

FPR FPS 2/4-T220 T221

Precision Power Shunt Resistors



- Resistances from 0.002 Ohm to 10 Ohms
- Power Rating to 15Watt
- Resistance Tolerances to $\pm 0.1\%$
- TCR to $\pm 50\text{ppm}/^\circ\text{C}$
- Load Stability to 0.1%
- TO-220 Housing
- Convenient SMD D2Pak Available
- Isolated Back Plate
- Non-Inductive Planar Construction

SPECIFICATIONS

| Type | FPR 2-T220/T221 | FPS 2-T220 | FPR 4-T220/T221 | FPS 4-T220 |
|---|--|------------|--|------------|
| Resistance Range | 0.002 to 10 Ohms (other resistance values possible on request) | | | |
| Power Rating - Free air 70°C With heatsink | | | 1.5 W | 15 W |
| Thermal Resistance Rthj-c | 4.8 °C/W | | | |
| Tolerances from 0.002 Ohms from 0.01 Ohms | 2% / 5% 0.5% / 1% / 2% / 5% | | 1% / 2% / 5% 0.1% / 0.25% / 0.5% / 1% / 2% / 5% | |
| Stability | 0.1% / 0.2% / 0.5% (depends on stress) | | | |
| Temperature Coefficient | All values from (20 to 60°C) R < 0.010 Ohms : $\pm 1000\text{ ppm}/^\circ\text{C}$ 0.010 \leq R < 0.040 Ohms : $\pm 500\text{ ppm}/^\circ\text{C}$ 0.040 \leq R < 0.075 Ohms : $\pm 100\text{ ppm}/^\circ\text{C}$ 0.075 \leq R : $\pm 50\text{ ppm}/^\circ\text{C}$ | | $\pm 30\text{ ppm}/^\circ\text{C}$ (20 to 60°C) $\pm 50\text{ ppm}/^\circ\text{C}$ (-40 to 130°C) | |
| Max. Current | 50 A | | | |
| Voltage Proof | 300 VDC | | | |
| Thermal EMF | < 0.1 $\mu\text{V}/\text{K}$ | | | |
| Operating Temperature Range | -40 to 130°C | | | |
| Resistor Material | CuNiMn-Foil | | | |
| Substrate | Al ₂ O ₃ or anodized aluminium | | | |
| Housing | Epoxy or PPS | | | |
| Connector Material | Cu tinned | | | |
| Terminals | 2 | | 4 | |
| Max. torque | 1 Nm / T221: 0.8 Nm | | 1 Nm / T221: 0.8 Nm | |

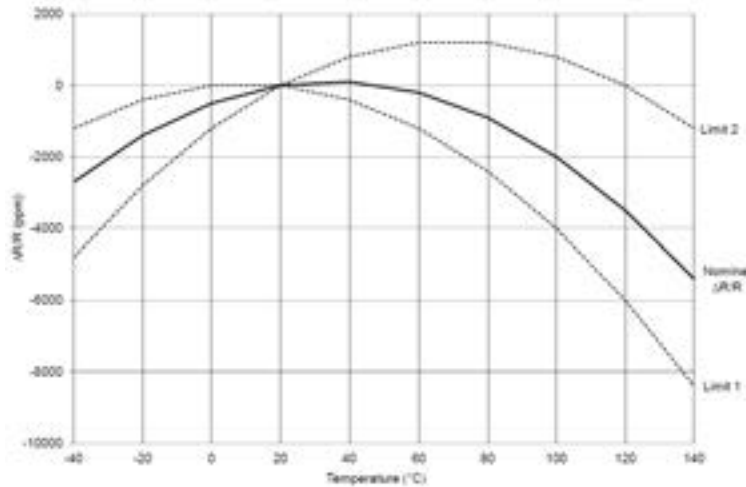
Ordering Information

Part Description: Part Type - Resistance - Tolerance
FPS 4-T220 0.01 Ohms 0.1%

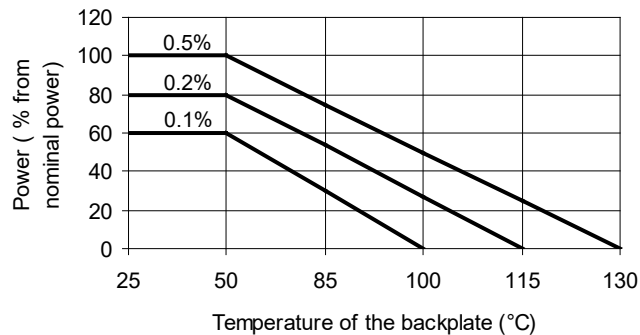


SPECIFICATIONS (continued)

Temperature Coefficient



Derating



Power Rating Notes -

The FPR Series Resistors must be attached to a suitable heat-sink. The maximum internal resistor temperature is 130°C.

