ALUMINUM ELECTROLYTIC CAPACITORS

CONTENTS **PAGE**

Note : Specification and dimensions in this catalogue are subject to change without notice.

APPLICATION NOTICE

When you use aluminum electrolytic capacitors, remember the following.

1. Polarity
   - Aluminum electrolytic capacitors are polarized.
   - 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:
   - Use the capacitors according to the specified operation temperature range.
   - Life time of the capacitor depends on the temperature.
   - If used the capacitor outside the maximum rated temperature will considerable shorten the life or cause the capacitor to vent. Usage of capacitor at room temperature will ensure longer life.

4. Ripple current
   - Do not apply a ripple current exceeding the rated maximum ripple current.
   - Applying too higher ripple current to the capacitor causes great heat generation, invites deterioration of properties of cases breakage.

5. Charge and discharging
   - Frequent and quick charge/discharge generates heat inside the capacitor, causing increase of leakage current, decrease of capacitance, or breakage occasionally.

6. Explosion-proof vent
   - During use the capacitor, the explosion-proof vent should keep at least 3mm space from other components or organization. If such space is not provided, the vent will not operate normally.

7. Soldering
   - Be careful of temperature and time when soldering. Dip of flow soldering of the capacitors should be limited at less than 260˚C and 10 seconds.
   - When soldering temperature is too high and the soldering time is too long, it will cause the capacitor,s characteristics and the sleeve may shrink or break.

8. Cleaning of boards after soldering

- If the PCB is cleaned in halogenated organic solvent, the solvent may penetrate into the inside of capacitor, and may cause corrosion.

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.

10. Sleeve materials

- The standard sleeve materials is polyvinyl-chloride (PVC). If it is dipped in xylene, toluene and then put under high temperature, the sleeve may crack. This sleeve will lost insulating function.

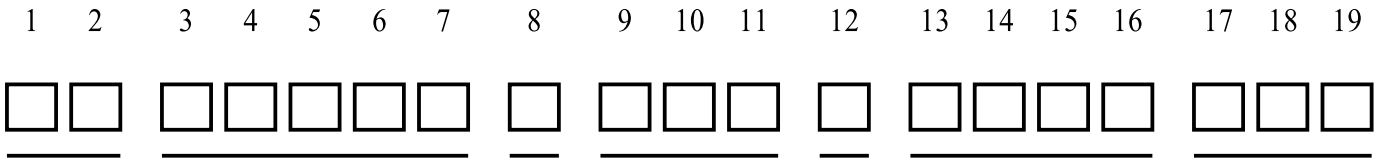
11. Storage

- 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 1KΩ of protective series resistor, if it is stored for more than 12 months.
- The capacitor should be stored at 5˚C~35˚C and less than 75% in relative humidity indoor.

List of the products

Series		Type	Features	Temperature Range	Load Life Time(hours)	Rated Voltgae Type Range(V)	Capacitance Range(μF)	Page
Standard Radial Type	GR	Radial	85℃ General Standard	-40 to+85℃	2000	6.3~63	220~15000	7
	GR (HR)	Radial	105℃ General Standard	-40 to+105℃	2000	10~100	0.1~1000	9
	HR	Radial	105℃ General Standard	-40 to+105℃ -25 to+105℃	2000	6.3~100 160~450	100~10000 1~470	11
	LL	Radial	105℃ Low Leakage Current	-40 to+105℃	1000	10~63	0.1~1000	14
Miniature Type	MR	Radial	105℃ 7mm Height	-40 to+105℃	1000	4~50	0.1~470	16
	SM	Radial	105℃ 5mm Height	-40 to+105℃	1000	4~50	0.1~470	18
	SS	Radial	105℃ 5mm Height	-40 to+105℃	1000	4~50	0.1~22	18
	SL	Radial	105℃ 7mm Height with Low Leakage Current	-40 to+105℃	1000	6.3~50	0.1~100	20
Non-polarized Type	NP	Radial	85℃ Non-Polarized	-40 to+85℃	2000	10~100	0.47~1000	22
	SN	Radial	105℃ 7mm Height with Non-Polarized	-40 to+105℃	1000	6.3~50	0.1~100	24
Hight Reliability Type	XR	Radial	105℃ Low Impedance	-40 to+105℃	2000	6.3~50	47~4700	26
	XL	Radial	105℃ Low Impedance, High Ripple Current	-40 to+105℃	2000~3000	6.3~50	100~4700	28
Axial Type	GA	Axial	85℃ Standard Axial Series	-40 to+85℃	1000	10~100	1~4700	30
Large Type	LP	Radial	85℃ Snap-In Type	-40 to+85℃ -25 to+85℃	2000	10~100 160~450	1000~47000 47~2200	32
	HP	Radial	105℃ Snap-In Type	-40 to+105℃ -25 to+105℃	2000	10~100 160~450	470~47000 47~2200	35

Part Number System

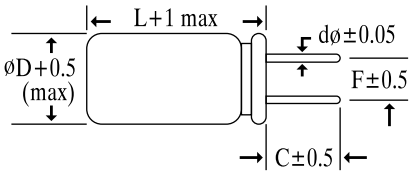
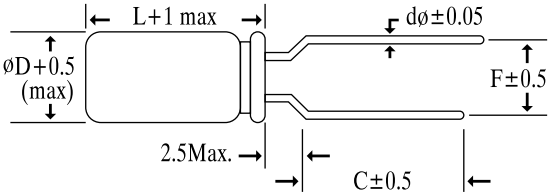
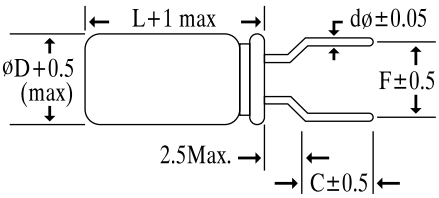


Capacitance	Tolerance	Rated Voltage	Sleeve	Case Size
0.1 = 0.1UF	M = ±20%	6.3 = 6.3V	W = PVC	5ø*11 = 0511
0.47 = 0.47UF	K = ±10%	10 = 10V	E = PET	8ø*11 = 0811
1 = 1UF		16 = 16V		13ø*26 = 1326
22 = 22UF		25 = 25V		25ø*26 = 2526
100 = 100UF		50 = 50V		

T = T/A	2.5	→ PITCH 2.5mm
C = CUT	6	→ LENGTH 6mm
H = FORMED	5	→ PITCH 5mm
HC = FORMED & CUT	H5C3	→ PITCH 5mm LENGTH 3mm

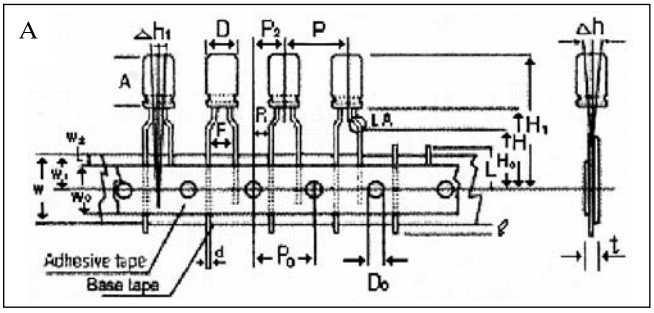
Cutting and Forming

RADIAL TYPE electrolytic capacitors with lead wires being cut short on formed in specified configurations are designed for use in printed circuits. These special leads contribute to reduction of the time for insertion and soldering. These capacitors are available on application dependent on your enquiry.

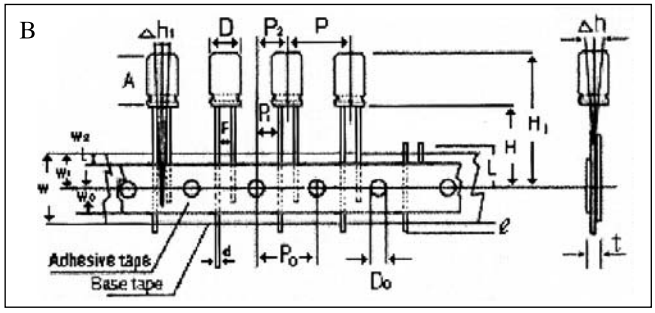
CODE	METHOD	DIMENSION(MM)		SHAPE
		ø D	F	
C	LEAD CUT ONLY	4	1.5	
		5	2	
		6	2.5	
		8	3.5	
		10	5	
		13	5	
		16	7.5	
		18	7.5	
H	FORMING ONLY	4	5	
		5	5	
		6	5	
		8	5	
HC	FORMING AND CUT	4	5	
		5	5	
		6	5	
		8	5	

帶式貼品　RADIAL AMMO PACK

A

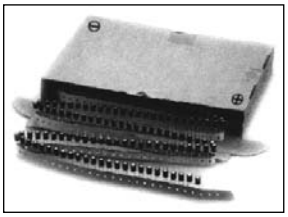


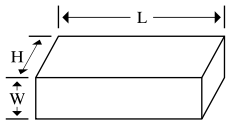
B



DIMENSIONS

ITEM	Symbol	Case size								(mm) Tolerance
		4x5 4x7	5x5 5x7	6x5 6.3x7	8x5 8x7	5x11	6.3x11	8x11	10x17	10x21	
端子線徑 Lead wire diameter	d	0.45				0.5		0.6			±0.05
本體高度 Body height	A	6.0 8.5				12.5			18.5	22.5	Max
本體間隔 Pitch of body	P	12.7									±1.0
打孔間隔 Feed hole pitch	P0	12.7									±0.3
打孔與端子線距離 Hole center to lead distance	P1	3.85 5.1						4.6	3.85		±0.5
打孔與本體距離 Feed hole center to body center distance	P2	6.35									±1.0
端子線間距離 Lead to lead distance	F	5.0 1.5	2.0	2.5	3.5	2.0	2.5	3.5	5.0		+0.6 -0.2
台紙寬度 Base tape width	W	18.0									±0.5
粘貼紙寬度 Adhesive tape width	W0	12.5									Min
打孔與台紙偏差 Hole position	W1	9.0									+0.75 -0.50
粘貼紙與台紙偏差 Hole down tape position	W2	3.0									Max
本體下端位置 Height of body from tape center	H	17.5				18.5		20.0	18.5		±0.75
端子線成形高度 Lead wire clinch height	H0	16.0									±0.5
製品上限位置 Component height	H1	27.5				32.5					Max
打孔孔徑 Feed hole diameter	D0	4.0									±0.3
端子線突出長度 Lead wire protrusion	ℓ	1.0									Max
不良品截切位置 Length of snipped lead	L	11.0									Max
台紙與粘貼紙厚度 Total tape thickness	t	0.7									±0.3
本體前後傾斜偏差 Body alignment	△h	0									±2.0
本體左右傾斜偏差 Body alignment	△hl	0									±1.0
端子線成形角度 Lead wire clinch angle	∠A	17°									±5°





