# Thick Film Panel Mount Power Resistors

multicomp PRO

RoHS Compliant

100 Model

101 Model

102 / 103 Models

250 Model

250T Model

252 / 254 Models

600 Model

800 Model

## Features

- Ideal for snubber and filter application
- Compact housed resistors with excellent heat conduction
- Must be used with external heatsink
- Molded housing which can withstand strong environmental conditions
- Optimized construction with high thermal conduction
- Large creep distance
- All internal electrical connections are welded

## Applications

Thick Film Resistors are ideally suited in electrical filters and snubbers because of their low parasitic inductance and easy to use. thick film resistors must be mounted on a heatsink to take full advantage of their power ratings. The base place is electrically insulated. No additional insulation foil is required. Thermal grease is necessary to provide a good thermal contact between resistor base an heatsink. Recommended is a conductivity of 1W/mK or better. are available in 4 housing types and 4 power ratings, ranging from 100W to over 800W.

## Construction

Thick Film Resistors are produced by firing a special paste onto an alumina ceramic substrate. The electrical connections are tin welded to the thick film through copper wire, making a stable connection. The substrate on the bottom side has a metal finish to minimize partial discharge. The substrate is slightly outside the molded housing. When the housing is mounted to the heat sink, sufficient force for pressing the substrate to the heat sink is automatically applied. All materials are UL94-V0 listed.

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## Mounting

The thick film resistors must be mounted on a heat sink. Between the heat sink and the resistor module, a thin layer of thermal grease must be applied (60-100 micrometers). Alternatively, high quality, thermal conductive, non-electrical insulating foils can be used. For proper mounting, please consult the mounting instructions. Mounting screws and washers are included.

## De-rating

The nominal power depends on the heat sink temperature. When the resistor is used at higher temperatures, the nominal power must be linearly de-rated. Graph 1 and 2 give the nominal power values for 100W and 250W, based on heatsink temperature. Graph 3 and 4 give the nominal power for 600W and 800W, based on resistor base temperature.

## Heat sink requirements

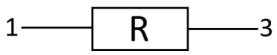
Depending on the total power which needs to be dissipated, a correct heat sink must be used. The maximum power the resistor can dissipate depends on the heat sink temperature and with that, on the thermal resistance of the heat sink and ambient temperature. The surface where the resistor will be mounted needs to be machined to a planarity of 50 micrometer and roughness of less than 6.3 micrometer.

| General Specifications | Remark | 100, 101, 102 & 103 Models |
|---|---|---|
| Power Rating | 100 Model | 100W |
| | 102 Model | 2 × 50W |
| Max Power | Not Trimmed | 150W |
| Resistance Range | E12 | 1R0 to 100R |
| Tolerance | Standard | 10% |
| Temperature Coefficient | | ±100ppm/K |
| Max Working Voltage | | 1500V AC |
| Working Temperature Range | | -55°C to +155°C |
| Dielectric Strength | 1 minute 50Hz | 2500V AC |
| Insulation Resistance | @ 500V | > $10^5$ MΩ |
| Partial Discharge | On Request | < 80pC @ 2000V AC |
| Self Inductance | | 40nH |
| Capacitance to Heatsink | | < 30pF |
| Overload | 10s | 2xPn |
| Thermal Resistance | | 0.5K/W |
| Heatsink Flatness | | 0.05mm |
| Heatsink Surface Finish | | 6.3µm |
| Max Torque for Contacts | | 1.2Nm |
| Max Torque for Mounting | | 1.5Nm |
| Weight | 100 Model/101 Model | 18g |
| | 102 Model/103 Model | 24g |

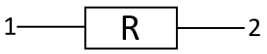
# Thick Film Panel Mount Power Resistors

