



## Features

- Surface mount packaging for automated assembly
- Small footprint size (1206) and low profile for space-constrained mobile applications
- Ultra-low resistance
- RoHS compliant\* and halogen free\*\*
- Agency recognition:  

## Applications

- Thermal protection for Li-ion & polymer battery packs
- USB port protection - USB 2.0, 3.0 & OTG
- HDMI 1.4 Source protection
- PC motherboards - Plug & Play protection
- Mobile phones - Battery & port protection
- PDAs / digital cameras
- Game console port protection

## MF-NSML Series - Low Ohmic 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-NSML150    | 6               | 50             | 1.50              | 3.00              | 0.0100            | 0.0650             | 8.00              | 0.50             | 0.8                       |
| MF-NSML175    | 6               | 50             | 1.75              | 3.50              | 0.0050            | 0.0400             | 8.00              | 0.50             | 0.8                       |
| MF-NSML190    | 6               | 50             | 1.90              | 4.90              | 0.0050            | 0.0300             | 8.00              | 1.00             | 0.8                       |
| MF-NSML200    | 6               | 50             | 2.00              | 4.00              | 0.0050            | 0.0300             | 8.00              | 1.00             | 0.8                       |
| MF-NSML260    | 6               | 50             | 2.60              | 5.20              | 0.0030            | 0.0260             | 8.00              | 4.00             | 0.8                       |
| MF-NSML300    | 6               | 50             | 3.00              | 6.00              | 0.0025            | 0.0200             | 8.00              | 4.00             | 0.8                       |
| MF-NSML350    | 6               | 50             | 3.50              | 7.00              | 0.0020            | 0.0180             | 8.00              | 5.00             | 0.8                       |
| MF-NSML380    | 6               | 50             | 3.80              | 8.00              | 0.0015            | 0.0140             | 8.00              | 5.00             | 0.8                       |
| MF-NSML400    | 6               | 50             | 4.00              | 8.00              | 0.0015            | 0.0140             | 8.00              | 5.00             | 0.8                       |
| MF-NSML450*** | 6               | 50             | 4.50              | 9.00              | 0.0010            | 0.0140             | 22.5              | 2.00             | 0.8                       |
| MF-NSML500*** | 6               | 50             | 5.00              | 10.0              | 0.0010            | 0.0120             | 25.0              | 2.00             | 0.8                       |
| MF-NSML550*** | 6               | 50             | 5.50              | 11.0              | 0.0010            | 0.0110             | 27.5              | 2.00             | 0.8                       |
| MF-NSML600*** | 6               | 50             | 6.00              | 12.0              | 0.0010            | 0.0100             | 30.0              | 2.00             | 0.8                       |

\*\*\* TÜV approval pending.

### Environmental Characteristics

|                                        |                                   |                                 |
|----------------------------------------|-----------------------------------|---------------------------------|
| Operating Temperature.....             | -40 °C to +85 °C                  |                                 |
| Passive Aging .....                    | +85 °C, 1000 hours.....           | ±10 % typical resistance change |
| Humidity Aging.....                    | +85 °C, 85 % R.H. 100 hours ..... | ±15 % typical resistance change |
| Thermal Shock .....                    | +85 °C to -40 °C, 20 times.....   | ±30 % typical resistance change |
| Solvent Resistance.....                | MIL-STD-202, Method 215 .....     | No change                       |
| Vibration .....                        | MIL-STD-883C, Method 2007.1.....  | No change                       |
|                                        | Condition A                       |                                 |
| Moisture Sensitivity Level (MSL) ..... | Level 1                           |                                 |
| ESD Classification - HBM.....          | Class 6                           |                                 |

### Test Procedures And Requirements For Model MF-NSML 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                       |
| cUL File Number.....         | E174545<br><a href="http://www.ul.com/">http://www.ul.com/</a> Follow link to Online Certificates Directory, then enter cUL File No. E174545, or <a href="#">click here</a> |                                          |
| TÜV Certificate Number ..... | R 02057213<br><a href="http://www.tuvdotcom.com/">http://www.tuvdotcom.com/</a> Follow link to "other certificates", enter File No. 2057213, or <a href="#">click here</a>  |                                          |

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

\*\*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.

