



High-Reliability Non-Hermetic TVS Products Portfolio



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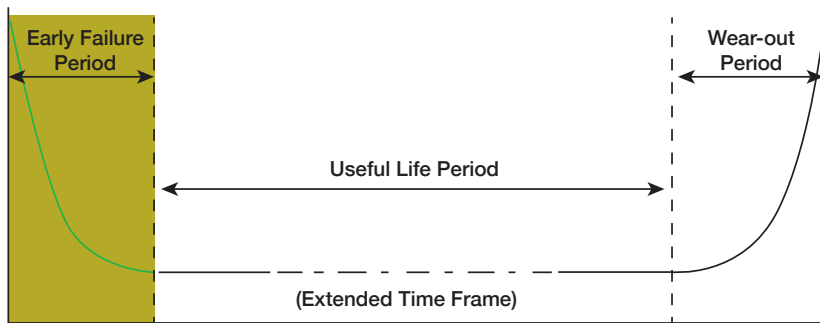
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High-Reliability Non-Hermetic Transient Voltage Suppressor (TVS) Products

Standard commercial-grade semiconductor testing may not detect some types of problems such as cracked die or ionic contamination. These and other defects lead to early life failures, and screening for them is particularly important in large-die devices. Microchip's high-reliability non-hermetic/plastic products under go through an up-screening program modeled on JANxxx Military Qualification Procedures uncover these defects and reduce or eliminate the region of early life failures. The tests are defined in MIL-PRF-19500, Appendix E, Table IV.



Microchip's high-reliability program also provides for date coding and lot traceability of all devices, continuous reliability monitoring, and controlled foundry, assembly, and test locations. Customers are also provided a full Certificate of Conformance with every lot. Any product changes are made only under a process/product change notification process with the customer.

We offer 3 levels of cost effective up-screening for more robust applications, such as avionics flight hardware, where even a very low level of device mortality is unacceptable. The available screening processes are described in the accompanying tables and are defined as MA, MXL and MX screening processes. These screening processes are recommended for all robust or harsh environmental applications, and for all power levels. You do not need to create source control drawings nor define screening flows to specify these up-screening options.

Examples: MA1.5KE48CA or MXMSMLJ43CA

Custom flows are always available from Microchip to support application specific requirements.

Within the metal and composite shell of every jetliner, tens of thousands of sensitive semiconductor components perform critical functions from navigation to engine control. Since aircraft are struck by lightning on average once every thousand flying hours, protection of sensitive electronic devices is essential.

| Process, Screen or Test Description | Product Assurance Level Requirement | | | |
|---|-------------------------------------|-----------------------|-----------------------|-----------------------|
| | M | MA | MXL | MX |
| 100% DC Electrical Test, Go/No-Go | R | R | R | R |
| 3 Sigma lot norm of key parameters | R | R | R | R |
| Initial Surge Test | 1x | 1x | 1x | 1x |
| Post-Surge Electrical Testing | R | R | R | R |
| Temperature Cycling Testing | 10 Cycles ¹ | 10 Cycles | 20 Cycles | 20 Cycles |
| Post Temperature Cycling Surge | 1x ¹ | 3x | 10x | 10x |
| Pre-HTRB Electrical Test, Read & Record | | | R | R |
| HTRB | | 24 hours ² | 96 hours ³ | 96 hours ³ |
| Interim Electrical Test, Read & Record | | | R | R |
| Final Electrical Test, Read & Record | go/no-go ¹ | go/no-go | R | R |
| Delta Calculations | | | R | R |
| PDA Evaluation | | | R | R |
| Group A Conformance Inspection | | | R | R |
| Group B Conformance Inspection | | | | R |
| Group C Conformance Inspection | | | | R |
| Certificate of Conformance | R | R | R | R |

R - Required and performed based on MIL-PRF-19500 conditions and limits

1 - Tests performed on PLAD18KP, PLAD36KP, PLAD6.5KP and PLAD7.5KP only

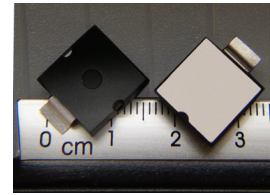
2 - 24 hours for unidirectional. 24 hours each side for bidirectional.

3 - 96 hours for unidirectional. 48 hours each side for bidirectional.

High-Reliability Non-Hermetic TVS

TVS Diodes for Transient Voltage Protection for Avionics and Robust Environments or Applications

Microchip is a world leader in the design, fabrication, qualification and supply of Transient Voltage Suppressors (TVS). Applications include military and medical equipment, telecommunications, computers and their peripherals. Microchip also provides protection to the electronics of engine control systems in the sophisticated avionics and aerospace industries. The company offers a broad portfolio of both uni- and bi-directional discreet plastic TVS devices with power levels from 600W to 130 kW. The qualification test plans and reliability monitoring provided for all these products are in line with the best industry standard practices.

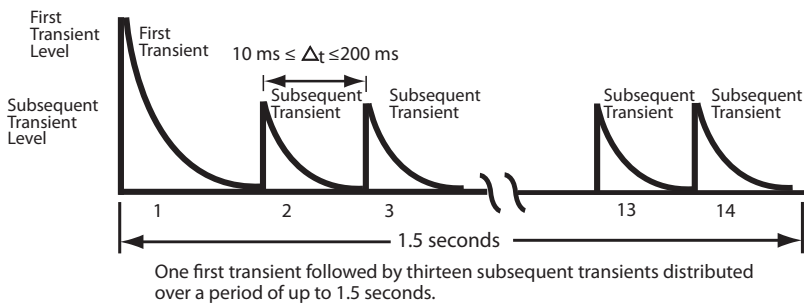
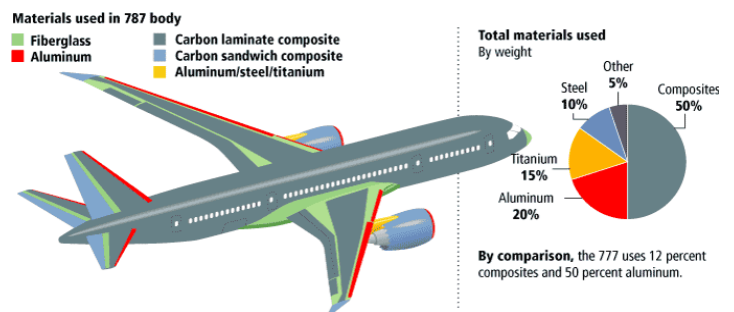


PLAD provides large exposed metal pads on the bottom of the package with excellent direct internal connection to the die.

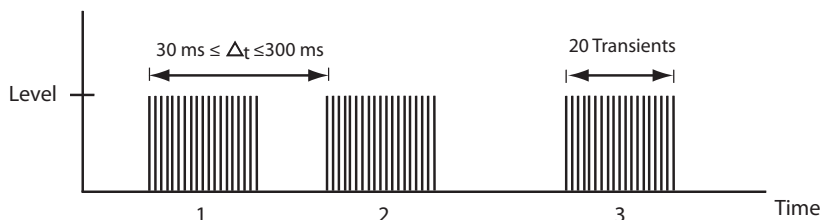
This catalog includes an exciting expansion in Microchip's industry leading Plastic Large Area Device (PLAD) surface mount package offerings for TVS devices. PLADs provide large exposed metal pads on the bottom of the package with excellent direct internal connection to the die—there are no wire bonds. This provides a very low resistance thermal path, which is much superior to axial leaded devices and is critical in meeting the expanding requirements for multi-stroke and multi-burst event protection in composite body aircraft.

Multi-Stroke and Multi-Burst TVS Protection

Increasing emphasis is being placed on multi-stroke and multi-burst lightning protection, particularly (but not exclusively) in the protection of the growing proportion of new aircraft being built with largely composite bodies. Test standards for these hazards are defined by RTCA standard DO-160. Microchip's high-reliability plastic PLAD packaged TVS devices are uniquely suited to address these requirements.



Multi-Burst Test Specification



Tutorial on TVS Component Selection

To use the TVS selection tables in this brochure, you must be able to answer the following questions:

1. What is the continuous or repetitive peak operating voltage at the circuit location where the TVS will be placed to protect a sensitive load?

This will determine the Working Standoff Voltage (V_{WM}) and minimum Breakdown Voltage (V_{BR}) required of the TVS. V_{WM} is the voltage across the TVS in its off, non-conducting state. You typically match this to the nominal working voltage of the circuit you are protecting. V_{BR} is the voltage at which avalanche breakdown begins and the TVS starts conducting. V_{BR} must be greater than the high end of the tolerance range of the operating voltage of the circuit you are protecting.

2. What is the worst case transient waveform in peak impulse current and pulse shape the TVS needs to divert around the sensitive load?

This will determine the Peak Surge Current (I_{PP}) the TVS must handle, and the correct de-rating factor (if any) required due to the pulse shape. See MicroNote 120.

3. What is the worst case peak voltage the sensitive load can withstand for the pulse duration in item #2 above?

This will determine the minimum Clamping Voltage (V_C) required of the TVS. This is the voltage across the TVS at the Peak Surge Current (I_{PP}).

4. What is the repetitive peak pulse power dissipation required?

This will determine the Peak Pulse Power (P_{PP}) required of the TVS. It is equal to $I_{PP} \times V_C$.

5. Is the required V_C lower in value than available on the data sheet for the V_{WM} described in item #1?

If the answer is yes, oversizing the P_{PP} selection for a given pulse condition will reduce V_C and bring it closer to V_{BR} and V_{WM} . Also see MicroNote 108.

6. Is the pulse shape and duration different than that for which P_{PP} is specified, or is the waveform of the threat difficult to define?

P_{PP} is typically rated for one of two standard exponential waveforms – 8/20 μs (8 μs rise time, 20 μs fall time to 50% of peak current) or 10/1000 μs . Shorter or longer pulses or different pulse shapes will increase or decrease the peak power the TVS can safely dissipate. See MicroNote 125 for general recommendations regarding industry standards on protection, and MicroNote 120 for advice on adjusting for various waveforms.

High-Reliability Non-Hermetic TVS

Symbols and Definitions

| Symbol | Definition |
|----------|--|
| V_{WM} | Working Standoff Voltage: The voltage across the TVS in its off, non-conducting state. |
| V_{BR} | Breakdown Voltage: The minimum voltage at which avalanche breakdown begins and the TVS starts conducting. |
| P_{PP} | Peak Pulse Power: The peak power that can be applied for a specific pulse width and waveform. |
| I_D | Standby Current: The maximum current that will flow at V_{WM} . |
| I_{PP} | Peak Pulse Current: The peak current that can be applied for a specified pulse width and waveform. |
| C | Capacitance: The capacitance in picofarads of the TVS as defined and at 0V at a frequency of 1 MHz. |

High-Reliability TVS Component Summary

The table below summarizes the Microchip range of high-reliability TVS devices, while the images illustrate the package sizes. New families and packages will shortly be added to the product range.

| Product Family | Rated Standoff Voltage V_{WM} | Minimum Breakdown Voltage V_{BR} | Peak Pulse Power Rating | SMD/Axial | Package |
|----------------|---------------------------------|------------------------------------|-------------------------|-----------|--------------------|
| MUPT | 5.0 V–48 V | 6.0 V–40 V | 150 W | SMD | DO-216AA |
| MSMB | 5.0 V–170 V | 6.4 V–189 V | 600 W | SMD | DO-214AA, DO-215AA |
| MSMC | 5.0 V–170 V | 6.4 V–189 V | 1.5 kW | SMD | DO-214AB, DO-215AB |
| MSMCxLCE | 6.5 V–170 V | 7.22 V–189 V | 1.5 kW | SMD | DO-214AB, DO-215AB |
| MSML | 5.0 V–170 V | 6.4 V–189 V | 3 kW | SMD | DO-214AB, DO-215AB |
| MPLAD6.5KP | 10 V–48 V | 11.1 V–189 V | 6.5 kW | SMD | mini-PLAD |
| MPLAD7.5KP | 10 V–48 V | 11.1 V–189 V | 7.5 kW | SMD | mini-PLAD |
| MPLAD18KP | 7.0 V–200 V | 7.78 V–222 V | 18 kW | SMD | PLAD |
| MPLAD36KP | 14 V–400 V | 15.6 V–444 V | 36 kW | SMD | PLAD |
| MP4KE | 5.8 V–342 V | 6.45 V–380 V | 400 W | Axial | DO-41 [DO-04AL] |
| MP6KE | 5.8 V–171 V | 6.45 V–190 V | 600 W | Axial | T-18 |
| M1.5KE | 5.8 V–324 V | 6.45 V–380 V | 1.5 kW | Axial | Case 1 |
| MLCE | 6.5 V–170 V | 7.22 V–189 V | 1.5 kW | Axial | Case 1 |
| M5KP | 5 V–110 V | 6.4 V–122 V | 5 kW | Axial | Case 5A [DO-204AR] |
| M15KP | 22 V–280 V | 24.4 V–311 V | 15 kW | Axial | Case 5A [DO-204AR] |
| MRT100KP | 40 V–400 V | 44.4 V–444 V | 100 kW | Axial | Case 5A [DO-204AR] |
| MSMBJSAC | 5.0 V–75 V | 7.60 V–83.3 V | 500 W | SMD | DO-214AA |
| MRT130KP | 275 V–295 V | 300 V | 130 kW | Axial | Case 5A [DO-204AR] |
| MRT65KP | 48 V–75 V | 53.3 V–83.3 V | 65 kW | Axial | Case 5A [DO-204AR] |
| MDA | 6–40 V | 6.67–44.4 V | 3000 W | SMD | 16-pin Dual SIP |

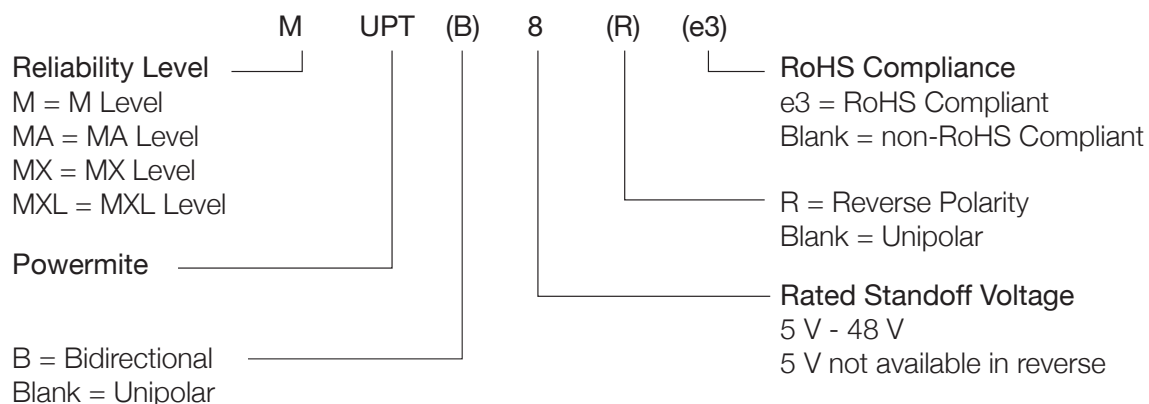


MUPT 5V–48V Powermite1, Surface-Mount Transient Voltage Suppressors

Features

- Powermite package with standoff voltages 5 V to 48 V.
- Both unidirectional and bidirectional polarities:
 - Anode to case bottom (MUPT5e3 thru MUPT48e3)
 - Bidirectional (MUPTB5e3 thru MUPTB48e3)
 - Reverse polarity (MUPT8Re3 thru MUPT48Re3)
- Operational and storage temperature of –55°C to +150°C
- 100% surge current testing of all parts.
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B.
- Both RoHS and non-RoHS compliant versions available.

