

Transient Voltage Suppressors (TVS) Data Sheet

Features

- Glass passivated junction
- Low zener impedance
- Excellent clamping capability
- 400W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycle):0.01%
- Fast response time
- Typical I_R less than 1µA above 13V.
- Plastic package has underwriters laboratory flammability 94V-0
- Meets MSL level 1, per J-STD-020.

Mechanical Data

- Case: JEDEC DO-214AC Moulded plastic
- Terminal:solderplated, solderable per MIL-STD-750, Method 2026
- Polarity: Color band denotes cathode except bi-directional models
- Mounting Position: Any

Applications

- I/O interface
- AC/DC power supply
- Low frequency signal transmission line (RS232, RS485, etc.)

Maximum Ratings and Characteristics

Ratings at 25°C ambient temperature unless otherwise specified.

| Rating | Symbol | Value | Units |
|--|-----------------|-------------|-------|
| Peak pulse power dissipation at 10/1000µs waveform (Note1, Fig.1) | P_{PPM} | Minimum 400 | Watts |
| Peak pulse current of at 10/1000µs waveform (Note 1, Fig.3) | I_{PPM} | See Table | Amps |
| Steady state power dissipation at $T_L=75^\circ\text{C}$ (Fig.4) | $P_{M(AV)}$ | 3.3 | Watts |
| Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load, (JEDEC Method) (Note2) | I_{FSM} | 40 | Amps |
| Operating junction and Storage Temperature Range. | T_J, T_{STG} | -55 to +150 | °C |
| Typical thermal resistance junction to lead | $R_{\theta JL}$ | 30 | °C/W |
| Typical thermal resistance junction to ambient | $R_{\theta JA}$ | 120 | °C/W |

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

2. 8.3ms single half sine-wave, or equivalent square wave, duty cycle=4 pulses per minutes maximum.

Dimensions (DO-214AC/SMA)

| Symbol | Millimeters | | Inches | |
|--------|-------------|------|--------|-------|
| | Min. | Max. | Min. | Max. |
| L | 3.90 | 4.50 | 0.154 | 0.177 |
| D | 2.40 | 2.80 | 0.094 | 0.110 |
| D1 | 1.30 | 1.70 | 0.051 | 0.067 |
| T | 4.80 | 5.30 | 0.189 | 0.208 |
| T1 | 0.76 | 1.52 | 0.030 | 0.060 |
| d | 0.10 | 0.20 | 0.003 | 0.008 |
| H | 2.00 | 2.50 | 0.078 | 0.098 |

Electrical Characteristics (T_A=25°C)

