# NSM20
## Surface-Mount Metal Oxide Varistor (MOV)



### Agency Approvals

| Agency | Standards | Agency File Number/ Certificate |
|---|---|---|
| c UL us | UL 1449<br>CSA C22.2 No. 269.5 | E320116 |

### General Technical Specification

| | | |
|---|---|---|
| **Climatic Category** | IEC 60068-1 | 40/125/56 (Lower temp/Upper temp/Duration of damp heat, steady state test) |
| **Operating Temperature** | IEC 61051-1 | -40°C ~ +125 °C |
| **Storage Temperature** | - | -40°C ~ +125 °C |
| **Voltage Proof** | IEC 61051-1 | ≥ 2.5 kV RMS |
| **Insulation Resistance** | IEC 61051-1 | ≥ 100MΩ |
| **Moisture Sensitivity** | J–STD–020 | Level 1 |

## Description

Littelfuse NSM20 Varistor Series is the surface-mount Metal Oxide Varistor (MOV) with ultra-high surge current handling capability (40 surges at 8kV/4kA) for absorbing excess energy from transient overvoltage surges. The NSM20 Varistor Series is constructed with an MOV disc and tin-plated terminals within polymer molding package, which is fully qualified in lead-free soldering and compatible with both reflow and wave soldering process.

## Features & Benefits

- Peak Surge Current Rating (Imax): 12 kA (single pulse, 8/20μs)
- Nominal Discharge Current (In): 6 kA (15 pulses, 8/20μs)
- Ultra-high Surge Life to 40 pulses 8kV / 4kA
- RoHS Compliant, Lead-Free and Halogen-Free
- Tape and Reel Packing
- UL Recognized as a Type 5 component under UL 1449 and CSA C22.2 No. 269.5
- Housing Meets Flammability Rating of V-0 per ANSI/UL 94
- AEC-Q200 Compliant

## Applications

- Electricity Power Storage
- EV On Board and Off Board Charger
- General Electronic and Electrical Products



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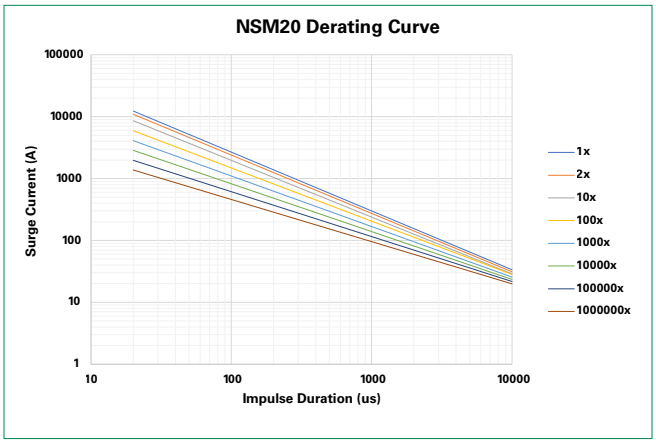
## Electrical Specifications

| Part Number | Specifications (125°C) | | Specifications (25°C) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Maximum Continuous Operating Voltage (MCOV)[1] | | Varistor Voltage at 1mA DC[2] | Rated Energy[3] 2ms | Peak Surge Current[4] (8/20µs, 1 Pulse) | Nominal Discharge Current[5] (8/20µs, 15 Pulses) | Surge Life[6] (Voltage 1.2/50µs, Current 8/20µs, 40 Pulses, Interval 1 minute) | Maximum Clamping Voltage at 1000A[7] (8/20µs) | Typical Capacitance at 1 kHz |
| | $V_{RMS}$ | $V_{DC}$ | $V_n$ | $W_{max}$ | $I_{max}$ | $I_n$ | $I_{cw}$ | $V_c$ | $C_{TYP}$ |
| | ( V ) | ( V ) | ( V ) | ( J ) | ( A ) | ( A ) | ( kV / kA ) | ( V ) | ( pF ) |
| V250NSM20 | 250 | 320 | 390 ± 10% | 300 | 12000 | 6000 | 8kV / 4kA | 750 | 1050 |
| V275NSM20 | 275 | 350 | 430 ± 10% | 320 | 12000 | 6000 | 8kV / 4kA | 800 | 980 |
| V320NSM20 | 320 | 420 | 510 ± 10% | 380 | 12000 | 6000 | 8kV / 4kA | 950 | 820 |
| V350NSM20 | 350 | 460 | 560 ± 10% | 400 | 12000 | 6000 | 8kV / 4kA | 1050 | 730 |
| V385NSM20 | 385 | 505 | 620 ± 10% | 420 | 12000 | 6000 | 8kV / 4kA | 1150 | 610 |
| V420NSM20 | 420 | 560 | 680 ±10% | 440 | 12000 | 6000 | 8kV / 4kA | 1250 | 490 |

