# TVS 20KPA Series — 20000W

R-6

## Features

- Available in uni-directional and bi-directional
- 20000 W peak pulse power capability with a 10/1000 μs waveform, repetitive rate (duty cycle): 0.01 %
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- Solder dip 260 °C, 40 seconds

## Maximum Ratings and Thermal Characteristics ($T_A$=25°C unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Peak Pulse Power Dissipation by 10x1000μs test waveform (Fig.1) (Note 1) | $P_{PPM}$ | 20000 | W |
| Steady State Power Dissipation on inifinite heat sink at $T_L$=75°C (Fig. 5) | $P_D$ | 8.0 | W |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional only (Note 2) | $I_{FSM}$ | 400 | A |
| Operating Junction and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to 175 | °C |
| Typical Thermal Resistance Junction to Lead | $R_{uJL}$ | 8.0 | °C/W |
| Typical Thermal Resistance Junction to Ambient | $R_{uJA}$ | 40 | °C/W |

**Notes:**

1. Non-repetitive current pulse , per Fig. 3 and derated above $T_A$ = 25°C per Fig. 2.
2. Measured on 8.3ms single half sine wave or equivalent square wave, duty cycle=4 per minute maximum.

## MECHANICAL DATA

**Case:** R-6
Epoxy meets UL 94V-0 flammability rating

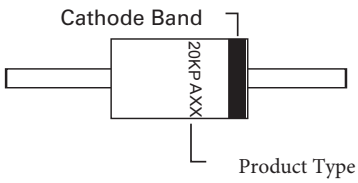
**Terminals:** Matte tin plated leads, solderable per J-STD-002B and JESD22-B102D

