

## HIGH POWERED MULTI-LINE LOW CAPACITANCE TVS ARRAY



**SO-16 PACKAGE**

### DESCRIPTION

The SMLCxxC-2 Series are high powered multi-line low capacitance transient voltage suppressor arrays that provide board level protection for standard TTL and MOS bus line applications against the damaging effects of ESD, tertiary lightning and switching transients.

This series has a peak pulse power rating of 400 Watts for an 10/1000 $\mu$ 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): 100A (*Applies to 6.5V Only*)
- 400 Watts Peak Pulse Power per Line ( $t_p = 10/1000\mu s$ )
- 3,900 Watts Peak Pulse Power per Line ( $t_p = 8/20\mu s$ )
- $ITKU.20 I_{pp} @ 40A (5/310\mu s)$  - (*Applies to 6.5V Only*)
- Bidirectional Configuration
- High Surge Capability
- Available in Multiple Voltages
- Protects 2 Bidirectional Lines
- Low Capacitance < 30pF per Line Pair
- RoHS Compliant
- REACH Compliant

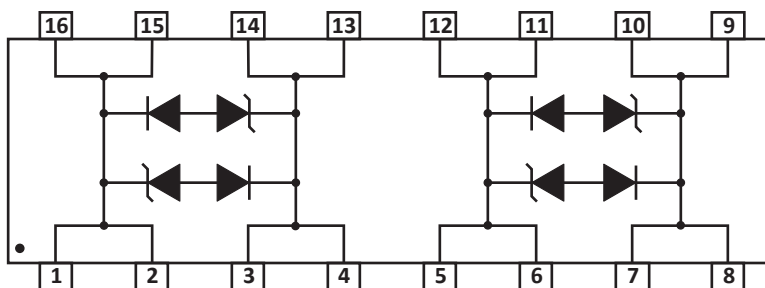
### APPLICATIONS

- T1/E1
- RS-422, RS-423 & RS-485
- SDH/SONET, ATM Equipment & Systems
- Industrial Control and Monitoring
- Cable Modem Intra-Building Protection
- Customer Premise Equipment (CPE)

### MECHANICAL CHARACTERISTICS

- Molded JEDEC SO-16 Package
- Approximate Weight: 0.15 grams
- Lead-Free Pure-Tin Plating (Annealed)
- Solder Reflow Temperature:  
Pure-Tin - Sn, 100: 260-270°C
- 16mm Tape and Reel Per EIA Standard 481
- Flammability Rating UL 94V-0

### PIN CONFIGURATION



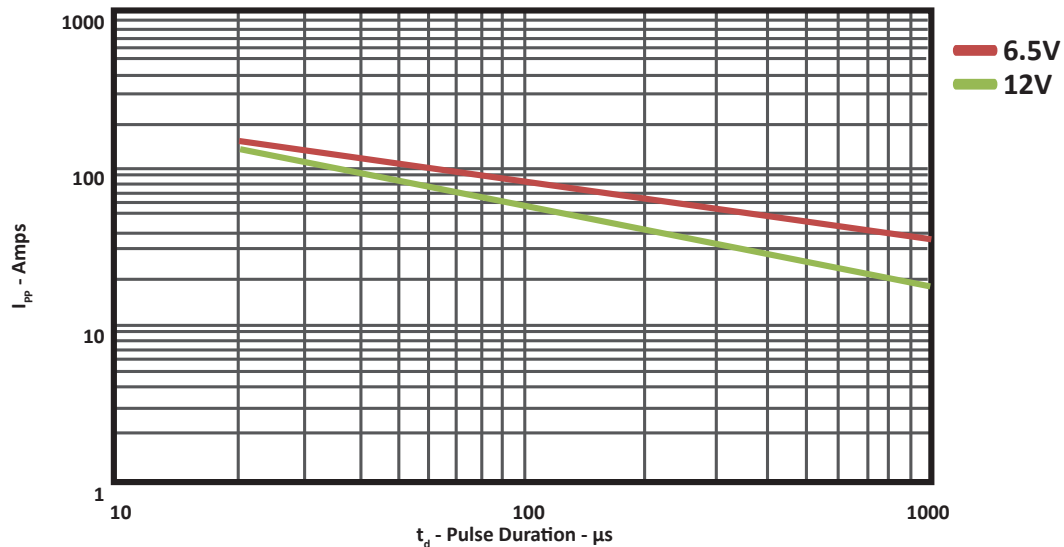
**TYPICAL DEVICE CHARACTERISTICS**
**MAXIMUM RATINGS @ 25°C Unless Otherwise Specified**

