



## Features

- Tip & ring line protection with two devices in one surface mount package
- High voltage surge capabilities
- Assists in meeting ITU-T K.20/K.21/K.45 specifications as well as Telcordia GR-1089 intra-building
- RoHS compliant\*
- Agency recognition:

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## MF-SD/250 Series – Telecom PTC Resettable Fuses

### Electrical Characteristics

| Model        | Max. Operating Voltage<br>Volts | Max. Interrupt Ratings |          | Ihold            | Itrip | Initial Resistance |      | *Post-Trip Resistance R <sub>1</sub> | Nominal Time to Trip |                  | Tripped Power Dissipation | Agency Recognition |
|--------------|---------------------------------|------------------------|----------|------------------|-------|--------------------|------|--------------------------------------|----------------------|------------------|---------------------------|--------------------|
|              |                                 | Volts (V)              | Amps (A) | Amperes at 23 °C |       | Ohms at 23 °C      |      | Ohms at 23 °C                        | Amps at 23 °C        | Seconds at 23 °C | Watts at 23 °C            | cUL                |
|              |                                 |                        |          | Hold             | Trip  | Min.               | Max. | Max.                                 |                      |                  |                           |                    |
| MF-SD013/250 | 60                              | 250                    | 3.0      | 0.13             | 0.26  | 2.0                | 7.0  | 10.0                                 | 1                    | 2.5              | 1.5                       | ✓                  |

\* R<sub>1</sub> value is measured 24 hours post reflow.

Resistance matched in housing: 1.0 ohm measured 24 hours after reflow installation.

### Environmental Characteristics

| Item                             | Condition                               | Criteria                                    |
|----------------------------------|---|---|
| Operating Temperature            | -40 °C to +85 °C                        |   |
| Storage Condition                | +40 °C max. / 70 % RH max.              |   |
| Passive Aging                    | +85 °C, 1000 hours                      | ±15 % typical resistance change             |
| Humidity Aging                   | +85 °C, 85 % R.H. 100 hours             | ±15 % typical resistance change             |
| Thermal Shock                    | -55 °C to +125 °C, 10 times             | ±15 % typical resistance change             |
| Resistance to Solvents           | MIL-STD-202, Method 215B                | No change (marking still legible)           |
| Resistance to Soldering Heat     | 245 °C ±5 °C, 5 seconds                 | (R <sub>min</sub> < R < R <sub>1max</sub> ) |
| Vibration                        | MIL-STD-883C, Method 2007.1 Condition A | ±5 % typical resistance change              |
| Moisture Sensitivity Level (MSL) | See <a href="#">Note</a>                |   |
| ESD Classification               | Class 6 (per AEC-Q200-2, HBM)           |   |

### Test Procedures and Requirements

| Item              | Test Condition  | Accept/Reject Criteria                  |
|-------------------|---|---|
| Visual/Mechanical | Verify dimensions and materials                           | Per MF physical description             |
| Resistance        | In still air @ 23 °C                                      | R <sub>min</sub> ≤ R ≤ R <sub>max</sub> |
| Time to Trip      | At specified current, V <sub>max</sub> , 23 °C, still air | T ≤ max. time to trip (seconds)         |
| Hold Current      | 30 min. at I <sub>hold</sub> , still air                  | No trip                                 |
| Trip Cycle Life   | V <sub>max</sub> , I <sub>max</sub> , 100 cycles          | No arcing or burning                    |
| Trip Endurance    | V <sub>max</sub> , I <sub>max</sub> , 48 hours            | No arcing or burning                    |
| Solderability     | 245 °C ±5 °C, 5 seconds                                   | 95 % min. coverage                      |

| Item                                   | Test Condition                      | Primary Protection |
|--|-------------------------------------|--------------------|
| Mains Power Contact - ITU-T K.20, K.21 | 230 Vrms, 10 ohms, t = 15 minutes   | None               |
| Power Induction - ITU-T K.20, K.21     | 600 Vrms, 600 ohms, t = 0.2 seconds | None               |
| Power Induction - ITU-T K.20, K.21     | 600 Vrms, 600 ohms, t = 1 second    | GDT                |
| Lightning Surge - ITU-T K.20, K.21     | 1.5 kV, 10/700 μs                   | None               |
| Lightning Surge                        | 4.0 kV, 10/700 μs                   | GDT                |

### Thermal Derating Table -I<sub>hold</sub> (Amps)

| Model        | Ambient Operating Temperature |        |      |       |       |       |       |       |       |
|--------------|-------------------------------|--------|------|-------|-------|-------|-------|-------|-------|
|              | -40 °C                        | -20 °C | 0 °C | 23 °C | 40 °C | 50 °C | 60 °C | 70 °C | 85 °C |
| MF-SD013/250 | 0.21                          | 0.18   | 0.16 | 0.13  | 0.10  | 0.09  | 0.08  | 0.07  | 0.05  |



**WARNING**  
Cancer and Reproductive Harm  
[www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

\*RoHS Directive 2015/863, Mar 31, 2015 and Annex.

