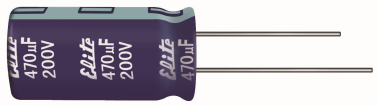
ALUMINUM ELECTROLYTIC CAPACITORS

SM Series

- **Standard size downsized**
- **2,000 hours assured at 85℃**



◆ SPECIFICATIONS

Item	Performance Characteristics	
Category Temperature Range	-40 ~ +85℃	-25 ~ +85℃
Working Voltage Range	6.3 ~ 100Vdc	160 ~ 450Vdc
Capacitance Range	0.1 ~ 22,000μF	0.47 ~ 470 μF
Capacitance Tolerance	±20% (at 25℃ and 120Hz)	

Dissipation Factor (tanδ) (at 25℃, 120Hz)

Rated Voltage (V)	6.3	10	16	25	35	50	63	100	160 ~ 250	350 ~ 450
tanδ(Max)	0.26	0.22	0.16	0.14	0.12	0.10	0.09	0.08	0.15	0.20

The above values should be increased by 0.02 for every additional 1000μF

Leakage Current

I=0.01CV or 3μA whichever is greater (6.3 ~ 100V)
I=0.03CV + 10μA (160 ~ 450V)
I : Leakage current (μA) C : Rated capacitance (μF) V : Rated voltage (V)
Impress the rated voltage for 2 minutes.

Low Temperature Characteristics Impedance Ratio(MAX)

Rated voltage (V)	6.3	10	16	25	35	50	63	100	160 ~ 250	350	400 ~ 450
Z(-40℃)/Z(+20℃)	12	10	8	5	4	3	3	3	—	—	—
Z(-25℃)/Z(+20℃)	—	—	—	—	—	—	—	—	3	6	6

(at 120Hz)

Endurance

The following requirements shall be satisfied when the capacitor are restored to 25℃ after the rated voltage applied for 2,000 hours at 85℃.

Capacitance change	≦ ±20% of the initial value
Dissipation factor(tanδ)	≦ 200% of the specified value
Leakage current	≦ specified value

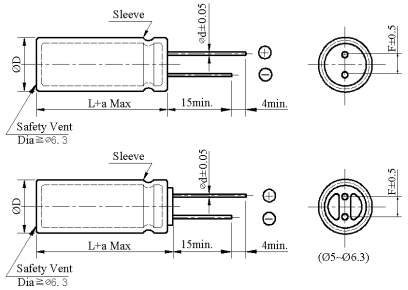
Shelf Life

The following requirements shall be satisfied when the capacitor are restored to 25℃ after the rated voltage applied for 1,000 hours at 85℃ without voltage applied.

Capacitance change	≦ ±20% of the initial value
Dissipation factor(tanδ)	≦ 200% of the specified value
Leakage current	≦ 200% of the specified value

Others	Conforms to JIS-C-5101-4 (1998), characteristic W.

◆ DIMENSIONS (mm)



ΦD	5	6.3	8	10	12.5 L＜35	12.5 L≧35	16	18	20	22
ΦD	ΦD +0.5 Max								ΦD +1.0 Max	
Φd	0.5	0.5	0.6	0.6	0.6	0.8	0.8	0.8	1.0	1.0
F	2.0	2.5	3.5	5.0	5.0		7.5	7.5	10	10
a	L+1.5 Max				≦ 35 L+1.5Max ≧ 40 L+2.0 Max		L+1.5 Max		L+2.0 Max	

◆ PART NUMBERING SYSTEM (Example : 35V 150μF)

S	M	1	V	1	5	1	M	N	N	0	8	1	2						

Special Request
Size code(0812 : 8×12)
Lead length code
Lead forming Type code
Capacitance tolerance code(M:±20%)
Capacitance code(150μF)
Voltage code(35V)
Series code(SM)

