

HIGH SPEED TVS DIODE ARRAY

APPLICATIONS

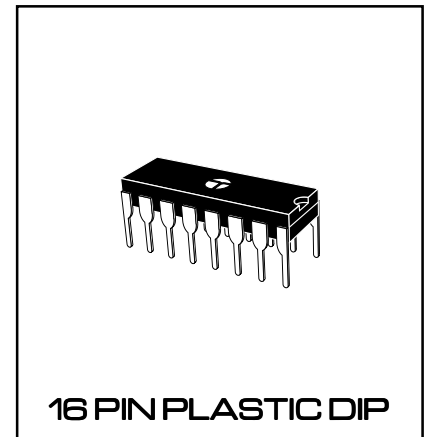
- ✓ Ethernet - 10/100 Base T
- ✓ RS-485
- ✓ xDSL & ATM
- ✓ SCSI & USB
- ✓ Audio/Video I/O Ports

IEC COMPATIBILITY(EN61000-4)

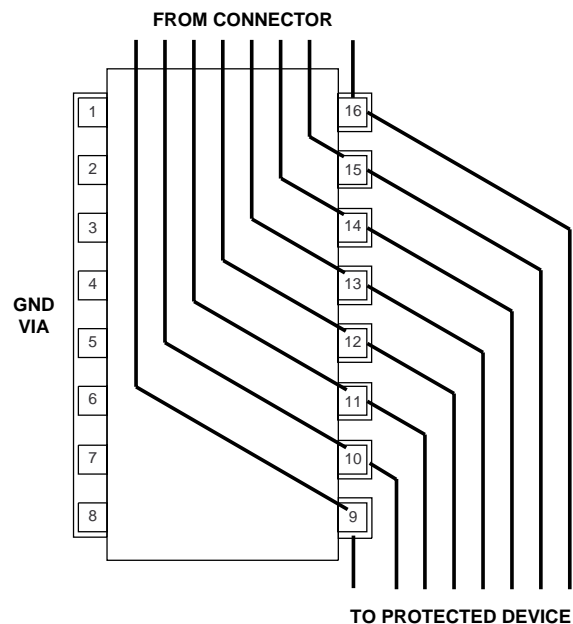
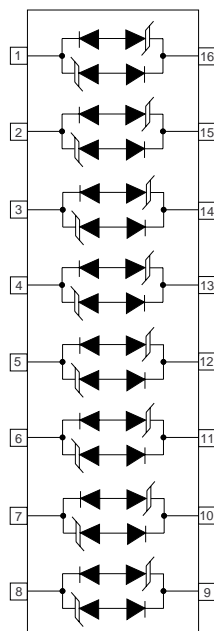
- ✓ 64100-4-2 (ESD): Air - 15kv, Contact - 8kv
- ✓ 64100-4-4 (EFT): 40A - 5/50ns
- ✓ 64100-4-5 (Lightning):

FEATURES

- ✓ Suitable for Low Capacitance High Speed V²D Protection
- ✓ 500 Watts Peak Pulse Power Dissipation per Line (8/20 μ 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 Eight (8) Lines
- ✓ UL 94V-0 Flammability Classification



CIRCUIT DIAGRAM & PCB LAYOUT RECOMMENDATION



DEVICE CHARACTERISTICS

MECHANICAL CHARACTERISTICS		MAXIMUM RATINGS	
PACKAGE	Molded 16 Pin Dual-in-Line Package	P_{PP} @ 25°C (SEE FIGURE 1)	500 Watts, 8/20 μ s Waveshape
APPROX. WEIGHT	1.2 grams	OPERATING & STORAGE TEMPERATURE	-55°C to +150°C
DEVICE MARKINGS	Logo & Part Number	REPETITION RATE (DUTY CYCLE)	0.01%
MISCELLANEOUS	Pin 1 Indicated by Dot on Top of Package	T_{CLAMPING} (0 VOLTS TO V_(BR) MIN.)	Bidirectional: < 1 x 10 ⁻⁹ seconds

ELECTRICAL CHARACTERISTICS @ 25° C Ambient Temperature							
PROTEK PART NUMBER (See Note 1)	RATED STAND-OFF VOLTAGE V _{WM} VOLTS	MINIMUM BREAKDOWN VOLTAGE @ 1 mA V _(BR) VOLTS	MAXIMUM CLAMPING VOLTAGE (See Fig. 2) @ I _p = 1 A V _C VOLTS	MAXIMUM CLAMPING VOLTAGE (See Fig. 2) @ 8/20 μ s V _C @ I _{PP}	MAXIMUM LEAKAGE CURRENT @ V _{WM} I _D μ A	MAXIMUM CAPACITANCE @ 0V, 1 MHz C pF	TEMPERATURE COEFFICIENT OF V _(BR) \ominus V _(BR) mV/°C
LCD05C	5.0	6.0	9.8	22V @ 40A	100	15	3
LCD08C	8.0	8.5	12.3	23.5V @ 22A	10	15	9
LCD12C	12.0	13.3	19.0	28V @ 25A	4	15	16
LCD15C	15.0	16.7	25.5	36V @ 20A	4	15	17
LCD24C	24.0	26.7	40.0	56V @ 12A	4	15	26

Note 1: Tested on pin pairs 1 & 16, 2 & 15, 3 & 14, 4 & 13, 5 & 12, 6 & 11, 7 & 10 and 8 & 9.

