



**THE DATASHEET OF  
P6KE170A**



### P6KE Series



#### Agency Approvals

| Agency  | Agency File Number |
|---|--------------------|
|  | E230531            |

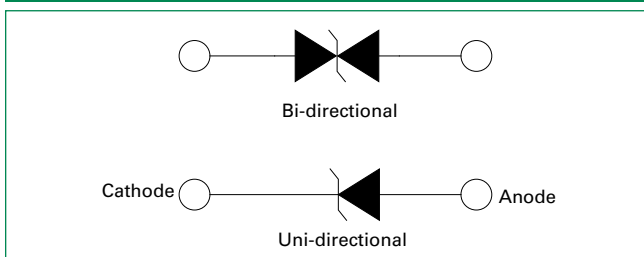
#### Maximum Ratings and Thermal Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Parameter  | Symbol                            | Value      | Unit |
|--|-----------------------------------|------------|------|
| Peak Pulse Power Dissipation by 10/1000µs Test Waveform (Fig.2)(Note 1), (Note 4)    | P <sub>PPM</sub>                  | 600        | W    |
| Steady State Power Dissipation on Infinite Heat Sink at T <sub>L</sub> =75°C         | P <sub>D</sub>                    | 5.0        | W    |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional Only (Note 2) | I <sub>FSM</sub>                  | 100        | A    |
| Maximum Instantaneous Forward Voltage at 50A for Unidirectional Only (Note 3)        | V <sub>F</sub>                    | 3.5/5.0    | V    |
| Operating Junction and Storage Temperature Range                                     | T <sub>J</sub> , T <sub>STG</sub> | -55 to 175 | °C   |
| Typical Thermal Resistance Junction to Lead  | R <sub>θJL</sub>                  | 20         | °C/W |
| Typical Thermal Resistance Junction to Ambient                                       | R <sub>θJA</sub>                  | 75         | °C/W |

#### Notes:

1. Non-repetitive current pulse, per Fig. 4 and derated above T<sub>J</sub> (initial) = 25°C per Fig. 3.
2. Measured on 8.3ms single half sine wave or equivalent square wave, duty cycle=4 per minute maximum.
3. V<sub>F</sub> < 3.5V for single die parts and V<sub>F</sub> < 5.0V for stacked-die parts.
4. The P<sub>PPM</sub> of stacked-die parts is 800W and please contact littelfuse for the detail stacked-die parts.

#### Functional Diagram



#### Description

The P6KE Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

#### Features

- 600W peak pulse capability at 10/1000µs waveform, repetition rate (duty cycles):0.01%
- Glass passivated chip junction in DO-15 Package
- Fast response time: typically less than 1.0ps from 0 Volts to BV min
- Excellent clamping capability
- Typical failure mode is short from over-specified voltage or current
- Whisker test conducted based on Table 4a and 4c of JEDEC JESD201A
- IEC z61000-4-2 ESD 30kV(Air), 30kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Low incremental surge resistance
- Typical I<sub>R</sub> less than 1µA when V<sub>BR</sub> min>12V
- Compatible with high temperature reflow soldering (260°C/40 s)
- V<sub>BR</sub> @ T<sub>J</sub> = V<sub>BR</sub> @ 25°C x (1 + α T x (T<sub>J</sub> - 25)) (α T: Temperature Coefficient, typical value is 0.1%)
- UL Recognized epoxy meeting flammability classification V-0
- Matte tin lead-free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

#### Applications

TVS components are ideal for the protection of I/O interfaces, V<sub>CC</sub> bus and other vulnerable circuits used in telecom, computer, industrial and consumer electronic applications.