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## Applications

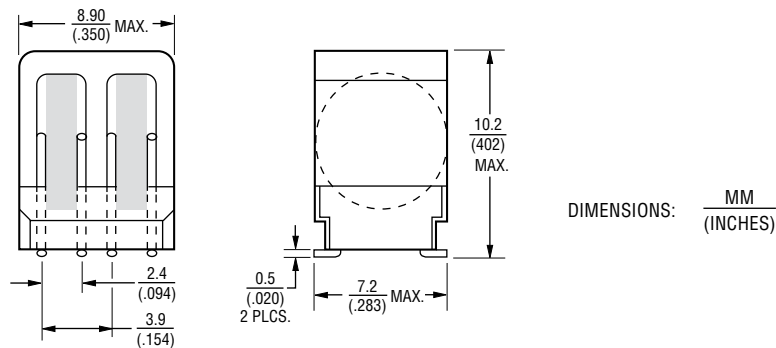
Used as a secondary overcurrent protection device in:

- Customer Premise Equipment (CPE)
- Central Office (CO)
- Subscriber Line Interface Cards (SLIC)

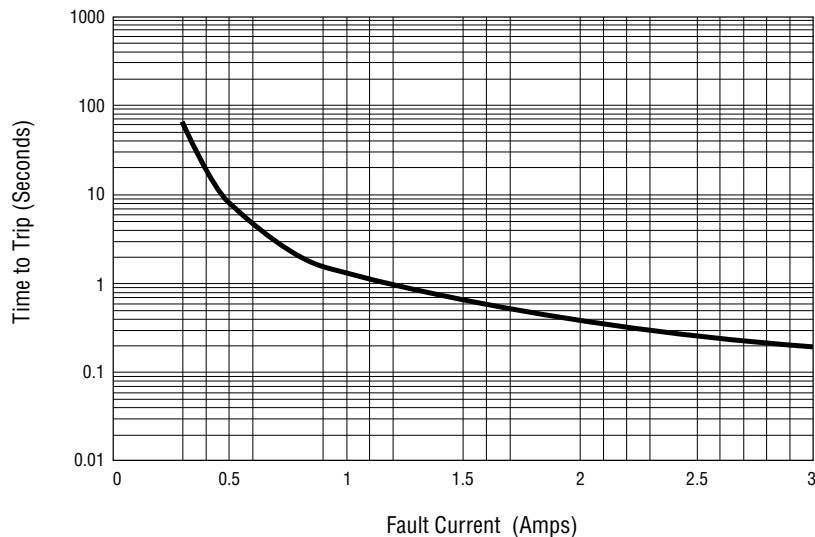
## MF-SD/250 Series – Telecom PTC Resettable Fuses

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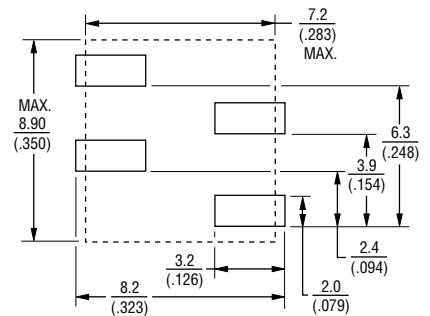
### Product Dimensions



