



## Features

- Surface Mount Devices
- High voltage surge capabilities
- Binned and sorted resistance ranges
- Assists in meeting ITU K.20/K.21 specifications
- RoHS compliant\*
- Agency recognition:   

## Applications

Used as a secondary overcurrent protection device in:

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

# MF-SM013/250 - Telecom PTC Resettable Fuses

## Electrical Characteristics

| Model            | Max. Oper. Voltage<br>Volts | Max. Interrupt Ratings |          | Hold Current<br>Amps at 23 °C | Initial Resistance |               | One Hour Post-Trip Resistance<br>Ohms at 23 °C | Tripped Power Dissipation<br>Watts at 23 °C |
|------------------|-----------------------------|------------------------|----------|-------------------------------|--------------------|---------------|------------------------------------------------|---------------------------------------------|
|                  |                             | Volts (V)              | Amps (A) |                               | Ohms at 23 °C      | Ohms at 23 °C |                                                |                                             |
|                  |                             | Max.                   | Max.     |                               | Min.               | Max.          |                                                |                                             |
| MF-SM013/250-2   | 60                          | 250                    | 3.0      | 0.13                          | 6.5                | 12.0          | 20.0                                           | 3.3                                         |
| MF-SM013/250-A-2 | 60                          | 250                    | 3.0      | 0.13                          | 6.5                | 9.0           | 20.0                                           | 3.3                                         |
| MF-SM013/250-B-2 | 60                          | 250                    | 3.0      | 0.13                          | 9.0                | 12.0          | 20.0                                           | 3.3                                         |
| MF-SM013/250-C-2 | 60                          | 250                    | 3.0      | 0.13                          | 7.0                | 10.0          | 20.0                                           | 3.3                                         |

## Environmental Characteristics

|                                                              |                                                |                                 |
|--------------------------------------------------------------|------------------------------------------------|---------------------------------|
| Operating/Storage Temperature .....                          | -45 °C to +85 °C                               |                                 |
| Maximum Device Surface Temperature<br>in Tripped State ..... | 125 °C                                         |                                 |
| Passive Aging .....                                          | +85 °C, 1000 hours .....                       | ±2 % typical resistance change  |
|                                                              | +60 °C, 1000 hours .....                       | ±3 % typical resistance change  |
| Humidity Aging .....                                         | +85 °C, 85 % R.H. 500 hours .....              | ±3 % typical resistance change  |
| Thermal Shock .....                                          | MIL-STD-202F, Method 107G, .....               | ±10 % typical resistance change |
|                                                              | +125 °C to -55 °C, 10 times .....              | ±15 % typical resistance change |
| Solvent Resistance .....                                     | MIL-STD-202, Method 215B .....                 | No change                       |
| Lead Solderability .....                                     | ANSI/J-STD-002                                 |                                 |
| Flammability .....                                           | IEC 695-2-2 .....                              |                                 |
|                                                              | No Flame for 60 secs.                          |                                 |
| Vibration .....                                              | MIL-STD-883C, Method 2007.1, Condition A ..... |                                 |
|                                                              | No change                                      |                                 |

## Test Procedures And Requirements For Model SM013/250 Series

| Test                  | Test Conditions                               | Accept/Reject Criteria                      |
|-----------------------|-----------------------------------------------|---------------------------------------------|
| Visual/Mech. ....     | Verify dimensions and materials .....         | Per MF physical description                 |
| Resistance .....      | In still air @ 23 °C .....                    | $R_{min} \leq R \leq R_{max}$               |
| Time to Trip .....    | At specified current, $V_{max}$ , 23 °C ..... | $T \leq \text{max. time to trip (seconds)}$ |
| Hold Current .....    | 30 min. at $I_{hold}$ .....                   | No trip                                     |
| Trip Cycle Life ..... | $V_{max}$ , $I_{max}$ , 100 cycles .....      | No arcing or burning                        |
| Trip Endurance .....  | $V_{max}$ , 48 hours .....                    | No arcing or burning                        |
| Solderability .....   | MIL-STD-202F, Method 208F .....               | 95 % min. coverage                          |
| UL File Number .....  | E 174545S                                     |                                             |
| CSA File Number ..... | CA 110338                                     |                                             |
| TÜV File Number ..... | R2057213                                      |                                             |

