



UNI-ROYAL
厚聲集團

DATA SHEET

Product Name Thick Film Chip Resistors

Part Name 01005/0201/0402/0603/0805/1206/1210/1812/2010/2512 Series

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Brands *RoyalOhm* *UniOhm*



1. Scope

- 1.1 This specification for approve relates to the Thick Film Chip Resistors manufactured by UNI-ROYAL.
- 1.2 Small size & light weight.
- 1.3 Reduction of assembly costs and matching with placement machine.
- 1.4 Suitable for both wave & re-flow soldering.
- 1.5 Applications: Navigator (GPS), Mobile Phone, Telecom, PDA, Setbox, Meter.

2. Explanation of Part No. System

Part No. includes 14 codes shown as below:

2.1 1st~4th codes: Part name. E.g.: 01005, 0201, 0402, 0603, 0805, 1206, 1210, 2010, 1812, 2512.

2.2 5th~6th codes: Power rating.

| | | | | | | | | | | | |
|---------------------|------|----------------|-----|-----|-----|-----|------|------|------|----|--|
| E.g.: W=Normal Size | | “1~G” = “1~16” | | | | | | | | | |
| Wattage | 1/32 | 3/4 | 1/2 | 1/3 | 1/4 | 1/8 | 1/10 | 1/16 | 1/20 | 1 | |
| Normal Size | WH | 07 | W2 | W3 | W4 | W8 | WA | WG | WM | 1W | |

If power rating is lower or equal than 1 watt, 5th code would be “W” and 6th code would be a number or letter.

E.g.: WA=1/10W W4=1/4W

2.3 7th code: Tolerance. E.g.: D=±0.5% F=±1% G=±2% J=±5%

2.4 8th~11th codes: Resistance Value.

2.4.1 If value belongs to standard value of ≥5% series, 8th code would be zero, 9th~10th codes are significant figures of the resistance and 11th code is the power of ten.

2.4.2 If value belongs to standard value of ≤2% series, 8th~10th codes are significant figures of the resistance, and 11th code is the power of ten.

2.4.3 11th codes listed as following:

0=10⁰ 1=10¹ 2=10² 3=10³ 4=10⁴ 5=10⁵ 6=10⁶ J=10⁻¹ K=10⁻² L=10⁻³ M=10⁻⁴ N=10⁻⁵ P=10⁻⁶

2.5 12th~14th codes.

2.5.1 12th code: Packaging Type. E.g.: C=Bulk T=Tape/Reel

2.5.2 13th code: Standard Packing Quantity.

4=4000pcs 5=5000pcs C=10000pcs D=20000pcs E=15000pcs

Chip Product: BD=B/B-20000pcs TC=T/R-10000pcs

2.5.3 14th code: Special features.

E = Environmental Protection, Lead Free, or Standard type.

3. Ordering Procedure

(Example: 0805 1/8W ±5% 10KΩ T/R-5000)



4. Marking

(1) For 01005、0201 and 0402 size. Due to the very 01005、0201、0402 small size of the resistor's body, there is no marking on the body.



(2) Normally, the making of 0Ω 0603, 0Ω 0805, 0Ω 1206, 0Ω 1210, 0Ω 1812, 0Ω 2010, 0Ω 2512 resistors as following



0 → 0Ω

(3) ±2%,±5% Tolerance: The first two digits are significant figures of resistance and the third denotes number of zeros following



333 → 33KΩ

(4) ±0.5%、±1% Tolerance: 4 digits, first three digits are significant; fourth digit is number of zeros. Letter r is decimal point.



2701 → 2.7KΩ

(5) More than 0805 specifications (including) 4 digits, Product below 1Ω, show as following, the first digit Is "R" which as decimal point.



R300 → 0.3Ω

(6) Standard E-96 series values of 0603 ≤±1% : due to the small size of the resistor's body, 3 digits marking will be used to indicate the accurate resistance value by using the following multiplier & resistance code.

Multiplier Code (for 0603 ≤±1% marking)

| Code | A | B | C | D | E | F | G | H | X | Y | Z |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Multiplier | 10 ⁰ | 10 ¹ | 10 ² | 10 ³ | 10 ⁴ | 10 ⁵ | 10 ⁶ | 10 ⁷ | 10 ⁻¹ | 10 ⁻² | 10 ⁻³ |

Standard E-96 series Resistance Value code (for 0603 ≤±1% marking)

