

### **Features**

- Compliant with AEC-Q200 Rev-C- Stress Test Qualification for Passive Components in Automotive Applications
- Surface Mount Devices
- Fully compatible with current industry standards
- Packaged per EIA 481-2 standard
- RoHS compliant\* and halogen free\*\*
- Agency recognition: ¶ ⑤
- Patents pending



# MF-SM Series - PTC Resettable Fuses

### **Electrical Characteristics**

	V max.	l max	l <sub>hold</sub>	I <sub>trip</sub>	Resis	stance	Max. Time To Trip		Tripped Power Dissipation
Model	Volts	Amps		eres 3 °C		Ohms at 23 °C		Amperes Seconds at 23 °C at 23 °C	
			Hold	Trip	R Min.	R1 Max.		Max.	Typ.
MF-SM030	60	40	0.30	0.60	0.90	4.80	1.5	3.0	1.7
MF-SM050	60	40	0.50	1.00	0.35	1.40	2.5	4.0	1.7
MF-SM075	30	80	0.75	1.50	0.23	1.00	8.0	0.3	1.7
MF-SM075/60*	60	10	0.75	1.50	0.23	1.00	8.0	0.3	1.7
MF-SM100	30	80	1.10	2.20	0.12	0.48	8.0	0.5	1.7
MF-SM100/33	33	40	1.10	2.20	0.12	0.41	8.0	0.5	1.7
MF-SM125	15	100	1.25	2.50	0.07	0.25	8.0	2.0	1.7
MF-SM150	15	100	1.50	3.00	0.06	0.25	8.0	5.0	1.9
MF-SM150/33	33	40	1.50	3.00	0.06	0.23	8.0	5.0	1.9
MF-SM185/33	33	40	1.80	3.60	0.04	0.15	8.0	5.0	1.9
MF-SM200	15	100	2.00	4.00	0.045	0.125	8.0	12.0	1.9
MF-SM250	15	100	2.50	5.00	0.024	0.085	8.0	25.0	1.9
MF-SM260	6	100	2.60	5.20	0.025	0.075	8.0	20.0	1.7
MF-SM300**	6	100	3.00	6.00	0.015	0.048	8.0	35.0	1.5

<sup>\*</sup>CSA recognition pending.

### **Environmental Characteristics**

Operating Temperature	-40 °C to +85 °C	
Maximum Device Surface Temperature		
in Tripped State		
Passive Aging		
Humidity Aging	+85 °C, 85 % R.H. 7 days	±5 % typical resistance change
Thermal Shock	MIL-STD-202F, Method 107G,	±10 % typical resistance change
	+125 °C to -55 °C,10 cycles	
Vibration	MIL-STD-883C, Method 2007.1, Condition A	No change

### **Test Procedures And Requirements For Model MF-SM Series**

Test	Test Conditions	Accept/Reject Criteria
Visual/Mech	Verify dimensions and materials	Per MF physical description
Resistance	In still air @ 23 °C	Rmin ≤ R ≤ R1max
Time to Trip	At specified current, Vmax, 23 °C	T ≤ max. time to trip (seconds)
Hold Current	30 min. at Ihold	No trip
Trip Cycle Life	Vmax, Imax, 100 cycles	No arcing or burning
Trip Endurance	Vmax, 48 hours	No arcing or burning
Solderability	MIL-STD-202F, Method 208F	95 % min. coverage
UL File Number E174545 CSA File Number CA110338 TÜV Certificate Number R 02057213	http://www.ul.com/ Follow link to Certifications, the http://directories.csa-international.org/ Under "Cert http://www.tuvdotcom.com/ Follow link to "other ce	ification Record" and "File Number" enter 110338-0-000

