AiSHi

ALUMINUM ELECTROLYTIC
CAPACITORS

2017-2018Y

Provide Aluminum Electrolytic Capacitor To
The World With Excellent Performance

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CAPACITOR SERIES TABLE, CONTENTS

Series				Features	Endurance (hours)	Rated Voltage Range (Vdc)	Operating Temperature Range(°C)	Capacitance Range(μF)	Page
Conductive Polymer Aluminum Solid Electrolytic Capacitors		Multilayer Type	A1	Low ESR	105°C 2,000	2~25	-55~+105	6.8~470	18
			A2	Low ESR	105°C 2,000	2~25	-55~+105	6.8~470	20
		Radial Type	PZ	Low ESR	105°C 2,000	6.3~100	-55~+105	4.7~5600	22
			PD	Low ESR, small size	105°C 2,000	6.3~35	-55~+105	4.7~4700	27
			PV	High voltage	125°C 2,000	35~100	-55~+125	4.7~1000	32
			PH	Huge capacitance, jumbo size	105°C 2,000	6.3~25	-55~+105	6.8~2200	34
			PT	Resistance to high temperature	125°C 2,000	6.3~25	-55~+125	22~5600	38
			PK	Resistance to high temperature	135°C 1,000	6.3~25	-55~+135	10~1800	42
			PF	Long life	105°C 3,000~5,000	6.3~100	-55~+105	4.7~5600	45
			PU	Ultra-low ESR	105°C 2,000	6.3~25	-55~+105	39~5600	50
		SMD Type	VZ	Standard type	105°C 2,000	2.5~63	-55~+105	10~1500	54
			VS	Low ESR	105°C 2,000	2.5~25	-55~+105	10~1500	56
			VD	High voltage	105°C 2,000	35~63	-55~+105	10~560	58
Aluminum Electrolytic Capacitors	Surface Mount Type	SMD Type	MK	Standard type	105°C 2,000~3,000	6.3~450	-40~+105	1~1,000	60
			MF	Long life	105°C 6,000	6.3~450	-40~+105	2.2~470	63
			MA	Long life	105°C 10,000	16~450	-40~+105	2.2~1000	66
			MH	Resistant to130°C, long life	130°C 1,000~5,000	10~450	-40~+130	1~4700	69
	Radial Type	Low Profile	M5	85°C 5mm Height, Standard type	85°C 1,000	4~50	-40~+85	0.1~470	72
			H5	105°C 5mm Height	105°C 1,000	6.3~50	-40~+105	0.1~100	74
			M7	85°C 7mm Height, Standard type	85°C 1,000	4~100	-40~+85	0.1~330	76
			H7	105°C 7mm Height, Standard type	105°C 1,000	6.3~50	-40~+105	0.1~100	78
			L7	105°C 7mm Height, Long life	105°C 2,000	6.3~63	-40~+105	0.1~220	80
		Standard Type	WK	Standard series for general purpose	85°C 2,000	6.3~100 160~450	-40~+85 -25~+85	0.1~22000	83
			WH	Standard series for general purpose	105°C 2,000	6.3~100 160~500	-40~+105 -25~+105	0.1~22000	88
			HP	Standard bi-polarized series	105°C 1,000	6.3~100	-40~+105	0.47~6800	93
		High reliability, long life. Especially designed for LED driver, electronic ballast, electronic energy saving lamp	CD11GC	Resistant to130°C, Long life	130°C 4,000~5,000 105°C 15,000~20,000	160~450	-40~+130	1~220	96
			CD11GES	Resistant to130°C, miniaturized, high ripple current and long life	130°C 3,000 105°C 12,000 105°C 10,000	160~450 500	-40~+130 -40~+105	1~220	99
			CD11GK	Extremely miniaturized, long life	105°C 12,000~20,000	160~450	-40~+105	1~47	104
			CD11GN	Resistant to130°C, miniaturized and long life	130°C 1,000~2,000 105°C 8,000~12,000 105°C 10,000	160~450 500	-40~+130 -40~+105	1~150	107
			CD11GZ(new)	Long life, suited for outdoor lighting	105°C 12,000	250~500	-40~+105	10~150	112
			CD11GAS	Miniaturized and long life	105°C 10,000 105°C 8,000	160~450 500	-40~+105	1~220	114
			CD11GD	Miniaturized and long life	105°C 6,000	160~500	-40~+105	1~330	119
			CD11GHS	Miniaturized, long life and high cost performance	105°C 6,000	160~450	-40~+105	1~150	126
			CD11GM	Miniaturized and high cost performance	105°C 3,000	160~400	-40~+105	1~68	131
		For input and output circuit	RR	High frequency,low impedance, Standard	105°C 2,000	6.3~50	-40~+105	22~6800	134
			RE(upgrade)	Miniaturized, low impedance	105°C 2,000~4,000	6.3~100	-40~+105	15~4700	137
			RF	High ripple current, low impedance	105°C 3,000~6,000	6.3~120	-40~+105	6.8~6800	141
			RS	High ripple current, low impe -dance and long life	105°C 4,000~10,000	6.3~120	-40~+105	6.8~18000	146
			RN (new)	Miniaturized, large capacitance	105°C 5,000~10,000	25~120	-40~+105	2.7~1500	152
			RZ	Miniaturized, long life and low impedance, high reliability	105°C 6,000~10,000	6.3~50	-40~+105	22~10000	157
			RJ(upgrade)	Downsized, long life and low impedance	105°C 8,000~12,000	10~120	-40~+105	8.2~5600	160
			RH	High frequency, low impedance	105°C 2,000~3,000	160~400 450	-40~+105 -25~+105	0.47~470	165

Continued

Series				Features	Endurance (hours)	Rated Voltage Range (Vdc)	Operating Temperature Range(°C)	Capacitance Range(μF)	Page
Aluminum Electrolytic Capacitors	Radial Type	For input and output circuit	HH	High ripple current	105°C 2,000	400	-40~+105	22~120	168
						420~450	-25~+105		
			HS	High ripple current	105°C 3,000~5,000	160~450	-25~+105	0.47~330	171
			HF	Long life and high ripple current	105°C 5,000~10,000	160~450	-25~+105	1~330	174
			HL(upgrade)	Long life, downsized and high ripple current	105°C 10,000~12,000	160~450	-25~+105	6.8~680	177
					105°C 8,000~10,000	500			
			RK	Miniaturized, high voltage. Specially designed for charger	105°C 2,000	400	-40~+105	1~150	182
						450~500	-25~+105		
		High Reliability	RG	"GBL"system,high reliability	105°C 2,000~8,000	6.3~63	-55~+105	10~10000	185
			RV	High reliability, low impedance, small size	105°C 4,000~5,000	6.3~35	-55~+105	330~6800	189
			ML	105°C 5~9mm Height, long life	105°C 3,000~5,000	6.3~50	-40~+105	1~1000	191
			RM	Miniaturized, long life	105°C 10,000	10~100	-40~+105	0.47~330	194
			NB	High reliability	130°C 2,000~5,000	10~120	-40~+130	1~4700	196
		Special Purpose	RD	Low water content series	105°C 2,000~5,000	6.3~100	-40~+105	0.47~15000	199
			GH(upgrade)	For intelligent instrument, high reliability	105°C 5,000~8,000	6.3~100	-40~+105	1~18000	204
					105°C 10,000	160~450			
			LL	Extremely low leakage current	105°C 2,000	6.3~100	-40~+105	0.47~2200	211
			BG	Large capacitance, low impedance; For airbags	105°C 5,000	25~35	-55~+105	1000~11000	214
			BH(new)	For automobile electronics	130°C 3,000	25~400	-40~+130	12~11000	216
	Snap-in&Lug Terminal Type	General Purpose	LK	Standard series for general purpose	85°C 2,000	10~100	-40~+85	56~82000	221
						160~500	-25~+85		
			LH	Withstand high temperature, general purpose	105°C 2,000	10~100	-40~+105	47~56000	232
						160~500	-25~+105		
			LC(new)	Wide temperature range; miniaturized	105°C 2,000	400~500	-40~+105	47~680	243
			LS(upgrade)	Downsized, Long life	85°C 3,000	160~600	-25~+85	47~3300	246
			LM(upgrade)	Downsized, long life	105°C 3,000	160~550	-25~+105	47~3300	253
			LP(new)	High ripple current, long life	105°C 3,000	400~450	-40~+105	82~820	260
		High Reliability	LQ	Long life	85°C 5,000	160~450	-25~+85	68~2200	263
			LG(new)	Long life, high ripple current	85°C 12,000	350~450	-25~+85	470~2700	269
			LT(upgrade)	Long life, downsized	105°C 5,000	160~550	-25~+105	82~2700	272
			LX	Long life	105°C 7,000	160~450	-25~+105	47~2200	279
			LB	High reliability, long life	105°C 10,000	200~450	-25~+105	39~1500	283
			LF	No sparks against DC overvoltage	105°C 5,000	200,400	-25~+105	68~1500	287
			LU	No sparks against DC overvoltage	105°C 2,000	200~450	-25~+105	56~1200	290
	Screw-mount Terminal Type	Standard Type	NR	Screw terminal, general	85°C 2,000	350~550	-25~+85	1000~15000	293
			NS	Screw terminal, general	105°C 2,000	350~450	-25~+105	1000~15000	295
		Long Life	NX	High ripple current, downsized, long life	85°C 5,000	350~500	-25~+85	1000~12000	297
			NL(new)	Long life	85°C 12,000	350~450	-25~+85	1500~15000	299
			NE	High ripple current, long life	85°C 20,000	350~450	-25~+85	1500~15000	301
			NF	Long life	105°C 5,000	350~450	-25~+105	1000~15000	303
			NK	High ripple current, long life	105°C 5,000	350~450	-25~+105	1000~15000	305

