Dwg. No. :A18-1978
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Customer : 深圳市瑞浦實業有限公司
(客　戶)

Part No. :
(貴公司料號)

SPECIFICATION FOR APPROVAL
承　認　書

Description : ALUMINUM ELECTROLYTIC CAPACITORS
(零 件 名 稱)

Lelon Series : RGA Series
(立 隆 系 列)

Lelon Part No.:
(立 隆 料 號)

LELON ELECTRONICS CORP.
立 隆 電 子 工 業 股 份 有 限 公 司

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Approval 核 准	Check 確 認	Design 作 成
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Approval Signatures
貴公司承認印

Please Return One Copy with Your Approval
承 認 後 請 寄 回 本 圖 一 份

Part Numbering System

Product Code Guide – Radial Type

RGA series	10μF	±20%	50V	Formed Lead Taping	Gas Type	5φ×11L	Pb-free wire + Black PET sleeve
RGA	**100**	**M**	**1H**	**TA**	**-**	**0511**	**G**
□□□	□□□	□	□□	□□	□	□□□□	□
①	②	③	④	⑤	⑥	⑦	⑧
Series	Capacitance	Capacitance Tolerance	Rated Voltage	Lead Configuration & Package	Rubber Type	Case size	Lead Wire and Sleeve Type

⑨ Supplement Code

① Series:

Series is represented by a three-letter code. When the series name only has two letters, use a hyphen, "-", to fill the third blank.

② Capacitance:

Capacitance in μF is represented by a three-digit code. The first two digits are significant and the third digit indicates the number of zeros following the significant figure. "R" represents the decimal point for capacitance under 10μF.

Example:

Capacitance	0.1	0.47	1	4.7	10	47	100	470	1,000	4,700	10,000
Part number	0R1	R47	010	4R7	100	470	101	471	102	472	103

③ Tolerance:

J = -5% ~ +5%	K = -10% ~ +10%	M = -20% ~ +20%	V = -10% ~ +20%

④ Rated voltage:

Rated voltage in volts (V) is represented by a two-digit code

Voltage (WV)	2.5	4	6.3	10	16	20	25	35	50	63	80	100
Code	0E	0G	0J	1A	1C	1D	1E	1V	1H	1J	1K	2A
Voltage (WV)	160	200	250	315	350	400	420	450	500	525		
Code	2C	2D	2E	2F	2V	2G	2P	2W	2H	2Y		

⑤ Lead configuration and package:

BK = Bulk Package	TA = Formed Lead Taping
FC = Formed & Cut Lead	SA = Straight Lead Taping
CC = Cut Lead	SD = Bent Cathode Lead
SF = Snap-in & Formed Cut Lead	BC = Bent & Cut Lead (Leads in Right Direction)
SC = Snap-in & Cut Lead	BU = Bent & Cut Lead (Leads in Left Direction)

⑥ Rubber type:

– = Gas escape type	F = Flat rubber bung

Note : For case size of 3φ×5L, 12.5φ×16L, 16φ×16L, 16φ×20L, 18φ×16L, 18φ×20L , 18φ×25L of aluminum e-caps, flat rubber bung is the standard design, In these cases, use a hyphen, "-", in this digit.

⑦ Case size:

The first two digits indicate case diameter and the last two digits indicate case length in mm.

φD×L	3×5	4×5	4×7	5×5	5×7	5×11	6.3×5	6.3×7	6.3×11	6.3×15
Code	**0305**	**0405**	**0407**	**0505**	**0507**	**0511**	**0605**	**0607**	**0611**	**0615**
φD×L	8×5	8×7	8×9	8×11.5	8×15	8×20	10×9	10×12.5	10×16	10×20
Code	**0805**	**0807**	**0809**	**0811**	**0815**	**0820**	**1009**	**1012**	**1016**	**1020**
φD×L	10×25	10×30	10×35	10×40	10×45	10×50	12.5×16	12.5×20	12.5×25	12.5×30
Code	**1025**	**1030**	**1035**	**1040**	**1045**	**1050**	**1316**	**1320**	**1325**	**1330**
φD×L	12.5×35	12.5×40	12.5×45	12.5×50	16×16	16×20	16×25	16×31.5	16×35.5	16×40
Code	**1335**	**1340**	**1345**	**1350**	**1616**	**1620**	**1625**	**1632**	**1636**	**1640**
φD×L	16×45	16×50	18×16	18×20	18×25	18×31.5	18×35.5	18×40	18×45	18×50
Code	**1645**	**1650**	**1816**	**1820**	**1825**	**1832**	**1836**	**1840**	**1845**	**1850**
φD×L	20×30	20×35	22×35	22×40	22×45	25×40	25×45			
Code	**2030**	**2035**	**2235**	**2240**	**2245**	**2540**	**2545**			

Note: When a case size is required and not shown in the table, please contact with us for further discussion.

⑧ Lead Wire and Sleeve Type:

None = Standard design Pb-free wire + PET sleeve (aluminum e-cap) Pb-free wire + Coating case (OP-CAP)	T = Sn-Pb wire + PET sleeve
B = Sn-Bi wire + PET sleeve	G = Pb-free wire + Black PET sleeve (for RGA & SG series only)
K / L = Automotive control code	P = Pb-free wire + PET sleeve

* When a supplement code following a blank digit code of lead wire and sleeve type (standard design), use a hyphen, "-", to fill the blank digit.
* When the automotive control code is required, please contact with us for further discussion.

⑨ Supplement code (Optional):

For special control purposes

RGA Series Type

Specifications

Capacitance Tolerance

± 20% at 120Hz, 20℃

Category Temperature Range

6.3 ~ 400V	450V
-40℃ ~ +105℃	-25℃ ~ +105℃

Rated Working Voltage and Surge Voltage

Rated Voltage	6.3	10	16	25	35	50	63	100
Surge Voltage	7.3	11.5	18.4	28.8	40.3	57.5	72.5	115
Rated Voltage	160	200	250	350	400	450		
Surge Voltage	184	230	288	385	440	495		

Leakage Current (at20℃)

After DC Voltage is applied to capacitor through the series protective resistance (1KΩ), and then terminal voltage may reach the rated working voltage .The Leakage current when measured after 2 / 5 minutes shall be below the value of the following equation.

Rated voltage	≦100V	＞100V	
Time	after 2 minutes	after 5 minutes	
Leakage Current	I = 0.01CV or 3 (μA) whichever is greater	CV≦1000 I = 0.03CV+15 (μA)	CV＞1000 I = 0.02CV+25 (μA)

Where, I = leakage current; C = rated capacitance in μF; V = rated DC working voltage in V.

Tan δ (at 120 Hz, 20℃)

Rated Voltage	6.3	10	16	25	35	50	63	100
Tanδ(max)	0.23	0.20	0.16	0.14	0.12	0.10	0.09	0.08
Rated Voltage	160	200	250	350	400	450		
Tanδ(max)	0.12	0.14	0.17	0.20	0.25	0.25		

When the capacitance exceeds 1000μF , 0.02 shall be added every 1000μF increase.

