Issue date Jan. 13. 2021

Specification
No. G210390B0002Z1 − 1 to 17

Electrolytic Capacitors
Specifications

Customer Part No. :

Customer Specification No. :

Nippon Chemi-Con Part No. : KY SERIES

Nippon Chemi-Con Corporation
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Receipt Stamp

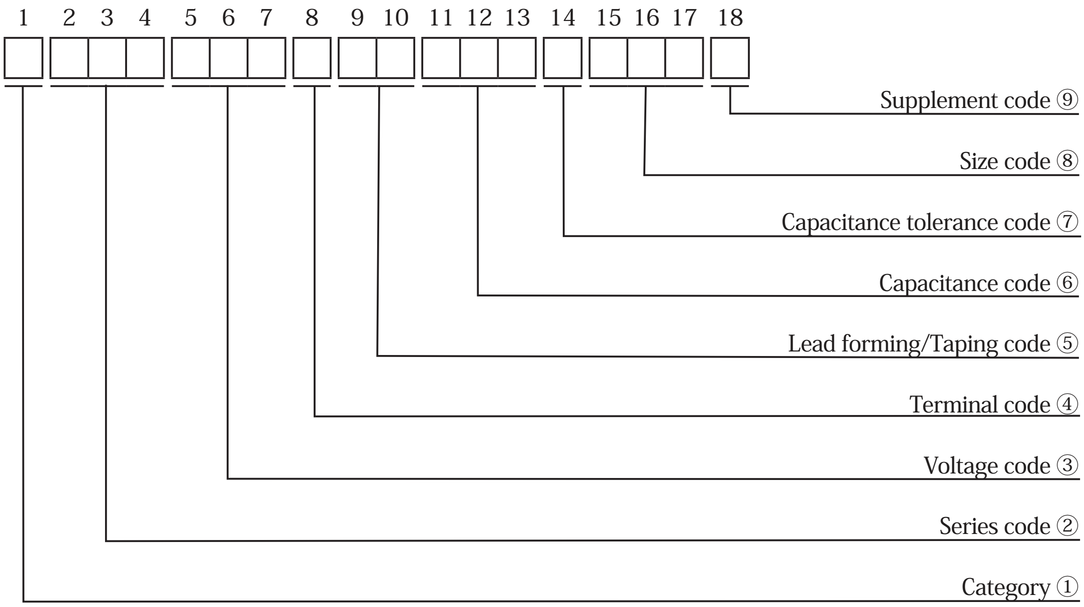
Change history of specifications

Specifications No.	Revision date	Pages/section revised	Changes made	Reasons for changes
G210390B0002Z1	Jan.13.2021	—	First issue	—

1 Scope

This specification defines the requirements for aluminum electrolytic capacitors KY series.

2 Part Numbering System



① Category

Category	Code
	1st
Polar	E

② Series code

Series name	Series code		
	2nd	3rd	4th
KY	K	Y	—

③ Voltage code

Voltage [V]	Voltage code		
	5th	6th	7th
6.3	6	R	3
10	1	0	0
16	1	6	0
25	2	5	0
35	3	5	0
50	5	0	0
63	6	3	0
80	8	0	0
100	1	0	1

④ Terminal code

Terminal configuration	Terminal code
	8th
Radial lead	E

⑤ Lead forming/Taping code

Type	Shape/contents	Lead forming/Taping code	
		9th	10th
Lead forming (Radial lead/Bulk)	Straight	L	L
Taping (Radial lead)	Straight	T	D
	Sloping clinch	T	D
	Straight（Skip a hole：Applicable to only ϕ 12.5）	T	E
	Straight（Styrofoam-less：Applicable to only ϕ 16 and ϕ 18）	T	S
	Clinch(F=5.0mm)	T	C

⑥ Capacitance code

Capacitance[μ F]	Capacitance code			Capacitance[μ F]	Capacitance code		
	11th	12th	13th		11th	12th	13th
1.0	1	R	0	330	3	3	1
2.2	2	R	2	390	3	9	1
3.3	3	R	3	470	4	7	1
4.7	4	R	7	560	5	6	1
6.8	6	R	8	680	6	8	1
10	1	0	0	820	8	2	1
15	1	5	0	1000	1	0	2
22	2	2	0	1200	1	2	2
27	2	7	0	1500	1	5	2
33	3	3	0	1800	1	8	2
39	3	9	0	2200	2	2	2
47	4	7	0	2700	2	7	2
56	5	6	0	3300	3	3	2
68	6	8	0	3900	3	9	2
82	8	2	0	4700	4	7	2
100	1	0	1	5600	5	6	2
120	1	2	1	6800	6	8	2
150	1	5	1	8200	8	2	2
180	1	8	1	10000	1	0	3
220	2	2	1	12000	1	2	3
270	2	7	1	15000	1	5	3
				18000	1	8	3

⑦ Capacitance tolerance code

Capacitance tolerance [%]	Capacitance tolerance code
	14th
± 20	M

⑧ Size code

φ D	Size code
	15th
5	E
6.3	F
8	H
10	J
12.5	K
16	L
18	M

L	Size code	
	16th	17th
11	1	1
11.5	B	5
12.5	C	5
15	1	5
16	1	6
20	2	0
25	2	5
30	3	0
31.5	N	3
35	3	5
35.5	P	1
40	4	0

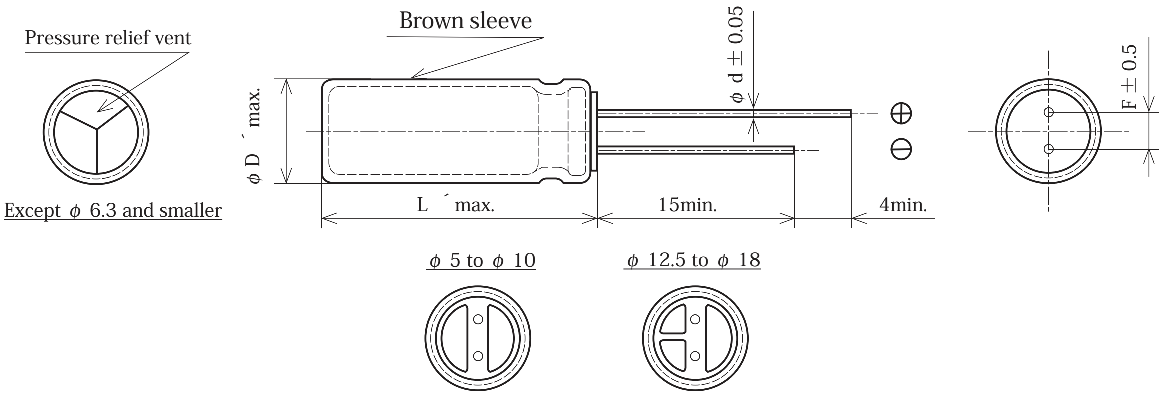
⑨ Supplement code

Sleeve material	Terminal plating material	Supplement code
		18th
PET	Sn-Bi	D
PET	Sn	S

3 Appearance and dimensions

Long lead

Lead forming code： L L

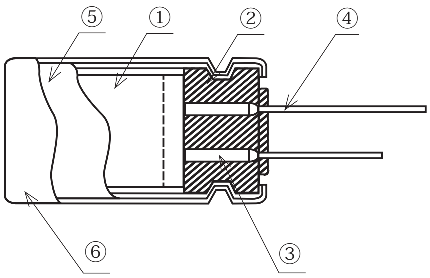


Dimension [mm]

φ D	5	6.3	8	10	12.5	16	18
L	11 to 40						
φ d	0.5		0.6			0.8	
F	2.0	2.5	3.5	5.0		7.5	
L ´	L＋1.5 ※1						
φ D ´	φ D＋0.5 ※1						

※1 φ D , L ：Nominal case size

4 Construction



No.	Compositions		Materials
①	Element	Anode foil	Aluminum
		Cathode foil	Aluminum
		Separator	Paper
		Fixing tape	Polypropylene(PP)
②	Seal		Rubber
③	Aluminum tab		Aluminum
④	Lead wire		Tinned copper clad steel Bismuth-containig tinned copper clad steel
⑤	Case		Aluminum
⑥	Sleeve		Polyester

※ No ozone depleting substance has been used.
Compliant to the RoHS Directive (2011/65/EU) and the revisions (2015/863/EU)

5 Rating and characteristics

No.	Item	Specification
1	Category temperature range	− 40 to + 105℃
2	Rated voltage range	6.3 to 100V$_{DC}$
3	Surge voltage	Table-1
4	Rated capacitance range	See the standard rating table
5	Capacitance tolerance	− 20 to + 20%
6	Dissipation factor(tan δ)	See the standard rating table
7	Leakage current	See the standard rating table
8	Rated ripple current	See the standard rating table
9	Impedance	See the standard rating table

Table-1 Surge voltage

Rated voltage [V$_{DC}$]	6.3	10	16	25	35	50	63	80	100
Surge voltage [V$_{DC}$]	8	13	20	32	44	63	79	100	125

Rated ripple current multipliers

Frequency multipliers

Frequency [Hz] / Capacitance [μ F]	120	1k	10k	100k
1.0 to 180	0.40	0.75	0.90	1.00
220 to 560	0.50	0.85	0.94	1.00
680 to 1800	0.60	0.87	0.95	1.00
2200 to 3900	0.75	0.90	0.95	1.00
4700 to 18000	0.85	0.95	0.98	1.00

When a frequency is different from the specified condition shown in the table of standard ratings, do not exceed the value obtained by multiplying the permissible maximum ripple current by the multiplier above.

6 Marking

The following items shall be marked on each capacitor. (White marking)

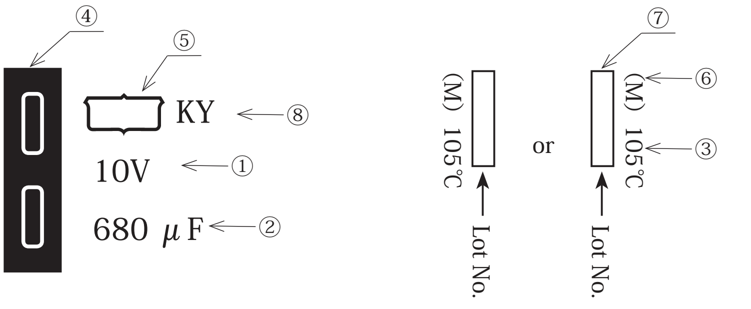
① Rated voltage	⑤ Manufacturer's identification mark
② Rated capacitance	⑥ Capacitance tolerance code
③ Upper category temperature	⑦ Lot No.
④ Negative polarity marking	⑧ Series name

Finish method

1.Lot No. is marked on either of the sieeve or the top of the alnminum case.

