

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)	See Note	
ESD Classification - HBM	Class 6 (per AEC-Q200-2, HBM)	

Agency Recognition

Model	cUL	TÜV
	E174545	R50362083
MF-SM013/250V	✓	✓
MF-SM013/250V-B5	✓	✓

Additional Information

Click these links for more information:

PRODUCT SELECTOR | TECHNICAL LIBRARY | INVENTORY | SAMPLES | CONTACT

CALIFORNIA WARNING: Can expose you to lead, a carcinogen and reproductive toxicant.
See www.P65Warnings.ca.gov

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

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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	$R_{min} \le R \le R_{max}$
Time to Trip	At specified current, V_{max}, 23 °C	T ≤ max. time to trip (seconds)
Hold Current	30 min. at I_{hold}	No trip
Solderability	245 °C ±5 °C, 5 seconds	95 % min. coverage

ITU Test Requirement for MF-SM013/250V

Item	Test Conditions	Criteria
Power Contact	230 Vrms, 10 Ω, hold under 15 minutes	Fail safe: no fire hazard arises on the DUT
Power Induction a	600 Vrms, 600 Ω, 0.2 sec. on / 60 sec. off for 10 cycles	No damage on DUT
Power Induction b	600 Vrms, 600 Ω, 1 sec. on / 60 sec. off for 10 cycles with GDT	No damage on DUT
Lightning Surge a	10 / 700 µS, 1.5 kV / 40 Ω, 10 pulses	No damage on DUT
Lightning Surge b	10 / 700 µS, 4.0 kV / 40 Ω, 10 pulses with GDT	No damage on DUT
Lightning Surge c	10 / 700 µS, 1.5 kV / 40 Ω, 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 Ω, hold under 15 minutes	Fail safe: no fire hazard arises on the DUT
Power Induction	600 Vrms, 600 Ω, 0.2 sec. on / 60 sec. off for 5 cycles	No damage on DUT
Lightning Surge a	10 / 700 µS, 1.5 kV / 40 Ω, 10 pulses	No damage on DUT
Lightning Surge b	10 / 700 µS, 4.0 kV / 40 Ω, 10 pulses with GDT	No damage on DUT

Thermal Derating Table - I_{hold} (Amps)

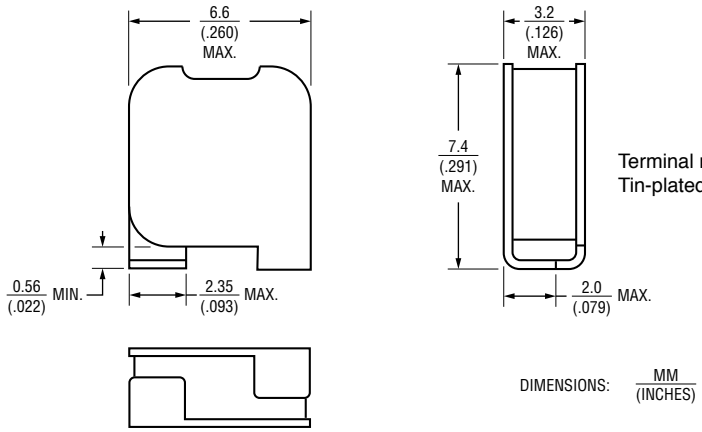
Model	Ambient Operating Temperature								
	-40 °C	-20 °C	0 °C	23 °C	40 °C	50 °C	60 °C	70 °C	85 °C
MF-SM013/250V	0.22	0.19	0.16	0.13	0.105	0.090	0.075	0.060	0.040
MF-SM013/250V-B5	0.22	0.19	0.16	0.13	0.105	0.090	0.075	0.060	0.040

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

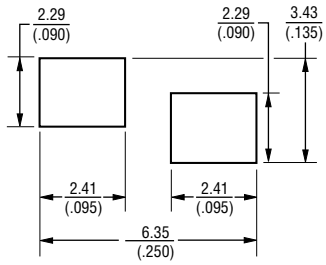
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Product Dimensions



