

CapXon Aluminum Electrolytic Capacitor

Catalog 2011/2012

CapXon Catalog 2011/2012 Aluminum Electrolytic Capacitor



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Aluminum
RoHS Compliance Electrolytic
Capacitor

<http://www.capxongroup.com>

History

- 1980 Capxon Electronic Ind. Co., Ltd. established with manufacturing aluminum electrolytic capacitor.
- 1985 Bought a new building in Shi Chih Town, and started to invest automatic manufacturing machines.
- 1991 Pushed new products development and whole line automatic.
- 1993 Established Capxon Electronic (Shen Zhen) Co., Ltd. in Shen Zhen City, Guang Dong, China.
- 1995 ISO-9002 certification both in Taiwan Factory (No. 5437) and Shen Zhen Factory. (No.5969)
- 1996 Shen Zhen Factory increased manufacturing area to 10,000 m².
- 1997 Cooperated with Capxon Electronic Technology (Ren Hua) Co., Ltd. to be a partner for Aluminum foil formed in Ren Hua, China.
- 1998 Cooperated with Hill Source Electronic Co., Ltd. for lead wire in Shen Zhen, China.
- 1999 ISO-9001 certification in Shen Zhen Factory. (No.61316.).
- 2001 Started to produce SMD E. Cap. in Taiwan Factory.
ISO-9001 certification in Taiwan Factory, (No. 0101-2001-AQ-RGA-RvA.)
Established Capxon Electronics (Suzhou) Co., Ltd. in Suzhou City, Jiangsu, China.
- 2002 Shen Zhen Factory increased to 105,000 m².
Cooperated with Yichang Fengshuo Equipment Co., Ltd. for foil machine in Yichang City, Huhei, China.
Cooperated with Capxon Electronic Technology (Yichang Sanxia) Co., Ltd. for foil formed/etched in Yichang City, Hubei, China.
- 2003 Established Capxon Electronic (Shen-Zhen) Co., Ltd. Suzhou Branch in Suzhou City, Jiangsu, China.
Established Capxon Electronic (Shen-Zhen) Co., Ltd. Tian Jin Branch in Tian Jin City, China.
Got the Award of "Best Supplier" from LG.
- 2004 ISO-14001 certification in Shen Zhen Factory. (No.01404E10006R0S)
- 2004 Earned the "SQCI Certificate" from Samsung, to be the only one capacitor vender in Taiwan.
- 2005 2Q Set up V-chip and screw terminal production line in Shen Zhen Factory.
- 2006 Mass Production of Conductive Polymer Aluminum Electrolytic Capacitor
- 2007 Listed on Hong Kong Stock Exchange
- 2009 Established CapXon Europe GmbH in Germany

Quality Policy

We adhere to the tenet of "QUALITY FIRST", and offer satisfying products and service to the customer.

General Information

Established:	June 5, 1980	November 13, 1993
Capital:	NT\$600,000,000 (US\$19,354,839)	NT\$635,800,000 (US\$19,350,000)
	Taipei, Taiwan	Mainland China
Building:	2,500M ²	105,000M ²
Employees	QA = 10	300
	ENG = 5	125
	Other = 35	2650
	Total = 50	3075

Main Product: Aluminum Electrolytic Capacitor

ALUMINUM ELECTROLYTIC CAPACITORS

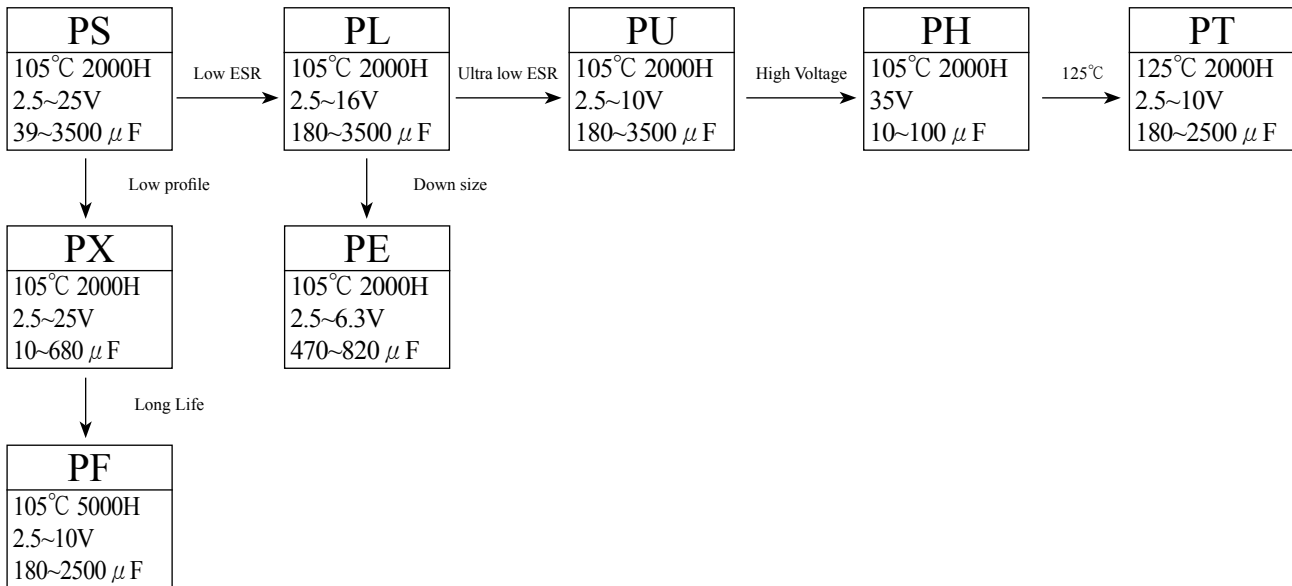
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Note:1.Specification and dimensions in this catalogue are subject to change without notice. If necessary, drawing can be provided.
2.Catalogue printed in July 2011.

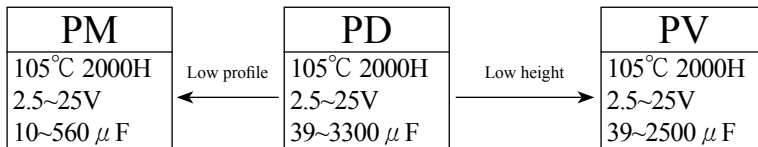
	Series Sleeve Color	Type	Features	Operating Temperature Range	Working Voltage	Capacitance	Leakage Current	Load Life Hrs	Page
Conductive Polymer	PL	Radial	Very low ESR	-55 to +105 °C	2.5~16V	180~3500μF	≤ 0.2CV	2000	23
	PS	Radial	Standard	-55 to +105 °C	2.5~25V	39~3500μF	≤ 0.2CV	2000	26
	PU	Radial	Ultra low ESR	-55 to +105 °C	2.5~10V	180~3500μF	≤ 0.2CV	2000	31
	PX	Radial	Low profile	-55 to +105 °C	2.5~25V	10~680μF	≤ 300μA	2000	34
	PE	Radial	Ultra low ESR, Down size to 6.3X8 (mm)	-55 to +105 °C	2.5~6.3V	470~820μF	≤ 0.2CV	2000	37
	PH	Radial	High Voltage/High Reliability	-55 to +105 °C	35V	10~100μF	≤ 0.2CV	2000	38
	PT	Radial	125 °C Guaranteed	-55 to +125 °C	2.5~10V	180~2500μF	≤ 0.2CV	2000	40
	PF	Radial	Long Life to 5,000Hours	-55 to +105 °C	2.5~10V	180~2500μF	≤ 0.2CV	5000	43
	PM	SMD	SMD & Low profile	-55 to +105 °C	2.5~25V	10~560μF	≤ 300μA	2000	46
	PD	SMD	SMD & Large capacitance	-55 to +105 °C	2.5~25V	39~3300μF	≤ 0.2CV	2000	49
	PV	SMD	SMD & Low height	-55 to +105 °C	2.5~25V	39~2500μF	≤ 0.2CV	2000	52
SMD type	EV	SMD	105 °C, Standard	-40 to +105 °C	6.3~50V	0.1~1500μF	0.01CV or 3μA	1000	55
	LV	SMD	85 °C, Standard	-40 to +85 °C	4~50V	0.1~1500μF	0.01CV or 3μA	2000	57
	HV	SMD	Wide temperature range	-40 to +105 °C	6.3~50V	0.1~1500μF	0.01CV or 3μA	2000	59
	JV	SMD	3000 hrs life	-40 to +105 °C	6.3~50V	0.1~1000μF	0.01CV or 3μA	3000	61
	MV	SMD	5000 hrs life	-40 to +105 °C	6.3~50V	0.1~1000μF	0.01CV or 3μA	5000	63
	NV	SMD	5.5 ~ 10.5mm height, Non-polar	-40 to +85 °C	6.3~50V	0.1~560μF	0.05CV or 10μA	2000	65
	KV	SMD	85 °C, Low leakage current	-40 to +85 °C	6.3~50V	0.1~330μF	0.002CV or 0.4μA	1000	67
	ZV	SMD	105 °C, Low impedance	-55 to +105 °C	6.3~50V	1~1500μF	0.01CV or 3μA	2000	69
	DV	SMD	105 °C, Low impedance	-55 to +105 °C	6.3~50V	1~1500μF	I≤ 0.01CV or 3μA	2000	71
	RV	SMD	105 °C, Low impedance, LongLife	-55 to +105 °C	6.3~50V	1~3300μF	I≤ 0.01CV or 3μA	2000 ~ 5000	73
	TV	SMD	125 °C	-40 to +125 °C	10~50V	10~330μF	0.03CV or 4μA	1000 ~ 2000	75
Ultra-miniature type	SS	Radial	5mm, Standard, 85 °C	-40 to +85 °C	4~50V	0.1~330μF	0.01CV or 3μA	1000	77
	ST	Radial	5mm, Standard, 105 °C	-40 to +105 °C	4~50V	0.1~100μF	0.01CV or 3μA	1000	79
	SA	Radial	5mm, Low leakage current	-40 to +85 °C	4~50V	0.1~100μF	0.002CV or 0.4μA	1000	81
	SP	Radial	5mm, Non-polar	-40 to +85 °C	6.3~50V	0.1~47μF	0.05CV or 10μA	1000	83
	SM	Radial	7mm, Standard, 85 °C	-40 to +85 °C	4~63V	0.1~470μF	0.01CV or 3μA	1000	85
	SH	Radial	7mm, 85 °C, Long life	-40 to +85 °C	4~63V	0.1~470μF	0.01CV or 3μA	2000	87
	SK	Radial	7mm, Standard, 105 °C	-40 to +105 °C	4~63V	0.1~470μF	0.01CV or 3μA	1000	89
	SJ	Radial	7mm, 105 °C, Long life	-40 to +105 °C	6.3~63V	0.1~220μF	0.01CV or 3μA	2000	91
	SL	Radial	7mm, Low leakage current, 85 °C	-40 to +85 °C	6.3~50V	0.1~220μF	0.002CV or 0.4μA	1000	93
	SD	Radial	7mm, Low leakage current, 105 °C	-40 to +105 °C	4~63V	0.1~100μF	0.002CV or 0.4μA	1000	95
	SN	Radial	7~ 9mm, Non-polar, 85 °C	-40 to +85 °C	6.3~50V	0.1~220μF	0.05CV or 10μA	1000	97
	SB	Radial	7mm, Non-polar, 105 °C	-40 to +105 °C	6.3~50V	0.1~100μF	0.05CV or 10μA	1000	99
	SZ	Radial	7mm, Low impedance	-55 to +105 °C	6.3~35V	6.8~330μF	0.01CV or 3μA	1000	101
	SY	Radial	7mm, Low impedance, Long life	-55 to +105 °C	6.3~50V	1~330μF	0.01CV or 3μA	2000	103
Standard type	GS (GR)	Radial	General purpose, 85 °C	-40 to +85 °C -25 to +85 °C	6.3~100V 160~450V	0.1~33000μF 0.47~470μF	0.01CV or 3μA 0.03CV	2000	105
	GW	Radial	9~25mm height low profile, 85 °C	-40 to +85 °C -25 to +85 °C	6.3~100V 160~450V	2.2~10000μF 2.2~220μF	0.01CV or 3μA 0.04CV + 100μA	2000	109
	KM	Radial	Standard, 105 °C	-40 to +105 °C -25 to +105 °C	6.3~100V 160~450V	0.1~22000μF 0.47~470μF	0.01CV or 3μA 0.03CV	2000	111
	KW	Radial	9~25mm height low profile, 105 °C	-40 to +105 °C -25 to +105 °C	6.3~100V 160~450V	2.2~10000μF 1.5~220μF	0.01CV or 3μA 0.04CV + 100μA	2000	115
	LL	Radial	Low leakage current	-40 to +105 °C	6.3~63V	0.1~2200μF	0.002CV or 0.4μA	2000	117
Low Impedance / ESR type	GL	Radial	Low impedance and Low ESR Miniaturized	-55 to +105 °C	6.3~63V	0.47~10000μF	0.01CV or 3μA	2000 ~ 6000	119
	KF	Radial	Low impedance for power supply	-40 to +105 °C -25 to +105 °C	6.3~100V 160~450V	0.47~15000μF 0.47~220μF	0.01CV or 3μA 0.03CV	2000 ~ 5000	122
	KZ	Radial	Low impedance	-40 to +105 °C	6.3~50V	0.47~6800μF	0.01CV or 3μA	1000 ~ 2000	127
	GF	Radial	Low impedance	-55 to +105 °C	6.3V~100V	4.7~6800μF	0.01CV or 3μA	2000 ~ 5000	130
	LZ	Radial	Ultra low ESR and High ripple current	-40 to +105 °C	6.3~25V	220~3300μF	0.01CV or 3μA	2000	135
	GH	Radial	High temperature and Long life	-55 to +105 °C	6.3~50V	0.47~6800μF	0.01CV or 3μA	3000 ~ 10000	137

	Series Sleeve Color	Type	Features	Operating Temperature Range	Working Voltage	Capacitance	Leakage Current	Load Life Hrs	Page
High reliability type	FH	Radial	Ultra Low ESR and Long Life	-40 to +105 °C	6.3V~100V	22~5600μF	0.01CV or 3μA	4000 ~ 10000	140
	KL	Radial	Long life 5,000 hrs	-25 to +105 °C	160~450V	10~220μF	0.04CV + 100μA	5000	144
	KH	Radial	Long life 5,000~10,000 hrs	-40 to +105 °C -25 to +105 °C	10~50V 160~450V	6.8~3300μF 6.8~220μF	0.01CV or 3μA 0.04CV + 100μA	5000 ~ 10000	146
	TH	Radial	For high temperature +125 °C	-40 to +125 °C -25 to +125 °C	10~100V 160~350V	0.47~1000μF 1~100μF	0.01CV or 3μA 0.02CVμA	1000 ~ 2000	148
	TE	Radial	For high temperature +130 °C	-40 to +130 °C	10~50V	3.3~4700μF	0.01CV or 3μA	2000 ~ 3000	150
	KS	Radial	Over voltage vent operating facility	-25 to +105 °C	200,400WV	4.7~470μF	0.03CV	2000	152
	FK	Radial	Long life for ballast	-25 to +105 °C	160~450WV	1~330μF	0.04CV+100μA	6000 ~ 8000	154
	FL	Radial	Long life for ballast	-25 to +105 °C	160~450WV	1~330μF	0.04CV+100μA	8000 ~ 10000	156
	KY	Radial	Slim type	-25 to +105 °C	250~450WV	10~150μF	$I \leq 3 \sqrt{CV}$	2000	158
	LY	Radial	Slim type, longlife 5000hrs	-25 to +105 °C	250~450WV	10~150μF	$I \leq 3 \sqrt{CV}$	5000	160
	HY	Radial	Slim type, longlife 10000hrs	-25 to +105 °C	250~450WV	12~120μF	$I \leq 3 \sqrt{CV}$	10000	162
Non/Bi polarized type	NP	Radial	Non-polarized, 85 °C	-40 to +85 °C -25 to +85 °C	6.3~100V 160~250V	0.47~3300μF 0.47~47μF	0.03CV or 3μA	2000	164
	NK	Radial	Non-polarized, 105 °C	-40 to +105 °C -25 to +105 °C	6.3~100V 160~250V	0.47~3300μF 0.47~47μF	0.03CV or 3μA	2000	166
	BP	Radial	Bi-polarized	-40 to +105 °C	25/50/63V	2.2~15μF	100μA	2000	168
For Audio Equipment	SW	Radial	5mm height, for audio equipment	-40 to +85 °C	4~50V	0.1~470μF	0.01CV or 3μA	1000	170
	SR	Radial	7mm height, for audio equipment	-40 to +85 °C	6.3~50V	0.1~220μF	0.01CV or 3μA	1000	172
	RW	Radial	Standard, for audio equipment	-40 to +85 °C	6.3~100V	0.1~33,000μF	0.01CV or 3μA	2000	174
	NR	Radial	Non-polar, for audio equipment	-40 to +85 °C	6.3~100V	0.47~1,000μF	0.03CV or 3μA	2000	176
	LR	Snap-in	85 °C, for audio equipment	-40 to +85 °C	16~100V	680~33,000μF	0.02CVμA	2000	178
Large can type	LP	Snap-in	85 °C, Standard	-40 to +85 °C -25 to +85 °C	10~100V 160~450V	470~68000μF 47~2700μF	0.02CVμA	2000	183
	LS	Snap-in	85 °C, Miniaturized	-25 to +85 °C	160~450V	47~2700μF	0.02CVμA	2000	187
	LU	Snap-in	85 °C, Longlife 3000hrs	-40 to +85 °C -25 to +85 °C	16~100V 160~450V	820~47000μF 56~2700μF	$I \leq 3 \sqrt{CV}$	3000	190
	HP	Snap-in	105 °C, Standard	-40 to +105 °C -25 to +105 °C	10~100V 160~450V	330~68000μF 33~2200μF	0.02CVμA	2000	194
	HS	Snap-in	105 °C, Miniaturized	-25 to +105 °C	160~450V	33~2700μF	0.02CVμA	2000	198
	HW	Snap-in	105 °C, Low Profile 15mm height	-25 to +105 °C	160~400V	39~390μF	$I \leq 3 \sqrt{CV}$	3000	201
	HU	Snap-in	105 °C, Longlife 3000hrs	-40 to +105 °C -25 to +105 °C	16~100V 160~450V	560~47000μF 47~2700μF	$I \leq 3 \sqrt{CV}$	3000	203
	HL	Snap-in	Long life with low ESR	-40 to +105 °C -25 to +105 °C	10~100V 160~400V	560~47000μF 56~1500μF	0.02CVμA	5000	207
	LT	Snap-in	4 Snap-in terminals type	-40 to +85 °C -25 to +85 °C	16~100V 160~450V	4700~82000μF 330~3300μF	0.02CVμA	2000	212
	HT	Snap-in	4 Snap-in terminals type	-25 to +105 °C	160~400V	82~1200μF	0.02CVμA	2000	214
Photo flash type	RF	Radial	Photo flash equipment	-20 to +55 °C	330/350V	100~450μF	1XCμA	5000times	216
	SF	Snap-in	Photo flash equipment	-20 to +55 °C	330/350V	150~1500μF	1XCμA	5000times	217
Screw large can type	RS	Screw	General	-40~85 °C	16~100V	3300~1000000μF	$\leq 0.3\mu A * (C*V)^{0.7} + 4\mu A$	2000	235
	RG	Screw	Standard	-25~85 °C	160~450V	680~68000μF	$\leq 0.3\mu A * (C*V)^{0.7} + 4\mu A$	2000	238
	RP	Screw	Long useful life 10000hrs	-25~85 °C	160~450V	680~68000μF	$\leq 0.3\mu A * (C*V)^{0.7} + 4\mu A$	2000	243
	RU	Screw	Long useful life 12000hrs high ripple current	-25~85 °C	350~450V	1000~22000μF	$\leq 0.3\mu A * (C*V)^{0.7} + 4\mu A$	2000	248
	RJ	Screw	Long useful life 10000hrs	-25~85 °C	350~450V	1500~22000μF	$\leq 0.3\mu A * (C*V)^{0.7} + 4\mu A$	2000	252
	RY	Screw	Long useful life 12000hrs high ripple current	-25~85 °C	350~450V	1500~22000μF	$\leq 0.3\mu A * (C*V)^{0.7} + 4\mu A$	2000	256
	RK	Screw	General	-40~105 °C	16~100V	1500~1000000μF	$\leq 0.3\mu A * (C*V)^{0.7} + 4\mu A$	2000	260
	RL	Screw	Long load life	-25~105 °C	350~450V	680~15000μF	$\leq 0.3\mu A * (C*V)^{0.7} + 4\mu A$	5000	263
	RM	Screw	Long useful life 6000hrs	-25~105 °C	160~450V	220~47000μF	$\leq 0.3\mu A * (C*V)^{0.7} + 4\mu A$	2000	266
	RH	Screw	Long useful life 8000hrs high ripple current	-25~105 °C	160~450V	220~47000μF	$\leq 0.3\mu A * (C*V)^{0.7} + 4\mu A$	2000	270
	RQ	Screw	Long useful life 6000hrs	-25~105 °C	160~450V	2200~47000μF	$\leq 0.3\mu A * (C*V)^{0.7} + 4\mu A$	2000	274
	RT	Screw	Long useful life 8000hrs high ripple current	-25~105 °C	160~450V	2200~47000μF	$\leq 0.3\mu A * (C*V)^{0.7} + 4\mu A$	2000	278

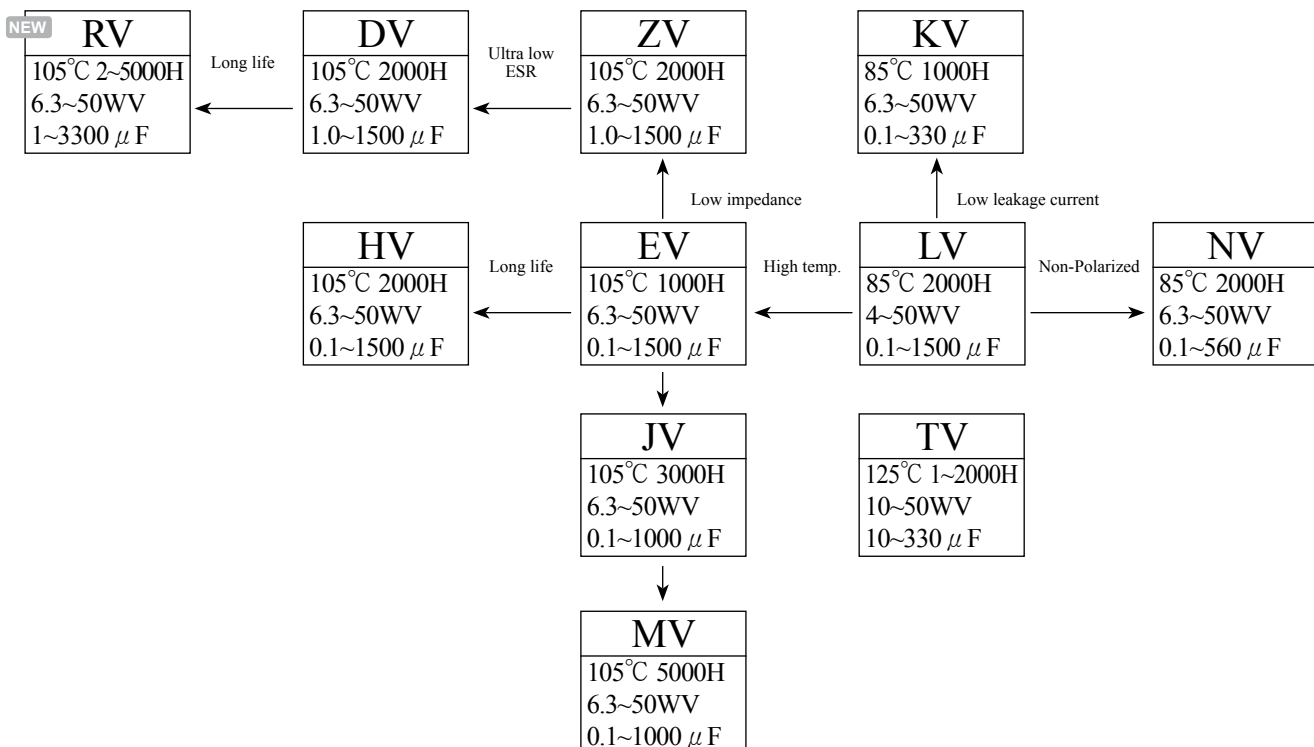
Conductive Polymer AL.E. Capacitors Radial type



Conductive Polymer AL.E. Capacitors SMD type



Aluminum Electrolytic Capacitors SMD type

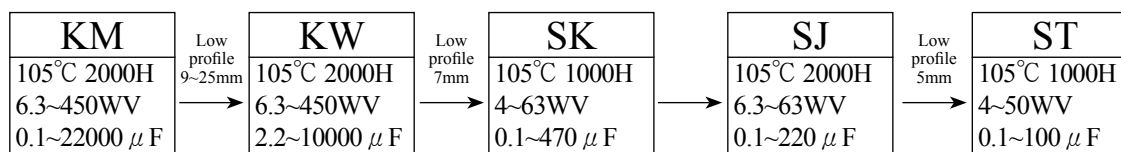
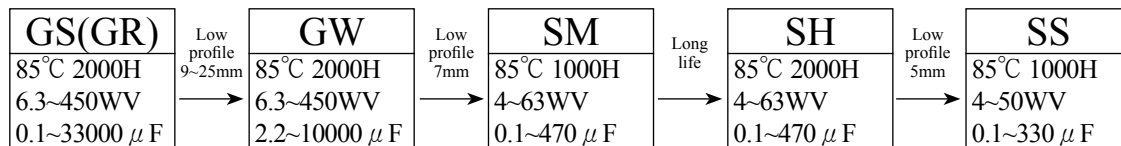


Aluminum Electrolytic Capacitors Radial type

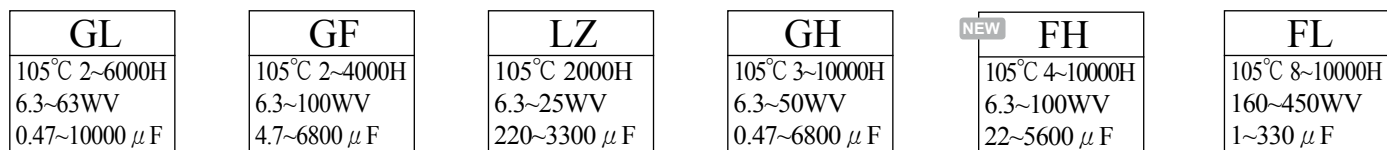
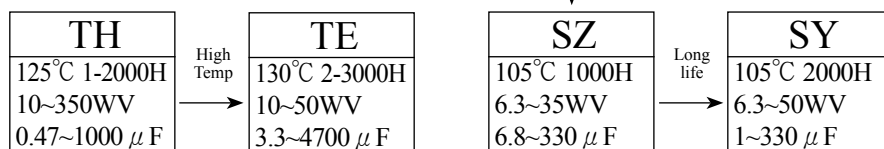
(Miniature)

(High temperature)

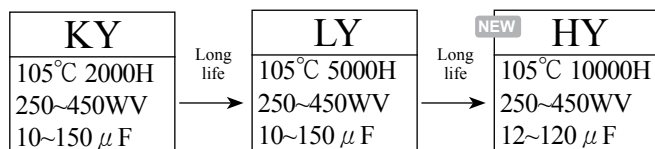
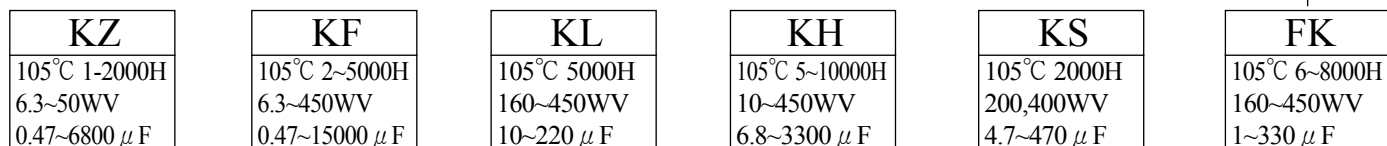
(High Reliability)



Low ESR

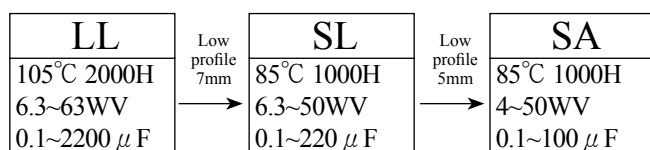


Long life

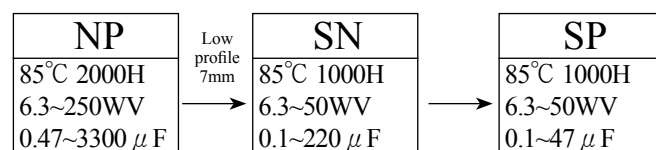
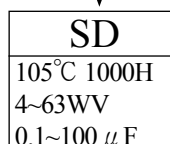


(Low Leakage Current)

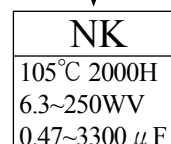
(Non/Bi-Polar)



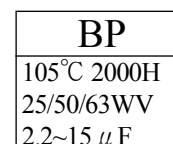
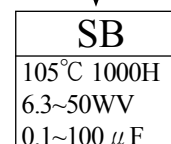
High temp.



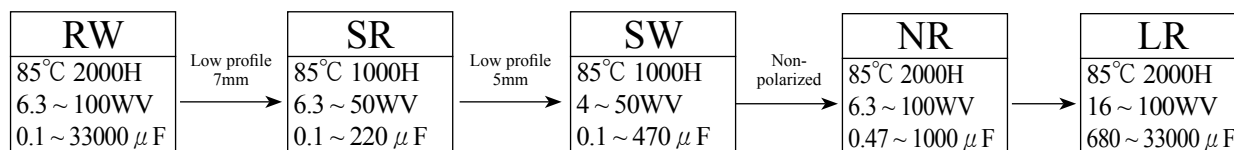
High temp.



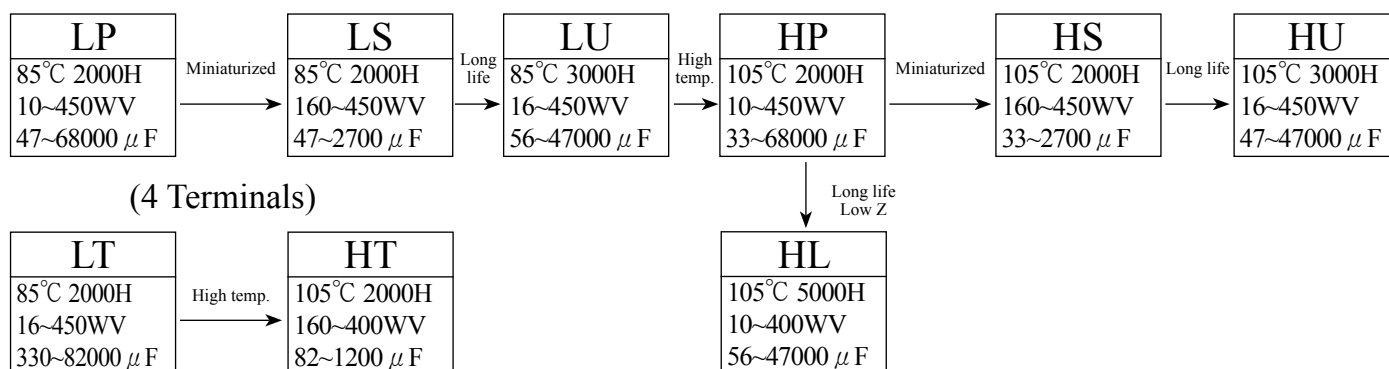
Low profile
5mm



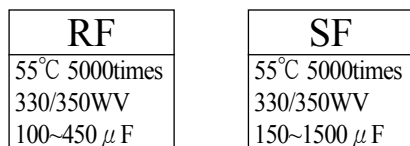
Aluminum Electrolytic Capacitors For audio equipment



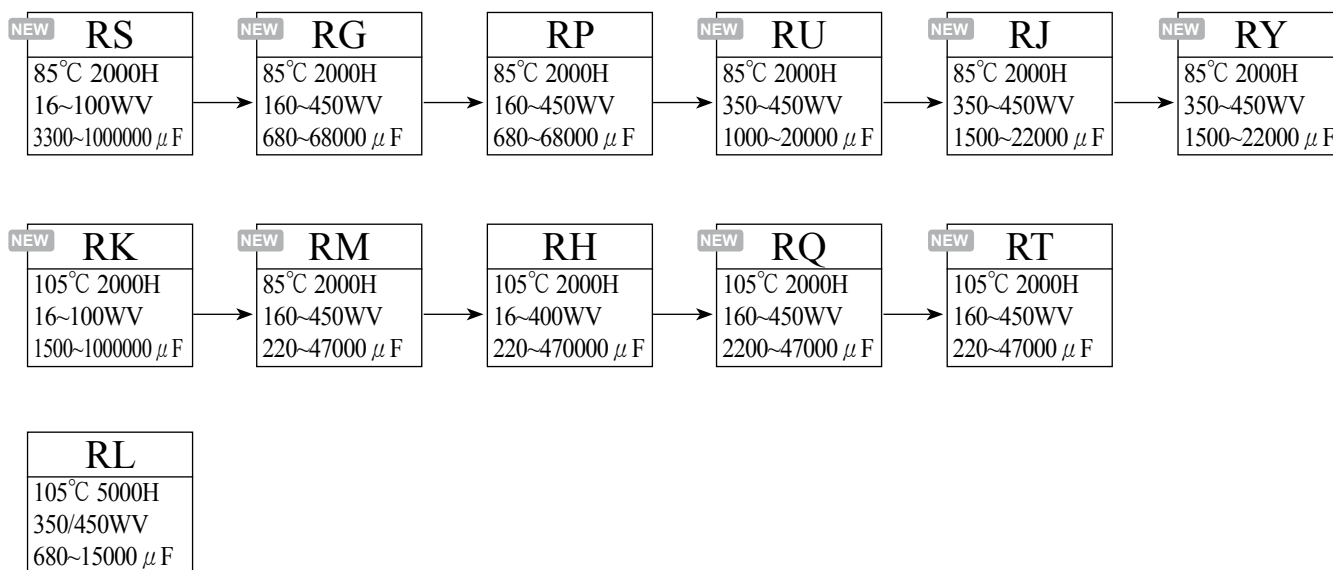
Aluminum Electrolytic Capacitors Snap-in type

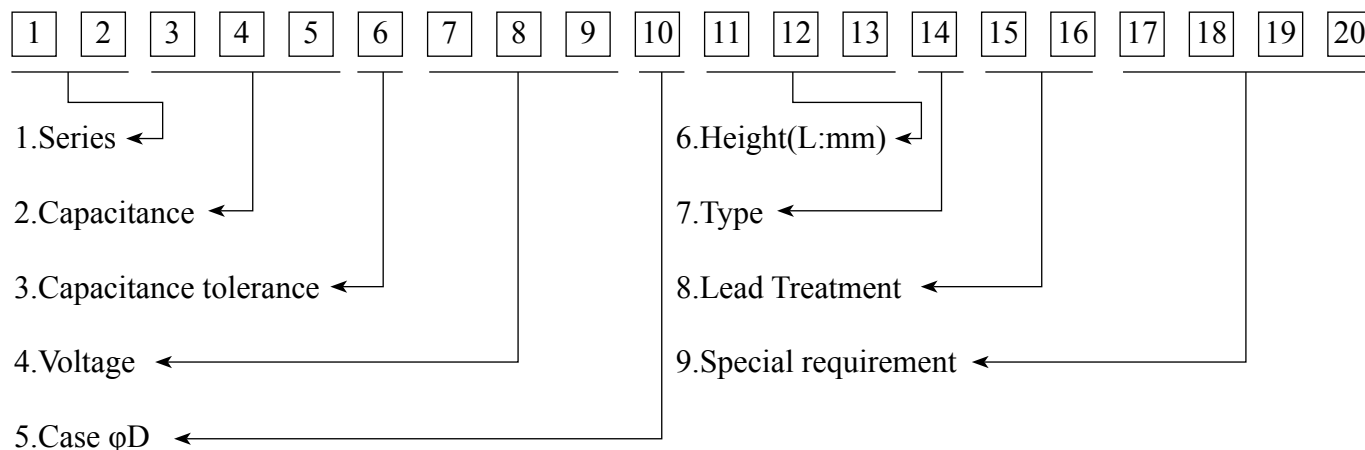


Aluminum Electrolytic Capacitors Photo flash type



Aluminum Electrolytic Capacitors Screw type





(1) Series

For the details, please refer to "List of the Products" on page3.

(2) Capacitance

Capacitance is shown in microfarads(uF)

μF	0.1	0.47	1	4.7	10	100	1000	10000
Code	oR1	R47	010	4R7	100	101	102	103

(3) Capacitance tolerance

Tolerance%	±5	±10	±20	±30	-10to+30	-10to+50	-10to+20	-10to100	0to+20	-30to+0	±15
Code	H	K	M	N	Q	T	V	W	Z	U	S
Tolerance%	0to+30	0to+40	0to+50	-5to+20	-8to+5	+5to+20	0to-20	-15to+20	-25to+20	-50to+0	-5to+30
Code	Y	X	A	J	E	I	B	P	L	O	C

(4) Voltage(W.V)

Voltage(W.V)	6.3	10	16	25	35	50	63	80	100	160	200	220	250	350	400	420	450	500
Code	6R3	010	016	025	035	050	063	080	100	160	200	220	250	350	400	420	450	500

(5) Case(φD)

Diameter	3	4	5	6.3	8	10	12	12.5	13	14.5	16	18	20	22	25	30	35	40	42	45	51	63.5	76.2	89	100
Code	A	B	C	E	F	G	H	Z	I	Y	J	K	L	M	N	O	P	Q	U	V	R	S	T	X	D

(6) Height(L:mm)

Height	5	7.5	11	11.5	12	12.5	16	21	25	26	25.5	31.5	35	35.5	41	47	52	83	98	118	141	151	230
Code	050	075	110	115	120	125	160	210	250	260	255	315	350	355	410	470	520	830	980	A18	A41	A51	B30

(7) Type

Type	Without Lead Treatment	With Lead Treatment	Polymer
Code	A	E	P

(8) Lead Treatment

For the details, please refer to page10-14.

(9) Special & appearance requirement (The 17th, 18th, 19th, 20th code)

Code	Special
A	Terminal
B	Rubber
C	Lead wire
D	DF
E	Electrolyte
F	Pitch
G	Fill glue
H	Height requirement

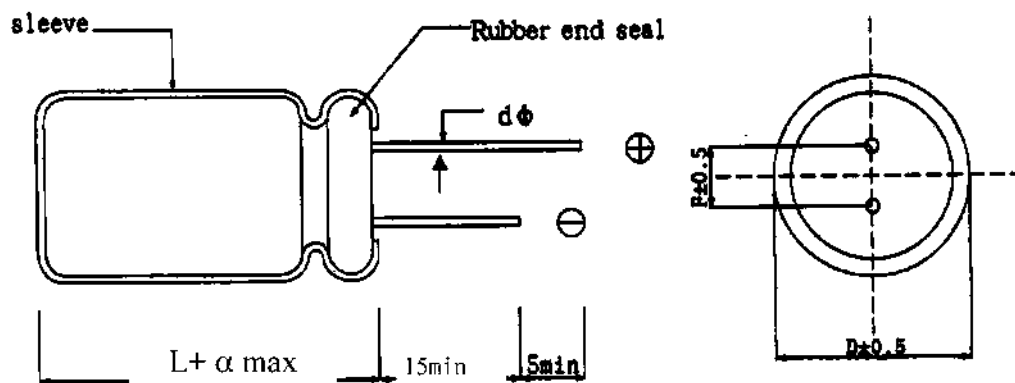
Code	Special
I	LC
K	Vent line
L	Life
N	Nude
P	Sleeve, tray, print, PVC sleeve
Q	Capacitance, Cv, Break
R	Ripple current
S	Countermeasure

Code	Special
T	Temperature characteristic
V	Vt, Electrolyte paper
M	solder, technics, form
Y	Case with snail, clip loop
Z	Impedance
U	Package& Label

Remark:

1. If it's without lead treatment & special requirement, the 14th code is blank
2. If it's with lead treatment & without require special requirement, the 17th 18th 19th 20th code is blank
3. If it's without lead treatment, but, with special requirement, the 15th 16th code filled with 0.
4. If it's without lead treatment, but with special requirement, also exceed 4 kinds, keystone characteristic is 4code.
5. If it's with lead treatment, but with 1 special requirement, only remark 17 code, latter three code is blank.
6. If it's with led treatment, but with 1 special requirement, and it is different from former data, the 17th is 0, the 18th code is characteristic.

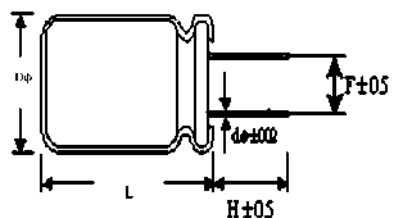
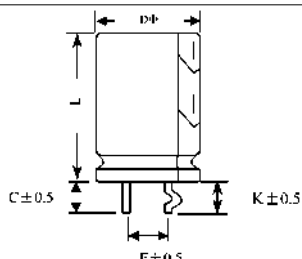
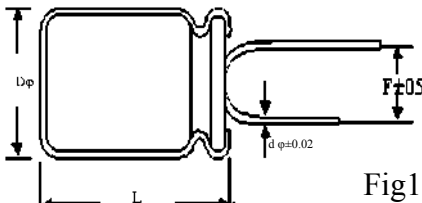
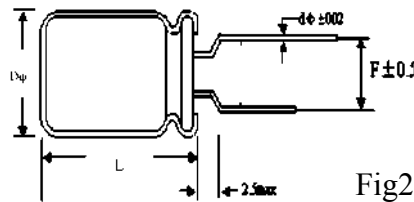
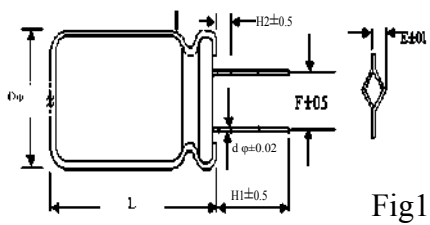
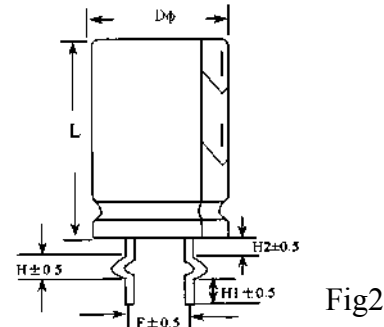
Standard

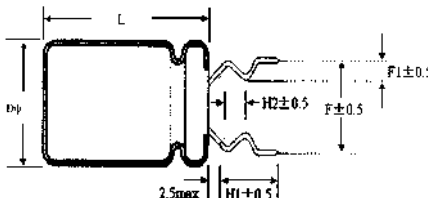
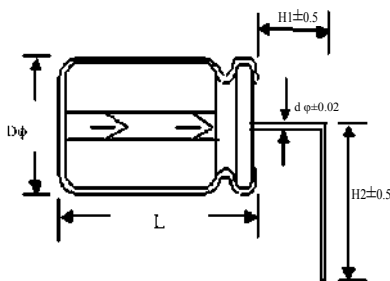
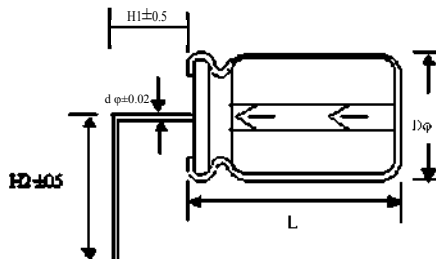
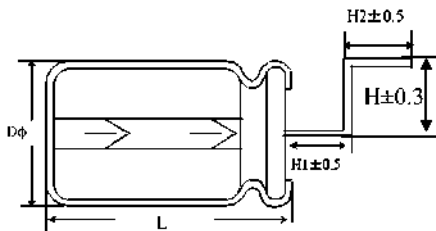
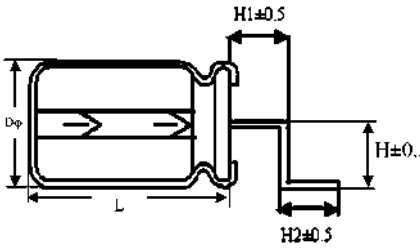


Dφ	3	4	5	6.3	8	10	13	16	18	20	22	25
					L < 20	L ≥ 20						
F	1.0	1.5	2.0	2.5	3.5		5.0	7.5		10		12.5
dφ	0.4	0.45	0.5		0.6		0.6	0.8				1.0

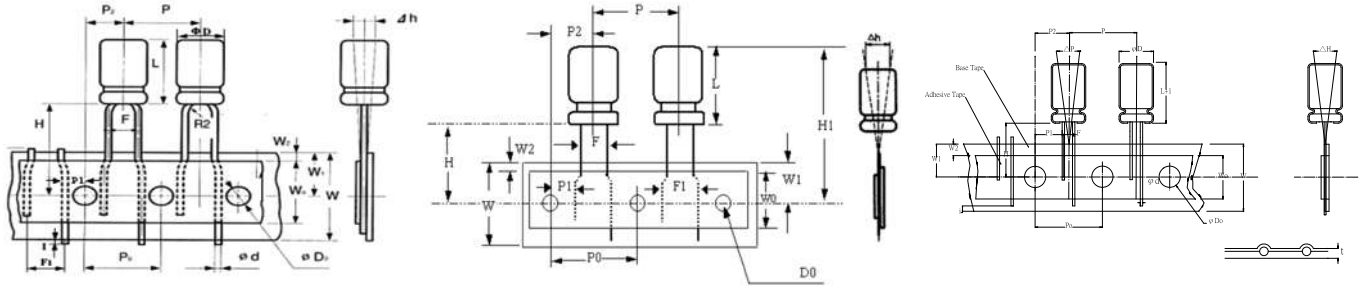
Cutting & Forming

Part No. Code (15th, 16th)	Cutting & Forming	Size (mm)																						
CF	Fig1	<table><tr><td>Dφ</td><td>4</td><td>5</td></tr><tr><td>F</td><td>2</td><td>2.5</td></tr></table>	Dφ	4	5	F	2	2.5																
	Dφ	4	5																					
F	2	2.5																						
	Fig2	<table><tr><td>Dφ</td><td>4</td><td>4</td><td>4</td><td>5</td><td>5</td><td>6.3</td><td>6.3</td><td>8</td><td>10</td><td>13</td></tr><tr><td>F</td><td>2.5</td><td>3.5</td><td>5</td><td>3.5</td><td>5</td><td>3.5</td><td>5</td><td>5</td><td>7.5</td><td>7.5</td></tr></table>	Dφ	4	4	4	5	5	6.3	6.3	8	10	13	F	2.5	3.5	5	3.5	5	3.5	5	5	7.5	7.5
Dφ	4	4	4	5	5	6.3	6.3	8	10	13														
F	2.5	3.5	5	3.5	5	3.5	5	5	7.5	7.5														
KF	Fig1	<table><tr><td>Dφ</td><td>4</td><td>5</td></tr><tr><td>F</td><td>2</td><td>2.5</td></tr><tr><td>E</td><td>1.12</td><td>1.12</td></tr><tr><td>H1</td><td>4</td><td>4</td></tr><tr><td>H2</td><td>1.8</td><td>1.8</td></tr></table>	Dφ	4	5	F	2	2.5	E	1.12	1.12	H1	4	4	H2	1.8	1.8							
	Dφ	4	5																					
F	2	2.5																						
E	1.12	1.12																						
H1	4	4																						
H2	1.8	1.8																						
	Fig2	<table><tr><td>Dφ</td><td>5</td><td>6.3</td><td>8</td></tr><tr><td>F</td><td>5</td><td>5</td><td>5</td></tr><tr><td>E</td><td>1.12</td><td>1.12</td><td>1.32</td></tr><tr><td>H1</td><td>4</td><td>4</td><td>4</td></tr><tr><td>H2</td><td>1.8</td><td>1.8</td><td>1.8</td></tr></table>	Dφ	5	6.3	8	F	5	5	5	E	1.12	1.12	1.32	H1	4	4	4	H2	1.8	1.8	1.8		
Dφ	5	6.3	8																					
F	5	5	5																					
E	1.12	1.12	1.32																					
H1	4	4	4																					
H2	1.8	1.8	1.8																					

Part No. Code (15th, 16th)	Cutting & Forming	Size (mm)																																																																											
CA		<table><tr><td>Dφ</td><td>4</td><td>5</td><td>6.3</td><td>8</td><td>10</td><td>13</td><td>16</td><td>18</td><td>22</td><td>25</td></tr><tr><td>F</td><td>1.5</td><td>2</td><td>2.5</td><td>3.5</td><td>5</td><td>5</td><td>7.5</td><td>7.5</td><td>10</td><td>12.5</td></tr></table>	Dφ	4	5	6.3	8	10	13	16	18	22	25	F	1.5	2	2.5	3.5	5	5	7.5	7.5	10	12.5																																																					
Dφ	4	5	6.3	8	10	13	16	18	22	25																																																																			
F	1.5	2	2.5	3.5	5	5	7.5	7.5	10	12.5																																																																			
CK		<table><tr><td>Dφ</td><td>4</td><td>5</td><td>6.3</td><td>8</td><td>10</td><td>13</td><td>16</td><td>18</td></tr><tr><td>F</td><td>1.5</td><td>2</td><td>2.5</td><td>3.5</td><td>5</td><td>5</td><td>7.5</td><td>7.5</td></tr><tr><td>C</td><td>4</td><td>4</td><td>4</td><td>4</td><td>4.5</td><td>4.5</td><td>4.5</td><td>4.5</td></tr><tr><td>K</td><td>4</td><td>4</td><td>4</td><td>4</td><td>4.5</td><td>4.5</td><td>4.5</td><td>4.5</td></tr></table>	Dφ	4	5	6.3	8	10	13	16	18	F	1.5	2	2.5	3.5	5	5	7.5	7.5	C	4	4	4	4	4.5	4.5	4.5	4.5	K	4	4	4	4	4.5	4.5	4.5	4.5																																							
Dφ	4	5	6.3	8	10	13	16	18																																																																					
F	1.5	2	2.5	3.5	5	5	7.5	7.5																																																																					
C	4	4	4	4	4.5	4.5	4.5	4.5																																																																					
K	4	4	4	4	4.5	4.5	4.5	4.5																																																																					
FA	 Fig1  Fig2	Fig1 <table><tr><td>Dφ</td><td>4</td><td>5</td></tr><tr><td>F</td><td>2</td><td>2.5</td></tr></table> Fig2 <table><tr><td>Dφ</td><td>4</td><td>4</td><td>4</td><td>5</td><td>5</td><td>6.3</td><td>6.3</td><td>8</td><td>10</td><td>13</td></tr><tr><td>F</td><td>2.5</td><td>3.5</td><td>5</td><td>3.5</td><td>5</td><td>3.5</td><td>5</td><td>5</td><td>7.5</td><td>7.5</td></tr></table>	Dφ	4	5	F	2	2.5	Dφ	4	4	4	5	5	6.3	6.3	8	10	13	F	2.5	3.5	5	3.5	5	3.5	5	5	7.5	7.5																																															
Dφ	4	5																																																																											
F	2	2.5																																																																											
Dφ	4	4	4	5	5	6.3	6.3	8	10	13																																																																			
F	2.5	3.5	5	3.5	5	3.5	5	5	7.5	7.5																																																																			
KA	 Fig1  Fig2	Fig1 <table><tr><td>Dφ</td><td>5</td><td>6.3</td><td>8</td><td>10</td><td>13</td><td>16</td><td>18</td><td>22</td></tr><tr><td>F</td><td>2</td><td>2.5</td><td>3.5</td><td>5</td><td>5</td><td>7.5</td><td>7.5</td><td>10</td></tr><tr><td>E</td><td>1.12</td><td>1.12</td><td>1.32</td><td>1.32</td><td>1.32</td><td>1.32</td><td>1.32</td><td>1.82</td></tr><tr><td>H1</td><td>4</td><td>4</td><td>4</td><td>4.5</td><td>4.5</td><td>4.5</td><td>4.5</td><td>4.5</td></tr><tr><td>H2</td><td>1.8</td><td>1.8</td><td>1.8</td><td>1.8</td><td>1.8</td><td>1.8</td><td>1.8</td><td>1.8</td></tr></table> Fig2 <table><tr><td>Dφ</td><td>10</td><td>13</td><td>16</td><td>18</td><td>22</td></tr><tr><td>F</td><td>5</td><td>5</td><td>7.5</td><td>7.5</td><td>10</td></tr><tr><td>H</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>H1</td><td>4</td><td>4</td><td>4</td><td>4.5</td><td>4.5</td></tr><tr><td>H2</td><td>1.8</td><td>1.8</td><td>1.8</td><td>1.8</td><td>1.8</td></tr></table>	Dφ	5	6.3	8	10	13	16	18	22	F	2	2.5	3.5	5	5	7.5	7.5	10	E	1.12	1.12	1.32	1.32	1.32	1.32	1.32	1.82	H1	4	4	4	4.5	4.5	4.5	4.5	4.5	H2	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	Dφ	10	13	16	18	22	F	5	5	7.5	7.5	10	H	2	2	2	2	2	H1	4	4	4	4.5	4.5	H2	1.8	1.8	1.8	1.8	1.8
Dφ	5	6.3	8	10	13	16	18	22																																																																					
F	2	2.5	3.5	5	5	7.5	7.5	10																																																																					
E	1.12	1.12	1.32	1.32	1.32	1.32	1.32	1.82																																																																					
H1	4	4	4	4.5	4.5	4.5	4.5	4.5																																																																					
H2	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8																																																																					
Dφ	10	13	16	18	22																																																																								
F	5	5	7.5	7.5	10																																																																								
H	2	2	2	2	2																																																																								
H1	4	4	4	4.5	4.5																																																																								
H2	1.8	1.8	1.8	1.8	1.8																																																																								

Part No. Code (15th, 16th)	Cutting & Forming	Size (mm)																																	
EF		<table><tr><td>Dφ</td><td>4</td><td>5</td><td>6.3</td><td>8</td></tr><tr><td>F</td><td>5</td><td>5</td><td>5</td><td>5</td></tr><tr><td>F1</td><td>1.2</td><td>1.2</td><td>1.2</td><td>1.2</td></tr><tr><td>H1</td><td>4</td><td>4</td><td>4</td><td>4</td></tr><tr><td>H2</td><td>1.8</td><td>1.8</td><td>1.8</td><td>1.8</td></tr></table>	Dφ	4	5	6.3	8	F	5	5	5	5	F1	1.2	1.2	1.2	1.2	H1	4	4	4	4	H2	1.8	1.8	1.8	1.8								
Dφ	4	5	6.3	8																															
F	5	5	5	5																															
F1	1.2	1.2	1.2	1.2																															
H1	4	4	4	4																															
H2	1.8	1.8	1.8	1.8																															
CR		<table><tr><td>Dφ</td><td>4</td><td>5</td><td>6.3</td><td>8</td><td>10</td><td>13</td><td>16</td><td>18</td><td>22</td><td>25</td></tr><tr><td>F</td><td>1.5</td><td>2</td><td>2.5</td><td>3.5</td><td>5</td><td>5</td><td>7.5</td><td>7.5</td><td>10</td><td>12.5</td></tr><tr><td>H1</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td></tr></table>	Dφ	4	5	6.3	8	10	13	16	18	22	25	F	1.5	2	2.5	3.5	5	5	7.5	7.5	10	12.5	H1	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Dφ	4	5	6.3	8	10	13	16	18	22	25																									
F	1.5	2	2.5	3.5	5	5	7.5	7.5	10	12.5																									
H1	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5																									
CL		<table><tr><td>Dφ</td><td>4</td><td>5</td><td>6.3</td><td>8</td><td>10</td><td>13</td><td>16</td><td>18</td><td>22</td><td>25</td></tr><tr><td>F</td><td>1.5</td><td>2</td><td>2.5</td><td>3.5</td><td>5</td><td>5</td><td>7.5</td><td>7.5</td><td>10</td><td>12.5</td></tr><tr><td>H1</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td><td>2.5</td></tr></table>	Dφ	4	5	6.3	8	10	13	16	18	22	25	F	1.5	2	2.5	3.5	5	5	7.5	7.5	10	12.5	H1	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Dφ	4	5	6.3	8	10	13	16	18	22	25																									
F	1.5	2	2.5	3.5	5	5	7.5	7.5	10	12.5																									
H1	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5																									
CS		<table><tr><td>Dφ</td><td>4</td><td>5</td><td>6.3</td><td>8</td><td>10</td><td>13</td><td>16</td><td>18</td><td>22</td><td>25</td></tr><tr><td>F</td><td>1.5</td><td>2</td><td>2.5</td><td>3.5</td><td>5</td><td>5</td><td>7.5</td><td>7.5</td><td>10</td><td>12.5</td></tr></table>	Dφ	4	5	6.3	8	10	13	16	18	22	25	F	1.5	2	2.5	3.5	5	5	7.5	7.5	10	12.5											
Dφ	4	5	6.3	8	10	13	16	18	22	25																									
F	1.5	2	2.5	3.5	5	5	7.5	7.5	10	12.5																									
CZ		<table><tr><td>Dφ</td><td>4</td><td>5</td><td>6.3</td><td>8</td><td>10</td><td>13</td><td>16</td><td>18</td><td>22</td><td>25</td></tr><tr><td>F</td><td>1.5</td><td>2</td><td>2.5</td><td>3.5</td><td>5</td><td>5</td><td>7.5</td><td>7.5</td><td>10</td><td>12.5</td></tr></table>	Dφ	4	5	6.3	8	10	13	16	18	22	25	F	1.5	2	2.5	3.5	5	5	7.5	7.5	10	12.5											
Dφ	4	5	6.3	8	10	13	16	18	22	25																									
F	1.5	2	2.5	3.5	5	5	7.5	7.5	10	12.5																									

Taping



T-1: Straight(3φ-5φ)

T-2: Straight(4φ-6.3φ)

T-3: Straight(8φ-13φ)

Specification Information

T-1: Straight(3φ-5φ)

Code	D	L	d	P	P0	P1	P2	F	F1	W	W0	W1	W2	H	D0	I	Δh	P/N code 15th,16th	Fig
Tol.	±0.5	Max	±0.02	±1.0	±0.2	±0.7	±1.3	$\frac{0.4}{-0.2}$	0.5	±0.5	Min	±0.5	Max	$\frac{0.75}{-0.5}$	±0.2	Max	Max		
Item	3	5(+1)	0.4	12.7	12.7	4.6	6.35	$\frac{2}{2.5}$	3.5	18	11	9	1.5	18.5	4.1	0	1	TB	T-1
	4	5-7(+1)	0.45	12.7	12.7	4.6	6.35	$\frac{2}{2.5}$	3.5	18	11	9	1.5	18.5	4.1	0	1	TC	
	5	5-7(+1)	0.45	12.7	12.7	4.6	6.35	2.5	3.5	18	11	9	1.5	18.5	4.1	0	1	TB	
		9-15(+1.5)	0.5															TC	

T-2: Straight(4φ-6.3φ)

Code	D	L	d	P	P0	P1	P2	F	F1	W	W0	W1	W2	H	D0	Δh	P/N code 15th,16th	Fig	
Tol.	±0.5	Max	±0.02	±1.0	±0.2	±0.7	±1.3	0.4 -0.2	0.5	±0.5	Min	±0.5	Max	0.75 -0.5	±0.2	Max	15th,16th	T-2	
Item	4	5-7(+1)	0.45	12.7	12.7	4.6	6.35	1.5	3.5	18	11	9	1.5	18.5	4.1	1			TF
	5	5-7(+1)	0.45	12.7	12.7	4.6	6.35	2	3.5	18	11	9	1.5	18.5	4.1	1			TB
		9-15(+1.5)	0.5																
	6.3	5(+1)	0.45	12.7	12.7	4.6	6.35	2.5	3.5	18	11	9	1.5	18.5	4.1	1			TC
		7(+1)	0.5																
		10(+1)*	0.6																
	9-15(+1.5)	0.5																	

T-3: Straight(8φ-13φ)

Code	D	L	d	P	P0	P1	P2	F	W	W0	W1	W2	H	D0	Δh	ΔP	t	P/N code 15th,16th	Fig
Tol.	±0.5	Max	±0.02	±1.0	±0.2	±0.7	±1.3	$\frac{0.4}{-0.2}$	±0.5	Min	±0.5	Max	$\frac{0.75}{-0.5}$	±0.2	Max	Max	±0.3		
Item	8	5-7(+1)	0.5	12.7	12.7	4.6	6.35	3.5	18	12	9	1.5	18.5	4.1	1	1.0	0.6	TD	T-3
		8(+1)*	0.6																
		11.5(+1.5)*	0.6																
		9-20(+1.5)	0.5																
	10	9-30(+1.5)	0.6	12.7	12.7	3.85	6.35	5	18	12	9	1.5	18.5	4.1	1	1.0	0.6	TA	
	13	13-40	0.6	15	15	5.0	7.5	5	18	12	9	1.5	18.5	4.1	2	1.3	0.6	TA	

*: In this case, that is suitable for polymer.

Part Number Ammo Package

F	5	2	2.5	3.5	7.5
Code (15th, 16th)	TA	TB	TC	TD	TE

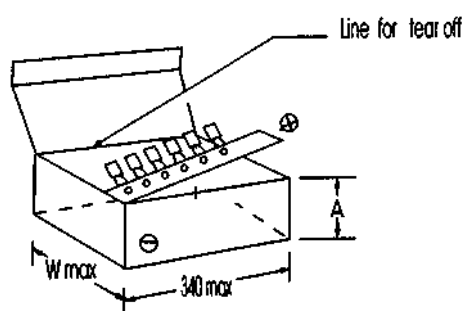
Part Number Reel Package

F	5	2	2.5	3.5	7.5
Code (15th, 16th)	RA	RB	RC	RD	RE

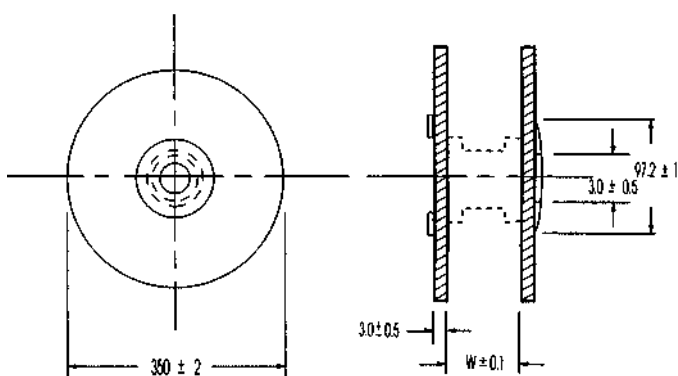
Package Information

Case Diameter Dφ(mm)	Ammo Package			Reel Package	
	W	A	Quantity (pcs)	W	Quantity (pcs)
4	218	50	2500	44	1800
5	285	50	2000	44	1300
6.3	285	50	1500	44	1000
8	240	50	800	44	800
10	300	55	500	44	600
13	285	62	300	44	400
16	254	67	250	-	-

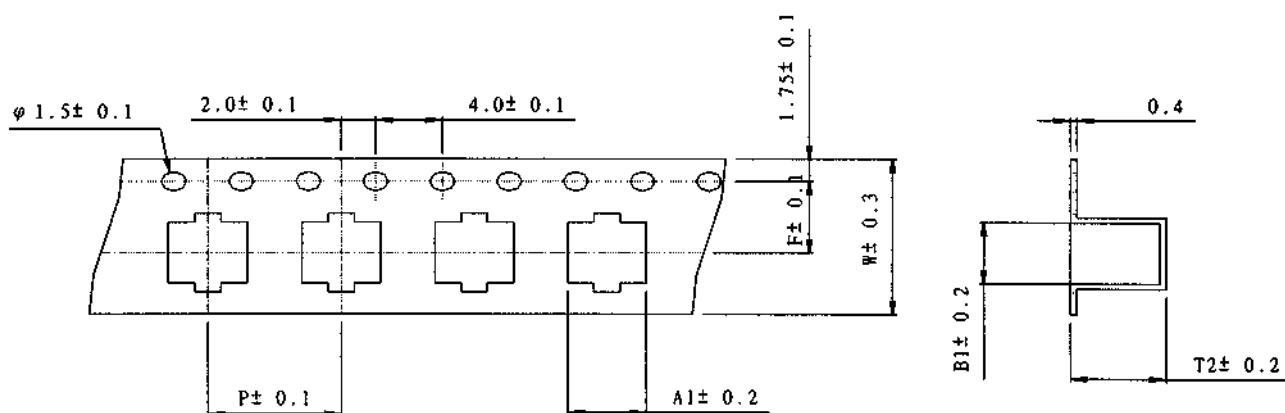
Ammo Package



Reel Package



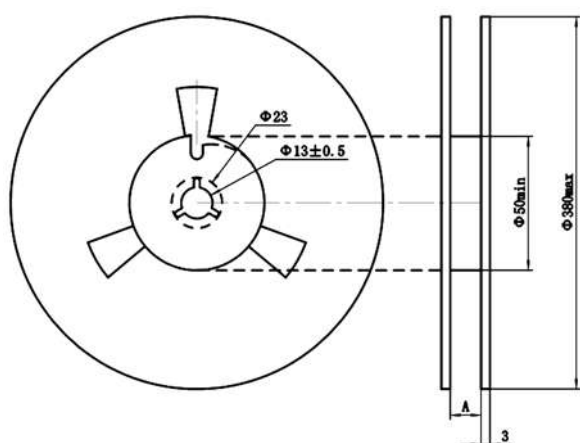
Carrier tape



Unit: mm

ϕD	4x5.5	5x5.5	6.3x5.5	6.3x5.8	6.3x7.7	8x6.5	8x7.7	8x10.5	8x11.7	10x10.5	10x12.4
W	12	12	16	16	16	16	16	24	24	24	24
P	8	12	12	12	12	12	12	16	16	16	16
F	5.5	5.5	7.5	7.5	7.5	7.5	7.5	11.5	11.5	11.5	11.5
A1	4.7	5.7	7	7	7	8.7	8.7	8.7	8.7	10.7	10.7
B1	4.7	5.7	7	7	7	8.7	8.7	8.7	8.7	10.7	10.7
T2	5.7	5.7	5.7	5.7	8	7	8.2	11	12.2	11	12.9

Reel



D ϕ	4	5	6.3	8	10
A	14	14	18	18	26

ϕD	Quantity
4x5.5	2000 pcs
5x5.5	1000 pcs
6.3x5.5	1000 pcs
6.3x5.8	1000 pcs
6.3x7.7	900 pcs
8x6.5	1000 pcs
8x7.7	700 pcs
8x10.5	500 pcs
8x11.7	400 pcs
10x7.7	700 pcs
10x10.5	500 pcs
10x12.4	400 pcs

For Conductive Polymer Capacitors

CP-CAP is a solid aluminum capacitor with conductive polymer electrolyte. Please read the following points in order to take the most out of your CP-CAP.

Designing device circuits

1. Circuits where CP-CAPs are prohibited to used

The leakage current of conductive polymer solid aluminum capacitors may vary depending on thermal stresses. Please don't use solid capacitors in the following types of circuits:

- (1) High-impedance circuits that are to sustain voltages.
- (2) Coupling circuits
- (3) Time constant circuits

In addition to the leakage current fluctuation, capacitance may also fluctuate depending on operational temperature and humidity. The fluctuation of the capacitance may cause problem if it is used as a time constant capacitor, which is extremely sensitive to the fluctuation of the capacitance. Do not use it as a time constant capacitance.

- (4) Other circuits that are significantly affected by leakage current. If you want to use 2 or more CP-CAPs in a series connection, please contact us before use.

2. Polarity

The CP-CAP is a polarized solid aluminum electrolytic capacitor. Do not apply either reverse voltages or AC voltages to the polarized capacitors, using reverse polarity may cause a short circuit. Refer to the catalog, product specifications or capacitor body to confirm the polarity prior to use.

3. Applied voltage

Do not apply DC voltages exceeding the full rated voltage. The peak voltage of superimposed AC voltages (ripple voltages) on DC voltages must not exceed the full rated voltage. While there are specifications for surge voltages exceeding the rated voltage, usage conditions apply, and continued operation for extended periods of time under such conditions cannot be guaranteed. Use the within 20% of the rated voltage for applications which may cause the reverse voltage during the transient phenomena when the power is turned off or the source is switched.

4. Ripple current

Do not apply currents in excess of the rated ripple current. The superimposition of a large ripple current increases the rate of heating within the capacitor. This may reduce the service life of the capacitor or damage the capacitor.

5. Operating temperature

Do not use the CP-CAP at high temperatures (temperatures exceeding the maximum temperature for the capacitor category) Use of the capacitor outside of the maximum temperature for the capacitor category may decrease the service life of the capacitor.

6. Sudden charge and discharge

Do not use the CP-CAP in circuits where the capacitor is repetitively charged and discharged rapidly. Repetitively charging and discharging the capacitor rapidly may reduce the capacitance or may cause damage due to internal heating. Use of a protective circuit to ensure reliability is recommended when rush currents exceed 10A or the rush current is over 10 times of allowable ripple current of CP-CAP.

A protection resistor(1 kΩ) must be inserted to the circuit during the charge and discharge when measuring the leakage current.

7. Failures and life-span

The CP-CAP failure rate in use is based on the failure rate level in the specification requirements. Upper category temperature and category voltage adhere to JIS C 5003 Standard. The confidence level is 60% and the failure rate is 0.5%/1,000 hours (applied rated voltage at category temperature).

The failure modes mainly have 2 types as follows.

(1) Contingency failure

The contingency failure mainly has short circuit. The phenomenon of after short is on following.

- (i) In the event a short circuit causes the current to become relatively small(less than approximately 1A for φ10,less than approximately 0.5A for φ8 and less than approximately 0.2A for smaller than φ6.3),the CP-CAP itself will generate a little heat, but its appearance will not be affected even when electricity is supplied continuously. However, if the short circuit current value exceeds the mentioned values above, the temperature inside the CP-CAP will increase, the internal pressure is

raised, rubber sealing is turned over, and odorous gas is released. In this case, keep your face and hands away from the area.

- (ii) The electrolyte, electrolytic paper, sealing rubber, and plastic spacer used in the CP-CAP are all combustible. If an extremely large electric current flows through the capacitor after shorting, the shorted part may spark, and in a worst case scenario, may ignite. Ensure safety by fully considering the design issues described below when using this capacitor in equipment where safety is a priority.

- Increase safety by using in conjunction with a protective circuit or protective equipment.
- Install measures such as redundant circuits so that the failure of a part of the equipment will not cause unstable operation.

(2) Performance characteristic and failure(life-span)

CP-CAP characteristics can possibly change(capacitance reduction and ESR increase) within the specified range in specifications when it is used in the condition of rated voltage, electric and mechanical performance.

When life span exceeded the specified guarantee time of endurance and damp heat, electric characteristic might change and cause electrolyte insulation. This is called open circuit mode. It is recommended to use the capacitor at a lower temperature than the maximum temperature for the capacitor category.

8. Circuit design

Verify the following before designing the circuit:

- (1) The electrical characteristics of the capacitor will vary depending on differences in temperature and frequency. Only design your after verifying the scope of these factors.
- (2) When connecting two or more capacitors in parallel, ensure that the design takes current balancing into account.
- (3) When two or more capacitors are connected in series, variability in applied voltage may cause over-voltage conditions. Contact CapXon before using capacitors connected in series.

9. Capacitor usage environment

Do not use/expose capacitors to the following conditions.

- (1) Oil, water, salty water, take care to avoid storage in damp locations.
- (2) Direct sunlight
- (3) Toxic gases such as hydrogen, sulfide, sulfurous acids, nitrous acids, chlorine and chlorine compounds, bromine and bromine compounds, ammonia, etc.
- (4) Ozone, ultraviolet rays and radiation.
- (5) Severe vibration or mechanical shock conditions beyond the limits advised in the product specification section of the catalog.

10.Capacitor mounting

- (1) For the surface mount capacitor, design the copper pads on the PC board in accordance with the catalog or the product specification
- (2) For radial capacitors, design the terminal holes on the PC board to fit the terminal pitch of the capacitor.

11.Leakage current

Heat pressure from soldering and mechanical stress from transportation may cause the leakage current to become large. In such a case, leakage current will gradually decrease by applying voltage less than or equal to the rated voltage at a temperature within the upper category temperature. In close conditions to the upper category temperature, the nearer the applied voltage is to the rated voltage, the faster the leakage current recovery speed is.

Mounting precautions

1. Note

- (1) For the surface mount capacitor, design the copper pads on the PC board in accordance with the catalog or the product specification
- (2) For radial capacitors, design the terminal holes on the PC board to fit the terminal pitch of the capacitor.
- (3) Mount after checking the capacitance and the rated voltage.
- (4) Mount after checking the polarity.
- (5) Do not apply excessive external force to the lead terminal and the CP-CAP itself.
- (6) Ensure that the soldering conditions meet the specifications recommended by CapXon. Note that the leakage current may increase due to thermal stresses that occur during soldering, etc. Note that increased leakage currents gradually decrease when voltage is

applied.

2. Soldering using a soldering iron:

- (1) The soldering conditions (temperature and time) are within the ranges specified in the catalog or product specifications.
- (2) The tip of the soldering iron does not come into contact with the capacitor itself.

3. Flow soldering

- (1) Do not dip the body of a capacitor into the solder bath only dip the terminals in. The soldering must be done on the reverse side of PC board.
- (2) Soldering conditions (preheat, solder temperature and dipping time) should be within the limits prescribed in the catalog or the product specifications.

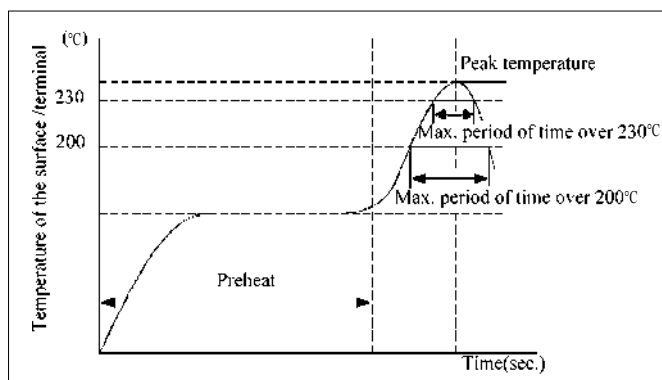
In regards to flow soldering, be sure to solder within the following conditions.

	Temperature	Duration	Flow number
Preheating	120°C or less (ambient temperature)	120 sec. or less	1 time
Soldering conditions	260±5°C or less	10±1 sec. or less	Twice or less

- (3) Do not apply flux to any part of capacitors other than their terminals.
- (4) Make sure the capacitors do not come into contact with any other components while soldering.

4. Reflow soldering

- (1) Soldering conditions (preheat, solder temperature and soldering time) should be within the limits prescribed in the catalogs or the product specification.
- (2) The heat level should be appropriate. (Note that the thermal stress on the capacitor varies depending on the type and position of the heater in the reflow oven.)
- (3) Vapor phase soldering (VPS) is not used.
- (4) Except for the surface mount type, reflow soldering must not be used for the capacitors.
- (5) In the case of reflow soldering, capacitive static electricity may decrease after soldering even when the soldering conditions are within the required values.
- (6) Recommended reflow condition of SMD type.



Voltage range	Preheat	Time maintained above 200°C	Time maintained above 230°C	Peak temp.	Reflow number
2.5 to 10v	150 to 180°C 120 sec. max.	90 sec. max.	60 sec. max.	260°C max	only 1 time
				250°C max	twice or less
16 to 25v		90 sec. max.	60 sec. max.	250°C max	only 1 time
		80 sec. max.	50 sec. max.	240°C max	twice or less

Note: All temperatures are measured on the topside of the Al-case and terminal surface.

The leakage current value may increase (from a few μA to a few mA) even within the above conditions. When the CP-CAP is used in a DC circuit, the leakage current will decrease gradually through self-recovery after voltage is applied. If your reflow profile deviates from the above conditions for mounting the CP-CAP, please consult with CapXon.

5. Handling after soldering

Do not apply any mechanical stress to the capacitor after soldering onto the PC board.

- (1) Do not lean or twist the body of the capacitor after soldering the capacitors onto the PC board
- (2) Do not use the capacitors for lifting or carrying the assembly board.
- (3) Do not hit or poke the capacitor after soldering to PC board. When stacking the assembly board, be careful that other components do not touch the aluminum electrolytic capacitors.
- (4) Do not drop the assembled board.

6. Washing the PC boards

- (1) Do not wash capacitors by using the following cleaning agents. Solvent resistant capacitors are only suitable for washing using the cleaning conditions prescribed in the catalog or the product specification. In particular, ultrasonic cleaning will accelerate damage to capacitors.

- Halogenated solvents; cause capacitors to fail due to corrosion.
Alkali system solvents; corrode (dissolve) an aluminum case.
- Petroleum system solvents; cause the rubber seal material to deteriorate.
- Xylene; causes the rubber seal material to deteriorate.
- Acetone; erases the markings.

- (2) Verify the following points when washing capacitors.

- Monitor conductivity, pH, specific gravity and the water content of cleaning agents. Contamination adversely affects these characteristics.
- Be sure not to expose the capacitors under solvent rich conditions or keep capacitors inside a closed container. In addition, please dry the solvent

sufficiently on the PC board and the capacitor with an air knife (temperature should be less than the maximum rated category temperature of the capacitor) for 10 minutes. Aluminum electrolytic capacitors can be characteristically and catastrophically damaged by halogen ions, particularly by chlorine ions, though the degree of the damage mainly depends upon the characteristics of the electrolyte and rubber seal material. When halogen ions come into contact with the capacitors, the foil corrodes when a voltage is applied. This corrosion causes an extremely high leakage current which results venting and an open circuit.

Storage

The following conditions for storage are recommend.

- (1) Store capacitors in a cool, dry place. Store at a temperature between 5 and 35°C , with a humidity of 75% or less. SMD products are sealed in a special laminated aluminum bag. Use all capacitors once the bag is opened. Return unused capacitors to the bag, and seal it with a zipper. Be sure to follow our recommendations for reflow soldering.
- (2) Store the capacitors in a location free from direct contact with water, salt water, and oil.
- (3) Store in a location where the capacitor is not exposed to toxic gas, such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine or chlorine compounds, bromine or other halogen gases, methyl bromide or other halogen compounds, ammonia, or similar.
- (4) Store in a location where the capacitor is not exposed to ozone, ultraviolet radiation, or other radiation.
- (5) It is recommended to store capacitors in their original packaging wherever possible.

For Aluminum Electrolytic Capacitors

When you use aluminum electrolytic capacitors, remember the following.

1. Polarity

- Regular electrolytic Capacitor has polarity.
- Reverse voltage causes short circuit breakage of the capacitor or leakage of electrolyte. Where the polarity in a circuit sometimes reversed or unknown, a bi-polar capacitor should be used.

2. Overvoltage

- Do not apply overvoltage continuously.
- When overvoltage is applied to the capacitor, leakage current increase drastically.
- Applied working voltage to capacitors should not exceed the rated working voltage of capacitor.

3. Operating temperature and life:

- Do not use the capacitor over the max operating temperature.
- Life time of the capacitor depends on the temperature.
- Generally, life time is doubled by decreasing each temperature 10°C.
- Use temperature as low as possible.

4. Vent

- It is recommended at least 3mm of space around the vent.
- If such space is not provided, the vent will not operate completely.

5. Ripple current

- Do not apply a ripple current exceeding the rated maximum ripple current.
- Applying too much ripple current to the capacitor causes great heat generation, invites deterioration of properties of cases breakage.
- Please consult factory if ripple current exceeds the specified limit.

6. Charge and discharging

- Frequent and quick charge/discharge generates heat inside the capacitor, causing increase of leakage current, decrease of capacitance, or breakage occasionally.
- Consult us for assistance in this application.

使用鋁電解電容器注意事項：

1. 極性

鋁電解電容器一般是有極性的，極性反接是造成鋁電解電容器短路損壞及漏液的原因，因此在無法辨識電氣迴路上之極性或使用於有極性變換設計之迴路時，請選用無極性電解電容器。

2. 過載

請勿連續施加過載電壓。當電壓過載時電解電容器的漏電流會急速增加，所以電解電容器之工作電壓不應超過額定值。

3. 使用溫度和壽命

電解電容器之使用溫度請勿超出最高使用溫度之設定範圍。電解電容器的壽命取決於使用溫度，一般來說當電解電容器之使用溫度降低10°C時，其壽命將增為兩倍，因此電解電容器應儘可能在較低溫度下使用。

4. 防爆孔

有防爆孔設計之電解電容器其使用時防爆孔側應與其它機構保持最少3mm以上之空間距離，如此條件不能滿足的話，防爆孔將無法正常運作。

5. 紋波電流

請勿施加超過額定最高紋波電流容許值以上之紋波電流。施加過大紋波電流將使電解電容器的內溫異常上升，引起電解電容器電氣特性劣化及破損。如有需要施加額定值以上之紋波電流等要求時，請諮詢敝廠人員。

6. 充放電

經常及快速的充放電將使電容器之內溫異常上升，使漏電流增加、容量降低，有時還會造成產品之損壞，如對充放電有特殊要求時請諮詢敝廠人員。

7.Storage

- When the capacitor is stored for a long time without applying voltage, leakage current tends to increase.
- This returns to normal by applying the rated voltage to the capacitor before use.
- It is recommended to apply D.C. working voltage to the capacitor for 30 minutes through $1K\Omega$ of protective series resistor, if it is stored for more than 6 months.
- The capacitor should be stored at a normal temperature and humidity.

8.Soldering

- Improper soldering may shrink or break the insulating sleeve and/or damage the internal element as terminals and lead wires conduct heat into the capacitor.
- Avoid too high a soldering temperature and/or too long a soldering time.

9.Mechanical stress on the lead wire and the terminal

- Do not apply excessive force to the lead wire and the terminal.
- Do not move the capacitor after soldering to the PC board, not carry the PC board by picking up the capacitor. For their strength, refer to JIS C-5141 and C-5102.

10.Cleaning of boards after soldering

- If the capacitor is cleaned in halogenated solvent for organic removing solder flux solvent, the solvent may penetrate into the inside of capacitor, and may generate corrosion.

11.Sleeve material

- The standard sleeve material is polyvinyl-chloride.
- If exposed to xylene, toluene, etc, and then subjected to high heat, the sleeve may crack. This sleeve is not insulating material.

12.CapXon's Products meet quality standards specified by JIS-C5141W and with the reliability requirements refer to JIS-C-5102.

13.None of ozone depleting chemicals (ODC) under the Montreal Protocol is used in manufacturing process of CapXon Electronic Industrial CO., Ltd.

7.電解電容器的儲存

當電解電容器經過長時間之放置後，通常其漏電流有增大之傾向。因此在使用經過長時間放置後之電解電容器以前，需先施加定額電壓使其電氣特性回復正常；如儲存時間長於6個月以上時，請串排 $1k\Omega$ 之保護電阻後，使其持續負載定額工作電壓30分鐘。另外電解電容器應儲存於常溫及常濕之環境下。

8.焊錫

不適當的焊錫溫度及時間可能造成表面膠管之異常收縮破裂，有時高溫也會藉由導針及端子導熱至素子內部，對產品造成不良影響，因此須儘量避免過高溫度及過長時間之焊錫。

9.導針與端子之機械強度

請勿施加過度之外力於導針及端子上。請勿扳開已焊接於PC板上之電解電容器，更不要以電解電容器為施力點提起或移動整塊PC板。

10.焊錫後之基板清洗

如使用鹵化有機溶劑清洗基板，溶劑有可能滲進電解電容器內部引起腐蝕。

11.套管材料

一般使用之塑膠套膠材質多為聚氯乙烯(PVC)，如塑膠管在浸漬二甲苯或甲苯後再放置於高溫下，將產生破裂現象也同時失去了絕緣之功能。

12.本公司之產品品質符合JIS-C-5141W指定標準，其信賴性試驗方法依JIS-C-5102之規範為基準。

13.本公司依蒙特利爾協議書之規定，於生產過程中不使用破壞臭氧層之藥品。

PL series Low ESR $\leq 7m\Omega$

Features

- ◆ Very Low ESR at high frequency range.
- ◆ Very Large permissible ripple current.



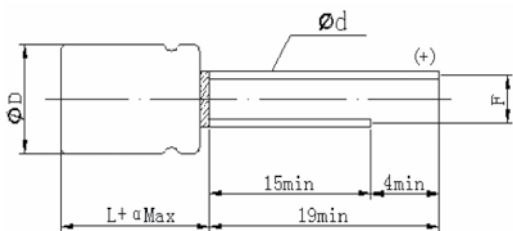
Specifications

Item	Performance Characteristics	
Operating Temperature Range	-55~+105°C	
Rated Voltage Range	2.5~16 VDC	
Capacitance Range	180 to 3500 μ F	
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20°C)	
Leakage Current (+20°C, max.)	$\leq 0.2CV$ (μ A, after 2 minutes)	
Dissipation Factor (tan δ , at 20°C, 120Hz)	Not to exceed the value specified	
ESR (100K~300KHz)	Not to exceed the value specified	
Endurance 105°C, 2000h, at rated voltage	Capacitance	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified
Moisture Resistance Stored at 60°C, RH90~95%, 2000h	Capacitance	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified

Frequency Coefficient for Ripple Current

Frequency	120Hz $\leq$ freq. < 1KHz	1KHz $\leq$ freq. < 10KHz	10KHz $\leq$ freq. < 100KHz	100KHz $\leq$ freq. < 300KHz
Coefficient	0.05	0.3	0.7	1

Diagram of Dimensions:(unit:mm)



$\phi D \times L$	$\phi D + 0.5\text{max.}$	α	$F \pm 0.5$	$\phi d \pm 0.05$
8×8	8.0	1.0	3.5	0.6
8×11.5	8.0	1.5	3.5	0.6
10×12.5	10.0	1.5	5.0	0.6

Dimensions & Characteristics

φ D×L(mm)

W.V. (V)	Capacitance (μF)	L.C. (μA, 2min)	tg δ (120Hz, 20°C)	ESR (mΩ, 100kHz)	Maximum Permissible Ripple Current(mA, r.m.s)	Size φ D×L(mm)
2.5	560	280	0.08	7	6100	8×8
						8×11.5
	680	340	0.08	7	6100	8×8
						8×11.5
	820	410	0.08	7	6100	8×8
						8×11.5
	1000	500	0.08	7	6100	8×8
						8×11.5
	1200	600	0.08	7	6100	8×8
						8×11.5
	1500	750	0.08	7	6100	8×8
						8×11.5
4.0	2000	1000	0.08	7	6640	10×12.5
	2500	1250	0.08	7	6640	10×12.5
	2700	1350	0.08	7	6640	10×12.5
	3000	1500	0.08	7	6640	10×12.5
	3300	1650	0.08	7	6640	10×12.5
	3500	1750	0.08	7	6640	10×12.5
	560	224	0.08	7	6100	8×8
						8×11.5
	680	272	0.08	7	6100	8×8
						8×11.5
	820	328	0.08	7	6100	8×8
						8×11.5
6.3	1000	800	0.08	7	6100	8×8
						8×11.5
	1200	960	0.08	7	6100	8×11.5
						8×11.5
	1500	1200	0.08	7	6100	8×11.5
						8×11.5
	2000	1600	0.08	7	6640	10×12.5
	2500	1500	0.08	7	6640	10×12.5
	180	226.8	0.07	7	6100	8×8
						8×11.5
	220	277	0.07	7	6100	8×8
						8×11.5
	270	340.2	0.07	7	6100	8×8
						8×11.5
	330	416	0.07	7	6100	8×8
						8×11.5
	390	491.4	0.08	7	6100	8×8
						8×11.5
	470	592	0.08	7	6100	8×8
						8×11.5
	560	705.6	0.08	7	6100	8×8
						8×11.5
	680	428	0.08	7	6100	8×8
						8×11.5
	820	516.6	0.10	7	6100	8×11.5
						8×11.5
	1000	630	0.10	7	6640	10×12.5
	1200	756	0.10	7	6640	10×12.5
	1500	945	0.10	7	6640	10×12.5
	2000	1260	0.10	7	6640	10×12.5

Ripple Current (mA, rms) at 105°C, 100KHz

W.V. (V)	Capacitance (μ F)	L.C. (μ A, 2min)	tg δ (120Hz, 20°C)	ESR (m Ω , 100kHz)	Maximum Permissible Ripple Current(mA, r.m.s)	Size Φ D $\times$ L(mm)
10	180	180	0.07	7	6100	8 $\times$ 8
					5600	8 $\times$ 11.5
	220	220	0.08	7	6100	8 $\times$ 8
					5600	8 $\times$ 11.5
	270	270	0.08	7	6100	8 $\times$ 8
					5600	8 $\times$ 11.5
	330	330	0.08	7	6100	8 $\times$ 8
					5600	8 $\times$ 11.5
	390	390	0.08	7	6100	8 $\times$ 8
					5600	8 $\times$ 11.5
	470	470	0.08	7	6100	8 $\times$ 8
					5600	8 $\times$ 11.5
	560	560	0.10	7	6100	8 $\times$ 8
					5600	8 $\times$ 11.5
16	680	680	0.10	7	5600	8 $\times$ 11.5
					6100	10 $\times$ 12.5
	820	820	0.10	7	5600	8 $\times$ 11.5
					6100	10 $\times$ 12.5
	1000	1000	0.10	7	6100	10 $\times$ 12.5
	1200	1200	0.10	7	6100	10 $\times$ 12.5
	1500	1500	0.10	7	6100	10 $\times$ 12.5
	180	288	0.08	7	5600	8 $\times$ 11.5
	220	352	0.08	7	5600	8 $\times$ 11.5
	270	432	0.08	7	5600	8 $\times$ 11.5
	330	528	0.08	7	5600	8 $\times$ 11.5
					6100	10 $\times$ 12.5
	390	624	0.08	7	6100	10 $\times$ 12.5
					5600	8 $\times$ 11.5
	470	752	0.10	7	6100	10 $\times$ 12.5
					6100	10 $\times$ 12.5
	560	896	0.10	7	6100	10 $\times$ 12.5
	680	1000	0.10	7	6100	10 $\times$ 12.5
	820	1280	0.10	7	6100	10 $\times$ 12.5

Φ D $\times$ L(mm)

Size List

WV(SV) Cap(μ F)	2.5 (2.8)	4 (4.6)	6.3 (7.2)	10 (11.5)	16 (18.4)
180			8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 11.5
220			8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 11.5
270			8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 11.5
330			8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 11.5 / 10 $\times$ 12.5
390			8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 8 / 8 $\times$ 11.5	10 $\times$ 12.5
470			8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 11.5 / 10 $\times$ 12.5
560	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 8 / 8 $\times$ 11.5	10 $\times$ 12.5
680	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 11.5 / 10 $\times$ 12.5	10 $\times$ 12.5
820	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 8 / 8 $\times$ 11.5 / 10 $\times$ 12.5	8 $\times$ 11.5	8 $\times$ 11.5 / 10 $\times$ 12.5	10 $\times$ 12.5
1000	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 8 / 8 $\times$ 11.5	10 $\times$ 12.5	10 $\times$ 12.5	
1200	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 11.5 / 10 $\times$ 12.5	10 $\times$ 12.5	10 $\times$ 12.5	
1500	8 $\times$ 8 / 8 $\times$ 11.5	8 $\times$ 11.5 / 10 $\times$ 12.5	10 $\times$ 12.5	10 $\times$ 12.5	
2000	10 $\times$ 12.5	10 $\times$ 12.5	10 $\times$ 12.5		
2500	10 $\times$ 12.5	10 $\times$ 12.5			
2700	10 $\times$ 12.5				
3000	10 $\times$ 12.5				
3300	10 $\times$ 12.5				
3500	10 $\times$ 12.5				

Ripple Current (mA, rms) at 105°C 100KHz

PS series Standard Products

Features

- ◆ Low ESR at high frequency range.
- ◆ Large permissible ripple current.



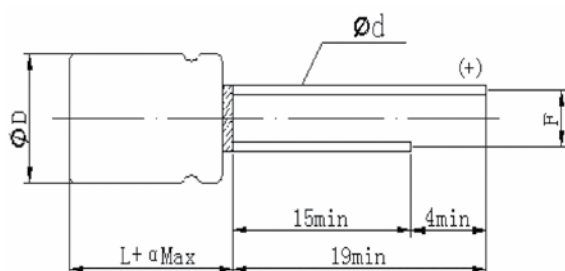
Specifications

Item	Performance Characteristics	
Operating Temperature Range	-55~+105°C	
Rated Voltage Range	2.5~25 VDC	
Capacitance Range	39 to 3500 μ F	
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20°C)	
Leakage Current (+20°C, max.)	$\leq 0.2CV$ (μ A, after 2 minutes)	
Dissipation Factor (tan δ , at 20°C, 120Hz)	Not to exceed the value specified	
ESR (100K~300KHz)	Not to exceed the value specified	
Endurance 105°C, 2000h, at rated voltage	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified
Moisture Resistance Stored at 60°C, RH90~95%, 2000h	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified

Frequency Coefficient for Ripple Current

Frequency	120Hz $\leq$ freq. < 1KHz	1KHz $\leq$ freq. < 10KHz	10KHz $\leq$ freq. < 100KHz	100KHz $\leq$ freq. < 300KHz
Coefficient	0.05	0.3	0.7	1

Diagram of Dimensions:(unit:mm)



$\phi D \times L$	$\phi D + 0.5\text{max.}$	α	$F \pm 0.5$	$\phi d \pm 0.05$
8×8	8.0	1.0	3.5	0.6
8×11.5	8.0	1.5	3.5	0.6
10×12.5	10.0	1.5	5.0	0.6

Dimensions & Characteristics

φ D×L(mm)

W.V. (V)	Capacitance (μF)	L.C. (μA, 2min)	tg δ (120Hz, 20°C)	ESR (mΩ, 100kHz)	Maximum Permissible Ripple Current(mA, r.m.s)	Size φ D×L(mm)
2.5	560	280	0.08	12	5100	8×8
						8×11.5
	680	340	0.08	12	5200	8×8
						8×11.5
	820	410	0.08	12	5200	8×8
						8×11.5
	1000	500	0.08	12	5500	8×8 / 8×11.5
	1200	600	0.08	12	5500	8×8 / 8×11.5
	1500	750	0.08	12	5500	8×8 / 8×11.5
	2000	1000	0.08	12	5900	8×11.5 / 10×12.5
	2500	1250	0.08	12	5900	10×12.5
	2700	1350	0.08	12	5900	10×12.5
4.0	560	224	0.08	12	5100	8×8
					5200	8×11.5
	680	272	0.08	12	5100	8×8
					5200	8×11.5
	820	328	0.08	12	5100	8×8
					5200	8×11.5
					5900	10×12.5
	1000	800	0.10	12	5500	8×11.5
					5900	10×12.5
	1200	960	0.10	12	5500	8×11.5
					5900	10×12.5
	1500	1200	0.10	12	5500	8×11.5
					5900	10×12.5
	2000	1600	0.10	12	5900	10×12.5
	2500	2000	0.10	12	5900	10×12.5

Ripple Current (mA, rms) at 105°C, 100KHz

Dimensions & Characteristics

φ D×L(mm)

W.V. (V)	Capacitance (μF)	L.C. (μA, 2min)	tg δ (120Hz, 20°C)	ESR (mΩ, 100kHz)	Maximum Permissible Ripple Current(mA, r.m.s)	Size Φ D×L(mm)
6.3	180	226.8	0.07	21	5100	8×8
					5100	8×11.5
	220	277	0.07	21	5100	8×8
					5100	8×11.5
	270	340.2	0.07	21	5100	8×8
					5100	8×11.5
	330	416	0.07	15	5100	8×8
					5500	8×11.5
	390	491	0.08	15	5100	8×8
					5500	8×11.5
	470	592	0.08	12	5100	8×8
					5500	8×11.5
	560	705.6	0.08	12	5100	8×8
					5500	8×11.5
	680	428	0.08	10	5100	8×8
				12	5500	8×11.5
10	180	180	0.08	12	5900	10×12.5
				12	5100	8×8
	220	220	0.08	15	5500	8×8
				15	5100	8×11.5
	270	270	0.08	15	5900	8×8
				15	5500	8×11.5
	330	330	0.08	12	5500	8×8
					5500	8×11.5
	390	390	0.08	12	5500	8×8
					5500	8×11.5
	470	470	0.08	12	5500	8×8
					5500	8×11.5
	560	560	0.08	12	5500	8×8
					5500	8×11.5
	680	680	0.10	12	5900	8×11.5
					5900	10×12.5
	820	820	0.10	12	5900	8×11.5
					5900	10×12.5
	1000	1000	0.10	12	5900	10×12.5
	1200	1200	0.10	12	5900	10×12.5
	1500	1500	0.10	12	5900	10×12.5

Ripple Current (mA, rms) at 105°C, 100KHz

φ D×L(mm)

W.V. (V)	Capacitance (μF)	L.C. (μA, 2min)	tg δ (120Hz, 20°C)	ESR (mΩ, 100kHz)	Maximum Permissible Ripple Current(mA, r.m.s)	Size ΦD×L(mm)
16	100	160	0.08	12	4800	8×11.5
	180	288	0.08	15	4500	8×8
					4800	8×11.5
	220	352	0.08	15	4500	8×8
					5000	8×11.5
	270	432	0.08	12	4500	8×8
				15	5000	8×11.5
				12	5500	10×12.5
	330	528	0.08	12	4500	8×8
					5000	8×11.5
					5500	10×12.5
	390	624	0.08	12	5000	8×11.5
					5500	10×12.5
20	39	156	0.08	30	4500	8×8
					4100	8×11.5
	47	188	0.08	30	4500	8×8
					4100	8×11.5
	68	272	0.08	25	4500	8×8
					4100	8×11.5
	82	328	0.08	20	4500	8×8
					4100	8×11.5
	100	400	0.08	18	4500	8×8
					4100	8×11.5
					4900	10×12.5
	180	720	0.08	18	4900	10×12.5
25	220	880	0.08	18	4900	10×12.5
	270	1080	0.08	20	4900	10×12.5
	330	1320	0.08	20	4900	10×12.5
	39	195	0.08	25	4500	8×8
					4100	8×11.5
	47	235	0.08	20	4500	8×8
					4100	8×11.5
	68	340	0.08	20	4500	8×8
					4100	8×11.5
	82	410	0.08	20	4500	8×8
					4100	8×11.5
	100	500	0.08	15	4500	8×8
				20	4100	8×11.5
				20	4900	10×12.5
	180	900	0.08	20	4900	10×12.5
	220	1100	0.08	20	4900	10×12.5
	270	1350	0.08	20	4900	10×12.5
	330	1650	0.08	20	4900	10×12.5

Ripple Current (mA, rms) at 105°C, 100KHz

Size List

φ DxL(mm)

RV (SV) Cap(μF)	2.5 (2.8)	4 (4.6)	6.3 (7.2)	10 (11.5)	16 (18.4)	20 (23)	25 (27.5)
39						8×8 8×11.5	8×8 8×11.5
47						8×8 8×11.5	8×8 8×11.5
68						8×8 8×11.5	8×8 8×11.5
82						8×8 8×11.5	8×8 8×11.5
100					8×11.5	8×8 8×11.5 10×12.5	8×8 8×11.5 10×12.5
180			8×8 / 8×11.5	8×8 / 8×11.5	8×8 / 8×11.5	10×12.5	10×12.5
220			8×8 / 8×11.5	8×8 / 8×11.5	8×8 / 8×11.5	10×12.5	10×12.5
270			8×8 / 8×11.5	8×8 / 8×11.5	8×8 / 8×11.5 10×12.5	10×12.5	10×12.5
330			8×8 / 8×11.5	8×8 / 8×11.5	8×8 / 8×11.5 10×12.5	10×12.5	10×12.5
390			8×8 / 8×11.5	8×8 / 8×11.5	8×11.5 / 10×12.5		
470			8×8 / 8×11.5	8×8 / 8×11.5	8×11.5 / 10×12.5		
560	8×8 / 8×11.5	8×8 / 8×11.5	8×8 / 8×11.5	8×8 / 8×11.5	10×12.5		
680	8×8 / 8×11.5	8×8 / 8×11.5	8×8 / 8×11.5 / 10×12.5	8×11.5 10×12.5	10×12.5		
820	8×8 / 8×11.5	8×8 / 8×11.5 / 10×12.5	8×8 / 8×11.5 / 10×12.5	8×11.5 10×12.5	10×12.5		
1000	8×8 / 8×11.5	8×11.5 / 10×12.5	10×12.5	10×12.5			
1200	8×8 / 8×11.5	8×11.5 / 10×12.5	8×11.5 / 10×12.5	10×12.5			
1500	8×8 / 8×11.5	10×12.5	10×12.5	10×12.5			
2000	8×11.5 / 10×12.5	8×11.5 / 10×12.5	10×12.5				
2500	10×12.5	10×12.5					
2700	10×12.5						
3000	10×12.5						
3300	10×12.5						
3500	10×12.5						

Ripple Current (mA, rms) at 105℃ 100KHz

PU series Ultra Low ESR $\leq 6m\Omega$

Features

- ◆ Ultra Low ESR at high frequency range.
- ◆ Ultra Large permissible ripple current.



