

LOW CAPACITANCE TVS ARRAY

APPLICATIONS

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

IEC COMPATIBILITY (EN61000-4)

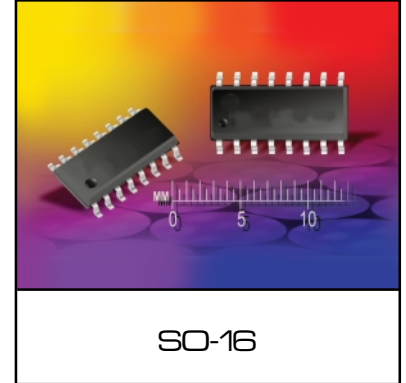
- ✓ 61000-4-2 (ESD): Air - 15kV, Contact - 8kV
- ✓ 61000-4-4 (EFT): 40A - 5/50ns
- ✓ 61000-4-5 (Surge): 12A, 8/20 μ s Level 1 (Line-Ground) & Level 2 (Line-Line)

FEATURES

- ✓ 500 Watts Peak Pulse Power per Line ($t_p=8/20\mu$ s)
- ✓ Unidirectional & Bidirectional Configuration
- ✓ ESD Protection > 40 kilovolts
- ✓ Available in Multiple Voltage Types: 3.3V to 36V
- ✓ Protects Up to Eight (8) Lines
- ✓ **LOW CAPACITANCE: 15pF**

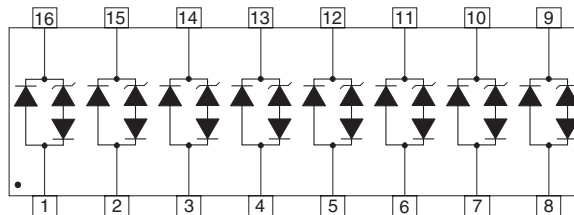
MECHANICAL CHARACTERISTICS

- ✓ 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, Date Code & Pin One Defined By Dot on Top of Package

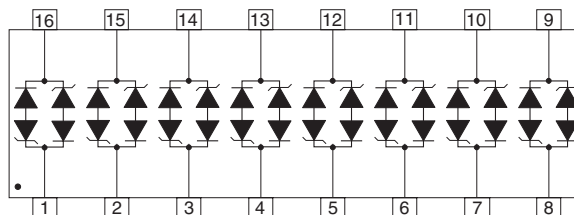


PIN CONFIGURATIONS

UNIDIRECTIONAL CONFIGURATION



BIDIRECTIONAL CONFIGURATION



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, 300 μs - 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 & 2) | 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) @ 8/20 μs V_C @ I_{PP} | MAXIMUM LEAKAGE CURRENT @ V_{WM} I_D μA | MAXIMUM CAPACITANCE @ 0V, 1 MHz C pF | TEMPERATURE COEFFICIENT OF $V_{(BR)}$ $\theta V_{(BR)}$ 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.

