

SMBJE

600 W Transient voltage suppressor



Product features

- Low profile SMB package
- Excellent clamping capability
- 600 W peak pulse power capability at 10/1000 μ s waveform
- Typical I_R less than 1 μ A above 10 V
- Fast response time: typically less than 1.0 ps from 0 V to V_{BR} minimum
- High temperature reflow soldering: +260 °C /40 s at terminal
- Plastic package meets UL 94 V-0 flammability rating
- Meets moisture sensitivity level (MSL) level 1
- Terminal: Solder plated leads, solderable per J-STD-002
- For surface mounted applications in order to optimize board space
- UL 497B recognized.
File No. : E198449 Guide QVGO2

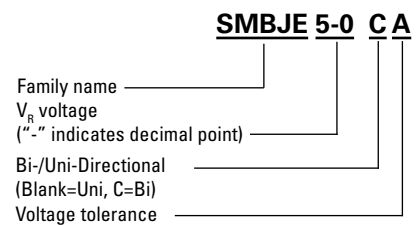
Applications

- Consumer electronics
- Telecommunications
- Computing and servers
- Appliances
- Industrial automation
- Mobile and wearables

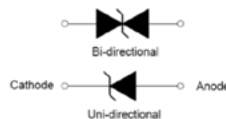
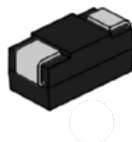
Environmental compliance and general specifications



Ordering part number



PIN configuration



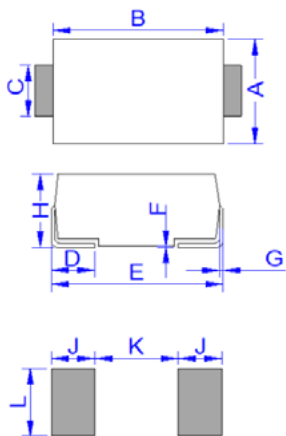
Absolute maximum ratings

(+25 °C, RH=45%-75%, unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|---|-----------------|-------------|------|
| Storage operating junction temperature range | T_{STG}/T_J | -55 to +150 | °C |
| Steady state power dissipation at $T_L = +75$ °C | $P_{M(AV)}$ | 5.0 | W |
| Peak pulse power dissipation on 10/1000 μ s waveform | P_{PP} | 600 | W |
| Maximum instantaneous forward voltage at 100 A for unidirectional | V_F | 5.0 | V |
| Peak forward surge current, 8.3 ms single half sine wave ¹ | I_{FSM} | 100 | A |
| Typical thermal resistance junction to lead | $R_{\theta JL}$ | 20 | °C/W |
| Typical thermal resistance junction to ambient | $R_{\theta JA}$ | 100 | °C/W |

1. Measured on 8.3 ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle = 4 per minute maximum

Mechanical parameters, pad layout- mm



| Dimension | Millimeters | | Inches | |
|-----------|-------------|---------|---------|---------|
| | Minimum | Maximum | Minimum | Maximum |
| A | 3.30 | 3.94 | 0.130 | 0.155 |
| B | 4.30 | 4.80 | 0.169 | 0.189 |
| C | 1.90 | 2.20 | 0.075 | 0.087 |
| D | 0.95 | 1.52 | 0.037 | 0.060 |
| E | 5.20 | 5.60 | 0.205 | 0.220 |
| F | 0.051 | 0.203 | 0.002 | 0.008 |
| G | 0.15 | 0.31 | 0.006 | 0.012 |
| H | 2.10 | 2.40 | 0.083 | 0.094 |
| J | 2.20 | | 0.087 | |
| K | | 2.60 | | 0.102 |
| L | 2.30 | | 0.091 | |

Part marking



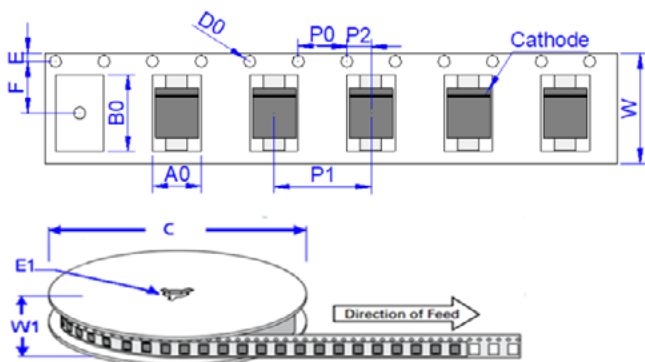
Cathode band (Uni-polar only)

Part marking: xxxx = Date code
yy- Refer to marking designator listed in Electrical Characteristics table

Packaging information (mm)

Drawing not to scale.

