

MSR Series

Bare Metal Element Resistors



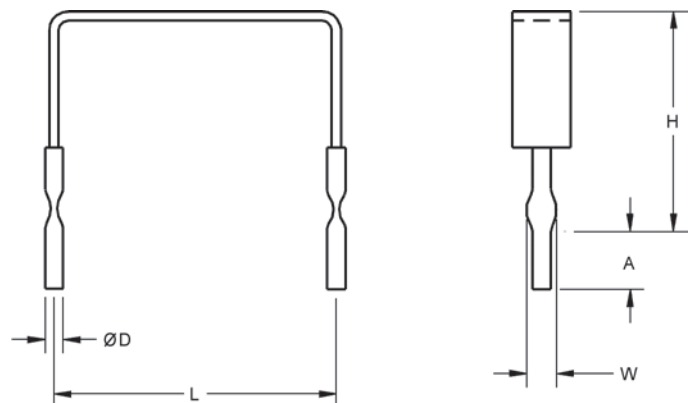
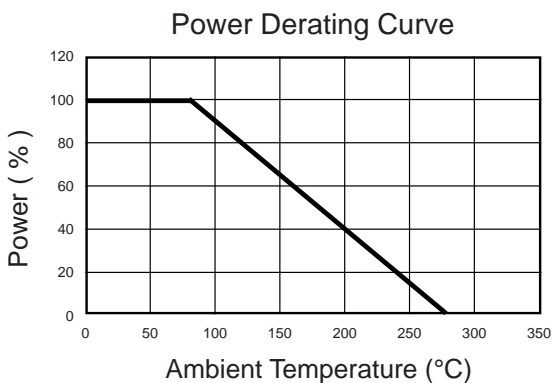
- Resistances from 0.005 to 0.100Ohms
- Tolerance to $\pm 1\%$
- Resistance Wire TCR: $\pm 20\text{ppm/K}$
- For Current Sensing and Shunt Applications
- All Welded Construction
- Low Inductance ($<10\text{nH}$)
- Economical Bare Metal Element



SPECIFICATIONS

| Type | Power Rating Watts @ 85°C | Resistance Range (Ω) ¹ | Tolerances | Dimensions | | | | |
|-------|------------------------------|---|-----------------------|--|--|---|--|--|
| | | | | L +0.040 / -0.020" [+1.0 / -0.5mm] | H ± 0.100 " [$\pm 2.5\text{mm}$] | D ± 0.002 " [$\pm 0.05\text{mm}$] | W +0.010 / -0.005" [+0.25 / -0.13mm] | A ± 0.030 " [$\pm 0.8\text{mm}$] |
| MSR-1 | 1 | 0.005, 0.01, 0.02, 0.025, 0.03, 0.04, 0.05, 0.1 | $\pm 1\%$ / $\pm 5\%$ | 0.450 [11.4] | 0.200 [5.1] | 0.040 [1.0] | 0.065 [1.7] | 0.125 [3.2] |
| MSR-3 | 3 | 0.005, 0.01, 0.015, 0.02, 0.025, 0.03, 0.04, 0.05; 0.1 | $\pm 1\%$ / $\pm 5\%$ | 0.600 [15.2] | 1.0 [25.4] MAX | 0.040 [1.0] | 0.065 [1.7] | 0.125 [3.2] |
| MSR-5 | 5 | 0.005, 0.01, 0.015, 0.02, 0.025, 0.03, 0.05; 0.1 | $\pm 1\%$ / $\pm 5\%$ | 0.800 [20.3] | 1.0 [25.4] MAX | 0.040 [1.0] | 0.065 [1.7] | 0.125 [3.2] |

¹ Call Factory for Other Resistances



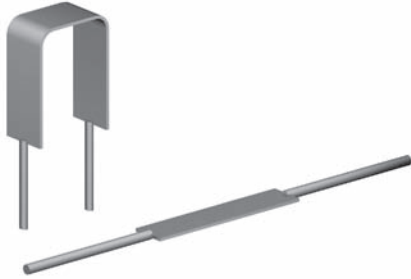
Ordering Information

Part Number - Resistance - Tolerance

Example: MSR-3 0.100Ohm 1%

MS Series

Bare Metal Element Resistors

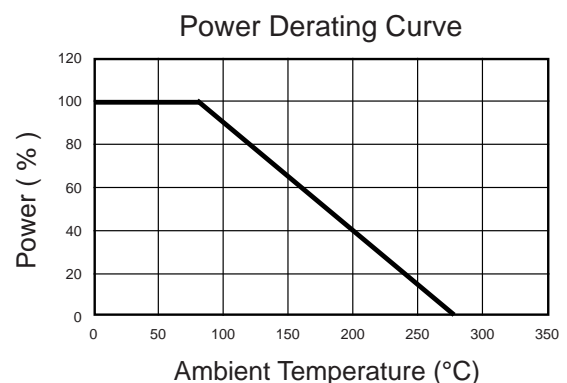
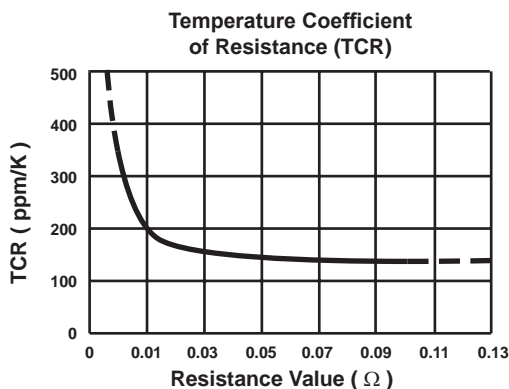
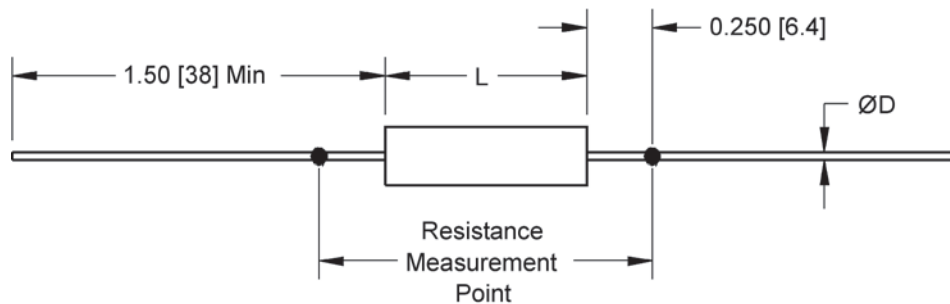


- Resistances from 0.005 to 0.10 Ohms
- Tolerance to $\pm 1\%$
- Resistance Wire TCR: $\pm 20 \text{ ppm/K}$
- For Current Sensing and Shunt Applications
- All Welded Construction
- Low Inductance ($< 10 \text{ nH}$)
- Economical Bare Metal Element

SPECIFICATIONS

| Type | Power Rating Watts @ 85°C | Resistance Range (Ω) ¹ | Tolerances | TCR (ppm/K) | Dimensions | |
|------|------------------------------|---|-----------------------|----------------|--|---|
| | | | | | L +0.040 / -0.020" [+1.0 / -0.5mm] | D ± 0.002 " [$\pm 0.05 \text{ mm}$] |
| MS-1 | 1 | 0.005 to 0.10 | $\pm 1\%$ / $\pm 5\%$ | See Chart | Consult Riedon | 0.032 [0.8] 0.040 [1.0] |
| MS-3 | 3 | 0.005 to 0.10 | $\pm 1\%$ / $\pm 5\%$ | See Chart | Consult Riedon | 0.040 [1.0] |
| MS-5 | 5 | 0.005 to 0.05 | $\pm 1\%$ / $\pm 5\%$ | See Chart | Consult Riedon | 0.040 [1.0] |

¹ Call Factory for Other Resistances



Ordering Information

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

Example: MS-3 0.05 Ohm 1%

MT Series

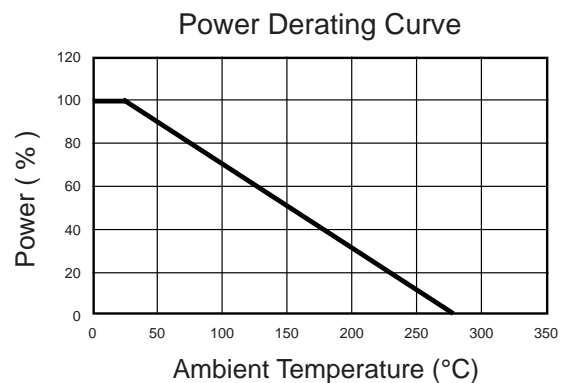
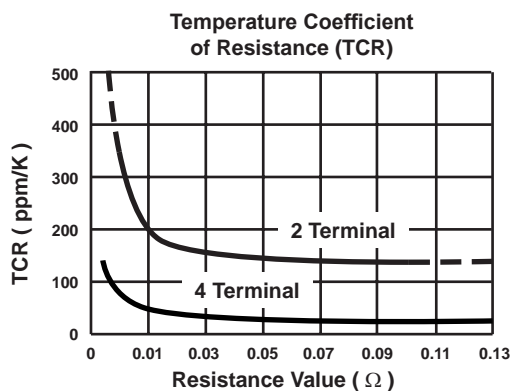
Low Ohm Power Resistors



- Resistances from 0.003 to 0.10 Ohms
- Tolerance to $\pm 0.1\%$
- TCR's to ± 20 ppm/K (Four Terminal Version)
- For Current Sensing and Shunt Applications
- All Welded Construction
- Low Inductance (<10nH)
- Four Terminal Versions Available (Consult Factory)

SPECIFICATIONS

| Specification | Value | |
|--|--|--|
| Resistance Range | 0.003 to 0.10 Ohms | |
| Tolerances | 2 Terminal: $\pm 1\%$ / $\pm 5\%$ (Contact Factory for Others) 4 Terminal: $\pm 0.1\%$ / $\pm 0.5\%$ / $\pm 1\%$ / $\pm 5\%$ (Contact Factory for Others) | |
| Temperature Coefficient | See Chart Below | |
| Inductance | <10nH | |
| Dielectric Strength | 1000VAC (500VAC for MT-1A and MT-2A) | |
| Insulation Resistance | >1000 MOhms / Dry | |
| Environmental Performance (MIL-STD 202) | ΔR | Test Conditions |
| Load Life | $\pm 1\%$ | 70°C / 90 min ON / 30 min OFF / 1000 hr |
| Moisture Resistance | $\pm 1\%$ | 40°C / 90-95% RH / DC 0.1W / 1000 hr |
| Temperature Cycling | $\pm 1\%$ | -40°C for 30 min / +125°C for 30 min / 1000 hr |
| Short Term Overload | $\pm 1\%$ | 5X rated power for 5 seconds |



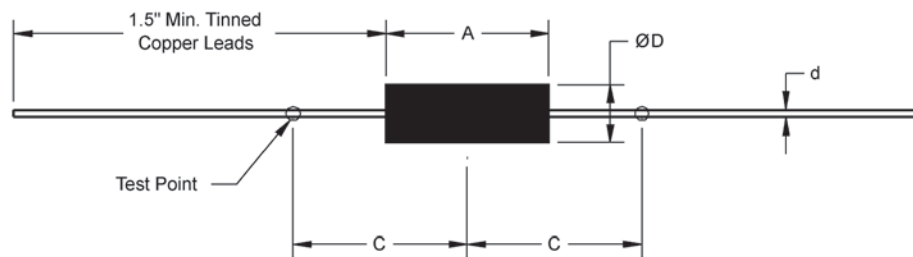
Ordering Information

Part Number - Resistance - Tolerance - TCR (if not standard) - 4T (if desired)
 Example: MT-5 0.01 Ohm 1% 4T

