

## Transient Voltage Suppressors (TVS) Data Sheet

### Features

- Glass passivated junction
- Low incremental surge resistance
- Excellent clamping capability
- 15000W peak pulse power capability at 10/1000 $\mu$ s waveform, repetition rate (duty cycle): 0.05%
- Fast response time
- Typical  $I_R$  less than 2 $\mu$ A above 30V.
- High Temperature soldering guaranteed: 265 $^{\circ}$ C/10 seconds/.375", (9.5mm) lead length, 5lbs (2.3kg) tension
- Plastic package has underwriters laboratory flammability 94V-0
- Meets MSL level 1, per J-STD-020.
- Safety certification: UL: E244458



### Mechanical Data

- Case: Moulded plastic over glass passivated junction
- Terminal: Plated Axial leads, solderable per MIL-STD-750, Method 2026
- Polarity: Color band denotes cathode except bi-directional models
- Mounting Position: Any
- Weight: 2.30g

### Applications

- I/O interface
- AC/DC power supply
- Low frequency signal transmission line (RS232, RS485, etc.)

### Maximum Ratings and Characteristics

Ratings at 25 $^{\circ}$ C ambient temperature unless otherwise specified.

| Rating  | Symbol          | Value         | Units          |
|---|-----------------|---------------|----------------|
| Peak pulse power dissipation at 10/1000 $\mu$ s waveform (Note1, Fig.1)   | $P_{PPM}$       | Minimum 15000 | Watts          |
| Peak pulse current of at 10/1000 $\mu$ s waveform (Note 1, Fig.3)   | $I_{PPM}$       | See Table     | Amps           |
| Steady state power dissipation at $T_L=75^{\circ}$ C (Fig.5)  | $P_{M(AV)}$     | 8.0           | Watts          |
| Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load, (JEDEC Method) (Note2, Fig.6) | $I_{FSM}$       | 400           | Amps           |
| Operating junction and Storage Temperature Range.   | $T_J, T_{STG}$  | -55 to +150   | $^{\circ}$ C   |
| Typical thermal resistance junction to lead   | $R_{\theta JL}$ | 8             | $^{\circ}$ C/W |
| Typical thermal resistance junction to ambient  | $R_{\theta JA}$ | 40            | $^{\circ}$ C/W |

Notes: 1. Non-repetitive current pulse, per Fig.3 and derated above  $T_A=25^{\circ}$ C per Fig.2.

2. 8.3ms single half sine-wave, or equivalent square wave, duty cycle=4 pulses per minutes maximum.

**Dimensions (P600)**

|   | Symbol | Millimeters |       | Inches |       |
|---|--------|-------------|-------|--------|-------|
|   |        | Min.        | Max.  | Min.   | Max.  |
|   | L      | 25.40       | -     | 1.000  | -     |
|   | T      | 8.60        | 9.10  | 0.340  | 0.360 |
|   | d      | 8.60        | 9.10  | 0.340  | 0.360 |
| s | 1.19   | 1.32        | 0.047 | 0.052  |       |