## Thermal Derating Chart - $I_{hold}$ / $I_{trip}$ (Amps)

| Model            | Ambient Operating Temperature |             |             |             |             |             |             |             |             |
|------------------|-------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                  | -40 °C                        | -20 °C      | 0 °C        | 23 °C       | 40 °C       | 50 °C       | 60 °C       | 70 °C       | 85 °C       |
| MF-SM013/250-2   | 0.21 / 0.42                   | 0.18 / 0.37 | 0.16 / 0.31 | 0.13 / 0.26 | 0.10 / 0.23 | 0.09 / 0.18 | 0.08 / 0.15 | 0.07 / 0.12 | 0.05 / 0.10 |
| MF-SM013/250-A-2 | 0.21 / 0.42                   | 0.18 / 0.37 | 0.16 / 0.31 | 0.13 / 0.26 | 0.10 / 0.23 | 0.09 / 0.18 | 0.08 / 0.15 | 0.07 / 0.12 | 0.05 / 0.10 |
| MF-SM013/250-B-2 | 0.21 / 0.42                   | 0.18 / 0.37 | 0.16 / 0.31 | 0.13 / 0.26 | 0.10 / 0.23 | 0.09 / 0.18 | 0.08 / 0.15 | 0.07 / 0.12 | 0.05 / 0.10 |
| MF-SM013/250-C-2 | 0.21 / 0.42                   | 0.18 / 0.37 | 0.16 / 0.31 | 0.13 / 0.26 | 0.10 / 0.23 | 0.09 / 0.18 | 0.08 / 0.15 | 0.07 / 0.12 | 0.05 / 0.10 |

## Additional Features

- Withstands lightning power induction

## MF-SM013/250 Series - Telecom PTC Resettable Fuses

**BOURNS®**

### Product Dimensions

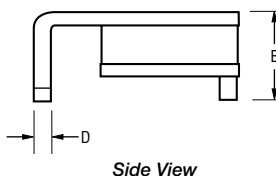
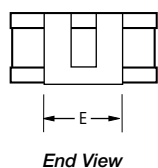
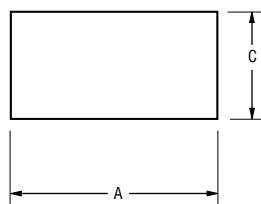
| Model            | A                     | B                     | C                     | D                     | E                     | G                     | H                    | I                     |
|------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------------|-----------------------|
|                  | Max.                  | Max.                  | Max.                  | Nom.                  | Nom.                  | Nom.                  | Nom.                 | Nom.                  |
| MF-SM013/250-2   | $\frac{9.4}{(0.370)}$ | $\frac{3.7}{(0.146)}$ | $\frac{7.4}{(0.291)}$ | $\frac{0.3}{(0.012)}$ | $\frac{3.8}{(0.149)}$ | $\frac{9.7}{(0.383)}$ | $\frac{4.6}{(0.18)}$ | $\frac{1.8}{(0.071)}$ |
| MF-SM013/250-A-2 | $\frac{9.4}{(0.370)}$ | $\frac{3.7}{(0.146)}$ | $\frac{7.4}{(0.291)}$ | $\frac{0.3}{(0.012)}$ | $\frac{3.8}{(0.149)}$ | $\frac{9.7}{(0.383)}$ | $\frac{4.6}{(0.18)}$ | $\frac{1.8}{(0.071)}$ |
| MF-SM013/250-B-2 | $\frac{9.4}{(0.370)}$ | $\frac{3.7}{(0.146)}$ | $\frac{7.4}{(0.291)}$ | $\frac{0.3}{(0.012)}$ | $\frac{3.8}{(0.149)}$ | $\frac{9.7}{(0.383)}$ | $\frac{4.6}{(0.18)}$ | $\frac{1.8}{(0.071)}$ |
| MF-SM013/250-C-2 | $\frac{9.4}{(0.370)}$ | $\frac{3.7}{(0.146)}$ | $\frac{7.4}{(0.291)}$ | $\frac{0.3}{(0.012)}$ | $\frac{3.8}{(0.149)}$ | $\frac{9.7}{(0.383)}$ | $\frac{4.6}{(0.18)}$ | $\frac{1.8}{(0.071)}$ |

Packaging:

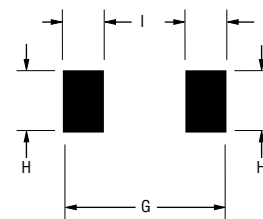
TAPE & REEL: 1500 pcs. per reel

DIMENSIONS =  $\frac{\text{MM}}{(\text{INCHES})}$

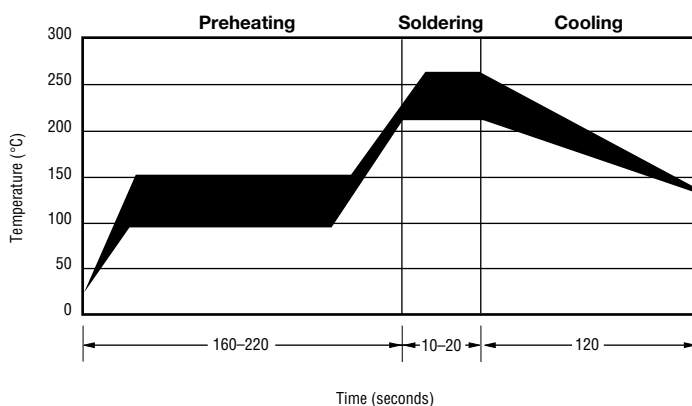
### Recommended Pad Layout



Terminal material:  
Tin-plated brass



### Solder Reflow Recommendations



#### Solder reflow

- Recommended reflow methods: IR, vapor phase oven, hot air oven.
- Devices are not designed to be wave soldered to the bottom side of the board.
- Gluing the devices is not recommended.
- Recommended maximum paste thickness is 0.25 mm (.010 inch).
- 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.

