

“Fixed Chip Resistors” manufactured for more compact electronic components and automatic mounting system.

These Chip Resistors have electrical stability and mechanical stress due to used reliable metal glazed paste printed on Alumina substrate. Resistors will reduce your cost and save developmental time.

FEATURES

1. Very small, thin and light weight.
2. Both flow soldering and reflow soldering are applicable.
3. Owing to the reduced lead inductance, the high frequency characteristic is excellent.
4. Suitable size and packaging for surface mount assembly.

PART NUMBERING

(EX) 0805 5% 10ohm

| | | | | |
|-----------|-----------|----------|------------|-----------|
| RM | 10 | J | 100 | CT |
| 1 | 2 | 3 | 4 | 5 |

1. Code Designation: Thick Film Chip Resistors

2. Dimensions: RM02 0.6x0.3mm; RM04 1.0x0.5mm;
 RM06 1.6x.8mm; RM10 2.0x1.25mm;
 RM12 3.2x1.6mm; RM14 3.2x2.65mm;
 RM20 5.0x2.5mm; RM25 6.3x3.1mm

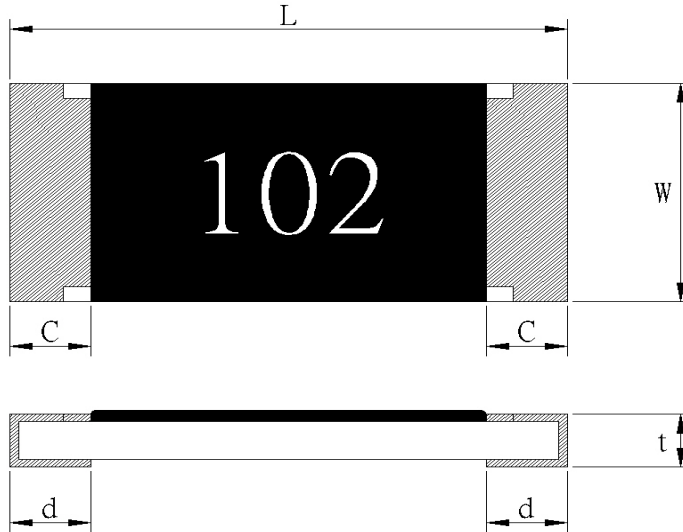
3. Resistance Tolerance: F: ±1%; J: ±5%

4. Nominal Resistance: 5% - 3 Digit
 1st 2 significant 3rd
 is multiplier (10x)
 000 = jumper “0” ohm
 1% - 4 digit
 1st 3 significant
 4th multiplier (10x)

5. Packaging: CT = Tape and reel*

*Note: Calchip has completed the Lead-Free transition. All parts shipped with or without the "custom designator" LF at the end of the part number will be Lead-Free. Lead-Free material will still continue to have an LF at the end of the Lot Code and a green RoHS symbol on the label. Please contact your sales associate if you require non-RoHS material.

Dimensions:



UNIT: mm

| Type | L | W | C | d | t |
|------|-----------|-----------|-----------|------------|------------|
| RM02 | 0.6 ±0.03 | 0.3 ±0.03 | 0.1 ±0.05 | 0.15 ±0.05 | 0.25 ±0.05 |

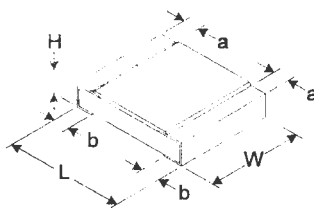
Ratings & Characteristics :

| Type | Power Rating at 70°C | Rated Voltage | Max. Working Voltage | Max. Over- Load Voltage | T.C.R (PPM/°C) | Resistance Range(Ω) | | |
|------|----------------------|---------------|----------------------|-------------------------|----------------|---------------------|-------------|-------------|
| | | | | | | F(±1%) E-96 | G(±2%) E-24 | J(±5%) E-24 |
| RM02 | 1/20W | Refer 5.2 | 25V | 50V | ±200 | 10Ω-1MΩ | 10Ω-1MΩ | 10Ω-10MΩ |
| | | | | | +600 -200 | | | 1-9.1Ω |