2.The negative polarity marking (stripe) is maked to disinguish the negative lead.

(Example)



(Front) (Back)

7 Performance

Unless otherwise specified, the capacitors shall be measured at a temperature at + 15 to + 35℃ , a humidity of 45 to 75%RH and a atmospheric pressure of 86 to 106kPa. However, if any doubt arises on the judgment, the measurement conditions shall be +20±2℃ , 60 to 70%RH and 86 to 106kPa.

7.1 Leakage current （L.C.）

〔Conditions〕 Rated voltage shall be applied to capacitors in series with a resistor of 1000 ± 10 Ω .Then leakage current shall be measured at the end of a specified period after the capacitors reached the rated voltage across the terminals.

〔Criteria〕 Shall not exceed the values specified in the table of Standard Ratings.

7.2 Capacitance（Cap.）

〔Conditions〕 Measuring frequency : 120Hz ± 20%
Measuring voltage : 0.5Vrms max. ＋ 1.5 to 2.0V_{DC}
Measuring circuit : Series equivalent circuit( )
〔Criteria〕 Shall be within the specified capacitance tolerance.

7.3 Dissipation factor（tan δ）

〔Conditions〕 Measuring frequency : 120Hz ± 20%
Measuring voltage : 0.5Vrms max. ＋ 1.5 to 2.0V_{DC}
Measuring circuit : Series equivalent circuit( )
〔Criteria〕 Shall not exceed the values specified in the table of Standard Ratings.

7.4 Impedance

〔Conditions〕 Measuring frequency : 100kHz ± 10%
Measuring voltage : 0.5V rms max.
〔Criteria〕 Shall not exceed the values specified in the table of Standard Ratings.

7.5 Terminal strength

(1) Pull strength
〔Conditions〕 The capacitor body shall be held. A force shall be gradually applied to the lead wire in the direction of the axis of the lead wire up to the specified pull force, and retained for 10 ± 1 seconds.

Nominal lead diameter [mm]	Pull force [N]
Over 0.3 to 0.5 incl.	5
Over 0.5 to 0.8 incl.	10

〔Criteria〕 The lead wire shall neither loosen nor break away.

(2) Lead bending strength
〔Conditions〕 The capacitor shall be held so that the normal axis of the lead wire can be in a vertical position. A weight equivalent to the specified load shall be hung on the end of the lead wire. The capacitor body shall be inclined through 90° and returned to its normal position within 2 to 3 seconds. The consecutive bend shall then be in the opposite direction in the same manner.

Nominal lead diameter [mm]	Bending load [N]
Over 0.3 to 0.5 incl.	2.5
Over 0.5 to 0.8 incl.	5

〔Criteria〕 The lead wire shall neither loosen nor break away.

7.6 Soldering heat

〔Conditions〕 Type of solder : Sn-3Ag-0.5Cu
Flux : Ethanol solution(25 wt.% rosin)
Solder temperature/immersion time : ＋ 260 ± 5℃ for 10 ± 1 seconds or ＋ 380 ± 10℃ for 3 ± 0.5 seconds.
Depth of immersion : Up to 1.5 to 2.0mm from the root of the lead wire covered with a thermal shield plate
Speed of immersion : 25 ± 2.5mm/sec.
〔Criteria〕 Appearance : No significant damage.
Leakage current : Shall not exceed the initial specified value.
Capacitance change : Shall be within ± 10% of the initial measured value.
Tan δ : Shall not exceed the initial specified value.

7.7 Solderability

〔Conditions〕 Type of solder : Sn-3Ag-0.5Cu
Flux : Ethanol solution (25 wt.% rosin)
Solder temperature : ＋ 245 ± 3℃
Depth of immersion : Up to 1.5 to 2.0mm
Immersion time : 2 to 3sec.
〔Criteria〕 Solder shall cover at least 3/4 of the lead surface immersed.

7.8 Vibration

〔Conditions〕 Vibration frequency range : 10 to 55Hz
Amplitude or Acceleration : 0.75 mm (Half amplitude)or 98m/s^2(Whichever is less severe)
Sweep rate : 10 to 55 to 10Hz in about 1 minute
Direction and period of motion : 2 hours in each of 3 mutually perpendicular directions (total of 6 hours)

Note : Capacitors shall be mounted on the pc board with their lead wires anchored at 4mm max. of their bodies, except for the capacitors with the case size φ 16 x30L, whose lead wire shall be anchored at 1mm max. of their bodies The body of the capacitor with 12.5mm or larger in diameter or 25mm or longer in length, in addition, shall be anchored to the pc board with a fixture.

〔Criteria〕 Appearance : No significant damage, legible marking, and no electrolyte leakage.
Capacitance change : Shall be within ± 5% of the initial measured value.

7.9 Damp heat

〔Conditions〕 Test temperature : ＋ 40 ± 2℃
Relative humidity : 90 to 95%RH
Test time : 240 ± 8 hours

〔Criteria〕 Appearance : No significant damage, legible marking, and no electrolyte leakage.
Leakage current : Shall not exceed the initial specified value.
Capacitance change : Shall be within ± 20% of the initial measured value.
Tan δ : Shall not exceed 120% of the initial specified value.

7.10 Endurance

〔Conditions〕 After the capacitors are put to a DC voltage with the rated ripple current within the rated voltage for the specified test of time at ＋ 105 ± 2℃ , the following specifications shall be satisfied when the capacitors are restored to ＋ 20℃ . The sum of a DC voltage and a peak AC voltage must not exceed their full rated voltage.

Specified test time（6.3V_{DC} to 10V_{DC}） : 4,000 $^{+72}_{0}$ hours (φ 5, φ 6.3)
: 6,000 $^{+72}_{0}$ hours (φ 8 , φ 10)
: 8,000 $^{+72}_{0}$ hours (φ 12.5 or more)
（16V_{DC} to 100V_{DC}） : 5,000 $^{+72}_{0}$ hours (φ 5, φ 6.3)
: 7,000 $^{+72}_{0}$ hours (φ 8 , φ 10)
: 10,000 $^{+72}_{0}$ hours (φ 12.5 or more)

〔Criteria〕 Appearance : No significant damage, legible marking, and no electrolyte leakage.
Leakage current : Shall not exceed the initial specified value.
Capacitance change : Shall be within ± 25% of the initial measured value.
Tan δ : Shall not exceed 200% of the initial specified value.

7.11 Surge voltage test

〔Conditions〕 Test temperature : ＋ 15 to ＋ 35℃
Series protective resistor : 1000 ± 10 Ω
Test voltage : Surge voltage shown in Table-1
Applying of voltage : 30 ± 5 seconds every 6 ± 0.5minutes.
Test cycle : 1000cycle.

〔Criteria〕 Appearance : No significant damage and no electrolyte leakage.
Leakage current : Shall not exceed the initial specified value.
Capacitance change : Shall be 80% or more of the initial measured value.
Tan δ : Shall not exceed 200% of the initial specified value.

7.12 Pressure relief vent

〔Conditions〕 Apply a reverse voltage with the DC current of 1 amp.(DC reverse voltage test)

〔Criteria〕 When the pressure relief vent operated, the capacitor shall not flame although emission of gas or a part of the inside element is allowable.
If the vent does not operate with the voltage applied for 30 minutes, the test is considered to be passed.

7.13 High Temperature Storage

〔Conditions〕 The following specifications shall be satisfied when the capacitors are restored to ＋ 20℃ after exposing them for 500 $^{+24}_{0}$ hours at ＋ 105 ± 2℃ without an applied voltage. Before the measurements, the capacitor shall be preconditioned by applying voltage according to Item 4.1 of JIS C 5101-4.

〔Criteria〕 Appearance : No significant damage, legible marking, and no electrolyte leakage.
Leakage current : Shall not exceed the initial specified value.
Capacitance change : Shall be within ± 25% of the initial measured value.
Tan δ : Shall not exceed 200% of the initial specified value.

7.14 High and Low Temperature characteristics

〔Conditions〕

Step	Temperature [℃]	
1	＋ 20 ± 2	Step 1：Measure capacitance , tan δ and impedance
2	－ 10 ± 3, － 25 ± 3, － 40 ± 3	Step 2：Measure impedance
3	＋ 105 ± 2	Step 3：Measure capacitance, tan δ and a leakage current.

〔Criteria〕 Step 2：Impedance ratio shall not exceed the values shown in Table attached.

[120Hz]

Rated voltage [V_{DC}]	6.3	10	16	25	35	50	63	80	100
Z － 25℃ /Z ＋ 20℃	4	3	2	2	2	2	2	2	2
Z － 40℃ /Z ＋ 20℃	8	6	4	3	3	3	3	3	3

8 Others

8.1 Export Trade Control Ordinance (When our product our is exported from Japan)

(1) Export Trade Control Ordinance (Section 1 through 15 of Appendix Table 1)

Export regulation of the capacitors for pulse use (750V or higher) and the capacitors for high voltage (5,000V or higher) is carried out sccording to (item 41-4) in Section 2 of Appendix Table 1 (Section 49 in Chapter 1 of METI's Ordinance) and (item 7) in Section 7 of Appendix Table 1 (Section 6 in Chapter 6 of METI's Ordinance). However, the aluminum electrolytic capacitors, which are described in this specification, don't fulfill the regulated level. Therefore, the aluminum electrolytic capacitors are not applicable to Export Trade Control Ordinance.

(2) Export Trade Control Ordinance (Section 16 of Appendix Table 1)

The aluminum electrolytic capacitors, which are described in this specification, applicable to goods under Export Regulations (Category 85 of Appendix Table in Customs Tariff Law) based on Section 16 of Appendix Table 1 in Export Trade Control Ordinance.

If the exporter got information that their exporting goods are used to any development of massive weapon, the exporter must apply for exporting permission to Ministry of Economy, Trade and Industry (METI), and get METI's approval.

Regardless of the above, if the exporter is notified by METI that his/her exporting goods are potentially used to any development of extensive destructive weapons, the exporter must seek permission from METI to export, and get METI's approval. When Nippon Chemi-Con receives such notice from METI, we will inform your company of that.