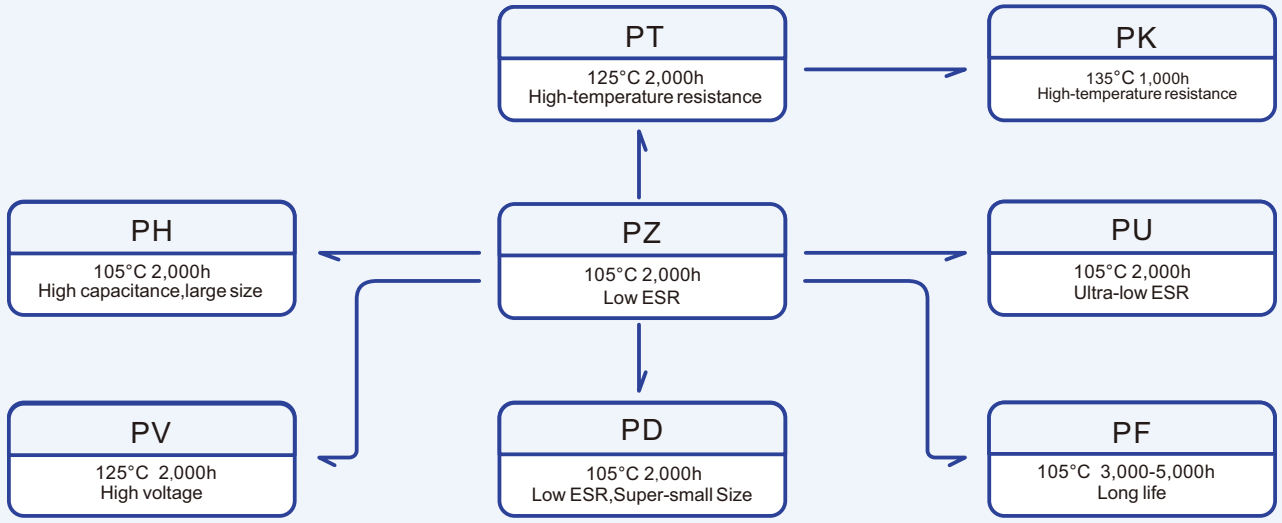
Group Chart

CONDUCTIVE POLYMER ALUMINUM SOLID ELECTROLYTIC CAPACITORS

MULTILAYER TYPE

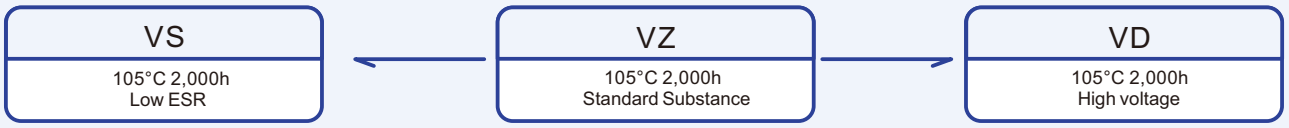
A1	A2
105°C 2,000h	105°C 2,000h

RADIAL TYPE



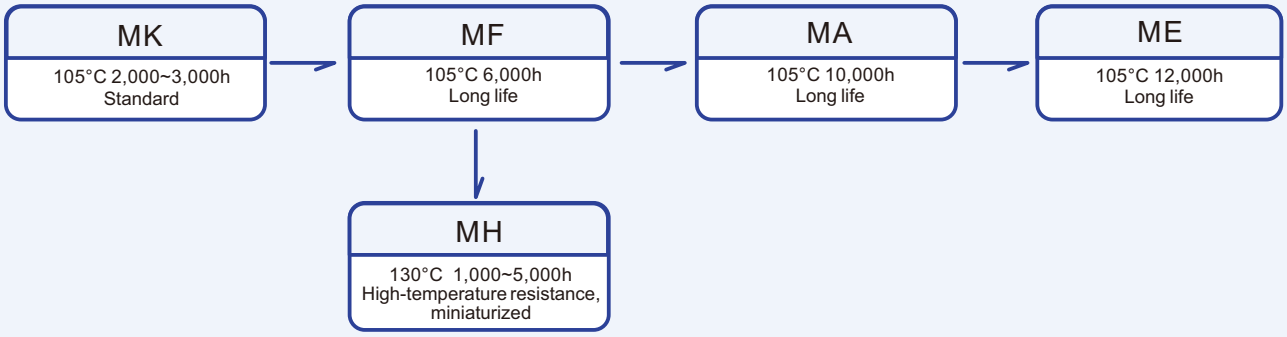
SMD TYPE

Downsized & Low Profile

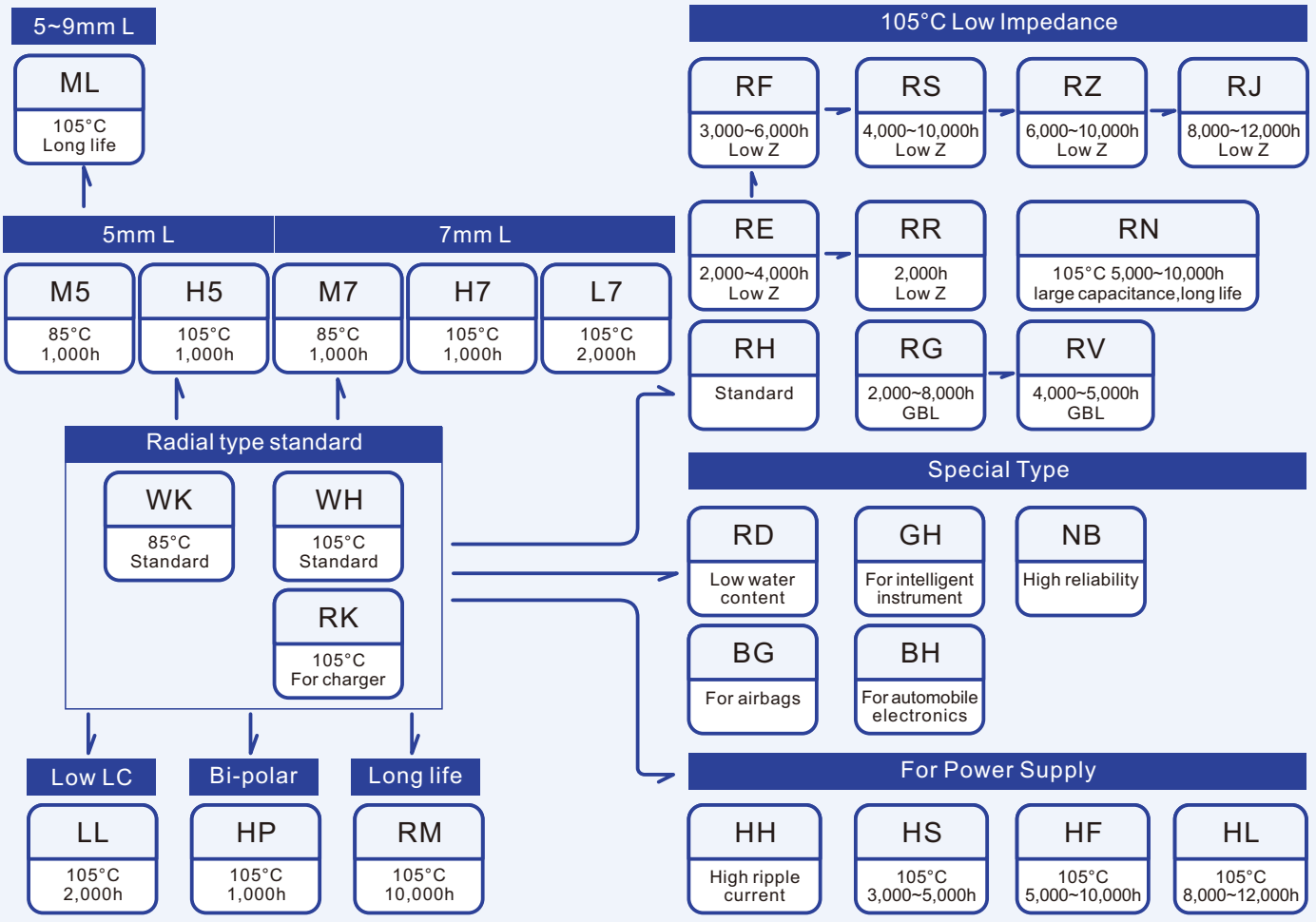


ALUMINUM ELECTROLYTIC CAPACITORS

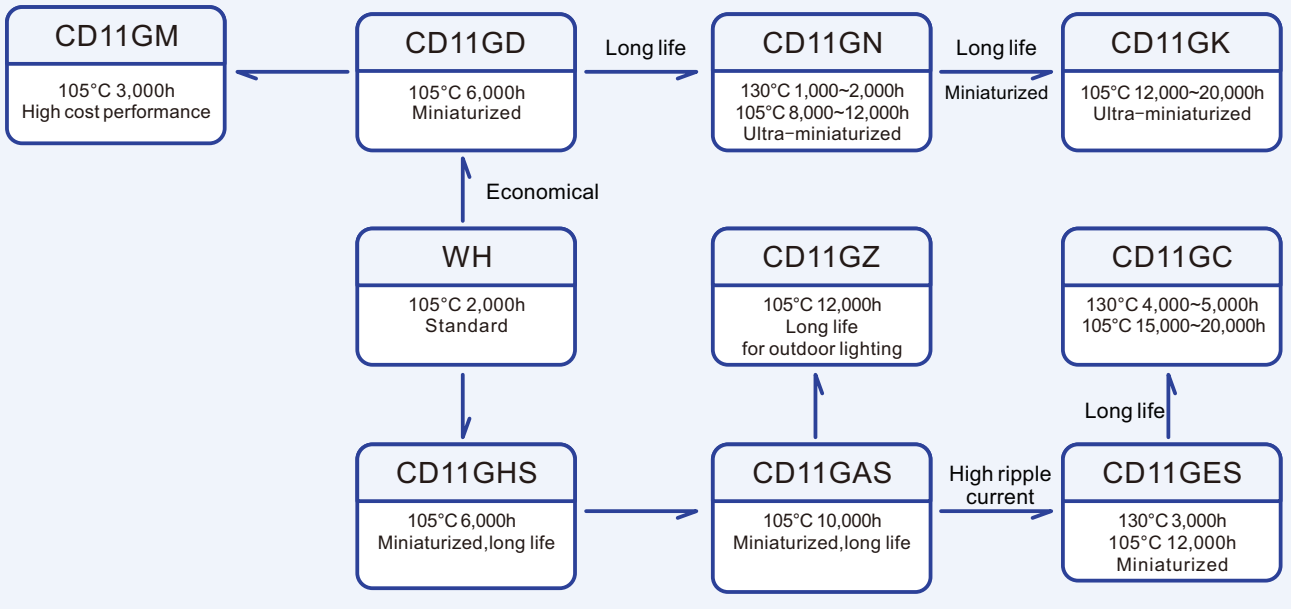
SMD TYPE



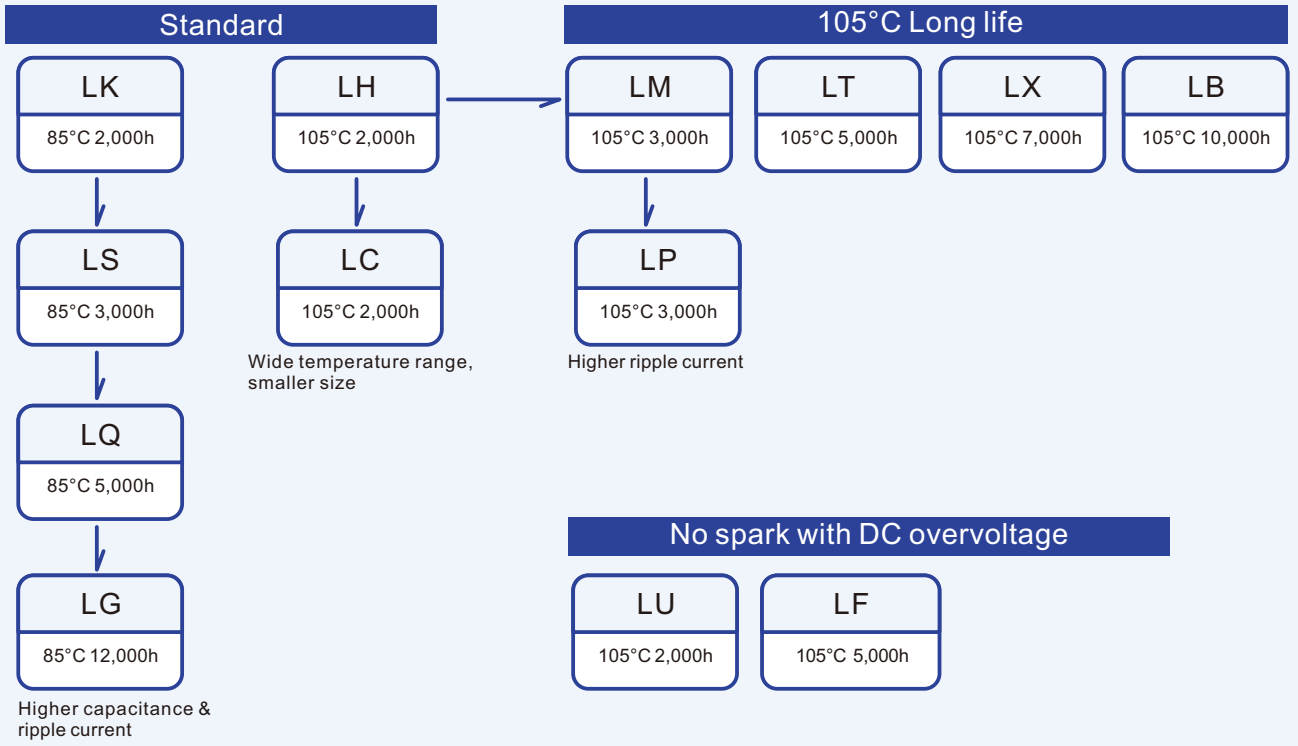
RADIAL TYPE



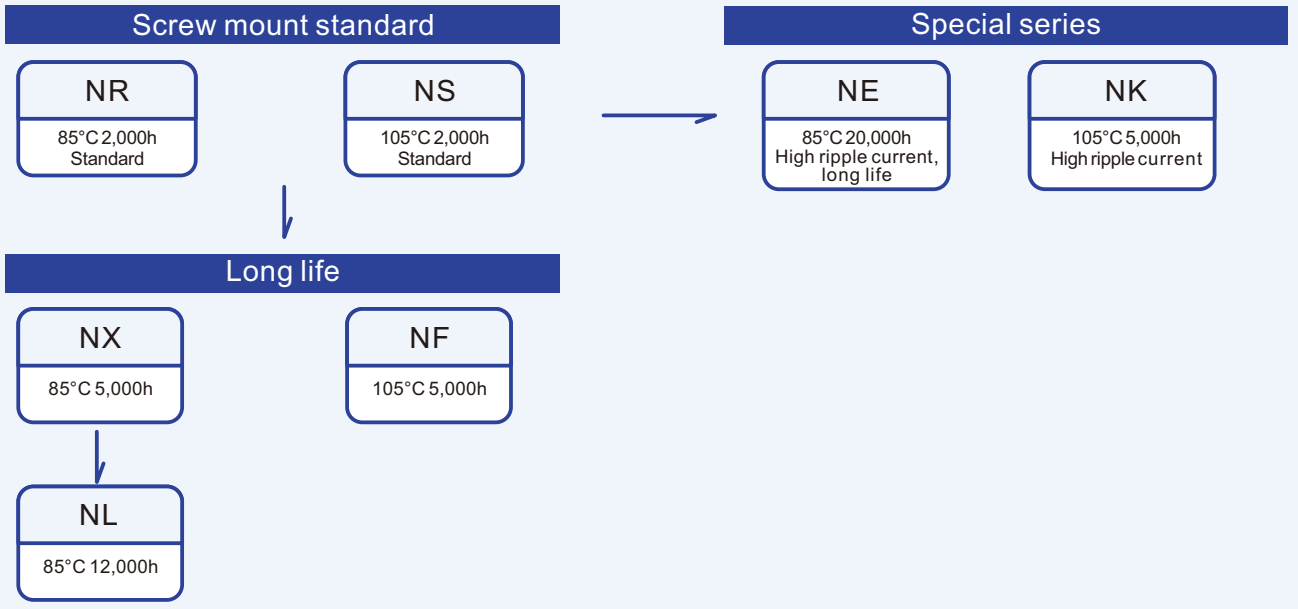
FOR LIGHTING APPLICATION



SNAP-IN & LUG TERMINAL TYPE

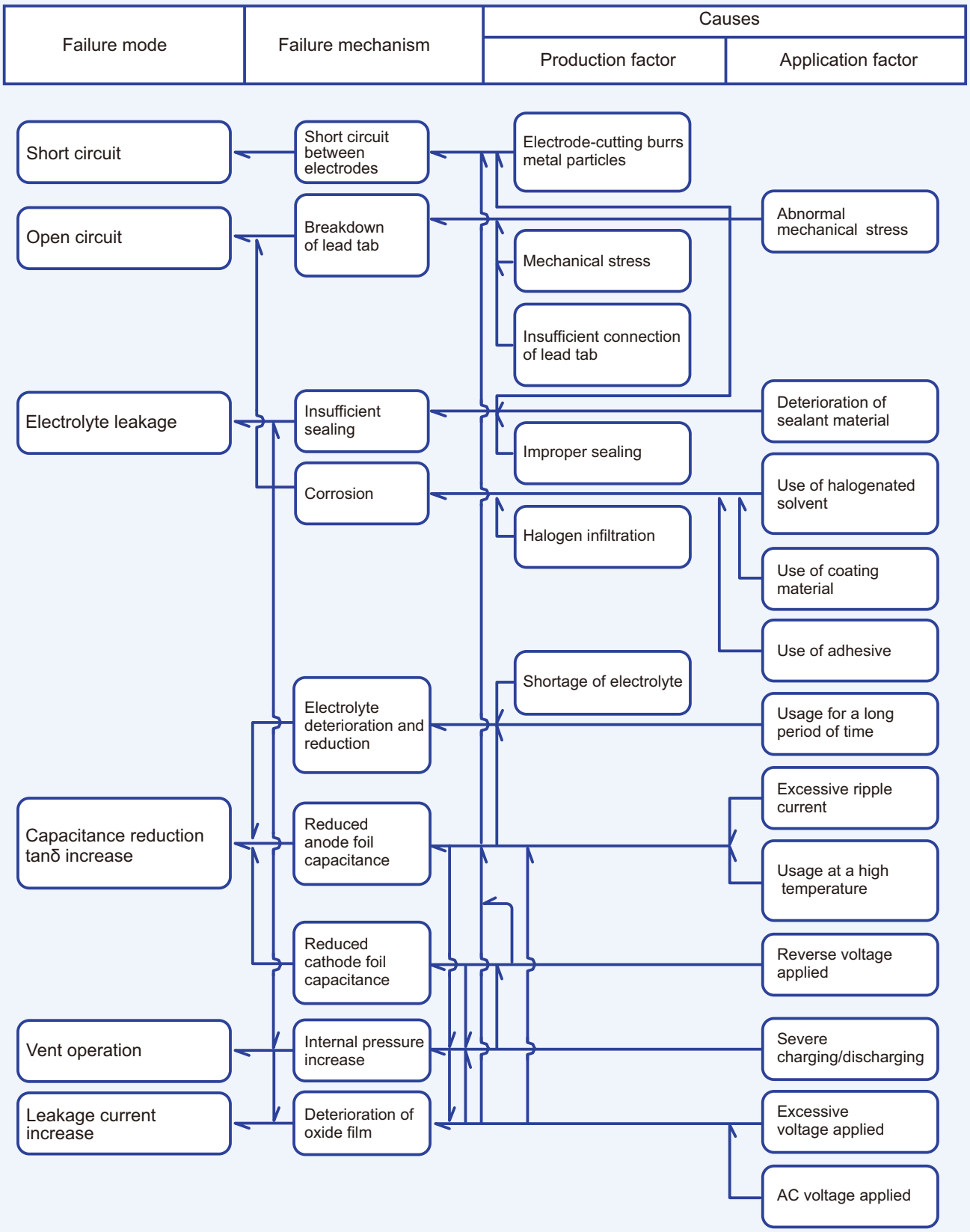


SCREW-MOUNT TERMINAL TYPE



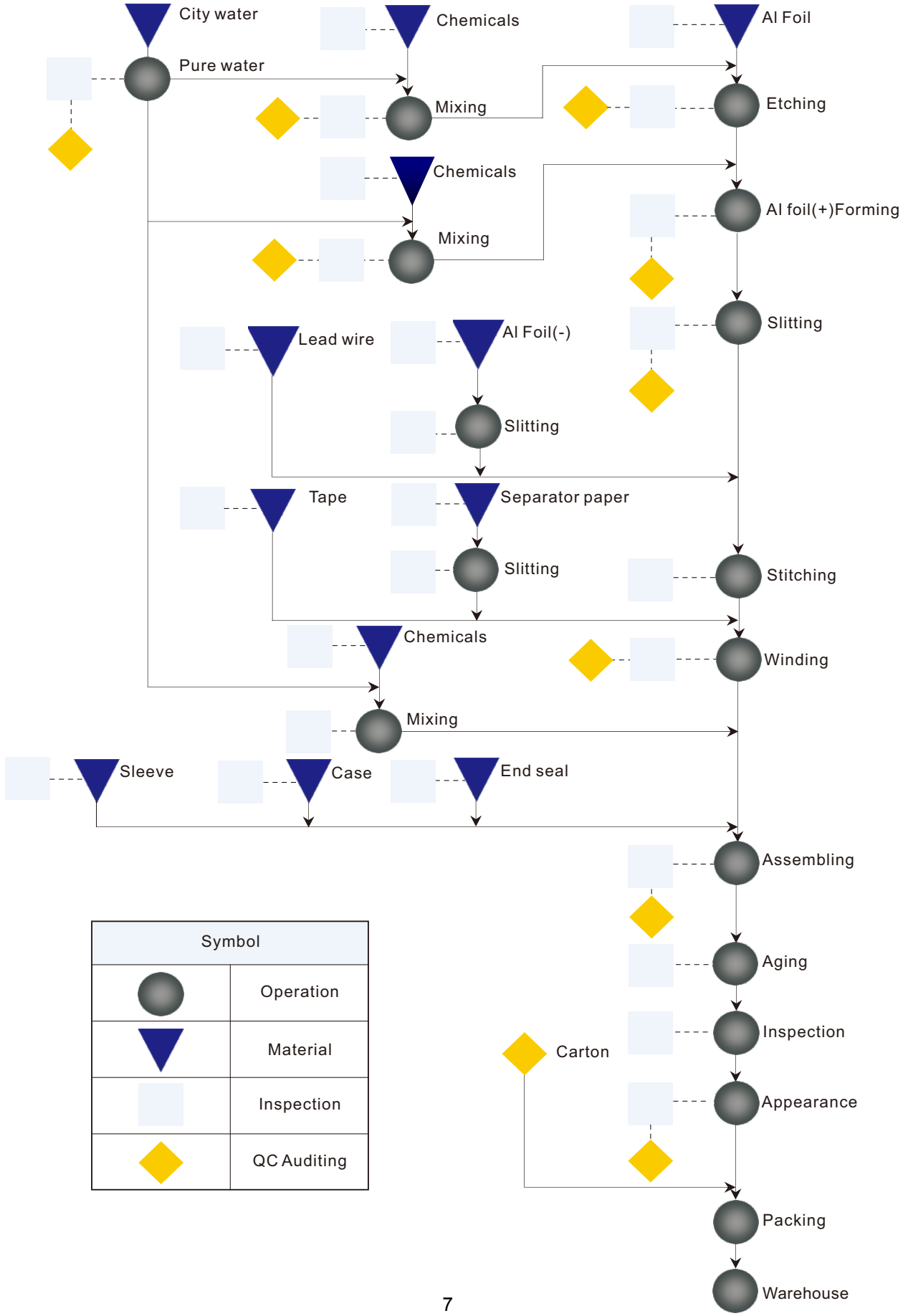
Failure Modes

Aluminum Electrolytic Capacitors Show Various Failure Modes in Different Applications



Flow Chart

Aluminum Electrolytic Capacitors Flow Chart



Application Guidelines for Conductive Polymer Aluminum Solid Electrolytic Capacitors

1. Polarity

AishiCAP is a solid aluminum electrolytic capacitor with positive and negative electrodes. Do not reverse the polarity when using. If it is used with the polarities reversed, its life may be shortened because of increasing leakage current or short circuit.

2. Prohibited circuits

Since leakage current may be increased during soldering and other processes, AishiCAP cannot be used in the following circuits.

1) High impedance circuits;

2) Coupling circuits;

3) Time-limited constant circuits;

4) Connection of two or more capacitors in series for higher withstand voltage;

5) Circuits to get bad influence by large leakage current.

