

# P6SMB

## 600 W Transient voltage suppressor



### Product features

- Low profile SMB package
- Excellent clamping capability
- 600 W peak pulse power capability at 10/1000  $\mu$ s waveform
- Typical  $I_R$  less than 1  $\mu$ A above 12 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 QVGQ2

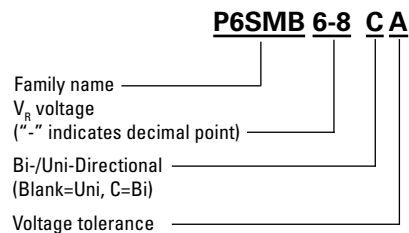
### Applications

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

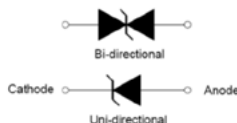
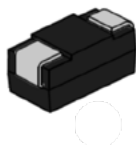
### Environmental compliance and general specifications



### Ordering part number



### PIN configuration



Powering Business Worldwide

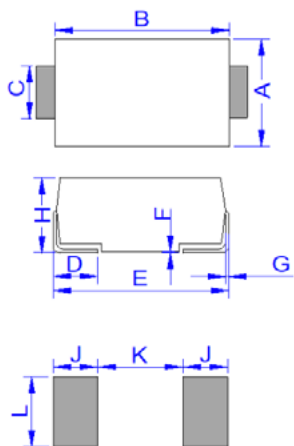
## Absolute maximum ratings

(+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 $\mu$ 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 <sup>1</sup> | $I_{FSM}$       | 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



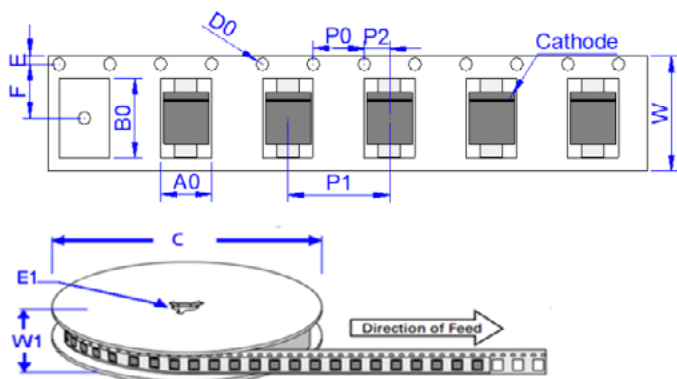
Cathode band (Uni-polar only)

Part marking: xxxx = Date code  
yyyy- 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)



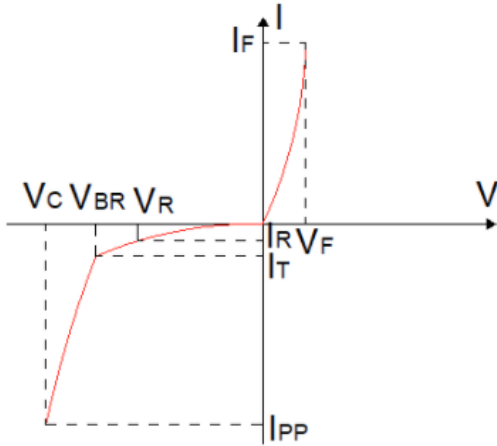
| Dimension | Millimeters | Inches        |
|-----------|-------------|---------------|
| A0        | 3.76 ± 0.3  | 0.148 ± 0.012 |
| B0        | 5.69 ± 0.3  | 0.224 ± 0.012 |
| C         | 330.0       | 13.0          |
| D0        | 1.55 ± 0.1  | 0.061 ± 0.004 |
| E         | 1.75 ± 0.2  | 0.069 ± 0.008 |
| E1        | 13.3 ± 0.3  | 0.524 ± 0.012 |
| F         | 5.5 ± 0.2   | 0.217 ± 0.008 |
| P0        | 4.00 ± 0.2  | 0.157 ± 0.008 |
| P1        | 8.00 ± 0.2  | 0.315 ± 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 |

Electrical characteristics (+25 °C)

