

Surface Mount Transient Voltage Suppressors



SMB (DO-214AA)

Features

- Excellent clamping capability
- Low leakage current
- Low capacitance
- High surge capability
- Glass passivated chip
- Epoxy resin package
- Built-in strain relief
- Will not fatigue
- RoHS Compliant
- Fast response time:
typically less than 1.0ps from 0 Volts to V_{BR} min

Mechanical Characteristics

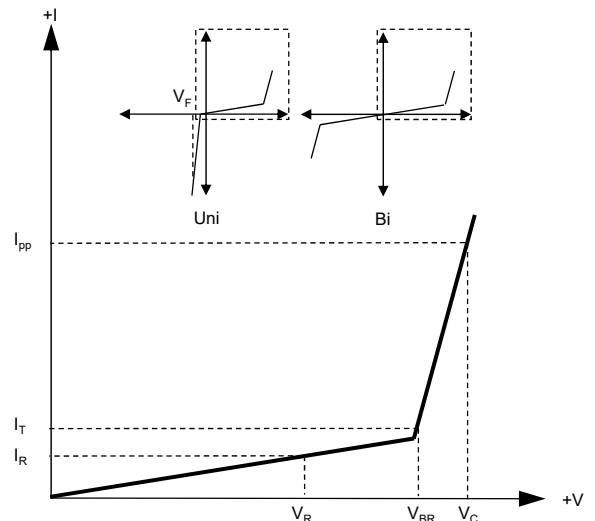
- Package: SMB plastic package.
- Lead Finish: Matte Tin
- Case Material: Epoxy Molding Compound.
- UL Flammability Classification Rating 94V-0
Moisture Sensitivity: Level 1 per J-STD-020

Applications

- Telecom
- Computer
- Industrial electronic
- Consumer electronic

■ Electrical Parameters

| Parameter | Definition |
|-----------|--|
| C_J | Junction Capacitance - typical capacitance measured with 0V or V_R bias |
| I_{PP} | Peak Pulse Current - maximum rated peak impulse current |
| V_C | Clamping Voltage - Peak voltage measured across the suppressor at a specified I_{ppm} (peak impulse current) |
| V_{BR} | Breakdown Voltage - Maximum voltage that flows through the TVS at a specified test current (I_T) |
| I_R | Leakage Current - maximum peak off-state current measured at V_R |
| V_R | Peak Off-state Voltage - maximum voltage that can be applied while maintaining off state |



■ Summary of Packing Options

| Package | Packing Description | Packing Quantity | Industry Standard |
|---------|---------------------|------------------|-------------------|
| SMB | Tape/Reel, 13" reel | 3000 | EIA-481-1 |
| | Tape/Reel, 7" reel | 500 | EIA-481-1 |

■ Absolute Maximum Ratings (T = 25°C unless otherwise noted)

| Parameter | Symbol | Value | Units | Remarks |
|--|------------------|------------|-------|----------------|
| Peak Pulse Power Dissipation | P _{PPM} | 600 | W | (Note1)(Note2) |
| Steady State Power Dissipation | P _D | 5 | W | (Note3) |
| Peak Forward Surge Current | I _{FSM} | 100 | A | (Note4) |
| Maximum Instantaneous Forward Voltage at 50A | V _{FM} | 3.5/5 | V | (Note5) |
| Typical Thermal Resistance Junction to Lead | R _{θJL} | 20 | °C/W | |
| Typical Thermal Resistance Junction to Ambient | R _{θJA} | 100 | °C/W | |
| Operating Temperature Range | T _J | -55 to 150 | °C | |
| Storage Temperature Range | T _{STG} | -55 to 150 | °C | |

Notes1: Non-repetitive current pulse , 10/1000us Waveform.

Notes2: Mounted on copper pad area of 5×5mm to each terminal.

Notes3: Infinite HeatSink at T_A=50°C

Notes4: Measured on 8.3ms single half sine wave or equivalent square wave, duty cycle=4 perminute maximum.

Notes5: For UnidirectionalOnly, V_{FM}<3.5V for V_{BR} ≤ 200V and V_{FM}<5.0V for V_{BR} ≥ 201V.

