

## 500 WATT MULTI-LINE ULTRA LOW CAPACITANCE TVS ARRAY



**SO-8 PACKAGE**

### DESCRIPTION

The PLCDAxx Series are ultra low capacitance multi-line transient voltage suppressor arrays that provides board level protection for standard TTL and CMOS bus line applications against the damaging effects of ESD, tertiary lightning and switching transients.

The PLCDAxx Series has a peak pulse power rating of 500 Watts for an 8/20 $\mu$ s waveshape. This device series meets the IEC 61000-4-2, IEC 61000-4-4 and IEC 61000-4-5 requirements.

### FEATURES

- Compatible with IEC 61000-4-2 (ESD): Air - 15kV, Contact - 8kV
- Compatible with IEC 61000-4-4 (EFT): 40A - 5/50ns
- Compatible with IEC 61000-4-5 (Surge): 24A, 8/20 $\mu$ s - Level 2(Line-Gnd) & Level 3(Line-Line)
- 500 Watts Peak Pulse Power per Line (tp = 8/20 $\mu$ s)
- Bidirectional Configuration
- Available in Multiple Voltages Ranging from 3V to 24V
- Protects Two Lines
- Ultra Low Capacitance: 5pF
- RoHS Compliant
- REACH Compliant

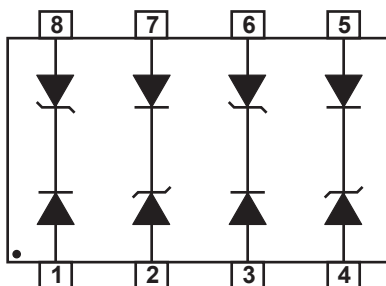
### APPLICATIONS

- Computer Interface Protection
- Ethernet - 10/100/1000 Base T
- Audio/Video Inputs
- Cellular Phone Terminals

### MECHANICAL CHARACTERISTICS

- Molded JEDEC SO-8 Package
- Approximate Weight: 70 milligrams
- Lead-Free Pure-Tin Plating (Annealed)
- Solder Reflow Temperature:  
Pure-Tin - Sn, 100: 260-270°C
- 12mm Tape and Reel Per EIA Standard 481
- Flammability Rating UL 94V-0

### PIN CONFIGURATION



**TYPICAL DEVICE CHARACTERISTICS**
**MAXIMUM RATINGS @ 25°C Unless Otherwise Specified**

| PARAMETER                                     | SYMBOL    | VALUE      | UNITS |
|---|-----------|------------|-------|
| Operating Temperature                         | $T_L$     | -55 to 150 | °C    |
| Storage Temperature                           | $T_{STG}$ | -55 to 150 | °C    |
| Peak Pulse Power (tp = 8/20μs) - See Figure 1 | $P_{PP}$  | 500        | Watts |