0Ω THICK FILM CHIP RESISTORS

| Type | Rated Current | Max Overload Current | Resistance Range |
|------|---------------|----------------------|------------------|
| RM02 | 0.5 | 1 | 50mΩ MAX |

Operating Temp(°C): : -55°C ~ +125°C



PERFORMANCE CHARACTERISTICS (Tested per MIL-STD-202 Oper. Temp. -55c ~ 125c)

| Type | Package Size | Power Rating (Watts) | Maximum Working Voltage | Maximum Overload Voltage | Resistance Temperature Coefficient | Resistance Range | Tolerance | Current Rating of Jumper ³ |
|------|--------------|----------------------|-------------------------|--------------------------|--|---|-------------------------------|---------------------------------------|
| RM04 | 0402 | 1/16 @ 70°C | 50V | 100V | ±500ppm/°C ±200ppm/°C ±200ppm/°C | .1Ω - 9.1Ω 10Ω - 10 M 10Ω - 1 M | ±5% / 1% ±5% ±1% | 1A max. |
| RM06 | 0603 | 1/10 @ 70°C | 50V | 100V | ±400ppm/°C ±200ppm/°C ±200ppm/°C ±100ppm/°C | .1Ω - 9.1Ω 1 M - 10 M 10Ω - 10 M 10Ω - 1 M | ±5% / 1% ±1% ±5% ±1% | 1A max. |
| RM10 | 0805 | 1/8 @ 70°C | 150V | 300V | ±400ppm/°C ±200ppm/°C ±200ppm/°C ±100ppm/°C | .1Ω - 9.1Ω 1 M - 10 M 10Ω - 20 M 10Ω - 1 M | ±5% / 1% ±1% ±5% ±1% | 2A max. |
| RM12 | 1206 | 1/4 @ 70°C | 200V | 400V | ±400ppm/°C ±200ppm/°C ±200ppm/°C ±100ppm/°C | .1Ω - 9.1Ω 1 M - 10 M 10Ω - 20 M 10Ω - 1 M | ±5% / 1% ±1% ±5% ±1% | 2A max. |
| RM14 | 1210 | 1/3 @ 70°C | 200V | 400V | ±400ppm/°C ±200ppm/°C ±200ppm/°C ±100ppm/°C | .1Ω - 9.1Ω 1 M - 10 M 10Ω - 10 M 10Ω - 1 M | ±5% / 1% ±1% ±5% ±1% | 3A max. |
| RM20 | 2010 | 1/2 @ 70°C | 200V | 400V | ±400ppm/°C ±200ppm/°C ±100ppm/°C | .1Ω - 9.1Ω 10Ω - 10 M 10Ω - 1 M | ±5% / 1% ±5% ±1% | 3A max. |
| RM25 | 2512 | 1 @ 70°C | 200V | 400V | ±400ppm/°C ±200ppm/°C ±100ppm/°C | .1Ω - 9.1Ω 10Ω - 10 M 10Ω - 1 M | ±5% / 1% ±5% ±1% | 3A max. |

DIMENSIONS

Inches (mm)

