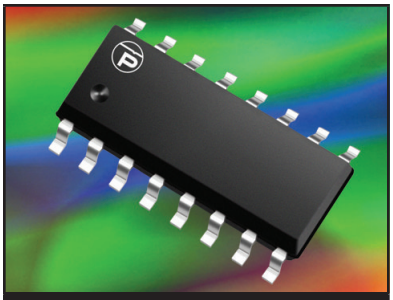
HIGH POWERED MULTI-LINE LOW CAPACITANCE TVS ARRAY



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 10/1000µs 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 (tp = 10/1000µs)
- 3,900 Watts Peak Pulse Power per Line (tp = 8/20µs)
- ITKU.20 I_{PP} @ 40A (5/310µs) - *(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

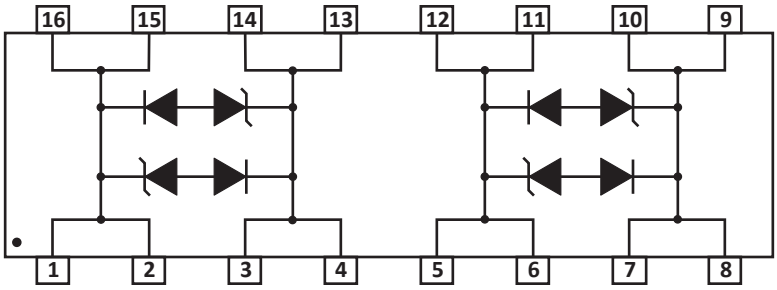
APPLICATIONS

- 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



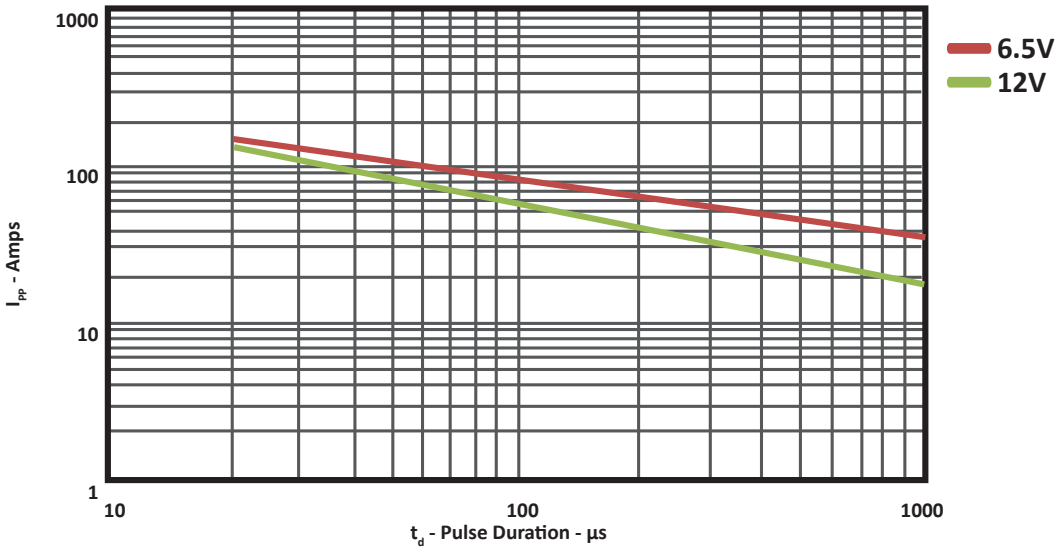
Downloaded from Elcodis.com electronic components distributor

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}	3,900	Watts
Peak Pulse Power (tp = 10/1000µs) - See Figure 1	P_{PP}	400	Watts

ELECTRICAL CHARACTERISTICS PER LINE @ 25°C Unless Otherwise Specified					
PART NUMBER	RATED STAND-OFF VOLTAGE V_{WM} VOLTS	MINIMUM BREAKDOWN VOLTAGE @1mA $V_{(BR)}$ VOLTS	MAXIMUM CLAMPING VOLTAGE (Fig. 3) @ 8/20µS V_C @ I_{PP}	MAXIMUM LEAKAGE CURRENT @V_{WM} I_D µA	TYPICAL CAPACITANCE @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