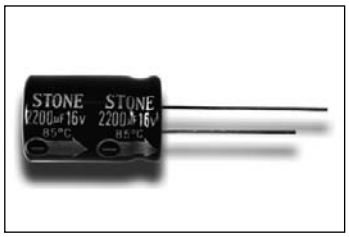
PACKAGE DIMENSION AND NUMBER UNIT:mm

SYMBOL	4ø	5ø	6.3ø	8ø	10ø
L	———	———	———	———	336
W	———	———	———	———	53
H	———	———	———	———	240
pcs/Box	2500	2000	1500	1000	650

Aluminum Electrolytic Capacitors **GR** Series

Features

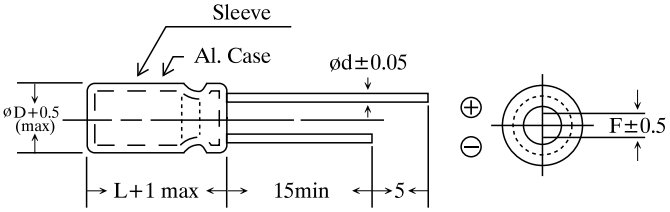
- 85℃, Standard series for general purpose
- RoHS Compliance



Specification

Items	Performance
Capacitance Tolerance	±20% (at 120Hz, 20℃)
Rated Voltage Range	6.3 to 63 VDC
Capacitance Range	220 to 15000 μF
Operating Temperature Range	-40 to + 85℃
Leakage Current (at 20℃)	I≦0.01 CV or 3 (μA), whichever is greater. After 2 minutes application of working voltage. I=Leakage current (μA), C=Rated capacitance (μF), V=Rated voltage (V)
Dissipation Factor (Tan δ at 120Hz, 20℃)	<table><tr><td>Rated Voltage</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>Tan δ (max)</td><td>0.24</td><td>0.20</td><td>0.17</td><td>0.15</td><td>0.12</td><td>0.10</td><td>0.10</td></tr></table>For capacitance＞1000 μF, add 0.02 per 1000 μF increase.
Low Temperature Characteristics (at 120Hz)	Impedance ratio max. <table><tr><td>Rated Voltage</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>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃/Z+20℃</td><td>10</td><td>8</td><td>6</td><td>4</td><td>3</td><td>3</td><td>3</td></tr></table>
Load Life	After 2000 hours application of W.V. at 85℃, the capacitor shall meet the following limits. Capacitance change : ≦±25% of initial value Dissipation factor : ≦200% of initial specified value Leakage Current : ≦Initial specified value
Shelf Life	After storage for 1000 hours at 85℃, with no voltage applied and being stabilized at + 20℃, Capacitor shall meet the limit specified in load life.
Ripple Current & Frequency Multiplier	<table><tr><td>Freq.(Hz) / Cap.(μF)</td><td>60 (50)</td><td>120</td><td>500</td><td>1K</td><td>10K up</td></tr><tr><td>220 to 1000</td><td>0.80</td><td>1.00</td><td>1.15</td><td>1.25</td><td>1.30</td></tr><tr><td>1000 up above</td><td>0.80</td><td>1.00</td><td>1.10</td><td>1.15</td><td>1.20</td></tr></table>
Ripple Current & Temperature Multiplier	<table><tr><td>Temperature(℃)</td><td>70</td><td>85</td></tr><tr><td>Multiplier</td><td>1.40</td><td>1.00</td></tr></table>

DIAGRAM OF DIMENSIONS



LEAD SPACING AND DIAMTER

Unit: mm

D	10	13	16	18	22	25	30
F	5.0		7.5		10.0	12.5	15.0
d	0.6		0.8			1.0	1.0

DIMENSION & PERMISSIBLE RIPPLE CURRENT

Dimension : ø D x L (mm)

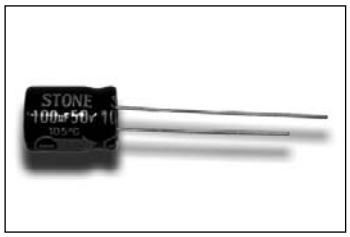
Ripple Current : mA/rms at 120Hz,85℃

VDC / μF	6.3V		10V		16V		25V		35V		50V		63V	
	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA
220											10x16	468	10x20	565
330											10x20	652	13x21	762
470									10x16	681	10x20 13x21	818 842	13x26	1011
1000					10x17	853	10x16 10x20	847 1028	13x21	1237	13x26	1468	16x26 16x32	1522 1685
2200			10x17 10x20	1052 1178	10x20 13x21	1098 1457	13x21	1535	16x26	1780	16x32	2290	18x36	2425
3300			13x21	1510	13x26	1840	16x26	1840	16x32	2325	18x36	2690	22x40	3020
4700			13x26	1950	16x26	2290	16x32	2580	18x36	2780	22x36	3050		
6800	16x26	2250	16x26	2435	16x32	2085	18x36	2905	18x36	3175	25x42	3240		
10000	16x32	2385	16x32	2385	18x36	2790	22x36	3030	25x42	3400	30x46	3690		
15000	18x36	2868	18x36	3010	22x36	3315	25x42	3350						

Aluminum Electrolytic Capacitors **GR(HR)** Series

Features

- 105℃, Standard series for general purpose
- RoHS Compliant

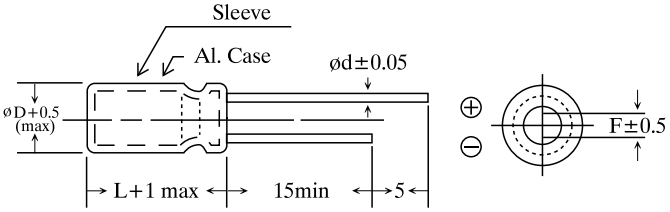


Specification

Items	Performance
Capacitance Tolerance	±20% (at 120Hz, 20℃)
Rated Voltage Range	10 to 100 VDC
Capacitance Range	0.1 to 1000μF
Operating Temperature Range	-40 to + 105℃
Leakage Current (at 20℃)	I≦0.01 CV or 3 (μA), whichever is greater. After 2 minutes application of working voltage. I=Leakage current (μA), C=Rated capacitance (μF), V=Rated voltage (V)
Dissipation Factor (Tan δ at 120Hz, 20℃)	Rated Voltage: 10 / 16 / 25 / 35 / 50 / 63 / 100 Tan δ (max): 0.20 / 0.17 / 0.15 / 0.12 / 0.10 / 0.10 / 0.10 For capacitance > 1000μF, add 0.02 per 1000μF increase.
Low Temperature Characteristics (at 120Hz)	Impedance ratio max. Rated Voltage: 10 / 16 / 25 / 35 / 50 / 63 / 100 Z-25℃/Z+20℃: 3 / 2 / 2 / 2 / 2 / 2 / 2 Z-40℃/Z+20℃: 8 / 6 / 4 / 3 / 3 / 3 / 3
Load Life	After 2000 hours application of W.V. at 105℃, the capacitor shall meet the following limits. Capacitance change : ≦±25% of initial value Dissipation factor : ≦200% of initial specified value Leakage Current : ≦Initial specified value
Shelf Life	After storage for 1000 hours at 105℃, with no voltage applied and being stabilized at + 20℃, Capacitor shall meet the limit specified in load life.
Ripple Current & Frequency Multiplier	Freq.(Hz) / Cap.(μF): 60 (50) / 120 / 500 / 1K / 10K up Under 100: 0.80 / 1.00 / 1.20 / 1.30 / 1.48 100 to 1000: 0.80 / 1.00 / 1.10 / 1.25 / 1.35
Ripple Current & Temperature Multiplier	Temperature(℃): 85 / 105 Multiplier: 1.40 / 1.00

Aluminum Electrolytic Capacitors **GR(HR)** Series

DIAGRAM OF DIMENSIONS



LEAD SPACING AND DIAMTER

Unit: mm

D	5	6.3	8
F	2.0	2.5	3.5
d	0.5		

DIMENSION & PERMISSIBLE RIPPLE CURRENT

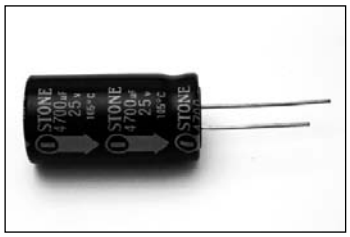
Dimension : ø D x L (mm)
Ripple Current : mA/rms at 120Hz,105℃

VDC / μF	10V		16V		25V		35V		50V		63V		100V	
	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA
0.1-0.47									5x11.5	6	5x11.5	6	5x11.5	8
1									5x11.5	12	5x11.5	12	5x11.5	14
2.2									5x11.5	20	5x11.5	20	5x11.5	21
3.3									5x11.5	25	5x11.5	25	5x11.5	28
4.7									5x11.5	30	5x11.5	30	5x11.5	32
10			5x11.5	35	5x11.5	35	5x11.5	46	5x11.5	46	5x11.5	40	6.3x11	54
22					5x11.5	55	5x11.5	59	5x11.5	59	6.3x11	78		
33					5x11.5	66	6.3x11	87	6.3x11	87	6.3x11	96		
47			5x11.5	96	5x11.5	100	6.3x11	120	6.3x11	115	8x11	136		
100	5x11.5	90	5x11.5	100	6.3x11	138	8x11	162	8x11	188	8x14	200		
220	6.3x11	163	6.3x11	210	8x11	229	8x11 8x14	250 280						
330	6.3x11	200	8x11	258	8x11	290	8x16	360						
470	6.3x11	220	8x11	355	8x14	396								
1000	8x14	516	8x16	520										

