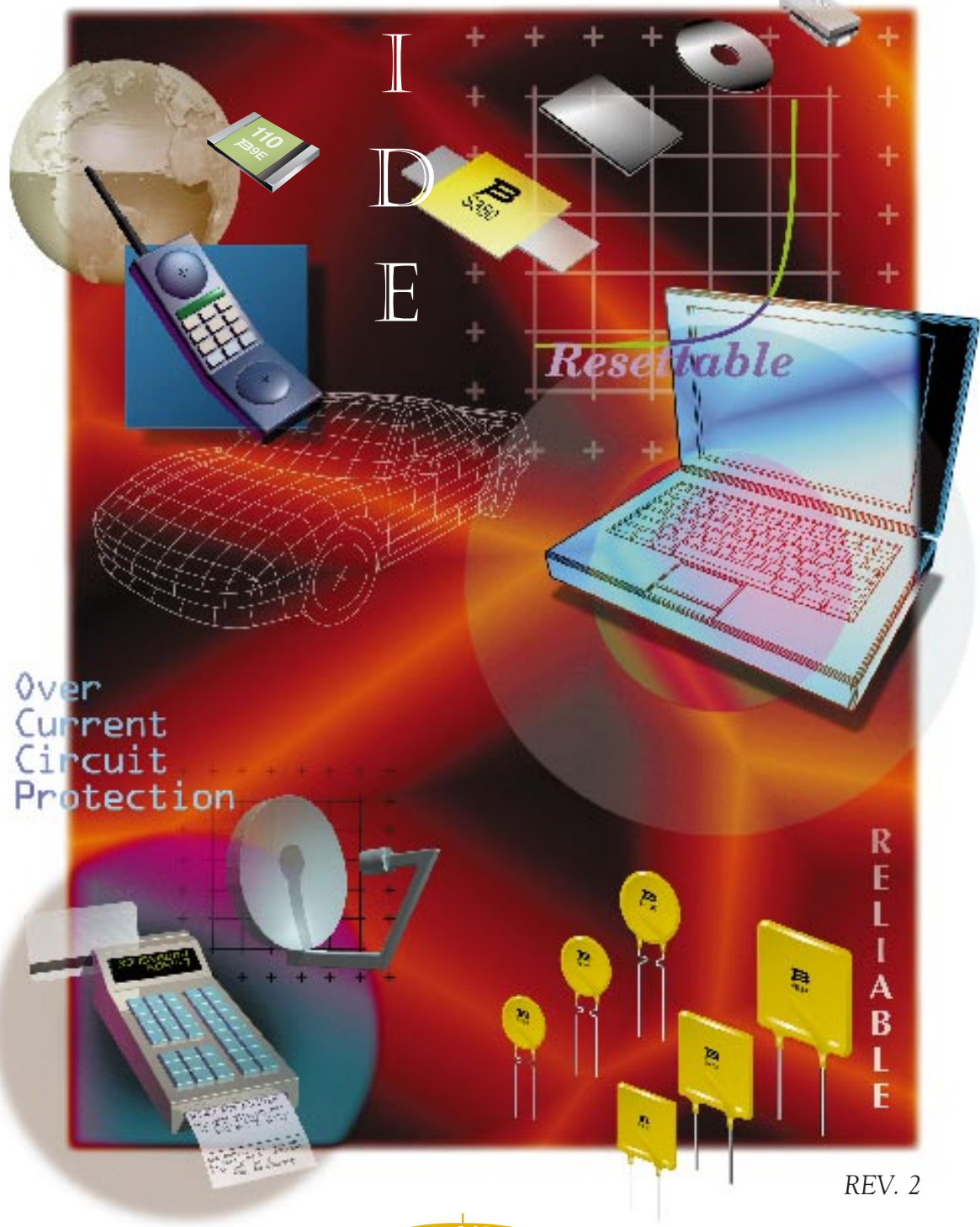


# G SOLUTIONS



Over  
Current  
Circuit  
Protection

*Resettable*

RELIABLE

REV. 2



Leading  
by Design™

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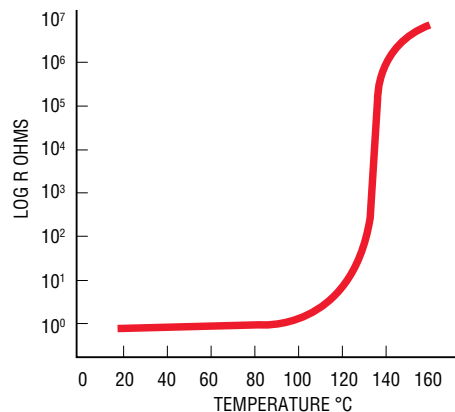
# Reset Your Current Thinking™

## CIRCUIT PROTECTION

When it comes to Polymeric Positive Temperature Coefficient (PPTC) circuit protection, you now have a choice. If you need a reliable source, look to MULTIFUSE® Resettable Fuses from Bourns.

MULTIFUSE products are made from a conductive plastic formed into thin sheets, with electrodes attached to either side. The conductive plastic is manufactured from a non-conductive crystalline polymer and a highly conductive carbon black. The electrodes ensure even distribution of power through the device, and provide a surface for leads to be attached or for custom mounting.

The phenomenon that allows conductive plastic materials to be used for resettable over-current protection devices is that they exhibit a very large non-linear Positive Temperature Coefficient (PTC) effect when heated. PTC is a characteristic that many materials exhibit whereby resistance increases with temperature. What makes the MULTIFUSE conductive plastic material unique is the magnitude of its resistance increase. At a specific transition temperature, the increase in resistance is so great that it is typically expressed on a log scale.

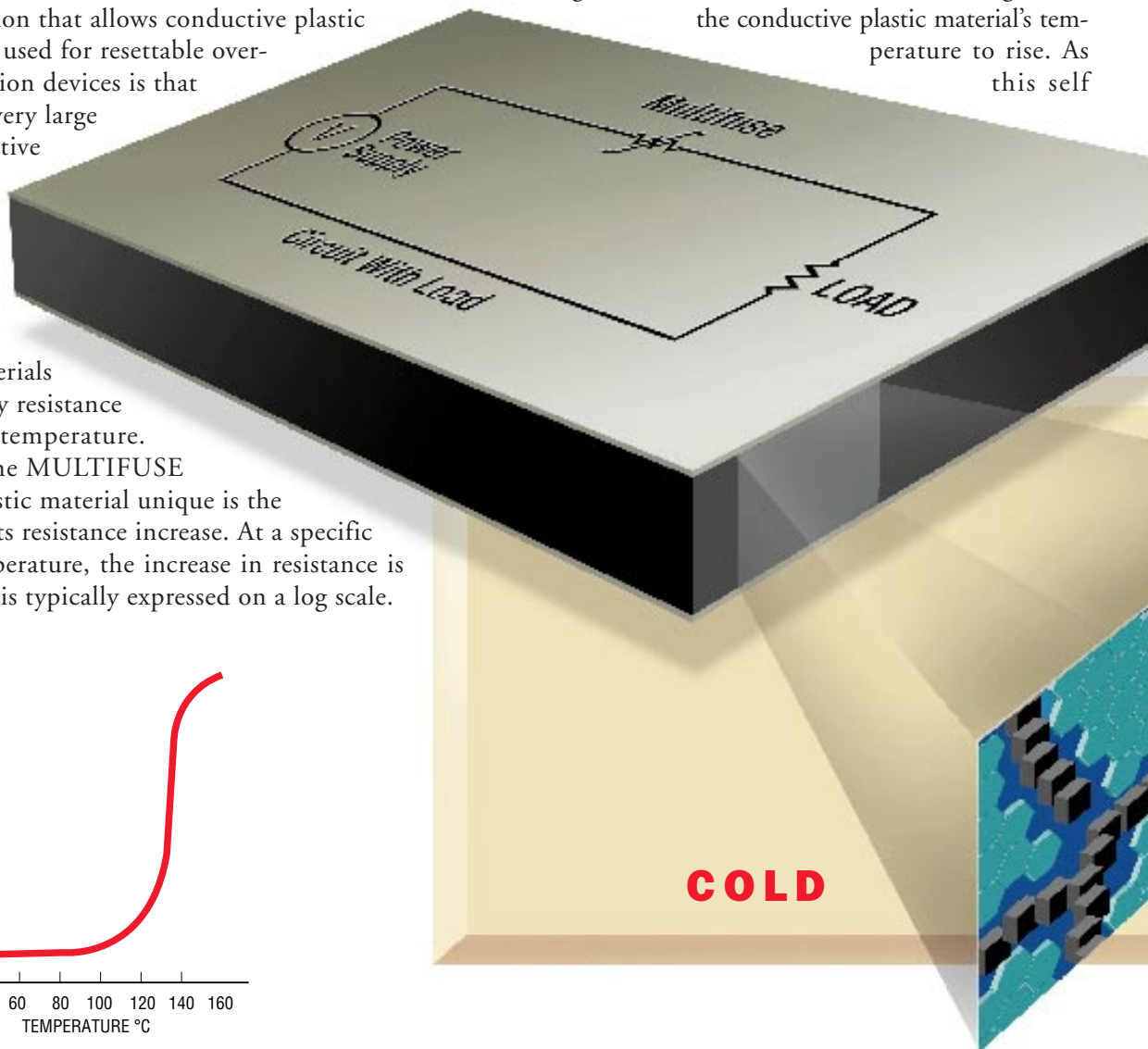


## HOW MULTIFUSE RESETTABLE FUSES WORK

The conductive carbon black filler material in the MULTIFUSE device is dispersed in a polymer that has a crystalline structure. The crystalline structure densely packs the carbon particles into its crystalline boundary so they are close enough together to allow current to flow through the polymer insulator via these carbon “chains.”

When the conductive plastic material is at normal room temperature, there are numerous carbon chains forming conductive paths through the material.

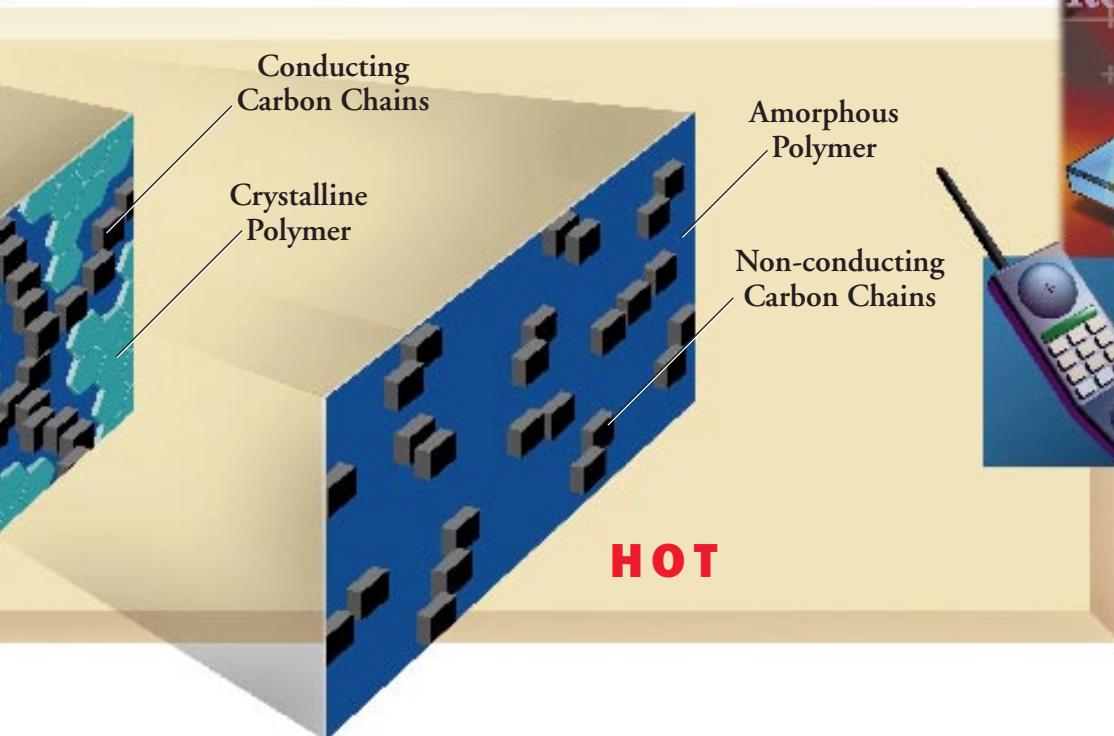
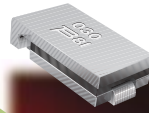
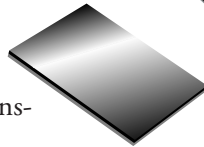
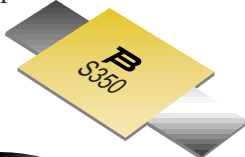
Under fault conditions, excessive current flows through the MULTIFUSE device. I<sup>2</sup>R heating causes the conductive plastic material’s temperature to rise. As this self



# Multi-Fuse®

heating continues, the material's temperature continues to rise until it exceeds its phase transformation temperature. As the material passes through this phase transformation temperature, the densely packed crystalline polymer matrix changes to an amorphous structure. This phase change is accompanied by a small expansion. As the conductive particles move apart from each other, most of them no longer conduct current and the resistance of the device increases sharply.

The material will stay "hot," remaining in this high resistance state as long as the power is applied. The device will remain latched, providing continuous protection, until the fault is cleared and the power is removed. Reversing the phase transformation allows the carbon chains to reform as the polymer re-crystallizes. The resistance quickly returns to its original value.



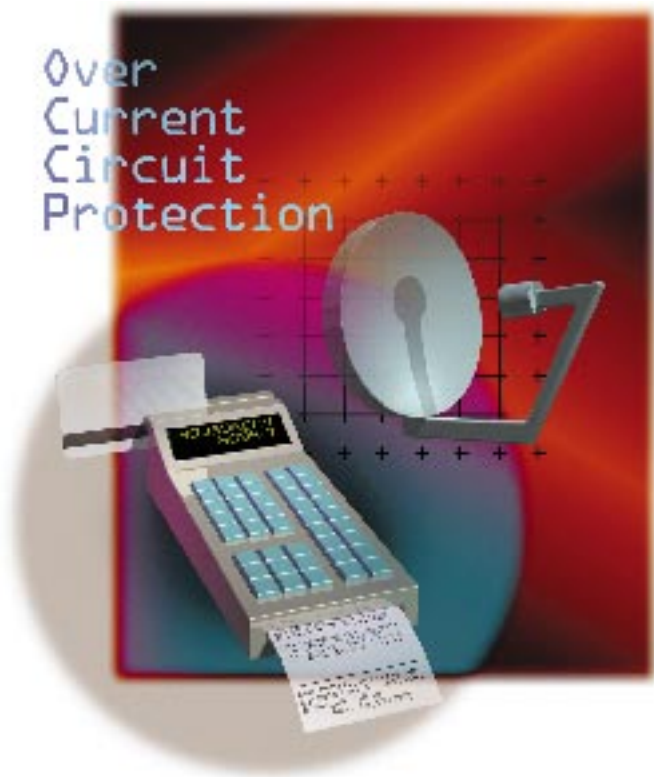
# MultiFuse®

## APPLICATIONS

Almost anywhere there is a low-voltage power source and a load, a MULTIFUSE Resettable Fuse can be used.

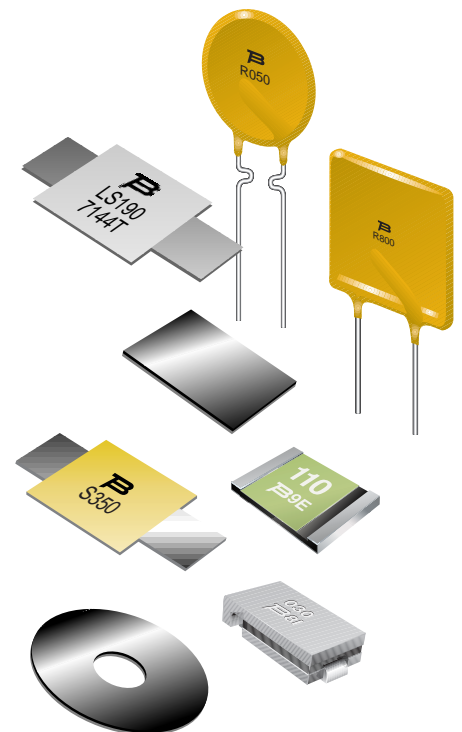
The fact that these protection devices reset automatically sets them apart among circuit protection devices.

- Personal computers
- Laptop computers
- Personal digital assistants
- Transformers
- Small and medium electric motors
- Audio equipment and speakers
- Test and measurement equipment
- Security and fire alarm systems
- Medical electronics
- Personal care products
- Point-of-sale equipment
- Industrial controls
- Automotive electronics and harness protection
- Marine electronics
- Battery-operated toys



Circuit designers know there are circumstances they have no control over which can result in potentially damaging overcurrent conditions. Non-resettable fuses work well, *once*, and in many applications, replacement is not an option due to inconvenience, warranty costs or damaged reputations.

The benefits of MULTIFUSE Resettable Fuses are being recognized by more and more design engineers, and new applications are being discovered every day. The use of MULTIFUSE types of devices have been widely accepted in the following applications and industries:



Polymer Positive Temperature Coefficient (PPTC) Fuses have provided designers in numerous industries a new tool in their battle to improve product quality and performance while at the same time reducing total installed cost.

As PPTC fuses are resettable, warranty costs and service calls are largely avoided. Since they do not need to be serviced, they can be utilized as embedded circuit protection devices.

Based on PPTC technology, MULTIFUSE Resettable Fuses are packaged in Radial Leaded, Surface Mount, Axial Leaded “Battery Strap” and Uncoated Disk form and have a wide range of power ratings. With this comprehensive selection of packages and power ratings, there is sure to be a MULTIFUSE Resettable Fuse that meets your application requirements.

