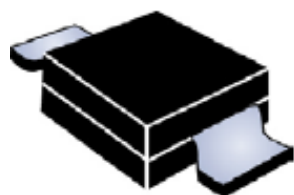


# MSMLG5.0A – MSMLG170CAe3, MSMLJ5.0A – MSMLJ170CAe3 Surface Mount 3000 Watt Transient Voltage Suppressor

## 1 Product Overview

The MSMLG5.0A–MSMLG170CA and the MSMLJ5.0A–MSMLJ170CA series of high-reliability transient voltage suppressors (TVS) protect circuits from voltage spikes containing up to 3000 W (10/1000  $\mu$ s model pulse). The SMLG gull-wing design in the DO-215AB package allows for visible solder connections. The SMLJ J-bend design in the DO-214AB package allows for greater PC board mounting density. Selections include unidirectional and bidirectional as well as RoHS-compliant versions. These are available with a variety of upscreening options for enhanced reliability. They protect against the secondary effects of lightning per IEC61000-4-5 and against voltage pulses from inductive switching environments and induced by RF radiation. Since their response time is virtually instantaneous, they can also be used in protection from ESD and EFT per IEC61000-4-2 and IEC61000-4-4.



**DO-215AB  
Package**



**DO-214AB  
Package**

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### 1.1 Features

The following are key features of the MSMLG5.0A through MSMLG170CAe3 and the MSMLJ5.0A through MSMLJ170CAe3 devices:

- High-reliability devices with fabrication and assembly lot traceability for all M prefix devices
- All devices are 100% surge tested
- $3\sigma$  lot norm screening performed on standby current ( $I_b$ ) for all M prefix devices
- Available in both unidirectional and bidirectional versions
- Moisture classification is “Level 1” with no dry pack required per IPC/JEDEC J-STD-020B for all M prefix devices.
- Enhanced reliability screening options with M prefix are available in reference to MIL-PRF-19500. Refer to [High Reliability Up-Screened Plastic Products Portfolio](#) for more details on the screening options (see Part Nomenclature for all available options).
- RoHS compliant versions available
- Axial-lead equivalent packages for thru-hole mounting are available as M5KP5.0A to M5KP110CA with 5000 W rating (contact Microsemi for other surface mount options).

## 1.2 Applications and Benefits

The following are benefits of the MSMLG5.0A through MSMLG170CAe3 and the MSMLJ5.0A through MSMLJ170CAe3 devices.

- Suppresses transients up to 3000 W (10/1000  $\mu$ s test pulse—see [Figure 2 \(see page 7\)](#))
- Protection from switching transients and induced RF
- Protection from ESD, and EFT per IEC 61000-4-2 and IEC 61000-4-4
- Secondary lightning protection per IEC 61000-4-5 with 42  $\Omega$  source impedance:

Class 1 and 2: SML 5.0A to SML 170A or CA

Class 3: SML 5.0A to SML 150A or CA

Class 4: SML 5.0A to SML 75A or CA

- Secondary lightning protection per IEC 61000-4-5 with 12  $\Omega$  source impedance:

Class 1: SML 5.0A to SML 170A or CA

Class 2: SML 5.0A to SML 90A or CA

Class 3: SML 5.0A to SML 48A or CA

Class 4: SML 5.0A to SML 24A or CA

- Secondary lightning protection per IEC 61000-4-5 with 2  $\Omega$  source impedance:

Class 2: SML 5.0A to SML 43A or CA

Class 3: SML 5.0A to SML 22A or CA

Class 4: SML 5.0A to SML10A or CA

## 1.3 Part Nomenclature

The following table lists the part nomenclature for the MSMLG5.0A through MSMLG170CAe3 and the MSMLJ5.0 through MSMLJ170CAe3 devices.

