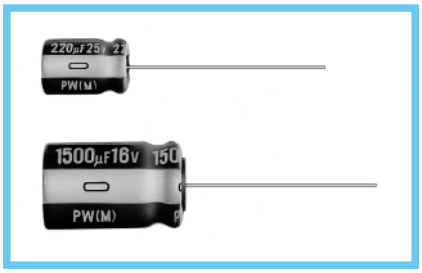
ALUMINUM ELECTROLYTIC CAPACITORS

nichicon

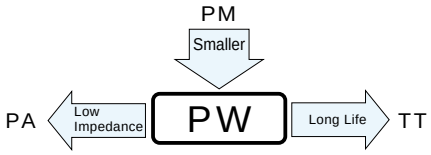
PW

Miniature Sized, Low Impedance,
High Reliability For Switching Power Supplies
series

Smaller | Low Impedance | Long Life | Anti-Solvent Feature (Through 100V only)



- Smaller case size and lower impedance than PM series.
- Low impedance and high reliability withstanding 2000 hours to 8000 hours.
- Capacitance ranges available based on the numerical values in E12 series under JIS.
- Adapted to the RoHS directive (2002/95/EC).



■Specifications

Item	Performance Characteristics
Category Temperature Range	−55 to +105˚C (6.3 to 100V), −40 to + 105˚C (160 to 400V), −25 to +105˚C (450V)
Rated Voltage Range	6.3 to 450V
Rated Capacitance Range	0.47 to 15000µF
Capacitance Tolerance	±20% at 120Hz, 20˚C
Leakage Current	Rated voltage (V): 6.3 to 100 / 160 to 450 Leakage current: After 1 minute's application of rated voltage, leakage current is not more than 0.03CV or 4 (µA), whichever is greater. / CV ≦ 1000 : I = 0.1CV+40 (µA) max. (1 minute's) CV > 1000 : I = 0.04CV+100 (µA) max. (1 minute's)
tan δ	For capacitance of more than 1000µF, add 0.02 for every increase of 1000µF. Measurement frequency : 120Hz, Temperature : 20˚C

Rated voltage (V)	6.3	10	16	25	35	50	63	100	160 to 250	315 · 350	400 · 450
tan δ (MAX.)	0.22	0.19	0.16	0.14	0.12	0.10	0.09	0.08	0.15	0.20	0.25

Stability at Low Temperature (120Hz)

Rated voltage (V)		6.3 · 10	16 · 25	35 · 50	63 · 100	160 · 200	250	315 · 350	400	450
Impedance ratio (MAX.)	Z−25˚C / Z+20˚C	—	—	—	—	3	3	4	6	15
	Z−40˚C / Z+20˚C	—	—	—	—	4	6	8	10	—
	Z−55˚C / Z+20˚C	3	3	3	3	—	—	—	—	—

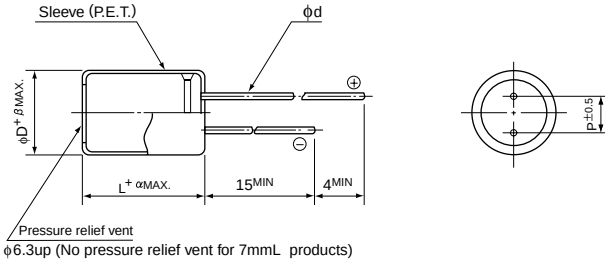
Endurance: After an application of D.C. bias voltage plus the rated ripple current for 8000 hours (2000 hours for D = 4, 5 and 6.3, 3000 hours for D = 8, 5000 hours for D = 10, 7000 hours for D = 12.5) at 105˚C the peak voltage shall not exceed the rated D.C.voltage, capacitors meet the characteristic requirements listed at right.

Capacitance change	Within ±20% of initial value
tan δ	200% or less of initial specified value
Leakage current	Initial specified value or less

Shelf Life: After storing the capacitors under no load at 105˚C for 1000 hours, and after performing voltage treatment based on JIS C 5101-4 clause 4.1 at 20°C, they will meet the specified value for endurance characteristics listed above.

Marking: Printed with white color letter on dark brown sleeve.