## Configurations

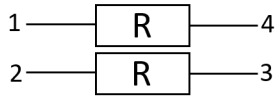
100 Model



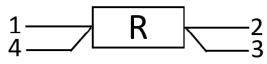

101 Model

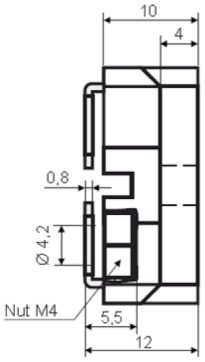


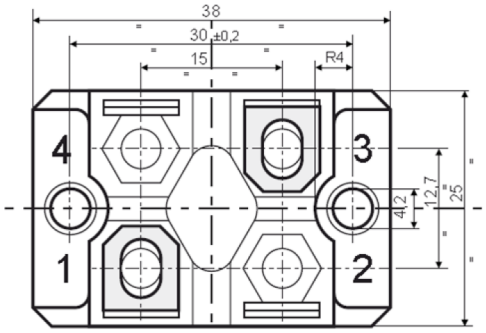

102 Model

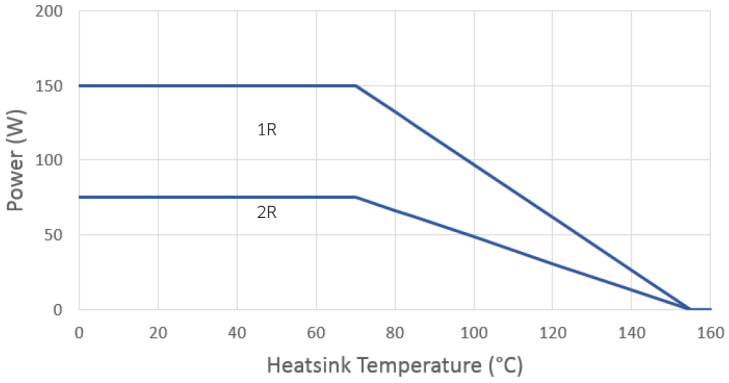



103 Model



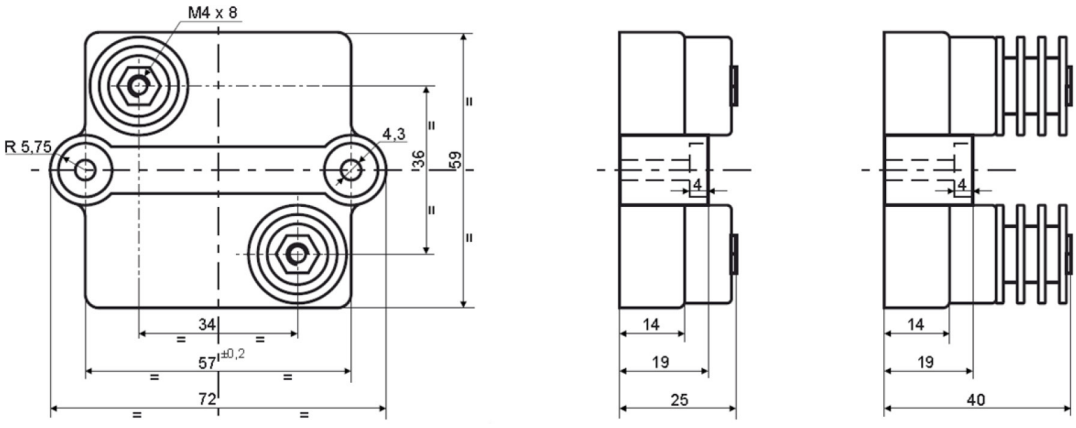




| General Specifications | Remark | 250, 250T, 252 & 254 Models |
|---|---|---|
| Power Rating | @ Heatsink 100°C | 250W |
| Max Power | Not Trimmed @ 70°C | 500W |
| Resistance Range | E12 | 1R0 to 100R |
| Tolerance | Standard | 10% |
| Temperature Coefficient | | ±100 ppm/K |
| Max Working Voltage | | 5000 V AC |
| Working Temperature Range | | -55°C to +155°C |
| Dielectric Strength | 250 Model | 7000VAC |
| | 250T Model | 12000V AC |
| Insulation Resistance | @ 500V | > $10^5$ MΩ |
| Creepage Distance | 250 Model | 42mm |
| | 250T Model | 65mm |
| Airgap Distance | 250 Model | 16mm |
| | 250T Model | 29mm |
| Partial Discharge | | < 10pC @ 5000V AC |
| Self Inductance | | 80nH |

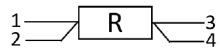
# Thick Film Panel Mount Power Resistors

| General Specifications | Remark | 250, 250T, 252 & 254 Models |
|---|---|---|
| Capacitance to Heatsink | | < 120pF |
| Overload | 10s | 4 × Pn |
| Thermal Resistance | | 0.15K/W |
| Heatsink Flatness | | 0.05mm |
| Heatsink Surface Finish | | 6.3µm |
| Max Torque for Contacts | | 2Nm |
| Max Torque for Mounting | | 2Nm |
| Weight | 250 Model | 100g |
| | 250T Model | 130g |
| Cable Terminals | Optional | |

