

USR 2-0808 /1510 /2110 /3010

Precision Foil Resistors

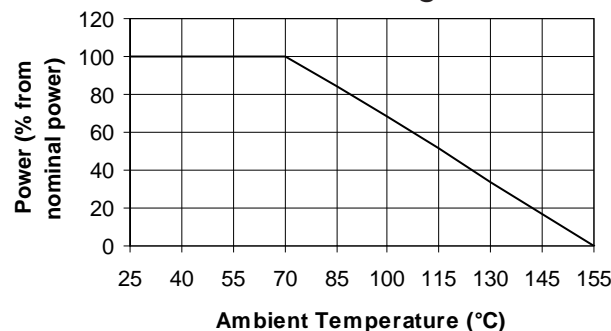


- Resistances from 10hm to 1MOhms
- Power Rating to 2Watt
- Resistance Tolerances to $\pm 0.005\%$
- TCR to $\pm 1\text{ppm/K}$
- Load Stability to 0.01%

SPECIFICATIONS

Type	USR 2-0808	USR 2-1510	USR 2-2110	USR 2-3010
Resistance Range	1.0 to 300 kOhms	1.0 to 300 kOhms	1.0 to 500 kOhms	1.0 to 1 MOhms
Power rating (70°C)	0.6W (<100 kOhms) 0.4 (>100 kOhms)	1.0W (<200 kOhms) 0.6 (>200 kOhms)	1.5W (<300 kOhms) 0.8 (>300 kOhms)	2.0W (<400 kOhms) 1.0 (>400 kOhms)
Tolerances from 1.0 Ohms from 5.0 Ohms from 12.0 Ohms from 25.0 Ohms from 100.0 Ohms	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% 0.005% / 0.01% / 0.02% / 0.05% / 0.1% / 0.25% / 0.5% / 1%			
Stability	0.01%			
Shelf Life Stability	25ppm / ΔR after 1 year 50ppm / ΔR after 3 year			
Temperature Coefficient	max. $\pm 5\text{ppm/K}$ (-55 to 155°C) typ. $\pm 3\text{ppm/K}$ (-55 to 125°C) upon request $\pm 1\text{ppm/K}$ (0 to 60°C) and $\pm 1\text{ppm/K}$ (-55 to 125°C)			
Insulation Resistance	> 10GOhm			
Thermal EMF	< 0.1 $\mu\text{V/K}$			
Operating Temperature Range	-55 to 155°C			
Resistor Material	NiCr-Foil			
Substrate	Al_2O_3			
Housing	PBTP / Epoxy			
Connector Material	Cu tinned			
Terminals	2			

Derating



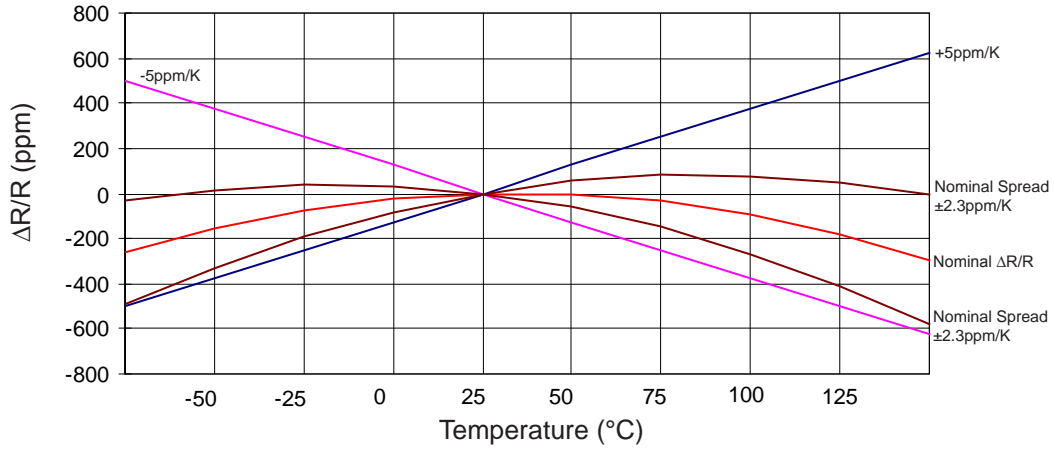
Ordering Information

Part Number - Resistance - Tolerance - TCR
 USR 2-2110 478kOhms 0.1% 5ppm

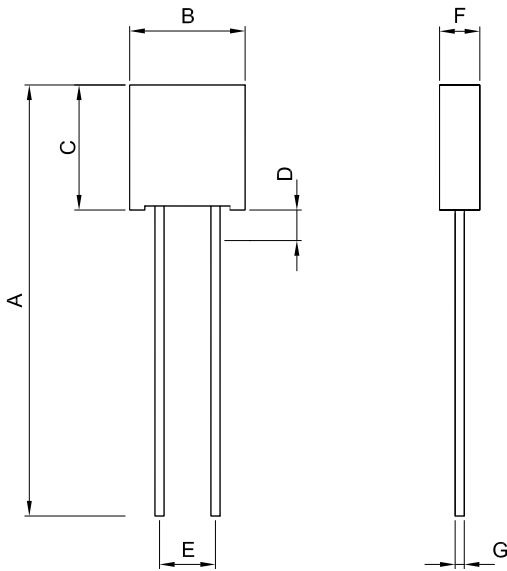
only 0808:
 Grid (E) 3.81mm (0.15inches) = D
 Grid (E) 5.08mm (0.2inches) = J

SPECIFICATIONS (continued)

Temperature Coefficient



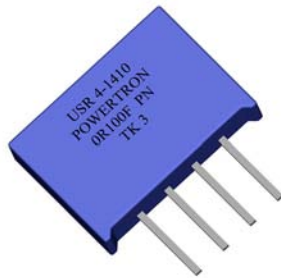
Dimensions



Type	Dimension	mm	tol. (±mm)	inches	tol. (±inches)
USR 2-0808 Grid D	A	28.30	2.0	1.11	0.079
	B	7.62	0.1	0.30	0.004
	C	8.30	0.2	0.33	0.008
	D	2.00	0.1	0.08	0.004
	E	3.81	0.1	0.15	0.004
	F	2.67	0.1	0.11	0.004
	G (>150kOhms)	Ø0.64 Ø0.3	0.1	Ø0.03 Ø0.012	0.004
USR 2-0808 Grid J	A	28.00	2.0	1.10	0.079
	B	7.49	0.1	0.29	0.004
	C	8.00	0.2	0.31	0.008
	D	2.00	0.1	0.08	0.004
	E	5.08	0.1	0.20	0.004
	F	2.49	0.1	0.10	0.004
	G (>150kOhms)	Ø0.64 Ø0.3	0.1	Ø0.03 Ø0.012	0.004
USR 2-1510	A	30.50	2.0	1.20	0.079
	B	14.61	0.2	0.58	0.008
	C	10.49	0.2	0.41	0.008
	D	2.00	0.1	0.08	0.004
	E	10.16	0.2	0.40	0.008
	F	4.06	0.1	0.16	0.004
	G	Ø0.64	0.1	Ø0.03	0.004
USR 2-2110	A	30.50	2.0	1.20	0.079
	B	20.83	0.2	0.82	0.008
	C	10.49	0.2	0.41	0.008
	D	2.00	0.1	0.08	0.004
	E	16.51	0.2	0.65	0.008
	F	4.06	0.1	0.16	0.004
	G	Ø0.64	0.1	Ø0.03	0.004
USR 2-3010	A	30.50	2.0	1.20	0.079
	B	30.48	0.2	1.20	0.008
	C	10.49	0.2	0.41	0.008
	D	2.00	0.1	0.08	0.004
	E	22.86	0.2	0.90	0.008
	F	6.60	0.2	0.26	0.008
	G	Ø0.64	0.1	Ø0.03	0.004

USR UNR 4-1410

Precision Shunt Resistors



- Resistances from 0.1Ohm to 100Ohms
- Power Rating to 0.8Watt
- Resistance Tolerances to $\pm 0.01\%$
- TCR to $\pm 1\text{ppm/K}$
- Load Stability to 0.01%

SPECIFICATIONS

Type	USR 4-1410	UNR 4-1410
Resistance Range	0.1 to 100 Ohms	
Power rating (70°C)	0.8 W	
Tolerances from 0.1 Ohms from 10.0 Ohms from 50.0 Ohms	0.1% / 0.25% / 0.5% / 1% 0.05% / 0.1% / 0.25% / 0.5% / 1% 0.01% / 0.02% / 0.05% / 0.1% / 0.25% / 0.5% / 1%	
Stability	0.01%	
Temperature Coefficient	max. $\pm 5\text{ppm/K}$ (-55 to 155°C) typ. $\pm 3\text{ppm/K}$ (-55 to 125°C) upon request $\pm 1\text{ppm/K}$ (0 to 60°C)	
Insulation Resistance	> 10 GOhm	
Thermal EMF	< 0.1 $\mu\text{V/K}$	
Operating Temperature Range	-55 to 155°C	
Resistor Material	NiCr-Foil	
Substrate	Al ₂ O ₃	AlN
Housing	PBTP / Epoxy	
Connector Material	Cu tinned	
Terminals	4	
Notes	Specially designed for applications with fast changing electrical load	

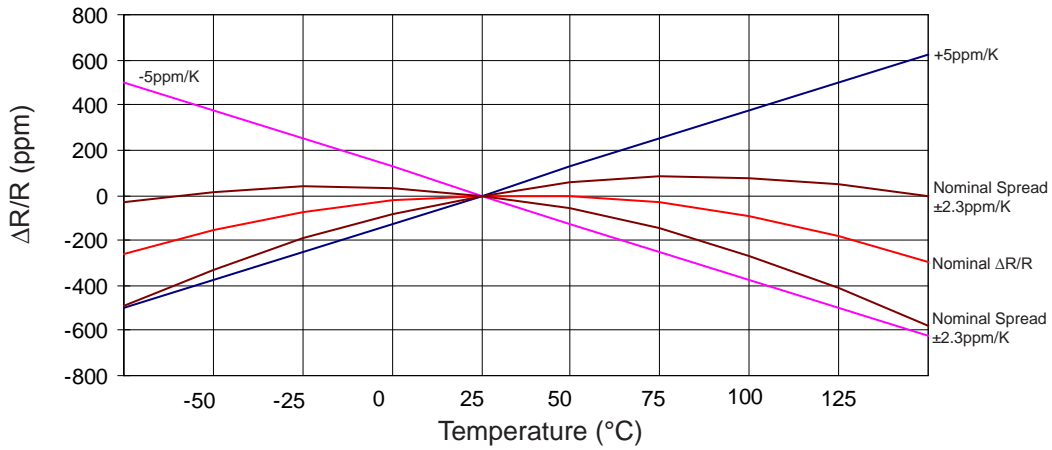
Ordering Information

Part Number - Resistance - Tolerance - TCR

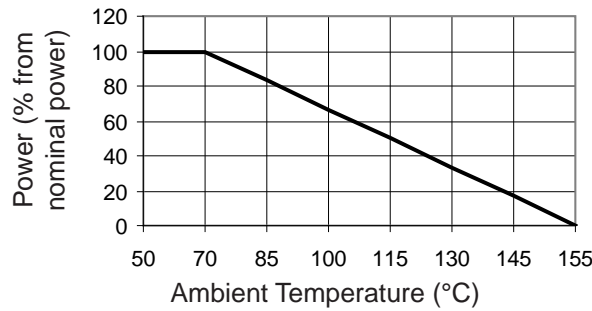
UNR 4-1410 0.1Ohms 0.5% 3ppm

SPECIFICATIONS (continued)

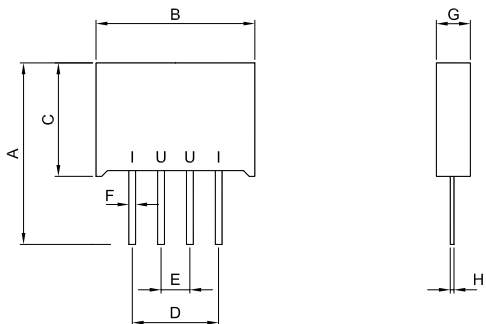
Temperature Coefficient



Derating



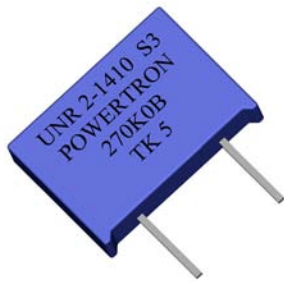
Dimensions



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	16.00	1.0	0.63	0.039
B	14.00	0.2	0.55	0.008
C	10.00	0.2	0.39	0.008
D	7.62	0.1	0.30	0.004
E	2.54	0.1	0.10	0.004
F	0.50	0.1	0.02	0.004
G	3.00	0.1	0.12	0.004
H	0.25	0.1	0.01	0.004

USR UNR 2-1410

Precision Foil Resistors



- Resistances from 10hm to 300kOhms
- Power Rating to 0.8Watt
- Resistance Tolerances to $\pm 0.01\%$
- TCR to $\pm 1\text{ppm/K}$
- Load Stability to 0.01%

