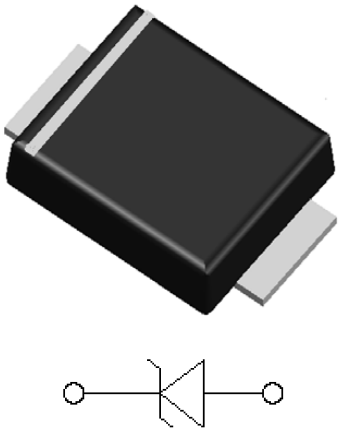
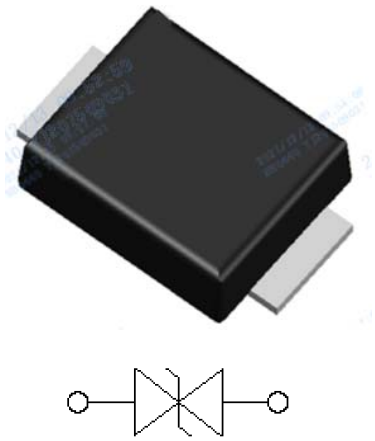
# Surface Mount Transient Voltage Suppressors

**Uni-directional**



**Bi-directional**



## Features

- For surface mounted applications
- Low-profile package
- Ideal for automated placement
- Available in Unidirectional and Bidirectional
- 600 W peak pulse power capability with a 10/1000 μs waveform
- Low incremental surge resistance, excellent clamping capability
- Very fast response time
- High temperature soldering guaranteed: 260 °C/10 s at terminals
- Meets MSL level 1
- Component in accordance to RoHS

## Typical Applications

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting on ICs, MOSFET, signal lines of sensor units for consumer, computer, industrial, telecommunication.

## Mechanical Data

- **Package**：SMBF
  Molding compound meets UL 94 V-0 flammability rating, RoHS-compliant, halogen-free
- **Terminals**: Matte tin plated leads, solderable per J-STD-002B and JESD22-B102D
- **Polarity**: For uni-directional types the band denotes cathode end, no marking on bi-directional types

## ■Maximum Ratings (Ta=25℃ Unless otherwise specified)

| PARAMETER | SYMBOL | UNIT | Max |
|---|---|---|---|
| Peak power dissipation, with a 10/1000us waveform (1) (2) (Fig.1) | $P_{PPM}$ | W | 600 |
| Peak pulse current, with a 10/1000us waveform(1) | $I_{PPM}$ | A | See Next Table |
| Power dissipation, on infinite heat sink at TL=75℃ | $P_D$ | W | 5.0 |
| Peak forward surge current, 8.3 ms single half sine-wave unidirectional only (2) | $I_{FSM}$ | A | 100 |
| Operating junction and storage temperature range | $T_J$,$T_{STG}$ | ℃ | -55 to +150 |

## ■Electrical Characteristics (Ta=25℃ Unless otherwise specified)

| PARAMETER | SYMBOL | UNIT | VALUE |
|---|---|---|---|
| Maximum instantaneous forward voltage @ at 50A for unidirectional only (3) | $V_F$ | V | 3.5/5.0 |

## ■Thermal Characteristics （$T_a$=25℃ Unless otherwise specified）

| PARAMETER | SYMBOL | UNIT | Conditions | VALUE |
|---|---|---|---|---|
| Thermal resistance(Typical) | $R_{\theta JA}$ | ℃/W | junction to ambient | 100 |
| | $R_{\theta JL}$ | ℃/W | junction to lead | 20 |
| | $R_{\theta JC}$ | ℃/W | Junction to case | 15 |

Notes:
(1) Non-repetitive current pulse, per Fig. 3 and derated above $T_A$= 25℃per Fig.2.
(2) Mounted on 0.2 x 0.2" (5.0 x 5.0 mm) copper pads to each terminal.
(3) $V_F$<3.5V for devices of $V_{BR}$<200V and $V_F$<5.0V for devices of $V_{BR}$>201V.