* In addition to the leakage current fluctuation, the operational conditions such as characteristics at high and low temperature, damp heat and endurance stipulated in the specifications will affect the capacitance. The fluctuation of the capacitance may cause problem if it is used as a time-limited constant capacitor, which is extremely sensitive to the fluctuation of the capacitance. So do not use it as a time-limited constant capacitor.

Additionally, please contact Hunan Aihua Group Co., Ltd. for usage of two or more AishiCAP in series for voltage proof.

3. Over voltage

Over voltage cannot be applied even for an instant as it may cause a short circuit.

4. Sudden charge and discharge

Sudden charge and discharge are prohibited (for maintenance of high reliability). A protection circuit is recommended when a sudden charge or discharge causes excessive rush current because this is a main cause of short circuits and large leakage current. Use protection circuits if the rush current exceeds 10A. If the rush current exceeds 10 times the maximum allowable ripple current of AishiCAP, be sure to insert a protection resistor of about 1kΩ for charge and discharge when measuring the leakage current.

5. Considerations when soldering

The soldering conditions are to be within the range prescribed in specifications. If the specifications are not followed, there is a possibility of the intensive increase of leakage current, and the capacitance reduction. Things to be noted before mounting:

a) Do not reuse capacitors that have been assembled in a set and energized. Capacitors that have been removed for measuring electrical characteristics during a periodic inspection also cannot be reused.