■ Electrical Characteristics (T_A=25°C unless otherwise noted)

| Part Number (Uni) | Part Number (Bi) | Marking Code | | Reverse Stand off Voltage V _R (V) | Breakdown Voltage V _{BR} @ I _T (V) | | Test Current I _T (mA) | Maximum Clamping Voltage V _C @ I _{PP} (V) | Maximum Peak Pulse Current I _{PP} (A) | Maximun Reverse Leakage I _R @ V _R (μA) |
|-------------------|------------------|--------------|----|--|--|------|----------------------------------|---|--|--|
| | | Uni | Bi | | Min | Max | | | | |
| SMBJ5.0A | SMBJ5.0CA | KE | AE | 5 | 6.4 | 7 | 10 | 9.2 | 65.3 | 800 |
| SMBJ6.0A | SMBJ6.0CA | KG | AG | 6 | 6.67 | 7.37 | 10 | 10.3 | 58.3 | 800 |
| SMBJ6.5A | SMBJ6.5CA | KK | AK | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 53.6 | 500 |
| SMBJ7.0A | SMBJ7.0CA | KM | AM | 7 | 7.78 | 8.6 | 10 | 12 | 50 | 200 |
| SMBJ7.5A | SMBJ7.5CA | KP | AP | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 46.6 | 100 |
| SMBJ8.0A | SMBJ8.0CA | KR | AR | 8 | 8.89 | 9.83 | 1 | 13.6 | 44.2 | 50 |
| SMBJ8.5A | SMBJ8.5CA | KT | AT | 8.5 | 9.44 | 10.4 | 1 | 14.4 | 41.7 | 20 |
| SMBJ9.0A | SMBJ9.0CA | KV | AV | 9 | 10 | 11.1 | 1 | 15.4 | 39 | 10 |
| SMBJ10A | SMBJ10CA | KX | AX | 10 | 11.1 | 12.3 | 1 | 17 | 35.3 | 5 |
| SMBJ11A | SMBJ11CA | KZ | AZ | 11 | 12.2 | 13.5 | 1 | 18.2 | 33 | 1 |
| SMBJ12A | SMBJ12CA | LE | BE | 12 | 13.3 | 14.7 | 1 | 19.9 | 30.2 | 1 |
| SMBJ13A | SMBJ13CA | LG | BG | 13 | 14.4 | 15.9 | 1 | 21.5 | 28 | 1 |
| SMBJ14A | SMBJ14CA | LK | BK | 14 | 15.6 | 17.2 | 1 | 23.2 | 25.9 | 1 |
| SMBJ15A | SMBJ15CA | LM | BM | 15 | 16.7 | 18.5 | 1 | 24.4 | 24.6 | 1 |
| SMBJ16A | SMBJ16CA | LP | BP | 16 | 17.8 | 19.7 | 1 | 26 | 23.1 | 1 |
| SMBJ17A | SMBJ17CA | LR | BR | 17 | 18.9 | 20.9 | 1 | 27.6 | 21.8 | 1 |
| SMBJ18A | SMBJ18CA | LT | BT | 18 | 20 | 22.1 | 1 | 29.2 | 20.6 | 1 |
| SMBJ20A | SMBJ20CA | LV | BV | 20 | 22.2 | 24.5 | 1 | 32.4 | 18.6 | 1 |

