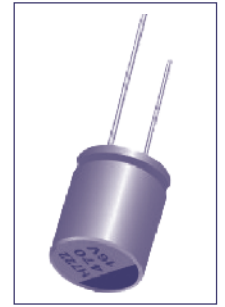
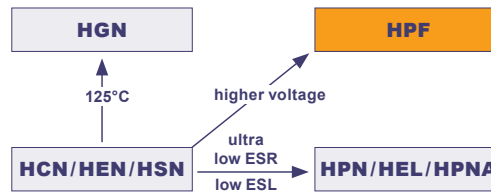




## 3000h, High Voltage 105°C

- Long Life
- Low ESR, high ripple current capability



Item	Characteristics		
Category Temperature Range (°C)	-55 ~ +105		
Rated Voltage Range (V <sub>DC</sub> )	16 ~ 200		
Capacitance Range (µF)	4,7 ~ 1200		
Capacitance Tolerance	± 20% (M)	(at 20°C, 120Hz)	
Surge Voltage	Rated Voltage(V) x 1,15		
Dissipation Factor (tanδ)	0,12	(at 20°C, 120Hz)	
Leakage Current *1	Please see the attached ratings list	Rated voltage applied, after 2 minutes.	
Equivalent Series Resistance (ESR)	Please see the attached ratings list	(at 20°C, 100kHz)	
Temperature Characteristics (Max. Impedance Ratio)	Z(+105°C) / Z(+20°C) ≤ 1,25	(at 100kHz)	
	Z(-55°C) / Z(+20°C) ≤ 1,25		
Life Time	105°C, 3000h Rated voltage applied	Δ C/C	≤ ±20% of the initial value
		DF (tanδ)	≤ 150% of the initial specified value
		ESR	≤ 150% of the initial specified value
		LC	≤ The initial specified value
Damp heat (Steady state)	60°C, 90 to 95% RH 1000h No-applied voltage	Δ C/C	≤ ±20% of the initial value
		DF (tanδ)	≤ 150% of the initial specified value
		ESR	≤ 150% of the initial specified value
		LC	≤ The initial specified value (after voltage processing)
Resistance to soldering heat	Wave method (260°C +/-5°C x 10s)	Δ C/C	≤ ±5% of the initial value
		DF (tanδ)	≤ The initial specified value
		ESR	≤ The initial specified value
		LC	≤ The initial specified value (after voltage processing)
*1 please see Handling Precautions and Chapter 4.1 of IEC 60384-26 :2011			

## Multiplier for Ripple Current

Frequency Coefficient

Frequency <i>f</i>	120Hz ≤ <i>f</i> < 1kHz	1kHz ≤ <i>f</i> < 10kHz	10kHz ≤ <i>f</i> < 100kHz	100kHz ≤ <i>f</i> ≤ 500kHz
Coefficient	0,05	0,3	0,7	1

