

## HIGH SPEED TVS DIODE ARRAY

### APPLICATIONS

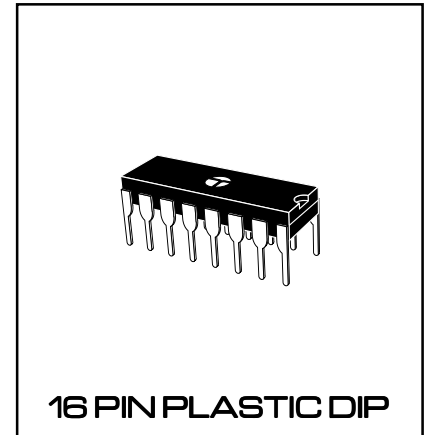
- ✓ Ethernet - 10/100 Base T
- ✓ RS-485
- ✓ xDSL & ATM
- ✓ SCSI & USB
- ✓ Audio/Video I/O Ports

### IEC COMPATIBILITY (EN61000-4)

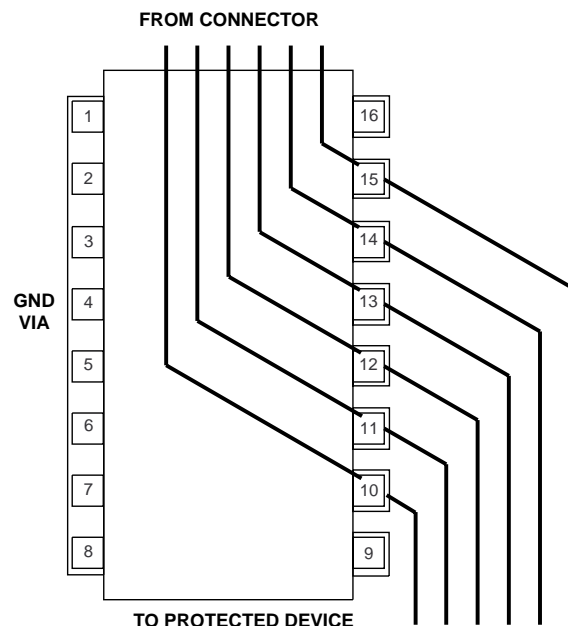
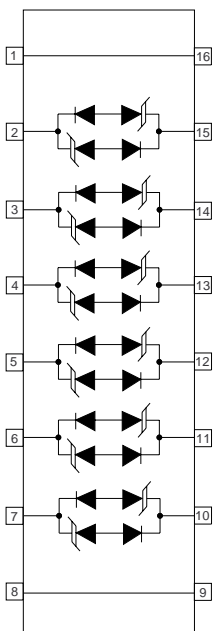
- ✓ 61000-4-2 (ESD): Air - 15kv, Contact - 8kv
- ✓ 61000-4-4 (EFT): 40A - 5/50ns
- ✓ 61000-4-5 (Lightning): Level 1 & 2, 12A & 24A, 8/20  $\mu$ s

### FEATURES

- ✓ Suitable for Low Capacitance High Speed V<sup>2</sup>D Protection
- ✓ 500 Watts Peak Pulse Power Dissipation per Line (8/20  $\mu$ s)
- ✓ Bidirectional Configuration
- ✓ ESD Protection > 40 kilovolts
- ✓ Low Capacitance - 15 pF
- ✓ Available in 5 Voltage Types: 5.0V to 24V
- ✓ Standard Dual-In-Line Package
- ✓ Protects Up to Six (6) Lines
- ✓ UL 94V-0 Flammability Classification



