

薄膜片式固定電阻器 - T 系列

THIN FILM CHIP FIXED RESISTOR - T SERIES

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Thin Film Chip Fixed Resistor - T Series

● 特點 Features

- * 低溫度系數及高精度 ($\pm 0.01\%$; $\pm 2\text{ppm}/^\circ\text{C}$)
Low TCR and high accuracy ($\pm 0.01\%$; $\pm 2\text{ppm}/^\circ\text{C}$)
- * 適應再流焊與波峰焊
Suit for re-flow and wave soldering
- * 良好的耐濕性, 高可靠性
Excellent moisture resistance, corrosion resistance
- * 符合ROHS指令要求
Compliant with RoHS directive
- * 符合無鹵素要求
Halogen free requirement



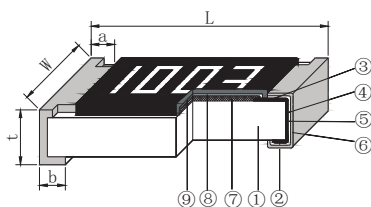
● 應用領域 Applications

醫學儀器、測試/測量設備、打印設備、自動設備控制器、轉換器、通訊設備、手機等。
Medical Equipment, Test/Masurement Equipment, Printer Equipment, Automatic Equipment Controller, Converters, Communication Device, Mobile phone etc.

● 品名構成 Type Designation

T	E	05	G	1003	B	T						
產品代號 Product Code	額定功率代號 Power Rating Code		封裝尺寸 Dimensions		電阻溫度系數代號 T.C.R Code		電阻值代號 Resistance Value Code		阻值誤差精度代號 Resistance Tolerance Code		包裝方式代號 Packaging Style Code	
T 系列 薄膜片式 固定電阻 T Series Thin Film Chip Fixed Resistor	代號 Code	額定功率系列 Power rating	代號 Code	型號 Type	代號 Code	T.C.R (ppm/ $^\circ\text{C}$)	四位數表示: 4digit 例如 Example: 10R0: 10 Ω 1000: 100 Ω 4321: 4.32K Ω	代號 Code	誤差精度 Tolerance	代號 Code	包裝方法 Packaging Style	
	A	1/32W	01	0201	2	± 2		T	$\pm 0.01\%$			
	C	1/16W	02	0402	3	± 3		A	$\pm 0.05\%$			
	D	1/10W	03	0603	D	± 5		B	$\pm 0.1\%$	T	編帶包裝 Tape & Reel	
	E	1/8W	05	0805	E	± 10		C	$\pm 0.25\%$			
	F	1/4W	06	1206	F	± 15		D	$\pm 0.5\%$			
	G	1/2W	1210	1210	G	± 25		F	$\pm 1\%$			
	Y	1/6W	10	2010	H	± 50		C	塑料袋散裝 Case			
	R	1/3W	12	2512								
	H	3/4W										
J	1W											

● 結構 Construction



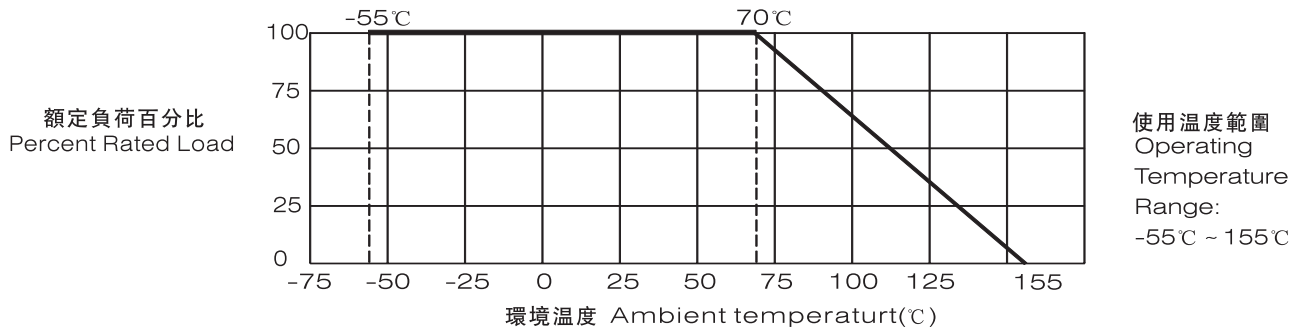
- ① 陶瓷基板 Ceramic Substrate
- ② 背電極 Bottom Electrode
- ③ 面電極 Top Electrode
- ④ 端電極 Edge Electrode
- ⑤ 中間電極 Barrier Layer
- ⑥ 外部電極 External Electrode
- ⑦ 電阻體 NiCr Resistor Layer
- ⑧ 鈍化層 Passivation
- ⑨ 保護層 Protective Coating

