

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

### FEATURES

- AEC-Q101 qualified
- 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    |
| $T_{J\ MAX}$                 | 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 SMBJ5.0H - SMBJ90H devices and  $V_F = 5.0\text{V}$  on SMBJ100H - SMBJ170H devices

#### Devices for Bipolar Applications

1. For bidirectional use CH or CAH suffix for types SMBJ5.0H - types SMBJ170H
2. Electrical characteristics apply in both directions

**THERMAL PERFORMANCE**

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

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

| Part number | Marking code | Breakdown voltage<br>$V_{BR@I_T}$<br>(V)<br>(Note 1) |      | Test<br>current<br>$I_T$<br>(mA) | Working<br>stand-off<br>voltage<br>$V_{WM}$<br>(V) | Maximum<br>blocking<br>leakage<br>current<br>$I_D@V_{WM}$<br>( $\mu\text{A}$ ) | Maximum<br>peak<br>impulse<br>current<br>$I_{PP}$<br>(A)<br>(Note 2) | Maximum<br>clamping<br>voltage<br>$V_C@I_{PP}$<br>(V) |
|-------------|--------------|------------------------------------------------------|------|----------------------------------|----------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------|
|             |              | Min                                                  | Max  |                                  |                                                    |                                                                                |                                                                      |                                                       |
| SMBJ5.0H    | KD           | 6.40                                                 | 7.30 | 10                               | 5.0                                                | 800                                                                            | 65.0                                                                 | 9.6                                                   |
| SMBJ5.0AH   | KE           | 6.40                                                 | 7.00 | 10                               | 5.0                                                | 800                                                                            | 68.0                                                                 | 9.2                                                   |
| SMBJ6.0H    | KF           | 6.67                                                 | 8.15 | 10                               | 6.0                                                | 800                                                                            | 55.0                                                                 | 11.4                                                  |
| SMBJ6.0AH   | KG           | 6.67                                                 | 7.37 | 10                               | 6.0                                                | 800                                                                            | 61.0                                                                 | 10.3                                                  |
| SMBJ6.5H    | KH           | 7.22                                                 | 8.82 | 10                               | 6.5                                                | 500                                                                            | 51.0                                                                 | 12.3                                                  |
| SMBJ6.5AH   | KK           | 7.22                                                 | 7.98 | 10                               | 6.5                                                | 500                                                                            | 56.0                                                                 | 11.2                                                  |
| SMBJ7.0H    | KL           | 7.78                                                 | 9.51 | 10                               | 7.0                                                | 200                                                                            | 47.0                                                                 | 13.3                                                  |
| SMBJ7.0AH   | KM           | 7.78                                                 | 8.60 | 10                               | 7.0                                                | 200                                                                            | 52.0                                                                 | 12.0                                                  |
| SMBJ7.5H    | KN           | 8.33                                                 | 10.3 | 1                                | 7.5                                                | 100                                                                            | 44.0                                                                 | 14.3                                                  |
| SMBJ7.5AH   | KP           | 8.33                                                 | 9.21 | 1                                | 7.5                                                | 100                                                                            | 48.0                                                                 | 12.9                                                  |
| SMBJ8.0H    | KQ           | 8.89                                                 | 10.9 | 1                                | 8.0                                                | 50                                                                             | 42.0                                                                 | 15.0                                                  |
| SMBJ8.0AH   | KR           | 8.89                                                 | 9.83 | 1                                | 8.0                                                | 50                                                                             | 46.0                                                                 | 13.6                                                  |
| SMBJ8.5H    | KS           | 9.44                                                 | 11.5 | 1                                | 8.5                                                | 10                                                                             | 39.0                                                                 | 15.9                                                  |
| SMBJ8.5AH   | KT           | 9.44                                                 | 10.4 | 1                                | 8.5                                                | 10                                                                             | 43.0                                                                 | 14.4                                                  |
| SMBJ9.0H    | KU           | 10.0                                                 | 12.2 | 1                                | 9.0                                                | 5                                                                              | 37.0                                                                 | 16.9                                                  |
| SMBJ9.0AH   | KV           | 10.0                                                 | 11.1 | 1                                | 9.0                                                | 5                                                                              | 40.0                                                                 | 15.4                                                  |
| SMBJ10H     | KW           | 11.1                                                 | 13.6 | 1                                | 10                                                 | 5                                                                              | 33.0                                                                 | 18.8                                                  |
| SMBJ10AH    | KX           | 11.1                                                 | 12.3 | 1                                | 10                                                 | 5                                                                              | 37.0                                                                 | 17.0                                                  |
| SMBJ11H     | KY           | 12.2                                                 | 14.9 | 1                                | 11                                                 | 1                                                                              | 31.0                                                                 | 20.1                                                  |