## Ratings for HPF Series (order code PF)

U <sub>R</sub> Code	Rated Capacitance 20°C, 120Hz	ESR (max) 20°C, 100kHz	Rated Ripple Current 105°C, 100kHz	Leakage Current (max) 20°C, 2 min	Size Ø D x L	Case Code	
(V)	(µF)	(mΩ)	(mArms)	(µA)	(mm)		
16 1C	100	38	1900	320	5 x 5	E05	
	150	25	2800	480	6,3 x 5	F05	
	180	25	2800	580	6,3 x 5	F05	
	270	22	3300	865	865	6,3 x 8	F08
		22	3300	865	865	8 x 6	B06
	330	22	3300	1060	1060	6,3 x 8	F08
		22	3300	1060	1060	8 x 6	B06
	470	16	4400	1505	1505	8 x 8	B08
		14	4950	1505	1505	8 x 11,5	BAB
	560	16	4400	1785	1785	8 x 8	B08
		14	4950	1795	1795	8 x 11,5	BAB
	680	14	4950	2180	2180	8 x 11,5	BAB
1000	12	5400	3200	3200	10 x 12,5	CAC	
1200	12	5400	3840	3840	10 x 12,5	CAC	
20 1D	68	40	1900	275	5 x 5	E05	
	82	40	1900	330	5 x 5	E05	
	120	28	2650	480	6,3 x 5	F05	
	150	28	2650	600	6,3 x 5	F05	
	220	24	3200	880	880	6,3 x 8	F08
		24	3200	880	880	8 x 6	B06
	270	24	3200	1080	1080	8 x 6	B06
	330	17	4300	1320	1320	8 x 8	B08
	390	17	4300	1560	1560	8 x 8	B08
		14	4950	1560	1560	8 x 11,5	BAB
	470	14	4950	1880	1880	8 x 11,5	BAB
	560	14	4950	2240	2240	8 x 11,5	BAB
		12	5400	2240	2240	10 x 12,5	CAC
	680	12	5400	2720	2720	10 x 12,5	CAC
820	12	5400	3280	3280	10 x 12,5	CAC	
25 1E	56	50	1700	280	5 x 5	E05	
	68	50	1700	340	5 x 5	E05	
	100	30	2550	500	6,3 x 5	F05	
	120	30	2550	600	6,3 x 5	F05	
	180	24	3200	900	900	6,3 x 8	F08
		24	3200	900	900	8 x 6	B06
	220	24	3200	1100	1100	8 x 6	B06
	270	18	4100	1350	1350	8 x 8	B08
	330	18	4100	1650	1650	8 x 8	B08
		16	4650	1650	1650	8 x 11,5	BAB
	390	16	4650	1950	1950	8 x 11,5	BAB
		16	4650	2350	2350	8 x 11,5	BAB
	470	14	5000	2350	2350	10 x 12,5	CAC
		14	5000	2800	2800	10 x 12,5	CAC
680	14	5000	3400	3400	10 x 12,5	CAC	
28 1L	47	50	1700	265	5 x 5	E05	
	82	33	2450	460	6,3 x 5	F05	
	150	28	2950	840	840	6,3 x 8	F08
		28	2950	840	840	8 x 6	B06
	180	22	3700	1010	1010	8 x 8	B08
	220	22	3700	1235	1235	8 x 8	B08
	270	18	4350	1515	1515	8 x 11,5	BAB
	330	18	4350	1850	1850	8 x 11,5	BAB
	470	16	4650	2635	2635	10 x 12,5	CAC
	560	16	4650	3140	3140	10 x 12,5	CAC
32 1F	39	55	1600	250	5 x 5	E05	
	68	35	2350	435	6,3 x 5	F05	
	120	30	2800	770	770	6,3 x 8	F08
		30	2800	770	770	8 x 6	B06
	180	24	3600	1155	1155	8 x 8	B08
	220	20	4000	1410	1410	8 x 11,5	BAB
	270	20	4000	1730	1730	8 x 11,5	BAB
	390	18	4400	2500	2500	10 x 12,5	CAC
	470	18	4400	3010	3010	10 x 12,5	CAC
	35 1V	33	55	1600	235	5 x 5	E05
39		55	1600	275	5 x 5	E05	
56		35	2350	395	6,3 x 5	F05	
68		35	2350	480	480	6,3 x 5	F05
		30	2800	700	700	6,3 x 8	F08
100		30	2800	700	700	8 x 6	B06
		30	2800	850	850	8 x 6	B06
150		24	3600	1050	1050	8 x 8	B08
180		24	3600	1260	1260	8 x 8	B08
220		20	4000	1540	1540	8 x 11,5	BAB
270		20	4000	1890	1890	8 x 11,5	BAB
330		18	4400	2310	2310	10 x 12,5	CAC
390		18	4400	2730	2730	10 x 12,5	CAC

