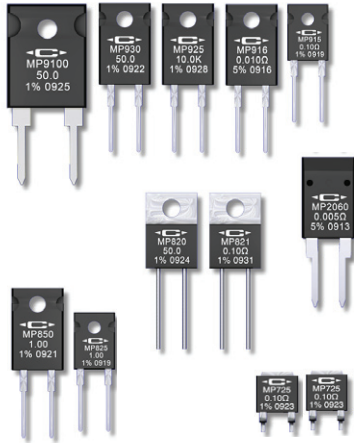


Power Resistors. Heat Sink Mountable with Non-Inductive Designs



[MP915, MP916, MP925, MP930, and MP9100 TO-Style Power Film Resistors](#)

Model MP915, 15 Watts, TO-126 All Molded Package, Resistance 0.020 ohm to 1.00 K
 Model MP916, 16 Watts, TO-220 All Molded Package, Resistance 0.010 ohm to 0.019 ohm
 Model MP925, 25 Watts, TO-220 All Molded Package, Resistance 5.00 K to 100 K
 Model MP930, 30 Watts, TO-220 All Molded Package, Resistance 0.020 ohm to 4.99 K
 Model MP9100, 100 Watts, TO-247 All Molded Package, Resistance 0.050 ohm to 100 ohms

[MP2060 Power Film Resistor, Clip Mount, in the TO-220 Style Power Package](#)

60 Watts, up to 60 Amps maximum, TO-220 All Molded Package, Resistance 0.005 ohm to 1.00 K

[MP820 and MP821 Power Film Resistors in the TO-220 Style Power Package](#)

20 Watt Power Resistor, Power Package with Metal Mounting Tab
Resistance 0.020 ohm to 10.0 K

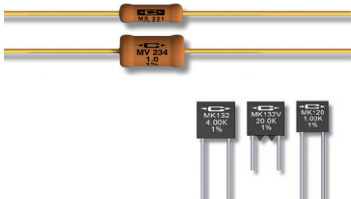
[MP825 and MP850 Power Film Resistors, TO-126 and TO-220 Style Power Package](#)

Model MP825, 25 Watts, Integral Copper Heat Sink, Resistance 0.020 ohm to 10.0 K
 Model MP850, 50 Watts, Integral Copper Heat Sink, Resistance 0.200 ohm to 10.0 K

[MP725 Surface Mount Power Film Resistor in a D-Pak Style Power Package](#)

25 Watt Power Resistor, D-Pak Style Power Package for Surface Mount Applications
Resistance 0.020 ohm to 1.00 K

Power Resistors, Axial Leads and Radial Leads with Non-Inductive Designs



[Type MS Power Film Resistors](#)

Power Rating to 22 Watts, Voltage Rating to 6000 Volts, Max. Temperature +275°C, Non-Inductive Design, 18 Models

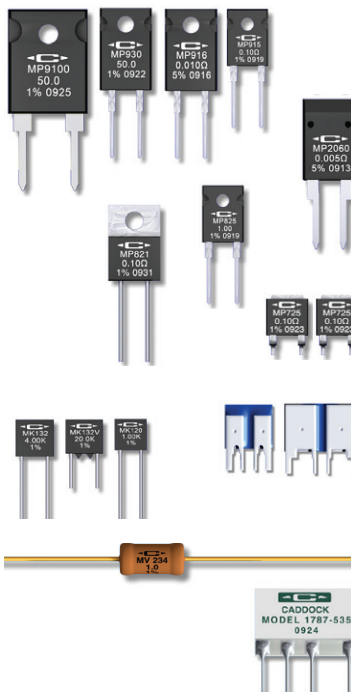
[Type MV Low Resistance Power Film Resistors](#)

Resistance from 0.1 ohm to 50 ohms, Power Rating to 10 Watts
Max. Temperature +275°C, Non-Inductive Design

[MK132 and MK120 Precision Power Film Resistors with Non-Inductive Design](#)

3/4 Watt at 400 Volts Max. and 1/2 Watt at 200 Volts Max. at +125°C, Resistance 1 ohm to as high as 5 Megohms

Current Sense, Low Resistance with Non-Inductive Designs



[MP915, MP916, MP930 and MP9100 TO-Style Power Film Resistors](#)

