High Precision Power Resistor

FEATURES

- Resistances from 0.5 Ω to 150 kΩ
- Power Rating to 15 W
- Resistance Tolerances to ±0.01%
- TCR to ±3 ppm/K
- Load Stability to ±0.01%
- TO-220 Housing

Pb-free Available

RoHS* COMPLIANT

TABLE 1 — SPECIFICATIONS

TYPE		USR 2-T220B USR 2-T221	UNR 2-T220B UNR 2-T221
Resistance Range		0.5 Ω to 150 kΩ	0.5 Ω to 5 kΩ
Power Rating	**Free air 70°C** **R < 50 Ω** **R > 50 Ω**	 1.5 W 1.0 W	 1.5 W 1.0 W
	With heatsink **R < 50 Ω** **R > 50 Ω**	 10 W 6 W	 15 W 10 W
Tolerances **from 0.5 Ω** **from 10 Ω** **from 25 Ω** **from 50 Ω**		 ±0.1% / ±0.25% / ±0.5% / ±1% ±0.05% / ±0.1% / ±0.25% / ±0.5% / ±1% ±0.02% / ±0.05% / ±0.1% / ±0.25% / ±0.5% / ±1% ±0.01% / ±0.02% / ±0.05% / ±0.1% / ±0.25% / ±0.5% / ±1%	
Thermal Resistance Rthj-c **R < 50 Ω** **R > 50 Ω**		 10.8 K/W 18.8 K/W	 6.8 K/W 10.8 K/W
Stability (1000 h)		±0.01%	
Shelf Life Stability		±25 ppm / ΔR after 1 year ±50 ppm / ΔR after 3 years	
Temperature Coefficient		max. ±5 ppm/K (-55°C to +155°C) typ. ±3 ppm/K (-55°C to +125°C)	
Voltage Proof		1 kVDC	
Thermal EMF		< 0.1 µV/K	
Operating Temperature Range		-55°C to +155°C	
Resistor Material		NiCr-Foil	
Substrate		Al_2O_3	AlN
Housing		PPS + Cu heatsink nickel plated	
Connector Material		Cu / tinned	
Terminals		2	
Max. Torque		1.0 Nm	
Notes			Especially designed for applications with fast changing electrical load

ORDERING INFORMATION

Part Number - Resistance - Contact - Tolerance - TCR (if not standard)
UNR 2-T220B 4K700 C 0.5%

FIGURE 1 — TEMPERATURE COEFFICIENT

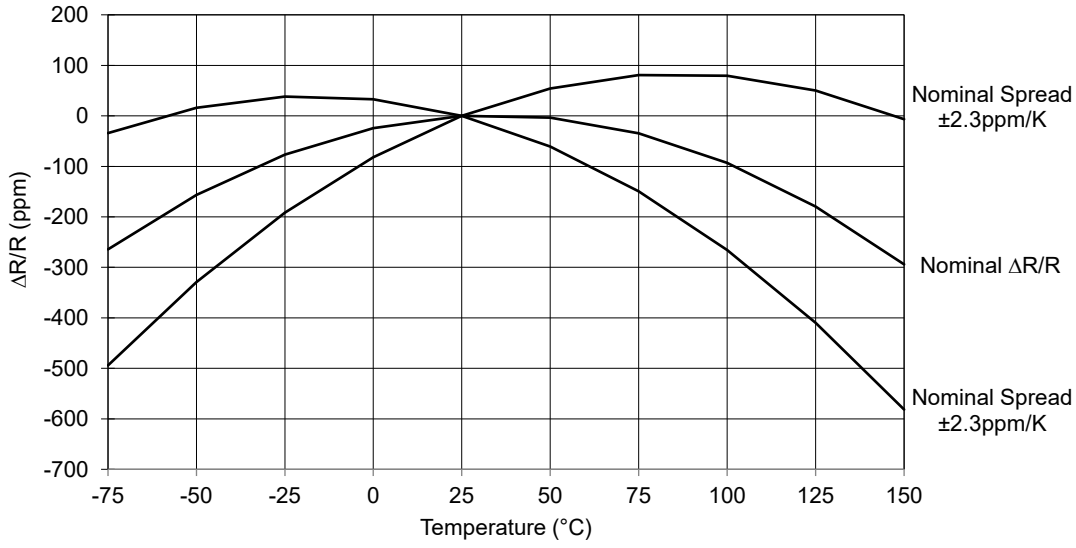
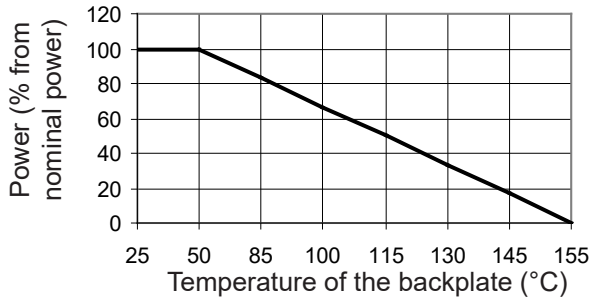