SPECIFICATIONS (continued)

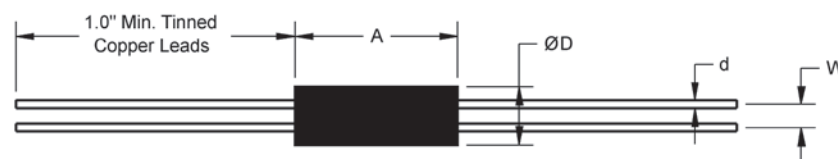
| Type | Power Rating Watts @ 25°C | Dimensions | | | | |
|-------|------------------------------|--------------------------|--------------------------|--------------------------|---------------------------|-------------------------------|
| | | A ±0.020" [±0.5mm] | D ±0.020" [±0.5mm] | C ±0.020" [±0.5mm] | d ±0.002" [±0.05mm] | W (4T) ±0.010" [±0.3mm] |
| MT-1A | 1 | 0.430 [10.9] | 0.120 [3.0] | 0.590 [15.0] | 0.025 [0.6] | - |
| MT-2A | 2 | 0.430 [10.9] | 0.120 [3.0] | 0.590 [15.0] | 0.032 [0.8] | - |
| MT-2B | 3 | 0.580 [14.7] | 0.200 [5.1] | 0.665 [16.9] | 0.032 [0.8] | - |
| MT-2C | 3 | 0.500 [12.7] | 0.250 [6.4] | 0.625 [15.9] | 0.032 [0.8] | - |
| MT-3 | 4 | 0.600 [15.2] | 0.250 [6.4] | 0.675 [17.1] | 0.032 [0.8] | 0.125 [3.2] |
| MT-4 | 4.5 | 0.750 [19.1] | 0.250 [6.4] | 0.750 [19.1] | 0.040 [1.0] | 0.125 [3.2] |
| MT-5 | 5 | 0.890 [22.6] | 0.335 [8.5] | 0.820 [20.8] | 0.040 [1.0] | 0.125 [3.2] |
| MT-6 | 6 | 1.055 [26.8] | 0.395 [10.0] | 0.903 [22.9] | 0.040 [1.0] | 0.125 [3.2] |
| MT-10 | 10 | 1.755 [44.58] | 0.355 [9.02] | 1.338 [34.0] | 0.040 [1.0] | 0.125 [3.2] |

Two Terminal



Terminal Strength: 10lb Pull Test

Four Terminal (4T)



MP Series

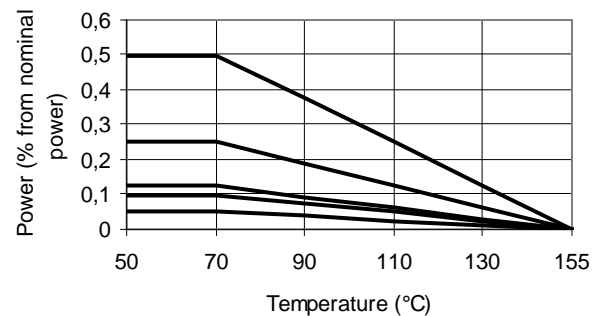
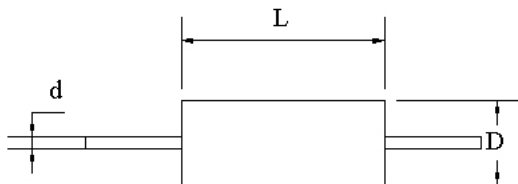
Film Resistors



- 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%

MF Series

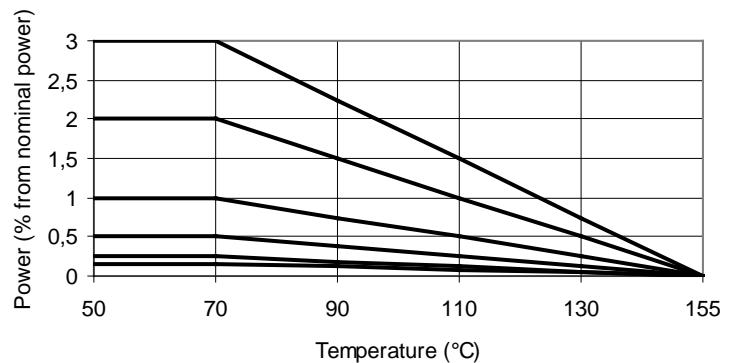
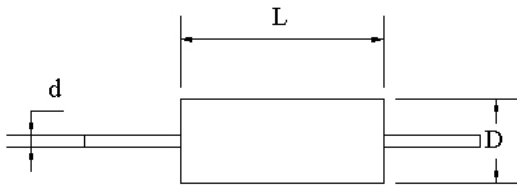
Film Resistors



- Resistances from 0.10hm to 22MOhms
- Power Rating to 3Watts
- Resistance Tolerances to $\pm 0.05\%$
- TCR's to $\pm 100\text{ppm/K}$
- Convenient RN Type Package Styles

SPECIFICATIONS

| Type | MF50 | MF55 | MF60 | MF65 | MF70 | MF75 |
|-----------------------------|-------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| MIL-R-10509F | RN50 | RN55 | RN60 | RN65 | RN70 | RN75 |
| Resistance Range | 0.1 Ohms to 22 MOhms | | | | | |
| Power rating (70°C) | 0.16W | 0.25W | 0.50W | 1.0W | 2.0W | 3.0W |
| Tolerances | 0.1% / 0.25% / 0.5% / 1% / 5% | | | | | |
| Temperature Coefficient | 5 / 10 / 15 / 25 / 50ppm/K | | | | | |
| Operating Voltage (Umax) | 200V | 250V | 300V | 350V | 450V | 500V |
| Short Time Overload Voltage | 400V | 500V | 600V | 700V | 900V | 1000V |
| Operating Temperature Range | -55 to 125°C | | | | | |
| Insulation Resistance | >1G | | | | | |
| Insulation Voltage | >500V | | | | | |
| Dimensions in mm [inches] | | | | | | |
| L | 3.8 [0.15] | 6.0 [0.24] | 10.0 [0.39] | 12 [0.47] | 16.0 [0.63] | 26.0 [1 / 02] |
| D | 2.0 [0.08] | 2.5 [0.1] | 3.5 [0.14] | 4.5 [0.18] | 5.5 [0.22] | 8.6 [0.34] |
| d | 0.5 [0.02] | 0.5 [0.02] | 0.6 [0.024] | 0.7 [0.027] | 0.8 [0.031] | 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] | ± 0.1 [0.003] |



Ordering Information

Part Number - Resistance - Tolerance
 MF55 100 kOhms 0.5%

SAA / SMA / SCA Series

Precision Metal Film Resistors

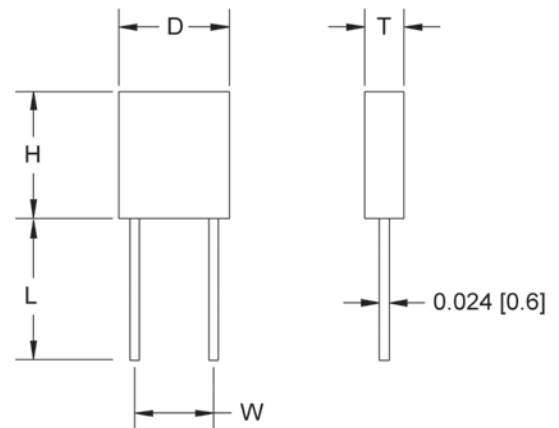


- Resistances from 10 to 1MOhms
- Power Rating 0.25Watts
- Resistance Tolerances to $\pm 0.05\%$
- TCR to $\pm 5\text{ppm/K}$
- Non-Inductive Design
- Space Efficient Radial Leads

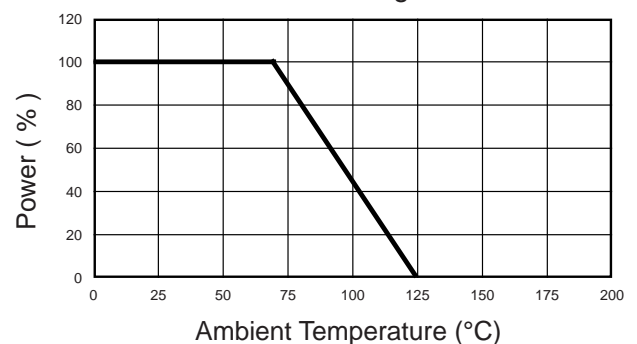
SPECIFICATIONS

| Type | Power Rating (Watts @ 70°C) | Resistance Range | Maximum Working Voltage | Dimensions | | | | |
|------|-----------------------------|------------------|-------------------------|---|---|--|--|---|
| | | | | D +0.000 / -0.020 [+0.0 / -0.5mm] | H +0.000 / -0.020 [+0.0 / -0.5mm] | L ± 0.040 [$\pm 1.0\text{mm}$] | W ± 0.008 [$\pm 0.2\text{mm}$] | T +0.000 / -0.020 [+0.0 / -0.5mm] |
| SCA | 0.25 | 10 to 330k | 300 | 0.205 [5.2] | 0.315 [8.0] | 0.390 [10.0] | 0.100 [2.5] | 0.090 [2.3] |
| SAA | 0.25 | 10 to 1M | 350 | 0.275 [7.0] | 0.315 [8.0] | 0.390 [10.0] | 0.200 [5.1] | 0.098 [2.5] |
| SMA | 0.25 | 10 to 500k | 350 | 0.433 [11.0] | 0.170 [4.3] | 0.492 [12.5] | 0.400 [10.2] | 0.098 [2.5] |

| Specification | Value |
|---|--|
| Resistance Range | 10 Ohms to 1MOhms |
| Tolerances | $\pm 0.1\%$ to $\pm 1\%$ $\pm 0.05\%$ ($100\Omega < R < 100\text{K}\Omega$) |
| Temperature Coefficient | $\pm 10\text{ppm/K}$ / $\pm 25\text{ppm/K}$ $\pm 3\text{ppm/K}$ ($100\Omega < R < 100\text{K}\Omega$) |
| Temperature Range | -25°C to $+125^\circ\text{C}$ |
| Insulation Resistance | $>10000\text{ MOhms}$ |
| Environmental Performance (MIL-STD 202) | ΔR |
| Load Life | $\pm 0.1\%$ |
| Moisture Resistance | $\pm 0.1\%$ |
| Temperature Cycling | $\pm 0.05\%$ |
| Short Time Overload | $\pm 0.01\%$ |
| Vibration | $\pm 0.01\%$ |