b) Leakage current may increase when capacitors are stored for one year. In this case, apply rated voltage for 2 hours at 105°C with load of 1 kΩ resistor.

c) Reflow soldering

Do not apply reflow soldering to radial lead type capacitors.

d) Handling after soldering

Do not tilt, bend or twist the AishiCAP;

Do not move the PCB with catching AishiCAP itself.

When stacking PCB, make sure that the AishiCAP does not touch other PCB or components.

Do not dump the AishiCAP with other objects.

6. Application of AishiCAP in industrial equipments

To ensure reliability, when using the AishiCAP in industrial equipments, appropriate design is required.

7. Use of AishiCAP for human life equipments

In case of using in equipments regarding human life (e.g. Space equipment, aeronautic equipment and atomic equipment,etc.) , be sure to consult with Hunan Aihua Group Co., Ltd. Don't use products without recognition document of Hunan Aihua Group Co., Ltd.

8. Storage

1) Store AishiCAP with the temperature range between 5 to 35°C(If between 35 to 85°C, it should be less than three months),and the relative humidity of 75% without direct sunshine and store AishiCAP in the package states if possible.

2) It is recommended that you open the bag just before use and use up as early as possible.

3) Store the capacitors in places free from water, oil or salt water or in condensation status.

4) Never store AishiCAP in any area filled with poisonous gases (including hydrogen sulfide, sulfurous acid, nitrous acid, chlorine and ammonia).

5) Store the capacitors in places free from ozone, ultraviolet rays or radiation.