U <sub>R</sub> Code	Rated Capacitance 20°C, 120Hz	ESR (max) 20°C, 100kHz	Rated Ripple Current 105°C, 100kHz	Leakage Current (max) 20°C, 2 min	Size Ø D x L	Case Code	
(V)	(µF)	(mΩ)	(mArms)	(µA)	(mm)		
40 1G	22	60	1550	180	5 x 5	E05	
	27	60	1550	220	5 x 5	E05	
	47	37	2300	380	6,3 x 5	F05	
	82	32	2700	660	660	6,3 x 8	F08
		32	2700	660	660	8 x 6	B06
	100	32	2700	800	800	8 x 6	B06
	120	26	3500	960	960	8 x 8	B08
	150	26	3500	1200	1200	8 x 8	B08
	180	21	3900	1400	1400	8 x 11,5	BAB
	220	18	4400	1760	1760	10 x 12,5	CAC
	270	18	4400	2160	2160	10 x 12,5	CAC
	330	18	4400	2640	2640	10 x 12,5	CAC
	10	70	1400	100	100	5 x 5	E05
	12	70	1400	120	120	5 x 5	E05
22	40	2200	220	220	6,3 x 5	F05	
50 1H	39	35	2600	390	6,3 x 8	F08	
	33	35	2600	330	8 x 6	B06	
	39	35	2600	390	8 x 6	B06	
	56	29	3300	560	560	8 x 8	B08
	68	29	3300	680	680	8 x 8	B08
	82	25	3800	820	820	8 x 11,5	BAB
		25	3800	1000	1000	8 x 11,5	BAB
	100	20	4300	1000	1000	10 x 12,5	CAC
		20	4300	1200	1200	10 x 12,5	CAC
	150	20	4300	1500	1500	10 x 12,5	CAC
	10	50	1950	130	130	6,3 x 5	F05
	12	50	1950	155	155	6,3 x 5	F05
	22	45	2350	280	280	6,3 x 8	F08
		45	2350	280	280	8 x 6	B06
27	45	2350	340	340	8 x 6	B06	
33	30	3200	420	420	8 x 8	B08	
39	30	3200	495	495	8 x 8	B08	
47	26	3600	595	595	8 x 11,5	BAB	
56	26	3600	710	710	8 x 11,5	BAB	
	22	4100	710	710	10 x 12,5	CAC	
68	22	4100	860	860	10 x 12,5	CAC	
82	22	4100	1035	1035	10 x 12,5	CAC	
100	22	4100	1260	1260	10 x 12,5	CAC	
22	36	2900	355	355	8 x 8	B08	
80 1K	27	36	2900	435	8 x 8	B08	
	33	32	3200	530	8 x 11,5	BAB	
	39	32	3200	625	8 x 11,5	BAB	
	47	28	3600	755	10 x 12,5	CAC	
	56	28	3600	900	900	10 x 12,5	CAC
	12	36	3000	240	240	8 x 11,5	BAB
100 2A	15	36	3000	300	8 x 11,5	BAB	
	22	32	3300	440	10 x 12,5	CAC	
	27	32	3300	540	10 x 12,5	CAC	
	10	45	2700	250	8 x 11,5	BAB	
125 2B	12	45	2700	300	8 x 11,5	BAB	
	18	40	3000	450	10 x 12,5	CAC	
	22	40	3000	550	10 x 12,5	CAC	
160 2C	8,2	70	2100	265	8 x 11,5	BAB	
	10	60	2400	320	10 x 12,5	CAC	
	12	60	4000	385	10 x 12,5	CAC	
200 2D	4,7	120	1600	190	8 x 11,5	BAB	
	8,2	100	1850	330	10 x 12,5	CAC	
	10	100	1850	400	10 x 12,5	CAC	

Customer products are available on request.

## Part Number System **Polymer Capacitors**

PC	R	1V	VG	101	M	CAC	LL	50	P	E3	JExxxx
Technology	Terminal Type	Rated Voltage Code	Series Code	Capacitance Code (in $\mu\text{F}$ )	Capacitance Tolerance	Size Code ( $\phi\text{D} \times \text{L}$ )	Lead Form	Pitch	Material Code	for internal use	for Specials only
PC = Polymer Capacitor	SMD = V	2,0V = 0D	SMD:	0,1 = 0R1	$\pm 20\%$ = M	SMD:	SMD:	SMD:	SMD:		
	Radial = R	2,5V = 0E	<b>HVC</b> = VC	0,47 = R47	$\pm 10\%$ = K	D55 4,0 x 5,2	<b>Taped</b> = FV	Standard -	W = Laminated		
		4V = 0G	<b>HVF</b> = VF	1,0 = 010	+30 / -10% = Q	D60 4,0 x 5,7			P = Plastic		
		6,3V = 0J	<b>HVG</b> = VG	2,2 = 2R2	+20 / -0% = R	E55 5,0 x 5,2	Radial:	Radial:			
		6,8V = 06	<b>HVS</b> = SV	47 = 470	$\pm 15\%$ = L	E60 5,0 x 5,7	<b>Taped</b> = FF	2,0mm = 20			
		7,0V = 07	<b>HVX</b> = VX	100 = 101	+20 / -10% = V	F50 6,3 x 5,0	<b>Long Lead</b> = LL	2,5mm = 25			Radial:
		7,5V = 75		1000 = 102		F55 6,3 x 5,2	Cut 5,0mm = CB	3,5mm = 35			- = Standard
		10V = 1A	Radial:			F60 6,3 x 5,7	Cut 4,5mm = CC	5,0mm = 50			F = Flat Rubber
		12,0V = A1	<b>HCN</b> = CN			B70 8,0 x 6,7	Cut 4,0mm = CD				S = Stand-Off
		12,5V = 1B	<b>HCE</b> = CE			B10 8,0 x 9,7	<b>Cut 3,5mm</b> = CE				
		16V = 1C	<b>HEN</b> = EN			B11 8,0 x 11,0	Cut 3,0mm = CF				
		20V = 1D	<b>HPN</b> = HN			B12 8,0 x 12,2					
		25V = 1E	<b>HPNA</b> = NA			C80 10 x 7,7					
		28V = L1	<b>HGN</b> = GN			C10 10 x 9,7					
		32V = 1F	<b>HEL</b> = EL			C12 10 x 12,2					
		35V = 1V	<b>HSN</b> = SN								
		40V = 1G	<b>HCS</b> = CS								
		50V = 1H	<b>HPF</b> = PF								
		63V = 1J									
		80V = 1K									
		100V = 2A									
		125V = 2B									
		160V = 2C									
		180V = 2K									
		200V = 2D									