To specify an appropriate heatsink use the following formula :

$$R_{\theta H} = \frac{T_{MAX} - (P * R_{\theta R}) - T_A}{P}$$

Where: $R_{\theta H}$ = Thermal Resistance of Heatsink (K/W)
 $R_{\theta R}$ = Thermal Resistance of Resistor (K/W)
 T_{MAX} = Maximum Temperature of Resistor
 T_A = Ambient Temperature of Heatsink (°C)
 P = Power Through Resistor (W)

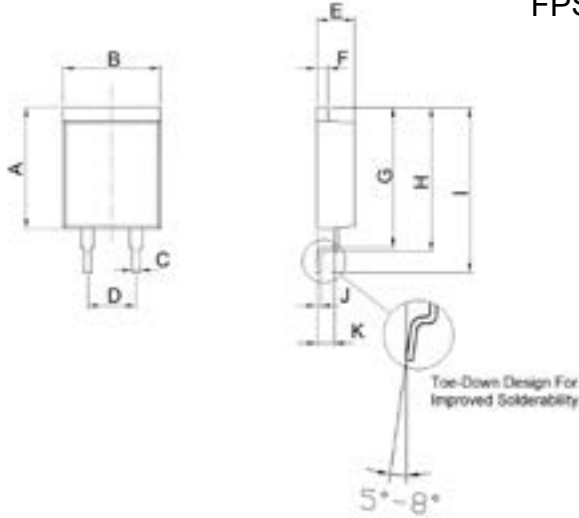
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Precision Power Shunt Resistors



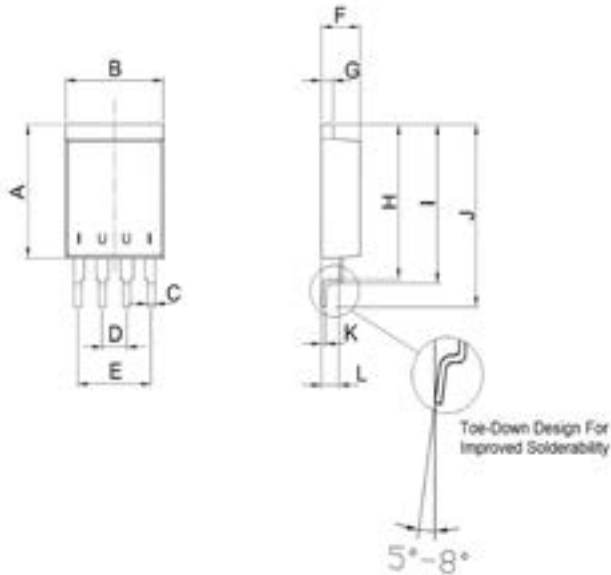
SPECIFICATIONS (continued)

Dimensions FPS 2-T220

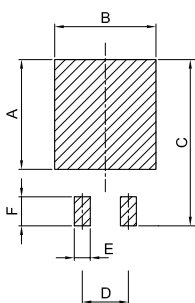


| Dimension | mm | tol. (±mm) | inches | tol. (±inches) |
|-----------|-------|------------|--------|----------------|
| A | 12.70 | 0.2 | 0.50 | 0.008 |
| B | 10.16 | 0.2 | 0.40 | 0.008 |
| C | 0.76 | 0.1 | 0.03 | 0.004 |
| D | 5.08 | 0.1 | 0.20 | 0.004 |
| E | 4.00 | 0.1 | 0.16 | 0.004 |
| F | 1.20 | 0.1 | 0.05 | 0.004 |
| G | 14.60 | 0.2 | 0.57 | 0.008 |
| H | 15.00 | 0.2 | 0.59 | 0.008 |
| I | 17.33 | 0.2 | 0.68 | 0.008 |
| J | 0.40 | 0.1 | 0.02 | 0.004 |
| K | 1.85 | 0.1 | 0.07 | 0.004 |

