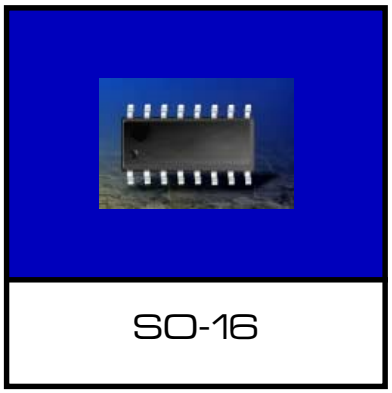
PROTEK DEVICES
. . . engineered solutions for the transient environment™

SM16LC03 thru SM16LC36C

LOW CAPACITANCE TVS ARRAYS



SO-16

APPLICATIONS

✔ Wireless Communication Circuits
✔ RS-422, RS-432 & RS-485
✔ Low Voltage ASICs
✔ Ethernet - 10/100 Base T

IEC COMPATIBILITY (EN61000-4)

✔ 61000-4-2 (ESD): Air - 15kV, Contact - 8kV
✔ 61000-4-4 (EFT): 40A - 5/50ns
✔ 61000-4-5 (Surge): 12A, 8/20µs - Level 1 (Line-Gnd) & Level 2 (Line-Line)

FEATURES

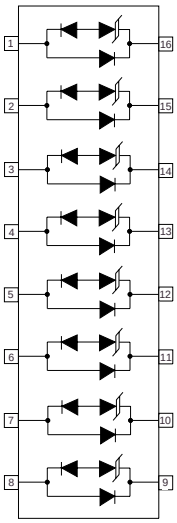
✔ 500 Watts Peak Pulse Power per Line (tp=8/20µs)
✔ Unidirectional & Bidirectional Configurations
✔ ESD Protection > 40 kilovolts
✔ Available in Multiple Voltage Types: 3.3V to 36V
✔ ***PROTECTS UP TO EIGHT (8) LINES***
✔ ***LOW CAPACITANCE: 15pF***

MECHANICAL CHARACTERISTICS

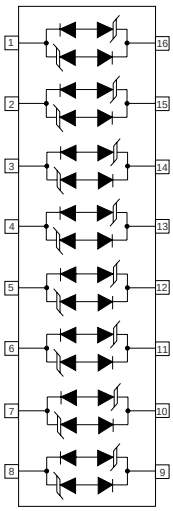
✔ Molded JEDEC SO-16 Package
✔ Weight 0.15 grams (Approximate)
✔ Flammability rating UL 94V-0
✔ 16mm Tape and Reel Per EIA Standard 481
✔ Marking: Logo, Part Number & Pin One Defined By Dot on Top of Package

CIRCUIT DIAGRAMS

UNIDIRECTIONAL



BIDIRECTIONAL



DEVICE CHARACTERISTICS

MAXIMUM RATINGS @ 25°C Unless Otherwise Specified			
PARAMETER	SYMBOL	VALUE	UNITS
Peak Pulse Power (t_p = 8/20µs) - See Figure 1	P_{PP}	500	Watts
Operating Temperature	T_J	-55°C to 150°C	°C
Storage Temperature	T_{STG}	-55°C to 150°C	°C
Forward Voltage @ 50mA, 300µs - Square Wave (Note 1)	V_F	1.5	Volts

Note 1: Only applies to unidirectional devices.

ELECTRICAL CHARACTERISTICS PER LINE @ 25°C Unless Otherwise Specified							
PART NUMBER (Notes 1 - 3)	RATED STAND-OFF VOLTAGE V_{WM} VOLTS	MINIMUM BREAKDOWN VOLTAGE @ 1mA $V_{(BR)}$ VOLTS	MAXIMUM CLAMPING VOLTAGE (See Fig. 2) @ I_P = 1 A V_C VOLTS	MAXIMUM CLAMPING VOLTAGE (See Fig. 2) @ 8/20µs V_C @ I_{PP}	MAXIMUM LEAKAGE CURRENT @V_{WM} I_D µA	MAXIMUM CAPACITANCE @ 0V, 1 MHz C pF	TEMPERATURE COEFFICIENT OF $V_{(BR)}$ $qV_{(BR)}$ mV/°C
SM16LC03	3.3	4.5	7.0	23.0V @ 43A	125	15	-3
SM16LC03C	3.3	4.5	7.0	23.0V @ 43A	125	15	-3
SM16LC05	5.0	6.0	9.8	24.0V @ 42A	20	15	3
SM16LC05C	5.0	6.0	9.8	24.0V @ 42A	20	15	3
SM16LC08	8.0	8.5	13.4	26.0V @ 30A	10	15	9
SM16LC08C	8.0	8.5	13.4	26.0V @ 30A	10	15	9
SM16LC12	12.0	13.3	19.0	33.0V @ 21A	2	15	16
SM16LC12C	12.0	13.3	19.0	33.0V @ 21A	2	15	16
SM16LC15	15.0	16.7	25.5	39.0V @ 15A	2	15	17
SM16LC15C	15.0	16.7	25.5	39.0V @ 15A	2	15	17
SM16LC24	24.0	26.7	40.0	57.0V @ 10A	2	15	26
SM16LC24C	24.0	26.7	40.0	57.0V @ 10A	2	15	26
SM16LC36	36.0	40.0	53.0	72.0V @ 7.0A	2	15	36
SM16LC36C	36.0	40.0	53.0	72.0V @ 7.0A	2	15	36