**Table 1 • MXSMLG5.0CAe3 Part Nomenclature**

|               |                                |   |
|---------------|--------------------------------|---|
| <b>MX</b>     | Reliability level*             | M (controlled product)<br>MA (avionics grade) MX (reference JANTX)<br>MXL (MX life)<br>Blank = commercial<br>*(see <a href="#">Hirel Non-Hermetic Product Portfolio</a> ) |
| <b>SM</b>     | Surface-mount package          |   |
| <b>L</b>      | 3000 W power level             |   |
| <b>G or J</b> | Gull-wing or J-bend lead frame |   |
| <b>5.0</b>    | Reverse standoff voltage       | (see <a href="#">Typical Electrical Performance (see page 5)</a> table)   |
| <b>C</b>      | Uni/bidirectional              | C = Bidirectional<br>Blank = Unidirectional   |
| <b>A</b>      | ± 5% Tolerance level           |   |
| <b>e3</b>     | RoHS Compliance                | e3 = RoHS compliant<br>Blank = non-RoHS compliant   |

## 1.4 Symbols and Definitions

The following table lists the symbols and definitions used for the MSMLG5.0A through MSMLG170CAe3 and the MSMLJ5.0 through MSMLJ170CAe3 devices.

**Table 2 • Symbols and Definitions**

| Symbol     | Value                          | Definition  |
|------------|--------------------------------|---|
| $I_{(BR)}$ | Breakdown current              | The current used for measuring breakdown voltage $V_{(BR)}$ .   |
| $I_D$      | Standby current                | The current at the rated standoff voltage $V_{WM}$ .  |
| $I_F$      | Forward current                | The forward current dc value, no alternating component.   |
| $I_{PP}$   | Peak impulse current           | The peak current during the impulse.  |
| $P_{PP}$   | Peak pulse Power               | The peak power dissipation resulting from peak impulse current $I_{PP}$ .   |
| $V_{(BR)}$ | Minimum breakdown voltage      | The minimum voltage the device will exhibit at a specified current.   |
| $V_C$      | Clamping voltage               | Clamping voltage at $I_{PP}$ (peak pulse current) at the specified pulse conditions (typically shown as maximum value). |
| $V_{WM}$   | Rated working standoff voltage | The maximum peak voltage that can be applied over the operating temperature range.                                      |

## 2 Electrical Specifications

This section shows the electrical specifications for the MSMLG5.0A–MSMLG170CA and the MSMLJ5.0A–MSMLJ170CA devices.

### 2.1 Maximum Ratings

The following table shows you the absolute maximum ratings for the MSMLG5.0A–MSMLG170CA and the MSMLJ5.0A–MSMLJ170CA devices.

**Table 3 • Absolute Maximum Ratings**

| Parameter/Test Conditions  | Symbol              | Value          | Unit              |
|--|---------------------|----------------|-------------------|
| Junction and storage temperature   | $T_J$ and $T_{STG}$ | –65 to 150     | °C                |
| Thermal resistance junction-to-lead  | $R_{\theta JL}$     | 17.5           | °C/W              |
| Thermal resistance junction-to-ambient <sup>1</sup>                                  | $R_{\theta JA}$     | 77.5           |                   |
| Peak pulse power dissipation at 25 °C<br>(10/1000 $\mu$ s, see Figures 1, 2, and 3). | $P_{PP}$            | 3000           | W                 |
| Impulse repetition rate (duty factor)  | df                  | 0.01 or less   | %                 |
| $t_{clamping}$ (0 V to $V_{(BR)}$ min)   | Unidirectional      | $t_{clamping}$ | <100 ps           |
|  | Bidirectional       |                | <5 ns             |
| Rated average power dissipation  | TL = 45 °C          | $P_{M(AV)}$    | 6 W               |
|  | TL = 25 °C          |                | 1.61 <sup>1</sup> |
| Maximum forward surge current <sup>2</sup>   | $I_{FSM}$           | 200            | A (pk)            |
| Solder temperature at 10 s   | $T_{SP}$            | 260            | °C                |

**Notes:**

1. When mounted on FR4 PC board (1 oz Cu) with recommended mounting pad (see pad layout).
2. Peak impulse of 8.3 ms half-sine wave at 25 °C (unidirectional only).