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

So the resistance value are marked as the following examples



$$1.96K\Omega = 196 \times 10^1 \Omega = 29B$$



$$12.4\Omega = 124 \times 10^{-1} \Omega = 10X$$

(7) Standard E-24 and not belong to E-96 series values ($\leq \pm 1\%$) of 0603 size: the marking is the same as 5% tolerance but marking as underli



$$333 = 33K\Omega$$



$$680 = 68\Omega$$

5. Dimension



| Type | Dimension(mm) | | | | |
|-------|---------------|------------------|-----------|-----------|-----------|
| | L | W | H | A | B |
| 01005 | 0.40±0.02 | 0.20±0.02 | 0.13±0.02 | 0.10±0.05 | 0.10±0.03 |
| 0201 | 0.60±0.03 | 0.30±0.03 | 0.23±0.03 | 0.10±0.05 | 0.15±0.05 |
| 0402 | 1.00±0.10 | 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 | 0.30±0.20 | 0.30±0.20 |
| 0805 | 2.00±0.15 | 1.25+0.15/-0.10 | 0.55±0.10 | 0.40±0.20 | 0.40±0.20 |
| 1206 | 3.10±0.15 | 1.55 +0.15/-0.10 | 0.55±0.10 | 0.45±0.20 | 0.45±0.20 |
| 1210 | 3.10±0.10 | 2.60±0.20 | 0.55±0.10 | 0.50±0.25 | 0.50±0.20 |
| 1812 | 4.50±0.20 | 3.20±0.20 | 0.55±0.20 | 0.50±0.20 | 0.50±0.20 |
| 2010 | 5.00±0.10 | 2.50±0.20 | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 |
| 2512 | 6.35±0.10 | 3.20±0.20 | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 |

6. Resistance Range

| Type | Power Rating at 70°C | Resistance Range | | | |
|-------|-------------------------|------------------|--------------|--------------|--------------|
| | | 0.5% | 1.0% | 2.0% | 5.0% |
| 01005 | 1/32W | --- | 10Ω-10MΩ | 10Ω-10MΩ | 1Ω -10MΩ |
| 0201 | 1/20W | --- | 1Ω-10MΩ | 1Ω-10MΩ | 1Ω-10MΩ |
| 0402 | 1/16W | 1Ω-10MΩ | 1Ω-10MΩ | 1Ω-10MΩ | 1Ω-10MΩ |
| 0603 | 1/10W | 1Ω-10MΩ | 0.01Ω-10MΩ | 0.01Ω-10MΩ | 0.01Ω-10MΩ |
| 0805 | 1/8W | 1Ω-10MΩ | 0.1Ω≤R<10MΩ | 0.1Ω≤R<10MΩ | 0.1Ω≤R<10MΩ |
| | 1/4W | --- | 0.01Ω≤R<0.1Ω | 0.01Ω≤R<0.1Ω | 0.01Ω≤R<0.1Ω |
| 1206 | 1/4W | 1Ω-10MΩ | 0.1Ω≤R<10MΩ | 0.1Ω≤R<10MΩ | 0.1Ω≤R<10MΩ |
| | 1/3W | --- | 0.01Ω≤R<0.1Ω | 0.01Ω≤R<0.1Ω | 0.01Ω≤R<0.1Ω |
| 1210 | 1/2W | 1Ω-10MΩ | 0.01Ω-10MΩ | 0.01Ω-10MΩ | 0.01Ω-10MΩ |
| 1812 | 3/4W | 1Ω-10MΩ | 0.01Ω-10MΩ | 0.01Ω-10MΩ | 0.01Ω-10MΩ |
| 2010 | 3/4W | 1Ω-10MΩ | 0.01Ω-10MΩ | 0.01Ω-10MΩ | 0.01Ω-10MΩ |
| 2512 | 1W | 1Ω-10MΩ | 0.01Ω-10MΩ | 0.01Ω-10MΩ | 0.01Ω-10MΩ |

7. Ratings

| Type | Max. Working Voltage | Max. Overload Voltage | Dielectric withstanding Voltage | Resistance Value of Jumper | Rated Current of Jumper | Max. Overload Current of Jumper | Operating Temperature |
|-------|----------------------|-----------------------|---------------------------------|----------------------------|-------------------------|---------------------------------|-----------------------|
| 01005 | 15V | 30V | -- | <50mΩ | 0.5A | 1A | -55°C~125°C |
| 0201 | 25V | 50V | -- | <50mΩ | 0.5A | 1A | -55°C~155°C |
| 0402 | 50V | 100V | 100V | <50mΩ | 1A | 2A | -55°C~155°C |
| 0603 | 75V | 150V | 300V | <50mΩ | 1A | 2A | -55°C~155°C |
| 0805 | 150V | 300V | 500V | <50mΩ | 2A | 5A | -55°C~155°C |
| 1206 | 200V | 400V | 500V | <50mΩ | 2A | 10A | -55°C~155°C |
| 1210 | 200V | 500V | 500V | <50mΩ | 2A | 10A | -55°C~155°C |
| 1812 | 200V | 500V | 500V | <50mΩ | 2A | 10A | -55°C~155°C |
| 2010 | 200V | 500V | 500V | <50mΩ | 2A | 10A | -55°C~155°C |
| 2512 | 200V | 500V | 500V | <50mΩ | 2A | 10A | -55°C~155°C |