### Typical Time to Trip at 23 °C



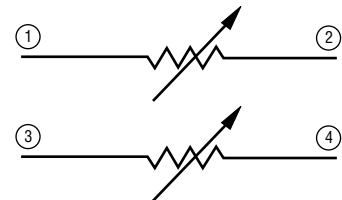
### Recommended Pad Layout



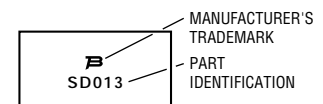
### Packaging Quantity

400 pcs. per reel

### Schematic



### Typical Part Marking



### How to Order

**MF - SD 013/250 - 2**

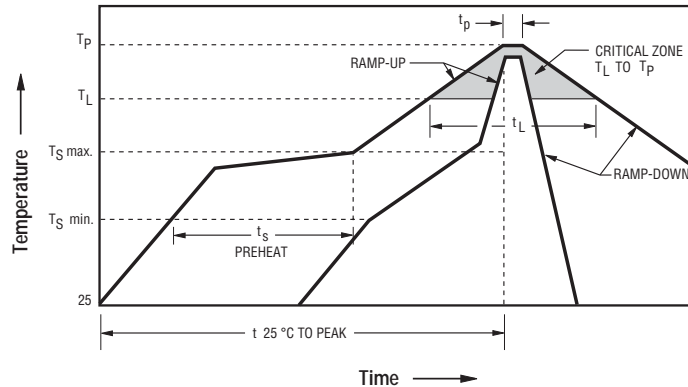
|                                 |   |
|---------------------------------|---|
| Multifuse® Product Designator   |   |
| Series                          | SD = Surface Mount Dual Package             |
| Hold Current, I <sub>hold</sub> | 013 (0.13 Amps)                             |
| Max. Interrupt Voltage, V       | 250 = 250 Volts                             |
| Packaging                       | - 2 = Tape and Reel<br>Packaged per EIA-481 |

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## Solder Reflow Recommendations



## Notes:

- MF-SD/250 models are intended for reflow soldering (including, but not limited to heating plate, hot air, IR, nitrogen, and vapor phase).
- Wave soldering is permissible only if the device is on the top of the PCB, opposite the heat source.
- Hand soldering is not recommended for these devices.
- All temperatures refer to the topside of the device, measured on the device body surface.
- If reflow temperatures exceed the recommended profile, devices may not meet the published specifications.
- Compatible with Pb and Pb-free solder reflow profiles.
- Excess solder may cause a short circuit.
- Please refer to the [Multifuse® Polymer PTC Resettable Fuse Soldering Recommendations](#) document for more details.

| Profile Feature   | Pb-Free Assembly                   |
|---|------------------------------------|
| Average Ramp-Up Rate ( $T_{S\ max}$ to $T_P$ )  | 3 °C / second max.                 |
| PREHEAT:<br>Temperature Min. ( $T_{S\ min}$ )<br>Temperature Max. ( $T_{S\ max}$ )<br>Time ( $T_{S\ min}$ to $T_{S\ max}$ ) ( $t_s$ ) | 150 °C<br>200 °C<br>60~180 seconds |
| TIME MAINTAINED ABOVE:<br>Temperature ( $T_L$ )<br>Time ( $t_L$ )   | 217 °C<br>60~150 seconds           |
| Peak Temperature ( $T_P$ )  | 260 °C                             |
| Time within 5 °C of Actual Peak Temperature ( $t_p$ )   | 20~40 seconds                      |
| Ramp-Down Rate  | 6 °C / second max.                 |
| Time 25 °C to Peak Temperature  | 8 minutes max.                     |

