

# HL series

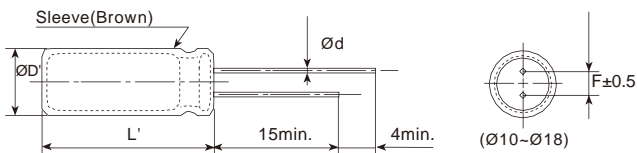
- Long life, downsized, high ripple current; For power supply applications
- Endurance: +105°C 8,000~12,000 hours
- RoHS Compliant



## SPECIFICATIONS

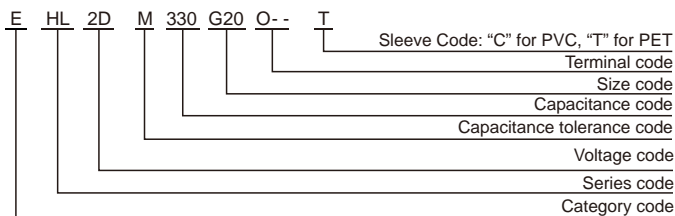
Items	Characteristics								
Category Temperature Range	-40~+105°C(160~400V <sub>dc</sub> )				-25~+105°C(450~500V <sub>dc</sub> )				
Rated Voltage Range	160~500 V <sub>dc</sub>								
Capacitance Tolerance	±20%(M) (at 20°C, 120Hz)								
Leakage Current		After 1 minute		After 5 minutes		Where, I: Max. leakage current (μA), C: Nominal capacitance (μF), V: Rated voltage (V) (at 20°C)			
	CV 1000	0.1CV+40μA		0.03CV+15μA					
	CV>1000	0.04CV+100μA		0.02CV+25μA					
Dissipation Factor (tan δ)	Rated Voltage(V <sub>dc</sub> )	160	200	250	350	400	450	500	
	tan δ (max.)	0.18	0.18	0.18	0.24	0.24	0.24	0.24	
Low Temperature Characteristics (Max. Impedance Ratio)	Rated Voltage(V <sub>dc</sub> )	160	200	250	350	400	450	500	
	Z(-25°C)/Z(+20°C)	3	3	3	6	6	6	6	
	Z(-40°C)/Z(+20°C)	8	8	8	10	10	-	-	
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after DC voltage plus the rated ripple current is applied for a specified period of time at 105°C.								
	Capacitance Change	±20% of the initial value					Rated Voltage	160 to 450V <sub>dc</sub>	500V <sub>dc</sub>
	D.F. (tan δ)	200% of the initial specified value					Life time	L 20: 10,000 hours	10: 8,000 hours
	Leakage Current	The initial specified value						L>20: 12,000 hours	12.5: 10,000 hours
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after exposing them for 1,000 hours at 105°C without voltage applied.								
	Capacitance Change	±20% of the initial value							
	D.F. (tan δ)	200% of the initial specified value							
	Leakage Current	200% of the initial specified value							

## DIMENSIONS[mm]



ØD	10	12.5	16	18
Ød	0.6	0.6	0.8	0.8
F	5.0	5.0	7.5	7.5
ØD'	ØD+0.5max.			
L'	L+2max.			

## PART NUMBERING SYSTEM



## RATED RIPPLE CURRENT MULTIPLIERS

Frequency correction factor for ripple current

Cap.(μF) \ Freq.(Hz)	120	1k	10k	100k
<100	1.0	1.75	2.25	2.50
100	1.0	1.67	2.05	2.25

The endurance of capacitors is shortened with internal heating produced by ripple current at the rate of halving the lifetime with every 5°C rise. When long life performance is required in actual use, the rms ripple current has to be reduced.