**ELECTRICAL CHARACTERISTICS PER LINE @ 25°C Unless Otherwise Specified**

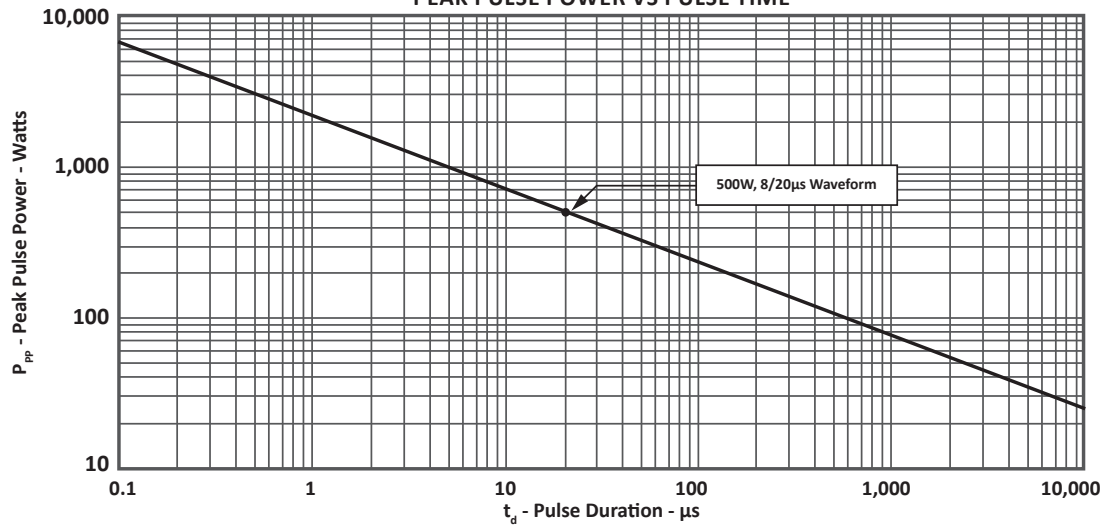
| PART NUMBER<br>(Note 1) | DEVICE MARKING | RATED STAND-OFF VOLTAGE<br><br>$V_{WM}$<br>VOLTS | MINIMUM BREAKDOWN VOLTAGE<br><br>@1mA<br>$V_{(BR)}$<br>VOLTS | MAXIMUM CLAMPING VOLTAGE (Fig. 2)<br><br>@ $I_p = 1A$<br>$V_c$<br>VOLTS | MAXIMUM LEAKAGE CURRENT<br><br>@ $V_{WM}$<br>$I_D$<br>μA | MAXIMUM CAPACITANCE (Note 2)<br><br>@0V, 1MHz<br>C<br>pF |
|-------------------------|----------------|--|--|---|--|--|
| PLCDA03                 | SGA            | 3.3  | 4.5  | 7.0   | 125  | 5  |
| PLCDA05                 | SGB            | 5.0  | 6.0  | 9.8   | 20   | 5  |
| PLCDA08                 | SGF            | 8.0  | 8.5  | 13.4  | 10   | 5  |
| PLCDA12                 | SGC            | 12.0   | 13.3   | 19.0  | 1  | 5  |
| PLCDA15                 | SGD            | 15.0   | 16.7   | 24.0  | 1  | 5  |
| PLCDA24                 | SGE            | 24.0   | 26.7   | 43.0  | 1  | 5  |

**NOTES**

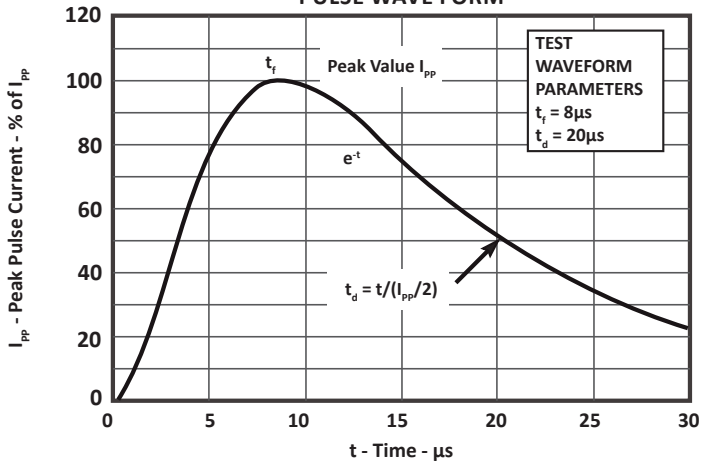
1. Devices are designed to be used in parallel (see application). For other applications, contact the factory. Do not apply surge in the forward direction of this device.
2. Do not surge from pins 8 to 1, 2 to 7, 6 to 3, and 4 to 5. PIV typically greater than 100V for each rectifier diode. Electrical characteristics apply to pins 1 to 8, 7 to 2, 3 to 6 and 5 to 4.

