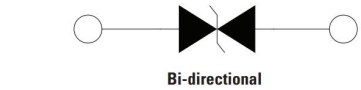
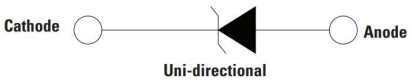
# TVS Diodes P4KE Series

## Transient Voltage Suppressors

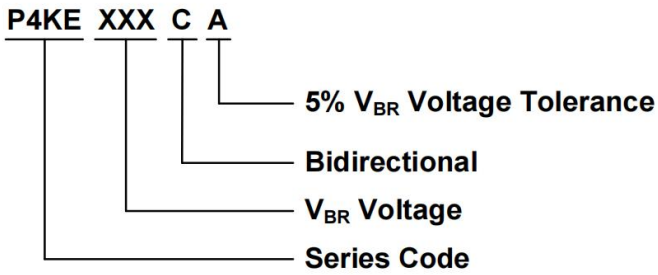
## Features

- 400W peak pulse power capability at 10/1000μs waveform, repetition rate (duty cycle): 0.01%
- Low incremental surge impedance
- Excellent clamping capability
- Typical $I_R$ less than 1μA when $V_{BR}$ min>12V.
- High Temperature soldering guaranteed: 260℃/30 seconds
- Plastic package has underwriters laboratory flammability 94V-0
- Meets MSL level 1, per J-STD-020
- Meet HF and RoHS compliant
- Marking code: printed according to model
- IEC-61000-4-2 ESD 30kV(Air), 30kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2
- EFT protection of data lines in accordance with IEC 61000- 4-4




## Part Number Coding System




## Applications

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

## Mechanical Data

- Case: JEDEC DO-41 Moulded plastic, Axial lead
- Polarity: Color band denotes positive end(cathode) except bi-directional models
- Weight: About 0.4g

## Maximum Rating and Characteristics

**Parameters at 25℃ ambient temperature unless otherwise Noted.**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Peak Pulse Power Dissipation by 10/1000us Test Waveform(Fig.2)(Note 1) -Single Die Parts | $P_{PPM}$ | Minimum 400 | Watts |
| Peak Pulse Power Dissipation by 10/1000us Test Waveform(Fig.2)(Note 1) -Stacked Die Parts(Note 4) | $P_{PPM}$ | 600 | Watts |
| Steady State Power Dissipation on Infinite Heat Sink at $T_L$ =75ºC | $P_D$ | 1.5 | Watts |
| Maximum Instantaneous Forward Voltage at 50A for Unidirectional Only (Note 3) | $V_F$ | 3.5/5.0 | V |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional Only (Note 2) | $I_{FSM}$ | 40 | Amps |
| Operating junction and Storage Temperature Range. | $T_J$, $T_{STG}$ | -55 to +175 | ℃ |
| Typical Thermal Resistance Junction to Lead | $R_{\theta JL}$ | 60 | ℃/W |
| Typical Thermal Resistance Junction to Ambient | $R_{\theta JA}$ | 100 | ℃/W |

**Notes:**

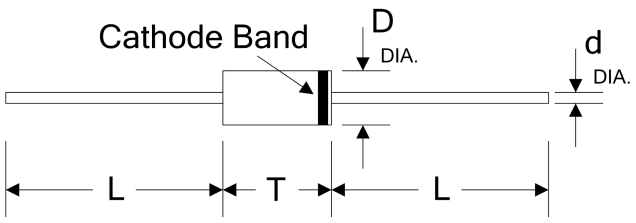
**1.**Non-repetitive current pulse , per Fig. 2 and derated above TJ (initial) = 25$^{O}$ C per Fig. 1.

