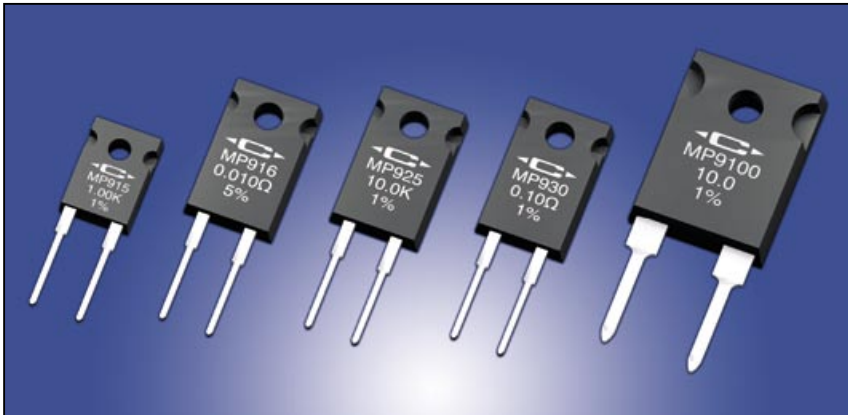


# MP900 and MP9000 Series Kool-Pak®

## Power Film Resistors TO-126, TO-220 and TO-247 Style

Page 1 of 2



### 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

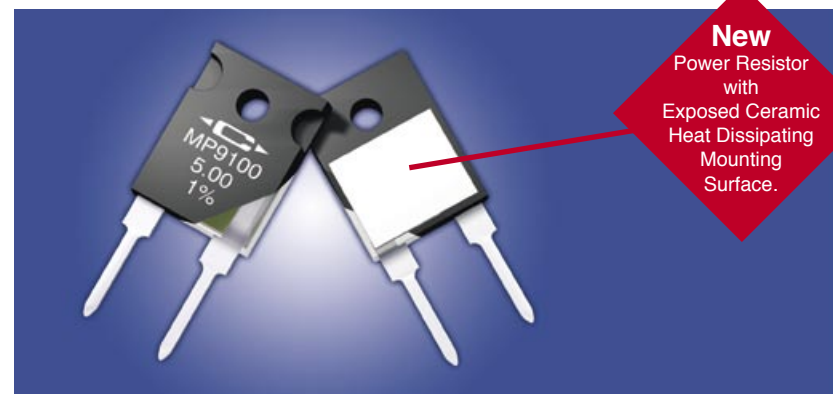
- **15 Watts at +25°C Case Temperature**, derated to zero at +150°C.
- **Exposed Ceramic Heat Dissipating Mounting Surface.**
- **Resistance Range of 0.020 ohm to 1 K.**
- **Non-Inductive Design.**

#### 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.**



**New**  
Power Resistor  
with  
Exposed Ceramic  
Heat Dissipating  
Mounting  
Surface.

#### 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.

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

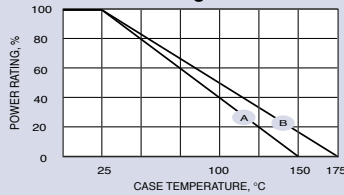
**CADDOCK ELECTRONICS, INC.**

e-mail: caddock@caddock.com • web: www.caddock.com  
For Caddock Distributors listed by country see caddock.com/contact/dist.html

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

| 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 $\Omega$ | 1.00 K         | 15 Watts *   | 200           | 8.33°C/Watt                                        | 150°C                | Figure 1   | Ceramic mounting surface |
| MP916     | TO-220 Style | 0.010 $\Omega$ | 0.019 $\Omega$ | 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 $\Omega$ | 4.99 K         | 30 Watts *   | 250           | 4.17°C/Watt                                        | 150°C                | Figure 2   | Ceramic mounting surface |
| MP9100    | TO-247 Style | 0.050 $\Omega$ | 100 $\Omega$   | 100 Watts *  | Power Limited | 1.50°C/Watt                                        | 175°C                | Figure 3   | Ceramic mounting surface |

Derating Curve



A - MP915, MP916, MP925, MP930 Max. Temperature,  $T_{MAX} = 150^\circ\text{C}$   
 B - MP9100 Max. Temperature,  $T_{MAX} = 175^\circ\text{C}$

\* 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  $+25^\circ\text{C}$ , 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 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](http://caddock.com) or contact Applications Engineering.

Figure 1  
TO-126 Style  
MP915

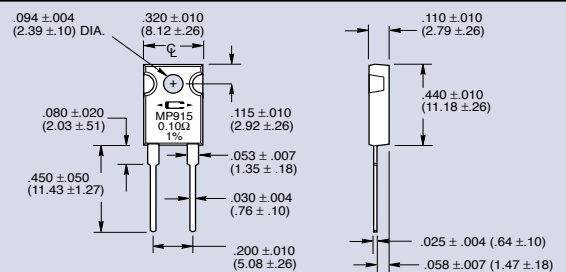


Figure 2  
TO-220 Style  
MP916, MP925  
and MP930

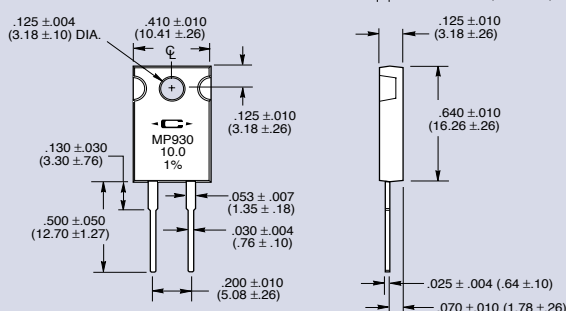
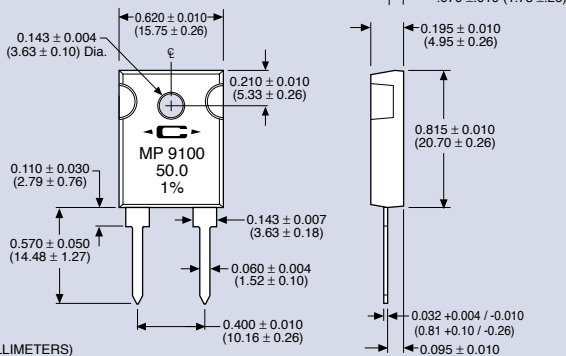


Figure 3  
TO-247 Style  
MP9100



DIMENSIONS IN INCHES AND (MILLIMETERS)

## Specifications:

## Temperature Coefficient for MP915, MP916, MP925, and MP930:

TC referenced to  $+25^\circ\text{C}$ ,  $\Delta R$  taken at  $+150^\circ\text{C}$

0.50 ohms and above,  $-20$  to  $+80$  ppm/ $^\circ\text{C}$   
 0.050 ohm to 0.49 ohms,  $0$  to  $+200$  ppm/ $^\circ\text{C}$   
 0.020 ohm to 0.049 ohm,  $0$  to  $+300$  ppm/ $^\circ\text{C}$   
 0.010 ohm to 0.019 ohm,  $0$  to  $+500$  ppm/ $^\circ\text{C}$

## Temperature Coefficient for MP9100:

TC referenced to  $+25^\circ\text{C}$ ,  $\Delta R$  taken at  $+175^\circ\text{C}$

0.50 ohms and above,  $-20$  to  $+80$  ppm/ $^\circ\text{C}$   
 0.050 ohm to 0.49 ohms,  $0$  to  $+150$  ppm/ $^\circ\text{C}$

Operating Temperature:  $-55^\circ\text{C}$  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.

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А