Aluminum Electrolytic Capacitors **HR** Series

Features

- 105℃, Standard series for general purpose
- RoHS Compliance

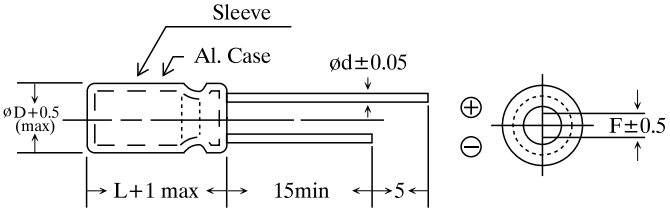


Specification

Items	Performance													
Capacitance Tolerance	±20% (at 120Hz, 20℃)													
Rated Voltage Range	6.3 to 100 VDC								160 to 450 VDC					
Capacitance Range	100 to 10000 μF								1 to 470 μF					
Operating Temperature Range	-40 to + 105℃								-25 to 105℃					
Leakage Current (at 20℃)	I≦0.01 CV or 3 (μA), whichever is greater.								I≦0.03 CV + 10 (μA), whichever is greater.					
	After 2 minutes application of working voltage. I＝Leakage current (μA), C＝Rated capacitance (μF), V＝Rated voltage (V)													
Dissipation Factor (Tan δ at 120Hz, 20℃)	Rated Voltage	6.3	10	16	25	35	50	63	100	160	200	250	350	400	450
	Tan δ (max)	0.24	0.20	0.17	0.15	0.12	0.10	0.10	0.10	0.20	0.20	0.20	0.20	0.25	0.25
	For capacitance＞1000 μF, add 0.02 per 1000 μF increase.													
Low Temperature Characteristics (at 120Hz)	Impedance ratio max.													
	Rated Voltage	6.3	10	16	25	35	50	63	100	160	200	250	350	400	450
	Z-25℃/Z+20℃	4	3	2	2	2	2	2	2	8	8	8	12	12	12
	Z-40℃/Z+20℃	10	8	6	4	3	3	3	3						
Load Life	After 2000 hours application of W.V. at +105℃, the capacitor shall meet the following limits. Capacitance change : ≦±25% of initial value Dissipation factor : ≦200% of initial specified value Leakage Current : ≦Initial specified value													
Shelf Life	After storage for 1000 hours at 105℃, with no voltage applied and being stabilized at + 20℃, Capacitor shall meet the limit specified in load life.													
Ripple Current & Frequency Multiplier	Freq.(Hz) / Cap.(μF)	60	120	500	1K	10K up								
	Under 100	0.70	1.00	1.20	1.30	1.50								
	100 to 1000	0.75	1.00	1.10	1.15	1.30								
	1000 up above	0.80	1.00	1.05	1.10	1.15								
Ripple Current & Temperature Multiplier	Temperature(℃)	85	105											
	Multiplier	1.25	1.00											

Aluminum Electrolytic Capacitors **HR** Series

DIAGRAM OF DIMENSIONS



LEAD SPACING AND DIAMTER

Unit: mm

D	8	10	13	16	18	22
F	3.5	5.0		7.5		10.0
d	0.5	0.6		0.8		

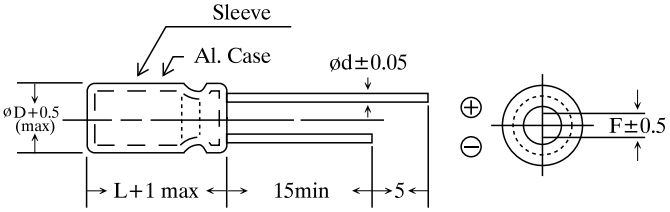
DIMENSION & PERMISSIBLE RIPPLE CURRENT

Dimension : ø D x L (mm)
Ripple Current : mA/rms at 120Hz,105℃

VDC / μF	6.3V		10V		16V		25V		35V		50V		63V	
	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA
100											8x14	192	10x12.5	210
220									10x12.5	280	10x17	340	10x20	400
330									10x12.5	320	10x20	400	13x26	480
470							10x12.5	400	10x17	480	13x21	580	13x26	620
1000	8x12	380	10x12.5	460	10x17 10x20	540	10x20 13x16	650 600	13x21	760	16x26	890	16x32	985
2200	10x17	600	10x17 10x20	600 760	13x21	890	13x21 13x26	890 1080	16x26	1120	18x32	1380	22x36	1580
3300	13x21	850	13x21	900	13x26	1020	16x32	1280	16x36	1460	22x40	1650		
4700	13x26	1150	13x26	1150	16x26	1400	16x32	1480	18x36	1670	22x40	1720		
6800	16x26	1480	16x27	1480	16x32	1670	18x36	1850	22x36	2020				
10000	16x27	1520	16x36	1680	18x36	1790	22x36	2060						

Aluminum Electrolytic Capacitors **HR** Series

DIAGRAM OF DIMENSIONS



LEAD SPACING AND DIAMTER

Unit: mm

D	5	6.3	8	10	13	16	18	22
F	2.0	2.5	3.5	5.0		7.5		10.0
d	0.5			0.6		0.8		

DIMENSION & PERMISSIBLE RIPPLE CURRENT

Dimension : ø D x L (mm)

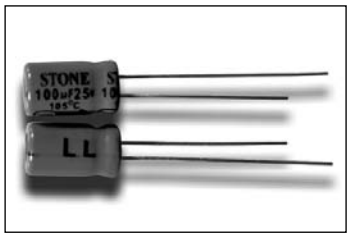
Ripple Current : mA/rms at 120Hz,105℃

VDC / μF	100V		160V		200V		250V		350V		400V		450V	
	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA
1			5x11.5	12	6.3x11	12	6.3x11	12	8x11	13	8x11	13	8x11	14
2.2			6.3x11	20	8x11	25	8x11	22	10x12.5	26	10x12.5	26	10x12.5	28
3.3			6.3x11 8x11	25 28	8x11	30	8x11	30	10x12.5	32	10x15	38	10x15	38
4.7			8x11	36	8x11	42	10x12.5	44	10x12.5	46	10x12.5	48	10x20	50
10			10x12.5	67	10x12.5	75	10x16	80	10x20	88	10x17	98	13x21	89
22	8x11	80	10x16	95	10x20	105	10x20	110	13x21	140	13x26	165	16x26	185
33	8x12.5	135	10x20	150	10x20	160	13x21	172	16x26	180	16x26	196	16x26	196
47	10x12.5	140	13x21	170	13x21	180	13x21	185	16x26	210	16x33	310	18x27	330
100	10x20	250	16x26	290	16x26	305	16x32	365	18x37	460	18x37	480	22x38	580
220	13x26	450	16x36	520	18x37 22x27	600 620	22x38	650						
330	16x26	620	22x38	700	22x38	780	22x42	780						
470	16x33	780	22x38	780	22x42	895								
1000	18x41	1100												

Aluminum Electrolytic Capacitors **LL** Series

Features

- 105℃, Low Leakage Current
- RoHS Compliance

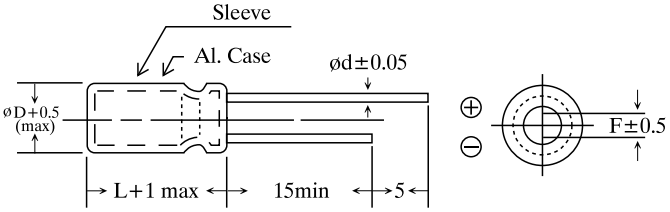


Specification

Items	Performance
Capacitance Tolerance	±20% (at 120Hz, 20℃)
Rated Voltage Range	10 to 63 VDC
Capacitance Range	0.1 to 1000 μF
Operating Temperature Range	-40 to + 105℃
Leakage Current (at 20℃)	I≦0.002 CV or 1 (μA), whichever is greater. After 3 minutes application of working voltage. I＝Leakage current (μA), C＝Rated capacitance (μF), V＝Rated voltage (V)
Dissipation Factor (Tan δ at 120Hz, 20℃)	Rated Voltage: 10 / 16 / 25 / 35 / 50 / 63 Tan δ (max): 0.20 / 0.17 / 0.15 / 0.12 / 0.10 / 0.10 For capacitance＞1000 μF, add 0.02 per 1000 μF increase.
Low Temperature Characteristics (at 120Hz)	Impedance ratio max. Rated Voltage: 10 / 16 / 25 / 35 / 50 / 63 Z-25℃/Z+20℃: 3 / 2 / 2 / 2 / 2 / 2 Z-40℃/Z+20℃: 8 / 6 / 4 / 3 / 3 / 3
Load Life	After 1000 hours application of W.V. at 105℃, the capacitor shall meet the following limits. Capacitance change : ≦±25% of initial value Dissipation factor : ≦200% of initial specified value Leakage Current : ≦Initial specified value
Shelf Life	After storage for 500 hours at 105℃, with no voltage applied and being stabilized at + 20℃, Capacitor shall meet the limit specified in load life.
Ripple Current & Frequency Multiplier	Freq.(Hz) / Cap.(μF): 60 (50) / 120 / 500 / 1K / 10K up Under 100: 0.75 / 1.00 / 1.35 / 1.50 / 2.00 100 to 1000: 0.83 / 1.00 / 1.23 / 1.32 / 1.50 1000 up above: 0.90 / 1.00 / 1.12 / 1.10 / 1.15
Ripple Current & Temperature Multiplier	Temperature(℃): 85 / 105 Multiplier: 1.40 / 1.00

Aluminum Electrolytic Capacitors **LL** Series

DIAGRAM OF DIMENSIONS



LEAD SPACING AND DIAMTER

Unit: mm

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

DIMENSION & PERMISSIBLE RIPPLE CURRENT

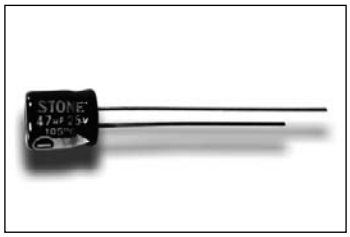
Dimension : ø D x L (mm)
Ripple Current : mA/rms at 120Hz,105℃