**2.** Measured on 8.3ms single half sine wave or equivalent square wave, duty cycle=4 per minute maximum.

**3.**VF < 3.5V for single die parts and VF < 5.0V for stacked-die parts.

**4.**For stacked die component details, please refer to part numbers labeled by * in Electrical Characteristics.

## Dimensions (DO-204AL/DO-41)




| Ref. | Millimeters | | Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| L | 25.40 | - | 1.000 | - |
| T | 4.10 | 5.20 | 0.160 | 0.205 |
| D | 2.00 | 2.70 | 0.080 | 0.107 |
| d | 0.71 | 0.86 | 0.028 | 0.034 |

## Electrical Characteristics ($T_A$=25℃ unless otherwise noted)

| 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) | $I_R$(μA) |
| P4KE6.8A | P4KE6.8CA | 5.80 | 6.45~7.14 | 10 | 10.5 | 39.0 | 600 |
| P4KE7.5A | P4KE7.5CA | 6.40 | 7.13~7.88 | 10 | 11.3 | 36.3 | 400 |
| P4KE8.2A | P4KE8.2CA | 7.02 | 7.79~8.61 | 10 | 12.1 | 33.9 | 150 |
| P4KE9.1A | P4KE9.1CA | 7.78 | 8.65~9.55 | 1 | 13.4 | 30.6 | 25 |
| P4KE10A | P4KE10CA | 8.55 | 9.50~10.50 | 1 | 14.5 | 28.3 | 5 |
| P4KE11A | P4KE11CA | 9.40 | 10.50~11.60 | 1 | 15.6 | 26.3 | 5 |
| P4KE12A | P4KE12CA | 10.20 | 11.40~12.60 | 1 | 16.7 | 24.6 | 5 |
| P4KE13A | P4KE13CA | 11.10 | 12.40~13.70 | 1 | 18.2 | 22.5 | 1 |
| P4KE15A | P4KE15CA | 12.80 | 14.30~15.80 | 1 | 21.2 | 19.3 | 1 |
| P4KE16A | P4KE16CA | 13.60 | 15.20~16.80 | 1 | 22.5 | 18.2 | 1 |
| P4KE18A | P4KE18CA | 15.30 | 17.10~18.90 | 1 | 25.2 | 16.1 | 1 |
| P4KE20A | P4KE20CA | 17.10 | 19.00~21.00 | 1 | 27.7 | 14.8 | 1 |
| P4KE22A | P4KE22CA | 18.80 | 20.90~23.10 | 1 | 30.6 | 13.4 | 1 |
| P4KE24A | P4KE24CA | 20.50 | 22.80~25.20 | 1 | 33.2 | 12.3 | 1 |
| P4KE27A | P4KE27CA | 23.10 | 25.70~28.40 | 1 | 37.5 | 10.9 | 1 |
| P4KE30A | P4KE30CA | 25.60 | 28.50~31.50 | 1 | 41.4 | 9.9 | 1 |
| P4KE33A | P4KE33CA | 28.20 | 31.40~34.70 | 1 | 45.7 | 9.0 | 1 |
| P4KE36A | P4KE36CA | 30.80 | 34.20~37.80 | 1 | 49.9 | 8.2 | 1 |
| P4KE39A | P4KE39CA | 33.30 | 37.10~41.00 | 1 | 53.9 | 7.6 | 1 |
| P4KE43A | P4KE43CA | 36.80 | 40.90~45.20 | 1 | 59.3 | 6.9 | 1 |
| P4KE47A | P4KE47CA | 40.20 | 44.70~49.40 | 1 | 64.8 | 6.3 | 1 |
| P4KE51A | P4KE51CA | 43.60 | 48.50~53.60 | 1 | 70.1 | 5.8 | 1 |
| P4KE56A | P4KE56CA | 47.80 | 53.20~58.80 | 1 | 77.0 | 5.3 | 1 |
| P4KE62A | P4KE62CA | 53.00 | 58.90~65.10 | 1 | 85.0 | 4.8 | 1 |
| P4KE68A | P4KE68CA | 58.10 | 64.60~71.40 | 1 | 92.0 | 4.5 | 1 |
| P4KE75A | P4KE75CA | 64.10 | 71.30~78.80 | 1 | 103.0 | 4.0 | 1 |
| P4KE82A | P4KE82CA | 70.10 | 77.90~86.10 | 1 | 113.0 | 3.6 | 1 |
| P4KE91A | P4KE91CA | 77.80 | 86.50~95.50 | 1 | 125.0 | 3.3 | 1 |
| P4KE100A | P4KE100CA | 85.50 | 95.00~105.00 | 1 | 137.0 | 3.0 | 1 |

