





## Features

- Surface Mount Device
- Reduced footprint size
- High voltage surge capabilities
- Assists in meeting ITU K.20/K.21/K.45 specifications
- RoHS compliant\*
- Agency recognition:  

## Applications

Provides overcurrent protection in:

- Customer Premise Equipment (CPE)
- Central Office (CO)
- Access/Outside Plant Equipment

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

### Electrical Characteristics

| Model         | Max. Operating 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-SM013/250V | 60                              | 250                    | 3.0      | 0.13                          | 4.0                | 7.0           | 16.0   | 3.0   |

### Environmental Characteristics

|  |  |
|--|--|
| Operating Temperature.....                                   | -40 °C to +85 °C   |
| Maximum Device Surface Temperature<br>in Tripped State ..... | 125 °C   |
| Passive Aging .....  | +85 °C, 1000 hours..... ±15 % typical resistance change            |
| Humidity Aging.....  | +85 °C, 85 % R.H. 1000 hours ..... ±15 % typical resistance change |
| Thermal Shock .....  | MIL-STD-202F, Method 107G..... ±15 % 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   |
| Vibration .....  | MIL-STD-883C, Method 2007.1, Condition A ..... No change           |
| Moisture Sensitivity Level (MSL) .....                       | Level 1  |
| ESD Classification - HBM.....                                | Class 6  |

### Test Procedures And Requirements For Model MF-SM013/250V 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 ..... | E174545                                      |   |
| 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-SM013/250V | 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 |

\*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.

Specifications are subject to change without notice.

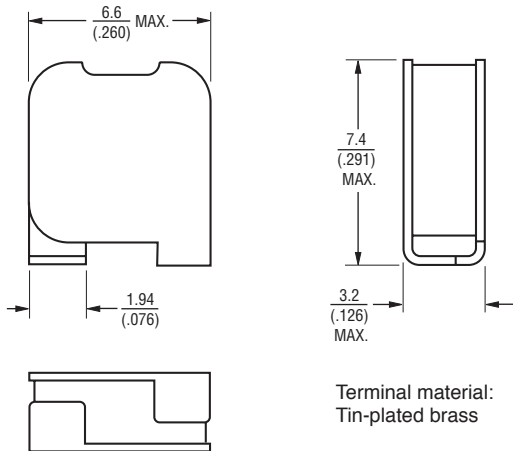
The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time.

Users should verify actual device performance in their specific applications.

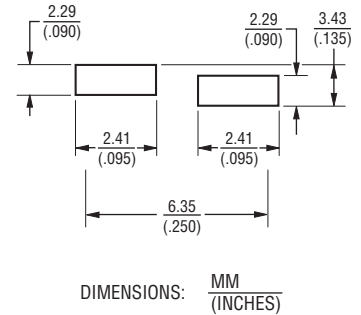
# MF-SM013/250V - Telecom PTC Resettable Fuses

