



## Features

- Compact design to save board space - 0603 footprint
- Small size results in very fast time to react to fault events
- Low profile
- RoHS compliant\* and halogen free\*\*
- Agency recognition: 

## Applications

- USB port protection
- HDMI 1.4 Source protection
- PC motherboards - Plug and Play protection
- Mobile phones - Battery and port protection
- PDAs / digital cameras

# MF-FSMF Series - PTC Resettable Fuses

## Electrical Characteristics

| Model       | V max.<br>Volts | I max.<br>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> |                   |                  | Typ.                      |
| MF-FSMF010X | 15              | 40             | 0.10              | 0.30              | 0.900             | 6.000              | 0.50              | 1.00             | 0.5                       |
| MF-FSMF020X | 9               | 40             | 0.20              | 0.50              | 0.550             | 3.500              | 1.00              | 0.60             | 0.5                       |
| MF-FSMF025X | 6               | 40             | 0.25              | 0.75              | 0.20              | 1.400              | 8.00              | 0.10             | 0.5                       |
| MF-FSMF035X | 6               | 40             | 0.35              | 0.75              | 0.200             | 1.400              | 8.00              | 0.10             | 0.5                       |
| MF-FSMF050X | 6               | 40             | 0.50              | 1.00              | 0.100             | 0.800              | 8.00              | 0.10             | 0.5                       |

## Environmental Characteristics

|                                                              |                                                                  |
|--------------------------------------------------------------|------------------------------------------------------------------|
| Operating Temperature.....                                   | -40 °C to +85 °C                                                 |
| Maximum Device Surface Temperature<br>in Tripped State ..... | 125 °C                                                           |
| Passive Aging .....                                          | +85 °C, 1000 hours.....±5 % typical resistance change            |
| Humidity Aging.....                                          | +85 °C, 85 % R.H. 1000 hours .....±5 % typical resistance change |
| Thermal Shock .....                                          | +85 °C to -40 °C, 20 times.....±10 % typical resistance change   |
| Solvent Resistance.....                                      | MIL-STD-202, Method 215 .....No change                           |
| Vibration .....                                              | MIL-STD-883C, Method 2007.1,.....No change<br>Condition A        |

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

| Test                         | Test Conditions                                                                                                                              | Accept/Reject Criteria                   |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Visual/Mech. ....            | Verify dimensions and materials .....                                                                                                        | Per MF physical description              |
| Resistance.....              | In still air @ 23 °C .....                                                                                                                   | R <sub>min</sub> ≤ R ≤ R <sub>1max</sub> |
| Time to Trip.....            | At specified current, V <sub>max</sub> , 23 °C.....                                                                                          | T ≤ max. time to trip (seconds)          |
| Hold Current .....           | 30 min. at I <sub>hold</sub> .....                                                                                                           | No trip                                  |
| Trip Cycle Life.....         | V <sub>max</sub> , I <sub>max</sub> , 100 cycles.....                                                                                        | No arcing or burning                     |
| Trip Endurance .....         | V <sub>max</sub> , 48 hours.....                                                                                                             | No arcing or burning                     |
| Solderability .....          | ANSI/J-STD-002 .....                                                                                                                         | 95 % min. coverage                       |
| UL File Number .....         | E174545<br><a href="http://www.ul.com/">http://www.ul.com/</a> Follow link to Certifications, then UL File No., enter E174545                |                                          |
| TÜV Certificate Number ..... | R 50171531<br><a href="http://www.tuvdotcom.com/">http://www.tuvdotcom.com/</a> Follow link to "other certificates", enter File No. 50171531 |                                          |

## 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-FSMF010X | 0.13                          | 0.12   | 0.11 | 0.10  | 0.08  | 0.07  | 0.06  | 0.05  | 0.03  |
| MF-FSMF020X | 0.27                          | 0.25   | 0.23 | 0.20  | 0.17  | 0.14  | 0.12  | 0.10  | 0.07  |
| MF-FSMF025X | 0.32                          | 0.29   | 0.27 | 0.25  | 0.21  | 0.18  | 0.16  | 0.14  | 0.10  |
| MF-FSMF035X | 0.47                          | 0.41   | 0.38 | 0.35  | 0.29  | 0.26  | 0.24  | 0.20  | 0.14  |
| MF-FSMF050X | 0.67                          | 0.59   | 0.54 | 0.50  | 0.41  | 0.37  | 0.34  | 0.29  | 0.20  |

\*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.

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

Specifications are subject to change without notice.

The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time. Users should verify actual device performance in their specific applications.