TYPICAL DEVICE CHARACTERISTICS

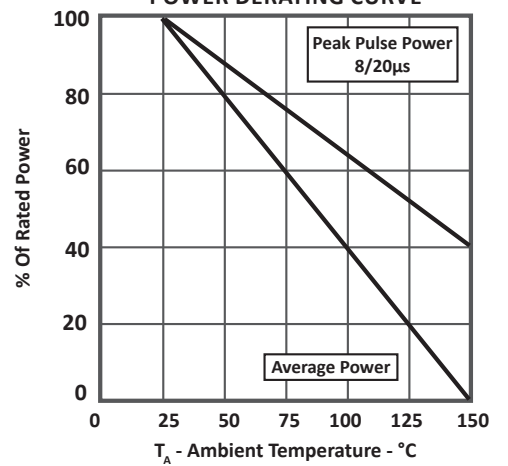
**FIGURE 1**  
PEAK PULSE POWER VS PULSE TIME



**FIGURE 2**  
PULSE WAVE FORM

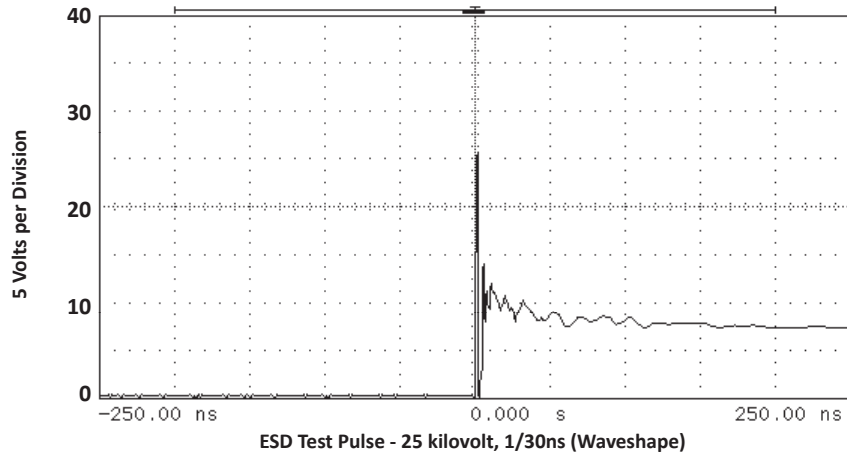


**FIGURE 3**  
POWER DERATING CURVE

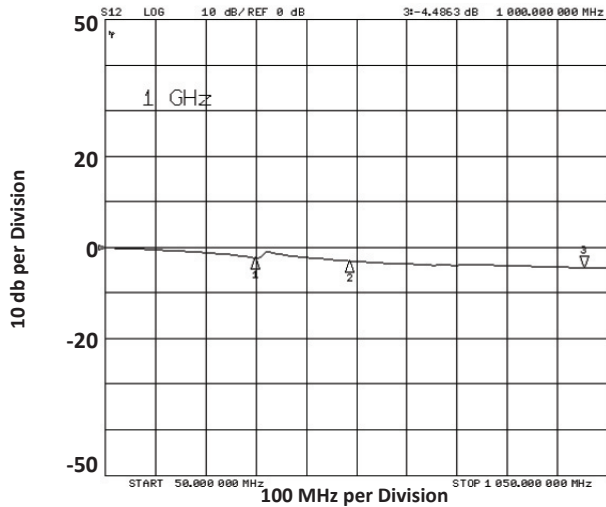


TYPICAL DEVICE CHARACTERISTICS

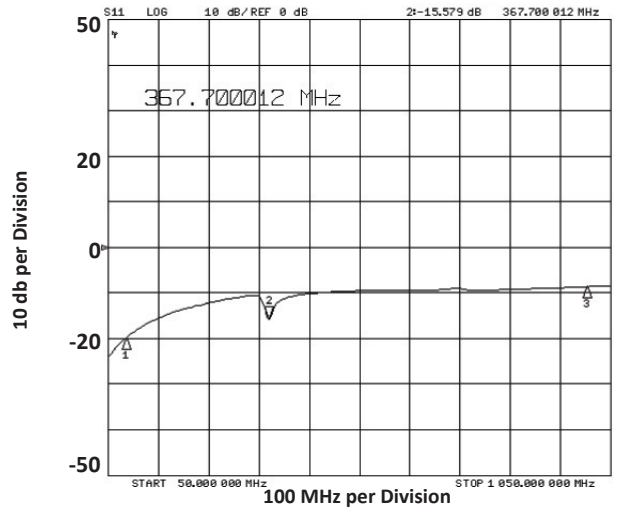
**FIGURE 4**  
OVERSHOOT & CLAMPING VOLTAGE FOR PLCDA05