PARAMETER	SYMBOL	VALUE	UNITS
Operating Temperature	$T_L$	-55 to 150	°C
Storage Temperature	$T_{STG}$	-55 to 150	°C
Peak Pulse Power ( $t_p = 8/20\mu s$ ) - See Figure 1	$P_{PP}$	3,900	Watts
Peak Pulse Power ( $t_p = 10/1000\mu s$ ) - See Figure 1	$P_{PP}$	400	Watts

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

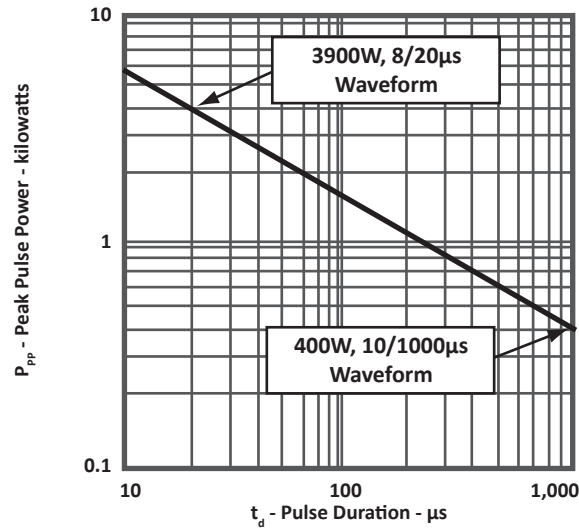
PART NUMBER	RATED STAND-OFF VOLTAGE	MINIMUM BREAKDOWN VOLTAGE	MAXIMUM CLAMPING VOLTAGE (Fig. 3)	MAXIMUM LEAKAGE CURRENT	TYPICAL CAPACITANCE
	$V_{WM}$ VOLTS	@1mA $V_{(BR)}$ VOLTS	@ 8/20 $\mu s$ $V_C @ I_{PP}$	@ $V_{WM}$ $I_D$ $\mu A$	@0V, 1MHz C pF
SMLC6.5C-2	6.5	7.2	28.0V @ 150.0A	300	30
SMLC12C-2	12.0	13.3	35.0V @ 140.0A	2	30

**FIGURE 1**  
**MAXIMUM IPP VS PULSE DURATION BY VOLTAGE**

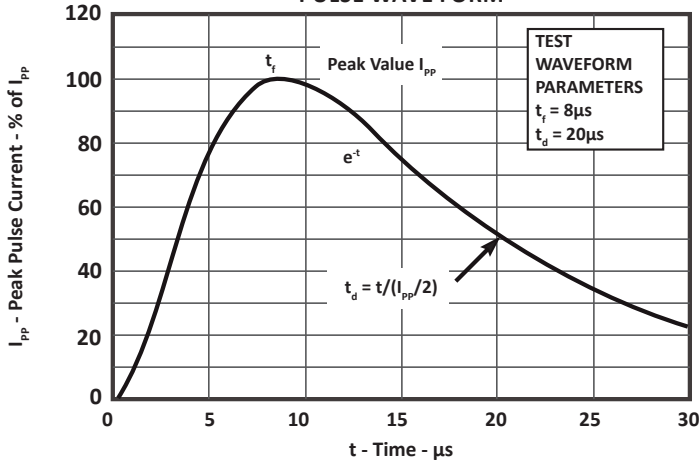


**TYPICAL DEVICE CHARACTERISTICS**

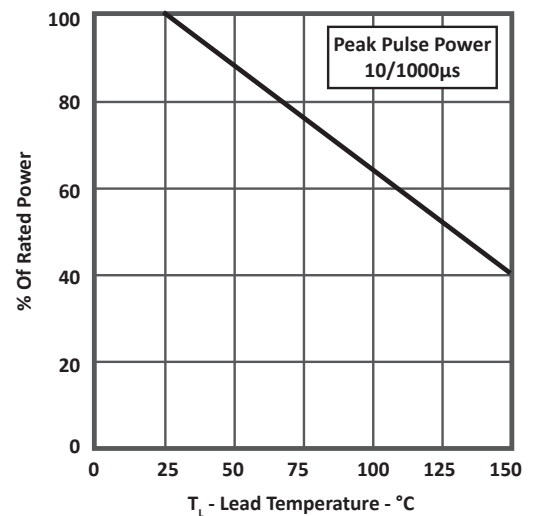
**FIGURE 2  
PEAK PULSE POWER VS PULSE TIME**



