

## 1500W, 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 from 0 V to BV min
- Typical  $I_R$  less than 1 $\mu$ A above 10V
- Moisture sensitivity level: level 1, per J-STD-020
- AEC-Q101 qualified available: ordering code with suffix "H"
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC

### KEY PARAMETERS

| PARAMETER     | VALUE          | UNIT |
|---------------|----------------|------|
| $V_{WM}$      | 5 - 170        | V    |
| $V_{BR}$      | 6.4 - 231      | V    |
| $P_{PK}$      | 1500           | W    |
| $T_{J\ MAX}$  | 150            | °C   |
| Package       | DO-214AB (SMC) |      |
| Configuration | Single die     |      |



### APPLICATIONS

- Immunization of sensitive devices in automotive, telecommunications, consumer electronics, and industrial equipment from electrostatic discharge (ESD) and transient voltages induced by load switching and lightning.



DO-214AB (SMC)

### MECHANICAL DATA

- Case : DO-214AB (SMC)
- 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 : 0.21 g (approximately)

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

| PARAMETER                                                                           | SYMBOL    | VALUE       | UNIT |
|-------------------------------------------------------------------------------------|-----------|-------------|------|
| Peak power dissipation at $T_A=25^\circ\text{C}$ , $t_p=1\text{ms}^{(1)}$           | $P_{PK}$  | 1500        | W    |
| Steady state power dissipation at $T_A=25^\circ\text{C}$                            | $P_D$     | 5           | W    |
| Peak forward surge current, 8.3 ms single half sine-wave superimposed on rated load | $I_{FSM}$ | 200         | A    |
| Forward Voltage @ $I_F=100\text{A}$ for Unidirectional only <sup>(2)</sup>          | $V_F$     | 3.5 / 5.0   | V    |
| Junction temperature                                                                | $T_J$     | -55 to +150 | °C   |
| Storage temperature                                                                 | $T_{STG}$ | -55 to +150 | °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 SMCJ5.0 - SMCJ90 devices and  $V_F=5.0\text{V}$  on SMCJ100 - SMCJ170 devices

Devices for bipolar applications

1. For bidirectional use C or CA suffix for types SMCJ5.0 - types SMCJ170
2. Electrical characteristics apply in both directions

