

## 600W, 5V - 170V Surface Mount Transient Voltage Suppressor

### FEATURES

- Ideal for automated placement
- Glass passivated junction
- Excellent clamping capability
- Fast response time: Typically less than 1.0ps
- Typical  $I_R$  less than 1 $\mu$ A above 10V
- Meets ISO 7637-2 (Pulse 1/2a/2b/3a/3b)
- Moisture sensitivity level: level 1, per J-STD-020
- RoHS Compliant
- Halogen-free according to IEC 61249-2-21

### APPLICATIONS

- Protect sensitive circuit from damage by high voltage transients
- Lighting, ESD transient voltage protection of IC, system
- Inductive switching load protection of IC, system
- Electrical Fast Transient Immunity protection of IC, system

### MECHANICAL DATA

- Case: DO-214AA (SMB)
- Molding compound meets UL 94V-0 flammability rating
- Terminal: Matte tin plated leads, solderable per J-STD-002
- Meet JESD 201 class 2 whisker test
- Polarity: As marked
- Weight: 0.090g (approximately)

| KEY PARAMETERS               |                |      |
|------------------------------|----------------|------|
| PARAMETER                    | VALUE          | UNIT |
| $V_{WM}$                     | 5 - 170        | V    |
| $V_{BR}$ (uni - directional) | 6.4 - 231      | V    |
| $V_{BR}$ (bi - directional)  | 6.4 - 231      | V    |
| $P_{PK}$                     | 600            | W    |
| $T_{JMAX}$                   | 150            |      |
| Package                      | DO-214AA (SMB) |      |
| Configuration                | Single die     |      |



**DO-214AA (SMB)**

| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)                                 |           |              |                  |
|---|-----------|--------------|------------------|
| PARAMETER   | SYMBOL    | VALUE        | UNIT             |
| Non-repetitive peak impulse power dissipation with 10/1000 $\mu$ s waveform <sup>(1)</sup>                  | $P_{PK}$  | 600          | W                |
| Steady state power dissipation at $T_A = 25^\circ\text{C}$  | $P_D$     | 3            | W                |
| Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load for Uni-directional only | $I_{FSM}$ | 100          | A                |
| Forward Voltage @ $I_F = 50\text{A}$ for Uni-directional only <sup>(2)</sup>                                | $V_F$     | 3.5 / 5.0    | V                |
| Junction temperature  | $T_J$     | - 55 to +150 | $^\circ\text{C}$ |
| Storage temperature   | $T_{STG}$ | - 55 to +150 | $^\circ\text{C}$ |

#### Notes:

1. Non-repetitive current pulse per Fig.3 and derated above  $T_A = 25^\circ\text{C}$  per Fig.2
2.  $V_F = 3.5\text{V}$  on SMBJ5.0 - SMBJ90 devices and  $V_F = 5.0\text{V}$  on SMBJ100 - SMBJ170 devices

#### Devices for Bipolar Applications

1. For bidirectional use C or CA suffix for types SMBJ5.0 - types SMBJ170
2. Electrical characteristics apply in both directions

| THERMAL PERFORMANCE                    |                 |     |               |
|--|-----------------|-----|---------------|
| PARAMETER                              | SYMBOL          | TYP | UNIT          |
| Junction-to-case thermal resistance    | $R_{\theta JC}$ | 10  | $^{\circ}C/W$ |
| Junction-to-ambient thermal resistance | $R_{\theta JA}$ | 55  | $^{\circ}C/W$ |

| ELECTRICAL SPECIFICATIONS ( $T_A = 25^{\circ}C$ unless otherwise noted) |  |  |  |  |  |  |  |
|---|--|--|--|--|--|--|--|
|---|--|--|--|--|--|--|--|

