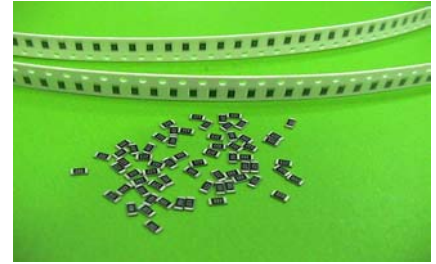


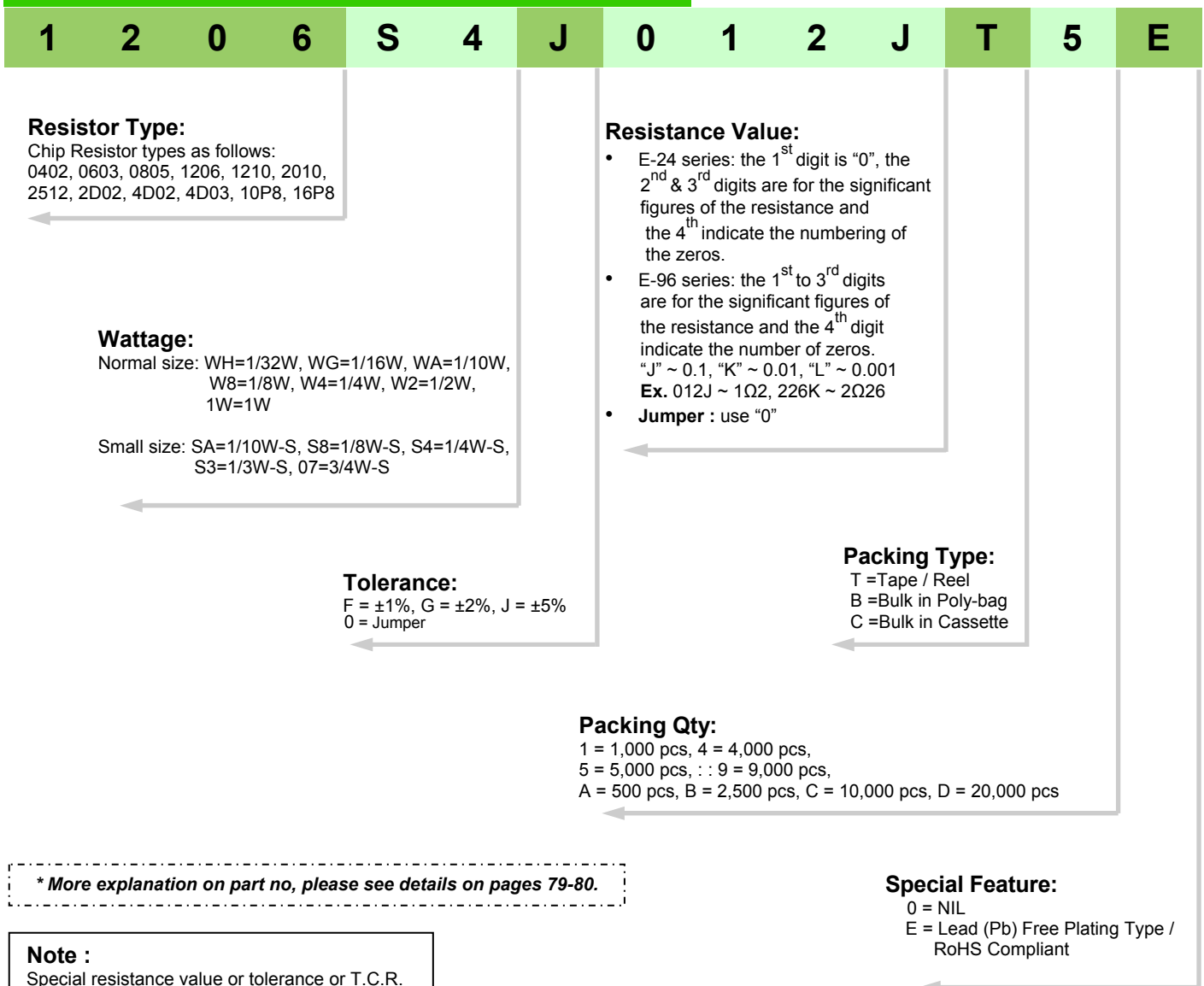
THICK FILM CHIP RESISTORS

Features

- Small size and lightweight
- Suitable for both flow and reflow soldering
- Reduction of assembly costs and matching with placement machines