8.2 Cleaning PC board

(1) Alcohol system

Higher alcohol system / Isopropyl alcohol cleaning agents

Recommended cleaning agents:

Pine Alpha ST-100S (Arakawa Chemical)
Clean Through 750H, 750K, 750L, and 710M (Kao)
Technocare FRW-14,15,16,17 (Momentive performance materials)

Cleaning conditions:

Using these cleaning agents, capacitors are capable of withstanding immersion or ultrasonic cleaning for 10 minutes at a maximum liquid temperature of 60℃ . Find optimum conditions for washing, rinsing, and drying. Be sure not to rub off the marking of the capacitors by coming in contact with any other components or the PC board. Note that shower cleaning adversely affects the markings on the sleeve.

It is necessary to maintain a flux content in the cleaning liquid in of 2 Wt.% or less, and to control for alkaline components not to remain in the final cleaning process.

8.3 Manufacturing plant

CHEMI–CON EAST JAPAN CORPORATION IWATE PLANT (JAPAN)
CHEMI–CON EAST JAPAN CORPORATION MIYAGI PLANT (JAPAN)
P.T. INDONESIA CHEMI-CON (INDONESIA)
TAIWAN CHEMI-CON (TAIWAN)
SAMYOUNG ELECTRONICS CO., LTD. (KOREA)
QINGDAO SAMYOUNG ELECTRONICS CO., LTD. (CHINA)
CHEMI-CON (WUXI) CO., LTD. (CHINA)

8.4 For aluminum electrolytic capacitors, please refer to PRECAUTIONS AND GUIDELINES.

9 Taping

9.1 Scope

This specification is applied to radial lead type aluminum electrolytic capacitors which are taped according to JIS C 0805-1989.

9.2 Taping configurations

Figure1
TCtype
φ 5 to φ 8

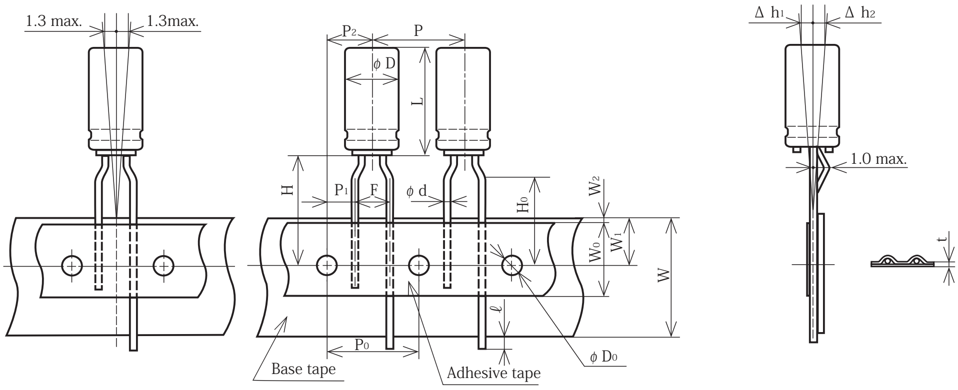


Figure2
TDtype
φ 5

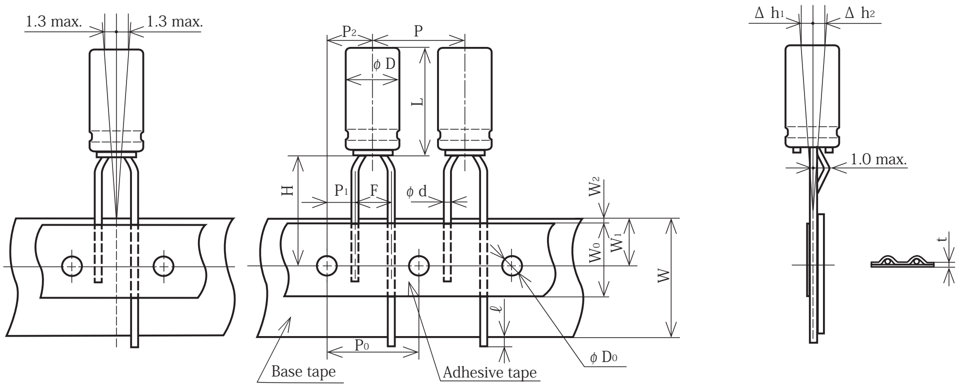


Figure3
TDtype
φ 6.3, φ 8, φ 10
TDtype
φ 12.5

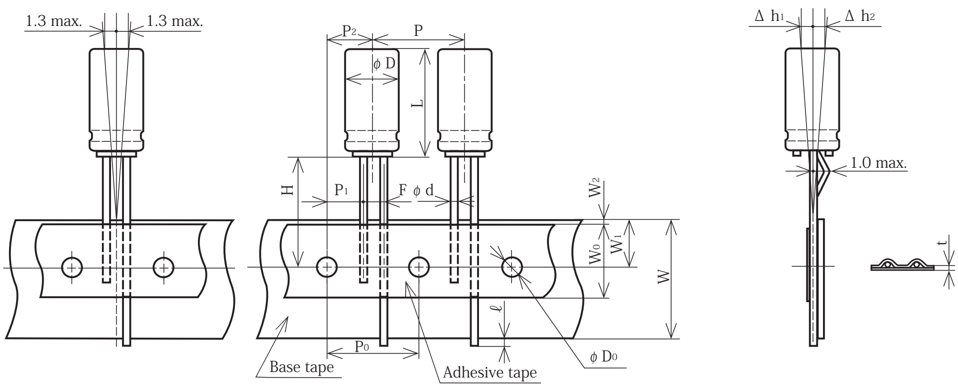
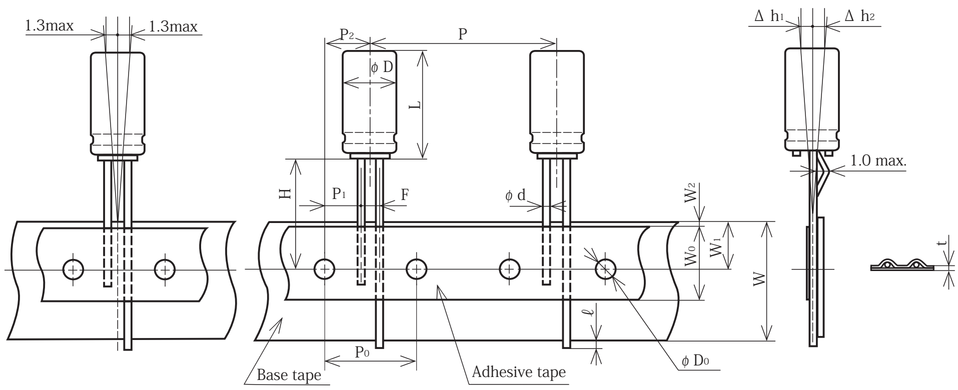


Figure4
TE type
φ 12.5
TD type, TS type
φ 16, φ 18



9.3 Taping dimensions

[mm]

Symbol	Tolerance	Nominal value						Remarks
ϕ D	－	5		6.3		8		
L	－	11		11		11.5 to 20		
ϕ d	± 0.05	0.5		0.5		0.6		
P	± 1.0	12.7		12.7		12.7		
P_0	± 0.2	12.7		12.7		12.7		※ 1
P_1	± 0.7	5.1	3.85	5.1	3.85	4.6	3.85	※ 2
P_2	± 1.0	6.35		6.35		6.35		
F	－ 0.2/ ＋ 0.8	2.5	5.0	2.5	5.0	3.5	5.0	※ 2
W	± 0.5	18.0		18.0		18.0		
W_0	min.	10.0		10.0		10.0		※ 3
W_1	± 0.5	9.0		9.0		9.0		
W_2	max.	1.5		1.5		1.5		※ 3
H	± 0.75	18.5		18.5		20.0		
H_0	± 0.5	－	16.0	－	16.0	－	16.0	※ 4
ϕ D_0	± 0.2	4.0		4.0		4.0		
ℓ	max.	1.0		1.0		1.0		
t	± 0.2	0.7		0.7		0.7		
Δh_1, Δh_2	Max.	2.0		2.0		2.0		※ 5
Figure		2	1	3	1	3	1	

[mm]

Symbol	Tolerance	Nominal value					Remarks
ϕ D	－	10	12.5		16	18	
L	－	12.5 to 30	15 to 25		15 to 25	15 to 25	
ϕ d	± 0.05	0.6	0.6		0.8	0.8	
P	± 1.0	12.7	15	25.4	30	30	
P_0	± 0.3	12.7	15	12.7	15	15	※ 1
P_1	± 0.7	3.85	5.0	3.85	3.75	3.75	※ 2
P_2	± 1.3	6.35	7.5	6.35	7.5	7.5	
F	－ 0.2/ ＋ 0.8	5.0	5.0		7.5	7.5	※ 2
W	± 0.5	18.0	18.0		18.0	18.0	
W_0	min.	12.5	12.5		12.5	12.5	※ 3
W_1	± 0.5	9.0	9.0		9.0	9.0	
W_2	max.	1.5	1.5		1.5	1.5	※ 3
H	－ 0/ ＋ 2.0	18.0	18.0		18.0	18.0	
ϕ D_0	± 0.2	4.0	4.0		4.0	4.0	
ℓ	max.	1.0	1.0		1.0	1.0	
t	± 0.2	0.7	0.7		0.7	0.7	
Δh_1, Δh_2	max.	2.0	2.0		2.0	2.0	※ 5
Figure		3	3	4	4	4	

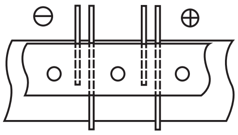
※ 1 Cumulative pitch error shall not exceed ± 1.0mm per 20 pitches.
※ 2 Measurement shall be made at the top of the tape and the center of the lead.
※ 3 Adhesive tape shall not extend beyond the edge of the base tape.
※ 4 Measurement shall be made from the bottom of the lead clinch.
※ 5 Measurement shall be made at the top to the capacitor.

9.4 Taping method and polarity

(1) Taping method

Capacitors shall be taped on the base tape with the adhesive tape so that their lead wires can be perpendicular to the longitudinal direction of the base tape, and their polarities shall be arranged in one orientation.

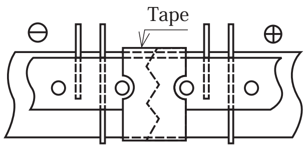
※ The polarity orientation does not apply to non-polarized capacitors.



