

抗硫化厚膜片式固定電阻器

ANTI-SULFURATED THICK FILM CHIP FIXED RESISTOR

■ 抗硫化厚膜片式固定電阻器

Anti-Sulfurated Thick Film Chip Fixed Resistor

● 特點 Features

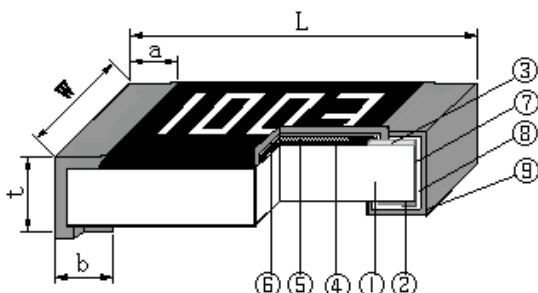
- * 體積小、重量輕
Miniature and light weight
- * 適應再流焊與波峰焊
Suit for reflow and wave flow solder
- * 電性能穩定，可靠性高
Stable electrical capability, high reliability
- * 裝配成本低，並與自動貼裝設備匹配
Low assembly cost, suit for automatic SMT equipment
- * 機械强度高、高頻特性優越
Superior mechanical and frequency characteristics
- * 具有優越的抗硫化性能
With excellent sulfuration-resistant performance
- * 符合RoHS指令要求
Compliant with RoHS directive
- * 符合無鹵素要求
Halogen free requirement



● 品名構成 Type Designation

RH	S	—	03	K	1003	F	T	
產品代號 Product Code	額定功率代號 Rated Power Code		型號代號 Type Code	電阻溫度系數代號 T.C.R Code		電阻值代號 Resistance Value Code	電阻值誤差精度代號 Resistance Tolerance Code	包裝方式代號 Packaging Style Code
抗硫化厚膜片式固定電阻器 Anti-Sulfurated Thick Film Chip Fixed Resistor	代號 Code	額定功率系列 Rated Power Series	代號 Code	型號 Type	代號 Code	T.C.R (ppm/C)	代號 Code	誤差精度 Tolerance
	C	常規功率系列 Normal Power Series	01 0201 02 0402 03 0603 05 0805 06 1206 1210 1210 10 2010 12 2512	0201 0402 0603 0805 1206 1210 2010 2512	W ±200 U ±400 K ±100 W ±200 U ±400 K ±100 L ±250	三位數(E-24系列): 前兩位表示有效數字, 第三位表示有效數字後零的個數。 The first two digits are significant figures and the third one denotes number of zeros. 四位數(E-96系列): 前三位表示有效數字, 第四位表示有效數字後零的個數。 Four digits (E-96 series): The first three digits are significant figures and the four one denotes number of zeros. 小數點用R表示Decimal point should be expressed by "R". 例如 Example: 103=10kΩ (E-24) 1003=100kΩ(E-96) 1R0=1.0Ω(E-24) 000=0Ω	D ±0.5% F ±1% G ±2% J ±5% K ±10%	T 編帶包裝 Tape & Reel C 塑料袋散裝 Case
	S	提升功率系列 Upgraded Power Series		跨接電阻 Chip Jumper	無表示	跨接電阻 Chip Jumper	F $\leq 10m\Omega$ G $\leq 20m\Omega$ J $\leq 50m\Omega$	

● 結構 Construction



- ① 陶瓷基板 Ceramic Substrate
- ② 背電極 Bottom Electrode
- ③ 面電極 Top Electrode
- ④ 電阻體 Resistor Layer
- ⑤ 一次保護 Primary Overcoat
- ⑥ 二次保護 Secondary Overcoat
- ⑦ 端電極 Edge Electrode
- ⑧ 中間電極 Barrier Layer
- ⑨ 外部電極 External Electrode

● 規格尺寸 Dimensions

型號 Type	尺寸 Dimensions(mm)				
	L	W	t	a	b
0201	0.60±0.03	0.30±0.03	0.23±0.03	0.17±0.05	0.15±0.05
0402	1.00±0.05	0.50±0.05	0.35±0.05	0.25±0.10	0.25±0.10
0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
0805	2.00±0.10	1.25±0.15	0.55±0.10	0.35±0.20	0.40±0.20
1206	3.20±0.20	1.60±0.15	0.55±0.10	0.45±0.20	0.50±0.20
1210	3.20±0.20	2.50±0.20	0.55±0.10	0.45±0.20	0.50±0.20
2010	5.00±0.20	2.50±0.20	0.55±0.10	0.65±0.20	0.60±0.20
2512	6.30±0.20	3.20±0.20	0.55±0.10	0.80±0.20	0.60±0.20