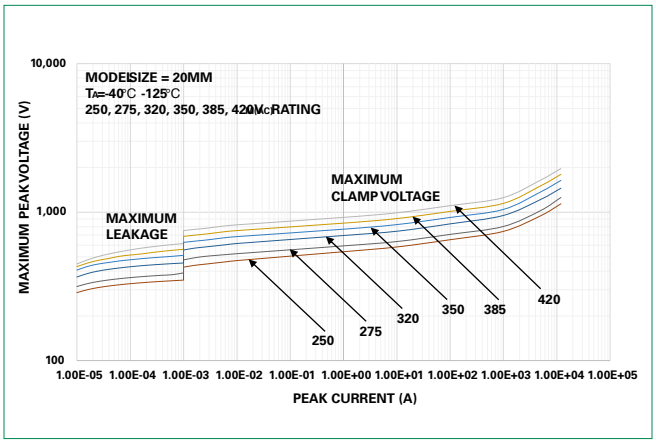
**Notes:**

1. Maximum Continuous Operating Voltage (MCOV): the maximum RMS or DC value of the voltage that may be continuously applied.
2. Varistor Voltage (Vn): the measured voltage across the varistor at 1mA DC.
3. Rated Energy 2ms (Wmax): the maximum energy that the varistor is able to withstand when exposed to a single 2ms rectangular pulse.
4. Peak Surge Current (Imax): The maximum current that the varistor is able to withstand when exposed to a single 8/20µs pulse, at ambient temperature of 25°C.
5. Nominal Discharge Current (In): The current that the varistor is able to withstand when exposed to fifteen 8/20µs pulses (15 pulses applied in 3 groups of 5 pulses, with 1min interval between pulses and 30min interval between groups), superimposed to VRMS MCOV.
6. Surge Life (Icw): The current that the varistor is able to withstand when exposed to forty combination pulses (applied in 8 groups of 5 pulses, alternatively positive and negative, with 1min interval between pulses and 1min interval between groups), superimposed to VRMS MCOV (synchronization 0°, 90°, 180°, 270°).
7. Clamping Voltage (Vc): the voltage at 1KA 8/20us waveshape.

## Repetitive Surge Capability for NSM20 Parts




## Transient V-I Characteristic Curve: Maximum Clamping Voltage






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### Lead-Free Soldering Recommendations

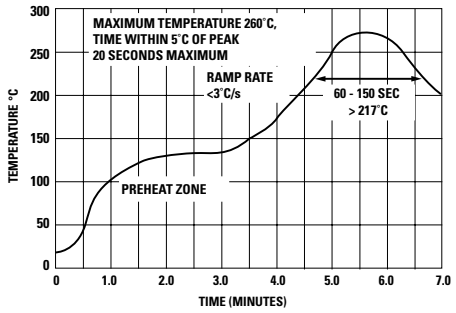
The terminals of NSM20 series devices are tin-plated. The recommended lead-free solder paste is SAC305 (Sn96.5Ag3.0Cu0.5) with an RMA flux, though there is a wide selection of pastes and fluxes available that should be compatible.

The reflow soldering profile must be constrained by the maximums in the "Lead-Free Reflow Soldering Profile".