## ■Ordering Information (Example)

| PREFERED P/N | PACKING CODE | UNIT WEIGHT(g) | MINIMUM PACKAGE(pcs) | INNER BOX QUANTITY(pcs) | OUTER CARTON QUANTITY(pcs) | DELIVERY MODE |
|---|---|---|---|---|---|---|
| SMBF5.0A-SMBF220CA | F1 | Approximate 0.065 | 5000 | / | 80000 | 13” reel |

## ■Electrical Characteristics （$T_a$=25℃ Unless otherwise specified）

| Part Number (Uni) | Part Number (Bi) | Breakdown Voltage $V_{BR}$@$I_T$ | | | Maximum Reverse Leakage $I_R$[6]@ $V_{RWM}$ (μA) | Working Peak Reverse Voltage $V_{RWM}$ (V) | Maximum Reverse Surge Current $I_{PP}$[5] (A) | Maximum Clamping Voltage Vc @ $I_{PP}$ (V) |
|---|---|---|---|---|---|---|---|---|
| | | Min(V) | Max (V) | $I_T$[4](mA) | | | | |
| SMBF5.0A | SMBF5.0CA(4) | 6.4 | 7.07 | 10 | 800 | 5 | 65.22 | 9.2 |
| SMBF6.0A | SMBF6.0CA | 6.67 | 7.37 | 10 | 800 | 6 | 58.25 | 10.3 |
| SMBF6.5A | SMBF6.5CA | 7.22 | 7.98 | 10 | 500 | 6.5 | 53.57 | 11.2 |
| SMBF7.0A | SMBF7.0CA | 7.78 | 8.6 | 10 | 200 | 7 | 50 | 12 |
| SMBF7.5A | SMBF7.5CA | 8.33 | 9.21 | 1 | 100 | 7.5 | 46.51 | 12.9 |
| SMBF8.0A | SMBF8.0CA | 8.89 | 9.83 | 1 | 50 | 8 | 44.12 | 13.6 |
| SMBF8.5A | SMBF8.5CA | 9.44 | 10.4 | 1 | 10 | 8.5 | 41.67 | 14.4 |
| SMBF9.0A | SMBF9.0CA | 10 | 11.1 | 1 | 5 | 9 | 38.96 | 15.4 |
| SMBF10A | SMBF10CA | 11.1 | 12.3 | 1 | 5 | 10 | 35.29 | 17 |
| SMBF11A | SMBF11CA | 12.2 | 13.5 | 1 | 5 | 11 | 32.97 | 18.2 |
| SMBF12A | SMBF12CA | 13.3 | 14.7 | 1 | 5 | 12 | 30.15 | 19.9 |
| SMBF13A | SMBF13CA | 14.4 | 15.9 | 1 | 1 | 13 | 27.91 | 21.5 |
| SMBF14A | SMBF14CA | 15.6 | 17.2 | 1 | 1 | 14 | 25.86 | 23.2 |
| SMBF15A | SMBF15CA | 16.7 | 18.5 | 1 | 1 | 15 | 24.59 | 24.4 |
| SMBF16A | SMBF16CA | 17.8 | 19.7 | 1 | 1 | 16 | 23.08 | 26 |
| SMBF17A | SMBF17CA | 18.9 | 20.9 | 1 | 1 | 17 | 21.74 | 27.6 |
| SMBF18A | SMBF18CA | 20 | 22.1 | 1 | 1 | 18 | 20.55 | 29.2 |
| SMBF19A | SMBF19CA | 21.1 | 23.3 | 1 | 1 | 19 | 19.49 | 30.8 |
| SMBF20A | SMBF20CA | 22.2 | 24.5 | 1 | 1 | 20 | 18.52 | 32.4 |
| SMBF22A | SMBF22CA | 24.4 | 26.9 | 1 | 1 | 22 | 16.9 | 35.5 |
| SMBF24A | SMBF24CA | 26.7 | 29.5 | 1 | 1 | 24 | 15.42 | 38.9 |
| SMBF26A | SMBF26CA | 28.9 | 31.9 | 1 | 1 | 26 | 14.25 | 42.1 |
| SMBF28A | SMBF28CA | 31.1 | 34.4 | 1 | 1 | 28 | 13.22 | 45.4 |
| SMBF30A | SMBF30CA | 33.3 | 36.8 | 1 | 1 | 30 | 12.4 | 48.4 |
| SMBF33A | SMBF33CA | 36.7 | 40.6 | 1 | 1 | 33 | 11.26 | 53.3 |

