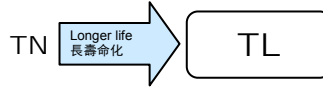


# TL Series

## EXTREMELY LOW IMPEDANCE, LONG LIFE

### 極低阻抗，長壽命品

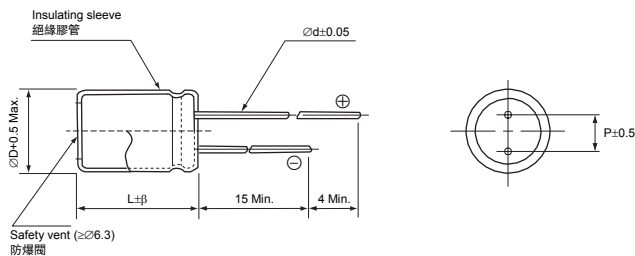
- 4000~10000 hours load life at 105°C  
在 105°C 環境中負荷壽命 4000~10000 小時
- Suitable for long life applications  
適用於長壽命應用
- Comply with the RoHS & REACH  
符合 RoHS 與 REACH



### □ SPECIFICATIONS 特性表

Items 項目	Characteristics 主要特性																					
Operation Temperature Range 使用溫度範圍	-40 ~ +105°C																					
Voltage Range 額定工作電壓範圍	6.3 ~ 63V																					
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 溫度: 20°C <table border="1"> <tr> <td>Rated Voltage (V) 額定工作電壓</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> </tr> <tr> <td>tan δ (max.) 最大損耗角正切</td> <td>0.22</td> <td>0.19</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> <td>0.09</td> </tr> </table>	Rated Voltage (V) 額定工作電壓	6.3	10	16	25	35	50	63	tan δ (max.) 最大損耗角正切	0.22	0.19	0.16	0.14	0.12	0.10	0.09					
Rated Voltage (V) 額定工作電壓	6.3	10	16	25	35	50	63															
tan δ (max.) 最大損耗角正切	0.22	0.19	0.16	0.14	0.12	0.10	0.09															
Stability at Low Temperature 低溫特性	Measurement frequency 測試頻率: 120Hz <table border="1"> <tr> <td>Rated Voltage (V) 額定工作電壓</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25-63</td> </tr> <tr> <td>Impedance Ratio 阻抗比</td> <td>Z(-25°C) / Z(20°C)</td> <td>4</td> <td>3</td> <td>2</td> </tr> <tr> <td></td> <td>Z(-40°C) / Z(20°C)</td> <td>8</td> <td>6</td> <td>4</td> </tr> </table>	Rated Voltage (V) 額定工作電壓	6.3	10	16	25-63	Impedance Ratio 阻抗比	Z(-25°C) / Z(20°C)	4	3	2		Z(-40°C) / Z(20°C)	8	6	4						
Rated Voltage (V) 額定工作電壓	6.3	10	16	25-63																		
Impedance Ratio 阻抗比	Z(-25°C) / Z(20°C)	4	3	2																		
	Z(-40°C) / Z(20°C)	8	6	4																		
Load Life 高溫負荷特性	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。 <table border="1"> <tr> <th>Size (mm) 尺寸</th> <th colspan="2">Life time (hours) 壽命 (小時)</th> </tr> <tr> <td></td> <td>6.3~10V</td> <td>16~63V</td> </tr> <tr> <td>∅5, ∅6.3 (∅5×15)*</td> <td>4000</td> <td>5000*</td> </tr> <tr> <td>∅8, ∅10</td> <td>6000</td> <td>7000</td> </tr> <tr> <td>∅D≥13</td> <td>8000</td> <td>10000</td> </tr> </table> <table border="1"> <tr> <td>Capacitance Change 靜電容量變化率</td> <td>Within ±25% of initial measured value 初始值的±25%以內</td> </tr> <tr> <td>Dissipation Factor 損耗角正切</td> <td>≤200% of initial specified value 不大於規範值的 200%</td> </tr> <tr> <td>Leakage Current 漏電流</td> <td>≤initial specified value 不大於規範值</td> </tr> </table>	Size (mm) 尺寸	Life time (hours) 壽命 (小時)			6.3~10V	16~63V	∅5, ∅6.3 (∅5×15)*	4000	5000*	∅8, ∅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
Size (mm) 尺寸	Life time (hours) 壽命 (小時)																					
	6.3~10V	16~63V																				
∅5, ∅6.3 (∅5×15)*	4000	5000*																				
∅8, ∅10	6000	7000																				
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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	After leaving capacitors under no load at 105°C for 1000 hours, they meet the specified value for load life characteristics listed above. 在 105°C 環境中無負荷放置 1000 小時後, 電容器的特性符合高溫負荷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
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 紋波電流頻率補償係數