Model MP915, 15 Watts, TO-126 All Molded Package, Resistance down to 0.020 ohm
 Model MP916, 16 Watts, TO-220 All Molded Package, Resistance down to 0.010 ohm
 Model MP930, 30 Watts, TO-220 All Molded Package, Resistance down to 0.020 ohm
 Model MP9100, 100 Watts, TO-247 All Molded Package, Resistance down to 0.050 ohm

[MP2060 Clip Mount Power Film Resistor in the TO-220 Style Power Package](#)

60 Watts, up to 60 Amps maximum, TO-220 All Molded Package, Resistance down to 0.005 ohm

[MP825 Power Film Resistor, TO-126 Style Power Package](#)

25 Watts, Integral Copper Heat Sink, Resistance as low as 0.020 ohm

[MP821 Power Film Resistors in the TO-220 Style Power Package](#)

20 Watt Power Resistor, Power Package with Metal Mounting Tab
Resistance as low as 0.020 ohm at 1% tolerance

[MP725 Surface Mount Power Film Resistor in a D-Pak Style Power Package](#)

25 Watt Power Resistor, D-Pak Style Power Package for Surface Mount Applications
Resistance as low as 0.020 ohm

[Type SR Precision Current Sense Resistors](#)

Compact Design with Kelvin Terminals, Absolute tolerance of 1%, 1 and 2 Watt Versions at +70°C, Resistance Values 0.005 ohm to 1.00 ohm

[MK132 and MK120 Precision Power Film Resistors](#)

3/4 and 1/2 Watt Ratings at +125°C, Resistance as low as 1 ohm

[Type MV Low Resistance Power Film Resistors](#)

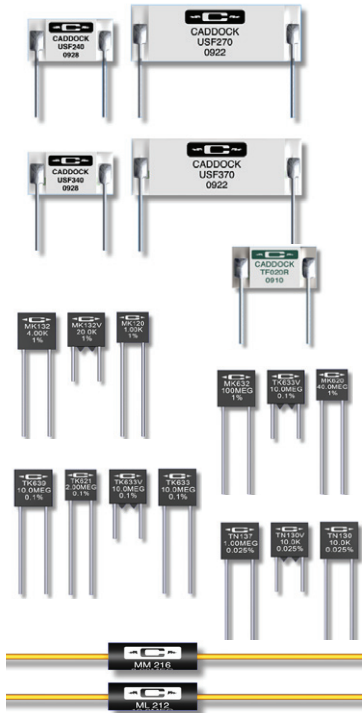
Resistance as low as 0.1 ohm, Power Rating to 10 Watts, Max. Temperature +275°C

[Type 1787 Precision Current Sense Resistor Networks](#)

3 and 4-step Current Sense Resistor Networks for Current Sensing in Multi-Range Instrumentation, Absolute Tolerance of 0.25% to 0.05%



Precision and Ultra-Precision Discrete Resistors



Type USF 200 Series Ultra-Stable Low TC Ultra-Precision Film Resistors

Standard Resistance Values from 50 Ω to 10 Megohm
 Max Absolute TC of 2ppm/ $^{\circ}$ C, -40 $^{\circ}$ C to +85 $^{\circ}$ C referenced to +25 $^{\circ}$ C
 Tolerance 0.01% or 0.1%
 Voltage Ratings from 300 Volts to 2500 Volts

Type USF 300 Series Ultra-Stable Low TC Ultra-Precision Film Resistors

Standard Resistance Values from 50 Ω to 20 Megohm
 Max Absolute TC of 5ppm/ $^{\circ}$ C -40 $^{\circ}$ C to +85 $^{\circ}$ C referenced to +25 $^{\circ}$ C
 Tolerance 0.01% or 0.1%
 Voltage Ratings from 300 Volts to 2500 Volts

Type TF Low TC Ultra-Precision Film Resistors

Tolerance to 0.01% Resistance Range from 1 Kohm to 125 Megohms,
 Temperature Coefficient 5, 10 or 15 ppm/ $^{\circ}$ C from -15 $^{\circ}$ C to +105 $^{\circ}$ C

Type TK Military Temp Range, Precision Low TC, Radial-Lead Film Resistors

Tolerance 0.1% to 0.05%, Resistance Range from 1 Kohm to 10 Megohms,
 Temperature Coefficient of 5, 10 or 20 ppm/ $^{\circ}$ C from -55 $^{\circ}$ C to +125 $^{\circ}$ C