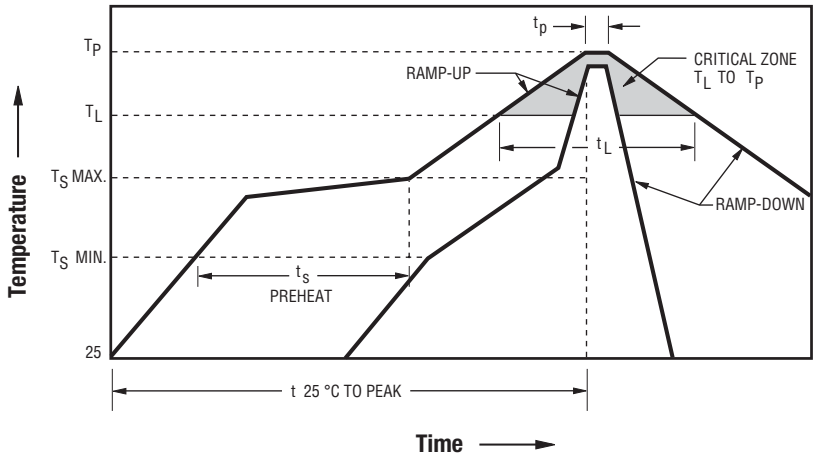
Recommended Pad Layout



Packaging Quantity

1,000 pieces per reel

Solder Reflow Recommendations



Notes:

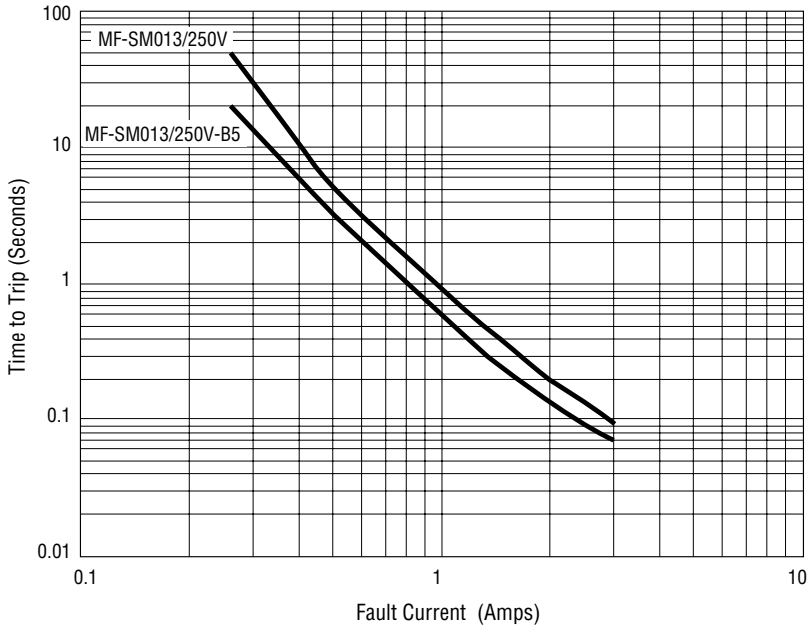
- MF-SM/250V models are intended for reflow soldering (including but not limited to heating plate, hot air, IR, nitrogen, and vapor phase).
- Wave soldering is permissible only if the device is on the top of the PCB, opposite the heat source.
- Hand soldering is not recommended for these devices.
- All 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 (Ts_{max} to T_p)	3 °C / second max.
PREHEAT: Temperature Min. (Ts_{min}) Temperature Max. (Ts_{max}) Time (Ts_{min} to Ts_{max}) (ts)	 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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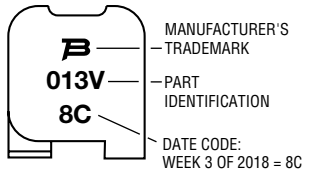
Typical Time to Trip at 23 °C



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

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

Multifuse® Product Designator

Series
SM = Surface Mount Component

Hold Current, I_{hold}
013 = 0.13 Amps

Max. Interrupt Voltage, V
250 = 250 Volts

Telecom Options
V = Vertical Profile
(Surface Mount Products Only)

