

### DESCRIPTION

The 1.5SMB series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.



### FEATURES

- 1500W peak pulsepower capability at 10 x 1000 $\mu$ s waveform, repetition rate (duty cycle): 0.01%
- Glass Passivated chip junction
- For surface mounted applications to optimize board space
- Low profile package
- Built-in strain relief
- Low incremental surge resistance
- Excellent clamping capability
- Plastic package has UL flammability classification 94V-0
- Fast response time: typically less than 1.0ps from 0 Volts to BV min
- Typical IR less than 1 $\mu$ A above 12V
- High temperature soldering: 260°C/40 seconds at terminals
- IEC-61000-4-2 ESD 15KV(Air),8KV(Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2(IEC801-2)
- EFT protection of data lines in accordance with IEC61000-4-4(IEC801-4)

## APPLICATIONS

TVS devices are ideal for the protection of I/O Interfaces, VCC bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

## Maximum Ratings and Electrical Characteristics

(TA=25°C unless otherwise noted)

| Parameter  | Symbol                            | Value       | Unit |
|--|-----------------------------------|-------------|------|
| Peak Pulse Power Dissipation at TA=25°C by 10x1000µs waveform (Fig.2)(Note 1) (Note 2) | P <sub>PPM</sub>                  | 1500        | W    |
| Power Dissipation on infinite heat sink at TA=50°C                                     | P <sub>D</sub>                    | 6.5         | W    |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional only(Note 3)    | I <sub>FSM</sub>                  | 200         | A    |
| Maximum Instantaneous Forward Voltage at 100A for Unidirectional only                  | V <sub>F</sub>                    | 3.5V/5.0    | V    |
| Operating Junction and Storage Temperature Range                                       | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |
| Typical Thermal Resistance Junction to Lead  | R <sub>uJL</sub>                  | 10          | °C/W |
| Typical Thermal Resistance Junction to Ambient   | R <sub>uJA</sub>                  | 75          | °C/W |

### Notes:

1. Non-repetitive current pulse, per Fig.3 and derated above TA=25°C per Fig. 2.
2. Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0mm) to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum.