#### Additional Information



[Datasheet](#)



[Resources](#)



[Samples](#)

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

| Part Number (Uni) | Part Number (Bi) | Reverse Stand off Voltage V <sub>R</sub> (Volts) | Breakdown Voltage V <sub>BR</sub> (Volts) @ I <sub>T</sub> |        | Test Current I <sub>T</sub> (mA) | Maximum Clamping Voltage V <sub>C</sub> @ I <sub>pp</sub> (V) | Maximum Peak Pulse Current I <sub>pp</sub> (A) | Maximum Reverse Leakage I <sub>R</sub> @ V <sub>R</sub> (μA) | Agency Approval  |
|-------------------|------------------|--|--|--------|----------------------------------|---|--|--|---|
|                   |                  |  | MIN  | MAX    |                                  |   |  |  |   |
| P6KE6.8A          | P6KE6.8CA        | 5.80   | 6.45   | 7.14   | 10                               | 10.5  | 58.1   | 1000   | X   |
| P6KE7.5A          | P6KE7.5CA        | 6.40   | 7.13   | 7.88   | 10                               | 11.3  | 54.0   | 500  | X   |
| P6KE8.2A          | P6KE8.2CA        | 7.02   | 7.79   | 8.61   | 10                               | 12.1  | 50.4   | 200  | X   |
| P6KE9.1A          | P6KE9.1CA        | 7.78   | 8.65   | 9.55   | 1                                | 13.4  | 45.5   | 50   | X   |
| P6KE10A           | P6KE10CA         | 8.55   | 9.50   | 10.50  | 1                                | 14.5  | 42.1   | 10   | X   |
| P6KE11A           | P6KE11CA         | 9.40   | 10.50  | 11.60  | 1                                | 15.6  | 39.1   | 5  | X   |
| P6KE12A           | P6KE12CA         | 10.20  | 11.40  | 12.60  | 1                                | 16.7  | 36.5   | 5  | X   |
| P6KE13A           | P6KE13CA         | 11.10  | 12.40  | 13.70  | 1                                | 18.2  | 33.5   | 1  | X   |
| P6KE15A           | P6KE15CA         | 12.80  | 14.30  | 15.80  | 1                                | 21.2  | 28.8   | 1  | X   |
| P6KE16A           | P6KE16CA         | 13.60  | 15.20  | 16.80  | 1                                | 22.5  | 27.1   | 1  | X   |
| P6KE18A           | P6KE18CA         | 15.30  | 17.10  | 18.90  | 1                                | 25.2  | 24.2   | 1  | X   |
| P6KE20A           | P6KE20CA         | 17.10  | 19.00  | 21.00  | 1                                | 27.7  | 22.0   | 1  | X   |
| P6KE22A           | P6KE22CA         | 18.80  | 20.90  | 23.10  | 1                                | 30.6  | 19.9   | 1  | X   |
| P6KE24A           | P6KE24CA         | 20.50  | 22.80  | 25.20  | 1                                | 33.2  | 18.4   | 1  | X   |
| P6KE27A           | P6KE27CA         | 23.10  | 25.70  | 28.40  | 1                                | 37.5  | 16.3   | 1  | X   |
| P6KE30A           | P6KE30CA         | 25.60  | 28.50  | 31.50  | 1                                | 41.4  | 14.7   | 1  | X   |
| P6KE33A           | P6KE33CA         | 28.20  | 31.40  | 34.70  | 1                                | 45.7  | 13.3   | 1  | X   |
| P6KE36A           | P6KE36CA         | 30.80  | 34.20  | 37.80  | 1                                | 49.9  | 12.2   | 1  | X   |
| P6KE39A           | P6KE39CA         | 33.30  | 37.10  | 41.00  | 1                                | 53.9  | 11.3   | 1  | X   |
| P6KE43A           | P6KE43CA         | 36.80  | 40.90  | 45.20  | 1                                | 59.3  | 10.3   | 1  | X   |
| P6KE47A           | P6KE47CA         | 40.20  | 44.70  | 49.40  | 1                                | 64.8  | 9.4  | 1  | X   |
| P6KE51A           | P6KE51CA         | 43.60  | 48.50  | 53.60  | 1                                | 70.1  | 8.7  | 1  | X   |