Part Nomenclature



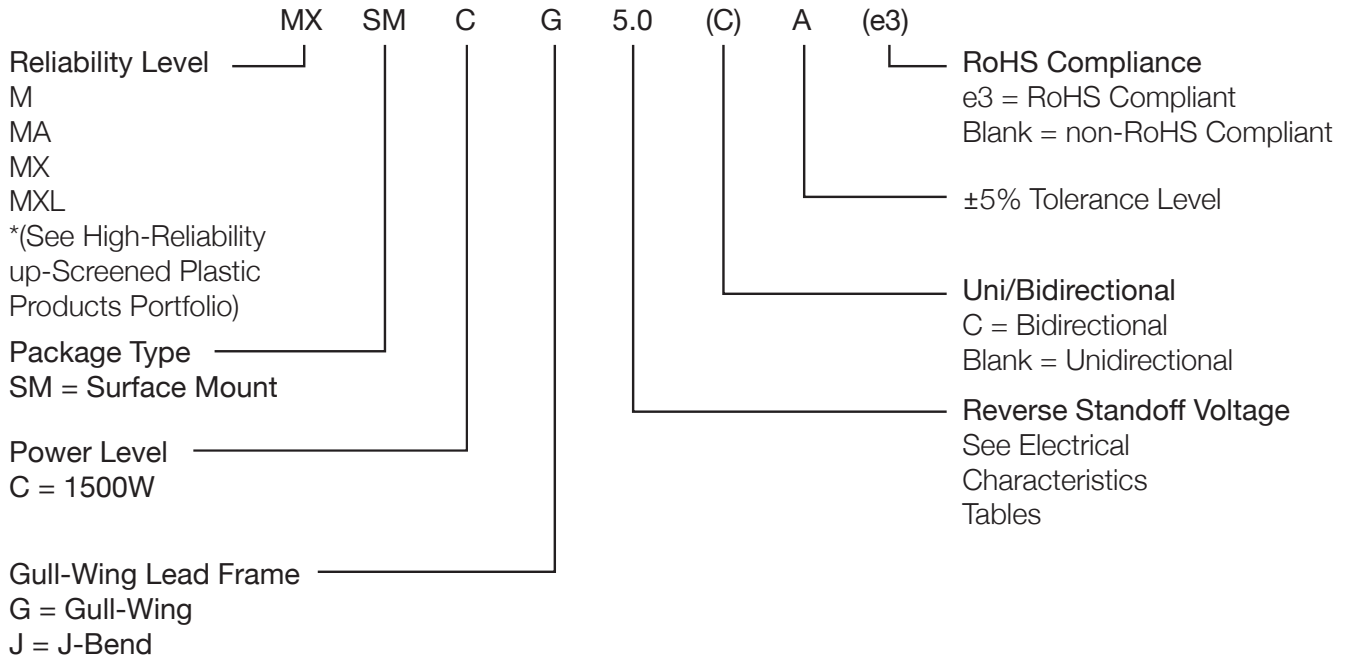
| Device Type | | Rated Standoff Voltage V _{WM} | Minimum Breakdown Voltage V _(BR) @ 1 mA | Maximum Standby Current I _D @ V _{WM} | Maximum Peak Pulse Current* I _{PP} @ 10/1000 μS | Maximum Clamping Voltage V _C @ I _{PP} | Maximum Temperature Coefficient of V _(BR) aV _(BR) /°C |
|-----------------|----------------|---|---|---|---|---|--|
| Uni-directional | Bi-directional | V | V | μA | A | V | %/°C |
| MUPT5 | MUPTB5 | 5 | 6.0 | 50 | 15.7 | 9.5 | 0.030 |
| MUPT8 | MUPTB8 | 8 | 9.0 | 2 | 10.9 | 13.7 | 0.040 |
| MUPT10 | MUPTB10 | 10 | 11.0 | 2 | 8.33 | 18.0 | 0.045 |
| MUPT12 | MUPTB12 | 12 | 13.8 | 1 | 6.94 | 21.6 | 0.050 |
| MUPT15 | MUPTB15 | 15 | 16.7 | 1 | 5.77 | 26.0 | 0.055 |
| MUPT17 | MUPTB17 | 17 | 19.0 | 1 | 5.14 | 29.2 | 0.060 |
| MUPT24 | MUPTB24 | 24 | 28.4 | 1 | 3.47 | 43.2 | 0.070 |
| MUPT28 | MUPTB28 | 28 | 31.0 | 1 | 3.13 | 47.8 | 0.075 |
| MUPT33 | MUPTB33 | 33 | 36.8 | 1 | 2.65 | 56.7 | 0.080 |
| MUPT48 | MUPTB48 | 48 | 54.0 | 1 | 1.78 | 84.3 | 0.090 |

MSMB/MSMC/MSML Surface-Mount Devices (SMDs)

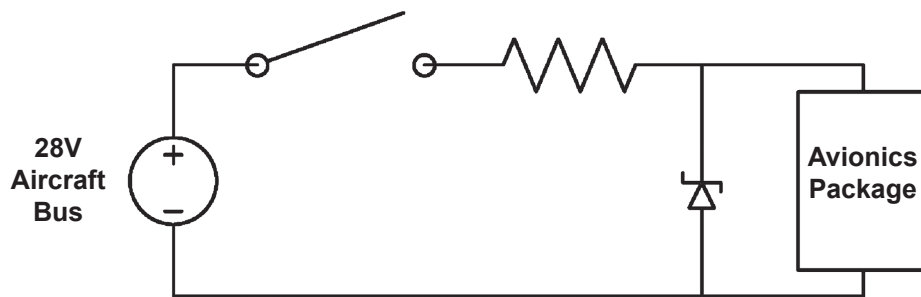
MSMx Surface-Mount Devices

| Features | Appearance |
|--|---|
| <ul style="list-style-type: none"> Both RoHS and non-RoHS compliant versions available Peak pulse power at 10/1000 μS <ul style="list-style-type: none"> MSMB series – 600 W MSMC series – 1500 W MSML series – 3000 W 100% surge current testing of all parts Standoff voltages of 5 V to 170 V Operational and storage temperature of -55°C to $+150^{\circ}\text{C}$ Unidirectional and bidirectional versions available Available in gull-wing and modified J-lead lead forming designs Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B |  |

Part Nomenclature



Circuit Breaker Options

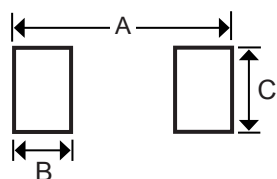


DC Supply Protection

MSMB 600 Watt, All Electrical Characteristics @ 25°C

| Type Number | Reverse Stand-Off Voltage V_{WM} Volts | Minimum Breakdown Voltage V_{BR} Min @ I_{BR} Volts | Breakdown Current I_{BR} mA | Maximum Clamping Voltage @ I_{PP} Vc Volts | Peak Pulse Current I_{PP} Amps | Maximum Standby Current @ V_{WM} Id μ A |
|-------------|--|---|-------------------------------------|---|-------------------------------------|--|
| MSMBx5.0A | 5.0 | 6.40 | 10 | 9.2 | 65.2 | 800 |
| MSMBx6.0A | 6.0 | 6.67 | 10 | 10.3 | 58.3 | 800 |
| MSMBx6.5A | 6.5 | 7.22 | 10 | 11.2 | 53.6 | 500 |
| MSMBx7.0A | 7.0 | 7.78 | 10 | 12.0 | 50.0 | 200 |
| MSMBx7.5A | 7.5 | 8.33 | 1 | 12.9 | 46.5 | 100 |
| MSMBx8.0A | 8.0 | 8.89 | 1 | 13.6 | 44.1 | 50 |
| MSMBx8.5A | 8.5 | 9.44 | 1 | 14.4 | 41.7 | 10 |
| MSMBx9.0A | 9.0 | 10.0 | 1 | 15.4 | 39.0 | 5 |
| MSMBx10A | 10 | 11.1 | 1 | 17.0 | 35.3 | 5 |
| MSMBx11A | 11 | 12.2 | 1 | 18.2 | 33.0 | 5 |
| MSMBx12A | 12 | 13.3 | 1 | 19.9 | 30.2 | 5 |
| MSMBx13A | 13 | 14.4 | 1 | 21.5 | 27.9 | 1 |
| MSMBx14A | 14 | 15.6 | 1 | 23.2 | 25.8 | 1 |
| MSMBx15A | 15 | 16.7 | 1 | 24.4 | 24.0 | 1 |
| MSMBx16A | 16 | 17.8 | 1 | 26.0 | 23.1 | 1 |
| MSMBx17A | 17 | 18.9 | 1 | 27.6 | 21.7 | 1 |
| MSMBx18A | 18 | 20.0 | 1 | 29.2 | 20.5 | 1 |
| MSMBx20A | 20 | 22.2 | 1 | 32.4 | 18.5 | 1 |
| MSMBx22A | 22 | 24.4 | 1 | 35.5 | 16.9 | 1 |
| MSMBx24A | 24 | 26.7 | 1 | 38.9 | 15.4 | 1 |
| MSMBx26A | 26 | 28.9 | 1 | 42.1 | 14.2 | 1 |
| MSMBx28A | 28 | 31.1 | 1 | 45.4 | 13.2 | 1 |
| MSMBx30A | 30 | 33.3 | 1 | 48.4 | 12.4 | 1 |
| MSMBx33A | 33 | 36.7 | 1 | 53.3 | 11.3 | 1 |
| MSMBx36A | 36 | 40.0 | 1 | 58.1 | 10.3 | 1 |
| MSMBx40A | 40 | 44.4 | 1 | 64.5 | 9.3 | 1 |
| MSMBx43A | 43 | 47.8 | 1 | 69.4 | 8.6 | 1 |
| MSMBx45A | 45 | 50.0 | 1 | 72.7 | 8.3 | 1 |
| MSMBx48A | 48 | 53.3 | 1 | 77.4 | 7.7 | 1 |
| MSMBx51A | 51 | 56.7 | 1 | 82.4 | 7.3 | 1 |
| MSMBx54A | 54 | 60.0 | 1 | 87.1 | 6.9 | 1 |
| MSMBx58A | 58 | 64.4 | 1 | 93.6 | 6.4 | 1 |
| MSMBx60A | 60 | 66.7 | 1 | 96.8 | 6.2 | 1 |
| MSMBx64A | 64 | 71.1 | 1 | 103 | 5.8 | 1 |
| MSMBx70A | 70 | 77.8 | 1 | 113 | 5.3 | 1 |
| MSMBx75A | 75 | 83.3 | 1 | 121 | 4.9 | 1 |
| MSMBx78A | 78 | 86.7 | 1 | 126 | 4.7 | 1 |
| MSMBx85A | 85 | 94.4 | 1 | 137 | 4.4 | 1 |
| MSMBx90A | 90 | 100 | 1 | 146 | 4.1 | 1 |
| MSMBx100A | 100 | 111 | 1 | 162 | 3.7 | 1 |
| MSMBx110A | 110 | 122 | 1 | 177 | 3.4 | 1 |
| MSMBx120A | 120 | 133 | 1 | 193 | 3.1 | 1 |
| MSMBx130A | 130 | 144 | 1 | 209 | 2.9 | 1 |
| MSMBx150A | 150 | 167 | 1 | 243 | 2.5 | 1 |
| MSMBx160A | 160 | 178 | 1 | 259 | 2.3 | 1 |
| MSMBx170A | 170 | 189 | 1 | 275 | 2.2 | 1 |

Pad Layout



| MSMBJ (DO-214AA) | | |
|------------------|--------|------|
| | Inches | mm |
| A | 0.260 | 6.60 |
| B | 0.085 | 2.16 |
| C | 0.110 | 2.79 |

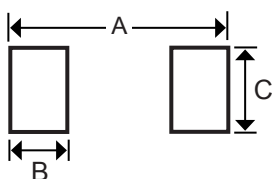
| MSMBG (DO-215AA) | | |
|------------------|--------|------|
| | Inches | mm |
| A | 0.320 | 8.13 |
| B | 0.085 | 2.16 |
| C | 0.110 | 2.79 |

MSMC Surface-Mount Devices

MSMC 1.5 kW, All Electrical Characteristics @ 25°C

| Type Number | Reverse Stand-Off Voltage V_{WM} Volts | Minimum Breakdown Voltage V_{BR} Min. @ I _{BR} Volts | Breakdown Current I _{BR} mA | Maximum Clamping Voltage @ I _{PP} V _C Volts | Peak Pulse Current I _{PP} Amps | Maximum Standby Current @ V_{WM} I _D mA |
|-------------|--|---|--|---|---|--|
| MSMCx5.0A | 5.0 | 6.40 | 10 | 9.2 | 163.0 | 1000 |
| MSMCx6.0A | 6.0 | 6.67 | 10 | 10.3 | 145.6 | 1000 |
| MSMCx6.5A | 6.5 | 7.22 | 10 | 11.2 | 133.9 | 500 |
| MSMCx7.0A | 7.0 | 7.78 | 10 | 12.0 | 125.0 | 200 |
| MSMCx7.5A | 7.5 | 8.33 | 1 | 12.9 | 116.3 | 100 |
| MSMCx8.0A | 8.0 | 8.89 | 1 | 13.6 | 110.3 | 50 |
| MSMCx8.5A | 8.5 | 9.44 | 1 | 14.4 | 104.2 | 20 |
| MSMCx9.0A | 9.0 | 10.0 | 1 | 15.4 | 97.4 | 10 |
| MSMCx10A | 10 | 11.1 | 1 | 17.0 | 88.2 | 5 |
| MSMCx11A | 11 | 12.2 | 1 | 18.2 | 82.4 | 5 |
| MSMCx12A | 12 | 13.3 | 1 | 19.9 | 75.3 | 5 |
| MSMCx13A | 13 | 14.4 | 1 | 21.5 | 69.7 | 1 |
| MSMCx14A | 14 | 15.6 | 1 | 23.2 | 64.7 | 1 |
| MSMCx15A | 15 | 16.7 | 1 | 24.4 | 61.5 | 1 |
| MSMCx16A | 16 | 17.8 | 1 | 26.0 | 57.7 | 1 |
| MSMCx17A | 17 | 18.9 | 1 | 27.6 | 53.3 | 1 |
| MSMCx18A | 18 | 20.0 | 1 | 29.2 | 51.4 | 1 |
| MSMCx20A | 20 | 22.2 | 1 | 32.4 | 46.3 | 1 |
| MSMCx22A | 22 | 24.4 | 1 | 35.5 | 42.2 | 1 |
| MSMCx24A | 24 | 26.7 | 1 | 38.9 | 38.6 | 1 |
| MSMCx26A | 26 | 28.9 | 1 | 42.1 | 35.6 | 1 |
| MSMCx28A | 28 | 31.1 | 1 | 45.4 | 33.0 | 1 |
| MSMCx30A | 30 | 33.3 | 1 | 48.4 | 31.0 | 1 |
| MSMCx33A | 33 | 36.7 | 1 | 53.3 | 28.1 | 1 |
| MSMCx36A | 36 | 40.0 | 1 | 58.1 | 25.8 | 1 |
| MSMCx40A | 40 | 44.4 | 1 | 64.5 | 23.2 | 1 |
| MSMCx43A | 43 | 47.8 | 1 | 69.4 | 21.6 | 1 |
| MSMCx45A | 45 | 50.0 | 1 | 72.7 | 20.6 | 1 |
| MSMCx48A | 48 | 53.3 | 1 | 77.4 | 19.4 | 1 |
| MSMCx51A | 51 | 56.7 | 1 | 82.4 | 18.2 | 1 |
| MSMCx54A | 54 | 60.0 | 1 | 87.1 | 17.2 | 1 |
| MSMCx58A | 58 | 64.4 | 1 | 93.6 | 16.0 | 1 |
| MSMCx60A | 60 | 66.7 | 1 | 96.8 | 15.5 | 1 |
| MSMCx64A | 64 | 71.1 | 1 | 103.0 | 14.6 | 1 |
| MSMCx70A | 70 | 77.8 | 1 | 113 | 13.3 | 1 |
| MSMCx75A | 75 | 83.3 | 1 | 121 | 12.4 | 1 |
| MSMCx78A | 78 | 86.7 | 1 | 126 | 11.4 | 1 |
| MSMCx85A | 85 | 94.4 | 1 | 137 | 10.4 | 1 |
| MSMCx90A | 90 | 100 | 1 | 146 | 10.3 | 1 |
| MSMCx100A | 100 | 111 | 1 | 162 | 9.3 | 1 |
| MSMCx110A | 110 | 122 | 1 | 177 | 8.4 | 1 |
| MSMCx120A | 120 | 133 | 1 | 193 | 7.8 | 1 |
| MSMCx130A | 130 | 144 | 1 | 209 | 7.2 | 1 |
| MSMCx150A | 150 | 167 | 1 | 243 | 6.2 | 1 |
| MSMCx160A | 160 | 178 | 1 | 259 | 5.8 | 1 |
| MSMCx170A | 170 | 189 | 1 | 275 | 5.5 | 1 |

