

Thick Film Chip Resistors



Features:

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

Performance Specifications:

| | |
|---------------------------------|---|
| Temperature coefficient | : $\pm 5\%$: $1\Omega \sim 10\Omega \leq \pm 200\text{PPM}/^\circ\text{C}$ $\pm 1\%$: $10\Omega \sim 100\Omega \leq \pm 200\text{PPM}/^\circ\text{C}$; $101\Omega \sim 1\text{M}\Omega \leq \pm 100\text{PPM}/^\circ\text{C}$. |
| Short-time overload | : $\pm 5\%$: $\pm(2.0\% + 0.1\Omega)$ Maximum $\pm 1\%$: $\pm(1.0\% + 0.1\Omega)$ Maximum. |
| Minimum Insulation resistance | : 1000 Megaohm. |
| Dielectric withstanding voltage | : No evidence of flashover, mechanical damage, arcing or insulation breakdown. |
| Terminal bending | : $\pm(1.0\% + 0.05\Omega)$ Maximum . |
| Soldering heat | : $\pm(1.0\% + 0.05\Omega)$ Maximum. |
| Minimum solderability | : 95% coverage. |
| Temperature cycling | : $\pm 5\%$: $\pm(1.0\% + 0.05\Omega)$ Maximum $\pm 1\%$: $\pm(0.5\% + 0.05\Omega)$ Maximum. |
| Humidity (Steady state) | : $\pm 5\%$: $\pm(3.0\% + 0.1\Omega)$ Maximum $\pm 1\%$: $\pm(0.5\% + 0.1\Omega)$ Maximum. |
| Load life in humidity | : $\pm 5\%$: $\pm(3.0\% + 0.1\Omega)$ Maximum $\pm 1\%$: $\pm(1.0\% + 0.1\Omega)$ Maximum. |
| Load life | : $\pm 5\%$: $\pm(3.0\% + 0.1\Omega)$ Maximum $\pm 1\%$: $\pm(1.0\% + 0.1\Omega)$ Maximum. |

*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.

Specification Table

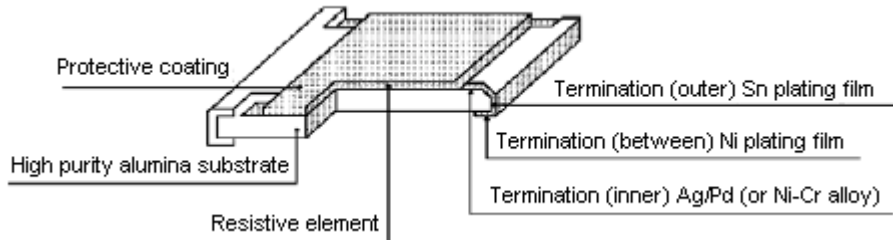
| Type | Power Rating at 70°C (W) | Maximum Working Voltage (V) | Maximum Overload Voltage (V) | Operating Temperature (°C) | Tolerance (%) | Resistance Range | Standard Series |
|------|--------------------------|-----------------------------|------------------------------|----------------------------|----------------|-------------------------------------|-------------------|
| 0402 | 1/16 | 1A | 2A | -55 to +155 | Jumper | <50mΩ | E96 E24 E24 |
| | | 50 | 100 | | ±1 ±2 ±5 | 10Ω - 1MΩ 1Ω - 10MΩ 1Ω - 10MΩ | |



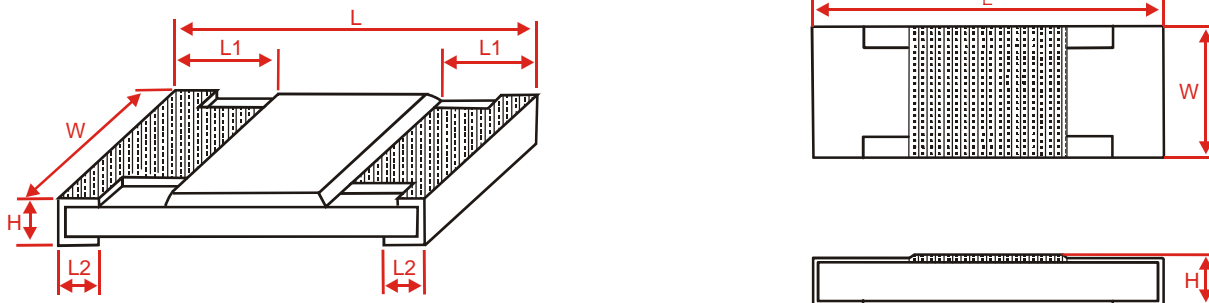
Thick Film Chip Resistors



Construction:



