Radial lead type

Discontinued

Series: HFE Type : A

■ Features Endurance :105°C 1000 to 2000h

■Specification

Operating temp. range	-55 to + 105°C
Rated W.V. range	6.3 to 100 V .DC
Nominal cap. range	3.3 to 15000 µ F
Capacitance	±20 % (120Hz/+20°C)
DC leakage current	I < 0.01 CV or 3 (µ A) after 2 min.(Whichever is the greater)

tan δ

W.V.	6.3	10	16	25	35	50	63	100
tan δ	0.22	0.19	0.16	0.14	0.12	0.10	0.08	0.07

(max.) (120Hz /+20°C)

Add 0.02 per 1000µF for products of 1000µF or more.

Temperature characteristics

W.V	6.3	10	16	25	35	50	63	100
Z(-25°C) / Z(+20°C)	3	2	2	2	2	2	2	2
Z(-40°C) / Z(+20°C)	6	5	3	3	3	3	3	3
Z(-55°C) / Z(+20°C)	8	6	4	4	4	4	4	4

(Impedance ratio at 120Hz)

Load life

After 2000 hours (1000 hours for <ϕ8mm) with DC voltage and specified ripple current value applied at +105±2°C (The sum of DC and ripple peak voltage shall not exceed the rated working voltage), the capacitor shall meet the following limits.

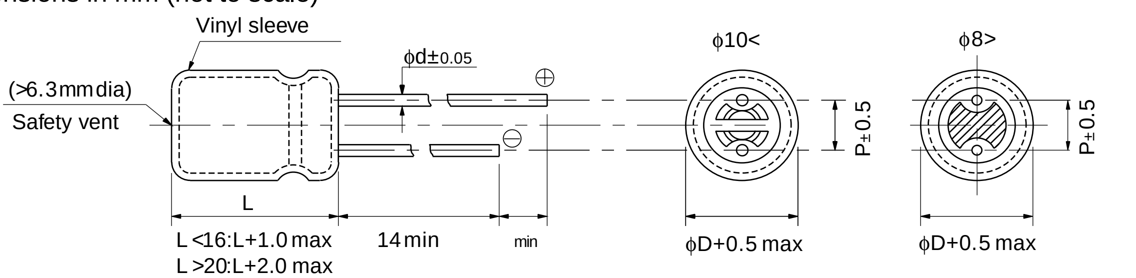
Capacitance chang	<±20% of the initial measured value
tan δ	<200% of the initial specified value
DC leakage current	<the initial specified value

Shelf life	After storage for 1000 hours at +105±2°C with no voltage applied and then being stabilized at +20°C, capacitor shall meet the limits specified in "Endurance"
Cleaning	Can withstand circuit-board cleaning within 5 minutes in Freon TE, TES, or TP-35 at 40°C by dipping, steaming, or ultrasonic.

■Explanation of Part Number

E	C	E	A			F	E				
Commom code			Shape	W.V. code		Series code		Capacitance code			Suffix

■Dimensions in mm (not to scale)



(mm)

Body Dia. ϕD	4	5	6.3	8	10	12.5		16	18
Body Length L						15 to 25	30 to 40		
Lead Dia. ϕd	0.45	0.5	0.5	0.6	0.6	0.6	0.8	0.8	0.8
Lead space P	1.5	2	2.5	3.5	5	5	5	7.5	7.5

Mar. 2005

Discontinued

■ Case size vs capacitance, ripple current table

W.V.(V.DC) (φDxL)	6.3 (0J)		10 (1A)		16(1C)	
	Capacitance (µF)	Ripplr current (mA) r.m.s. (100kHz/+105°C)	Capacitance (µF)	Ripplr current (mA) r.m.s. (100kHz/+105°C)	Capacitance (µF)	Ripplr current (mA) r.m.s. (100kHz/+105°C)
4 × 11	68	89	47	89	33	89
5 × 11	120	121	82	121	56	121
5 × 15	150	133	120	133	82	133
6.3 × 11.2	220	148	180	148	120	148
6.3 × 15	330	163	270	163	180	163
8 × 12.5	390	303	330	303	220	303
8 × 15	560	381	470	381	330(L)	381
8 × 20	820	496	560(L)	496	470	496
10 × 12.5	470	379	390	379	270	379
10 × 16	680	453	560	453	390	453
10 × 20	1200(L)	620	820	620	680(L)	620
10 × 25	1500	723	1200	723	820	723
10 × 30	2200(L)	869	1500(L)	869	1000	869
12.5 × 15	1200	707	1000	707	680	707
12.5 × 20	2200	861	1800	861	1200	861
12.5 × 25	2700	1010	2200	1010	1500	1010
12.5 × 30	3900(L)	1160	2700	1160	2200(L)	1160
12.5 × 35	4700	1350	3300(L)	1350	2700(L)	1350
12.5 × 40	5600(L)	1440	3900(L)	1440	3300(L)	1440
16 × 15	2700(S)	984	1500	984	1200(S)	984
16 × 20	3900	1250	3300	1250	2200	1250
16 × 25	5600	1470	3900	1470	2700	1470
16 × 31.5	6800	1700	4700	1700	3900	1700
16 × 35.5	8200	1940	6800(L)	1940	4700(L)	1940
16 × 40	10000(L)	2220	8200(L)	2220	5600	2220
18 × 15	3300	1170	2200(S)	1170	1500(S)	1170
18 × 20	5600(S)	1460	3900(S)	1460	3300	1460
18 × 25	6800(S)	1690	4700(S)	1690	3900(S)	1690
18 × 31.5	10000	1920	6800	1920	4700	1920
18 × 35.5	12000	2130	8200	2130	6800	2130
18 × 40	15000	2390	10000	2390	8200	2390