| 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) | $I_R$(μA) |
| P4KE110A | P4KE110CA | 94.00 | 105.00~116.00 | 1 | 152.0 | 2.7 | 1 |
| P4KE120A | P4KE120CA | 102.00 | 114.00~126.00 | 1 | 165.0 | 2.5 | 1 |
| P4KE130A | P4KE130CA | 111.00 | 124.00~137.00 | 1 | 179.0 | 2.3 | 1 |
| P4KE150A | P4KE150CA | 128.00 | 143.00~158.00 | 1 | 207.0 | 2.0 | 1 |
| P4KE160A | P4KE160CA | 136.00 | 152.00~168.00 | 1 | 219.0 | 1.9 | 1 |
| P4KE170A | P4KE170CA | 145.00 | 162.00~179.00 | 1 | 234.0 | 1.8 | 1 |
| P4KE180A | P4KE180CA | 154.00 | 171.00~189.00 | 1 | 246.0 | 1.7 | 1 |
| P4KE200A | P4KE200CA | 171.00 | 190.00~210.00 | 1 | 274.0 | 1.5 | 1 |
| P4KE220A | P4KE220CA | 185.00 | 209.00~231.00 | 1 | 328.0 | 1.3 | 1 |
| P4KE250A | P4KE250CA* | 214.00 | 237.00~263.00 | 1 | 344.0 | 1.2 | 1 |
| P4KE300A | P4KE300CA* | 256.00 | 285.00~315.00 | 1 | 414.0 | 1.0 | 1 |
| P4KE350A* | P4KE350CA* | 300.00 | 332.00~368.00 | 1 | 482.0 | 0.85 | 1 |
| P4KE400A* | P4KE400CA* | 342.00 | 380.00~420.00 | 1 | 548.0 | 0.75 | 1 |
| P4KE440A* | P4KE440CA* | 376.00 | 418.00~462.00 | 1 | 602.0 | 0.68 | 1 |
| P4KE480A* | P4KE480CA* | 408.00 | 456.00~504.00 | 1 | 658.0 | 0.61 | 1 |
| P4KE510A* | P4KE510CA* | 434.00 | 485.00~535.00 | 1 | 698.0 | 0.57 | 1 |
| P4KE530A* | P4KE530CA* | 451.00 | 503.50~556.50 | 1 | 725.0 | 0.55 | 1 |
| P4KE540A* | P4KE540CA* | 460.00 | 513.00~567.00 | 1 | 740.0 | 0.54 | 1 |
| P4KE550A* | P4KE550CA* | 468.00 | 522.50~577.50 | 1 | 760.0 | 0.52 | 1 |
| P4KE600A* | P4KE600CA* | 512.00 | 570.00~630.00 | 1 | 828.0 | 0.48 | 1 |

**Notes:** 1.For bidirectional type having $V_{RWM}$ of 10V and less, the $I_R$ limit is double.

2.For parts without A , the $V_{BR}$ is ± 10% and $V_C$ is 5% higher than with A parts, the parts without A are currently available, but not recommended for new designs. The parts with A are preferred.

3.For stack-die parts, use * to label the part number.