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## Product Dimensions

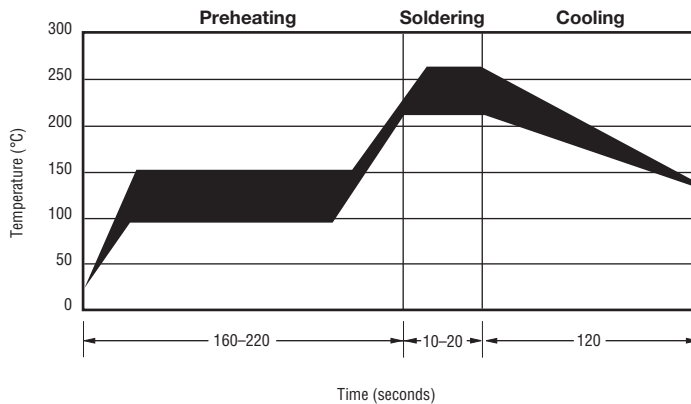


## Recommended Pad Layout



Packaging:  
TAPE & REEL: 1000 pcs. per reel

## 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.

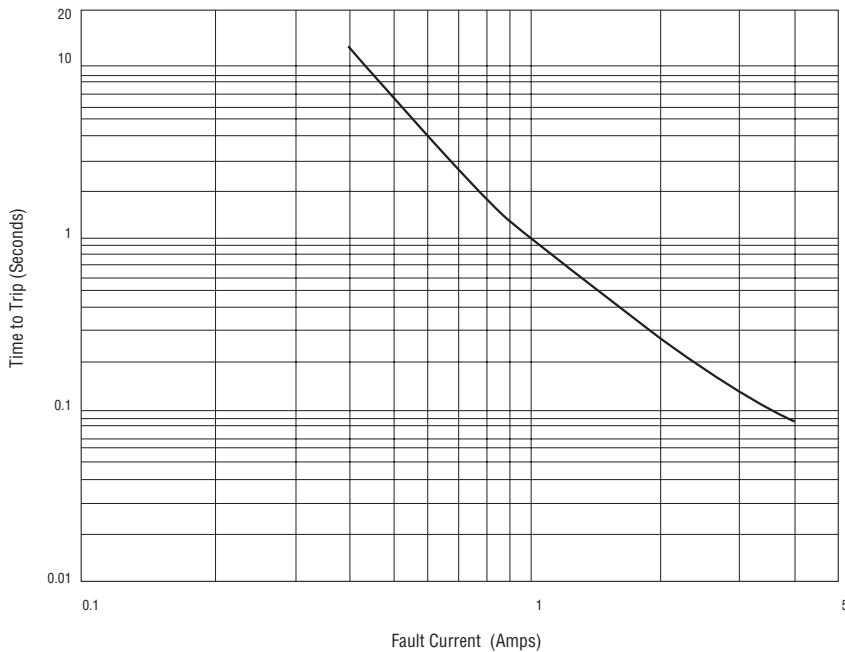
## Storage Recommendations

The recommended long term storage conditions for Multifuse® Polymer PTC devices are 40 °C maximum and 70 % RH maximum. All devices should remain in the original sealed packaging prior to use. Devices may not conform with data sheet specifications if these storage recommendations are exceeded. Devices stored in this manner have an indefinite shelf life.

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

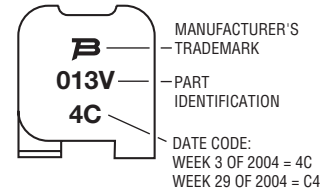
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## Typical Time to Trip at 23 °C



## Typical Part Marking

Represents total content. Layout may vary.



## How to Order

**MF - SM 013/250V - 2**

Multifuse®  
Product Designator  
Series SM = Surface Mount Component  
Hold Current, I<sub>hold</sub> 013 = 0.13 Amps  
Max. Interrupt Voltage, V 250 = 250 Volts  
Telecom Options V = Vertical Profile (Surface Mount Products Only)  
Packaging Options - 0 = Bulk Packaging - 2 = Tape and Reel\*  
\*Packaged per EIA486-B

MF-SM013/250V, REV. I, 07/17

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

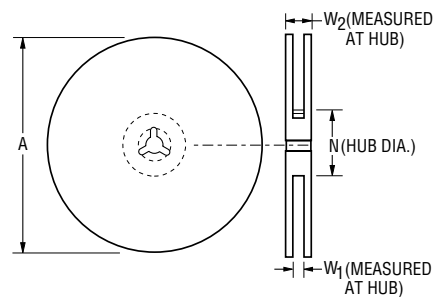
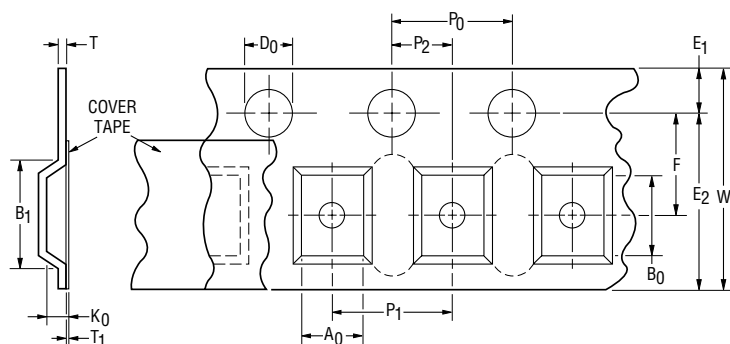
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NOTE: Effective December 1, 2010 (product date code V0), the cover tape was changed to the new 3M™ Universal Cover Tape (UCT).

| Tape Dimensions        | MF-SM030, 050, 075, 100, 125, 260, 300;<br>MF-SM075/60; MF-SM-100/33; MF-SM008/250<br>per EIA-481-2 | MF-SM150, 200, 250;<br>MF-SM-150/33, MF-SM-185/33;<br>MF-SM013/250 per EIA 481-2 |
|------------------------|---|--|
|                        |   |  |
| W max.                 | $\frac{16.3}{(0.642)}$  | $\frac{16.3}{(0.642)}$   |
| 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>         | $\frac{1.5 + 0.1/-0.0}{(0.059 + 0.004/-0)}$   | $\frac{1.5 + 0.1/-0.0}{(0.059 + 0.004/-0)}$                                      |
| 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.           | $\frac{160}{(6.30)}$  | $\frac{160}{(6.30)}$   |
| <b>Reel Dimensions</b> |   |  |
| A max.                 | $\frac{360}{(14.17)}$   | $\frac{360}{(14.17)}$  |
| N min.                 | $\frac{50}{(1.97)}$   | $\frac{50}{(1.97)}$  |
| W <sub>1</sub>         | $\frac{16.4 + 2.0/-0.0}{(0.646 + 0.079/-0)}$  | $\frac{16.4 + 2.0/-0.0}{(0.646 + 0.079/-0)}$                                     |
| W <sub>2</sub> max.    | $\frac{22.4}{(0.882)}$  | $\frac{22.4}{(0.882)}$   |

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

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



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