## CIRCUIT DIAGRAM & PCB LAYOUT RECOMMENDATION



## DEVICE CHARACTERISTICS

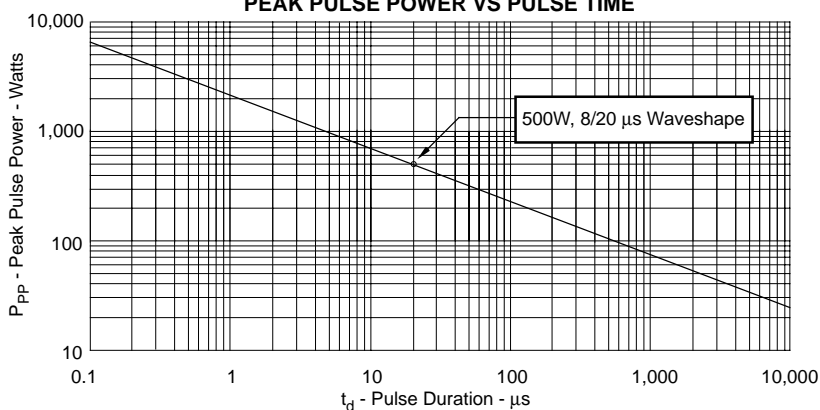
MECHANICAL CHARACTERISTICS		MAXIMUM RATINGS	
<b>PACKAGE</b>	Molded 16 Pin Dual-in-Line Package	<b>P<sub>PP</sub> @ 25°C (SEE FIGURE 1)</b>	500 Watts, 8/20 $\mu$ s Waveshape
<b>APPROX. WEIGHT</b>	1.2 grams	<b>OPERATING &amp; STORAGE TEMPERATURE</b>	-55°C to +150°C
<b>DEVICE MARKINGS</b>	Logo & Part Number	<b>REPETITION RATE (DUTY CYCLE)</b>	0.01%
<b>MISCELLANEOUS</b>	Pin No. 1 Indicated by Dot on Package	<b>T<sub>CLAMPING</sub> (0 VOLTS TO V<sub>(BR)</sub> MIN.)</b>	Bidirectional: < 1 x 10 <sup>-9</sup> seconds

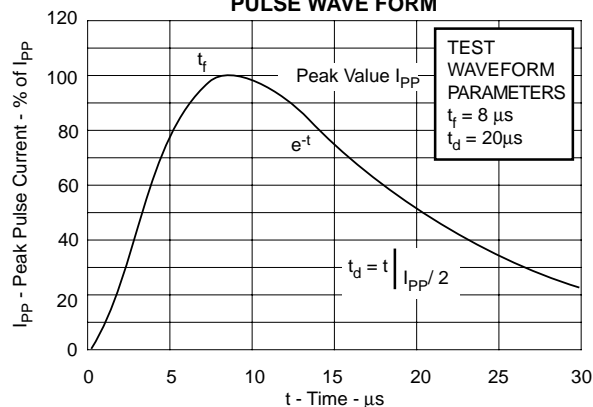
ELECTRICAL CHARACTERISTICS @ 25° C Ambient Temperature							
PROTEK PART NUMBER (See Note 1)	RATED STAND-OFF VOLTAGE  V <sub>WM</sub> VOLTS	MINIMUM BREAKDOWN VOLTAGE  @ 1 mA V <sub>(BR)</sub> VOLTS	MAXIMUM CLAMPING VOLTAGE (See Fig. 2) @ I <sub>P</sub> = 1 A V <sub>C</sub> VOLTS	MAXIMUM CLAMPING VOLTAGE (See Fig. 2) @ 8/20 $\mu$ s V <sub>C</sub> @ I <sub>PP</sub>	MAXIMUM LEAKAGE CURRENT  @ V <sub>WM</sub> I <sub>D</sub> $\mu$ A	MAXIMUM CAPACITANCE  @ 0V, 1 MHz C pF	TEMPERATURE COEFFICIENT OF V <sub>(BR)</sub>  $\ominus$ V <sub>(BR)</sub> mV/°C
LCA05C	5.0	6.0	9.8	22V @ 40A	100	15	3
LCA08C	8.0	8.5	12.3	22.5V @ 30A	10	15	9
LCA12C	12.0	13.3	19.0	28V @ 25A	4	15	16
LCA15C	15.0	16.7	25.5	36V @ 20A	4	15	17
LCA24C	24.0	26.7	40.0	56V @ 12A	4	15	26

**Note 1:** Tested on pin pairs 2 & 15, 3 & 14, 4 & 13, 5 & 12, 6 & 11 and 7 & 10. Pins 1, 8, 9 and 16 are not active and are for position only.