SPECIFICATIONS

Type	USR 2-1410	UNR 2-1410
Resistance Range	1.0 Ohms to 300 kOhms	1.0 Ohms to 10 kOhms
Power rating (70°C)	0.8W	
Tolerances from 1.0 Ohms from 5.0 Ohms from 25.0 Ohms	0.1% / 0.25% / 0.5% / 1% 0.05% / 0.1% / 0.25% / 0.5% / 1% 0.01% / 0.02% / 0.05% / 0.1% / 0.25% / 0.5% / 1%	
Stability	0.01%	
Shelf Life Stability	25ppm / ΔR after 1 year 50ppm / ΔR after 3 year	
Temperature Coefficient	max. $\pm 5\text{ppm/K}$ (-55 to 155°C) typ. $\pm 3\text{ppm/K}$ (-55 to 125°C) upon request $\pm 1\text{ppm/K}$ (0 to 60°C)	
Insulation Resistance	> 10GOhm	
Thermal EMF	< 0.1 $\mu\text{V/K}$	
Operating Temperature Range	-55 to 155°C	
Resistor Material	NiCr-Foil	
Substrate	Al ₂ O ₃	AlN
Housing	PBTP / Epoxy	
Connector Material	Cu tinned	
Terminals	2	
Notes		Specially designed for applications with fast changing electrical load

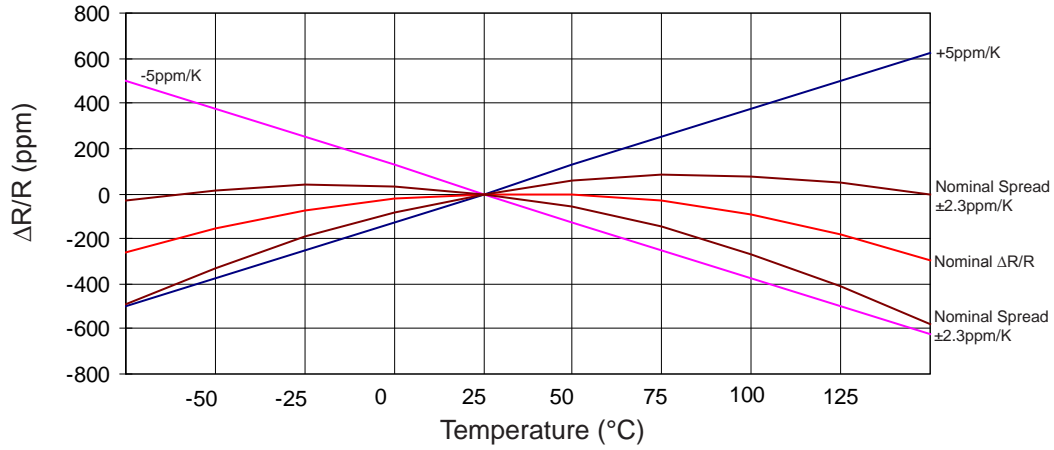
Ordering Information

Part Number - Resistance - Tolerance - TCR

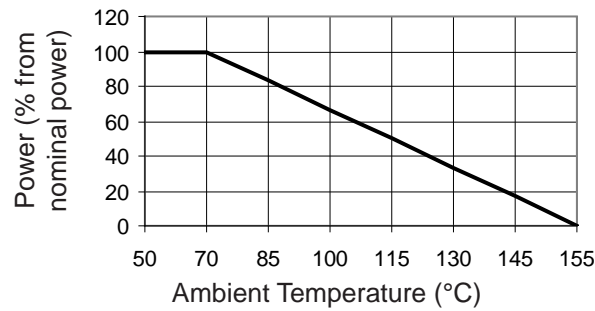
UNR 2-1410 3.7Ohms 0.5% 3ppm

SPECIFICATIONS (continued)

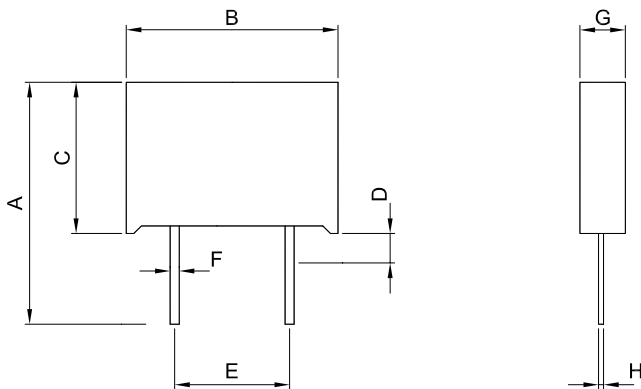
Temperature Coefficient



Derating



Dimensions



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	16.00	1.0	0.63	0.039
B	14.00	0.2	0.55	0.008
C	10.00	0.2	0.39	0.008
D	2.00	0.1	0.08	0.004
E	7.62	0.1	0.30	0.004
F	0.50	0.1	0.02	0.004
G	3.00	0.1	0.12	0.004
H	0.25	0.1	0.01	0.004

USR 4-1414

Precision Shunt Resistors



- Resistances from 0.50Ohm to 100Ohms
- Power Rating to 25Watt
- Resistance Tolerances to $\pm 0.01\%$
- TCR to $\pm 1\text{ppm/K}$
- Load Stability to 0.01%

SPECIFICATIONS

Type	USR 4-1414
Resistance Range	0.5 to 100 Ohms
Power rating free air 70°C with heatsink	0.8 W 25 W
Thermal Resistance Rthj-c	< 4.2 K/W
Tolerances from 0.5 Ohms from 1.0 Ohms	0.1% / 0.25% / 0.5% / 1% 0.01% / 0.02% / 0.05% / 0.1% / 0.25% / 0.5% / 1%
Stability	0.01%
Temperature Coefficient	max. $\pm 5\text{ppm/K}$ (-55 to 155°C) typ. $\pm 3\text{ppm/K}$ (-55 to 125°C) upon request $\pm 1\text{ppm/K}$ (0 to 60°C)
Voltage Proof	1.5 kVDC
Thermal EMF	< 0.1 $\mu\text{V/K}$
Operating Temperature Range	-55 to 155°C
Resistor Material	NiCr-Foil
Substrate	Al ₂ O ₃ upon request: AlN
Housing	Plastic / Epoxy
Connector Material	Cu tinned
Terminals	4

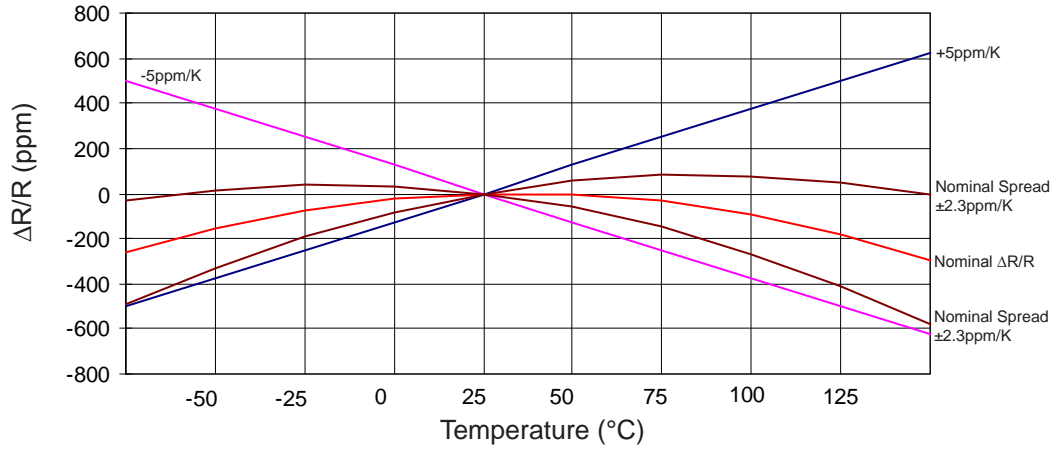
Ordering Information

Part Number - Resistance - Tolerance - TCR

USR 4-1414 0.50Ohms 0.5% 1ppm

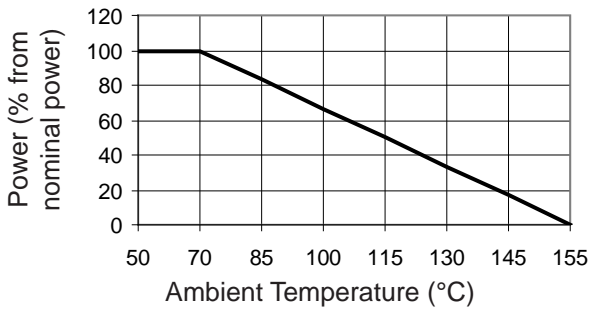
SPECIFICATIONS (continued)

Temperature Coefficient

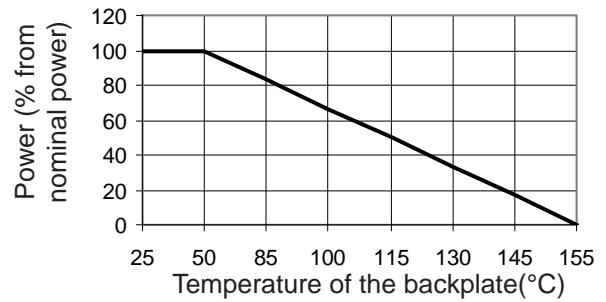


Derating

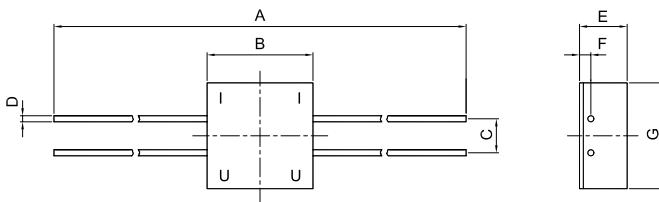
without Heatsink



with Heatsink



Dimensions

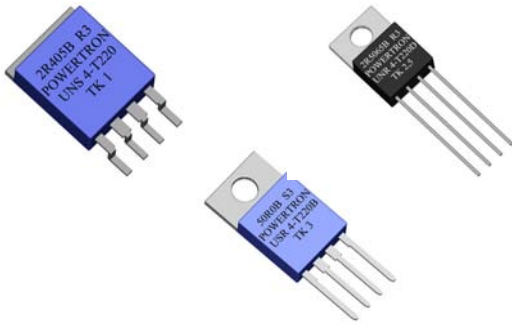


Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	94.00	0.5	3.70	0.020
B	14.00	0.2	0.55	0.008
C	4.50	0.1	0.18	0.004
D	∅0.80	0.1	∅0.03	0.004
E	6.30	0.2	0.25	0.008
F	1.50	0.2	0.06	0.008
G	14.00	0.2	0.55	0.008

USR UNR 4-T220 / T220B

USS UNS 4-T220

Precision Shunt Resistors



- Resistances from 0.20hm to 80Ohms
- Power Rating to 15Watt
- Resistance Tolerances to $\pm 0.01\%$
- TCR to $\pm 1\text{ppm/K}$
- Load Stability to 0.01%

SPECIFICATIONS

Type	USR / USS	UNR /UNS
Resistance Range	0.2 to 80 Ohms	
Power rating free air 70°C with heatsink	1.5W 10W	1.5W 15W
Thermal Resistance Rthj-c	10.8 K/W	6.8 K/W
Tolerances from 0.5 Ohms from 10.0 Ohms from 50.0 Ohms	0.1% / 0.25% / 0.5% / 1% 0.05% / 0.1% / 0.25% / 0.5% / 1% 0.01% / 0.02% / 0.05% / 0.1% / 0.25% / 0.5% / 1%	
Stability	0.01%	
Shelf Life Stability	25ppm / ΔR after 1 year 50ppm / ΔR after 3 year	
Temperature Coefficient	max. $\pm 5\text{ppm/K}$ (-55 to 155°C) typ. $\pm 3\text{ppm/K}$ (-55 to 125°C) upon request $\pm 1\text{ppm/K}$ (0 to 60°C)	
Voltage Proof	1 kVDC	
Thermal EMF	< 0.1 $\mu\text{V/K}$	
Operating Temperature Range	-55 to 155°C	
Resistor Material	NiCr-Foil	
Substrate	Al ₂ O ₃	AlN
Housing	Epoxy + Cu heatsink nickel plated	
Connector Material	Cu tinned	
Terminals	4	
Max. Torque	1.0 Nm	
Notes	Specially designed for applications with fast changing electrical load	

