

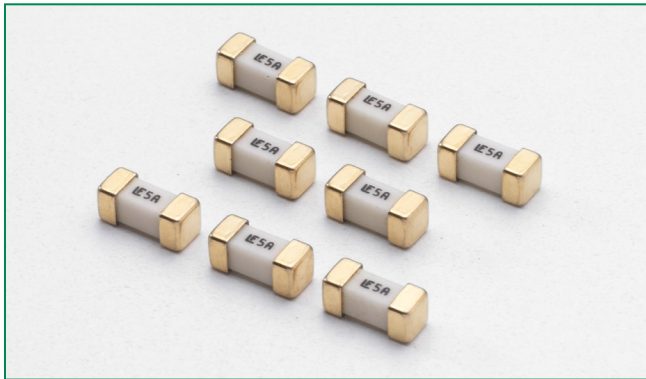
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## 451/453 Series Fuse







### Description

The Nano<sup>2</sup> SMF Fuse is a very small, Wire-in-Air (WIA) square shape surface mount fuse that was designed for secondary side circuit over-current protection applications. These fuses are designed for PCB using surface mount technology.

### Features

- Very fast-acting
- Small size
- Wide range of current rating available (0.062A to 20A)
- Wide operating temperature range
- Low temperature derating
- RoHS compliant and Halogen Free

### Agency Approvals

| AGENCY   | AGENCY FILE NUMBER                       | AMPERE RANGE          |
|--|--|-----------------------|
|   | E10480                                   | 6.3A - 20A            |
|   | 29862                                    | 0.062A - 15A          |
|   | NBK030205-E10480A/B<br>NBK101105-E184655 | 1A - 5A<br>6.3A - 10A |
|  | E10480                                   | 0.062A - 5A           |

### Electrical Characteristics for Series

| % of Ampere Rating | Ampere Rating | Opening Time     |
|--------------------|---------------|------------------|
| 100%               | 0.062 – 20    | 4 hours, Minimum |
| 200%               | 0.062 – 10    | 5 sec., Maximum  |
|                    | 12 – 20       | 20 sec., Maximum |

### Applications

- Notebook PC
- LCD/PDPTV
- LCD monitor
- LCD/PDP panel
- LCD backlight inverter
- Portable DVD player
- Power supply
- Networking
- PC server
- Cooling fan system
- Storage system
- Telecom system
- Wireless basestation
- White goods
- Game console
- Office Automation equipment
- Battery charging circuit protection
- Industrial equipment

