

Datasheet

## RS Pro RS Series Thick Film Surface Mount Resistor 0402

Case **9.09k $\Omega$   $\pm$ 1% 0.063W  $\pm$ 100ppm/ $^{\circ}$ C**

RS Stock No: **716-9137**



### Product Details

RS Pro 0402 thick film surface mount resistor with  $\pm$ 1% tolerance, provides 9.09 k $\Omega$  resistance and is power rated at 0.0625 W. The temperature coefficient of resistance is  $\pm$ 100 ppm/ $^{\circ}$ C. Applications include telecommunication equipment, radio and tape recorders, TV tuners, video cameras, watches, pocket calculators, automotive industry, computers, instruments, medical and military equipment.

### Features and Benefits

- Small size and lightweight
- Highly reliable multilayer electrode construction
- Compatible with all soldering process

**Specifications:**

|                                 |                   |
|---------------------------------|-------------------|
| Case Style                      | Ruthenium Oxide   |
| Depth                           | 0.5 mm            |
| Dimensions                      | 1 x 0.5 x 0.35 mm |
| Height                          | 0.35 mm           |
| Length                          | 1 mm              |
| Maximum Operating Temperature   | +155°C            |
| Maximum Temperature Coefficient | +100 ppm/°C       |
| Minimum Operating Temperature   | -55°C             |
| Minimum Temperature Coefficient | -100 ppm/°C       |
| Package/Case                    | 0402              |
| Power Rating                    | 0.0625 W          |
| Resistance                      | 9.09 kΩ           |
| Technology                      | Thick Film        |
| Temperature Coefficient         | ±100 ppm/°C       |
| Termination Style               | Solder Pad        |
| Tolerance                       | ±1%               |
| Maximum Overload Voltage        | 100 V             |
| Maximum Operating Voltage       | 50 V              |
| Tape Width                      | 8 mm              |

# Thick Film Chip Resistor 1% - RS Series

0201/0402/0603/0805/1206

## Construction



|                         |                           |   |
|-------------------------|---------------------------|---|
| ① Alumina Substrate     | ④ Edge Electrode (NiCr)   | ⑦ Resistor Layer (RuO <sub>2</sub> /Ag) |
| ② Bottom Electrode (Ag) | ⑤ Barrier Layer (Ni)      | ⑧ Primary Overcoat (Glass)              |
| ③ Top Electrode (Ag-Pd) | ⑥ External Electrode (Sn) | ⑨ Secondary Overcoat (Epoxy)            |

## Dimensions

Unit: mm

| Type    | Size (Inch) | L         | W         | T         | D1        | D2        | Weight (g) (1000pcs) |
|---------|-------------|-----------|-----------|-----------|-----------|-----------|----------------------|
| RS-0201 | 0201        | 0.60±0.03 | 0.30±0.03 | 0.23±0.03 | 0.15±0.05 | 0.15±0.05 | 0.150                |
| RS-0402 | 0402        | 1.00±0.05 | 0.50±0.05 | 0.35±0.05 | 0.20±0.10 | 0.20±0.10 | 0.620                |
| RS-0603 | 0603        | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 | 2.042                |
| RS-0805 | 0805        | 2.00±0.10 | 1.25±0.10 | 0.50±0.10 | 0.35±0.20 | 0.40±0.20 | 4.368                |
| RS-1206 | 1206        | 3.10±0.10 | 1.55±0.10 | 0.55±0.10 | 0.50±0.25 | 0.50±0.20 | 8.947                |

## Part Numbering

|     |                                      |  |           |                                    |
|-----|--------------------------------------|--|-----------|------------------------------------|
| RS- | 0402-                                | 10R-   | 1%-       | 0.0625W                            |
|     | Dimensions                           | Resistance   | Tolerance | Power Rating @ 70 °C               |
|     | 0201<br>0402<br>0603<br>0805<br>1206 | 10R: 10Ω<br>100R: 100Ω<br>10K: 10KΩ<br>100K: 100KΩ | 1%        | 0.0625W<br>0.1W<br>0.125W<br>0.25W |

Derating Curve



Standard Electrical Specifications

| Type \ Item | Power Rating at 70°C Jumper Rated Current | Operating Temp. Range | Max. Operating Voltage | Max. Overload Voltage | Resistance Range | TCR (PPM/°C) |
|-------------|---|-----------------------|------------------------|-----------------------|------------------|--------------|
|             |   |                       |                        |                       | ±1%              |              |
| RS-0201     | 1/20W                                     | -55 ~ +155°C          | 25V                    | 50V                   | 10Ω – 910KΩ      | ±200         |
| RS-0402     | 1/16W                                     | -55 ~ +155°C          | 50V                    | 100V                  | 10Ω – 910KΩ      | ±100         |
| RS-0603     | 1/10W                                     | -55 ~ +155°C          | 75V                    | 150V                  | 10Ω – 910KΩ      | ±100         |
| RS-0805     | 1/8W                                      | -55 ~ +155°C          | 150V                   | 300V                  | 10Ω – 910KΩ      | ±100         |
| RS-1206     | 1/4W                                      | -55 ~ +155°C          | 200V                   | 400V                  | 10Ω – 910KΩ      | ±100         |

