

MA Varistor Series



Agency Approvals

| Agency | Agency File Number |
|--------|--------------------|
| | None |

Additional Information



Datasheet



Resources



Samples

Description

The MA Series of transient surge suppressors are axial lead Metal Oxide Varistors (MOVs) for use in a wide variety of board level industrial and commercial electronic equipment. They are intended to protect components and signal/data lines from low energy transients where the small axial lead package is required.

The MA Series is offered with standard ('S' suffix) or tightened ('B' suffix) clamping voltage.

See MA Series Device Ratings and Specifications Table for part number and brand information.

Features

- Lead-free, Halogen-Free and RoHS compliant.
- 3mm diameter disc size
- Small axial lead package
- Wide operating voltage range:
 $V_{M(AC)RMS}$ 9V to 264V
 $V_{M(DC)}$ 13V to 365V
- Available in tape and reel or bulk packaging
- No derating up to 85°C ambient
- New black epoxy offers improved performance for high temperature Lead-free wave soldering process.

Absolute Maximum Ratings

• For ratings of individual members of a series, see Device Ratings and Specifications chart

| Continuous | MA Series | Units |
|---|-------------|------------|
| Steady State Applied Voltage: | | |
| AC Voltage Range ($V_{M(AC)RMS}$) | 9 to 264 | V |
| DC Voltage Range ($V_{M(DC)}$) | 13 to 365 | V |
| Transient: | | |
| Peak Pulse Current (I_{TM}) | | |
| For 8/20 μ s Current Wave (See Figure 2) | 40 to 100 | A |
| Single-Pulse Energy Range | | |
| For 2ms Current Square Wave (W_{TM}) | 0.06 to 1.7 | J |
| Operating Ambient Temperature Range (T_A) | -55 to +85 | °C |
| Storage Temperature Range (T_{STG}) | -55 to +125 | °C |
| Temperature Coefficient (αV) of Clamping Voltage (V_C) at Specified Test Current | <0.01 | %/°C |
| Hi-Pot Encapsulation (COATING Isolation Voltage Capability) Dielectric must withstand indicated DC voltage for one minute per MIL-STD 202, Method 301) | 1000 | V |
| COATING Insulation Resistance | 1000 | M Ω |