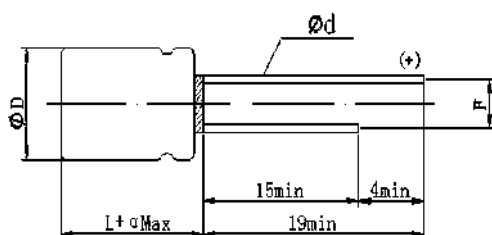
Specifications

Item	Performance Characteristics	
Operating Temperature Range	-55~+105°C	
Rated Voltage Range	2.5~10 VDC	
Capacitance Range	180 to 3500 μ F	
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20°C)	
Leakage Current (+20°C, max.)	$\leq 0.2CV$ (μ A, after 2 minutes)	
Dissipation Factor (tan δ , at 20°C, 120Hz)	Not to exceed the value specified	
ESR (100K~300KHz)	Not to exceed the value specified	
Endurance 105°C, 2000h, at rated voltage	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified
Moisture Resistance Stored at 60°C, RH90~95%, 2000h	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified

Frequency Coefficient for Ripple Current

Frequency	120Hz $\leq$ freq. < 1KHz	1KHz $\leq$ freq. < 10KHz	10KHz $\leq$ freq. < 100KHz	100KHz $\leq$ freq. < 300KHz
Coefficient	0.05	0.3	0.7	1

Diagram of Dimensions:(unit:mm)



$\phi D \times L$	$\phi D + 0.5\text{max.}$	α	$F \pm 0.5$	$\phi d \pm 0.05$
8×8	8.0	1.0	3.5	0.6
8×11.5	8.0	1.5	3.5	0.6
10×12.5	10.0	1.5	5.0	0.6

Dimensions & Characteristics

							ϕ DxL(mm)
W.V. (V)	Capacitance (μ F)	L.C. (μ A,2min)	tg δ (120Hz,20°C)	ESR (m Ω ,100kHz)	Maximum Permissible Ripple Current(mA,r.m.s)	Size Φ D×L(mm)	
2.5	560	280	0.08	6	6100	8×8	
						8×11.5	
	680	340	0.08	6	6100	8×8	
						8×11.5	
	820	410	0.08	6	6100	8×8	
						8×11.5	
	1000	500	0.08	6	6100	8×11.5	
	1200	600	0.08	6	6100	8×11.5	
	1500	750	0.10	6	6100	8×11.5	
					7100	10×12.5	
	2000	1000	0.10	6	7100	10×12.5	
	2500	1250	0.10	6	7100	10×12.5	
	2700	1350	0.10	6	7100	10×12.5	
	3000	1500	0.10	6	7100	10×12.5	
4.0	560	224	0.08	6	6100	8×8	
						8×11.5	
	680	544	0.08	6	6100	8×8	
						8×11.5	
	820	656	0.08	6	6100	8×11.5	
					6600	10×12.5	
	1000	800	0.08	6	6100	8×11.5	
	1200	960	0.08	6	6100	8×11.5	
					6600	10×12.5	
	1500	1200	0.10	6	6600	10×12.5	
6.3	180	113.4	0.10	6	6100	8×8	
						8×11.5	
	220	138.6	0.10	6	6100	8×8	
						8×11.5	
	270	170	0.10	6	6100	8×8	
						8×11.5	
	330	207.9	0.10	6	6100	8×8	
						8×11.5	
	390	245.7	0.10	6	6100	8×8	
						8×11.5	
	470	296.1	0.10	6	6100	8×8	
						8×11.5	
	560	352	0.08	6	6100	8×8	
						8×11.5	
	680	428.4	0.08	6	6600	8×11.5 / 10×12.5	
	820	516.6	0.10	6	6600	8×11.5 / 10×12.5	
	1000	630	0.10	6	7100	8×11.5 / 10×12.5	
	1200	756	0.10	6	7100	8×11.5 / 10×12.5	
	1500	945	0.10	6	7100	10×12.5	
	2000	1260	0.10	6	7100	10×12.5	
10	180	180	0.08	6	6600	8×11.5	
	220	220	0.08	6	6600	8×11.5	
	270	270	0.08	6	6600	8×11.5	
	330	330	0.08	6	6600	8×11.5	
	390	390	0.08	6	6600	8×11.5	
	470	470	0.08	6	6600	8×11.5 / 10×12.5	
	560	560	0.08	6	6600	8×11.5 / 10×12.5	
	680	680	0.10	6	6600	8×11.5 / 10×12.5	
	820	820	0.10	6	7100	10×12.5	
	1000	1000	0.10	6	7100	10×12.5	
	1200	1200	0.10	6	7100	10×12.5	
						10×12.5	

Ripple Current (mA, rms) at 105°C, 100KHz

Size List

φ DxL(mm)

WV (SV) Cap(μF)	2.5 (2.8)	4 (4.6)	6.3 (7.2)	10 (11.5)
180			8x8 / 8x11.5	8x11.5
220			8x8 / 8x11.5	8x11.5
270			8x8 / 8x11.5	8x11.5
330			8x8 / 8x11.5	8x11.5
390			8x8 / 8x11.5	8x11.5
470			8x8 / 8x11.5	8x11.5 / 10x12.5
560	8x8 / 8x11.5	8x8 / 8x11.5	8x8 / 8x11.5	8x11.5 / 10x12.5
680	8x8 / 8x11.5	8x8 / 8x11.5	8x11.5 / 10x12.5	8x11.5 / 10x12.5
820	8x8 / 8x11.5	8x11.5 / 10x12.5	8x11.5 / 10x12.5	10x12.5
1000	8x11.5	8x11.5	8x11.5 / 10x12.5	10x12.5
1200	8x11.5	8x11.5 / 10x12.5	8x11.5 / 10x12.5	10x12.5
1500	8x11.5 / 10x12.5	10x12.5	10x12.5	
2000	10x12.5	10x12.5	10x12.5	
2500	10x12.5	10x12.5		
2700	10x12.5			
3000	10x12.5			
3300	10x12.5			
3500	10x12.5			

Ripple Current (mA, rms) at 105°C 100KHz

PX series Low Profile

Features

- ◆ Low profile
- ◆ Low ESR at high frequency range & Large permissible ripple current.



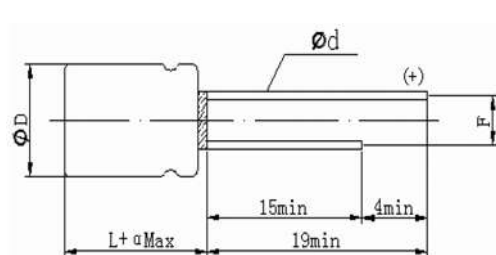
Specifications

Item	Performance Characteristics	
Operating Temperature Range	-55~+105°C	
Rated Voltage Range	2.5~25 VDC	
Capacitance Range	10 to 680 μ F	
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20°C)	
Leakage Current (+20°C, max.)	Not to exceed the value specified (μ A, after 2 minutes)	
Dissipation Factor (tan δ , at 20°C , 120Hz)	Not to exceed the value specified	
ESR (100K~300KHz)	Not to exceed the value specified	
Endurance 105°C , 2000h , at rated voltage	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified
Moisture Resistance Stored at 60°C , RH90~95% , 2000h	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified

Frequency Coefficient for Ripple Current

Frequency	120Hz $\leq$ freq.<1KHz	1KHz $\leq$ freq.<10KHz	10KHz $\leq$ freq.<100KHz	100KHz $\leq$ freq.<300KHz
Coefficient	0.05	0.3	0.7	1

Diagram of Dimensions:(unit:mm)



$\phi D \times L$	$\phi D + 0.5\text{max.}$	α	$F \pm 0.5$	$\phi d \pm 0.05$
4×5	4	1.0	1.5	0.45
5×5	5	1.0	2.0	0.45
6.3×5.2	6.3	1.0	2.5	0.45
6.3×7	6.3	1.0	2.5	0.45
6.3×10	6.3	1.0	2.5	0.6

Dimensions & Characteristics

φ D×L(mm)

W.V. (V)	Capacitance (μF)	L.C. (μA, 2min)	tg δ (120Hz, 20°C)	ESR (mΩ, 100kHz)	Maximum Permissible Ripple Current(mA, r.m.s)	Size ΦD×L(mm)
2.5	100	300	0.08	30	1670	4×5
	100	300	0.08	30	1970	5×5
	150	300	0.08	30	1970	5×5
	150	300	0.08	30	2200	6.3×5.2
	180	300	0.08	30	1970	5×5
	180	300	0.08	30	2200	6.3×5.2
	220	300	0.08	30	2200	5×5
	220	300	0.08	30	2610	6.3×5.2
	270	300	0.08	25	2610	6.3×5.2
	270	300	0.08	20	2690	6.3×7
	330	300	0.08	25	2610	6.3×5.2
	330	300	0.08	20	2690	6.3×7
	390	300	0.08	20	2690	6.3×5.2 / 6.3×7
	470	300	0.08	15	3100	6.3×5.2 / 6.3×7
4.0	560	300	0.08	15	3100	6.3×7
	680	300	0.08	15	3500	6.3×11
	100	300	0.08	30	1970	5×5
	150	300	0.08	30	2200	6.3×5.2
	150	300	0.08	25	2670	6.3×7
	180	300	0.08	30	2200	6.3×5.2
	180	300	0.08	25	2670	6.3×7
	220	300	0.08	25	2610	6.3×5.2
	220	300	0.08	20	2690	6.3×7
	270	300	0.08	25	2610	6.3×5.2
	270	300	0.08	20	2690	6.3×7
	330	300	0.08	20	2690	6.3×5.2
	330	300	0.08	15	3100	6.3×7
	390	300	0.08	15	3100	6.3×5.2 / 6.3×7
63	470	300	0.08	15	3100	6.3×7
	560	300	0.08	15	3500	6.3×11
	100	300	0.08	25	2390	6.3×5.2
	100	300	0.08	20	2690	6.3×7
	150	300	0.08	25	2390	6.3×5.2
	150	300	0.08	20	2690	6.3×7
	180	300	0.08	20	2690	6.3×5.2 / 6.3×7
	220	300	0.08	15	3100	6.3×5.2 / 6.3×7
	270	300	0.08	15	3100	6.3×5.2 / 6.3×7
	330	300	0.08	15	3100	6.3×5.2 / 6.3×7
10	390	300	0.08	15	3500	6.3×7 / 6.3×11
	470	300	0.08	15	3500	6.3×11
	10	300	0.08	45	1200	4×5
	15	300	0.08	45	1200	4×5
	22	300	0.08	45	1200	4×5
	33	300	0.08	45	1670	5×5
	33	300	0.08	30	2200	6.3×5.2
	39	300	0.08	45	1670	5×5
	39	300	0.08	30	2200	6.3×5.2
	47	300	0.08	30	2200	6.3×5.2
	47	300	0.08	20	2690	6.3×7
	68	300	0.08	30	2200	6.3×5.2
	68	300	0.08	20	2690	6.3×7
	82	300	0.08	30	2200	6.3×5.2
	82	300	0.08	20	2690	6.3×7
	100	300	0.08	30	2200	6.3×5.2
	100	300	0.08	20	2690	6.3×7
	150	300	0.08	20	2690	6.3×5.2 / 6.3×7
	180	300	0.08	20	2690	6.3×7
	220	300	0.08	20	2690	5×11 / 6.3×7
	270	300	0.08	15	3500	6.3×11
	330	300	0.08	15	3500	6.3×11

Ripple Current (mA, rms) at 105°C, 100KHz

W.V. (V)	Capacitance (μ F)	L.C. (μ A, 2min)	tg δ (120Hz, 20°C)	ESR (m Ω , 100kHz)	Maximum Permissible Ripple Current(mA, r.m.s)	Size Φ D $\times$ L(mm)
16	10	300	0.08	30	2200	6.3 $\times$ 5.2
	10	300	0.08	25	2610	6.3 $\times$ 7
	15	300	0.08	30	2200	6.3 $\times$ 5.2
	15	300	0.08	25	2610	6.3 $\times$ 7
	22	300	0.08	30	2200	6.3 $\times$ 5.2
	22	300	0.08	25	2610	6.3 $\times$ 7
	33	300	0.08	30	2200	6.3 $\times$ 5.2
	33	300	0.08	25	2610	6.3 $\times$ 7
	47	300	0.08	30	2200	6.3 $\times$ 5.2
	47	300	0.08	25	2610	6.3 $\times$ 7
	68	300	0.08	30	2200	6.3 $\times$ 5.2
	68	300	0.08	20	2690	6.3 $\times$ 7
	82	300	0.08	20	2690	6.3 $\times$ 7
	100	300	0.08	20	2690	6.3 $\times$ 7
20	10	300	0.08	30	2200	6.3 $\times$ 5.2
	10	300	0.08	25	2670	6.3 $\times$ 7
	15	300	0.08	30	2200	6.3 $\times$ 5.2
	15	300	0.08	25	2670	6.3 $\times$ 7
	22	300	0.08	30	2200	6.3 $\times$ 5.2
	22	300	0.08	25	2670	6.3 $\times$ 7
	33	300	0.08	25	2670	6.3 $\times$ 7
	39	300	0.08	25	2670	6.3 $\times$ 7
	47	300	0.08	25	2670	6.3 $\times$ 7
	68	300	0.08	20	2900	6.3 $\times$ 11
	10	300	0.08	30	2200	6.3 $\times$ 5.2
	10	300	0.08	25	2670	6.3 $\times$ 7
	15	300	0.08	25	2200	6.3 $\times$ 5.2
	15	300	0.08	25	2670	6.3 $\times$ 7
25	22	300	0.08	25	2670	6.3 $\times$ 7
	33	300	0.08	25	2670	6.3 $\times$ 7
	39	300	0.08	25	2670	6.3 $\times$ 7
	47	300	0.08	20	2900	6.3 $\times$ 11

Ripple Current (mA, rms) at 105°C, 100KHz

Size List

Φ DxL(mm)

WV (SV) Cap(μ F)	2.5 (2.8)	4 (4.6)	6.3 (7.2)	10 (11.5)	16 (18.4)	20 (23)	25 (27.5)
10				4X5	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7
15				4X5	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7
22				4X5	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	6.3X7
33				5X5 / 6.3X5.2	6.3X5.2 / 6.3X7	6.3X7	6.3X7
39				5X5 / 6.3X5.2	6.3X5.2 / 6.3X7	6.3X7	6.3X7
47				6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	6.3X7	6.3X11
68				6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	6.3X11	
82				6.3X5.2 / 6.3X7	6.3X7		
100	4X5 / 5X5	5X5	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	6.3X7 / 6.3X11		
150	5X5 / 6.3X5.2	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	6.3X11		
180	5X5 / 6.3X5.2	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	6.3X7	6.3X11		
220	5X5 / 6.3X5.2	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	5X11 / 6.3X7			
270	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	6.3X11			
330	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	6.3X11			
390	6.3X5.2 / 6.3X7	6.3X5.2 / 6.3X7	6.3X7 / 6.3X11				
470	6.3X5.2 / 6.3X7	6.3X7	6.3X11				
560	6.3X7	6.3X11					
680	6.3X11						

Ripple Current (mA, rms) at 105°C 100KHz

PE series

Features

- ◆ Down Size to $\phi 6.3 \times 8$.
- ◆ Low ESR & large capacitance.
- ◆ Large permissible ripple current.

Specifications

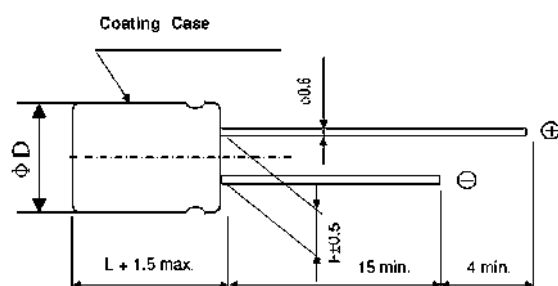


Item	Performance Characteristics	
Operating Temperature Range	-55~+105°C	
Rated Voltage Range	2.5~6.3 VDC	
Capacitance Range	470 to 820 μ F	
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20°C)	
Leakage Current (+20°C, max.)	$\leq 0.2CV$ (μ A, after 2 minutes)	
Dissipation Factor (tan δ , at 20°C , 120Hz)	Not to exceed the value specified	
ESR (100K~300KHz)	Not to exceed the value specified	
Endurance 105°C , 2000h , at rated voltage	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified
Moisture Resistance Stored at 60°C , RH90~95% , 2000h	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified

Frequency Coefficient for Ripple Current

Frequency	120Hz $\leq$ freq.<1KHz	1KHz $\leq$ freq.<10KHz	10KHz $\leq$ freq.<100KHz	100KHz $\leq$ freq.<300KHz
Coefficient	0.05	0.3	0.7	1

Diagram of Dimensions:(unit:mm)



$\phi D \times L$	$\phi D + 0.5 \text{ max.}$	α	$F \pm 0.5$	$\phi d \pm 0.05$
6.3 $\times$ 8	6.3	1.5	2.5	0.6

Dimensions & Characteristics

W.V. (V)	Capacitance (μ F)	L.C. (μ A, 2min)	tg δ (120Hz, 20°C)	ESR (m Ω , 100kHz)	Maximum Permissible Ripple Current(mA, r.m.s)	Size $\phi D \times L$ (mm)
2.5	820	410	0.08	7	5600	6.3X8
4.0	560	448	0.08	7	5600	
6.3	470	592.2	0.08	8	5100	
	560	705.6	0.08	8	5100	

Ripple Current (mA, rms) at 105°C, 100KHz

PH series High Voltage/High Reliability

Features

- ◆ High voltage and high reliability
- ◆ Large permissible ripple current.
- ◆ Low ESR at high frequency range.

Specifications

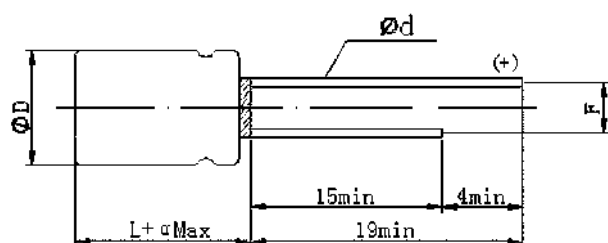


Item	Performance Characteristics	
Operating Temp. Range	-55°C~+105°C	
Capacitance Range	22~100 μ F	
Capacitance Tolerance	M : ±20%	
Rated Voltage Range	35V DC	
Dissipation Factor (at 120Hz,20°C)	Not to exceed the value specified	
Leakage Current	≤0.2CV (μ A, after 2 minutes)	
ESR (100K~300KHz)	Not to exceed the value specified	
Endurance 105°C , 2000h , at rated voltage	Capacitance Change	Within ±20% of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified
Moisture Resistance Stored at 60°C , RH90~95% , 2000h	Capacitance Change	Within ±20% of the value before test
	Leakage Current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified

Frequency Coefficient for Ripple Current

Frequency	120Hz≤freq.<1KHz	1KHz≤freq.<10KHz	10KHz≤freq.<100KHz	100KHz≤freq.<300KHz
Coefficient	0.05	0.3	0.7	1

Diagram of Dimensions:(unit:mm)



Φ D×L	Φ D+0.5max.	α	F±0.5	Φ d±0.05
8×11.5	8.0	1.5	3.5	0.6
10×12.5	10.0	1.5	5.0	0.6

Characteristics List

φ D×L(mm)

W.V. (V)	Capacitance (μF)	L.C. (μA, 2min)	tg δ (120Hz, 20°C)	ESR (mΩ, 100kHz)	Maximum Permissible Ripple Current(mA, r.m.s)	Size φ D×L(mm)
35	10	100	0.12	25	2890	8*11.5
	22	154	0.12	25	2890	8*11.5
	33	231	0.12	25	2890	8*11.5
	39	273	0.12	25	2890	8*11.5
	47	329	0.12	25	2890	8*11.5
					3500	10*12.5
	56	392	0.12	25	2890	8*11.5
					3500	10*12.5
	68	476	0.12	20	3700	10*12.5
	82	574	0.12	20	3700	10*12.5
	100	700	0.12	20	3700	10*12.5

Ripple Current (mA, rms) at 105°C, 100KHz

PT series 125°C Guaranteed

Features

- ◆ 125°C Guaranteed.
- ◆ Low ESR at high frequency range.

Specifications

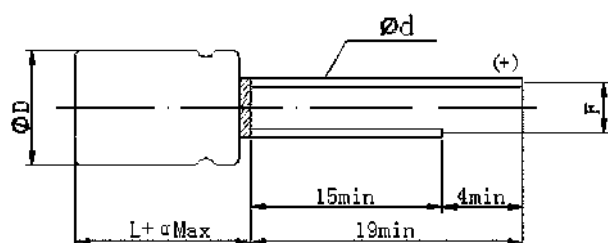


Item	Performance Characteristics	
Operating Temp. Range	-55°C~+125°C	
Capacitance Range	180~2500 μ F	
Capacitance Tolerance	M : $\pm 20\%$	
Rated Voltage Range	2.5V ~10V DC	
Dissipation Factor (at 120Hz,20°C)	Not to exceed the value specified	
Leakage Current	$\leq 0.2CV$ (μ A, after 2 minutes)	
ESR (100K~300KHz)	Not to exceed the value specified	
Endurance 125°C , 2000h , at rated voltage	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified
Moisture Resistance Stored at 60°C , RH90~95% , 1000h	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage Current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified

Frequency Coefficient for Ripple Current

Frequency	120Hz $\leq$ freq.<1KHz	1KHz $\leq$ freq.<10KHz	10KHz $\leq$ freq.<100KHz	100KHz $\leq$ freq.<300KHz
Coefficient	0.05	0.3	0.7	1

Diagram of Dimensions:(unit:mm)



$\phi D \times L$	$\phi D + 0.5\text{max.}$	α	$F \pm 0.5$	$\phi d \pm 0.05$
6.3 $\times$ 11	6.3	1.5	2.5	0.6
8 $\times$ 8	8.0	1.0	3.5	0.6
8 $\times$ 11.5	8.0	1.5	3.5	0.6
10 $\times$ 12.5	10.0	1.5	5.0	0.6

Size List

WV (SV) Cap(μF)	φ DxL(mm)				
	2.5 (2.8)	4 (4.6)	6.3 (7.2)	10 (11.5)	16 (18.4)
100					6.3×11
180					8×11.5
220					8×11.5
270					8×11.5
330					8×11.5 / 10×12.5
390			8×8 / 8×11.5	8×11.5	10×12.5
470			8×8 / 8×11.5	8×11.5	10×12.5
560		8×8 / 8×11.5	8×8 / 8×11.5	8×11.5	10×12.5
680		8×8 / 8×11.5	8×11.5	8×11.5 / 10×12.5	
820	8×8 / 8×11.5	8×8 / 8×11.5	8×11.5	10×12.5	
1000	8×11.5	8×11.5	10×12.5	10×12.5	
1200	8×11.5	8×11.5 / 10×12.5	10×12.5		
1500	8×11.5	10×12.5	10×12.5		
2000	10×12.5	10×12.5	10×12.5		
2500	10×12.5	10×12.5			
2700	10×12.5				

Ripple Current (mA, rms) at 105°C, 100KHz

Characteristics List

φ D×L(mm)

W.V. (V)	Capacitance (μ F)	L.C. (μ A,2min)	tg δ (120Hz,20℃)	ESR (mΩ ,100kHz)	Rated Ripple Current	Allowable ripple current	Size ΦD×L(mm)
					100KHz (mA,r.m.s)		
					105℃ <T _x ≤125℃	T _x ≤105℃	
2.5	820	410	0.08	7	1929	6100	8×8
	820	410	0.08	7	1929	6100	8×11.5
	1000	500	0.08	7	1929	6100	8×11.5
	1200	600	0.08	7	1929	6100	8×11.5
	1500	750	0.08	7	1929	6100	8×11.5
	2000	1000	0.08	7	2100	6640	10×12.5
	2500	1250	0.08	7	2100	6640	10×12.5
4.0	560	224	0.08	7	1929	6100	8×8
	560	224	0.08	7	1929	6100	8×11.5
	680	272	0.08	7	1929	6100	8×8
	680	272	0.08	7	1929	6100	8×11.5
	820	328	0.08	7	1929	6100	8×8
	820	328	0.08	7	1929	6100	8×11.5
	1000	800	0.08	7	1929	6100	8×11.5
	1200	960	0.08	7	1929	6100	8×11.5
	1200	960	0.08	7	2100	6640	10×12.5
	1500	1200	0.08	7	2100	6640	10×12.5
	2000	1600	0.08	7	2100	6640	10×12.5
	2500	2000	0.08	7	2100	6640	10×12.5
6.3	390	491.4	0.08	7	1929	6100	8×8
	390	491.4	0.08	7	1929	6100	8×11.5
	470	592	0.08	7	1929	6100	8×8
	470	592	0.08	7	1929	6100	8×11.5
	560	705.6	0.08	7	1929	6100	8×8
	560	705.6	0.08	7	1929	6100	8×11.5
	680	428	0.08	7	1929	6100	8×11.5
	820	516.6	0.10	7	1929	6100	8×11.5
	1000	630	0.10	7	2100	6640	10×12.5
	1200	756	0.10	7	2100	6640	10×12.5
	1500	945	0.10	7	2100	6640	10×12.5
	2000	1260	0.10	7	2100	6640	10×12.5
10	390	390	0.08	7	1929	6100	8×11.5
	470	470	0.08	7	1929	6100	8×11.5
	560	560	0.10	7	1929	6100	8×11.5
	680	680	0.10	7	2100	6640	8×11.5 / 10×12.5
	820	820	0.10	7	2100	6640	10×12.5
	1000	1000	0.10	7	2100	6640	10×12.5
16	100	160	0.08	12	1518	4800	6.3×11
	180	288	0.08	9	1771	5600	8×11.5
	220	352	0.08	9	1771	5600	8×11.5
	270	432	0.08	9	1771	5600	8×11.5
	330	528	0.08	9	1771	5600	8×11.5
	330	528	0.08	9	1929	6100	10×12.5
	390	624	0.08	9	1929	6100	10×12.5
	470	752	0.10	9	1929	6100	10×12.5
	560	896	0.10	9	1929	6100	10×12.5

Ripple Current (mA, rms) at 105°C, 100KHz

PF series Long Life to 5,000Hours

Features

- ◆ Super Long Life to 5,000Hours.
- ◆ Low ESR at high frequency range.

Specifications

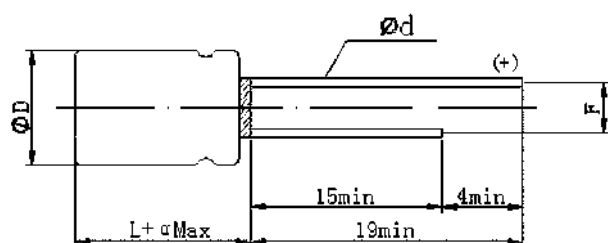


Item	Performance Characteristics	
Operating Temp. Range	-55°C~+105°C	
Capacitance Range	180~2500 μ F	
Capacitance Tolerance	M : $\pm 20\%$	
Rated Voltage Range	2.5V ~10V DC	
Dissipation Factor (at 120Hz,20°C)	Not to exceed the value specified	
Leakage Current	$\leq 0.2CV$ (μ A, after 2 minutes)	
ESR (100K~300KHz)	Not to exceed the value specified	
Endurance 105°C , 5000h , at rated voltage	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified
Moisture Resistance Stored at 60°C , RH90~95% , 1000h	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage Current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified

Frequency Coefficient for Ripple Current

Frequency	120Hz $\leq$ freq.<1KHz	1KHz $\leq$ freq.<10KHz	10KHz $\leq$ freq.<100KHz	100KHz $\leq$ freq.<300KHz
Coefficient	0.05	0.3	0.7	1

Diagram of Dimensions:(unit:mm)



$\phi D \times L$	$\phi D+0.5\text{max.}$	α	$F \pm 0.5$	$\phi d \pm 0.05$
6.3 $\times$ 11	6.3	1.5	2.5	0.6
8 $\times$ 8	8.0	1.0	3.5	0.6
8 $\times$ 11.5	8.0	1.5	3.5	0.6
10 $\times$ 12.5	10.0	1.5	5.0	0.6

Size List

WV (SV) Cap(μF)		φ DxL(mm)				
		2.5 (2.8)	4 (4.6)	6.3 (7.2)	10 (11.5)	16 (18.4)
100						6.3×11
180						6.3×11 / 8×8 / 8×11.5
220						8×8 / 8×11.5
270						8×8 / 8×11.5
330						8×11.5 / 10×12.5
390				8×8 / 8×11.5	8×8 / 8×11.5	10×12.5
470				8×8 / 8×11.5	8×8 / 8×11.5	10×12.5
560			8×8 / 8×11.5	8×8 / 8×11.5	8×8 / 8×11.5	10×12.5
680			8×8 / 8×11.5	8×11.5	8×11.5/10×12.5	
820	8×8 / 8×11.5	8×8 / 8×11.5/10×12.5		8×11.5	10×12.5	
1000	8×8 / 8×11.5	8×11.5		10×12.5	10×12.5	
1200	8×8 / 8×11.5	8×11.5 / 10×12.5		10×12.5		
1500	8×11.5	10×12.5		10×12.5		
2000	10×12.5	10×12.5		10×12.5		
2500	10×12.5	10×12.5				
2700	10×12.5					

Ripple Current (mA, rms) at 105°C, 100KHz

Characteristics List

φ D×L(mm)

W.V. (V)	Capacitance (μF)	L.C. (μA, 2min)	tg δ (120Hz, 20°C)	ESR (mΩ, 100kHz)	Maximum Permissible Ripple Current(mA, r.m.s)	Size φ D×L(mm)
2.5	820	410	0.08	7	6100	8×8
	820	410	0.08	7	6100	8×11.5
	1000	500	0.08	7	6100	8×11.5
	1200	600	0.08	7	6100	8×11.5
	1500	750	0.08	7	6100	8×11.5
	2000	1000	0.08	7	6640	10×12.5
	2500	1250	0.08	7	6640	10×12.5
	2700	1350	0.08	7	6640	10×12.5
4.0	560	224	0.08	7	6100	8×8
	560	224	0.08	7	6100	8×11.5
	680	272	0.08	7	6100	8×8
	680	272	0.08	7	6100	8×11.5
	820	328	0.08	7	6100	8×8 / 8×11.5
	820	328	0.08	7	6100	10×12.5
	1000	800	0.08	7	6100	8×11.5
	1200	960	0.08	7	6100	8×11.5
	1200	960	0.08	7	6640	10×12.5
	1500	1200	0.08	7	6640	10×12.5
6.3	2000	1600	0.08	7	6640	10×12.5
	390	491.4	0.08	7	6100	8×8
	390	491.4	0.08	7	6100	8×11.5
	470	592	0.08	7	6100	8×8
	470	592	0.08	7	6100	8×11.5
	560	705.6	0.08	7	6100	8×8
	560	705.6	0.08	7	6100	8×11.5
	680	428	0.08	7	6100	8×11.5
	820	516.6	0.10	7	6100	8×11.5
	1000	630	0.10	7	6640	10×12.5
	1200	756	0.10	7	6640	10×12.5
	1500	945	0.10	7	6640	10×12.5
10	2000	1260	0.10	7	6640	10×12.5
	390	390	0.08	7	6100	8×8
	390	390	0.08	7	6100	8×11.5
	470	470	0.08	7	6100	8×8
	470	470	0.08	7	6100	8×11.5
	560	560	0.10	7	6100	8×8
	560	560	0.10	7	6100	8×11.5
	680	680	0.10	7	6640	8×11.5
	680	680	0.10	7	6640	10×12.5
	820	820	0.10	7	6640	10×12.5
16	1000	1000	0.10	7	6640	10×12.5
	100	160	0.08	12	4800	6.3×11
	180	288	0.08	9	5600	6.3×11
	180	288	0.08	10	5100	8×8
	180	288	0.08	9	5600	8×11.5
	220	352	0.08	10	5100	8×8
	220	352	0.08	9	5600	8×11.5
	270	432	0.08	10	5100	8×8
	270	432	0.08	9	5600	8×11.5
	330	528	0.08	9	5600	8×11.5
	330	528	0.08	9	6100	10×12.5
	390	624	0.08	9	6100	10×12.5
	470	752	0.10	9	6100	10×12.5
	560	896	0.10	9	6100	10×12.5

Ripple Current (mA, rms) at 105°C, 100KHz

PM series SMD type & Low Profile

Features

- ◆ SMD type & Low profile
- ◆ Low ESR at high frequency range & Large permissible ripple current.



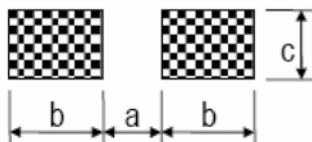
Specifications

Item	Performance Characteristics	
Operating Temperature Range	-55~+105°C	
Rated Voltage Range	2.5~25 VDC	
Capacitance Range	10 to 560 μ F	
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20°C)	
Leakage Current (+20°C, max.)	Not to exceed the value specified (μ A, after 2 minutes)	
Dissipation Factor (tan δ , at 20°C , 120Hz)	Not to exceed the value specified	
ESR (100K~300KHz)	Not to exceed the value specified	
Endurance 105°C , 2000h , at rated voltage	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified
Moisture Resistance Stored at 60°C , RH90~95% , 2000h	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified

Frequency Coefficient for Ripple Current

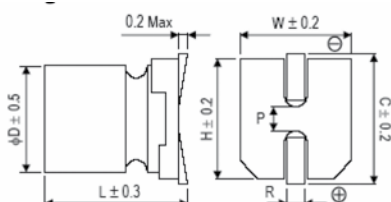
Frequency	120Hz $\leq$ freq.<1KHz	1KHz $\leq$ freq.<10KHz	10KHz $\leq$ freq.<100KHz	100KHz $\leq$ freq.<300KHz
Coefficient	0.05	0.3	0.7	1

Recommended land pattern:(unit:mm)



$\phi D \times L$	a	b	c
4 $\times$ 5.5	1.0	2.6	1.6
5 $\times$ 5.5	1.4	3.0	1.6
6.3 $\times$ 5.8	2.1	3.5	1.6
6.3 $\times$ 7.7	2.1	3.5	1.6

Diagram of Dimensions:(unit:mm)



$\phi D \times L$	W	H	C	R	P
4 $\times$ 5.5	4.3	4.3	5.1	0.5 to 0.8	1.0
5 $\times$ 5.5	5.3	5.3	5.9	0.5 to 0.8	1.4
6.3 $\times$ 5.8	6.5	6.5	7.2	0.5 to 0.8	2.1
6.3 $\times$ 7.7	6.5	6.5	7.2	0.5 to 0.8	2.1

Dimensions & Characteristics

							$\phi D \times L(mm)$
W.V. (V)	Capacitance (μF)	L.C. ($\mu A, 2min$)	$tg \delta$ (120Hz, 20°C)	ESR ($m\Omega, 100kHz$)	Maximum Permissible Ripple Current(mA, r.m.s)	Size $\phi D \times L(mm)$	
2.5	150	300	0.08	30	2200	6.3X5.8	
	180	300	0.08	30	2200	6.3X5.8	
	220	300	0.08	30	2610	6.3X5.8	
	270	300	0.08	25	2610	6.3X5.8	
	270	300	0.08	20	2690	6.3X7.7	
	330	300	0.08	25	2610	6.3X5.8	
	330	300	0.08	20	2690	6.3X7.7	
	390	300	0.08	20	2690	6.3X7.7	
	470	300	0.08	25	2610	6.3X5.8	
	470	300	0.08	15	3100	6.3X7.7	
	560	300	0.08	15	3100	6.3X7.7	
4.0	150	300	0.08	30	2200	6.3X5.8	
	150	300	0.08	25	2670	6.3X7.7	
	180	300	0.08	30	2200	6.3X5.8	
	180	300	0.08	25	2670	6.3X7.7	
	220	300	0.08	25	2610	6.3X5.8	
	220	300	0.08	20	2690	6.3X7.7	
	270	300	0.08	25	2610	6.3X5.8	
	270	300	0.08	20	2690	6.3X7.7	
	330	300	0.08	20	2690	6.3X5.8	
	330	300	0.08	15	3100	6.3X7.7	
6.3	100	300	0.08	25	2390	6.3X5.8	
	100	300	0.08	20	2690	6.3X7.7	
	150	300	0.08	25	2390	6.3X5.8	
	150	300	0.08	20	2690	6.3X7.7	
	180	300	0.08	20	2690	6.3X5.8	
	180	300	0.08	20	2690	6.3X7.7	
	220	300	0.08	15	3000	6.3X5.8	
	220	300	0.08	15	3400	6.3X7.7	
	270	300	0.08	15	3000	6.3X5.8	
	270	300	0.08	15	3400	6.3X7.7	
10	330	300	0.08	15	3100	6.3X5.8	
	330	300	0.08	15	3400	6.3X7.7	
	390	300	0.08	15	3100	6.3X5.8	
	390	300	0.08	15	3400	6.3X7.7	
	33	300	0.08	30	2200	6.3X5.8	
	39	300	0.08	30	2200	6.3X5.8	
	47	300	0.08	30	2200	6.3X5.8	
	47	300	0.08	20	2690	6.3X7.7	
	56	300	0.08	30	2200	6.3X5.8	
	68	300	0.08	30	2200	6.3X5.8	
10	68	300	0.08	20	2690	6.3X7.7	
	82	300	0.08	30	2200	6.3X5.8	
	82	300	0.08	20	2690	6.3X7.7	
	100	300	0.08	30	2200	6.3X5.8	
	100	300	0.08	20	2690	6.3X7.7	
	150	300	0.08	20	2690	6.3X7.7	
	180	300	0.08	20	2690	6.3X7.7	
	220	300	0.08	20	2690	6.3X7.7	

Ripple Current (mA, rms) at 105°C, 100KHz

W.V. (V)	Capacitance (μ F)	L.C. (μ A,2min)	tg δ (120Hz,20°C)	ESR (m Ω ,100kHz)	Maximum Permissible Ripple Current(mA,r.m.s)	Size Φ D $\times$ L(mm)
16	10	400	0.08	30	2200	6.3X5.8
	10	400	0.08	25	2610	6.3X7.7
	15	400	0.08	30	2200	6.3X5.8
	15	400	0.08	25	2610	6.3X7.7
	22	400	0.08	30	2200	6.3X5.8
	22	400	0.08	25	2610	6.3X7.7
	33	400	0.08	30	2200	6.3X5.8
	33	400	0.08	25	2610	6.3X7.7
	47	400	0.08	30	2200	6.3X5.8
	47	400	0.08	25	2610	6.3X7.7
	68	400	0.08	30	2200	6.3X5.8
	68	400	0.08	20	2690	6.3X7.7
	82	400	0.08	20	2690	6.3X5.8 / 6.3X7.7
	100	400	0.08	20	2690	6.3X5.8 / 6.3X7.7
20	10	600	0.08	30	2200	6.3X5.8
	10	600	0.08	30	2670	6.3X5.8
	15	600	0.08	25	2200	6.3X7.7
	15	600	0.08	30	2670	6.3X5.8
	22	600	0.08	25	2200	6.3X7.7
	22	600	0.08	30	2670	6.3X5.8
	33	600	0.08	25	2670	6.3X7.7
	39	600	0.08	25	2670	6.3X7.7
	47	600	0.08	25	2670	6.3X7.7
25	10	600	0.08	30	2200	6.3X5.8
	10	600	0.08	25	2670	6.3X7.7
	22	600	0.08	25	2670	6.3X7.7
	33	600	0.08	25	2670	6.3X7.7
	39	600	0.08	25	2670	6.3X7.7

Ripple Current (mA, rms) at 105°C, 100KHz

Size List

ϕ DxL(mm)

WV (SV) Cap(μ F)	2.5 (2.8)	4 (4.6)	6.3 (7.2)	10 (11.5)	16 (18.4)	20 (23)	25 (27.5)
10					6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7
15					6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7
22					6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7	6.3X7.7
33				6.3X5.8	6.3X5.8 / 6.3X7.7	6.3X7.7	6.3X7.7
39				6.3X5.8	6.3X5.8 / 6.3X7.7	6.3X7.7	6.3X7.7
47				6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7	6.3X7.7	
68				6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7		
82				6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7		
100			6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7		
150	6.3X5.8	6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7			
180	6.3X5.8	6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7	6.3X7.7			
220	6.3X5.8	6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7	6.3X7.7			
270	6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7				
330	6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7				
390	6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7					
470	6.3X5.8 / 6.3X7.7	6.3X5.8 / 6.3X7.7					
560	6.3X5.8 / 6.3X7.7						

Ripple Current (mA, rms) at 105°C 100KHz

PD series SMD type & Large capacitance

Features

- ◆ SMD type & Large capacitance
- ◆ Ultra low ESR at high frequency range & Large permissible ripple current.
- ◆ Long life and high reliability(reliability: 0.1% / 1000Hrs).

Specifications

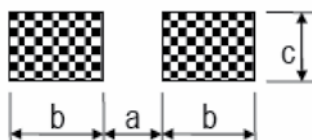


Item	Performance Characteristics	
Operating Temperature Range	-55~+105°C	
Rated Voltage Range	2.5~25 VDC	
Capacitance Range	39 to 3300 μ F	
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20°C)	
Leakage Current (+20°C, max.)	Not to exceed the value specified (μ A, after 2 minutes)	
Dissipation Factor (tan δ , at 20°C , 120Hz)	Not to exceed the value specified	
ESR (100K~300KHz)	Not to exceed the value specified	
Endurance 105°C , 2000h , at rated voltage	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified
Moisture Resistance Stored at 60°C , RH90~95% , 2000h	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified

Frequency Coefficient for Ripple Current

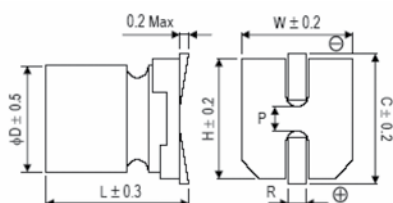
Frequency	120Hz $\leq$ freq.<1KHz	1KHz $\leq$ freq.<10KHz	10KHz $\leq$ freq.<100KHz	100KHz $\leq$ freq.<300KHz
Coefficient	0.05	0.3	0.7	1

Recommended land pattern:(unit:mm)



$\phi D \times L$	a	b	c
8X11.7	2.8	4.2	1.9
10X12.4	4.3	4.4	1.9

Diagram of Dimensions:(unit:mm)



$\phi D \times L$	W	H	C	R	P
8X11.7	8.3	8.3	9.0	0.8 to 1.1	3.2
10X12.4	10.3	10.3	11.0	0.8 to 1.1	4.6

Dimensions & Characteristics

W.V. (V)	Capacitance (μ F)	L.C. (μ A,2min)	tg δ (120Hz,20°C)	ESR (m Ω ,100kHz)	Maximum Permissible Ripple Current(mA,r.m.s)	ϕ DxL(mm)
						Size Φ D $\times$ L(mm)
2.5	560	280	0.08	8	5200	8X11.7
	680	340	0.08	8	5200	8X11.7
	820	410	0.08	8	5200	8X11.7
	1000	500	0.08	8	5200	8X11.7
	1500	750	0.08	8	5200	8X11.7
	2000	1000	0.08	8	5500	10X12.4
	2500	1250	0.08	8	5500	10X12.4
	2700	1350	0.10	8	5500	10X12.4
	3000	1500	0.10	8	5500	10X12.4
	3300	1650	0.10	8	5500	10X12.4
4.0	560	448	0.08	8	5200	8X11.7
	680	544	0.08	8	5200	8X11.7
	820	656	0.08	8	5200	8X11.7
	1000	800	0.10	8	5200	8X11.7
	1200	960	0.10	8	5200	8X11.7
	1500	1200	0.10	8	5500	10X12.4
	2000	1600	0.10	8	5500	10X12.4
	2500	2000	0.10	8	5500	10X12.4
6.3	180	226.8	0.08	8	5200	8X11.7
	220	277.2	0.08	8	5200	8X11.7
	270	340.2	0.08	8	5200	8X11.7
	330	416	0.08	8	5200	8X11.7
	390	491	0.08	8	5200	8X11.7
	470	592	0.08	8	5200	8X11.7
	560	705.6	0.08	8	5200	8X11.7
	680	856	0.08	8	5200	8X11.7
	680	856	0.08	8	5500	10X12.4
	820	1033.2	0.10	8	5200	8X11.7
	820	1033.2	0.10	8	5500	10X12.4
	1000	1260	0.10	8	5200	8X11.7
	1000	1260	0.10	8	5500	10X12.4
	1200	1512	0.10	8	5500	10X12.4
	1500	1890	0.10	8	5500	10X12.4
	2000	2520	0.10	8	5500	10X12.4
10	180	360	0.08	8	5200	8X11.7
	220	440	0.08	8	5200	8X11.7
	270	540	0.08	8	5200	8X11.7
	330	660	0.08	8	5200	8X11.7
	390	780	0.08	8	5200	8X11.7
	470	940	0.08	8	5200	8X11.7
	560	1120	0.08	8	5200	8X11.7
	680	1360	0.10	8	5500	10X12.4
	820	1640	0.10	8	5500	10X12.4
	1000	2000	0.10	8	5500	10X12.4
	1200	2400	0.10	8	5500	10X12.4
16	180	576	0.08	10	4700	8X11.7
	220	704	0.08	10	4700	8X11.7
	270	864	0.08	10	4700	8X11.7
	330	1056	0.08	10	4700	8X11.7
	330	1056	0.08	10	5100	10X12.4
	470	1504	0.10	10	5100	10X12.4
	680	2176	0.10	10	5100	10X12.4
	820	2624	0.10	10	5100	10X12.4
20	39	156	0.08	15	4210	8X11.7
	47	188	0.08	15	4210	8X11.7
	68	272	0.08	15	4210	8X11.7
	82	328	0.08	15	4210	8X11.7
	100	400	0.08	15	4800	10X12.4

Ripple Current (mA, rms) at 105°C, 100KHz

W.V. (V)	Capacitance (μ F)	L.C. (μ A, 2min)	tg δ (120Hz, 20°C)	ESR (m Ω , 100kHz)	Maximum Permissible Ripple Current(mA, r.m.s)	Size Φ D $\times$ L(mm)
20	180	720	0.10	15	4800	10X12.4
	220	880	0.10	15	4800	10X12.4
25	39	195	0.08	15	4210	8X11.7
	47	235	0.08	15	4210	8X11.7
	68	340	0.08	15	4210	8X11.7
	82	410	0.08	15	4210	8X11.7
	100	500	0.10	15	4800	10X12.4
	150	750	0.10	15	4800	10X12.4
	180	900	0.10	15	4800	10X12.4

Ripple Current (mA, rms) at 105°C, 100KHz

Size List

Φ DxL(mm)

WV (SV) Cap(μ F)	2.5 (2.8)	4 (4.6)	6.3 (7.2)	10 (11.5)	16 (18.4)	20 (23)	25 (27.5)
39						8X11.7	8X11.7
47						8X11.7	8X11.7
68						8X11.7	8X11.7
82						8X11.7	8X11.7
100						10X12.4	10X12.4
180			8X11.7	8X11.7	8X11.7	10X12.4	10X12.4
220			8X11.7	8X11.7	8X11.7	10X12.4	
270			8X11.7	8X11.7	8X11.7		
330			8X11.7	8X11.7	8X11.7 / 10X12.4		
390			8X11.7	8X11.7	10X12.4		
470			8X11.7	8X11.7	10X12.4		
560	8X11.7	8X11.7	8X11.7	8X11.7	10X12.4		
680	8X11.7	8X11.7	8X11.7 / 10X12.4	10X12.4	10X12.4		
820	8X11.7	8X11.7	8X11.7 / 10X12.4	10X12.4	10X12.4		
1000	8X11.7	8X11.7	10X12.4	10X12.4			
1200	8X11.7	8X11.7	10X12.4	10X12.4			
1500	8X11.7	10X12.4	10X12.4				
2000	10X12.4	10X12.4	10X12.4				
2500	10X12.4	10X12.4					
2700	10X12.4						
3000	10X12.4						
3300	10X12.4						

Ripple Current (mA, rms) at 105°C 100KHz

PV series SMD type & Low height

Features

- ◆ SMD type , Low height & Large capacitance
- ◆ Low ESR at high frequency range & Large permissible ripple current.
- ◆ Long life and high reliability(reliability: 0.1% / 1000Hrs).

Specifications

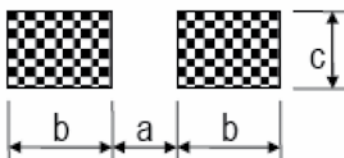


Item	Performance Characteristics	
Operating Temperature Range	-55~+105°C	
Rated Voltage Range	2.5~25 VDC	
Capacitance Range	39 to 2500 μ F	
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20°C)	
Leakage Current (+20°C, max.)	Not to exceed the value specified (μ A, after 2 minutes)	
Dissipation Factor (tan δ , at 20°C , 120Hz)	Not to exceed the value specified	
ESR (100K~300KHz)	Not to exceed the value specified	
Endurance 105°C , 2000h , at rated voltage	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified
Moisture Resistance Stored at 60°C , RH90~95% , 2000h	Capacitance Change	Within $\pm 20\%$ of the value before test
	Leakage current	Not to exceed the value specified
	ESR	Not to exceed 150% of the value specified
	Dissipation Factor	Not to exceed 150% of the value specified

Frequency Coefficient for Ripple Current

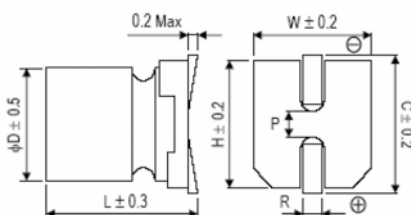
Frequency	120Hz $\leq$ freq.<1KHz	1KHz $\leq$ freq.<10KHz	10KHz $\leq$ freq.<100KHz	100KHz $\leq$ freq.<300KHz
Coefficient	0.05	0.3	0.7	1

Recommended land pattern:(unit:mm)



$\phi D \times L$	a	b	c
8X7.7	2.8	4.2	1.9
8X10.5	2.8	4.2	1.9
10X7.7	4.3	4.4	1.9
10X10.5	4.3	4.4	1.9

Diagram of Dimensions:(unit:mm)



$\phi D \times L$	W	H	C	R	P
8X7.7	8.3	8.3	9.0	0.8 to 1.1	3.2
8X10.5	8.3	8.3	9.0	0.8 to 1.1	3.2
10X7.7	10.3	10.3	11.0	0.8 to 1.1	4.6
10X10.5	10.3	10.3	11.0	0.8 to 1.1	4.6

Dimensions & Characteristics

φ D×L(mm)						
W.V. (V)	Capacitance (μF)	L.C. (μA,2min)	tg δ (120Hz,20°C)	ESR (mΩ,100kHz)	Maximum Permissible Ripple Current(mA,r.m.s)	Size ΦD×L(mm)
2.5	560	280	0.08	11	4800	8×10.5
	680	340	0.08	11	4800	8×10.5
	820	410	0.08	11	4800	8×10.5
	1000	500	0.08	11	4800	8×10.5
	1200	600	0.08	11	4800	8×10.5
	1500	750	0.10	11	5100	10×10.5
	2000	1000	0.10	11	5100	10×10.5
4.0	2500	1250	0.10	11	5100	10×10.5
	560	448	0.08	11	4800	8×10.5
	680	544	0.08	11	4800	8×10.5
	820	656	0.08	11	4800	8×10.5
	1000	800	0.10	11	4800	8×10.5
	1200	960	0.10	11	5100	10×10.5
	1500	1200	0.10	11	5100	10×10.5
6.3	2000	1600	0.10	11	5100	10×10.5
	390	491	0.08	11	4800	8×10.5
	470	592	0.08	11	4800	8×10.5
	560	705.6	0.08	11	4800	8×10.5
	680	856.8	0.10	11	5100	10×10.5
	820	1033.2	0.10	11	5100	10×10.5
	1000	1260	0.10	11	5100	10×10.5
10	1200	1260	0.10	11	5100	10×10.5
	390	780	0.08	11	4800	8×10.5
	470	940	0.08	11	4800	8×10.5
				20	3700	10×7.7
	560	1120	0.08	11	4800	10×10.5
16	680	1360	0.10	11	4800	10×10.5
	820	1640	0.10	11	5100	10×10.5
	180	288	0.08	11	4800	8×10.5
	220	352	0.08	11	4800	8×10.5
	270	432	0.10	11	5100	10×10.5
	330	528	0.10	11	5100	10×10.5
	390	624	0.10	11	5100	10×10.5
	470	752	0.10	11	5100	10×10.5

Ripple Current (mA, rms) at 105°C, 100KHz

Size List

WV(SV) Cap(μF)	2.5 (2.8)	4 (4.6)	6.3 (7.2)	10 (11.5)	16 (18.4)
180					8×10.5
220					8×10.5
270					10×10.5
330				8×10.5	10×10.5
390			8×10.5	8×10.5	10×10.5
470			8×10.5	8×10.5 / 10×7.7	10×10.5
560	8×10.5	8×10.5	8×10.5	8×10.5	
680	8×10.5	8×10.5	10×10.5	10×10.5	
820	8×10.5	8×10.5	10×10.5	10×10.5	
1000	8×10.5	8×10.5	10×10.5		
1200	8×10.5	10×10.5	10×10.5		
1500	10×10.5	10×10.5			
2000	10×10.5	10×10.5			
2500	10×10.5				

Ripple Current (mA, rms) at 105°C, 100KHz

EV Series High CV

Features

- ◆ Chip type long life capacitance in large case sizes
- ◆ Chip type with load life of 1000 hours at +105°C
- ◆ Designed for surface mounting on high density PC board
- ◆ Applicable to automatic insertion machine using carrier tape
- ◆ For detail specifications, please refer to Engineering Bulletin NO.E159
- ◆ RoHS Compliant



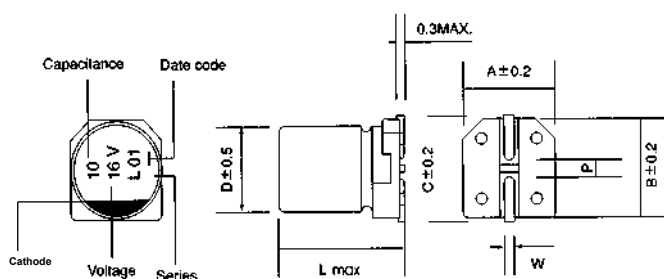
Specifications

Item	Performance Characteristics
Operating Temperature Range	-55~ +105°C
Rated Voltage Range	6.3~50 VDC
Capacitance Range	0.1 to 1500 μ F
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20°C)
Leakage Current (+20°C, max.)	$I \leq 0.01$ CV or 3 (μ A) After 2 minutes whichever is greater measured with rated working voltage applied.
Dissipation Factor ($\tan \delta$, at 20°C , 120Hz)	Working voltage(VDC) 6.3 10 16 25 35 50
	D.F.(%)max ϕ 4~6.3 30 24 20 18 16 14
	ϕ 8~10 35 28 24 18 16 14
Low Temperature Characteristics (at 120Hz)	Impedance ratio max
	Working voltage(VDC) 6.3 10 16 25 35 50
	Z-25°C / Z+20°C 4 3 2 2 2 2
Load Life	Z-40°C / Z+20°C 8 8 4 4 3 3
	Test condition
	Duration time :1000 Hrs Ambient temperature :+105°C Applied voltage :Rated DC working voltage After test requirement at +20°C Capacitance change : Within $\pm 25\%$ of initial value for capacitance of 16V or less Within $\pm 20\%$ of initial value for capacitance of 25V or more Dissipation factor : Less than 200% of specified value Leakage current : Less than specified value
Shelf Life	Test condition
	Duration time :1000 Hrs Ambient temperature :+105°C Applied voltage :None After test requirement at +20°C :Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250°C for 30 seconds. After removing from the hot plate and restored at room temperature, they meet the characteristic requirements listed under.
	Leakage current Less than specified value
	Capacitance change Within $\pm 10\%$ of initial value
	$\tan \delta$ Less than specified value

Multiplier for Ripple Current vs. Frequency

CAP(μ F)\Frequency(Hz)	60(50)	120	500	1K	$\geq 10K$
$0.1 \leq CAP \leq 100 \mu F$	0.8	1.0	1.20	1.30	1.50
$100 < CAP \leq 1500 \mu F$	0.8	1.0	1.10	1.15	1.20

Diagram of Dimensions:(unit:mm)



ϕ D	L	A	B	C	W	P
4	5.5	4.3	4.3	4.9	0.5~0.8	1.0
5	5.5	5.3	5.3	5.9	0.5~0.8	1.4
6.3	5.5	6.6	6.6	7.2	0.5~0.8	2.2
6.3	7.7	6.6	6.6	7.2	0.5~0.8	2.2
8	6.5	8.3	8.3	9.0	0.5~0.8	2.3
8	10.5	8.3	8.3	9.0	0.7~1.1	3.1
10	10.5	10.3	10.3	11.0	0.7~1.1	4.5

Case Size

φ DxL(mm)

WV Cap(μF)	6.3		10		16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1											4X5.5	1.0
0.22											4X5.5	2.6
0.33											4X5.5	3.2
0.47											4X5.5	3.8
1.0											4X5.5	6.3
2.2											4X5.5	11
3.3											4X5.5	14
4.7							4X5.5	16	4X5.5	16	5X5.5	22
10					4X5.5	18	4X5.5	26	4X5.5	27	6.3X5.5	33
22	4X5.5	22	4X5.5	27	4X5.5	30	5X5.5	38	6.3X5.5	42	6.3X5.5	51
33	4X5.5	30	4X5.5	25	5X5.5	40	5X5.5	48	6.3X5.5	50	6.3X7.7	60
			5X5.5	40					6.3X7.7	58	8X6.5	60
47	4X5.5	36	5X5.5	46	5X5.5	51	6.3X5.5	63	6.3X7.7	66	6.3X7.7	66
											8X6.5	66
100	5X5.5	60	6.3X5.5	60	6.3X5.5	60	6.3X7.7	91	6.3X7.7	84	8X10.5	140
							8X6.5	91	8X6.5	84		
150	6.3X5.5	86	6.3X5.5	86	6.3X7.7	95	8X10.5	140	8X10.5	155	10X10.5	180
					8X6.5	95						
220	6.3X7.7	102	6.3X7.7	105	6.3X7.7	105	8X10.5	155	10X10.5	190	10X10.5	220
	8X6.5	102	8X6.5	105								
330	6.3X7.7	105	8X10.5	195	8X10.5	195	8X10.5	175	10X10.5	300		
	8X6.5	105					10X10.5	198				
470	8X10.5	210	8X10.5	210	8X10.5	210	10X10.5	300				
1000	10X10.5	230	10X10.5	310								
1500	10X10.5	310										

Ripple Current (mA, rms) at 105°C 120Hz

LV Series

Features

- ◆ 85°C standard, case diameter $\phi 4 \sim \phi 10$ mm
- ◆ Reflow soldering is available
- ◆ Available for high density mounting
- ◆ For detail specifications, please refer to Engineering Bulletin No. E130
- ◆ RoHS Compliant



SMD

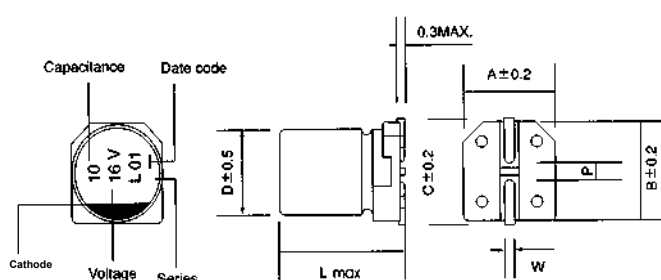
Specifications

Item	Performance Characteristics																																		
Operating Temperature Range	-40~ +85℃																																		
Rated Voltage Range	4~50 VDC																																		
Capacitance Range	0.1 to 3300 μF																																		
Capacitance Tolerance	±20%(120Hz,+20℃)																																		
Leakage Current (+20℃,max.)	I≤0.01 CV or 3 (μA) After 2 minutes, whichever is greater measured with rated working voltage applied																																		
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td colspan="2">Rated voltage(VDC)</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>D.F.(%)</td><td>φ 4~6.3</td><td>42</td><td>30</td><td>22</td><td>18</td><td>16</td><td>14</td><td>14</td></tr><tr><td>max</td><td>φ 8~10</td><td>45</td><td>34</td><td>26</td><td>20</td><td>16</td><td>14</td><td>14</td></tr></table>								Rated voltage(VDC)		4	6.3	10	16	25	35	50	D.F.(%)	φ 4~6.3	42	30	22	18	16	14	14	max	φ 8~10	45	34	26	20	16	14	14
	Rated voltage(VDC)		4	6.3	10	16	25	35	50																										
	D.F.(%)	φ 4~6.3	42	30	22	18	16	14	14																										
max	φ 8~10	45	34	26	20	16	14	14																											
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																																		
	<table><tr><td colspan="2">Rated voltage(VDC)</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td colspan="2">Z-25℃／Z+20℃</td><td>7</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td colspan="2">Z-40℃／Z+20℃</td><td>15</td><td>8</td><td>8</td><td>4</td><td>4</td><td>3</td><td>3</td></tr></table>								Rated voltage(VDC)		4	6.3	10	16	25	35	50	Z-25℃／Z+20℃		7	4	3	2	2	2	2	Z-40℃／Z+20℃		15	8	8	4	4	3	3
	Rated voltage(VDC)		4	6.3	10	16	25	35	50																										
	Z-25℃／Z+20℃		7	4	3	2	2	2	2																										
Z-40℃／Z+20℃		15	8	8	4	4	3	3																											
Load Life	Test conditions																																		
	Duration time		:2000 Hrs																																
	Ambient temperature		:+85℃																																
	Applied voltage		:Rated DC working voltage																																
	After test requirement at +20℃:																																		
	Capacitance change		:Within ±25% of the initial value																																
	Dissipation factor		:Not more than 200% of specified value																																
Shelf Life	Leakage current		:Not more than the specified value																																
	Test conditions																																		
	Duration time		:1000 Hrs																																
	Ambient temperature		:+85℃																																
	Applied voltage		:None																																
After test requirement at +20℃ : Same limits as Load life.																																			
Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																																			
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250℃for 30 seconds. After removing form the hot plate and restored at room temperature, they meet the characteristic requirements listed under.																																		
	Leakage current		Less than specified value																																
	Capacitance change		Within ±10% of initial value																																
	tan δ		Less than specified value																																

Multiplier for Ripple Current vs. Frequency

CAP(μ F) \ Frequency(Hz)	60(50)	120	500	1K	$\geq 10K$
$0.1 \leq CAP \leq 100 \mu F$	0.8	1.0	1.20	1.30	1.50
$100 < CAP \leq 1500 \mu F$	0.8	1.0	1.10	1.15	1.20

Diagram of Dimensions:(unit:mm)



ϕD	L	A	B	C	W	P
4	5.5	4.3	4.3	4.9	0.5~0.8	1.0
5	5.5	5.3	5.3	5.9	0.5~0.8	1.4
6.3	5.5	6.6	6.6	7.2	0.5~0.8	2.2
6.3	6.3	6.6	6.6	7.2	0.5~0.8	2.2
6.3	7.7	6.6	6.6	7.2	0.5~0.8	2.2
8	6.5	8.3	8.3	9.0	0.5~0.8	2.3
8	10.5	8.3	8.3	9.0	0.7~1.1	3.1
10	10.5	10.3	10.3	11.0	0.7~1.1	4.5
12.5	14	13.5	13.5	15.0	1.0~1.4	5.5

Case Size

WV(V) Cap(uF)		4		6.3		10		16		25		35		50	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1														4X5.5	1.0
0.22														4X5.5	2.0
0.33														4X5.5	2.8
0.47														4X5.5	4.0
1														4X5.5	8.4
2.2														4X5.5	14
3.3														4X5.5	17
4.7										4X5.5	18	4X5.5	18	4X5.5	22
10						4X5.5	21	4X5.5	23	4X5.5	27	4X5.5	29	6.3X5.5	35
22				4X5.5	29	4X5.5 5X5.5	33 37	4X5.5	37	5X5.5 6.3X5.5	40	5X5.5 6.3X5.5	45 48	6.3x6.3 6.3X7.7 8X6.5	60 75 80
33				4X5.5 5X5.5	33 37	4X5.5 5X5.5	41 43	5X5.5	45	5X5.5 6.3X5.5	46 54	6.3X5.5	58	6.3X7.7 8X6.5	188 200
47	4X5.5	28		4X5.5 5X5.5	40 46	5X5.5	52	5X5.5 6.3X5.5	50 60	6.3X5.5 6.3x6.3	60 68	6.3X5.5 6.3x6.3 8X6.5	65 70 115	6.3X7.7 8X6.5	225 240
100	5x5.5	34		5X5.5 6.3x6.3	70 85	6.3X5.5	76	6.3X5.5 6.3x6.3	100 108	6.3X7.7 8X6.5	150 160	6.3X7.7 8X10.5	250 280	8X10.5	300
150	6.3x6.3	50		6.3x6.3	100	6.3x6.3	88	6.3x7.7	135	8x10.5	200	8x10.5	300	10x10.5	320
220	6.3X5.5	61		6.3x6.3 6.3X7.7 8X6.5	130 141 150	6.3X7.7 8X6.5	170 190	6.3X7.7 8X10.5	185 290	8X10.5	300	10X10.5	400	10X10.5	450
330	6.3X7.7 8X6.5	135 145		6.3X7.7 8X6.5	197 210	8X10.5	330	8X10.5	330	10X10.5	450	10X10.5	460	12.5x14	520
470	8X6.5 8X10.5	220 220		8X10.5	380	8X10.5	420	10X10.5	480	10X10.5	460	12.5x14	590		
560	8X10.5	242		8X10.5	410	10X10.5	450	10X10.5	500	12.5x14	520	12.5x14	600		
680	8X10.5	285		8X10.5	460	10X10.5	480	10x10.5	550	12.5x14	580	12.5x14	610		
1000	10X10.5	370		10X10.5	500	10X10.5	510	12.5x14	600	12.5x14	660				
1200	10X10.5	410		10X10.5	510			12.5x14	660						
1500	10X10.5	470		10X10.5	530			12.5x14	710						
2200						12.5x14	730								
3300				12.5x14	750										

Ripple Current (mA, rms) at 85°C 120Hz

HV Series

Features

- ◆ Long life of 2000 hrs at 105°C
- ◆ Reflow soldering is available
- ◆ Available for high density mounting
- ◆ For detail specifications, please refer to Engineering Bulletin No. E131
- ◆ RoHS Compliant



SMD

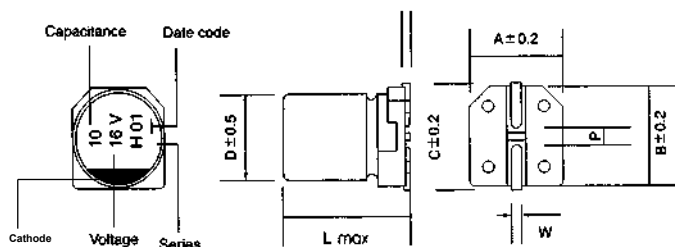
Specifications

Item	Performance Characteristics							
Operating Temperature Range	-55 +105℃							
Rated Voltage Range	6.3~50 VDC							
Capacitance Range	0.1 to 3300 μF							
Capacitance Tolerance	± 20%(120Hz,+20℃)							
Leakage Current (+20℃,max.)	I≤0.01 CV or 3 (μA) After 2 minutes, whichever is greater measured with rated working voltage applied							
Dissipation Factor (tan δ , at 20℃ , 120Hz)	Working voltage(VDC)		6.3	10	16	25	35	50
	D.F.(%)max	φ 4~6.3	30	24	20	16	14	14
		φ 8~10	35	26	24	18	14	14
Low Temperature Characteristics (at 120Hz)	Impedance ratio max							
	Rated voltage(VDC)		6.3	10	16	25	35	50
	Z-25℃／Z+20℃		6	4	4	3	2	2
	Z-40℃／Z+20℃		12	10	8	6	4	4
Load Life	Test conditions							
	Duration time		:2000 Hrs					
Shelf Life	Ambient temperature		:+105℃					
	Applied voltage		:None					
Resistance to soldering heat	After test requirement at +20℃		: Same limits as Load life.					
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.							
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250℃for 30 seconds. After removing form the hot plate and restored at room temperature, they meet the characteristic requirements listed under.							
	Leakage current		Less than specified value					
	Capacitance change		Within ± 10% of initial value					
	tan δ		Less than specified value					

Multiplier for Ripple Current vs. Frequency

CAP(µF) \ Frequency(Hz)	60(50)	120	500	1K	≥10K
0.1 ≤ CAP ≤ 100 µF	0.8	1.0	1.20	1.30	1.50
100 < CAP ≤ 1500 µF	0.8	1.0	1.10	1.15	1.20

Diagram of Dimensions:(unit:mm)



φD	L	A	B	C	W	P
4	5.5	4.3	4.3	4.9	0.5~0.8	1.0
5	5.5	5.3	5.3	5.9	0.5~0.8	1.4
6.3	5.5	6.6	6.6	7.2	0.5~0.8	2.2
6.3	7.7	6.6	6.6	7.2	0.5~0.8	2.2
8	6.5	8.3	8.3	9.0	0.5~0.8	2.3
8	10.5	8.3	8.3	9.0	0.7~1.1	3.1
10	10.5	10.3	10.3	11.0	0.7~1.1	4.5
12.5	14	13.5	13.5	15.0	1.0~1.4	5.5

Case Size

φ DxL(mm)

WV(V) Cap(μF)	6.3		10		16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1											4x5.5	1.0
0.22											4x5.5	2.0
0.33											4x5.5	3.0
0.47											4x5.5	4.0
1											4x5.5	8.4
2.2											4x5.5	11
3.3											4x5.5	13
4.7							4x5.5	12	4x5.5	14	4x5.5	18
10					4x5.5	20	4x5.5	22	4x5.5	24	6.3x5.5	28
22	4x5.5	23	4x5.5	25	4x5.5 5x5.5	31 35	5x5.5	38	5x5.5 6.3x5.5	40 46	6.3x7.7 8x6.5	50 55
33	4x5.5	28	4x5.5	34	5x5.5 6.3x5.5	36 40	6.3x5.5	48	6.3x7.7 8x6.5	47 50	6.3x7.7 8x10.5	95 135
47	4x5.5 5x5.5	37 40	5x5.5	42	5x5.5 6.3x5.5	45 56	6.3x7.7 8x6.5	56 60	6.3x7.7 8x6.5	60 65	6.3x7.7 8x10.5	115 155
100	5x5.5 6.3x5.5	46 57	6.3x5.5 8x6.5	55 60	6.3x7.7 8x6.5	58 62	6.3x7.7 8x10.5	110 160	6.3x7.7 8x10.5	130 180	10x10.5	315
150	6.3x5.5 8x6.5	70 90	6.3x5.5 8x6.5	90 110	6.3x7.7 8x6.5	125 140	8x10.5	175	8x10.5	190	10x10.5	330
220	6.3x7.7 8x6.5	90 130	6.3x7.7 8x6.5	140 160	6.3x7.7 8x10.5	170 185	8x10.5 10x10.5	180 190	8x10.5 10x10.5	250 280	10x10.5	350
330	6.3x7.7 8x10.5	140 170	8x10.5	195	8x10.5	250	8x10.5	290	10x10.5	360	12.5x14	400
470	8x10.5	210	8x10.5 10x10.5	350 420	8x10.5 10x10.5	370 420	10x10.5	440	12.5x14	460		
560	8x10.5	310	10x10.5	450	10x10.5	480	12.5x14	490	12.5x14	500		
680	10x10.5	370	10x10.5	480	10x10.5	540	12.5x14	510				
1000	10x10.5	480	10x10.5	530	12.5x14	580						
1200	10x10.5	500	12.5x14	570	12.5x14	590						
1500	10x10.5	520	12.5x14	750	12.5x14	620						
1800	12.5x14	600										
2200	12.5x14	650										
3300	12.5x14	700										

Ripple Current (mA, rms) at 105°C

JV Series Long Life, High CV

Features

- ◆ Chip type long life capacitance in large case sizes
- ◆ Chip type with load life of 3000 hours at +105°C
- ◆ Designed for surface mounting on high density PC board
- ◆ Applicable to automatic insertion machine using carrier tape
- ◆ For detail specifications, please refer to Engineering Bulletin NO.E155
- ◆ RoHS Compliant



SMD

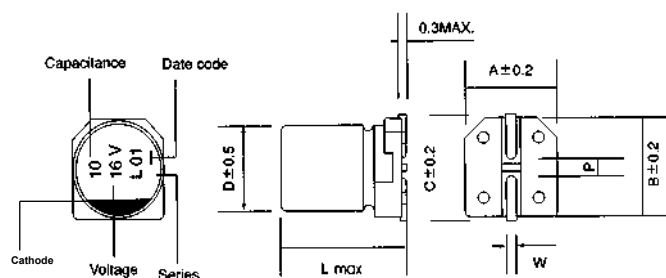
Specifications

Item	Performance Characteristics						
Operating Temperature Range	-55~+105°C						
Rated Voltage Range	6.3~50 VDC						
Capacitance Range	0.1 to 1000 μ F						
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20°C)						
Leakage Current (+20°C, max.)	$I \leq 0.01$ CV or 3 (μ A) After 2 minutes whichever is greater measured with rated working voltage applied.						
Dissipation Factor ($\tan \delta$, at 20°C, 120Hz)	Working Voltage(VDC)	6.3	10	16	25	35	50
	D.F.(%)max.	28	24	20	16	13	12
Low Temperature Characteristics (at 120Hz)	Impedance ratio max (at: 120Hz)						
	Working voltage(VDC)	6.3	10	16	25	35	50
	Z-25°C / Z+20°C	4	3	2	2	2	2
	Z-40°C / Z+20°C	10	7	5	3	3	3
Load Life	Test condition						
	Duration time : 3000 Hrs Ambient temperature : +105°C Applied voltage : Rated DC working voltage After test requirement at +20°C Capacitance change : Within $\pm 30\%$ of initial value Dissipation factor : Less than 300% of specified value Leakage current : Less than specified value						
Shelf Life	Test condition						
	Duration time : 1000 Hrs Ambient temperature : +105°C Applied voltage : None After test requirement at +20°C: Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.						
Resistance to soldering heat	The following specifications shall be satisfied when the capacitors are restored to 20°C after exposing them at 250°C for 30 seconds.						
	Leakage current	Less than specified value					
	Capacitance change	Within $\pm 10\%$ of initial value					
	$\tan \delta$	Less than specified value					

Multiplier for Ripple Current vs. Frequency

CAP(μ F) \ Frequency(Hz)	60(50)	120	500	1K	$\geq 10K$
$0.1 \leq CAP \leq 100 \mu F$	0.8	1.0	1.20	1.30	1.50
$100 < CAP \leq 1000 \mu F$	0.8	1.0	1.10	1.15	1.20

Diagram of Dimensions:(unit:mm)



ϕD	L	A	B	C	W	P
4	5.5	4.3	4.3	4.9	0.5~0.8	1.0
5	5.5	5.3	5.3	5.9	0.5~0.8	1.4
6.3	5.5	6.6	6.6	7.2	0.5~0.8	2.2
6.3	7.7	6.6	6.6	7.2	0.5~0.8	2.2
8	6.5	8.3	8.3	9.0	0.5~0.8	2.3
8	10.5	8.3	8.3	9.0	0.7~1.1	3.1
10	10.5	10.3	10.3	11.0	0.7~1.1	4.5

Case Size

φ DxL(mm)

WV Cap(μF)	6.3		10		16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1											4X5.5	1.0
0.22											4X5.5	2.6
0.33											4X5.5	3.2
0.47											4X5.5	5.0
1.0											4X5.5	8.0
2.2											4X5.5	12
3.3											4X5.5	17
4.7							4X5.5	16	4X5.5	16	5X5.5	22
10					4X5.5	18	4X5.5	26	5X5.5	27	6.3X5.5	33
22	4X5.5	22	5X5.5	30	5X5.5	31	6.3X5.5	44	6.3X5.5	45	6.3X7.7	58
33	5X5.5	33	5X5.5	35	6.3X5.5	48	6.3X5.5	50	6.3X7.7	58	8X10.5	140
47	5X5.5	36	6.3X5.5	52	6.3X5.5	51	6.3X7.7	66	8X10.5	93	8X10.5	170
100	6.3X5.5	68	6.3X7.7	81	6.3X7.7	83	8X10.5	118	10X10.5	155	10X10.5	300
220	6.3X7.7	120	8X10.5	142	10X10.5	222	10X10.5	300	10X10.5	340		
330	8X10.5	230	10X10.5	280	10X10.5	305	10X10.5	395				
470	10X10.5	290	10X10.5	305	10X10.5	330						
1000	10X10.5	360										

Ripple Current (mA, rms) at 105°C 120Hz

MV Series Chip type ,Long Life, High CV

Features

- ◆ Chip type long life capacitance in large case sizes
- ◆ Chip type with load life of 5000 hours at +105°C
- ◆ Designed for surface mounting on high density PC board
- ◆ Applicable to automatic insertion machine using carrier tape
- ◆ Complied to the RoHS directive
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E156
- ◆ RoHS Compliant



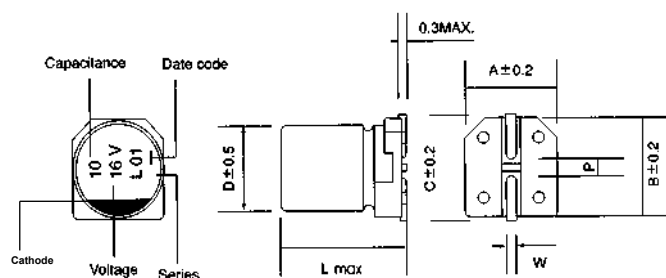
Specifications

Item	Performance Characteristics						
Operating Temperature Range	-40~+105°C						
Rated Voltage Range	6.3~50 VDC						
Capacitance Range	0.1 to 1000 μ F						
Capacitance Tolerance	$\pm 20\%$ (120Hz, +20°C)						
Leakage Current (+20°C, max.)	$I \leq 0.01$ CV or 3 (μ A) After 2 minutes whichever is greater measured with rated working voltage applied.						
Dissipation Factor ($\tan \delta$, at 20°C , 120Hz)	Working Voltage(VDC)	6.3	10	16	25	35	50
	D.F.(%)max.	32	28	22	16	13	12
Low Temperature Characteristics (at 120Hz)	Impedance ratio max (at: 120Hz)						
	Working voltage(VDC)	6.3	10	16	25	35	50
	Z-25°C / Z+20°C	4	3	2	2	2	2
	Z-40°C / Z+20°C	10	7	5	3	3	3
Load Life	Test condition Duration time : 5000 Hrs Ambient temperature : +105°C Applied voltage : Rated DC working voltage						
	After test requirement at +20°C Capacitance change : Within $\pm 30\%$ of initial value Dissipation factor : Less than 300% of specified value Leakage current : Less than specified value						
Shelf Life	Test condition Duration time : 1000 Hrs Ambient temperature : +105°C Applied voltage : None						
	After test requirement at +20°C : Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.						
Resistance to soldering heat	The following specifications shall be satisfied when the capacitors are restored to 20°C after exposing them at 250°C for 30 seconds.						
	Leakage current	Less than specified value					
	Capacitance change	Within $\pm 10\%$ of initial value					
	$\tan \delta$	Less than specified value					

Multiplier for Ripple Current vs. Frequency

CAP(μ F) \ Frequency(Hz)	60(50)	120	500	1K	$\geq 10K$
$0.1 \leq CAP \leq 100 \mu F$	0.8	1.0	1.20	1.30	1.50
$100 < CAP \leq 1000 \mu F$	0.8	1.0	1.10	1.15	1.20

Diagram of Dimensions:(unit:mm)



ϕD	L	A	B	C	W	P
4	5.5	4.3	4.3	4.9	0.5~0.8	1.0
5	5.5	5.3	5.3	5.9	0.5~0.8	1.4
6.3	5.5	6.6	6.6	7.2	0.5~0.8	2.2
6.3	7.7	6.6	6.6	7.2	0.5~0.8	2.2
8	6.5	8.3	8.3	9.0	0.5~0.8	2.3
8	10.5	8.3	8.3	9.0	0.7~1.1	3.1
10	10.5	10.3	10.3	11.0	0.7~1.1	4.5

Case Size

WV Cap(μF)		6.3		10		16		25		35		50	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1												4X5.5	1.0
0.22												4X5.5	2.6
0.33												4X5.5	3.2
0.47												4X5.5	3.8
1.0												4X5.5	6.2
2.2												4X5.5	11
3.3												4X5.5	14
4.7								4X5.5	13	4X5.5	15	5X5.5	19
10						4X5.5	17	4X5.5	23	5X5.5	25	6.3X5.5	30
22	4X5.5	22	5X5.5	28	5X5.5	30	6.3X5.5	40	6.3X5.5	42	6.3X7.7	52	
33	5X5.5	32	5X5.5	34	6.3X5.5	44	6.3X5.5	48	6.3X7.7	57	8X10.5	80	
47	5X5.5	36	6.3X5.5	48	6.3X5.5	50	6.3X7.7	63	8X10.5	92	8X10.5	95	
100	6.3X5.5	60	6.3X7.7	79	6.3X7.7	81	8X10.5	116	10X10.5	150	10X10.5	160	
220	6.3X7.7	110	8X10.5	140	10X10.5	216	10X10.5	240	10X10.5	280			
330	8X10.5	160	10X10.5	240	10X10.5	300	10X10.5	375					
470	10X10.5	260	10X10.5	280	10X10.5	320							
1000	10X10.5	340											

Ripple Current (mA, rms) at 105°C 120Hz

NV Series

Features

- ◆ 85°C Non-polarized
- ◆ Reflow soldering is available
- ◆ Available for high density mounting
- ◆ For detail specifications, please refer to Engineering Bulletin No.E132
- ◆ RoHS Compliant



SMD

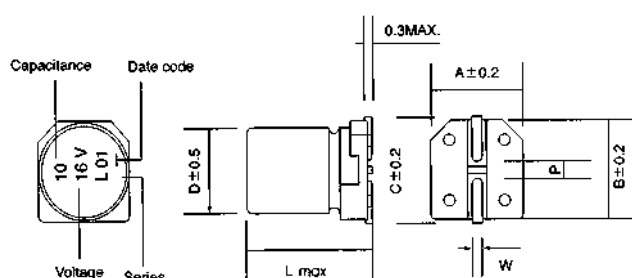
Specifications

Item	Performance Characteristics																											
Operating Temperature Range	-40~ +85℃																											
Rated Voltage Range	6.3~50 VDC																											
Capacitance Range	0.1 to 560 μ F																											
Capacitance Tolerance	±20%(120Hz,+20℃)																											
Leakage Current (+20℃,max.)	0.05 CV or 10 (μ A) After 2 minutes, whichever is greater measured with rated working voltage applied																											
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Rated voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>D.F. (%) max.</td><td>24</td><td>20</td><td>17</td><td>17</td><td>15</td><td>15</td></tr></table>							Rated voltage(VDC)	6.3	10	16	25	35	50	D.F. (%) max.	24	20	17	17	15	15							
Rated voltage(VDC)	6.3	10	16	25	35	50																						
D.F. (%) max.	24	20	17	17	15	15																						
Low Temperature Characteristics (at 120Hz)	Impedance ratio max <table><tr><td>Rated voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z-25℃／Z+20℃</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃／Z+20℃</td><td>8</td><td>6</td><td>4</td><td>3</td><td>3</td><td>3</td></tr></table>							Rated voltage(VDC)	6.3	10	16	25	35	50	Z-25℃／Z+20℃	4	3	2	2	2	2	Z-40℃／Z+20℃	8	6	4	3	3	3
Rated voltage(VDC)	6.3	10	16	25	35	50																						
Z-25℃／Z+20℃	4	3	2	2	2	2																						
Z-40℃／Z+20℃	8	6	4	3	3	3																						
Load Life	Test conditions Duration time :2000 Hrs Ambient temperature :+85℃ Applied voltage :Rated DC working voltage After test requirement at +20℃: Capacitance change :Within ±25% of the initial value Dissipation factor :Not more than 200% of specified value Leakage current :Not more than the specified value																											
Shelf Life	Test conditions Duration time :1000 Hrs Ambient temperature :+85℃ Applied voltage :None After test requirement at +20℃ : Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																											
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250℃for 30 seconds. After removing form the hot plate and restored at room temperature, they meet the characteristic requirements listed under. <table><tr><td>Leakage current</td><td>Less than specified value</td></tr><tr><td>Capacitance change</td><td>Within ±10% of initial value</td></tr><tr><td>tan δ</td><td>Less than specified value</td></tr></table>							Leakage current	Less than specified value	Capacitance change	Within ±10% of initial value	tan δ	Less than specified value															
Leakage current	Less than specified value																											
Capacitance change	Within ±10% of initial value																											
tan δ	Less than specified value																											

Multiplier for Ripple Current vs. Frequency

Frequency(Hz)	60(50)	120	500	1K	$\geq 10K$
Multiplier	0.8	1.0	1.20	1.30	1.50

Diagram of Dimensions:(unit:mm)



ϕ D	L	A	B	C	W	P
4	5.5	4.3	4.3	4.9	0.5~0.8	1.0
5	5.5	5.3	5.3	5.9	0.5~0.8	1.4
6.3	5.5	6.6	6.6	7.2	0.5~0.8	2.2
6.3	7.7	6.6	6.6	7.2	0.5~0.8	2.2
8	6.5	8.3	8.3	9.0	0.5~0.8	2.3
8	10.5	8.3	8.3	9.0	0.7~1.1	3.1

Case Size

φ DxL(mm)

WV Cap(μF)	6.3		10		16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1											4X5.5	1.0
0.22											4X5.5	2.0
0.33											4X5.5	2.8
0.47											4X5.5	4.0
1											4X5.5	8.4
2.2									4X5.5	8.4	4X5.5	13
											5X5.5	13
3.3					4X5.5	12	4X5.5	12	4X5.5	16	4X5.5	17
							5X5.5	12	5X5.5	16	5X5.5	17
4.7					4X5.5	12	4X5.5	16	4X5.5	18	5X5.5	20
							5X5.5	16	5X5.5	18	6.3X5.5	20
10	4X5.5	15	4X5.5	17	4X5.5	23	5X5.5	27	6.3X5.5	29	6.3X5.5	32
					5X5.5	23	6.3X5.5	27				
22	4X5.5	28	5X5.5	33	5X5.5	37	6.3X5.5	40	6.3X5.5	45	8X10.5	60
	5X5.5	32	6.3X5.5	37	6.3X5.5	37						
33	5X5.5	37	6.3X5.5	41	6.3X5.5	49	6.3X7.7	51	8X10.5	58	10X10.5	75
							8X6.5	55				
47	6.3X5.5	45	6.3X5.5	50	6.3X7.7	51	6.3X7.7	56	8X10.5	64	10X10.5	100
					8X6.5	55	8X6.5	60				
100	6.3X7.7	65	6.3X7.7	75	8X10.5	100	8X10.5	130				
	8X6.5	70	8X6.5	80								
220	8X10.5	120	8X10.5	150	10X10.5	170						
330	8X10.5	160	10X10.5	180								
470	10X10.5	190										
560	10X10.5	220										

Ripple Current (mA, rms) at 85°C 120Hz

KV Series

Features

- ◆ 85°C Low leakage current case diameter $\phi 4 \sim \phi 8$
- ◆ Reflow soldering is available
- ◆ Available for high density mounting
- ◆ For detail specifications, please refer to Engineering Bulletin No.E134
- ◆ RoHS Compliant



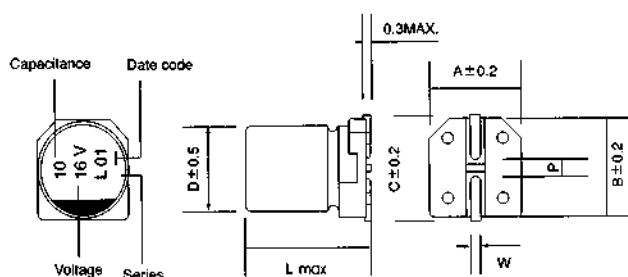
Specifications

Item	Performance Characteristics																											
Operating Temperature Range	-40~ +85℃																											
Rated Voltage Range	6.3~50 VDC																											
Capacitance Range	0.1 to 330 μ F																											
Capacitance Tolerance	±20%(120Hz,+20℃)																											
Leakage Current (+20℃,max.)	I≤0.002 CV or 0.4 (μ A) After 2 minutes, whichever is greater measured with rated working voltage applied																											
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>D.F. (%) max.</td><td>26</td><td>22</td><td>18</td><td>16</td><td>14</td><td>12</td></tr></table>							Working voltage(VDC)	6.3	10	16	25	35	50	D.F. (%) max.	26	22	18	16	14	12							
Working voltage(VDC)	6.3	10	16	25	35	50																						
D.F. (%) max.	26	22	18	16	14	12																						
Low Temperature Characteristics (at 120Hz)	Impedance ratio max <table><tr><td>Working voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z -25℃ / Z +20℃</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z -40℃ / Z +20℃</td><td>8</td><td>6</td><td>4</td><td>4</td><td>3</td><td>3</td></tr></table>							Working voltage(VDC)	6.3	10	16	25	35	50	Z -25℃ / Z +20℃	4	3	2	2	2	2	Z -40℃ / Z +20℃	8	6	4	4	3	3
Working voltage(VDC)	6.3	10	16	25	35	50																						
Z -25℃ / Z +20℃	4	3	2	2	2	2																						
Z -40℃ / Z +20℃	8	6	4	4	3	3																						
Load Life	Test conditions Duration time :1000 Hrs Ambient temperature :+85℃ Applied voltage :Rated DC working voltage After test requirement at +20℃: Capacitance change :Within ±25% of the initial value Dissipation factor :Not more than 200% of specified value Leakage current :Not more than the specified value																											
Shelf Life	Test conditions Duration time :1000 Hrs Ambient temperature :+85℃ Applied voltage :None After test requirement at +20℃ : Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																											
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250℃for 30 seconds. After removing form the hot plate and restored at room temperature, they meet the characteristic requirements listed under. <table><tr><td>Leakage current</td><td>Less than specified value</td></tr><tr><td>Capacitance change</td><td>Within ±10% of initial value</td></tr><tr><td>tan δ</td><td>Less than specified value</td></tr></table>							Leakage current	Less than specified value	Capacitance change	Within ±10% of initial value	tan δ	Less than specified value															
Leakage current	Less than specified value																											
Capacitance change	Within ±10% of initial value																											
tan δ	Less than specified value																											

Multiplier for Ripple Current vs. Frequency

CAP(μ F)\Frequency(Hz)	60(50)	120	500	1K	$\geq 10K$
$0.1 \leq CAP \leq 100 \mu F$	0.8	1	1.2	1.3	1.5
$100 < CAP \leq 330 \mu F$	0.8	1	1.1	1.15	1.2

Diagram of Dimensions:(unit:mm)



ϕD	L	A	B	C	W	P
4	5.5	4.3	4.3	4.9	0.5~0.8	1.0
5	5.5	5.3	5.3	5.9	0.5~0.8	1.4
6.3	5.5	6.6	6.6	7.2	0.5~0.8	2.2
6.3	7.7	6.6	6.6	7.2	0.5~0.8	2.2
8	6.5	8.3	8.3	9.0	0.5~0.8	2.3
8	10.5	8.3	8.3	9.0	0.7~1.1	3.1
10	10.5	10.3	10.3	11.0	0.7~1.1	4.5

Case Size

φ DxL(mm)

WV Cap(μF)	6.3		10		16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1											4x5.5	1
0.22											4x5.5	2
0.33											4x5.5	2.8
0.47											4x5.5	4
1											4x5.5	8.4
2.2									4x5.5	8.4	4x5.5	13
3.3							4x5.5	10	4x5.5	15	4x5.5	17
4.7					4x5.5	10	4x5.5	16	4x5.5	18	6.3x5.5	20
10	4x5.5	15	4x5.5	23	4x5.5	23	4x5.5	27	6.3x5.5	29	6.3x5.5	33
22	4x5.5	28	4x5.5	33	5x5.5	37	5x5.5	42	6.3x5.5	46	6.3x7.7	48
											8x6.5	52
33	4x5.5	37	5x5.5	41	6.3x5.5	49	6.3x5.5	52	6.3x7.7	58	6.3x7.7	66
									8x6.5	62	8x6.5	71
47	4x5.5	45	6.3x5.5	52	6.3x5.5	58	6.3x7.7	65	6.3x7.7	75		
							8x6.5	70	8x6.5	80		
100	5x5.5	70	6.3x7.7	75	6.3x7.7	85	6.3x7.7	102				
			8x6.5	80	8x6.5	92	8x6.5	110				
220	6.3x7.7	102	6.3x7.7	125								
	8x6.5	110	8x6.5	135								
330	6.3x7.7	155										
	8x6.5	170										

Ripple Current (mA, rms) at 85°C 120Hz

ZV Series

Features

- ◆ Low impedance 100 KHz
- ◆ Reflow soldering is available
- ◆ Available for high density mounting
- ◆ Load life 2000 hrs at 105°C
- ◆ For detail specifications, please refer to Engineering Bulletin No.E135
- ◆ RoHS Compliant



SMD

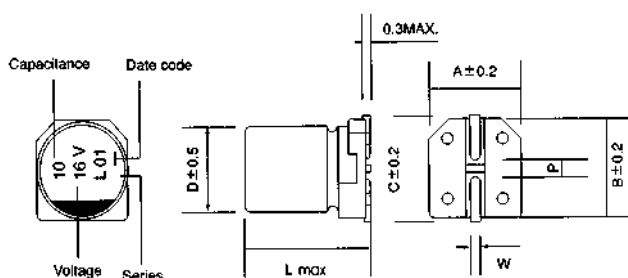
Specifications

Item	Performance Characteristics						
Operating Temperature Range	-55~ +105℃						
Rated Voltage Range	6.3~50 VDC						
Capacitance Range	1 to 3300 μ F						
Capacitance Tolerance	±20%(120Hz,+20℃)						
Leakage Current (+20℃,max.)	0.01CV or 3(μ A) After 2 minutes, whichever is greater measured with rated working voltage applied						
Dissipation Factor (tan δ , at 20℃ , 120Hz)	Working voltage(VDC)	6.3	10	16	25	35	50
	D.F. (%) max.	26	19	16	14	14	12
Low Temperature Characteristics (at 120Hz)	Impedance ratio max						
	Working voltage(VDC)	6.3	10	16	25	35	50
	Z-25℃／Z+20℃	2	3	2	2	2	2
	Z-55℃／Z+20℃	8	6	4	4	3	3
Load Life	Test conditions						
	Duration time	:2000 Hrs					
Shelf Life	Ambient temperature	:+105℃					
	Applied voltage	:Rated DC working voltage					
Resistance to soldering heat	After test requirement at +105℃ :						
	Capacitance change	:≤ ±25% of the initial measured value					
Resistance to soldering heat	Dissipation factor	:≤200% of the initial specified value					
	Leakage current	:≤ The initial specified value					
Resistance to soldering heat	Test conditions						
	Duration time	:1000 Hrs					
Resistance to soldering heat	Ambient temperature	:+105℃					
	Applied voltage	:None					
Resistance to soldering heat	After test requirement at +20℃ : Same limits as Load life.						
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.						
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250℃for 30 seconds. After removing form the hot plate and restored at room temperature, they meet the characteristic requirements listed under.						
	Leakage current	Less than specified value					
	Capacitance change	Within ± 10% of initial value					
	tan δ	Less than specified value					