SM Series

◆ **Case size & Permissible rated ripple current: (mA rms) at 85℃ / 120Hz**

uF \ Vdc	6.3		10		16		25	
	ΦD × L	RC	ΦD × L	RC	ΦD × L	RC	ΦD × L	RC
4.7							5×11	30
10					5×11	40	5×11	55
22	5×11	65	5×11	65	5×11	75	5×11	80
33	5×11	80	5×11	85	5×11	90	5×11	95
47	5×11	95	5×11	100	5×11	110	5×11	120
68	5×11	100	5×11	110	5×11	120	6.3×11	145
100	5×11	130	5×11	150	5×11	160	6.3×11	190
150	5×11	150	5×11	160	6.3×11	210	6.3×11	210
220	5×11	200	5×11	220	6.3×11	270	8×11.5	320
330	6.3×11	270	6.3×11	300	8×11.5	370	8×11.5	400
470	6.3×11	330	6.3×11	360	8×11.5	440	10×12.5	520
680	8×11.5	445	8×11.5	445	10×12.5	500	10×16	605
1000	8×11.5	540	10×12.5	650	10×16	770	10×20	930
2200	10×16	930	10×20	1130	12.5×20	1300	12.5×25	1550
3300	10×20	1230	12.5×20	1450	12.5×25	1700	16×25	1730
4700	12.5×20	1520	12.5×25	1790	16×25	1840	16×31.5	2140
6800	12.5×25	1890	16×25	1940	16×31.5	2280	18×35.5	2630
10000	16×25	2030	16×31.5	2470	18×35.5	2750		
15000	16×35.5	2590	18×35.5	2870				
22000	18×35.5	3220	18×40	3300				

uF \ Vdc	35		50		63		100	
	ΦD × L	RC	ΦD × L	RC	ΦD × L	RC	ΦD × L	RC
0.1			5×11	2			5×11	3
0.22			5×11	3			5×11	5
0.33			5×11	5			5×11	7
0.47			5×11	14			5×11	16
1			5×11	20			5×11	23
2.2			5×11	30			5×11	34
3.3			5×11	37			5×11	42
4.7	5×11	35	5×11	40	5×11	45	5×11	50
10	5×11	60	5×11	65	5×11	65	6.3×11	80
22	5×11	90	5×11	95	5×11	95	6.3×11	120
33	5×11	110	6.3×11	120	6.3×11	130	8×11.5	170
47	5×11	130	6.3×11	160	6.3×11	160	10×12.5	220
68	6.3×11	160	6.3×11	170	8×11.5	180	10×12.5	235
100	6.3×11	210	8×11.5	270	10×12.5	290	10×16	340
150	8×11.5	290	10×12.5	345	10×12.5	345	12.5×20	490
220	8×11.5	360	10×12.5	430	10×16	470	12.5×25	710
330	10×12.5	490	10×20	600	12.5×20	660	12.5×25	870
470	10×16	580	12.5×20	760	12.5×20	850	16×25	1010
680	10×20	720	12.5×20	875	12.5×25	1000	16×35.5	1100
1000	12.5×20	1200	12.5×25	1360	16×25	1310	18×35.5	1350
2200	16×25	1880	16×35.5	2060	18×35.5	2220		
3300	16×35.5	2190	18×35.5	2500				
4700	18×35.5	2560						