■ Case size vs capacitance, ripple current table

W.V.(V.DC) (φD×L)	25 (1E)		35 (1V)		50(1H)	
	Capacitance (µF)	Ripplr current (mA) r.m.s. (100kHz/+105°C)	Capacitance (µF)	Ripplr current (mA) r.m.s. (100kHz/+105°C)	Capacitance (µF)	Ripplr current (mA) r.m.s. (100kHz/+105°C)
4 × 11	22	89	15	89	10	89
5 × 11	39	121	27	121	18	121
5 × 15	56	133	39	133	27	133
6.3 × 11.2	82	148	56	148	39	148
6.3 × 15	120	163	82	163	56	163
8 × 12.5	150	303	100	303	68	303
8 × 15	220	381	150	381	82(L)	381
8 × 20	270(L)	496	220	496	120	496
10 × 12.5	180	379	120	379	82	379
10 × 16	270	453	180	453	100	453
10 × 20	470(L)	620	330(L)	620	180(L)	620
10 × 25	560	723	390	723	220	723
10 × 30	680	869	470	869	330(L)	869
12.5 × 15	470	707	330	707	180	707
12.5 × 20	820	861	560	861	330	861
12.5 × 25	1000	1010	680	1010	470	1010
12.5 × 30	1500(L)	1160	1000(L)	1160	560	1160
12.5 × 35	1800(L)	1350	1200(L)	1350	680(L)	1350
12.5 × 40	2200(L)	1440	1500(L)	1440	820(L)	1440
16 × 15	820(S)	984	560(S)	984	330(S)	984
16 × 20	1500	1250	1000	1250	680	1250
16 × 25	1800	1470	1200	1470	820	1470
16 × 31.5	2700	1700	1800	1700	1000	1700
16 × 35.5	3300(L)	1940	2200(L)	1940	1200	1940
16 × 40	3900(L)	2220	2700(L)	2220	1500(L)	2220
18 × 15	1200	1170	820	1170	470(S)	1170
18 × 20	2200	1460	1500	1460	820(S)	1460
18 × 25	2700(S)	1690	1800(S)	1690	1000(S)	1690
18 × 31.5	3300	1920	2200	1920	1500	1920
18 × 35.5	3900	2130	2700	2130	1800	2130
18 × 40	4700	2390	3300	2390	2200	2390

Discontinued

■ Case size vs capacitance, ripple current table

W.V.(V.DC) / (φDxL)	63 (1J)		100 (2A)	
	Capacitance (µF)	Ripplr current (mA) r.m.s. (100kHz/+105°C)	Capacitance (µF)	Ripplr current (mA) r.m.s. (100kHz/+105°C)
4 × 11	6.8	58	3.3	58
5 × 11	12	80	5.6	80
5 × 15	18	90	8.2	90
6.3 × 11.2	27	99	12	99
6.3 × 15	39	102	18	102
8 × 12.5	47	260	22	260
8 × 15	68(L)	340	33(L)	340
8 × 20	82	455	39	455
10 × 12.5	56	306	27	306
10 × 16	68	400	33	400
10 × 20	120	463	56	463
10 × 25	150(L)	599	68(L)	599
10 × 30	180	698	100(L)	698
12.5 × 15	150	511	68	511
12.5 × 20	220	671	100	671
12.5 × 25	270	807	120	807
12.5 × 30	390(L)	937	180(L)	937
12.5 × 35	470(L)	1040	220(L)	1040
12.5 × 40	560(L)	1090	270(L)	1090
16 × 15	220(S)	668	120(S)	668
16 × 20	390	865	180	865
16 × 25	470	1080	220	1080
16 × 31.5	680	1360	330	1360
16 × 35.5	820(L)	1460	390(L)	1460
16 × 40	1000(L)	1650	470	1650
18 × 15	330	822	150	822
18 × 20	560	1010	270	1010
18 × 25	680(S)	1250	330(S)	1250
18 × 31.5	820	1360	390	1360
18 × 35.5	1000	1600	560	1600
18 × 40	1200	1770	680	1770