PAD Layout

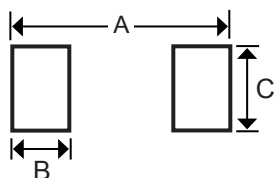


| MSMCJ (DO-214AB) | | |
|------------------|--------|------|
| | Inches | mm |
| A | 0.390 | 9.90 |
| B | 0.110 | 2.79 |
| C | 0.150 | 3.81 |

| MSMCG (DO-215AB) | | |
|------------------|--------|-------|
| | Inches | mm |
| A | 0.510 | 12.95 |
| B | 0.110 | 2.79 |
| C | 0.150 | 3.81 |

MSML 3 kW, All Electrical Characteristics @ 25°C

| Type Number | Reverse Stand-Off Voltage V_{WM} Volts | Minimum Breakdown Voltage V_{BR} Min. @ I_{BR} Volts | Breakdown Current I_{BR} mA | Maximum Clamping Voltage @ I_{PP} V_C Volts | Peak Pulse Current I_{PP} Amps | Maximum Standby Current @ V_{WM} I_D mA |
|-------------|--|--|-------------------------------------|---|--|---|
| MSMLx5.0A | 5.0 | 6.40 | 10 | 9.2 | 326.0 | 1000 |
| MSMLx6.0A | 6.0 | 6.67 | 10 | 10.3 | 291.3 | 1000 |
| MSMLx6.5A | 6.5 | 7.22 | 10 | 11.2 | 267.9 | 500 |
| MSMLx7.0A | 7.0 | 7.78 | 10 | 12.0 | 250.0 | 200 |
| MSMLx7.5A | 7.5 | 8.33 | 1 | 12.9 | 232.6 | 100 |
| MSMLx8.0A | 8.0 | 8.89 | 1 | 13.6 | 220.6 | 50 |
| MSMLx8.5A | 8.5 | 9.44 | 1 | 14.4 | 208.4 | 25 |
| MSMLx9.0A | 9.0 | 10.0 | 1 | 15.4 | 194.8 | 10 |
| MSMLx10A | 10 | 11.1 | 1 | 17.0 | 176.4 | 5 |
| MSMLx11A | 11 | 12.2 | 1 | 18.2 | 164.8 | 5 |
| MSMLx12A | 12 | 13.3 | 1 | 19.9 | 150.6 | 5 |
| MSMLx13A | 13 | 14.4 | 1 | 21.5 | 139.4 | 5 |
| MSMLx14A | 14 | 15.6 | 1 | 23.2 | 129.4 | 2 |
| MSMLx15A | 15 | 16.7 | 1 | 24.4 | 123.0 | 2 |
| MSMLx16A | 16 | 17.8 | 1 | 26.0 | 115.4 | 2 |
| MSMLx17A | 17 | 18.9 | 1 | 27.6 | 106.6 | 2 |
| MSMLx18A | 18 | 20.0 | 1 | 29.2 | 102.8 | 2 |
| MSMLx20A | 20 | 22.2 | 1 | 32.4 | 92.6 | 2 |
| MSMLx22A | 22 | 24.4 | 1 | 35.5 | 84.4 | 2 |
| MSMLx24A | 24 | 26.7 | 1 | 38.9 | 77.2 | 2 |
| MSMLx26A | 26 | 28.9 | 1 | 42.1 | 71.2 | 2 |
| MSMLx28A | 28 | 31.1 | 1 | 45.4 | 66.0 | 2 |
| MSMLx30A | 30 | 33.3 | 1 | 48.4 | 62.0 | 2 |
| MSMLx33A | 33 | 36.7 | 1 | 53.3 | 56.2 | 2 |
| MSMLx36A | 36 | 40.0 | 1 | 58.1 | 51.6 | 2 |
| MSMLx40A | 40 | 44.4 | 1 | 64.5 | 46.4 | 2 |
| MSMLx43A | 43 | 47.8 | 1 | 69.4 | 43.2 | 2 |
| MSMLx45A | 45 | 50.0 | 1 | 72.7 | 41.2 | 2 |
| MSMLx48A | 48 | 53.3 | 1 | 77.4 | 38.8 | 2 |
| MSMLx51A | 51 | 56.7 | 1 | 82.4 | 36.4 | 2 |
| MSMLx54A | 54 | 60.0 | 1 | 87.1 | 34.4 | 2 |
| MSMLx58A | 58 | 64.4 | 1 | 93.6 | 32.0 | 2 |
| MSMLx60A | 60 | 66.7 | 1 | 96.8 | 31.0 | 2 |
| MSMLx64A | 64 | 71.1 | 1 | 103 | 29.2 | 2 |
| MSMLx70A | 70 | 77.8 | 1 | 113 | 26.6 | 2 |
| MSMLx75A | 75 | 83.3 | 1 | 121 | 24.8 | 2 |
| MSMLx78A | 78 | 86.7 | 1 | 126 | 22.8 | 2 |
| MSMLx85A | 85 | 94.4 | 1 | 137 | 20.8 | 2 |
| MSMLx90A | 90 | 100 | 1 | 146 | 20.6 | 2 |
| MSMLx100A | 100 | 111 | 1 | 162 | 18.6 | 2 |
| MSMLx110A | 110 | 122 | 1 | 177 | 16.8 | 2 |
| MSMLx120A | 120 | 133 | 1 | 193 | 15.6 | 2 |
| MSMLx130A | 130 | 144 | 1 | 209 | 14.4 | 2 |
| MSMLx150A | 150 | 167 | 1 | 243 | 12.4 | 2 |
| MSMLx160A | 160 | 178 | 1 | 259 | 11.6 | 2 |
| MSMLx170A | 170 | 189 | 1 | 275 | 11.0 | 2 |

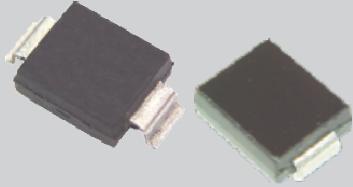
PAD Layout


| MSMLJ (DO-214AB) | | |
|------------------|--------|------|
| | Inches | mm |
| A | 0.390 | 9.90 |
| B | 0.110 | 2.79 |
| C | 0.150 | 3.81 |

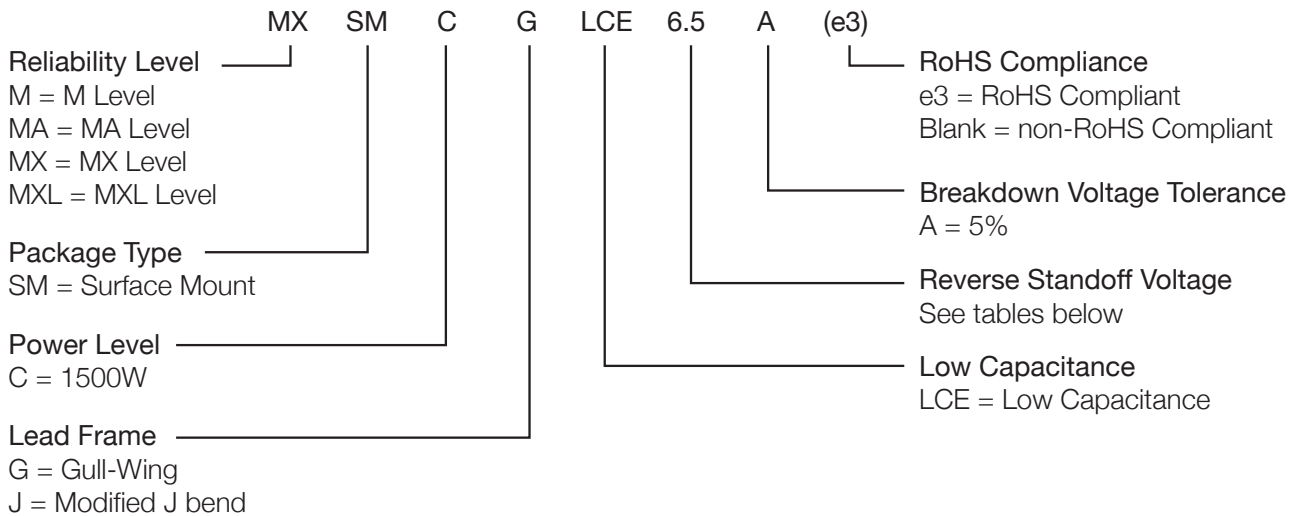
| MSMLG (DO-215AB) | | |
|------------------|--------|-------|
| | Inches | mm |
| A | 0.510 | 12.95 |
| B | 0.110 | 2.79 |
| C | 0.150 | 3.81 |

MSMCxLCE Surface-Mount Devices

MSMCxLCE Low Capacitance 1.5 kW SMDs

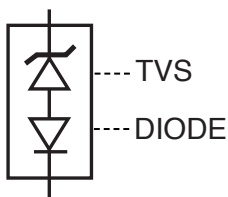
| Features | Appearance |
|--|---|
| <ul style="list-style-type: none"> Both RoHS and non-RoHS compliant versions available 1500W peak pulse power at 10/1000 μS Standoff voltages of 6.5 V to 170 V Operational and storage temperature of -55°C to $+150^{\circ}\text{C}$ Unidirectional versions only Available in Gull-Wing and modified J-lead lead forming designs Uses a rectifier diode in series and in the opposite direction of the protection diode to lower device capacitance Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B 100% surge current testing of all parts |  |

Part Nomenclature

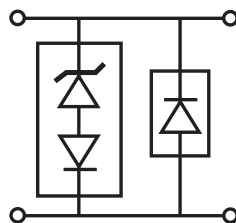


Sample Part Number

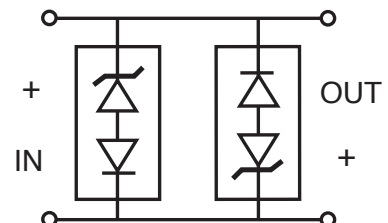
MXSMCJLCE6.5Ae3 - MX screened surface mount 1.5 kW device, J bend, 6.5 V stand-off, unidirectional low capacitance, 5% tolerance and RoHS compliant.



TVS with internal low-capacitance rectifier diode



Optional Unidirectional configuration (TVS and separate rectifier diode in parallel)

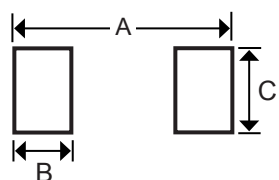


Optional Bidirectional configuration (two TVS devices in parallel)

MSMCxLCE 1.5 kW, All Electrical Characteristics @ 25°C

| Type Number | Reverse Stand-Off Voltage V_{WM} Volts | Minimum Breakdown Voltage V_{BR} Min @ I_{BR} Volts | Breakdown Current I_{BR} mA | Maximum Clamping Voltage @ I_{PP} V_c Volts | Peak Pulse Current I_{PP} Amps | Maximum Standby Current @ V_{WM} I_d mA | Max Cap @ 0 Volts $F=1$ MHz pF | Working Inverse Blocking Voltage V_{WIB} Volts | Inverse Blocking Leakage Current I_{IB} mA | Peak Inverse Blocking Voltage V_{PIB} Volts |
|--------------|--|---|-------------------------------|---|----------------------------------|---|--------------------------------|--|--|---|
| MSMCxLCE6.5A | 6.5 | 7.22 | 10 | 11.2 | 100 | 1000 | 100 | 75 | 10 | 100 |
| MSMCxLCE7.0A | 7.0 | 7.78 | 10 | 12.0 | 100 | 500 | 100 | 75 | 10 | 100 |
| MSMCxLCE7.5A | 7.5 | 8.33 | 10 | 12.9 | 100 | 250 | 100 | 75 | 10 | 100 |
| MSMCxLCE8.0A | 8.0 | 8.89 | 1 | 13.6 | 100 | 100 | 100 | 75 | 10 | 100 |
| MSMCxLCE8.5A | 8.5 | 9.44 | 1 | 14.4 | 100 | 50 | 100 | 75 | 10 | 100 |
| MSMCxLCE9.0A | 9.0 | 10.0 | 1 | 15.4 | 97 | 10 | 100 | 75 | 10 | 100 |
| MSMCxLCE10A | 10 | 11.1 | 1 | 17.0 | 88 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE11A | 11 | 12.2 | 1 | 18.2 | 82 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE12A | 12 | 13.3 | 1 | 19.9 | 75 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE13A | 13 | 14.4 | 1 | 21.5 | 70 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE14A | 14 | 15.6 | 1 | 23.2 | 65 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE15A | 15 | 16.7 | 1 | 24.4 | 61 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE16A | 16 | 17.8 | 1 | 26.0 | 57 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE17A | 17 | 18.9 | 1 | 27.6 | 49 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE18A | 18 | 20.0 | 1 | 29.2 | 51 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE20A | 20 | 22.2 | 1 | 32.4 | 46 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE22A | 22 | 24.4 | 1 | 35.5 | 42 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE24A | 24 | 26.7 | 1 | 38.9 | 39 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE26A | 26 | 28.9 | 1 | 42.1 | 36 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE28A | 28 | 31.1 | 1 | 45.5 | 33 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE30A | 30 | 33.3 | 1 | 48.4 | 31 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE33A | 33 | 36.7 | 1 | 53.3 | 28.1 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE36A | 36 | 40.0 | 1 | 58.1 | 25.8 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE40A | 40 | 44.4 | 1 | 64.5 | 23.3 | 5 | 100 | 75 | 10 | 100 |
| MSMCxLCE43A | 43 | 47.8 | 1 | 69.4 | 21.6 | 5 | 100 | 150 | 10 | 200 |
| MSMCxLCE45A | 45 | 50.0 | 1 | 72.7 | 20.6 | 5 | 100 | 150 | 10 | 200 |
| MSMCxLCE48A | 48 | 53.3 | 1 | 77.4 | 19.4 | 5 | 100 | 150 | 10 | 200 |
| MSMCxLCE51A | 51 | 56.7 | 1 | 82.4 | 18.2 | 5 | 100 | 150 | 10 | 200 |
| MSMCxLCE54A | 54 | 60.0 | 1 | 87.1 | 17.2 | 5 | 100 | 150 | 10 | 200 |
| MSMCxLCE58A | 58 | 64.4 | 1 | 93.6 | 16.0 | 5 | 100 | 150 | 10 | 200 |
| MSMCxLCE60A | 60 | 66.7 | 1 | 96.8 | 15.5 | 5 | 90 | 150 | 10 | 200 |
| MSMCxLCE64A | 64 | 71.1 | 1 | 103 | 14.6 | 5 | 90 | 150 | 10 | 200 |
| MSMCxLCE70A | 70 | 77.8 | 1 | 113 | 13.3 | 5 | 90 | 150 | 10 | 200 |
| MSMCxLCE75A | 75 | 83.3 | 1 | 121 | 12.4 | 5 | 90 | 150 | 10 | 200 |
| MSMCxLCE80A | 80 | 88.7 | 1 | 129 | 11.6 | 5 | 90 | 150 | 10 | 200 |
| MSMCxLCE90A | 90 | 100 | 1 | 146 | 10.3 | 5 | 90 | 300 | 10 | 200 |
| MSMCxLCE100A | 100 | 111 | 1 | 162 | 9.3 | 5 | 90 | 300 | 10 | 200 |
| MSMCxLCE110A | 110 | 122 | 1 | 178 | 8.4 | 5 | 90 | 300 | 10 | 400 |
| MSMCxLCE120A | 120 | 133 | 1 | 193 | 7.8 | 5 | 90 | 300 | 10 | 400 |
| MSMCxLCE130A | 130 | 144 | 1 | 209 | 7.2 | 5 | 90 | 300 | 10 | 400 |
| MSMCxLCE150A | 150 | 167 | 1 | 243 | 6.2 | 5 | 90 | 300 | 10 | 400 |
| MSMCxLCE160A | 160 | 178 | 1 | 259 | 5.8 | 5 | 90 | 300 | 10 | 400 |
| MSMCxLCE170A | 170 | 189 | 1 | 275 | 5.4 | 5 | 90 | 300 | 10 | 400 |