Multiplier for Ripple Current vs. Frequency

CAP(μ F) \ Frequency(Hz)	60(50)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.47	0.59	0.76	0.85	0.97	1.0
10 < CAP ≤ 100	0.52	0.65	0.80	0.89	0.97	1.0

Diagram of Dimensions:(unit:mm)



ϕD	L	A	B	C	W	P
4	5.5	4.3	4.3	4.9	0.5~0.8	1.0
5	5.5	5.3	5.3	5.9	0.5~0.8	1.4
6.3	5.5	6.6	6.6	7.2	0.5~0.8	2.2
6.3	6.3	6.6	6.6	7.2	0.5~0.8	2.2
6.3	7.7	6.6	6.6	7.2	0.5~0.8	2.2
8	6.5	8.3	8.3	9.0	0.5~0.8	2.3
8	10.5	8.3	8.3	9.0	0.7~1.1	3.1
10	10.5	10.3	10.3	11.0	0.7~1.1	4.5
12.5	14	13.5	13.5	15.0	1.0~1.4	5.5

Case Size

φ DxL(mm)

WV(V) Cap(uF)	6.3			10			16			25			35			50		
	Size	Ripple	imp.	Size	Ripple	imp.	Size	Ripple	imp.	Size	Ripple	imp.	Size	Ripple	imp.	Size	Ripple	imp.
2.2													4x5.5	53	5	4x5.5	53	5
3.3													4x5.5	53	5	4x5.5	53	5
4.7										4x5.5	53	5	4x5.5	53	5	4x5.5	53	5
6.8										4x5.5	58	4.5	4x5.5 5x5.5	65 85	4.0 2.8	5x5.5	65	4
10							4x5.5	65	5	4x5.5 5x5.5	74 80	3.7 2.6	4x5.5 5x5.5 6.3x5.5	90 98 110	3.5 2.5 2.4	5x5.5 6.3x5.5	90 100	3.5 2.5
15							4x5.5	70	4.6	5x5.5 6.3x5.5	100 115	2.2 1.8	5x5.5 6.3x5.5	120 140	1.8 1.5	6.3x5.5	130	1.8
22	4x5.5	53	3.5	4x5.5	80	2.6	4x5.5 5x5.5	83 110	3.0 2.6	5x5.5 6.3x5.5	128 140	1.7 1.5	5x5.5 6.3x5.5	140 150	1.4 1.3	6.3x5.5 6.3x6.3	140 150	1.5 1.45
27	4x5.5	65	3.2	5x5.5	85	2.4	5x5.5	135	1.9	6.3x5.5	145	1.4	6.3x5.5	165	1.2	6.3x7.7	160	1.35
33	4x5.5 5x5.5	80 82	2.8 2.6	4x5.5 5x5.5	85 110	2.3 2.1	5x5.5 6.3x5.5	160 170	2.2 1.5	5x5.5 6.3x5.5	145 175	1.4 1.3	6.3x5.5 6.3x7.7 8x6.5	185 210 230	1.2 0.9 0.8	6.3x7.7 8x6.5	170 180	0.8 0.75
47	4x5.5 5x5.5	82 85	2.4 2.2	5x5.5 6.3x5.5	130 160	2.0 1.5	5x5.5 6.3x5.5	170 185	2.0 1.5	6.3x5.5 6.3x7.7 8x6.5	180 195 220	1.2 0.8 0.75	6.3x5.5 6.3x7.7 8x6.5	200 220 240	1.0 0.75 0.7	6.3x7.7 8x6.5	200 220	0.79 0.72
56	5x5.5	94	1.70	6.3x5.5	180	1.45	6.3x5.5	195	1.3	6.3x5.5	195	1.15	6.3x7.7	230	0.73	8x10.5	260	0.68
68	5x5.5 6.3x5.5	100 120	1.6 1.3	6.3x5.5 6.3x7.7	195 210	1.4 1.3	6.3x5.5 6.3x7.7 8x6.5	205 210 220	1.2 1.1 1.0	6.3x5.5 6.3x7.7 8x6.5	200 210 230	1.1 0.75 0.7	6.3x7.7 8x6.5	240 250	0.7 0.68	8x10.5	300	0.6
100	5x5.5 6.3x5.5	110 160	1.5 1.1	6.3x5.5 6.3x7.7	210 230	1.3 1.2	6.3x5.5 6.3x7.7	210 220	1.1 0.9	6.3x7.7 8x6.5	220 250	0.75 0.7	6.3x7.7 8x10.5	270 350	0.67 0.5	8x10.5	310	0.55
150	6.3x5.5 6.3x7.7	170 195	0.95 0.85	6.3x5.5 6.3x6.3 8x6.5	220 230 240	1.0 0.9 0.8	6.3x7.7 8x6.5	225 240	0.8 0.7	8x10.5	420	0.5	8x10.5	430	0.45	10x10.5	540	0.28
220	6.3x5.5 6.3x6.3 6.3x7.7	195 200 210	0.6 0.59 0.57	6.3x7.7 8x6.5	245 255	0.60 0.55	6.3x7.7 8x6.5	250 260	0.75 0.66	8x10.5 10x10.5	480 500	0.3 0.28	8x10.5	450	0.25	10x10.5	570	0.26
330	6.3x7.7 8x6.5	230 250	0.51 0.49	8x10.5	400	0.36	8x10.5	470	0.34	8x10.5	510	0.26	10x10.5	570	0.23	12.5x14	620	0.25
470	8x10.5	380	0.45	8x10.5	470	0.32	8x10.5	520	0.3	10x10.5	570	0.18	12.5x14	900	0.15			
680	8x10.5	420	0.42	10x10.5	620	0.29	10x10.5	600	0.26				12.5x14	900	0.15			
1000	8x10.5 10x10.5	470 500	0.28 0.25	10x10.5	670	0.25				12.5x14	900	0.15						
1200	10x10.5	530	0.20				12.5x14	900	0.15									
1500	10x10.5	570	0.17				12.5x14	900	0.15									
2200				12.5x14	900	0.15												
3300	12.5x14	900	0.15															

Ripple current (mArms) at 105°C 100KHz

Max Impedance at 20°C 100KHz

DV Series Chip type

Features

- ◆ Chip type ,Low impedance
- ◆ Chip type with load life of 2000 hours at +105°C
- ◆ Designed for surface mounting on high density PC board
- ◆ Applicable to automatic mounting machine using carrier tape
- ◆ Complied to the RoHS directive
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E173

ZV Low Impedance → DV



SMD

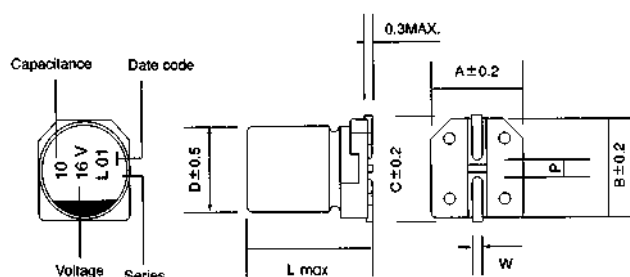
Specifications

Item	Performance Characteristics						
Operating Temperature Range	-55~ +105℃						
Rated Voltage Range	6.3~50 VDC						
Capacitance Range	1 to 3300 μ F						
Capacitance Tolerance	± 20%(120Hz, +20℃)						
Leakage Current (+20℃, max.)	I ≤0.01 CV or 3 (μ A)After 2 minutes whichever is greater measured with rated working voltage applied.						
Dissipation Factor (tan δ , at 20℃ , 120Hz)	Working voltage(VDC)	6.3	10	16	25	35	50
	D.F. (%) max.	24	19	16	14	14	12
Low Temperature Characteristics (at 120Hz)	Impedance ratio max						
	Working voltage(VDC)	6.3	10	16	25	35	50
	Z-25℃／Z+20℃	2	2	2	2	2	2
	Z-55℃／Z+20℃	8	6	4	4	3	3
Load Life	Test conditions Duration time :2000 Hrs Ambient temperature :+105℃ Applied voltage :Rated DC working voltage						
	After test requirement at +20℃ : Capacitance change :Within ±30% of initial value Dissipation factor :Less than 300% of specified value Leakage current :Less than specified value						
Shelf Life	Test conditions Duration time :1000 Hrs Ambient temperature :+105℃ Applied voltage :None						
	After test requirement at +20℃ : Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.						
Resistance to soldering heat	The following specifications shall be satisfied when the capacitors are restored to20℃ after exposing them at 250℃ for 30 seconds.						
	Leakage current	Less than specified value					
	Capacitance change	Within ± 10% of initial value					
	tan δ	Less than specified value					

Multiplier for Ripple Current vs. Frequency

CAP(μ F) \ Frequency(Hz)	60(50)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.47	0.59	0.76	0.85	0.97	1.0
10 < CAP ≤ 100	0.52	0.65	0.80	0.89	0.97	1.0

Diagram of Dimensions:(unit:mm)



ϕ D	L	A	B	C	W	P
4	5.5	4.3	4.3	4.9	0.5~0.8	1.0
5	5.5	5.3	5.3	5.9	0.5~0.8	1.4
6.3	5.5	6.6	6.6	7.2	0.5~0.8	2.2
6.3	7.7	6.6	6.6	7.2	0.5~0.8	2.2
8	6.5	8.3	8.3	9.0	0.5~0.8	2.3
8	10.5	8.3	8.3	9.0	0.7~1.1	3.1
10	10.5	10.3	10.3	11.0	0.7~1.1	4.5
12.5	14	13.5	13.5	15.0	1.0~1.4	5.5

Case Size

φ DxL(mm)

WV(V) Cap(μF)	6.3			10			16			25			35			50		
	Size	Ripple	imp.	Size	Ripple	imp.	Size	Ripple	imp.	Size	Ripple	imp.	Size	Ripple	imp.	Size	Ripple	imp.
1.0																4X5.5	55	4.5
2.2																4X5.5	55	4.5
3.3													4X5.5	80	2.8	4X5.5	55	4.5
4.7													4X5.5	85	2.5	4X5.5	55	4.5
6.8										4X5.5	70	2.8	4X5.5	88	2.2	5X5.5	75	3.8
10							4X5.5	80	2.2	4X5.5	85	2.1	4X5.5	90	2.0	5X5.5	95	2.8
15							4X5.5	85	2.0	5X5.5	125	1.9	5X5.5	125	1.4	6.3X5.5	130	2.2
22	4X5.5	75	2.2	4X5.5	80	2.2	4X5.5	90	1.98	5X5.5	145	1.2	5X5.5	155	1.1	6.3X5.5	150	1.3
27	4X5.5	79	1.98	5X5.5	125	1.9	5X5.5	140	1.2	6.3X5.5	160	1.15	6.3X5.5	170	1.05	6.3X5.5	170	1.05
33	4X5.5	82	1.9	4X5.5	90	1.85	5X5.5	170	0.74	6.3X5.5	200	0.62	6.3X5.5	210	0.6	6.3X7.7	180	1.2
	5X5.5	130	1.3	5X5.5	150	1.2	6.3X5.5	185	0.6	5X5.5	160	1.05	6.3X5.5	230	0.54	6.3X7.7	190	0.71
										6.3X5.5	220	0.58	8X6.5	260	0.51	8X6.5	200	0.7
47	4X5.5	86	1.88	5X5.5	165	1.1	5X5.5	195	1.05	6.3X5.5	220	0.56	6.3X5.5	240	0.53	6.3X7.7	230	0.7
	5X5.5	150	1.1	6.3X5.5	180	0.59	6.3X5.5	210	0.58	6.3X7.7	230	0.54	8X6.5	250	0.49	8X6.5	240	0.69
56	5X5.5	150	1.10	6.3X5.5	210	0.57	6.3X5.5	220	0.56	6.3X5.5	230	0.54	6.3X7.7	250	0.49	8X10.5	300	0.52
68	5X5.5	160	0.9	6.3X5.5	220	0.55	6.3X5.5	230	0.54	6.3X5.5	240	0.48	6.3X7.7	265	0.4	8X10.5	320	0.5
	6.3X5.5	220	0.55				8X6.5	240	0.50	8X6.5	260	0.45						
100	5X5.5	170	0.8	6.3X5.5	240	0.53	6.3X5.5	255	0.52	6.3X7.7	290	0.38	6.3X7.7	300	0.38	8X10.5	350	0.46
	6.3X5.5	230	0.53							8X6.5	300	0.36	8X10.5	420	0.28			
150	6.3X5.5	235	0.51	6.3X5.5	250	0.49	6.3X7.7	265	0.45	8X10.5	480	0.25	8X10.5	510	0.24	10X10.5	600	0.25
	8X6.5	250	0.48	8X6.5	260	0.47	8X6.5	270	0.44									
220	6.3X5.5	240	0.48	6.3X7.7	270	0.44	6.3X7.7	275	0.43	8X10.5	530	0.22	8X10.5	570	0.21	10X10.5	650	0.23
	6.3X7.7	260	0.45	8X6.5	285	0.40	8X6.5	285	0.41									
330	6.3X7.7	275	0.36	8X10.5	500	0.25	8X10.5	550	0.25	8X10.5	570	0.2	10X10.5	650	0.15	12.5X14	800	0.21
	8X6.5	290	0.34															
470	8X10.5	450	0.28	8X10.5	550	0.25	8X10.5	590	0.22	10X10.5	650	0.15	12.5X14	1100	0.08			
680	8X10.5	500	0.25	10X10.5	680	0.2	10X10.5	720	0.16				12.5X14	1100	0.08			
1000	8X10.5	530	0.20	10X10.5	740	0.15				12.5X14	1100	0.08						
	10X10.5	570	0.17															
1200	10X10.5	600	0.16															
1500	10X10.5	650	0.13				12.5X14	1100	0.08									
2200				12.5X14	1100	0.08												
3300	12.5X14	1100	0.08															

Ripple current (mA rms) at 105°C 100KHz

Max Impedance at 20°C 100KHz

RV Series Chip type

Features

- ◆ Chip type ,Low impedance
- ◆ Chip type with load life of 5000 hours at +105°C
- ◆ Designed for surface mounting on high density PC board
- ◆ Applicable to automatic mounting machine using carrier tape
- ◆ Complied to the RoHS directive
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E175

DV Low Impedance Long Life **RV**



SMD

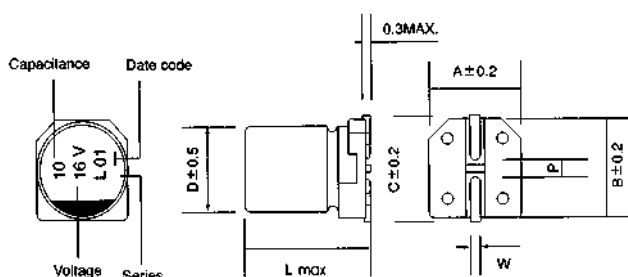
Specifications

Item	Performance Characteristics						
Operating Temperature Range	-55 to +105℃						
Rated Voltage Range	6.3 to 50 VDC						
Capacitance Range	1.0 to 3300μF						
Capacitance Tolerance	±20%(120Hz, +20℃)						
Leakage Current (+20℃, max.)	I ≤0.01 CV or 3 (μA)After 2 minutes whichever is greater measured with rated working voltage applied.						
Dissipation Factor (tan δ)	Working voltage(VDC)	6.3	10	16	25	35	50
	D.F. (%) max.	22	19	16	14	14	12
Low Temperature Characteristics (Impedance ratio at 120hz)	Impedance ratio max						
	Working voltage(VDC)	6.3	10	16	25	35	50
	Z-25℃／Z+20℃	4	3	2	2	2	2
	Z-55℃／Z+20℃	8	6	4	4	3	3
Load Life	Test condition						
	Duration time : 5000hours (2000 hours for ΦD ≤ 6.3) Ambient temperature : +105℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change : Within ±30% of initial value Dissipation factor : Less than 300% of specified value Leakage curren : Less than specified value						
Shelf Life	Test condition						
	Duration time :1000Hrs Ambient temperature : +105℃ Applied voltage :None After test requirement at +20℃:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.						
Resistance to soldering heat	The following specifications shall be satisfied when the capacitors are restored to20℃ after exposing them at 250℃ for 30 seconds.						
	Leakage current	Less than specified value					
	Capacitance change	Within ± 10% of initial value					
	tan δ	Less than specified value					

Multiplier for Ripple Current vs. Frequency

CAP(μF)\Frequency(Hz)	60(50)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.47	0.59	0.76	0.85	0.97	1.0
10 < CAP ≤ 100	0.52	0.65	0.80	0.89	0.97	1.0

Diagram of Dimensions:(unit:mm)



φD	L	A	B	C	W	P
4	5.5	4.3	4.3	4.9	0.5~0.8	1.0
5	5.5	5.3	5.3	5.9	0.5~0.8	1.4
6.3	5.5	6.6	6.6	7.2	0.5~0.8	2.2
6.3	7.7	6.6	6.6	7.2	0.5~0.8	2.2
8	6.5	8.3	8.3	9.0	0.5~0.8	2.3
8	10.5	8.3	8.3	9.0	0.7~1.1	3.1
10	10.5	10.3	10.3	11.0	0.7~1.1	4.5
12.5	14	13.5	13.5	15.0	1.0~1.4	5.5

Case Size

φ DxL(mm)

WV(V) Cap(uF)	6.3			10			16			25			35			50		
	Size	Ripple	imp.	Size	Ripple	imp.	Size	Ripple	imp.	Size	Ripple	imp.	Size	Ripple	imp.	Size	Ripple	imp.
1.0																4X5.5	60	2.9
2.2																4X5.5	60	2.9
3.3																4X5.5	60	2.9
4.7													4X5.5	90	1.35	5X5.5	85	1.52
10							4X5.5	90	1.35	4X5.5	90	1.35	5X5.5	150	0.8	6.3X5.5	165	1.4
22	4X5.5	80	1.35	4X5.5	90	1.35	5X5.5	150	0.8	5X5.5	150	0.8	6.3X5.5	230	0.44	6.3X5.5	165	1.2
33	4X5.5	85	1.35	5X5.5	160	0.8	6.3X5.5	230	0.44	6.3X5.5	230	0.44	6.3X5.5	230	0.44	6.3X7.7	185	0.68
47	5X5.5	160	0.8	6.3X5.5	230	0.44	6.3X5.5	230	0.44	6.3X5.5	230	0.44	6.3X5.5	240	0.44	6.3X7.7	185	0.68
68																8X10.5	300	0.34
100	6.3X5.5	240	0.44	6.3X5.5	240	0.44	6.3X5.5	255	0.44	6.3X7.7	300	0.36	8X10.5	450	0.17	8X10.5	350	0.34
150	6.3X5.5	240	0.44	6.3X5.5	250	0.44	6.3X7.7	280	0.36	8X10.5	500	0.17	8X10.5	550	0.17	10X10.5	555	0.25
220	6.3X7.7	280	0.36	6.3X7.7	280	0.36	6.3X7.7	280	0.36	8X10.5	550	0.17	10X10.5	670	0.09	10X10.5	600	0.23
330	8X10.5	450	0.17	8X10.5	500	0.17	8X10.5	550	0.17	8X10.5	600	0.17						
470	8X10.5	500	0.17	8X10.5	550	0.17	8X10.5 10X10.5	600 670	0.17 0.09	10X10.5	670	0.09	12.5X14	1150	0.066	12.5X14	900	0.17
680	8X10.5	550	0.17	10X10.5	690	0.09	10X10.5	750	0.09				12.5X14	1150	0.066			
1000	8X10.5	550	0.17	10X10.5	690	0.09				12.5X14	1150	0.066						
1500	10X10.5	690	0.09				12.5X14	1150	0.066									
2200				12.5X14	1150	0.066												
3300	12.5X14	1150	0.066															

Ripple Current(mA rms) at 105°C /100KHz

Max.Impedance(Ω) at 20°C /100KHz

TV Series High Temperature 125°C

Features

- ◆ Chip type ,operating temperature range-40 to +125°C
- ◆ Designed for surface mounting on high density PC board
- ◆ Applicable to automatic insertion machine using carrier tape
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E157
- ◆ RoHS Compliant



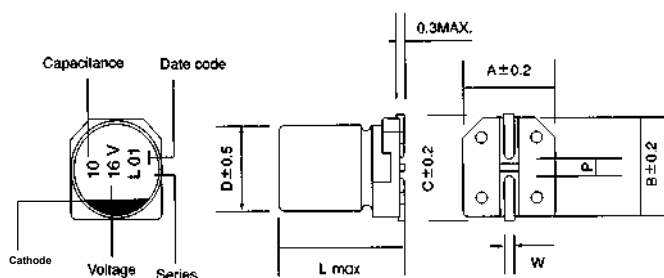
Specifications

Item	Performance Characteristics																	
Operating Temperature Range	-40~+125℃																	
Rated Voltage Range	10~50 VDC																	
Capacitance Range	10 to 330 μF																	
Capacitance Tolerance	± 20%(120Hz, +20℃)																	
Leakage Current (+20℃, max.)	I ≤0.03 CV or 4 (μA)After 1 minutes whichever is greater measured with rated working voltage applied.																	
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>D.F.(%)max.</td><td>32</td><td>24</td><td>21</td><td>18</td><td>18</td></tr></table>						Working Voltage(VDC)	10	16	25	35	50	D.F.(%)max.	32	24	21	18	18
	Working Voltage(VDC)	10	16	25	35	50												
D.F.(%)max.	32	24	21	18	18													
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																	
	<table><tr><td>Working voltage(VDC)</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z-25℃ / Z+20℃</td><td>12</td><td>8</td><td>6</td><td>4</td><td>4</td></tr></table>						Working voltage(VDC)	10	16	25	35	50	Z-25℃ / Z+20℃	12	8	6	4	4
Working voltage(VDC)	10	16	25	35	50													
Z-25℃ / Z+20℃	12	8	6	4	4													
Load Life	Test condition Duration time : 1000 Hrs (Φ8X6.5mm & 6.3X7.7mm) ; 2000Hrs (Φ8X10.5mm & 10X10.5mm) Ambient temperature :+125℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change : Within ±30% of initial value Dissipation factor : Less than 300% of specified value Leakage current : Less than specified value																	
Shelf Life	Test condition Duration time :1000 Hrs Ambient temperature :+125℃ Applied voltage :None After test requirement at +20℃ :Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																	
Resistance to soldering heat	The following specifications shall be satisfied when the capacitors are restored to20℃ after exposing them at 250℃ for 30 seconds.																	
	Leakage current		Less than specified value															
	Capacitance change		Within ± 10% of initial value															
	tan δ		Less than specified value															

Multiplier for Ripple Current vs. Frequency

CAP(μ F) \ Frequency(Hz)	60(50)	120	500	1K	$\geq 10K$
0.1~47 μ F	0.8	1.0	1.20	1.30	1.50
100~1000 μ F	0.8	1.0	1.10	1.15	1.20

Diagram of Dimensions:(unit:mm)



ϕD	L	A	B	C	W	P
6.3	7.7	6.6	6.6	7.2	0.5~0.8	2.2
8	6.5	8.3	8.3	9.0	0.5~0.8	2.3
8	10.5	8.3	8.3	9.0	0.7~1.1	3.1
10	10.5	10.3	10.3	11.0	0.7~1.1	4.5

Case Size

φ DxL(mm)

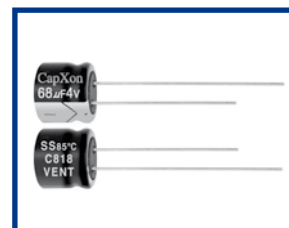
WV Cap(μF)	10		16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
10									6.3X7.7	22
									8X6.5	24
22									6.3X7.7	35
									8X6.5	38
33							6.3X7.7	40		
							8X6.5	44	8X10.5	46
47					6.3X7.7	45				
					8X6.5	48	8X10.5	52	10X10.5	58
100	6.3X7.7	53								
	8X6.5	58	8X10.5	66	8X10.5	74	10X10.5	80		
220	8X10.5	90	10X10.5	102	10X10.5	116				
330	10X10.5	112								

Ripple Current (mA, rms) at 125°C 120Hz

SS Series 5 mm 85°C

Features

- ◆ Design for space-saving and high density insertion.
- ◆ 4WV products are standardized for recent battery power source devices.
- ◆ Low price compared to Tantalum capacitors.
- ◆ Applications: VTR, car radio and commercial applications.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E108
- ◆ RoHS Compliant



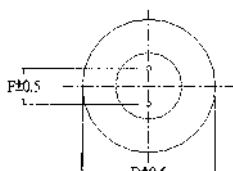
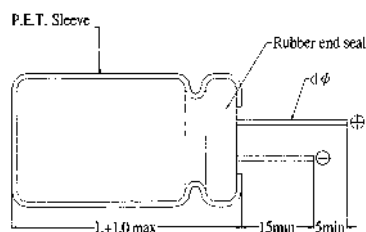
Specifications

Item	Performance Characteristics																															
Operating Temperature Range	-40 to +85°C																															
Rated Voltage Range	4 to 50 VDC																															
Capacitance Range	0.1 to 330 μF																															
Capacitance Tolerance	±20% (120Hz, +20°C)																															
Leakage Current(+20°C, max)	I≤0.01 CV or 3 (μA)																															
	After 1 minute, whichever is greater measured with rated working voltage applied.																															
Dissipation Factor (tan δ , at 20°C , 120Hz)	<table><tr><td>Working Voltage (VDC)</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>D.F. (%)max</td><td>35</td><td>24</td><td>20</td><td>16</td><td>14</td><td>12</td><td>10</td></tr></table>								Working Voltage (VDC)	4	6.3	10	16	25	35	50	D.F. (%)max	35	24	20	16	14	12	10								
Working Voltage (VDC)	4	6.3	10	16	25	35	50																									
D.F. (%)max	35	24	20	16	14	12	10																									
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																															
	<table><tr><td>Rated voltage(VDC)</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z-25°C／Z+20°C</td><td>7</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40°C／Z+20°C</td><td>15</td><td>8</td><td>8</td><td>4</td><td>4</td><td>3</td><td>3</td></tr></table>								Rated voltage(VDC)	4	6.3	10	16	25	35	50	Z-25°C／Z+20°C	7	4	3	2	2	2	2	Z-40°C／Z+20°C	15	8	8	4	4	3	3
Rated voltage(VDC)	4	6.3	10	16	25	35	50																									
Z-25°C／Z+20°C	7	4	3	2	2	2	2																									
Z-40°C／Z+20°C	15	8	8	4	4	3	3																									
Load Life	Test conditions Duration time :1000 Hrs Ambient temperature :+85°C Applied voltage :Rated DC working voltage After test requirement at +20°C Capacitance change :≤ ±20% of the initial measured value (4V : ≤ ±30%) Dissipation factor :≤ 200% of the initial specified value Leakage current :≤ The initial specified value																															
Shelf Life	Test conditions Duration time :1000 Hrs Ambient temperature :+85°C Applied voltage :None After test requirement at +20°C : Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																															

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	60(50)	120	1K	≥10K
0.1~68 µF	0.8	1	1.30	1.50
100~330 µF	0.8	1	1.15	1.20

Diagram of Dimensions:(unit:mm)



D φ	3	4	5	6.3	8
F	1.0±0.3	1.5±0.5	2.0±0.5	2.5±0.5	3.5±0.5
d φ	0.4	0.45			

Case Size

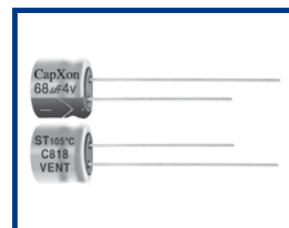
WV Cap(μF)		4		6.3		10		16		25		35		50	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1														3x5	1.0
														4x5	1.5
0.15														3x5	1.8
														4x5	2.0
0.22														3x5	2.3
														4x5	2.6
0.33														3x5	3.0
														4x5	3.2
0.47														3x5	3.5
														4x5	3.8
0.68														3x5	4.6
														4x5	5.0
1														3x5	5.6
														4x5	6.2
1.5														3x5	6.5
														4x5	7.0
2.2												3x5	8.4	3x5	8.6
												4x5	8.4	4x5	9.0
3.3										3x5	9.2	3x5	10	4x5	14
										4x5	10	4x5	11		
4.7								3x5	10	3x5	12	4x5	18	5x5	20
								4x5	11	4x5	15				
6.8						3x5	9	3x5	11	4x5	17	5x5	20	6.3x5	25
						4x5	11	4x5	13						
10		3x5	9	3x5	13	3x5	15	3x5	18	4x5	27	5x5	29	6.3x5	30
		4x5	11	4x5	14	4x5	17	4x5	20	5x5	28				
15		4x5	17	4x5	17	4x5	21	5x5	26	5x5	30	6.3x5	33	6.3x5	37
										6.3x5	33				
22		3x5	19	3x5	21	4x5	30	4x5	33	6.3x5	44	6.3x5	46	6.3x5	48
		4x5	21	4x5	24	5x5	33	5x5	35					8x5	52
33		3x5	26	4x5	33	5x5	39	5x5	42	6.3x5	52	8x5	63	8x5	70
		4x5	28	5x5	37			6.3x5	46						
47		4x5	33	5x5	39	5x5	42	6.3x5	58	6.3x5	62	8x5	83		
						6.3x5	46								
68		5x5	43	6.3x5	53	6.3x5	56	6.3x5	65	8x5	90				
		6.3x5	48												
100		5x5	52	6.3x5	65	6.3x5	76	6.3x5	86	8x5	108				
								8x5	92						
220		6.3x5	78	6.3x5	90	8x5	138								
				8x5	115										
330		8x5	142	8x5	145										

Ripple Current (mA, rms) at 85°C 120Hz

ST Series 5 mm 105°C

Features

- ◆ 5.0+1 mm max height
- ◆ Load life 105°C, 1000 hrs assured
- ◆ For detail specifications, please refer to Engineering Bulletin No. E112
- ◆ RoHS Compliant



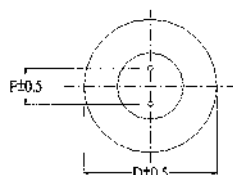
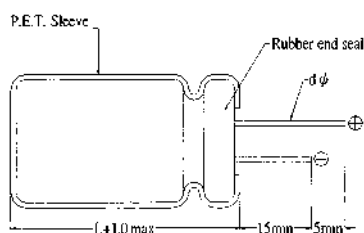
Specifications

Item	Performance Characteristics							
Operating Temperature Range	-40 to +105℃							
Rated Voltage Range	4 to 50 VDC							
Capacitance Range	0.1 to 100 μF							
Capacitance Tolerance	±20% (120Hz, +20℃)							
Leakage Current(+20℃, max)	1≦0.01 CV or 3 (μA)							
	After 2 minutes, whichever is greater measured with rated working voltage applied.							
Dissipation Factor (tan δ , at 20℃ , 120Hz)	Working Voltage (VDC)	4	6.3	10	16	25	35	50
	D.F. (%)max	35	24	20	16	14	12	10
Low Temperature Characteristics (at 120Hz)	Impedance ratio max							
	Working Voltage (VDC)	4	6.3	10	16	25	35	50
	Z-25℃ / Z+20℃	6	3	3	2	2	2	2
	Z-40℃ / Z+20℃	12	8	5	4	3	3	3
Load Life	Test conditions							
	Duration time	:1000 Hrs						
	Ambient temperature	:+105℃						
	Applied voltage	:Rated DC working voltage						
	After test requirement at +20℃							
	Capacitance change	:≦ ±20% of the initial measured value (4V : ≦ ±30%)						
	Dissipation factor	:≦ 200% of the initial specified value						
	Leakage current	:≦ The initial specified value						
Shelf Life	Test conditions							
	Duration time	:1000 Hrs						
	Ambient temperature	:+105℃						
	Applied voltage	:None						
	After test requirement at +20℃ : Same limits as Load life.							
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.							

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	1K	≥10K
0.1~47	0.8	1	1.30	1.50
100~220	0.8	1	1.15	1.20

Diagram of Dimensions:(unit:mm)



D φ	3	4	5	6.3	8
F	1.0±0.3	1.5±0.5	2.0±0.5	2.5±0.5	3.5±0.5
d φ	0.4	0.45			

Case Size

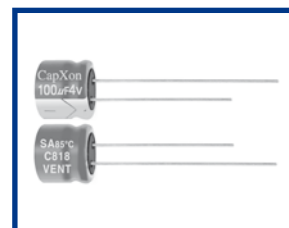
WV Cap(μF)		4		6.3		10		16		25		35		50		φ DxL(mm)	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple		
0.1														3x5	1.0		
														4x5	1.5		
0.15														3x5	1.8		
														4x5	2.0		
0.22														3x5	2.3		
														4x5	2.6		
0.33														3x5	3.0		
														4x5	3.2		
0.47														3x5	3.5		
														4x5	3.8		
0.68														3x5	4.6		
														4x5	5		
1														3x5	5.6		
														4x5	6.2		
1.5														3x5	6.5		
														4x5	7		
2.2												3x5	7.5	3x5	8		
												4x5	7.5	4x5	11		
3.3										3x5	8.5	3x5	9	4x5	14		
										4x5	8.5	4x5	11				
4.7								3x5	9	3x5	10	4x5	15	5x5	19		
								4x5	9	4x5	13						
6.8						3x5	11	4x5	13	4x5	15	5x5	19	5x5	22		
						4x5	11							6.3x5	25		
10		3x5	10	3x5	12	4x5	15	4x5	18	5x5	23	5x5	25	6.3x5	30		
		4x5	10	4x5	12												
15		4x5	13	4x5	15	4x5	18	5x5	23	6.3x5	32	6.3x5	32	8x5	35		
22		4x5	22	4x5	22	5x5	27	5x5	30	6.3x5	39	6.3x5	48	8x5	50		
33		5x5	30	5x5	30	5x5	35	6.3x5	45	6.3x5	48	8x5	50				
47		5x5	36	5x5	36	6.3x5	48	6.3x5	50	6.3x5	50						
										8x5	55						
68		6.3x5	52	6.3x5	52	6.3x5	53	8x5	55								
100		6.3x5	60	6.3x5	60	8x5	65	8x5	68								
220		6.3x5	80	6.3x5	80	8x5	83										

Ripple Current (mA, rms) at 105°C 120Hz

SA Series 5 mm, Low Leakage Current 85°C

Features

- ◆ Low leakage current, height 5 mm
- ◆ For detail specifications, please refer to Engineering Bulletin No. E136
- ◆ RoHS Compliant



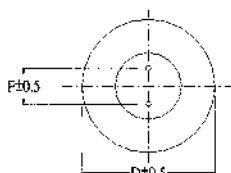
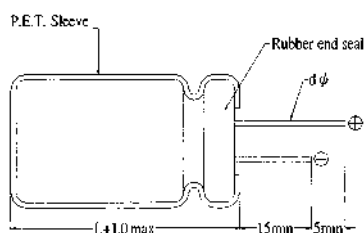
Specifications

Item	Performance Characteristics							
Operating Temperature Range	-40 to +85°C							
Rated Voltage Range	4 to 50 VDC							
Capacitance Range	0.1 to 100 μF							
Capacitance Tolerance	± 20%(120Hz, +20°C)							
Leakage Current(+20°C, max)	I ≤0.002 CV or 0.4 (μA) After 2 minutes, whichever is greater measured with rated working voltage applied.							
Dissipation Factor (tan δ , at 20°C , 120Hz)	Working Voltage (VDC)	4	6.3	10	16	25	35	50
	D.F. (%)max	35	24	20	16	14	12	10
Low Temperature Characteristics (at 120Hz)	Impedance ratio max							
	Working Voltage (VDC)	4	6.3	10	16	25	35	50
	Z-40°C / Z+20°C	15	10	8	6	4	3	3
Load Life	Test conditions							
	Duration time	:1000 Hrs						
Shelf Life	Ambient temperature							
	Applied voltage	:None						
	After test requirement at +20°C : Same limits as Load life.							
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.							

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	1K	≥10K
0.1~47	0.8	1	1.30	1.50
100	0.8	1	1.15	1.20

Diagram of Dimensions:(unit:mm)



D φ	4	5	6.3	8
F	1.5±0.5	2.0±0.5	2.5±0.5	3.5±0.5
d φ	0.45			

Case Size

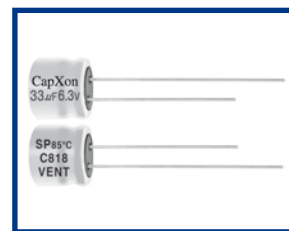
WV Cap(μF)		4		6.3		10		16		25		35		50	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1														4x5	1.0
0.22														4x5	2.0
0.33														4x5	2.8
0.47														4x5	4.0
1														4x5	8.4
2.2														4x5	13
3.3														5x5	17
4.7										4x5	16	4x5	18	5x5	20
10								4x5	25	5x5	27	5x5	29	6.3x5	33
22				4x5	28	4x5	32	5x5	37	6.3x5	42	6.3x5	46	8x5	60
33		5x5	28	5x5	37	5x5	41	6.3x5	49	6.3x5	52				
47		5x5	33	5x5	45	6.3x5	52	6.3x5	58						
100		6.3x5	56	6.3x5	70										

Ripple Current (mA, rms) at 85°C 120Hz

SP Series 5 mm, Non-polar 85°C

Features

- ◆ Non-polarized with 5 mm for crossover networks of height-pitched, mean and low pitched sounds in high-fidelity sound systems.
- ◆ The series offers excellent frequency characteristics and minimal capacitance deviation with frequency.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E118
- ◆ RoHS Compliant



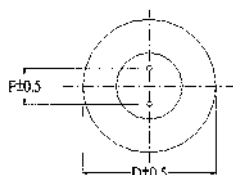
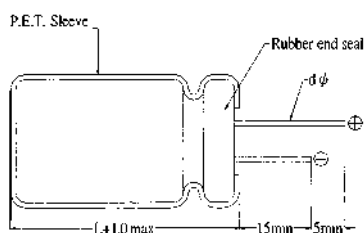
Specifications

Item	Performance Characteristics																											
Operating Temperature Range	-40 to +85°C																											
Rated Voltage Range	6.3 to 50 VDC																											
Capacitance Range	0.1 to 47 μF																											
Capacitance Tolerance	±20% (120Hz, +20°C)																											
Leakage Current(+20°C, max)	I≤0.05 CV or 10 (μA)																											
	After 2 minutes, whichever is greater measured with rated working voltage applied.																											
Dissipation Factor (tan δ , at 20°C , 120Hz)	<table><tr><td>Working Voltage (VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>D.F. (%)max</td><td>24</td><td>20</td><td>17</td><td>17</td><td>15</td><td>15</td></tr></table>							Working Voltage (VDC)	6.3	10	16	25	35	50	D.F. (%)max	24	20	17	17	15	15							
Working Voltage (VDC)	6.3	10	16	25	35	50																						
D.F. (%)max	24	20	17	17	15	15																						
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																											
	<table><tr><td>Working Voltage (VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z-25°C / Z+20°C</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40°C / Z+20°C</td><td>8</td><td>6</td><td>4</td><td>4</td><td>3</td><td>3</td></tr></table>							Working Voltage (VDC)	6.3	10	16	25	35	50	Z-25°C / Z+20°C	4	3	2	2	2	2	Z-40°C / Z+20°C	8	6	4	4	3	3
Working Voltage (VDC)	6.3	10	16	25	35	50																						
Z-25°C / Z+20°C	4	3	2	2	2	2																						
Z-40°C / Z+20°C	8	6	4	4	3	3																						
Load Life	Test conditions Duration time :1000 Hrs Ambient temperature :+85°C Applied voltage :Rated DC working voltage to each polarity for 500 Hrs After test requirement at +20°C Capacitance change :≤ ±20% of the initial measured value (4V : ≤ ±30%) Dissipation factor :≤ 200% of the initial specified value Leakage current :≤ The initial specified value																											
Shelf Life	Test conditions Duration time :1000 Hrs Ambient temperature :+85°C Applied voltage :None After test requirement at +20°C : Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																											

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	60(50)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.8	1	1.30	1.45	1.65	1.70
10 < CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.16	1.25	1.35	1.38

Diagram of Dimensions:(unit:mm)



D φ	4	5	6.3
F	1.5±0.5	2.0±0.5	2.5±0.5
d φ	0.45		

Case Size

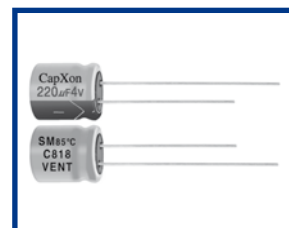
φ DxL(mm)												
WV Cap(μF)	6.3		10		16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1											4x5	1
0.22											4x5	2
0.33											4x5	2.8
0.47											4x5	4
1											4x5	8
2.2									4x5	8.5	5x5	13
3.3					4x5	10	5x5	13	5x5	14	5x5	15
4.7					4x5	12	5x5	15	5x5	16	6.3x5	18
10	4x5	15	4x5	16	5x5	23	6.3x5	25	6.3x5	28		
			5x5	18								
22	5x5	27	6.3x5	32	6.3x5	36						
33	6.3x5	35	6.3x5	40	6.3x5	47						
47	6.3x5	44										

Ripple Current (mA, rms) at 85°C 120Hz

SM Series 7 mm 85°C Standard

Features

- ◆ Design for space-saving and high density insertion.
- ◆ Applications: VTR, car radio, car stereos, charger, etc.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E104
- ◆ RoHS Compliant



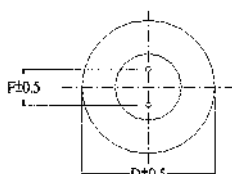
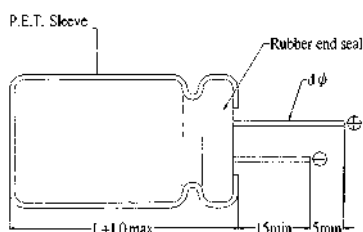
Specifications

Item	Performance Characteristics								
Operating Temperature Range	-40 to +85°C								
Rated Voltage Range	4 to 63 VDC								
Capacitance Range	0.1 to 470 µF								
Capacitance Tolerance	± 20% (120Hz, +20°C)								
Leakage Current(+20°C, max)	I ≤ 0.01 CV or 3 (µA) After 1 minute, whichever is greater measured with rated working voltage applied.								
Dissipation Factor (tan δ , at 20°C , 120Hz)	Working Voltage (VDC)	4	6.3	10	16	25	35	50	63
	D.F. (%)max	25	22	20	16	14	12	10	9
Low Temperature Characteristics (at 120Hz)	Impedance ratio max								
	Working Voltage (VDC)	4	6.3	10	16	25	35	50	63
	Z-25°C / Z+20°C	7	4	3	2	2	2	2	2
	Z-40°C / Z+20°C	15	8	6	4	4	3	3	3
Load Life	Test conditions								
	Duration time :1000 Hrs								
	Ambient temperature :+85°C								
	Applied voltage :Rated DC working voltage								
	After test requirement at +20°C								
	Capacitance change :≤ ±20% of the initial measured value (4V : ≤ ±30%)								
	Dissipation factor :≤ 200% of the initial specified value								
	Leakage current :≤ The initial specified value								
Shelf Life	Test conditions								
	Duration time :1000 Hrs								
	Ambient temperature :+85°C								
	Applied voltage :None								
	After test requirement at +20°C : Same limits as Load life.								
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.								

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	60(50)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.8	1	1.30	1.45	1.65	1.70
10 < CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.16	1.25	1.35	1.38

Diagram of Dimensions:(unit:mm)



D φ	4	5	6.3	8
F	1.5±0.5	2.0±0.5	2.5±0.5	3.5±0.5
d φ	0.45		0.5	

Case Size

φ DxDL(mm)										
WV Cap(μF)	4		6.3		10		16		25	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
4.7							4x7	15	4x7	20
6.8							4x7	20	4x7	22
10							4x7	28	4x7	30
15			4x7	28	4x7	32	4x7	35	5x7	37
22			4x7	35	4x7	36	4x7	40	4x7	46
					5x7	38	5x7	42	5x7	50
33	4x7	33	4x7	40	4x7	43	4x7	45	5x7	52
			5x7	42	5x7	45	5x7	55	6.3x7	58
47	4x7	35	4x7	46	4x7	50	5x7	65	6.3x7	71
			5x7	48	5x7	58	6.3x7	68		
68	4x7	42	5x7	50	5x7	60	6.3x7	70	6.3x7	79
100	4x7	55	5x7	75	5x7	82	6.3x7	98	8x7	113
	5x7	61	6.3x7	80	6.3x7	90	8x7	105		
150	5x7	72	6.3x7	82	6.3x7	95	8x7	111		
			8x7	85						
220	6.3x7	110	6.3x7	120	6.3x7	136	8x7	152		
			8x7	133	8x7	140				
330	6.3x7	120	8x7	160	8x7	182				
	8x7	165								
470	8x7	235								

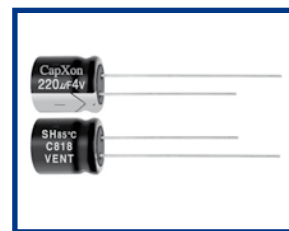
WV Cap(μ F)	35		50		63	
	Size	Ripple	Size	Ripple	Size	Ripple
0.1			4x7	1.3	4x7	1.3
0.15			4x7	2	4x7	2.0
0.22			4x7	3	4x7	3.0
0.33			4x7	3.5	4x7	4.0
0.47			4x7	5	4x7	6.3
0.68			4x7	7.5	4x7	8
1			4x7	10	4x7	12
1.5			4x7	13	4x7	14
2.2			4x7	17	4x7	18
3.3	4x7	18	4x7	23	5x7	25
4.7	4x7	22	4x7	24	5x7	30
			5x7	26	6.3x7	33
6.8	5x7	25	5x7	28	6.3x7	31
10	4x7	31	5x7	35	6.3x7	48
	5x7	33	6.3x7	38		
15	5x7	37	6.3x7	42	8x7	45
22	5x7	47	6.3x7	59	8x7	65
	6.3x7	55	8x7	63		
33	6.3x7	65	8x7	75		
	8x7	68				
47	8x7	85	8x7	88		
68	8x7	88				
100	8x7	119				

Ripple Current (mA, rms) at 85°C 120Hz

SH Series 7 mm 85°C Long Life

Features

- ◆ Long life 2000 hrs.
- ◆ Design for space-saving and high density insertion.
- ◆ Applications: VTR, car radio, car stereos, charger, etc.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E137
- ◆ RoHS Compliant



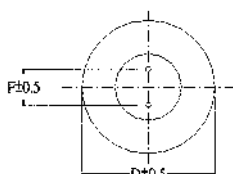
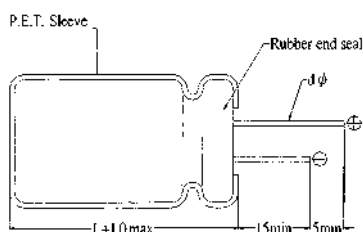
Specifications

Item	Performance Characteristics								
Operating Temperature Range	-40 to +85°C								
Rated Voltage Range	4 to 63 VDC								
Capacitance Range	0.1 to 470 µF								
Capacitance Tolerance	±20% (120Hz, +20°C)								
Leakage Current(+20°C, max)	I ≤ 0.01 CV or 3 (µA) After 1 minute, whichever is greater measured with rated working voltage applied.								
Dissipation Factor (tan δ, at 20°C, 120Hz)	Working Voltage (VDC)	4	6.3	10	16	25	35	50	63
	D.F. (%)max	25	22	20	16	14	12	10	9
Low Temperature Characteristics (at 120Hz)	Impedance ratio max								
	Working Voltage (VDC)	4	6.3	10	16	25	35	50	63
	Z-25°C / Z+20°C	7	4	3	2	2	2	2	2
	Z-40°C / Z+20°C	15	8	6	4	4	3	3	3
Load Life	Test conditions Duration time :2000 Hrs Ambient temperature :+85°C Applied voltage :Rated DC working voltage After test requirement at +20°C Capacitance change :≤ ±20% of the initial measured value (4V : ≤ ±30%) Dissipation factor :≤ 200% of the initial specified value Leakage current :≤ The initial specified value								
Shelf Life	Test conditions Duration time :1000 Hrs Ambient temperature :+85°C Applied voltage :None After test requirement at +20°C : Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.								

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	60(50)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.8	1	1.30	1.45	1.65	1.70
10 < CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.16	1.25	1.35	1.38

Diagram of Dimensions:(unit:mm)



D φ	4	5	6.3	8
F	1.5±0.5	2.0±0.5	2.5±0.5	3.5±0.5
d φ	0.45		0.5	

Case Size

WV Cap(μF)		4		6.3		10		16		25	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
4.7										4x7	17
6.8								4x7	20	4x7	21
10								4x7	30	4x7	30
15						4x7	28	4x7	32	5x7	33
22	4x7	23	4x7	31	4x7	35	4x7	37	5x7	45	45
33	4x7	26	4x7	32	4x7	40	4x7	45	50	6.3x7	60
47	4x7	35	4x7	40	4x7	47	5x7	61	6.3x7	68	68
68	5x7	55	5x7	55	5x7	60	6.3x7	72	6.3x7	75	75
100	5x7	58	5x7	65	5x7	80	6.3x7	95	8x7	115	115
220	6.3x7	65	6.3x7	70	6.3x7	105					
330	6.3x7	90	8x7	90	8x7	125					
470	8x7	120									

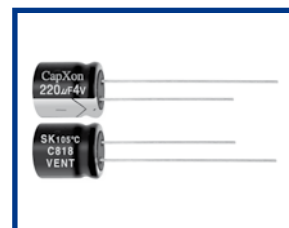
WV Cap(μF)		35		50		63	
		Size	Ripple	Size	Ripple	Size	Ripple
0.1				4x7	1.5	4x7	1.5
0.15				4x7	1.8	4x7	1.8
0.22				4x7	2.5	4x7	2.5
0.33				4x7	3.5	4x7	3.5
0.47				4x7	5	4x7	6
0.68				4x7	7	4x7	7
1				4x7	10	4x7	12
1.5				4x7	13	4x7	14
2.2				4x7	19	4x7	19
3.3				4x7	24	5x7	25
4.7	4x7	22	4x7	27	5x7	29	29
6.8	4x7	24	5x7	32	6.3x7	33	33
10	5x7	30	6.3x7	35	6.3x7	40	40
15	5x7	38	6.3x7	52	8x7	55	55
22	6.3x7	45	6.3x7	60	8x7	65	65
33	5x7	50	8x7	63			
47	6.3x7	54	8x7	78			
68	8x7	68					
	8x7	80					
	8x7	85					

Ripple Current (mA, rms) at 85°C 120Hz

SK Series 7 mm Standard 105°C

Features

- ◆ Design for space-saving and high density insertion.
- ◆ Applications: VTR, car radio, car stereos. charger, etc.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E115
- ◆ RoHS Compliant



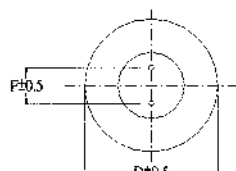
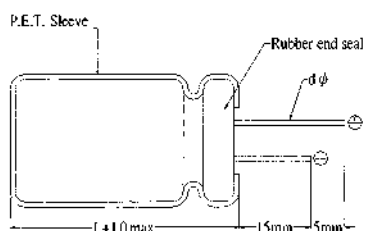
Specifications

Item	Performance Characteristics								
Operating Temperature Range	-40 to +105℃								
Rated Voltage Range	4 to 63 VDC								
Capacitance Range	0.1 to 470 μF								
Capacitance Tolerance	±20% (120Hz, +20℃)								
Leakage Current(+20℃, max)	I≤0.01 CV or 3 (μA)								
	After 1 minute, whichever is greater measured with rated working voltage applied.								
Dissipation Factor (tan δ , at 20℃ , 120Hz)	Working Voltage (VDC)	4	6.3	10	16	25	35	50	63
	D.F. (%)max	25	22	20	16	14	12	10	9
Low Temperature Characteristics (at 120Hz)	Impedance ratio max								
	Working Voltage (VDC)	4	6.3	10	16	25	35	50	63
	Z-25℃ / Z+20℃	7	4	3	2	2	2	2	2
	Z-40℃ / Z+20℃	15	8	6	4	4	3	3	3
Load Life	Test conditions								
	Duration time	:1000 Hrs							
	Ambient temperature	:+105℃							
	Applied voltage	:Rated DC working voltage							
	After test requirement at +20℃								
	Capacitance change	:≤ ±20% of the initial measured value (4V : ≤ ±30%)							
	Dissipation factor	:≤ 200% of the initial specified value							
Leakage current	:≤ The initial specified value								
Shelf Life	Test conditions								
	Duration time	:1000 Hrs							
	Ambient temperature	:+105℃							
	Applied voltage	:None							
	After test requirement at +20℃ : Same limits as Load life.								
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.								

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.8	1	1.30	1.45	1.65	1.70
10 < CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.16	1.25	1.25	1.38

Diagram of Dimensions:(unit:mm)



D φ	4	5	6.3	8
F	1.5±0.5	2.0±0.5	2.5±0.5	3.5±0.5
d φ	0.45		0.5	

Case Size

φ DxL(mm)

WV Cap(μF)	4		6.3		10		16		25	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
4.7									4x7	17
6.8							4x7	20	4x7	21
10							4x7	30	4x7	30
15									5x7	33
22	4x7	23	4x7	31	4x7	28	4x7	32	5x7	38
						35	4x7	37	5x7	45
33	4x7	26	4x7	32	4x7	40	5x7	42	6.3x7	48
			5x7	35	5x7	45	4x7	45	5x7	52
47	4x7	35	4x7	40	5x7	47	5x7	50	6.3x7	60
			5x7	47	5x7	51	5x7	61	6.3x7	68
68	5x7	55	5x7	55	5x7	60	6.3x7	67	8x7	72
					6.3x7	68	6.3x7	72	6.3x7	75
100	5x7	58	5x7	65	5x7	80	6.3x7	95	8x7	115
			6.3x7	75	6.3x7	90	8x7	105		
220	6.3x7	65	6.3x7	90	6.3x7	105				
			8x7	120	8x7	150				
330	6.3x7	90	8x7	120						
470	8x7	120								

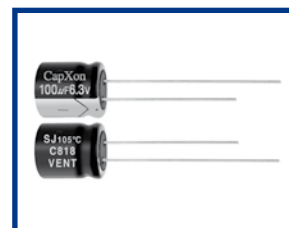
WV Cap(μF)	35		50		63	
	Size	Ripple	Size	Ripple	Size	Ripple
0.1			4x7	1.5	4x7	1.5
0.15			4x7	1.8	4x7	1.8
0.22			4x7	2.5	4x7	2.5
0.33			4x7	3.5	4x7	3.5
0.47			4x7	5	4x7	6
0.68			4x7	7	4x7	7
1			4x7	10	4x7	12
1.5			4x7	13	4x7	14
2.2			4x7	19	4x7	19
3.3			4x7	24	5x7	25
4.7	4x7	22	4x7	27	5x7	29
			5x7	29	6.3x7	33
6.8	4x7	24	5x7	32	6.3x7	35
	5x7	28	6.3x7	33		
10	4x7	30	5x7	35	6.3x7	40
	5x7	35	6.3x7	38		
15	5x7	38	6.3x7	52	8x7	55
	6.3x7	45				
22	5x7	50	6.3x7	60	8x7	65
	6.3x7	58	8x7	63		
33	6.3x7	54	8x7	78		
	8x7	68				
47	8x7	80				
68	8x7	85				

Ripple Current (mA, rms) at 105°C 120Hz

SJ Series 7 mm 105°C Long Life

Features

- ◆ Design for space-saving and high density insertion.
- ◆ Applications: VTR, car radio, car stereos, charger, etc.
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E146
- ◆ RoHS Compliant



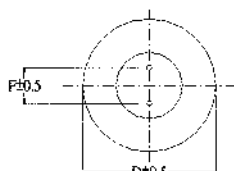
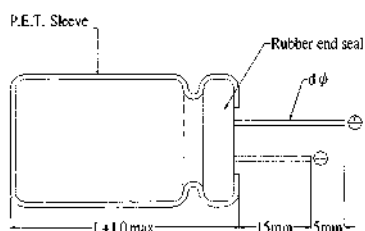
Specifications

Item	Performance Characteristics							
Operating Temperature Range	-40 to +105°C							
Rated Voltage Range	6.3 to 63 VDC							
Capacitance Range	0.1 to 220 µF							
Capacitance Tolerance	±20% (120Hz, +20°C)							
Leakage Current(+20°C, max)	I ≤ 0.01 CV or 3 (µA) After 1 minute, whichever is greater measured with rated working voltage applied.							
Dissipation Factor (tan δ, at 20°C, 120Hz)	Working Voltage (VDC)	6.3	10	16	25	35	50	63
	D.F. (%)max	24	20	16	14	12	10	9
Low Temperature Characteristics (at 120Hz)	Impedance ratio max							
	Working Voltage (VDC)	6.3	10	16	25	35	50	63
	Z-25°C / Z+20°C	4	3	2	2	2	2	2
	Z-40°C / Z+20°C	8	6	4	4	3	3	3
Load Life	Test conditions Duration time :2000 Hrs Ambient temperature :+105°C Applied voltage :Rated DC working voltage After test requirement at +20°C Capacitance change :≤ ±20% of the initial measured value (4V : ≤ ±30%) Dissipation factor :≤ 200% of the initial specified value Leakage current :≤ The initial specified value							
Shelf Life	Test conditions Duration time :1000 Hrs Ambient temperature :+105°C Applied voltage :None After test requirement at +20°C : Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.							

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.8	1	1.30	1.45	1.65	1.70
10 < CAP ≤ 220	0.8	1	1.23	1.36	1.36	1.53

Diagram of Dimensions:(unit:mm)



D φ	4	5	6.3	8
F	1.5±0.5	2.0±0.5	2.5±0.5	3.5±0.5
d φ	0.45		0.5	

Case Size

φ DxL(mm)

WV Cap(μF)	6.3		10		16		25	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
4.7							4x7	17
6.8					4x7	19	4x7	19
10					4x7	28	4x7	28
15							5x7	33
22	4x7	28	4x7	26	4x7	30	5x7	35
				32	4x7	35	5x7	43
33	4x7	32	5x7	48	5x7	42	6.3x7	45
	5x7	35			5x7	50	6.3x7	62
47	5x7	47	5x7	51	6.3x7	67	8x7	75
68	5x7	50	6.3x7	68	6.3x7	70	8x7	80
					8x7	78		
100	6.3x7	75	6.3x7	80	8x7	110	8x7	115
			8x7	95				
220	8x7	92	8x7	130				

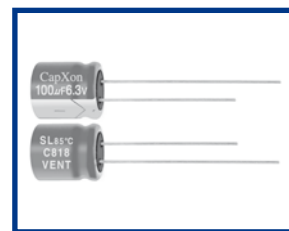
WV Cap(μF)	35		50		63	
	Size	Ripple	Size	Ripple	Size	Ripple
0.1			4x7	1.5	4x7	1.5
0.15			4x7	1.8	4x7	1.8
0.22			4x7	2.5	4x7	2.5
0.33			4x7	3.5	4x7	3.5
0.47			4x7	5	4x7	6
0.68			4x7	7	4x7	7
1			4x7	10	4x7	12
1.5			4x7	13	4x7	14
2.2			4x7	20	4x7	20
3.3			4x7	26	5x7	28
4.7	4x7	22	4x7	27	5x7	29
			5x7	29	6.3x7	33
6.8	4x7	24	5x7	32	6.3x7	35
	5x7	28	6.3x7	33		
10	5x7	35	6.3x7	38	6.3x7	40
15	5x7	38	6.3x7	52	8x7	55
	6.3x7	45				
22	6.3x7	60	8x7	63	8x7	65
33	6.3x7	50	8x7	78		
	8x7	68				
47	8x7	80				
68	8x7	85				

Ripple Current (mA, rms) at 105°C 120Hz

SL Series 7 mm, Low Leakage Current 85°C

Features

- ◆ Low leakage current, height 7 mm
- ◆ For detail specifications, please refer to Engineering Bulletin No. E120
- ◆ RoHS Compliant



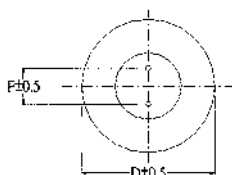
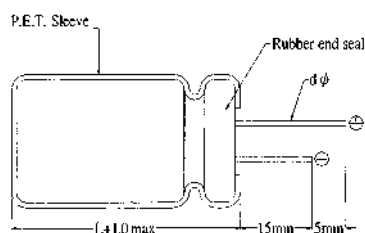
Specifications

Item	Performance Characteristics																				
Operating Temperature Range	-40 to +85°C																				
Rated Voltage Range	6.3 to 50 VDC																				
Capacitance Range	0.1 to 220 μF																				
Capacitance Tolerance	±20% (120Hz, +20°C)																				
Leakage Current(+20°C, max)	I≤0.002 CV or 0.4 (μA) After 2 minutes, whichever is greater measured with rated working voltage applied.																				
Dissipation Factor (tan δ , at 20°C , 120Hz)	<table><tr><td>Working Voltage (VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>D.F. (%)max</td><td>22</td><td>20</td><td>16</td><td>14</td><td>12</td><td>10</td></tr></table>							Working Voltage (VDC)	6.3	10	16	25	35	50	D.F. (%)max	22	20	16	14	12	10
Working Voltage (VDC)	6.3	10	16	25	35	50															
D.F. (%)max	22	20	16	14	12	10															
Low Temperature Characteristics (at 120Hz)	Impedance ratio max <table><tr><td>Working Voltage (VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z-40°C / Z+20°C</td><td>8</td><td>6</td><td>4</td><td>4</td><td>3</td><td>3</td></tr></table>							Working Voltage (VDC)	6.3	10	16	25	35	50	Z-40°C / Z+20°C	8	6	4	4	3	3
Working Voltage (VDC)	6.3	10	16	25	35	50															
Z-40°C / Z+20°C	8	6	4	4	3	3															
Load Life	Test conditions Duration time :1000 Hrs Ambient temperature :+85°C Applied voltage :Rated DC working voltage After test requirement at +20°C Capacitance change :≤ ±20% of the initial measured value (4V : ≤ ±30%) Dissipation factor :≤ 200% of the initial specified value Leakage current :≤ The initial specified value																				
Shelf Life	Test conditions Duration time :1000 Hrs Ambient temperature :+85°C Applied voltage :None After test requirement at +20°C : Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																				

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP≤10	0.8	1	1.30	1.45	1.65	1.70
10<CAP≤100	0.8	1	1.23	1.36	1.48	1.53
100<CAP≤1000	0.8	1	1.16	1.25	1.25	1.38

Diagram of Dimensions:(unit:mm)



D φ	4	5	6.3	8
F	1.5±0.5	2.0±0.5	2.5±0.5	3.5±0.5
d φ	0.45		0.5	

Case Size

φ DxL(mm)

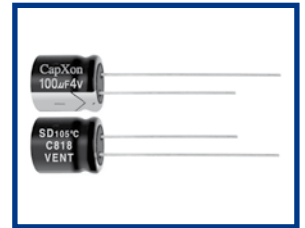
WV Cap(μF)	6.3		10		16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1											4x7	0.8
0.22											4x7	2.0
0.33											4x7	3.1
0.47											4x7	4.5
1											4x7	8.0
2.2											4x7	16
3.3											4x7	21
4.7									4x7	21	5x7	25
10					4x7	25	5x7	30	5x7	33	6.3x7	40
22	4x7	31	5x7	35	5x7	40	6.3x7	48	6.3x7	52	8x7	58
33	5x7	40	5x7	44	6.3x7	53	6.3x7	59	8x7	65		
47	5x7	48	6.3x7	55	6.3x7	60	8x7	73				
100	6.3x7	70	8x7	90	8x7	95						
220	8x7	110										

Ripple Current (mA, rms) at 85°C 120Hz

SD Series 7 mm, Low Leakage Current 105°C

Features

- ◆ 105°C Low leakage current, height 7 mm
- ◆ For detail specifications, please refer to Engineering Bulletin No. E122
- ◆ RoHS Compliant



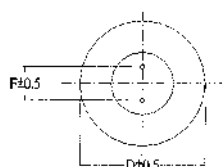
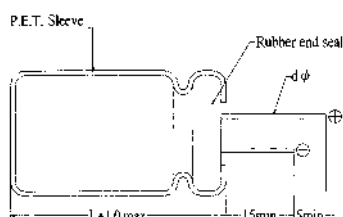
Specifications

Item	Performance Characteristics								
Operating Temperature Range	40 to +105°C								
Rated Voltage Range	4 to 63 VDC								
Capacitance Range	0.1 to 100 µF								
Capacitance Tolerance	± 20% (120Hz, +20°C)								
Leakage Current(+20°C, max)	I ≤ 0.002 CV or 0.4 (µA) After 2 minutes, whichever is greater measured with rated working voltage applied.								
Dissipation Factor (tan δ, at 20°C, 120Hz)	Working Voltage (VDC)	4	6.3	10	16	25	35	50	63
	D.F. (%)max	25	22	20	16	14	12	10	10
Low Temperature Characteristics (at 120Hz)	Impedance ratio max								
	Rated voltage(VDC)	4	6.3	10	16	25	35	50	63
	Z-25°C/Z+20°C	6	4	3	3	2	2	2	2
	Z-40°C/Z+20°C	12	10	6	6	4	4	4	3
Load Life	Test conditions								
	Duration time	:1000 Hrs							
	Ambient temperature	:+105°C							
	Applied voltage	:Rated DC working voltage							
	After test requirement at +20°C								
	Capacitance change	:≤ ±20% of the initial measured value (4V : ≤ ±30%)							
	Dissipation factor	:≤ 200% of the initial specified value							
	Leakage current	:≤ The initial specified value							
Shelf Life	Test conditions								
	Duration time	:1000 Hrs							
	Ambient temperature	:+105°C							
	Applied voltage	:None							
	After test requirement at +20°C	: Same limits as Load life.							
	Pre-treatment for measurements	shall be conducted after application of DC working voltage for 30 minutes.							

Multiplier for Ripple Current vs. Frequency

CAP(µF) \ Frequency(Hz)	50(60)	120	400	1K	≥10K
0.1~10	0.65	1.0	1.20	1.30	1.50
10~100	0.8	1.0	1.10	1.15	1.20

Diagram of Dimensions:(unit:mm)



D φ	4	5	6.3	8
F	1.5±0.5	2.0±0.5	2.5±0.5	3.5±0.5
d φ	0.45		0.50	

Case Size

φ DxL(mm)

WV Cap(μF)	4		6.3		10		16	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1								
0.22								
0.33								
0.47								
1.0								
2.2								
3.3								
4.7								
10							4x7	27
22					4x7	36	4x7	40
33	4x7	33	4x7	41	5x7	44	5x7	50
47	4x7	39	5x7	49	6.3x7	54	6.3x7	62
100	6.3x7	59	6.3x7	75	8x7	90		

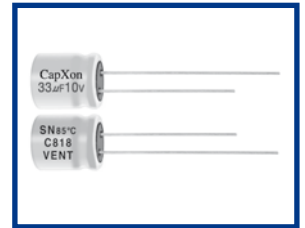
WV Cap(μF)	25		35		50		63	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1					4x7	3	4x7	3
0.22					4x7	5	4x7	5
0.33					4x7	6	4x7	6
0.47					4x7	7	4x7	7
1.0					4x7	10	4x7	10
2.2					4x7	16	5x7	19
3.3			4x7	18	4x7	20	6.3x7	29
4.7	4x7	19	5x7	21	6.3x7	24	6.3x7	36
10	5x7	29	5x7	32	8x7	40		
22	6.3x7	44	6.3x7	49				
33	6.3x7	55	8x7	67				
47	8x7	74						
100								

Ripple Current (mA, rms) at 105°C 120Hz

SN Series 7 mm Non-polar 85°C

Features

- ◆ Non-polarized with 7 mm height for crossover networks of high-pitched, mean and low-pitched sounds in high-fidelity sound systems.
- ◆ The series offers excellent frequency characteristics and minimal capacitance deviation with frequency.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E119
- ◆ RoHS Compliant



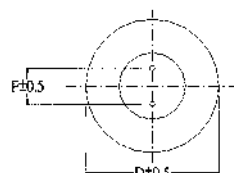
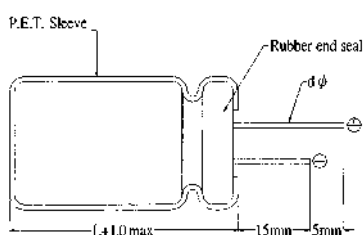
Specifications

Item	Performance Characteristics																											
Operating Temperature Range	-40 to +85°C																											
Rated Voltage Range	6.3 to 50 VDC																											
Capacitance Range	0.1 to 220 μF																											
Capacitance Tolerance	±20% (120Hz, +20°C)																											
Leakage Current(+20°C, max)	I≤0.05 CV or 10 (μA) After 2 minutes, whichever is greater measured with rated working voltage applied.																											
Dissipation Factor (tan δ , at 20°C , 120Hz)	<table><tr><td>Working Voltage (VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>D.F. (%)max</td><td>22</td><td>20</td><td>16</td><td>16</td><td>14</td><td>12</td></tr></table>							Working Voltage (VDC)	6.3	10	16	25	35	50	D.F. (%)max	22	20	16	16	14	12							
Working Voltage (VDC)	6.3	10	16	25	35	50																						
D.F. (%)max	22	20	16	16	14	12																						
Low Temperature Characteristics (at 120Hz)	Impedance ratio max <table><tr><td>Rated voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z-25°C／Z+20°C</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40°C／Z+20°C</td><td>8</td><td>6</td><td>4</td><td>4</td><td>3</td><td>3</td></tr></table>							Rated voltage(VDC)	6.3	10	16	25	35	50	Z-25°C／Z+20°C	4	3	2	2	2	2	Z-40°C／Z+20°C	8	6	4	4	3	3
Rated voltage(VDC)	6.3	10	16	25	35	50																						
Z-25°C／Z+20°C	4	3	2	2	2	2																						
Z-40°C／Z+20°C	8	6	4	4	3	3																						
Load Life	Test conditions Duration time :1000 Hrs Ambient temperature :+85°C Applied voltage :Rated DC working voltage to each polarity for 500 Hrs After test requirement at +20°C Capacitance change :≤ ±20% of the initial measured value Dissipation factor :≤ 200% of the initial specified value Leakage current :≤ The initial specified value																											
Shelf Life	Test conditions Duration time :1000 Hrs Ambient temperature :+85°C Applied voltage :None After test requirement at +20°C : Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																											

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.8	1	1.30	1.45	1.65	1.70
10 < CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.16	1.25	1.35	1.38

Diagram of Dimensions:(unit:mm)



D φ	4	5	6.3	8
F	1.5±0.5	2.0±0.5	2.5±0.5	3.5±0.5
d φ	0.45		0.5	

Case Size

φ DxL(mm)

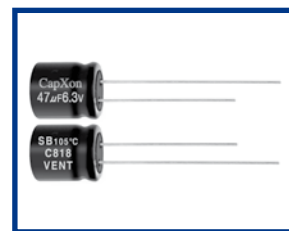
WV Cap(μF)	6.3		10		16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1											4x7	1.0
0.22											4x7	2.3
0.33											4x7	3.5
0.47											4x7	5.0
1											4x7	10
2.2									4x7	13	4x7	14
											5x7	16
3.3							4x7	14	4 x7	15	4x7	18
									5x7	16	5x7	20
4.7					4x7	18	4x7	18	5x7	22	6.3x7	27
							5x7	21				
10	4x7	23	4x7	24	4x7	25	6.3x7	35	6.3x7	37	8x7	44
					5x7	30						
22	5x7	30	5x7	38	6.3x7	51	6.3x7	53	8x7	58	8x7	60
33	5x7	40	6.3x7	55	6.3x7	60	8x7	70	8x7	73		
47	6.3x7	56	6.3x7	65	6.3x7	73	8x7	80				
100	8x7	92	8x7	105	8x7	120						
220	8x7	135										

Ripple Current (mA, rms) at 85°C 120Hz

SB Series 7 mm Non-polar 105°C

Features

- ◆ Non-polarized with 7mm height for crossover network of high-pitched, mean and low-pitched sounds in high-frequency sound systems.
- ◆ The series offers excellent frequency characteristics and minimal capacitance deviation with frequency.
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E145
- ◆ RoHS Compliant



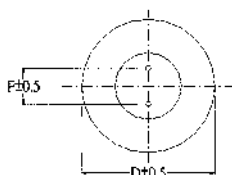
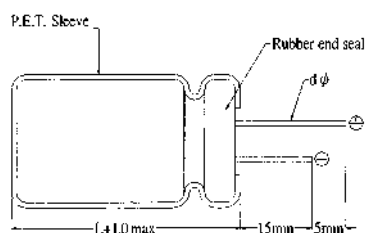
Specifications

Item	Performance Characteristics							
Operating Temperature Range	-40 to +105℃							
Rated Voltage Range	6.3 to 50 VDC							
Capacitance Range	0.1 to 100 μF							
Capacitance Tolerance	±20% (120Hz, +20℃)							
Leakage Current(+20℃, max)	I≤0.05 CV or 10 (μA)							
	After 2 minutes, whichever is greater measured with rated working voltage applied.							
Dissipation Factor (tan δ , at 20℃ , 120Hz)	Working Voltage (VDC)		6.3	10	16	25	35	50
	D.F. (%)max		24	20	16	16	14	12
Low Temperature Characteristics (at 120Hz)	Impedance ratio max							
	Rated voltage(VDC)		6.3	10	16	25	35	50
	Z-25℃／Z+20℃		4	3	2	2	2	2
	Z-40℃／Z+20℃		8	6	4	4	3	3
Load Life	Test conditions							
	Duration time		:1000 Hrs					
	Ambient temperature		:+105℃					
	Applied voltage		:Rated DC working voltage to each polarity for 500 Hrs					
	After test requirement at +20℃							
	Capacitance change		:≤ ±20% of the initial measured value					
	Dissipation factor		:≤ 200% of the initial specified value					
Shelf Life	Leakage current		:≤ The initial specified value					
	Test conditions							
	Duration time		:1000 Hrs					
	Ambient temperature		:+105℃					
	Applied voltage		:None					
	After test requirement at +20℃ : Same limits as Load life.							
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.							

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP≤10	0.8	1	1.30	1.45	1.65	1.70
10<CAP≤100	0.8	1	1.23	1.36	1.48	1.53
100<CAP≤1000	0.8	1	1.16	1.25	1.35	1.38

Diagram of Dimensions:(unit:mm)



D φ	4	5	6.3	8
F	1.5±0.5	2.0±0.5	2.5±0.5	3.5±0.5
d φ	0.45		0.5	

Case Size

φ DxL(mm)

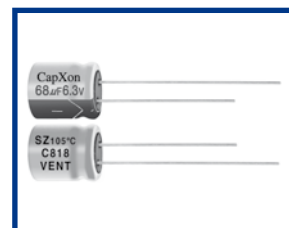
WV Cap(μF)	6.3		10		16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1											4x7	1.0
0.22											4x7	2.3
0.33											4x7	3.5
0.47											4x7	5.0
1											4x7	10
2.2									4x7	13	5x7	16
3.3							4x7	14	5x7	18	5x7	20
4.7					4x7	18	5x7	19	5x7	22	6.3x7	27
10	4x7	23	4x7	24	5x7	30	6.3x7	35	6.3x7	37	8x7	44
22	5x7	30	5x7	38	6.3x7	51	6.3x7	53	8x7	58		
33	5x7	40	6.3x7	52	6.3x7	58	8x7	70	8x7	70		
47	6.3x7	56	8x7	65	8x7	73	8x7	80				
100	8x7	92	8x7	105	8x7	120						

Ripple Current (mA, rms) at 105°C 120Hz

SZ Series 7-9 mm Low Impedance

Features

- ◆ Operating temperature range -55 to +105°C
- ◆ 105°C, 1000 hours assured
- ◆ For detail specifications, please refer to Engineering Bulletin No. E121
- ◆ RoHS Compliant



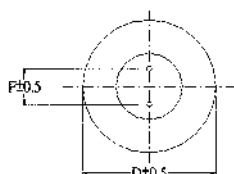
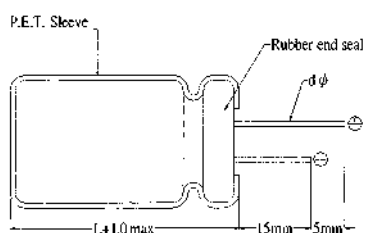
Specifications

Item	Performance Characteristics																							
Operating Temperature Range	-55 to +105℃																							
Rated Voltage Range	6.3 to 35 VDC																							
Capacitance Range	6.8 to 330 μF																							
Capacitance Tolerance	±20% (120Hz, +20℃)																							
Leakage Current(+20℃, max)	I≤0.01 CV or 3 (μA)																							
	After 2 minutes, whichever is greater measured with rated working voltage applied.																							
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage (VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td></tr><tr><td>D.F. (%)max</td><td>18</td><td>16</td><td>14</td><td>12</td><td>12</td></tr></table>						Working Voltage (VDC)	6.3	10	16	25	35	D.F. (%)max	18	16	14	12	12						
Working Voltage (VDC)	6.3	10	16	25	35																			
D.F. (%)max	18	16	14	12	12																			
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																							
	<table><tr><td>Rated voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td></tr><tr><td>Z-25℃／Z+20℃</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-55℃／Z+20℃</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td></tr></table>						Rated voltage(VDC)	6.3	10	16	25	35	Z-25℃／Z+20℃	2	2	2	2	2	Z-55℃／Z+20℃	3	3	3	3	3
Rated voltage(VDC)	6.3	10	16	25	35																			
Z-25℃／Z+20℃	2	2	2	2	2																			
Z-55℃／Z+20℃	3	3	3	3	3																			
Load Life	Test conditions Duration time :1000 Hrs Ambient temperature :+105℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change :≤ ±20% of the initial measured value Dissipation factor :≤ 200% of the initial specified value Leakage current :≤ The initial specified value																							
Shelf Life	Test conditions Duration time :1000 Hrs Ambient temperature :+105℃ Applied voltage :None After test requirement at +20℃ : Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																							

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.47	0.59	0.76	0.85	0.97	1
10 < CAP ≤ 100	0.52	0.65	0.80	0.89	0.97	1
100 < CAP ≤ 1000	0.58	0.72	0.84	0.90	0.98	1

Diagram of Dimensions:(unit:mm)



D φ	4	5	6.3	8
F	1.5±0.5	2.0±0.5	2.5±0.5	3.5±0.5
d φ	0.45		0.5	

Case Size

φ DxL(mm)

WV Cap(μF)	6.3			10			16		
	Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance
22				4x7	70	3.30	5x7	115	1.7
33	5x7	110	1.70	5x7	110	1.70	6.3x7	160	0.8
47	5x7	110	1.70	5x7	160	0.80	6.3x7	160	0.8
68	6.3x7	160	0.80	6.3x7	160	0.80	8x7	200	0.5
100	6.3x7	160	0.80	6.3x7	200	0.50	8x7	200	0.45
120	6.3x7	165	0.70	6.3x7	205	0.48	8x7	350	0.35
150	6.3x7	178	0.60	8x7	230	0.45	8x7	370	0.32
180	8x7	190	0.58	8x7	250	0.45	8x7	400	0.30
220	8x7	200	0.50	8x7	280	0.35	8x7	430	0.26
330	8x7	350	0.35	8x9	320	0.30	8x9	500	0.22
470	8x9	400	0.30	10x9	430	0.22			

WV Cap(μF)	25			35		
	Size	Ripple	Impedance	Size	Ripple	Impedance
6.8				4x7	70	3.3
10	4x7	70	3.0	5x7	110	1.7
22	5x7	110	1.70	6.3x7	160	0.8
33	6.3x7	160	0.80	8x7	200	0.5
47	8x7	200	0.50	8x7	245	0.45
68	8x7	200	0.50	8x7	280	0.42
100	8x7	250	0.35			
150	8x7	340	0.40			
180	8x9	450	0.25			
220	8x9	600	0.22			
330	10x9	750	0.15			

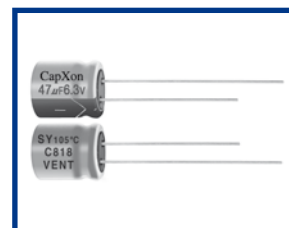
Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100 KHz

SY Series 7mm Low Impedance Long Life

Features

- ◆ Operating temperature -55~105°C.
- ◆ 105°C 2000Hours assured.
- ◆ For detail specifications, please refer to Engineering Bulletin NO.E167
- ◆ RoHS Compliant



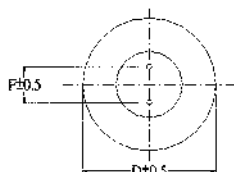
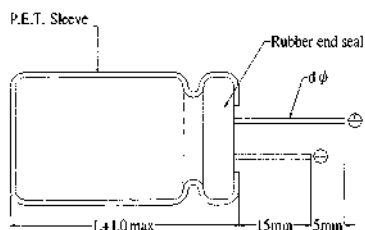
Specifications

Item	Performance Characteristics																											
Operating Temperature Range	-55 to +105℃																											
Rated Voltage Range	6.3 to 50 VDC																											
Capacitance Range	1~330 μF																											
Capacitance Tolerance	±20%(120Hz,+20℃)																											
Leakage Current (+20℃,max.)	I≤0.01 CV or 3 (μA) After 2 minute with rated working voltage applied.																											
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>D.F.(%)max.</td><td>18</td><td>16</td><td>14</td><td>12</td><td>12</td><td>10</td></tr></table>							Working Voltage(VDC)	6.3	10	16	25	35	50	D.F.(%)max.	18	16	14	12	12	10							
	Working Voltage(VDC)	6.3	10	16	25	35	50																					
D.F.(%)max.	18	16	14	12	12	10																						
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																											
	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z-25℃ / Z+20℃</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-55℃ / Z+20℃</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td></tr></table>							Working Voltage(VDC)	6.3	10	16	25	35	50	Z-25℃ / Z+20℃	2	2	2	2	2	2	Z-55℃ / Z+20℃	3	3	3	3	3	3
	Working Voltage(VDC)	6.3	10	16	25	35	50																					
Z-25℃ / Z+20℃	2	2	2	2	2	2																						
Z-55℃ / Z+20℃	3	3	3	3	3	3																						
Load Life	Test condition Duration time :2000Hrs Ambient temperature :+105℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change : within ±20% of the initial measured value Dissipation factor : ≤200% of the initial specified value Leakage current : ≤The initial specified value																											
Shelf Life	Test condition Duration time :1000Hrs Ambient temperature :+105℃ Applied voltage :None After test requirement at +20℃:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																											

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	10K	50-100K
$1 \leq CAP \leq 10$	0.47	0.59	0.76	0.85	0.97	1
$10 < CAP \leq 100$	0.52	0.65	0.80	0.89	0.97	1
$100 < CAP \leq 1000$	0.58	0.72	0.84	0.90	0.98	1

Diagram of Dimensions:(unit:mm)



Dφ	4	5	6.3	8
F	1.5±0.5	2.0±0.5	2.5±0.5	3.5±0.5
dφ	0.45		0.5	

Case Size

φ DxL(mm)

Cap(μF) \ WV	6.3			10			16		
	Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance
10							4X7	60	3.5
15							4X7	75	3.0
22				4X7	63	3.63	5X7	90	2
33	5X7	90	1.95	5X7	95	1.9	6.3X7	120	1.4
47	6.3X7	99	1.87	5X7	120	1.3	6.3X7	140	0.9
68	6.3X7	125	1	6.3X7	144	0.88	8X7	160	0.65
100	6.3X7	144	0.82	6.3X7	180	0.55	8X7	180	0.49
120	6.3X7	148	0.77	6.3X7	185	0.52	8X7	315	0.93
150	6.3X7	160	0.66	8X7	207	0.5	8X7	333	0.95
180	8X7	171	0.64	8X7	225	0.49	8X7	360	0.33
220	8X7	180	0.55	8X7	252	0.4	8X7	387	0.29
330	8X7	315	0.39						

Cap(μF) \ WV	25			35			50		
	Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance
1							4X7	60	3.5
2.2							4X7	60	3.5
3.3							4X7	60	3.5
4.7							4X7	60	3.5
6.8				4X7	63	3.63	5X7	80	2.2
10	4X7	60	3.5	5X7	99	1.87	6.3X7	135	0.92
22	5X7	99	1.87	6.3X7	140	0.9			
33	6.3X7	144	0.88	8X7	180	0.55			
47	8X7	160	0.7	8X7	220	0.5			
68	8X7	180	0.55						
100	8X7	225	0.39						
150	8X7	306	0.35						

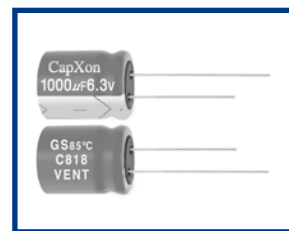
Ripple Current(mA,rms) at 105℃ 100KHz

Max Impedance (Ω) at 20℃ 100KHz

GS(GR) Series General Purpose 85°C

Features

- ◆ Wide CV value range.
- ◆ Load life 2000 hrs at 85°C.
- ◆ Safety vent construction design.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E101
- ◆ RoHS Compliant



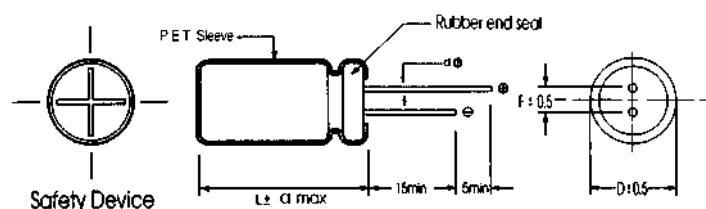
Specifications

Item	Performance Characteristics	
Operating Temperature Range	-40 to +85°C	-25 to +85°C
Rated Voltage Range	6.3 to 100 VDC	160 to 450 VDC
Capacitance Range	0.1 to 33000 µF	0.47 to 470 µF
Capacitance Tolerance	±20% (120Hz, +20°C)	
Leakage Current (+20°C, max.)	I ≤ 0.01 CV or 3 (µA)	I ≤ 0.03 CV (µA)
	After 1 minute whichever is greater measures with rated working voltage applied.	
Dissipation Factor (tan δ, at 20°C, 120Hz)	Working Voltage(VDC)	6.3 10 16 25 35 50 63 100
	D.F. (%)max.	22 19 16 14 12 10 9 8
	Working Voltage(VDC)	160 200 250 350 400 450
	D.F. (%)max.	12 12 12 15 15 17
	For capacitance > 1000 µF, add 2% per another 1000 µF.	
Low Temperature Characteristics (at 120Hz)	Impedance ratio max	
	Working Voltage(VDC)	6.3 10 16 25 35 50 63 100
	Z-25°C/Z+20°C	4 3 2 2 2 2 2 2
	Z-40°C/Z+20°C	8 6 4 3 3 3 3 3
	Working Voltage(VDC)	160 200 250 350 400 450
	Z-25°C/Z+20°C	2 2 3 5 15 15
	For Capacitance > 1000 µF, add 0.5 per another 1000 µF for -25°C/+20°C add 1 per another 1000 µF for -40°C/+20°C	
Load Life	Test conditions Duration time :2000Hrs Ambient temperature :+85°C Applied voltage :Rated DC working voltage After test requirement at +20°C Capacitance change :≤ ±20% of the initial measured value Dissipation factor :≤ 200% of the initial specified value Leakage Current :≤ The initial specified value	
Shelf Life	Test conditions Duration time :1000Hrs Ambient temperature :+85°C Applied voltage :None After test requirement at +20°C: Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.	