● 規格尺寸 Dimensions

單位 Unit:mm

型號 Type	L	w	t	a	b
0201	0.60 \pm 0.03	0.30 \pm 0.03	0.23 \pm 0.03	0.10 \pm 0.05	0.15 \pm 0.05
0402	1.00 \pm 0.05	0.50 \pm 0.05	0.30 \pm 0.05	0.20 \pm 0.10	0.25 \pm 0.10
0603	1.60 \pm 0.10	0.80 \pm 0.10	0.45 \pm 0.10	0.30 \pm 0.20	0.30 \pm 0.20
0805	2.00 \pm 0.10	1.25 \pm 0.15	0.50 \pm 0.10	0.30 \pm 0.20	0.40 \pm 0.20
1206	3.20 \pm 0.20	1.60 \pm 0.15	0.55 \pm 0.10	0.40 \pm 0.20	0.50 \pm 0.20
1210	3.20 \pm 0.20	2.50 \pm 0.20	0.55 \pm 0.10	0.40 \pm 0.20	0.50 \pm 0.20
2010	5.00 \pm 0.20	2.50 \pm 0.20	0.55 \pm 0.10	0.60 \pm 0.20	0.60 \pm 0.20
2512	6.30 \pm 0.20	3.20 \pm 0.20	0.55 \pm 0.10	0.60 \pm 0.20	0.60 \pm 0.20

● 負荷下降曲線 Derating Curve



注：當電阻使用的環境溫度超過70°C時，其額定負荷(額定功率)按上述曲線下降。

Note: For resistors operated in ambient over 70°C, rated load (rated power) shall be derated in accordance with the above figure.

● 額定值 Ratings

* 標準產品 Standard electrical specifications

項目 Item 型號 Type	70°C下額定功率(注) Rated Power at 70°C (note)	元件極限電壓 Limiting Element Voltage	最大過負荷電壓 Max. Overload Voltage	阻值範圍 Resistance Range						電阻溫度係數 TCR (ppm/°C)	
				± 0.01%	± 0.05%	± 0.1%	± 0.25%	± 0.5%	± 1%		
0201	1/32W	15V	30V	---			49.9Ω ~ 4.99KΩ			± 25	
				---			49.9Ω ~ 33KΩ			± 50	
0402	1/16W	50V	100V	49.9Ω ~ 4.99KΩ		---				± 2 ± 3	
				49.9Ω ~ 20KΩ						± 5	
				49.9Ω ~ 12KΩ		49.9Ω ~ 60KΩ				± 10	
				49.9Ω ~ 12KΩ		10Ω ~ 255KΩ		4.7Ω ~ 511KΩ		± 15	
0603	1/16W	50V	100V	---		49.9Ω ~ 12KΩ		4.7Ω ~ 511KΩ		± 25	
				24.9Ω ~ 15KΩ		---				± 50	
				24.9Ω ~ 60KΩ						± 2 ± 3	
				24.9Ω ~ 100KΩ		4.7Ω ~ 332KΩ		4.7Ω ~ 511KΩ			
0805	1/10W	100V	200V	---		4.7Ω ~ 332KΩ		4.7Ω ~ 1MΩ		± 10	
				24.9Ω ~ 30KΩ		---				± 15	
				24.9Ω ~ 150KΩ						± 25	
				24.9Ω ~ 200KΩ		4.7Ω ~ 1MΩ				± 50	
1206	1/8W	150V	300V	---		4.7Ω ~ 1MΩ		1Ω ~ 2MΩ		± 25	
				24.9Ω ~ 49.9KΩ		---				± 50	
				24.9Ω ~ 300KΩ						± 2 ± 3	
1210	1/4W	150V	300V	24.9Ω ~ 499KΩ		4.7Ω ~ 1MΩ				± 10	
				---		4.7Ω ~ 1MΩ		4.7Ω ~ 2.49MΩ		± 15	
				---		4.7Ω ~ 1MΩ		4.7Ω ~ 2.49MΩ		± 25	
2010	1/4W	150V	300V	24.9Ω ~ 100KΩ		---				± 25	
				24.9Ω ~ 499KΩ		---				± 50	
				24.9Ω ~ 300KΩ						± 2 ± 3	
				24.9Ω ~ 499KΩ		4.7Ω ~ 1MΩ				± 5	
2512	1/2W	150V	300V	---		4.7Ω ~ 3MΩ		1Ω ~ 3MΩ		± 10	
				24.9Ω ~ 100KΩ		---				± 15	
				24.9Ω ~ 300KΩ						± 25	
				24.9Ω ~ 499KΩ		4.7Ω ~ 1MΩ				± 50	
				---		4.7Ω ~ 3MΩ		1Ω ~ 3MΩ		± 25	
				24.9Ω ~ 100KΩ		---				± 50	
				24.9Ω ~ 300KΩ						± 2 ± 3	

