

500 WATT MULTI-LINE LOW CAPACITANCE TVS ARRAY

SO-16 PACKAGE
DESCRIPTION

The SM16LCxx and SM16LCxxC Series are low capacitance multi-line transient voltage suppressor arrays that provides 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 500 Watts for an 8/20 μ s waveshape. This device series meets the IEC 61000-4-2, IEC 61000-4-4 and IEC 61000-4-5 requirements.

FEATURES

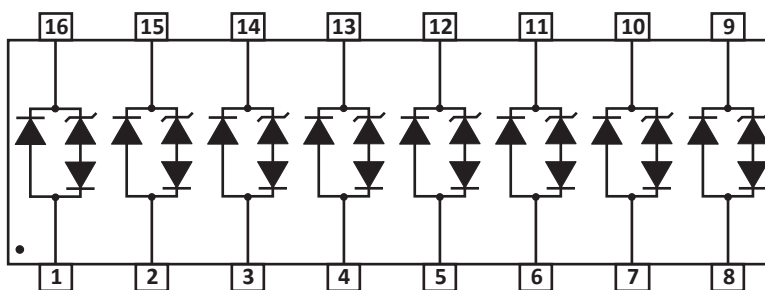
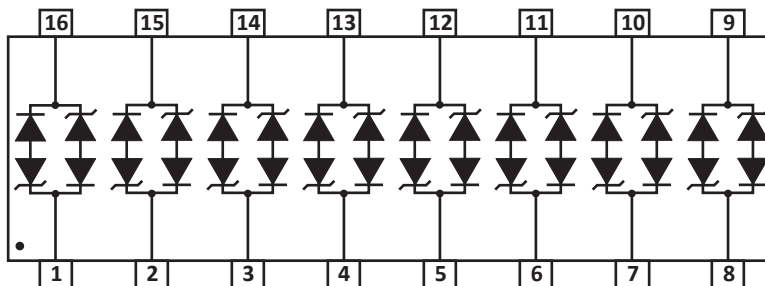
- Compatible with IEC 61000-4-2 (ESD): Air - 15kV, Contact - 8kV
- Compatible with IEC 61000-4-4 (EFT): 40A - 5/50ns
- Compatible with IEC 61000-4-5 (Surge): 12A, 8/20 μ s - Level 1(Line-Gnd) & Level 2(Line-Line)
- 500 Watts Peak Pulse Power per Line (tp = 8/20 μ s)
- Unidirectional and Bidirectional Configurations
- ESD Protection > 25 kilovolts
- Available in Multiple Voltages Ranging from 3.3V to 36V
- Protects up to 8 Lines
- Low Capacitance: 15pF
- RoHS Compliant
- REACH Compliant

APPLICATIONS

- Wireless Communication Circuits
- RS-422, RS-432 & RS-485
- Low Voltage ASICs
- Ethernet Interfaces

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 CONFIGURATIONS

UNIDIRECTIONAL

BIDIRECTIONAL

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}	500	Watts
Forward Voltage @ 50mA, 300μs - Square Wave (See Note 1)	V_F	1.5	Volts
Soldering Temperature for 10 seconds	T_{II}	260	°C

NOTES

1. Only applies to unidirectional devices.

ELECTRICAL CHARACTERISTICS PER LINE @ 25°C Unless Otherwise Specified

PART NUMBER (Note 1)	RATED STAND-OFF VOLTAGE V_{WM} VOLTS	MINIMUM BREAKDOWN VOLTAGE @1mA $V_{(BR)}$ VOLTS	MAXIMUM CLAMPING VOLTAGE (Fig. 2) @ $I_p = 1A$ V_c VOLTS	MAXIMUM CLAMPING VOLTAGE (Fig. 2) @ 8/20μs $V_c @ I_{PP}$	MAXIMUM LEAKAGE CURRENT @ V_{WM} I_D μA	MAXIMUM CAPACITANCE @0V, 1MHz C pF	TEMPERATURE COEFFICIENT OF $V_{(BR)}$ $qV_{(BR)}$ mV/°C
SM16LC03	3.3	4.5	7.0	20.0V @ 35A	125	15	-3
SM16LC03C	3.3	4.5	7.0	20.0V @ 35A	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 @ 7A	2	15	36
SM16LC36C	36.0	40.0	53.0	72.0V @ 7A	2	15	36

