




**BOURNS®**

### Features

- Fast tripping resettable circuit protection
- Surface mount packaging for automated assembly
- Very low internal resistance
- Patents pending
- 100 °C trip temperature
- Agency recognition:   

### Applications

- Battery cell protection

## MF-ESMD Series - PTC Resettable Fuses

### Electrical Characteristics

Model	V max. Volts	I max. Amps	I <sub>hold</sub>	I <sub>trip</sub>	Resistance		Max. Time To Trip		Tripped Power Dissipation
			Amperes at 23 °C		Ohms at 23 °C		Amperes at 23 °C	Seconds at 23 °C	Watts at 23 °C
			Hold	Trip	Min.	R <sub>1</sub> Max.			Typ.
MF-ESMD190	16	100	1.9	3.8	0.010	0.08	10	2.0	1.5

### Environmental Characteristics

Operating/Storage Temperature	-40 °C to +85 °C
Maximum Device Surface Temperature	
in Tripped State	125 °C
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	+85 °C to -40 °C, 20 times ±10 % typical resistance change
Solvent Resistance	MIL-STD-202, Method 215 No change
Vibration	MIL-STD-883C, Method 2007.1, Condition A No change

### Test Procedures And Requirements For Model MF-ESMD Series

Test	Test Conditions	Accept/Reject Criteria
Visual/Mech	Verify dimensions and materials	Per MF physical description
Resistance	In still air @ 23 °C	R <sub>min</sub> ≤ R ≤ R <sub>1max</sub>
Time to Trip	At specified current, V <sub>max</sub> , 23 °C	T ≤ max. time to trip (seconds)
Hold Current	30 min at I <sub>hold</sub>	No trip
Trip Cycle Life	V <sub>max</sub> , I <sub>max</sub> , 100 cycles	No arcing or burning
Trip Endurance	V <sub>max</sub> , 48 hours	No arcing or burning
Solderability	MIL-STD-202F, Method 208F	95 % min. coverage

UL File Number .....E174545

<http://www.ul.com/> Follow link to Certifications, then UL File No., enter E174545

CSA File Number .....CA110338

<http://directories.csa-international.org/> Under "Certification Record" and "File Number" enter 110338-0-000

TÜV Certificate Number .....R 02057213

<http://www.tuvdotcom.com/> Follow link to "other certificates", enter File No. 2057213

### Thermal Derating Chart - I<sub>hold</sub> (Amps)

Model	Ambient Operating Temperature								
	-40 °C	-20 °C	0 °C	23 °C	40 °C	50 °C	60 °C	70 °C	85 °C
MF-ESMD190	3.04	2.7	2.2	1.9	1.44	1.23	1.00	0.78	0.49

# MF-ESMD Series - PTC Resettable Fuses

**BOURNS®**

## Product Dimensions

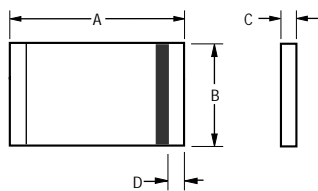
Model	A		B		C		D
	Min.	Max.	Min.	Max.	Min.	Max.	Min.
MF-ESMD190	$\frac{11.25}{(0.443)}$	$\frac{11.61}{(0.457)}$	$\frac{4.83}{(0.190)}$	$\frac{5.33}{(0.210)}$	$\frac{0.33}{(0.013)}$	$\frac{0.63}{(0.025)}$	$\frac{0.51}{(0.020)}$

Packaging: 1500 pcs. per reel.

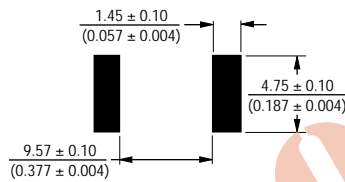
UNIT =  $\frac{\text{MM}}{\text{(INCHES)}}$

Top and Bottom View

Side View

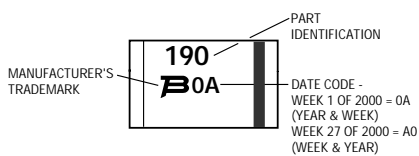


Recommended Pad Layout



## Typical Part Marking

Represents total content. Layout may vary.



