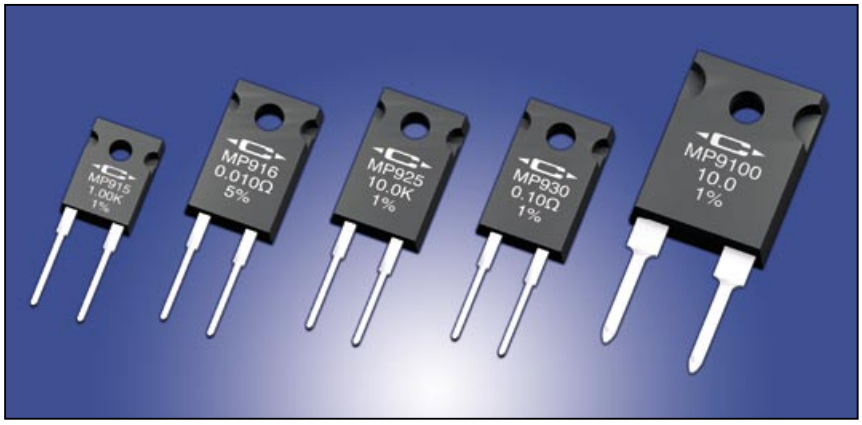
MP900 and MP9000 Series Kool-Pak®
Power Film Resistors TO-126, TO-220 and TO-247 Style



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

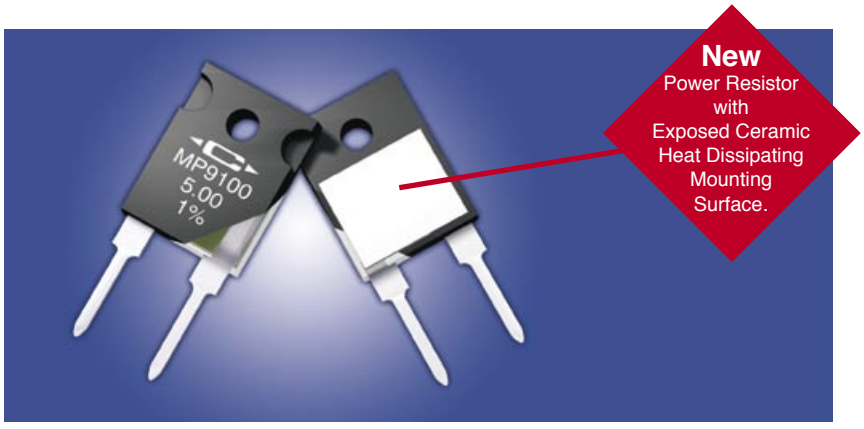
- **15 Watts at +25°C Case Temperature, derated to zero at +150°C.**
- **Exposed Ceramic Heat Dissipating Mounting Surface.**
- **Resistance Range of 0.020 ohm to 1 K.**
- **Non-Inductive Design.**

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.

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

For custom resistance values and tolerances contact applications engineering.

Ordering Information:

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

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.

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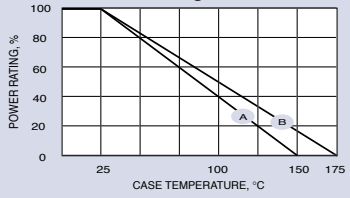
Model No.	Package	Resistance		Power Rating	Max. Voltage	Thermal Resistance $R_{\theta JC}$ Film (J) to Case (C)	Max. Temp. T_{MAX}	Dimensions	Comments
		Min.	Max.						
MP915	TO-126 Style	0.020 Ω	1.00 K	15 Watts*	200	8.33°C/Watt	150°C	Figure 1	Ceramic mounting surface
MP916	TO-220 Style	0.010 Ω	0.019 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*	500	5.00°C/Watt	150°C	Figure 2	Ceramic mounting surface
MP930	TO-220 Style	0.020 Ω	4.99 K	30 Watts*	250	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