Power Derating Curve



Ordering Information

Part Number - Resistance - Tolerance - TCR
 Example: SAA 10 kOhms 0.1% 10ppm

MG Series

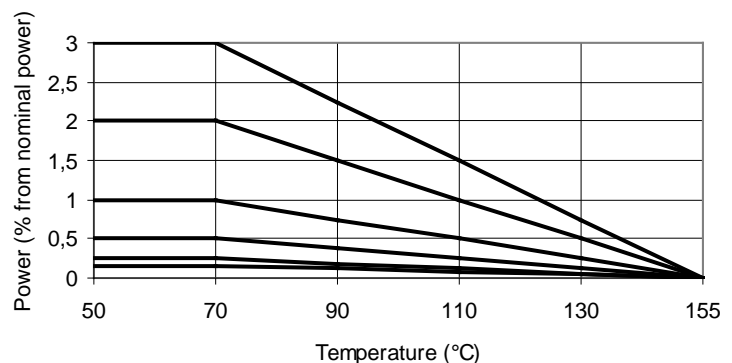
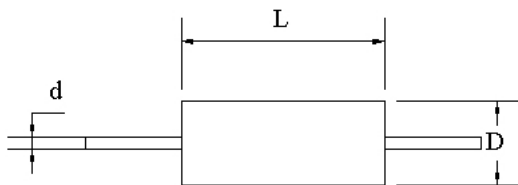
Film Resistors



- Resistances from 50kOhm to 2GOhms
- Power Rating to 3Watts
- Resistance Tolerances to $\pm 0.5\%$
- Max. working voltage to 10000V
- Convenient RN Type Package Styles

SPECIFICATIONS

| Type | MG50 | MG55 | MG60 | MG65 | MG70 | MG75 |
|---|----------------------|-------------------|-------------------|-------------------|--------------------|-------------------|
| Resistance Range | 50kOhms to 1GOhms | | 50kOhms to 1GOhms | | 100kOhms to 2GOhms | |
| Power rating (70°C) | 0.16W | 0.25W | 0.50W | 1.0W | 2.0W | 3.0W |
| Tolerances | 0.5% / 1% / 5% / 10% | | | | | |
| Temperature Coefficient | 50 / 100 / 200ppm/K | | | | | |
| Operating Voltage (Umax) | 400V | 800V | 1500V | 3000V | 6000V | 8000V |
| Short Time Overload Voltage | 800V | 1500V | 3000V | 6000V | 10000V | 15000V |
| Operating Temperature Range | -55 to 155°C | | | | | |
| Max. Resistance Change at rated power $\Delta R/R$ max after 1000h | $\leq 1.5\%$ | | | | | |
| Insulation Resistance | $> 1G$ | | | | | |
| Insulation Voltage | $> 500V$ | | | | | |
| Dimensions in mm [inches] | | | | | | |
| L | 3.8 [0.15] | 6.0 [0.24] | 10.0 [0.39] | 13 [0.51] | 17.0 [0.67] | 26.0 [1 /02] |
| D | 1.9 [0.07] | 2.5 [0.1] | 3.5 [0.14] | 4.5 [0.18] | 5.5 [0.22] | 8.5 [0.33] |
| d | 0.5 [0.02] | 0.6 [0.024] | 0.6 [0.024] | 0.7 [0.027] | 0.8 [0.031] | 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] | ± 0.1 [0.003] |

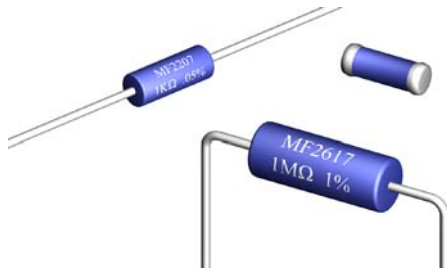


Ordering Information

Part Number - Resistance - Tolerance
 MG55 100 kOhms 0.5%

MF2000 Series

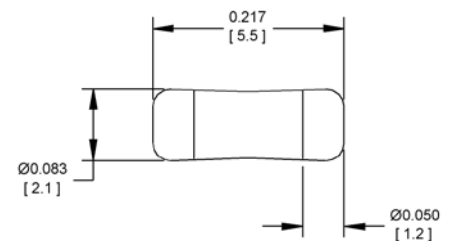
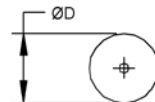
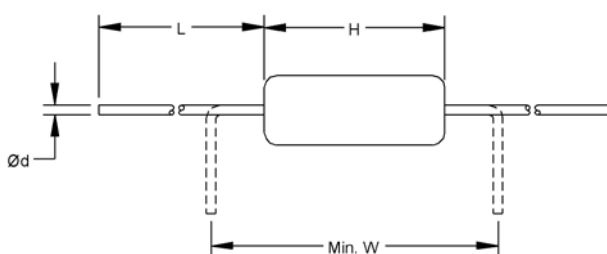
Precision / Metal Film Resistors



- Resistances from 1 to 10MOhms
- Power Rating 0.4 to 0.65Watts
- Resistance Tolerances to $\pm 0.05\%$
- TCR's to $\pm 3\text{ppm/K}$
- Very Low Inductance
- Matched Sets Available
- E192 Values in Stock

SPECIFICATIONS

| Type | Power Rating Watts @ 70°C | Resistance Range (Ω) | Maximum Voltage | H _(MAX) | D _(MAX) | d $\pm 0.002^*$ [$\pm 0.05\text{mm}$] | L _(MIN) | W _(MIN) | RN Size |
|---------|---------------------------|-------------------------------|-----------------|-------------------------|--------------------|---|--------------------|--------------------|---------|
| MFM2207 | 0.40 | 1 to 5M | 300 | (See MFM2207 Drawing) | | | | | - |
| MF2207 | 0.40 | 1 to 10M | 300 | 0.260 [6.5] | 0.100 [2.5] | 0.028 [0.7] | 1.20 [30] | 0.300 [7.5] | RN55 |
| MF2617 | 0.65 | 3 to 10M | 500 | 0.600 [15.2] | 0.230 [5.8] | 0.032 [0.8] | 1.20 [30] | 0.690 [17.5] | RN65 |



MF2207

| Specification | Value |
|---------------------------|--|
| Resistance Range | 1 Ohms to 10MOhms |
| Tolerances | $\pm 0.05\%$ to $\pm 1\%$ |
| Temperature Coefficient | (See Charts) |
| Temperature Range | -25°C to +125°C (TC $\geq 25\text{ppm/K}$) -10°C to +85°C (TC $< 25\text{ppm/K}$) |
| Insulation Resistance | >10000 MOhms |
| Climatic Category | 55/125/56 |
| Max Soldering Temperature | +260°C / 10s |
| Voltage Coefficient | < 5ppm/V |

SPECIFICATIONS (continued)

MF2207 TCR / Tolerance / Resistance Chart

| TCR (\pm ppm/K) | Resistances Available at These Tolerances | | | | |
|-----------------------|---|-------------|--------------|-------------|-----------|
| | $\pm 0.05\%$ | $\pm 0.1\%$ | $\pm 0.25\%$ | $\pm 0.5\%$ | $\pm 1\%$ |
| 5 | 50 - 250K | 10 - 500K | 10 - 500K | 10 - 500K | - |
| 10 | 50 - 510K | 5 - 1M | 5 - 1M | 5 - 1M | - |
| 15 | 50 - 510K | 5 - 1.5M | 5 - 1.5M | 5 - 2M | 1 - 2M |
| 25 | 50 - 510K | 5 - 1.5M | 5 - 3M | 2 - 5M | 1 - 5M |
| 50 | 50 - 510K | 5 - 2M | 3 - 3M | 2 - 5M | 1 - 5M |

MF2207 TCR / Tolerance / Resistance Chart

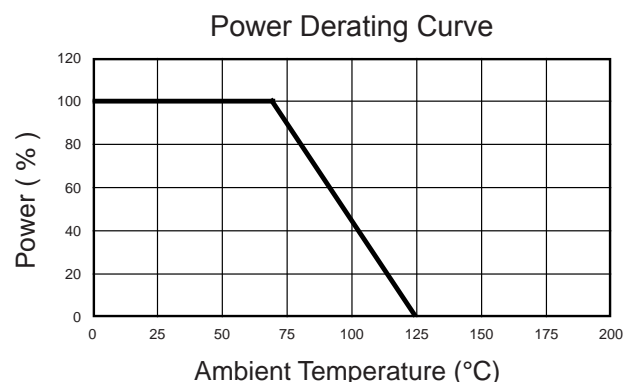
| TCR (\pm ppm/K) | Resistances Available at These Tolerances | | | | |
|-----------------------|---|-------------|--------------|-------------|-----------|
| | $\pm 0.05\%$ | $\pm 0.1\%$ | $\pm 0.25\%$ | $\pm 0.5\%$ | $\pm 1\%$ |
| 3 | 50 - 120K | 30 - 200K | 30 - 200K | 30 - 200K | - |
| 5 | 50 - 250K | 10 - 500K | 10 - 500K | 10 - 500K | - |
| 10 | 50 - 510K | 5 - 1M | 50 - 1M | 50 - 1M | - |
| 15 | 50 - 510K | 5 - 1.5M | 5 - 2M | 5 - 2M | 1 - 2M |
| 25 | 50 - 510K | 5 - 3M | 2 - 3M | 2 - 5M | 1 - 5M |
| 50 | 50 - 510K | 5 - 3M | 2 - 3M | 2 - 10M | 1 - 10M |

MF2617 TCR / Tolerance / Resistance Chart

| TCR (\pm ppm/K) | Resistances Available at These Tolerances | | | | |
|-----------------------|---|-------------|--------------|-------------|-----------|
| | $\pm 0.05\%$ | $\pm 0.1\%$ | $\pm 0.25\%$ | $\pm 0.5\%$ | $\pm 1\%$ |
| 10 | 240 - 250K | 100 - 250K | 50 - 250K | 20 - 510K | 20 - 510K |
| 15 | 240 - 250K | 100 - 250K | 50 - 250K | 20 - 510K | 20 - 510K |
| 25 | 240 - 510K | 100 - 1M | 50 - 2M | 20 - 5M | 10 - 5M |
| 50 | 100 - 510K | 50 - 10M | 10 - 10M | 5 - 10M | 3 - 10M |

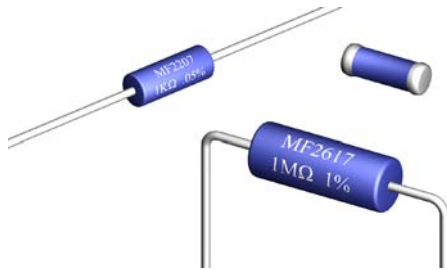
Ordering Information

Part Number - Resistance - Tolerance - TCR
 Example: MF2207 1.1 kOhm 0.05% 5ppm
 (Note: If no TCR is specified / the highest value will be supplied)



MF2000 Series

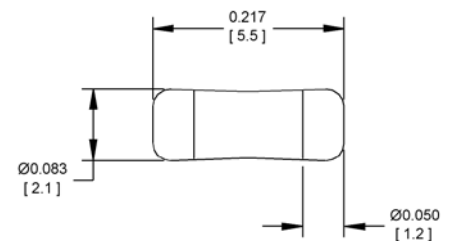
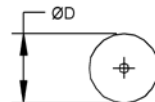
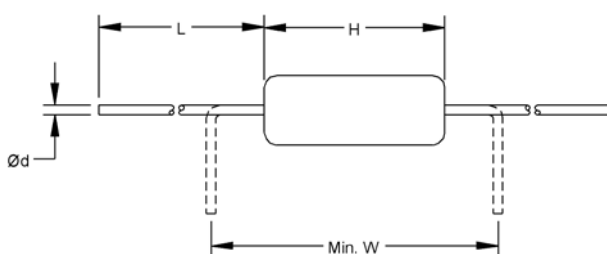
Precision / Metal Film Resistors