Before unseal: within 1 year after delivery

After seal: within 7 days from opening

9. Cleaning

Concerning about HCFC, soak with high concentration alcohol, petroleum and terpene, water or surface active agent and other solvents (separate or blended), wash under the maker's recommendation by ultrasonic wave, boiling and evaporation, etc. Please contact us if you require further details.

10. Notes on circuit designs for AishiCAP

10.1 Performance

Use AishiCAP within the rated performance ranges defined in this specification.

10.2 Operating temperature and ripple current

If AishiCAP is used at a temperature higher than the upper category temperature(105°C), or excess ripple current flows through AishiCAP, there are high possibilities of service life reduction or leakage current increase to cause AishiCAP defective.

10.3 Leakage current

The leakage current of AishiCAP may increase slightly by soldering conditions. The application of DC voltage enables the capacitors to be repaired by itself and this leads the leakage current to be smaller gradually.

10.4 Applied voltage

For the reliability of AishiCAP, it is recommended that the voltage applied to AishiCAP should be less than 80% of the rated voltage. Peak value of the DC and AC voltage should not exceed its rated voltage.

10.5 Failure mode

AishiCAP contains conductive polymer. The life ends mostly due to random failure mode, mainly short circuit. In case of short circuit, AishiCAP can be overheated by continuous current flow, and then Al case of AishiCAP would be separated by increased internal pressure.

Application Guidelines for Aluminum Electrolytic Capacitors

Designing Device Circuits

1. Select the capacitors to suit installation and operating conditions, and use the capacitors to meet the performance limits prescribed in this catalog or the product specifications.

2. Polarity

Aluminum Electrolytic Capacitors are polarized.

Apply neither reverse voltage nor AC voltage to polarized capacitors. Using reversed polarity causes a short circuit or venting. Before use, refer to the catalog, product specifications or capacitor body to identify the polarity marking. (The shape of rubber seal does not represent the directional rule for polarity.) Use a bi-polar type of non-solid aluminum electrolytic capacitor for a circuit where the polarity is occasionally reversed. However, note that even a bi-polar aluminum electrolytic capacitor must not be used for AC voltage applications.

3. Operating voltage

Do not apply a DC voltage which exceeds the full rated voltage. The peak voltage of a superimposed AC voltage (ripple voltage) on the DC voltage must not exceed the full rated voltage.

A surge voltage value, which exceeds the full rated voltage, is prescribed in the catalogs, but it is a restricted condition, for especially short periods of time.

4. Ripple current

The rated ripple current has been specified at a certain ripple frequency. The rated ripple current at several frequencies must be calculated by multiplying the rated ripple current at the original frequency using the frequency multipliers for each product series.

5. Category temperature

The use of a capacitor outside the maximum rated category temperature will considerably shorten the life or cause the capacitor to vent.

The relation between the lifetime of aluminum electrolytic capacitors and ambient temperature follows Arrhenius' rule that the lifetime is approximately halved with each 10°C rise in ambient temperature.

6. Life expectancy

Select the capacitors to meet the service life of a device.

7. Charge and discharge

Do not use capacitors in circuits where heavy charge and discharge cycles are frequently repeated. Frequent and sharp heavy discharging cycles will result in decreasing capacitance and damage to the capacitors due to generated heat. Specified capacitors can be designed to enduring such a condition. Rapid charging/discharging may be repeated in a circuit where the ripple voltage at the two terminals of the aluminum electrolytic capacitor fluctuates greatly. If the variation range of voltage exceeds 70Vp-p, please consult us.

8. Failure modes of capacitors

Non-solid aluminum electrolytic capacitors, in general, have a lifetime which ends in an open circuit, the period is dependent upon temperature. Consequently, lifetime of capacitors can be extended by reducing the ambient temperature and/or ripple current.

9. Insulating

a) Electrically isolate the following parts of a capacitor from the negative terminal, the positive terminal and the circuit traces.

- The outer can case of a non-solid aluminum electrolytic capacitors.
- The dummy terminal of a non-solid aluminum electrolytic capacitors, which is designed for mounting stability.

b) The outer sleeve of a capacitor is not assured as an insulator (Except for screw type). For applications that require an insulated outer sleeve, a custom-designed capacitor is recommended.

10. Conditions

Do not use/expose capacitors to the following conditions.

a) Oil, water, salty water. Avoid storage in damp locations.

b) Direct sunlight.

c) Toxic gases such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine or its compounds, and ammonium.

d) Ozone, ultraviolet rays or radiation.

e) Severe vibration or mechanical shock conditions beyond the limits prescribed in the catalogs or the product specification.

11. Mounting

a) The electrolytic paper and the electrolytic-conductive electrolyte in a non-solid aluminum electrolytic capacitor are flammable. Leaking electrolyte on a printed circuit board can gradually erode the copper traces, possibly causing smoke or burning by shortcircuiting the copper traces.

Verify the following points when designing a PC board.

- Provide the appropriate hole spacing on the PC board to match the terminal spacing of the capacitor.
- Make the following open space over the vent so that the vent can operate correctly.

Case diameter	Clearance
Ø6.3 to Ø16mm	2mm minimum
Ø18 to Ø35mm	3mm minimum
Ø40mm or more	5mm minimum

- Do not place any wires or copper traces over the vent of the capacitor.
- Installing a capacitor with the vent facing the PC board needs an appropriate ventilation hole in PC board.
- Do not pass any copper traces beneath the seal side of a capacitor. The trace must pass 1 or 2mm to the side of the capacitor.
- Avoid placing any heat-generating objects adjacent to a capacitor or even on the reverse side of the PC board.
- Do not pass anything via holes or underneath a capacitor.
- In designing double-sided PC boards, do not locate any copper trace under the seal side of a capacitor.

b) Do not mount the terminal side of a screw mount capacitor downwards. If a screw terminal capacitor is mounted on its side, make sure the positive terminal is higher than the negative terminal.

Do not fasten the screws of the terminals and the mounting clamps over

b) 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 keep the capacitors in an atmosphere containing the cleaning agent or in an air tight 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) over 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 voltage is applied. This corrosion causes extremely high leakage current, which in turn, causes venting and an open circuit.

5. Precautions for using adhesives and coating

a) Do not use any adhesive and coating materials containing halogenated solvent.
b) Verify the following before using adhesive and coating material.
- Remove flux and dust leftover between the rubber seal and the PC board before applying adhesive or coating materials to the capacitor.
- Dry and remove any residual cleaning agents before applying adhesive and coating materials to the capacitors. Do not cover over the whole surface of the rubber seal with the adhesive or coating materials.
- For permissible heat conditions for curing adhesives or coating materials, follow the instructions in the catalogs or the product specifications of the capacitors.
- Covering over the whole surface of the capacitor rubber seal with resin may result in a hazardous condition because the inside pressure cannot be released completely. Also, a large amount of halogen ions in resins will cause the capacitors to fail because the halogen ions penetrate into the rubber seal and the inside of the capacitor.

c) Some of coating material cannot be cured over the capacitor. Please note that loose luster and whitening on the surface of the outer sleeve might be caused according to the kind of solvents used for mounting adhesives and coating agents.

6. Fumigation

In many cases when exporting or importing electronic devices, such as capacitors, wooden packaging is used. In order to control insects, most often, it becomes necessary to fumigate the shipments. Precautions during "Fumigation" using halogenated chemical such as Methyl Bromide must be taken. Halogen gas can penetrate packaging materials used, such as, cardboard boxes and vinyl bags. Penetration of the halogenated gas can cause corrosion of electrolytic capacitors.

■ The Operation of Devices

a) Do not touch a capacitor directly with bare hands.
b) Do not short-circuit the terminal of a capacitor by letting it come into contact with any conductive object. Also, do not spill conductive liquid such as acid or alkaline solution over the capacitor.
c) Do not use capacitors in circumstance where they would be subject to exposure to the following materials:
- Oil, water, salty water or damp location.
- Direct sunlight.
- Toxic gases such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine or its compounds, and ammonium.
- Ozone, ultraviolet rays or radiation.
- Severe vibration or mechanical shock conditions beyond the limits prescribed in the catalogs or product specification.

■ Maintenance Inspection

a) Make periodic inspections of capacitors that have been used in industrial applications. Before inspection, turn off the power supply and carefully discharge the electricity in the capacitors. Verify the polarity when measuring the capacitors with a volt-ohm meter. Also, do not apply any mechanical stress to the terminals of the capacitors.
b) The following items should be checked during the periodic inspections.
- Significant damage in appearance: venting and electrolyte leakage.
- Electrical characteristics: leakage current, capacitance, tanδ and other characteristics prescribed in the catalog or product specifications.We recommend replacing the capacitors if the parts are out of specification.

■ In Case of Venting

a) If a non-solid aluminum electrolytic capacitor expels gas when venting, it will discharge odors or smoke, or burn in the case of a short-circuit failure. Immediately turn off or unplug the main power supply of the device.
b) When venting, a non-solid aluminum electrolytic capacitor blows out gas with a temperature of over 100°C. (A solid aluminum electrolytic capacitor discharges decomposition gas or burning gas while the outer resin case is burning.) Never expose the face close to a venting capacitor.
If your eyes inadvertently become exposed to the spouting gas or you inhale it, immediately flush the open eyes with large amounts of water and gargle with water respectively. If electrolyte is on the skin, wash the electrolyte away from the skin with soap and plenty of water. Do not lick the electrolyte of non-solid aluminum electrolytic capacitors.