VDC / μF	10V		16V		25V		35V		50V		63V	
	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA
0.1-0.47									5x11.5	6	5x11.5	6
1									5x11.5	12	5x11.5	12
2.2									5x11.5	20	5x11.5	20
3.3									5x11.5	25	5x11.5	25
4.7									5x11.5	30	5x11.5	30
10					5x11.5	35	5x11.5	46	5x11.5	46	6.3x11	54
22					5x11.5	55	5x11.5	59	5x11.5	59	6.3x11	78
33			5x11.5	60	5x11.5	66	6.3x11	87	6.3x11	87	8x11	96
47	5x11.5	65	5x11.5	90	6.3x11	105	6.3x11	115	6.3x11	115	8x11	136
100	5x11.5	95	6.3x11	115	6.3x11	138	8x11	162	8x11	188	10x16	236
220	6.3x11	165	8x11	220	10x12.5	240	10x12.5	290	10x20	340	13x21	410
330	8x11	235	8x11	250	10x12.5	315	10x16	380	10x20	440	13x21	440
470	8x11	285	10x12.5	360	10x16	430	13x21	520	13x26	630		
1000	10x16	540	10x20	630	13x21	720	13x25	890				

Aluminum Electrolytic Capacitors **MR** Series

Features

- 105℃ with 7mm height
- RoHS Compliance



Specification

Items	Performance
Capacitance Tolerance	±20% (at 120Hz, 20℃)
Rated Voltage Range	4 to 50 VDC
Capacitance Range	0.1 to 470 μF
Operating Temperature Range	-40 to + 105℃
Leakage Current (at 20℃)	I≦0.01 CV or 3 (μA), whichever is greater. After 2 minutes application of working voltage. I＝Leakage current (μA), C＝Rated capacitance (μF), V＝Rated voltage (V)
Dissipation Factor (Tan δ at 120Hz, 20℃)	

Rated Voltage	4	6.3	10	16	25	35	50
Tan δ (max)	0.35	0.24	0.20	0.17	0.15	0.12	0.10

Low Temperature Characteristics (at 120Hz)

Impedance ratio max.

Rated Voltage	4	6.3	10	16	25	35	50
Z-25℃/Z+20℃	7	4	3	2	2	2	2
Z-40℃/Z+20℃	15	10	8	6	4	3	3

Load Life

After 1000 hours application of W.V. at 105℃,
the capacitor shall meet the following limits.

Capacitance change	:	≦±25% of initial value
Dissipation factor	:	≦200% of initial specified value
Leakage Current	:	≦Initial specified value

Shelf Life

After storage for 500 hours at 105℃, with no voltage applied and being stabilized at + 20℃, Capacitor shall meet the limit specified in load life.

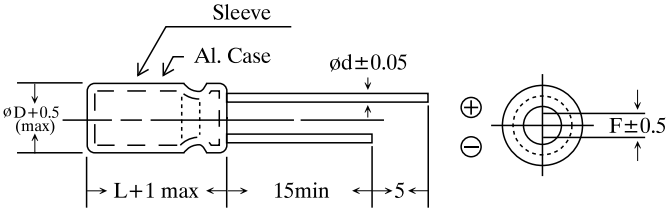
Ripple Current & Frequency Multiplier

Freq.(Hz) / Cap.(μF)	60 (50)	120	500	1K	10K up
Under 47	0.70	1.00	1.20	1.30	1.45
100 to 470	0.80	1.00	1.10	1.15	1.20

Ripple Current & Temperature Multiplier

Temperature(℃)	85	105
Multiplier	1.40	1.00

DIAGRAM OF DIMENSIONS



LEAD SPACING AND DIAMTER

Unit: mm

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

DIMENSION & PERMISSIBLE RIPPLE CURRENT

Dimension : ø D x L (mm)

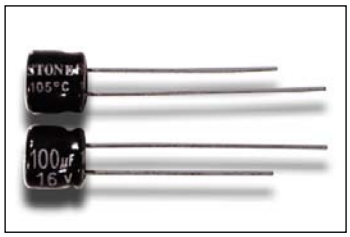
Ripple Current : mA/rms at 120Hz,105℃

VDC / μF	4V		6.3V		10V		16V		25V		35V		50V	
	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA
0.1													4x7	1
0.22													4x7	1
0.33													4x7	2
0.47													4x7	4
1													4x7	7
2.2													4x7	15
3.3													4x7	20
4.7													4x7	22
10									4x7	25	5x7	28	5x7	32
22							4x7	30	5x7	40	6.3x7	52	6.3x7	55
33					4x7	35	5x7	45	6.3x7	50	6.3x7	50	8x9	65
47					4x7	40	5x7	50	6.3x7	60	6.3x7	63	8x9	75
100					5x7	70	6.3x7	85	6.3x7 8x7 8x9	80 90	8x9	90		
220			6.3x7	88	6.3x7	94	6.3x7 8x7	100 120	8x9	130				
330			6.3x7	90	8x7	110	8x7	115						
470	8x7	120	8x7	120	8x9	140	8x9	140						

Aluminum Electrolytic Capacitors **SM/SS** Series

Features

- 105℃ with 5mm height
- RoHS Compliance



Specification

Items	Performance
Capacitance Tolerance	±20% (at 120Hz, 20℃)
Rated Voltage Range	4 to 50 VDC
Capacitance Range	0.1 to 470 μF
Operating Temperature Range	-40 to + 105℃
Leakage Current (at 20℃)	I≦0.01 CV or 3 (μA), whichever is greater. After 2 minutes application of working voltage. I=Leakage current (μA), C=Rated capacitance (μF), V=Rated voltage (V)
Dissipation Factor (Tan δ at 120Hz, 20℃)	
Low Temperature Characteristics (at 120Hz)	Impedance ratio max.
Load Life	After 1000 hours application of W.V. at 105℃, the capacitor shall meet the following limits. Capacitance change : ≦±25% of initial value Dissipation factor : ≦200% of initial specified value Leakage Current : ≦Initial specified value
Shelf Life	After storage for 500 hours at 105℃, with no voltage applied and being stabilized at + 20℃, Capacitor shall meet the limit specified in load life.
Ripple Current & Frequency Multiplier	
Ripple Current & Temperature Multiplier	

Rated Voltage	4	6.3	10	16	25	35	50
Tan δ (max)	0.35	0.24	0.20	0.17	0.15	0.12	0.10

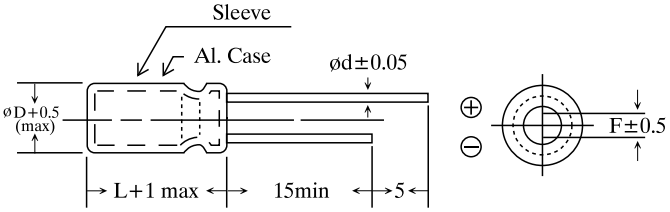
Rated Voltage	4	6.3	10	16	25	35	50
Z-25℃/Z+20℃	7	4	3	2	2	2	2
Z-40℃/Z+20℃	15	10	8	6	4	3	3

Freq.(Hz) / Cap.(μF)	60 (50)	120	500	1K	10K up
Under 47	0.75	1.00	1.20	1.30	1.45
100 to 470	0.80	1.00	1.10	1.15	1.20

Temperature(℃)	85	105
Multiplier	1.40	1.00

Aluminum Electrolytic Capacitors **SM/SS** Series

DIAGRAM OF DIMENSIONS



LEAD SPACING AND DIAMTER

Unit: mm

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

DIMENSION & PERMISSIBLE RIPPLE CURRENT

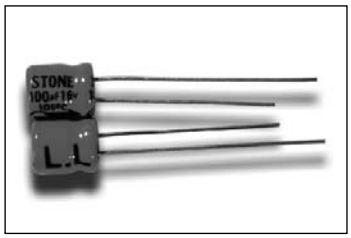
Dimension : ø D x L (mm)
Ripple Current : mA/rms at 120Hz,105℃

VDC / μF	4V		6.3V		10V		16V		25V		35V		50V	
	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA
0.1													3x5 4x5	1
0.22													3x5 4x5	2
0.33													3x5 4x5	2
0.47													3x5 4x5	3
1													3x5 4x5	5
2.2													3x5 4x5	7
3.3													4x5	8
4.7									3x5	8	4x5	12	4x5	12
10							3x5	12	4x5	18	5x5	20	6.3x5	25
22					3x5	15	4x5	20	5x5	30	6.3x5	42	6.3x5	42
33					4x5	20	5x5	35	6.3x5	42	8x5	50		
47			4x5	28	5x5	36	5x5	34	6.3x5	48	8x5	52		
100			5x5	34	6.3x5	60	6.3x5	65	8x5	68				
220			6.3x5	80	8x5	83	8x5	83						
330			8x5	80										
470	8x5	83												

Aluminum Electrolytic Capacitors **SL** Series

Features

- 105℃, 7mm height with Low Leakage Current
- RoHS Compliance



Specification

Items	Performance
Capacitance Tolerance	±20% (at 120Hz, 20℃)
Rated Voltage Range	6.3 to 50 VDC
Capacitance Range	0.1 to 100 μF
Operating Temperature Range	-40 to + 105℃
Leakage Current (at 20℃)	I≦0.002 CV or 1 (μA), whichever is greater. After 3 minutes application of working voltage. I=Leakage current (μA), C=Rated capacitance (μF), V=Rated voltage (V)

Dissipation Factor (Tan δ at 120Hz, 20℃)

Rated Voltage	6.3	10	16	25	35	50
Tan δ (max)	0.24	0.20	0.17	0.15	0.12	0.10

Low Temperature Characteristics (at 120Hz)

Impedance ratio max.

Rated Voltage	6.3	10	16	25	35	50
Z-25℃/Z+20℃	4	3	2	2	2	2
Z-40℃/Z+20℃	10	8	6	4	3	3

Load Life

After 1000 hours application of W.V. at 105℃,
the capacitor shall meet the following limits.

Capacitance change	:	≦±25% of initial value
Dissipation factor	:	≦200% of initial specified value
Leakage Current	:	≦Initial specified value

Shelf Life

After storage for 500 hours at 105℃, with no voltage applied and being stabilized at + 20℃, Capacitor shall meet the limit specified in load life.