**HL series**

■ STANDARD RATINGS

WV (Vdc)	Cap (μF)	Size DxL(mm)	tan	Rated ripple current (mA <sub>RMS</sub> /105°C, 120Hz)	Part Number
160(2C)	33	10x16	0.18	210	EHL2CM330G16OT
	47	10x20	0.18	300	EHL2CM470G20OT
	56	10x20	0.18	318	EHL2CM560G20OT
	68	10x25	0.18	345	EHL2CM680G25OT
	82	10x25	0.18	416	EHL2CM820G25OT
		10x30	0.18	448	EHL2CM820G30OT
	100	12.5x20	0.18	575	EHL2CM101W20OT
	120	10x35	0.18	572	EHL2CM121G35OT
		10x40	0.18	668	EHL2CM151G40OT
	150	10x45	0.18	696	EHL2CM151G45OT
		12.5x25	0.18	767	EHL2CM151W25OT
	180	10x50	0.18	788	EHL2CM181G50OT
		12.5x30	0.18	885	EHL2CM181W30OT
		16x20	0.18	858	EHL2CM181L20OT
	220	12.5x35	0.18	1044	EHL2CM221W35OT
		16x25	0.18	1022	EHL2CM221L25OT
		18x20	0.18	992	EHL2CM221M20OT
	270	12.5x40	0.18	1196	EHL2CM271W40OT
		12.5x45	0.18	1230	EHL2CM271W45OT
	330	12.5x50	0.18	1404	EHL2CM331W50OT
		16x30	0.18	1355	EHL2CM331L30OT
		18x25	0.18	1292	EHL2CM331M25OT
	390	16x35	0.18	1505	EHL2CM391L35OT
		16x40	0.18	1708	EHL2CM471L40OT
	470	16x45	0.18	1730	EHL2CM471L45OT
		18x30	0.18	1665	EHL2CM471M30OT
		18x35	0.18	1722	EHL2CM471M35OT
	560	16x50	0.18	1924	EHL2CM561L50OT
		18x40	0.18	1910	EHL2CM561M40OT
	680	18x45	0.18	2135	EHL2CM681M45OT
		18x50	0.18	2148	EHL2CM681M50OT
	200(2D)	33	10x20	0.18	255
39		10x20	0.18	268	EHL2DM390G20OT
47		10x20	0.18	302	EHL2DM470G20OT
56		10x25	0.18	346	EHL2DM560G25OT
68		10x30	0.18	406	EHL2DM680G30OT
82		12.5x20	0.18	522	EHL2DM820W20OT
100		10x35	0.18	520	EHL2DM101G35OT
		12.5x25	0.18	628	EHL2DM101W25OT
120		10x40	0.18	595	EHL2DM121G40OT
		10x45	0.18	624	EHL2DM121G45OT
		12.5x30	0.18	728	EHL2DM121W30OT
150		16x20	0.18	698	EHL2DM121L20OT
		10x50	0.18	720	EHL2DM151G50OT
		12.5x35	0.18	862	EHL2DM151W35OT
180		16x25	0.18	928	EHL2DM181L25OT
		18x20	0.18	895	EHL2DM181M20OT
		12.5x40	0.18	1078	EHL2DM221W40OT
220		12.5x45	0.18	1116	EHL2DM221W45OT
		18x25	0.18	1050	EHL2DM221M25OT
270		12.5x50	0.18	1268	EHL2DM271W50OT
		16x30	0.18	1225	EHL2DM271L30OT
		16x35	0.18	1252	EHL2DM271L35OT
330		16x40	0.18	1428	EHL2DM331L40OT
		18x30	0.18	1402	EHL2DM331M30OT
390		16x45	0.18	1575	EHL2DM391L45OT
		18x35	0.18	1570	EHL2DM391M35OT
470		16x50	0.18	1762	EHL2DM471L50OT
		18x40	0.18	1748	EHL2DM471M40OT
		18x45	0.18	1775	EHL2DM471M45OT
560		18x50	0.18	1952	EHL2DM561M50OT