- Resistances from 1 to 10MOhms
- Power Rating 0.4 to 0.65Watts
- Resistance Tolerances to $\pm 0.05\%$
- TCR's to $\pm 3\text{ppm/K}$
- Very Low Inductance
- Matched Sets Available
- E192 Values in Stock

SPECIFICATIONS

| Type | Power Rating Watts @ 70°C | Resistance Range (Ω) | Maximum Voltage | H _(MAX) | D _(MAX) | d $\pm 0.002^*$ [$\pm 0.05\text{mm}$] | L _(MIN) | W _(MIN) | RN Size |
|---------|---------------------------|-------------------------------|-----------------|-------------------------|--------------------|---|--------------------|--------------------|---------|
| MFM2207 | 0.40 | 1 to 5M | 300 | (See MFM2207 Drawing) | | | | | - |
| MF2207 | 0.40 | 1 to 10M | 300 | 0.260 [6.5] | 0.100 [2.5] | 0.028 [0.7] | 1.20 [30] | 0.300 [7.5] | RN55 |
| MF2617 | 0.65 | 3 to 10M | 500 | 0.600 [15.2] | 0.230 [5.8] | 0.032 [0.8] | 1.20 [30] | 0.690 [17.5] | RN65 |



MFM2207

| Specification | Value |
|---------------------------|--|
| Resistance Range | 1 Ohms to 10MOhms |
| Tolerances | $\pm 0.05\%$ to $\pm 1\%$ |
| Temperature Coefficient | (See Charts) |
| Temperature Range | -25°C to +125°C (TC $\geq 25\text{ppm/K}$) -10°C to +85°C (TC $< 25\text{ppm/K}$) |
| Insulation Resistance | >10000 MOhms |
| Climatic Category | 55/125/56 |
| Max Soldering Temperature | +260°C / 10s |
| Voltage Coefficient | < 5ppm/V |

SPECIFICATIONS (continued)

MF2207 TCR / Tolerance / Resistance Chart

| TCR (\pm ppm/K) | Resistances Available at These Tolerances | | | | |
|-----------------------|---|-------------|--------------|-------------|-----------|
| | $\pm 0.05\%$ | $\pm 0.1\%$ | $\pm 0.25\%$ | $\pm 0.5\%$ | $\pm 1\%$ |
| 5 | 50 - 250K | 10 - 500K | 10 - 500K | 10 - 500K | - |
| 10 | 50 - 510K | 5 - 1M | 5 - 1M | 5 - 1M | - |
| 15 | 50 - 510K | 5 - 1.5M | 5 - 1.5M | 5 - 2M | 1 - 2M |
| 25 | 50 - 510K | 5 - 1.5M | 5 - 3M | 2 - 5M | 1 - 5M |
| 50 | 50 - 510K | 5 - 2M | 3 - 3M | 2 - 5M | 1 - 5M |

MF2207 TCR / Tolerance / Resistance Chart

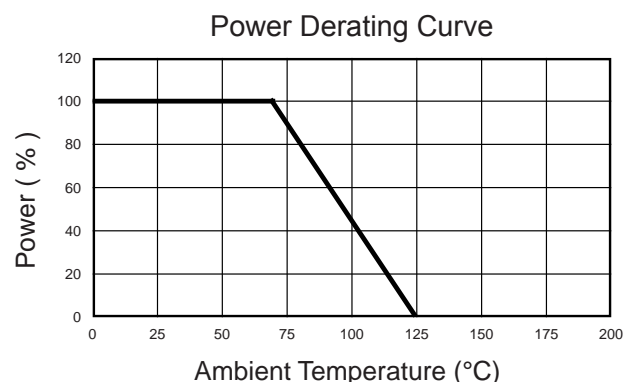
| TCR (\pm ppm/K) | Resistances Available at These Tolerances | | | | |
|-----------------------|---|-------------|--------------|-------------|-----------|
| | $\pm 0.05\%$ | $\pm 0.1\%$ | $\pm 0.25\%$ | $\pm 0.5\%$ | $\pm 1\%$ |
| 3 | 50 - 120K | 30 - 200K | 30 - 200K | 30 - 200K | - |
| 5 | 50 - 250K | 10 - 500K | 10 - 500K | 10 - 500K | - |
| 10 | 50 - 510K | 5 - 1M | 50 - 1M | 50 - 1M | - |
| 15 | 50 - 510K | 5 - 1.5M | 5 - 2M | 5 - 2M | 1 - 2M |
| 25 | 50 - 510K | 5 - 3M | 2 - 3M | 2 - 5M | 1 - 5M |
| 50 | 50 - 510K | 5 - 3M | 2 - 3M | 2 - 10M | 1 - 10M |

MF2617 TCR / Tolerance / Resistance Chart

| TCR (\pm ppm/K) | Resistances Available at These Tolerances | | | | |
|-----------------------|---|-------------|--------------|-------------|-----------|
| | $\pm 0.05\%$ | $\pm 0.1\%$ | $\pm 0.25\%$ | $\pm 0.5\%$ | $\pm 1\%$ |
| 10 | 240 - 250K | 100 - 250K | 50 - 250K | 20 - 510K | 20 - 510K |
| 15 | 240 - 250K | 100 - 250K | 50 - 250K | 20 - 510K | 20 - 510K |
| 25 | 240 - 510K | 100 - 1M | 50 - 2M | 20 - 5M | 10 - 5M |
| 50 | 100 - 510K | 50 - 10M | 10 - 10M | 5 - 10M | 3 - 10M |

Ordering Information

Part Number - Resistance - Tolerance - TCR
 Example: MF2207 1.1 kOhm 0.05% 5ppm
 (Note: If no TCR is specified / the highest value will be supplied)





- Resistances from 1M to 1TOhms
- Power Rating 0.5 to 2Watts
- Resistance Tolerances to $\pm 0.5\%$
- TCR's to $\pm 25\text{ppm/K}$
- Non-Magnetic
- High Value Thick Film Resistance Element

SPECIFICATIONS

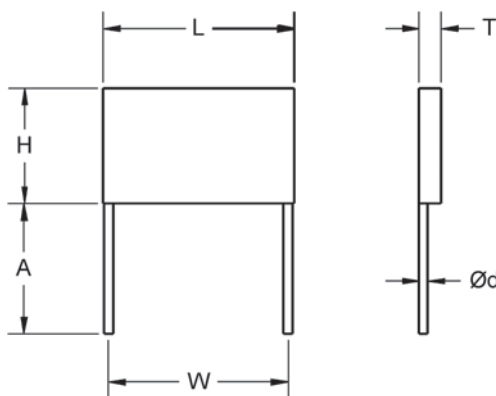
| Type | | 1210 | 25 | 2512 | 4020 |
|---------------------------------|-----------|---|--|--|--|
| Power Rating (W) ¹ | | 0.5 | 0.7 | 1.0 | 2.0 |
| Working Voltage (VAC) | Trimmed | 300 | 300 | 1200 | 4000 |
| | Untrimmed | 1000 | 500 | 2500 | 6000 |
| Resistance Range (Ω) | | Tolerances Available (%) Temperature Coefficients Available ($\pm \text{ppm/K}$) ² Voltage Coefficient (ppm / V) | | | |
| 1M - 100M | | 0.5% to 10% 25 / 50 / 100 <50ppm/V | 2% to 10% 50 / 100 <50ppm/V | 0.5% to 10% 25 / 50 / 100 <10ppm/V | 0.25% to 10% 25 / 50 / 100 <5ppm/V |
| >100M - 500M | | 2% to 20% 50 / 100 / 250 <100ppm/V | 5% to 20% 100 / 250 <100ppm/V | 1% to 20% 25 / 50 / 100 <25ppm/V | 0.5% to 20% 25 / 50 / 100 <10ppm/V |
| >500M - 1G | | 5% to 20% 100 / 250 <100ppm/V | 5% to 20% 100 / 250 <100ppm/V | 1% to 20% 100 / 250 <25ppm/V | 1% to 20% 25 / 50 / 100 <10ppm/V |
| >1G - 10G | | 5% to 30% 250 / 500 <500ppm/V | 10% to 30% 250 / 500 <500ppm/V | 2% to 20% 100 / 250 <100ppm/V | 2% to 20% 50 / 100 <25ppm/V |
| >10G - 100G | | 5% to 30% 500 / 1000 <1000ppm/V | 10% to 30% 500 / 1000 <1000ppm/V | 5% to 30% 250 / 500 <250ppm/V | 5% to 30% 100 / 250 <100ppm/V |
| >100G - 1T | | - | - | 10% to 50% 500 / 1000 <500ppm/V | 5% to 30% 250 / 500 <250ppm/V |

¹W @ 70 °C / 0W @ 125 °C

²25 / 50 PPM : +25°C to +85°C

SPECIFICATIONS (continued)

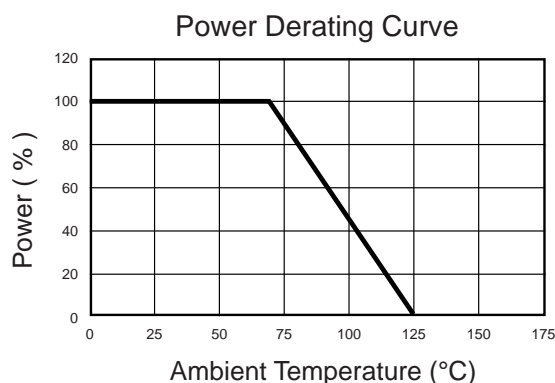
| Specification | Value | | |
|-------------------------|-----------------|--------------|--------|
| Temperature Range | -55°C to +125°C | | |
| Climactic Category | 55 / 125 / 56 | | |
| Long Term Stability | Max ΔR | | |
| | <1 GΩ | 1 GΩ - 10 GΩ | >10 GΩ |
| Storage 125°C / 1000h | ±1% | ±2% | ±5% |
| Maximum Voltage / 1000h | ±0.5% | ±1% | ±2% |



| Type | Dimensions | | | | | |
|----------|-----------------|-----------------|-----------------|-----------------|--------------------------|------------------|
| | L ±0.008 [±0.2] | H ±0.008 [±0.2] | T ±0.008 [±0.2] | W ±0.008 [±0.2] | A +0 / -0.08 [+0 / -2.0] | d ±0.002 [±0.05] |
| GST 1210 | 0.126 [3.2] | 0.098 [2.5] | 0.035 [0.9] | 0.079 [2.0] | 0.79 [20] | 0.016 [0.4] |
| GST 25 | 0.150 [3.8] | 0.200 [5.0] | 0.039 [1.0] | 0.098 [2.5] | 0.79 [20] | 0.016 [0.4] |
| GST 2512 | 0.250 [6.3] | 0.138 [3.5] | 0.039 [1.0] | 0.217 [5.5] | 0.79 [20] | 0.016 [0.4] |
| GST 4020 | 0.400 [10.2] | 0.200 [5.1] | 0.039 [1.0] | 0.374 [9.5] | 0.79 [20] | 0.016 [0.4] |

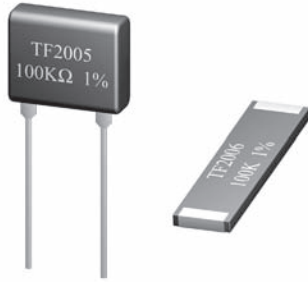
Ordering Information

Part Number - Resistance - Tolerance - TCR
 Example: GST 2512 10GOhms 10% 100ppm
 (Note: if no TCR is Specified / The highest value will be supplied)