| Part number | Marking code | Breakdown voltage $V_{BR}@I_T$ (V) (Note 1) |      | Test current $I_T$ (mA) | Working stand-off voltage $V_{WM}$ (V) | Maximum blocking leakage current $I_D@V_{WM}$ ( $\mu A$ ) | Maximum peak impulse current $I_{PP}$ (A) (Note 2) | Maximum clamping voltage $V_C@I_{PP}$ (V) |
|-------------|--------------|---|------|-------------------------|--|---|--|---|
|             |              | Min   | Max  |                         |  |   |  |   |
| SMBJ5.0     | KD           | 6.40  | 7.30 | 10                      | 5.0                                    | 800   | 65.0   | 9.6                                       |
| SMBJ5.0A    | KE           | 6.40  | 7.00 | 10                      | 5.0                                    | 800   | 68.0   | 9.2                                       |
| SMBJ5V0A    |              |   |      |                         |  |   |  |   |
| SMBJ6.0     | KF           | 6.67  | 8.15 | 10                      | 6.0                                    | 800   | 55.0   | 11.4                                      |
| SMBJ6.0A    | KG           | 6.67  | 7.37 | 10                      | 6.0                                    | 800   | 61.0   | 10.3                                      |
| SMBJ6V0A    |              |   |      |                         |  |   |  |   |
| SMBJ6.5     | KH           | 7.22  | 8.82 | 10                      | 6.5                                    | 500   | 51.0   | 12.3                                      |
| SMBJ6.5A    | KK           | 7.22  | 7.98 | 10                      | 6.5                                    | 500   | 56.0   | 11.2                                      |
| SMBJ6V5A    |              |   |      |                         |  |   |  |   |
| SMBJ7.0     | KL           | 7.78  | 9.51 | 10                      | 7.0                                    | 200   | 47.0   | 13.3                                      |
| SMBJ7.0A    | KM           | 7.78  | 8.60 | 10                      | 7.0                                    | 200   | 52.0   | 12.0                                      |
| SMBJ7V0A    |              |   |      |                         |  |   |  |   |
| SMBJ7.5     | KN           | 8.33  | 10.3 | 1                       | 7.5                                    | 100   | 44.0   | 14.3                                      |
| SMBJ7.5A    | KP           | 8.33  | 9.21 | 1                       | 7.5                                    | 100   | 48.0   | 12.9                                      |
| SMBJ7V5A    |              |   |      |                         |  |   |  |   |
| SMBJ8.0     | KQ           | 8.89  | 10.9 | 1                       | 8.0                                    | 50  | 42.0   | 15.0                                      |
| SMBJ8.0A    | KR           | 8.89  | 9.83 | 1                       | 8.0                                    | 50  | 46.0   | 13.6                                      |
| SMBJ8V0A    |              |   |      |                         |  |   |  |   |
| SMBJ8.5     | KS           | 9.44  | 11.5 | 1                       | 8.5                                    | 10  | 39.0   | 15.9                                      |
| SMBJ8.5A    | KT           | 9.44  | 10.4 | 1                       | 8.5                                    | 10  | 43.0   | 14.4                                      |
| SMBJ8V5A    |              |   |      |                         |  |   |  |   |
| SMBJ9.0     | KU           | 10.0  | 12.2 | 1                       | 9.0                                    | 5   | 37.0   | 16.9                                      |
| SMBJ9.0A    | KV           | 10.0  | 11.1 | 1                       | 9.0                                    | 5   | 40.0   | 15.4                                      |
| SMBJ9V0A    |              |   |      |                         |  |   |  |   |
| SMBJ10      | KW           | 11.1  | 13.6 | 1                       | 10                                     | 5   | 33.0   | 18.8                                      |
| SMBJ10A     | KX           | 11.1  | 12.3 | 1                       | 10                                     | 5   | 37.0   | 17.0                                      |
| SMBJ11      | KY           | 12.2  | 14.9 | 1                       | 11                                     | 1   | 31.0   | 20.1                                      |
| SMBJ11A     | KZ           | 12.2  | 13.5 | 1                       | 11                                     | 1   | 34.0   | 18.2                                      |
| SMBJ12      | LD           | 13.3  | 16.3 | 1                       | 12                                     | 1   | 28.0   | 22.0                                      |
| SMBJ12A     | LE           | 13.3  | 14.7 | 1                       | 12                                     | 1   | 31.0   | 19.9                                      |
| SMBJ13      | LF           | 14.4  | 17.6 | 1                       | 13                                     | 1   | 26.0   | 23.8                                      |
| SMBJ13A     | LG           | 14.4  | 15.9 | 1                       | 13                                     | 1   | 29.0   | 21.5                                      |
| SMBJ14      | LH           | 15.6  | 19.1 | 1                       | 14                                     | 1   | 24.4   | 25.8                                      |
| SMBJ14A     | LK           | 15.6  | 17.2 | 1                       | 14                                     | 1   | 27.0   | 23.2                                      |
| SMBJ15      | LL           | 16.7  | 20.4 | 1                       | 15                                     | 1   | 23.1   | 26.9                                      |
| SMBJ15A     | LM           | 16.7  | 18.5 | 1                       | 15                                     | 1   | 25.1   | 24.4                                      |
| SMBJ16      | LN           | 17.8  | 21.8 | 1                       | 16                                     | 1   | 21.8   | 28.8                                      |
| SMBJ16A     | LP           | 17.8  | 19.7 | 1                       | 16                                     | 1   | 24.2   | 26.0                                      |
| SMBJ17      | LQ           | 18.9  | 23.1 | 1                       | 17                                     | 1   | 20.0   | 30.5                                      |
| SMBJ17A     | LR           | 18.9  | 20.9 | 1                       | 17                                     | 1   | 22.8   | 27.6                                      |
| SMBJ18      | LS           | 20.0  | 24.4 | 1                       | 18                                     | 1   | 19.5   | 32.2                                      |
| SMBJ18A     | LT           | 20.0  | 22.1 | 1                       | 18                                     | 1   | 21.5   | 29.2                                      |
| SMBJ20      | LU           | 22.2  | 27.1 | 1                       | 20                                     | 1   | 17.6   | 35.8                                      |
| SMBJ20A     | LV           | 22.2  | 24.5 | 1                       | 20                                     | 1   | 19.4   | 32.4                                      |
| SMBJ22      | LW           | 24.4  | 29.8 | 1                       | 22                                     | 1   | 15.0   | 39.4                                      |
| SMBJ22A     | LX           | 24.4  | 26.9 | 1                       | 22                                     | 1   | 17.7   | 35.5                                      |
| SMBJ24      | LY           | 26.7  | 32.6 | 1                       | 24                                     | 1   | 14.6   | 43.0                                      |
| SMBJ24A     | LZ           | 26.7  | 29.5 | 1                       | 24                                     | 1   | 16.0   | 38.9                                      |