WV (Vdc)	Cap (μF)	Size DxL(mm)	tan	Rated ripple current (mA <sub>RMS</sub> /105°C, 120Hz)	Part Number	
250(2E)	27	10x20	0.18	205	EHL2EM270G20OT	
	33	10x20	0.18	242	EHL2EM330G20OT	
	47	10x25	0.18	316	EHL2EM470G25OT	
		10x30	0.18	342	EHL2EM470G30OT	
	56	12.5x20	0.18	430	EHL2EM560W20OT	
	68	10x35	0.18	432	EHL2EM680G35OT	
		10x40	0.18	495	EHL2EM820G40OT	
		10x45	0.18	518	EHL2EM820G45OT	
	82	12.5x25	0.18	565	EHL2EM820W25OT	
		12.5x30	0.18	575	EHL2EM820W30OT	
		10x50	0.18	586	EHL2EM101G50OT	
	100	12.5x30	0.18	662	EHL2EM101W30OT	
		16x20	0.18	638	EHL2EM101L20OT	
	120	12.5x35	0.18	770	EHL2EM121W35OT	
		16x25	0.18	758	EHL2EM121L25OT	
		18x20	0.18	732	EHL2EM121M20OT	
	150	12.5x40	0.18	892	EHL2EM151W40OT	
		12.5x45	0.18	922	EHL2EM151W45OT	
	180	12.5x50	0.18	1040	EHL2EM181W50OT	
		16x30	0.18	995	EHL2EM181L30OT	
		18x25	0.18	955	EHL2EM181M25OT	
	220	16x35	0.18	1130	EHL2EM221L35OT	
		18x30	0.18	1138	EHL2EM221M30OT	
	270	16x40	0.18	1290	EHL2EM271L40OT	
		16x45	0.18	1315	EHL2EM271L45OT	
	330	18x35	0.18	1300	EHL2EM271M35OT	
		16x50	0.18	1480	EHL2EM331L50OT	
		18x40	0.18	1466	EHL2EM331M40OT	
	390	18x45	0.18	1488	EHL2EM331M45OT	
		18x50	0.18	1630	EHL2EM391M50OT	
	350(2V)	15	10x16	0.24	150	EHL2VM150G16OT
		18	10x20	0.24	165	EHL2VM180G20OT
22		10x20	0.24	200	EHL2VM220G20OT	
27		10x25	0.24	242	EHL2VM270G25OT	
		10x30	0.24	256	EHL2VM270G30OT	
33		12.5x20	0.24	332	EHL2VM330W20OT	
39		10x35	0.24	326	EHL2VM390G35OT	
47		10x40	0.24	376	EHL2VM470G40OT	
		12.5x25	0.24	425	EHL2VM470W25OT	
56		10x45	0.24	426	EHL2VM560G45OT	
		12.5x30	0.24	498	EHL2VM560W30OT	
		16x20	0.24	476	EHL2VM560L20OT	
68		10x50	0.24	486	EHL2VM680G50OT	
		12.5x35	0.24	583	EHL2VM680W35OT	
82		18x20	0.24	550	EHL2VM680M20OT	
		12.5x40	0.24	658	EHL2VM820W40OT	
		16x25	0.24	628	EHL2VM820L25OT	
100		12.5x45	0.24	752	EHL2VM101W45OT	
		12.5x50	0.24	772	EHL2VM101W50OT	
		16x30	0.24	744	EHL2VM101L30OT	
120		18x25	0.24	710	EHL2VM101M25OT	
		16x35	0.24	832	EHL2VM121L35OT	
		16x40	0.24	964	EHL2VM151L40OT	
150		16x45	0.24	978	EHL2VM151L45OT	
		18x30	0.24	944	EHL2VM151M30OT	
180		16x50	0.24	1095	EHL2VM181L50OT	
		18x35	0.24	1065	EHL2VM181M35OT	
		18x40	0.24	1086	EHL2VM181M40OT	
220		18x45	0.24	1215	EHL2VM221M45OT	
		18x50	0.24	1222	EHL2VM221M50OT	

