

Surface Mount Transient Voltage Suppressors
Peak Pulse Power 400W Stand Off Voltage 5.0 to 440V

SMAJ5.0 thru SMAJ440CA

Features

- Low profile package with built-in strain relief for surface mounted applications
- Plastic package has UL flammability classification 94V-0
- Ideal for ESD protection of data line in accordance with IEC1000-4-2 (IEC801-2)
- Ideal for EFT protection of data line in accordance with IEC1000-4-4 (IEC801-4)
- Very-fast response time
- Optimized for LAN protection applications
- Low incremental surge resistance, excellent clamping capability
- Glass passivated junction
- High temperature soldering guaranteed: 250°C/10seconds at terminals
- 400W peak pulse power capability with a 10/1000µs waveform, repetition rate (duty cycle) : 0.01%

Outline



Mechanical Data

- Case : JEDEC DO-214AC(SMA) molded plastic body
- Terminals: Pure tin plated, solderable per MIL-STD-750 method 2026
- Polarity: For uni-directional types, the band denotes the cathode, which is positive with respect to the anode under normal TVS operation
- Mounting position : Any
- Weight: 0.002 oz., 0.064 gram

Devices for bidirectional applications

For bi-directional devices, electrical characteristics apply in both directions.

Maximum Ratings and Characteristics (T_A=25°C, unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|---|----------------------------------|-------------------------|------|
| Peak pulse power dissipation with a 10/1000µs waveform (Fig. 1) | PPPM | Minimum 400 (Note 1, 2) | W |
| Peak pulse current with a 10/1000µs waveform (Fig. 3) | IPPM | See next table (Note 1) | A |
| Peak forward surge current, 8.3ms single half sine wave uni-directional only (Note 2) | IFSM | 40 | A |
| Typical thermal resistance, junction-to-case | R _{θJC} | 32 | °C/W |
| Typical thermal resistance, junction-to-ambient (Note 3) | R _{θJA} | 120 | °C/W |
| Maximum instantaneous forward voltage at 25A for unidirectional only (Note 4) | V _F | 3.5 / 5.0 | V |
| Operating junction and storage temperature range | T _J ;T _{STG} | -55 ~ +150 | °C |

Notes: 1. Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2.

2. Mounted on 0.2"×0.2" (5mm×5mm) copper pads to each terminal.

3. Mounted on minimum recommended pad layout.

4. V_F<3.5V for devices of V_{BR}<200V and V_F<5V for devices of V_{BR}>201V.



Electrical Characteristics Ratings at 25°C ambient temperature, unless otherwise noted.