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

| Part Number (Uni) | Part Number (Bi) | Marking Code | | Reverse Stand off Voltage V_R (V) | Breakdown Voltage $V_{BR} @ I_T$ (V) | | Test Current I_T (mA) | Maximum Clamping Voltage $V_C @ I_{PP}$ (V) | Maximum Peak Pulse Current I_{PP} (A) | Maximum Reverse Leakage $I_R @ V_R$ (μA) |
|-------------------|------------------|--------------|----|-------------------------------------|--------------------------------------|------|-------------------------|---|---|---|
| | | Uni | Bi | | Min | Max | | | | |
| SMBJ22A | SMBJ22CA | LX | BX | 22 | 24.4 | 26.9 | 1 | 35.5 | 16.9 | 1 |
| SMBJ24A | SMBJ24CA | LZ | BZ | 24 | 26.7 | 29.5 | 1 | 38.9 | 15.5 | 1 |
| SMBJ26A | SMBJ26CA | ME | CE | 26 | 28.9 | 31.9 | 1 | 42.1 | 14.3 | 1 |
| SMBJ28A | SMBJ28CA | MG | CG | 28 | 31.1 | 34.4 | 1 | 45.4 | 13.3 | 1 |
| SMBJ30A | SMBJ30CA | MK | CK | 30 | 33.3 | 36.8 | 1 | 48.4 | 12.4 | 1 |
| SMBJ33A | SMBJ33CA | MM | CM | 33 | 36.7 | 40.6 | 1 | 53.3 | 11.3 | 1 |
| SMBJ36A | SMBJ36CA | MP | CP | 36 | 40 | 44.2 | 1 | 58.1 | 10.4 | 1 |
| SMBJ40A | SMBJ40CA | MR | CR | 40 | 44.4 | 49.1 | 1 | 64.5 | 9.3 | 1 |
| SMBJ43A | SMBJ43CA | MT | CT | 43 | 47.8 | 52.8 | 1 | 69.4 | 8.7 | 1 |
| SMBJ45A | SMBJ45CA | MV | CV | 45 | 50 | 55.3 | 1 | 72.7 | 8.3 | 1 |
| SMBJ48A | SMBJ48CA | MX | CX | 48 | 53.3 | 58.9 | 1 | 77.4 | 7.8 | 1 |
| SMBJ51A | SMBJ51CA | MZ | CZ | 51 | 56.7 | 62.7 | 1 | 82.4 | 7.3 | 1 |
| SMBJ54A | SMBJ54CA | NE | DE | 54 | 60 | 66.3 | 1 | 87.1 | 6.9 | 1 |
| SMBJ58A | SMBJ58CA | NG | DG | 58 | 64.4 | 71.2 | 1 | 93.6 | 6.5 | 1 |
| SMBJ60A | SMBJ60CA | NK | DK | 60 | 66.7 | 73.7 | 1 | 96.8 | 6.2 | 1 |
| SMBJ64A | SMBJ64CA | NM | DM | 64 | 71.1 | 78.6 | 1 | 103 | 5.9 | 1 |
| SMBJ70A | SMBJ70CA | NP | DP | 70 | 77.8 | 86 | 1 | 113 | 5.3 | 1 |
| SMBJ75A | SMBJ75CA | NR | DR | 75 | 83.3 | 92.1 | 1 | 121 | 5 | 1 |
| SMBJ78A | SMBJ78CA | NT | DT | 78 | 86.7 | 95.8 | 1 | 126 | 4.8 | 1 |
| SMBJ85A | SMBJ85CA | NV | DV | 85 | 94.4 | 104 | 1 | 137 | 4.4 | 1 |
| SMBJ90A | SMBJ90CA | NX | DX | 90 | 100 | 111 | 1 | 146 | 4.1 | 1 |
| SMBJ100A | SMBJ100CA | NZ | DZ | 100 | 111 | 123 | 1 | 162 | 3.7 | 1 |
| SMBJ110A | SMBJ110CA | PE | EE | 110 | 122 | 135 | 1 | 177 | 3.4 | 1 |
| SMBJ120A | SMBJ120CA | PG | EG | 120 | 133 | 147 | 1 | 193 | 3.1 | 1 |
| SMBJ130A | SMBJ130CA | PK | EK | 130 | 144 | 159 | 1 | 209 | 2.9 | 1 |
| SMBJ150A | SMBJ150CA | PM | EM | 150 | 167 | 185 | 1 | 243 | 2.5 | 1 |
| SMBJ160A | SMBJ160CA | PP | EP | 160 | 178 | 197 | 1 | 259 | 2.3 | 1 |
| SMBJ170A | SMBJ170CA | PR | ER | 170 | 189 | 209 | 1 | 275 | 2.2 | 1 |
| SMBJ180A | SMBJ180CA | PT | ET | 180 | 201 | 222 | 1 | 292 | 2.1 | 1 |
| SMBJ200A | SMBJ200CA | PV | EV | 200 | 224 | 247 | 1 | 324 | 1.9 | 1 |
| SMBJ220A | SMBJ220CA | PX | EX | 220 | 246 | 272 | 1 | 356 | 1.7 | 1 |
| SMBJ250A | SMBJ250CA | PZ | EZ | 250 | 279 | 309 | 1 | 405 | 1.5 | 1 |
| SMBJ300A | SMBJ300CA | QE | FE | 300 | 335 | 371 | 1 | 486 | 1.3 | 1 |
| SMBJ350A | SMBJ350CA | QG | FG | 350 | 391 | 432 | 1 | 567 | 1.1 | 1 |
| SMBJ400A | SMBJ400CA | QK | FK | 400 | 447 | 494 | 1 | 648 | 0.9 | 1 |
| SMBJ440A | SMBJ440CA | QM | FM | 440 | 492 | 543 | 1 | 713 | 0.9 | 1 |