Type TN Lab Grade, Precision Low TC, Radial-Lead Film Resistors

Tolerance 0.1% to 0.025%, Resistance Range from 1 Kohm to 1 Megohm
 Temperature Coefficient of 5, 10, or 20 ppm/ $^{\circ}$ C from 0 $^{\circ}$ C to +70 $^{\circ}$ C

MK132 and MK120 Precision Power Film Radial-Lead Resistors

Tolerance 1.0% to 0.1%, 3/4 and 1/2 Watt Ratings at +125 $^{\circ}$ C, 1 ohm to 5 Megohms

MK632 and MK620 Extended Resistance Range Radial-Lead Film Resistors

Tolerance 1.0% to 0.1%, Resistance Range from 2.1 Megohms to 100 Megohms

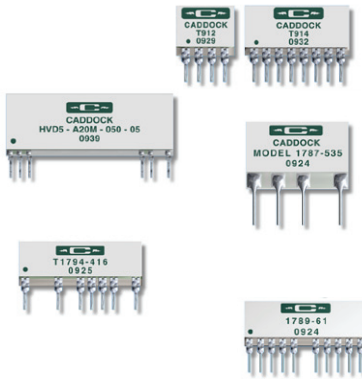
Type MM Precision Film Resistors

Tolerance 1.0% to 0.1%, High Temperature Resistors for Geophysical, Aerospace and Industrial Requirements

Type ML Precision Film Resistors

Tolerance 1.0% to 0.1%, Resistors for Aerospace and Industrial Requirements

Precision and Ultra-Precision Resistor Networks and Custom Resistor Networks



Type T912 and T914 Precision and Ultra-Precision Networks with Low Ratio TC

Two Resistor and Four Resistor Networks with Precise Ratio Performance,
 Ratio Tolerance from 0.1% to 0.01%, Ratio TC 10 ppm/ $^{\circ}$ C to 2 ppm/ $^{\circ}$ C

Type 1776 Precision Decade Resistor Voltage Dividers

39 Models of Input Voltage Dividers for Digital Multimeters and other
 Range-Switching Circuits, Ratio Tol. 0.5% to 0.02%, Ratio TC 50 ppm/ $^{\circ}$ C to 5 ppm/ $^{\circ}$ C

Type 1787 Precision Current Sense Resistor Networks

3 and 4-step Current Sense Resistor Networks for Current Sensing in
 Multi-Range Instrumentation, Absolute Tolerance of 0.25% to 0.05%

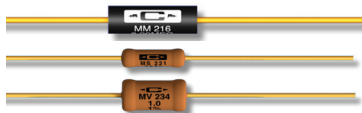
Type T1794 Custom Low Ratio TC, Precision SIP Resistor Networks

Ratio TC to 5 ppm/ $^{\circ}$ C, Ratio Tolerance to 0.01%,
 Resistance Range from 500 ohms to 50 Megohms

Type 1789 Custom Low Resistance Value, Precision SIP Resistor Networks

Ratio TC to 15 ppm/ $^{\circ}$ C, Ratio Tolerance to 0.05%,
 Resistance Range from 0.5 ohm to 10,000 ohms

High Temperature Resistors, 275 $^{\circ}$ C, Non-Inductive Designs are available



Type MM Precision Film Resistors

High Temp. Resistors for Geophysical, Aerospace, and Industrial, Max. Temp. +275 $^{\circ}$ C

Type MS Power Film Resistors

Power Rating to 22 Watts, Max. Temperature +275 $^{\circ}$ C, Non-Inductive Design, 18 Models

Type MV Low Resistance Power Film Resistors

Resistance from 0.1 ohm to 50 ohms, Power Rating to 10 Watts,
 Max. Temp. +275 $^{\circ}$ C



Applications Engineering
 17271 North Umpqua Hwy.
 Roseburg, Oregon 97470-9422
 Phone: (541) 496-0700
 Fax: (541) 496-0408

Sales and Corporate Office
 1717 Chicago Avenue
 Riverside, California 92507-2364
 Phone: (951) 788-1700
 Fax: (951) 369-1151