| ELECTRICAL SPECIFICATIONS (T <sub>A</sub> = 25°C unless otherwise noted) |              |   |      |  |   |   |  |  |
|--|--------------|---|------|--|---|---|--|--|
| Part number  | Marking code | Breakdown voltage<br>V <sub>BR</sub> @I <sub>T</sub><br>(V)<br>(Note 1) |      | Test current<br>I <sub>T</sub><br>(mA) | Working stand-off voltage<br>V <sub>WM</sub><br>(V) | Maximum blocking leakage current<br>I <sub>D</sub> @V <sub>WM</sub><br>(μA) | Maximum peak impulse current<br>I <sub>PP</sub><br>(A)<br>(Note 2) | Maximum clamping voltage<br>V <sub>C</sub> @I <sub>PP</sub><br>(V) |
|  |              | Min   | Max  |  |   |   |  |  |
| SMBJ26   | MD           | 28.9  | 35.3 | 1                                      | 26  | 1   | 13.5   | 46.6   |
| SMBJ26A  | ME           | 28.9  | 31.9 | 1                                      | 26  | 1   | 14.9   | 42.1   |
| SMBJ28   | MF           | 31.1  | 38.0 | 1                                      | 28  | 1   | 12.6   | 50.0   |
| SMBJ28A  | MG           | 31.1  | 34.4 | 1                                      | 28  | 1   | 13.8   | 45.4   |
| SMBJ30   | MH           | 33.3  | 40.7 | 1                                      | 30  | 1   | 11.7   | 53.5   |
| SMBJ30A  | MK           | 33.3  | 36.8 | 1                                      | 30  | 1   | 13.0   | 48.4   |
| SMBJ33   | ML           | 36.7  | 44.9 | 1                                      | 33  | 1   | 10.6   | 59.0   |
| SMBJ33A  | MM           | 36.7  | 40.6 | 1                                      | 33  | 1   | 11.8   | 53.3   |
| SMBJ36   | MN           | 40.0  | 48.9 | 1                                      | 36  | 1   | 9.8  | 64.3   |
| SMBJ36A  | MP           | 40.0  | 44.2 | 1                                      | 36  | 1   | 10.8   | 58.1   |
| SMBJ40   | MQ           | 44.4  | 54.3 | 1                                      | 40  | 1   | 8.8  | 71.4   |
| SMBJ40A  | MR           | 44.4  | 49.1 | 1                                      | 40  | 1   | 9.7  | 64.5   |
| SMBJ43   | MS           | 47.8  | 58.4 | 1                                      | 43  | 1   | 8.2  | 76.7   |
| SMBJ43A  | MT           | 47.8  | 52.8 | 1                                      | 43  | 1   | 9.0  | 69.4   |
| SMBJ45   | MU           | 50.0  | 61.1 | 1                                      | 45  | 1   | 7.8  | 80.3   |
| SMBJ45A  | MV           | 50.0  | 55.3 | 1                                      | 45  | 1   | 8.6  | 72.7   |
| SMBJ48   | MW           | 53.3  | 65.1 | 1                                      | 48  | 1   | 7.3  | 85.5   |
| SMBJ48A  | MX           | 53.3  | 58.9 | 1                                      | 48  | 1   | 8.1  | 77.4   |
| SMBJ51   | MY           | 56.7  | 69.3 | 1                                      | 51  | 1   | 6.9  | 91.1   |
| SMBJ51A  | MZ           | 56.7  | 62.7 | 1                                      | 51  | 1   | 7.6  | 82.4   |
| SMBJ54   | ND           | 60.0  | 73.3 | 1                                      | 54  | 1   | 6.5  | 96.3   |
| SMBJ54A  | NE           | 60.0  | 66.3 | 1                                      | 54  | 1   | 7.2  | 87.1   |