■ Rating And Characteristic Curves ($T_A=25^\circ\text{C}$ unless otherwise noted)

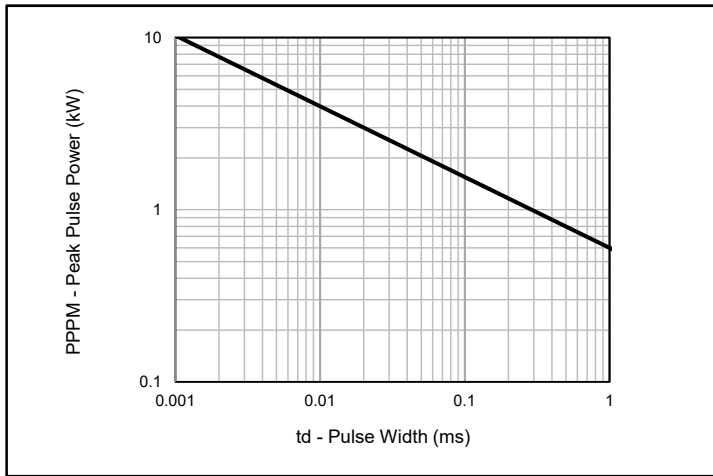


Fig.1 - Peak Pulse Power Rating

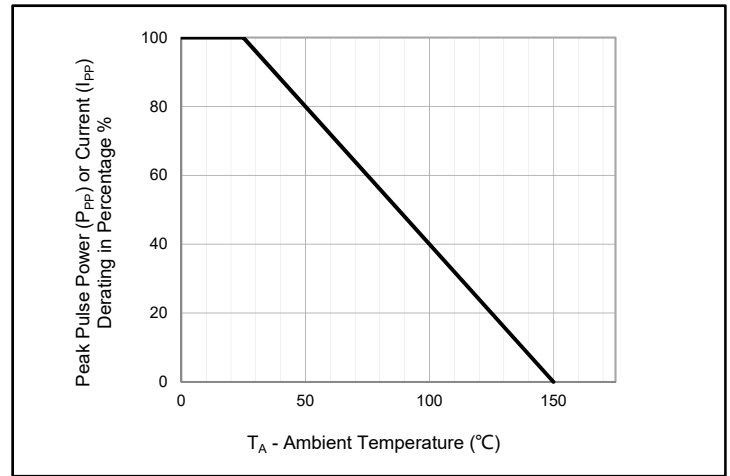


Fig.2 - Pulse Derating Curve

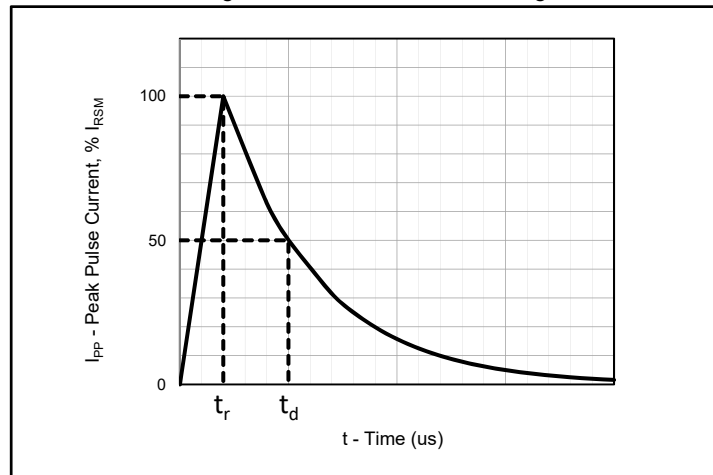