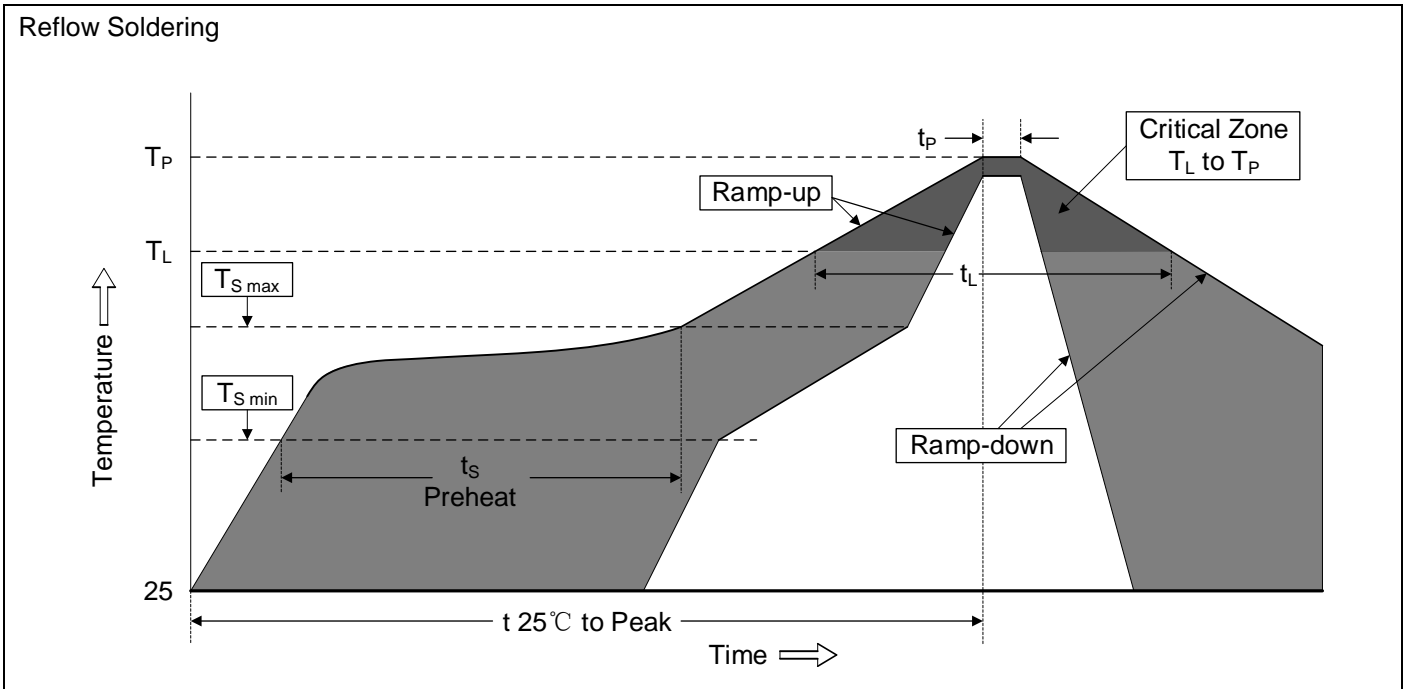
| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage | Breakdown Voltage @I _T | Test Current | Maximum Clamping Voltage @I _{PP} | Peak Pulse Current | Reverse Leakage @V _{RWM} |
|----------------|---------------|---------------------|----|---------------------------|-----------------------------------|---------------------|---|---------------------|-----------------------------------|
| Unidirectional | Bidirectional | UNI | BI | V _{RWM} (V) | V _{BR} (V) | I _T (mA) | V _C (V) | I _{PP} (A) | I _R (μA) |
| SMAJ5.0A | SMAJ5.0CA | AE | WE | 5.0 | 6.4~7.0 | 10 | 9.2 | 43.5 | 800 |
| SMAJ6.0A | SMAJ6.0CA | AG | WG | 6.0 | 6.7~7.4 | 10 | 10.3 | 38.8 | 800 |
| SMAJ6.5A | SMAJ6.5CA | AK | WK | 6.5 | 7.2~8.0 | 10 | 11.2 | 35.7 | 500 |
| SMAJ7.0A | SMAJ7.0CA | AM | WM | 7.0 | 7.8~8.6 | 10 | 12.0 | 33.3 | 200 |
| SMAJ7.5A | SMAJ7.5CA | AP | WP | 7.5 | 8.3~9.2 | 1 | 12.9 | 31.0 | 100 |
| SMAJ8.0A | SMAJ8.0CA | AR | WR | 8.0 | 8.9~9.8 | 1 | 13.6 | 29.4 | 50 |
| SMAJ8.5A | SMAJ8.5CA | AT | WT | 8.5 | 9.4~10.4 | 1 | 14.4 | 27.8 | 10 |
| SMAJ9.0A | SMAJ9.0CA | AV | WV | 9.0 | 10.0~11.0 | 1 | 15.4 | 26.0 | 5 |
| SMAJ10A | SMAJ10CA | AX | WX | 10.0 | 11.1~12.3 | 1 | 17.0 | 23.5 | 5 |
| SMAJ11A | SMAJ11CA | AZ | WZ | 11.0 | 12.2~13.5 | 1 | 18.2 | 22.0 | 1 |
| SMAJ12A | SMAJ12CA | BE | XE | 12.0 | 13.3~14.7 | 1 | 19.9 | 20.1 | 1 |
| SMAJ13A | SMAJ13CA | BG | XG | 13.0 | 14.4~15.9 | 1 | 21.5 | 18.6 | 1 |
| SMAJ14A | SMAJ14CA | BK | XK | 14.0 | 15.6~17.2 | 1 | 23.2 | 17.2 | 1 |
| SMAJ15A | SMAJ15CA | BM | XM | 15.0 | 16.7~18.5 | 1 | 24.4 | 16.4 | 1 |
| SMAJ16A | SMAJ16CA | BP | XP | 16.0 | 17.8~19.7 | 1 | 26.0 | 15.4 | 1 |
| SMAJ17A | SMAJ17CA | BR | XR | 17.0 | 18.9~20.9 | 1 | 27.6 | 14.5 | 1 |
| SMAJ18A | SMAJ18CA | BT | XT | 18.0 | 20.0~22.1 | 1 | 29.2 | 13.7 | 1 |
| SMAJ19A | SMAJ19CA | BW | XW | 19.0 | 21.1~23.3 | 1 | 30.8 | 13.0 | 1 |
| SMAJ20A | SMAJ20CA | BV | XV | 20.0 | 22.2~24.5 | 1 | 32.4 | 12.4 | 1 |
| SMAJ22A | SMAJ22CA | BX | XX | 22.0 | 24.4~26.9 | 1 | 35.5 | 11.3 | 1 |
| SMAJ24A | SMAJ24CA | BZ | XZ | 24.0 | 26.7~29.5 | 1 | 38.9 | 10.3 | 1 |
| SMAJ26A | SMAJ26CA | CE | YE | 26.0 | 28.9~31.9 | 1 | 42.1 | 9.5 | 1 |

