

Part Numbering System



① Category code

Type	Code
	1
Electrolytic Capacitor	E
Conductive Polymer	S

② 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
PZ	P	Z

③ Voltage code

WV (V _{dc})	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

④ 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

⑤ 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

⑥ Size code

ΦD (mm)	Code
10	
4	C
5	D
6.3	E
8	F
10	G
11	H
12	J
12.5	W
13	K
14	X
16	L
18	M
19	Z
20	N
22	O
25	P
30	Q
35	R
40	Y
51.6	S
64.3	T
76.9	U
91	V
100	A

L (mm)	Code	
	11	12
5	0	5
7	0	7
11	1	1
12	1	2
16	1	6
20	2	0
25	2	5
30	3	0
35	3	5
40	4	0
46	4	6
50	5	0
60	6	0
80	8	0
100	A	0
115	B	5
120	C	0
130	D	0
140	E	0
160	G	0
200	K	0
220	M	0
236	N	6
250	P	0

⑦ Terminal code

Specification	Code	Size	
	13	14	15
Bulk packing	O	-	-
Taping (SMD Type)	D	0	0
Φ4~8 Taping F=5.0mm	P	5	0
Φ10~12.5 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	-	-

⑧ 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

Fig.1 code: X



Fig.2 code: B



Fig.3 code: B



Fig.4 code: P



Lead Forming

Specification Fig.1 & Fig.2 & Fig.3

Items	Symbol	Case size										Tolerance		
		4*5 4*7		5*5 5*7		5*11		6.3*5	6.3*7 6.3*9	6.3*11 6.3*12	8*5/7 8*9/11 8*11.5 8*12		8*16 8*20	10*9/12 10*12.5 10*13/16 10*20/25
Pin Code		X	B	X	B	X	B	B	B	B	B	B	B	
Lead wire diameter	Φd	0.45		0.45		0.5		0.45	0.5	0.5	0.45/0.5	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	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	±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	5.1	4.6	4.6	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	±1.0
Lead-to-lead distance	F	2.5	1.5	2.5	2.0	2.5	2.0	2.5	2.5	2.5	3.5	3.5	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	6.0	8.0	8.0	8.0	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	3.0		3.0		3.0		3.0	3.0	3.0	3.0	3.0	3.0	max

Specification Fig.4

Items	Symbol	Case size									Tolerance
		4*5 4*7	5*5	5*7	5*11	6.3*5	6.3*7 6.3*9	6.3*11 6.3*12	8*5/7 8*9/11 8*11.5/12	8*16 8*20	
Pin Code		P	P	P	P	P	P	P	P	P	
Lead wire diameter	Φd	0.45	0.45	0.45	0.5	0.45	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	±1.0
Feed hole pitch	P0	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	±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	±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	±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	±0.5
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	6.0	6.0	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	+0.75 -0.5
Hole down tape position	W2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	max

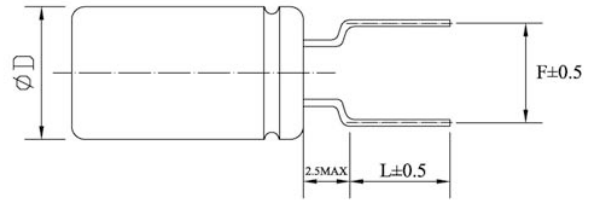
Lead Forming

Lead Forming & Cut

Code:C
RANGE: $\Phi 4 \sim \Phi 18$



Code:F
RANGE: $\Phi 4 \sim \Phi 8$



ΦD	F	L	ΦD	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:J
RANGE: $\Phi 10 \sim \Phi 18$



ΦD	F	L
10	5.0	4.0, 4.5, 5.0
12.5	5.0	4.0, 4.5, 5.0
16	7.5	4.0, 4.5, 5.0
18	7.5	4.0, 4.5, 5.0

Solering Recommendation

■ Flow Soldering(Radial Lead Type)



■ Reflow Soldering

- (For Polymer SMD Type)

Recommended Reflow Profile



Item	Preheating	T1(°C)	T2(°C)	T3(°C)	t1(sec.)	t2(sec.)	t3(sec.)	Reflow cycle
Condition 1	150°C to 180°C Within 90sec.	≤260	230	200	≤10	≤40	≤60	1
Condition 2		≤250	230	200	≤10	≤40	≤60	2

● (For Liquid SMD Type)

Case size: $\Phi 6.3$ – $\Phi 10$ mm:

- Temperature at surface of capacitor shall not exceed $T^{\circ}\text{C}$.
- The duration for over 200°C temperature and $T_1^{\circ}\text{C}$ at surface of capacitor shall not exceed t and t_1 seconds, respectively.
- Preheat shall be done at 100°C to 200°C and for Maximum 180 seconds.

