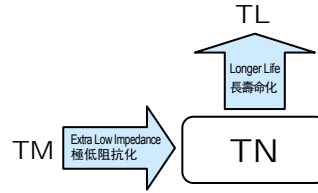


# TN Series

## EXTREMELY LOW IMPEDANCE

### 極低阻抗品

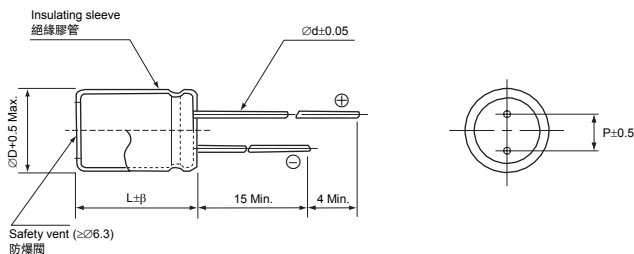
- Extremely low impedance at high frequency  
高頻極低阻抗
- Ideally suited for use of switching power supplies  
適用於開關電源
- High reliability withstanding 5000 hours load life at 105°C  
(2000~3000 hours for smaller case sizes as specified below)  
高可靠性，在 105°C 環境中負荷壽命 5000 小時  
(小尺寸為 2000~3000 小時，請看以下說明)
- 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	-25 ~ +105°C																						
Voltage Range 額定工作電壓範圍	6.3 ~ 63V	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)																						
Dissipation Factor (tan δ) 損耗角正切	C: Nominal capacitance (µF) 標稱靜電容量, V: Rated voltage (V) 額定電壓 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 溫度: 20°C																							
Stability at Low Temperature 低溫特性	<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> <td>100</td> <td>160~250</td> <td>350~450</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> <td>0.08</td> <td>0.15</td> <td>0.20</td> </tr> </table>		Rated Voltage (V) 額定工作電壓	6.3	10	16	25	35	50	63	100	160~250	350~450	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	0.15	0.20
Rated Voltage (V) 額定工作電壓	6.3	10	16	25	35	50	63	100	160~250	350~450														
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	0.15	0.20														
Load Life 高溫負荷特性	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, 10</td> <td>16~35</td> <td>50, 63</td> <td>100</td> <td>160~250</td> <td>350~450</td> </tr> <tr> <td>Impedance Ratio Z(-25°C) / Z(20°C)</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>3</td> <td>8</td> </tr> <tr> <td>Impedance Ratio Z(-40°C) / Z(20°C)</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>—</td> <td>—</td> </tr> </table>		Rated Voltage (V) 額定工作電壓	6.3, 10	16~35	50, 63	100	160~250	350~450	Impedance Ratio Z(-25°C) / Z(20°C)	4	3	2	2	3	8	Impedance Ratio Z(-40°C) / Z(20°C)	4	3	2	2	—	—	
Rated Voltage (V) 額定工作電壓	6.3, 10	16~35	50, 63	100	160~250	350~450																		
Impedance Ratio Z(-25°C) / Z(20°C)	4	3	2	2	3	8																		
Impedance Ratio Z(-40°C) / Z(20°C)	4	3	2	2	—	—																		
Shelf Life 高溫貯存特性	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> <td>Size (mm) 尺寸</td> <td>Life time (hours) 壽命 (小時)</td> </tr> <tr> <td>∅D5, ∅6.3</td> <td>2000</td> </tr> <tr> <td>∅D8</td> <td>3000</td> </tr> <tr> <td>∅D≥10</td> <td>5000</td> </tr> </table>		Size (mm) 尺寸	Life time (hours) 壽命 (小時)	∅D5, ∅6.3	2000	∅D8	3000	∅D≥10	5000														
Size (mm) 尺寸	Life time (hours) 壽命 (小時)																							
∅D5, ∅6.3	2000																							
∅D8	3000																							
∅D≥10	5000																							
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	50Hz	120Hz	300Hz	1KHz	10KHz~
Coefficient 係數	0.75	1.00	1.35	1.55	2.0
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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TN Series

□ DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT & 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 ØD×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current (mA rms) 紋波電流		
				105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz	
33	330														5 × 11	0.80	88	155
47	470					5 × 11	0.90	75	125		5 × 11	0.80	92	155	6.3×11.5	0.55	125	210
68	680					5 × 11	0.80	97	155		6.3×11.5	0.50	135	220	6.3×11.5	0.36	160	260
100	101	5 × 11	0.85	99	150	5 × 11 (6.3×11.5)	0.70 (0.55)	115 (135)	185 (210)		6.3×11.5	0.35	175	265	6.3×11.5 (8×11.5)	0.32 (0.24)	195 (254)	312 (383)
150	151	6.3×11.5	0.49	155	225	6.3×11.5	0.35	185	265		8 × 11.5	0.23	270	388	8 × 11.5	0.16	320	460
220	221	6.3×11.5	0.30	205	285	6.3×11.5 (8×11.5)	0.30 (0.24)	225 (283)	305 (387)		8 × 11.5	0.16	335	460	8 × 11.5 (10×12)	0.14 (0.13)	370 (435)	500 (600)
330	331	8 × 11.5	0.20	223	292	6.3×11.5 (8×11.5)	0.20 (0.16)	305 (350)	425 (460)		8 × 11.5 (10×12)	0.14 (0.12)	400 (480)	520 (625)	8 × 16 (10×12)	0.12 (0.10)	450 (595)	545 (680)
470	471	8 × 11.5 (10×12)	0.18 (0.14)	325 (455)	435 (575)	8 × 11.5 (10×12)	0.15 (0.13)	405 (475)	575 (600)		8 × 11.5 (10×12)	0.12 (0.10)	575 (520)	645 (680)	10 × 16 (10×20)	0.084 (0.065)	680 (810)	890 (1020)
680	681	10 × 16	0.11	580	700	10 × 12 (10×16)	0.11 (0.09)	545 (635)	650 (770)		10 × 20	0.065	845	1020	10 × 20 (13×21)	0.054 (0.046)	985 (1160)	1165 (1392)
1000	102	10 × 12 (10×20)	0.095 (0.075)	715 (820)	865 (950)	8 × 16 (10×20)	0.068 (0.060)	760 (915)	880 (1060)		10 × 16 (10×20)	0.058 (0.055)	850 (950)	1060 (1185)	13 × 21 (13×25)	0.043 (0.036)	1200 (1430)	1475 (1660)
1500	152	10 × 25	0.055	1090	1220	10 × 20 (13×21)	0.058 (0.045)	1020 (1266)	1245 (1417)		10 × 20 (13×25)	0.050 (0.036)	1050 (1490)	1245 (1660)	16 × 20	0.034	1590	1770
2200	222	10 × 20 (13×21)	0.050 (0.043)	1115 (1296)	1305 (1438)	10 × 25 (13×25)	0.038 (0.034)	1375 (1530)	1550 (1710)		13 × 21 (13×25) (16×20)	0.035 (0.035) (0.033)	1485 (1545) (1620)	1695 (1705) (1800)	13 × 25 (16×25)	0.030 (0.028)	1645 (1848)	1750 (2051)
3300	332	13 × 25	0.034	1530	1710	16 × 20	0.031	1660	1850		13 × 25 (16×25)	0.034 (0.027)	1700 (1888)	1725 (2095)	16 × 35	0.020	2410	2680
4700	472	16 × 25	0.032	1728	1935	16 × 31	0.023	2170	2420		16 × 35	0.020	2410	2680	18 × 31 (18×40)	0.019 (0.018)	2515 (2660)	2785 (2960)
6800	682	16 × 31	0.024	2130	2370	16 × 35	0.020	2410	2680		18 × 35	0.018	2610	2900				
10000	103	16 × 40	0.020	2470	2750	18 × 40	0.017	2730	3040									
15000	153	18 × 40	0.018	2660	2960													

WV Parameter 參數 μF		35V (1V)				50V (1H)				63V (1J)			
		Case size ØD×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current (mA rms) 紋波電流	
				105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz
1	101					5 × 11	4.0	18	36				
1.5	1R5					5 × 11	3.8	22	45				
2.2	2R2					5 × 11	3.5	27	54				
3.3	3R3					5 × 11	3.0	33	66				
4.7	4R7					5 × 11	2.2	40	81				
6.8	6R8					5 × 11	1.8	45	91				
10	100					5 × 11	1.4	57	115	5 × 11	1.06	67	135
15	150					5 × 11	0.93	72	145	6.3 × 11.5	0.73	92	185
22	220	5 × 11	0.75	85	160	5 × 11 (6.3×11.5)	0.86 (0.65)	85 (100)	165 (195)	6.3 × 11.5	0.52	110	215
33	330	6.3 × 11.5	0.49	125	225	6.3 × 11.5	0.43	135	240	8 × 11.5	0.35	179	320
47	470	6.3 × 11.5	0.34	160	270	6.3 × 11.5 (8×11.5)	0.10 (0.30)	170 (204)	300 (344)	8 × 11.5	0.25	215	365
68	680	8 × 11.5	0.24	239	384	8 × 11.5	0.20	255	410	10 × 12	0.19	310	495
100	101	8 × 11.5	0.16	305	460	8 × 16 (10×16)	0.18 (0.16)	315 (385)	490 (581)	8 × 16 (10×20)	0.16 (0.12)	400 (495)	615 (750)
150	151	10 × 12	0.12	435	625	10 × 20	0.10	570	820	10 × 25	0.09	665	950
220	221	8 × 16 (10×12) (10×16)	0.12 (0.10) (0.09)	485 (520) (560)	700 (735) (770)	10 × 16 (10×20) (10×25)	0.09 (0.09) (0.075)	615 (650) (760)	850 (900) (1040)	10 × 20 (13×21)	0.080 (0.065)	785 (835)	1010 (1140)
330	331	10 × 16 (10×20)	0.063 (0.060)	745 (810)	1000 (1060)	10 × 20 (13×21)	0.058 (0.055)	885 (978)	1150 (1281)	13 × 21 (13×25)	0.056 (0.049)	945 (1090)	1295 (1420)
470	471	10 × 20 (13×21)	0.050 (0.046)	995 (1112)	1300 (1401)	10 × 20 (13×21)	0.054 (0.050)	980 (1085)	1285 (1385)	13 × 25 (16×25)	0.045 (0.042)	1220 (1350)	1580 (1700)
680	681	13 × 25	0.036	1370	1660	16 × 20	0.040	1350	1630	16 × 31	0.032	1700	2050
1000	102	16 × 20	0.034	1330	1770	16 × 25 (16×31)	0.036 (0.030)	1755 (1830)	1950 (2120)	16 × 31 (18×31) (18×35)	0.032 (0.032) (0.029)	1840 (1840) (1970)	2180 (2180) (2280)
1500	152	16 × 31	0.028	2149	2385	16 × 35	0.026	2170	2410	18 × 35	0.026	1850	2165
2200	222	16 × 31 (16×35)	0.024 (0.020)	2365 (2410)	2600 (2680)	18 × 35 (18×40)	0.026 (0.024)	2265 (2300)	2485 (2560)				
3300	332	18 × 40	0.017	2730	3040								