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

MA Series Ratings & Specifications

| Part Number | Brand (mm) | Maximum Rating (85°C) | | | | Specifications (25°C) | | | | |
|-------------|------------|-----------------------|-------------|--------------------------|-----------------------------|---|-------------|------|--|---------------------|
| | | Continuous | | Transient | | Varistor Voltage at 1mA DC Test Current | | | Max Clamping Volt V_C at 2.0A (8/20 μ s) | Typical Capacitance |
| | | V_{RMS} | V_{DC} | Energy (10/1000 μ s) | Peak Current (8/20 μ s) | | | | | |
| | | $V_{M(AC)}$ | $V_{M(DC)}$ | W_{TM} | I_{TM} | Min | $V_{N(DC)}$ | Max | V_C | $f = 1\text{MHz}$ |
| | | (V) | (V) | (J) | (A) | (V) | (V) | (V) | (A) | (pF) |
| V18MA1A | 18A | 9 | 13 | 0.06 | 40 | 14 | 18 | 23 | 49 | 550 |
| V18MA1B | 18B | 10 | 14 | 0.07 | 40 | 15 | 18 | 21 | 44 | 550 |
| V18MA1S | 18S | 10 | 14 | 0.06 | 40 | 15 | 18 | 21 | 49 | 550 |
| V22MA1A | 22A | 10 | 15 | 0.09 | 40 | 16 | 22 | 28 | 55 | 410 |
| V22MA1B | 22B | 14 | 18 | 0.10 | 40 | 19 | 22 | 26 | 51 | 410 |
| V22MA1S | 22S | 14 | 18 | 0.09 | 40 | 19 | 22 | 26 | 55 | 410 |
| V27MA1A | 27A | 13 | 19 | 0.10 | 40 | 21 | 27 | 34 | 67 | 370 |
| V27MA1B | 27B | 17 | 22 | 0.11 | 40 | 24 | 27 | 31 | 59 | 370 |
| V27MA1S | 27S | 17 | 22 | 0.10 | 40 | 24 | 27 | 31 | 67 | 370 |
| V33MA1A | 33A | 18 | 23 | 0.13 | 40 | 26 | 33 | 40 | 73 | 300 |
| V33MA1B | 33B | 20 | 26 | 0.15 | 40 | 29.5 | 33 | 36.5 | 67 | 300 |
| V33MA1S | 33S | 20 | 26 | 0.14 | 40 | 29.5 | 33 | 36.5 | 73 | 300 |
| V39MA2A | 39A | 22 | 28 | 0.16 | 40 | 31 | 39 | 47 | 86 | 250 |
| V39MA2B | 39B | 25 | 31 | 0.18 | 40 | 35 | 39 | 43 | 79 | 250 |
| V39MA2S | 39S | 25 | 31 | 0.17 | 40 | 35 | 39 | 43 | 86 | 250 |
| V47MA2A | 47A | 27 | 34 | 0.19 | 40 | 37 | 47 | 57 | 99 | 210 |
| V47MA2B | 47B | 30 | 38 | 0.21 | 40 | 42 | 47 | 52 | 90 | 210 |
| V47MA2S | 47S | 30 | 38 | 0.19 | 40 | 42 | 47 | 52 | 99 | 210 |
| V56MA2A | 56A | 32 | 40 | 0.23 | 40 | 44 | 56 | 68 | 117 | 180 |
| V56MA2B | 56B | 35 | 45 | 0.25 | 40 | 50 | 56 | 62 | 108 | 180 |
| V56MA2S | 56S | 35 | 45 | 0.23 | 40 | 50 | 56 | 62 | 117 | 180 |
| V68MA3A | 68A | 38 | 48 | 0.26 | 40 | 54 | 68 | 82 | 138 | 150 |
| V68MA3B | 68B | 40 | 56 | 0.30 | 40 | 61 | 68 | 75 | 127 | 150 |
| V68MA3S | 68S | 40 | 56 | 0.27 | 40 | 61 | 68 | 75 | 138 | 150 |
| V82MA3A | 82A | 45 | 60 | 0.33 | 40 | 65 | 82 | 99 | 163 | 120 |
| V82MA3B | 82B | 50 | 66 | 0.37 | 40 | 73 | 82 | 91 | 150 | 120 |
| V82MA3S | 82S | 50 | 66 | 0.34 | 40 | 73 | 82 | 91 | 163 | 120 |
| V100MA4A | 100 | 57 | 72 | 0.40 | 40 | 80 | 100 | 120 | 200 | 100 |
| V100MA4B | 101 | 60 | 81 | 0.45 | 40 | 90 | 100 | 110 | 185 | 100 |
| V100MA4S | 102 | 60 | 81 | 0.42 | 40 | 90 | 100 | 110 | 200 | 100 |
| V120MA1A | 120 | 72 | 97 | 0.40 | 100 | 102 | 120 | 138 | 220 | 40 |
| V120MA2B | 121 | 75 | 101 | 0.50 | 100 | 108 | 120 | 132 | 205 | 40 |
| V120MA2S | 122 | 75 | 101 | 0.46 | 100 | 108 | 120 | 132 | 220 | 40 |
| V150MA1A | 150 | 88 | 121 | 0.50 | 100 | 127 | 150 | 173 | 255 | 32 |
| V150MA2B | 151 | 92 | 127 | 0.60 | 100 | 135 | 150 | 165 | 240 | 32 |
| V180MA1A | 180 | 105 | 144 | 0.60 | 100 | 153 | 180 | 207 | 310 | 27 |
| V180MA3B | 181 | 110 | 152 | 0.70 | 100 | 162 | 180 | 198 | 290 | 27 |
| V220MA2A | 220 | 132 | 181 | 0.80 | 100 | 187 | 220 | 253 | 380 | 21 |
| V220MA4B | 221 | 138 | 191 | 0.90 | 100 | 198 | 220 | 242 | 360 | 21 |
| V270MA2A | 270 | 163 | 224 | 0.90 | 100 | 229 | 270 | 311 | 460 | 17 |
| V270MA4B | 271 | 171 | 235 | 1.00 | 100 | 243 | 270 | 297 | 440 | 17 |
| V330MA2A | 330 | 188 | 257 | 1.00 | 100 | 280 | 330 | 380 | 570 | 14 |
| V330MA5B | 331 | 200 | 274 | 1.10 | 100 | 297 | 330 | 363 | 540 | 14 |
| V390MA3A | 390 | 234 | 322 | 1.20 | 100 | 331 | 390 | 449 | 670 | 12 |
| V390MA6B | 391 | 242 | 334 | 1.30 | 100 | 351 | 390 | 429 | 640 | 12 |
| V430MA3A | 430 | 253 | 349 | 1.50 | 100 | 365 | 430 | 495 | 740 | 11 |
| V430MA7B | 431 | 264 | 365 | 1.70 | 100 | 387 | 430 | 473 | 700 | 11 |