Fig.3 - Pulse Waveform

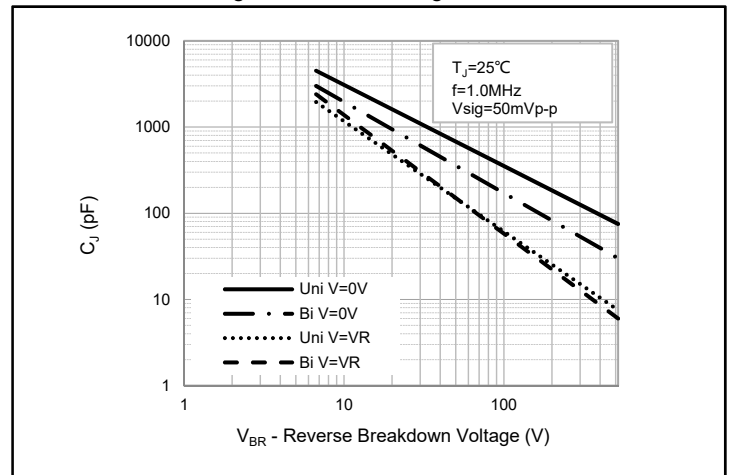


Fig.4 - Typical Junction Capacitance

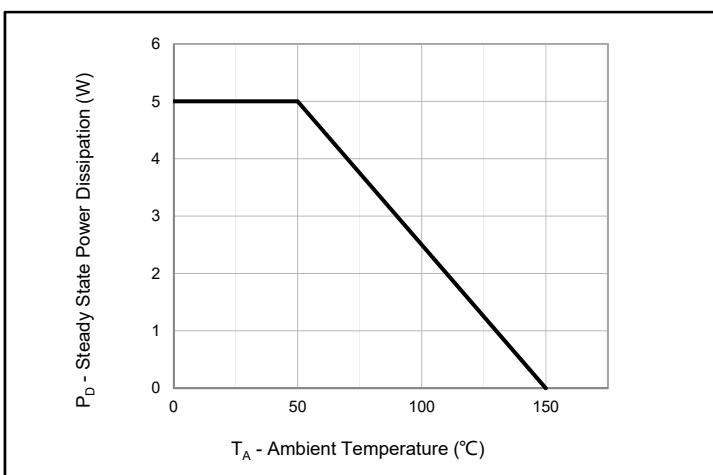


Fig.5 - Steady State Power Dissipation Derating Curve

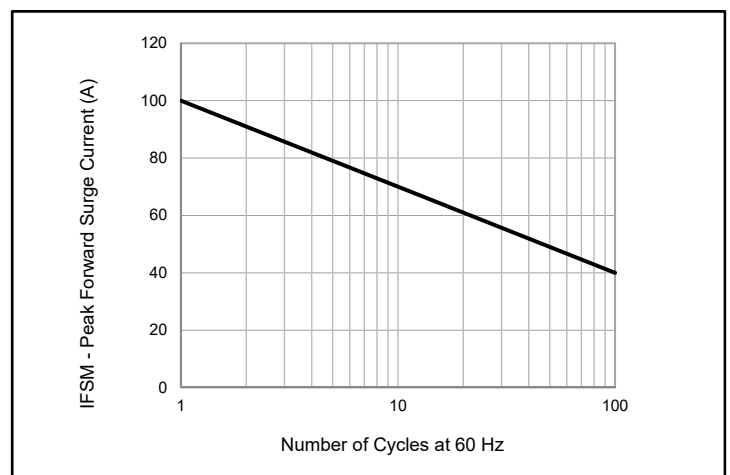
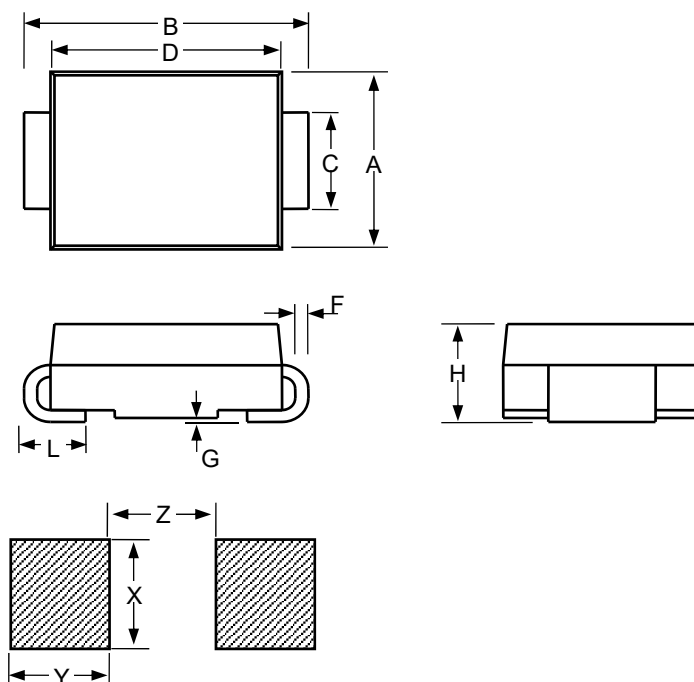


