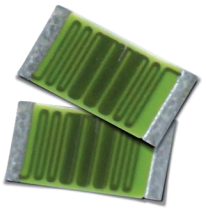
MCH SERIES

Military Grade High Voltage Chip Resistors

Advantages

Our patented Micropen® precision printing technology provides ultra precision, thick-film high voltage, military grade, surface mount resistors. Our military SMT chips have extended TCR temperature range and are stringently inspected. Ohmcraft's Micropenned serpentine patterned resistors produce superior electrical characteristics:



- **Voltage Ratings to 5,000 Volts**
- **Resistance Values to 50 Gigohms**
- **Extended TCR Range**
- **Ultra High Stability**
- **Very Low Noise**
- **Tolerances to 0.1%**
- **TCR to 25 ppm/°C**
- **VCR to 1 ppm/V**
- **Custom Configurations**

Electrical Specifications

Case Size / Ratings	TCR (±ppm/°C)	Tolerance 0.10%	0.25%	0.50%	1%	2%	5%	10%	20%
0402 40mW 150V	50				10K-100M	10K-100M	10K-100M	10K-100M	10K-100M
	100				10K-500M	10K-500M	10K-500M	10K-500M	10K-500M
	200				10K-500M	10K-1G	10K-1G	10K-1G	10K-1G
0603 60mW 400V	50			10K-10M	10K-100M	10K-500M	10K-500M	10K-500M	10K-500M
	100			10K-10M	10K-500M	10K-1G	10K-1G	10K-1G	10K-1G
	200			10K-10M	10K-500M	10K-1G	10K-1G	10K-10G	10K-50G
0805 200mW 600V	50			10K-10M	10K-500M	10K-500M	10K-500M	10K-500M	10K-500M
	100			10K-10M	10K-1G	10K-1G	10K-1G	10K-1G	10K-1G
	200			10K-10M	10K-1G	10K-1G	10K-10G	10K-10G	10K-50G
1206 330mW 1500V	25	1M-10M	1M-100M	1M-100M	1M-100M	1M-100M	1M-100M	1M-100M	1M-100M
	50	100K-10M	100K-100M	100K-500M	100K-500M	100K-500M	100K-500M	100K-500M	100K-500M
	100	10K-10M	10K-100M	10K-500M	10K-1G	10K-1G	10K-1G	10K-1G	10K-1G
	200	10K-10M	10K-100M	10K-500M	10K-1G	10K-10G	10K-10G	10K-10G	10K-50G
2010 1W 2000V	25	1M-10M	1M-100M	1M-100M	1M-100M	1M-100M	1M-100M	1M-100M	1M-100M
	50	100K-10M	100K-100M	100K-500M	100K-500M	100K-500M	100K-500M	100K-500M	100K-500M
	100	10K-10M	10K-100M	10K-500M	10K-1G	10K-1G	10K-1G	10K-1G	10K-1G
	200	10K-10M	10K-100M	10K-500M	10K-1G	10K-10G	10K-10G	10K-10G	10K-50G
2512 2W 3000V	25	1M-100M	1M-500M	1M-500M	1M-500M	1M-500M	1M-500M	1M-500M	1M-500M
	50	100K-100M	100K-500M	100K-1G	100K-1G	100K-1G	100K-1G	100K-1G	100K-1G
	100	10K-100M	10K-500M	10K-1G	10K-10G	10K-10G	10K-10G	100K-10G	100K-10G
	200	10K-100M	10K-500M	10K-1G	10K-10G	10K-10G	10K-10G	100K-50G	100K-50G
3512 2W 3500V	25	1M-100M	1M-500M	1M-500M	1M-500M	1M-500M	1M-500M	1M-500M	1M-500M
	50	100K-100M	100K-500M	100K-1G	100K-1G	100K-1G	100K-1G	100K-1G	100K-1G
	100	10K-100M	10K-500M	10K-1G	10K-10G	10K-10G	10K-10G	100K-10G	100K-10G
	200	10K-100M	10K-500M	10K-1G	10K-10G	10K-10G	10K-10G	100K-50G	100K-50G
4020 2W 4000V	25	1M-100M	1M-500M	1M-500M	1M-500M	1M-500M	1M-500M	1M-500M	1M-500M
	50	100K-100M	100K-500M	100K-1G	100K-1G	100K-1G	100K-1G	100K-1G	100K-1G
	100	10K-100M	10K-500M	10K-1G	10K-10G	10K-10G	10K-10G	100K-10G	100K-10G
	200	10K-100M	10K-500M	10K-1G	10K-10G	10K-10G	10K-10G	100K-50G	100K-50G
5020 2W 5000V	25	1M-100M	1M-500M	1M-500M	1M-500M	1M-500M	1M-500M	1M-500M	1M-500M
	50	100K-100M	100K-500M	100K-1G	100K-1G	100K-1G	100K-1G	100K-1G	100K-1G
	100	10K-100M	10K-500M	10K-1G	10K-10G	10K-10G	10K-10G	100K-10G	100K-10G
	200	10K-100M	10K-500M	10K-1G	10K-10G	10K-10G	10K-10G	100K-50G	100K-50G

