



## 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		Max. Interrupt Ratings		$I_{hold}$	$I_{trip}$	Initial Resistance		One Hour Post-Trip Resistance	Nominal Time to Trip		Tripped Power Dissipation
	$V_{DC}$	$V_{AC}$	Amps	Amps at 23 °C		Ohms at 23 °C		Ohms at 23 °C	at 23 °C		Watts at 23 °C	
				Min.	Max.	Min.	Max.	Max.	Amps	Sec.	Typ.	
MF-SM013/250V	60	250	3	0.13	0.26	4.0	7.0	16.0	1.0	2.0	3.0	
MF-SM013/250V-B5	60	250	3	0.13	0.26	9.0	12.0	20.0	1.0	0.7	3.0	

### Environmental Characteristics

Item	Condition	Criteria
Operating Temperature	-40 °C to +85 °C	
Recommended Storage	+40 °C max. 70 % R.H. max.	
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	-55 °C to +125 °C, 10 times	±15 % typical resistance change
Solvent Resistance	MIL-STD-202, Method 215B	No change (marking still legible)
Vibration	MIL-STD-883C, Method 2007.1 Condition A	±5 % typical resistance change
Moisture Sensitivity Level (MSL)	<a href="#">See Note</a>	
ESD Classification - HBM	Class 6 (per AEC-Q200-2, HBM)	

### Additional Information

Click these links for more information:



[PRODUCT SELECTOR](#) [TECHNICAL LIBRARY](#) [INVENTORY](#) [SAMPLES](#) [CONTACT](#)

### Agency Recognition

Model	cUL	TÜV
		<a href="#">E174545</a>
MF-SM013/250V	✓	✓
MF-SM013/250V-B5	✓	✓



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

\*RoHS Directive 2015/863, Mar 31, 2015 and Annex. Specifications are subject to change without notice. Users should verify actual device performance in their specific applications. The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at [www.bourns.com/docs/legal/disclaimer.pdf](http://www.bourns.com/docs/legal/disclaimer.pdf).

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

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## Conformance Test Procedures and Requirements

Item	Test Conditions	Criteria
Visual/Mechanical	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
Solderability	245 °C $\pm$ 5 °C, 5 seconds	95 % min. coverage

## ITU Test Requirement for MF-SM013/250V

Item	Test Conditions	Criteria
Power Contact	230 Vrms, 10 $\Omega$ , hold under 15 minutes	Fail safe: no fire hazard arises on the DUT
Power Induction a	600 Vrms, 600 $\Omega$ , 0.2 sec. on / 60 sec. off for 10 cycles	No damage on DUT
Power Induction b	600 Vrms, 600 $\Omega$ , 1 sec. on / 60 sec. off for 10 cycles with GDT	No damage on DUT
Lightning Surge a	10 / 700 $\mu$ S, 1.5 kV / 40 $\Omega$ , 10 pulses	No damage on DUT
Lightning Surge b	10 / 700 $\mu$ S, 4.0 kV / 40 $\Omega$ , 10 pulses with GDT	No damage on DUT
Lightning Surge c	10 / 700 $\mu$ S, 1.5 kV / 40 $\Omega$ , 100 V incremental until fail	$V_{ptc}$ must be higher than 390V

## ITU Test Requirement for MF-SM013/250V-B5

Item	Test Conditions	Criteria
Power Contact	230 Vrms, 10 $\Omega$ , hold under 15 minutes	Fail safe: no fire hazard arises on the DUT
Power Induction	600 Vrms, 600 $\Omega$ , 0.2 sec. on / 60 sec. off for 5 cycles	No damage on DUT
Lightning Surge a	10 / 700 $\mu$ S, 1.5 kV / 40 $\Omega$ , 10 pulses	No damage on DUT
Lightning Surge b	10 / 700 $\mu$ S, 4.0 kV / 40 $\Omega$ , 10 pulses with GDT	No damage on DUT

## Thermal Derating Table - $I_{hold}$ (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	0.22	0.19	0.16	0.13	0.105	0.090	0.075	0.060	0.040
MF-SM013/250V-B5	0.22	0.19	0.16	0.13	0.105	0.090	0.075	0.060	0.040

$I_{trip}$  is approximately two times  $I_{hold}$ .

