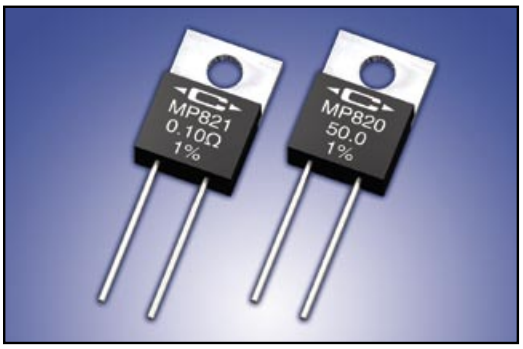
MP800 Series Kool-Pak® Power Film Resistors

TO-220 Style and TO-126 Style - Non-Inductive Designs

Use your thermal design experience with power semiconductors in TO-220 and TO-126 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.



MP820 and MP821 TO-220 Style Power Package with Metal Mounting Tab

- **20 Watts at +25°C Case Temperature derated to zero at +175°C.**
- **Metal Heat Sink Mounting Tab.**
- **MP820 Resistance Range of 10.0 ohm to 10.0 K.**
- **MP821 Resistance Range of 0.020 ohm to 9.99 ohm.**
- **Resistor element is electrically isolated from the mounting surface.**
- **Non-Inductive design for high speed switching, snubbers, and rf applications.**

Construction of MP820 and MP821:

The MP820 and MP821 Kool-Tab® Power Film Resistors are constructed with Caddock's Micronox® resistance film fired onto a flat ceramic substrate which is thermally bonded to the copper heat sink tab. The resistor body is then molded with a high temperature molding compound to finish the metal tab TO-220 package. The lead wire attachment and resistance element geometry are configured to provide outstanding non-inductive performance.

MP821 Standard Resistance Values:

Tolerance MP821: ±1% Standard (0.5%, 2%, 5%, 10%, and 20% are available for most resistance values).

0.020 Ω	0.050 Ω	0.25 Ω	0.75 Ω	3.00 Ω	7.50 Ω
0.025 Ω	0.075 Ω	0.30 Ω	1.00 Ω	3.30 Ω	8.00 Ω
0.030 Ω	0.10 Ω	0.33 Ω	1.50 Ω	4.00 Ω	
0.033 Ω	0.15 Ω	0.40 Ω	2.00 Ω	5.00 Ω	
0.040 Ω	0.20 Ω	0.50 Ω	2.50 Ω		

MP820 Standard Resistance Values:

Tolerance MP820: ±1% Standard (0.5%, 2%, 5%, 10%, and 20% are available for most resistance values).

10.0 Ω	30.0 Ω	75.0 Ω	300 Ω	750 Ω	3.30 K
12.0 Ω	33.0 Ω	100 Ω	330 Ω	1.00 K	4.00 K
15.0 Ω	40.0 Ω	120 Ω	400 Ω	1.50 K	5.00 K
20.0 Ω	47.0 Ω	150 Ω	470 Ω	2.00 K	7.50 K
25.0 Ω	50.0 Ω	200 Ω	500 Ω	2.50 K	10.0 K
27.0 Ω	56.0 Ω	250 Ω	560 Ω	3.00 K	

MP825 and MP850 Power Film Resistors Include an Integral Metal Mounting Surface for Highly Efficient Thermal Transfer

MP825 TO-126 Style Power Package

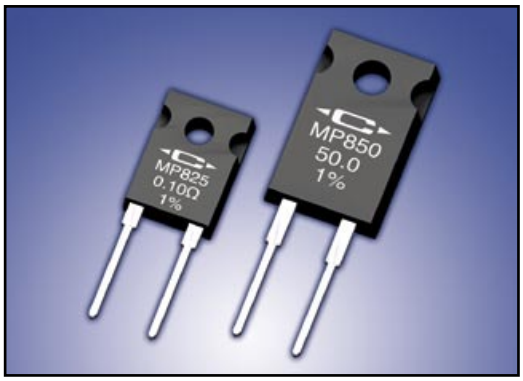
- **25 Watts at +25°C Case Temperature derated to zero at +150°C.**
- **Copper Heat Sink Integral in the Molded Package.**
- **Resistance Range of 0.020 ohm to 10.0 K.**
- **Resistor element is electrically isolated from the mounting surface.**
- **Non-inductive Design.**