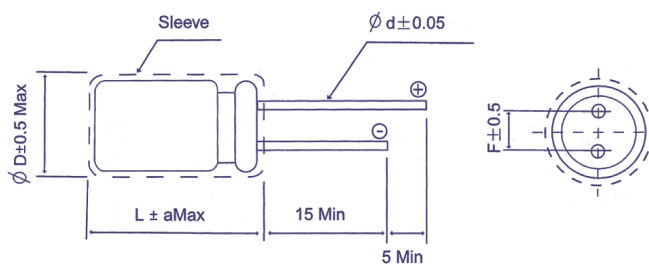
Radial:		
D05	4,0 x	5,7
D07	4,0 x	7,0
E05	5,0 x	5,7
E07	5,0 x	7,0
F05	6,3 x	5,7
F06	6,3 x	6,7
F07	6,3 x	7,0
F08	6,3 x	8,0
F09	6,3 x	9,0
F10	6,3 x	10,0
B05	8,0 x	5,7
B06	8,0 x	6,7
B07	8,0 x	7,0
B08	8,0 x	8,0
B09	8,0 x	9,0
B10	8,0 x	10,0
B11	8,0 x	11,0
BAB	8,0 x	11,5
B12	8,0 x	12,0
BAC	8,0 x	12,5
B13	8,0 x	13,0
C08	10 x	8,0
C09	10 x	9,0
C10	10 x	10,0
C11	10 x	11,0
CAB	10 x	11,5
C12	10 x	12,0
CAC	10 x	12,5
C13	10 x	13,0

on request: alternative lead forms  
(Keyed polarity, axial, 90°-bended, other)

### Technical Specification **Radial Type Polymer**

Dimensions for loose, long-lead type (bulk)

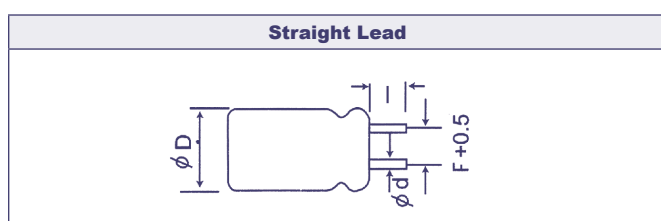
Order Code: LL



L	L < 7			L ≥ 7			
$\phi D$	5	6,3	8	5	6,3	8	10
F	2,0	2,5	3,5	2,0	2,5	3,5	5,0
$\phi d$	0,45			0,5		0,6	
$a_{\text{Max}}$	1,0			2,0			

in mm

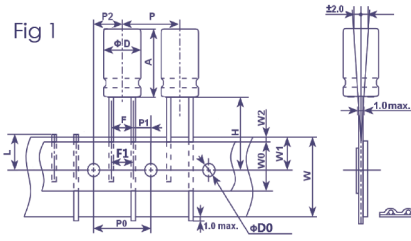
Dimensions for loose, cut leads



Code	CB	CC	CD	<b>CE</b>	CF
<b>I</b>	5,0±0,5	4,5±0,5	4,0±0,5	<b>3,5±0,5</b>	3,0±0,5