### Additional Information



**Datasheet**  
451 Series



**Resources**  
451 Series



**Samples**  
451 Series



**Datasheet**  
453 Series



**Resources**  
453 Series



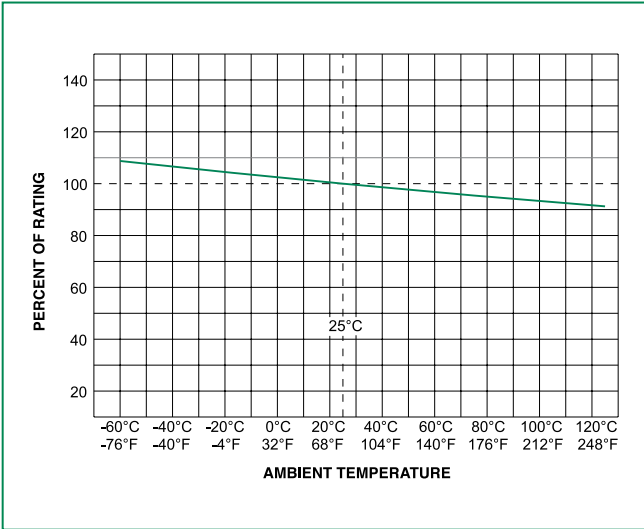
**Samples**  
453 Series

## Electrical Specifications by Item

| Ampere Rating (A) | Amp Code | Max Voltage Rating (V) | Interrupting Rating   | Nominal Cold Resistance (Ohms) | Nominal Melting I <sup>2</sup> t (A <sup>2</sup> sec) | Agency Approvals  |   |   |   |
|-------------------|----------|------------------------|---|--------------------------------|---|---|---|---|---|
|                   |          |                        |   |                                |   |  |  |  |  |
| 0.062             | .062     | 125                    | 50A @125VAC/VDC<br>300A @32VDC<br>PSE: 100A @100VAC                   | 5.5000                         | 0.00019   |   | x   |   | x   |
| 0.080             | .080     | 125                    |   | 4.0500                         | 0.00033   |   | x   |   | x   |
| 0.100             | .100     | 125                    |   | 3.1000                         | 0.00138   |   | x   |   | x   |
| 0.125             | .125     | 125                    |   | 1.7000                         | 0.00286   |   | x   |   | x   |
| 0.160             | .160     | 125                    |   | 1.2157                         | 0.0048  |   | x   |   | x   |
| 0.200             | .200     | 125                    |   | 0.8372                         | 0.0089  |   | x   |   | x   |
| 0.250             | .250     | 125                    |   | 0.5765                         | 0.0158  |   | x   |   | x   |
| 0.315             | .315     | 125                    |   | 0.3918                         | 0.0311  |   | x   |   | x   |
| 0.375             | .375     | 125                    |   | 0.4541                         | 0.0442  |   | x   |   | x   |
| 0.400             | .400     | 125                    |   | 0.4233                         | 0.0551  |   | x   |   | x   |
| 0.500             | .500     | 125                    |   | 0.3046                         | 0.0824  |   | x   |   | x   |
| 0.630             | .630     | 125                    |   | 0.2022                         | 0.1381  |   | x   |   | x   |
| 0.750             | .750     | 125                    |   | 0.1444                         | 0.2143  |   | x   |   | x   |
| 0.800             | .800     | 125                    |   | 0.1355                         | 0.2654  |   | x   |   | x   |
| 1.00              | .001.    | 125                    |   | 0.0780                         | 0.6029  |   | x   | x   | x   |
| 1.25              | 1.25     | 125                    |   | 0.0780                         | 0.664   |   | x   | x   | x   |
| 1.50              | 01.5     | 125                    |   | 0.0630                         | 0.853   |   | x   | x   | x   |
| 1.60              | 01.6     | 125                    | 0.0580  | 1.060                          |   | x   | x   | x   |   |
| 2.00              | 002.     | 125                    | 50A @125VAC/VDC<br>10,000A @75VDC<br>300A @32VDC<br>PSE: 100A @100VAC | 0.0367                         | 0.530   |   | x   | x   | x   |
| 2.50              | 02.5     | 125                    |   | 0.0286                         | 1.029   |   | x   | x   | x   |
| 3.00              | 003.     | 125                    |   | 0.0227                         | 1.650   |   | x   | x   | x   |
| 3.15              | 3.15     | 125                    |   | 0.0215                         | 1.920   |   | x   | x   | x   |
| 3.50              | 03.5     | 125                    |   | 0.0200                         | 2.469   |   | x   | x   | x   |
| 4.00              | 004.     | 125                    |   | 0.0160                         | 3.152   |   | x   | x   | x   |
| 5.00              | 005.     | 125                    |   | 0.0125                         | 5.566   |   | x   | x   | x   |
| 6.30              | 06.3     | 125                    | 50A @125VAC/VDC<br>400A @32VDC<br>PSE: 100A @100VAC                   | 0.0096                         | 9.170   | x   | x   | x   |   |
| 7.00              | 007.     | 125                    |   | 0.0090                         | 10.32   | x   | x   | x   |   |
| 8.00              | 008.     | 125                    |   | 0.0077                         | 20.23   | x   | x   | x   |   |
| 10.0              | 010.     | 125                    | 35A @125 VAC/<br>50A @125 VDC<br>400A @32 VDC<br>PSE: 100A @100VAC    | 0.0056                         | 26.46   | x   | x   | x   |   |
| 12.0              | 012.     | 65                     | 150A @65VDC<br>100A @65VAC<br>400A @32VDC                             | 0.0049                         | 47.97   | x   | x   |   |   |
| 15.0              | 015.     | 65                     |   | 0.0037                         | 97.82   | x   | x   |   |   |
| 20.0              | 020.     | 65                     |   | 0.00244                        | 154   | x   |   |   |   |

Notes:  
 - I<sup>2</sup>t calculated at 8ms.  
 - Resistance is measured at 10% of rated current, 25°C

