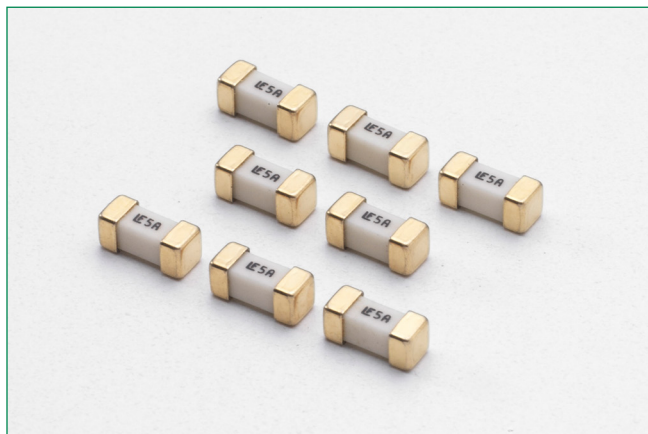


# 451/453 Series

## Very Fast-Acting Fuse



### Additional Information



Resources  
451 Series



Accessories  
451 Series



Samples  
451 Series



Resources  
453 Series



Accessories  
453 Series



Samples  
453 Series

### 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 |



### Description

The Nano2® 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 & Benefits

- Very fast-acting
- Small size
- Wide range of current rating available (0.062A to 20A)
- Wide operating temperature range
- RoHS compliant and Halogen Free
- UL Listed and Recognized to UL/CSA/NMX UL 248-1 and UL/CSA/NMX UL 248-14 (see Agency Approvals)
- Conforms to DENAN's Appendix 3
- Conforms to IEC/EN 60127-1 and IEC/EN 60127-7

### 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

### Agency Approvals

| Agency | Agency File Number                                          | Ampere Range                                              |
|--------|-------------------------------------------------------------|-----------------------------------------------------------|
|        | E10480                                                      | 6.3A - 20A                                                |
|        | 29862                                                       | 0.062A - 15A                                              |
|        | J50446731                                                   | 1A, 1.25A, 2A, 2.5A, 3.15A, 4A, 5A, 7A, 8A, 10A, 12A, 20A |
|        | NBK030205-E10480A<br>NBK030205-E10480B<br>NBK101105-E184655 | 1A-1.6A<br>2A-5A<br>6.3A - 10A                            |
|        | E10480                                                      | 0.062A - 5A                                               |
|        | NA                                                          | 1A, 1.25A, 2A, 2.5A, 3.15A, 4A, 5A, 7A, 8A, 10A, 12A, 20A |
|        | NA                                                          | 1A, 1.25A, 2A, 2.5A, 3.15A, 4A, 5A, 7A, 8A, 10A, 12A, 20A |

# 451/453 Series

## Very Fast-Acting Fuse

### Electrical Specifications by Item

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

**Notes:**

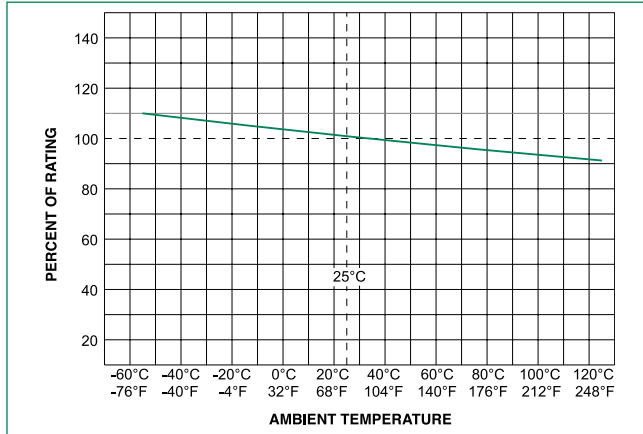
 -  $I^2t$  calculated at 8ms.