Supplied in tape and reel packaging, 3,000 parts per 13" diameter reel (EIA-481 compliant)



| Dimension | Millimeters | Inches |
|-----------|-------------|----------------|
| A0 | 3.76 ± 0.3 | 0.148 ± 0.012 |
| B0 | 5.69 ± 0.3 | 0.224 ± 0.012 |
| C | 330.0 | 13.0 |
| D0 | 1.55 ± 0.1 | 0.061 ± 0.004 |
| E | 1.75 ± 0.2 | 0.069 ± 0.008 |
| E1 | 13.3 ± 0.3 | 0.524 ± 0.012 |
| F | 5.50 ± 0.2 | 0.217 ± 0.008 |
| P0 | 4.00 ± 0.2 | 0.157 ± 0.008 |
| P1 | 8.00 ± 0.2 | 0.3145 ± 0.008 |
| P2 | 2.00 ± 0.2 | 0.079 ± 0.008 |
| W | 12.0 ± 0.2 | 0.472 ± 0.008 |
| W1 | 15.7 ± 2.0 | 0.618 ± 0.079 |

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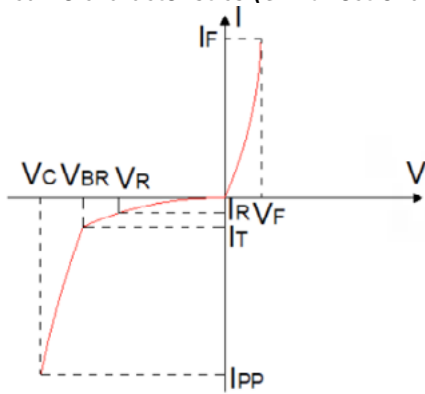
Technical Data 11214
Effective November 2020

Electrical characteristics (+25 °C)