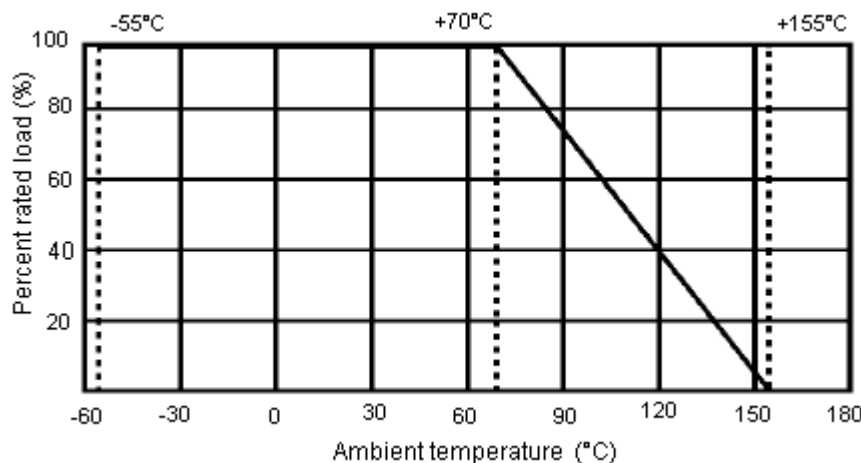
Power Rating and Dimension:



| Series | Dimension | | | | |
|--------|-----------------------|----------------------|-----------------------|------------------------|------------------------|
| | Length (L) ± 0.10 | Width (W) ± 0.05 | Height (H) ± 0.05 | Length (L1) ± 0.10 | Length (L2) ± 0.10 |
| 0402 | 1.00 | 0.50 | 0.35 | 0.20 | 0.25 |

Dimensions : Millimetres

Derating Curve



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Marking on the Resistors Body

- For 0402 size, no marking on the body due to the small size of resistor.
- $\pm 5\%$ 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 = $15000\Omega = 15K\Omega$; 120 = 12Ω

Below 10Ω shown as this: 6R8 = 6.8Ω

| | | |
|--|-----|--|
| | 153 | |
|--|-----|--|

| | | |
|--|-----|--|
| | 6R8 | |
|--|-----|--|

Resistance Preferred Value Range

| E6 | E12 | E24 | E96 | E6 | E12 | E24 | E96 | E6 | E12 | E24 | E96 |
|----|-----|-----|------|----|-----|-----|------|----|-----|-----|------|
| 10 | 10 | 10 | 10.0 | | | | 21.5 | | | | 46.4 |
| | | | 10.2 | 22 | 22 | 22 | 22.1 | 47 | 47 | 47 | 47.5 |
| | | | 10.5 | | | | 22.6 | | | | 48.7 |
| | | | 10.7 | | | | 23.2 | | | | 49.9 |
| | | 11 | 11.0 | | | | 23.7 | | | 51 | 51.1 |
| | | | 11.3 | | | 24 | 24.3 | | | | 52.3 |
| | | | 11.5 | | | | 24.9 | | | | 53.6 |
| | | | 11.8 | | | | 25.5 | | | | 54.9 |
| | 12 | 12 | 12.1 | | | | 26.1 | | 56 | 56 | 56.2 |
| | | | 12.4 | | | | 27.7 | | | | 57.6 |
| | | | 12.7 | | | 27 | 27.4 | | | | 59.0 |
| | | 13 | 13.0 | | | | 28.0 | | | | 60.4 |
| | | | 13.3 | | | | 28.7 | | | 62 | 61.9 |
| | | | 13.7 | | | | 29.4 | | | | 63.4 |
| | | | 14.0 | | | 30 | 30.1 | | | | 64.9 |
| | | | 14.3 | | | | 30.9 | | | | 66.5 |
| | | | 14.7 | | | | 31.6 | 68 | 68 | 68 | 68.1 |
| 15 | 15 | 15 | 15.0 | | | | 32.4 | | | | 69.8 |
| | | | 15.4 | 33 | 33 | 33 | 33.2 | | | | 71.5 |
| | | | 15.8 | | | | 34.0 | | | | 73.2 |
| | | 16 | 16.2 | | | | 34.8 | | | 75 | 75.0 |
| | | | 16.5 | | | | 35.7 | | | | 76.8 |
| | | | 16.9 | | | 36 | 36.5 | | | | 78.7 |
| | | | 17.4 | | | | 37.4 | | | | 80.6 |
| | | | 17.8 | | | | 38.3 | | 82 | 82 | 82.5 |
| | 18 | 18 | 18.2 | | 39 | 39 | 39.2 | | | | 84.5 |
| | | | 18.7 | | | | 40.2 | | | | 86.6 |
| | | | 19.1 | | | | 41.2 | | | | 88.7 |
| | | | 19.6 | | | | 42.2 | | | 91 | 90.9 |
| | | 20 | 20.0 | | | 43 | 43.2 | | | | 93.1 |
| | | | 20.5 | | | | 44.2 | | | | 95.3 |
| | | | 21.0 | | | | 45.3 | | | | 97.6 |