| Part Number | | Device Marking Code | | Breakdown Voltage V _{BR} @ I _T (V) | | Test current at I _T (mA) | Reverse standoff voltage V _{RWM} (V) | Maximum reverse leakage at V _{RWM} I _R (μA) | Maximum peak pulse Current I _{PPM} (A) | Maximum clamping voltage at I _{PPM} V _C (V) |
|-------------|-----------|---------------------|----|--|------|-------------------------------------|---|---|---|---|
| UNI | BI | UNI | BI | Min | Max | | | | | |
| SMAJ5.0 | SMAJ5.0C | AD | WD | 6.40 | 7.30 | 10 | 5.0 | 800 | 41.7 | 9.6 |
| SMAJ5.0A | SMAJ5.0CA | AE | WE | 6.40 | 7.00 | 10 | 5.0 | 800 | 43.5 | 9.2 |
| SMAJ6.0 | SMAJ6.0C | AF | WF | 6.67 | 8.15 | 10 | 6.0 | 800 | 35.1 | 11.4 |
| SMAJ6.0A | SMAJ6.0CA | AG | WG | 6.67 | 7.37 | 10 | 6.0 | 800 | 38.8 | 10.3 |
| SMAJ6.5 | SMAJ6.5C | AH | WH | 7.22 | 8.82 | 10 | 6.5 | 500 | 32.5 | 12.3 |
| SMAJ6.5A | SMAJ6.5CA | AK | WK | 7.22 | 7.98 | 10 | 6.5 | 500 | 35.7 | 11.2 |
| SMAJ7.0 | SMAJ7.0C | AL | WL | 7.78 | 9.51 | 10 | 7.0 | 200 | 30.1 | 13.3 |
| SMAJ7.0A | SMAJ7.0CA | AM | WM | 7.78 | 8.60 | 10 | 7.0 | 200 | 33.3 | 12.0 |
| SMAJ7.5 | SMAJ7.5C | AN | WN | 8.33 | 10.2 | 1.0 | 7.5 | 100 | 28.0 | 14.3 |
| SMAJ7.5A | SMAJ7.5CA | AP | WP | 8.33 | 9.21 | 1.0 | 7.5 | 100 | 31.0 | 12.9 |
| SMAJ8.0 | SMAJ8.0C | AQ | WQ | 8.89 | 10.9 | 1.0 | 8.0 | 50 | 26.7 | 15.0 |
| SMAJ8.0A | SMAJ8.0CA | AR | WR | 8.89 | 9.83 | 1.0 | 8.0 | 50 | 29.4 | 13.6 |
| SMAJ8.5 | SMAJ8.5C | AS | WS | 9.44 | 11.5 | 1.0 | 8.5 | 10 | 25.2 | 15.9 |
| SMAJ8.5A | SMAJ8.5CA | AT | WT | 9.44 | 10.4 | 1.0 | 8.5 | 10 | 27.8 | 14.4 |
| SMAJ9.0 | SMAJ9.0C | AU | WU | 10.0 | 12.2 | 1.0 | 9.0 | 5.0 | 23.7 | 16.9 |
| SMAJ9.0A | SMAJ9.0CA | AV | WV | 10.0 | 11.1 | 1.0 | 9.0 | 5.0 | 26.0 | 15.4 |
| SMAJ10 | SMAJ10C | AW | WW | 11.1 | 13.6 | 1.0 | 10 | 5.0 | 21.3 | 18.8 |
| SMAJ10A | SMAJ10CA | AX | WX | 11.1 | 12.3 | 1.0 | 10 | 5.0 | 23.5 | 17.0 |