| Type | Body Length (L) | Body Width (W) | Body Height (H) | Top Terminator (a) | Bottom Terminator (b) |
|------|-----------------------------------|------------------------------------|------------------------------------|-----------------------|------------------------------------|
| RM04 | 0.39±.004/-0.002 (1.0±0.10/-0.05) | .020±.004/-0.002 (0.50±.10/-0.05) | .014±.002 (0.35±0.05) | .008±.004 (0.20±0.10) | .010±.008/-0.004 (0.25±0.20/-0.10) |
| RM06 | .063±.004 (1.60±0.10) | .031±.006/-0.002 (0.80±0.15/-0.05) | .018±.004 (0.45±0.10) | .010±.004 (0.25±0.10) | .012±.008/-0.004 (0.30±0.20/-0.10) |
| RM10 | .078±.008 (2.00±0.20) | .049±.008 (1.25±0.20) | .018±.004 (0.45±0.15) | .016±.008 (0.40±0.20) | .012±.008/-0.004 (0.30±0.20/-0.10) |
| RM12 | .122±.004 (3.10±0.10) | .061±.004 (1.55±0.10) | .021±.004/-0.002 (0.55±0.10/-0.05) | .018±.008 (0.45±0.20) | .012±.008/-0.004 (0.30±0.20/-0.10) |
| RM14 | .122±.004 (3.10±0.10) | .100±.004 (2.55±0.10) | .021±.004/-0.002 (0.55±0.10/-0.05) | .018±.008 (0.45±0.20) | .012±.008/-0.004 (0.30±0.20/-0.10) |
| RM20 | .197±.008 (5.00±0.20) | .098±.008 (2.50±0.20) | .021±.004 (0.55±0.10) | .020±.008 (0.50±0.20) | .020±.008 (0.50±0.20) |
| RM25 | .248±.008 (6.30±0.20) | .124±.008 (3.15±0.20) | .021±.004 (0.55±0.10) | .020±.008 (0.50±0.20) | .020±.008 (0.50±0.20) |

NOTES

1. RM04 J & F are not marked
2. Zero Ohm (0.05 max.) jumper available in all sizes
3. EIA, E24 and E96 resistance ranges apply
4. Higher and lower values available. Consult Factory.

Thick Film Chip Resistors

MARKING



Resistance value in three digit designation system is marked on the glasscoat. Illustrated is a resistor of 15KΩ. Four digit resistance designation system is applied to RM12 and E-96 Series. For example, 1502 designated 15KΩ. (The last digit specifies the number of zeros.)

- For E-24 Series ($\pm 5\%$ -J and $\pm 10\%$ -K Tolerances)
In 0603, 0805, 1206, 1210, 2010 and 2512 sizes:
3 DIGIT SYSTEM - First two digits are significant and third digit is multiplier, "R" indicates decimal on values under 10 ohms.
Examples: 100 = 10 ohms 102 = 1k ohms
470 = 47 ohm 103 = 10k ohms
101 = 100 ohms 104 = 100k ohms
105 = 1 megohms

- For E-96 Series ($\pm 1\%$ -F Tolerance)
In 0805, 1206, and 1210 sizes:
4 DIGIT SYSTEM - First three digits are significant and fourth digit is multiplier, "R" indicates decimal on values under 10 ohms.
Examples: 10R0 = 10 ohms 1003 = 100k ohms
1000 = 100 ohms 1004 = 1 megohms
1001 = 1k ohms 1052 = 10.5k ohms
1002 = 10k ohms 2213 = 221k ohms

- For E-96 Series ($\pm 1\%$ -F Tolerance) in 0603 size
3 DIGIT SYSTEM (Due to space restrictions)