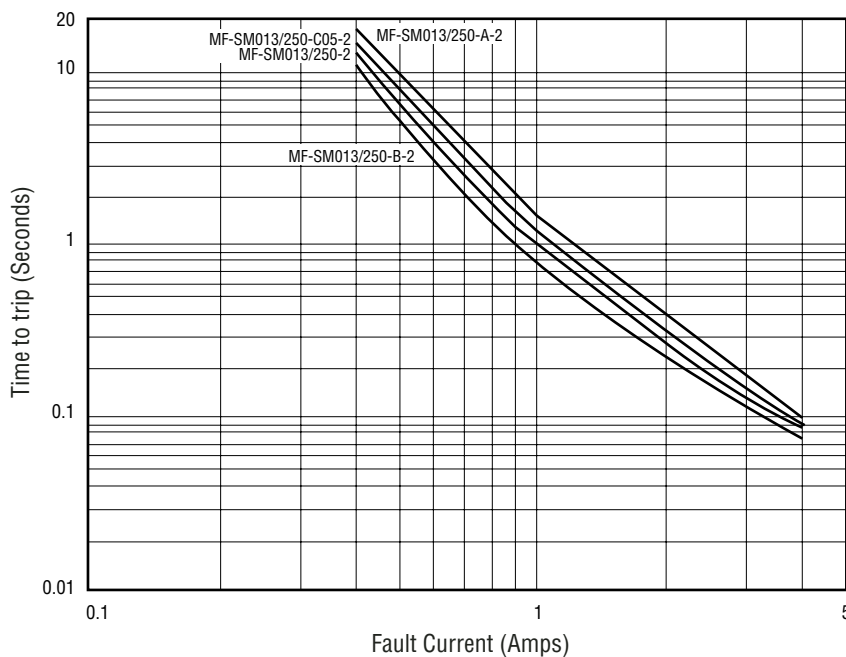
#### Rework

- A device should not be reworked.

# MF-SM013/250 Series - Telecom PTC Resettable Fuses

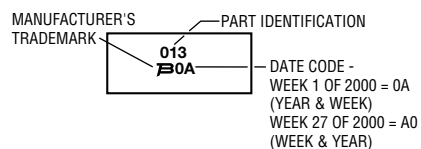
**BOURNS®**

## Typical Time to Trip at 23 BC

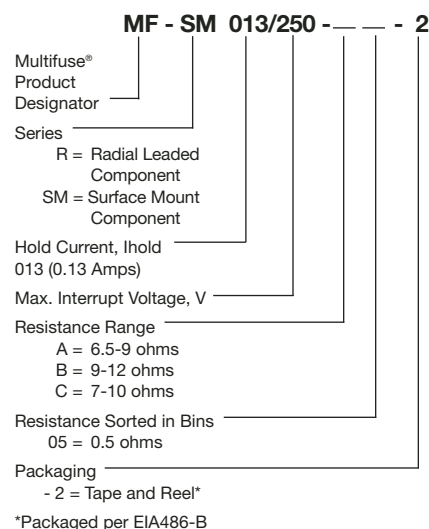


## Typical Part Marking

Represents total content. Layout may vary.



## How to Order



NOTE: All parts are also available "binned". All parts within a package will be within 0.5 ohms of each other within the initial resistance range.