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High Voltage Resistors, Low TC and Precision



Type USG Ultra-Stable Low TC Precision High Voltage Resistors

Temperature Coefficient of 10 ppm/°C from -40°C to +85°C

Type TG Low TC Precision High Voltage Resistors

Temperature Coefficient of 25 ppm/°C from -55°C to +125°C

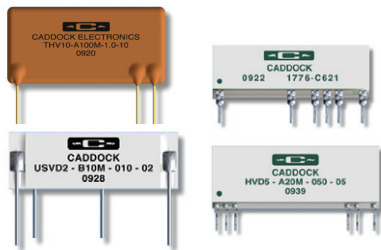
Type MG Precision High Voltage Resistors with Extended Resistance Range

Resistance Value to as high as 10,000 Megohms, TC of 80 ppm/°C

Type MX Precision High Voltage Resistors

High Voltage Resistors for Industrial and Laboratory Applications

Voltage Dividers, Precision and Ultra-Precision, Input Voltage Rating up to 20,000 Volts



Type THV Precision High Voltage Divider Networks

Ratio Temperature Coefficient to 10 ppm/°C from -55°C to +125°C

Ratio Tolerance to 0.25% at 10 KVDC, 15 KVDC or 20 KVDC

Type HVD Ultra-Precision Voltage Divider Networks

Up to 5KVDC, Ratio Temperature Coefficient 5 ppm/°C from -40°C to +85°C, Ratio Tol. of 0.05%

Type USVD Ultra-Precision Voltage Divider Networks

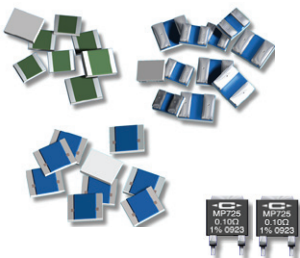
Up to 2KVDC, Ratio Temperature Coefficient 2 ppm/°C from -40°C to +85°C, Ratio Tol. to 0.01%

Type 1776 Precision Decade Resistor Voltage Dividers for Range Switching Instruments

39 Models up to 1200 volts, Voltage Division of 10,000:1, 1,000:1, 100:1, 10:1.

Ratio Tol. 0.5% to 0.02%, Ratio TC 50 ppm/°C to 5 ppm/°C

Surface Mount Resistors for SMT Applications



Type CC Low Resistance Precision Chip Resistors

Resistance range down to 0.010 ohm at ±5%, 0.050 ohm at ±2%, and 0.10 ohm at ±1%, Style FC and Style WB. Sizes 1512, 2015, and 2520

Type CD Low Resistance Precision Chip Resistors with Pedestal Terminals

Tolerance ±1% for all resistance values, Resistance range 0.010 ohm to 0.20 ohm, Style FC and Style WB. Sizes 2015, and 2520

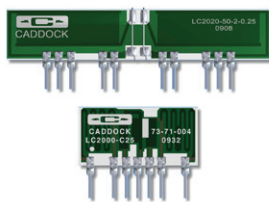
Type CHR High Resistance Precision Chip Resistors Size 2520, Style FC

Resistance range 10 Meg to 100 Meg, Tolerance 1%
Temperature Coefficient of 25 ppm for values up to 25 Meg

MP725 Surface Mount Power Film Resistor in a D-Pak Style Power Package

25 Watt Power Resistor, D-Pak Style Power Package for Surface Mount Applications
Resistance 0.020 ohm to 1.00 K

Telephone Line Interface Resistor Networks and Custom Resistor Networks



LC2000 Series Standard Transient Tolerant Precision Resistor Networks

Lightning Transient Handling with Optional Thermal Cut-off Protection or Optional Thermistor Temperature Sensing Element for Telephone Line Card Applications
Resistor Networks available which meet the requirements of GR-1089-CORE and ITU-T K.20

LC2000 Series Custom Transient Tolerant Resistor Networks

Lightning Transient Handling Custom Resistor Networks for Telephone Line Card Applications