PAD Layout




| MSMCJ (DO-214AB) | | |
|------------------|--------|------|
| | Inches | mm |
| A | .390 | 9.90 |
| B | .110 | 2.79 |
| C | .150 | 3.81 |

| MSMCG (DO-215AB) | | |
|------------------|--------|-------|
| | Inches | mm |
| A | .510 | 12.95 |
| B | .110 | 2.79 |
| C | .150 | 3.81 |

MSMBJSAC Surface-Mount Devices

MSMBJSAC Low-Capacitance 600W SMDs

| Features | Appearance |
|--|---|
| <ul style="list-style-type: none"> 100% surge tested devices Operational and storage temperature of -55 °C to +150 °C" Low-capacitance performance of 30 pF Suppresses transients up to 600 W peak pulse power @ 10/1000 Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B RoHS-compliant devices available by adding an e3 suffix |  |

MSMBJSAC5.0 Thru MSMBJSAC75, e3, All Electrical Characteristics @ 25°C

| Part Number | Reverse Stand-Off Voltage (Note 1) V_{WM} Volts | Breakdown Voltage @ I_{BR} 1.0 mA V_{BR} Volts Min. | Maximum Standby Current @ V_{WM} I_D μ A | Maximum Clamping Voltage $I_P = 5.0A^* V_C$ Volts | Maximum Peak Pulse Current* Rating I_{PP} Amps | Maximum Capacitance @ 0 Volts, $F = 1$ MHZ P_F | Working Inverse Blocking Voltage V_{WIB} Volts | Inverse Blocking Leakage Current I_{IB} @ V_{WIB} mA | Peak Inverse Blocking Voltage V_{PIB} Volts |
|-------------|---|---|--|---|--|--|--|--|---|
| MSMBJSAC5.0 | 5.0 | 7.60 | 300 | 10.0 | 44 | 30 | 75 | 10 | 100 |
| MSMBJSAC6.0 | 6.0 | 7.90 | 300 | 11.2 | 41 | 30 | 75 | 10 | 100 |
| MSMBJSAC7.0 | 7.0 | 8.33 | 300 | 12.6 | 38 | 30 | 75 | 10 | 100 |
| MSMBJSAC8.0 | 8.0 | 8.89 | 100 | 13.4 | 36 | 30 | 75 | 10 | 100 |
| MSMBJSAC8.5 | 8.5 | 9.44 | 50 | 14.0 | 34 | 30 | 75 | 10 | 100 |
| MSMBJSAC10 | 10 | 11.10 | 5.0 | 16.3 | 29 | 30 | 75 | 10 | 100 |
| MSMBJSAC12 | 12 | 13.30 | 5.0 | 19.0 | 25 | 30 | 75 | 10 | 100 |
| MSMBJSAC15 | 15 | 16.70 | 5.0 | 23.6 | 20 | 30 | 75 | 10 | 100 |
| MSMBJSAC18 | 18 | 20.00 | 5.0 | 28.8 | 15 | 30 | 75 | 10 | 100 |
| MSMBJSAC22 | 22 | 24.40 | 5.0 | 35.4 | 14 | 30 | 75 | 10 | 100 |
| MSMBJSAC26 | 26 | 28.90 | 5.0 | 42.3 | 11.1 | 30 | 75 | 10 | 100 |
| MSMBJSAC36 | 36 | 40.0 | 5.0 | 60.0 | 8.6 | 30 | 75 | 10 | 100 |
| MSMBJSAC45 | 45 | 50.00 | 5.0 | 77.0 | 6.8 | 30 | 150 | 10 | 200 |
| MSMBJSAC50 | 50 | 55.50 | 5.0 | 88.0 | 5.8 | 30 | 150 | 10 | 200 |
| MSMBJSAC75 | 75 | 83.3 | 5.0 | 121 | 4.1 | 30 | 150 | 10 | 200 |

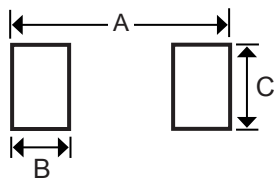
*See Figure 3. For the MSMBJSAC75, the maximum clamping voltage V_C is at the maximum rated Peak Pulse Current (I_{PP}) of 4.1 Amps.

Clamping Factor: The ratio of the numerical value of V_C to V_{BR} is typically 1.4 @ full rated power, 1.20 @ 50% rated power. Also see MicroNote 108.

Note 1: A transient voltage suppressor is normally selected according to voltage (V_{WM}), that should be equal to or greater than the dc or continuous peak operating voltage level.


Note 2: When pulse testing, test in TVS avalanche direction. Do not pulse in forward direction. See section for Schematic Applications herein.

PAD Layout

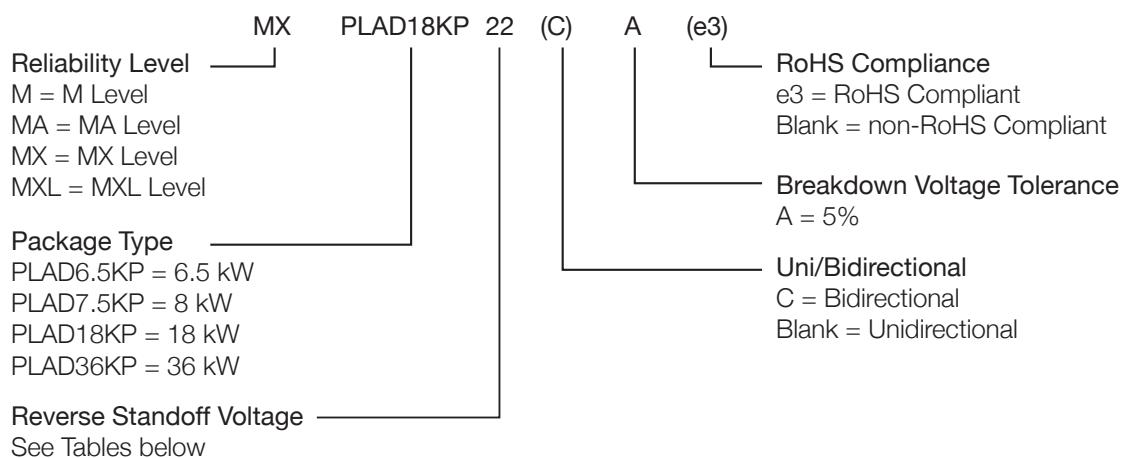


| MSMBJ (DO-214AA) | | |
|------------------|--------|------|
| | Inches | mm |
| A | .390 | 9.90 |
| B | .110 | 2.79 |
| C | .150 | 3.81 |

MPLAD Surface-Mount Devices

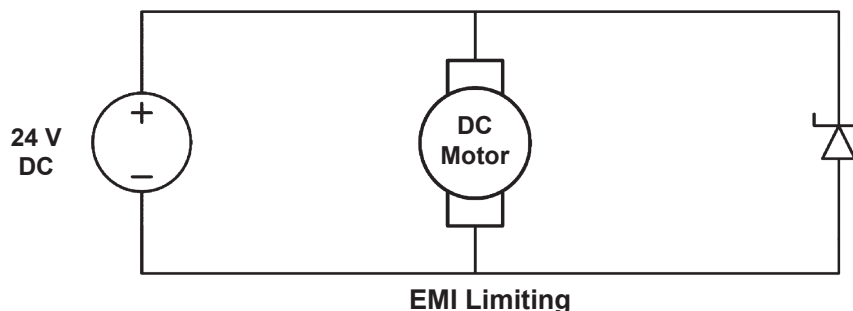
| Features | Appearance |
|--|---|
| <ul style="list-style-type: none"> Peak pulse power at 10/1000 μS <ul style="list-style-type: none"> PLAD6.5KP series – 6.5 kW PLAD7.5KP series – 7.5 kW PLAD18KP series – 15 kW PLAD36KP series – 30 kW Standoff voltage <ul style="list-style-type: none"> PLAD6.5KP – 10 V to 48 V PLAD7.5KP – 10 V to 48 V PLAD18KP – 7 V to 200 V PLAD36KP – 14 V to 400 V 100% surge tested devices Both RoHS and non-RoHS compliant versions available. Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B Unidirectional and bidirectional versions available Replaces high-power through-hole devices for surface-mount applications Operational and storage temperature of -55°C to $+150^{\circ}\text{C}$ |  <p style="text-align: center;">PLAD</p> |

Part Nomenclature



Sample Part Number

MXPLAD18KP9.0Ae3 – MX screened 18 kW device, 9 V reverse stand-off, unidirectional, 5% tolerance and RoHS compliant



MPLAD Surface-Mount Devices

MPLAD6.5KP 6.5 kW, All Electrical Characteristics @ 25°C

| Type Number | Reverse Stand-Off Voltage V_{WM} Volts | Minimum Breakdown Voltage V_{BR} Min @ I_{BR} Volts | Breakdown Current I_{BR} mA | Maximum Clamping Voltage @ I_{PP} V_C Volts | Peak Pulse Current I_{PP} Amps | Maximum Standby Current @ V_{WM} I_D mA |
|---------------|--|---|-------------------------------------|---|--|---|
| MPLAD6.5KP10A | 10 | 11.1–12.3 | 5 | 17.0 | 383 | 15 |
| MPLAD6.5KP11A | 11 | 12.2–13.5 | 5 | 18.2 | 358 | 10 |
| MPLAD6.5KP12A | 12 | 13.3–14.7 | 5 | 19.9 | 327 | 10 |
| MPLAD6.5KP13A | 13 | 14.4–15.9 | 5 | 21.5 | 302 | 10 |
| MPLAD6.5KP14A | 14 | 15.6–17.2 | 5 | 23.2 | 280 | 10 |
| MPLAD6.5KP15A | 15 | 16.7–18.5 | 5 | 24.4 | 267 | 10 |
| MPLAD6.5KP16A | 16 | 17.8–19.7 | 5 | 26.0 | 250 | 10 |
| MPLAD6.5KP17A | 17 | 18.9–20.9 | 5 | 27.6 | 236 | 10 |
| MPLAD6.5KP18A | 18 | 20.0–22.1 | 5 | 29.2 | 223 | 10 |
| MPLAD6.5KP20A | 20 | 22.2–24.5 | 5 | 32.4 | 202 | 10 |
| MPLAD6.5KP22A | 22 | 24.4–26.9 | 5 | 35.5 | 183 | 10 |
| MPLAD6.5KP24A | 24 | 26.7–29.5 | 5 | 38.9 | 167 | 10 |
| MPLAD6.5KP26A | 26 | 28.9–31.9 | 5 | 42.1 | 154 | 10 |
| MPLAD6.5KP28A | 28 | 31.1–34.4 | 5 | 45.5 | 143 | 10 |
| MPLAD6.5KP30A | 30 | 33.3–36.8 | 5 | 48.4 | 135 | 10 |
| MPLAD6.5KP33A | 33 | 36.7–40.6 | 5 | 53.3 | 123 | 10 |
| MPLAD6.5KP36A | 36 | 40.0–44.2 | 5 | 58.1 | 111 | 10 |
| MPLAD6.5KP40A | 40 | 44.4–49.1 | 5 | 64.5 | 101 | 10 |
| MPLAD6.5KP43A | 43 | 47.8–52.8 | 5 | 69.4 | 93 | 10 |
| MPLAD6.5KP45A | 45 | 50.0–55.3 | 5 | 72.7 | 89 | 10 |
| MPLAD6.5KP48A | 48 | 53.3–58.9 | 5 | 77.4 | 85 | 10 |

MPLAD7.5KP 7.5 kW, All Electrical Characteristics @ 25°C

| Type Number | Reverse Stand-Off Voltage V_{WM} Volts | Minimum Breakdown Voltage V_{BR} Min @ I_{BR} Volts | Breakdown Current I_{BR} mA | Maximum Clamping Voltage @ I_{PP} V_C Volts | Peak Pulse Current I_{PP} Amps | Maximum Standby Current @ V_{WM} I_D mA |
|---------------|--|---|-------------------------------------|---|--|---|
| MPLAD7.5KP10A | 10 | 11.1–12.3 | 5 | 17.0 | 383 | 15 |
| MPLAD7.5KP11A | 11 | 12.2–13.5 | 5 | 18.2 | 358 | 10 |
| MPLAD7.5KP12A | 12 | 13.3–14.7 | 5 | 19.9 | 327 | 10 |
| MPLAD7.5KP13A | 13 | 14.4–15.9 | 5 | 21.5 | 302 | 10 |
| MPLAD7.5KP14A | 14 | 15.6–17.2 | 5 | 23.2 | 280 | 10 |
| MPLAD7.5KP15A | 15 | 16.7–18.5 | 5 | 24.4 | 267 | 10 |
| MPLAD7.5KP16A | 16 | 17.8–19.7 | 5 | 26.0 | 250 | 10 |
| MPLAD7.5KP17A | 17 | 18.9–20.9 | 5 | 27.6 | 236 | 10 |
| MPLAD7.5KP18A | 18 | 20.0–22.1 | 5 | 29.2 | 223 | 10 |
| MPLAD7.5KP20A | 20 | 22.2–24.5 | 5 | 32.4 | 202 | 10 |
| MPLAD7.5KP22A | 22 | 24.4–26.9 | 5 | 35.5 | 183 | 10 |
| MPLAD7.5KP24A | 24 | 26.7–29.5 | 5 | 38.9 | 167 | 10 |
| MPLAD7.5KP26A | 26 | 28.9–31.9 | 5 | 42.1 | 154 | 10 |
| MPLAD7.5KP28A | 28 | 31.1–34.4 | 5 | 45.5 | 143 | 10 |
| MPLAD7.5KP30A | 30 | 33.3–36.8 | 5 | 48.4 | 135 | 10 |
| MPLAD7.5KP33A | 33 | 36.7–40.6 | 5 | 53.3 | 123 | 10 |
| MPLAD7.5KP36A | 36 | 40.0–44.2 | 5 | 58.1 | 111 | 10 |
| MPLAD7.5KP40A | 40 | 44.4–49.1 | 5 | 64.5 | 101 | 10 |
| MPLAD7.5KP43A | 43 | 47.8–52.8 | 5 | 69.4 | 93 | 10 |
| MPLAD7.5KP45A | 45 | 50.0–55.3 | 5 | 72.7 | 89 | 10 |
| MPLAD7.5KP48A | 48 | 53.3–58.9 | 5 | 77.4 | 85 | 10 |