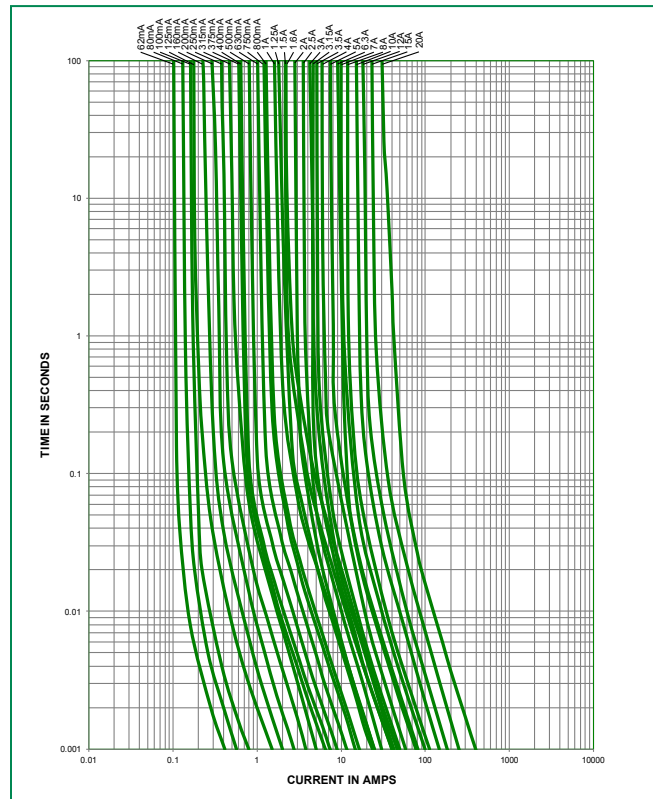
**Temperature Re-rating Curve**



Note:

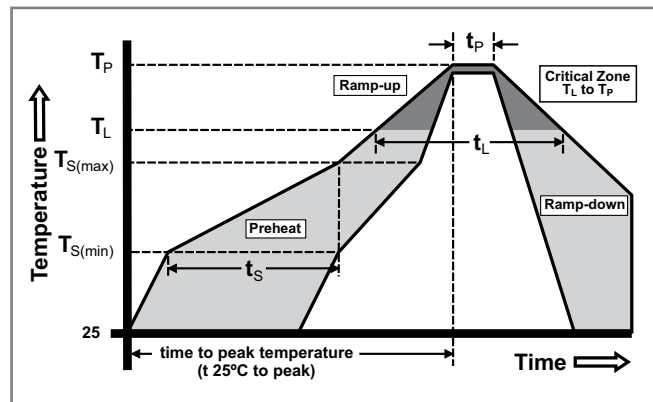
1. Rerating depicted in this curve is in addition to the standard derating of 25% for continuous operation.

**Average Time Current Curves**



**Soldering Parameters**

|  |                                    |   |
|--|------------------------------------|---|
| Reflow Condition                                       |                                    | Pb – Free assembly                      |
| Pre Heat   | - Temperature Min ( $T_{s(min)}$ ) | 150°C                                   |
|  | - Temperature Max ( $T_{s(max)}$ ) | 200°C                                   |
|  | - Time (Min to Max) ( $t_s$ )      | 60 – 120 secs                           |
| Average ramp up rate (Liquidus Temp ( $T_L$ ) to peak) |                                    | 5°C/second max.                         |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                   |                                    | 5°C/second max.                         |
| Reflow   | - Temperature ( $T_L$ ) (Liquidus) | 217°C                                   |
|  | - Temperature ( $t_l$ )            | 60 – 90 seconds                         |
| Peak Temperature ( $T_p$ )                             |                                    | 260 <sup>+0/-5</sup> °C                 |
| Time within 5°C of actual peak Temperature ( $t_p$ )   |                                    | 20 – 40 seconds                         |
| Ramp-down Rate   |                                    | 5°C/second max.                         |
| Time 25°C to peak Temperature ( $T_p$ )                |                                    | 8 minutes max.                          |
| Do not exceed  |                                    | 260°C                                   |
| Wave Soldering Parameters                              |                                    | 260°C Peak Temperature, 10 seconds max. |