## Additional Applications

- Automotive electronic control modules
- Game console port protection

# MF-FSMF Series - PTC Resettable Fuses

**BOURNS®**

## Product Dimensions

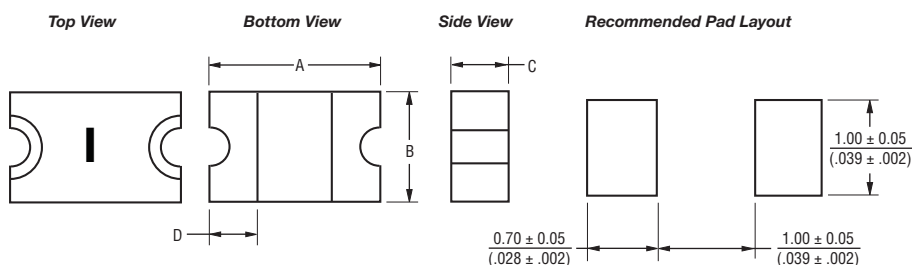
| Model       | A                      |                        | B                      |                        | C                      |                        | D                      |
|-------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
|             | Min.                   | Max.                   | Min.                   | Max.                   | Min.                   | Max.                   | Min.                   |
| MF-FSMF010X | $\frac{1.45}{(0.057)}$ | $\frac{1.85}{(0.073)}$ | $\frac{0.65}{(0.026)}$ | $\frac{1.05}{(0.041)}$ | $\frac{0.30}{(0.012)}$ | $\frac{0.65}{(0.026)}$ | $\frac{0.20}{(0.008)}$ |
| MF-FSMF020X | $\frac{1.45}{(0.057)}$ | $\frac{1.85}{(0.073)}$ | $\frac{0.65}{(0.026)}$ | $\frac{1.05}{(0.041)}$ | $\frac{0.30}{(0.012)}$ | $\frac{0.65}{(0.026)}$ | $\frac{0.20}{(0.008)}$ |
| MF-FSMF025X | $\frac{1.45}{(0.057)}$ | $\frac{1.85}{(0.073)}$ | $\frac{0.65}{(0.026)}$ | $\frac{1.05}{(0.041)}$ | $\frac{0.30}{(0.012)}$ | $\frac{0.65}{(0.026)}$ | $\frac{0.20}{(0.008)}$ |
| MF-FSMF035X | $\frac{1.45}{(0.057)}$ | $\frac{1.85}{(0.073)}$ | $\frac{0.65}{(0.026)}$ | $\frac{1.05}{(0.041)}$ | $\frac{0.30}{(0.012)}$ | $\frac{0.65}{(0.026)}$ | $\frac{0.20}{(0.008)}$ |
| MF-FSMF050X | $\frac{1.45}{(0.057)}$ | $\frac{1.85}{(0.073)}$ | $\frac{0.65}{(0.026)}$ | $\frac{1.05}{(0.041)}$ | $\frac{0.65}{(0.026)}$ | $\frac{1.00}{(0.039)}$ | $\frac{0.20}{(0.008)}$ |

Packaging: MF-FSMF010X = 5000 pcs. per reel;

MF-FSMF020X, MF-FSMF025X & MF-FSMF035X = 6000 pcs. per reel;

MF-FSMF050X = 4000 pcs. per reel

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

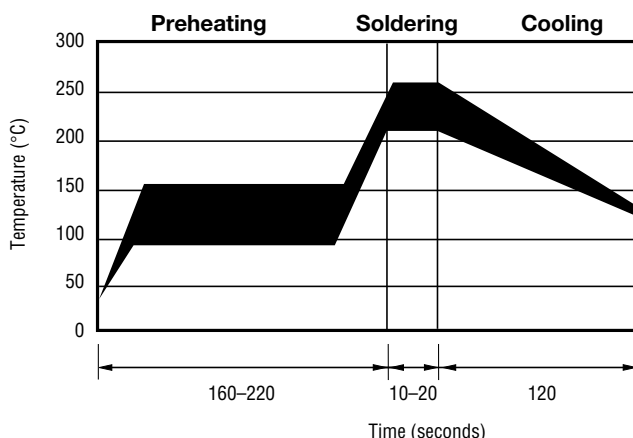


Terminal material:  
Nickel/gold plated.

Termination pad solderability:  
Standard Au finish:  
Meets ANSI/J-STD-002 Category 2.

Recommended Storage:  
40 °C max./70 % RH max.

## Solder Reflow Recommendations



### Notes:

- MF-FSMF models cannot be wave soldered. Please contact Bourns for hand soldering recommendations.
- If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.
- Compatible with Pb and Pb-free solder reflow profiles.
- Excess solder may cause a short circuit, especially during hand soldering. Please refer to the Multifuse® Polymer PTC Soldering Recommendation guidelines.