Soldering Condition



IR Reflow Soldering

- (1) Time of IR reflow soldering at maximum temperature point 260°C: 10s
- (2) Time of wave soldering at maximum temperature point 260°C: 10s
- (3) Time of soldering iron at maximum temperature point 410°C: 5s

Wave Soldering (Flow Soldering)



■ Environmental Characteristics

| Item   | Requirement  | Test Method   |
|--|--|---|
|  | ±1%  |   |
| Temperature Coefficient of Resistance (T.C.R.) | As Spec.   | JIS-C-5201-1 4.8<br>IEC-60115-1 4.8<br>-55°C~+125/+155°C, 25°C is the reference temperature                               |
| Short Time Overload                            | ±(1.0%+0.05Ω)  | JIS-C-5201-1 4.13<br>IEC-60115-1 4.13<br>RCWV*2.5 or Max. overload voltage for 5 seconds, 2 seconds for high power series |
| Insulation Resistance                          | ≥10G   | JIS-C-5201-1 4.6<br>IEC-60115-1 4.6<br>Max. overload voltage for 1 minute   |
| Endurance                                      | ±(2.0%+0.10Ω)  | JIS-C-5201-1 4.25<br>IEC-60115-1 4.25.1<br>70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"  |
| Damp Heat with Load                            | ±(2.0%+0.10Ω)  | JIS-C-5201-1 4.24<br>40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"            |
| Dry Heat                                       | ±(1.0%+0.05Ω)  | JIS-C-5201-1 4.23<br>IEC-60115-1 2.23.2<br>at +125/+155°C for 1000 hrs  |
| Bending Strength                               | ±(1.0%+0.05Ω)  | JIS-C-5201-1 4.33<br>IEC-60115-1 4.33<br>Bending once for 5 seconds<br>2010, 2512 sizes: 2mm Other sizes: 3mm             |
| Solderability                                  | 95% min. coverage  | JIS-C-5201-1 4.17<br>IEC-60115-1 4.17<br>245±5°C for 3 seconds  |
| Resistance to Soldering Heat                   | ±(0.5%+0.05Ω)  | JIS-C-5201-1 4.18<br>IEC-60115-1 4.18<br>260±5°C for 10 seconds   |
| Voltage Proof                                  | No breakdown or flashover                                  | JIS-C-5201-1 4.7<br>IEC-60115-1 4.7<br>1.42 times RCWV (RMS) for 1 minute   |
| Leaching                                       | Individual leaching area □ 5%<br>Total leaching area □ 10% | JIS-C-5201-1 4.18<br>IEC-60068-2-58 8.2.1<br>260±5°C for 30 seconds   |
| Rapid Change of Temperature                    | ±(0.5%+0.05Ω)  | JIS-C-5201-1 4.18<br>IEC-60115-1 4.18<br>-55°C to +125/+155°C, 5 cycles   |

■ Storage Temperature: 25±3°C; Humidity < 80%RH

**■Packaging**

Reel Specifications & Packaging Quantity



Unit: mm

| Type                          | Packaging Quantity | Tape Width | Reel Diameter | $\Phi A$  | $\Phi B$            | $\Phi C$ | W       | T        |
|-------------------------------|--------------------|------------|---------------|-----------|---------------------|----------|---------|----------|
| RS-0201<br>RS-0402            | Paper              | 8mm        | 7 inch        | 178.5±1.5 | 60 <sup>+1/-0</sup> | 13.0±0.2 | 9.0±0.5 | 12.5±0.5 |
| RS-0603<br>RS-0805<br>RS-1206 |                    |            | 10 inch       | 254±1     | 100±0.5             | 13.0±0.2 | 9.5±0.5 | 13.5±0.5 |
|                               |                    |            | 13 inch       | 330±1     | 100±0.5             | 13.0±0.2 | 9.5±0.5 | 13.5±0.5 |