Radial Type

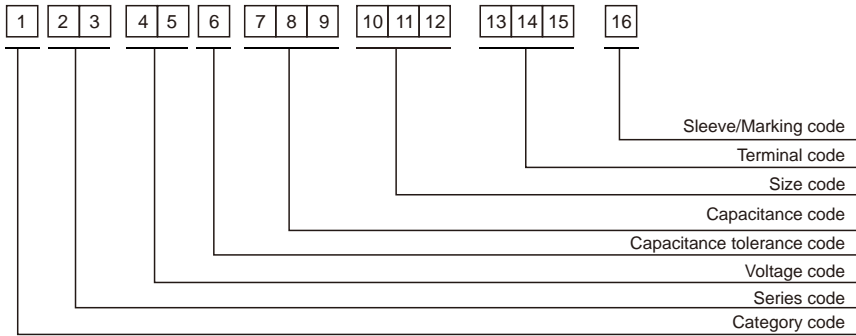
**HL series**

■ STANDARD RATINGS

WV (Vdc)	Cap (μF)	Size DxL(mm)	tan	Rated ripple current (mA <sub>rms</sub> /105°C, 120Hz)	Part Number
400(2G)	12	10x16	0.24	135	EHL2GM120G16OT
	15	10x20	0.24	155	EHL2GM150G20OT
	18	10x20	0.24	180	EHL2GM180G20OT
	22	10x25	0.24	216	EHL2GM220G25OT
	27	10x30	0.24	256	EHL2GM270G30OT
		12.5x20	0.24	300	EHL2GM270W20OT
	33	10x35	0.24	300	EHL2GM330G35OT
	39	10x40	0.24	342	EHL2GM390G40OT
		10x45	0.24	358	EHL2GM390G45OT
		12.5x25	0.24	390	EHL2GM390W25OT
	47	12.5x30	0.24	456	EHL2GM470W30OT
		16x20	0.24	438	EHL2GM470L20OT
	56	10x50	0.24	440	EHL2GM560G50OT
		12.5x35	0.24	528	EHL2GM560W35OT
		18x20	0.24	502	EHL2GM560M20OT
	68	12.5x40	0.24	600	EHL2GM680W40OT
		16x25	0.24	572	EHL2GM680L25OT
	82	12.5x45	0.24	684	EHL2GM820W45OT
		12.5x50	0.24	700	EHL2GM820W50OT
		16x30	0.24	672	EHL2GM820L30OT
		18x25	0.24	644	EHL2GM820M25OT
	100	16x35	0.24	760	EHL2GM101L35OT
	120	16x40	0.24	864	EHL2GM101L40OT
		16x45	0.24	880	EHL2GM121L45OT
		18x30	0.24	842	EHL2GM121M30OT
		18x35	0.24	875	EHL2GM121M35OT
	150	16x50	0.24	1000	EHL2GM151L50OT
		18x40	0.24	985	EHL2GM151M40OT
	180	18x45	0.24	1098	EHL2GM181M45OT
	220	18x50	0.24	1225	EHL2GM221M50OT