## How to Order

MF - ESMD 190 - 2

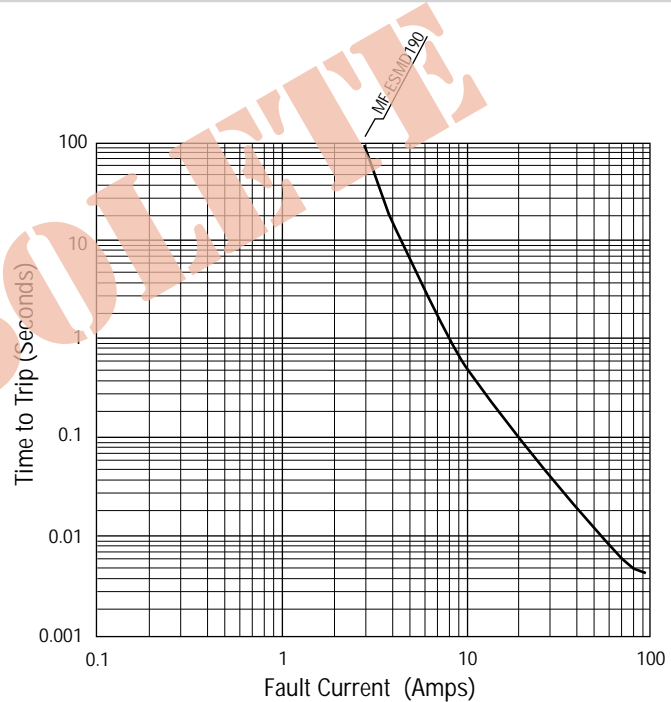
Multifuse® Product Designator

Series ESMD = 11.5mm Surface Mount Component

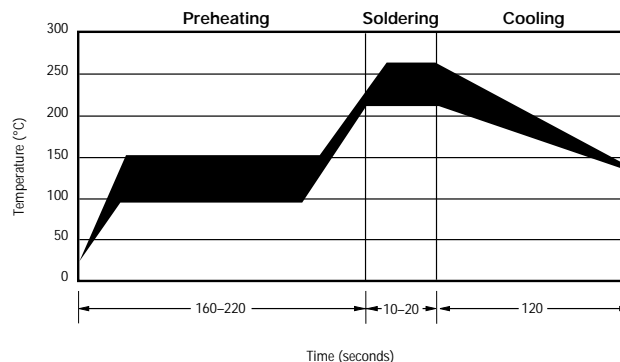
Hold Current,  $I_{hold}$  190 (1.9 Amps)

Packaging Packaged per EIA 481-2  
-2 = Tape and Reel

## Typical Time to Trip at 23 °C



## Solder Reflow Recommendations



**Note:**

- MF-ESMD models can be wave soldered and reworked.
- If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

MF-ESMD, REV. J, 11/02

Specifications are subject to change without notice.