SM Series

◆ **Case size & Permissible rated ripple current: (mA rms) at 85℃ / 120Hz**

Vdc / uF	160		200		250		350	
	ΦD × L	RC	ΦD × L	RC	ΦD × L	RC	ΦD × L	RC
0.47	5×11	12	5×11	12	5×11	12	5×11	14
1	5×11	17	5×11	17	6.3×11	17	6.3×11	18
2.2	6.3×11	26	6.3×11	26	6.3×11	30	8×11.5	28
3.3	6.3×11	35	6.3×11	35	8×11.5	35	8×11.5	35
4.7	6.3×11	40	8×11.5	45	8×11.5	45	10×12.5	41
10	8×11.5	65	8×11.5	70	10×12.5	70	10×16	70
22	10×16	110	10×20	110	10×20	130	12.5×20	110
33	10×20	150	10×20	160	12.5×20	160	12.5×25	140
47	12.5×20	180	12.5×20	180	12.5×20	210	16×25	220
68	12.5×25	230	12.5×25	230	16×25	250	16×31.5	260
82	12.5×25	250	12.5×25	260	16×25	265	18×31.5	270
100	12.5×25	300	16×25	330	16×31.5	310	18×31.5	305
120	12.5×25	325	16×25	350	16×31.5	345	18×31.5	340
150	16×25	360	16×31.5	400	16×35.5	530	18×35.5	380
180	16×31.5	415	16×35.5	430	18×35.5	540	18×40	410
220	16×31.5	510	16×35.5	520	18×35.5	600		
330	18×35.5	600	18×35.5	635	18×40	650		
470	18×40	700	18×40	705				

Vdc / uF	400		450	
	ΦD × L	RC	ΦD × L	RC
0.47	6.3×11	14	6.3×11	14
1	6.3×11	18	8×11.5	19
2.2	8×11.5	28	8×11.5	25
3.3	8×11.5	32	10×12.5	32
4.7	10×16	41	10×16	50
10	10×20	70	12.5×20	75
22	12.5×25	120	12.5×25	110
33	16×25	140	16×25	150
47	16×25	160	16×31.5	220
68	16×35.5	280	18×31.5	230
82	18×31.5	290	18×35.5	245
100	18×31.5	300	18×40	280
120	18×35.5	330	18×45	300
150	18×40	360		
180	18×45	400		

◆ **RIPPLE CURRENT MULTIPLIERS**

Frequency Multipliers

Vdc	Cap.(uF)	Frequency (Hz)				
		50/60	120	1K	10K	100K
6.3 ~ 100	0.1 ~ 68	0.75	1.00	1.57	2.00	2.00
	100 ~ 680	0.80	1.00	1.34	1.40	1.50
	1000 ~ 22000	0.85	1.00	1.13	1.13	1.13
160 ~ 450	0.47 ~ 220	0.80	1.00	1.40	1.40	1.40
	330 ~ 470	0.90	1.00	1.13	1.13	1.13

PART NUMBER SYSTEM (I)

♦ RADIAL LEAD TYPE

Series	Rated Voltage	Capacitance	Tolerance	Lead Forming Type	Lead Length	Case Dimension	Special Request
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
□□	□□	□□□	□	□	□	□□□□	□□□□□□

(1) Series

Series	SS	SS-H	SB	SB-H	SF	LK	EM	ER	EH	EP	EC	ND
	ND-H	LB	LB-H	SM	PF	PW	EL	EB	ED	EK	EV	EJ
	EG	EY	RF	PY	TL	TD	TX	PC	LF	LL	PV	PJ
	KJ	KY	MW	MV	MJ	PZ	PA	PQ	MZ	MA	MQ	SW
	SQ	SP	VW	VQ	VJ							

(2) Rated Voltage

Code	0J	1A	1C	1E	1F	1V	1H	1J	1K	2A	2C	2Z	2D	2P	2E	2V	2G	2S	2W	2H
WV	6.3	10	16	25	30	35	50	63	80	100	160	180	200	220	250	350	400	420	450	500

(3) Capacitance

Code	R10	R47	010	4R7	100	470	101	471	102	472	473
µF	0.1	0.47	1.0	4.7	10	47	100	470	1000	4700	47000

(4) Capacitance Tolerance

Code	J	Q	R	K	V	M	H
%	± 5	+30 / -10	+20 / -0	± 10	+20 / -10	± 20	+20 / -5

(5) Lead Type

Code	N	C	B	D	F	L	T	R	S	E	P
Description	Long Lead	Cutting	Kink & Cutting	Forming & Cutting							Taping
Drawing	---	Fig 1	Fig 2	Fig 3	Fig 4	Fig 5	Fig 6	Fig 7	Fig 8	Fig 9	Fig 10

(6) Lead Length (Cut / Formed lead)