A - MP915, MP916, MP925, MP930 Max. Temperature, T_{Max} = 150°C

B - MP9100 Max. Temperature, T_{Max} = 175°C

*** 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)] ≤ 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.

Figure 1
TO-126 Style
MP915

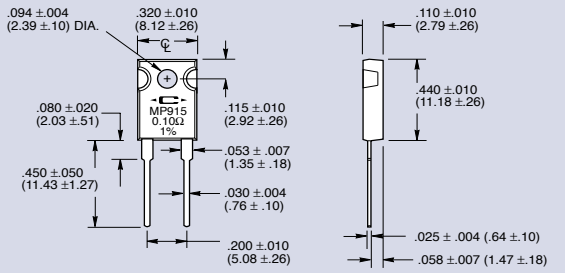


Figure 2
TO-220 Style
MP916, MP925
and MP930

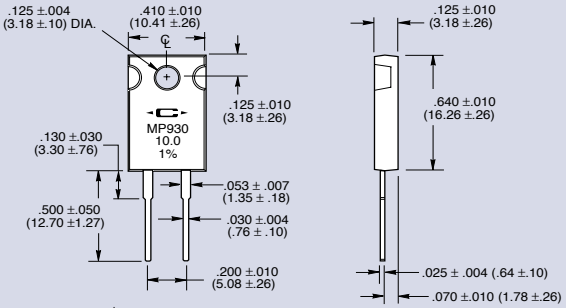
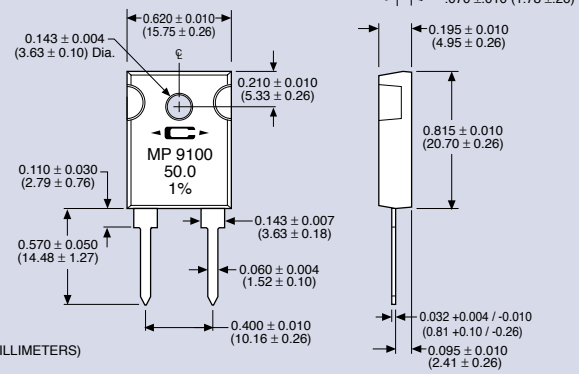


Figure 3
TO-247 Style
MP9100



DIMENSIONS IN INCHES AND (MILLIMETERS)

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. ΔR ±(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. ΔR ±(0.5 percent + 0.0005 ohm) max.

Moisture Resistance: Mil-Std-202, Method 106. ΔR ±(0.5 percent + 0.0005 ohm) max.

Thermal Shock: Mil-Std-202, Method 107, Cond. F. ΔR ±(0.5 percent + 0.0005 ohm) max.

Shock: 100G, Mil-Std-202, Method 213, Cond. I. ΔR ±(0.4 percent + 0.0005 ohm) max.

Vibration, High Frequency: Mil-Std-202, Method 204, Cond. D. ΔR ±(0.4 percent + 0.0005 ohm) max.

Terminal Strength: Mil-Std-202, Method 211, Cond. A (Pull Test) 5 lbs. ΔR ±(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.

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MP930-4.0-1% MP930-0.04-5% MP930-0.33 1% MP930-0.075-1% MP925-30.0K-1% MP930-500-1% MP930-100-1% MP930-1.5-1% MP915-7.5-1% MP915-0.40 1% MP915-470-1% MP915-4-1% MP930-3.0K-1% MP930-2.50-1% MP915-500-1% MP925-100K-1% MP930-150-1% MP915-100-1% MP930-200-1% MP930-0.75-1% MP930-1.5K-1% MP9100-100-1% MP9100-30.0-1% MP9100-33-1% MP9100-15-1% MP9100-40.0-1% MP9100-5.6-1% MP925 5.10K 1% MP915-0.15-1% MP915-0.33-1% MP915-200-1% MP930-56-1% MP930-30.0-1% MP915-15-1% MP9100-7.50-1% MP930-39-5% MP925-75.0K-1% MP930-33.0-1% MP930-3.30-1% MP930-15.0-1% MP925-7.5K-1% MP925 82.0K 1% MP9100-2.5-1% MP9100-8.00-1% MP9100-0.25-1% MP9100-12.0-1% MP930-0.40-1% MP930-0.25-1% MP915-0.75-1% MP915-560- 1% MP930-3.3K-1% MP9100-3-1% MP9100-0.75-1% MP9100-1.50-1% MP9100-0.3-1% MP9100-0.4-1% MP930-250-1% MP915-0.025-5% MP930-0.15-1% MP915-250-1% MP915-0.020-5% MP915-0.050-1% MP915-0.10-1% MP915-0.20-1% MP915-0.50-1% MP915-1.00-1% MP915-2.00-1% MP915-5.00-1% MP915-10.0-1% MP915-20.0-1% MP915-25.0-1% MP915-50.0-1% MP915-75.0-1% MP915-1.00K-1% MP916-0.010-5% MP930-0.020-5% MP930-0.050-1% MP930-0.10-1% MP930-0.20-1% MP930-0.50-1% MP930-1.00-1% MP930-2.00-1% MP930-5.00-1% MP930-10.0-1% MP930-20.0-1% MP930-25.0-1% MP930-50.0-1% MP930-75.0-1% MP930-1.00K-1% MP930-2.00K-1% MP925-5.00K-1% MP925-10.0K-1% MP925-20.0K-1% MP925-50.0K-1% MP9100-0.050-1% MP9100-0.10-1% MP9100-0.20-1% MP9100-0.50-1% MP9100-1.00-1% MP9100-2.00-1%