| SMBJ11AH    | KZ           | 12.2                                                 | 13.5 | 1                                | 11                                                 | 1                                                                              | 34.0                                                                 | 18.2                                                  |
| SMBJ12H     | LD           | 13.3                                                 | 16.3 | 1                                | 12                                                 | 1                                                                              | 28.0                                                                 | 22.0                                                  |
| SMBJ12AH    | LE           | 13.3                                                 | 14.7 | 1                                | 12                                                 | 1                                                                              | 31.0                                                                 | 19.9                                                  |
| SMBJ13H     | LF           | 14.4                                                 | 17.6 | 1                                | 13                                                 | 1                                                                              | 26.0                                                                 | 23.8                                                  |
| SMBJ13AH    | LG           | 14.4                                                 | 15.9 | 1                                | 13                                                 | 1                                                                              | 29.0                                                                 | 21.5                                                  |
| SMBJ14H     | LH           | 15.6                                                 | 19.1 | 1                                | 14                                                 | 1                                                                              | 24.4                                                                 | 25.8                                                  |
| SMBJ14AH    | LK           | 15.6                                                 | 17.2 | 1                                | 14                                                 | 1                                                                              | 27.0                                                                 | 23.2                                                  |
| SMBJ15H     | LL           | 16.7                                                 | 20.4 | 1                                | 15                                                 | 1                                                                              | 23.1                                                                 | 26.9                                                  |
| SMBJ15AH    | LM           | 16.7                                                 | 18.5 | 1                                | 15                                                 | 1                                                                              | 25.1                                                                 | 24.4                                                  |
| SMBJ16H     | LN           | 17.8                                                 | 21.8 | 1                                | 16                                                 | 1                                                                              | 21.8                                                                 | 28.8                                                  |
| SMBJ16AH    | LP           | 17.8                                                 | 19.7 | 1                                | 16                                                 | 1                                                                              | 24.2                                                                 | 26.0                                                  |
| SMBJ17H     | LQ           | 18.9                                                 | 23.1 | 1                                | 17                                                 | 1                                                                              | 20.0                                                                 | 30.5                                                  |
| SMBJ17AH    | LR           | 18.9                                                 | 20.9 | 1                                | 17                                                 | 1                                                                              | 22.8                                                                 | 27.6                                                  |
| SMBJ18H     | LS           | 20.0                                                 | 24.4 | 1                                | 18                                                 | 1                                                                              | 19.5                                                                 | 32.2                                                  |
| SMBJ18AH    | LT           | 20.0                                                 | 22.1 | 1                                | 18                                                 | 1                                                                              | 21.5                                                                 | 29.2                                                  |
| SMBJ20H     | LU           | 22.2                                                 | 27.1 | 1                                | 20                                                 | 1                                                                              | 17.6                                                                 | 35.8                                                  |
| SMBJ20AH    | LV           | 22.2                                                 | 24.5 | 1                                | 20                                                 | 1                                                                              | 19.4                                                                 | 32.4                                                  |
| SMBJ22H     | LW           | 24.4                                                 | 29.8 | 1                                | 22                                                 | 1                                                                              | 15.0                                                                 | 39.4                                                  |
| SMBJ22AH    | LX           | 24.4                                                 | 26.9 | 1                                | 22                                                 | 1                                                                              | 17.7                                                                 | 35.5                                                  |
| SMBJ24H     | LY           | 26.7                                                 | 32.6 | 1                                | 24                                                 | 1                                                                              | 14.6                                                                 | 43.0                                                  |
| SMBJ24AH    | LZ           | 26.7                                                 | 29.5 | 1                                | 24                                                 | 1                                                                              | 16.0                                                                 | 38.9                                                  |
| SMBJ26H     | MD           | 28.9                                                 | 35.3 | 1                                | 26                                                 | 1                                                                              | 13.5                                                                 | 46.6                                                  |
| SMBJ26AH    | ME           | 28.9                                                 | 31.9 | 1                                | 26                                                 | 1                                                                              | 14.9                                                                 | 42.1                                                  |

