

## 1500W, 12V - 51V Surface Mount Transient Voltage Suppressor

### FEATURES

- AEC-Q101 qualified
- Moisture sensitivity level: level 1, per J-STD-020
- Meets IEC 61000-4-2 (Level: 4) / ISO 10605 (Level: L4)
- Meets ISO7637-2 (Pulse 1/2a/2b/3a/3b)
- RoHS Compliant
- Halogen-free according to IEC 61249-2-21

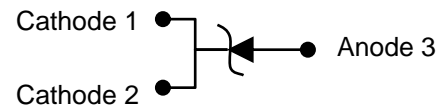
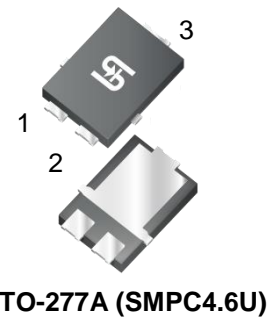
### APPLICATIONS

- Switching mode power supply (SMPS)
- Motor for BLDC
- Lighting application
- Battery Management System
- Automotive

### MECHANICAL DATA

- Case: TO-277A (SMPC4.6U)
- Molding compound meets UL 94V-0 flammability rating
- Terminal: Matte tin plated leads, solderable per J-STD-002
- Meet JESD 201 class 2 whisker test
- Polarity: Uni-directional
- Weight: 0.095g (approximately)

| KEY PARAMETERS |                    |      |
|----------------|--------------------|------|
| PARAMETER      | VALUE              | UNIT |
| $V_{WM}$       | 10.2 - 43.6        | V    |
| $V_{BR}$       | 12 - 51            | V    |
| $P_{PPM}$      | 1500               | W    |
| $T_{JMAX}$     | 175                | °C   |
| Polarity       | Uni-directional    |      |
| Package        | TO-277A (SMPC4.6U) |      |



| ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)                      |           |             |      |
|--|-----------|-------------|------|
| PARAMETER  | SYMBOL    | VALUE       | UNIT |
| Non-repetitive peak impulse power dissipation with 10/1000 $\mu\text{s}$ waveform <sup>(1)</sup> | $P_{PPM}$ | 1500        | W    |
| Peak forward surge current 8.3ms single half sine-wave   | $I_{FSM}$ | 200         | A    |
| Junction temperature   | $T_J$     | -55 to +175 | °C   |
| Storage temperature  | $T_{STG}$ | -55 to +175 | °C   |

#### Notes:

1. Non-repetitive current pulse per Fig.3 and derated above  $T_A = 25^\circ\text{C}$  per Fig.1

| THERMAL PERFORMANCE                    |                 |      |      |
|--|-----------------|------|------|
| PARAMETER                              | SYMBOL          | TYP  | UNIT |
| Junction-to-lead thermal resistance    | $R_{\theta JL}$ | 6.4  | °C/W |
| Junction-to-ambient thermal resistance | $R_{\theta JA}$ | 51.1 | °C/W |
| Junction-to-case thermal resistance    | $R_{\theta JC}$ | 8.9  | °C/W |