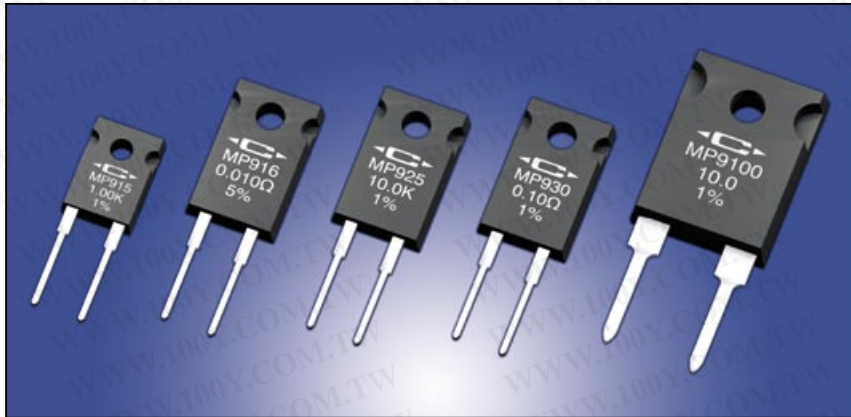
Applications Engineering
17271 North Umpqua Hwy.
Roseburg, Oregon 97470-9422
Phone: (541) 496-0700
Fax: (541) 496-0408

Sales and Corporate Office
1717 Chicago Avenue
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MP900 and MP9000 Series Kool-Pak® Power Film Resistors TO-126, TO-220 and TO-247 Style



Low Cost Heat Sink Mountable Design featuring an Exposed Ceramic Heat Dissipating Mounting Surface

Use your thermal design experience with power semiconductors in TO-126, TO-220, and TO-247 style power packages to help you get the most out of this unique family of power resistors. The thermal design issues are the same where power handling capability is based on the case temperature which is maintained in your design.

MP915 TO-126 Style Power Package

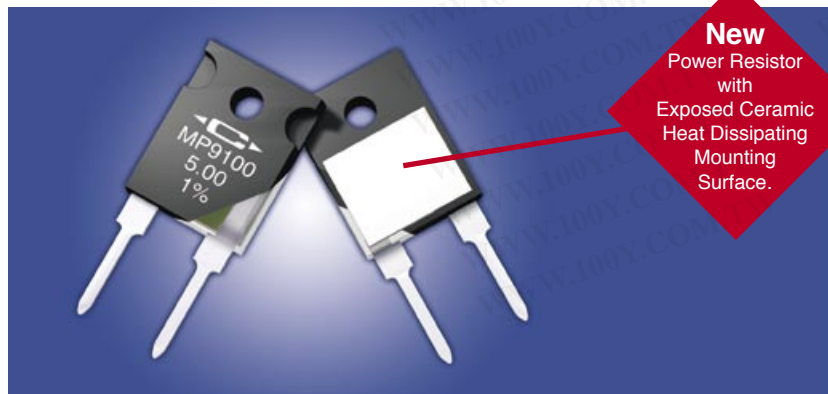
- **15 Watts at +25°C Case Temperature**, derated to zero at +150°C.
- **Exposed Ceramic Heat Dissipating Mounting Surface.**
- **Resistance Range of 0.020 ohm to 1 K.**
- **Non-Inductive Design.**

MP916, MP925, and MP930 TO-220 Style Power Package

- **Up to 30 Watts at +25°C Case Temperature**, derated to zero at +150°C.
- **Exposed Ceramic Heat Dissipating Mounting Surface.**
- **Resistance Range of 0.010 ohm to 100 K.**
- **Non-Inductive Design.**

MP9100 TO-247 Style Power Package

- **100 Watts at +25°C Case Temperature**, derated to zero at +175°C.
- **Exposed Ceramic Heat Dissipating Mounting Surface.**
- **Resistance Range of 0.050 ohm to 100 ohm.**
- **Non-Inductive Design.**



MP916 Standard Resistance Values:

Tolerance MP916 ±5% Standard (20% is available).

0.010 Ω 5%
0.015 Ω 5%

MP915, MP925, and MP930 Standard Resistance Values:

Tolerance MP915, MP925, and MP930 ±1% Standard - except as noted. (5% and 20% are available for most resistance values).