## 2.2 Typical Electrical Performance

The following table shows the Electrical characteristics for the MSMLG5.0A–MSMLG170CA and the MSMLJ5.05A–MSMLJ170CA devices at 25 °C unless otherwise specified.

For bidirectional device types, indicate a CA suffix after the part number (i.e. MSMLG170CA).

**Table 4 • Typical Electrical Performance**

| Part Number |          | V <sub>WM</sub><br>Reverse<br>Standoff<br>Voltage | V <sub>BR</sub> Breakdown<br>Voltage at I <sub>BR</sub> | I <sub>BR</sub> Test<br>Current | V <sub>c</sub> Max<br>Clamping<br>Voltage<br>at I <sub>PP</sub> | I <sub>PP</sub> Max<br>Peak<br>Pulse<br>Current | I <sub>D</sub> Max<br>Stand-by<br>Current<br>at V <sub>WM</sub> |
|-------------|----------|---|---|---------------------------------|---|---|---|
| Gull-wing   | J-bend   | (V)   | (V)   | (mA)                            | (V)   | (A)   | (μA)  |
| SMLG5.0A    | SMLJ5.0A | 5.0   | 6.40 – 7.00   | 10                              | 9.2   | 326.0   | 1000  |
| SMLG6.0A    | SMLJ6.0A | 6.0   | 6.67 – 7.37   | 10                              | 10.3  | 291.3   | 1000  |
| SMLG6.5A    | SMLJ6.5A | 6.5   | 7.22 – 7.98   | 10                              | 11.2  | 267.9   | 500   |
| SMLG7.0A    | SMLJ7.0A | 7.0   | 7.78 – 8.60   | 10                              | 12.0  | 250.0   | 200   |
| SMLG7.5A    | SMLJ7.5A | 7.5   | 8.33 – 9.21   | 1                               | 12.9  | 232.6   | 100   |
| SMLG8.0A    | SMLJ8.0A | 8.0   | 8.89 – 9.83   | 1                               | 13.6  | 220.6   | 50  |
| SMLG8.5A    | SMLJ8.5A | 8.5   | 9.44 – 10.4   | 1                               | 14.4  | 208.4   | 25  |
| SMLG9.0A    | SMLJ9.0A | 9.0   | 10.0 – 11.1   | 1                               | 15.4  | 194.8   | 10  |
| SMLG10A     | SMLJ10A  | 10  | 11.1 – 12.3   | 1                               | 17.0  | 176.4   | 5   |
| SMLG11A     | SMLJ11A  | 11  | 12.2 – 13.5   | 1                               | 18.2  | 164.8   | 5   |
| SMLG12A     | SMLJ12A  | 12  | 13.3 – 14.7   | 1                               | 19.9  | 150.6   | 5   |
| SMLG13A     | SMLJ13A  | 13  | 14.4 – 15.9   | 1                               | 21.5  | 139.4   | 5   |
| SMLG14A     | SMLJ14A  | 14  | 15.6 – 17.2   | 1                               | 23.2  | 129.4   | 2   |
| SMLG15A     | SMLJ15A  | 15  | 16.7 – 18.5   | 1                               | 24.4  | 123.0   | 2   |
| SMLG16A     | SMLJ16A  | 16  | 17.8 – 19.7   | 1                               | 26.0  | 115.4   | 2   |
| SMLG17A     | SMLJ17A  | 17  | 18.9 – 20.9   | 1                               | 27.6  | 106.6   | 2   |
| SMLG18A     | SMLJ18A  | 18  | 20.0 – 22.1   | 1                               | 29.2  | 102.8   | 2   |
| SMLG20A     | SMLJ20A  | 20  | 22.2 – 24.5   | 1                               | 32.4  | 92.6  | 2   |
| SMLG22A     | SMLJ22A  | 22  | 24.4 – 26.9   | 1                               | 35.5  | 84.4  | 2   |
| SMLG24A     | SMLJ24A  | 24  | 26.7 – 29.5   | 1                               | 38.9  | 77.2  | 2   |
| SMLG26A     | SMLJ26A  | 26  | 28.9 – 31.9   | 1                               | 42.1  | 71.2  | 2   |
| SMLG28A     | SMLJ28A  | 28  | 31.1 – 34.4   | 1                               | 45.4  | 66.0  | 2   |
| SMLG30A     | SMLJ30A  | 30  | 33.3 – 36.8   | 1                               | 48.4  | 62.0  | 2   |
| SMLG33A     | SMLJ33A  | 33  | 36.7 – 40.6   | 1                               | 53.3  | 56.2  | 2   |
| SMLG36A     | SMLJ36A  | 36  | 40.0 – 44.2   | 1                               | 58.1  | 51.6  | 2   |
| SMLG40A     | SMLJ40A  | 40  | 44.4 – 49.1   | 1                               | 64.5  | 46.4  | 2   |
| SMLG43A     | SMLJ43A  | 43  | 47.8 – 52.8   | 1                               | 69.4  | 43.2  | 2   |
| SMLG45A     | SMLJ45A  | 45  | 50.0 – 55.3   | 1                               | 72.7  | 41.2  | 2   |
| SMLG48A     | SMLJ48A  | 48  | 53.3 – 58.9   | 1                               | 77.4  | 38.8  | 2   |
| SMLG51A     | SMLJ51A  | 51  | 56.7 – 62.7   | 1                               | 82.4  | 36.4  | 2   |
| SMLG54A     | SMLJ54A  | 54  | 60.0 – 66.3   | 1                               | 87.1  | 34.4  | 2   |
| SMLG58A     | SMLJ58A  | 58  | 64.4 – 71.2   | 1                               | 93.6  | 32.0  | 2   |
| SMLG60A     | SMLJ60A  | 60  | 66.7 – 73.7   | 1                               | 96.8  | 31.0  | 2   |
| SMLG64A     | SMLJ64A  | 64  | 71.1 – 78.6   | 1                               | 103.0   | 29.2  | 2   |
| SMLG70A     | SMLJ70A  | 70  | 77.8 – 86.0   | 1                               | 113   | 26.6  | 2   |
| SMLG75A     | SMLJ75A  | 75  | 83.3 – 92.1   | 1                               | 121   | 24.8  | 2   |