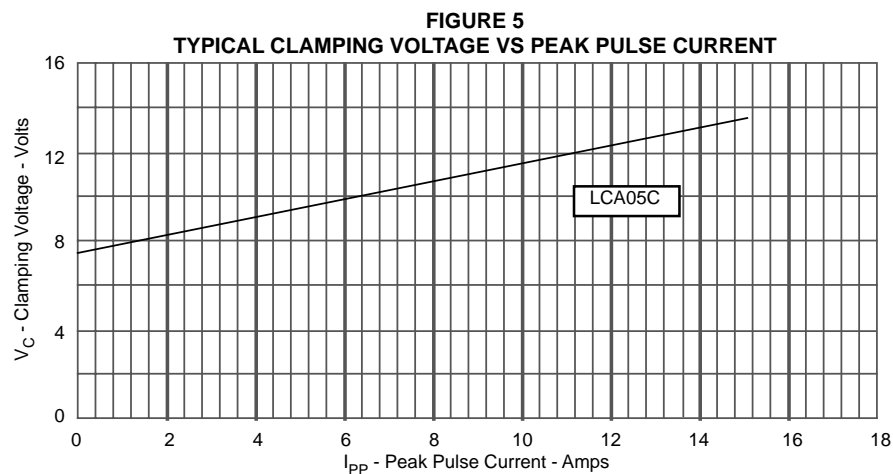
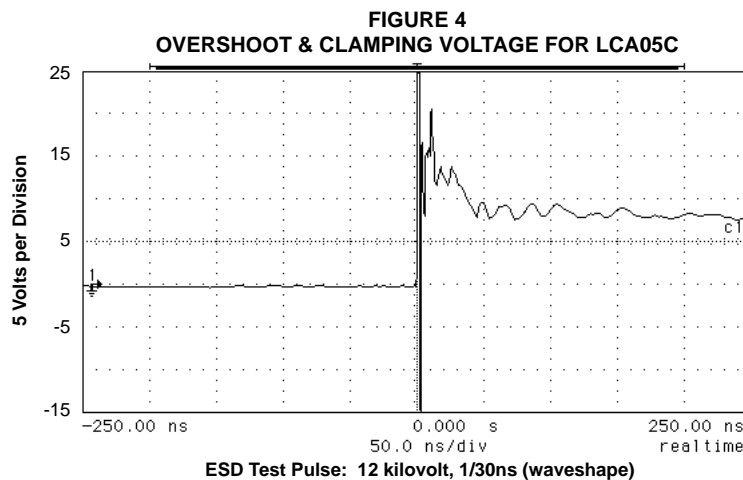
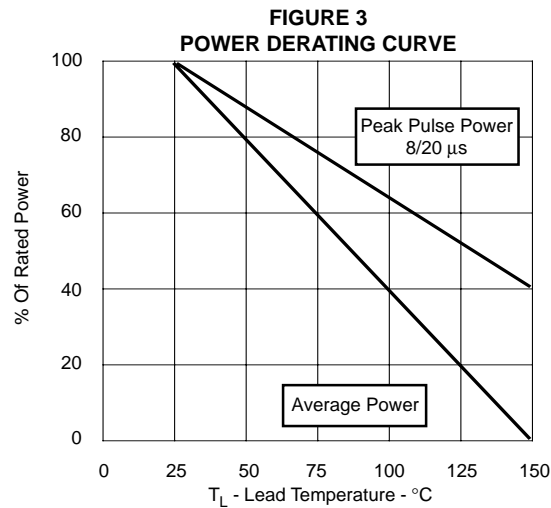
**FIGURE 1  
PEAK PULSE POWER VS PULSE TIME**



**FIGURE 2  
PULSE WAVE FORM**



## DEVICE CHARACTERISTICS



## DEVICE SPECIFIC APPLICATION NOTE

The LCA Series are bidirectional, low capacitance, silicon TVS devices designed to protect multiple data or signal lines. This device provides ESD protection > 40kV and has a 500 Watt peak pulse power dissipation for an 8/20  $\mu$ s pulse per line.