preferred in mm

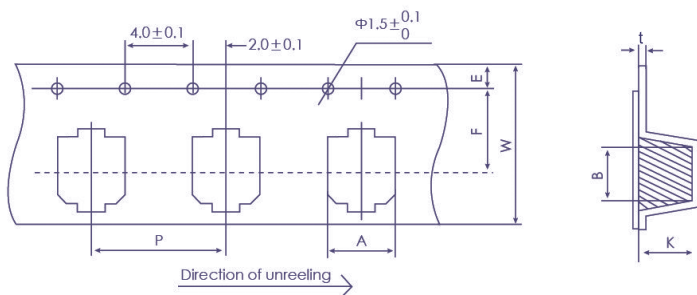
## Dimension for Ammopack Taping



	ΦD	A	P	P0	P1	P2	F	F1	W	W0	W1	W2	H	L	ΦD0	t
	±0,5	±1,0	±1,0	±0,2	±0,5	±1,0	0,8/-0,2	±1,0	±0,5	min	±0,5	max	0,75/-0,5	max	±0,5	±0,3
Φ 5 x 5	5	5	12,7	12,7	5,35	6,35	2,0	3,5	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 5 x 7	5	7	12,7	12,7	5,35	6,35	2,0	3,5	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 5 x 8	5	8	12,7	12,7	5,35	6,35	2,0	3,5	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 5 x 9	5	9	12,7	12,7	5,35	6,35	2,0	3,5	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 5 x 10	5	10	12,7	12,7	5,35	6,35	2,0	3,5	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 6,3 x 5	6,3	5	12,7	12,7	5,1	6,35	2,5	3,5	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 6,3 x 8	6,3	8	12,7	12,7	5,1	6,35	2,5	3,5	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 6,3 x 10	6,3	10	12,7	12,7	5,1	6,35	2,5	3,5	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 6,3 x 11,5	6,3	11,5	12,7	12,7	5,1	6,35	2,5	3,5	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 8 x 6	8	6	12,7	12,7	4,6	6,35	3,5	3,5	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 8 x 6,7	8	6,7	12,7	12,7	4,6	6,35	3,5	3,5	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 8 x 8	8	8	12,7	12,7	4,6	6,35	3,5	3,5	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 8 x 11,5	8	11,5	12,7	12,7	4,6	6,35	3,5	3,5	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 10 x 7	10	7	12,7	12,7	3,85	6,35	5,0	5,0	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 10 x 9	10	9	12,7	12,7	3,85	6,35	5,0	5,0	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 10 x 10	10	10	12,7	12,7	3,85	6,35	5,0	5,0	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7
Φ 10 x 12,5	10	12,5	12,7	12,7	3,85	6,35	5,0	5,0	18,0	12,0	9,0	1,5	18,5	11,0	4,0	0,7

in mm

## Dimension for SMD Type and Dimensions for Taping

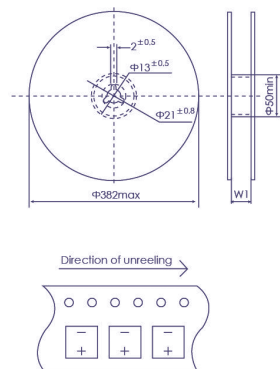


Dimension / Case Code	A	B	W	F	P	K
		±0,2	±0,2	±0,3	±0,1	±0,1
<b>F60</b>	7,0	7,0	16,0	7,5	12,0	6,3
<b>F80</b>	7,0	7,0	16,0	7,5	12,0	8,2
<b>F10</b>	7,0	7,0	24,0	11,5	16,0	10,2
<b>B70</b>	8,7	8,7	24,0	11,5	12,0	7,3
<b>B80</b>	8,7	8,7	24,0	11,5	12,0	8,3
<b>B10</b>	8,7	8,7	24,0	11,5	16,0	10,2
<b>B12</b>	8,7	8,7	24,0	11,5	16,0	13,0
<b>C80</b>	10,7	10,7	24,0	11,5	16,0	8,3
<b>C10</b>	10,7	10,7	24,0	11,5	16,0	11,0
<b>C12</b>	10,7	10,7	24,0	11,5	16,0	13,0

in mm

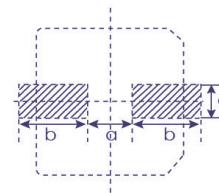
E = 1,75 ± 0,1 mm  
T = 0,4 ± 0,1 mm

## Real Dimensions



Case Code	Quantity (pcs/reel)	W1 (mm)
F60	1000	18
F80	900	18
F10	500	26
B70	1000	26
B80	900	26
B10	500	26
B12	400	26
C80	500	26
C10	500	26
C12	400	26

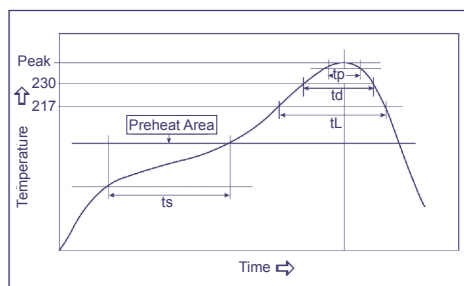
## Recommended Soldering Pad



Φ D (code)	a	b	c
<b>Φ 6,3 (F)</b>	1,9	3,5	1,6
<b>Φ 8 (B)</b>	3,1	4,2	2,2
<b>Φ 10 (C)</b>	4,5	4,4	2,2

in mm

## Recommended Soldering Profile SMD



Voltage Range (Vdc)	Preheat	Time maintained above 217°C	Time maintained above 230°C	Peak Temperature
2,5 ~ 16V	150~180°C 60~120 seconds	50 seconds max.	40 seconds max.	260°C max.
20 ~ 200V	150~180°C 60~120 seconds	50 seconds max.	40 seconds max.	250°C max.

Only 1 reflow soldering cycle allowed. All temperatures are measured on the topside of the Al-can.

## Jianghai Electrolytic Capacitors

**Warning:** JIANGHAI is not responsible for any extent of possible damages to persons or things, of any kind, caused by the improper application of and/or operating conditions harmful to electrolytic capacitors.