| Part Number |          | V <sub>WM</sub><br>Reverse<br>Standoff<br>Voltage | V <sub>BR</sub> Breakdown<br>Voltage at I <sub>BR</sub> | I <sub>BR</sub> Test<br>Current | V <sub>c</sub> Max<br>Clamping<br>Voltage<br>at I <sub>PP</sub> | I <sub>PP</sub> Max<br>Peak<br>Pulse<br>Current | I <sub>b</sub> Max<br>Stand-by<br>Current<br>at V <sub>WM</sub> |
|-------------|----------|---|---|---------------------------------|---|---|---|
| SMLG78A     | SMLJ78A  | 78  | 86.7 – 95.8   | 1                               | 126   | 22.8  | 2   |
| SMLG85A     | SMLJ85A  | 85  | 94.4 – 104.0  | 1                               | 137   | 20.8  | 2   |
| SMLG90A     | SMLJ90A  | 90  | 100 – 111   | 1                               | 146   | 20.6  | 2   |
| SMLG100A    | SMLJ100A | 100   | 111 – 123   | 1                               | 162   | 18.6  | 2   |
| SMLG110A    | SMLJ110A | 110   | 122 – 135   | 1                               | 177   | 16.8  | 2   |
| SMLG120A    | SMLJ120A | 120   | 133 – 147   | 1                               | 193   | 15.6  | 2   |
| SMLG130A    | SMLJ130A | 130   | 144 – 159   | 1                               | 209   | 14.4  | 2   |
| SMLG150A    | SMLJ150A | 150   | 167 – 185   | 1                               | 243   | 12.4  | 2   |
| SMLG160A    | SMLJ160A | 160   | 178 – 197   | 1                               | 259   | 11.6  | 2   |
| SMLG170A    | SMLJ170A | 170   | 189 – 209   | 1                               | 275   | 11.0  | 2   |