| SMBJ58   | NF           | 64.4  | 78.7 | 1                                      | 58  | 1   | 6.1  | 103  |
| SMBJ58A  | NG           | 64.4  | 71.2 | 1                                      | 58  | 1   | 6.7  | 93.6   |
| SMBJ60   | NH           | 66.7  | 81.5 | 1                                      | 60  | 1   | 5.8  | 107  |
| SMBJ60A  | NK           | 66.7  | 73.7 | 1                                      | 60  | 1   | 6.5  | 96.8   |
| SMBJ64   | NL           | 71.1  | 86.9 | 1                                      | 64  | 1   | 5.5  | 114  |
| SMBJ64A  | NM           | 71.1  | 78.6 | 1                                      | 64  | 1   | 6.1  | 103  |
| SMBJ70   | NN           | 77.8  | 95.1 | 1                                      | 70  | 1   | 5.0  | 125  |
| SMBJ70A  | NP           | 77.8  | 86   | 1                                      | 70  | 1   | 5.5  | 113  |
| SMBJ75   | NQ           | 83.3  | 102  | 1                                      | 75  | 1   | 4.7  | 134  |
| SMBJ75A  | NR           | 83.3  | 92.1 | 1                                      | 75  | 1   | 5.2  | 121  |
| SMBJ78   | NS           | 86.7  | 106  | 1                                      | 78  | 1   | 4.5  | 139  |
| SMBJ78A  | NT           | 86.7  | 95.8 | 1                                      | 78  | 1   | 5.0  | 126  |
| SMBJ85   | NU           | 94.4  | 115  | 1                                      | 85  | 1   | 4.1  | 151  |
| SMBJ85A  | NV           | 94.4  | 104  | 1                                      | 85  | 1   | 4.6  | 137  |
| SMBJ90   | NW           | 100   | 122  | 1                                      | 90  | 1   | 3.9  | 160  |
| SMBJ90A  | NX           | 100   | 111  | 1                                      | 90  | 1   | 4.3  | 146  |
| SMBJ100  | NY           | 111   | 136  | 1                                      | 100   | 1   | 3.5  | 179  |
| SMBJ100A   | NZ           | 111   | 123  | 1                                      | 100   | 1   | 3.8  | 162  |
| SMBJ110  | PD           | 122   | 149  | 1                                      | 110   | 1   | 3.2  | 196  |
| SMBJ110A   | PE           | 122   | 135  | 1                                      | 110   | 1   | 3.5  | 177  |
| SMBJ120  | PF           | 133   | 163  | 1                                      | 120   | 1   | 2.9  | 214  |
| SMBJ120A   | PG           | 133   | 147  | 1                                      | 120   | 1   | 3.2  | 193  |
| SMBJ130  | PH           | 144   | 176  | 1                                      | 130   | 1   | 2.7  | 231  |
| SMBJ130A   | PK           | 144   | 159  | 1                                      | 130   | 1   | 3.0  | 209  |
| SMBJ150  | PL           | 167   | 204  | 1                                      | 150   | 1   | 2.3  | 266  |
| SMBJ150A   | PM           | 167   | 185  | 1                                      | 150   | 1   | 2.5  | 243  |
| SMBJ160  | PN           | 178   | 218  | 1                                      | 160   | 1   | 2.2  | 287  |
| SMBJ160A   | PP           | 178   | 197  | 1                                      | 160   | 1   | 2.4  | 259  |
| SMBJ170  | PQ           | 189   | 231  | 1                                      | 170   | 1   | 2.0  | 304  |