(2) Splicing of base tape

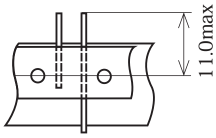
Splicing shall be made with a tape by means of a prescribed tool as shown below. The spliced base tapes shall be aligned within a error of 1.0mm. The splicing joint shall not have capacitors.

※ The polarity orientation does not apply to non-polarized capacitors.



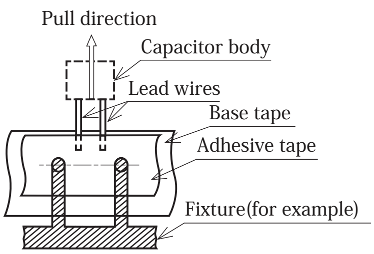
(3) Missing of capacitor

Consecutive missing capacitors shall not exceed 3 pcs after taped. Although quantity of discontinuous missing capacitors is not specified, the total quantity per a box shall be satisfied. When a capacitor is removed from the tape after taped, its lead wires shall be cut off or the capacitor shall be pulled out. Cutting the lead wires shall be made as follows.



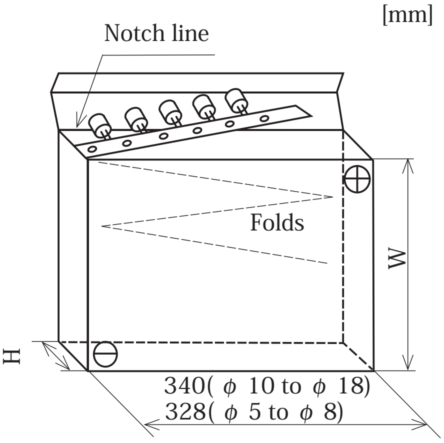
(4) Pull strength of taped capacitor

The capacitors which were fixed in between the base tape and adhesive tape shall have adhesion of at least 5N when the capacitor was pulled out in the axis direction of the capacitor as follows.



10 Packaging

10.1 Packaging for taping



Case size（φ D × L）		W	H	Quantity packed
[mm]				[pcs]
φ 5	length 11	232	51	2000
φ 6.3	length 11	284	51	2000
φ 8	length 11.5 to 15	232	51	1000
	length 20	235	60	1000
φ 10	length 16 max.	308	56	800
	length 20	308	62	800
	length 25	308	67	800
	length 30	308	71	500
φ 12.5	length 16 max.	308	62	500
	length 20 to 25	308	67	500
φ 16	length 15	350	57	250
	length 20 to 25	350	67	250
φ 18	length 15	350	57	250
	length 20 to 25	350	67	250

Note ; The box dimensions may change slightly.

For φ 10 and φ 12.5 with P=15, the capacitors located on folds shall be removed.
（The polarity orientation does not apply to non-polarized capacitors.）

The following items shall be marked on the box.
1）Part Numbering System
2）Lot No.
3）Manufacturer's name
4）Quantity

Standard Ratings

WV [Vdc]	Cap [μF]	Case size φD × L[mm]	tan δ Max.	LC [μA] Max.	Impedance [Ω Max./100kHz]		Rated ripple current [mArms/105℃]	Part No.
				2minutes	20℃	-10℃	100kHz	
6.3	150	5 × 11	0.22	9.4	0.58	2.3	210	EKY-6R3E □□ 151ME11D
6.3	330	6.3 × 11	0.22	20.7	0.22	0.87	340	EKY-6R3E □□ 331MF11D
6.3	680	8 × 11.5	0.22	42.8	0.13	0.52	640	EKY-6R3E □□ 681MHB5D
6.3	820	10 × 12.5	0.22	51.6	0.080	0.32	865	EKY-6R3E □□ 821MJC5S
6.3	1000	8 × 15	0.22	63.0	0.087	0.35	840	EKY-6R3E □□ 102MH15D
6.3	1200	8 × 20	0.22	75.6	0.069	0.27	1050	EKY-6R3E □□ 122MH20D
6.3	1200	10 × 16	0.22	75.6	0.060	0.24	1210	EKY-6R3E □□ 122MJ16S
6.3	1500	10 × 20	0.22	94.5	0.046	0.18	1400	EKY-6R3E □□ 152MJ20S
6.3	1800	12.5 × 15	0.22	113	0.049	0.16	1450	EKY-6R3E □□ 182MK15S
6.3	2200	10 × 25	0.24	138	0.042	0.17	1650	EKY-6R3E □□ 222MJ25S
6.3	2700	10 × 30	0.24	170	0.031	0.12	1910	EKY-6R3E □□ 272MJ30S
6.3	2700	16 × 15	0.24	170	0.042	0.12	1940	EKY-6R3E □□ 272ML15S
6.3	3300	12.5 × 20	0.26	207	0.035	0.12	1900	EKY-6R3E □□ 332MK20S
6.3	3900	12.5 × 25	0.26	245	0.027	0.089	2230	EKY-6R3E □□ 392MK25S
6.3	3900	18 × 15	0.26	245	0.043	0.11	2210	EKY-6R3E □□ 392MM15S
6.3	4700	12.5 × 30	0.28	296	0.024	0.078	2650	EKY-6R3E □□ 472MK30S
6.3	5600	12.5 × 35	0.30	352	0.020	0.065	2880	EKY-6R3E □□ 562MK35S
6.3	5600	16 × 20	0.30	352	0.027	0.078	2530	EKY-6R3E □□ 562ML20S
6.3	6800	12.5 × 40	0.32	428	0.017	0.056	3350	EKY-6R3E □□ 682MK40S
6.3	6800	16 × 25	0.32	428	0.021	0.060	2930	EKY-6R3E □□ 682ML25S
6.3	6800	18 × 20	0.32	428	0.026	0.067	2860	EKY-6R3E □□ 682MM20S
6.3	8200	16 × 31.5	0.36	516	0.017	0.050	3450	EKY-6R3E □□ 822MLN3S
6.3	10000	16 × 35.5	0.40	630	0.015	0.044	3610	EKY-6R3E □□ 103MLP1S
6.3	10000	18 × 25	0.40	630	0.019	0.049	3140	EKY-6R3E □□ 103MM25S
6.3	12000	16 × 40	0.44	756	0.013	0.038	4080	EKY-6R3E □□ 123ML40S
6.3	12000	18 × 31.5	0.44	756	0.015	0.040	4170	EKY-6R3E □□ 123MMN3S
6.3	15000	18 × 35.5	0.50	945	0.014	0.038	4220	EKY-6R3E □□ 153MMP1S
6.3	18000	18 × 40	0.56	1130	0.012	0.032	4280	EKY-6R3E □□ 183MM40S
10	100	5 × 11	0.19	10.0	0.58	2.3	210	EKY-100E □□ 101ME11D
10	220	6.3 × 11	0.19	22.0	0.22	0.87	340	EKY-100E □□ 221MF11D
10	470	8 × 11.5	0.19	47.0	0.13	0.52	640	EKY-100E □□ 471MHB5D
10	680	8 × 15	0.19	68.0	0.087	0.35	840	EKY-100E □□ 681MH15D
10	680	10 × 12.5	0.19	68.0	0.080	0.32	865	EKY-100E □□ 681MJC5S
10	1000	8 × 20	0.19	100	0.069	0.27	1050	EKY-100E □□ 102MH20D
10	1000	10 × 16	0.19	100	0.060	0.24	1210	EKY-100E □□ 102MJ16S
10	1200	10 × 20	0.19	120	0.046	0.18	1400	EKY-100E □□ 122MJ20S
10	1500	10 × 25	0.19	150	0.042	0.17	1650	EKY-100E □□ 152MJ25S
10	1500	12.5 × 15	0.19	150	0.049	0.16	1450	EKY-100E □□ 152MK15S
10	2200	10 × 30	0.21	220	0.031	0.12	1910	EKY-100E □□ 222MJ30S
10	2200	12.5 × 20	0.21	220	0.035	0.12	1900	EKY-100E □□ 222MK20S
10	2200	16 × 15	0.21	220	0.042	0.12	1940	EKY-100E □□ 222ML15S
10	2700	18 × 15	0.21	270	0.043	0.11	2210	EKY-100E □□ 272MM15S
10	3300	12.5 × 25	0.23	330	0.027	0.089	2230	EKY-100E □□ 332MK25S
10	3900	12.5 × 30	0.23	390	0.024	0.078	2650	EKY-100E □□ 392MK30S
10	3900	16 × 20	0.23	390	0.027	0.078	2530	EKY-100E □□ 392ML20S
10	4700	12.5 × 35	0.25	470	0.020	0.065	2880	EKY-100E □□ 472MK35S
10	5600	12.5 × 40	0.27	560	0.017	0.056	3350	EKY-100E □□ 562MK40S
10	5600	16 × 25	0.27	560	0.021	0.060	2930	EKY-100E □□ 562ML25S
10	5600	18 × 20	0.27	560	0.026	0.067	2860	EKY-100E □□ 562MM20S
10	6800	16 × 31.5	0.29	680	0.017	0.050	3450	EKY-100E □□ 682MLN3S
10	6800	18 × 25	0.29	680	0.019	0.049	3140	EKY-100E □□ 682MM25S
10	8200	16 × 35.5	0.33	820	0.015	0.044	3610	EKY-100E □□ 822MLP1S
10	8200	18 × 31.5	0.33	820	0.015	0.040	4170	EKY-100E □□ 822MMN3S
10	10000	16 × 40	0.37	1000	0.013	0.038	4080	EKY-100E □□ 103ML40S
10	10000	18 × 35.5	0.37	1000	0.014	0.038	4220	EKY-100E □□ 103MMP1S
10	12000	18 × 40	0.41	1200	0.012	0.032	4280	EKY-100E □□ 123MM40S
16	56	5 × 11	0.16	8.9	0.58	2.3	210	EKY-160E □□ 560ME11D
16	120	6.3 × 11	0.16	19.2	0.22	0.87	340	EKY-160E □□ 121MF11D
16	330	8 × 11.5	0.16	52.8	0.13	0.52	640	EKY-160E □□ 331MHB5D
16	470	8 × 15	0.16	75.2	0.087	0.35	840	EKY-160E □□ 471MH15D
16	470	10 × 12.5	0.16	75.2	0.080	0.32	865	EKY-160E □□ 471MJC5S

