

## 400W, 5V - 188V 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"
- 400 W peak pulse power capability with a 10 / 1000  $\mu$ s waveform(300W above 78V)
- Compliant to RoHS directive 2011/65/EU and in accordance to WEEE 2002/96/EC

| KEY PARAMETERS                              |                |             |
|---|----------------|-------------|
| PARAMETER                                   | VALUE          | UNIT        |
| $V_{WM}$                                    | 5 - 188        | V           |
| $V_{BR}$                                    | 6.4 - 255      | V           |
| $P_{PPM}$<br>$t_p = 10/1000 \mu s$ waveform | 400            | W           |
| $T_{JMAX}$                                  | 150            | $^{\circ}C$ |
| Package                                     | DO-214AC (SMA) |             |
| Configuration                               | Single die     |             |



### APPLICATIONS

- Switching mode power supply (SMPS)
- Adapters
- Lighting application
- On-board DC/DC converter

### MECHANICAL DATA

- Case: DO-214AC (SMA)
- Molding compound meets UL 94V-0 flammability rating
- Matte tin plated leads, solderable per J-STD-002
- Meet JESD 201 class 2 whisker test
- Weight: 0.06g (approximately)



DO-214AC (SMA)

| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^{\circ}C$ unless otherwise noted)              |           |             |             |
|---|-----------|-------------|-------------|
| PARAMETER   | SYMBOL    | VALUE       | UNIT        |
| Peak power dissipation at $T_A=25^{\circ}C$ , $t_p=1ms$ (Note 1)                    | $P_{PK}$  | 400         | W           |
| Steady state power dissipation  | $P_D$     | 1           | W           |
| Peak forward surge current, 8.3 ms single half sine-wave superimposed on rated load | $I_{FSM}$ | 40          | A           |
| Maximum instantaneous forward voltage at 25 A for unidirectional only               | $V_F$     | 3.5         | V           |
| Operating junction temperature range  | $T_J$     | -55 to +150 | $^{\circ}C$ |
| Storage temperature range   | $T_{STG}$ | -55 to +150 | $^{\circ}C$ |

**Note:**

1. Non-repetitive current pulse per Fig. 3 and derated above  $T_A=25^{\circ}C$  per Fig. 2

Devices for Bipolar Applications

1. For bidirectional use C or CA suffix for types SMAJ5.0 - Types SMAJ188
2. Electrical characteristics apply in both directions