The LCA is ideal for use in protecting multimode transceiver I/O lines and data communications applications such as USB. This low capacitance device allows these types of applications to operate safely without significant signal distortion. When a transient voltage strikes a data line, the device becomes a low impedance path diverting the transient current to ground. TVS devices are capable of clamping both positive and negative transient voltages to a low enough level such that a sensitive IC component will not be damaged.

As shown in Figure 1, a typical RS-485 transceiver application, the LCA protects up to four (4) bidirectional lines where the normal signal voltage is both positive and negative. Each pin pair is symmetrical so that each pair can be connected to both data lines and ground. In order to insure low crosstalk and isolation, each line/ground pin pair is electrically independent of each other. Pins 3, 4, 10, and 11 are connected to ground. Pins 2, 5, 6, 7, 12, 13, 14 and 15 are connected to the data lines. Pins 1, 8, 9 and 16 are not active and for position only.

In addition, the LCA can protect up to three USB ports. As shown in Figure 2, in order to provide common-mode protection, pins 15 through 10 can be connected to the data lines and pins 2 through 7 can be connected to ground.

### Circuit Board Layout Recommendations

Circuit board layout is critical for Electromagnetic Compatibility (EMC) protection. The following guidelines are recommended:

- ✓ The LCA should be placed near the input terminals or connectors. By placing the TVS close to the 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.

Figure 1. RS-485 Transceiver Protection Circuit (Common & Differential-Mode)

