

# 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



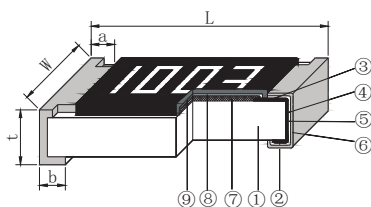
### ● 應用領域 Applications

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/Measurement 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 $\Omega$ 1000: 100 $\Omega$ 4321: 4.32K $\Omega$	代號 Code	誤差精度 Tolerance	代號 Code	包裝方法 Packaging Style	
	A	1/32W	01	0201	2	$\pm 2$		T	$\pm 0.01\%$	T	編帶包裝 Tape & Reel	
	C	1/16W	02	0402	3	$\pm 3$		A	$\pm 0.05\%$	C	塑料袋散裝 Case	
	D	1/10W	03	0603	D	$\pm 5$		B	$\pm 0.1\%$			
	E	1/8W	05	0805	E	$\pm 10$		C	$\pm 0.25\%$			
	F	1/4W	06	1206	F	$\pm 15$		D	$\pm 0.5\%$			
	G	1/2W	1210	1210	G	$\pm 25$		F	$\pm 1\%$			
	Y	1/6W	10	2010	H	$\pm 50$						
	R	1/3W	12	2512								
	H	3/4W										
J	1W											

### ● 結構 Construction



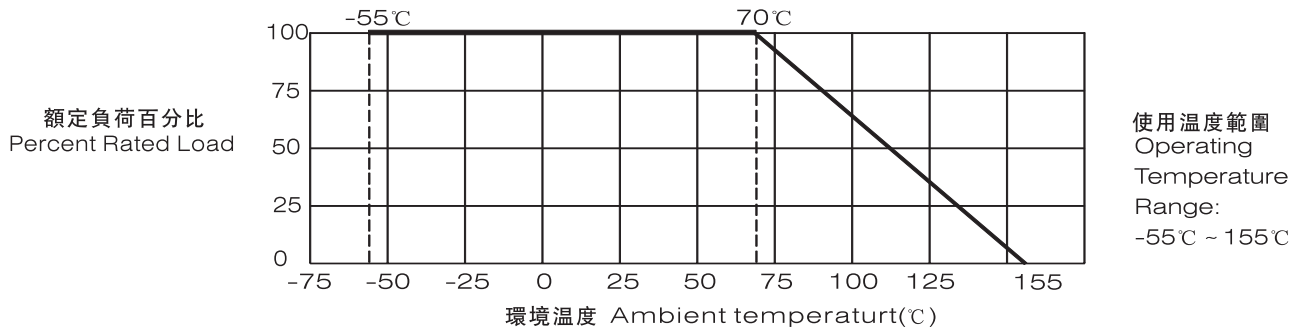
- ① 陶瓷基板 Ceramic Substrate
- ② 背電極 Bottom Electrode
- ③ 面電極 Top Electrode
- ④ 端電極 Edge Electrode
- ⑤ 中間電極 Barrier Layer
- ⑥ 外部電極 External Electrode
- ⑦ 電阻體 NiCr Resistor Layer
- ⑧ 鈍化層 Passivation
- ⑨ 保護層 Protective Coating

### ● 規格尺寸 Dimensions

單位 Unit:mm

型號 Type	L	w	t	a	b
0201	0.60 $\pm$ 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			± 25 ± 50	
0603	1/16W	50V	100V	24.9Ω ~ 15KΩ		---				± 2 ± 3		
				24.9Ω ~ 60KΩ						± 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 ~ 150KΩ						± 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 ~ 300KΩ						± 5		
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 ~ 300KΩ						± 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 ~ 300KΩ						± 5		
				24.9Ω ~ 499KΩ	4.7Ω ~ 1MΩ					± 10 ± 15		
				---	4.7Ω ~ 1MΩ	4.7Ω ~ 3MΩ	1Ω ~ 3MΩ			± 25 ± 50		

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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			
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
				10Ω ~ 470KΩ						± 10 ± 15
	1/2W	200V	400V	---	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
	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 .

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