● 負荷下降曲線 Derating Curve



注1: 曲線①適用於0201產品; 曲線②適用於0402、0603、0805、1206、1210、2010、2512產品。

Note 1: 0201 product be the same with curve ①; 0402, 0603, 0805, 1206, 1210, 2010, 2512 be the same with curve ②.

注2: 當電阻使用的環境溫度超過70°C時, 其額定負荷(額定功率或額定電流)按上述曲線下降。

Note 2: For resistors operated in ambient over 70°C, rated load (rated power or rated current) shall be derated in accordance with the above figure.

● 額定值 Ratings

型號 Type	70°C下額定功率 Rated Power at 70°C (W)		元件極限電壓 Limiting Element Voltage(V)		最大過負荷電壓 Max.Overload Voltage(V)		跨接電阻70°C 下額定電流 Rated Current for Chip Jumper at 70°C (A)	跨接電阻最大 過負荷電流 Max.Overload Current for Chip Jumper (A)
	常規功 率系列 Normal Power Series	提升功 率系列 Upgraded Power Series	常規功 率系列 Normal Power Series	提升功 率系列 Upgraded Power Series	常規功 率系列 Normal Power Series	提升功 率系列 Upgraded Power Series		
0201	1/20	/	25	/	50	/	0.5	1
0402	1/16	/	50	/	100	/	1	2
0603	1/16	1/10	50	50	100	100	1	3
0805	1/10	1/8	100	150	200	300	2	5
1206	1/8	1/4	200	200	400	400	2	5
1210	1/4	1/3	200	200	400	400	2	5
2010	1/2	3/4	200	200	400	400	2	5
2512	1	/	200	/	400	/	2	5

注
Note

- 1、電壓、電流為直流或交流有效值。
Voltage, current of DC or AC RMS value.
- 2、 $E = \sqrt{P \times R}$ 或元件極限電壓兩者中的較小值。
 $E = \sqrt{P \times R}$ or Limiting element voltage whichever is lower.
E: 額定電壓 Rated voltage(V)
P: 額定功率 Rated power(W)
R: 標稱阻值 Normal resistance(Ω)

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● 額定值 Ratings

型號 Type	阻值範圍 Resistance Range	電阻溫度係數 T.C.R(ppm/°C)				
		標稱阻值允許偏差 Resistance Tolerance				
		±0.5%	±1%	±2%	±5%	±10%
0201	$1\Omega \leq R < 10\Omega$	/	±400	±400	±400	±400
	$10\Omega \leq R \leq 1M\Omega$	±200	±200	±200	±200	±200
	$1M\Omega < R \leq 10M\Omega$	/	±400	±400	±400	±400
0402	$1\Omega \leq R < 10\Omega$	/	±400	±400	±400	±400
	$10\Omega \leq R \leq 1M\Omega$	±100 or ±200	±100 or ±200	±100 or ±200	±100 or ±200	±100 or ±200
	$1M\Omega < R \leq 10M\Omega$	/	±400	±400	±400	±400
0603, 0805 1206, 1210 2010, 2512	$1\Omega \leq R < 10\Omega$	/	±250	±250	±250	±250
	$10\Omega \leq R \leq 1M\Omega$	±100	±100	±100	±100	±100
	$1M\Omega < R \leq 10M\Omega$	/	±250	±250	±250	±250