Frequency 頻率	60Hz	120Hz	300Hz	1KHz	10KHz~	
Coefficient 係數	< 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 &amp; MAXIMUM PERMISSIBLE RIPPLE CURRENT &amp; IMPEDANCE 規格尺寸及最大允許紋波電流及阻抗值

WV Parameter 參數 μF		6.3 (0J)			10 (1A)			16 (1C)			25 (1E)		
		Case size ∅D×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current 紋波電流 (mA rms, 105°C, 100KHz)	Case size ∅D×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current 紋波電流 (mA rms, 105°C, 100KHz)	Case size ∅D×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current 紋波電流 (mA rms, 105°C, 100KHz)	Case size ∅D×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	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 (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
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)
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				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)
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)	13 x 21	0.035	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	16 x 35 (18 x 31)	0.017 (0.019)	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 &amp; MAXIMUM PERMISSIBLE RIPPLE CURRENT &amp; IMPEDANCE 規格尺寸及最大允許紋波電流及阻抗值

WV Parameter 參數 μF		35 (1V)			50 (1H)			63 (1J)		
		Case size ∅D×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current 紋波電流 (mA rms, 105°C, 100KHz)	Case size ∅D×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current 紋波電流 (mA rms, 105°C, 100KHz)	Case size ∅D×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current 紋波電流 (mA rms, 105°C, 100KHz)
0.47	R47				5 x 11	7.2	17			
1	010				5 x 11 (5 x 15)	5.2 (5.0)	30 (33)			
2.2	2R2				5 x 11 (5 x 15)	3.3 (3.0)	43 (48)			
3.3	3R3				5 x 11 (5 x 15)	2.9 (2.6)	53 (56)			
4.7	4R7				5 x 11 (5 x 15)	2.5 (2.2)	95 (100)			
10	100				5 x 11 (6.3 x 11.5)	2.0 (2.0)	120 (130)			
15	150							6.3 x 11.5	1.2	165
22	220				6.3 x 11.5	0.91	180			
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	8 x 11.5	0.39	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	0.20	450	10 x 12	0.22	555			
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				10 x 16	0.118	910	10 x 20 (13 x 21)	0.078 (0.101)	1150 (1150)
220	221	10 x 12	0.080	865	10 x 16 (10 x 20)	0.11 (0.11)	980 (1050)	10 x 25	0.064	1350
270	271	8 x 20	0.064	1050	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 25 (16 x 20)	0.044 (0.070)	1950 1930	13 x 35	0.034	2500
680	681	13 x 21 (16 x 20)	0.035 (0.042)	1900 (1940)	13 x 30	0.039	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	16 x 25 (18 x 20)	0.027 (0.043)	2230 (2210)	13 x 40 (16 x 25) (18 x 20)	0.027 (0.033) (0.047)	2920 (2555) (2490)	16 x 35	0.027	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 35	0.024	3150	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 35 (18 x 31)	0.016 (0.019)	3500 (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)						

- Please refer to page 19 "Taping Specifications" & page 21 "Lead Forming & Cutting" about the taped or formed product spec. 編帶與引線成型標準請查閱第 19 頁 "編帶標準" 及第 21 頁 "引線成型與剪腳"。
- Please refer to page 20 "Packaging Specifications" for the minimum package quantity. 最小包裝數量請查閱第 20 頁 "包裝標準"。
- Please refer to page 16 for the Part Number System. 產品編碼規則請查閱第 16 頁。

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