□□ : Enter the appropriate lead forming or taping code

Standard Ratings

WV [Vdc]	Cap [μF]	Case size φD × L[mm]	tan δ Max.	LC [μA] Max.	Impedance [Ω Max./100kHz]		Rated ripple current [mArms/105℃]	Part No.
				2minutes	20℃	-10℃	100kHz	
16	680	8 × 20	0.16	108	0.069	0.27	1050	EKY-160E □□ 681MH20D
16	680	10 × 16	0.16	108	0.060	0.24	1210	EKY-160E □□ 681MJ16S
16	1000	10 × 20	0.16	160	0.046	0.18	1400	EKY-160E □□ 102MJ20S
16	1000	12.5 × 15	0.16	160	0.049	0.16	1450	EKY-160E □□ 102MK15S
16	1200	10 × 25	0.16	192	0.042	0.17	1650	EKY-160E □□ 122MJ25S
16	1500	10 × 30	0.16	240	0.031	0.12	1910	EKY-160E □□ 152MJ30S
16	1500	12.5 × 20	0.16	240	0.035	0.12	1900	EKY-160E □□ 152MK20S
16	1500	16 × 15	0.16	240	0.042	0.12	1940	EKY-160E □□ 152ML15S
16	2200	12.5 × 25	0.18	352	0.027	0.089	2230	EKY-160E □□ 222MK25S
16	2200	18 × 15	0.18	352	0.043	0.11	2210	EKY-160E □□ 222MM15S
16	2700	12.5 × 30	0.18	432	0.024	0.078	2650	EKY-160E □□ 272MK30S
16	2700	16 × 20	0.18	432	0.027	0.078	2530	EKY-160E □□ 272ML20S
16	3300	12.5 × 35	0.20	528	0.020	0.065	2880	EKY-160E □□ 332MK35S
16	3900	12.5 × 40	0.20	624	0.017	0.056	3350	EKY-160E □□ 392MK40S
16	3900	16 × 25	0.20	624	0.021	0.060	2930	EKY-160E □□ 392ML25S
16	3900	18 × 20	0.20	624	0.026	0.067	2860	EKY-160E □□ 392MM20S
16	4700	16 × 31.5	0.22	752	0.017	0.050	3450	EKY-160E □□ 472MLN3S
16	4700	18 × 25	0.22	752	0.019	0.049	3140	EKY-160E □□ 472MM25S
16	5600	16 × 35.5	0.24	896	0.015	0.044	3610	EKY-160E □□ 562MLP1S
16	5600	18 × 31.5	0.24	896	0.015	0.040	4170	EKY-160E □□ 562MMN3S
16	6800	16 × 40	0.26	1080	0.013	0.038	4080	EKY-160E □□ 682ML40S
16	8200	18 × 35.5	0.30	1310	0.014	0.038	4220	EKY-160E □□ 822MMP1S
16	10000	18 × 40	0.34	1600	0.012	0.032	4280	EKY-160E □□ 103MM40S
25	47	5 × 11	0.14	11.7	0.58	2.3	210	EKY-250E □□ 470ME11D
25	100	6.3 × 11	0.14	25.0	0.22	0.87	340	EKY-250E □□ 101MF11D
25	220	8 × 11.5	0.14	55.0	0.13	0.52	640	EKY-250E □□ 221MHB5D
25	330	8 × 15	0.14	82.5	0.087	0.35	840	EKY-250E □□ 331MH15D
25	330	10 × 12.5	0.14	82.5	0.080	0.32	865	EKY-250E □□ 331MJC5S
25	470	8 × 20	0.14	117	0.069	0.27	1050	EKY-250E □□ 471MH20D
25	470	10 × 16	0.14	117	0.060	0.24	1210	EKY-250E □□ 471MJ16S
25	680	10 × 20	0.14	170	0.046	0.18	1400	EKY-250E □□ 681MJ20S
25	680	12.5 × 15	0.14	170	0.049	0.16	1450	EKY-250E □□ 681MK15S
25	820	10 × 25	0.14	205	0.042	0.17	1650	EKY-250E □□ 821MJ25S
25	1000	10 × 30	0.14	250	0.031	0.12	1910	EKY-250E □□ 102MJ30S
25	1000	12.5 × 20	0.14	250	0.035	0.12	1900	EKY-250E □□ 102MK20S
25	1000	16 × 15	0.14	250	0.042	0.12	1940	EKY-250E □□ 102ML15S
25	1200	18 × 15	0.14	300	0.043	0.11	2210	EKY-250E □□ 122MM15S
25	1500	12.5 × 25	0.14	375	0.027	0.089	2230	EKY-250E □□ 152MK25S
25	1800	12.5 × 30	0.14	450	0.024	0.078	2650	EKY-250E □□ 182MK30S
25	1800	16 × 20	0.14	450	0.027	0.078	2530	EKY-250E □□ 182ML20S
25	2200	12.5 × 35	0.16	550	0.020	0.065	2880	EKY-250E □□ 222MK35S
25	2200	18 × 20	0.16	550	0.026	0.067	2860	EKY-250E □□ 222MM20S
25	2700	12.5 × 40	0.16	675	0.017	0.056	3350	EKY-250E □□ 272MK40S
25	2700	16 × 25	0.16	675	0.021	0.060	2930	EKY-250E □□ 272ML25S
25	3300	16 × 31.5	0.18	825	0.017	0.050	3450	EKY-250E □□ 332MLN3S
25	3300	18 × 25	0.18	825	0.019	0.049	3140	EKY-250E □□ 332MM25S
25	3900	16 × 35.5	0.18	975	0.015	0.044	3610	EKY-250E □□ 392MLP1S
25	3900	18 × 31.5	0.18	975	0.015	0.040	4170	EKY-250E □□ 392MMN3S
25	4700	16 × 40	0.20	1170	0.013	0.038	4080	EKY-250E □□ 472ML40S
25	4700	18 × 35.5	0.20	1170	0.014	0.038	4220	EKY-250E □□ 472MMP1S
25	5600	18 × 40	0.22	1400	0.012	0.032	4280	EKY-250E □□ 562MM40S
35	33	5 × 11	0.12	11.5	0.58	2.3	210	EKY-350E □□ 330ME11D
35	56	6.3 × 11	0.12	19.6	0.22	0.87	340	EKY-350E □□ 560MF11D
35	150	8 × 11.5	0.12	52.5	0.13	0.52	640	EKY-350E □□ 151MHB5D
35	220	8 × 15	0.12	77.0	0.087	0.35	840	EKY-350E □□ 221MH15D
35	220	10 × 12.5	0.12	77.0	0.080	0.32	865	EKY-350E □□ 221MJC5S
35	270	8 × 20	0.12	94.5	0.069	0.27	1050	EKY-350E □□ 271MH20D
35	330	10 × 16	0.12	115	0.060	0.24	1210	EKY-350E □□ 331MJ16S
35	470	10 × 20	0.12	164	0.046	0.18	1400	EKY-350E □□ 471MJ20S
35	470	12.5 × 15	0.12	164	0.049	0.16	1450	EKY-350E □□ 471MK15S
35	560	10 × 25	0.12	196	0.042	0.17	1650	EKY-350E □□ 561MJ25S