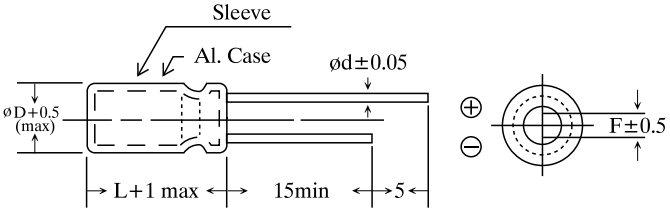
Ripple Current & Frequency Multiplier

Freq.(Hz) / Cap.(μF)	60 (50)	120	500	1K	10K up
Under 10	0.80	1.00	1.20	1.30	1.40
10 to 100	0.80	1.00	1.10	1.15	1.20

Ripple Current & Temperature Multiplier

Temperature(℃)	85	105
Multiplier	1.40	1.00

DIAGRAM OF DIMENSIONS



LEAD SPACING AND DIAMTER

Unit: mm

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

DIMENSION & PERMISSIBLE RIPPLE CURRENT

Dimension : ø D x L (mm)

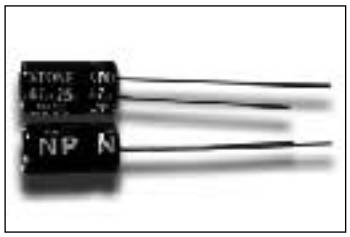
Ripple Current : mA/rms at 120Hz,105℃

VDC / μF	6.3V		10V		16V		25V		35V		50V	
	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA
0.1											4x7	2
0.22											4x7	2
0.33											4x7	3
0.47											4x7	5
1											4x7	8
2.2											4x7	12
3.3											4x7	15
4.7											4x7	19
10							4x7	20	5x7	30	6.3x7	35
22					5x7	35	5x7	38	6.3x7	45	8x7	48
33			5x7	38	5x7	44	6.3x7	50	8x7	58		
47			5x7	48	6.3x7	55	6.3x7	60				
100	5x7	59	6.3x7	78	6.3x7	78						

Aluminum Electrolytic Capacitors **NP** Series

Features

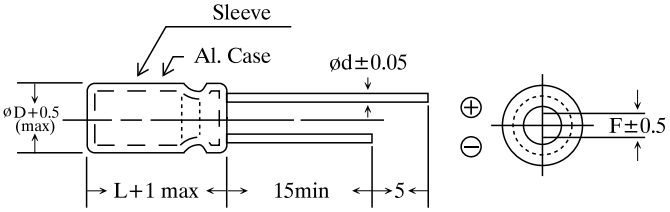
- 85℃, Standard non-polarized series
- RoHS Compliance



Specification

Items	Performance
Capacitance Tolerance	±20% (at 120Hz, 20℃)
Rated Voltage Range	10 to 100 VDC
Capacitance Range	0.47 to 1000 μF
Operating Temperature Range	-40 to + 85℃
Leakage Current (at 20℃)	I≦0.03 CV or 4 (μA), whichever is greater. After 3 minutes application of working voltage. I=Leakage current (μA), C=Rated capacitance (μF), V=Rated voltage (V)
Dissipation Factor (Tan δ at 120Hz, 20℃)	<table><tr><td>Rated Voltage</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>Tan δ (max)</td><td>0.20</td><td>0.17</td><td>0.17</td><td>0.15</td><td>0.12</td><td>0.11</td><td>0.10</td></tr></table>For capacitance＞1000 μF, add 0.02 per 1000 μF increase.
Low Temperature Characteristics (at 120Hz)	Impedance ratio max. <table><tr><td>Rated Voltage</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>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></tr></table>
Load Life	After 2000 hours application of W.V. at 85℃, the capacitor shall meet the following limits. Capacitance change : ≦±25% of initial value Dissipation factor : ≦200% of initial specified value Leakage Current : ≦Initial specified value
Shelf Life	After storage for 1000 hours at 85℃, with no voltage applied and being stabilized at + 20℃, Capacitor shall meet the limit specified in load life.
Ripple Current & Frequency Multiplier	<table><tr><td>Freq.(Hz) / Cap.(μF)</td><td>60 (50)</td><td>120</td><td>500</td><td>1K</td><td>10K up</td></tr><tr><td>Under 100</td><td>0.70</td><td>1.00</td><td>1.20</td><td>1.30</td><td>1.50</td></tr><tr><td>100 to 1000</td><td>0.75</td><td>1.00</td><td>1.10</td><td>1.15</td><td>1.30</td></tr><tr><td>1000 up above</td><td>0.80</td><td>1.00</td><td>1.05</td><td>1.10</td><td>1.15</td></tr></table>
Ripple Current & Temperature Multiplier	<table><tr><td>Temperature(℃)</td><td>70</td><td>85</td></tr><tr><td>Multiplier</td><td>1.40</td><td>1.00</td></tr></table>

DIAGRAM OF DIMENSIONS



LEAD SPACING AND DIAMTER

Unit: mm

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

DIMENSION & PERMISSIBLE RIPPLE CURRENT

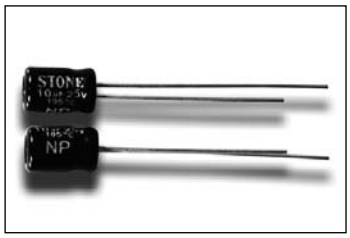
Dimension : ø D x L (mm)
Ripple Current : mA/rms at 120Hz,85℃

VDC / μF	10V		16V		25V		35V		50V		63V		100V	
	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA
0.47									5x11.5	7	5x11.5	7	5x11.5	8
1									5x11.5	9	5x11.5	9	5x11.5	10
2.2									5x11.5	15	5x11.5	15	6.3x11	17
3.3									5x11.5	18	5x11.5	18	6.3x11	22
4.7									5x11.5	22	5x11.5	22	6.3x11	26
10					5x11.5	29	5x11.5	30	6.3x11	42	6.3x11	45	8x11	45
22			5x11.5	42	6.3x11	46	6.3x11	52	6.3x11	63	8x11	70	10x16	98
33			5x11.5	52	6.3x11	58	8x11	70	8x11	77	10x16	82	10x20	148
47	5x11.5	62	6.3x11	78	6.3x11	82	8x11	92	8x11	95	10x16	125	13x21	166
100	6.3x11	90	6.3x11	99	8x11	136	10x16	172	10x20	190	13x21	265	16x26	371
220	8x11	150	10x16	224	10x16	232	10x20	280	13x26	342				
330	10x12.5	225	10x12.5	245	10x17	290	13x21	340	16x26	460				
470	10x12.5	280	10x20	345	13x21	380	13x26	450	16x26	590				
1000	10x20	400	13x26	471										

Aluminum Electrolytic Capacitors **SN** Series

Features

- 105℃, 7mm height with non-polarized series
- RoHS Compliance



Specification

Items	Performance
Capacitance Tolerance	±20% (at 120Hz, 20℃)
Rated Voltage Range	6.3 to 50 VDC
Capacitance Range	0.1 to 100 μF
Operating Temperature Range	-40 to + 105℃
Leakage Current (at 20℃)	I≦0.03 CV or 10 (μA), whichever is greater. After 3 minutes application of working voltage. I=Leakage current (μA), C=Rated capacitance (μF), V=Rated voltage (V)
Dissipation Factor (Tan δ at 120Hz, 20℃)	

Rated Voltage	6.3	10	16	25	35	50
Tan δ (max)	0.24	0.20	0.17	0.15	0.12	0.10

Low Temperature Characteristics (at 120Hz)

Impedance ratio max.

Rated Voltage	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

After 1000 hours application of W.V. at 105℃,
the capacitor shall meet the following limits.

Capacitance change	:	≦±25% of initial value
Dissipation factor	:	≦200% of initial specified value
Leakage Current	:	≦Initial specified value

Shelf Life

After storage for 500 hours at 105℃, with no voltage applied and being stabilized at + 20℃, Capacitor shall meet the limit specified in load life.

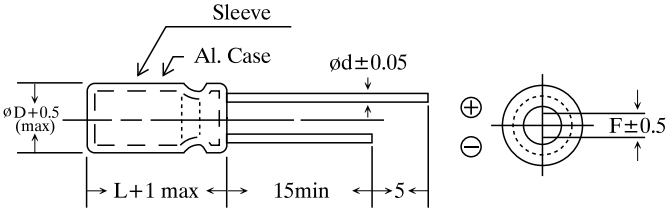
Ripple Current & Frequency Multiplier

Freq.(Hz) / Cap.(μF)	60 (50)	120	500	1K	10K up
Under 10	0.65	1.00	1.20	1.30	1.50
10 to 100	0.80	1.00	1.20	1.30	1.50

Ripple Current & Temperature Multiplier

Temperature(℃)	85	105
Multiplier	1.40	1.00

DIAGRAM OF DIMENSIONS



LEAD SPACING AND DIAMTER

Unit: mm

D	4	5	6.3
F	1.5	2.0	2.5
d	0.45		

DIMENSION & PERMISSIBLE RIPPLE CURRENT

Dimension : ø D x L (mm)

Ripple Current : mA/rms at 120Hz,105℃

VDC / μF	6.3V		10V		16V		25V		35V		50V	
	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA
0.1											4x7	1
0.22											4x7	1.5
0.33											4x7	2
0.47											4x7	3
1											4x7	7
2.2											5x7	12
3.3											5x7	14
4.7							4x7	14	5x7	18	6.3x7	22
10					4x7	20	5x7	24	6.3x7	30		
22			4x7	25	5x7	30	6.3x7	50				
33			5x7	35	6.3x7	48	6.3x7	50				
47			5x7	40	6.3x7	50						
100	6.3x7	50										