0.020 Ω 5%	0.33 Ω	7.50 Ω	50.0 Ω	500 Ω	10.0 K
0.025 Ω 5%	0.40 Ω	8.00 Ω	56.0 Ω	560 Ω	15.0 K
0.030 Ω 5%	0.50 Ω	10.0 Ω	75.0 Ω	750 Ω	20.0 K
0.033 Ω 5%	0.75 Ω	12.0 Ω	100 Ω	1.00 K	25.0 K
0.040 Ω 5%	1.00 Ω	15.0 Ω	120 Ω	1.50 K	30.0 K
0.050 Ω	1.50 Ω	20.0 Ω	150 Ω	2.00 K	33.0 K
0.075 Ω	2.00 Ω	25.0 Ω	200 Ω	2.50 K	40.0 K
0.10 Ω	2.50 Ω	27.0 Ω	250 Ω	3.00 K	47.0 K
0.15 Ω	3.00 Ω	30.0 Ω	300 Ω	3.30 K	50.0 K
0.20 Ω	3.30 Ω	33.0 Ω	330 Ω	4.00 K	56.0 K
0.25 Ω	4.00 Ω	40.0 Ω	400 Ω	5.00 K	68.0 K
0.30 Ω	5.00 Ω	47.0 Ω	470 Ω	7.50 K	75.0 K
					82.0 K
					100 K

MP9100 Standard Resistance Values:

Tolerance MP9100 ±1% Standard.

0.050 Ω	0.40 Ω	3.30 Ω	20.0 Ω	56.0 Ω
0.075 Ω	0.50 Ω	4.00 Ω	25.0 Ω	75.0 Ω
0.10 Ω	0.75 Ω	5.00 Ω	27.0 Ω	100 Ω
0.15 Ω	1.00 Ω	7.50 Ω	30.0 Ω	
0.20 Ω	1.50 Ω	8.00 Ω	33.0 Ω	
0.25 Ω	2.00 Ω	10.0 Ω	40.0 Ω	
0.30 Ω	2.50 Ω	12.0 Ω	47.0 Ω	
0.33 Ω	3.00 Ω	15.0 Ω	50.0 Ω	

For custom resistance values and tolerances contact applications engineering.

Ordering Information:

MP915 - 50.0 - 1%
Model Number: Tolerance
Resistor Value:

Packaging: MP915, MP916, MP925, MP930 resistors are packaged in plastic shipping tubes, 50 pieces per tube. These resistors are available in a 50 piece minimum quantity and in full tube quantity increments (i.e. 50, 100, 150, etc.). The MP9100 resistors are packaged in plastic shipping tubes, 25 pieces per tube.

Construction of MP900 and MP9000 Series:

The MP900 and MP9000 Series Kool-Pak® Power Film Resistors are constructed with Caddock's Micronox® resistance film fired onto a flat ceramic substrate. The terminal attachment and resistance element geometry are configured to provide outstanding non-inductive performance. The ceramic substrate is positioned in the molded package such that the resistor element and terminal attachment areas on the substrate are encapsulated in the molded body with the other side of the ceramic being exposed flush with the back mounting surface of the device. This construction is covered by one or more issued patents, also patents pending.

Model No.	Package	Resistance		Power Rating	Max. Voltage	Thermal Resistance $R_{\theta JC}$ (J to Case (c))	Max. Temp. T_{MAX}	Dimensions	Comments
		Min.	Max.						
MP915	TO-126 Style	0.020 Ω	1.00 K	15 Watts *	200	8.33°C/Watt	150°C	Figure 1	Ceramic mounting surface
MP916	TO-220 Style	0.010 Ω	0.019 Ω	16 Watts *	Power Limited	7.81°C/Watt	150°C	Figure 2	Ceramic mounting surface
MP925	TO-220 Style	5.00 K	100 K	25 Watts *		5.00°C/Watt	150°C	Figure 2	Ceramic mounting surface
MP930	TO-220 Style	0.020 Ω	4.99 K	30 Watts *		4.17°C/Watt	150°C	Figure 2	Ceramic mounting surface
MP9100	TO-247 Style	0.050 Ω	100 Ω	100 Watts *	Power Limited	1.50°C/Watt	175°C	Figure 3	Ceramic mounting surface

Derating Curve

*** Derating Using Case Temperature (T_C):**

All power and associated overload ratings are derated based upon case temperature using the derating curve. The case temperature is measured at the center of the ceramic mounting surface, with the part properly mounted and under electrical load. Without a heat sink, when in free air at +25°C, the MP915 is rated for 1.25 watts, the MP916, MP925, MP930 are rated for 2.25 watts, and the MP9100 is rated for 3.5 watts.

