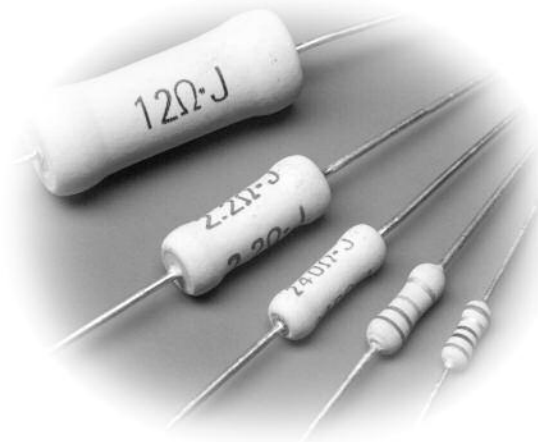


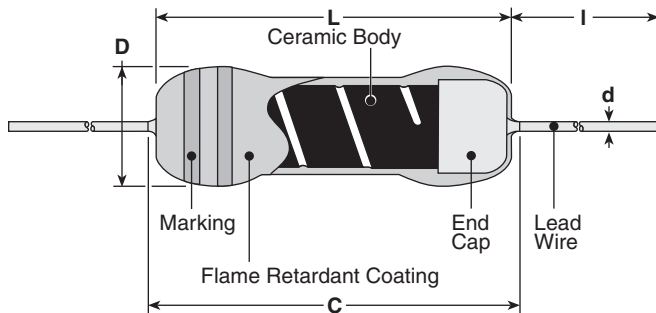
**reduced size metal oxide power type  
leaded resistor**



**features**

- Small size power type resistor
- Coated with UL94V0 equivalent flameproof material
- Suitable for automatic machine insertion
- Products with lead-free terminations meet EU RoHS and China RoHS requirements
- Surface mount style “N” forming is suitable for automatic mounting

**dimensions and construction**



| Type              | Dimensions inches (mm)  |                |                        |               |                          |
|-------------------|-------------------------|----------------|------------------------|---------------|--------------------------|
|                   | L                       | C (max.)       | D                      | d (nom.)      | I*                       |
| MOS1/2<br>MOSX1/2 | .244±.02<br>(6.2±0.5)   | .280<br>(7.1)  | .098±.02<br>(2.5±0.5)  | .024<br>(0.6) | .945 Min.<br>(24.0 Min.) |
| MOS1<br>MOSX1     | .244±.02<br>(6.2±0.5)   | .280<br>(7.1)  | .098±.02<br>(2.5±0.5)  | .024<br>(0.6) |                          |
| MOS1<br>MOSX1     | .354±.039<br>(9.0±1.0)  | .437<br>(11.1) | .118±.02<br>(3.0±0.5)  | .031<br>(0.8) |                          |
| MOS2<br>MOSX2     | .472±.039<br>(12.0±1.0) | .591<br>(15.0) | .157±.02<br>(4.0±0.5)  |               |                          |
| MOS3<br>MOSX3     | .610±.039<br>(15.5±1.0) | .709<br>(18.0) | .236±.039<br>(6.0±1.0) |               | 1.18±.118<br>(30.0±3.0)  |
| MOS5<br>MOSX5     | .965±.039<br>(24.5±1.0) | 1.10<br>(28.0) | .354±.039<br>(9.0±1.0) |               | 1.50±.118<br>(38.0±3.0)  |

\* Lead length changes depending on taping and forming type.

**ordering information**

| MOS         | 1   | C                    | T52   | 8  | A  | 103   | J                          |
|-------------|---|----------------------|---|--|--|---|----------------------------|
| Type        | Power Rating                                  | Termination Material | Taping and Forming  | Lead Diameter  | Packaging  | Nominal Resistance  | Tolerance                  |
| MOS<br>MOSX | 1/2: 0.5W<br>1: 1W<br>2: 2W<br>3: 3W<br>5: 5W | C: SnCu              | Axial: T26, T52, T521, T631<br>Stand-off Axial: L52, L521, L631<br>Radial: VTP, VTE, GT, GT4, VTF<br>L, U, M, N Forming | MOS(X)1 only:<br>Blank: 0.6mm<br>8: 0.8mm<br>Blank: All others | A: Ammo<br>R: Reel<br>TEB, TEG: Plastic embossed (N forming) | ±2%, ±5%:<br>2 significant figures + 1 multiplier “R” indicates decimal on value <10Ω<br>±1%: 3 significant figures + 1 multiplier “R” indicates decimal on value <100Ω | F: ±1%<br>G: ±2%<br>J: ±5% |

For further information on packaging, please refer to Appendix C.

