

# 250S Series

## Radial Leaded



### Description

The 250S High Voltage Radial device is a Polymer-based PTC suitable to protect telephony equipment against lightning and power cross strikes. The 250S Series is fully compatible with telecommunications standards, and is offered in horizontal and new vertical surface mount package.

### Features & Benefits

- RoHS Compliant, Directive 2002/95/EC
- Lead-Free & Halogen-Free
- Low resistance
- Compatible with telecom standards
- Helps meets ITU K.20, K.21/ Telcordia standards
- Excellent solder joint inspectability
- High voltage

### Additional Information



Resources



Accessories



Samples

### Applications

- Customer Premises Equipment (CPE)
- Central Office (CO)/ telecom centers
- LAN/WAN equipment
- Access equipment

### Agency Approvals

| Agency                                                                                 | Agency File Number |
|----------------------------------------------------------------------------------------|--------------------|
|  US | E183209            |
|     | R50120008          |

### Electrical Characteristics

| Part Number | Device Mounting Layout | $I_{hold}$ (A) | $I_{trip}$ (A) | $V_{max}$ ( $V_{int}/V_{op}$ ) | $I_{max}$ (A) | $P_d$ typ. (W) | Time to Trip at 1A |                | Resistance             |                        |                         | Agency Approvals |
|-------------|------------------------|----------------|----------------|--------------------------------|---------------|----------------|--------------------|----------------|------------------------|------------------------|-------------------------|------------------|
|             |                        |                |                |                                |               |                | Typical (Sec.)     | Maximum (Sec.) | $R_{min}$ ( $\Omega$ ) | $R_{max}$ ( $\Omega$ ) | $R_{1max}$ ( $\Omega$ ) |                  |
| 250S130     | Horizontal             | 0.13           | 0.26           | 250/60                         | 3             | 1.2            | 0.9                | 4.0            | 4                      | 13                     | 20                      | —                |
| 250S130-RA  |                        | 0.13           | 0.26           | 250/60                         | 3             | 1.2            | 1.4                | 4.0            | 6.5                    | 10                     | 15                      | —                |
| 250S130-RB  |                        | 0.13           | 0.26           | 250/60                         | 3             | 1.2            | 0.7                | 4.0            | 9                      | 13                     | 20                      | —                |
| 250S130V    | Vertical               | 0.13           | 0.26           | 250/60                         | 3             | 1.2            | 2.0                | 4.0            | 4                      | 13                     | 20                      | —                |

$I_{hold}$  = Hold current: maximum current device will pass without tripping in 20°C still air.  
 $I_{trip}$  = Trip current: minimum current at which the device will trip in 20°C still air.  
 $V_{int}$  = Maximum voltage the device can withstand without damage at rated current ( $I_{max}$ )  
 $V_{op}$  = The device regular operation voltage  
 $I_{max}$  = Maximum fault current device can withstand without damage at rated voltage ( $V_{max}$ )

$P_d$  = Power dissipated from device when in the tripped state at 20°C still air.  
 $R_{min}$  = Minimum resistance of device in initial (un-soldered) state.  
 $R_{max}$  = Maximum resistance of device in initial (un-soldered) state.  
 $R_{1max}$  = Maximum resistance of device at 20°C measured one hour after tripping.  
**Caution:** Operation beyond the specified rating may result in damage and possible arcing and flame.

### Warning

- Users shall independently assess the suitability of these devices for each of their applications
- Operation of these devices beyond the stated maximum ratings could result in damage to the devices and lead to electrical arcing and/or fire
- These devices are intended to protect against the effects of temporary over-current or over-temperature conditions and are not intended to perform as protective devices where such conditions are expected to be repetitive or prolonged in duration

- Exposure to silicon-based oils, solvents, electrolytes, acids, and similar materials can adversely affect the performance of these PPTC devices
- These devices undergo thermal expansion under fault conditions, and thus shall be provided with adequate space and be protected against mechanical stresses
- Circuits with inductance may generate a voltage ( $L di/dt$ ) above the rated voltage of the PPTC device.