### Thermal Derating Chart - Ihold (Amps)

NA1 - 1	Ambient Operating Temperature											
Model	-40 °C	-20 °C	0 ℃	23 °C	40 °C	50 °C	60 °C	70 °C	85 °C			
MF-SM030	0.45	0.40	0.35	0.30	0.25	0.23	0.20	0.17	0.14			
MF-SM050	0.76	0.67	0.59	0.50	0.42	0.38	0.33	0.29	0.23			
MF-SM075	1.11	0.99	0.84	0.75	0.63	0.57	0.49	0.45	0.36			
MF-SM075/60	1.11	0.99	0.84	0.75	0.63	0.57	0.49	0.45	0.36			
MF-SM100	1.66	1.47	1.29	1.10	0.91	0.83	0.73	0.64	0.50			
MF-SM100/33	1.66	1.47	1.29	1.10	0.91	0.83	0.73	0.64	0.50			
MF-SM125	1.89	1.68	1.46	1.25	1.04	0.94	0.83	0.73	0.56			
MF-SM150	2.27	2.01	1.76	1.50	1.25	1.13	0.99	0.87	0.68			
MF-SM150/33	2.27	2.01	1.76	1.50	1.25	1.13	0.99	0.87	0.68			
MF-SM185/33	2.56	2.32	2.08	1.85	1.60	1.44	1.28	1.12	0.88			
MF-SM200	3.02	2.68	2.34	2.00	1.66	1.50	1.32	1.16	0.90			
MF-SM250	3.78	3.35	2.93	2.50	2.08	1.88	1.65	1.45	1.13			
MF-SM260	3.64	3.25	2.91	2.60	2.26	2.08	1.95	1.74	1.48			
MF-SM300	4.13	3.75	3.30	2.87	2.62	2.43	2.25	2.00	1.78			

I<sub>trip</sub> is approximately two times I<sub>hold</sub>.

<sup>\*\*</sup>UL approved, CSA & TUV approval pending.

<sup>\*</sup>RoHS Directive 2002/95/EC Jan 27, 2003 including Annex.
\*\*To be considered halogen free, each homogenous material can have a maximum concentration of 900 ppm of either bromine or chlorine. Specifications are subject to change without notice.

### **Applications**

Almost anywhere there is a low voltage power supply and a load to be protected, including:

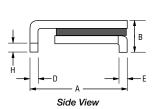
- Computers & peripherals
- General electronics
- Automotive applications

