

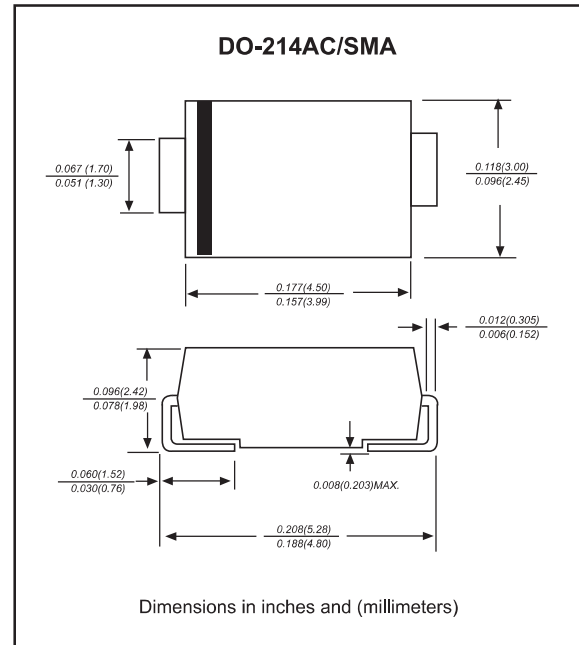
## Features

- 400W peak pulse power capability with a 10/1000  $\mu$ s waveform, repetition rate (duty cycle): 0.01%.
- Low profile surface mounted application in order to optimize board space.
- Excellent clamping capability.
- Low incremental surge resistance.
- Fast response time from 0V to VBR, typically less than 1 ps for uni-directional & 5 ns for bi-directional types.
- Glass passivated chip junction.
- Lead-free parts meet RoHS requirements.
- Compliant to Halogen-free

## Mechanical data

- Epoxy: UL94-V0 rated flame retardant
- Case : Molded plastic, DO-214AC / SMA
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Polarity : Indicated by cathode band
- Mounting Position : Any

## Package outline



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

| PARAMETER                             | CONDITIONS  | Symbol      | Value       | UNIT             |
|---------------------------------------|---|-------------|-------------|------------------|
| Peak Power Dissipation                | with a 10/1000 $\mu$ s waveform, Note 1, 2 & Fig. 1 | $P_{PPM}$   | 400         | W                |
| Peak Pulse current                    | with a 10/1000 $\mu$ s waveform                     | $I_{PPM}$   | See Table 1 | A                |
| Steady State Power Dissipation        | at $T_L=75^\circ\text{C}$ , Note 2                  | $P_{M(AV)}$ | 1.0         | W                |
| Peak Forward Surge Current            | 8.3ms Single Half Sine-Wave, Note 3                 | $I_{FSM}$   | 40          | A                |
| Maximum Instantaneous Forward Voltage | at 25A For Uni-Directional Types Only, Note 4       | $V_F$       | 3.5/6.5     | V                |
| Operating temperature range           |   | $T_J$       | -55 ~ +150  | $^\circ\text{C}$ |
| Storage temperature range             |   | $T_{STG}$   | -55 ~ +150  | $^\circ\text{C}$ |

Note 1. Non-repetitive current pulse, per Fig. 3 and derated above  $T_A=25^\circ\text{C}$  per Fig. 2  
 2. Mounted on copper pad area of 0.2"x0.2" (5.0x5.0 mm) per Fig 5  
 3. Measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum  
 4.  $V_F < 3.5\text{V}$  for  $V_{BR} < 200\text{V}$  and  $V_F < 6.5\text{V}$  for  $V_{BR} > 201\text{V}$ .

