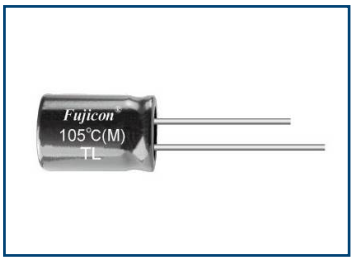
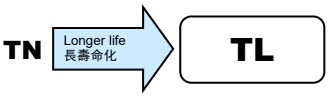
TL Series

ULTRA-LOW ESR, LONG LIFE
超低等效串聯電阻，長壽命品



- Endurance 4000~10000 hours
  耐久性 4000~10000 小時
- Suitable for long life applications
  適用於長壽命應用
- Comply with the RoHS & REACH
  符合 RoHS 與 REACH

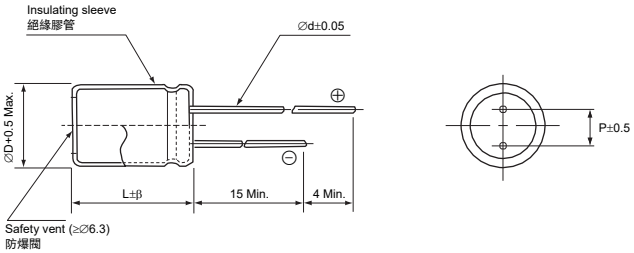




☐ SPECIFICATIONS 特性表

Items 項目	Characteristics 主要特性
Category Temperature Range 工作溫度範圍	-40 ~ +105°C
Voltage Range 額定工作電壓範圍	6.3 ~ 100V
Capacitance Range 靜電容量範圍	0.47 ~ 18000μF
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） 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	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 / 25 / 35 / 50 / 63 / 100 tan δ (max.) 最大損耗角正切: 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 / 0.09 / 0.08
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 / 10 / 16 / 25 ~ 100 Impedance Ratio 阻抗比 Z(-25°C) / Z(+20°C): 4 / 3 / 2 / 2 Impedance Ratio 阻抗比 Z(-40°C) / Z(+20°C): 8 / 6 / 4 / 3
Endurance 耐久性	The characteristics listed below shall be satisfied when the capacitors are restored to 20°C after subject to DC voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for the specified period of time at 105°C. 在 105°C 環境中的規定時間內施加額定紋波電流（峰值電壓不得超過額定電壓）後，電容器經直流電壓後恢復至 20°C 時，應符合下表參數要求。 Size (mm) 尺寸 / Life time (hours) 壽命（小時）: 6.3 ~ 10V / 16 ~ 100V ∅5, ∅6.3 (∅5×15)*: 4000 / 5000* ∅D8, ∅10: 6000 / 7000 ∅D≥13: 8000 / 10000 Capacitance Change 靜電容量變化率: Within ±25% of initial measured value 初始值的±25%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 & DIMENSIONS 外形圖及尺寸 (Unit: mm)



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

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

Frequency 頻率		60Hz	120Hz	300Hz	1KHz	10KHz~
Coefficient 系數	< 33μF	0.20	0.42	0.52	0.70	0.90
	39 ~ 270μF	0.26	0.50	0,55	0.73	0.92
	330 ~ 680μF	0.28	0.55	0.60	0.77	0.94.
	820 ~ 1800μF	0.35	0.60	0.70	0.80	0.96
	2200 ~ 18000μF	0.42	0.70	0.77	0.85	0.98

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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TL Series