■ Case size vs impedance table(at 100kHz)

W.V.(V.DC) / Temp. / (φD×L)	6.3 ~ 50V.DC		63 ~ 100V.DC	
	-10°C	20°C	-10°C	20°C
4 × 11	12.5	4.0	23.0	7.8
5 × 11	6.8	2.3	11.0	4.4
5 × 15	4.4	1.5	6.7	2.8
6.3 × 11.2	3.1	1.2	4.7	2.1
6.3 × 15	2.0	0.76	2.9	1.3
8 × 12.5	1.0	0.42	1.7	0.82
8 × 15	0.8	0.35	1.3	0.61
8 × 20	0.77	0.34	0.75	0.36
10 × 12.5	0.56	0.22	1.4	0.64
10 × 16	0.48	0.21	0.93	0.39
10 × 20	0.35	0.16	0.72	0.27
10 × 25	0.35	0.17	0.52	0.21
10 × 30	0.30	0.13	0.41	0.16
12.5 × 15	0.24	0.091	0.65	0.28
12.5 × 20	0.22	0.11	0.41	0.18
12.5 × 25	0.25	0.11	0.37	0.14
12.5 × 30	0.19	0.086	0.28	0.11
12.5 × 35	0.20	0.084	0.24	0.089
12.5 × 40	0.17	0.068	0.21	0.077
16 × 15	0.19	0.073	0.39	0.18
16 × 20	0.14	0.057	0.31	0.12
16 × 25	0.16	0.063	0.24	0.089
16 × 31.5	0.12	0.049	0.18	0.064
16 × 35.5	0.16	0.060	0.15	0.055
16 × 40	0.14	0.053	0.13	0.048
18 × 15	0.14	0.052	0.34	0.13
18 × 20	0.12	0.045	0.24	0.089
18 × 25	0.12	0.045	0.21	0.076
18 × 31.5	0.096	0.037	0.18	0.064
18 × 35.5	0.10	0.040	0.16	0.060
18 × 40	0.094	0.036	0.12	0.045

Discontinued

■ Frequency correction factor for ripple current

W.V. (V.DC)	Capacitance (µF)	Frequency (Hz)				
		60	120	1 k	10 k	100k
6.3 ~ 50	10 ~ 330	0.55	0.65	0.85	0.90	1
	390 ~ 1000	0.70	0.75	0.90	0.95	1
	1200 ~ 2200	0.75	0.80	0.90	0.95	1
	2700 ~	0.80	0.85	0.95	1.00	1
63 ~ 100	4.7 ~ 56	0.40	0.55	0.85	0.90	1
	68 ~ 220	0.45	0.60	0.85	0.95	1
	330 ~	0.55	0.70	0.90	0.95	1

⚠ Application Guidelines

1. Circuit Design

Ensure that operational and mounting conditions follw the specified conditions detailed in the catalog and specification sheets.

1.1 Operating Temperature and Frequency

Electrolytic capacitor electrical parameters are normally specified at 20°C temperature and 120Hz frequency. These parameters vary with changes in temperature and frequency. Circuit designers should take these changes into consideration.

(1) Effects of operating temperature on electrical parameters

a) At higher temperatures, leakage current and capacitance increase while equivalent series resistance(ESR) decreases.

b) At lower temperatures, leakage current and capacitance decrease while equivalent series resistance(ESR) increases.

(2) Effects of frequency on electrical parameters

a) At higher frequencies, capacitance and impedance decrease while tan δ increases.

b) At lower frequencies, ripple current generated heat will rise due to an increase in equivalent series resistance (ESR).

1.2 Operating Temperature and Life Expectancy

(1) Expected life is affected by operating temperature. Generally, each 10°C reduction in temperature will double the expected life. Use capacitors at the lowest possible temperature below the maximum guaranteed temperature.

(2) If operating conditions exceed the maximum guaranteed limit, rapid electrical parameter deterioration will occur, and irreversible damage will result.

Check for maximum capacitor operating temperatures including ambient temperature, internal capacitor temperature rise caused by ripple current, and the effects of radiated heat from power transistors, IC?s or resistors.