■ Storage

We recommend the following conditions for storage.
a) Do not store capacitors at a high temperature or in high humidity. Store the capacitors indoors at a temperature of 5 to 35°C and a relative humidity of 75% or below.
b) Store the capacitors in places free from water, oil or salt water.
c) Store the capacitors in places free from toxic gases (hydrogen sulfide, sulfurous acid, chlorine, ammonium, etc.)
d) Store the capacitors in places free from ozone, ultraviolet rays or radiation.
e) Keep capacitors in the original package.

■ Disposal

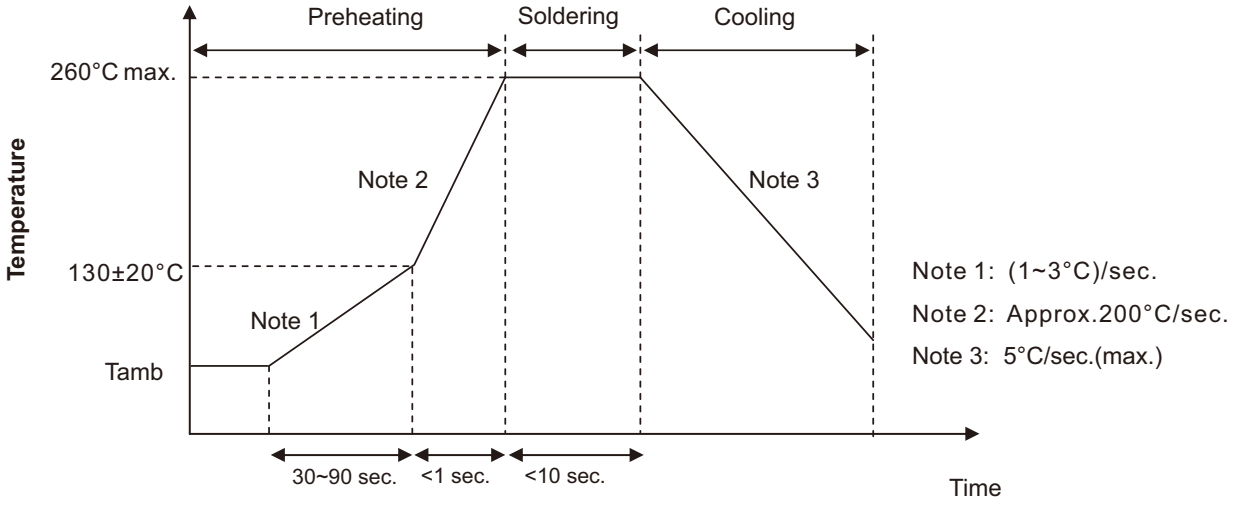
Please consult with a local industrial waste disposal specialist when disposing aluminum electrolytic capacitors.

■ Catalog

Specifications in the catalog may be subject to change without notice. Please consult us first before use. Hunan Aihua Group reserves the right of final interpretation of all the content.

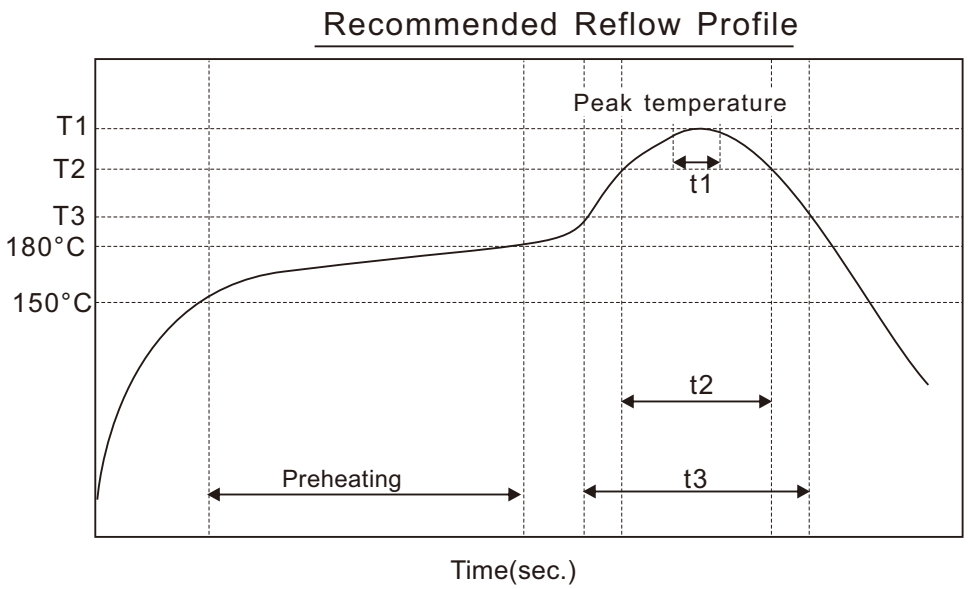
Soldering Recommendation

■ Flow Soldering(Radial Lead Type)



■ Reflow Soldering

• (For Polymer SMD Type)

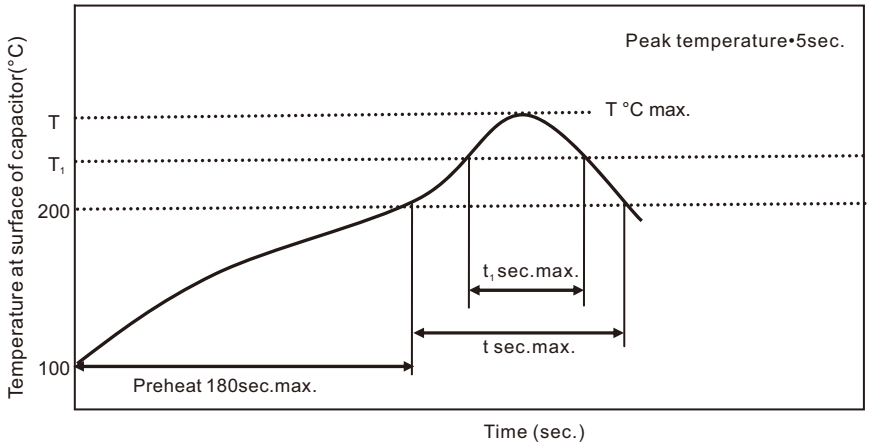


Item	Preheating	T1(°C)	T2(°C)	T3(°C)	t1(sec.)	t2(sec.)	t3(sec.)	Reflow cycle
Condition 1	150°C to 180°C Within 90sec.	≤260	230	200	≤10	≤40	≤60	1
Condition 2		≤250	230	200	≤10	≤40	≤60	2

• (For Liquid SMD Type)

Case size:Φ6.3~Φ10mm:

- Temperature at surface of capacitor shall not exceed T°C.
- The duration for over 200°C temperature and T_1°C at surface of capacitor shall not exceed t and $t_1$seconds,respectively.
- Preheat shall be done at 100°C to 200°C and for Maximum 180 seconds.

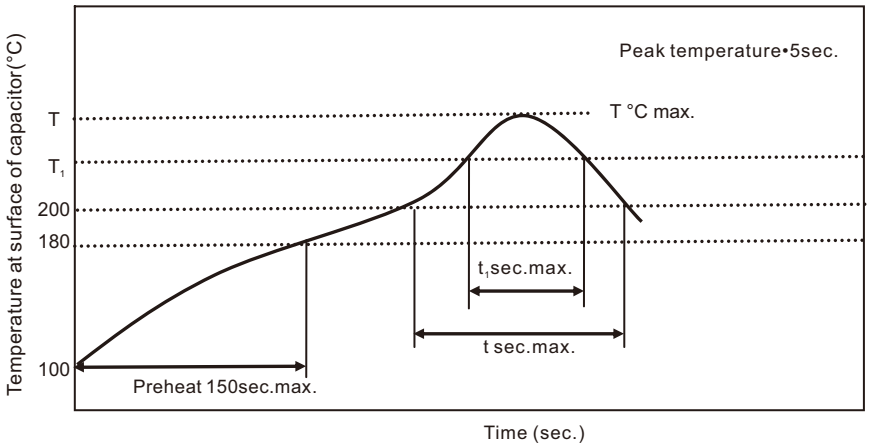


Case size (mm)	T(°C) ①	T_1(°C)	t(sec.) ②	t_1(sec.) ③	Reflow cycle
Φ6.3	250	230	90	40	1
Φ8	240	230	90	30	1
Φ10	235	230	60	30	1

① Peak temperature
② The duration over 200°C (max.)
③ The duration over T_1°C
■ Please contact us if capacitors are subject to the conditions other than the allowable range of reflow.

Case size:Φ12.5~Φ18mm:

- Temperature at surface of capacitor shall not exceed T°C.
- The duration for over 200°C temperature and T_1°C at surface of capacitor shall not exceed t and t_1 seconds,respectively.
- Preheat shall be done at 100°C to 180°C and for Maximum 150 seconds.



Case size (mm)	T(°C) ①	T_1(°C)	t(sec.) ②	t_1(sec.) ③	Reflow cycle
Φ12.5~Φ18	240	230	60	30	1

① Peak temperature
② The duration over 200°C (max.)
③ The duration over T_1°C
■ Please contact us if capacitors are subject to the conditions other than the allowable range of reflow.

the specified torque prescribed in the catalog or the product specifications.

c) For a surface mount capacitor, design the copper pads of the PC board in accordance with the catalog or the product specifications.