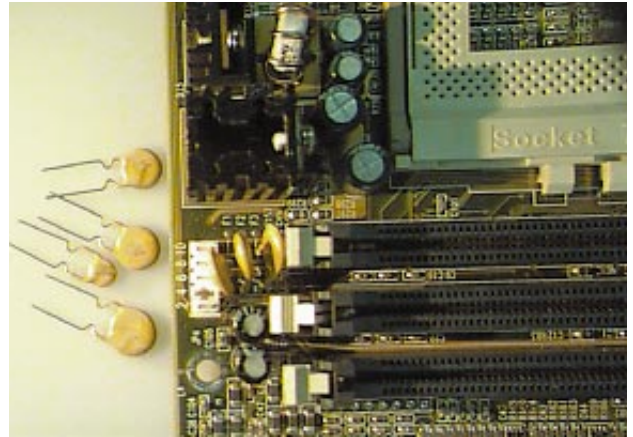
There are many applications for MULTIFUSE Resettable Fuses in a variety of market segments, including:

- Computers and Peripherals
- Primary and Secondary Batteries
- Automotive
- Telecommunications
- Industrial Controls
- Consumer Electronics

### COMPUTERS AND PERIPHERAL DEVICES

Circuit protection in desktop, laptop, notebook computers and peripheral devices is growing increasingly complex and important. Overcurrent protection applications for MULTIFUSE Resettable Fuses include:

- Hard Disk Drives
- Keyboard and Mouse Ports
- SCSI Interface Ports
- SCSI Adapter Cards
- Audio and Video Cards
- Ethernet and Token Ring LAN Ports and Adapter Cards
- Cooling Fan Motors
- Universal Serial Bus (USB)



Because computers have grown more modular, portable and flexible in their design and size, circuit protection requirements have changed dramatically. Consequently, circuit protection may entail overcurrent or overvoltage protection, and filtering applications. A proactive approach to the selection of circuit protection components will enable the computer or peripheral manufacturer to meet the necessary safety requirements while providing the consumer the assurance of a reliable, trouble-free computing tool. At the same time, warranty costs due to consumer misuse can be greatly reduced.

PPTC resettable fuses afford manufacturers the option to improve their hardware design and set their equipment apart from that of manufacturers who are not as forward thinking in their designs. MULTIFUSE products are the answer to the overcurrent circuit protection challenges of today's electronic design engineer.

The protection requirements of all computer applications are very similar when motherboards or back planes need to be protected from faults in devices being “hot plugged” in or faults in the devices themselves. Compliance with industrial standards and agency safety requirements is also similar in most cases.

MULTIFUSE Resettable Fuses in the MF-R, MF-SM and MF-MSMD configurations provide solutions for all computer and peripheral overcurrent protection requirements.



## BATTERY APPLICATIONS

Since batteries are important components of today's diverse array of portable equipment, protection of the battery pack is essential to keep the system up and running. Battery chargers are designed to accommodate the power specifications of specific batteries. Charging is limited to the needs of a battery's given charge at any point in time. If the charger's current limiting circuitry fails, the battery pack can be charged beyond what it is designed to handle, thus damaging an expensive battery pack.

Protection of the battery and equipment being powered while the battery is installed can be achieved by several current limiting technologies including PPTC resettable fuses. However, when the battery pack is removed from the portable equipment, it is susceptible to a short circuit across its contacts. Here, designers have fewer choices. High discharge due to short circuits can permanently damage the battery pack, and may constitute a serious potential hazard. MULTIFUSE Resettable Fuses in the MF-S and MF-LS form factors can prevent such accidents, and the consumer will greatly appreciate the manufacturer's attention to this detail.

## AUTOMOTIVE

MULTIFUSE Resettable Fuses provide ideal protection for a wide range of automotive electrical applications. And they eliminate the nuisance factor of replacing blown fuses.

Automotive manufacturers continue to design more powered accessories such as seats, antennas, mirrors and windows into their vehicles. With added features comes the added complexity of wiring harnesses, motors, the electronics that control them, and the protection required to make them safe.

In addition to fuse replacement throughout the vehicle, MULTIFUSE devices are ideal for:

- Motors – protection for the small motors that power door lock actuators, seats, mirrors, etc.
- “Black Box” Control Modules
- Wire Harness Protection
- Car Alarm Module Protection
- Instrument Panel Protection
- Diagnostic Port Protection
- Cigarette Lighters

## INDUSTRIAL CONTROLS

Designers of pressure sensing equipment are now turning to PPTC Resettable Fuses to help protect the control electronics of their sensors. PPTC Resettable Fuses are low-resistance, resettable overcurrent protectors which may be placed in series with the input and output lines of a pressure sensor to protect the electronics. This is especially important for sensors which need to work in gaseous environments and must be explosion protected.

Many of the more advanced pressure sensors integrate complex combinations of resistors and data processing components to digitally compensate for the non-linearity and temperature dependence of the membrane used to sense pressure. For sensors which must operate in a gaseous environment, it must be ensured that the components in the sensor do not overheat as a result of a short circuit. It must also be ensured that no arcing can occur in the circuit which could potentially lead to an explosion.



### III. Multifuse® Product Selection Worksheet

To select the correct Multifuse® resettable fuse, complete the information below, and refer to the relevant Multifuse product family page.

1. Determine the **NORMAL** operating current ( $I_{hold}$ ): \_\_\_\_\_ Amps
2. Determine the **MAXIMUM** circuit voltage ( $V_{max}$ ): \_\_\_\_\_ Volts
3. Determine the **MAXIMUM** fault current ( $I_{max}$ ): \_\_\_\_\_ Amps
4. Determine the **OPERATING TEMPERATURE** range  
min. \_\_\_\_\_ °C  
max. \_\_\_\_\_ °C
5. Which form factor is the most suitable for the application:

**Radial Leaded Through-Hole** (Pages 8-12)

- MF-R010 through MF-R090 ..... $I_{hold}$  of 100 mAmps - 900 mAmps and ( $V_{max}$ ) of 60.0 volts
- MF-RX110 through MF-RX375 ..... $I_{hold}$  of 1.10 Amps - 3.75 Amps and ( $V_{max}$ ) of 60.0 volts
- MF-R110 through MF-R900 ..... $I_{hold}$  of 1.1 Amps - 9.0 Amps and ( $V_{max}$ ) of 30.0 volts

**Surface Mount** (Pages 13-17 and 24-25)

- MF-SM030 through MF-SM260 ..... $I_{hold}$  of 300 mAmps - 2.6 Amps
- MF-MSMD014 through MF-MSMD150 ..... $I_{hold}$  of 140 mAmps - 1.50 Amps
- MF-MSME190 ..... $I_{hold}$  of 1.9 Amps

**Axial Leaded Battery Strap** (Pages 18-23)

- MF-S120 through MF-S420 ..... $I_{hold}$  of 1.2 Amps - 4.2 Amps
- MF-LS070 through MF-LS340 ..... $I_{hold}$  of 0.7 Amps - 3.4 Amps
- MF-LR190 through MF-LR730 ..... $I_{hold}$  of 1.9 Amps - 7.3 Amps

**Battery Cap** (Page 26)

- MF-AAA170 and MF-AAA210 ..... $I_{hold}$  of 1.7 Amps - 2.1 Amps

**Disk** (Page 27)




- MF-D ..... $I_{hold}$  of 2.5 Amps - 12.2 Amps

6. Check that the maximum ratings for  $V_{max}$  and  $I_{max}$  of the product family chosen is higher than the maximum circuit voltage and fault current in the application.
7. Using the Thermal Derating Chart on the data sheets, select the Multifuse device at the maximum operating temperature with an  $I_{hold}$  greater than or equal to the normal operating current.
8. Order samples and test in the application. Lab Design Kits for most Multifuse® product lines are available. Contact your nearest Bourns sales office for more information.





## Features

- Radial Leaded Devices
- Cured, flame retardant epoxy polymer insulating material meets UL 94V-0 requirements
- Bulk packaging, tape and reel and Ammo-Pak available on most models
- Agency recognition:   

## Applications

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

- Computers & peripherals
- General electronics
- Automotive applications

# MF-R Series - PTC Resettable Fuses

## Electrical Characteristics

Model	V max. Volts	I max. Amps	I <sub>hold</sub>	I <sub>trip</sub>	Initial Resistance		1 Hour (R <sub>1</sub> ) Post-Trip Resistance	Max. Time To Trip		Tripped Power Dissipation
			Amperes at 23°C		Ohms at 23°C		Ohms at 23°C	Amperes at 23°C	Seconds at 23°C	Watts at 23°C
			Hold	Trip	Min.	Max.	Max.			
MF-R010	60	40	0.10	0.20	2.50	4.50	7.50	0.5	4.0	0.38
MF-R017	60	40	0.17	0.34	2.00	3.20	8.00	0.85	3.0	0.48
MF-R020	60	40	0.20	0.40	1.50	2.84	4.40	1.0	2.2	0.40
MF-R025	60	40	0.25	0.50	1.00	1.95	3.00	1.25	2.5	0.45
MF-R030	60	40	0.30	0.60	0.76	1.36	2.10	1.5	3.0	0.50
MF-R040	60	40	0.40	0.80	0.52	0.86	1.29	2.0	3.8	0.55
MF-R050	60	40	0.50	1.00	0.41	0.77	1.17	2.5	4.0	0.75
MF-R065	60	40	0.65	1.30	0.27	0.48	0.72	3.25	5.3	0.90
MF-R075	60	40	0.75	1.50	0.18	0.40	0.60	3.75	6.3	0.90
MF-R090	60	40	0.90	1.80	0.14	0.31	0.47	4.5	7.2	1.00
MF-R090-0-9	30	40	0.90	1.80	0.07	0.12	0.22	4.5	5.9	0.60
MF-R110	30	40	1.10	2.20	0.10	0.18	0.27	5.5	6.6	0.70
MF-R135	30	40	1.35	2.70	0.065	0.115	0.17	6.75	7.3	0.80
MF-R160	30	40	1.60	3.20	0.055	0.105	0.15	8.0	8.0	0.90
MF-R185	30	40	1.85	3.70	0.040	0.07	0.11	9.25	8.7	1.00
MF-R250	30	40	2.50	5.00	0.025	0.048	0.07	12.5	10.3	1.20
MF-R250-0-10	30	40	2.50	5.00	0.025	0.048	0.07	12.5	10.3	1.20
MF-R300	30	40	3.00	6.00	0.020	0.05	0.08	15.0	10.8	2.00
MF-R400	30	40	4.00	8.00	0.010	0.03	0.05	20.0	12.7	2.50
MF-R500	30	40	5.00	10.00	0.010	0.03	0.05	25.0	14.5	3.00
MF-R600	30	40	6.00	12.00	0.005	0.02	0.04	30.0	16.0	3.50
MF-R700	30	40	7.00	14.00	0.005	0.02	0.03	35.0	17.5	3.80
MF-R800	30	40	8.00	16.00	0.005	0.02	0.03	40.0	18.8	4.00
MF-R900	30	40	9.00	18.00	0.005	0.01	0.02	45.0	*20.0	4.20

\*Tested at 40 amps

## Environmental Characteristics

Operating/Storage Temperature	.....-40°C to +85°C
Maximum Device Surface Temperature	.....125°C
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	.....MIL-STD-202F, Method 107G, .....±10% typical resistance change +125°C to -40°C, 10 times
Mechanical Shock	.....MIL-STD-202, Method 213, .....No resistance change Condition 1 (100g, 6 seconds)
Solvent Resistance	.....MIL-STD-202, Method 215 .....No change
Vibration	.....MIL-STD-883C, Method 2007.1, .....No change Condition A

## Test Procedures And Requirements For Model MF-R 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>max</sub>
Time to Trip	.....5 times I <sub>hold</sub> , 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

UL File Number .....E 174545S\*  
 CSA File Number .....CA 110338  
 TÜV File Number .....E9772255.01

\*MF-R010 - R050 rated at 30V.

Specifications are subject to change without notice.

## Additional Features

■ Patents pending

# MF-R Series - PTC Resettable Fuses

# BOURNS®

### Product Dimensions

Model	A Max.	B Max.	C		D Min.	E Max.	Physical Characteristics		
			Nom.	Tol. ±			Style	Lead	Material
MF-R010	7.4	12.7	5.1	0.7	7.6	3.1	1	0.51 dia.	Sn/NiCu
MF-R017	7.4	12.7	5.1	0.7	7.6	3.1	1	0.51 dia.	Sn/CuFe
MF-R020	7.4	12.7	5.1	0.7	7.6	3.1	1	0.51 dia.	Sn/CuFe
MF-R025	7.4	12.7	5.1	0.7	7.6	3.1	1	0.51 dia.	Sn/CuFe
MF-R030	7.4	13.4	5.1	0.7	7.6	3.1	1	0.51 dia.	Sn/CuFe
MF-R040	7.4	13.7	5.1	0.7	7.6	3.1	1	0.51 dia.	Sn/CuFe
MF-R050	7.9	13.7	5.1	0.7	7.6	3.1	1	0.51 dia.	Sn/Cu
MF-R065	9.7	15.2	5.1	0.7	7.6	3.1	1	0.51 dia.	Sn/Cu
MF-R075	10.4	16.0	5.1	0.7	7.6	3.1	1	0.51 dia.	Sn/Cu
MF-R090	11.7	16.7	5.1	0.7	7.6	3.1	1	0.51 dia.	Sn/Cu
MF-R090-0-9	7.4	12.2	5.1	0.7	7.6	3.0	2	0.51 dia.	Sn/CuFe
MF-R110	8.9	14.0	5.1	0.7	7.6	3.0	1	0.51 dia.	Sn/Cu
MF-R135	8.9	18.9	5.1	0.7	7.6	3.0	1	0.51 dia.	Sn/Cu
MF-R160	10.2	16.8	5.1	0.7	7.6	3.0	1	0.51 dia.	Sn/Cu
MF-R185	12.0	18.4	5.1	0.7	7.6	3.0	1	0.51 dia.	Sn/Cu
MF-R250	12.0	18.3	5.1	0.7	7.6	3.0	2	0.81 dia.	Sn/Cu
MF-R250-0-10	11.4	18.3	5.1	0.7	7.6	3.0	3	0.51 dia.	Sn/CuFe
MF-R300	12.0	18.3	5.1	0.7	7.6	3.0	2	0.81 dia.	Sn/Cu
MF-R400	14.4	24.8	5.1	0.7	7.6	3.0	2	0.81 dia.	Sn/Cu
MF-R500	17.4	24.9	10.2	0.7	7.6	3.0	2	0.81 dia.	Sn/Cu
MF-R600	19.3	31.9	10.2	0.7	7.6	3.0	2	0.81 dia.	Sn/Cu
MF-R700	22.1	29.8	10.2	0.7	7.6	3.0	2	0.81 dia.	Sn/Cu
MF-R800	24.2	32.9	10.2	0.7	7.6	3.0	2	0.81 dia.	Sn/Cu
MF-R900	24.2	32.9	10.2	0.7	7.6	3.0	2	0.81 dia.	Sn/Cu

DIMENSIONS = MM.  
0.51 (24AWG)  
0.81 (20AWG)

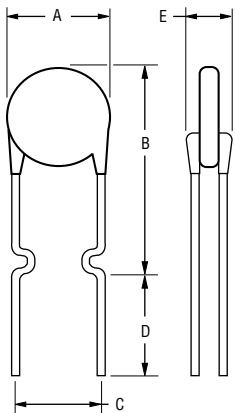
#### Packaging options:

**BULK:** MF-R010-MF-R185 = 500 pcs. per bag; MF-R250-MF-R900 = 100 pcs. per bag;  
MF-R090-0-9 & MF-R250-0-10 = 500 pcs. per bag.

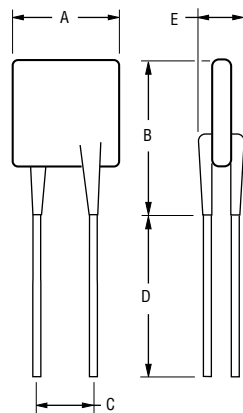
**TAPE & REEL:** MF-R010-MF-R160 - 12.7mm device pitch = 3000 pcs. per reel; MF-R185-MF-R400 - 25.4mm device pitch = 1500 pcs. per reel;  
MF-R090-0-9 & MF-R250-0-10 = 3000 pcs. per reel.

**AMMO-PACK:** MF-R010-MF-R160 - 12.7mm device pitch = 2000 pcs. per reel; MF-R185-MF-R400 - 25.4mm device pitch = 1000 pcs. per reel;  
MF-R090-0-9 & MF-R250-0-10 = 2000 pcs. per reel.

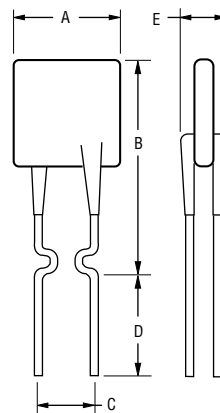
Style 1



Style 2



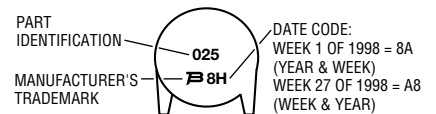
Style 3



NOTE: Kinked lead option is available for board standoff. Contact factory for details.

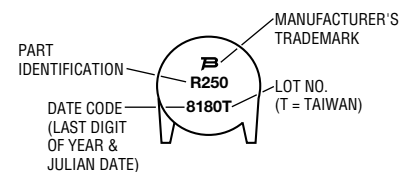
### Typical Part Marking: MF-R010 - R025

Represents total content. Layout may vary.



### Typical Part Marking: MF-R030 - R900

Represents total content. Layout may vary.