**FIGURE 5**  
INSERTION LOSS - PLCDA15

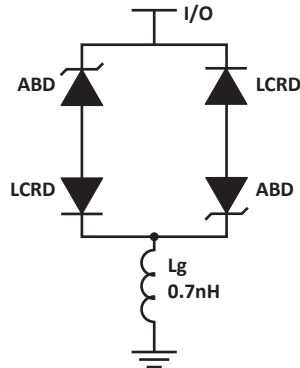


**FIGURE 6**  
RETURN LOSS - PLCDA15



## SPICE MODEL

FIGURE 1  
SPICE MODEL



ABD - Avalanche Breakdown Diode (TVS)  
 LCRD: Low Capacitance Rectifier Diode  
 Lg - Lead Inductance

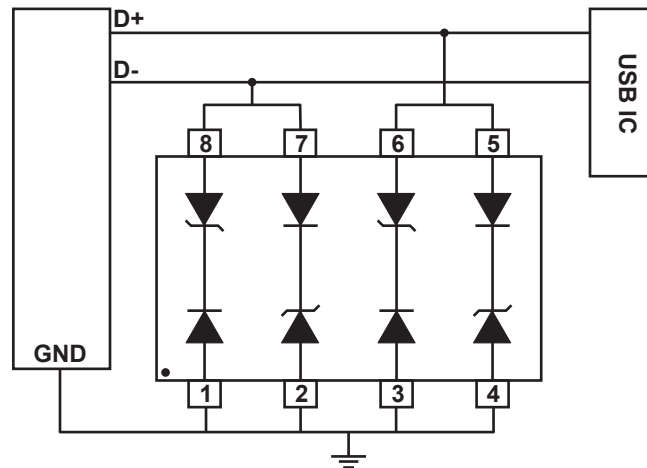
TABLE 1 - SPICE PARAMETERS

| PARAMETER | UNIT          | ABD(TVS)    | LCRD  |
|-----------|---------------|-------------|-------|
| BV        | V             | See Table 2 | 200   |
| IBV       | $\mu\text{A}$ | 1           | 0.01  |
| $C_{jo}$  | pF            | See Table 2 | 5     |
| $I_s$     | A             | See Table 2 | 1E-13 |
| Vj        | V             | 0.6         | 0.6   |
| M         | -             | 0.33        | 0.33  |
| N         | -             | 1           | 1     |
| $R_s$     | Ohms          | See Table 2 | 0.31  |
| TT        | s             | 1E-8        | 1E-9  |
| EG        | eV            | 1.11        | 1.11  |

TABLE 2 - ABD SPECIFIC SPICE PARAMETERS

| PART NUMBER | $B_v$ (VOLTS) | $C_{jo}$ (pF) | $I_s$ (AMPS) | $R_s$ (OHMS) |
|-------------|---------------|---------------|--------------|--------------|
| PLCDA03     | 4.5           | 438           | 1E-11        | 0.21         |
| PLCDA05     | 6.0           | 284           | 1E-11        | 0.14         |
| PLCDA08     | 8.5           | 146           | 1E-13        | 0.275        |
| PLCDA12     | 13.3          | 123           | 1E-13        | 0.4          |
| PLCDA15     | 16.7          | 102           | 1E-13        | 0.52         |
| PLCDA24     | 26.7          | 61            | 1E-13        | 1.54         |

## APPLICATION INFORMATION



### FIGURE 1 - BIDIRECTIONAL COMMON-MODE USB PROTECTION

Circuit connectivity is as follows:

- Pins 1, 2, 3 and 4 connected to ground.
- Pins 5 and 6 connected to I/O Line D+.
- Pins 7 and 8 connected to I/O Line D-.