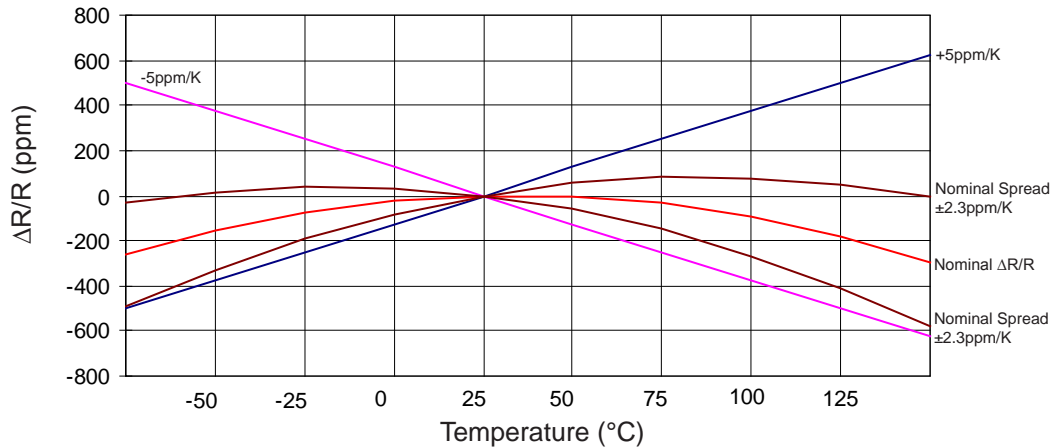
Ordering Information

Part Number - Resistance - Contact - Tolerance - TCR

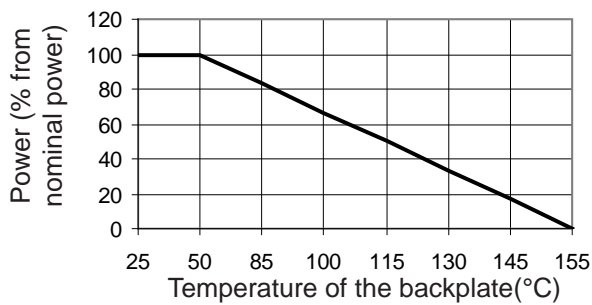
UNR 2-T220B 5.7kOhms C 0.5% 3ppm

SPECIFICATIONS (continued)

Temperature Coefficient



Derating



Power Rating Notes -

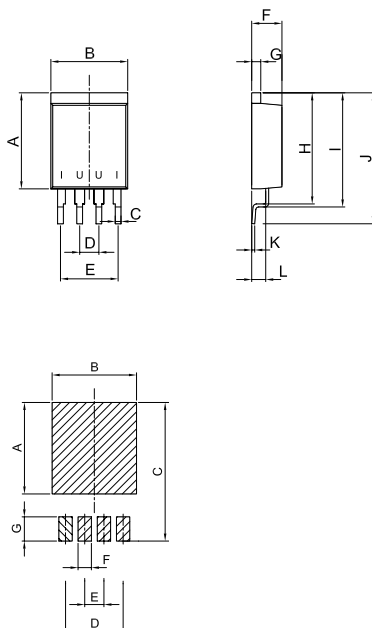
The U-Series Resistors must be attached to a suitable heatsink. The maximum internal resistor temperature is 155°C. To specify an appropriate heatsink use the following formula :

$$R_{0H} = \frac{T_{MAX} - (P \times R_{0R}) - T_A}{P}$$

Where: R_{0H} = Thermal Resistance of Heatsink (K/W)
 R_{0R} = Thermal Resistance of Resistor (K/W)
 T_{MAX} = Maximum Temperature of Resistor
 T_A = Ambient Temperature of Heatsink (°C)
 P = Power Through Resistor (W)

Dimensions

USS 4-T220 / UNS 4-T220



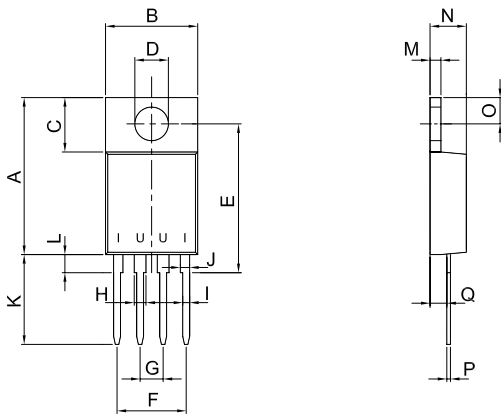
Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	12.70	0.2	0.50	0.008
B	10.16	0.2	0.40	0.008
C	0.76	0.1	0.03	0.004
D	2.54	0.1	0.10	0.004
E	7.62	0.1	0.30	0.004
F	4.00	0.1	0.16	0.004
G	1.20	0.1	0.05	0.004
H	14.60	0.2	0.57	0.008
I	15.00	0.2	0.59	0.008
J	17.33	0.2	0.68	0.008
K	0.40	0.1	0.02	0.004
L	1.85	0.1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

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

SPECIFICATIONS (continued)

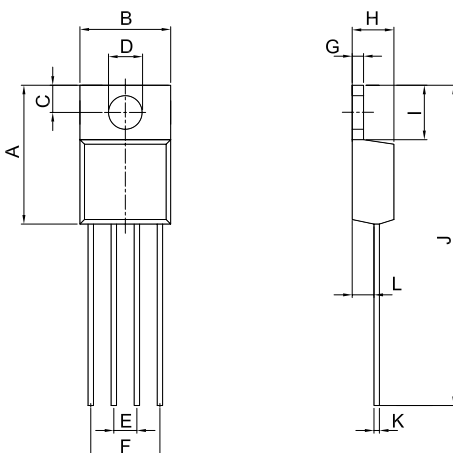
Dimensions

USR 4-T220B / UNR 4-T220B



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	10.00	0.2	0.39	0.008
K (C-Contact)	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

USR 4-T220 / UNR 4-T220



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	15.30	0.2	0.60	0.008
B	10.00	0.2	0.39	0.008
C	2.80	0.1	0.11	0.004
D	Ø3.7	0.1	Ø0.146	0.004
E	2.54	0.1	0.10	0.004
F	7.62	0.1	0.30	0.004
G	1.27	0.1	0.05	0.004
H	4.60	0.1	0.18	0.004
I	6.00	0.2	0.24	0.008
J	35.30	2.0	1.39	0.079
K	Ø0.6	0.1	Ø0.02	0.004
L	2.41	0.1	0.09	0.004



- Resistances from 100Ohm to 20kOhms
- Power Rating to 0.2Watt
- Resistance Tolerances to $\pm 0.005\%$
- TCR to $\pm 0.5\text{ppm/K}$
- Load Stability to 0.001%
- Twin Resistor Construction

SPECIFICATIONS

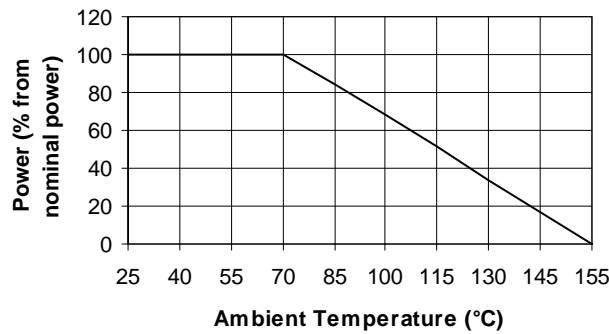
Type	USN 2-0808	UPN 2-0808
Resistance Range	100 Ohms to 20 kOhms	
Variations	Double-resistor with middle-pin (R1-R2)	
Power rating (70°C)	0.2W (R1+R2)	
Tolerances Absolut Ratio	from 0.005% from 0.005%	from 0.02% from 0.02%
Stability (Ratio)	0.001%	
Shelf Life Stability	25ppm / ΔR after 1 year 50ppm / ΔR after 3 year	
Temperature Coefficient Absolut Tracking upon request	typ. $\pm 3\text{ppm/K}$ < 1.0ppm/K < 0.5ppm/K	typ. $\pm 5\text{ppm/K}$ < 2.0ppm/K < 1.5ppm/K
Insolation Resistance	> 10GOhm	
Thermal EMF	< 0.1 $\mu\text{V/K}$	
Operating Temperature Range	-55 to 155°C	
Resistor Material	NiCr-Foil	
Substrate	Al_2O_3	
Housing	Capsule / Epoxy	
Connector Material	Cu tinned	
Terminals	3	

Ordering Information

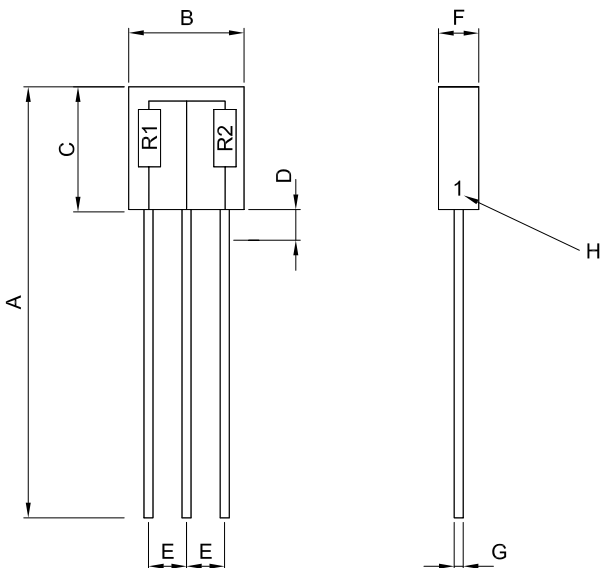
Part Number - Resistance - Tolerance
USN 2-0808 2kOhms-4kOhms 0.01%

SPECIFICATIONS (continued)

Derating



Dimensions

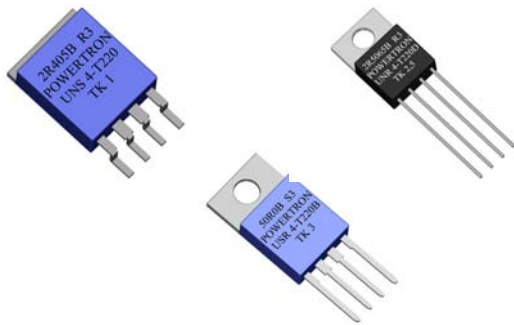


Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	27.20	2.0	1.07	0.079
B	7.49	0.2	0.29	0.008
C	8.13	0.2	0.32	0.008
D	2.00	0.1	0.08	0.004
E	2.54	0.1	0.10	0.004
F	2.54	0.1	0.10	0.004
G	∅0.64	0.1	∅0.025	0.004
H	Marking of the position of the low ohmic resistor			

USR UNR 4-T220 / T220B

USS UNS 4-T220

Precision Shunt Resistors



- Resistances from 0.2Ohm to 80Ohms
- Power Rating to 15Watt
- Resistance Tolerances to $\pm 0.01\%$
- TCR to $\pm 1\text{ppm/K}$
- Load Stability to 0.01%

SPECIFICATIONS

Type	USR / USS	UNR /UNS
Resistance Range	0.2 to 80 Ohms	
Power rating free air 70°C with heatsink	1.5W 10W	1.5W 15W
Thermal Resistance Rthj-c	10.8 K/W	6.8 K/W
Tolerances from 0.5 Ohms from 10.0 Ohms from 50.0 Ohms	0.1% / 0.25% / 0.5% / 1% 0.05% / 0.1% / 0.25% / 0.5% / 1% 0.01% / 0.02% / 0.05% / 0.1% / 0.25% / 0.5% / 1%	
Stability	0.01%	
Shelf Life Stability	25ppm / ΔR after 1 year 50ppm / ΔR after 3 year	
Temperature Coefficient	max. $\pm 5\text{ppm/K}$ (-55 to 155°C) typ. $\pm 3\text{ppm/K}$ (-55 to 125°C) upon request $\pm 1\text{ppm/K}$ (0 to 60°C)	
Voltage Proof	1 kVDC	
Thermal EMF	< 0.1 $\mu\text{V/K}$	
Operating Temperature Range	-55 to 155°C	
Resistor Material	NiCr-Foil	
Substrate	Al ₂ O ₃	AlN
Housing	Epoxy + Cu heatsink nickel plated	
Connector Material	Cu tinned	
Terminals	4	
Max. Torque	1.0 Nm	
Notes	Specially designed for applications with fast changing electrical load	

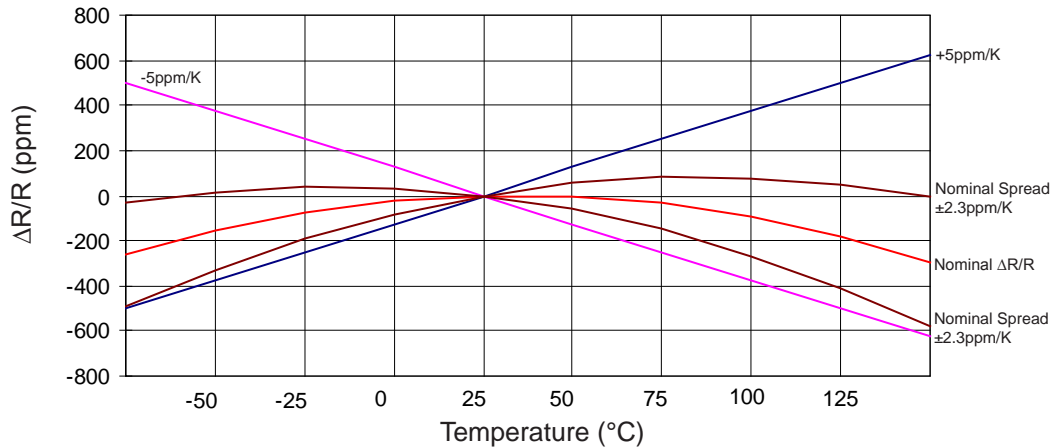
Ordering Information

Part Number - Resistance - Contact - Tolerance - TCR

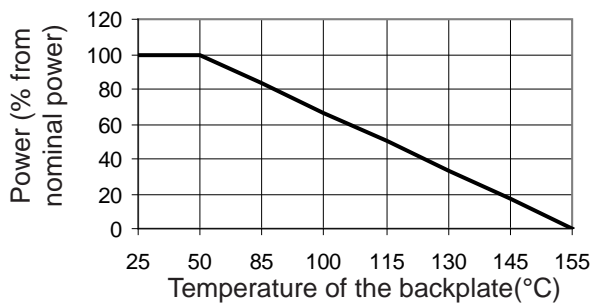
UNR 2-T220B 5.7kOhms C 0.5% 3ppm

SPECIFICATIONS (continued)