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

| Part No.<br>(Uni) | Part No.<br>(Bi) | Reverse Stand-off Voltage | Breakdown Voltage @ $I_T$ |                    | Test Current | Maximum Clamping Voltage @ $I_{PP}$ |          | Maximum Reverse Leakage Current | Marking Code |    |
|-------------------|------------------|---------------------------|---------------------------|--------------------|--------------|-------------------------------------|----------|---------------------------------|--------------|----|
|                   |                  | $V_{RWM}$                 | $V_{BR\text{Min}}$        | $V_{BR\text{Max}}$ | $I_T$        | $V_c$                               | $I_{PP}$ | $I_R@V_{RWM}$                   |              |    |
|                   |                  | Volts                     | Volts                     | Volts              | mA           | Volts                               | A        | $\mu\text{A}$                   | UNI          | BI |
| SMAJ5.0A          | SMAJ5.0CA        | 5.0                       | 6.40                      | 7.00               | 10           | 9.2                                 | 43.5     | 800                             | AE           | WE |
| SMAJ6.0A          | SMAJ6.0CA        | 6.0                       | 6.67                      | 7.37               | 10           | 10.3                                | 38.0     | 800                             | AG           | WG |
| SMAJ6.5A          | SMAJ6.5CA        | 6.5                       | 7.22                      | 7.98               | 10           | 11.2                                | 35.7     | 500                             | AK           | WK |
| SMAJ7.0A          | SMAJ7.0CA        | 7.0                       | 7.78                      | 8.60               | 10           | 12.0                                | 33.3     | 200                             | AM           | WM |
| SMAJ7.5A          | SMAJ7.5CA        | 7.5                       | 8.33                      | 9.21               | 1.0          | 12.9                                | 31.0     | 100                             | AP           | WP |
| SMAJ8.0A          | SMAJ8.0CA        | 8.0                       | 8.89                      | 9.83               | 1.0          | 13.6                                | 29.4     | 50                              | AR           | WR |
| SMAJ8.5A          | SMAJ8.5CA        | 8.5                       | 9.44                      | 10.4               | 1.0          | 14.4                                | 27.7     | 20                              | AT           | WT |
| SMAJ9.0A          | SMAJ9.0CA        | 9.0                       | 10.0                      | 11.1               | 1.0          | 15.4                                | 26.0     | 10                              | AV           | WV |
| SMAJ10A           | SMAJ10CA         | 10                        | 11.1                      | 12.3               | 1.0          | 17.0                                | 23.5     | 5                               | AX           | WX |
| SMAJ11A           | SMAJ11CA         | 11                        | 12.2                      | 13.5               | 1.0          | 18.2                                | 22.0     | 5                               | AZ           | WZ |
| SMAJ12A           | SMAJ12CA         | 12                        | 13.3                      | 14.7               | 1.0          | 19.9                                | 20.1     | 5                               | BE           | XE |
| SMAJ13A           | SMAJ13CA         | 13                        | 14.4                      | 15.9               | 1.0          | 21.5                                | 18.6     | 5                               | BG           | XG |
| SMAJ14A           | SMAJ14CA         | 14                        | 15.6                      | 17.2               | 1.0          | 23.2                                | 17.2     | 5                               | BK           | XK |
| SMAJ15A           | SMAJ15CA         | 15                        | 16.7                      | 18.5               | 1.0          | 24.4                                | 16.4     | 5                               | BM           | XM |
| SMAJ16A           | SMAJ16CA         | 16                        | 17.8                      | 19.7               | 1.0          | 26.0                                | 15.4     | 5                               | BP           | XP |
| SMAJ17A           | SMAJ17CA         | 17                        | 18.9                      | 20.9               | 1.0          | 27.6                                | 14.5     | 5                               | BR           | XR |
| SMAJ18A           | SMAJ18CA         | 18                        | 20.0                      | 22.1               | 1.0          | 29.2                                | 13.7     | 5                               | BT           | XT |