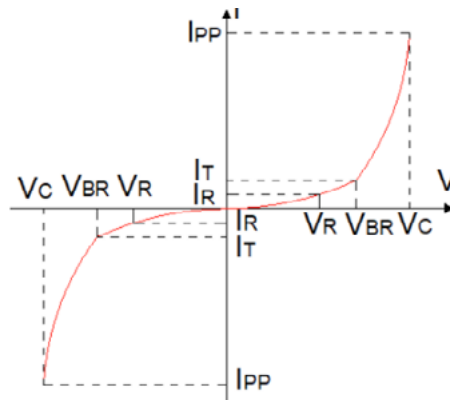
| Part number | Marking | | V_R (V) | $I_R @ V_R$ (μ A) | $V_{BR} @ I_T$ min (V) | max (V) | I_T (mA) | $V_C @ I_{PP}$ max (V) | I_{PP} (A) | |
|-------------|------------|----------|--------------|---------------------------|---------------------------|---------|---------------|---------------------------|-----------------|------|
| | Uni-polar | Bi-polar | | | | | | | | Uni |
| SMBJE5-0A | SMBJE5-0CA | KE | AE | 5 | 120 | 6.4 | 7 | 10 | 9.2 | 65.2 |
| SMBJE6-0A | SMBJE6-0CA | KG | AG | 6 | 120 | 6.67 | 7.37 | 10 | 10.3 | 58.3 |
| SMBJE6-5A | SMBJE6-5CA | KK | AK | 6.5 | 120 | 7.22 | 7.98 | 10 | 11.2 | 53.6 |
| SMBJE7-0A | SMBJE7-0CA | KM | AM | 7 | 50 | 7.78 | 8.6 | 10 | 12 | 50 |
| SMBJE7-5A | SMBJE7-5CA | KP | AP | 7.5 | 50 | 8.33 | 9.21 | 1 | 12.9 | 46.5 |
| SMBJE8-0A | SMBJE8-0CA | KR | AR | 8 | 20 | 8.89 | 9.83 | 1 | 13.6 | 44.1 |
| SMBJE8-5A | SMBJE8-5CA | KT | AT | 8.5 | 10 | 9.44 | 10.4 | 1 | 14.4 | 41.7 |
| SMBJE9-0A | SMBJE9-0CA | KV | AV | 9 | 5 | 10 | 11.1 | 1 | 15.4 | 39 |
| SMBJE10A | SMBJE10CA | KX | AX | 10 | 2 | 11.1 | 12.3 | 1 | 17 | 35.3 |
| SMBJE11A | SMBJE11CA | KZ | AZ | 11 | 1 | 12.2 | 13.5 | 1 | 18.2 | 33 |
| SMBJE12A | SMBJE12CA | LE | BE | 12 | 1 | 13.3 | 14.7 | 1 | 19.9 | 30.2 |
| SMBJE13A | SMBJE13CA | LG | BG | 13 | 1 | 14.4 | 15.9 | 1 | 21.5 | 27.9 |
| SMBJE14A | SMBJE14CA | LK | BK | 14 | 1 | 15.6 | 17.2 | 1 | 23.2 | 25.9 |
| SMBJE15A | SMBJE15CA | LM | BM | 15 | 1 | 16.7 | 18.5 | 1 | 24.4 | 24.6 |
| SMBJE16A | SMBJE16CA | LP | BP | 16 | 1 | 17.8 | 19.7 | 1 | 26 | 23.1 |
| SMBJE17A | SMBJE17CA | LR | BR | 17 | 1 | 18.9 | 20.9 | 1 | 27.6 | 21.8 |
| SMBJE18A | SMBJE18CA | LT | BT | 18 | 1 | 20 | 22.1 | 1 | 29.2 | 20.6 |
| SMBJE20A | SMBJE20CA | LV | BV | 20 | 1 | 22.2 | 24.5 | 1 | 32.4 | 18.6 |
| SMBJE22A | SMBJE22CA | LX | BX | 22 | 1 | 24.4 | 26.9 | 1 | 35.5 | 16.9 |
| SMBJE24A | SMBJE24CA | LZ | BZ | 24 | 1 | 26.7 | 29.5 | 1 | 38.9 | 15.4 |
| SMBJE26A | SMBJE26CA | ME | CE | 26 | 1 | 28.9 | 31.9 | 1 | 42.1 | 14.3 |
| SMBJE28A | SMBJE28CA | MG | CG | 28 | 1 | 31.1 | 34.4 | 1 | 45.4 | 13.2 |
| SMBJE30A | SMBJE30CA | MK | CK | 30 | 1 | 33.3 | 36.8 | 1 | 48.4 | 12.4 |
| SMBJE33A | SMBJE33CA | MM | CM | 33 | 1 | 36.7 | 40.6 | 1 | 53.3 | 11.3 |
| SMBJE36A | SMBJE36CA | MP | CP | 36 | 1 | 40 | 44.2 | 1 | 58.1 | 10.4 |