| <b>ELECTRICAL SPECIFICATIONS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted) |              |  |     |                               |  |   |   |   |
|---|--------------|--|-----|-------------------------------|--|---|---|---|
| Part number   | Marking code | Breakdown voltage<br>$V_{BR}@I_T$<br>(V)<br>(Note 1) |     | Test current<br>$I_T$<br>(mA) | Working stand-off voltage<br>$V_{WM}$<br>(V) | Maximum blocking leakage current<br>$I_D@V_{WM}$<br>( $\mu\text{A}$ ) | Maximum peak impulse current<br>$I_{PP}$<br>(A)<br>(Note 2) | Maximum clamping voltage<br>$V_C@I_{PP}$<br>(V) |
|   |              | Min  | Max |                               |  |   |   |   |
| SMBJ170A  | PR           | 189  | 209 | 1                             | 170  | 1   | 2.2   | 275   |

**Notes:**

1.  $V_{BR}$  measure after  $I_T$  applied for 30ms,  $I_T =$  square wave pulse or equivalent.
2. Surge current waveform per Fig.3 and derate per Fig.2.
3. All terms and symbols are consistent with ANSI/IEEE C62.35.
4. For bidirectional use C or CA suffix for types SMBJ5.0 - SMBJ170
5. For bipolar types having  $V_{WM}$  of 10V (SMBJ10C) and under, the  $I_D$  limit is doubled.

| <b>ORDERING INFORMATION</b>        |                |                     |
|------------------------------------|----------------|---------------------|
| <b>ORDERING CODE<sup>(1)</sup></b> | <b>PACKAGE</b> | <b>PACKING</b>      |
| SMBJx                              | DO-214AA (SMB) | 3,000 / Tape & Reel |

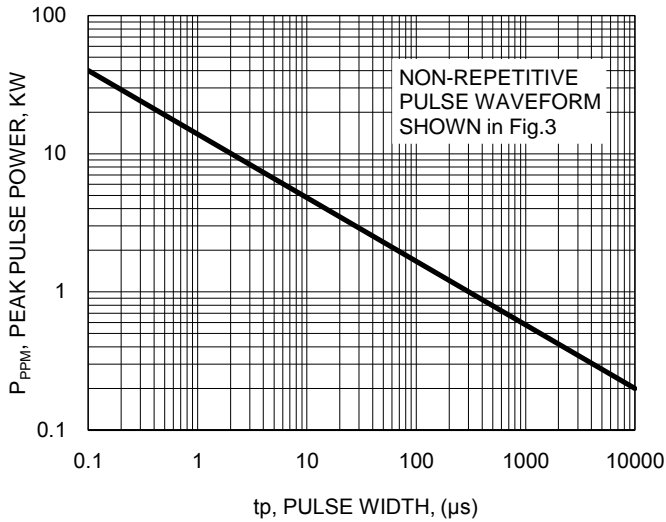
**Notes:**

1. "x" defines voltage from 5V(SMBJ5.0) to 170V(SMBJ170A)

