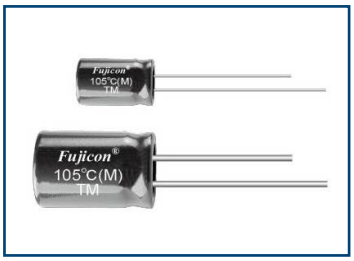
TM Series

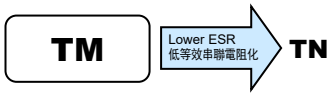
LOW ESR

低等效串聯電阻品





- Low ESR
  低等效串聯電阻
- Ideally suited for use of switching power supplies
  適用於開關電源
- Endurance 2000~3000 hours
  壽耐久性 2000~3000 小時
- Comply with the RoHS & REACH
  符合 RoHS 與 REACH



☐ SPECIFICATIONS 特性表

Items 項目	Characteristics 主要特性	
Category Temperature Range 工作溫度範圍	-40 ~ +105°C	-25 ~ +105°C
Voltage Range 額定工作電壓範圍	6.3 ~ 100V	160 ~ 450V
Capacitance Range 靜電容量範圍	1 ~ 15000μF	22 ~ 330μF
Capacitance Tolerance 靜電容量允許偏差	±20% at 120Hz, 20°C	
Leakage Current 漏電流	Leakage current ≤0.01CV or 3μA, whichever is greater (after 2 minutes application of rated voltage at 20°C) 漏電流 ≤0.01CV 或 3μA，取較大值（在 20°C 環境中施加額定工作電壓 2 分鐘後）	Leakage current ≤0.02CV + 15μA (after 5 minutes application of rated voltage at 20°C) 漏電流 ≤0.02CV + 15μA（在 20°C 環境中施加額定工作電壓 5 分鐘後）
	C: Nominal capacitance (μF) 標稱靜電容量, V: Rated voltage (V) 額定電壓	
Dissipation Factor (tan δ) 損耗角正切	When nominal capacitance is over 1000μF, tan δ shall be added 0.02 to the listed value with increase of every 1000μF. 當標稱靜電容量大於 1000μF，其標稱靜電容量每增加 1000μF，損耗角正切增加 0.02。 Measurement frequency 測試頻率: 120Hz, Temperature 温度: 20°C	

Rated Voltage (V) 額定工作電壓	6.3	10	16~35	50, 63	100	160~250	350~450
tan δ (max.) 最大損耗角正切	0.18	0.14	0.12	0.10	0.08	0.15	0.20

Stability at Low Temperature 低溫特性

Measurement frequency 測試頻率: 120Hz

Rated Voltage (V) 額定工作電壓		6.3~16	25~100	160~250	350~450
Impedance Ratio 阻抗比	Z(-25°C) / Z(+20°C)	2	2	3	8
	Z(-40°C) / Z(+20°C)	4	3	—	—

Endurance 耐久性

When the capacitors are restored to 20°C after 3000 hours (∅5~∅8 products are for 2000 hours) application of the rated voltage at 105°C, they meet the characteristics listed below.
在 105°C 環境中施加額定工作電壓 3000 小時（∅5~∅8 產品為 2000 小時）後，待電容器恢復至 20°C 時進行測量，電容器的特性符合下表要求。

Capacitance Change 靜電容量變化率	Within ±20% of initial measured value 初始值的±20%以內
Dissipation Factor 損耗角正切	≤200% of initial specified value 不大於規範值的 200%
Leakage Current 漏電流	≤initial specified value 不大於規範值

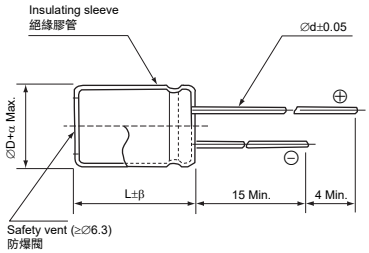
Shelf Life 高溫貯存特性

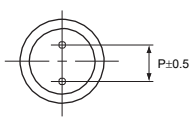
When the capacitors are restored to 20°C after leaving under no load at 105°C for 1000 hours, they meet the specified value for endurance characteristics listed above.
在 105°C 環境中無負荷放置 1000 小時後，待電容器恢復至 20°C 時進行測量，電容器的特性符合耐久性特性中所列的規定值。