| SMAJ11 | SMAJ11C | AY | WY | 12.2 | 14.9 | 1.0 | 11 | 5.0 | 19.9 | 20.1 |
| SMAJ11A | SMAJ11CA | AZ | WZ | 12.2 | 13.5 | 1.0 | 11 | 5.0 | 22.0 | 18.2 |
| SMAJ12 | SMAJ12C | BD | XD | 13.3 | 16.3 | 1.0 | 12 | 5.0 | 18.2 | 22.0 |
| SMAJ12A | SMAJ12CA | BE | XE | 13.3 | 14.7 | 1.0 | 12 | 5.0 | 20.1 | 19.9 |
| SMAJ13 | SMAJ13C | BF | XF | 14.4 | 17.6 | 1.0 | 13 | 5.0 | 16.8 | 23.8 |
| SMAJ13A | SMAJ13CA | BG | XG | 14.4 | 15.9 | 1.0 | 13 | 5.0 | 18.6 | 21.5 |
| SMAJ14 | SMAJ14C | BH | XH | 15.6 | 19.1 | 1.0 | 14 | 5.0 | 15.5 | 25.8 |
| SMAJ14A | SMAJ14CA | BK | XK | 15.6 | 17.2 | 1.0 | 14 | 5.0 | 17.2 | 23.2 |
| SMAJ15 | SMAJ15C | BL | XL | 16.7 | 20.4 | 1.0 | 15 | 5.0 | 14.9 | 26.9 |
| SMAJ15A | SMAJ15CA | BM | XM | 16.7 | 18.5 | 1.0 | 15 | 5.0 | 16.4 | 24.4 |
| SMAJ16 | SMAJ16C | BN | XN | 17.8 | 21.8 | 1.0 | 16 | 5.0 | 13.9 | 28.8 |
| SMAJ16A | SMAJ16CA | BP | XP | 17.8 | 19.7 | 1.0 | 16 | 5.0 | 15.4 | 26.0 |
| SMAJ17 | SMAJ17C | BQ | XQ | 18.9 | 23.1 | 1.0 | 17 | 5.0 | 13.1 | 30.5 |
| SMAJ17A | SMAJ17CA | BR | XR | 18.9 | 20.9 | 1.0 | 17 | 5.0 | 14.5 | 27.6 |
| SMAJ18 | SMAJ18C | BS | XS | 20.0 | 24.4 | 1.0 | 18 | 5.0 | 12.4 | 32.2 |
| SMAJ18A | SMAJ18CA | BT | XT | 20.0 | 22.1 | 1.0 | 18 | 5.0 | 13.7 | 29.2 |
| SMAJ19 | SMAJ19C | BA | XA | 21.1 | 25.8 | 1.0 | 19 | 5.0 | 11.8 | 34.0 |
| SMAJ19A | SMAJ19CA | BB | XB | 21.1 | 23.3 | 1.0 | 19 | 5.0 | 13.0 | 30.8 |
| SMAJ20 | SMAJ20C | BU | XU | 22.2 | 27.1 | 1.0 | 20 | 5.0 | 11.2 | 35.8 |
| SMAJ20A | SMAJ20CA | BV | XV | 22.2 | 24.5 | 1.0 | 20 | 5.0 | 12.3 | 32.4 |
| SMAJ22 | SMAJ22C | BW | XW | 24.4 | 29.8 | 1.0 | 22 | 5.0 | 10.2 | 39.4 |
| SMAJ22A | SMAJ22CA | BX | XX | 24.4 | 26.9 | 1.0 | 22 | 5.0 | 11.3 | 35.5 |
| SMAJ24 | SMAJ24C | BY | XY | 26.7 | 32.6 | 1.0 | 24 | 5.0 | 9.3 | 43.0 |
| SMAJ24A | SMAJ24CA | BZ | XZ | 26.7 | 29.5 | 1.0 | 24 | 5.0 | 10.3 | 38.9 |