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

| Part number | Marking code | Breakdown voltage<br>$V_{BR}@I_T^{(1)}$<br>(V) |       | Test current<br>$I_T$<br>(mA) | Working stand-off voltage<br>$V_{WM}$<br>(V) | Maximum reverse leakage current<br>$I_R@V_{WM}^{(1)}$ ( $\mu\text{A}$ ) | Maximum peak impulse current<br>$I_{PPM}$ (A) <sup>(2)</sup> | Maximum clamping voltage<br>$V_C@I_{PPM}$ (V) <sup>(2)</sup> |
|-------------|--------------|--|-------|-------------------------------|--|---|--|--|
|             |              | Min.   | Max.  |                               |  |   |  |  |
| SMAJ5.0     | AD           | 6.4  | 7.30  | 10                            | 5  | 800   | 41.7   | 9.6  |
| SMAJ5.0A    | AE           | 6.4  | 7.00  | 10                            | 5  | 800   | 43.5   | 9.2  |
| SMAJ6.0     | AF           | 6.67   | 8.15  | 10                            | 6  | 800   | 35.1   | 11.4   |
| SMAJ6.0A    | AG           | 6.67   | 7.37  | 10                            | 6  | 800   | 38.8   | 10.3   |
| SMAJ6.5     | AH           | 7.22   | 8.82  | 10                            | 6.5  | 500   | 32.5   | 12.3   |
| SMAJ6.5A    | AK           | 7.22   | 7.98  | 10                            | 6.5  | 500   | 35.7   | 11.2   |
| SMAJ7.0     | AL           | 7.78   | 9.51  | 10                            | 7  | 200   | 30.1   | 13.3   |
| SMAJ7.0A    | AM           | 7.78   | 8.60  | 10                            | 7  | 200   | 33.3   | 12.0   |
| SMAJ7.5     | AN           | 8.33   | 10.30 | 1                             | 7.5  | 100   | 28.0   | 14.3   |
| SMAJ7.5A    | AP           | 8.33   | 9.21  | 1                             | 7.5  | 100   | 31.0   | 12.9   |
| SMAJ8.0     | AQ           | 8.89   | 10.90 | 1                             | 8  | 50  | 26.7   | 15.0   |
| SMAJ8.0A    | AR           | 8.89   | 9.83  | 1                             | 8  | 50  | 29.4   | 13.6   |
| SMAJ8.5     | AS           | 9.44   | 11.50 | 1                             | 8.5  | 10  | 25.2   | 15.9   |
| SMAJ8.5A    | AT           | 9.44   | 10.40 | 1                             | 8.5  | 10  | 27.8   | 14.4   |
| SMAJ9.0     | AU           | 10.0   | 12.20 | 1                             | 9  | 5   | 23.7   | 16.9   |
| SMAJ9.0A    | AV           | 10.0   | 11.10 | 1                             | 9  | 5   | 26.0   | 15.4   |
| SMAJ10      | AW           | 11.1   | 13.60 | 1                             | 10   | 5   | 21.3   | 18.8   |
| SMAJ10A     | AX           | 11.1   | 12.30 | 1                             | 10   | 5   | 23.5   | 17.0   |
| SMAJ11      | AY           | 12.2   | 14.90 | 1                             | 11   | 1   | 19.9   | 20.1   |
| SMAJ11A     | AZ           | 12.2   | 13.50 | 1                             | 11   | 1   | 22.0   | 18.2   |
| SMAJ12      | BD           | 13.3   | 16.30 | 1                             | 12   | 1   | 18.2   | 22.0   |