**Electrical Characteristics (T<sub>A</sub>=25°C)**

| Part Number    |               | Reverse Stand-Off Voltage | Breakdown Voltage @I <sub>T</sub> | Test Current        | Maximum Clamping Voltage @I <sub>PP</sub> | Peak Pulse Current  | Reverse Leakage @V <sub>RWM</sub> |
|----------------|---------------|---------------------------|-----------------------------------|---------------------|---|---------------------|-----------------------------------|
| Unidirectional | Bidirectional | V <sub>RWM</sub> (V)      | V <sub>BR</sub> (V)               | I <sub>T</sub> (mA) | V <sub>C</sub> (V)                        | I <sub>PP</sub> (A) | I <sub>R</sub> (μA)               |
| 15KPA17A       | 15KPA17CA     | 17.0                      | 18.99~21.22                       | 50                  | 29.3                                      | 515.4               | 5000                              |
| 15KPA18A       | 15KPA18CA     | 18.0                      | 20.11~22.65                       | 50                  | 30.9                                      | 488.7               | 5000                              |
| 15KPA20A       | 15KPA20CA     | 20.0                      | 22.34~24.96                       | 20                  | 34.3                                      | 440.2               | 1500                              |
| 15KPA22A       | 15KPA22CA     | 22.0                      | 24.57~27.46                       | 10                  | 37.1                                      | 407.0               | 500                               |
| 15KPA24A       | 15KPA24CA     | 24.0                      | 26.81~29.95                       | 5                   | 40.7                                      | 371.0               | 150                               |
| 15KPA26A       | 15KPA26CA     | 26.0                      | 29.04~32.45                       | 5                   | 44.0                                      | 343.2               | 50                                |
| 15KPA28A       | 15KPA28CA     | 28.0                      | 31.28~34.95                       | 5                   | 47.5                                      | 317.9               | 25                                |
| 15KPA30A       | 15KPA30CA     | 30.0                      | 33.51~37.44                       | 5                   | 50.7                                      | 297.8               | 15                                |
| 15KPA33A       | 15KPA33CA     | 33.0                      | 36.90~41.19                       | 5                   | 54.7                                      | 276.1               | 2                                 |
| 15KPA36A       | 15KPA36CA     | 36.0                      | 40.20~44.93                       | 5                   | 59.8                                      | 252.5               | 2                                 |
| 15KPA40A       | 15KPA40CA     | 40.0                      | 44.70~49.92                       | 5                   | 65.8                                      | 229.5               | 2                                 |
| 15KPA43A       | 15KPA43CA     | 43.0                      | 48.00~53.67                       | 5                   | 69.8                                      | 216.3               | 2                                 |
| 15KPA45A       | 15KPA45CA     | 45.0                      | 50.30~56.16                       | 5                   | 72.8                                      | 207.4               | 2                                 |
| 15KPA48A       | 15KPA48CA     | 48.0                      | 53.60~59.91                       | 5                   | 77.7                                      | 194.3               | 2                                 |
| 15KPA51A       | 15KPA51CA     | 51.0                      | 57.00~63.65                       | 5                   | 82.9                                      | 182.1               | 2                                 |
| 15KPA54A       | 15KPA54CA     | 54.0                      | 60.30~67.39                       | 5                   | 87.7                                      | 172.2               | 2                                 |
| 15KPA58A       | 15KPA58CA     | 58.0                      | 64.80~72.39                       | 5                   | 93.8                                      | 161.0               | 2                                 |

**Electrical Characteristics ( $T_A=25^\circ\text{C}$ )**

| Part Number    |               | Reverse Stand-Off Voltage | Breakdown Voltage @ $I_T$ | Test Current | Maximum Clamping Voltage @ $I_{PP}$ | Peak Pulse Current | Reverse Leakage @ $V_{RWM}$ |
|----------------|---------------|---------------------------|---------------------------|--------------|-------------------------------------|--------------------|-----------------------------|
| Unidirectional | Bidirectional | $V_{RWM}(V)$              | $V_{BR}(V)$               | $I_T(mA)$    | $V_C(V)$                            | $I_{PP}(A)$        | $I_R(\mu A)$                |
| 15KPA60A       | 15KPA60CA     | 60.0                      | 67.00~74.88               | 5            | 97.4                                | 155.0              | 2                           |
| 15KPA64A       | 15KPA64CA     | 64.0                      | 71.50~79.87               | 5            | 104.2                               | 144.9              | 2                           |
| 15KPA70A       | 15KPA70CA     | 70.0                      | 78.20~87.36               | 5            | 113.6                               | 132.9              | 2                           |
| 15KPA75A       | 15KPA75CA     | 75.0                      | 83.80~93.60               | 5            | 122.0                               | 123.8              | 2                           |
| 15KPA78A       | 15KPA78CA     | 78.0                      | 87.10~97.35               | 5            | 126.1                               | 119.7              | 2                           |
| 15KPA85A       | 15KPA85CA     | 85.0                      | 94.90~106.08              | 5            | 137.6                               | 109.7              | 2                           |
| 15KPA90A       | 15KPA90CA     | 90.0                      | 100.50~112.32             | 5            | 145.6                               | 103.7              | 2                           |
| 15KPA100A      | 15KPA100CA    | 100.0                     | 111.70~124.80             | 5            | 161.3                               | 93.6               | 2                           |
| 15KPA110A      | 15KPA110CA    | 110.0                     | 122.90~137.28             | 5            | 178.6                               | 84.5               | 2                           |
| 15KPA120A      | 15KPA120CA    | 120.0                     | 134.00~149.76             | 5            | 192.3                               | 78.5               | 2                           |
| 15KPA130A      | 15KPA130CA    | 130.0                     | 145.20~162.25             | 5            | 208.3                               | 72.5               | 2                           |
| 15KPA150A      | 15KPA150CA    | 150.0                     | 167.60~187.21             | 5            | 241.9                               | 62.4               | 2                           |
| 15KPA160A      | 15KPA160CA    | 160.0                     | 178.70~199.69             | 5            | 258.6                               | 58.4               | 2                           |
| 15KPA170A      | 15KPA170CA    | 170.0                     | 189.90~212.17             | 5            | 272.7                               | 55.4               | 2                           |
| 15KPA180A      | 15KPA180CA    | 180.0                     | 201.10~224.65             | 5            | 288.5                               | 52.3               | 2                           |
| 15KPA200A      | 15KPA200CA    | 200.0                     | 223.40~249.61             | 5            | 319.1                               | 47.3               | 2                           |
| 15KPA220A      | 15KPA220CA    | 220.0                     | 245.70~274.57             | 5            | 352.5                               | 42.8               | 2                           |
| 15KPA240A      | 15KPA240CA    | 240.0                     | 268.10~299.53             | 5            | 384.6                               | 39.3               | 2                           |
| 15KPA260A      | 15KPA260CA    | 260.0                     | 290.40~324.49             | 5            | 416.7                               | 36.2               | 2                           |
| 15KPA280A      | 15KPA280CA    | 280.0                     | 312.80~349.45             | 5            | 454.5                               | 33.2               | 2                           |