Note 1: Part numbers with a “C” suffix are bidirectional devices, i.e., SM16LC05C.
Note 2: Unidirectional Devices Only: Do not surge from pins 16 to 1, 15 to 2, 14 to 3, 13 to 4, 12 to 5, 11 to 6, 10 to 7 and 9 to 8. PIV typically greater than 100V for each rectifier diode.
Note 3: SPICE model and parameters available for this device on the ProTek Devices website: www.protekdevices.com.

GRAPHS

FIGURE 1
PEAK PULSE POWER VS PULSE TIME

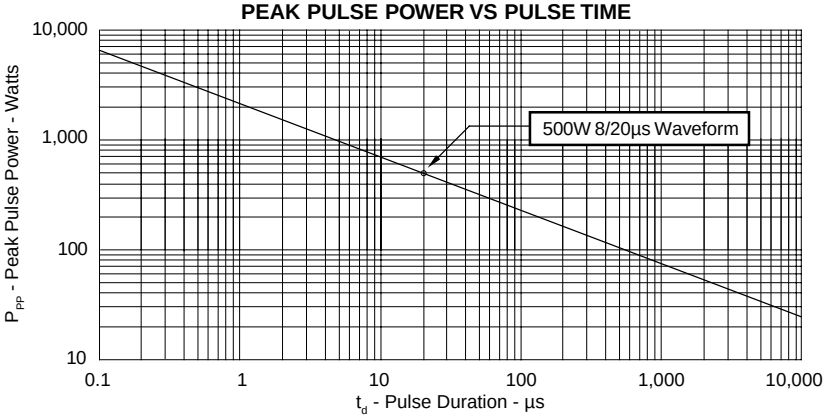


FIGURE 2
PULSE WAVE FORM

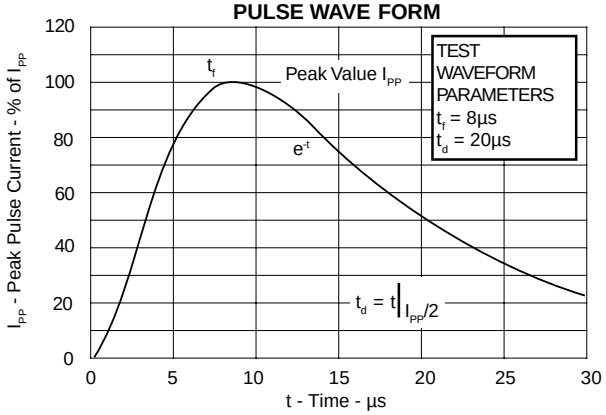


FIGURE 3
POWER DERATING CURVE

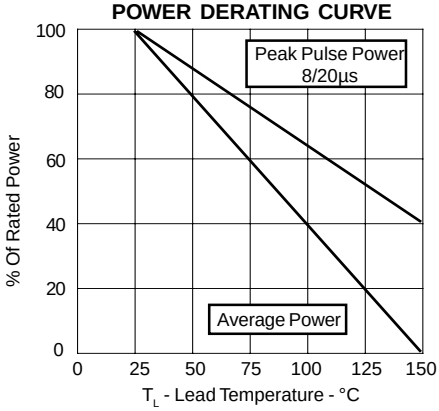
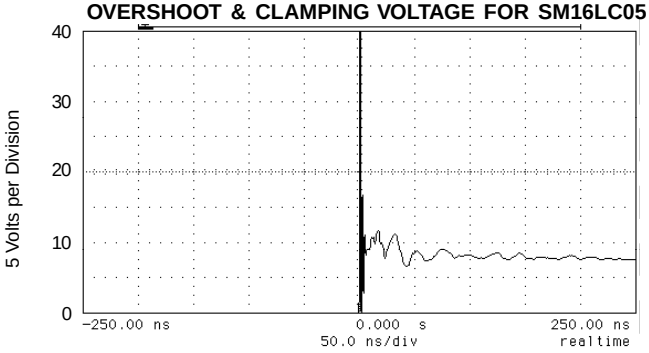


