

## 1-Line Uni-directional TVS Diode

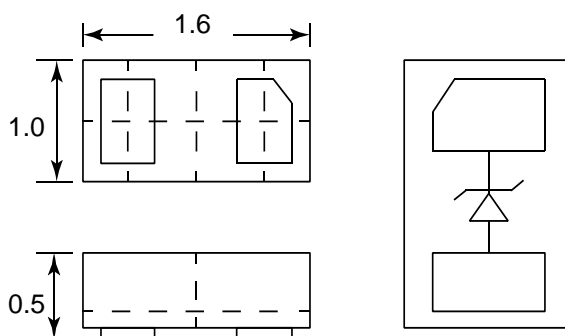
### Description

The PESDUxx71P6 is an uni-directional TVS diode, utilizing leading monolithic silicon technology to provide fast response time and low ESD clamping voltage, making this device an ideal solution for protecting voltage sensitive data and power line. The PESDUxx71P6 complies with the IEC 61000-4-2 (ESD) standard with  $\pm 30\text{kV}$  air and  $\pm 30\text{kV}$  contact discharge. It is assembled into an ultra-small 1.6x1.0x0.5mm lead-free DFN package. The small size and high ESD surge protection make PESDUxx71P6 an ideal choice to protect cell phone, digital cameras, audio players and many other portable applications.

### Features

- Small package: 1.6x1.0x0.5mm
- Protects one data or power line
- Working Voltage: 3.3V, 5V, 7V, 12V, 15V, 18V, 24V, 36V
- High peak pulse current capability
- Ultra low clamping voltage
- 2-pin leadless package
- Complies with following standards:
  - IEC 61000-4-2 (ESD) immunity test  
Air discharge:  $\pm 30\text{kV}$   
Contact discharge:  $\pm 30\text{kV}$
  - IEC61000-4-4 (EFT) 80A (5/50ns)
- RoHS Compliant

### Dimensions and Pin Configuration



Package Dimensions      Circuit and Pin Schematic

### Mechanical Characteristics

- Package: DFN1610-2
- Case Material: “Green” Molding Compound.
- Moisture Sensitivity: Level 3 per J-STD-020
- Terminal Connections: See Diagram Below
- Marking Information: See Below

### Applications

- Mobile Phones and Accessories
- Battery Protection
- USB  $V_{\text{Bus}}$
- Power Line Protection
- Hand Held Portable Applications

### Marking Information



XX = Device Marking Code  
Bar denotes Cathode

### Ordering Information

| VMPart Number | Marking | Packaging        | Reel Size |
|---------------|---------|------------------|-----------|
| PESDU0371P6   | 73      | 3000/Tape & Reel | 7 inch    |
| PESDU0571P6   | 91      | 3000/Tape & Reel | 7 inch    |
| PESDU0771P6   | 76      | 3000/Tape & Reel | 7 inch    |
| PESDU1271P6   | 72      | 3000/Tape & Reel | 7 inch    |
| PESDU1571P6   | 75      | 3000/Tape & Reel | 7 inch    |
| PESDU1871P6   | 78      | 3000/Tape & Reel | 7 inch    |
| PESDU2471P6   | 74      | 3000/Tape & Reel | 7 inch    |
| PESDU3671P6   | 79      | 3000/Tape & Reel | 7 inch    |

**Absolute Maximum Ratings ( $T_A=25^{\circ}\text{C}$  unless otherwise specified)**

| Parameter                                | Symbol           | Value          | Unit               |
|--|------------------|----------------|--------------------|
| Peak Pulse Power (8/20 $\mu\text{s}$ )   | PPK              | 1875           | W                  |
| Peak Pulse Current (8/20 $\mu\text{s}$ ) | I <sub>PP</sub>  | See next table | A                  |
| ESD per IEC 61000-4-2 (Air)              | V <sub>ESD</sub> | $\pm 30$       | kV                 |
| ESD per IEC 61000-4-2 (Contact)          |                  | $\pm 30$       | kV                 |
| Operating Temperature Range              | T <sub>J</sub>   | -55 to +125    | $^{\circ}\text{C}$ |
| Storage Temperature Range                | T <sub>stg</sub> | -55 to +150    | $^{\circ}\text{C}$ |