Marking 標識

Printed with white colour on black sleeve (PVC) or printed with white colour on green sleeve (PET).
黑色膠管白字印刷（PVC）或綠色膠管白字印刷（PET）。

☐ DRAWING 外形圖 (Unit: mm)





∅D	5	6.3	8 (L≤11.5)	8 (L>16)	10	13	16	18	22
P	2.0	2.5	3.5		5.0		7.5		10.0
∅d	0.5			0.6			0.8		
β	1.5				2.0				
α	0.5								1.0

☐ FREQUENCY COEFFICIENT OF ALLOWABLE RIPPLE CURRENT 紋波電流頻率補償系數

Frequency 頻率		50Hz	120Hz	300Hz	1KHz	10KHz~
Coefficient 系數	1 ~ 47μF	0.75	1.00	1.35	1.55	2.0
	68 ~ 680μF	0.80	1.00	1.25	1.34	1.5
	1000 ~ 15000μF	0.85	1.00	1.10	1.13	1.15

The endurance of capacitors is reduced with internal heating produced by ripple current at the rate of halving the lifetime with every 5~10°C rise. When long life performance is required in actual use, the rms ripple current has to be reduced. 鋁電解電容器在疊加紋波電流後會引起發熱，溫度每上升 5~10°C 壽命會減半。若要保持長壽命性能，請在使用過程中適當降低紋波電流。

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CAT.2026/V2.1

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WV / Parameter 參數 / μF		6.3 (0J)				10 (1A)			
		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current (mA rms) 紋波電流	
				105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz
33	330					5 × 11	2.10	74	111
47	470	5 × 11	2.10	56	117	5 × 11	1.90	88	132
68	680	5 × 11	1.90	74	140	5 × 11	1.74	106	156
100	101	5 × 11	1.70	113	170	5 × 11	1.30	147	221
220	221	6.3 × 11.5	0.92	158	260	6.3 × 11.5	0.59	185	280
330	331	6.3 × 11.5	0.83	195	300	6.3 × 11.5	0.33	215	410
470	471	8 × 11.5	0.62	385	578	8 × 11.5 (10 × 12)	0.29 (0.25)	443 (465)	563 (630)
680	681	8 × 11.5	0.44	483	627	8 × 11.5	0.13	482	697
1000	102	8 × 11.5	0.36	505	645	8 × 16 (10 × 12)	0.10 (0.098)	816 (820)	928 (935)
1200	122	8 × 16	0.18	525	685	10 × 16	0.095	835	969
1500	152	10 × 12 (10 × 16)	0.16 (0.16)	787 (787)	964 (964)	10 × 16 (10 × 20)	0.094 (0.092)	905 (1029)	1050 (1208)
2200	222	10 × 20	0.095	1002	1195	10 × 20 (13 × 21)	0.08 (0.08)	1006 (1103)	1200 (1315)
3300	332	10 × 20 (13 × 21)	0.093 (0.087)	1100 (1189)	1225 (1391)	13 × 25 (16 × 20)	0.065 (0.063)	1573 (1425)	1812 (1645)
4700	472	13 × 25	0.068	1608	1875	16 × 25	0.060	1971	2262
6800	682	13 × 25 (16 × 25)	0.067 (0.065)	1680 (1776)	1905 (2076)	16 × 31	0.048	2390	2650
10000	103	16 × 31	0.050	2169	2404	18 × 31	0.035	2590	2730
15000	153	18 × 31	0.040	2380	2850				