Above values in accordance with IEC Publication 63 (1963) and BS2488



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Part Number Table

| Resistance Value | Part Number |
|------------------|----------------|
| 0R | 0402WGF0000TCE |
| 1R5 | 0402WGF150KTCE |
| 2R2 | 0402WGF220KTCE |
| 3R3 | 0402WGF330KTCE |
| 4R7 | 0402WGF470KTCE |
| 6R8 | 0402WGF680KTCE |
| 10R | 0402WGF100JTCE |
| 11R | 0402WGF110JTCE |
| 12R | 0402WGF120JTCE |
| 13R | 0402WGF130JTCE |
| 15R | 0402WGF150JTCE |
| 16R | 0402WGF160JTCE |
| 18R | 0402WGF180JTCE |
| 20R | 0402WGF200JTCE |
| 22R | 0402WGF220JTCE |
| 24R | 0402WGF240JTCE |
| 27R | 0402WGF270JTCE |
| 30R | 0402WGF300JTCE |
| 33R | 0402WGF330JTCE |
| 36R | 0402WGF360JTCE |
| 39R | 0402WGF390JTCE |
| 43R | 0402WGF430JTCE |
| 47R | 0402WGF470JTCE |
| 51R | 0402WGF510JTCE |
| 56R | 0402WGF560JTCE |
| 62R | 0402WGF620JTCE |
| 68R | 0402WGF680JTCE |
| 75R | 0402WGF750JTCE |
| 82R | 0402WGF820JTCE |
| 91R | 0402WGF910JTCE |
| 100R | 0402WGF1000TCE |



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Part Number Table

| Resistance Value | Part Number |
|------------------|----------------|
| 110R | 0402WGF1100TCE |
| 120R | 0402WGF1200TCE |
| 130R | 0402WGF1300TCE |
| 150R | 0402WGF1500TCE |
| 160R | 0402WGF1600TCE |
| 180R | 0402WGF1800TCE |
| 200R | 0402WGF2000TCE |
| 220R | 0402WGF2200TCE |
| 240R | 0402WGF2400TCE |
| 270R | 0402WGF2700TCE |
| 300R | 0402WGF3000TCE |
| 330R | 0402WGF3300TCE |
| 360R | 0402WGF3600TCE |
| 390R | 0402WGF3900TCE |
| 430R | 0402WGF4300TCE |
| 470R | 0402WGF4700TCE |
| 510R | 0402WGF5100TCE |
| 560R | 0402WGF5600TCE |
| 620R | 0402WGF6200TCE |
| 680R | 0402WGF6800TCE |
| 750R | 0402WGF7500TCE |
| 820R | 0402WGF8200TCE |
| 910R | 0402WGF9100TCE |
| 1K | 0402WGF1001TCE |
| 1K1 | 0402WGF1101TCE |
| 1K2 | 0402WGF1201TCE |
| 1K3 | 0402WGF1301TCE |
| 1K5 | 0402WGF1501TCE |
| 1K6 | 0402WGF1601TCE |
| 1K8 | 0402WGF1801TCE |
| 2K | 0402WGF2001TCE |