# MF-SM Series - PTC Resettable Fuses

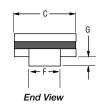
### **Product Dimensions**

Model	Δ.		В	С		D		E		=		G	н
	Min.	Max.	Max.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
MF-SM030	6.73 (0.265)	7.98 (0.314)	3.18 (0.125)	5.44 (0.214)	0.56 (0.022)	<u>0.71</u> (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM050	<u>6.73</u> (0.265)	7.98 (0.314)	3.18 (0.125)	<u>5.44</u> (0.214)	<u>0.56</u> (0.022)	<u>0.71</u> (0.028)	<u>0.56</u> (0.022)	<u>0.71</u> (0.028)	2.16 (0.085)	<u>2.41</u> (0.095)	<u>0.66</u> (0.026)	<u>1.37</u> (0.054)	<u>0.43</u> (0.017)
MF-SM075	$\frac{6.73}{(0.265)}$	7.98 (0.314)	3.18 (0.125)	$\frac{5.44}{(0.214)}$	$\frac{0.56}{(0.022)}$	$\frac{0.71}{(0.028)}$	$\frac{0.56}{(0.022)}$	$\frac{0.71}{(0.028)}$	2.16 (0.085)	2.41 (0.095)	$\frac{0.66}{(0.026)}$	$\frac{1.37}{(0.054)}$	0.43 (0.017)
MF-SM075/60	$\frac{6.73}{(0.265)}$	7.98 (0.314)	3.18 (0.125)	<u>5.44</u> (0.214)	$\frac{0.56}{(0.022)}$	$\frac{0.71}{(0.028)}$	$\frac{0.56}{(0.022)}$	$\frac{0.71}{(0.028)}$	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	$\frac{1.37}{(0.054)}$	$\frac{0.43}{(0.017)}$
MF-SM100	$\frac{6.73}{(0.265)}$	7.98 (0.314)	3.0 (0.118)	<u>5.44</u> (0.214)	<u>0.56</u> (0.022)	$\frac{0.71}{(0.028)}$	<u>0.56</u> (0.022)	$\frac{0.71}{(0.028)}$	2.16 (0.085)	<u>2.41</u> (0.095)	0.66 (0.026)	1.37 (0.054)	<u>0.43</u> (0.017)
MF-SM100/33	6.73 (0.265)	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)	0.56 (0.022)	$\frac{0.71}{(0.028)}$	0.56 (0.022)	$\frac{0.71}{(0.028)}$	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM125	6.73 (0.265)	7.98 (0.314)	3.0 (0.118)	<u>5.44</u> (0.214)	<u>0.56</u> (0.022)	$\frac{0.71}{(0.028)}$	<u>0.56</u> (0.022)	<u>0.71</u> (0.028)	2.16 (0.085)	<u>2.41</u> (0.095)	0.66 (0.026)	1.37 (0.054)	<u>0.43</u> (0.017)
MF-SM150	8.00 (0.315)	9.50 (0.374)	3.0 (0.118)	<u>6.71</u> (0.264)	<u>0.56</u> (0.022)	$\frac{0.71}{(0.028)}$	<u>0.56</u> (0.022)	<u>0.71</u> (0.028)	3.68 (0.145)	3.94 (0.155)	<u>0.66</u> (0.026)	1.37 (0.054)	<u>0.43</u> (0.017)
MF-SM150/33	8.00 (0.315)	9.50 (0.374)	3.0 (0.118)	$\frac{6.71}{(0.264)}$	0.56 (0.022)	$\frac{0.71}{(0.028)}$	0.56 (0.022)	$\frac{0.71}{(0.028)}$	3.68 (0.145)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM185/33	8.00 (0.315)	9.50 (0.374)	3.0 (0.118)	6.71 (0.264)	0.56 (0.022)	<u>0.71</u> (0.028)	0.56 (0.022)	<u>0.71</u> (0.028)	3.68 (0.145)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM200	8.00 (0.315)	9.50 (0.374)	3.0 (0.118)	<u>6.71</u> (0.264)	<u>0.56</u> (0.022)	<u>0.71</u> (0.028)	<u>0.56</u> (0.022)	<u>0.71</u> (0.028)	3.68 (0.145)	3.94 (0.155)	<u>0.66</u> (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM250	8.00 (0.315)	9.50 (0.374)	3.0 (0.118)	6.71 (0.264)	0.56 (0.022)	<u>0.71</u> (0.028)	0.56 (0.022)	<u>0.71</u> (0.028)	3.68 (0.145)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	<u>0.43</u> (0.017)
MF-SM260	6.73 (0.265)	7.98 (0.314)	3.0 (0.118)	<u>5.44</u> (0.214)	<u>0.56</u> (0.022)	<u>0.71</u> (0.028)	<u>0.56</u> (0.022)	<u>0.71</u> (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	<u>0.43</u> (0.017)
MF-SM300	6.73 (0.265)	7.98 (0.314)	3.0 (0.118)	<u>5.44</u> (0.214)	<u>0.56</u> (0.022)	<u>0.71</u> (0.028)	<u>0.56</u> (0.022)	<u>0.71</u> (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	<u>0.43</u> (0.017)

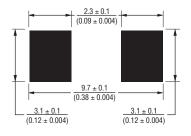
Packaging: TAPE & REEL: MF-SM030, 050, 075, 075/60, 100, 100/33, 125, 260, 300 = 2000 pcs. per reel; MF-SM150, 150/33, 185/33, 200, 250 = 1500 pcs. per reel.



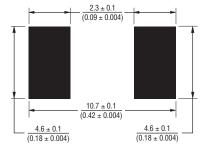




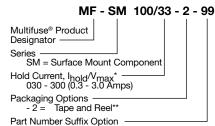
### Recommended Pad Layout MF-SM030, 050, 075, 075/60, 100, 100/33, 125, 260, 300



### Recommended Pad Layout MF-SM150, 150/33, 185/33, 200, 250



### **How to Order**



- 99 = As of date code April 1, 2005 all MF-SM models are RoHS compli-ant. The suffix "-99" can be used if a new part number is required to reference the RoHS compliance.

Examples: MF-SM030-2..... .Tape and reel packaging MF-SM030-2-99...... Tape and reel packaging with part number suffix option MF-SM150-2..... Tape and reel packaging MF-SM150/33-2-99 .. Tape and reel packaging with part number suffix option

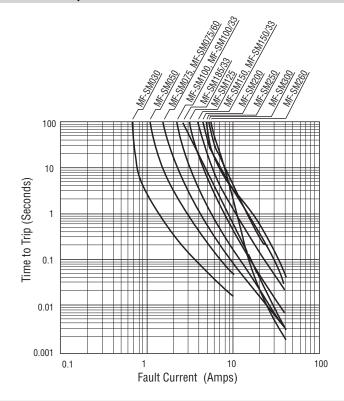
Vmax entry applies only to models MF-SM075/60, MF-SM100/33, MF-SM150/33 & MF-SM185/33.
Packaged per EIA-481-2

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.