WV / Parameter 參數 / μF		16 (1C)				25 (1E)			
		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current (mA rms) 紋波電流	
				105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz
22	220	5 × 11	2.00	66	132	5 × 11	1.90	65	130
33	330	5 × 11	1.80	81	163	5 × 11	1.60	78	156
47	470	5 × 11	1.40	97	194	5 × 11	1.30	106	198
68	580	5 × 11	0.93	134	201	6.3 × 11.5	0.82	152	228
100	101	5 × 11 (6.3 × 11.5)	0.90 (0.85)	152 (163)	230 (244)	6.3 × 11.5	0.71	198	265
220	221	6.3 × 11.5 (8 × 11.5)	0.50 (0.45)	320 (358)	400 (430)	6.3 × 11.5 (8 × 11.5)	0.46 (0.38)	305 (356)	440 (480)
330	331	8 × 11.5	0.41	425	565	8 × 11.5 (10 × 12)	0.36 (0.25)	434 (645)	656 (840)
470	471	6.3 × 15 (8 × 11.5) (10 × 12)	0.38 (0.35) (0.30)	465 (503) (600)	660 (707) (845)	8 × 11.5 (8 × 16) (10 × 12)	0.32 0.23 (0.20)	500 (600) (700)	780 (949) (970)
680	681	8 × 16 (10 × 12)	0.26 (0.24)	768 (815)	1024 (1038)	10 × 16	0.10	924	1387
1000	102	10 × 16 (10 × 20)	0.12 (0.14)	982 (1000)	1126 (1207)	10 × 16 (10 × 20)	0.09 (0.068)	1179 (1179)	1386 (1386)
1200	122	10 × 20	0.15	1035	1268	13 × 21	0.065	1280	1515
1500	152	10 × 20 (13 × 21)	0.096 (0.072)	1100 (1182)	1270 (1355)	13 × 25	0.062	1403	1621
2200	222	13 × 25	0.063	1453	1674	13 × 25 (16 × 25)	0.063 (0.055)	1500 (1567)	1774 (1839)
3300	332	13 × 30	0.056	1619	1816	16 × 31 (18 × 25)	0.050 (0.052)	2003 (1745)	2391 (1992)
4700	472	16 × 25	0.050	2173	2403	16 × 35	0.040	2420	2840
6800	682	16 × 35	0.040	2440	2797	18 × 35	0.035	2840	3250
10000	103	18 × 35	0.038	2850	3230				

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□ DIMENSIONS & STANDARD RATINGS 規格尺寸及標準參數

WV / Parameter 參數 / μF		35 (1V)				50 (1H)			
		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current (mA rms) 紋波電流	
				105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz
1	010					5 × 11	4.20	16	32
2.2	2R2					5 × 11	4.00	18	36
3.3	3R3					5 × 11	3.80	20	40
4.7	4R7					5 × 11	2.50	29	58
6.8	6R8					5 × 11	2.20	38	76
10	100	5 × 11	1.80	55	100	5 × 11	2.00	52	104
22	220	5 × 11 (6.3 × 11.5)	1.50 (1.40)	67 (75)	134 (145)	5 × 11 (6.3 × 11.5)	1.60 (1.00)	68 (76)	136 (150)
33	330	5 × 11	1.20	81	163	6.3 × 11.5	0.80	85	175
47	470	6.3 × 11.5 (6.3 × 7)	1.10 (1.20)	114 (102)	229 (210)	6.3 × 11.5	0.71	125	225
68	680	6.3 × 11.5	0.85	137	273	8 × 11.5	0.65	215	385
100	101	6.3 × 11.5 (8 × 11.5)	0.68 (0.50)	205 (273)	340 (409)	8 × 11.5	0.40	380	480
220	221	8 × 11.5 (8 × 16)	0.27 (0.25)	484 (510)	725 (750)	8 × 16 (10 × 12)	0.25 (0.20)	580 (600)	760 (805)
330	331	8 × 16 (10 × 16)	0.16 (0.14)	540 (610)	795 (900)	10 × 20	0.10	900	1045
470	470	10 × 16 (10 × 20)	0.12 (0.10)	810 (960)	1020 (1095)	10 × 20 (13 × 21)	0.09 (0.088)	1000 (1085)	1120 (1260)
680	681	10 × 20 (10 × 25)	0.085 (0.072)	1015 (1089)	1160 (1433)	13 × 25	0.078	1275	1464
1000	102	13 × 21	0.065	1350	1490	13 × 25 (16 × 25)	0.075 (0.065)	1305 (1460)	1500 (1700)
1500	152	13 × 25	0.060	1580	1715	16 × 31	0.050	1710	1990
2200	222	16 × 25	0.055	1759	2069	16 × 35 (18 × 31)	0.045 (0.045)	2076 (2076)	2326 (2326)
3300	332	16 × 35 (18 × 25)	0.045 (0.050)	2300 (2165)	2520 (2420)	18 × 35	0.04	2500	2700
4700	472	18 × 35	0.038	2450	2875				