Electrical Characteristics ($T_A=25^\circ\text{C}$)

| Part Number | | Device Marking Code | | Reverse Stand-Off Voltage | Breakdown Voltage @ I_T | Test Current | Maximum Clamping Voltage @ I_{PP} | Peak Pulse Current | Reverse Leakage @ V_{RWM} |
|----------------|---------------|---------------------|----|---------------------------|---------------------------|--------------|-------------------------------------|--------------------|-----------------------------|
| Unidirectional | Bidirectional | UNI | BI | $V_{RWM}(V)$ | $V_{BR}(V)$ | $I_T(mA)$ | $V_C(V)$ | $I_{PP}(A)$ | $I_R(\mu A)$ |
| SMAJ28A | SMAJ28CA | CG | YG | 28.0 | 31.1~34.4 | 1 | 45.4 | 8.8 | 1 |
| SMAJ30A | SMAJ30CA | CK | YK | 30.0 | 33.3~36.8 | 1 | 48.4 | 8.3 | 1 |
| SMAJ33A | SMAJ33CA | CM | YM | 33.0 | 36.7~40.6 | 1 | 53.3 | 7.5 | 1 |
| SMAJ36A | SMAJ36CA | CP | YP | 36.0 | 40.0~44.2 | 1 | 58.1 | 6.9 | 1 |
| SMAJ40A | SMAJ40CA | CR | YR | 40.0 | 44.4~49.1 | 1 | 64.5 | 6.2 | 1 |
| SMAJ43A | SMAJ43CA | CT | YT | 43.0 | 47.8~52.8 | 1 | 69.4 | 5.8 | 1 |
| SMAJ45A | SMAJ45CA | CV | YV | 45.0 | 50.0~55.3 | 1 | 72.7 | 5.5 | 1 |
| SMAJ48A | SMAJ48CA | CX | YX | 48.0 | 53.3~58.9 | 1 | 77.4 | 5.2 | 1 |
| SMAJ51A | SMAJ51CA | CZ | YZ | 51.0 | 56.7~62.7 | 1 | 82.4 | 4.9 | 1 |
| SMAJ54A | SMAJ54CA | RE | ZE | 54.0 | 60.0~66.3 | 1 | 87.1 | 4.6 | 1 |
| SMAJ58A | SMAJ58CA | RG | ZG | 58.0 | 64.4~71.2 | 1 | 93.6 | 4.3 | 1 |
| SMAJ60A | SMAJ60CA | RK | ZK | 60.0 | 66.7~73.7 | 1 | 96.8 | 4.1 | 1 |
| SMAJ64A | SMAJ64CA | RM | ZM | 64.0 | 71.1~78.6 | 1 | 103.0 | 3.9 | 1 |
| SMAJ70A | SMAJ70CA | RP | ZP | 70.0 | 77.8~86.0 | 1 | 113.0 | 3.5 | 1 |
| SMAJ75A | SMAJ75CA | RR | ZR | 75.0 | 83.3~92.1 | 1 | 121.0 | 3.3 | 1 |
| SMAJ78A | SMAJ78CA | RT | ZT | 78.0 | 86.7~95.8 | 1 | 126.0 | 3.2 | 1 |
| SMAJ80A | SMAJ80CA | RW | ZW | 80.0 | 88.8~97.6 | 1 | 129.6 | 3.1 | 1 |
| SMAJ85A | SMAJ85CA | RV | ZV | 85.0 | 94.4~104 | 1 | 137.0 | 2.9 | 1 |
| SMAJ90A | SMAJ90CA | RX | ZX | 90.0 | 100~111 | 1 | 146.0 | 2.7 | 1 |
| SMAJ100A | SMAJ100CA | RZ | ZZ | 100.0 | 111~123 | 1 | 162.0 | 2.5 | 1 |
| SMAJ110A | SMAJ110CA | SE | VE | 110.0 | 122~135 | 1 | 177.0 | 2.3 | 1 |
| SMAJ120A | SMAJ120CA | SG | VG | 120.0 | 133~147 | 1 | 193.0 | 2.1 | 1 |
| SMAJ130A | SMAJ130CA | SK | VK | 130.0 | 144~159 | 1 | 209.0 | 1.9 | 1 |
| SMAJ140A | SMAJ140CA | SW | VW | 140.0 | 155~171 | 1 | 227.0 | 1.8 | 1 |
| SMAJ150A | SMAJ150CA | SM | VM | 150.0 | 167~185 | 1 | 243.0 | 1.7 | 1 |
| SMAJ160A | SMAJ160CA | SP | VP | 160.0 | 178~197 | 1 | 259.0 | 1.6 | 1 |
| SMAJ170A | SMAJ170CA | SR | VR | 170.0 | 189~209 | 1 | 275.0 | 1.5 | 1 |
| SMAJ180A | SMAJ180CA | ST | VT | 180.0 | 200~220 | 1 | 291.0 | 1.4 | 1 |
| SMAJ190A | SMAJ190CA | SU | VU | 190.0 | 211~232 | 1 | 308.0 | 1.3 | 1 |
| SMAJ200A | SMAJ200CA | SV | VV | 200.0 | 224~247 | 1 | 324.0 | 1.2 | 1 |
| SMAJ220A | SMAJ220CA | SX | VX | 220.0 | 246~272 | 1 | 356.0 | 1.1 | 1 |
| SMAJ250A | SMAJ250CA | SZ | VZ | 250.0 | 279~309 | 1 | 405.0 | 1.0 | 1 |
| SMAJ300A | SMAJ300CA | TE | UE | 300.0 | 335~371 | 1 | 486.0 | 0.8 | 1 |
| SMAJ350A | SMAJ350CA | TG | UG | 350.0 | 391~432 | 1 | 567.0 | 0.7 | 1 |
| SMAJ400A | SMAJ400CA | TK | UK | 400.0 | 447~494 | 1 | 648.0 | 0.6 | 1 |
| SMAJ440A | SMAJ440CA | TM | UM | 440.0 | 492~543 | 1 | 713.0 | 0.6 | 1 |