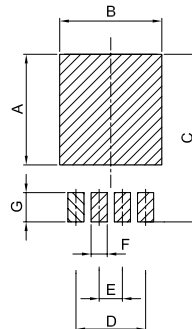
FPS 4-T220



| Dimension | mm | tol. (±mm) | inches | tol. (±inches) |
|-----------|-------|------------|--------|----------------|
| A | 12.70 | 0.2 | 0.50 | 0.008 |
| B | 10.16 | 0.2 | 0.40 | 0.008 |
| C | 0.76 | 0.1 | 0.03 | 0.004 |
| D | 2.54 | 0.1 | 0.10 | 0.004 |
| E | 7.62 | 0.1 | 0.30 | 0.004 |
| F | 4.00 | 0.1 | 0.16 | 0.004 |
| G | 1.20 | 0.1 | 0.05 | 0.004 |
| H | 14.60 | 0.2 | 0.57 | 0.008 |
| I | 15.00 | 0.2 | 0.59 | 0.008 |
| J | 17.33 | 0.2 | 0.68 | 0.008 |
| K | 0.40 | 0.1 | 0.02 | 0.004 |
| L | 1.85 | 0.1 | 0.07 | 0.004 |



| FPS 2-T220 Land Pattern | | |
|-------------------------|-------|--------|
| Dimension | mm | inches |
| A | 12.10 | 0.476 |
| B | 11.16 | 0.439 |
| C | 18.33 | 0.722 |
| D | 5.08 | 0.200 |
| E | 1.76 | 0.069 |
| F | 3.20 | 0.126 |



| FPS 4-T220 Land Pattern | | |
|-------------------------|-------|--------|
| Dimension | mm | inches |
| A | 12.10 | 0.476 |
| B | 11.16 | 0.439 |
| C | 18.33 | 0.722 |
| D | 7.62 | 0.300 |
| E | 2.54 | 0.100 |
| F | 1.76 | 0.069 |
| G | 3.20 | 0.126 |

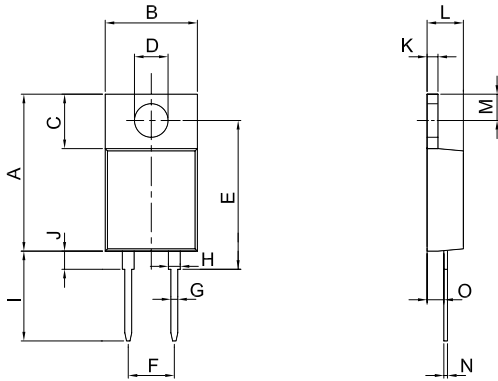
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Precision Power Shunt Resistors



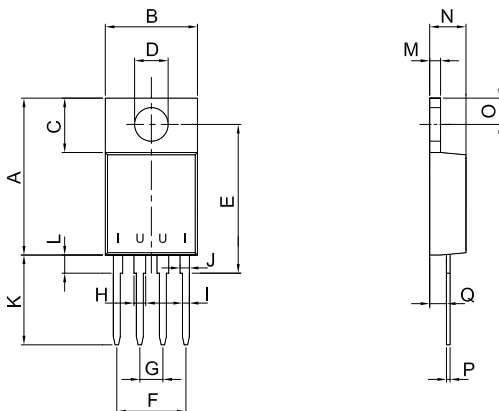
SPECIFICATIONS (continued)

FPR 2-T220



| Dimension | mm | tol. (±mm) | inches | tol. (±inches) |
|-----------|-------|------------|--------|----------------|
| A | 17.30 | 0.2 | 0.68 | 0.008 |
| B | 10.16 | 0.2 | 0.40 | 0.008 |
| C | 6.00 | 0.1 | 0.24 | 0.004 |
| D | Ø3.7 | 0.1 | Ø0.146 | 0.004 |
| E | 16.40 | 0.2 | 0.65 | 0.008 |
| F | 5.08 | 0.1 | 0.20 | 0.004 |
| G | 0.76 | 0.1 | 0.03 | 0.004 |
| H | 1.30 | 0.1 | 0.05 | 0.004 |
| I | 13.80 | 0.2 | 0.54 | 0.008 |
| J | 2.00 | 0.1 | 0.08 | 0.004 |
| K | 1.20 | 0.1 | 0.05 | 0.004 |
| L | 4.00 | 0.1 | 0.16 | 0.004 |
| M | 2.90 | 0.1 | 0.11 | 0.004 |
| N | 0.40 | 0.1 | 0.02 | 0.004 |
| O | 1.85 | 0.1 | 0.07 | 0.004 |

FPR 4-T220



| Dimension | mm | tol. (±mm) | inches | tol. (±inches) |
|-----------|-------|------------|--------|----------------|
| A | 17.30 | 0.2 | 0.68 | 0.008 |
| B | 10.16 | 0.2 | 0.40 | 0.008 |
| C | 6.00 | 0.1 | 0.24 | 0.004 |
| D | Ø3.7 | 0.1 | Ø0.146 | 0.004 |
| E | 16.40 | 0.2 | 0.65 | 0.008 |
| F | 7.62 | 0.2 | 0.30 | 0.008 |
| G | 2.54 | 0.1 | 0.10 | 0.004 |
| H | 1.30 | 0.1 | 0.05 | 0.004 |
| I | 0.76 | 0.1 | 0.03 | 0.004 |
| J | 1.03 | 0.1 | 0.04 | 0.004 |
| K | 13.80 | 0.2 | 0.54 | 0.008 |
| L | 2.00 | 0.1 | 0.08 | 0.004 |
| M | 1.20 | 0.1 | 0.05 | 0.004 |
| N | 4.00 | 0.1 | 0.16 | 0.004 |
| O | 2.90 | 0.1 | 0.11 | 0.004 |
| P | 0.40 | 0.1 | 0.02 | 0.004 |
| Q | 1.85 | 0.1 | 0.07 | 0.004 |