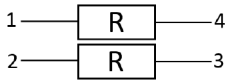



250 Model

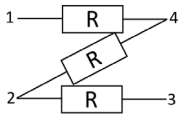
250T Model




250 Model




252 Model




254 Model

## Heatsink Calculation

These resistors must be mounted on a heatsink to take full advantage of the power capability. The maximum thermal resistance of the heatsink can be calculated by the following formula:

$$P = \frac{\Delta T}{R_{TH\ j-c} + R_{TH\ c-h} + R_{TH\ h-a}}$$

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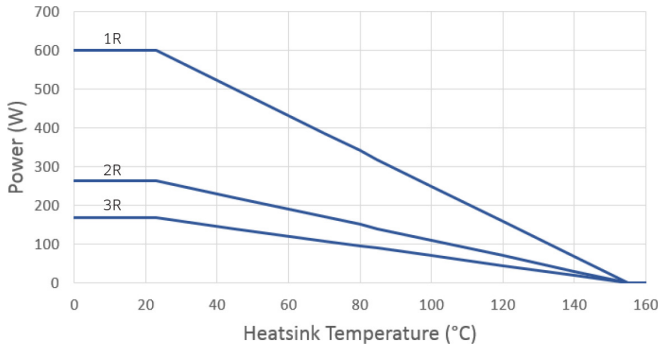
P is dissipated power in the resistor in Watts.

ΔT is the difference between maximum working temperature (155°C) and room temperature.

$R_{TH\ j\text{-}c}$ is the thermal resistance of the resistor between junction and case. 0.5K/W for 100 Model and 0.15K/W for 250 Model

$R_{TH\ c\text{-}h}$ is the thermal resistance between the base plate of the resistor and the heatsink This value is determined by the thickness and the properties of the paste, and the surface area size. Recommended is a paste with conductivity of 1W/mK or better.

$R_{TH\ h\text{-}a}$ is the thermal resistance of the heatsink to ambient. This value is given by the manufacturer of the heatsink.

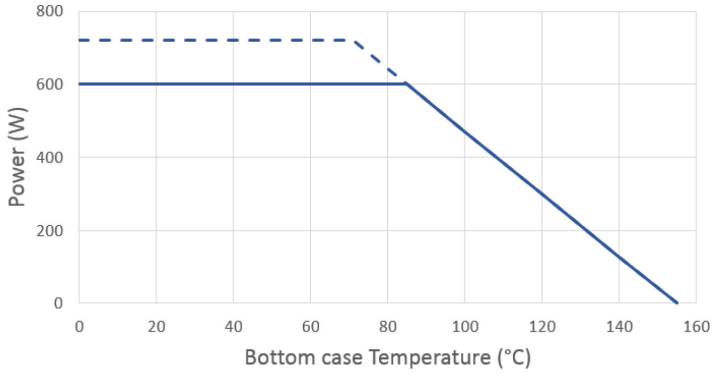


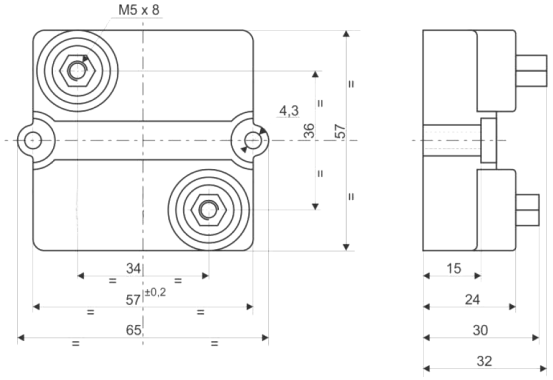

| General Specifications | Remark | 600 Model | 800 Model |
|---|---|---|---|
| Power Rating | @ Bottom Base 85°C | 600W | 800W |
| Max Power | | 700W | 950W |
| Resistance Range | E12 | 1R0 to 100K | |
| Tolerance | Standard | 10% | |
| Temperature Coefficient | | ±100 ppm/K | |
| Max Working Voltage | | 5000V AC | |
| Working Temperature Range | | -55°C - +155°C | |
| Dielectric Strength | Standard | 7000VAC | |
| | On Request | 12000V AC | |
| Insulation Resistance | @ 500V | > $10^5$ MΩ | |
| Creepage Distance | | 42mm | |
| Airgap Distance | | 16mm | |
| Partial Discharge | | < 10pC @ 5000V AC | |
| Self Inductance | | 80nH | |
| Parallel Capacitance | | 40pF | |
| Capacitance to Heatsink | | < 110pF | < 150pF |
| Overload | 10s | 1kW | |
| Thermal Resistance | | 0.115K/W | 0.11K/W |
| Heatsink Flatness | | 0.05mm | |
| Heatsink Surface Finish | | 6.3µm | |
| Max Torque for Contacts | | 2Nm | |
| Max Torque for Mounting | | 2Nm | |
| Weight | | 95g | 100g |