Temperature Coefficient



Derating



Power Rating Notes -

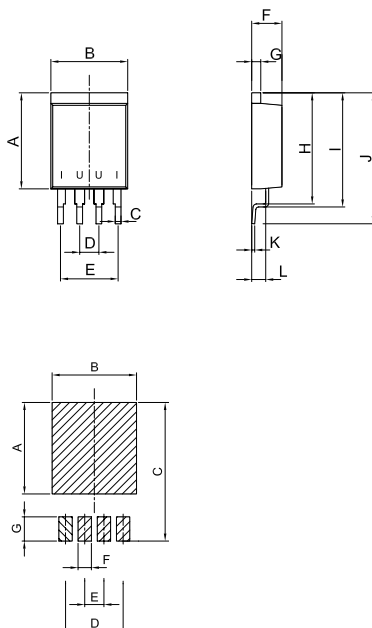
The U-Series Resistors must be attached to a suitable heatsink. The maximum internal resistor temperature is 155°C. To specify an appropriate heatsink use the following formula :

$$R_{0H} = \frac{T_{MAX} - (P \times R_{0R}) - T_A}{P}$$

Where: R_{0H} = Thermal Resistance of Heatsink (K/W)
 R_{0R} = Thermal Resistance of Resistor (K/W)
 T_{MAX} = Maximum Temperature of Resistor
 T_A = Ambient Temperature of Heatsink (°C)
 P = Power Through Resistor (W)

Dimensions

USS 4-T220 / UNS 4-T220



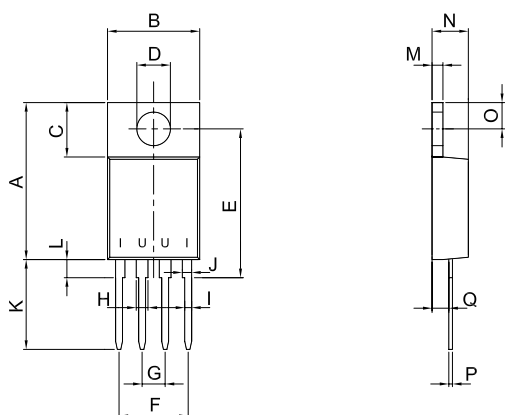
Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	12.70	0.2	0.50	0.008
B	10.16	0.2	0.40	0.008
C	0.76	0.1	0.03	0.004
D	2.54	0.1	0.10	0.004
E	7.62	0.1	0.30	0.004
F	4.00	0.1	0.16	0.004
G	1.20	0.1	0.05	0.004
H	14.60	0.2	0.57	0.008
I	15.00	0.2	0.59	0.008
J	17.33	0.2	0.68	0.008
K	0.40	0.1	0.02	0.004
L	1.85	0.1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

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

SPECIFICATIONS (continued)

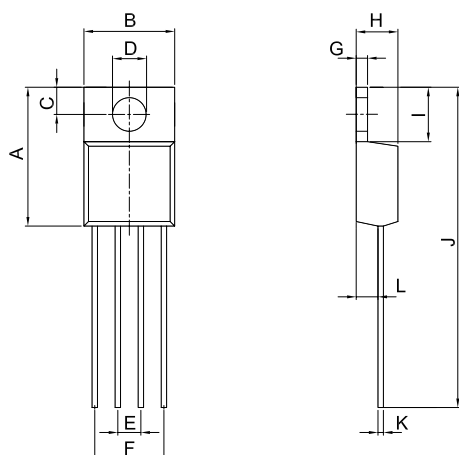
Dimensions

USR 4-T220B / UNR 4-T220B



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	10.00	0.2	0.39	0.008
K (C-Contact)	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

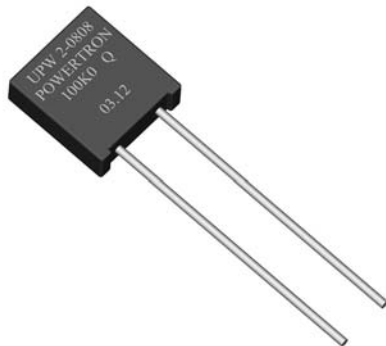
USR 4-T220 / UNR 4-T220



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	15.30	0.2	0.60	0.008
B	10.00	0.2	0.39	0.008
C	2.80	0.1	0.11	0.004
D	Ø3.7	0.1	Ø0.146	0.004
E	2.54	0.1	0.10	0.004
F	7.62	0.1	0.30	0.004
G	1.27	0.1	0.05	0.004
H	4.60	0.1	0.18	0.004
I	6.00	0.2	0.24	0.008
J	35.30	2.0	1.39	0.079
K	Ø0.6	0.1	Ø0.02	0.004
L	2.41	0.1	0.09	0.004

UPW 2-0808

Precision Foil Resistors



- Resistances from 10Ohm to 150kOhms
- Power Rating to 0.25Watt
- Resistance Tolerances to $\pm 0.01\%$
- TCR to $\pm 4\text{ppm/K}$
- Load Stability to 0.01%

SPECIFICATIONS

Type	UPW 2-0808			
Resistance Range	1.0 to 4.99 Ohms	5.0 to 24.99 Ohms	25.0 to 99.99Ohms	100k to 150kOhms
Power rating (70°C)	0.25W			0.20W
Tolerances	0.5% / 1%	0.05% / 0.1% / 0.25% / 0.5% / 1%	0.01% / 0.02% / 0.05% / 0.1% / 0.25% / 0.5% / 1%	
Stability	0.01%			
Shelf Life Stability	25ppm / ΔR after 1 year			
Temperature Coefficient	max. $\pm 8\text{ppm/K}$ (-55 to 125°C) max. $\pm 4\text{ppm/K}$ (0 to 60°C)			
Insulation Resistance	> 10GOhm			
Thermal EMF	< 0.1 $\mu\text{V/K}$			
Operating Temperature Range	-55 to 155°C			
Resistor Material	NiCr-Foil			
Substrate	Al_2O_3			
Housing	PBTP / Epoxy			
Connector Material	Cu tinned			
Terminals	2			

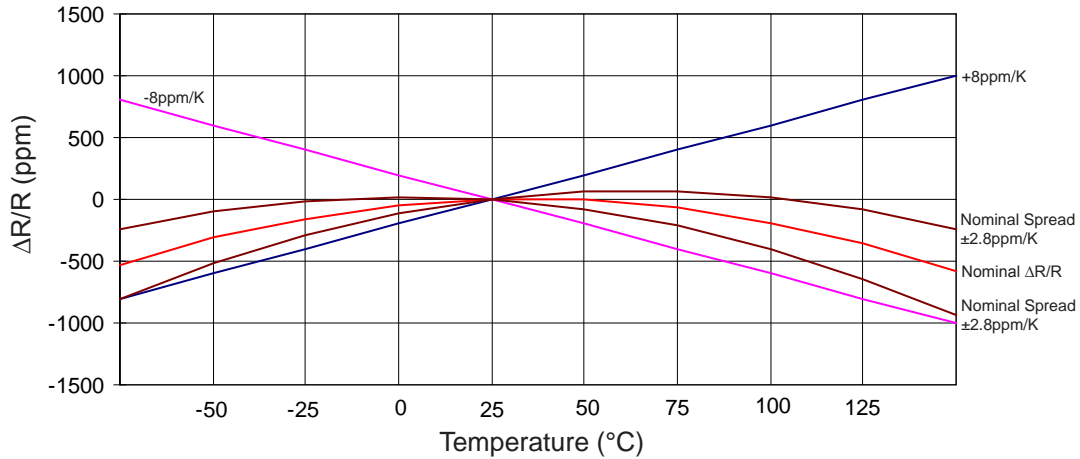
Ordering Information

Part Number - Resistance - Contact - Tolerance - TCR
UPW 2-0808 5.10kOhms J 0.01% 4ppm

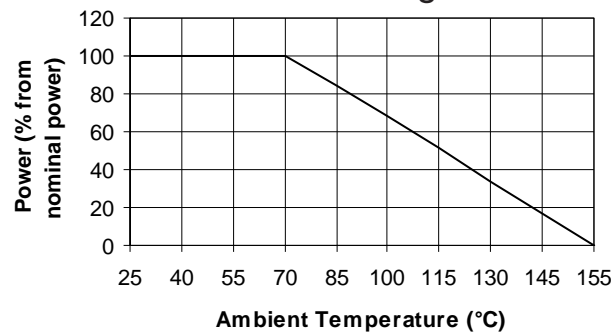
Grid (E) 3.81mm (0.15inches) = D
Grid (E) 5.08mm (0.2inches) = J

SPECIFICATIONS (continued)

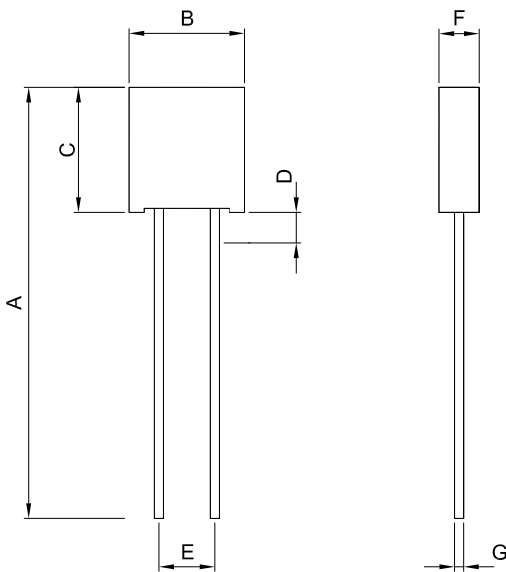
Temperature Coefficient



Derating



Dimensions

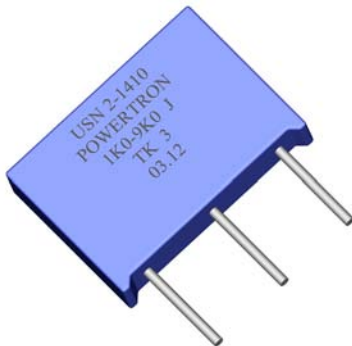


Type D / Grid = 3.81mm (0.15inches)				
Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	28.30	2.0	1.11	0.079
B	7.62	0.1	0.30	0.004
C	8.30	0.2	0.33	0.008
D	2.00	0.1	0.08	0.004
E	3.81	0.1	0.15	0.004
F	2.67	0.1	0.11	0.004
G	∅0.64	0.1	∅0.03	0.004

Type J / Grid = 5.08mm (0.2inches)				
Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	28.00	2.0	1.10	0.079
B	7.49	0.1	0.29	0.004
C	8.00	0.2	0.31	0.008
D	2.00	0.1	0.08	0.004
E	5.08	0.1	0.20	0.004
F	2.49	0.1	0.10	0.004
G	∅0.64	0.1	∅0.03	0.004

USN 2-1410

Precision Foil Resistors



- Resistances from 10hm to 150kOhms
- Power Rating to 0.4Watt
- Resistance Tolerances to $\pm 0.05\%$
- TCR to $\pm 1\text{ppm/K}$
- Load Stability to 0.01%