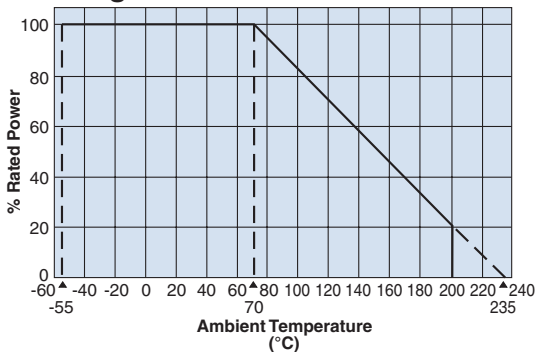
## applications and ratings

| Part Designation | Power Rating @ 70°C | Minimum Dielectric Withstanding Voltage | T.C.R. (ppm/°C) Max. | Resistance Range   |              |             | Absolute Maximum Working Voltage | Absolute Maximum Overload Voltage | Operating Temperature Range |
|------------------|---------------------|---|----------------------|--------------------|--------------|-------------|----------------------------------|-----------------------------------|-----------------------------|
|                  |                     |   |                      | E-24, E-96* (F±1%) | E-24* (G±2%) | E-24 (J±5%) |                                  |                                   |                             |
| MOS1/2           | 0.5W                | 400V                                    | ±300                 | 10Ω - 47kΩ         | 10Ω - 47kΩ   | 10Ω - 47kΩ  | $E = \sqrt{P \times R}$          | 600V                              | -55°C to +200°C             |
| MOS1             | 1.0W                | 500V                                    |                      | 10Ω - 68kΩ         | 10Ω - 68kΩ   | 10Ω - 100kΩ |                                  |                                   |                             |
| MOS2             | 2.0W                |   |                      | 10Ω - 100kΩ        | 10Ω - 100kΩ  |             | 350V                             | 700V                              |                             |
| MOS3             | 3.0W                | 700V                                    |                      | 500V               |              | 1000V       |                                  |                                   |                             |
| MOS5             | 5.0W                | 800V                                    |                      |                    | 0.1Ω - 9.1Ω  |             | 0.1Ω - 9.1Ω                      | $E = \sqrt{P \times R}$           |                             |
| MOSX1/2          | 0.5W                | 400V                                    |                      | 0.1Ω - 9.1Ω        |              | 0.1Ω - 9.1Ω |                                  |                                   |                             |
| MOSX1            | 1.0W                | 500V                                    |                      |                    | —            |             | 0.22Ω - 9.1Ω                     |                                   |                             |
| MOSX2            | 2.0W                |   |                      | 700V               |              |             |                                  |                                   |                             |
| MOSX3            | 3.0W                | 700V                                    |                      |                    |              |             |                                  |                                   |                             |
| MOSX5            | 5.0W                | 800V                                    |                      |                    |              |             |                                  |                                   |                             |

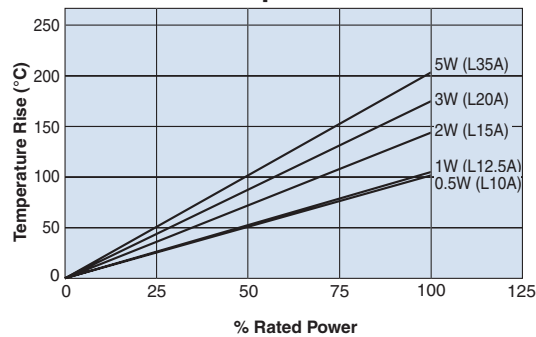
\* Please consult when there is a demand of the resistance besides the 1% and 2% range.