Avoid placing components which could conduct heat to the capacitor from the back side of the circuit board.

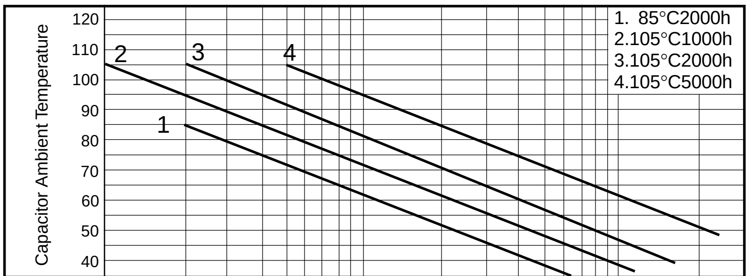
(3) The formula for calculating expected life at lower operating temperatures is as fllows;

$$L_2 = L_1 \times 2^{\frac{T_1 - T_2}{10}}$$ where,

L_1: Guaranteed life (h) at temperature, T_1° C
L_2: Expected life (h) at temperature, T_2°C
T_1: Maximum operating temperature (°C)
T_2: Actual operating temperature, ambient temperature + temperature rise due to ripple currentheating(°C)

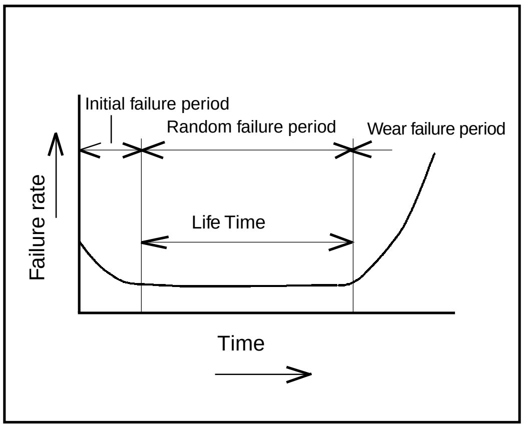
A quick eference capacitor guide for estimating exected life is included for your reference.