WV / Parameter 參數 / μF		63 (1J)				100 (2A)			
		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current (mA rms) 紋波電流	
				105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz
1	010					5 × 11	7.00	47	66
2.2	2R2					5 × 11	6.00	66	72
3.3	3R3					5 × 11	5.00	68	78
4.7	4R7	5 × 11	2.50	45	71	5 × 11	4.00	72	88
10	100	5 × 11	1.50	50	81	6.3 × 11.5	1.20	100	180
22	220	5 × 11	1.20	110	165	6.3 × 11.5 (8 × 11.5)	0.80 (0.66)	135 (196)	210 (282)
33	330	6.3 × 11.5	0.85	135	210	8 × 11.5	0.50	310	380
47	470	8 × 11.5	0.56	210	330	8 × 16 (10 × 12)	0.32 (0.25)	405 (460)	500 (630)
68	680	8 × 11.5	0.56	210	330	10 × 16	0.25	515	780
100	101	8 × 16 (10 × 12)	0.50 (0.40)	370 (380)	581 (600)	10 × 16 (10 × 20)	0.22 (0.16)	600 (650)	820 (890)
220	221	10 × 16 (10 × 20)	0.35 (0.27)	540 (710)	850 (1000)	13 × 25	0.13	920	1280
330	331	10 × 20 (13 × 21)	0.20 (0.16)	860 (950)	1100 (1200)	16 × 25	0.09	1200	1440
470	471	13 × 25	0.14	1100	1300	16 × 31	0.06	1560	1790
680	681	16 × 25	0.08	1215	1450	18 × 35	0.055	1650	1850
1000	102	16 × 25 (16 × 31)	0.06 (0.06)	1295 (1350)	1525 (1600)	18 × 40	0.051	1700	2040
2200	222	18 × 40	0.045	1500	1800				

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WV / Parameter 參數 / μF		160 (2C)				200 (2D)			
		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current (mA rms) 紋波電流	
				105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz
10	100					8 × 11.5 (10 × 12)	7.80 (6.20)	225 (240)	295 (320)
22	220	10 × 20	1.30	315	440	10 × 16 (10 × 20)	4.30 (4.20)	285 (300)	365 (380)
33	330	10 × 20	1.30	405	565	13 × 21	3.00	425	560
47	470	10 × 20 (13 × 21)	1.12 (0.91)	495 (525)	685 (725)	13 × 21	2.60	510	785
68	680	13 × 25	0.63	680	950	13 × 25	1.40	645	875
100	101	16 × 25 (16 × 31)	0.27 (0.25)	920 (925)	1280 (1290)	13 × 25	0.95	715	980
150	151	16 × 31	0.22	930	1300	16 × 31 (18 × 25)	0.80 (0.72)	745 (730)	995 (985)
220	221	16 × 31	0.22	930	1300	18 × 31	0.45	750	1000
330	331	16 × 35 (18 × 31)	0.22 (0.22)	1580 (1580)	1700 (1700)	18 × 35 (22 × 35)	0.38 (0.28)	760 (795)	1050 (1135)