Downloaded from Elcodis.com electronic components distributor

TYPICAL DEVICE CHARACTERISTICS

FIGURE 2
PEAK PULSE POWER VS PULSE TIME

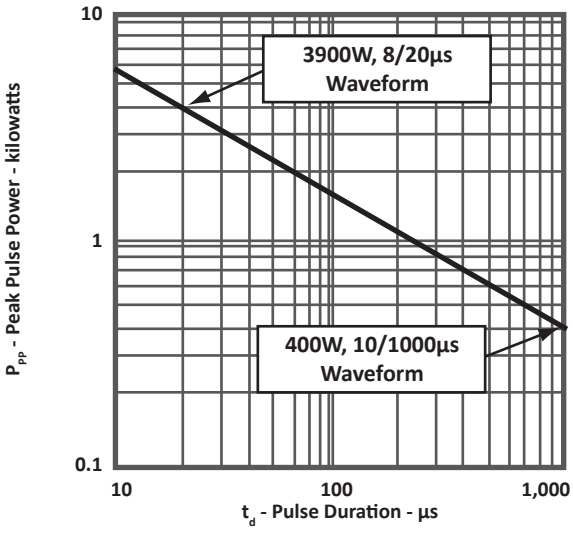


FIGURE 3
PULSE WAVE FORM

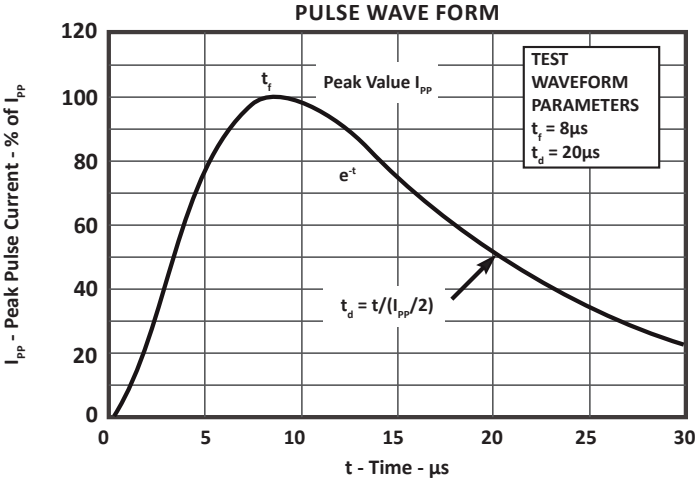
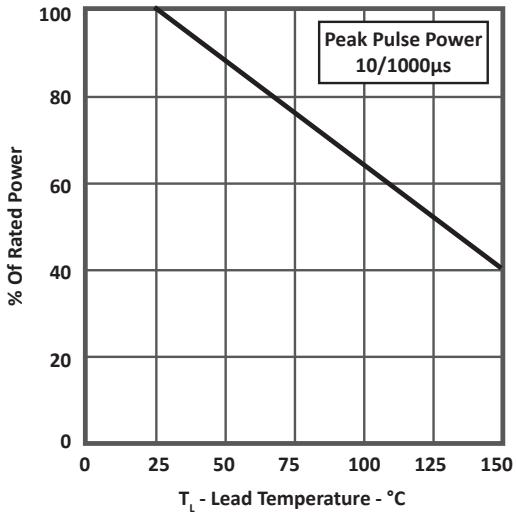


