

常规系列厚膜晶片电阻  
Thick Film Chip Resistor  
FRC Series



■应用 ( Application )

- Entertainment : Stereo, TV tuners , Tape recorder
- Appliance: Air conditioner, Refrigerator
- Computer & relative products : Main board, PDA
- Communication equipment: Cell phone, Fax machine
- Power equipment: Power supply , II Lumination equipment
- Measuring instrument: Electric meter, Navigation equipment

- 娱乐：立体声、电视调谐器、录音机
- 电器：空调、冰箱
- 电脑及相关产品：主板、PDA
- 通讯设备：手机、传真机
- 电源设备：电源、二级照明设备
- 测量仪器：电表、导航设备

■特点 ( Features )

- small size and light weight
- Reliability, high quality

- 体积小、重量轻
- 可靠性，高质量

■产品料号 ( Parts Number Explanation )

示例 ( Example ) : FRC1206F1001 TSD

| F<br>公司名     | R<br>产品别   | C<br>功能别  | 1206<br>尺寸   | F<br>公差   | 1001<br>字码  | T<br>包装别   | S<br>端电极                   | D<br>特殊码            |
|--------------|--|---|--|---|---|--|----------------------------|---------------------|
| FOJAN        | R:Resistor<br>C:Capacitor<br>L:Inductor<br>D:Diode<br>A:Audion | C:Normal<br>P:Hi-Power<br>L:Lowohmic<br>A:Array<br>S:Surge<br>H:Hi-Precision<br>V:Hi-Voltage<br>Q:Auto-motive<br>R:Anti-sulfur<br>M:Metal<br>D: LED | 0201<br>0402<br>0603<br>0805<br>1206<br>1210<br>1218<br>1812<br>2010<br>2512 | B:±0.1%<br>C:±0.25%<br>D:±0.5%<br>F:±1%<br>J:±5%<br>P: Jumper | ±5%:E24<br>3-digits+blank<br>102=1KΩ<br>1R0=1Ω<br><br>±1%&Below :<br>E24+E96 :<br>4-digits<br>1001=1KΩ<br>1R00=1Ω | T: 7 inch reel<br>Q:10 inch reel<br>R:13 inch reel<br>B:Bulk | S : Sn<br>C : Cu<br>A : Au | N:Normal<br>D : LED |
| Company code | Type code  | Functional code   | Size code  | Tolerance code  | Resistance code   | Packaging code   | Termination code           | Special Case        |

■尺寸 (Dimension)

| 尺寸<br>dimension |  |           |           |           |           |
|-----------------|--|-----------|-----------|-----------|-----------|
|                 | 单位 (unit) : mm   |           |           |           |           |
| 型别 ( Type )     | L  | W         | H         | T1        | T2        |
| 0201            | 0.60±0.03  | 0.30±0.03 | 0.23±0.03 | 0.10±0.05 | 0.15±0.05 |
| 0402            | 1.00±0.05  | 0.50±0.05 | 0.35±0.05 | 0.20±0.10 | 0.25±0.10 |
| 0603            | 1.60±0.10  | 0.80±0.10 | 0.45±0.10 | 0.25±0.15 | 0.25±0.15 |
| 0805            | 2.00±0.10  | 1.25±0.10 | 0.50±0.10 | 0.35±0.20 | 0.35±0.20 |
| 1206            | 3.10±0.10  | 1.60±0.10 | 0.55±0.10 | 0.45±0.20 | 0.40±0.20 |
| 1210            | 3.10±0.10  | 2.60±0.15 | 0.55±0.10 | 0.45±0.15 | 0.50±0.20 |
| 1218            | 3.10±0.10  | 4.60±0.10 | 0.55±0.10 | 0.45±0.20 | 0.40±0.20 |
| 1812            | 4.50±0.20  | 3.10±0.20 | 0.55±0.10 | 0.55±0.20 | 0.70±0.20 |
| 2010            | 5.00±0.10  | 2.50±0.15 | 0.55±0.10 | 0.45±0.15 | 0.50±0.20 |
| 2512            | 6.35±0.10  | 3.10±0.15 | 0.55±0.10 | 0.60±0.20 | 0.50±0.20 |