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WV		100 (2A)				160 (2C)				200 (2D)				250 (2E)			
Parameter 參數	μF	Case size ØD×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current (mA rms) 紋波電流	
				105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz
2.2	2R2	5 × 11	2.50	25	52									5 × 11	0.80	88	155
3.3	3R3	5 × 11	2.50	30	64									8 × 11.5	1.40	105	200
4.7	4R7	5 × 11	2.50	35	76									8 × 11.5	2.00	135	240
6.8	6R8	6.3×11.5	1.00	70	128									8 × 11.5	2.80	165	275
10	100	8 × 11.5	0.60	125	224									10 × 16	3.50	170	300
22	220	8 × 11.5 (10×12)	0.50 (0.40)	130 (185)	285 (319)	10 × 20	1.30	310	440	10 × 20	1.5	310	440	13 × 21	2.30	315	480
33	330	10 × 16	0.30	285	417	10 × 20	1.30	395	565	13 × 21	0.91	390	590	13 × 25	1.70	435	630
47	470	10 × 16 (13×21)	0.08 (0.15)	445 (380)	680 (570)	13 × 21	0.91	470	725	13 × 21	0.91	515	780	13 × 25	1.70	435	630
68	680	13 × 25	0.12	490	760	13 × 25	0.63	675	950	13 × 25	0.63	675	950	16 × 25	0.78	765	1000
100	101	10 × 16 (16×25)	0.22 (0.07)	450 (905)	700 (1250)	16 × 25	0.27	980	1280	16 × 25	0.27	980	1280	16 × 31	0.63	1080	1400
150	151	16 × 31	0.05	1080	1400	16 × 31	0.22	1015	1300	18 × 25	0.27	1190	1500	18 × 31	0.42	1100	1450
220	221	18 × 40	0.03	1695	1980	16 × 31	0.22	1015	1300	18 × 31	0.22	1350	1700	18 × 40	0.35	1175	1485
330	331					18 × 31	0.22	1350	1700								

WV		350V (2V)				400V (2G)				450V (2W)			
Parameter 參數	μF	Case size ØD×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current (mA rms) 紋波電流		Case size ØD×L (mm) 尺寸	Impedance (Ω) max. 20°C, 100KHz 阻抗值	Ripple current (mA rms) 紋波電流	
				105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 100KHz			105°C, 120Hz	105°C, 120Hz
3.3	3R3					8 × 11.5	4.80	60	110	10 × 20	6.5	75	150
4.7	4R7					8 × 11.5	4.20	75	125	13 × 21	3.6	105	200
10	100	10 × 20	2.90	100	180	10 × 20	2.90	95	180	13 × 25	2.5	185	315
22	220	13 × 21	2.10	160	270	13 × 25	1.30	175	300	16 × 25	1.7	380	570
33	330	16 × 20	0.91	365	600	16 × 20	0.91	365	600	16 × 31	1.1	435	620
47	470	16 × 25	0.73	485	700	16 × 25	0.73	485	700	18 × 31	0.93	650	900
68	680	16 × 31	0.49	845	1100	16 × 31	0.49	845	1100	18 × 35	0.71	670	980
100	101	18 × 31	0.40	855	1170	18 × 40	0.34	975	1250				

- 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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