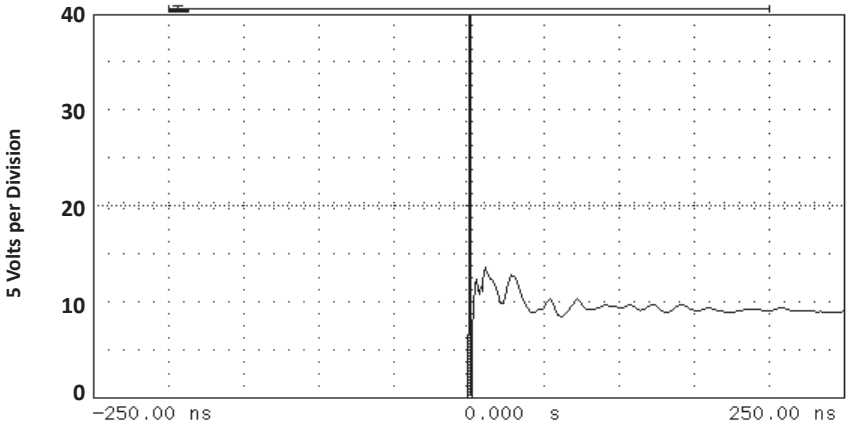
FIGURE 4
POWER DERATING CURVE



Downloaded from Elcodis.com electronic components distributor

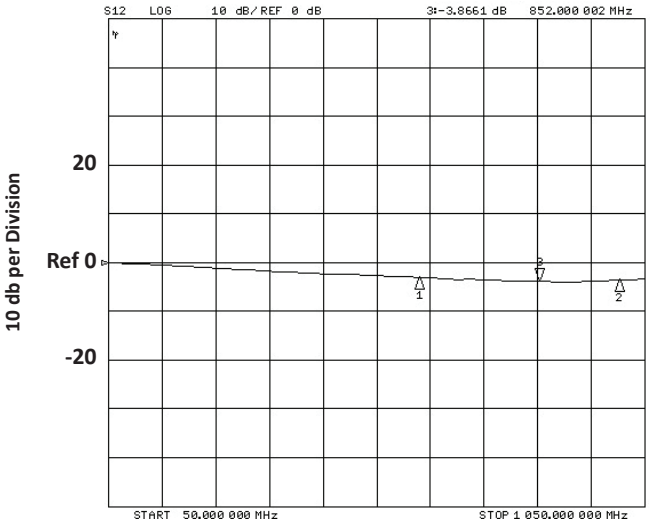
TYPICAL DEVICE CHARACTERISTICS

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



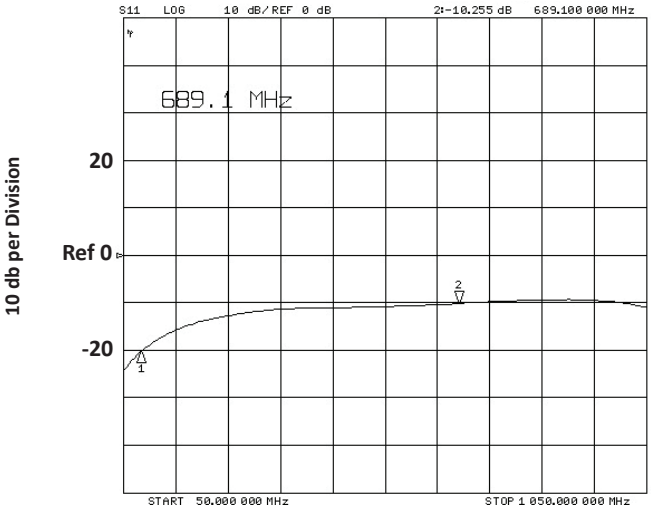
ESD Test Pulse - 25 kilovolt, 1/30ns (Waveshape)

FIGURE 6
INSERTION LOSS - SMLC12C-2



100 MHz per Division

FIGURE 7
RETURN LOSS - SMLC12C-2

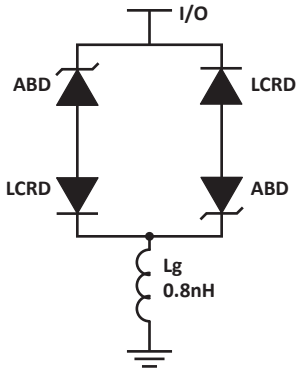


100 MHz per Division

Downloaded from Elcodis.com electronic components distributor

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	µA	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)	Rs(OHMS)
SMLC6.5-2	7.2	2600	1E-11	0.075
SMLC12C-2	13.3	1150	1E-13	0.080