■Radial Lead Type



φ6.3up (No pressure relief vent for 7mmL products)

α	
	(L = 7) 1.0
	(L < 20) 1.5
	(L ≧ 20) 2.0

(mm)

φD	4	5	6.3	8	10	12.5	16	18	20	22	25
P	1.5	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0	10.0	12.5
φd	0.45	0.5 (0.45)	0.5 (0.45)	0.6	0.6	0.6 ※0.8	0.8	0.8	1.0	1.0	1.0
β	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.0	1.0

※: Applied to L>25 products
( ): Applied to 7mmL products

Type numbering system (Example : 10V 680µF)

1	2	3	4	5	6	7	8	9	10	11	12
U	P	W	1	A	6	8	1	M	P	D	

Size code
Configuration ※
Capacitance tolerance (±20%)
Rated Capacitance (680µF)
Rated voltage (10V)
Series name
Type

※Configuration

φ D	Pb-free leadwire Pb-free PET sleeve
4 · 5	DD
6.3	ED (7mm L : DD)
8 · 10	PD
12.5 to 18	HD
20 to 25	RD

• Please refer to page 20 about the end seal configulation.

●Frequency coefficient of rated ripple current

V	Cap. (µF) \ Frequency	50Hz	120Hz	300Hz	1kHz	10kHz or more
6.3 to 100	Less than 56	0.20	0.30	0.50	0.80	1.00
	68 to 330	0.55	0.65	0.75	0.85	1.00
	390 to 1000	0.70	0.75	0.80	0.90	1.00
	1200 to 15000	0.80	0.85	0.90	0.95	1.00
160 to 450	0.47 to 220	0.80	1.00	1.25	1.40	1.60
	330 to 470	0.90	1.00	1.10	1.13	1.15

Please refer to page 20, 21, 22 about the formed or taped product spec.
Please refer to page 4 for the minimum order quantity.
●Dimension table in next page.

PW series

■Standard ratings

Cap.(μF) \ V (Code) / Item / Code		6.3 (0J)				10 (1A)			
		Case size φD × L (mm)	Impedance (Ω) MAX. 20°C / 100kHz	Impedance (Ω) MAX. −10°C / 100kHz	Rated ripple (mArms) 105°C / 100kHz	Case size φD × L (mm)	Impedance (Ω) MAX. 20°C / 100kHz	Impedance (Ω) MAX. −10°C / 100kHz	Rated ripple (mArms) 105°C / 100kHz
22	220	5 × 11	0.60	1.20	180	5 × 11	0.60	1.20	180
						▲4 × 7	2.00	5.00	65
27	270	4 × 7	2.00	5.00	65				
33	330	5 × 11	0.60	1.20	180	5 × 11	0.60	1.20	180
		▲5 × 7	0.95	2.40	120	▲5 × 7	0.95	2.40	120
39	390					5 × 7	0.95	2.40	120
47	470	5 × 11	0.60	1.20	180	5 × 11	0.60	1.20	180
		▲5 × 7	0.95	2.40	120	▲4 × 11	1.30	2.60	120
56	560	5 × 7	0.95	2.40	120				
68	680	4 × 11	1.30	2.60	120				
82	820					5 × 11	0.60	1.20	180
						▲6.3 × 7	0.45	1.20	200
100	101	5 × 11	0.60	1.20	180	5 × 11	0.60	1.20	180
						▲5 × 15	0.50	1.00	235
120	121	6.3 × 7	0.45	1.20	200				
150	151	6.3 × 11	0.25	0.50	290	6.3 × 11	0.25	0.50	290
		▲5 × 15	0.50	1.00	235				
180	181					6.3 × 11	0.25	0.50	290
220	221	6.3 × 11	0.25	0.50	290	6.3 × 11	0.25	0.50	290
						▲6.3 × 15	0.23	0.46	430
330	331	6.3 × 11	0.25	0.50	290	8 × 11.5	0.117	0.234	555
		▲6.3 × 15	0.23	0.46	430				
470	471	8 × 11.5	0.117	0.234	555	8 × 11.5	0.117	0.234	555
560	561	8 × 11.5	0.117	0.234	555				
680	681	10 × 12.5	0.090	0.18	755	10 ×12.5	0.090	0.18	760
						▲8 × 15	0.085	0.17	730
820	821	8 × 15	0.085	0.17	730				
		▲10 × 12.5	0.090	0.18	755				
1000	102	10 × 12.5	0.090	0.18	755	10 × 16	0.068	0.136	1050
						▲8 × 20	0.065	0.13	995
1200	122	8 × 20	0.065	0.13	995	10 × 20	0.052	0.104	1220
		▲10 × 16	0.068	0.136	1050				
1500	152	10 × 20	0.052	0.104	1220	10 × 20	0.052	0.104	1220
						▲10 × 25	0.045	0.090	1440
2200	222	12.5 × 20	0.038	0.076	1655	12.5 × 20	0.038	0.076	1655
		▲10 × 25	0.045	0.090	1440	▲10 × 31.5	0.035	0.070	1815
2700	272	10 × 31.5	0.035	0.070	1815	12.5 × 25	0.030	0.060	1945
3300	332	12.5 × 20	0.038	0.076	1655	12.5 × 25	0.030	0.060	1950
						▲12.5 × 31.5	0.025	0.050	2310
3900	392	12.5 × 25	0.030	0.060	1945	12.5 × 35.5	0.022	0.044	2510
						▲16 × 20	0.029	0.058	2210
4700	472	16 × 25	0.022	0.044	2555	16 × 25	0.022	0.044	2555
		▲12.5 × 31.5	0.025	0.050	2310				
5600	562	12.5 × 35.5	0.022	0.044	2510	16 × 25	0.022	0.044	2560
		▲16 × 20	0.029	0.058	2210	▲18 × 20	0.028	0.056	2490
6800	682	16 × 25	0.022	0.044	2560	16 × 31.5	0.018	0.036	3010
		▲18 × 20	0.028	0.056	2490	▲18 × 25	0.020	0.040	2740
8200	822	16 × 31.5	0.018	0.036	3010	16 × 35.5	0.016	0.032	3150
						▲18 × 31.5	0.016	0.032	3635
10000	103	16 × 31.5	0.016	0.032	3150	18 × 35.5	0.015	0.030	3680
		▲18 × 25	0.020	0.040	2740				
12000	123	18 × 31.5	0.016	0.032	3635				
15000	153	18 × 35.5	0.015	0.030	3680	18 × 40	0.014	0.028	3800