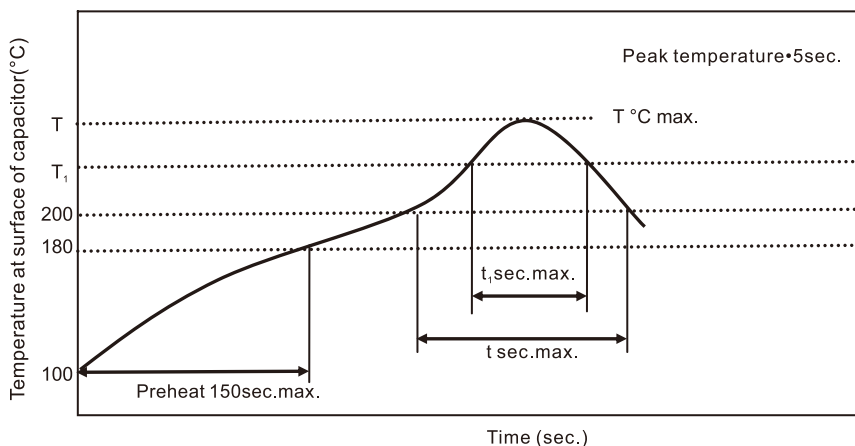


Case size (mm)	$T(^{\circ}\text{C})$ ①	$T_1(^{\circ}\text{C})$	$t(\text{sec.})$ ②	$t_1(\text{sec.})$ ③	Reflow cycle
$\Phi 6.3$	250	230	90	40	1
$\Phi 8$	240	230	90	30	1
$\Phi 10$	235	230	60	30	1

- ① Peak temperature
- ② The duration over 200°C (max.)
- ③ The duration over $T_1^{\circ}\text{C}$
- Please contact us if capacitors are subject to the conditions other than the allowable range of reflow.

Case size: $\Phi 12.5$ – $\Phi 18$ mm:

- Temperature at surface of capacitor shall not exceed $T^{\circ}\text{C}$.
- The duration for over 200°C temperature and $T_1^{\circ}\text{C}$ at surface of capacitor shall not exceed t and t_1 seconds, respectively.
- Preheat shall be done at 100°C to 180°C and for Maximum 150 seconds.



Case size (mm)	$T(^{\circ}\text{C})$ ①	$T_1(^{\circ}\text{C})$	$t(\text{sec.})$ ②	$t_1(\text{sec.})$ ③	Reflow cycle
$\Phi 12.5$ – $\Phi 18$	240	230	60	30	1

- ① Peak temperature
- ② The duration over 200°C (max.)
- ③ The duration over $T_1^{\circ}\text{C}$
- Please contact us if capacitors are subject to the conditions other than the allowable range of reflow.

RF series

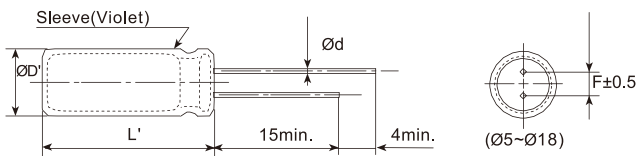
- Ultra-low impedance, high ripple current
- Endurance: +105°C 3,000~6,000 hours
- RoHS Compliant