Misapplications which may cause failures include, but are not limited to: \* Ripple current or peak current or voltage above specification, \* Operating voltage above surge voltage specified, \* Temperature exposure beyond specified operating temperature range.

Examples of harmful operating conditions comprise, but are not limited to: \* unusual storage or transport temperatures, \* excessive and/or rapid changes of ambient temperature or humidity, \* heavy mechanical shock or vibration, \* corrosive and abrasive particles in the ambient (cooling) air, \* conducting dust in the ambient (cooling) air, \* oil or water vapor or corrosive substances, \* explosive gas or dust, \* operation under extremely high or low ambient pressure conditions (below or above sea level), \* superimposed radio frequency voltages, \* radioactivity. In case of doubt about the impact of operating conditions on capacitor performance, please contact JIANGHAI.

**Personal Safety:** Electrical or mechanical misapplication of electrolytic capacitors may be hazardous. Personal injury or property damage may result from explosion of a capacitor or from the expulsion of electrolyte due to mechanical disruption or the release of a safety vent of a capacitor. In case of injury or skin or eye exposure to electrolyte, immediately seek professional medical advice. Before using electrolytic capacitors in any application, please read these Handling Precautions, familiarizing thoroughly with the information contained herein. Please check before using any of our electrolytic capacitors if these components fulfill the requirements of your application and warnings and instructions for use are followed.

**Warranty:** The information contained in this catalogue does not form part of any quotation or contract, is believed to be accurate, reliable and up to date. Quality data are based on the statistical evaluations of a large quantity of parts and do not constitute a guarantee in a legal sense. However, agreement on these specifications does mean that the customer may claim for replacement of individual defective capacitors within the terms of delivery. We will not assume any liability beyond the replacement of defective components. This applies in particular to any consequential damage caused by component failure. Furthermore it must be taken into consideration that the figures stated for lifetime, failure rates and outlier percentages refer to the average production status and are therefore to be understood as mean values (statistic expectations) for a large number of delivery lots of identical capacitors. These figures are based on application experience and data obtained from preceding tests under normal conditions, or – for purpose of accelerated aging – more severe conditions. JIANGHAI reserves the right to change these specifications without prior notice. Any application information given is advisory and does not form part of any specification. The products are not primarily designed for use in life support applications, devices or systems where malfunction of these products can reasonably be expected to result in personal injury. JIANGHAI customers using or selling these products for use in such applications without prior written consent of JIANGHAI do so at their own risk and agree fully to indemnify JIANGHAI for any damage resulting from such improper use or sale. This version of the catalogue supersedes all previous versions. Latest versions of datasheets can be found on our homepage: [www.jianghai-europe.com](http://www.jianghai-europe.com) For more details on precautions and guidelines for aluminum electrolytic capacitors, please refer to CENELEC Technical Report CLC/TR 50454:2008 E, "Guide for the application of aluminum electrolytic capacitors".

**Polarity:** Electrolytic capacitors are polar and shall never be used with incorrect polarity, as there is a possible danger of shorting or destruction.

**Rated Voltage Ur:** The Rated Voltage is marked on the capacitor and defined in the datasheets as Ur. This voltage should never be exceeded and is the maximum peak voltage including any ripple voltages allowed to avoid a shortening of the lifetime or damage of the capacitor. When a ripple current is applied to the capacitor, the sum of the peak ripple voltage and bias DC voltage shall never exceed the Rated Voltage. It might be necessary to lower the maximum allowed bias DC voltage, when certain ripple currents are applied to the capacitor.

**Surge Voltage:** Maximum Voltage, which may be applied to the capacitor for short periods of time: max. 1000 cycles of 30 sec. per 6 min., max. 5 pulses per hour. Capacitance drift +/- 15% max.

**Reverse Voltage:** Reverse voltages or voltages < 0 V are not allowed.

**Recovery Voltage:** After charging and discharging a capacitor there might still be a voltage between the terminals, which is built up internally due to dielectric absorption. Please take action that this load does not damage other devices or scare the workers during production (sparks possible).

**Temperature Range:** Use electrolytic capacitors only within the specified operating temperature range.

**Over-Current:** Currents exceeding the rated ripple currents should be avoided.

**Ripple Current/Voltage:** The combined value of DC voltage and peak AC voltage (due to ripple current) shall not exceed the rated voltage and shall never be < 0 V. Use of aluminum electrolytic capacitors under ripple current with wide amplitudes is equivalent to quick charge-discharge operation.