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THIN FILM CHIP FIXED RESISTOR - T SERIES

* 高功率產品 High power rating electrical specifications

項目 型號 Item Type	70°C下額定功率(注) Rated Power at 70°C (note)	元件極限電壓 Limiting Element Voltage	最大過負荷電壓 Max .Overload Voltage	阻值範圍 Resistance Range						電阻溫度系數 TCR (ppm/°C)
				± 0.01%	± 0.05%	± 0.1%	± 0.25%	± 0.5%	± 1%	
0402	1/10W	50V	100V	49.9Ω ~ 4.99KΩ		---				± 2 ± 3
				49.9Ω ~ 10KΩ						± 5
				49.9Ω ~ 12KΩ		49.9Ω ~ 60KΩ				± 10
						49.9Ω ~ 69.8KΩ				± 15
				---	49.9Ω ~ 12KΩ	10Ω ~ 255KΩ	4.7Ω ~ 255KΩ			± 25 ± 50
0603	1/10W	75V	150V	24.9Ω ~ 15KΩ		---				± 2 ± 3
				24.9Ω ~ 30KΩ						± 5
				24.9Ω ~ 100KΩ		4.7Ω ~ 332KΩ				± 10 ± 15
						4.7Ω ~ 1MΩ				± 25 ± 50
	1/8W、1/6W	100V	150V	---	10Ω ~ 332KΩ					± 25 ± 50
0805	1/8W	150V	300V	24.9Ω ~ 30KΩ		---				± 2 ± 3
				---		24.9Ω ~ 49.9KΩ				± 5
				24.9Ω ~ 200KΩ		4.7Ω ~ 511KΩ				± 10
						4.7Ω ~ 1MΩ				± 15
	1/4W	150V	300V	---	4.7Ω ~ 1MΩ	1Ω ~ 1MΩ	± 25 ± 50			
10Ω ~ 499KΩ						± 25 ± 50				
1206	1/4W	200V	400V	24.9Ω ~ 49.9KΩ		---				± 2 ± 3
				24.9Ω ~ 100KΩ						± 5
				24.9Ω ~ 499KΩ	4.7Ω ~ 1MΩ					± 10 ± 15 ± 25 ± 50
1/3W	200V	400V	---	10Ω ~ 1MΩ					± 25 ± 50	
1210	1/3W	200V	400V	24.9Ω ~ 49.9KΩ		---				± 2 ± 3
				24.9Ω ~ 100KΩ						± 5
				24.9Ω ~ 499KΩ		4.7Ω ~ 1MΩ				± 10 ± 15 ± 25 ± 50
						4.7Ω ~ 1MΩ				± 25 ± 50
				10Ω ~ 470KΩ						± 10 ± 15
---		4.7Ω ~ 1MΩ		1Ω ~ 1MΩ		± 25 ± 50				
2010	1/3W	200V	400V	24.9Ω ~ 49.9KΩ		---				± 2 ± 3
				24.9Ω ~ 100KΩ						± 5
				24.9Ω ~ 499KΩ		4.7Ω ~ 1MΩ				± 10 ± 15 ± 25 ± 50
						4.7Ω ~ 1MΩ				± 25 ± 50
	1/2W	200V	400V	---	10Ω ~ 470KΩ					± 10 ± 15
---		4.7Ω ~ 1MΩ		1Ω ~ 1MΩ		± 25 ± 50				
2512	3/4W	200V	400V	24.9Ω ~ 2KΩ		4.7Ω ~ 470KΩ		1Ω ~ 470KΩ		± 10 ± 15
						4.7Ω ~ 1MΩ		1Ω ~ 1MΩ		± 25 ± 50
	1W	200V	400V	---	4.7Ω ~ 1MΩ		1Ω ~ 1MΩ		± 25 ± 50	

注：1、額定電壓 = $\sqrt{\text{額定功率} \times \text{標稱電阻值}}$ 或元件極限電壓中的較小值。

2、使用溫度範圍：-55°C ~ 155°C。

Note: 1、Rated Voltage = $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$ or Limiting element voltage whichever is lower.

2、Operating temp. Range: -55°C ~ 155°C.