SPECIFICATIONS

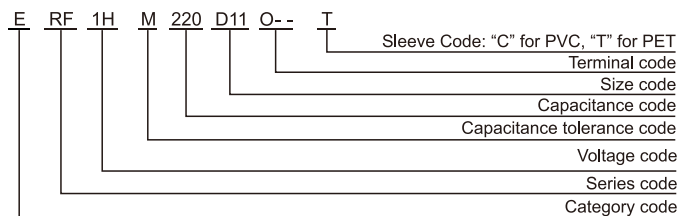
Items	Characteristics												
Category Temperature Range	-40~+105°C												
Rated Voltage Range	6.3~120 V _{dc}												
Capacitance Tolerance	±20%(M) (at 20°C,120Hz)												
Leakage Current	I≤0.01CV or 3μA, whichever is greater. Where, I:Max.leakage current (μA),C:Nominal capacitance (μF),V: Rated voltage (V) (at 20°C after 2 minutes)												
Dissipation Factor (tanδ)	Rated Voltage(V _{dc})	6.3 10 16 25 35 50 63 80 100 120											
	tanδ (max.)	0.15 : 0.14 : 0.12 : 0.10 : 0.10 : 0.08 : 0.08 : 0.08 : 0.08 : 0.12											
When nominal capacitance exceeds 1,000μF, add 0.02 to the value above for each 1,000μF increase. (at 20°C,120Hz)													
Low Temperature Characteristics (Max. Impedance Ratio)	Rated Voltage(V _{dc})	6.3 10 16 25 35 50 63 80 100 120											
	Z(-25°C)/Z(+20°C)	5 4 3 3 3 3 3 3 3 3 (at 120Hz)											
	Z(-40°C)/Z(+20°C)	10 8 5 4 4 4 4 4 4 4											
Endurance	The following specifications shall be met when the capacitors are restored to 20°C after DC voltage plus rated ripple current is applied for a specified period of time at 105 °C.												
	Capacitance Change	≤±25% of the initial value	<table border="1"> <tr><th>Dia.</th><th>Load life (hours)</th></tr> <tr><td>ØD≤6.3</td><td>3,000</td></tr> <tr><td>ØD=8</td><td>4,000</td></tr> <tr><td>ØD=10</td><td>5,000</td></tr> <tr><td>ØD≥12.5</td><td>6,000</td></tr> </table>	Dia.	Load life (hours)	ØD≤6.3	3,000	ØD=8	4,000	ØD=10	5,000	ØD≥12.5	6,000
	Dia.	Load life (hours)											
	ØD≤6.3	3,000											
ØD=8	4,000												
ØD=10	5,000												
ØD≥12.5	6,000												
D.F. (tanδ)	≤200% of the initial specified value												
Leakage Current	≤The initial specified value												
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after leaving them under no load at 105°C for 1,000 hours.												
	Capacitance Change	≤±25% of the initial value											
	D.F. (tanδ)	≤200% of the initial specified value											
	Leakage Current	≤200% of the initial specified value											

DIMENSIONS[mm]



ØD	5	6.3	8	10	12.5	16	18
Ød	0.5	0.5	0.5	0.6	0.6	0.6	0.8
F	2.0	2.5	3.5	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

Freq.(Hz)	120	1k	10k	100k
Cap.<220	0.40	0.75	0.90	1.00
220≤Cap.<680	0.50	0.85	0.94	1.00
680≤Cap.<2200	0.60	0.87	0.95	1.00
2200≤Cap.<4700	0.75	0.90	0.95	1.00
Cap.≥4700	0.85	0.95	0.98	1.00

RF series

■ STANDARD RATINGS

WV (V _{dc})	Cap (μF)	Size ΦDxL(mm)	tanδ	Impedance (Ω _{max} /20°C, 100kHz)	Rated ripple current (mA _{rms} /105°C, 100kHz)
6.3(0J)	150	5*11	0.15	0.29	300
		6.3*9	0.15	0.37	270
	220	6.3*11	0.15	0.205	377
		8*9	0.15	0.26	337
	330	6.3*11	0.15	0.12	455
		8*9	0.15	0.15	408
	470	8*11	0.15	0.09	632
		10*9	0.15	0.12	565
	820	8*16	0.15	0.055	1045
	1000	8*16	0.15	0.052	1000
	1200	8*20	0.15	0.04	1300
		10*16	0.15	0.037	1480
	1500	10*20	0.15	0.022	1870
	2200	10*20	0.17	0.021	2200
	2700	10*25	0.17	0.02	2250
	3300	12.5*20	0.19	0.02	2410
3900	12.5*25	0.19	0.017	2820	
4700	12.5*30	0.21	0.015	3340	
5600	12.5*35	0.23	0.014	3400	
	16*20	0.23	0.017	3190	
6800	16*25	0.25	0.015	3510	
10(1A)	100	5*11	0.14	0.29	300
		6.3*9	0.14	0.37	270
	220	6.3*11	0.14	0.12	455
		8*9	0.14	0.15	408
	470	8*11	0.14	0.071	810
		10*9	0.14	0.092	720
	680	8*16	0.14	0.055	1046
		10*12.5	0.14	0.052	1080
	1000	8*20	0.14	0.04	1300
		10*16	0.14	0.037	1480
	1200	10*20	0.14	0.022	1870
	1500	10*20	0.14	0.021	2220
	2200	12.5*20	0.16	0.02	2410
	3300	12.5*25	0.18	0.017	2820
3900	12.5*30	0.18	0.015	3340	
4700	12.5*35	0.20	0.014	3450	
5600	16*25	0.22	0.015	3510	
16(1C)	56	5*11	0.12	0.29	300
		6.3*9	0.12	0.37	270
	120	6.3*11	0.12	0.12	455
		8*9	0.12	0.15	408
	150	6.3*11	0.12	0.096	632
		8*9	0.12	0.12	565
	220	6.3*12	0.12	0.084	721
		8*9	0.12	0.1	650
	330	8*11	0.12	0.071	810
		10*9	0.12	0.092	720
	470	8*16	0.12	0.055	1045
		10*12.5	0.12	0.052	1080
	680	8*20	0.12	0.04	1300
		10*16	0.12	0.04	1480
	1000	10*20	0.12	0.022	1870
	1200	10*25	0.12	0.021	2200
	1500	12.5*20	0.12	0.02	2410
	2200	12.5*25	0.14	0.017	2820
		12.5*30	0.14	0.015	3340
	2700	16*20	0.14	0.017	3190
12.5*35		0.16	0.014	3450	
3300	16*25	0.16	0.016	3350	
	16*25	0.16	0.015	3510	