● 特性 Characteristics

項目 Item	標準 Specifications		測試方法 (IEC 60115-1) Test Methods (IEC 60115-1)
	片式電阻器 Resistor	跨接電阻 Jumper	
可焊性 Solderability	可焊面積 ≥ 95% 95% Cover Min	可焊面積 ≥ 95% 95% Cover Min	IEC 60115-1 4.17 245°C ± 5°C 錫槽, 保持 3s ± 0.3s. Lead-free solder bath at 245°C ± 5°C for 3s ± 0.3s.
耐焊接熱 Resistance to Soldering Heat	無可見損傷 No mechanical damage $\Delta R \leq \pm(1.0\%R + 0.05\Omega)$	無可見損傷 No mechanical damage R < 50 mΩ (J級) R < 20 mΩ (G級) R < 10 mΩ (F級)	IEC 60115-1 4.18 270°C ± 5°C 錫槽, 保持 10s ± 1s. Lead-free solder bath at 270°C ± 5°C for 10s ± 1s.
基板彎曲試驗 Substrate Bending Test	外觀無可見損傷 No mechanical damage $\Delta R \leq \pm(1.0\%R + 0.05\Omega)$	無可見損傷 No mechanical damage R < 50 mΩ (J級) R < 20 mΩ (G級) R < 10 mΩ (F級)	IEC 60115-1 4.33 彎曲距離 (Bending distance): 0201, 0402, 0603, 0805: 5mm; 1206, 1210: 4mm; 2010, 2512: 2mm. 保持時間 (Duration): 60s ± 5s.
剪切力試驗 Shear Test	外觀無可見損傷 No mechanical damage	外觀無可見損傷 No mechanical damage	IEC 60115-1 4.32 施加力 (Applying force): 0201: 2N; 0402, 0603: 5N; 0805: 9N; 1206, 1210: 25N; 2010, 2512: 45N. 保持時間 (Duration): 10s ± 1s.
電阻溫度係數 T.C.R	在規定值內 Within specified T.C.R	/	IEC 60115-1 4.8 +20°C/-55°C/+20°C/+125°C/+20°C
溫度快速變化 Rapid Change of Temperature	無可見損傷 No mechanical damage 0.5%, 1%: $\Delta R \leq \pm(0.5\%R + 0.05\Omega)$ 2%, 5%, 10%: $\Delta R \leq \pm(1.0\%R + 0.05\Omega)$	無可見損傷 No mechanical damage R < 50 mΩ (J級) R < 20 mΩ (G級) R < 10 mΩ (F級)	IEC 60115-1 4.19 0201: -55°C(30分鐘) ~ 常溫(5分鐘) ~ 125°C(30分鐘), 300個循環; 0201: -55°C(30min) ~ normal temperature(5min) ~ 125°C(30min), 300 cycles; 0402, 0603, 0805, 1206, 1210, 2010, 2512: -55°C(30分鐘) ~ 常溫(5分鐘) ~ 155°C(30分鐘), 300個循環。 0402, 0603, 0805, 1206, 1210, 2010, 2512: -55°C(30min) ~ normal temperature(5min) ~ 155°C(30min), 300cycles.
短時間過負載 Short Time Overload	無可見損傷 No mechanical damage 0.5%, 1%: $\Delta R \leq \pm(1.0\%R + 0.05\Omega)$ 2%, 5%, 10%: $\Delta R \leq \pm(2.0\%R + 0.05\Omega)$	無可見損傷 No mechanical damage R < 50 mΩ (J級) R < 20 mΩ (G級) R < 10 mΩ (F級)	IEC 60115-1 4.13 2.5倍額定電壓或最大過負荷電壓/電流(取最小值), 持續5秒。 2.5 times rated voltage or max. overload voltage (current) whichever is lower for 5s.
斷續過負載 Intermittent Overload	無可見損傷 No mechanical damage $\Delta R \leq \pm(5.0\%R + 0.05\Omega)$	無可見損傷 No mechanical damage R < 100mΩ (J級) R < 40mΩ (G級) R < 20mΩ (F級)	IEC 60115-1 4.39 2.5倍額定電壓或最大過負荷電壓/電流(取最小值)通1秒/ 斷25秒, 10000個循環。 2.5 times rated voltage or max. overload voltage (current) whichever is lower for 1s ON/ 25s OFF, 10000 cycles.