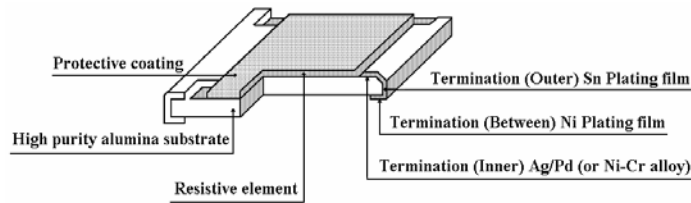


Ordering Procedure: (Ex.: 1206, 1/4W-S, 5%, 1.2Ω, T/R-5000)

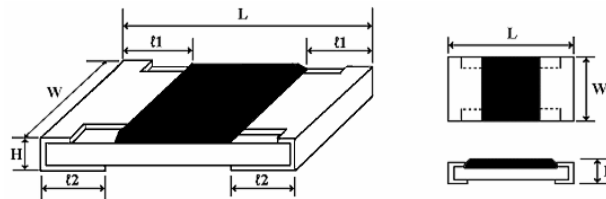


THICK FILM CHIP RESISTORS

Construction

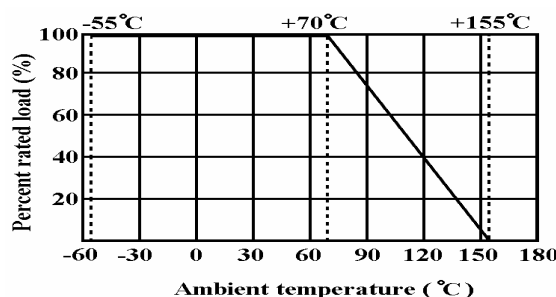


Power Rating & Dimension



| Type | Power Rating at 70°C | Max Working Voltage | Max Overload Voltage | Operating Temp. (°C) | Tolerance % | Resistance Range | Standard Series | Dimension (mm) | | | | |
|------|----------------------|---------------------|----------------------|----------------------|----------------|--|----------------------|----------------|------------------------|-----------|-----------|-----------|
| | | | | | | | | L | W | H | ℓ1 | ℓ2 |
| 0402 | 1/16W | 1A | 2A | -55~+155 | Jumper | <50 m Ω | E-96 E-24 E-24 | 1.00±0.10 | 0.50±0.05 | 0.35±0.05 | 0.20±0.10 | 0.25±0.10 |
| | | 50V | 100V | | ±1 ±2 ±5 | 10 Ω -1M Ω 1 Ω -10M Ω 1 Ω -10M Ω | | | | | | |
| 0603 | 1/10W-S 1/16W | 1A | 2A | -55~+155 | Jumper | <50 m Ω | E-96 E-24 E-24 | 1.60±0.10 | 0.80 +0.15 -0.10 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 |
| | | 50V | 100V | | ±1 ±2 ±5 | 10 Ω -1M Ω 1 Ω -10M Ω 1 Ω -10M Ω | | | | | | |
| 0805 | 1/8W-S 1/10W | 2A | 4A | -55~+155 | Jumper | <50 m Ω | E-96 E-24 E-24 | 2.00±0.15 | 1.25 +0.15 -0.10 | 0.55±0.10 | 0.40±0.20 | 0.40±0.20 |
| | | 150V | 300V | | ±1 ±2 ±5 | 10 Ω -1M Ω 1 Ω -10M Ω 1 Ω -10M Ω | | | | | | |
| 1206 | 1/4W-S 1/8W | 2A | 4A | -55~+155 | Jumper | <50 m Ω | E-96 E-24 E-24 | 3.10±0.15 | 1.55 +0.15 -0.10 | 0.55±0.10 | 0.45±0.20 | 0.45±0.20 |
| | | 200V | 400V | | ±1 ±2 ±5 | 10 Ω -1M Ω 1 Ω -10M Ω 1 Ω -10M Ω | | | | | | |
| 1210 | 1/3W-S 1/4W | 2A | 4A | -55~+155 | Jumper | <50 m Ω | E-96 E-24 E-24 | 3.10±0.10 | 2.60±0.15 | 0.55±0.10 | 0.50±0.25 | 0.50±0.20 |
| | | 200V | 400V | | ±1 ±2 ±5 | 10 Ω -1M Ω 1 Ω -10M Ω 1 Ω -10M Ω | | | | | | |
| 2010 | 3/4W-S 1/2W | 2A | 4A | -55~+155 | Jumper | <50 m Ω | E-96 E-24 E-24 | 5.00±0.10 | 2.50±0.15 | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 |
| | | 200V | 400V | | ±1 ±2 ±5 | 10 Ω -1M Ω 1 Ω -10M Ω 1 Ω -10M Ω | | | | | | |
| 2512 | 1W | 2.5A | 5A | -55~+155 | Jumper | <50 m Ω | E-96 E-24 E-24 | 6.35±0.10 | 3.20±0.15 | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 |
| | | 200V | 400V | | ±1 ±2 ±5 | 10Ω-1M Ω 1Ω-10M Ω 1Ω-10M Ω | | | | | | |