**THERMAL PERFORMANCE**

| PARAMETER                              | SYMBOL          | TYP | UNIT |
|----------------------------------------|-----------------|-----|------|
| Junction-to-ambient thermal resistance | $R_{\theta JA}$ | 55  | °C/W |
| Junction-to-case thermal resistance    | $R_{\theta JC}$ | 10  | °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) |       | Test current<br>$I_T$<br>(mA) | Working stand-off voltage<br>$V_{WM}$<br>(V) | Maximum Reverse Leakage<br>(Note 3)<br>$I_R@V_{WM}$ (μA) | Maximum peak impulse current<br>(Note 2)<br>$I_{PPM}$<br>(A) | Maximum clamping voltage<br>(Note 2)<br>$V_C@I_{PPM}$<br>(V) |
|-------------|--------------|------------------------------------------|-------|-------------------------------|----------------------------------------------|----------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|             |              | MIN.                                     | MAX.  |                               |                                              |                                                          |                                                              |                                                              |
| SMCJ5.0     | GDD          | 6.4                                      | 7.3   | 10                            | 5                                            | 1000                                                     | 164                                                          | 9.6                                                          |
| SMCJ5.0A    | GDE          | 6.4                                      | 7     | 10                            | 5                                            | 1000                                                     | 171                                                          | 9.2                                                          |
| SMCJ6.0     | GDF          | 6.67                                     | 8.15  | 10                            | 6                                            | 1000                                                     | 138                                                          | 11.4                                                         |
| SMCJ6.0A    | GDG          | 6.67                                     | 7.37  | 10                            | 6                                            | 1000                                                     | 152                                                          | 10.3                                                         |
| SMCJ6.5     | GDH          | 7.22                                     | 8.82  | 10                            | 6.5                                          | 500                                                      | 128                                                          | 12.3                                                         |
| SMCJ6.5A    | GDK          | 7.22                                     | 7.98  | 10                            | 6.5                                          | 500                                                      | 140                                                          | 11.2                                                         |
| SMCJ7.0     | GDL          | 7.78                                     | 9.51  | 10                            | 7                                            | 200                                                      | 118                                                          | 13.3                                                         |
| SMCJ7.0A    | GDM          | 7.78                                     | 8.6   | 10                            | 7                                            | 200                                                      | 131                                                          | 12.0                                                         |
| SMCJ7.5     | GDN          | 8.33                                     | 10.30 | 1                             | 7.5                                          | 100                                                      | 110                                                          | 14.3                                                         |
| SMCJ7.5A    | GDP          | 8.33                                     | 9.21  | 1                             | 7.5                                          | 100                                                      | 122                                                          | 12.9                                                         |
| SMCJ8.0     | GDQ          | 8.89                                     | 10.9  | 1                             | 8                                            | 50                                                       | 105                                                          | 15.0                                                         |
| SMCJ8.0A    | GDR          | 8.89                                     | 9.83  | 1                             | 8                                            | 50                                                       | 115                                                          | 13.6                                                         |
| SMCJ8.5     | GDS          | 9.44                                     | 11.5  | 1                             | 8.5                                          | 20                                                       | 99                                                           | 15.9                                                         |
| SMCJ8.5A    | GDT          | 9.44                                     | 10.4  | 1                             | 8.5                                          | 20                                                       | 109                                                          | 14.4                                                         |
| SMCJ9.0     | GDU          | 10                                       | 12.2  | 1                             | 9                                            | 10                                                       | 93                                                           | 16.9                                                         |
| SMCJ9.0A    | GDV          | 10                                       | 11.1  | 1                             | 9                                            | 10                                                       | 102                                                          | 15.4                                                         |
| SMCJ10      | GDW          | 11.1                                     | 13.6  | 1                             | 10                                           | 5                                                        | 83                                                           | 18.8                                                         |
| SMCJ10A     | GDX          | 11.1                                     | 12.3  | 1                             | 10                                           | 5                                                        | 92                                                           | 17.0                                                         |
| SMCJ11      | GDY          | 12.2                                     | 14.9  | 1                             | 11                                           | 1                                                        | 78                                                           | 20.1                                                         |
| SMCJ11A     | GDZ          | 12.2                                     | 13.5  | 1                             | 11                                           | 1                                                        | 86                                                           | 18.2                                                         |