| P6KE56A           | P6KE56CA         | 47.80  | 53.20  | 58.80  | 1                                | 77.0  | 7.9  | 1  | X   |
| P6KE62A           | P6KE62CA         | 53.00  | 58.90  | 65.10  | 1                                | 85.0  | 7.2  | 1  | X   |
| P6KE68A           | P6KE68CA         | 58.10  | 64.60  | 71.40  | 1                                | 92.0  | 6.6  | 1  | X   |
| P6KE75A           | P6KE75CA         | 64.10  | 71.30  | 78.80  | 1                                | 103.0   | 5.9  | 1  | X   |
| P6KE82A           | P6KE82CA         | 70.10  | 77.90  | 86.10  | 1                                | 113.0   | 5.4  | 1  | X   |
| P6KE91A           | P6KE91CA         | 77.80  | 86.50  | 95.50  | 1                                | 125.0   | 4.9  | 1  | X   |
| P6KE100A          | P6KE100CA        | 85.50  | 95.00  | 105.00 | 1                                | 137.0   | 4.5  | 1  | X   |
| P6KE110A          | P6KE110CA        | 94.00  | 105.00   | 116.00 | 1                                | 152.0   | 4.0  | 1  | X   |
| P6KE120A          | P6KE120CA        | 102.00   | 114.00   | 126.00 | 1                                | 165.0   | 3.7  | 1  | X   |
| P6KE130A          | P6KE130CA        | 111.00   | 124.00   | 137.00 | 1                                | 179.0   | 3.4  | 1  | X   |
| P6KE150A          | P6KE150CA        | 128.00   | 143.00   | 158.00 | 1                                | 207.0   | 2.9  | 1  | X   |
| P6KE160A          | P6KE160CA        | 136.00   | 152.00   | 168.00 | 1                                | 219.0   | 2.8  | 1  | X   |
| P6KE170A          | P6KE170CA        | 145.00   | 162.00   | 179.00 | 1                                | 234.0   | 2.6  | 1  | X   |
| P6KE180A          | P6KE180CA        | 154.00   | 171.00   | 189.00 | 1                                | 246.0   | 2.5  | 1  | X   |
| P6KE200A          | P6KE200CA        | 171.00   | 190.00   | 210.00 | 1                                | 274.0   | 2.2  | 1  | X   |
| P6KE220A          | P6KE220CA        | 185.00   | 209.00   | 231.00 | 1                                | 328.0   | 1.9  | 1  | X   |
| P6KE250A          | P6KE250CA        | 214.00   | 237.00   | 263.00 | 1                                | 344.0   | 1.8  | 1  | X   |
| P6KE300A          | P6KE300CA        | 256.00   | 285.00   | 315.00 | 1                                | 414.0   | 1.5  | 1  | X   |
| P6KE350A          | P6KE350CA        | 300.00   | 332.00   | 368.00 | 1                                | 482.0   | 1.3  | 1  | X   |
| P6KE400A          | P6KE400CA        | 342.00   | 380.00   | 420.00 | 1                                | 548.0   | 1.1  | 1  | X   |
| P6KE440A          | P6KE440CA        | 376.00   | 418.00   | 462.00 | 1                                | 602.0   | 1.0  | 1  | X   |
| P6KE480A          | P6KE480CA        | 408.00   | 456.00   | 504.00 | 1                                | 658.0   | 0.9  | 1  | X   |
| P6KE510A          | P6KE510CA        | 434.00   | 485.00   | 535.00 | 1                                | 698.0   | 0.9  | 1  | X   |
| P6KE530A          | P6KE530CA        | 451.00   | 503.50   | 556.50 | 1                                | 725.0   | 0.8  | 1  | X   |
| P6KE540A          | P6KE540CA        | 460.00   | 513.00   | 567.00 | 1                                | 740.0   | 0.8  | 1  | X   |
| P6KE550A          | P6KE550CA        | 468.00   | 522.50   | 577.50 | 1                                | 760.0   | 0.8  | 1  | X   |
| P6KE600A          | P6KE600CA        | 512.00   | 570.00   | 630.00 | 1                                | 828.0   | 0.75   | 1  | -   |

For bidirectional type having V<sub>R</sub> of 10 volts and less, the I<sub>R</sub> limit is double.