TF2000 Series

Thick Film Resistors



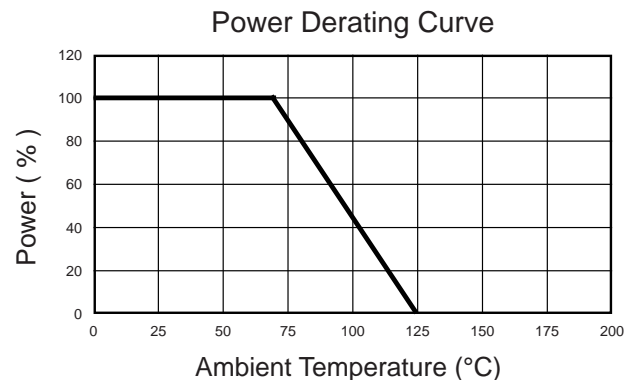
- Resistances from 100 to 20GOhms
- Power Rating 0.125 to 3Watts
- Resistance Tolerances to $\pm 1\%$
- TCR's to $\pm 100\text{ppm/K}$
- Voltage Ratings to 20KV
- Voltage Coefficient : 50ppm/V (MAX)
- Thick Film Resistance Element



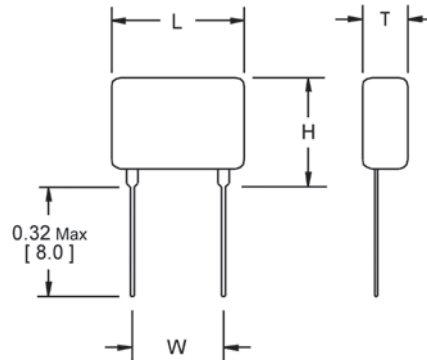
SPECIFICATIONS

| Type | 2003 | 2004 | 2005 | 2006 | 2007 | 2009 |
|--|-------------------|-------------------|--------------------|--------------------|--------------------|--------------------|
| Power Rating (W @ 70 °C) | 0.125 | 0.25 | 0.40 | 0.70 | 1.5 | 3.0 |
| Working Voltage (rms) | 100 | 250 | 750 | 2000 | 10000 | 20000 |
| Available Resistances at each Tolerance Tolerance 0.5% upon request | | | | | | |
| $\pm 1\%$ | 100 - 10M | 10k - 10M | 10k - 22M | 100k - 100M | 100k - 100M | 100K - 100M |
| $\pm 2\%$ | 100 - 25M | 10k - 100M | 10k - 200M | 100k - 250M | 100k - 500M | 100K - 500M |
| $\pm 5\%$ | 100 - 150M | 10k - 250M | 10k - 500M | 100k - 1G | 100k - 2G | 100K - 2G |
| $\pm 10\%$ | 100 - 500M | 10k - 1G | 10k - 10G | 100k - 10G | 100k - 10G | 100K - 20G |
| Available Resistances at each Temperature Coefficient | | | | | | |
| $\pm 100\text{ ppm/K}$ | $\leq 25\text{M}$ | $\leq 50\text{M}$ | $\leq 250\text{M}$ | $\leq 250\text{M}$ | $\leq 250\text{M}$ | $\leq 250\text{M}$ |
| $\pm 250\text{ ppm/K}$ | $> 25\text{M}$ | $> 50\text{M}$ | $> 250\text{M}$ | $> 250\text{M}$ | $> 250\text{M}$ | $> 250\text{M}$ |

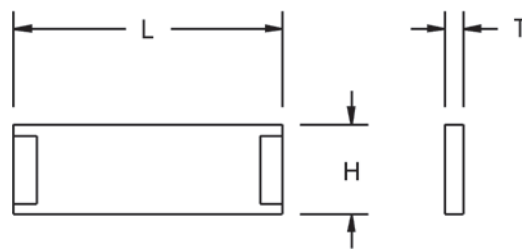
| Specification | Value |
|---------------------------|---|
| Resistance Range | 100 Ohms to 20G Ohms |
| Tolerances | $\pm 1\%$ to $\pm 10\%$ |
| Temperature Coefficient | $\pm 100\text{ppm/K}$ / $\pm 250\text{ppm/K}$ |
| Temperature Range | -55°C to +125°C |
| Insulation Resistance | $> 10000\text{ MOhms}$ |
| Shelf Life Stability | 1% / 5 Years |
| Climatic Category | 55/125/56 |
| Max Soldering Temperature | +260°C / 10s |
| Voltage Coefficient | $< 5\text{ppm/V}$ |



SPECIFICATIONS (continued)



| Type | H (MAX) | L (MAX) | T (MAX) | W ±0.015" [±0.4mm] |
|--------|-------------|--------------|-------------|-----------------------|
| TF2003 | 0.236 [6.0] | 0.197 [5.0] | 0.100 [2.5] | 0.100 [2.5] |
| TF2004 | 0.236 [6.0] | 0.287 [7.3] | 0.100 [2.5] | 0.200 [5.1] |
| TF2005 | 0.236 [6.0] | 0.492 [12.5] | 0.100 [2.5] | 0.400 [10.2] |
| TF2006 | 0.236 [6.0] | 0.886 [22.5] | 0.100 [2.5] | 0.800 [20.3] |
| TF2007 | 0.354 [9.0] | 1.535 [39.0] | 0.100 [2.5] | 1.400 [35.6] |
| TF2009 | 0.354 [9.0] | 3.071 [78.0] | 0.100 [2.5] | 2.900 [73.7] |



| Type | H (MAX) | L (MAX) | T (MAX) |
|---------|-------------|--------------|-------------|
| TFC2004 | 0.153 [3.9] | 0.260 [6.6] | 0.032 [0.8] |
| TFC2005 | 0.153 [3.9] | 0.465 [11.8] | 0.032 [0.8] |
| TFC2006 | 0.153 [3.9] | 0.866 [22.0] | 0.032 [0.8] |
| TFC2007 | 0.26 [6.6] | 1.512 [38.4] | 0.032 [0.8] |

Ordering Information

Part Number - Resistance - Tolerance - TCR

Example: TF2009 100 MOhms 2% 100ppm

(Note: If no TCR is specified / the highest value will be supplied)

HTE Series

High Voltage / Thick Film Resistors

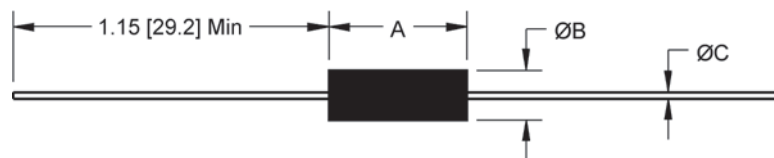


- Resistances from 200Ohms to 700MOhms
- Power Rating 0.7 to 17Watts
- Resistance Tolerances to $\pm 1\%$
- Low TCR: $\pm 100\text{ppm/K}$ Standard
- Voltage Ratings to 48KV
- Non-Inductive Design
- SMD upon request



SPECIFICATIONS

| Type | Wattage Rating (Watts) | Dimensions (special dimensions possible) | | | Maximum Working Voltage (KV ACrms) |
|--------|-----------------------------|---|---|--|---------------------------------------|
| | | A $\pm 0.062''$ [$\pm 1.6\text{mm}$] | B $\pm 0.031''$ [$\pm 0.8\text{mm}$] | C $\pm 0.002''$ [$\pm 0.05\text{mm}$] | |
| HTE15 | 0.7 | 0.590 [15.0] | 0.197 [5.0] | 0.032 [0.8] | 2.5 |
| HTE19 | 1 | 0.748 [19.0] | 0.197 [5.0] | 0.032 [0.8] | 3.5 |
| HTE24 | 2 | 0.944 [24.0] | 0.314 [8.0] | 0.040 [1.0] | 5.5 |
| HTE25 | 1.2 | 1.00 [25.4] | 0.197 [5.0] | 0.032 [0.8] | 5.5 |
| HTE39 | 3 | 1.535 [39.0] | 0.314 [8.0] | 0.040 [1.0] | 10 |
| HTE52 | 5 | 2.05 [52.0] | 0.314 [8.0] | 0.040 [1.0] | 15 |
| HTE76 | 8 | 2.99 [76.0] | 0.354 [9.0] | 0.040 [1.0] | 22.5 |
| HTE102 | 12 | 4.02 [102] | 0.354 [9.0] | 0.040 [1.0] | 32 |
| HTE127 | 12 | 5.00 [127] | 0.354 [9.0] | 0.040 [1.0] | 40 |
| HTE152 | 15 | 5.98 [152] | 0.354 [9.0] | 0.040 [1.0] | 48 |



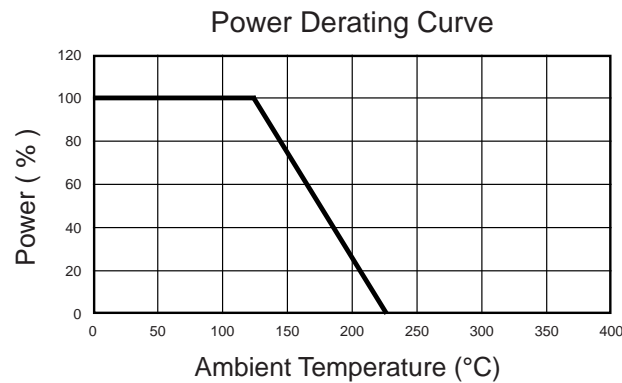
Ordering Information

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

Example: HTE39 10MOhm 1%

SPECIFICATIONS (continued)

| Specification | Value |
|--|--|
| Resistance Range | 200 Ohms to 700MOhms |
| Tolerances | ±1% to ±10% |
| Temperature Coefficient | ±100ppm/K : -25°C to +125°C (Standard) ±20 to ±150 ppm/K (On Request) |
| Temperature Range | -55°C to +195°C |
| Insulation Resistance | >10000 MOhms |
| Encapsulation | Epoxy Conformal Coating / silicon or glass upon request |
| Environmental Performance (MIL-STD 202) | ΔR |
| Load Life | ±0.7% |
| Moisture Resistance | ±0.4% |
| Thermal Shock | ±0.4% |
| 5X Overload (5s) | ±0.5% |



HVR Series

High Voltage / Thick Film Leaded Resistors



- Resistances from 1M to 10TOhms
- Power Rating 1 to 3Watts
- Resistance Tolerances to $\pm 0.25\%$
- TCR's to $\pm 25\text{ppm/K}$
- Non-Magnetic
- High Value Thick Film Resistance Element