FIGURE 4
OVERSHOOT & CLAMPING VOLTAGE FOR SM16LC05



ESD Test Pulse: 25 kilovolt, 1/30ns (waveform)

FIGURE 5
INSERTION LOSS - SM16LC12

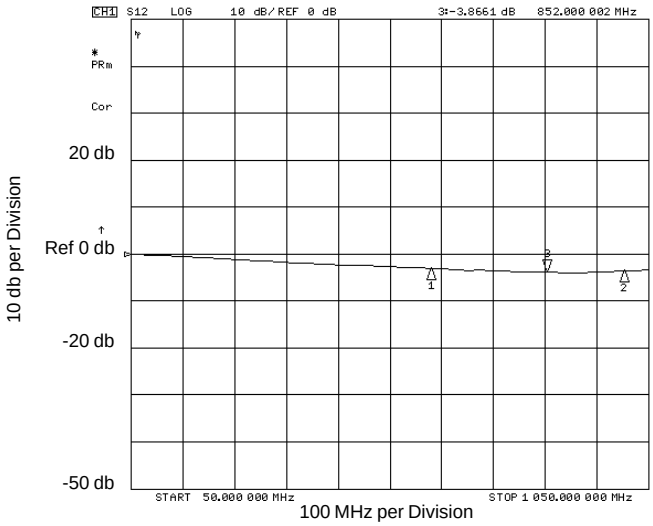
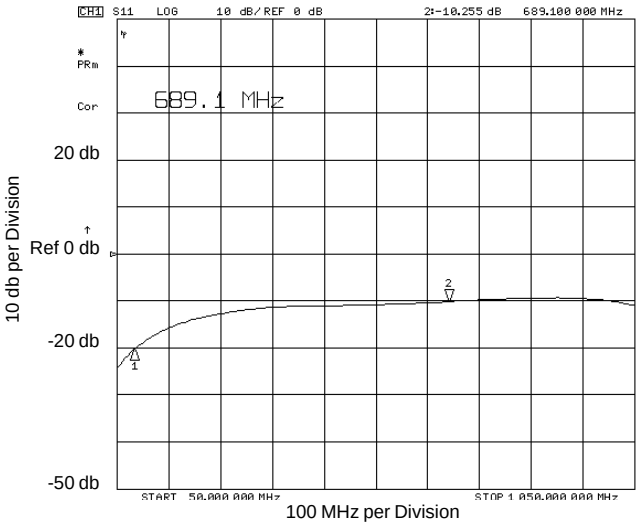


FIGURE 6
RETURN LOSS - SM16LC12



APPLICATION NOTES

The SM16LC & SM16LCxxC Series are TVS arrays designed to protect I/O or data lines from the damaging effects of ESD (> 40kV), EFT and other types of surges. This product series provides both unidiretional and bidirectional protection, with a surge capability of 500 Watts P_{PP} per line for an 8/20µs waveform.

BIDIRECTIONAL CONFIGURATION COMMON-MODE PROTECTION (Figure 1)

Ideal for RS-485 applications, the SM16LCxxC Series provides up to eight (8) lines of protection in a common mode configuration as depicted in Figure 1. This low capacitance series allows the transceiver or telecommunications circuit to operate safely without significant signal distortion.

Circuit connectivity is as follows:

- ✔ Lines 1 is connected to Pin 9.
- ✔ Line 2 is connected to Pin 10.
- ✔ Line 3 is connected to Pin 11.
- ✔ Line 4 is connected to Pin 12.
- ✔ Line 5 is connected to Pin 13.
- ✔ Line 6 is connected to Pin 14.
- ✔ Line 7 is connected to Pin 15.
- ✔ Line 8 is connected to Pin 16.
- ✔ Pins 1-8 are connected to ground.