● 特性 Characteristics

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項目 Item	標準 Specifications		測試方法 (IEC 60115-1) Test Methods (IEC 60115-1)
	片式電阻器 Resistor	跨接電阻 Jumper	
穩態濕熱 Damp Heat, Steady State	無可見損傷 No mechanical damage 0.5%、1%: $\Delta R \leq \pm(1.0\%R+0.05\Omega)$ 2%、5%、10%: $\Delta R \leq \pm(2.0\%R+0.05\Omega)$	無可見損傷 No mechanical damage $R \leq 100 \text{ m}\Omega$ (J級) $R \leq 40 \text{ m}\Omega$ (G級) $R \leq 20 \text{ m}\Omega$ (F級)	IEC 60115-1 4.24 40°C ± 2°C, 93% ± 3%RH, 1000小時, 額定電壓(電流)或元件極限電壓(取較小值)通1.5小時/斷0.5小時。 40°C ± 2°C, 93% ± 3%RH, 1000h, rated voltage (current) or limiting element voltage whichever is lower for 1.5h ON/0.5h OFF.
70°C 耐久性 Endurance at 70°C	無可見損傷 No mechanical damage 0.5%、1%: $\Delta R \leq \pm(1.0\%R+0.05\Omega)$ 2%、5%、10%: $\Delta R \leq \pm(2.0\%R+0.05\Omega)$	無可見損傷 No mechanical damage $R \leq 100 \text{ m}\Omega$ (J級) $R \leq 40 \text{ m}\Omega$ (G級) $R \leq 20 \text{ m}\Omega$ (F級)	IEC 60115-1 4.25.1 70°C ± 2°C, 1000小時, 額定電壓(電流)或元件極限電壓(取較小值)通1.5小時/斷0.5小時。 70°C ± 2°C, 1000h, rated voltage(current)or limiting element voltage whichever is lower for 1.5h ON/0.5h OFF.
上限類別溫度 耐久性 Endurance at Upper Category Temperature	無可見損傷 No mechanical damage 0.5%、1%: $\Delta R \leq \pm(1.0\%R+0.05\Omega)$ 2%、5%、10%: $\Delta R \leq \pm(2.0\%R+0.05\Omega)$	無可見損傷 No mechanical damage $R \leq 100 \text{ m}\Omega$ (J級) $R \leq 40 \text{ m}\Omega$ (G級) $R \leq 20 \text{ m}\Omega$ (F級)	IEC 60115-1 4.25.3 0201: 125°C ± 2°C, 1000h. 0402、0603、0805、1206、1210、2010、2512: 155°C ± 2°C, 1000h.
低溫負載 Operation at Low Temperature	無可見損傷 No mechanical damage 0.5%、1%: $\Delta R \leq \pm(1.0\%R+0.05\Omega)$ 2%、5%、10%: $\Delta R \leq \pm(2.0\%R+0.05\Omega)$	無可見損傷 No mechanical damage $R \leq 50 \text{ m}\Omega$ (J級) $R \leq 20 \text{ m}\Omega$ (G級) $R \leq 10 \text{ m}\Omega$ (F級)	IEC 60115-1 4.36 -55°C ± 5°C, 無負載1小時, 額定電壓(電流)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 (current) or limiting element voltage whichever is lower for 45min, 15 min without load.
絕緣電阻 Insulation Resistance	1000MΩ Min	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 terminations for 1 min, then check insulation resistance.
耐電壓 Voltage Proof	無擊穿或飛弧 No breakdown or flashover	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.
耐溶劑 Component Solvent Resistance	無可見損傷 No mechanical damage $\Delta R \leq \pm(1.0\%R+0.05\Omega)$	無可見損傷 No mechanical damage $R \leq 50 \text{ m}\Omega$ (J級) $R \leq 20 \text{ m}\Omega$ (G級) $R \leq 10 \text{ m}\Omega$ (F級)	IEC 60115-1 4.29 異丙醇 (IPA), 23°C ± 5°C, 浸10小時。 Iso-propyl alcohol (IPA), 23°C ± 5°C, 10h.
抗硫化性能 Sulfuration- Resistant	無可見損傷 No mechanical damage $\Delta R \leq \pm(5.0\%R+0.05\Omega)$	無可見損傷 No mechanical damage $R \leq 100 \text{ m}\Omega$ (J級) $R \leq 40 \text{ m}\Omega$ (G級) $R \leq 20 \text{ m}\Omega$ (F級)	0201: 切削油: 硫磺粉, 恆溫: 105°C ± 3°C, 放置時間: 500小時 Cutting oil :sulphur powder ,constant temperature: 105°C ± 3°C,for 500 h. 0402、0603、0805、1206、1210、2010、2512: 切削油: 硫磺粉, 恆溫: 105°C ± 3°C, 放置時間: 1000小時 Cutting oil :sulphur powder ,constant temperature: 105°C ± 3°C,for 1000 h.

● 包裝 Packaging

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