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.8	1	1.30	1.45	1.65	1.70
10 < CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.16	1.25	1.35	1.38
1000 < CAP	0.8	1	1.11	1.17	1.25	1.28

Diagram of Dimensions:(unit:mm)



D φ	5	6.3	8		10	13	16	18	22
F	2.0	2.5	3.5		5.0	5.0	7.5	7.5	10
d φ	0.5		L < 20 0.5	L ≥ 20 0.6	0.6		0.8		

α	D < 18	D = 18		D > 18
		L < 35.5	L ≥ 35.5	
	1.5	1.5	2.0	2.0

Case Size

φ DxL(mm)

WV Cap(μF)	6.3		10		16		25		35	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
4.7							5x11	34	5x11	44
10					5x11	44	5x11	50	5x11	66
22			5x11	66	5x11	83	5x11	94	5x11	108
33	5x11	72	5x11	88	5x11	84	5x11	105	5x11	121
47	5x11	88	5x11	105	5x11	132	5x11	132	5x11	143
									6.3x11	154
68	5x11	110	5x11	132	5x11	149	6.3x11	176	6.3x11	198
100	5x11	143	5x11	198	5x11	176	6.3x11	209	6.3x11	231
					6.3x11	204			8x11.5	253
120	5x11	165	5x11	209	6.3x11	231	6.3x11	253	8x11.5	275
150	5x11	198	5x11	231	6.3x11	253	6.3x11	275	8x11.5	308
180	5x11	220	6.3x11	253	6.3x11	275	6.3x11	280	8x11.5	352
							8x11.5	319		
220	5x11	242	6.3x11	294	6.3x11	308	6.3x11	310	8x11.5	385
	6.3x11	264			8x11.5	352	8x11.5	363	10x12.5	407
330	6.3x11	330	6.3x11	363	8x11.5	407	8x11.5	451	10x12.5	528
							10x12.5	484	10x16	539
470	6.3x11	385	6.3x11	418	8x11.5	517	8x11.5	561	10x16	693
	8x11.5	418	8x11.5	440			10x12.5	594	10x20	748
560	8x11.5	473	8x11.5	506	10x12.5	572	10x16	693	10x20	847
680	8x11.5	539	8x11.5	572	8x16	640	10x16	792	10x20	891
					10x12.5	682	10x20	825		
820	8x11.5	605	10x12.5	671	10x16	803	10x20	891	13x20	1045
	8x11.5	649	8x16	725	10x16	869	10x20	1050	13x20	1265
1000	10x12.5	715	8x20	803						
			10x12.5	726						
1200	10x12.5	814	10x16	902	10x16	979	13x20	1155	13x20	1375
1500	10x16	935	10x16	1001	10x20	1100	13x20	1353	13x25	1570
1800	10x16	1035	10x20	1089	13x20	1298	13x20	1496	16x25	1749
2200	10x20	1135	10x20	1210	13x20	1485	13x25	1705	16x25	1870
			13x20	1330					16x31.5	1980
2700	10x20	1353	13x20	1419	13x20	1716	16x25	1804	16x31.5	2178
3300	10x20	1430	13x20	1540	13x20	1750	16x25	1870	16x31.5	2365
	13x20	1485			13x25	1870	16x31.5	2145	16x35.5	2552
3900	13x20	1529	13x20	1760	16x25	2002	16x31.5	2343	18x31.5	2640
4700	13x20	1672	13x25	1980	16x25	2310	16x31.5	2640	18x35.5	2860
	13x25	1870								
5600	13x25	2002	16x25	2189	16x31.5	2453	18x31.5	2816	18x41	2915
6800	16x25	2310	16x25	2475	16x31.5	2805	18x35.5	2970	22x41	3630
8200	16x25	2332	16x31.5	2541	16x35.5	2893	18x35.5	2981		
10000	16x31.5	2530	16x35.5	2640	18x35.5	2970	22x41	3960		
			18x35.5	2915	18x41	3190				
12000	16x35.5	2783	18x35.5	3025	18x35.5	3058				
					18x41	3212				
15000	16x35.5	2948	18x35.5	3310	22x41	3905				
	18x35.5	3168								
18000	18x35.5	3300	18x41	3410						
22000	18x41	3575	22x41	4092						
33000	22x41	4290	22x51	4620						

Ripple Current (mA, rms) at 85°C 120Hz

φ DxL(mm)

WV Cap(μF)	50		63		100		160		200	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1	5x11	3.3	5x11	4	5x11	4.5				
0.22	5x11	3.3	5x11	4	5x11	6				
0.33	5x11	5.5	5x11	6	5x11	10				
0.47	5x11	7.5	5x11	8	5x11	14	5x11	12	5x11	12
1	5x11	17	5x11	17	5x11	27	5x11	17	6.3x11	17
2.2	5x11	28	5x11	31	5x11	40	6.3x11	30	6.3x11	30
3.3	5x11	39	5x11	39	5x11	48	6.3x11	36	6.3x11	36
4.7	5x11	46	5x11	50	5x11	58	6.3x11	40	8x11.5	51
							8x11.5	48		
10	5x11	72	5x11	77	5x11	85	8x11.5	80	10x12.5	83
					6.3x11	92			10x16	88
22	5x11	110	6.3x11	127	6.3x11	157	10x12.5	135	10x20	135
					8x11.5	164				
33	5x11	132	6.3x11	149	8x11.5	206	10x16	180	13x20	205
	6.3x11	138	8x11.5	160	10x12.5	218				
47	6.3x11	165	6.3x11	198	10x12.5	278	10x20	230	13x20	250
			8x11.5	209	10x16	303			13x25	280
68	8x11.5	220	8x11.5	253	10x16	387	13x20	360	13x25	370
100	8x11.5	286	10x12.5	330	10x20	472	13x25	430	16x25	460
120	8x11.5	319	10x16	396	10x20	532	16x25	530	16x25	550
150	10x12.5	363	10x16	462	13x20	629	16x25	560	16x31.5	580
180	10x12.5	418	10x16	528	13x20	667	16x31.5	650	16x31.5	660
220	10x12.5	468	10x16	550	13x25	740	16x31.5	850	18x35.5	750
	10x16	484	10x20	583	16x25	872	16x35.5	890	18x35.5	800
330	10x16	649	10x20	759	13x25	920	18x31.5	890	18x35.5	940
	10x20	671	13x20	781	16x25	1040	18x35.5	920	18x41	1000
470	10x20	828	13x20	968	16x25	1210	18x35.5	1180	18x41	1330
	13x20	858	13x25	1023	16x31.5	1330	18x41	1250		
560	13x20	902	13x25	1056	16x35.5	1465	18x45	1320		
			16x25	1089						
680	13x20	1056	16x25	1265	16x35.5	1634				
820	13x25	1287	16x25	1430	18x35.5	1815				
1000	13x25	1485	16x25	1540	18x41	1940				
	16x25	1540	16x31.5	1705						
1200	16x25	1617	16x31.5	1837						
1500	16x31.5	1848	16x35.5	2090						
1800	16x31.5	2112	16x35.5	2255						
2200	16x35.5	2310	18x35.5	2475						
			18x41	2750						
2700	18x31.5	2420	22x41	2860						
3300	18x35.5	2750	22x41	3080						
3900	18x41	2871								
4700	22x41	3355								

Ripple Current (mA, rms) at 85°C 120Hz

φ DxL(mm)

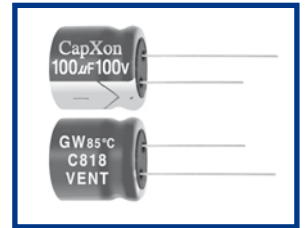
WV Cap(μF)	250		350		400		450	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.47	5x11	12	6.3x11	15	6.3x11	12	6.3x11	12
1	6.3x11	17	6.3x11	22	8x11.5	12	8x11.5	22
					8x11.5	20		
2.2	6.3x11	20	8x11.5	30	8x11.5	32	8x11.5	32
3.3	8x11.5	33	10x12.5	32	10x12.5	35	10x12.5	35
	8x11.5	38	8x11.5	46	8x11.5	45	8x11.5	35
4.7							10x12.5	37
	10x12.5	43	10x12.5	51	10x12.5	53	10x16	40
10	8x11.5	48	8x11.5	55	8x11.5	55	10x12.5	50
			10x12.5	63	10x12.5	66		
22	10x12.5	51	10x16	66	10x16	70	10x16	56
	10x12.5	90	10x16	115	10x16	100	10x20	90
33					10x20	115	13x20	105
			10x20	125	13x20	120	13x25	110
47	10x20	135	13x20	180	13x20	190	13x20	140
							13x25	150
68	13x20	165			13x25	200	16x25	165
	13x20	210	13x20	225	13x25	230	16x25	190
100	13x25	220	13x25	250	16x25	250	16x31.5	210
	13x20	240	16x25	290	16x25	270	16x31.5	260
120	13x25	260						
	13x25	260			16x31.5	290	16x35.5	280
150	13x25	340	16x31.5	400	16x35.5	410	18x31.5	370
	16x25	390			18x25	380	18x35.5	390
180					18x31.5	420		
	16x25	410	18x31.5	430	18x31.5	440	18x41	420
	16x31.5	450			18x35.5	450		
	16x31.5	560	18x35.5	550	18x41	520	18x45	510
	18x31.5	600	18x41	570				
	18x31.5	680						

Ripple Current (mA, rms) at 85°C 120Hz

GW Series 9-25 mm height Low Profile 85°C

Features

- ◆ Miniaturized low profile.
- ◆ Height 9mm-25mm max.
- ◆ Safety vent construction design.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E123
- ◆ RoHS Compliant



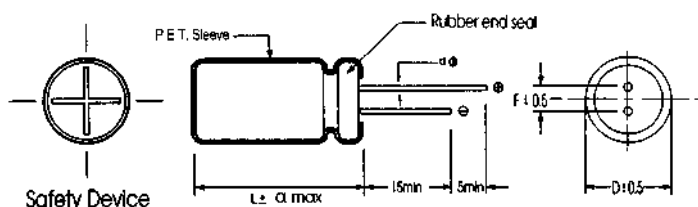
Specifications

Item	Performance Characteristics																																				
Operating Temperature Range	-40 to +85℃					-25 to +85℃																															
Rated Voltage Range	6.3 to 100 VDC					160 to 450 VDC																															
Capacitance Range	2.2 to 10000 μF					2.2 to 220 μF																															
Capacitance Tolerance	±20% (120Hz, +20℃)																																				
Leakage Current (+20℃,max.)	I≤0.01 CV or 3 (μA) After 2 minutes whichever is greater measured with rated working voltage applied.					I≤0.04 CV+100 (μA) After 2 minutes with rated working voltage applied.																															
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>D.F. (%)max.</td><td>24</td><td>22</td><td>20</td><td>14</td><td>12</td><td>12</td><td>10</td><td>10</td></tr></table>										Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	D.F. (%)max.	24	22	20	14	12	12	10	10									
	Working Voltage(VDC)	6.3	10	16	25	35	50	63	100																												
	D.F. (%)max.	24	22	20	14	12	12	10	10																												
	<table><tr><td>Working Voltage(VDC)</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr><tr><td>D.F. (%)max.</td><td>15</td><td>15</td><td>15</td><td>20</td><td>20</td><td>20</td></tr></table>										Working Voltage(VDC)	160	200	250	350	400	450	D.F. (%)max.	15	15	15	20	20	20													
	Working Voltage(VDC)	160	200	250	350	400	450																														
D.F. (%)max.	15	15	15	20	20	20																															
For capacitance > 1000 μF, add 2% per another 1000 μF.																																					
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																																				
	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>Z-25℃／Z+20℃</td><td>6</td><td>4</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃／Z+20℃</td><td>12</td><td>10</td><td>8</td><td>6</td><td>4</td><td>3</td><td>3</td><td>3</td></tr></table>										Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	Z-25℃／Z+20℃	6	4	4	3	2	2	2	2	Z-40℃／Z+20℃	12	10	8	6	4	3	3	3
	Working Voltage(VDC)	6.3	10	16	25	35	50	63	100																												
	Z-25℃／Z+20℃	6	4	4	3	2	2	2	2																												
	Z-40℃／Z+20℃	12	10	8	6	4	3	3	3																												
<table><tr><td>Working Voltage(VDC)</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr><tr><td>Z-25℃／Z+20℃</td><td>2</td><td>2</td><td>3</td><td>5</td><td>5</td><td>7</td></tr></table>										Working Voltage(VDC)	160	200	250	350	400	450	Z-25℃／Z+20℃	2	2	3	5	5	7														
Working Voltage(VDC)	160	200	250	350	400	450																															
Z-25℃／Z+20℃	2	2	3	5	5	7																															
For Capacitance > 1000 μF, add 0.5 per another 1000 μF for -25℃／+20℃ add 1 per another 1000 μF for -40℃／+20℃																																					
Load Life	Test conditions Duration time :2000Hrs Ambient temperature :+85℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change :≤ ±20% of the initial measured value Dissipation factor :≤ 200% of the initial specified value Leakage current :≤ The initial specified value																																				
Shelf Life	Test conditions Duration time :1000Hrs Ambient temperature :+85℃ Applied voltage :None After test requirement at +20℃:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																																				

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	≥10K
2.2~47 µF	0.8	1	1.20	1.30	1.50
100~1000 µF	0.8	1	1.10	1.15	1.20
2200~10000 µF	0.8	1	1.05	1.10	1.15

Diagram of Dimensions:(unit:mm)



D φ	5	6.3	8	10	13	16	18
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
d φ	0.5			0.6		0.8	

Case Size

WV Cap(μF)		6.3		10		16		25		35		50		63		φ DxL(mm)	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple		
2.2												5x9	23	5x9	26		
3.3												5x9	30	5x9	31		
4.7												5x9	35	5x9	36		
6.8												5x9	50	5x9	54		
10												5x9	64	6.3x9	68		
22												5x9	86	6.3x9	102		
33										5x9	95	6.3x9	115	8x9	135		
47								5x9	105	6.3x9	120	6.3x9	135	10x9	170		
68						5x9	120	6.3x9	130	6.3x9	140	8x9	155	10x9	200		
100		5x9	128	5x9	134	6.3x9	160	6.3x9	175	8x9	220	10x9	230	10x16	340		
150		5x9	150	6.3x9	180	6.3x9	260	8x9	280	8x9	300	10x9	320	13x13	384		
220		6.3x9	180	6.3x9	210	8x9	290	8x9	310	10x9	335	10x16	380	13x13	490		
												13x13	400				
330		6.3x9	247	8x9	300	8x9	340	10x9	400	10x12.5	475	13x13	530	16x16	610		
						10x9	355					13x16	550				
470		8x9	360	8x9	360	10x9	410	10x12.5	525	13x13	590	13x16	720	16x16	840		
										13x16	650	16x16	750				
680		10x9	420	10x9	540	10x12.5	560	10x16	700	13x16	750	16x16	805	16x21	950		
								13x13	730								
1000		10x9	530	10x12.5	625	13x13	750	13x16	1050	16x16	1230	16x21	1450	18x25	1600		
2200		13x16	1050	13x16	1080	16x16	1150	16x21	1350	18x21	1600	18x25	1650				
								18x16	1300								
3300		16x16	1200	16x16	1350	16x16	1500	18x21	1600	18x25	1750						
						18x16	1460										
4700		16x16	1500	16x21	1550	18x21	1650	18x25	2100								
6800		16x21	1550	18x21	1850	18x25	2120										
		18x16	1600														
10000		18x21	2000	18x25	2300												

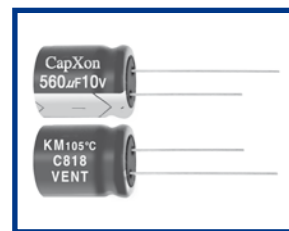
WV Cap(μF)		100		160		200		250		350		400		450	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
1.5														8x9	30
2.2		5x9	27									8x9	38	10x9	46
3.3		5x9	33							8x9	45	10x9	50	10x9	55
4.7		6.3x9	41	8x9	50	8x9	55	8x9	60	10x9	78	10x9	90	10x12.5	105
								10x9	52						
6.8		6.3x9	59	8x9	75	8x9	78	10x9	82	10x16	105	13x16	125	13x16	135
10		8x9	78	10x9	87	10x9	92	10x9	98	13x16	145	13x16	160	16x16	200
								10x16	120			16x16	190		
22		8x9	107	10x16	135	13x16	150	13x16	165	16x16	190	16x21	230	16x21	250
								16x16	210			18x16	225		
33		10x9	155	13x16	175	13x16	190	16x16	230	16x21	270	18x21	300	18x21	320
						16x16	200	18x16	260	18x16	335				
47		10x16	220	13x16	285	16x16	320	16x21	340	18x21	360	18x21	385	18x25	410
				16x16	325			18x16	380						
68		10x16	261	16x16	340	16x16	360	16x21	420	18x25	510	18x25	540		
		13x13	270			18x16	390								
100		13x13	410	16x21	515	16x21	575	18x21	610						
150		16x16	579	18x21	620	18x25	645	18x25	685						
220		16x21	668	18x25	840										
330		16x25	864												
470		18x25	1361												

Ripple Current (mA, rms) at 85°C 120Hz

KM Series Standard 105°C

Features

- ◆ Used in communication equipments, switching power supply, etc.
- ◆ Safety vent construction design.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E102
- ◆ RoHS Compliant



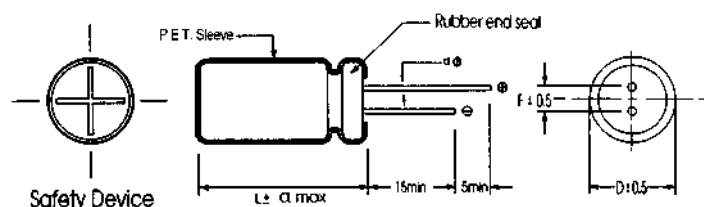
Specifications

Item	Performance Characteristics																																				
Operating Temperature Range	-40 to +105℃					-25 to +105℃																															
Rated Voltage Range	6.3 to 100 VDC					160 to 450 VDC																															
Capacitance Range	0.1 to 22000 μF					0.47 to 470 μF																															
Capacitance Tolerance	±20% (120Hz, +20℃)																																				
Leakage Current (+20℃, max.)	I≤0.01 CV or 3 (μA)					I≤0.03 CV (μA)																															
	After 1 minute whichever is greater measured with rated working voltage applied.					After 1 minute with rated working voltage applied.																															
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>D.F. (%)max.</td><td>22</td><td>17</td><td>15</td><td>14</td><td>12</td><td>10</td><td>9</td><td>8</td></tr></table>										Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	D.F. (%)max.	22	17	15	14	12	10	9	8									
	Working Voltage(VDC)	6.3	10	16	25	35	50	63	100																												
	D.F. (%)max.	22	17	15	14	12	10	9	8																												
	<table><tr><td>Working Voltage(VDC)</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>420</td><td>450</td></tr><tr><td>D.F. (%)max.</td><td>12</td><td>12</td><td>12</td><td>15</td><td>15</td><td>17</td><td>17</td></tr></table>										Working Voltage(VDC)	160	200	250	350	400	420	450	D.F. (%)max.	12	12	12	15	15	17	17											
	Working Voltage(VDC)	160	200	250	350	400	420	450																													
D.F. (%)max.	12	12	12	15	15	17	17																														
For capacitance > 1000 φ F, add 2% per another 1000 μ F.																																					
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																																				
	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>Z-25℃／Z+20℃</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃／Z+20℃</td><td>8</td><td>6</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td></tr></table>										Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	Z-25℃／Z+20℃	4	3	2	2	2	2	2	2	Z-40℃／Z+20℃	8	6	4	3	3	3	3	3
	Working Voltage(VDC)	6.3	10	16	25	35	50	63	100																												
	Z-25℃／Z+20℃	4	3	2	2	2	2	2	2																												
	Z-40℃／Z+20℃	8	6	4	3	3	3	3	3																												
<table><tr><td>Working Voltage(VDC)</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>420</td><td>450</td></tr><tr><td>Z-25℃／Z+20℃</td><td>2</td><td>2</td><td>3</td><td>5</td><td>6</td><td>6</td><td>6</td></tr></table>										Working Voltage(VDC)	160	200	250	350	400	420	450	Z-25℃／Z+20℃	2	2	3	5	6	6	6												
Working Voltage(VDC)	160	200	250	350	400	420	450																														
Z-25℃／Z+20℃	2	2	3	5	6	6	6																														
For Capacitance > 1000 μ F, add 0.5 per another 1000 μ F for -25℃／+20℃ add 1 per another 1000 μ F for -40℃／+20℃																																					
Load Life	Test conditions																																				
	Duration time :2000Hrs Ambient temperature :+105℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change :≤ ±20% of the initial measured value Dissipation factor :≤ 200% of the initial specified value Leakage current :≤ The initial specified value																																				
Shelf Life	Test conditions																																				
	Duration time :1000Hrs Ambient temperature :+105℃ Applied voltage :None After test requirement at +20℃:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																																				

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.8	1	1.30	1.45	1.65	1.70
10 < CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.16	1.25	1.35	1.38
1000 < CAP	0.8	1	1.11	1.17	1.25	1.28

Diagram of Dimensions:(unit:mm)



D ϕ	5	6.3	8		10	13	16	18	22
F	2.0	2.5	3.5		5.0	5.0	7.5	7.5	10
d ϕ	0.5		L < 20 0.5	L ≥ 20 0.6	0.6		0.8		

α	D < 18	D = 18		D > 18
		L < 35.5	L ≥ 35.5	
	1.5	1.5	2.0	2.0

Case Size

φ DxL(mm)

WV Cap(μF)	6.3		10		16		25		35	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
4.7							5X11	26	5X11	28
6.8							5X11	32	5X11	36
10					5X11	35	5X11	38	5X11	46
22			5X11	45	5X11	54	5X11	58	5X11	61
33	5X11	54	5X11	60	5X11	64	5X11	69	5X11	75
47	5X11	65	5X11	70	5X11	100	5X11	105	5X11	110
68	5X11	75	5X11	80	5X11	105	6.3X11	120	6.3X11	140
100	5X11	96	5X11	105	5X11	115	6.3X11	145	6.3X11	160
120	5X11	110	5X11	110	6.3X11	130			8X11.5	175
					6.3X11	155	6.3X11	175	8X11.5	185
150	5X11	120	5X11	120	6.3X11	170	6.3X11	180	8X11.5	215
	6.3X11	130	6.3X11	145			8X11.5	200		
180	6.3X11	140	6.3X11	160	6.3X11	190	8X11.5	210	8X11.5	225
									10X12.5	265
220	6.3X11	160	6.3X11	175	6.3X11	215	8X11.5	235	8X11.5	255
									10X12.5	300
330	6.3X11	195	6.3X11	205	6.3X11	225	8X11.5	310	10X12.5	400
			8X11.5	255	8X11.5	265	10X12.5	335		
470	6.3X11	220	6.3X11	235	8X11.5	370	8X11.5	410	10X16	520
	8X11.5	270	8X11.5	290	8X16	400	10X12.5	440		
560	8X11.5	310	8X11.5	330			10X16	460	10X20	540
			10X12.5	340	10X12.5	410				
680	8X11.5	360	8X11.5	365	8X16	470			10X20	560
			8X16	410	10X12.5	480	10X16	520	13X20	650
820	8X11.5	390	10X12.5	480	10X16	550	10X20	640	13X20	760
1000	10X12.5	430	10X12.5	520	10X12.5	540	10X20	710	13X20	830
					10X16	600				
1200	10X12.5	550	10X16	630	10X20	700	13X20	810	13X20	900
									13X25	930
1500	10X16	625	8X20	715	10X20	820	13X20	900	13X25	960
			10X16	770						
1800	10X16	710	10X20	820	13X20	920	13X25	1050	16X25	1150
2200	10X16	750	10X20	860	13X20	1000	13X25	1200	16X25	1290
	10X20	775							16X31.5	1350
2700	10X20	850	10X25	880	13X20	1080	16X25	1320	16X31.5	1480
			13X20	920						
3300	13X20	960	13X20	1100	13X25	1200	16X25	1460	16X35.5	1650
3900	13X20	1000	13X20	1280	16X25	1490	16X31.5	1670	18X31.5	1820
4700	13X20	1150	13X25	1350	16X25	1600	16X35.5	1780	18X35.5	1900
5600	13X25	1300	16X25	1490	16X31.5	1720	16X35.5	1890	18X35.5	2000
6800	13X25	1480	16X25	1670	16X31.5	1900	18X35.5	2050		
8200	16X25	1520	16X31.5	1840	16X35.5	2020	18X35.5	2090		
10000	16X25	1680	16X35.5	1900	18X35.5	2060				
12000	16X31.5	1750	16X35.5	2050	18X35.5	2150				
15000	16X35.5	2075	18X35.5	2180						
18000	18X31.5	2150	18X35.5	2205						
22000	18X41	2300								

Ripple Current (mA, rms) at 105°C 120Hz

φ DxL(mm)

WV Cap(μF)	50		63		100		160		200	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1	5X11	1.3	5X11	1.3	5X11	1.9				
0.22	5X11	2.9	5X11	2.9	5X11	3.4				
0.33	5X11	4	5X11	4.5	5X11	5				
0.47	5X11	7	5X11	7	5X11	10	5X11	11	5X11	12
1	5X11	13	5X11	13	5X11	15	5X11	17	6.3X11	17
							6.3X11	19		
2.2	5X11	20	5X11	20	5X11	21	6.3X11	25	6.3X11	25
3.3	5X11	26	5X11	28	5X11	30	6.3X11	32	6.3X11	33
									8X11.5	35
4.7	5X11	32	5X11	32	5X11	35	6.3X11	38	6.3X11	42
							8X11.5	42	8X11.5	50
6.8	5X11	40	5X11	40	6.3X11	47	8X11.5	56	8X11.5	60
									10X12.5	63
10	5X11	48	5X11	42	6.3X11	56	8X11.5	63	8X11.5	78
			6.3X11	48	8X11.5	60	10X12.5	75	10X12.5	85
22	5X11	60	6.3X11	82	6.3X11	75	10X12.5	95	10X16	125
							10X16	105		
	6.3X11	70			8X11.5	90	10X20	120	10X20	130
33	5X11	75	6.3X11	100	8X11.5	140	10X16	155	10X16	160
									10X20	180
	6.3X11	90			10X12.5	155	10X20	170	13X20	190
47	6.3X11	115	6.3X11	125	8X16	165	10X20	180	13X20	220
			8X11.5	140	10X12.5	170	13X20	210		
68	6.3X11	130	8X11.5	155	10X16	240	13X20	260	13X20	270
	8X11.5	155	10X12.5	185			13X25	280	13X25	300
100	8X11.5	200	10X12.5	230	10X20	280	13X25	310	13X25	320
							16X25	330	16X25	345
120	8X16	220	10X16	255	10X20	295	13X25	320	16X25	360
	10X12.5	225					16X25	350	16X31.5	390
150	10X12.5	245	10X16	270	13X20	340	16X25	470	16X25	440
					13X25	360			16X31.5	480
180	10X12.5	260	10X16	310	13X20	410	16X25	550	16X31.5	550
	10X16	280			13X25	480			16X35.5	560
220	10X12.5	345	10X16	375	13X25	520	16X31.5	560	16X35.5	670
	10X16	360	10X20	400			16X35.5	580	18X31.5	690
330	10X16	450	13X20	580	16X25	690	18X31.5	660	18X35.5	750
	10X20	470					18X35.5	700	18X41	810
470	10X20	600	13X20	690	16X25	820	18X35.5	810	18X41	840
	13X20	650			16X31.5	860	18X41	860	22X41	925
560	13X20	660	13X25	770	16X35.5	900			18X51	940
680	13X20	700	16X25	880	16X35.5	920				
	13X25	770			18X31.5	950				
820	13X25	850	16X25	920	18X35.5	1020				
1000	13X25	890	16X31.5	1185	18X41	1200				
	16X25	1000								
1200	16X25	1150	16X35.5	1200						
1500	16X31.5	1300	18X31.5	1350						
1800	16X35.5	1480								
2200	16X35.5	1530								
2700	18X35.5	1590								
3300	18X35.5	1750								

Ripple Current (mA, rms) at 105°C 120Hz

φ DxL(mm)

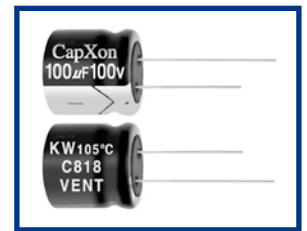
WV Cap(μF)	250		350		400		420		450	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.47	5X11	8	6.3X11	13	6.3X11	14	6.3X11	14	6.3X11	14
1	6.3X11	16	6.3X11	16	6.3X11	17	8X11.5	20	8X11.5	20
2.2	6.3X11	20	8X11.5	31	6.3X15	34	8X11.5	35	10X12.5	35
	8X11.5	25			8X11.5	35				
3.3	8X11.5	33	8X11.5	34	6.3X15	35	10X12.5	42	8X11.5	32
					8X11.5	36			10X12.5	38
			10X12.5	38	10X12.5	41			10X16	42
4.7	8X11.5	46	8X11.5	47	8X11.5	48	10X12.5	58	8X16	44
					10X12.5	55				
	10X12.5	50	10X12.5	52	10X16	65	10X16	61	10X12.5	45
6.8									10X16	50
	8X11.5	60	10X12.5	79	8X14	75	10X16	84	10X16	65
	10X12.5	70			8X16	80			10X20	72
10					10X16	90				
	8X11.5	68	10X16	87	10X16	110	10X20	96	10X20	92
	10X12.5	80	10X20	92	10X20	125	10X20	112	13X20	98
22	10X16	110	13X20	160	13X20	170			13X20	165
	10X20	125								
33	13X20	150	13X25	170	13X25	190	13X25	185	13X25	180
	13X20	190	13X20	180	13X20	235			16X25	210
			13X25	200	13X25	260	16X25	230		
47	13X20	230	16X25	245	16X25	300	16X31.5	310	16X31.5	340
	13X25	240	16X31.5	260	16X31.5	360			16X35.5	380
									18X25	350
56	13X20	255	16X25	330	16X25	360	16X35.5	390	16X31.5	370
	13X25	280			16X31.5	400			16X35.5	400
									18X25	370
68	13X25	310	16X31.5	370	18X25	440	18X31.5	470	16X35.5	450
					16X35.5	480			18X31.5	460
	16X25	355			18X31.5	500			18X35.5	470
82	16X25	370	16X35.5	385	18X25	470	18X35.5	500	18X31.5	465
					18X31.5	520			18X35.5	480
100	16X25	375	18X31.5	390	18X31.5	530	18X35.5	555	18X35.5	525
	16X31.5	395			18X35.5	550			18X41	560
	16X31.5	420	16X41	400	18X31.5	550			18X41	580
120					18X35.5	580			22X41	650
	16X35.5	430	18X35.5	400	18X35.5	580	18X41	630		
150	16X35.5	460	18X41	420	18X35.5	610	18X41	660	18X45	690
	18X31.5	460			18X41	650				
180	18X31.5	465	18X41	430	18X45	700	18X45	680		
	18X35.5	470								
220	18X35.5	650	22X41	500						
	18X41	700								
330	18X45	720								
	22X41	780								

Ripple Current (mA, rms) at 105°C 120Hz

KW Series 9-25mm Low Profile 105°C

Features

- ◆ Used space-saving equipment, low profile.
- ◆ Load life 2000 hrs at 105°C.
- ◆ Safety vent construction design.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E124
- ◆ RoHS Compliant



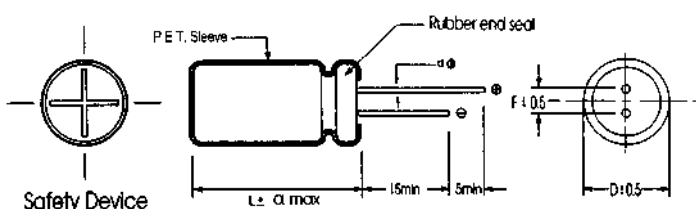
Specifications

Item	Performance Characteristics																																				
Operating Temperature Range	-40 to +105℃					-25 to +105℃																															
Rated Voltage Range	6.3 to 100 VDC					160 to 450 VDC																															
Capacitance Range	2.2 to 10000 μF					1.5 to 220 μF																															
Capacitance Tolerance	±20% (120Hz, +20℃)																																				
Leakage Current (+20℃,max.)	I≤0.01 CV or 3 (μA) After 2 minutes whichever is greater measures with rated working voltage applied.					I≤0.04 CV +100 (μA) After 2 minutes with rated working voltage applied.																															
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>D.F. (%)max.</td><td>24</td><td>22</td><td>20</td><td>16</td><td>14</td><td>12</td><td>10</td><td>10</td></tr></table>										Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	D.F. (%)max.	24	22	20	16	14	12	10	10									
	Working Voltage(VDC)	6.3	10	16	25	35	50	63	100																												
	D.F. (%)max.	24	22	20	16	14	12	10	10																												
	<table><tr><td>Working Voltage(VDC)</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr><tr><td>D.F. (%)max.</td><td>15</td><td>15</td><td>15</td><td>15</td><td>20</td><td>20</td></tr></table>										Working Voltage(VDC)	160	200	250	350	400	450	D.F. (%)max.	15	15	15	15	20	20													
	Working Voltage(VDC)	160	200	250	350	400	450																														
D.F. (%)max.	15	15	15	15	20	20																															
For capacitance > 1000, add 2% per another 1000 μF.																																					
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																																				
	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>Z-25℃／Z+20℃</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃／Z+20℃</td><td>8</td><td>6</td><td>4</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td></tr></table>										Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	Z-25℃／Z+20℃	4	3	2	2	2	2	2	2	Z-40℃／Z+20℃	8	6	4	4	3	3	3	3
	Working Voltage(VDC)	6.3	10	16	25	35	50	63	100																												
	Z-25℃／Z+20℃	4	3	2	2	2	2	2	2																												
	Z-40℃／Z+20℃	8	6	4	4	3	3	3	3																												
<table><tr><td>Working Voltage(VDC)</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr><tr><td>Z-25℃／Z+20℃</td><td>3</td><td>3</td><td>3</td><td>6</td><td>6</td><td>6</td></tr></table>										Working Voltage(VDC)	160	200	250	350	400	450	Z-25℃／Z+20℃	3	3	3	6	6	6														
Working Voltage(VDC)	160	200	250	350	400	450																															
Z-25℃／Z+20℃	3	3	3	6	6	6																															
For Capacitance > 1000 μF, add 0.5 per another 1000 μF for -25℃／+20℃ add 1 per another 1000 μF for -40℃／+20℃																																					
Load Life	Test conditions																																				
	Duration time :2000Hrs Ambient temperature :+105℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change :≤ ±20% of the initial measured value Dissipation factor :≤ 200% of the initial specified value Leakage current :≤ The initial specified value																																				
Shelf Life	Test conditions																																				
	Duration time :1000Hrs Ambient temperature :+105℃ Applied voltage :None After test requirement at +20℃:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																																				

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	≥10K
0.47 < CAP ≤ 68	0.8	1	1.20	1.30	1.50
100 < CAP ≤ 1000	0.8	1	1.10	1.15	1.20
2200 < CAP ≤ 10000	0.8	1	1.05	1.10	1.15

Diagram of Dimensions:(unit:mm)



D φ	5	6.3	8	10	13	16	18
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
d φ		0.5		0.6		0.8	

Case Size

WV Cap(μF)		6.3		10		16		25		35		50		63		φ DxL(mm)
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	
2.2												5x9	19	5x9	20	
3.3												5x9	25	5x9	26	
4.7												5x9	40	5x9	41	
6.8												5x9	48	5x9	49	
10												5x9	54	5x9	55	
22												5x9	75	6.3x9	107	
33										5x9	90	6.3x9	115	6.3x9	114	
47						5x9	105	5x9	110	6.3x9	120	6.3x9	130	8x9	136	
68				5x9	115	6.3x9	125	6.3x9	130	8x9	145	8x9	169	10x9	170	
100		5x9	120	5x9	135	6.3x9	150	6.3x9	160	8x9	180	10x9	200	10x9	173	
150		5x9	135	6.3x9	150	6.3x9	160	8x9	185	8x9	210	10x9	250	10x16	245	
220		6.3x9	165	6.3x9	165	8x9	200	8x9	230	10x9	255	10x12.5	290	13x13	317	
330		6.3x9	185	8x9	205	8x9	250	10x9	310	10x12.5	360	13x13	375	13x16	382	
470												13x16	400			
		8x9	260	8x9	275	10x9	310	10x12.5	370	13x13	410	16x16	550	16x16	490	
680				10x9	280					13x16	430					
1000		10x9	310	10x9	360	13x13	390	13x16	520	13x16	580	16x16	700	16x21	730	
2200		10x9	370	10x9	450	13x13	520	13x16	600	16x16	750	16x21	850	16x25	1050	
3300		13x16	620	13x16	690	16x16	850	16x21	950	18x21	1200	18x25	1300			
								18x15	940							
4700		16x16	860	16x16	950	16x21	1180	18x21	1250	18x25	1450					
6800		16x16	1010	16x21	1150	18x21	1480	18x25	1470							
8000		16x16	1210	18x21	1350	18x25	1600									
10000		18x21	1450	18x25	1700											

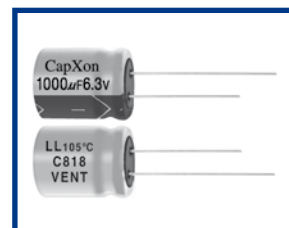
WV Cap(μF)		100		160		200		250		350		400		450	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
1.5														8x9	18
2.2		5x9	20									8x9	35	10x9	25
3.3		5x9	27							8x9	35	10x9	40	10x9	30
4.7		5x9	42	8x9	50	8x9	50	8x9	50	10x9	50	13x16	50	13x16	48
6.8		6.3x9	56	8x9	55	8x9	58	10x9	65	13x16	80	13x16	80	13x16	68
10		8x9	72	10x9	80	10x9	78	13x16	82	13x16	95	13x16	100	16x16	100
22												16x16	105		
		8x9	114	13x16	120	13x16	145	13x16	165	16x16	180	16x21	185	16x21	170
33								16x16	180						
47		10x9	141	13x16	175	16x16	200	16x16	225	16x21	225	18x21	230	18x25	225
68		10x16	197	16x16	225	16x16	240	18x16	350	18x21	300	18x21	309	18x25	270
100		10x16	200	16x21	305	16x21	360	18x21	390	18x25	390				
150		13x13	247	16x21	380	18x21	410	18x25	450						
		13x16	295	18x21	530	18x25	560								
220		16x16	346												
		16x16	373	18x25	600										
330		16x21	500												
470		18x25	745												

Ripple Current (mA, rms) at 105°C 120Hz

LL Series Low Leakage Current

Features

- ◆ Extremely low and stable leakage current characteristics.
- ◆ Close capacitance tolerance $\pm 20\%$ ($\pm 10\%$ on requested)
- ◆ For detail specifications, please refer to Engineering Bulletin No. E109
- ◆ RoHS Compliant



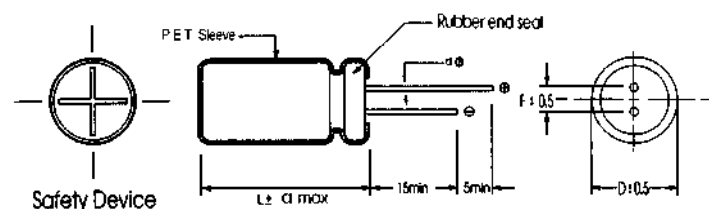
Specifications

Item	Performance Characteristics																							
Operating Temperature Range	-40 to +105℃																							
Rated Voltage Range	6.3 to 63 VDC																							
Capacitance Range	0.1 to 2200 μF																							
Capacitance Tolerance	±20% (120Hz, +20℃)																							
Leakage Current(+20℃, max)	I≤0.002 CV or 0.4 (μA) After 3 minutes(90sec. ≤10 μF) whichever is greater measured with rated working voltage applied.																							
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage (VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td></tr><tr><td>D.F. (%)max</td><td>20</td><td>17</td><td>13</td><td>10</td><td>9</td><td>8</td><td>8</td></tr></table>								Working Voltage (VDC)	6.3	10	16	25	35	50	63	D.F. (%)max	20	17	13	10	9	8	8
Working Voltage (VDC)	6.3	10	16	25	35	50	63																	
D.F. (%)max	20	17	13	10	9	8	8																	
Low Temperature Characteristics (at 120Hz)	Impedance ratio max <table><tr><td>Working Voltage (VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td></tr><tr><td>Z-40℃ / Z+20℃</td><td>4</td><td>3</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr></table>								Working Voltage (VDC)	6.3	10	16	25	35	50	63	Z-40℃ / Z+20℃	4	3	3	2	2	2	2
Working Voltage (VDC)	6.3	10	16	25	35	50	63																	
Z-40℃ / Z+20℃	4	3	3	2	2	2	2																	
Load Life	Test conditions Duration time :2000Hrs Ambient temperature :+105℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change :≤ ±20% of the initial measured value Dissipation factor :≤ 150% of the initial specified value Leakage current :≤ The initial specified value																							
Shelf Life	Test conditions Duration time :1000Hrs Ambient temperature :+105℃ Applied voltage :None After test requirement at +20℃:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																							

Multiplier for Ripple Current vs. Frequency

CAP(μ F)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.8	1	1.30	1.45	1.65	1.70
10<CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100<CAP ≤ 2200	0.8	1	1.16	1.25	1.35	1.38

Diagram of Dimensions:(unit:mm)



D ϕ	5	6.3	8	10	13
F	2.0	2.5	3.5	5.0	5.0
d ϕ	0.5			0.6	

Case Size

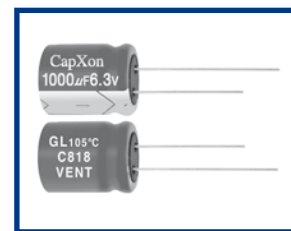
WV Cap(μF)		6.3		10		16		25		35		50		63		φ DxL(mm)	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple		
0.1												5x11	8.8	5x11	8.8		
0.22												5x11	8.8	5x11	8.8		
0.33												5x11	8.8	5x11	8.8		
0.47												5x11	12	5x11	12		
1												5x11	17	5x11	17		
2.2												5x11	24	5x11	24		
3.3												5x11	29	5x11	32		
4.7								5x11	32	5x11	33	5x11	36	5x11	39		
10						5x11	39	5x11	43	5x11	48	5x11	52	6.3x11	58		
22	5x11	36		5x11	50	5x11	62	5x11	65	6.3x11	71	6.3x11	77	6.3x11	94		
33	5x11	44		5x11	66	5x11	68	5x11	76	6.3x11	83	6.3x11	99	8x11.5	110		
47	5x11	53		5x11	75	5x11	105	6.3x11	116	6.3x11	125	8x11.5	138	8x11.5	152		
100	5x11	74		5x11	104	6.3x11	138	8x11.5	149	8x11.5	187	10x12.5	217	10x16	260		
220	6.3x11	131		8x11.5	193	8x11.5	220	10x12.5	246	10x12.5	330	10x20	380	13x20	440		
330	6.3x11	161		8x11.5	256	8x11.5	268	10x12.5	352	10x16	440	13x20	506	13x25	594		
470	8x11.5	242		8x11.5	319	10x12.5	407	10x16	484	13x20	590	13x25	705				
1000	10x12.5	390		10x16	605	10x20	704	13x20	847	13x25	1012						
2200	13x20	665		13x20	860	13x25	890										

Ripple Current (mA, rms) at 105°C 120Hz

GL Series Low Impedance, Long Life

Features

- ◆ Low impedance for high frequency, Anti-Solvent Design.
- ◆ Long Life 2000 ~ 6000 hrs at 105°C depending on case size.
- ◆ Radial type for switching power supply.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E103
- ◆ RoHS Compliant



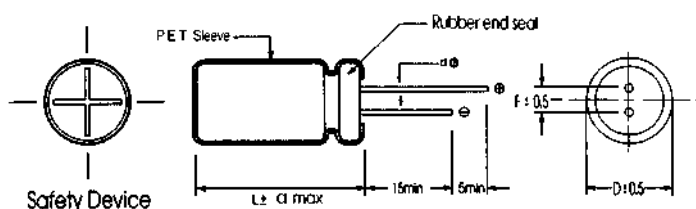
Specifications

Item	Performance Characteristics																																							
Operating Temperature Range	-55 to +105℃																																							
Rated Voltage Range	6.3 to 63 VDC																																							
Capacitance Range	0.47 to 10000 μ F																																							
Capacitance Tolerance	± 20% (120Hz, +20℃)																																							
Leakage Current (+20℃,max.)	I ≤0.01 CV or 3 (μ A) After 2 minutes whichever is greater measured with rated working voltage applied.																																							
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage (VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td></tr><tr><td>D.F. (%)max</td><td>20</td><td>18</td><td>16</td><td>14</td><td>12</td><td>10</td><td>9</td></tr></table>								Working Voltage (VDC)	6.3	10	16	25	35	50	63	D.F. (%)max	20	18	16	14	12	10	9																
	Working Voltage (VDC)	6.3	10	16	25	35	50	63																																
D.F. (%)max	20	18	16	14	12	10	9																																	
	For Capacitance > 1000 μ F, add 2% per another 1000 μ F.																																							
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																																							
	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td></tr><tr><td>Z-25℃ / Z+20℃</td><td>4</td><td>3</td><td>2</td><td>2</td><td>1.5</td><td>1.5</td><td>1.5</td></tr><tr><td>Z-40℃ / Z+20℃</td><td>6</td><td>4</td><td>3</td><td>3</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-55℃ / Z+20℃</td><td>8</td><td>6</td><td>5</td><td>5</td><td>4</td><td>4</td><td>4</td></tr></table>								Working Voltage(VDC)	6.3	10	16	25	35	50	63	Z-25℃ / Z+20℃	4	3	2	2	1.5	1.5	1.5	Z-40℃ / Z+20℃	6	4	3	3	2	2	2	Z-55℃ / Z+20℃	8	6	5	5	4	4	4
	Working Voltage(VDC)	6.3	10	16	25	35	50	63																																
	Z-25℃ / Z+20℃	4	3	2	2	1.5	1.5	1.5																																
	Z-40℃ / Z+20℃	6	4	3	3	2	2	2																																
Z-55℃ / Z+20℃	8	6	5	5	4	4	4																																	
	For Capacitance > 1000 μ F, add 0.5 per another 1000 μ F for -25℃ / +20℃ add 1 per another 1000 μ F for -40℃ / +20℃ add 1.5 per another 1000 μ F for -55℃ / +20℃																																							
Load Life	Test conditions						D φ		Life hours																															
	Duration time :as right						5 - 6.3 φ		2000																															
	Ambient temperature :+105℃						8 φ		3000																															
	Applied voltage :Rated DC working voltage						≥ 10 φ		6000																															
	After test requirement at +20℃																																							
Shelf Life	Capacitance change :≤ ±20% of the initial measured value																																							
	Dissipation factor :≤ 200% of the initial specified value																																							
	Leakage current :≤ The initial specified value																																							
	Test conditions																																							
	Duration time :1000Hrs																																							
	Ambient temperature :+105℃																																							
	Applied voltage :None																																							
	After test requirement at +20℃:Same limits as Load life.																																							
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																																							

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.47	0.59	0.76	0.85	0.97	1
10 < CAP ≤ 100	0.52	0.65	0.80	0.89	0.97	1
100 < CAP ≤ 1000	0.58	0.72	0.84	0.90	0.98	1
1000 < CAP	0.63	0.78	0.87	0.91	0.98	1

Diagram of Dimensions:(unit:mm)



D φ	5	6.3	8	10	13	16	18	22
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10
d φ	0.5		L < 20 0.5	L ≥ 20 0.6	0.6		0.8	

α	D < 18	D = 18		D > 18
		L < 35.5	L ≥ 35.5	
	1.5	1.5	2.0	2.0

Case Size

WV Cap(μF)	6.3			10			16		
	Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance
10							5x11	37	4.00
15							5x11	60	3.52
22				5x11	56	2.60	5x11	70	2.00
27				5x11	57	2.40	5x11	110	1.60
33				5x11	58	2.20	5x11	130	1.26
39				5x11	95	1.85	5x11	150	0.87
47				5x11	120	1.20	5x11	190	0.52
56				5x11	130	1.05	5x11	205	0.49
68				5x11	145	0.89	5x11	210	0.45
82				5x11	170	0.75	6.3x11	250	0.37
100	5x11	185	0.95	5x11	205	0.48	6.3x11	260	0.31
120	5x11	190	0.90	5x11	230	0.44	6.3x11	290	0.29
150	6.3x11	210	0.75	6.3x11	270	0.37	6.3x11	300	0.26
180	6.3x11	240	0.70	6.3x11	290	0.35	6.3x15	370	0.23
							8x11.5	368	0.24
220	6.3x11	300	0.55	6.3x11	330	0.28	6.3x15	470	0.20
							8x11.5	455	0.21
270	6.3x11	310	0.49	6.3x15	370	0.25	8x11.5	490	0.17
				8x11.5	390	0.21			
330	6.3x15	320	0.34	6.3x15	445	0.15	8x11.5	550	0.12
	8x11.5	390	0.30	8x11.5	430	0.16			
470	6.3x15	435	0.25	8x11.5	555	0.115	8x16	745	0.092
	8x11.5	430	0.22				10x12.5	722	0.095
560	8x11.5	480	0.20	8x11.5	620	0.095	10x12.5	780	0.082
680	8x11.5	510	0.18	8x16	630	0.090	10x16	920	0.074
820	8x16	620	0.14	8x20	870	0.084	10x16	1020	0.067
1000	8x16	710	0.10	8x20	1040	0.070	10x20	1180	0.050
	10x12.5	625	0.12	10x16	1010	0.072			
1200	10x16	810	0.095	10x16	1130	0.062	10x25	1370	0.047
1500	10x16	1050	0.074	10x20	1270	0.056	10x25	1470	0.041
1800	10x20	1200	0.065	10x25	1430	0.045	13x20	1630	0.038
				13x20	1450	0.048			
2200	10x20	1300	0.060	13x20	1690	0.040	13x20	1800	0.035
	10x25	1400	0.057				13x25	1950	0.033
2700	10x25	1400	0.055	13x20	1800	0.033	13x25	2050	0.031
	13x20	1410	0.052						
3300	13x20	1500	0.048	13x25	1980	0.029	13x30	2410	0.025
							16x25	2340	0.028
4700	13x25	1800	0.032	13x30	2300	0.025	16x31.5	2650	0.022
	13x30	1950	0.025	16x25	2100	0.029	18x25	2570	0.024
6800	13x30	2020	0.024	16x31.5	2340	0.023	18x31.5	2700	0.020
	16x25	2230	0.021						
8200	16x31.5	2530	0.020	16x35.5	2580	0.019	18x35.5	2830	0.018
10000	16x35.5	2740	0.019	18x31.5	2770	0.017	18x41	3300	0.015

Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

φ DxL(mm)

WV Cap(μF)	25			35			50			63		
	Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance
0.47							5x11	15	5.00	5x11	16	5.00
1							5x11	25	3.95	5x11	27	3.95
2.2							5x11	33	2.60	5x11	38	2.60
3.3							5x11	45	2.00	5x11	48	2.00
4.7							5x11	58	1.89	5x11	62	1.89
5.6							5x11	80	1.85	5x11	85	1.82
6.8							5x11	85	1.77	5x11	90	1.75
8.2							5x11	90	1.72	5x11	100	1.69
10	5x11	56	2.10	5x11	70	1.90	5x11	100	1.70	5x11	105	1.65
15	5x11	97	1.95	5x11	115	1.72	5x11	110	1.53	5x11	110	1.47
22	5x11	120	1.80	5x11	130	1.36	6.3x11	135	1.00	6.3x11	170	0.80
27	5x11	130	1.56	5x11	140	1.20	6.3x11	160	0.93	6.3x11	190	0.75
33	5x11	150	1.20	5x11	175	0.95	6.3x11	230	0.74	8x11.5	245	0.61
39	5x11	170	0.82	6.3x11	200	0.74	6.3x11	240	0.65	8x11.5	270	0.58
47	5x11	220	0.50	6.3x11	250	0.44	8x11.5	285	0.50	8x11.5	290	0.56
56	5x11	245	0.44	6.3x11	270	0.40	8x11.5	300	0.39	8x11.5	320	0.38
68	6.3x11	270	0.39	6.3x11	300	0.35	8x11.5	340	0.30	8x16	480	0.30
82	6.3x11	285	0.33	6.3x15	350	0.29	8x11.5	400	0.25	8x16	510	0.28
100	6.3x11	300	0.28	6.3x15	390	0.18	8x16	475	0.18	10x16	590	0.24
				8x11.5	380	0.19						
120	6.3x11	350	0.22	8x11.5	460	0.17	8x16	520	0.17	10x16	660	0.16
150	6.3x15	420	0.20	8x16	580	0.15	10x16	675	0.13	10x20	790	0.11
180	6.3x15	440	0.18	8x16	630	0.13	10x16	760	0.095	10x20	850	0.095
	8x11.5	435	0.19									
220	8x11.5	550	0.125	8x16	740	0.095	10x20	900	0.085	10x25	1020	0.082
				10x12.5	720	0.098				13x20	1054	0.080
270				8x20	830	0.086	10x20	950	0.075	13x20	1100	0.072
				10x16	840	0.088						
330	8x16	740	0.085	10x16	995	0.065	10x25	1050	0.068	10x30	1200	0.064
	10x12.5	720	0.082							13x25	1160	0.067
470	10x16	1040	0.065	10x20	1150	0.050	13x20	1490	0.048	16x25	1750	0.048
560	10x16	1070	0.061	10x25	1310	0.048	13x20	1550	0.045	16x25	1830	0.044
680	10x20	1280	0.052	13x20	1440	0.044	13x25	1840	0.041	16x31.5	2070	0.040
820	10x25	1460	0.043	13x20	1600	0.038	13x30	2060	0.036	16x31.5	2100	0.035
1000	10x25	1530	0.039	13x30	1950	0.036	13x40	2200	0.033	16x35.5	2450	0.031
	13x25	1580	0.038				16x31.5	2130	0.030			
1200	13x25	1800	0.036	16x25	2200	0.029	16x31.5	2520	0.027	18x31.5	2500	0.026
1500	13x25	2020	0.032	16x31.5	2520	0.027	16x35.5	2700	0.026	18x35.5	2700	0.025
1800	13x30	2300	0.027	16x31.5	2560	0.026	18x31.5	2800	0.025	18x41	2900	0.024
2200	13x30	2480	0.025	16x31.5	2650	0.025	18x35.5	2900	0.024	18x41	2990	0.023
	16x25	2405	0.027	18x25	2570	0.026						
2700	16x31.5	2670	0.024	18x31.5	2660	0.023	18x41	2970	0.021			
3300	16x31.5	2960	0.020	18x35.5	3000	0.020						
	18x25	3050	0.022									
4700	16x41	3490	0.022	18x41	3300	0.019						
	18x35.5	3520	0.021									
6800	18x41	3600	0.017									

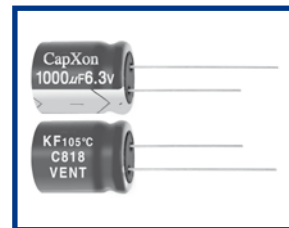
Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

KF Series Low Impedance

Features

- ◆ Used in communication equipments, switching power supply, industrial measuring instruments, etc.
- ◆ Load life 2000~5000 Hrs at 105°C
- ◆ Safety vent construction design.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E126
- ◆ RoHS Compliant



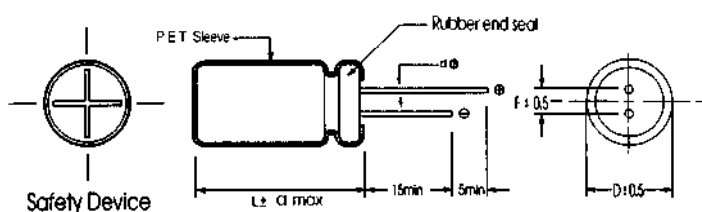
Specifications

Item	Performance Characteristics	
Operating Temperature Range	-40 to +105°C	-25 to +105°C
Rated Voltage Range	6.3 to 100 VDC	160 to 450 VDC
Capacitance Range	0.47 to 15000 µF	0.47 to 470 µF
Capacitance Tolerance	±20%(120Hz, +20°C)	
Leakage Current (+20°C, max.)	$I \leq 0.01 CV$ or $3 (\mu A)$ After 2 minutes whichever is greater measured with rated working voltage applied.	
Dissipation Factor ($\tan \delta$, at 20°C, 120Hz)	$I \leq 0.03 CV (\mu A)$ After 2 minutes with rated working voltage applied.	
	Working Voltage(VDC)	6.3 10 16 25 35 50 63 100
	D.F. (%)max.	18 16 14 12 10 9 8 8
	Working Voltage(VDC)	160 200 250 350 400 420 450
Low Temperature Characteristics (at 120Hz)	D.F. (%)max.	12 12 12 15 15 17 17
	For capacitance > 1000 µF, add 2% per another 1000uF.	
	Impedance ratio max	
	Working Voltage(VDC)	6.3 10 16 25 35 50 63 100
Load Life	Z-25°C/Z+20°C	4 3 3 3 3 3 2 2
	Z-40°C/Z+20°C	8 6 4 3 3 3 3 3
	Working Voltage(VDC)	160 200 250 350 400 450
	Z-25°C/Z+20°C	2 2 3 5 5 6
Shelf Life	Z-40°C/Z+20°C	3 6 6 6 6 -
	For capacitance > 1000 µF, add 0.5 per another 1000uF for -25°C/+20°C add 1 per another 1000uF for -40°C/+20°C	
	Test conditions	
	Duration time : as right	
	Ambient temperature : +105°C	
	Applied voltage : Rated DC working voltage	
	After test requirement at +20°C	
	Capacitance change : $\leq \pm 20\%$ of the initial measured value	
	Dissipation factor : $\leq 200\%$ of the initial specified value	
	Leakage current : $\leq$ The initial specified value	
		(160-450V : 2000hrs)

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.47	0.59	0.76	0.85	0.97	1
10 < CAP ≤ 100	0.52	0.62	0.80	0.89	0.97	1
100 < CAP ≤ 1000	0.58	0.72	0.84	0.90	0.98	1
1000 < CAP	0.63	0.78	0.87	0.91	0.98	1

Diagram of Dimensions:(unit:mm)



D φ	5	6.3	8	10	13	16	18	22
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10
d φ	0.5		L < 20 0.5	L ≥ 20 0.6	0.6		0.8	
α	D < 18		D = 18		D > 18			
	1.5		L < 35.5	L ≥ 35.5	2.0		2.0	

Case Size

WV Cap(μF)		6.3			10			16			φ DxL(mm)
		Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance	
10								5x11	74	4.7	
22					5x11	98	2.7	5x11	100	2.6	
33					5x11	100	2.6	5x11	114	2	
47					5x11	150	1.34	5x11	155	1.1	
56					5x11	160	1.23	5x11	180	0.82	
68					5x11	170	1.05	5x11	195	0.69	
100		5x11	170	1.00	5x11	210	0.8	6.3x11	265	0.5	
120		5x11	175	0.92	6.3x11	250	0.75	6.3x11	270	0.47	
150		6.3x11	220	0.81	6.3x11	290	0.61	6.3x11	290	0.41	
		5x11	185	0.90							
180		6.3x11	240	0.76	6.3x11	320	0.46	8x11.5	370	0.34	
								6.3x11	315	0.38	
220		6.3x11	310	0.65	6.3x11	340	0.35	8x11.5	480	0.25	
270		6.3x11	340	0.54	8x11.5	400	0.3	8x11.5	520	0.21	
330		8x11.5	390	0.42	8x11.5	460	0.27	8x11.5	590	0.156	
470		8x11.5	450	0.25	8x11.5	580	0.25	10x12.5	750	0.124	
560		8x11.5	490	0.23	10x12.5	635	0.16	10x12.5	785	0.105	
					8x11.5	550	0.17				
680		8x11.5	550	0.21	10x12.5	765	0.11	10x16	1100	0.092	
820		8x16	620	0.20	10x16	890	0.1	10x16	1180	0.078	
1000		10x12.5	770	0.17	10x16	1040	0.076	10x20	1350	0.065	
		8x16	750	0.15							
1200		10x16	860	0.16	10x16	1200	0.067	10x25	1500	0.061	
1500		10x16	1100	0.14	10x20	1400	0.062	10x30	1600	0.056	
								13x20	1380	0.06	
1800		10x20	1250	0.11	10x25	1550	0.058	13x20	1800	0.047	
								10x25	1730	0.05	
2200		10x20	1380	0.090	13x20	1750	0.041	13x25	2000	0.038	
		10x25	1470	0.095	10x25	1650	0.52	13x20	1880	0.04	
2700		10x25	1490	0.075	13x20	1900	0.035	13x25	2450	0.033	
		13x20	1550	0.075							
3300		13x20	1650	0.036	13x25	2000	0.031	16x25	2790	0.030	
								13x30	2640	0.030	
4700		13x30	2100	0.036	16x25	2100	0.030	16x31.5	2880	0.026	
		13x25	1900	0.040							
5600		13x30	2160	0.034	16x25	2290	0.028	16x35.5	2990	0.025	
6800		16x25	2350	0.032	16x31.5	2650	0.026	18x35.5	3200	0.024	
8200		16x31.5	2550	0.027	16x35.5	2770	0.026	18x35.5	3320	0.024	
10000		16x35.5	2700	0.024	18x35.5	2850	0.024	18x41	3550	0.024	
15000		18x35.5	2950	0.023							

Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

φ DxL(mm)

WV Cap(μF)	25			35			50		
	Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance
0.47							5x11	25	5.4
1							5x11	40	4
2.2							5x11	55	2.8
3.3							5x11	60	2.2
4.7	5x11	68	3.95	5x11	85	3.65	5x11	90	2
5.6	5x11	75	3.25	5x11	92	3.09	5x11	105	1.93
6.8	5x11	80	2.98	5x11	97	2.82	5x11	110	1.89
10	5x11	85	2.56	5x11	105	2.37	5x11	120	1.82
22	5x11	125	1.95	5x11	150	1.5	6.3x11	150	1.25
33	5x11	155	1.42	5x11	180	1.21	6.3x11	250	0.8
47	5x11	190	1.10	6.3x11	280	0.8	6.3x11	290	0.65
	6.3x11	220	1.00						
56	6.3x11	250	0.79	6.3x11	310	0.64	8x11.5	310	0.49
68	6.3x11	280	0.65	8x11.5	350	0.52	8x11.5	375	0.33
100	6.3x11	370	0.35	8x11.5	450	0.25	10x12.5	480	0.17
120	6.3x11	380	0.33	8x11.5	510	0.22	10x12.5	530	0.156
150	8x11.5	410	0.31	8x11.5	540	0.191	10x12.5	590	0.132
180	8x11.5	455	0.25	10x12.5	650	0.172	10x16	860	0.114
220	8x11.5	550	0.15	10x12.5	750	0.114	10x16	930	0.096
270	10x12.5	720	0.125	10x16	910	0.095	10x20	1060	0.078
330	10x12.5	820	0.114	10x16	1050	0.079	10x25	1150	0.065
470	10x16	1200	0.076	10x20	1200	0.065	13x20	1590	0.055
560	10x16	1250	0.072	10x25	1500	0.061	13x20	1740	0.05
680	10x20	1320	0.065	13x20	1570	0.056	13x25	1930	0.044
820	10x20	1400	0.052	13x20	1700	0.048	13x30	2100	0.039
	10x25	1530	0.052						
1000	13x20	1650	0.045	13x25	1900	0.042	16x25	2300	0.036
1200	13x25	1980	0.041	13x30	2130	0.039	16x31.5	2650	0.036
1500	13x25	2210	0.038	16x25	2270	0.036	16x35.5	2750	0.034
1800	16x25	2510	0.036	16x31.5	2700	0.035	16x35.5	2850	0.034
2200	16x25	2650	0.035	16x31.5	2780	0.034	18x35.5	3040	0.032
2700	16x25	2820	0.031	16x35.5	2850	0.029	18x41	3070	0.027
3300	16x31.5	3240	0.026	18x35.5	3100	0.026	18x41	3100	0.025
4700	16x35.5	3650	0.024	18x41	3500	0.024			
5600	18x35.5	3720	0.024						
6800	18x41	3850	0.024						

Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

φ DxL(mm)

WV Cap(μF)	63			100			160		
	Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance
0.47	5x11	25	5.4	5x11	20	5.9	5x11	36	9.44
1	5x11	33	4	5x11	30	4.4	6.3x11	45	7.85
2.2	5x11	45	2.8	5x11	42	3.3	6.3x11	55	5.21
3.3	5x11	58	2.2	5x11	55	2.8	8x11.5	70	4.31
4.7	5x11	65	2	5x11	72	2.6	8x11.5	80	4.16
5.6	5x11	95	1.9	5x11	100	2.33	10x12.5	91	3.61
6.8	5x11	100	1.82	6.3x11	115	1.95	10x16	100	3.12
10	5x11	110	1.75	6.3x11	130	1.77	10x16	140	2.69
22	6.3x11	180	0.80	8x11.5	220	0.85	10x16	205	1.3
33	8x11.5	270	0.61	10x12.5	320	0.69	10x20	260	1.1
47	8x11.5	300	0.56	10x12.5	370	0.58	13x20	320	0.91
56	8x11.5	330	0.38	10x12.5	400	0.43	13x20	340	0.67
				10x16	440	0.42	13x25	370	0.66
68	10x12.5	480	0.21	10x16	470	0.35	13x25	450	0.56
100	10x16	610	0.14	10x25	560	0.3	16x25	540	0.47
120	10x16	620	0.13	10x25	660	0.22	16x25	560	0.35
150	10x16	700	0.11	13x20	780	0.174	16x31.5	710	0.26
180	10x20	800	0.10	13x20	820	0.142	16x35.5	760	0.22
220	10x20	920	0.080	13x25	950	0.13	16x35.5	820	0.19
270	13x20	1150	0.065	13x30	1120	0.11	18x35.5	990	0.18
330	13x20	1250	0.055	16x25	1440	0.1	18x41	1180	0.16
470	13x25	1620	0.053	16x31.5	1650	0.09			
560	13x25	1680	0.049	16x35.5	1720	0.085			
680	13x30	1950	0.043	18x35.5	1790	0.08			
820	16x25	2150	0.038	18x35.5	1840	0.071			
1000	16x31.5	2350	0.034	18x41	1930	0.066			
1200	16x35.5	2550	0.032						
1500	18x35.5	2710	0.031						
1800	18x41	3000	0.027						

Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

φ DxL(mm)

WV Cap(μF)	200			250			350		
	Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance
0.47	5x11	36	9.38	5x11	40	8.85	6.3x11	40	8.82
1	6.3x11	45	7.76	6.3x11	50	6.54	6.3x11.5	50	7.90
							8x11.5	58	6.35
2.2	6.3x11	55	5.18	8x11.5	72	4.12	8x11.5	75	5.3
							10x12.5	86	4.02
3.3	8x11.5	71	4.25	8x11.5	75	3.85	10x12.5	90	3.80
							10x16	100	3.52
4.7	8x11.5	78	5.00	8x11.5	85	3.50	10x16	118	3.13
	10x12.5	85	4.12	10x12.5	100	2.95	10x20	130	2.77
5.6	8x11.5	90	4.50	8x11.5	95	2.93	10x16	120	2.76
	10x12.5	95	3.55	10x12.5	105	2.72	10x20	132	2.58
6.8	8x16	115	3.25	8x16	124	2.50	10x16	148	2.43
	10x16	140	2.71	10x12.5	126	2.20	10x25	180	1.65
				10x16	140	1.86			
10	10x16	150	2.02	8x16	141	1.80	10x16	165	1.64
				10x12.5	144	1.75	10x25	200	1.35
				10x16	160	1.4			
22	10x16	186	1.80						
	10x20	205	1.40	10x20	210	1.3	13x20	220	1.22
33	10x20	280	1.00	10x25	248	1.25	13x20	263	1.02
	13x20	330	0.80	13x20	310	0.9	13x25	290	0.86
47	13x20	360	0.65	13x20	375	0.60	16x25	389	0.76
	13x25	400	0.62	13x25	405	0.45	16x31.5	430	0.62
56	13x20	430	0.45	13x25	420	0.42	16x35.5	460	0.60
68	13x25	480	0.42						
	16x25	540	0.35	16x25	490	0.38	16x31.5	475	0.57
	16x25	780	0.30	16x31.5	675	0.27	16x35.5	481	0.56
100	16x31.5	820	0.28				18x31.5	487	0.56
							18x35.5	513	0.55
120	16x25	740	0.28	16x31.5	692	0.26	18x35.5	525	0.54
	16x31.5	830	0.26	16x35.5	730	0.25	18x41	560	0.52
150	16x31.5	840	0.25	16x35.5	750	0.24	18x41	590	0.50
	16x35.5	860	0.23	18x31.5	750	0.23			
180	18x31.5	920	0.20	18x35.5	830	0.21			
220	18x35.5	1050	0.19	18x31.5	850	0.20			
	18x41	1090	0.16	18x41	910	0.19			

WV Cap(μF)	400			420			450		
	Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance
0.47	6.3x11	26	33.00	6.3x11	28	34.00	8x11.5	30	34.00
1	8x11.5	36	16.50	8x11.5	38	17.00	8x11.5	45	17.35
2.2	10x12.5	76	13.00	10x12.5	58	12.10	10x16	65	10.25
	8x11.5	65	13.00						
3.3	8x11.5	86	12.00	10x12.5	87	11.00	10x16	89	10.00
4.7	10x12.5	105	10.00	10x16	102	8.50	10x20	105	5.00
5.6	8x16	105	8.00	10x16	109	6.80	10x20	110	4.75
	10x12.5	120	9.00						4.60
6.8	10x16	160	7.50	10x16	160	6.00	10x20	135	4.05
10	10x20	235	3.60	10x20	180	3.70	10x25	180	3.75
22	13x20	295	2.65	13x25	330	2.70	13x25	320	2.80
33	13x25	440	1.60	16x25	480	1.80	16x25	460	2.20
47	16x25	580	1.40	16x31.5	620	1.10	16x35.5	650	1.05
56	16x31.5	650	0.85	16x35.5	670	0.90	18x31.5	730	0.95
68	16x31.5	800	0.80	18x31.5	750	0.80	18x35.5	760	0.75
100	18x35.5	900	0.61	18x35.5	820	0.70	18x41	880	0.74

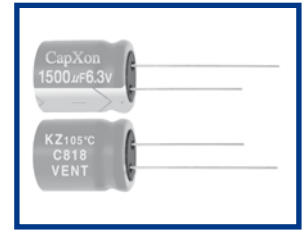
Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

KZ Series Low Impedance

Features

- ◆ Used in communication equipments, switching power supply, industrial measuring instruments, etc.
- ◆ Load life 1000~2000hrs.
- ◆ Safety vent construction design.
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E144
- ◆ RoHS Compliant



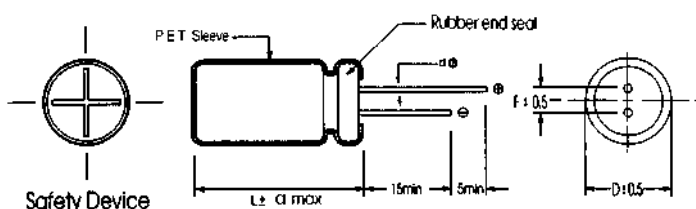
Specifications

Item	Performance Characteristics																											
Operating Temperature Range	-40 to +105℃																											
Rated Voltage Range	6.3 to 50 VDC																											
Capacitance Range	0.47 to 6800 μ F																											
Capacitance Tolerance	±20%(120Hz,+20℃)																											
Leakage Current (+20℃,max.)	I ≤0.01 CV or 3 (μ A) After 2 minutes whichever is greater measured with rated working voltage applied.																											
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>D.F. (%)max.</td><td>18</td><td>16</td><td>14</td><td>12</td><td>10</td><td>9</td></tr></table>							Working Voltage(VDC)	6.3	10	16	25	35	50	D.F. (%)max.	18	16	14	12	10	9							
	Working Voltage(VDC)	6.3	10	16	25	35	50																					
D.F. (%)max.	18	16	14	12	10	9																						
For capacitance > 1000 μ F, add 2% per another 1000uF.																												
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																											
	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z-25℃ / Z+20℃</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td></tr><tr><td>Z-40℃ / Z+20℃</td><td>8</td><td>6</td><td>4</td><td>3</td><td>3</td><td>3</td></tr></table>							Working Voltage(VDC)	6.3	10	16	25	35	50	Z-25℃ / Z+20℃	4	3	3	3	3	3	Z-40℃ / Z+20℃	8	6	4	3	3	3
	Working Voltage(VDC)	6.3	10	16	25	35	50																					
	Z-25℃ / Z+20℃	4	3	3	3	3	3																					
Z-40℃ / Z+20℃	8	6	4	3	3	3																						
For capacitance > 1000 μ F, add 0.5 per another 1000uF for -25℃ / +20℃ add 1 per another 1000uF for -40℃ / +20℃																												
Load Life	Test conditions Duration time : as right Ambient temperature : +105℃ Applied voltage : Rated DC working voltage						<table><tr><td>D φ</td><td>Life hours</td></tr><tr><td>5 - 6.3 φ</td><td>1000</td></tr><tr><td>≥ 8 φ</td><td>2000</td></tr></table>	D φ	Life hours	5 - 6.3 φ	1000	≥ 8 φ	2000															
	D φ	Life hours																										
	5 - 6.3 φ	1000																										
≥ 8 φ	2000																											
After test requirement at +20℃ Capacitance change : ≤ ±20% of the initial measured value Dissipation factor : ≤ 200% of the initial specified value Leakage current : ≤ The initial specified value																												
Shelf Life	Test conditions Duration time : 1000Hrs Ambient temperature : +105℃ Applied voltage : None																											
	After test requirement at +20℃: Same limits as Load life.																											
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																											

Multiplier for Ripple Current vs. Frequency

CAP(µ F) \ Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
$CAP \leq 10$	0.47	0.59	0.76	0.85	0.97	1
$10 < CAP \leq 100$	0.52	0.62	0.80	0.89	0.97	1
$100 < CAP \leq 1000$	0.58	0.72	0.84	0.90	0.98	1
$1000 < CAP$	0.63	0.78	0.87	0.91	0.98	1

Diagram of Dimensions:(unit:mm)



D φ	5	6.3	8	10	13	16	18
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
d φ	0.5		$L < 20$ 0.5	$L \geq 20$ 0.6	0.6	0.8	

α	D < 18	D = 18		D > 18
		L < 35.5	L ≥ 35.5	
	1.5	1.5	2.0	2.0

Case Size

φ DxL(mm)

Cap(μ F) WV	6.3			10			16		
	Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance
10							5x11	80	4
22	5x11	80	3	5x11	90	2.5	5x11	110	2.0
33	5x11	90	2.0	5x11	105	2.0	5x11	114	1.8
47	5x11	140	1.5	5x11	155	1.3	5x11	160	1.0
56	5x11	150	1.5	5x11	165	1.2	5x11	180	0.8
68	5x11	160	1.1	5x11	175	1.0	5x11	200	0.65
100	5x11	170	1.0	5x11	215	0.75	5x11	255	0.55
120	5x11	173	0.9	6.3x11	240	0.73	6.3x11	270	0.45
150	5x11	178	0.85	6.3x11	225	0.60	6.3x11	292	0.40
180	6.3x11	215	0.72	6.3x11	280	0.58	6.3x11	380	0.32
220	6.3x11	295	0.62	6.3x11	300	0.43	6.3x11	430	0.25
270	6.3x11	320	0.50	8x11.5	405	0.28	8x11.5	480	0.20
330	6.3x11	380	0.45	8x11.5	465	0.25	8x11.5	595	0.15
470	8x11.5	460	0.22	8x11.5	500	0.22	8x11.5	650	0.15
560	8x11.5	490	0.22	8x11.5	620	0.17	8x11.5	730	0.12
680	8x11.5	520	0.19	8x11.5	750	0.12	10x12.5	890	0.09
820	8x11.5	605	0.19	10x12.5	805	0.10	10x12.5	980	0.085
1000	8x11.5	680	0.18	10x12.5	1050	0.08	10x16	1180	0.07
1200	10x12.5	750	0.15	10x16	1150	0.065	10x20	1320	0.06
1500	10x12.5	820	0.14	10x16	1210	0.062	10x20	1450	0.056
1800	10x16	920	0.12	10x20	1280	0.06	10x20	1510	0.053
2200	10x20	1150	0.10	10x20	1520	0.05	13x20	1820	0.04
2700	10x20	1500	0.075	13x20	1580	0.048	13x20	2050	0.035
3300	10x20	1620	0.06	13x20	1700	0.043	13x25	2300	0.033
3900	13x25	1820	0.058	13x25	1860	0.040	16x25	2550	0.033
4700	13x25	1920	0.04	13x25	1950	0.038	16x25	2580	0.032
5600	13x30	2210	0.038	16x25	2290	0.033	16x31.5	2650	0.030
6800	16x25	2380	0.032	16x25	2480	0.028	16x31.5	2900	0.024

Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

WV Cap(μF)	25			35			50		
	Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance
0.47							5x11	28	5.0
1							5x11	42	3.8
2.2							5x11	55	2.8
3.3							5x11	62	2.0
4.7	5x11	72	3.5	5x11	87	3.5	5x11	90	2.0
5.6	5x11	75	3.5	5x11	95	3.0	5x11	108	1.8
6.8	5x11	83	2.8	5x11	98	2.7	5x11	112	1.8
10	5x11	87	2.5	5x11	107	2.2	5x11	120	1.75
22	5x11	118	1.8	5x11	150	1.5	5x11	150	1.5
33	5x11	155	1.4	5x11	180	1.2	6.3x11	233	0.78
47	5x11	183	0.9	5x11	257	0.75	6.3x11	270	0.65
56	5x11	207	0.83	6.3x11	283	0.6	6.3x11	290	0.6
68	5x11	210	0.69	6.3x11	290	0.55	6.3x11	310	0.5
100	6.3x11	378	0.34	6.3x11	430	0.26	8x11.5	480	0.17
120	6.3x11	380	0.33	8x11.5	470	0.20	10x12.5	500	0.1638
150	8x11.5	390	0.325	8x11.5	510	0.2	10x12.5	560	0.16
180	8x11.5	430	0.25	8x11.5	570	0.18	10x12.5	580	0.14
220	8x11.5	550	0.15	8x11.5	620	0.13	10x16	640	0.09
270	8x11.5	620	0.15	10x12.5	850	0.12	10x16	905	0.08
330	8x11.5	710	0.13	8x16	1050	0.08	10x16	1050	0.07
470	8x11.5	980	0.078	10x16	1100	0.065	13x20	1450	0.05
	8x16	1050	0.07						
560	10x16	1080	0.065	13x20	1300	0.06	13x20	1510	0.05
680	10x16	1100	0.065	13x20	1570	0.056	13x20	1750	0.05
820	10x20	1350	0.05	13x20	1700	0.048	13x25	1980	0.04
1000	10x20	1580	0.045	13x20	1820	0.042	13x25	2000	0.04
1200	13x20	1720	0.04	13x25	2130	0.038	16x25	2200	0.038
1500	13x20	1780	0.04	13x25	2150	0.038	16x25	2300	0.038
1800	13x20	1980	0.035	13x25	2450	0.035	16x31.5	2610	0.036
2200	13x25	2000	0.033	16x25	2650	0.034	16x31.5	2900	0.033
2700	13x25	2250	0.032	16x31.5	2690	0.030	18x35.5	3000	0.028
3300	16x25	2580	0.027	16x35.5	2750	0.027	18x35.5	3050	0.026
4700	16x31.5	2850	0.025	18x35.5	2940	0.025			
5600	16x35.5	3000	0.025	18x35.5	3050	0.024			
6800	18x35.5	3550	0.025						

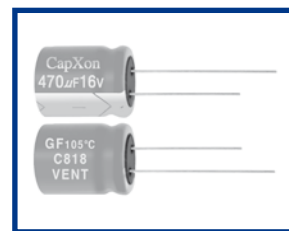
Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

GF Series Low Impedance

Features

- ◆ Used in mother board, computer peripheral, etc.
- ◆ Load life 2000 ~ 5000 Hrs at 105 °C
- ◆ Safety vent construction design.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E127
- ◆ RoHS Compliant



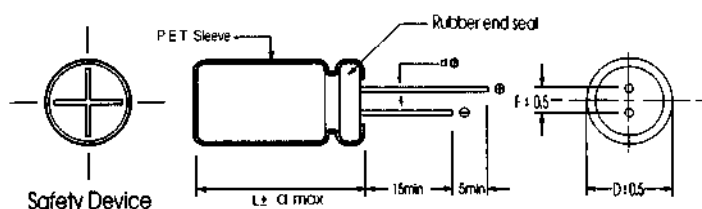
Specifications

Item	Performance Characteristics																																				
Operating Temperature Range	-55 to +105°C																																				
Rated Voltage Range	6.3 to 100 VDC																																				
Capacitance Range	4.7 to 6800 μF																																				
Capacitance Tolerance	±20% (120Hz, +20°C)																																				
Leakage Current (+20°C,max.)	I≤0.01 CV or 3 (μA) After 2 minutes whichever is greater measured with rated working voltage applied.																																				
Dissipation Factor (tan δ , at 20°C , 120Hz)	<table><tr><td>Working Voltage (VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>D.F. (%)max</td><td>16</td><td>14</td><td>12</td><td>10</td><td>9</td><td>8</td><td>8</td><td>8</td></tr></table>										Working Voltage (VDC)	6.3	10	16	25	35	50	63	100	D.F. (%)max	16	14	12	10	9	8	8	8									
	Working Voltage (VDC)	6.3	10	16	25	35	50	63	100																												
	D.F. (%)max	16	14	12	10	9	8	8	8																												
For capacitance > 1000 μF, add 2% per another 1000 μF.																																					
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																																				
	<table><tr><td>Working Voltage</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>Z(-25°C) / Z(20°C)</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td><td>2</td><td>2</td></tr><tr><td>Z(-40°C) / Z(20°C)</td><td>8</td><td>6</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td></tr></table>										Working Voltage	6.3	10	16	25	35	50	63	100	Z(-25°C) / Z(20°C)	4	3	3	3	3	3	2	2	Z(-40°C) / Z(20°C)	8	6	4	3	3	3	3	3
	Working Voltage	6.3	10	16	25	35	50	63	100																												
	Z(-25°C) / Z(20°C)	4	3	3	3	3	3	2	2																												
Z(-40°C) / Z(20°C)	8	6	4	3	3	3	3	3																													
For Capacitance > 1000 μF, add 0.5 per another 1000 μF for -25°C／+20°C add 1 per another 1000 μF for -40°C／+20°C																																					
Load Life	Test conditions Duration time :as right Ambient temperature :+105°C Applied voltage :Rated DC working voltage							<table><tr><td>D φ</td><td>Life hours</td></tr><tr><td>5 - 6.3 φ</td><td>2000</td></tr><tr><td>8 φ</td><td>3000</td></tr><tr><td>≧ 10 φ</td><td>5000</td></tr></table>		D φ	Life hours	5 - 6.3 φ	2000	8 φ	3000	≧ 10 φ	5000																				
	D φ	Life hours																																			
	5 - 6.3 φ	2000																																			
8 φ	3000																																				
≧ 10 φ	5000																																				
After test requirement at +20°C Capacitance change :≧ ±20% of the initial measured value Dissipation factor :≧ 200% of the initial specified value Leakage current :≧ The initial specified value																																					
Shelf Life	Test conditions Duration time :1000Hrs Ambient temperature :+105°C Applied voltage :None																																				
	After test requirement at +20°C:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																																				

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.47	0.59	0.76	0.85	0.97	1.0
10 < CAP ≤ 100	0.52	0.62	0.80	0.89	0.97	1.0
100 < CAP ≤ 1000	0.58	0.72	0.84	0.90	0.98	1.0
1000 < CAP	0.63	0.78	0.87	0.91	0.98	1.0

Diagram of Dimensions:(unit:mm)



D φ	5	6.3	8	10	13	16	18
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
d φ	0.5		L < 20 0.5	L ≥ 20 0.6	0.6		0.8
α	D < 18		D = 18		D > 18		
	1.5		L < 35.5	L ≥ 35.5	2.0		2.0

Case Size

WV Cap(μF)		6.3				10			
		Size	Ripple	Impedance		Size	Ripple	Impedance	
				+20°C	-10°C			+20°C	-10°C
68						5x11	190	0.70	2.065
82						5x11	210	0.50	1.475
100		5x11	200	0.40	1.240	5x11	242	0.31	0.915
120		5x11	210	0.38	1.178	5x11	261	0.28	0.826
150		5x11	225	0.35	1.085	6.3x11	300	0.26	0.767
180		6.3x11	300	0.32	0.992	6.3x11	350	0.22	0.649
220		6.3x11	360	0.25	0.775	6.3x11	390	0.18	0.531
270		6.3x11	377	0.24	0.744	6.3x15	460	0.16	0.472
330		6.3x11	395	0.20	0.465	8x11.5	540	0.11	0.325
390		8x11.5	576	0.14	0.434	8x11.5	620	0.095	0.280
470		8x11.5	600	0.095	0.294	8x11.5	750	0.075	0.221
560		8x16	720	0.087	0.270	8x16	870	0.072	0.212
680		8x16	800	0.080	0.248	8x20	1010	0.068	0.201
		10x16	814	0.084	0.260				
820		8x20	970	0.070	0.217	8x20	1030	0.065	0.192
1000		10x12.5	1000	0.055	0.168	8x20	1220	0.050	0.148
						10x16	1400	0.042	0.124
1200		8x20	1150	0.048	0.146	10x20	1560	0.035	0.095
		10x16	1180	0.050	0.152				
1500		10x20	1400	0.045	0.137	10x20	1670	0.032	0.086
		10x25	1560	0.043	0.131				
1800		10x20	1500	0.041	0.125	10x25	2000	0.028	0.076
2200		10x25	1720	0.037	0.113	13x20	2370	0.025	0.065
		13x20	1890	0.039	0.119				
2700		13x20	2080	0.034	0.095	13x20	2400	0.023	0.060
3300		13x20	2290	0.026	0.073	13x25	2720	0.021	0.055
3900		10x30	2450	0.024	0.067	13x30	3000	0.020	0.052
		13x25	2670	0.022	0.062				
4700		13x30	3200	0.021	0.059	13x35	3450	0.019	0.049
5600		13x35	3270	0.020	0.056	16x31.5	3460	0.018	0.047
6800		16x31.5	3490	0.018	0.050	16x31.5	3630	0.016	0.042

Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

φ pDxL(mm)

WV Cap(μF)	16				25			
	Size	Ripple	Impedance		Size	Ripple	Impedance	
			+20°C	-10°C			+20°C	-10°C
39					5x11	210	0.42	1.218
47	5x11	200	0.40	1.16	5x11	240	0.35	1.015
56	5x11	220	0.38	1.10	5x11	256	0.31	0.899
68	5x11	230	0.35	1.02	6.3x11	300	0.28	0.812
82	5x11	260	0.31	0.90	6.3x11	350	0.24	0.696
100	6.3x11	360	0.25	0.73	6.3x11	410	0.15	0.435
120	6.3x11	365	0.23	0.67	6.3x15	490	0.13	0.377
150	6.3x11	385	0.21	0.61	8x11.5	540	0.11	0.319
180	8x11.5	520	0.19	0.55	8x11.5	620	0.098	0.2842
220	8x11.5	575	0.14	0.41	8x11.5	750	0.075	0.218
270	8x11.5	600	0.12	0.35	8x16	850	0.063	0.183
330	8x11.5	740	0.08	0.23	8x16	990	0.056	0.1624
					10x12.5	1010	0.054	0.1566
390	8x16	790	0.075	0.22	10x12.5	1050	0.051	0.1479
	8x16	990	0.062	0.18	8x20	1260	0.045	0.1305
470	10x12.5	1000	0.058	0.17	10x16	1415	0.042	0.1218
560	8x20	1070	0.057	0.17	10x20	1450	0.040	0.116
	8x20	1120	0.055	0.16	10x20	1570	0.035	0.1015
680	10x16	1280	0.052	0.15				
820	10x20	1400	0.048	0.14	10x25	1910	0.032	0.093
1000	10x20	1840	0.035	0.09	13x20	2340	0.025	0.055
1200	10x25	1920	0.032	0.08	13x20	2390	0.025	0.055
	10x25	2050	0.030	0.08	13x25	2710	0.023	0.0506
1500	13x20	2200	0.029	0.07				
1800	13x20	2380	0.026	0.07	13x30	3150	0.021	0.0462
2200	13x25	2750	0.022	0.06	13x35	3420	0.018	0.0396
2700	13x25	3000	0.022	0.06	16x31.5	3480	0.018	0.0396
3300	13x35	3490	0.018	0.05	16x31.5	3600	0.018	0.0396
3900	16x25	3520	0.018	0.05				
4700	16x31.5	3770	0.017	0.04				

Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

φ DxL(mm)

WV Cap(μF)	35				50			
	Size	Ripple	Impedance		Size	Ripple	Impedance	
			+20°C	-10°C			+20°C	-10°C
22					5x11	220	0.35	1.015
27					6.3x11	265	0.34	0.986
33	5x11	230	0.32	0.934	6.3x11	280	0.32	0.928
39	6.3x11	277	0.31	0.905	6.3x11	300	0.28	0.812
47	6.3x11	340	0.20	0.584	8x11.5	360	0.20	0.580
56	6.3x11	375	0.20	0.584	8x11.5	375	0.19	0.551
68	6.3x11	400	0.19	0.555	8x11.5	400	0.17	0.493
82	8x11.5	480	0.17	0.496	8x11.5	550	0.12	0.348
100	8x11.5	560	0.15	0.438	8x11.5	730	0.075	0.2175
120	8x11.5	585	0.13	0.38	8x16	770	0.073	0.2117
					10x12.5	790	0.072	0.2088
150	8x11.5	680	0.11	0.321	10x12.5	870	0.068	0.1972
180	8x16	810	0.098	0.286	8x20	1060	0.055	0.1595
					10x16	1090	0.055	0.1595
220	8x16	1000	0.056	0.164	10x16	1385	0.045	0.1305
	10x12.5	1060	0.052	0.152				
270	10x16	1190	0.050	0.146	10x20	1500	0.043	0.1247
330	8x20	1210	0.041	0.12	10x25	1850	0.032	0.0928
	10x16	1400	0.038	0.111				
390	10x20	1550	0.035	0.102	13x20	1910	0.031	0.0899
470	10x20	1850	0.022	0.064	13x20	2000	0.030	0.0870
560	10x25	2040	0.022	0.064	13x20	2150	0.028	0.0812
680	13x20	2260	0.021	0.061	13x25	2490	0.026	0.0754
820	13x25	2630	0.021	0.053	13x30	2770	0.025	0.0725
					16x25	2960	0.024	0.0696
1000	13x25	2780	0.019	0.048	16x25	3000	0.020	0.0580
1200	13x30	2950	0.019	0.048				
	16x25	3150	0.018	0.045				
1500	13x35	3350	0.018	0.045				
	16x31.5	3600	0.017	0.043				
1800	16x31.5	3670	0.016	0.04				
2200	16x35.5	3750	0.015	0.038				
2700	18x31.5	3850	0.014	0.035				

Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

φ DxL(mm)

WV Cap(μF)	63				100			
	Size	Ripple	Impedance		Size	Ripple	Impedance	
			+20°C	-10°C			+20°C	-10°C
4.7					5x11	105	1.60	4.64
5.6					5x11	116	1.49	4.321
6.8					5x11	120	1.45	4.205
10	5x11	135	0.95	2.755	6.3x11	170	0.70	2.03
15	6.3x11	168	0.85	2.465	8x11.5	255	0.61	1.769
18	6.3x11	170	0.82	2.378	8x11.5	270	0.56	1.624
22	6.3x11	250	0.75	2.175	8x11.5	320	0.48	1.392
27	6.3x11	260	0.55	1.595	8x11.5	340	0.39	1.131
33	6.3x11	270	0.38	1.102	8x16	400	0.31	0.899
39	8x11.5	320	0.35	1.015	8x16	425	0.29	0.841
					10x12.5	440	0.27	0.783
47	8x11.5	400	0.22	0.638	10x12.5	450	0.25	0.725
56	8x11.5	420	0.22	0.638	10x16	540	0.21	0.609
68	10x12.5	500	0.20	0.58	10x20	630	0.18	0.522
82	8x16	540	0.17	0.493	10x20	720	0.15	0.435
	10x12.5	570	0.16	0.464				
100	10x12.5	720	0.14	0.406	10x25	890	0.12	0.348
	8x20	790	0.14	0.406	10x25	900	0.12	0.348
120	10x16	835	0.13	0.377	13x20	980	0.11	0.319
150	10x16	900	0.11	0.319	13x20	1100	0.095	0.276
180	10x20	1200	0.095	0.276	13x25	1250	0.078	0.226
220	10x25	1315	0.075	0.218	13x30	1420	0.065	0.189
					16x21	1270	0.075	0.218
270	13x20	1400	0.071	0.206	13x35	1630	0.057	0.165
					16x25	1570	0.058	0.168
	10x30	1750	0.047	0.136	13x40	1650	0.045	0.131
330	13x25	1870	0.045	0.131				
390	13x25	1920	0.044	0.128	16x31.5	1850	0.043	0.125
470	13x30	2225	0.041	0.119	16x35.5	1900	0.032	0.093
	16x20	1970	0.043	0.125	18x31.5	1700	0.038	0.095
560	16x25	2350	0.039	0.098	16x41	2170	0.032	0.08
					18x31.5	2100	0.031	0.078
680	16x31.5	2600	0.035	0.088	18x35.5	2400	0.029	0.073
820	16x31.5	2650	0.031	0.078				
	16x35.5	2780	0.026	0.065				
1000	18x31.5	3230	0.028	0.070				

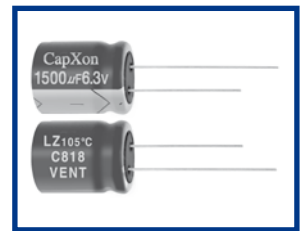
Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

LZ Series Ultra Low Impedance

Features

- ◆ Ultra low impedance in 100KHz.
- ◆ Allow higher ripple current applied due to ultra low impedance.
- ◆ Load life 2000hrs at 105°C
- ◆ Suitable for application of mother board, computer peripheral etc.
- ◆ For more details, please refer to CapXon Engineering Bulletin No. 133
- ◆ RoHS Compliant



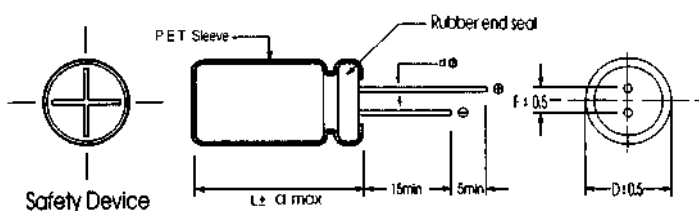
Specifications

Item	Performance Characteristics				
Operating Temperature Range	-40 ~ +105°C				
Rated Voltage Range	6.3 ~ 25V with rated working voltage applied				
Capacitance Range	220 to 3300 μ F				
Capacitance Tolerance	$\pm 20\%$ (20°C, 120Hz)				
Leakage Current (+20°C, max.)	$I \leq 0.01CV$ or $3 \mu A$ After 2 minutes whichever is greater measured				
Dissipation Factor ($\tan \delta$, at 20°C , 120Hz)	Rated Voltage(V)	6.3	10	16	25
	D.F. (%) max	14	12	10	9
For capacitance > 1000 μ F, add 2% per another 1000 μ F					
Low Temperature Characteristics (at 120Hz)	Impedance ratio max				
	Rated Voltage(V)	6.3	10	16	25
	Z-25°C / Z+20°C	4	3	2	2
	Z-40°C / Z+20°C	6	4	3	3
For Capacitance Value > 1000 μ F, add 0.5 per another 1000 μ F for -25°C / +20°C add 1 per another 1000 μ F for -40°C / +20°C					
Load Life	Test Conditions Duration : 2000 hrs Ambient temperature : +105°C Applied voltage : Rated DC working voltage After test requirement at +20°C Capacitance change : Within $\pm 25\%$ of the initial measured value Dissipation factor : Not exceed 200% of the initial specified value Leakage current : Not exceed the specified value				
Shelf Life	Test Conditions Duration : 1000 hrs Ambient temperature : +105°C After test requirement at +20°C Capacitance change : Within $\pm 25\%$ of the initial measured value Dissipation factor : Not exceed 200% of the initial specified value Leakage current : Not exceed the specified value				

Multiplier for Ripple Current vs. Frequency

CAP(μ F) \ Frequency(Hz)	120Hz	1KHz	10KHz	100KHz
100 ~ 330 μ F	0.40	0.75	0.93	1.00
390 ~ 1000 μ F	0.50	0.85	0.95	1.00
1200 ~ 3300 μ F	0.55	0.90	0.98	1.00

Diagram of Dimensions:(unit:mm)



D ϕ	8	10
F	3.5	5.0
d ϕ	L < 20 0.5	L $\geq$ 20 0.6

α	D < 18	D = 18		D > 18
		L < 35.5	L $\geq$ 35.5	
	1.5	1.5	2.0	2.0

Case Size

WV Cap(μF)		6.3			10			16			φ DxL(mm)
		Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance	
330								8X11.5	1080	0.038	
470					8X11.5	1080	0.038	8X11.5	1080	0.038	
								10X12.5	1500	0.027	
560		8x11.5	1080	0.038	8X11.5	1080	0.038	8X16	1450	0.029	
680		8x11.5	1080	0.038	8X11.5	1080	0.038	8X16	1450	0.029	
					10X12.5	1500	0.027	10X12.5	1500	0.027	
820		8x11.5	1080	0.038	10X12.5	1450	0.029	8X20	1850	0.020	
		8x16	1100	0.036	8X16	1450	0.029	8X20	1850	0.020	
1000		10x12.5	1500	0.027	10X12.5	1500	0.027	10X16	1910	0.018	
1200		8x16	1450	0.029	8X20	1850	0.020	10X20	2540	0.017	
		8x20	1850	0.020	8X20	1850	0.020	10X20	2540	0.015	
1500		10x12.5	1500	0.027	10X16	1910	0.018				
1800		10x16	1910	0.018	10X20	2540	0.016	10X25	2800	0.013	
		8x20	1850	0.020	10X20	2540	0.015				
2200		10x16	1910	0.018	10X25	2800	0.014				
2700		10x20	2540	0.013							
3300		10x30	2800	0.012							

WV Cap(μF)		25		
		Size	Ripple	Impedance
220		8X11.5	1080	0.032
270		8X11.5	1150	0.031
		8X11.5	1450	0.029
330		10X12.5	1850	0.027
		8X20	1720	0.020
470		10X12.5	1440	0.025
		10X16	1830	0.022
560		10X16	1850	0.021
		8X20	1820	0.018
680		10X16	1920	0.020
		10X20	2060	0.018
1000		10X20	2180	0.016

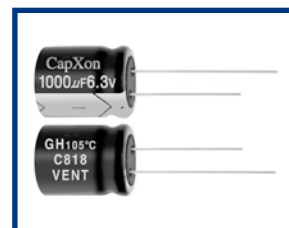
Ripple Current (mA, rms) at 105°C 100KHz

Max ESR (Ω) at 20°C 100KHz

GH Series

Features

- ◆ Low impedance
- ◆ High temperature, Long life 3,000 to 10,000 hours at 105°C
- ◆ For detail specifications, please refer to Engineering Bulletin NO. 170.