Low Temperature Characteristics (at 120Hz)

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

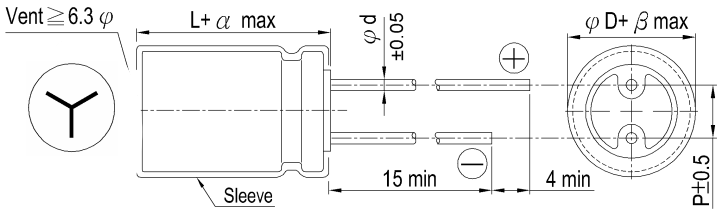
Rated Voltage			6.3	10	16	25	35	50	63	100
Impedance Ratio	Z(-25℃)/ Z(+20℃)	φD＜16	4	3	3	2	2	2	2	2
		φD≧16	6	4	4	3	3	3	3	3
	Z(-40℃)/ Z(+20℃)	φD＜16	8	6	6	4	4	3	3	3
		φD≧16	12	10	8	8	8	8	6	6

Rated Voltage		160	200	250	350	400	450
Impedance Ratio	Z(-25℃)/ Z(+20℃)	3	6	8	12	14	16
	Z(-25℃)/ Z(+20℃)	4	8	10	16	18	-

Ripple Current & Frequency Multipliers

Freq.(Hz) / Cap.(μF)	60 (50)	120	500	1k	10k up
Under 100	0.70	1.00	1.30	1.40	1.50
100 < C ≦ 1,000	0.75	1.00	1.20	1.30	1.35
1000 up above	0.80	1.00	1.10	1.12	1.15

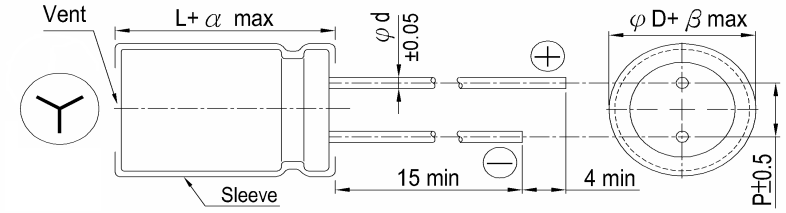
Diagram of Dimensions



Lead Spacing and Diameter Unit: mm

φD	5	6.3	8	10	12.5	16	18	22	25
P	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10	12.5
φd	0.5		0.6			0.8		1.0	
α	L < 20: 1.5, L ≧ 20: 2.0							2.0	
β	0.5								

The case size of 12.5×16, 16×16, 16×20, 18×16, 18×20 and 18×25 are suitable for below diagram:



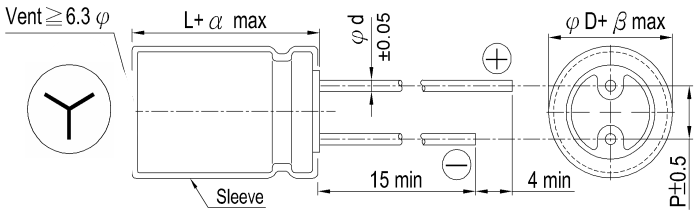
Dimension & Permissible Ripple Current

Dimension: φD × L(mm)
Ripple Current: mA/rms at 120 Hz, 105℃

V. DC		6.3V (0J)		10V (1A)		16V (1C)		25V (1E)		35V (1V)		50V (1H)		63V (1J)		100V (2A)	
μF	Contents	φD×L	mA	φD×L	mA	φD×L	mA	φD×L	mA	φD×L	mA	φD×L	mA	φD×L	mA	φD×L	mA
2.2	2R2											5×11	20			5×11	30
3.3	3R3											5×11	30			5×11	31
4.7	4R7											5×11	33			5×11	36
10	100					5×11	35			5×11	46	5×11	50			6.3×11	54
22	220											5×11	78	6.3×11	86	6.3×11 8×11.5	93 99
33	330					5×11	71			5×11	75	5×11	90	6.3×11	100	8×11.5	130
47	470					5×11	85	5×11	97	5×11 6.3×11	90 100	6.3×11	120	6.3×11 8×11.5	130 141	10×12.5	165
100	101					5×11	110	5×11 6.3×11	120 142	6.3×11 8×11.5	150 180	8×11.5	188	10×12.5	235	10×20 12.5×16	265 290
220	221	5×11	140	6.3×11	175	6.3×11	190	8×11.5	236	8×11.5	270	10×12.5	240	10×16	335	12.5×25 16×16	440 420
330	331			6.3×11	200	8×11.5	270	8×11.5 10×12.5	310 335	10×12.5	350	10×16	410	10×20 12.5×16	510 460	16×25	620
470	471	6.3×11	230	8×11.5	290	8×11.5 10×12.5	310 370	10×12.5	380	10×16	460	10×20 12.5×16	530 425	12.5×20 16×16	640 665	16×31.5 18×25	715 745
1,000	102	8×11.5	380	10×12.5	460	10×16	560	10×20 12.5×16	680 590	10×25 12.5×20 16×16	830 810 720	12.5×25 16×20	950 830	16×25	930	18×40	1,275
2,200	222	10×16	690	10×20	760	12.5×16	780	10×30 12.5×25	1,050 1,110	16×25 18×20	1,260 1,110	16×35.5 18×31.5	1,470 1,520	18×40	2,280	25×45	2,400
3,300	332	10×20 12.5×16	840 850	12.5×20 16×16	1,100 940	12.5×25 16×16	1,170 950	16×25 18×20	1,440 1,220	16×31.5 18×25	1,420 1,570	18×35.5	1,770	22×40	2,510		
4,700	472	12.5×20 16×16	1,090 1,010	12.5×25 16×16	1,260 1,060	16×20 18×16	1,185 1,290	16×31.5 18×25	1,650 1,550	18×35.5	1,900	22×40	2,340	25×40	3,000		
6,800	682	12.5×25 16×20	1,460 1,190	16×20	1,270	16×31.5 18×20	1,930 1,585	16×40 18×35.5	2,000 2,160	18×40	2,250	25×40	2,530				
10,000	103	16×20	1,340	16×31.5 18×25	2,220 1,800	16×35.5 18×31.5	2,210 2,330	18×45 22×40	2,410 2,720								
15,000	153	16×31.5 18×25	2,365 2,290	16×35.5 18×31.5	2,590 2,620	18×40	2,950	25×40	3,200								
22,000	223	16×40 18×35.5	2,800 2,930	18×40	3,230	22×40	3,460										
33,000	333	18×45	3,080	22×40	4,090	25×45	4,500										

V. DC / μF	Contents	160V (2C)		200V (2D)		250V (2E)		350V (2V)		400V (2G)		450V (2W)	
		φD×L	mA	φD×L	mA	φD×L	mA	φD×L	mA	φD×L	mA	φD×L	mA
1	010	6.3×11	17							6.3×11	21	8×11.5	27
2.2	2R2			6.3×11	30	6.3×11	35	6.3×11	35	8×11.5	39	8×11.5	39
3.3	3R3			6.3×11	39	6.3×11	40	8×11.5	43	8×11.5 10×12.5	45 45	8×11.5	45
4.7	4R7			6.3×11	43	8×11.5	45	8×11.5 10×12.5	45 55	8×11.5 10×12.5	50 55	8×11.5 10×12.5	50 55
6.8	6R8									8×11.5	70		
10	100	8×11.5	65	8×11.5	65	10×12.5	92	10×16	95	10×12.5	92	10×20	105
22	220	10×12.5	110	10×16	140	10×16	140	12.5×20	220	12.5×16 12.5×20	160 160	12.5×20 16×25	160 200
33	330	10×16	150	10×20	170	12.5×16	175	12.5×25 16×16	215 205	12.5×20 16×20	235 225	16×20 18×16	225 220
47	470	10×20	195	12.5×16	215	12.5×20 16×16	230 245	16×20	255	16×25	295	16×25 18×31.5	280 345
68	680	12.5×20	275	12.5×20 16×16	265 290	16×20	320	18×25 16×31.5	360 370	16×25 18×25 16×31.5	440 360 375	16×35.5 18×31.5	400 420
100	101	12.5×25	355	16×20 18×16	365 360	16×25 18×20	425 415	18×31.5 16×35.5	460 430	18×35.5	540	18×40	560
180										18×40	650		
220	221	16×31.5	660	18×31.5	750	18×35.5	760	22×45 25×40	850 865	22×45	930		
330	331	18×35.5	820	18×40	965	22×40	1,140	25×45	1,070				
470	471	22×40	1,130	22×40	1,130	25×40	1,325						