| SMAJ12A     | BE           | 13.3   | 14.70 | 1                             | 12   | 1   | 20.1   | 19.9   |
| SMAJ13      | BF           | 14.4   | 17.60 | 1                             | 13   | 1   | 16.8   | 23.8   |
| SMAJ13A     | BG           | 14.4   | 15.90 | 1                             | 13   | 1   | 18.6   | 21.5   |
| SMAJ14      | BH           | 15.6   | 19.10 | 1                             | 14   | 1   | 15.5   | 25.8   |
| SMAJ14A     | BK           | 15.6   | 17.20 | 1                             | 14   | 1   | 17.2   | 23.2   |
| SMAJ15      | BL           | 16.7   | 20.40 | 1                             | 15   | 1   | 14.9   | 26.9   |
| SMAJ15A     | BM           | 16.7   | 18.50 | 1                             | 15   | 1   | 16.4   | 24.4   |
| SMAJ16      | BN           | 17.8   | 21.80 | 1                             | 16   | 1   | 13.9   | 28.8   |
| SMAJ16A     | BP           | 17.8   | 19.70 | 1                             | 16   | 1   | 15.4   | 26.0   |
| SMAJ17      | BQ           | 18.9   | 23.10 | 1                             | 17   | 1   | 13.1   | 30.5   |
| SMAJ17A     | BR           | 18.9   | 20.90 | 1                             | 17   | 1   | 14.5   | 27.6   |
| SMAJ18      | BS           | 20.0   | 24.40 | 1                             | 18   | 1   | 12.4   | 32.2   |
| SMAJ18A     | BT           | 20.0   | 22.10 | 1                             | 18   | 1   | 13.7   | 29.2   |
| SMAJ20      | BU           | 22.2   | 27.10 | 1                             | 20   | 1   | 11.2   | 35.8   |
| SMAJ20A     | BV           | 22.2   | 24.50 | 1                             | 20   | 1   | 12.3   | 32.4   |
| SMAJ22      | BW           | 24.4   | 29.80 | 1                             | 22   | 1   | 10.2   | 39.4   |
| SMAJ22A     | BX           | 24.4   | 26.90 | 1                             | 22   | 1   | 11.3   | 35.5   |
| SMAJ24      | BY           | 26.7   | 32.60 | 1                             | 24   | 1   | 9.3  | 43.0   |
| SMAJ24A     | BZ           | 26.7   | 29.50 | 1                             | 24   | 1   | 10.3   | 38.9   |
| SMAJ26      | CD           | 28.9   | 35.30 | 1                             | 26   | 1   | 8.6  | 46.6   |
| SMAJ26A     | CE           | 28.9   | 31.90 | 1                             | 26   | 1   | 9.5  | 42.1   |
| SMAJ28      | CF           | 31.1   | 38.00 | 1                             | 28   | 1   | 8.0  | 50.0   |
| SMAJ28A     | CG           | 31.1   | 34.40 | 1                             | 28   | 1   | 8.8  | 45.4   |
| SMAJ30      | CH           | 33.3   | 40.7  | 1                             | 30   | 1   | 7.5  | 53.5   |
| SMAJ30A     | CK           | 33.3   | 36.8  | 1                             | 30   | 1   | 8.3  | 48.4   |
| SMAJ33      | CL           | 36.7   | 44.9  | 1                             | 33   | 1   | 6.8  | 59.0   |
| SMAJ33A     | CM           | 36.7   | 40.6  | 1                             | 33   | 1   | 7.5  | 53.3   |