| SMAJ20A           | SMAJ20CA         | 20                        | 22.2                      | 24.5               | 1.0          | 32.4                                | 12.3     | 5                               | BV           | XV |
| SMAJ22A           | SMAJ22CA         | 22                        | 24.4                      | 26.9               | 1.0          | 35.5                                | 11.2     | 5                               | BX           | XX |
| SMAJ24A           | SMAJ24CA         | 24                        | 26.7                      | 29.5               | 1.0          | 38.9                                | 10.3     | 5                               | BZ           | XZ |
| SMAJ26A           | SMAJ26CA         | 26                        | 28.9                      | 31.9               | 1.0          | 42.1                                | 9.5      | 5                               | CE           | YE |
| SMAJ28A           | SMAJ28CA         | 28                        | 31.1                      | 34.4               | 1.0          | 45.4                                | 8.8      | 5                               | CG           | YG |
| SMAJ30A           | SMAJ30CA         | 30                        | 33.3                      | 36.8               | 1.0          | 48.4                                | 8.3      | 5                               | CK           | YK |
| SMAJ33A           | SMAJ33CA         | 33                        | 36.7                      | 40.6               | 1.0          | 53.3                                | 7.5      | 5                               | CM           | YM |
| SMAJ36A           | SMAJ36CA         | 36                        | 40.0                      | 44.2               | 1.0          | 58.1                                | 6.9      | 5                               | CP           | YP |
| SMAJ40A           | SMAJ40CA         | 40                        | 44.4                      | 49.1               | 1.0          | 64.5                                | 6.2      | 5                               | CR           | YR |
| SMAJ43A           | SMAJ43CA         | 43                        | 47.8                      | 52.8               | 1.0          | 69.4                                | 5.8      | 5                               | CT           | YT |
| SMAJ45A           | SMAJ45CA         | 45                        | 50.0                      | 55.3               | 1.0          | 72.7                                | 5.5      | 5                               | CV           | YV |
| SMAJ48A           | SMAJ48CA         | 48                        | 53.3                      | 58.9               | 1.0          | 77.4                                | 5.2      | 5                               | CX           | YX |
| SMAJ51A           | SMAJ51CA         | 51                        | 56.7                      | 62.7               | 1.0          | 82.4                                | 4.9      | 5                               | CZ           | YZ |
| SMAJ54A           | SMAJ54CA         | 54                        | 60.0                      | 66.3               | 1.0          | 87.1                                | 4.6      | 5                               | RE           | ZE |
| SMAJ58A           | SMAJ58CA         | 58                        | 64.4                      | 71.2               | 1.0          | 93.6                                | 4.3      | 5                               | RG           | ZG |
| SMAJ60A           | SMAJ60CA         | 60                        | 66.7                      | 73.7               | 1.0          | 96.8                                | 4.1      | 5                               | RK           | ZK |
| SMAJ64A           | SMAJ64CA         | 64                        | 71.1                      | 78.6               | 1.0          | 103.0                               | 3.9      | 5                               | RM           | ZM |
| SMAJ70A           | SMAJ70CA         | 70                        | 77.8                      | 86.0               | 1.0          | 113.0                               | 3.5      | 5                               | RP           | ZP |
| SMAJ75A           | SMAJ75CA         | 75                        | 83.3                      | 92.1               | 1.0          | 121.0                               | 3.3      | 5                               | RR           | ZR |
| SMAJ78A           | SMAJ78CA         | 78                        | 86.7                      | 95.8               | 1.0          | 126.0                               | 3.2      | 5                               | RT           | ZT |
| SMAJ85A           | SMAJ85CA         | 85                        | 94.4                      | 104                | 1.0          | 137.0                               | 2.9      | 5                               | RV           | ZV |