# MF-MSMD, MF-USMD & MF-ESMD Series Tape and Reel Specs **BOURNS®**

Tape Dimensions	MF-MSMD Series per EIA-481-1	MF-USMD Series per EIA 481-1	MF-ESMD Series per EIA 481-2
W	$\frac{12.0 \pm 0.30}{(0.472 \pm 0.012)}$	$\frac{8.0 \pm 0.30}{(0.315 \pm 0.012)}$	$\frac{24.0 \pm 0.3}{(0.945 \pm 0.012)}$
P <sub>0</sub>	$\frac{4.0 \pm 0.10}{(0.157 \pm 0.004)}$	$\frac{4.0 \pm 0.10}{(0.157 \pm 0.004)}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$
P <sub>1</sub>	$\frac{8.0 \pm 0.10}{(0.315 \pm 0.004)}$	$\frac{4.0 \pm 0.10}{(0.157 \pm 0.004)}$	$\frac{8.0 \pm 0.1}{(0.315 \pm 0.004)}$
P <sub>2</sub>	$\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$	$\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$	$\frac{2.0 \pm 0.1}{(0.079 \pm 0.004)}$
A <sub>0</sub>	$\frac{3.66 \pm 0.15}{(0.144 \pm 0.006)}$	MF-USMD005,010,020: $\frac{2.76 \pm 0.10}{(0.109 \pm 0.004)}$	MF-USMD035,050,075,110: $\frac{2.93 \pm 0.15}{(0.115 \pm 0.006)}$
B <sub>0</sub>	$\frac{4.98 \pm 0.10}{(0.196 \pm 0.004)}$	MF-USMD005,010,020: $\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$	MF-USMD035,050,075,110: $\frac{3.56 \pm 0.1}{(0.140 \pm 0.004)}$
B <sub>1</sub> max.	$\frac{5.9}{(0.232)}$	$\frac{4.35}{(0.171)}$	$\frac{20.1}{(0.791)}$
D <sub>0</sub>	$\frac{1.5 + 0.10/-0.00}{(0.059 + 0.004/-0)}$	$\frac{1.50 + 0.1/-0.0}{(0.059 + 0.004/-0)}$	$\frac{1.5 + 0.1/-0.0}{(0.059 + 0.004/-0)}$
F	$\frac{5.5 \pm 0.05}{(0.217 \pm 0.002)}$	$\frac{3.5 \pm 0.05}{(0.138 \pm 0.002)}$	$\frac{11.5 \pm 0.10}{(0.453 \pm 0.004)}$
E <sub>1</sub>	$\frac{1.75 \pm 0.10}{(0.069 \pm 0.004)}$	$\frac{1.75 \pm 0.10}{(0.069 \pm 0.004)}$	$\frac{1.75 \pm 0.10}{(0.069 \pm 0.004)}$
E <sub>2</sub> min.	$\frac{10.25}{(0.404)}$	$\frac{6.25}{(0.246)}$	$\frac{22.25}{(0.876)}$
T max.	$\frac{0.6}{(0.024)}$	$\frac{0.6}{(0.024)}$	$\frac{0.6}{(0.024)}$
T <sub>1</sub> max.	$\frac{0.1}{(0.004)}$	$\frac{0.1}{(0.004)}$	$\frac{0.1}{(0.004)}$
K <sub>0</sub>	$\frac{0.95 \pm 0.10}{(0.037 \pm 0.004)}$	MF-USMD005,010,020: $\frac{1.07 \pm 0.10}{(0.042 \pm 0.004)}$	MF-USMD035,050,075,110: $\frac{0.75 \pm 0.10}{(0.030 \pm 0.004)}$
Leader min.	$\frac{390}{(15.35)}$	$\frac{390}{(15.35)}$	$\frac{390}{(15.35)}$
Trailer min.	$\frac{160}{(6.30)}$	$\frac{160}{(6.30)}$	$\frac{160}{(6.30)}$
<b>Reel Dimensions</b>			
A max.	$\frac{185}{(7.28)}$	$\frac{185}{(7.28)}$	$\frac{360}{(14.17)}$
N min.	$\frac{50}{(1.97)}$	$\frac{50}{(1.97)}$	$\frac{60}{(2.36)}$
W <sub>1</sub>	$\frac{12.4 + 2.0/-0.0}{(0.488 + 0.079/-0.0)}$	$\frac{8.4 + 1.5/-0.0}{(0.331 + 0.059/-0)}$	$\frac{24.4 + 2.0/-0.0}{(0.961 + 0.079/-0)}$
W <sub>2</sub> max.	$\frac{18.4}{(0.724)}$	$\frac{14.4}{(0.567)}$	$\frac{30.4}{(1.20)}$

