NiChromes Precision Chip Resistors

Electrical Data

TCR: ...........................................-25 ± 25 ppm/°C max.
TCR Tracking: .................................1 ppm/°C max.
Power Rating @ 70°C:
  .040" x .040" .............................................350 mW max.
  .030" x .030" .............................................250 mW max.
  .020" x .020" .............................................125 mW max.
Operating Voltage: .............................200V max.
Noise: ..................................................-25 dB max.
Short Time Overload (2.5 x rated power)
@ 25°C for 5 seconds: .................................± .02% max. ΔR/R
High Temperatures Exposure: ........................± .15% max. ΔR/R
(105°C, 1000 hrs., in air): .................................± .06% typical ΔR/R
Thermal Shock Mil-Std-202 Method 107,
Test Condition C: .........................................± .02% max. ΔR/R
Low Temperature Operation Mil-R-55342
Paragraph 4.7.4: .........................................± .02% max. ΔR/R
Resistance Ratio Accuracy: ........................± .025% max. or ± 0.1 ohm,
  whichever is greater
Absolute Resistance Tolerance: ........................± 0.1% max. or ± 0.1 ohm,
  whichever is greater

Mechanical Data

Substrate: Silicon ........................................12 ± 1 mil thick
Bonding Pads: ............................................Gold
Resistor: ............................................NiCr Passivated (Silox)
Chip Sizes: ............................................20 mil square,
  .............................................30 mil square (Center Tap)
  .............................................40 mil square
Recommended Mounting Techniques:
  Epoxy Chip Mount is preferable for high accuracy;
  Eutectic Solder is acceptable for 1% tolerance chips
Wire Bonding: ........................................Bonding Pad TYP 5 mils square
  Thermosonic Gold
  Ultrasonic Aluminum

Features

High Accuracy
  ± 0.025% Matching
  ± 0.10% Absolute

High Stability
  ± 0.06% per 1000 hrs.
  At 150°C Typical

Assembly Compatibility
  Identical format to Semiconductor Devices

Low TCR
  ± 1 ppm/°C Matching (Center Tap)
  -25 ± 25 ppm/°C Absolute

Small Size
  0.020" x 0.020"
  0.030" x 0.030"
  0.040" x 0.040"

Trimmable: Using Xenon, Yag Lasers
Film Microelectronics chip resistors are produced utilizing advanced techniques in
sputtering nickel-chrome alloy upon oxidized silicon. Sputtered films and laser trimming
provide a resistor product that is being used in a variety of military systems.
TANTALUM NITRIDE 
PRECISION CHIP RESISTORS
Oxidized Silicon

ELECTRICAL DATA

TCR: ........................................... -100 ± 50 ppm/°C max.
TCR Tracking: ................................ 1 ppm/°C max.
Power Rating @ 70°C:
.040" x .040" .................................. 350 mW max.
.030" x .030" .................................. 250 mW max.
.020" x .020" .................................. 125 mW max.
Operating Voltage: ........................... 200V max.
Noise: ........................................... -25 dB max.
Short Time Overload (2.5 x rated power @ 25°C for 5 seconds): .............. ± .02% max. ΔR/R
High Temperatures Exposure: .................. ± .15% max. ΔR/R
(150°C, 1000 hrs., in air): .............. ± .10% typical ΔR/R
Thermal Shock Mil-Std-202 Method 107,
Test Condition C: ........................... ± .02% max. ΔR/R
Low Temperature Operation Mil-R-55342
Paragraph 4.7.4: ........................... ± .02% max. ΔR/R
Resistance Ratio Accuracy: ................ ± .050% max. or ± .1 ohm,
whichever is greater
Absolute Resistance Tolerance: ............ ± .1% max. or ± .1 ohm,
whichever is greater

MECHANICAL DATA

Substrate: Silicon ............................ .12 ± 1 mil thick
Bonding Pads: ................................ Gold
Resistor: ...................................... TaN
Chip Sizes: .................................... .20 mil square,
............................................. .30 mil square (Center Tap)
............................................. .40 mil square
Recommended Mounting Techniques:
............................................. Epoxy Chip Mount is preferable for high accuracy;
............................................. Eutectic Scrub is acceptable for 1% tolerance chips
Wire Bonding: ............................. Bonding Pad TYP 5 mils square
............................................. Thermosonic Gold
............................................. Ultrasonic Aluminum