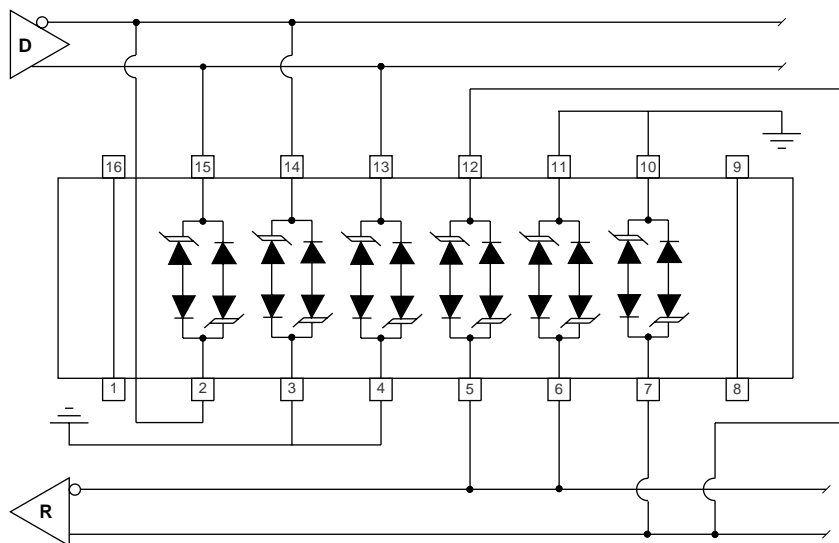
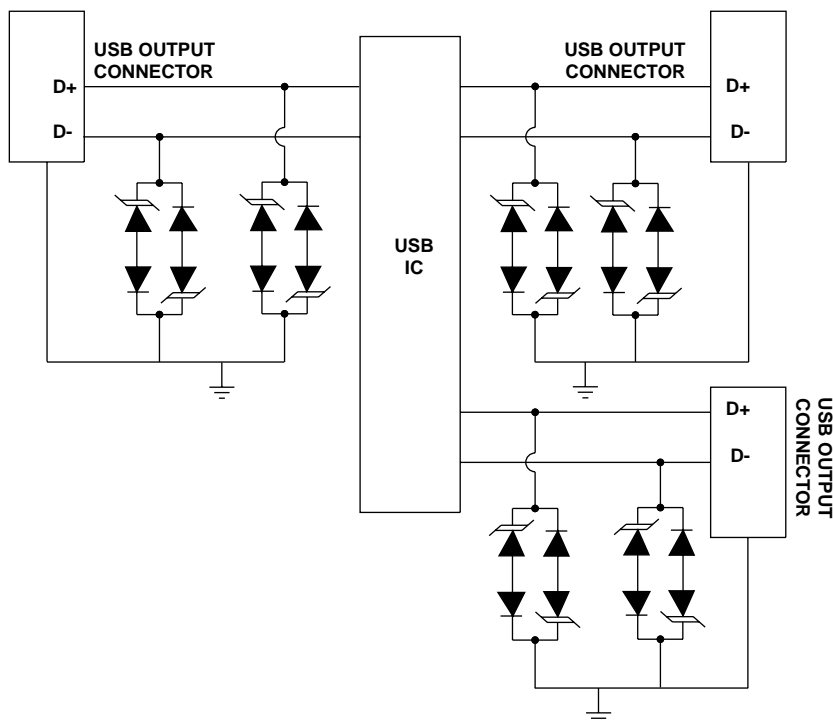
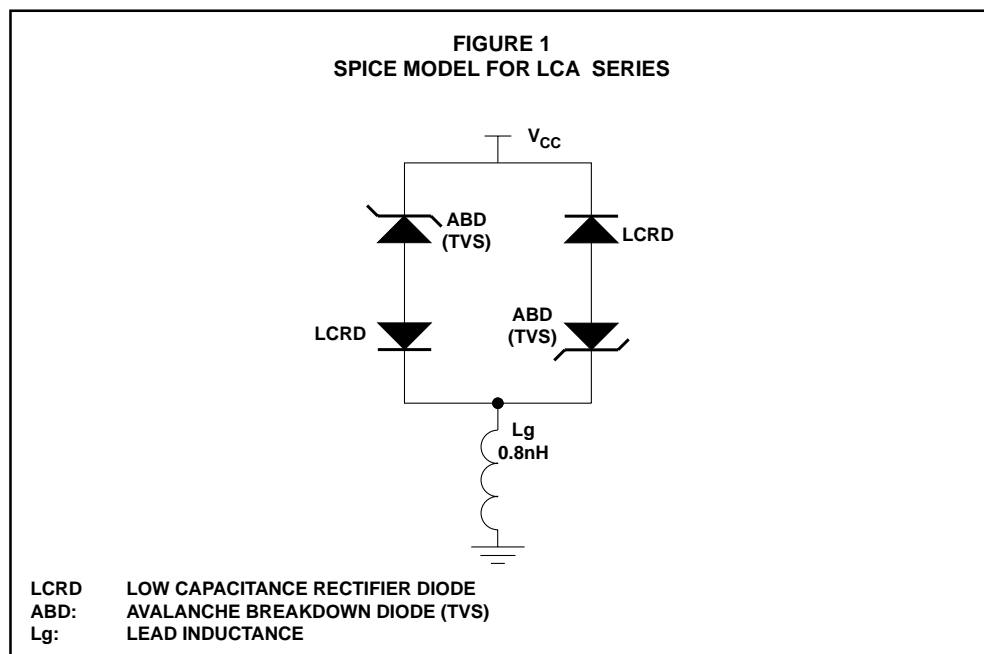