### CIRCUIT BOARD RECOMMENDATIONS

Circuit board layout is critical for electromagnetic compatibility protection. The following guidelines are recommended:

- The protection device should be placed near the input terminals or connectors, the device will divert the transient current immediately before it can be coupled into the nearby traces.
- The path length between the TVS device and the protected line should be minimized.
- All conductive loops including power and ground loops should be minimized.
- The transient current return path to ground should be kept as short as possible to reduce parasitic inductance.
- Ground planes should be used whenever possible. For multilayer PCBs, use ground vias.

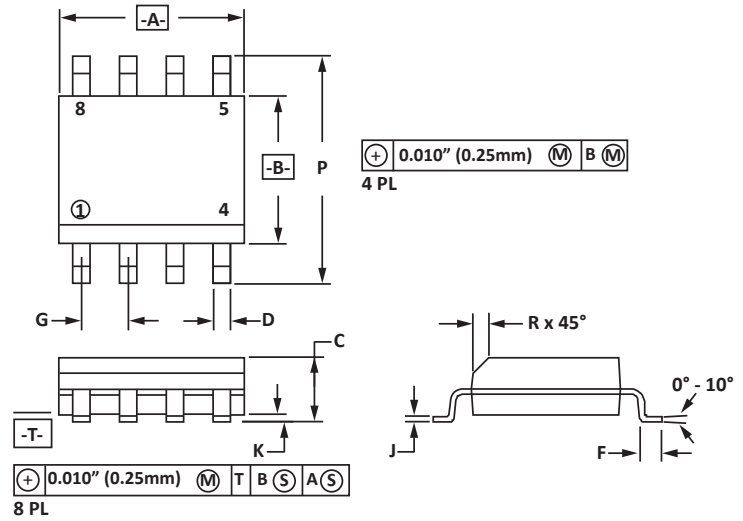
## SO-8 PACKAGE INFORMATION

## OUTLINE DIMENSIONS

| DIM | MILLIMETERS |      | INCHES   |       |
|-----|-------------|------|----------|-------|
|     | MIN         | MAX  | MIN      | MAX   |
| A   | 4.80        | 5.00 | 0.189    | 0.196 |
| B   | 3.80        | 4.00 | 0.150    | 0.157 |
| C   | 1.35        | 1.75 | 0.054    | 0.068 |
| D   | 0.35        | 0.49 | 0.014    | 0.019 |
| F   | 0.40        | 1.25 | 0.016    | 0.049 |
| G   | 1.27 BSC    |      | 0.05 BSC |       |
| J   | 0.18        | 0.25 | 0.007    | 0.009 |
| K   | 0.10        | 0.25 | 0.004    | 0.008 |
| P   | 5.80        | 6.20 | 0.229    | 0.244 |
| R   | 0.25        | 0.50 | 0.010    | 0.019 |

## NOTES

- T = Seating plane and datum surface.
- Dimensions "A" and "B" are datum.
- Dimensions "A" and "B" do not include mold protrusion.
- Maximum mold protrusion is 0.015" (0.380mm) per side.
- Dimensioning and tolerances per ANSI Y14.5M, 1982.
- Dimensions are exclusive of mold flash and metal burrs.