Paper Tape Specifications



Unit: mm

| Type    | A         | B         | W       | E        | F         | $P_0$     | $P_1$     | $P_2$     | $\Phi D_0$  | T        |
|---------|-----------|-----------|---------|----------|-----------|-----------|-----------|-----------|-------------|----------|
| RS-0201 | 0.38±0.05 | 0.68±0.05 | 8.0±0.2 | 1.75±0.1 | 3.50±0.05 | 4.00±0.10 | 2.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.42±0.1 |
| RS-0402 | 0.65±0.10 | 1.15±0.1  | 8.0±0.2 | 1.75±0.1 | 3.50±0.05 | 4.00±0.10 | 2.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.45±0.1 |
| RS-0603 | 1.10±0.10 | 1.90±0.1  | 8.0±0.2 | 1.75±0.1 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.70±0.1 |
| RS-0805 | 1.60±0.10 | 2.40±0.2  | 8.0±0.2 | 1.75±0.1 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.85±0.1 |
| RS-1206 | 1.90±0.10 | 3.50±0.2  | 8.0±0.2 | 1.75±0.1 | 3.50±0.05 | 4.00±0.10 | 4.00±0.05 | 2.00±0.05 | 1.50+0.1,-0 | 0.85±0.1 |

### ■ Marking

No Marking for 0201 and 0402

1% for 0805/1206: 4 digits marking

Example:

|            |      |       |      |        |       |
|------------|------|-------|------|--------|-------|
| Resistance | 100Ω | 2.2KΩ | 10KΩ | 49.9KΩ | 100KΩ |
| Marking    | 1000 | 2201  | 1002 | 4992   | 1003  |

1% for 0603: 3 digits marking in E96



3 digits marking for Example: 14C=13K7Ω 13C=13K3Ω  
68B=4K99Ω 68X=49.9Ω

### Marking Table

| Code | E96 | Code | E96 | Code | E96 | Code | E96 |
|------|-----|------|-----|------|-----|------|-----|
| 01   | 100 | 25   | 178 | 49   | 316 | 73   | 562 |
| 02   | 102 | 26   | 182 | 50   | 324 | 74   | 576 |
| 03   | 105 | 27   | 187 | 51   | 332 | 75   | 590 |
| 04   | 107 | 28   | 191 | 52   | 340 | 76   | 604 |
| 05   | 110 | 29   | 196 | 53   | 348 | 77   | 619 |
| 06   | 113 | 30   | 200 | 54   | 357 | 78   | 634 |
| 07   | 115 | 31   | 205 | 55   | 365 | 79   | 649 |
| 08   | 118 | 32   | 210 | 56   | 374 | 80   | 665 |
| 09   | 121 | 33   | 215 | 57   | 383 | 81   | 681 |
| 10   | 124 | 34   | 221 | 58   | 392 | 82   | 698 |
| 11   | 127 | 35   | 226 | 59   | 402 | 83   | 715 |
| 12   | 130 | 36   | 232 | 60   | 412 | 84   | 732 |
| 13   | 133 | 37   | 237 | 61   | 422 | 85   | 750 |
| 14   | 137 | 38   | 243 | 62   | 432 | 86   | 768 |
| 15   | 140 | 39   | 249 | 63   | 442 | 87   | 787 |
| 16   | 143 | 40   | 255 | 64   | 453 | 88   | 806 |
| 17   | 147 | 41   | 261 | 65   | 464 | 89   | 825 |
| 18   | 150 | 42   | 267 | 66   | 475 | 90   | 845 |
| 19   | 154 | 43   | 274 | 67   | 487 | 91   | 866 |
| 20   | 158 | 44   | 280 | 68   | 499 | 92   | 887 |
| 21   | 162 | 45   | 287 | 69   | 511 | 93   | 909 |
| 22   | 165 | 46   | 294 | 70   | 523 | 94   | 931 |
| 23   | 169 | 47   | 301 | 71   | 536 | 95   | 953 |
| 24   | 174 | 48   | 309 | 72   | 549 | 96   | 976 |

  

| Code       | A               | B               | C               | D               | E               | F               | G               | X                | Y                |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|
| Multiplier | 10 <sup>0</sup> | 10 <sup>1</sup> | 10 <sup>2</sup> | 10 <sup>3</sup> | 10 <sup>4</sup> | 10 <sup>5</sup> | 10 <sup>6</sup> | 10 <sup>-1</sup> | 10 <sup>-2</sup> |

### ■ Recommend Land Pattern



Unit: mm

| Type    | A    | B    | C    |
|---------|------|------|------|
| RS-0201 | 0.30 | 0.25 | 0.30 |
| RS-0402 | 0.50 | 0.45 | 0.60 |
| RS-0603 | 0.90 | 0.60 | 0.90 |
| RS-0805 | 1.20 | 0.70 | 1.30 |
| RS-1206 | 2.00 | 0.90 | 1.60 |