

薄膜片式固定電阻器 -T 系列

THIN FILM CHIP FIXED RESISTOR - T SERIES

■ 薄膜片式固定電阻器 -T 系列

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

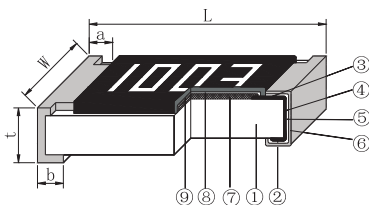
醫學儀器、測試/測量設備、打印設備、自動設備控制器、轉換器、通訊設備、手機等。

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/°C)	四位數表示： 4digit 例如 Example: 10R0: 10Ω 1000: 100Ω 4321: 4.32KΩ	代 號 Code	誤差精度 Tolerance	代 號 Code	包裝方法 Packaging Style
	A	1/32W	01	0201	B	± 2		T	± 0.01%	T	編帶包裝 Tape & Reel
	C	1/16W	02	0402	C	± 3		A	± 0.05%		
	D	1/10W	03	0603	D	± 5		B	± 0.1%		
	E	1/8W	05	0805	E	± 10		C	± 0.25%	C	塑料袋散裝 Case
	F	1/4W	06	1206	F	± 15		D	± 0.5%		
	G	1/2W	1210	1210	G	± 25		F	± 1%		
	P	1/6W	10	2010	H	± 50					
	R	1/3W	12	2512							
	H	3/4W									
J	1W										

● 結構 Construction



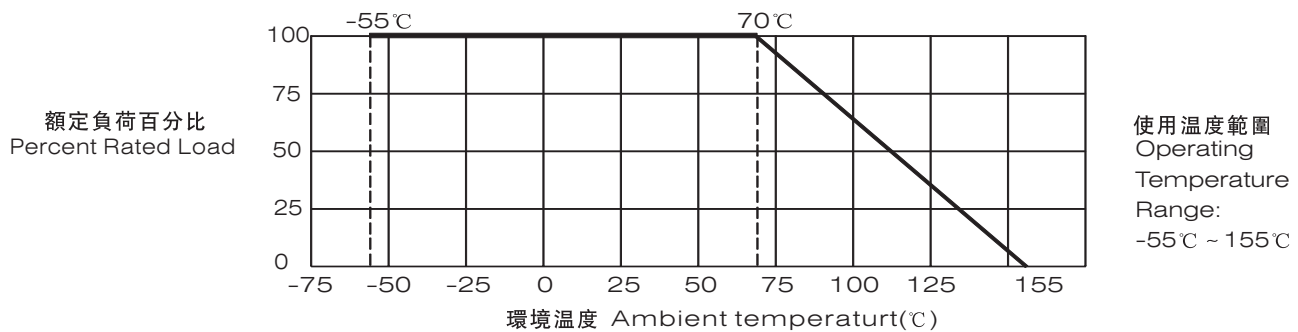
- ① 陶瓷基板 Ceramic Substrate
- ② 背電極 Bottom Electrode
- ③ 面電極 Top Electrode
- ④ 端電極 Edge Electrode
- ⑤ 中間電極 Barrier Layer
- ⑥ 外部電極 External Electrode
- ⑦ 電阻體 NiCr Resistor Layer
- ⑧ 鈍化層 Passivation
- ⑨ 保護層 Protective Coating