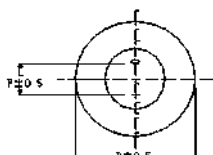
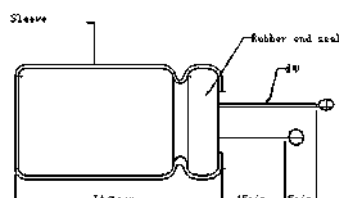
Specifications

Item	Performance Characteristics																																		
Operating Temperature Range	-55 to +105℃																																		
Rated Voltage Range	6.3 to 50 VDC																																		
Capacitance Range	0.47 to 6800 μF																																		
Capacitance Tolerance	±20%(120Hz,+20℃)																																		
Leakage Current (+20℃,max.)	I≤0.01 CV or 3 (μA) (After 2 minute with rated working voltage applied.)																																		
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>D.F.(%)max.</td><td>22</td><td>19</td><td>16</td><td>14</td><td>12</td><td>10</td></tr></table>							Working Voltage(VDC)	6.3	10	16	25	35	50	D.F.(%)max.	22	19	16	14	12	10														
	Working Voltage(VDC)	6.3	10	16	25	35	50																												
D.F.(%)max.	22	19	16	14	12	10																													
For capacitance > 1000 μF,add 2% per another 1000 μF.																																			
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																																		
	<table><tr><td>Rated voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z-25℃ / Z+20℃</td><td>4</td><td>3</td><td>2</td><td>2</td><td>1.5</td><td>1.5</td></tr><tr><td>Z-40℃ / Z+20℃</td><td>6</td><td>4</td><td>3</td><td>3</td><td>2</td><td>2</td></tr><tr><td>Z-55℃ / Z+20℃</td><td>8</td><td>6</td><td>5</td><td>5</td><td>4</td><td>4</td></tr></table>							Rated voltage(VDC)	6.3	10	16	25	35	50	Z-25℃ / Z+20℃	4	3	2	2	1.5	1.5	Z-40℃ / Z+20℃	6	4	3	3	2	2	Z-55℃ / Z+20℃	8	6	5	5	4	4
	Rated voltage(VDC)	6.3	10	16	25	35	50																												
	Z-25℃ / Z+20℃	4	3	2	2	1.5	1.5																												
	Z-40℃ / Z+20℃	6	4	3	3	2	2																												
Z-55℃ / Z+20℃	8	6	5	5	4	4																													
For Capacitance > 1000 μF, add 0.5 per another 1000 μF for -25℃／+20℃ add 1 per another 1000 μF for -40℃／+20℃ add 1.5 per another 1000 μF for -55℃／+20℃																																			
Load Life	Test condition Duration time:																																		
	<table><tr><td>D φ</td><td>5-6.3 φ</td><td>8-12 φ</td><td>≥13 φ</td></tr><tr><td>+105℃Life hours</td><td>4000 hours</td><td>7000 hours</td><td>10000 hours</td></tr></table>							D φ	5-6.3 φ	8-12 φ	≥13 φ	+105℃Life hours	4000 hours	7000 hours	10000 hours																				
	D φ	5-6.3 φ	8-12 φ	≥13 φ																															
	+105℃Life hours	4000 hours	7000 hours	10000 hours																															
	* down size load life																																		
	<table><tr><td>D φ</td><td>5-6.3 φ</td><td>8 φ</td><td>10~12.5 φ</td><td>≥13 φ</td></tr><tr><td>+105℃</td><td>3000 hours</td><td>4000 hours</td><td>6000 hours</td><td>7000 hours</td></tr></table>							D φ	5-6.3 φ	8 φ	10~12.5 φ	≥13 φ	+105℃	3000 hours	4000 hours	6000 hours	7000 hours																		
D φ	5-6.3 φ	8 φ	10~12.5 φ	≥13 φ																															
+105℃	3000 hours	4000 hours	6000 hours	7000 hours																															
Ambient temperature :+105℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change :≤±25% of the initial measured value Dissipation factor :≤200% of the initial specified value Leakage current :≤The initial specified value																																			
Shelf Life	Test condition																																		
	Duration time :1000 Hrs																																		
	Ambient temperature :+105℃																																		
	Applied voltage :None																																		
After test requirement at +20℃:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																																			

Multiplier for Ripple Current vs. Frequency

CAP(µF) \ Frequency(Hz)	120	400	1K	10K	100K
CAP ≤ 10	0.40	0.52	0.60	0.92	1
10 < CAP ≤ 100	0.67	0.80	0.83	0.94	1
100 < CAP ≤ 1000	0.75	0.84	0.88	0.95	1
1000 < CAP	0.82	0.87	0.92	0.95	1

Diagram of Dimensions:(unit:mm)



D φ	5	6.3	8	10	13	16	18
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
d φ	0.5		L < 20 0.5	L ≥ 20 0.6	0.6		0.8

α	D < 18	D = 18		D > 18
		L < 35.5	L ≥ 35.5	
	1.5	1.5	2.0	2.0

Case Size

φ D×L(mm)

WV Cap(μF)	6.3			10			16		
	Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance
10							5X11	36	3.9
15							5X11	72	3.32
22				5X11	66	3.08	5X11	72	2.64
27				5X11	72	2.67	5X11	132	2.37
33				5X11	72	2.33	5X11	144	2
39				5X11	120	2.02	5X11	168	1.61
47				5X11	132	1.71	5X11	186	1.35
56				5X11	144	1.47	5X11	210	1.24
68				5X11	162	1.3	5X11	228	1.18
82	5X11	198	1.63	5X11	192	1.15	6.3X11	264	1.03
100	5X11	210	1.45	5X11	222	1.02	6.3X11	264	0.86
				6.3X11	240	1.02	5X11*	228	1.1
120	5X11	222	1.28	5X11*	246	1.02	6.3X11	312	0.66
				6.3X11	258	1.02			
150	6.3X11	240	1.16	6.3X11	282	0.95	6.3X11*	336	0.58
							6.3X15	396	0.58
180	6.3X11	282	1.04	6.3X11	318	0.68	6.3X15	420	0.56
							8X11.5	426	0.54
220	6.3X11	378	0.89	6.3X11*	366	0.60	6.3X15	504	0.52
				6.3X15	390	0.58	8X11.5	540	0.46
270	6.3X11	396	0.77	6.3X15	414	0.56	6.3X15*	540	0.42
				8X11.5	420	0.53	8X11.5	582	0.38
330	6.3X11*	378	0.77	6.3X15	462	0.47	8X11.5*	588	0.37
	6.3X15	426	0.68	8X11.5	492	0.45	8X16	618	0.35
	8X11.5	444	0.68				6.3X15*	588	0.14
390	6.3X15*	462	0.58	6.3X15*	456	0.42	8X11.5*	612	0.33
	8X11.5	480	0.52	8X11.5	516	0.42	8X16	654	0.33
							10X12.5	648	0.33
470	6.3X15	504	0.41	6.3X15*	480	0.37	8X16*	846	0.29
	8X11.5	534	0.38	8X11.5	552	0.30	8X20	900	0.28
	10X12.5	564	0.38				10X12.5	882	0.28
560	8X11.5*	570	0.36	8X11.5*	588	0.28	8X16*	864	0.26
	8X16	600	0.36	8X16	636	0.25	8X20	936	0.24
	10X12.5	612	0.36	10X12.5	636	0.25	10X12.5*	882	0.24
							10X16	960	0.20
680	8X11.5*	582	0.33	8X16	660	0.21	8X20*	960	0.20
	8X16	618	0.33	8X20	684	0.20	10X16	1044	0.18
	10X12.5	642	0.33	10X12.5	684	0.20			
820	8X11.5*	666	0.25	8X16*	732	0.20	8X20*	1104	0.17
	10X12.5	720	0.25	8X20	828	0.18	10X16*	1254	0.15
				10X12.5*	876	0.16	10X20	1320	0.15
				10X16	936	0.16			
1000	8X16	690	0.22	8X16*	1020	0.16	10X16*	1404	0.14
	8X20	756	0.22	8X20	1122	0.14	10X20	1476	0.12
	10X12.5	708	0.22	10X12.5*	1032	0.14			
				10X16	1140	0.13			
1200	8X20	840	0.18	8X20*	1248	0.13	10X20*	1500	0.13
	10X16	888	0.18	10X16*	1272	0.13	10X25	1578	0.11
				10X20	1368	0.12			
1500	8X20	1056	0.15	10X20	1536	0.106	10X25*	1620	0.096
	10X16	1128	0.12				13X20	1728	0.095
	10X20	1176	0.12						
1800	8X25*	1230	0.11	10X25	1650	0.102	10X30*	1776	0.097
	10X20	1308	0.11	13X20	1704	0.098	13X20*	1854	0.094
							13X25	1956	0.090
2200	10X20	1350	0.1	10X25*	1776	0.095	13X20*	2082	0.09
	10X25	1362	0.1	10X30	1860	0.093	13X25	2340	0.085
				13X20	1872	0.093			
2700	10X25	1488	0.09	10X30	2076	0.084	13X25*	2436	0.076
	10X30	1560	0.09	13X20*	2028	0.084	13X30	2496	0.072
	13X20	1512	0.09	13X25	2124	0.084	16X25	2544	0.072
3300	10X30	1620	0.085	10X30*	2232	0.070	13X30*	2562	0.068
	13X20	1584	0.085	13X25*	2268	0.070	13X35	2628	0.066
				16X25	2316	0.070	16X25*	2700	0.064
3900	13X25	1860	0.08	13X25*	2304	0.065	13X35*	2664	0.05
				13X30	2376	0.065	16X25*	2736	0.06
				16X25	2544	0.065	16X31.5	2856	0.058
4700	13X25	1938	0.075	13X30*	2484	0.065	16X31.5	2886	0.05
	13X30	1992	0.07	13X35	2568	0.060	18X25*	2844	0.055
				16X25*	2634	0.057			
5600	13X30	1980	0.068	13X35*	2640	0.054	18X31.5*	3084	0.048
	16X25	2196	0.068	16X31.5	2736	0.050	18X35.5	3168	0.045
6800	13X30*	2520	0.063	16X31.5	2964	0.046	18X35.5*	3252	0.040
	16X25	2718	0.063						

“*” is down size

Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance(Ω)at 20°C 100KHz

φ DxL(mm)

WV Cap(μ F)	25			35			50		
	Size	Ripple	Impedance	Size	Ripple	Impedance	Size	Ripple	Impedance
0.47							5X11	12	7.23
1							5X11	24	4.31
2.2							5X11	36	3.6
3.3							5X11	48	3.5
4.7							5X11	66	3.3
5.6							5X11	96	3.2
6.8							5X11	96	3.0
8.2							5X11	108	2.8
10	5X11	66	3.01	5X11	84	2.65	5X11	120	2.6
15	5X11	120	2.64	5X11	144	2.29	5X11	150	1.87
22	5X11	144	2.3	5X11	162	1.9	5X11*	162	1.6
							6.3X11	168	1.27
27	5X11	156	2.03	5X11*	174	1.58	6.3X11	192	1.02
				6.3X11	198	1.42			
33	5X11	174	1.72	5X11*	222	1.25	6.3X11*	282	0.87
				6.3X11	240	1.25	6.3X15	296.4	0.85
39	5X11	174	1.5	6.3X11	252	1.1	6.3X11*	306	0.72
							6.3X15	330	0.7
47	5X11	222	1.37	6.3X11	264	0.92	6.3X15	348	0.55
	6.3X11	240	1.28				8X11.5	366	0.55
56	5X11	264	1.25	6.3X11*	282	0.75	8X11.5	378	0.47
				6.3X15	306	0.68			
68	6.3X11	300	0.97	6.3X11*	312	0.62	8X11.5	420	0.36
				6.3X15	348	0.55			
82	6.3X11	312	0.79	6.3X15	354	0.51	6.3X15*	462	0.35
				8X11.5	384	0.47	8X11.5*	492	0.32
100	6.3X11	360	0.68	6.3X15*	378	0.47	8X16	528	0.28
	8X11.5	516	0.54	8X11.5	414	0.45	8X11.5*	540	0.28
120	6.3X11	402	0.58	8X11.5*	546	0.42	8X16	576	0.25
	6.3X15	462	0.56	8X16	612	0.38	8X16	630	0.21
150	6.3X15	510	0.54	8X16	714	0.35	8X16*	696	0.21
	8X11.5	528	0.52	10X12.5	720	0.35	8X20	756	0.18
180							10X16	780	0.18
	6.3X15	546	0.51	8X16	792	0.32	8X20*	864	0.18
220	8X11.5	552	0.46	10X12.5	804	0.32	10X16	912	0.16
	8X11.5	618	0.42	8X16*	864	0.26	10X16*	1056	0.15
270	8X16	642	0.4	8X20	936	0.24	10X20	1122	0.15
				10X12.5*	888	0.24			
330	8X11.5*	750	0.34	8X20*	1056	0.22	10X20*	1212	0.1
	8X16	756	0.32	10X12.5*	984	0.24	10X25	1284	0.1
470	10X12.5	816	0.32	10X16	1068	0.21			
	8X16	960	0.25	8X20*	1140	0.16	10X25*	1404	0.084
560	10X12.5	924	0.24	10X16*	1176	0.15	13X20	1500	0.082
	8X20	1056	0.23	10X20*	1302	0.11	13X20*	1776	0.078
680	10X12.5*	1020	0.21	10X25	1398	0.10	13X25	1860	0.078
	10X16	1080	0.21	13X20	1398	0.10			
820	8X20*	1224	0.17	10X25*	1572	0.096	13X20*	2094	0.075
	10X16	1260	0.15	13X20	1584	0.096	13X25	2172	0.070
1000	10X20	1470	0.11	10X25*	1680	0.084	13X25*	2304	0.057
				13X20	1692	0.082	16X25	2376	0.057
1200	10X20*	1668	0.11	13X20*	1818	0.068	13X30*	2412	0.052
	10X25	1704	0.1	13X25	1944	0.062	16X31.5	2484	0.052
1500	10X25*	1812	0.093	10X30*	2136	0.060	16X25*	2676	0.050
	13X20	1872	0.090	13X25*	2184	0.060	16X31.5	2736	0.048
1800				13X30	2280	0.058			
	13X20	2028	0.082	13X25*	2292	0.052	16X31.5*	2952	0.045
2200				16X25	2568	0.05	16X35.5	3048	0.042
	13X20*	2124	0.067	13X35*	2820	0.048	16X35.5*	3216	0.038
2700	13X25	2190	0.065	16X31.5	2928	0.048			
	13X30	2310	0.058	13X35*	2976	0.045			
3300	16X25	2340	0.058	16X31.5	3012	0.045			
	13X30*	2592	0.052	16X31.5*	3228	0.036			
3300	16X25	2712	0.050	18X25*	3132	0.036			
	13X35	2850	0.050	18X31.5*	3336	0.032			
3300	16X31.5	2958	0.046						
	16X31.5*	3204	0.038						
3300	16X35.5	3288	0.036						
	18X25*	3156	0.041						

“*” is down size

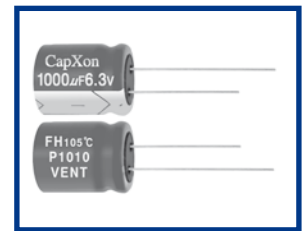
Ripple Current (mA, rms) at 105℃ 100KHz

Max Impedance(Ω)at 20℃ 100KHz

FH 105°C high ripple current at frequency range

Features

- ◆ News innovative electrolyte is employed to minimize ESR
- ◆ Long life 4,000 to 10,000 hours at 105°C
- ◆ Non solvent proof type
- ◆ 6.3 to 100VDC newly type
- ◆ RoHS compliant
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E160



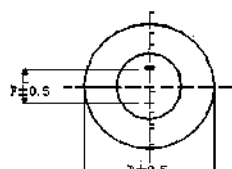
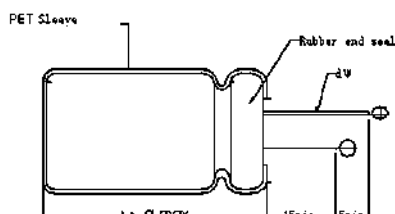
Specifications

Item	Performance Characteristics																																			
Operating Temperature Range	-40 to +105℃																																			
Rated Voltage Range	6.3 to 100VDC																																			
Capacitance Tolerance	± 20%(120Hz,+20℃)																																			
Capacitance Range	22~5600 μ F																																			
Leakage Current (+20℃,max.)	I=0.01 CV or 3 (μA) (After 2 minute) with rated working voltage applied.)																																			
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>D. F.(%) max.</td><td>22</td><td>19</td><td>16</td><td>14</td><td>12</td><td>10</td><td>9</td><td>9</td></tr></table>									Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	D. F.(%) max.	22	19	16	14	12	10	9	9									
	Working Voltage(VDC)	6.3	10	16	25	35	50	63	100																											
	D. F.(%) max.	22	19	16	14	12	10	9	9																											
For capacitance > 1000μF,add 2% per another 1000μF.																																				
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																																			
	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>Z-25℃／Z+20℃</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃／Z+20℃</td><td>8</td><td>6</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td></tr></table>									Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	Z-25℃／Z+20℃	4	3	2	2	2	2	2	2	Z-40℃／Z+20℃	8	6	4	3	3	3	3	3
	Working Voltage(VDC)	6.3	10	16	25	35	50	63	100																											
Z-25℃／Z+20℃	4	3	2	2	2	2	2	2																												
Z-40℃／Z+20℃	8	6	4	3	3	3	3	3																												
Load Life	Test conditions																																			
	Duration time :																																			
	SIZE		φ D≤6.3		φ D = 8,10		φ D≥13																													
	Voltage	6.3~10WV	4000 hours		6000 hours		8000 hours																													
		16~100WV	5000 hours		7000 hours		10000hours																													
Ambient temperature :+105℃																																				
Applied voltage :Rated DC working voltage																																				
After test requirement at +20℃																																				
Capacitance change : within±25% of the initial measured value																																				
Dissipation factor : ≦200% of the initial specified value																																				
Leakage current : ≦The initial specified value																																				
Shelf Life	Test condition																																			
	Duration time :1000Hrs																																			
	Ambient temperature :+105℃																																			
	Applied voltage :None																																			
	After test requirement at +20℃:Same limits as Load life.																																			
Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																																				

Multiplier for Ripple Current vs. Frequency

CAP(µF)/Hz	50(60)	120	400	1K	10K	100K
CAP ≤ 10	0.47	0.59	0.76	0.85	0.97	1.00
10 < CAP ≤ 100	0.52	0.62	0.80	0.89	0.97	1.00
100 < CAP ≤ 1000	0.58	0.72	0.84	0.90	0.98	1.00
1000 < CAP	0.63	0.78	0.87	0.91	0.98	1.00

Diagram of Dimensions:(unit:mm)



φ D	5	6.3	8	10	13	16	18
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
φ d	0.5			0.6		0.8	

α	D < 18	D = 18		D > 18
		L < 35.5	L ≥ 35.5	
	1.5	1.5	2.0	2.0

Case Size

φ D×L(mm)

μ F \ WV	6.3				10			
	Size	Ripple	Impedance		Size	Ripple	Impedance	
			20°C	-10°C			20°C	-10°C
100					5×11	215	0.580	2.300
150	5×11	190	0.550	2.300				
220	6.3×11	290	0.260	0.900	6.3×11	340	0.230	0.870
330	6.3×11	330	0.210	0.870	6.3×11	380	0.220	0.870
470	8×11.5	325	0.140	0.580	8×11.5	600	0.130	0.520
680	8×11.5	520	0.130	0.520	8×16	770	0.096	0.350
					10×12.5	800	0.085	0.310
820	10×12.5	800	0.090	0.320	10×16	920	0.075	0.280
1000	8×16	850	0.080	0.350	8×20	1050	0.072	0.270
					10×16	1110	0.064	0.240
1200	8×20	1000	0.075	0.260	10×20	1380	0.045	0.180
	10×16	1020	0.064	0.240				
1500	10×20	1340	0.050	0.180	10×25	1550	0.043	0.170
2200	10×25	1550	0.046	0.170	10×30	1880	0.030	0.120
					13×20	1800	0.035	0.120
3300	13×20	1720	0.038	0.120	13×25	2120	0.029	0.089
3900	13×25	1840	0.029	0.088	13×30	2400	0.025	0.078
4700	13×30	2400	0.027	0.078				
5600	13×35	2650	0.024	0.065				

Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

φ D×L(mm)

μ F \ WV	16V				25V			
	Size	Ripple	Impedance		Size	Ripple	Impedance	
			20°C	-10°C			20°C	-10°C
47					5×11	160	0.560	2.300
56	5×11	200	0.560	2.300	5×11	240	0.560	2.300
100	6.3×11	280	0.220	0.820	6.3×11	350	0.250	0.870
120	6.3×11	310	0.215	0.870				
220	8×11.5	480	0.180	0.850	8×11.5	590	0.150	0.520
330	8×11.5	600	0.140	0.520	8×16	810	0.092	0.350
					10×12.5	826	0.082	0.320
470	8×16	780	0.095	0.350	8×20	1020	0.074	0.270
	10×12.5	800	0.085	0.320	10×16	1210	0.068	0.240
680	8×20	1000	0.080	0.270	10×20	1400	0.050	0.180
820	10×20	1280	0.052	0.220	10×25	1580	0.041	0.170
1000	10×20	1380	0.046	0.180	10×30	1820	0.032	0.120
	13×16	1420	0.050	0.160	13×20	1800	0.036	0.120
1200	10×25	1560	0.044	0.170				
1500	13×20	1720	0.037	0.120	13×25	2240	0.028	0.089
1800	13×25	2030	0.030	0.095	13×30	2640	0.024	0.078
2200	13×25	2200	0.026	0.089	13×35	2880	0.023	0.065
2700	13×30	2600	0.023	0.077	16×25	2820	0.022	0.060
3300	13×35	2860	0.022	0.066				
4700	18×25	3000	0.020	0.049				

Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

φ D×L(mm)

μ F \ WV	35V				50V			
	Size	Ripple	Impedance		Size	Ripple	Impedance	
			20°C	-10°C			20°C	-10°C
22					5×11	220	0.650	2.800
33	5×11	230	0.550	2.300				
47					6.3×11	260	0.370	1.500
56	6.3×11	360	0.210	0.860	6.3×11	300	0.290	1.200
100					8×11.5	680	0.160	0.670
120					8×16	760	0.120	0.480
150	8×11.5	680	0.140	0.520	10×12.5	800	0.120	0.480
180					8×20	1000	0.090	0.360
220	8×16	1000	0.090	0.350	10×16	1300	0.082	0.340
	10×12.5	1060	0.080	0.320				
270	8×20	1180	0.070	0.260	10×20	1350	0.060	0.240
330	10×16	1380	0.062	0.240	10×25	1600	0.057	0.220
470	10×20	1800	0.048	0.180	10×30	1800	0.048	0.170
560	10×25	1900	0.042	0.160	13×25	1950	0.042	0.110
680	10×30	2000	0.035	0.120				
	13×20	2100	0.034	0.120				
1000	13×25	2400	0.028	0.088				
1200	13×30	2800	0.024	0.078	16×31.5	2870	0.030	0.066
	16×20	2850	0.028	0.078				
1500	13×35	3000	0.022	0.065				
1800	16×25	2800	0.020	0.060				
2700	16×35.5	3500	0.018	0.044				
	18×31.5	3850	0.016	0.040				

Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

φ DxL(mm)

μF \ WV	63V				100V			
	Size	Ripple	Impedance		Size	Ripple	Impedance	
			20°C	-10°C			20°C	-10°C
27					8×11.5	300	0.610	2.80
33	6.3×11	260	1.200	5.00				
47	8×11.5	360	0.660	3.10	10×12.5	400	0.420	1.80
56	8×11.5	380	0.600	2.80				
68					10×16	460	0.300	1.50
82	8×16	460	0.440	2.10	10×20	600	0.210	0.94
	10×12.5	500	0.430	1.80				
100	10×12.5	640	0.340	1.80	10×25	800	0.200	0.84
120	8×20	700	0.320	1.60				
	10×16	760	0.300	1.50	13×20	900	0.160	0.64
180	10×20	880	0.190	0.94				
220	10×25	1100	0.185	0.84				
270	13×20	1200	0.160	0.64	16×25	1480	0.073	0.27
330	13×25	1600	0.120	0.45	13×40	1600	0.071	0.30
390					16×31.5	1700	0.055	0.20
					18×25	1740	0.054	0.21
470	13×30	1800	0.100	0.42	16×35.5	1880	0.047	0.17
					18×31.5	1600	0.047	0.17
560	16×25	2000	0.073	0.27				
680	13×40	2200	0.070	0.30	18×35.5	1720	0.042	0.15
820	16×31.5	2400	0.054	0.20	18×41	2340	0.040	0.13
1000	16×35.5	2500	0.048	0.17				
	18×31.5	2800	0.047	0.17				
1200	16×40	2920	0.040	0.15				
	18×35.5	3000	0.039	0.15				
1500	18×41	3200	0.036	0.13				

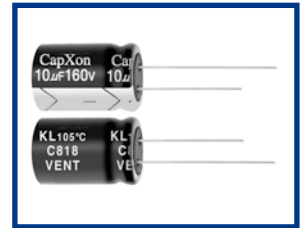
Ripple Current (mA, rms) at 105°C 100KHz

Max Impedance (Ω) at 20°C 100KHz

KL Series Long Life 5,000 hrs

Features

- ◆ Used in electronic ballast, switching power supply, industrial measuring instruments.
- ◆ Load life 5000 Hrs at 105°C
- ◆ Safety vent construction design.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E125
- ◆ RoHS Compliant



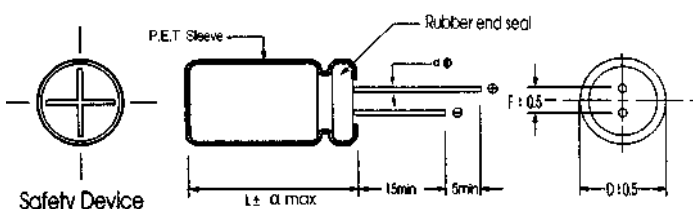
Specifications

Item	Performance Characteristics																												
Operating Temperature Range	-25 to +105℃																												
Rated Voltage Range	160 to 450 VDC																												
Capacitance Range	10 to 220 μF																												
Capacitance Tolerance	±20%(120Hz,+20℃)																												
Leakage Current (+20℃,max.)	I ≤0.04 CV+100 (μA) After 1 minute with rated working voltage applied.																												
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr><tr><td>D. F.(%) max.</td><td>12</td><td>12</td><td>12</td><td>15</td><td>15</td><td>17</td></tr></table>							Working Voltage(VDC)	160	200	250	350	400	450	D. F.(%) max.	12	12	12	15	15	17								
Working Voltage(VDC)	160	200	250	350	400	450																							
D. F.(%) max.	12	12	12	15	15	17																							
Low Temperature Characteristics (at 120Hz)	<table><tr><td colspan="8">Impedance ratio max</td></tr><tr><td>Working Voltage(VDC)</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr><tr><td>Z-25℃／Z+20℃</td><td>3</td><td>3</td><td>3</td><td>6</td><td>6</td><td>6</td></tr></table>							Impedance ratio max								Working Voltage(VDC)	160	200	250	350	400	450	Z-25℃／Z+20℃	3	3	3	6	6	6
Impedance ratio max																													
Working Voltage(VDC)	160	200	250	350	400	450																							
Z-25℃／Z+20℃	3	3	3	6	6	6																							
Load Life	Test conditions Duration time : 5000Hrs Ambient temperature : +105℃ Applied voltage : Rated DC working voltage After test requirement at +20℃ Capacitance change : ≤ ±20% of the initial measured value Dissipation factor : ± 200% of the initial specified value Leakage current : ± The initial specified value																												
Shelf Life	Test conditions Duration time : 1000Hrs Ambient temperature : +105℃ Applied voltage : None After test requirement at +20℃: Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																												

Multiplier for Ripple Current vs. Frequency

Frequency(Hz)	120	1K	10K	100KHz
Multiplier	1.0	1.5	1.70	1.90

Diagram of Dimensions:(unit:mm)



D φ	10	13	16	18	22
F	5.0	5.0	7.5	7.5	10
d φ	0.6		0.8		

α	D < 18	D = 18		D > 18
		L < 35.5	L ≥ 35.5	
	1.5	1.5	2.0	2.0

Case Size

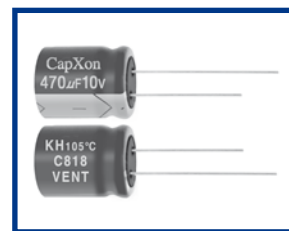
WV Cap(μF)		160		200		250		350		400		450	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
10		10x16	115	10x20	210	10x20	200	13x20	180	13x20	200	13x25	130
22		10x20	195	10x20	255	13x20	350	13x20	250	13x25	320	16x25	170
33		13x20	250	13x20	350	13x25	400	16x21	320	16x25	350	16x31.5	215
47		13x20	300	13x20	490	13x25	500	16x31.5	440	16x31.5	450		
68		13x25	390	13x25	530	16x25	600	16x35.5	450				
100		16x25	560	16x25	810	18x31.5	660						
220		16x31.5	730	18x31.5	970	22x41	750						

Ripple Current (mA, rms) at 105°C 120Hz

KH Series Long Life 5,000~10,000 hrs

Features

- ◆ Used in electronic ballast, switching power supply, industrial measuring instruments.
- ◆ higher ripple current
- ◆ Load life 5000~10000 Hrs at 105°C
- ◆ Safety vent construction design.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E142
- ◆ RoHS Compliant



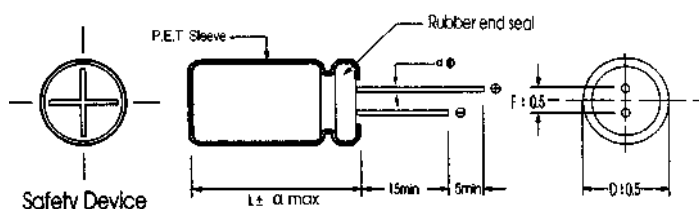
Specifications

Item	Performance Characteristics											
Operating Temperature Range	-40 to +105℃						-25 to +105℃					
Rated Voltage Range	10 to 50 VDC						160 to 450 VDC					
Capacitance Range	6.8 to 3300 μ F						6.8 to 220 μ F					
Capacitance Tolerance	± 20%(120Hz,+20℃)											
Leakage Current (+20℃,max.)	I ≤0.01 CV or 3 (μ A)						I ≤0.04 CV+100 (μ A)					
	After 1 minute with rated working voltage applied.											
	I=Leakage Current(μ A) C=Rated capacitance(μ F) V=Rated Voltage(V)											
Dissipation Factor (tan δ , at 20℃ , 120Hz)	Working oltage(VDC)											
	10	16	25	35	50	160	200	250	350	400	450	
	D.F.(%)max.											
	19	16	14	12	10	15	15	15	20	20	20	
Low Temperature Characteristics (at 120Hz)	Impedance ratio max											
	Working oltage(VDC)											
	10	16	25	35	50	160	200	250	350	400	450	
	Z-25℃ / Z+20℃											
	4	3	2	2	2	3	3	3	6	6	6	
Load Life	Test conditions											
	Duration time : as right										D φ	Life hours
	Ambient temperature : +105℃										< 8 φ	5,000
	Applied voltage : Rated DC working voltage										8 φ	8,000
	After test requirement at +20℃										≥ 10 φ	10,000
	Capacitance change : ≤ ±20% of the initial measured value											
	Dissipation factor : ≤ 200% of the initial specified value											
	Leakage current : ≤ The initial specified value											
Shelf Life	Test conditions											
	Duration time : 1000Hrs											
	Ambient temperature :+105℃											
	Applied voltage : None											
	After test requirement at +20℃: Same limits as Load life.											
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.											

Multiplier for Ripple Current vs. Frequency

Frequency(Hz)	120	1K	10K	≥100K
Multiplier	0.50	0.80	0.85	1.0

Diagram of Dimensions:(unit:mm)



D φ	5	6.3	8	10	13	16	18
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
d φ	0.5			0.6		0.8	

α	D < 18	D = 18		D > 18
	1.5	L < 35.5	L ≥ 35.5	2.0
	1.5	1.5	2.0	2.0

Case Size

φ DxL(mm)

WV Cap(μF)	10		16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
6.8									5x11	75
10							5x11	65	5x11	97
22					5x11	100	5x11	125	6.3x11	130
33			5x11	115	5x11	130	6.3x11	178	8x11.5	241
47	5x11	100	5x11	145	6.3x11	160	8x11.5	240	8x11.5	287
									10x12.5	300
68	5x11	130	6.3x11	200	8x11.5	230	8x11.5	270	10x12.5	356
100	6.3x11	190	8x11.5	245	8x11.5	327	10x12.5	390	10x16	500
150	6.3x11	220	8x11.5	300	10x12.5	460	10x16	632	10x20	747
220	6.3x11	270	8x11.5	420	10x16	580	10x20	760	13x20	977
			10x12.5	495						
330	8x11.5	390	8x16	500	10x20	805	13x20	1035	13x25	1150
470	10x12.5	540	10x16	730	10x20	950	13x25	1100	16x25	1552
1000	10x16	900	13x20	1173	13x25	1552	16x31.5	1932	18x31.5	2093
2200	13x20	1540	16x25	2093	16x31.5	2400				
3300	16x25	1900								

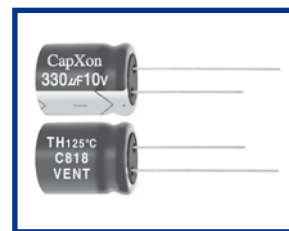
WV Cap(μF)	160		200		250		350		400		450	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
6.8							10x20	270	10x20	270	13x20	240
10	10x16	280	10x20	310	10x20	320	13x20	350	13x20	350	13x25	430
22	10x20	450	10x20	470	13x20	490	13x25	600	16x25	690	16x25	710
33	13x20	610	13x20	620	13x25	750	16x21	820	18x21	870	18x25	950
47	13x20	680	13x20	910	16x21	930	18x21	1020	18x25	1130	18x31.5	1120
68	13x25	1100	16x25	1190	18x21	1300	18x25	1400	18x31.5	1460		
100	18x21	1310	18x21	1380	18x25	1500						
150	18x25	1780	18x25	1800	18x31.5	1870						
220	18x25	2290	18x31.5	2350								

Ripple Current (mA, rms) at 105°C 100KHz

TH Series High Temperature

Features

- ◆ The series has guaranteed operating life of 1000~2000 hours at 125°C widest operating temperature range, -40 to +125°C
- ◆ Applications : High reliability equipment, filtering circuit of switching power supply, and industrial control equipment.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E129
- ◆ RoHS Compliant



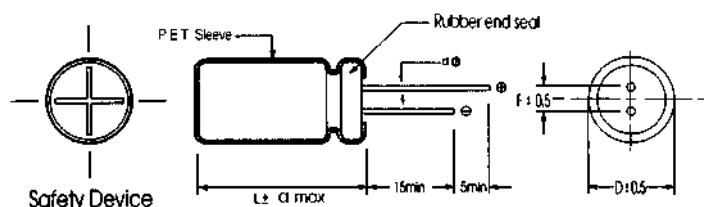
Specifications

Item	Performance Characteristics														
Operating Temperature Range	-40 to +125℃					-25 to +125℃									
Rated Voltage Range	10 to 100 VDC					160 to 350 VDC									
Capacitance Range	0.47 to 1000 μF					1 to 100 μF									
Capacitance Tolerance	± 20%(120Hz,+20℃)														
Leakage Current (+20℃,max.)	I≤0.01 CV or 3(μA) After 1 minute whichever is greater measured with rated working voltage applied.					I≤0.02 CV (μA) After 1 minute withrated working voltage applied.									
Dissipation Factor (tan δ , at 20℃ , 120Hz)															
	Working Voltage(VDC)		10	16	25	35	50	63	100						
	D. F.(%) max.		18	15	13	12	10	8	7						
	Working Voltage(VDC)		160	200	250	350									
	D. F.(%) max.		7	8	10	12									
	For capacitance > 1000 uF, add 2% per another 1000uF.														
Low Temperature Characteristics (at 120Hz)	Impedance ratio max														
	Working Voltage(VDC)		10	16	25	35	50	63	100	160~250	350~450				
	Z-25℃ / Z+20℃		3	2	2	2	2	2	2	3	6				
	Z-40℃ / Z+20℃		4	4	4	4	4	4	4		-				
Load Life	Test conditions Duration time : 1000~2000Hrs Ambient temperature : +125℃ Applied voltage : Rated DC working voltage After test requirement at +20℃ Capacitance change : ≤ ±20% of the initial measured value Dissipation factor : ≤ 300% of the initial specified value Leakage current : ≤ The initial specified value														
	<table><tr><td>D φ</td><td>Life hours</td></tr><tr><td>≤8 φ</td><td>1,000</td></tr><tr><td>≥10 φ</td><td>2,000</td></tr></table>										D φ	Life hours	≤8 φ	1,000	≥10 φ
D φ	Life hours														
≤8 φ	1,000														
≥10 φ	2,000														
Shelf Life	Test conditions Duration time : 1000Hrs Ambient temperature : +125℃ Applied voltage : None After test requirement at +20℃: Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.														

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.8	1	1.30	1.45	1.65	1.70
10 < CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.16	1.25	1.35	1.38
1000 < CAP	0.8	1	1.11	1.17	1.25	1.28

Diagram of Dimensions:(unit:mm)



D φ	5	6.3	8	10	13	16	18
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
d φ	0.5			0.6		0.8	

α	D < 18	D = 18		D > 18
		L < 35.5	L ≥ 35.5	
	1.5	1.5	2.0	2.0

Case Size

φ DxL(mm)

WV Cap(μF)	10		16		25		35		50		63	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
4.7											6.3X11	38
10									6.3X11	48	8X11.5	55
22					6.3X11	70	6.3X11	82	6.3X11	75	8X11.5	93
33			6.3X11	91	6.3X11	100	8X11.5	108	8X11.5	122	8X11.5	110
47	5X11	92	6.3X11	110	6.3X11	110	8X11.5	130	8X11.5	140	10X12.5	150
100	6.3X11	145	6.3X11	175	8X11.5	210	10X12.5	230	10X16	250	10X16	260
220	8X11.5	330	8X11.5	206	10X12.5	250	10X16	262	10X20	277	10X20	295
330	8X11.5	340	10X12.5	340	10X16	420	10X16	480	10X25	560	13X20	540
470	10X12.5	410	10X16	400	10X20	470	10X20	540	13X20	587	13X25	595
1000	10X16	525	10X20	570	13X20	631	13X20	718	13X25	810	13X25	880
	10X20	505	10X25	650	13X25	770	13X25	810	13X25	900	16X25	1000
	10X16	525	10X20	720	13X20	810	13X25	900	16X25	1000		
	10X16	870	10X25	950	13X25	970	16X25	1080				
	10X20	960	13X20	1000	16X25	1100	16X31.5	1200				

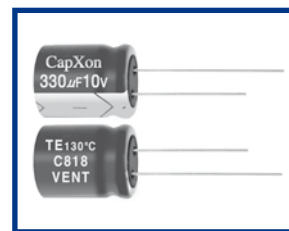
WV Cap(μF)	100		160		200		250		350	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.47	6.3X11	14								
1	6.3X11	24	6.3X11	30	6.3X11	36	6.3X11	41	8X11.5	45
2.2	6.3X11	31	6.3X11	37	6.3X11	43	6.3X11	42	8X11.5	47
3.3							8X11.5	50	10X12.5	55
4.7	6.3X11	36	6.3X11	37	8X11.5	48	8X11.5	50	10X12.5	55
10			8X11.5	41			10X12.5	53	10X16	60
22	6.3X11	38	8X11.5	52	8X11.5	50	10X12.5	60	10X16	68
33	8X11.5	45			10X12.5	60	10X16	68	10X20	75
47	8X11.5	60	8X11.5	70	10X12.5	80	10X16	83	10X25	105
100	10X12.5	70	10X12.5	82	10X16	88	10X20	92	13X20	110
220	10X2.5	90	10X16	115	10X25	125	13X20	145	13X25	160
330	10X16	100	10X20	128	13X20	135	13.25	160	16X25	180
470	10X16	140	10X25	155	13X20	155	13X25	164	16X25	180
1000	10X20	158	13X20	164	13X25	172	16X25	185	16X31.5	200
	10X25	175	13X20	180	13X25	190	16X25	205	16X31.5	230
	13X20	185	13X25	200	16X25	215	16X31.5	230	16X35.5	245
	13X25	270	13X25	320	16X25	360				
	16X25	310	16X25	365	16X31.5	400				

Ripple Current (mA, rms) at 125°C 120Hz

TE Series High Temperature

Features

- ◆ The series has guaranteed operation life of 2000~3000 hours at 130°C wide operating temperature range, -40 to +130°C
- ◆ Applications :High reliability equipment, filtering circuit of switching power supply, and industrial control equipment.
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E147
- ◆ RoHS Compliant



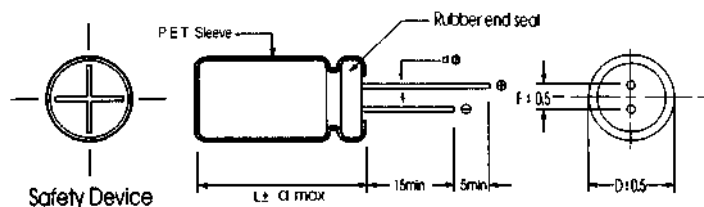
Specifications

Item	Performance Characteristics																							
Operating Temperature Range	-40 to +130℃																							
Rated Voltage Range	10 to 50 VDC																							
Capacitance Range	3.3to 4700 μ F																							
Capacitance Tolerance	± 20%(120Hz,+20℃)																							
Leakage Current (+20℃,max.)	I ≤0.01 CV or 3 (μ A) After 1 minute whichever is greater measured with rated working voltage applied.																							
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>D. F.(%) max.</td><td>20</td><td>16</td><td>14</td><td>12</td><td>10</td></tr></table>						Working Voltage(VDC)	10	16	25	35	50	D. F.(%) max.	20	16	14	12	10						
	Working Voltage(VDC)	10	16	25	35	50																		
	D. F.(%) max.	20	16	14	12	10																		
For capacitance > 1000uF, add 2% per another 1000uF.																								
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																							
	<table><tr><td>Working Voltage(VDC)</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z-25℃ / Z+20℃</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃ / Z+20℃</td><td>4</td><td>4</td><td>4</td><td>4</td><td>4</td></tr></table>						Working Voltage(VDC)	10	16	25	35	50	Z-25℃ / Z+20℃	3	2	2	2	2	Z-40℃ / Z+20℃	4	4	4	4	4
	Working Voltage(VDC)	10	16	25	35	50																		
Z-25℃ / Z+20℃	3	2	2	2	2																			
Z-40℃ / Z+20℃	4	4	4	4	4																			
Load Life	Test conditions																							
	Duration time : as right																							
	Ambient temperature : +130℃																							
	Applied voltage : Rated DC working voltage																							
	After test requirement at +20℃																							
	Capacitance change : ≤ ±30% of the initial measured value																							
	Dissipation factor : ≤ 300% of the initial specified value																							
	Leakage current : ≤ The initial specified value																							
Shelf Life	Test conditions																							
	Duration time : 1000Hrs																							
	Ambient temperature : +130℃																							
	Applied voltage : None																							
	After test requirement at +20℃:Same limits as Load life.																							
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																							

Multiplier for Ripple Current vs. Frequency

CAP(µ F) \ Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.8	1	1.30	1.45	1.65	1.70
10 < CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.16	1.25	1.35	1.38
1000 < CAP	0.8	1	1.11	1.17	1.25	1.28

Diagram of Dimensions:(unit:mm)



D φ	6.3	8	10	13	16	18
F	2.5	3.5	5.0	5.0	7.5	7.5
d φ	0.5		0.6		0.8	

α	D < 18	D = 18		D > 18
		L < 35.5	L ≥ 35.5	
	1.5	1.5	2.0	2.0

Case Size

φ DxL(mm)

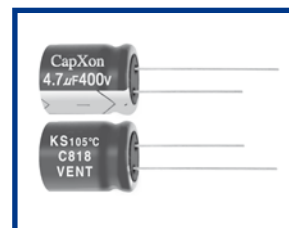
WV Cap(μF)	10		16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
3.3										
4.7										
10									6.3x11	150
22									6.3x11	220
33									8x11.5	270
47									10x12.5	300
100							10x16	420	10x16	480
220	8x11.5	250	10x12.5	260	10x16	330	10x20	520	13x20	700
330	8x11.5	330	10x16	360	10x20	540	13x20	700	13x25	820
	10x12.5	350								
470	10x12.5	500	10x20	600	13x20	720	13x25	880	16x25	1000
	10x16	540								
1000	10x20	880	13x20	930	16x25	950	16x31.5	1150	16x31.5	1850
1500	13x20	1120	13x25	1250	16x31.5	1550	16x35.5	1850		
2200	13x25	1350	16x25	1400	16x35.5	2010	18x35.5	2300		
3300	16x25	1820	16x31.5	2150	18x35.5	2300				
4700	16x31.5	2210	16x35.5	2350						

Ripple Current (mA, rms) at 130°C 120Hz

KS Series 105°C Overvoltage Vent Operation Facility

Features

- ◆ High ripple current capability.
- ◆ This series has specification of vent operation in overvoltage situation.
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E158
- ◆ RoHS Compliant



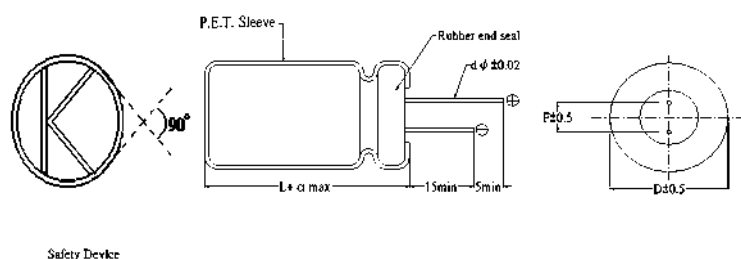
Specifications

Item	Performance Characteristics		
Operating Temperature Range	-25~+105°C		
Rated Voltage Range	200V 、 400V		
Capacitance Tolerance	±20%(120Hz,+20°C)		
Leakage Current (+20°C,max.)	I ≤ 0.03 CV (μ A) After 1 minute with rated working voltage applied.		
Dissipation Factor (tan δ , at 20°C , 120Hz)	Working Voltage(VDC)	200	400
	D.F.(%)max.	15	15
Load Life	Test condition Duration time :2000 Hrs Ambient temperature:+105°C Applied voltage :Rated DC working voltage After test requirement at +20°C Capacitance change : ≤ ±20% of the initial measured value Dissipation factor: ≤200% of the initial specified value Leakage current : ≤The initial specified value		
Shelf Life	Test condition Duration time :1000 Hrs Ambient temperature :+105°C Applied voltage :None After test requirement at +20°C:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.		

Multiplier for Ripple Current vs. Frequency

VDC	Capacitance(μ F)	Frequency(Hz)				
		60(50)	120	400	1K	≥10K
200	22~470	0.85	1.00	1.10	1.25	1.50
400	4.7~68	0.85	1.00	1.05	1.20	1.40
	82~150	0.85	1.00	1.03	1.15	1.35

Diagram of Dimensions:(unit:mm)



D φ	10	13	16	18
F	5.0	5.0	7.5	7.5
d φ	0.6		0.8	
α	1.5	D < 18	D = 18	
		L < 35.5	L ≥ 35.5	
		1.5	2.0	

Case Size

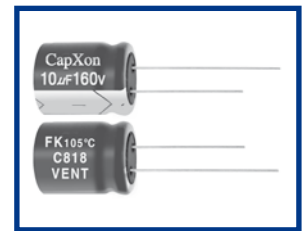
						ϕ DxL(mm)		
WV Cap(μ F)	200		WV Cap(μ F)	400		Size	Ripple	
	Size	Ripple		Size	Ripple			
22	10X20	120	4.7	10X12.5	60			
33	10X25	160	10	10X16	100			
	13X20	160		10X20	125			
47	10X30	195	22	13X20	135			
	13X20	195		13X25	150			
56	13X25	210		16X21	150			
68	13X25	270	33	13X25	180			
	16X21	270		16X21	210			
82	13X30	310	47	16X31.5	300			
	16X21	320		16X35.5	320			
	16X25	360		18X25	300			
100	16X25	400		18X31.5	320			
	18X21	400	56	16X31.5	360			
120	16X25	460		18X25	350			
	16X31.5	500		18X31.5	370			
	18X25	500	68	16X31.5	365			
150	16X31.5	560		16X35.5	380			
	16X35.5	590		18X31.5	375			
	18X25	560	82	16X35.5	410			
180	16X35.5	600		18X31.5	410			
	18X31.5	650		18X35.5	450			
220	18X31.5	700	100	16X35.5	470			
	18X35.5	740		18X31.5	470			
330	18X35.5	780		18X35.5	490			
	18X41	840	120	18X31.5	520			
390	18X41	860		18X35.5	540			
	18X45	920		18X41	560			
470	18X45	1120	150	18X35.5	770			
				18X41	790			

Ripple Current (mA, rms) at 105°C 120Hz

FK Series Long Life for ballast 105°C

Features

- ◆ Specially designed for electronic ballast and energy-save lamp
- ◆ Load life 6000~8000 hrs at 105°C
- ◆ Safety vent construction design.
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E167
- ◆ RoHS Compliant



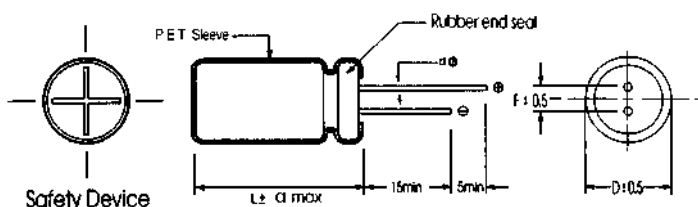
Specifications

Item	Performance Characteristics																				
Operating Temperature Range	-25~+105℃																				
Rated Voltage Range	160~450 VDC																				
Capacitance Range	1 to 330 μF																				
Capacitance Tolerance	±20%(120Hz,+20℃)																				
Leakage Current (+20℃,max.)	I≤0.04 CV +100 (μA)After 1 minute with rated working voltage applied.																				
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr><tr><td>D.F.(%)max.</td><td>10</td><td>10</td><td>10</td><td>12</td><td>12</td><td>12</td></tr></table>							Working Voltage(VDC)	160	200	250	350	400	450	D.F.(%)max.	10	10	10	12	12	12
	Working Voltage(VDC)	160	200	250	350	400	450														
D.F.(%)max.	10	10	10	12	12	12															
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																				
	<table><tr><td>Working voltage(VDC)</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr><tr><td>Z-25℃ / Z+20℃</td><td>3</td><td>3</td><td>3</td><td>6</td><td>6</td><td>6</td></tr></table>							Working voltage(VDC)	160	200	250	350	400	450	Z-25℃ / Z+20℃	3	3	3	6	6	6
Working voltage(VDC)	160	200	250	350	400	450															
Z-25℃ / Z+20℃	3	3	3	6	6	6															
Load Life	Test condition Duration time :As right Ambient temperature :+105℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change : with±20% of the initial measured value Dissipation factor : ≤200% of the initial specified value Leakage current : ≤The initial specified value						<table><tr><td>D φ</td><td>Life (hours)</td></tr><tr><td>8 φ</td><td>6000</td></tr><tr><td>≥ 10 φ</td><td>8000</td></tr></table>	D φ	Life (hours)	8 φ	6000	≥ 10 φ	8000								
	D φ	Life (hours)																			
8 φ	6000																				
≥ 10 φ	8000																				
Shelf Life	Test condition Duration time :1000Hrs Ambient temperature :+105℃ Applied voltage :None																				
	After test requirement at +20℃:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																				

Multiplier for Ripple Current vs. Frequency

Frequency (Hz)	120	1K	10K	10K ≤
Multiplier	1.0	1.5	1.70	1.90

Diagram of Dimensions:(unit:mm)



D φ	8	10	13	16	18
F	3.5	5.0	5.0	7.5	7.5
d φ	L < 20 0.5	L ≥ 20 0.6	0.6	0.8	
α	D < 18 1.5	D = 18 L < 35.5 1.5	L ≥ 35.5 2.0	D > 18 2.0	

Case Size

φ DxL(mm)

WV Cap(μF)	160		200		250		350		400		450	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
1.0							8X11.5	75	8X11.5	65	8X11.5	85
2.2					8X11.5	70	8X11.5	80	8X11.5	85	10X12.5	90
3.3					8X11.5	75	10X12.5	85	10X12.5	95	10X16	105
4.7			8X11.5	80	10X12.5	100	10X12.5	100	10X16	110	10X16	115
6.8			8X11.5	100	10X12.5	105	10X16	110	10X16	115	10X20	125
10	10X12.5	105	10X12.5	115	10X16	130	10X20	140	10X20	160	13X20	175
22	10X16	170	10X16	170	10X20	190	13X20	245	13X20	230	16X21	275
33	10X20	235	10X20	245	13X20	305	13X25	340	13X25	310	16X25	370
47	13X20	285	13X20	370	13X25	370	16X25	410	16X31.5	445	18X25	455
68	13X20	445	13X 25	425	16X25	495	18X25	530	18X31.5	550	18X31.5	600
100	16X21	550	16X25	600	16X31.5	645	18X35.5	665	18X41	750		
150	16X25	655	16X31.5	825	18X31.5	775						
220	18X31.5	875	18X31.5	1000								
330	18X35.5	1190										

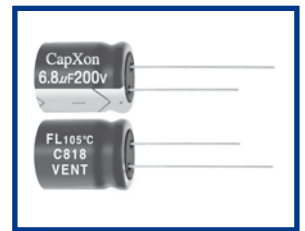
Ripple Current (mA, rms) at 105°C 120Hz

FL Series Long Life for ballast 105°C

Features

- ◆ Specially designed for electronic ballast and energy-save lamp
- ◆ Load life 8000~10000 hrs at 105°C
- ◆ Safety vent construction design.
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E149
- ◆ RoHS Compliant

FK long life → FL



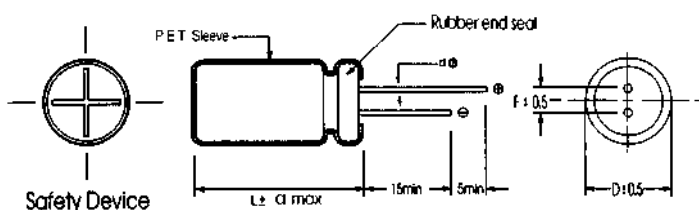
Specifications

Item	Performance Characteristics						
Operating Temperature Range	-25~+105℃						
Rated Voltage Range	160~450 VDC						
Capacitance Range	0.1 to 330 μ F						
Capacitance Tolerance	± 20%(120Hz, +20℃)						
Leakage Current (+20℃,max.)	I=0.04 CV +100 (μ A) (After 1 minute with rated working voltage applied.)						
Dissipation Factor (tan δ , at 20℃ , 120Hz)							
	Working Voltage(VDC)	160	200	250	350	400	450
	D.F.(%)max.	10	10	10	12	12	12
(+20℃ , at 120Hz)							
Low Temperature Characteristics (at 120Hz)	Impedance ratio max						
	Working voltage(VDC)	160	200	250	350	400	450
	Z-25℃ / Z+20℃	3	3	3	6	6	6
Load Life	Test condition						
	Duration time :As right						
	Ambient temperature :+105℃						
	Applied voltage :Rated DC working voltage						
After test requirement at +20℃							
Capacitance change : ≤ ±20% of the initial measured value							
Dissipation factor : ≤200% of the initial specified value							
Leakage current : ≤The initial specified value							
						φ D	Life (hours)
						8 φ	8000
						≥ 10 φ	10000
Shelf Life	Test condition						
	Duration time :1000 Hrs						
	Ambient temperature :+105℃						
	Applied voltage :None						
After test requirement at +20℃:Same limits as Load life.							
Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.							

Multiplier for Ripple Current vs. Frequency

Frequency(Hz)	120	1K	10K	10K≤
Multiplier	1.0	1.5	1.70	1.90

Diagram of Dimensions:(unit:mm)



D φ	8	10	13	16	18
F	3.5	5.0	5.0	7.5	7.5
d φ	L < 20 0.5	L ≥ 20 0.6	0.6	0.8	
α	D < 18 1.5	D = 18 L < 35.5 1.5	L ≥ 35.5 2.0	D > 18 2.0	

Case Size

φ DxL(mm)

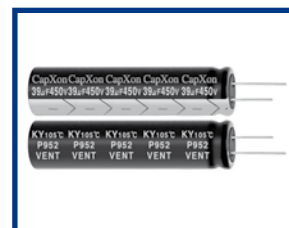
WV Cap(μF)	160		200		250 (300)		350 (400)		400		450	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
1.0							8X11.5	80	10X12.5	85	10X12.5	90
2.2							10X12.5	85	10X12.5	90	10X12.5	95
3.3					8X11.5	80	10X12.5	90	10X16	100	10X16	110
4.7					10X12.5	105	10X16	105	10X20	115	10X20	125
6.8			10X12.5	105	10X12.5	110	10X16	115	10X20	125	10X20	135
10	10X16	125	10X16	125	10X16	140	10X20	150	13X20	170	13X20	185
22	10X20	200	10X20	200	13X20	200	13X20	260	13X25	270	16X21	290
33	10X20	250	13X20	260	13X20	320	13X25	360	16X25	370	16X25	390
47	13X20	300	13X20	390	13X25	390	16X25	430	16X31.5	470	18X31.5	480
68	13X20	470	16X21	470	16X25	520	18X25	560	18X31.5	580	18X41	630
100	16X21	580	16X25	630	16X31.5	680	18X35.5	700	18X41	790	18X45	850
150	16X25	690	18X25	840	18X35.5	860	18X45	960				
220	18X31.5	980	18X35.5	1050	18X45	1130						
330	18X41	1250										

Ripple Current (mA, rms) at 105°C 120Hz

KY Series

Features

- ◆ Load Life: 105°C 2000hours.
- ◆ Suitable for slim application
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E171



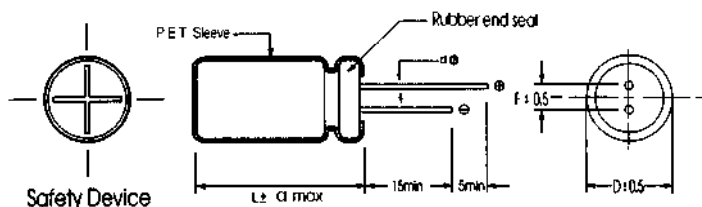
Specifications

Item	Performance Characteristics																	
Operating Temperature Range	-25~+105℃																	
Rated Voltage Range	250~450 VDC																	
Capacitance Tolerance	± 20%(120Hz,+20℃)																	
Leakage Current (+20℃,max.)	I ≤ 3 √CV (μA) (After 5 minute with rated working voltage applied.) I= Leakage Current(μA) C= Rated Capacitance V= Rated voltage(V)																	
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>250</td><td>350</td><td>400</td><td>420</td><td>450</td></tr><tr><td>D.F.(%)max.</td><td>15</td><td>15</td><td>15</td><td>20</td><td>20</td></tr></table>						Working Voltage(VDC)	250	350	400	420	450	D.F.(%)max.	15	15	15	20	20
	Working Voltage(VDC)	250	350	400	420	450												
D.F.(%)max.	15	15	15	20	20													
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																	
	<table><tr><td>Working voltage(VDC)</td><td>250</td><td colspan="4">350~450</td></tr><tr><td>Z-25℃ / Z+20℃</td><td>3</td><td colspan="4">8</td></tr></table>						Working voltage(VDC)	250	350~450				Z-25℃ / Z+20℃	3	8			
Working voltage(VDC)	250	350~450																
Z-25℃ / Z+20℃	3	8																
Load Life	Test condition																	
	Duration time : 2000hrs Ambient temperature : +105℃ Applied voltage : Rated DC working voltage																	
	After test requirement at +20℃																	
	Capacitance change : ≤ ±20% of the initial measured value Dissipation factor : ≤200% of the initial specified value Leakage current : ≤ The initial specified value																	

Multiplier for Ripple Current vs. Frequency

Frequency(Hz)		60	120	400	1K	100K
Coefficient	250~350WV	0.8	1.00	1.20	1.30	1.40
	400~450WV	0.8	1.00	1.25	1.40	1.50

Diagram of Dimensions:(unit:mm)



D φ	8	10~13	
F	3.5	5.0	5.0
d φ	0.6	0.6	0.6
α	1.5	2.0	

Case Size

φ DxL(mm)

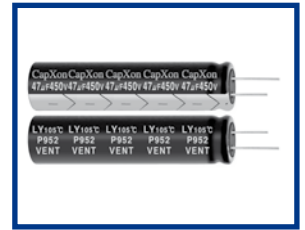
WV Cap(μF)	250		350		400		420		450	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
10										
12									8x30	135
15			8x30	145	8x30	170	8x30	150	8x35	150
22	8x30	200	8x35	185	8x35	220	8x35	195	8x40	195
									10x30	195
27	8x30	220	8x40	220	8x40	255	8x40	230	8x45	230
					10x30	255			10x30	220
33	8x30	240	8x40	250	8x45	280	8x50	300	10x35	255
					10x30	280	10x35	290	10x40	280
39	8x35	270	10x35	300	8x50	330	10x40	315	10x40	300
					10x35	330	13x30	315	10x45	315
									10x50	330
47	8x40	330	10x40	380	10x40	430	10x40	360	10x50	390
					13x30	430	13x30	360		
56	10x35	380	10x45	430	10x50	480	10x50	440	13x35	420
					13x30	450	13x30	400	13x40	450
68	10x35	435	13x35	480	10x55	550	13x35	470	13x40	520
					13x35	520			13x45	550
					13x40	550				
82	10x40	500	13x40	550	13x40	580	13x40	550	13x45	570
100	10x45	585	13x45	600	13x45	620	13x50	620		
					13x50	650				
120	13x35	620			13x55	750				
150	13x40	670								

Ripple Current (mA r.m.s) at 105°C,120Hz

LY Series

Features

- ◆ Load Life: 105°C 5000hours.
- ◆ Suitable for slim application
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E174



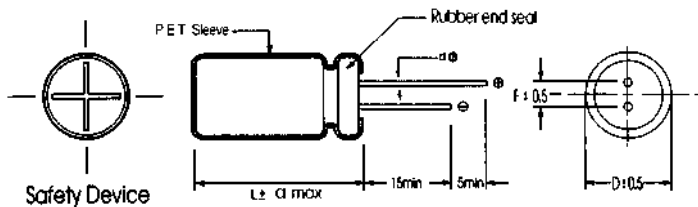
Specifications

Item	Performance Characteristics																	
Operating Temperature Range	-25~+105℃																	
Rated Voltage Range	250~450 VDC																	
Capacitance Tolerance	±20%(120Hz,+20℃)																	
Leakage Current (+20℃,max.)	I≤3 √CV (μA) (After 5 minute with rated working voltage applied.) I= Leakage Current(μA) C= Rated Capacitance V= Rated voltage(V)																	
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>250</td><td>350</td><td>400</td><td>420</td><td>450</td></tr><tr><td>D.F.(%)max.</td><td>15</td><td>15</td><td>15</td><td>20</td><td>20</td></tr></table>						Working Voltage(VDC)	250	350	400	420	450	D.F.(%)max.	15	15	15	20	20
	Working Voltage(VDC)	250	350	400	420	450												
D.F.(%)max.	15	15	15	20	20													
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																	
	<table><tr><td>Working voltage(VDC)</td><td>250</td><td colspan="4">350~450</td></tr><tr><td>Z-25℃ / Z+20℃</td><td>3</td><td colspan="4">8</td></tr></table>						Working voltage(VDC)	250	350~450				Z-25℃ / Z+20℃	3	8			
	Working voltage(VDC)	250	350~450															
Z-25℃ / Z+20℃	3	8																
Load Life	Test condition Duration time : 5000hrs Ambient temperature : +105℃ Applied voltage : Rated DC working voltage																	
	After test requirement at +20℃ Capacitance change : ≤±20% of the initial measured value Dissipation factor : ≤200% of the initial specified value Leakage current : ≤The initial specified value																	

Multiplier for Ripple Current vs. Frequency

Frequency(Hz)		60	120	400	1K	100K
Coefficient	250~350WV	0.8	1.00	1.20	1.30	1.40
	400~450WV	0.8	1.00	1.25	1.40	1.50

Diagram of Dimensions:(unit:mm)



D φ	8	10~13	
F	3.5	5.0	5.0
d φ	0.6	0.6	0.6
α	1.5	2.0	

Case Size

φ DxL(mm)

WV Cap(μF)	250		350		400		420		450	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
10										
12									8x30	110
15			8x30	110	8x30	120	8x30	100	8x35	120
22	8x30	130	8x35	150	8x35	160	8x40	180	8x45	160
									10x30	150
27	8x30	150	8x40	165	8x40	195	8x45	200	8x50	190
					10x30	195			10x35	180
33	8x35	170	8x45	195	8x45	250	10x35	230	10x40	220
					10x30	250			10x45	235
									10x50	250
39	8x40	200	10x40	280	8x50	280	10x45	275	10x45	260
					10x40	300	13x30	275	10x50	290
									13x35	290
47	8x45	220	10x45	330	10x45	350	10x45	330	10x55	350
					13x30	330	13x35	360	13x35	350
56	10x35	260	10x50	380	10x50	400	10x55	420	13x35	400
	10x40	300			13x30	380	13x35	410	13x40	425
					13x35	420				
68	10x40	350	13x35	425	13x35	440	13x40	450	13x45	470
			13x40	450	13x40	460			13x50	500
82	10x45	480	13x40	500	13x45	520	13x45	500	13x50	530
100	10x50	550	13x50	520	13x50	580	13x50	600		
120	13x40	570			13x60	680				
150	13x45	620								

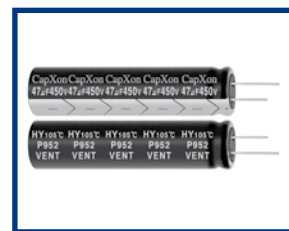
Ripple Current (mA r.m.s) at 105°C, 120Hz

HY Series

Features

- ◆ Load Life: 105°C 10000hours.
- ◆ Suitable for slim application
- ◆ High ripple current
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E176

LY Long life, high ripple current HY



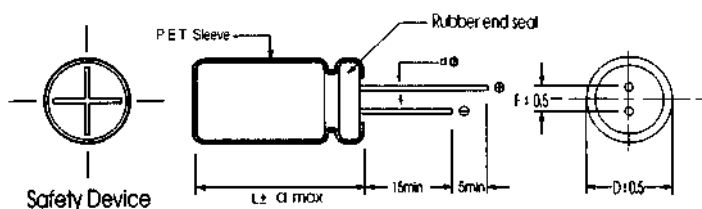
Specifications

Item	Performance Characteristics		
Operating Temperature Range	-25 to +105°C		
Rated Voltage Range	250~450VDC		
Capacitance Range	12 ~120 µF		
Capacitance Tolerance	±20%(120Hz, +20°C)		
Leakage Current (+20°C, max.)	$I \leq 3 \sqrt{CV} (\mu A)$ (After 5 minute with rated working voltage applied.) I= Leakage Current(µA) C= Rated Capacitance V= Rated voltage(V)		
Dissipation Factor (tan δ , at 20°C , 120Hz)	Working Voltage(VDC)	250~400	420~450
	D.F.(%)max.	20	25
Low Temperature Characteristics (at 120Hz)	Impedance ratio max		
	Working voltage(VDC)	250	350~450
	Z-25°C / Z+20°C	3	8
Load Life	Test condition Duration time : 10000hrs Ambient temperature : +105°C Applied voltage : Rated DC working voltage After test requirement at +20°C Capacitance change : ≤ ±20% of the initial measured value Dissipation factor : ≤ 200% of the initial specified value Leakage current : ≤ The initial specified value		

Multiplier for Ripple Current vs. Frequency

Frequency(Hz)		60	120	400	1K	100K
Coefficient	250~350WV	0.8	1.00	1.20	1.30	1.40
	400~450WV	0.8	1.00	1.25	1.40	1.50

Diagram of Dimensions:(unit:mm)



D φ	8	10	10<D<16
F	3.5	5.0	5.0
d φ	0.6	0.6	0.8
α	1.5	2.0	

Case Size

φ DxL(mm)

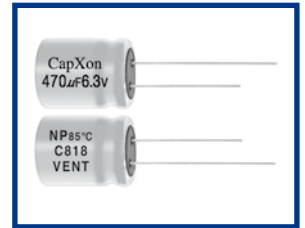
WV Cap(μF)	250		350		400		420		450	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
12			8x30	100	8x30	130	8x30	140	8x30	150
15			8x35	130	8x35	180	8x35	170	8x40	190
22	8x35	140	8x40	165	8x45	230	8x50	250	10x30	220
27	8x40 10x30	165 165	10x30	185	10x30	240	10x35	270	10x40	280
33	10x30	180	10x35	200	10x35	290	10x40	370	10x40 13x30	360 370
39	10x35	210	10x40 13x30	285 285	10x40 13x30	400 400	10x45 13x30	410 390	10x50 13x35	410 420
47	10x40 13x30	280 260	10x45 13x30	340 330	10x45 13x30	450 440	10x50 13x35	420 450	10x50 13x40	420 480
56	10x45 13x35	330 330	10x50 13x35	380 360	10x50 13x35	520 500	10x60 13x40	530 520	13x45	530
68	10x50 13x35	380 370	10x60 13x40	450 430	13x40	580	13x45	580	13x50	620
82	10x60 13x40	490 465	13x45	520	13x45	650	13x50	660	13x55	680
100	13x45	500	13x50	580	13x50	680				
120	13x50	580								

Ripple Current (mA r.m.s) at 105°C, 120Hz

NP Series Non-polarized 85°C

Features

- ◆ NP Series for crossover networks of high-pitched, mean and low-pitched sounds in high-fidelity sound systems.
- ◆ The series offers excellent frequency characteristics and minimal capacitance deviation with frequency.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E105
- ◆ RoHS Compliant



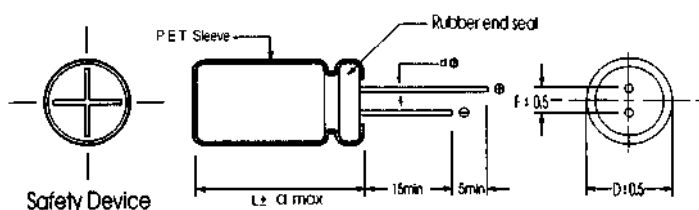
Specifications

Item	Performance Characteristics																																														
Operating Temperature Range	-40 to +85℃						-25 to +85℃																																								
Rated Voltage Range	6.3 to 100 VDC						160 to 250 VDC																																								
Capacitance Range	0.47 to 3300 μF						0.47 to 47 μF																																								
Capacitance Tolerance	±20%(120Hz,+20℃)																																														
Leakage Current (+20℃,max.)	I≤0.03 CV or 3 (μA) After 1 minute whichever is greater measured with rated working voltage applied.																																														
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td><td>160</td><td>200</td><td>250</td></tr><tr><td>D.F. (%)max.</td><td>25</td><td>25</td><td>20</td><td>15</td><td>15</td><td>13</td><td>10</td><td>10</td><td>15</td><td>15</td><td>20</td></tr></table> For Capacitance > 1000 uF, add 2% per another 1000 uF												Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	160	200	250	D.F. (%)max.	25	25	20	15	15	13	10	10	15	15	20											
Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	160	200	250																																				
D.F. (%)max.	25	25	20	15	15	13	10	10	15	15	20																																				
Low Temperature Characteristics (at 120Hz)	Impedance ratio max <table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>Z-25℃／Z+20℃</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃／Z+20℃</td><td>8</td><td>6</td><td>4</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td></tr></table> <table><tr><td>Working Voltage(VDC)</td><td>160</td><td>200</td><td>250</td></tr><tr><td>Z-25℃／Z+20℃</td><td>2</td><td>2</td><td>3</td></tr></table> For Capacitance > 1000 uF, add 0.5 per another 1000 uF for -25℃／+20℃ add 1 per another 1000 uF for -40℃／+20℃												Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	Z-25℃／Z+20℃	4	3	2	2	2	2	2	2	Z-40℃／Z+20℃	8	6	4	4	3	3	3	3	Working Voltage(VDC)	160	200	250	Z-25℃／Z+20℃	2	2	3
Working Voltage(VDC)	6.3	10	16	25	35	50	63	100																																							
Z-25℃／Z+20℃	4	3	2	2	2	2	2	2																																							
Z-40℃／Z+20℃	8	6	4	4	3	3	3	3																																							
Working Voltage(VDC)	160	200	250																																												
Z-25℃／Z+20℃	2	2	3																																												
Load Life	Test conditions Duration time : 2000Hrs Ambient temperature : +85℃ Applied voltage : Rated DC working voltage Each 250 hours, we will reserve the terminal and test the characteristics. After test requirements at +20℃ Capacitance change : ≤ ±20% of the initial measured value Dissipation factor : ≤ 150% of the initial specified value Leakage current : ≤ The initial specified value																																														
Shelf Life	Test conditions Duration time : 1000Hrs Ambient temperature : +85℃ Applied voltage : None After test requirements at +20℃: Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																																														

Multiplier for Ripple Current vs. Frequency

CAP(μ F) \ Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.8	1	1.30	1.45	1.65	1.70
10 < CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.16	1.25	1.35	1.38
1000 < CAP	0.8	1	1.11	1.17	1.25	1.28

Diagram of Dimensions:(unit:mm)



D ϕ	5	6.3	8	10	13	16	18
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
d ϕ	0.5		L < 20 0.5	L ≥ 20 0.6	0.6		0.8

α	D < 18		D = 18	
	1.5		L < 35.5 1.5	L ≥ 35.5 2.0

Case Size

WV Cap(μF)		6.3		10		16		25		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
10								5x11	34	5x11	43
22				5x11	55	5x11	57	6.3x11	65	6.3x11	75
33				5x11	66	5x11	75	6.3x11	86	8x11.5	105
47				5x11	82	6.3x11	97	6.3x11	100	8x11.5	120
100		6.3x11	120	6.3x11	125	8x11.5	162	8x11.5	175	10x12.5	210
										10x16	230
220		6.3x11	175	8x11.5	205	10x12.5	270	10x12.5	295	10x20	400
								10x16	310		
330		8x11.5	250	10x12.5	270	10x16	350	10x20	440	13x20	495
				10x16	300						
470		10x12.5	330	10x16	388	10x20	455	13x20	530	13x25	655
1000		10x20	650	13x20	700	13x20	730				
						13x25	800				
2200		13x20	850	16x25	1000	16x31.5	1100				
3300		16x25	970	18x35.5	1300						

WV Cap(μF)		50		63		100		160	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.47		5x11	11	5x11	12	5x11	14	5x11	17
1		5x11	17	5x11	18	5x11	21	6.3x11	25
2.2		5x11	25	5x11	26	5x11	34	8x11.5	38
3.3		5x11	27	6.3x11	28	6.3x11	39	8x11.5	43
4.7		5x11	34	6.3x11	34	8x11.5	47	10x12.5	52
10		6.3x11	52	6.3x11	57	8x11.5	71	10x16	89
22		8x11.5	92	8x11.5	97	10x16	140	13x20	155
33		8x11.5	109	10x12.5	140	10x16	190	13x20	230
						10x20	220		
47		10x12.5	150	10x16	180	10x20	195	13x25	250
						13x20	240		
100		10x20	265	13x20	320	16x25	425		
220		13x20	475	13x25	510	16x25	520		
						16x31.5	550		
330		13x25	560						

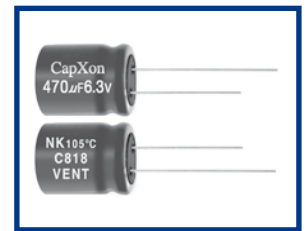
WV Cap(μF)		200		250	
		Size	Ripple	Size	Ripple
0.47		6.3x11	21	6.3x11	28
1		8x11.5	28	8x11.5	32
2.2		8x11.5	42	10x12.5	48
3.3		10x12.5	46	10x16	57
4.7		10x16	56	10x20	88
10		10x20	95	10x20	130
22		13x20	180	13x25	224
33		13x25	250	16x25	305

Ripple Current (mA, rms) at 85°C 120Hz

NK Series Non-polarized 105°C

Features

- ◆ NK Series for crossover networks of high-pitched, mean and low-pitched sounds in high-fidelity sound systems.
- ◆ The series offers excellent frequency characteristics and minimal capacitance deviation with frequency.
- ◆ For detail specifications, please refer to Engineering Bulletin No.E110
- ◆ RoHS Compliant



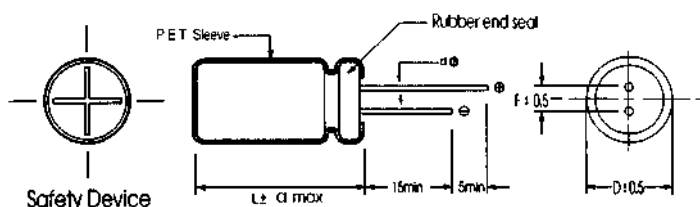
Specifications

Item	Performance Characteristics																																														
Operating Temperature Range	-40 to +105℃						-25 to +105℃																																								
Rated Voltage Range	6.3 to 100 VDC						160 to 250 VDC																																								
Capacitance Range	0.47 to 3300 μF						0.47 to 47 μF																																								
Capacitance Tolerance	±20%(120Hz,+20℃)																																														
Leakage Current (+20℃,max.)	I≤0.03 CV or 3(μA) After 1 minute whichever is greater measured with rated working voltage applied.																																														
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td><td>160</td><td>200</td><td>250</td></tr><tr><td>D.F. (%)max.</td><td>25</td><td>25</td><td>20</td><td>15</td><td>15</td><td>13</td><td>10</td><td>10</td><td>15</td><td>15</td><td>20</td></tr></table> For Capacitance > 1000 uF, add 2% per another 1000 uF												Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	160	200	250	D.F. (%)max.	25	25	20	15	15	13	10	10	15	15	20											
Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	160	200	250																																				
D.F. (%)max.	25	25	20	15	15	13	10	10	15	15	20																																				
Low Temperature Characteristics (at 120Hz)	Impedance ratio max <table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>Z-25℃／Z+20℃</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃／Z+20℃</td><td>8</td><td>6</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td></tr></table> <table><tr><td>Working Voltage(VDC)</td><td>160</td><td>200</td><td>250</td></tr><tr><td>Z-25℃／Z+20℃</td><td>2</td><td>2</td><td>3</td></tr></table> For Capacitance > 1000 uF, add 0.5 per another 1000 uF for -25℃／+20℃ add 1 per another 1000 uF for -40℃／+20℃												Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	Z-25℃／Z+20℃	4	3	2	2	2	2	2	2	Z-40℃／Z+20℃	8	6	4	3	3	3	3	3	Working Voltage(VDC)	160	200	250	Z-25℃／Z+20℃	2	2	3
Working Voltage(VDC)	6.3	10	16	25	35	50	63	100																																							
Z-25℃／Z+20℃	4	3	2	2	2	2	2	2																																							
Z-40℃／Z+20℃	8	6	4	3	3	3	3	3																																							
Working Voltage(VDC)	160	200	250																																												
Z-25℃／Z+20℃	2	2	3																																												
Load Life	Test conditions Duration time : 2000Hrs Ambient temperature : +105℃ Applied voltage : Rated DC working voltage Each 250 hours, we will reserve the terminal and test the characteristics. After test requirement at +20℃ Capacitance change : ≦ ±20% of the initial measured value Dissipation factor : ≦ 150% of the initial specified value Leakage current : ≦ The initial specified value																																														
Shelf Life	Test conditions Duration time : 1000Hrs Ambient temperature : +105℃ Applied voltage : None After test requirement at +20℃: Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																																														

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.8	1	1.30	1.45	1.65	1.70
10 < CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.16	1.25	1.35	1.38

Diagram of Dimensions:(unit:mm)



D φ	5	6.3	8	10	13	16	18
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
d φ	0.5		L < 20 0.5	L ≥ 20 0.6	0.6		0.8

α	D < 18	D = 18	
	1.5	L < 35.5 1.5	L ≥ 35.5 2.0

Case Size

WV Cap(μF)		6.3		10		16		25		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
10								5x11	34	5x11	38
22						5x1	53	6.3x11	55	6.3x11	65
33				5x11	59	5x11	62	6.3x11	72	8x11.5	75
47				5x11	79	6.3x11	90	6.3x11	96	8x11.5	107
100	5x11	99		6.3x11	99	6.3x11	99	8x11.5	152	10x12.5	198
						8x11.5	123				
220	8x11.5	149		8x11.5	157	8x11.5	200	10x12.5	245	10x20	320
						10x12.5	234				
330	8x11.5	190		10x12.5	235	10x12.5	255	10x16	310	13x20	370
470	10x12.5	280		10x12.5	290	10x16	360	13x20	420	13x25	495
1000	10x16	352		10x20	430	13x20	511				
2200	13x20	645		16x25	830	16x31.5	950				
3300	16x25	950		16x31.5	1150						

WV Cap(μF)		50		63		100		160	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.47		5x11	8	5x11	9	5x11	10	5x11	12
1		5x11	12	5x11	14	5x11	15	6.3x11	18
2.2		5x11	17	5x11	20	5x11	20	8x11.5	28
						6.3x11	22		
3.3		5x11	23	6.3x11	25	6.3x11	28	8x11.5	37
4.7		5x11	30	6.3x11	30	6.3x11	32	10x12.5	45
						8x11.5	36		
10		6.3x11	50	6.3x11	52	8x11.5	52	10x16	79
						10x12.5	55		
22		8x11.5	85	8x11.5	88	10x16	120	13x20	140
				10x12.5	92				
33		8x11.5	89	10x12.5	115	10x20	175	13x20	200
47		10x12.5	123	10x16	150	13x20	187	13x25	215
100		10x16	198	13x20	295	16x25	399		
		10x20	220						
220		13x20	340	13x25	420				
		13x25	375						
330		16x25	500						

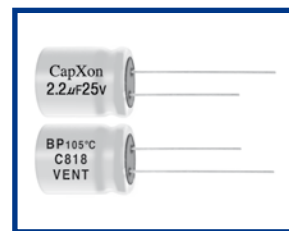
WV Cap(μF)		200		250	
		Size	Ripple	Size	Ripple
0.47		6.3x11	17	6.3x11	22
1		8x11.5	21	8x11.5	25
2.2		8x11.5	32	10x12.5	39
3.3		10x12.5	40	10x16	43
4.7		10x16	52	10x20	65
10		10x20	86	10x20	109
22		13x20	160	13x25	189
33		13x25	213	16x25	250

Ripple Current (mA, rms) at 105°C 120Hz

BP Series Bi-polarized

Features

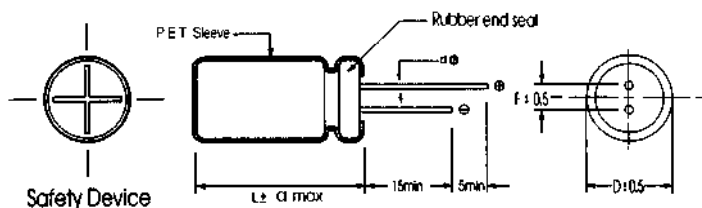
- ◆ The BP Series is designed for horizontal deflection current in TV sets where high frequency and high ripple current flows.
- ◆ Low dissipation factor at high frequency.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E111
- ◆ RoHS Compliant



Specifications

Item	Performance Characteristics			
Operating Temperature Range	-40 to +105℃			
Rated Voltage Range	25,50,63 VDC			
Capacitance Range	2.2 to 15 μF			
Capacitance Tolerance	± 10% (120Hz, +20℃)			
Leakage Current (+20℃,max.)	I ≤ 100 (μ A) After 1 minute with rated working voltage applied.			
Dissipation Factor (tan δ , at 20℃ , 120Hz)	Less than 3% (+20℃,at 120Hz)			
Low Temperature Characteristics (at 120Hz)	Impedance ratio max			
	Working Voltage (VDC)	25	50	63
	Z-40℃／Z+20℃	4	4	4
Load Life	Test conditions Duration time :2000Hrs Ambient temperature :+105℃ Applied voltage :Rated DC working voltage			
	After test requirement at +20℃ Capacitance change :≦ ± 15% of the initial measured value Dissipation factor :≦ 150% of the initial specified value Leakage current :≦ The initial specified value			
Shelf Life	Test conditions Duration time :1000Hrs Ambient temperature :+105℃ Applied voltage :None			
	After test requirement at +20℃:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.			

Diagram of Dimensions:(unit:mm)



D ϕ	10	13	16	18	22
F	5.0	5.0	7.5	7.5	10
d ϕ	0.6		0.8		

α	D < 18	D = 18		D > 18
		L < 35.5	L $\geq$ 35.5	
	1.5	1.5	2.0	2.0

Case Size

Cap(μ F)	Size	WV	Max Ripple Current (at 15.75K Hz Unit:A P-P)		
			105°C	85°C	70°C
2.2	13x25	25v, 50v, 63v	3.4a p-p	5.8 a p-p	7.5 a p-p
3.3	16x25	25v, 50v, 63v	4.1a p-p	7.0 a p-p	9.1 a p-p
4.7	16x31.5	25v, 50v, 63v	4.5 a p-p	7.8 a p-p	10 a p-p
6.8	16x35.5	25v, 50v, 63v	4.6 a p-p	8.0 a p-p	10.4 a p-p
10	18x35.5	25v, 50v, 63v	4.9 a p-p	8.6 a p-p	11.1 a p-p
12	18x41	25v, 50v, 63v	5.0 a p-p	8.8 a p-p	11.5 a p-p
15	18x41	25v, 50v, 63v	5.4 a p-p	9.5 a p-p	12.2 a p-p

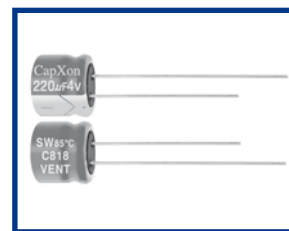
ϕ DxL(mm)

Ripple Current (A, rms) at 15.75KHz

SW Series 5mm 85°C

Features

- ◆ Design for audio equipment.
- ◆ For detail specifications, please refer to Engineering Bulletin NO.E152
- ◆ RoHS Compliant



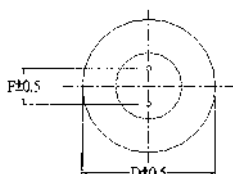
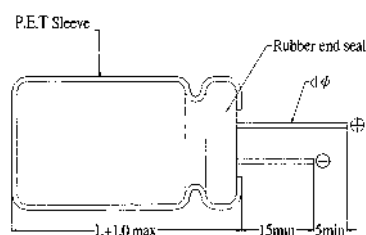
Specifications

Item	Performance Characteristics							
Operating Temperature Range	-40~+85°C							
Rated Voltage Range	4~50 VDC							
Capacitance Range	0.1 to 470 µ F							
Capacitance Tolerance	±20%(120Hz, +20°C)							
Leakage Current (+20°C, max.)	I=0.01 CV or 3 (µ A) (After 2 minute with rated working voltage applied.)							
Dissipation Factor (tan δ , at 20°C , 120Hz)	Working Voltage(VDC)	4	6.3	10	16	25	35	50
	D.F.(%)max.	35	24	20	16	14	12	10
Low Temperature Characteristics (at 120Hz)	Impedance ratio max							
	Working voltage(VDC)	4	6.3	10	16	25	35	50
	Z-25°C / Z+20°C	7	4	3	2	2	2	2
	Z-40°C / Z+20°C	15	8	6	4	4	3	3
Load Life	Test condition							
	Duration time :1000 Hrs							
	Ambient temperature :+85°C							
	Applied voltage :Rated DC working voltage							
	After test requirement at +20°C							
	Capacitance change : ≤ ±20% of the initial measured value							
Shelf Life	Dissipation factor : ≤200% of the initial specified value							
	Leakage current : ≤The initial specified value							
	Test condition							
	Duration time :1000 Hrs							
	Ambient temperature :+85°C							
	Applied voltage :None							
	After test requirement at +20°C :Same limits as Load life.							
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.							

Multiplier for Ripple Current vs. Frequency

CAP (µ F) \ Frequency(Hz)	50	120	300	1K	10K
Multiplier	0.70	1.00	1.17	1.36	1.50

Diagram of Dimension:(unit:mm)



D φ	4	5	6.3	8
F	1.5	2.0	2.5	3.5
d φ	0.45			0.50

Case Size

φ DxL(mm)

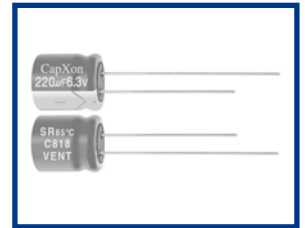
Cap(μF) \ WV	4		6.3		10		16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1													4×5	1.2
0.22													4×5	2.3
0.33													4×5	3.0
0.47													4×5	3.9
1													4×5	7.3
2.2													4×5	11
3.3											4×5	13	4×5	15
4.7									4×5	15	4×5	18	5×5	20
10							4×5	21	5×5	27	5×5	29	6.3×5	31
22			4×5	26	5×5	33	5×5	36	6.3×5	43	6.3×5	46	8×5	52
33	4×5	30	5×5	37	5×5	40	6.3×5	47	6.3×5	52	8×5	62	8×5	70
47	4×5	33	5×5	42	6.3×5	49	6.3×5	58	8×5	70	8×5	81		
100	5×5	54	6.3×5	67	8×5	80	8×5	92	8×5	109				
220	6.3×5	87	8×5	112	8×5	136								
330	8×5	143	8×5	170										
470	8×5	185												

Ripple Current (mA, rms) at 85°C 120Hz

SR Series 7mm 85°C

Features

- ◆ Design for audio equipment.
- ◆ Lineally suited for very compact audio products.
- ◆ For detail specifications, please refer to Engineering Bulletin NO.E151
- ◆ RoHS Compliant



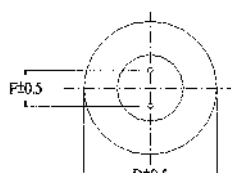
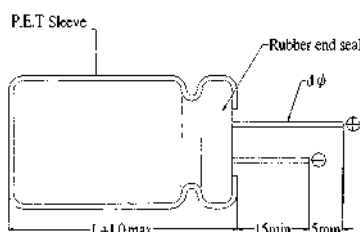
Specifications

Item	Performance Characteristics																											
Operating Temperature Range	-40~+85℃																											
Rated Voltage Range	6.3~50 VDC																											
Capacitance Range	0.1 to 220 μ F																											
Capacitance Tolerance	± 20%(120Hz,+20℃)																											
Leakage Current (+20℃,max.)	I=0.01 CV or 3 (μ A) (After 2 minute with rated working voltage applied.)																											
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>D.F.(%)max.</td><td>24</td><td>20</td><td>16</td><td>14</td><td>12</td><td>10</td></tr></table>							Working Voltage(VDC)	6.3	10	16	25	35	50	D.F.(%)max.	24	20	16	14	12	10							
	Working Voltage(VDC)	6.3	10	16	25	35	50																					
D.F.(%)max.	24	20	16	14	12	10																						
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																											
	<table><tr><td>Working voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z-25℃ / Z+20℃</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃ / Z+20℃</td><td>8</td><td>6</td><td>4</td><td>4</td><td>3</td><td>3</td></tr></table>							Working voltage(VDC)	6.3	10	16	25	35	50	Z-25℃ / Z+20℃	4	3	2	2	2	2	Z-40℃ / Z+20℃	8	6	4	4	3	3
	Working voltage(VDC)	6.3	10	16	25	35	50																					
	Z-25℃ / Z+20℃	4	3	2	2	2	2																					
Z-40℃ / Z+20℃	8	6	4	4	3	3																						
Load Life	Test condition																											
	Duration time :1000 Hrs Ambient temperature :+85℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change : ≤ ±20% of the initial measured value Dissipation factor : ≤200% of the initial specified value Leakage current : ≤The initial specified value																											
Shelf Life	Test condition																											
	Duration time :1000 Hrs Ambient temperature :+85℃ Applied voltage :None After test requirement at +20℃:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																											

Multiplier for Ripple Current vs. Frequency

CAP (µ F) \ Frequency(Hz)	50	120	300	1K	10K
Multiplier	0.70	1.00	1.17	1.36	1.50

Diagram of Dimension:(unit:mm)



D φ	4	5	6.3
F	1.5	2.0	2.5
d φ	0.45		0.50

Case Size

φ DxL(mm)

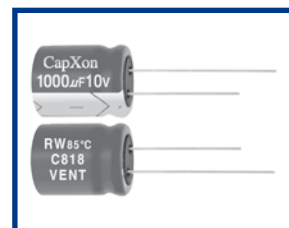
Cap(μF) \ WV	6.3		10		16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1											4×7	1.1
0.22											4×7	2.6
0.33											4×7	3.5
0.47											4×7	5.0
1											4×7	10
2.2											4×7	18
3.3											4×7	23
4.7									4×7	23	4×7	26
10					4×7	28	4×7	29	4×7	31	5×7	35
22	4×7	34	4×7	35	4×7	39	5×7	49	5×7	49	6.3×7	58
33	4×7	40	4×7	45	5×7	55	5×7	55	6.3×7	65		
47	4×7	47	5×7	59	5×7	65	6.3×7	71				
100	5×7	76	6.3×7	88	6.3×7	98						
220	6.3×7	124										

Ripple Current (mA, rms) at 85°C 120Hz

RW Series 85°C

Features

- ◆ Standard for audio equipment.
- ◆ For detail specifications, please refer to Engineering Bulletin NO.E150
- ◆ RoHS Compliant



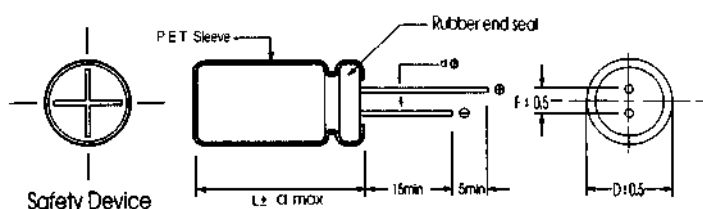
Specifications

Item	Performance Characteristics																																			
Operating Temperature Range	-40~+85℃																																			
Rated Voltage Range	6.3~100 VDC																																			
Capacitance Range	0.1 to 33000 μ F																																			
Capacitance Tolerance	± 20%(120Hz,+20℃)																																			
Leakage Current (+20℃,max.)	I≤0.01 CV or 3 (μ A) (After 1 minute with rated working voltage applied.)																																			
Dissipation Factor (tan δ , at 20℃ , 120Hz)	<table><tr><td>Working Voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>D.F.(%)max.</td><td>28</td><td>24</td><td>20</td><td>16</td><td>14</td><td>12</td><td>10</td><td>8</td></tr></table>									Working Voltage(VDC)	6.3	10	16	25	35	50	63	100	D.F.(%)max.	28	24	20	16	14	12	10	8									
	Working Voltage(VDC)	6.3	10	16	25	35	50	63	100																											
	D.F.(%)max.	28	24	20	16	14	12	10	8																											
For capacitance > 1000 μ F,add 2% per another 1000 μ F.																																				
Low Temperature Characteristics (at 120Hz)	Impedance ratio max																																			
	<table><tr><td>Working voltage(VDC)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>Z-25℃ / Z+20℃</td><td>5</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃ / Z+20℃</td><td>12</td><td>10</td><td>8</td><td>5</td><td>4</td><td>3</td><td>3</td><td>3</td></tr></table>									Working voltage(VDC)	6.3	10	16	25	35	50	63	100	Z-25℃ / Z+20℃	5	4	3	2	2	2	2	2	Z-40℃ / Z+20℃	12	10	8	5	4	3	3	3
	Working voltage(VDC)	6.3	10	16	25	35	50	63	100																											
Z-25℃ / Z+20℃	5	4	3	2	2	2	2	2																												
Z-40℃ / Z+20℃	12	10	8	5	4	3	3	3																												
Load Life	Test condition																																			
	Duration time :2000 Hrs Ambient temperature :+85℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change : ≤ ±20% of the initial measured value Dissipation factor : ≤200% of the initial specified value Leakage current : ≤ The initial specified value																																			
Shelf Life	Test condition																																			
	Duration time :1000 Hrs Ambient temperature :+85℃ Applied voltage :None After test requirement at +20℃ :Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.																																			

Multiplier for Ripple Current vs. Frequency

CAP(µF)\Frequency(Hz)	50(60)	120	300	1K	10K
CAP ≤ 47	0.75	1.00	1.35	1.57	1.20
100 < CAP ≤ 470	0.80	1.00	1.23	1.34	1.50
1000 ≤ 33000	0.85	1.00	1.10	1.13	1.15

Diagram of Dimension:(unit:mm)



D φ	5	6.3	8		10	13	16	18	22
F	2.0	2.5	3.5		5.0	5.0	7.5	7.5	10
d φ	0.5		L < 20 0.5	L ≥ 20 0.6	0.6		0.8		

α	D < 18	D = 18		D > 18
	1.5	L < 35.5	L ≥ 35.5	
			1.5	2.0

Case Size

φ D×L(mm)

WV Cap(μF)	6.3		10		16		25	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
47							5×11	117
100			5×11	162	5×11	155	6.3×11	187
220			6.3×11	247	6.3×11	265	8×11.5	325
330	6.3×11	282	6.3×11	300	8×11.5	365	10×12.5	415
470	6.3×11	330	6.3×11	355	8×11.5	445	10×12.5	535
1000	8×11.5	560	10×12.5	600	10×16	780	10×20	950
2200	10×20	1015	10×20	1075	13×20	1300	13×25	1550
3300	10×20	1245	13×20	1410	13×25	1700	16×25	1675
4700	13×20	1435	13×25	1800	16×25	2100	16×31.5	2380
6800	13×25	1600	16×25	2200	16×35.5	2520	18×35.5	2650
10000	16×25	2000	16×35.5	2450	18×35.5	2670	22×41	3000
15000	16×35.5	2620	18×35.5	2900	22×41	3400	22×51	3800
22000	18×41	3220	22×41	3700	22×51	4200		
33000	22×51	3900	22×51	4300				

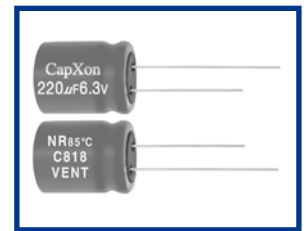
WV Cap(μF)	35		50		63		100	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1			5×11	2.1	5×11	1.5	5×11	2.1
0.22			5×11	2.7	5×11	3	5×11	4.7
0.33			5×11	4.2	5×11	5	5×11	7.5
0.47			5×11	6.0	5×11	7	5×11	11
1			5×11	12	5×11	15	5×11	21
2.2			5×11	24	5×11	28	5×11	31
3.3			5×11	35	5×11	35	5×11	40
4.7			5×11	41	5×11	45	5×11	46
10			5×11	65	5×11	70	6.3×11	75
22			5×11	97	5×11	107	6.3×11	125
33	5×11	107	5×11	120	6.3×11	137	8×11.5	165
47	5×11	125	6.3×11	150	6.3×11	172	10×12.5	220
100	6.3×11	205	8×11.5	255	10×12.5	300	10×20	370
220	10×12.5	370	10×12.5	417	10×16	485	13×25	615
330	10×12.5	475	10×16	580	10×20	670	13×25	755
470	10×16	630	13×20	770	13×20	880	16×25	1000
1000	13×20	1120	13×25	1320	16×25	1350	18×41	1500
2200	16×25	1650	16×35.5	2090	18×35.5	2220	22×51	2400
3300	16×35.5	2270	18×35.5	2430	22×41	2700		
4700	18×35.5	2540	22×41	2900	22×51	3400		
6800	22×41	3000	22×51	3500				

Ripple Current (mA, rms) at 85°C 120Hz

NR Series 85°C

Features

- ◆ Standard non polarity series for using in polarity reversal circuits.
- ◆ Design For audio equipment.
- ◆ For detail specifications, please refer to Engineering Bulletin NO.E153
- ◆ RoHS Compliant



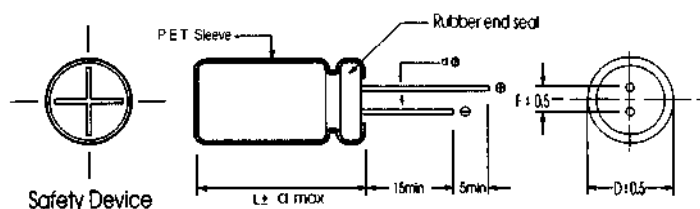
Specifications

Item	Performance Characteristics								
Operating Temperature Range	-40~+85°C								
Rated Voltage Range	6.3~100 VDC								
Capacitance Range	0.15 to 1000 μF								
Capacitance Tolerance	±20%(120Hz,+20°C)								
Leakage Current (+20°C,max.)	I ≤ 0.03 CV or 3 (μA) (After 1 minute with rated working voltage applied.)								
Dissipation Factor (tan δ , at 20°C , 120Hz)	Working Voltage(VDC)	6.3	10	16	25	35	50	63	100
	D.F.(%)max.	24	20	16	16	14	12	10	10
Low Temperature Characteristics (at 120Hz)	Impedance ratio max (at: 120Hz)								
	Working voltage(VDC)	6.3	10	16	25	35	50	63	100
	Z-25°C / Z+20°C	4	3	2	2	2	2	2	2
	Z-40°C / Z+20°C	8	6	4	4	3	3	3	3
Load Life	Test condition Duration time : 2000 Hrs Ambient temperature : +85°C Applied voltage : Rated DC working voltage Each 250 hours,we will reserve the terminal and test the characteristics After test requirement at +20°C Capacitance change : within ≤ ±20% of the initial measured value Dissipation factor : ≤200% of the initial specified value Leakage current : ≤The initial specified value								
Shelf Life	Test condition Duration time :1000 Hrs Ambient temperature :+85°C Applied voltage :None After test requirement at +20°C:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.								

Multiplier for Ripple Current vs. Frequency

CAP(μF)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
CAP ≤ 10	0.8	1	1.30	1.45	1.65	1.70
10 < CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.16	1.25	1.35	1.38
1000 < CAP	0.8	1	1.11	1.17	1.25	1.28

Diagram of Dimension:(unit:mm)



D φ	5	6.3	8	10	13	16
F	2.0	2.5	3.5	5.0	5.0	7.5
d φ	0.5			0.6		0.8

α	D < 18	D = 18		D > 18
		L < 35.5	L ≥ 35.5	
	1.5	1.5	2.0	2.0

Case Size

φ DxL(mm)

WV Cap(μF)	6.3V		10		16		25	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
4.7							5×11	26
10					5×11	43	5×11	44
22			5×11	60	6.3×11	71	6.3×11	71
33	5×11	62	6.3×11	70	6.3×11	90	8×11.5	110
47	6.3×11	76	6.3×11	95	8×11.5	122	10×12.5	150
100	8×11.5	154	10×12.5	188	10×12.5	208	10×16	250
220	10×12.5	245	10×16	294	10×20	360	13×25	478
330	10×16	330	10×20	360	13×20	480	13×25	615
470	10×20	360	13×20	538	13×25	638	16×25	720
1000	13×25	910	16×25	940	16×31.5	1090		

WV Cap(μF)	35		50		63		100	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.15							6.3×11	13
0.47			5×11	12	6.3×11	14	6.3×11	17
1			5×11	18	6.3×11	22	6.3×11	25
1.8			5×11	22	6.3×11	26	6.3×11	32
2.2			5×11	27	6.3×11	33	6.3×11	39
3.3			5×11	29	8×11.5	36	8×11.5	49
4.7	5×11	34	6.3×11	42	8×11.5	44	10×12.5	60
10	6.3×11	48	8×11.5	65	8×11.5	73	10×16	98
22	8×11.5	96	10×12.5	118	10×12.5	125	10×20	165
33	10×12.5	135	10×16	155	10×16	170	13×20	275
47	10×12.5	154	10×20	200	10×20	215		
100	10×20	275	13×25	370	13×25	384		
220	13×25	560	16×25	645				
330	16×25	670	16×31.5	760				

Ripple Current (mA, rms) at 85°C 120Hz

LR Series Snap-in Type 85°C

Features

- ◆ Snap-in design for audio equipment.
- ◆ Aluminum case designed explosion-proof vent. Non solvent-proof type
- ◆ For detail specifications, please refer to Engineering Bulletin NO. E154
- ◆ RoHS Compliant



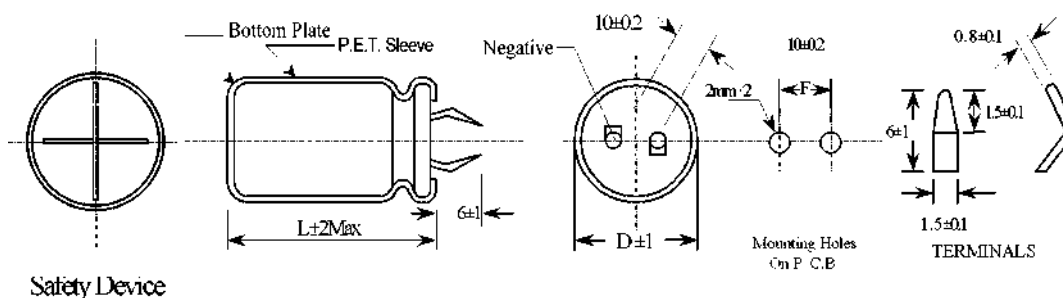
Specifications

Item	Performance Characteristics							
Operating Temperature Range	-40~+85℃							
Rated voltage Range	16 to 100 VDC							
Capacitance Range	680~33000 μ F							
Capacitance Tolerance	± 20%(120Hz,+20℃)							
Leakage Current (+20℃,max.)	I ≤0.02 CV(μ A) After 5 minute with rated working voltage applied.							
Dissipation Factor (tan δ , at 20℃ , 120Hz)								
	Working Voltage(VDC)	16	25	35	50	63	80	100
	D.F.(%)max.	35	30	30	30	22	20	20
For capacitance > 22000 μ F,add 2% per another 1000 μ F.								
Low Temperature Characteristics (at 120Hz)	Impedance ratio max							
	Rated voltage(V)	16	25	35	50	63	100	
	Z - 25℃／Z+20℃	5	4	4	4	4	4	
	Z - 40℃／Z+20℃	15	15	12	12	12	12	
Load Life	Test condition							
	Duration time :2000 Hrs Ambient temperature :+85℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change : ≤ ± 25% of the initial measured value Dissipation factor : ≤200% of the initial specified value Leakage current : ≤ The initial specified value							
Shelf Life	Test condition							
	Duration time :1000 Hrs Ambient temperature :+85℃ Applied voltage :None After test requirement at +20℃:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.							