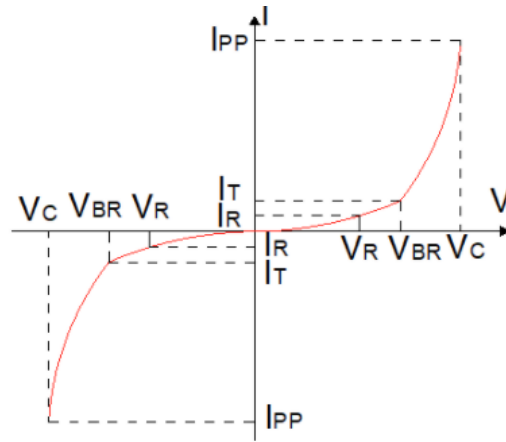
| Part number | Uni-polar  | Bi-polar | Marking | Uni  | Bi  | $V_R$<br>(V) | $I_R @ V_R$<br>( $\mu A$ ) | $V_{BR} @ I_T$<br>min (V) | max (V) | $I_T$<br>(mA) | $V_C @ I_{PP}$<br>max (V) | $I_{PP}$<br>(A) |
|-------------|------------|----------|---------|------|-----|--------------|----------------------------|---------------------------|---------|---------------|---------------------------|-----------------|
|             |            |          |         |      |     |              |                            |                           |         |               |                           |                 |
| P6SMB6-8A   | P6SMB6-8CA | 6V8A     | 6V8C    | 5.8  | 150 | 6.45         | 7.14                       | 10                        | 10.5    | 58.1          |                           |                 |
| P6SMB7-5A   | P6SMB7-5CA | 7V5A     | 7V5C    | 6.4  | 120 | 7.13         | 7.88                       | 10                        | 11.3    | 54            |                           |                 |
| P6SMB8-2A   | P6SMB8-2CA | 8V2A     | 8V2C    | 7.02 | 50  | 7.79         | 8.61                       | 10                        | 12.1    | 50.4          |                           |                 |
| P6SMB9-1A   | P6SMB9-1CA | 9V1A     | 9V1C    | 7.78 | 20  | 8.65         | 9.55                       | 1                         | 13.4    | 45.5          |                           |                 |
| P6SMB10A    | P6SMB10CA  | 10A      | 10C     | 8.55 | 10  | 9.5          | 10.5                       | 1                         | 14.5    | 42.1          |                           |                 |
| P6SMB11A    | P6SMB11CA  | 11A      | 11C     | 9.4  | 5   | 10.5         | 11.6                       | 1                         | 15.6    | 39.1          |                           |                 |
| P6SMB12A    | P6SMB12CA  | 12A      | 12C     | 10.2 | 2   | 11.4         | 12.6                       | 1                         | 16.7    | 36.5          |                           |                 |
| P6SMB13A    | P6SMB13CA  | 13A      | 13C     | 11.1 | 1   | 12.4         | 13.7                       | 1                         | 18.2    | 33.5          |                           |                 |
| P6SMB15A    | P6SMB15CA  | 15A      | 15C     | 12.8 | 1   | 14.3         | 15.8                       | 1                         | 21.2    | 28.8          |                           |                 |
| P6SMB16A    | P6SMB16CA  | 16A      | 16C     | 13.6 | 1   | 15.2         | 16.8                       | 1                         | 22.5    | 27.1          |                           |                 |
| P6SMB18A    | P6SMB18CA  | 18A      | 18C     | 15.3 | 1   | 17.1         | 18.9                       | 1                         | 25.2    | 24.2          |                           |                 |
| P6SMB20A    | P6SMB20CA  | 20A      | 20C     | 17.1 | 1   | 19           | 21                         | 1                         | 27.7    | 21.7          |                           |                 |
| P6SMB22A    | P6SMB22CA  | 22A      | 22C     | 18.8 | 1   | 20.9         | 23.1                       | 1                         | 30.6    | 19.7          |                           |                 |
| P6SMB24A    | P6SMB24CA  | 24A      | 24C     | 20.5 | 1   | 22.8         | 25.2                       | 1                         | 33.2    | 18.4          |                           |                 |
| P6SMB27A    | P6SMB27CA  | 27A      | 27C     | 23.1 | 1   | 25.7         | 28.4                       | 1                         | 37.5    | 16.3          |                           |                 |
| P6SMB30A    | P6SMB30CA  | 30A      | 30C     | 25.6 | 1   | 28.5         | 31.5                       | 1                         | 41.4    | 14.7          |                           |                 |
| P6SMB33A    | P6SMB33CA  | 33A      | 33C     | 28.2 | 1   | 31.4         | 34.7                       | 1                         | 45.7    | 13.3          |                           |                 |
| P6SMB36A    | P6SMB36CA  | 36A      | 36C     | 30.8 | 1   | 34.2         | 37.8                       | 1                         | 49.9    | 12.2          |                           |                 |
| P6SMB39A    | P6SMB39CA  | 39A      | 39C     | 33.3 | 1   | 37.1         | 41                         | 1                         | 53.9    | 11.3          |                           |                 |
| P6SMB43A    | P6SMB43CA  | 43A      | 43C     | 36.8 | 1   | 40.9         | 45.2                       | 1                         | 59.3    | 10.3          |                           |                 |
| P6SMB47A    | P6SMB47CA  | 47A      | 47C     | 40.2 | 1   | 44.7         | 49.4                       | 1                         | 64.8    | 9.4           |                           |                 |
| P6SMB51A    | P6SMB51CA  | 51A      | 51C     | 43.6 | 1   | 48.5         | 53.6                       | 1                         | 70.1    | 8.7           |                           |                 |