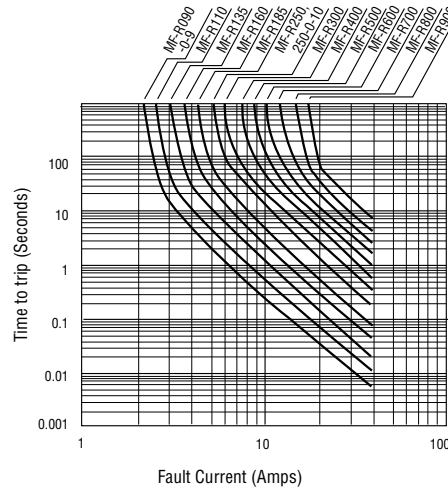
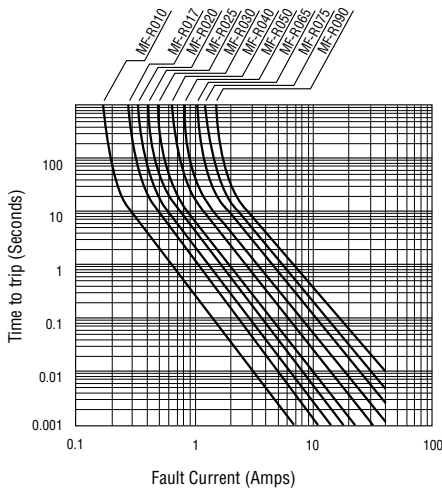
# MF-R Series - PTC Resettable Fuses



## Thermal Derating Chart - $I_{hold}$ / $I_{trip}$ (Amps)

Model	Ambient Operating Temperature								
	-40°C	-20°C	0°C	23°C	40°C	50°C	60°C	70°C	85°C
MF-R010	0.16 / 0.32	0.14 / 0.28	0.12 / 0.24	0.10 / 0.20	0.08 / 0.16	0.07 / 0.14	0.06 / 0.12	0.05 / 0.10	0.04 / 0.08
MF-R017	0.26 / 0.52	0.23 / 0.46	0.20 / 0.40	0.17 / 0.34	0.14 / 0.28	0.12 / 0.24	0.11 / 0.22	0.09 / 0.18	0.07 / 0.14
MF-R020	0.31 / 0.62	0.27 / 0.54	0.24 / 0.48	0.20 / 0.40	0.16 / 0.32	0.14 / 0.28	0.13 / 0.26	0.11 / 0.22	0.08 / 0.16
MF-R025	0.39 / 0.78	0.34 / 0.68	0.30 / 0.60	0.25 / 0.50	0.20 / 0.40	0.18 / 0.36	0.16 / 0.32	0.14 / 0.28	0.10 / 0.20
MF-R030	0.47 / 0.94	0.41 / 0.82	0.36 / 0.72	0.30 / 0.60	0.24 / 0.48	0.22 / 0.44	0.19 / 0.38	0.16 / 0.32	0.12 / 0.24
MF-R040	0.62 / 1.24	0.54 / 1.08	0.48 / 0.96	0.40 / 0.80	0.32 / 0.64	0.29 / 0.58	0.25 / 0.50	0.22 / 0.44	0.16 / 0.32
MF-R050	0.78 / 1.56	0.68 / 1.36	0.60 / 1.20	0.50 / 1.00	0.41 / 0.82	0.36 / 0.72	0.32 / 0.64	0.27 / 0.54	0.20 / 0.40
MF-R065	1.01 / 2.02	0.88 / 1.76	0.77 / 1.54	0.65 / 1.30	0.53 / 1.06	0.47 / 0.94	0.41 / 0.82	0.35 / 0.70	0.26 / 0.52
MF-R075	1.16 / 2.32	1.02 / 2.04	0.89 / 1.78	0.75 / 1.50	0.61 / 1.22	0.54 / 1.08	0.47 / 0.94	0.41 / 0.82	0.30 / 0.60
MF-R090	1.40 / 2.80	1.22 / 2.44	1.07 / 2.14	0.90 / 1.80	0.73 / 1.46	0.65 / 1.30	0.57 / 1.14	0.49 / 0.98	0.36 / 0.72
MF-R090-0-9	1.40 / 2.80	1.22 / 2.44	1.07 / 2.14	0.90 / 1.80	0.73 / 1.46	0.65 / 1.30	0.57 / 1.14	0.49 / 0.98	0.36 / 0.72
MF-R110	1.60 / 3.20	1.43 / 2.86	1.27 / 2.54	1.10 / 2.20	0.91 / 1.82	0.85 / 1.70	0.75 / 1.50	0.67 / 1.34	0.57 / 1.14
MF-R135	1.96 / 3.92	1.76 / 3.52	1.55 / 3.10	1.35 / 2.70	1.12 / 2.24	1.04 / 2.08	0.92 / 1.84	0.82 / 1.64	0.70 / 1.40
MF-R160	2.32 / 4.64	2.08 / 4.16	1.84 / 3.68	1.60 / 3.20	1.33 / 2.66	1.23 / 2.46	1.09 / 2.18	0.98 / 1.96	0.83 / 1.66
MF-R185	2.68 / 5.36	2.41 / 4.82	2.13 / 4.26	1.85 / 3.70	1.54 / 3.08	1.42 / 2.84	1.26 / 2.52	1.13 / 2.26	0.96 / 1.92
MF-R250	3.63 / 7.26	3.25 / 6.50	2.88 / 5.76	2.50 / 5.00	2.08 / 4.16	1.93 / 3.86	1.70 / 3.40	1.53 / 3.06	1.30 / 2.60
MF-R250-0-10	3.63 / 7.26	3.25 / 6.50	2.88 / 5.76	2.50 / 5.00	2.08 / 4.16	1.93 / 3.86	1.70 / 3.40	1.53 / 3.06	1.30 / 2.60
MF-R300	4.35 / 8.70	3.90 / 7.80	3.45 / 6.90	3.00 / 6.00	2.49 / 4.98	2.31 / 4.62	2.04 / 4.08	1.83 / 3.66	1.56 / 3.12
MF-R400	5.80 / 11.6	5.20 / 10.4	4.60 / 9.20	4.00 / 8.00	3.32 / 6.64	3.08 / 6.16	2.72 / 5.44	2.44 / 4.88	2.08 / 4.16
MF-R500	7.25 / 14.5	6.50 / 13.0	5.75 / 11.5	5.00 / 10.0	4.15 / 8.30	3.85 / 7.70	3.40 / 6.80	3.05 / 6.10	2.60 / 5.20
MF-R600	8.70 / 17.4	7.80 / 15.6	6.90 / 13.8	6.00 / 12.0	4.98 / 9.96	4.62 / 9.24	4.08 / 8.16	3.66 / 7.32	3.12 / 6.24
MF-R700	10.1 / 20.3	9.10 / 18.2	8.05 / 16.1	7.00 / 14.0	5.81 / 11.6	5.39 / 10.7	4.76 / 9.52	4.27 / 9.44	3.64 / 7.28
MF-R800	11.6 / 23.2	10.4 / 20.8	9.20 / 18.4	8.00 / 16.0	6.64 / 13.2	6.16 / 12.3	5.44 / 10.8	4.88 / 9.76	4.16 / 8.32
MF-R900	13.0 / 26.1	11.7 / 23.4	10.3 / 20.7	9.00 / 18.0	7.47 / 14.9	6.93 / 12.7	6.12 / 12.2	5.49 / 10.9	4.68 / 9.36

### Typical Time to Trip at 23°C



### How to Order

MF - R 250 -

Multifuse® Product Designator

Series

**R = Radial Leaded Component**

RX = Radial Leaded Component

SM = Surface Mount Component

MSMD = 4.5mm Surface Mount Component

MSME = 11.5mm Surface Mount Component

S = Axial Leaded "Strap" Component

LS = Axial Leaded "Strap" Component

LR = Axial Leaded "Strap" Component

AAA = Battery Cap Component

D = Uncoated, Unleaded "Disk" Component

Hold Current,  $I_{hold}$   
010-900 (100m Amps - 9.0 Amps)

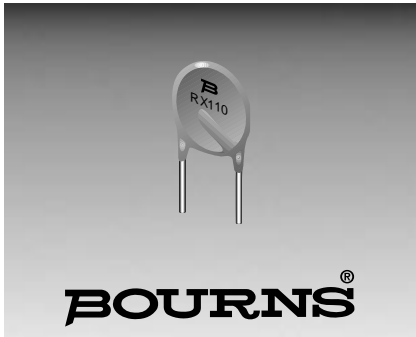
Packaging Options

- = Bulk Packaging




- 2 = Tape and Reel\*

- AP = Ammo-Pak\*

\*Packaged per EIA486-B



## Features

- Radial Leaded Devices
- Cured, flame retardant epoxy polymer insulating material meets UL 94V-0 requirements
- Bulk packaging, tape and reel and Ammo-Pak available on most models
- Agency recognition:   

## Applications

Almost anywhere there is a low voltage power supply, up to 60V and a load to be protected, including:

- Security and fire alarm systems
- Loud speakers
- Power transformers

# MF-RX Series - PTC Resettable Fuses

## Electrical Characteristics

Model	V max. Volts	I max. Amps	I <sub>hold</sub>	I <sub>trip</sub>	Initial Resistance		1 Hour (R <sub>1</sub> ) Post-Trip Resistance	Max. Time To Trip		Tripped Power Dissipation
			Amperes at 23°C		Ohms at 23°C		Ohms at 23°C	Amperes at 23°C	Seconds at 23°C	Watts at 23°C
			Hold	Trip	Min.	Max.	Max.			
MF-RX110	60	40	1.10	2.20	0.15	0.25	0.38	5.5	8.2	1.50
MF-RX135	60	40	1.35	2.70	0.12	0.19	0.30	6.75	9.6	1.70
MF-RX160	60	40	1.60	3.20	0.09	0.14	0.22	8.0	11.4	1.90
MF-RX185	60	40	1.85	3.70	0.08	0.12	0.19	9.25	12.6	2.10
MF-RX250	60	40	2.50	5.00	0.05	0.08	0.13	12.5	15.6	2.50
MF-RX300	60	40	3.00	6.00	0.04	0.06	0.10	15.0	19.8	2.80
MF-RX375	60	40	3.75	7.50	0.03	0.05	0.08	18.75	24.0	3.20

## 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	.....MIL-STD-202F, Method 107G, .....±10% typical resistance change
	.....+125°C to -40°C, 10 times
Mechanical Shock	.....MIL-STD-202, Method 213, .....No resistance change
	Condition 1 (100g, 6 seconds)
Solvent Resistance	.....MIL-STD-202, Method 215 .....No change
Vibration	.....MIL-STD-883C, Method 2007.1, .....No change
	Condition A

## Test Procedures And Requirements For Model MF-RX 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>max</sub>
Time to Trip	.....5 times I <sub>hold</sub> , 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
UL File Number	.....E 174545S	
CSA File Number	.....CA 110338	
TÜV File Number	.....E9772255.01	

## Thermal Derating Chart - I<sub>hold</sub> / I<sub>trip</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-RX110	1.71 / 3.42	1.50 / 3.00	1.31 / 2.62	1.10 / 2.20	0.89 / 1.78	0.79 / 1.58	0.69 / 1.38	0.59 / 1.18	0.44 / 0.88
MF-RX135	2.09 / 4.18	1.84 / 3.68	1.61 / 3.22	1.35 / 2.70	1.09 / 2.18	0.97 / 1.94	0.85 / 1.70	0.73 / 1.46	0.54 / 1.08
MF-RX160	2.48 / 4.96	2.18 / 4.36	1.90 / 3.80	1.60 / 3.20	1.30 / 2.60	1.15 / 2.30	1.01 / 2.02	0.86 / 1.72	0.64 / 1.28
MF-RX185	2.87 / 5.74	2.52 / 5.04	2.20 / 4.40	1.85 / 3.70	1.50 / 3.00	1.33 / 2.66	1.17 / 2.34	1.00 / 2.00	0.74 / 1.48
MF-RX250	3.88 / 7.76	3.40 / 6.80	2.98 / 5.96	2.50 / 5.00	2.03 / 4.06	1.80 / 3.60	1.58 / 3.16	1.35 / 2.70	1.00 / 2.00
MF-RX300	4.65 / 9.30	4.08 / 8.16	3.57 / 7.14	3.00 / 6.00	2.43 / 4.86	2.16 / 4.32	1.89 / 3.78	1.62 / 3.24	1.20 / 2.40
MF-RX375	5.81 / 11.6	5.10 / 10.2	4.46 / 8.92	3.75 / 7.50	3.04 / 6.08	2.70 / 5.40	2.36 / 4.72	2.03 / 4.06	1.50 / 3.00

## Additional Features

- Resettable circuit protection
- Patents pending

# MF-RX Series - PTC Resettable Fuses

**BOURNS®**

## Product Dimensions

Model	A	B	C		D	E	Physical Characteristics		
	Max.	Max.	Nom.	Tol. ±	Min.	Max.	Style	Lead	Material
MF-RX110	13.0	18.0	5.1	0.7	7.6	3.1	1	0.81 dia.	Sn/Cu
MF-RX135	14.5	19.6	5.1	0.7	7.6	3.1	1	0.81 dia.	Sn/Cu
MF-RX160	16.3	21.3	5.1	0.7	7.6	3.1	1	0.81 dia.	Sn/Cu
MF-RX185	17.8	22.9	5.1	0.7	7.6	3.1	1	0.81 dia.	Sn/Cu
MF-RX250	21.3	26.4	10.2	0.7	7.6	3.1	1	0.81 dia.	Sn/Cu
MF-RX300	24.9	30.0	10.2	0.7	7.6	3.1	1	0.81 dia.	Sn/Cu
MF-RX375	28.4	33.5	10.2	0.7	7.6	3.1	1	0.81 dia.	Sn/Cu

Packaging options:

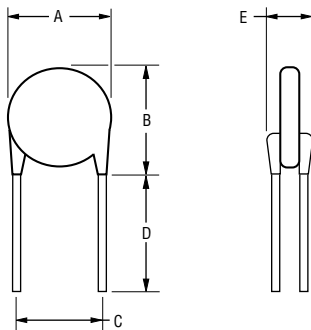
BULK: All models = 100 pcs. per bag.

TAPE & REEL: MF-RX110 – MF-RX160 = 1500 pcs. per reel; MF-RX185 – MF-RX375 = 1000 pcs. per reel

AMMO-PACK: MF-RX110 – MF-RX160 = 1000 pcs. per reel; MF-RX185 – MF-RX375 = 500 pcs. per reel

DIMENSIONS = MM

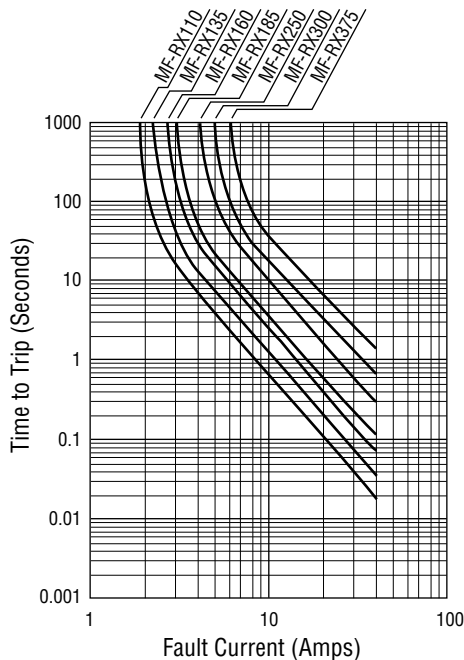
### Style 1



Lead Material  
0.81 dia. (20AWG)

NOTE: Kinked lead option is available for board standoff. Contact factory for details.

## Typical Time to Trip at 23°C



MF-RX SERIES, REV. D, 11/99

## How to Order

### MF - RX 110 -

Multifuse® Product Designator

Series

R = Radial Leaded Component

**RX = Radial Leaded Component**

SM = Surface Mount Component

MSMD = 4.5mm Surface Mount Component

MSME = 11.5mm Surface Mount Component

S = Axial Leaded "Strap" Component

LS = Axial Leaded "Strap" Component

LR = Axial Leaded "Strap" Component

AAA = Battery Cap Component

D = Uncoated, Unleaded "Disk" Component

Hold Current,  $I_{hold}$   
110-375 (1.10 Amps - 3.75 Amps)

Packaging Options

- = Bulk Packaging

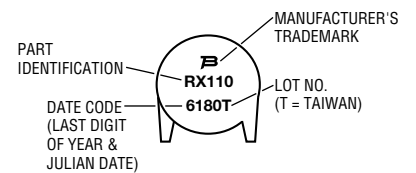
- 2 = Tape and Reel\*

- AP = Ammo-Pak\*

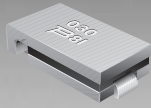
\*Packaged per EIA 486-B

## Typical Part Marking

Represents total content. Layout may vary.






Specifications are subject to change without notice.



**BOURNS®**

## Features

- Surface Mount Devices
- Fully compatible with current industry standards
- Packaged per EIA 481-2 standard
- Agency recognition:   
- Patents pending

## 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

### 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	R <sub>Min.</sub>	R <sub>1Max.</sub>	Max.	Nom.	
MF-SM030	60	10	0.30	0.60	0.90	4.80	1.5	3.0	1.7
MF-SM050	30	10	0.50	1.00	0.35	1.40	2.5	4.0	1.7
MF-SM075	30	40	0.75	1.50	0.26	1.00	8.0	0.30	1.7
MF-SM100	15	40	1.10	2.20	0.12	0.48	8.0	0.50	1.7
MF-SM125	15	40	1.25	2.50	0.07	0.25	8.0	2.0	1.7
MF-SM150	15	40	1.50	3.00	0.06	0.25	8.0	5.0	1.9
MF-SM200	15	40	2.00	4.00	0.05	0.125	8.0	12.0	1.9
MF-SM250	15	40	2.50	5.00	0.024	0.085	8.0	25.0	1.9
MF-SM260	6	40	2.60	5.20	0.025	0.075	8.0	20.0	1.7

### 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 .....	MIL-STD-202F, Method 107G, .....±10% typical resistance change +125°C to -40°C, 10 times
Mechanical Shock .....	MIL-STD-202, Method 213, .....No resistance change Condition 1 (100g, 6 seconds)
Solvent Resistance .....	MIL-STD-202, Method 215 .....No change
Vibration .....	MIL-STD-883C, Method 2007.1, .....No change Condition A

### 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 .....	R <sub>min</sub> ≤ R ≤ R <sub>max</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-202, Method 208 .....	95% min. coverage

UL File Number ..... E 174545S  
 CSA File Number ..... CA 110338  
 TÜV File Number ..... E9772255.01

NOTE: Model MF-SM260 CSA and TÜV approvals are pending.