Multiplier for Ripple Current vs. Frequency

CAP(µ F)\Frequency(Hz)	50(60)	120	1K	10K	100K
CAP ≤100	0.80	0.1	1.36	1.48	1.53
100 < CAP ≤1000	0.80	1	1.25	1.35	1.38
1000 < CAP	0.80	1	1.17	1.25	1.28

Diagram of Dimensions:(unit:mm)



Case Size

φ D x L (mm)

Cap (μF)	WV	16								25							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
820										22×21	0.75						
1000												25×21	0.95				
1200		22×21	0.95														
1500				25×21	1.10									30×21	1.30		
1800		22×26	1.20									25×26	1.55				
2200						30×21	1.35			22×36	1.85	25×21	1.50	30×26	1.80	35×22	1.75
												25×31	1.80				
2700				25×26	1.75					22×26	1.70						
										22×46	2.20	25×36	2.15				
3300		22×21	1.50	25×31	2.00			35×22	1.95	22×21	1.50			30×21	1.85		
										22×31	1.80			30×31	2.40		
										22×51	2.50	25×41	2.45			35×27	2.45
3900		22×46	2.30	25×21	1.55							25×21	1.55				
				25×36	2.35	30×26	2.35					25×26	1.10				
												25×46	2.80	30×36	2.80		
4700		22×21	1.35	25×41	2.70					22×26	1.70					35×22	2.20
		22×26	1.75					35×27	2.60	22×36	2.30	25×31	2.25			35×32	3.15
		22×51	2.75			30×31	2.70							30×41	3.25		
5600				25×46	2.90	30×21	1.85			22×41	2.50	25×36	2.40	30×21	1.85		
														30×26	2.50	35×36	3.50
						30×36	2.90							30×46	3.50		
6800		22×31	2.20	25×21	1.70			35×32	3.15	22×31	2.20	25×26	2.15				
				25×26	2.15					22×51	2.65	25×41	2.65	30×31	2.65		
				25×51	3.20	30×41	3.20									35×42	3.80
8200								35×22	2.25	22×36	2.35	25×31	2.30			35×22	2.25
		22×26	1.90	25×31	2.30			35×37	3.30			25×46	2.90	30×36	2.85	35×27	3.05
		22×36	2.40			30×46	3.35									35×47	4.00
10000		22×31	2.05			30×21	2.10	35×42	3.50	22×41	2.65	25×36	2.50	30×26	2.65		
				25×26	2.00	30×26	2.50					25×51	3.30	30×41	3.30	35×32	3.30
		22×41	2.65	25×36	2.45												
12000		22×36	2.20	25×31	2.15	30×31	2.72	35×22	2.10	22×46	2.90	25×41	2.75	30×31	2.80	35×27	2.65
		22×51	2.75	25×41	2.75			35×42	3.50					30×46	3.55	35×37	3.50
								35×47	3.70								
15000		20×41	2.50	25×36	2.40	30×26	2.50					25×46	3.15	30×36	3.10		
				25×46	3.10	30×36	3.10							30×51	4.15	35×42	4.00
18000		22×46	2.80	25×41	2.60	30×31	2.65	35×32	3.45			25×51	3.55	30×41	3.40	35×32	3.50
				25×51	3.50	30×41	3.40									35×47	4.45
22000				25×46	2.95	30×36	2.90	35×27	2.90					30×46	3.85	35×37	3.85
						30×46	3.80	35×37	3.80								
27000				25×51	3.40	30×41	3.25										
						30×51	4.25	35×32	3.35							35×42	4.30
								35×42	4.25								
33000						30×46	3.70	35×37	3.65							35×47	4.85
								35×47	4.50								

Ripple Current (A, rms) at 85°C 120Hz

φ D×L(mm)

Cap(μF)	WV	35								50							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
680										22×26	1.00						
820				25×21	0.85					22×21	1.00						
										22×31	1.25	25×21	1.35				
1000		22×26	1.00									25×21	1.50				
1200		22×21	1.30	25×26	1.40												
		22×31	1.45			30×21	1.40										
1500		22×36	1.55	25×31	1.55					22×21	1.55	25×36	2.15	30×21	1.80		
										22×31	1.80			30×26	2.15		
										22×46	2.20						
1800		22×26	1.55	25×21	1.65	30×26	1.75	35×22	1.70	22×51	2.45	25×21	1.65			35×27	2.40
		22×41	1.45									25×26	2.15				
												25×41	2.45				
2200		22×46	1.95	25×36	1.95	30×31	1.95			22×26	1.85	25×31	2.30	30×36	2.60	35×22	2.60
										22×36	2.35	25×51	2.65			35×32	2.60
2700		22×31	2.05	25×26	2.00	30×21	2.05	35×27	2.30	22×46	2.45			30×26	2.60		
				25×46	2.35	30×36	2.30					25×36	2.50	30×46	3.00	35×37	2.95
3300		22×26	1.75	25×31	2.20			35×32	2.65	22×36	2.20			30×31	2.80		
		22×36	2.25	25×51	2.70	30×41	2.70			22×51	2.80	25×41	2.80	30×51	3.30	35×42	3.25
3900		22×41	2.40	25×36	2.30	30×21	1.85	35×22	2.50							35×22	2.45
						30×26	2.40	35×37	3.00	22×41	2.45	25×31	2.50	30×26	2.35	35×27	3.15
						30×46	3.00					25×46	3.00	30×36	3.00	35×47	3.50
4700																	
		22×31	2.20	25×26	2.15	30×31	2.55	35×42	3.55	22×46	2.60	25×36	2.70	30×41	3.30	35×32	3.35
		22×46	2.70			30×51	3.55					25×51	3.40			35×52	3.90
5600		22×36	2.35	25×31	2.25			35×22	2.25	22×51	2.90			30×31	3.00	35×22	2.85
		22×41	3.00	25×41	3.00			35×27	2.85			25×41	2.90	30×46	3.60	35×37	3.60
		22×51	2.60					35×47	3.80								
6800						30×26	2.60					25×41	3.30	30×36	3.25		
						30×36	3.30	35×32	3.05					30×51	4.10	35×42	3.95
								35×52	4.15								
8200		22×46	2.90	25×41	2.70	30×31	2.75							30×41	3.55	35×32	3.65
						30×41	3.60	35×37	3.30							35×47	4.40
10000				25×46	3.05	30×36	3.00							30×46	4.00	35×37	4.00
						30×51	3.80	35×27	3.20							35×52	5.50
								35×42	3.70								
12000				25×51	3.45	25×51	3.30	35×32	3.40								
								35×37	4.10							35×42	4.35
								35×47	3.80								
15000						30×46	3.80	35×52	4.80							35×52	4.70
18000						30×51	4.30	35×42	4.15								
22000								35×47	4.70								

Ripple Current (A, rms) at 85°C 120Hz

φ D x L (mm)

WV φ D Cap (μ F)	63								80							
	22		25		30		35		22		25		30		35	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
680	22×26	1.75							22×36	2.25	25×31	2.15				
820	22×21	1.30	25×21	1.65	30×21	1.90			22×31	2.05	25×21	1.65	30×21	2.05	35×22	2.55
	22×31	1.90	25×26	1.85					22×41	2.45	25×26	2.00	30×26	2.40		
1000											25×36	2.35				
	22×26	1.85							22×26	1.85			30×31	2.60	35×22	2.10
	22×36	2.05	25×31	2.00					22×36	2.20	25×31	2.15				
1200									22×51	2.60	25×41	2.60				
	22×31	1.95	25×21	1.65	30×21	1.95			22×31	1.95	25×26	1.90	30×21	2.00	35×27	2.95
	22×41	2.25	25×26	1.90	30×26	2.20	35×22	2.30	22×41	2.45	25×36	2.30	30×26	2.40		
1500											25×46	2.85	30×36	2.80		
	22×26	1.90							22×36	2.15	25×31	2.10				
	22×36	2.15	25×31	2.10					22×51	2.60	25×41	2.65	30×31	2.65	35×32	3.25
1800			25×36	2.65							25×51	3.30	30×41	3.20		
	22×31	2.00	25×26	2.00	30×21	2.05	35×22	2.45	22×41	2.35			30×26	2.40	35×22	2.50
	22×41	2.35	25×41	2.90	30×26	2.35	35×27	2.70	22×46	2.70	25×46	2.85	30×36	2.85	35×27	3.00
2200					30×31	2.90							30×46	3.55	35×37	3.50
	22×36	2.20	25×31	2.15			35×22	2.10			25×36	2.75	30×31	2.55		
	22×46	2.70	25×36	2.75	30×31	2.50					25×51	3.25	30×41	3.15	35×32	3.25
2700			25×46	3.25	30×36	3.20							30×51	4.05	35×42	3.90
	22×41	2.45	25×36	2.35	30×26	2.50	35×27	2.95					30×36	2.80	35×27	3.00
			25×46	2.80	30×36	2.75	35×32	3.65					30×46	3.60	35×37	3.55
3300					30×46	3.30									35×47	4.45
	22×46	2.80	25×41	2.60	30×31	2.70	35×32	3.15			25×51	3.25	30×41	3.15	35×32	3.20
			25×51	3.20	30×41	3.20	35×37	4.00					30×51	4.10	35×42	3.95
3900					30×51	3.80									35×52	5.05
			25×46	2.85	30×36	2.85							30×46	3.45	35×37	3.40
					30×46	3.35	35×37	3.35							35×47	4.35
4700							35×42	4.30								
							35×32	3.20					30×46	3.85	35×42	3.75
			25×51	3.20	30×41	3.10									35×52	4.85
5600					30×51	3.80	35×52	4.50								
															35×47	4.10
					30×46	3.45	35×37	3.40								
6800							35×42	4.35								
					30×51	3.90	35×42	3.75							35×52	4.65
8200							35×52	4.60								
							35×47	4.20								
10000							35×52	4.80								

Ripple Current (A, rms) at 85°C 120Hz

φ DxL(mm)

Cap(μF)	WV	100							
		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
680	φ D	22×26	1.75						
		22×36	2.15	25×31	2.10				
		22×46	2.65	25×36	2.70				
820	φ D	22×31	1.85	25×26	1.80	30×21	1.90		
		22×41	2.40			30×26	2.35	35×22	2.45
		22×51	3.00	25×41	3.00			35×27	2.85
1000	φ D	22×46	2.70	25×36	2.35	30×31	3.00		
				25×41	3.10	30×36	3.30	35×32	3.05
				25×51	2.35				
1200	φ D	22×41	2.20	25×31	2.75	30×26	2.20	35×22	2.30
		22×51	3.00			30×31	3.05	35×27	2.90
						30×41	3.60	35×37	3.30
1500	φ D	22×46	2.55	25×36	3.60	30×36	3.40	35×32	3.40
				25×51	3.20	30×51	3.90	35×42	3.95
1800	φ D	22×51	2.85	25×41	2.85	30×31	2.90	35×27	2.75
						30×41	3.70	35×37	3.40
								35×47	4.15
2200	φ D			25×46	3.20	30×36	3.20	35×32	3.00
						30×51	3.95	35×42	3.80
								35×52	4.75
2700	φ D					30×41	3.55	35×37	3.25
								35×47	4.30
3300	φ D					30×51	3.75	35×52	4.95
3900	φ D							35×42	4.30
4700	φ D							35×52	4.50

Ripple Current (A, rms) at 85°C 120Hz

LP Series Snap-in Type 85°C

Features

- ◆ Directly mountable on printed circuit board, without holders.
- ◆ Aluminum case designed explosion-proof vent.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E106
- ◆ RoHS Compliant



Specifications

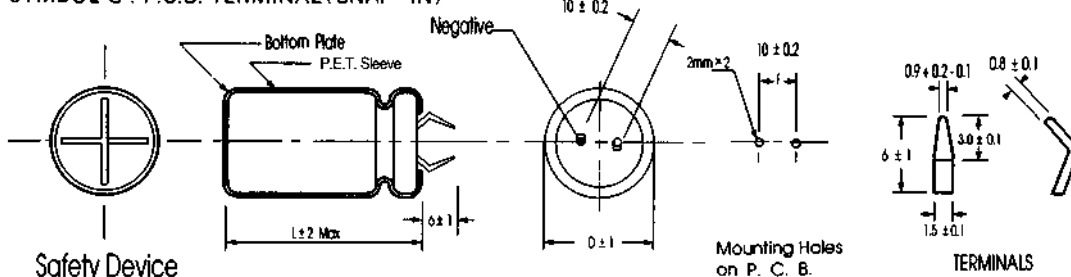
Item	Performance Characteristics										
Operating Temperature Range	-40 to +85℃						-25 to +85℃				
Rated Voltage Range	10 to 100 VDC						160 to 450 VDC				
Capacitance Range	470 to 68000 μ F						47 to 2700 μ F				
Capacitance Tolerance	± 20% (120Hz, +20℃)										
Leakage Current (+20℃,max.)	I ≤ 0.02CV After 5 minutes with rated working voltage applied.										
Dissipation Factor (tan δ , at 20℃ , 120Hz)	Less than the value under table (%)										
	μ F \ VDC	10~16	25~35	50~63	80~100	160~250	315~450				
	47~390	—	—	—	—	15	20				
	470~3900	25	20	20	20	15	20				
	4700~8200	35	30	30	25	—	—				
	10000~22000	40	35	30	—	—	—				
	27000~47000	45	40	35	—	—	—				
	56000~68000	50	45	—	—	—	—				
Low Temperature Characteristics (at 120Hz)	Impedance ratio max.										
	Rated voltage(V)	10	16	25	35	50	63	100	160	200~250	400~450
	Z - 25℃ / Z +20℃	5	5	4	4	4	4	4	4	4	8
	Z - 40℃ / Z +20℃	15	15	15	12	12	12	12	—	—	—
Load Life	Test conditions										
	Duration time	:2000 Hrs									
Shelf Life	Ambient temperature :+85℃										
	Applied voltage	:Rated DC working voltage									
	After test requirement at +20℃										
	Capacitance change	:≤ ±20% of the initial measured value									
	Dissipation factor :≤ 200% of the initial specified value										
	Leakage current	:≤ The initial specified value									
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.										

Multiplier for Ripple Current vs. Frequency

CAP(µF) \ Frequency(Hz)	50(60)	120	1K	10K	50K-100K
10 < CAP ≤ 100	0.8	1	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.25	1.35	1.38
1000 < CAP	0.8	1	1.17	1.25	1.28

Diagram of Dimensions:(unit:mm)

SYMBOL G : P.C.B. TERMINAL (SNAP-IN)



Case Size

WV Cap (μF) φ D		10								16							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
4700		22x21	2.40							22x21	2.40						
6800		22x26	2.84							22x26	2.84						
8200		22x26	2.90							22x26	2.90						
10000		22x31	3.06	25x26	3.06					22x31	3.06	25x26	3.06				
12000		22x31	3.43	25x26	3.43					22x31	3.43	25x26	3.43				
15000		22x36	3.94	25x31	3.94					22x36	3.94	25x31	3.94				
18000		22x41	4.34	25x31	4.34					22x41	4.34	25x31	4.34				
22000		22x46	4.80	25x36	4.80	30x31	4.80			22x46	4.80	25x36	4.80	30x31	4.80		
27000				25x46	7.57	30x36	7.57					25x46	7.57	30x36	7.57		
33000				25x51	8.20	30x41	8.20	35x32	8.20			25x51	8.20	30x41	8.20	35x32	8.20
39000						30x46	8.33	35x37	8.33					30x46	8.33	35x37	8.33
47000						30x51	8.96	35x42	8.93					30x51	8.96	35x42	8.96
56000								35x47	10.5					30x56	10.5	35x52	10.8
68000								35x52	10.8								

WV Cap (μF) φ D		25								35							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
2200										22x21	2.00						
										22x26	2.18						
3300										22x26	2.46						
										22x26	2.50						
3900										22x31	2.64						
										22x31	2.68	25x26	2.68				
4700		22x26	2.64							22x31	2.72	25x26	2.72				
		22x26	2.72							22x31	2.72	25x26	2.72				
5600		22x31	2.78														
		22x31	2.93	25x26	2.93					22x36	3.06	25x31	3.06				
8200		22x31	3.05	25x26	3.05					22x41	3.29	25x36	3.34				
10000		22x36	3.43	25x31	3.43	30x26	3.43			22x46	3.60	25x41	3.60	30x31	3.60		
12000		22x41	3.84	25x36	3.84	30x31	3.84			22x51	3.80	25x46	3.80	30x36	3.80	35x32	3.80
15000		22x51	4.39	25x41	4.39	30x31	4.39					25x51	3.92	30x41	3.92	35x32	3.92
18000				25x46	4.80	30x36	4.80							30x46	4.70	35x37	4.70
22000				25x51	5.40	30x41	5.40							30x51	5.45	35x42	5.45
27000						30x46	5.97	35x37	5.97							35x47	5.78
33000						30x51	6.24	35x42	6.24							35x52	6.36
39000								35x47	7.10								
47000								35x52	7.60								

WV Cap (μF) φ D		50								63							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
1000										22x21	1.50						
										22x26	1.58						
1500		22x26	1.44							22x26	1.68						
2200		22x26	2.04							22x31	2.52	25x26	2.52				
2700		22x31	2.30							22x36	2.82	25x31	2.82				
3300		22x31	2.64	25x26	2.64					22x41	3.12	25x31	3.12	30x26	3.12		
3900		22x31	2.72	25x26	2.72					22x46	3.21	25x36	3.21	30x31	3.21		
4700		22x36	2.88	25x31	2.88	30x26	2.88			22x51	3.28	25x41	3.28			35x27	3.28
5600		22x41	3.06	25x36	3.06	30x31	3.06					25x46	3.86	30x36	3.86	35x32	3.86
6800		22x51	3.24	25x41	3.24	30x31	3.24					25x51	4.32	30x41	4.32	35x32	4.32
8200				25x46	3.48	30x36	3.48							30x46	4.44	35x37	4.44
10000				25x51	3.96	30x41	3.96	35x32	3.96							35x47	4.77
12000						30x46	4.10	35x37	4.10								
15000						30x51	4.70	35x42	4.70							35x63	5.04
18000								35x47	5.31								
22000								35x52	5.85								

Ripple Current (A, rms) at 85°C 120Hz

φ D x L (mm)

Cap (μF)	φ D	80								100							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
470										22x21	1.34						
680		22x21	1.25														
		22x26	1.34							22x26	1.53						
1000		22x26	1.62							22x31	1.62	25x26	1.62				
1200		22x31	1.65							22x31	1.65	25x31	1.74				
										22x36	1.74						
1500		22x31	1.76	25x26	1.76					22x36	1.72	25x36	1.85	30x31	1.85		
										22x41	1.85						
1800		22x36	1.82	25x31	1.82					22x41	2.05	25x41	2.20	30x31	2.20		
										22x46	2.20						
2200		22x41	2.52	25x31	2.52	30x26	2.52			22x46	2.52	25x41	2.64	30x31	2.64		
										22x51	2.64						
2700		22x46	2.76	25x36	2.76	30x31	2.76			22x51	3.08	25x46	3.16	30x36	3.16		
3300		22x51	3.24	25x41	3.24	30x31	3.24					25x51	3.42	30x41	3.42		
3900				25x46	3.40	30x36	3.40							30x46	3.58	35x37	3.58
4700				25x51	3.60	30x41	3.60							30x51	3.72	35x42	3.72
5600						30x46	3.78	35x37	3.78							35x47	3.78
6800						30x51	4.60	35x42	4.60							35x52	4.1
8200								35x52	4.92								
10000								35x63	5.04								

Cap (μF)	φ D	160								200							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
150										22x21	0.96						
180		22x21	1.12							22x21	0.98						
										22x26	1.00						
220		22x21	1.16							22x26	1.36						
		22x26	1.20														
270		22x26	1.35							22x26	1.46						
										22x31	1.50						
330		22x36	1.39							22x31	1.89	25x26	1.89				
		22x31	1.44														
390		22x31	1.66	25x26	1.66					22x31	1.92	25x31	1.92				
470		22x31	1.70	25x31	1.76					22x36	2.23	25x31	2.23	30x26	2.23		
		22x36	1.76														
560		22x36	2.03	25x31	2.03	30x26	2.03			22x41	2.57	25x41	2.57	30x26	2.57		
680		22x41	2.36	25x36	2.36	30x31	2.36			22x46	2.98	25x36	2.98	30x31	2.98		
820		22x46	2.72	25x41	2.72	30x31	2.57			22x51	3.26	25x46	3.26	30x36	3.26	35x27	3.26
						30x36	2.72										
1000				25x46	3.13	30x41	3.13	35x32	3.13			25x51	3.92	30x41	3.92	35x32	3.92
				25x51	3.44	30x36	3.44	35x32	3.25					30x46	4.25	35x37	4.25
1200								35x37	3.44								
1500						30x46	3.96	35x37	3.96					30x51	4.99	35x47	4.99
1800						30x51	4.47	35x42	4.47							35x47	5.84
2200								35x47	4.65							35x52	6.07
2700								35x52	4.76								

Cap (μF)	φ D	220								250							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
120										22x21	0.85						
150										22x21	0.90						
		22x21	0.75							22x26	0.98						
180		22x21	0.87							22x26	1.05						
		22x26	0.95							22x31	1.12						
220		22x26	1.10							22x31	1.36	25x26	1.36				
		22x26	1.22							22x31	1.60	25x31	1.72				
270		22x31	1.30	25x26	1.30												
330		22x31	1.55	25x26	1.55					22x36	1.87	25x31	1.87	30x26	1.87		
		22x31	1.57							22x41	2.04	25x36	2.04	30x31	2.04		
390		22x36	1.65	25x31	1.65												
		22x36	1.75							22x46	2.38	25x41	2.38	30x31	2.38		
470		22x41	1.85	25x36	1.85	30x26	1.85										
		22x41	2.10	25x36	2.10					22x51	2.74	25x46	2.81	30x36	2.81	35x27	2.81
560		22x46	2.20	25x41	2.20	30x31	2.20	35x27	2.20								
		22x46	2.25	25x41	2.25							25x51	3.11	30x41	3.11	35x32	3.11
680		22x51	2.30	25x46	2.30	30x36	2.30	35x27	2.30								
				25x46	2.54												
820		22x51	2.54	25x51	2.60	30x41	2.60	35x32	2.60					30x46	3.55	35x37	3.55
				25x51	3.07												
1000				25x56	3.20	30x46	3.20	35x37	3.20					30x51	4.00	35x42	4.00
1200						30x51	3.70	35x42	3.70							35x47	4.55
1500						30x56	3.85	35x47	3.85							35x52	5.34
1800								35x52	4.00								
2200								35x57	4.20								

φ DxL(mm)

Cap (μF)	φ D	350										400									
		22		25		30		35		40		22		25		30		35		40	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
47												22x21	0.42								
56																					
68												22x31	0.51								
82												22x26	0.83								
100		22x26	0.76									22x31	1.03	25x26	1.03						
120		22x31	0.89	25x26	0.89							22x31	1.07	25x26	1.07						
150		22x31	1.02	25x26	1.02							22x36	1.26	25x31	1.26	30x26	1.26				
		22x36	1.08	25x31	1.08																
180		22x41	1.15	25x36	1.15	30x26	1.15					22x41	1.46	25x36	1.46	30x31	1.46				
220		22x46	1.40	25x41	1.40	30x31	1.40	35x27	1.40			22x51	1.75	25x41	1.75	30x36	1.75				
270				25x46	1.63	30x36	1.63	35x27	1.75					25x46	1.96	30x36	1.96	35x32	1.96		
330				25x51	1.88	30x41	1.88	35x32	1.88					25x51	2.26	30x41	2.26	35x37	2.26		
390						30x46	2.12	35x37	2.12							30x46	2.50	35x42	2.50		
470						30x51	2.41	35x42	2.41									35x47	2.80	40x37	2.80
560								35x47	2.90									35x52	3.16	40x46	3.20
680								35x52	3.20											40x52	3.69
820																					
1000																					
1200																					
1500																					
1800																					

Cap (μF)	φ D	420										450									
		22		25		30		35		40		22		25		30		35		40	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
47		22x21	0.38									22x26	0.36								
56		22x26	0.42																		
68		22x31	0.49									22x31	0.50								
82		22x31	0.85	25x26	0.85							22x31	0.89	25x26	0.89						
100		22x36	1.03	25x26	1.03							22x36	1.03	25x31	1.03						
120		22x36	1.12	25x31	1.12							22x41	1.19	25x36	1.19						
150		22x41	1.32	25x36	1.32	30x31	1.32					22x51	1.39	25x41	1.39	30x31	1.39				
180				25x41	1.48	30x36	1.48					22x51	1.52	25x46	1.52	30x36	1.52				
220				25x46	1.75	30x41	1.75	35x32	1.75					25x51	1.76	30x41	1.76	35x37	1.76		
270				25x51	1.98	30x46	1.98	35x37	1.98							30x46	2.00	35x37	2.00		
330								35x42	2.27							30x46	2.29	35x37	2.29		
390								35x47	2.52	40x32	2.52							35x42	2.54	40x37	2.54
470										40x37	2.91							35x47	2.89	40x42	2.89
560										40x42	2.95									40x52	3.26
680										40x52	3.30										

Ripple Current (A, rms) at 85°C 120Hz

LS Series Snap-in Type 85°C Miniaturized

Features

- ◆ Directly mountable on printed circuit board, without holders.
- ◆ Aluminum case designed explosion-proof vent.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E138
- ◆ RoHS Compliant



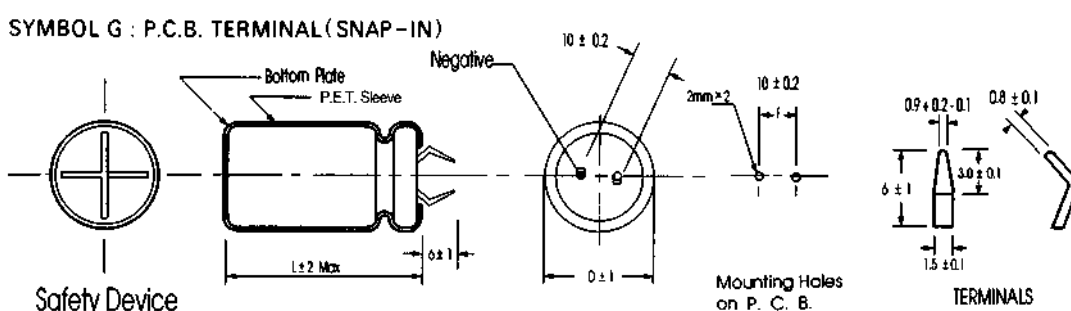
Specifications

Item	Performance Characteristics			
Operating Temperature Range	-25 to +85°C			
Rated Voltage Range	160 to 450 VDC			
Capacitance Range	47 to 2700 μ F			
Capacitance Tolerance	± 20% (120Hz, +20°C)			
Leakage Current (+20°C,max.)	I ≤ 0.02CV After 5 minutes with rated working voltage applied.			
Dissipation Factor (tan δ , at 20°C , 120Hz)	Less than the value under table (%)			
	μ F \ VDC	160~250	315~450	
	47~390	15	20	
	470~2700	15	20	
Low Temperature Characteristics (at 120Hz)	Impedance ratio max			
	Working voltage (VDC)	160	200~250	400~450
	Z -25°C / Z +20°C	4	4	8
Load Life	Test conditions Duration time :2000 Hrs Ambient temperature :+85°C Applied voltage :Rated DC working voltage After test requirement at +20°C Capacitance change :≤ ±20% of the initial measured value Dissipation factor :≤ 200% of the initial specified value Leakage current :≤ The initial specified value			
Shelf Life	Test conditions Duration time :1000 Hrs Ambient temperature :+85°C Applied voltage :None After test requirement at +20°C : Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.			

Multiplier for Ripple Current vs. Frequency

CAP(µF) \ Frequency(Hz)	50(60)	120	1K	10K	50K-100K
$10 < CAP \leq 100$	0.8	1	1.36	1.48	1.53
$100 < CAP \leq 1000$	0.8	1	1.25	1.35	1.38
$1000 < CAP$	0.8	1	1.17	1.25	1.28

Diagram of Dimensions:(unit:mm)



Case Size

φ D×L(mm)

Cap (μF)	φ D	WV		160								200							
				22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
150												22X21	0.96						
180		22X21	1.12									22X21	1.00						
220		22X21	1.35									22X21	1.36						
270		22X21	1.40									22X26	1.50						
330		22X26	1.44									22X26	1.70	25X26	1.70				
390		22X26	1.66	25X21	1.66							22X26	1.80	25X26	1.80				
470		22X31	1.76	25X26	1.76	30X21	1.76					22X31	2.23	25X26	2.23	30X21	2.23		
560		22X31	2.03	25X26	2.03	30X26	2.03	35X27	3.13			22X36	2.40	25X31	2.40	30X26	2.40		
						30X21	1.87												
680		22X36	2.36	25X31	2.36	30X26	2.36	35X32	3.44	22X41	2.55	25X36	2.55	30X26	2.55	35X32	3.52		
								35X27	3.20							35X27	3.29		
820		22X41	2.27	25X36	2.27	30X31	2.27	35X32	3.96			25X36	3.00	30X31	3.00	35X32	3.80		
						30X26	2.10	35X27	2.10	22X46	2.80					35X27	3.50		
1000				25X41	3.13	30X31	3.13	35X32	4.47			25X46	3.52	30X36	3.52	35X37	4.40		
		22X51	2.50	25X36	2.95			35X27								35X32	4.10		
1200				25X46	3.44	30X36	3.44	35X37	4.65					30X41	3.80	35X42	5.00		
								35X32	4.10							35X37	4.70		
1500						30X41	3.96	35X42	4.76					30X46	4.40	35X47	5.40		
								35X37	4.30							35X42	5.10		
1800						30X46	4.47	35X47	4.60					30X56	5.15	35X52	5.15		
2200						30X56	4.60	35X52	4.60							35X57	5.21		

Cap (μF)	φ D	WV		220								250							
				22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
120												22X21	0.85						
150		22X21	0.71									22X21	0.95						
180		22X21	0.90									22X26	1.12	25X21	1.12				
220		22X26	1.04									22X26	1.25	25X21	1.20				
270		22X26	1.23	25X26	1.32							22X26	1.5	25X26	1.25				
330		22X31	1.47	25X26	1.47							22X31	1.7	25X26	1.50	30X21	1.70		
				25X21	1.35														
390		22X36	1.56	25X31	1.58							22X36	1.92	25X31	1.70	30X26	1.92		
		22X31	1.46	25X26	1.46														
470		22X36	1.75	25X31	1.75	30X26	1.75					22X41	2.2	25X31	1.92	30X26	2.20		
560		22X41	2.09	25X36	2.09	30X31	2.09	35X27	2.09					25X36	2.20	30X31	2.52	35X27	2.52
				25X31	1.92	30X26	1.92												
680		22X46	2.18	25X41	2.18	30X31	2.18	35X27	2.18					25X41	2.52	30X36	2.80	35X27	2.80
				25X36	2.05														
820				25X46	2.34	30X36	2.34	35X32	2.34					25X46	2.80	30X41	3.15	35X32	3.15
		22X51	2.21	25X41	2.21														
1000				25X51	3.04	30X41	3.04	35X32	3.04							30X46	3.60	35X37	3.60
1200						30X51	3.51	35X37	3.51							30X56	3.9	35X42	3.90
				25X56	3.30	30X46	3.30												
1500						30X56	3.65	35X42	3.65									35X47	4.50
1800								35X52	3.80									35X63	4.60
2200								35X57	3.99									35X70	4.72

Ripple Current (A, rms) at 85°C 120Hz

φ D x L (mm)

Cap (μF)	φ D	WV	350								400							
			22		25		30		35		22		25		30		35	
			Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
47											22x21	0.42						
68											22x21	0.51						
82											22x26	0.83						
100			22x26	0.76							22x26	0.95	25x21	0.95				
120			22x26	0.89	25x26	0.89					22x26	1.07	25x21	1.07				
150			22x31	0.99	25x26	0.99	30x21	0.99			22x31	1.26	25x26	1.26	30x21	1.26		
180			22x36	1.15	25x31	1.15	30x26	1.15			22x36	1.46	25x31	1.46	30x26	1.46		
220			22x41	1.40	25x36	1.40	30x26	1.40	35x22	1.40	22x41	1.75	25x36	1.75	30x31	1.75		
270					25x41	1.63	30x31	1.63	35x27	1.63			25x41	1.85	30x31	1.85	35x27	1.85
330					25x46	1.88	30x36	1.88	35x27	1.88			25x46	2.10	30x36	2.10	35x32	2.10
390							30x36	2.12	35x32	2.12			25x41	1.98	30x31	1.98	35x27	1.98
470							30x41	2.41	35x37	2.41			25x51	2.20	30x36	2.20	35x32	2.20
560									35x42	2.80					30x41	2.45	35x37	2.45
680									35x47	3.20					30x46	2.90	35x42	2.90
															30x56	3.05		

Cap (μF)	φ D	WV	420								450									
			22		25		30		35		22		25		30		35		40	
			Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
47		22x21	0.38							22x21	0.36									
68		22x26	0.49							22x26	0.60									
82		22x31	0.85	25x26	0.85					22x26	0.89	25x21	0.89							
		22X26	0.79	25X21	0.79															
100		22x36	1.03	25x26	1.03					22x31	1.03	25x26	1.03							
		22X31	0.96																	
120		22x36	1.12	25x31	1.12					22x36	1.10	25x31	1.10							
		22X31	1.04	25X26	1.04															
150		22x41	1.32	25x36	1.32	30x31	1.32			22x41	1.30	25x36	1.30	30x26	1.30					
		22X36	1.34	25X31	1.34	30X26	1.34			22X36	1.13	25X31	1.13	30X21	1.13					
180				25x41	1.48	30x31	1.48			22x46	1.45	25x41	1.45	30x31	1.45					
		22X36	1.4	25X36	1.40	30X26	1.40			22X41	1.36	25X36	1.36	30X26	1.36					
220				25x46	1.75	30x36	1.75	35x32	1.75	22X51	1.65	25x46	1.65	30x36	1.65	35X27	1.65			
		22X41	1.65	25X41	1.65	30X31	1.65	35X27	1.65			25X41	1.55	30X31	1.55					
270				25x51	1.98	30x41	1.98	35x37	1.98			25x51	1.90	30x41	1.90	35X32	1.90			
		22X46	1.88	25X46	1.88	30X36	1.88	35X32	1.88			25X46	1.80	30X36	1.80					
330								35x42	2.27			25X56	2.20	30x41	2.20	35x37	2.20			
				25X51	2.15	30X41	2.15	35X37	2.15							35X32	2.10			
390								35x47	2.52							35x42	2.40	40x32	2.40	
				25X56	2.40	30X46	2.40	35X42	2.40							35X37	2.30			
470						30X51	2.50	35X47	2.50							35x47	2.75	40x37	2.75	
																35X42	2.60			
560						30X56	2.98	35X52	2.98							35x52	2.90	40x42	2.90	
																35X47	2.78			
680								35X57	3.20							35X57	3.0	40X47	3.0	
820																35X63	3.2	40X57	3.2	

Ripple Current (A, rms) at 85°C 120Hz

LU Series Snap-in Type 85°C

LP Long life LU

Features

- ◆ Load life 3000 hours 85°C
- ◆ RoHS compliant
- ◆ For detail specifications, please refer to Engineering Bulletin No. E180

Specifications

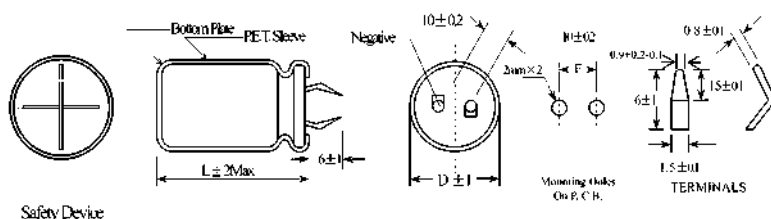


Item	Performance Characteristics						
Operating Temperature Range	-40 to +85℃				-25 to +85℃		
Capacitance Range	820 to 47000uF				56 to 2700uF		
Rated Voltage Range	16 to 100VDC				160 to 450VDC		
Capacitance Tolerance	±20%(120Hz,+20℃)				±20%(120Hz,+20℃)		
Leakage Current (+20℃,max.)	I ≤ 3 √CV (μA) (After 5 minute with rated working voltage applied.) I= Leakage Current(μA) C= Rated Capacitance V= Rated voltage(V)						
Dissipation Factor (tan δ) (+20℃, at 120Hz)	Less than the value under table (%)						
	Cap(μ F) / W.V.(V)	16	25~35	50~63	80~100	160~250	315~450
	56~390	-	-	-		15	20
	470~3900	25	20	20	20	15	20
	4700~8200	35	30	30	25	-	-
	10000~22000	40	35	30	25	-	-
	27000~47000	45	40	35		-	-
Low Temperature Characteristics (120Hz)	Impedance ratio max						
	Working voltage(VDC)	16	25~100	160~250	315~450		
	Z-25℃ / Z+20℃	5	4	4	8		
	Z-40℃/Z+20℃	20	20	-	-		
Load Life	Test condition Duration time :3000Hrs Ambient temperature :+85℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change : ≤ ±20% of the initial measured value Dissipation factor : ≤200% of the initial specified value Leakage current : ≤The initial specified value						
Shelf Life	Test condition Duration time :1000Hrs Ambient temperature :+85℃ Applied voltage :None After test requirement at +20℃:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.						

Multiplier for Ripple Current vs. Frequency

CAP (μF) \ Hz	50(60)	120	1K	10K	50K-100K
10<CAP≤100	0.8	1	1.36	1.48	1.53
100<CAP≤1000	0.8	1	1.25	1.35	1.38
1000<CAP	0.8	1	1.17	1.25	1.28

Diagram of Dimensions:(unit:mm)



Case Size

φ DxL(mm)

WV (V) Cap(uF)	16		25		35		50		63	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
1800									22x26	1.90
2200							22x26	1.93	22x31	2.00
2700									25x26	35.00
3300							22x31	2.21	22x36	2.50
3900									25x31	2.52
4700							22x31	3.41	22x36	2.72
5600							25x26	2.38	25x31	2.74
6800									30x26	2.84
8200					22x26	2.22	22x36	2.72	22x41	3.09
10000							25x31	2.68	25x36	3.13
12000									30x31	3.09
15000					22x31	2.46	22x41	3.02	22x51	3.69
18000					25x26	2.43	25x31	3.07	25x41	3.59
22000							30x26	3.01	30x31	3.54
27000			22x26	2.31	22x36	2.79	22x46	3.43	25x46	4.01
33000					25x31	2.75	25x36	3.47	30x36	4.00
39000							30x31	3.43	35x32	3.75
47000			22x31	2.56	22x41	2.97	22x51	3.94	25x50	4.52
56000			25x26	2.47	25x31	2.89	25x41	3.87	30x41	4.55
68000					30x26	3.09	30x36	3.93	35x32	4.44
82000	22x26	2.56	22x36	2.86	22x46	3.47	25x46	4.44	30x46	5.12
100000			25x26	2.78	25x36	3.33	30x36	4.47	35x37	5.05
120000					30x31	3.29	35x32	4.41		
150000	22x31	2.98	22x36	3.31	22x51	3.75	30x41	5.08	30x51	5.78
180000			25x31	3.16	25x41	3.65	35x37	4.92	35x42	5.75
220000					30x31	3.61				
270000	22x31	3.13	22x41	3.77	25x46	4.15	30x51	5.72	35x47	6.47
330000	25x26	3.01	25x36	3.63	30x36	4.14	35x42	5.69		
390000			30x26	3.8	35x32	4.27				
470000	22x36	3.69	22x51	4.21	25x51	4.8	35x47	6.56		
560000	25x31	3.64	25x41	4.1	30x41	4.8				
680000	30x26	3.73	30x31	4	35x37	4.95				
820000	22x41	3.98	25x46	4.68	30x46	5.3				
1000000	25x36	3.98	30x36	4.66	35x42	5.71				
1200000	30x31	3.88	35x32	4.68						
1500000	22x51	4.52	25x51	5.19	35x47	6.38				
1800000	25x41	4.44	30x41	5.33						
2200000	30x31	4.38	35x37	5.26						
2700000	25x46	4.98	30x46	6.02	35x52	6.9				
3300000	30x36	4.95	35x42	6.02						
3900000	35x32	4.82								
4700000	25x51	5.49	35x47	6.75						
5600000	30x41	5.60								
6800000	35x32	5.46								
8200000	30x46	6.21	35x52	7.56						
10000000	35x37	6.12								
12000000	30x51	6.93								
15000000	35x42	6.89								

Ripple Current(A rms) at 85°C /120Hz

φ DxL(mm)

WV (V) Cap(uF)	80		100		160		200		250	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
220									22x26	1.26
270							22x26	1.39	22x26	1.50
330							22x26	1.51	22x31	1.66
									25x26	1.61
390					22x26	1.63	22x31	1.73	22x36	1.88
							25x26	1.71	25x31	1.88
470					22x31	1.9	22x31	1.93	22x36	2.10
					25x26	1.86	25x26	1.95	25x36	2.15
									30x26	2.04
560					22x31	2.15	22x36	2.18	22x41	2.48
					25x26	2.15	25x31	2.15	25x36	2.35
							30x26	2.15	30x26	2.35
680					22x36	2.35	22x41	2.48	25x41	2.67
					25x31	2.33	25x31	2.48	30x31	2.71
					30x26	2.33	30x26	2.48		
820			22x26	1.86	22x41	2.68	22x46	2.81	25x46	3.01
					25x31	2.65	25x36	2.78	30x35	2.98
					30x26	2.64	30x31	2.80	35x32	2.96
1000			22x31	2.02	22x46	3.02	22x51	3.28	30x41	3.56
					25x36	3	25x41	3.28	35x37	3.48
					30x31	2.96	30x36	3.15		
1200	22x26	1.77	22x31	2.12	25x41	3.43	30x36	3.61	30x46	3.99
			25x26	2.11	30x31	3.41	35x32	3.57	35x37	3.84
					35x27	3.4				
1500	22x31	2.01	22x36	2.45	25x51	3.96	30x46	4.13	35x42	4.33
			25x31	2.47	30x36	3.96	35x37	4.06		
			30x26	2.56	35x32	3.94				
1800	22x31	2.11	22x41	2.77	30x41	4.31	30x51	4.60	35x52	4.54
	25x26	2.26	25x36	2.81	35x37	4.28	35x42	4.59		
			30x26	2.65						
2200	22x36	2.53	22x46	3.15	30x51	4.96	35x47	5.25		
	25x31	2.53	25x41	3.21	35x42	4.96				
	30x26	2.56	30x31	3.17						
2700	22x41	2.93	25x46	3.66	35x47	5.57				
	25x36	2.93	30x36	3.65						
	30x31	2.91	35x32	3.77						
3300	22x46	3.23	25x51	4.15						
	25x41	3.29	30x41	4.18						
	30x31	3.25	35x37	4.07						
3900	22x51	3.62	30x46	4.67						
	25x46	3.71	35x37	4.61						
	30x36	3.70								
4700	25x51	4.28	30x51	5.26						
	30x41	4.23	35x42	5.23						
	35x32	4.12								
5600	30x46	4.70	35x47	5.88						
	35x37	4.64								
6800	30x51	5.27	35x52	6.01						
	35x42	5.24								

Ripple Current(A rms) at 85°C /120Hz

WV (V) Cap(uF)		250		350		400		450	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
68								22x26	0.71
82						22x26	0.84	22x26	0.86
100						22x26	0.95	22x31	0.95
								25x26	0.97
120				22x26	1.04	22x31	1.09	22x36	1.07
						25x26	1.13	25x31	1.09
								30x26	1.12
150				22x31	1.2	22x36	1.24	22x41	1.18
				25x26	1.22	25x31	1.27	25x31	1.25
								30x26	1.29
180				22x31	1.34	22x41	1.41	22x46	1.32
				25x26	1.37	25x31	1.44	25x36	1.40
						30x26	1.52	30x31	1.45
220	22x26	1.10		22x36	1.47	22x46	1.58	25x41	1.59
				25x31	1.53	25x36	1.64	30x31	1.64
				30x26	1.54	30x31	1.66	35x27	1.59
270	22x36	1.18		22x41	1.7	25x41	1.79	30x36	1.89
	25x26	1.18		25x36	1.73	30x31	1.82	35x32	1.90
				30x26	1.8				
330	22x41	1.30		22x46	1.87	25x46	2	30x41	2.12
	25x31	1.30		25x36	1.97	30x36	2.05	35x37	2.15
	30x26	1.30		30x31	2.03	35x32	2.05		
390	22x46	1.49		25x41	2.14	30x41	2.26	30x46	2.35
	25x36	1.49		30x36	2.23	35x37	2.28	35x42	2.38
	30x26	1.49		35x32	2.3				
470	22x51	1.65		25x51	2.55	30x46	2.51	35x47	2.68
	25x41	1.65		30x36	2.53	35x37	2.51		
	30x31	1.65		35x32	2.55				
	35x27	1.65							
560	25x46	1.80		30x41	2.73	30x51	2.85	35x52	2.88
	30x36	1.80		35x37	2.75	35x42	2.85		
	35x27	1.80							
680	25x51	2.00		30x51	3.15	35x52	3.1		
	30x41	2.00		35x42	3.15				
	35x32	2.00							
820	30x46	2.30		35x47	3.47				
	35x37	2.30							
1000	30x51	2.47		35x52	3.6				
	35x42	2.47							
1200	35x47	2.60							
1500	35x52	3.00							

Ripple Current(A rms) at 85°C /120Hz

HP Series Snap-in Type 105°C

Features

- ◆ Highly reliable capacitors that with high ripple current.
- ◆ Terminal spacing fixed at 10 mm for printed circuit board plug in.
- ◆ Aluminum case designed explosion-proof vent.
- ◆ Best for switching power supplies.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E107
- ◆ RoHS Compliant



Specifications

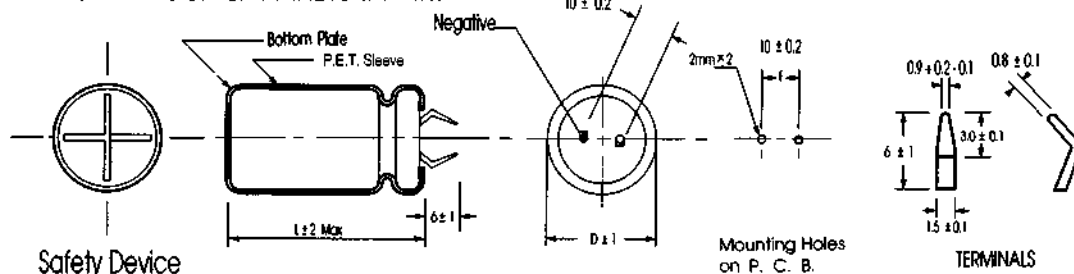
Item	Performance Characteristics										
Operating Temperature Range	-40 to +105℃							-25 to +105℃			
Rated Voltage Range	10 to 100 VDC							160 to 450 VDC			
Capacitance Range	330 to 68000 μ F							33 to 2200 μ F			
Capacitance Tolerance	± 20% (120Hz, +20℃)										
Leakage Current (+20℃,max.)	I ≤ 0.02CV After 5 minutes with rated working voltage applied.										
Dissipation Factor (tan δ , at 20℃ , 120Hz)	Less than the value under table (%)										
	μ F \ VDC	10~16	25~35	50~63	80~100	160~250	315~450				
	47~390	—	—	—	15	15	20				
	470~3900	25	20	20	20	15	20				
	4700~8200	35	30	30	25	—	—				
	10000~22000	40	35	30	—	—	—				
	27000~47000	45	40	35	—	—	—				
	56000~68000	50	45	—	—	—	—				
Low Temperature Characteristics (at 120Hz)	Impedance ratio max.										
	Rated voltage(V)	10	16	25	35	50	63	100	160	200~250	400~450
	Z - 25℃ / Z+20℃	5	5	4	4	4	4	4	4	4	8
	Z - 40℃ / Z+20℃	15	15	15	12	12	12	12	—	—	—
Load Life	Test conditions										
	Duration time	:2000 Hrs									
	Ambient temperature	:+105℃									
	Applied voltage	:Rated DC working voltage									
	After test requirement at +20℃										
	Capacitance change	:≤ ±20% of the initial measured value									
	Dissipation factor	:≤ 200% of the initial specified value									
Leakage current	:≤ The initial specified value										
Shelf Life	Test conditions										
	Duration time	:1000 Hrs									
	Ambient temperature	:+105℃									
	Applied voltage	:None									
	After test requirement at +20℃ : Same limits as Load life.										
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.										

Multiplier for Ripple Current vs. Frequency

CAP(μ F) \ Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
10 < CAP $\leq$ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP $\leq$ 1000	0.8	1	1.16	1.25	1.35	1.38
1000 < CAP	0.8	1	1.11	1.17	1.25	1.28

Diagram of Dimensions:(unit:mm)

SYMBOL G : P.C.B. TERMINAL (SNAP-IN)



Case Size

φ D x L (mm)

Cap (μF)	φ D	10								16							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
3300		22x26	1.24							22x26	1.17						
4700										22x26	1.53	25x26	1.55				
										22x31	1.65						
6800		22x26	1.56	25x26	1.56					22x31	2.02	25x26	2.02	30x26	2.02		
8200		22x26	2.04	25x26	2.04					22x31	2.20						
10000		22x31	2.20	25x26	2.20	30x26	2.20			22x31	2.79	25x26	2.79	30x26	2.81		
										22x36	2.97	25x31	2.97				
12000		22x31	2.34							22x36	3.06	25x31	3.06	30x26	3.06		
		22x36	2.49	25x26	2.40												
15000		22x36	2.76	25x26	2.60	30x26	2.80			22x41	3.24	25x36	3.24	30x26	3.24	35x32	3.24
				25x31	2.76							25x41	3.42				
18000		22x36	2.94	25x31	2.94					22x51	3.51	25x46	3.51	30x36	3.51	35x32	3.54
22000		22x41	3.12	25x36	3.12	30x26	3.08	35x27	3.20			25x46	4.08	30x36	4.08	35x32	4.08
						30x31	3.30					25x51	4.25				
27000		22x46	3.48	25x36	3.48	30x31	3.48	35x27	3.48			25x51	4.30	30x41	4.30	35x32	4.30
				25x46	3.72	30x36	3.72	35x27	3.65					30x46	4.83	35x37	4.83
33000								35x32	3.85								
39000				25x51	4.10	30x41	4.10	35x32	4.10					30x51	5.78	35x42	5.78
47000						30x46	4.38	35x37	4.38							35x47	6.32
56000						30x51	4.64	35x42	4.64							35x52	7.05
68000								35x52	4.80								

Cap (μF)	φ D	25								35							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
1500										22x26	1.26						
2200		22x26	1.03							22x26	1.35	25x26	1.45				
										22x31	1.45						
3300		22x26	1.48	25x26	1.48					22x26	1.80	25x26	1.90	30x26	1.92		
										22x31	1.90						
3900										22x31	2.23						
4700		22x26	1.88	25x26	1.90	30x26	1.92			22x36	2.42	25x26	2.30	30x26	2.54		
		22x31	1.92									25x31	2.44				
5600		22x31	2.25							22x36	2.89	25x31	2.89	30x26	2.89		
6800		22x31	2.60	25x26	2.60	30x26	2.60			22x41	3.24	25x36	3.24	30x26	3.21	35x27	3.24
														30x31	3.43		
8200		22x36	3.14	25x31	3.14	30x26	3.14			22x51	3.57	25x41	3.57	30x31	3.57	35x27	3.57
10000		22x41	3.50	25x36	3.50	30x31	3.50	35x27	3.50			25x46	3.96	30x36	3.96	35x27	3.75
																35x32	4.00
12000		22x46	4.02	25x41	4.02	30x31	4.02	35x27	4.02			25x51	4.21	30x41	4.21	35x32	4.21
15000				25x46	4.58	30x36	4.58	35x32	4.58					30x46	4.69	35x37	4.69
				25x51	4.82	30x41	4.82	35x32	4.79							35x42	5.07
18000								35x37	4.82								
22000						30x46	5.12	35x37	5.12							35x52	5.50
								35x42	5.30								
27000								35x47	5.47								
33000								35x52	6.09								

Cap (μF)	φ D	50								63							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
680										22x26	0.70						
1000		22x26	0.84							22x26	0.85	25x26	0.85				
1200										22x26	0.98						
1500		22x26	1.10	25x26	1.12					22x26	1.10	25x26	1.12	30x26	1.14		
		22x31	1.12							22x31	1.15						
1800		22x26	1.50							22x31	1.40	25x26	1.40				
		22x331	1.62														
2200		22x31	1.65	25x26	1.65	30x26	1.65			22x36	1.65	25x31	1.65	30x26	1.65		
		22x31	1.85	25x26	1.85					22x41	2.07	25x36	2.07	30x26	2.07		
2700		22x36	1.97	25x31	1.98												
3300		22x36	2.24	25x31	2.24	30x26	2.24			22x46	2.46	25x36	2.40	30x31	2.48	35x27	2.48
										22x51	2.55	25x41	2.54				
3900		22x41	2.54	25x36	2.54	30x26	2.49					25x41	2.92	30x36	3.05	35x27	3.05
						30x31	2.66					25x46	3.07				
4700		22x46	2.95	25x36	2.80	30x31	2.95	35x27	2.95			25x51	3.43	30x41	3.43	35x32	3.43
				25x41	3.01												
5600				25x41	3.02	30x36	3.14	35x27	3.10					30x46	3.86	35x37	3.86
				25x46	3.15	30x41	3.20	35x32	3.20								
6800				25x46	3.23	30x41	3.26	35x32	3.26					30x51	4.64	35x42	4.64
				25x51	3.35												
8200						30x46	3.58	35x37	3.58							35x47	5.05
10000						30x51	4.11	35x42	4.11							35x52	5.75
12000								35x47	4.62								
15000								35x52	5.05								

φ DxDL(mm)

Cap (μF)	φ D	80								100							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
330										22x26	0.54						
470		22x26	0.63							22x26	0.79	25x26	0.81				
										22x31	0.85						
560		22x26	0.70							22x26	0.90	25x26	0.95				
		22x31	0.75							22x31	0.97						
680		22x26	0.81	25x26	0.86					22x31	1.02	25x26	1.02	30x26	1.14		
		22x31	0.87														
820		22x31	1.02	25x26	1.02					22x31	1.26	25x26	1.26	30x26	1.32		
				25x31	1.09												
1000		22x31	1.11	25x31	1.16	30x26	1.16			22x36	1.38	25x31	1.38	30x26	1.38		
		22x36	1.18														
1200		22x36	1.46	25x31	1.46	30x26	1.46			22x41	1.65	25x36	1.65	30x31	1.65		
						30x31	1.56										
1500		22x41	1.74	25x36	1.74	30x26	1.70			22x46	1.83	25x41	1.83	30x31	1.83	35x27	1.83
						30x31	1.82										
1800		22x46	1.95	25x36	1.89	30x31	1.95	35x27	1.95			25x41	2.52	30x36	2.52	35x32	2.52
				25x41	1.99												
2200		22x51	2.25	25x41	2.20	30x31	2.20	35x27	2.25			25x51	3.03	30x41	3.03	35x32	3.03
				25x46	2.31	30x36	2.31	35x32	2.40								
2700				25x46	2.58	30x36	2.58	35x32	2.68					30x46	4.10	35x37	4.10
				25x51	2.70	30x41	2.72	35x37	2.85								
3300				25x51	3.30	30x41	3.30	35x37	3.30					30x56	4.59	35x47	4.59
				25x56	3.45	30x46	3.50	35x42	3.50								
3900						30x46	3.73	35x37	3.73							35x47	4.98
						30x51	3.90	35x42	3.93								
4700						30x51	4.29	35x42	4.29							35x52	5.43
5600								35x47	5.10								
6800								35x52	5.66								

Cap (μF)	φ D	160								200							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
100										22x26	0.38						
150		22x26	0.37							22x26	0.54	25x26	0.54				
220		22x26	0.42							22x31	0.92	25x26	0.92	30x26	0.92		
270		22x26	0.74							22x31	1.03	25x26	1.03	30x26	1.05		
330		22x31	0.98	25x26	0.98	30x26	1.00			22x36	1.21	25x31	1.21	30x26	1.21		
		22x31	1.09	25x31	1.10	30x26	1.10			22x36	1.33	25x31	1.34	30x31	1.45		
390		22x36	1.15							22x41	1.41	25x36	1.43				
470		22x36	1.21	25x31	1.21	30x26	1.21			22x41	1.57	25x36	1.59	30x31	1.65	35x27	1.65
										22x46	1.65	25x41	1.68				
560		22x41	1.40	25x36	1.40	30x31	1.40	35x27	1.40	22x46	1.81	25x41	1.85	30x31	1.85	35x27	1.85
										22x51	1.90	25x46	1.94	30x36	1.94		
680		22x46	1.64	25x36	1.58	30x31	1.65	35x27	1.71	22x51	2.04	25x46	2.07	30x31	2.04	35x32	2.17
				25x41	1.67	30x36	1.75	35x32	1.80	22x56	2.12	25x51	2.17	30x36	2.17		
820				25x41	1.76	30x36	1.85	35x32	1.85			25x51	2.30	30x36	2.30	35x37	2.31
				25x46	1.85							25x56	2.40	30x41	2.40		
1000				25x51	2.15	30x41	2.15	35x32	2.15					30x41	2.62	35x37	2.62
														30x46	2.75	35x42	2.75
1200				25x56	2.46	30x46	2.46	35x37	2.46					30x51	3.00	35x42	3.00
1500						30x51	2.80	35x42	2.80							35x47	3.28
1800																35x52	3.46
						30x51	3.13	35x42	3.13							35x52	4.01
2200								35x52	3.26								
								35x57	3.39								

Cap (μF)	φ D	220								250							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
68										22x26	0.27						
100										22x31	0.44	25x26	0.44				
150		22x26	0.50	25x26	0.50					22x31	0.60	25x26	0.60	30x26	0.60		
180		22x26	0.60	25x26	0.60					22x31	0.69	25x26	0.69	30x26	0.69		
220		22x31	0.85	25x26	0.85	30x26	0.85			22x36	1.00	25x31	1.00	30x26	1.00		
270		22x31	1.05	25x26	1.05	30x26	1.05			22x41	1.16	25x36	1.16	30x31	1.16		
330		22x36	1.15	25x31	1.15	30x26	1.15			22x46	1.28	25x36	1.28	30x31	1.28	35x27	1.28
		22x41	1.25	25x31	1.20	30x26	1.25			22x46	1.48	25x36	1.48	30x31	1.48	35x27	1.48
390				25x36	1.28	30x31	1.33										
470		22x46	1.35	25x36	1.31	30x31	1.35	35x27	1.35			25x41	1.76	30x36	1.76	35x32	1.76
				25x41	1.38							25x46	1.85				
560		22x51	1.60	25x46	1.60	30x36	1.60	35x27	1.60			25x51	1.93	30x41	1.93	35x32	1.93
680		22x56	1.70	25x51	1.75	30x41	1.75	35x32	1.75					30x46	2.22	35x37	2.22
820				25x56	2.00	30x46	2.00	35x37	2.00					30x51	2.48	35x42	2.48
1000						30x51	2.30	35x42	2.30							35x47	2.80
1200								35x47	2.35							35x52	3.17
1500								35x52	2.40								
1800								35x56	2.50								

φ DxL (mm)

Cap (μF)	φ D	400								420							
		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
33		22x26	0.39							22x26	0.32						
47		22x26	0.56	25x26	0.56					22x26	0.45	25x26	0.45				
56		22x26	0.63	25x26	0.68					22x26	0.52	25x26	0.52				
		22x31	0.68														
68		22x31	0.72	25x26	0.72	30x26	0.72			22x31	0.64	25x26	0.64	30x26	0.64		
82		22x31	0.77	25x31	0.82	30x26	0.85			22x31	0.75	25x31	0.75	30x26	0.75		
		22x36	0.82														
100		22x36	0.82	25x31	0.82	30x26	0.82			22x36	0.78	25x31	0.78	30x26	0.78		
120		22x36	0.90	25x31	0.90	30x26	0.90			22x36	0.84	25x36	1.84	30x26	0.84		
150		22x41	0.98	25x36	0.98	30x31	0.95	35x27	0.95	22x41	0.97	25x36	0.97	30x31	0.97		
180		22x46	1.14	25x41	1.14	30x36	1.14	35x32	1.14	22x46	1.02	25x41	1.02	30x36	1.02	35x27	1.02
220				25x46	1.21	30x41	1.21	35x32	1.21			25x46	1.22	30x41	1.22	35x32	1.22
270						30x46	1.40	35x37	1.40					30x46	1.5	35x37	1.5
330						30x51	1.57	35x42	1.57					30x51	1.68	35x42	1.68
390								35x42	1.71							35x47	1.76
								35x47	1.79								
470								35x47	1.94							35x52	1.87
								35x52	2.03								
560								35x52	2.23								

Cap (μF)	φ D	450							
		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
33		22x26	0.24						
47		22x31	0.35	25x26	0.35				
56		22x31	0.41	25x26	0.41				
68		22x36	0.55	25x31	0.55	30x26	0.55		
82		22x36	0.64	25x31	0.64	30x26	0.64		
100		22x41	0.74	25x31	0.74	30x31	0.74		
120		22x46	0.82	25x36	0.82	30x31	0.82		
150		22x51	0.96	25x41	0.96	30x36	0.96	35x27	0.96
180				25x46	1.14	30x36	1.10	35x32	1.14
						30x41	1.16		
220						30x41	1.24	35x37	1.24
270						30x51	1.48	35x42	1.48
330								35x47	1.64
390								35x52	1.86
470									
560									

Ripple Current (A, rms) at 105°C 120Hz

HS Series Snap-in Type 105°C Miniaturized

Features

- ◆ Highly reliable capacitors that withstand ripple current.
- ◆ Terminal spacing fixed at 10 mm for printed circuit board plug in.
- ◆ Aluminum case designed explosion-proof vent.
- ◆ Best for switching power supplies.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E139
- ◆ RoHS Compliant



Specifications

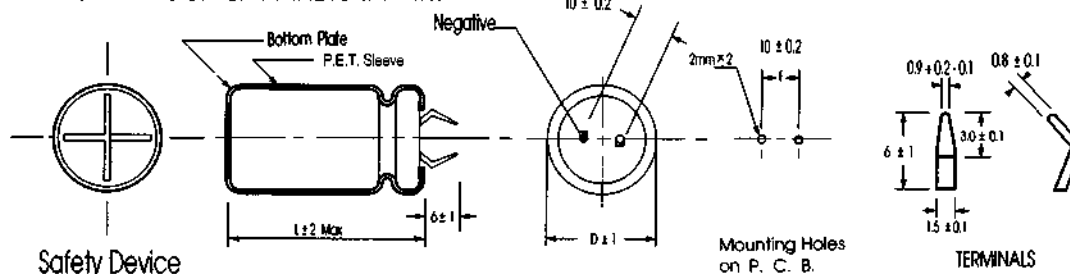
Item	Performance Characteristics			
Operating Temperature Range	-25 to +105℃			
Rated Voltage Range	160 to 450 V · DC			
Capacitance Range	33 to 2700 μ F			
Capacitance Tolerance	±20% (120Hz, +20℃)			
Leakage Current (+20℃,max.)	I ≤ 0.02CV After 5 minutes with rated working voltage applied.			
Dissipation Factor (tan δ , at 20℃ , 120Hz)	Less than the value under table (%)			
	μ F \ VDC	160~250	315~450	
	47~390	15	20	
	470~2700	15	20	
Low Temperature Characteristics (at 120Hz)	Impedance ratio Max			
	Working voltage (VDC)	160	200~250	400~450
	Z -25℃ / Z +20℃	4	4	8
Load Life	Test conditions Duration time :2000 Hrs Ambient temperature :+105℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change :≦ ±20% of the initial measured value Dissipation factor :≦ 200% of the initial specified value Leakage current :≦ The initial specified value			
Shelf Life	Test conditions Duration time :1000 Hrs Ambient temperature :+105℃ Applied voltage :None After test requirement at +20℃ : Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.			

Multiplier for Ripple Current vs. Frequency

CAP (µ F) \ Frequency (Hz)	50(60)	120	400	1K	10K	50K-100K
$10 < CAP \leq 100$	0.8	1	1.23	1.36	1.48	1.53
$100 < CAP \leq 1000$	0.8	1	1.16	1.25	1.35	1.38
$1000 < CAP$	0.8	1	1.11	1.17	1.25	1.28

Diagram of Dimensions:(unit:mm)

SYMBOL G : P.C.B. TERMINAL (SNAP-IN)



Case Size

φ D x L (mm)

Cap (μF)	φ D	WV		160								200							
				22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
100												22X21	0.38						
150		22X21	0.37									22X21	0.54	25X21	0.54				
220		22X21	0.65									22X26	0.92	25X21	0.92	30X21	0.92		
270		22X21	0.74									22X26	1.03	25X21	1.03	30X21	1.03		
330				25X21	0.98	30X21	0.98					22X31	1.21	25X26	1.21	30X21	1.21		
390												22X26	1.10	25X21	1.10				
470		22X26	1.10	25X26	1.10	30X21	1.10					22X31	1.39	25X26	1.39	30X26	1.39		
560				25X21	1.00											30X21	1.27		
680		22X31	1.21	25X26	1.21	30X21	1.21					22X36	1.45	25X31	1.45	30X26	1.45	35X22	1.45
820												22X31	1.35	25X26	1.35				
1000		22X36	1.40	25X31	1.40	30X26	1.40					22X41	1.60	25X36	1.60	30X26	1.60	35X22	1.60
1200		22X31	1.30	25X26	1.30							22X36	1.50	25X31	1.50				
1500		22X41	1.64	25X31	1.64	30X26	1.64	35X27	1.64	22X46	1.80	25X36	1.80	30X31	1.80	35X27	1.80		
1800		22X36	1.53							22X41	1.70								
2200				25X36	1.85	30X31	1.85	35X27	1.85			25X41	2.00	30X31	2.00	35X32	2.00		
2700		22X51	1.70							22X51	1.88	25X36	1.88			35X27	1.88		
3300				25X46	2.15	30X31	2.15	35X27	2.15			25X51	2.30	30X36	2.30	35X32	2.30		
4000		22X56	2.03	25X41	2.03														
4700				25X51	2.46	30X41	2.46	35X32	2.46							30X41	2.70	35X37	2.70
5600						30X46	2.46	35X37	2.46							30X51	3.10	35X42	3.10
6800						30X51	3.13	35X42	3.13							30X70	3.75	35X47	3.75
8200						30X70	3.39	35X47	3.39									35X57	3.82
10000								35X52	3.90									35X70	4.00

Cap (μF)	φ D	WV		220								250							
				22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
68												22X21	0.27						
82												22X21	0.34						
100												22X21	0.44	25X21	0.44				
120												22X26	0.48	25X21	0.48				
150		22X21	0.57									22X26	0.60	25X21	0.60	30X21	0.60		
180		22X26	0.61	25X26	0.61							22X26	0.69	25X26	0.69	30X21	0.69		
220				25X21	0.55									25X21	0.63				
270		22X26	0.81	25X26	0.81							22X31	1.00	25X26	1.00	30X21	1.00		
330												22X26	0.92	25X21	0.92				
390		22X31	1.01	25X26	1.01	30X26	1.01					22X36	1.16	25X31	1.16	30X26	1.16		
470		22X26	0.93			30X21	0.93					22X31	1.05	25X26	1.05	30X21	1.05		
560		22X31	1.09	25X26	1.09	30X26	1.09					22X41	1.28	25X31	1.28	30X26	1.28		
680												22X36	1.20	25X26	1.20				
820		22X36	1.18	25X31	1.18	30X26	1.18					22X41	1.48	25X31	1.48	30X31	1.48		
1000				25X26	1.08							22X36	1.38			30X26	1.38		
1200		22X41	1.28	25X36	1.28	30X26	1.28					22X46	1.65	25X36	1.65	30X31	1.65	35X27	1.65
1500		22X36	1.2	25X31	1.2							22X41	1.55						
1800		22X46	1.52	25X41	1.52	30X31	1.52	35X27	1.52					25X46	1.85	30X36	1.85	35X27	1.85
2200		22X41	1.4	25X36	1.4	30X26	1.4					22X51	1.75	25X41	1.75	30X31	1.75		
2700		22X51	1.66	25X46	1.66	30X36	1.66	35X27	1.66							30X41	2.00	35X32	2.00
3300		22X46	1.56	25X41	1.56	30X31	1.56							25X51	1.85				
4000				25X51	1.9	30X41	1.9	35X32	1.9							30X46	2.30	35X37	2.30
4700				25X46	1.8	30X36	1.8												
5600						30X46	2.28	35X37	2.28							30X61	2.60	35X42	2.60
6800				25X56	2.15	30X41	2.15												
8200						30X51	2.32	35X42	2.32									35X47	2.85
10000						30X70	2.35	35X47	2.35									35X63	2.92
12000								35X52	2.40									35X70	2.95
15000								35X63	2.45										

Ripple Current (A , rms) at 105°C 120Hz

φ DxL(mm)

Cap (μF)	φ D	350																400							
		22		25		30		35		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
33										22X21	0.39														
47										22X21	0.56	25X21	0.56												
56										22X21	0.60	25X21	0.60												
68		22X21	0.45							22X26	0.65	25X21	0.65												
82		22X26	0.53							22X26	0.75	25X26	0.75												
												25X21	0.71												
100		22X26	0.65							22X31	0.78	25X26	0.78	30X21	0.78										
										22X26	0.72														
120		22X31	0.74	25X26	0.74					22X31	0.85	25X26	0.85	30X21	0.85										
		22X26	0.68							22X26	0.79														
150		22X36	0.80	25X31	0.80					22X36	0.98	25X31	0.98	30X26	0.98										
		22X31	0.74	25X26	0.74					22X31	0.91	25X26	0.91												
180		22X41	0.95	25X31	0.95	30X26	0.95			22X41	1.14	25X36	1.14	30X31	1.14	35X27	1.14								
		22X36	0.89	25X26	0.89					22X36	1.05	25X31	1.05	30X26	1.05										
220		22X46	1.10	25X36	1.10	30X31	1.10			22X51	1.21	25X41	1.21	30X36	1.21	35X27	1.21								
		22X41	1.00	25X31	1.00	30X26	1.00			22X46	1.10	25X36	1.10	30X31	1.10										
270		22X51	1.20	25X41	1.20	30X31	1.20	35X27	1.20	22X51	1.40	25X46	1.40	30X41	1.40	35X32	1.40								
		22X46	1.10	25X36	1.10	30X26	1.10			22X46	1.30	25X41	1.30	30X36	1.30	35X27	1.30								
330				25X46	1.30	30X36	1.30	35X32	1.30					30X41	1.57	35X37	1.57								
		22X51	1.20	25X41	1.20	30X31	1.20	35X27	1.20	22X51	1.40	25X46	1.40	30X36	1.40	35X32	1.40								
390						30X41	1.45	35X37	1.45							35X37	1.74								
		22X56	1.30	25X46	1.30	30X36	1.30	35X32	1.30	22X56	1.60	25X51	1.60	30X41	1.60	35X32	1.60								
470						30X46	1.70	35X37	1.70							35X42	1.98								
				25X51	1.60	30X41	1.60	35X32	1.60							30X46	1.80								
560								35X42	1.85							30X56	2.23	35X47	2.23						
						30X46	1.70	35X37	1.70								35X42	2.10							
680								35X47	1.98								35X52	2.40							
								35X42	1.80																
820								35X52	1.82																
1000								35X63	1.84																

Cap (μF)	φ D	420																450							
		22		25		30		35		22		25		30		35		22		25		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
33		22X21	0.34							22X21	0.24							22X21	0.24						
47		22X21	0.45	25X21	0.45					22X26	0.35	25X21	0.35					22X26	0.35	25X21	0.41				
56		22X21	0.5	25X21	0.5	30X21	0.5			22X26	0.41	25X21	0.41					22X31	0.55	25X26	0.55	30X21	0.55		
68		22X26	0.58	25X21	0.58	30X21	0.58			22X26	0.51	25X21	0.51					22X26	0.51	25X21	0.51				
										22X31	0.64	25X26	0.64	30X21	0.64										
82		22X26	0.68	25X26	0.68	30X21	0.68																		
				25X21	0.62																				
100		22X31	0.75	25X31	0.75	30X26	0.75			22X36	0.74	25X26	0.74	30X26	0.74			22X36	0.74	25X26	0.74	30X26	0.74		
				25X26	0.69	30X21	0.69			22X31	0.69			30X21	0.69			22X31	0.69			30X21	0.69		
120		22X36	0.83	25X31	0.83	30X26	0.83			22X41	0.82	25X31	0.82	30X26	0.82			22X41	0.82	25X31	0.82	30X26	0.82		
		22X31	0.77	25X26	0.77	30X21	0.77			22X36	0.77	25X26	0.77					22X36	0.77	25X26	0.77				
150		22X41	0.97	25X36	0.97	30X26	0.97			22X46	0.96	25X36	0.96	30X31	0.96			22X41	0.91	25X31	0.91	30X26	0.91		
		22X36	0.91	25X31	0.91					22X41	0.91	25X31	0.91	30X26	0.91			22X41	0.91	25X31	0.91	30X26	0.91		
180				25X41	1.08	30X31	1.08					25X41	1.05	30X31	1.05	35X27	1.05								
		22X41	1.02	25X36	1.02	30X26	1.02			22X46	0.99	25X36	0.99	30X26	0.99			22X46	0.99	25X36	0.99	30X26	0.99		
220		22X51	1.18	25X46	1.18	30X36	1.18	35X27	1.18					30X36	1.15	35X32	1.15								
				25X41	1.1	30X31	1.1					25X41	1.08	30X31	1.08	35X27	1.08								
270						30X41	1.42	35X32	1.42					30X41	1.48	35X37	1.48								
				25X46	1.3	30X36	1.3					25X46	1.38	30X41	1.38	35X32	1.38								
330						30X46	1.56	35X37	1.56							35X42	1.55								
				25X51	1.45	30X41	1.45	35X32	1.45							35X37	1.45								
390								35X42	1.76							35X47	1.75								
						30X46	1.65	35X37	1.65							35X42	1.65								
470								35X47	1.78							35X52	1.85								
						30X51	1.68	35X42	1.68							35X47	1.75								
560								35X52	1.8							35X52	1.86								
								35X47	1.72																
680								35X57	1.82																
820								35X63	1.84																

Ripple Current (A, rms) at 105°C 120Hz

HW Series Snap-in Type 105°C 15mm Height

Features

- ◆ Load life 2000 hours 105°C with height 15mm
- ◆ ROHS compliant
- ◆ For detail specifications, please refer to Engineering Bulletin No. E181

HS Low Profile HW



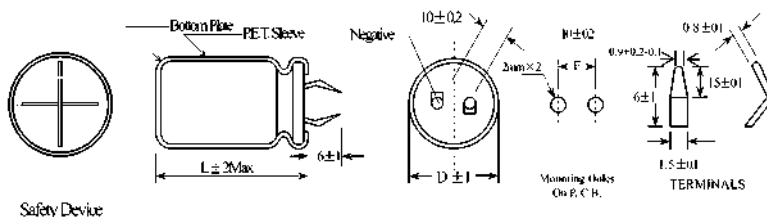
Specifications

Item	Performance Characteristics		
Operating Temperature Range	-25 to +105℃		
Capacitance Range	39 to 390uF		
Rated Voltage Range	160 to 400VDC		
Capacitance Tolerance	±20%(120Hz, +20℃)		
Leakage Current (+20℃, max.)	I ≤ 3 √CV (μA) (After 5 minute with rated working voltage applied.) I= Leakage Current(μA) C= Rated Capacitance V= Rated voltage(V)		
Dissipation Factor (tan δ) (+20℃, at 120Hz)	Cap(μ F) / W.V.(V)	160~250	315~450
	D.F.	20%	20%
Low Temperature Characteristics (120Hz)	Impedance ratio max		
	Rated voltage	160~250	315~450
	Z-25℃/Z+20℃	4	8
Load Life	Test condition Duration time :2000Hrs Ambient temperature :+105℃ Applied voltage :Rated DC working voltage After test requirement at +20℃ Capacitance change : ≤ ±20% of the initial measured value Dissipation factor : ≤200% of the initial specified value Leakage current : ≤The initial specified value		
Shelf Life	Test condition Duration time :1000Hrs Ambient temperature :+105℃ Applied voltage :None After test requirement at +20℃:Same limits as Load life. Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.		

Multiplier for Ripple Current vs. Frequency

CAP (μF) \ Hz	50(60)	120	1K	10K	50K-100K
10<CAP≤100	0.8	1	1.36	1.48	1.53
100<CAP≤1000	0.8	1	1.25	1.35	1.38

Diagram of Dimensions:(unit:mm)



Case Size

φ DxL(mm)

WV (V) Cap(μF)	160		180		200		250		315		400	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
39											22x15	0.30
47											25x15	0.35
56									22x15	0.35	30x15	0.40
68									25x15	0.4	30x15	0.45
82									30x15	0.45	35x15	0.50
100					20x15	0.45	22x15	0.50	30x15	0.5	35x15	0.55
120			20x15	0.50	22x15	0.55	25x15	0.60	35x15	0.55		
150	20x15	0.55	22x15	0.60	25x15	0.65	30x15	0.70	35x15	0.6		
180	22x15	0.65	25x15	0.75	25x15	0.75	30x15	0.75				
					30x15	0.80						
220	25x15	0.80	30x15	0.85	30x15	0.90	35x15	0.90				
270	30x15	0.95	30x15	1.00	30x15	1.00	35x15	1.00				
330	30x15	1.00	35x15	1.10	35x15	1.10						
390	35x15	1.20	35x15	1.20								

Ripple Current(A rms) at 105°C /120Hz

HU Series Snap-in Type 105°C

HP Long life → HU

Features

- ◆ Load life 3000 hours 105°C
- ◆ ROHS compliant
- ◆ For detail specifications, please refer to Engineering Bulletin No. E178



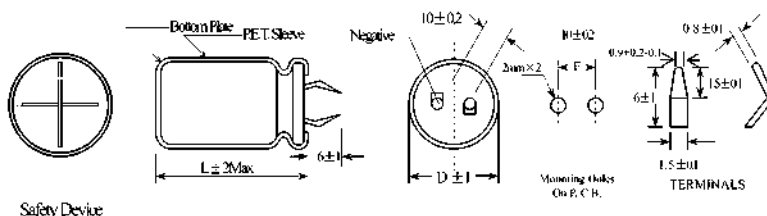
Specifications

Item	Performance Characteristics						
Operating Temperature Range	-40 to +105℃				-25 to +105℃		
Capacitance Range	560 to 47000uF				47 to 2700uF		
Rated Voltage Range	16 to 100VDC				160 to 450VDC		
Capacitance Tolerance	± 20%(120Hz,+20℃)				± 20%(120Hz,+20℃)		
Leakage Current (+20℃,max.)	I≤3 √CV (μA) (After 5 minute with rated working voltage applied.) I= Leakage Current(μA) C= Rated Capacitance V= Rated voltage(V)						
Dissipation Factor (tan δ) (+20℃, at 120Hz)	Less than the value under table (%)						
	Cap(μ F)) / W.V.(V)	16	25~35	50~63	80~100	160~250	315~450
	47~390	-	-	-	15	15	20
	470~3900	-	20	20	20	15	20
	4700~8200	35	30	30	25	-	-
	10000~22000	40	35	30	-	-	-
	27000~47000	45	40	35	-	-	-
Low Temperature Characteristics (120Hz)	Impedance ratio max						
	Working voltage(VDC)	16	25~100	160~250	315~450		
	Z-25℃ / Z+20℃	5	4	4	8		
	Z-40℃/Z+20℃	20	20	-	-		
Load Life	Test condition						
	Duration time	:3000Hrs					
Shelf Life	Ambient temperature						
	Applied voltage	:Rated DC working voltage					
	After test requirement at +20℃						
	Capacitance change	: ≤ ±20% of the initial measured value					
	Dissipation factor						
	Leakage current	: ≤200% of the initial specified value					
	: ≤The initial specified value						
	Test condition						
	Duration time						
	Ambient temperature	: +105℃					
	Applied voltage						
	:None						
	After test requirement at +20℃:Same limits as Load life.						
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.						

Multiplier for Ripple Current vs. Frequency

CAP (μF) \ Hz	50(60)	120	1K	10K	50K-100K
10<CAP≤100	0.8	1	1.36	1.48	1.53
100<CAP≤1000	0.8	1	1.25	1.35	1.38
1000<CAP	0.8	1	1.17	1.25	1.28

Diagram of Dimensions:(unit:mm)



Case Size

φ DxL(mm)

WV (V) Cap(uF)	16V		25V		35V		50V		63V	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
1200									22x26	1.25
1500									22x31	1.47
									25x26	1.44
1800							22x26	1.34	22x31	1.58
									25x26	1.52
2200							22x31	1.50	22x36	1.82
									25x31	1.75
							22x31	1.70	22x41	2.07
2700							25x26	1.70	25x36	2.11
									30x26	1.93
					22x26	1.45	22x36	1.98	22x46	2.33
3300							25x31	2.00	25x36	2.27
									30x31	2.24
					22x31	1.69	22x41	2.25	25x41	2.54
3900							25x31	2.28	30x36	2.55
							30x26	2.22		
			22x26	1.61	22x36	2.02	22x46	2.56	25x51	2.97
4700					25x26	1.78	25x36	2.61	30x41	2.90
							30x31	2.58	35x32	2.83
			22x31	1.80	22x36	2.13	22x51	2.89	30x41	3.28
5600					25x31	2.04	25x41	2.81	35x37	3.24
					30x26	2.12	30x31	2.95		
	22x26	1.75	22x31	1.91	22x41	2.41	25x46	3.37	30x51	3.73
6800			25x26	1.91	25x36	2.31	30x36	3.39	35x42	3.71
					30x26	2.31	35x32	3.31		
	22x31	2.00	22x36	2.14	22x51	2.85	30x41	3.71	35x47	4.16
8200			25x31	2.34	25x41	2.73	35x37	3.66		
			30x26	2.25	30x31	2.75				
	22x31	2.10	22x41	2.65	25x46	3.05	30x51	4.09	35x52	4.69
10000	25x26	2.05	25x36	2.61	30x36	3.05	35x42	4.07		
			30x31	2.61						
	22x36	2.31	22x46	2.69	25x51	3.37	35x47	4.56		
12000	25x31	2.30	25x41	2.81	30x41	3.28				
	30x26	2.38	30x31	2.74	35x32	3.20				
	22x41	2.68	25x46	3.27	30x46	3.74	35x52	4.77		
15000	25x36	2.68	30x36	3.13	35x37	3.69				
	30x31	2.57	35x32	3.26						
	22x46	2.98	25x51	3.54	35x42	4.37				
18000	25x41	3.16	30x41	3.56						
	30x31	3.00	35x37	3.84						
	25x46	3.40	30x46	4.24	35x52	4.92				
22000	30x36	3.39	35x37	3.96						
	35x32	3.25								
	25x51	3.85	35x47	4.75						
27000	30x41	3.83								
	35x32	3.74								
	30x46	4.30	35x52	5.50						
33000	35x37	4.27								
	30x51	4.81								
39000	35x42	4.80								
47000	35x47	5.53								

Ripple Current(A rms) at 105°C /120Hz

		ϕ DxL(mm)								
WV (V) Cap(uF)	80V		100V		160V		200V		220V	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
220							22x26	1.05	22x26	1.10
270									22x31	1.15
330							22x31	1.25	22x36	1.25
							25x26	1.25	25x26	1.25
390					22x26	1.30	22x31	1.35	22x36	1.40
							25x26	1.35	25x31	1.40
470					22x31	1.55	22x36	1.50	22x41	1.45
					25x26	1.55	25x31	1.50	25x36	1.45
							30x26	1.50	30x26	1.45
560			22x26	1.07	22x36	1.67	22x41	1.67	22x46	1.70
					25x31	1.67	25x31	1.67	25x41	1.70
					30x26	1.67	30x26	1.67	30x31	1.70
680			22x31	1.22	22x41	1.82	22x46	1.78	25x46	1.78
			25x26	1.22	25x31	1.82	25x36	1.78	30x36	1.78
					30x26	1.82	30x31	1.78	35x27	1.78
820	22x26	1.11	22x31	1.35	22x46	2.04	22x51	2.04	25x51	2.10
			25x26	1.35	25x36	2.04	25x46	2.04	30x41	2.10
					30x31	2.04	30x31	2.04	35x32	2.10
					35x27	2.04	35x27	2.04		
1000	22x26	1.29	22x31	1.54	22x51	2.25	25x51	2.30	30x46	2.40
			25x31	1.56	25x41	2.25	30x36	2.30	35x37	2.40
					30x31	2.25	35x32	2.30		
					35x27	2.25				
1200	22x31	1.44	22x41	1.74	25x46	2.49	30x41	2.65	30x51	2.60
	25x26	1.39	25x31	1.76	30x36	2.49	35x32	2.65	35x42	2.60
			30x26	1.71	35x32	2.49				
1500	22x31	1.61	22x46	1.99	30x41	2.84	30x51	3.08	35x47	3.00
	25x26	1.62	25x36	2.03	35x32	2.84	35x42	3.08		
			30x31	2.00						
1800	22x36	1.83	25x41	2.28	30x46	3.32	35x47	3.48		
	25x31	1.86	30x36	2.27	35x37	3.00				
	30x26	1.81								
2200	22x41	2.09	25x51	2.57	35x47	3.50	35x52	3.78		
	25x36	2.01	30x36	2.59						
	30x26	2.10	35x32	2.52						
2700	25x41	2.43	30x46	2.94	35x52	4.00				
	30x31	2.43	35x37	2.90						
3300	25x46	2.76	30x51	3.32						
	30x36	2.78	35x42	3.31						
	35x32	2.71								
3900	25x51	2.92	35x47	3.69						
	30x41	3.12								
	35x32	3.07								
4700	30x46	3.52	35x52	4.14						
	35x37	3.50								
5600	30x51	3.80								
	35x42	3.87								
6800	35x47	4.19								

Ripple Current(A rms) at 105°C /120Hz

φ DxL(mm)

WV (V) Cap(μF)	250V		315V		400V		420V		450V	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
68					22x26	0.55			22x26	0.52
82					22x26	0.64	22x26	0.64	22x31	0.64
									25x26	0.64
100					22x31	0.70	22x31	0.70	22x36	0.69
					25x26	0.70	25x26	0.70	25x31	0.69
120			22x26	0.75	22x36	0.75	22x36	0.75	22x41	0.80
					25x26	0.75	25x31	0.75	25x31	0.80
									30x26	0.80
150			22x31	0.82	22x41	0.88	22x41	0.88	22x46	0.88
			25x26	0.82	25x26	0.83	25x36	0.88	25x36	0.88
					25x31	0.88	30x26	0.88	30x31	0.88
					30x26	0.88				
180			22x36	0.92	22x46	0.98	22x46	0.95	22x51	1.00
			25x26	0.92	25x36	0.98	25x36	0.95	25x41	1.00
					30x31	0.98	30x31	0.95	30x31	1.00
					35x27	0.98				
220	22x26	1.10	22x41	1.04	22x51	1.10	22x51	1.10	22x51	1.00
	22x26	1.10	25x31	1.04	25x41	1.10	25x46	1.10	25x46	1.12
			30x26	1.04	30x31	1.10	30x36	1.10	30x36	1.12
					35x27	1.10	35x27	1.10	35x32	1.12
270	22x36	1.18	22x46	1.16	22x51	1.19	25x51	1.22	30x41	1.28
	25x26	1.18	25x36	1.16	25x46	1.22	30x41	1.22	35x37	1.28
			30x26	1.16	30x36	1.22	35x32	1.22		
					35x35	1.22				
330	22x41	1.30	22x51	1.33	22x61	1.45	30x46	1.45	30x51	1.45
	25x31	1.30	25x41	1.33	25x51	1.44	30x51	1.52	35x42	1.45
	30x26	1.30	30x31	1.33	30x41	1.44	35x37	1.45		
			35x27	1.33	35x32	1.44				
390	22x46	1.49	25x46	1.47	30x46	1.60	30x51	1.55	35x42	1.50
	25x36	1.49	30x36	1.47	35x37	1.60	35x42	1.55		
	30x26	1.49	35x32	1.47						
470	22x51	1.65	25x51	1.70	30x51	1.90	35x47	1.90	35x52	1.85
	25x41	1.65	30x41	1.70	35x42	1.90				
	30x31	1.65	35x32	1.70	35x47	2.10				
	35x27	1.65								
560	25x46	1.80	30x46	2.05	35x47	2.12	35x47	2.10	35x57	2.15
	30x36	1.80	35x37	2.05			35x52	2.15		
	35x27	1.80								
680	25x51	2.00	30x51	2.17	35x57	2.35	35x57	2.35	35x57	2.20
	30x41	2.00	35x42	2.17					35x62	2.30
	35x32	2.00								
820	30x46	2.30	35x47	2.20	35x57	2.50				
	35x37	2.30								
1000	30x51	2.47			35x80	2.65				
	35x42	2.47								
1200	35x47	2.60			35x80	2.75				
1500	35x52	3.00								

Ripple Current(A rms) at 105°C /120Hz

HL Series Low ESR, Snap-in Type

Features

- ◆ Highly reliable capacitors that withstand low ESR & long life.
- ◆ Two or three dimensions with same ratings.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E128
- ◆ RoHS Compliant



Specifications

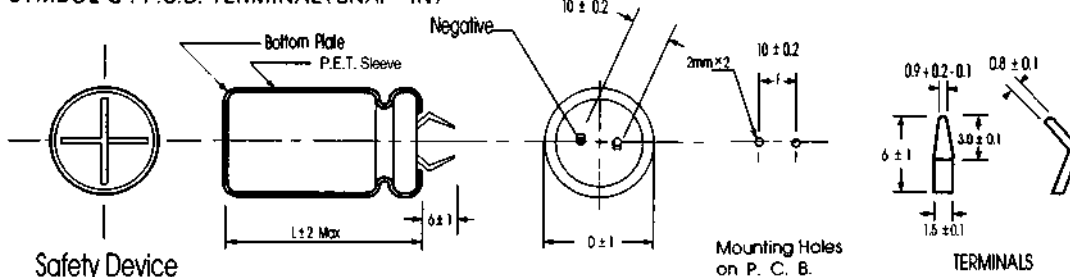
Item	Performance Characteristics										
Operating Temperature Range	-40 to +105℃						-25 to +105℃				
Rated Voltage Range	10 to 100 VDC						160 to 400 VDC				
Capacitance Range	560 to 47000 μ F						56 to 1500 μ F				
Capacitance Tolerance	± 20% (120Hz, +20℃)										
Leakage Current (+20℃,max.)	I ≤ 0.02CV After 5 minutes with rated working voltage applied.										
Dissipation Factor (tan δ , at 20℃ , 120Hz)	Less than the value under table (%)										
	Working Voltage(VDC)	10	16	25	35	50	63	80	100	160 ~ 250	350 ~ 400
	D.F. (%) max.	55	40	30	25	20	15	15	15	15	15
Low Temperature Characteristics (at 120Hz)	Impedance ratio max.										
	Working voltage (VDC)	10 , 16		25	35	50 , 63		80 , 100		160 to 400	
	Z -25℃ /Z +20℃	4		3	3	2		2		4	
	Z -40℃ /Z +20℃	15		10	8	6		5		—	
Load Life	Test conditions										
	Duration time	:5000 Hrs									
	Ambient temperature	:+105℃									
	Applied voltage	:Rated DC working voltage									
	After test requirement at +20℃										
	Capacitance change	:≤ ±25% of the initial measured value									
	Dissipation factor	:≤ 250% of the initial specified value									
	Leakage current	:≤ The initial specified value									
Shelf Life	Test conditions										
	Duration time	:1000 Hrs									
	Ambient temperature	:+105℃									
	Applied voltage	:None									
	After test requirement at +20℃ : The same limits as Load life.										
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.										