SPECIFICATIONS

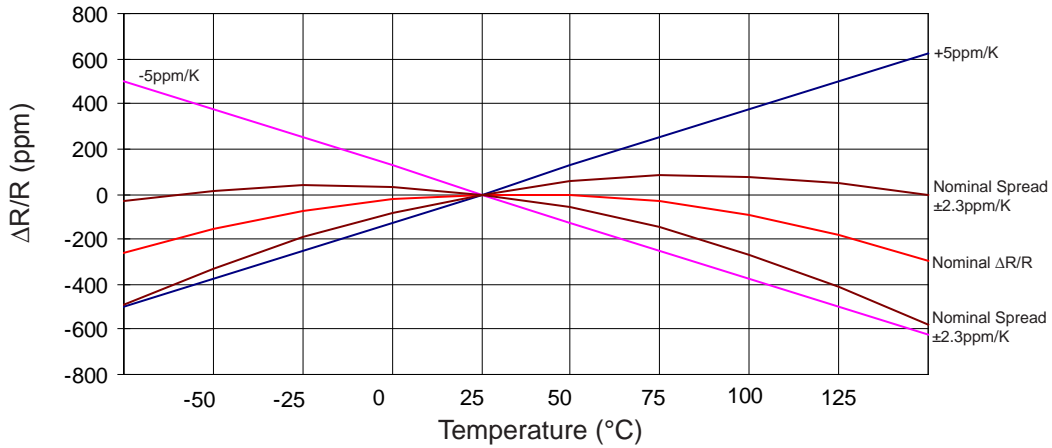
Type	USN 2-1410
Resistance Range	1.0 Ohms to 150kOhms
Variations	Double-resistor with middle-pin (R1-R2) Two single resistors (R1/R2)
Power rating (70°C)	0.4W per resistor
Tolerances	0.05% / 0.1% / 0.25% / 0.5% / 1%
Stability	0.01%
Shelf Life Stability	25ppm / ΔR after 1 year 50ppm / ΔR after 3 year
Temperature Coefficient	max. $\pm 5\text{ppm/K}$ (-55 to 155°C) typ. $\pm 3\text{ppm}$ (-55 to 125°C) upon request $\pm 1\text{ppm/K}$ (0 to 60°C) TCR-Tracking 1ppm/K upon request $< 1\text{ppm/K}$
Insulation Resistance	$> 10\text{GOhm}$
Thermal EMF	$< 0.1\mu\text{V/K}$
Operating Temperature Range	-55 to 155°C
Resistor Material	NiCr-Foil
Substrate	Al_2O_3
Housing	Capsule / Epoxy
Connector Material	Cu tinned
Terminals	3 (R1-R2) / 4 (R1/R2)

Ordering Information

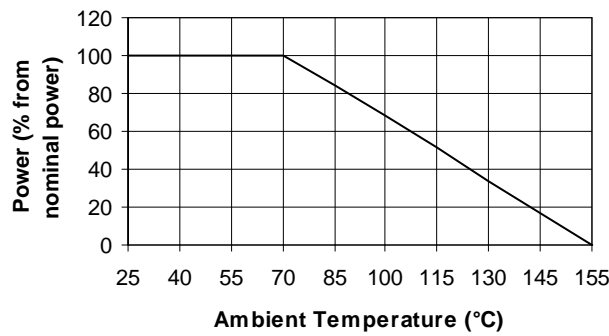
Part Number - Resistance - Contact - Tolerance - TCR
USN 2-1410 1kOhms-9kOhms D 0.1% 5ppm Tracking 1ppm

SPECIFICATIONS (continued)

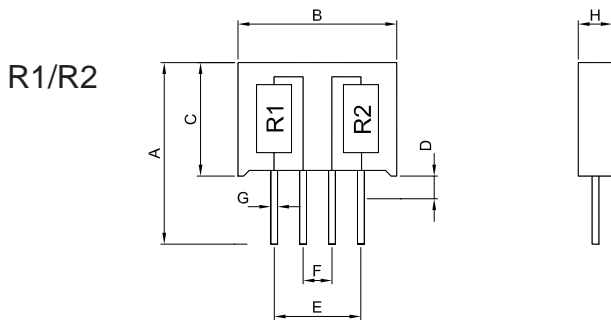
Temperature Coefficient



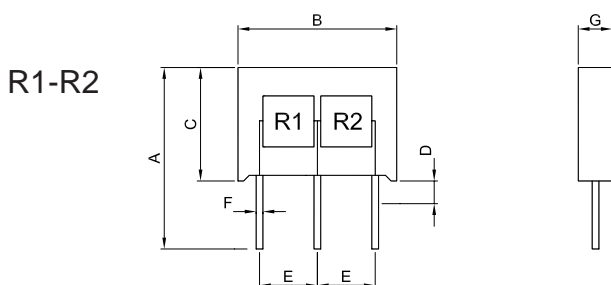
Derating



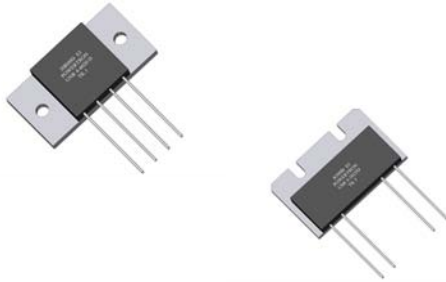
Dimensions



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	16.00	1.0	0.63	0.039
B	14.00	0.2	0.55	0.008
C	10.00	0.2	0.39	0.008
D	2.00	0.1	0.08	0.004
E	7.62	0.1	0.30	0.004
F	2.54	0.1	0.10	0.004
G	∅0.6	0.1	∅0.024	0.004
H	3.00	0.1	0.12	0.004



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	16.00	1.0	0.63	0.039
B	14.00	0.2	0.55	0.008
C	10.00	0.2	0.39	0.008
D	2.00	0.1	0.08	0.004
E	5.08	0.1	0.20	0.004
F	∅0.6	0.1	∅0.024	0.004
G	3.00	0.1	0.12	0.004



- Resistances from 0.05Ohm to 500Ohms
- Power Rating to 50Watt
- Resistance Tolerances to $\pm 0.01\%$
- TCR to $\pm 1\text{ppm/K}$
- Load Stability to 0.01%

SPECIFICATIONS

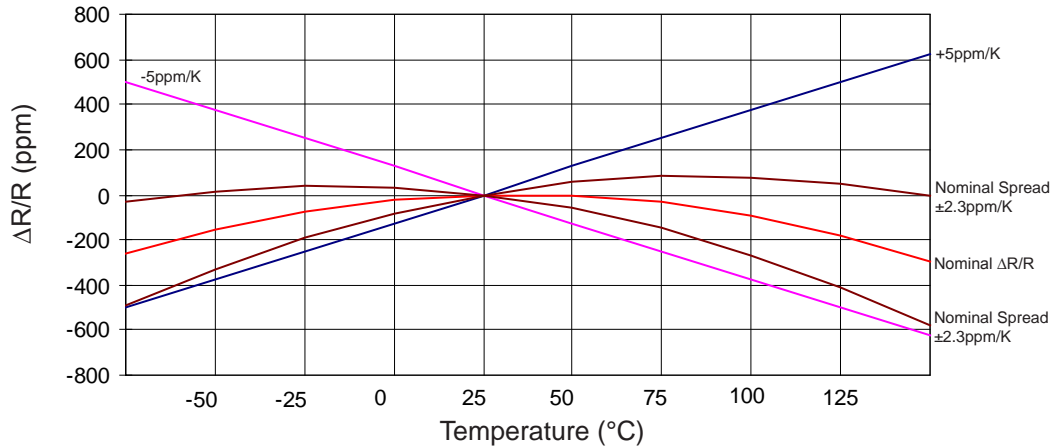
Type	USR 4-3425 3825	USR 4-4020	UNR 4-3425 3825	UNR 4-4020
Resistance Range	0.05 to 500 Ohms other resistance values upon request / power rating depending on resistance value			0.05 to 400 Ohms
Power rating free air 70°C for 3825H with heatsink	3 W 5 W 30 W	2.5 W 30 W	3 W 5 W 50 W	2.5 W 50 W
Thermal Resistance Rthj-c	3.5 K/W	3.6 K/W	2.1 K/W	2.2 K/W
Tolerances from 0.05 Ohms from 10.0 Ohms from 50.0 Ohms	0.1% / 0.25% / 0.5% / 1% 0.05% / 0.1% / 0.25% / 0.5% / 1% 0.01% / 0.02% / 0.05% / 0.1% / 0.25% / 0.5% / 1%			
Stability	0.01%			
Shelf Life Stability	25ppm / ΔR after 1 year 50ppm / ΔR after 3 year			
Temperature Coefficient	max. $\pm 5\text{ppm/K}$ (-55 to 155°C) typ. $\pm 3\text{ppm/K}$ (-55 to 125°C) upon request $\pm 1\text{ppm/K}$ (0 to 60°C)			
Voltage Proof	750 VDC			
max. Current	15 A			
Thermal EMF	< 0.1 $\mu\text{V/K}$			
Operating Temperature Range	-55 to 155°C			
Resistor Material	NiCr-Foil			
Substrate	Al ₂ O ₃		AlN	
Housing	Epoxy + Al-heatsink			
Connector Material	Cu tinned			
Terminals	4			
Max. Torque	1.0 Nm			
Notes	Specially designed for applications with fast changing electrical load			

Ordering Information

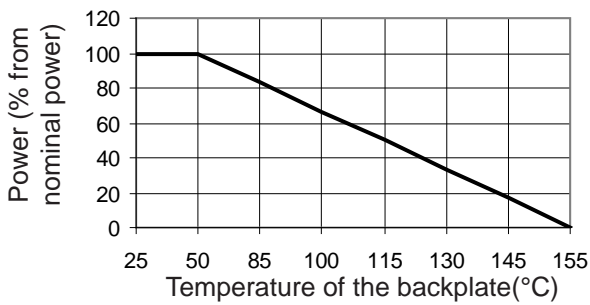
Part Number - Resistance - Contact - Tolerance - TCR
 USR 4-3825H 10Ohms D 0.5% 3ppm

SPECIFICATIONS (continued)

Temperature Coefficient



Derating



Power Rating Notes -

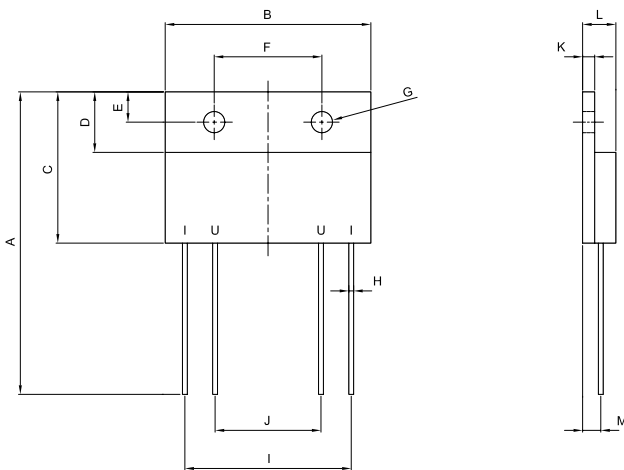
The U-Series Resistors must be attached to a suitable heatsink. The maximum internal resistor temperature is 155°C. To specify an appropriate heatsink use the following formula :

$$R_{0H} = \frac{T_{MAX} - (P \times R_{0R}) - T_A}{P}$$

Where: R_{0H} = Thermal Resistance of Heatsink (K/W)
 R_{0R} = Thermal Resistance of Resistor (K/W)
 T_{MAX} = Maximum Temperature of Resistor
 T_A = Ambient Temperature of Heatsink (°C)
 P = Power Through Resistor (W)

Dimensions

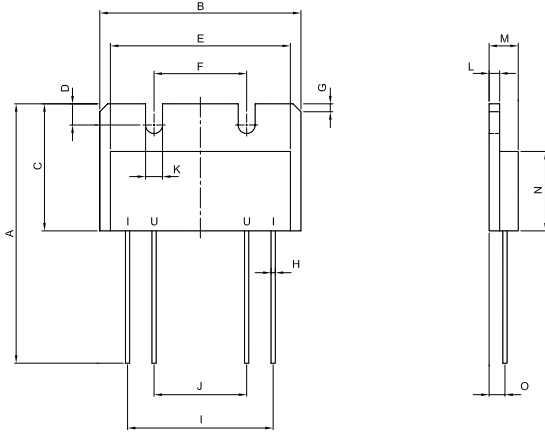
USR 4-3425 / UNR 4-3425



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	50.00	2.0	1.97	0.079
B	34.00	0.3	1.34	0.012
C	25.00	0.2	0.98	0.008
D	10.00	0.2	0.39	0.008
E	5.00	0.1	0.20	0.004
F	17.80	0.2	0.70	0.008
G	∅3.50	0.1	∅0.14	0.004
H	∅0.8	0.1	∅0.031	0.004
I	27.50	0.2	1.08	0.008
J	17.50	0.2	0.69	0.008
K	2.00	0.1	0.08	0.004
L	5.50	0.1	0.22	0.004
M	3.00	0.2	0.12	0.008

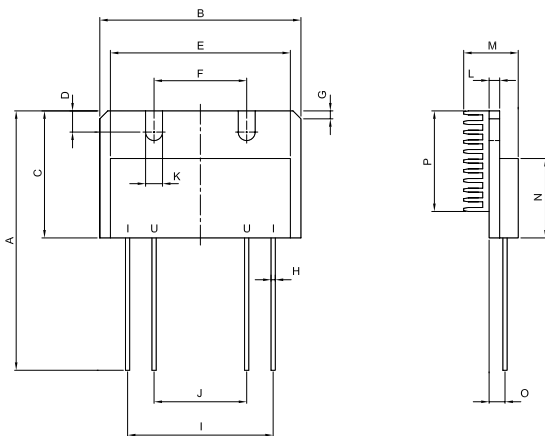
SPECIFICATIONS (continued)