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

| PESDU0371P6             |                  |     |     |      |               |  |
|-------------------------|------------------|-----|-----|------|---------------|--|
| Parameter               | Symbol           | Min | Typ | Max  | Unit          | Test Condition                                     |
| Reverse Working Voltage | V <sub>RWM</sub> |     |     | 3.3  | V             |  |
| Breakdown Voltage       | V <sub>BR</sub>  | 3.5 |     |      | V             | I <sub>T</sub> = 1mA                               |
| Reverse Leakage Current | I <sub>R</sub>   |     |     | 1.0  | $\mu\text{A}$ | V <sub>RWM</sub> = 3.3 V                           |
| Forward Voltage         | V <sub>F</sub>   |     | 1.0 | 1.2  | V             | V <sub>F</sub> = 10mA                              |
| Peak Pulse Current      | I <sub>PP</sub>  |     |     | 90   | A             | T <sub>P</sub> = 8 / 20 $\mu\text{s}$              |
| Clamping Voltage        | V <sub>C</sub>   |     |     | 5.5  | V             | I <sub>PP</sub> = 10A (8 x 20 $\mu\text{s}$ pulse) |
| Clamping Voltage        | V <sub>C</sub>   |     |     | 12.5 | V             | I <sub>PP</sub> = 90A (8 x 20 $\mu\text{s}$ pulse) |
| Junction Capacitance    | C <sub>J</sub>   |     |     | 750  | pF            | V <sub>R</sub> = 0V, f = 1MHz                      |

| PESDU0571P6             |                  |     |     |     |               |   |
|-------------------------|------------------|-----|-----|-----|---------------|---|
| Parameter               | Symbol           | Min | Typ | Max | Unit          | Test Condition                                      |
| Reverse Working Voltage | V <sub>RWM</sub> |     |     | 5.0 | V             |   |
| Breakdown Voltage       | V <sub>BR</sub>  | 6   |     |     | V             | I <sub>T</sub> = 1mA                                |
| Reverse Leakage Current | I <sub>R</sub>   |     |     | 1.0 | $\mu\text{A}$ | V <sub>RWM</sub> = 5V                               |
| Forward Voltage         | V <sub>F</sub>   |     | 1.0 | 1.2 | V             | V <sub>F</sub> = 10mA                               |
| Peak Pulse Current      | I <sub>PP</sub>  |     |     | 125 | A             | T <sub>P</sub> = 8 / 20 $\mu\text{s}$               |
| Clamping Voltage        | V <sub>C</sub>   |     |     | 9   | V             | I <sub>PP</sub> = 10A (8 x 20 $\mu\text{s}$ pulse)  |
| Clamping Voltage        | V <sub>C</sub>   |     |     | 15  | V             | I <sub>PP</sub> = 125A (8 x 20 $\mu\text{s}$ pulse) |
| Junction Capacitance    | C <sub>J</sub>   |     |     | 650 | pF            | V <sub>R</sub> = 0V, f = 1MHz                       |

| <b>PESDU0771P6</b>      |               |            |            |            |               |   |
|-------------------------|---------------|------------|------------|------------|---------------|---|
| <b>Parameter</b>        | <b>Symbol</b> | <b>Min</b> | <b>Typ</b> | <b>Max</b> | <b>Unit</b>   | <b>Test Condition</b>                               |
| Reverse Working Voltage | $V_{RWM}$     |            |            | 7          | V             |   |
| Breakdown Voltage       | $V_{BR}$      | 7.5        |            |            | V             | $I_T = 1\text{mA}$                                  |
| Reverse Leakage Current | $I_R$         |            |            | 0.5        | $\mu\text{A}$ | $V_{RWM} = 7\text{V}$                               |
| Forward Voltage         | $V_F$         |            | 1.0        | 1.2        | V             | $V_F = 10\text{mA}$                                 |
| Peak Pulse Current      | $I_{PP}$      |            |            | 115        | A             | $T_P = 8 / 20\mu\text{s}$                           |
| Clamping Voltage        | $V_C$         |            |            | 12         | V             | $I_{PP} = 10\text{A}$ (8 x 20 $\mu\text{s}$ pulse)  |
| Clamping Voltage        | $V_C$         |            |            | 16.5       | V             | $I_{PP} = 115\text{A}$ (8 x 20 $\mu\text{s}$ pulse) |
| Junction Capacitance    | $C_J$         |            |            | 550        | pF            | $V_R = 0\text{V}$ , $f = 1\text{MHz}$               |