**FIGURE 3  
PULSE WAVE FORM**

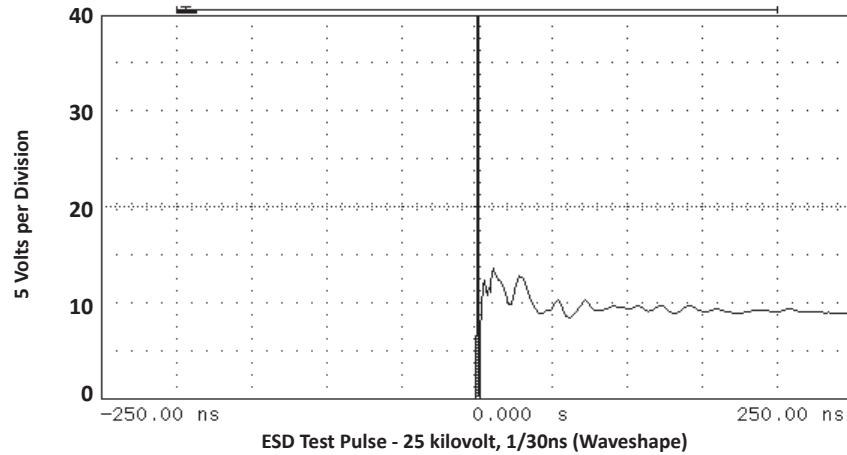


**FIGURE 4  
POWER DERATING CURVE**

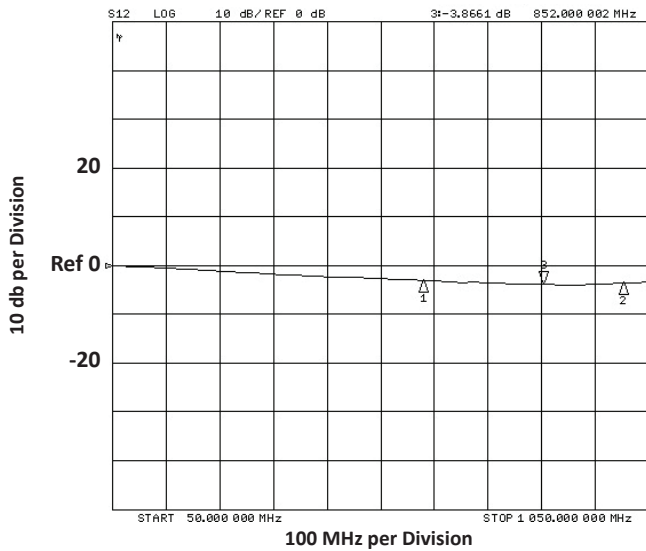


**TYPICAL DEVICE CHARACTERISTICS**

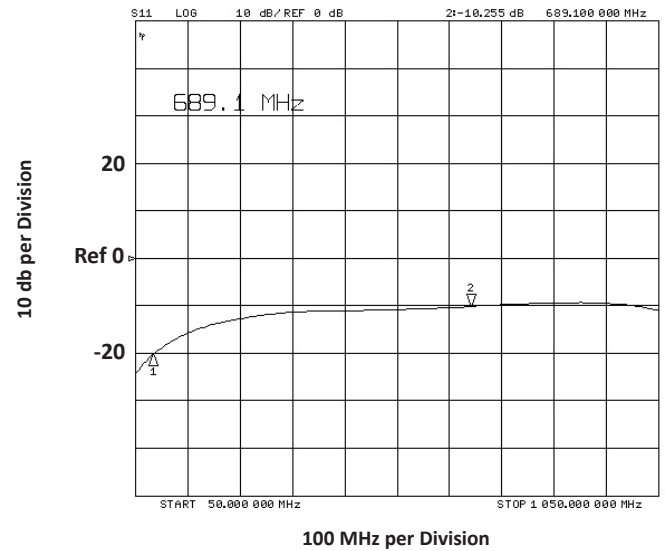
**FIGURE 5**  
**OVERSHOOT & CLAMPING VOLTAGE FOR SMLC6.5C-2**