Aluminum Electrolytic Capacitors **XR** Series

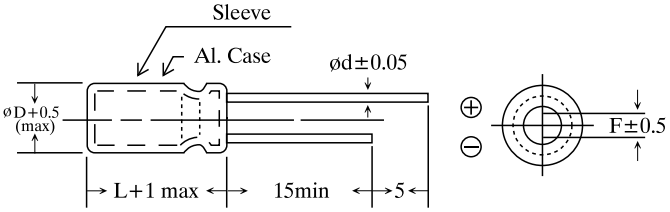
Features

- Low Impedance
- Load Life of 2000 hours at 105℃
- RoHS Compliance

Specification

Items	Performance
Capacitance Tolerance	±20% (at 120Hz, 20℃)
Rated Voltage Range	6.3 to 50 VDC
Capacitance Range	47 to 4700 μF
Operating Temperature Range	-40 to + 105℃
Leakage Current (at 20℃)	I≦0.01 CV or 3 (μA), whichever is greater. After 2 minutes application of working voltage. I＝Leakage current (μA), C＝Rated capacitance (μF), V＝Rated voltage (V)
Dissipation Factor (Tan δ at 120Hz, 20℃)	Rated Voltage: 6.3 / 10 / 16 / 25 / 35 / 50 Tan δ (max): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 For capacitance＞1000 μF, add 0.02 per 1000 μF increase.
Low Temperature Characteristics (at 120Hz)	Impedance ratio max. Rated Voltage: 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	After 2000 hours application of W.V. at +105℃, the capacitor shall meet the following limits. Capacitance change : ≦±25% of initial value Dissipation factor : ≦200% of initial specified value Leakage Current : ≦Initial specified value
Shelf Life	After storage for 1000 hours at 105℃, with no voltage applied and being stabilized at + 20℃, Capacitor shall meet the limit specified in load life.
Ripple Current & Frequency Multiplier	Freq.(Hz) / Cap.(μF): 60 (50) / 120 / 1K / 10K / 100K 47 to 330: 0.60 / 0.70 / 0.85 / 0.95 / 1.00 470 to 1000: 0.65 / 0.75 / 0.90 / 0.98 / 1.00 1200 up above: 0.75 / 0.80 / 0.95 / 1.00 / 1.00
Ripple Current & Temperature Multiplier	Temperature(℃): 85 / 105 Multiplier: 1.70 / 1.00

DIAGRAM OF DIMENSIONS



LEAD SPACING AND DIAMTER

Unit: mm

D	8	10	13
F	3.5	5.0	5.0
d	0.5	0.6	

DIMENSION & PERMISSIBLE RIPPLE CURRENT

Dimension : ø D x L (mm)
Ripple Current : mA/rms at 100KHz,105℃
Max Impedance : (Ω) at 100KHz,20℃

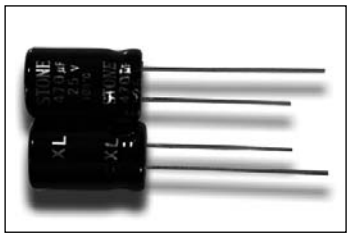
VDC / μF	6.3V			10V			16V		
	ø DxL	Ripple	Impedance	ø DxL	Ripple	Impedance	ø DxL	Ripple	Impedance
470							8x12	600	0.100
1000	8x12 8x14	500 600	0.090 0.090	10x12.5	1000	0.080	10x20	1380	0.060
1200	8x20 10x16	800 1000	0.060 0.060	10x20	1200	0.045			
1500	8x20 10x16 10x20	800 1000 1100	0.070 0.060 0.045	10x20	1200	0.045	10x20	1800	0.045
2200	10x20	1100	0.075	10x20	1450	0.060	10x25 13x21	1720 1810	0.050 0.045
3300	10x25	1500	0.050	13x26	1800	0.043			
4700	13x26	1790	0.050						

VDC / μF	25V			35V			50V		
	ø DxL	Ripple	Impedance	ø DxL	Ripple	Impedance	ø DxL	Ripple	Impedance
47							8x11	275	0.400
100				8x12	400	0.180	8x14	420	0.140
220	8x14	700	0.085	10x12.5	700	0.090	10x20	850	0.110
330	8x14	800	0.075	10x16	1000	0.065	10x25	1100	0.060
470	10x16	1050	0.075	10x20	1250	0.060	13x21	1450	0.050
1000	10x20 13x21	1580 1820	0.045 0.035	13x26	1820	0.035	16x26	2000	0.045
1500	13x26	1870	0.035						
2200	13x26	2200	0.035						

Aluminum Electrolytic Capacitors **XL** Series

Features

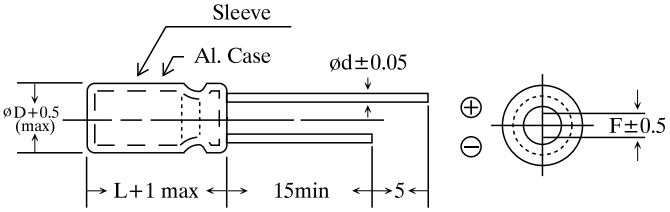
- Low Impedance, High Ripple Current
- Load Life of 2000~3000 Hours at 105℃
- RoHS Compliance



Specification

Items	Performance
Capacitance Tolerance	±20% (at 120Hz, 20℃)
Rated Voltage Range	6.3 to 50 VDC
Capacitance Range	100 to 4700 μF
Operating Temperature Range	-40 to + 105℃
Leakage Current (at 20℃)	I≦0.01 CV or 3 (μA), whichever is greater. After 2 minutes application of working voltage. I＝Leakage current (μA), C＝Rated capacitance (μF), V＝Rated voltage (V)
Dissipation Factor (Tan δ at 120Hz, 20℃)	<table><tr><td>Rated Voltage</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Tan δ (max)</td><td>0.22</td><td>0.19</td><td>0.16</td><td>0.14</td><td>0.12</td><td>0.10</td></tr></table>For capacitance＞1000μF, add 0.02 per 1000μF increase.
Low Temperature Characteristics (at 120Hz)	Impedance ratio max. <table><tr><td>Rated Voltage</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>3</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>6</td><td>6</td><td>4</td><td>4</td><td>3</td><td>3</td></tr></table>
Load Life	Application of W.V. at +105℃, the capacitor shall meet the following limits. Capacitance change : ≦±25% of initial value Dissipation factor : ≦200% of initial specified value Leakage Current : ≦Initial specified value Life Time : 3000 hours for øD>10 2000 hours for øD=8,10
Shelf Life	After storage for 1000 hours at 105℃, with no voltage applied and being stabilized at + 20℃, Capacitor shall meet the limit specified in load life.
Ripple Current & Frequency Multiplier	<table><tr><td>Freq.(Hz) / Cap.(μF)</td><td>60 (50)</td><td>120</td><td>1K</td><td>10K</td><td>100K</td></tr><tr><td>under 330</td><td>0.60</td><td>0.70</td><td>0.85</td><td>0.95</td><td>1.00</td></tr><tr><td>470 to 1000</td><td>0.65</td><td>0.75</td><td>0.90</td><td>0.98</td><td>1.00</td></tr><tr><td>1200 up above</td><td>0.75</td><td>0.80</td><td>0.95</td><td>1.00</td><td>1.00</td></tr></table>
Ripple Current & Temperature Multiplier	<table><tr><td>Temperature(℃)</td><td>85</td><td>105</td></tr><tr><td>Multiplier</td><td>1.70</td><td>1.00</td></tr></table>

DIAGRAM OF DIMENSIONS



LEAD SPACING AND DIAMTER

Unit: mm

D	8	10	13
F	3.5	5.0	5.0
d	0.5	0.6	

DIMENSION & PERMISSIBLE RIPPLE CURRENT

Dimension : ø D x L (mm)
Ripple Current : mA/rms at 100KHz,105℃
Max Impedance : (Ω) at 100KHz,20℃

VDC / μF	6.3V			10V			16V		
	ø DxL	Ripple	Impedance	ø DxL	Ripple	Impedance	ø DxL	Ripple	Impedance
330							8x12	610	0.085
470							10x12.5	900	0.060
1000	8x14	840	0.065	8x14	900	0.065	10x20	1650	0.040
1200	10x16	1180	0.060	10x20	1560	0.035	10x25	1920	0.035
1500	10x20	1400	0.050	10x20	1650	0.030	13x21	2100	0.030
2200	10x20 10x25	1560 1920	0.040 0.040	10x25 13x21	2000 2100	0.035 0.035	10x25 13x26	2000 2500	0.035 0.030
3300	13x21	2050	0.030	13x26	2500	0.030	13x26	2800	0.030
4700	13x26	2850	0.030						

VDC / μF	25V			35V			50V		
	ø DxL	Ripple	Impedance	ø DxL	Ripple	Impedance	ø DxL	Ripple	Impedance
100				8x12	400	0.120	8x14	500	0.090
220	8x14	600	0.085	10x12.5	900	0.065	10x20	1100	0.050
330	10x12.5	900	0.060	10x16	1250	0.050	10x25	1650	0.040
470	10x16	1250	0.050	10x20	1650	0.030	13x21	1900	0.035
1000	10x25	1910	0.030	13x26	2150	0.030			
1500	13x26	2500	0.030						
2200	13x26	2800	0.030						

Aluminum Electrolytic Capacitors **GA** Series

Features

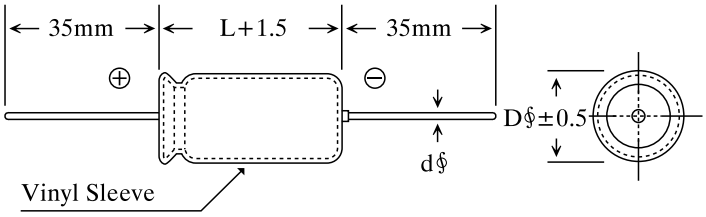
- 85℃ Standard Axial series for general purpose
- RoHS Compliance