MPLAD Surface-Mount Devices

MPLAD18KP 18 kW, All Electrical Characteristics @ 25°C

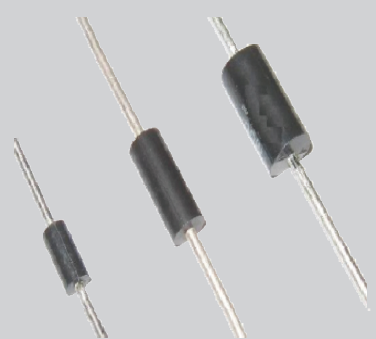
| Type Number | Reverse Stand-Off Voltage V_{WM} Volts | Minimum Breakdown Voltage V_{BR} Min. @ I_{BR} Volts | Breakdown Current I_{BR} mA | Maximum Clamping Voltage @ I_{PP} V_C Volts | Peak Pulse Current I_{PP} Amps | Maximum Standby Current @ V_{WM} I_D μA |
|---------------|--|--|-------------------------------------|---|--|--|
| MPLAD18KP7.0A | 7.0 | 7.78 | 150 | 12.0 | 1500 | 3000 |
| MPLAD18KP7.5A | 7.5 | 8.33 | 5 | 12.9 | 1396 | 750 |
| MPLAD18KP8.0A | 8.0 | 8.89 | 5 | 13.6 | 1324 | 450 |
| MPLAD18KP8.5A | 8.5 | 9.44 | 5 | 14.4 | 1250 | 150 |
| MPLAD18KP9.0A | 9.0 | 10.0 | 5 | 15.4 | 1169 | 60 |
| MPLAD18KP10A | 10 | 11.1 | 5 | 17.0 | 1059 | 45 |
| MPLAD18KP11A | 11 | 12.2 | 5 | 18.2 | 989 | 10 |
| MPLAD18KP12A | 12 | 13.3 | 5 | 19.9 | 905 | 10 |
| MPLAD18KP13A | 13 | 14.4 | 5 | 21.5 | 836 | 10 |
| MPLAD18KP14A | 14 | 15.6 | 5 | 23.2 | 776 | 10 |
| MPLAD18KP15A | 15 | 16.7 | 5 | 24.4 | 738 | 10 |
| MPLAD18KP16A | 16 | 17.8 | 5 | 26.0 | 693 | 10 |
| MPLAD18KP17A | 17 | 18.9 | 5 | 27.6 | 653 | 10 |
| MPLAD18KP18A | 18 | 20.0 | 5 | 29.2 | 617 | 10 |
| MPLAD18KP20A | 20 | 22.2 | 5 | 32.4 | 516 | 10 |
| MPLAD18KP22A | 22 | 24.4 | 5 | 35.5 | 508 | 10 |
| MPLAD18KP24A | 24 | 26.7 | 5 | 38.9 | 463 | 10 |
| MPLAD18KP26A | 26 | 28.9 | 5 | 42.1 | 428 | 10 |
| MPLAD18KP28A | 28 | 31.1 | 5 | 45.5 | 396 | 10 |
| MPLAD18KP30A | 30 | 33.3 | 5 | 48.4 | 372 | 10 |
| MPLAD18KP33A | 33 | 36.7 | 5 | 53.3 | 338 | 10 |
| MPLAD18KP36A | 36 | 40.0 | 5 | 58.1 | 310 | 10 |
| MPLAD18KP40A | 40 | 44.4 | 5 | 64.5 | 280 | 10 |
| MPLAD18KP43A | 43 | 47.8 | 5 | 69.4 | 260 | 10 |
| MPLAD18KP45A | 45 | 50.0 | 5 | 72.7 | 248 | 10 |
| MPLAD18KP48A | 48 | 53.3 | 5 | 77.4 | 233 | 10 |
| MPLAD18KP51A | 51 | 56.7 | 5 | 82.4 | 219 | 10 |
| MPLAD18KP54A | 54 | 60.0 | 5 | 87.1 | 207 | 10 |
| MPLAD18KP58A | 58 | 64.4 | 5 | 93.6 | 193 | 10 |
| MPLAD18KP60A | 60 | 66.7 | 5 | 96.8 | 186 | 10 |
| MPLAD18KP64A | 64 | 71.1 | 5 | 103 | 175 | 10 |
| MPLAD18KP70A | 70 | 77.8 | 5 | 113 | 160 | 10 |
| MPLAD18KP75A | 75 | 83.3 | 5 | 121 | 149 | 10 |
| MPLAD18KP78A | 78 | 86.7 | 5 | 126 | 143 | 10 |
| MPLAD18KP85A | 85 | 94.4 | 5 | 137 | 132 | 10 |
| MPLAD18KP90A | 90 | 100 | 5 | 146 | 124 | 10 |
| MPLAD18KP100A | 100 | 111 | 5 | 162 | 112 | 10 |
| MPLAD18KP110A | 110 | 122 | 5 | 177 | 102 | 10 |
| MPLAD18KP120A | 120 | 133 | 5 | 193 | 94 | 10 |
| MPLAD18KP130A | 130 | 144 | 5 | 209 | 87 | 10 |
| MPLAD18KP150A | 150 | 167 | 5 | 243 | 75 | 10 |
| MPLAD18KP160A | 160 | 178 | 5 | 259 | 70 | 10 |
| MPLAD18KP170A | 170 | 189 | 5 | 275 | 66 | 10 |
| MPLAD18KP180A | 180 | 200 | 5 | 291 | 62 | 10 |
| MPLAD18KP200A | 200 | 222 | 5 | 322 | 56 | 10 |

MPLAD36KP 36 kW, All Electrical Characteristics @ 25°C

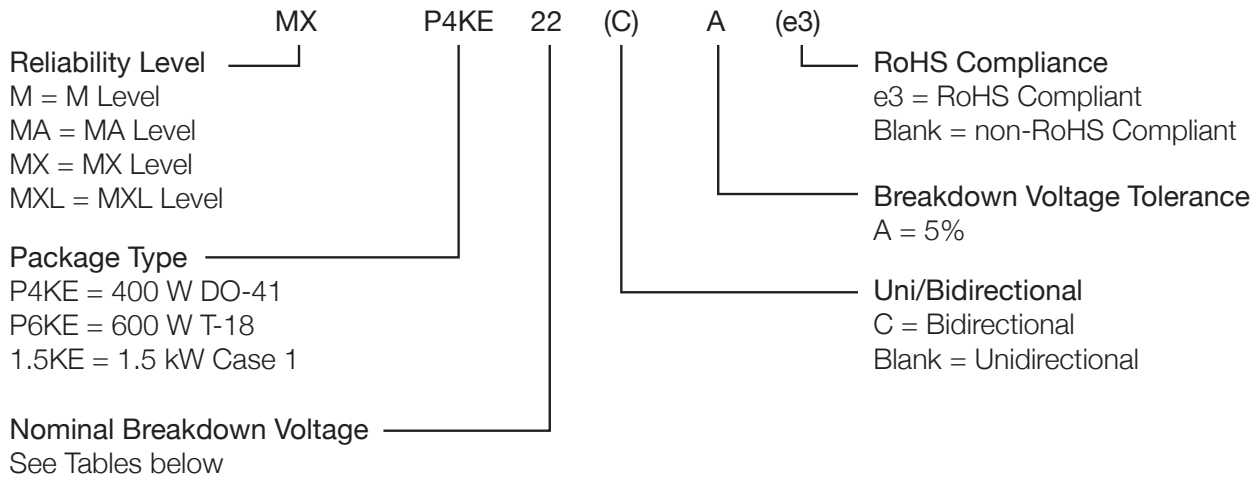
| Type Number | Reverse Stand-Off Voltage V _{WM} Volts | Minimum Breakdown Voltage V _{BR} Min. @ I _{BR} Volts | Breakdown Current I _{BR} mA | Maximum Clamping Voltage @ I _{PP} V _C Volts | Peak Pulse Current I _{PP} Amps | Maximum Standby Current @ V _{WM} I _D µA |
|--------------------------------|---|--|--|---|---|---|
| MPLAD36KP14A MPLAD36KP15A | 14 15 | 15.6 16.7 | 150 5 | 24.0 25.8 | 1500 1396 | 3000 750 |
| MPLAD36KP16A MPLAD36KP17A | 16 17 | 17.8 18.9 | 5 5 | 27.2 28.8 | 1324 1250 | 450 150 |
| MPLAD36KP18A MPLAD36KP20A | 18 20 | 20.0 22.2 | 5 5 | 30.8 34.0 | 1169 1059 | 60 45 |
| MPLAD36KP22A MPLAD36KP24A | 22 24 | 24.4 26.7 | 5 5 | 36.4 39.8 | 990 905 | 10 10 |
| MPLAD36KP26A MPLAD36KP28A | 26 28 | 28.9 31.1 | 5 5 | 43.0 46.4 | 838 776 | 10 10 |
| MPLAD36KP30A MPLAD36KP33A | 30 33 | 33.3 36.7 | 5 5 | 48.8 53.3 | 738 676 | 10 10 |
| MPLAD36KP36A MPLAD36KP40A | 36 40 | 40.0 44.4 | 5 5 | 58.1 64.5 | 620 559 | 10 10 |
| MPLAD36KP43A MPLAD36KP45A | 43 45 | 47.8 50.0 | 5 5 | 69.4 72.7 | 519 496 | 10 10 |
| MPLAD36KP48A MPLAD36KP51A | 48 51 | 53.3 56.7 | 5 5 | 77.4 82.4 | 466 437 | 10 10 |
| MPLAD36KP54A MPLAD36KP58A | 54 58 | 60.0 64.4 | 5 5 | 87.1 93.6 | 414 385 | 10 10 |
| MPLAD36KP60A MPLAD36KP64A | 60 64 | 66.7 71.1 | 5 5 | 96.8 103.0 | 372 350 | 10 10 |
| MPLAD36KP70A MPLAD36KP75A | 70 75 | 77.8 83.3 | 5 5 | 113 121 | 319 298 | 10 10 |
| MPLAD36KP78A MPLAD36KP85A | 78 85 | 86.7 94.4 | 5 5 | 126 137 | 286 263 | 10 10 |
| MPLAD36KP90A MPLAD36KP100A | 90 100 | 100 111 | 5 5 | 146 162 | 247 223 | 10 10 |
| MPLAD36KP110A MPLAD36KP120A | 110 120 | 122 133 | 5 5 | 177 193 | 204 187 | 10 10 |
| MPLAD36KP130A MPLAD36KP150A | 130 150 | 144 167 | 5 5 | 209 243 | 173 149 | 10 10 |
| MPLAD36KP160A MPLAD36KP170A | 160 170 | 178 189 | 5 5 | 259 275 | 139 131 | 10 10 |
| MPLAD36KP180A MPLAD36KP200A | 180 200 | 200 222 | 5 5 | 291 322 | 124 112 | 10 10 |
| MPLAD36KP220A MPLAD36KP260A | 220 260 | 245 289 | 5 5 | 356 419 | 102 86 | 10 10 |
| MPLAD36KP280A MPLAD36KP300A | 280 300 | 311 333 | 5 5 | 451 483 | 80 75 | 10 10 |
| MPLAD36KP350A MPLAD36KP400A | 350 400 | 389 444 | 5 5 | 564 644 | 64 56 | 10 10 |

MP4KE/MP6KE/M1.5KE Axial Devices

KE Axial Devices

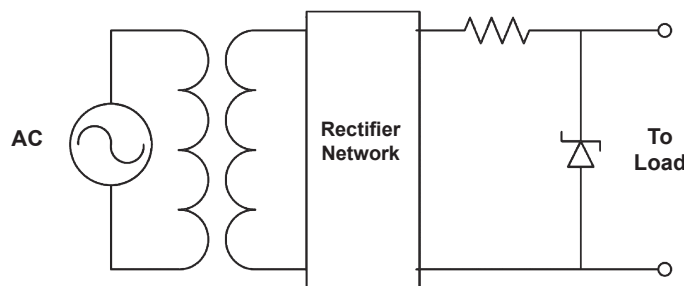
| Features | Appearance |
|---|--|
| <ul style="list-style-type: none"> Peak pulse power at 10/1000 μS <ul style="list-style-type: none"> P4KE series – 400 W P6KE series – 600 W 1.5KE series – 1.5 kW Standoff voltage <ul style="list-style-type: none"> P4KE series – 5.8 V to 342 V P6KE series – 5.8 V to 171 V 1.5KE series – 5.8 V to 324 V 100% surge-tested devices Both RoHS and non-RoHS compliant versions available. Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B Unidirectional and bidirectional versions available Replaces high-power through-hole devices for surface-mount applications Operational and storage temperature of -55°C to $+150^{\circ}\text{C}$ |  |

Part Nomenclature



Sample Part Number

MA1.5KE27Ae3 – MA screened 1.5 KE 15 kW device, 27 V breakdown, unidirectional, 5% tolerance and RoHS compliant.



DC Line Protection

MP4KE 400 W, All Electrical Characteristics @ 25°C

| Type Number | Reverse Stand-Off Voltage V _{WM} Volts | Minimum Breakdown Voltage V _{BR} Min. @ I _{BR} Volts | Breakdown Current I _{BR} mA | Maximum Clamping Voltage @ I _{PP} V _C Volts | Peak Pulse Current I _{PP} Amps | Maximum Standby Current @ V _{WM} I _D μA |
|-------------|---|--|--|---|---|---|
| MP4KE6.8A | 5.80 | 6.45 | 10 | 10.5 | 38 | 500 |
| MP4KE7.5A | 6.40 | 7.13 | 10 | 11.3 | 35 | 200 |
| MP4KE8.2A | 7.02 | 7.79 | 10 | 12.1 | 33 | 100 |
| MP4KE9.1A | 7.78 | 8.65 | 1 | 13.4 | 30 | 20 |
| MP4KE10A | 8.55 | 9.50 | 1 | 14.5 | 28 | 5 |
| MP4KE11A | 9.40 | 10.5 | 1 | 15.6 | 26 | 2 |
| MP4KE12A | 10.2 | 11.4 | 1 | 16.7 | 24 | 1 |
| MP4KE13A | 11.1 | 12.4 | 1 | 18.2 | 22 | 1 |
| MP4KE15A | 12.8 | 14.3 | 1 | 21.2 | 19 | 1 |
| MP4KE16A | 13.6 | 15.2 | 1 | 22.5 | 18 | 1 |
| MP4KE18A | 15.3 | 17.1 | 1 | 25.2 | 16 | 1 |
| MP4KE20A | 17.1 | 19.0 | 1 | 27.7 | 14.5 | 1 |
| MP4KE22A | 18.8 | 20.9 | 1 | 30.6 | 13 | 1 |
| MP4KE24A | 20.5 | 22.8 | 1 | 33.2 | 12 | 1 |
| MP4KE27A | 23.1 | 25.7 | 1 | 37.5 | 11 | 1 |
| MP4KE30A | 25.6 | 28.5 | 1 | 41.4 | 9.5 | 1 |
| MP4KE33A | 28.2 | 31.4 | 1 | 45.7 | 9.0 | 1 |
| MP4KE36A | 30.8 | 34.2 | 1 | 49.9 | 8.0 | 1 |
| MP4KE39A | 33.3 | 37.1 | 1 | 53.9 | 7.5 | 1 |
| MP4KE43A | 36.8 | 40.9 | 1 | 59.3 | 7.0 | 1 |
| MP4KE47A | 40.2 | 44.7 | 1 | 64.8 | 6.2 | 1 |
| MP4KE51A | 43.6 | 48.5 | 1 | 70.1 | 5.7 | 1 |
| MP4KE56A | 47.8 | 53.2 | 1 | 77.0 | 5.2 | 1 |
| MP4KE62A | 53.0 | 58.9 | 1 | 85.0 | 4.7 | 1 |
| MP4KE68A | 58.1 | 64.6 | 1 | 92.0 | 4.4 | 1 |
| MP4KE75A | 64.1 | 71.3 | 1 | 103.0 | 3.9 | 1 |
| MP4KE82A | 70.1 | 77.9 | 1 | 113.0 | 3.5 | 1 |
| MP4KE91A | 77.8 | 86.5 | 1 | 125.0 | 3.2 | 1 |
| MP4KE100A | 85.5 | 95.0 | 1 | 137.0 | 2.9 | 1 |
| MP4KE110A | 94.0 | 105.0 | 1 | 152.0 | 2.6 | 1 |
| MP4KE120A | 102.0 | 114.0 | 1 | 165.0 | 2.4 | 1 |
| MP4KE130A | 111.0 | 124.0 | 1 | 179.0 | 2.2 | 1 |
| MP4KE150A | 128.0 | 143.0 | 1 | 207.0 | 1.95 | 1 |
| MP4KE160A | 136.0 | 152.0 | 1 | 219.0 | 1.8 | 1 |
| MP4KE170A | 145.0 | 162.0 | 1 | 234.0 | 1.7 | 1 |
| MP4KE180A | 154.0 | 171.0 | 1 | 246.0 | 1.6 | 1 |
| MP4KE200A | 171.0 | 190.0 | 1 | 274.0 | 1.5 | 1 |
| MP4KE220A | 185.0 | 209.0 | 1 | 328.0 | 1.0 | 1 |
| MP4KE250A | 214.0 | 237.0 | 1 | 344.0 | 1.0 | 1 |
| MP4KE300A | 256.0 | 285.0 | 1 | 414.0 | 1.0 | 1 |
| MP4KE350A | 300.0 | 333.0 | 1 | 482.0 | 1.0 | 1 |
| MP4KE400A | 342.0 | 380.0 | 1 | 548.0 | 1.0 | 1 |