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

| Part number | Marking code | Breakdown voltage<br>$V_{BR}@I_T^{(1)}$<br>(V) |      | Test current<br>$I_T$<br>(mA) | Working stand-off voltage<br>$V_{WM}$<br>(V) | Maximum reverse leakage current<br>$I_R@V_{WM}^{(1)}$ ( $\mu\text{A}$ ) | Maximum peak impulse current<br>$I_{PPM}$ (A) <sup>(2)</sup> | Maximum clamping voltage<br>$V_C@I_{PPM}$ (V) <sup>(2)</sup> |
|-------------|--------------|--|------|-------------------------------|--|---|--|--|
|             |              | Min.   | Max. |                               |  |   |  |  |
| SMAJ36      | CN           | 40.0   | 48.9 | 1                             | 36   | 1   | 6.2  | 64.3   |
| SMAJ36A     | CP           | 40.0   | 44.2 | 1                             | 36   | 1   | 6.9  | 58.1   |
| SMAJ40      | CQ           | 44.4   | 54.3 | 1                             | 40   | 1   | 5.6  | 71.4   |
| SMAJ40A     | CR           | 44.4   | 49.1 | 1                             | 40   | 1   | 6.2  | 64.5   |
| SMAJ43      | CS           | 47.8   | 58.4 | 1                             | 43   | 1   | 5.2  | 76.7   |
| SMAJ43A     | CT           | 47.8   | 52.8 | 1                             | 43   | 1   | 5.8  | 69.4   |
| SMAJ45      | CU           | 50.0   | 61.1 | 1                             | 45   | 1   | 5.0  | 80.3   |
| SMAJ45A     | CV           | 50.0   | 55.3 | 1                             | 45   | 1   | 5.5  | 72.7   |
| SMAJ48      | CW           | 53.3   | 65.1 | 1                             | 48   | 1   | 4.7  | 85.5   |
| SMAJ48A     | CX           | 53.3   | 58.9 | 1                             | 48   | 1   | 5.2  | 77.4   |
| SMAJ51      | CY           | 56.7   | 69.3 | 1                             | 51   | 1   | 4.4  | 91.1   |
| SMAJ51A     | CZ           | 56.7   | 62.7 | 1                             | 51   | 1   | 4.9  | 82.4   |
| SMAJ54      | RD           | 60.0   | 73.3 | 1                             | 54   | 1   | 4.2  | 96.3   |
| SMAJ54A     | RE           | 60.0   | 66.3 | 1                             | 54   | 1   | 4.6  | 87.1   |
| SMAJ58      | RF           | 64.4   | 78.7 | 1                             | 58   | 1   | 3.9  | 103  |
| SMAJ58A     | RG           | 64.4   | 71.2 | 1                             | 58   | 1   | 4.3  | 93.6   |
| SMAJ60      | RH           | 66.7   | 81.5 | 1                             | 60   | 1   | 3.7  | 107  |
| SMAJ60A     | RK           | 66.7   | 73.7 | 1                             | 60   | 1   | 4.1  | 96.8   |
| SMAJ64      | RL           | 71.1   | 86.9 | 1                             | 64   | 1   | 3.5  | 114  |
| SMAJ64A     | RM           | 71.1   | 78.6 | 1                             | 64   | 1   | 3.9  | 103  |
| SMAJ70      | RN           | 77.8   | 95.1 | 1                             | 70   | 1   | 3.2  | 125  |
| SMAJ70A     | RP           | 77.8   | 86   | 1                             | 70   | 1   | 3.5  | 113  |
| SMAJ75      | RQ           | 83.3   | 102  | 1                             | 75   | 1   | 3.0  | 134  |
| SMAJ75A     | RR           | 83.3   | 92.1 | 1                             | 75   | 1   | 3.3  | 121  |
| SMAJ78      | RS           | 86.7   | 106  | 1                             | 78   | 1   | 2.9  | 139  |
| SMAJ78A     | RT           | 86.7   | 95.8 | 1                             | 78   | 1   | 3.2  | 126  |
| SMAJ85      | RU           | 94.4   | 115  | 1                             | 85   | 1   | 2.0  | 151  |
| SMAJ85A     | RV           | 94.4   | 104  | 1                             | 85   | 1   | 2.2  | 137  |
| SMAJ90      | RW           | 100  | 122  | 1                             | 90   | 1   | 1.9  | 160  |
| SMAJ90A     | RX           | 100  | 111  | 1                             | 90   | 1   | 2.1  | 146  |
| SMAJ100     | RY           | 111  | 136  | 1                             | 100  | 1   | 1.7  | 179  |
| SMAJ100A    | RZ           | 111  | 123  | 1                             | 100  | 1   | 1.9  | 162  |
| SMAJ110     | SD           | 122  | 149  | 1                             | 110  | 1   | 1.6  | 196  |
| SMAJ110A    | SE           | 122  | 135  | 1                             | 110  | 1   | 1.7  | 177  |
| SMAJ120     | SF           | 133  | 163  | 1                             | 120  | 1   | 1.4  | 214  |
| SMAJ120A    | SG           | 133  | 147  | 1                             | 120  | 1   | 1.6  | 193  |
| SMAJ130     | SH           | 144  | 176  | 1                             | 130  | 1   | 1.3  | 231  |
| SMAJ130A    | SK           | 144  | 159  | 1                             | 130  | 1   | 1.5  | 209  |
| SMAJ150     | SL           | 167  | 204  | 1                             | 150  | 1   | 1.1  | 266  |
| SMAJ150A    | SM           | 167  | 185  | 1                             | 150  | 1   | 1.3  | 243  |
| SMAJ160     | SN           | 178  | 218  | 1                             | 160  | 1   | 1.0  | 287  |
| SMAJ160A    | SP           | 178  | 197  | 1                             | 160  | 1   | 1.2  | 259  |
| SMAJ170     | SQ           | 189  | 231  | 1                             | 170  | 1   | 1.0  | 304  |
| SMAJ170A    | SR           | 189  | 209  | 1                             | 170  | 1   | 1.1  | 275  |
| SMAJ188     | ST           | 209  | 255  | 1                             | 188  | 1   | 0.9  | 344  |
| SMAJ188A    | SS           | 209  | 231  | 1                             | 188  | 1   | 0.9  | 328  |

**Notes:**

1. Pulse test with PW=30 ms
2. Non-repetitive current pulse, per Fig. 3 and derated above  $T_A=25^\circ\text{C}$  per Fig. 2
3. Peak pulse power waveform is 10/1000 $\mu\text{s}$
4. For bi-directional devices having  $V_R$  of 10 V and under, the  $I_R$  limit is double.