## ■Electrical Characteristics（Ta=25℃ Unless otherwise specified）

| Part Number (Uni) | Part Number (Bi) | Breakdown Voltage $V_{BR}$@$I_T$ | | | Maximum Reverse Leakage $I_R$[6]@ $V_{RWM}$ (μA) | Working Peak Reverse Voltage $V_{RWM}$ (V) | Maximum Reverse Surge Current $I_{PP}$[5] (A) | Maximum Clamping Voltage Vc @ $I_{PP}$ (V) |
|---|---|---|---|---|---|---|---|---|
| | | Min(V) | Max (V) | $I_T$[4](mA) | | | | |
| SMBF36A | SMBF36CA | 40 | 44.2 | 1 | 1 | 36 | 10.33 | 58.1 |
| SMBF40A | SMBF40CA | 44.4 | 49.1 | 1 | 1 | 40 | 9.3 | 64.5 |
| SMBF43A | SMBF43CA | 47.8 | 52.8 | 1 | 1 | 43 | 8.65 | 69.4 |
| SMBF45A | SMBF45CA | 50 | 55.3 | 1 | 1 | 45 | 8.25 | 72.7 |
| SMBF48A | SMBF48CA | 53.3 | 58.9 | 1 | 1 | 48 | 7.75 | 77.4 |
| SMBF51A | SMBF51CA | 56.7 | 62.7 | 1 | 1 | 51 | 7.28 | 82.4 |
| SMBF54A | SMBF54CA | 60 | 66.3 | 1 | 1 | 54 | 6.89 | 87.1 |
| SMBF58A | SMBF58CA | 64.4 | 71.2 | 1 | 1 | 58 | 6.41 | 93.6 |
| SMBF60A | SMBF60CA | 66.7 | 73.7 | 1 | 1 | 60 | 6.2 | 96.8 |
| SMBF64A | SMBF64CA | 71.1 | 78.6 | 1 | 1 | 64 | 5.83 | 103 |
| SMBF70A | SMBF70CA | 77.8 | 86 | 1 | 1 | 70 | 5.31 | 113 |
| SMBF75A | SMBF75CA | 83.3 | 92.1 | 1 | 1 | 75 | 4.96 | 121 |
| SMBF78A | SMBF78CA | 86.7 | 95.8 | 1 | 1 | 78 | 4.76 | 126 |
| SMBF80A | SMBF80CA | 88.8 | 97.6 | 1 | 1 | 80 | 4.63 | 129.6 |
| SMBF85A | SMBF85CA | 94.4 | 104 | 1 | 1 | 85 | 4.38 | 137 |
| SMBF90A | SMBF90CA | 100 | 111 | 1 | 1 | 90 | 4.11 | 146 |
| SMBF100A | SMBF100CA | 111 | 123 | 1 | 1 | 100 | 3.7 | 162 |
| SMBF110A | SMBF110CA | 122 | 135 | 1 | 1 | 110 | 3.39 | 177 |
| SMBF120A | SMBF120CA | 133 | 147 | 1 | 1 | 120 | 3.11 | 193 |
| SMBF130A | SMBF130CA | 144 | 159 | 1 | 1 | 130 | 2.87 | 209 |
| SMBF140A | SMBF140CA | 155 | 171 | 1 | 1 | 140 | 2.65 | 226.8 |
| SMBF150A | SMBF150CA | 167 | 185 | 1 | 1 | 150 | 2.47 | 243 |
| SMBF160A | SMBF160CA | 178 | 197 | 1 | 1 | 160 | 2.32 | 259 |
| SMBF170A | SMBF170CA | 189 | 209 | 1 | 1 | 170 | 2.18 | 275 |
| SMBF180A | SMBF180CA | 200 | 220 | 1 | 1 | 180 | 2.06 | 291.6 |
| SMBF190A | SMBF190CA | 211 | 232 | 1 | 1 | 190 | 1.95 | 307.8 |
| SMBF200A | SMBF200CA | 224 | 247 | 1 | 1 | 200 | 1.85 | 324 |
| SMBF220A | SMBF220CA | 246 | 272 | 1 | 1 | 220 | 1.69 | 356 |