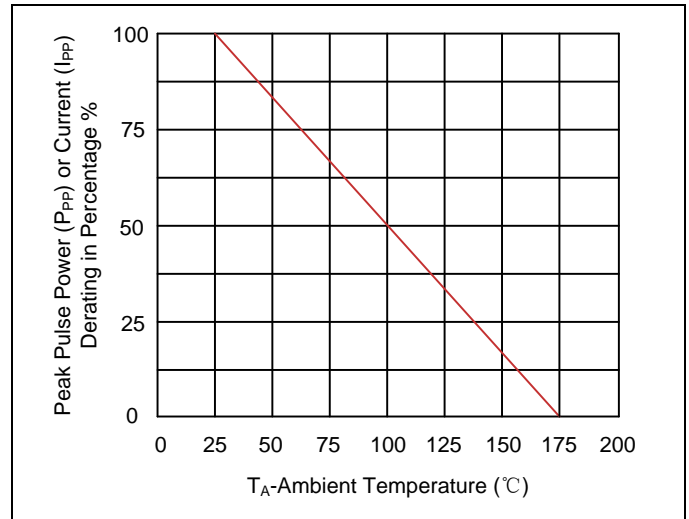
Notes: For bidirectional type having  $V_{RWM}$  of 30V and less, the  $I_R$  limit is double.

**Ratings and Characteristic Curves ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

**Figure 1. Peak Pulse Power Rating Curve**



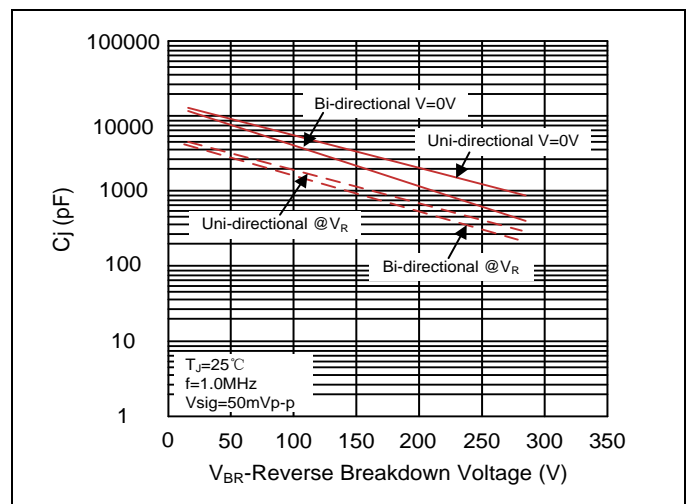
**Figure 2. Pulse Derating Curve**



**Figure 3. Pulse Waveform**



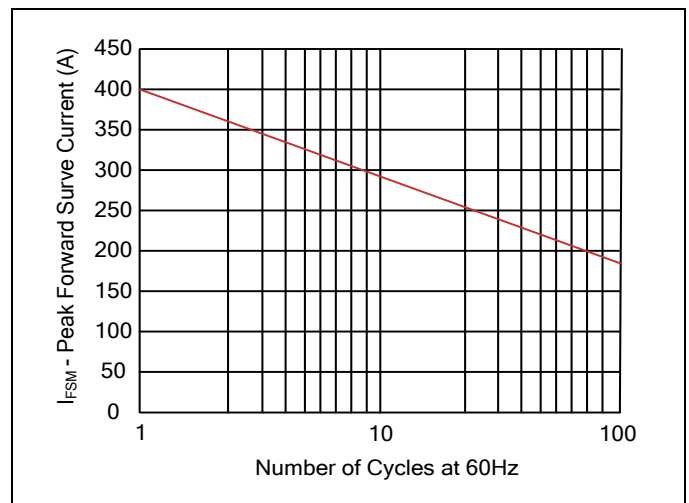
**Figure 4. Typical Junction Capacitance**