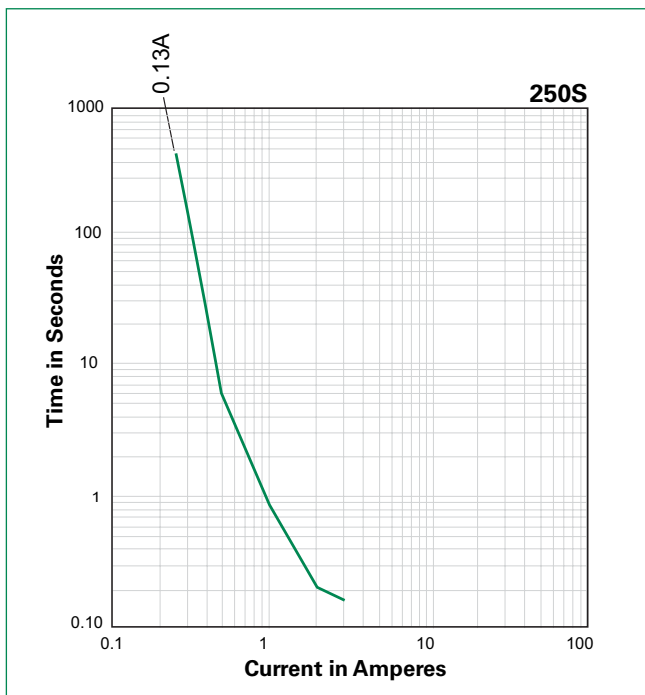
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### Temperature Derating

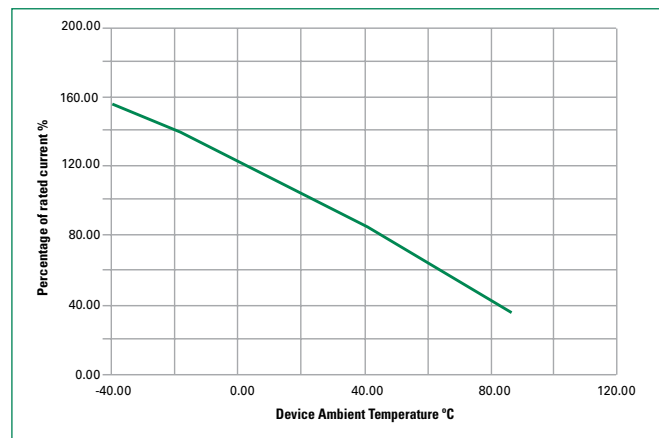
| Part Number | Ambient Operation Temperature |       |      |      |      |      |      |      |      |
|-------------|-------------------------------|-------|------|------|------|------|------|------|------|
|             | -40°C                         | -20°C | 0°C  | 20°C | 40°C | 50°C | 60°C | 70°C | 85°C |
| 250S130     | 0.21                          | 0.19  | 0.17 | 0.13 | 0.11 | 0.10 | 0.09 | 0.07 | 0.05 |

### 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                     |
|-------------------------------------------------|------------------------------------|---------------------------------|
| 250S130<br>250S130V<br>250S130-RA<br>250S130-RB | ITU K.20/21/45 – 1.5kV<br>10/700µs | ITU K.20/21/45 – 230Vac,<br>10Ω |

### Protection Application Guide

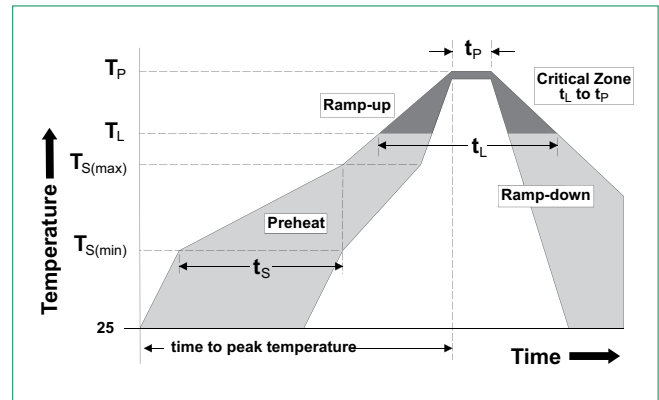
| Region/ Specification                     | Application                                                                                                                                   | Device Selection                                |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| South America/<br>Asia/Europe<br>ITU K.45 | Access network equipment<br>Remote terminal<br>Repeaters<br>WAN equipment<br>Cross-connect                                                    | 250S130<br>250S130V<br>250S130-RA<br>250S130-RB |
|                                           | Customer and IT equipment<br>Analog modems<br>ADSL, xDSL<br>Phone sets, PBX systems<br>Internet appliances<br>POS terminals<br>Central Office | 250S130<br>250S130V<br>250S130-RA<br>250S130-RB |
| South America/<br>Asia/Europe<br>ITU K.21 | POTS/ISDN linecards<br>T1/E1/J1 linecards<br>ADSL/VDSL splitters<br>CSU/DSU                                                                   | 250S130<br>250S130V<br>250S130-RA<br>250S130-RB |