## environmental applications

### Derating Curve



### Surface Temperature Rise



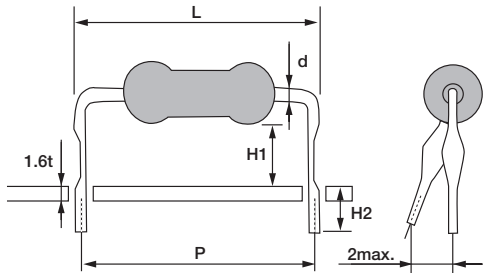
For resistors operated at an ambient temperature of 70°C or above, a power rating shall be derated in accordance with the above derating curve.

## Performance Characteristics

| Parameter                   | Requirement   | $\Delta R \pm(\% + 0.05\Omega)$ | Test Method   |
|-----------------------------|---|---------------------------------|---|
|                             | Limit   | Typical                         |   |
| Resistance                  | Within specified tolerance                                    | —                               | Measuring points are at 10mm ±1mm from the end cap.   |
| T.C.R.                      | Within specified T.C.R.                                       | —                               | +25°C/+125°C  |
| Overload (Short time)       | ±(2% +0.1Ω)   | ±1%                             | Rated voltage x 2.5 for 5 seconds   |
| Resistance to Solder Heat   | ±1%   | ±0.5%                           | 260°C ±5°C, 10 seconds ± 1 second   |
| Terminal Strength           | No lead-coming off and loose terminals                        | —                               | Twist 360°C, 5 times  |
| Rapid Change of Temperature | ±1%   | ±0.5%                           | -55°C (30 minutes), +155°C (30 minutes), 5 cycles   |
| Moisture Resistance         | ±(5%+0.1Ω)  | ±2.5%                           | 40°C ± 2°C, 90 - 95% RH, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle  |
| Endurance at 70°C           | ±(5%+0.1Ω)  | ±2.5%                           | 70°C ± 2°C, 1000 hours, 1.5 hr ON, 0.5 hr OFF cycle   |
| Resistance to Solvent       | No abnormality in appearance. Marking shall be easily legible | —                               | Ultrasonic washing with isopropyl alcohol for 2 minutes. Power: 0.3W/cm <sup>3</sup> , f: 28kHz, Temp: 35°C ±5°C  |
| Flame Retardant             | No evidence of flaming or self-flaming                        | —                               | Flame test: the test flame shall be applied and removed for each 15 seconds respectively to repeat the cycle 5 times. Overload flame retardant: power (AC) corresponding to 2, 4, 8, 16 and 32 times the power rating shall be applied for each 1 minute until disconnection occurs. However the applied voltage shall not exceed the value of 4 times of the maximum operating voltage |

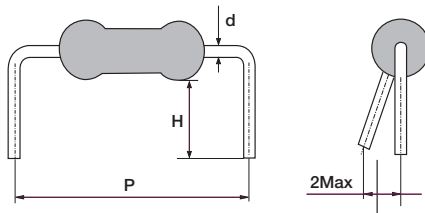
## secondary processed products

### L Forming



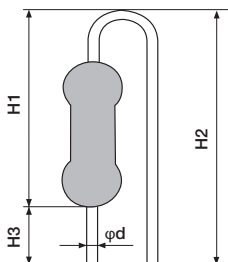
| Type     | Dimensions millimeters |          |          |          | Substrate Hole Dia. |      |
|----------|------------------------|----------|----------|----------|---------------------|------|
|          | P                      | H1       | H2       | d (Nom.) |                     |      |
| 1/2CL10A | 10.0±1.0               | 5.3±1.0  | 4.0      | 0.6      | ø0.8                |      |
| 1CL12.5A | 12.5±1.0               | 7.0±1.0  |          | 17.5     |                     |      |
| 1CL15A   | 15.0±1.0               | 6.5±1.0  |          |          |                     |      |
| 2CL15A   |                        | 7.0±1.0  |          |          |                     |      |
| 2CL15F   | 4.5±1.0                |          |          |          |                     |      |
| 2CL20A   | 20.0±1.0               | 9.0±1.0  |          | 0.8      |                     | ø1.0 |
| 2CL20D   |                        | 4.8±1.0  |          |          |                     |      |
| 3CL20A   |                        | 8.0±1.0  |          |          |                     |      |
| 3CL20C   |                        | 10.0±1.0 |          |          |                     |      |
| 3CL20T   | 4.0±1.0                |          |          |          |                     |      |
| 3CL25A   | 25.0±1.0               | 7.0±1.0  | 30.0±1.0 | ø1.0     |                     |      |
| 3CL30A   | 7.0±1.0                |          |          |          |                     |      |
| 5CL30A   | 8.5±1.0                |          |          |          |                     |      |
| 5CL35A   | 35.0±1.0               | 5.5±1.0  |          |          |                     |      |