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

| Part number | Marking code | Breakdown voltage<br>$V_{BR}@I_T$<br>(V)<br>(Note 1) |      | Test<br>current<br>$I_T$<br>(mA) | Working<br>stand-off<br>voltage<br>$V_{WM}$<br>(V) | Maximum<br>blocking<br>leakage<br>current<br>$I_D@V_{WM}$<br>( $\mu\text{A}$ ) | Maximum<br>peak<br>impulse<br>current<br>$I_{PP}$<br>(A)<br>(Note 2) | Maximum<br>clamping<br>voltage<br>$V_C@I_{PP}$<br>(V) |
|-------------|--------------|------------------------------------------------------|------|----------------------------------|----------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------|
|             |              | Min                                                  | Max  |                                  |                                                    |                                                                                |                                                                      |                                                       |
| SMBJ28H     | MF           | 31.1                                                 | 38.0 | 1                                | 28                                                 | 1                                                                              | 12.6                                                                 | 50.0                                                  |
| SMBJ28AH    | MG           | 31.1                                                 | 34.4 | 1                                | 28                                                 | 1                                                                              | 13.8                                                                 | 45.4                                                  |
| SMBJ30H     | MH           | 33.3                                                 | 40.7 | 1                                | 30                                                 | 1                                                                              | 11.7                                                                 | 53.5                                                  |
| SMBJ30AH    | MK           | 33.3                                                 | 36.8 | 1                                | 30                                                 | 1                                                                              | 13.0                                                                 | 48.4                                                  |
| SMBJ33H     | ML           | 36.7                                                 | 44.9 | 1                                | 33                                                 | 1                                                                              | 10.6                                                                 | 59.0                                                  |
| SMBJ33AH    | MM           | 36.7                                                 | 40.6 | 1                                | 33                                                 | 1                                                                              | 11.8                                                                 | 53.3                                                  |
| SMBJ36H     | MN           | 40.0                                                 | 48.9 | 1                                | 36                                                 | 1                                                                              | 9.8                                                                  | 64.3                                                  |
| SMBJ36AH    | MP           | 40.0                                                 | 44.2 | 1                                | 36                                                 | 1                                                                              | 10.8                                                                 | 58.1                                                  |
| SMBJ40H     | MQ           | 44.4                                                 | 54.3 | 1                                | 40                                                 | 1                                                                              | 8.8                                                                  | 71.4                                                  |
| SMBJ40AH    | MR           | 44.4                                                 | 49.1 | 1                                | 40                                                 | 1                                                                              | 9.7                                                                  | 64.5                                                  |
| SMBJ43H     | MS           | 47.8                                                 | 58.4 | 1                                | 43                                                 | 1                                                                              | 8.2                                                                  | 76.7                                                  |
| SMBJ43AH    | MT           | 47.8                                                 | 52.8 | 1                                | 43                                                 | 1                                                                              | 9.0                                                                  | 69.4                                                  |
| SMBJ45H     | MU           | 50.0                                                 | 61.1 | 1                                | 45                                                 | 1                                                                              | 7.8                                                                  | 80.3                                                  |
| SMBJ45AH    | MV           | 50.0                                                 | 55.3 | 1                                | 45                                                 | 1                                                                              | 8.6                                                                  | 72.7                                                  |
| SMBJ48H     | MW           | 53.3                                                 | 65.1 | 1                                | 48                                                 | 1                                                                              | 7.3                                                                  | 85.5                                                  |
| SMBJ48AH    | MX           | 53.3                                                 | 58.9 | 1                                | 48                                                 | 1                                                                              | 8.1                                                                  | 77.4                                                  |
| SMBJ51H     | MY           | 56.7                                                 | 69.3 | 1                                | 51                                                 | 1                                                                              | 6.9                                                                  | 91.1                                                  |
| SMBJ51AH    | MZ           | 56.7                                                 | 62.7 | 1                                | 51                                                 | 1                                                                              | 7.6                                                                  | 82.4                                                  |
| SMBJ54H     | ND           | 60.0                                                 | 73.3 | 1                                | 54                                                 | 1                                                                              | 6.5                                                                  | 96.3                                                  |
| SMBJ54AH    | NE           | 60.0                                                 | 66.3 | 1                                | 54                                                 | 1                                                                              | 7.2                                                                  | 87.1                                                  |
| SMBJ58H     | NF           | 64.4                                                 | 78.7 | 1                                | 58                                                 | 1                                                                              | 6.1                                                                  | 103                                                   |
| SMBJ58AH    | NG           | 64.4                                                 | 71.2 | 1                                | 58                                                 | 1                                                                              | 6.7                                                                  | 93.6                                                  |
| SMBJ60H     | NH           | 66.7                                                 | 81.5 | 1                                | 60                                                 | 1                                                                              | 5.8                                                                  | 107                                                   |