Code	Z	2	B	E	G	M	3	T	C	D	4	5	6
Length	2.0	2.5	2.8	3.1	3.3	3.5	3.5	3.8	3.8	4.0	4.5	5.0	6.3
Tolerance	+0.3/-0.2						±0.5	±0.3	±0.5				
Code	7	I	8	J	9	K	A	L	F	S	H	Q	N
Length	7.0	7.5	8.0	8.5	9.0	9.5	10	10.5	14.8	1.0	12	3.6	⊕19mm min
Tolerance	±0.5								±0.3		±1.0	+0.3/-0.2	⊖15mm min

Taping Code

Code	Z	2	3	5	I
Lead Pitch:+0.8/-0.2	2.0	2.5	3.5	5.0	7.5

(7) Case Dimension

Code	0407	0511	6311	08B5	10C5	1016	1225	16N3	16P1	18N3	18P1	1840
Size	04x07	05x11	6.3x11	08x11.5	10x12.5	10x16	12.5x25	16x31.5	16x35.5	18x31.5	18x35.5	18x40

(8) Special Request

Code	R	F	L	D
Description	High Rated ripple current	Endurance	Low Leakage Current	Low Dissipation Factor
Code	H	E	P	---
Description	High Temperature	Low Impedance & ESR	PET Sleeve	---

PART NUMBER SYSTEM (Ⅱ)

♦ SNAP-IN TYPE

Series	Rated Voltage	Capacitance	Tolerance	Lead Forming Type	Lead Length	Case Dimension	Special Request
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
□ □ (□)	□ □	□ □ □	□	□	□	□ □ □ □	□ □ □ □ □ □

(1) Series

Series	GM	GR	GSF	GVF	PM	PL	PK	PT	PG	PO	PI
	TG	GD	PX								

(2) Rated Voltage

Code	1C	1E	1F	1V	1H	1J	1K	2A	2C	2Z	2D	2P	2E	2V	2G	2S	2W	2H
WV	16	25	30	35	50	63	80	100	160	180	200	220	250	350	400	420	450	500

(3) Capacitance

Code	470	101	471	102	472	473	683
µF	47	100	470	1000	4700	47000	68000

(4) Capacitance Tolerance

Code	J	Q	R	K	V	M	H
%	± 5	+30 / -10	+20 / -0	± 10	+20 / -10	± 20	+20 / -5

(5) Lead Forming Type

Code	K	N	R
Description	Four Terminals	Snap-in Terminal	Forming & Cutting

(6) Terminal Length

Code	D	4	N	6
Length	4.0	4.5	5.5	6.3
Tolerance	±0.5	±0.5	±0.5	±1.0

(7) Case Dimension

Code	2225	2530	2545	2550	3035	3540	3550
Size	22 x 25	25 x 30	25 x 45	25 x 50	30 x 35	35 x 40	35 x 50

(8) Special Request

Code	R	F	L	D
Description	High Rated ripple current	Endurance	Low Leakage Current	Low Dissipation Factor
Code	H	E	P	---
Description	High Temperature	Low Impedance & ESR	PET Sleeve	---

PART NUMBER SYSTEM (Ⅲ)

♦ SPECIAL TYPE

Series	Rated Voltage	Capacitance	Tolerance	Terminal Forming Type	Case Dimension	Special Request
(1)	(2)	(3)	(4)	(5)	(6)	(7)
□□	□□	□□□	□	□□	□□□□	□□□□□□

(1) Series

Series	AQ	AN	SC	SA	SK	SX	SL		

(2) Rated Voltage

Code	1C	1E	1F	1V	1H	1J	1K	2A	2C	2Z	2D	2P	2E	2V	2G	2S	2W	2H	2L	2J
WV	16	25	30	35	50	63	80	100	160	180	200	220	250	350	400	420	450	500	550	600

(3) Capacitance

Code	R10	R47	010	4R7	100	470	101	471	102	472	473
μF	0.1	0.47	1.0	4.7	10	47	100	470	1000	4700	47000