### Thermal Derating Chart - I<sub>hold</sub> / I<sub>trip</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-SM030	0.45 / 0.90	0.40 / 0.80	0.35 / 0.70	0.30 / 0.60	0.25 / 0.50	0.23 / 0.46	0.20 / 0.40	0.17 / 0.34	0.14 / 0.28
MF-SM050	0.76 / 1.52	0.67 / 1.34	0.59 / 1.18	0.50 / 1.00	0.42 / 0.84	0.38 / 0.76	0.33 / 0.66	0.29 / 0.58	0.23 / 0.46
MF-SM075	1.13 / 2.26	1.01 / 2.02	0.88 / 1.76	0.75 / 1.50	0.62 / 1.24	0.56 / 1.12	0.50 / 1.00	0.44 / 0.88	0.34 / 0.68
MF-SM100	1.66 / 3.32	1.47 / 2.94	1.29 / 2.58	1.10 / 2.20	0.91 / 1.82	0.83 / 1.66	0.73 / 1.46	0.64 / 1.28	0.50 / 1.00
MF-SM125	1.89 / 3.78	1.68 / 3.36	1.46 / 2.92	1.25 / 2.50	1.04 / 2.08	0.94 / 1.88	0.83 / 1.66	0.73 / 1.46	0.56 / 1.12
MF-SM150	2.27 / 4.54	2.01 / 4.02	1.76 / 3.52	1.50 / 3.00	1.25 / 2.50	1.13 / 2.26	0.99 / 1.98	0.87 / 1.74	0.68 / 1.36
MF-SM200	3.02 / 6.04	2.68 / 5.36	2.34 / 4.68	2.00 / 4.00	1.66 / 3.32	1.50 / 3.00	1.32 / 2.64	1.16 / 2.32	0.90 / 1.80
MF-SM250	3.78 / 7.56	3.35 / 6.70	2.93 / 5.86	2.50 / 5.00	2.08 / 4.16	1.88 / 3.76	1.65 / 3.30	1.45 / 2.90	1.13 / 2.26
MF-SM260	3.64 / 7.28	3.25 / 6.50	2.91 / 5.82	2.60 / 5.20	2.26 / 4.52	2.08 / 4.16	1.95 / 3.90	1.74 / 3.48	1.48 / 2.96

# MF-SM Series - PTC Resettable Fuses



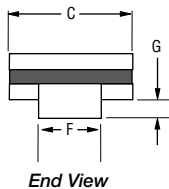
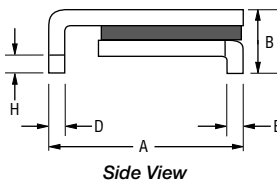
## Product Dimensions

Model	A		B	C	D		E		F		G		H
	Min.	Max.	Max.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
MF-SM030	6.73	7.98	3.18	5.44	0.56	0.71	0.56	0.71	2.16	2.41	0.66	1.37	0.43
MF-SM050	6.73	7.98	3.18	5.44	0.56	0.71	0.56	0.71	2.16	2.41	0.66	1.37	0.43
MF-SM075	6.73	7.98	3.18	5.44	0.56	0.71	0.56	0.71	2.16	2.41	0.66	1.37	0.43
MF-SM100	6.73	7.98	3.00	5.44	0.56	0.71	0.56	0.71	2.16	2.41	0.66	1.37	0.43
MF-SM125	6.73	7.98	3.00	5.44	0.56	0.71	0.56	0.71	2.16	2.41	0.66	1.37	0.43
MF-SM150	8.00	9.50	3.00	6.71	0.56	0.71	0.56	0.71	3.68	3.94	0.66	1.37	0.43
MF-SM200	8.00	9.50	3.00	6.71	0.56	0.71	0.56	0.71	3.68	3.94	0.66	1.37	0.43
MF-SM250	8.00	9.50	3.00	6.71	0.56	0.71	0.56	0.71	3.68	3.94	0.66	1.37	0.43
MF-SM260	6.73	7.98	3.00	5.44	0.56	0.71	0.56	0.71	2.16	2.41	0.66	1.37	0.43

Packaging:

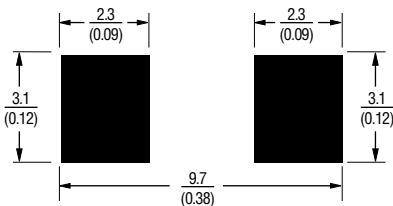
TAPE & REEL: MF-SM030, 050, 075, 100, 125, 260 = 2000 pcs. per reel; MF-SM150, 200, 250 = 1500 pcs. per reel.

DIMENSIONS = MM



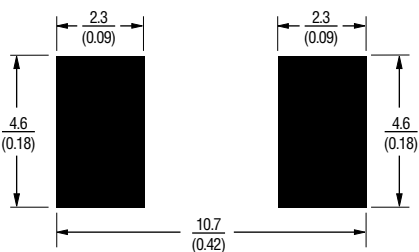
Terminal material:  
Tin-plated brass

### Recommended Pad Layout



MF-SM030, 050, 075, 100, 125, 260

### Recommended Pad Layout



MF-SM150, 200, 250

DIMENSIONS:  $\frac{\text{MM}}{\text{(INCHES)}}$

## 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.

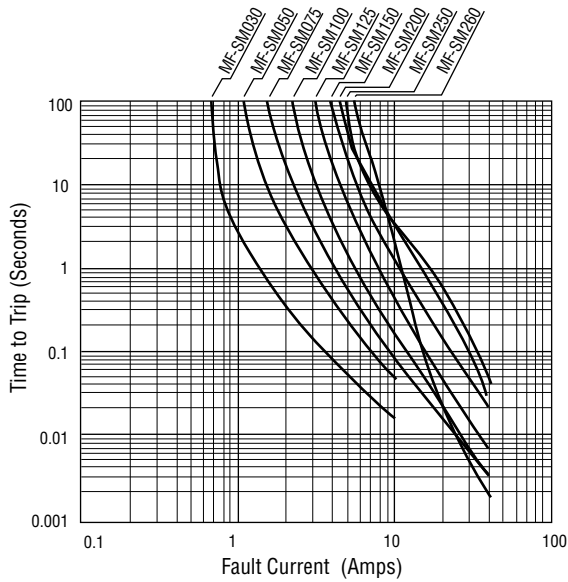
### Rework

- A device should not be reworked.

# MF-SM Series - PTC Resettable Fuses



## Typical Time to Trip at 23°C



## How To Order

**MF - SM 030 - 2**

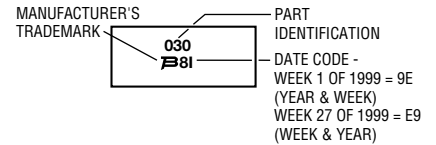
Multifuse® Product \_\_\_\_\_  
 Designator \_\_\_\_\_  
 Series \_\_\_\_\_  
 R = Radial Leaded Component  
 RX = Radial Leaded Component  
**SM = Surface Mount Component**  
 MSMD = 4.5mm Surface Mount Component  
 MSME = 11.5mm Surface Mount Component  
 S = Axial Leaded "Strap" Component  
 LS = Axial Leaded "Strap" Component  
 LR = Axial Leaded "Strap" Component  
 AAA = Battery Cap Component  
 D = Uncoated, Unleaded "Disk" Component

Hold Current,  $I_{hold}$  \_\_\_\_\_  
 030-260 (0.30 Amps - 2.60 Amps)

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

## Typical Part Marking

Represents total content. Layout may vary.








**BOURNS®**

**Features**

- 4.5mm SMD
- Fast tripping resettable circuit protection
- Surface mount packaging for automated assembly
- Reduced component size and resistance
- Agency recognition: 

**Applications**

- High Density Circuit Board Applications:
- Hard disk drives
  - PC motherboards
  - PC peripherals
  - Point-of-sale (POS) equipment
  - PCMCIA cards

**MF-MSMD 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	R <sub>Min.</sub>	R <sub>1Max.</sub>			
MF-MSMD014	60.0	10	0.14	0.34	1.50	6.50	8.0	0.006	0.8
MF-MSMD020	30.0	10	0.20	0.40	0.40	5.00	8.0	0.02	0.8
MF-MSMD035	6.0	40	0.35	0.70	0.32	1.30	8.0	0.10	0.6
MF-MSMD050	15.0	40	0.50	1.00	0.15	1.00	8.0	0.15	0.8
MF-MSMD075	13.2	40	0.75	1.50	0.11	0.45	8.0	0.20	0.8
MF-MSMD110	6.0	40	1.10	2.20	0.04	0.21	8.0	0.30	0.8
MF-MSMD125	6.0	40	1.25	2.50	0.05	0.18	8.0	0.8	0.8
MF-MSMD150	6.0	40	1.50	3.00	0.03	0.15	8.0	0.9	0.8

NOTE: CSA & TÜV approvals are pending on all models. UL approval is pending on Models MF-MSMD125 and MSMD150.

**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 .....MIL-STD-202F, Method 107G, .....±10% typical resistance change  
+125°C to -40°C, 10 times
- Mechanical Shock .....MIL-STD-202, Method 213, .....No resistance change  
Condition 1 (100g, 6 seconds)
- Solvent Resistance .....MIL-STD-202, Method 215 .....No change
- Vibration .....MIL-STD-883C, Method 2007.1, .....No change  
Condition A

**Test Procedures And Requirements For Model MF-MSMD 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>max</sub>
Time to Trip	At 8.0 Amps, 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
UL File Number	E 174545S	
CSA File Number	CA 110338	
TÜV File Number	E9772255.01	

**Thermal Derating Chart - I<sub>hold</sub> / I<sub>trip</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-MSMD014	0.23 / 0.52	0.19 / 0.45	0.17 / 0.40	0.14 / 0.34	0.12 / 0.29	0.10 / 0.25	0.09 / 0.23	0.08 / 0.21	0.06 / 0.16
MF-MSMD020	0.29 / 0.58	0.26 / 0.52	0.23 / 0.46	0.20 / 0.40	0.17 / 0.34	0.15 / 0.30	0.14 / 0.28	0.12 / 0.24	0.10 / 0.20
MF-MSMD035	0.47 / 0.94	0.45 / 0.90	0.40 / 0.80	0.35 / 0.70	0.30 / 0.60	0.28 / 0.56	0.24 / 0.48	0.21 / 0.42	0.18 / 0.36
MF-MSMD050	0.77 / 1.54	0.68 / 1.36	0.59 / 1.18	0.50 / 1.00	0.44 / 0.88	0.40 / 0.80	0.37 / 0.74	0.33 / 0.66	0.29 / 0.58
MF-MSMD075	1.15 / 2.30	1.01 / 2.02	0.88 / 1.76	0.75 / 1.50	0.65 / 1.30	0.60 / 1.20	0.55 / 1.10	0.49 / 0.98	0.43 / 0.86
MF-MSMD110	1.59 / 3.18	1.43 / 2.86	1.26 / 2.52	1.10 / 2.20	0.95 / 1.90	0.87 / 1.74	0.80 / 1.60	0.71 / 1.42	0.60 / 1.20
MF-MSMD125	1.80 / 3.61	1.63 / 3.25	1.43 / 2.86	1.25 / 2.50	1.08 / 2.16	0.99 / 1.98	0.91 / 1.82	0.81 / 1.62	0.68 / 1.36
MF-MSMD150	2.17 / 4.34	1.95 / 3.90	1.72 / 3.44	1.50 / 3.00	1.30 / 2.59	1.18 / 2.37	1.09 / 2.18	0.97 / 1.94	0.82 / 1.64

## Additional Features

- Patents pending

# MF-MSMD Series - PTC Resettable Fuses

# BOURNS®

### Product Dimensions

Model	A		B		C		D
	Min.	Max.	Min.	Max.	Min.	Max.	Min.
MF-MSMD014	4.37	4.73	3.07	3.17	0.63	0.89	0.30
MF-MSMD020	4.37	4.73	3.07	3.41	0.56	0.81	0.30
MF-MSMD035	3.00	3.43	2.35	2.80	0.38	0.62	0.35
MF-MSMD050	4.37	4.73	3.07	3.41	0.38	0.62	0.30
MF-MSMD075	4.37	4.73	3.07	3.41	0.38	0.62	0.30
MF-MSMD110	4.37	4.73	3.07	3.41	0.38	0.62	0.30
MF-MSMD125	4.37	4.73	3.07	3.41	0.28	0.48	0.25
MF-MSMD150	4.37	4.73	3.07	3.41	0.28	0.48	0.25

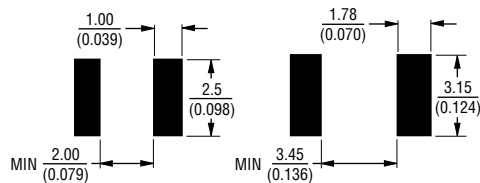
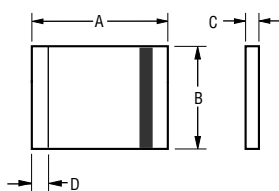
Packaging: Models MF-MSMD014, MF-MSMD020, MF-MSMD050, MF-MSMD075, MF-MSMD110, MF-MSMD125, MF-MSMD150 = 1500 pcs. per reel.  
Model MF-MSMD035 = 3000 pcs. per reel.

DIMENSIONS = MM

#### Top and Bottom View

#### Side View

#### Recommended Pad Layout



MF-MSMD035 MF-MSMD020, 050, 075, 110, 125, 150

Terminal material: solder-plated copper

Termination pad solderability: Meets EIA Specification RS-186-9E, ANSI/J-STD-002 Category 3.

### How to Order

**MF - MSMD 020 - 2**

Multifuse® Product Designator \_\_\_\_\_

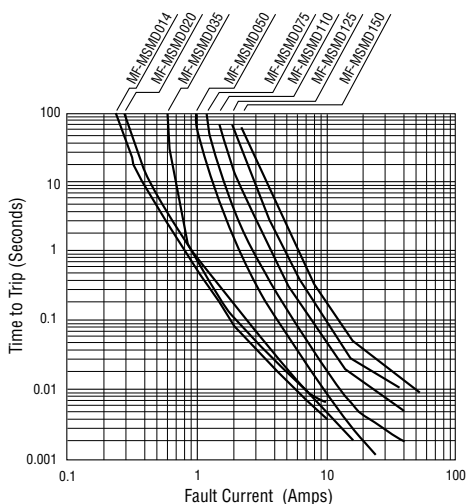
Series \_\_\_\_\_

R = Radial Leaded Component  
RX = Radial Leaded Component  
SM = Surface Mount Component  
**MSMD = 4.5mm Surface Mount Component**  
MSME = 11.5mm Surface Mount Component  
S = Axial Leaded "Strap" Component  
LS = Axial Leaded "Strap" Component  
LR = Axial Leaded "Strap" Component  
AAA = Battery Cap Component  
D = Uncoated, Unleaded "Disk" Component

Hold Current,  $I_{hold}$  \_\_\_\_\_  
020-150 (0.20 Amps - 1.50 Amps)

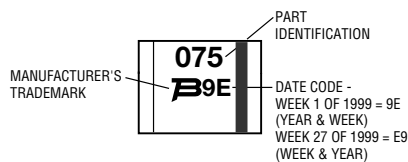
Packaging \_\_\_\_\_  
Packaged per EIA 481-1  
-2 = Tape and Reel

### Typical Time to Trip at 23°C

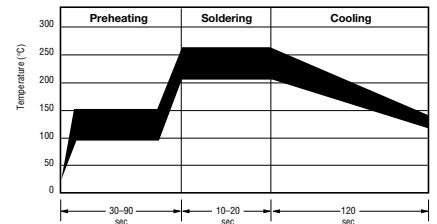


### Typical Part Marking

Represents total content. Layout may vary.



### Solder Reflow Recommendations




#### Note:

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



## Features

- Axial leaded
- Fully compatible with current industry standards
- Weldable nickel terminals
- Very low internal resistance
- Agency recognition: 

## Applications

- Rechargeable Battery Pack Protection
- Provides overcurrent protection with 125°C trip temperature

# MF-S Series - PTC Resettable Fuses

### Electrical Characteristics

Model	V max. Volts	I max. Amps	I <sub>hold</sub>	I <sub>trip</sub>	Initial Resistance		1 Hour (R <sub>1</sub> ) Post-Trip Resistance	Max. Time To Trip		Tripped Power Dissipation
			Amperes at 23°C		Ohms at 23°C		Ohms at 23°C	Amperes at 23°C	Seconds at 23°C	Watts at 23°C
			Hold	Trip	Min.	Max.	Max.			
MF-S120	15	100	1.20	2.70	0.085	0.160	0.220	6	5.0	1.20
MF-S120S	15	100	1.20	2.70	0.085	0.160	0.220	6	5.0	1.20
MF-S150	15	100	1.50	3.00	0.050	0.090	0.110	8	5.0	1.30
MF-S175	15	100	1.75	3.80	0.050	0.090	0.120	9	4.0	1.50
MF-S175S	15	100	1.75	3.80	0.050	0.090	0.120	9	4.0	1.50
MF-S200	30	100	2.00	4.40	0.030	0.060	0.080	10	4.0	1.90
MF-S350	30	100	3.50	6.30	0.017	0.031	0.040	20	3.0	2.50
MF-S420	30	100	4.20	7.60	0.012	0.024	0.040	20	6.0	2.90

NOTE: Slotted lead option available on all models.

### 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 .....MIL-STD-202F, Method 107G, .....±10% typical resistance change  
 +125°C to -40°C, 10 times  
 Vibration .....MIL-STD-883C, Method 2007.1, .....No change  
 Condition A

### Test Procedures And Requirements For Model MF-S 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>max</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

UL File Number .....E 174545S  
 CSA File Number .....CA 110338  
 TÜV File Number .....E9772255.01

### Thermal Derating Chart - I<sub>hold</sub> / I<sub>trip</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-S120	1.90 / 4.28	1.70 / 3.83	1.50 / 3.38	1.20 / 2.70	1.00 / 2.25	0.90 / 2.03	0.80 / 1.80	0.70 / 1.58	0.50 / 1.13
MF-S120S	1.90 / 4.28	1.70 / 3.83	1.50 / 3.38	1.20 / 2.70	1.00 / 2.25	0.90 / 2.03	0.80 / 1.80	0.70 / 1.58	0.50 / 1.13
MF-S150	2.20 / 4.40	2.00 / 4.00	1.80 / 3.60	1.50 / 3.00	1.30 / 2.60	1.10 / 2.20	1.00 / 2.00	0.90 / 1.80	0.70 / 1.40
MF-S175	2.50 / 5.59	2.30 / 5.14	2.00 / 4.47	1.70 / 3.80	1.50 / 3.35	1.30 / 2.91	1.20 / 2.68	1.10 / 2.46	0.90 / 2.01
MF-S175S	2.50 / 5.59	2.30 / 5.14	2.00 / 4.47	1.70 / 3.80	1.50 / 3.35	1.30 / 2.91	1.20 / 2.68	1.10 / 2.46	0.90 / 2.01
MF-S200	3.20 / 7.04	2.80 / 6.16	2.50 / 5.50	2.00 / 4.40	1.70 / 3.74	1.60 / 3.52	1.40 / 3.08	1.20 / 2.64	0.90 / 1.98
MF-S350	5.40 / 9.72	4.80 / 8.64	4.30 / 7.74	3.50 / 6.30	3.00 / 5.40	2.80 / 5.04	2.50 / 4.50	2.20 / 3.96	1.70 / 3.06
MF-S420	6.40 / 11.5	5.70 / 10.3	5.10 / 9.23	4.20 / 7.60	3.60 / 6.51	3.30 / 5.97	3.00 / 5.43	2.60 / 4.70	2.10 / 3.80

## Additional Features

- Patents pending

# MF-S Series - PTC Resettable Fuses

**BOURNS®**

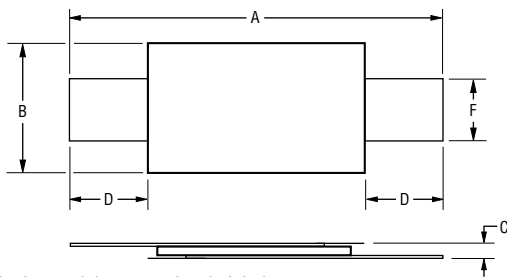
### Product Dimensions

Model	A		B		C		D		F	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
MF-S120	19.9	22.1	4.9	5.2	0.6	1.0	5.5	7.5	3.9	4.1
MF-S120S	19.9	22.1	4.9	5.2	0.6	1.0	5.5	7.5	3.9	4.1
MF-S150	21.3	23.4	10.2	11.0	0.5	1.1	4.1	5.5	4.8	5.4
MF-S175	20.9	23.1	4.9	5.2	0.6	1.0	4.1	5.5	3.9	4.1
MF-S175S	20.9	23.1	4.9	5.2	0.6	1.0	4.1	5.5	3.9	4.1
MF-S200	21.3	23.4	10.2	11.0	0.5	1.1	5.0	7.6	4.8	5.4
MF-S350	28.4	31.8	13.0	13.5	0.5	1.1	6.3	8.9	6.0	6.6
MF-S420	30.6	32.4	12.9	13.6	0.5	1.1	5.0	7.5	6.0	6.7

All models packaged in bulk, 500 pieces each.