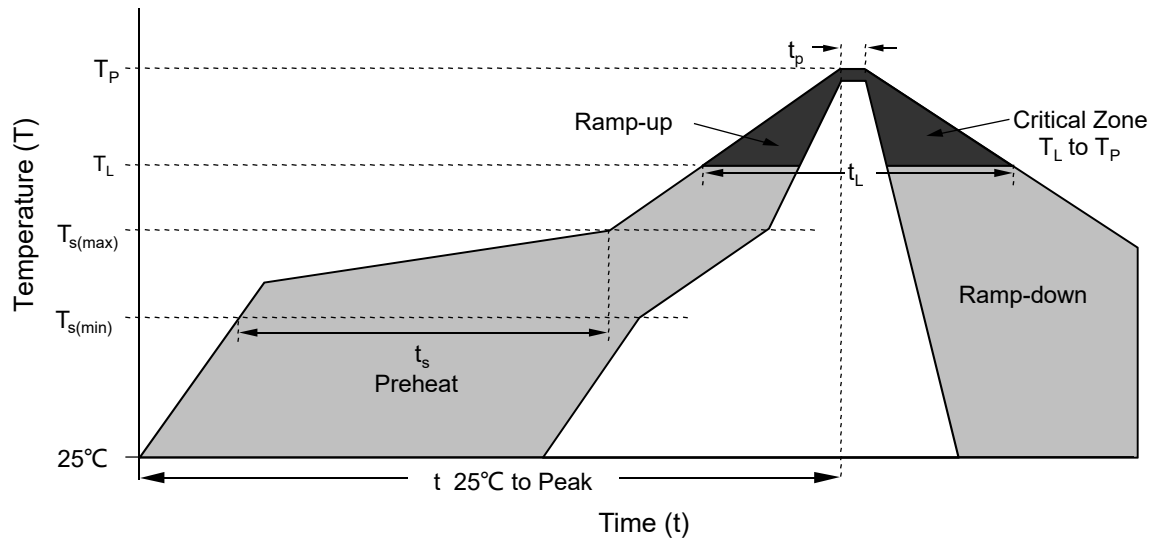
Fig.6 - Maximum Non-Repetitive Peak Forward Surge Current
Uni-Directional Only

■ Package Dimensions



| SMB | | | | | | |
|-----------|--------|-------|-------|-------------|------|-------|
| Dimension | Inches | | | Millimeters | | |
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.134 | 0.144 | 0.155 | 3.4 | 3.67 | 3.94 |
| B | 0.205 | 0.213 | 0.22 | 5.21 | 5.4 | 5.59 |
| C | 0.075 | 0.079 | 0.083 | 1.9 | 2 | 2.1 |
| D | 0.169 | | 0.185 | 4.3 | | 4.7 |
| F | 0.006 | | 0.012 | 0.152 | | 0.305 |
| G | - | | 0.008 | - | | 0.203 |
| H | 0.085 | 0.091 | 0.096 | 2.15 | 2.3 | 2.45 |
| L | 0.03 | | 0.06 | 0.76 | | 1.52 |
| X | | 0.11 | | | 2.8 | |
| Y | | 0.079 | | | 2 | |
| Z | | 0.079 | | | 2 | |

■ Soldering Parameters



| Reflow Condition | | Lead-free assembly |
|--|------------------------------------|-------------------------|
| Pre Heat | - Temperature Min ($T_{s(min)}$) | 150°C |
| | - Temperature Max ($T_{s(max)}$) | 200°C |
| | - Time (min to max) (t_s) | 60 – 180 secs |
| Average ramp up rate (Liquidus Temp (T_L) to peak) | | 3°C/second max |
| $T_{s(max)}$ to T_L - Ramp-up Rate | | 3°C/second max |
| Reflow | - Temperature (T_L) (Liquidus) | 217°C |
| | - Time (t_L) | 60 – 150 secs |
| Peak Temperature (T_P) | | 260 ^{+0/-5} °C |
| Time within 5°C of actual peak Temperature (t_p) | | 20 – 40 secs |
| Ramp-down Rate | | 6°C/second max |
| Time 25°C to peak Temperature (t) | | 8 minutes Max. |
| Do not exceed | | 260°C |