

Features

- Compliant with AEC-Q200 Rev-D Stress Test Qualification for Passive Components in Automotive Applications
- Fast tripping resettable circuit protection
- Surface mount packaging for automated assembly
- Small footprint size (1210)
- RoHS compliant* and halogen free**
- Agency recognition: cULus

Some models are currently available but not recommended for new designs.

MF-USMF Series - PTC Resettable Fuses

Electrical Characteristics

Model	$V_{max.}$	$I_{max.}$	I_{hold}	I_{trip}	Resistance		Max. Time to Trip		Tripped Power Dissipation	Agency Recognition		AEC-Q200 Compliance
			at 23 °C		Ohms at 23 °C		at 23 °C		Typ. at 23 °C	cUL	TÜV	
	Volts	Amps	Amps		R_{min}	R_{1max}	Amps	Sec.	Watts	E174545	R50256634	
MF-USMF005	30	10	0.05	0.15	2.80	50.00	0.25	1.50	0.6	✓	✓	✓
MF-USMF010	30	10	0.10	0.30	0.80	15.00	0.50	0.60	0.6	✓	✓	✓
MF-USMF020	30	10	0.20	0.40	0.40	5.00	8.00	0.02	0.6	✓	✓	✓
MF-USMF035	6	40	0.35	0.75	0.20	1.30	8.00	0.20	0.6	✓	✓	
MF-USMF050	13.2	40	0.50	1.00	0.18	0.90	8.00	0.10	0.6	✓	✓	✓
MF-USMF075	6	40	0.75	1.50	0.07	0.45	8.00	0.10	0.6	✓	✓	
MF-USMF110	6	40	1.10	2.20	0.05	0.21	5.00	1.00	0.6	✓	✓	
MF-USMF150	6	40	1.50	3.00	0.03	0.11	5.00	5.00	0.6	✓	✓	
MF-USMF175	6	40	1.75	3.50	0.02	0.09	8.00	1.00	0.7	✓	✓	
MF-USMF175X	6	40	1.75	3.50	0.02	0.08	8.00	1.00	0.7	✓	✓	
MF-USMF200X	6	40	2.00	4.00	0.02	0.08	8.00	1.00	0.7	✓	✓	

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	±5 % typical resistance change
Humidity Aging	+85 °C, 85 % R.H. 1000 hours	±5 % typical resistance change
Thermal Shock	-40 °C to +85 °C, 20 times	±10 % typical resistance change
Solvent Resistance	MIL-STD-202, Method 215	No change (marking still legible)
Vibration	MIL-STD-883C, Method 2007.1 Condition A	No change ($R_{min} < R < R_{1max}$)
Moisture Sensitivity Level (MSL)	See Note	
ESD Classification	Class 6 (per AEC-Q200-2, HBM)	

Additional Information

Click these links for more information:

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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.
** Bourns considers a product to be "halogen free" if (a) the Bromine (Br) content is 900 ppm or less; (b) the Chlorine (Cl) content is 900 ppm or less; and (c) the total Bromine (Br) and Chlorine (Cl) content is 1500 ppm or less.

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Applications

- Game consoles
- PC motherboards
- USB port protection - USB 2.0, 3.0 & OTG
- HDMI 1.4 Source protection
- IEEE 1394 ports
- Mobile phones
- Digital cameras

Test Procedures and Requirements

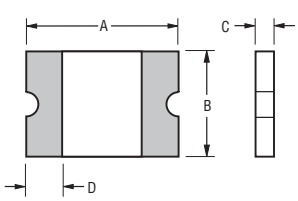
Item	Test Conditions	Accept/Reject Criteria
Visual/Mechanical	Verify dimensions and materials	Per MF physical description
Resistance	In still air @ 23 °C	$R_{min} \le R \le R_{max}$
Time to Trip	At specified current, V_{max}, 23 °C	T ≤ max. time to trip (seconds)
Hold Current	30 min. at I_{hold}	No trip
Trip Cycle Life	V_{max}, I_{max}, 100 cycles	No arcing or burning
Trip Endurance	V_{max}, 48 hours	No arcing or burning
Solderability	245 °C ± 5 °C, 5 seconds	95 % min. coverage