| SMCJ12      | GED          | 13.3                                     | 16.3  | 1                             | 12                                           | 1                                                        | 71                                                           | 22.0                                                         |
| SMCJ12A     | GEE          | 13.3                                     | 14.7  | 1                             | 12                                           | 1                                                        | 79                                                           | 19.9                                                         |
| SMCJ13      | GEF          | 14.4                                     | 17.6  | 1                             | 13                                           | 1                                                        | 66                                                           | 23.8                                                         |
| SMCJ13A     | GEG          | 14.4                                     | 15.9  | 1                             | 13                                           | 1                                                        | 73                                                           | 21.5                                                         |
| SMCJ14      | GEH          | 15.6                                     | 19.1  | 1                             | 14                                           | 1                                                        | 61                                                           | 25.8                                                         |
| SMCJ14A     | GEK          | 15.6                                     | 17.2  | 1                             | 14                                           | 1                                                        | 67                                                           | 23.2                                                         |
| SMCJ15      | GEL          | 16.7                                     | 20.4  | 1                             | 15                                           | 1                                                        | 58                                                           | 26.9                                                         |
| SMCJ15A     | GEM          | 16.7                                     | 18.5  | 1                             | 15                                           | 1                                                        | 64                                                           | 24.4                                                         |
| SMCJ16      | GEN          | 17.8                                     | 21.8  | 1                             | 16                                           | 1                                                        | 54                                                           | 28.8                                                         |
| SMCJ16A     | GEP          | 17.8                                     | 19.7  | 1                             | 16                                           | 1                                                        | 60                                                           | 26.0                                                         |
| SMCJ17      | GEQ          | 18.9                                     | 23.1  | 1                             | 17                                           | 1                                                        | 51                                                           | 30.5                                                         |
| SMCJ17A     | GER          | 18.9                                     | 20.9  | 1                             | 17                                           | 1                                                        | 57                                                           | 27.6                                                         |
| SMCJ18      | GES          | 20                                       | 24.4  | 1                             | 18                                           | 1                                                        | 48                                                           | 32.2                                                         |
| SMCJ18A     | GET          | 20                                       | 22.1  | 1                             | 18                                           | 1                                                        | 53                                                           | 29.2                                                         |
| SMCJ20      | GEU          | 22.2                                     | 27.1  | 1                             | 20                                           | 1                                                        | 43                                                           | 35.8                                                         |
| SMCJ20A     | GEV          | 22.2                                     | 24.5  | 1                             | 20                                           | 1                                                        | 48                                                           | 32.4                                                         |
| SMCJ22      | GEW          | 24.4                                     | 29.8  | 1                             | 22                                           | 1                                                        | 39                                                           | 39.4                                                         |
| SMCJ22A     | GEX          | 24.4                                     | 26.9  | 1                             | 22                                           | 1                                                        | 44                                                           | 35.5                                                         |
| SMCJ24      | GEY          | 26.7                                     | 32.6  | 1                             | 24                                           | 1                                                        | 36                                                           | 43.0                                                         |
| SMCJ24A     | GEZ          | 26.7                                     | 29.5  | 1                             | 24                                           | 1                                                        | 40                                                           | 38.9                                                         |
| SMCJ26      | GFD          | 28.9                                     | 35.3  | 1                             | 26                                           | 1                                                        | 33                                                           | 46.6                                                         |
| SMCJ26A     | GFE          | 28.9                                     | 31.9  | 1                             | 26                                           | 1                                                        | 37                                                           | 42.1                                                         |
| SMCJ28      | GFF          | 31.1                                     | 38    | 1                             | 28                                           | 1                                                        | 31                                                           | 50.0                                                         |