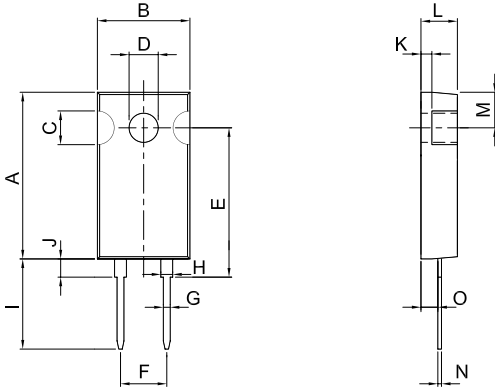
FPR FPS 2/4-T220 T221

Precision Power Shunt Resistors



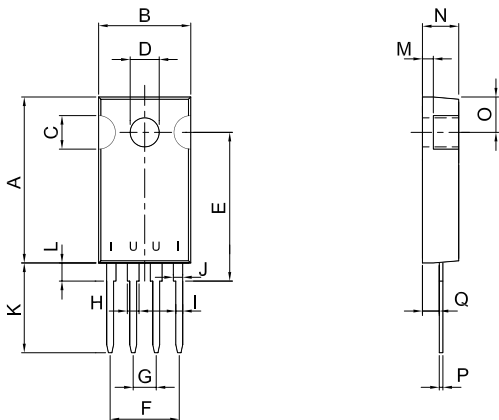
SPECIFICATIONS (continued)

FPR 2-T221



| Dimension | mm | tol. (±mm) | inches | tol. (±inches) |
|-----------|-------|------------|--------|----------------|
| A | 18.30 | 0.2 | 0.72 | 0.008 |
| B | 10.16 | 0.2 | 0.40 | 0.008 |
| C | 3.70 | 0.1 | 0.15 | 0.004 |
| D | Ø3.2 | 0.1 | Ø0.126 | 0.004 |
| E | 16.40 | 0.2 | 0.65 | 0.008 |
| F | 5.08 | 0.1 | 0.20 | 0.004 |
| G | 0.76 | 0.1 | 0.03 | 0.004 |
| H | 1.30 | 0.1 | 0.05 | 0.004 |
| I | 13.80 | 0.2 | 0.54 | 0.008 |
| J | 2.00 | 0.1 | 0.08 | 0.004 |
| K | 1.20 | 0.1 | 0.05 | 0.004 |
| L | 4.00 | 0.1 | 0.16 | 0.004 |
| M | 3.90 | 0.1 | 0.15 | 0.004 |
| N | 0.40 | 0.1 | 0.02 | 0.004 |
| O | 1.85 | 0.1 | 0.07 | 0.004 |

FPR 4-T221



| Dimension | mm | tol. (±mm) | inches | tol. (±inches) |
|-----------|-------|------------|--------|----------------|
| A | 18.30 | 0.2 | 0.72 | 0.008 |
| B | 10.16 | 0.2 | 0.40 | 0.008 |
| C | 3.70 | 0.1 | 0.15 | 0.004 |
| D | Ø3.2 | 0.1 | Ø0.126 | 0.004 |
| E | 16.40 | 0.2 | 0.65 | 0.008 |
| F | 7.62 | 0.2 | 0.30 | 0.008 |
| G | 2.54 | 0.1 | 0.10 | 0.004 |
| H | 1.30 | 0.1 | 0.05 | 0.004 |
| I | 0.76 | 0.1 | 0.03 | 0.004 |
| J | 1.03 | 0.1 | 0.04 | 0.004 |
| K | 13.80 | 0.2 | 0.54 | 0.008 |
| L | 2.00 | 0.1 | 0.08 | 0.004 |
| M | 1.20 | 0.1 | 0.05 | 0.004 |
| N | 4.00 | 0.1 | 0.16 | 0.004 |
| O | 3.90 | 0.1 | 0.15 | 0.004 |
| P | 0.40 | 0.1 | 0.02 | 0.004 |
| Q | 1.85 | 0.1 | 0.07 | 0.004 |

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