

### Description

- The 250R series is designed to protect against short duration high voltage fault currents (power cross or power induction surge) typically found in telecom applications (250Vrms). The series can be used to help telecom networking equipment meet the protection requirements specified in ITU K.20 and K.21.

### Features

- RoHS compliant and lead-free
- Fast time-to-trip
- Binned and sorted narrow resistance ranges available
- 0.08 – 0.18 Hold current range, 60VDC operating voltage
- 250VAC interrupt rating

### Applications

- Customer Premises Equipment (CPE)
- Central Office (CO)/Telecom Centers
- LAN/WAN Equipment
- Access equipment

### Agency Approvals

| AGENCY | AGENCY FILE NUMBER |
|--------|--------------------|
|        | E183209            |
|        | R50082521          |

### Electrical Characteristics

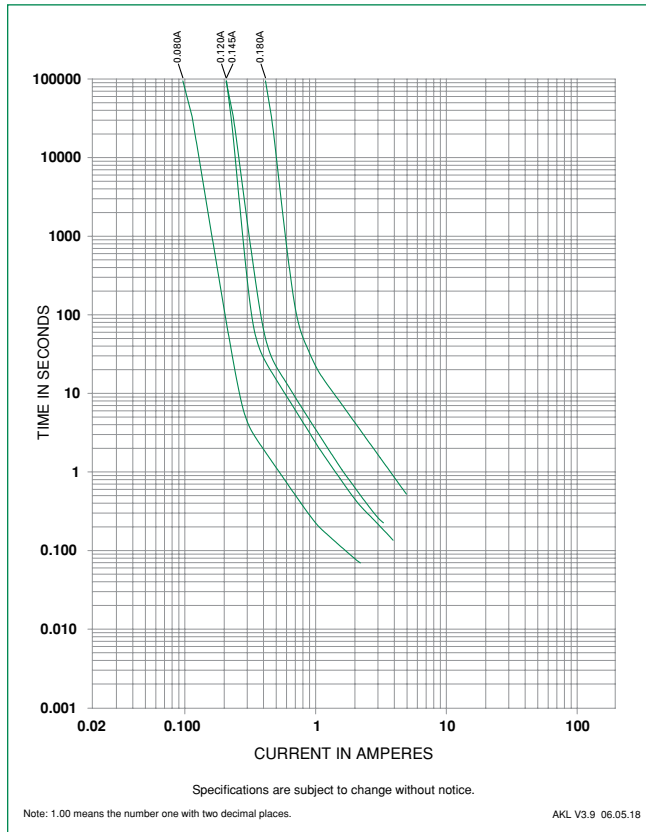
| Part Number | I <sub>hold</sub> (A) | I <sub>trip</sub> (A) | V <sub>max</sub><br>V <sub>int</sub> / V <sub>op</sub> | I <sub>max</sub> (A) | P <sub>d</sub> max. (W) | Maximum Time To Trip |             | Resistance           |                      |                       | Agency Approvals |   |
|-------------|-----------------------|-----------------------|--|----------------------|-------------------------|----------------------|-------------|----------------------|----------------------|-----------------------|------------------|---|
|             |                       |                       |  |                      |                         | Current (A)          | Time (Sec.) | R <sub>min</sub> (Ω) | R <sub>typ</sub> (Ω) | R <sub>1max</sub> (Ω) |                  |   |
| 250R080T    | 0.08                  | 0.16                  | 250/60   | 3                    | 1                       | 0.35                 | 3           | 15                   | 22                   | 33                    | X                | X |
| 250R080     | 0.08                  | 0.16                  | 250/60   | 3                    | 1                       | 0.35                 | 3           | 14                   | 22                   | 33                    | X                | X |
| 250R120     | 0.12                  | 0.24                  | 250/60   | 3                    | 1                       | 1                    | 1.5         | 4                    | 8                    | 16                    | X                | X |
| 250R120-RA  | 0.12                  | 0.24                  | 250/60   | 3                    | 1                       | 1                    | 1.0         | 7                    | 9                    | 16                    | X                | X |
| 250R120-RC  | 0.12                  | 0.24                  | 250/60   | 3                    | 1                       | 1                    | 0.85        | 5.4                  | 7.5                  | 14                    | X                | X |
| 250R120-RF  | 0.12                  | 0.24                  | 250/60   | 3                    | 1                       | 1                    | 0.7         | 6                    | 10.5                 | 16                    | X                | X |
| 250R120-R1  | 0.12                  | 0.24                  | 250/60   | 3                    | 1                       | 1                    | 0.8         | 6                    | 9                    | 16                    | X                | X |
| 250R120-R2  | 0.12                  | 0.24                  | 250/60   | 3                    | 1                       | 1                    | 0.7         | 8                    | 10.5                 | 16                    | X                | X |
| 250R120-R3  | 0.12                  | 0.24                  | 250/60   | 3                    | 1                       | 1                    | 1           | 8                    | 10                   | 16                    | X                | X |
| 250R120T    | 0.12                  | 0.24                  | 250/60   | 3                    | 1                       | 1                    | 1.2         | 7                    | 12                   | 16                    | X                | X |
| 250R145     | 0.145                 | 0.29                  | 250/60   | 3                    | 1                       | 1                    | 2.5         | 3                    | 6                    | 14                    | X                | X |
| 250R145-RA  | 0.145                 | 0.29                  | 250/60   | 3                    | 1                       | 1                    | 5           | 3                    | 5.5                  | 12                    | X                | X |
| 250R145-RB  | 0.145                 | 0.29                  | 250/60   | 3                    | 1                       | 1                    | 2.5         | 4.5                  | 6                    | 14                    | X                | X |
| 250R145T    | 0.145                 | 0.29                  | 250/60   | 3                    | 1                       | 1                    | 2.0         | 5.4                  | 7.5                  | 14                    | X                | X |
| 250R180     | 0.18                  | 0.65                  | 250/60   | 10                   | 1.8                     | 1                    | 21          | 0.8                  | 2.2                  | 4                     | X                | X |
| 250R180T    | 0.18                  | 0.65                  | 250/60   | 10                   | 1.8                     | 1                    | 20          | 1.4                  | 3.9                  | 4.5                   | X                | X |