● 規格尺寸 Dimensions

單位 Unit:mm

型號 Type	L	W	t	a	b
0201	0.60 ± 0.05	0.30 ± 0.05	0.23 ± 0.05	0.10 ± 0.05	0.15 ± 0.05
0402	1.00 ± 0.10	0.50 ± 0.10	0.30 ± 0.10	0.20 ± 0.10	0.25 ± 0.10
0603	1.60 ± 0.15	0.80 ± 0.15	0.40 ± 0.10	0.30 ± 0.20	0.30 ± 0.20
0805	2.00 ± 0.20	1.25 ± 0.15	0.50 ± 0.10	0.30 ± 0.20	0.40 ± 0.20
1206	3.20 ± 0.20	1.60 ± 0.15	0.55 ± 0.10	0.40 ± 0.20	0.50 ± 0.20
1210	3.20 ± 0.20	2.50 ± 0.20	0.55 ± 0.10	0.40 ± 0.20	0.50 ± 0.20
2010	5.00 ± 0.20	2.50 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 0.20
2512	6.40 ± 0.20	3.20 ± 0.20	0.55 ± 0.10	0.60 ± 0.20	0.60 ± 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℃ 下額定功率(注) Rated Power at 70℃ (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/℃)
				± 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	25V	50V	49.9Ω ~ 4.99KΩ			---			±2 ±3
				49.9Ω ~ 4.99KΩ						± 5
				49.9Ω ~ 12KΩ		49.9Ω ~ 60KΩ				± 10
						49.9Ω ~ 69.8KΩ				± 15
				---	49.9Ω ~ 12KΩ	10Ω ~ 255KΩ	4.7Ω ~ 511KΩ			±25 ±50
0603	1/16W	50V	100V	24.9Ω ~ 15KΩ			---			±2 ±3
				24.9Ω ~ 15KΩ						± 5
				24.9Ω ~ 100KΩ	4.7Ω ~ 332KΩ	4.7Ω ~ 511KΩ				±10 ±15
				---	4.7Ω ~ 332KΩ	4.7Ω ~ 1MΩ	1Ω ~ 1MΩ			±25 ±50
0805	1/10W	100V	200V	24.9Ω ~ 30KΩ			---			±2 ±3
				24.9Ω ~ 30KΩ						± 5
				24.9Ω ~ 200KΩ	4.7Ω ~ 1MΩ					±10 ±15
				---	4.7Ω ~ 1MΩ	4.7Ω ~ 2MΩ	1Ω ~ 2MΩ			±25 ±50
1206	1/8W	150V	300V	24.9Ω ~ 49.9KΩ			---			±2 ±3
24.9Ω ~ 49.9KΩ						± 5				
1210	1/4W	150V	300V	24.9Ω ~ 499KΩ	4.7Ω ~ 1MΩ					±10 ±15
				---	4.7Ω ~ 1MΩ	4.7Ω ~ 2.49MΩ	1Ω ~ 2.49MΩ			±25 ±50
2010	1/4W	150V	300V	24.9Ω ~ 100KΩ			---			±2 ±3
				24.9Ω ~ 100KΩ						± 5
				24.9Ω ~ 499KΩ	4.7Ω ~ 1MΩ					±10 ±15
				---	4.7Ω ~ 1MΩ	4.7Ω ~ 3MΩ	1Ω ~ 3MΩ			±25 ±50
2512	1/2W	150V	300V	24.9Ω ~ 100KΩ			---			±2 ±3
				24.9Ω ~ 100KΩ						± 5
				24.9Ω ~ 499KΩ	4.7Ω ~ 1MΩ					±10 ±15
				---	4.7Ω ~ 1MΩ	4.7Ω ~ 3MΩ	1Ω ~ 3MΩ			±25 ±50

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* 高功率產品 High power rating electrical specifications

項目 Item 型號 Type	70℃下額定功率(注) Rated Power at 70℃ (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/℃)
				± 0.01%	± 0.05%	± 0.1%	± 0.25%	± 0.5%	± 1%	
0603	1/10W	75V	150V	24.9Ω ~ 15KΩ			---			±2 ±3
				24.9Ω ~ 15KΩ						±5
				24.9Ω ~ 100KΩ	4.7Ω ~ 332KΩ	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 ~ 30KΩ			±5	
				24.9Ω ~ 200KΩ	4.7Ω ~ 511KΩ	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 ~ 49.9KΩ						±5
				24.9Ω ~ 499KΩ	4.7Ω ~ 1MΩ				±10 ±15 ±25 ±50	
		1/3W	200V	400V	---	10Ω ~ 1MΩ				
1210	1/3W	200V	400V	24.9Ω ~ 49.9KΩ			---			±2 ±3
				24.9Ω ~ 49.9KΩ						±5
				24.9Ω ~ 499KΩ	4.7Ω ~ 1MΩ				±10 ±15 ±25 ±50	
2010	1/3W	200V	400V	24.9Ω ~ 49.9KΩ			---			±2 ±3
				24.9Ω ~ 49.9KΩ						±5
				24.9Ω ~ 499KΩ	4.7Ω ~ 1MΩ				±10 ±15 ±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 ~ 100Ω	1Ω ~ 100Ω			±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℃ ~ 155℃。

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

2、Operating temp. Range: -55℃ ~ 155℃.

• 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℃/-55℃/+25℃/+125℃/+25℃
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℃±5℃ 10秒±1秒 270℃±5℃ 10s±1s
可焊性 Solder-ability	可焊面積≥95% 95% Cover Min		IEC 60115-1 4.17 245℃±5℃ 3秒±0.3秒 245℃±5℃ 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℃~155℃ 100個循環 -55℃~155℃ 100 cycles.
70℃耐久性 Endurance at 70℃	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℃±2℃ 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℃±2℃, 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℃±2℃, 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℃±2℃ 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℃±5℃, 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℃±5℃, 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℃±2℃ 96小時。 Resistor should be exposed at 155℃±2℃ 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 83 頁 ~ 90 頁 Packaging see the appendix Page 83 to 90 Page .