Product Dimensions

Model	A		B		C		D
	Min.	Max.	Min.	Max.	Min.	Max.	Min.
MF-USMF005	3.00 (0.118)	3.43 (0.135)	2.35 (0.093)	2.80 (0.110)	0.80 (0.031)	1.1 (0.043)	0.30 (0.012)
MF-USMF010	3.00 (0.118)	3.43 (0.135)	2.35 (0.093)	2.80 (0.110)	0.80 (0.031)	1.1 (0.043)	0.30 (0.012)
MF-USMF020	3.00 (0.118)	3.43 (0.135)	2.35 (0.093)	2.80 (0.110)	0.80 (0.031)	1.1 (0.043)	0.30 (0.012)
MF-USMF035	3.00 (0.118)	3.43 (0.135)	2.35 (0.093)	2.80 (0.110)	0.55 (0.022)	0.85 (0.033)	0.30 (0.012)
MF-USMF050	3.00 (0.118)	3.43 (0.135)	2.35 (0.093)	2.80 (0.110)	0.55 (0.022)	0.85 (0.033)	0.30 (0.012)
MF-USMF075	3.00 (0.118)	3.43 (0.135)	2.35 (0.093)	2.80 (0.110)	0.55 (0.022)	0.85 (0.033)	0.30 (0.012)
MF-USMF110	3.00 (0.118)	3.43 (0.135)	2.35 (0.093)	2.80 (0.110)	0.55 (0.022)	0.85 (0.033)	0.30 (0.012)
MF-USMF150	3.00 (0.118)	3.43 (0.135)	2.35 (0.093)	2.80 (0.110)	0.40 (0.016)	0.85 (0.033)	0.30 (0.012)
MF-USMF175	3.00 (0.118)	3.43 (0.135)	2.35 (0.093)	2.80 (0.110)	0.40 (0.016)	0.85 (0.033)	0.30 (0.012)
MF-USMF175X	3.00 (0.118)	3.43 (0.135)	2.35 (0.093)	2.80 (0.110)	0.40 (0.016)	0.85 (0.033)	0.30 (0.012)
MF-USMF200X	3.00 (0.118)	3.43 (0.135)	2.35 (0.093)	2.80 (0.110)	0.40 (0.016)	0.85 (0.033)	0.30 (0.012)

DIMENSIONS: MM (INCHES)

Top and Bottom View *Side View*

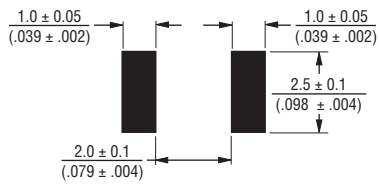


Terminal material:
Electroless Ni under immersion Au

Packaging Quantity

3000 pcs. per reel

Recommended Pad Layout



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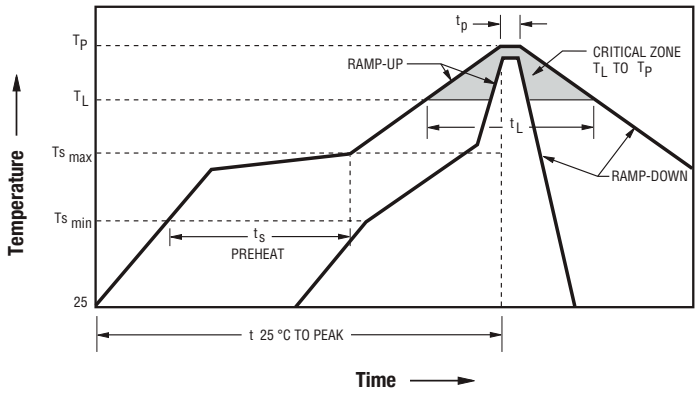
Solder Reflow Recommendations



Notes:

- MF-USMF 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 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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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-USMF005	0.08	0.07	0.06	0.05	0.04	0.04	0.03	0.03	0.02
MF-USMF010	0.15	0.13	0.12	0.10	0.09	0.08	0.07	0.06	0.05
MF-USMF020	0.32	0.28	0.24	0.20	0.18	0.16	0.14	0.12	0.10
MF-USMF035	0.51	0.46	0.40	0.35	0.30	0.27	0.24	0.22	0.18
MF-USMF050	0.76	0.66	0.58	0.50	0.42	0.38	0.35	0.29	0.26
MF-USMF075	1.10	0.97	0.86	0.75	0.64	0.58	0.55	0.47	0.39
MF-USMF110	1.60	1.42	1.26	1.10	0.94	0.86	0.80	0.70	0.58
MF-USMF150	2.30	2.02	1.76	1.50	1.24	1.11	1.00	0.85	0.65
MF-USMF175	2.80	2.45	2.10	1.75	1.55	1.45	1.35	1.25	1.10
MF-USMF175X	2.80	2.45	2.10	1.75	1.55	1.45	1.35	1.25	1.10
MF-USMF200X	3.06	2.68	2.32	2.00	1.78	1.58	1.48	1.38	1.22

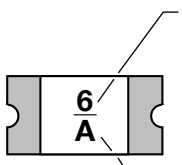
How to Order

MF - USMF 010 X - 2

- Multifuse® Product Designator
- Series
  - USMF = 1210 Surface Mount Component
- Hold Current, Ihold
  - 005-200 (0.05-2.00 Amps)
- Multifuse® freeXpansion™ Design
- Packaging
  - -2 = Tape and Reel packaged per EIA 481-1

Typical Part Marking

Represents total content. Layout may vary.