WV (Vdc)	Cap (μF)	Size DxL(mm)	tan	Rated ripple current (mA <sub>rms</sub> /105°C, 120Hz)	Part Number	
450(2W)	10	10x16	0.24	120	EHL2WM100G16OT	
	12	10x20	0.24	150	EHL2WM120G20OT	
	15	10x25	0.24	186	EHL2WM150G25OT	
	18	10x30	0.24	216	EHL2WM180G30OT	
		12.5x20	0.24	256	EHL2WM180W20OT	
	22	10x35	0.24	252	EHL2WM220G35OT	
	27	10x40	0.24	292	EHL2WM270G40OT	
		10x45	0.24	306	EHL2WM270G45OT	
		12.5x25	0.24	342	EHL2WM270W25OT	
	33	12.5x30	0.24	400	EHL2WM330W30OT	
		16x20	0.24	386	EHL2WM330L20OT	
	39	10x50	0.24	378	EHL2WM390G50OT	
		12.5x35	0.24	462	EHL2WM390W35OT	
		18x20	0.24	440	EHL2WM390M20OT	
	47	12.5x40	0.24	528	EHL2WM470W40OT	
		16x25	0.24	500	EHL2WM470L25OT	
	56	12.5x45	0.24	592	EHL2WM560W45OT	
		16x30	0.24	588	EHL2WM560L30OT	
		18x25	0.24	562	EHL2WM560M25OT	
	68	12.5x50	0.24	672	EHL2WM680W50OT	
		16x35	0.24	664	EHL2WM680L35OT	
	82	16x40	0.24	750	EHL2WM820L40OT	
		16x45	0.24	762	EHL2WM820L45OT	
		18x30	0.24	734	EHL2WM820M30OT	
	100	16x50	0.24	858	EHL2WM101L50OT	
		18x35	0.24	836	EHL2WM101M35OT	
	120	18x40	0.24	935	EHL2WM121M40OT	
		18x45	0.24	948	EHL2WM121M45OT	
	150	18x50	0.24	1065	EHL2WM151M50OT	
	500(2H)	6.8	10x20	0.24	90	EHL2HM6R8G20OT
		10	10x30	0.24	130	EHL2HM100G30OT
			12.5x20	0.24	125	EHL2HM100W20OT
12		12.5x20	0.24	135	EHL2HM120W20OT	
15		10x35	0.24	170	EHL2HM150G35OT	
		12.5x25	0.24	170	EHL2HM150W25OT	
		16x20	0.24	165	EHL2HM150L20OT	
18		10x45	0.24	190	EHL2HM180G45OT	
		12.5x30	0.24	190	EHL2HM180W30OT	
22		10x50	0.24	230	EHL2HM220G50OT	
		12.5x35	0.24	225	EHL2HM220W35OT	
		16x20	0.24	220	EHL2HM220L20OT	
33		18x25	0.24	285	EHL2HM330M25OT	
47		18x30	0.24	400	EHL2HM470M30OT	

## Part Numbering System



Category code

Type	Code
	1
Aluminum electrolytic capacitor	E

Voltage code

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

Capacitance tolerance code

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

Capacitance code

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

Series code

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

Size code

D (mm)	Code	L (mm)	Code	
	10		11	12
4	C	5	0	5
5	D	7	0	7
6.3	E	11	1	1
8	F	12	1	2
10	G	16	1	6
11	H	20	2	0
12	J	25	2	5
12.5	W	30	3	0
13	K	35	3	5
14	X	40	4	0
16	L	46	4	6
18	M	50	5	0
19	Z	60	6	0
20	N	80	8	0
22	O	100	A	0
25	P	115	B	5
30	Q	120	C	0
35	R	130	D	0
40	Y	140	E	0
51.6	S	160	G	0
64.3	T	200	K	0
76.9	U	220	M	0
91	V	236	N	6
100	A	250	P	0

Terminal code

Specification	Code	Size	
	13	14	15
Bulk packing	O	-	-
Taping (SMD Type)	D	0	0
4~8 Taping F=5.0mm	P	5	0
10~12.5 Taping F=5.0mm	B	5	0
Lead Cut L=3.5mm	C	3	5
Lead Cut L=11.0mm	C	B	0
Lead Forming & Cut L=4.5mm	F	-	-
Kink & Cut L=4.5mm	J	-	-
Snap-in type Terminal 4.0mm in length	K	-	-
Three Terminals	T	-	-
Ring clip mounting standard design	A	0	0
Ring clip mounting special design	S	-	-

Sleeve/Marking code

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

Lead Forming

Taping Specifications (Unit: mm)