| <b>ORDERING INFORMATION</b>          |                |                          |
|--------------------------------------|----------------|--------------------------|
| <b>ORDERING CODE</b><br>(Note 1,2,3) | <b>PACKAGE</b> | <b>PACKING</b>           |
| SMAJxxxAHR3G                         | SMA            | 1,800 / 7" Plastic reel  |
| SMAJxxxAHR2G                         | SMA            | 7,500 / 13" Paper reel   |
| SMAJxxxAHM2G                         | SMA            | 7,500 / 13" Plastic reel |
| SMAJxxxAHF3G                         | Folded SMA     | 1,800 / 7" Plastic reel  |
| SMAJxxxAHF2G                         | Folded SMA     | 7,500 / 13" Paper reel   |
| SMAJxxxAHF4G                         | Folded SMA     | 7,500 / 13" Plastic reel |
| SMAJxxxAHE3G                         | Clip SMA       | 1,800 / 7" Plastic reel  |
| SMAJxxxAHE2G                         | Clip SMA       | 7,500 / 13" Plastic reel |
| SMAJxxxA R3G                         | SMA            | 1,800 / 7" Plastic reel  |
| SMAJxxxA R2G                         | SMA            | 7,500 / 13" Paper reel   |
| SMAJxxxA M2G                         | SMA            | 7,500 / 13" Plastic reel |
| SMAJxxxA F3G                         | Folded SMA     | 1,800 / 7" Plastic reel  |
| SMAJxxxA F2G                         | Folded SMA     | 7,500 / 13" Paper reel   |
| SMAJxxxA F4G                         | Folded SMA     | 7,500 / 13" Plastic reel |
| SMAJxxxA E3G                         | Clip SMA       | 1,800 / 7" Plastic reel  |
| SMAJxxxA E2G                         | Clip SMA       | 7,500 / 13" Plastic reel |
| SMAJxxxAHR3                          | SMA            | 1,800 / 7" Plastic reel  |
| SMAJxxxAHR2                          | SMA            | 7,500 / 13" Paper reel   |
| SMAJxxxAHM2                          | SMA            | 7,500 / 13" Plastic reel |
| SMAJxxxAHF3                          | Folded SMA     | 1,800 / 7" Plastic reel  |
| SMAJxxxAHF2                          | Folded SMA     | 7,500 / 13" Paper reel   |
| SMAJxxxAHF4                          | Folded SMA     | 7,500 / 13" Plastic reel |
| SMAJxxxAHE3                          | Clip SMA       | 1,800 / 7" Plastic reel  |
| SMAJxxxAHE2                          | Clip SMA       | 7,500 / 13" Plastic reel |
| SMAJxxxA R3                          | SMA            | 1,800 / 7" Plastic reel  |
| SMAJxxxA R2                          | SMA            | 7,500 / 13" Paper reel   |
| SMAJxxxA M2                          | SMA            | 7,500 / 13" Plastic reel |
| SMAJxxxA F3                          | Folded SMA     | 1,800 / 7" Plastic reel  |
| SMAJxxxA F2                          | Folded SMA     | 7,500 / 13" Paper reel   |
| SMAJxxxA F4                          | Folded SMA     | 7,500 / 13" Plastic reel |
| SMAJxxxA E3                          | Clip SMA       | 1,800 / 7" Plastic reel  |
| SMAJxxxA E2                          | Clip SMA       | 7,500 / 13" Plastic reel |

**Note 1:**

"xxx" defines voltage from 5V (SMAJ5.0) to 188V (SMAJ188)

**Note 2:**

"H" means AEC-Q101 qualified

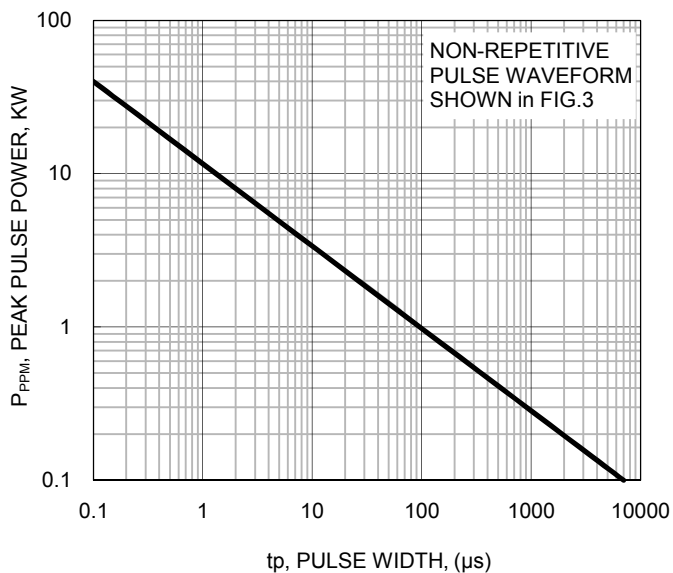
**Note 3:**

"G" means green compound (halogen free)