FEATURES

High Accuracy
± 0.050% Matching
± 0.10% Absolute

High Stability
± 0.10% per 1000 hrs.
At 150°C Typical

Assembly Compatibility
Identical format to Semiconductor Devices

Low TCR
± 1 ppm/°C Matching (Center Tap)
-100 ± 50 ppm/°C Absolute

Small Size
0.020" x 0.020"
0.030" x 0.030"
0.040" x 0.040"

Trimmable: Using Xenon, Yag Lasers
Film Microelectronics chip resistors are produced utilizing advanced techniques in sputtering tantalum nitride alloy upon oxidized silicon. Sputtered films and laser trimming produce a resistor product that is being used in a variety of military systems.
MICROWAVE CHIP RESISTORS
Thin Film on Ceramic

SPECIFICATIONS
Substrate:
Material: 99.6% Al₂O₃
Thickness: 0.010 ± 0.001 in.
Conductor Film Thickness:
MCB
NNichrome: As required for resistivity
Tungsten: 700 Å min.
Gold: 100μ in. min.
MCC
Front: same as MCB
Back
Tungsten: 250 ± 100Å
Gold: 100μ in. min.
MCS
Nichrome: As required for resistivity
Tungsten: 700 Å min.
Gold: 7μ in. min.
Nickel: 10μ in. min.
Gold: 30μ in. min.
Solder (60/40): 1 to 3 mils typ

TYPICAL ELECTRICAL DATA
Tcr: 0 to -50 ppm
-55° to +150°C
Noise: < 0.1 mV/V
VSWR: < 1.2 to 8 GHz
< 1.48 to 18 CHZ
Dielectric k: 9.9
Dissipation Factor: 0.001
Loss Factor: 0.0001

Specifications subject to change without notice.

SIZES / POWER / RESISTANCE RANGE

<table>
<thead>
<tr>
<th>Dimensions (Inches)</th>
<th>Power* (mW)</th>
<th>Range (ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size 2:</td>
<td>75</td>
<td>10 to 3000</td>
</tr>
<tr>
<td>0.020 by 0.040</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size 3:</td>
<td>100</td>
<td>10 to 1500</td>
</tr>
<tr>
<td>0.050 by 0.050</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size 4:</td>
<td>150</td>
<td>10 to 1500</td>
</tr>
<tr>
<td>0.50 by 0.100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size 5:</td>
<td>250</td>
<td>10 to 1500</td>
</tr>
<tr>
<td>0.100 by 0.100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Maximum continuous rating at 70°C when bonded to substrate.
Decrease to zero at 150°C.

FMi also manufactures Custom Microwave Substrates on a variety of materials, a wide range of Microwave, PIN Diode Drivers, and Custom Hybrid Circuits. Please contact the factory or your local FMi representative for more information.
MICROWAVE CHIP RESISTORS
Thin Film on Ceramic

These FMI Chip Resistors are produced with state-of-the-art thin film sputtering techniques on microwave grade alumina. The advantages of sputtered over evaporated metal films include better adhesion to the substrate, increased reliability, and more uniform composition, density, and thickness. Their TCR, noise level, and stability are similar to discrete metal film resistors. The small size and careful design of FMI Chip Resistors result in low VSWR and low parasitics. They are available with gold pads for wire bonding or solder bumps for surface mounting.

MCB/MCG (Bare Back/Gold Back)

The MCB and MCG resistors have gold terminations for wire-bonds, although epoxy may also be used. MCB resistors have no backside metallization. They are die-mounted with epoxy. MCG resistors have a gold backside metallization. The metallization is electronically isolated from the front terminations.

MCS (Solder Bump)

MCS resistors have solder bump terminations for flip-chip surface-mounting. They have no backside metallizing. They can also be die-mounted with epoxy with solder bumps exposed for connection.

ORDERING INSTRUCTIONS

Construct Part Number From Choices:

<table>
<thead>
<tr>
<th>(size)</th>
<th>(type)</th>
<th>(ohms)*</th>
<th>(tolerance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>MCB</td>
<td></td>
<td>D = 0.5%</td>
</tr>
<tr>
<td>3</td>
<td>MCG</td>
<td></td>
<td>F = 1%</td>
</tr>
<tr>
<td>4</td>
<td>MCS</td>
<td></td>
<td>J = 5%</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>K = 10%</td>
</tr>
</tbody>
</table>

*First 3 digits are significant figures. Fourth is number of zeros to follow or D for decimal between second and third digits.

Example: 2-MCS-1001-J

(Example is a 0.020-by-0.040-inch chip with solder-bump terminations, 1000 ohms ±5% resistance.)