FIGURE 1
PEAK PULSE POWER VS PULSE TIME

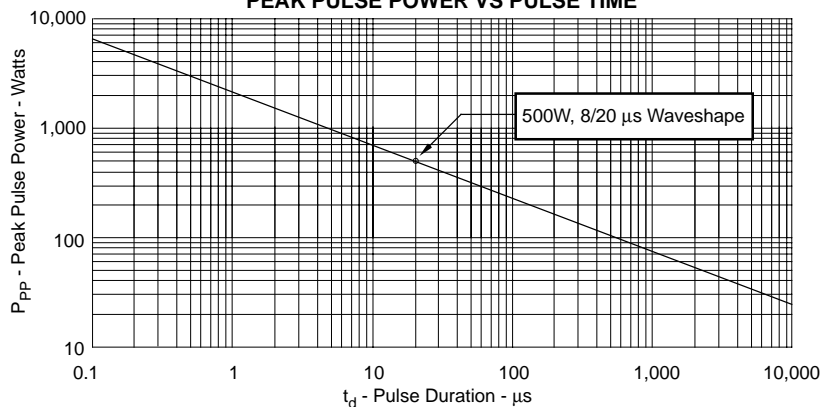
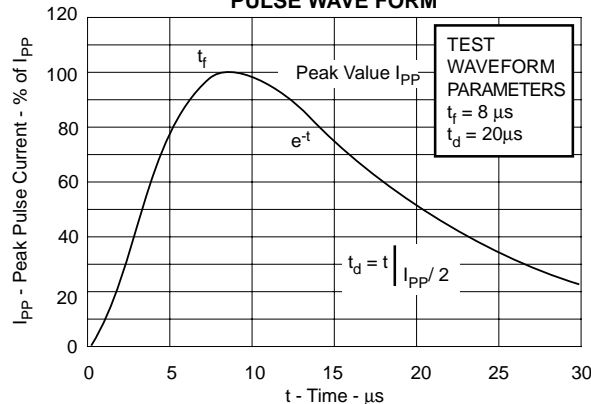
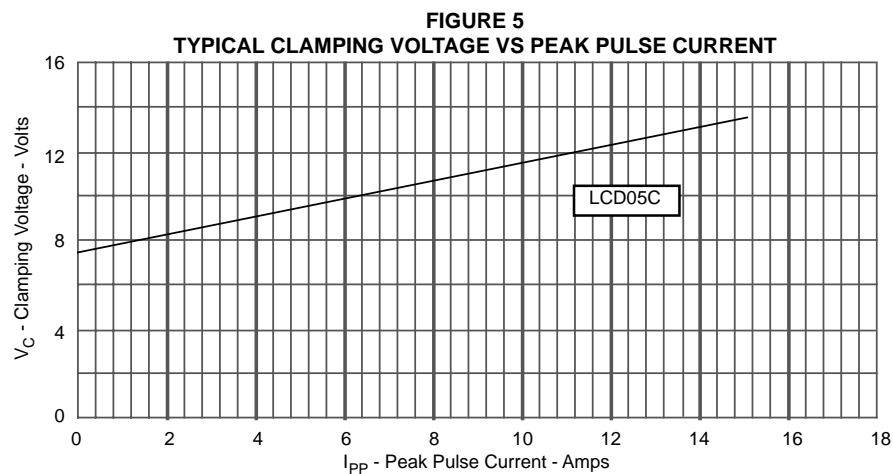
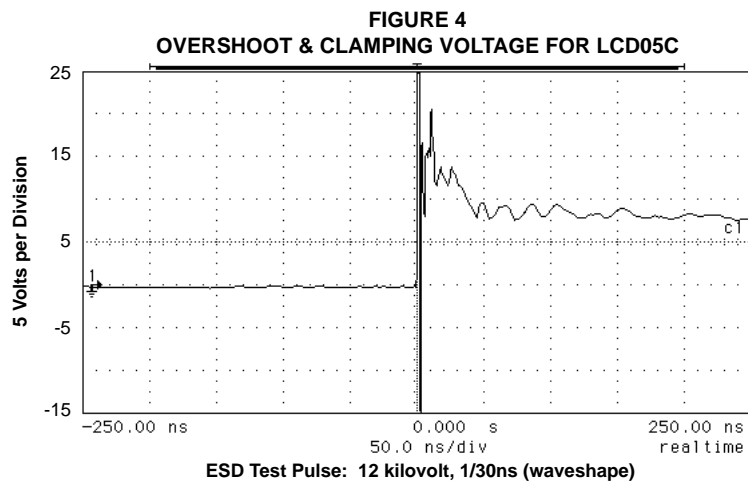
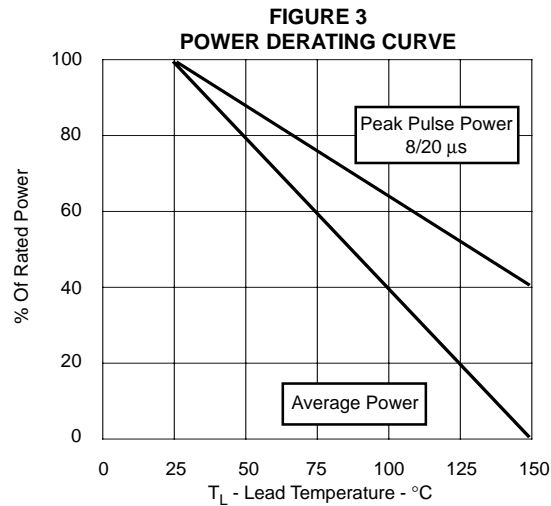