PART IDENTIFICATION:
MF-USMF005 = 0
MF-USMF010 = 1
MF-USMF020 = 2
MF-USMF035 = 3
MF-USMF050 = 4
MF-USMF075 = 5
MF-USMF110 = 6
MF-USMF150 = 8
MF-USMF175 = 9
MF-USMF175X = 9
MF-USMF200X = A

BIWEEKLY DATE CODE:
WEEK 1 AND 2 = A
WEEK 51 AND 52 = Z

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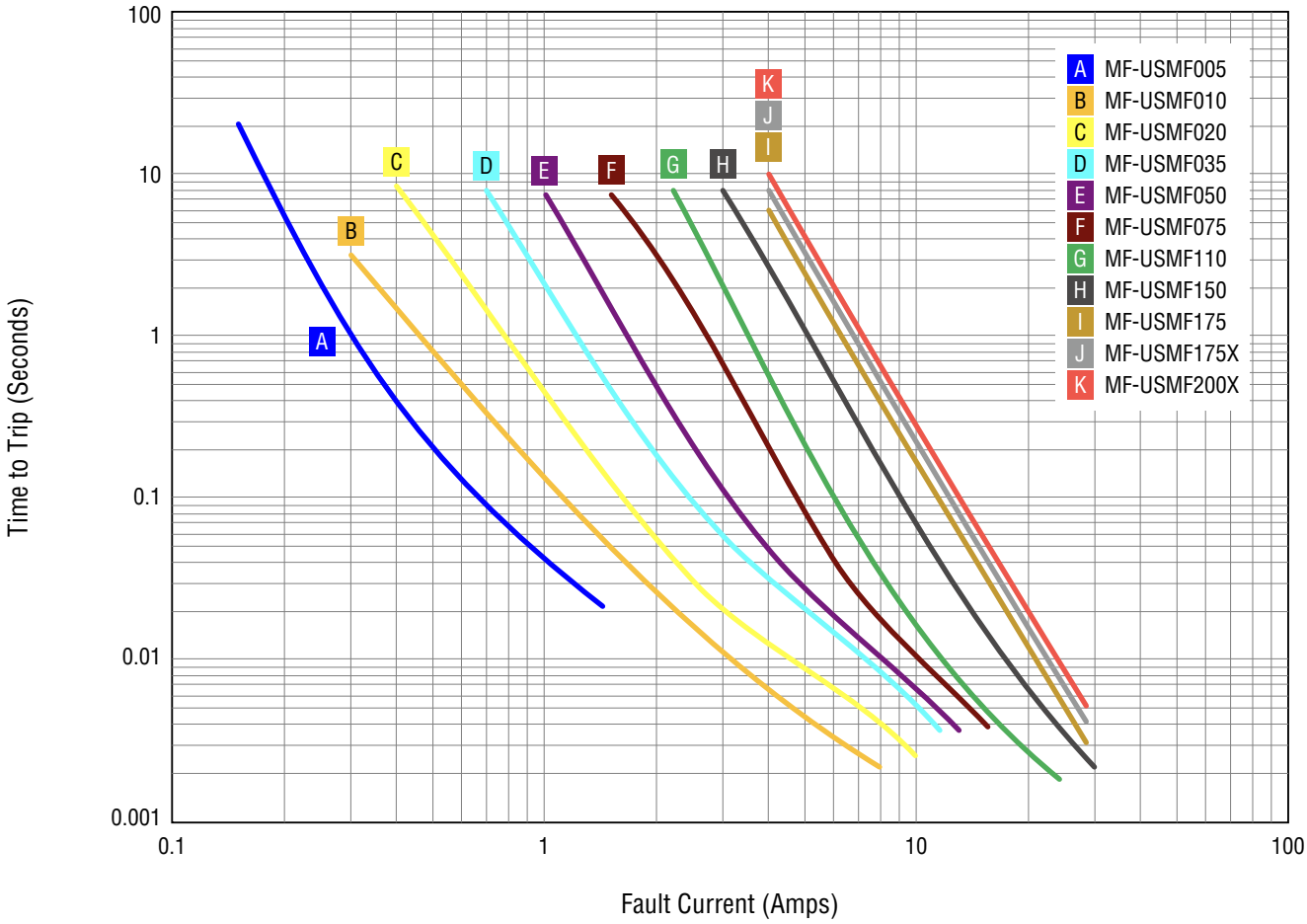
Typical Time to Trip at 23 °C