\*typical value      C: coated device      T: pre-tripped device

## Temperature Derating

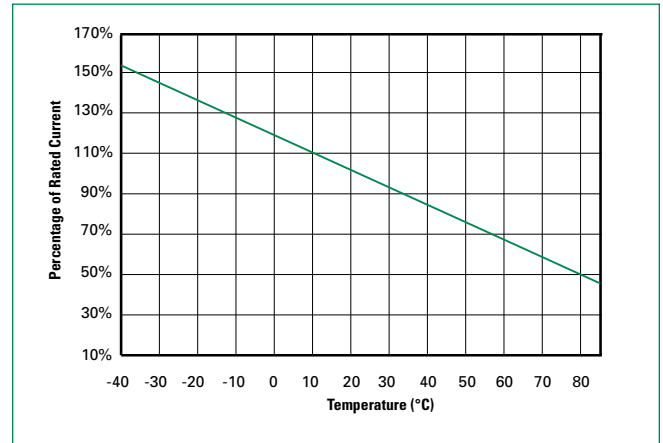
| Part Number | Ambient Operation Temperature |       |      |       |      |      |      |      |       |
|-------------|-------------------------------|-------|------|-------|------|------|------|------|-------|
|             | -40°C                         | -20°C | 0°C  | 23°C  | 40°C | 50°C | 60°C | 70°C | 85°C  |
| 250R080     | 0.12                          | 0.11  | 0.09 | 0.08  | 0.06 | 0.05 | 0.05 | 0.04 | 0.03  |
| 250R080T    | 0.12                          | 0.11  | 0.09 | 0.08  | 0.06 | 0.05 | 0.05 | 0.04 | 0.03  |
| 250R120     | 0.18                          | 0.16  | 0.14 | 0.12  | 0.10 | 0.09 | 0.08 | 0.06 | 0.05  |
| 250R120T    | 0.18                          | 0.16  | 0.14 | 0.12  | 0.10 | 0.09 | 0.08 | 0.06 | 0.05  |
| 250R145     | 0.26                          | 0.20  | 0.17 | 0.145 | 0.12 | 0.11 | 0.09 | 0.08 | 0.06  |
| 250R145T    | 0.26                          | 0.20  | 0.17 | 0.145 | 0.12 | 0.11 | 0.09 | 0.08 | 0.06  |
| 250R180     | 0.28                          | 0.23  | 0.21 | 0.18  | 0.16 | 0.13 | 0.10 | 0.11 | 0.083 |
| 250R180T    | 0.28                          | 0.23  | 0.21 | 0.18  | 0.16 | 0.13 | 0.10 | 0.11 | 0.083 |

## Average Time Current Curves



The average time current curves and temperature derating curve performance is affected by a number of variables, and these curves provided as guidance only. Customer must verify the performance in their application.