FIGURE 2 — DERATING



Power Rating Notes

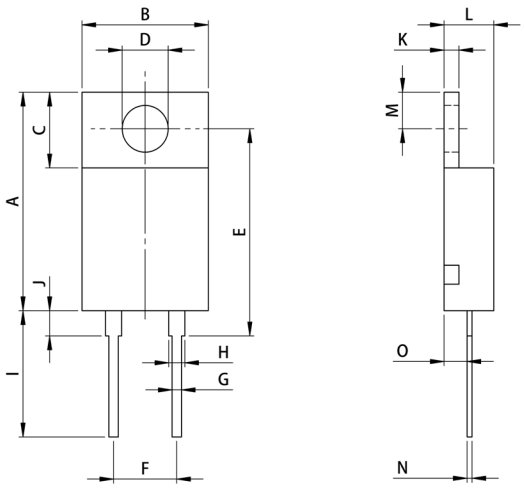
The U-Series resistors must be attached to a suitable heatsink.
The maximum internal resistor temperature is 155°C.
To specify an appropriate heatsink use the following formula:

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

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)

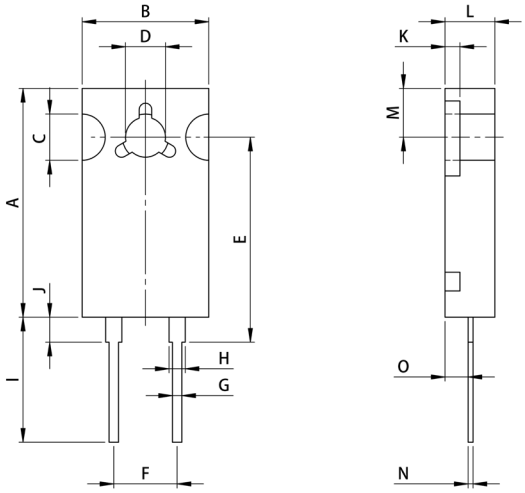
FIGURE 3 — DIMENSIONS in mm (inches)

USR 2-T220B / UNR 2-T220B



Dimension	S-Contact	C-Contact
A ±0.2 (±0.008)	17.30 (0.68)	
B ±0.2 (±0.008)	10.16 (0.40)	
C ±0.1 (±0.004)	6.00 (0.24)	
D ±0.1 (±0.004)	Ø3.7 (Ø0.146)	
E ±0.2 (±0.008)	16.40 (0.65)	
F ±0.1 (±0.004)	5.08 (0.20)	
G ±0.1 (±0.004)	0.76 (0.03)	
H ±0.1 (±0.004)	1.30 (0.05)	
I ±0.2 (±0.008)	10.00 (0.39)	13.80 (0.54)
J ±0.1 (±0.004)	2.00 (0.08)	
K ±0.1 (±0.004)	1.20 (0.05)	
L ±0.1 (±0.004)	4.00 (0.16)	
M ±0.1 (±0.004)	2.90 (0.11)	
N ±0.1 (±0.004)	0.40 (0.02)	
O ±0.1 (±0.004)	1.85 (0.07)	

USR 2-T221 / UNR 2-T221



Dimension	S-Contact	C-Contact
A ±0.2 (±0.008)	18.30 (0.72)	
B ±0.2 (±0.008)	10.16 (0.40)	
C ±0.1 (±0.004)	3.70 (0.15)	
D ±0.1 (±0.004)	Ø3.2 (Ø0.126)	
E ±0.2 (±0.008)	16.40 (0.65)	
F ±0.1 (±0.004)	5.08 (0.20)	
G ±0.1 (±0.004)	0.76 (0.03)	
H ±0.1 (±0.004)	1.30 (0.05)	
I ±0.2 (±0.008)	10.00 (0.39)	13.80 (0.54)
J ±0.1 (±0.004)	2.00 (0.08)	
K ±0.1 (±0.004)	1.20 (0.05)	
L ±0.1 (±0.004)	4.00 (0.16)	
M ±0.1 (±0.004)	3.90 (0.15)	
N ±0.1 (±0.004)	0.40 (0.02)	
O ±0.1 (±0.004)	1.85 (0.07)	

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