Multiplier for Ripple Current vs. Frequency

VDC\Frequency(Hz)	50	120	300	1K	10K	50K
10~50 WV	0.95	1	1.03	1.05	1.08	1.08
63~100 WV	0.93	1	1.07	1.13	1.19	1.20
160,250 WV	0.81	1	1.17	1.32	1.45	1.50
350,400 WV	0.77	1	1.16	1.30	1.41	1.43

Diagram of Dimensions:(unit:mm)

SYMBOL G : P.C.B. TERMINAL (SNAP-IN)



Case Size

Cap (μF) / φ D		10											φ DxL(mm)
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
5600	22x26	1.10	126										
6800	22x26	1.30	126		25x26	1.30	88						
8200	22x26	1.56	126		25x26	1.56	88						
10000	22x31	1.60	98		25x26	1.60	88	30x26	1.60	75			
12000	22x36	1.80	82		25x31	1.80	78	30x26	1.80	75			
15000	22x36	2.10	82		25x31	2.10	68	30x26	2.10	75			
18000	22x36	2.20	82		25x31	2.20	68	30x31	2.20	65			
22000	22x41	2.75	68		25x36	2.75	62	30x31	2.75	48	35x27	2.75	68
27000					25x51	3.05	41	30x41	3.05	30	35x32	3.05	47
33000					25x51	3.40	41	30x41	3.40	30	35x37	3.40	37
39000								30x51	3.60	28	35x41	3.60	31
47000								30x51	4.60	28	35x52	4.60	25

Cap (μF) / φ D		16											
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
5600	22x26	1.40	126										
6800	22x31	1.60	98		25x26	1.60	88						
8200	22x36	1.80	82		25x31	1.80	75						
10000	22x41	2.10	68		25x31	2.10	68	30x26	2.10	75			
12000	22x41	2.40	68		25x36	2.40	52	30x26	2.40	75			
15000	22x51	2.70	53		25x41	2.70	52	30x31	2.70	48			
18000					25x51	3.05	41	30x36	3.05	36	35x32	3.05	47
22000					25x51	3.40	41	30x41	3.40	30	35x47	3.40	37
27000								30x51	4.02	28	35x42	4.02	31
33000								30x51	4.32	28	35x42	4.32	31
39000											35x52	4.95	25

Cap (μF) / φ D		25											
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
3900	22x26	1.30	126										
4700	22x31	1.50	98		25x26	1.50	88						
5600	22x36	1.60	82		25x26	1.60	88						
6800	22x41	1.87	68		25x31	1.87	68	30x26	1.87	75			
8200	22x46	2.20	62		25x36	2.20	62	30x31	2.20	48	35x27	2.20	68
10000	22x51	2.35	41		25x41	2.35	52	30x36	2.35	36	35x32	2.35	60
12000					25x51	2.70	41	30x36	2.70	36	35x32	2.70	47
15000								30x41	3.15	30	35x37	3.15	37
18000								30x51	3.60	28	35x42	3.60	31
22000											35x47	3.90	29
27000											35x52	4.60	25

Cap (μF) / φ D		35											
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
2200	22x26	1.10	126										
2700	22x26	1.29	126										
3300	22x31	1.40	98		25x26	1.40	88						
3900	22x36	1.55	82		25x31	1.55	68						
4700	22x41	1.75	68		25x31	1.75	68	30x26	1.75	75			
5600	22x46	1.95	62		25x36	1.95	62	30x31	1.95	48	35x27	1.95	68
6800	22x51	2.20	53		25x41	2.20	52	30x36	2.20	36	35x32	2.20	60
8200					25x51	2.50	41	30x36	2.50	36	35x32	2.50	47
10000								30x41	2.80	30	35x37	2.80	37
12000								30x51	3.30	28	35x42	3.30	31
15000											35x52	4.25	25

Ripple Current (A, rms) at 105°C 120Hz
Max ESR (mΩ) at 20°C 30KHz

φ D x L (mm)

Cap (μF)	φ D	WV	50											
			22			25			30			35		
			Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
1500		22x26	1.00	126										
1800		22x31	1.10	98	25x26	1.10	88							
2200		22x36	1.30	82	25x26	1.30	88							
2700		22x41	1.45	68	25x31	1.45	68	30x26	1.45	75				
3300		22x41	1.70	68	25x36	1.70	62	30x31	1.70	48				
3900		22x51	1.90	53	25x41	1.90	52	30x36	1.90	36				
4700					25x41	2.10	52	30x36	2.10	36	35x32	2.10	47	
5600					25x51	2.36	41	30x41	2.36	30	35x37	2.36	37	
6800								30x51	2.70	28	35x42	2.70	31	
8200								30x51	3.16	28	35x42	3.16	31	
10000											35x52	3.50	25	

Cap (μF)	φ D	VV	63											
			22			25			30			35		
			Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
1000			22x26	1.00	126									
1200			22x26	1.15	126	25x26	1.15	88						
1500			22x36	1.30	82	25x31	1.30	68						
1800			22x41	1.45	68	25x31	1.45	68	30x26	1.45	75			
2200			22x46	1.65	62	25x36	1.65	62	30x31	1.65	48	35x27	1.65	68
2700			22x51	1.90	53	25x41	1.90	52	30x36	1.90	36	35x32	1.90	60
3300						25x51	2.15	41	30x36	2.15	36	35x32	2.15	47
3900									30x41	2.40	30	35x37	2.40	37
4700									30x51	2.70	28	35x42	2.70	31
5600									30x51	3.10	28	35x42	3.10	31
6800												35x52	3.50	25

Cap (μF)	φ D	80											
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
680		22x26	0.95	148									
820		22x31	1.00	118									
1000		22x36	1.20	98	25x26	1.20	115						
1200		22x41	1.40	78	25x31	1.40	80						
1500		22x46	1.60	48	25x36	1.60	65	30x26	1.60	82			
1800		22x51	1.80	58	25x41	1.80	62	30x31	1.80	58	35x27	1.80	68
2200					25x51	2.05	43	30x36	2.05	52	35x32	2.05	48
2700								30x41	2.35	41	35x37	2.35	42
3300								30x51	2.70	28	35x42	2.70	28
3900											35x47	2.80	26
4700											35x52	3.40	22

Cap (μF)	φ D	100											
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
560		22x31	0.95	118	25x26	0.95	115						
680		22x36	1.10	98	25x31	1.10	80						
820		22x41	1.40	78	25x31	1.40	80	30x26	1.40	82			
1000		22x46	1.40	75	25x36	1.40	65	30x31	1.40	58	35x27	1.40	68
1200		22x51	1.60	58	25x41	1.60	62	30x36	1.60	52	35x32	1.60	65
1500					25x51	1.85	43	30x41	1.85	41	35x32	1.85	48
1800								30x46	2.05	37	35x37	2.05	42
2200								30x51	2.40	28	35x42	2.40	28
2700											35x52	2.80	22

Ripple Current (A, rms) at 105°C 120Hz

Max ESR (mΩ) at 20°C 30KHz

φ D×L(mm)

Cap (μF)	φ D	WV	160											
			22			25			30			35		
			Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
270			22x31	0.60	565									
330			22x36	0.80	455	25x26	0.80	525						
390			22x36	0.85	455	25x31	0.85	415						
470			22x46	1.10	380	25x36	1.10	365	30x31	1.10	315			
560			22x46	1.16	380	25x36	1.16	300	30x31	1.16	315			
680						25x46	1.30	280	30x36	1.30	262			
820						25x46	1.43	280	30x41	1.43	345	35x32	1.43	255
1000									30x46	1.69	300	35x37	1.69	205
1200												35x47	1.95	165
1500												35x52	2.40	145

Cap (μF)	φ D	WV	200											
			22			25			30			35		
			Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
180			22x26	0.57	645									
220			22x31	0.65	565									
270			22x36	0.78	455	25x26	0.78	525						
330			22x41	0.90	405	25x31	0.90	415						
390			22x41	0.98	405	25x36	0.98	405	30x26	0.98	405			
470			22x41	1.15	405	25x36	1.15	405	30x26	1.15	405			
560			22x46	1.30	345	25x36	1.30	365	30x26	1.30	405			
680			22x51	1.45	315	25x41	1.45	300	30x31	1.45	315	35x27	1.45	345
820						25x46	1.60	300	30x36	1.60	362	35x37	1.60	285
1000						25x56	1.90	235	30x46	1.90	300	35x37	1.90	205
1200									30x51	2.10	173	35x42	2.10	175

Cap (μF)	φ D	WV	250											
			22			25			30			35		
			Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
150			22x26	0.52	645									
180			22x31	0.64	565	25x26	0.64	525						
220			22x36	0.75	455	25x31	0.75	415						
270			22x41	0.85	405	25x31	0.85	415	30x26	0.85	405			
330			22x46	1.00	380	25x36	1.00	365	30x31	1.00	315	35x27	1.00	345
390			22x51	1.10	315	25x41	1.10	300	30x36	1.10	262			
470						25x51	1.20	235	30x36	1.20	262	35x32	1.20	255
560									30x41	1.35	345	35x37	1.35	205
680									30x51	1.55	173	35x42	1.55	175
820									30x56	1.70	300			
1000												35x52	2.00	145

Cap (μF)	φ D	WV	350											
			22			25			30			35		
			Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
68			22x26	0.34	795									
82			22x31	0.40	705									
100			22x36	0.50	565	25x26	0.50	655						
120			22x41	0.56	505	25x31	0.56	525	30x26	0.56	495			
150			22x46	0.63	460	25x36	0.63	435	30x31	0.63	395			
180			22x51	0.70	385	25x41	0.70	375	30x31	0.70	395			
220						25x51	0.82	305	30x36	0.82	325	35x32	0.82	310
270									30x41	0.90	285	35x37	0.90	250
330									30x51	1.10	215	35x42	1.10	225
390												35x47	1.20	210
470												35x52	1.30	175

Ripple Current (A, rms) at 105°C 120Hz

Max ESR (mΩ) at 20°C 30KHz

Cap (μ F) ϕ D		400											ϕ DxL(mm)
		22			25			30			35		
		Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR	Size	Ripple	ESR
56	WV	22x26	0.32	795									
68		22x31	0.40	705	25x26	0.40	656						
82		22x36	0.45	565	25x31	0.45	525						
100		22x41	0.50	505	25x31	0.50	525	30x26	0.50	495			
120		22x41	0.55	505	25x36	0.55	435	30x31	0.55	395			
150		22x51	0.65	385	25x41	0.65	375	30x36	0.65	325			
180					25x46	0.75	350	30x36	0.75	325	35x32	0.75	310
220					25x51	0.85	305	30x41	0.85	285	35x37	0.85	250
270								30x51	1.05	215	35x42	1.05	225
330											35x47	1.10	210
390											35x52	1.20	175

Ripple Current (A, rms) at 105°C 120Hz

Max ESR (m Ω) at 20°C 30KHz

LT Series 4 Terminals Snap-in Type 85°C

Features

- ◆ Highly capacitors values and compact size.
- ◆ Two vent construction.
- ◆ 4 snap-in terminals for printed circuit board mounting.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E113
- ◆ RoHS Compliant



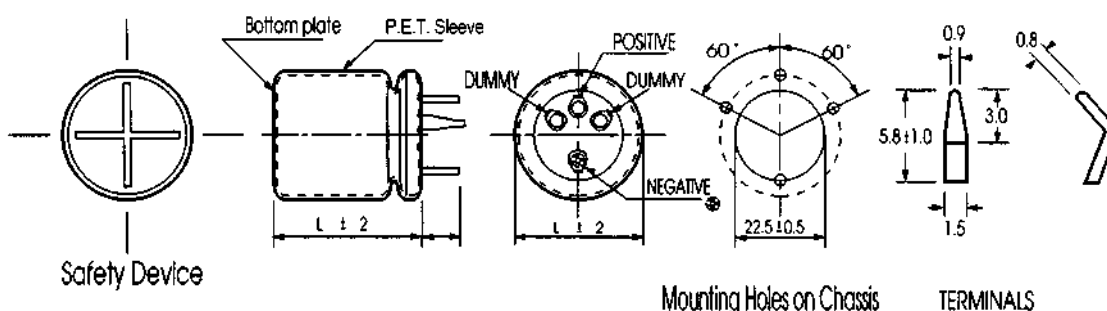
Specifications

Item	Performance Characteristics									
Operating Temperature Range	-40 to 85 °C					-25 ~ +85°C				
Rated Voltage Range	16 ~ 100 VDC					160 ~ 450 VDC				
Capacitance Range	4700 ~ 82000 μ F					330 ~ 3300 μ F				
Capacitance Tolerance	± 20% (120Hz, +20°C)									
Leakage Current (+20°C,max.)	I≤0.02 CV (μ A) After 5 minutes with rated working voltage applied.									
Dissipation Factor (tan δ , at 20°C , 120Hz)	Less than the value under table (%)									
	φ /VDC	16	25	35	50	63	80	100	160 ~ 250	350 ~ 450
	φ 35 D.F. (%) max.	45	40	35	30	25	25	20	15	20
	φ 40 D.F. (%) max.	50	45	40	35	30	25	20	15	20
Low Temperature Characteristics (at 120Hz)	Impedance ratio max.									
	Working voltage (VDC)	16	25	35 ~ 100	160 ~ 250	400 ~ 450				
	Z-25°C / Z+20°C	5	3	3	7	15				
Load Life	Test conditions									
	Duration time	:2000 Hrs								
	Ambient temperature	:+85°C								
	Applied voltage	:Rated DC working voltage								
	After test requirement at +20°C									
	Capacitance change	:≤ ±20% of the initial measured value								
	Dissipation factor	:≤ 175% of the initial specified value								
	Leakage current	:≤ The initial specified value								
Shelf Life	Test conditions									
	Duration time	:1000 Hrs								
	Ambient temperature	:+85°C								
	Applied voltage	:None								
	After test requirement at +20°C : Same limits as Load life.									
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.									

Multiplier for Ripple Current vs. Frequency

CAP(µ F)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
10 < CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.16	1.25	1.35	1.38
1000 < CAP	0.8	1	1.11	1.17	1.25	1.28

Diagram of Dimensions:(unit:mm)



Case Size

WV φ D Cap(μ F)		16				25			
		35		40		35		40	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
33000						35x52	5.76		
39000						35x63	6.24	40x52	6.24
47000		35x32	5.88			35x83	7.08	40x63	7.08
56000		35x63	6.48	40x52	6.48			40x83	7.40
68000		35x83	7.20	40x63	7.20			40x83	8.55
82000				40x83	8.16				

WV φ D Cap(μ F)		35				50			
		35		40		35		40	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
15000						35x52	4.53		
18000						35x63	5.07	40x52	5.07
22000		35x52	4.98			35x83	5.74	40x63	5.74
27000		35x63	5.82					40x63	6.16
33000		35x83	6.00	40x63	6.38				
39000		35x83	6.91	40x63	7.00				
47000				40x83	7.52				

WV φ D Cap(μ F)		63				80			
		35		40		35		40	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
4700						35x52	3.20		
6800						35x52	3.62		
8200						35x63	3.92	40x52	3.92
10000						35x83	4.42	40x63	4.42
12000		35x63	4.65	40x52	4.80			40x83	5.10
15000		35x83	4.90	40x63	5.00			40x83	5.58
18000		35x83	5.86						
22000				40x83	6.00				

WV φ D Cap(μ F)		100				160			
		35		40		35		40	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
1800						35x52	2.46		
2200						35x63	2.77	40x52	2.77
2700						35x83	3.00	40x63	3.00
3300								40x83	3.26
5600		35x63	3.64	40x52	3.64				
6800		35x83	3.94	40x63	3.94				
8200				40x83	4.47				

WV φ D Cap(μ F)		220				250			
		35		40		35		40	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
390						35x52	1.18		
1000		35x52	2.02			35x63	2.10		
1200		35x52	2.24			35x63	2.24	40x52	2.24
1500		35x63	2.44			35x83	2.37	40x63	2.37
1800		35x83	2.65	40x63	2.65			40x83	2.79
2700				40x83	3.03				

WV φ D Cap(μ F)		400				450			
		35		40		35		40	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
330						35x52	1.16		
390						35x63	1.22		
470		35x63	1.36			35x83	1.38	40x52	1.38
560		35x83	1.44	40x52	1.44	35x83	1.50	40x63	1.50
680		35x83	1.59	40x63	1.59			40x83	1.64
820				40x83	1.78				

Ripple Current (A, rms) at 85°C 120Hz

HT Series 4 Terminals Snap-in Type 105°C

Features

- ◆ Premium industrial grade.
- ◆ Long life 2000 Hrs at +105°C with ripple current applied.
- ◆ Expected life : 75000 hrs at +65°C with ripple current applied.
- ◆ Various case sizes and vent construction.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E114
- ◆ RoHS Compliant



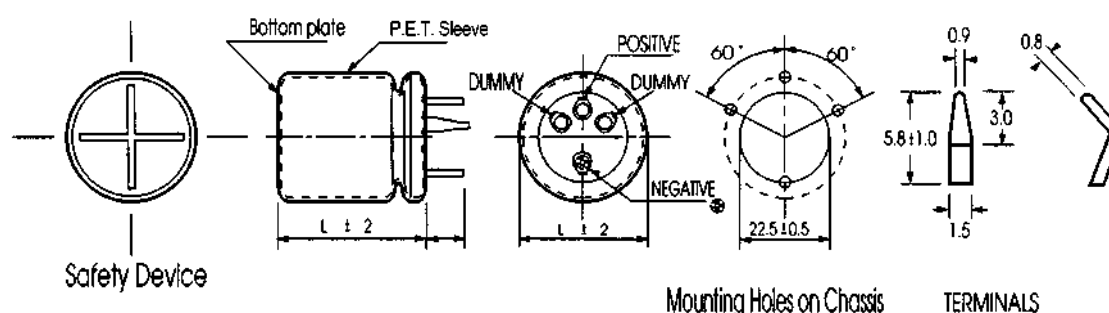
Specifications

Item	Performance Characteristics					
Operating Temperature Range	-25 to +105℃					
Rated Voltage Range	160 ~ 400 VDC					
Capacitance Range	82 ~ 1200 μ F					
Capacitance Tolerance	± 20% (120Hz, +20℃)					
Leakage Current (+20℃, max.)	I ≤ 0.02CV After 5 minutes with rated working voltage applied.					
Dissipation Factor (tan δ , at 20℃ , 120Hz)	15% max.					
Low Temperature Characteristics (at 120Hz)	Impedane ratio max					
	Working voltage (VDC)	160	200	250	400	
	Z -25℃ / Z +20℃	4	4	4	8	
Load Life	Test conditions					
	Duration time	:2000 Hrs				
	Ambient temperature	:+105℃				
	Applied voltage	:Rated DC working voltage				
	After test requirement at +20℃					
	Capacitance change	:≦ ± 20% of the initial measured value				
	Dissipation factor	:≦ 200% of the initial specified value				
	Leakage current	:≦ The initial specified value				
Shelf Life	Test conditions					
	Duration time	:1000 Hrs				
	Ambient temperature	:+105℃				
	Applied voltage	:None				
	After test requirement at +20℃ : Same limits as Load life.					
	Pre-treatment for measurements shall be conducted after application of DC working voltage for 30 minutes.					

Multiplier for Ripple Current vs. Frequency

CAP(µ F)\Frequency(Hz)	50(60)	120	400	1K	10K	50K-100K
10 < CAP ≤ 100	0.8	1	1.23	1.36	1.48	1.53
100 < CAP ≤ 1000	0.8	1	1.16	1.25	1.35	1.38
1000 < CAP	0.8	1	1.11	1.17	1.25	1.28

Diagram of Dimensions:(unit:mm)



Case Size

WV φ D Cap(μF)		160				200				φ DxL(mm)
		30		35		30		35		
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple	
220						30x26	1.15			
270						30x26	1.22			
330	30x26	1.39				30x31	1.33			
390	30x26	1.47				30x31	1.47	35x27	1.47	
470	30x31	1.64				30x36	1.54	35x32	1.54	
560	30x31	1.76				30x41	1.69	35x32	1.69	
680	30x36	1.98	35x32	1.98		30x46	1.90	35x37	1.90	
820	30x41	2.36	35x32	2.36		30x51	2.24	35x42	2.24	
1000	30x51	2.60	35x37	2.60						
1200	30x56	2.73								

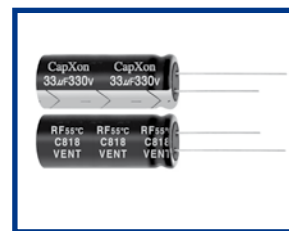
Cap(μF)	WV φ D	250				400			
		30		35		30		35	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
82						30x26	0.73		
100						30x31	0.82		
120						30x36	0.87	35x27	0.87
150						30x41	1.00	35x32	1.00
180		30x26	0.98			30x46	1.06	35x37	1.06
220		30x31	1.10			30x51	1.18	35x42	1.18
270		30x31	1.22						
330		30x36	1.36	35x32	1.36				
390		30x41	1.47	35x32	1.47				
470		30x41	1.58	35x37	1.58				
560		30x51	1.76	35x42	1.76				

Ripple Current (A, rms) at 105°C 120Hz

RF Series Radial Type for Photo Flash

Features

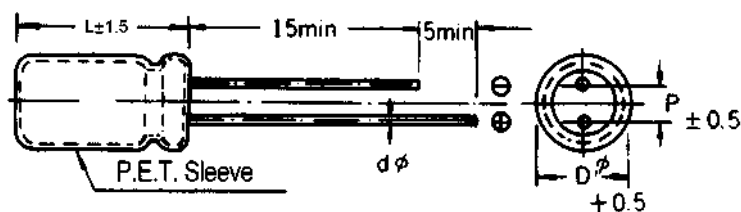
- ◆ RF Series is for photo flash applications that require not only superior volumetric efficiency, low dissipation factor and low leakage current.
- ◆ These capacitors effectively convert electrostatic energy into light.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E116
- ◆ RoHS Compliant



Specifications

Item	Performance Characteristics
Operating Temperature Range	-20 to +55°C
Rated Voltage Range	330/350 VDC
Capacitance Range	100 ~ 450 μ F
Capacitance Tolerance	-10% ~ +20% (120Hz, +25°C)
Leakage Current (+20°C, max.)	$I \leq 1 \times C \mu$ A max After 5 minutes with rated working voltage applied
Dissipation Factor (tan δ , at 20°C , 120Hz)	8% max.
Load Life	Test conditions Duration time : 5000 Times Ambient temperature : Room Temperature (5 ~ 35°C) Applied voltage : Charge and Discharge Cycles : 30 Sec. After test requirement at +25°C Capacitance change : $\leq \pm 10\%$ of the initial measured value Dissipation factor : $\leq 150\%$ of the initial specified value Leakage current : $\leq 150\%$ of the initial specified value
Shelf Life	Test conditions Duration time : 1000 Hrs Ambient temperature : +55°C Applied voltage : None After test requirement at +25°C Capacitance change : $\leq \pm 10\%$ of the initial measured value Dissipation factor : $\leq 150\%$ of the initial specified value Leakage current : $\leq 150\%$ of the initial specified value

Diagram of Dimensions:(unit:mm)



ϕ D	8	10	12	13	14	16	18	20
ϕ d	0.6	0.6	0.8	0.8	0.8	0.8	0.8	0.8
F	3.5	5			7.5			

Please check with us about individual sizes and dimensions.

SF Series Snap-in Type for Photo Flash

Features

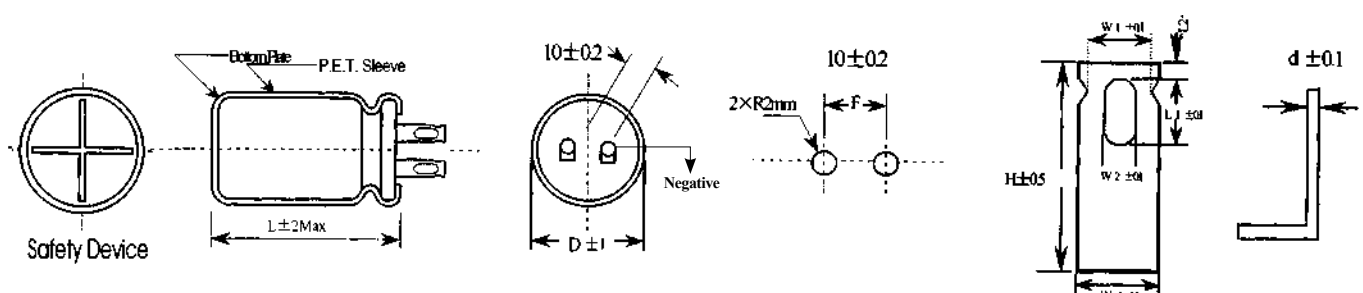
- ◆ SF Series is for photo flash applications that require not only superior volumetric efficiency, low dissipation factor and low leakage current.
- ◆ These capacitors effectively convert electrostatic energy into light.
- ◆ For detail specifications, please refer to Engineering Bulletin No. E117
- ◆ RoHS Compliant



Specifications

Item	Performance Characteristics
Operating Temperature Range	-20 to +55°C
Rated Voltage Range	330/350 VDC
Capacitance Range	150 ~ 1500 µF
Capacitance Tolerance	-10% ~ +20% (120Hz, +25°C)
Leakage Current (+20°C, max.)	$I \leq 1 \times C \mu A$ max After 5 minutes
Dissipation Factor (tan δ, at 20°C, 120Hz)	8% max.
Load Life	Test conditions Duration time : 5000 Times Ambient temperature : Room Temperature (5 ~ 35°C) Applied voltage : Charge and Discharge Cycles : 30 Sec. After test requirement at +25°C Capacitance change : $\leq \pm 10\%$ of the initial measured value Dissipation factor : $\leq 150\%$ of the initial specified value Leakage current : $\leq 150\%$ of the initial specified value
Shelf Life	Test conditions Duration time : 1000 Hrs Ambient temperature : +55°C Applied voltage : None After test requirement at +25°C Capacitance change : $\leq \pm 10\%$ of the initial measured value Dissipation factor : $\leq 150\%$ of the initial specified value Leakage current : $\leq 150\%$ of the initial specified value

Diagram of Dimensions:(unit:mm)



Case Size

Dφ	H±0.5	L1±0.1	L2±0.1	W±0.1	W1±0.1	W2±0.1	d±0.1
25	8.0	3.3	1.3	4.0	3.7	1.8	0.6
30	8.5	3.3	1.3	4.6	4.3	1.8	0.8
35	9.0	3.3	1.3	4.6	4.3	1.8	0.8
40	9.0	3.3	1.3	4.6	4.3	1.8	0.8

Please check with us about individual size and dimensions.

Screw

1 Definitions of electrical parameters

1.1 Voltages

1.1.1 Rated voltage

The rated voltage is the direct voltage value for which the capacitor has been designed and which is indicated upon it. For Aluminum electrolytic capacitors, rated voltages of 100 V are usually designated as "low voltage" and rated voltages >100 V as "high voltage"

1.1.2 Operating voltage

The capacitors can be operated continuously at full rated voltage (including superimposed AC voltage) within the entire operating temperature range.

1.1.3 Surge voltage

The surge voltage is the maximum voltage which may be applied to the capacitor for short periods of time, i.e. up to 5 times for 1 minute per hour. IEC 60384-4 specifies the surge voltage as follows:

for $UR \leq 315 \text{ V}$ Surge voltage = 1.15 UR

for $500 \text{ V} > UR > 315 \text{ V}$ Surge voltage = 1.10 UR

1.1.4 Superimposed AC, ripple voltage

A superimposed alternating (AC) voltage, or ripple voltage, may be applied to Aluminum electrolytic capacitors provided that the sum of the DC voltage and superimposed alternating (AC) voltage does not exceed the rated voltage, and the rated ripple current is not exceeded

1.1.5 Reverse voltage

Aluminum electrolytic capacitors are polar capacitors. Where necessary voltages of opposite polarity should be prevented by connecting a diode. The diode's conducting state voltage of approximately 0.8 V is permissible. Reverse voltages 1.5 V are tolerable for a duration of less than 1 second, but not in continuous or repetitive operation.

2.2 Capacitance

2.2.1 AC and DC capacitance

The capacitance of a capacitor can be determined by measuring its AC impedance (taking into account amplitude and phase) or by measuring the charge it will hold when a DC voltage is applied. The two methods produce slightly different results. As a general rule, it can be said that DC voltage based measurements (DC capacitance) yield higher values (DC capacitance) than the alternating current method (AC capacitance). The factors are approximately 1.0 to 1.5 and maximum deviations occur with capacitors of low voltage ratings. Corresponding to the most common applications (e.g. smoothing and coupling), it is most usual to Determine the AC capacitance of Aluminum electrolytic capacitors. Corresponding to the most common applications (e.g. smoothing and coupling), it is most usual to

Determine the AC capacitance of Aluminum electrolytic capacitors.



Figure 1

Simplified equivalent circuit diagram of an electrolytic capacitor

For this purpose, the capacitive component of the equivalent series circuit (the series capacitance C_S) is determined by applying an alternating voltage of ≤ 0.5 V. As the AC capacitance depends on frequency and temperature, IEC 60384-1 and IEC 60384-4 prescribe a measuring frequency of 100 Hz or 120 Hz and a temperature of 20 °C (other reference values by special request). There are also applications (e.g. discharge circuits and timing elements) in which the DC capacity C_{DC} is decisive. In spite of this fact, capacitors for which the capacitance has been determined by the AC method are also used in such applications, whereby allowances are made to compensate for the difference between the two measuring methods.

However, in exceptional cases it may be necessary to determine the DC capacitance. The IEC Publications do not provide any corresponding specifications. Because of this, a separate DIN standard has been defined. This standard, DIN 41328-4, describes a measuring method involving one-time, non-recurrent charging and discharging of the capacitor.

2.2.2 Rated capacitance CR

The rated capacitance is the AC capacitance value for which the capacitor has been designed and which is indicated upon it. C_R is determined by specific measurement methods described in the relevant standards (IEC 60384-1 and IEC 60384-4).

2.2.3 Capacitance tolerance

The capacitance tolerance is the range within which the actual capacitance may deviate from the specific rated capacitance. Where the capacitance tolerances are to be indicated on the components themselves, CapXon uses code letters to IEC 60062; this code letter is also part of the ordering code.

2.2.4 Temperature dependence of the capacitance

The capacitance of an electrolytic capacitor is not a constant quantity that retains its value under all operating conditions. The temperature has a considerable effect on the capacitance. With decreasing temperature, the viscosity of the electrolyte increases, thus reducing its conductivity. The resulting typical behavior is shown in figure 2.

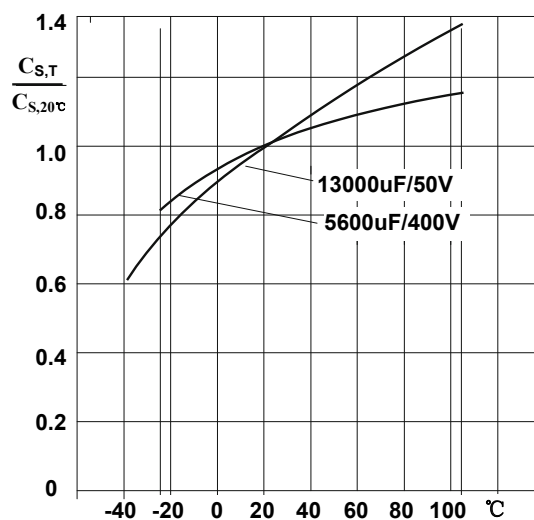


Figure 2

Temperature dependence of series capacitance C_S (typical behavior) Reference value: AC capacitance at 20°C and 120 Hz. As a general rule, the characteristic curves are steeper for lower rated voltages and increasing Anode surface roughness (deeper etching).

The most favorable flat shape of the curves shown in figure 2 is obtained by using special electrolytes which ensure that the capacitors can be operated at temperatures far below zero.

The shape of the curves varies widely, depending on whether the temperature relationship of the AC or of the DC capacitance is determined. The DC capacitance has a flatter temperature characteristic.

2.2.5 Frequency dependence of the capacitance

The AC capacitance depends not only on the temperature but also on the measuring frequency. Figure 3 shows the typical behavior. Typical values of the effective capacitance can be derived from the impedance curve, as long as the impedance is still in the range where the capacitive component is dominant.

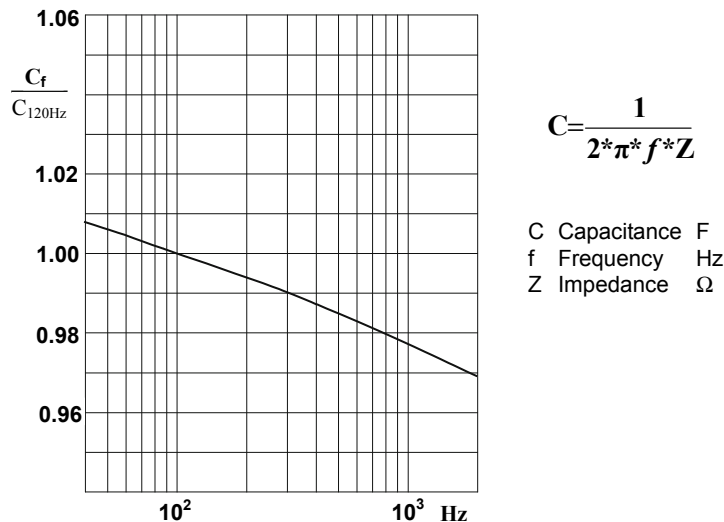


Figure 3

Capacitance C versus frequency f Typical behavior

2.2.6 Charge-discharge proof

Frequent charging/discharging cycles may lead to a decrease in capacitance. (Charge-discharge test to IEC 60384-4).

3.3 Dissipation factor $\tan \delta$

The dissipation factor $\tan \delta$ is the ratio of the equivalent series resistance to the capacitive reactance component in the equivalent series circuit, or the ratio of effective power (dissipated power) to reactive power for sinusoidal voltages.

It is measured using the same setup as for the series capacitance C_s (see figure 1).

IEC 60384-4 specifies the following maximum values:

3.4 Self-inductance ESL

The self-inductance or equivalent series inductance results from the terminal configuration and the internal design of the capacitor. It is defined by the equivalent series circuit shown in figure 1

3.5 Equivalent series resistance ESR

The equivalent Series Resistance is the resistive component of the equivalent series circuit.

The ESR value depends on frequency and temperature and is related to the dissipation factor by the following equation:

$$ESR = \frac{\tan \delta}{\omega * C_s}$$

ESR Equivalent series resistance
 $\tan \delta$ Dissipation factor
 C_s Series capacitance

The tolerance limits of the rated capacitance must be taken into account when calculating this value.

3.6 Impedance Z

The impedance of an electrolytic capacitor results primarily from the series circuit formed by the following individual equivalent series components (figure 4):

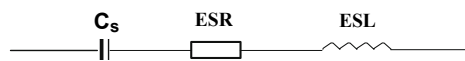


Figure 4

Simplified equivalent circuit diagram of an electrolytic capacitor

- 1) Capacitive reactance $1/\omega C_s$ of the capacitance C_s
- 2) Dielectric losses and ohmic resistance of the electrolyte and the terminals (ESR)
- 3) Inductive reactance ωESL of the capacitor winding and the terminals.

The inductive reactance ωESL only depends on the frequency, whereas $1/\omega C_s$ and ESR depend on frequency and on temperature. The characteristics of the individual resistive and reactive components determine the total impedance of the capacitor.

Capacitive reactance predominates at low frequencies. With increasing frequency, the capacitive reactance ($X_c = 1/\omega C_s$) decreases until it reaches the order of magnitude of the electrolyte resistance.

At even higher frequencies and unchanged temperatures (see 20 °C curve), the resistance of the electrolyte predominates.

When the capacitor's resonance frequency is reached, capacitive and inductive reactance mutually cancels each other.

Above this frequency, the inductive resistance of the winding and its terminals ($X_L = \omega L$) becomes effective and leads to an increase in impedance.

The resistance of the electrolyte increases strongly with decreasing temperature.

3.7 Leakage current I_{Leak}

Due to the special properties of the aluminum oxide layer that serves as a dielectric, a small current will continue to flow even after a DC voltage has been applied for longer periods. This current is called the leakage current. A low leakage current is an indication that the dielectric is well designed.

3.7.1 Time and temperature dependence of the leakage current

As figure 5 shows, a high leakage current flow (inrush current) in the first minutes after applying a voltage to the capacitor, in particular after prolonged storage without any applied voltage. In the course of continuous operation, the leakage current will decrease and reach an almost constant "steady-state" value. The temperature dependence of the leakage current is shown in figure 6, taking a capacitor of the 85 °C temperature category as an example.

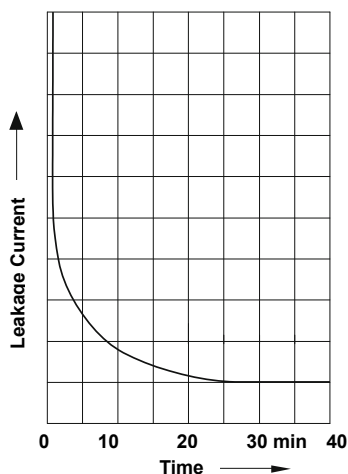


Figure 5

Leakage current versus time for which a voltage is applied

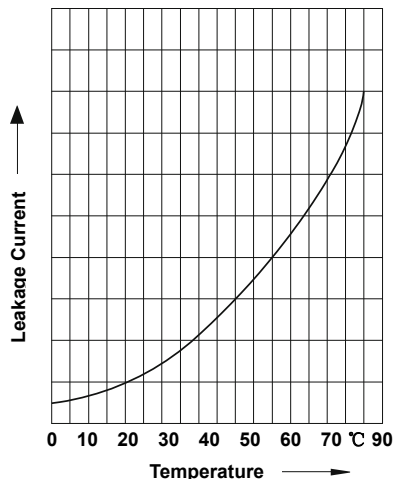


Figure 6

Leakage current versus temperature

3.7.2 Voltage dependence of the leakage current

The relationship between the leakage current and the voltage applied under constant temperature conditions is shown schematically in figure 7.

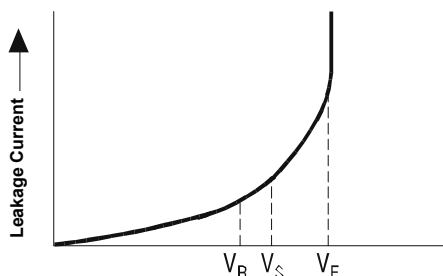


Figure 7→V

3.7.3 Leakage current for acceptance test I_{leak}

As the leakage current varies with time and temperature, it is necessary to define reference values for measuring time and temperature. To JIS-C-5101 the leakage current is to be measured at 20°C, after the rated voltage has been applied for 5 minutes. The following equations apply:

$$I_{leak} \leq 0.3\mu A * (C * V)^{0.7} + 4\mu A$$

Acceptance testing for leakage current can be carried out at any temperature between 15°C and 35°C, Referee tests are to be carried out at 20°C.

3.7.4 Reforming

To IEC 60384-4, Aluminum electrolytic capacitors are to be subjected to a reforming process before acceptance testing. The purpose of this preconditioning is to ensure that the same initial conditions are maintained when comparing and assessing different products.

For this purpose, the rated voltage is applied to the capacitors via a series resistance of approximately 100 Ω for $V_R \leq 100$ V DC, or 1000 Ω for $V_R > 100$ V DC, for a period of one hour. Subsequently, the capacitors are stored under no-voltage conditions for 12 to 48 hours at a temperature between 15 and 35 °C. The leakage current must then be measured, at the latest after 48 hours.

If the capacitors meet the leakage current requirements without preconditioning, this procedure can be omitted.

3.7.5 Leakage current behavior with no voltage applied (voltage-free storage)

The oxide layer may deteriorate when Aluminum electrolytic capacitors are stored without an externally applied voltage, especially at higher temperatures. Since there is no leakage current to transport oxygen ions to the anode in this case, the oxide layer is not regenerated. The result is that a higher than normal leakage current will flow when a voltage is applied after prolonged storage. As the oxide layer is regenerated in use, however, the leakage current will gradually decrease to its normal level.

If aluminum electrolytic capacitors can be stored voltage-free for more than six months, Provided that these storage periods have not been exceeded, the capacitors can be operated at rated voltage directly after being taken out of storage. When designing application circuits, attention must be paid to the fact that the leakage current may be up to 100 times higher than normal during the first minutes following the application of power. When the capacitors have been stored for more than six months, it is decisive whether the circuit will tolerate high initial leakage currents. A circuit that has been stored for more than six months with the capacitors incorporated, should be operated trouble-free for one hour. This will usually regenerate the capacitors so far that storage can be continued.

3.8 Breakdown strength and insulation resistance of insulating sleeves

Most Aluminum electrolytic capacitors made by CapXon are enveloped by an insulating sleeve. The minimum breakdown strength of the sleeve is 2500 V AC or 3500 V DC. A test method for verifying the breakdown strength of the sleeves is described in IEC 60384-4.

In order to ensure full breakdown strength, care must be taken not to damage the insulating sleeve, especially when ring clips are used for mounting.

The insulation resistance of the sleeve is at least 100 MΩ. IEC 60384-4 specifies corresponding test methods.

As a standard feature, capacitors with an upper category temperature of +85 °C and +105 °C are fitted with external PET insulation.

4 Ripple current considerations

4.1 General

The term ripple current is used for the RMS value of the alternating current that flows through the device as a result of any pulsating or ripple voltage. The maximum permissible ripple current value depends on the ambient temperature, the surface area of the capacitor (i.e. heat dissipation area), the dissipation factor $\tan \delta$ (or ESR) and on the AC frequency.

As thermal stress has a decisive effect on the capacitor's life expectancy, the dissipation heat generated by the ripple current is an important factor affecting the useful life. Diagrams showing the useful life as a function of the ambient temperature T_A are given in the individual data sheets

These thermal considerations imply that, under certain circumstances, it may be necessary to select a capacitor with a higher voltage or capacitance rating than would normally be required by the respective application.

4.2 Frequency dependence of the ripple current

The dissipation factor (which is related to the equivalent series resistance) of aluminum electrolytic capacitors varies with the frequency of the applied voltage. As a result, the ripple current is also a function of the frequency. In the individual data sheets, the ripple current capability of the capacitors is generally referred to a frequency of 120 Hz, or in some cases to 10 or 20 kHz. Conversion factors for other operating frequencies are given for each type in the form of a graph.

4.3 Temperature dependence of the ripple current

The data sheets specify the maximum permissible ripple current for the upper category temperature for each capacitor type. For most of the types with category temperature above 85°C or 105°C, the ripple current ratings for 85°C or 105°C have also been included for the purpose of comparison. The data sheets for each capacitor type also include a diagram showing the limit values for continuous operation at other ambient temperatures and ripple currents. This diagram also permits the expected useful life to be estimated for given operating conditions.

5 Useful life

Useful life (also termed service life or operational life) is defined as the life achieved by the capacitor without exceeding a specified failure rate. Total failure or failure due parametric variation is considered to constitute the end of the useful life

Depending on the circuit design, device failure due to parametric variation does not necessarily

imply equipment failure. This means that the actual life of a capacitor may be longer than the specified useful life. Data on useful life have been obtained from experience gained in the field and from accelerated tests.

The useful life can be prolonged by operating the capacitor at loads below the rating values (e.g. lower operating voltage, current or ambient temperature). In addition to the standard type series, CapXon is able to offer types with useful life ratings

specially matched to customer specifications.

5.1 Load conditions

CECC defines the useful life of capacitors with liquid electrolytes on the basis of the following load conditions:

rated voltage

rated ripple current (the peak value of the AC voltage superimposed on the DC voltage must not exceed the rated voltage)

rated temperature

5.3 Calculation of useful life

The tables in the individual data sheets list the rated ripple current $I_{AC,R}$ for the upper category temperature(+85°C,+105°C) and for a frequency of 120Hz. The useful life for known ripple current loads and ambient temperatures is determined on the basis of the useful life graphs as follows:

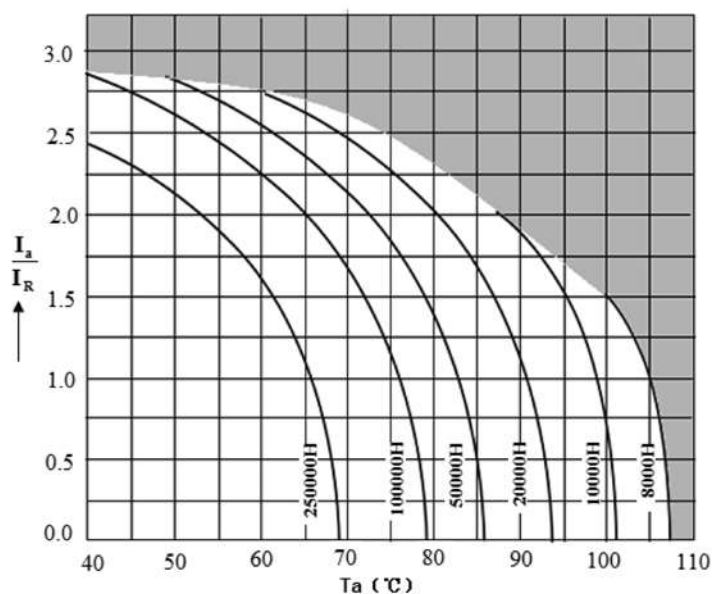
Determine the quotient $I_{AC}/I_{AC,R}$ of the required ripple current at the given ambient temperature

and the rated ripple current at the upper category temperature. The corresponding useful life value is given by the curve passing through the respective ambient temperature and the current quotient coordinates, or it can be interpolated if none of the useful life curves passes directly through these coordinates.

The frequency dependence of the ripple current has not been taken into account in the procedure described above. This must be introduced into the calculation in the form of an additional factor.

For each series precise curves for conversion factor $I_{RC,f}/I_{RC,120Hz}$ versus frequency f are given in the individual data sheets.

The following examples illustrate the calculation procedure, using the data of a capacitor of the RH series. For this type series, the upper category temperature is +105 °C. As an example, a capacitor with the following ratings has been selected from the data sheets:



VR	CR	Case	IRC,max 120Hz 105°C A
450	6800	89*160	9.5

Example 1 – Calculating the useful life

The following values have been determined for capacitors to be used in a frequency converter. The corresponding useful life is to be calculated.

Ripple current 25 A

Frequency 400 Hz

Ambient temperature 50 °C

The equivalent ripple current for 120 Hz is calculated using the frequency-dependence conversion factor (see series RH "Frequency factor of permissible ripple current I_{RC} "):

$$\frac{25 \text{ A}}{1.25} = 20 \text{ A}$$

The ripple current factor is then calculated using the resulting equivalent 120 Hz ripple current.

$$\frac{I_{RC}}{I_{RC.R}} = \frac{20 \text{ A}}{9.5 \text{ A}} \approx 2.1$$

The useful life curve passing through the coordinates for the ripple current factor and the ambient temperature (50 °C) indicates the useful life that can be expected: 100 000 h (see figure 8).

Example 2 – Checking the ripple current load on an Aluminum electrolytic capacitor

In many applications, Aluminum electrolytic capacitors are subjected to ripple currents of varying frequencies.

The equivalent total ripple current load shall be calculated for the following given RMS values:

Current 1: $I_{RC, RMS}$ at 400 Hz 20 A

Current 2: $I_{AC, RMS}$ at 4 kHz 16 A

Ambient temperature 50°C

Required useful life 100000 h

The first step is to calculate the equivalent 120Hz values for the two current values (frequency factors given on series RH "Frequency factor of permissible ripple current I_{RC} ") and the root-mean-square value of the two equivalent values:

$$\text{Current } I_1: \frac{20 \text{ A}}{1.25} = 16 \text{ A}$$

$$\text{Current } I_2: \frac{16 \text{ A}}{1.32} \approx 12.12 \text{ A}$$

$$I_{total.RMS} = \sqrt{I_1^2 + I_2^2} = \sqrt{(16)^2 + (12.12)^2} \approx 20.07 \text{ A}$$

The ripple current factor can then be calculated

$$\frac{I_{total.RMS}}{I_{RC.R}} = \frac{23.38 \text{ A}}{9.5 \text{ A}} \approx 2.11 \text{ A}$$

The useful life curve passing through the coordinates for the ripple current factor and the ambient temperature (50 °C) indicates the useful life that can be expected: 100 000 h (see figure 8)

6.1 Parallel connection of Aluminum electrolytic capacitors

If one of the capacitors in a parallel circuit fails as a result of an internal short circuit, the entire bank is discharged through the defective capacitor. In the case of large banks with high energy content this may lead to extremely abrupt

and severe discharge phenomena. It is therefore advisable to take measures to prevent or limit the short-circuit discharge current. In smoothing capacitor banks, e.g., this is achieved by installing individual fuses; the principle is shown in figure 9.

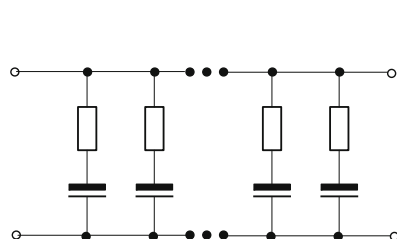


Figure 9
Individual fuses in smoothing
capacitor banks

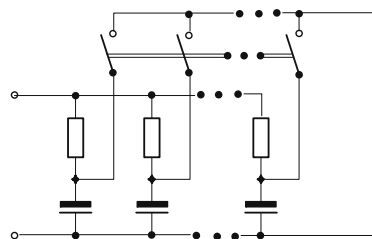


Figure 10
Protection by charging resistors

This principle is not suitable for capacitor banks designed for impulse discharges. Here, the capacitors should be protected during the charging process by means of appropriate resistors. The capacitors are then connected in parallel immediately before they are to be discharged. The principle is shown in figure 10.

6.2 Series connection of Aluminum electrolytic capacitors

When designing series circuits with Aluminum electrolytic capacitors, care must be taken to ensure that the load on each individual capacitor does not exceed its maximum permissible voltage. Here, the fact that the total DC voltage applied is divided up among the individual capacitors in proportion to their individual dielectric insulation resistances (figure 11) must be taken into consideration.

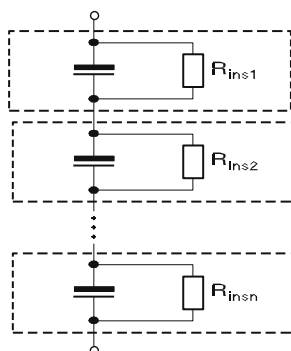


Figure 11
Series connection (with
dielectric resistances)

If this is not possible, external balancing resistors $R_{\text{balance resistor}}$ (see figure 12) can be connected to the individual capacitors. The balancing resistances must be equal to one another, and must be substantially lower than the dielectric insulation resistance of the capacitor

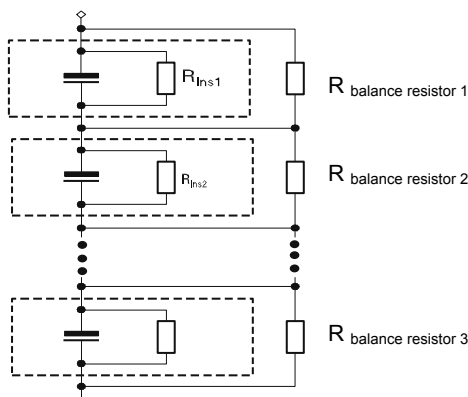


Figure 12
Series connection (external balancing resistors
R connected to the individual capacitors)

Experience has shown that it is preferable to choose balancing resistance values that will cause a current of approximately 20 times the leakage current of the capacitor to flow through the resistors. The equation for calculating the resistance value is:

$$R_{\text{balance resistance}} = 50\text{M}\Omega * \mu\text{F} * \frac{1}{C_R}$$

The balancing measures described above may be omitted in cases where the total DC voltage to be applied is substantially lower than the sum of the rated voltages of the capacitors to be used.

Experience has shown that this is possible for $n = 2$ to 3 single capacitors in series without any considerable risk if the total voltage does not exceed $0.8 n V_R$. However, this solution can only be implemented if the series circuit consists of matching capacitors (same type, same capacitance), so that the dielectric insulation resistance of the capacitors, which is the only factor determining the voltage distribution in this case, will not vary too greatly from one capacitor to the next.

6.3 Combined parallel and series connection

The recommendations given above apply similarly to combinations of parallel and series circuits. If balancing resistors are to be used, it is advisable to allocate a separate resistor to each capacitor (figure 13).

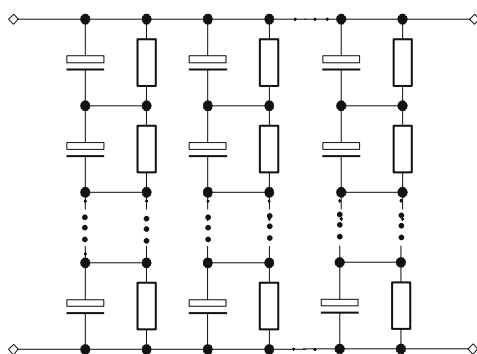


Figure 13
Combined parallel / series connection
(voltage balancing by shunt resistors)

The alternative solution, parallel connection of the series capacitors in the individual branch and the use of one balancing resistor for each capacitor group, is shown in figure 14

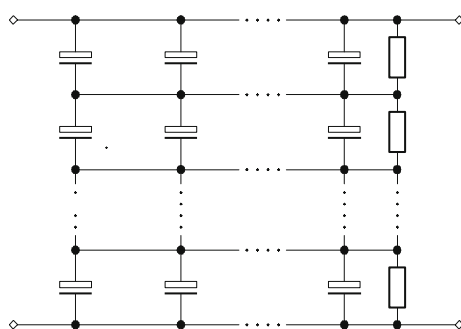


Figure 14
Combined parallel / series connection (group
voltage balancing)

This solution is less complicated, but it has one serious disadvantage:

If a capacitor in one of the series branches fails and causes a short-circuit, the total voltage will be applied to the remaining capacitors. This will lead to a voltage overload and may destroy the remaining capacitors.

In the balancing arrangement shown in figure 13, only the series branch with the defective capacitor is subject to this risk, whereas in the more simple configuration shown in figure 14, the voltage overload affects all series branches due to the internal cross-connections, thus causing more severe damage. For the same reason, internal parallel connections should not be used in parallel groups connected in series without balancing resistors.

7.1 Minimum permissible operating temperature (lower category temperature)

The conductivity of the electrolyte diminishes with decreasing temperature, causing an increase in electrolyte resistance. This, in turn, leads to increasing impedances and dissipation factors (or equivalent series resistances). For most applications, these increases are only permissible up to a certain maximum value. Therefore, minimum permissible operating temperatures are specified for Aluminum electrolytic capacitors. These temperature limits are designated "lower category temperature" and are also part of the IEC climatic category.

It should be emphasized that operation below this temperature limit will not damage the capacitor.

Especially when a ripple current flows through the device, the heat dissipated by the increased equivalent series resistance will raise the capacitor temperature so far above the ambient temperature that the capacitance will be adequate to maintain equipment operation.

The typical response of impedance and capacitance of a capacitor with a lower category temperature of 25°C

7.2 Maximum permissible operating temperature (upper category temperature)

The upper category temperature is the maximum permissible ambient temperature at which a capacitor may be continuously operated. It depends on the capacitor design and is stated in the respective IEC climatic category. If this limit is exceeded the capacitor may fail prematurely.

For some type series, however, operation at temperatures above the upper category temperature is permissible for short periods of time. Details are given in the individual data sheets.

Useful life and reliability depend to a large extent on the capacitor's temperature. Operation at the Lowest possible temperature will increase both useful life and reliability and is therefore recommended. For the same reason, it is advisable to select the coolest possible position within the equipment as a location for Aluminum electrolytic capacitors.

7.3 Storage temperature

Aluminum electrolytic capacitors can be stored voltage-free at temperatures up to the upper category temperature.

However, it must be taken into account that storage at elevated temperatures will reduce leakage current stability, useful life and reliability. In order not to impair these qualities unnecessarily, the storage temperature should not exceed +40°C and should preferably be below +25°C. The standards for Aluminum electrolytic capacitors specify a lower storage temperature that corresponds to the lower category temperature.

8 Mechanical stress resistance

8.1 Vibration resistance

The vibration resistance values are specified in the individual data sheets.

8.2 Operating altitude

Aluminum electrolytic capacitors can be used in high-altitude locations (to EN 130300 subclause 4.11.4).

8.3 Robustness of terminals

The mechanical strength of terminals and leads is defined in the respective detail specifications. Terminals of the capacitors in this book also meet the test conditions specified by IEC 60068-2-21. For tightening torques for screw terminals, refer to chapter "General technical information, 11.3 mounting torques".

9 Maintenance

CENELEC R040-001 (chapter 1 to 19) provides general information on applications in which Aluminum electrolytic capacitors are used. The most important subjects are: safety requirements and measures, installation in equipment with inherent heating, destruction by overpressure, parallel and series capacitor circuits.

Make periodic inspections for the capacitors that have been used in the devices for industrial applications. Before the inspection, make sure to turn off the power supply and carefully discharge the electricity of the capacitors. To check the capacitors, make sure of the polarity when measuring the capacitors by using a volt-ohm meter, for instance. Also, do not apply any mechanical stress to the capacitor terminals. The following items should be checked by the periodic inspections:

Significant damage to appearances: venting, electrolyte leakage, etc.

Electrical characteristics: leakage current, capacitance, tan and other characteristics prescribed in the catalogs or product specifications.

If any of the above is found, replace it or take any other proper measure.

10 Mounting

10.1 Mounting positions of capacitors with screw terminals

During operation Aluminum electrolytic capacitors will always conduct a leakage current which causes electrolysis. On one hand, the oxygen produced by electrolysis will regenerate the dielectric layer, but, on the other hand, the hydrogen released may cause increased internal pressure of the capacitor.

A safety vent in the can disk allows the gas to escape when the pressure reaches a certain level and prevents the capacitor from exploding in case of pressure increase due to an overload condition.

To prevent electrolyte from leaking out when the gas has vented, the capacitor should not be mounted with the terminals (safety vent) upside down. The recommended mounting positions to avoid a vent-down installation of the capacitor are shown in figure 15.

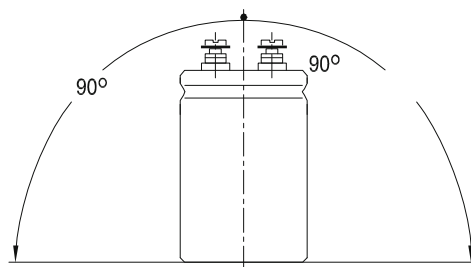


Figure 15

Recommended range of mounting positions

Upright mounting is recommended, particularly when the capacitors are fixed by their terminals, by a threaded stud or near the base.

In case of horizontal mounting, the safety vent should be at the "12 o'clock" position.

Mounting positions other than recommended will not cause any direct damage to the capacitor, but may result in serious consequential damage in the application during operation due to electrolyte leakage in the case of venting.

10.2 Soldering

Excessive time or temperature during soldering will affect capacitor's characteristics and cause damage to the insulation sleeve.

Contact of the sleeve with soldering iron must be avoided.

Soldering conditions (preheat, solder temperature and dipping time) should be within the limits prescribed in the product specifications.

10.3 Cleaning agents

Halogenated hydrocarbons may cause serious damage if allowed to come into contact with aluminum electrolytic capacitors. These solvents may dissolve or decompose the insulating film and reduce the insulating properties to below the permissible level. The capacitor seals may be affected and swell and the solvents may even penetrate them. This will lead to premature component failure.

Because of this, measures must be taken to prevent electrolytic capacitors from coming into con-

tact with the solvents when using halogenated hydrocarbon solvents to clean printed circuit boards after soldering the components, or to remove flux residues. If it is not possible to prevent the electrolytic capacitors from being wetted by the solvent, halogen-free solvents must be used in order to eliminate the possibility of damage.

Halogen-free solvents:

Ethanol (methylated spirits) Propanol
Isopropanol Isobutanol Propylenglycolether
Diethyleneglycoldibutylether

Critical solvents:

The following list contains a selection of critical halogenated hydrocarbons and other solvents frequently used, partially in pure form, partially in mixtures with other solvents, as cleaning agents in the electrical industry.

Trichlorotrifluoroethane (trade names e.g. Freon, Kaltron, Frigene)

Trichloroethylene

Trichloroethane (trade names e.g. Chlorothene, Wacker 3 1) Tetrachloroethylene (trade name: Per)

Methylenechloride Chloroform Carbontetrachloride Acetone Methyllethylketone Ethylacetate Butylacetate

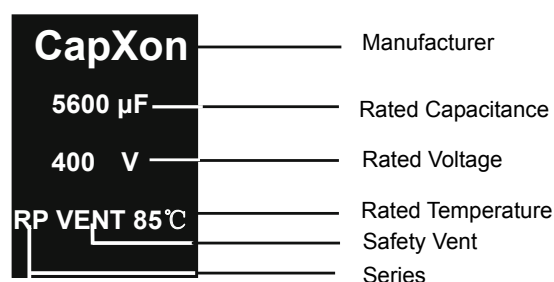
However, printed-circuit board cleaning equipment is available which uses halogenated solvents but is designed to enable thorough cleaning in a very short time (four-chamber ultrasonic cleaning process). Furthermore, the processes used ensure that virtually no solvent remains on the cleaned parts.

This means that the general warning against the use of halogenated cleaning solvents on aluminum electrolytic capacitors can be qualified if the following conditions are met:

1. The cleaning period in each chamber must not exceed 1 minute.
2. The final cleaning stage must use a solvent vapor only. The temperature must be 50°C or lower.
3. Adequate drying must be ensured immediately after the cleaning process in order to evaporate any condensed residual solvent.
4. Contaminated cleaning agents must be regularly replaced as specified by the manufacturer and by legal regulations.

11 Marking of the capacitors

The example below shows how the screw capacitors are marked:



Screw

Corporate goals

We adhere to the tenet of "QUALITY FIRST", and offer satisfying products and service to the customer. This aim is shared by the CapXon quality and environment management system:

1 CapXon quality system

1.1 CapXon quality policy and environment policy

We adhere to the tenet of "QUALITY FIRST", and offer satisfying products and service to the customer.

1.2 Quality management system

The quality management system to ISO/TS 16949:2009 is applied throughout the company and is used to implement the CapXon quality policy.

The implications include:

As a rule, product and process developments follow the rules of APQP),

Quality tools such as FMEA), MSA) and SPC) minimize risks and ensure continuous improvements in conjunction with regular internal audits and QM reviews.

1.3 Certification

The CapXon quality management system forms the basis for the company certification to ISO 9001-2008 and ISO/TS16949:2009 that comprises the CapXon plants and sales organizations.

1.4 Delivery quality

"Delivery quality" means compliance with the agreed data at the time of delivery.

1.5 Failure criteria

A component is defective if one of its features does not correspond to the specification of the data sheet or an agreed delivery specification. Failure criteria please refer to Defective degree evaluation and handling method of reliability experiment.

1.6 Incoming goods inspection at the customer

We recommend the use of a random sampling plan according to ANSI-ASQC Z 1.4 (contents compliant with MIL STD 105 D and IEC 60410) for incoming goods inspection. The test methods to be used are laid down in the relevant standards. Deviations must be agreed by the customer and the supplier.

1.7 Duration of use

The service life in terms of reliability is the time period during which random failures occur, i.e. the range in the product operating life in which the failure rate remains largely constant (early failures and end of operating life excepted). The value depends strongly on conditions of use.

1.7.1 Failure rate (long-term failure rate)

The failure rate is defined as the failure percentage divided by a specified operating period. The failure rate is expressed in fit (failures in 10^9 component hours) or as percentage of failures in 1000 hours.

1 fit = 1×10^{-9} /h (fit = failure in time)

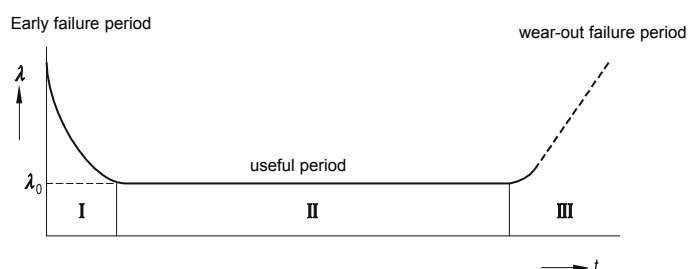
Example of a failure rate test determined by a useful life test:

- | | |
|--------------------------------|--------------|
| 1. Number of components tested | N = 10000 |
| 2. Operating hours | tb = 20000 h |
| 3. Number of failures | n = 2 |

$$\lambda_{\text{test}} = \frac{n}{N} * \frac{1}{t_b} = \frac{2}{10000} * \frac{1}{20000H} = 10\text{FIT} = 0.001\%/1000H$$

Failure rate specifications must include failure criteria, operating conditions and ambient conditions. Usually the failure rate of components, when plotted against time, shows a characteristic curve with the following three periods:

I: early failure period, II: useful period, III: wear-out failure period



Unless otherwise specified, the failure rate refers to the useful period (II). During this period, an approximately constant failure rate λ_0 can be assumed.

1.8 AQL values

The AQL (AQL= acceptable quality level) figures are based on a random sampling plan to ANSI-ASQC Z1.4.

The sampling instructions of this standard are such that a delivered lot will be accepted with a probability of 90% if the percentage of non-conformancies does not exceed the stated AQL figure. As a rule, the percentage of non-conformancies in deliveries from CapXon is significantly below the AQL figure. The acceptance value we apply to inoperatives, i.e. unusable components is $c=0$.

2 Environmental management system

2.1 Environmental policy

CapXon defines the following environmental protection principles:

Comply with the law, Govern the pollution, Produce Cleanly, Reduce the consume, Save resource, Cut down the toxic substance, Make Improvement Continuously, Beautify the environment

2.2 Environmental management system

The CapXon ISO 14001 based environmental management system is applied company wide for implementing the CapXon environmental policy. It is posted on the CapXon Intranet and is thus accessible to all employees.

2.3 Environmental Hazardous Substances Free management system

The CapXon QC080000 based HSF management system is applied company wide for implementing the CapXon environmental Hazardous Substances management. that Capxon products effectively in the management of hazardous substances.

2.4 Certification

The CapXon Group operates an environmental management system that conforms to the requirements of ISO14001 and is mandatory for all plants. The CapXon Group operates an environmental Hazardous Substances Free management system that conforms to the requirements of QC080000 and is mandatory for all plants. The company certificate is posted on the CapXon internet:

(www.CapXongroup.com.cn).

2.5 RoHS

The term “RoHS-compatible” shall mean the following:

The components described as “RoHS-compatible” are compatible with the requirements of the regulations listed below (“Regulations”) and with the requirements of the provisions which will result from transformation of the Regulations into national law to the extent such provisions reflect the Regulations:

Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

("Directive 2002/95/EC"); The directive from July 1, 2006 entered into force.

Commission Decision of 18 August 2005 amending Directive 2002/95/EC (2005/618/EC); Commission Decision of 13 October 2005 and of 21 October 2005 amending the Annex to Directive 2002/95/EC (2005/717/EC, 2005/747/EC, 2006/310/EC, 2006/690 .692/EC).

December 3, 2008 The European Commission published its official Web site of the RoHS directive revised draft COM (2008) 809 / 4.

September 3, 2009 RoHS EU issued a revised second draft Directive COM (2008) 809final.

October 22, 2009 EU Environment Public Health and Food Safety Committee (Committee on the environment, public health and food safety) released on COM (2008) 809 of the amendments.

RoHS Directive, also known as Amendment RoHS 2.0, the amendment involves a lot of content. But the basic objectives and mechanisms have not been changes, the ultimate goal still is to reduce the electrical and electronic products of certain hazardous substances.

The instruction modified to increase 4 to be "priority review" the use of substances HBCDD, DEHP, DBP and BBP.

2.6 Halogen Free(HF)

Base on customer and environmental regulations on the management and control requirements of halogen , such as the European 2002-95-EC, IEC 61249-2-1, "Montreal Protocol on Substances that Deplete the Ozone Layer", "Controls the Stockholm joint pledge about durable organic pollutant", CapXon has imported halogen-free materials of all electrolytic capacitors completely at the beginning of 1st,June,2009. All products shipped meet the halogen-free requirements on 31th,Oct,2009.

2.7 Banned and Environmental Hazardous Substances in components

As a manufacturer of passive components, we develop our products on the basis of sustainability.

In order to guarantee a standardized procedure for CapXon Group, a mandatory list of Environmental Hazardous Substances of special interest is part of our environmental management system. The planning and development instructions include regulations and guidelines that aim to identify environmental aspects and to optimize products and processes with respect to material use and environmental compliance, to design them with sparing use of resources and to substitute hazardous substances as far as possible.

In consideration of the environmental aspects are checked and recorded in the design reviews: the environmental officer provides support in the assessment of the environmental impacts of a development project.

2.8 Product Series and Specifications for product catalog

CapXon Product Series and Specifications on the Internet (www.capxongroup.com) ,It is available to refer to check for customers.

2.9 Disposal

All aluminum electrolytic capacitors can be disposed off, reused or recycled. However as disposal is regulated by national law, the respective national provisions have to be observed.

RS Series 85°C

Features

General capacitors

Applications

- ◆ Frequency converters
- ◆ Professional power supplies
- ◆ Uninterruptible power supplies

Features

- ◆ Wide temperature range
- ◆ All-welded construction ensures reliable electrical contact
- ◆ Self-extinguishing electrolyte
- ◆ RoHS-compatible
- ◆ For detail specifications, please refer to Engineering Bulletin No. E182

Construction

- ◆ Charge-discharge proof, polar
- ◆ Aluminum case with insulating sleeve
- ◆ Poles with screw terminal connections
- ◆ Mounting with ring clips, clamps or threaded stud

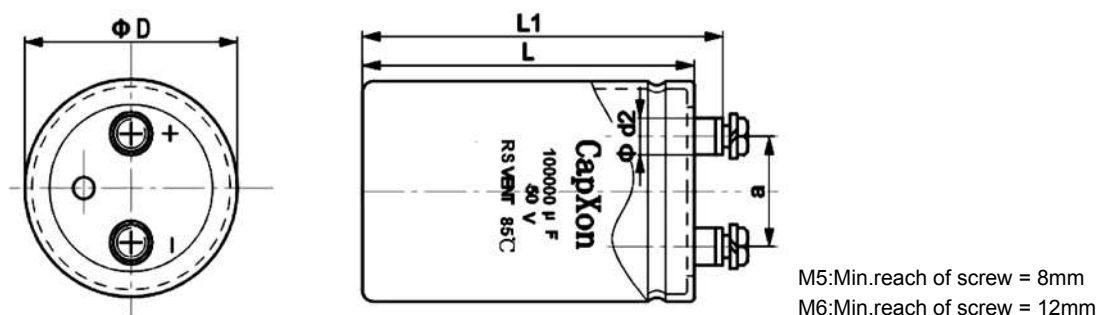


Specifications

Item	Performance Characteristics					
Rated voltage V _R	16... 100 V DC					
Surge voltage V _S	1.15 V _R					
Rated capacitance C _R	3300 ... 1000000 μF					
Capacitance tolerance	±20%					
tan δ (at 20℃ · 120Hz)	Less than the value under table(%)					
	ΦD WV	35	51	63.5	76.2	89
	16	60	70	80	120	140
	25	40	50	70	80	100
	35	30	50	60	70	90
	50	25	30	50	60	80
	63	20	25	30	40	60
	80	20	20	25	30	50
	100	15	20	25	30	30
Leakage Current I _{leak} (20 °C, 5 min)	I _{leak} ≤ 0.3μA * (C*V) ^{0.7} + 4μA					
Load life test 85 °C; V _R	2000 h	Requirements: Δ DC/C ≤ ±40% of initial value ESR ≤ 4 times initial specified limit I _{leak} ≤ initial specified limit				
Vibration Resistance test	To IEC 60068-2-6, test Fc:					
	Displacement amplitude 0.75 mm, frequency range 10 ... 55 Hz, acceleration max. 10 g, duration 3X2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.					
Low Temperature Characteristics	Max. impedance ratio at 120 Hz					
	Z _{-25℃} / Z _{20℃}		3			
	Z _{-40℃} / Z _{20℃}		12			
Sectional specification	IEC 60384-4 and JIS-C-5101					

Dimensional drawings

Ring clip/clamp mounting:



Dimensions

Terminal	Dimensions(mm) with insulating sleeve				
	$D \pm 2$	$L \pm 3$	$L_1 \pm 3$	$d_{2max.}$	$a \pm 0.5$
M5	35	50~120	56.5~126.5	10.3	12.7
M5	51	80~140	86.5~146.5	10.3	22
M5	63.5	80~140	86.5~146.5	10.3	28.6
M5	76.2/89	100~240	106.4~246.5	10.3	31.8
M6	76.2/89	100~240	106.4~246.5	17.5	31.8

Packing

Diameter D(mm)	Length L(mm)	Packing (pcs.)
35	≤ 70 mm	120
	> 70 mm	60
42	≤ 70 mm	120
	> 70 mm	60
51	≤ 70 mm	70
	> 70 mm	35
63.5	all	24
76.2	all	15
89	all	12

Accessories

The following items are included in the delivery package, but are not fastened to the capacitors.

	Thread	Maximum torque
For terminal	M5	2 Nm
	M6	2.5 Nm

Case Size

φ DxL(mm)

WV(V) Cap(μF)	16		25		35		50	
	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
6800							35x50	3.7
10000					35x60	4.5	35x60	5.0
15000			35x50	5.0	35x80	5.7	35x80	7.8
22000	35x60	7.3	35x60	7.7	35x80	8.0	35x100	11.5
					35x100	9.0	35x120	12.8
33000	35x60	8.5	35x80	10	35x100	11.0	51x80	11.8
	35x80	9.5					51x100	13.2
47000	35x80	11.0	35x100	12.5	35x120	13.7	51x100	14.7
	35x100	12.0	35x105	13.0				
68000	35x100	11.3	35x120	13.5	51x80	14.5	51x120	16.5
	35x105	13.0	51x80	14.3	51x100	15.1	51x140	17.8
	51x80	13.5						
100000	35x120	13.5	51x100	15.5	51x120	19.2	63.5x120	19.0
	51x80	14.0	51x105	16.0			63.5x140	21.5
	51x100	15.0					76.2x100	19.5
150000	51x80	15.0	51x120	21.2				
	51x100	16.5	51x140	24.2	63.5x120	25.0	76.2x120	26.5
	51x140	17.6	63.5x105	24.0			76.2x140	28.0
220000	51x120	17.8						
	63.5x105	20.0	63.5x120	25.8	76.2x100	26.0	76.2x160	32.7
	63.5x120	21.5			76.2x140	27.4	89x130	32.5
330000	63.5x105	21.0						
	63.5x120	23.0	76.2x120	26.7	76.2x140	33.0	89x160	36.0
	63.5x140	25.2	76.2x140	28.5	76.2x160	35.7		
470000	76.2x120	25.5	76.2x150	31.3	89x170	39.0	89x220	41.0
	76.2x140	27.5						
680000	76.2x160	35.1	89x160	37.0	89x220	41.0		
820000	76.2x220	38.0	89x190	40.0				
1000000	89x200	41.1	89x220	42.0				

Ripple Current(A,rms) at 85°C 120Hz

WV(V) Cap(μF)	63		80		100	
	Size	Ripple	Size	Ripple	Size	Ripple
3300					35x60	4.1
					35x80	5.8
4700			35x60	5.0	35x80	6.7
6800	35x50	5.0	35x60	6.0	35x80	8.0
					35x105	8.7
10000	35x60	6.2	35x80	8.0	35x100	9.0
	35x80	7.7			51x80	10.0
15000	35x80	8.7	35x120	11.0	51x80	11.0
	35x105	10.0			51x100	12.4
					51x105	13.0
22000	35x120	13.1	51x80	14.0	51x120	16.2
	51x80	13.0			63.5x105	17.0
33000	51x100	13.9	51x120	16.1	51x140	21.3
	51x105	14.0			76.2x105	23.0
47000	51x120	18.6	63.5x120	21.0	63.5x140	24.3
	63.5x105	19.0			76.2x140	25.0
68000	63.5x120	21.3	63.5x140	24.1	76.2x140	26.4
	76.2x105	22.0				
100000	76.2x120	24.0	76.2x160	27.0	89x160	27.2
	76.2x145	25.0				
150000	76.2x160	27.0	89x160	30.0	89x230	29.0
220000	89x160	29.0	89x230	35.0		
330000	89x220	32.0				

Ripple Current(A,rms) at 85°C 120Hz

RG Series 85°C

Features

Standard capacitors

Applications

- ◆ Frequency converters
- ◆ Uninterruptible power supplies

Features

- ◆ All-welded construction ensures reliable electrical contact
- ◆ Self-extinguishing electrolyte
- ◆ RoHS-compatible
- ◆ For detail specifications, please refer to Engineering Bulletin No. E183

Construction

- ◆ Charge-discharge proof, polar
- ◆ Aluminum case with insulating sleeve
- ◆ Poles with screw terminal connections
- ◆ Mounting with ring clips, clamps

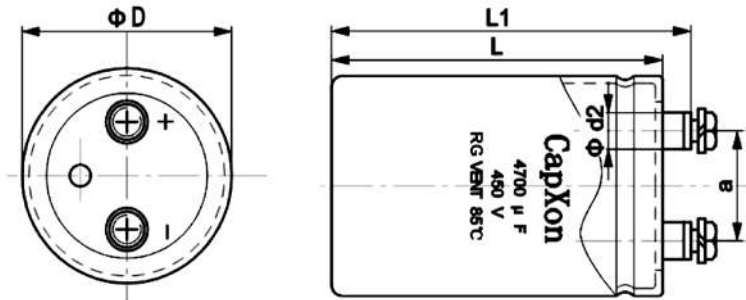


Specifications

Item	Performance Characteristics					
Rated voltage V _R	160... 450 V DC					
Surge voltage V _S	1.10 V _R					
Rated capacitance C _R	680 ...68000 μF					
Capacitance tolerance	±20%					
tan δ (at 20℃ · 120Hz)	Less than the value under table(%)					
	ΦD WV	35	51	53	76.2	89
	160~250	15	15	20	20	20
	350~450	20	20	25	25	25
Leakage Current I _{leak} (20 ℃, 5 min)	I _{leak} ≤ 0.3μA * (C*V) ^{0.7} + 4μA					
Self-inductance ESL	d = 51.6 mm: approx. 17 nH					
	d ≥ 64.3 mm: approx. 20 nH					
	Capacitors with low-inductance design:					
	d ≥ 64.3 mm: approx. 15 nH					
Useful life 85 ℃; V _R I _{AC} [*] R	> 6000 h	Requirements: Δ DC/C ≤ ±40% of initial value ESR ≤ 4 times initial specified limit I _{leak} ≤ initial specified limit				
Voltage Endurance test 85 ℃; V _R	2000 h	Post test requirements: Δ DC/C ≤ ±20% of initial value ESR ≤ 2 times initial specified limit I _{leak} ≤ initial specified limit				
Vibration Resistance test	To IEC 60068-2-6, test Fc:					
	Displacement amplitude 0.75 mm, frequency range 10 ... 55 Hz, acceleration max. 10 g, duration 3X2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.					
Low Temperature Characteristics	Max. impedance ratio at 120 Hz					
	V _R	≤ 400 V		≥ 450 V		
	Z _{-25℃} / Z _{20℃}	6		4		
	Z _{-40℃} / Z _{20℃}	22		16		
Sectional specification	IEC 60384-4 and JIS-C-5101					

Dimensional drawings

Ring clip/clamp mounting:



M5:Min.reach of screw = 8mm
M6:Min.reach of screw = 12mm

Dimensions

Terminal	Dimensions(mm) with insulating sleeve				
	D±2	L±3	L ₁ ±3	d ₂ max.	a±0.5
M5	35	50~120	56.5~126.5	10.3	12.7
M5	51	80~140	86.5~146.5	10.3	22
M5	63.5	80~140	86.5~146.5	10.3	28.6
M5	76.2/89	100~240	106.4~246.5	10.3	31.8
M6	76.2/89	100~240	106.4~246.5	17.5	31.8

Packing

Diameter D(mm)	Length L(mm)	Packing (pcs.)
35	≤70mm	120
	>70mm	60
42	≤70mm	120
	>70mm	60
51	≤70mm	70
	>70mm	35
63.5	all	24
76.2	all	15
89	all	12

Accessories

The following items are included in the delivery package, but are not fastened to the capacitors.

	Thread	Maximum torque
For terminal	M5	2 Nm
	M6	2.5 Nm

Case Size

φ DxL(mm)

WV(V) Cap(μF)	160		200		250	
	Size	Ripple	Size	Ripple	Size	Ripple
680					35x60	1.80
1000	35x60	2.80	35x60	3.00	35x80	3.30
1500	35x60	3.00	35x80	3.30	35x80	3.50
2200	35x80	3.50	35x100	4.20	35x120	3.80
	35x100	4.00			51x80	4.00
2700			35x120	4.70	51x80	4.40
3300	35x100	4.70	35x120	4.80	51x100	5.40
	35x120	5.20	51x80	4.90	51x120	5.80
3900	51x80	5.30	51x80	5.50	51x115	6.30
4700	51x80	6.00	51x100	6.40	51x120	7.00
					51x140	7.50
					63.5x100	7.30
6800	51x100	7.80	51x120	7.30	51x140	8.50
	51x120	8.50	51x140	9.00	63.5x120	9.20
					76.2x100	9.50
8200	51x120	9.20	63.5x100	9.40	63.5x115	10.00
10000	51x140	10.50	63.5x100	10.40	76.2x120	11.50
	63.5x100	10.50	63.5x120	11.20	76.2x140	12.30
12000	63.5x100	11.50	76.2x100	12.10	76.2x115	12.90
15000	63.5x120	12.50	76.2x120	13.00	76.2x150	14.50
	63.5x140	14.50	76.2x140	14.20	76.2x160	15.10
	76.2x100	13.00			89x120	14.50
22000	76.2x120	16.50	76.2x160	17.80	89x160	18.50
	76.2x140	17.00	89x120	17.00		
27000	76.2x140	18.00	89x130	18.00		
68000	89x230	23.00				

Ripple Current(A,rms) at 85°C 120Hz

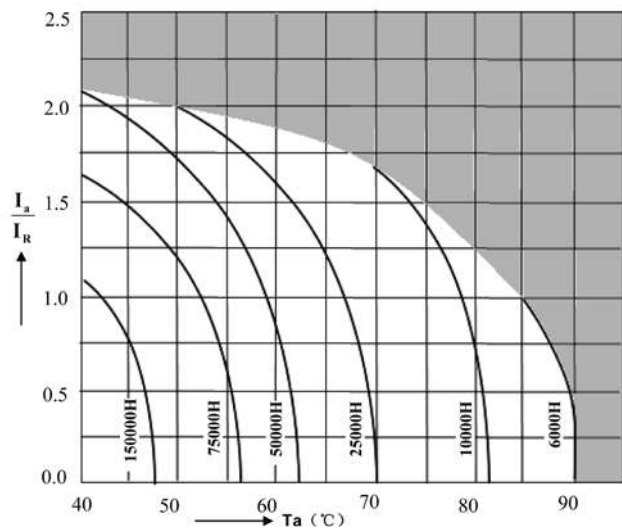
φ DxL(mm)

WV(V) Cap(μF)	350		400		450	
	Size	Ripple	Size	Ripple	Size	Ripple
1000	35x100	4.50	35x120	4.60	51x80	4.50
			51x80	4.60	51x105	5.00
1500	51x80	4.90	51x80	5.40	51x100	5.80
			51x100	5.70	51x120	6.30
			51x105	6.00	63.5x80	6.00
2200	51x100	6.60	51x100	6.90	51x120	7.30
	51x105	6.80	51x120	7.40	63.5x100	7.60
	51x120	7.20	51x140	7.70	63.5x105	7.80
					63.5x120	8.30
2700	63.5x80	7.50	63.5x105	8.50	76.2x105	9.00
3300	51x120	8.00	51x130	8.60	63.5x120	9.50
	51x140	8.30	63.5x100	8.90	63.5x140	10.00
	63.5x100	8.10	63.5x120	9.40	76.2x120	10.50
3900	63.5x105	9.80	76.2x100	10.30	76.2x120	11.00
			76.2x105	10.50	76.2x140	12.00
4700	63.5x120	10.50	76.2x100	11.00	76.2x120	12.00
	63.5x140	11.20	76.2x120	12.00	76.2x140	13.00
	76.2x100	10.50			76.2x160	13.50
5600	63.5x140	12.50	76.2x140	13.80	76.2x160	14.00
6800	76.2x120	14.00	76.2x140	15.00	76.2x160	15.00
	76.2x140	14.90	76.2x160	16.00		
	89x100	14.00				
8200	76.2x160	16.00	76.2x160	16.50	76.2x220	18.00
10000	76.2x160	16.50	76.2x160	16.70	76.2x220	19.00
	89x120	16.00	89x130	16.70	89x170	19.00
12000	76.2x180	20.50	89x160	19.50		
	76.2x220	22.50	89x220	23.00		
15000	89x160	23.00	76.2x230	26.50		
	89x220	26.50	89x180	26.00		
			89x220	28.00		
18000	89x220	30.00	89x240	31.00		
22000	89x230	33.00				

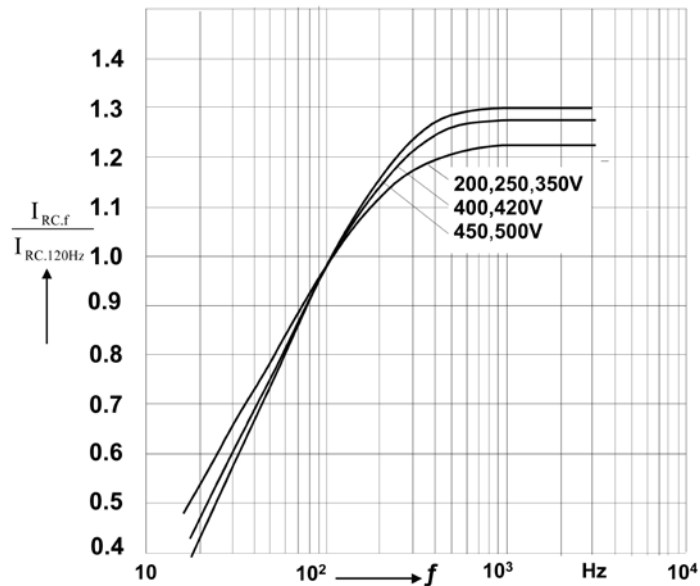
Ripple Current(A,rms) at 85°C 120Hz

Useful life

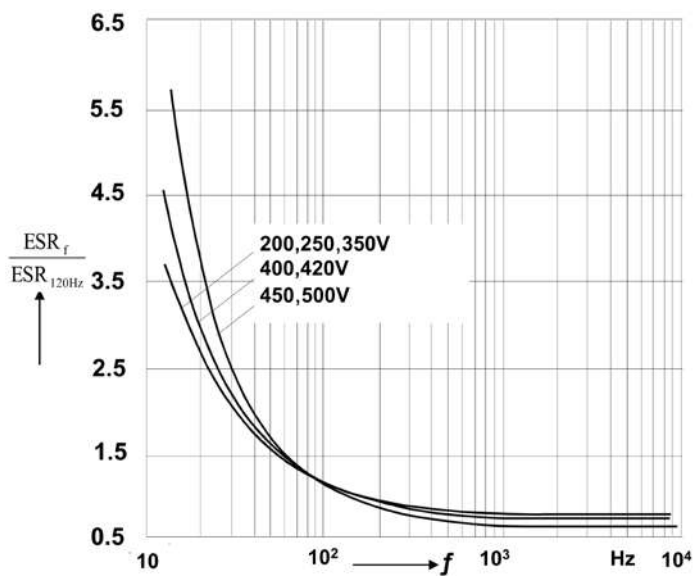
depending on ambient temperature T_a versus under ripple current operating conditions



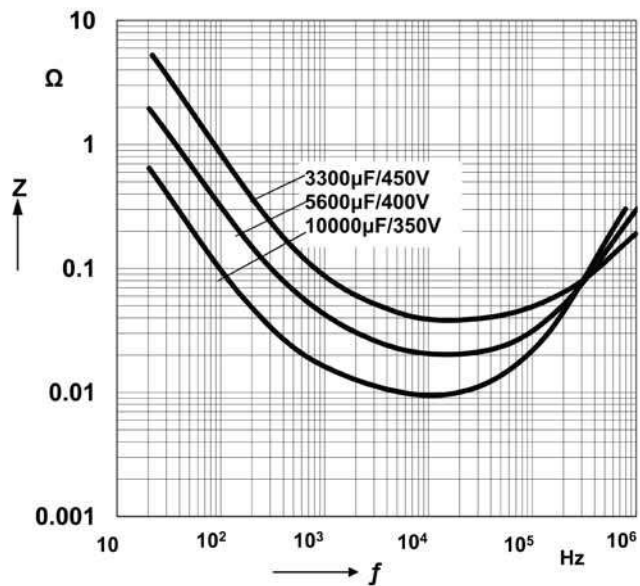
Frequency factor of permissible ripple current I_{RC} versus frequency f



Frequency characteristics of ESR Typical behavior



Impedance Z versus frequency f



RP Series 85°C

Features

Long useful life

Applications

- ◆ Professional power supplies
- ◆ Frequency converters
- ◆ Uninterruptible power supplies

Features

- ◆ WLong useful life
- ◆ High reliability
- ◆ All-welded construction ensures reliable electrical contact
- ◆ Version with low-inductance design available
- ◆ Self-extinguishing electrolyte
- ◆ RoHS-compatible
- ◆ For detail specifications, please refer to Engineering Bulletin No. E140

Construction

- ◆ Charge-discharge proof, polar
- ◆ Aluminum case with insulating sleeve
- ◆ Poles with screw terminal connections
- ◆ Mounting with ring clips, clamps or threaded stud

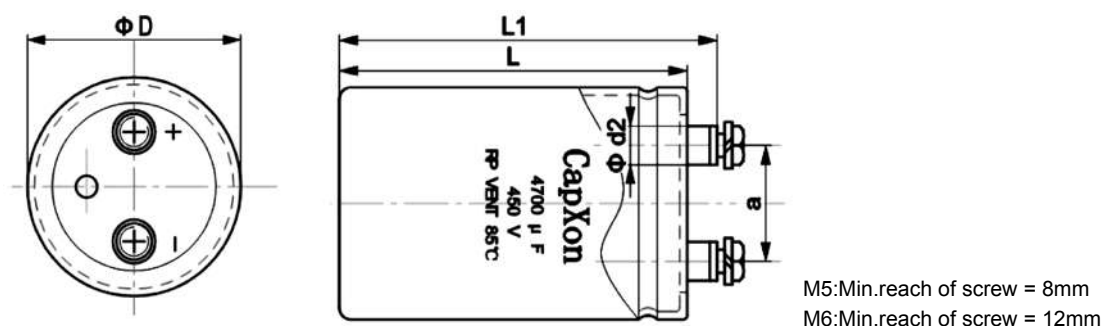


Specifications

Item	Performance Characteristics					
Rated voltage V _R	160... 450 V DC					
Surge voltage V _S	1.10 V _R					
Rated capacitance C _R	680 ...68000 μF					
Capacitance tolerance	±20%					
tan δ (at 20℃ · 120Hz)	Less than the value under table(%)					
	ΦD WV	35	51	53	76.2	89
	160~250	15	15	20	20	20
	350~450	20	20	25	25	25
Leakage Current I _{leak} (20 ℃, 5 min)	I _{leak} ≤ 0.3μA * (C*V) ^{0.7} + 4μA					
Self-inductance ESL	d = 51.6 mm: approx. 17 nH					
	d ^ 3 64.3 mm: approx. 20 nH					
	Capacitors with low-inductance design:					
	d ^ 3 64.3 mm: approx. 15 nH					
Useful life 85 ℃; V _R I _{AC} ¹ R	> 10000 h	Requirements: Δ DC/C ≤ ±50% of initial value ESR ≤ 5 times initial specified limit Ileak ≤ initial specified limit				
Voltage Endurance test 85 ℃; V _R	2000 h	Post test requirements: Δ DC/C ≤ ±20% of initial value ESR ≤ 2 times initial specified limit Ileak ≤ initial specified limit				
Vibration Resistance test	To IEC 60068-2-6, test Fc:					
	Displacement amplitude 0.75 mm, frequency range 10 ... 55 Hz, acceleration max. 10 g, duration 3X2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.					
Low Temperature Characteristics	Max. impedance ratio at 120 Hz					
	V _R	≤ 400 V		≥ 450 V		
	Z _{-25℃} / Z _{20℃}	4		3		
	Z _{-40℃} / Z _{20℃}	16		12		
Sectional specification	IEC 60384-4 and JIS-C-5101					

Dimensional drawings

Ring clip/clamp mounting:



Dimensions

Terminal	Dimensions(mm) with insulating sleeve				
	$D \pm 2$	$L \pm 3$	$L_1 \pm 3$	$d_{2max.}$	$a \pm 0.5$
M5	35	50~120	56.5~126.5	10.3	12.7
M5	51	80~140	86.5~146.5	10.3	22
M5	63.5	80~140	86.5~146.5	10.3	28.6
M5	76.2/89	100~240	106.4~246.5	10.3	31.8
M6	76.2/89	100~240	106.4~246.5	17.5	31.8

Packing

Diameter D(mm)	Length L(mm)	Packing (pcs.)
35	≤ 70 mm	120
	> 70 mm	60
42	≤ 70 mm	120
	> 70 mm	60
51	≤ 70 mm	70
	> 70 mm	35
63.5	all	24
76.2	all	15
89	all	12
100	all	6

Accessories

The following items are included in the delivery package, but are not fastened to the capacitors.

	Thread	Maximum torque
For terminal	M5	2 Nm
	M6	2.5 Nm

Case Size

φ DxL(mm)

WV(V) Cap(μF)	160		200		250	
	Size	Ripple	Size	Ripple	Size	Ripple
680					35x60	2.5
1000	35x60	2.8	35x60	3.0	35x80	3.1
1500	35x60	3.1	35x80	3.5	35x80	3.8
2200	35x80	4.2	35x100	4.8	35x120	5.3
	35x100	4.7			51x80	5.4
2700			35x120	5.5	51x80	5.8
3300	35x100	6.0	35x120	6.2	51x100	6.8
	35x120	6.8	51x80	6.3	51x120	7.5
3900	51x80	7.2	51x80	6.8	51x115	8.0
4700	51x80	7.5	51x100	7.8	51x120	8.5
					51x140	9.1
					63.5x100	8.8
6800	51x100	10.0	51x120	9.0	51x140	9.5
	51x120	11.5	51x140	9.8	63.5x120	9.8
					76.2x100	10.0
8200	51x120	12.0	63.5x100	11.0	63.5x115	11.5
10000	51x140	13.4	63.5x100	12.0	76.2x120	12.5
	63.5x100	13.0	63.5x120	13.0	76.2x140	13.3
12000			76.2x100	14.4	76.2x115	14.0
15000	63.5x120	13.5	76.2x120	16.0	76.2x150	16.0
	63.5x140	14.8	76.2x140	17.0	76.2x160	16.5
	76.2x100	14.0			89x120	16.0
22000	76.2x120	17.6	76.2x160	19.6	89x160	21.0
	76.2x140	18.9	89x120	18.8		
27000			89x130	21.5		
33000	76.2x160	22.0	89x160	25.0	89x220	23.0
	89x140	23.0				
47000	89x170	25.0	89x220	27.0	100x240	25.0
68000	89x230	27.0				

Ripple Current(A,rms) at 85°C 120Hz

Case Size

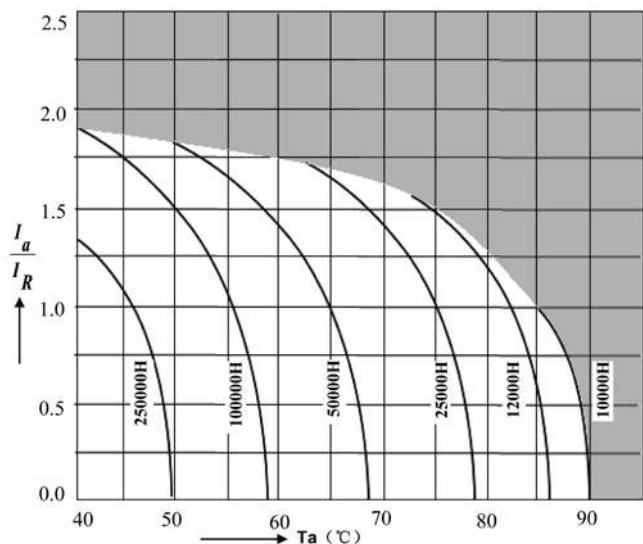
φ DxL(mm)

WV(V) Cap(μF)	350		400		450	
	Size	Ripple	Size	Ripple	Size	Ripple
1000			35x120	5.0	51x80	4.6
			51x80	5.0	51x105	5.0
1500	51x80	5.3	51x80	6.2	51x100	6.2
			51x100	6.8	51x120	6.7
			51x105	6.9	63.5x80	6.4
2200	51x100	6.9	51x100	7.3	51x120	7.5
	51x105	7.1	51x120	8.0	63.5x100	7.8
	51x120	7.4	51x140	8.5	63.5x105	8.0
					63.5x120	8.5
2700	63.5x80	8.0	63.5x105	9.3	76.2x105	9.2
3300	51x120	8.5	51x130	9.8	63.5x120	10.3
	51x140	9.0	63.5x100	10.0	63.5x140	11.0
	63.5x100	8.7	63.5x120	10.8	76.2x120	11.3
3900	63.5x105	10.2	76.2x100	11.5	76.2x120	12.0
			76.2x105	11.8	76.2x140	12.8
4700	63.5x120	11.5	76.2x100	12.0	76.2x120	13.0
	63.5x140	12.0	76.2x120	13.0	76.2x140	14.0
	76.2x100	11.5			76.2x160	14.8
5600	63.5x140	13.0	76.2x140	14.5	76.2x160	15.0
6800	76.2x120	15.0	76.2x140	16.0	76.2x160	16.0
	76.2x140	16.0	76.2x160	17.0		
	89x100	15.0				
8200	76.2x160	17.5	76.2x160	18.0	76.2x220	19.0
10000	76.2x160	18.0	76.2x160	19.5	76.2x220	21.0
	89x120	16.5	89x130	19.5	89x170	20.0
12000	76.2x180	22.0	89x160	22.0		
	76.2x220	25.0	89x220	25.0		
15000	89x160	26.5	76.2x230	27.0		
	89x220	30.0	89x180	26.0		
			89x220	28.5		
18000	89x220	33.0	89x240	33.0		
22000	89x230	35.0	100x240	36.0		

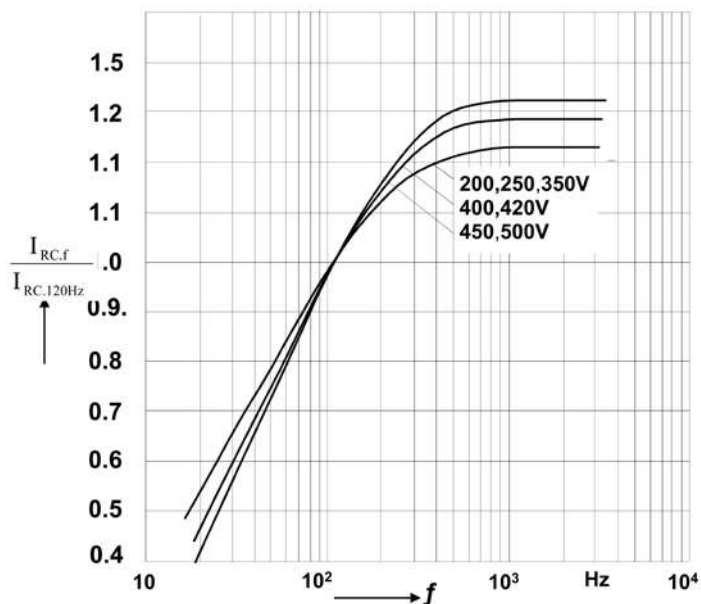
Ripple Current(A,rms) at 85°C 120Hz

Useful life

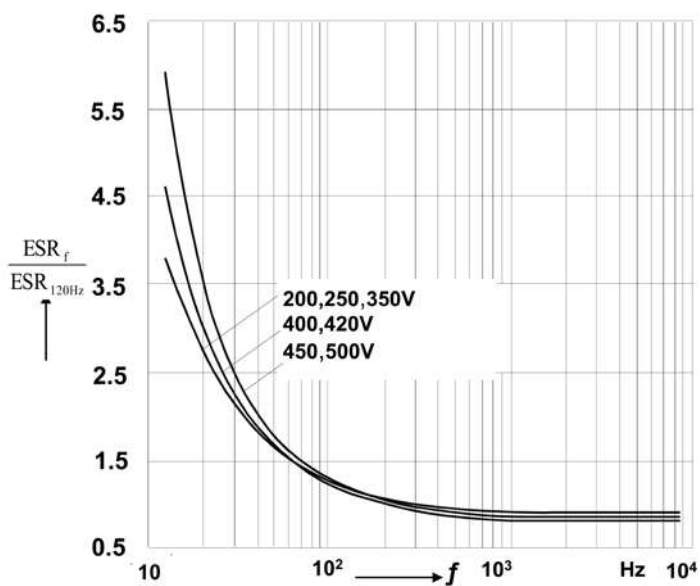
depending on ambient temperature T_a versus under ripple current operating conditions



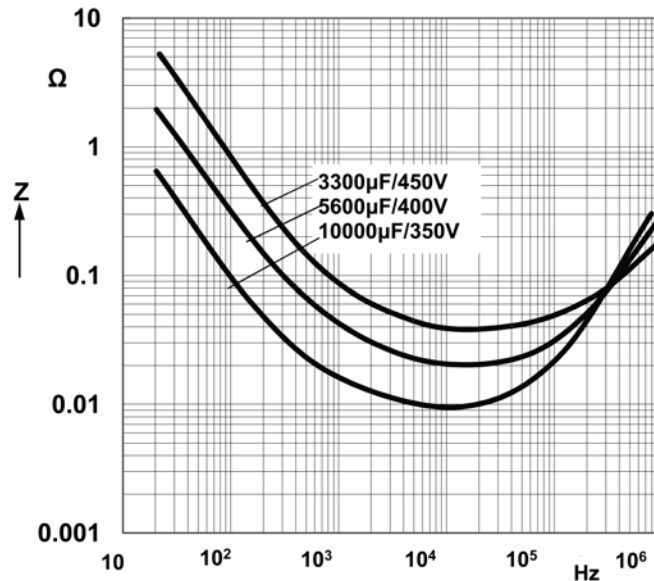
Frequency factor of permissible ripple current I_{RC} versus frequency f



Frequency characteristics of ESR Typical behavior



Impedance Z versus frequency f



RU Series 85°C

Features

Extremely Long useful life

Applications

- ◆ Professional power supplies
- ◆ Frequency converters
- ◆ Uninterruptible power supplies

Features

- ◆ Long useful life
- ◆ High reliability
- ◆ High ripple current capability
- ◆ All-welded construction ensures reliable electrical contact
- ◆ Version with low-inductance design available
- ◆ Self-extinguishing electrolyte
- ◆ RoHS-compatible
- ◆ For detail specifications, please refer to Engineering Bulletin No. E184

Construction

- ◆ Charge-discharge proof, polar
- ◆ Aluminum case with insulating sleeve
- ◆ Poles with screw terminal connections
- ◆ Mounting with ring clips, clamps or threaded stud

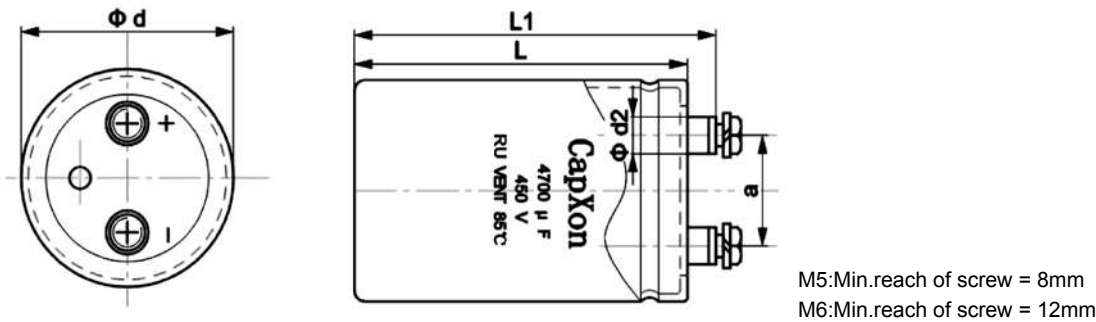


Specifications

Item	Performance Characteristics					
Rated voltage V _R	350... 450 V DC					
Surge voltage V _S	1.10 V _R					
Rated capacitance C _R	1000 …22000 μF					
Capacitance tolerance	±20%					
tan δ (at 20℃ , 120Hz)	Less than the value under table(%)					
	ΦD WV	35	51	53	76.2	89
	160~250	15	15	20	20	20
	350~450	20	20	25	25	25
Leakage Current I _{leak} (20 °C, 5 min)	I _{leak} ≤ 0.3μA * (C*V) ^{0.7} + 4μA					
Self-inductance ESL	d = 51.6 mm: approx. 17 nH					
	d ≥ 64.3 mm: approx. 20 nH					
	Capacitors with low-inductance design:					
	d ≥ 64.3 mm: approx. 15 nH					
Useful life 85 °C; V _R I _{AC} [*] I _R	> 12000 h	Requirements: Δ DC/C ≤ ±50% of initial value ESR ≤ 5 times initial specified limit I _{leak} ≤ initial specified limit				
Voltage Endurance test 85 °C; V _R	2000 h	Post test requirements: Δ DC/C ≤ ±20% of initial value ESR ≤ 2 times initial specified limit I _{leak} ≤ initial specified limit				
Vibration Resistance test	To IEC 60068-2-6, test Fc:					
	Displacement amplitude 0.75 mm, frequency range 10 ... 55 Hz, acceleration max. 10 g, duration 3X2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.					
Low Temperature Characteristics	Max. impedance ratio at 120 Hz					
	V _R	≤ 400 V		≥ 450 V		
	Z _{-25℃} / Z _{20℃}	3		4		
	Z _{-40℃} / Z _{20℃}	9		12		
Sectional specification	IEC 60384-4 and JIS-C-5101					

Dimensional drawings

Ring clip/clamp mounting:



Dimensions

Terminal	Dimensions(mm) with insulating sleeve				
	$D \pm 2$	$L \pm 3$	$L_1 \pm 3$	$d_2 \text{max.}$	$a \pm 0.5$
M5	35	50~120	56.5~126.5	10.3	12.7
M5	51	80~140	86.5~146.5	10.3	22
M5	63.5	80~140	86.5~146.5	10.3	28.6
M5	76.2/89	100~240	106.4~246.5	10.3	31.8
M6	76.2/89	100~240	106.4~246.5	17.5	31.8

Packing

Diameter D(mm)	Length L(mm)	Packing (pcs.)
35	$\leq 70\text{mm}$	120
	$> 70\text{mm}$	60
42	$\leq 70\text{mm}$	120
	$> 70\text{mm}$	60
51	$\leq 70\text{mm}$	70
	$> 70\text{mm}$	35
63.5	all	24
76.2	all	15
89	all	12

Accessories

The following items are included in the delivery package, but are not fastened to the capacitors.