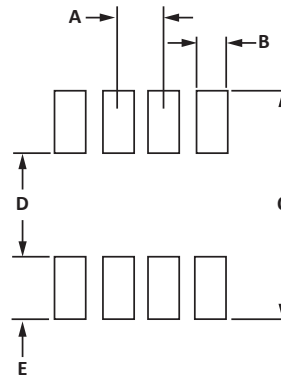


## PAD LAYOUT DIMENSIONS

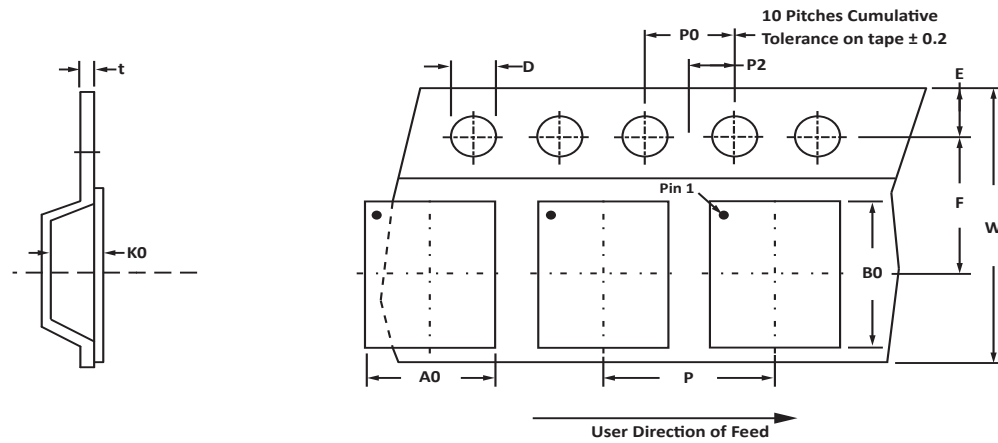
| DIM | MILLIMETERS |      | INCHES |       |
|-----|-------------|------|--------|-------|
|     | MIN         | MAX  | MIN    | MAX   |
| A   | 1.14        | 1.40 | 0.045  | 0.055 |
| B   | 0.64        | 0.89 | 0.025  | 0.035 |
| C   | 6.22        | -    | 0.245  | -     |
| D   | 3.94        | 4.17 | 0.155  | 0.165 |
| E   | 1.02        | 1.27 | 0.040  | 0.050 |

## NOTES

- Controlling dimension: inches.



## TAPE AND REEL



## SPECIFICATIONS

| REEL DIA.  | TAPE WIDTH | A0          | B0          | K0          | D           | E           | F           | W            | P0          | P2          | P           | t <sub>max</sub> |
|------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|-------------|-------------|-------------|------------------|
| 178mm (7") | 12mm       | 6.50 ± 0.10 | 5.40 ± 0.10 | 2.00 ± 0.10 | 1.50 ± 0.10 | 1.75 ± 0.10 | 5.50 ± 0.05 | 12.00 ± 0.30 | 4.00 ± 0.12 | 2.00 ± 0.10 | 4.00 ± 0.10 | 0.25             |

## NOTES

1. Dimensions are in millimeters.
2. Surface mount product is taped and reeled in accordance with EIA-481.
3. Suffix - T7 = 7" Reel - 1,000 pieces per 12mm tape.
4. Suffix - T13 = 13" Reel - 2,500 pieces per 12mm tape.
5. Bulk product shipped in tubes of 98 pieces per tube.
6. Marking on Part - marking code (see page 2), date code, logo and pin one defined by dot on top of package.

Package outline, pad layout and tape specifications per document number 06011.R4 8/10.

## ORDERING INFORMATION

| BASE PART NUMBER<br>(xx = Voltage) | LEADFREE SUFFIX | TAPE SUFFIX | QTY/REEL | REEL SIZE | TUBE QTY |
|------------------------------------|-----------------|-------------|----------|-----------|----------|
| PLCDAxx                            | -LF             | -T7         | 1,000    | 7"        | 98       |
| PLCDAxx                            | -LF             | -T13        | 2,500    | 13"       | 98       |



## COMPANY INFORMATION

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### COMPANY PROFILE

ProTek Devices, based in Tempe, Arizona USA, is a manufacturer of Transient Voltage Suppression (TVS) products designed specifically for the protection of electronic systems from the effects of lightning, Electrostatic Discharge (ESD), Nuclear Electromagnetic Pulse (NEMP), inductive switching and EMI/RFI. With over 25 years of engineering and manufacturing experience, ProTek designs TVS devices that provide application specific protection solutions for all electronic equipment/systems.

ProTek Devices Analog Products Division, also manufactures analog interface, control, RF and power management products.

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