| SMBJE40A | SMBJE40CA | MR | CR | 40 | 1 | 44.4 | 49.1 | 1 | 64.5 | 9.3 |
| SMBJE43A | SMBJE43CA | MT | CT | 43 | 1 | 47.8 | 52.8 | 1 | 69.4 | 8.7 |
| SMBJE45A | SMBJE45CA | MV | CV | 45 | 1 | 50 | 55.3 | 1 | 72.7 | 8.3 |
| SMBJE48A | SMBJE48CA | MX | CX | 48 | 1 | 53.3 | 58.9 | 1 | 77.4 | 7.8 |
| SMBJE51A | SMBJE51CA | MZ | CZ | 51 | 1 | 56.7 | 62.7 | 1 | 82.4 | 7.3 |
| SMBJE54A | SMBJE54CA | NE | DE | 54 | 1 | 60 | 66.3 | 1 | 87.1 | 6.9 |
| SMBJE58A | SMBJE58CA | NG | DG | 58 | 1 | 64.4 | 71.2 | 1 | 93.6 | 6.4 |
| SMBJE60A | SMBJE60CA | NK | DK | 60 | 1 | 66.7 | 73.7 | 1 | 96.8 | 6.2 |
| SMBJE64A | SMBJE64CA | NM | DM | 64 | 1 | 71.1 | 78.6 | 1 | 103 | 5.8 |
| SMBJE70A | SMBJE70CA | NP | DP | 70 | 1 | 77.8 | 86 | 1 | 113 | 5.3 |
| SMBJE75A | SMBJE75CA | NR | DR | 75 | 1 | 83.3 | 92.1 | 1 | 121 | 5 |
| SMBJE78A | SMBJE78CA | NT | DT | 78 | 1 | 86.7 | 95.8 | 1 | 126 | 4.8 |
| SMBJE85A | SMBJE85CA | NV | DV | 85 | 1 | 94.4 | 104 | 1 | 137 | 4.4 |
| SMBJE90A | SMBJE90CA | NX | DX | 90 | 1 | 100 | 111 | 1 | 146 | 4.1 |
| SMBJE100A | SMBJE100CA | NZ | DZ | 100 | 1 | 111 | 123 | 1 | 162 | 3.7 |
| SMBJE110A | SMBJE110CA | PE | EE | 110 | 1 | 122 | 135 | 1 | 177 | 3.4 |
| SMBJE120A | SMBJE120CA | PG | EG | 120 | 1 | 133 | 147 | 1 | 193 | 3.1 |
| SMBJE130A | SMBJE130CA | PK | EK | 130 | 1 | 144 | 159 | 1 | 209 | 2.9 |
| SMBJE150A | SMBJE150CA | PM | EM | 150 | 1 | 167 | 185 | 1 | 243 | 2.5 |
| SMBJE160A | SMBJE160CA | PP | EP | 160 | 1 | 178 | 197 | 1 | 259 | 2.3 |
| SMBJE170A | SMBJE170CA | PR | ER | 170 | 1 | 189 | 209 | 1 | 275 | 2.2 |
| SMBJE180A | SMBJE180CA | PT | ET | 180 | 1 | 201 | 222 | 1 | 292 | 2.1 |
| SMBJE190A | SMBJE190CA | PV | EV | 190 | 1 | 211 | 234 | 1 | 307 | 2 |
| SMBJE200A | SMBJE200CA | PX | EX | 200 | 1 | 224 | 247 | 1 | 324 | 1.9 |
| SMBJE210A | SMBJE210CA | PZ | EZ | 210 | 1 | 233 | 258 | 1 | 337 | 1.8 |
| SMBJE220A | SMBJE220CA | QE | FE | 220 | 1 | 246 | 272 | 1 | 356 | 1.7 |
| SMBJE250A | SMBJE250CA | QG | FG | 250 | 1 | 279 | 309 | 1 | 405 | 1.5 |
| SMBJE300A | SMBJE300CA | QK | FK | 300 | 1 | 335 | 371 | 1 | 486 | 1.3 |
| SMBJE350A | SMBJE350CA | QM | FM | 350 | 1 | 391 | 432 | 1 | 567 | 1.1 |
| SMBJE400A | SMBJE400CA | QP | FP | 400 | 1 | 447 | 494 | 1 | 648 | 0.9 |
| SMBJE440A | SMBJE440CA | QR | FR | 440 | 1 | 492 | 543 | 1 | 713 | 0.8 |