| <b>PESDU1271P6</b>      |               |            |            |            |               |  |
|-------------------------|---------------|------------|------------|------------|---------------|--|
| <b>Parameter</b>        | <b>Symbol</b> | <b>Min</b> | <b>Typ</b> | <b>Max</b> | <b>Unit</b>   | <b>Test Condition</b>                              |
| Reverse Working Voltage | $V_{RWM}$     |            |            | 12         | V             |  |
| Breakdown Voltage       | $V_{BR}$      | 12.6       |            |            | V             | $I_T = 1\text{mA}$                                 |
| Reverse Leakage Current | $I_R$         |            |            | 0.1        | $\mu\text{A}$ | $V_{RWM} = 12\text{V}$                             |
| Forward Voltage         | $V_F$         |            |            | 1.2        | V             | $V_F = 10\text{mA}$                                |
| Peak Pulse Current      | $I_{PP}$      |            |            | 75         | A             | $T_P = 8 / 20\mu\text{s}$                          |
| Clamping Voltage        | $V_C$         |            |            | 18         | V             | $I_{PP} = 10\text{A}$ (8 x 20 $\mu\text{s}$ pulse) |
| Clamping Voltage        | $V_C$         |            |            | 25         | V             | $I_{PP} = 75\text{A}$ (8 x 20 $\mu\text{s}$ pulse) |
| Junction Capacitance    | $C_J$         |            |            | 500        | pF            | $V_R = 0\text{V}$ , $f = 1\text{MHz}$              |

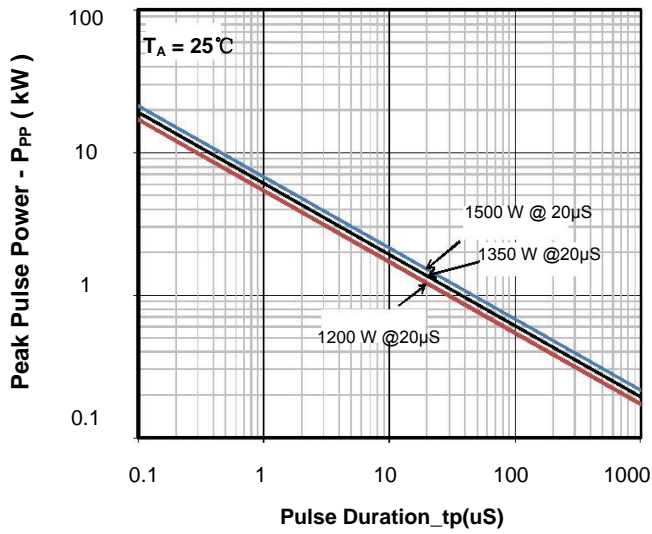
| <b>PESDU1571P6</b>      |               |            |            |            |               |  |
|-------------------------|---------------|------------|------------|------------|---------------|--|
| <b>Parameter</b>        | <b>Symbol</b> | <b>Min</b> | <b>Typ</b> | <b>Max</b> | <b>Unit</b>   | <b>Test Condition</b>                              |
| Reverse Working Voltage | $V_{RWM}$     |            |            | 15         | V             |  |
| Breakdown Voltage       | $V_{BR}$      | 16.5       |            |            | V             | $I_T = 1\text{mA}$                                 |
| Reverse Leakage Current | $I_R$         |            |            | 0.1        | $\mu\text{A}$ | $V_{RWM} = 15\text{V}$                             |
| Forward Voltage         | $V_F$         |            |            | 1.2        | V             | $V_F = 10\text{mA}$                                |
| Peak Pulse Current      | $I_{PP}$      |            |            | 60         | A             | $T_P = 8 / 20\mu\text{s}$                          |
| Clamping Voltage        | $V_C$         |            |            | 22         | V             | $I_{PP} = 10\text{A}$ (8 x 20 $\mu\text{s}$ pulse) |
| Clamping Voltage        | $V_C$         |            |            | 31.2       | V             | $I_{PP} = 60\text{A}$ (8 x 20 $\mu\text{s}$ pulse) |
| Junction Capacitance    | $C_J$         |            |            | 450        | pF            | $V_R = 0\text{V}$ , $f = 1\text{MHz}$              |