- Resistance is measured at 10% of rated current, 25°C

# 451/453 Series

## Very Fast-Acting Fuse

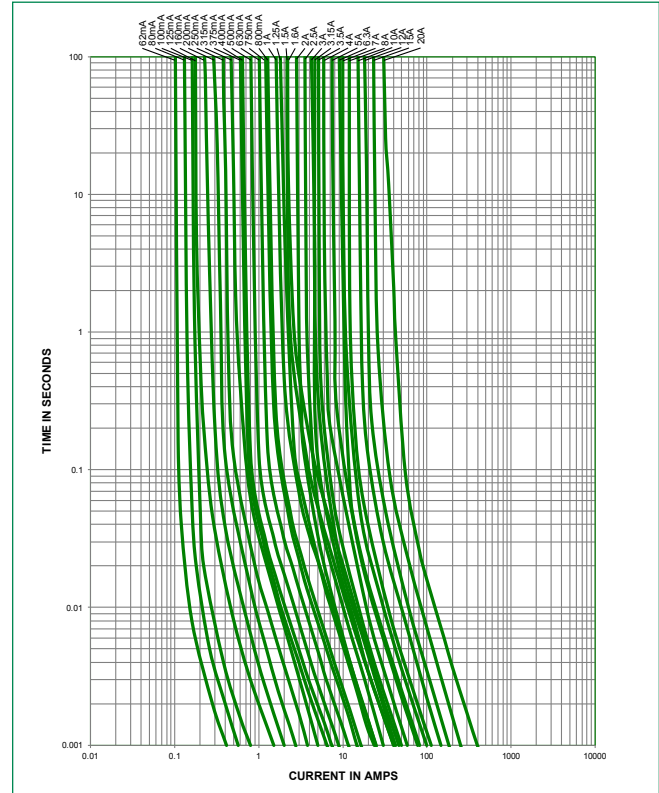
### Temperature Re-rating Curve



#### Note:

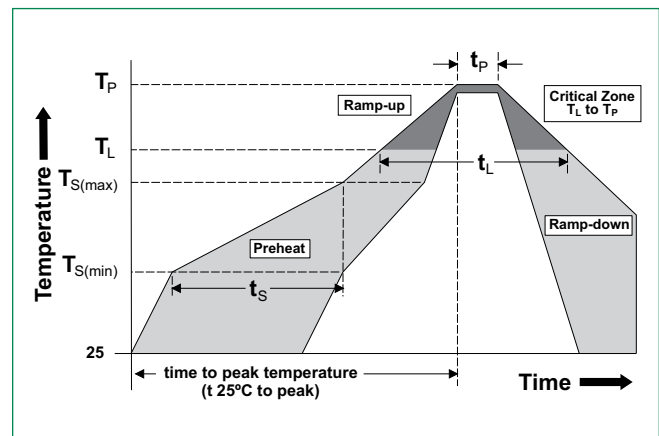
1. Rerating depicted in this curve is in addition to the standard derating of 25% for continuous operation.

### Average Time Current Curves



### Soldering Parameters

|                                                                       |                                    |                                         |
|-----------------------------------------------------------------------|------------------------------------|-----------------------------------------|
| <b>Reflow Condition</b>                                               |                                    | Pb – Free assembly                      |
| <b>Pre Heat</b>                                                       | - Temperature Min ( $T_{s(min)}$ ) | 150°C                                   |
|                                                                       | - Temperature Max ( $T_{s(max)}$ ) | 200°C                                   |
|                                                                       | - Time (Min to Max) ( $t_s$ )      | 60 – 180 secs                           |
| <b>Average ramp up rate (Liquidus Temp (<math>T_L</math>) to peak</b> |                                    | 5°C/second max.                         |
| <b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>     |                                    | 5°C/second max.                         |
| <b>Reflow</b>                                                         | - Temperature ( $T_L$ ) (Liquidus) | 217°C                                   |
|                                                                       | - Temperature ( $t_L$ )            | 60 – 150 seconds                        |
| <b>Peak Temperature (<math>T_p</math>)</b>                            |                                    | 260 $^{+0/-5}$ °C                       |
| <b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>  |                                    | 20 – 40 seconds                         |
| <b>Ramp-down Rate</b>                                                 |                                    | 5°C/second max.                         |
| <b>Time 25°C to peak Temperature (<math>T_p</math>)</b>               |                                    | 8 minutes max.                          |
| <b>Do not exceed</b>                                                  |                                    | 260°C                                   |
| <b>Wave Soldering Parameters</b>                                      |                                    | 260°C Peak Temperature, 10 seconds max. |



# 451/453 Series

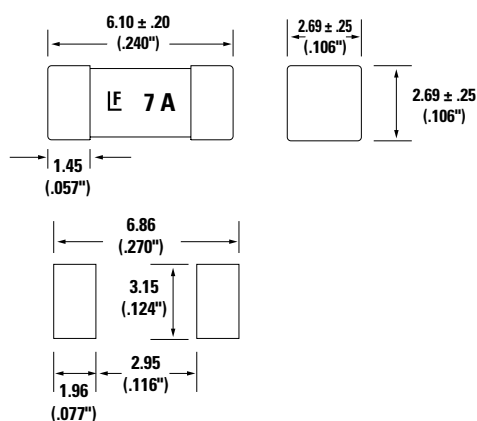
## Very Fast-Acting Fuse

### 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>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)                                                                                                                                 |

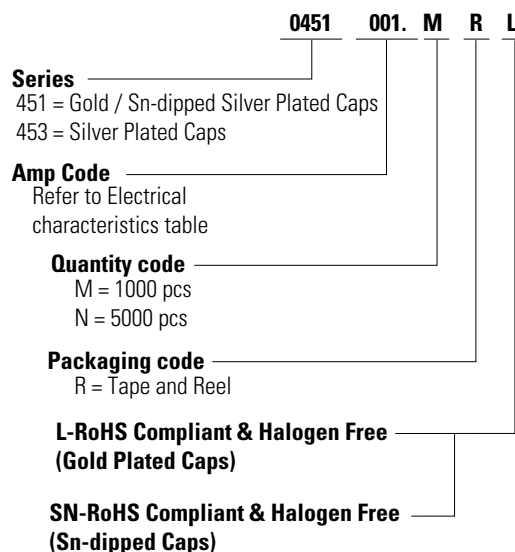
|                                     |                                                                                                                             |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <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 mm (inches)



Recommended pad layout

### Part Numbering System



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

- 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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