| SMBJ60AH    | NK           | 66.7                                                 | 73.7 | 1                                | 60                                                 | 1                                                                              | 6.5                                                                  | 96.8                                                  |
| SMBJ64H     | NL           | 71.1                                                 | 86.9 | 1                                | 64                                                 | 1                                                                              | 5.5                                                                  | 114                                                   |
| SMBJ64AH    | NM           | 71.1                                                 | 78.6 | 1                                | 64                                                 | 1                                                                              | 6.1                                                                  | 103                                                   |
| SMBJ70H     | NN           | 77.8                                                 | 95.1 | 1                                | 70                                                 | 1                                                                              | 5.0                                                                  | 125                                                   |
| SMBJ70AH    | NP           | 77.8                                                 | 86   | 1                                | 70                                                 | 1                                                                              | 5.5                                                                  | 113                                                   |
| SMBJ75H     | NQ           | 83.3                                                 | 102  | 1                                | 75                                                 | 1                                                                              | 4.7                                                                  | 134                                                   |
| SMBJ75AH    | NR           | 83.3                                                 | 92.1 | 1                                | 75                                                 | 1                                                                              | 5.2                                                                  | 121                                                   |
| SMBJ78H     | NS           | 86.7                                                 | 106  | 1                                | 78                                                 | 1                                                                              | 4.5                                                                  | 139                                                   |
| SMBJ78AH    | NT           | 86.7                                                 | 95.8 | 1                                | 78                                                 | 1                                                                              | 5.0                                                                  | 126                                                   |
| SMBJ85H     | NU           | 94.4                                                 | 115  | 1                                | 85                                                 | 1                                                                              | 4.1                                                                  | 151                                                   |
| SMBJ85AH    | NV           | 94.4                                                 | 104  | 1                                | 85                                                 | 1                                                                              | 4.6                                                                  | 137                                                   |
| SMBJ90H     | NW           | 100                                                  | 122  | 1                                | 90                                                 | 1                                                                              | 3.9                                                                  | 160                                                   |
| SMBJ90AH    | NX           | 100                                                  | 111  | 1                                | 90                                                 | 1                                                                              | 4.3                                                                  | 146                                                   |
| SMBJ100H    | NY           | 111                                                  | 136  | 1                                | 100                                                | 1                                                                              | 3.5                                                                  | 179                                                   |
| SMBJ100AH   | NZ           | 111                                                  | 123  | 1                                | 100                                                | 1                                                                              | 3.8                                                                  | 162                                                   |
| SMBJ110H    | PD           | 122                                                  | 149  | 1                                | 110                                                | 1                                                                              | 3.2                                                                  | 196                                                   |
| SMBJ110AH   | PE           | 122                                                  | 135  | 1                                | 110                                                | 1                                                                              | 3.5                                                                  | 177                                                   |
| SMBJ120H    | PF           | 133                                                  | 163  | 1                                | 120                                                | 1                                                                              | 2.9                                                                  | 214                                                   |
| SMBJ120AH   | PG           | 133                                                  | 147  | 1                                | 120                                                | 1                                                                              | 3.2                                                                  | 193                                                   |
| SMBJ130H    | PH           | 144                                                  | 176  | 1                                | 130                                                | 1                                                                              | 2.7                                                                  | 231                                                   |
| SMBJ130AH   | PK           | 144                                                  | 159  | 1                                | 130                                                | 1                                                                              | 3.0                                                                  | 209                                                   |
| SMBJ150H    | PL           | 167                                                  | 204  | 1                                | 150                                                | 1                                                                              | 2.3                                                                  | 266                                                   |
| SMBJ150AH   | PM           | 167                                                  | 185  | 1                                | 150                                                | 1                                                                              | 2.5                                                                  | 243                                                   |
| SMBJ160H    | PN           | 178                                                  | 218  | 1                                | 160                                                | 1                                                                              | 2.2                                                                  | 287                                                   |
| SMBJ160AH   | PP           | 178                                                  | 197  | 1                                | 160                                                | 1                                                                              | 2.4                                                                  | 259                                                   |
| SMBJ170H    | PQ           | 189                                                  | 231  | 1                                | 170                                                | 1                                                                              | 2.0                                                                  | 304                                                   |

