

## LOW CAPACITANCE TVS ARRAYS

### 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, 8/20 $\mu$ s - Level 1 (Line-Gnd) & Level 2 (Line-Line)

### FEATURES

- ✓ 500 Watts Peak Pulse Power per Line ( $t_p=8/20\mu$ s)
- ✓ 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**

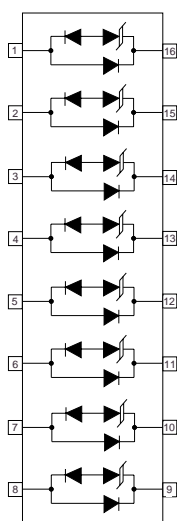
### MECHANICAL CHARACTERISTICS

- ✓ 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

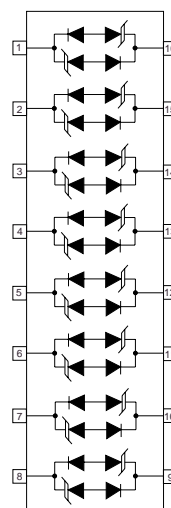


### CIRCUIT DIAGRAMS

UNIDIRECTIONAL



BIDIRECTIONAL



# SM16LC03

thru

# SM16LC36C

## DEVICE CHARACTERISTICS

MAXIMUM RATINGS @ 25°C Unless Otherwise Specified			
PARAMETER	SYMBOL	VALUE	UNITS
Peak Pulse Power ( $t_p = 8/20\mu s$ ) - 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 $V_{(BR)}$  $\frac{dV_{(BR)}}{dT}$ 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.

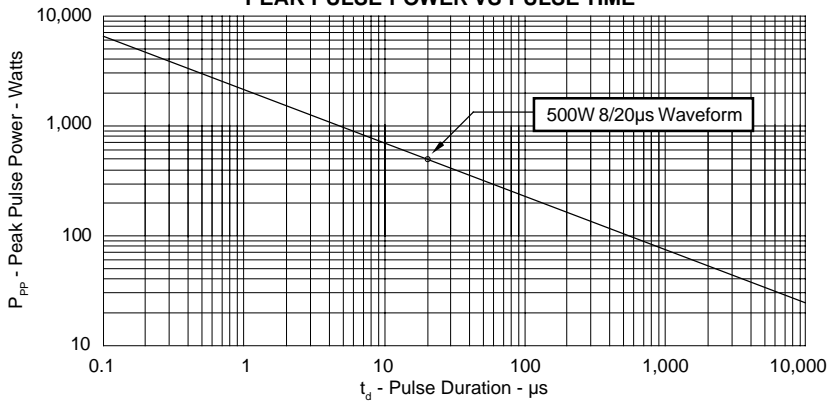
**Note 2:** Unidirectional Devices Only: Do not surge from pins 16 to 1, 15 to 2, 14 to 3, 13 to 4, 12 to 5, 11 to 6, 10 to 7 and 9 to 8. PIV typically greater than 100V for each rectifier diode.

**Note 3:** SPICE model and parameters available for this device on the ProTek Devices website: [www.protekdevices.com](http://www.protekdevices.com).

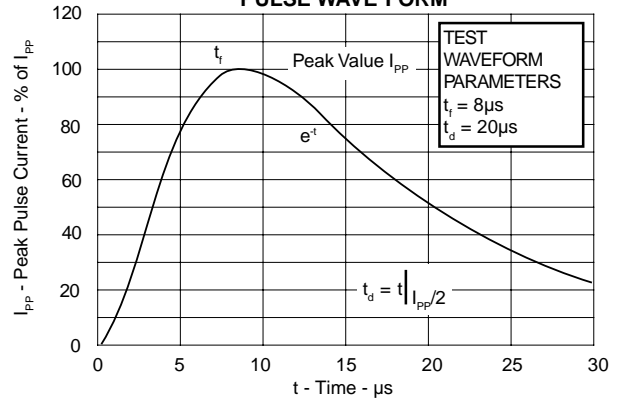
# SM16LC03 thru SM16LC36C

## GRAPHS

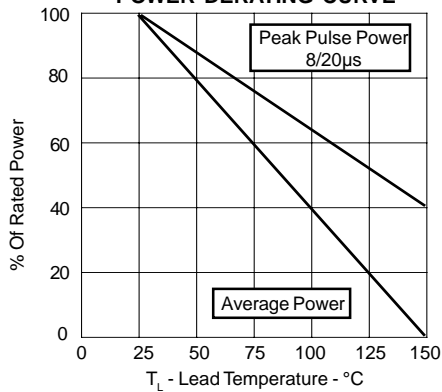
**FIGURE 1  
PEAK PULSE POWER VS PULSE TIME**