**Thermal Performance Note:** Units mounted on PCB (16mm x 16mm Cu pad test board)

## ELECTRICAL CHARACTERISTICS ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)

| PART NUMBER  | 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 $V_{WM}$ $I_R$ ( $\mu\text{A}$ ) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $T_J = 150\text{ }^\circ\text{C}$ $I_b$ ( $\mu\text{A}$ ) | MAXIMUM PEAK PULSE SURGE CURRENT $I_{PPM}^{(2)}$ (A) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V) | TYPICAL TEMP. COEFFICIENT OF $V_{BR}^{(3)}$ $\alpha_T$ (%/°C) |
|--------------|---------------------|---|------|------|-------------------------|--------------------------------|---|---|--|---|---|
|              |                     | MIN   | NOM  | MAX  |                         |                                |   |   |  |   |   |
| 1K5SMPC12APH | SMPC12AP            | 11.4  | 12.0 | 12.6 | 1.0                     | 10.2                           | 2.0   | 10  | 89.8   | 16.7  | 0.070   |
| 1K5SMPC13APH | SMPC13AP            | 12.4  | 13.0 | 13.7 | 1.0                     | 11.1                           | 2.0   | 10  | 82.4   | 18.2  | 0.072   |
| 1K5SMPC15APH | SMPC15AP            | 14.3  | 15.0 | 15.8 | 1.0                     | 12.8                           | 1.0   | 10  | 70.8   | 21.2  | 0.076   |
| 1K5SMPC16APH | SMPC16AP            | 15.2  | 16.0 | 16.8 | 1.0                     | 13.6                           | 1.0   | 10  | 66.7   | 22.5  | 0.078   |
| 1K5SMPC18APH | SMPC18AP            | 17.1  | 18.0 | 18.9 | 1.0                     | 15.3                           | 1.0   | 10  | 59.5   | 25.2  | 0.080   |
| 1K5SMPC20APH | SMPC20AP            | 19.0  | 20.0 | 21.0 | 1.0                     | 17.1                           | 1.0   | 10  | 54.2   | 27.7  | 0.082   |
| 1K5SMPC22APH | SMPC22AP            | 20.9  | 22.0 | 23.1 | 1.0                     | 18.8                           | 1.0   | 10  | 49.0   | 30.6  | 0.084   |
| 1K5SMPC24APH | SMPC24AP            | 22.8  | 24.0 | 25.2 | 1.0                     | 20.5                           | 1.0   | 10  | 45.2   | 33.2  | 0.085   |
| 1K5SMPC27APH | SMPC27AP            | 25.7  | 27.0 | 28.4 | 1.0                     | 23.1                           | 1.0   | 10  | 40.0   | 37.5  | 0.087   |
| 1K5SMPC30APH | SMPC30AP            | 28.5  | 30.0 | 31.5 | 1.0                     | 25.6                           | 1.0   | 10  | 36.2   | 41.4  | 0.088   |
| 1K5SMPC33APH | SMPC33AP            | 31.4  | 33.0 | 34.7 | 1.0                     | 28.2                           | 1.0   | 10  | 32.8   | 45.7  | 0.089   |
| 1K5SMPC36APH | SMPC36AP            | 34.2  | 36.0 | 37.8 | 1.0                     | 30.8                           | 1.0   | 15  | 30.1   | 49.9  | 0.090   |
| 1K5SMPC39APH | SMPC39AP            | 37.1  | 39.0 | 41.0 | 1.0                     | 33.3                           | 1.0   | 15  | 27.8   | 53.9  | 0.091   |
| 1K5SMPC43APH | SMPC43AP            | 40.9  | 43.0 | 45.2 | 1.0                     | 36.8                           | 1.0   | 20  | 25.3   | 59.3  | 0.092   |
| 1K5SMPC47APH | SMPC47AP            | 44.7  | 47.0 | 49.4 | 1.0                     | 40.2                           | 1.0   | 20  | 23.1   | 64.8  | 0.092   |
| 1K5SMPC51APH | SMPC51AP            | 48.5  | 51.0 | 53.6 | 1.0                     | 43.6                           | 1.0   | 20  | 21.4   | 70.1  | 0.093   |

**Notes:**

1. Pulse test with  $PW = 30\text{ms}$
2. Surge current waveform per Fig.3 and derated per Fig.1
3. To calculate  $V_{BR}$  vs. junction temperature, use the following formula:  $V_{BR}$  at  $T_J = V_{BR}$  at  $25\text{ }^\circ\text{C} \times (1 + \alpha_T \times (T_J - 25))$

## ORDERING INFORMATION

| ORDERING CODE <sup>(1)</sup> | PACKAGE            | PACKING            |
|------------------------------|--------------------|--------------------|
| 1K5SMPCxAPH                  | TO-277A (SMPC4.6U) | 6,000/ Tape & Reel |

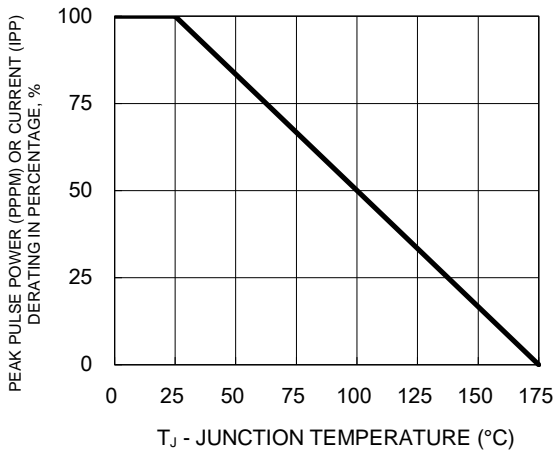
**Notes:**

1. "x" defines voltage from 12V (1K5SMPC12APH) to 51V (1K5SMPC51APH)