**FIGURE 6**  
**INSERTION LOSS - SMLC12C-2**

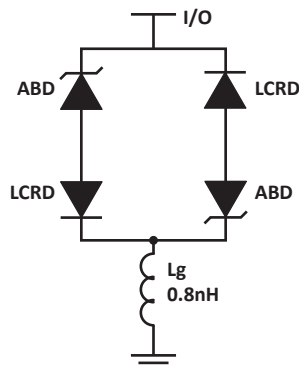


**FIGURE 7**  
**RETURN LOSS - SMLC12C-2**



## SPICE MODEL

FIGURE 1  
SPICE MODEL



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

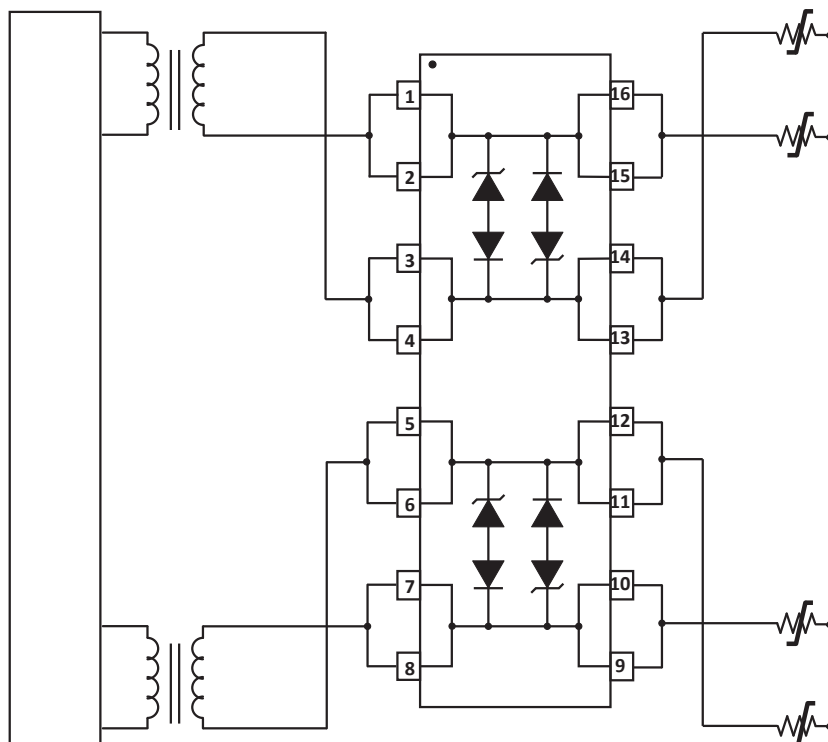
TABLE 1 - SPICE PARAMETERS

PARAMETER	UNIT	ABD(TVS)	LCRD
BV	V	See Table 2	200
IBV	$\mu$ A	1	0.01
$C_{jo}$	pF	See Table 2	5
$I_s$	A	See Table 2	1E-14
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)
SMLC6.5-2	7.2	2600	1E-11	0.075
SMLC12C-2	13.3	1150	1E-13	0.080

## APPLICATION INFORMATION



**FIGURE 1 - BIDIRECTIONAL DIFFERENTIAL PROTECTION FOR T1/E1**

Circuit connectivity is as follows:

- Line 1 connected to pins 1, 2, 15 and 16.
- Line 2 connected to pins 3, 4, 13 and 14.
- Line 3 connected to pins 5, 6, 11 and 12.
- Line 4 connected to pins 7, 8, 9 and 10.