GRAPHS

FIGURE 1
PEAK PULSE POWER VS PULSE TIME

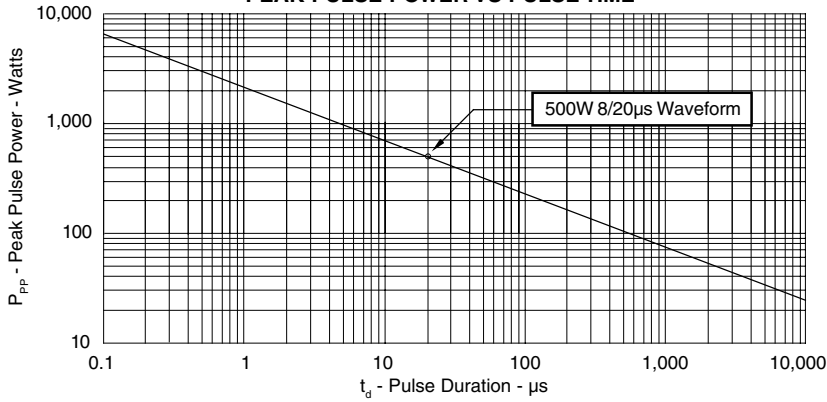


FIGURE 2
PULSE WAVE FORM

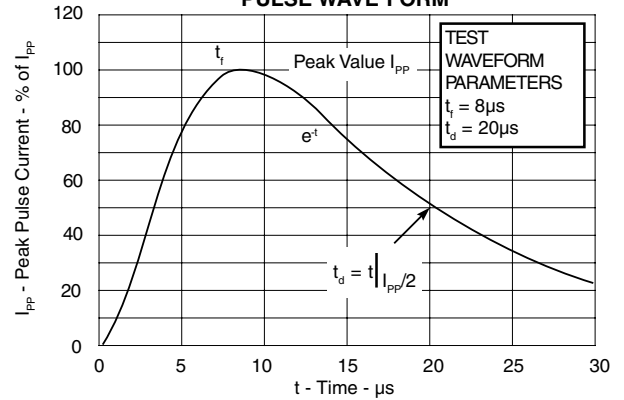


FIGURE 3
POWER DERATING CURVE

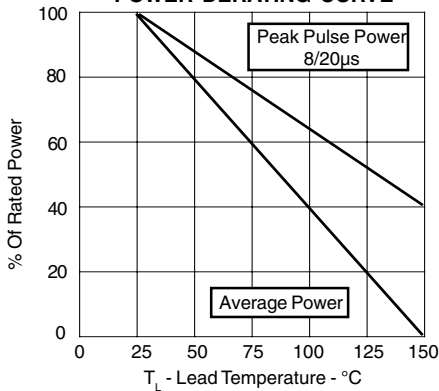
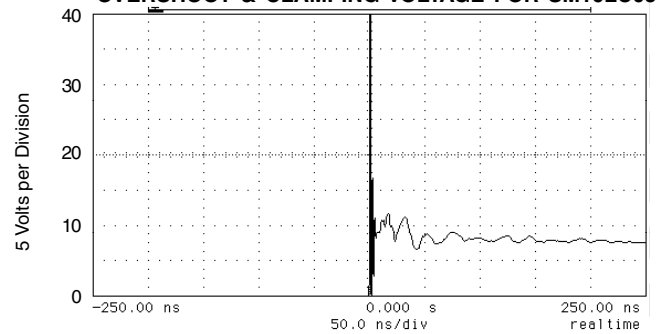


FIGURE 4
OVERSHOOT & CLAMPING VOLTAGE FOR SM16LC05



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

FIGURE 5
INSERTION LOSS - SM16LC12

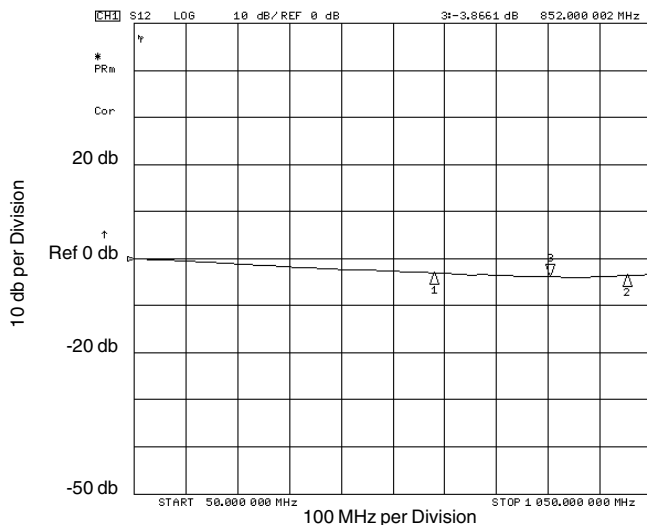
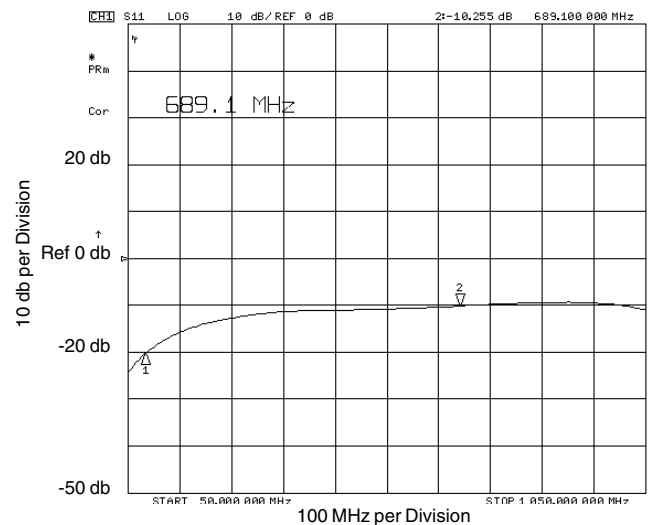


FIGURE 6
RETURN LOSS - SM16LC12



APPLICATION NOTE

The SM16LC & SM16LCxxC Series are TVS arrays designed to protect I/O or data lines from the damaging effects of ESD, 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 μ s waveform and ESD protection > 40kV.

BIDIRECTIONAL COMMON-MODE CONFIGURATION (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:

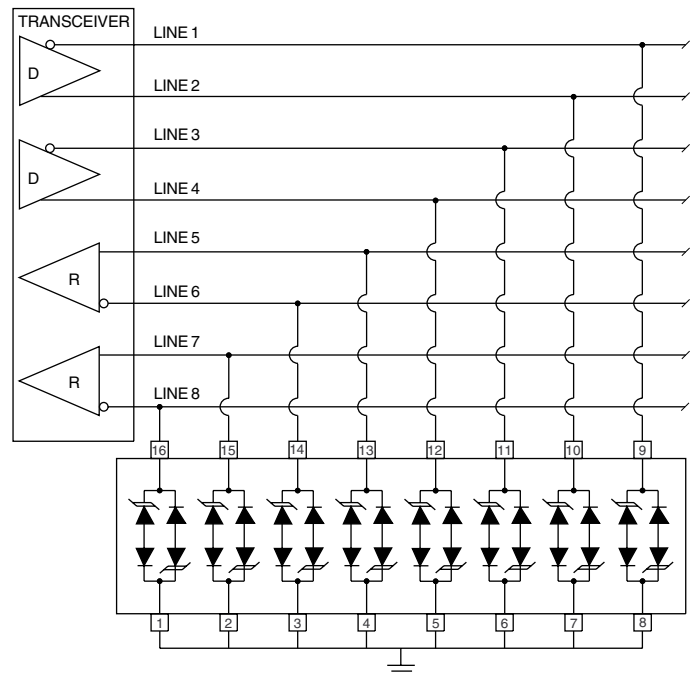
- ✓ Lines 1 is connected to Pin 9.
- ✓ Line 2 is connected to Pin 10.
- ✓ Line 3 is connected to Pin 11.
- ✓ Line 4 is connected to Pin 12.
- ✓ Line 5 is connected to Pin 13.
- ✓ Line 6 is connected to Pin 14.
- ✓ Line 7 is connected to Pin 15.
- ✓ Line 8 is connected to Pin 16.
- ✓ Pins 1-8 are connected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