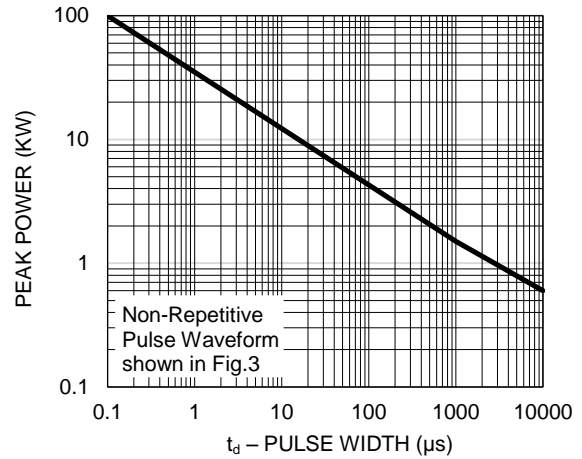
**CHARACTERISTICS CURVES**

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

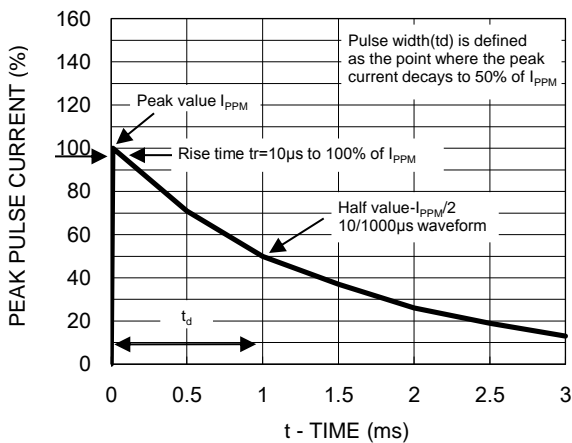
**Fig.1 Pulse Power or Current vs. Junction Temperature**