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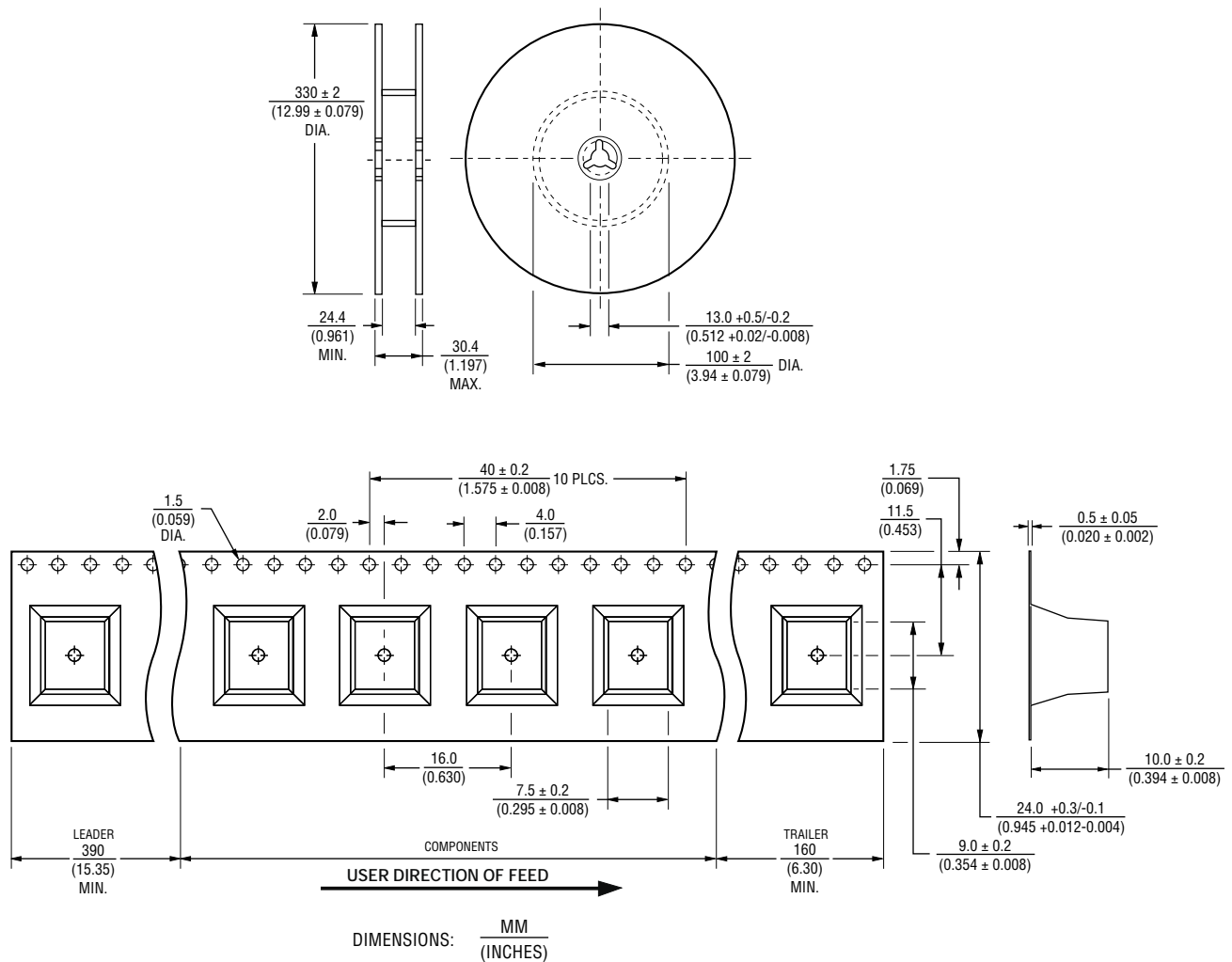
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# MF-SD/250 Series – Tape and Reel Specifications

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## Packaging Dimensions

Packaged per EIA-481



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MF-SD/250, REV. G 05/20

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- Users are responsible for independent and adequate evaluation of Bourns® Multifuse® Polymer PTC devices in the user's application, including the PPTC device characteristics stated in the applicable data sheet.
- Polymer PTC devices must not be allowed to operate beyond their stated maximum ratings. Operation in excess of such maximum ratings could result in damage to the PTC device and possibly lead to electrical arcing and/or fire. Circuits with inductance may generate a voltage above the rated voltage of the polymer PTC device and should be thoroughly evaluated within the user's application during the PTC selection and qualification process.
- Polymer PTC devices are intended to protect against adverse effects of temporary overcurrent or overtemperature conditions up to rated limits and are not intended to serve as protective devices where overcurrent or overvoltage conditions are expected to be repetitive or prolonged.
- In normal operation, polymer PTC devices experience thermal expansion under fault conditions. Thus, a polymer PTC device must be protected against mechanical stress, and must be given adequate clearance within the user's application to accommodate such thermal expansion. Rigid potting materials or fixed housings or coverings that do not provide adequate clearance should be thoroughly examined and tested by the user, as they may result in the malfunction of polymer PTC devices if the thermal expansion is inhibited.
- Exposure to lubricants, silicon-based oils, solvents, gels, electrolytes, acids, and other related or similar materials may adversely affect the performance of polymer PTC devices.
- Aggressive solvents may adversely affect the performance of polymer PTC devices. Conformal coating, encapsulating, potting, molding, and sealing materials may contain aggressive solvents including but not limited to xylene and toluene, which are known to cause adverse effects on the performance of polymer PTCs. Such aggressive solvents must be thoroughly cured or baked to ensure their complete removal from polymer PTCs to minimize the possible adverse effect on the device.
- Recommended storage conditions should be followed at all times. Such conditions can be found on the applicable data sheet and on the Multifuse® Polymer PTC Moisture/Reflow Sensitivity Classification (MSL) note:  
[https://www.bourns.com/docs/RoHS-MSL/msl\\_mf.pdf](https://www.bourns.com/docs/RoHS-MSL/msl_mf.pdf)

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