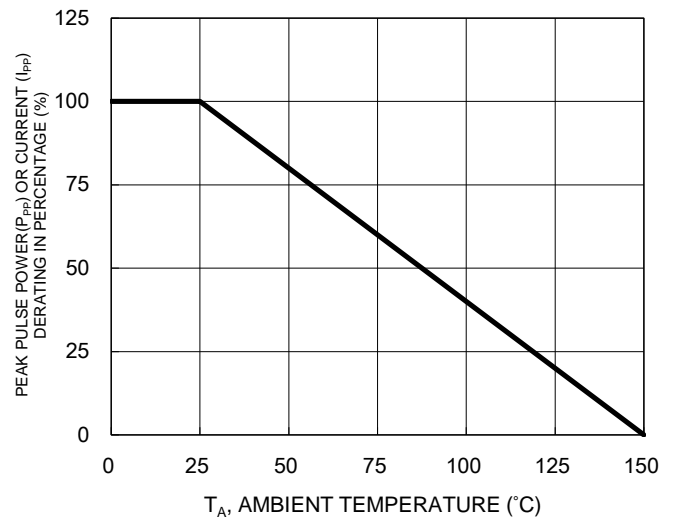
**CHARACTERISTICS CURVES**

( $T_A = 25^\circ\text{C}$  unless otherwise noted)

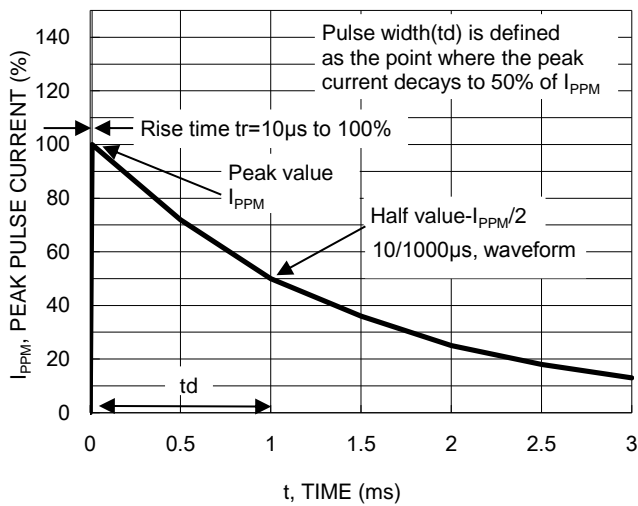
**Fig.1 Peak Pulse Power Rating Curve**



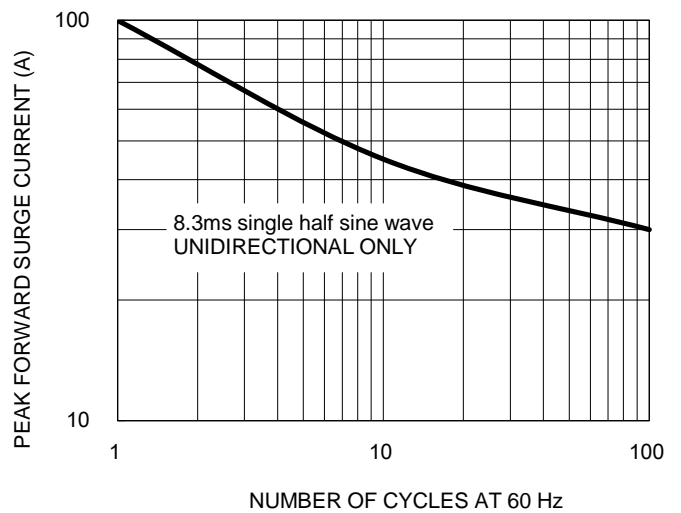
**Fig.2 Pulse Derating Curve**



**Fig.3 Clamping Power Pulse Waveform**



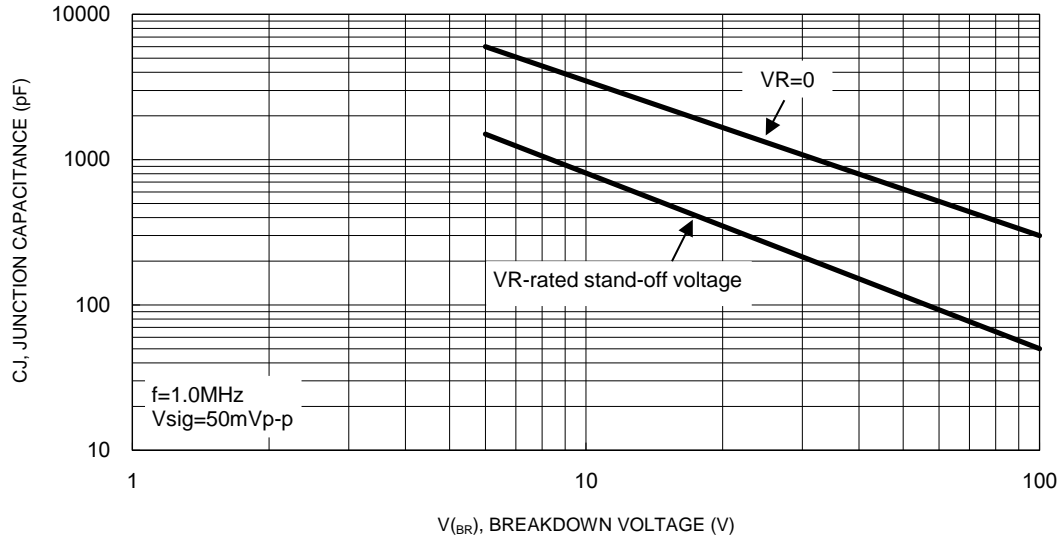
**Fig.4 Maximum Non-Repetitive Forward Surge Current**