# MF-NSML Series - Low Ohmic PTC Resettable Fuses

**BOURNS®**

## Product Dimensions

| Model      | A                      |                        | B                      |                        | C                      |                        | D                      | E                      |                        |
|------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
|            | Min.                   | Max.                   | Min.                   | Max.                   | Min.                   | Max.                   | Min.                   | Min.                   | Max.                   |
| MF-NSML150 | $\frac{3.00}{(0.118)}$ | $\frac{3.50}{(0.138)}$ | $\frac{1.40}{(0.055)}$ | $\frac{1.80}{(0.071)}$ | $\frac{0.30}{(0.012)}$ | $\frac{0.60}{(0.024)}$ | $\frac{0.25}{(0.010)}$ | $\frac{0.05}{(0.002)}$ | $\frac{0.45}{(0.018)}$ |
| MF-NSML175 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML190 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML200 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML260 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML300 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML350 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML380 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML400 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML450 | $\frac{3.00}{(0.118)}$ | $\frac{3.50}{(0.138)}$ | $\frac{1.40}{(0.055)}$ | $\frac{1.80}{(0.071)}$ | $\frac{0.60}{(0.024)}$ | $\frac{1.20}{(0.047)}$ | $\frac{0.25}{(0.010)}$ | $\frac{0.05}{(0.002)}$ | $\frac{0.45}{(0.018)}$ |
| MF-NSML500 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML550 |                        |                        |                        |                        |                        |                        |                        |                        |                        |
| MF-NSML600 |                        |                        |                        |                        |                        |                        |                        |                        |                        |

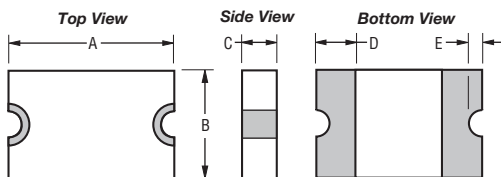
Packaging:

MF-NSML150~MF-NSML400 = 5000 pcs. per reel

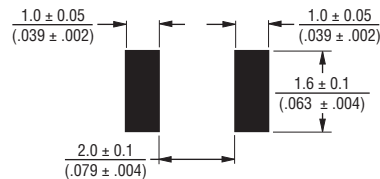
MF-NSML450~MF-NSML500 = 3500 pcs. per reel

MF-NSML550~MF-NSML600 = 3000 pcs. per reel

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



Recommended Pad Layout



### Terminal material:

ENIG-plated terminals  
(Tin-plated terminals available upon request).

### Termination pad solderability:

Meets ANSI/J-STD-002 Category 2.

### Recommended Storage:

40 °C max./70 % RH max.

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

| Model      | Ambient Operating Temperature |        |      |       |       |       |       |       |       |
|------------|-------------------------------|--------|------|-------|-------|-------|-------|-------|-------|
|            | -40 °C                        | -20 °C | 0 °C | 23 °C | 40 °C | 50 °C | 60 °C | 70 °C | 85 °C |
| MF-NSML150 | 2.67                          | 2.32   | 1.95 | 1.50  | 1.15  | 0.96  | 0.78  | 0.64  | 0.52  |
| MF-NSML175 | 2.57                          | 2.33   | 2.07 | 1.75  | 1.49  | 1.34  | 1.24  | 1.00  | 0.91  |
| MF-NSML190 | 2.89                          | 2.58   | 2.25 | 1.90  | 1.54  | 1.36  | 1.21  | 0.94  | 0.77  |
| MF-NSML200 | 3.30                          | 2.90   | 2.50 | 2.00  | 1.62  | 1.39  | 1.16  | 0.90  | 0.52  |
| MF-NSML260 | 3.71                          | 3.42   | 3.01 | 2.60  | 2.08  | 1.72  | 1.49  | 1.30  | 0.89  |
| MF-NSML300 | 4.41                          | 3.99   | 3.54 | 3.00  | 2.55  | 2.32  | 2.13  | 1.71  | 1.56  |
| MF-NSML350 | 5.51                          | 4.66   | 4.13 | 3.50  | 2.98  | 2.71  | 2.49  | 2.00  | 1.82  |
| MF-NSML380 | 5.59                          | 5.05   | 4.48 | 3.80  | 3.23  | 2.95  | 2.70  | 2.17  | 1.98  |
| MF-NSML400 | 5.71                          | 5.26   | 4.63 | 4.00  | 3.20  | 2.70  | 2.29  | 2.00  | 1.37  |
| MF-NSML450 | 6.62                          | 5.99   | 5.31 | 4.50  | 3.83  | 3.50  | 3.20  | 2.57  | 2.34  |
| MF-NSML500 | 7.35                          | 6.66   | 5.90 | 5.00  | 4.25  | 3.88  | 3.55  | 2.85  | 2.60  |
| MF-NSML550 | 8.09                          | 7.32   | 6.49 | 5.50  | 4.68  | 4.27  | 3.91  | 3.41  | 2.86  |
| MF-NSML600 | 8.82                          | 7.98   | 7.08 | 6.00  | 5.10  | 4.66  | 4.26  | 3.43  | 3.12  |