MP4KE/MP6KE/1.5KE Axial Devices

MP6KE 600 W, All Electrical Characteristics @ 25°C

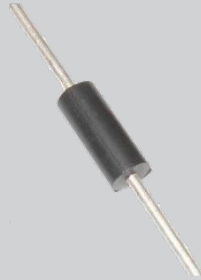
| Type Number | Reverse Stand-Off Voltage V_{WM} Volts | Minimum Breakdown Voltage V_{BR} Min. @ I_{BR} Volts | Breakdown Current I_{BR} mA | Maximum Clamping Voltage @ I_{PP} V_C Volts | Peak Pulse Current I_{PP} Amps | Maximum Standby Current @ V_{WM} I_D μA |
|------------------------|--|--|-------------------------------------|---|--|--|
| MP6KE6.8A MP6KE7.5A | 5.8 6.4 | 6.45 7.13 | 10 10 | 10.5 11.3 | 57 53 | 1000 500 |
| MP6KE8.2A MP6KE9.1A | 7.02 7.78 | 7.79 8.65 | 10 1 | 12.1 13.4 | 50 45 | 200 50 |
| MP6KE10A MP6KE11A | 8.55 9.4 | 9.5 10.5 | 1 1 | 14.5 15.6 | 41 38 | 10 5 |
| MP6KE12A MP6KE13A | 10.2 11.1 | 11.4 12.4 | 1 1 | 16.7 18.2 | 36 33 | 5 5 |
| MP6KE15A MP6KE16A | 12.8 13.6 | 14.3 15.2 | 1 1 | 21.2 22.5 | 28 27 | 1 1 |
| MP6KE18A MP6KE20A | 15.3 17.1 | 17.1 19 | 1 1 | 25.2 27.7 | 24 22 | 1 1 |
| MP6KE22A MP6KE24A | 18.8 20.5 | 20.9 22.8 | 1 1 | 30.6 33.2 | 20 18 | 1 1 |
| MP6KE27A MP6KE30A | 23.1 25.6 | 25.7 28.5 | 1 1 | 37.5 41.4 | 16 14.4 | 1 1 |
| MP6KE33A MP6KE36A | 28.2 30.8 | 31.4 34.2 | 1 1 | 45.7 49.9 | 13.2 12 | 1 1 |
| MP6KE39A MP6KE43A | 33.3 36.8 | 37.1 40.9 | 1 1 | 53.9 59.3 | 11.2 10.1 | 1 1 |
| MP6KE47A MP6KE51A | 40.2 43.6 | 44.7 48.5 | 1 1 | 64.8 70.1 | 9.3 8.6 | 1 1 |
| MP6KE56A MP6KE62A | 47.8 53 | 53.2 58.9 | 1 1 | 77 85 | 7.8 7.1 | 1 1 |
| MP6KE68A MP6KE75A | 58.1 64.1 | 64.6 71.3 | 1 1 | 92 103 | 6.5 5.8 | 1 1 |
| MP6KE82A MP6KE91A | 70.1 77.8 | 77.9 86.5 | 1 1 | 113 125 | 5.3 4.8 | 1 1 |
| MP6KE100A MP6KE110A | 85.5 94 | 95 105 | 1 1 | 137 152 | 4.4 3.4 | 1 1 |
| MP6KE120A MP6KE130A | 102 111 | 114 124 | 1 1 | 165 179 | 3.6 3.3 | 1 1 |
| MP6KE150A MP6KE160A | 128 136 | 143 152 | 1 1 | 207 219 | 2.9 2.7 | 1 1 |
| MP6KE170A MP6KE180A | 145 154 | 161 171 | 1 1 | 234 246 | 2.6 2.4 | 1 1 |
| MP6KE200A | 171 | 190 | 1 | 274 | 2.2 | 1 |

M1.5KE 1.5kW, All Electrical Characteristics @ 25°C

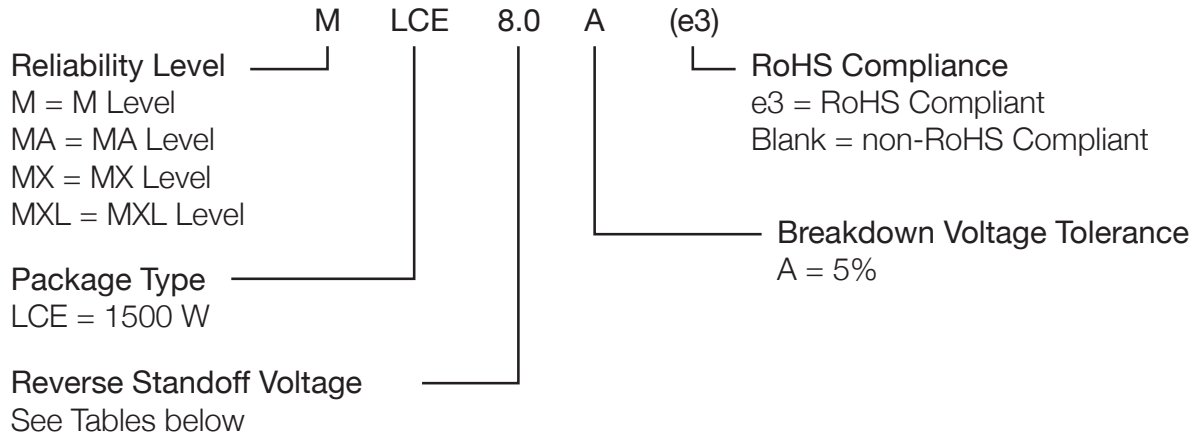
| Type Number | Reverse Stand-Off Voltage V_{WM} Volts | Minimum Breakdown Voltage V_{BR} Min @ I_{BR} Volts | Breakdown Current I_{BR} mA | Maximum Clamping Voltage @ I_{PP} V_C Volts | Peak Pulse Current I_{PP} Amps | Maximum Standby Current @ V_{WM} I_D μA |
|--------------------------|--|---|-------------------------------------|---|--|--|
| M1.5KE6.8A M1.5KE7.5A | 5.80 6.40 | 6.45 7.13 | 10 10 | 10.5 11.3 | 143.0 132.0 | 1000 500 |
| M1.5KE8.2A M1.5KE9.1A | 7.02 7.78 | 7.79 8.65 | 10 1 | 12.1 13.4 | 124.0 112.0 | 200 50 |
| M1.5KE10A M1.5KE11A | 8.55 9.40 | 9.50 10.50 | 1 1 | 14.5 15.6 | 103.0 96.0 | 10 5 |
| M1.5KE12A M1.5KE13A | 10.220 11.10 | 11.40 12.40 | 1 1 | 16.7 18.2 | 90.0 82.0 | 5 5 |
| M1.5KE15A M1.5KE16A | 12.80 13.60 | 14.30 15.20 | 1 1 | 21.2 22.5 | 71.0 67.0 | 1 1 |
| M1.5KE18A M1.5KE20A | 15.30 17.10 | 17.10 19.00 | 1 1 | 25.2 27.7 | 59.5 54.0 | 1 1 |
| M1.5KE22A M1.5KE24A | 18.80 20.50 | 20.90 22.80 | 1 1 | 30.6 33.2 | 49.0 45.0 | 1 1 |
| M1.5KE27A M1.5KE30A | 23.10 25.60 | 25.70 28.50 | 1 1 | 37.5 41.4 | 40.0 36.0 | 1 1 |
| M1.5KE33A M1.5KE36A | 28.20 30.80 | 31.40 34.20 | 1 1 | 45.7 49.9 | 33.0 30.0 | 1 1 |
| M1.5KE39A M1.5KE43A | 33.30 36.80 | 37.10 40.90 | 1 1 | 53.9 59.3 | 28.0 25.3 | 1 |
| M1.5KE47A M1.5KE51A | 40.20 43.60 | 44.70 48.50 | 1 1 | 64.8 70.1 | 23.2 21.4 | 1 1 |
| M1.5KE56A M1.5KE62A | 47.80 53.00 | 53.20 58.90 | 1 1 | 77.0 85.0 | 19.5 17.7 | 1 1 |
| M1.5KE68A M1.5KE75A | 58.10 64.10 | 64.60 71.30 | 1 1 | 92.0 103.0 | 16.3 14.6 | 1 1 |
| M1.5KE82A M1.5KE91A | 70.10 77.80 | 77.90 86.50 | 1 1 | 113.0 125.0 | 13.3 12.0 | 1 1 |
| M1.5KE100A M1.5KE110A | 85.50 94.00 | 95.00 105.00 | 1 1 | 137.0 152.0 | 11.0 9.9 | 1 1 |
| M1.5KE120A M1.5KE130A | 102.00 111.00 | 114.00 124.00 | 1 1 | 165.0 179.0 | 9.1 8.4 | 1 1 |
| M1.5KE150A M1.5KE160A | 128.00 136.00 | 143.00 152.00 | 1 1 | 207.0 219.0 | 7.2 6.8 | 1 1 |
| M1.5KE170A M1.5KE180A | 145.00 154.00 | 162.00 171.00 | 1 1 | 234.0 246.0 | 6.4 6.1 | 1 1 |
| M1.5KE200A M1.5KE220A | 171.00 185.00 | 190.00 209.00 | 1 1 | 274.0 328.0 | 5.5 4.6 | 1 1 |
| M1.5KE250A M1.5KE300A | 214.00 256.00 | 237.00 285.00 | 1 1 | 344.0 414.0 | 5.0 5.0 | 1 1 |
| M1.5KE350A M1.5KE400A | 300.00 324.00 | 332.00 380.00 | 1 1 | 482.0 548.0 | 4.0 4.0 | 1 1 |

MLCE Low-Capacitance Axial Devices

MLCE Axial Devices

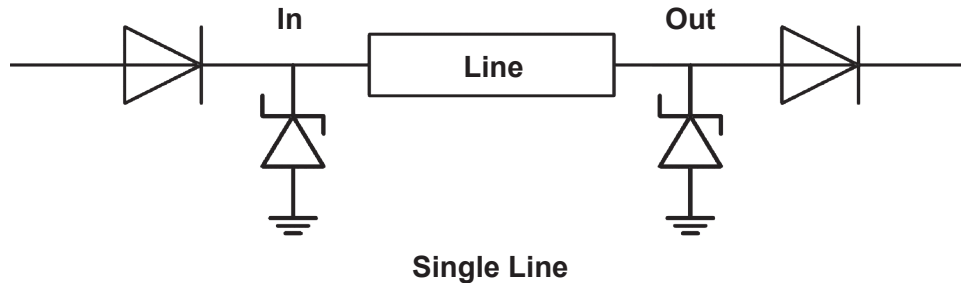
| Features | Appearance |
|--|---|
| <ul style="list-style-type: none"> • 1.5 kW peak pulse power at 10/1000 μS • Standoff voltage of 6.5 V to 170 V • Operational and storage temperature of -55°C to $+150^{\circ}\text{C}$ • Low-capacitance performance ≤ 100 pF • 100% surge-tested devices • Both RoHS and non-RoHS compliant versions available. • Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B |  |

Part Nomenclature



Sample Part Number


MALCE48A – MA screened axial Low Capacitance 1.5 kW device, 48 V stand-off, unidirectional with 5% tolerance



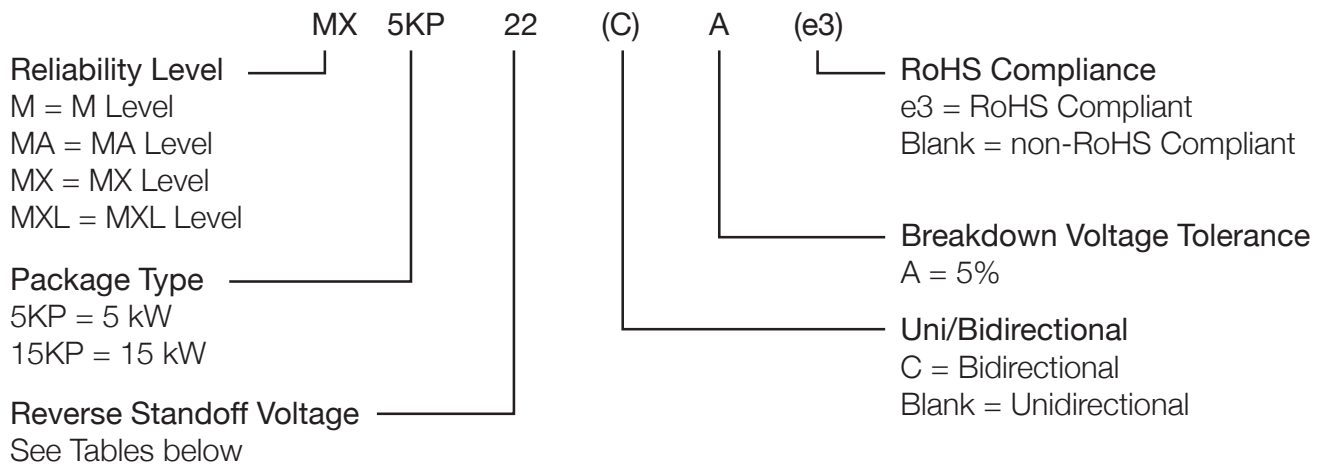
MLCE 1.5 kW, All Electrical Characteristics @ 25°C

| Type Number | Reverse Stand-Off Voltage V_{WM} Volts | Minimum Breakdown Voltage V_{BR} Min @ I_{BR} Volts | Breakdown Current I_{BR} mA | Maximum Clamping Voltage @ I_{PP} V_C Volts | Peak Pulse Current I_{PP} Amps | Maximum Standby Current I_D @ V_{WM} μA | Max Cap @ 0 Volts $F=1$ MHz pF | Working Inverse Blocking Voltage V_{WIB} @ V_{WIB} Volts | Inverse Blocking Leakage Current I_{IB} @ V_{WIB} μA | Peak Inverse Blocking Voltage V_{PIB} Volts |
|-------------|--|---|-------------------------------|---|----------------------------------|--|--------------------------------|--|---|---|
| MLCE6.5A | 6.5 | 7.22 | 10 | 11.2 | 100 | 1000 | 100 | 75 | 10 | 100 |
| MLCE7.0A | 7.0 | 7.78 | 10 | 12.0 | 100 | 500 | 100 | 75 | 10 | 100 |
| MLCE7.5A | 7.5 | 8.33 | 10 | 12.9 | 100 | 250 | 100 | 75 | 10 | 100 |
| MLCE8.0A | 8.0 | 8.89 | 1 | 13.6 | 100 | 100 | 100 | 75 | 10 | 100 |
| MLCE8.5A | 8.5 | 9.44 | 1 | 14.4 | 100 | 50 | 100 | 75 | 10 | 100 |
| MLCE9.0A | 9.0 | 10.0 | 1 | 15.4 | 97 | 10 | 100 | 75 | 10 | 100 |
| MLCE10A | 10 | 11.1 | 1 | 17.0 | 88 | 5 | 100 | 75 | 10 | 100 |
| MLCE11A | 11 | 12.2 | 1 | 18.2 | 82 | 5 | 100 | 75 | 10 | 100 |
| MLCE12A | 12 | 13.3 | 1 | 19.9 | 75 | 5 | 100 | 75 | 10 | 100 |
| MLCE13A | 13 | 14.4 | 1 | 21.5 | 70 | 5 | 100 | 75 | 10 | 100 |
| MLCE14A | 14 | 15.6 | 1 | 23.2 | 65 | 5 | 100 | 75 | 10 | 100 |
| MLCE15A | 15 | 16.7 | 1 | 24.4 | 61 | 5 | 100 | 75 | 10 | 100 |
| MLCE16A | 16 | 17.8 | 1 | 26.0 | 57 | 5 | 100 | 75 | 10 | 100 |
| MLCE17A | 17 | 18.9 | 1 | 27.6 | 54 | 5 | 100 | 75 | 10 | 100 |
| MLCE18A | 18 | 20.0 | 1 | 29.2 | 51 | 5 | 100 | 75 | 10 | 100 |
| MLCE20A | 20 | 22.2 | 1 | 32.4 | 46 | 5 | 100 | 75 | 10 | 100 |
| MLCE22A | 22 | 24.4 | 1 | 35.5 | 42 | 5 | 100 | 75 | 10 | 100 |
| MLCE24A | 24 | 26.7 | 1 | 38.9 | 39 | 5 | 100 | 75 | 10 | 100 |
| MLCE26A | 26 | 28.9 | 1 | 42.1 | 36 | 5 | 100 | 75 | 10 | 100 |
| MLCE28A | 28 | 31.1 | 1 | 45.4 | 33 | 5 | 100 | 75 | 10 | 100 |
| MLCE30A | 30 | 33.3 | 1 | 48.4 | 31 | 5 | 100 | 75 | 10 | 100 |
| MLCE33A | 33 | 36.7 | 1 | 53.3 | 28.1 | 5 | 100 | 75 | 10 | 100 |
| MLCE36A | 36 | 40.0 | 1 | 58.1 | 25.8 | 5 | 100 | 75 | 10 | 100 |
| MLCE40A | 40 | 44.4 | 1 | 64.5 | 23.3 | 5 | 100 | 75 | 10 | 100 |
| MLCE43A | 43 | 47.8 | 1 | 69.4 | 21.6 | 5 | 100 | 150 | 10 | 200 |
| MLCE45A | 45 | 50.0 | 1 | 72.7 | 20.6 | 5 | 100 | 150 | 10 | 200 |
| MLCE48A | 48 | 53.3 | 1 | 77.4 | 19.4 | 5 | 100 | 150 | 10 | 200 |
| MLCE51A | 51 | 56.7 | 1 | 82.4 | 18.2 | 5 | 100 | 150 | 10 | 200 |
| MLCE54A | 54 | 60.0 | 1 | 87.1 | 17.2 | 5 | 100 | 150 | 10 | 200 |
| MLCE58A | 58 | 64.4 | 1 | 93.6 | 16.0 | 5 | 100 | 150 | 10 | 200 |
| MLCE60A | 60 | 66.7 | 1 | 96.8 | 15.5 | 5 | 90 | 150 | 10 | 200 |
| MLCE64A | 64 | 71.1 | 1 | 103 | 14.6 | 5 | 90 | 150 | 10 | 200 |
| MLCE70A | 70 | 77.8 | 1 | 113 | 13.3 | 5 | 90 | 150 | 10 | 200 |
| MLCE75A | 75 | 83.3 | 1 | 121 | 12.4 | 5 | 90 | 150 | 10 | 200 |
| MLCE80A | 80 | 88.7 | 1 | 129 | 11.6 | 5 | 90 | 150 | 10 | 200 |
| MLCE90A | 90 | 100 | 1 | 146 | 10.3 | 5 | 90 | 300 | 10 | 200 |
| MLCE100A | 100 | 111 | 1 | 162 | 9.3 | 5 | 90 | 300 | 10 | 200 |
| MLCE110A | 110 | 122 | 1 | 178 | 8.4 | 5 | 90 | 300 | 10 | 400 |
| MLCE120A | 120 | 133 | 1 | 193 | 7.8 | 5 | 90 | 300 | 10 | 400 |
| MLCE130A | 130 | 144 | 1 | 209 | 7.2 | 5 | 90 | 300 | 10 | 400 |
| MLCE150A | 150 | 167 | 1 | 243 | 6.2 | 5 | 90 | 300 | 10 | 400 |
| MLCE160A | 160 | 178 | 1 | 259 | 5.8 | 5 | 90 | 300 | 10 | 400 |
| MLCE170A | 170 | 189 | 1 | 275 | 5.4 | 5 | 90 | 300 | 10 | 400 |