**Rapid Charging/Discharging:** Rapid Charging/Discharging generates severe heat and gas may be emitted which may lead to explosion. Consult JIANGHAI about specially designed capacitors suitable for such kind of applications. Example: Servo Drive Application

**Balancing resistors:** Balancing resistors should be utilized if capacitors are used in serial connection. Please choose low-tolerance resistors to limit voltage drift.

**Charge-Discharge Proof:** JIANGHAI capacitors are charge-discharge proof, which means that 10<sup>6</sup> switching cycles will cause capacitance reduction of less than 10%.

**Lifetime:** There are many different lifetime definitions known without any true standard definition. Take special care when capacitors are compared that the capacitors fulfill the needed requirements. JIANGHAI publishes all conditions to be as transparent as possible. In the case of lifetime tests with additional ripple currents, the bias DC voltage must be reduced, so that the sum of bias DC voltage and the peak of the ripple voltage does not exceed the Rated Voltage Ur.

• **Load Life:** Period of time, during which the technical parameters of all capacitors stay within the given limits. JIANGHAI defines this without allowing for outliers.

• **Useful Life:** defined like load life, but a given percentage of components may be outside the defined limits. Useful life data are usually calculated within a confidence level of 60%. See further details in specifications and data sheets. Outlier percentage: ≤ 1%.

• **Endurance Test:** IEC 60384-4 defines the acceptable drift criteria of electrical parameters after the endurance tests (continuous voltage test).

• **Shelf Life:** Definition of time with acceptable drift of capacitor parameters after storage at upper category temperature without load. JIS-C-5102-1994

**Vibration and mechanical stress:** Capacitors are sensitive to vibration and mechanical forces applied on the leads. Do not use capacitors, which have been dropped onto a rigid surface.

**Insulation:** If any defect of the sleeve is visible, the component should not be used – same for any kind of visible damage. A capacitor should be electrically isolated from the following parts: Aluminum case, cathode lead wire, anode lead wire and circuit pattern, and auxiliary terminal of snap-in type. The PVC sleeve is not recognized as an isolator and therefore the standard capacitor should not be used in a place where insulation function is needed. Please contact JIANGHAI if higher grade of insulation is required.

### Environmental Conditions:

- Avoid direct contact with water, salt solution, oil, dewing conditions
- Halogens generally, especially fumigation treatment with bromides and flame retardant agents containing halogens must be avoided.
- Avoid exposing to direct sunshine, ozone, ultraviolet rays and x-ray radiation.
- Air Pressure: Max. 150kPa, min. 8kPa.
- No heavy air pressure changes are allowed.
- Do not use or store in an environment containing any hazardous gas (e.g., hydrogen sulphide, sulphurous acid, nitrous acid, chlorine, ammonia, bromine, methyl bromide, other halogens) or acidic or alkaline solutions.

### Storage:

- Temperature 5 to 35°C, Relative Humidity below 75%.
- Electrolytic capacitors may accumulate charge naturally during storage. In this case discharge through a 1kOhm resistor before use (Recovery Voltage).
- Leakage current may be increased after long storage time. In this case the capacitor should be subjected to the rated voltage treatment through a 1kOhm resistor before use for 1 hour, then it should be discharged through a resistor of about 1 Ohm/Volt.
- Storage times above 1 year should be avoided or rated voltage treatment may be necessary.
- In accordance to IEC 60384-4 electrolytic capacitors are subject to a reforming process before acceptance testing. Rated voltage is applied via a series resistance (100Ω: Ur ≤ 100VDC, 1kΩ: Ur > 100VDC).

**Soldering:** Soldering conditions (temperature, times) should be within specified conditions, especially for SMD components. Avoid high soldering temperatures as this may reduce lifetime or damage the capacitor. Do never dip the capacitor body into molten solder. Flux should not be adhered to the capacitor's body but only to its terminals. For details and different methods please contact us.

**Cleaning and Coating:** Do not use fixing agents or cleaning substances containing halogens and the epoxy resin coating materials. Also never use solvents containing: Halogenated hydrocarbons, alkali, petroleum, trichloroethylene/ethane, xylene, acetones, trichlorotrifluoroethane, tetrachloroethylene, methylenechloride, chloroform, acetates, ketones, esters, chlorides and bromides. In case of questions see detailed instructions.

**Mounting:** Other devices, which are mounted near the capacitor, should not touch the capacitor. Additional heat coming from other components near the capacitor may reduce the lifetime of the capacitor. Do never bend or twist the capacitor after soldering to avoid stress on the leads. Radial capacitors are not protected against mechanical forces on the leads. Forces on the pins might damage the capacitor. No printed circuit board tracks are allowed between the lead pads of the capacitor. Screw Terminal capacitors should only be mounted in an upright position.

**Transport:** Avoid fumigation and spraying insecticides (especially with bromides) in the import or export procedures which can cause corrosion. This applies also to the finished devices.