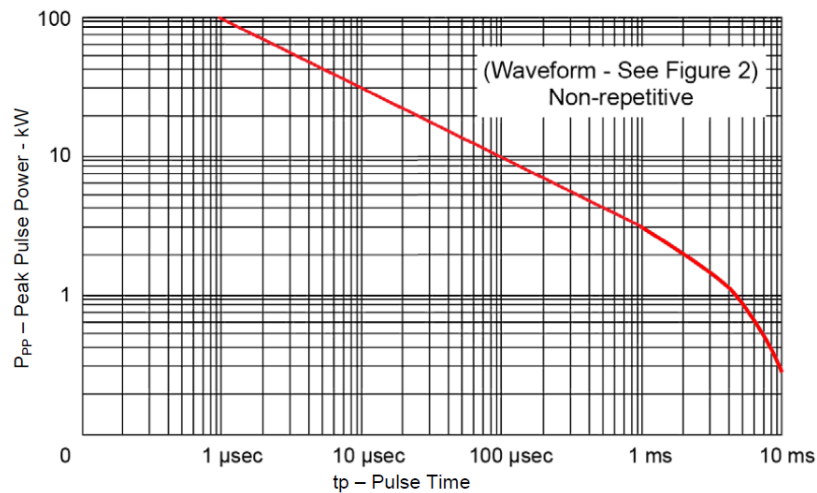
Bidirectional capacitance is half that shown in [Figure 4](#) (see page 8) at 0 V.

## 2.3 Typical Performance Curves

This section shows the typical performance curves of the MSMLG5.0A–MSMLG170CA and the MSMLJ5.0A–MSMLJ170CA devices.

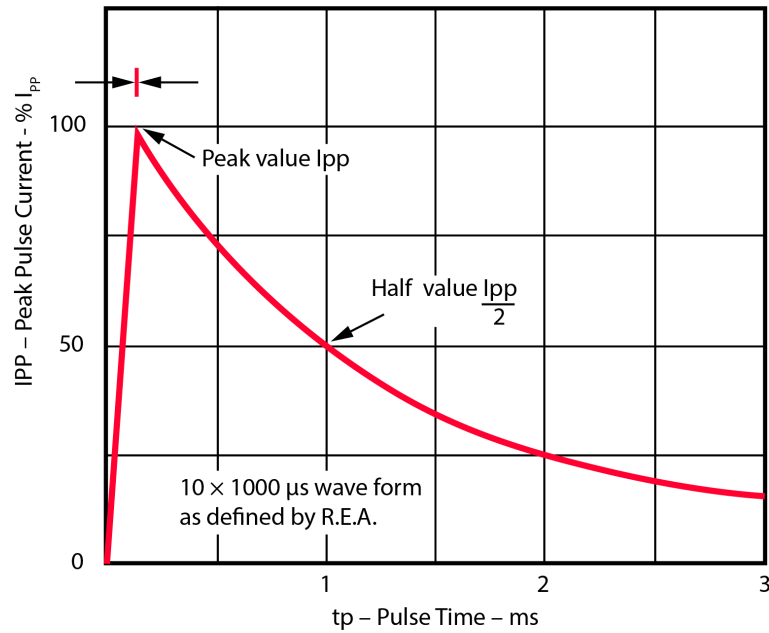
The following graph shows peak-pulse power versus pulse time (up to 50% of exponentially decaying pulse).