■ Expected Life Estimate Quick Reference Guide

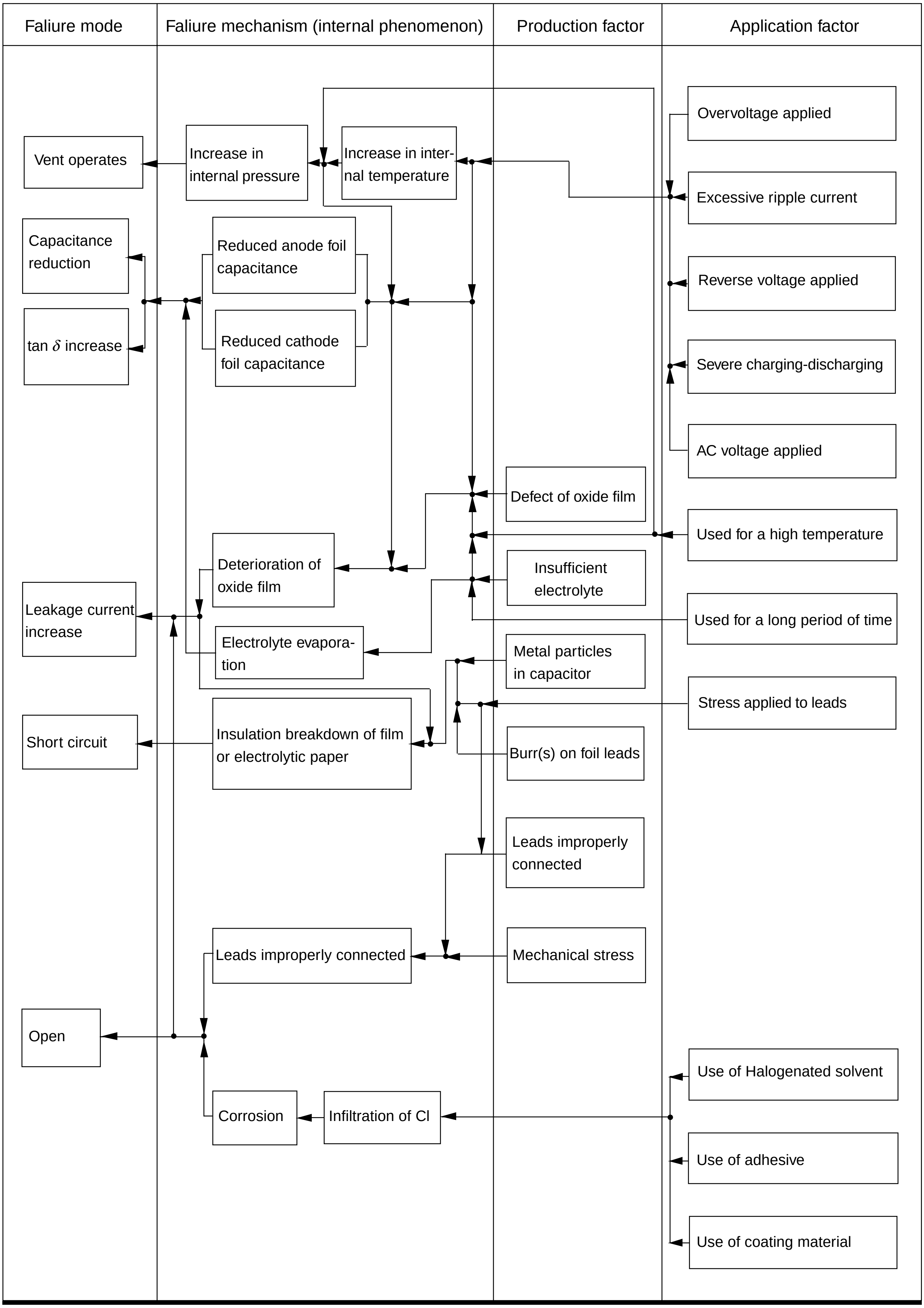


24h operat-ion	(h)	2000	5000	10,000	20,000			50,000	100,000	200,000	
	Years			1	2	3	4	5	7		20
8h/d	Years			3	6	10		15	20	30	

■ Failure rate curve



■ Typical failure modes and their factors



1.3 Common Application Conditions to Avoid

The following misapplication load conditions will cause rapid deterioration to capacitor electrical parameters. In addition, rapid heating and gas generation within the capacitor can occur causing the pressure relief vent to operate and resultant leakage of electrolyte. Under extreme conditions, explosion and fire could result. Leakinq electrolyte is combustible and electrically conductive.

(1) Reverse Voltaqe

DC capacitors have polarity. Verify correct polarity before insertion. For circuits with changing or uncertain polarity,use DC bipolar capacitors. DC bipolar capacitors are not suitable for use in AC circuits.

(2) Charqe/Discharqe Applications

Standard capacitors are not suitable for use in repeating charge/discharge applications. For charqe/discharqe applications consult us and advise actual conditions.

(3) Overvoltage

Do not apply voltaqes exceeding the maximum specified rated voltages. Voltage up to the surge voltage rating are acceptable for short periods of time. Ensure that the sum of the DC voltage and the superimposed AC ripple voltage does not exceed the rated voltage.

(4) Ripple Current

Do not apply ripple currents exceeding the maximum specified value. For high ripple current applications, use a capacitor designed for high ripple currents or contact us with your requirements.

Ensure that allowable ripple currents superimposed on low DC bias voltages do not cause reverse voltage conditions.

1.4 Using Two or More Capacitors in Series or Parallel

(1) Capacitors Connected in Parallel

The circuit resistance can closely approximate the series resistance of the capacitor causing an imbalance of ripple current loads within the capacitors. Careful design of wiring methods can minimize the possibility of excessive ripple currents applied to a capacitor.

(2) Capacitors Connected in Series

Normal DC leakage current differences among capacitors can cause voltage imbalances. The use of voltage divider shunt resistors with consideration to leakage currents, can prevent capacitor voltage imbalances.

1.5 Capacitor Mounting Considerations

(1) Double - Sided Circuit Boards

Avoid wiring Pattern runs which pass between the mounted capacitor and the circuit board. When dipping into a solder bath, excess solder may collect under the capacitor by capillary action and shortcircuit the anode and cathode terminals.

(2) Circuit Board Hole Positioning

The vinyl sleeve of the capacitor can be damaged if solder passes through a lead hole for subsequently processed parts. Special care when locating hole positions in proximity to capacitors is recommended.

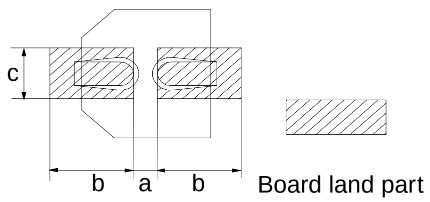
(3) Circuit Board Hole Spacing

The circuit board holes spacing should match the capacitor lead wire spacing within the specified tolerances. Incorrect spacing can cause excessive lead wire stress during the insertion process. This may result in premature capacitor failure due to short or open circuit, increased leakage current, or electrolyte leakage.