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

| Part No. (Uni) | Part No. (Bi) | Reverse Stand-off Voltage | Breakdown Voltage @ $I_T$ |              | Test Current | Maximum Clamping Voltage @ $I_{PP}$ |          | Maximum Reverse Leakage Current | Marking Code |    |
|----------------|---------------|---------------------------|---------------------------|--------------|--------------|-------------------------------------|----------|---------------------------------|--------------|----|
|                |               | $V_{RWM}$                 | $V_{BR Min}$              | $V_{BR Max}$ | $I_T$        | $V_c$                               | $I_{PP}$ | $I_R@V_{RWM}$                   |              |    |
|                |               | Volts                     | Volts                     | Volts        | mA           | Volts                               | A        | $\mu\text{A}$                   | UNI          | BI |
| SMAJ90A        | SMAJ90CA      | 90                        | 100                       | 111          | 1.0          | 146.0                               | 2.7      | 5                               | RX           | ZX |
| SMAJ100A       | SMAJ100CA     | 100                       | 111                       | 123          | 1.0          | 162.0                               | 2.5      | 5                               | RZ           | ZZ |
| SMAJ110A       | SMAJ110CA     | 110                       | 122                       | 135          | 1.0          | 177.0                               | 2.3      | 5                               | SE           | VE |
| SMAJ120A       | SMAJ120CA     | 120                       | 133                       | 147          | 1.0          | 193.0                               | 2.1      | 5                               | SG           | VG |
| SMAJ130A       | SMAJ130CA     | 130                       | 144                       | 159          | 1.0          | 209.0                               | 1.9      | 5                               | SK           | VK |
| SMAJ150A       | SMAJ150CA     | 150                       | 167                       | 185          | 1.0          | 243.0                               | 1.6      | 5                               | SM           | VM |
| SMAJ160A       | SMAJ160CA     | 160                       | 178                       | 197          | 1.0          | 259.0                               | 1.5      | 5                               | SP           | VP |
| SMAJ170A       | SMAJ170CA     | 170                       | 189                       | 209          | 1.0          | 275.0                               | 1.5      | 5                               | SR           | VR |
| SMAJ180A       | SMAJ180CA     | 180                       | 201                       | 222          | 1.0          | 292.0                               | 1.4      | 5                               | ST           | VT |
| SMAJ200A       | SMAJ200CA     | 200                       | 224                       | 247          | 1.0          | 324.0                               | 1.2      | 5                               | SV           | VV |
| SMAJ220A       | SMAJ220CA     | 220                       | 246                       | 272          | 1.0          | 356.0                               | 1.1      | 5                               | SX           | VX |
| SMAJ250A       | SMAJ250CA     | 250                       | 279                       | 309          | 1.0          | 405.0                               | 1.0      | 5                               | SZ           | VZ |
| SMAJ300A       | SMAJ300CA     | 300                       | 335                       | 371          | 1.0          | 486.0                               | 0.8      | 5                               | TE           | UE |
| SMAJ350A       | SMAJ350CA     | 350                       | 391                       | 432          | 1.0          | 567.0                               | 0.7      | 5                               | TG           | UG |
| SMAJ400A       | SMAJ400CA     | 400                       | 447                       | 494          | 1.0          | 648.0                               | 0.6      | 5                               | TK           | UK |
| SMAJ440A       | SMAJ440CA     | 440                       | 492                       | 543          | 1.0          | 713.0                               | 0.6      | 5                               | TM           | UM |

- Note 1.  $V_{BR}$  measured after  $I_T$  applied for 300us,  $I_T$ =square wave pulse or equivalent
- 2. Surge current waveform per Fig. 3 and derated per Fig. 2
- 3. For bi-directional types having  $V_{RWM}$  of 10 volts and less, the  $I_R$  limit is doubled
- 4. Suffix 'C' denotes bi-directional devices. Suffix 'A' denotes 5% tolerance devices, no suffix denotes 10% tolerance devices.

Fig. a - Transients of several thousand volts can be clamped to a safe level by the TVS