CIRCUIT BOARD LAYOUT RECOMMENDATIONS

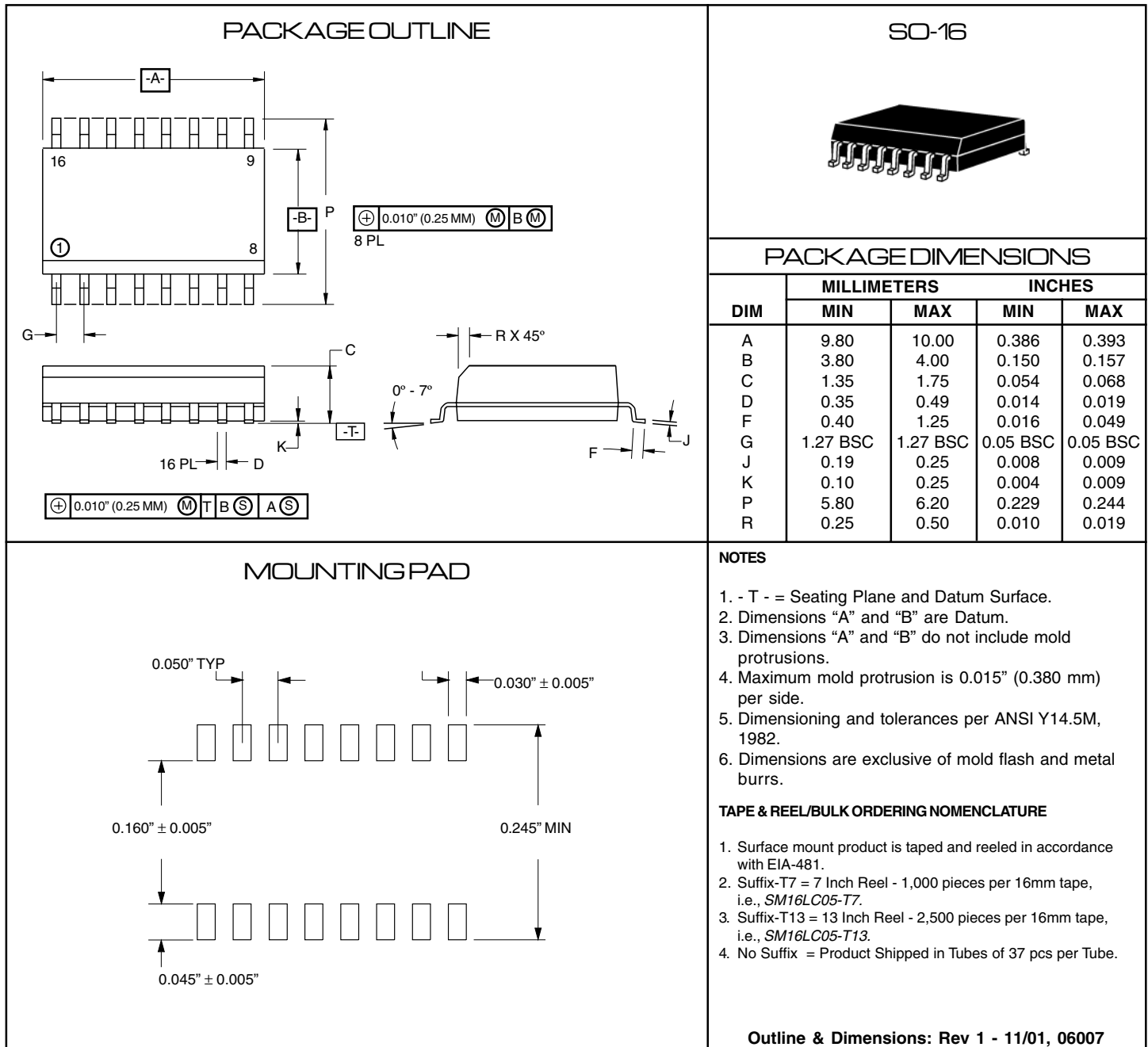
Circuit board layout is critical for Electromagnetic Compatibility (EMC) protection. The following guidelines are recommended:

- ✓ 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



PACKAGE OUTLINE & DIMENSIONS



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