| <b>PESDU1871P6</b>      |               |            |            |            |               |  |
|-------------------------|---------------|------------|------------|------------|---------------|--|
| <b>Parameter</b>        | <b>Symbol</b> | <b>Min</b> | <b>Typ</b> | <b>Max</b> | <b>Unit</b>   | <b>Test Condition</b>                              |
| Reverse Working Voltage | $V_{RWM}$     |            |            | 18         | V             |  |
| Breakdown Voltage       | $V_{BR}$      | 19.6       |            |            | V             | $I_T = 1\text{mA}$                                 |
| Reverse Leakage Current | $I_R$         |            |            | 0.1        | $\mu\text{A}$ | $V_{RWM} = 18\text{V}$                             |
| Forward Voltage         | $V_F$         |            | 1.0        | 1.2        | V             | $V_F = 10\text{mA}$                                |
| Peak Pulse Current      | $I_{PP}$      |            |            | 50         | A             | $T_P = 8 / 20\mu\text{s}$                          |
| Clamping Voltage        | $V_C$         |            |            | 26         | V             | $I_{PP} = 10\text{A}$ (8 x 20 $\mu\text{s}$ pulse) |
| Clamping Voltage        | $V_C$         |            |            | 37.5       | V             | $I_{PP} = 50\text{A}$ (8 x 20 $\mu\text{s}$ pulse) |
| Junction Capacitance    | $C_J$         |            |            | 350        | pF            | $V_R = 0\text{V}$ , $f = 1\text{MHz}$              |

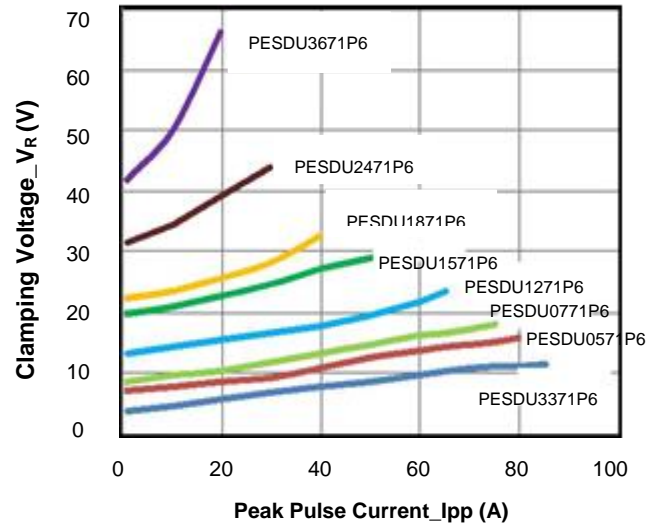
| <b>PESDU2471P6</b>      |               |            |            |            |               |  |
|-------------------------|---------------|------------|------------|------------|---------------|--|
| <b>Parameter</b>        | <b>Symbol</b> | <b>Min</b> | <b>Typ</b> | <b>Max</b> | <b>Unit</b>   | <b>Test Condition</b>                              |
| Reverse Working Voltage | $V_{RWM}$     |            |            | 24         | V             |  |
| Breakdown Voltage       | $V_{BR}$      | 26.7       |            |            | V             | $I_T = 1\text{mA}$                                 |
| Reverse Leakage Current | $I_R$         |            |            | 0.1        | $\mu\text{A}$ | $V_{RWM} = 24\text{V}$                             |
| Forward Voltage         | $V_F$         |            |            | 1.2        | V             | $V_F = 10\text{mA}$                                |
| Peak Pulse Current      | $I_{PP}$      |            |            | 35         | A             | $T_P = 8 / 20\mu\text{s}$                          |
| Clamping Voltage        | $V_C$         |            |            | 42         | V             | $I_{PP} = 10\text{A}$ (8 x 20 $\mu\text{s}$ pulse) |
| Clamping Voltage        | $V_C$         |            |            | 53.5       | V             | $I_{PP} = 35\text{A}$ (8 x 20 $\mu\text{s}$ pulse) |
| Junction Capacitance    | $C_J$         |            |            | 200        | pF            | $V_R = 0\text{V}$ , $f = 1\text{MHz}$              |