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

WV / Parameter 參數 / μF		6.3 (0J)			10 (1A)			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 紋波電流 (mA rms, 105°C, 100KHz)	Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current 紋波電流 (mA rms, 105°C, 100KHz)	Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current 紋波電流 (mA rms, 105°C, 100KHz)	Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current 紋波電流 (mA rms, 105°C, 100KHz)
47	470										5 x 11 (5 x 15)	0.58 (0.55)	210 (230)
56	560							5 x 11	0.58	210			
100	101	5 x 11	0.90	150	5 x 11 (5 x 15)	0.58 (0.52)	210 (230)	6.3 x 11.5	0.35	295	6.3 x 11.5	0.22	340
120	121							6.3 x 11.5	0.35	340			
150	151	5 x 11 (5 x 15)	0.58 (0.52)	210 (230)				6.3 x 11.5	0.22	340			
220	221				6.3 x 11.5	0.22	340	8 x 11.5	0.16	430	8 x 11.5 (10 x 12)	0.11 (0.10)	640 (735)
270	271										8 x 16	0.085	820
330	331	6.3 x 11.5	0.22	340				8 x 11.5	0.11	640	8 x 16 (10 x 12)	0.083 (0.080)	840 (865)
470	471	6.3 x 11.5	0.20	450	8 x 11.5	0.11	640	8 x 16 (10 x 12)	0.083 (0.080)	840 (865)	8 x 20 (10 x 16)	0.064 (0.060)	1050 (1210)
560	561							8 x 16	0.083	880			
680	681	8 x 11.5	0.13	640	8 x 16 (10 x 12)	0.083 (0.080)	840 (865)	8 x 20 (10 x 16)	0.064 (0.060)	1050 (1210)	10 x 20 (13 x 21)	0.046 (0.049)	1400 (1450)
820	82	10 x 12	0.080	865							10 x 25	0.042	1650
1000	102	8 x 16	0.087	840	8 x 20 (10 x 16)	0.064 (0.060)	1050 (1210)	10 x 20 (13 x 21)	0.046 (0.049)	1400 (1450)	10 x 30 (13 x 21) (16 x 20)	0.031 (0.035) (0.042)	1910 (1900) (1940)
1200	122	8 x 20 (10 x 16)	0.069 (0.060)	1050 (1210)	10 x 20	0.046	1400	10 x 25	0.042	1650	13 x 25	0.043	2210
1500	152	13 x 21	0.046	1400	10 x 25 (13 x 21)	0.042 (0.049)	1650 (1450)	10 x 20 (13 x 21)	0.072 (0.035)	1500 (1900)	13 x 25	0.027	2230
1800	182	13 x 21	0.049	1450							13 x 30 (16 x 25)	0.024 (0.027)	2650 (2530)
2200	222	13 x 21	0.042	1650	10 x 30 (13 x 21) (16 x 20)	0.031 (0.035) (0.042)	1910 (1900) (1940)	13 x 25 (18 x 20)	0.027 (0.043)	2230 (2210)	13 x 35 (16 x 25)	0.020 (0.026)	2880 (2860)
2700	272	13 x 25	0.042	1940	13 x 25	0.043	2210	13 x 30 (16 x 25)	0.024 (0.027)	2650 (2530)	16 x 25 (16 x 31)	0.026 (0.017)	2860 (3350)
3300	332	13 x 25	0.035	1900	13 x 25	0.027	2230	13 x 35	0.020	2880	13 x 30 (16 x 35) (18 x 31)	0.036 (0.017) (0.019)	2880 (3450) (3140)
3900	392	13 x 25 (18 x 16)	0.027 (0.043)	2230 (2210)	13 x 30 (16 x 25)	0.024 (0.027)	2650 (2530)	16 x 35 (18 x 31)	0.021 (0.026)	2930 (2860)	16 x 40 (18 x 31)	0.015 (0.015)	3610 (4170)
4700	472	13 x 30	0.024	2650	13 x 35	0.020	2880	16 x 35 (18 x 31)	0.017 (0.019)	3450 (3140)	16 x 40 (18 x 35)	0.013 (0.014)	4080 (4220)
5600	562	13 x 35 (16 x 20)	0.020 (0.027)	2880 (2530)	16 x 31 (18 x 25)	0.021 (0.026)	2930 (2860)	16 x 35 (18 x 31)	0.015 (0.015)	3610 (4170)	18 x 40	0.012	4280
6800	682	16 x 31 (18 x 25)	0.021 (0.026)	2930 (2860)	16 x 31 (18 x 25)	0.017 (0.019)	3450 (3140)	18 x 35	0.013	4080			
8200	822	16 x 31	0.017	3450	16 x 35 (18 x 31)	0.015 (0.015)	3610 (4170)	18 x 35	0.014	4220			
10000	103	16 x 35 (18 x 31)	0.015 (0.019)	3610 (3140)	16 x 40 (18 x 35)	0.013 (0.014)	4080 (4220)	18 x 40	0.012	4280			
12000	123	16 x 40 (18 x 31)	0.013 (0.015)	4080 (4170)	18 x 40	0.012	4280						
15000	153	18 x 35	0.014	4220									
18000	183	18 x 40	0.012	4280									