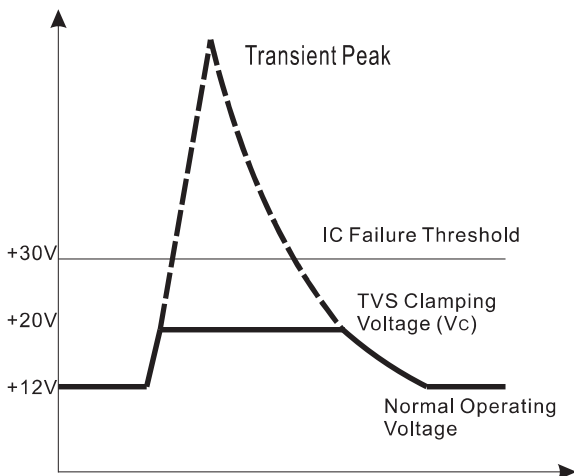
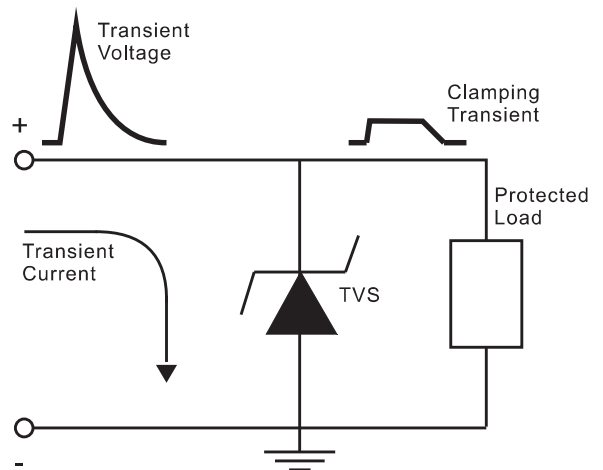
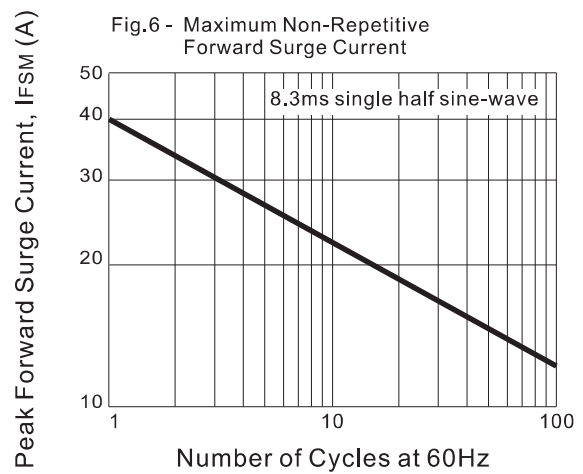
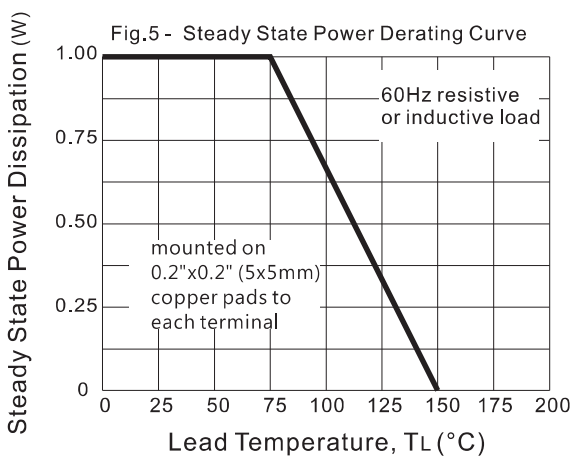
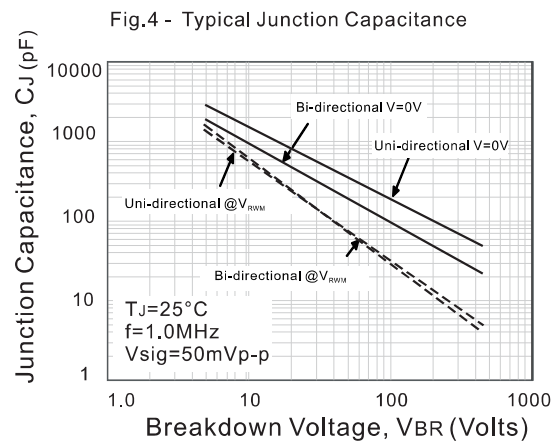
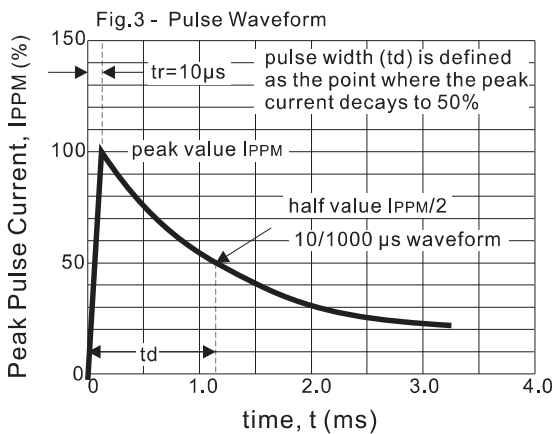
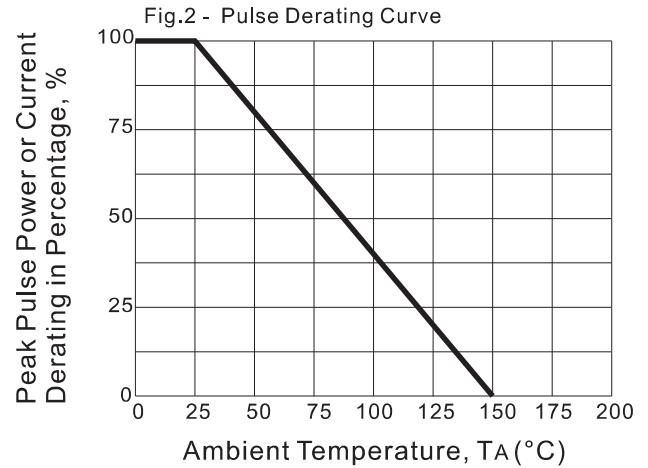
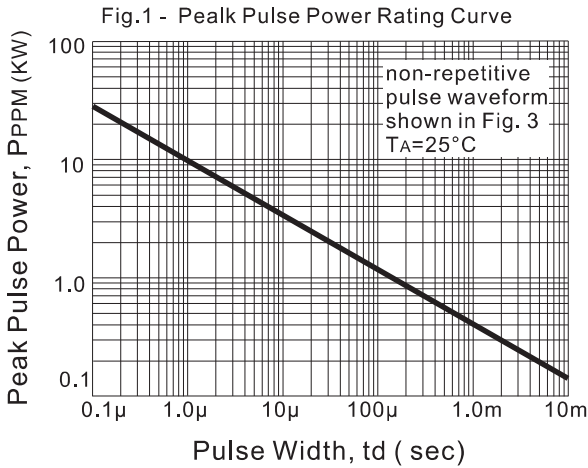