### M Forming



| Type     | Dimensions millimeters |          |          | Substrate Hole Dia. |
|----------|------------------------|----------|----------|---------------------|
|          | P                      | H        | d (Nom.) |                     |
| 1/2CM10C | 10.0±1.0               | 3.5±1.0  | 0.6      | ø0.8                |
| 1/2CM10F | 10.0±1.0               | 5.0±1.0  | 0.6      |                     |
| 1CM12.5C | 12.5±1.0               | 3.5±1.0  | 0.8      | ø1.0                |
| 1CM12.5D | 12.5±1.0               | 4.0±1.0  | 0.8      |                     |
| 1CM15F   | 15.0±1.0               | 5.0±1.0  | 0.8      |                     |
| 1CM15J   | 15.0±1.0               | 6.3±1.0  | 0.8      |                     |
| 1CM15S   | 15.0±1.0               | 11.0±1.0 | 0.8      |                     |
| 2CM15C   | 15.0±1.0               | 3.5±1.0  | 0.8      |                     |
| 2CM15E   | 15.0±1.0               | 4.5±1.0  | 0.8      |                     |
| 2CM16D   | 16.0±1.0               | 4.0±1.0  | 0.8      |                     |
| 2CM20D   | 20.0±1.0               | 4.0±1.0  | 0.8      |                     |
| 2CM20U   | 20.0±1.0               | 13.5±1.0 | 0.8      |                     |
| 3CM20E   | 20.0±1.0               | 4.6±1.0  | 0.8      |                     |
| 3CM26E   | 26.0±1.0               | 4.7±1.0  | 0.8      |                     |
| 5CM30U   | 30.0±1.0               | 13.0±1.0 | 0.8      |                     |

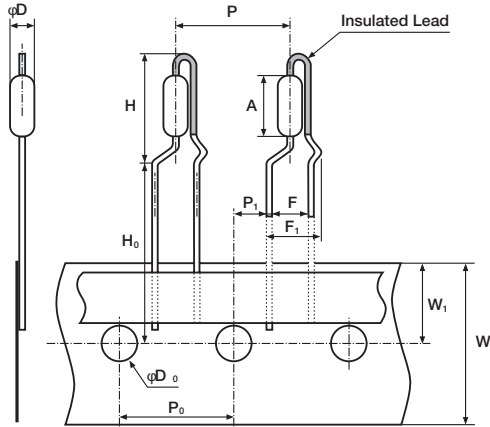
### UCL Forming



| Type  | Dimensions millimeters |           |         | Insertion Pitch | Substrate Hole Dia. |
|-------|------------------------|-----------|---------|-----------------|---------------------|
|       | H1                     | H2        | H3      |                 |                     |
| 1CUCL | 13.0±1.0               | 17.0 max. | 3.5±1.0 | 0.8             | ø1.0                |
| 2CUCL | 14.5±1.0               | 18.5 max. | 3.5±1.0 |                 |                     |
| 3CUCL | 20.0 max.              | 22.0±1.0  | 4.0±1.0 |                 |                     |