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

| Part number | Marking code | Breakdown voltage<br>$V_{BR@I_T}$<br>(V) |      | Test current<br>$I_T$<br>(mA) | Working stand-off voltage<br>$V_{WM}$<br>(V) | Maximum Reverse Leakage<br>(Note 3)<br>$I_R@V_{WM}$ ( $\mu\text{A}$ ) | Maximum peak impulse current<br>(Note 2)<br>$I_{PPM}$<br>(A) | Maximum clamping voltage<br>(Note 2)<br>$V_C@I_{PPM}$<br>(V) |
|-------------|--------------|------------------------------------------|------|-------------------------------|----------------------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|
|             |              | MIN.                                     | MAX. |                               |                                              |                                                                       |                                                              |                                                              |
| SMCJ28A     | GFG          | 31.1                                     | 34.4 | 1                             | 28                                           | 1                                                                     | 34                                                           | 45.4                                                         |
| SMCJ30      | GFH          | 33.3                                     | 40.7 | 1                             | 30                                           | 1                                                                     | 29                                                           | 53.5                                                         |
| SMCJ30A     | GFK          | 33.3                                     | 36.8 | 1                             | 30                                           | 1                                                                     | 32                                                           | 48.4                                                         |
| SMCJ33      | GFL          | 36.7                                     | 44.9 | 1                             | 33                                           | 1                                                                     | 26                                                           | 59.0                                                         |
| SMCJ33A     | GFM          | 36.7                                     | 40.6 | 1                             | 33                                           | 1                                                                     | 29                                                           | 53.3                                                         |
| SMCJ36      | GFN          | 40                                       | 48.9 | 1                             | 36                                           | 1                                                                     | 24                                                           | 64.3                                                         |
| SMCJ36A     | GFP          | 40                                       | 44.2 | 1                             | 36                                           | 1                                                                     | 27                                                           | 58.1                                                         |
| SMCJ40      | GFQ          | 44.4                                     | 54.3 | 1                             | 40                                           | 1                                                                     | 22                                                           | 71.4                                                         |
| SMCJ40A     | GFR          | 44.4                                     | 49.1 | 1                             | 40                                           | 1                                                                     | 24                                                           | 64.5                                                         |
| SMCJ43      | GFS          | 47.8                                     | 58.4 | 1                             | 43                                           | 1                                                                     | 20                                                           | 76.7                                                         |
| SMCJ43A     | GFT          | 47.8                                     | 52.8 | 1                             | 43                                           | 1                                                                     | 22                                                           | 69.4                                                         |
| SMCJ45      | GFU          | 50                                       | 61.1 | 1                             | 45                                           | 1                                                                     | 19                                                           | 80.3                                                         |
| SMCJ45A     | GFV          | 50                                       | 55.3 | 1                             | 45                                           | 1                                                                     | 21                                                           | 72.7                                                         |
| SMCJ48      | GFW          | 53.3                                     | 65.1 | 1                             | 48                                           | 1                                                                     | 18                                                           | 85.5                                                         |
| SMCJ48A     | GFX          | 53.3                                     | 58.9 | 1                             | 48                                           | 1                                                                     | 20                                                           | 77.4                                                         |
| SMCJ51      | GFY          | 56.7                                     | 69.3 | 1                             | 51                                           | 1                                                                     | 17                                                           | 91.1                                                         |
| SMCJ51A     | GFZ          | 56.7                                     | 62.7 | 1                             | 51                                           | 1                                                                     | 19                                                           | 82.4                                                         |
| SMCJ54      | GGD          | 60                                       | 73.3 | 1                             | 54                                           | 1                                                                     | 16                                                           | 96.3                                                         |
| SMCJ54A     | GGE          | 60                                       | 66.3 | 1                             | 54                                           | 1                                                                     | 18                                                           | 87.1                                                         |
| SMCJ58      | GGF          | 64.4                                     | 78.7 | 1                             | 58                                           | 1                                                                     | 15                                                           | 103                                                          |
| SMCJ58A     | GGG          | 64.4                                     | 71.2 | 1                             | 58                                           | 1                                                                     | 16                                                           | 93.6                                                         |
| SMCJ60      | GGH          | 66.7                                     | 81.5 | 1                             | 60                                           | 1                                                                     | 14                                                           | 107                                                          |
| SMCJ60A     | GGK          | 66.7                                     | 73.7 | 1                             | 60                                           | 1                                                                     | 16                                                           | 96.8                                                         |