Specifications are subject to change without notice.

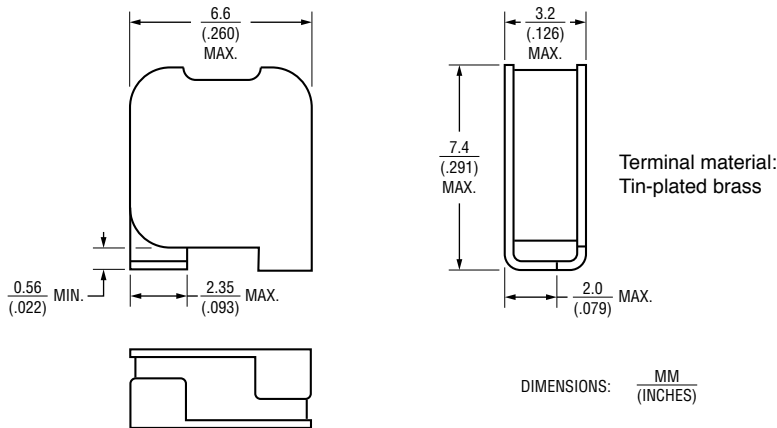
Users should verify actual device performance in their specific applications.

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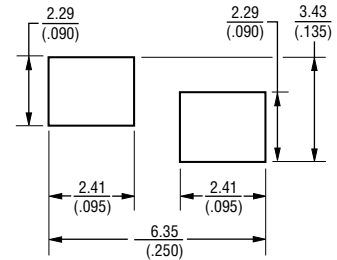
# MF-SM013/250V – Telecom PTC Resettable Fuses