| E-24 | | | E-96 | | | | | |
|-------|-------|------|-------|------|-------|------|-------|------|
| Value | Value | Code | Value | Code | Value | Code | Value | Code |
| 100 | 100 | 01 | 102 | 02 | 105 | 03 | 107 | 04 |
| 110 | 110 | 05 | 113 | 06 | 115 | 07 | 118 | 08 |
| 120 | 121 | 09 | 124 | 10 | 127 | 11 | 130 | 12 |
| 130 | 133 | 13 | 137 | 14 | 140 | 15 | 143 | 16 |
| 150 | 147 | 17 | 150 | 18 | 154 | 19 | 158 | 20 |
| 160 | 162 | 21 | 165 | 22 | 169 | 23 | 174 | 24 |
| 180 | 178 | 25 | 182 | 26 | 187 | 27 | 191 | 28 |
| 200 | 196 | 29 | 200 | 30 | 205 | 31 | 210 | 32 |
| 220 | 215 | 33 | 221 | 34 | 226 | 35 | 232 | 36 |
| 240 | 237 | 37 | 243 | 38 | 249 | 39 | 255 | 40 |
| 270 | 261 | 41 | 267 | 42 | 274 | 43 | 280 | 44 |
| 300 | 287 | 45 | 294 | 46 | 301 | 47 | 309 | 48 |
| 330 | 316 | 49 | 324 | 50 | 332 | 51 | 340 | 52 |
| 360 | 348 | 53 | 357 | 54 | 365 | 55 | 374 | 56 |
| 390 | 383 | 57 | 392 | 58 | 402 | 59 | 412 | 60 |
| 430 | 422 | 61 | 432 | 62 | 442 | 63 | 453 | 64 |
| 470 | 464 | 65 | 475 | 66 | 487 | 67 | 499 | 68 |
| 510 | 511 | 69 | 523 | 70 | 536 | 71 | 549 | 72 |
| 560 | 562 | 73 | 576 | 74 | 590 | 75 | 604 | 76 |
| 620 | 619 | 77 | 634 | 78 | 649 | 79 | 665 | 80 |
| 680 | 681 | 81 | 698 | 82 | 715 | 83 | 732 | 84 |
| 750 | 750 | 85 | 768 | 86 | 787 | 87 | 806 | 88 |
| 820 | 825 | 89 | 845 | 90 | 866 | 91 | 887 | 92 |
| 910 | 909 | 93 | 931 | 94 | 953 | 95 | 976 | 96 |

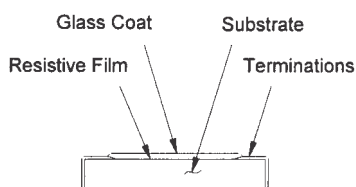
*For 1%, a 3-digit alpha-numeric marking system is used as follows.

| A | B | C | D | E | F | X |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| 10 ⁰ | 10 ¹ | 10 ² | 10 ³ | 10 ⁴ | 10 ⁵ | 10 ⁻¹ |

PERFORMANCE CHARACTERISTICS

| ITEMS | SPECIFICATIONS, REQUIREMENT | TESTED PER EIA J-RC-2690A | TYPICAL | |
|------------------------------------|--|--|---------------------------|--------------------|
| Moisture Resistance, Thermal Shock | $\pm(1\%+0.05\Omega)$, No Mechanical Damage | -55°C to +125°C, 5 cycles | Within $\pm 0.2\%$ | |
| Low Temperature Exposure | $\pm(3\%+0.1\Omega)$, No Mechanical Damage | -55°C, 1,000 Hours | Within $\pm 0.5\%$ | |
| Load Life | <1 meg $\pm(3\%+0.1\Omega)$, ≥ 1 meg $\pm 5\%$ | 70°C, rated voltage, 1.5hr on/0.5hr off, 1,000 hrs | See Graph | |
| Load Life in Moisture | <1 meg $\pm(3\%+0.1\Omega)$, ≥ 1 meg $\pm 5\%$ | 40°C, 95% R.H., 1.5hr on/0.5hr off, 1,000 hrs | See Graph | |
| Vibration | $\pm(1\%+0.05\Omega)$, No Mechanical Damage | 10-55 Hz, 3 direction, each 2 hours | Within $\pm 0.1\%$ | |
| Resistance to Soldering Heat | $\pm(1\%+0.05\Omega)$, No Mechanical Damage | 270°C, 10 seconds | See Graph | |
| Solderability | min. 95% coverage | 230°C, 3 seconds, flux applied ¹ | More than 97% | |
| Heat Resistance | Adhesion Curing | $\pm(1\%+0.05\Omega)$ | +150°C, 10 minutes | Within $\pm 0.3\%$ |
| | Dry Heat | $\pm(3\%+0.1\Omega)$, No Mechanical Damage | -125°C, 1,000 hours | Within $\pm 0.5\%$ |
| Terminal Strength | Pull | $\pm(1\%+0.05\Omega)$, No Mechanical Damage | 500G load, 30 seconds | Within $\pm 0.2\%$ |
| | Board Bending | $\pm(1\%+0.05\Omega)$, No Mechanical Damage | 1/45mm bend, 10 seconds | Within $\pm 0.2\%$ |
| Dielectric Withstanding Voltage | No Insulation Breakdown | 500V, 1 minute | Above 900V | |
| Short Time Overload | $\pm(1\%+0.05\Omega)$, No Evidence of Arc | 2 1/2 times rated voltage, 5 seconds | Within $\pm 0.4\%$ | |
| Insulation Resistance | 1,000 meg minimum | 500V, 1 minute | Above 10 ⁶ meg | |
| Voltage Coefficient | +0/-100ppm/V (above 1K \pm) | Rated Voltage & 1/10 times rated voltage | Within -90ppm/V | |