□□ : Enter the appropriate lead forming or taping code

Standard Ratings

WV [Vdc]	Cap [μ F]	Case size ϕ D × L[mm]	tan δ Max.	LC [μ A] Max.	Impedance [Ω Max./100kHz]		Rated ripple current [mArms/105℃]	Part No.
				2minutes	20℃	-10℃	100kHz	
35	680	10 × 30	0.12	238	0.031	0.12	1910	EKY-350E □□ 681MJ30S
35	680	12.5 × 20	0.12	238	0.035	0.12	1900	EKY-350E □□ 681MK20S
35	680	16 × 15	0.12	238	0.042	0.12	1940	EKY-350E □□ 681ML15S
35	1000	12.5 × 25	0.12	350	0.027	0.089	2230	EKY-350E □□ 102MK25S
35	1000	18 × 15	0.12	350	0.043	0.11	2210	EKY-350E □□ 102MM15S
35	1200	12.5 × 30	0.12	420	0.024	0.078	2650	EKY-350E □□ 122MK30S
35	1200	16 × 20	0.12	420	0.027	0.078	2530	EKY-350E □□ 122ML20S
35	1500	12.5 × 35	0.12	525	0.020	0.065	2880	EKY-350E □□ 152MK35S
35	1800	12.5 × 40	0.12	630	0.017	0.056	3350	EKY-350E □□ 182MK40S
35	1800	16 × 25	0.12	630	0.021	0.060	2930	EKY-350E □□ 182ML25S
35	1800	18 × 20	0.12	630	0.026	0.067	2860	EKY-350E □□ 182MM20S
35	2200	16 × 31.5	0.14	770	0.017	0.050	3450	EKY-350E □□ 222MLN3S
35	2200	18 × 25	0.14	770	0.019	0.049	3140	EKY-350E □□ 222MM25S
35	2700	16 × 35.5	0.14	945	0.015	0.044	3610	EKY-350E □□ 272MLP1S
35	2700	18 × 31.5	0.14	945	0.015	0.040	4170	EKY-350E □□ 272MMN3S
35	3300	16 × 40	0.16	1150	0.013	0.038	4080	EKY-350E □□ 332ML40S
35	3300	18 × 35.5	0.16	1150	0.014	0.038	4220	EKY-350E □□ 332MMP1S
35	3900	18 × 40	0.16	1360	0.012	0.032	4280	EKY-350E □□ 392MM40S
50	1.0	5 × 11	0.10	3.0	4.0	16.0	30	EKY-500E □□ 1R0ME11D
50	2.2	5 × 11	0.10	3.0	2.5	10.0	43	EKY-500E □□ 2R2ME11D
50	3.3	5 × 11	0.10	3.0	2.2	8.8	53	EKY-500E □□ 3R3ME11D
50	4.7	5 × 11	0.10	3.0	1.9	7.6	88	EKY-500E □□ 4R7ME11D
50	10	5 × 11	0.10	5.0	1.5	6.0	100	EKY-500E □□ 100ME11D
50	22	5 × 11	0.10	11.0	0.70	2.8	180	EKY-500E □□ 220ME11D
50	56	6.3 × 11	0.10	28.0	0.30	1.2	295	EKY-500E □□ 560MF11D
50	100	8 × 11.5	0.10	50.0	0.17	0.68	555	EKY-500E □□ 101MHB5D
50	120	8 × 15	0.10	60.0	0.12	0.48	730	EKY-500E □□ 121MH15D
50	150	10 × 12.5	0.10	75.0	0.12	0.48	760	EKY-500E □□ 151MJC5S
50	180	8 × 20	0.10	90.0	0.091	0.36	910	EKY-500E □□ 181MH20D
50	220	10 × 16	0.10	110	0.084	0.34	1050	EKY-500E □□ 221MJ16S
50	270	10 × 20	0.10	135	0.060	0.24	1220	EKY-500E □□ 271MJ20S
50	270	12.5 × 15	0.10	135	0.061	0.20	1260	EKY-500E □□ 271MK15S
50	330	10 × 25	0.10	165	0.055	0.22	1440	EKY-500E □□ 331MJ25S
50	470	10 × 30	0.10	235	0.043	0.17	1690	EKY-500E □□ 471MJ30S
50	470	12.5 × 20	0.10	235	0.045	0.15	1660	EKY-500E □□ 471MK20S
50	470	16 × 15	0.10	235	0.055	0.17	1690	EKY-500E □□ 471ML15S
50	560	12.5 × 25	0.10	280	0.034	0.11	1950	EKY-500E □□ 561MK25S
50	560	18 × 15	0.10	280	0.054	0.15	1930	EKY-500E □□ 561MM15S
50	680	12.5 × 30	0.10	340	0.030	0.10	2310	EKY-500E □□ 681MK30S
50	820	12.5 × 35	0.10	410	0.025	0.083	2510	EKY-500E □□ 821MK35S
50	820	16 × 20	0.10	410	0.034	0.10	2210	EKY-500E □□ 821ML20S
50	1000	12.5 × 40	0.10	500	0.021	0.069	2920	EKY-500E □□ 102MK40S
50	1000	16 × 25	0.10	500	0.025	0.075	2555	EKY-500E □□ 102ML25S
50	1000	18 × 20	0.10	500	0.036	0.097	2490	EKY-500E □□ 102MM20S
50	1200	16 × 31.5	0.10	600	0.022	0.066	3010	EKY-500E □□ 122MLN3S
50	1200	18 × 25	0.10	600	0.026	0.070	2740	EKY-500E □□ 122MM25S
50	1500	16 × 35.5	0.10	750	0.019	0.057	3150	EKY-500E □□ 152MLP1S
50	1800	16 × 40	0.10	900	0.016	0.048	3710	EKY-500E □□ 182ML40S
50	1800	18 × 31.5	0.10	900	0.021	0.057	3635	EKY-500E □□ 182MMN3S
50	2200	18 × 35.5	0.12	1100	0.017	0.046	3680	EKY-500E □□ 222MMP1S
50	2700	18 × 40	0.12	1350	0.014	0.038	3800	EKY-500E □□ 272MM40S
63	15	5 × 11	0.09	9.4	0.88	3.5	165	EKY-630E □□ 150ME11D
63	33	6.3 × 11	0.09	20.7	0.35	1.4	265	EKY-630E □□ 330MF11D
63	56	8 × 11.5	0.09	35.2	0.22	0.88	500	EKY-630E □□ 560MHB5D
63	82	8 × 15	0.09	51.6	0.16	0.64	665	EKY-630E □□ 820MH15D
63	82	10 × 12.5	0.09	51.6	0.11	0.44	690	EKY-630E □□ 820MJC5S
63	120	8 × 20	0.09	75.6	0.12	0.48	820	EKY-630E □□ 121MH20D
63	120	10 × 16	0.09	75.6	0.076	0.31	950	EKY-630E □□ 121MJ16S
63	180	10 × 20	0.09	113	0.056	0.23	1150	EKY-630E □□ 181MJ20S
63	180	12.5 × 16	0.09	113	0.072	0.29	1150	EKY-630E □□ 181MK16S
63	220	10 × 25	0.09	138	0.046	0.19	1350	EKY-630E □□ 221MJ25S

□□ : Enter the appropriate lead forming or taping code

Standard Ratings

WV [Vdc]	Cap [μ F]	Case size ϕ D × L[mm]	tan δ Max.	LC [μ A] Max.	Impedance [Ω Max./100kHz]		Rated ripple current [mArms/105℃]	Part No.
				2minutes	20℃	-10℃	100kHz	
63	270	12.5 × 20	0.09	170	0.041	0.13	1500	EKY-630E □□ 271MK20S
63	390	12.5 × 25	0.09	245	0.031	0.093	1900	EKY-630E □□ 391MK25S
63	470	12.5 × 30	0.09	296	0.028	0.084	2300	EKY-630E □□ 471MK30S
63	470	16 × 20	0.09	296	0.032	0.096	2000	EKY-630E □□ 471ML20S
63	560	12.5 × 35	0.09	352	0.024	0.072	2500	EKY-630E □□ 561MK35S
63	680	12.5 × 40	0.09	428	0.021	0.063	2800	EKY-630E □□ 681MK40S
63	680	16 × 25	0.09	428	0.025	0.075	2600	EKY-630E □□ 681ML25S
63	680	18 × 20	0.09	428	0.030	0.090	2500	EKY-630E □□ 681MM20S
63	820	16 × 31.5	0.09	516	0.021	0.063	2850	EKY-630E □□ 821MLN3S
63	820	18 × 25	0.09	516	0.024	0.072	2800	EKY-630E □□ 821MM25S
63	1000	16 × 35.5	0.09	630	0.019	0.057	2900	EKY-630E □□ 102MLP1S
63	1200	16 × 40	0.09	756	0.018	0.054	3400	EKY-630E □□ 122ML40S
63	1200	18 × 31.5	0.09	756	0.020	0.060	3300	EKY-630E □□ 122MMN3S
63	1500	18 × 35.5	0.09	945	0.018	0.054	3400	EKY-630E □□ 152MMP1S
63	1800	18 × 40	0.09	1130	0.017	0.051	3500	EKY-630E □□ 182MM40S
80	68	10 × 12.5	0.09	54.4	0.17	0.66	480	EKY-800E □□ 680MJC5S
80	100	10 × 16	0.09	80.0	0.11	0.47	600	EKY-800E □□ 101MJ16S
80	120	10 × 20	0.09	96.0	0.084	0.34	800	EKY-800E □□ 121MJ20S
80	150	10 × 25	0.09	120	0.069	0.28	900	EKY-800E □□ 151MJ25S
80	150	12.5 × 16	0.09	120	0.11	0.34	750	EKY-800E □□ 151MK16S
80	220	12.5 × 20	0.09	176	0.062	0.18	1100	EKY-800E □□ 221MK20S
80	330	12.5 × 25	0.09	264	0.047	0.14	1250	EKY-800E □□ 331MK25S
80	330	16 × 20	0.09	264	0.048	0.15	1350	EKY-800E □□ 331ML20S
80	390	12.5 × 30	0.09	312	0.042	0.13	1500	EKY-800E □□ 391MK30S
80	470	12.5 × 35	0.09	376	0.036	0.11	1650	EKY-800E □□ 471MK35S
80	470	16 × 25	0.09	376	0.038	0.12	1700	EKY-800E □□ 471ML25S
80	470	18 × 20	0.09	376	0.045	0.14	1500	EKY-800E □□ 471MM20S
80	560	12.5 × 40	0.09	448	0.032	0.095	1800	EKY-800E □□ 561MK40S
80	680	16 × 31.5	0.09	544	0.032	0.095	1850	EKY-800E □□ 681MLN3S
80	680	18 × 25	0.09	544	0.036	0.11	1750	EKY-800E □□ 681MM25S
80	820	16 × 35.5	0.09	656	0.029	0.086	2000	EKY-800E □□ 821MLP1S
80	820	18 × 31.5	0.09	656	0.030	0.090	1900	EKY-800E □□ 821MMN3S
80	1000	16 × 40	0.09	800	0.027	0.081	2200	EKY-800E □□ 102ML40S
80	1000	18 × 35.5	0.09	800	0.027	0.081	2200	EKY-800E □□ 102MMP1S
80	1200	18 × 40	0.09	960	0.026	0.077	2700	EKY-800E □□ 122MM40S
100	6.8	5 × 11	0.08	6.8	1.4	5.6	125	EKY-101E □□ 6R8ME11D
100	15	6.3 × 11	0.08	15.0	0.57	2.3	205	EKY-101E □□ 150MF11D
100	27	8 × 11.5	0.08	27.0	0.36	1.4	355	EKY-101E □□ 270MHB5D
100	39	8 × 15	0.08	39.0	0.25	1.0	450	EKY-101E □□ 390MH15D
100	47	10 × 12.5	0.08	47.0	0.17	0.66	480	EKY-101E □□ 470MJC5S
100	56	8 × 20	0.08	56.0	0.19	0.76	565	EKY-101E □□ 560MH20D
100	68	10 × 16	0.08	68.0	0.11	0.47	600	EKY-101E □□ 680MJ16S
100	82	10 × 20	0.08	82.0	0.084	0.34	800	EKY-101E □□ 820MJ20S
100	100	12.5 × 16	0.08	100	0.11	0.34	750	EKY-101E □□ 101MK16S
100	120	10 × 25	0.08	120	0.069	0.28	900	EKY-101E □□ 121MJ25S
100	150	12.5 × 20	0.08	150	0.062	0.18	1100	EKY-101E □□ 151MK20S
100	220	12.5 × 25	0.08	220	0.047	0.14	1250	EKY-101E □□ 221MK25S
100	220	16 × 20	0.08	220	0.048	0.15	1350	EKY-101E □□ 221ML20S
100	270	12.5 × 30	0.08	270	0.042	0.13	1500	EKY-101E □□ 271MK30S
100	330	12.5 × 35	0.08	330	0.036	0.11	1650	EKY-101E □□ 331MK35S
100	330	16 × 25	0.08	330	0.038	0.12	1700	EKY-101E □□ 331ML25S
100	330	18 × 20	0.08	330	0.045	0.14	1500	EKY-101E □□ 331MM20S
100	390	12.5 × 40	0.08	390	0.032	0.095	1800	EKY-101E □□ 391MK40S
100	470	16 × 31.5	0.08	470	0.032	0.095	1850	EKY-101E □□ 471MLN3S
100	470	18 × 25	0.08	470	0.036	0.11	1750	EKY-101E □□ 471MM25S
100	560	16 × 35.5	0.08	560	0.029	0.086	2000	EKY-101E □□ 561MLP1S
100	560	18 × 31.5	0.08	560	0.030	0.090	1900	EKY-101E □□ 561MMN3S
100	680	16 × 40	0.08	680	0.027	0.081	2200	EKY-101E □□ 681ML40S
100	680	18 × 35.5	0.08	680	0.027	0.081	2200	EKY-101E □□ 681MMP1S
100	820	18 × 40	0.08	820	0.026	0.077	2700	EKY-101E □□ 821MM40S

□□ : Enter the appropriate lead forming or taping code

Precautions and Guidelines (Aluminum Non-Solid Electrolytic Capacitors)

The circuits described as examples in the catalog and the "specifications" are featured in order to show the operations and usage of our products, however, this fact does not guarantee that the circuits are available to function in your equipment systems.
We are not in any case responsible for any failures or damage caused by the use of information contained herein.
You should examine our products, of which the characteristics are described in the "specifications" and other documents, and determine whether or not our products suit your requirements according to the specifications of your equipment systems. Therefore, you bear final responsibility regarding the use of our products.
Please make sure that you take appropriate safety measures such as use of redundant design and malfunction prevention measures in order to prevent fatal accidents and/or fires in the event any of our products malfunction.