**Figure 1 • Peak Pulse Power vs. Pulse Time (to 50% of exponentially decaying pulse)**



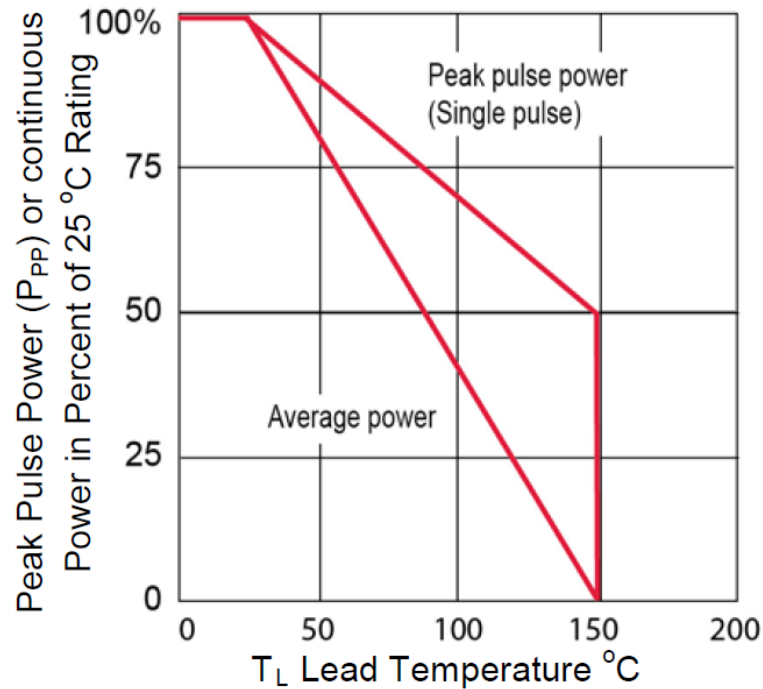
The following graph shows the pulse waveform with these parameters:  $t_r = 10 \mu s$  and  $t_p = 1000 \mu s$ .

**Figure 2 • Pulse Waveform**



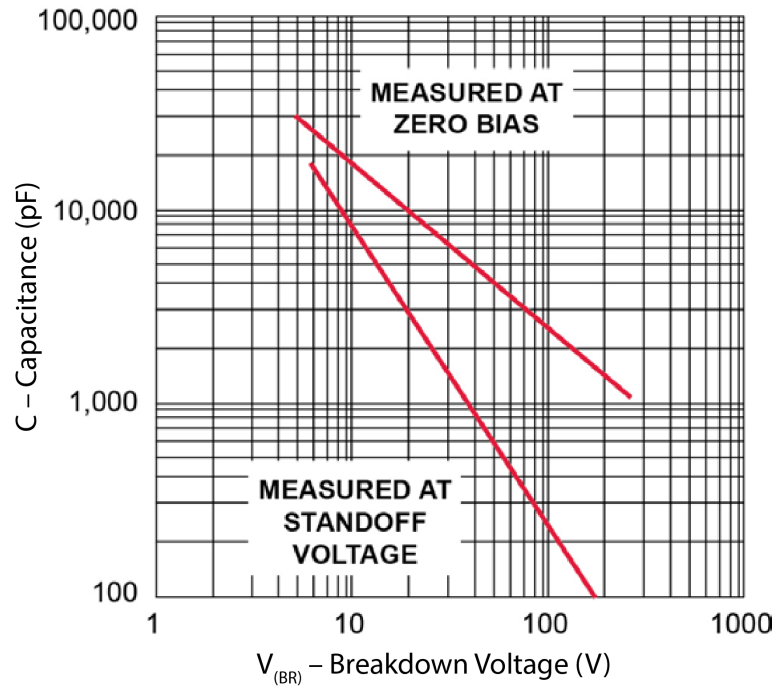
The following graph shows the derating curve.

**Figure 3 • Derating Curve**



The following graph shows the typical capacitance versus the breakdown voltage. Note that the bidirectional capacitance is half that shown at 0 V.