**ELECTRICAL SPECIFICATIONS** ( $T_A = 25^\circ\text{C}$  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 |                               |                                              |                                                                       |                                                             |                                                 |
| SMBJ170AH   | PR           | 189                                                  | 209 | 1                             | 170                                          | 1                                                                     | 2.2                                                         | 275                                             |

**Notes:**

- $V_{BR}$  measure after  $I_T$  applied for 30ms,  $I_T$ =square wave pulse or equivalent.
- Surge current waveform per Figure. 3 and derate per Figure. 2.
- All terms and symbols are consistent with ANSI/IEEE C62.35.
- For bidirectional use CH or CAH suffix for types SMBJ5.0H - SMBJ170H
- For bipolar types having  $V_{WM}$  of 10V (SMBJ10CH) and under, the  $I_D$  limit is doubled.

**ORDERING INFORMATION**

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

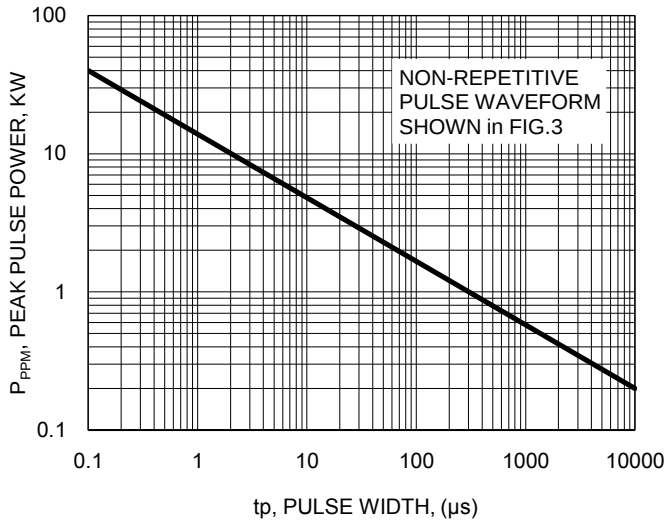
**Notes:**

- "x" defines voltage from 5V(SMBJ5.0H) to 170V(SMBJ170AH)