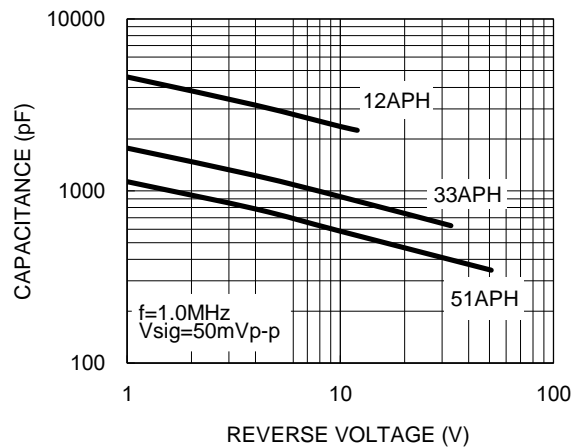
**Fig.2 Peak Pulse Power Rating Curve**



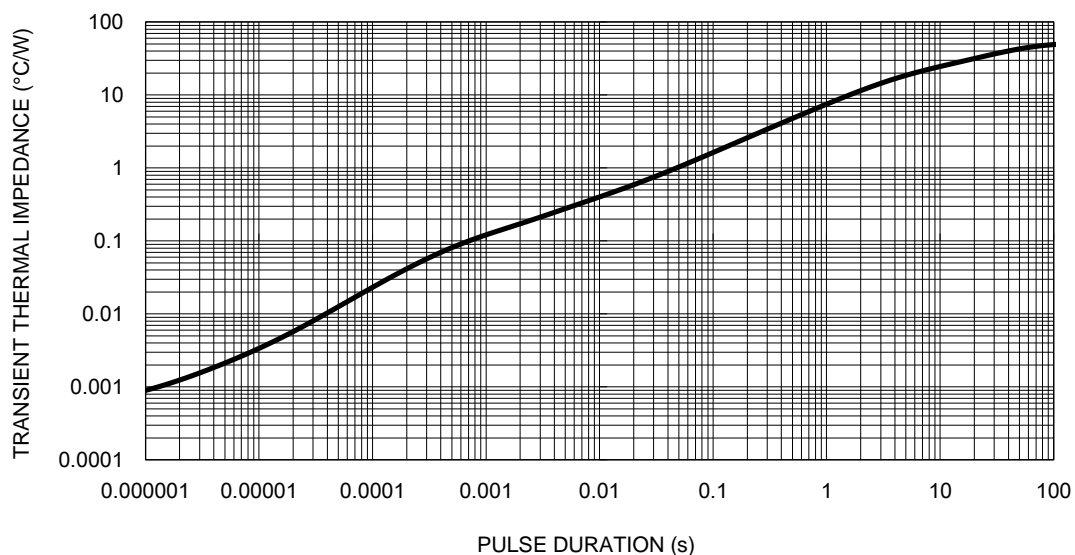
**Fig.3 Clamping Power Pulse Waveform**

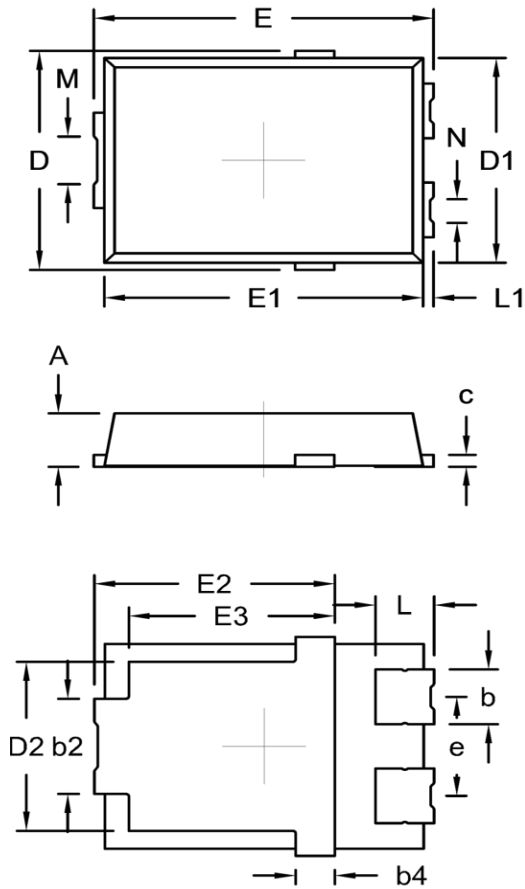


**Fig.4 Typical Junction Capacitance**



**Fig.5 Typical Transient Thermal Impedance**

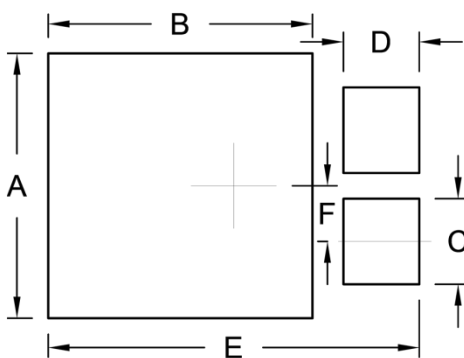


**PACKAGE OUTLINE DIMENSIONS**
**TO-277A (SMPC4.6U)**


| DIM. | Unit (mm)   |      | Unit (inch)  |       |
|------|-------------|------|--------------|-------|
|      | Min.        | Max. | Min.         | Max.  |
| A    | 1.00        | 1.20 | 0.039        | 0.047 |
| b    | 1.05        | 1.35 | 0.041        | 0.053 |
| b2   | 1.90        | 2.20 | 0.075        | 0.087 |
| b4   | 0.75 (NOM.) |      | 0.030 (NOM.) |       |
| c    | 0.15        | 0.40 | 0.006        | 0.016 |
| D    | 4.45        | 4.75 | 0.175        | 0.187 |
| D1   | 4.25        | 4.35 | 0.167        | 0.171 |
| D2   | 3.40        | 3.70 | 0.134        | 0.146 |
| E    | 6.35        | 6.65 | 0.250        | 0.262 |
| E1   | 6.05        | 6.15 | 0.238        | 0.242 |
| E2   | 4.40        | 4.80 | 0.173        | 0.189 |
| E3   | 3.94 (NOM.) |      | 0.155 (NOM.) |       |
| e    | 2.08 (NOM.) |      | 0.082 (NOM.) |       |
| L    | 0.94        | 1.24 | 0.037        | 0.049 |
| L1   | 0.05        | 0.35 | 0.002        | 0.014 |
| M    | 0.65        | 1.15 | 0.026        | 0.045 |
| N    | 0.25        | 0.75 | 0.010        | 0.030 |

Package body size D1 and E1 do not include mold flash

Mold flash shall not exceed 0.1mm per side

**SUGGESTED PAD LAYOUT**


| Symbol | Unit (mm) | Unit (inch) |
|--------|-----------|-------------|
| A      | 4.95      | 0.195       |
| B      | 4.95      | 0.195       |
| C      | 1.60      | 0.063       |
| D      | 1.42      | 0.056       |
| E      | 6.95      | 0.274       |
| F      | 1.04      | 0.041       |

**MARKING DIAGRAM**


P/N = Marking Code

YW = Date Code

F = Factory Code