▲ : In this case, 6 will be put at 12th digit of type numbering system.

PW series

■Standard ratings

Cap. (μF) / Code	V(Code) 16 (1C) Case size φD × L (mm)	Impedance (Ω) MAX. 20°C / 100kHz	Impedance (Ω) MAX. −10°C / 100kHz	Rated ripple (mArms) 105°C / 100kHz	25 (1E) Case size φD × L (mm)	Impedance (Ω) MAX. 20°C / 100kHz	Impedance (Ω) MAX. −10°C / 100kHz	Rated ripple (mArms) 105°C / 100kHz
4.7 4R7					5 × 11	0.60	1.20	180
10 100	5 × 11	0.60	1.20	180	5 × 11	0.60	1.20	180
					▲4 × 7	2.00	5.00	65
15 150	4 × 7	2.00	5.00	65				
22 220	5 × 11	0.60	1.20	180	5 × 11	0.60	1.20	180
	▲5 × 7	0.95	2.40	120	▲5 × 7	0.95	2.40	120
27 270	5 × 7	0.95	2.40	120	4 × 11	1.30	2.60	120
33 330	5 × 11	0.60	1.20	180	5 × 11	0.60	1.20	180
	▲6.3 × 7	0.45	1.20	200				
39 390	4 × 11	1.30	2.60	120	5 × 11	0.60	1.20	180
					▲6.3 × 7	0.45	1.20	200
47 470	5 × 11	0.60	1.20	180	5 × 11	0.60	1.20	180
56 560	5 × 11	0.60	1.20	180	5 × 15	0.50	1.00	235
	▲6.3 × 7	0.45	1.20	200				
82 820	5 × 15	0.50	1.00	235	6.3 × 11	0.25	0.50	290
100 101	6.3 × 11	0.25	0.50	290	6.3 × 11	0.25	0.50	290
120 121	6.3 × 11	0.25	0.50	290	6.3 × 15	0.23	0.46	430
150 151	6.3 × 11	0.25	0.50	290	8 × 11.5	0.117	0.234	555
180 181	6.3 × 15	0.23	0.46	430				
220 221	8 × 11.5	0.117	0.234	555	8 × 11.5	0.117	0.234	555
330 331	8 × 11.5	0.117	0.234	555	10 × 12.5	0.090	0.18	760
					▲8 × 15	0.085	0.17	730
470 471	10 × 12.5	0.090	0.18	760	10 × 16	0.068	0.136	1050
	▲8 × 15	0.085	0.17	730	▲8 × 20	0.065	0.13	995
560 561					10 × 20	0.052	0.104	1220
680 681	10 × 16	0.068	0.136	1050	10 × 20	0.052	0.104	1220
	▲8 × 20	0.065	0.13	995				
820 821	10 × 20	0.052	0.104	1220	10 × 25	0.045	0.090	1440
1000 102	10 × 20	0.052	0.104	1220	12.5 × 20	0.038	0.076	1660
					▲10 × 31.5	0.035	0.070	1815
1200 122	10 × 25	0.045	0.090	1440				
1500 152	12.5 × 20	0.038	0.076	1655	16 × 25	0.022	0.044	2555
	▲10 × 31.5	0.035	0.070	1815	▲12.5 × 25	0.030	0.060	1950
1800 182					12.5 × 31.5	0.025	0.050	2310
					▲16 × 20	0.029	0.058	2210
2200 222	12.5 × 25	0.030	0.060	1945	16 × 25	0.022	0.044	2555
					▲18 × 20	0.028	0.056	2490
					※12.5 × 35.5	0.022	0.044	2510
2700 272	12.5 × 31.5	0.025	0.050	2310	16 × 25	0.022	0.044	2555
	▲16 × 20	0.029	0.058	2210				
3300 332	16 × 25	0.022	0.044	2555	16 × 31.5	0.018	0.036	3010
	▲12.5 × 35.5	0.022	0.044	2510	▲18 × 25	0.020	0.040	2740
3900 392	16 × 25	0.022	0.044	2560	16 × 35.5	0.016	0.032	3150
	▲18 × 20	0.028	0.056	2490	▲18 × 31.5	0.016	0.032	3635
4700 472	16 × 31.5	0.018	0.036	3010	18 × 35.5	0.015	0.030	3680
	▲18 × 25	0.020	0.040	2740				
5600 562	16 × 35.5	0.016	0.032	3150				
	▲18 × 31.5	0.016	0.032	3635				
6800 682	18 × 35.5	0.015	0.030	3680	18 × 40	0.014	0.028	3800
8200 822	18 × 35.5	0.015	0.030	3680				
10000 103	18 × 40	0.014	0.028	3800				