## Pulse load / overload capability.

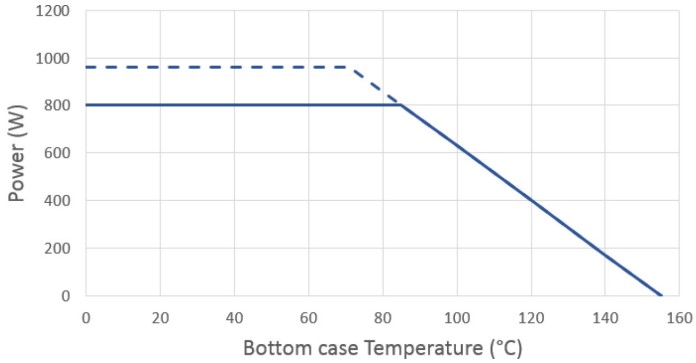
These resistors can be overloaded during a certain time. The energy the resistor can take is in relation to the duration of the overload. For repetitive overloads, a minimum cooldown time must be observed before the resistor can take another pulse load.

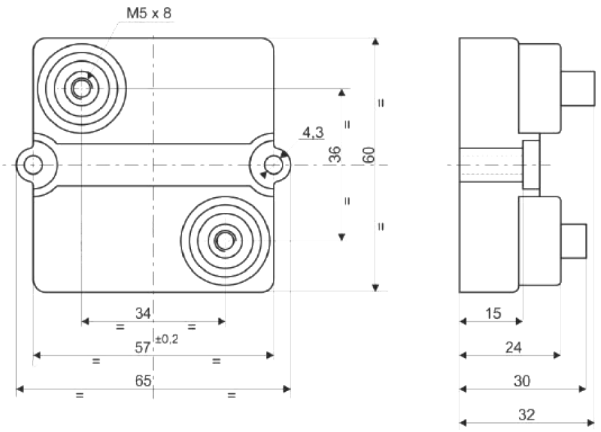
### 600 Model




### 800 Model



## Part Number Table

| Description | Models | Part Number |
|---|---|---|
| Power Resistor, Thick Film, 100W, 1R, 10%, Panel Mount | 100 | MP005151 |
| Power Resistor, Thick Film, 100W, 10R, 10%, Panel Mount | 100 | MP005152 |
| Power Resistor, Thick Film, 100W, 22R, 10%, Panel Mount | 100 | MP005153 |
| Power Resistor, Thick Film, 100W, 47R, 10%, Panel Mount | 100 | MP005154 |
| Power Resistor, Thick Film, 100W, 68R, 10%, Panel Mount | 100 | MP005155 |
| Power Resistor, Thick Film, 100W, 100R, 10%, Panel Mount | 100 | MP005156 |
| Power Resistor, Thick Film, 100W, 1R, 10%, Panel Mount | 101 | MP005157 |
| Power Resistor, Thick Film, 100W, 10R, 10%, Panel Mount | 101 | MP005158 |
| Power Resistor, Thick Film, 100W, 22R, 10%, Panel Mount | 101 | MP005159 |
| Power Resistor, Thick Film, 100W, 47R, 10%, Panel Mount | 101 | MP005160 |
| Power Resistor, Thick Film, 100W, 68R, 10%, Panel Mount | 101 | MP005161 |
| Power Resistor, Thick Film, 100W, 100R, 10%, Panel Mount | 101 | MP005162 |
| Power Resistor, Thick Film, 100W, 1R, 10%, Panel Mount | 102 | MP005163 |
| Power Resistor, Thick Film, 100W, 10R, 10%, Panel Mount | 102 | MP005164 |
| Power Resistor, Thick Film, 100W, 22R, 10%, Panel Mount | 102 | MP005165 |
| Power Resistor, Thick Film, 100W, 47R, 10%, Panel Mount | 102 | MP005166 |
| Power Resistor, Thick Film, 100W, 68R, 10%, Panel Mount | 102 | MP005167 |
| Power Resistor, Thick Film, 100W, 100R, 10%, Panel Mount | 102 | MP005168 |
| Power Resistor, Thick Film, 100W, 1R, 10%, Panel Mount | 103 | MP005169 |
| Power Resistor, Thick Film, 100W, 10R, 10%, Panel Mount | 103 | MP005170 |
| Power Resistor, Thick Film, 100W, 22R, 10%, Panel Mount | 103 | MP005171 |
| Power Resistor, Thick Film, 100W, 47R, 10%, Panel Mount | 103 | MP005172 |
| Power Resistor, Thick Film, 100W, 68R, 10%, Panel Mount | 103 | MP005173 |
| Power Resistor, Thick Film, 100W, 100R, 10%, Panel Mount | 103 | MP005174 |
| Power Resistor, Thick Film, 250W, 1R, 10%, Panel Mount | 250 | MP005175 |