The continuous maximum applied voltage cannot exceed the maximum power rating and is ohmic value dependent.
Standard case sizes: 0402, 0403, 0502, 0504, 0603, 0805, 1004, 1005, 1206, 1210, 1505, 2010, 2208, 2510, 2512, 3512, 4020, 5020.
Military case sizes: RM0402, RM0603, RM0705, RM1206, RM2010, RM2512.
For custom sizes and configurations, contact us.

How to Order

MCH + [ ] + [ ] + [ ] + [ ] + [ ]

Type

Military Grade High Voltage Chips

Case Size

See dimension table.

Custom case sizes are available. Please consult factory.

TCR

E ±25ppm/°C

H ±50ppm/°C

K ±100ppm/°C

L ±200ppm/°C

Value

Resistance value expressed as a four digit number, where the first three numbers are the significant value, and the fourth number is the number of zeroes.

Tolerance

B ±0.1%

C ±0.25%

D ±0.5%

F ±1.0%

G ±2.0%

J ±5.0%

K ±10%

L ±20%

Termination

T Solderable wraparound matte tin Sn99.9 on Ni barrier, RoHS

B Solderable wraparound Sn63Pb37 solder over Ni barrier

Z Solderable single surface matte tin Sn99.9 on Ni barrier, flip-chip, RoHS

S Solderable single surface Sn63Pb37, flip-chip

U Epoxy bondable gold wraparound over Ni

Packaging options: Bulk, Tape & Reel or Flat Pack

Military Grade High Voltage Chip Resistors

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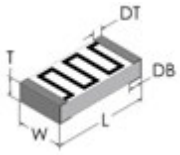
Chip Dimensions

