

## Surface Mount Automotive Transient Voltage Suppressors

High Temperature Stability and High Reliability Conditions

Patented\*



\* Patent #'s  
4,980,315  
5,166,769  
5,278,094

DO-214AB (SMC)



### FEATURES

- Patented PAR<sup>®</sup> construction
- Available in uni-directional polarity only
- 1500 W peak pulse power capability with a 10/1000  $\mu$ s waveform
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- Meets MSL level 1, per J-STD-020C, LF max peak of 260 °C
- Solder dip 260 °C, 40 seconds
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

### 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, automotive and telecommunication.

### MECHANICAL DATA

**Case:** DO-214AB (SMC)

Epoxy meets UL 94V-0 flammability rating

**Terminals:** Matte tin plated leads, solderable per J-STD-002B and JESD22-B102D

HE3 suffix for high reliability grade (AEC Q101 qualified)

**Polarity:** Color band denotes cathode end

| PRIMARY CHARACTERISTICS |               |
|-------------------------|---------------|
| $V_{BR}$                | 6.8 V to 47 V |
| $P_{PPM}$               | 1500 W        |
| $I_{FSM}$               | 200 A         |
| $T_J$ max.              | 185 °C        |

| MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise noted)                                 |                |                |      |
|---|----------------|----------------|------|
| PARAMETER   | SYMBOL         | VALUE          | UNIT |
| Peak pulse power dissipation with a 10/1000 $\mu$ s waveform <sup>(1)(2)</sup> (Fig. 3) | $P_{PPM}$      | 1500           | W    |
| Peak power pulse current with a 10/1000 $\mu$ s waveform <sup>(1)</sup> (Fig. 1)        | $I_{PPM}$      | See next table | A    |
| Peak forward surge current 8.3 ms single half sine-wave <sup>(2)(3)</sup>               | $I_{FSM}$      | 200            | A    |
| Maximum instantaneous forward voltage at 100 A <sup>(2)(3)</sup>                        | $V_F$          | 3.5            | V    |
| Operating junction and storage temperature range  | $T_J, T_{STG}$ | - 65 to + 185  | °C   |

#### Notes:

(1) Non-repetitive current pulse, per Fig. 3 and derated above  $T_A = 25$  °C per Fig. 2

(2) Mounted on 0.31 x 0.31" (8.0 x 8.0 mm) copper pads at each terminal

(3) Measured on 8.3 ms single half sine-wave, or equivalent square wave, duty cycle = 4 pulses per minute maximum



| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted) |                     |   |      |                         |                                |   |   |  |   |
|--|---------------------|---|------|-------------------------|--------------------------------|---|---|--|---|
| DEVICE TYPE  | DEVICE MARKING CODE | BREAKDOWN VOLTAGE $V_{BR}^{(1)}$ AT $I_T$ (V) |      | TEST CURRENT $I_T$ (mA) | STAND-OFF VOLTAGE $V_{WM}$ (V) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $I_R$ ( $\mu\text{A}$ ) | $T_J = 150\text{ }^\circ\text{C}$ MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $I_D$ ( $\mu\text{A}$ ) | MAXIMUM PEAK PULSE SURGE CURRENT $I_{PPM}^{(2)}$ (A) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V) |
|  |                     | MIN   | MAX  |                         |                                |   |   |  |   |
| TPSMC6.8   | DDP                 | 6.12  | 7.48 | 10.0                    | 5.50                           | 1000  | 10000   | 139.0  | 10.8  |
| TPSMC6.8A  | DEP                 | 6.45  | 7.14 | 10.0                    | 5.80                           | 1000  | 10000   | 143.0  | 10.5  |
| TPSMC7.5   | DFP                 | 6.75  | 8.25 | 10.0                    | 6.05                           | 500   | 5000  | 128.0  | 11.7  |
| TPSMC7.5A  | DGP                 | 7.13  | 7.88 | 10.0                    | 6.40                           | 500   | 5000  | 133.0  | 11.3  |
| TPSMC8.2   | DHP                 | 7.38  | 9.02 | 10.0                    | 6.63                           | 200   | 2000  | 120.0  | 12.5  |
| TPSMC8.2A  | DKP                 | 7.79  | 8.61 | 10.0                    | 7.02                           | 200   | 2000  | 124.0  | 12.1  |
| TPSMC9.1   | DLP                 | 8.19  | 10.0 | 1.0                     | 7.37                           | 50  | 500   | 109.0  | 13.8  |
| TPSMC9.1A  | DMP                 | 8.65  | 9.55 | 1.0                     | 7.78                           | 50  | 500   | 112.0  | 13.4  |
| TPSMC10  | DNP                 | 9.00  | 11.0 | 1.0                     | 8.10                           | 20  | 200   | 100.0  | 15.0  |
| TPSMC10A   | DPP                 | 9.50  | 10.5 | 1.0                     | 8.55                           | 20  | 200   | 103.0  | 14.5  |
| TPSMC11  | DQP                 | 9.90  | 12.1 | 1.0                     | 8.92                           | 5.0   | 50  | 92.6   | 16.2  |
| TPSMC11A   | DRP                 | 10.5  | 11.6 | 1.0                     | 9.40                           | 5.0   | 50  | 96.2   | 15.6  |
| TPSMC12  | DSP                 | 10.8  | 13.2 | 1.0                     | 9.72                           | 2.0   | 10  | 86.7   | 17.3  |
| TPSMC12A   | DTP                 | 11.4  | 12.6 | 1.0                     | 10.2                           | 2.0   | 10  | 89.8   | 16.7  |
| TPSMC13  | DUP                 | 11.7  | 14.3 | 1.0                     | 10.5                           | 2.0   | 10  | 78.9   | 19.0  |
| TPSMC13A   | DVP                 | 12.4  | 13.7 | 1.0                     | 11.1                           | 2.0   | 10  | 82.4   | 18.2  |
| TPSMC15  | DWP                 | 13.5  | 16.5 | 1.0                     | 12.1                           | 1.0   | 10  | 68.2   | 22.0  |
| TPSMC15A   | DXP                 | 14.3  | 15.8 | 1.0                     | 12.8                           | 1.0   | 10  | 70.8   | 21.2  |