(4) Capacitance Tolerance

Code	J	Q	R	K	V	M	H
%	± 5	+30 / -10	+20 / -0	± 10	+20 / -10	± 20	+20 / -5

(5) Terminal Forming Type

Code	AC	HU	LS (Screw M5×10)	LA (Screw M5×13)	LB (Screw M6×17)	CA	CL
Description	Two Parts of Terminals	Two Vertical Terminals	Two Screw Terminals			Snap-in Terminal	Lug Terminal

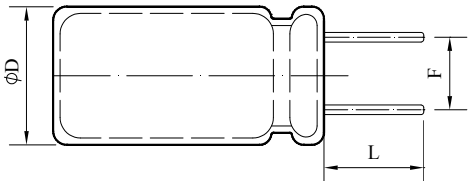
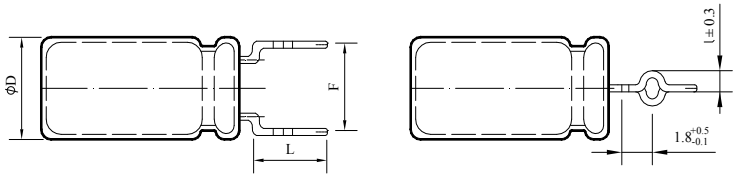
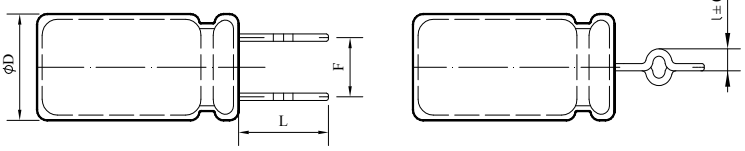
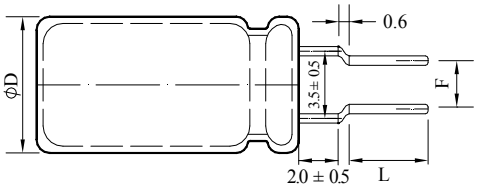
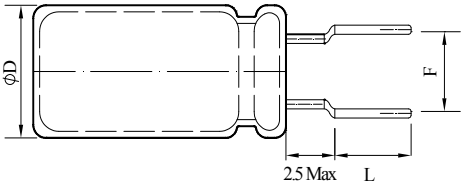
(6) Case Dimension

Code	3535	4095	40A5	51A5	51C0	64A0	64B0	76E3	76L5	90F0	90H0	90J0	90K5	90N0
Size	35x35	40x95	40x105	51x105	51x120	64x100	64x110	76x143	76x215	90x150	90x170	90x190	90x205	90x230

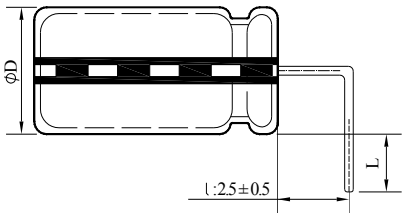
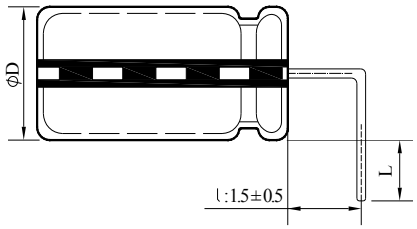
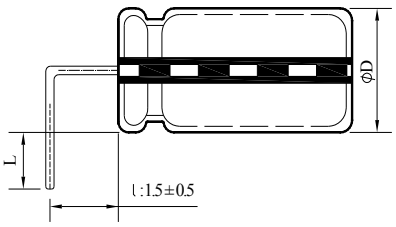
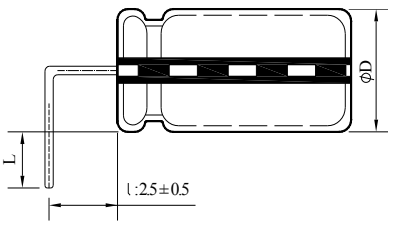
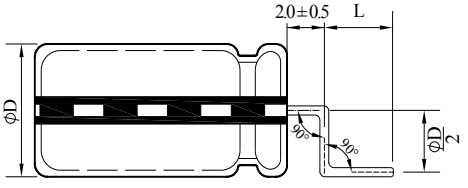
(7) Special Request