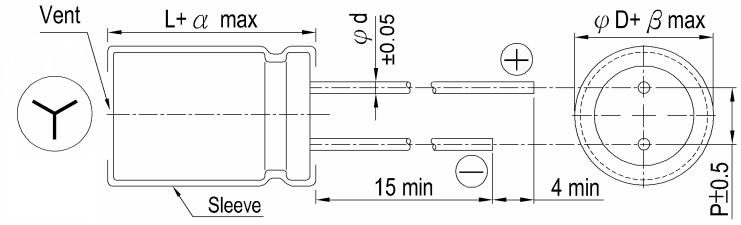
Diagram of Dimensions:



Lead Spacing & Diameter Unit: mm

φD	5	6.3	8	10	12.5	16	18	22	25
P	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10	12.5
φd	0.5		0.6			0.8		1.0	
α	L＜20: 1.5, L≧20: 2.0							2.0	
β	0.5								

The case size of 12.5×16, 16×16, 16×20, 18×16, 18×20 and 18×25 are suitable for below diagram:



Marking:

Each capacitor shall be marked with the following information.

(The Front)

120μF 450V → Rated capacitance and rated DC working voltage

— — → Polarity

(The Back)

→ Brand name

RGA 105℃ → Series & maximum operating temperature

H 8 01 (M) → Date code

- Tolerance of capacitance
- Week of manufacture
- The last digit of A. D.
- Place of manufacture
  - T: Taiwan
  - H: Huizhou
  - A: Suzhou

Appearance:

Marking color: White

Sleeve color: Black -------- RGA Series

Sleeve material: PET

Packaging Quantity:

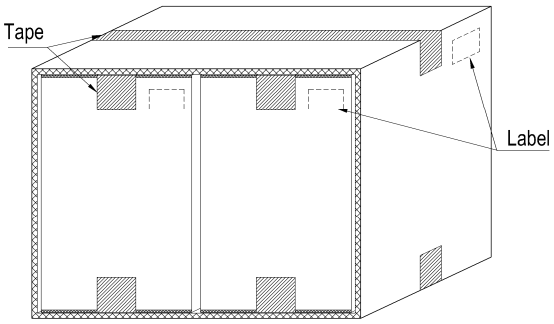
1. Radial Type in Bulk Pack (Long Lead):

Case Size	Pcs / Bag	Inner Box / Carton	Pcs / Carton	Case Size	Pcs / Bag	Inner Box / Carton	Pcs / Carton
3φ × 5	1,000	2	60,000	10φ × 16L	500	2	7,000
4φ × 5 ~ 7L	1,000	2	50,000	10φ × 20 ~ 25L	500	2	6,000
5φ × 5 ~ 7L	1,000	2	40,000	10φ × 30 ~ 40L	400	2	4,000
*5φ ×8	*1000	2	*20,000	10φ × 45 ~ 50L	200	2	3,000
5φ × 11L	1,000	2	30,000	12.5φ × 16 ~ 25L	250	2	3,000
6.3φ × 5 ~ 7L	1,000	2	30,000	12.5φ × 30 ~ 35L	250	2	2,500
*6.3φ × 5.5 ~ 8L	*1000	2	*20,000	12.5φ × 40L	250	2	2,000
6.3φ × 11L	1,000	2	20,000	12.5φ × 45 ~ 50L	100	2	2,000
	*1000	2	*20,000	16φ × 16 ~ 25L	150	2	1,800
6.3φ × 15L	1,000	2	15,000	16φ × 31.5L	100	2	1,200
8φ × 5 ~ 9L	1,000	2	15,000	16φ × 35.5L	100	2	1,200
8φ × 11.5L	1,000	2	12,000	16φ × 40 ~ 50L	100	2	1,000
*8φ × 8 ~12L	*1000	2	*12,000	18φ × 16L	150	2	1,800
8φ × 15L	1,000	2	10,000	18φ × 20 ~ 31.5L	100	2	1,200
8φ × 20L	1,000	2	8,000	18φ × 35.5 ~ 40L	100	2	800
8φ × 25 ~ 30L	500	2	6,000	18φ × 45 ~ 50L	50	2	600
8φ × 35 ~ 50L	250	2	3,000	20φ × 40L	50	2	600
*10φ × 7.7 ~10L	*500	2	*10,000	22φ	50	2	500
10φ × 9L	1,000	2	12,000	25φ × 40L	25	2	300
10φ × 12.5 ~13L	500	2	8,000	25φ × 45 ~ 50L	25	2	250

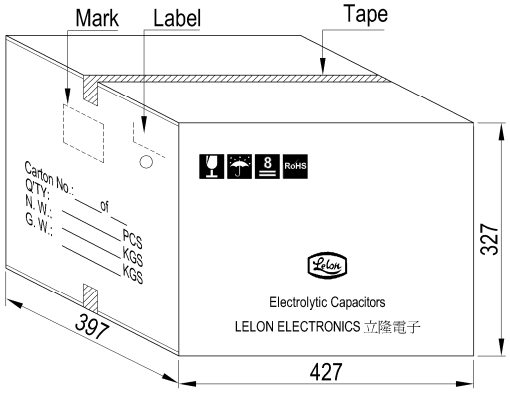
Remark: "*" Suitable for CA04 type (OP-CAP).

Packing Figure:

a) Inner Box



b) Outer Box Unit: mm



C) Label

Taping Specification for Radial Type

Fig. 1

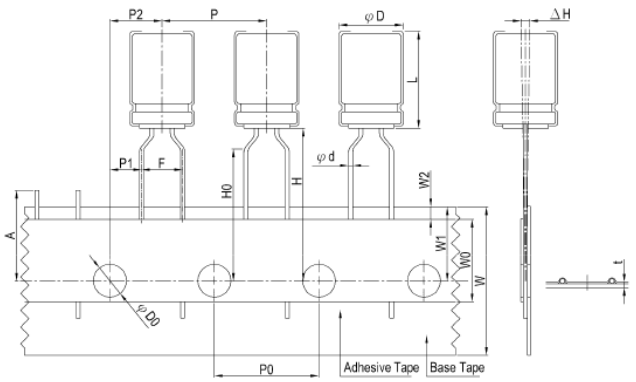


Fig. 2

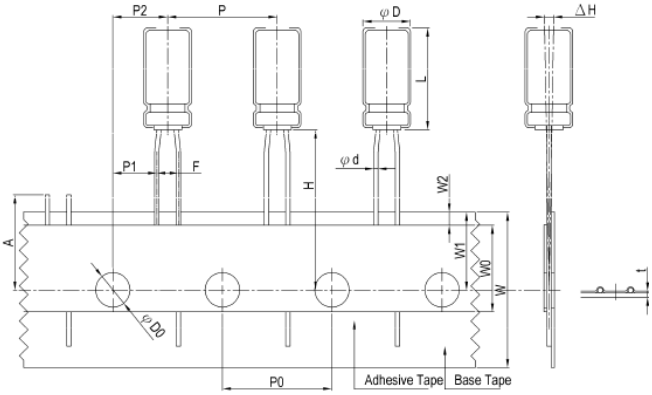


Fig. 3

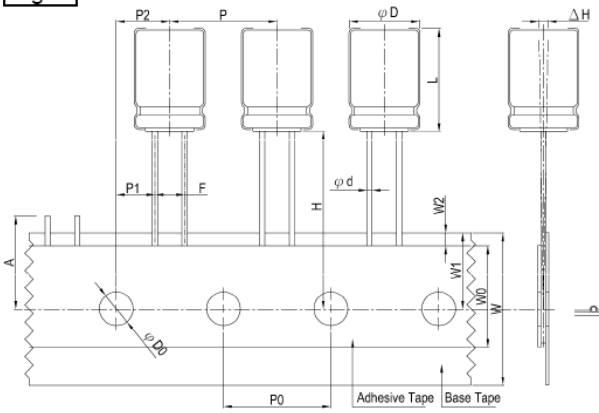
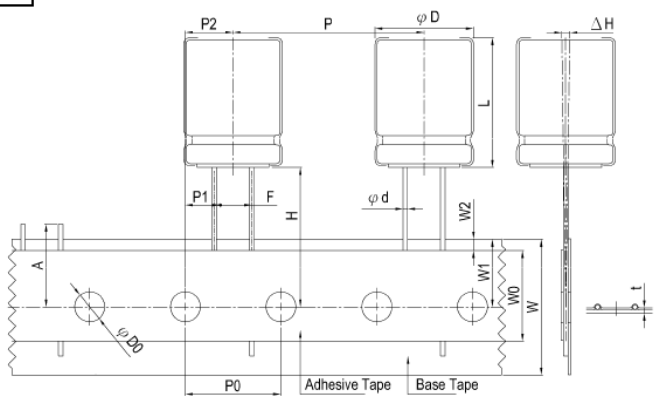


Fig. 4



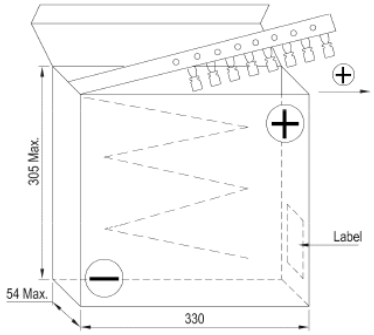
Unit: mm

Packing / L	TA											SA													SP	
	5					7 ~ 9			≥ 11			5					≥ 7		7~9	11.5 ~ 20		9 ~ 25				
Symbol φD	3	4*	5	6.3	8	5	6.3	8*	5	6.3	8	3	4*	5	6.3	8	5	6.3	8	8	Tol.	10	12.5	12.5	Tol.
φd	0.4	0.45				0.5*			0.5		0.6	0.4	0.45		0.45	0.45	0.5	0.5*	0.5*	0.6	±0.05	0.6	0.6	0.6	±0.05
F	5.0					5.0			5.0		5.0	2.5			2.5	2.5	2.5	2.5	3.5	3.5	+0.8/-0.2	5.0	5.0	5.0	+0.8/-0.2
H	17.5					17.5			18.5		20.0	17.5			17.5	17.5	17.5	17.5	17.5	18.5	±0.75	18.5	18.5	18.5	±0.75
H0	16.0					16.0			16.0			---			---	---	---	---	---	---	±0.5	---	---	---	±0.5
P	12.7					12.7			12.7			12.7			12.7	12.7	12.7	12.7	12.7	12.7	±1.0	12.7	25.4	15.0	±1.0
P0	12.7					12.7			12.7			12.7			12.7	12.7	12.7	12.7	12.7	12.7	±0.2	12.7	12.7	15.0	±0.2/±0.3
P1	3.85					3.85			3.85			5.1			5.1	5.1	5.1	5.1	4.6	4.6	±0.5	3.85	3.85	3.75	±0.7
P2	6.35					6.35			6.35			6.35			6.35						±1.0	6.35	6.35	7.5	±1.3
W	18.0					18.0			18.0			18.0			18.0						±0.5	18.0			±0.5
W0	6.0					10.0			10.0		12.0	6.0			10.0					12.0	Min	12.0			Min
W1	9.0					9.0			9.0			9.0			9.0						±0.5	9.0			±0.5
W2	1.5					1.5			1.5			1.5			1.5						Max	1.5			Max
A	11.0					11.0			11.0			11.0			11.0						Max	11.0			Max
φD0	4.0					4.0			4.0			4.0			4.0						±0.2	4.0			±0.2
ΔH	0					0			0			0			0						±1.0	0			±1.0
t	0.7					0.7			0.7			0.7			0.7						±0.2	0.7			±0.2
Fig. No.	1					1			1			2			3	3	2	3	3	3		3	4	3	

Remark: 1. 4φ in mark of " * " is 4φ×7L the same spec. " SA " packing: 5 ~ 6.3φ×11 ~ 15L in H is 18.5mm.
2. For 3 ~ 8φ×5L, W0 = 10.0 is available.
3. φ in mark of " * " is 0.6mm for OP-CAP's 6.3φ and 8φ
4. The " Tol." of " TA " is the same " SA ".

Packaging

Fig. 5 Ammo pack box



Packaging Quantity Unit: pcs/box

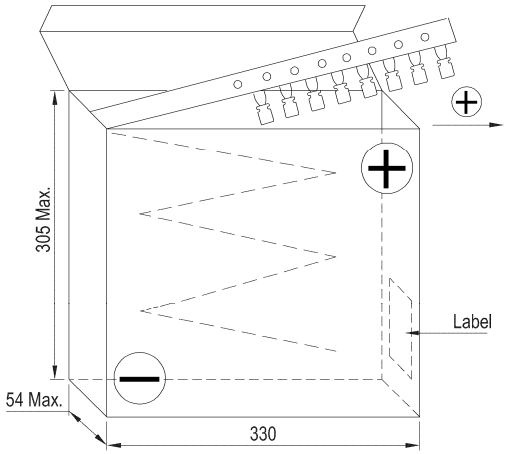
φD	3	4	5	6.3	8	10	12.5
TA, SA	3,000	2,000	2,000	2,000	1,000	500	300

Note: The component shall be oriented on the tape as such that the positive lead is leading or the negative lead is leading with customer's request.

Packing Quantity:

2. Radial Type in Taping Pack:

Inner Box of Ammo Pack:



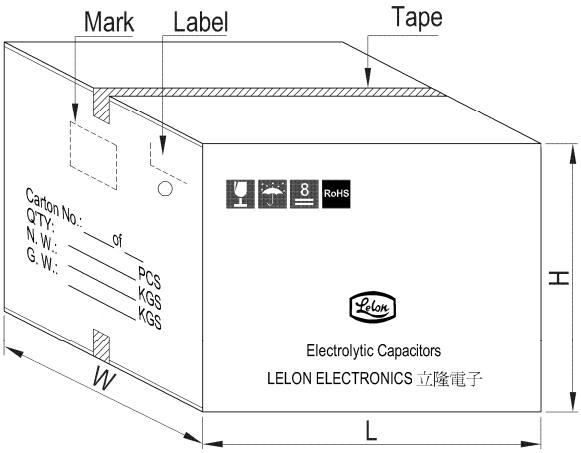
Unit: mm

φD	TA, SA
3	3,000
4	2,500
5	2,000
6.3	2,000
8	1,000
10φ × 8 ~ 30L	500
10φ × 35 ~ 50L	250
12.5	300
16	200

NOTE: (1) Above quantities are principle. Some difference may be provided.
(2) The component shall be orient on the tape as such that the positive lead is leading or the negative lead is leading with customer's request.