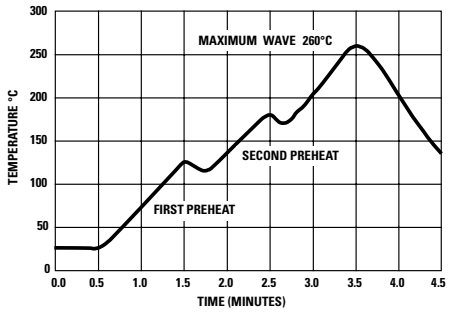
**Note:**

The Lead–free paste, flux and profile were used for evaluation purposes by Littelfuse based on industry standards and practices. There are multiple choices of all three available, so it is advised that the customer explores the optimum combination for their process as processes vary considerably from site to site.

### Lead-Free Reflow Soldering Profile Recommendation




### Lead-Free Wave Soldering Profile Recommendation




### Part Numbering System

**V 275 NSM20 Xxxxx**

- **V** — For "Varistor"
- **275** — Rated AC Maximum Continuous Operating Voltage
- **NSM20** — Series Number
- **Xxxxx** — Other Non-Standard Options

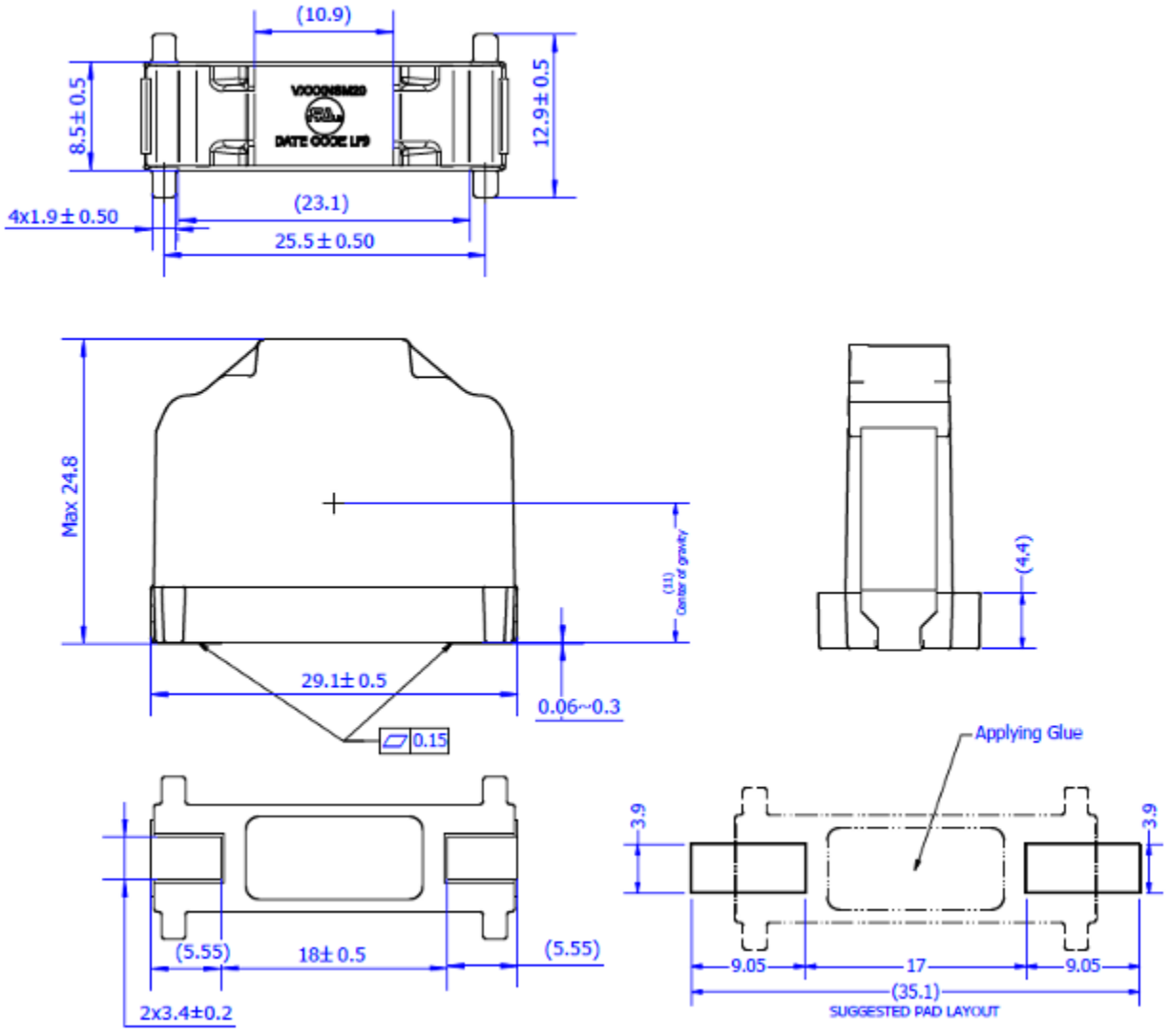


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### Mechanical Dimensions in mm

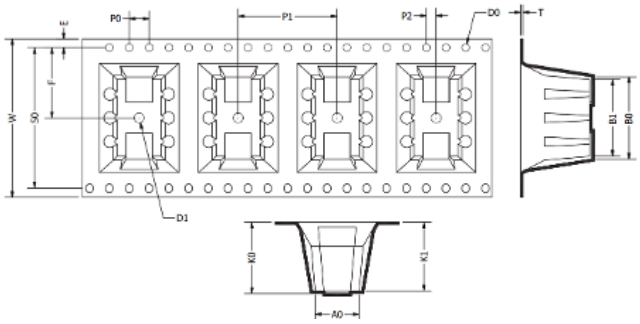



**Note:**
**1.** Need apply the glue under the parts bottom area to pass the Mechanical Shock (MIL-STD-202, Method 213) & Vibration (MIL-STD-202, Method 204).


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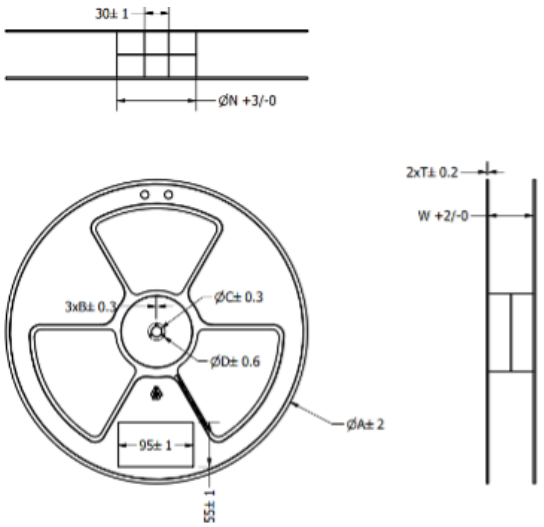
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## Surface-Mount Metal Oxide Varistor (MOV)

### Packing Dimensions in mm
### Carrier Tape




| Symbol | Spec |
|---|---|
| A0 | 13.10 |
| B0 | 28.85 |
| K0 | 24.90 |
| K1 | 24.60 |
| P0 | 4.00 |
| P1 | 32.00 |
| P2 | 2.00 |
| W | 56.00 |
| T | 0.60 |
| E | 1.75 |
| F | 26.20 |
| D0 | 1.50 |
| D1 | 2.00 |
| S0 | 52.40 |

### Plastic Reel




| Code | Dimension |
|---|---|
| A | 380 |
| B | 2.6 |
| C | 13.40 |
| D | 21.60 |
| N | 100 |
| W | 56 |
| T | 2.2 |

**Notes:**
All Dimensions per EIA-481 (Rev. D) and JIS C0806-3-1999

### Packing

| Packaging Option | Packaging Specification | Quantity |
|---|---|---|
| Reel | See plastic reel drawing above | 100 Pcs |
| Inner Box | 400*395*62mm | One Reel (100 Pcs) |
| Outer Carton | 420*420*265mm | 4 Inner Box (400Pcs) |

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