Resistance Range
B = 9~12 Ohms

Resistance Sorted in Bins
5 = 0.5 Ohm

Packaging Options
- 0 = Bulk Packaging
- 2 = Tape and Reel packaged per EIA-481

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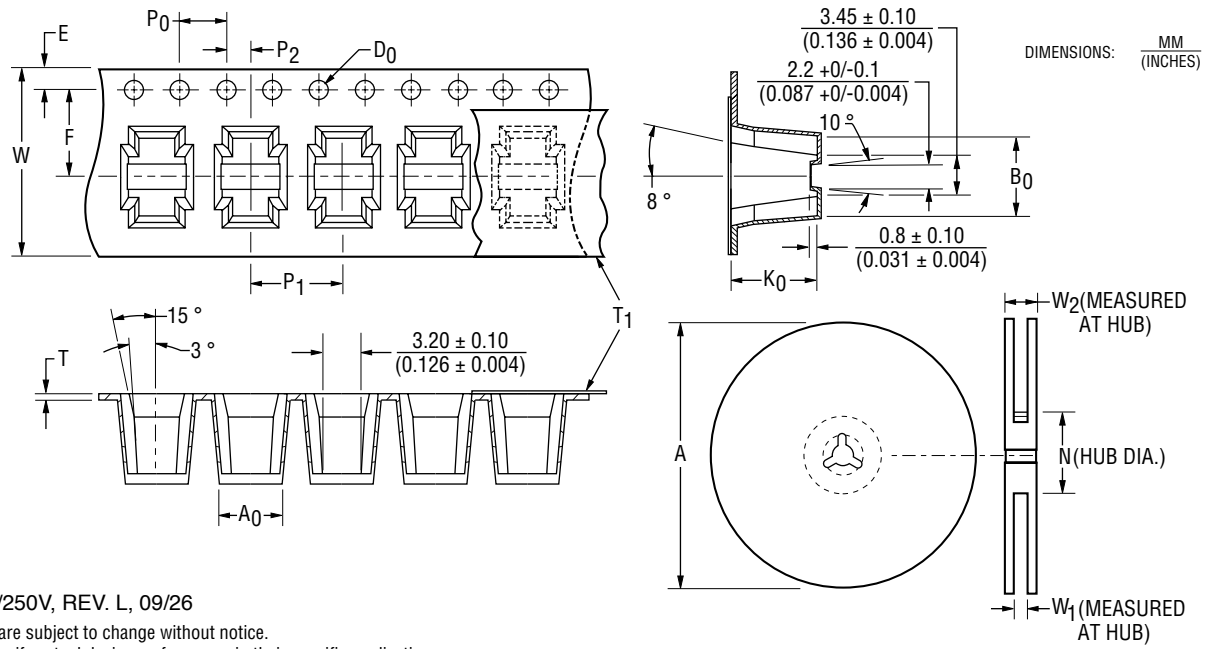
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MF-SM013/250V Series Tape and Reel Specifications

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Tape Dimensions per EIA-481	MF-SM013/250V Series
W max.	16.3 (0.642)
P_0	4.0 ± 0.1 (0.157 ± 0.004)
10 P_0	40 ± 0.20 (1.575 ± 0.008)
P_1	8.0 ± 0.1 (0.315 ± 0.004)
P_2	2.0 ± 0.1 (0.079 ± 0.004)
A_0	5.0 ± 0.1 (0.197 ± 0.004)
B_0	6.66 ± 0.1 (0.262 ± 0.004)
D_0	1.5 +0.1/-0 (0.059 +0.004/-0)
F	7.5 ± 0.1 (0.295 ± 0.004)
E	1.75 ± 0.1 (0.069 ± 0.004)
T	0.5 ± 0.05 (0.020 ± 0.002)
T_1 max.	0.1 (0.004)
K_0	7.45 ± 0.1 (0.293 ± 0.004)
Leader min.	390 (15.35)
Trailer min.	160 (6.30)
Reel Dimensions	
A max.	332 (13.1)
N min.	98 (3.86)
W_1	16.4 +2.0/-0 (0.646 +0.079/-0)
W_2 max.	22.4 (0.882)



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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

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