**Polarity:** For uni-directional types the color band denotes cathode end, no marking on bi-directional types

## 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.

## Part Marking System



## ELECTRICAL CHARACTERISTICS (TA = 25 °C unless otherwise noted)

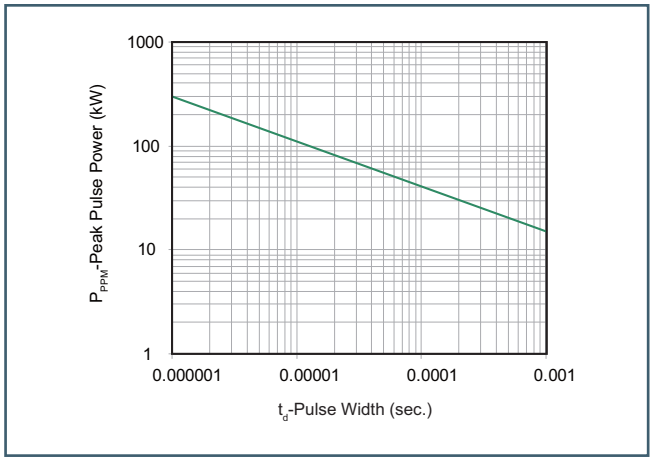
| 20KPA PART NUMBER | | REVERSE STAND- OFF VOLTAGE $V_{RWM}$(V) | BREAKDOWN VOLTAGE $V_{BR}$(V) MIN. @$I_T$ | BREAKDOWN VOLTAGE $V_{BR}$(V) MAX. @$I_T$ | TEST CURRENT $I_T$ (mA) | PEAK PULSE CURRENT Ipp (A) | REVERSE LEAKAGE @ $V_{RWM}$ $I_R$(μA) | MAXIMUN CLAMPING VOLTAGE @$I_{PP}$ $V_C$ (V) |
|---|---|---|---|---|---|---|---|---|
| UNI-POLAR | BI-POLAR | | | | | | | |
| 20KPA20A | 20KPA20CA | 20 | 22.20 | 24.50 | 50 | 548.9 | 5000 | 36.8 |
| 20KPA24A | 20KPA24CA | 24 | 26.67 | 29.49 | 50 | 490.3 | 5000 | 41.2 |
| 20KPA26A | 20KPA26CA | 26 | 28.90 | 31.90 | 50 | 451.9 | 2000 | 44.7 |
| 20KPA28A | 20KPA28CA | 28 | 31.10 | 34.40 | 50 | 420.8 | 1000 | 48.0 |
| 20KPA30A | 20KPA30CA | 30 | 33.30 | 36.90 | 5 | 392.2 | 250 | 51.5 |
| 20KPA32A | 20KPA32CA | 32 | 35.60 | 39.10 | 5 | 372.0 | 150 | 54.3 |
| 20KPA34A | 20KPA34CA | 34 | 37.84 | 41.53 | 5 | 351.3 | 50 | 57.5 |
| 20KPA36A | 20KPA36CA | 36 | 39.3 | 44.1 | 5 | 328.5 | 20 | 61.5 |
| 20KPA40A | 20KPA40CA | 40 | 44.4 | 49.1 | 5 | 297.9 | 15 | 67.8 |
| 20KPA44A | 20KPA44CA | 44 | 48.8 | 54.0 | 5 | 277.9 | 2 | 72.7 |
| 20KPA48A | 20KPA48CA | 48 | 53.2 | 58.8 | 5 | 254.4 | 2 | 79.4 |
| 20KPA52A | 20KPA52CA | 52 | 57.6 | 63.6 | 5 | 235.4 | 2 | 85.8 |
| 20KPA56A | 20KPA56CA | 56 | 62.4 | 68.8 | 5 | 218.1 | 2 | 92.6 |
| 20KPA60A | 20KPA60CA | 60 | 66.8 | 74.0 | 5 | 207.0 | 2 | 97.6 |
| 20KPA64A | 20KPA64CA | 64 | 71.2 | 78.8 | 5 | 194.2 | 2 | 104.0 |
| 20KPA68A | 20KPA68CA | 68 | 75.6 | 83.6 | 5 | 183.6 | 2 | 110.0 |
| 20KPA72A | 20KPA72CA | 72 | 80.0 | 88.4 | 5 | 174.1 | 2 | 116.0 |
| 20KPA80A | 20KPA80CA | 80 | 88.8 | 98.0 | 5 | 155.4 | 2 | 130.0 |
| 20KPA88A | 20KPA88CA | 88 | 97.6 | 107.6 | 5 | 142.3 | 2 | 142.0 |
| 20KPA96A | 20KPA96CA | 96 | 106.8 | 118.0 | 5 | 130.3 | 2 | 155.0 |
| 20KPA104A | 20KPA104CA | 104 | 115.6 | 127.6 | 5 | 120.2 | 2 | 168.0 |
| 20KPA112A | 20KPA112CA | 112 | 124.4 | 137.6 | 5 | 111.0 | 2 | 182.0 |
| 20KPA120A | 20KPA120CA | 120 | 133.2 | 147.2 | 5 | 104.1 | 2 | 194.0 |
| 20KPA132A | 20KPA132CA | 132 | 146.8 | 162.4 | 5 | 94.8 | 2 | 213.0 |
| 20KPA144A | 20KPA144CA | 144 | 160.0 | 176.8 | 5 | 87.1 | 2 | 232.0 |
| 20KPA160A | 20KPA160CA | 160 | 177.6 | 196.4 | 5 | 78.3 | 2 | 258.0 |
| 20KPA172A | 20KPA172CA | 172 | 191.2 | 211.2 | 5 | 72.9 | 2 | 277.0 |
| 20KPA180A | 20KPA180CA | 180 | 200.0 | 221.2 | 5 | 69.4 | 2 | 291.0 |
| 20KPA192A | 20KPA192CA | 192 | 213.2 | 235.6 | 5 | 65.4 | 2 | 309.0 |
| 20KPA204A | 20KPA204CA | 204 | 226.8 | 250.8 | 5 | 61.4 | 2 | 329.0 |
| 20KPA216A | 20KPA216CA | 216 | 240.0 | 265.2 | 5 | 58.0 | 2 | 348.0 |
| 20KPA232A | 20KPA232CA | 232 | 257.6 | 284.8 | 5 | 54.0 | 2 | 374.0 |
| 20KPA240A | 20KPA240CA | 240 | 266.8 | 294.8 | 5 | 52.2 | 2 | 387.0 |
| 20KPA256A | 20KPA256CA | 256 | 284.4 | 314.4 | 5 | 49.0 | 2 | 412.0 |
| 20KPA280A | 20KPA280CA | 280 | 311.2 | 344.0 | 5 | 44.8 | 2 | 451.0 |
| 20KPA300A | 20KPA300CA | 300 | 333.2 | 368.4 | 5 | 41.8 | 2 | 483.0 |

For bidirectional type having $V_R$ of 30 volts and less, the $I_R$ limit is double.