## Electrical Characteristics

| PART NUMBER  |             | REVERSE<br>STAND-OFF<br>VOLTAGE | BREAKDOWN<br>N VOLTAGE<br>VBR(V)MAX.<br>@IT |               | TEST<br>CURRENT | REVERSE<br>LEAKAGE<br>@VRWM | PEAK PULSE<br>CURRENT | MAXIMUM<br>CLAMPING<br>VOLTAGE<br>@Ipp |
|--------------|-------------|---------------------------------|---|---------------|-----------------|-----------------------------|-----------------------|--|
| BI- POLAR    | UNI-POLAR   | VRWM<br>(V)                     | VBR<br>MIN(V)                               | VBR<br>MAX(V) | IT<br>(mA)      | IR<br>( $\mu$ A)            | Ipp<br>(A)            | Vc<br>(v)                              |
| 1.5SMB5.0CA  | 1.5SMB5.0A  | 5.0                             | 6.4   | 7.25          | 10              | 800                         | 163.0                 | 9.2                                    |
| 1.5SMB6.0CA  | 1.5SMB6.0A  | 6.0                             | 6.67  | 7.67          | 10              | 800                         | 145.6                 | 10.3                                   |
| 1.5SMB 6.5CA | 1.5SMB 6.5A | 6.5                             | 7.22  | 8.30          | 10              | 500                         | 133.9                 | 11.2                                   |
| 1.5SMB7.0 CA | 1.5SMB7.0 A | 7.0                             | 7.78  | 8.95          | 10              | 200                         | 125.0                 | 12.0                                   |
| 1.5SMB 7.5CA | 1.5SMB 7.5A | 7.5                             | 8.33  | 9.58          | 1               | 100                         | 116.3                 | 12.9                                   |
| 1.5SMB 8.0CA | 1.5SMB 8.0A | 8.0                             | 8.89  | 10.23         | 1               | 50                          | 110.3                 | 13.6                                   |
| 1.5SMB8.5 CA | 1.5SMB8.5 A | 8.5                             | 9.44  | 10.82         | 1               | 20                          | 104.2                 | 14.4                                   |
| 1.5SMB9.0 CA | 1.5SMB9.0 A | 9.0                             | 10.00                                       | 11.50         | 1               | 10                          | 97.4                  | 15.4                                   |
| 1.5SMB10CA   | 1.5SMB10A   | 10.0                            | 11.1  | 12.30         | 1               | 10                          | 88.2                  | 17.0                                   |
| 1.5SMB11CA   | 1.5SMB11A   | 11.0                            | 12.20                                       | 14.00         | 1               | 1                           | 82.4                  | 18.2                                   |
| 1.5SMB12CA   | 1.5SMB12A   | 12.0                            | 13.30                                       | 14.70         | 1               | 1                           | 75.4                  | 19.9                                   |
| 1.5SMB13CA   | 1.5SMB13A   | 13.0                            | 14.40                                       | 16.50         | 1               | 1                           | 69.8                  | 21.5                                   |
| 1.5SMB14CA   | 1.5SMB14A   | 14.0                            | 15.60                                       | 17.20         | 1               | 1                           | 64.7                  | 23.2                                   |
| 1.5SMB15CA   | 1.5SMB15A   | 15.0                            | 16.70                                       | 19.20         | 1               | 1                           | 61.5                  | 24.4                                   |
| 1.5SMB16CA   | 1.5SMB16A   | 16.0                            | 17.80                                       | 19.70         | 1               | 1                           | 57.7                  | 26.0                                   |
| 1.5SMB17CA   | 1.5SMB17A   | 17.0                            | 18.90                                       | 21.70         | 1               | 1                           | 54.3                  | 27.6                                   |
| 1.5SMB18CA   | 1.5SMB18A   | 18.0                            | 20.00                                       | 23.30         | 1               | 1                           | 51.4                  | 29.2                                   |
| 1.5SMB20CA   | 1.5SMB20A   | 20.0                            | 22.20                                       | 25.50         | 1               | 1                           | 46.3                  | 32.4                                   |
| 1.5SMB22CA   | 1.5SMB22A   | 22.0                            | 24.40                                       | 28.00         | 1               | 1                           | 42.3                  | 35.5                                   |
| 1.5SMB24CA   | 1.5SMB24A   | 24.0                            | 26.70                                       | 30.70         | 1               | 1                           | 38.6                  | 38.9                                   |
| 1.5SMB26CA   | 1.5SMB26A   | 26.0                            | 28.90                                       | 33.20         | 1               | 1                           | 35.6                  | 42.1                                   |
| 1.5SMB28CA   | 1.5SMB28A   | 28.0                            | 31.10                                       | 35.80         | 1               | 1                           | 33.0                  | 45.4                                   |
| 1.5SMB30CA   | 1.5SMB30Adf | 30.0                            | 33.30                                       | 38.30         | 1               | 1                           | 31.0                  | 48.4                                   |
| 1.5SMB33CA   | 1.5SMB33A   | 33.0                            | 36.70                                       | 42.20         | 1               | 1                           | 28.1                  | 53.3                                   |
| 1.5SMB36CA   | 1.5SMB36A   | 36.0                            | 40.00                                       | 46.00         | 1               | 1                           | 25.8                  | 58.1                                   |
| 1.5SMB40CA   | 1.5SMB40A   | 40.0                            | 44.40                                       | 51.10         | 1               | 1                           | 23.3                  | 64.5                                   |
| 1.5SMB43CA   | 1.5SMB43A   | 43.0                            | 47.8  | 52.8          | 1               | 1                           | 21.6                  | 69.4                                   |
| 1.5SMB45CA   | 1.5SMB45A   | 45.0                            | 50.00                                       | 57.50         | 1               | 1                           | 20.6                  | 72.7                                   |
| 1.5SMB48CA   | 1.5SMB48A   | 48.0                            | 53.30                                       | 58.90         | 1               | 1                           | 19.4                  | 77.4                                   |
| 1.5SMB51CA   | 1.5SMB51A   | 51.0                            | 56.70                                       | 65.20         | 1               | 1                           | 18.2                  | 82.4                                   |
| 1.5SMB54CA   | 1.5SMB54A   | 54.0                            | 60.00                                       | 69.00         | 1               | 1                           | 17.2                  | 87.1                                   |