Electrical Characteristics(Cont.)

| Part Number | | Device Marking Code | | Breakdown Voltage VBR @ Ir (V) | | Test current at Ir (mA) | Reverse standoff voltage VRWM (V) | Maximum reverse leakage at VRWM IR (µA) | Maximum peak pulse Current IPPM (A) | Maximum clamping voltage at IPPM Vc (V) |
|-------------|-----------|---------------------|----|--------------------------------|------|-------------------------|-----------------------------------|---|-------------------------------------|---|
| UNI | BI | UNI | BI | Min | Max | | | | | |
| SMAJ26 | SMAJ26C | CD | YD | 28.9 | 35.3 | 1.0 | 26 | 5.0 | 8.6 | 46.6 |
| SMAJ26A | SMAJ26CA | CE | YE | 28.9 | 31.9 | 1.0 | 26 | 5.0 | 9.5 | 42.1 |
| SMAJ28 | SMAJ28C | CF | YF | 31.1 | 38.0 | 1.0 | 28 | 5.0 | 8.0 | 50.0 |
| SMAJ28A | SMAJ28CA | CG | YG | 31.1 | 34.4 | 1.0 | 28 | 5.0 | 8.8 | 45.4 |
| SMAJ30 | SMAJ30C | CH | YH | 33.3 | 40.7 | 1.0 | 30 | 5.0 | 7.5 | 53.5 |
| SMAJ30A | SMAJ30CA | CK | YK | 33.3 | 36.8 | 1.0 | 30 | 5.0 | 8.3 | 48.4 |
| SMAJ33 | SMAJ33C | CL | YL | 36.7 | 44.9 | 1.0 | 33 | 5.0 | 6.8 | 59.0 |
| SMAJ33A | SMAJ33CA | CM | YM | 36.7 | 40.6 | 1.0 | 33 | 5.0 | 7.5 | 53.3 |
| SMAJ36 | SMAJ36C | CN | YN | 40.0 | 48.9 | 1.0 | 36 | 5.0 | 6.2 | 64.3 |
| SMAJ36A | SMAJ36CA | CP | YP | 40.0 | 44.2 | 1.0 | 36 | 5.0 | 6.9 | 58.1 |
| SMAJ40 | SMAJ40C | CQ | YQ | 44.4 | 54.3 | 1.0 | 40 | 5.0 | 5.6 | 71.4 |
| SMAJ40A | SMAJ40CA | CR | YR | 44.4 | 49.1 | 1.0 | 40 | 5.0 | 6.2 | 64.5 |
| SMAJ43 | SMAJ43C | CS | YS | 47.8 | 58.4 | 1.0 | 43 | 5.0 | 5.2 | 76.7 |
| SMAJ43A | SMAJ43CA | CT | YT | 47.8 | 52.8 | 1.0 | 43 | 5.0 | 5.8 | 69.4 |
| SMAJ45 | SMAJ45C | CU | YU | 50.0 | 61.1 | 1.0 | 45 | 5.0 | 5.0 | 80.3 |
| SMAJ45A | SMAJ45CA | CV | YV | 50.0 | 55.3 | 1.0 | 45 | 5.0 | 5.5 | 72.7 |
| SMAJ48 | SMAJ48C | CW | YW | 53.3 | 65.1 | 1.0 | 48 | 5.0 | 4.7 | 85.5 |
| SMAJ48A | SMAJ48CA | CX | YX | 53.3 | 58.9 | 1.0 | 48 | 5.0 | 5.2 | 77.4 |
| SMAJ51 | SMAJ51C | CY | YY | 56.7 | 69.3 | 1.0 | 51 | 5.0 | 4.4 | 91.1 |
| SMAJ51A | SMAJ51CA | CZ | YZ | 56.7 | 62.7 | 1.0 | 51 | 5.0 | 4.9 | 82.4 |
| SMAJ54 | SMAJ54C | RD | ZD | 60.0 | 73.3 | 1.0 | 54 | 5.0 | 4.2 | 96.3 |
| SMAJ54A | SMAJ54CA | RE | ZE | 60.0 | 66.3 | 1.0 | 54 | 5.0 | 4.6 | 87.1 |
| SMAJ58 | SMAJ58C | RF | ZF | 64.4 | 78.7 | 1.0 | 58 | 5.0 | 3.9 | 103 |
| SMAJ58A | SMAJ58CA | RG | ZG | 64.4 | 71.2 | 1.0 | 58 | 5.0 | 4.3 | 93.6 |
| SMAJ60 | SMAJ60C | RH | ZH | 66.7 | 81.5 | 1.0 | 60 | 5.0 | 3.7 | 107 |
| SMAJ60A | SMAJ60CA | RK | ZK | 66.7 | 73.7 | 1.0 | 60 | 5.0 | 4.1 | 96.8 |
| SMAJ64 | SMAJ64C | RL | ZL | 71.1 | 86.9 | 1.0 | 64 | 5.0 | 3.5 | 114 |
| SMAJ64A | SMAJ64CA | RM | ZM | 71.1 | 78.6 | 1.0 | 64 | 5.0 | 3.9 | 103 |
| SMAJ70 | SMAJ70C | RN | ZN | 77.8 | 95.1 | 1.0 | 70 | 5.0 | 3.2 | 125 |
| SMAJ70A | SMAJ70CA | RP | ZP | 77.8 | 86.0 | 1.0 | 70 | 5.0 | 3.5 | 113 |
| SMAJ75 | SMAJ75C | RQ | ZQ | 83.3 | 102 | 1.0 | 75 | 5.0 | 3.0 | 134 |
| SMAJ75A | SMAJ75CA | RR | ZR | 83.3 | 92.1 | 1.0 | 75 | 5.0 | 3.3 | 121 |
| SMAJ78 | SMAJ78C | RS | ZS | 86.7 | 106 | 1.0 | 78 | 5.0 | 2.9 | 139 |
| SMAJ78A | SMAJ78CA | RT | ZT | 86.7 | 95.8 | 1.0 | 78 | 5.0 | 3.2 | 126 |
| SMAJ80 | SMAJ80C | RA | ZA | 88.8 | 109 | 1.0 | 80 | 5.0 | 2.8 | 143 |
| SMAJ80A | SMAJ80CA | RB | ZB | 88.8 | 98 | 1.0 | 80 | 5.0 | 3.1 | 130 |
| SMAJ85 | SMAJ85C | RU | ZU | 94.4 | 115 | 1.0 | 85 | 5.0 | 2.7 | 151 |
| SMAJ85A | SMAJ85CA | RV | ZV | 94.4 | 104 | 1.0 | 85 | 5.0 | 2.9 | 137 |
| SMAJ90 | SMAJ90C | RW | ZW | 100 | 122 | 1.0 | 90 | 5.0 | 2.5 | 160 |
| SMAJ90A | SMAJ90CA | RX | ZX | 100 | 111 | 1.0 | 90 | 5.0 | 2.7 | 146 |
| SMAJ100 | SMAJ100C | RY | ZY | 111 | 136 | 1.0 | 100 | 5.0 | 2.2 | 179 |
| SMAJ100A | SMAJ100CA | RZ | ZZ | 111 | 123 | 1.0 | 100 | 5.0 | 2.5 | 162 |