**CHARACTERISTICS CURVES**

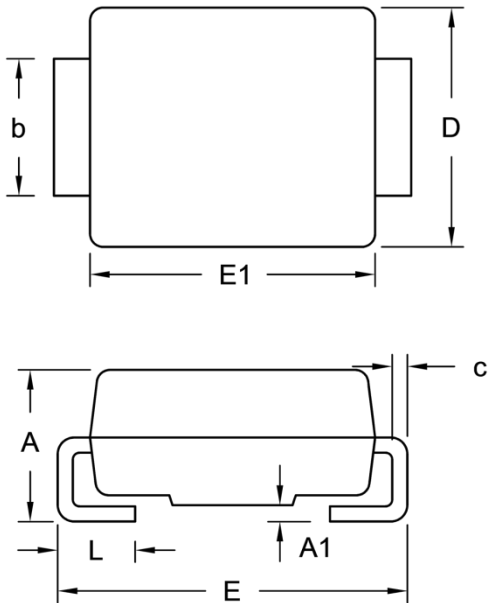
( $T_A = 25^\circ\text{C}$  unless otherwise noted)

**Fig.5 Typical Junction Capacitance**



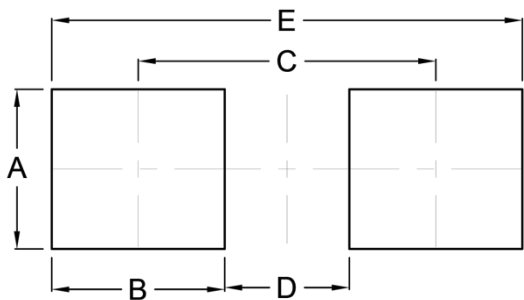
**PACKAGE OUTLINE DIMENSIONS**

DO-214AA (SMB)



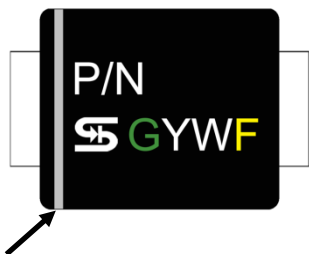
| DIM. | Unit (mm) |      | Unit (inch) |       |
|------|-----------|------|-------------|-------|
|      | Min.      | Max. | Min.        | Max.  |
| A    | 1.95      | 2.65 | 0.077       | 0.104 |
| A1   | 0.05      | 0.20 | 0.002       | 0.008 |
| b    | 1.95      | 2.20 | 0.077       | 0.087 |
| c    | 0.15      | 0.31 | 0.006       | 0.012 |
| D    | 3.30      | 3.95 | 0.130       | 0.156 |
| E    | 5.10      | 5.60 | 0.201       | 0.220 |
| E1   | 4.05      | 4.60 | 0.159       | 0.181 |
| L    | 0.75      | 1.60 | 0.030       | 0.063 |

**SUGGESTED PAD LAYOUT**



| Symbol | Unit (mm) | Unit (inch) |
|--------|-----------|-------------|
| A      | 2.30      | 0.091       |
| B      | 2.50      | 0.098       |
| C      | 4.30      | 0.169       |
| D      | 1.80      | 0.071       |
| E      | 6.80      | 0.268       |

**MARKING DIAGRAM**



- P/N = Marking Code
- G = Green Compound
- YW = Date Code
- F = Factory Code

Cathode band for uni-directional products only

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