M5KP/M15KP Axial Devices

| Features | Appearance |
|--|---|
| <ul style="list-style-type: none"> Peak pulse power at 10/1000 μS <ul style="list-style-type: none"> 5 KP series – 5 kW 15 KP series – 15 kW Standoff voltage <ul style="list-style-type: none"> 5 KP series – 5 V to 110 V 15 KP series – 22 V to 280 V Operational and storage temperature of -55°C to $+150^{\circ}\text{C}$ Unidirectional and bidirectional versions available Both RoHS and non-RoHS compliant versions available. Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B 100% surge-tested devices |  |

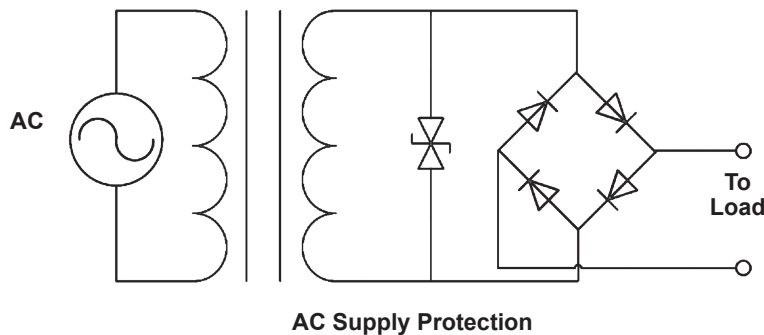
Part Nomenclature



Sample Part Number

MA5KP36Ae3 – MA screened axial 5 kW device, 36 V reverse stand-off, unidirectional, 5% tolerance and RoHS compliant

MXL15KPA40CA – MXL screened axial 15 kW device, 40 V breakdown, bidirectional, 5% tolerance and non-RoHS compliant



M5KP 5kW, All Electrical Characteristics @ 25°C

| Type Number | Reverse Stand-Off Voltage V_{WM} Volts | Minimum Breakdown Voltage V_{BR} Min @ I_{BR} Volts | Breakdown Current I_{BR} mA | Maximum Clamping Voltage @ I_{PP} V_c Volts | Peak Pulse Current I_{PP} Amps | Maximum Standby Current @ V_{WM} I_d μA |
|----------------------|--|---|-------------------------------------|---|--|--|
| M5KP5.0A M5KP6.0A | 5.0 6.0 | 6.40 6.67 | 50 50 | 9.2 10.3 | 543 485 | 2000* 5000 |
| M5KP6.5A M5KP7.0A | 6.5 7.0 | 7.22 7.78 | 50 50 | 11.2 12.0 | 447 417 | 2000 1000 |
| M5KP7.5A M5KP8.0A | 7.5 8.0 | 8.33 8.89 | 5 5 | 12.9 13.6 | 388 367 | 250 150 |
| M5KP8.5A M5KP9.0A | 8.5 9.0 | 9.44 10.0 | 5 5 | 14.4 15.4 | 347 325 | 50 20 |
| M5KP10A M5KP11A | 10 11 | 11.1 12.2 | 5 5 | 17.0 18.2 | 294 274 | 15 10 |
| M5KP12A M5KP13A | 12 13 | 13.3 14.4 | 5 5 | 19.9 21.5 | 251 232 | 10 10 |
| M5KP14A M5KP15A | 14 15 | 15.6 16.7 | 5 5 | 23.2 24.4 | 215 206 | 10 10 |
| M5KP16A M5KP17A | 16 17 | 17.8 18.9 | 5 5 | 26.0 27.6 | 192 181 | 10 10 |
| M5KP18A M5KP20A | 18 20 | 20.0 22.2 | 5 5 | 29.2 32.4 | 172 154 | 10 10 |
| M5KP22A M5KP24A | 22 24 | 24.4 26.7 | 5 5 | 35.5 38.9 | 141 128 | 10 10 |
| M5KP26A M5KP28A | 26 28 | 28.9 31.1 | 5 5 | 42.1 45.5 | 119 110 | 10 10 |
| M5KP30A M5KP33A | 30 33 | 33.3 36.7 | 5 5 | 48.4 53.3 | 103 94 | 10 10 |
| M5KP36A M5KP40A | 36 40 | 40.0 44.4 | 5 5 | 58.1 64.5 | 86 78 | 10 10 |
| M5KP43A M5KP45A | 43 45 | 47.8 50.0 | 5 5 | 69.4 72.7 | 72 69 | 10 10 |
| M5KP48A M5KP51A | 48 51 | 53.3 56.7 | 5 5 | 77.4 82.4 | 65 61 | 10 10 |
| M5KP54A M5KP58A | 54 58 | 60.0 64.4 | 5 5 | 87.1 93.6 | 57 53 | 10 10 |
| M5KP60A M5KP64A | 60 64 | 66.7 71.1 | 5 5 | 96.8 103.0 | 52 49 | 10 10 |
| M5KP70A M5KP75A | 70 75 | 77.8 83.3 | 5 5 | 113 121 | 44 41 | 10 10 |
| M5KP78A M5KP85A | 78 85 | 86.7 94.4 | 5 5 | 126 137 | 40 36 | 10 10 |
| M5KP90A M5KP100A | 90 100 | 100 111 | 5 5 | 146 162 | 34 31 | 10 10 |
| M5KP110A | 110 | 122 | 5 | 177 | 28 | 10 |

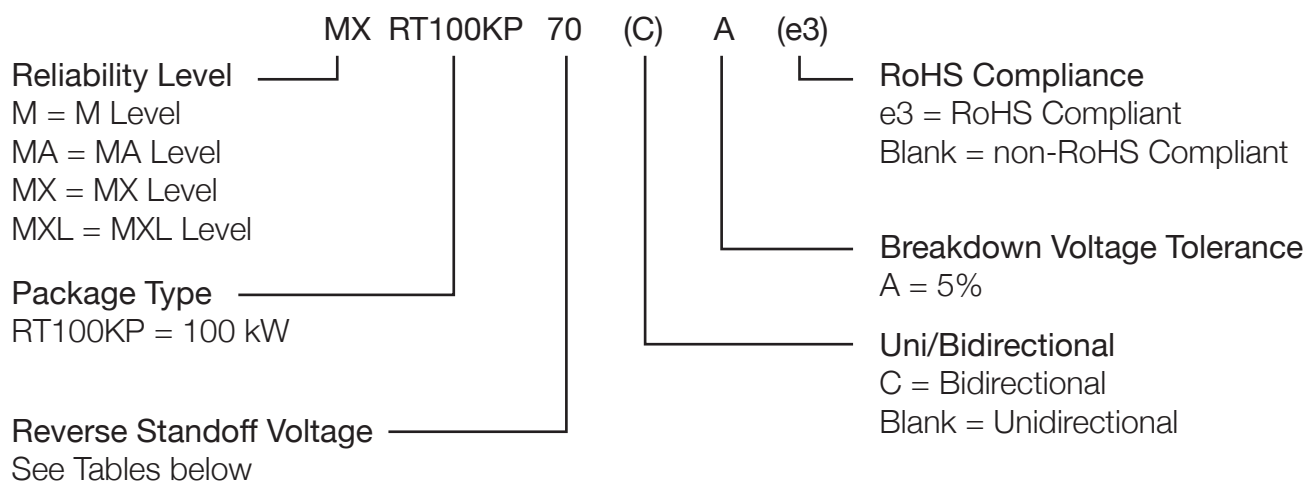
M5KP/M15KP Axial Devices

M15KP 15 kW, All Electrical Characteristics @ 25°C

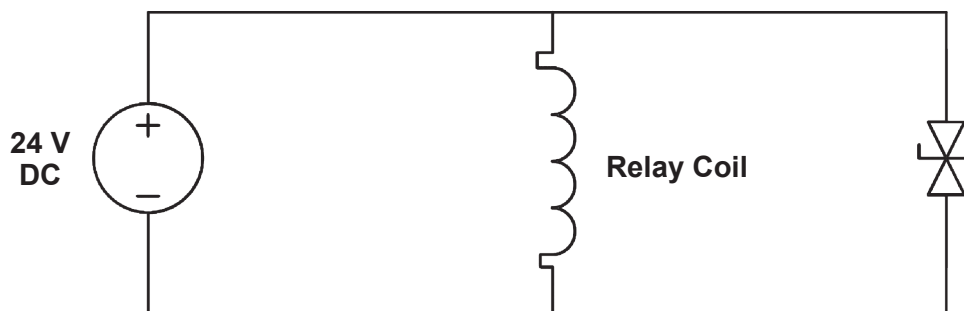
| Type Number | Reverse Stand-Off Voltage V_{WM} Volts | Minimum Breakdown Voltage V_{BR} Min @ I_{BR} Volts | Breakdown Current I_{BR} mA | Maximum Clamping Voltage @ I_{PP} V_C Volts | Peak Pulse Current I_{PP} Amps | Maximum Standby Current @ V_{WM} I_D μA |
|-------------|--|---|-------------------------------------|---|--|--|
| M15KP22A | 22 | 24.4 | 10 | 37.1 | 404 | 500 |
| M15KP24A | 24 | 26.7 | 5 | 40.7 | 369 | 150 |
| M15KP26A | 26 | 28.9 | 5 | 44.0 | 341 | 50 |
| M15KP28A | 28 | 31.1 | 5 | 47.5 | 316 | 25 |
| M15KP30A | 30 | 33.3 | 5 | 50.7 | 296 | 15 |
| M15KP33A | 33 | 36.7 | 5 | 54.8 | 274 | 10 |
| M15KP36A | 36 | 40.0 | 5 | 59.7 | 251 | 10 |
| M15KP40A | 40 | 44.4 | 5 | 65.8 | 228 | 10 |
| M15KP43A | 43 | 47.8 | 5 | 69.7 | 215 | 10 |
| M15KP45A | 45 | 50.0 | 5 | 73.0 | 205 | 10 |
| M15KP48A | 48 | 53.3 | 5 | 77.7 | 193 | 10 |
| M15KP51A | 51 | 56.7 | 5 | 82.8 | 181 | 10 |
| M15KP54A | 54 | 60.0 | 5 | 87.5 | 171 | 10 |
| M15KP58A | 58 | 64.4 | 5 | 94.0 | 160 | 10 |
| M15KP60A | 60 | 66.7 | 5 | 97.3 | 154 | 10 |
| M15KP64A | 64 | 71.7 | 5 | 104 | 144 | 10 |
| M15KP70A | 70 | 77.8 | 5 | 114 | 132 | 10 |
| M15KP75A | 75 | 83.3 | 5 | 122 | 123 | 10 |
| M15KP78A | 78 | 86.7 | 5 | 126 | 119 | 10 |
| M15KP85A | 85 | 94.4 | 5 | 137 | 109 | 10 |
| M15KP90A | 90 | 100 | 5 | 146 | 103 | 10 |
| M15KP100A | 100 | 111 | 5 | 162 | 93 | 10 |
| M15KP110A | 110 | 122 | 5 | 178 | 84 | 10 |
| M15KP120A | 120 | 133 | 5 | 193 | 78 | 10 |
| M15KP130A | 130 | 144 | 5 | 209 | 72 | 10 |
| M15KP150A | 150 | 167 | 5 | 243 | 62 | 10 |
| M15KP160A | 160 | 178 | 5 | 259 | 58 | 10 |
| M15KP170A | 170 | 189 | 5 | 275 | 55 | 10 |
| M15KP180A | 180 | 200 | 5 | 291 | 52 | 10 |
| M15KP200A | 200 | 222 | 5 | 322 | 47 | 10 |
| M15KP220A | 220 | 245 | 5 | 356 | 42 | 10 |
| M15KP240A | 240 | 267 | 5 | 388 | 39 | 10 |
| M15KP260A | 260 | 289 | 5 | 419 | 36 | 10 |
| M15KP280A | 280 | 311 | 5 | 452 | 33 | 10 |

MRT100KP Axial Devices

| Features | Appearance |
|---|---|
| <ul style="list-style-type: none"> • 100 kW peak pulse power at 6.4/69 μS • Standoff voltage of 40V to 400V • Operational and storage temperature of -55°C to $+150^{\circ}\text{C}$ • Unidirectional and bidirectional versions available • 100% surge-tested devices • Both RoHS and non-RoHS compliant versions available. • Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B |  |

Part Nomenclature

Sample Part Number

MXRT100KP70CAe3 – MX screened axial 100 kW device, 70 V stand-off, bidirectional, 5% tolerance and RoHS compliant.