Figure 2. Typical Common-Mode USB Protection Circuit



## SPICE MODEL & PARAMETERS



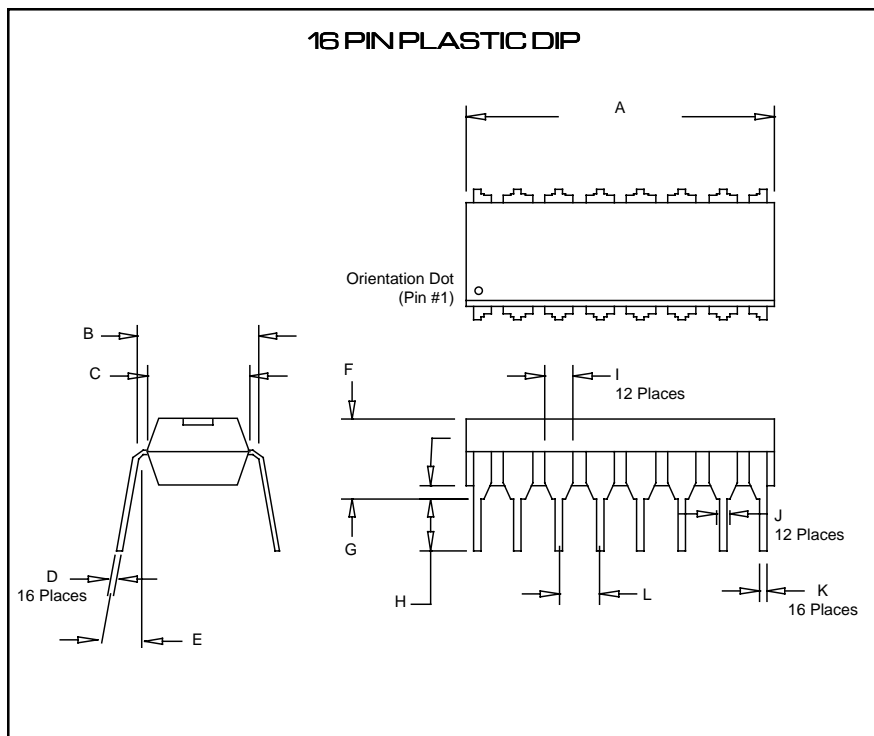
**TABLE 1 - SPICE PARAMETERS**

PARAMETER	UNIT	ABD (TVS)	LCRD
BV	V	See Table 2	200
IBV	μA	1	0.01
Cjo	pF	See Table 2	5
Is	A	See Table 2	10E <sup>-14</sup>
Vj	V	0.6	0.6
M	-	0.33	0.33
N	-	1	1
Rs	Ohms	See Table 2	0.31
TT	μs	0.1	1
EG	eV	1.11	1.11

**TABLE 2 - ABD SPECIFIC SPICE PARAMETERS**

PART NO.	BV (Volts)	Cjo (pF)	Is (Amps)	Rs (Ohms)
LCA05C	6.0	893	10E <sup>-12</sup>	0.09
LCA08C	8.5	481	10E <sup>-14</sup>	0.18
LCA12C	13.3	319	10E <sup>-14</sup>	0.22
LCA15C	16.7	238	10E <sup>-14</sup>	0.31
LCA24C	26.7	210	10E <sup>-14</sup>	0.93

## PACKAGE OUTLINES & DIMENSIONS



16 PIN DIP DIMENSIONS				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	-	19.8	-	0.780
B	6.10	6.60	0.240	0.260
C	7.37	7.87	0.290	0.310
D	0.25	0.36	0.010	0.014
E	0°	10°	0°	10°
F	0.51	-	0.020	-
G	-	5.08	-	0.200
H	3.17	-	0.125	-
I	-	1.78	-	0.070
J	0.84 TYP	0.84 TYP	0.033 TYP	0.033 TYP
K	0.381	0.533	0.021	0.051
L	2.54 TYP	2.54 TYP	0.100 TYP	0.100 TYP

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