| TPSMC16  | DYP                 | 14.4  | 17.6 | 1.0                     | 12.9                           | 1.0   | 10  | 63.8   | 23.5  |
| TPSMC16A   | DZP                 | 15.2  | 16.8 | 1.0                     | 13.6                           | 1.0   | 10  | 66.7   | 22.5  |
| TPSMC18  | EDP                 | 16.2  | 19.8 | 1.0                     | 14.5                           | 1.0   | 10  | 56.6   | 26.5  |
| TPSMC18A   | EEP                 | 17.1  | 18.9 | 1.0                     | 15.3                           | 1.0   | 10  | 59.5   | 25.2  |
| TPSMC20  | EFP                 | 18.0  | 22.0 | 1.0                     | 16.2                           | 1.0   | 10  | 51.5   | 29.1  |
| TPSMC20A   | EGP                 | 19.0  | 21.0 | 1.0                     | 17.1                           | 1.0   | 10  | 54.2   | 27.7  |
| TPSMC22  | EHP                 | 19.8  | 24.2 | 1.0                     | 17.8                           | 1.0   | 10  | 47.0   | 31.9  |
| TPSMC22A   | EKP                 | 20.9  | 23.1 | 1.0                     | 18.8                           | 1.0   | 10  | 49.0   | 30.6  |
| TPSMC24  | ELP                 | 21.6  | 26.4 | 1.0                     | 19.4                           | 1.0   | 10  | 43.2   | 34.7  |
| TPSMC24A   | EMP                 | 22.8  | 25.2 | 1.0                     | 20.5                           | 1.0   | 10  | 45.2   | 33.2  |
| TPSMC27  | ENP                 | 24.3  | 29.7 | 1.0                     | 21.8                           | 1.0   | 10  | 38.4   | 39.1  |
| TPSMC27A   | EPP                 | 25.7  | 28.4 | 1.0                     | 23.1                           | 1.0   | 10  | 40.0   | 37.5  |
| TPSMC30  | EQP                 | 27.0  | 33.0 | 1.0                     | 24.3                           | 1.0   | 10  | 34.5   | 43.5  |
| TPSMC30A   | ERP                 | 28.5  | 31.5 | 1.0                     | 25.6                           | 1.0   | 10  | 36.2   | 41.4  |
| TPSMC33  | ESP                 | 29.7  | 36.3 | 1.0                     | 26.8                           | 1.0   | 10  | 31.4   | 47.7  |
| TPSMC33A   | ETP                 | 31.4  | 34.7 | 1.0                     | 28.2                           | 1.0   | 10  | 32.8   | 45.7  |
| TPSMC36  | EUP                 | 32.4  | 39.6 | 1.0                     | 29.1                           | 1.0   | 15  | 28.8   | 52.0  |
| TPSMC36A   | EVP                 | 34.2  | 37.8 | 1.0                     | 30.8                           | 1.0   | 15  | 30.1   | 49.9  |
| TPSMC39  | EWP                 | 35.1  | 42.9 | 1.0                     | 31.6                           | 1.0   | 15  | 26.6   | 56.4  |
| TPSMC39A   | EXP                 | 37.1  | 41.0 | 1.0                     | 33.3                           | 1.0   | 15  | 27.8   | 53.9  |
| TPSMC43  | EYP                 | 38.7  | 47.3 | 1.0                     | 34.8                           | 1.0   | 20  | 24.2   | 61.9  |
| TPSMC43A   | EZP                 | 40.9  | 45.2 | 1.0                     | 36.8                           | 1.0   | 20  | 25.3   | 59.3  |
| TPSMC47  | FDP                 | 42.3  | 51.7 | 1.0                     | 38.1                           | 1.0   | 20  | 22.1   | 67.8  |
| TPSMC47A   | FEP                 | 44.7  | 49.4 | 1.0                     | 40.2                           | 1.0   | 20  | 23.1   | 64.8  |