Fig. b - Transient current is diverted to ground thru TVS; the voltage seen by the protected load is limited to the clamping voltage level



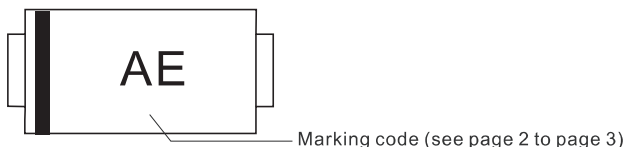
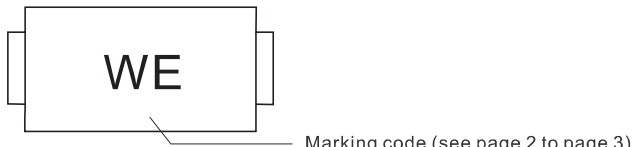
## Rating and characteristic curves



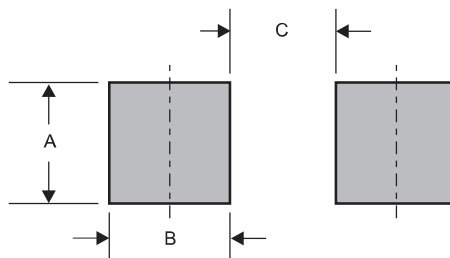
## Pinning information

| Pin   | Simplified outline  | Symbol  |
|---|---|---|
| Uni-Directional<br>Pin1 cathode<br>Pin2 anode |  |  |
| Bi-Directional                                |  |  |