(4)Land/Pad Pattern

The circuit board land/pad pattern size for chip capacitors is specified in the following table.

[Table of Board Land Size vs. Capacitor Size]



(mm)

Size	a	b	c
A(ϕ3)	0.6	2.2	1.5
B(ϕ4)	1.0	2.5.	1.6
C(ϕ5)	1.5	2.8	1.6
D(ϕ6.3)	1.8	3.2	1.6
E(ϕ8 x 6.2L)	2.2	4.0	1.6
F(ϕ8 x 10.2L)	3.1	4.0	2.0
G(ϕ10 x 10.2L)	4.6	4.1	2.0

Among others, when the size a is wide , back fillet can not be made, decreasing fitting strength.

❇ Decide considering mounting condition, solderability and fitting strength, etc. based on the design standards of your company.

(5) Clearance for Case Mounted Pressure Relief Vents

Capacitors with case mounted pressure relief vents require sufficient clearance to allow for proper vent operation. The minimum clearances are dependent on capacitor diameters as follows.

ϕ6.3 to ϕ16 mm : 2 mm minimum,
ϕ18 to ϕ35 mm : 3 mm minimum.
ϕ40 mm or greater: 5 mm minimum

(6) Clearance for Seal Mounted Pressure Relief Vents

A hole in the circuit board directly under the seal vent location is required to allow proper release of pressure.

(7) Wiring Near the Pressure Relief Vent

Avoid locating high voltage or high current wiring or circuit board paths above the pressure relief vent. Flammable, high temperature gas exceeding 100°C may be released which could dissolve the wire insulation and ignite.

(8) Circuit Board Patterns Under the Capacitor

Avoid circuit board runs under the capacitor as electrolyte leakage could cause an electrical short.

(9) Screw Terminal Capacitor Mounting

- Do not orient the capacitor with the screw terminal side of the capacitor facing downwards.
- Tighten the terminal and mounting bracket screws within the torque range specified in the specification.

1.6 Electrical Isolation of the Capacitor

Completely isolate the capacitor as follows.

- Between the cathode and the case (except for axially leaded B types) and between the anode terminal and other circuit paths.
- Between the extra mounting terminals (on T types) and the anode terminal, cathode terminal, and other circuit paths.

1.7 Capacitor Sleeve

The vinyl sleeve or laminate coating is intended for marking and identification purposes and is not meant to electrically insulate the capacitor.

The sleeving may split or crack if immersed into solvents such as toluene or xylene, and then exposed to high temperatures.

> Always consider safety when designing equipment and circuits. Plan for worst case failure modes such as short circuits and open circuits which could occur during use.
> (1) Provide protection circuits and protection devices to allow safe failure modes.
> (2) Design redundant or secondary circuits where possible to assure continued operation in case of main circuit failure.

2. Capacitor Handling Techniques

2.1 Considerations Before Using

(1) Capacitors have a finite life. Do not reuse or recycle capacitors from used equipment.
(2) Transient recovery voltage may be generated in the capacitor due to dielectric absorption. If required, this voltage can be discharged with a resistor with a value of about 1 kΩ.
(3) Capacitors stored for long periods of time may exhibit an increase in leakage current. This can be corrected by gradually applying rated voltage in series with a resistor of approximately 1 kΩ.
(4) If capacitors are dropped, they can be damaged mechanically or electrically. Avoid using dropped capacitors.
(5) Dented or crushed capacitors should not be used. The seal integrity can be compromised and loss of electrolyte/shortened life can result.

2.2 Capacitor Insertion

(1) Verify the correct capacitance and rated voltage of the capacitor.
(2) Verify the correct polarity of the capacitor before inserting.
(3) Verify the correct hole spacing before insertion (land pattern size on chip type) to avoid stress on the terminals.
(4) Ensure that the auto insertion equipment lead clinching operation does not stress the capacitor leads where they enter the seal of the capacitor. For chip type capacitors, excessive mounting pressure can cause high leakage current, short circuit, or disconnection.

2.3 Manual Soldering

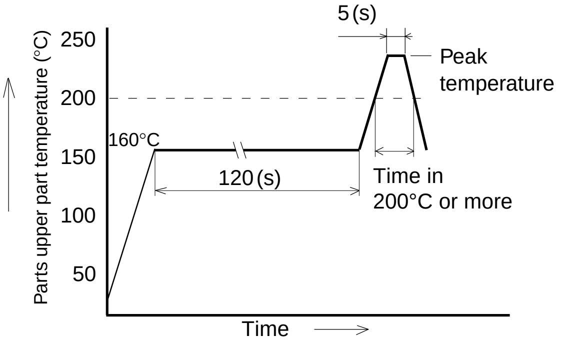
(1) Observe temperature and time soldering specifications or do not exceed temperatures of 350°C for 3 seconds or less.
(2) If lead wires must be formed to meet terminal board hole spacing, avoid stress on the leadwire where it enters the capacitor seal.
(3) If a soldered capacitor must be removed and reinserted, avoid excessive stress to the capacitor leads.
(4) Aviod touching the tip of the soldering iron to the capacitor, to prevent melting of the vinyl sleeve.

