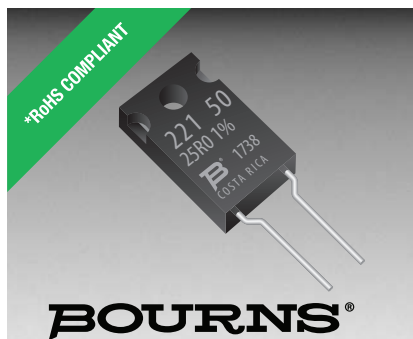




## Features

- TO-220 housing
- Low inductance
- Ceramic backplane
- High power rating
- RoHS compliant\*

## Applications

- Power supplies
- Motor drives
- Test and measurement
- Rectifiers

# PWR221T-50 Series Power Resistor

## General Information

Bourns® PWR221T-50 Series is a TO-220 style power resistor made using thick film on alumina ceramic technology. It is used in current limiting, capacitor discharge or current measurement circuits in power supplies for telecom and industrial applications.

## Electrical & Thermal Characteristics

| Parameter                                        | Value(s)                                   |
|--------------------------------------------------|--------------------------------------------|
| Resistance (See Popular Resistance Values table) | 0.02 $\Omega$ to 130 K $\Omega$            |
| Power Rating @ 25 °C Case Temperature            | 50 W <sup>(1)</sup>                        |
| Tolerance                                        | $\pm 1\%$ <sup>(2)</sup> , $\pm 5\%$       |
| Hot TCR                                          |                                            |
| 0.100 $\Omega \leq R \leq 130.0$ K $\Omega$      | $\pm 100$ PPM/°C                           |
| 0.050 $\Omega \leq R \leq 0.100$ $\Omega$        | $\pm 300$ PPM/°C                           |
| 0.020 $\Omega \leq R \leq 0.050$ $\Omega$        | $\pm 600$ PPM/°C                           |
| Thermal Resistance - R <sub>thj</sub>            | 4.2 °C/W                                   |
| Inductance                                       | 0.1 $\mu$ H maximum                        |
| Operating Voltage                                | $\sqrt{P \cdot R}$ with a maximum of 250 V |
| Dielectric Strength                              | 2 KV AC                                    |
| Insulation Resistance                            | 10 G $\Omega$                              |
| Operating Temperature                            | -55 °C to +150 °C                          |

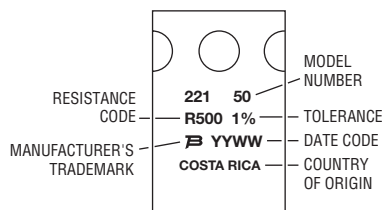
(1) Power rating of 2.25 W when mounted free to air (no heat sink).

(2) Available for most values. Check Popular Resistance Values table.

## Reliability Characteristics

| Parameter                                                                                                       | Specification         |
|-----------------------------------------------------------------------------------------------------------------|-----------------------|
| Short Term Overload (2x Pr for R < 2 $\Omega$ , 1.6 x Pr for R $\geq 2$ $\Omega$ , V < 1.5 x Operating Voltage) | $\Delta R \pm 0.25\%$ |
| Load Life (2000 hours at rated power)                                                                           | $\Delta R \pm 1.0\%$  |
| Thermal Shock (-55 °C to 155 °C, 5 cycles)                                                                      | $\Delta R \pm 0.5\%$  |
| Resistance to Soldering Heat (10 seconds at 270 °C)                                                             | $\Delta R \pm 0.5\%$  |
| Vibration (20 G 10-2000 Hz .06 " D.A.)                                                                          | $\Delta R \pm 0.25\%$ |
| Terminal Strength (MIL-STD-202, Method 211 Test A1)                                                             | $\Delta R \pm 0.2\%$  |
| Shock (Saw Tooth: 100 g/6 ms)                                                                                   | $\Delta R \pm 0.5\%$  |
| Humidity (Steady State) 1000 hrs. 85 °C/85 % RH                                                                 | $\Delta R \pm 0.5\%$  |
| High Temperature Exposure (100 hrs - 40 % Pr @ +125 °C)                                                         | $\Delta R \pm 0.5\%$  |

## Typical Part Marking



## Material Characteristics

Resistor ..... Thick film  
 Substrate ..... Alumina (AL2O3)  
 Housing ..... Epoxy  
 Pins ..... Tinned Copper (Sn/Cu)  
 Flammability ..... Conforms to UL-94V0  
 Moisture Sensitivity Level ..... 1  
 ESD Classification (HBM) ..... 3B