■电阻结构 ( Construction )



| NO. | 结构<br>construction             | 主要材料<br>Major material                  |
|-----|--------------------------------|---|
| 1   | 陶瓷基板<br>Ceramic substrate      | 三氧化二铝<br>Al <sub>2</sub> O <sub>3</sub> |
| 2   | 银电极<br>Conductive layer        | 银<br>Ag                                 |
| 3   | 侧电极<br>Side conductive layer   | 镍铬合金<br>NiCr                            |
| 4   | 阻体层<br>Resistive layer         | 氧化钌+玻璃<br>RuO <sub>2</sub> + glass      |
| 5   | 内保护层<br>Inner protective layer | 玻璃<br>Glass                             |
| 6   | 外保护层<br>Outer Protective layer | 环氧树脂<br>Epoxy                           |
| 7   | 文字<br>Marking                  | 环氧树脂<br>Epoxy                           |
| 8   | 镍电极<br>Ni plating layer        | 镍<br>Ni                                 |
| 9   | 锡电极<br>Sn plating layer        | 锡<br>Matte Tin                          |

■功率衰减曲线 ( Derating Curve )

| 使用温度范围  | -55°C~+125°C(0201)               | -55°C~+155°C                     |
|---------|----------------------------------|----------------------------------|
| 说明      | 周围温度若超过70°C至125°C之间,功率可照下图曲线予以修订 | 周围温度若超过70°C至155°C之间,功率可照下图曲线予以修订 |
| 功率衰减曲线图 |                                  |                                  |

■电气特性 ( Electrical characteristics )

| 型别 Type                                     | 0201  | 0402  | 0603  | 0805  | 1206  | 1210  | 1218  | 1812  | 2010  | 2512  |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 绝缘耐压<br>Dielectric Withstanding Voltage     | -     | 100V  | 100V  | 300V  | 500V  | 500V  | 500V  | 500V  | 500V  | 500V  |
| 零欧姆阻值 ±1%<br>Resistance Value of Jumper ±1% | -     | <30mΩ | <30mΩ | <30mΩ | <30mΩ | <30mΩ | <30mΩ | <30mΩ | <30mΩ | <30mΩ |
| 零欧姆阻值 ±5%<br>Resistance Value of Jumper ±5% | <50mΩ | <50mΩ | <50mΩ | <50mΩ | <50mΩ | <50mΩ | <50mΩ | <50mΩ | <50mΩ | <50mΩ |
| 零欧姆额定电流<br>Rated Current of Jumper          | 0.5A  | 1A    | 1A    | 2A    | 2A    | 2A    | 6A    | 2A    | 2A    | 2A    |
| 零欧姆电阻最大电流<br>Max Current of Jumper          | 1A    | 2A    | 2A    | 5A    | 10A   | 10A   | 10A   | 10A   | 10A   | 10A   |

■电性规格 ( Standard Electrical Specifications )