For parts without A, the V<sub>BR</sub> is ± 10% and V<sub>C</sub> is 5% higher than with A parts

**I-V Curve Characteristics**



- $P_{PPM}$  Peak Pulse Power Dissipation** – Max power dissipation
- $V_R$  Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation
- $V_{BR}$  Breakdown Voltage** – Maximum voltage that flows through the TVS at a specified test current ( $I_t$ )
- $V_C$  Clamping Voltage** – Peak voltage measured across the TVS at a specified  $I_{ppm}$  (peak impulse current)
- $I_R$  Reverse Leakage Current** – Current measured at  $V_R$
- $V_F$  Forward Voltage Drop for Uni-directional**

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

**Figure 1 - TVS Transients Clamping Waveform**



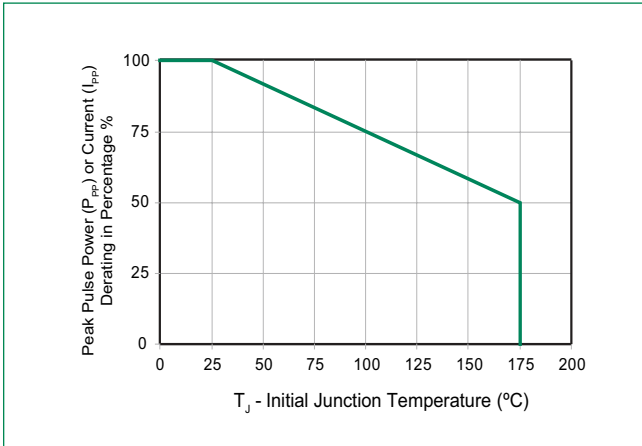
**Figure 2 - Peak Pulse Power Rating**



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

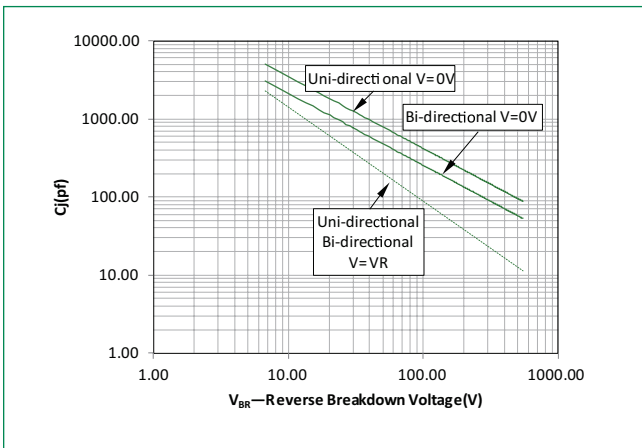
**Figure 3 - Peak Pulse Power Derating Curve**



**Figure 4 - Pulse Waveform**



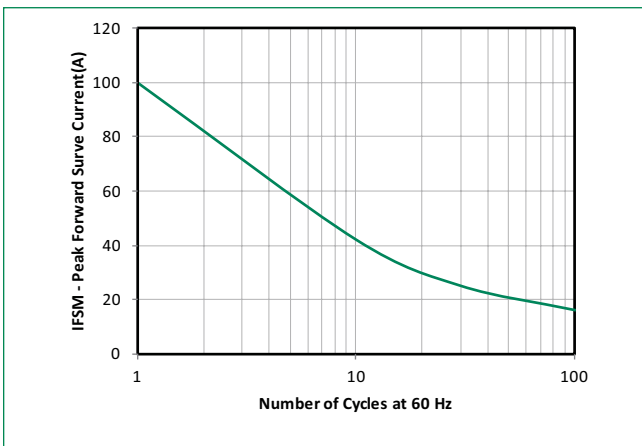
**Figure 5 - Typical Junction Capacitance**