Ratings and V-I characteristic curves (+25 °C unless otherwise noted)

V- I curve characteristics (Uni-directional)



V- I curve characteristics (Bi-directional)



Surge waveform: 10/1000 μ s

V_R : Stand-off voltage – Maximum voltage that can be applied

V_{BR} : Breakdown voltage

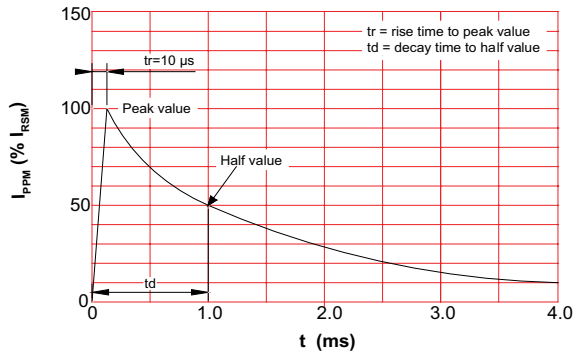
V_C : Clamping voltage – Peak voltage measured across the suppressor at a specified I_{PP}

I_R : Reverse leakage current

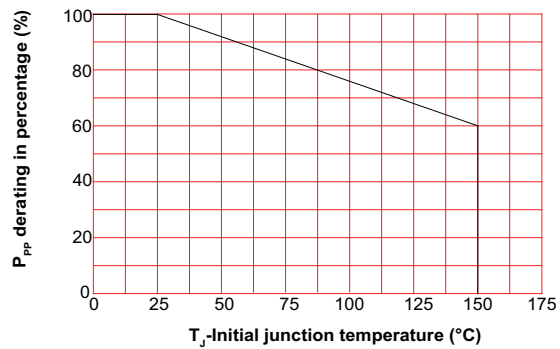
I_T : Test current

V_F : Forward voltage drop for Uni-directional TVS diode

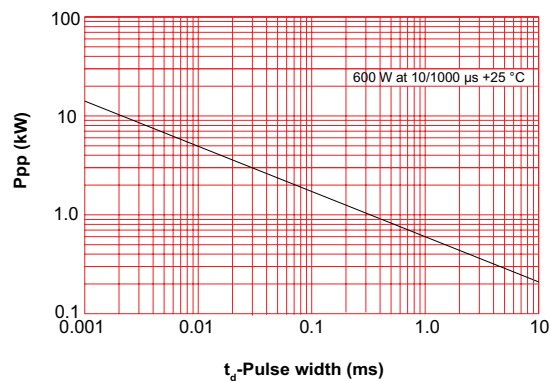
Pulse waveform



Pulse derating curve



Peak pulse power dissipation vs. pulse width



Solder reflow profile

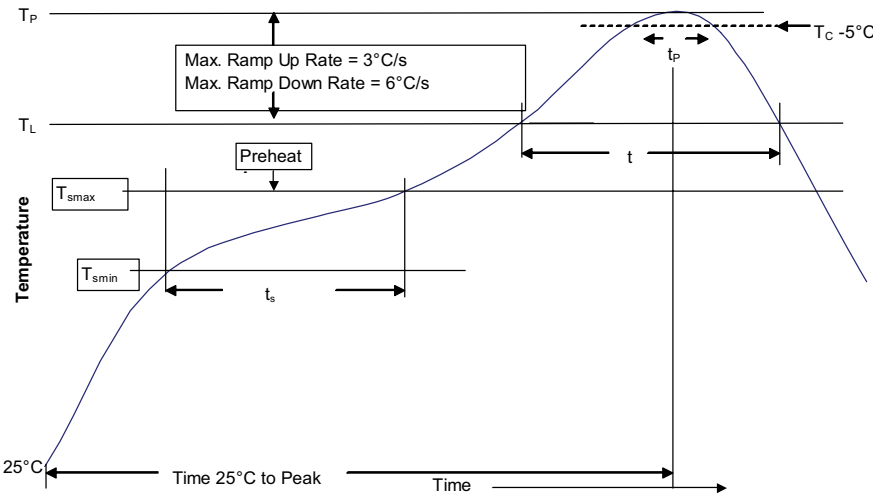


Table 1 - Standard SnPb solder (T_C)

| Package thickness | Volume mm ³ <350 | Volume mm ³ ≥350 |
|-------------------|-----------------------------|-----------------------------|
| <2.5 mm | 235 °C | 220 °C |
| ≥2.5 mm | 220 °C | 220 °C |

Table 2 - Lead (Pb) free solder (T_C)

| Package thickness | Volume mm ³ <350 | Volume mm ³ 350 - 2000 | Volume mm ³ >2000 |
|-------------------|-----------------------------|-----------------------------------|------------------------------|
| <1.6 mm | 260 °C | 260 °C | 260 °C |
| 1.6 – 2.5 mm | 260 °C | 250 °C | 245 °C |
| >2.5 mm | 250 °C | 245 °C | 245 °C |

Reference J-STD-020

| Profile feature | Standard SnPb solder | Lead (Pb) free solder |
|---|--|--|
| Preheat and soak | <ul style="list-style-type: none"> Temperature min. (T_{smin}) Temperature max. (T_{smax}) Time (T_{smin} to T_{smax}) (t_s) | <ul style="list-style-type: none"> 100 °C 150 °C 60-120 seconds |
| Ramp up rate T_L to T_p | 3 °C/ second max. | 3 °C/ second max. |
| Liquidous temperature (T_L) | 183 °C | 217 °C |
| Time (t_L) maintained above T_L | 60-150 seconds | 60-150 seconds |
| Peak package body temperature (T_p)* | Table 1 | Table 2 |
| Time (t_p)* within 5 °C of the specified classification temperature (T_C) | 20 seconds* | 40 seconds* |
| Ramp-down rate (T_p to T_L) | 6 °C/ second max. | 6 °C/ second max. |
| Time 25 °C to peak temperature | 6 minutes max. | 8 minutes max. |

* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum.

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