## Electrical Characteristics

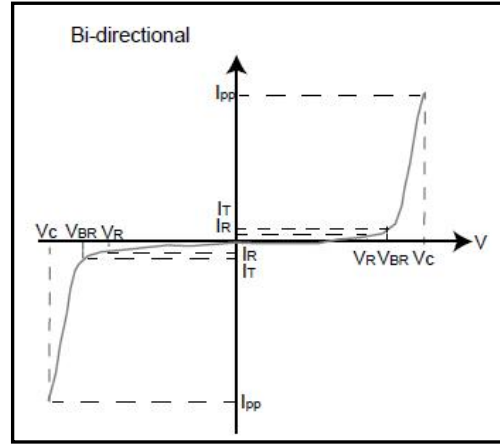
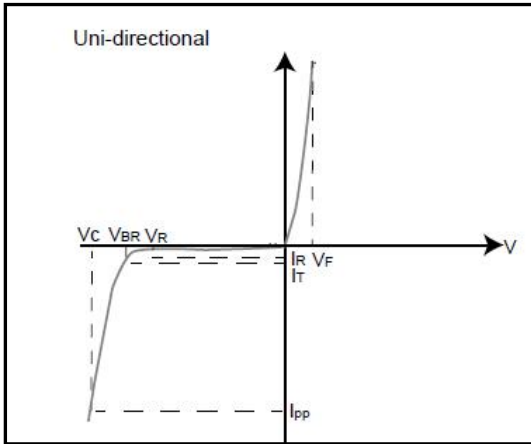
| PART NUMBER |            | REVERSE<br>STAND-OFF<br>VOLTAGE | BREAKDOWN<br>N VOLTAGE<br>VBR(V)MAX.<br>@IT |               | TEST<br>CURRENT | REVERSE<br>LEAKAGE<br>@VRWM | PEAK PULSE<br>CURRENT | MAXIMUM<br>CLAMPING<br>VOLTAGE<br>@Ipp |
|-------------|------------|---------------------------------|---|---------------|-----------------|-----------------------------|-----------------------|--|
| BI- POLAR   | UNI-POLAR  | VRWM<br>(V)                     | VBR<br>MIN(V)                               | VBR<br>MAX(V) | IT<br>(mA)      | IR<br>( $\mu$ A)            | Ipp<br>(A)            | Vc<br>(v)                              |
| 1.5SMB58CA  | 1.5SMB58A  | 58.0                            | 64.4  | 71.2          | 1               | 1                           | 16.0                  | 93.6                                   |
| 1.5SMB60CA  | 1.5SMB60A  | 60.0                            | 66.7  | 73.7          | 1               | 1                           | 15.5                  | 96.8                                   |
| 1.5SMB64CA  | 1.5SMB64A  | 64.0                            | 71.10                                       | 81.80         | 1               | 1                           | 14.6                  | 103.0                                  |
| 1.5SMB70CA  | 1.5SMB70A  | 70.0                            | 77.8  | 95.1          | 1               | 1                           | 13.3                  | 113.0                                  |
| 1.5SMB75CA  | 1.5SMB75A  | 75.0                            | 83.3  | 92.1          | 1               | 1                           | 12.4                  | 121.0                                  |
| 1.5SMB78CA  | 1.5SMB78A  | 78.0                            | 86.70                                       | 99.70         | 1               | 1                           | 11.9                  | 126.0                                  |
| 1.5SMB85CA  | 1.5SMB85A  | 85.0                            | 94.40                                       | 108.20        | 1               | 1                           | 10.9                  | 137.0                                  |
| 1.5SMB90CA  | 1.5SMB90A  | 90.0                            | 100.0                                       | 111.0         | 1               | 1                           | 10.3                  | 146.0                                  |
| 1.5SMB100CA | 1.5SMB100A | 100.0                           | 111.00                                      | 123.00        | 1               | 1                           | 9.3                   | 162.0                                  |
| 1.5SMB110CA | 1.5SMB110A | 110.0                           | 122.00                                      | 135.00        | 1               | 1                           | 8.5                   | 177.0                                  |
| 1.5SMB120CA | 1.5SMB120A | 110.0                           | 133.00                                      | 147.00        | 1               | 1                           | 7.8                   | 193.0                                  |