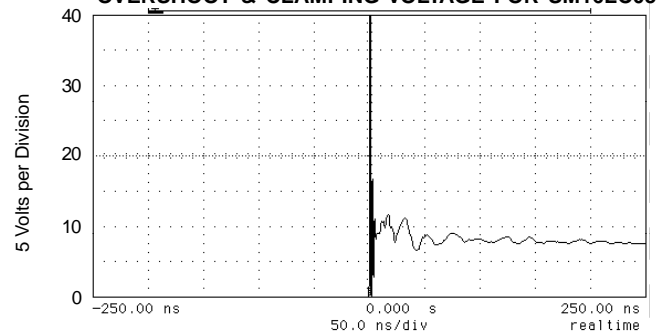
**FIGURE 2  
PULSE WAVE FORM**



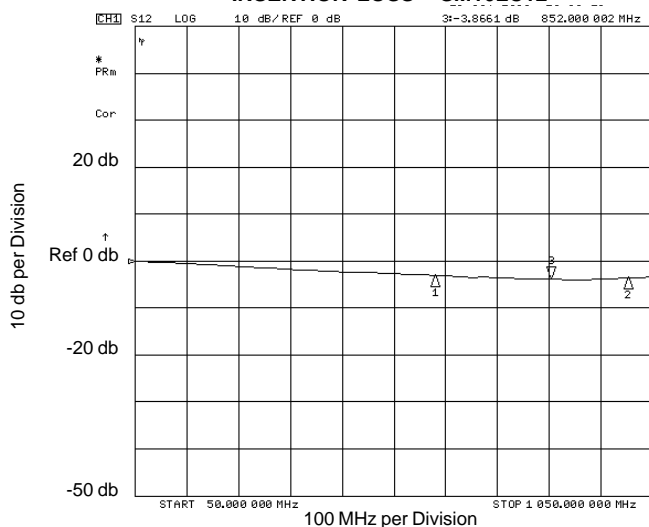
**FIGURE 3  
POWER DERATING CURVE**



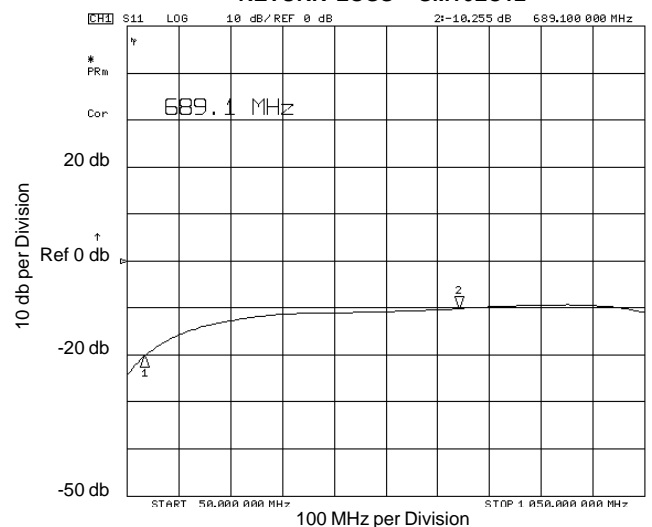
**FIGURE 4  
OVERSHOOT & CLAMPING VOLTAGE FOR SM16LC05**



**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 unidirectional and bidirectional protection, with a surge capability of 500 Watts  $P_{pp}$  per line for an 8/20 $\mu$ s 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.