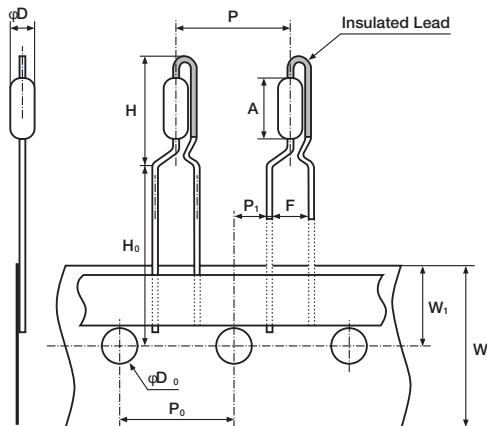
**secondary processed products** (continued)

**VTF Radial Taping**

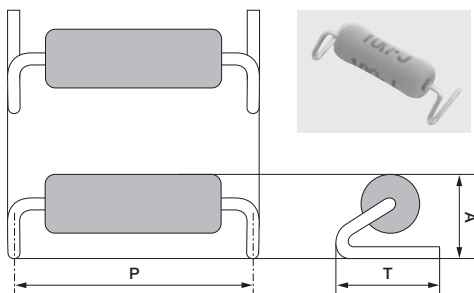


| Type                | 1/2C        | 1C          | 2C          | 2C          |
|---------------------|-------------|-------------|-------------|-------------|
|                     | VTP         | VTP         | VTP         | VTF         |
| A                   | 6.2±0.5     | 9.0±1.0     | 12.0±1.0    | 12.0±1.0    |
| øD                  | 2.5±0.5     | 3.0±0.5     | 4.0±0.5     | 4.0±0.5     |
| d (Nom.)            | 0.6         | 0.6         | 0.65        | 0.8         |
| F                   | 5.0±0.5     | 5.0±0.5     | 5.0±0.5     | 5.0±0.5     |
| F1                  | —           | —           | —           | 7.3 max.    |
| H                   | 13 max.     | 16 max.     | 22.5 max.   | 22.5 max.   |
| H0                  | 16.0+1.0/-0 | 16.0+1.0/-0 | 16.0+1.0/-0 | 16.0+1.0/-0 |
| P                   | 12.7±1.0    | 12.7±1.0    | 12.7±1.0    | 12.7±1.0    |
| P0                  | 12.7±0.3    | 12.7±0.3    | 12.7±0.3    | 12.7±0.3    |
| P1                  | 3.85±0.7    | 3.85±0.7    | 3.85±0.7    | 3.85±0.7    |
| W                   | 18.0±0.5    | 18.0±0.5    | 18.0±0.5    | 18.0±0.5    |
| W1                  | 9.0±0.5     | 9.0±0.5     | 9.0±0.5     | 9.0±0.5     |
| øD0                 | 4.0±0.2     | 4.0±0.2     | 4.0±0.2     | 4.0±0.2     |
| Substrate Hole Dia. | ø0.8        | ø0.8        | ø0.8        | ø1.0        |

**VTP Radial Taping**

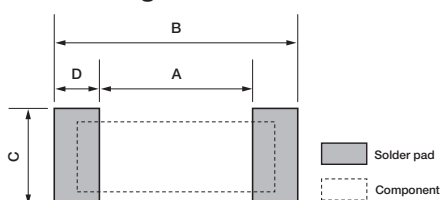


**N Forming**



| Type     | 1C       | 2C     | 3C      |
|----------|----------|--------|---------|
|          | N14.5TEB | N17TEB | N20TEG  |
| P±1      | 14.5     | 17.0   | 20.0    |
| T±0.5    | 5.0      | 6.0    | 7.5±1.0 |
| A±0.5    | 4.8      | 5.8    | 6.5     |
| d (Nom.) | 0.8      | 0.8    | 0.8     |

**UCL Forming**



| Type | 1C       | 2C     | 3C     |
|------|----------|--------|--------|
|      | N14.5TEB | N17TEB | N20TEG |
| A    | 12.5     | 14.6   | 17.6   |
| B    | 16.5     | 19.4   | 22.4   |
| C    | 7.0      | 8.0    | 9.5    |
| D    | 2.0      | 2.4    | 2.4    |