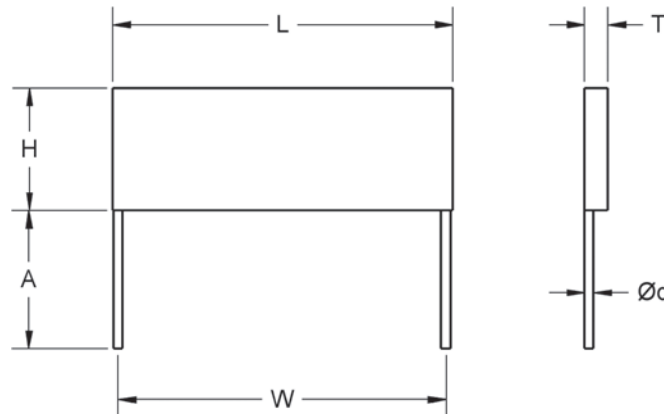
SPECIFICATIONS

| Type | HVR 25 | HVR 30 | HVR 40 | HVR 50 |
|---------------------------------|---|--|--|--|
| Power Rating (W) ¹ | 1.0 | 1.0 | 1.2 | 3.0 |
| Working Voltage (VAC) | 15KV | 10KV | 20KV | 30KV |
| Resistance Range (Ω) | Tolerances Available (%) Temperature Coefficients Available (\pm ppm/K) ² Voltage Coefficient (ppm / V) ³ | | | |
| 1M - 100M | 0.25% to 10% 25 / 50 / 100 <1ppm/V | 0.25% to 10% 25 / 50 / 100 <2ppm/V | 0.25% to 10% 25 / 50 / 100 <1ppm/V | 0.25% to 10% 25 / 50 / 100 <1ppm/V |
| >100M - 1G | 1% to 20% 50 / 100 / 250 <2ppm/V | 1% to 20% 50 / 100 / 250 <5ppm/V | 1% to 20% 50 / 100 / 250 <2ppm/V | 1% to 20% 25 / 50 / 100 <1ppm/V |
| >1G - 100G | 5% to 30% 250 / 500 <10ppm/V | 5% to 30% 250 / 500 <20ppm/V | 5% to 30% 250 / 500 <10ppm/V | 5% to 30% 100 / 250 <5ppm/V |
| >100G - 1T | 5% to 30% 500 / 1000 <50ppm/V | 5% to 30% 500 / 1000 <100ppm/V | 5% to 30% 500 / 1000 <50ppm/V | 5% to 30% 250 / 500 <25ppm/V |
| >1T - 10T | - | - | - | 10% to 30% 500 / 1000 <100ppm/V |

¹ W @ 70 °C / 0W @ 125 °C
² 25 / 50 PPM : +25°C to +85°C
³ measured between 10 and 100V

SPECIFICATIONS (continued)

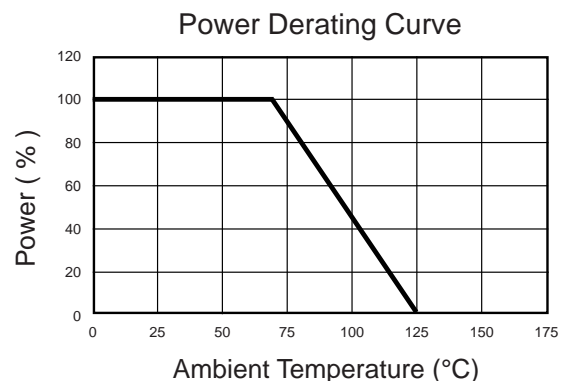
| Specification | Value | |
|-------------------------|---------------------------|------------------------|
| Temperature Range | -55°C to +125°C | |
| Climactic Category | 55 / 125 / 56 | |
| Long Term Stability | Max ΔR | |
| | $\leq 10 \text{ G}\Omega$ | $> 10 \text{ G}\Omega$ |
| Storage 125°C / 1000h | $\pm 1\%$ | $\pm 2\%$ |
| Maximum Voltage / 1000h | $\pm 1\%$ | $\pm 2\%$ |



| Type | Dimensions | | | | | |
|--------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|------------------------------|
| | L ± 0.020 [± 0.5] | H ± 0.020 [± 0.5] | T ± 0.020 [± 0.5] | W ± 0.020 [± 0.5] | A ± 0.020 [± 0.5] | d ± 0.002 [± 0.05] |
| HVR 25 | 0.99 [25.0] | 0.35 [9.0] | 0.055 [1.4] | 0.90 [22.9] | 0.79 [20] | 0.016 [0.4] |
| HVR 30 | 0.787 [30.0] | 0.236 [6.0] | 0.055 [1.4] | 1.083 [27.5] | 0.79 [20] | 0.016 [0.4] |
| HVR 40 | 1.574 [40.0] | 0.236 [6.0] | 0.055 [1.4] | 1.488 [37.8] | 0.79 [20] | 0.016 [0.4] |
| HVR 50 | 1.968 [50.0] | 0.492 [12.5] | 0.055 [1.4] | 1.882 [47.8] | 0.79 [20] | 0.016 [0.4] |

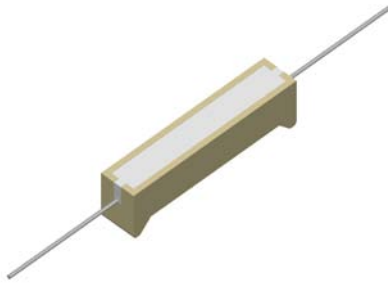
Ordering Information

Part Number - Resistance - Tolerance - TCR
 Example: HVR 30 10GOhm 10% 250ppm
 (Note: if no TCR is specified, the highest value will be supplied)



UW Series

Ceramic Wirewound Resistors

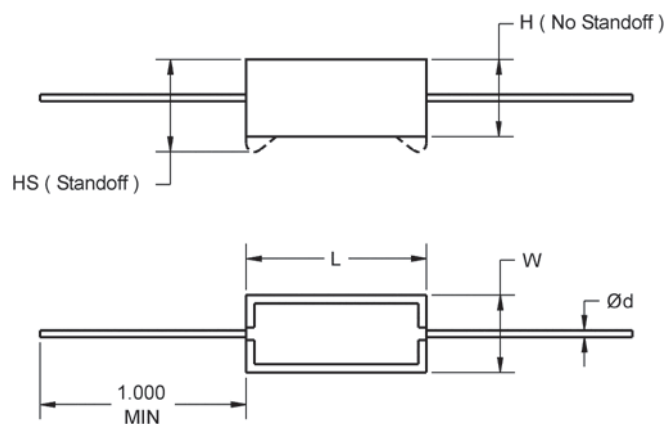


- Resistances from 0.01 to 91kOhms
- Tolerance to $\pm 0.01\%$
- Low Temperature Coefficient
- Power Rating to 15Watts
- All Welded Resistance Element
- Non-Inductive Windings are Available
- Flameproof Inorganic Construction

SPECIFICATIONS

| Type | Power Rating W @ 70°C | Resistance ¹ Range | L ± 0.04 [± 1.0] | H ± 0.04 [± 1.0] | HS ± 0.04 [± 1.0] | W ± 0.015 [± 0.4] | d ² ± 0.015 [± 0.4] |
|-------|--------------------------|----------------------------------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|---|
| UW-2 | 2 | 0.01 to 22k | 0.700 [17.8] | 0.245 [6.2] | 0.300 [7.6] | 0.255 [6.5] | 0.032 [0.8] |
| UW-3 | 3 | 0.01 to 22k | 0.875 [22.2] | 0.312 [7.9] | 0.375 [9.5] | 0.312 [7.9] | 0.032 [0.8] |
| UW-5 | 5 | 0.01 to 45k | 0.875 [22.2] | 0.375 [9.5] | 0.437 [11.1] | 0.375 [9.5] | 0.032 [0.8] |
| UW-10 | 10 | 0.01 to 65k | 1.875 [48] | 0.375 [9.5] | 0.500 [12.7] | 0.375 [9.5] | 0.040 [1.0] |
| UW-15 | 15 | 0.01 to 91k | 1.875 [48] | 0.500 [12.7] | 0.625 [15.9] | 0.500 [12.7] | 0.040 [1.0] |

¹ For non-inductive windings / divide maximum resistance by 2
² Lead Diameter: 18 AWG = 0.040" / 20 AWG = 0.032"



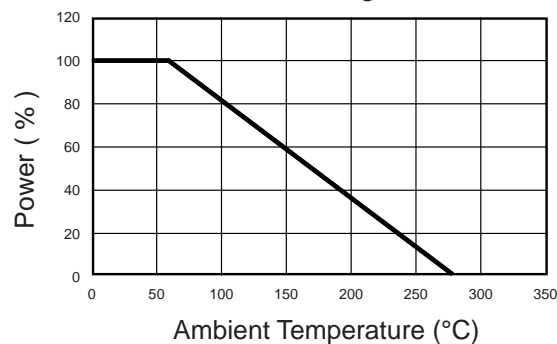
Ordering Information

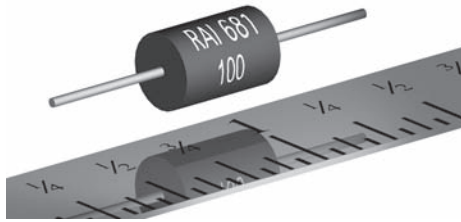
For Non-Inductive Windings / insert the letter "N" (i.e. UWN-5)
 Part Number - Resistance - Tolerance - TCR (If not standard)
 Example: UW-5 100 Ohm 1%

SPECIFICATIONS (continued)

| Specification | Value |
|--|---|
| Tolerances | ±0.01% to ±10% (1% Standard) |
| Temperature Coefficient | >10Ω : ±20ppm/K 1Ω to 10Ω : ±50ppm/K <1Ω : Call Factory |
| Temperature Range | -55°C to +275°C |
| Dielectric Strength | 1500 VAC |
| Constuction | Centerless ground ceramic core Tinned copper or copperweld leads High temperature / inorganic potting compound All welded terminations |
| Environmental Performance (MIL-STD 202) | ΔR |
| Dielectric | ±0.2% + 0.05Ω |
| Load Life | ±1% + 0.05Ω |
| Storage | ±0.2% + 0.05Ω |
| Moisture Resistance | ±0.2% + 0.05Ω |
| Thermal Shock | ±0.2% + 0.05Ω |
| 5X Overload (5s) | ±0.2% + 0.05Ω |
| Shock | ±0.1% + 0.05Ω |
| Vibration | ±0.1% + 0.05Ω |

Power Derating Curve





- 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

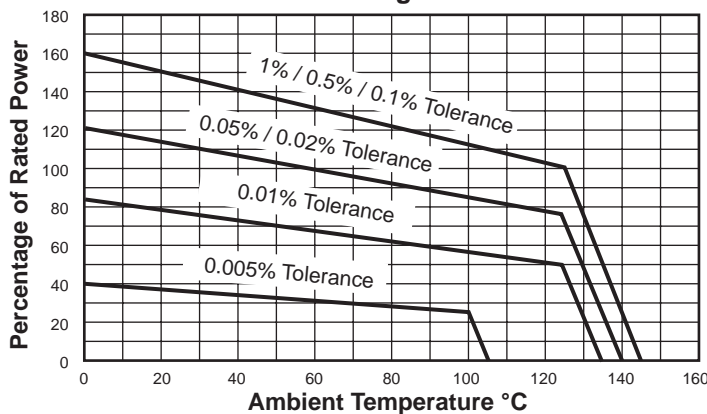
| Type | Commercial Wattage (Watts) | Maximum Ohms | Dimensions | | | | | Maximum Working Voltage |
|--------|------------------------------|--------------|-------------------------------|--------------------------------|--------------------------------|--|-------------------------------------|-------------------------|
| | | | 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.