Electrical Characteristics(Cont.)

| Part Number | | Device Marking Code | | Breakdown Voltage V _{BR} @ I _T (V) | | Test current at I _T (mA) | Reverse standoff voltage V _{RWM} (V) | Maximum reverse leakage at V _{RWM} I _R (μA) | Maximum peak pulse Current I _{PPM} (A) | Maximum clamping voltage at I _{PPM} V _C (V) |
|-------------|-----------|---------------------|----|--|-----|-------------------------------------|---|---|---|---|
| UNI | BI | UNI | BI | Min | Max | | | | | |
| SMAJ110 | SMAJ110C | SD | VD | 122 | 149 | 1.0 | 110 | 5.0 | 2.0 | 196 |
| SMAJ110A | SMAJ110CA | SE | VE | 122 | 135 | 1.0 | 110 | 5.0 | 2.3 | 177 |
| SMAJ120 | SMAJ120C | SF | VF | 133 | 163 | 1.0 | 120 | 5.0 | 1.9 | 214 |
| SMAJ120A | SMAJ120CA | SG | VG | 133 | 147 | 1.0 | 120 | 5.0 | 2.1 | 193 |
| SMAJ130 | SMAJ130C | SH | VH | 144 | 176 | 1.0 | 130 | 5.0 | 1.7 | 231 |
| SMAJ130A | SMAJ130CA | SK | VK | 144 | 159 | 1.0 | 130 | 5.0 | 1.9 | 209 |
| SMAJ140 | SMAJ140C | SA | VA | 155 | 190 | 1.0 | 140 | 5.0 | 1.6 | 251 |
| SMAJ140A | SMAJ140CA | SB | VB | 155 | 171 | 1.0 | 140 | 5.0 | 1.8 | 227 |
| SMAJ150 | SMAJ150C | SL | VL | 167 | 204 | 1.0 | 150 | 5.0 | 1.5 | 268 |
| SMAJ150A | SMAJ150CA | SM | VM | 167 | 185 | 1.0 | 150 | 5.0 | 1.7 | 243 |
| SMAJ160 | SMAJ160C | SN | VN | 178 | 218 | 1.0 | 160 | 5.0 | 1.4 | 287 |
| SMAJ160A | SMAJ160CA | SP | VP | 178 | 197 | 1.0 | 160 | 5.0 | 1.5 | 259 |
| SMAJ170 | SMAJ170C | SQ | VQ | 189 | 231 | 1.0 | 170 | 5.0 | 1.3 | 304 |
| SMAJ170A | SMAJ170CA | SR | VR | 189 | 209 | 1.0 | 170 | 5.0 | 1.5 | 275 |
| SMAJ180 | SMAJ180C | SS | VS | 200 | 245 | 1.0 | 180 | 5.0 | 1.2 | 322 |
| SMAJ180A | SMAJ180CA | ST | VT | 200 | 222 | 1.0 | 180 | 5.0 | 1.4 | 292 |
| SMAJ190 | SMAJ190C | SU | VU | 211 | 258 | 1.0 | 190 | 5.0 | 1.2 | 340 |
| SMAJ190A | SMAJ190CA | SV | VV | 211 | 232 | 1.0 | 190 | 5.0 | 1.3 | 308 |
| SMAJ200A | SMAJ200CA | SW | VW | 224 | 247 | 1.0 | 200 | 5.0 | 1.2 | 324 |
| SMAJ220A | SMAJ220CA | SX | VX | 246 | 272 | 1.0 | 220 | 5.0 | 1.1 | 356 |
| SMAJ250A | SMAJ250CA | SZ | VZ | 279 | 309 | 1.0 | 250 | 5.0 | 1.0 | 405 |
| SMAJ300A | SMAJ300CA | DE | HE | 335 | 371 | 1.0 | 300 | 5.0 | 0.8 | 486 |
| SMAJ350A | SMAJ350CA | DG | HG | 391 | 432 | 1.0 | 350 | 5.0 | 0.7 | 567 |
| SMAJ400A | SMAJ400CA | DK | HK | 447 | 494 | 1.0 | 400 | 5.0 | 0.6 | 648 |
| SMAJ440A | SMAJ440CA | DM | HM | 492 | 543 | 1.0 | 440 | 5.0 | 0.6 | 713 |