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

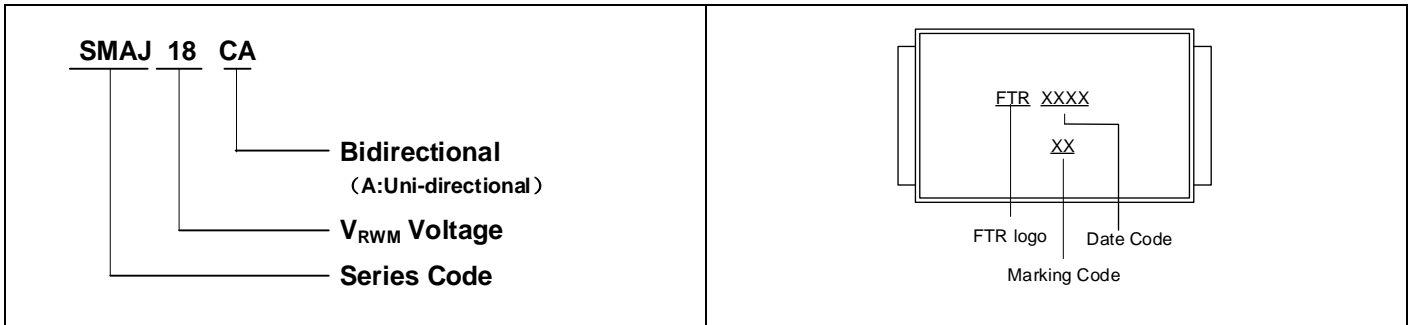
Recommended Soldering Conditions



Recommended Conditions

| Profile Feature | Pb-Free Assembly |
|---|----------------------------------|
| Average ramp-up rate (T_L to T_P) | 3°C/second max. |
| Preheat -Temperature Min ($T_{S\ min}$) -Temperature Max ($T_{S\ max}$) -Time (min to max) (t_s) | 150°C 200°C 60-180 seconds |
| $T_{S\ max}$ to T_L -Ramp-up Rate | 3°C/second max. |
| Time maintained above: -Temperature (T_L) -Time (t_L) | 217°C 60-150 seconds |
| Peak Temperature (T_P) | 260°C |
| Time within 5°C of actual Peak Temperature (t_p) | 20-40 seconds |
| Ramp-down Rate | 6°C/second max. |
| Time 25°C to Peak Temperature | 8 minutes max. |