**Notes:**

- (1)  $V_{BR}$  measured after  $I_T$  applied for 300  $\mu\text{s}$ ,  $I_T$  = square wave pulse or equivalent
- (2) Surge current waveform per Fig. 3 and derated per Fig. 2
- (3) All terms and symbols are consistent with ANSI/IEEE C62.35

| ORDERING INFORMATION (Example)  |                 |                        |               |                                    |
|---------------------------------|-----------------|------------------------|---------------|------------------------------------|
| PREFERRED P/N                   | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                      |
| TPSMC6.8AHE3/57T <sup>(1)</sup> | 0.211           | 57T                    | 850           | 7" diameter plastic tape and reel  |
| TPSMC6.8AHE3/9AT <sup>(1)</sup> | 0.211           | 9AT                    | 3500          | 13" diameter plastic tape and reel |

**Note:**

(1) Automotive grade AEC Q101 qualified

## RATINGS AND CHARACTERISTICS CURVES

(T<sub>A</sub> = 25 °C unless otherwise noted)

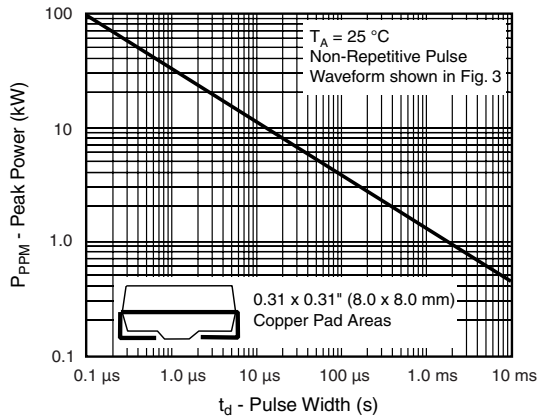


Figure 1. Peak Pulse Power Rating Curve

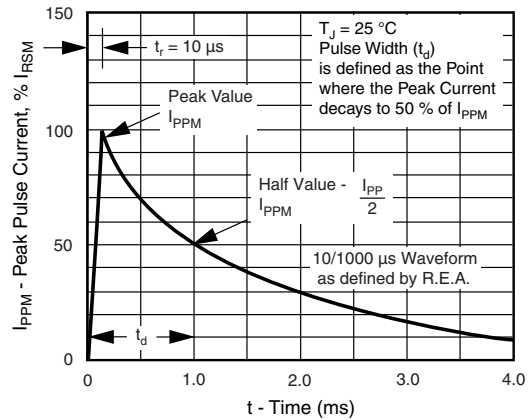


Figure 3. Pulse Waveform

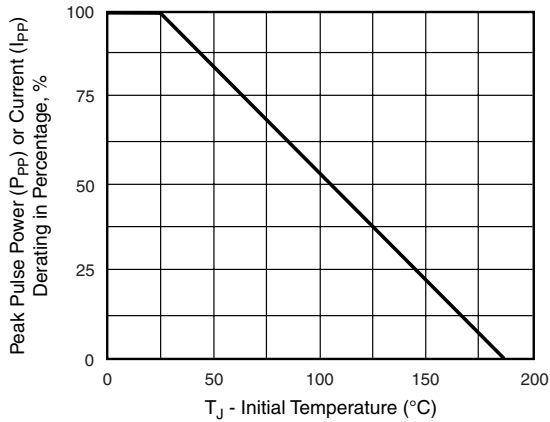


Figure 2. Pulse Power or Current vs. Initial Junction Temperature

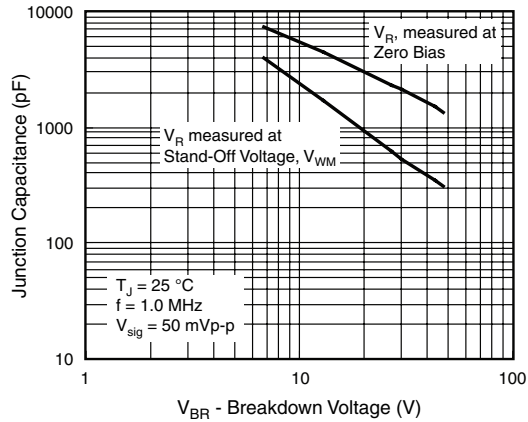


Figure 4. Typical Junction Capacitance

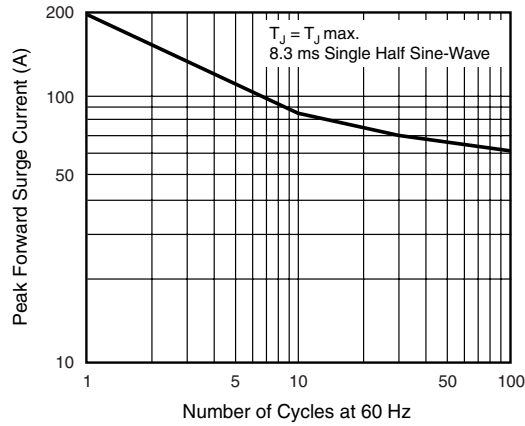
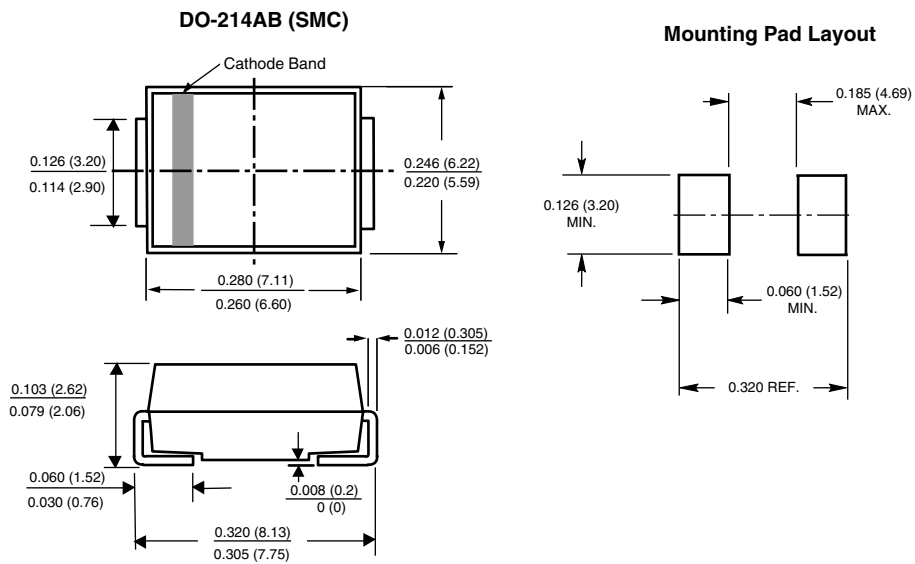


Figure 5. Maximum Non-Repetitive/Peak Forward Surge Current

## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)





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