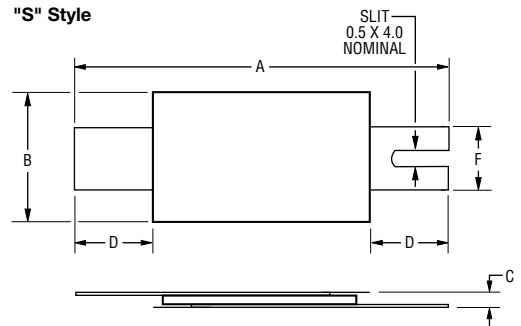
DIMENSIONS = MM

#### Standard Style

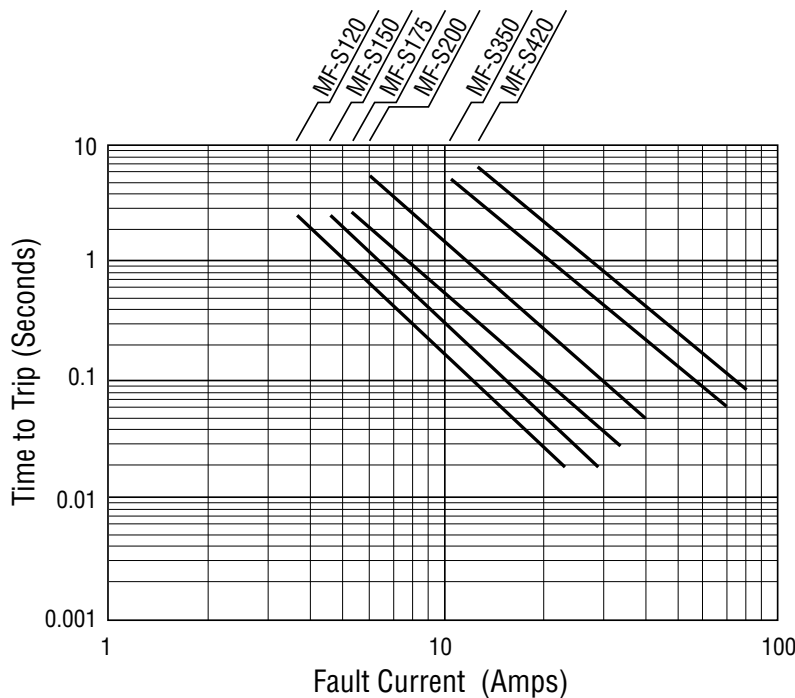


Terminal material: quarter-hard nickel

#### "S" Style



### Typical Time to Trip at 23°C



### How To Order

**MF - S 120 S**

Multifuse® Product Designator \_\_\_\_\_

Series \_\_\_\_\_

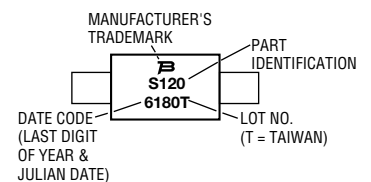
- R = Radial Leaded Component
- RX = Radial Leaded Component
- SM = Surface Mount Component
- MSMD = 4.5mm Surface Mount Component
- MSME = 11.5mm Surface Mount Component
- S = Axial Leaded "Strap" Component**
- LS = Axial Leaded "Strap" Component
- LR = Axial Leaded "Strap" Component
- AAA = Battery Cap Component
- D = Uncoated, Unleaded "Disk" Component

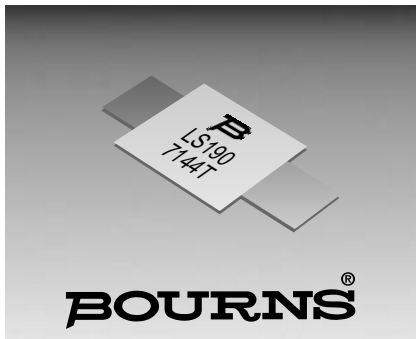
Hold Current,  $I_{hold}$  \_\_\_\_\_  
 120-420 (1.20 Amps - 4.20 Amps)

Slotted Lead Option \_\_\_\_\_

### Typical Part Marking

Represents total content. Layout may vary.





## Features

- Axial/radial leaded
- Fully compatible with current industry standards
- Weldable nickel terminals
- Very low internal resistance
- Agency recognition:

## Applications

- Any application that requires extra protection at elevated ambient temperatures, which the 100°C trip temperature provides.
- Rechargeable battery pack protection
  - Cellular phones
  - Laptop computers

# MF-LS Series - PTC Resettable Fuses

### Electrical Characteristics

Model	V max. Volts	I max. Amps	I <sub>hold</sub>		I <sub>trip</sub>		Initial Resistance		1 Hour (R <sub>1</sub> ) Post-Trip Resistance	Max. Time To Trip		Tripped Power Dissipation
			Amperes at 23°C		Ohms at 23°C		Ohms at 23°C	Amperes at 23°C		Seconds at 23°C	Watts at 23°C	
			Hold	Trip	Min.	Max.			Max.			
MF-LS070	15	100	0.7	1.5	0.100	0.200	0.340	3.5	5.0	1.0		
MF-LS070S	15	100	0.7	1.5	0.100	0.200	0.340	3.5	5.0	1.0		
MF-LS100S	24	100	1.0	2.5	0.070	0.130	0.260	5	7.0	1.5		
MF-LS180	24	100	1.8	3.8	0.040	0.068	0.120	9	2.9	2.0		
MF-LS180S	24	100	1.8	3.8	0.040	0.068	0.120	9	2.9	2.0		
MF-LS190	24	100	1.9	4.2	0.030	0.057	0.100	10	3.0	1.9		
MF-LS190RU	15	100	1.9	4.2	0.030	0.057	0.100	10	3.0	1.9		
MF-LS260	24	100	2.6	5.2	0.025	0.042	0.076	13	5.0	2.3		
MF-LS300	24	100	3.0	6.3	0.015	0.031	0.055	15	4.0	2.0		
MF-LS340	24	100	3.4	6.8	0.016	0.027	0.050	17	5.0	2.7		

Note: Slotted option available on all models.

### 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.....MIL-STD-202F, Method 107G, .....±10% typical resistance change  
 +125°C to -40°C, 10 times  
 Vibration.....MIL-STD-883C, Method 2007.1, .....No change  
 Condition A

### Test Procedures And Requirements For Model MF-LS 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>max</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

UL File Number .....E 174545S  
 CSA File Number.....CA 110338  
 TÜV File Number .....E9772255.01

### Thermal Derating Chart - I<sub>hold</sub> / I<sub>trip</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-LS070	1.20 / 2.57	1.09 / 2.33	0.85 / 1.82	0.70 / 1.50	0.50 / 1.07	0.45 / 0.96	0.35 / 0.75	0.28 / 0.60	0.16 / 0.34	
MF-LS070S	1.20 / 2.57	1.09 / 2.33	0.85 / 1.82	0.70 / 1.50	0.50 / 1.07	0.45 / 0.96	0.35 / 0.75	0.28 / 0.60	0.16 / 0.34	
MF-LS100S	1.80 / 4.50	1.60 / 4.00	1.40 / 3.50	1.00 / 2.50	0.80 / 2.00	0.70 / 1.75	0.60 / 1.50	0.40 / 1.00	0.20 / 0.50	
MF-LS180	3.10 / 6.54	2.60 / 5.49	2.20 / 4.64	1.80 / 3.80	1.30 / 2.74	1.10 / 2.32	0.90 / 1.90	0.60 / 1.27	0.20 / 0.42	
MF-LS180S	3.10 / 6.54	2.60 / 5.49	2.20 / 4.64	1.80 / 3.80	1.30 / 2.74	1.10 / 2.32	0.90 / 1.90	0.60 / 1.27	0.20 / 0.42	
MF-LS190	3.30 / 7.29	2.80 / 6.19	2.40 / 5.31	1.90 / 4.20	1.40 / 3.09	1.20 / 2.65	1.10 / 2.43	0.70 / 1.55	0.40 / 0.88	
MF-LS190RU	3.30 / 7.29	2.80 / 6.19	2.40 / 5.31	1.90 / 4.20	1.40 / 3.09	1.20 / 2.65	1.10 / 2.43	0.70 / 1.55	0.40 / 0.88	
MF-LS260	4.30 / 8.60	3.70 / 7.40	3.10 / 6.20	2.60 / 5.20	1.90 / 3.80	1.60 / 3.20	1.40 / 2.80	1.10 / 2.20	0.60 / 1.20	
MF-LS300	5.10 / 10.7	4.40 / 9.24	3.70 / 7.77	3.00 / 6.30	2.30 / 4.83	1.90 / 3.99	1.60 / 3.36	1.20 / 2.52	0.60 / 1.26	
MF-LS340	5.50 / 11.0	4.70 / 9.40	4.00 / 8.00	3.40 / 6.80	2.60 / 5.20	2.20 / 4.40	1.90 / 3.80	1.50 / 3.00	0.80 / 1.60	

Specifications are subject to change without notice.

## Additional Features

- Patents pending

# MF-LS Series - PTC Resettable Fuses

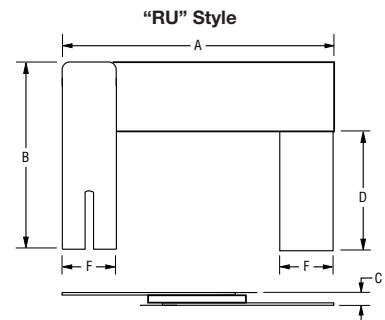
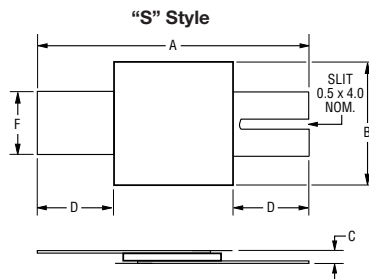
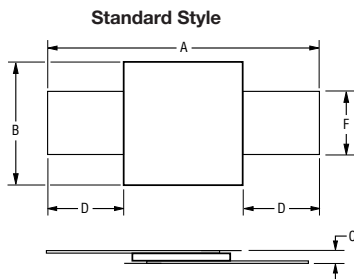
# BOURNS®

### Product Dimensions

Model	A		B		C		D		F		Package Style
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
MF-LS070	19.9	22.1	4.9	5.2	0.7	1.2	5.5	7.5	3.9	4.1	Std.
MF-LS070S	19.9	22.1	4.9	5.2	0.7	1.2	5.5	7.5	3.9	4.1	S
MF-LS100S	20.9	23.1	4.9	5.2	0.6	1.0	4.1	5.5	3.9	4.1	S
MF-LS180	24.0	26.0	4.9	5.2	0.6	1.0	4.1	5.5	3.9	4.1	Std.
MF-LS180S	24.0	26.0	4.9	5.2	0.6	1.0	4.1	5.5	3.9	4.1	S
MF-LS190	21.3	23.4	10.2	11.0	0.5	1.1	5.0	7.6	4.8	5.4	Std.
MF-LS190RU	19.8	20.8	13.3	14.3	0.4	0.76	8.1	9.5	3.8	4.2	RU
MF-LS260	24.0	26.0	10.8	11.9	0.6	1.0	5.0	7.0	5.9	6.1	Std.
MF-LS300	28.4	31.8	13.0	13.5	0.5	1.1	6.3	8.9	6.0	6.6	Std.
MF-LS340	24.0	26.0	14.8	15.9	0.6	1.0	4.0	5.0	5.9	6.1	Std.

All models packaged in bulk, 500 pieces each. NOTE: Longer lead option available. Consult factory.

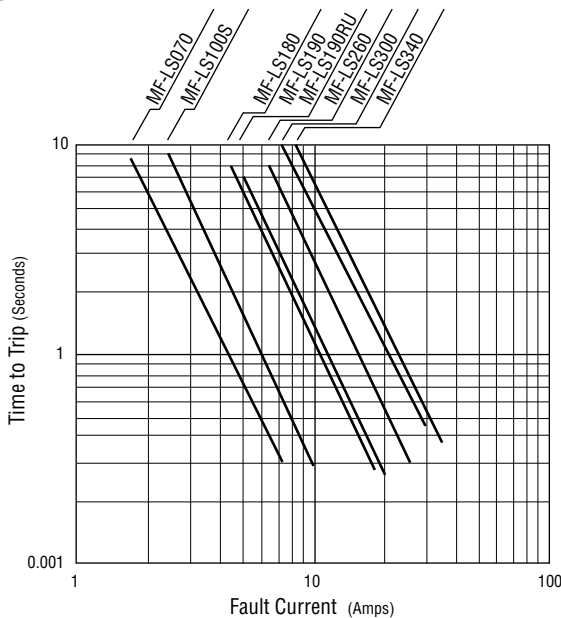
DIMENSIONS = MM



Terminal material: quarter-hard nickel

### Typical Time to Trip at 23°C

MF-LS models offer trip temperatures lower than MF-S models for extra protection at elevated temperatures.



### How To Order

**MF - LS 100 S**

Multifuse® Product Designator

Series

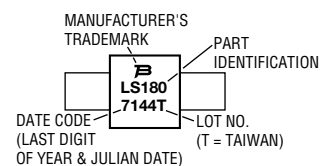
- R = Radial Leaded Component
- RX = Radial Leaded Component
- SM = Surface Mount Component
- MSMD = 4.5mm Surface Mount Component
- MSME = 11.5mm Surface Mount Component
- S = Axial Leaded "Strap" Component
- LS = Axial Leaded "Strap" Component**
- LR = Axial Leaded "Strap" Component
- AAA = Battery Cap Component
- D = Uncoated, Unleaded "Disk" Component

Hold Current,  $I_{hold}$  \_\_\_\_\_  
70-340 (0.70 Amps - 3.40 Amps)

Lead Option \_\_\_\_\_  
S = Slotted Lead Option  
RU = Radial Lead Option

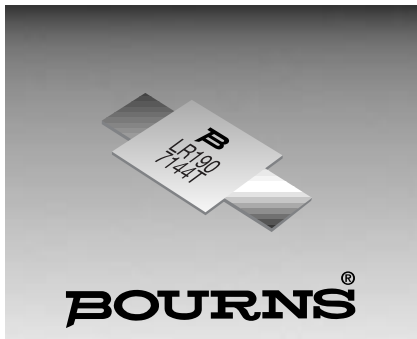
### Typical Part Marking

Represents total content. Layout may vary.



MF-LS, REV. C, 11/99

Specifications are subject to change without notice.



## Features

- Axial leaded
- Fully compatible with current industry standards
- Weldable nickel terminals
- Very low internal resistance
- Operating currents to 7.3 Amps
- Patents pending

- Agency recognition: (pending)



## Applications

- Any application that requires protection at low resistances
- Rechargeable battery packs
- Cellular phones
- Laptop computers

# MF-LR Series - PTC Resettable Fuses

### Electrical Characteristics

Model	V max. Volts	I max. Amps	$I_{hold}$	$I_{trip}$	Initial Resistance		1 Hour ( $R_1$ ) Post-Trip Resistance	Max. Time To Trip		Tripped Power Dissipation
			Amperes At 23°C		Ohms At 23°C		Ohms At 23°C	Amperes At 23°C	Seconds At 23°C	Watts At 23°C
			Hold	Trip	Min.	Max.	Max.			
MF-LR190	15	100	1.90	3.90	0.039	0.072	0.102	9.5	5.0	1.2
MF-LR190S	15	100	1.90	3.90	0.039	0.072	0.102	9.5	5.0	1.2
MF-LR260S	15	100	2.60	5.80	0.020	0.042	0.063	13.0	5.0	2.5
MF-LR380	15	100	3.80	8.30	0.013	0.026	0.037	19.0	5.0	2.5
MF-LR450	20	100	4.50	8.90	0.011	0.020	0.028	22.5	5.0	2.5
MF-LR550	20	100	5.50	10.50	0.009	0.019	0.022	27.5	5.0	2.8
MF-LR600	20	100	6.00	11.70	0.007	0.014	0.016	30.0	5.0	2.8
MF-LR730	20	100	7.3	14.1	0.006	0.012	0.015	30.0	5.0	3.3

NOTE: TÜV approvals are pending on all models. UL approval is pending on Model MF-LR730.

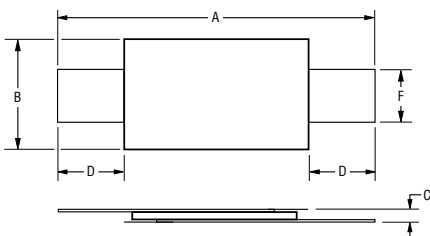
### Product Dimensions

Model	A		B		C		D		F		Package Style
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
MF-LR190	19.9	22.1	4.9	5.5	0.6	1.0	5.5	7.5	3.9	4.1	Std.
MF-LR190S	19.9	22.1	4.9	5.5	0.6	1.0	5.5	7.5	3.9	4.1	S
MF-LR260S	20.9	23.1	4.9	5.5	0.6	1.0	4.1	5.5	3.9	4.1	S
MF-LR380	24.0	26.0	6.9	7.5	0.6	1.0	4.1	5.5	4.9	5.1	Std.
MF-LR450	24.0	26.0	9.9	10.5	0.6	1.0	5.3	6.7	5.9	6.1	Std.
MF-LR550	35.0	37.0	6.9	7.5	0.6	1.0	5.3	6.7	4.9	5.1	Std.
MF-LR600	24.0	26.0	13.9	14.5	0.6	1.0	4.1	5.5	5.9	6.1	Std.
MF-LR730	26.0	29.1	13.9	14.5	0.6	1.0	4.1	5.5	5.9	6.1	Std.

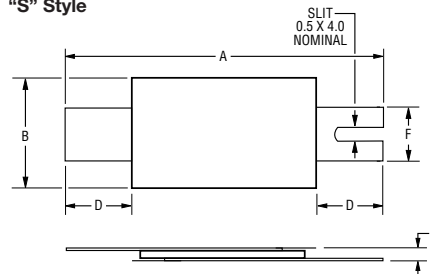
All models packaged in bulk, 500 pieces each.

DIMENSIONS = MM

#### Standard Style

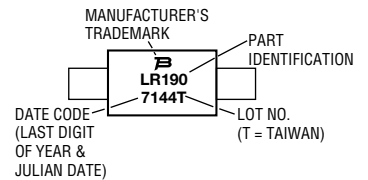


#### "S" Style



#### Typical Part Marking

Represents total content. Layout may vary.