| 型别<br>Type | 额定功率<br>( PowerRating<br>at 70℃ ) | 最高<br>工作电压<br>Max. RCWV | 最大过负荷电压<br>Max. Overload Voltage | T.C.R.<br>(PPM/°C) | 阻值范围<br>Resistance Range |
|------------|-----------------------------------|-------------------------|----------------------------------|--------------------|--------------------------|
| 0201       | 1/20W                             | 25V                     | 50V                              | ± 400              | 1Ω~10Ω                   |
|            |                                   |                         |                                  | ± 200              | 10Ω~10MΩ                 |
| 0402       | 1/16W                             | 50V                     | 100V                             | ±200               | 1Ω~10Ω                   |
|            |                                   |                         |                                  | ± 100              | 10MΩ~100MΩ               |
| 0603       | 1/10W                             | 75V                     | 150V                             | ± 200              | 10Ω~10MΩ                 |
|            |                                   |                         |                                  | ± 100              | 1Ω~10Ω                   |
| 0805       | 1/8W                              | 150V                    | 300V                             | ± 200              | 10MΩ~100MΩ               |
|            |                                   |                         |                                  | ± 100              | 1Ω~10Ω                   |
| 1206       | 1/4W                              | 200V                    | 400V                             | ± 200              | 10Ω~10MΩ                 |
|            |                                   |                         |                                  | ± 100              | 1Ω~10Ω                   |
| 1210       | 1/3W                              | 200V                    | 400V                             | ± 200              | 10MΩ~100MΩ               |
|            |                                   |                         |                                  | ± 100              | 1Ω~10Ω                   |
| 1218       | 1W                                | 200V                    | 500V                             | ± 200              | 10Ω~1MΩ                  |
|            |                                   |                         |                                  | ± 100              | 1Ω~10Ω                   |
| 1812       | 3/4W                              | 200V                    | 400V                             | ± 200              | 10MΩ~100MΩ               |
|            |                                   |                         |                                  | ± 100              | 1Ω~10Ω                   |
| 2010       | 3/4W                              | 200V                    | 400V                             | ± 200              | 10Ω~10MΩ                 |
|            |                                   |                         |                                  | ± 100              | 10MΩ~100MΩ               |
| 2512       | 1W                                | 200V                    | 400V                             | ± 200              | 1Ω~10Ω                   |
|            |                                   |                         |                                  | ± 100              | 10MΩ~100MΩ               |

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■性能 ( Performance Specifications )

| 内容<br>Item                                    | 测试方法<br>Test Methods | 测试条件<br>Test Conditions   | 规格<br>Specification   |
|---|----------------------|---|---|
| 温度系数<br>Temperature<br>Coefficient            | JIS C 5201 4.8       | $TCR = (R - R_0) / (t - t_0) R_0 \times 10^6$ ( ppm )<br>R <sub>0</sub> 电阻在室温下的阻值(resistance at room temperature)<br>R 电阻在 125℃或-55℃下的阻值(resistance at 125℃ or -55℃)<br>t <sub>0</sub> 室温(room temperature)<br>t 测试温度 ( test temperature 125℃ or -55℃ ) | 0201 规格 :<br>1Ω ≤ R ≤ 10Ω:<br>±400 PPM/℃<br>10Ω < R ≤ 10MΩ:<br>±200 PPM/℃<br>0402~2512 规格 :<br>1Ω ≤ R ≤ 10Ω:<br>±200 PPM/℃<br>10Ω < R ≤ 10MΩ:<br>±100 PPM/℃<br>10MΩ < R ≤ 100MΩ:<br>±200PPM/℃ |
| 短时间过负荷<br>Short-time<br>overload              | JIS C 5201 4.13      | 加载 2.5 倍的额定电压，时间 5 秒后测量试验前后的阻值变化率。<br>Applied 2.5 times of rated voltage for 5 second.<br>Measure the variation of resistance.  | ±(1.00% +0.05Ω)   |
| 焊锡性<br>Solderability                          | JIS C 5201 4.17      | 沾助焊剂后浸入锡炉，锡炉温度 245±5℃，时间 3±0.5 秒。<br>Dip the terminal in a flux and then dip into a soldering bath at 245±5℃ for 3±0.5sec.  | > 95%面积上锡<br>( > 95% coverage)  |
| 抗焊锡热<br>Resist to soldering<br>heat           | JIS C 5201 4.18      | 沾助焊剂后浸入锡炉，锡炉温度 260±5℃，时间 10±0.5 秒，测量试验前后的阻值变化率。<br>Dip the terminal in a flux and then dip into a soldering bath at 260±5℃ for 10±0.5sec.<br>Measure the variation of resistance.   | ±(1.00% +0.05Ω)   |
| 绝缘电阻<br>Insulation<br>resistance              | JIS C 5201 4.6       | 电阻本体上加载绝缘耐压 60±5 秒后，测量绝缘电阻。<br>Applied the dielectric withstanding voltage on the center of body for 60±5seconds. Then measure insulation resistance.   | >10GΩ   |
| 绝缘耐压<br>Dielectric<br>withstanding<br>voltage | JIS C 5201 4.7       | 电阻本体上加载绝缘耐压 60±5 秒。<br>Applied the dielectric withstanding voltage on the center of body for 60±5seconds.   | 无击穿、飞弧及可见机械性损伤<br>No evidence of flashover, mechanical damage arcing or insulation breakdown  |