## How To Order

### MF - FSMF 020 X - 2

Multifuse® Product Designator  
Series  
FSMF = 0603 Surface Mount Component  
Hold Current, I<sub>hold</sub>  
010-050 (0.10 - 0.50 Amps)  
Multifuse® freeXpansion™ Design  
Packaging  
Packaged per EIA 481-1  
-2 = Tape and Reel

## Typical Part Marking



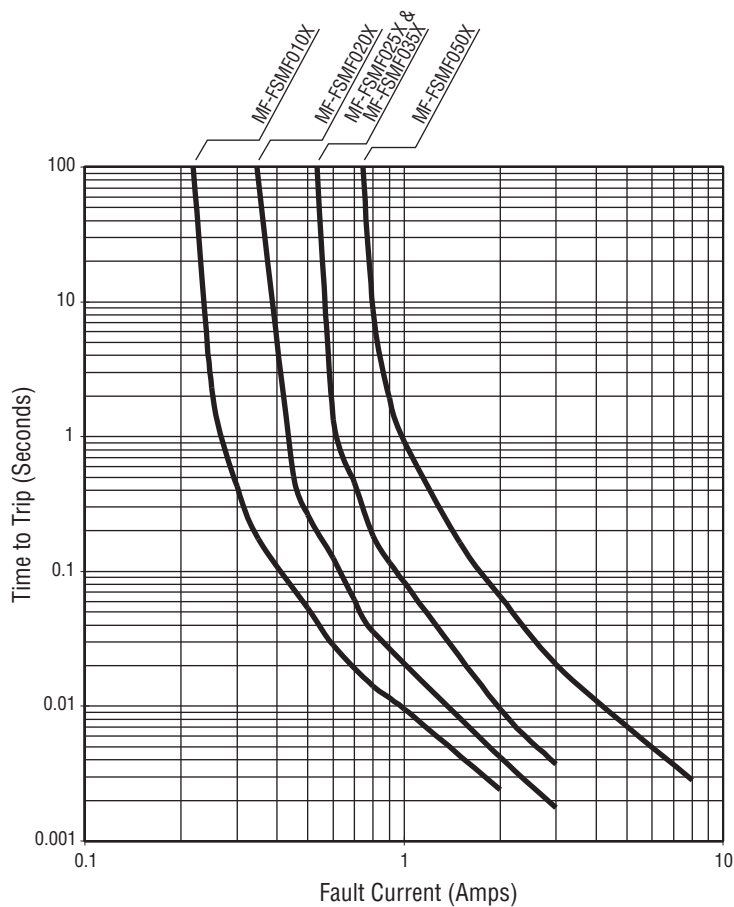
BI-WEEKLY DATE CODE WILL APPEAR ON THE PACKAGING LABEL:  
WEEK 1 AND 2 = A  
WEEK 51 AND 52 = Z

"freeXpansion Design" is a trademark of Bourns, Inc.  
Specifications are subject to change without notice.  
The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time.  
Users should verify actual device performance in their specific applications.

# MF-FSMF Series - PTC Resettable Fuses

**BOURNS®**

Typical Time to Trip at 23 °C



The Time to Trip curves represent typical performance of a device in a simulated application environment. Actual performance in specific customer applications may differ from these values due to the influence of other variables.

**BOURNS®**

**Asia-Pacific:** Tel: +886-2 2562-4117 • Fax: +886-2 2562-4116

**EMEA:** Tel: +36 88 520 390 • Fax: +36 88 520 211

**The Americas:** Tel: +1-951 781-5500 • Fax: +1-951 781-5700

[www.bourns.com](http://www.bourns.com)

MF-FSMF SERIES, REV. I, 08/15

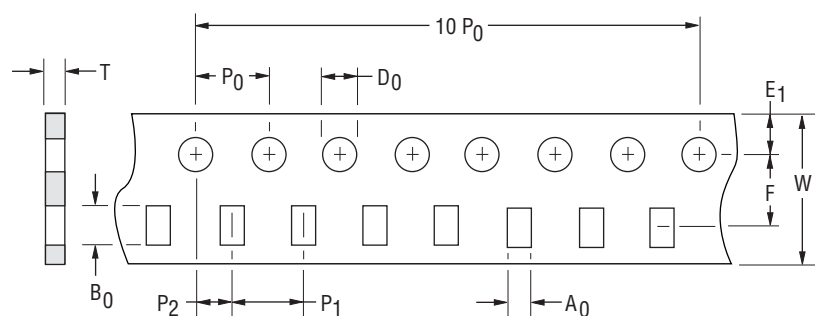
Specifications are subject to change without notice.  
The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time.  
Users should verify actual device performance in their specific applications.