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Part Number Table

| Resistance Value | Part Number |
|------------------|----------------|
| 2K2 | 0402WGF2201TCE |
| 2K4 | 0402WGF2401TCE |
| 2K7 | 0402WGF2701TCE |
| 3K | 0402WGF3001TCE |
| 3K3 | 0402WGF3301TCE |
| 3K6 | 0402WGF3601TCE |
| 3K9 | 0402WGF3901TCE |
| 4K3 | 0402WGF4301TCE |
| 4K7 | 0402WGF4701TCE |
| 5K1 | 0402WGF5101TCE |
| 5K6 | 0402WGF5601TCE |
| 6K2 | 0402WGF6201TCE |
| 6K8 | 0402WGF6801TCE |
| 7K5 | 0402WGF7501TCE |
| 8K2 | 0402WGF8201TCE |
| 9K1 | 0402WGF9101TCE |
| 10K | 0402WGF1002TCE |
| 11K | 0402WGF1102TCE |
| 12K | 0402WGF1202TCE |
| 13K | 0402WGF1302TCE |
| 15K | 0402WGF1502TCE |
| 16K | 0402WGF1602TCE |
| 18K | 0402WGF1802TCE |
| 20K | 0402WGF2002TCE |
| 22K | 0402WGF2202TCE |
| 24K | 0402WGF2402TCE |
| 27K | 0402WGF2702TCE |
| 30K | 0402WGF3002TCE |
| 33K | 0402WGF3302TCE |
| 36K | 0402WGF3602TCE |
| 39K | 0402WGF3902TCE |



Thick Film Chip Resistors



Part Number Table

| Resistance Value | Part Number |
|------------------|----------------|
| 43K | 0402WGF4302TCE |
| 47K | 0402WGF4702TCE |
| 51K | 0402WGF5102TCE |
| 56K | 0402WGF5602TCE |
| 62K | 0402WGF6202TCE |
| 68K | 0402WGF6802TCE |
| 75K | 0402WGF7502TCE |
| 82K | 0402WGF8202TCE |
| 91K | 0402WGF9102TCE |
| 100K | 0402WGF1003TCE |
| 110K | 0402WGF1103TCE |
| 120K | 0402WGF1203TCE |
| 130K | 0402WGF1303TCE |
| 150K | 0402WGF1503TCE |
| 160K | 0402WGF1603TCE |
| 180K | 0402WGF1803TCE |
| 200K | 0402WGF2003TCE |
| 220K | 0402WGF2203TCE |
| 240K | 0402WGF2403TCE |
| 270K | 0402WGF2703TCE |
| 300K | 0402WGF3003TCE |
| 330K | 0402WGF3303TCE |
| 360K | 0402WGF3603TCE |
| 390K | 0402WGF3903TCE |
| 430K | 0402WGF4303TCE |
| 470K | 0402WGF4703TCE |
| 510K | 0402WGF5103TCE |
| 560K | 0402WGF5603TCE |
| 620K | 0402WGF6203TCE |
| 680K | 0402WGF6803TCE |
| 750K | 0402WGF7503TCE |
| 820K | 0402WGF8203TCE |
| 910K | 0402WGF9103TCE |
| 1M | 0402WGF1004TCE |



Thick Film Chip Resistors



Multiplier Code (for 0402 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 0402 1% Marking)

| Value | Code | Value | Code | Value | Code | Value | Code | 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 | - | - |

Stocked Values

| Tolerance | Wattage | Preferred Value Range | Range Value |
|-----------|---------|-----------------------|-------------|
| 1% | 0.06W | E96 | 0R - 1M |
| 1% | 0.1W | E24 | 0R - 1M |
| 1% | 0.125W | E24 | 0R - 1M |



















Thick Film Chip Resistors



Notes:

International Sales Offices:

| | | | | | | | |
|--|---|---|---|---|--|---|---|
|  | AUSTRALIA - Farnell Tel No: ++61 1300 361 005 Fax No: ++61 1300 361 225 |  | FINLAND - Farnell Tel No: ++ 358 9 560 7780 Fax No: ++ 358 9 345 5411 |  | ITALY - Farnell Tel No: ++ 39 02 93 995 200 Fax No: ++ 39 02 93 995 300 |  | SPAIN - Farnell Tel No: 901 20 20 80 Fax No: 901 20 20 90 |
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