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## Product Dimensions



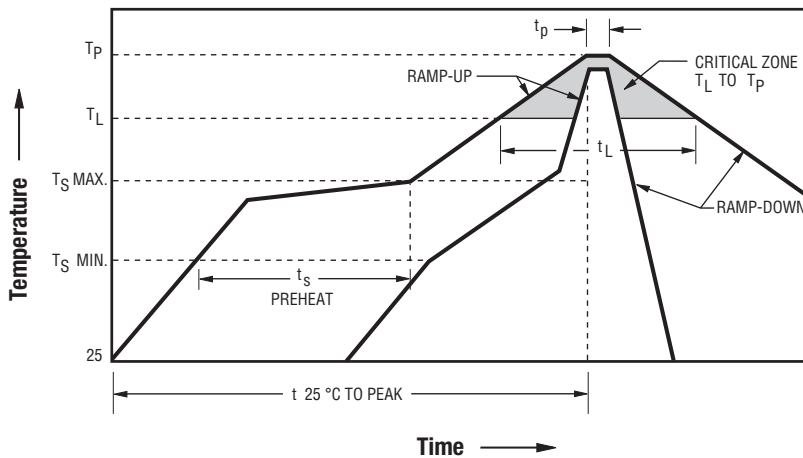
## Recommended Pad Layout



## Packaging Quantity

1,000 pieces per reel

## Solder Reflow Recommendations



### Notes:

- MF-SM/250V 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: Temperature Min. ( $T_{s_{min}}$ ) Temperature Max. ( $T_{s_{max}}$ ) Time ( $T_{s_{min}}$ to $T_{s_{max}}$ ) ( $t_s$ )	150 °C 200 °C 60~180 seconds
TIME MAINTAINED ABOVE: Temperature ( $T_L$ ) Time ( $t_L$ )	217 °C 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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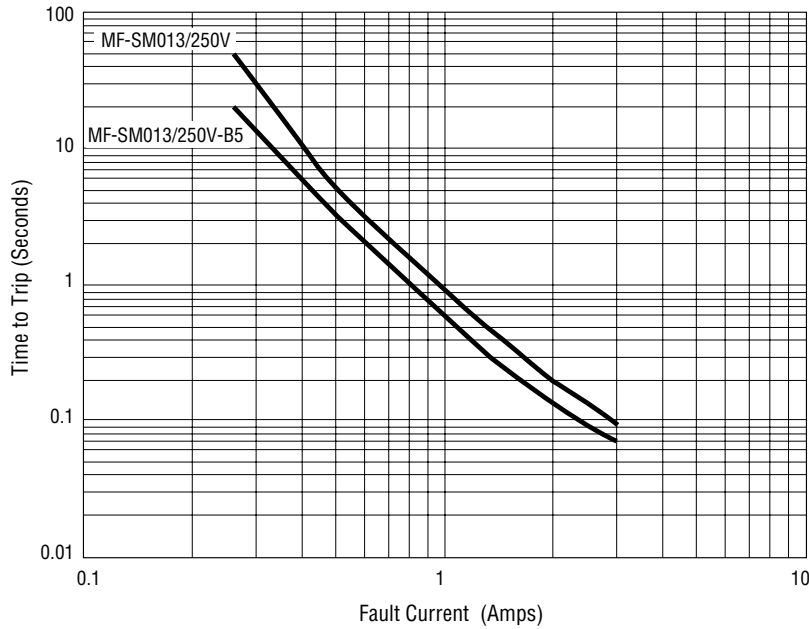
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# MF-SM013/250V – Telecom PTC Resettable Fuses

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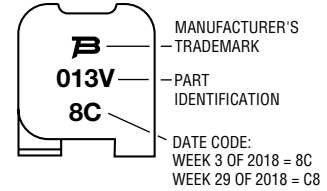
## Typical Time to Trip at 23 °C



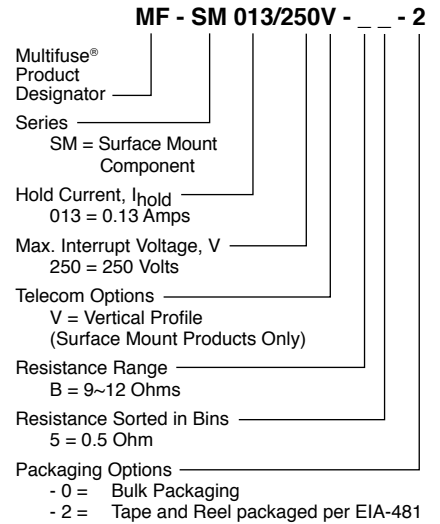
The Time to Trip curves represent typical performance of a device in a simulated application environment. Actual performance in specific customer applications may differ from these values due to the influence of other variables.

## Typical Part Marking

Represents total content. Layout may vary.



## How to Order



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# MF-SM013/250V Series Tape and Reel Specifications

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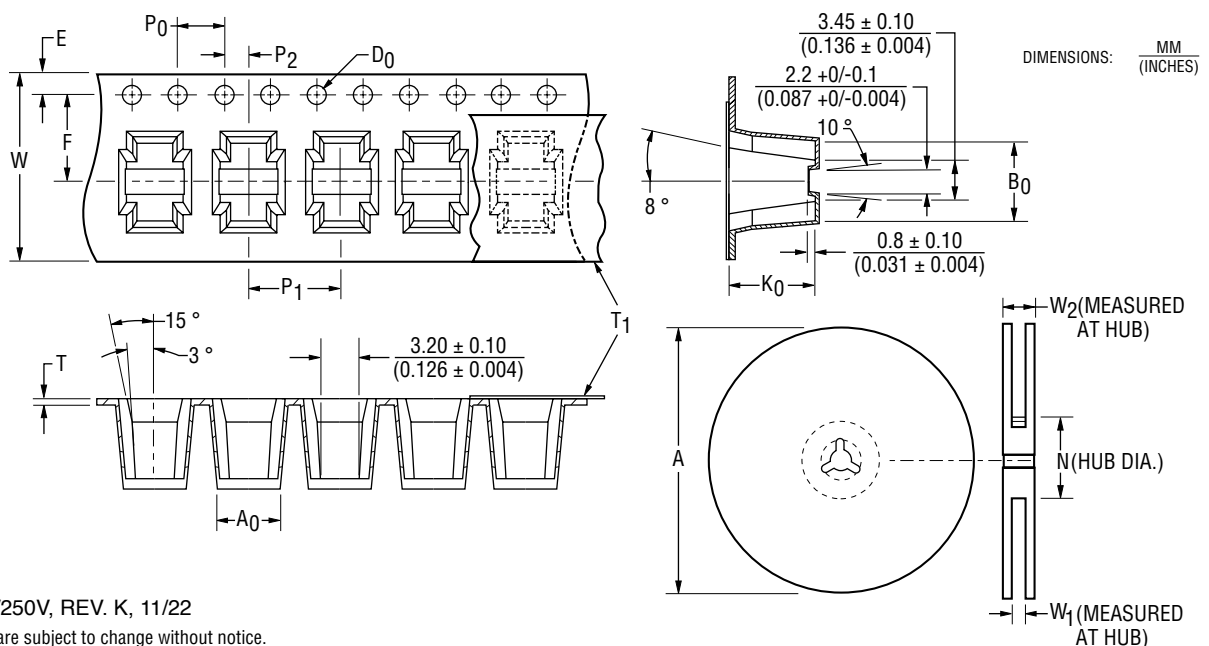
## Tape Dimensions per EIA-481