【1】Device circuits design considerations

1) Confirm installation and operating requirements for capacitors, then use them within the performance limits prescribed in this catalog or product specifications.

2) Polarity

Aluminum electrolytic capacitors are polarized.
Never apply a reverse voltage or AC voltage. Connecting with wrong polarity will short-circuit or damage the capacitor with the pressure relief vent opening early on. To identify the polarity of a capacitor, see the relevant diagram in the catalogs or product specifications, or the polarity marking on the body of the capacitor.
Incidentally, the rubber end seal bungs of the radial lead type capacitors have a solder-flux gas escaping configuration, which is nothing to do with the polarity of the capacitors. For circuits where the polarity is occasionally reversed, use a bi-polar type of aluminum electrolytic capacitor. However, note that even bi-polar type capacitors must not be used for AC circuits.

3) Operating voltage

Do not apply an over-voltage that exceeds a rated voltage specified for the capacitors.
The total peak value of the ripple voltage plus the DC voltage must not exceed the rated voltage of the capacitors. Although capacitors specify a surge voltage that exceeds the full rated voltage, it does not assure long-term use but limited use under specific conditions.

4) Ripple current

Do not apply an overcurrent that exceeds the rated ripple current specified for the capacitors.
Excessive ripple current will increase heat production within the capacitors, causing the capacitors to be damaged as follows:

- Shorten lifetime
- Open pressure relief vent
- Short circuit

The rated ripple current is specified along with a specific ripple frequency.
Where using the capacitors at any other ripple frequency other than the specified frequency, calculate the allowable ripple current by multiplying the rated ripple current by a frequency compensation factor (Frequency Multiplier) specified for each product series.

5) Operating temperature (Category temperature)

Do not apply high temperatures that exceed the upper limit of the category temperature range specified for the capacitors.
Using the capacitor at temperatures higher than the upper limit will considerably shorten the lifetime of the capacitor and make the pressure relief vent open.
In other words, lowering ambient temperatures will extend the expected lifetime of the capacitors.

6) Lifetime

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

7) Charging and discharging

Do not use capacitors in circuits intended for rapid charge and discharge cycle operations.
If capacitors are used in the circuits that repeat a charge and discharge with a large voltage drop or a rapid charge and discharge at a short interval cycle, capacitance will decrease and/or the capacitors will be damaged by internal heat generation.
Consult us for a heavy charge and discharge type of capacitor so that the capacitor will be designed in accordance with requirements of duty cycle of charge and discharge, the number of cycles, discharging resistance and operating temperatures.

8) Failure mode of capacitors

Non-solid aluminum electrolytic capacitors have a limited lifetime which ends in an open circuit failure mode, in general.
Depending on the product type and operating conditions, the failure mode may involve in opening of the pressure relief vent.

9) Capacitor insulation

Electrically isolate the following sections of a capacitor from the negative terminal, the positive terminal and the circuit patterns.

- The outer can case of a non-solid aluminum capacitor.
- The dummy terminal of a snap-in type non-solid aluminum capacitor, which is designed for mounting stability.

10) Outer sleeve

The outer sleeve of a capacitor does not assure electrical insulation (except for screw-terminal type capacitors). It should not be used where electrical insulation is required.

11) Operating conditions

Do not use/expose capacitors to the following conditions:

(1) Direct contact with water, salt water or oil, or high condensation environment.

(2) Direct sunlight.

(3) Toxic gases such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine and its compounds, bromine and its compounds and ammonium.

(4) Ozone, ultraviolet rays or radiation.

(5) Extreme vibration or mechanical shock that exceeds limits in the catalogs or product specifications.
The standard vibration condition is applicable to JIS C 5101-4.

12) Mounting

(1) Non-solid aluminum electrolytic capacitors contain paper separators and electric-conductive electrolyte that contains organic solvent as main solvent material, both of which are flammable. If the electrolyte leaks onto a printed circuit board, it can erode the device circuit pattern, may short-circuit the copper traces, smoke and burn. Make sure of designing a PC board as follows:

- Provide the appropriate hole spacing on the PC board to match the terminal spacing of a capacitor.
- Provide the following adequate clearance space over the pressure relief vent of a capacitor to avoid blocking the correct opening of the pressure relief vent.

Case diameter	Clearance
ϕ 8(6.3) to ϕ 16mm	: 2mm minimum
ϕ 18 to ϕ 35mm	: 3mm minimum
ϕ 40 mm and above	: 5mm minimum

- Do not locate any wire or circuit pattern over the pressure relief vent of a capacitor.
- If a capacitor is mounted with its pressure relief vent facing down on the PC board, provide a ventilation hole in the board beneath it to let gas escape when the vent opens.
- Do not print any copper trace under the seal (terminal) side of a capacitor. Copper traces should be 1 mm (preferably 2mm or more) spaced apart from the side of the capacitor body.
- Avoid locating any heat source components near capacitors or on the opposite side of the PC board under capacitors.
- In designing a double-sided PC board, do not locate any through-hole via or unnecessary hole underneath a capacitor.
- In designing a double-sided PC board, do not print any circuit pattern underneath a capacitor.

(2) For a screw terminal type capacitor, tightening the terminal screws and the mounting clamp should be within the maximum torque specified in the catalogs or product specifications. Do not mount a screw terminal type capacitor with the terminals facing downward. Also, if the body of a capacitor is installed horizontally such as being laid on its side, do not position the pressure relief vent downward.

(3) For a chip type capacitor, design the land patterns of the PC board in accordance with the recommended footprint dimensions described in the catalogs or product specifications.

13) Using capacitors for significantly safety-oriented applications

Consult with us in advance of usage of our products in the following listed applications. ① Aerospace equipment ② Power generation equipment such as thermal power, nuclear power etc. ③ Medical equipment ④ Transport equipment (automobiles, trains, ships, etc.) ⑤ Transportation control equipment ⑥ Disaster prevention / crime prevention equipment ⑦ Highly publicized information processing equipment ⑧ Submarine equipment ⑨ Other applications that are not considered general- purpose applications.
Note that some products such as photoflash use capacitors which have been designed for specific applications cannot be used for any other application.

14) Others

Design device circuits taking into consideration the following conditions:

(1) Electrical characteristics of a capacitor depend on the temperature and frequency. In designing the device circuits, consider the change in the characteristics.

(2) If using more than one capacitor connected in parallel, design the device circuits to balance the current flow in individual capacitors.

(3) If using more than one capacitor connected in series, connect shunting resistors in parallel with the individual capacitors to balance the voltage.

【2】Installation

1) Assembling

(1) Do not try to reuse the capacitors once assembled and electrified, except only capacitors that are taken from a device for periodic inspection to measure their electrical characteristics.

(2) Capacitors may have been spontaneously recharged with time by a recovery voltage phenomenon. In this case, discharge the capacitors through a resistor of approximately 1k Ω before use.

(3) If non-solid aluminum electrolytic capacitors have been stored at any conditions more than 35℃ and 75%RH for long storage periods of time more than the limits specified in the catalogs or product specifications, they may have high leakage current. In this case, make pre-conditioning by applying the rated voltage through a resistor of approximately 1k Ω .

(4) Confirm the rated capacitance and voltage of capacitors before installation.

(5) Confirm the polarity of capacitors before installation.

(6) Do not try to use the capacitors that were dropped to the floor and so forth.

(7) Do not deform the can case of a capacitor.

(8) Make sure that the terminal spacing of a capacitor equals the holes spacing on the PC board before installing the capacitor. For radial lead type capacitors, some standard pre-formed lead types are also available.

(9) When installing a snap-in type capacitor on the PC board, insert the terminals into the holes and press the capacitor down until the body is settled flush on the surface of the PC board (without the body standing off).

(10) Do not apply excessive mechanical force to capacitors more than the limits prescribed in the catalogs or product specifications. Avoid excessive mechanical force while the capacitors are in the process of vacuum-picking, placing and positioning by automatic mounting machines or cutting the lead wires by automatic insertion machines.

2) Soldering and heat resistance

(1) For soldering using a soldering iron, consider the following conditions:

- Soldering conditions (temperature and time) should be within the limits prescribed in the catalogs or product specifications.
- If it is necessary to pre-form the terminal spacing of a capacitor to match the hole spacing on the PC board before assembly and soldering, do not make mechanical stress reach into the body of the capacitor but only the lead wires.
- Do not touch the body of a capacitor with the hot tip of the soldering iron.

(2) For flow soldering, consider the following conditions:

- Do not dip the body of a capacitor into a solder bath.
  Expose only the terminals to the melt solder with the PC board interposing between the solder and the body of the capacitor. Solder only the reverse side of the PC board where the body of the capacitor is not located.
- Soldering conditions should be within the limits prescribed in the catalogs or product specifications.
- Do not apply flux to any part of a capacitor other than the terminals.
- Do not let any other component lean against nor come into contact with the capacitor while soldering.

(3) For reflow soldering, consider the following conditions:

- Soldering conditions (preheat, reflow temperature and time) should be within the limits prescribed in the catalogs or product specifications.
- When using the infrared heater and setting its temperatures, adjust the heating levels taking into consideration that the color and materials of a capacitor vary in their infrared absorbance.
- The allowable number of reflow passes is specified in the catalogs or product specifications.
- When mounting a capacitor on the double-sided PC board, do not place any wiring pattern underneath the capacitor.
- Please consult us about vapor phase soldering (VPS).

(4) Do not try to reuse the capacitor that was removed from the PC board after soldering.

(5) Only use chip type capacitors for reflow soldering. The other type capacitors are not designed for the reflow.