# MF-FSMF Series Tape and Reel Specifications

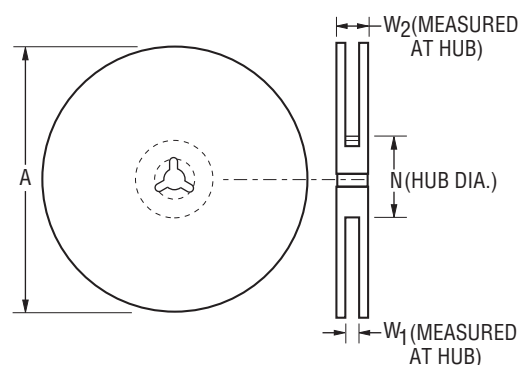
**BOURNS®**

## Product Dimensions

| Tape Dimensions        | MF-FSMF010X<br>per EIA 481-1           | MF-FSMF020X,<br>MF-FSMF025X, MF-FSMF035X<br>per EIA 481-1 | MF-FSMF050X<br>per EIA 481-1           |
|------------------------|----------------------------------------|-----------------------------------------------------------|----------------------------------------|
| W                      | $8.0 \pm 0.1$<br>(0.315 ± 0.004)       | $8.0 \pm 0.1$<br>(0.315 ± 0.004)                          | $8.0 \pm 0.1$<br>(0.315 ± 0.004)       |
| P <sub>0</sub>         | $4.0 \pm 0.1$<br>(0.157 ± 0.004)       | $4.0 \pm 0.1$<br>(0.157 ± 0.004)                          | $4.0 \pm 0.1$<br>(0.157 ± 0.004)       |
| P <sub>1</sub>         | $4.0 \pm 0.05$<br>(0.157 ± 0.002)      | $4.0 \pm 0.05$<br>(0.157 ± 0.002)                         | $4.0 \pm 0.05$<br>(0.157 ± 0.002)      |
| P <sub>2</sub>         | $2.0 \pm 0.05$<br>(0.079 ± 0.002)      | $2.0 \pm 0.05$<br>(0.079 ± 0.002)                         | $2.0 \pm 0.05$<br>(0.079 ± 0.002)      |
| A <sub>0</sub>         | $1.17 \pm 0.05$<br>(0.046 ± 0.002)     | $1.17 \pm 0.05$<br>(0.046 ± 0.002)                        | $1.17 \pm 0.05$<br>(0.046 ± 0.002)     |
| B <sub>0</sub>         | $2.02 \pm 0.05$<br>(0.079 ± 0.002)     | $2.02 \pm 0.05$<br>(0.079 ± 0.002)                        | $2.02 \pm 0.05$<br>(0.079 ± 0.002)     |
| D <sub>0</sub>         | $1.55 \pm 0.05$<br>(0.061 ± 0.002)     | $1.55 \pm 0.05$<br>(0.061 ± 0.002)                        | $1.55 \pm 0.05$<br>(0.061 ± 0.002)     |
| F                      | $3.5 \pm 0.05$<br>(0.138 ± 0.002)      | $3.5 \pm 0.05$<br>(0.138 ± 0.002)                         | $3.5 \pm 0.05$<br>(0.138 ± 0.002)      |
| E <sub>1</sub>         | $1.75 \pm 0.1$<br>(0.069 ± 0.004)      | $1.75 \pm 0.1$<br>(0.069 ± 0.004)                         | $1.75 \pm 0.1$<br>(0.069 ± 0.004)      |
| T                      | $0.75 \pm 0.05$<br>(0.030 ± 0.002)     | $0.60 \pm 0.05$<br>(0.024 ± 0.002)                        | $0.95 \pm 0.05$<br>(0.037 ± 0.002)     |
| 10 P <sub>0</sub>      | $40.0 \pm 0.1$<br>(1.575 ± 0.004)      | $40.0 \pm 0.1$<br>(1.575 ± 0.004)                         | $40.0 \pm 0.1$<br>(1.575 ± 0.004)      |
| <b>Reel Dimensions</b> |                                        |                                                           |                                        |
| A max.                 | $185$<br>(7.283)                       | $185$<br>(7.283)                                          | $185$<br>(7.283)                       |
| N min.                 | $50$<br>(1.97)                         | $50$<br>(1.97)                                            | $50$<br>(1.97)                         |
| W <sub>1</sub>         | $8.4 + 1.5/-0.0$<br>(0.331 + 0.059/-0) | $8.4 + 1.5/-0.0$<br>(0.331 + 0.059/-0)                    | $8.4 + 1.5/-0.0$<br>(0.331 + 0.059/-0) |
| W <sub>2</sub> max.    | $14.4$<br>(0.567)                      | $14.4$<br>(0.567)                                         | $14.4$<br>(0.567)                      |



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



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