Downloaded from Elcodis.com electronic components distributor

APPLICATION INFORMATION

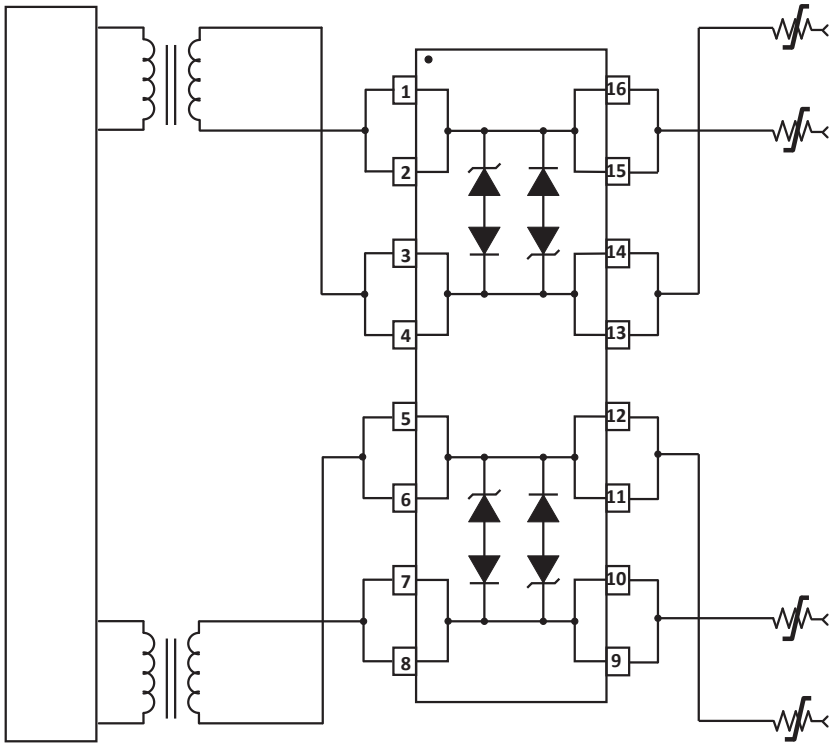


FIGURE 1 - BIDIRECTIONAL DIFFERENTIAL PROTECTION FOR T1/E1

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:

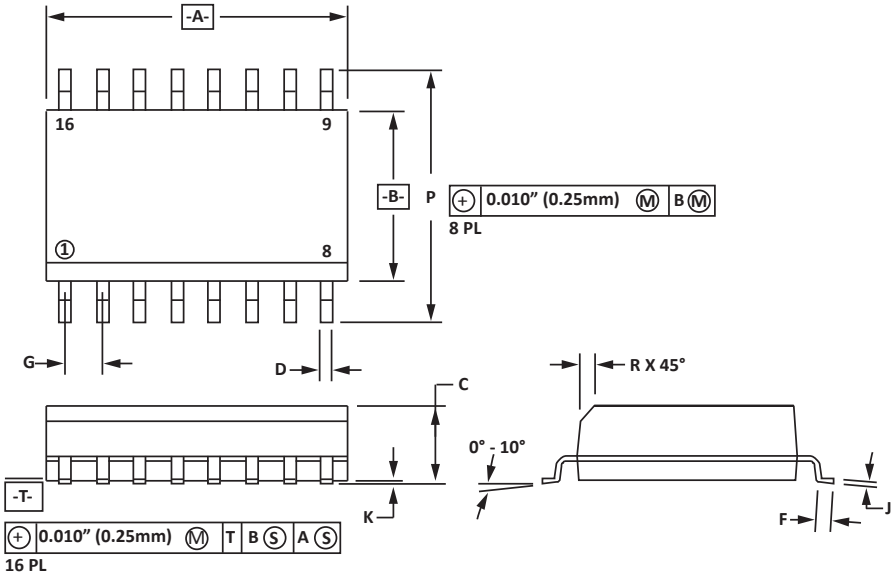
- The protection device should be placed near the input terminals or connectors, the device will divert the transient current immediately before it can be coupled into the nearby traces.
- The path length between the TVS device and the protected line should be minimized.
- All conductive loops including 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.

Downloaded from Elcodis.com electronic components distributor

SO-16 PACKAGE INFORMATION

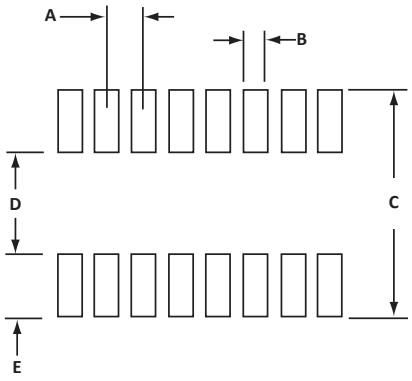
OUTLINE DIMENSIONS				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.05 BSC	
J	0.18	0.25	0.007	0.009
K	0.10	0.25	0.004	0.008
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