▲ : In this case, 6 will be put at 12th digit of type numbering system.
※ : In this case, 3 will be put at 12th digit of type numbering system.

PW series

■Standard ratings

Cap.(μF) \ V(Code) / Item / Code		35 (1V)				50 (1H)			
		Case size φD × L (mm)	Impedance (Ω) MAX. 20˚C / 100kHz	Impedance (Ω) MAX. −10˚C / 100kHz	Rated ripple (mArms) 105˚C / 100kHz	Case size φD × L (mm)	Impedance (Ω) MAX. 20˚C / 100kHz	Impedance (Ω) MAX. −10˚C / 100kHz	Rated ripple (mArms) 105˚C / 100kHz
0.47	R47					5 × 11	5.00	10.0	25
1	010					5 × 11	3.50	7.00	40
2.2	2R2					5 × 11	3.00	6.00	55
3.3	3R3					5 × 11	2.60	5.20	65
4.7	4R7	5 × 11	0.60	1.20	180	5 × 11	2.30	4.60	90
6.8	6R8	4 × 7	2.00	5.00	65				
10	100	5 × 11	0.60	1.20	180	5 × 11	1.40	2.80	120
		▲ 5 × 7	0.95	2.40	120	▲ 4 × 11	2.50	5.00	90
12	120	5 × 7	0.95	2.40	120				
18	180	4 × 11	1.30	2.60	120	5 × 11	1.30	2.60	155
22	220	5 × 11	0.60	1.20	180	5 × 11	1.20	2.40	170
27	270	5 × 11	0.60	1.20	180	5 × 15	0.90	1.80	215
		▲ 6.3 × 7	0.45	1.20	200				
33	330	5 × 11	0.60	1.20	180	6.3 × 11	0.43	0.86	300
39	390	5 × 15	0.50	1.00	235				
47	470	6.3 × 11	0.25	0.50	290	6.3 × 11	0.43	0.86	300
56	560	6.3 × 11	0.25	0.50	290	6.3 × 15	0.40	0.80	360
82	820	6.3 × 15	0.23	0.46	430	8 × 11.5	0.234	0.468	485
100	101	8 × 11.5	0.117	0.234	555	8 × 11.5	0.234	0.468	485
120	121					8 × 15	0.155	0.31	635
						▲ 10 × 12.5	0.162	0.324	620
150	151	8 × 11.5	0.117	0.234	555	10 × 12.5	0.162	0.324	615
180	181					8 × 20	0.120	0.240	860
						▲ 10 × 16	0.119	0.238	850
220	221	10 × 12.5	0.090	0.18	760	10 × 16	0.119	0.238	850
		▲ 8 × 15	0.085	0.17	730	▲ 10 × 20	0.090	0.18	1030
270	271					10 × 25	0.082	0.164	1200
330	331	10 × 16	0.068	0.136	1050	10 × 20	0.090	0.18	1030
		▲ 8 × 20	0.065	0.13	995	▲ 10 × 31.5	0.060	0.12	1610
390	391	10 × 20	0.052	0.104	1220	12.5 × 20	0.063	0.126	1480
470	471	10 × 20	0.052	0.104	1220	12.5 × 20	0.060	0.12	1500
560	561	10 × 25	0.045	0.090	1440	12.5 × 25	0.050	0.10	1832
680	681	12.5 × 20	0.038	0.076	1660	12.5 × 25	0.050	0.10	1840
		▲ 10 × 31.5	0.035	0.070	1815	▲ 16 × 20	0.048	0.096	1840
820	821					12.5 × 35.5	0.034	0.068	2290
						▲ 18 × 20	0.042	0.084	2420
1000	102	12.5 × 25	0.030	0.060	1950	16 × 25	0.034	0.068	2235
1200	122	12.5 × 31.5	0.025	0.050	2310	16 × 31.5	0.028	0.056	2700
		▲ 16 × 20	0.029	0.058	2210	▲ 18 × 25	0.029	0.058	2610
1500	152	16 × 25	0.022	0.044	2555	16 × 31.5	0.028	0.056	2700
		▲ 12.5 × 35.5	0.022	0.044	2510	▲ 16 × 35.5	0.025	0.050	2790
1800	182	16 × 25	0.022	0.044	2555	18 × 31.5	0.025	0.050	3000
		▲ 18 × 20	0.028	0.056	2490				
2200	222	16 × 31.5	0.018	0.036	3010	18 × 35.5	0.023	0.046	3100
		▲ 18 × 25	0.020	0.040	2740				
2700	272	16 × 35.5	0.016	0.032	3150				
		▲ 18 × 31.5	0.016	0.032	3635				
3300	332	18 × 35.5	0.015	0.030	3680				
4700	472	18 × 40	0.014	0.028	3800				