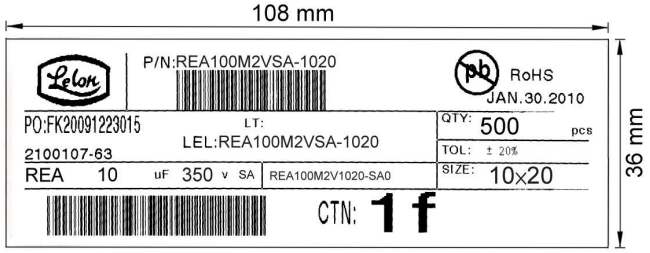
Packing Figure:

a) Outer Box



Case Size	L	W	H
3 ~ 4φ	427	345	230
5φ	491	345	275
6.3φ	597	349	294
8φ	491	345	275
10φ× 8 ~ 30L	412	358	303
10φ× 35 ~ 50L	210	358	405
12.5φ× 16 ~ 40L	597	349	294
16φ× 16 ~ 25L	430	330	325

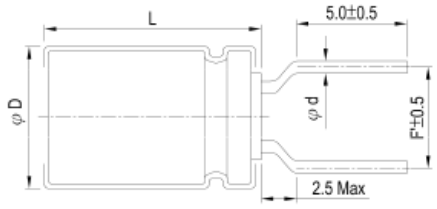
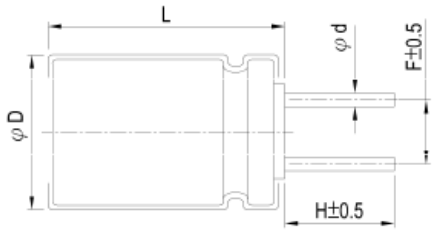
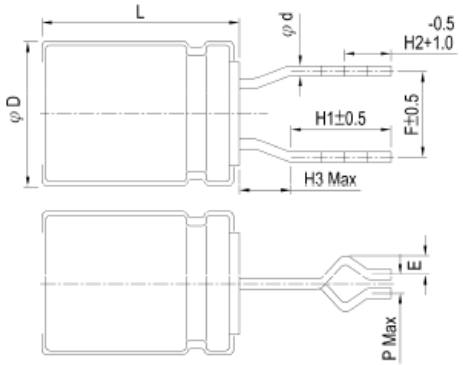
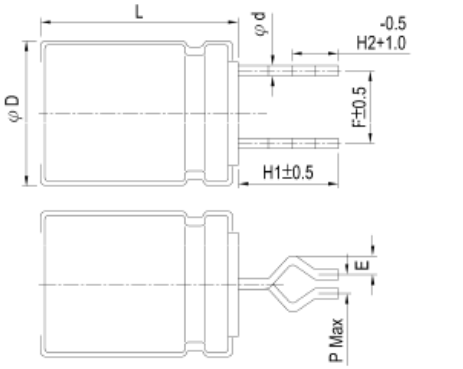
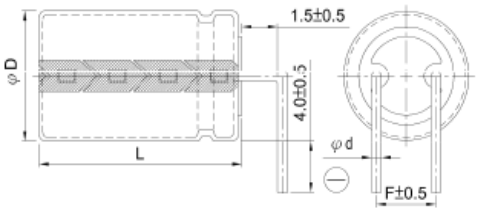
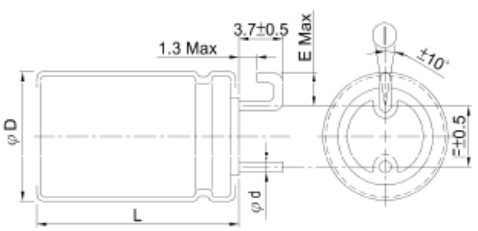
b) Label



Lead Forming & Cutting Specification

Radial Type

Unit: mm

Forming Method	Code	Shape	Dimensions
Forming Cut (4φ ~ 8φ)	FC		
Cut (3φ ~ 25φ)	CC		
Snap-in Forming Cut (4φ ~ 8φ)	SF		
Snap-in Cut (10φ ~ 25φ)	SC		
Bending Cut (5φ ~ 25φ)	BC		
Cathode Lead Bending (10φ ~ 25φ)	SD		

φD×L	φd	F	F'	H
3 × 5	0.4	1.0	5.0	5.0
4 × 5	0.45	1.5	5.0	5.0
5 × 5	0.45	2.0	5.0	5.0
6.3~8 × 5	0.45	2.5	5.0	5.0
4 × 7	0.45	1.5	5.0	5.0
5 × 7~11	0.5	2.0	5.0	5.0
6.3 × 7~15	0.5	2.5	5.0	5.0
8 × 7~9	0.5	3.5	5.0	5.0
8 × 11.5~50	0.6	3.5	5.0	5.0
10	0.6	5.0	---	4.5
12.5	0.6	5.0	---	4.5
16	0.8	7.5	---	4.5
18	0.8	7.5	---	4.5
22	1.0	10.0	---	4.5
25	1.0	12.5	---	4.5

φD × L	φd	H1	H2	H3	F	P	E
4 ~ 8 × 5	0.45	5.0	2.8	2.5	5.0	1.1	1.1
4 × 7	0.45	5.0	2.8	2.5	5.0	1.1	1.1
5 × 7~11	0.5	5.0	2.8	2.5	5.0	1.1	1.1
6.3 × 7~15	0.5	5.0	2.8	2.5	5.0	1.1	1.1
8 × 7~9	0.5	5.0	2.8	2.5	5.0	1.1	1.1
8 × 11.5~50	0.6	5.0	2.8	2.5	5.0	1.1	1.1
10	0.6	4.5	2.5	---	5.0	1.2	1.1
12.5	0.6	4.5	2.5	---	5.0	1.2	1.1
16	0.8	4.5	2.5	---	7.5	1.2	1.1
18	0.8	4.5	2.5	---	7.5	1.2	1.1
22	1.0	4.5	2.5	---	10.0	1.2	1.3
25	1.0	4.5	2.5	---	12.5	1.2	1.3

φD × L	φd	F ± 0.5	*E Max
5 × 11	0.5	2.0	---
6.3 × 11 ~ 15	0.5	2.5	---
8 × 11.5 ~ 50	0.6	3.5	---
10	0.6	5.0	2.3
12.5	0.6	5.0	2.3
16	0.8	7.5	2.7
18	0.8	7.5	2.7
22	1.0	10.0	2.7
25	1.0	12.5	2.7

"*E" is only suitable for SD cutting
"*BU": Leads bending cut are different direction from BC.

Packaging Quantity:

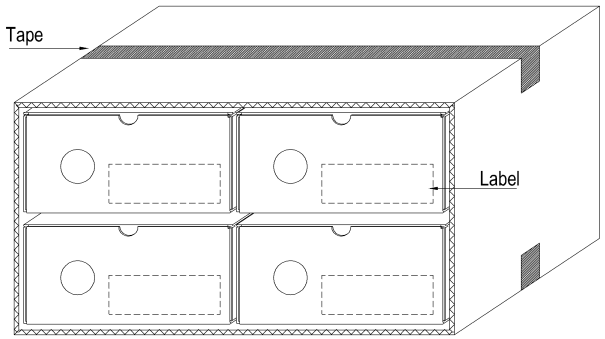
3. Radial Type in Cutting Pack:

Case Size	pcs / Bag	Inner Box / Carton	Pcs / Carton	Case Size	pcs / Bag	Inner Box / Carton	Pcs / Carton
3φ × 5	1,000	8	80,000	*10φ × 8 ~ 10L	*500	8	*12,000
4φ × 5 ~ 7L	1,000	8	80,000	10φ × 12.5 ~ 16L	500	8	8,000
5φ × 5 ~ 7L	1,000	8	56,000	10φ × 20L	400	8	6,400
*5φ × 8L	*1000	8	*24,000	10φ × 25L	300	8	4,800
5φ × 11L	1,000	8	40,000	10φ × 30 ~ 40L	250	8	4,000
6.3φ × 5 ~ 7L	1,000	8	40,000	10φ × 45 ~ 50L	200	8	3,200
*6.3φ × 5.5 ~ 8L	*1000	8	*20,000	12.5φ × 16 ~ 25L	200	8	3,200
6.3φ × 11L	1,000	8	24,000	12.5φ × 30 ~ 40L	150	8	2,400
	*1000	8	*20,000	12.5φ × 45 ~ 50L	100	8	1,600
6.3φ × 15L	500	8	12,000	16φ × 16 ~ 31.5L	100	8	1,600
8φ × 5 ~ 9L	1,000	8	16,000	16φ × 35.5 ~ 40L	75	8	1,200
8φ × 11.5L	1,000	8	16,000	16φ × 45 ~ 50L	50	8	800
*8φ × 8 ~ 12L	*1000	8	*16,000	18φ × 16 ~ 25L	100	8	1,600
8φ × 15L	800	8	12,800	18φ × 31.5 ~ 35.5L	75	8	1,200
8φ × 20L	500	8	8,000	18φ × 40L	50	8	800
8φ × 25 ~ 30L	500	8	8,000	18φ × 45 ~ 50L	50	8	400
8φ × 35 ~ 50L	250	8	4,000	20 ~ 25φ	---	---	400
10φ × 9L	500	8	12,000				