Code	R	F	L	D
Description	High Rated ripple current	Endurance	Low Leakage Current	Low Dissipation Factor
Code	H	E	P	---
Description	High Temperature	Low Impedance & ESR	PET Sleeve	---

♦ LEAD FORMING TYPE

Type	Part Number	Dimensions (Unit: mm)																										
		ΦD	F	ι	L (Part number for lead length and pitch for taping)																							
					Z	2	B	E	G	M	Q	S	T	F	H	3	C	D	4	5	6	7	I	8	J	9	K	A	L
					2.0	2.5	2.8	3.1	3.3	3.5	3.6	1.0	3.8	14.8	12	3.5	3.8	4.0	4.5	5.0	6.3	7.0	7.5	8.0	8.5	9.0	9.5	10	10.5
					+0.3 / -0.2							±0.3				±0.5												
Cut	C	4	1.5	----																								Fig 1
		5	2.0	----																								
		6.3	2.5	----																								
		8	3.5	----																								
		10	5.0	----																								
		12.5	5.0	----																								
		16	7.5	----																								
		18	7.5	----																								
		20	10	----																								
		22	10	----																								
Kink & Cut	B	4	5.0	1.1																								Fig 2
		5	5.0	1.1																								
		6.3	5.0	1.1																								
		8	5.0	1.3																								
		10	5.0	1.3																									
		12.5	5.0	1.3																								
		16	7.5	1.3																								
		18	7.5	1.3																								
Form & Cut	D	8	2.5	----																								Fig 3
	F	4	5.0	----																								Fig 4
		5	5.0	----																								
		6.3	5.0	----																								
		8	5.0	----																								

♦ LEAD FORMING TYPE

Type	Part Number	Dimensions (Unit: mm)																										
		ΦD	F	ι	L (Part number for lead length and pitch for taping)																							
					Z	2	B	E	G	M	Q	S	T	F	H	3	C	D	4	5	6	7	I	8	J	9	K	A	L
					2.0	2.5	2.8	3.1	3.3	3.5	3.6	1.0	3.8	14.8	12	3.5	3.8	4.0	4.5	5.0	6.3	7.0	7.5	8.0	8.5	9.0	9.5	10	10.5
					+0.3 / -0.2							±0.3				±0.5												
Form & Cut	L	5	2.0	2.5																								Fig 5
		6.3	2.5	2.5																								
		8	3.5	2.5																								
		10	5.0	2.5																								
		12.5	5.0	2.5																								
		16	7.5	2.5																								
		18	7.5	2.5																								
	T	5	2.0	1.5																								Fig 6
		6.3	2.5	1.5																								
		8	3.5	1.5																								
		10	5.0	1.5																								
		12.5	5.0	1.5																								
		16	7.5	1.5																								
		18	7.5	1.5																								
	R	5	2.0	1.5																								Fig 7
		6.3	2.5	1.5																								
		8	3.5	1.5																								
		10	5.0	1.5																								
		12.5	5.0	1.5																								
		16	7.5	1.5																								
		18	7.5	1.5																								
	S	5	2.0	2.5																								Fig 8
		6.3	2.5	2.5																								
		8	3.5	2.5																								
		10	5.0	2.5																								
		12.5	5.0	2.5																								
		16	7.5	2.5																								
		18	7.5	2.5																								
	E	5	2.0	----																								Fig 9
		6.3	2.5	----																								
		8	3.5	----																								
		10	5.0	----																								
		12.5	5.0	----																								
		16	7.5	----																								
		18	7.5	----																								