USR 4-3825 / UNR 4-3825



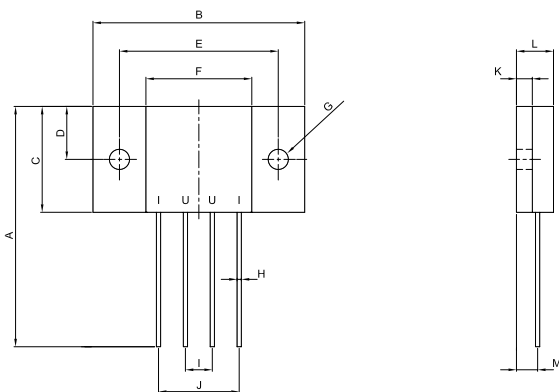
Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	49.00	2.0	1.93	0.079
B	38.00	0.3	1.50	0.012
C	24.00	0.2	0.94	0.008
D	4.00	0.1	0.16	0.004
E	34.00	0.3	1.34	0.012
F	17.50	0.2	0.69	0.008
G	1.5x45°	0.1	0.6x45°	0.004
H	∅0.8	0.1	∅0.031	0.004
I	27.50	0.2	1.08	0.008
J	17.50	0.2	0.69	0.008
K	∅3.2	0.1	∅0.126	0.004
L	2.00	0.1	0.08	0.004
M	5.50	0.1	0.22	0.004
N	15.00	0.2	0.59	0.008
O	3.00	0.2	0.12	0.008

USR 4-3825H / UNR 4-3825H

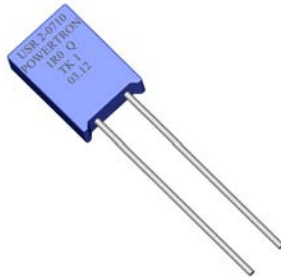


Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	49.00	2.0	1.93	0.079
B	38.00	0.3	1.50	0.012
C	24.00	0.2	0.94	0.008
D	4.00	0.1	0.16	0.004
E	34.00	0.3	1.34	0.012
F	17.50	0.2	0.69	0.008
G	1.5x45°	0.1	0.6x45°	0.004
H	∅0.8	0.1	∅0.031	0.004
I	27.50	0.2	1.08	0.008
J	17.50	0.2	0.69	0.008
K	∅3.2	0.1	∅0.126	0.004
L	2.00	0.1	0.08	0.004
M	max.10.3	0.2	max.0.4	0.008
N	15.00	0.2	0.59	0.008
O	3.00	0.2	0.12	0.008
P	19.00	0.2	0.75	0.008

USR 4-4020 / UNR 4-4020



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	45.40	2.0	1.79	0.079
B	40.00	0.3	1.57	0.012
C	20.00	0.2	0.79	0.008
D	10.00	0.2	0.39	0.008
E	30.00	0.2	1.18	0.008
F	20.00	0.2	0.79	0.008
G	∅3.80	0.1	∅0.15	0.004
H	∅0.8	0.1	∅0.031	0.004
I	5.08	0.1	0.20	0.004
J	15.24	0.2	0.60	0.008
K	3.00	0.1	0.12	0.004
L	7.00	0.1	0.28	0.004
M	4.00	0.1	0.16	0.004



- Resistances from 10Ohm to 150kOhms
- Power Rating to 0.6Watt
- Resistance Tolerances to $\pm 0.005\%$
- TCR to $\pm 1\text{ppm/K}$
- Load Stability to 0.01%

SPECIFICATIONS

Type	USR 2-0710		UNR 2-0710
Resistance Range	1.0 Ohms to 4.99 kOhms	5.0 kOhms to 150 kOhms	1.0 Ohms to 5.0 kOhms
Power rating (70°C)	0.4W (0.6W upon request)	0.6W	0.4W
Tolerances from 1.0 Ohms from 5.0 Ohms from 12.0 Ohms from 25.0 Ohms from 50.0 Ohms	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% 0.005% / 0.01% / 0.02% / 0.05% / 0.1% / 0.25% / 0.5% / 1%		
Stability	0.01%		
Shelf Life Stability	25ppm / ΔR after 1 year 50ppm / ΔR after 3 year		
Temperature Coefficient	max. $\pm 5\text{ppm/K}$ (-55 to 155°C) typ. $\pm 3\text{ppm/K}$ (-55 to 125°C) upon request $\pm 1\text{ppm/K}$ (0 to 60°C) and $\pm 1\text{ppm/K}$ (-55 to 125°C)		
Insulation Resistance	> 10GOhm		
Thermal EMF	< 0.1 $\mu\text{V/K}$		
Operating Temperature Range	-55 to 155°C		
Resistor Material	NiCr-Foil		
Substrate	Al ₂ O ₃	AlN	
Housing	PBTP / Epoxy		
Connector Material	Cu tinned		
Terminals	2		
Notes			Specially designed for applications with fast changing electrical load

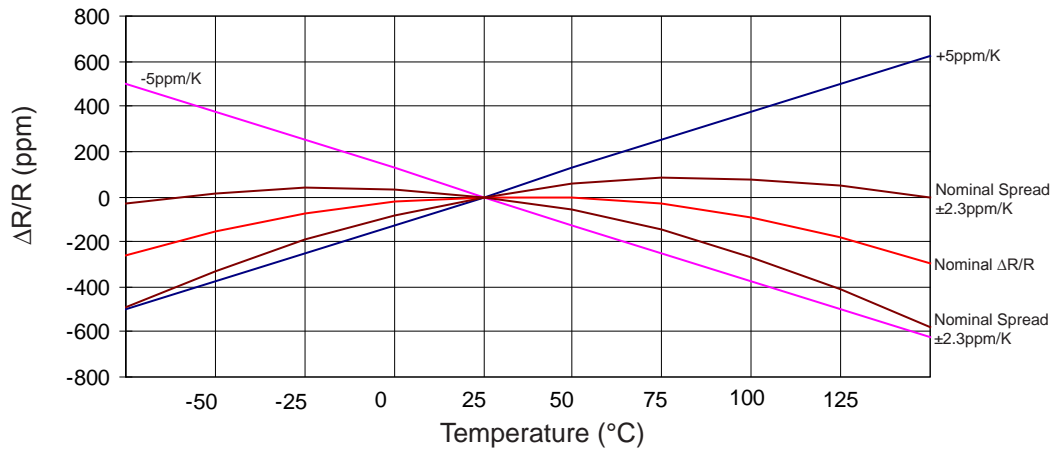
Ordering Information

Part Number - Resistance - Contact - Tolerance - TCR
UNR 2-0710 3.7Ohms J 0.5% 1ppm

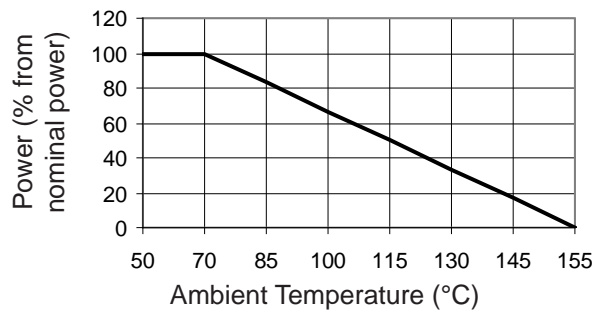
Grid (E) 3.81mm (0.15inches) = D
Grid (E) 5.08mm (0.2inches) = J

SPECIFICATIONS (continued)

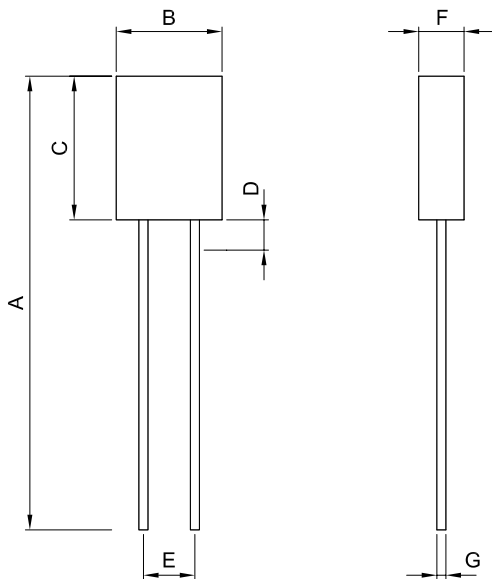
Temperature Coefficient



Derating



Dimensions



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	30.00	2.0	1.18	0.079
B	7.00	0.1	0.28	0.004
C	9.50	0.2	0.37	0.008
D	2.00	0.1	0.08	0.004
E1	3.81	0.1	0.15	0.004
E2	5.08	0.1	0.20	0.004
F	3.00	0.1	0.12	0.004
G	∅0.60	0.1	∅0.02	0.004

USR UNR 2-T220 / T220B / T221

USS UNS 2-T220

Precision Foil Resistors



- Resistances from 0.5Ohm to 150kOhms
- Power Rating to 10Watt
- Resistance Tolerances to $\pm 0.01\%$
- TCR to $\pm 3\text{ppm/K}$
- Load Stability to 0.01%
- TO-220 Housing
- Convenient SMD D2Pak Available



SPECIFICATIONS

Type	USR / USS	UNR / UNS
Resistance Range	0.5 Ohms to 150 kOhms	0.5 Ohms to 5 kOhms
Power rating free air 70°C (R<50R0) free air 70°C (R>50R0) with heatsink (R<50R0) with heatsink (R>50R0)	1.5W 1.0W 10W 6W	1.5W 1.0W 15W 10W
Thermal Resistance Rthj-c R<50R0 R>50R0	10.8 K/W 18.8 K/W	6.8 K/W 10.8 K/W
Tolerances from 0.5 Ohms from 10.0 Ohms from 25.0 Ohms from 50.0 Ohms	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%	
Stability	0.01%	
Shelf Life Stability	25ppm / ΔR after 1 year 50ppm / ΔR after 3 year	
Temperature Coefficient	max. $\pm 5\text{ppm/K}$ (-55 to 155°C) typ. $\pm 3\text{ppm/K}$ (-55 to 125°C)	
Voltage Proof	1 kVDC	
Thermal EMF	< 0.1 $\mu\text{V/K}$	
Operating Temperature Range	-55 to 155°C	
Resistor Material	NiCr-Foil	
Substrate	Al ₂ O ₃	AlN
Housing	Epoxy + Cu heatsink nickel plated	
Connector Material	Cu tinned	
Terminals	2	
Max. Torque	1.0 Nm	
Notes	Specially designed for applications with fast changing electrical load	

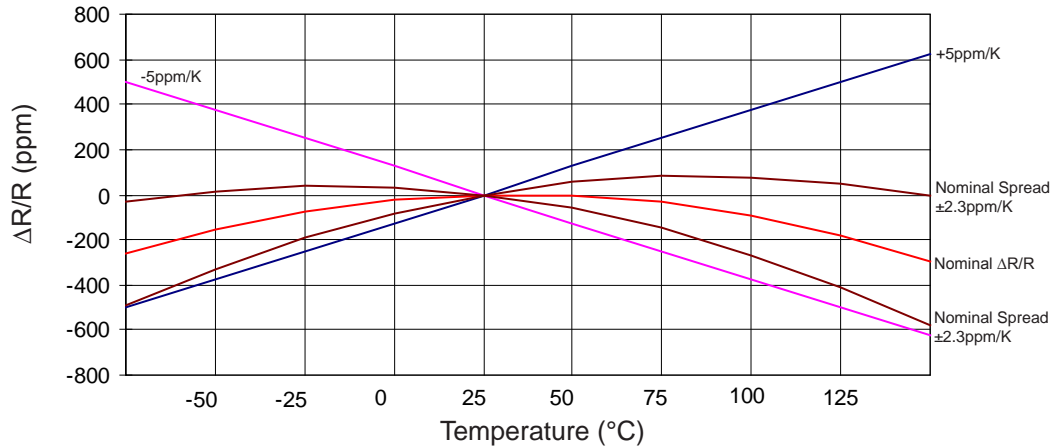
Ordering Information

Part Number - Resistance - Contact - Tolerance - TCR

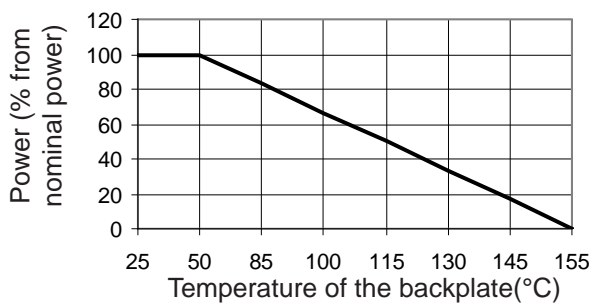
UNR 2-T220B 5.7kOhms C 0.5% 3ppm

SPECIFICATIONS (continued)

Temperature Coefficient



Derating



Power Rating Notes -

The U-Series Resistors must be attached to a suitable heatsink. The maximum internal resistor temperature is 155°C.