| 1.5SMB130CA | 1.5SMB110A | 130.0                           | 144.00                                      | 159.00        | 1               | 1                           | 7.2                   | 209.0                                  |
| 1.5SMB150CA | 1.5SMB150A | 150.0                           | 167.00                                      | 185.00        | 1               | 1                           | 6.2                   | 243.0                                  |
| 1.5SMB160CA | 1.5SMB160A | 160.0                           | 178.00                                      | 197.00        | 1               | 1                           | 5.8                   | 259.0                                  |
| 1.5SMB170CA | 1.5SMB170A | 170.0                           | 189.00                                      | 209.00        | 1               | 1                           | 5.5                   | 275.0                                  |
| 1.5SMB180CA | 1.5SMB180A | 180.0                           | 201.00                                      | 222.0         | 1               | 1                           | 5.1                   | 292.0                                  |
| 1.5SMB190CA | 1.5SMB190A | 190.0                           | 211.00                                      | 233.00        | 1               | 1                           | 4.9                   | 308.0                                  |
| 1.5SMB200CA | 1.5SMB200A | 200.0                           | 224.0                                       | 247.00        | 1               | 1                           | 4.6                   | 324.0                                  |
| 1.5SMB210CA | 1.5SMB220A | 210.0                           | 237.00                                      | 263.00        | 1               | 1                           | 4.2                   | 356.0                                  |
| 1.5SMB220CA | 1.5SMB220A | 220.0                           | 246.00                                      | 272.00        | 1               | 1                           | 4.2                   | 356.0                                  |
| 1.5SMB250CA | 1.5SMB250A | 250.0                           | 279.00                                      | 309.00        | 1               | 1                           | 3.7                   | 405.0                                  |
| 1.5SMB300CA | 1.5SMB300A | 300.0                           | 335.0                                       | 371.00        | 1               | 1                           | 3.1                   | 486.0                                  |
| 1.5SMB350CA | 1.5SMB350A | 350.0                           | 391.00                                      | 432.00        | 1               | 1                           | 2.6                   | 567.0                                  |
| 1.5SMB400CA | 1.5SMB400A | 400.0                           | 447.00                                      | 494.00        | 1               | 1                           | 2.3                   | 648.0                                  |
| 1.5SMB440CA | 1.5SMB440A | 440.0                           | 492.00                                      | 543.00        | 1               | 1                           | 2.1                   | 713.0                                  |