3) Handling after soldering

After soldering the PC board, do not apply the following mechanical stress to the capacitor:

(1) Do not tilt, push down or twist the body of the capacitor.

(2) Do not grab the body of the capacitor to carry the assembly board.

(3) Do not hit anything against the capacitor. When stacking the assembled boards, do not put any of the PC boards or other components against the capacitor.

(4) Do not drop the assembled board.

4) Cleaning assembly boards

(1) Do not clean capacitors with the following cleaning agents:

- Halogenated solvents : cause capacitor failures due to corrosion.
- Alkali system solvents : corrode (dissolve) the aluminum can case.
- Terpene and petroleum system solvents : deteriorate the rubber seal materials.
- Xylene and toluene : deteriorates the rubber seal materials as well.
- Acetone : erases the markings printed on a capacitor.

Where cleaning is necessary, use only solvent resistant type capacitors that have been assured for the cleaning within the specific cleaning conditions prescriber in the catalogs or product specifications. In particular, carefully set up the conditions for ultrasonic cleaning system.

(2) Where cleaning the solvent resistance type of aluminum electrolytic capacitors, confirm the following conditions:

- Control the contamination (the conductivity, pH, specific gravity, water content, etc.) of the cleaning agents.
- After the cleaning, do not leave the capacitors (assembly boards) in an environment of cleaning agent-rich or in a closed container. Sufficiently evaporate the residual cleaning agent from the assembly boards and the capacitors by forced hot air at temperatures less than the upper limit of category temperature range for more than 10 minutes. In general, aluminum electrolytic capacitors are sensitive to contamination of halogen ions (particularly to chlorine ions). Depending on the properties of the electrolyte and rubber seal materials used in a capacitor, the halogen ions lead up to catastrophic failures on the capacitor. Where the inside of a capacitor has been contaminated with more than a certain amount of halogen ions and the capacitor is in use, the corrosion reaction of aluminum occurs. The corrosion causes the capacitor to have a significant increase in leakage current with heat produced, open the pressure relief vent and become open circuit mode failure. Due to global environmental issues (greenhouse effects and other environmental destruction by depletion of the ozone layer), the conventional cleaning solvents of CFC 113, Trichloroethylene and 1,1,1-tricholoroethylene were replaced by substitutes. The following are some substitute cleaning agents and allowable cleaning conditions:

a) Fatty-alcohol cleaning agents

Pine Alpha ST-100S (Arakawa Chemical)
Clean Through 750H, 750K, 750L and 710M (Kao)
Technocare FRW-14, 15, 16 and 17 (Momentive Performance Materials)
〔Compatible capacitor products〕

Terminal Shape	Subject Series
Surface Mount Type	All Series
Radial Lead Type	All Series
Snap-in Type	All Series (Less and equal 100V_{dc})

[Cleaning conditions]
Either of immersion or ultrasonic cleaning, for a maximum of 10 minutes and at a maximum liquid temperature of 60℃ is acceptable. Make sure that the markings on the capacitor are not rubbed against any other component or the PC board during cleaning. Note that shower cleaning affects the markings on the capacitor.

b) HCFC (Freon 225) as Alternative CFCs

AK225AES (Asahi Glass)

[Cleaning conditions]
Solvent resistant type capacitors, which were originally developed to intend to resist Freon TE or Freon TES, are also capable of withstanding any one of immersion, ultrasonic or vapor cleaning, for a maximum of 5 minutes (or 2 minutes for KRE series capacitors or 3 minutes for SRM series). However, this type of cleaning agent is not recommended to use, as the cleaning materials may be banned in near future in view of global environmental issues.

c) IPA (Isopropyl Alcohol)

Immersion cleaning with a maximum flux concentration of 2 wt% is acceptable.

5) Adhesives and coating materials

(1) Do not use any adhesive or coating materials containing halogenated solvents.

(2) Make sure of the following conditions before applying adhesive or coating materials to a capacitor,

- No flux residue nor stain is left between the rubber seal of a capacitor and PC board.
- Dry the capacitor to remove residual cleaning agents before applying adhesive and coating materials. Do not cover up the entire surface of the rubber seal of the capacitor with adhesives or coating materials.
- Heating and curing conditions for adhesives and coating materials should be followed as prescribed in the catalogs or product specifications.
- Covering up the entire surface of the rubber seal with resin mold materials will obstruct the normal diffusion of internal hydrogen gas from a capacitor and result in serious failures. Also, where the adhesive and coating materials contain a large amount of halogen ions, the halogen ions will contaminate the inside of the capacitor through the rubber seal materials, causing the capacitor to become a failure.
- Depending on solvent materials that the adhesive or coating materials contains, note that the outer sleeve of a capacitor may lose a gloss or whiten in appearance.

6) Fumigation

In exporting or importing electronic devices, they may be exposed to fumigation with halide such as methyl bromide.
Where aluminum electrolytic capacitors are exposed to halide such as methyl bromide, the capacitors will be damaged with the corrosion reaction with halogen ions in the same way as cleaning agents. For the export and import, Nippon Chemi-Con considers using some packaging method and so forth so that fumigation is not required. For customers to export or import electronic devices, semi-assembly products or capacitor components, confirm if they will be exposed to fumigation and also consider final condition of packaging. (Note that either cardboard or vinyl package has a risk of fumigation gas penetration.)

【3】Precautions during operation of devices

1) Never touch the terminals of a capacitor directly with bare hands.

2) Do not short-circuit between the capacitor terminals with anything conductive. Also, do not spill any conductive liquid such as acid or alkaline solution over a capacitor.

3) Confirm environmental conditions where the device will be placed. Do not use the devise in the following environmental conditions:

   (1) Water or oil spatters, or high condensation environment.

   (2) Direct sunlight.

   (3) Ozone, ultraviolet rays or radiation.

   (4) Toxic gases such as hydrogen sulfide, sulfuric acid, nitrous acid, chlorine and its compounds, bromine and its compounds and ammonium.

   (5) Extreme vibration or mechanical shock that exceeds the limits in the catalogs or product specifications.
   The standard vibration condition is applicable to JIS C 5101-4.

【4】Maintenance inspections

1) For industrial use capacitors, make periodic inspections of the capacitors. Before the inspections, turn off the power supply of the device and discharge the electricity of the capacitors. Where checking it by a volt-ohm meter, confirm the polarity beforehand. Do not apply mechanical stress to the terminals of the capacitors during inspection.

2) Characteristics to be inspected

   (1) Significant damage in appearance: vent opening, electrolyte leakage, etc.

   (2) Electrical characteristics: leakage current, capacitance, tan δ and other characteristics prescribed in the catalogs or product specifications

   If finding anything abnormal on the characteristics above, check the specifications of the capacitor and take appropriate actions such as replacement.

【5】Capacitor venting

1) A capacitor with more than a certain case size has the pressure relief vent functioning to escape abnormal gas pressure increase.
   If gas expels from a venting capacitor, disconnect the power supply of the device or unplug the power supply cord. If not disconnecting the power supply, the device circuit may be damaged due to the short circuit failure of the capacitor or short-circuited with the liquid that the gas was condensed to.
   It may cause secondary damages such as device burnout in the worst case scenario.
   The gas that comes out of the open vent is vaporized electrolyte, not smoke.

2) The gas expelled from a venting capacitor is more than100° C.
   Never expose your face to the capacitor. If your eyes are exposed to the gas or you inhale it, immediately flush your eyes and/or gargle with water. If the electrolyte comes in contact with the skin, wash with soap and water.

【6】Storage

1) Do not store capacitors at high temperature or high humidity.
   Store the capacitors indoors at temperatures of 5 to 35℃ and humidities of less than 75%RH.
   In principle, aluminum electrolytic capacitors should be used within three years after production.

2) Keep capacitors packed in the original packaging material wherever possible.

3) Avoid the following storage environmental conditions:

   (1) Water spattering, high temperatures, high humidity or condensation environment.

   (2) Oil spattering or oil mist filled.

   (3) Salt water spattering or salt filled.

   (4) Acidic toxic gases such as hydrogen sulfide, sulfuric acid, nitrous acid, chlorine, bromine and methyl bromide filled.

   (5) Alkaline toxic gases such as ammonium filled.

   (6) Acid or alkaline solutions spattering.

   (7) Direct sunlight, ozone, ultraviolet rays or radiation.

   (8) Extreme vibration or shock loading

4) JEDEC J-STD-020 is not applicable.

【7】Capacitor disposal

Please consult with a local organization for the proper disposal of industrial waste. For incinerating capacitors, apply a hightemperature incineration (over 800 ℃). Incinerating them at temperatures lower than that may produce toxic gases such as chlorine. To prevent capacitors from explosion, punch holes in or sufficiently crush the can cases of the capacitors, then incinerate.

【8】About AEC-Q200

The Automotive Electronics Council (AEC) was originally established by major American automotive related manufactures. Today, the committees are composed of representatives from the sustaining Members of manufacturing companies in automotive electrical components. It has standardized the criteria for "stress test qualification" and "reliability tests" for electronic components.

AEC-Q200 is the reliability test standard for approval of passive components in Automotive applications. It specifies the test type, parameters and quantity, etc. for each component. The criteria of the reliability tests such as for our main products, "Aluminum Electrolytic Capacitors" are described in this standard.

Pursuant to the customer's specific testing requirements, Chemi-Con submits the test results according to AEC-Q200 for Aluminum Electrolytic Capacitors used in automotive applications on request.

An electronic component manufacturer cannot simply claim that their product is "AEC-Q200 Qualified". It can be claimed "Compliant", "Capable", "Available", etc., however each component must be tested per each users "Qualification Test Plan" in order to claim AEC-Q200 status.

Please contact us for more information.

【9】Response to the Substances of Concern

1) Nippon Chemi-Con aims for developing products that meet laws and regulations concerning substances of concern.
(Some products may contain regulated substances for exempted application)
Please contact us for more information about law-compliance status.

2) According to the content of REACH handbook (Guidance on requirements for substances in articles which is published on May 2008), our electronic components are "articles without any intended release". Therefore they are not applicable for "Registration" for EU REACH Regulation Article 7 (1). Reference: Electrolytic Condenser Investigation Society "Study of REACH Regulation in EU about Electrolytic Capacitor"(publicized on 13 March 2008)

【10】Safety Application Guide

For more details, refer to JEITA RCR-2367D (March 2019) with the title of "Safety Application Guide for fixed aluminum electrolytic capacitors for use in electronic equipment".