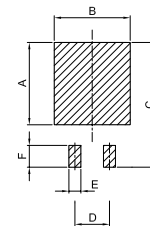
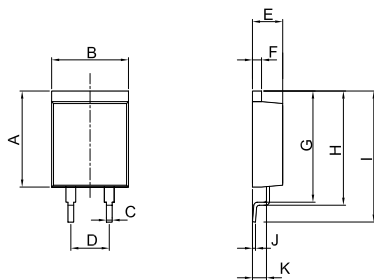
To specify an appropriate heatsink use the following formula :

$$R_{0H} = \frac{T_{MAX} - (P \times R_{0R}) - T_A}{P}$$

Where: R_{0H} = Thermal Resistance of Heatsink (K/W)
 R_{0R} = Thermal Resistance of Resistor (K/W)
 T_{MAX} = Maximum Temperature of Resistor
 T_A = Ambient Temperature of Heatsink (°C)
 P = Power Through Resistor (W)

Dimensions

USS 2-T220 / UNS 2-T220



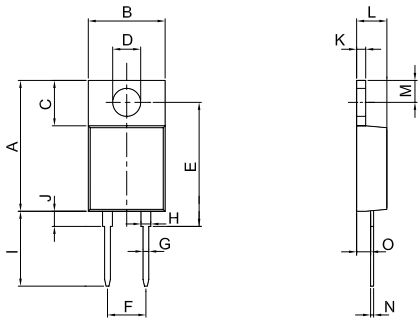
Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	12.70	0.2	0.50	0.008
B	10.16	0.2	0.40	0.008
C	0.76	0.1	0.03	0.004
D	5.08	0.1	0.20	0.004
E	4.00	0.1	0.16	0.004
F	1.20	0.1	0.05	0.004
G	14.60	0.2	0.57	0.008
H	15.00	0.2	0.59	0.008
I	17.33	0.2	0.68	0.008
J	0.40	0.1	0.02	0.004
K	1.85	0.1	0.07	0.004

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

SPECIFICATIONS (continued)

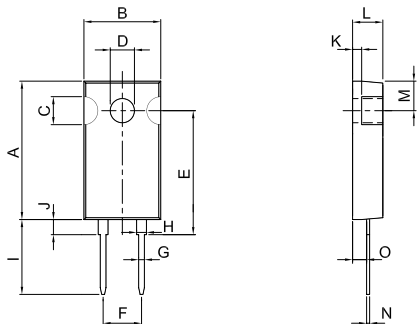
Dimensions

USR 2-T220B / UNR 2-T220B



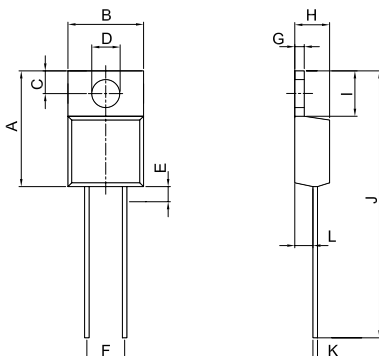
Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	17.30	0.2	0.68	0.008
B	10.16	0.2	0.40	0.008
C	6.00	0.1	0.24	0.004
D	Ø3.7	0.1	Ø0.146	0.004
E	16.40	0.2	0.65	0.008
F	5.08	0.1	0.20	0.004
G	0.76	0.1	0.03	0.004
H	1.30	0.1	0.05	0.004
I	10.00	0.2	0.39	0.008
I (C-Contact)	13.80	0.2	0.54	0.008
J	2.00	0.1	0.08	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

USR 2-T221 / UNR 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	10.00	0.2	0.39	0.008
I (C-Contact)	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

USR 2-T220 / UNR 2-T220



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	15.30	0.2	0.60	0.008
B	10.00	0.2	0.39	0.008
C	2.80	0.1	0.11	0.004
D	Ø3.7	0.1	Ø0.146	0.004
E	2.00	0.1	0.08	0.004
F	5.08	0.1	0.20	0.004
G	1.27	0.1	0.05	0.004
H	4.60	0.1	0.18	0.004
I	6.00	0.2	0.24	0.008
J	35.30	2.0	1.39	0.079
K	Ø0.6	0.1	Ø0.02	0.004
L	2.41	0.1	0.09	0.004

UHN 2-3825D

Precision Shunt Resistors



- Resistances from 50Ohm
- Power Rating to 30Watt
- Resistance Tolerances to $\pm 1\%$
- TCR to $\pm 5\text{ppm/K}$
- Load Stability to 0.01%
- Customized Resistance Values
- Twin Resistor Construction

SPECIFICATIONS

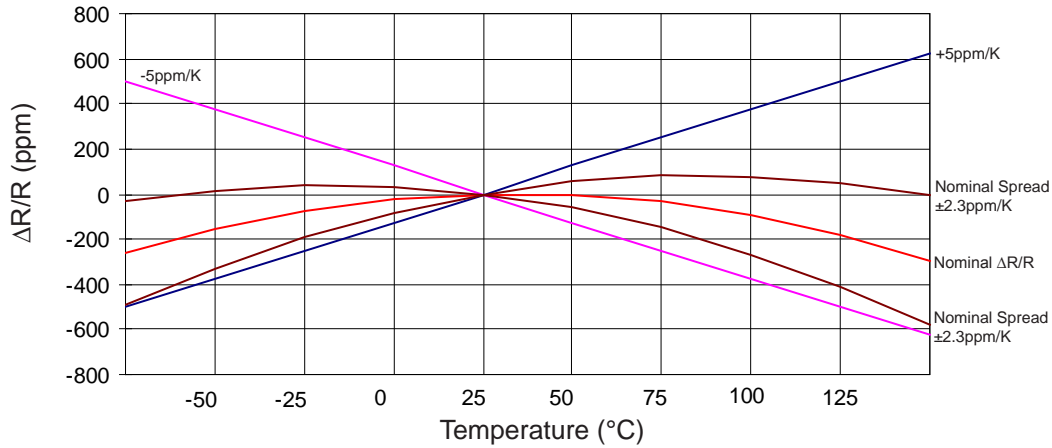
Type	UHN 2-3825D
Resistance Range	50 Ohms (2x) Other values upon request
Power rating free air 70°C with heatsink	3 W 30 W
Thermal Resistance Rthj-c	3.5 K/W
Tolerances	1% (0.1% difference between the two resistances) Other tolerances upon request
Stability	0.01%
Temperature Coefficient	max. $\pm 5\text{ppm/K}$ (-55 to 155°C)
Voltage Proof	500 VDC
max. Current	15 A
Thermal EMF	$< 0.1\mu\text{V/K}$
Operating Temperature Range	-55 to 155°C
Resistor Material	NiCr-Foil
Substrate	Al_2O_3
Housing	Epoxy + Al-heatsink
Connector Material	Cu tinned
Terminals	3
Max. Torque	1.0 Nm

Ordering Information

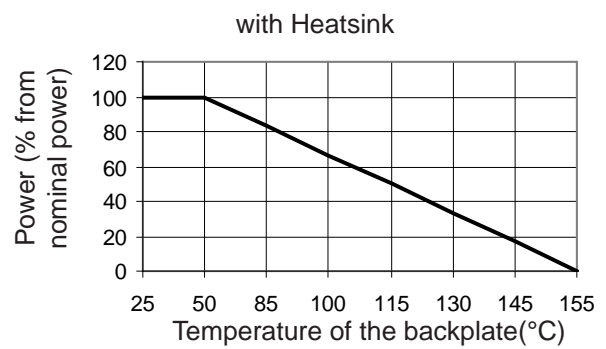
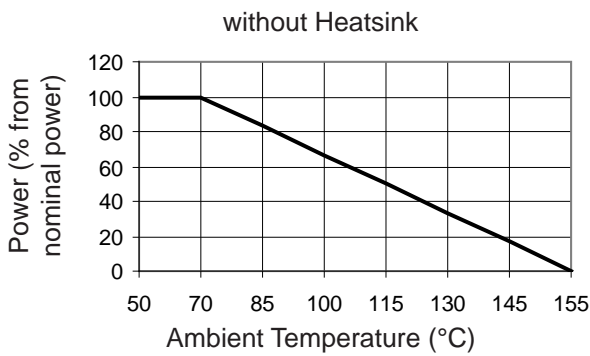
Part Number - Resistance - Tolerance
UHN 2-3825D 50Ohms-50Ohms 0.5%

SPECIFICATIONS (continued)

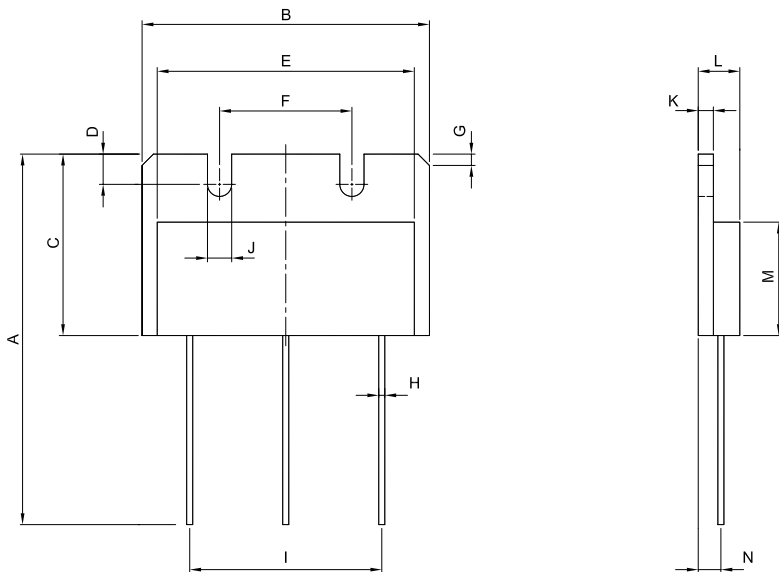
Temperature Coefficient



Derating



Dimensions



Dimension	mm	tol. (±mm)	inches	tol. (±inches)
A	49.00	2.0	1.93	0.079
B	38.00	0.3	1.50	0.012
C	24.00	0.2	0.94	0.008
D	4.00	0.1	0.16	0.004
E	34.00	0.3	1.34	0.012
F	17.50	0.2	0.69	0.008
G	1.5x45°	0.1	0.6x45°	0.004
H	∅0.8	0.1	∅0.031	0.004
I	25.40	0.2	1.00	0.008
J	∅3.2	0.1	∅0.126	0.004
K	2.00	0.1	0.08	0.004
L	5.50	0.1	0.22	0.004
M	15.00	0.2	0.59	0.008
N	3.00	0.2	0.12	0.008

MP Series

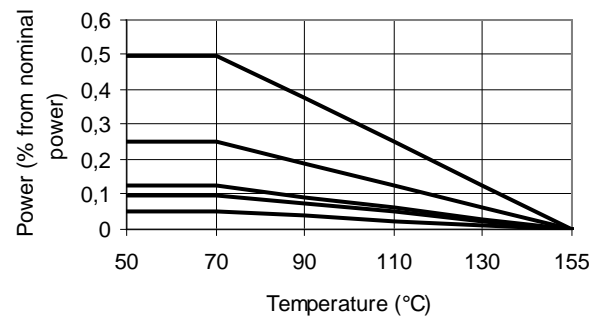
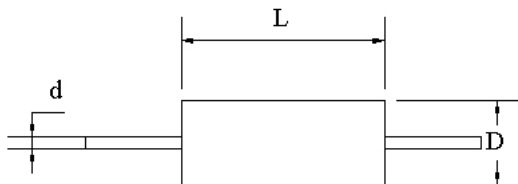
Film Resistors



- Resistances from 100ohm to 2MOhms
- Power Rating to 0.5Watts
- Resistance Tolerances to $\pm 0.01\%$
- TCR's to $\pm 50\text{ppm/K}$
- Convenient RN Type Package Styles

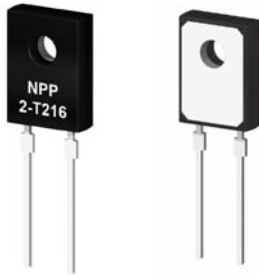
SPECIFICATIONS

Type	MP50	MP55	MP60	MP65	MP70
MIL-R-10509F	RN50	RN55	RN60	RN65	RN70
DIN-44061	0204	0207	0411	0617	0719
Resistance Range	20Ohms to 1M5Ohms		10Ohms to 2MOhms		
Power rating (70°C)	0.125W	0.25W	0.5W	0.75W	1W
Tolerances	0.02% / 0.05% / 0.10% / 0.25% / 0.5%				
Temperature Coefficient	5 / 10 / 15 / 25ppm/K				
Operating Voltage (Umax)	200V	250V	300V	350V	400V
Short Time Overload Voltage	400V	500V	600V	700V	800V
Operating Temperature Range	-55 to 125°C				
Max. Resistance Change at rated power $\Delta R/R$ max after 1000h	$\leq 0.025\%$			$\leq 0.05\%$	
Insulation Resistance	$> 1\text{G}$				
Insulation Voltage	$> 500\text{V}$				
Dimensions in mm [inches]					
L	3.9 [0.14]	6.8 [0.27]	10.0 [0.39]	15 [0.98]	18.3 [0.72]
D	1.6 [0.06]	2.5 [0.1]	3.7 [0.15]	5.2 [0.20]	6.5 [0.26]
d	0.5 [0.02]	0.6 [0.024]	0.6 [0.024]	0.6 [0.024]	0.8 [0.031]
Tolerance	± 0.1 [0.003]	± 0.1 [0.003]	± 0.1 [0.003]	± 0.1 [0.003]	± 0.1 [0.003]