12. Others

a) The electrical characteristics of capacitors vary in respect to temperature, frequency and service life. Design the device circuits by taking these changes into account.

b) Capacitors mounted in parallel need the current to flow equally through the individual capacitors.

c) Capacitors mounted in series require resistors in parallel with the individual capacitors to balance the voltage.

d) Using capacitor for applications which always consider safety. Consult with our factory before use in applications which can affect human life.(space equipment, aerial equipment, nuclear equipment, medical equipment, vehicle control equipment, etc.) Please note that the product which is designed only for specific usage can not be used for other purposes.(ex.Photo flash type, etc.)

■ Installing Capacitors

1. Installing

a) Used capacitors are not reusable, except in the case that the capacitors are detached from a device for periodic inspection to measure their electrical characteristics.

b) If the capacitors have self-charged, discharge the capacitors through a resistor of approximately 1kΩ before use.

c) If capacitors are stored at a temperature of 35°C or more and more than 75% RH, the leakage current may increase. In this case, they can be reformed by applying the rated voltage through a resistor of approximately 1kΩ.

d) Verify the rated capacitance and voltage of the capacitors when installing.

e) Verify the polarity of the capacitors.

f) Do not use the capacitors if they have been dropped on the floor.

g) Do not deform the cases of capacitors.

h) Verify that the lead spacing of the capacitor fits the hole spacing in the PC board before installing the capacitors. Some standard preformed leads are available.

i) For pin terminals or snap-in terminals, insert the terminals into PC board and press the capacitor downward until the bottom of the capacitor body reaches PC board surface.

j) Do not apply any mechanical force in excess of the limits prescribed in the catalogs or the product specifications of the capacitors. Also, note the capacitors may be damaged by mechanical shocks caused by the vacuum/insertion head, component checker or centering operation of an automatic mounting or insertion machine.

2. Soldering and Solderability

a) When soldering with a soldering iron

- Soldering conditions (temperature and time) should be within the limits prescribed in the catalogs or the product specifications.
- If the terminal spacing of a capacitor does not fit the terminal hole spacing of the PC board, reform the terminals in a manner to minimize a mechanical stress into the body of the capacitor.
- Remove the capacitors from the PC board , after the solder is completely melted, reworking by using a soldering iron minimizes the mechanical stress to the capacitors.
- Do not touch the capacitor body with the hot tip of the soldering iron.

b) Flow soldering

- 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.
- Soldering conditions (preheat, solder temperature and dipping time) should be within the limits prescribed in the catalogs or the product specifications.
- Do not apply flux to any part of capacitors other than their terminals.
- Make sure the capacitors do not come into contact with any other components while soldering.

c) Reflow soldering (only applicable for SMD type)

- Soldering conditions (preheat, solder temperature and dipping time) should be within the limits prescribed in the catalogs or the product specifications.
- When setting the temperature infrared heaters, consider that the infrared absorption causes material to be discolored and change in appearance.
- Do not solder capacitors more than once using reflow. If it should be done for twice, please consult us first.
- Make sure capacitors do not come into contact with copper traces.

d) Do not re-use surface mount capacitors which have already been soldered. In addition, when installing a new capacitor onto the assembly board to rework, remove old residual flux from the surface of the PC board, and then use a soldering iron within the prescribed conditions.

e) Confirm whether reflow soldering is applicable for the capacitors.

3. Handling after soldering

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

a) Do not lean or twist the body of the capacitor after soldering the capacitors onto the PC board.

b) Do not use the capacitors for lifting or carrying the assembly board.

c) 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.

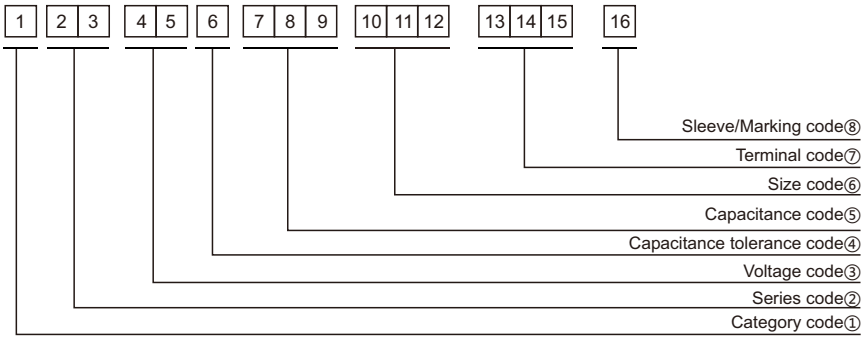
d) Do not drop the assembly board.

4. Cleaning PC board

a) Do not wash capacitors by using the following cleaning agents.

- Halogenated solvents: cause capacitors to fail due to corrosion.
- Alkali system solvents: corrode (dissolve) an aluminum case.
- Petroleum and terpene system solvents: cause the rubber seal material to deteriorate.
- Xylene: cause the rubber seal material to deteriorate.
- Acetone: erase the marking. Solvent-proof capacitors are only suitable for washing within the cleaning conditions prescribed in the catalogs or the product specifications. In particular, ultrasonic cleaning will accelerate damaging capacitors.

Part Numbering System



① Category code

Type	Code
	1
Electrolytic Capacitor	E
Conductive Polymer	S

② Series code

Series name	Code	
	2	3
WH	W	H
CD11GE	G	E
CD11GES	G	X
CD11GAS	G	W
CD11GHS	G	S
NR	N	R
PZ	P	Z

③ Voltage code

WV (V_{dc})	Code	
	4	5
2.5	0	E
3	0	D
4	0	G
6.3	0	J
6.8	0	C
7	0	Q
7.5	0	A
10	1	A
12	1	T
16	1	C
25	1	E
35	1	V
40	1	G
50	1	H
63	1	J
80	1	B
100	1	K
120	2	B
160	2	C
180	2	L
200	2	D
220	2	N
250	2	E
315	2	F
350	2	V
380	2	P
400	2	G
420	2	T
450	2	W
500	2	H
550	2	J
600	2	K

④ Capacitance tolerance code

Tol. (%)	Code
	6
-10~+10	K
-20~+20	M
-10~+30	Q
-10~+20	V
0~+20	A
-5~+20	C
-10~-20	B
-5~+5	D
0~+10	E
-5~-20	F
-15~+5	N

⑤ Capacitance code

Cap (μF)	Code		
	7	8	9
0.10	R	1	0
0.22	R	2	2
0.33	R	3	3
0.47	R	4	7
0.68	R	6	8
1	0	1	0
2.2	2	R	2
3.3	3	R	3
4.7	4	R	7
6.8	6	R	8
10	1	0	0
22	2	2	0
33	3	3	0
47	4	7	0
68	6	8	0
100	1	0	1
220	2	2	1
330	3	3	1
470	4	7	1
680	6	8	1
1000	1	0	2
2200	2	2	2
3300	3	3	2
4700	4	7	2
6800	6	8	2
10000	1	0	3
22000	2	2	3
33000	3	3	3
68000	6	8	3

⑥ Size code

ΦD (mm)	Code
	10
4	C
5	D
6.3	E
8	F
10	G
11	H
12	J
12.5	W
13	K
14	X
16	L
18	M
19	Z
20	N
22	O
25	P
30	Q
35	R
40	Y
51.6	S
64.3	T
76.9	U
91	V
100	A

L (mm)	Code	
	11	12
5	0	5
7	0	7
11	1	1
12	1	2
16	1	6
20	2	0
25	2	5
30	3	0
35	3	5
40	4	0
46	4	6
50	5	0
60	6	0
80	8	0
100	A	0
115	B	5
120	C	0
130	D	0
140	E	0
160	G	0
200	K	0
220	M	0
236	N	6
250	P	0

⑦ Terminal code

Specification	Code	Size	
	13	14	15
Bulk packing	O	-	-
Taping (SMD Type)	D	0	0
Φ4~8 Taping F=5.0mm	P	5	0
Φ10~12.5 Taping F=5.0mm	B	5	0
Lead Cut L=3.5mm	C	3	5
Lead Cut L=11.0mm	C	B	0
Lead Forming & Cut L=4.5mm	F	-	-
Kink & Cut L=4.5mm	J	-	-
Snap-in type Terminal 4.0mm in length	K	-	-
Three Terminals	T	-	-
Ring clip mounting standard design	A	0	0
Ring clip mounting special design	S	-	-

⑧ Sleeve/Marking code

Sleeve/Marking	Code
	16
PVC	C
PET	T
Dark blue	B
Bright red	R
Sky-blue	S
Light blue	T
Pink	Z
Black	H
Purple-blue	V
Red	O