♦ TAPING

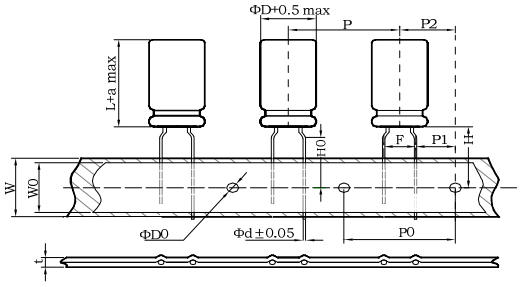


FIG 10-Ⅰ

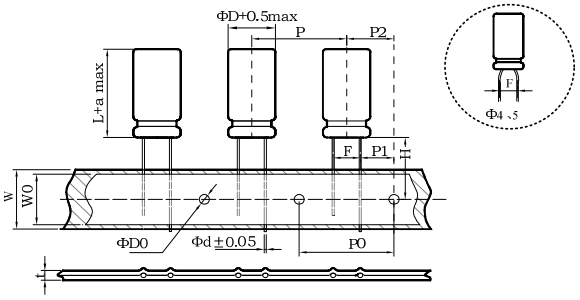
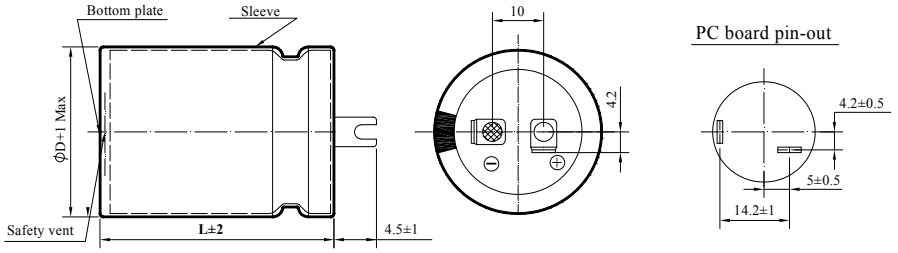
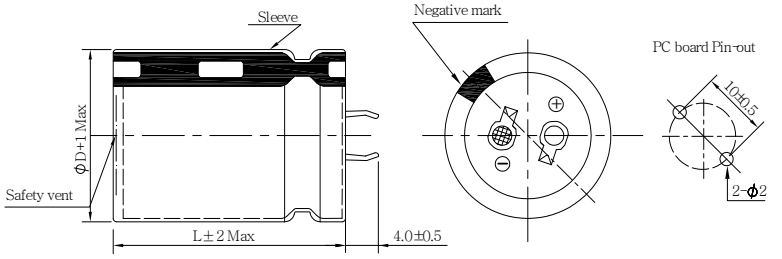
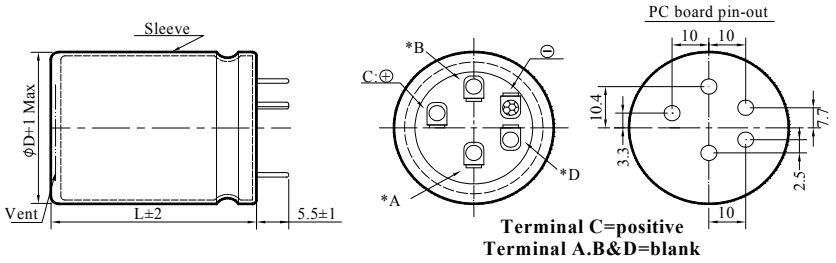
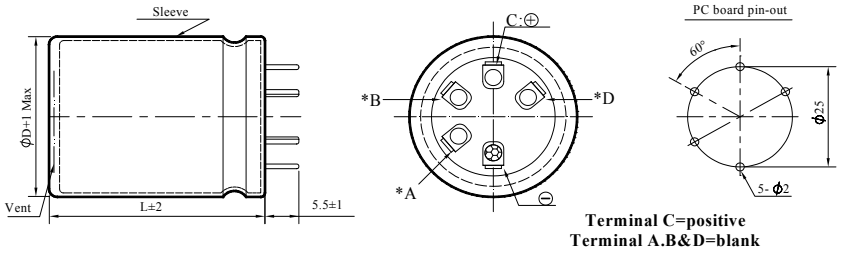
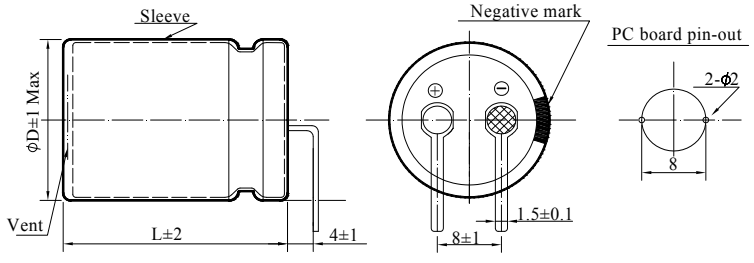