# MF-SM, MF-SM/33, MF-SM/60 & MF-SM/250 Series Tape and Reel Specifications

**BOURNS®**

**MF-SM030, 050, 075, 100, 125, 260, 300;  
MF-SM075/60; MF-SM-100/33  
per EIA-481-2**

**MF-SM150, 200, 250;  
MF-SM-150/33; MF-SM013/250  
per EIA 481-2**

## Tape Dimensions

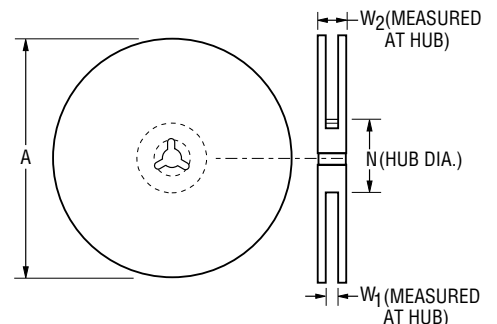
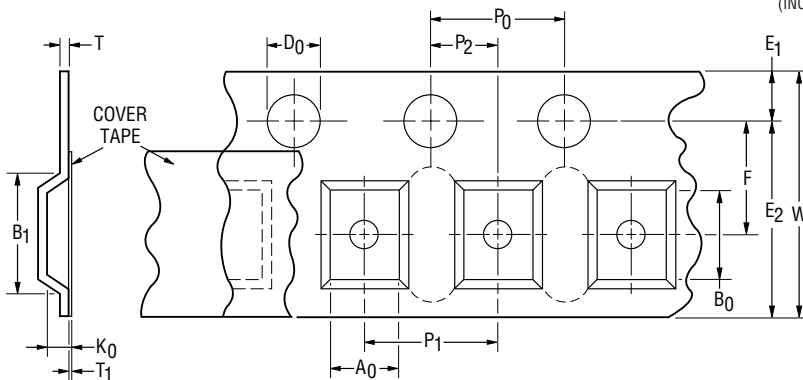
|                     |                                                 |                                                 |
|---------------------|-------------------------------------------------|-------------------------------------------------|
| W                   | $\frac{16.0 \pm 0.3}{(0.630 \pm 0.012)}$        | $\frac{16.0 \pm 0.3}{(0.630 \pm 0.012)}$        |
| P <sub>0</sub>      | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$         | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$         |
| P <sub>1</sub>      | $\frac{8.0 \pm 0.1}{(0.315 \pm 0.004)}$         | $\frac{12.0 \pm 0.1}{(0.472 \pm 0.004)}$        |
| P <sub>2</sub>      | $\frac{2.0 \pm 0.1}{(0.079 \pm 0.004)}$         | $\frac{2.0 \pm 0.1}{(0.079 \pm 0.004)}$         |
| A <sub>0</sub>      | $\frac{5.7 \pm 0.1}{(0.224 \pm 0.004)}$         | $\frac{6.9 \pm 0.1}{(0.272 \pm 0.004)}$         |
| B <sub>0</sub>      | $\frac{8.1 \pm 0.1}{(0.319 \pm 0.004)}$         | $\frac{9.6 \pm 0.1}{(0.378 \pm 0.004)}$         |
| B <sub>1</sub> max. | $\frac{12.1}{(0.476)}$                          | $\frac{12.1}{(0.476)}$                          |
| D <sub>0</sub>      | $\frac{1.5 \pm 0.1/-0.0}{(0.059 \pm 0.004/-0)}$ | $\frac{1.5 \pm 0.1/-0.0}{(0.059 \pm 0.004/-0)}$ |
| F                   | $\frac{7.5 \pm 0.1}{(0.295 \pm 0.004)}$         | $\frac{7.5 \pm 0.1}{(0.295 \pm 0.004)}$         |
| E <sub>1</sub>      | $\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$        | $\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$        |
| E <sub>2</sub> min. | $\frac{14.25}{(0.561)}$                         | $\frac{14.25}{(0.561)}$                         |
| T max.              | $\frac{0.6}{(0.024)}$                           | $\frac{0.6}{(0.024)}$                           |
| T <sub>1</sub> max. | $\frac{0.1}{(0.004)}$                           | $\frac{0.1}{(0.004)}$                           |
| K <sub>0</sub>      | $\frac{3.4 \pm 0.1}{(0.134 \pm 0.004)}$         | $\frac{3.4 \pm 0.1^*}{(0.134 \pm 0.004)^*}$     |
| Leader min.         | $\frac{390}{(15.35)}$                           | $\frac{390}{(15.35)}$                           |
| Trailer min.        | $\frac{160}{(6.30)}$                            | $\frac{160}{(6.30)}$                            |

## Reel Dimensions

|                     |                                                  |                                                  |
|---------------------|--------------------------------------------------|--------------------------------------------------|
| A max.              | $\frac{360}{(14.17)}$                            | $\frac{360}{(14.17)}$                            |
| N min.              | $\frac{50}{(1.97)}$                              | $\frac{50}{(1.97)}$                              |
| W <sub>1</sub>      | $\frac{16.4 \pm 2.0/-0.0}{(0.646 \pm 0.079/-0)}$ | $\frac{16.4 \pm 2.0/-0.0}{(0.646 \pm 0.079/-0)}$ |
| W <sub>2</sub> max. | $\frac{22.4}{(0.882)}$                           | $\frac{22.4}{(0.882)}$                           |

\* Model MF-SM013/250 =  $\frac{3.8 \pm 0.1}{(0.150 \pm 0.004)}$

UNIT =  $\frac{\text{MM}}{(\text{INCHES})}$



Specifications are subject to change without notice.  
Customers should verify actual device performance in their specific applications.