## Temperature Derating Curve



**Agency Specification Selection Guide For Telecom and Networking Applications**

| Product            | Lightning   | Power Cross  |
|--------------------|---|--|
| 250R120<br>250R145 | ITU K.20/21/45 – 1.5kV 10/700µs<br>ITU K.20/21/45 – 4kV 10/700µs*   | ITU K.20/21/45 – 230Vac, 10Ω<br>ITU K.20/21/45 – 600Vac, 600Ω                                    |
| 250R180            | ITU K.20/21/45 – 1.5kV 10/700µs<br>ITU K.20/21/45 – 4kV 10/700µs*<br>Telcordia GR – 974 – 1.0kV 10/1000µs | ITU K.20/21/45 – 230Vac, 10Ω<br>ITU K.20/21/45 – 600Vac, 600Ω<br>Telcordia GR – 974- 283Vac, 10A |

\*Devices should be independently evaluated and tested for use in any specific application

**Protection Application Guide**

| Region/Specification                           | Application   | Device Selection  |
|--|---|---|
| South America/Asia/Europe<br>ITU K.45          | *Access network equipment<br>Remote terminal<br>Repeaters<br>WAN equipment<br>Cross –connect                                | 250R180<br>250R180T<br>250R145<br>250R145T<br>250R120<br>250R120T |
| South America/Asia/Europe<br>ITU K.21          | Customer and IT equipment<br>Analog modems<br>ADSL, xDSL<br>Phone sets, PBX systems<br>Internet appliances<br>POS terminals | 250R180<br>250R180T<br>250R145<br>250R145T<br>250R120<br>250R120T |
| South America/Asia/Europe<br>ITU K.20          | Central Office<br>POTS/ISDN linecards<br>T1/E1/J1 linecards<br>ADSL/VDSL splitters<br>CSU/DSU                               | 250R180<br>250R180T<br>250R145<br>250R145T<br>250R120<br>250R120T |
| North America<br>Telcordia GR-974              | *Primary protection modules<br>MDF modules<br>Network interface   | 250R180<br>250R180T<br>250R145<br>250R145T<br>250R120<br>250R120T |
| South America/Asia/Europe<br>ITU K.20          |   |   |
| North America<br>Telcordia GR-1089             | *Intrabuilding communication systems<br>LAN, VOIP cards<br>Local loop handsets  | 250R180<br>250R180T<br>250R145<br>250R145T<br>250R120<br>250R120T |
| South America/Asia/Europe<br>ITU K.20 and K.21 |   |   |
|  | LAN Intrabuilding power cross<br>Protection<br>LAN equipment, IP phone  | 250R080   |

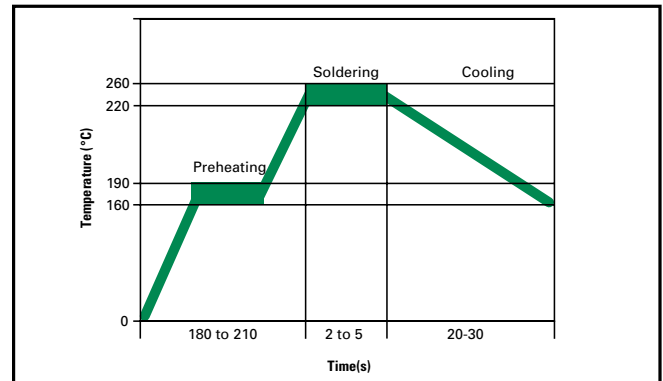
\*Resistance binned parts are recommended