WV (V _{dc})	Cap (μF)	Size ΦDxL(mm)	tanδ	Impedance (Ω _{max} /20°C, 100kHz)	Rated ripple current (mA _{rms} /105°C, 100kHz)
25(1E)	47	5*11	0.10	0.29	300
		6.3*9	0.10	0.37	270
	100	6.3*11	0.10	0.12	455
		8*9	0.10	0.15	408
	220	8*11	0.10	0.071	810
		10*9	0.10	0.092	720
	330	8*16	0.10	0.055	1045
		10*12.5	0.10	0.052	1080
	390	8*20	0.10	0.044	1236
	470	10*16	0.10	0.037	1480
	560	10*16	0.10	0.03	1675
	680	10*20	0.10	0.022	1870
	820	10*25	0.10	0.021	2200
	1000	12.5*20	0.10	0.019	2550
	1500	12.5*25	0.10	0.017	2820
	1800	12.5*30	0.10	0.015	3340
16*20		0.10	0.017	3190	
2200	12.5*35	0.12	0.014	3450	
2700	16*25	0.12	0.015	3510	
35(1V)	33	5*11	0.10	0.29	300
		6.3*9	0.10	0.37	270
	56	6.3*11	0.10	0.12	455
		8*9	0.10	0.15	408
	100	8*11	0.10	0.095	632
		10*9	0.10	0.12	565
	150	8*11	0.10	0.071	810
		10*9	0.10	0.092	720
	220	8*16	0.10	0.055	1045
		10*12.5	0.10	0.052	1080
	270	8*20	0.10	0.04	1300
	330	10*16	0.10	0.037	1480
	470	10*20	0.10	0.022	1870
	560	10*25	0.10	0.021	2200
680	12.5*20	0.10	0.02	2410	
1000	12.5*25	0.10	0.017	2820	
1200	12.5*30	0.10	0.015	3340	
1500	16*20	0.10	0.017	3190	
	12.5*35	0.10	0.014	3450	
50(1H)	22	5*11	0.08	0.33	288
		6.3*9	0.08	0.43	260
	56	6.3*11	0.08	0.13	435
		8*9	0.08	0.17	390
	100	8*11	0.08	0.073	774
		10*9	0.08	0.095	695
	120	8*16	0.08	0.06	1000
	150	10*12.5	0.08	0.06	1029
	180	8*20	0.08	0.045	1240
	220	10*16	0.08	0.041	1420
	270	10*20	0.08	0.029	1630
	330	10*25	0.08	0.027	1920
	470	12.5*20	0.08	0.026	2100
	560	12.5*25	0.08	0.022	2460
	680	12.5*30	0.08	0.02	2910
	820	12.5*35	0.08	0.018	3010
16*20		0.08	0.022	2780	
1000	16*25	0.08	0.02	3060	