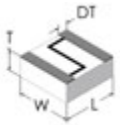
Wrap-around

B and T Terminations



Bondable

G, Z, and S Terminations



Case Size	Length	Width	Thickness (Max.)	DT	DB	Units
0402	0.040 ±0.005 1.02 ±0.13	0.020 ±0.003 0.51 ±0.08	0.020 0.51	0.008 ±0.004 0.20 ±0.10	0.010 +0.002/-0.004 0.25 +0.05/-0.10	inches mm
0603	0.063 +0.01/-0.005 1.60 +0.25/-0.13	0.031 ±0.005 0.79 ±0.13	0.020 0.51	0.010 ±0.005 0.25 ±0.13	0.012 ±0.008 0.30 ±0.20	inches mm
0805	0.079 +0.01/-0.005 2.01 +0.25/-0.13	0.050 ±0.005 1.27 ±0.13	0.025 0.64	0.010 ±0.005 0.25 ±0.13	0.013 ±0.008 0.33 ±0.20	inches mm
1206	0.126 +0.01/-0.005 3.20 +0.25/-0.13	0.063 ±0.005 1.60 ±0.13	0.030 0.76	0.010 ±0.005 0.25 ±0.13	0.020 ±0.010 0.51 ±0.25	inches mm
2010	0.200 +0.01/-0.005 5.08 +0.25/-0.13	0.100 ±0.005 2.54 ±0.13	0.030 0.76	0.018 ±0.010 0.46 ±0.25	0.020 ±0.010 0.51 ±0.25	inches mm
2512	0.250 +0.01/-0.005 6.35 +0.25/-0.13	0.125 ±0.005 3.18 ±0.13	0.030 0.76	0.020 ±0.010 0.51 ±0.25	0.024 ±0.010 0.61 ±0.25	inches mm
3512	0.350 +0.01/-0.005 8.89 +0.25/-0.13	0.125 ±0.005 3.18 ±0.13	0.030 0.76	0.020 ±0.010 0.51 ±0.25	0.024 ±0.010 0.61 ±0.25	inches mm
4020	0.400 +0.01/-0.005 10.16 +0.25/-0.13	0.200 ±0.005 5.08 ±0.13	0.030 0.76	0.025 ±0.010 0.64 ±0.25	0.030 ±0.010 0.76 ±0.25	inches mm
5020	0.500 +0.01/-0.005 12.70 +0.25/-0.13	0.200 ±0.005 5.08 ±0.13	0.030 0.76	0.025 ±0.010 0.76 ±0.25	0.030 ±0.010 0.76 ±0.25	inches mm

Other available case sizes: 0403, 0502, 0504, 1004, 1005, 1210, 1505, 2208, 2510, and custom.
For custom sizes and configurations, contact us.

Typical Performance Characteristics

Test	Maximum ΔR
Short Time Overload	0.1%
Load Life	0.1%
Thermal Shock	0.1%
Resistance to Soldering Heat	0.05%

Parameter	Typical
Operating Temperature	-55°C to 150°C
TCR	Measured from 25°C to 75°C
Pulse Capability	10X rated wattage for custom pulse applications consult factory
Resistance Value	Values > 10M are measured at 100 VDC for custom test voltages consult factory

Material Construction

Resistive Element	Thick Film
Substrate	96% Alumina
Encapsulation	Epoxy
Termination	Tin over nickel barrier, lead solder over nickel barrier, or gold

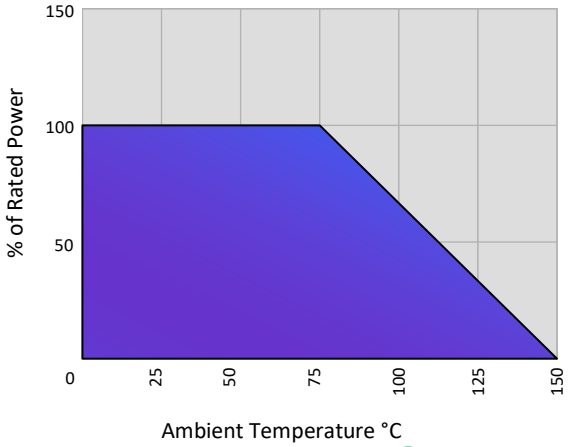
Custom Configurations Available Upon Request

Please consult us with our knowledgeable sales staff for help specifying custom parts to meet your needs.

Tape and Reel Specifications

Parts are packaged in accordance with EIA-481 tape and reel specifications.

Power Derating Curve



Lot Acceptance Testing (LAT)

Lot Acceptance Testing provides screening and qualification tests to enable the use of Exxelia Ohmcraft's standard parts in flight applications (Aerospace/Space).