**Figure 4 • Typical Capacitance vs. Breakdown Voltage (Unidirectional Configuration)**



**Note:**

Bidirectional capacitance is half that shown in Figure 4 at 0 V.



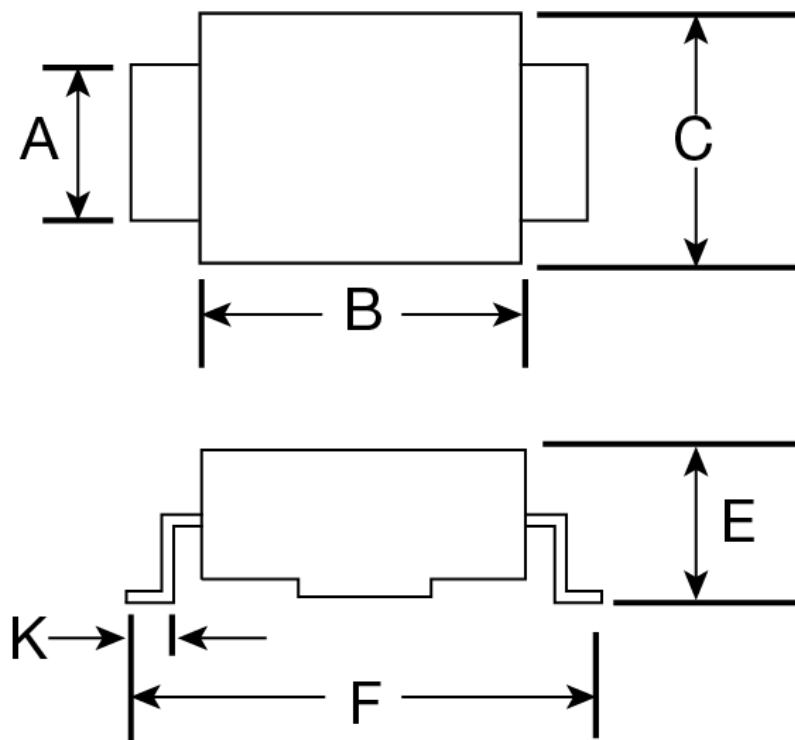
### 3 Package Specification

The following sections shows the package specifications for the SMLG (DO-215AB) and SMLG (DO-214AB) packages.

#### 3.1 Package Information

The following illustration shows the SMLJ DO-214AB package dimensions. The typical standoff height is 0.004 in—0.008 in (0.1—0.2 mm).

Figure 5 • SMLG (DO-215AB) Package Dimensions



The following table shows the SMLG DO-215AB mechanical and packaging information.

Table 5 • SMLG (DO-215AB) Mechanical and Package Information

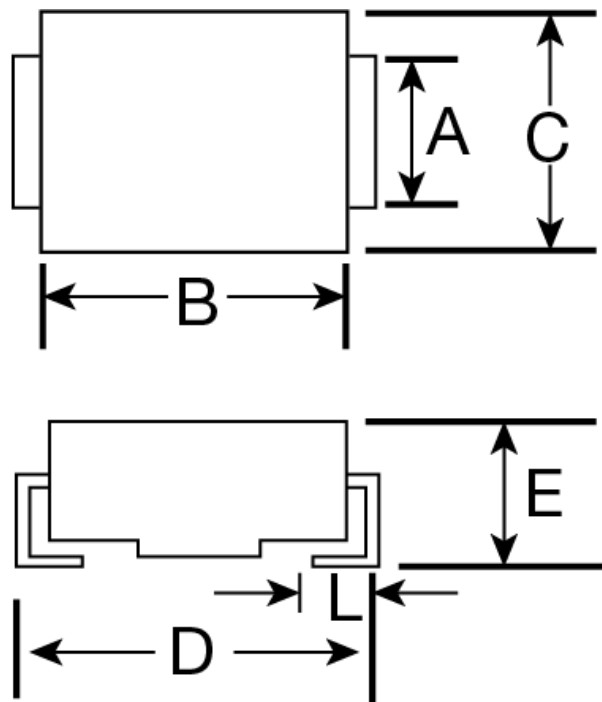
| Letter         | Dimensions (in.) | Dimensions (mm) |
|----------------|------------------|-----------------|
| A              | 0.115—0.121      | 2.92—3.07       |
| B              | 0.260—0.280      | 6.60—7.11       |
| C              | 0.220—0.245      | 5.59—6.22       |
| E              | 0.077—0.110      | 1.95—2.80       |
| F <sup>1</sup> | 0.380—0.400      | 9.65—10.16      |
| K              | 0.025—0.040      | 0.635—1.016     |