Derating Curve



THICK FILM CHIP RESISTORS

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)

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

Marking on the Resistors Body:

- For 0402 size, no marking on the body due to the small size of the resistor.
- ±5% tolerance product. (Including resistance values less than 1Ω; both 1% and 5%) The marking is 3 digits, the first 2 digits are the significant figures of the resistance and the 3rd digit denotes number of zeros.

153 = 15000Ω = 15KΩ; 120 = 12Ω

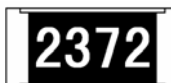
Below 10Ω shown as this: 6R8 = 6.8Ω



- 1% tolerance marking of case size 0805 and bigger is 4 digits, the first 3 digits are the significant figures of the resistance and the 4th digit denotes number of zeros.

2372 = 23700Ω = 23.7KΩ; 1430 = 143Ω

Below 10Ω shown as this: 3R24 = 3.24Ω



THICK FILM CHIP RESISTORS

- Standard E-96 series values ($\pm 1\%$ tolerance) of 0603 size. 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 Multiplier code & Standard E-96 Series Resistance Value Code as shown on Page 6.

$$1.96\text{K}\Omega = 196 \times 10^1 \Omega = \mathbf{29B}$$



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



- Standard E-24 series values which does not belong to E-96 series values ($\pm 1\%$ tolerance) of 0603 size. The marking is the same as 5% tolerance but mark with underline.

$$\underline{\mathbf{122}} = 1200 = 1.2\text{K}\Omega$$



$$\underline{\mathbf{680}} = 68\Omega$$



Performance Specifications

| | |
|--|---|
| Temperature coefficient | $\pm 5\%$: $1\Omega \sim 10\text{M}\Omega \leq \pm 200\text{PPM}/^\circ\text{C}$ $\pm 1\%$: $10\Omega \sim 100\Omega \leq \pm 200\text{PPM}/^\circ\text{C}$; $101\Omega \sim 1\text{M}\Omega \leq \pm 100\text{PPM}/^\circ\text{C}$ |
| Short-time overload | $\pm 5\%$: $\pm(2.0\% + 0.1\Omega)$ Max. $\pm 1\%$: $\pm(1.0\% + 0.1\Omega)$ Max. |
| Insulation resistance | Min. 1,000 Mega Ohm |
| Dielectric withstanding voltage | No evidence of flashover, mechanical damage, arcing or insulation breakdown |
| Terminal bending | $\pm(1.0\% + 0.05\Omega)$ Max. |
| Soldering heat | $\pm(1.0\% + 0.05\Omega)$ Max. |
| Solderability | Min. 95% coverage |
| Temperature cycling | $\pm 5\%$: $\pm(1.0\% + 0.05\Omega)$ Max. $\pm 1\%$: $\pm(0.5\% + 0.05\Omega)$ Max. |
| Humidity (Steady state) | $\pm 5\%$: $\pm(3.0\% + 0.1\Omega)$ Max. $\pm 1\%$: $\pm(0.5\% + 0.1\Omega)$ Max. |
| Load life in humidity | $\pm 5\%$: $\pm(3.0\% + 0.1\Omega)$ Max. $\pm 1\%$: $\pm(1.0\% + 0.1\Omega)$ Max. |
| Load life | $\pm 5\%$: $\pm(3.0\% + 0.1\Omega)$ Max. $\pm 1\%$: $\pm(1.0\% + 0.1\Omega)$ Max. |

* The values which are not of standard E-24 series (2% & 5%) and not of E-96 series (1%) could be offered on a case to case basis.

* More details, please see pages 77-78.

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