## Packaging

..... 50 pcs./tube

## Popular Resistance Values

| Code | Resistance Value              | Code | Resistance Value |
|------|-------------------------------|------|------------------|
| R020 | 0.02 $\Omega$ <sup>(3)</sup>  | 1000 | 100 $\Omega$     |
| R025 | 0.025 $\Omega$ <sup>(3)</sup> | 1200 | 120 $\Omega$     |
| R030 | 0.03 $\Omega$ <sup>(3)</sup>  | 1500 | 150 $\Omega$     |
| R033 | 0.033 $\Omega$ <sup>(3)</sup> | 2000 | 200 $\Omega$     |
| R040 | 0.04 $\Omega$ <sup>(3)</sup>  | 2500 | 250 $\Omega$     |
| R050 | 0.05 $\Omega$ <sup>(3)</sup>  | 3000 | 300 $\Omega$     |
| R075 | 0.075 $\Omega$ <sup>(3)</sup> | 3300 | 330 $\Omega$     |
| R100 | 0.1 $\Omega$                  | 4000 | 400 $\Omega$     |
| R150 | 0.15 $\Omega$                 | 4700 | 470 $\Omega$     |
| R200 | 0.2 $\Omega$                  | 5000 | 500 $\Omega$     |
| R250 | 0.25 $\Omega$                 | 5600 | 560 $\Omega$     |
| R300 | 0.3 $\Omega$                  | 7500 | 750 $\Omega$     |
| R330 | 0.33 $\Omega$                 | 1001 | 1.0 K $\Omega$   |
| R400 | 0.4 $\Omega$                  | 1501 | 1.5 K $\Omega$   |
| R500 | 0.5 $\Omega$                  | 2001 | 2.0 K $\Omega$   |
| R750 | 0.75 $\Omega$                 | 2501 | 2.5 K $\Omega$   |
| 1R00 | 1 $\Omega$                    | 3001 | 3.0 K $\Omega$   |
| 1R50 | 1.5 $\Omega$                  | 3301 | 3.3 K $\Omega$   |
| 2R00 | 2 $\Omega$                    | 4001 | 4.0 K $\Omega$   |
| 2R50 | 2.5 $\Omega$                  | 5001 | 5.0 K $\Omega$   |
| 3R00 | 3 $\Omega$                    | 7501 | 7.5 K $\Omega$   |
| 3R30 | 3.3 $\Omega$                  | 1002 | 10 K $\Omega$    |
| 4R00 | 4 $\Omega$                    | 1502 | 15 K $\Omega$    |
| 5R00 | 5 $\Omega$                    | 2002 | 20 K $\Omega$    |
| 7R50 | 7.5 $\Omega$                  | 2502 | 25 K $\Omega$    |
| 8R00 | 8 $\Omega$                    | 3002 | 30 K $\Omega$    |
| 10R0 | 10 $\Omega$                   | 3302 | 33 K $\Omega$    |
| 12R0 | 12 $\Omega$                   | 4002 | 40 K $\Omega$    |
| 15R0 | 15 $\Omega$                   | 4702 | 47 K $\Omega$    |
| 20R0 | 20 $\Omega$                   | 5002 | 50 K $\Omega$    |
| 25R0 | 25 $\Omega$                   | 5602 | 56 K $\Omega$    |
| 27R0 | 27 $\Omega$                   | 6802 | 68 K $\Omega$    |
| 30R0 | 30 $\Omega$                   | 7502 | 75 K $\Omega$    |
| 33R0 | 33 $\Omega$                   | 8202 | 82 K $\Omega$    |
| 40R0 | 40 $\Omega$                   | 1003 | 100 K $\Omega$   |
| 47R0 | 47 $\Omega$                   | 1153 | 115 K $\Omega$   |
| 50R0 | 50 $\Omega$                   | 1203 | 120 K $\Omega$   |
| 56R0 | 56 $\Omega$                   | 1253 | 125 K $\Omega$   |
| 75R0 | 75 $\Omega$                   | 1303 | 130 K $\Omega$   |

(3) 5 % Tolerance

\*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011. Specifications are subject to change without notice. Users should verify actual device performance in their specific applications.

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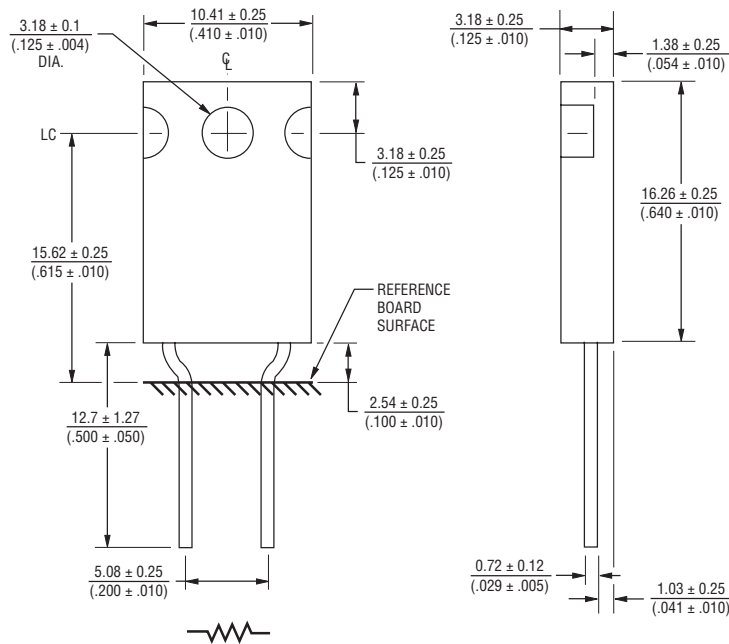