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### Soldering Parameters

|                                                                           |                                                  |                         |
|---------------------------------------------------------------------------|--------------------------------------------------|-------------------------|
| <b>Profile Feature</b>                                                    |                                                  | Pb-Free Assembly        |
| <b>Average Ramp-Up Rate (<math>T_{S(max)}</math> to <math>T_p</math>)</b> |                                                  | 3°C/second max          |
| <b>Pre Heat:</b>                                                          | <b>Temperature Min (<math>T_{S(min)}</math>)</b> | 150°C                   |
|                                                                           | <b>Temperature Max (<math>T_{S(max)}</math>)</b> | 200°C                   |
|                                                                           | <b>Time (Min to Max) (<math>t_s</math>)</b>      | 60 – 180 secs           |
| <b>Time Maintained Above:</b>                                             | <b>Temperature (<math>T_L</math>)</b>            | 217°C                   |
|                                                                           | <b>Temperature (<math>t_L</math>)</b>            | 60 – 150 seconds        |
| <b>Peak / Classification Temperature (<math>T_p</math>)</b>               |                                                  | 260 <sup>+0/-5</sup> °C |
| <b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>      |                                                  | 20 – 40 seconds         |
| <b>Ramp-down Rate</b>                                                     |                                                  | 6°C/second max          |
| <b>Time 25°C to peak Temperature (<math>T_p</math>)</b>                   |                                                  | 8 minutes Max.          |



- All temperature refer to topside of the package, measured on the package body surface
- If reflow temperature exceeds the recommended profile, devices may not meet the performance requirements
- Recommended reflow methods: IR, vapor phase oven, hot air oven, N<sub>2</sub> environment for lead
- Recommended maximum paste thickness is 0.25mm (0.010inch)
- Devices can be cleaned using standard industry methods and solvents
- Devices can be reworked using the standard industry practices

### Physical Specifications

|                           |                                                              |
|---------------------------|--------------------------------------------------------------|
| <b>Terminal Material</b>  | Solder-Plated Brass (Solder Material: Matte Tin(Sn))         |
| <b>Lead Solderability</b> | Meets EIA Specification RS186-9E, ANSI/J-STD-002 Category 3. |

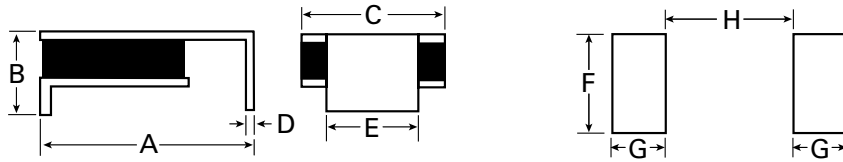
### Environmental Specifications

|                                                            |                                                     |
|------------------------------------------------------------|-----------------------------------------------------|
| <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>                                       | +85°C, 1000 hours                                   |
| <b>Humidity Aging</b>                                      | +85°C, 85%, R.H., 1000 hours                        |
| <b>Thermal Shock</b>                                       | MIL-STD-202, Method 107<br>+125°C to -55°C 10 times |
| <b>Solvent Resistance</b>                                  | MIL-STD-202, Method 215                             |
| <b>Moisture Sensitivity Level</b>                          | Level 1, J-STD-020                                  |