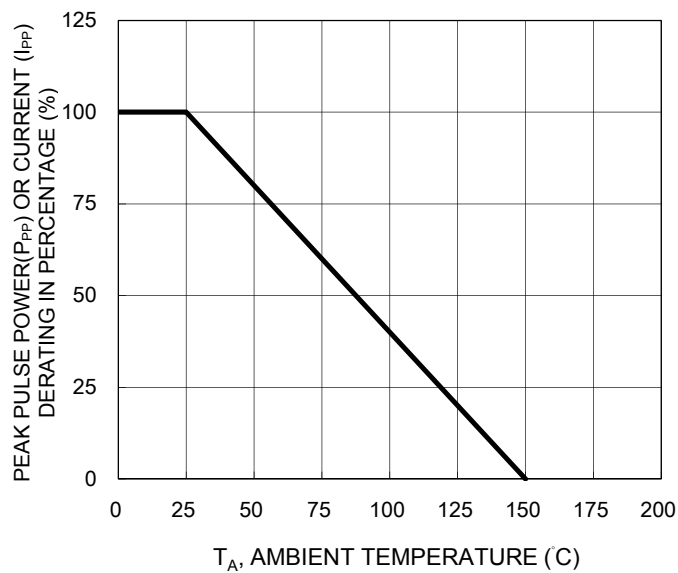
**CHARACTERISTICS CURVES**

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

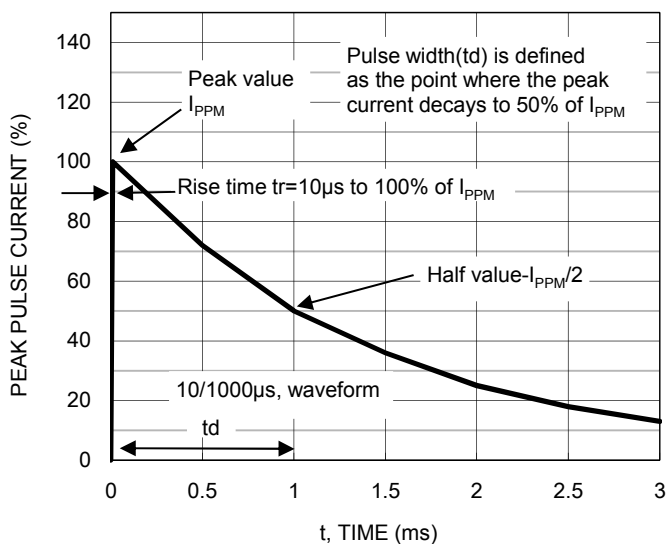
**Fig.1 Peak Pulse Power Rating Curve**



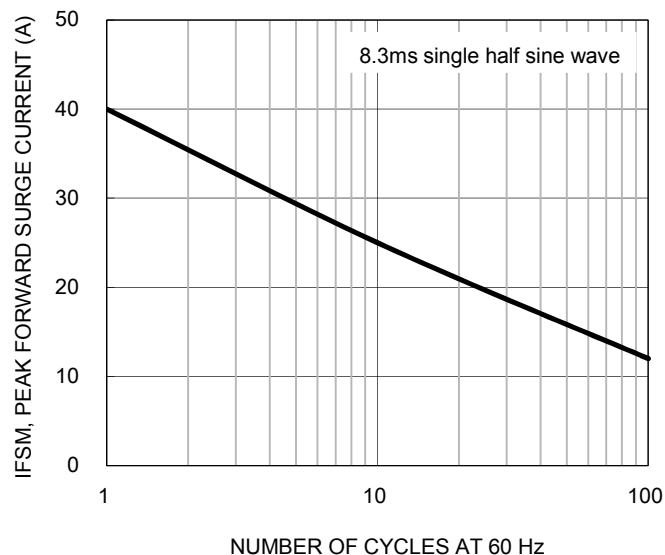
**Fig.2 Pulse Derating Curve**



**Fig.3 Clamping Power Pulse Waveform**



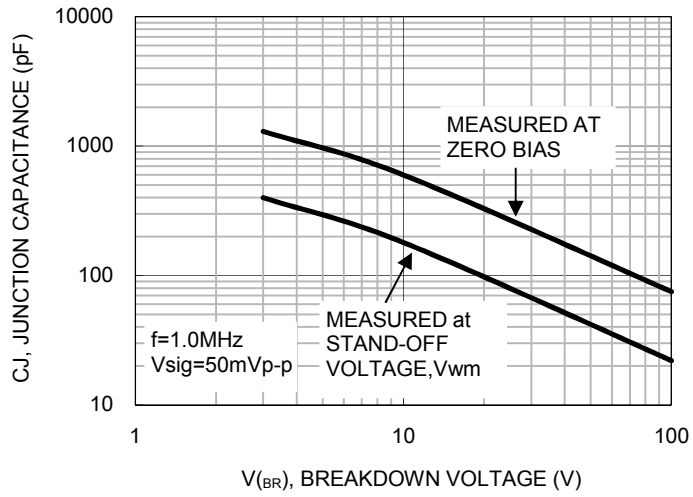
**Fig.4 Maximum Non-repetitive Forward Surge Current**



**CHARACTERISTICS CURVES**

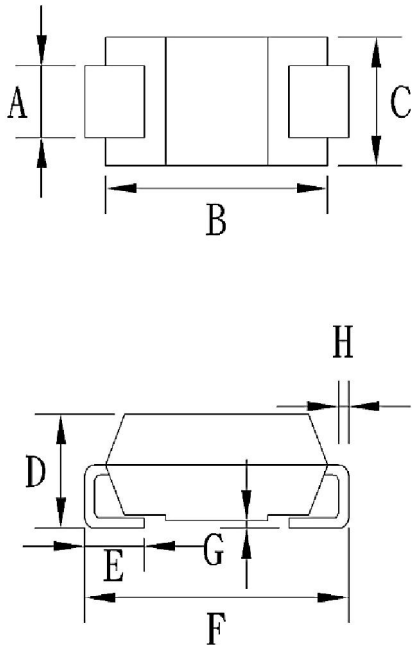
( $T_A = 25^\circ\text{C}$  unless otherwise noted)

**Fig.5 Typical Junction Capacitance**



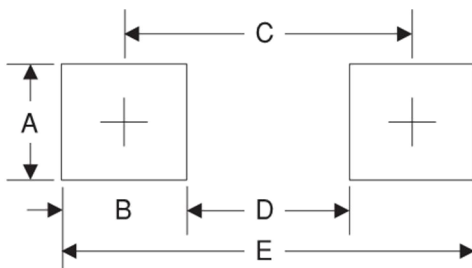
**PACKAGE OUTLINE DIMENSIONS**

DO-214AC (SMA)



| DIM | Unit (mm) |      | Unit (inch) |       |
|-----|-----------|------|-------------|-------|
|     | Min       | Max  | Min         | Max   |
| A   | 1.27      | 1.58 | 0.050       | 0.062 |
| B   | 4.06      | 4.60 | 0.160       | 0.181 |
| C   | 2.29      | 2.83 | 0.090       | 0.111 |
| D   | 1.99      | 2.50 | 0.078       | 0.098 |
| E   | 0.90      | 1.41 | 0.035       | 0.056 |
| F   | 4.95      | 5.33 | 0.195       | 0.210 |
| 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      | 1.68      | 0.066       |
| B      | 1.52      | 0.060       |
| C      | 3.93      | 0.155       |
| D      | 2.41      | 0.095       |
| E      | 5.45      | 0.215       |

**MARKING DIAGRAM**



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

Note: Cathode band for uni-directional products only

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