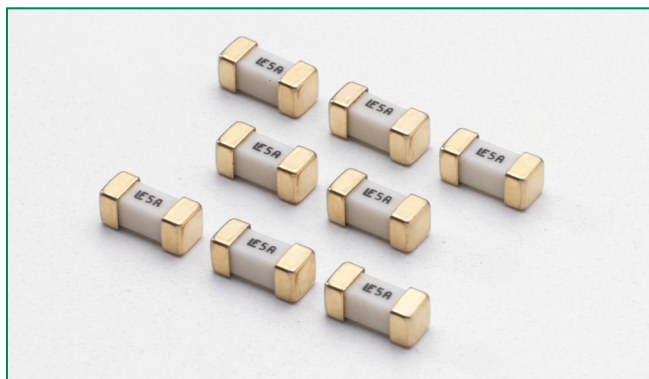


### 451/453 Series Fuse



#### Agency Approvals

| AGENCY                                                                             | AGENCY FILE NUMBER                     | AMPERE RANGE          |
|------------------------------------------------------------------------------------|----------------------------------------|-----------------------|
|   | E10480                                 | 6.3A - 15A            |
|   | LR29862                                | 62mA - 15A            |
|   | NBK030205-E10480B<br>NBK101105-E184655 | 1A - 5A<br>6.3A - 10A |
|  | E10480                                 | 62mA - 5A             |

#### Electrical Characteristics for Series

| % of Ampere Rating | Ampere Rating | Opening Time     |
|--------------------|---------------|------------------|
| 100%               | 1/16 – 15     | 4 hours, Minimum |
| 200%               | 1/16 – 10     | 5 sec., Maximum  |
|                    | 12 – 15       | 20 sec., Maximum |

#### Additional Information



**Datasheet**  
451 Series



**Resources**  
451 Series



**Samples**  
451 Series



**Datasheet**  
453 Series



**Resources**  
453 Series



**Samples**  
453 Series

#### Description

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

#### Features

- Very fast acting
- Small size
- Wide range of current rating available (62mA to 15A)
- Wide operating temperature range
- Low temperature de-rating
- RoHS compliant
- Halogen Free

#### Applications

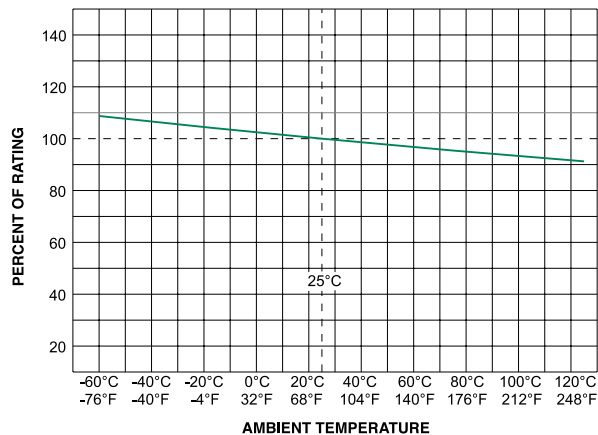
- Notebook PC
- LCD/PDPTV
- LCD monitor
- LCD/PDP panel
- LCD backlight inverter
- Portable DVD player
- Power supply
- Networking
- PC server
- Cooling fan system
- Storage system
- Telecom system
- Wireless basestation
- White goods
- Game console
- Office Automation equipment
- Battery charging circuit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

## 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                    | 50 amperes @125VAC/VDC<br>300 amperes @32VDC<br>PSE: 100 amperes @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                    | 50 amperes @125VAC/VDC<br>1000 amperes @75VDC<br>300 amperes @32VDC<br>PSE: 100 amperes @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                    | 50 amperes @125VAC/VDC<br>300 amperes @32VDC<br>PSE: 100 amperes @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                    | 35 amperes @125 VAC/<br>50 amperes @125 VDC<br>300 amperes @32 VDC<br>PSE: 100 amperes @100VAC  | 0.0056                         | 26.46                                                 | x                                                                                   | x                                                                                   | x                                                                                   |                                                                                     |
| 12.0              | 012.     | 65                     | 50 amperes @65 VAC/VDC<br>300 amperes @24 VDC                                                   | 0.0049                         | 47.97                                                 | x                                                                                   | x                                                                                   |                                                                                     |                                                                                     |
| 15.0              | 015.     | 65                     |                                                                                                 | 0.0037                         | 97.82                                                 | x                                                                                   | x                                                                                   |                                                                                     |                                                                                     |