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MF-USMF Series Tape and Reel Specifications

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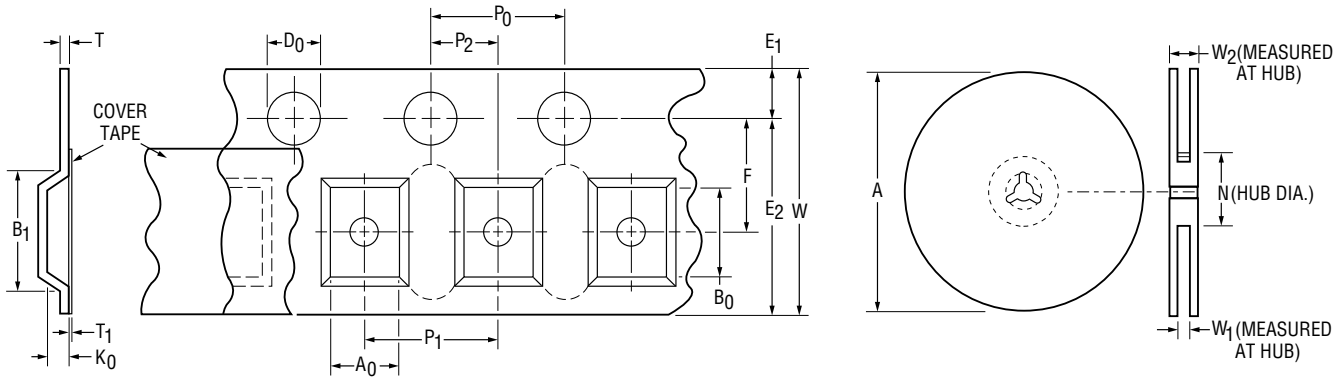
Tape Dimensions	MF-USMF005 ~ MF-USMF110 per EIA-481	MF-USMF150 ~ MF-USMF200X per EIA-481
W	8.0 ± 0.3 (.315 ± .012)	8.0 ± 0.3 (.315 ± .012)
P_0	4.0 ± 0.1 (.157 ± .004)	4.0 ± 0.1 (.157 ± .004)
P_1	4.0 ± 0.1 (.157 ± .004)	4.0 ± 0.1 (.157 ± .004)
P_2	2.0 ± 0.05 (.079 ± .002)	2.0 ± 0.05 (.079 ± .002)
A_0	2.86 ± 0.10 (.113 ± .004)	3.00 ± 0.10 (.118 ± .004)
B_0	3.50 ± 0.10 (.138 ± .004)	3.65 ± 0.10 (.144 ± .004)
B_1 max.	4.35 (.171)	4.35 (.171)
D_0	1.5 +0.1/-0 (.059 +.004/-0)	1.5 +0.1/-0 (.059 +.004/-0)
F	3.5 ± 0.05 (.138 ± .002)	3.5 ± 0.05 (.138 ± .002)
E_1	1.75 ± 0.10 (.069 ± .004)	1.75 ± 0.10 (.069 ± .004)
E_2 min.	6.25 (.246)	6.25 (.246)
T max.	0.6 (.024)	0.6 (.024)
T_1 max.	0.1 (.004)	0.1 (.004)
K_0	1.07 ± 0.10 (.042 ± .004)	0.85 ± 0.10 (.033 ± .004)
Leader min.	390 (15.35)	390 (15.35)
Trailer min.	160 (6.30)	160 (6.30)
Reel Dimensions		
A max.	185 (7.283)	185 (7.283)
N min.	50 (1.97)	50 (1.97)
W_1	8.4 +1.5/-0 (.331 +.059/-0)	8.4 +1.5/-0 (.331 +.059/-0)
W_2 max.	14.4 (.567)	14.4 (.567)

DIMENSIONS: MM (INCHES)



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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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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."

- Bourns expressly identifies those Bourns® standard products that are suitable for use in typical automotive applications associated with any Automotive Safety Integrity Level (ASIL) in its publication entitled "Bourns Automotive Grade Component Guide." Bourns' designation of Bourns® product as compliant with the AEC-Q standard does not by itself mean that Bourns has approved such product for use in an automotive application.

- 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.

- Bourns will review and authorize on a case-by-case basis the use of Bourns® standard products which are at least AEC-Q compliant in space-related civil applications (rockets, satellites) with a negotiated cross-waiver and indemnity agreement.

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