Ordering Information

Part Number - Resistance - Tolerance
 MP55 100 Ohms 0.5%



- Resistances from 0.01 to 51K Ohms
- Power Rating to 20Watt
- Resistance Tolerances to $\pm 0.05\%$
- TCR to $\pm 5\text{ppm/K}$
- TO-126 Housing
- Convenient SMD DPak Available
- Low Inductance ($< 50\text{nH}$)



SPECIFICATIONS

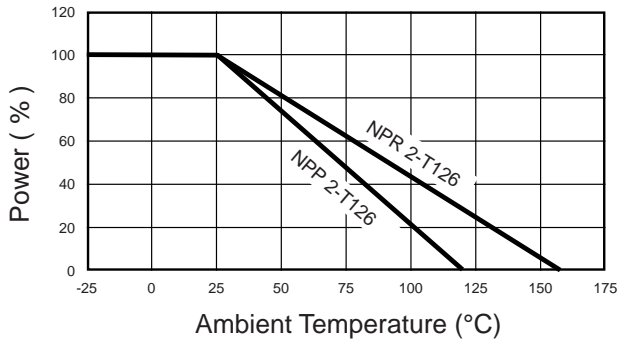
Type	Power Rating		Thermal Resistance	Resistance Range ³		Tolerances	Temperature Coefficients
	Heatsink ¹	Free Air ²		Min	Max		
NPR 2-T126	20W	1W	5.9K/W	0.01 Ω	51K Ω	$\pm 1\%$ (R>0.1 Ω) $\pm 5\%$	$\pm 50\text{ppm/K}$ (R>10 Ω) $\pm 100\text{ppm/K}$ (R>0.1 Ω) $\pm 250\text{ppm/K}$
NPP 2-T126	5W	0.5W	6.0K/W	0.1 Ω	51K Ω	$\pm 0.05\%$ / $\pm 0.1\%$ / $\pm 0.25\%$ (R>5 Ω) $\pm 0.5\%$ (R>1 Ω) / $\pm 1\%$ (R>0.1 Ω) $\pm 2\%$ / $\pm 5\%$	± 5 / $\pm 10\text{ppm/K}$ (R>1 Ω) $\pm 25\text{ppm/K}$ (R>0.1 Ω) $\pm 100\text{ppm/K}$

¹ Power rating based on 25°C Flange Temperature
² Power rating based on 25°C Ambient Temperature
³ Consult Factory for Higher or Lower Values

Specification	Value	
Maximum Current	25A	
Temperature Range	-55°C to +155°C : NPP 2T126 -55°C to +120°C : NPR 2-T126	
Dielectric Strength	2000 VAC	
Max. Operating Voltage	500 V	
Insulation Resistance	>1000 Meg-Ohm	
Environmental Performance	ΔR	Test Conditions
Load Life	$\pm 1\%$	25°C / 90 min ON / 30 min OFF / 1000 hr
Humidity Resistance	$\pm 1\%$	40°C / 90-95% RH / DC 0.1W / 1000 hr
Temperature Cycle	$\pm 0.25\%$	-55°C for 30 min / +155°C for 30 min / 1000 hr
Solder Heat	$\pm 0.1\%$	+350°C / 3s
Vibration	$\pm 0.25\%$	

SPECIFICATIONS (continued)

Power Derating Curve



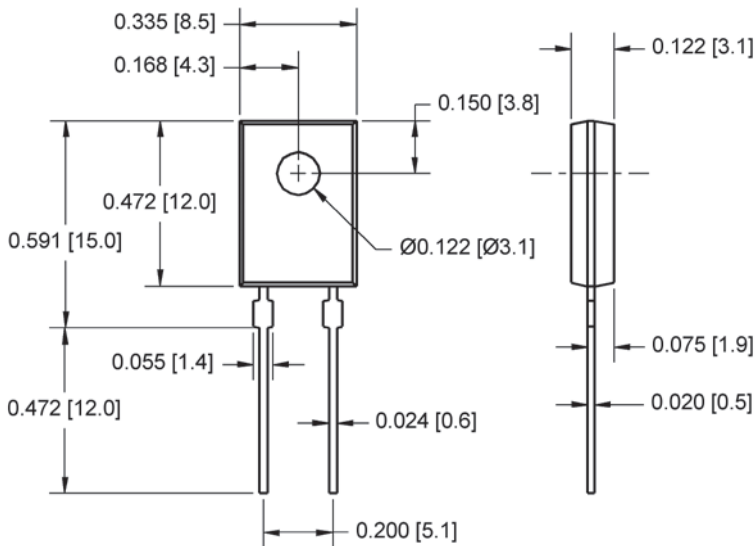
Power Rating Notes -

The NPR 2-T126 Series Foil Resistors must be attached to a suitable heatsink. The maximum internal resistor temperature is 155°C (120°C for the NPP 2-T126).

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)



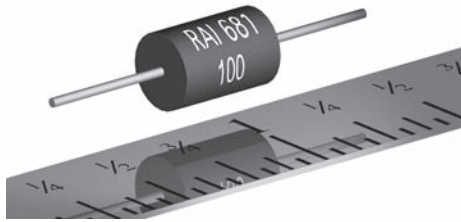
Mounting Notes -

The NPR 2-T126 Series Film Resistors must be attached to a suitable heatsink. Mount resistor using thermal grease to a clean / flat surface. Use a compression washer to provide 150 to 300 pounds (665 to 1330N) of mounting force. Torque mounting screw to 8 in-lbs (0.9 Nm).

Ordering Information

Part Number - Resistance - Tolerance - TCR

Example: NPR 2-T126 0.5 Ohm 1% 100ppm



- Resistances to 25MΩ
- Resistance Tolerances to $\pm 0.005\%$
- Temperature Coefficients of ± 1 ppm/K
- Power Ratings to 2W
- 100% Acceptance Tested / Traceable to NIST
- Long Term Stability / 100ppm/year
- Matched Resistance Sets to $\pm 0.001\%$ and ± 0.5 ppm/K

SPECIFICATIONS



Type	Commercial Wattage (Watts)	Maximum Ohms	Minimum Tolerance (%)	Dimensions			Maximum Working Voltage
				Diameter $\pm 0.005''$ [± 0.13 mm]	Length $\pm 0.025''$ [± 0.64 mm]	Lead Diameter ¹ $\pm 0.002''$ [± 0.05 mm]	
SM-2	0.06	75k	0.005	0.100 [2.5]	0.210 [5.3]	0.020 [0.5]	75
SM-3	0.08	150k		0.125 [3.2]	0.260 [6.6]	0.020 [0.5] 0.025 [0.6]	100
SM-4	0.10	250k		0.125 [3.2]	0.375 [9.5]	0.020 [0.5]	100
SM-13	0.10	250k		0.156 [4.0]	0.312 [7.9]	0.020 [0.5]	100
SM-5	0.12	400k		0.187 [4.7]	0.250 [6.4]	0.025 [0.6]	150
SM-6	0.15	500k		0.187 [4.7]	0.295 [7.5]	0.025 [0.6]	150
139A	0.15	500k		0.250 [6.4]	0.250 [6.4]	0.025 [0.6]	100
SM-15	0.175	750k		0.187 [4.7]	0.375 [9.5]	0.025 [0.6] 0.020 [0.5]	200
SM-12	0.20	750k		0.187 [4.7]	0.450 [11.4]	0.025 [0.6]	200
100	0.20	800k		0.250 [6.4]	0.375 [9.5]	0.032 [0.8] 0.025 [0.6]	200
SM-7	0.25	1M		0.210 [5.3]	0.465 [11.8]	0.025 [0.6]	250
101	0.25	1.2M		0.250 [6.4]	0.500 [12.7]	0.032 [0.8] 0.025 [0.6]	300
102	0.33	2.5M		0.250 [6.4]	0.750 [19.1]	0.032 [0.8] 0.025 [0.6]	400
120	0.40	3.8M		0.375 [9.5]	0.500 [12.7]	0.032 [0.8]	300
121	0.50	3.8M		0.375 [9.5]	0.750 [19.1]	0.032 [0.8]	400
129	0.75	10M		0.375 [9.5]	1.000 [25.4]	0.032 [0.8]	600
106	1.00	12M		0.500 [12.7]	1.000 [25.4]	0.032 [0.8]	800
107	1.50	15M	0.500 [12.7]	1.500 [38.1]	0.032 [0.8]	900	
108	2.00	25M	0.500 [12.7]	2.000 [50.8]	0.032 [0.8]	1000	

¹ Where more than one lead is listed / the top value is Standard
Lead Length = 1.50 [38] Min.

Ordering Information

Part Number - Resistance - Tolerance - TCR (If not standard)

Example: SM-6 25kΩ 0.1%

SPECIFICATIONS (continued)

PC Series

Type	Commercial Wattage (Watts)	Maximum Ohms	Minimum Tolerance (%)	Dimensions				Maximum Working Voltage
				Diameter ±0.005" [±0.13mm]	Length ±0.025" [±0.64mm]	Lead Diameter ¹ ±0.002" [±0.05mm]	Lead Spacing ±0.015" [±0.4mm]	
100PC	0.125	500k	0.005	0.250 [6.4]	0.375 [9.5]	0.025 [0.6]	0.150 [3.8]	150
130PC	0.125	500k		0.250 [6.4]	0.312 [7.9]	0.025 [0.6]	0.150 [3.8]	150
131PC	0.125	500k		0.250 [6.4]	0.312 [7.9]	0.025 [0.6]	0.200 [5.1]	150
101PC	0.25	600k		0.250 [6.4]	0.500 [12.7]	0.025 [0.6]	0.150 [3.8]	150
120PC	0.40	800k		0.375 [9.5]	0.500 [12.7]	0.032 [0.8]	0.200 [5.1]	300
104PC	0.50	1M		0.500 [12.7]	0.500 [12.7]	0.032 [0.8] 0.025 [0.6]	0.300 [7.6]	400



¹ Where more than one lead is listed / the top value is Standard
Lead Length = 1.00 [25] Min.

Rectangular Series

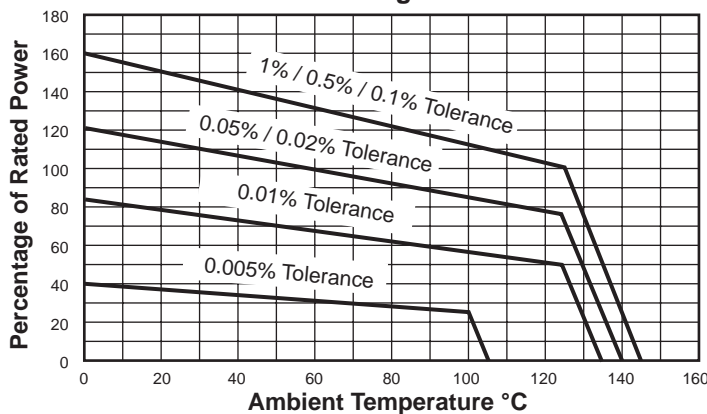
Type	Commercial Wattage (Watts)	Maximum Ohms	Dimensions					Maximum Working Voltage
			Width ±0.010" [±0.25mm]	Height ±0.025" [±0.64mm]	Length ±0.010" [±0.25mm]	Lead Diameter ¹ ±0.002" [±0.05mm]	Lead Spacing ±0.015" [±0.4mm]	
SM-8	0.125	500k	0.140 [3.6]	0.250 [6.4]	0.270 [6.9]	0.032 [0.8]	0.125 [3.2]	150
SM-9	0.250	750k	0.150 [3.8]	0.270 [6.9]	0.540 [13.7]	0.032 [0.8]	0.250 [6.4]	150
SP5086	0.300	500k	0.102 [2.6]	0.320 [8.1]	0.300 [7.6]	0.025 [0.6]	0.150 [3.8]	150
SP5232	0.500	1M	0.160 [4.1]	0.525 [13.3]	0.585 [14.9]	0.032 [0.8]	0.400 [10.2]	150



¹ Lead Length = 1.00 [25] Min.

Specification	Value
Tolerances	±0.005% to ±1% (See Derating Curve)
Temperature Coefficient (Standard) (down to 1ppm on request)	>100Ω : ±10ppm/K 10Ω to 100Ω : ±20ppm/K <10Ω : ±30ppm/K
Temperature Range	-55°C to +145°C (See Derating Curve)

Power Derating Curve



Notes: (Contact Factory for these options)

Fast Rise Time - These resistors are available in a low reactance design for fast rise time and extended frequency response.

High Stability - These resistors are available in a High Stability version with maximum resistance change of ±20ppm/year under normal conditions.

High TC - These resistors are available in High TC configurations. Standard TC's are +2600 / +3850 / +4500 / +5000 / and +6000 ppm/K.