Relay Transient Protection

MRT100KP Axial Devices

MRT100KP 100 kW @ 6.4/69 μ S, All Electrical Characteristics @ 25°C

| Type Number | Reverse Stand-Off Voltage V_{WM} Volts | Minimum Breakdown Voltage V_{BR} Min. @ I_{BR} Volts | Breakdown Current I_{BR} mA | Maximum Clamping Voltage @ I_{PP} V_C Volts | Peak Pulse Current I_{PP} Amps | Maximum Standby Current @ V_{WM} I_D μ A |
|--------------|--|--|-------------------------------------|---|--|--|
| MRT100KP40A | 40 | 44.4 | 20 | 78.6 | 1273* | 1500 |
| MRT100KP43A | 43 | 47.8 | 10 | 84.5 | 1184 * | 500 |
| MRT100KP45A | 45 | 50.0 | 5 | 88.5 | 1130 * | 150 |
| MRT100KP48A | 48 | 53.3 | 5 | 94.3 | 1061 * | 150 |
| MRT100KP51A | 51 | 56.7 | 5 | 101 | 990 * | 50 |
| MRT100KP54A | 54 | 60.0 | 5 | 106 | 943 * | 25 |
| MRT100KP58A | 58 | 64.4 | 5 | 114 | 878 | 15 |
| MRT100KP60A | 60 | 66.7 | 5 | 118 | 848 | 15 |
| MRT100KP64A | 64 | 71.1 | 5 | 126 | 795 | 10 |
| MRT100KP70A | 70 | 77.8 | 5 | 138 | 725 | 10 |
| MRT100KP75A | 75 | 83.3 | 5 | 147 | 680 | 10 |
| MRT100KP78A | 78 | 86.7 | 5 | 153 | 655 | 10 |
| MRT100KP85A | 85 | 94.4 | 5 | 166 | 602 | 10 |
| MRT100KP90A | 90 | 100 | 5 | 178 | 563 | 10 |
| MRT100KP100A | 100 | 111 | 5 | 197 | 508 | 10 |
| MRT100KP110A | 110 | 122 | 5 | 216 | 463 | 10 |
| MRT100KP120A | 120 | 133 | 5 | 235 | 426 | 10 |
| MRT100KP130A | 130 | 144 | 5 | 254 | 394 | 10 |
| MRT100KP150A | 150 | 167 | 5 | 296 | 338 | 10 |
| MRT100KP160A | 160 | 178 | 5 | 315 | 318 | 10 |
| MRT100KP170A | 170 | 189 | 5 | 334 | 300 | 10 |
| MRT100KP180A | 180 | 200 | 5 | 354 | 283 | 10 |
| MRT100KP200A | 200 | 222 | 5 | 392 | 256 | 10 |
| MRT100KP220A | 220 | 245 | 5 | 434 | 231 | 10 |
| MRT100KP250A | 250 | 278 | 5 | 493 | 203 | 10 |
| MRT100KP260A | 260 | 289 | 5 | 512 | 196 | 10 |
| MRT100KP280A | 280 | 311 | 5 | 552 | 181 | 10 |
| MRT100KP300A | 300 | 333 | 5 | 590 | 170 | 10 |
| MRT100KP350A | 350 | 389 | 5 | 690 | 145 | 10 |
| MRT100KP400A | 400 | 444 | 5 | 787 | 127 | 10 |

*The Maximum Peak Pulse Current (I_{PP}) shown represents the performance capabilities by design. Surge test screening is only performed up to 900 Amps (test equipment limitations).

MRT130KP 130 kW Transient Voltage Suppressor

Features

- Operational and storage temperature of $-55\text{ }^{\circ}\text{C}$ to $+150\text{ }^{\circ}\text{C}$
- 100% surge-tested devices
- Suppresses transients up to 130 kW @ 6.4/69 μs
- Available as either low clamp with “CV” suffix or normal clamping features with “CA” suffix
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B
- RoHS compliant devices available by adding “e3” suffix

Electrical Characteristics @ 25°C

| Part Number | Working Standoff Voltage V_{WM} | Maximum Standby Current I_D @ V_{WM} | Minimum Breakdown Voltage V_{BR} @ I_{BR} | Breakdown Current I_{BR} | Maximum Clamping Voltage V_C @ I_{PP} (Note 1) | Peak Pulse Current I_{PP} @ 6.4/69 μs (Note 2) |
|---------------|--------------------------------------|---|--|-------------------------------|--|---|
| | V Max | μA | Volts | mA | Volts | Amps |
| MRT130KP275CV | 275 | 5 | 300 | 5 | 400 | 292 |
| MRT130KP275CA | 275 | 5 | 300 | 5 | 445 | 292 |
| MRT130KP295CV | 295 | 5 | 300 | 5 | 410 | 282 |
| MRT130KP295CA | 295 | 5 | 300 | 5 | 460 | 282 |

MRT65KP Transient Voltage Suppressor

MRT65KP 65 kW Transient Voltage Suppressor

Features

- 100% surge-tested devices
- Suppresses transients up to 65 kW @ 6.4/69 μ s
- Operational and storage temperature of -55°C to $+150^{\circ}\text{C}$
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B
- RoHS compliant devices available by adding “e3” suffix

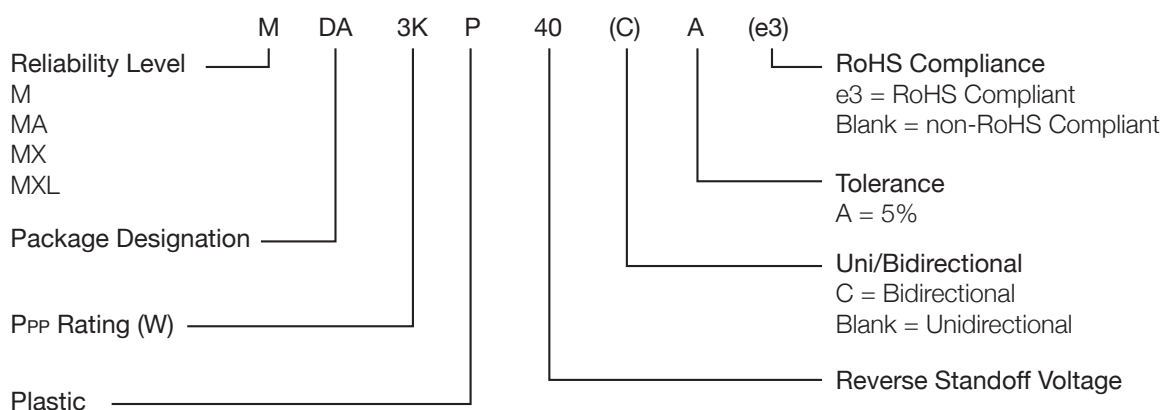
Electrical Characteristics @ 25°C

| PART NUMBER (replace A suffix with CA for bidirectional) | Working Standoff Voltage V_{WM} | Maximum Standby Current $I_D @ V_{WM}$ | Minimum Breakdown Voltage $V_{BR} @ I_{BR}$ | Breakdown Current I_{BR} | Maximum Clamping Voltage $V_C @ I_{PP}$ (Note 1) | Peak Pulse Current $I_{PP} @ 6.4/69 \mu\text{S}$ (Note 2) |
|--|---|--|--|----------------------------------|---|--|
| | V max | μA | V | mA | V | A |
| MRT65KP48A | 48 | 5 | 53.3 | 5 | 77.7 | 836 |
| MRT65KP54A | 54 | 5 | 60.0 | 5 | 87.5 | 742 |
| MRT65KP60A | 60 | 5 | 66.7 | 5 | 97.3 | 668 |
| MRT65KP75A | 75 | 5 | 83.3 | 5 | 122 | 533 |

MDA 3 kW Transient Voltage Suppressor Array

| Features |
|--|
| <ul style="list-style-type: none"> Available in both unidirectional and bidirectional construction Selections for 6.0 to 40 Volts Standoff Voltages (VWM) Operational and storage temperature of -55°C to +150°C RoHS compliant devices available by adding "e3" suffix Suppresses transients up to 3,000 W @ 10/1000 μs Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B 100% surge-tested devices |

Part Nomenclature

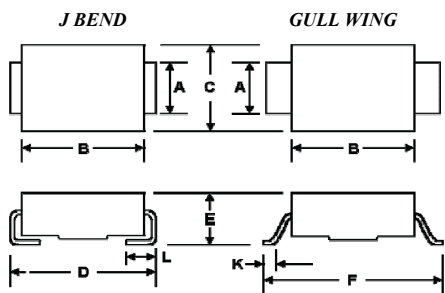


| Part Number | Reverse Stand off Voltage V _{WM} | Breakdown Voltage | | Maximum Clamping Voltage V _c @ I _{PP} | Maximum Standby Current ID @ V _{WM} | Maximum Peak Pulse Current I _{PP} |
|-------------|--|-----------------------------|---------------------|---|--|--|
| | | V _(br) (Min-Max) | @ I _(br) | | | |
| | | V | mA | | | |
| MDA3KP6.0A | 6 | 6.67-7.37 | 10 | 10.3 | 1000 | 291.3 |
| MDA3KP6.5A | 6.5 | 7.22-7.98 | 10 | 11.2 | 500 | 267.9 |
| MDA3KP7.0A | 7 | 7.78-8.6 | 10 | 12.0 | 200 | 250 |
| MDA3KP7.5A | 7.5 | 8.33-9.21 | 1 | 12.9 | 100 | 232.6 |
| MDA3KP8.0A | 8 | 8.89-9.83 | 1 | 13.6 | 50 | 220.6 |
| MDA3KP8.5A | 8.5 | 9.44-10.4 | 1 | 14.4 | 25 | 208.3 |
| MDA3KP9.0A | 9 | 10.0-11.1 | 1 | 15.4 | 10 | 194.8 |
| MDA3KP10A | 10 | 11.1-12.3 | 1 | 17.0 | 5 | 176.5 |
| MDA3KP11A | 11 | 12.2-13.5 | 1 | 18.2 | 5 | 164.8 |
| MDA3KP12A | 12 | 13.3-14.7 | 1 | 19.9 | 5 | 150.8 |
| MDA3KP13A | 13 | 14.4-15.9 | 1 | 21.5 | 5 | 139.5 |
| MDA3KP14A | 14 | 15.6-17.2 | 1 | 23.2 | 2 | 129.3 |
| MDA3KP15A | 15 | 16.7-18.5 | 1 | 24.4 | 2 | 123 |
| MDA3KP16A | 16 | 17.8-19.7 | 1 | 26.0 | 2 | 115.4 |
| MDA3KP17A | 17 | 18.9-20.9 | 1 | 27.6 | 2 | 108.7 |
| MDA3KP18A | 18 | 20.0-22.1 | 1 | 29.2 | 2 | 102.7 |
| MDA3KP20A | 20 | 22.2-24.5 | 1 | 32.4 | 2 | 92.6 |
| MDA3KP22A | 22 | 24.4-26.9 | 1 | 35.5 | 2 | 84.5 |
| MDA3KP24A | 24 | 26.7-29.5 | 1 | 38.9 | 2 | 77.1 |
| MDA3KP26A | 26 | 28.9-31.9 | 1 | 42.1 | 2 | 71.3 |
| MDA3KP28A | 28 | 31.1-34.4 | 1 | 45.4 | 2 | 66.1 |
| MDA3KP30A | 30 | 33.3-36.8 | 1 | 48.8 | 2 | 62 |
| MDA3KP33A | 33 | 36.7-40.6 | 1 | 53.3 | 2 | 56.3 |
| MDA3KP36A | 36 | 40.0-44.2 | 1 | 58.1 | 2 | 51.6 |
| MDA3KP40A | 40 | 44.4-49.1 | 1 | 64.5 | 2 | 46.5 |

NOTE 1: For bidirectional types, indicate a C suffix as shown on page 2 in "Part Nomenclature"
 Transient Voltage Suppressors are normally selected with reverse standoff voltage VWM, which should be equal to or greater than peak operating voltage.

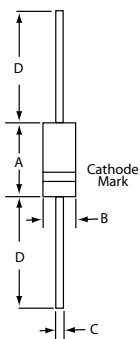
Package Outline Drawings

MSMB/MSMC/MSML



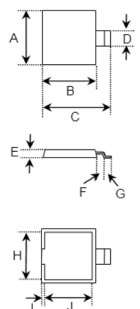
| MSMB PACKAGE DIMENSIONS IN INCHES (DO-214AA/DO-215AA) | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|
| | A | B | C | D | E | F | K | L |
| MIN | 0.077 | 0.160 | 0.130 | 0.205 | 0.077 | 0.235 | 0.015 | 0.030 |
| MAX | 0.083 | 0.180 | 0.155 | 0.220 | 0.104 | 0.255 | 0.030 | 0.060 |
| DIMENSIONS IN MILLIMETERS | | | | | | | | |
| MIN | 1.95 | 4.06 | 3.30 | 5.21 | 1.95 | 5.97 | 0.381 | 0.760 |
| MAX | 2.10 | 4.57 | 3.94 | 5.59 | 2.65 | 6.48 | 0.762 | 1.520 |
| MSMC/MSML PACKAGE DIMENSIONS IN INCHES (DO-214AB/DO-215AB) | | | | | | | | |
| | A | B | C | D | E | F | K | L |
| MIN | 0.115 | 0.260 | 0.220 | 0.305 | 0.077 | 0.380 | 0.025 | 0.030 |
| MAX | 0.121 | 0.280 | 0.245 | 0.320 | 0.110 | 0.400 | 0.040 | 0.060 |
| DIMENSIONS IN MILLIMETERS | | | | | | | | |
| MIN | 2.92 | 6.60 | 5.59 | 7.75 | 1.95 | 9.65 | 0.635 | 0.760 |
| MAX | 3.07 | 7.11 | 6.22 | 8.13 | 2.80 | 10.16 | 1.016 | 1.520 |

MP4KE, MP6KE, M1.5KE & MLCE



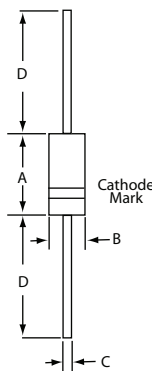
| DIM | P4KE (DO-41) | | | | P6KE (T-18) | | | | 1.5KE & LCE (Case 1) | | | |
|-----|--------------|-------|------|-------|-------------|-------|------|------|----------------------|-------|-------|-------|
| | INCHES | | MM | | INCHES | | MM | | INCHES | | MM | |
| | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX |
| A | - | 0.205 | - | 5.207 | 0.330 | 0.350 | 8.39 | 8.89 | 0.360 | 0.375 | 9.144 | 9.525 |
| B | - | 0.107 | - | 2.72 | 0.130 | 0.145 | 3.31 | 3.68 | 0.190 | 0.205 | 4.826 | 5.207 |
| C | 0.03 | 0.034 | 0.76 | 0.86 | 0.038 | 0.042 | 0.97 | 1.06 | 0.038 | 0.042 | 0.965 | 1.067 |
| D | 1.00 | - | 25.4 | - | 1.00 | - | 25.4 | - | 1.10 | - | 27.9 | - |

mini-PLAD



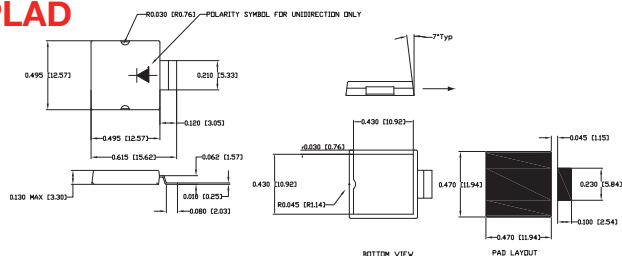
| Ref. | Dimensions | |
|------|------------|--------|
| | mm | Inches |
| A | 8.76 | 0.345 |
| B | 8.76 | 0.345 |
| C | 11.27 | 0.444 |
| D | 2.54 | 0.100 |
| E | 3.18 | 0.125 |
| F | 0.76 | 0.030 |
| G | 1.78 | 0.070 |
| H | 7.24 | 0.285 |
| I | 0.76 | 0.030 |
| J | 7.24 | 0.285 |

M5KP, M15KP and MRT100KP Case 5A

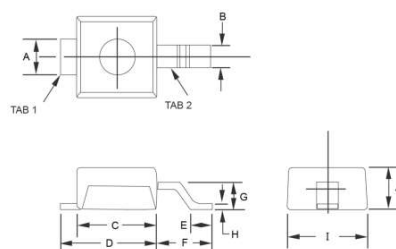


| | RT100KP (Case 5A) | | | |
|---|-------------------|-------|-------|-------|
| | INCHES | | MM | |
| | MIN | MAX | MIN | MAX |
| A | 0.365 | 0.385 | 9.271 | 9.779 |
| B | 0.235 | 0.255 | 5.969 | 6.477 |
| C | 0.047 | 0.053 | 1.194 | 1.346 |
| D | 0.75 | - | 19.05 | - |

PLAD



Powermite1 DO-216AA



| Ltr | Dimensions | |
|-----|------------|-------------|
| | Inch | Millimeters |
| A | 0.100 | 2.54 |
| B | 0.105 | 2.67 |
| C | 0.050 | 1.27 |
| D | 0.030 | 0.76 |
| E | 0.025 | 0.64 |