### 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.

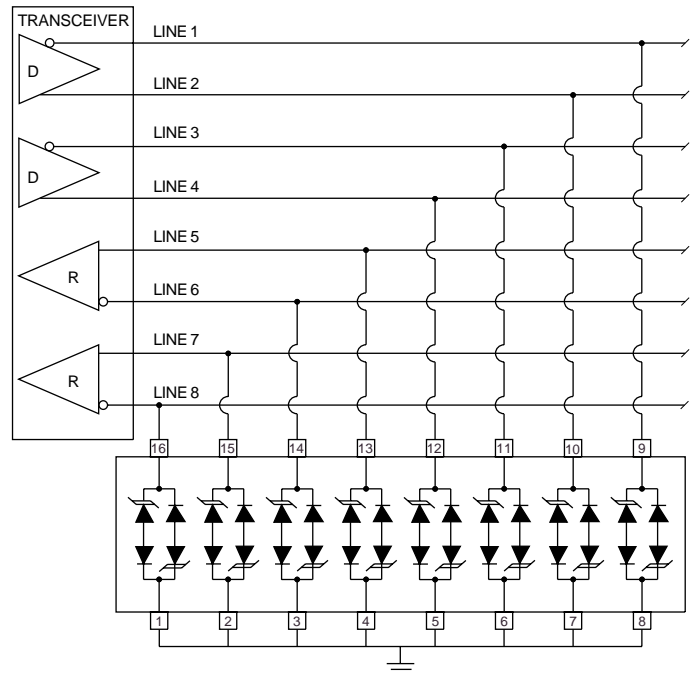
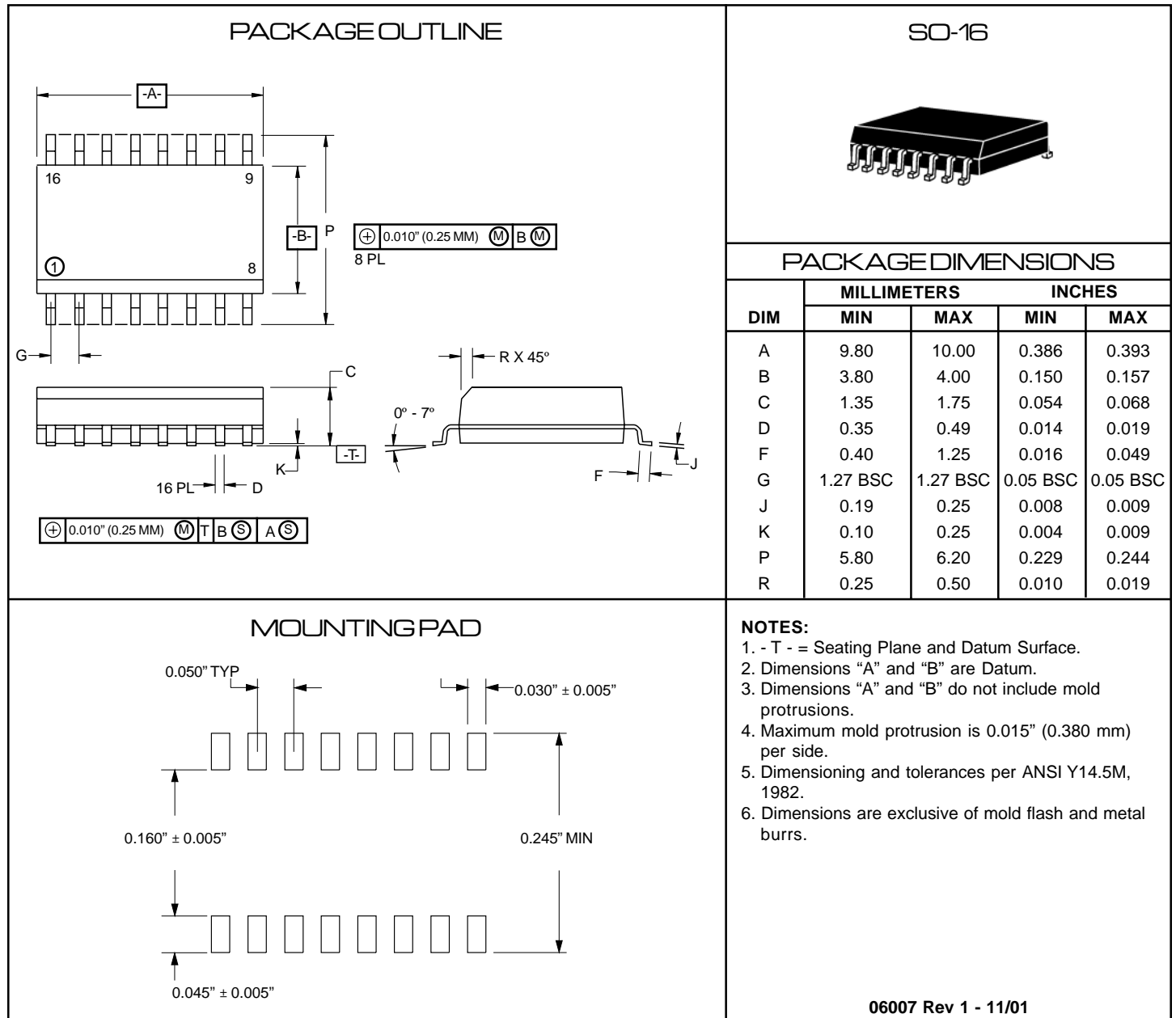


Figure 1. Bidirectional Common-Mode Protection

# SM16LC03 thru SM16LC36C

## PACKAGE OUTLINE & DIMENSIONS



### 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

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