| SMCJ64      | GGL          | 71.1                                     | 86.9 | 1                             | 64                                           | 1                                                                     | 13.8                                                         | 114                                                          |
| SMCJ64A     | GGM          | 71.1                                     | 78.6 | 1                             | 64                                           | 1                                                                     | 15                                                           | 103                                                          |
| SMCJ70      | GGN          | 77.8                                     | 95.1 | 1                             | 70                                           | 1                                                                     | 12.6                                                         | 125                                                          |
| SMCJ70A     | GGP          | 77.8                                     | 86   | 1                             | 70                                           | 1                                                                     | 13.9                                                         | 113                                                          |
| SMCJ75      | GGQ          | 83.3                                     | 102  | 1                             | 75                                           | 1                                                                     | 11.7                                                         | 134                                                          |
| SMCJ75A     | GGR          | 83.3                                     | 92.1 | 1                             | 75                                           | 1                                                                     | 13                                                           | 121                                                          |
| SMCJ78      | GGs          | 86.7                                     | 106  | 1                             | 78                                           | 1                                                                     | 11.3                                                         | 139                                                          |
| SMCJ78A     | GGT          | 86.7                                     | 95.8 | 1                             | 78                                           | 1                                                                     | 12.5                                                         | 126                                                          |
| SMCJ85      | GGU          | 94.4                                     | 115  | 1                             | 85                                           | 1                                                                     | 10.4                                                         | 151                                                          |
| SMCJ85A     | GGV          | 94.4                                     | 104  | 1                             | 85                                           | 1                                                                     | 11.5                                                         | 137                                                          |
| SMCJ90      | GGW          | 100                                      | 122  | 1                             | 90                                           | 1                                                                     | 9.8                                                          | 160                                                          |
| SMCJ90A     | GGX          | 100                                      | 111  | 1                             | 90                                           | 1                                                                     | 10.7                                                         | 146                                                          |
| SMCJ100     | GGY          | 111                                      | 136  | 1                             | 100                                          | 1                                                                     | 8.8                                                          | 179                                                          |
| SMCJ100A    | GGZ          | 111                                      | 123  | 1                             | 100                                          | 1                                                                     | 9.7                                                          | 162                                                          |
| SMCJ110     | GHD          | 122                                      | 149  | 1                             | 110                                          | 1                                                                     | 8                                                            | 196                                                          |
| SMCJ110A    | GHE          | 122                                      | 135  | 1                             | 110                                          | 1                                                                     | 8.9                                                          | 177                                                          |
| SMCJ120     | GHF          | 133                                      | 163  | 1                             | 120                                          | 1                                                                     | 7.3                                                          | 214                                                          |
| SMCJ120A    | GHG          | 133                                      | 147  | 1                             | 120                                          | 1                                                                     | 8.1                                                          | 193                                                          |
| SMCJ130     | GHH          | 144                                      | 176  | 1                             | 130                                          | 1                                                                     | 6.8                                                          | 231                                                          |
| SMCJ130A    | GHK          | 144                                      | 159  | 1                             | 130                                          | 1                                                                     | 7.5                                                          | 209                                                          |
| SMCJ150     | GHL          | 167                                      | 204  | 1                             | 150                                          | 1                                                                     | 5.8                                                          | 266                                                          |
| SMCJ150A    | GHM          | 167                                      | 185  | 1                             | 150                                          | 1                                                                     | 6.4                                                          | 243                                                          |
| SMCJ160     | GHN          | 178                                      | 218  | 1                             | 160                                          | 1                                                                     | 5.4                                                          | 287                                                          |
| SMCJ160A    | GHP          | 178                                      | 197  | 1                             | 160                                          | 1                                                                     | 6                                                            | 259                                                          |
| SMCJ170     | GHQ          | 189                                      | 231  | 1                             | 170                                          | 1                                                                     | 5.1                                                          | 304                                                          |
| SMCJ170A    | GHR          | 189                                      | 209  | 1                             | 170                                          | 1                                                                     | 5.7                                                          | 275                                                          |