## Soldering Parameters - Wave Soldering

|                          |                   |
|--------------------------|-------------------|
| Condition                | Wave Soldering    |
| Peak Temp/ Duration Time | 260°C ≤ 5 Sec     |
| ≥ 220°C                  | 2 Sec ~ 20 Sec    |
| Preheat 140°C ~ 180°C    | 180 Sec ~ 210 Sec |
| Storage Condition        | 0°C~35°C ≤ 70%RH  |

- Recommended soldering methods: heat element oven or N<sub>2</sub> environment for lead-free.
- Devices are designed to be wave soldered to the bottom side of the board.
- Devices can be cleaned using standard industry methods and solvents.
- This profile can be used for lead-free device

**Note:** If soldering temperatures exceed the recommended profile, devices may not meet the performance requirements.

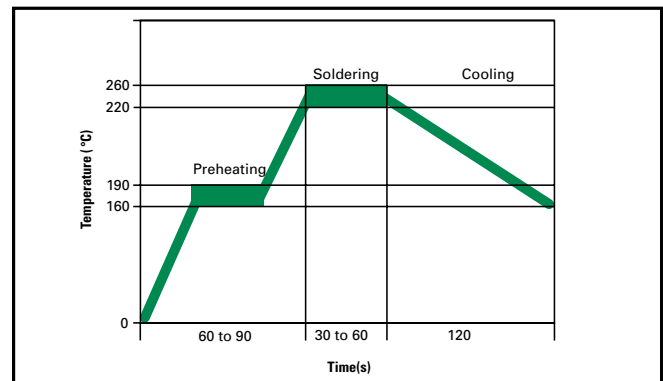


## Soldering Parameters - Solder Reflow

|                          |                   |
|--------------------------|-------------------|
| Condition                | Reflow            |
| Peak Temp/ Duration Time | 260°C ≥ 5 Sec     |
| ≥ 220°C                  | 30 Sec ~ 60 Sec   |
| Preheat 160°C ~ 190°C    | 60 Sec ~ 90 Sec   |
| Storage Condition        | 0°C~35°C, ≤ 70%RH |

- Recommended reflow methods: IR, vapor phase oven, hot air oven, N<sub>2</sub> environment for lead-free.
- Devices are not designed to be wave soldered to the bottom side of the board.
- Devices can be cleaned using standard industry methods and solvents.

**Note:** If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.



## Physical Specifications

|                                  |  |
|----------------------------------|--|
| <b>Lead Material</b>             | Tin-plated copper  |
| <b>Soldering Characteristics</b> | Solderability per MIL-STD-202, Method 208E                       |
| <b>Insulating Material</b>       | Cured, flame retardant epoxy polymer meets UL94V-0 requirements. |
| <b>Device Labeling</b>           | Marked with LF, voltage, current rating, and date code.          |

## Environmental Specifications

|  |   |
|--|---|
| <b>Operating/Storage Temperature</b>                       | -40°C to +85°C                                    |
| <b>Maximum Device Surface Temperature in Tripped State</b> | 125°C   |
| <b>Passive Aging</b>                                       | 65°C/85°C, 1000 hours                             |
| <b>Humidity Aging</b>                                      | +85°C, 85%R.H. 1000 hours                         |
| <b>Thermal Shock</b>                                       | MIL-STD-202F Method 107G +125°C to -55°C 10 times |
| <b>Solvent Resistance</b>                                  | MIL-STD-202, Method 215F                          |

### Dimensions

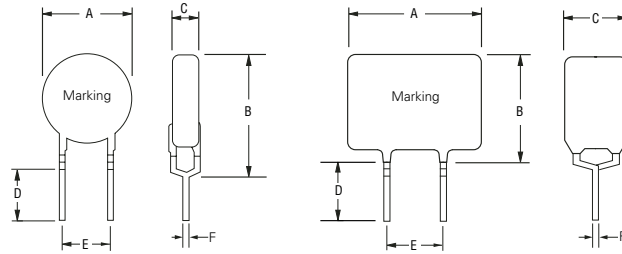
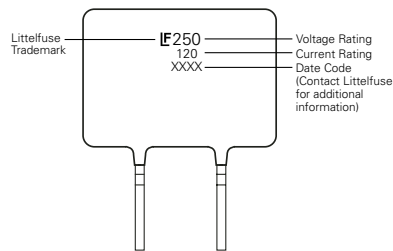
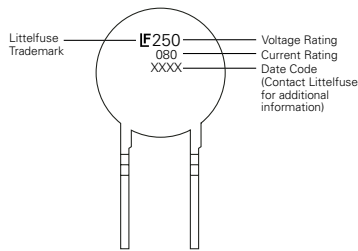