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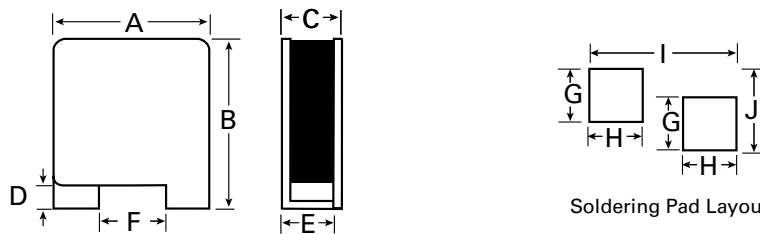
## Radial Leaded

### Dimensions



Soldering Pad Layout

| Part Number | A    |      | B    |      | C    |      | D     |      | E    |      | Material | F    |      | G    |      | H    |      |
|-------------|------|------|------|------|------|------|-------|------|------|------|----------|------|------|------|------|------|------|
|             | Inch | mm   | Inch | mm   | Inch | mm   | Inch  | mm   | Inch | mm   |          | Inch | mm   | Inch | mm   | Inch | mm   |
|             | Max. | Max. | Max. | Max. | Max. | Max. | Max.  | Max. | Max. | Max. |          | Max. | Max. | Max. | Max. | Max. | Max. |
| 250S130     | 0.37 | 9.4  | 0.15 | 3.7  | 0.29 | 7.4  | 0.016 | 0.4  | 0.15 | 3.8  | Sn/Ni/Cu | 0.18 | 4.6  | 0.07 | 1.8  | 0.24 | 6.1  |
| 250S130-RA  | 0.37 | 9.4  | 0.15 | 3.7  | 0.29 | 7.4  | 0.016 | 0.4  | 0.15 | 3.8  | Sn/Ni/Cu | 0.18 | 4.6  | 0.07 | 1.8  | 0.24 | 6.1  |
| 250S130-RB  | 0.37 | 9.4  | 0.15 | 3.7  | 0.29 | 7.4  | 0.016 | 0.4  | 0.15 | 3.8  | Sn/Ni/Cu | 0.18 | 4.6  | 0.07 | 1.8  | 0.24 | 6.1  |



Soldering Pad Layout

| Part Number | A    |      | B    |      | C    |      | D    |      | E    |      | F    |      | Material | G    |      | H    |      | I    |      | J    |      |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|----------|------|------|------|------|------|------|------|------|
|             | Inch | mm   | Inch | mm   | Inch | mm   | Inch | mm   | Inch | mm   | Inch | mm   |          | Inch | mm   | Inch | mm   | Inch | mm   | Inch | mm   |
|             | Max. | Max. | Max. | Max. | Max. | Max. | Max. | Max. | Max. | Max. | Max. | Max. |          | Max. | Max. | Max. | Max. | Max. | Max. | Max. | Max. |
| 250S130V    | .24  | 6.1  | .27  | 6.9  | .13  | 3.2  | .04  | 1.6  | .07  | 1.9  | .09  | 2.3  | Sn/Ni/Cu | .09  | 2.3  | .09  | 2.4  | .25  | 6.4  | .14  | 3.43 |

### Part Ordering Number System

#### 250 S 130 -RA D R

PACKAGING STYLE

R: Tape & Reel

QUANTITY CODE: D=1500 Z=1200

OPTION CODE

(BLANK) = Horizontal / 4-13Ω resistance range

V = Vertical / 4-13Ω resistance range

-RA = Horizontal / 6.5-10Ω resistance range

-RB = Horizontal / 9-13Ω resistance range

-RC = Horizontal / 7-11Ω resistance range

I<sub>hold</sub> CURRENT CODE

(Refer to Electrical Characteristics Table)

SURFACE MOUNT

PEAK VOLTAGE RATING

### Packaging

| Part Number | Ordering Number | I <sub>hold</sub> (A) | I <sub>hold</sub> Code | Packaging Option | Quantity | Quantity & Packaging Code |
|-------------|-----------------|-----------------------|------------------------|------------------|----------|---------------------------|
| 250S130     | 250S130DR       | 0.13                  | 130                    | Tape and Reel    | 1500     | DR                        |
| 250S130V    | 250S130VZR      | 0.13                  | 130                    | Tape and Reel    | 1200     | ZR                        |
| 250S130-RA  | 250S130-RADR    | 0.13                  | 130                    | Tape and Reel    | 1500     | DR                        |
| 250S130-RB  | 250S130-RBDR    | 0.13                  | 130                    | Tape and Reel    | 1500     | DR                        |

