



## 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 Volts	Max. Interrupt Ratings		Hold Current Amps at 23 °C	Initial Resistance		One Hour Post-Trip Resistance Ohms at 23 °C	Tripped Power Dissipation 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 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 .....	$T \leq$ 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

\*RoHS Directive 2002/95/EC Jan 27 2003 including Annex  
 Specifications are subject to change without notice.  
 Customers should verify actual device performance in their specific applications.

## Additional Features

- Withstands lightning power induction

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

**BOURNS®**

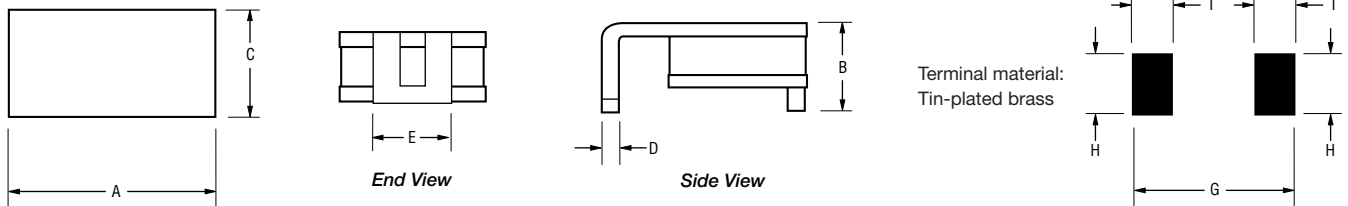
## Product Dimensions

Model	A	B	C	D	E	G	H	I
	Max.	Max.	Max.	Nom.	Nom.	Nom.	Nom.	Nom.
MF-SM013/250-2	$\frac{9.4}{(0.370)}$	$\frac{3.4}{(0.133)}$	$\frac{7.4}{(0.291)}$	$\frac{0.3}{(0.012)}$	$\frac{3.8}{(0.149)}$	$\frac{9.7}{(0.383)}$	$\frac{4.6}{(0.18)}$	$\frac{1.8}{(0.071)}$
MF-SM013/250-A-2	$\frac{9.4}{(0.370)}$	$\frac{3.4}{(0.133)}$	$\frac{7.4}{(0.291)}$	$\frac{0.3}{(0.012)}$	$\frac{3.8}{(0.149)}$	$\frac{9.7}{(0.383)}$	$\frac{4.6}{(0.18)}$	$\frac{1.8}{(0.071)}$
MF-SM013/250-B-2	$\frac{9.4}{(0.370)}$	$\frac{3.4}{(0.133)}$	$\frac{7.4}{(0.291)}$	$\frac{0.3}{(0.012)}$	$\frac{3.8}{(0.149)}$	$\frac{9.7}{(0.383)}$	$\frac{4.6}{(0.18)}$	$\frac{1.8}{(0.071)}$
MF-SM013/250-C-2	$\frac{9.4}{(0.370)}$	$\frac{3.4}{(0.133)}$	$\frac{7.4}{(0.291)}$	$\frac{0.3}{(0.012)}$	$\frac{3.8}{(0.149)}$	$\frac{9.7}{(0.383)}$	$\frac{4.6}{(0.18)}$	$\frac{1.8}{(0.071)}$

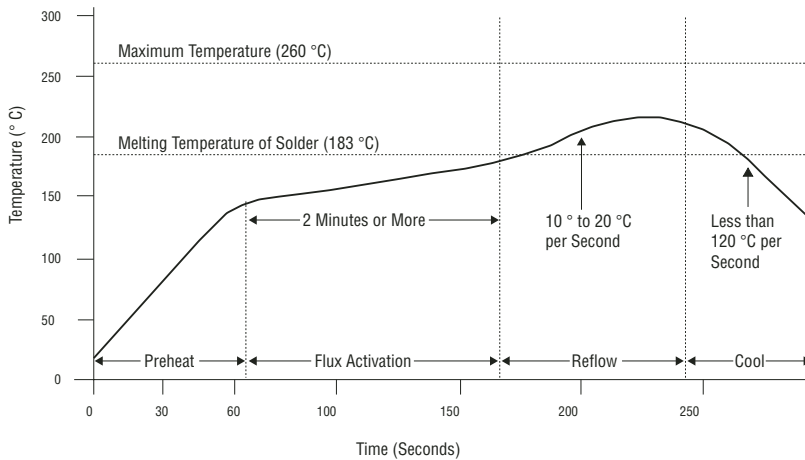
Packaging:  
TAPE & REEL: 2000 pcs. per reel