8. Recommend the size of welding plate



| Type | Dimension(mm) | | | |
|-------|---------------|-----------|----------|-----------|
| | A | B | C | D |
| 01005 | 0.14±0.03 | 0.2±0.03 | 0.2±0.03 | 0.54±0.03 |
| 0201 | 0.25±0.05 | 0.35±0.05 | 0.4±0.05 | 1.0±0.05 |
| 0402 | 0.50±0.05 | 0.45±0.05 | 0.5±0.05 | 1.4±0.05 |
| 0603 | 0.9±0.05 | 0.65±0.05 | 0.8±0.05 | 2.1±0.05 |
| 0805 | 1.0±0.1 | 1.0±0.1 | 1.3±0.1 | 3.0±0.1 |
| 1206 | 2.0±0.1 | 1.1±0.1 | 1.6±0.1 | 4.2±0.1 |
| 1210 | 2.0±0.1 | 1.1±0.1 | 2.6±0.1 | 4.2±0.1 |
| 1812 | 3.2±0.1 | 1.4±0.1 | 3.3±0.1 | 5.8±0.1 |
| 2010 | 3.6±0.1 | 1.3±0.1 | 2.6±0.1 | 6.2±0.1 |
| 2512 | 5.0±0.1 | 1.6±0.1 | 3.3±0.1 | 8.2±0.1 |

9. Derating Curve

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55°C to 70°C. For temperature in excess of 70°C, the load shall be derated as shown in figure 1

Figure 1



Voltage rating:

Resistors shall have a rated direct-current (DC) continuous working

voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

$$RCWV = \sqrt{P \times R}$$

Where: RCWV commercial-line frequency and waveform (Volt.)

P = power rating (WATT.) R = nominal resistance (OHM)

In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value.

The overload voltage is 2.5 times RCWV or Max. Overload voltage whichever is less

| | | |
|-------------------------------|--------------------------------------|---|
| ◎ Rapid change of temperature | ±0.5%,±1%: ±(0.5%+0.05Ω) | 4.19 30 min at -55 °C and 30 min at 155°C; 100 cycles. |
| | ±2%,±5% : ±(1.0%+0.05Ω) | |
| | 01005: ±(1.0%+0.05Ω) | |
| ◎ Soldering heat | ±(1.0%+0.05Ω) | 4.18 Dip the resistor into a solder bath having a temperature of 260°C±5°C and hold it for 10±1 seconds. |
| Terminal bending | ±(1.0%+0.05Ω) | 4.33 Twist of test board: Y/X = 3/90 mm for 60Seconds |
| * Insulation resistance | ≥1,000 MΩ | 4.6 The measuring voltage shall be ,measured with a direct voltage of (100±15)V or a voltage equal to the dielectric withstanding voltage., and apply for 1min. |
| ◎ Humidity (steady state) | ±0.5%,±1%: ±(0.5%+0.05Ω) | 4.24 Temporary resistance change after 240 hours exposure in a humidity test chamber controlled at 40±2°C and 90-95% relative humidity, |
| | ±2%,±5% : ±(3.0%+0.05Ω) | |
| | 01005(-55°C~125°C): ±(2.0%+0.05Ω) | |
| ◎ *Load life in humidity | ±0.5%,±1% : ±(1.0%+0.05Ω) | 7.9 Resistance change after 1,000 hours (1.5 hours “ON”,0.5 hour “OFF”) at RCWV in a humidity chamber controlled at 40°C±2°C and 90 to 95% relative humidity. |
| | ±2%,±5% : ±(3.0%+0.05Ω) | |
| | 01005: ±(3.0%+0.05Ω) | |
| | * <50mΩ | Apply to rated current for 0Ω |
| ◎ *Load life | ±0.5%,±1%: ±(1.0%+0.05Ω) | 4.25.1 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle 1.5 hours “ON”, 0.5 hour “OFF” at 70°C±2°C ambient. |
| | ±2%,±5% : ±(3.0%+0.05Ω) | |
| | 01005: ±(3.0%+0.05Ω) | |
| | * <50MΩ | Apply to rated current for 0Ω |
| ◎ *Low Temperature Storage | ±0.5%,±1% : ±(1.0%+0.05Ω) | 4.23.4 Lower limit temperature , for 2H. |
| | ±2%,±5% : ±(3.0%+0.05Ω) | |
| | * <50mΩ | |
| | | Apply to rated current for 0Ω |
| ◎ *High Temperature Exposure | ±0.5%,±1%: ±(1.0%+0.05Ω) | 4.23.2 Upper limit temperature , for 16H. |
| | ±2%,±5% : ±(3.0%+0.05Ω) | |
| | 01005: ±(1.0%+0.05Ω) | |
| | * <50mΩ | 4.23.2 Upper limit temperature , for 1000H. |
| | | Apply to rated current for 0Ω |
| ◎ *Leaching | No visible damage | J-STD-002 Test D Samples completely immersed for 30 sec in solder bath at 260°C. |