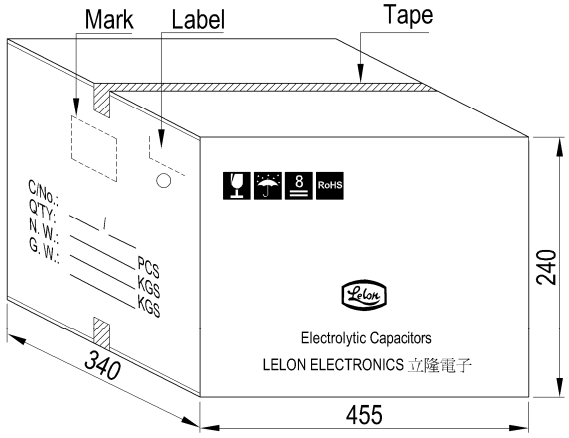
Remark: "*" Suitable for CA04 type (OP-CAP).

Packing Figure:

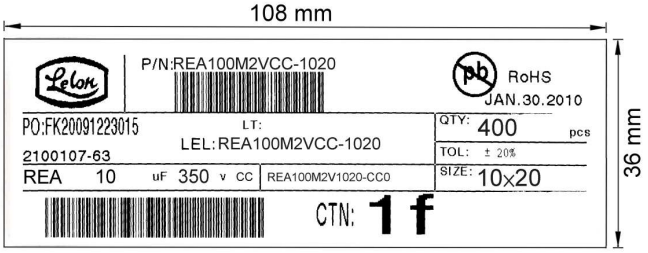
a) Inner Box



b) Outer Box: Unit: mm



c) Label:



Endurance Characteristic:

No.	Item	Conditions	Specification	
1	Rotational Temperature Test	Capacitor is placed in an oven whose temperature follow specific regulation to " +25℃ (3 min.) → -40℃ / -25℃ (30 min.) → +25℃ (3 min.) → +105℃ (30 min.) →+25℃ (3 min.)", and it is called a cycle. The test totals 10 cycles. And then the capacitor shall be subjected to standard atmospheric conditions for 4 hours, after which measurements shall be made. 6.3 ~ 400V: -40℃; 450V: -25℃	Capacitance change	Within ± 10% of initial value.
			Tanδ	Within specified value
			Leakage Current	Within specified value
			Physical	No broken and undamaged
2	High Temperature Endurance Life Test	1. Capacitors shall be placed in oven with application of ripple current and rated voltage for 2000 +72 / -0 hours at 105℃. 2. The capacitor should be used within specified permissible ripple current in each standard products table (the sum of DC voltage and AC peak voltage shall be equal to the rated DC working voltage). 3. The specified maximum permissible ripple current in defined at 105℃ and 120Hz (unless otherwise specified). 4. Then the capacitor shall be subjected to standard atmospheric conditions for 4 hours, after which measurements shall be made.	Capacitance change	Within ± 20% of initial value.
			Tanδ	Less than 200% of specified value
			Leakage Current	Within specified value
			Physical	No broken and undamaged
3	High Temperature Unload Life Test	After 1000 +48 / -0 hours test at 105℃ without rated working voltage. And then the capacitor shall be subjected to standard atmospheric conditions for 4 hours, after which measurements shall be made The rated voltage shall be applied to the capacitors before the measurenments for 160 ~ 450V (Refer to JIS C 5101-4 4.1)	Capacitance change	Within ± 20% of initial value.
			Tanδ	Less than 200% of specified value
			Leakage Current	Within specified value
			Physical	No broken and undamaged
4	Humidity Test	Capacitors shall be exposed for 1000 +48 / -0 hours in an atmosphere of 90% ~ 95% R. H. at 60 ± 3℃ And then the capacitor shall be subjected to standard atmospheric conditions for 4 hours, after which measurements shall be made.	Capacitance change	Within ± 10% of initial value.
			Tanδ	Less than 120% of specified value
			Leakage Current	Within specified value
			Physical	No broken and undamaged
5	Low Temperature Test	Capacitors are placed at -40 / -25 ±3℃ for 96 ± 4 hours. And then the capacitor shall be subjected to atmospheric conditions for 4 hours, after which measurements shall be made. 6.3 ~ 400V: -40℃; 450V: -25℃	Capacitance change	Within ± 10% of initial value.
			Tanδ	Within specified value
			Leakage Current	Within specified value
			Physical	No broken and undamaged
6	Vibration Test	1. Fix it at the point 4mm or less form body. For ones of 12.5mm or more in diameter or 25 mm or more length, use separate fixture. 2. Direction and during of vibration: 3 orthogonal directions mutually each for 2 hours (total of 6 hours). 3. Frequency: 10 to 55 Hz reciprocation for 1min. 4. Total amplitude: 1.5mm	Capacitance change	Within ± 10% of initial value.
			Tanδ	Within specified value
			Leakage Current	Within specified value
			Physical	No broken and undamaged
7	Solder Heat-Resistance Test	The section of lead below 4mm form the body of capacitor must be immersed in 260 ± 5℃ liquid tin 10 ± 1 seconds, than, after removing the following specifications shall be satisfied when capacitor terminal is restored to 20℃ over 4 hours.	Capacitance change	Within ± 10% of initial value.
			Tanδ	Within specified value
			Leakage Current	Within specified value
			Physical	No broken and undamaged

<table>
<tr><th>No.</th><th>Item</th><th>Conditions</th><th colspan="2">Specification</th></tr>
<tr><td>8</td><td>Surge Voltage Test</td><td rowspan="2">The capacitor shall be subjected to 1000 cycles at 15 ~ 35℃. Protective series resistor a 1KΩ each consisting of a charge period of 30 ± 5 seconds, followed by discharge period of approximately 5.5 minutes.