## Ratings and Characteristic Curves (TA=25℃ unless otherwise noted)

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

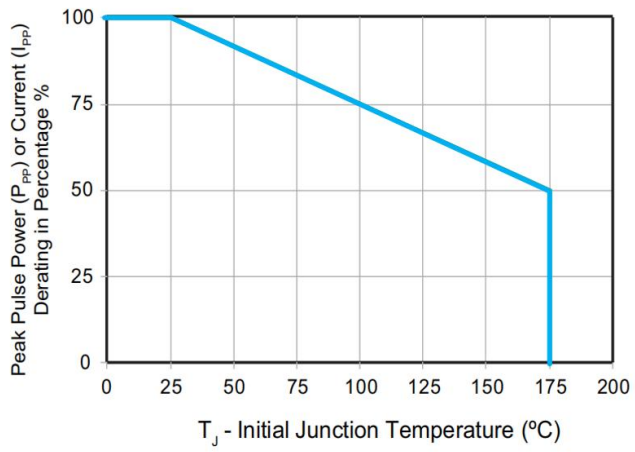



**Figure 2. Pulse Waveform**

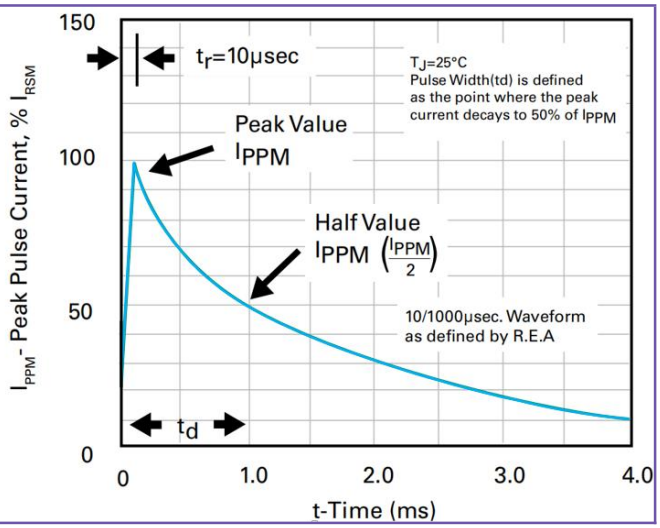



**Figure 3. Typical Junction Capacitance**

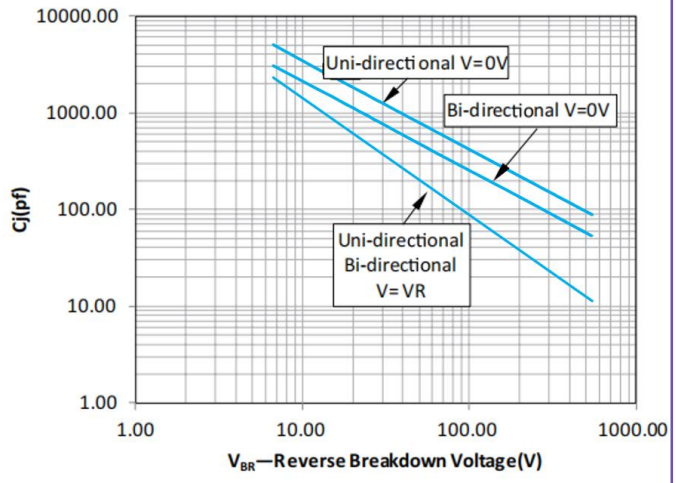



**Figure 4. Typical Transient Thermal Impedance**

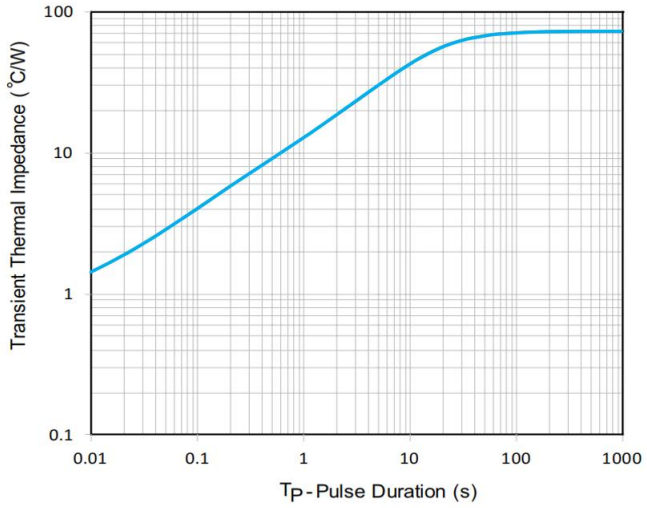



**Figure 5.Maximum Non-Repetitive Forward Surge Current Uni-Directional Only**

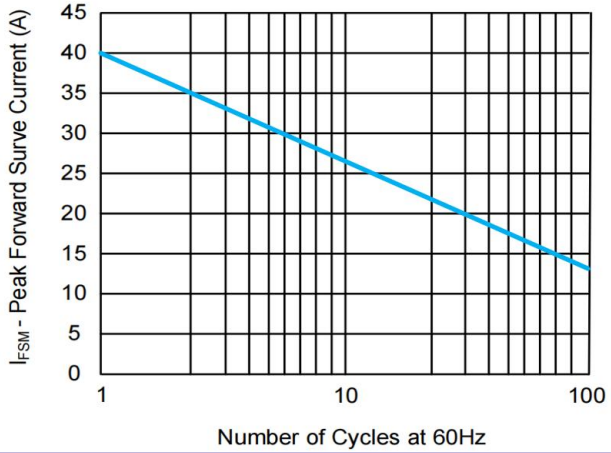
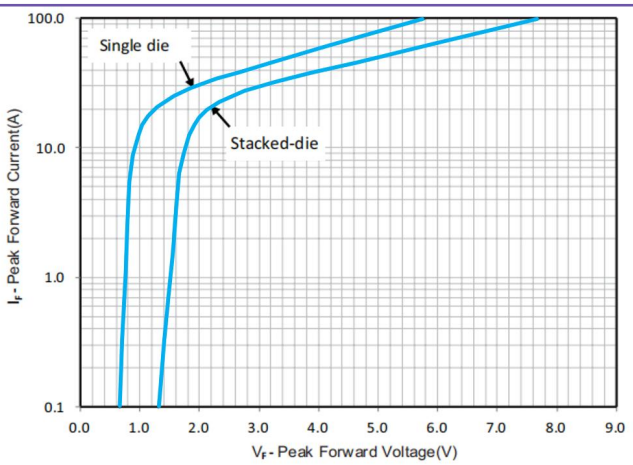
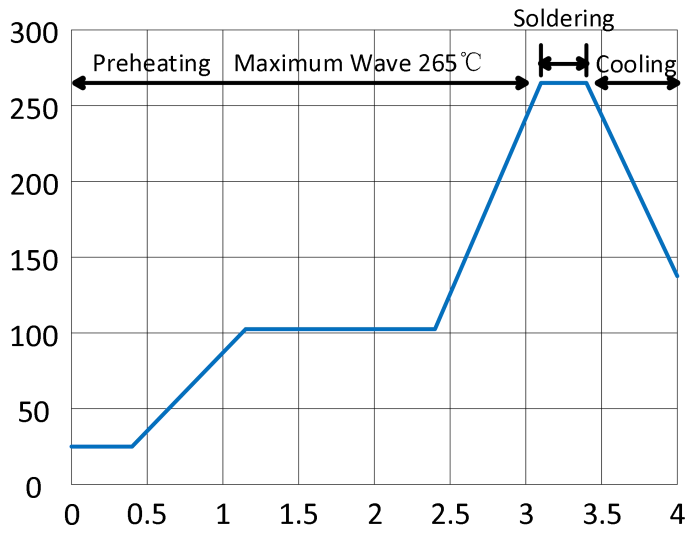



**Figure 6. Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)**



## Wave Soldering Parameters




| Condition | Lead-free Assembly |
|---|---|
| Peak Temperature | 265℃ |
| Dipping Time | 10 seconds |
| Soldering | 1 time |

## Reliability

| Items | Standards |
|---|---|
| Terminal strength | MIL-STD-750 Method 2036 |
| Mechanical shock | JESD22-B104 |
| Vibration | JESD22-B103 |
| High Temp. Storage | JESD22-A103 |
| High Temp Reverse Bias | JESD22-A108 |
| Temperature Cycling | JESD22-A104 |
| High Temp High Humidity Reverse Bias | JESD22-A101 |
| Resistance to solder heat | JESD22-B106 |