| P6SMB56A    | P6SMB56CA  | 56A      | 56C     | 47.8 | 1   | 53.2         | 58.8                       | 1                         | 77      | 7.9           |                           |                 |
| P6SMB62A    | P6SMB62CA  | 62A      | 62C     | 53   | 1   | 58.9         | 65.1                       | 1                         | 85      | 7.2           |                           |                 |
| P6SMB68A    | P6SMB68CA  | 68A      | 68C     | 58.1 | 1   | 64.6         | 71.4                       | 1                         | 92      | 6.6           |                           |                 |
| P6SMB75A    | P6SMB75CA  | 75A      | 75C     | 64.1 | 1   | 71.3         | 78.8                       | 1                         | 103     | 5.9           |                           |                 |
| P6SMB82A    | P6SMB82CA  | 82A      | 82C     | 70.1 | 1   | 77.9         | 86.1                       | 1                         | 113     | 5.4           |                           |                 |
| P6SMB91A    | P6SMB91CA  | 91A      | 91C     | 77.8 | 1   | 86.5         | 95.5                       | 1                         | 125     | 4.9           |                           |                 |
| P6SMB100A   | P6SMB100CA | 100A     | 100C    | 85.5 | 1   | 95           | 105                        | 1                         | 137     | 4.5           |                           |                 |
| P6SMB110A   | P6SMB110CA | 110A     | 110C    | 94   | 1   | 105          | 116                        | 1                         | 152     | 4             |                           |                 |
| P6SMB120A   | P6SMB120CA | 120A     | 120C    | 102  | 1   | 114          | 126                        | 1                         | 165     | 3.7           |                           |                 |
| P6SMB130A   | P6SMB130CA | 130A     | 130C    | 111  | 1   | 124          | 137                        | 1                         | 179     | 3.4           |                           |                 |
| P6SMB150A   | P6SMB150CA | 150A     | 150C    | 128  | 1   | 143          | 158                        | 1                         | 207     | 2.9           |                           |                 |
| P6SMB160A   | P6SMB160CA | 160A     | 160C    | 136  | 1   | 152          | 168                        | 1                         | 219     | 2.8           |                           |                 |
| P6SMB170A   | P6SMB170CA | 170A     | 170C    | 145  | 1   | 162          | 179                        | 1                         | 234     | 2.6           |                           |                 |
| P6SMB180A   | P6SMB180CA | 180A     | 180C    | 154  | 1   | 171          | 189                        | 1                         | 246     | 2.5           |                           |                 |
| P6SMB200A   | P6SMB200CA | 200A     | 200C    | 171  | 1   | 190          | 210                        | 1                         | 274     | 2.2           |                           |                 |
| P6SMB220A   | P6SMB220CA | 220A     | 220C    | 185  | 1   | 209          | 231                        | 1                         | 328     | 1.9           |                           |                 |
| P6SMB250A   | P6SMB250CA | 250A     | 250C    | 214  | 1   | 237          | 263                        | 1                         | 344     | 1.8           |                           |                 |
| P6SMB300A   | P6SMB300CA | 300A     | 300C    | 256  | 1   | 285          | 315                        | 1                         | 414     | 1.5           |                           |                 |
| P6SMB350A   | P6SMB350CA | 350A     | 350C    | 300  | 1   | 332          | 368                        | 1                         | 482     | 1.3           |                           |                 |
| P6SMB400A   | P6SMB400CA | 400A     | 400C    | 342  | 1   | 380          | 420                        | 1                         | 548     | 1.1           |                           |                 |
| P6SMB440A   | P6SMB440CA | 440A     | 440C    | 376  | 1   | 418          | 462                        | 1                         | 602     | 1             |                           |                 |
| P6SMB480A   | P6SMB480CA | 480A     | 480C    | 408  | 1   | 456          | 504                        | 1                         | 658     | 0.9           |                           |                 |
| P6SMB510A   | P6SMB510CA | 510A     | 510C    | 434  | 1   | 485          | 535                        | 1                         | 698     | 0.9           |                           |                 |
| P6SMB540A   | P6SMB540CA | 540A     | 540C    | 460  | 1   | 513          | 567                        | 1                         | 740     | 0.8           |                           |                 |
| P6SMB600A   | P6SMB600CA | 600A     | 600C    | 512  | 1   | 570          | 630                        | 1                         | 828     | 0.75          |                           |                 |