	Thread	Maximum torque
For terminal	M5	2 Nm
	M6	2.5 Nm

Case Size

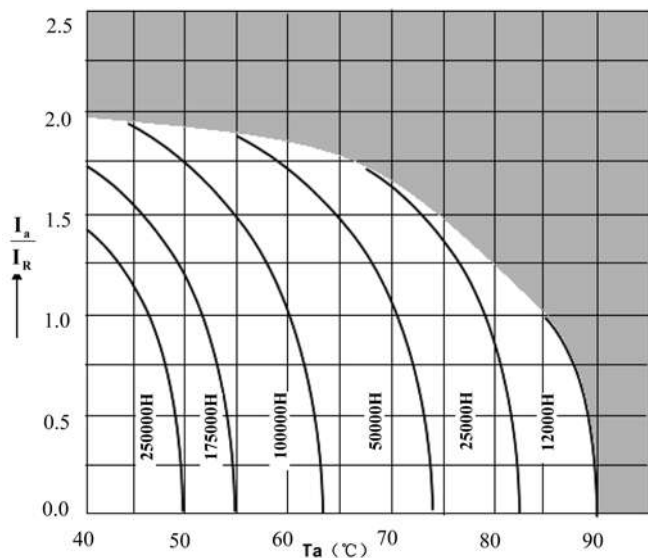
φ DxL(mm)

WV(V) Cap(μF)	350		400		450	
	Size	Ripple	Size	Ripple	Size	Ripple
1000			51x80	4.6	51x80	4.8
					51x105	5.5
1500	51x80	5.7	51x80	6.0	51x100	6.5
			51x100	6.6	51x120	7.0
			51x105	6.6	63.5x80	6.7
2200	51x100	7.4	51x100	8.0	63.5x100	8.3
	51x105	7.6	51x120	8.6	63.5x105	8.5
	51x120	8.0	51x140	9.5	63.5x120	9.0
2700	63.5x80	9.0	63.5x105	9.5	76.2x105	10.5
	51x120	10.0	51x130	11.0	63.5x140	12.0
3300	51x140	10.5	63.5x100	11.0	76.2x100	12.0
	63.5x100	10.5	63.5x120	12.0	76.2x120	13.0
3900	63.5x105	12.0	76.2x100	14.0	76.2x120	13.5
			76.2x105	14.0	76.2x140	14.5
4700	63.5x120	13.5	76.2x100	14.5	76.2x120	15.0
	63.5x140	14.5	76.2x120	15.6	76.2x140	16.0
	76.2x100	13.5			76.2x160	17.0
5600	63.5x140	15.0	76.2x140	17.0	76.2x160	18.0
	76.2x105	15.0				
6800	76.2x120	17.0	76.2x140	19.0	76.2x160	19.0
	76.2x140	18.0	76.2x160	20.0		
	89x100	18.0				
8200	76.2x140	20.0	76.2x160	21.0	76.2x220	24.0
	76.2x160	21.0				
10000	76.2x160	24.5	76.2x190	25.0	76.2x220	27.0
	89x120	23.5	89x160	26.0	89x170	26.0
12000	76.2x180	28.0	89x160	28.0		
	76.2x220	30.0	89x220	32.0		
	89x145	28.0				
15000	76.2x220	33.0	76.2x230	32.0		
	89x160	32.0	89x180	32.0		
	89x220	36.0	89x220	35.0		
18000	89x220	38.0	89x240	37.0		
22000	89x230	40.0				

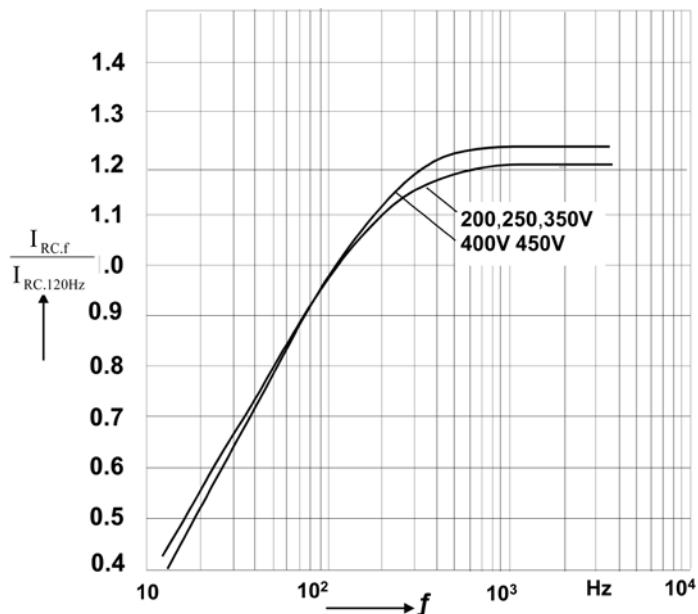
Ripple Current(A,rms) at 85°C 120Hz

Useful life

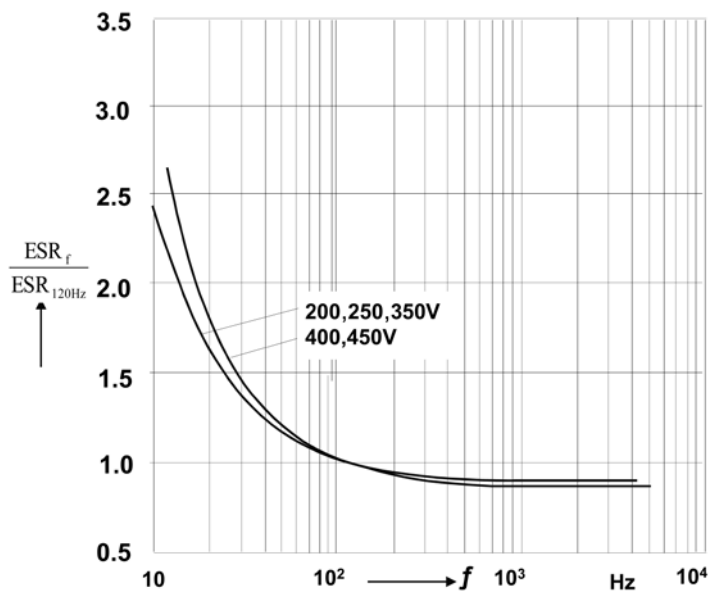
depending on ambient temperature T_a versus under ripple current operating conditions



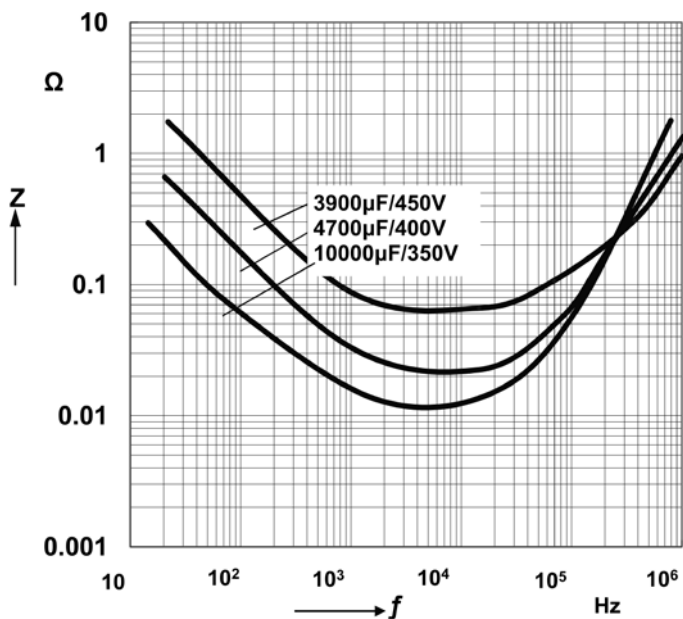
Frequency factor of permissible ripple current I_{RC} versus frequency f



Frequency characteristics of ESR Typical behavior



Impedance Z versus frequency f



RJ Series 85°C

Features

Long useful life

Applications

- ◆ Professional power supplies
- ◆ Frequency converters
- ◆ Uninterruptible power supplies

Features

- ◆ Long useful life
- ◆ High reliability
- ◆ All-welded construction ensures reliable electrical contact
- ◆ Version with low-inductance design available
- ◆ Self-extinguishing electrolyte
- ◆ RoHS-compatible
- ◆ For detail specifications, please refer to Engineering Bulletin No. E185

Construction

- ◆ Charge-discharge proof, polar
- ◆ Aluminum case with insulating sleeve
- ◆ Poles with screw terminal connections
- ◆ Mounting with ring clips, clamps or threaded stud

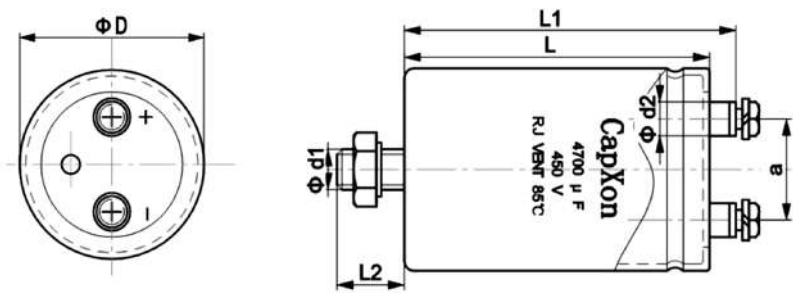


Specifications

Item	Performance Characteristics					
Rated voltage V _R	350... 450 V DC					
Surge voltage V _S	1.10 V _R					
Rated capacitance C _R	1500 ...22000 μF					
Capacitance tolerance	±20%					
tan δ (at 20℃ · 120Hz)	Less than the value under table(%)					
	ΦD WV	35	51	53	76.2	89
	160~250	15	15	20	20	20
	350~450	20	20	25	25	25
Leakage Current I _{leak} (20 ℃, 5 min)	I _{leak} ≤ 0.3μA * (C*V) ^{0.7} + 4μA					
Self-inductance ESL	d = 51.6 mm: approx. 17 nH					
	d ≥ 64.3 mm: approx. 20 nH					
	Capacitors with low-inductance design:					
	d ≥ 64.3 mm: approx. 15 nH					
Useful life 85 ℃; V _R * I _{AC} *R	> 10000 h	Requirements: Δ DC/C ≤ ±50% of initial value ESR ≤ 5 times initial specified limit I _{leak} ≤ initial specified limit				
Voltage Endurance test 85 ℃; V _R	2000 h	Post test requirements: Δ DC/C ≤ ±20% of initial value ESR ≤ 2 times initial specified limit I _{leak} ≤ initial specified limit				
Vibration Resistance test	To IEC 60068-2-6, test Fc:					
	Displacement amplitude 0.75 mm, frequency range 10 ... 55 Hz, acceleration max. 10 g, duration 3X2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.					
Low Temperature Characteristics	Max. impedance ratio at 120 Hz					
	V _R	≤ 400 V		≥ 450 V		
	Z _{-25℃} / Z _{20℃}	4		3		
	Z _{-40℃} / Z _{20℃}	16		12		
Sectional specification	IEC 60384-4 and JIS-C-5101					

Dimensional drawings

Ring clip/clamp mounting:



M5:Min.reach of screw = 8mm
M6:Min.reach of screw = 12mm

Dimensions

Terminal	Dimensions(mm) with insulating sleeve						
	$D \pm 2$	$L \pm 3$	$L_1 \pm 3$	$L_2 \pm 1$	d_1	$d_2 \text{ max.}$	$a \pm 0.5$
M5	63.5	80~140	86.5~146.5	16	M12	10.3	28.6
M5/M6	76.2/89	100~240	106.4~246.5	16	M12	10.3	31.8
M5/M6	76.2/89	100~240	106.4~246.5	16	M12	17.5	31.8

Packing

Diameter D(mm)	Length L(mm)	Packing (pcs.)
63.5	all	24
76.2	all	15
89	all	12

Accessories

The following items are included in the delivery package, but are not fastened to the capacitors.

	Thread	Maximum torque
For terminal	M5	2 Nm
	M6	2.5 Nm

Case Size

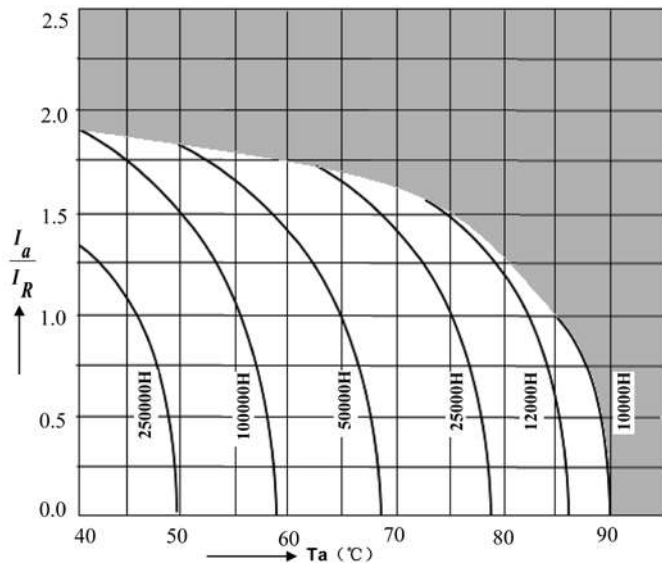
φ DxL(mm)

WV(V) Cap(μF)	350		400		450	
	Size	Ripple	Size	Ripple	Size	Ripple
1500					63.5x80	11.4
2200					63.5x100	12.5
					63.5x105	12.8
					63.5x120	13.5
2700	63.5x80	12.8	63.5x105	10.8	76.2x105	14.6
3300					63.5x120	15.0
	63.5x100	14.2	63.5x100	11.0	63.5x140	16.0
			63.5x120	12.0	76.2x120	17.7
3900	63.5x105	14.6	76.2x100	14.0	76.2x120	18.0
			76.2x105	14.3	76.2x140	19.0
4700	63.5x120	15.0	76.2x100	15.7	76.2x120	18.3
	63.5x140	15.5	76.2x120	17.0	76.2x140	19.6
	76.2x100	19.7			76.2x160	20.5
5600	63.5x140	21.5	76.2x140	18.8	76.2x160	21.0
6800	76.2x120	22.5	76.2x140	22.0	76.2x160	22.0
	76.2x140	24.0	76.2x160	23.0		
	89x100	23.0				
8200	76.2x160	26.0	76.2x160	23.5	76.2x220	25.6
10000	76.2x160	27.5	76.2x160	24.0	76.2x220	26.0
	89x120	26.0	89x130	25.0	89x170	26.0
12000	76.2x180	29.0	89x160	25.5		
	76.2x220	32.0	89x220	28.5		
15000	89x160	34.0	76.2x230	33.0		
	89x220	39.0	89x180	32.0		
			89x220	35.0		
18000	89x220	40.0	89x240	38.0		
22000	89x230	42.0				

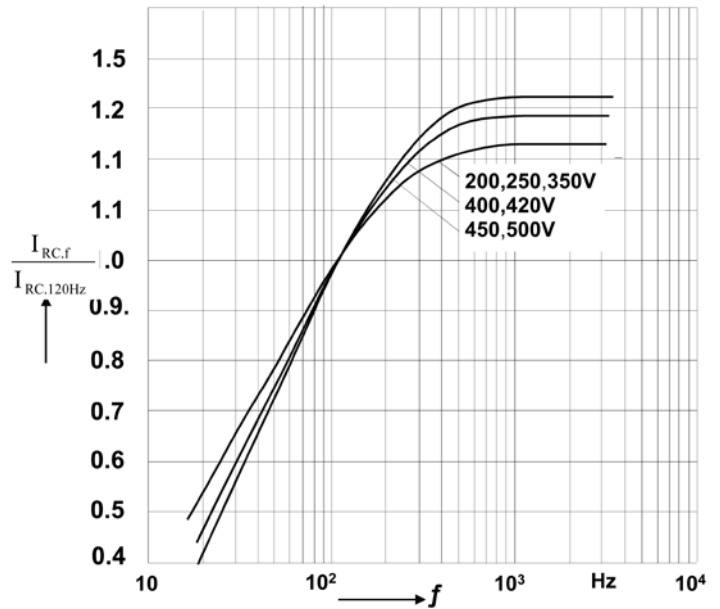
Ripple Current(A,rms) at 85°C 120Hz

Useful life

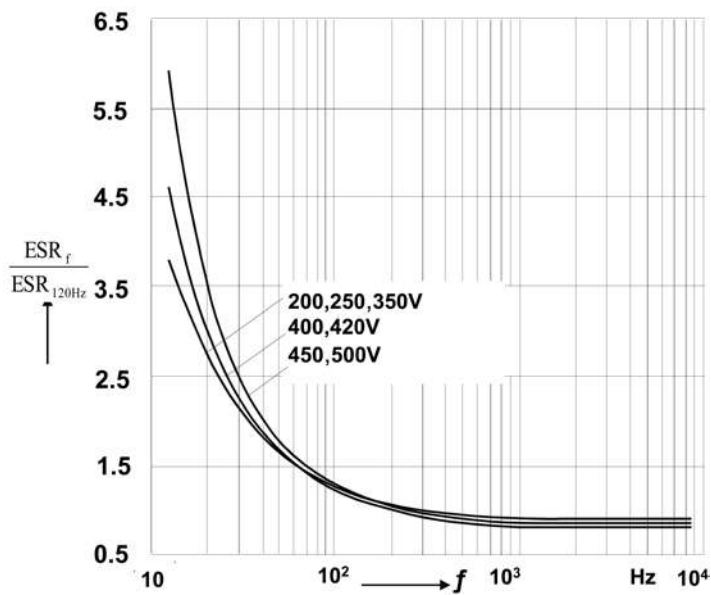
depending on ambient temperature T_a versus under ripple current operating conditions



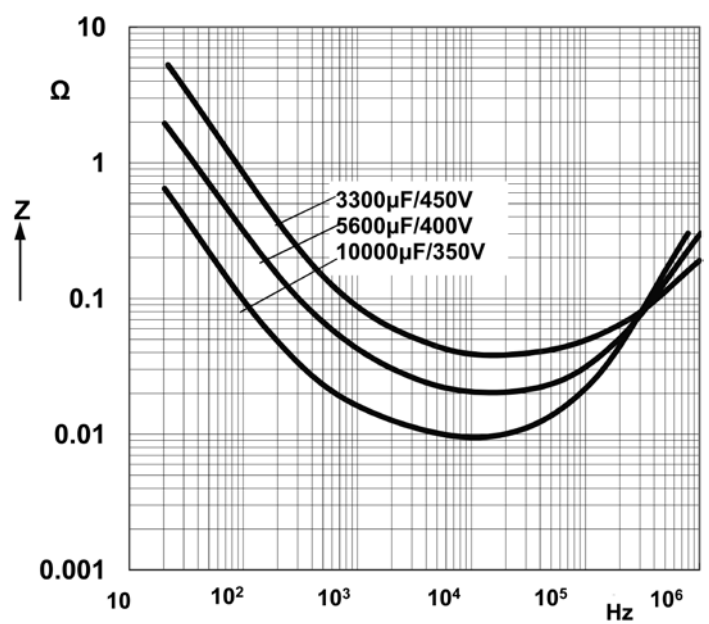
Frequency factor of permissible ripple current I_{RC} versus frequency f



Frequency characteristics of ESR Typical behavior



Impedance Z versus frequency f



RY Series 85°C

Features

Extremely Long useful life

Applications

- ◆ Professional power supplies
- ◆ Frequency converters
- ◆ Uninterruptible power supplies

Features

- ◆ Long useful life
- ◆ High reliability
- ◆ High ripple current capability
- ◆ All-welded construction ensures reliable electrical contact
- ◆ Version with low-inductance design available
- ◆ Self-extinguishing electrolyte
- ◆ RoHS-compatible
- ◆ For detail specifications, please refer to Engineering Bulletin No. E186

Construction

- ◆ Charge-discharge proof, polar
- ◆ Aluminum case with insulating sleeve
- ◆ Poles with screw terminal connections
- ◆ Mounting with ring clips, clamps or threaded stud

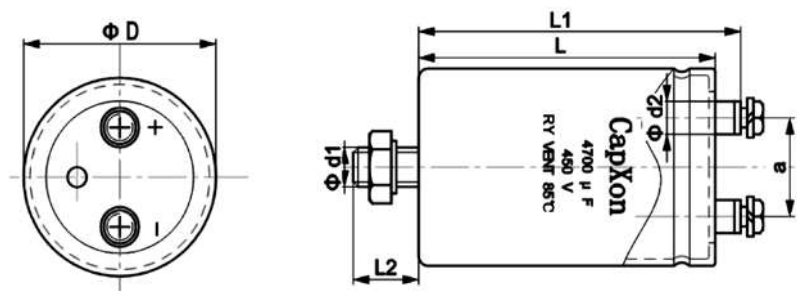


Specifications

Item	Performance Characteristics					
Rated voltage V _R	350... 450 V DC					
Surge voltage V _S	1.10 V _R					
Rated capacitance C _R	1500 …22000 μF					
Capacitance tolerance	±20%					
tan δ (at 20℃ · 120Hz)	Less than the value under table(%)					
	ΦD WV	35	51	53	76.2	89
	160~250	15	15	20	20	20
	350~450	20	20	25	25	25
Leakage Current I _{leak} (20℃, 5 min)	I _{leak} ≤ 0.3μA * (C*V) ^{0.7} + 4μA					
Self-inductance ESL	d = 51.6 mm: approx. 17 nH					
	d ≥ 64.3 mm: approx. 20 nH					
	Capacitors with low-inductance design:					
	d ≥ 64.3 mm: approx. 15 nH					
Useful life 85℃; V _R ¹ I _{AC} ² R	> 12000 h	Requirements: Δ DC/C ≤ ±50% of initial value ESR ≤ 5 times initial specified limit I _{leak} ≤ initial specified limit				
Voltage Endurance test 85℃; V _R	2000 h	Post test requirements: Δ DC/C ≤ ±20% of initial value ESR ≤ 2 times initial specified limit I _{leak} ≤ initial specified limit				
Vibration Resistance test	To IEC 60068-2-6, test Fc:					
	Displacement amplitude 0.75 mm, frequency range 10 ... 55 Hz, acceleration max. 10 g, duration 3X2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.					
Low Temperature Characteristics	Max. impedance ratio at 120 Hz					
	V _R	≤ 400 V	≥ 450 V			
	Z _{-25℃} / Z _{20℃}	3	4			
	Z _{-40℃} / Z _{20℃}	9	12			
Sectional specification	IEC 60384-4 and JIS-C-5101					

Dimensional drawings

Ring clip/clamp mounting:



M5:Min.reach of screw = 8mm
M6:Min.reach of screw = 12mm

Dimensions

Terminal	Dimensions(mm) with insulating sleeve						
	D±2	L±3	L ₁ ±3	L ₂ +/-1	d ₁	d ₂ max.	a±0.5
M5	63.5	80~140	86.5~146.5	16	M12	10.3	28.6
M5	76.2/89	100~240	106.4~246.5	16	M12	10.3	31.8
M6	76.2/89	100~240	106.4~246.5	16	M12	17.5	31.8

Packing

Diameter D(mm)	Length L(mm)	Packing (pcs.)
63.5	all	24
76.2	all	15
89	all	12

Accessories

The following items are included in the delivery package, but are not fastened to the capacitors.

	Thread	Maximum torque
For terminal	M5	2 Nm
	M6	2.5 Nm

Case Size

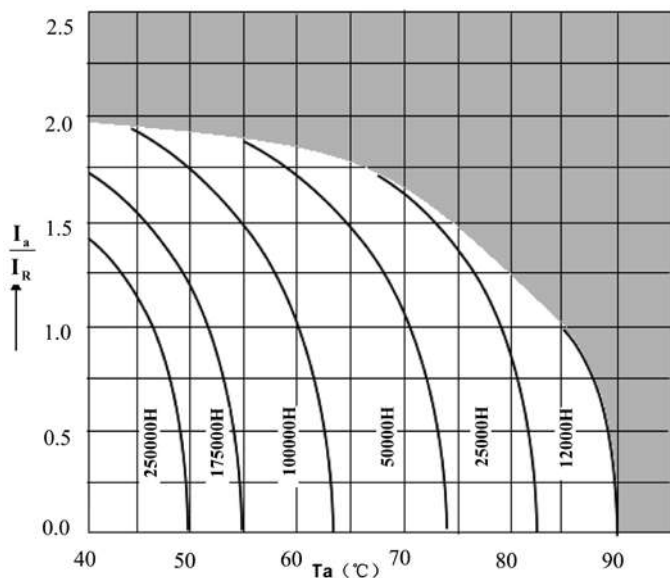
φ DxL(mm)

WV(V) Cap(μF)	350		400		450	
	Size	Ripple	Size	Ripple	Size	Ripple
1500					63.5x80	13.0
2200					63.5x100	14.0
					63.5x105	15.0
					63.5x120	16.0
2700	63.5x80	16.0	63.5x105	17.0	76.2x105	18.0
3300			63.5x100	20.0	63.5x140	23.0
	63.5x100	19.0	63.5x120	21.5	76.2x100	23.0
					76.2x120	25.0
3900	63.5x105	21.0	76.2x100	23.0	76.2x120	24.0
			76.2x105	23.0	76.2x140	25.0
4700	63.5x120	22.0	76.2x100	26.0	76.2x120	27.0
	63.5x140	23.5	76.2x120	28.0	76.2x140	28.0
	76.2x100	24.0			76.2x160	29.0
5600	63.5x140	28.0	76.2x140	30.0	76.2x160	31.5
	76.2x105	30.0				
6800	76.2x120	31.0	76.2x140	33.0	76.2x160	32.0
	76.2x140	33.0	76.2x160	35.0		
	89x100	34.0				
8200	76.2x140	36.0	76.2x160	34.0	76.2x220	36.0
	76.2x160	38.0				
10000	76.2x160	42.0	76.2x190	38.0	76.2x220	40.0
	89x120	42.0	89x160	39.0	89x170	40.0
12000	76.2x180	45.0	89x160	41.0		
	76.2x220	49.0	89x220	46.0		
	89x145	51.0				
15000	76.2x220	53.0	76.2x230	48.0		
	89x160	53.0	89x180	52.0		
	89x220	55.0	89x220	57.0		
18000	89x220	58.0	89x240	60.0		
22000	89x230	60.0				

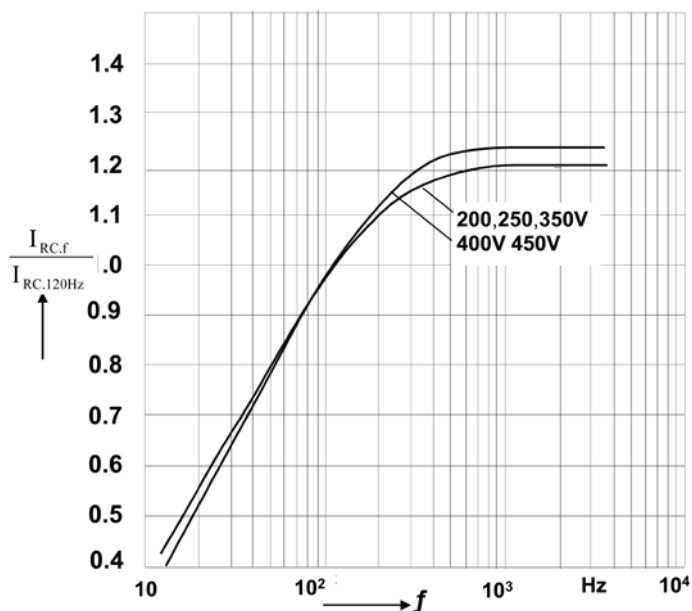
Ripple Current(A,rms) at 85°C 120Hz

Useful life

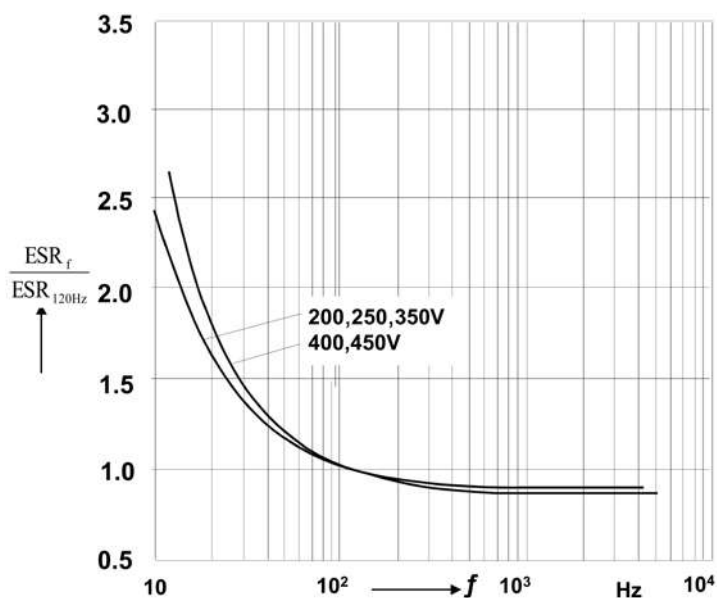
depending on ambient temperature T_a versus under ripple current operating conditions



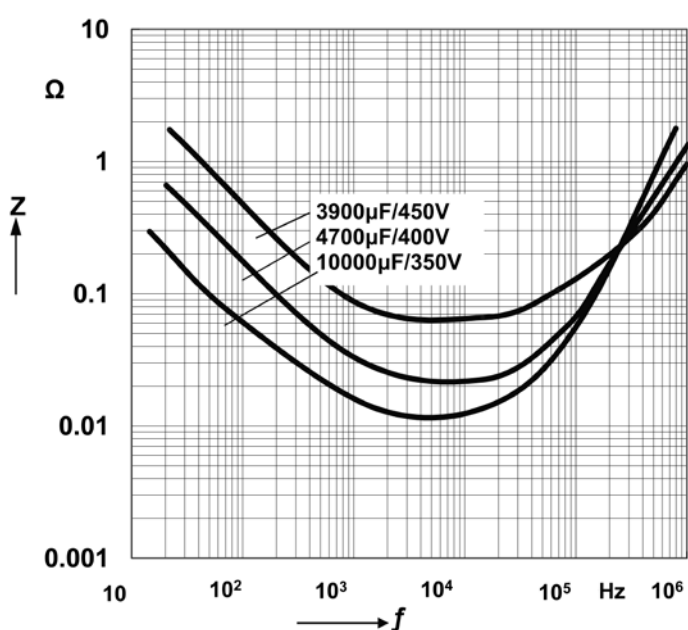
Frequency factor of permissible ripple current I_{RC} versus frequency f



Frequency characteristics of ESR Typical behavior



Impedance Z versus frequency f



RK Series 105°C

Features

General capacitors

Applications

- ◆ Frequency converters
- ◆ Professional power supplies
- ◆ Uninterruptible power supplies

Features

- ◆ Wide temperature range
- ◆ All-welded construction ensures reliable electrical contact
- ◆ Self-extinguishing electrolyte
- ◆ RoHS-compatible
- ◆ For detail specifications, please refer to Engineering Bulletin No. E187

Construction

- ◆ Charge-discharge proof, polar
- ◆ Aluminum case with insulating sleeve
- ◆ Poles with screw terminal connections
- ◆ Mounting with ring clips, clamps or threaded stud

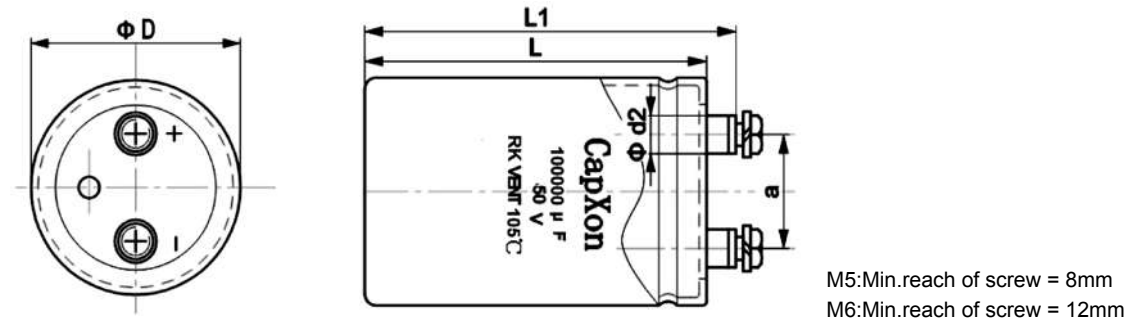


Specifications

Item	Performance Characteristics									
Rated voltage V _R	16... 100 V DC									
Surge voltage V _S	1.15 V _R									
Rated capacitance C _R	1500 ... 1000000 μF									
Capacitance tolerance	±20%									
tan δ (at 20℃ , 120Hz)	Less than the value under table(%)									
	ΦD WV	35	51	63.5	76.2	89				
	16	60	70	80	120	140				
	25	40	50	70	80	100				
	35	30	50	60	70	90				
	50	25	30	50	60	80				
	63	20	25	30	40	60				
	80	20	20	25	30	50				
	100	15	20	25	30	30				
	Leakage Current I _{leak} (20 ℃, 5 min)	I _{leak} ≤ 0.3μA * (C*V) ^{0.7} + 4μA								
Load life test 105 ℃; V _R	2000 h	Requirements: Δ DC/C ≤ ±20% of initial value ESR ≤ 2 times initial specified limit Ileak ≤ initial specified limit								
Vibration Resistance test	To IEC 60068-2-6, test Fc: Displacement amplitude 0.75 mm, frequency range 10 ... 55 Hz, acceleration max. 10 g, duration 3X2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.									
Low Temperature Characteristics	Max. impedance ratio at 120 Hz <table><tr><td>Z_{-25℃} / Z_{20℃}</td><td>3</td></tr><tr><td>Z_{-40℃} / Z_{20℃}</td><td>12</td></tr></table>						Z _{-25℃} / Z _{20℃}	3	Z _{-40℃} / Z _{20℃}	12
Z _{-25℃} / Z _{20℃}	3									
Z _{-40℃} / Z _{20℃}	12									
Sectional specification	IEC 60384-4 and JIS-C-5101									

Dimensional drawings

Ring clip/clamp mounting:



Dimensions

Terminal	Dimensions(mm) with insulating sleeve				
	$D \pm 2$	$L \pm 3$	$L_1 \pm 3$	$d_2 \text{max.}$	$a \pm 0.5$
M5	35	50~120	56.5~126.5	10.3	12.7
M5	51	80~140	86.5~146.5	10.3	22
M5	63.5	80~140	86.5~146.5	10.3	28.6
M5	76.2/89	100~240	106.4~246.5	10.3	31.8
M6	76.2/89	100~240	106.4~246.5	17.5	31.8

Packing

Diameter D(mm)	Length L(mm)	Packing (pcs.)
35	$\leq 70\text{mm}$	120
	$> 70\text{mm}$	60
42	$\leq 70\text{mm}$	120
	$> 70\text{mm}$	60
51	$\leq 70\text{mm}$	70
	$> 70\text{mm}$	35
63.5	all	24
76.2	all	15
89	all	12
100	all	6

Accessories

The following items are included in the delivery package, but are not fastened to the capacitors.

	Thread	Maximum torque
For terminal	M5	2 Nm
	M6	2.5 Nm

Case Size

WV(V) Cap(μF)		16		25		35		50	
		Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
6800								35x50	3.1
10000						35x60	3.5	35x60	4.0
15000				35x50	5.3	35x80	4.8	35x80	5.5
22000	35x60	4.9		35x60	6.5	35x100	8.8	35x120	10.0
				35x80	7.4			51x80	10.0
33000	35x80	6.7		35x80	8.8	35x120	11.0	51x100	13.0
				35x100	9.7	51x80	12.0		
47000	35x100	8.8		35x105	11.0	51x100	14.0	51x120	15.8
				35x120	11.7			63.5x100	16.5
				51x80	12.0				
68000	51x80	9.5		51x80	13.0	51x120	16.5	63.5x100	18.0
				51x100	14.3				
100000	51x100	12.5		51x105	15.0				
				51x120	16.0	63.5x120	20.0	76.2x120	23.0
				63.5x100	16.7				
150000	51x120	15.5		63.5x105	18.0	76.2x120	23.0	76.2x140	25.0
	51x140	17.6		63.5x120	19.0				
220000	63.5x120	18.0		76.2x105	20.0	76.2x160	27.0	89X160	30.0
				76.2x120	21.2	89X140	27.5		
330000	76.2x120	19.1		76.2x145	24.0	89X160	30.0	89X220	35.0
				76.2x160	25.0				
				89X140	26.0				
470000	76.2x160	25.5		89X160	28.0	89X220	35.0		
	89X140	26.0							
680000	89X160	27.0		89X220	33.0				
1000000	89X220	28.5							

φ DxL(mm)

Ripple Current(A rms) at 105°C /120Hz

WV(V) Cap(μF)		63		80		100	
		Size	Ripple	Size	Ripple	Size	Ripple
1500						35x60	3.5
2200						35x80	4.7
3300						35x80	5.7
						35x100	6.3
4700				35x60	5.3	35x100	3.8
						35x105	7.5
						51x80	4.3
6800	35x60	5.3		35x80	7.0	51x80	8.7
	35x80	6.0				51x100	9.5
10000	35x80	7.2		35x100	8.2	51x100	10.5
	35x105	8.1		51x80	9.0	51x105	11.0
						51x140	12.5
15000	35x120	9.0		51x80	10.0	63.5x100	14.5
	51x80	9.5				63.5x105	15.0
						63.5x120	16.0
22000	51x80	10.5		51x100	13.0	76.2x100	16.5
	51x105	12.0				76.2x105	17.0
						76.2x120	18.0
33000	51x120	14.0		51x140	16.0	76.2x140	20.5
	63.5x100	14.5		76.2x100	17.0	76.2x145	21.0
	63.5x105	15.0					
47000	63.5x100	16.6		63.5x140	19.0	76.2x160	23.0
	63.5x105	17.0		76.2x120	19.0	89X140	23.5
68000	63.5x140	19.5		76.2x140	22.0	89X160	25.5
	76.2x105	19.0					
	76.2x120	20.0					
100000	76.2x140	22.5		89X160	26.0	89X230	30.0
	76.2x145	23.0					
150000	89X160	27.0					

Ripple Current(A rms) at 105°C /120Hz

RL Series 105°C

Features

Long load life

Applications

- ◆ Frequency converters
- ◆ Professional power supplies
- ◆ Uninterruptible power supplies

Features

- ◆ Outstanding reliability
- ◆ Wide temperature range
- ◆ Version with low-inductance design available
- ◆ All-welded construction ensures reliable electrical contact
- ◆ Self-extinguishing electrolyte
- ◆ RoHS-compatible
- ◆ For detail specifications, please refer to Engineering Bulletin No. E148

Construction

- ◆ Charge-discharge proof, polar
- ◆ Aluminum case with insulating sleeve
- ◆ Poles with screw terminal connections
- ◆ Mounting with ring clips, clamps or threaded stud

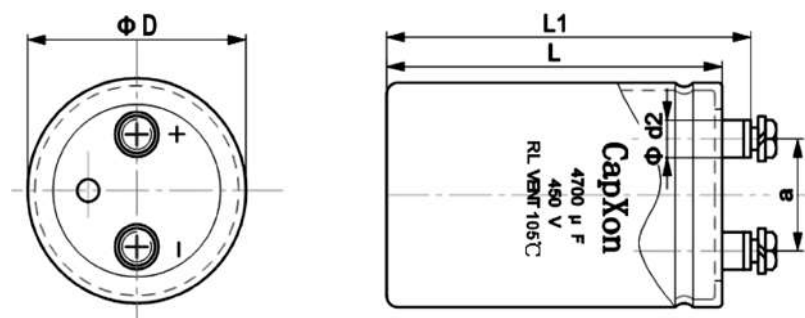


Specifications

Item	Performance Characteristics					
Rated voltage V _R	350... 450 V DC					
Surge voltage V _S	1.10 V _R					
Rated capacitance C _R	680 ... 15000 μF					
Capacitance tolerance	±20%					
tan δ (at 20℃ · 120Hz)	Less than the value under table(%)					
	Φ D WV	35	51	53	76.2	89
	350~450	20	20	25	25	25
Leakage Current I _{leak} (20 ℃, 5 min)	I _{leak} ≤ 0.3μA * (C*V) ^{0.7} + 4μA					
Load life test 105 ℃; V _R	5000 h	Requirements: Δ DC/C ≤ ±20% of initial value ESR ≤ 2 times initial specified limit I _{leak} ≤ initial specified limit				
Vibration Resistance test	To IEC 60068-2-6, test Fc:					
	Displacement amplitude 0.75 mm, frequency range 10 ... 55 Hz, acceleration max. 10 g, duration 3X2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.					
Low Temperature Characteristics	Max. impedance ratio at 120 Hz					
	Z _{-25℃} / Z _{20℃}	3				
	Z _{-40℃} / Z _{20℃}	12				
Sectional specification	IEC 60384-4 and JIS-C-5101					

Dimensional drawings

Ring clip/clamp mounting:



M5:Min.reach of screw = 8mm
M6:Min.reach of screw = 12mm

Dimensions

Terminal	Dimensions(mm) with insulating sleeve				
	D±2	L±3	L ₁ ±3	d ₂ max.	a±0.5
M5	35	50~120	56.5~126.5	10.3	12.7
M5	51	80~140	86.5~146.5	10.3	22
M5	63.5	80~140	86.5~146.5	10.3	28.6
M5	76.2/89	100~240	106.4~246.5	10.3	31.8
M6	76.2/89	100~240	106.4~246.5	17.5	31.8

Packing

Diameter d(mm)	Length L(mm)	Packing (pcs.)
35	≤70mm	120
	>70mm	60
42	≤70mm	120
	>70mm	60
51	≤70mm	70
	>70mm	35
63.5	all	24
76.2	all	15
89	all	12

Accessories

The following items are included in the delivery package, but are not fastened to the capacitors.

	Thread	Maximum torque
For terminal	M5	2 Nm
	M6	2.5 Nm

Case Size

WV(V) Cap(μF)		350		400		450		φ DxL(mm)	
		Size	Ripple	Size	Ripple	Size	Ripple		
680		51x80	4.0						
1000		51x80	6.5	51x80	6.6	63.5x115	12.1		
1200		51x80	6.8	51x80	7.0	63.5x120	12.3		
1500		51x100	8.6	51x120	9.0	63.5x120	12.5		
1800		51x120	9.2	51x140	10.8	63.5x120	13.0		
				63.5x100	10.8				
2200		51x120	11.0	63.5x110	11.6	76.2x100	14.0		
2700		63.5x100	12.5	63.5x115	13.7	76.2x110	16.9		
3300		63.5x110	14.5	63.5x130	16.1	76.2x130	18.0		
3900		63.5x130	16.5	63.5x150	17.9	76.2x140	19.0		
				76.2x110	18.2	89x120	19.5		
4700		63.5x150	20.0	76.2x130	21.2	76.2x140	22.6		
		76.2x120	20.0			89x140	24.5		
5600		63.5x170	22.5	76.2x150	24.3	76.2x160	25.2		
		76.2x130	22.5			89x150	26.5		
6800		76.2x150	26.0	89x150	27.1	89x160	26.0		
8200		76.2x170	30.0	89x170	29.8	89x190	28.3		
		89x150	29.0						
10000		89x150	32.5						
12000		89x190	36.0						
15000		89x220	43.0						

Ripple Current(A,rms) at 105°C 120Hz

RM Series 85°C

Features

Long useful life

Applications

- ◆ Frequency converters
- ◆ Professional power supplies
- ◆ Hybrid electric vehicles(HEV)
- ◆ Traction

Construction

- ◆ Charge-discharge proof, polar
- ◆ Aluminum case with insulating sleeve
- ◆ Poles with screw terminal connections
- ◆ Mounting with ring clips, clamps or threaded stud



Features

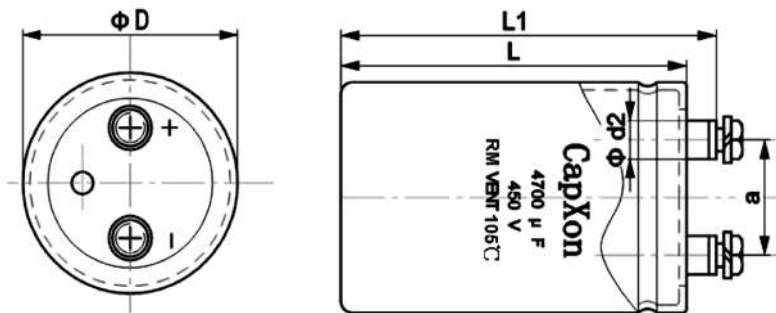
- ◆ High reliability
- ◆ long useful life
- ◆ Extremely high ripple current capability
- ◆ Wide temperature range
- ◆ All-welded construction ensures reliable electrical contact
- ◆ Low-inductance design
- ◆ Self-extinguishing electrolyte
- ◆ RoHS-compatible
- ◆ For detail specifications, please refer to Engineering Bulletin No. E188

Specifications

Item	Performance Characteristics					
Rated voltage V _R	160... 450 V DC					
Surge voltage V _S	1.10 V _R					
Rated capacitance C _R	220 ...47000 μF					
Capacitance tolerance	±20%					
tan δ (at 20℃ · 120Hz)	Less than the value under table(%)					
	Φ D WV	35	51	53	76.2	89
	160~250	15	15	20	20	20
	350~450	20	20	25	25	25
Leakage Current I _{leak} (20 °C, 5 min)	I _{leak} ≤ 0.3μA * (C*V) ^{0.7} + 4μA					
Self-inductance ESL	d = 51.6 mm: approx. 16 nH					
	d ≥ 64.3 mm: approx. 18 nH					
	Capacitors with low-inductance design:					
	d ≥ 64.3 mm: approx. 14 nH					
Useful life 105 °C; V _R , I _{AC} *R	> 6000 h	Requirements: Δ DC/C ≤ ±40% of initial value ESR ≤ 4 times initial specified limit Ileak ≤ initial specified limit				
Voltage Endurance test 105 °C; V _R	2000 h	Post test requirements: Δ DC/C ≤ ±20% of initial value ESR ≤ 2 times initial specified limit Ileak ≤ initial specified limit				
Vibration Resistance test	To IEC 60068-2-6, test Fc:					
	Displacement amplitude 0.75 mm, frequency range 10 ... 55 Hz, acceleration max. 10 g, duration 3X2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.					
Low Temperature Characteristics	Max. impedance ratio at 120 Hz					
	V _R	≤ 400 V	≥ 450 V			
	Z _{-25℃} / Z _{20℃}	4	4			
	Z _{-40℃} / Z _{20℃}	10	10			
Sectional specification	IEC 60384-4 and JIS-C-5101					

Dimensional drawings

Ring clip/clamp mounting:



M5:Min.reach of screw = 8mm
M6:Min.reach of screw = 12mm

Dimensions

Terminal	Dimensions(mm) with insulating sleeve				
	$D \pm 2$	$L \pm 3$	$L_1 \pm 3$	$d_2 \text{ max.}$	$a \pm 0.5$
M5	35	50~120	56.5~126.5	10.3	12.7
M5	51	80~140	86.5~146.5	10.3	22
M5	63.5	80~140	86.5~146.5	10.3	28.6
M5	76.2/89	100~240	106.4~246.5	10.5	31.8
M6	76.2/89	100~240	106.4~246.5	17.5	31.8

Packing

Diameter D(mm)	Length L(mm)	Packing (pcs.)
35	$\leq 70\text{mm}$	120
	$> 70\text{mm}$	60
42	$\leq 70\text{mm}$	120
	$> 70\text{mm}$	60
51	$\leq 70\text{mm}$	70
	$> 70\text{mm}$	35
63.5	all	24
76.2	all	15
89	all	12

Accessories

The following items are included in the delivery package, but are not fastened to the capacitors.

	Thread	Maximum torque
For terminal	M5	2 Nm
	M6	2.5 Nm

Case Size

WV(V) Cap(μF)		160		200		250		φ DxL(mm)
		Size	Ripple	Size	Ripple	Size	Ripple	
470						35×60	1.1	
680				35×50	1.3	35×80	1.5	
1000		35×60	1.7	35×60	1.8	35×100	2.1	
1500		35×80	2.1	35×80	2.3	51×80	2.6	
2200		35×100	3.0	35×120	3.3	51×100	3.5	
				51×80	3.3			
3300		35×120	4.0	51×80	4.1	51×140	4.8	
		51×80	4.0	51×100	4.2	63.5×100	4.6	
4700		51×100	5.0	51×140	5.8	63.5×120	6.0	
				63.5×100	5.6			
6800		51×140	7.0	63.5×120	7.0	76.2×120	7.5	
		63.5×100	6.8					
10000		63.5×120	7.9	76.2×120	9.0	76.2×160	10.0	
						89×140	10.3	
15000		76.2×120	9.8	76.2×140	10.5	89×170	13.0	
				76.2×160	11.0			
22000		76.2×140	12.5	76.2×160	14.0	89×220	15.5	
		89×130	13.2	89×140	15.0			
33000		89×140	14.0					
47000		89×220	17.5					

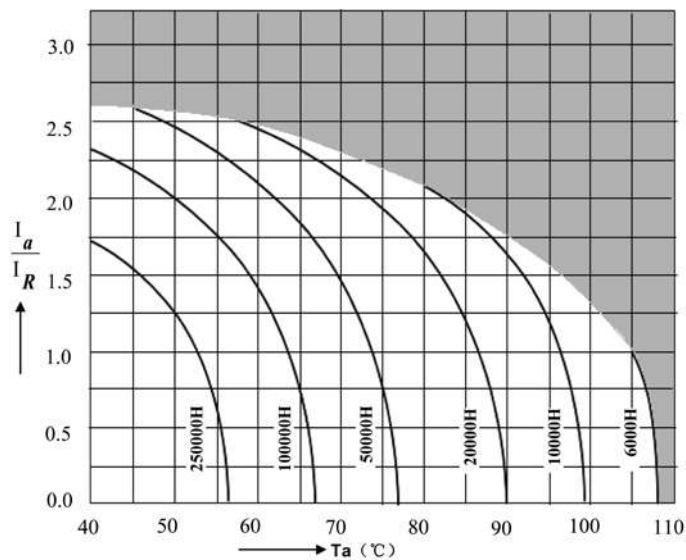
Ripple Current(A,rms) at 105°C 120Hz

WV(V) Cap(μF)		350		400		450	
		Size	Ripple	Size	Ripple	Size	Ripple
220				35×50	1.2	35×50	1.2
330		35×60	1.5	35×60	1.5	35×60	1.5
470		35×80	2.0	35×80	3.0	35×80	3.0
680		35×100	3.0	35×120	3.5	35×120	3.6
				51×80	3.7	51×80	3.8
1000		35×120	4.0	51×80	4.3	51×80	4.2
		51×80	4.2			51×105	4.7
1500		51×80	5.2	51×105	5.8	51×120	6.2
		51×100	6.2	51×120	6.3		
2200		51×105	7.0	51×130	8.3	63.5×100	7.3
		51×120	7.5	63.5×100	7.5	63.5×120	8.0
		51×140	8.0				
2700		63.5×80	7.9	63.5×105	9.0	63.5×130	9.8
3300		63.5×100	9.1	63.5×130	10.4	63.5×145	11.5
		63.5×120	9.8	76.2×105	10.6	76.2×120	11.0
				76.2×120	11.0		
3900		63.5×120	10.0	76.2×120	12.0	76.2×145	13.0
4700		63.5×145	11.5	76.2×120	13.2	76.2×120	13.0
		76.2×105	11.5	76.2×130	13.7	76.2×160	14.7
		76.2×120	12.0				
5600		76.2×130	13.4	76.2×145	15.5	76.2×160	15.5
						89×145	17.3
6800		76.2×140	15.0	76.2×160	17.5	76.2×160	17.3
				89×145	18.3	76.2×220	19.7
						89×170	20.0
8200		76.2×160	18.4	89×160	20.0	89×180	21.0
		89×145	19.5				
10000		76.2×160	19.5	89×160	22.0	89×200	24.0
		76.2×190	21.0				
		89×140	21.0				
12000		76.2×220	25.0	89×180	26.0		
		89×170	26.0				
15000		89×190	27.0	89×200	28.0		
18000		89×220	31.0				

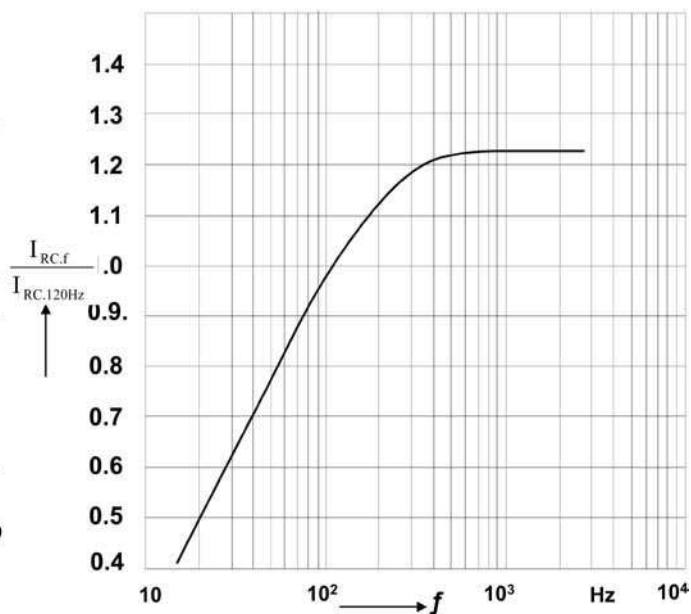
Ripple Current(A,rms) at 105°C 120Hz

Useful life

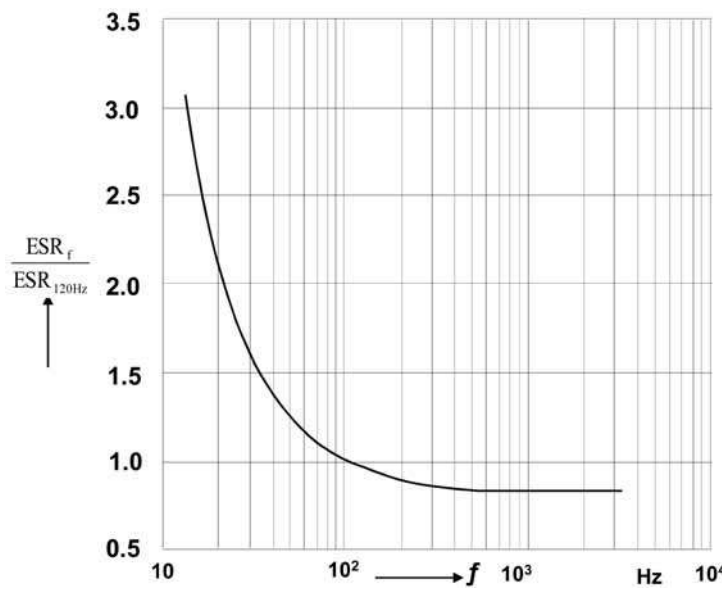
depending on ambient temperature T_a versus under ripple current operating conditions



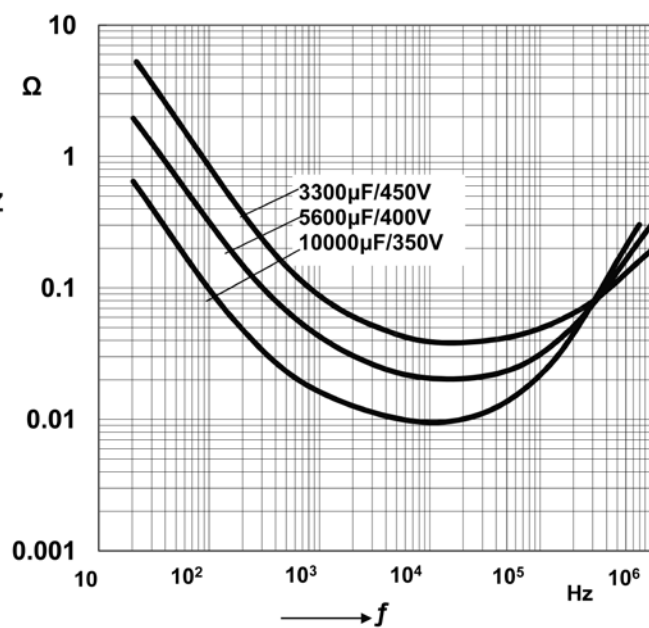
Frequency factor of permissible ripple current I_{RC} versus frequency f



Frequency characteristics of ESR Typical behavior



Impedance Z versus frequency f



RH Series 105°C

Features

Extremely Long useful life

Applications

- ◆ Frequency converters
- ◆ Professional power supplies
- ◆ Traction

Features

- ◆ Outstanding reliability
- ◆ Wide temperature range
- ◆ Extra long useful life
- ◆ Version with low-inductance design available
- ◆ All-welded construction ensures reliable electrical contact
- ◆ Self-extinguishing electrolyte
- ◆ RoHS-compatible
- ◆ For detail specifications, please refer to Engineering Bulletin No. E141

Construction

- ◆ Charge-discharge proof, polar
- ◆ Aluminum case with insulating sleeve
- ◆ Poles with screw terminal connections
- ◆ Mounting with ring clips, clamps or threaded stud

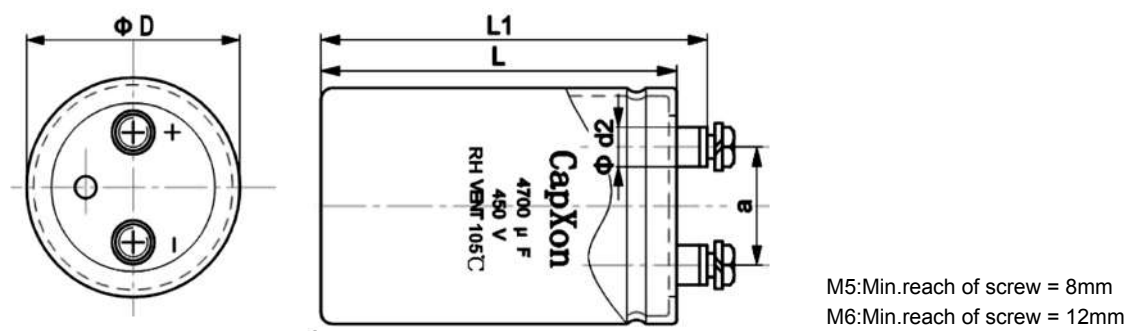


Specifications

Item	Performance Characteristics					
Rated voltage V _R	160... 450 V DC					
Surge voltage V _S	1.10 V _R					
Rated capacitance C _R	220 ...47000 μF					
Capacitance tolerance	±20%					
tan δ (at 20℃ , 120Hz)	Less than the value under table(%)					
	Φ D WV	35	51	53	76.2	89
	160~250	15	15	20	20	20
	350~450	20	20	25	25	25
Leakage Current I _{leak} (20 ℃, 5 min)	I _{leak} ≤ 0.3μA * (C*V) ^{0.7} + 4μA					
Self-inductance ESL	d = 51.6 mm: approx. 17 nH					
	d ≥ 64.3 mm: approx. 20 nH					
	Capacitors with low-inductance design:					
	d ≥ 64.3 mm: approx. 15 nH					
Useful life 105 ℃; V _R , I _{AC} *R	> 8000 h	Requirements: Δ DC/C ≤ ±40% of initial value ESR ≤ 4 times initial specified limit Ileak ≤ initial specified limit				
Voltage Endurance test 105 ℃; V _R	2000 h	Post test requirements: Δ DC/C ≤ ±20% of initial value ESR ≤ 2 times initial specified limit Ileak ≤ initial specified limit				
Vibration Resistance test	To IEC 60068-2-6, test Fc:					
	Displacement amplitude 0.75 mm, frequency range 10 ... 55 Hz, acceleration max. 10 g, duration 3X2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.					
Low Temperature Characteristics	Max. impedance ratio at 120 Hz					
	V _R	≤ 400 V		≥ 450 V		
	Z _{25℃} / Z _{20℃}	4		4		
	Z _{-40℃} / Z _{20℃}	10		10		
Sectional specification	IEC 60384-4 and JIS-C-5101					

Dimensional drawings

Ring clip/clamp mounting:



Dimensions

Terminal	Dimensions(mm) with insulating sleeve				
	$D \pm 2$	$L \pm 3$	$L_1 \pm 3$	$d_2 \text{max.}$	$a \pm 0.5$
M5	35	50~120	56.5~126.5	10.3	12.7
M5	51	80~140	86.5~146.5	10.3	22
M5	63.5	80~140	86.5~146.5	10.3	28.6
M5	76.2/89	100~240	106.4~246.5	10.3	31.8
M6	76.2/89	100~240	106.4~246.5	17.5	31.8

Packing

Diameter D(mm)	Length L(mm)	Packing (pcs.)
35	$\leq 70\text{mm}$	120
	$> 70\text{mm}$	60
42	$\leq 70\text{mm}$	120
	$> 70\text{mm}$	60
51	$\leq 70\text{mm}$	70
	$> 70\text{mm}$	35
63.5	all	24
76.2	all	15
89	all	12

Accessories

The following items are included in the delivery package, but are not fastened to the capacitors.

	Thread	Maximum torque
For terminal	M5	2 Nm
	M6	2.5 Nm

Case Size

φ DxL(mm)

WV(V) Cap(μF)	160		200		250	
	Size	Ripple	Size	Ripple	Size	Ripple
470					35×60	1.2
680			35×50	1.4	35×80	1.7
1000	35×60	1.9	35×60	2.0	35×100	2.5
1500	35×80	2.5	35×80	2.5	51×80	2.9
2200	35×100	3.3	35×120	3.6	51×100	4.0
			51×80	3.6		
3300	35×120	4.5	51×80	4.6	51×140	5.3
	51×80	4.5	51×100	4.8	63.5×100	5.0
4700	51×100	5.5	51×140	6.4	63.5×120	6.6
			63.5×100	6.2		
6800	51×140	7.8	63.5×120	7.7	76.2×120	8.3
	63.5×100	7.5				
10000	63.5×120	8.8	76.2×120	10.0	76.2×160	11.0
					89×140	11.5
15000	76.2×120	10.8	76.2×140	11.5	89×170	14.5
			76.2×160	12.2		
22000	76.2×140	13.8	76.2×160	15.5	89×220	17.0
	89×130	14.5	89×140	16.5		
33000	89×140	15.5				
47000	89×220	19.2				

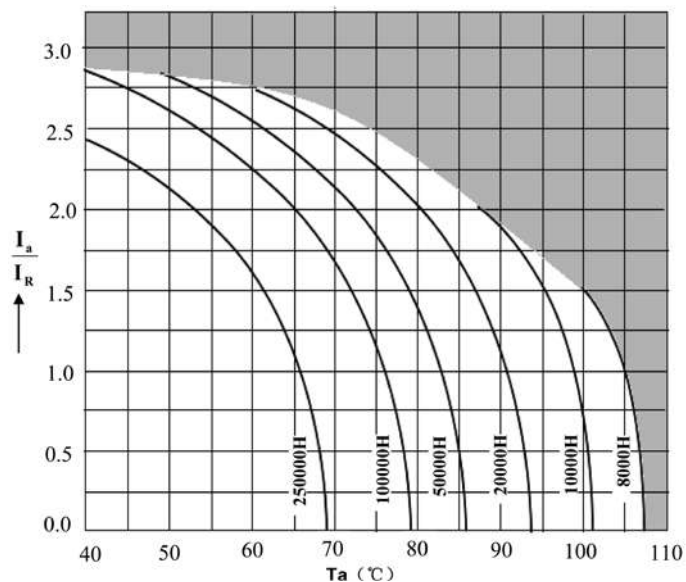
Ripple Current(A,rms) at 105°C 120Hz

WV(V) Cap(μF)	350		400		450	
	Size	Ripple	Size	Ripple	Size	Ripple
220			35×50	1.4	35×50	1.4
330	35×60	1.6	35×60	1.7	35×60	1.7
470	35×80	2.3	35×80	3.3	35×80	3.5
680	35×100	3.3	35×120	3.9	35×120	4.2
			51×80	4.1	51×80	5.5
1000	35×120	4.4	51×80	4.7	51×80	4.8
	51×80	4.6			51×105	5.5
1500	51×80	5.7	51×105	6.4	51×120	7.1
	51×100	6.8	51×120	7.0		
2200	51×105	7.7	51×130	9.1	63.5×100	8.4
	51×120	8.3	63.5×100	8.3	63.5×120	9.2
	51×140	8.8				
2700	63.5×80	8.7	63.5×105	10.0	63.5×130	11.3
3300	63.5×100	10.0	63.5×130	11.5	63.5×145	13.2
	63.5×120	10.8	76.2×105	11.7	76.2×120	12.7
			76.2×120	12.2		
3900	63.5×120	11.5	76.2×120	13.0	76.2×145	15.0
4700	63.5×145	12.6	76.2×120	14.5	76.2×120	15.0
	76.2×105	12.6	76.2×130	15.0	76.2×160	17.0
	76.2×120	13.0				
5600	76.2×130	14.8	76.2×145	17.0	76.2×160	17.8
					89×145	20.0
6800	76.2×140	16.5	76.2×160	19.3	76.2×160	20.0
			89×145	20.0	76.2×220	22.0
					89×170	23.0
8200	76.2×160	20.0	89×160	22.0	89×180	24.0
	89×145	21.5				
10000	76.2×160	21.5	89×160	24.0	89×200	27.0
	76.2×190	23.0				
	89×140	23.0				
12000	76.2×220	27.5	89×180	28.0		
	89×170	28.5				
15000	89×190	30.0	89×200	31.0		
18000	89×220	34.0				

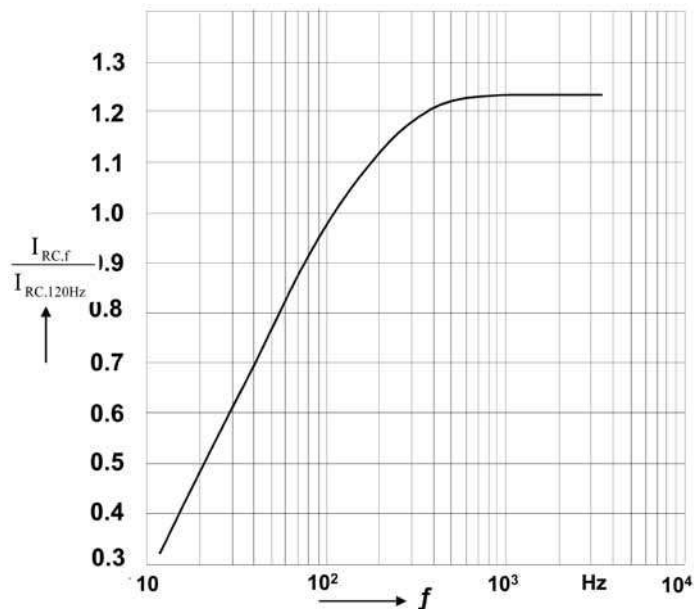
Ripple Current(A,rms) at 105°C 120Hz

Useful life

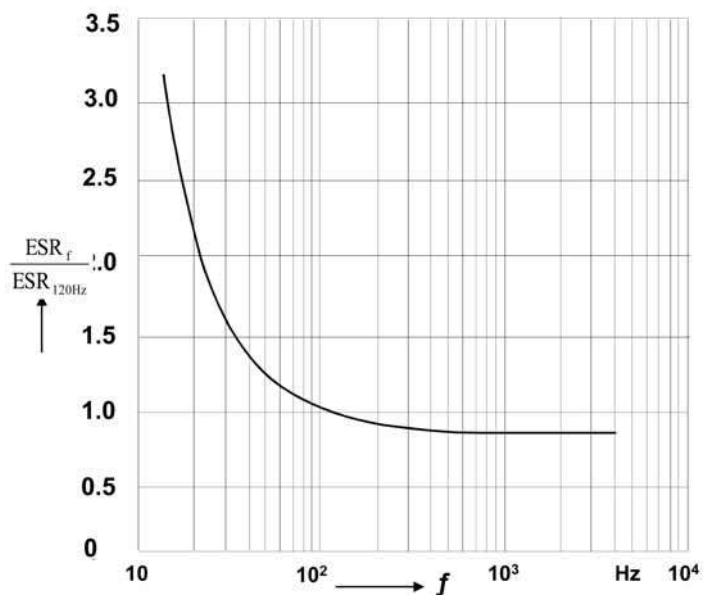
depending on ambient temperature T_a versus under ripple current operating conditions



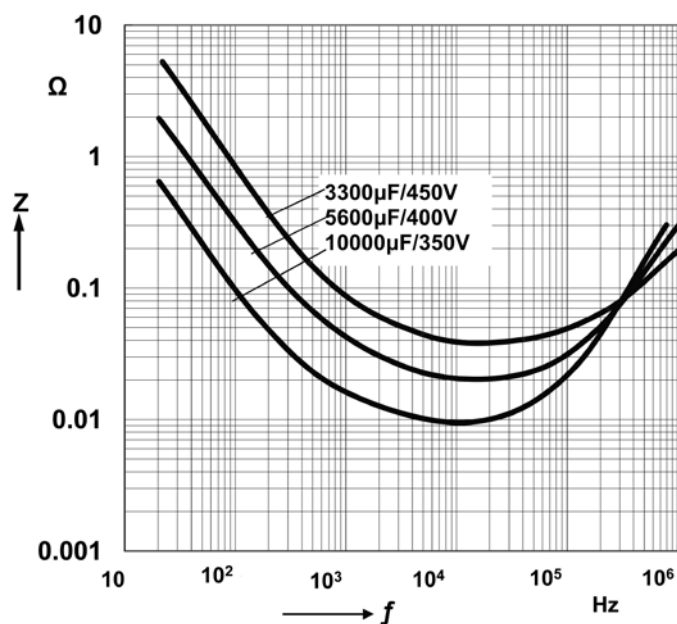
Frequency factor of permissible ripple current I_{RC} versus frequency f



Frequency characteristics of ESR Typical behavior



Impedance Z versus frequency f



RQ Series 105°C

Features

Long useful life

Applications

- ◆ Frequency converters
- ◆ Professional power supplies
- ◆ Hybrid electric vehicles(HEV)
- ◆ Traction

Construction

- ◆ Charge-discharge proof, polar
- ◆ Aluminum case with insulating sleeve
- ◆ Poles with screw terminal connections
- ◆ Mounting with ring clips, clamps or threaded stud



Features

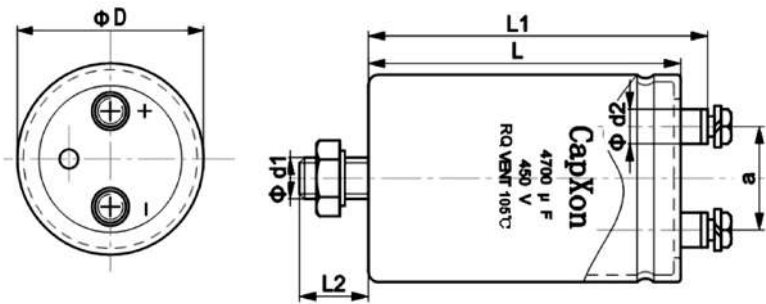
- ◆ High reliability
- ◆ Long useful life
- ◆ Extremely high ripple current capability
- ◆ Wide temperature range
- ◆ All-welded construction ensures reliable electrical contact
- ◆ Low-inductance design
- ◆ Self-extinguishing electrolyte
- ◆ RoHS-compatible
- ◆ For detail specifications, please refer to Engineering Bulletin No. E189

Specifications

Item	Performance Characteristics					
Rated voltage V _R	160... 450 V DC					
Surge voltage V _S	1.10 V _R					
Rated capacitance C _R	2200 ...47000 μF					
Capacitance tolerance	± 20%					
tan δ (at 20℃ · 120Hz)	Less than the value under table(%)					
	ΦD WV	35	51	53	76.2	89
	160~250	15	15	20	20	20
	350~450	20	20	25	25	25
Leakage Current I _{leak} (20 ℃, 5 min)	I _{leak} ≤ 0.3μA * (C*V) ^{0.7} + 4μA					
Self-inductance ESL	d = 51.6 mm: approx. 16 nH					
	d ≥ 64.3 mm: approx. 18 nH					
	Capacitors with low-inductance design:					
	d ≥ 64.3 mm: approx. 14 nH					
Useful life 105 ℃; V _R , I _{AC} ³ R	> 6000 h	Requirements: Δ DC/C ≤ ±40% of initial value ESR ≤ 4 times initial specified limit Ileak ≤ initial specified limit				
Voltage Endurance test 105 ℃; V _R	2000 h	Post test requirements: Δ DC/C ≤ ±20% of initial value ESR ≤ 2 times initial specified limit Ileak ≤ initial specified limit				
Vibration Resistance test	To IEC 60068-2-6, test Fc:					
	Displacement amplitude 0.75 mm, frequency range 10 ... 55 Hz, acceleration max. 10 g, duration 3X2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.					
Low Temperature Characteristics	Max. impedance ratio at 120 Hz					
	V _R	≤ 400 V		≥ 450 V		
	Z _{25℃} / Z _{20℃}	4		4		
	Z _{-40℃} / Z _{20℃}	10		10		
Sectional specification	IEC 60384-4 and JIS-C-5101					

Dimensional drawings

Ring clip/clamp mounting:



M5:Min.reach of screw = 8mm
M6:Min.reach of screw = 12mm

Dimensions

Terminal	Dimensions(mm) with insulating sleeve						
	$D \pm 2$	$L \pm 3$	$L_1 \pm 3$	$L_2 + / - 1$	d_1	$d_2 \text{ max.}$	$a \pm 0.5$
M5	63.5	80~140	86.5~146.5	16	M12	10.3	28.6
M5	76.2/89	100~240	106.4~246.5	16	M12	10.3	31.8
M6	76.2/89	100~240	106.4~246.5	16	M12	17.5	31.8

Packing

Diameter D(mm)	Length L(mm)	Packing (pcs.)
63.5	all	24
76.2	all	15
89	all	12

Accessories

The following items are included in the delivery package, but are not fastened to the capacitors.

	Thread	Maximum torque
For terminal	M5	2 Nm
	M6	2.5 Nm

Case Size

φ DxL(mm)

WV(V) Cap(μF)	160		200		250	
	Size	Ripple	Size	Ripple	Size	Ripple
3300					63.5×100	7.5
4700			63.5×100	8.8	63.5×120	9.5
6800	63.5×100	11.0	63.5×120	12.0	76.2×120	13.0
10000	63.5×120	12.5	76.2×120	13.5	76.2×160	15.0
					89×140	16.0
15000	76.2×120	15.5	76.2×140	16.0	89×170	20.0
			76.2×160	17.0		
22000	76.2×140	20.0	76.2×160	22.0	89×220	24.5
	89×130	21.0	89×140	24.0		
33000	89×140	22.0				
47000	89×220	28.0				

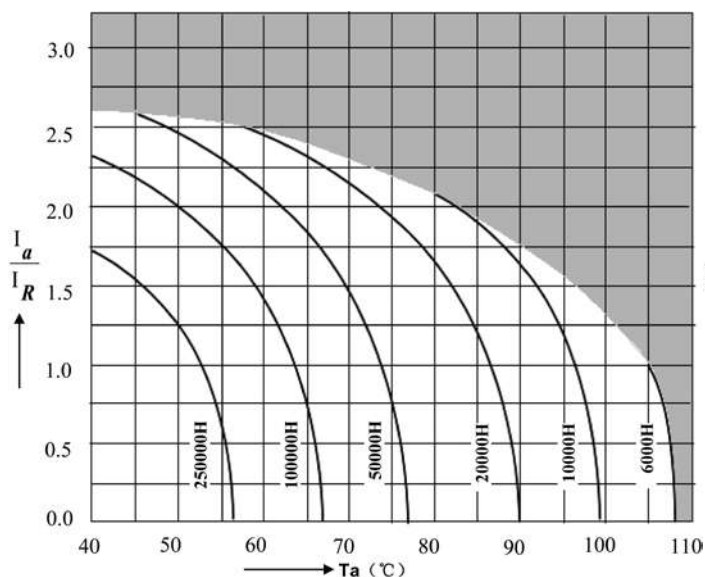
Ripple Current(A,rms) at 105°C 120Hz

WV(V) Cap(μF)	160		200		250	
	Size	Ripple	Size	Ripple	Size	Ripple
2200			63.5×100	13.5	63.5×100	13.0
					63.5×120	14.0
2700	63.5×80	16.0	63.5×105	16.5	63.5×130	16.0
3300	63.5×100	16.5	63.5×130	17.5	63.5×145	18.5
	63.5×120	17.5	76.2×105	20.2	76.2×120	19.0
			76.2×120	21.0		
3900	63.5×120	17.7	76.2×120	22.2	76.2×145	22.0
4700	63.5×145	18.6	76.2×120	23.5	76.2×120	21.0
	76.2×105	22.4	76.2×130	24.5	76.2×160	23.0
	76.2×120	23.0				
5600	76.2×130	24.0	76.2×145	27.0	76.2×160	23.5
					89×145	30.5
6800	76.2×140	26.0	76.2×160	28.6	76.2×160	26.5
			89×145	33.0	76.2×220	30.5
					89×170	39.0
8200	76.2×160	30.0	89×160	35.0	89×180	42.0
	89×145	34.5				
10000	76.2×160	30.5	89×160	39.0	89×200	45.0
	76.2×190	33.0				
	89×140	38.4				
12000	76.2×220	35.0	89×180	40.0		
	89×170	37.0				
15000	89×190	38.0	89×200	42.0		
18000	89×220	49.0				

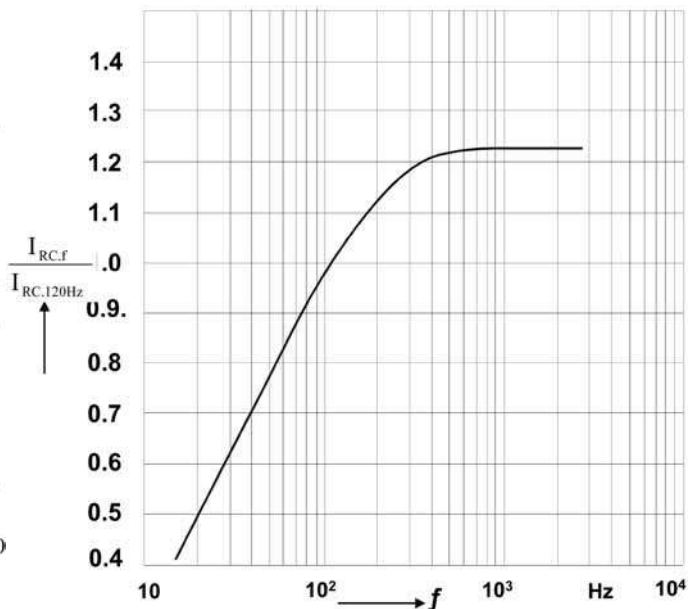
Ripple Current(A,rms) at 105°C 120Hz

Useful life

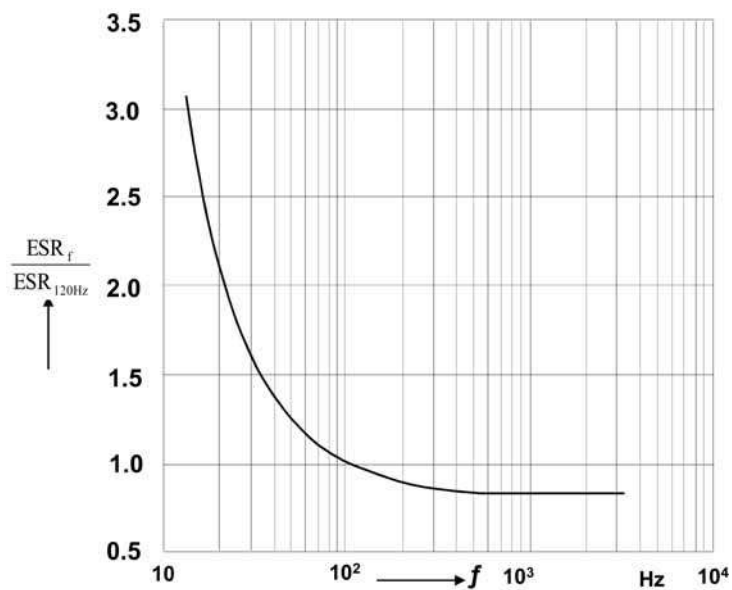
depending on ambient temperature T_a versus under ripple current operating conditions



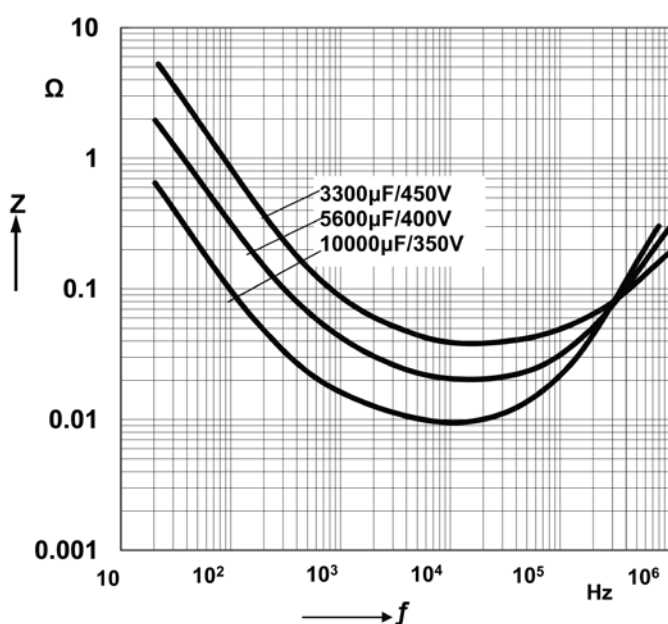
Frequency factor of permissible ripple current I_{RC} versus frequency f



Frequency characteristics of ESR Typical behavior



Impedance Z versus frequency f



RT Series 105°C

Features

Extremely Long useful life

Applications

- ◆ Frequency converters
- ◆ Professional power supplies
- ◆ Traction

Features

- ◆ Outstanding reliability
- ◆ Wide temperature range
- ◆ Extra long useful life
- ◆ Version with low-inductance design available
- ◆ All-welded construction ensures reliable electrical contact
- ◆ Self-extinguishing electrolyte
- ◆ RoHS-compatible
- ◆ For detail specifications, please refer to Engineering Bulletin No. E190

Construction

- ◆ Charge-discharge proof, polar
- ◆ Aluminum case with insulating sleeve
- ◆ Poles with screw terminal connections
- ◆ Mounting with ring clips, clamps or threaded stud

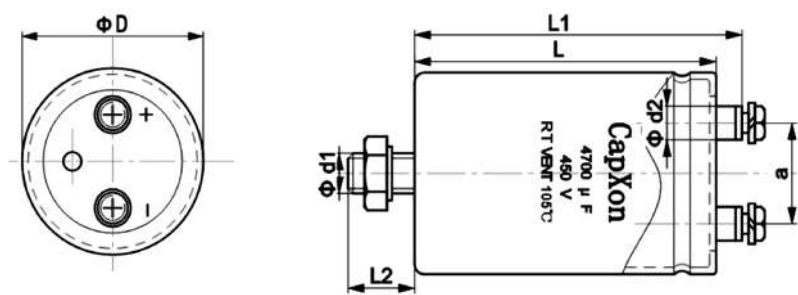


Specifications

Item	Performance Characteristics					
Rated voltage V _R	160... 450 V DC					
Surge voltage V _S	1.10 V _R					
Rated capacitance C _R	220 ...47000 μF					
Capacitance tolerance	±20%					
tan δ (at 20℃ · 120Hz)	Less than the value under table(%)					
	ΦD WV	35	51	53	76.2	89
	160~250	15	15	20	20	20
	350~450	20	20	25	25	25
Leakage Current I _{leak} (20 °C, 5 min)	I _{leak} ≤ 0.3μA * (C*V) ^{0.7} + 4μA					
Self-inductance ESL	d = 51.6 mm: approx. 17 nH					
	d ≥ 64.3 mm: approx. 20 nH					
	Capacitors with low-inductance design:					
	d ≥ 64.3 mm: approx. 15 nH					
Useful life 105 °C; V _R , I _{AC} *R	> 8000 h	Requirements: Δ DC/C ≤ ±40% of initial value ESR ≤ 4 times initial specified limit Ileak ≤ initial specified limit				
Voltage Endurance test 105 °C; V _R	2000 h	Post test requirements: Δ DC/C ≤ ±20% of initial value ESR ≤ 2 times initial specified limit Ileak ≤ initial specified limit				
Vibration Resistance test	To IEC 60068-2-6, test Fc:					
	Displacement amplitude 0.75 mm, frequency range 10 ... 55 Hz, acceleration max. 10 g, duration 3X2 h. Capacitor mounted by its body which is rigidly clamped to the work surface.					
Low Temperature Characteristics	Max. impedance ratio at 120 Hz					
	V _R	≤ 400 V		≥ 450 V		
	Z _{-25℃} / Z _{20℃}	4		4		
	Z _{-40℃} / Z _{20℃}	10		10		
Sectional specification	IEC 60384-4 and JIS-C-5101					

Dimensional drawings

Ring clip/clamp mounting:



M5:Min.reach of screw = 8mm
M6:Min.reach of screw = 12mm

Dimensions

Terminal	Dimensions(mm) with insulating sleeve						
	$D \pm 2$	$L \pm 3$	$L_1 \pm 3$	$L_2 + / - 1$	d_1	$d_2 \text{ max.}$	$a \pm 0.5$
M5	63.5	80~140	86.5~146.5	16	M12	10.3	28.6
M5	76.2/89	100~240	106.4~246.5	16	M12	10.3	31.8
M6	76.2/89	100~240	106.4~246.5	16	M12	17.5	31.8

Packing

Diameter D(mm)	Length L(mm)	Packing (pcs.)
63.5	all	24
76.2	all	15
89	all	12

Accessories

The following items are included in the delivery package, but are not fastened to the capacitors.

	Thread	Maximum torque
For terminal	M5	2 Nm
	M6	2.5 Nm
For mounting	M12	10 Nm

Case Size

φ DxL(mm)

WV(V) Cap(μF)	160		200		250	
	Size	Ripple	Size	Ripple	Size	Ripple
3300					63.5×100	8.3
4700			63.5×100	9.7	63.5×120	10.5
6800	63.5×100	12.0	63.5×120	13.5	76.2×120	14.5
10000	63.5×120	13.8	76.2×120	15.0	76.2×160	16.5
					89×140	17.5
15000	76.2×120	17.0	76.2×140	17.5	89×170	22.0
			76.2×160	18.5		
22000	76.2×140	22.0	76.2×160	24.0	89×220	27.0
	89×130	23.0	89×140	26.0		
33000	89×140	24.0				
47000	89×220	31.0				

Ripple Current(A,rms) at 105°C 120Hz

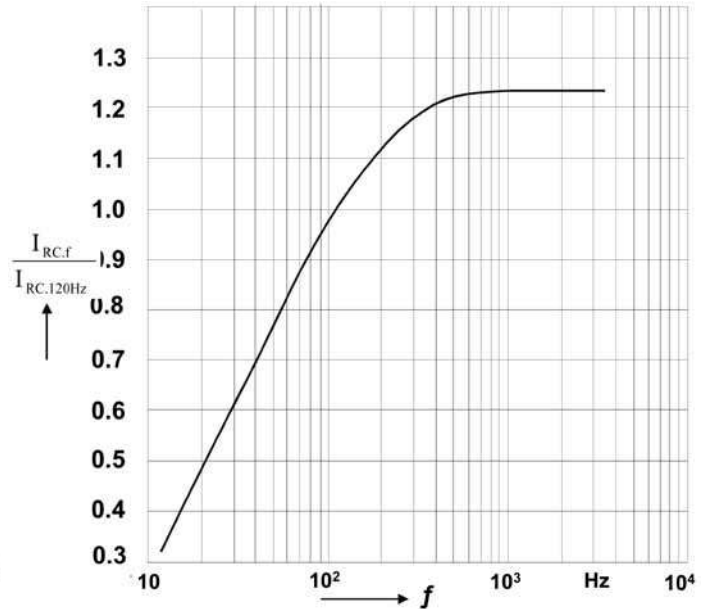
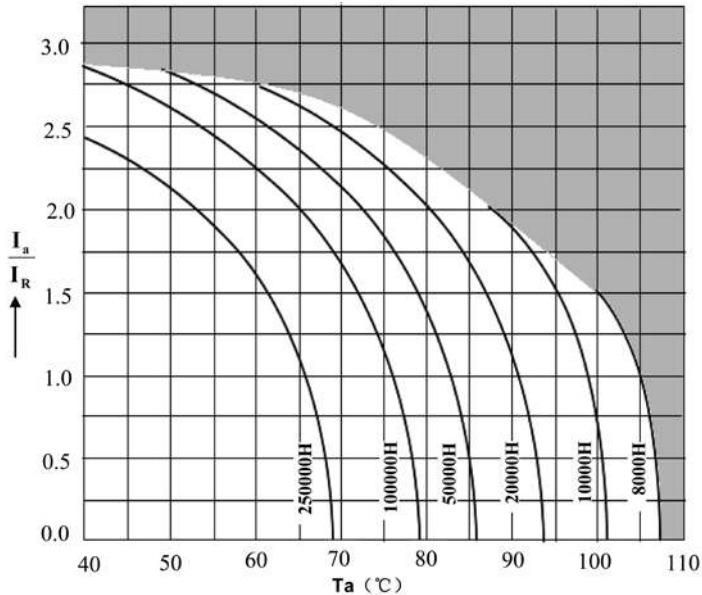
WV(V) Cap(μF)	350		400		450	
	Size	Ripple	Size	Ripple	Size	Ripple
2200			63.5×100	14.8	63.5×100	15.0
					63.5×120	16.0
2700	63.5×80	17.5	63.5×105	18.2	63.5×130	18.5
3300	63.5×100	18.0	63.5×130	19.3	63.5×145	21.5
	63.5×120	19.0	76.2×105	22.0	76.2×120	22.0
			76.2×120	23.0		
3900	63.5×120	19.5	76.2×120	24.0	76.2×145	25.5
4700	63.5×145	20.5	76.2×120	25.8	76.2×120	24.3
	76.2×105	24.6	76.2×130	27.0	76.2×160	26.5
	76.2×120	25.5				
5600	76.2×130	26.5	76.2×145	30.0	76.2×160	27.3
					89×145	35.0
6800	76.2×140	28.5	76.2×160	31.5	76.2×160	30.7
			89×145	36.0	76.2×220	35.0
					89×170	45.0
8200	76.2×160	33.0	89×160	38.5	89×180	48.0
	89×145	39.0				
10000	76.2×160	33.5	89×160	43.0	89×200	50.0
	76.2×190	36.0				
	89×140	42.0				
12000	76.2×220	38.0	89×180	44.0		
	89×170	40.0				
15000	89×190	42.0	89×200	46.0		
18000	89×220	51.0				

Ripple Current(A,rms) at 105°C 120Hz

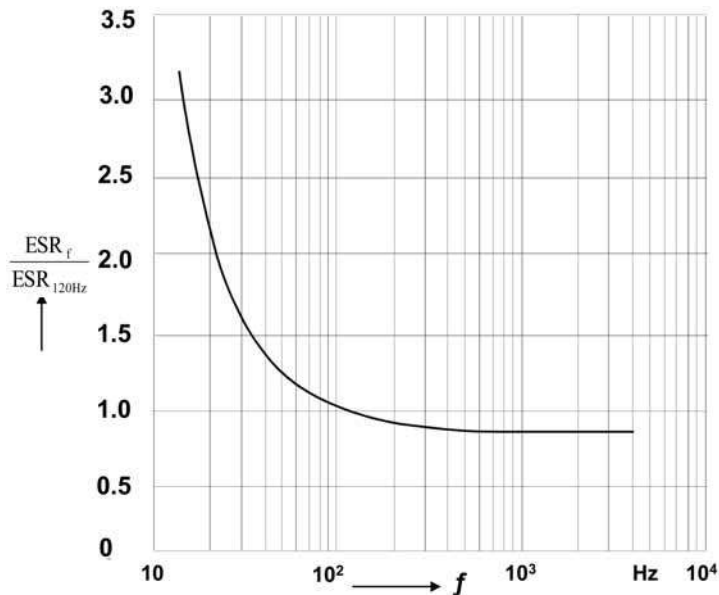
Useful life

depending on ambient temperature T_a versus under ripple current operating conditions

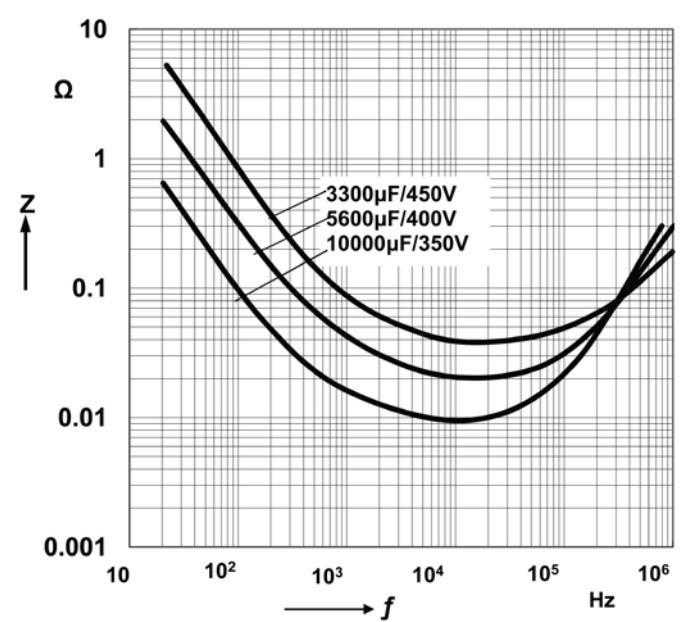
Frequency factor of permissible ripple current I_{RC} versus frequency f



Frequency characteristics of ESR Typical behavior



Impedance Z versus frequency f



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