## 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.

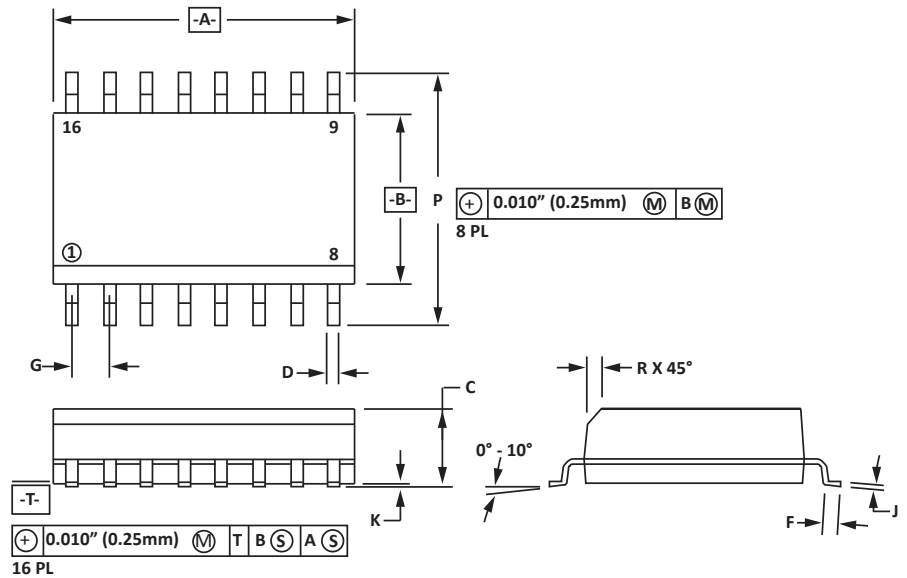
## SO-16 PACKAGE INFORMATION

## OUTLINE DIMENSIONS

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
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.

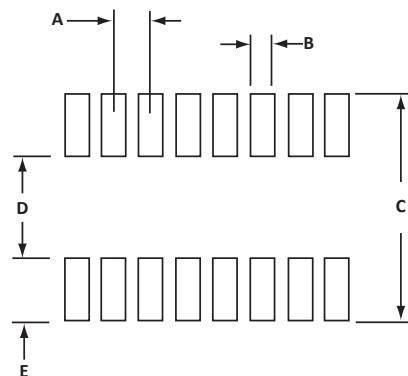


## PAD LAYOUT DIMENSIONS

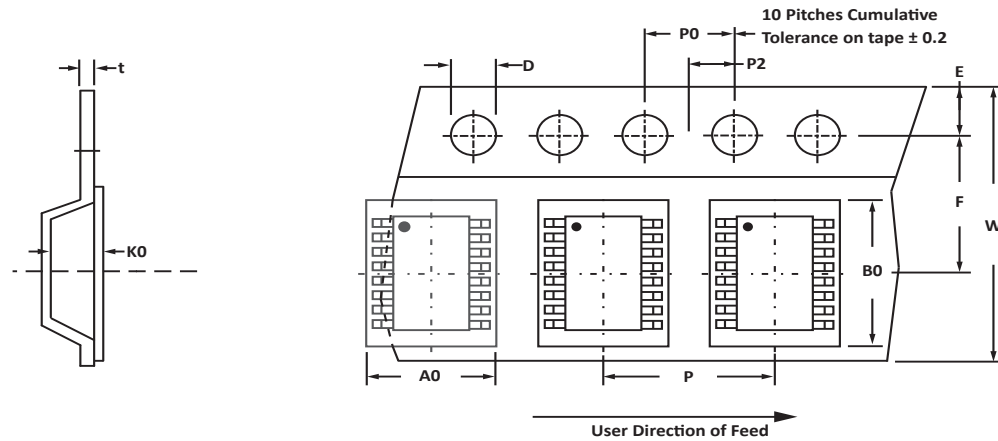
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.14	1.40	0.045	0.055
B	0.64	0.89	0.025	0.035
C	6.22	-	0.245	-
D	3.94	4.17	0.155	0.165
E	1.02	1.27	0.040	0.050

## NOTES

- Controlling dimension: inches.



## TAPE AND REEL



## SPECIFICATIONS

REEL DIA.	TAPE WIDTH	A0	B0	K0	D	E	F	W	P0	P2	P	tmax
178mm (7")	16mm	6.50 ± 0.10	10.30 ± 0.10	2.10 ± 0.10	1.50 ± 0.10	1.75 ± 0.10	3.50 ± 0.05	16.00 ± 0.30	4.00 ± 0.12	2.00 ± 0.10	4.00 ± 0.10	0.25

## NOTES

- Dimensions are in millimeters.
- Surface mount product is taped and reeled in accordance with EIA-481.
- Suffix - T7 = 7" Reel - 1,000 pieces per 16mm tape.
- Suffix - T13 = 13" Reel - 2,500 pieces per 16mm tape.
- Bulk product shipped in tubes of 48 pieces per tube.
- Marking on Part - part number, date code, logo and pin one defined by dot on top of package.

Package outline per document number 06007.R3 1/11.

## ORDERING INFORMATION

BASE PART NUMBER (xx = Voltage)	LEADFREE SUFFIX	TAPE SUFFIX	QTY/REEL	REEL SIZE	TUBE QTY
SMLCxxC-2	-LF	-T7	1,000	7"	48
SMLCxxC-2	-LF	-T13	2,500	13"	48



## 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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