**Figure 5. Steady State Power Dissipation Derating Curve**

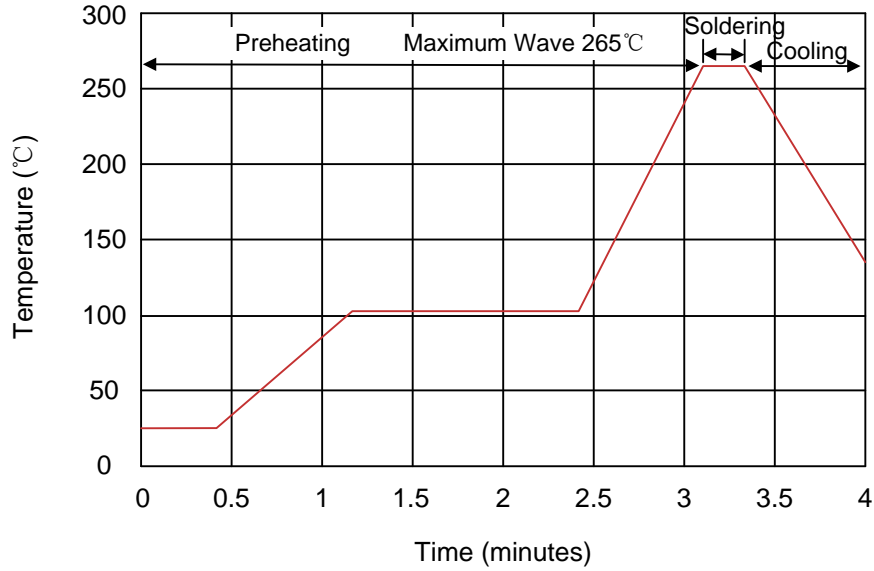


**Figure 6. Maximum Non-Repetitive Forward Surge Current Uni-Directional Only**



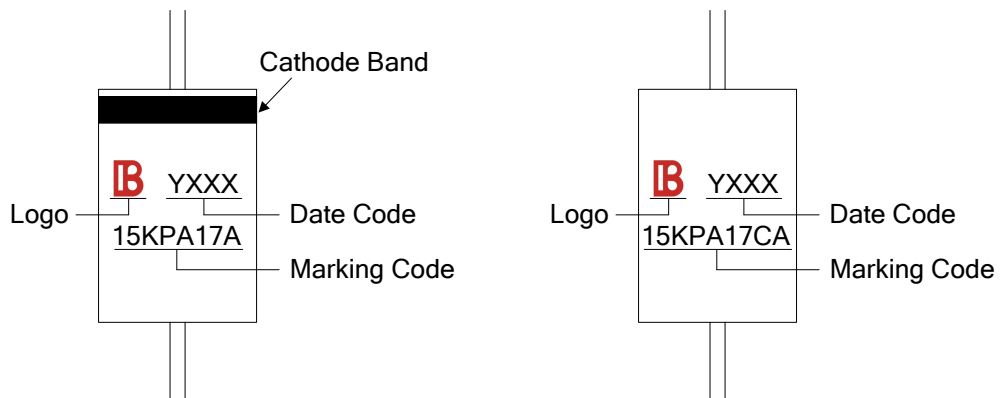
## Recommended Soldering Conditions

### Wave Soldering



| Item             | Conditions |
|------------------|------------|
| Peak Temperature | 265°C      |
| Dipping Time     | 10 seconds |
| Soldering        | 1 time     |

## Marking Code



**Part Number Code**



**Ordering Code for Different Package**

Box package: Add suffix “/B” at the end of the part number, such as 15KPA60A/B

Reel package: Add suffix “/TR13” at the end of the part number, such as 15KPA120CA/TR13

**Packaging**

|      | Symbol           | Dimension (mm) |
|------|------------------|----------------|
| Tape | A                | 10.0±0.5       |
|      | B                | 53.0±1.0       |
|      | Z                | 1.2Max.        |
|      | T                | 6.0±0.4        |
|      | E                | 0.8Max.        |
|      | L1-L2            | 1.0Max.        |
|      | L                | 250.0±5.0      |
| Box  | W                | 75.0±5.0       |
|      | H                | 114.0±5.0      |
|      | Quantity: 300PCS |                |
| Reel | D                | 330.0±3.0      |
|      | D0               | 16.4±2.0       |
|      | D1               | 86.0±2.0       |
|      | W1               | 76.0±3.0       |
|      | Quantity: 800PCS |                |

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