Lead Forming

Taping Specifications

Fig.1 code: X

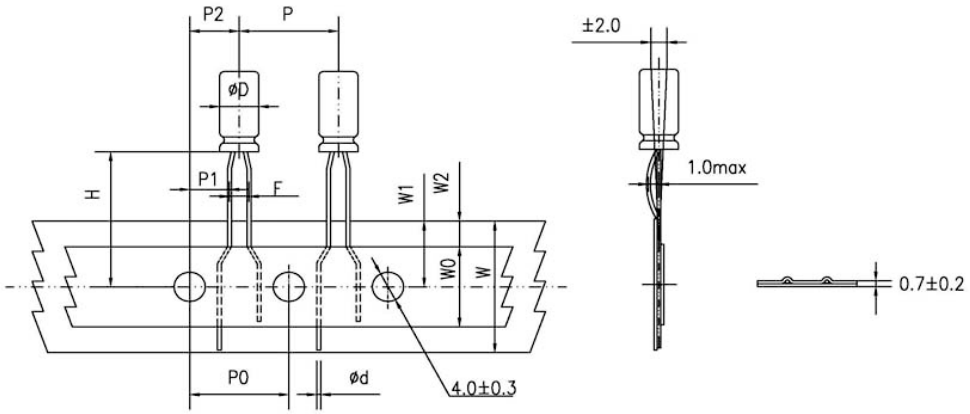


Fig.2 code: B

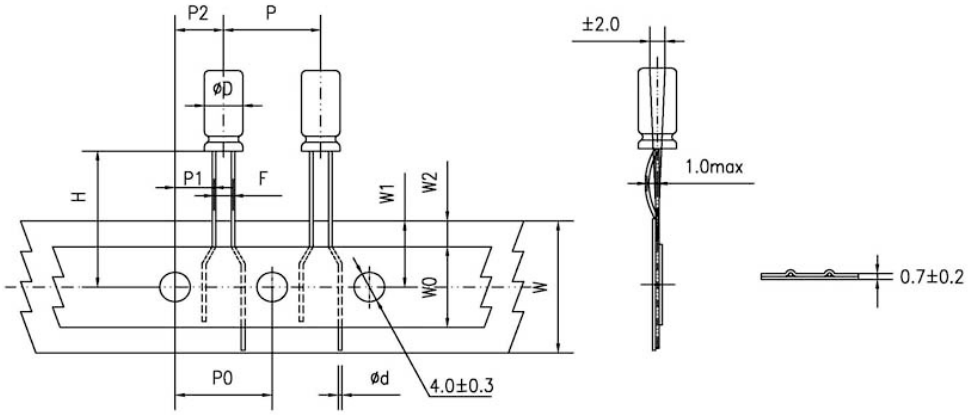


Fig.3 code: B

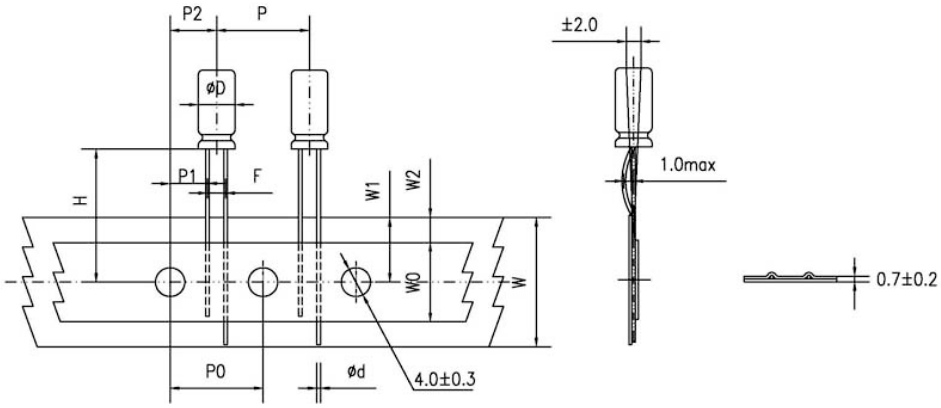
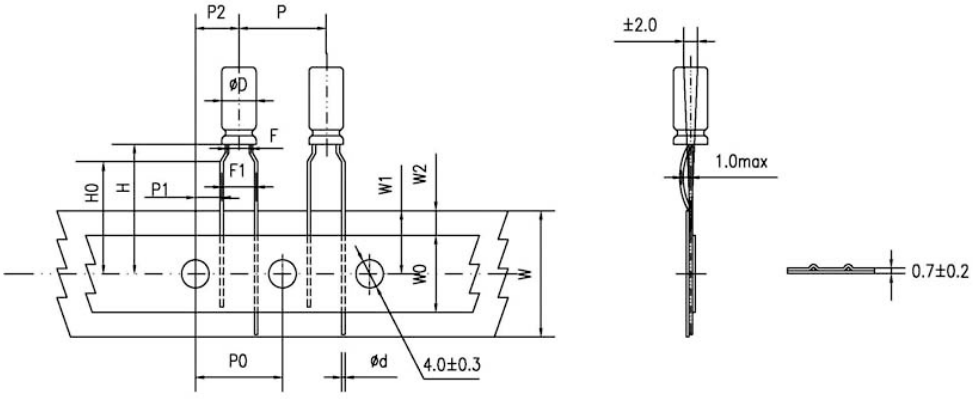


Fig.4 code: P



Lead Forming

Specification Fig.1 & Fig.2 & Fig.3

Items	Symbol	Case size									Tolerance
		4×5 4×7	5×5 5×7	5×11	6.3×5	6.3×7 6.3×9	6.3×11 6.3×12	8×5/7 8×9/11 8×11.5 8×12	8×16 8×20	10×9/12 10×12.5 10×13/16 10×20/25	
Pin Code		X B	X B	X B	B	B	B	B	B	B	
Lead wire diameter	Φd	0.45	0.45	0.5	0.45	0.5	0.5	0.45/0.5	0.6	0.6	±0.05
Pitch of body	P	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	±1.0
Feed hole pitch	P0	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	±0.2
Distance from hole center to lead	P1	5.1 5.6	5.1 5.35	5.1 5.35	5.1	5.1	5.1	4.6	4.6	3.85	±0.7
Distance from feed hole center to body center	P2	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	±1.0
Lead-to-lead distance	F	2.5 1.5	2.5 2.0	2.5 2.0	2.5	2.5	2.5	3.5	3.5	5.0	±0.5
Height of body from tape center	H	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	±0.75
Base tape width	W	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	±0.5
Adhesive tape width	W0	6.0	6.0	6.0	6.0	6.0	8.0	8.0	8.0	11.0	min
Hole position	W1	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	+0.75 -0.5
Hole down tape position	W2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	max

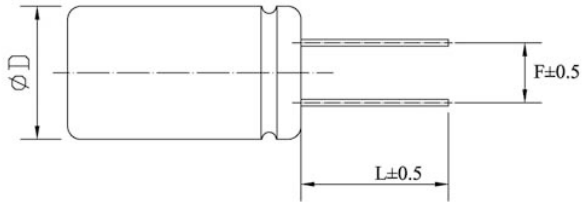
Specification Fig.4

Items	Symbol	Case size									Tolerance
		4×5 4×7	5×5	5×7	5×11	6.3×5	6.3×7 6.3×9	6.3×11 6.3×12	8×5/7 8×9/11 8×11.5/12	8×16 8×20	
Pin Code		P	P	P	P	P	P	P	P	P	
Lead wire diameter	Φd	0.45	0.45	0.45	0.5	0.45	0.5	0.5	0.45/0.5	0.6	±0.05
Pitch of body	P	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	±1.0
Feed hole pitch	P0	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	±0.2
Distance from hole center to lead	P1	3.85	3.85	3.85	3.85	3.85	3.85	3.85	3.85	3.85	±0.7
Distance from feed hole center to body center	P2	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	±1.0
Lead-to-lead distance	F	1.5	2.0	2.0	2.0	2.5	2.5	2.5	3.5	3.5	±0.5
Lead to lead distance	F1	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	+0.8 -0.2
Height of body from tape center	H	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	±0.75
Lead wire clinch height	H0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	±0.5
Base tape width	W	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	±0.5
Adhesive tape width	W0	6.0	6.0	6.0	6.0	6.0	6.0	8.0	8.0	8.0	min
Hole position	W1	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	+0.75 -0.5
Hole down tape position	W2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	max

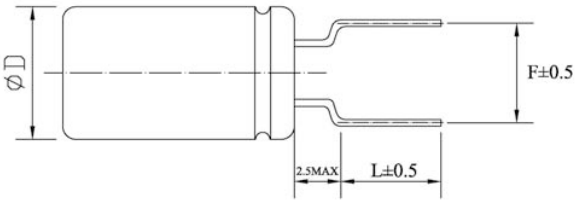
Lead Forming

Lead Forming & Cut

Code:C
RANGE: Φ4~Φ18

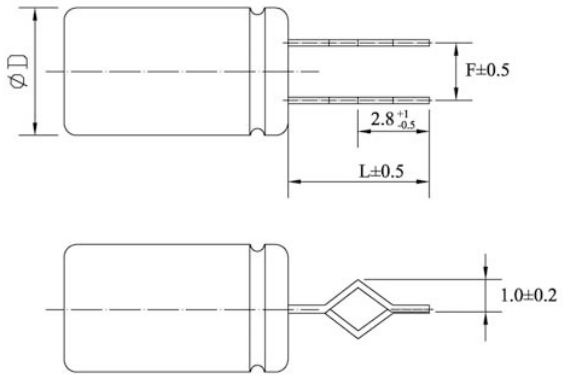


Code:F
RANGE: Φ4~Φ8



ΦD	F	L	ΦD	F	L
4	1.5	3.0~12.0	4	5.0	3.5, 4.5, 5.0, 7.0
5	2.0	3.0~12.0	5	5.0	3.5, 4.5, 5.0, 7.0
6.3	2.5	3.0~12.0	6.3	5.0	3.5, 4.5, 5.0, 7.0
8	3.5	3.0~12.0	8	5.0	3.5, 4.5, 5.0, 7.0
10	5.0	3.0~12.0	-	-	-
12.5	5.0	3.0~12.0	-	-	-
16	7.5	3.0~12.0	-	-	-
18	7.5	3.0~12.0	-	-	-

Code:J
RANGE: Φ10~Φ18



ΦD	F	L
10	5.0	4.0, 4.5, 5.0
12.5	5.0	4.0, 4.5, 5.0
16	7.5	4.0, 4.5, 5.0
18	7.5	4.0, 4.5, 5.0