## MF-SM013/250V Series

W max.	$\frac{16.3}{(0.642)}$
P <sub>0</sub>	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$
10 P <sub>0</sub>	$\frac{40 \pm 0.20}{(1.575 \pm 0.008)}$
P <sub>1</sub>	$\frac{8.0 \pm 0.1}{(0.315 \pm 0.004)}$
P <sub>2</sub>	$\frac{2.0 \pm 0.1}{(0.079 \pm 0.004)}$
A <sub>0</sub>	$\frac{5.0 \pm 0.1}{(0.197 \pm 0.004)}$
B <sub>0</sub>	$\frac{6.66 \pm 0.1}{(0.262 \pm 0.004)}$
D <sub>0</sub>	$\frac{1.5 + 0.1/-0}{(0.059 + 0.004/-0)}$
F	$\frac{7.5 \pm 0.1}{(0.295 \pm 0.004)}$
E	$\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$
T	$\frac{0.5 \pm 0.05}{(0.020 \pm 0.002)}$
T <sub>1</sub> max.	$\frac{0.1}{(0.004)}$
K <sub>0</sub>	$\frac{7.45 \pm 0.1}{(0.293 \pm 0.004)}$
Leader min.	$\frac{390}{(15.35)}$
Trailer min.	$\frac{160}{(6.30)}$

## Reel Dimensions

A max.	$\frac{332}{(13.1)}$
N min.	$\frac{98}{(3.86)}$
W <sub>1</sub>	$\frac{16.4 + 2.0/-0}{(0.646 + 0.079/-0)}$
W <sub>2</sub> max.	$\frac{22.4}{(0.882)}$



MF-SM013/250V, REV. K, 11/22

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**Application Notice**

- 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)

MFAN 12/18

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Bourns® products are not recommended, authorized or intended for use in applications where failure or malfunction may result in personal injury, death, or severe property or environmental damage, such as without limitation nuclear, life-critical medical and certain automotive and aviation applications. Except as set forth in the bullet points below or unless expressly and specifically approved in writing on a case-by-case basis by an authorized Bourns' representative, use of any Bourns® products in such unauthorized high-risk applications is at the user's sole risk.

- Bourns considers implantable/invasive devices and devices/procedures designed as life-supporting or life-sustaining by the U.S. Food and Drug Administration or equivalent organizations outside of the United States as "life-critical" medical applications. Bourns expressly identifies those Bourns® standard products that are suitable for use in typical medical applications that are not life-critical in its publication entitled "Bourns Medical Grade Component Guide."
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- Bourns expressly identifies Bourns® standard products that are suitable for use in the typical aviation applications/systems requiring System Design Assurance Level (RTCA DO-254 DAL) of C, D or E in its publication entitled "Bourns Civilian Aerospace/Aviation Grade Component Guide." Bourns does not test its products for compliance with United States Federal Aviation Administration standards or any other generally equivalent governmental organization standard applicable to products designed or manufactured for use in aviation applications. Use of Bourns® standard components in aviation applications associated with RTCA DO-254 DAL A or B without proper approval noted above shall be at the user's sole risk.
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