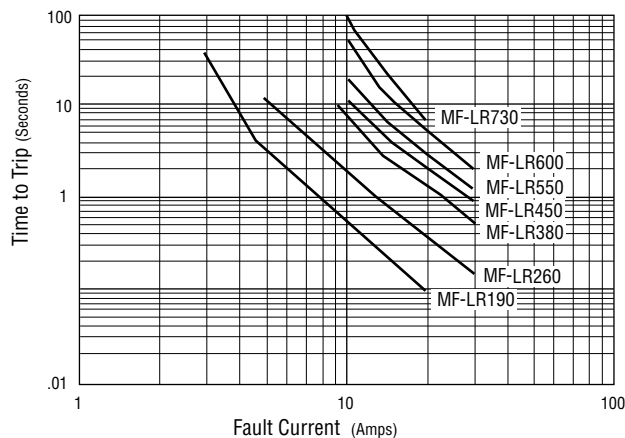
# MF-LR Series - PTC Resettable Fuses



## Thermal Derating Chart - $I_{hold}$ / $I_{trip}$ (Amps)

Model	Ambient Operating Temperature								
	-40°C	-20°C	0°C	23°C	40°C	50°C	60°C	70°C	85°C
MF-LR190	2.8 / 5.7	2.5 / 5.1	2.3 / 4.7	1.9 / 3.9	1.6 / 3.3	1.5 / 3.1	1.4 / 2.9	1.2 / 2.5	1.0 / 2.1
MF-LR190S	2.8 / 5.7	2.5 / 5.1	2.3 / 4.7	1.9 / 3.9	1.6 / 3.3	1.5 / 3.1	1.4 / 2.9	1.2 / 2.5	1.0 / 2.1
MF-LR260	3.8 / 8.5	3.4 / 7.6	3.1 / 6.9	2.6 / 5.8	2.2 / 4.9	2.0 / 4.5	1.9 / 4.2	1.7 / 3.8	1.4 / 3.1
MF-LR260S	3.8 / 8.5	3.4 / 7.6	3.1 / 6.9	2.6 / 5.8	2.2 / 4.9	2.0 / 4.5	1.9 / 4.2	1.7 / 3.8	1.4 / 3.1
MF-LR380	5.5 / 12.0	4.9 / 10.7	4.4 / 9.6	3.8 / 8.3	3.3 / 7.2	3.0 / 6.6	2.8 / 6.1	2.5 / 5.5	2.1 / 4.6
MF-LR450	6.5 / 12.9	5.8 / 11.5	5.3 / 10.5	4.5 / 8.9	3.9 / 7.7	3.6 / 7.1	3.3 / 6.5	2.9 / 5.7	2.5 / 4.9
MF-LR550	8.0 / 15.3	7.1 / 13.6	6.2 / 11.8	5.5 / 10.5	4.7 / 9.0	4.3 / 8.2	4.0 / 7.6	3.6 / 6.9	3.0 / 5.7
MF-LR600	8.7 / 17.0	7.8 / 15.2	7.1 / 13.8	6.0 / 11.7	5.2 / 10.1	4.7 / 9.2	4.4 / 8.6	3.9 / 7.6	3.3 / 6.4
MF-LR730	10.6 / 20.5	9.5 / 18.3	8.6 / 16.6	7.3 / 14.1	6.3 / 12.2	5.7 / 11.0	5.4 / 10.4	4.7 / 9.1	4.0 / 7.7

## Typical Time to Trip at 23°C




## How To Order

**MF - LR 190 S**  
 Multifuse® Product Designator \_\_\_\_\_  
 Series \_\_\_\_\_  
 R = Radial Leaded Component  
 RX = Radial Leaded Component  
 SM = Surface Mount Component  
 MSMD = 4.5mm Surface Mount Component  
 MSME = 11.5mm Surface Mount Component  
 S = Axial Leaded "Strap" Component  
 LS = Axial Leaded "Strap" Component  
**LR = Axial Leaded "Strap" Component**  
 AAA = Battery Cap Component  
 D = Uncoated, Unleaded "Disk" Component  
 Hold Current,  $I_{hold}$  \_\_\_\_\_  
 190-730 (1.90 Amps - 7.30 Amps)  
 Lead Option \_\_\_\_\_  
 S = Slotted Lead Option





## 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-MSME190 - PTC Resettable Fuses

### Electrical Characteristics

Model	V max. Volts	I max. Amps	I <sub>hold</sub>	I <sub>trip</sub>	Initial 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.	Max.		
MF-MSME190	16	100	1.9	3.8	0.024	0.08	10	2.0	1.5

NOTE: CSA & TÜV approvals are pending.

### Product Dimensions

Model	A		B		C		D	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
MF-MSME190	11.15	11.51	4.83	5.33	0.33	0.53	0.51	1.02

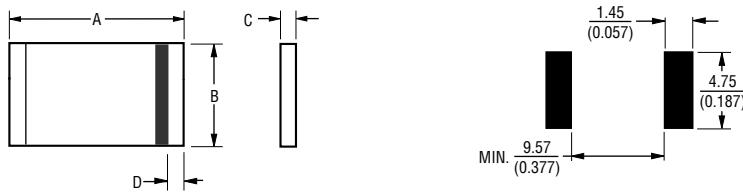
Packaging: 1500 pcs. per reel.

DIMENSIONS = MM

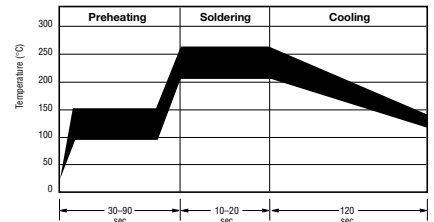
Top and Bottom View

Side View

Recommended Pad Layout



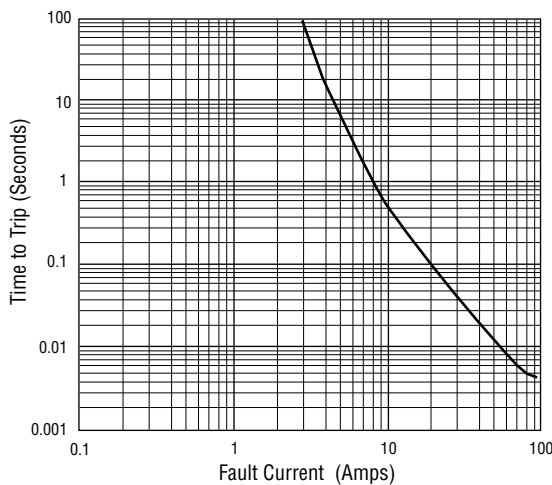
### Solder Reflow Recommendations



**Note:**

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

### Typical Time to Trip at 23°C



### 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-MSME190	3.04	2.7	2.2	1.9	1.44	1.23	1.00	0.78	0.49

Specifications are subject to change without notice.

# MF-MSME190 - PTC Resettable Fuses



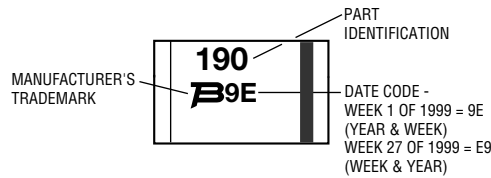
## How to Order

**MF - MSME 190 - 2**

Multifuse® Product Designator \_\_\_\_\_  
 Series \_\_\_\_\_  
     R = Radial Leaded Component  
     RX = Radial Leaded Component  
     SM = Surface Mount Component  
 MSMD = 4.5mm Surface Mount Component  
**MSME = 11.5mm Surface Mount Component**  
     S = Axial Leaded "Strap" Component  
     LS = Axial Leaded "Strap" Component  
     LR = Axial Leaded "Strap" Component  
     AAA = Battery Cap Component  
     D = Uncoated, Unleaded "Disk" Component  
 Hold Current,  $I_{hold}$  \_\_\_\_\_  
 (1.9 Amps)  
 Packaging \_\_\_\_\_  
 Packaged per EIA 481-1  
     -2 = Tape and Reel

## Typical Part Marking

Represents total content. Layout may vary.





## Features

- Fast tripping resettable circuit protection
- Low internal resistance
- Patents pending
- Weldable nickel terminals

## Applications

- AAA size battery cells

# MF-AAA Series - PTC Resettable Fuses

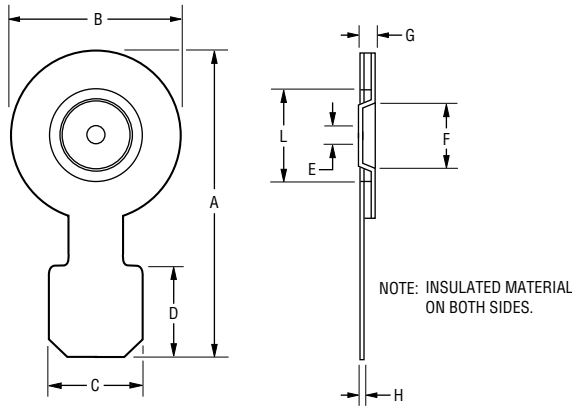
### Electrical Characteristics

Model	V max. Volts	I max. Amps	I <sub>h</sub> Rated Current	Typical Current Trip Limit						Initial Resistance Values		Maximum Time To Trip	Nominal Tripped Power Dissipation
				Amps at 23°C		Amps at 0°C		Amps at 23°C		Amps at 60°C			
			Hold	Trip	Hold	Trip	Hold	Trip	Hold	Trip	Min.	R <sub>1</sub> Max.	Seconds at 23°C
MF-AAA170	15	50	1.7	2.0	4.2	1.7	3.7	1.3	2.5	0.050	0.14	5 @ 8.5A	2.0
MF-AAA210	15	50	2.1	2.5	5.4	2.1	4.5	1.6	3.4	0.035	0.113	5 @ 10.5A	2.0

### Product Dimensions

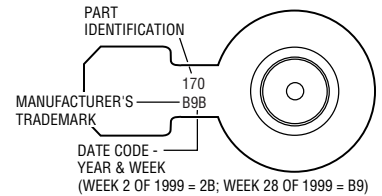
Model	A	B	C	D	E	F	G	H	L
MF-AAA170	17.5 ± 0.2 (.689 ± .008)	9.8 ± 0.1 (.386 ± .004)	5.0 ± 0.2 (.197 ± .008)	5.0 ± 0.2 (.197 ± .008)	1.0 MAX. (.039 MAX.)	5.00 ± 0.3 (.197 ± .012)	.90 MAX. (.035 MAX.)	.15 ± .05 (.006 ± .002)	6.0 ± 0.5 (.236 ± .020)
MF-AAA210	17.2 ± 0.2 (.677 ± .008)	9.5 ± 0.2 (.374 ± .012)	5.0 ± 0.2 (.197 ± .008)	5.0 ± 0.2 (.197 ± .008)	1.0 MAX. (.039 MAX.)	3.75 ± 0.3 (.148 ± .012)	.90 MAX. (.035 MAX.)	.15 ± .05 (.006 ± .002)	5.0 ± 0.5 (.197 ± .020)

DIMENSIONS =  $\frac{MM}{(IN)}$



### Typical Part Marking

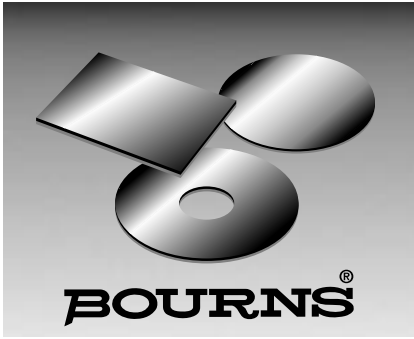
Represents total content. Layout may vary.



### How to Order

#### MF - AAA 170 - 2

Multifuse® Product \_\_\_\_\_  
 Designator \_\_\_\_\_  
 Series \_\_\_\_\_  
 R = Radial Leaded Component  
 RX = Radial Leaded Component  
 SM = Surface Mount Component  
 MSMD = 4.5mm Surface Mount Component  
 MSME = 11.5mm Surface Mount Component  
 S = Axial Leaded "Strap" Component  
 LS = Axial Leaded "Strap" Component  
 LR = Axial Leaded "Strap" Component  
**AAA = Battery Cap Component**  
 D = Uncoated, Unleaded "Disk" Component  
 Hold Current, I<sub>hold</sub> \_\_\_\_\_  
 170 or 210 (1.7Amps, 2.1 Amps)  
 Packaging \_\_\_\_\_  
 Packaged per EIA 481-1  
 -2 = Tape and Reel



## Features

- Custom designs to meet appropriate applications
- Compatible with current industry standards
- Overcurrent and overtemperature protection
- Standard and low-temperature material

- Patents pending

## Applications

- Lithium cells
- Battery cells
- Powered toys
- Motors

# MF-D Series - PTC Resettable Fuses

Multifuse® Products offers a PTC resettable fuse in a disk, square or rectangular configuration for overcurrent protection in various custom applications. These products are specific to customer's design requirements and are designed by Bourns to meet customer requirements. Some typical specification

information is listed below. However, all disk products are subject to the end customer verification of the product in the application. For ordering information, contact your nearest Bourns representative.

### Typical Electrical Characteristics

Model	V max. Volts	I max. Amps	Ihold Amperes at 23°C Hold	Initial Resistance		Max. Time to Trip	
				Ohms at 23°C		Amperes at 23°C	Seconds at 23°C
				Min.	Max.		
MF-D	15	10	2.5	0.015	0.032	5	80
MF-D	15	10	2.5	0.015	0.032	10	10
MF-D	15	40	5.5	0.14	0.30	10	5
MF-D	15	50	12.2	0.007	0.017	15	15

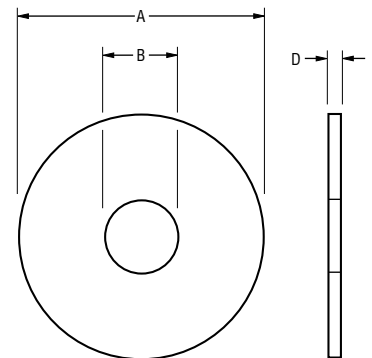
### Product Dimensions

Model	A	B	D
MF-D	14.4	6.3	0.36 max.
MF-D	16.4	10	0.36 max.
MF-D	16.08	9	0.36 max.
MF-D	24	—	0.36 max.

#### NOTES:

1. Devices are 100% resistance tested.
2. Foil materials are Nickel-coated Copper.
3. Alternative electrical and mechanical parameters are possible. Please contact your local Bourns sales office or representative for details.
4. Operating and storage temperatures: -40 to +85°C.
5. All specifications are at 23°C unless otherwise stated.

DIMENSIONS = MM  
TOLERANCE = ±0.05MM TYPICAL



## Upcoming Product Releases

*This section contains data sheets for products that are soon to be released by Bourns Multifuse® Products. The specifications contained in the data sheets are subject to change as the products are released.*

PRELIMINARY



**BOURNS®**

### Features

- Radial Leaded Devices
- Smaller size for similar I<sub>hold</sub> rating.
- Faster tripping
- Tighter trip-to-hold ratios
- Bulk packaging, tape and reel and Ammo-Pak available on most models
- Patents pending

### Applications

- Automotive
- Computers and peripherals
- General electronics

## MF-RG Series - PTC Resettable Fuses

### Electrical Characteristics

Model	V max. Volts	I max. Amps	I <sub>hold</sub>	I <sub>trip</sub>	Initial Resistance		1 Hour (R <sub>1</sub> ) Post-Trip Resistance	Max. Time To Trip		Tripped Power Dissipation
			Amperes At 23°C		Ohms At 23°C		Ohms At 23°C	Amperes At 23°C	Seconds At 23°C	Watts At 23°C
			Hold	Trip	Min.	Max.	Max.			
MF-RG300	16	100	3.00	5.40	0.032	0.075	0.105	15.0	1.1	2.00
MF-RG500	16	100	5.00	9.00	0.015	0.028	0.039	25.0	2.0	2.30
MF-RG700	16	100	7.00	12.60	0.008	0.016	0.023	35.0	3.2	2.90
MF-RG900	16	100	9.00	15.30	0.004	0.080	0.015	45.0	12.0	3.30
MF-RG1100	16	100	11.00	18.70	0.003	0.006	0.010	55.0	15.2	3.70
MF-RG1400	16	100	14.00	23.80	0.002	0.005	0.008	70.0	20.0	4.60

### Product Dimensions

Model	A		B		C		D		E		F		Physical Characteristics	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Lead	Material
MF-RG300	6.1	7.1	6.1	10.2	4.8	5.6	4.4	7.7	2.3	3.0	0.8	1.3	0.81 dia.	Sn/Cu
MF-RG500	9.4	10.4	9.4	12.7	4.8	5.6	4.4	7.7	2.3	3.0	0.8	1.3	0.81 dia.	Sn/Cu
MF-RG700	10.2	11.2	14.7	19.7	4.8	5.6	4.4	7.7	2.3	3.0	0.8	1.3	0.81 dia.	Sn/Cu
MF-RG900	13.0	14.0	16.8	21.7	4.8	5.6	4.4	7.7	2.3	3.0	0.8	1.3	0.81 dia.	Sn/Cu
MF-RG1100	16.5	17.5	21.1	26.0	4.8	5.6	4.4	7.7	2.3	3.0	0.8	1.3	0.81 dia.	Sn/Cu
MF-RG1400	26.9	27.9	22.9	27.9	9.8	10.8	4.4	7.7	2.7	3.4	1.0	1.5	0.81 dia.	Sn/Cu

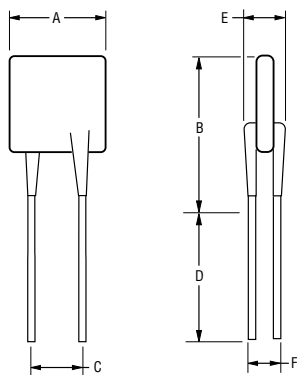
Packaging options:

BULK: MF-RG300-MF-RG1400 = 500 pcs. per bag.

TAPE & REEL: MF-RG300 & MF-RG500 - 12.7mm device pitch = 3000 pcs. per reel; MF-RG700 - 25.4mm device pitch = 1500 pcs. per reel.

AMMO-PACK: MF-RG300 & MF-RG500 - 12.7mm device pitch = 2000 pcs. per reel; MF-RG700 - 25.4mm device pitch = 1000 pcs. per reel.

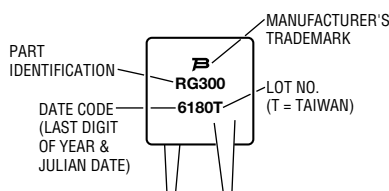
DIMENSIONS = MM.



NOTE: Kinked leads are available for board standoff options. Contact factory for details.

### Typical Part Marking

Represents total content. Layout may vary.