▲ : In this case, 6 will be put at 12th digit of type numbering system.

PW series

■Standard ratings

V(Code) / Item / Cap(μF) / Code		63 (1J)				100 (2A)			
		Case size φD × L (mm)	Impedance (Ω) MAX. 20°C / 100kHz	Impedance (Ω) MAX. −10°C / 100kHz	Rated ripple (mArms) 105°C / 100kHz	Case size φD × L (mm)	Impedance (Ω) MAX. 20°C / 100kHz	Impedance (Ω) MAX. −10°C / 100kHz	Rated ripple (mArms) 105°C / 100kHz
0.47	R47					5 × 11	43.0	86.0	20
1	010					5 × 11	20.0	40.0	30
2.2	2R2					5 × 11	9.80	19.6	44
3.3	3R3					5 × 11	6.60	13.2	58
4.7	4R7	5 × 11	4.70	9.40	68	5 × 11	4.60	9.20	74
6.8	6R8	5 × 11	2.50	5.00	95	5 × 11	3.50	7.00	95
		▲ 4 × 11	3.50	7.00	80				
10	100	5 × 11	2.10	4.20	110	6.3 × 11	1.80	3.60	130
12	120	5 × 11	2.00	4.00	145				
15	150	6.3 × 11	1.20	2.40	160	8 × 11.5	0.83	1.66	180
18	180	5 × 15	1.30	2.60	200	6.3 × 15	0.80	1.60	200
22	220	6.3 × 11	0.71	1.42	250	8 × 11.5	0.68	1.36	230
33	330	6.3 × 11	0.71	1.42	250	10 × 12.5	0.46	0.92	320
						▲ 8 × 15	0.45	0.90	360
39	390	6.3 × 15	0.70	1.40	330				
47	470	8 × 11.5	0.342	0.684	405	10 × 16	0.37	0.74	420
						▲ 8 × 20	0.37	0.74	420
68	680	8 × 11.5	0.342	0.684	405	10 × 20	0.30	0.60	490
82	820					10 × 25	0.25	0.50	540
100	101	10 × 12.5	0.256	0.512	540	12.5 × 20	0.18	0.36	580
		▲ 8 × 15	0.23	0.46	535				
120	121	10 × 16	0.194	0.388	600				
150	151	10 × 16	0.194	0.388	660	12.5 × 25	0.13	0.26	710
180	181	10 × 20	0.147	0.294	890	12.5 × 31.5	0.12	0.24	790
		▲ 12.5 × 15	0.15	0.30	1020	▲ 16 × 20	0.13	0.26	750
220	221	10 × 20	0.147	0.294	885	16 × 25	0.10	0.20	890
		▲ 10 × 25	0.13	0.26	1050	▲ 18 × 20	0.11	0.22	850
270	271	16 × 15	0.090	0.18	1410				
330	331	12.5 × 20	0.085	0.17	1290	16 × 25	0.090	0.18	1080
390	391	12.5 × 25	0.070	0.14	1720	18 × 25	0.083	0.166	1260
		▲ 18 × 15	0.086	0.172	1690				
470	471	12.5 × 25	0.070	0.14	1720	16 × 31.5	0.076	0.152	1310
		▲ 12.5 × 31.5	0.055	0.11	2090				
		※ 16 × 20	0.059	0.118	1770				
560	561					18 × 31.5	0.068	0.136	1370
680	681	16 × 25	0.050	0.10	2160	16 × 35.5	0.064	0.128	1410
		▲ 12.5 × 35.5	0.047	0.094	2270				
		※ 18 × 20	0.055	0.11	2290				
820	821	16 × 31.5	0.043	0.086	2670				
		▲ 18 × 25	0.043	0.086	2590				
1000	102	16 × 31.5	0.043	0.086	2770	18 × 40	0.047	0.094	1520
		▲ 16 × 35.5	0.036	0.072	2770				
1200	122	18 × 31.5	0.032	0.064	2950				
1500	152	18 × 35.5	0.030	0.060	3100				
2200	222	18 × 40	0.028	0.056	3200				