# MF-SM Series - PTC Resettable Fuses

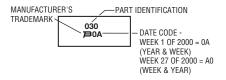
### BOURNS

### Typical Time to Trip at 23 °C

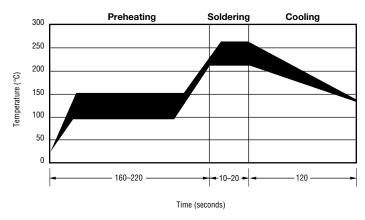


### **Typical Part Marking**

Represents total content. Layout may vary.



### **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-SM SERIES, REV. P, 11/10

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

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

Tape Dimensions	MF-SM030, 050, 075, 100, 125, 260, 300; MF-SM075/60; MF-SM-100/33 per EIA-481-2	MF-SM150, 200, 250; MF-SM-150/33, MF-SM-185/33; MF-SM013/250 per EIA 481-2
W	16.0 ± 0.3	16.0 ± 0.3
vv	$(0.630 \pm 0.012)$	$(0.630 \pm 0.012)$
$P_0$	$\frac{4.0 \pm 0.1}{4.0 \pm 0.1}$	$4.0 \pm 0.1$
. 0	$(0.157 \pm 0.004)$	(0.157 ± 0.004)
P <sub>1</sub>	$\frac{8.0 \pm 0.1}{(0.315 \pm 0.004)}$	$\frac{12.0 \pm 0.1}{(0.472 \pm 0.004)}$
	2.0 ± 0.1	2.0 ± 0.1
$P_2$	$\frac{2.0 \pm 0.1}{(0.079 \pm 0.004)}$	$\frac{2.0 \pm 0.1}{(0.079 \pm 0.004)}$
	5.7 ± 0.1	6.9 ± 0.1
A <sub>0</sub>	$\frac{0.024 \pm 0.004}{0.224 \pm 0.004}$	0.00000000000000000000000000000000000
D .	8.1 ± 0.1	9.6 ± 0.1
В <sub>0</sub>	$(0.319 \pm 0.004)$	$(0.378 \pm 0.004)$
B <sub>1</sub> max.	<u>12.1</u>	<u>12.1</u>
B   max.	(0.476)	(0.476)
$D_0$	1.5 + 0.1/-0.0	1.5 + 0.1/-0.0
0	(0.059 + 0.004/-0)	(0.059 + 0.004/-0)
F	$\frac{7.5 \pm 0.1}{(0.295 + 0.004)}$	$\frac{7.5 \pm 0.1}{(0.295 + 0.004)}$
	1.75 ± 0.1	(0.295 ± 0.004) 1.75 ± 0.1
E <sub>1</sub>	$\frac{1.73 \pm 0.1}{(0.069 \pm 0.004)}$	$\frac{1.73 \pm 0.1}{(0.069 \pm 0.004)}$
	14.25	14.25
E <sub>2</sub> min.	(0.561)	(0.561)
T	0.6	0.6
T max.	(0.024)	(0.024)
T <sub>1</sub> max.	0.1	0.1
1   111ax.	(0.004)	(0.004)
K <sub>0</sub>	$3.4 \pm 0.1$	$3.4 \pm 0.1^*$
	$(0.134 \pm 0.004)$	$(0.134 \pm 0.004)^*$
Leader min.	<u>390</u> (15.35)	390 (15.35)
	160	160
Trailer min.	(6.30)	(6.30)
Reel Dimensions	(6.66)	(0.00)
A max.	360	360
	(14.17)	(14.17)
N min.	<u>50</u> (1.97)	<u>50</u> (1.97)
	16.4 + 2.0/ -0.0	16.4 + 2.0/ -0.0
W <sub>1</sub>	$\frac{10.4 + 2.07 - 0.3}{(0.646 + 0.079/-0)}$	$\frac{10.4 + 2.07 - 0.0}{(0.646 + 0.079/-0)}$
NA many	22.4	22.4
W <sub>2</sub> max.	(0.882)	(0.882)
* Model MF-SM013/250 = 3.8 ± 0.1	· ·	DIMENSIONS. MM