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



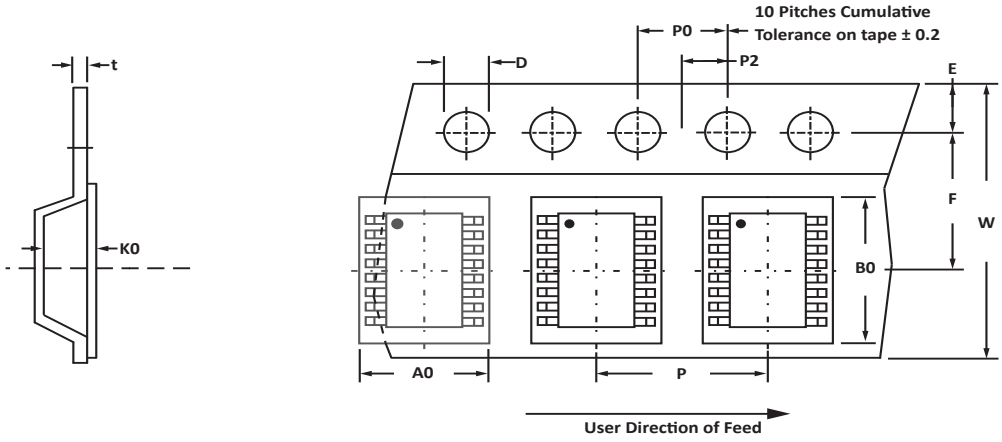
PAD LAYOUT DIMENSIONS				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.14	1.40	0.045	0.055
B	0.64	0.89	0.025	0.035
C	6.22	-	0.245	-
D	3.94	4.17	0.155	0.165
E	1.02	1.27	0.040	0.050

NOTES
1. Controlling dimension: inches.



Downloaded from Elcodis.com electronic components distributor

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
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 16mm tape.
4. Suffix - T13 = 13" Reel - 2,500 pieces per 16mm tape.
5. Bulk product shipped in tubes of 48 pieces per tube.
6. 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

This device is only available in a Lead-Free configuration.

Downloaded from Elcodis.com electronic components distributor

COMPANY INFORMATION

COMPANY PROFILE

In business more than 20 years, ProTek Devices™ is a privately-held company located in Tempe, Arizona, that offers a product line of transient voltage suppressors (TVS); avalanche breakdown diodes; steering diode TVS arrays and other surge suppressor component products. These TVS devices protect electronic systems from the effects of lightning, electrostatic discharge (ESD), nuclear electromagnetic pulses (NEMP), inductive switching and EMI / RFI. ProTek Devices also offers high performance interface and linear products that include analog switches; multiplexers; LED drivers; audio control ICs; RF and related high frequency products. The analog devices work in a host of consumer; industrial; automotive and other applications.

CONTACT US

Corporate Headquarters
2929 South Fair Lane
Tempe, Arizona 85282
USA

By Telephone
General: 602-431-8101
Sales: & Marketing: 602-414-5109
Customer Service: 602-414-5114
Product Technical Support: 602-414-5107

By Fax
General: 602-431-2288

By E-mail:
Sales: sales@protekdevices.com
Customer Service: service@protekdevices.com
Technical Support: support@protekdevices.com

ProTek Devices (Asia Pacific) Pte. Ltd.
8 Ubi Road 2, #06-19
Zervex
Singapore - 408538
Tel: +65-67488312
Fax: +65-67488313

Web
www.protekdevices.com

COPYRIGHT © ProTek Devices 2000 - This literature is subject to all applicable copyright laws and is not for resale in any manner.

SPECIFICATIONS: ProTek reserves the right to change the electrical and or mechanical characteristics described herein without notice.

DESIGN CHANGES: ProTek reserves the right to discontinue product lines without notice and that the final judgement concerning selection and specifications is the buyer's and that in furnishing engineering and technical assistance. ProTek assumes no responsibility with respect to the selection or specifications of such products. ProTek makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ProTek assume any liability arising out of the application or use of any product or circuit and specifically disclaims any and all liability without limitation special, consequential or incidental damages.

LIFE SUPPORT POLICY: ProTek Devices products are not authorized for use in life support systems without written consent from the factory.

Downloaded from Elcodis.com electronic components distributor