**Notes:**

For bidirectional type having VRWM of 10 volts and less, the IR limit is double.

For parts without A (VBR is  $\pm$  10% and VC is 5% higher than A parts)

### I-V Curve Characteristics



### RATINGS AND CHARACTERISTIC CURVES (TA=25°C unless otherwise noted)

Figure 1 - Peak Pulse Power Rating Curve

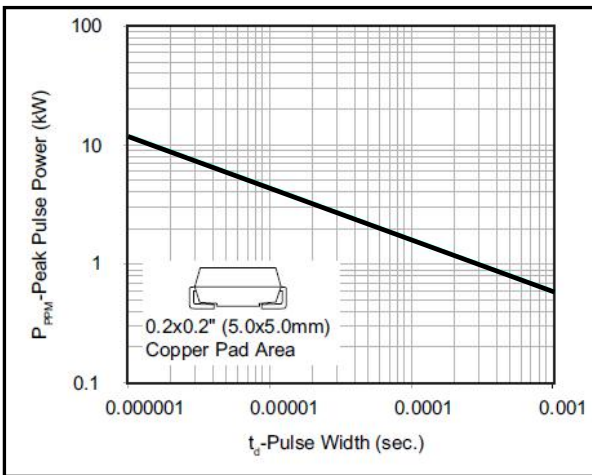


Figure 2 - Pulse Derating Curve

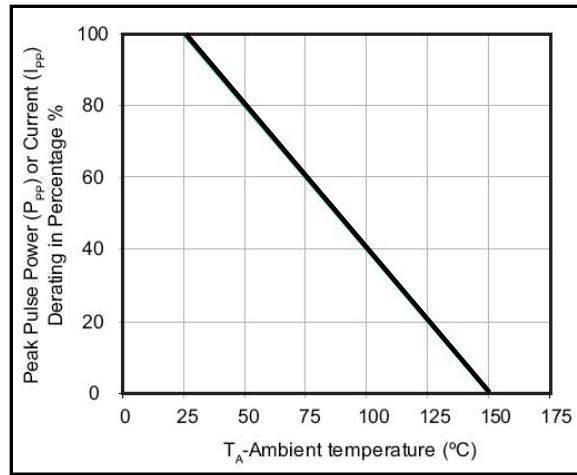


Figure 3 - Pulse Waveform

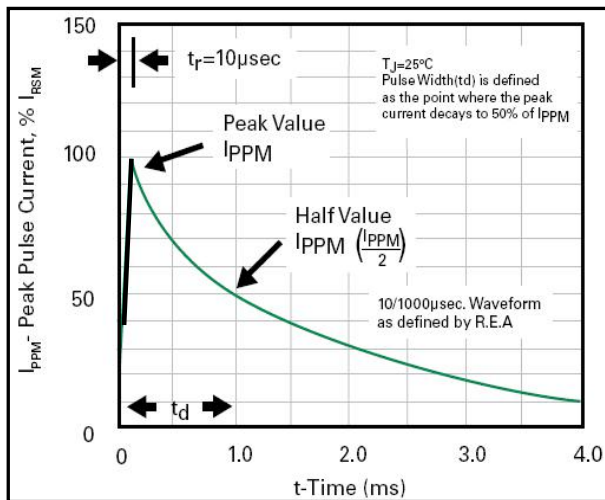


Figure 4 - Typical Junction Capacitance

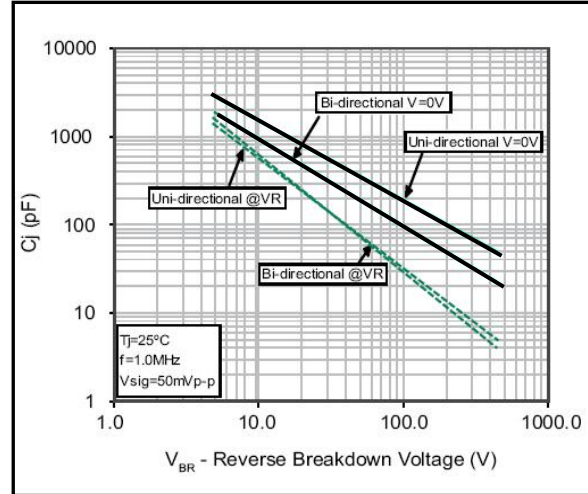


Figure 5 - Steady State Power Dissipation Derating Curve

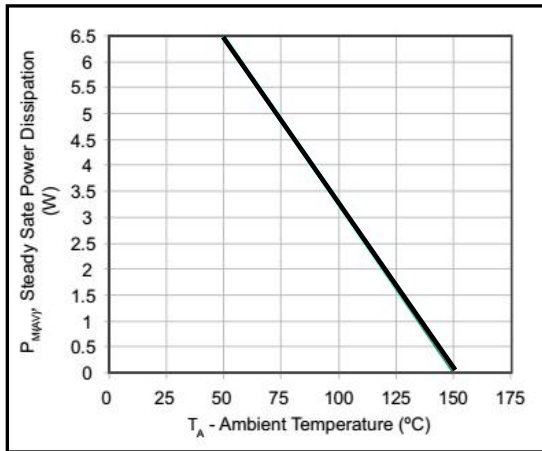
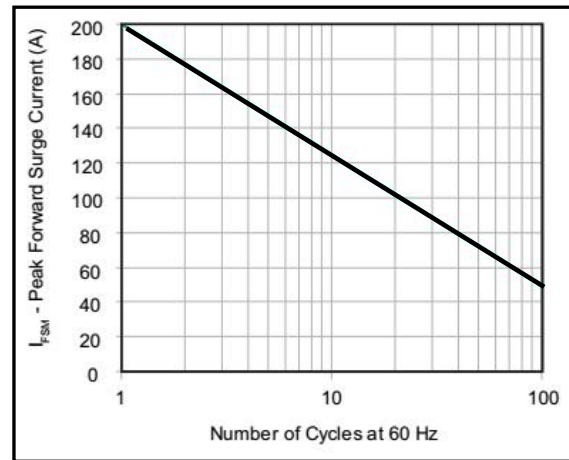