### How to Order

**MF - RG 300 -**

Multifuse® Product Designator

Series \_\_\_\_\_

R = Radial Leaded Component  
 RX = Radial Leaded Component  
**RG = Radial Leaded Component**  
 SM = Surface Mount Component  
 MSMD = 4.5mm Surface Mount Component  
 MSME = 11.5mm Surface Mount Component  
 S = Axial Leaded "Strap" Component  
 LS = Axial Leaded "Strap" Component  
 LR = Axial Leaded "Strap" Component  
 VS = Axial Leaded "Strap" Component  
 AAA = Battery Cap Component  
 D = Uncoated, Unleaded "Disk" Component

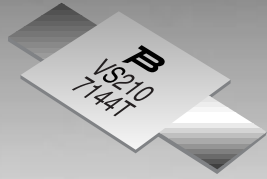
Hold Current, I<sub>hold</sub> \_\_\_\_\_  
 300-1400 (3.00 Amps - 14.00 Amps)

Packaging Options \_\_\_\_\_

- \_\_\_\_\_ = Bulk Packaging  
 - 2 = Tape and Reel\*  
 - AP = Ammo-Pak\*

\*Packaged per EIA 486-B

PRELIMINARY



**BOURNS**<sup>®</sup>

### Features

- Axial leaded
- Fully compatible with current industry standards
- Weldable nickel terminals
- Very low internal resistance
- Low switching temperature
- Patents pending

### Applications

- Any application that requires protection at low resistances
- Rechargeable battery packs
- Cellular phones
- Laptop computers

## MF-VS Series - PTC Resettable Fuses

### Electrical Characteristics

Model	V max. Volts	I max. Amps	$I_{hold}$	$I_{trip}$	Initial Resistance		1 Hour ( $R_1$ ) Post-Trip Resistance	Max. Time To Trip		Tripped Power Dissipation
			Amperes At 23°C		Ohms At 23°C		Ohms At 23°C	Amperes At 23°C	Seconds At 23°C	Watts At 23°C
			Hold	Trip	Min.	Max.	Max.			
MF-VS170	16	100	1.7	3.9	0.030	0.052	0.100	10	1.7	1.2
MF-VS210	16	100	2.1	4.8	0.018	0.030	0.060	10	1.7	1.2

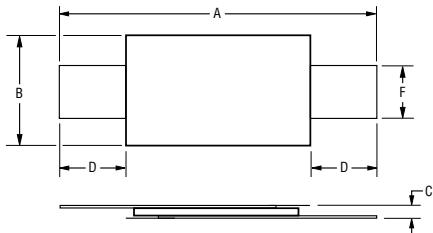
### Product Dimensions

Model	A		B		C		D		F		Package Style
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
MF-VS170	15.5	17.5	7.0	7.4	0.35	0.75	4.1	5.8	3.9	4.1	Std.
MF-VS210G	20.9	23.1	4.9	5.3	0.6	1.0	4.1	5.8	3.9	4.1	Std.
MF-VS210S	20.9	23.1	4.9	5.3	0.6	1.0	4.1	5.8	3.9	4.1	S
MF-VS210L	24.0	26.0	4.9	5.3	0.6	1.0	4.0	7.1	3.9	4.1	Std.

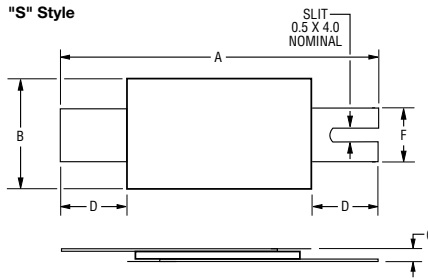
All models packaged in bulk, 500 pieces each.

DIMENSIONS = MM

#### Standard Style

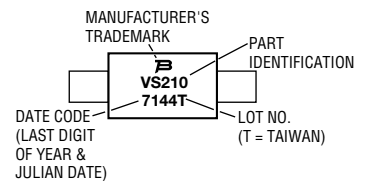


#### "S" Style



### Typical Part Marking

Represents total content. Layout may vary.



### How To Order

**MF - VS 170 S**

Multifuse<sup>®</sup> Product Designator \_\_\_\_\_

Series \_\_\_\_\_

- R = Radial Leaded Component
- RX = Radial Leaded Component
- RG = Radial Leaded Component
- SM = Surface Mount Component
- MSMD = 4.5mm Surface Mount Component
- MSME = 11.5mm Surface Mount Component
- S = Axial Leaded "Strap" Component
- LS = Axial Leaded "Strap" Component
- LR = Axial Leaded "Strap" Component
- VS = Axial Leaded "Strap" Component**
- AAA = Battery Cap Component
- D = Uncoated, Unleaded "Disk" Component

Hold Current,  $I_{hold}$  \_\_\_\_\_  
170-210 (1.7 Amps - 2.1 Amps)

Lead Option \_\_\_\_\_  
S = Slotted Lead Option

MF-VS SERIES, REV. C, 11/99

Specifications are subject to change without notice.

## MF-R and MF-RX Series Tape and Reel Specifications

**BOURNS®**

Devices taped using EIA468-B/IEC286-2 standards. See table below and Figures 1 and 2 for details.

Dimension Description	IEC Mark	EIA Mark	Dimensions	
			Dim. (mm)	Tol. (mm)
Carrier tape width	<i>W</i>	<i>W</i>	18	-0.5/+1.0
Hold down tape width		<i>W4</i>	5	min.
Hold down tape	<i>W0</i>		No protrusion	
Top distance between tape edges	<i>W2</i>	<i>W6</i>	3	max.
Sprocket hole position	<i>W1</i>	<i>W5</i>	9	-0.5/+0.75
Sprocket hole diameter	<i>D0</i>	<i>D0</i>	4	± 0.2
Abscissa to plane (straight lead)	<i>H</i>	<i>H</i>	18.5	± 3.0
Abscissa to plane (kinked lead)	<i>H0</i>	<i>H0</i>	16	± 0.5
Abscissa to top	<i>H1</i>	<i>H1</i>	32.2	max.
Overall width w/lead protrusion		<i>C1</i>	43.2	max.
Overall width w/o lead protrusion		<i>C2</i>	42.5	max.
Lead protrusion	<i>I1</i>	<i>L1</i>	1.0	max.
Protrusion of cutout	<i>L</i>	<i>L</i>	11	max.
Protrusion beyond hold tape	<i>I2</i>	<i>I2</i>	Not specified	
Sprocket hole pitch	<i>P0</i>	<i>P0</i>	12.7	± 0.3
Pitch tolerance			20 seconds	± 1
Device pitch: MF-R010 – MF-R160			12.7	
Device pitch: MF-R185 – MF-R400			25.4	
Device pitch: MF-RX110 – MF-RX160			12.7	
Device pitch: MF-RX185 – MF-RX375			25.4	
Tape thickness	<i>t</i>	<i>t</i>	0.9	max.
Tape thickness with splice		<i>t1</i>	2.0	max.
Splice sprocket hole alignment			0	± 0.3
Body lateral deviation	$\Delta h$	$\Delta h$	0	± 1.0
Body tape plane deviation	$\Delta p$	$\Delta p$	0	± 1.3
Lead seating plane deviation	$\Delta P1$	<i>P1</i>	0	± 0.7
Lead spacing	<i>F</i>	<i>F</i>	5.08	± 0.8
Reel width	<i>w</i>	<i>w</i>	56	max.
Reel diameter	<i>d</i>	<i>a</i>	370	max.
Space between flanges less device			4.75	± 3.25
Arbor hole diameter	<i>f</i>	<i>c</i>	26	± 12.0
Core diameter	<i>h</i>	<i>n</i>	80	max.
Box			56/372/372	max.
Consecutive missing places			3 maximum	
Empty places per reel			Not specified	



## MF-R and MF-RX Series Tape and Reel Specifications

**BOURNS**<sup>®</sup>

Devices taped using EIA468–B/IEC286-2 standards. See table below and Figures 1 and 2 for details.

Dimension Description	IEC Mark	EIA Mark	Dimensions	
			Dim. (mm)	Tol. (mm)
Carrier tape width	<i>W</i>	<i>W</i>	18	-0.5/+1.0
Hold down tape width		<i>W4</i>	5	min.
Hold down tape	<i>W0</i>		No protrusion	
Top distance between tape edges	<i>W2</i>	<i>W6</i>	3	max.
Sprocket hole position	<i>W1</i>	<i>W5</i>	9	-0.5/+0.75
Sprocket hole diameter	<i>D0</i>	<i>D0</i>	4	± 0.2
Abscissa to plane (straight lead)	<i>H</i>	<i>H</i>	18.5	± 3.0
Abscissa to plane (kinked lead)	<i>H0</i>	<i>H0</i>	16	± 0.5
Abscissa to top	<i>H1</i>	<i>H1</i>	32.2	max.
Overall width w/lead protrusion		<i>C1</i>	43.2	max.
Overall width w/o lead protrusion		<i>C2</i>	42.5	max.
Lead protrusion	<i>I1</i>	<i>L1</i>	1.0	max.
Protrusion of cutout	<i>L</i>	<i>L</i>	11	max.
Protrusion beyond hold tape	<i>I2</i>	<i>I2</i>	Not specified	
Sprocket hole pitch	<i>P0</i>	<i>P0</i>	12.7	± 0.3
Pitch tolerance			20 seconds	± 1
Device pitch: MF-R010 – MF-R160			12.7	
Device pitch: MF-R185 – MF-R400			25.4	
Device pitch: MF-RX110 – MF-RX160			12.7	
Device pitch: MF-RX185 – MF-RX375			25.4	
Tape thickness	<i>t</i>	<i>t</i>	0.9	max.
Tape thickness with splice		<i>t1</i>	2.0	max.
Splice sprocket hole alignment			0	± 0.3
Body lateral deviation	$\Delta h$	$\Delta h$	0	± 1.0
Body tape plane deviation	$\Delta p$	$\Delta p$	0	± 1.3
Lead seating plane deviation	$\Delta P1$	<i>P1</i>	0	± 0.7
Lead spacing	<i>F</i>	<i>F</i>	5.08	± 0.8
Reel width	<i>w</i>	<i>w</i>	56	max.
Reel diameter	<i>d</i>	<i>a</i>	370	max.
Space between flanges less device			4.75	± 3.25
Arbor hole diameter	<i>f</i>	<i>c</i>	26	± 12.0
Core diameter	<i>h</i>	<i>n</i>	80	max.
Box			56/372/372	max.
Consecutive missing places			3 maximum	
Empty places per reel			Not specified	

Specifications are subject to change without notice.

## Taped Component Dimensions

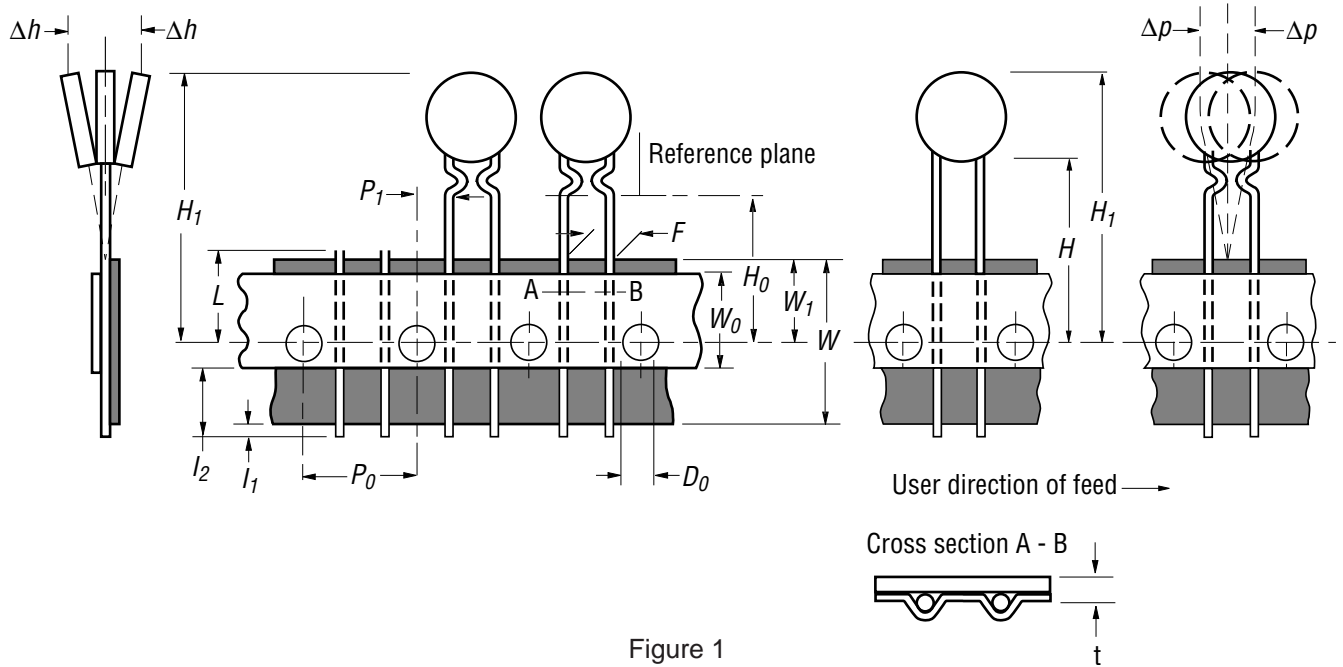


Figure 1

## Reel Dimensions

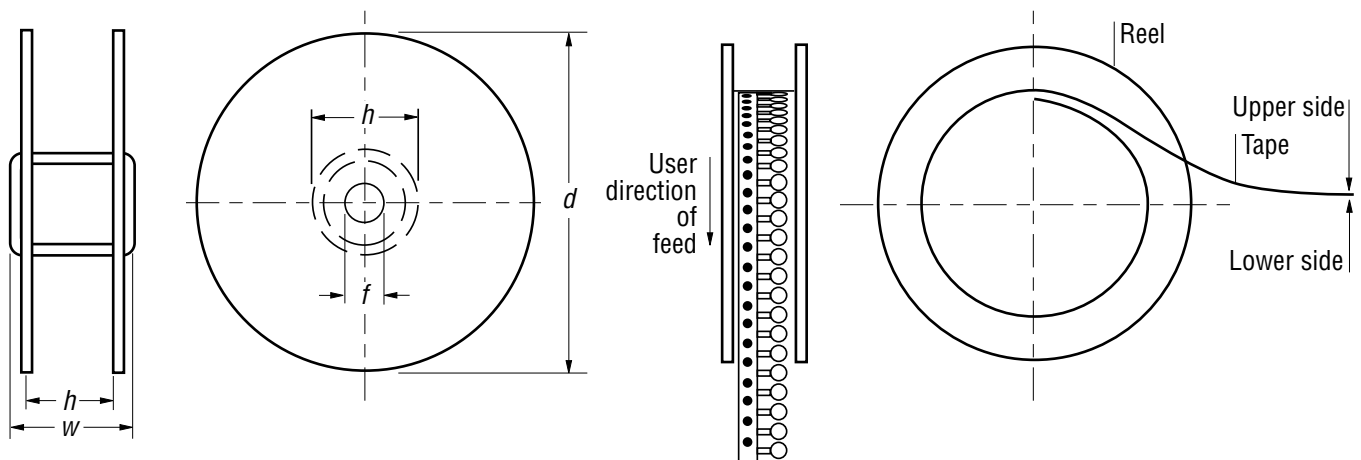


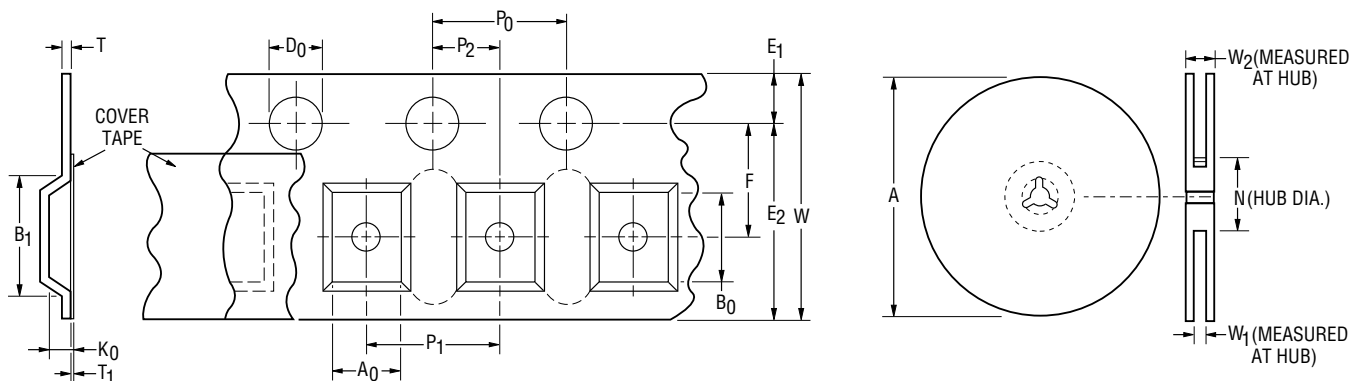
Figure 2

# MF-SM Series Tape and Reel Specifications



Tape Dimension Identifiers	MF-SM030, 050, 075, 100, 125 per EIA-481-2	MF-SM150, 200, 250, 260 per EIA 481-2
W	16 ± 0.3	16 ± 0.3
P <sub>0</sub>	4.0 ± 0.10	4.0 ± 0.10
P <sub>1</sub>	8.0 ± 0.10	12.0 ± 0.10
P <sub>2</sub>	2.0 ± 0.10	2.0 ± 0.10
A <sub>0</sub>	5.7 ± 0.10	6.9 ± 0.10
B <sub>0</sub>	8.1 ± 0.15	9.6 ± 0.10
B <sub>1</sub> max.	9.1	11.0
D <sub>0</sub>	1.5 + 0.1/ - 0	1.5 + 0.1/ - 0
F	7.5 ± 0.10	7.5 ± 0.10
E <sub>1</sub>	1.75 ± 0.10	1.75 ± 0.10
E <sub>2</sub> min.	14.25	14.25
T max.	0.4	0.4
T <sub>1</sub> max.	0.1	0.1
K <sub>0</sub>	3.4 ± 0.15	3.5 ± 0.10
Leader min.	390	390
Trailer min.	160	160
<b>Reel Dimension Identifiers</b>		
A max.	360	360
N min.	50	50
W <sub>1</sub>	16.4 + 2.0/ - 0	16.4 + 2.0/ - 0
W <sub>2</sub> max.	22.4	22.4