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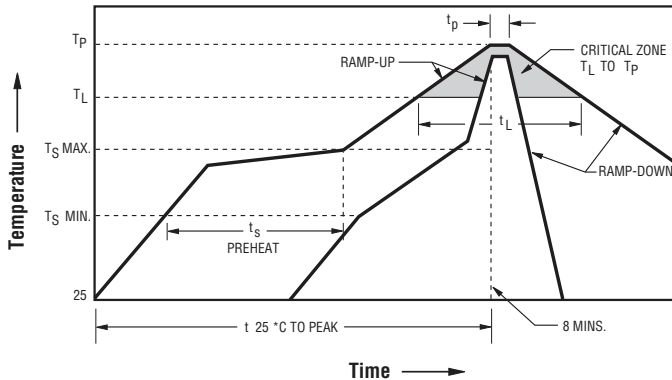
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# MF-NSML Series - Low Ohmic PTC Resettable Fuses

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## Solder Reflow Recommendations



### Notes:

- MF-NSML models cannot be wave soldered or hand soldered. Please contact Bourns for soldering recommendations.
- All temperatures refer to topside of the package, measured on the package body surface.
- If reflow temperatures exceed the recommended profile, devices may not meet the published specifications.
- Compatible with Pb and Pb-free solder reflow profiles.
- Excess solder may cause a short circuit, especially during hand soldering. Please refer to the Multifuse® Polymer PTC Soldering Recommendation guidelines.
- Designed for single solder reflow operations.

| Profile Feature                                                                                                                              | Pb-Free Assembly                   |
|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Average Ramp-Up Rate (TS <sub>max</sub> to TP)                                                                                               | 3 °C / second max.                 |
| PREHEAT:<br>Temperature Min. (TS <sub>min</sub> )<br>Temperature Max. (TS <sub>max</sub> )<br>Time (ts <sub>min</sub> to ts <sub>max</sub> ) | 150 °C<br>200 °C<br>60~180 seconds |
| TIME MAINTAINED ABOVE:<br>Temperature (TL)<br>Time (tL)                                                                                      | 217 °C<br>60~150 seconds           |
| Peak / Classification Temperature (TP)                                                                                                       | 260 °C                             |
| Time within 5 °C of Actual Peak Temperature (tp)                                                                                             | 20~40 seconds                      |
| Ramp-Down Rate                                                                                                                               | 6 °C / second max.                 |
| Time within 25 °C to Peak Temperature                                                                                                        | 8 minutes max.                     |

### How to Order

**MF - NSML 200 - 2**

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

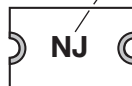
Series \_\_\_\_\_  
NSML = 1206 Low Ohmic Surface Mount Component

Hold Current, Ihold \_\_\_\_\_  
150 - 600 (1.50 Amps - 6.00 Amps)

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

### Typical Part Marking

Represents total content. Layout may vary.



#### PART IDENTIFICATION:

MF-NSML150 = NG  
MF-NSML175 = NH  
MF-NSML190 = NI  
MF-NSML200 = NJ  
MF-NSML260 = NN  
MF-NSML300 = NP  
MF-NSML350 = NS  
MF-NSML380 = NV  
MF-NSML400 = NU  
MF-NSML450 = NX  
MF-NSML500 = NY  
MF-NSML550 = N5  
MF-NSML600 = NZ

MANUFACTURING DATE CODE IS LOCATED ON PACKING LABEL.