Notes:
(4) Pulse test: $t_p$≤50ms.
(5) Surge current waveform per Fig. 3 and derated per Fig.2.
(6) For bi-directional types having $V_{RWM}$ of 10 V and less, the $I_R$ limit is doubled.
(7) For the bi-directional SMBJ5.0CA, the maximum $V_{BR}$ is 7.25 V.

## ■ **Characteristics** (Typical)

FIG1:Peak Pulse Power Rating Curve

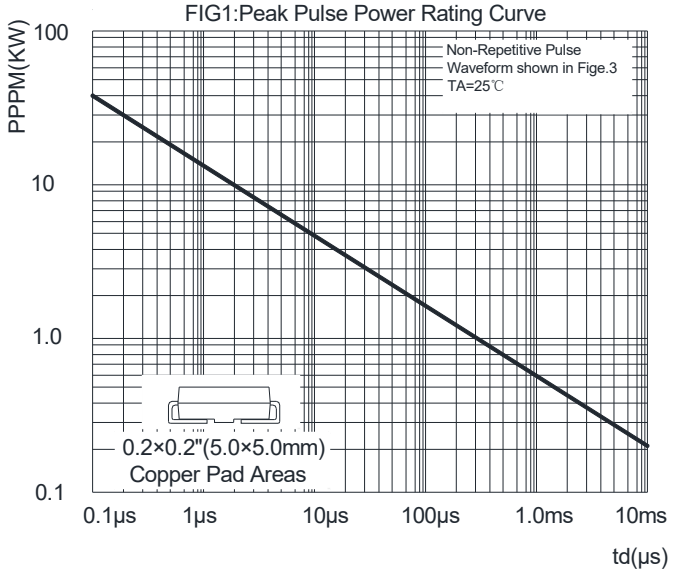



FIG2: Pulse Power or Current vs. Initial Junction Temperature