2.4 Flow Soldering

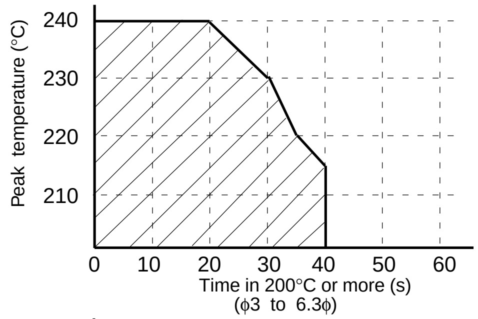
(1) Don not immerse the capacitor body into the solder bath as excessive internal pressure could result.
(2) Observe proper soldering conditions (temperature, time, etc.). Do not exceed the specified limits.
(3) Do not allow other parts or components to touch the capacitor during soldering.

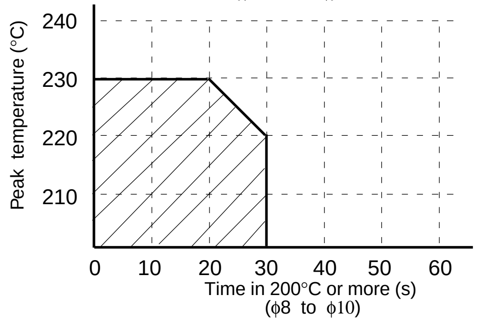
2.5 Reflow Soldering for Chip Capacitors

(1) For reflow, use a thermal conduction system such as infrared radiation (IR) or hot blast. Vapor heat transfer systems (VPS) are not recommended.
(2) Observe proper soldering conditions (temperature, time, etc.). Do not exceed the specified limits.
(3) Reflow should be performed one time. Consult us for additional reflow restrictions.

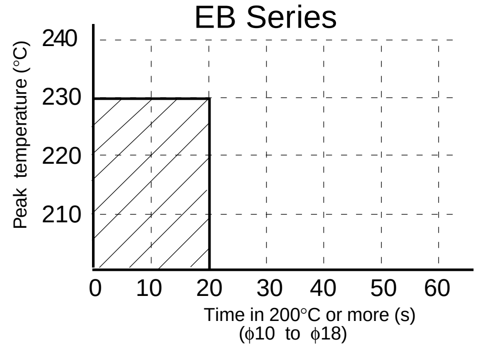


Chip capacitor reflow guaranteed condition





EB Series



2.6 Other Soldering Considerations

Rapid temperature rises during the preheat operation and resin bonding operation can cause cracking of the capacitor vinyl sleeve. For heat curing, do not exceed 150°C for a maximum time of 2 minutes.

2.7 Capacitor Handling after Soldering

(1) Avoid movement of the capacitor after soldering to prevent excessive stress on the leadwires where they enter the seal.
(2) Do not use the capacitor as a handle when moving the circuit board assembly.
(3) Avoid striking the capacitor after assembly to prevent failure due to excessive shock.

2.8 Circuit Board Cleaning

(1) Circuit boards can be immersed or ultrasonically cleaned using suitable cleaning solvents for up to 5 minutes and up to 60°C maximum temperatures. The boards should be thoroughly rinsed and dried.
Recommended cleaning solvents include Pine Alpha ST-100S, Sunelec B-12, DK Beclear CW-5790, Aqua Cleaner 210SEP, Cold Cleaner P3-375, Telpen Cleaner EC-7R, Clean-thru 750H, Clean-thru 750L, Clean thru 710M, Techno Cleaner 219, Techno Care FRW-17, Techno Care FRW-1, Techno Care FRV-1, IPA (isopropyl alcohol)

✻ The use of ozone depleting cleaning agents are not recommended in the interest of protecting the environment.

(2) Avoid using the following solvent groups unless specifically allowed for in the specification;

- Halogenated cleaning solvents: except for solvent resistant capacitor types, halogenated solvents can permeate the seal and cause internal capacitor corrosion and failure. For solvent resistant capacitors, carefully follow the temperature and time requirements of the specificaion. 1-1-1 trichloroe thane should never be used on any aluminium electrolytic capacitor.
- Alkali solvents: could attack and dissolve the aluminum case.
- Petroleum based solvents: deterioration of the rubber seal could result.
- Xylene: deterioration of the rubber seal could result.
- Acetone: removal of the ink markings on the vinyl sleeve could result.