**Notes:**

1.  $V_{BR}$  measure after  $I_T$  applied for 300 $\mu\text{s}$ ,  $I_T$ =square wave pulse or equivalent
2. Surge current waveform per Figure. 3 and derate per Figure. 2
3. For bipolar types having  $V_{WM}$  of 10 V and under, the  $I_R$  limit is doubled
4. All terms and symbols are consistent with ANSI/IEEE C62.35

**ORDERING INFORMATION**

| <b>ORDERING CODE</b><br>(Note 1, 2, 3) | <b>PACKAGE</b> | <b>PACKING</b>           |
|----------------------------------------|----------------|--------------------------|
| SMCJxxxxHR7G                           | SMC            | 850 / 7" Plastic reel    |
| SMCJxxxxHR6G                           | SMC            | 3,000 / 13" Paper reel   |
| SMCJxxxxHM6G                           | SMC            | 3,000 / 13" Plastic reel |
| SMCJxxxx R7G                           | SMC            | 850 / 7" Plastic reel    |
| SMCJxxxx R6G                           | SMC            | 3,000 / 13" Paper reel   |
| SMCJxxxx M6G                           | SMC            | 3,000 / 13" Plastic reel |
| SMCJxxxxHV7G                           | Matrix SMC     | 850 / 7" Plastic reel    |
| SMCJxxxxHV6G                           | Matrix SMC     | 3,000 / 13" Plastic reel |
| SMCJxxxx V7G                           | Matrix SMC     | 850 / 7" Plastic reel    |
| SMCJxxxx V6G                           | Matrix SMC     | 3,000 / 13" Plastic reel |
| SMCJxxxxHR7                            | SMC            | 850 / 7" Plastic reel    |
| SMCJxxxxHR6                            | SMC            | 3,000 / 13" Paper reel   |
| SMCJxxxxHM6                            | SMC            | 3,000 / 13" Plastic reel |
| SMCJxxxx R7                            | SMC            | 850 / 7" Plastic reel    |
| SMCJxxxx R6                            | SMC            | 3,000 / 13" Paper reel   |
| SMCJxxxx M6                            | SMC            | 3,000 / 13" Plastic reel |
| SMCJxxxxHV7                            | Matrix SMC     | 850 / 7" Plastic reel    |
| SMCJxxxxHV6                            | Matrix SMC     | 3,000 / 13" Plastic reel |
| SMCJxxxx V7                            | Matrix SMC     | 850 / 7" Plastic reel    |
| SMCJxxxx V6                            | Matrix SMC     | 3,000 / 13" Plastic reel |

**Note 1:**

"xxxx" defines voltage from 5.0V (SMCJ5.0) to 170V (SMCJ170A)

**Note 2:**

"H" means AEC-Q101 qualified

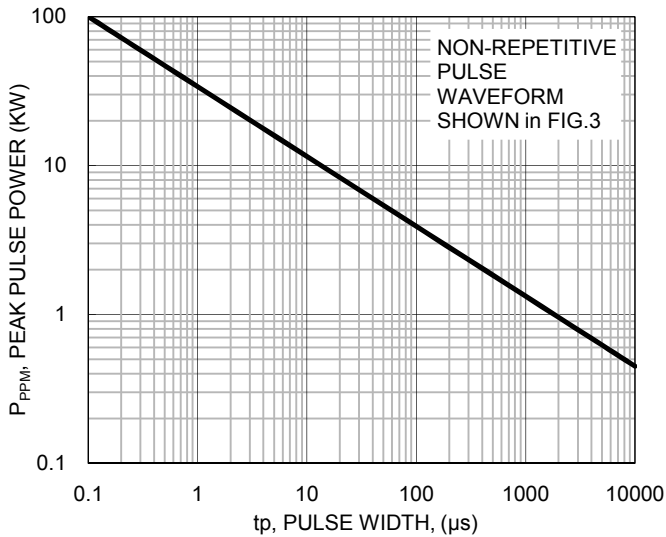
**Note 3:**

"G" means green compound (halogen free)