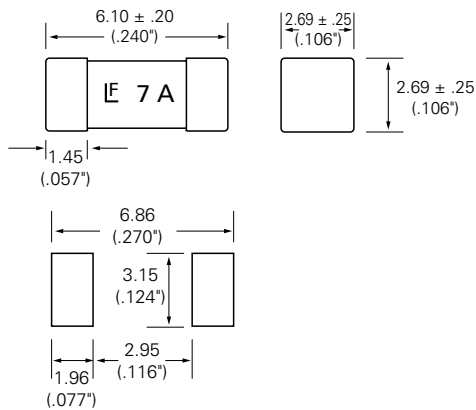


## Product Characteristics

|  |  |
|--|--|
| <b>Materials</b>                             | <b>Body:</b> Ceramic<br><b>Terminations:</b><br>Gold-Plated Caps / Sn-dipped Silver Plated Caps (451 RoHS/HF series)<br>SnPb Plated Caps (for 451 Non-RoHS series, 375mA-15A)<br>Silver-plated Caps (451MR RoHS ratings below 375mA and 453 RoHS Series) |
| <b>Product Marking</b>                       | Brand, Ampere Rating   |
| <b>Operating Temperature</b>                 | -55°C to 125°C   |
| <b>Moisture Sensitivity Level</b>            | Level 1, J-STD-020   |
| <b>Solderability</b>                         | MIL-STD-202, Method 208  |
| <b>Insulation Resistance (after Opening)</b> | MIL-STD-202, Method 302, Test Condition A (10,000 ohms minimum)  |

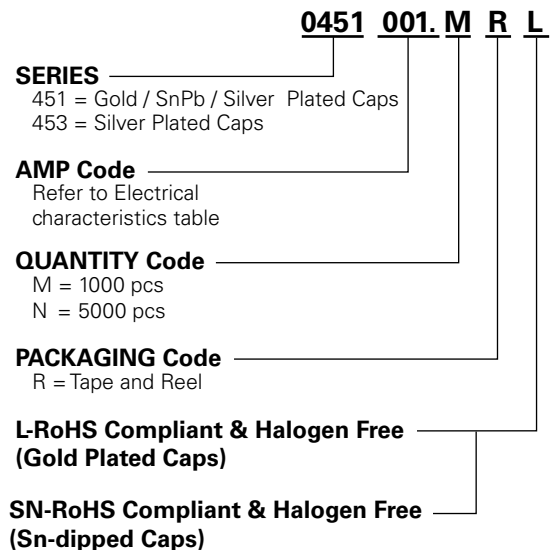
|                                     |   |
|-------------------------------------|---|
| <b>Thermal Shock</b>                | MIL-STD-202, Method 107, Test Condition B, 5 cycles, -65°C / +125°C, 15 minutes @ each extreme                              |
| <b>Mechanical Shock</b>             | MIL-STD-202, Method 213, Test I: Deenergized. 100G's pk amplitude, sawtooth wave 6ms duration, 3 cycles XYZ+xyz = 18 shocks |
| <b>Vibration</b>                    | MIL-STD-202, Method 201: 0.03" amplitude, 10-55 Hz in 1 min. 2hrs each XYZ=6hrs   |
| <b>Moisture Resistance</b>          | MIL-STD-202, Method 106, 10 cycles  |
| <b>Salt Spray</b>                   | MIL-STD-202, Method 101, Test Condition B (48hrs)   |
| <b>Resistance to Soldering Heat</b> | MIL-STD-202, Method 210, Test condition B (10 sec at 260°C)   |

## Dimensions



Recommended pad layout

## Part Numbering System



**NOTE: "L" suffix applies to 451 series only**

- 451 series may be ordered as either "RoHS and HF" ("L" suffix) or non-RoHS (no suffix) version.
- 453 series is available only as RoHS compliant version and does not require "L" suffix. Please do not include "L" suffix within 453 series ordering instructions.

## Packaging

| Packaging Option   | Packaging Specification        | Quantity | Quantity & Packaging Code |
|--------------------|--------------------------------|----------|---------------------------|
| 12mm Tape and Reel | EIA RS-481-2 (IEC 286, part 3) | 5000     | NR                        |
| 12mm Tape and Reel | EIA RS-481-2 (IEC 286, part 3) | 1000     | MR                        |

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