▲ : In this case, 6 will be put at 12th digit of type numbering system.
※ : In this case, 3 will be put at 12th digit of type numbering system.

V(Code) / Cap. (μF) / Code		160		200		250		315		350		400		450	
		2C		2D		2E		2F		2V		2G		2W	
0.47	R47	6.3 × 11	12	6.3 × 11	12	6.3 × 11	12	8 × 11.5	11	8 × 11.5	11				
1	010	6.3 × 11	17	6.3 × 11	17	6.3 × 11	17	8 × 11.5	16	10 × 12.5	17	10 × 12.5	16	10 × 12.5	18
2.2	2R2	6.3 × 11	25	6.3 × 11	25	8 × 11.5	29	10 × 12.5	28	10 × 16	31	10 × 16	27	10 × 20	29
3.3	3R3	8 × 11.5	36	8 × 11.5	36	10 × 12.5	42	10 × 12.5	34	10 × 16	38	10 × 20	36	12.5 × 20	41
4.7	4R7	8 × 11.5	43	10 × 12.5	50	10 × 12.5	50	10 × 16	45	10 × 20	49	10 × 20	43	12.5 × 20	49
10	100	10 × 12.5	70	10 × 16	80	10 × 20	88	10 × 20	72	12.5 × 20	82	12.5 × 25	72	16 × 25	75
22	220	10 × 20	130	10 × 20	140	12.5 × 25	155	12.5 × 25	120	16 × 25	130	16 × 25	110	16 × 31.5	115
33	330	12.5 × 20	180	12.5 × 25	190	12.5 × 25	190	16 × 25	155	16 × 31.5	160	16 × 31.5	140	●18 × 35.5	145
47	470	12.5 × 25	220	12.5 × 25	220	16 × 25	230	16 × 35.5	190	●18 × 35.5	200	●18 × 35.5	170	20 × 40	175
100	101	16 × 25	330	16 × 31.5	335	●18 × 35.5	340	Δ18 × 40	285	20 × 40	290	22 × 50	350	25 × 50	350
220	221	●18 × 35.5	500	Δ18 × 40	515	20 × 40	525	22 × 50	540	25 × 50	550				
330	331	20 × 40	900	22 × 40	1100	22 × 50	1150								
470	471	22 × 50	1200	22 × 50	1310	25 × 50	1350							Case size φD × L (mm)	※

※ Rated Ripple (mArms) at 105°C 120Hz
Size 20 × 31 is available for capacitors marked " ● "
Size 20 × 35 is available for capacitors marked " Δ "
In this case, 6 will be put at 12th digit of type numbering system.