**WARNING** Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

# PWR221T-50 Series Power Resistor

**BOURNS®**

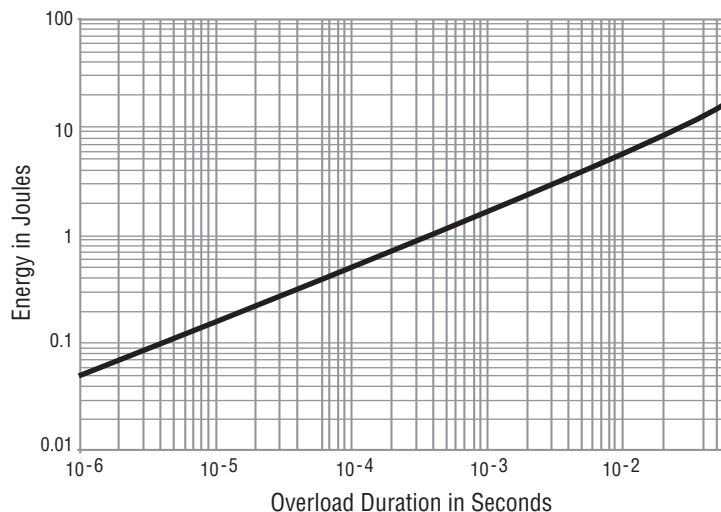
## Product Dimensions



DIMENSIONS:  $\frac{\text{MM}}{\text{INCHES}}$

TOLERANCE:  $\pm \frac{0.38}{(0.015)}$  UNLESS OTHERWISE NOTED

## Pulse Power Rating



The energy absorbed by the resistor expressed in Joules can be calculated by multiplying the peak power of the pulse in watts times the length of the pulse in seconds.

The energy should not exceed the limits shown in the graph. The overload voltage should not exceed 1.5 times the maximum operating voltage.

## How to Order

**PWR 221 T - 50 - 10R0 F**

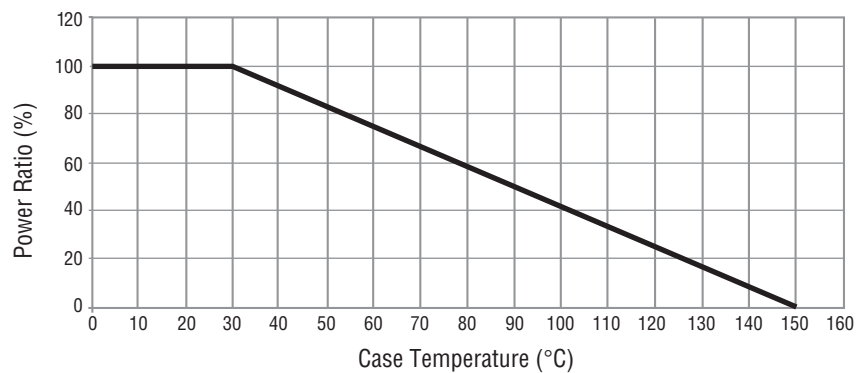
Model \_\_\_\_\_  
 PWR = Power Resistor  
 Package \_\_\_\_\_  
 221 = TO-220 Style  
 Pin Style \_\_\_\_\_  
 T = Through-hole  
 Power \_\_\_\_\_  
 50 = 50 W  
 Resistance Value \_\_\_\_\_  
 <100 ohms ... "R" represents decimal point (examples: 7R50 = 7.5  $\Omega$ ; R500 = 0.5  $\Omega$ )  
 $\geq$ 100 ohms.... First three digits are significant, fourth digit represents number of zeros to follow (examples: 2000 = 200 ohms; 3002 = 30K ohms)  
 Absolute Tolerance \_\_\_\_\_  
 J = 5 %  
 F = 1 % (Available for most values. Check Popular Resistance Values table.)

Specifications are subject to change without notice.

Users should verify actual device performance in their specific applications.

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## Derating Curve



## BOURNS®

**Asia-Pacific:** Tel: +886-2 2562-4117 • Email: [asiacus@bourns.com](mailto:asiacus@bourns.com)

**EMEA:** Tel: +36 88 520 390 • Email: [eurocus@bourns.com](mailto:eurocus@bourns.com)

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