**Figure 6 - Typical Transient Thermal Impedance**



**Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only**



**Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)**



**Soldering Parameters**

|  |                                    |                         |
|--|------------------------------------|-------------------------|
| <b>Reflow Condition</b>  |                                    | Lead-free assembly      |
| <b>Pre Heat</b>  | - Temperature Min ( $T_{s(min)}$ ) | 150°C                   |
|  | - Temperature Max ( $T_{s(max)}$ ) | 200°C                   |
|  | - Time (min to max) ( $t_p$ )      | 60 – 120 secs           |
| <b>Average ramp up rate (Liquidus Temp (<math>T_L</math>) to peak)</b> |                                    | 3°C/second max          |
| <b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>      |                                    | 3°C/second max          |
| <b>Reflow</b>  | - Temperature ( $T_L$ ) (Liquidus) | 217°C                   |
|  | - Time (min to max) ( $t_r$ )      | 60 – 150 seconds        |
| <b>Peak Temperature (<math>T_p</math>)</b>                             |                                    | 260 <sup>+0/-5</sup> °C |
| <b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>   |                                    | 30 Seconds Max          |
| <b>Ramp-down Rate</b>  |                                    | 6°C/second max          |
| <b>Time 25°C to peak Temperature (<math>T_p</math>)</b>                |                                    | 8 minutes Max.          |
| <b>Do not exceed</b>   |                                    | 260°C                   |



**Flow/Wave Soldering (Solder Dipping)**

|                           |            |
|---------------------------|------------|
| <b>Peak Temperature :</b> | 265°C      |
| <b>Dipping Time :</b>     | 10 seconds |
| <b>Soldering :</b>        | 1 time     |

**Physical Specifications C**

|                 |  |
|-----------------|--|
| <b>Weight</b>   | 0.015oz., 0.4g   |
| <b>Case</b>     | JEDEC DO-204AC (DO-15) molded plastic body over passivated junction. |
| <b>Polarity</b> | Color band denotes the cathode except Bipolar.                       |
| <b>Terminal</b> | Matte Tin axial leads, solderable per JESD22-B102.                   |

**Environmental Specifications**

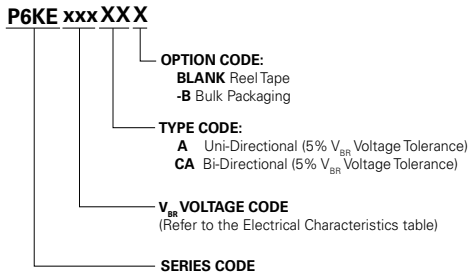
|                            |             |
|----------------------------|-------------|
| <b>High Temp. Storage</b>  | JESD22-A103 |
| <b>HTRB</b>                | JESD22-A108 |
| <b>Temperature Cycling</b> | JESD22-A104 |
| <b>H3TRB</b>               | JESD22-A101 |
| <b>RSH</b>                 | JESD22-B106 |

**Dimensions**



| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| <b>A</b>   | 1.000  | -     | 25.40       | -    |
| <b>B</b>   | 0.230  | 0.300 | 5.80        | 7.60 |
| <b>C</b>   | 0.028  | 0.034 | 0.71        | 0.86 |
| <b>D</b>   | 0.104  | 0.140 | 2.60        | 3.60 |

### Part Numbering System



### Part Marking System



### Packaging

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|-------------|-------------------|----------|------------------|-------------------------|
| P6KExxxXX   | DO-204AC          | 4000     | Tape & Reel      | EIA STD RS-296          |
| P6KExxxXX-B | DO-204AC          | 1000     | BULK             | Littelfuse Spec.        |



### Tape and Reel Specification



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