FIGURE 2
PULSE WAVE FORM



DEVICE CHARACTERISTICS



DEVICE SPECIFIC APPLICATION NOTE

The LCD 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 μ s pulse per line.

The LCD 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 LCD 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 1, 2, 3, 4, 9, 10, 11 and 12 are connected to ground. Pins 5, 6, 7, 8, 13, 14, 15 and 16 are connected to the data lines.

In addition, the LCD can protect up to four USB ports. As shown in Figure 2, in order to provide common-mode protection, pins 16 through 10 can be connected to the data lines and pins 1 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 LCD 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. Typical RS-485 Transceiver Protection Circuit (Differential & Common-Mode)

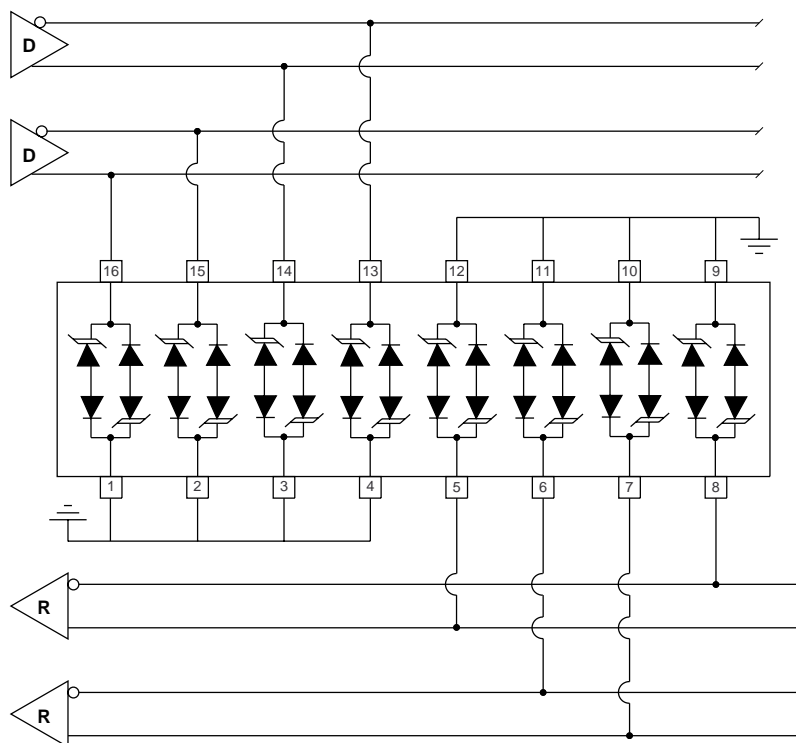
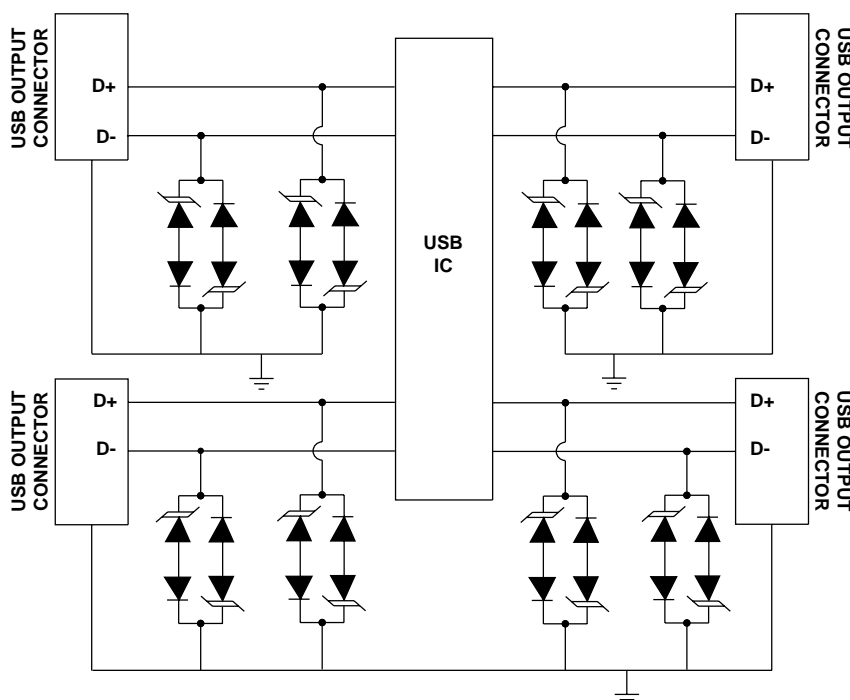
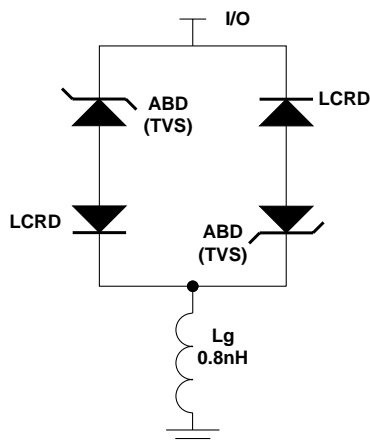