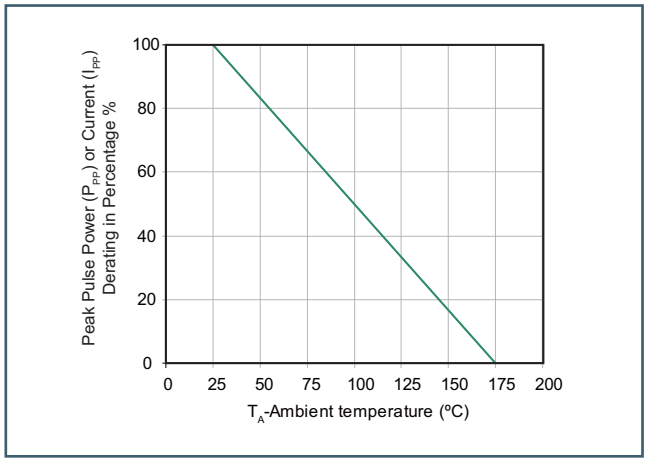
For parts without A, the $V_{BR}$ is + 0% and Vc is 5% higher than with A parts

## Ratings and Characteristic Curves ($T_A$=25°C unless otherwise noted)

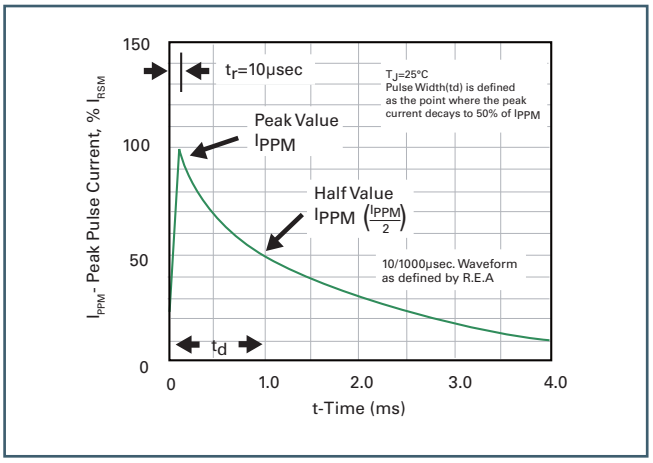
### Figure 1 - Peak Pulse Power Rating Curve