Specification

Items	Performance
Capacitance Tolerance	±20% (at 120Hz, 20℃)
Rated Voltage Range	10 to 100 VDC
Capacitance Range	1 to 4700 μF
Operating Temperature Range	-40 to + 85℃
Leakage Current (at 20℃)	I≦0.01 CV or 3 (μA), whichever is greater. After 2 minutes application of working voltage. I＝Leakage current (μA), C＝Rated capacitance (μF), V＝Rated voltage (V)
Dissipation Factor (Tan δ at 120Hz, 20℃)	Rated Voltage: 10 / 16 / 25 / 35 / 50 / 63 / 100 Tan δ (max): 0.20 / 0.17 / 0.15 / 0.12 / 0.10 / 0.10 / 0.10 For capacitance＞1000 μF, add 0.02 per 1000 μF increase.
Low Temperature Characteristics (at 120Hz)	Impedance ratio max. Rated Voltage: 10 / 16 / 25 / 35 / 50 / 63 / 100 Z-25℃/Z+20℃: 3 / 2 / 2 / 2 / 2 / 2 / 2 Z-40℃/Z+20℃: 8 / 6 / 4 / 3 / 3 / 3 / 3
Load Life	After 1000 hours application of W.V. at 85℃, the capacitor shall meet the following limits. Capacitance change : ≦±25% of initial value Dissipation factor : ≦200% of initial specified value Leakage Current : ≦Initial specified value
Shelf Life	After storage for 500 hours at 85℃, with no voltage applied and being stabilized at + 20℃, Capacitor shall meet the limit specified in load life.
Ripple Current & Frequency Multiplier	Freq.(Hz) / Cap.(μF): 60 (50) / 120 / 500 / 1K / 10K up Under 100: 0.75 / 1.00 / 1.20 / 1.40 / 1.50 100 to 1000: 0.75 / 1.00 / 1.10 / 1.20 / 1.30 1000 up above: 0.80 / 1.00 / 1.05 / 1.12 / 1.15
Ripple Current & Temperature Multiplier	Temperature(℃): 70 / 85 Multiplier: 1.40 / 1.00

Aluminum Electrolytic Capacitors **GA** Series

DIAGRAM OF DIMENSIONS



LEAD SPACING AND DIAMTER

Unit: mm

D	6.3 - 13	16 - 25
d	0.6	0.8

DIMENSION & PERMISSIBLE RIPPLE CURRENT

Dimension : ø D x L (mm)
Ripple Current : mA/rms at 120Hz,85℃

VDC / μF	10V		16V		25V		35V		50V		63V		100V	
	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA	ø DxL	mA
1									6x13	6	6x13	7	6x13	10
2.2									6x13	15	6x13	17	6x13	20
3.3									6x13	25	6x13	28	6x13	34
4.7									6x13	35	6x13	38	6x13	40
10									6x13	52	6x13	55	8x16	78
22									6x13	82	6x13	93	8x16	105
33					6x13	75	6x13	90	8x16	105	8x16	110	8x21	115
47					6x13	92	6x13	105	8x16	135	8x16	158	10x21	190
100			6x13	148	8x13	175	8x16	200	8x16	223	10x21	260	13x21	340
220			8x16	278	8x16	297	10x16	362	10x21	420	13x22	471	16x28	570
330	8x16	317	8x16	340	10x21	415	10x21	464	13x22	552	13x27	618		
470	8x16	370	8x16	410	10x21	485	10x21	560	13x27	690	13x27	729		
1000	10x21	590	10x21	680	13x22	740	13x27	839	16x32	974	16x36	1112		
2200	13x22	910	13x22	980	16x28	1134	16x32	1152	18x36	1399	22x42	1544		
3300	13x27	1050	16x28	1254	16x32	1411	18x36	1640	20x36	1810	22x42	1882		
4700	16x28	1250	16x32	1451	18x36	1581	20x36	1918	22x41	2047	25x43	2530		

Aluminum Electrolytic Capacitors **LP** Series

Features

- PCB Snap-In type 85℃
- Directly mountable on printed circuit board without holders.
- Terminal spacing fixed at 10mm for pc board plug in.
- RoHS Compliance

Specification

Items	Performance												
Capacitance Tolerance	±20% (at 120Hz, 25℃)												
Rated Voltage Range	10 to 100 VDC						160 to 450 VDC						
Capacitance Range	1000 to 47000 μF						47 to 2200 μF						
Operating Temperature Range	-40 to + 85℃						-25 to 85℃						
Leakage Current (at 20℃)	I≦0.02 CV After 5 minutes application of working voltage. I＝Leakage current (μA), C＝Rated capacitance (μF), V＝Rated voltage (V)												
Dissipation Factor (Tan δ at 120Hz, 20℃)	Rated Voltage	10	16	25	35	50	63	100	160	200	250	350	400	450
	Tan δ (max)	0.50	0.50	0.40	0.40	0.30	0.30	0.25	0.15	0.15	0.15	0.20	0.20	0.20
Low Temperature Characteristics (at 120Hz)	Impedance ratio shall not exceed the values given in the table below.													
	Rated Voltage	10	16	25	35	50	63	100	160	200	250	350	400	450
	Z-25℃/Z+20℃	5	5	4	4	4	4	4	4	4	4	4	8	8
	Z-40℃/Z+20℃	15	15	15	12	12	12	12	-	-	-	-	-	-
Load Life	After 2000 hours application of W.V. at 85℃, the capacitor shall meet the following limits. Capacitance change : ≦±25% of initial value Dissipation factor : ≦200% of initial specified value Leakage Current : ≦Initial specified value													
Shelf Life	After storage for 1000 hours at 85℃, with no voltage applied and being stabilized at + 20℃, Capacitor shall meet the limit specified in load life.													

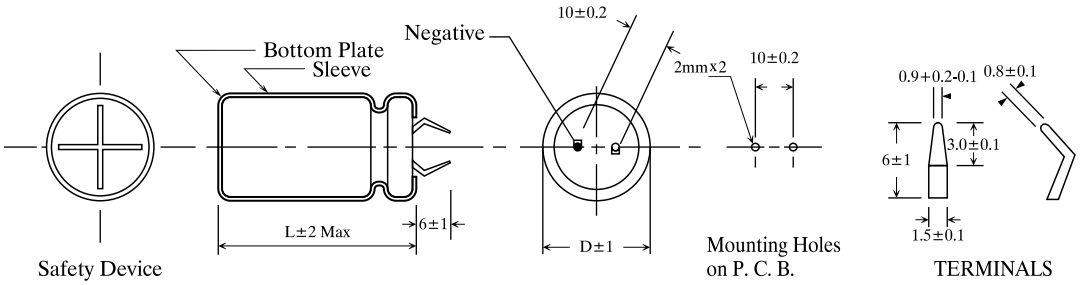
Ripple Current & Frequency Multiplier

Freq.(Hz) / W.V. (V)	60 (50)	120	500	1K	10K up
Under 100	0.90	1.00	1.13	1.19	1.20
160 to 250	0.81	1.00	1.17	1.32	1.45
350 to up	0.77	1.00	1.16	1.30	1.41

Ripple Current & Temperature Multiplier

Temperature(℃)	70	85
Multiplier	1.50	1.00

DIAGRAM OF DIMENSIONS

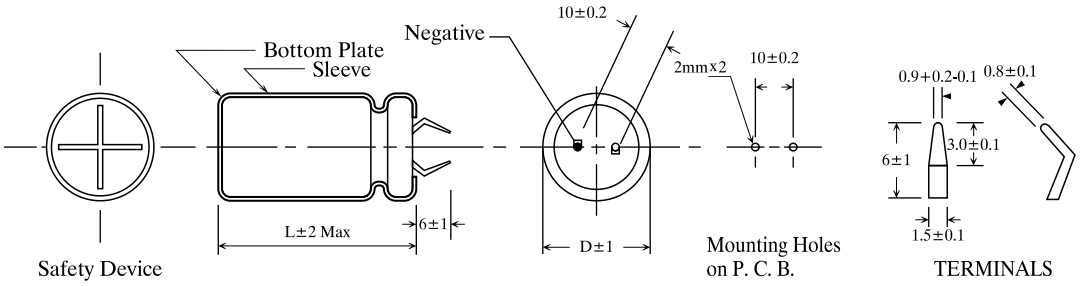


DIMENSION & PERMISSIBLE RIPPLE CURRENT

Dimension : ø D x L (mm)
Ripple Current : A/rms at 120Hz,85℃

VDC / μF	10V		16V		25V		35V		50V		63V		100V	
	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple
1000													22x32 25x26	1.58 2.58
1500											22x26	1.59	22x41 25x36 30x32	1.75 1.75 1.75
2200							22x26	2.08	22x26	1.98	22x32 25x26	2.48 2.48	22x51 25x41 30x32	2.52 2.52 2.52
3300							22x26	2.24	22x32 25x36	2.52 2.52	22x41 25x32	3.06 3.06	25x51 30x41	3.34 3.34
4700					22x26	2.52	22x32 25x26	2.46 2.46	22x36 25x36	2.72 2.72	22x51 25x41 30x32	3.12 3.12 3.12	30x51 35x46	3.62 3.62
6800					22x32 25x26	2.78 2.78	22x36 25x32	2.85 2.85	22x51 25x41 30x32	3.12 3.12 3.12	25x51 30x50	4.19 4.19	35x52	3.95
10000			22x26 25x26	2.85 2.85	22x36 25x32	3.36 3.36	22x46 25x41 30x32	3.42 3.42 3.42	25x51 30x41	3.88 3.88	30x50 35x45	4.67 4.67		
15000	22x36 25x32	3.68 3.68	22x36 25x32	3.68 3.68	22x51 25x41 30x32	4.18 4.18 4.18	25x51 30x35	3.78 3.78	30x51 35x48	4.57 4.57	35x58	4.98		
22000	22x46 25x36 30x32	4.6 4.6 4.6	22x46 25x36 30x32	4.6 4.6 4.6	25x51 30x41	5.24 5.24	30x51 35x42	5.35 5.35	35x58	5.74				
33000	25x51 30x41	7.95 7.95	25x51 30x41	7.95 7.95	30x51 35x42	6.12 6.12	35x52	6.28						
47000	30x51 35x42	8.78 8.78	30x51 35x42	8.78 8.78	35x52	7.55								