**Note:**

1. Dimension "E" exceeds the JEDEC outline as shown.

The following illustration shows the mechanical and packaging information for the SMLG (DO-214AB) package.

**Figure 6 • SMLJ\_(DO-214AB)\_Package\_Dimensions**



The following table shows the SMLJ DO-214AB mechanical and packaging information.

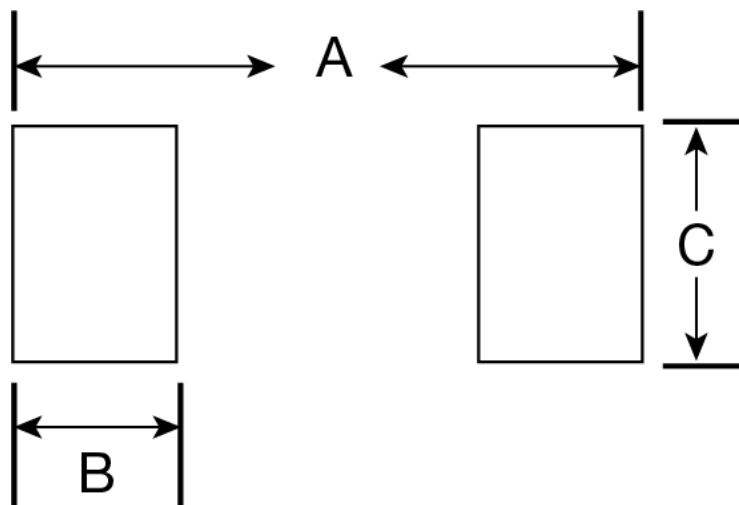
**Table 6 • SMLJ (DO-214AB) Mechanical and Package Information**

| Letter | Dimensions (in.) | Dimensions (mm) |
|--------|------------------|-----------------|
| A      | 0.115–0.121      | 2.92–3.07       |
| B      | 0.260–0.280      | 6.60–7.11       |
| C      | 0.220–0.245      | 5.59–6.22       |
| D      | 0.305–0.320      | 7.75–8.13       |
| E      | 0.077–0.110      | 1.95–2.80       |
| L      | 0.030–0.060      | 0.760–1.52      |

## 3.2 Pad Layout

The following illustration shows the pad layout for the SMLG (DO-215AB) and SMLJ (DO-214AB) packages.

**Figure 7 • Pad Layout**



The following table shows the SMLG DO-215AB pad layout dimensions.

**Table 7 • SMLG (DO-215AB) Pad Layout Dimensions**

| Letter | Dimensions (in.) | Dimensions (mm) |
|--------|------------------|-----------------|
| A      | 0.510            | 12.95           |
| B      | 0.110            | 2.79            |
| C      | 0.150            | 3.81            |

The following table shows the SMLJ DO-214AB pad layout dimensions.

**Table 8 • SMLJ (DO-214AB) Pad Layout Dimensions**

| Letter | Dimensions (in.) | Dimensions (mm) |
|--------|------------------|-----------------|
| A      | 0.390            | 9.90            |
| B      | 0.110            | 2.79            |
| C      | 0.150            | 3.81            |



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