MATERIALS



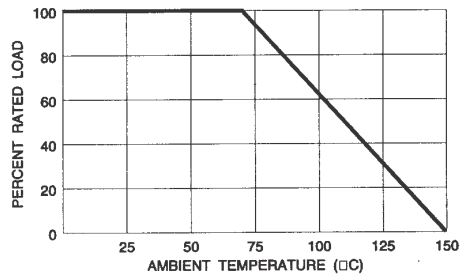
| Feature | Material | Remarks (Reference Only) |
|----------------|---|---|
| Substrate | Alumina Porcelain | Purity 90% min. |
| Resistive Film | Ruthenium-Oxide Film | 20 Microns Thick |
| Coating | Boro-Silicated Acid Lead Glass | 20 Microns Thick |
| Terminations | 100% matte Tin (Electrical Plated) over Nickel (Electrical Plated) over AG-PD (Silver Palladium[Glaze Printed]) | 3 Microns Thick 3 Microns Thick 8 Microns Thick |

Thick Film Chip Resistors

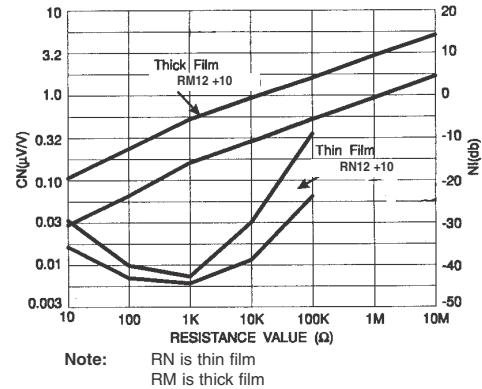


PERFORMANCE CURVES

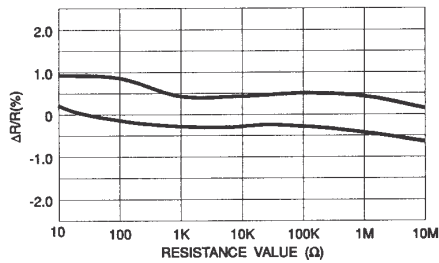
Power - Temperature Derating



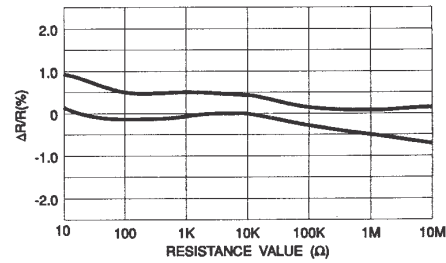
Current Noise



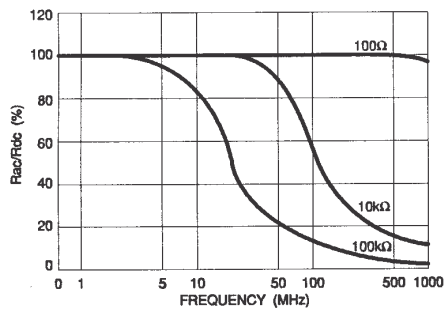
Load Life in Moisture (1,000 hours)



Load Life (1,000 hours)



High Frequency Characteristics



Resistance to Soldering Heat