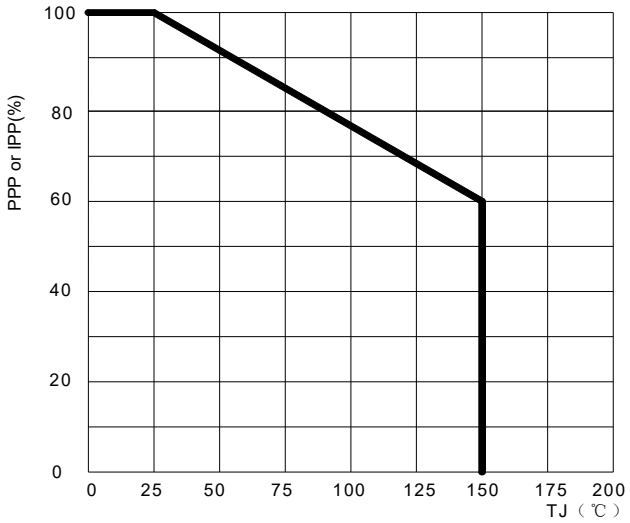



FIG3: Pulse Waveform

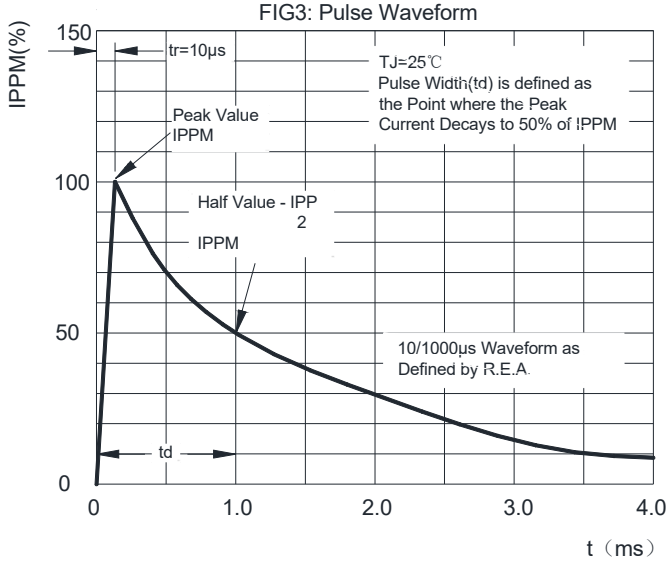



FIG4:Typical Transient Thermal Impedance

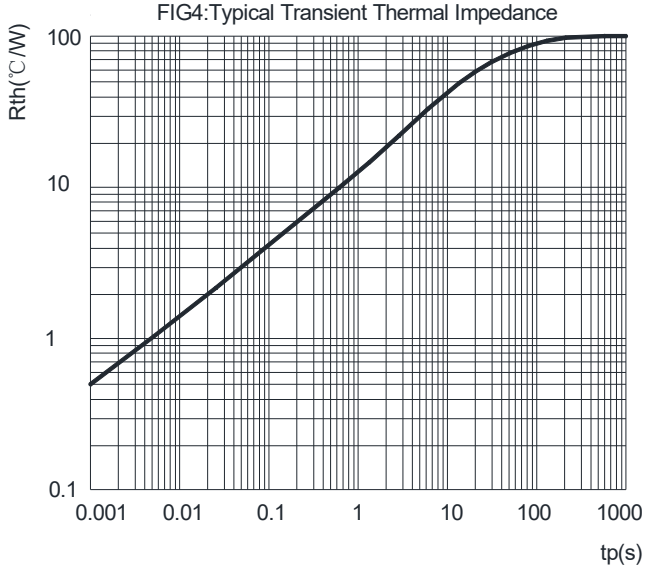



FIG5: Maximum Non-Repetitive Surge Current

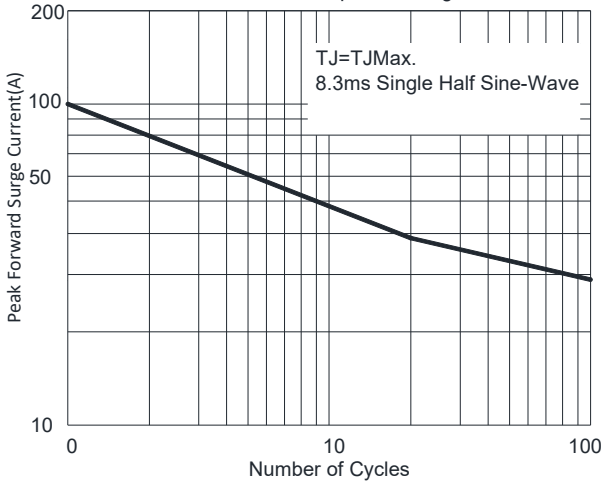
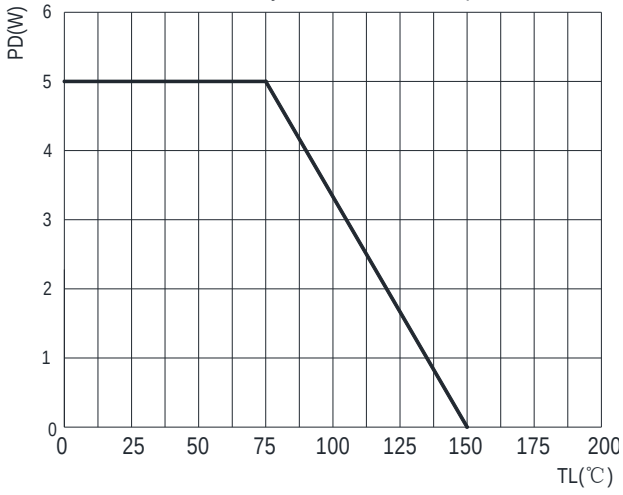
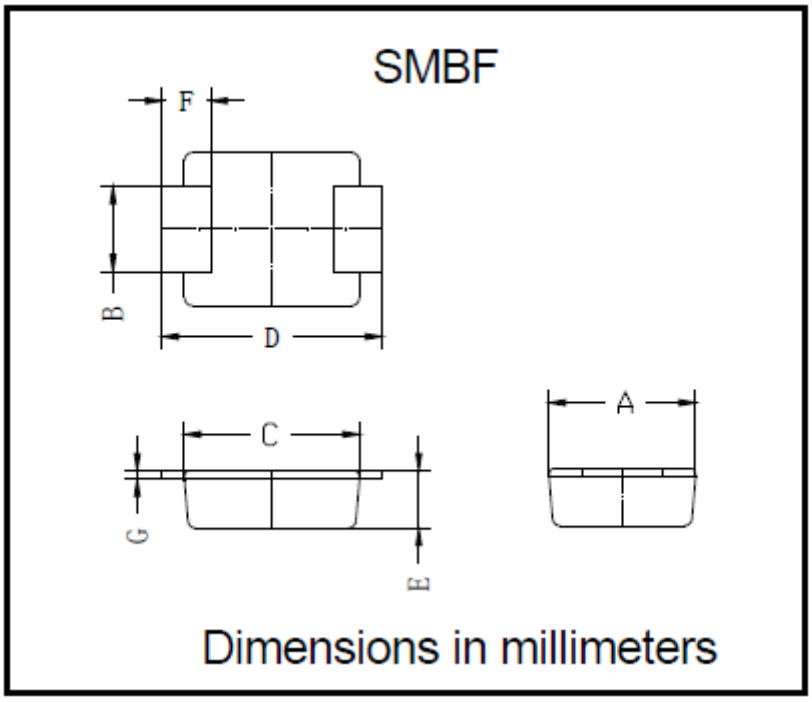



FIG6:Steady State Power Dissipation