MP850 TO-220 Style Power Package

- **50 Watts at +25°C Case Temperature derated to zero at +150°C.**
- **Copper Heat Sink Integral in the Molded Package.**
- **Resistance Range of 0.20 ohm to 10.0 K.**
- **Resistor element is electrically isolated from the mounting surface.**
- **Non-inductive Design.**

Construction of MP825 and MP850:

The MP825 and MP850 Kool-Pak® Power Film Resistors are constructed with Caddock's Micronox® resistance film fired onto a flat ceramic substrate. **The ceramic substrate is bonded to a copper heat sink which becomes the metal mounting surface.** This assembly is molded with the copper heat sink flush with the back surface of the part. The terminal attachment and resistance element geometry are configured to provide outstanding non-inductive performance.



MP825 Standard Resistance Values:

Tolerance MP825: ±1% standard (except as noted), (0.5%, 2%, 5%,10%, and 20% are available for most resistance values).

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

MP850 Standard Resistance Values:

Tolerance MP850: ±1% standard, (0.5%, 2%, 5%,10%, and 20% are available for most resistance values).

0.20 Ω	2.00 Ω	12.0 Ω	50.0 Ω	330 Ω	2.50 K
0.25 Ω	2.50 Ω	15.0 Ω	56.0 Ω	400 Ω	3.00 K
0.30 Ω	3.00 Ω	20.0 Ω	75.0 Ω	470 Ω	3.30 K
0.33 Ω	3.30 Ω	25.0 Ω	100 Ω	500 Ω	4.00 K
0.40 Ω	4.00 Ω	27.0 Ω	120 Ω	560 Ω	5.00 K
0.50 Ω	5.00 Ω	30.0 Ω	150 Ω	750 Ω	7.50 K
0.75 Ω	7.50 Ω	33.0 Ω	200 Ω	1.00 K	10.0 K
1.00 Ω	8.00 Ω	40.0 Ω	250 Ω	1.50 K	
1.50 Ω	10.0 Ω	47.0 Ω	300 Ω	2.00 K	

Ordering Information:

MP850 - 50.0 - 1%

Model Number: — **Resistor Value:** — **Tolerance**

Packaging: MP800 Series Resistors are packaged in plastic shipping tubes, 50 pieces per tube when the order quantity permits.

For custom resistance values and tolerances contact applications engineering

Certain products shown in this catalog are covered by one or more patents, there are also patents pending.

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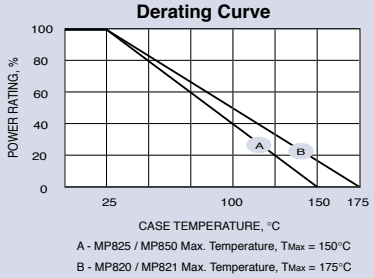
Model No.	Package	Resistance Min.	Resistance Max.	Power Rating	Max. Voltage	Thermal Resistance $R_{\theta JC}$ Film (J) to Case (c)	Max. Temp. T_{MAX}	Dimensions	Comments
MP820	TO-220 Style	10.0 Ω	10.0 K	20 Watts*	300	7.50°C/Watt	175°C	Figure 1	Metal Mounting Tab
MP821	TO-220 Style	0.020 Ω	9.99 Ω	20 Watts*	Power Limited	7.50°C/Watt	175°C	Figure 1	Metal Mounting Tab
MP825	TO-126 Style	0.020 Ω	10.0 K	25 Watts*	300	5.00°C/Watt	150°C	Figure 2	Integral Metal Mounting Surface in Molded Package
MP850	TO-220 Style	0.20 Ω	10.0 K	50 Watts*	300	2.50°C/Watt	150°C	Figure 3	Integral Metal Mounting Surface in Molded Package