Exxelia Ohmcraft can screen and qualify its resistor products to MIL-PRF-55342, MIL-PRF-49462, NASA EEE-INST-002 (Level 1 or Level 2) or a custom test plan. LAT Testing includes but is not limited to:

- Thermal Shock
- Power Conditioning
- High Temperature Exposure
- Solderability
- TCR
- Load Life
- Short Term Overload
- Terminal Strength
- Resistance to Solvents

Electrical Specifications

Value R	R Ω	Resistance Value in kΩs, MΩs, GΩs, or TΩs
Tolerance	± X% at V	Resistance Tolerance measured at specified voltage
TCR	< [Ordering Coder TCR] ppm/ºC (Hot to TmaxºC, Cold to TminºC) < 2*[Ordering Coder TCR] ppm/ºC (Hot to 125ºC, Cold to -55ºC)	TCR referenced to 25ºC
Working Voltage	V	Voltage across the resistor during application operation
Max Voltage Rating	V	Maximum Voltage based on resistance value or case rating
Max Power Rating	W	Maximum Wattage based on resistance value or case rating

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S.A.S. au capital de 12.525.700 €
SIREN 444 344 766 RCS Paris
APE 2611Z - TVA FR 73 444 344 766
SIRET 444 344 766 00027
www.exxelia.com

Lot Acceptance Testing (LAT)

Conformance Testing

Pre-Cap Visual Inspection

Prior to Conformance Test	13 pcs

Conformance Test – 100% Screening

Visual Inspection • Magnification: 30x to 60x	100%
Mechanical Inspection	3 pcs. (minimum)
DC Resistance • Per MIL-STD-202, Method 303 • Measured at specified test voltage for resistance tolerance	100%
Thermal Shock • Per-MIL-STD-202. Method 107, Test Condition B (modified) • 5 cycles (MIL-PRF-55342), 10 cycles (NASA level 2) or 25 cycles (NASA level 1) • Min. temp -55ºC, Max temp 125ºC	100%
High Temperature Exposure (SMT) • 100 hours at 125ºC	100%
Power Conditioning (Leaded) • 100 hours at Working Voltage at 25ºC	100%
Final DC Resistance	100%

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• Per MIL-STD-202, Method 303 • Measured at specified test voltage for resistance tolerance	

Conformance PDA: 5% (NASA Level 1 or MIL-PRF-55342), 10% (MIL-PRF-49462) or 15% (NASA Level 2)

Qualification Testing

Group	NASA Sample Size (Level 1 / Level 2)
Group 1 • Conformance Testing: Basic Screening	100%

Group 2
• Solderability
  • MIL-STD-202, Method 208
• Resistance to Solvents (Leaded)
  • MIL-STD-202, Method 215
	3 pcs / 3 pcs

Group 3
• Temperature Coefficient (TCR)
  • Per MIL-STD-202, Method 304
  • Reference Temperature: 25ºC
• Low Temperature Storage
  • -65ºC no load dwell for 24±4 hours
  • +25ºC ambient no load dwell for 2-8 hours
• Low Temperature Operation
  • -65ºC no load dwell for 1 hour
  • Working Voltage for 54 minutes
  • +25ºC no load dwell for 24±4 hours
• Short Time Overload
  • 2X Working Voltage for 5 seconds
	10 pcs / 6 pcs

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Lot Acceptance Testing (LAT)

Group 4
• Resistance to soldering heat
  • MIL-STD-202, Method 210, Test Condition B (modified)
  • 260ºC for 20 seconds
• Terminal Strength (Leaded)
• MIL-STD-202, Method 211 Test Condition C
• 16 ounces ± 1 ounce for 10 seconds
	9 pcs / 6 pcs

Group 5
• Shock (Leaded)
  • MIL-STD-202, Method 213B, Test Condition I
• Vibration (Leaded)
  • Per MIL-STD-202, Method 204, Test Condition D
	9 pcs / 6 pcs

Group 6
• Load Life
  • Per MIL-STD-202, Method 108
  • Working Voltage for 1000 or 2000 hours at 25ºC
	12 pcs / 9 pcs

Group 7
• Resistance to Bonding Exposure (SMT)
  • Solder mounted to a ceramic test plate
  • 4-12 hours stabilization at 25ºC
	10 pcs / 5 pcs

Group 8 • No Applicable Tests	

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Group 9 • High Temperature Exposure • 125ºC for 100 hours	5 pcs

Custom Configurations Available Upon Request

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