Figure 6 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Only



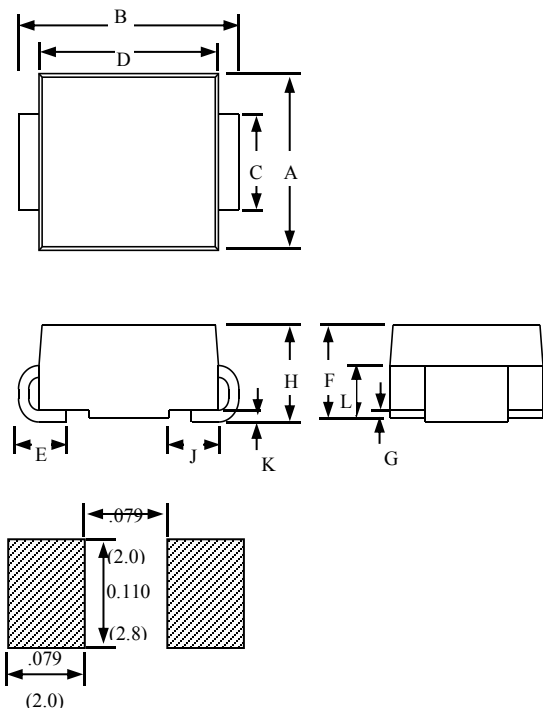
## PART NUMBERING SYSTEM

**1.5SMB**      **XXX**      **C**      **A**  
 (1)                      (2)                      (3)                      (4)

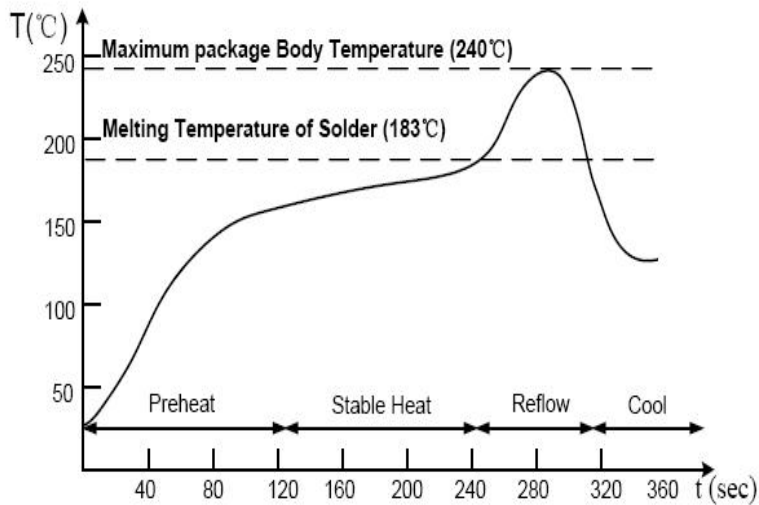
- (1) SERIES.
- (2) VR VOLTAGE.
- (3) BI-DIRECTIONAL AND UNI-DIRECTIONAL.
- (4) 5% VOLTAGE TOLERANCE.

## PRODUCT DIMENSIONS

| Dimension | Inches |       | Millimeters |      |
|-----------|--------|-------|-------------|------|
|           | MIN    | MAX   | MIN         | MAX  |
| A         | 0.134  | 0.155 | 3.40        | 3.94 |
| B         | 0.205  | 0.22  | 5.21        | 5.59 |
| C         | 0.075  | 0.083 | 1.90        | 2.11 |
| D         | 0.166  | 0.185 | 4.22        | 4.70 |
| E         | 0.036  | 0.056 | 0.91        | 1.42 |
| F         | 0.073  | 0.087 | 1.85        | 2.2  |
| G         | 0.002  | 0.008 | 0.05        | 0.20 |
| H         | 0.077  | 0.094 | 1.95        | 2.45 |
| J         | 0.043  | 0.053 | 1.09        | 1.35 |
| K         | 0.008  | 0.014 | 0.20        | 0.35 |
| L         | 0.039  | 0.049 | 0.99        | 1.24 |




## SOLDER REFLOW RECOMMENDATIONS



- Recommended reflow methods: IR, vapor phase oven, hot air oven, wave solder.
- The device can be exposed to a maximum temperature of 265°C for 10 seconds.
- Devices can be cleaned using standard industry methods and solvents.

**Notes:** If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

## SUMMARY OF PACKING OPTIONS

| Package Type   | Description                | Packing Quantity | Industry Standard |
|--|----------------------------|------------------|-------------------|
| DO-214AA(SMB)<br> | Embossed Carrier Reel Pack | 3000PCS          | EIA-481-D         |