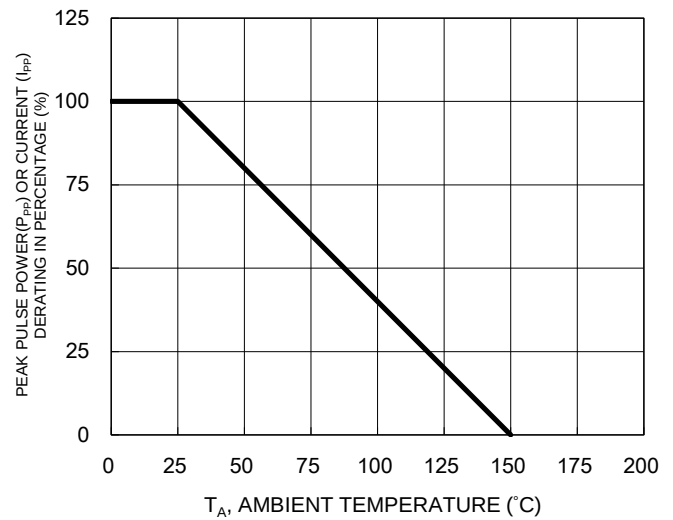
## CHARACTERISTICS CURVES

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

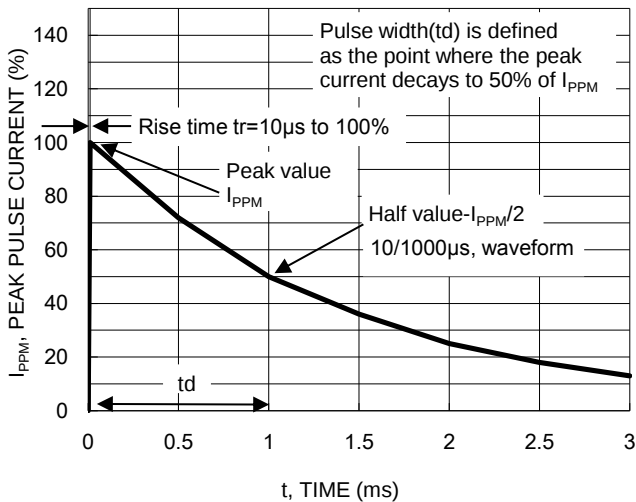
**Fig.1 Peak Pulse Power Rating Curve**



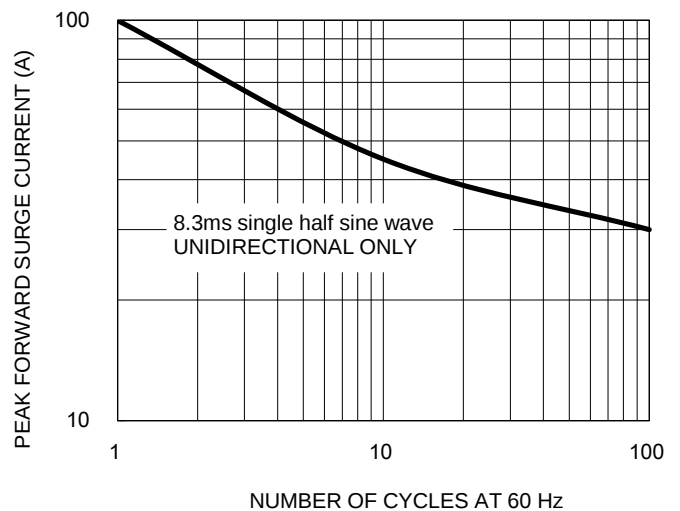
**Fig.2 Pulse Derating Curve**



**Fig.3 Clamping Power Pulse Waveform**



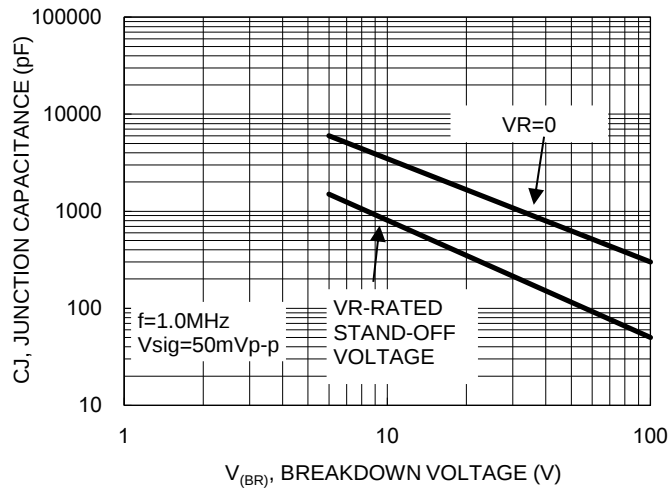
**Fig.4 Maximum Non-Repetitive Forward Surge Current**



## CHARACTERISTICS CURVES

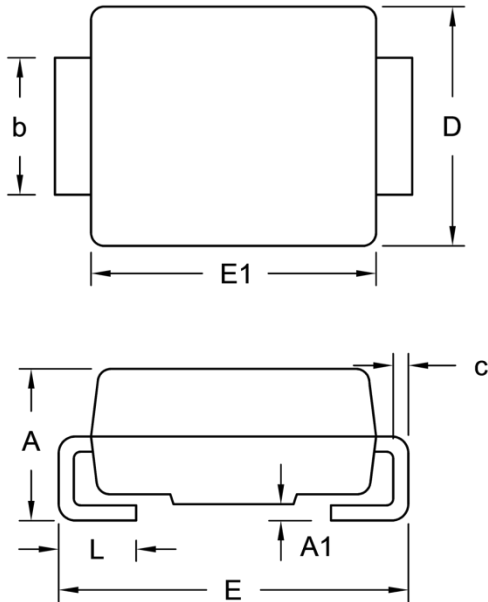
( $T_A = 25^\circ\text{C}$  unless otherwise noted)

**Fig.5 Typical Junction Capacitance**



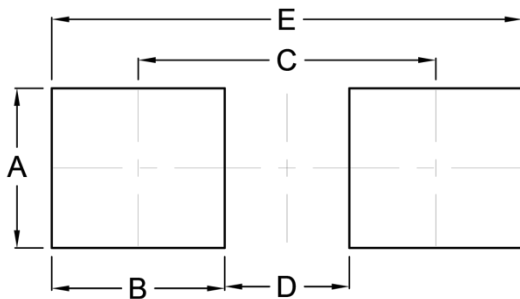
## PACKAGE OUTLINE DIMENSIONS

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



Cathode band for uni-directional products only

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

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