The resistors of 0Ω only can do the characteristic noted of *

The resistors of 01005 & 0201 only can do the characteristic noted of ◎

12. Packing of Surface Mount Resistors

12.1 Dimension of Paper Taping :(Unit: mm)



| Type | A | B | C | $\begin{matrix} +0.1 \\ \Phi D \\ -0 \end{matrix}$ | E | F | G | W | T |
|-------|-----------|-----------|------|--|------|------|------|------|-----------|
| 01005 | 0.24±0.05 | 0.45±0.05 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.40±0.1 |
| 0201 | 0.40±0.05 | 0.70±0.05 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.42±0.1 |
| 0402 | 0.65±0.10 | 1.20±0.10 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.42±0.05 |



| Type | A ±0.2 | B ±0.2 | C ±0.05 | +0.1 ØD -0 | E ±0.1 | F ±0.05 | G ±0.1 | W ±0.2 | T ±0.1 |
|------|-----------|-----------|------------|------------------|-----------|------------|-----------|-----------|-----------|
| 0603 | 1.10 | 1.90 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.67 |
| 0805 | 1.65 | 2.40 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.81 |
| 1206 | 2.00 | 3.60 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.81 |
| 1210 | 2.80 | 3.50 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.75 |

12.2 Dimension of Embossed Taping: (Unit: mm)



| Type | A ±0.2 | B ±0.2 | C ±0.05 | +0.1 ØD -0 | +0.25 ØD1 -0 | E ±0.1 | F ±0.05 | G ±0.1 | W ±0.2 | T ±0.1 |
|------|-----------|-----------|------------|------------------|--------------------|-----------|------------|-----------|-----------|-----------|
| 2010 | 2.90 | 5.60 | 2.00 | 1.50 | 1.50 | 1.75 | 5.50 | 4.00 | 12.00 | 1.00 |
| 1812 | 3.50 | 4.80 | 2.00 | 1.50 | 1.50 | 1.75 | 5.50 | 4.00 | 12.00 | 1.00 |
| 2512 | 3.50 | 6.70 | 2.00 | 1.50 | 1.50 | 1.75 | 5.50 | 4.00 | 12.00 | 1.00 |

12.3 Dimension of Reel : (Unit: mm)



| Type | Taping | Qty/Reel | A ±0.5 | B ±0.5 | C ±0.5 | D ±1 | M ±2 | W ±1 |
|-------|----------|-----------|-----------|-----------|-----------|---------|---------|---------|
| 01005 | Paper | 20,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| 0201 | Paper | 15,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| 0402 | Paper | 10,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| 0603 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| 0805 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| 1206 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| 1210 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| 2010 | Embossed | 4,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 13.8 |
| 1812 | Embossed | 4,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 13.8 |
| 2512 | Embossed | 4,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 13.8 |

13. Note

- 13.1. UNI-ROYAL recommend the storage condition temperature: 15°C~35°C, humidity :25%~75%.
 (Put condition for individual product).Even under UNI-ROYAL recommended storage condition, solderability of products over 1 year old.
 (Put condition for each product) may be degraded.
- 13.2. Store / transport cartons in the correct direction, which is indicated on a carton as a symbol.
 Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.
- 13.3. Product performance and soldered connections may deteriorate if the products are stored in the following places:
- Storage in high Electrostatic.
 - Storage in direct sunshine 、rain and snow or condensation.
 - Where the products are exposed to sea winds or corrosive gases, including Cl₂, H₂S, NH₃, SO₂, NO₂.
- 13.4. The products are used in circuit board thickness greater than 1.6mm. If customers use less than the thickness of the circuit board that you should confirm with the company, in order to recommend a more suitable product.

14. Record

| Version | Description of amendment | Page | Date | Amended by | Checked by |
|---------|--|------|--------------|-------------|------------|
| 1 | First issue of this specification | 1~7 | Mar.20, 2018 | Chen Haiyan | Chen Nana |
| 2 | Modify 0201 packing quantity | 7 | May.24, 2018 | Chen Haiyan | Chen Nana |
| 3 | 1. Add 0603 code mark | 3~4 | Feb.12, 2019 | Chen Haiyan | Xu Yuhua |
| | 2. Modify the operating temperature of 01005 | 5 | | | |
| | 3. Modify the Performance Specification | 6~7 | | | |

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