Fig.1 code: X

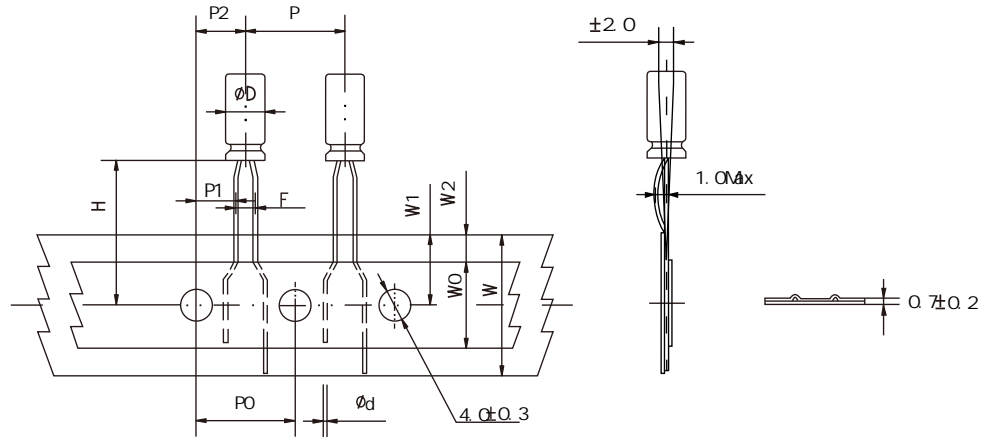


Fig.2 code: B

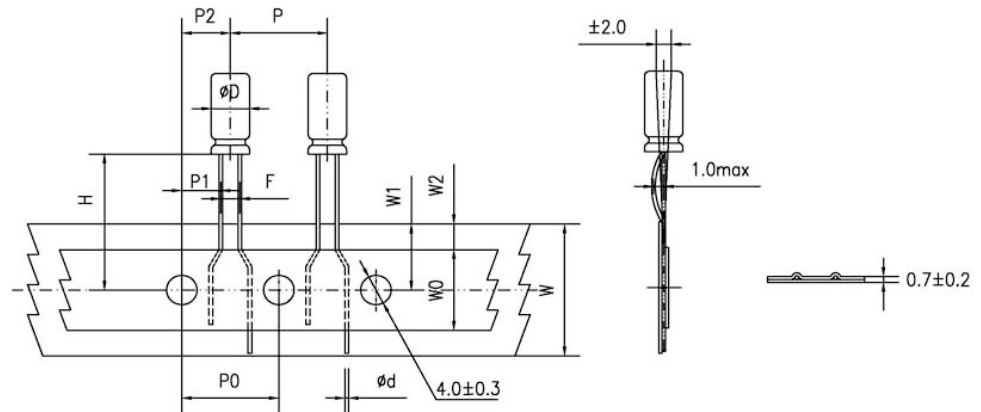


Fig.3 code: B

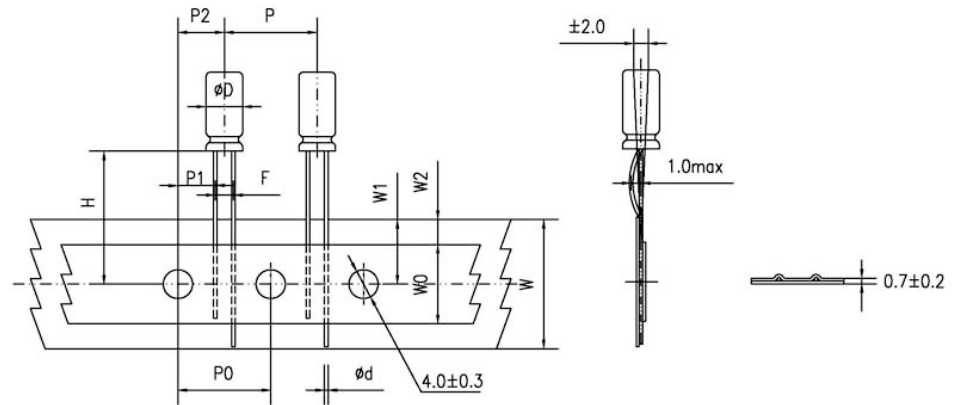
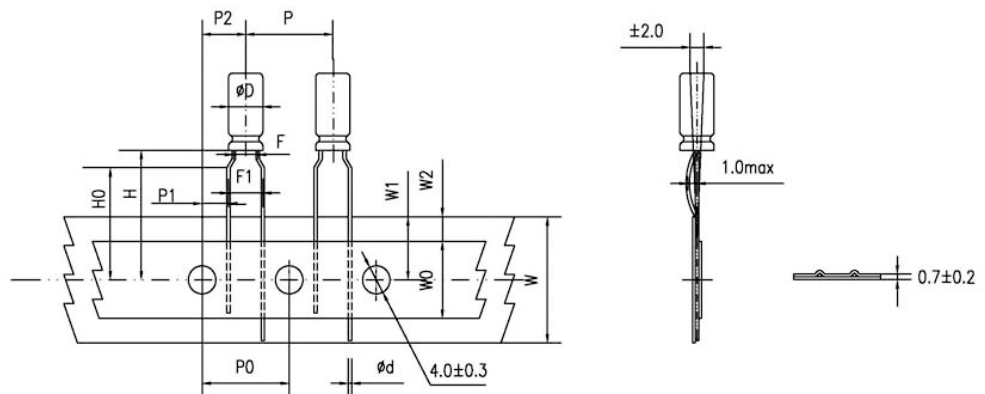


Fig.4 code: P



## Lead Forming

Specification Fig.1 &amp; Fig.2 &amp; Fig.3

(mm)

Items	Symbol	Case size										Tolerance		
		4x5 4x7		5x5 5x7		5x11		6.3x5	6.3x7 6.3x9 6.3x11 6.3x12	8x5/7 8x9/11 8x11.5 8x12	8x16 8x20		10x9 10x12 10x13/16 10x20/25	12.5x16 12.5x20 13x20
Pin Code		X	B	X	B	X	B	B	B	B	B	B	B	
Lead wire diameter	d	0.45		0.45		0.5		0.45	0.5	0.45/0.5	0.6	0.6	0.6	±0.05
Pitch of body	P	12.7		12.7		12.7		12.7	12.7	12.7	12.7	12.7	15	±1.0
Feed hole pitch	P0	12.7		12.7		12.7		12.7	12.7	12.7	12.7	12.7	15	±0.2