- Note: 1.Suffix 'A' denotes 5% tolerance device. Without 'A' denotes 10% tolerance device.
 2.Add suffix 'C' or 'CA' after part number to specify bi-directional devices.
 3.For bi-directional devices with V_R of 10 volts and less, the I_R limit is doubled.

Ordering Information

| Device | Package | Shipping |
|--------------------|---|------------------------|
| SMAJXXX(A)-0-T4-G | SMA | 7500 pcs / Tape & Reel |
| SMAJXXXC(A)-0-T4-G | (Pb-free lead plating and halogen-free package) | |



Typical Characteristics



Fig. 1 - Pulse Derating Curve

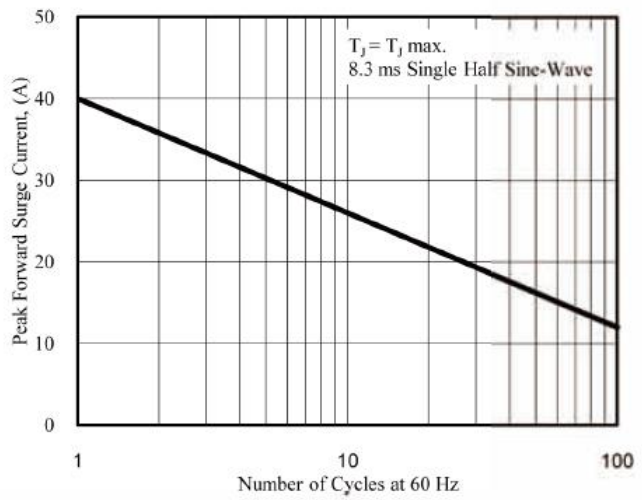


Fig. 2 - Maximum Non-Repetitive Surge Current

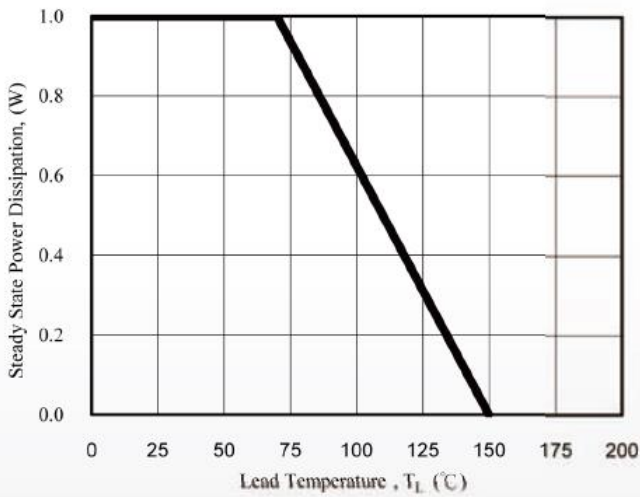


Fig. 3 - Steady State Power Derating Curve

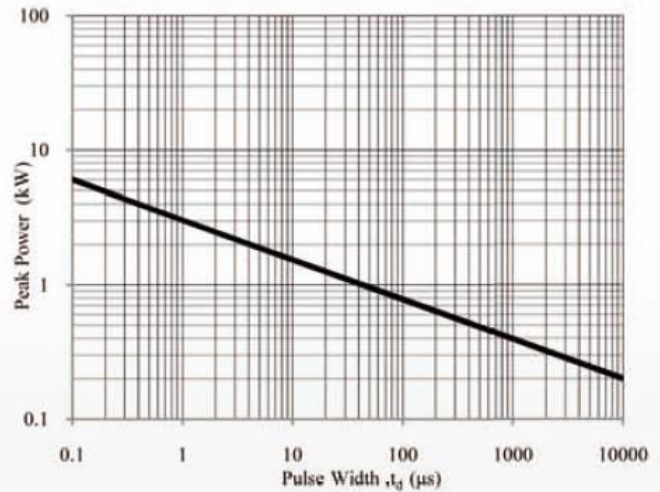


Fig. 4 - Peak Pulse Power Rating Curve

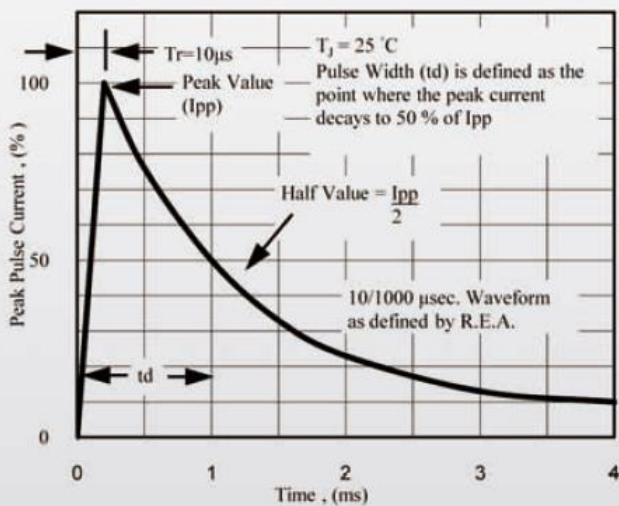


Fig. 5 - Pulse Waveform

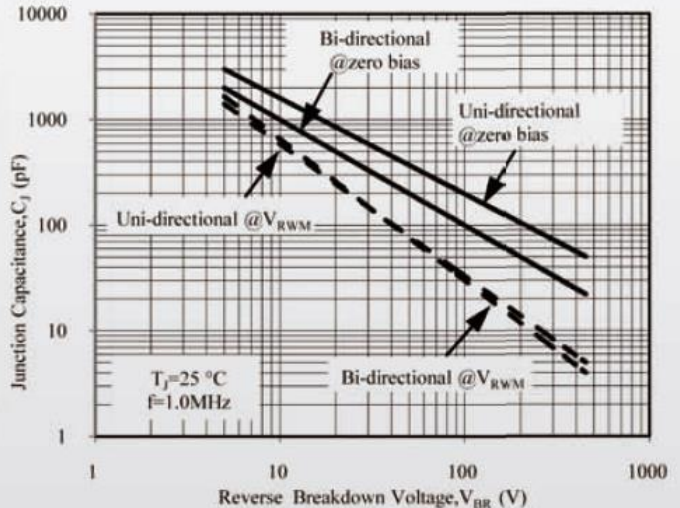


Fig. 6 - Typical Junction Capacitance

Reel Dimension



Carrier Tape Dimension