| Power Resistor, Thick Film, 250W, 10R, 10%, Panel Mount | 250 | MP005176 |
| Power Resistor, Thick Film, 250W, 22R, 10%, Panel Mount | 250 | MP005177 |
| Power Resistor, Thick Film, 250W, 47R, 10%, Panel Mount | 250 | MP005178 |
| Power Resistor, Thick Film, 250W, 100R, 10%, Panel Mount | 250 | MP005179 |
| Power Resistor, Thick Film, 250W, 1R, 10%, Panel Mount | 250T | MP005180 |
| Power Resistor, Thick Film, 250W, 10R, 10%, Panel Mount | 250T | MP005181 |
| Power Resistor, Thick Film, 250W, 22R, 10%, Panel Mount | 250T | MP005182 |
| Power Resistor, Thick Film, 250W, 47R, 10%, Panel Mount | 250T | MP005183 |
| Power Resistor, Thick Film, 250W, 100R, 10%, Panel Mount | 250T | MP005184 |
| Power Resistor, Thick Film, 250W, 1R, 10%, Panel Mount | 252 | MP005185 |
| Power Resistor, Thick Film, 250W, 10R, 10%, Panel Mount | 252 | MP005186 |

| Description | Models | Part Number |
|---|---|---|
| Power Resistor, Thick Film, 250W, 22R, 10%, Panel Mount | 252 | MP005187 |
| Power Resistor, Thick Film, 250W, 47R, 10%, Panel Mount | 252 | MP005188 |
| Power Resistor, Thick Film, 250W, 100R, 10%, Panel Mount | 252 | MP005189 |
| Power Resistor, Thick Film, 250W, 1R, 10%, Panel Mount | 254 | MP005190 |
| Power Resistor, Thick Film, 250W, 10R, 10%, Panel Mount | 254 | MP005191 |
| Power Resistor, Thick Film, 250W, 22R, 10%, Panel Mount | 254 | MP005192 |
| Power Resistor, Thick Film, 250W, 47R, 10%, Panel Mount | 254 | MP005193 |
| Power Resistor, Thick Film, 250W, 100R, 10%, Panel Mount | 254 | MP005194 |
| Power Resistor, Thick Film, 600W, 1R, 10%, Panel Mount | 600 | MP005195 |
| Power Resistor, Thick Film, 600W, 22R, 10%, Panel Mount | 600 | MP005196 |
| Power Resistor, Thick Film, 600W, 50R, 10%, Panel Mount | 600 | MP005197 |
| Power Resistor, Thick Film, 600W, 75R, 10%, Panel Mount | 600 | MP005198 |
| Power Resistor, Thick Film, 600W, 100R, 10%, Panel Mount | 600 | MP005199 |
| Power Resistor, Thick Film, 600W, 100K, 10%, Panel Mount | 600 | MP005200 |
| Power Resistor, Thick Film, 800W, 1R, 10%, Panel Mount | 800 | MP005201 |
| Power Resistor, Thick Film, 800W, 1.5R, 10%, Panel Mount | 800 | MP005202 |
| Power Resistor, Thick Film, 800W, 10R, 10%, Panel Mount | 800 | MP005203 |
| Power Resistor, Thick Film, 800W, 22R, 10%, Panel Mount | 800 | MP005204 |
| Power Resistor, Thick Film, 800W, 50R, 10%, Panel Mount | 800 | MP005205 |
| Power Resistor, Thick Film, 800W, 100R, 10%, Panel Mount | 800 | MP005206 |