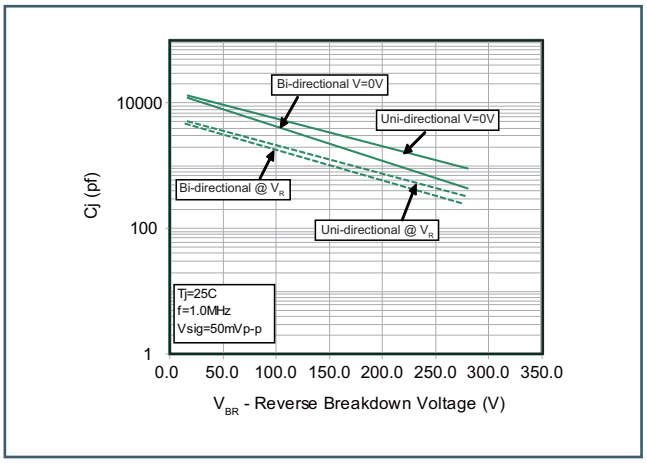

### Figure 2 - Pulse Derating Curve



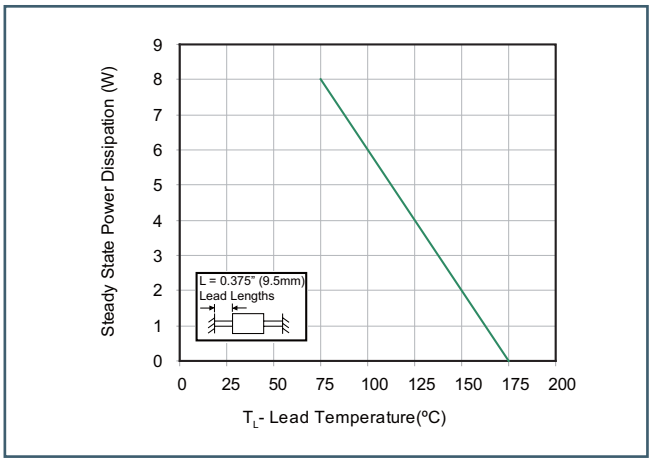

### Figure 3 - Pulse Waveform



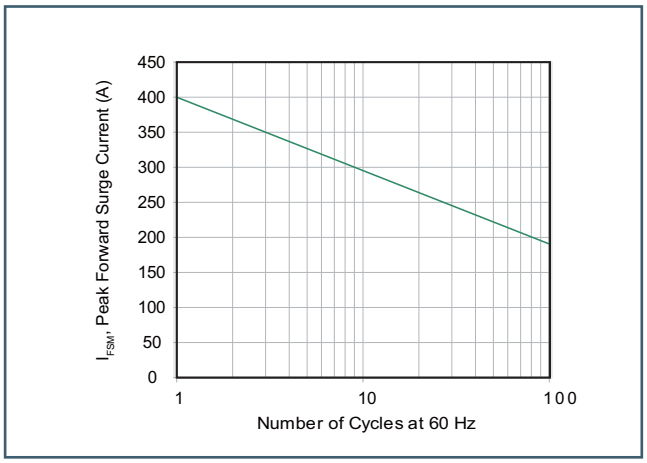

### Figure 4 - Typical Junction Capacitance




### Figure 5 - Steady State Power Dissipation Derating Curve

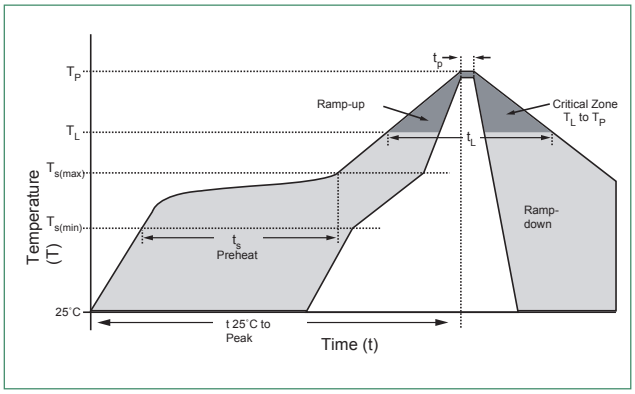



### Figure 6 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Only



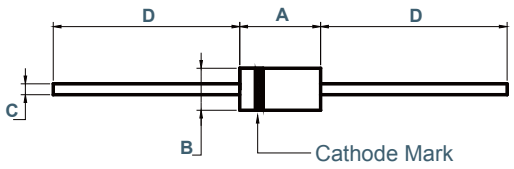
## Soldering Parameters

| Reflow Condition | | Lead–free assembly |
|---|---|---|
| Pre Heat | -Temperature Min ($T_{s(min)}$) | 150°C |
| | -Temperature Max ($T_{s(max)}$) | 200°C |
| | -Time (min to max) ($t_s$) | 60 – 180 secs |
| Average ramp up rate (Liquidus Temp ($T_L$) to peak | | 3°C/second max |
| $T_{S(max)}$ to $T_L$ - Ramp-up Rate | | 3°C/second max |
| Reflow | -Temperature ($T_L$) (Liquidus) | 217°C |
| | -Time (min to max) ($t_s$) | 60 – 150 seconds |
| Peak Temperature ($T_P$) | | 260+0/-5 °C |
| Time within 5°C of actual peak Temperature ($t_p$) | | 20 – 40 seconds |
| Ramp-down Rate | | 6°C/second max |
| Time 25°C to peak Temperature ($T_P$) | | 8 minutes Max. |
| Do not exceed | | 280°C |




## Dimensions

**R-6**




| DIMENSIONS | | | | | |
|---|---|---|---|---|---|
| DIM | INCHES | | MM | | NOTE |
| | MIN | MAX | MIN | MAX | |
| A | 0.340 | 0.360 | 8.60 | 9.10 | |
| B | 0.340 | 0.360 | 8.60 | 9.10 | Φ |
| C | 0.048 | 0.052 | 1.20 | 1.30 | Φ |
| D | 1.000 | — | 25.4 | — | |