| <b>PESDU3671P6</b>      |               |            |            |            |               |  |
|-------------------------|---------------|------------|------------|------------|---------------|--|
| <b>Parameter</b>        | <b>Symbol</b> | <b>Min</b> | <b>Typ</b> | <b>Max</b> | <b>Unit</b>   | <b>Test Condition</b>                              |
| Reverse Working Voltage | $V_{RWM}$     |            |            | 36         | V             |  |
| Breakdown Voltage       | $V_{BR}$      | 37         |            |            | V             | $I_T = 1\text{mA}$                                 |
| Reverse Leakage Current | $I_R$         |            |            | 0.1        | $\mu\text{A}$ | $V_{RWM} = 36\text{V}$                             |
| Forward Voltage         | $V_F$         |            |            | 1.2        | V             | $V_F = 10\text{mA}$                                |
| Peak Pulse Current      | $I_{PP}$      |            |            | 25         | A             | $T_P = 8 \times 20\mu\text{s}$                     |
| Clamping Voltage        | $V_C$         |            |            | 60         | V             | $I_{PP} = 10\text{A}$ (8 x 20 $\mu\text{s}$ pulse) |
| Clamping Voltage        | $V_C$         |            |            | 75         | V             | $I_{PP} = 25\text{A}$ (8 x 20 $\mu\text{s}$ pulse) |
| Junction Capacitance    | $C_J$         |            |            | 100        | pF            | $V_R = 0\text{V}$ , $f = 1\text{MHz}$              |

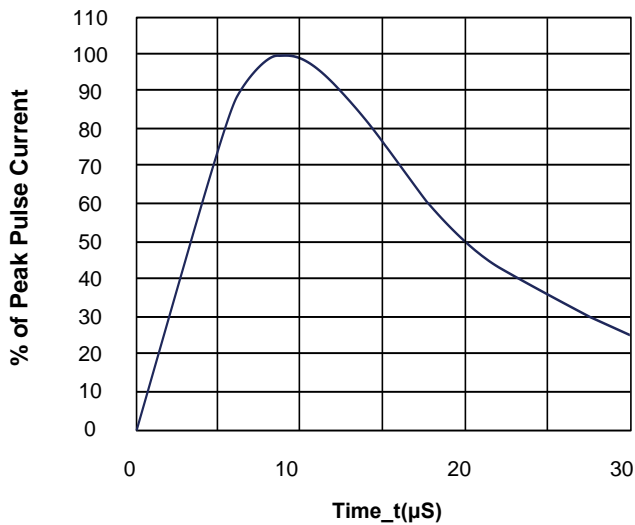
**Typical Performance Characteristics ( $T_A=25^\circ\text{C}$  unless otherwise Specified)**