Partnumber code



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

Figure 1. Peak Pulse Power Rating Curve

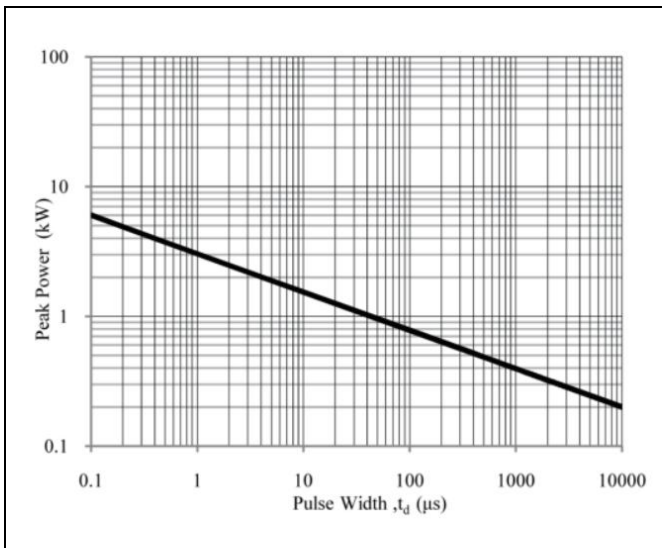


Figure 2. Pulse Derating Curve

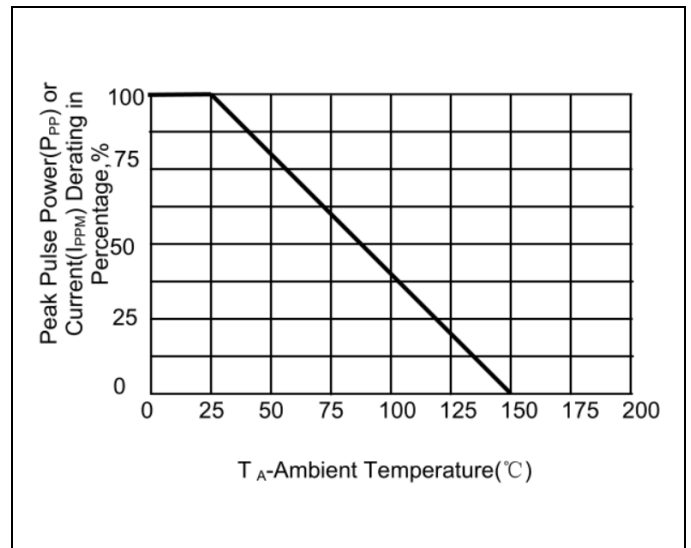


Figure 3. Pulse Waveform

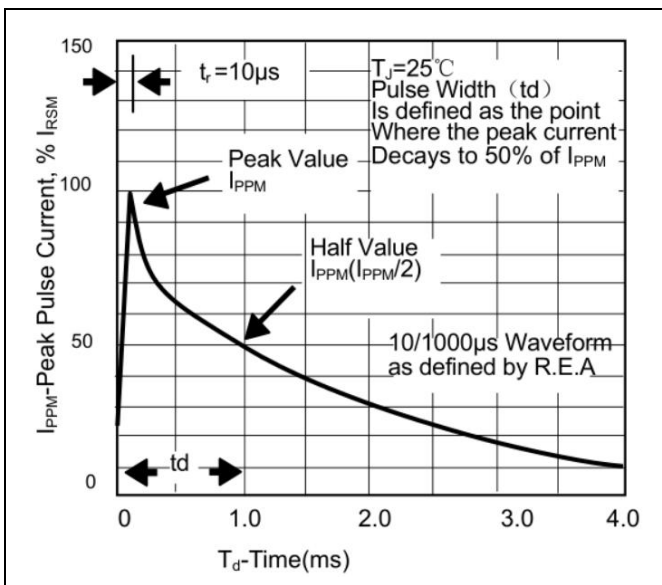
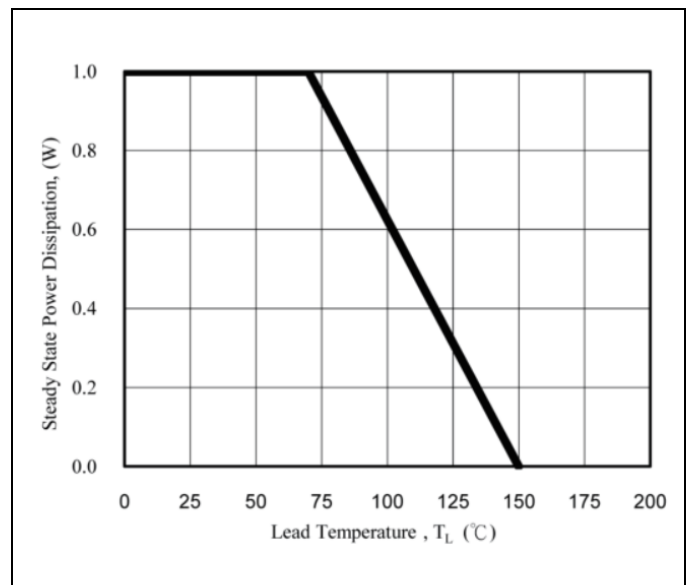
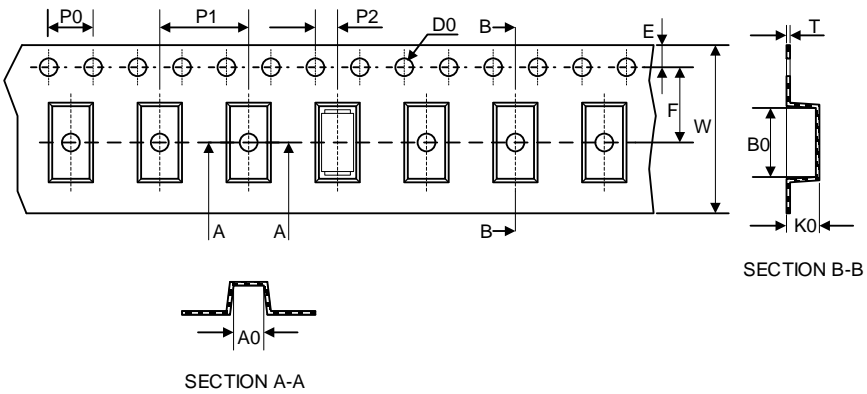
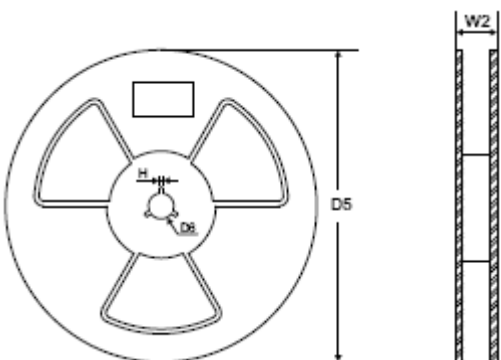


Figure 4. Steady State Power Dissipation Derating Curve



Packaging

| Tape | | Symbol | Dimension (mm) |
|---|----------|-------------------|----------------|
|  | | W | 12.00±0.10 |
| | | P0 | 4.00±0.10 |
| | | P1 | 4.00±0.10 |
| | | P2 | 2.00±0.10 |
| | | D0 | Φ1.55±0.10 |
| | | E | 1.75±0.10 |
| | | F | 5.50±0.10 |
| | | A0 | 2.80±0.1 |
| | | B0 | 5.30±0.1 |
| | | K0 | 2.36±0.1 |
| T | 0.25±0.1 | | |
| Reel | | D5 | Φ330.0±2.0 |
|  | | D6 | Φ12.0±0.5 |
| | | W2 | 14.0±2.0 |
| | | Quantity: 5000PCS | |

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