NOTE: Average power dissipation of transients not to exceed 200mW.

Power Dissipation Ratings

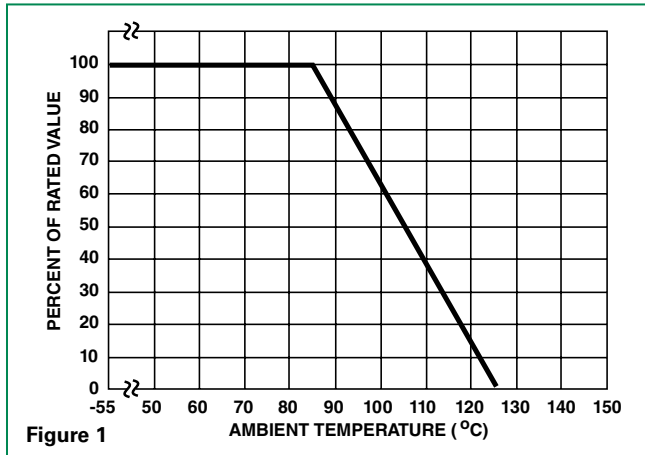


Figure 1

Should transients occur in rapid succession, the average power dissipation required is simply the energy (watt-seconds) per pulse times the number of pulses per second. The power so developed must be within the specifications shown on the Device Ratings and Specifications table for the specific device. Furthermore, the operating values need to be derated at high temperatures as shown above. Because varistors can only dissipate a relatively small amount of average power they are, therefore, not suitable for repetitive applications that involve substantial amounts of average power dissipation.

Peak Pulse Current Test Waveform

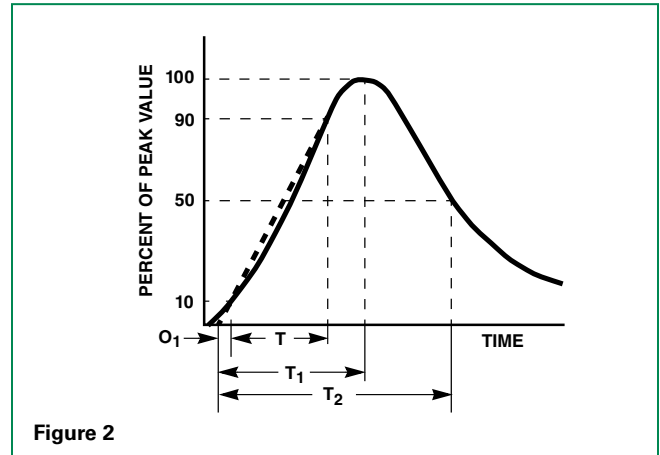


Figure 2

- O_1 = Virtual Origin of Wave
- T = Time from 10% to 90% of Peak
- T_1 = Rise Time = $1.25 \times T$
- T_2 = Decay Time

Example - For an 8/20 μ s Current Waveform:

- $8\mu s = T_1 = \text{Rise Time}$
- $20\mu s = T_2 = \text{Decay Time}$

Repetitive Surge Capability

V18MA - V100MA

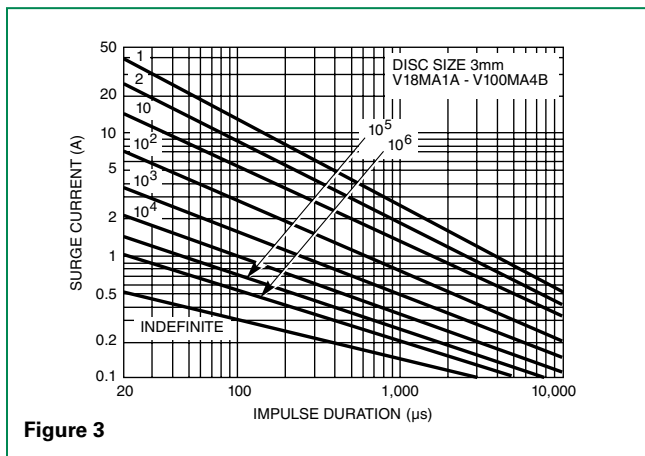


Figure 3

V120MA1A/S - V430MA3A

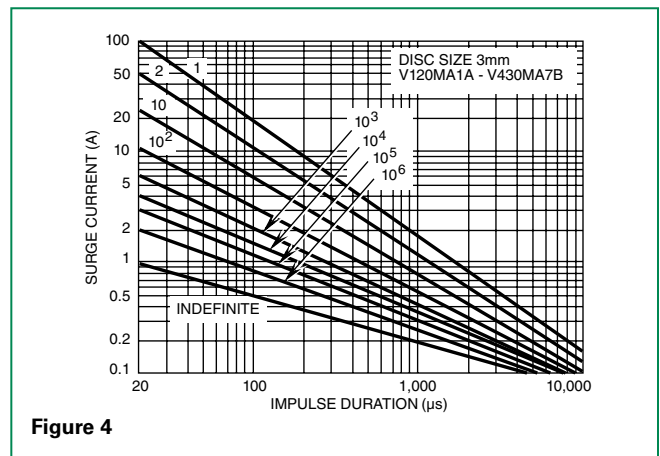


Figure 4

NOTE: If pulse ratings are exceeded, a shift of V_{NDC} (at specified current) of more than +/-10% could result. This type of shift, which normally results in a decrease of V_{NDC} , may result in the device not meeting the original published specifications, but it does not prevent the device from continuing to function, and to provide ample protection.