FIG 10-Ⅱ

Item	Symbol	Tolerance	Formed Lead Type (10-Ⅰ)						
			Φ 4×5 Φ 4×7	Φ 5×5 Φ 5×7	Φ 6.3×5	Φ 6.3×7	Φ 5×11 Φ 6.3×11	Φ 8×5 Φ 8×7 Φ 8×9	Φ 8×11.5 Φ 8×15 Φ 8×20
Lead wire diameter	Φd	±0.05	0.45	0.45	0.45	0.45	0.5	0.45/0.5	0.6
Pitch of component	P	±1.0	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Feed hole pitch	P0	±0.2	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Hole center to lead	P1	±0.5	3.85	3.85	3.85	3.85	3.85	3.85	3.85
Feed hole center to component center	P2	±1.0	6.35	6.35	6.35	6.35	6.35	6.35	6.35
Lead-to-lead distance	F	+ 0.8/-0.2	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Height of component from tape center	H	±0.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5
Lead wire clinch height	H0	±0.5	16.0	16.0	16.0	16.0	16.0	16.0	16.0
Tape width	W	±0.5	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Hole down tape width	W0	Min	12.5	12.5	12.5	12.5	12.5	12.5	12.5
Feed hole diameter	ΦD0	±0.2	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total tape thickness	t	±0.2	0.7	0.7	0.7	0.7	0.7	0.7	0.7

Item	Symbol	Tolerance	Straight Lead Type (10-Ⅱ)						
			Φ 4	Φ 5	Φ 6.3	Φ 8	Φ 10	Φ 12.5	Φ 16
Lead wire diameter	Φd	±0.05	0.45	0.5	0.5	0.6	0.6	0.6	0.8
Pitch of component	P	±1.0	12.7	12.7	12.7	12.7	12.7	15.0	30.0
Feed hole pitch	P0	±0.2	12.7	12.7	12.7	12.7	12.7	15.0	15.0
Hole center to lead	P1	±0.5	5.6	5.35	5.1	4.6	3.85	5.0	3.75
Feed hole center to component center	P2	±1.0	6.35	6.35	6.35	6.35	6.35	7.5	7.5
Lead-to-lead distance	F	+ 0.8/-0.2	2.5	2.5	2.5	3.5	5.0	5.0	7.5
Height of component from tape center	H	±0.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5
Tape width	W	±0.5	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Hole down tape width	W0	Min	12.5	12.5	12.5	12.5	12.5	12.5	12.5
Feed hole diameter	ΦD0	±0.2	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Total tape thickness	t	±0.2	0.7	0.7	0.7	0.7	0.7	0.7	0.7

AVAILABLE TERMINALS FOR SNAP-IN TYPE (Unit:mm)

D=Ø30 to Ø35 mm	
D=Ø22 to Ø35 mm	
D=Ø35 to Ø40 mm	 **Terminal C=positive** **Terminal A.B&D=blank**
D=Ø40 mm	 **Terminal C=positive** **Terminal A.B&D=blank**
D=Ø20X25 to 61 mm **D=Ø25X31 to 61 mm**