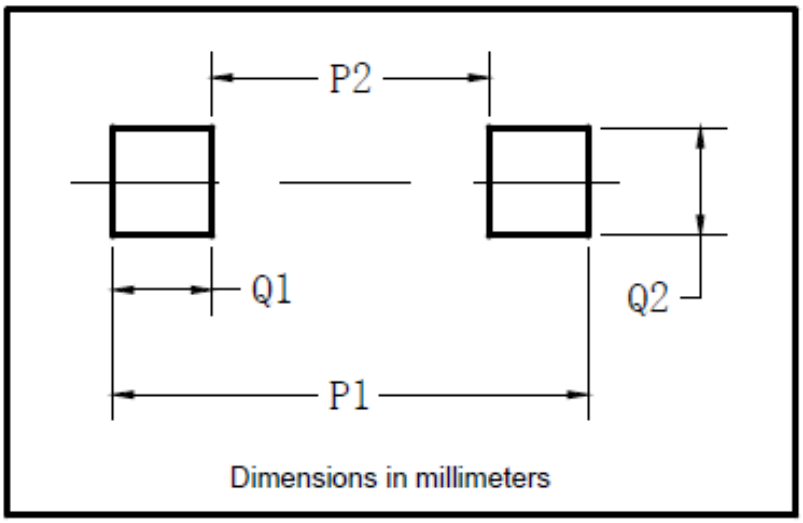


## ■ Outline Dimensions




| SMBF | | |
|---|---|---|
| Dim | Min | Max |
| A | 3.40 | 3.80 |
| B | 1.90 | 2.10 |
| C | 4.15 | 4.45 |
| D | 5.10 | 5.60 |
| E | 1.05 | 1.55 |
| F | 0.7 | 1.35 |
| G | 0.15 | 0.25 |

## ■ Suggested pad layout




| SMBF | |
|---|---|
| Dim | Millimeters |
| P1 | 6.20 |
| P2 | 2.40 |
| Q1 | 1.90 |
| Q2 | 2.20 |

## Notice

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