**BOURNS®**

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MF-NSML SERIES, REV. H, 09/17

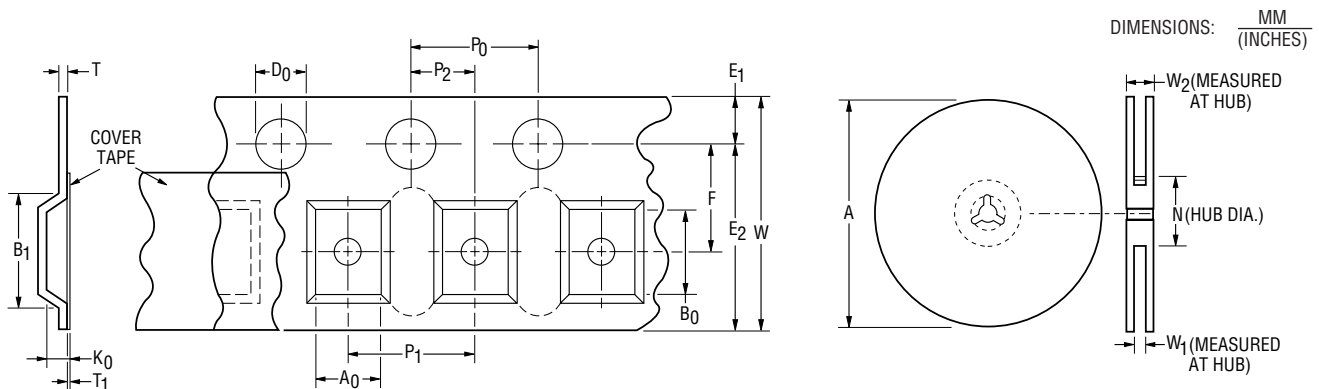
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# MF-NSML Series - Low Ohmic PTC Resettable Fuses

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| Tape Dimensions                        | MF-NSML Series<br>per EIA 481-2         |
|----------------------------------------|-----------------------------------------|
| W                                      | $12.0 \pm 0.30$<br>(0.472 $\pm$ 0.012)  |
| P <sub>0</sub>                         | $4.0 \pm 0.10$<br>(0.157 $\pm$ 0.004)   |
| P <sub>1</sub>                         | $4.0 \pm 0.10$<br>(0.157 $\pm$ 0.004)   |
| P <sub>2</sub>                         | $2.0 \pm 0.05$<br>(0.079 $\pm$ 0.002)   |
| A <sub>0</sub> (MF-NSML150~MF-NSML500) | $1.90 \pm 0.10$<br>(0.075 $\pm$ 0.004)  |
| A <sub>0</sub> (MF-NSML550~MF-NSML600) | $2.0 \pm 0.05$<br>(0.078 $\pm$ 0.002)   |
| B <sub>0</sub> (MF-NSML150~MF-NSML500) | $3.50 \pm 0.10$<br>(0.138 $\pm$ 0.004)  |
| B <sub>0</sub> (MF-NSML550~MF-NSML600) | $3.60 \pm 0.10$<br>(0.142 $\pm$ 0.004)  |
| B <sub>1</sub> max.                    | $4.5$<br>(0.177)                        |
| D <sub>0</sub>                         | $1.5 + 0.10/-0.0$<br>(0.059 + 0.004/-0) |
| F                                      | $5.5 \pm 0.05$<br>(0.216 + 0.002)       |
| E <sub>1</sub>                         | $1.75 \pm 0.10$<br>(0.069 $\pm$ 0.004)  |
| E <sub>2</sub> typ.                    | $10.25$<br>(0.404)                      |
| T max.                                 | $0.6$<br>(0.024)                        |
| T <sub>1</sub> max.                    | $0.1$<br>(0.004)                        |
| K <sub>0</sub> (MF-NSML150~MF-NSML400) | $0.65 \pm 0.10$<br>(0.026 $\pm$ 0.004)  |
| K <sub>0</sub> (MF-NSML450~MF-NSML500) | $1.10 \pm 0.10$<br>(0.043 $\pm$ 0.004)  |
| K <sub>0</sub> (MF-NSML550~MF-NSML600) | $1.35 \pm 0.10$<br>(0.053 $\pm$ 0.004)  |
| Leader min.                            | $390$<br>(15.35)                        |
| Trailer min.                           | $160$<br>(6.30)                         |
| <b>Reel Dimensions</b>                 |                                         |
| A max.                                 | $185$<br>(7.283)                        |
| N min.                                 | $50$<br>(1.97)                          |
| W <sub>1</sub>                         | $12.4 + 1/-0$<br>(0.488 + 0.039/-0)     |
| W <sub>2</sub> max.                    | $15.4$<br>(0.606)                       |



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