Applying voltage:
<table>
<tr><td>Rated Voltage(V)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr>
<tr><td>Surge Voltage(V)</td><td>7.3</td><td>11.5</td><td>18.4</td><td>28.8</td><td>40.3</td><td>57.5</td><td>72.5</td><td>115</td></tr>
<tr><td>Rated Voltage(V)</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td><td></td><td></td></tr>
<tr><td>Surge Voltage(V)</td><td>184</td><td>230</td><td>288</td><td>385</td><td>440</td><td>495</td><td></td><td></td></tr>
</table></td><td>Capacitance change</td><td>Within ± 20% of initial value.</td></tr>
<tr><td></td><td></td><td>Tanδ</td><td>Less than 175% of specified value</td></tr>
<tr><td></td><td></td><td></td><td>Leakage Current</td><td>Within specified value</td></tr>
<tr><td></td><td></td><td></td><td>Physical</td><td>No broken and undamaged</td></tr>
<tr><td>9</td><td>Mechanical Characteristics Test</td><td colspan="3">1. The test is about lead tabs strength.
2. Tension Test:
The lead tabs shall not be broken or any malformed condition after fixing capacitor vertically and pressing the following weight on the lead tabs of capacitor for 10 ± 1 secs.
<table>
<tr><th>Lead tabs diameter (mm)</th><th>Weight (Kg)</th></tr>
<tr><td>≦ 0.5</td><td>0.5</td></tr>
<tr><td>0.6 ~ 0.8</td><td>1.0</td></tr>
<tr><td>＞ 0.8</td><td>2.0</td></tr>
</table>
3. Bending Test:
The capacitor is held in vertical position. Attach a weight to the lead tabs, slowly rotate the capacitor 90° to a same way in the opposite direction. Repeat it again (5 secs / cycle). The lead tabs shall not be broken or cracked.
<table>
<tr><th>Lead tabs diameter (mm)</th><th>Weight(Kg)</th></tr>
<tr><td>≦ 0.5</td><td>0.25</td></tr>
<tr><td>0.6 ~ 0.8</td><td>0.50</td></tr>
<tr><td>＞ 0.8</td><td>1.00</td></tr>
</table></td></tr>
<tr><td>10</td><td>Solderability Test</td><td colspan="3">After the lead wire fully immersed in the solder for 2 ± 0.5 secs at a temperature of 245 ± 5℃, the solder coating must be more than 95%.</td></tr>
<tr><td>11</td><td>Venting Test</td><td colspan="3">1. Applicable to the capacitors with case diameter is 6.3 mm and larger.
2. Test condition:
(1) AC test:
The capacitor shall be connected across an applying 50 or 60 Hz AC which is 0.7 times of rated voltage or 250Vrms AC whichever is the lower.
(2) DC test:
Applying inverse DC rated voltage with current to the capacitor.
Where case diameter: φD ≦ 22.4mm: 1 A DC max
φD ＞ 22.4mm: 10 A DC max
Note:
(1) When the pressure relief vent operated, the capacitor shall avoid any danger of fire or explosion of capacitor element (terminal and metal foil etc.) or cover.
(2) When the pressure relief device does not open with the voltage applied over 30 minutes, the test is considered to be passed.</td></tr>
<tr><td>12</td><td>Standards</td><td colspan="3">Satisfies Characteristic JIS C 5101-4</td></tr>
</table>

Precautions and Guidelines for Aluminum Electrolytic Capacitors

1. Guidelines for Circuit Design (General / Application guidelines for using electrolytic capacitors)

Selecting of a right capacitor is a key to a good circuit design.

(1) Polarity

Most of the aluminum electrolytic capacitors are polarized. Therefore, they must be installed with the correct polarity. Usage in the reverse polarity results into a short-circuit condition that may damage or even explode the capacitor. In addition, it may influence circuit functionality. A bi-polar electrolytic capacitor should be installed when polarity across a capacitor is unstable / reversible. It should be, however, noted that usage of both polar and bi-polar capacitors are limited to DC applications. They must NOT be used for AC application.

(2) Operating Voltage

Applied DC voltage must not exceed rated voltage of the capacitor. Applying higher voltage than its rated voltage across a capacitor terminals cause overheating due to higher leakage currents and capacitor dielectric/insulation deterioration that will ultimately affect a capacitor's performance. The device, however, is capable of working under short-time transient voltages such as DC transients and peak AC ripples. Reverse voltages higher than 1 Volt within a specified temperature limit or AC voltages are not permissible. Overall, using capacitors at recommended operating voltages can prolong its lifespan. Note that the result of DC voltage overlapped with peak ripple voltage should not exceed rated voltage.

(3) Ripple Current

One of the key functions of any capacitor is removal of the ripple current i.e. the RMS value of AC flowing through a capacitor. But, a ripple current higher than rated ripple current will drop resultant capacitance, cause undue internal heating and thus reduces life span of the capacitor. In extreme cases, internal high temperature will cause the pressure relief vent to operate while destroying the device. Overall, it is important to note that an electrolytic capacitor must be used within a permissible range of ripple current. Indicators like temperature coefficient of allowable ripple current are generally used to determine life expectancy of the capacitor, but to avoid related complex calculations and for the sake of simplicity, we haven't provided temperature coefficient in the catalogue. But it offers key indicators like maximum operating temperature for calculation of life expectancy at a given temperature.

(4) Operating Temperature

Capacitors should be used within a permissible range of operating temperatures. Using capacitor at a higher temperature than maximum rated temperature will considerably shorten its life. In the worst-case scenario, high temperature can cause pressure relief vent to operate and the device will get destroyed. Using capacitors at an ambient room temperature assure their longer life.

(5) Leakage Current

Leakage current flows through a capacitor when DC voltage is applied across it. Leakage current varies with changes in ambient temperature and applied DC voltage level and its time of application. Overvoltage situation, presence of moisture, and thermal stresses, especially occurring during the soldering process can enhance leakage current. Initial leakage current is usually higher and does not decrease until voltage is applied for a certain period of time. It is recommended to keep initial leakage current within specified levels.

(6) Charge and Discharge

Regular electrolytic capacitors are not suitable for rapid charging/discharging circuits. Such usage may either cause reduction in overall capacitance or damage due to overheating. Lelon provides special assistance for selecting appropriate capacitors for rapid charging/discharging circuits.

(7) Surge Voltage

The Surge voltage rating is referred as the maximum DC overvoltage that may be applied to an electrolytic capacitor for a short time interval of 30 seconds at infrequent time intervals not exceeding 5.5minutes with a limiting resistance of 1kΩ. Unless otherwise described on the catalogue or product specifications, please do not apply a voltage exceeding the capacitor's voltage rating. The rated surge voltages corresponding to rated voltages of electrolytic capacitors are presented as follows:

Rated Voltage(V)	4	6.3	10	16	25	35	50
Surge Voltage(V)	**4.6**	**7.3**	**11.5**	**18.4**	**28.8**	**40.3**	**57.5**

Rated Voltage(V)	63	80	100	160	200	250	315
Surge Voltage(V)	**72.5**	**92**	**115**	**184**	**230**	**288**	**347**

Rated Voltage(V)	350	400	420	450	500	525
Surge Voltage(V)	**385**	**440**	**462**	**495**	**550**	**578**

(8) Condition of Use

The capacitors shall NOT be exposed to:

(a) Fluids including water, saltwater spray, oil, fumes, highly humid or condensed climates, etc.
(b) Ambient conditions containing hazardous gases/fumes like hydrogen sulfide, sulfurous acid, nitrous acid, chlorine or bromine gas, ammonia, etc.
(c) Exposed to ozone, ultraviolet rays and radiation.
(d) Severe vibrations or physical shocks that exceeds the specifications mentioned in this catalogue.

(9) Circuit Design Consideration

(a) Please ensure whether application, operating and mounting conditions satisfy the conditions specified in the catalog before installation of a capacitor. Please consult Lelon, if any of the conditions are beyond the conditions specified in the catalog.
(b) Heat-generating components or heat sinks should not be placed closer to Aluminum electrolytic capacitors on the PCB to avoid their premature failure. A cooling system is recommended to improve their reliable working.
(c) Electrical characteristics and performance of aluminum electrolytic capacitors are affected by variation of applied voltage, ripple current, ripple frequency and operating temperature. Therefore, these parameters shall not exceed specified values in the catalog.
(d) Aluminum capacitors may be connected in the parallel fashion for increasing total capacitance and/or for achieving higher ripple current capability. But, such design may cause unequal current flow through each of the capacitors due to differences in their impedances.
(e) When two or more capacitors are connected in series, voltage across each capacitor may differ and fall below the applied voltage. A resistor should be placed across each capacitor so as to match applied voltage with voltage across a capacitor.
(f) Please consult Lelon while selecting a capacitor for high-frequency switching circuit or a circuit that undergoes rapid charging/ discharging
(g) Standard outer sleeve of the capacitor is not a perfect electrical insulator therefore is unsuitable for the applications that requires perfect electrical insulation. Please consult Lelon, if your application requires perfect electrical insulation.
(h) Tilting or twisting capacitor body is not recommended once it is soldered to the PCB.