**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  $\mu$ s

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

$V_{BR}$ : Breakdown voltage

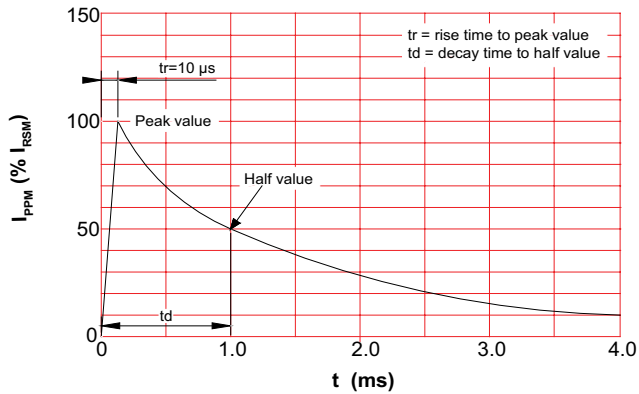
$V_C$ : Clamping voltage – Peak voltage measured across the suppressor at a specified  $I_{pp}$

$I_R$ : Reverse leakage current

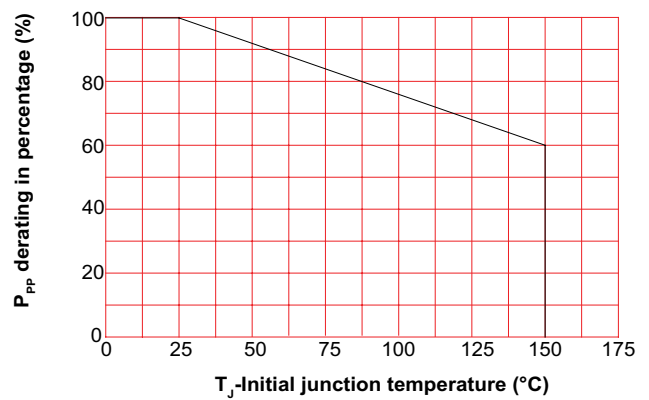
$I_T$ : Test current

$V_F$ : Forward voltage drop for Uni-directional TVS diode

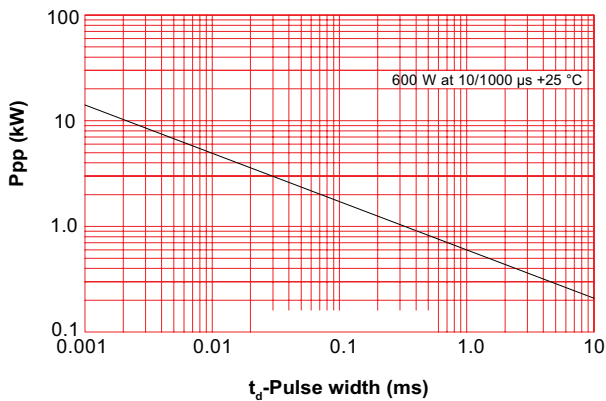
**Pulse waveform**



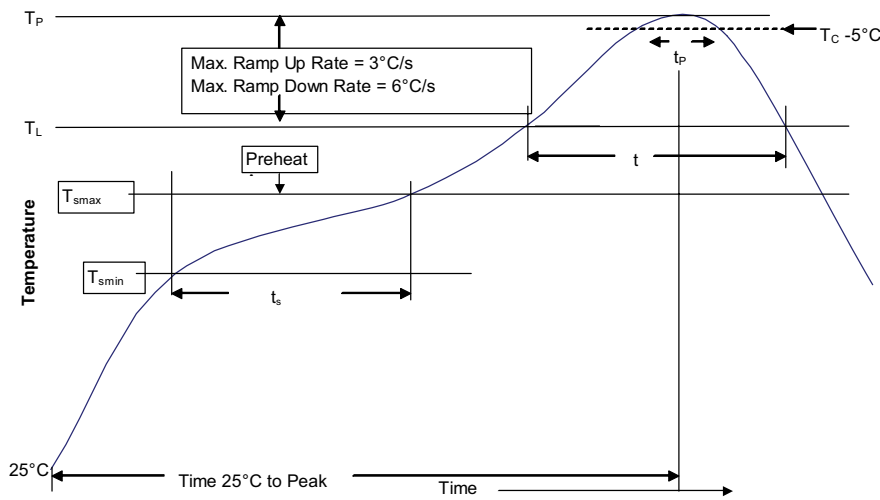
**Pulse derating curve**



**Peak pulse power dissipation vs. pulse width**



## Solder reflow profile



**Table 1 - Standard SnPb solder ( $T_C$ )**

| Package thickness | Volume mm <sup>3</sup> <350 | Volume mm <sup>3</sup> ≥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 <sup>3</sup> <350 | Volume mm <sup>3</sup> 350 - 2000 | Volume mm <sup>3</sup> >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                                                                  |                      |                       |
| • Temperature min. ( $T_{smin}$ )                                                 | 100 °C               | 150 °C                |
| • Temperature max. ( $T_{smax}$ )                                                 | 150 °C               | 200 °C                |
| • Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )                                     | 60-120 seconds       | 60-180 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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