Distance from hole center to lead	P1	5.1	5.6	5.1	5.35	5.1	5.35	5.1	5.1	4.6	4.6	3.85	5.0	±0.7
Distance from feed hole center to body center	P2	6.35		6.35		6.35		6.35	6.35	6.35	6.35	6.35	7.5	±1.0
Lead-to-lead distance	F	2.5	1.5	2.5	2.0	2.5	2.0	2.5	2.5	3.5	3.5	5.0	5.0	±0.5
Height of body from tape center	H	18.5		18.5		18.5		18.5	18.5	18.5	18.5	18.5	18.5	±0.75
Base tape width	W	18.0		18.0		18.0		18.0	18.0	18.0	18.0	18.0	18.0	±0.5
Adhesive tape width	W0	6.0		6.0		6.0		6.0	8.0	8.0	8.0	11.0	11.0	min
Hole position	W1	9.0		9.0		9.0		9.0	9.0	9.0	9.0	9.0	9.0	+0.75 -0.5
Hole down tape position	W2	1.5		1.5		1.5		1.5	1.5	1.5	1.5	1.5	1.5	max

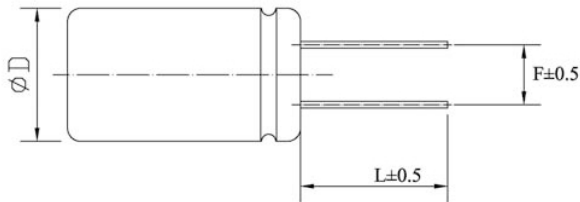
Specification Fig.4

(mm)