2. Caution for Assembling Capacitors

(1) Mounting

(a) Aluminum electrolytic capacitors are not recommended to re-use in other circuits once they are mounted and powered in a circuit.

(b) Aluminum electrolytic capacitors may hold static charge between its anode and cathode, which is recommended to be discharged through a 1kΩ resistor before re-use.
(c) A long storage of capacitors may result into its insulation deterioration. This can lead to a high leakage current when voltage is applied that may damage the capacitor. Capacitors following a long storage period must undergo voltage treatment/re-forming.
Capacitors are charged by applying rated DC voltage through a resistor of 1kΩ in series at least for an hour. It is recommended to increase applied voltage gradually using a voltage regulator unit once capacitors are assembled on the board. The charging should be followed by discharging through a 1KΩ resistor.
(d) Please check capacitor rated voltage before mounting.
(e) Please check capacitor polarity before mounting.
(f) Please don't drop capacitor on the floor / hard object.
(g) Please don't deform the capacitor during installation.
(h) Please confirm whether the lead spacing of the capacitors match with its pad spacing / footprint on PCB prior to installation.
(i) Please avoid excessive mechanical shocks to capacitor during the auto-insertion process, inspection or centering operations.
(j) Please don't place any wiring or circuit over the capacitor's pressure relief vent. The pressure relief vent may fail to open if adequate clearance space is not provided. Following table shows minimum clearance space required for different case diameters.

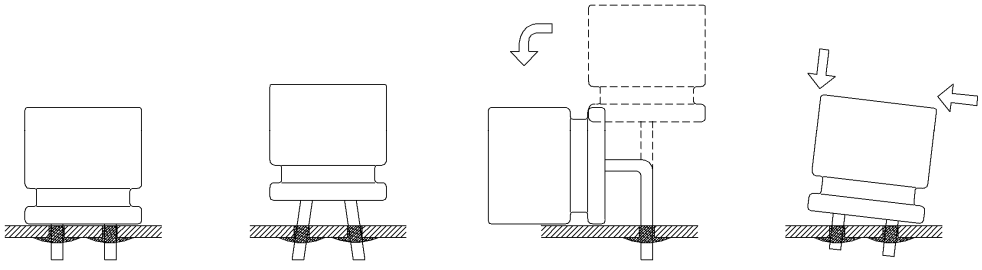
Case Diameter	ϕ6.3 ~ ϕ16	ϕ18 ~ ϕ35	ϕ40 or above
Clearance (min)	2 mm	3 mm	5 mm

(2) Soldering

(a) Please confirm that soldering conditions, especially temperature and contact time are within our specifications. Dip or flow soldering temperature should be limited at 260 ± 5℃ for 10 ± 1 sec while manual soldering using soldering iron should be limited at 350 ± 5℃ for 3 +1/-0 seconds. Please do not dip capacitor body into molten solder. A capacitor's life will be negatively affected if these conditions are violated.
(b) Storage of capacitors in *high humidity* conditions is likely to *affect* the *solder-ability of lead wires and terminals*.
(c) **Reflow soldering should NOLY be used for SMD type capacitors.** The temperature and duration shall not exceed the specified temperature and duration in the specification. If the temperature or duration is higher than the value specified, please consult Lelon before usage.
(d) Standard aluminum electrolytic capacitors are not designed to withstand multiple reflow processes. Please consult Lelon if repeated reflowing is unavoidable.
(e) Incorrect mounting on PCB with improper external strength applied on its lead wires or capacitor body after soldering may damage a capacitor's internal structure, cause short circuit, or lead to high leakage current issues. Do not bend or twist the capacitor body after soldering. Referring to the drawings below only case (i) is recommended.
(i) Correct soldering
(ii) Hole-to-hole spacing on PCB differs from the lead space of lead wires.
(iii) Lead wires are bent after soldering.
(iv) Capacitor body doesn't stand vertical on PCB after soldering.

(3) Cleaning Circuit Boards after Soldering

(a) Following chemicals are not recommended for cleaning: Solvent containing halogen ions, Alkaline solvent, Xylene, Acetone, Terpene, petro-based solvent.
(b) Recommended cleaning conditions:
Fatty-alcohol - Pine Alpha ST-100S, Clean Through-750H and IPA (isopropyl alcohol) are examples of the most acceptable cleaning agents. Temperature of the cleaning agent must not exceed 60℃. Flux content in the cleaning agents should be limited to 2 Wt. %. Overall length of cleaning process (e.g., immersion, ultrasonic or other) shall be within 5 minutes (5 ~ 7mm height within 3 minutes). CFC substitute cleaning agents such as AK225AES can also be used for cleaning. In this case, its temperature shall not exceed 40 C and cleaning process (e.g., immersion, ultrasonic or other) shall be completed within 2 ~ 3 minutes. After cleaning capacitors should be dried with hot air for at least 10 minutes along with the PCB. Temperature of hot air shall not exceed maximum category temperature of the capacitor. Insufficient drying may cause appearance defects, sleeve shrinkage, and bottom-plate bulging. However, usage of this CFC substitute must completely regulated for protection of environment.



3. Maintenance Inspection

Periodical inspection of aluminum capacitors is absolutely necessary, especially when they are used with industrial equipment. The following items should be checked:
(1) Appearance: Bloated, vent operated, leaked, etc.
(2) Electrical characteristic: Capacitance, Tanδ, leakage current, and other specified items listed in specification.
Lelon recommend replacing the capacitors if any of the abovementioned items fail to meet specifications.

4. Storage

(1) The most suitable conditions for aluminum capacitor storage are 5 ℃ ~ 35℃ and indoor relative humidity less than 75%. High temperature and/or humidity storage is detrimental to the capacitors.
(2) Capacitors shall not be stored in wet or damp atmospheres containing water, brine, fumes or oil.
(3) Capacitors storage area shall neither be exposed to hazardous gases such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonium, etc. nor to acidic or alkaline solutions.
(4) Capacitors shall not be exposed to ozone, ultraviolet rays or radiation.

5. Disposal

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

6. Environmental Consideration

Lelon already have received ISO 14000 certificate. Cadmium (Cd), Lead (Pb), Mercury (Hg), Hexavalent Chromium (Cr^{+6}), PBB, PBDE, DEHP, BBP, DBP and DIBP have never been using in capacitor. If you need “Halogen-free” products, please consult with us.

7. AEC-Q200 Compliance

Automotive Electronics Counsel (AEC) has established various electronic component qualification/reliability standards in order to serve automotive electronics industry. AEC-Q200 standard is dedicated for passive components like capacitors, inductors, etc. and is widely adopted domestically as well as internationally.
Lelon offers compliant product designs and support services to satisfy customers’ product requirements, including the ACE-Q200 required criteria of the reliability tests. Lelon’s capacitors are professionally designed to outperform all requirements of ACE-Q200.

For further details, please refer to

IEC 60384-4- Fixed capacitors for use in electronic equipment – Part 4: Sectional specification – Aluminium electrolytic capacitors with solid (MnO_2) and non-solid electrolyte (Established in January 1995, Revised in March 2007), and

EIAJ RCR-2367B- Guideline of notabilia for fixed aluminium electrolytic capacitors for use in electronic equipment [Technical Standardization Committee on Passive Components (Established in March 1995, Revised in March 2002)].