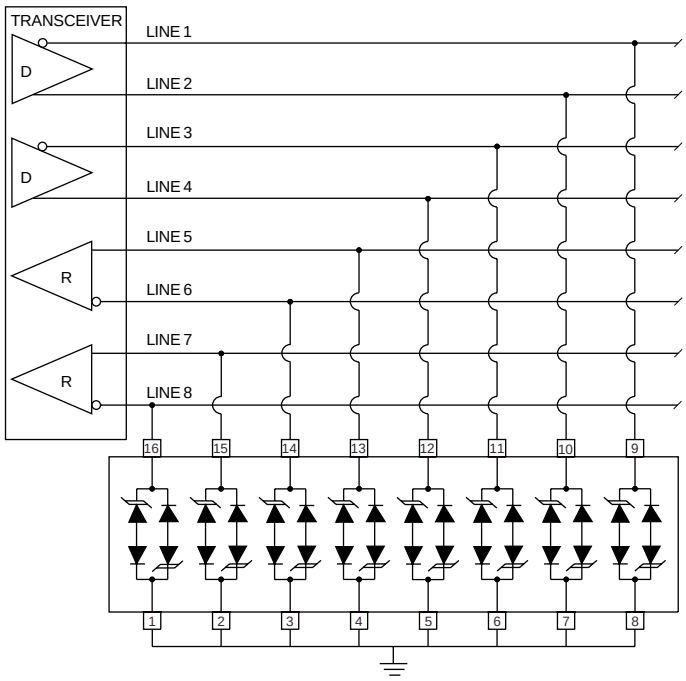


Figure 1. Birectional Common-Mode Protection

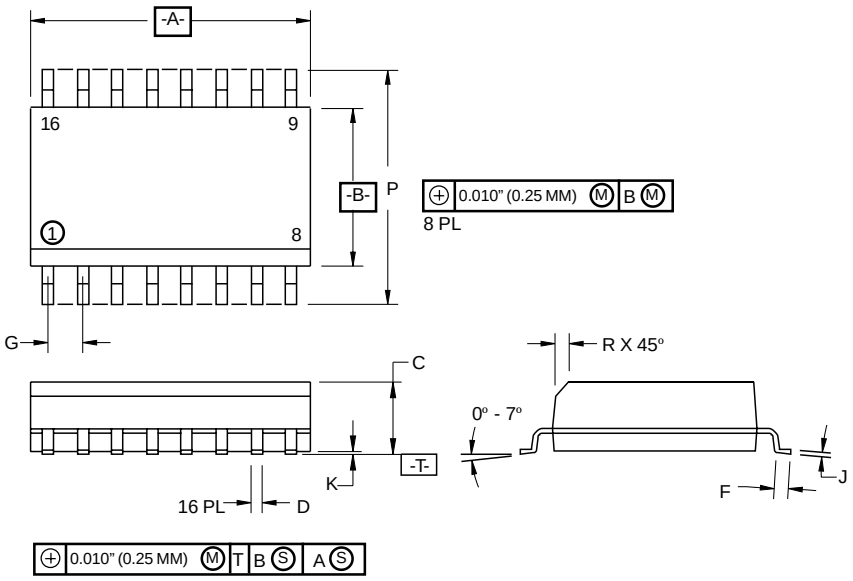
CIRCUIT BOARD LAYOUT RECOMMENDATIONS

Circuit board layout is critical for Electromagnetic Compatibility (EMC) 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.

PACKAGE OUTLINE & DIMENSIONS

PACKAGE OUTLINE



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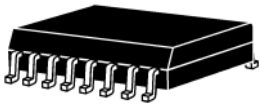
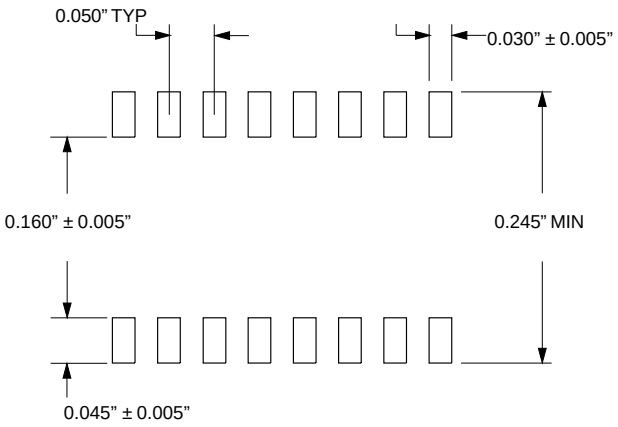


PACKAGE DIMENSIONS

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	1.27 BSC	0.05 BSC	0.05 BSC
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

MOUNTING PAD



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

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PART NUMBER SUFFIXES USED FOR TAPE & REEL/BULK ORDERING:

Surface mount product is taped and reeled in accordance with EIA-481.
Suffix-T7 = 7 Inch Reel - 1,000 pieces per reel i.e.: SM16LC03 - T7
Suffix-T13 = 13 Inch Reel - 2,500 pieces per reel i.e: SM16LC03 - T13
No Suffix = Product Shipped in Tubes of 37 pcs per Tube

Protek Devices
2929 South Fair Lane, Tempe, AZ 85282
Tel: 602-431-8101 Fax: 602-431-2288
E-Mail: sales@protekdevices.com
Web Site: www.protekdevices.com