## Marking

| Type number     | Example  |
|-----------------|--|
| Uni-Directional |  |
| Bi-Directional  |  |

## Suggested solder pad layout

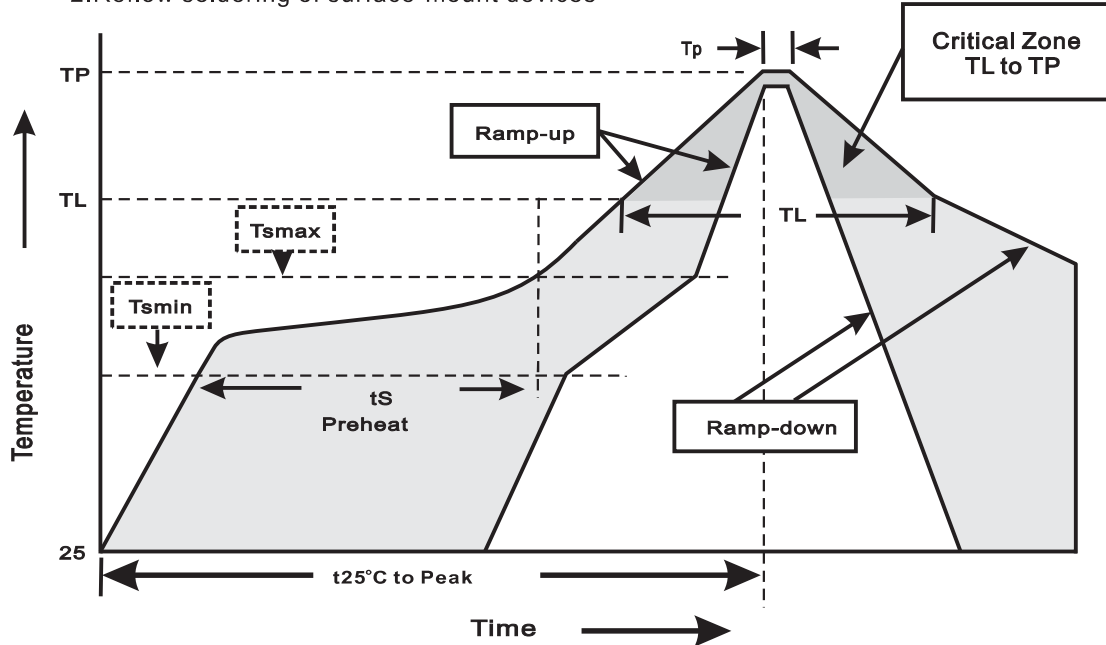


Dimensions in inches and (millimeters)

| PACKAGE | A            | B            | C            |
|---------|--------------|--------------|--------------|
| SMA     | 0.063 (1.60) | 0.059 (1.50) | 0.110 (2.80) |

## Suggested thermal profiles for soldering processes

- 1.Storage environment: Temperature=5°C~40°C Humidity=55%±25%
- 2.Reflow soldering of surface-mount devices



### 3.Reflow soldering

| Profile Feature   | Soldering Condition         |
|---|-----------------------------|
| Average ramp-up rate(T <sub>L</sub> to T <sub>P</sub> )   | <3°C/sec                    |
| Preheat<br>-Temperature Min(T <sub>smin</sub> )<br>-Temperature Max(T <sub>smax</sub> )<br>-Time(min to max)(t <sub>s</sub> ) | 150°C<br>200°C<br>60~120sec |
| T <sub>smax</sub> to T <sub>L</sub><br>-Ramp-upRate   | <3°C/sec                    |
| Time maintained above:<br>-Temperature(T <sub>L</sub> )<br>-Time(t <sub>L</sub> )   | 217°C<br>60~260sec          |
| Peak Temperature(T <sub>P</sub> )   | 255°C-0/+5°C                |
| Time within 5°C of actual Peak Temperature(t <sub>P</sub> )   | 10~30sec                    |
| Ramp-down Rate  | <6°C/sec                    |
| Time 25°C to Peak Temperature   | <6minutes                   |

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