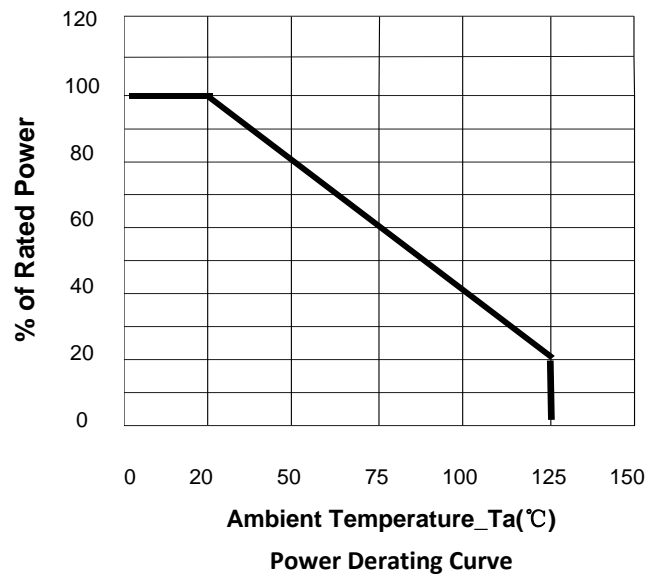
Peak Pulse Power vs. Pulse Time



Clamping Voltage vs. Peak Pulse Current

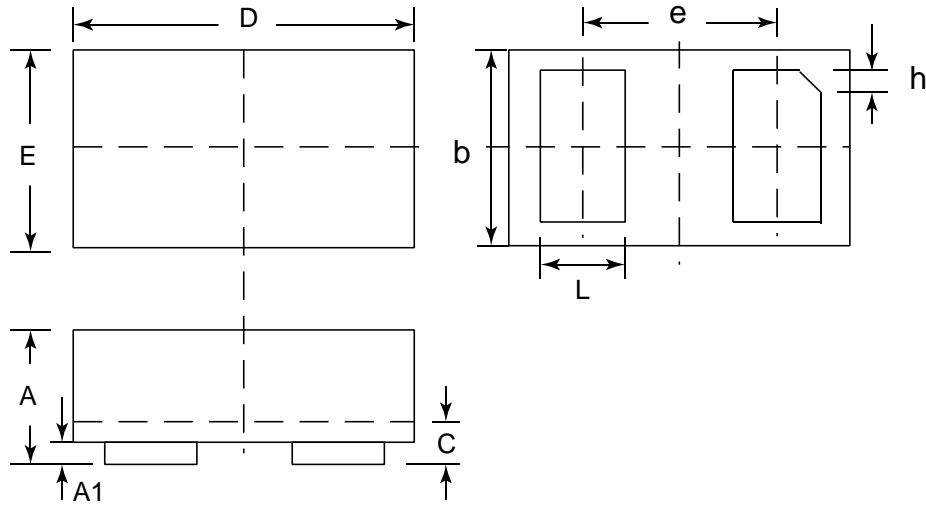


8 X 20uS Pulse Waveform



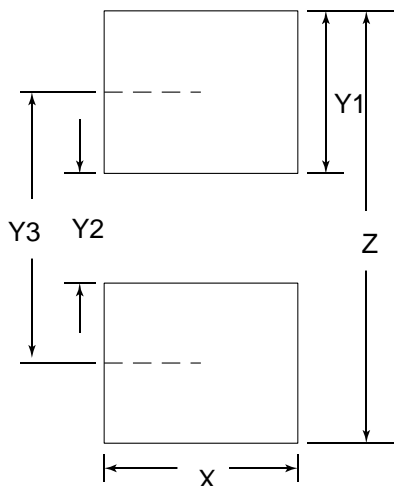
Ambient Temperature  $T_a$  ( $^\circ\text{C}$ )  
Power Derating Curve

**DFN1610-2 Package Outline Drawing**



| SYM | DIMENSIONS  |      |      |           |       |       |
|-----|-------------|------|------|-----------|-------|-------|
|     | MILLIMETERS |      |      | INCHES    |       |       |
|     | MIN         | NOM  | MAX  | MIN       | NOM   | MAX   |
| A   | 0.45        | 0.50 | 0.55 | 0.018     | 0.020 | 0.022 |
| A1  |             | 0.02 | 0.05 |           | 0.001 | 0.002 |
| b   | 0.75        | 0.80 | 0.85 | 0.030     | 0.032 | 0.034 |
| c   | 0.10        | 0.15 | 0.20 | 0.004     | 0.006 | 0.008 |
| D   | 1.55        | 1.60 | 1.65 | 0.062     | 0.064 | 0.066 |
| e   | 1.10 BSC    |      |      | 0.044 BSC |       |       |
| E   | 0.95        | 1.00 | 1.05 | 0.038     | 0.040 | 0.042 |
| L   | 0.35        | 0.40 | 0.45 | 0.014     | 0.016 | 0.018 |

**Suggested Land Pattern**



| SYM | DIMENSIONS  |        |
|-----|-------------|--------|
|     | MILLIMETERS | INCHES |
| X   | 1.00        | 0.040  |
| Y1  | 0.62        | 0.025  |
| Y2  | 0.60        | 0.024  |
| Y3  | 1.22        | 0.049  |
| Z   | 1.85        | 0.074  |

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