DIAGRAM OF DIMENSIONS



DIMENSION & PERMISSIBLE RIPPLE CURRENT

Dimension : ø D x L (mm)
Ripple Current : A/rms at 120Hz,85℃

VDC / μF	160V		200V		250V		350V		400V		450V	
	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple
47											22x26	032
68									22x26	0.48	22x26	0.38
100							22x32	0.72	22x32 25x26	0.95 0.95	22x36 25x32	0.98 0.98
150					22x26	0.86	22x36 25x32	1.02 1.02	22x36 25x32	1.08 1.08	22x51 25x41 30x32	1.13 1.13 1.13
220			22x26	1.28	22x32 25x26	1.28 1.28	22x46 25x41 30x32	1.32 1.32 1.32	22x51 25x41 30x36	1.68 1.68 1.68	25x51 30x41 35x37	1.55 1.55 1.55
330	22x26	1.38	22x32 25x26	1.79 1.79	22x36 25x32	1.79 1.79	25x51 30x41	1.76 1.76	22x51 25x51 30x46 35x37	1.89 2.18 2.18 2.18	30x51 35x37	2.18 2.18
470	22x32 25x26	1.67 1.67	22x36 25x32	2.12 2.12	22x26 25x41 30x32	2.22 2.22 2.22	30x51 35x42	2.32 2.32	25x56 30x46 35x46	2.39 2.39 2.71	35x50	2.60
680	22x41 25x36 30x32	2.29 2.29 2.29	22x46 25x40 30x41	2.84 2.84 2.84	25x51 30x41 35x32	3.02 3.02 3.02	35x52	3.10	30x56 35x51	2.98 3.05	35x57	2.89
1000	25x48 30x41	2.98 2.98	25x51 30x41	3.82 3.82	30x51 35x46	3.80 3.80	35x63	3.40				
1500	30x46 35x36	3.84 3.84	30x51 35x46	4.87 4.87	35x52	5.28						
2200	35x47	4.58	35x56	5.89								

Aluminum Electrolytic Capacitors **HP** Series

Features

- PCB Snap-In type 105℃
- Directly mountable on printed circuit board without holders.
- Terminal spacing fixed at 10mm for pc board plug in.

Specification

Items	Performance	
Capacitance Tolerance	±20%	(at 120Hz, 20℃)
Rated Voltage Range	10 to 100 VDC	160 to 450 VDC
Capacitance Range	470 to 47000 μF	47 to 2200 μF
Operating Temperature Range	-40 to + 105℃	-25 to 105℃
Leakage Current (at 20℃)	I≦0.02 CV After 5 minutes application of working voltage. I＝Leakage current (μA), C＝Rated capacitance (μF), V＝Rated voltage (V)	

Dissipation Factor (Tan δ at 120Hz, 20℃)

Rated Voltage	10	16	25	35	50	63	100	160	200	250	350	400	450
Tan δ (max)	0.50	0.50	0.40	0.40	0.30	0.30	0.25	0.15	0.15	0.15	0.20	0.20	0.20

Low Temperature Characteristics (at 120Hz)

Impedance ratio shall not exceed the values given in the table below.

Rated Voltage	10	16	25	35	50	63	100	160	200	250	350	400	450
Z-25℃/Z+20℃	5	5	4	4	4	4	4	4	4	4	4	8	8
Z-40℃/Z+20℃	15	15	15	12	12	12	12	-	-	-	-	-	-

Load Life

After 2000 hours application of W.V. at 105℃,
the capacitor shall meet the following limits.

Capacitance change	:	≦±25% of initial value
Dissipation factor	:	≦200% of initial specified value
Leakage Current	:	≦Initial specified value

Shelf Life

After storage for 1000 hours at 105℃, with no voltage applied and being stabilized at + 20℃, Capacitor shall meet the limit specified in load life.

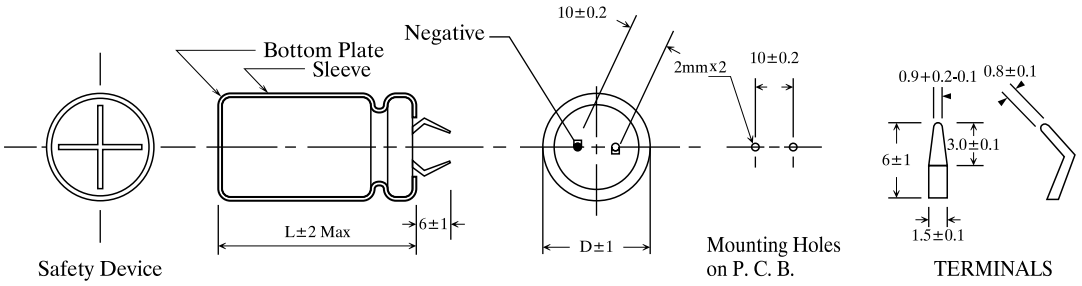
Ripple Current & Frequency Multiplier

Freq.(Hz) / W.V. (V)	60 (50)	120	500	1K	10K up
Under 100	0.90	1.00	1.13	1.19	1.20
160 to 250	0.81	1.00	1.17	1.32	1.45
350 to up	0.77	1.00	1.16	1.30	1.41

Ripple Current & Temperature Multiplier

Temperature(℃)	85	105
Multiplier	1.50	1.00

DIAGRAM OF DIMENSIONS



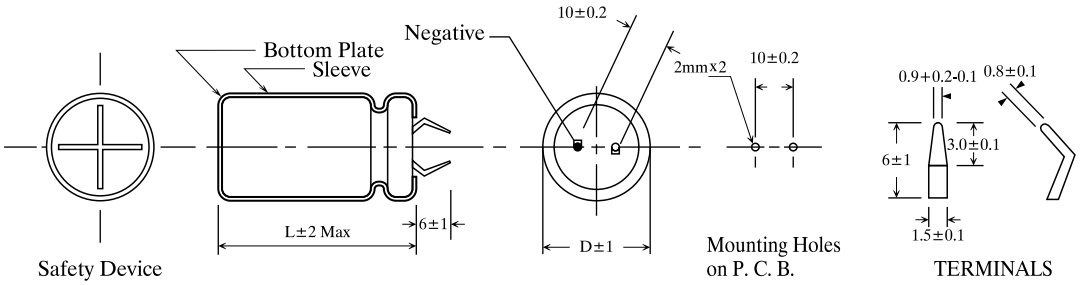
DIMENSION & PERMISSIBLE RIPPLE CURRENT

Dimension : ø D x L (mm)

Ripple Current : A/rms at 120Hz,105℃

VDC / μF	10V		16V		25V		35V		50V		63V		100V	
	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple
470													22x26 25x26	0.72 0.68
680													22x32 25x26	0.98 0.98
1000													22x35 25x32	1.13 1.13
1500									22x26 25x26	0.98 1.10	22x32 25x26	1.02 1.02	22x46 25x41 30x32	1.68 1.68 1.68
2200									22x26 25x26	1.46 1.46	22x36 25x32	1.46 1.46	25x51 30x41	2.97 2.97
3300									22x41 25x32	2.08 2.08	22x42 25x41 30x32	2.37 2.37 2.34	30x51 35x47	4.38 4.38
4700					22x26 25x26	1.72 1.72	22x32 25x26	2.37 2.16	22x46 25x41 30x32	2.73 2.73 2.73	25x51 30x41	3.22 3.22	35x56	5.32
6800					22x32 25x26	2.48 2.48	22x41 25x36 30x32	3.12 3.12 3.12	25x46 30x41	3.14 3.14	30x51 35x48	4.49 4.49		
10000	22.32 25x26	2.12 2.12	22x36 25x32	2.82 2.82	22x41 25x36 30x32	3.38 3.38 3.38	25x41 30x32	3.78 3.78	30x51 35x42	3.99 3.99	30x51 35x46	5.52 5.52		
15000	22x32 25x32	2.64 2.64	22x41 25x36	3.14 3.14	25x46 30x36	4.42 4.42	30x41 35x37	4.46 4.46	35x58	4.98				
22000	22x41 25x36 30x32	3.06 3.06 3.06	25x51 30x36	4.03 4.03	25x51 30x51 35x40	4.79 5.02 5.02	30x52 35x52	4.98 5.38						
33000	25x46 30x36	3.58 3.58	25x51 30x41 35x37	4.65 4.65 4.65	35x46	5.98	35x53	5.42						
47000	30x46 35x37	4.18 4.18	35x47	6.22										

DIAGRAM OF DIMENSIONS



DIMENSION & PERMISSIBLE RIPPLE CURRENT

Dimension : ø D x L (mm)
Ripple Current : A/rms at 120Hz,105℃

VDC / μF	160V		200V		250V		350V		400V		450V	
	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple	ø DxL	Ripple
47											22x27 25x26	0.32 0.32
68											22x32 25x32	0.50 0.50
100							22x26	0.50	22x32 25x32	0.78 0.82	22x41 25x32 30x32	0.68 0.68 0.68
150					22x26 25x26	0.50 0.50	22x36 25x32	0.65 0.65	22x41 25x32 30x32	0.86 0.86 0.86	22x51 25x48 30x36	0.87 0.87 0.87
220			22x32 25x26	0.78 0.78	22x26 25x32	0.86 0.86	22x46 25x36 30x32	0.88 0.88 0.88	22x51 25x41 30x41	1.03 1.03 1.03	25x51 30x48	0.98 1.12
330	22x32 25x26	0.82 0.82	22x32 25x26	1.10 1.10	22x36 25x32 30x32	1.02 1.02 1.02	25x41 30x41	0.92 0.92	25x52 30x48 35x42	1.20 1.34 1.34	30x53 35x47	1.27 1.48
470	22x36 25x32	1.02 1.02	22x41 25x41 30x32	1.45 1.45 1.48	22x46 25x46 30x36 35x32	1.34 1.65 1.65 1.65	25x51 30x46	1.40 1.40	25x58 30x52 35x52	1.67 1.67 1.67	35x53	1.67
680	22x46 25x41 30x32	1.48 1.50 1.67	22x56 25x40 30x36	1.80 1.80 1.80	25x53 30x46 35x37	1.67 2.02 2.02	35x42	1.65	30x64 35x52	2.18 2.18		
1000	22x56 25x51 30x41	1.98 2.03 2.03	25x51 30x42 35x42	2.05 2.30 2.30	30x51 35x51	2.28 2.52	35x63	1.68	35x62	2.36		
1500	30x51 25x42	2.46 2.46	30x51 35x53	2.75 3.10								
2200	35x51	3.18	35x63	3.58								

STONE
YELLOW STONE CORP.

MEMO

MEMO