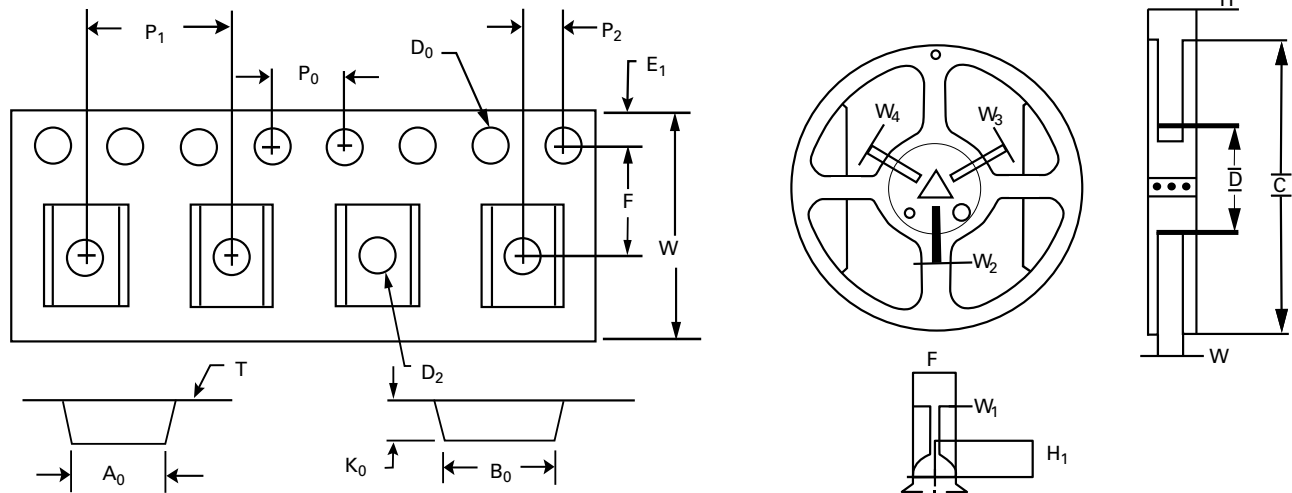
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### Tape and Reel Specifications

| TAPE SPECIFICATIONS:<br>EIA-481-1 (mm) |               | REEL DIMENSIONS:<br>EIA-481-1 (mm) |               |
|----------------------------------------|---------------|------------------------------------|---------------|
| <b>W</b>                               | 16 +/-0.30    | <b>H</b>                           | 22.4 +/-0.05  |
| <b>F</b>                               | 7.5 +/-0.05   | <b>W</b>                           | 16.4 .0 +0/+2 |
| <b>E<sub>1</sub></b>                   | 1.75 +/-0.10  | <b>D</b>                           | Ø60+0.5       |
| <b>D<sub>0</sub></b>                   | 1.5 +/-0.05   | <b>F</b>                           | Ø13.0+/-0.2   |
| <b>D<sub>1</sub></b>                   | 1.00(MIN)     | <b>C</b>                           | Ø340+/-1.0    |
| <b>P<sub>0</sub></b>                   | 4.00 +/-0.10  | <b>H<sub>1</sub></b>               | 11+/-0.5      |
| <b>P<sub>1</sub></b>                   | 12.00 +/-0.10 | <b>W<sub>1</sub></b>               | 2.2+/-0.5     |
| <b>P<sub>2</sub></b>                   | 2.00 +/-0.05  | <b>W<sub>2</sub></b>               | 3.0+0.5       |
| <b>A<sub>0</sub></b>                   | 6.9 +/-0.10   | <b>W<sub>3</sub></b>               | 4.0+0.5       |
| <b>B<sub>0</sub></b>                   | 9.6 +/-0.10   | <b>W<sub>4</sub></b>               | 5.5+0.5       |
| <b>T<sub>max</sub></b>                 | 0.4 +/-0.10   |                                    |               |
| <b>K<sub>0</sub></b>                   | 3.4 +/-0.15   |                                    |               |
| Leader Min.                            | 300           |                                    |               |
| Trailer Min.                           | 300           |                                    |               |

### Tape and Reel Diagram



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