

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

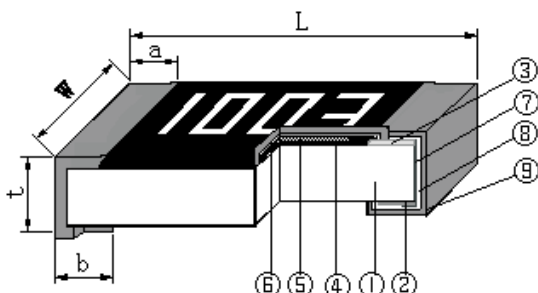
- * 體積小、重量輕
Miniature and light weight
- * 適應再流焊與波峰焊
Suit for reflow and wave flow solder
- * 電性能穩定，可靠性高
Stable electrical capability, high reliability
- * 裝配成本低，並與自動貼裝設備匹配
Low assembly cost, suit for automatic SMT equipment
- * 機械强度高、高頻特性優越
Superior mechanical and frequency characteristics
- * 具有優越的抗硫化性能
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 | 型號 Type | 代號 Code | T.C.R (ppm/C) | 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。 Three digits (E-24 series): 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 | | | | 代號 Code | 誤差精度 Tolerance | 代號 Code | 包裝方法 Packaging Style |
| | C | 常規功率系列 Normal Power Series | 01 | 0201 | 0201 | W | ±200 | D | ±0.5% | T | 編帶包裝 Tape & Reel | | | | |
| | S | 提升功率系列 Upgraded Power Series | 02 | 0402 | 0402 | U | ±400 | F | ±1% | C | 塑料袋散裝 Case | | | | |
| | | | 03 | 0603 | | K | ±100 | G | ±2% | | | | | | |
| | | 05 | 0805 | | W | ±200 | J | ±5% | | | | | | | |
| | | 06 | 1206 | 0603 | | U | ±400 | K | ±10% | | | | | | |
| | | 1210 | 1210 | 0805 | | K | ±100 | 跨接電阻 Chip Jumper | | F | ≤10mΩ | | | | |
| | | 10 | 2010 | 1206 | | L | ±250 | G | ≤20mΩ | | | | | | |
| | | 12 | 2512 | 1210 | | | | J | ≤50mΩ | | | | | | |
| | | | | 2512 | | | | | | | | | | | |
| | | | | 跨接電阻 Chip Jumper | | | 無表示 | | | | | | | | |

● 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

● 规格尺寸 Dimensions

| 型号 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 |

● 负荷下降曲线 Derating Curve



注1: 曲线①适用于0201产品; 曲线②适用于0402、0603、0805、1206、1210、2010、2512产品。

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: 当电阻使用的环境温度超过70°C时, 其额定负荷(额定功率或额定电流)按上述曲线下降。

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.

● 额定值 Ratings

| 型号 Type | 70°C下额定功率 Rated Power at 70°C (W) | | 元件极限电压 Limiting Element Voltage(V) | | 最大过负荷电压 Max. Overload Voltage(V) | | 跨接电阻70°C 下额定电流 Rated Current for Chip Jumper at 70°C (A) | 跨接电阻最大 过负荷电流 Max. Overload Current for Chip Jumper (A) |
|------------|---|------------------------------------|--|------------------------------------|--|------------------------------------|--|--|
| | 常规功率系列 Normal Power Series | 提升功率系列 Upgraded Power Series | 常规功率系列 Normal Power Series | 提升功率系列 Upgraded Power Series | 常规功率系列 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、电压、电流为直流或交流有效值。
Voltage, current of DC or AC RMS value.
- 2、 $E = \sqrt{P \times R}$ 或元件极限电压两者中的较小值。
 $E = \sqrt{P \times R}$ or Limiting element voltage whichever is lower.
E: 额定电压 Rated voltage(V)
P: 额定功率 Rated power(W)
R: 标称阻值 Normal resistance(Ω)

抗硫化厚膜片式固定電阻器

ANTI-SULFURATED THICK FILM CHIP FIXED RESISTOR

● 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

(續上頁 Continue)

| 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, 恒溫: 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, 恒溫: 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 .

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