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

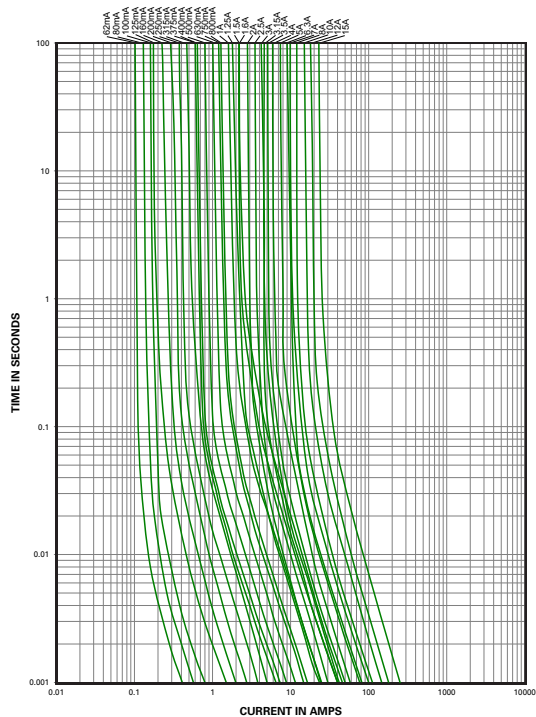
### Temperature Derating Curve



Note:

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

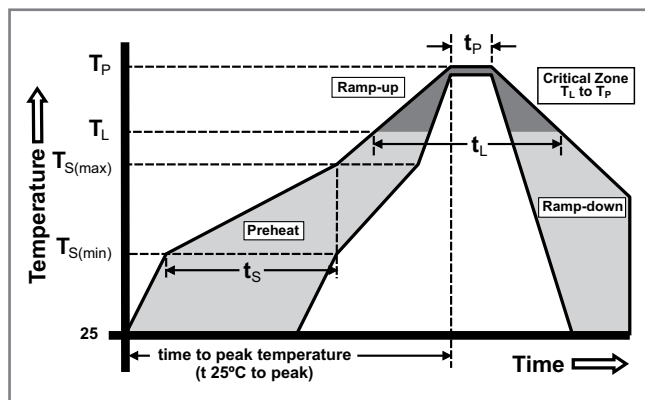
### Average Time Current Curves



### 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. |
|---------------------------|-----------------------------------------|

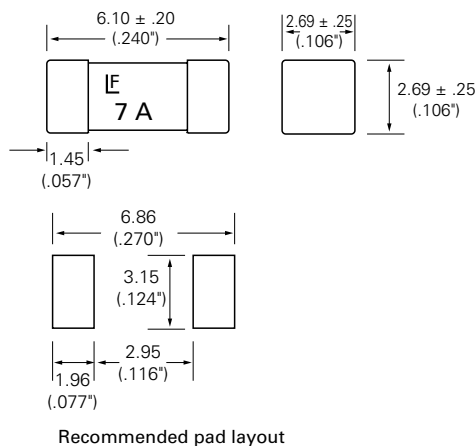


## Product Characteristics

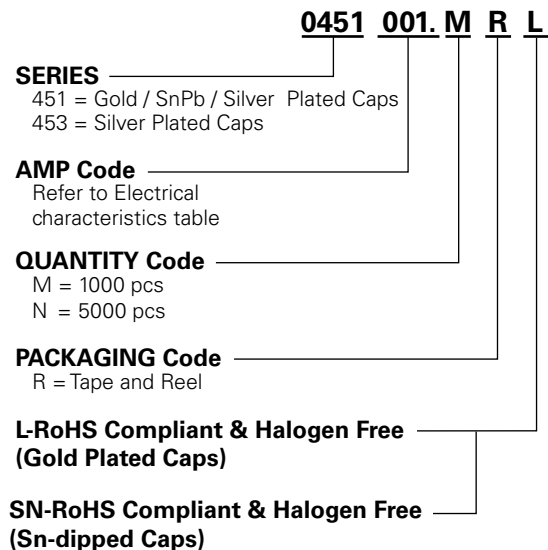
|                                              |                                                                                                                                                                                                                                                          |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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-020C                                                                                                                                                                                                                                      |
| <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



## 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                        |