UT Series

Silicone Coated Power Resistors

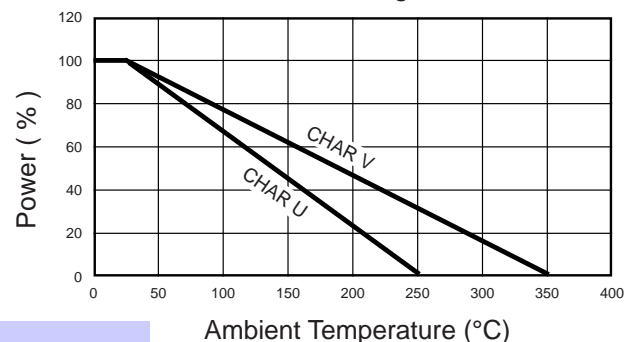


- Resistances from 0.005 to 260kOhms
- Power Rating 0.1 to 13Watts
- Resistance Tolerances to $\pm 0.01\%$
- Low TCR: $\pm 20\text{ppm/K}$ Standard
- MIL-R-26 / MIL-R-39007 Power Ratings
- Temperature Range: -55°C to $+350^{\circ}\text{C}$ ("V" Rating)
- Non-Inductive Windings Available

SPECIFICATIONS

| Specification | Value | |
|--|---|--------------------------|
| Tolerances | $\pm 0.01\%$ to $\pm 10\%$ (1% Standard) | |
| Temperature Coefficient | $>10\Omega$: $\pm 20\text{ppm/K}$ 1Ω to 10Ω : $\pm 50\text{ppm/K}$ $<1\Omega$: Call Factory | |
| Temperature Range | -55°C to $+250^{\circ}\text{C}$: Characteristic U -55°C to $+350^{\circ}\text{C}$: Characteristic V | |
| Dielectric Strength | 500 VAC : UT-1 / UT-1/2A / UT-1/2 / UT-1A 1000 VAC : All Others | |
| Constuction | Centerless ground ceramic core Tinned copper or copperweld leads High temperature / trivalent / inorganic Silicone coating All welded terminations | |
| Environmental Performance (MIL-STD 202) | ΔR | |
| | Characteristic U | Characteristic V |
| Dielectric | $\pm 0.2\% + 0.05\Omega$ | $\pm 0.2\% + 0.05\Omega$ |
| Load Life | $\pm 1\% + 0.05\Omega$ | $\pm 3\% + 0.05\Omega$ |
| Storage | $\pm 0.2\% + 0.05\Omega$ | $\pm 2\% + 0.05\Omega$ |
| Moisture Resistance | $\pm 0.2\% + 0.05\Omega$ | $\pm 2\% + 0.05\Omega$ |
| Thermal Shock | $\pm 0.2\% + 0.05\Omega$ | $\pm 2\% + 0.05\Omega$ |
| 5X Overload (5s) | $\pm 0.2\% + 0.05\Omega$ | $\pm 2\% + 0.05\Omega$ |
| Shock | $\pm 0.1\% + 0.05\Omega$ | $\pm 0.2\% + 0.05\Omega$ |
| Vibration | $\pm 0.1\% + 0.05\Omega$ | $\pm 0.2\% + 0.05\Omega$ |

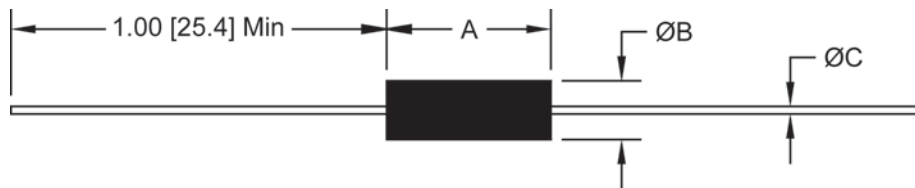
Power Derating Curve



Ordering Information

For Non-Inductive Windings / insert the letter "N" (i.e. UTN-5)
Part Number - Resistance - Tolerance - TCR (If not standard)
Example: UT-5 25kOhms 0.1%

SPECIFICATIONS (continued)



| Type | Wattage Rating (Watts) | | Maximum Ohms ² | Dimensions | | | Maximum Working Voltage | MIL-R-26 / MIL-R-39007 Style |
|---------------------|------------------------|------|---------------------------|--------------------------|--------------------------|--|-------------------------|------------------------------|
| | U | V | | A ±0.062" [±1.6mm] | B ±0.031" [±0.8mm] | C ¹ ±0.002" [±0.05mm] | | |
| UT-1 | 0.1 | 0.25 | 500 | 0.150 [3.8] | 0.078 [2.0] | 0.018 [0.46] | 8.5 | |
| UT-1/2A | 0.4 | 0.5 | 2.5k | 0.250 [6.4] | 0.078 [2.0] | 0.020 [0.5] 0.025 [0.6] | 20 | |
| UT-1/2 ³ | 0.75 | 0.9 | 7.5k | 0.330 [8.4] | 0.078 [2.0] | 0.020 [0.5] 0.025 [0.6] | 29 | |
| UT-1A | 1.0 | 1.5 | 10k | 0.406 [10.3] | 0.094 [2.4] | 0.020 [0.5] 0.025 [0.6] | 52 | RW-70 |
| UT-2 | 1.5 | 2.0 | 12.5k | 0.350 [8.9] | 0.156 [4.0] | 0.032 [0.8] | 60 | |
| UT-2A | 2.5 | 3.0 | 22k | 0.500 [12.7] | 0.187 [4.7] | 0.032 [0.8] | 130 | RW-69 |
| UT-2B | 3.0 | 3.75 | 22k | 0.560 [14.2] | 0.187 [4.7] | 0.032 [0.8] | 140 | RW-79 RWR-79 |
| UT-2C | 3.0 | 4.0 | 40k | 0.500 [12.7] | 0.250 [6.4] | 0.040 [1.0] 0.032 [0.8] | 140 | |
| UT-2E | 3.0 | 3.5 | 30k | 0.500 [12.7] | 0.200 [5.1] | 0.032 [0.8] | 140 | |
| UT-3 | 4.0 | 5.5 | 45k | 0.625 [15.9] | 0.250 [6.4] | 0.040 [1.0] 0.032 [0.8] | 210 | |
| UT-5 | 5.0 | 6.5 | 91k | 0.875 [22.2] | 0.312 [7.9] | 0.040 [1.0] | 360 | RW-74 RWR-74 |
| UT-5A | 5.0 | 6.5 | 65k | 0.970 [24.6] | 0.203 [5.2] | 0.032 [0.8] | 390 | |
| UT-6 | 5.0 | 6.5 | 95k | 1.000 [25.4] | 0.312 [7.9] | 0.040 [1.0] | 504 | RW-67 |
| UT-7A ³ | 7.0 | 9.0 | 150k | 1.375 [35.0] | 0.375 [9.5] | 0.040 [1.0] | 650 | |
| UT-7B | 7.0 | 9.0 | 100k | 1.400 [35.6] | 0.312 [7.9] | 0.040 [1.0] | 590 | |
| UT-7C | 7.0 | 9.0 | 154k | 1.220 [31.0] | 0.312 [7.9] | 0.040 [1.0] | 620 | |
| UT-10 | 10 | 13 | 260k | 1.780 [45.2] | 0.375 [9.5] | 0.040 [1.0] | 850 | RW-78 RWR-78 |

¹ Lead Diameter: 18 AWG = 0.040" / 20 AWG = 0.032" / 22 AWG = 0.025" / 24 AWG = 0.020" / 25 AWG = 0.018"

Where more than one lead is listed / the top value is Standard

² For non-inductive windings / divide maximum resistance by 2

³ This part does not meet the RoHS directive - call factory for details

UB Series

Silicone Coated Power Resistors



- Resistances from 0.005 to 260kOhms
- Power Rating 1 to 18Watts
- Resistance Tolerances to $\pm 0.01\%$
- Low TCR: $\pm 20\text{ppm/K}$ Standard
- MIL-R-26 / MIL-R-39007 Power Ratings
- Temperature Range: -55°C to $+350^{\circ}\text{C}$ ("V" Rating)
- Non-Inductive Windings Available

SPECIFICATIONS

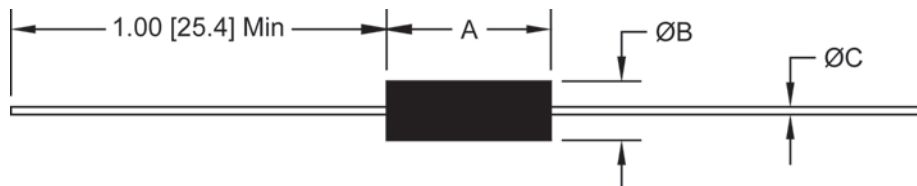
| Type | Wattage Rating (Watts) | | Maximum Ohms ² | Dimensions | | | Maximum Working Voltage | MIL-R-26 / MIL-R-39007 Style |
|-------------------|--------------------------|-----|---------------------------|--|--|--|-------------------------|------------------------------|
| | U | V | | A $\pm 0.062''$ [$\pm 1.6\text{mm}$] | B $\pm 0.031''$ [$\pm 0.8\text{mm}$] | C ¹ $\pm 0.002''$ [$\pm 0.05\text{mm}$] | | |
| UB-1 | 1 | 1.5 | 3.4k | 0.250 [6.4] | 0.085 [2.2] | 0.020 [0.5] 0.025 [0.6] | 33 | RW-81 RWR-81 |
| UB-2 ³ | 1.5 | 2 | 7.5k | 0.312 [7.9] | 0.078 [2.0] | 0.020 [0.5] 0.025 [0.6] | 42 | RWR-82 |
| UB-3 | 2 | 3 | 10k | 0.406 [10.3] | 0.094 [2.4] | 0.025 [0.6] 0.020 [0.5] | 80 | RW-80 RWR-80 |
| UB-5 | 4 | 5 | 25k | 0.560 [14.2] | 0.187 [4.7] | 0.032 [0.8] | 162 | |
| UB-5C | 5 | 7 | 32k | 0.500 [12.7] | 0.218 [5.5] | 0.032 [0.8] | 194 | |
| UB-6 | 6 | 8 | 50k | 0.625 [15.9] | 0.250 [6.4] | 0.040 [1.0] | 258 | |
| UB-10 | 7 | 10 | 95k | 0.875 [22.2] | 0.312 [7.9] | 0.040 [1.0] | 425 | RW-84 |
| UB-12 | 10 | 12 | 150k | 1.220 [31.0] | 0.312 [7.9] | 0.040 [1.0] | 607 | |
| UB-15 | 15 | 18 | 260k | 1.780 [45.2] | 0.375 [9.5] | 0.040 [1.0] | 1050 | |

¹ Lead Diameter: 18 AWG = 0.040" / 20 AWG = 0.032" / 22 AWG = 0.025" / 24 AWG = 0.020"

Where more than one lead is listed / the top value is Standard

² For non-inductive windings / divide maximum resistance by 2

³ This part does not meet the RoHS directive - call factory for details



Ordering Information

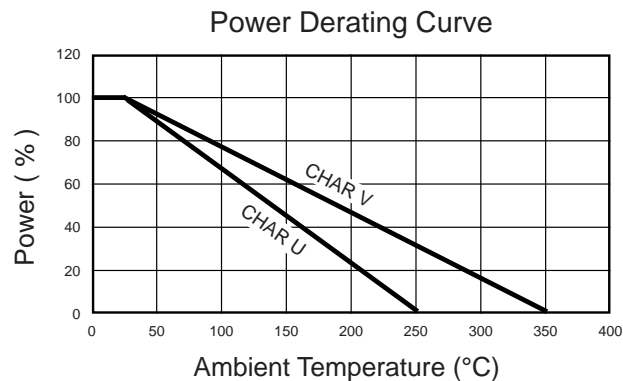
For Non-Inductive Windings / insert the letter "N" (i.e. UBN-5)