| 内容<br>Item                     | 测试方法<br>Test Methods      | 测试条件<br>Test Conditions  | 规格<br>Specification |
|--------------------------------|---------------------------|--|---------------------|
| 端子弯曲<br>Terminalbending        | JIS C 5201 4.33           | 电阻焊接在测试板上进行弯折,弯折保持时间<br>20±1 秒,1206(含) 以下的尺寸弯曲 5+0.2/0 mm;<br>1206 以上的尺寸弯曲 2+0.2/0 mm; 量测试验前<br>后阻值变化率<br>Specimen shall be mounted on test board, then<br>bend the board and maintained for 20±1s. the<br>distance of bending is 5+0.2/0 mm for resistors<br>which size no larger than 1206 or 2+0.2/0 mm<br>which size larger than 1206. Measure the<br>variation of resistance. | ±(1.00% +0.05Ω)     |
| 温度循环<br>Temperature<br>Cycling | JIS C 5201 4.19           | 电阻放入温度循环机中,温度 155±2℃至<br>-55±3℃,共 5 个循环。量测试验前后阻值变化率。<br>Put specimen in a chamber which temperature<br>can be changed to 155±2℃ or -55±3℃,<br>repeated 5 times. Measure the variation of<br>resistance.  | ±(2.00% +0.05Ω)     |
| 耐湿特性<br>Humidity               | JIS C 5201 4.24           | 电阻放入恒温恒湿箱,温度 40±2℃,湿度<br>90~95 %RH;通电额定电压 1.5 小时,断电 0.5 小<br>时;重复通断电至试验时间 1000 <sup>+48/-0</sup> 小时。量<br>测试验前后阻值变化率。<br>Put the specimen in a chamber at 40±2℃<br>temperature and 90~95% relative humidity, then<br>applied rated voltage for 1.5H and rested for<br>0.5H repeatedly till total test time is 1000 <sup>+48/-0</sup><br>H. Measure the variation of resistance.     | ±(2.00% +0.05Ω)     |
| 负荷寿命<br>Load life              | JIS C 5201 4.25.1         | 电阻放入恒温箱中,温度 70±2℃, ON<br>TIME:1.5H, OFF TIME:0.5H 通电额定电压 1000 <sup>+24/-0</sup><br>小时,量测试验前后阻值变化率。<br>Put the specimen in a chamber at 70±2℃<br>temperature, ON TIME:1.5H, OFF TIME:0.5H,<br>and applied rated voltage for 1000 <sup>+24/-0</sup> H.<br>Measure the variation of resistance.   | ±(2.00% +0.05Ω)     |
| 温湿循环<br>Moisture<br>resistance | MIL-STD-202<br>METHOD 106 | 25℃~65℃,90~100%RH, 2.5 小时; 65℃<br>90~100%RH, 3 小时;<br>65℃~25℃,80~100%RH,2.5 小时,10 个循环,试<br>验结束 24±4 小时后进行测试。<br>25℃~65℃,90~100%RH, 2.5H; 65℃<br>90~100%RH, 3H; 65℃~25℃<br>80~100%RH, 2.5H, 10 cycles, Measurement at<br>24±4 hours after test conclusion.  | ±(2.00% +0.05Ω)     |

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