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TL Series

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

WV / Parameter 參數 / μF		35 (1V)			50 (1H)			63 (1J)		
		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current 紋波電流 (mA rms, 105°C, 100KHz)	Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current 紋波電流 (mA rms, 105°C, 100KHz)	Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current 紋波電流 (mA rms, 105°C, 100KHz)
0.47	R47				5 x 11	7.20	17			
1	010				5 x 11 (5 x 15)	5.20 (5.00)	30 (33)			
2.2	2R2				5 x 11 (5 x 15)	3.30 (3.00)	43 (48)			
3.3	3R3				5 x 11 (5 x 15)	2.90 (2.60)	53 (56)			
4.7	4R7				5 x 11 (5 x 15)	2.50 (2.20)	95 (100)			
10	100				5 x 11 (6.3 x 11.5)	2.00 (2.00)	120 (130)			
15	150							6.3 x 11.5	1.20	165
22	220				5 x 11 (6.3 x 11.5)	0.80 (0.91)	180 (180)	6.3 x 11.5	1.00	215
33	330	5 x 11 (5 x 15)	0.58 (0.55)	210 (235)	6.3 x 11.5	0.75	225	6.3 x 11.5	0.49	265
47	470	6.3 x 11.5	0.22	340	6.3 x 11.5 (8 x 11.5)	0.40 (0.39)	250 (295)			
56	560	6.3 x 11.5	0.22	340				8 x 11.5	0.31	500
82	820							8 x 16 (10 x 12)	0.22 (0.15)	665 (690)
100	101	6.3 x 11.5 (8 x 11.5)	0.20 (0.19)	450 (500)	10 x 12	0.22	555	10 x 12	0.15	690
120	121				10 x 16	0.154	730	8 x 20 (10 x 16)	0.17 (0.11)	820 (950)
150	151	8 x 11.5	0.11	640	10 x 16	0.16	760			
180	181	8 x 16	0.086	850	10 x 16	0.118	910	10 x 20 (13 x 21)	0.078 (0.101)	1150 (1150)
220	221	8 x 11.5 (8 x 16) (10 x 12)	0.10 (0.086) (0.080)	745 (850) (865)	10 x 16 (10 x 20)	0.11 (0.11)	980 (1050)	10 x 25	0.064	1350
270	271	8 x 20 (10 x 12)	0.064 (0.053)	1050 (1160)	10 x 20 (13 x 21)	0.078 (0.079)	1220 (1260)	13 x 21	0.057	1500
330	331	10 x 16	0.060	1210	10 x 25	0.072	1440			
390	391							13 x 25	0.043	1900
470	471	10 x 20 (13 x 21)	0.046 (0.049)	1400 (1450)	13 x 21 (16 x 20)	0.059 (0.072)	1660 (1690)	13 x 30 (16 x 25)	0.039 (0.045)	2300 (2000)
560	561	13 x 21	0.042	1650	13 x 21 (13 x 25) (16 x 20)	0.059 (0.044) (0.070)	1750 (1950) (1930)	13 x 35	0.034	2500
680	681	13 x 21 (16 x 20)	0.035 (0.042)	1900 (1940)	13 x 17 (13 x 25) (13 x 30)	0.046 (0.044) (0.039)	1850 (1950) (2310)	16 x 31	0.035	2600
820	821				13 x 35 (16 x 20)	0.033 (0.044)	2510 (2210)	16 x 31 (18 x 25)	0.029 (0.034)	2850 (2800)
1000	102	13 x 21 (16 x 25) (18 x 20)	0.058 (0.027) (0.043)	2150 (2230) (2210)	13 x 40 (16 x 25) (18 x 20)	0.027 (0.033) (0.047)	2920 (2555) (2490)	16 x 31 (16 x 35)	0.039 (0.027)	2850 (2900)
1200	122	13 x 30 (16 x 20)	0.024 (0.027)	2650 (2530)	16 x 31 (18 x 25)	0.027 (0.028)	3010 (2740)	16 x 40 (18 x 31)	0.025 (0.028)	3400 (3300)
1500	152	13 x 35	0.020	2880	16 x 31	0.048	3050	18 x 35	0.025	3400
1800	182	16 x 31 (18 x 25)	0.021 (0.026)	2930 (2860)	16 x 40 (18 x 31)	0.021 (0.024)	3710 (3635)	18 x 40	0.024	3500
2200	222	16 x 31 (16 x 35) (18 x 25) (18 x 31)	0.021 (0.016) (0.021) (0.019)	3300 (3500) (3300) (3140)	18 x 35 (18 x 40)	0.022 (0.020)	3680 (3750)			
2700	272	16 x 40 (18 x 35)	0.015 (0.015)	3610 (4170)	18 x 40	0.018	3800			
3300	332	16 x 40 (18 x 35)	0.013 (0.014)	4080 (4220)						

WV / Parameter 參數 / μF		80 (1K)			100 (2A)		
		Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current 紋波電流 (mA rms, 105°C, 100KHz)	Case size ØD×L (mm) 尺寸	ESR (Ω) max. 20°C, 100KHz 等效串聯電阻	Ripple current 紋波電流 (mA rms, 105°C, 100KHz)
47	470				10 x 16	0.28	680
220	221				13 x 21	0.064	1350
470	471				16 x 25	0.043	2500
1000	102	18 x 31	0.048	2500			
1500	152	18 x 40	0.028	3650			

- 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。

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