● 特性 Characteristics

試驗項目 Test Item	標準 Specification		測試方法 (IEC 60115-1) Test Method (IEC 60115-1)
	常規功率系列 Normal power rating	高功率系列 High power rating	
電阻溫度系數 T.C.R	在規定值內 within specified T.C.R		IEC 60115-1 4.8 +25°C/-55°C/+25°C/+125°C/+25°C
絕緣電阻 Insulation Resistance	1000MΩ Min		IEC 60115-1 4.6 在電極與基片間施加100V ± 15V直流電壓,保持1分鐘,然後測絕緣電阻值。 Apply DC 100V ± 15V between substrate and termination for 1 minute, then check the insulation resistance.
耐電壓 Voltage Proof	無擊穿或飛弧 No breakdown or flashover		IEC 60115-1 4.7 在電極與基片間以大約100V/s的速率施加有效值為最大過負荷電壓的交流電壓, 保持60s ± 5s。 Apply max. overload voltage of AC RMS at a rate of approximately 100V/s between substrate and terminations for 60s ± 5s.
短時間過負載 Short Time Overload	無可見損傷 No mechanical damage $\Delta R \leq \pm(0.2\%R+0.05\Omega)$	無可見損傷 No mechanical damage $\Delta R \leq \pm(0.5\%R+0.05\Omega)$	IEC 60115-1 4.13 施加2.5倍額定電壓或最大過負載電壓(取較小者)持續5秒。 Apply 2.5 times rated voltage or Max overload voltage, whichever is lower, for 5 s.
耐焊接熱 Resistance to Soldering Heat	無可見損傷 No mechanical damage $\Delta R \leq \pm(0.2\%R+0.05\Omega)$		IEC 60115-1 4.18 270°C ± 5°C 10秒 ± 1秒 270°C ± 5°C 10s ± 1s
可焊性 Solder-ability	可焊面積 ≥ 95% 95% Cover Min		IEC 60115-1 4.17 245°C ± 5°C 3秒 ± 0.3秒 245°C ± 5°C 3s ± 0.3s
溫度快速變化 Rapid Change of Temperature	無可見損傷 No mechanical damage $\Delta R \leq \pm(0.25\%R+0.05\Omega)$		IEC 60115-1 4.19 -55°C ~ 155°C 100 個循環 -55°C ~ 155°C 100 cycles.
70°C 耐久性 Endurance at 70°C	無可見損傷 No mechanical damage $\Delta R \leq \pm(0.2\%R+0.05\Omega)$	無可見損傷 No mechanical damage $\Delta R \leq \pm(0.5\%R+0.05\Omega)$	IEC 60115-1 4.25.1 70°C ± 2°C 額定電壓或元件極限電壓(取較小者)通1.5小時,斷0.5小時, 持續1000小時。 Resistor should be exposed at 70°C ± 2°C, and apply rated voltage or limiting element voltage, whichever is lower, for 1.5h on, 0.5h off for 1000h.
穩態濕熱 Damp Heat, Steady State	無可見損傷 No mechanical damage $\Delta R \leq \pm(0.3\%R+0.05\Omega)$	無可見損傷 No mechanical damage $\Delta R \leq \pm(0.5\%R+0.05\Omega)$	IEC 60115-1 4.24 40°C ± 2°C, 93% ± 3%RH, 額定電壓或元件極限電壓(取較小者)通1.5小時, 斷0.5小時, 持續1000小時。 Resistor should be exposed at 40°C ± 2°C 93% ± 3%RH, and apply rated voltage or limiting element voltage, whichever is lower, for 1.5h on, 0.5h off for 1000h.
低溫負載 Operation at Low Temperature	無可見損傷 No mechanical damage $\Delta R \leq \pm(0.2\%R+0.05\Omega)$	無可見損傷 No mechanical damage $\Delta R \leq \pm(0.5\%R+0.05\Omega)$	IEC 60115-1 4.36 -55°C ± 5°C, 無負載1小時, 額定電壓或元件極限電壓(取較小值)45分鐘, 無負載15分鐘。 -55°C ± 5°C, 1h without load, rated voltage or limiting element voltage whichever is lower for 45min, 15min without load.
上限類別溫度 耐久性 Endurance at Upper Category Temperature	無可見損傷 No mechanical damage $\Delta R \leq \pm(0.2\%R+0.05\Omega)$		IEC 60115-1 4.25.3 155°C ± 2°C 96小時。 Resistor should be exposed at 155°C ± 2°C for 96 hours.
基板彎曲試驗 Substrate Bending Test	無可見損傷 No mechanical damage $\Delta R \leq \pm(0.2\%R+0.05\Omega)$		IEC 60115-1 4.33 保持時間(Duration):60s ± 5s 彎曲距離(Bending Distance): 0201、0402、0603、0805: 5mm; 1206、1210: 4mm; 2010、2512: 2mm

● 包裝 Packaging

包裝方式見附錄105 ~ 113頁 Packaging see the appendix 105-113 Page .