DIMENSIONS: MM

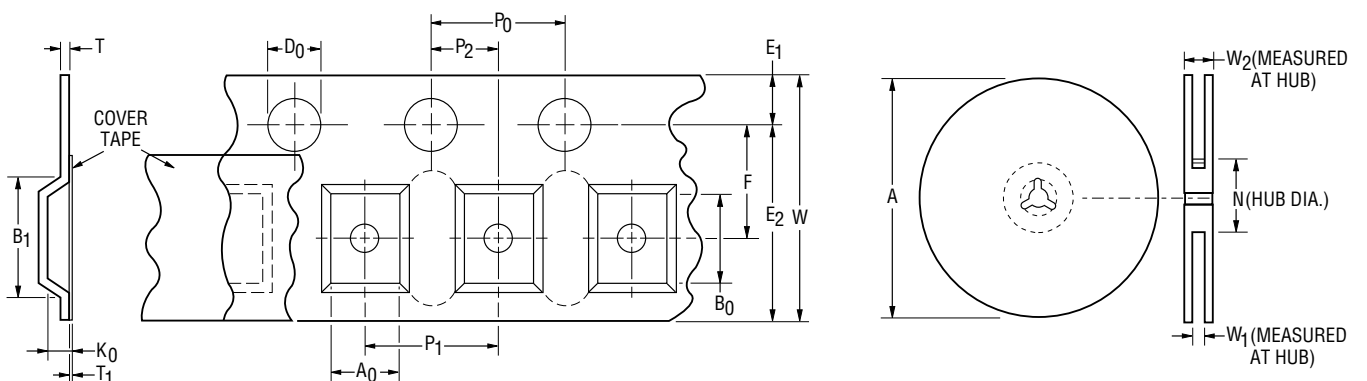


# MF-MSMD Series Tape and Reel Specifications



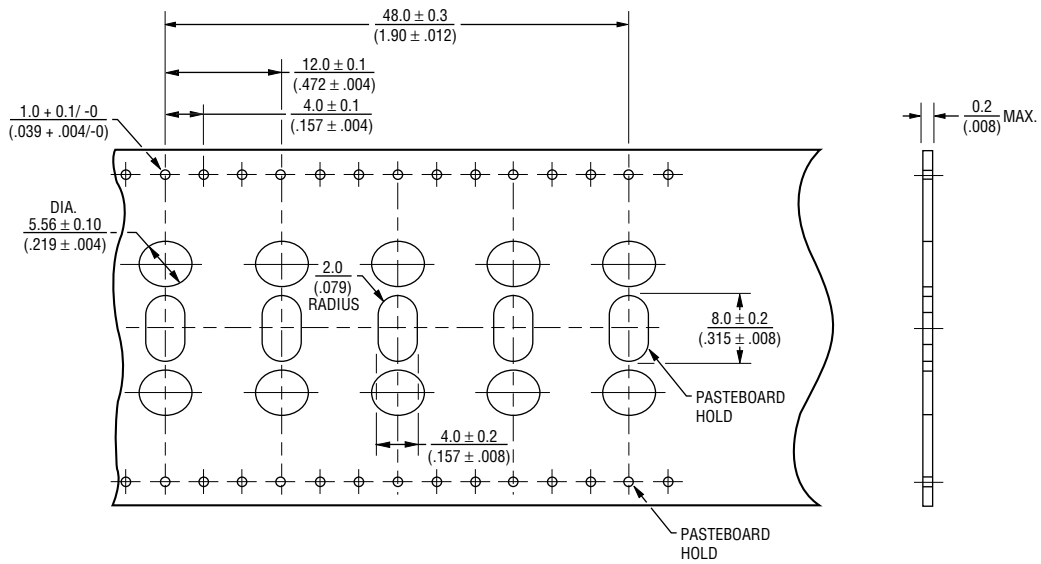
Tape Dimension Identifiers	MF-MSMD014, 020, 050, 075, 110, 125, 150 per EIA-481-1	MF-MSMD035 per EIA 481-1
W	12 ± 0.3	8 ± 0.3
P <sub>0</sub>	4.0 ± 0.10	4.0 ± 0.10
P <sub>1</sub>	8.0 ± 0.10	4.0 ± 0.10
P <sub>2</sub>	2.0 ± 0.05	2.0 ± 0.05
A <sub>0</sub>	3.5 ± 0.23	2.8 ± 0.1
B <sub>0</sub>	5.1 ± 0.15	3.5 ± 0.1
B <sub>1</sub> max.	5.9	4.35
D <sub>0</sub>	1.5 + 0.1/ - 0	1.5 + 0.1/ - 0
F	5.5 ± 0.05	3.5 ± 0.05
E <sub>1</sub>	1.75 ± 0.10	1.75 ± 0.10
E <sub>2</sub> min.	10.25	6.25
T max.	0.6	0.6
T <sub>1</sub> max.	0.1	0.1
K <sub>0</sub>	0.9 ± 0.15	1.1 ± 0.05
Leader min.	390	390
Trailer min.	160	160
<b>Reel Dimension Identifiers</b>		
A max.	185	185
N min.	50	50
W <sub>1</sub>	12.4 + 2.0/ - 0	8.4 + 1.5/ - 0
W <sub>2</sub> max.	18.4	14.4

DIMENSIONS: MM

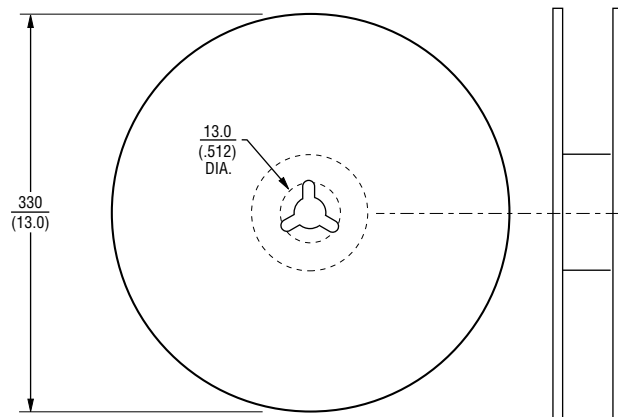


# MF-S, MF-LS, MF-LR and MF-VS Series Tape and Reel Specifications **BOURNS**<sup>®</sup>

## Taped Component Dimensions



## Reel Dimensions



## Radial Leaded Model MF-R, MF-RX and MF-RG Series

Raychem PolySwitch® Model No.	Bourns Multifuse® Model No.	Maximum Voltage	Maximum Current (A)	Pin Layout (mm)	
				Nom.	Tol.
RXE010	<b>MF-R010</b>	60	40	5.1	0.7
RXE017	<b>MF-R017</b>	60	40	5.1	0.7
RXE020	<b>MF-R020</b>	60	40	5.1	0.7
RXE025	<b>MF-R025</b>	60	40	5.1	0.7
RXE030	<b>MF-R030</b>	60	40	5.1	0.7
RXE040	<b>MF-R040</b>	60	40	5.1	0.7
RXE050	<b>MF-R050</b>	60	40	5.1	0.7
RXE065	<b>MF-R065</b>	60	40	5.1	0.7
RXE075	<b>MF-R075</b>	60	40	5.1	0.7
RXE090	<b>MF-R090</b>	60	40	5.1	0.7
RXE110	<b>MF-RX110</b>	60	40	5.1	0.7
RXE135	<b>MF-RX135</b>	60	40	5.1	0.7
RXE160	<b>MF-RX160</b>	60	40	5.1	0.7
RXE185	<b>MF-RX185</b>	60	40	5.1	0.7
RXE250	<b>MF-RX250</b>	60	40	10.2	0.4
RXE300	<b>MF-RX300</b>	60	40	10.2	0.4
RXE375	<b>MF-RX375</b>	60	40	10.2	0.4
RUE090	<b>MF-R090-0-9</b>	30	40	5.1	0.7
RUE110	<b>MF-R110</b>	30	40	5.1	0.7
RUE135	<b>MF-R135</b>	30	40	5.1	0.7
RUE160	<b>MF-R160</b>	30	40	5.1	0.7
RUE185	<b>MF-R185</b>	30	40	5.1	0.7
—	<b>MF-R250*</b>	30	40	5.1	0.7
RUE250**	<b>MF-R250-0-10**</b>	30	40	5.1	0.7
RUE300	<b>MF-R300</b>	30	40	5.1	0.7
RUE400	<b>MF-R400</b>	30	40	5.1	0.7
RUE500	<b>MF-R500</b>	30	40	5.1	0.7
RUE600	<b>MF-R600</b>	30	40	5.1	0.7
RUE700	<b>MF-R700</b>	30	40	10.2	0.4
RUE800	<b>MF-R800</b>	30	40	10.2	0.4
RUE900	<b>MF-R900</b>	30	40	10.2	0.4
RGE300	<b>MF-RG300</b>	16	100	5.1	0.7
RGE500	<b>MF-RG500</b>	16	100	5.1	0.7
RGE700	<b>MF-RG700</b>	16	100	5.1	0.7
RGE900	<b>MF-RG900</b>	16	100	5.1	0.7
RGE1100	<b>MF-RG1100</b>	16	100	5.1	0.7
RGE1400	<b>MF-RG1400</b>	16	100	5.1	0.7

\* with 20AWG wire

\*\* with 24 AWG wire

"Multifuse" is a registered trademark of Bourns, Inc.  
"PolySwitch" is a registered trademark of Raychem Corporation.

## Axial Leaded Battery Strap Model MF-S and MF-LS Series

Raychem PolySwitch® Model No.	Bourns Multifuse® Model No.	Maximum Voltage	Maximum Current (A)	Dimensions
SRP120	<b>MF-S120</b>	15	100	Compatible
SRP120S	<b>MF-S120S</b>	15	100	Compatible
—	<b>MF-S150</b>	15	100	Compatible
SRP175	<b>MF-S175</b>	15	100	Compatible
SRP175S	<b>MF-S175S</b>	15	100	Compatible
SRP200	<b>MF-S200</b>	30	100	Compatible
SRP350	<b>MF-S350</b>	30	100	Compatible
SRP420	<b>MF-S420</b>	30	100	Compatible
LTP070	<b>MF-LS070</b>	24	100	Compatible
LTP070S	<b>MF-LS07S</b>	24	100	Compatible
LTP100S	<b>MF-LS100S</b>	24	100	Compatible
LTP180	<b>MF-LS180</b>	24	100	Compatible
LTP180S	<b>MF-LS180S</b>	24	100	Compatible
LTP190	<b>MF-LS190</b>	24	100	Compatible
LTP190R-U	<b>MF-LS190RU</b>	15	100	Compatible
LTP260	<b>MF-LS260</b>	24	100	Compatible
LTP300	<b>MF-LS300</b>	24	100	Compatible
LTP340	<b>MF-LS340</b>	24	100	Compatible

## Axial Leaded Battery Strap Model MF-LR and MF-VS Series

Raychem PolySwitch® Model No.	Bourns Multifuse® Model No.	Maximum Voltage	Maximum Current (A)	Dimensions
LR4-190	<b>MF-LR90</b>	15	100	Compatible
LR4-190S	<b>MF-LR190S</b>	15	100	Compatible
LR4-260S	<b>MF-LR260S</b>	15	100	Compatible
LR4-380	<b>MF-LR380</b>	15	100	Compatible
LR4-450	<b>MF-LR450</b>	20	100	Compatible
LR4-550	<b>MF-LR550</b>	20	100	Compatible
LR4-600	<b>MF-LR600</b>	20	100	Compatible
LR4-730	<b>MF-LR730</b>	20	100	Compatible
VTP170	<b>MF-VS170</b>	16	100	Compatible
VTP210	<b>MF-VS210</b>	16	100	Compatible

"Multifuse" is a registered trademark of Bourns, Inc.  
 "PolySwitch" is a registered trademark of Raychem Corporation.

## Surface Mount Model MF-SM Series

Raychem PolySwitch® Model No.	Bourns Multifuse® Model No.	Maximum Voltage	Maximum Current (A)	Dimensions (mm)		
				A	B max.	C max.
SMD030	<b>MF-SM030</b>	60	10	6.73/7.98	3.18	5.44
SMD050	<b>MF-SM050</b>	60	10	6.73/7.98	3.18	5.44
SMD075	<b>MF-SM075</b>	30	40	6.73/7.98	3.18	5.44
SMD100	<b>MF-SM100</b>	30	40	6.73/7.98	3.00	5.44
SMD125	<b>MF-SM125</b>	15	40	6.73/7.98	3.00	5.44
SMD150	<b>MF-SM150</b>	15	40	8.00/9.5	3.00	6.71
SMD200	<b>MF-SM200</b>	15	40	8.00/9.5	3.00	6.71
SMD250	<b>MF-SM250</b>	15	40	8.00/9.5	3.00	6.71
SMD260	<b>MF-SM260</b>	6	40	6.73/7.98	3.00	5.44

## Surface Mount Model MF-MSMD and MF-MSME Series

Raychem PolySwitch® Model No.	Bourns Multifuse® Model No.	Maximum Voltage	Maximum Current (A)	Dimensions (mm)		
				A min.	B max.	C max.
miniSMDC014	MF-MSMD014	60	10	4.37	3.17	0.89
—	See Note 1	30	10	4.37	3.41	0.81
miniSMDC035	MF-MSMD035	6.0	40	3.00	2.80	0.62
miniSMDC050	See Note 1	15.0	40	4.37	3.41	0.62
miniSMDC075	See Note 1	13.2	40	4.37	3.41	0.62
miniSMDC110	MF-MSMD110	6.0	40	4.37	3.41	0.62
miniSMDC125	MF-MSMD125	6.0	40	4.37	3.41	0.48
miniSMDC150	MF-MSMD150	6.0	40	4.37	3.41	0.48
PSR23550	MF-MSME190	24	100	15.7	6.5	0.35

A = length B = height C = width

"Multifuse" is a registered trademark of Bourns, Inc.  
"PolySwitch" is a registered trademark of Raychem Corporation.

Note 1: Please see MF-MSMD Series data sheet for exact specifications.



# Glossary

## DEFINITIONS:

**Amorphous** - Without crystallization in the ultimate texture of a solid substance. Used to describe the material structure in the tripped state of a Multifuse device.

**Carbon Black** - A conductive material used in Multifuse devices to provide a path for current flow under normal operating conditions.

**Conductive Plastic** - A plastic material, such as a polymer, containing conductive particles, such as carbon black, that provide a path for current flow.

**Current, Hold ( $I_{\text{hold}}$ )** - The maximum current a Multifuse device can pass without interruption.

**Current, Maximum ( $I_{\text{MAX}}$ )** - The maximum fault current a Multifuse device can withstand without damage at the rated voltage.

**Current, Trip ( $I_{\text{trip}}$ )** - The minimum current that will switch a device from the low resistance to the high resistance state.

**Electrode** - A device or material that emits or controls the flow of electricity. Nickel and Copper elements are used in Multifuse devices to aid even distribution of current across the surface of the device.

**Power Dissipation ( $P_d$ )** - Power dissipated from the device while in the tripped state.

**Polymer** - a synthetic plastic material consisting of large molecules made up of a linked series of repeated simple monomers. The insulating medium used in Multifuse devices which maintains the carbon chains in suspension during overcurrent while permitting the carbon chains to form during normal operation.

**Polymeric Positive Temperature Coefficient (PPTC)** - A characteristic of Multifuse devices that describes a large increase in resistance as the device reaches its trip temperature.

**Resistance, Initial ( $R_{\text{Min}}$  -  $R_{\text{Max}}$ )** - The resistance range of the Multifuse devices, as received from the factory.

**Resistance, Post Trip ( $R_{1\text{max}}$ )** - The maximum post-trip resistance one hour after a Multifuse device has been tripped and power has been removed.

**Resistance, Post Reflow ( $R_{1\text{max}}$ )** - The maximum resistance one hour after a Multifuse surface mount device has been reflow soldered.

**Temperature, Operating** - The ambient temperature range in which a Multifuse device is designed to operate under rated voltage and current.

**Temperature, Tripped State** - The maximum device surface temperature in the tripped state.

**Thermal Derating** - The effect of a change in ambient temperature on the hold and trip current.

**Voltage, Maximum ( $V_{\text{Max}}$ )** - The maximum voltage a Multifuse device can withstand without damage at the rated current.

## TEST PROCEDURES:

**Humidity Aging** - a test used to determine the effects, if any, of exposure of a Multifuse device to humidity at an elevated temperature. The room temperature resistance is measured before and after conditioning the device.

**Mechanical Shock** - a test used to evaluate the physical effects, if any, and constructional integrity of a Multifuse device when subjected to mechanical shock. The room temperature resistance is measured before and after conditioning.

**Passive Aging** - a test used to determine the effects, if any, of the aging of a Multifuse device. The room temperature resistance is measured before and after conditioning the device at an elevated temperature for an extended time period.

**Solvent Resistance** - a test used to determine the effects, if any, on the marking and external portion of a Multifuse device by common industrial solvents.

**Thermal Shock** - a test used to determine the effects, if any, of a rapidly and drastic changes in ambient temperature on a Multifuse device. The room temperature resistance is measured before and after conditioning.

**Time to Trip** - a test used to determine the time it takes for a Multifuse device to trip at a given temperature and current. Normally, the time to trip is measured at  $I = 5 \times I_{hold}$  and 23°C. The time to trip decreases as the fault current and/or ambient temperature is increased.

**Trip Cycle Life** - a test used to determine the number of trip cycles (at  $V_{Max}$  &  $I_{Max}$ ) a Multifuse device will sustain without failure.

**Trip Endurance** - a test used to determine the duration of time a Multifuse device will sustain its maximum rated voltage in the tripped state without failure.

**Vibration** - a test used to evaluate the physical effects, if any, and constructional integrity of a Multifuse device when subjected to vibration. The room temperature resistance is measured before and after conditioning.

**ENGINEERING NOTES:**

Tripped Power Dissipation .....  $P_d = I_{ss} V$   
 Tripped State Resistance .....  $R_T = V^2/P_d$   
 Automatic Reset Condition.....  $V^2/4R_L < P_d$

where,

$I_{ss}$  = current flowing through the device in tripped state

$V$  = Voltage dropped across the device in tripped state

$R_L$  = Circuit Load Resistance

**RELEVANT STANDARDS:**

UL

- UL 1434.....Standard for Thermistor-Type Devices
- UL 1950 (IEC 950).....Computer Equipment (8A-5sec. protection)
- UL 603.....Burglar Alarm Systems (8A-1min. protection)
- UL 813 .....Commercial Audio Systems (8A-1 min. protection)

TUV

- IEC 730-1/J (EN60730-1/J) .....Requirements for Controls Using Thermistors

CSA

- Component Acceptance Service NO 18A .....PTC Thermistors Used as Overcurrent Devices

Other Multifuse Applications

- IEEE 1394 .....High Performance Serial Bus Standard
- USB .....Universal Serial Bus Standard

## Worldwide Sales Offices

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<b>Benelux:</b>	+31- 703004333	+31- 703004345
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<b>Singapore:</b>	+65- 3461933	+65- 3461911
<b>South Africa:</b>	+27- (0)11 802 1400	+27- (0)11 802 1429
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REV. 2

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