Derating Curve



A - MP825 / MP850 Max. Temperature, T_{Max} = 150°C

B - MP820 / MP821 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 metal mounting surface, with the part properly mounted and under electrical load. Without a heat sink, when in free air at +25°C, the MP820, MP821, and MP850 are rated for 2.25 watts, the MP825 is rated for 1.25 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 metal backface 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
Metal Tab
TO-220 Style
MP820 and MP821

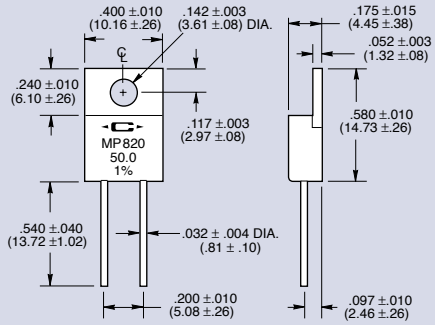


Figure 2
TO-126 Style
MP825

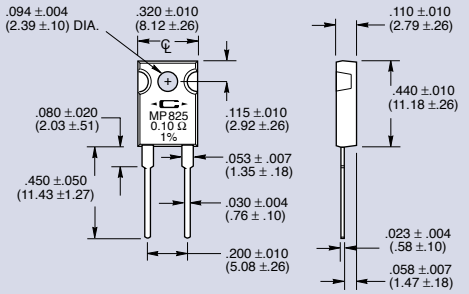
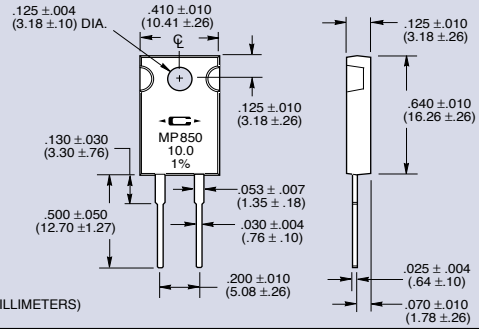


Figure 3
TO-220 Style
MP850



DIMENSIONS IN INCHES AND (MILLIMETERS)

Specifications:

Temperature Coefficient:
TC referenced to +25°C, ΔR taken at T_{MAX}

5.00 ohms and above, -20 to +50 ppm/°C
0.50 ohm to 4.99 ohms, -20 to +80 ppm/°C
0.050 ohm to 0.49 ohm, 0 to +200 ppm/°C
0.020 ohm to 0.049 ohm, 0 to +300 ppm/°C

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

Inductance: 10nH 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 either 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 + 0.001 ohm) max. Power rating dependent upon case temperature. See derating curve.

Momentary Overload:
MP820, MP821, MP850: 2 times rated power with applied voltage not to exceed 1.5 times maximum continuous operating voltage for 5 seconds. ΔR ±(0.3 percent + 0.001 ohm) max.

MP825: 1.5 times rated power with applied voltage not to exceed 1.5 times maximum continuous operating voltage for 5 seconds. ΔR ±(0.3 percent + 0.001 ohm) max.

Moisture Resistance: Mil-Std-202, Method 106. ΔR ±(0.5 percent + 0.001 ohm) max.

Thermal Shock: Mil-Std-202, Method 107, Cond. F. ΔR ±(0.3 percent + 0.001 ohm) max.

Shock: 100G, Mil-Std-202, Method 213, Cond. I. ΔR ±(0.2 percent + 0.001 ohm) max.

Vibration, High Frequency: Mil-Std-202, Method 204, Cond. D. ΔR ±(0.2 percent + 0.001 ohm) max.

Terminal Strength: Mil-Std-202, Method 211, Cond. A (Pull Test) 5 lbs. ΔR ±(0.2 percent + 0.001 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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