Figure 2. Typical Common-Mode USB Protection Circuit



SPICE MODEL & PARAMETERS

**FIGURE 1
SPICE MODEL FOR LCD SERIES**



LCRD: LOW CAPACITANCE RECTIFIER DIODE
ABD: AVALANCHE BREAKDOWN DIODE (TVS)
Lg: LEAD INDUCTANCE

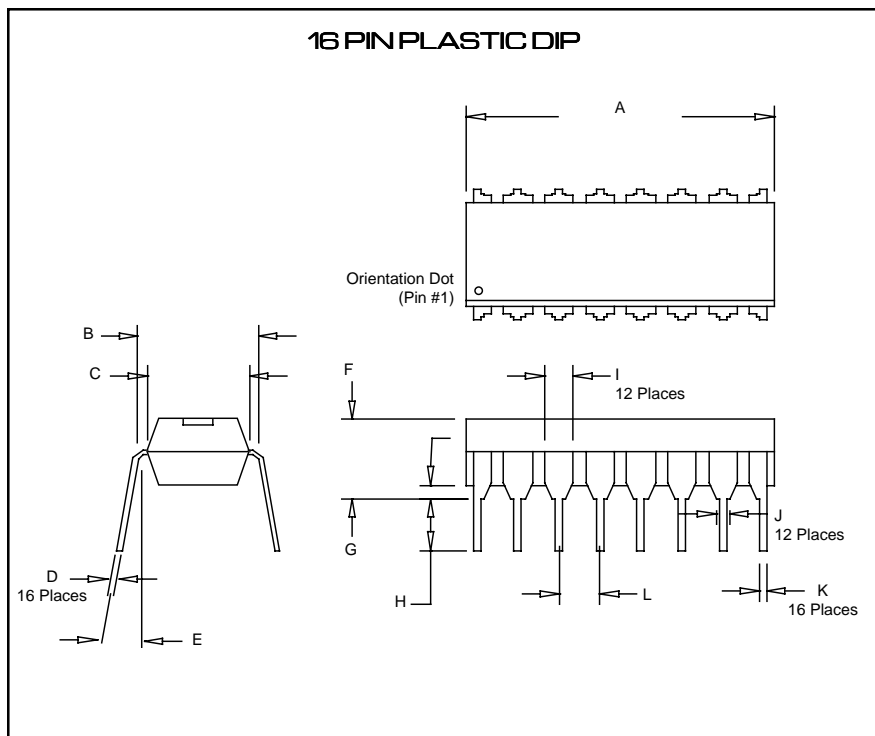
TABLE 1 - SPICE PARAMETERS

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-14
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)
LCD05C	6.0	880	10E-12	0.09
LCD08C	8.5	481	10E-14	0.18
LCD12C	13.3	319	10E-14	0.22
LCD15C	16.7	238	10E-14	0.31
LCD24C	26.7	210	10E-14	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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