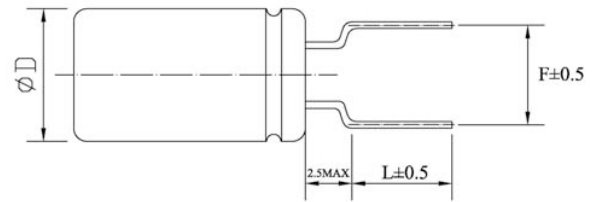
Items	Symbol	Case size									Tolerance	
		4x5 4x7	5x5	5x7	5x11	6.3x5	6.3x7 6.3x9	6.3x11 6.3x12	8x5/7 8x9/11 8x11.5/12	8x16 8x20		
Pin Code		P	P	P	P	P	P	P	P	P		
Lead wire diameter	d	0.45	0.45	0.45	0.5	0.45	0.5	0.5	0.5	0.45/0.5	0.6	±0.05
Pitch of body	P	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	±1.0
Feed hole pitch	P0	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	±0.2
Distance from hole center to lead	P1	3.85	3.85	3.85	3.85	3.85	3.85	3.85	3.85	3.85	3.85	±0.7
Distance from feed hole center to body center	P2	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	±1.0
Lead-to-lead distance	F	1.5	2.0	2.0	2.0	2.5	2.5	2.5	3.5	3.5	±0.5	
Lead to lead distance	F1	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	+0.8 -0.2	
Height of body from tape center	H	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	±0.75
Lead wire clinch height	H0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	16.0	±0.5
Base tape width	W	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	±0.5
Adhesive tape width	W0	6.0	6.0	6.0	6.0	6.0	6.0	8.0	8.0	8.0	8.0	min
Hole position	W1	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	+0.75 -0.5
Hole down tape position	W2	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	max

Lead Forming  
Lead Forming & Cut

Code:C  
RANGE: 4~ 18



Code:F  
RANGE: 4~ 8

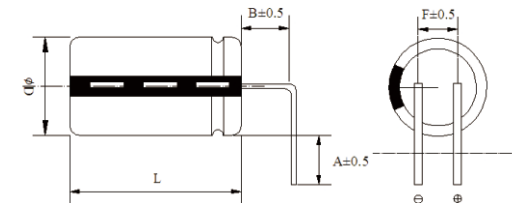


(mm)

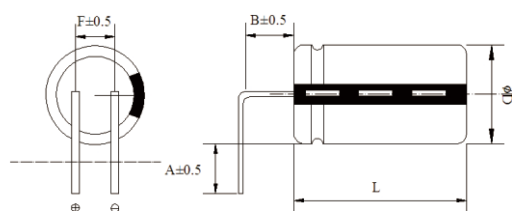
D	F	L	D	F	L
4	1.5	3.0~12.0	4	5.0	3.5, 4.5, 5.0, 7.0
5	2.0	3.0~12.0	5	5.0	3.5, 4.5, 5.0, 7.0
6.3	2.5	3.0~12.0	6.3	5.0	3.5, 4.5, 5.0, 7.0
8	3.5	3.0~12.0	8	5.0	3.5, 4.5, 5.0, 7.0
10	5.0	3.0~12.0	-	-	-
12.5	5.0	3.0~12.0	-	-	-
16	7.5	3.0~12.0	-	-	-
18	7.5	3.0~12.0	-	-	-

Code:R/L  
RANGE: 10~ 18

Right horizontal forming



Left horizontal forming



(mm)

D	F	A	B
10~12.5	5.0	2.5, 3.0, 3.5, 4.0, 4.5, 5.0	1.5, 2.5
16~18	7.5	2.5, 3.0, 3.5, 4.0, 4.5, 5.0	1.5, 2.5