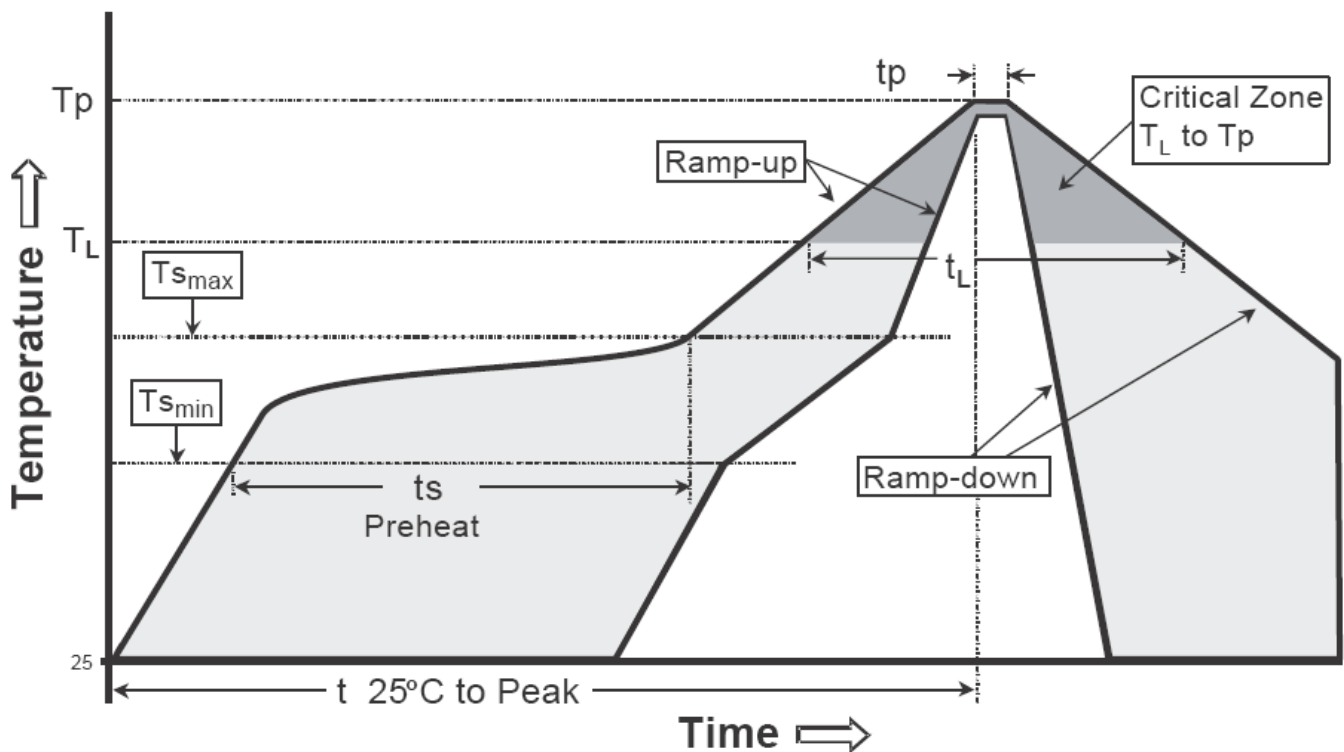
Recommended soldering footprint



Recommended wave soldering condition

| | | |
|-----------------|------------------|-----------------|
| Product | Peak Temperature | Soldering Time |
| Pb-free devices | 260 +0/-5 °C | 5 +1/-1 seconds |

Recommended temperature profile for IR reflow



| Profile feature | Sn-Pb eutectic Assembly | Pb-free Assembly |
|--|-------------------------|------------------|
| Average ramp-up rate (Tsmax to Tp) | 3°C/second max. | 3°C/second max. |
| Preheat | | |
| -Temperature Min(Ts min) | 100°C | 150°C |
| -Temperature Max(Ts max) | 150°C | 200°C |
| -Time(ts min to ts max) | 60-120 seconds | 60-180 seconds |
| Time maintained above: | | |
| -Temperature (T _L) | 183°C | 217°C |
| - Time (t _L) | 60-150 seconds | 60-150 seconds |
| Peak Temperature(T _P) | 240 +0/-5 °C | 260 +0/-5 °C |
| Time within 5°C of actual peak temperature(tp) | 10-30 seconds | 20-40 seconds |
| Ramp down rate | 6°C/second max. | 6°C/second max. |
| Time 25 °C to peak temperature | 6 minutes max. | 8 minutes max. |

Note : All temperatures refer to topside of the package, measured on the package body surface.

DO-214AC/SMA Dimension



*:Typical

| DIM | Inches | | Millimeters | | DIM | Inches | | Millimeters | |
|-----|--------|-------|-------------|------|-----|--------|-------|-------------|------|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.048 | 0.064 | 1.23 | 1.63 | E | 0.006 | 0.012 | 0.15 | 0.31 |
| B | 0.095 | 0.109 | 2.40 | 2.76 | F | 0.000 | 0.008 | 0.00 | 0.20 |
| C | 0.157 | 0.181 | 4.00 | 4.60 | G | 0.030 | 0.059 | 0.75 | 1.51 |
| D | 0.075 | 0.089 | 1.90 | 2.26 | H | 0.189 | 0.206 | 4.80 | 5.22 |

Notes : 1.Controlling dimension : millimeters.
 2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
 3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material :

- Lead : Pure tin plated.
- Mold Compound : Epoxy resin family, flammability solid burning class:UL94V-0.

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