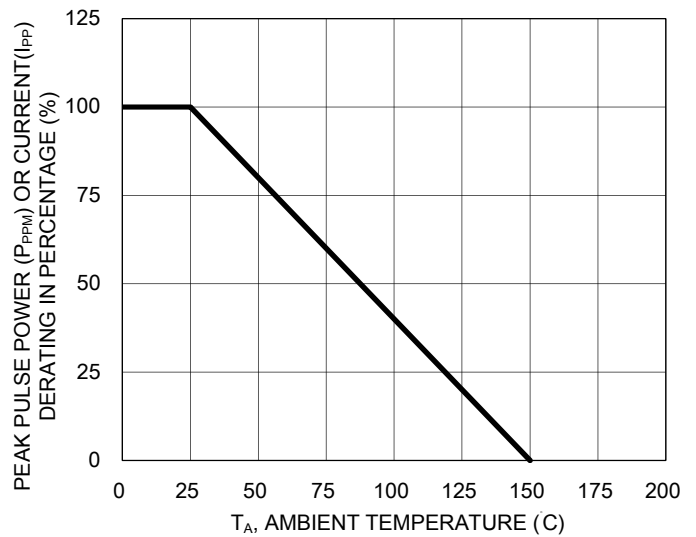
## CHARACTERISTICS CURVES

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

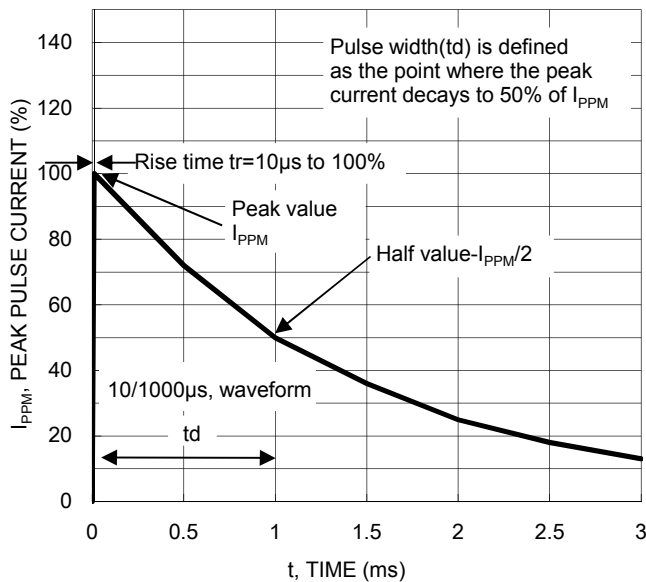
**Fig.1 Peak Pulse Power Rating Curve**



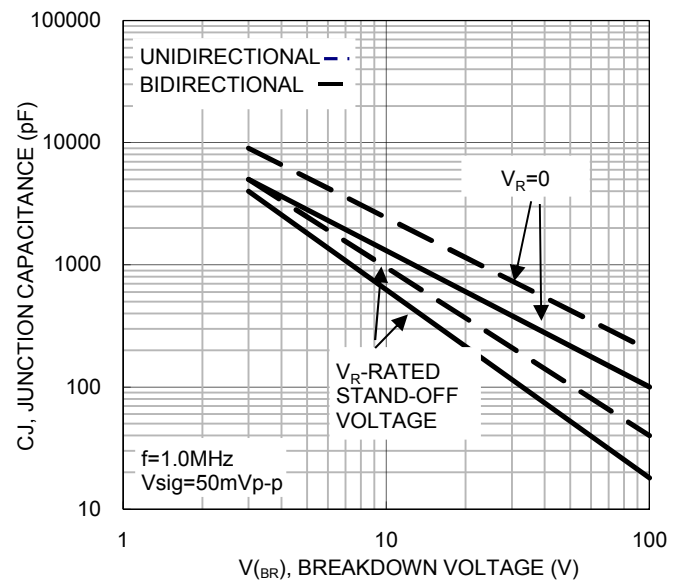
**Fig.2 Pulse Derating Curve**



**Fig.3 Clamping Power Pulse Waveform**



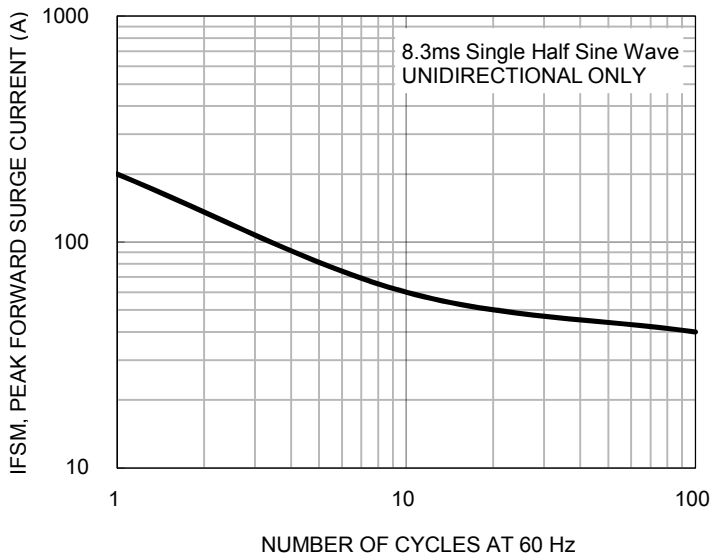
**Fig.4 Typical Junction Capacitance**



## CHARACTERISTICS CURVES

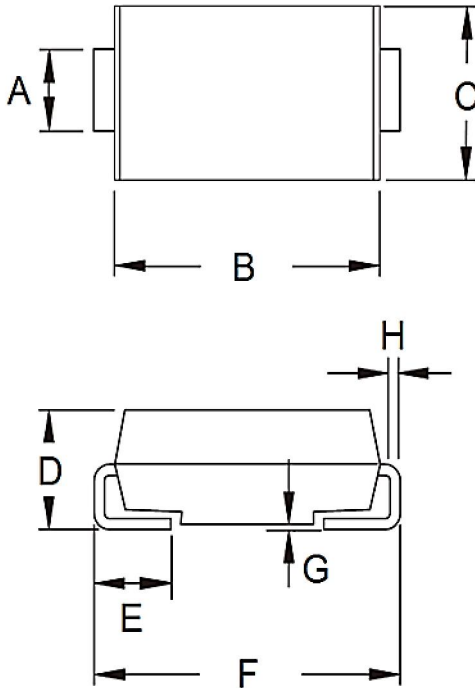
( $T_A = 25^\circ\text{C}$  unless otherwise noted)

**Fig.5 Maximum Non-repetitive Forward Surge Current**



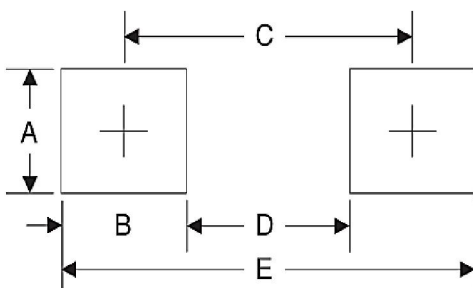
## PACKAGE OUTLINE DIMENSIONS

DO-214AB (SMC)



| DIM. | Unit (mm) |      | Unit (inch) |       |
|------|-----------|------|-------------|-------|
|      | Min.      | Max. | Min.        | Max.  |
| A    | 2.90      | 3.20 | 0.114       | 0.126 |
| B    | 6.60      | 7.11 | 0.260       | 0.280 |
| C    | 5.59      | 6.22 | 0.220       | 0.245 |
| D    | 2.00      | 2.62 | 0.079       | 0.103 |
| E    | 1.00      | 1.60 | 0.039       | 0.063 |
| F    | 7.75      | 8.13 | 0.305       | 0.320 |
| G    | 0.10      | 0.20 | 0.004       | 0.008 |
| H    | 0.15      | 0.31 | 0.006       | 0.012 |

## SUGGESTED PAD LAYOUT



| Symbol | Unit (mm) | Unit (inch) |
|--------|-----------|-------------|
| A      | 3.30      | 0.130       |
| B      | 2.50      | 0.098       |
| C      | 6.80      | 0.268       |
| D      | 4.40      | 0.173       |
| E      | 9.40      | 0.370       |

## MARKING DIAGRAM

SMC

Matrix SMC



Note: Cathode band for unidirectional products only

P/N =Marking Code

G =Green Compound

YW =Date Code

F =Factory Code

## Notice

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