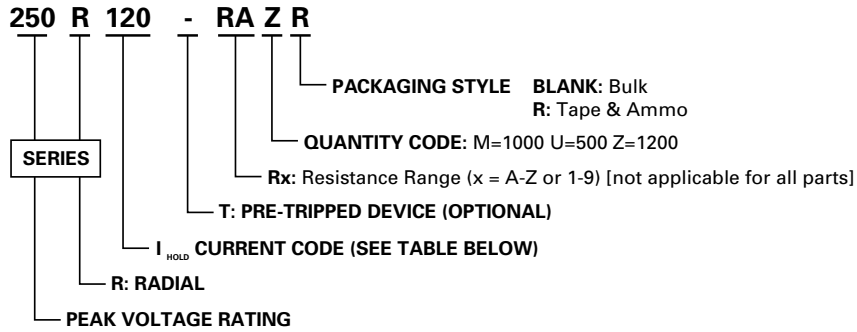
Figure 1

Figure 2

| Part Number | A      |      | B      |      | C      |      | D      |      | E      |      | Physical Characteristics |      |          |        |
|-------------|--------|------|--------|------|--------|------|--------|------|--------|------|--------------------------|------|----------|--------|
|             | Inches | mm   | Inches | mm   | Inches | mm   | Inches | mm   | Inches | mm   | Lead (dia)               |      | Material | Figure |
|             | Max.   | Max. | Max.   | Max. | Max.   | Max. | Min.   | Min. | Typ.   | Typ. | Inches                   | mm   |          |        |
| 250R080     | 0.23   | 5.8  | 0.39   | 9.9  | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 1      |
| 250R080T    | 0.23   | 5.8  | 0.39   | 9.9  | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 1      |
| 250R120     | 0.26   | 6.5  | 0.43   | 11   | 0.15   | 3.8  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 2      |
| 250R120-RA  | 0.26   | 6.5  | 0.43   | 11   | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 2      |
| 250R120-RC  | 0.26   | 6.5  | 0.43   | 11   | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 2      |
| 250R120-RF  | 0.26   | 6.5  | 0.43   | 11   | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 2      |
| 250R120-R1  | 0.26   | 6.5  | 0.43   | 11   | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 2      |
| 250R120-R2  | 0.26   | 6.5  | 0.43   | 11   | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 2      |
| 250R120-R3  | 0.26   | 6.5  | 0.43   | 11   | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 2      |
| 250R120T    | 0.26   | 6.5  | 0.43   | 11   | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 2      |
| 250R145     | 0.26   | 6.5  | 0.43   | 11   | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 2      |
| 250R145-RA  | 0.26   | 6.5  | 0.43   | 11   | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 2      |
| 250R145-RB  | 0.26   | 6.5  | 0.43   | 11   | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 2      |
| 250R145T    | 0.26   | 6.5  | 0.43   | 11   | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 2      |
| 250R180     | 0.37   | 9.5  | 0.47   | 12   | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 1      |
| 250F180T    | 0.37   | 9.5  | 0.47   | 12   | 0.18   | 4.6  | 0.19   | 4.7  | 0.20   | 5.1  | 0.026                    | 0.65 | Sn/Cu    | 1      |

### Part Marking System



**Part Numbering System**

**Packaging**

| I <sub>hold</sub> (A) | I <sub>hold</sub> Code | Packaging Option | Quantity | Quantity & Packaging Codes |
|-----------------------|------------------------|------------------|----------|----------------------------|
| 0.080                 | 080                    | Bulk             | 500      | U                          |
|                       |                        | Tape and Ammo    | 1500     | DR                         |
| 0.120                 | 120                    | Bulk             | 500      | U                          |
|                       |                        | Tape and Ammo    | 1200     | ZR                         |
| 0.145                 | 145                    | Bulk             | 500      | U                          |
|                       |                        | Tape and Ammo    | 1200     | ZR                         |
| 0.180                 | 180                    | Bulk             | 200      | F                          |
|                       |                        | Tape and Ammo    | 1000     | MR                         |