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

### Recommended Pad Layout



## 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.

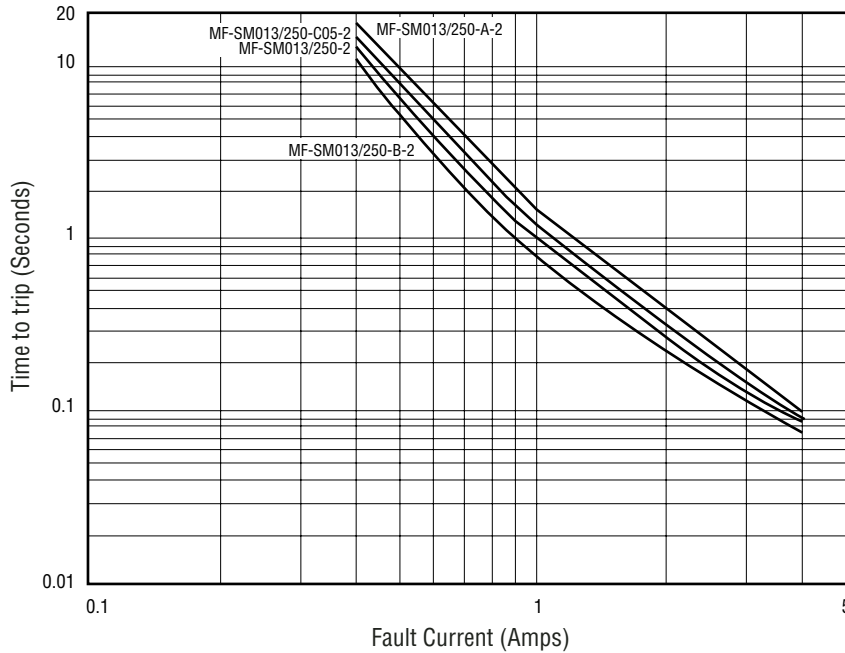
### Rework

- A device should not be reworked.

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

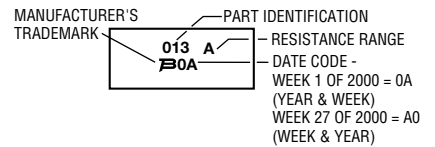


## Typical Time to Trip at 23 °C

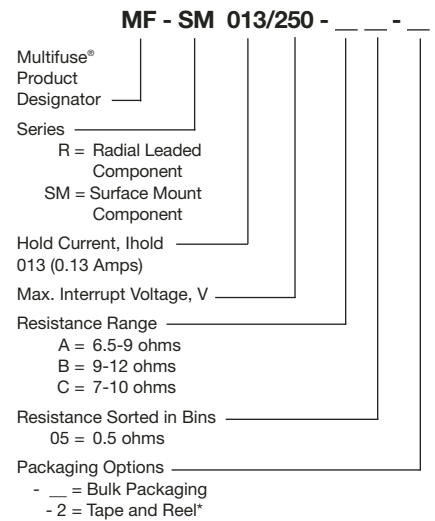


## Typical Part Marking

Represents total content. Layout may vary.



## How to Order



\*Packaged per EIA486-B

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-SM030, 050, 075, 100, 125, 260;  
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>	$\frac{1.5 + 0.1/-0.0}{(0.059 + 0.004/-0)}$	$\frac{1.5 + 0.1/-0.0}{(0.059 + 0.004/-0)}$
F	$\frac{7.5 \pm 0.1}{(0.295 + 0.004)}$	$\frac{7.5 \pm 0.1}{(0.295 + 0.004)}$
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>	$\frac{16.4 + 2.0/-0.0}{(0.646 + 0.079/-0)}$	$\frac{16.4 + 2.0/-0.0}{(0.646 + 0.079/-0)}$
W <sub>2</sub> max.	$\frac{22.4}{(0.882)}$	$\frac{22.4}{(0.882)}$

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