**Maintenance:** Periodical inspection should be carried out for the capacitor: visual inspection to check pressure relief open or leakage of electrolyte, electrical characteristics as leakage current, capacitance, and dissipation factor.

**Electrolyte and Separator paper:** Electrolyte and separator paper used in Aluminum Capacitors may be flammable. Also electrolyte is electrically conductive. Therefore in case electrolyte gets in contact with PC board it may cause corrosion of circuit pattern or cause short circuit between patterns, and may lead to smoke generation or ignition in worst case.

**Caution during Use of Capacitors:** Do not touch the terminals of capacitors. Keep the capacitor free from conductive solution, such as acids, alkali and so on. Ensure that the operating environment of the equipment into which the capacitor has been built is within the specified conditions mentioned in the catalogue or specification sheets.

**Safety Vent:** The safety vent needs some free space to open properly. Allow for free headroom of at least 2mm for diameter ≤16mm, more than 3mm for diameter 18-35mm, more than 5mm for case diameter 40mm and larger.

**Emergency Actions:** When the pressure relief vent is open and some gas blows out from the capacitor, please turn the main switch of the equipment off or pull out the plug from the power outlet immediately. During safety vent operation, extremely hot gas (>100°C) may blow out of the capacitors. Do not stand close to the capacitors. In case of eye contact, rinse the open eye(s) with clean water immediately. In case of ingestion, gargle with water immediately, do not swallow. Do not touch electrolyte but wash skin with soap and water in case of skin contact.

**Definition of electrical parameters:** Separate documents as application notes, equivalent circuit diagrams and so on are available on request.

**Packaging:** Please refer to the data book for details. Further information is available on request.



## Introduction

Aluminum solid electrolyte capacitors with conductive polymer are wound aluminum electrolytic capacitors that use a polythiophene electrolytic system. The conductive polymer yields extremely low ESR-values that allow for very high ripple currents at high frequencies. Typically, these types of capacitors are used in smoothing circuits of DC-DC converters and in high-frequency applications. Polymer Capacitors from Jianghai has been enlarged to voltages up to 200V, which allows the usage in many power supply applications too.

## Lifetime

The lifetime of a polymer capacitor can be estimated by:

$$L = L_o \cdot 10^{\frac{T_o - T}{20}}$$

$L_o$  = Lifetime at 105°C or 125°C

$T_o$  = 105°C or 125°C

$T$  = Ambient temperature

## Comparison of Solid Polymer Capacitors and Liquid Electrolytic Capacitors

Besides the excellent lifetime performance, the temperature characteristics of polymer capacitors allow for a usage in a wide range of ambient temperatures. Temperatures in the range from -55°C to 105°C lead merely to capacitance changes from 10 ... 15%, while the ESR remains almost constant. Especially the stability of its low ESR-values makes the polymer capacitor attractive for smoothing circuits or for decoupling functions. Compared to tantalum electrolytic capacitors, polymer capacitors offer a more reliable solution with a similar functionality.

## Handling Precautions

Please see "General Handling Precautions" at page 138.

Additional requirements for aluminum solid electrolyte capacitors with conductive polymer:

- 1) Polymer Capacitors cannot be used:
  - in circuits with frequent and/or rapid charging and discharging function,
  - in time-constant or coupling circuits,
  - in high impedance circuits or applications, where the leakage current affects the circuit operation,
  - after heavy thermal stress during soldering as the capacitance and leakage current may change,
  - under mechanical stress. Avoid mechanical vibration and shock.
  - in applications with heavy discharges / negative transients higher than 20% of  $U_r$ .
- 2) Ripple currents above the specified rating must be avoided as they may damage the capacitor.
- 3) Never apply any reverse voltages or voltages above the rated voltages.
- 4) Serial connections shall be avoided to prevent possible overvoltage conditions.
- 5) When parallel connections between polymer capacitors are planned, please take proper current balancing into account.
- 6) Use a protection circuit when the inrush current exceeds 10A.
- 7) Always consider the safety when designing circuits. Plan for worst case failures such as short circuits and open circuits.
- 8) Laminated capacitors need to be handled like non-isolated components. Please take care of a completely separation of the lead wires and the case of the capacitor.
- 9) Please follow the soldering recommendations and restrictions for Polymer capacitors. In case of any questions please contact Jianghai Europe.
- 10) Leakage Currents might increase as consequence of longer storage, critical soldering processes, overload conditions, heavy charging/discharging, mechanical stress.

Without written consent by Jianghai, Polymer capacitors should not be used in highly reliable or life sustaining applications such as: medical equipment, aviation/aerospace equipment, automotive and nuclear applications and others, where a capacitor failure may have a major impact.