The thermal design should satisfy the following equation:

Case Temperature (T_C) + [Thermal Resistance ($R_{\theta JC}$) x power applied (Watts)] $\leq T_{MAX}$ considering the full operating temperature range of the application.

Mounting Note: Mount on a smooth, clean, and flat heat sink surface with a thermal interface material, such as thermal grease. The entire exposed ceramic portion must be in thermal contact with the heat sink. When screw mounting, use a compression washer which provides a mounting force of 150 to 300 pounds (665 to 1330 N). This will provide sufficient pressure on the package over time and through large temperature variations to maintain the maximum power dissipation capability. Mounting torque to avoid package damage is 8 in-lbs. (0.90 N-m). If a spring clip is used, a clip force of 8 to 30 pounds (35 to 130 N) is recommended to be applied to the center of the package. The clip should be round or smooth in the contact area to avoid concentrating the load on a small point of the plastic body of the package. Another mounting option is to use a pressure bar method which can achieve a greater mounting force with a greater contact area.

For additional applications information regarding mounting and pulse handling see the Caddock Applications Notes at caddock.com or contact Applications Engineering.

Specifications:

Temperature Coefficient for MP915, MP916, MP925, and MP930:
 TC referenced to +25°C, ΔR taken at +150°C
 0.50 ohms and above, -20 to +80 ppm/°C
 0.050 ohm to 0.49 ohms, 0 to +200 ppm/°C
 0.020 ohm to 0.049 ohm, 0 to +300 ppm/°C
 0.010 ohm to 0.019 ohm, 0 to +500 ppm/°C

Temperature Coefficient for MP9100:
 TC referenced to +25°C, ΔR taken at +175°C
 0.50 ohms and above, -20 to +80 ppm/°C
 0.050 ohm to 0.49 ohms, 0 to +150 ppm/°C

Operating Temperature: -55°C to T_{MAX}

Inductance: MP915, MP916, MP925, and MP930 10nH typical; MP9100, 20nH typical, in series when measured at a point 0.2 inches from the resistor body.

DWV: The dielectric strength rating of 1500 V_{rms} AC is based upon connections made between terminals shorted, and the metal surface the part is mounted to or a metal clip in contact with the top surface of the part.

Insulation Resistance: 10,000 Megohms min. The resistor element is electrically isolated from the mounting surface.

Load Stability: 2,000 hours at rated power. $\Delta R \pm(1.0$ percent + 0.0005 ohm) max. Power rating dependent upon case temperature. See derating curve.

Momentary Overload: 1.5 times rated power with applied voltage not to exceed 1.5 times maximum continuous operating voltage for 5 seconds. $\Delta R \pm(0.5$ percent + 0.0005 ohm) max.

Moisture Resistance: Mil-Std-202, Method 106. $\Delta R \pm(0.5$ percent + 0.0005 ohm) max.

Thermal Shock: Mil-Std-202, Method 107, Cond. F. $\Delta R \pm(0.5$ percent + 0.0005 ohm) max.

Shock: 100G, Mil-Std-202, Method 213, Cond. I. $\Delta R \pm(0.4$ percent + 0.0005 ohm) max.

Vibration, High Frequency: Mil-Std-202, Method 204, Cond. D. $\Delta R \pm(0.4$ percent + 0.0005 ohm) max.

Terminal Strength: Mil-Std-202, Method 211, Cond. A (Pull Test) 5 lbs. $\Delta R \pm(0.2$ percent + 0.0005 ohm) max.

Terminal Material: Solderable

Measurement Note: For these specifications, resistance measurement shall be made at a point 0.2 inch (5.08 mm) from the resistor body.

Figure 1 TO-126 Style MP915

Figure 2 TO-220 Style MP916, MP925 and MP930

Figure 3 TO-247 Style MP9100

DIMENSIONS IN INCHES AND (MILLIMETERS)

Applications Engineering
 17271 North Umpqua Hwy.
 Roseburg, Oregon 97470-9422
 Phone: (541) 496-0700
 Fax: (541) 496-0408

CADDOCK ELECTRONICS, INC.
 e-mail: caddock@caddock.com • web: www.caddock.com
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