Radial Type

RF series

■ STANDARD RATINGS

WV (V _{dc})	Cap (μF)	Size ΦDxL(mm)	tanδ	Impedance (Ω _{max} /20°C, 100kHz)	Rated ripple current (mA _{rms} /105°C, 100kHz)
63(1J)	15	5*11	0.08	0.88	165
		6.3*9	0.08	1.14	148
	33	6.3*11	0.08	0.35	265
		8*9	0.08	0.45	235
	56	8*11	0.08	0.22	500
		10*9	0.08	0.28	450
	82	8*16	0.08	0.16	665
		10*12.5	0.08	0.11	690
	120	8*20	0.08	0.12	820
		10*16	0.08	0.076	950
	180	10*20	0.08	0.056	1150
		12.5*16	0.08	0.072	1150
	220	10*25	0.08	0.046	1350
	270	12.5*20	0.08	0.041	1500
	390	12.5*25	0.08	0.031	1900
		12.5*30	0.08	0.028	2300
	470	16*20	0.08	0.032	2000
		12.5*35	0.08	0.024	2500
	680	12.5*40	0.08	0.021	2800
		16*25	0.08	0.025	2600
820	18*20	0.08	0.03	2500	
	16*30	0.08	0.021	2850	
1000	18*25	0.08	0.024	2800	
	16*35	0.08	0.019	2900	
1200	16*40	0.08	0.018	3400	
	18*30	0.08	0.02	3300	
1500	18*35	0.08	0.018	3400	
1800	18*40	0.08	0.017	3500	
80(1B)	68	10*12.5	0.08	0.17	480
	100	10*16	0.08	0.11	600
	120	10*20	0.08	0.084	800
	150	10*25	0.08	0.069	900
		12.5*16	0.08	0.11	750
	220	12.5*20	0.08	0.062	1100
		12.5*25	0.08	0.047	1250
	330	16*20	0.08	0.048	1350
		12.5*30	0.08	0.042	1500
	470	12.5*35	0.08	0.036	1650
		16*25	0.08	0.038	1700
	560	18*20	0.08	0.045	1500
		12.5*40	0.08	0.032	1800
	680	16*30	0.08	0.032	1850
		18*25	0.08	0.036	1750
	820	16*35	0.08	0.029	2000
18*30		0.08	0.03	1900	
1000	16*40	0.08	0.027	2200	
	18*35	0.08	0.027	2200	
1200	18*40	0.08	0.026	2700	

WV (V _{dc})	Cap (μF)	Size ΦDxL(mm)	tanδ	Impedance (Ω _{max} /20°C, 100kHz)	Rated ripple current (mA _{rms} /105°C, 100kHz)
100(1K)	6.8	5*11	0.08	1.4	125
		6.3*9	0.08	1.8	110
	15	6.3*11	0.08	0.57	205
		8*9	0.08	0.74	180
	27	8*12	0.08	0.36	355
		10*9	0.08	0.47	320
	39	8*16	0.08	0.25	450
	47	10*12.5	0.08	0.17	480
	56	8*20	0.08	0.19	565
	68	10*16	0.08	0.11	600
	82	10*20	0.08	0.084	800
	100	12.5*16	0.08	0.11	750
	120	10*25	0.08	0.069	900
	150	12.5*20	0.08	0.062	1100
	220	12.5*25	0.08	0.047	1250
		16*20	0.08	0.048	1350
	270	12.5*30	0.08	0.042	1500
		12.5*35	0.08	0.036	1650
	330	16*25	0.08	0.038	1700
		18*20	0.08	0.045	1500
390	12.5*40	0.08	0.032	1800	
	16*30	0.08	0.032	1850	
470	18*25	0.08	0.036	1750	
	16*35	0.08	0.029	2000	
560	18*30	0.08	0.03	1900	
	16*40	0.08	0.027	2200	
680	18*35	0.08	0.027	2200	
	18*40	0.08	0.026	2700	
120(2B)	10	6.3*11	0.12	5.5	80
	15	6.3*12	0.12	4.5	100
	18	8*9	0.12	4.0	120
	22	8*12	0.12	3.5	130
	33	8*16	0.12	3.0	220
		10*12.5	0.12	3.0	220
	47	8*20	0.12	2.5	270
		10*16	0.12	2.5	270
	56	10*16	0.12	2.2	285
	68	10*16	0.12	2.0	285
	82	10*20	0.12	1.8	300
	100	10*25	0.12	1.5	380
	120	12.5*20	0.12	1.3	520
	150	12.5*25	0.12	1.0	570
	220	13*30	0.12	0.75	700
		16*20	0.12	0.75	700
270	16*25	0.12	0.55	800	
	18*20	0.12	0.55	800	
330	16*30	0.12	0.42	860	
	18*25	0.12	0.42	860	
470	16*40	0.12	0.30	960	
	18*30	0.12	0.30	960	