WV / Parameter 參數 / μF		250 (2E)				350 (2V)			
		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current (mA rms) 紋波電流	
				105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz
4.7	4R7	8 × 11.5	7.00	90	145	8 × 11.5 (10 × 12)	6.50 (6.20)	115 (140)	460 (195)
6.8	6R8	10 × 12	5.80	115	180	10 × 12 (10 × 16)	5.40 (5.00)	145 (150)	210 (220)
10	100	10 × 16	4.50	150	245	10 × 16 (10 × 20)	4.50 (4.20)	160 (175)	230 (275)
22	220	10 × 20	3.20	265	360	13 × 21 (13 × 25)	3.90 (2.50)	295 (300)	400 (455)
33	330	13 × 21	2.50	310	495	13 × 25 (16 × 20)	3.40 (3.00)	405 (465)	525 (645)
47	470	13 × 25	1.90	425	570	16 × 25	2.80	550	705
68	680	16 × 25	1.20	480	655	16 × 31	2.00	625	825
100	101	16 × 31 (18 × 31)	0.65 (0.40)	505 (550)	690 (750)	16 × 35 (18 × 31)	1.20 (0.70)	700 (705)	905 (960)
150	151	18 × 35 (22 × 35)	0.30 (0.24)	600 (630)	845 (900)	18 × 35	0.60	1020	1050
220	221	22 × 35	0.25	750	1000				

WV / Parameter 參數 / μF		400 (2G)				450 (2W)			
		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current (mA rms) 紋波電流	
				105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz
2.2	2R2	6.3 × 11.5 (8 × 11.5)	8.80 (8.00)	80 (95)	110 (130)	8 × 11.5	7.00	95	138
3.3	3R3	8 × 11.5	8.00	105	140	8 × 11.5	6.00	105	140
4.7	4R7	8 × 11.5 (10 × 12)	8.00 (6.00)	130 (135)	175 (210)	10 × 12	5.60	150	200
6.8	6R8	10 × 12 (10 × 16)	5.00 (4.50)	150 (160)	220 (230)	10 × 16	6.50	205	265
10	100	10 × 16 (10 × 20)	3.60 (3.60)	195 (205)	265 (285)	10 × 20	9.00	235	320
22	220	13 × 21	3.80	310	420	13 × 35	6.00	415	570
27	270	13 × 21	3.80	310	420				
33	330	16 × 20 (16 × 25)	3.40 (3.00)	405 (465)	525 (645)	16 × 31	2.40	385	710
39	390					16 × 25	2.80	450	650
47	470	16 × 25 (16 × 31)	2.80 (2.60)	550 (585)	705 (775)	16 × 35 (18 × 26)	1.80 (1.20)	515 (585)	755 (800)
68	680	16 × 31	2.00	625	825	18 × 31	1.00	620	845
100	101	18 × 31 (18 × 35)	1.20 (0.70)	700 (705)	905 (960)	18 × 35	0.64	380	520
150	151	18 × 40	0.60	1020	1050				

- Please refer to page 21 “Taping Specifications” & page 23 “Lead Forming & Cutting” about the taped or formed product spec. 編帶與引線成型標準請查閱第 21 頁“編帶標準”及第 23 頁“引線成型與剪腳”。
- Please refer to page 22 “Packaging Specifications” for the minimum package quantity. 最小包裝數量請查閱第 22 頁“包裝標準”。
- Please refer to page 18 for the Part Number System. 產品編碼規則請查閱第 18 頁。

Note: All design and specifications are for reference only and is subject to change without prior notice. If any doubt about safety for your application, please contact us immediately for technical assistance before purchase.
注：以上所提供的設計及特性參數僅供參考，任何修改不作預先通知。如果在使用上有疑問，請在採購前與我們聯繫，以便提供技術上的協助。