Maximum Clamping Voltage

V18MA1A/S - V100MA4A/S

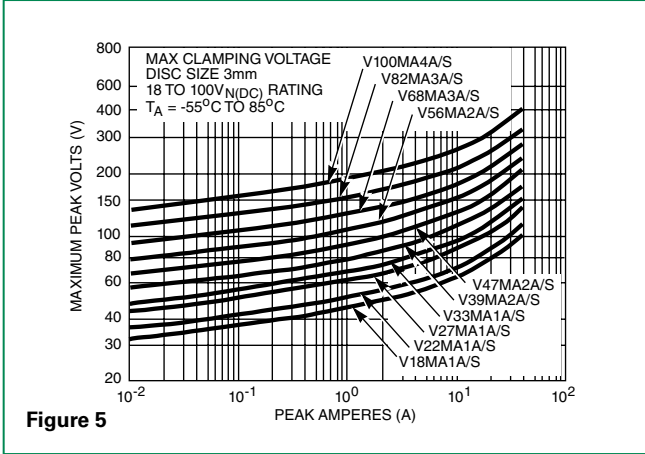


Figure 5

V18MA1B - V100MA4B

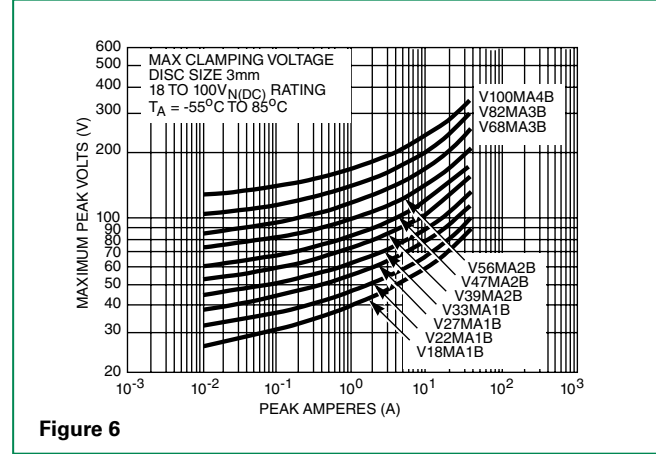


Figure 6

V120MA1A/S - V430MA3A

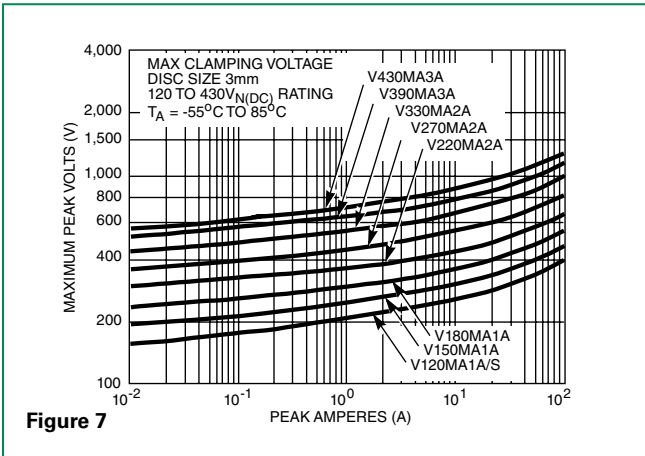


Figure 7

V120MA2B - V430MA7B

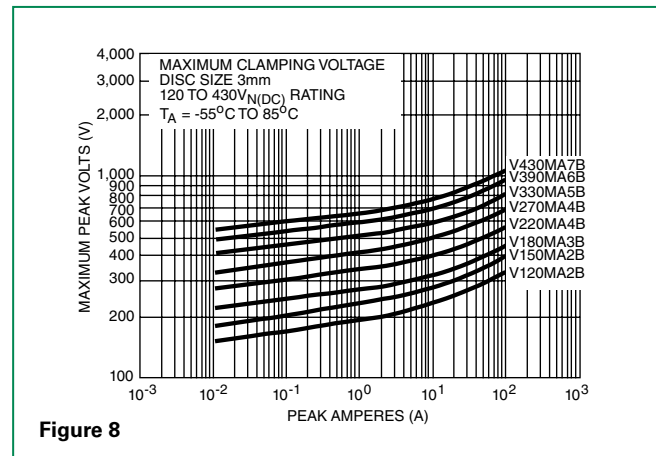


Figure 8

Wave Solder Profile

Non Lead-free Profile

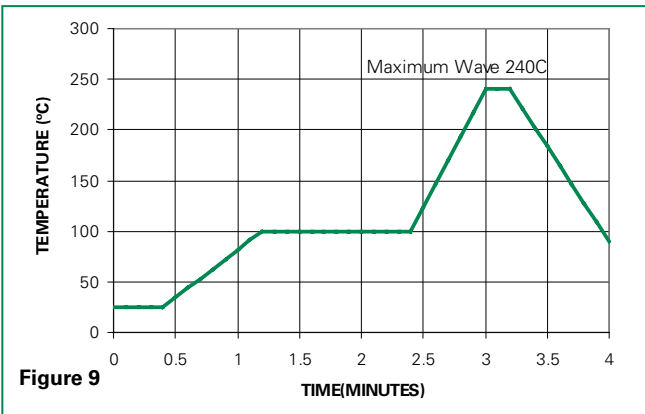


Figure 9

Lead-free Profile

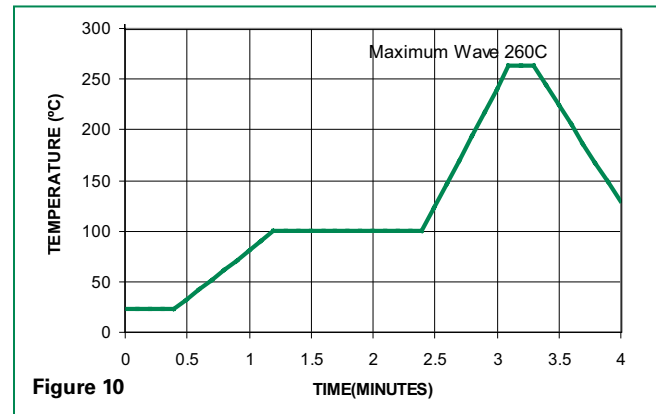


Figure 10