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

Example: UB-3 10 Ohm 1%

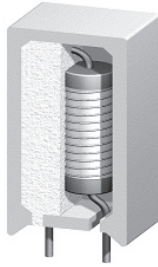
SPECIFICATIONS (continued)

| Specification | Value | | | | | | | | | | | | | | | | | |
|--|--|------------------|------------------|------------|---------------|-----------|---|---------|---------------|---------------------|---------------|---------------|---------------|--------------------|---------------|-------|---------------|-----------|
| Tolerances | ±0.01% to ±10% (1% Standard) | | | | | | | | | | | | | | | | | |
| Temperature Coefficient | >10Ω : ±20ppm/K 1Ω to 10Ω : ±50ppm/K <1Ω : Call Factory | | | | | | | | | | | | | | | | | |
| Temperature Range | -55°C to +250°C : Characteristic U -55°C to +350°C : Characteristic V | | | | | | | | | | | | | | | | | |
| Dielectric Strength | 500 VAC : UB-1 / UB-2 / UB-3 1000 VAC : All Others | | | | | | | | | | | | | | | | | |
| Constuction | Centerless ground ceramic core Tinned copper or copperweld leads High temperature / trivalent / inorganic Silicone coating All welded terminations | | | | | | | | | | | | | | | | | |
| Environmental Performance (MIL-STD 202) | ΔR | | | | | | | | | | | | | | | | | |
| | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Characteristic U</th> <th style="width: 50%;">Characteristic V</th> </tr> </thead> <tbody> <tr> <td>Dielectric</td> <td>±0.2% + 0.05Ω</td> </tr> <tr> <td>Load Life</td> <td>to ±1% depending on size and Resistance Value</td> </tr> <tr> <td>Storage</td> <td>±0.2% + 0.05Ω</td> </tr> <tr> <td>Moisture Resistance</td> <td>±0.2% + 0.05Ω</td> </tr> <tr> <td>Thermal Shock</td> <td>±0.2% + 0.05Ω</td> </tr> <tr> <td>5X Overload (5s)</td> <td>±0.2% + 0.05Ω</td> </tr> <tr> <td>Shock</td> <td>±0.1% + 0.05Ω</td> </tr> <tr> <td>Vibration</td> <td>±0.1% + 0.05Ω</td> </tr> </tbody> </table> | Characteristic U | Characteristic V | Dielectric | ±0.2% + 0.05Ω | Load Life | to ±1% depending on size and Resistance Value | Storage | ±0.2% + 0.05Ω | Moisture Resistance | ±0.2% + 0.05Ω | Thermal Shock | ±0.2% + 0.05Ω | 5X Overload (5s) | ±0.2% + 0.05Ω | Shock | ±0.1% + 0.05Ω | Vibration |
| Characteristic U | Characteristic V | | | | | | | | | | | | | | | | | |
| Dielectric | ±0.2% + 0.05Ω | | | | | | | | | | | | | | | | | |
| Load Life | to ±1% depending on size and Resistance Value | | | | | | | | | | | | | | | | | |
| Storage | ±0.2% + 0.05Ω | | | | | | | | | | | | | | | | | |
| Moisture Resistance | ±0.2% + 0.05Ω | | | | | | | | | | | | | | | | | |
| Thermal Shock | ±0.2% + 0.05Ω | | | | | | | | | | | | | | | | | |
| 5X Overload (5s) | ±0.2% + 0.05Ω | | | | | | | | | | | | | | | | | |
| Shock | ±0.1% + 0.05Ω | | | | | | | | | | | | | | | | | |
| Vibration | ±0.1% + 0.05Ω | | | | | | | | | | | | | | | | | |
| Dielectric | ±0.2% + 0.05Ω | | | | | | | | | | | | | | | | | |
| Load Life | to ±1% depending on size and Resistance Value | | | | | | | | | | | | | | | | | |
| Storage | ±0.2% + 0.05Ω | | | | | | | | | | | | | | | | | |
| Moisture Resistance | ±0.2% + 0.05Ω | | | | | | | | | | | | | | | | | |
| Thermal Shock | ±0.2% + 0.05Ω | | | | | | | | | | | | | | | | | |
| 5X Overload (5s) | ±0.2% + 0.05Ω | | | | | | | | | | | | | | | | | |
| Shock | ±0.1% + 0.05Ω | | | | | | | | | | | | | | | | | |
| Vibration | ±0.1% + 0.05Ω | | | | | | | | | | | | | | | | | |



UV Series

Ceramic Wirewound Resistors



- Flameproof Inorganic Construction
- Resistances from 0.01 to 91kOhms
- Tolerance to $\pm 0.01\%$
- Low Temperature Coefficient
- Power Rating to 10Watts
- All Welded Resistance Element
- Non-Inductive Windings are Available

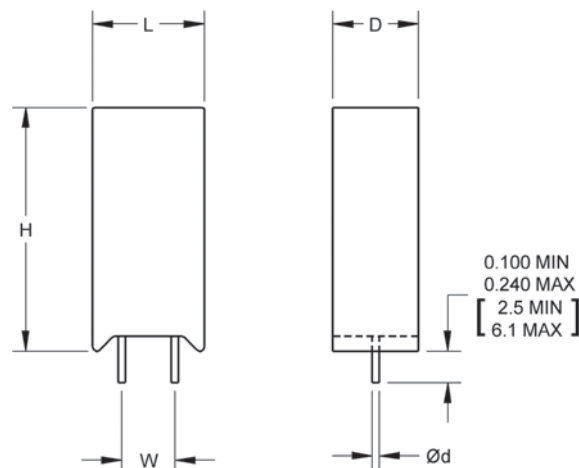


SPECIFICATIONS

| Type | Power Rating W @ 70°C | Resistance ¹ Range | H ± 0.06 [± 1.5] | L ± 0.04 [± 1.0] | D ± 0.04 [± 1.0] | W ± 0.015 [± 0.4] | d ² ± 0.002 [± 0.05] |
|-------|--------------------------|----------------------------------|-------------------------------|-------------------------------|-------------------------------|--------------------------------|--|
| UV-2 | 2 | 0.01 to 22k | 0.80 [20.3] | 0.435 [11.0] | 0.275 [7.0] | 0.200 [5.1] | 0.032 [0.8] |
| UV-3 | 3 | 0.01 to 22k | 1.00 [25.4] | 0.475 [12.1] | 0.320 [8.1] | 0.200 [5.1] | 0.032 [0.8] |
| UV-5 | 5 | 0.01 to 45k | 1.00 [25.4] | 0.520 [13.2] | 0.350 [8.9] | 0.200 [5.1] | 0.032 [0.8] |
| UV-7 | 7 | 0.01 to 65k | 1.52 [38.7] | 0.520 [13.2] | 0.380 [9.7] | 0.200 [5.1] | 0.040 [1.0] |
| UV-10 | 10 | 0.01 to 91k | 1.38 [35.1] | 0.635 [16.1] | 0.480 [12.2] | 0.300 [7.6] | 0.040 [1.0] |

¹ For non-inductive windings / divide maximum resistance by 2

² Lead Diameter: 18 AWG = 0.040" / 20 AWG = 0.032"



Ordering Information

For Non-Inductive Windings / insert the letter "N" (i.e. UVN-5)

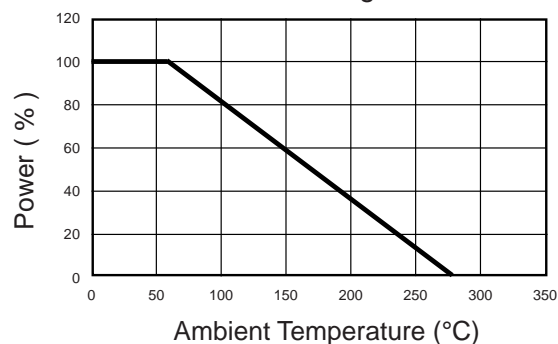
Part Number - Resistance - Tolerance - TCR (If not standard)

Example: **UV-5 100 Ohm 1%**

SPECIFICATIONS (continued)

| Specification | Value |
|--|---|
| Tolerances | ±0.01% to ±10% (1% Standard) |
| Temperature Coefficient | >10Ω : ±20ppm/K 1Ω to 10Ω : ±50ppm/K <1Ω : Call Factory |
| Temperature Range | -55°C to +275°C |
| Dielectric Strength | 1500 VAC |
| Constuction | Centerless ground ceramic core Tinned copper or copperweld leads High temperature / inorganic potting compound All welded terminations |
| Environmental Performance (MIL-STD 202) | ΔR |
| Dielectric | ±0.2% + 0.05Ω |
| Load Life | ±1% + 0.05Ω |
| Storage | ±0.2% + 0.05Ω |
| Moisture Resistance | ±0.2% + 0.05Ω |
| Thermal Shock | ±0.2% + 0.05Ω |
| 5X Overload (5s) | ±0.2% + 0.05Ω |
| Shock | ±0.1% + 0.05Ω |
| Vibration | ±0.1% + 0.05Ω |

Power Derating Curve



VT Series

Vitreous Enamel Wirewound Resistors



- All Welded Construction
- Resistances from 0.1 to 100kOhms
- Tolerance to $\pm 1\%$
- High Overload and Pulse Handling
- Power Rating to 14Watts

SPECIFICATIONS

| Type | Power Rating W @ 25°C | Maximum Voltage | Resistance Range | L MAX | D MAX | l Nominal | d ¹ ± 0.003 [± 0.08] |
|-------|--------------------------|--------------------|---------------------|--------------|-------------|--------------|---|
| VT-3 | 3 | 100 | 0.1 to 10k | 0.500 [12.7] | 0.220 [5.6] | 1.05 [26.5] | 0.032 [0.8] |
| VT-5 | 5 | 160 | 0.1 to 20k | 0.906 [23.0] | 0.276 [7.0] | 1.05 [26.5] | 0.032 [0.8] |
| VT-7 | 7 | 200 | 0.1 to 22k | 0.874 [22.2] | 0.315 [8.0] | 1.05 [26.5] | 0.032 [0.8] |
| VT-10 | 10 | 500 | 0.1 to 68k | 1.500 [38.1] | 0.315 [8.0] | 1.38 [35] | 0.032 [0.8] |
| VT-14 | 14 | 750 | 0.1 to 100k | 2.106 [53.5] | 0.315 [8.0] | 1.38 [35] | 0.032 [0.8] |

¹ Lead Diameter: 20 AWG = 0.032"



Ordering Information

Part Number - Resistance - Tolerance
 Example: VT-5 100 Ohm 1%

SPECIFICATIONS (continued)

| Specification | Value |
|--|---|
| Tolerances | $\pm 1\%$ / $\pm 2\%$ / $\pm 5\%$ / $\pm 10\%$ |
| Temperature Coefficient | Standard : +200ppm/K / Typical : +100ppm/K |
| Temperature Range | -55°C to +350°C |
| Dielectric Strength | 1500 VAC |
| Constuction | Non-Flammable Enamel Coating All welded terminations |
| Environmental Performance (MIL-STD 202) | ΔR |
| Dielectric | $\pm 1\% + 0.05\Omega$ |
| Load Life | $\pm 5\% + 0.05\Omega$ |
| Storage | $\pm 1\% + 0.05\Omega$ |
| Moisture Resistance | $\pm 5\% + 0.05\Omega$ |
| Thermal Shock | $\pm 1\% + 0.05\Omega$ |
| 10X Overload (5s) | $\pm 1\% + 0.05\Omega$ |
| Shock | $\pm 1\% + 0.05\Omega$ |
| Vibration | $\pm 1\% + 0.05\Omega$ |

Power Derating Curve