✻ Temperature measuring method: Measure temperature in assuming quantitative production, by sticking the thermo-couple to the capacitor upper part with epoxy adhesives.

(3) A thorough drying after cleaning is required to remove residual cleaning solvents which may be trapped between the capacitor and the circuit board. Avoid drying temperatures which exceed the maximum rated temperature of the capacitor.
(4) Monitor the contamination levels of the cleaning solvents during use by electrical conductivity, pH, specific gravity, or water content. Chlorine levels can rise with contamination and adversely affect the performance of the capacitor.

✻ Please consult us for additonal information about acceptable cleaning solvents or cleaning methods.

Type	Series	Cleaning permitted
Surface mount type	V(Except EB Series)	○
Lead type	Bi-polar SU	○
	M	○(~ 100V)
	KA	○
	Bi-polar KA	○
	FB	○
	FC	○
	GA	○
	NHG	○(~ 100V)
	EB	○(~ 100V)
	TA	○
Snap-in type	TS UP	○(~ 100V)
	TS HA	○(~ 100V)

2.9 Mounting Adhesives and Coating Agents

When using mounting adhesives or coating agents to control humidity, avoid using materials containing halogenated solvents. Also, avoid the use of chloroprene based polymers.

✻ After applying adhesives or coatings, dry thoroughly to prevent residual solvents from being trapped between the capacitor and the circuit board.

3. Precautions for using capacitors

3.1 Environmental Conditions

Capacitors should not be used in the following environments.
(1) Temperature exposure above the maximum rated or below the minimum rated temperature of the capacitor.
(2) Direct contact with water, salt water, or oil.
(3) High humidity conditions where water could condense on the capacitor.
(4) Exposure to toxic gases such as hydrogen sulfide, sulfuric acid, nitric acid, chlorine, or ammonia.
(5) Exposure to ozone, radiation, or ultraviolet rays.
(6) Vibration and shock conditions exceeding specified requirements.

3.2 Electrical Precautions

(1) Avoid touching the terminals of the capacitor as possible electric shock could result. The exposed aluminium case is not insulated and could also cause electric shock if touched.
(2) Avoid short circuiting the area between the capacitor terminals with conductive materials including liquids such as acids or alkaline solutions.

4. Emergency Procedures

(1) If the pressure relief vent of the capacitor operates, immediately turn off the equipment and disconnect from the power source. This will minimize additional damage caused by the vaporizing electrolyte.
(2) Avoid contact with the escaping electrolyte gas which can exceed 100°C temperatures.
If electrolyte or gas enters the eye, immediately flush the eye with large amounts of water.
If electrolyte or gas is ingested by mouth, gargle with water. If electrolyte contacts the skin, wash with soap and water.

5. Long Term Storage

Leakage current of a capacitor increases with long storage times. The aluminium oxide film deteriorates as a function of temperature and time. If used without reconditioning, an abnormally high current will be required to restore the oxide film. This current surge could cause the circuit or the capacitor to fail. Capacitor should be reconditioned by applying rated voltage in series with a 1000 Ω, current limiting resistor for a time period of 30 minutes.

5.1 Environmental Conditions (Storage)

Capacitors should not be stored in the following environments.
(1) Temperature exposure above 35°C or below 15 °C.
(2) Direct contact with water, salt water, or oil.
(3) High humidity conditions where water could condense on the capacitor.
(4) Exposure to toxic gases such as hydrogen sulfide,sulfuric acid, nitric acid, chlorine, or ammonia.
(5) Exposure to ozone, radiation, or ultraviolet rays.
(6) Vibration and shock conditions exceeding specified requirements.

6. Capacitor Disposal

When disposing of capacitors, use one of the following methods.

- Incinerate after crushing the capacitor or puncturing the can wall (to prevent explosion due to internal pressure rise). Capacitors should be incinerated at high temperatures to prevent the release of toxic gases such as chlorine from the polyvinyl chloride sleeve, etc.
- Dispose of as solid waste.
- Local laws may have specific disposal requirements which must be followed.

The application guidelines above are taken from:

Technical Report EIAJ RCR-2367 issued by the Japan Electronic Industry Association, Inc. -
Guideline of notabilia for aluminium electrolytic capacitors with non-solid electrolytic for use in electronic equipment.

Refer to this Technical Report for additional details.