NOTES

1. Part numbers with a "C" suffix are bidirectional devices, i.e., SM16LC05C.

TYPICAL DEVICE CHARACTERISTICS

FIGURE 1
PEAK PULSE POWER VS PULSE TIME

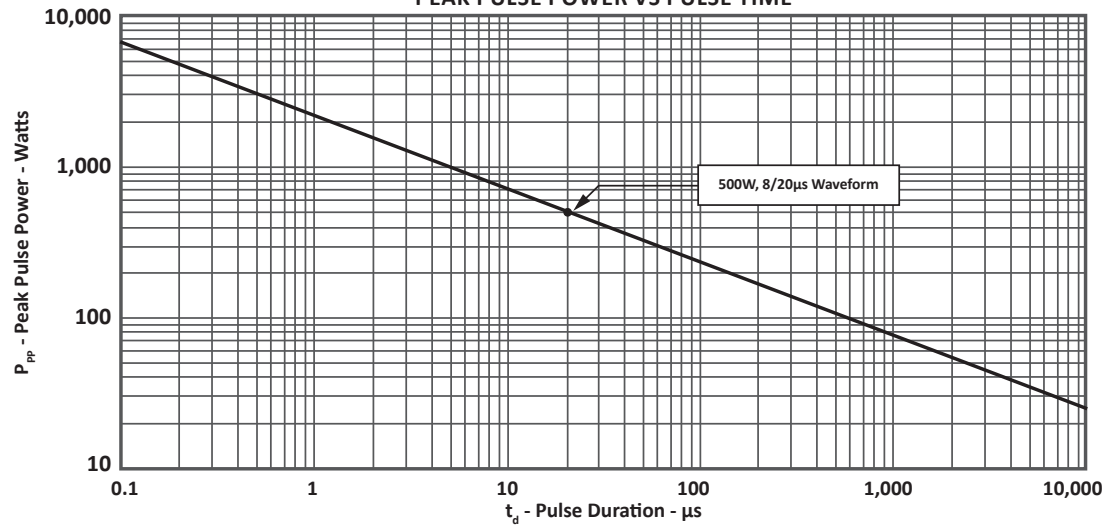


FIGURE 2
PULSE WAVE FORM

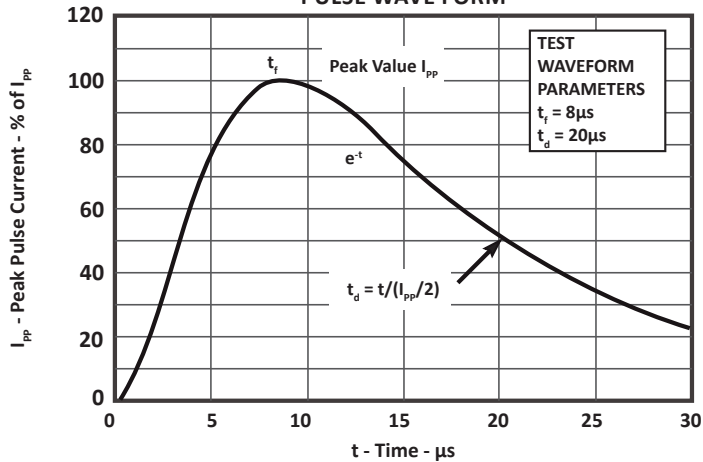
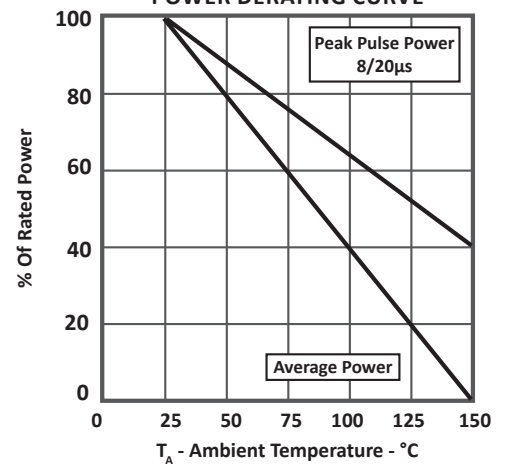


FIGURE 3
POWER DERATING CURVE



TYPICAL DEVICE CHARACTERISTICS

FIGURE 4
OVERSHOOT & CLAMPING VOLTAGE FOR SM16LC05

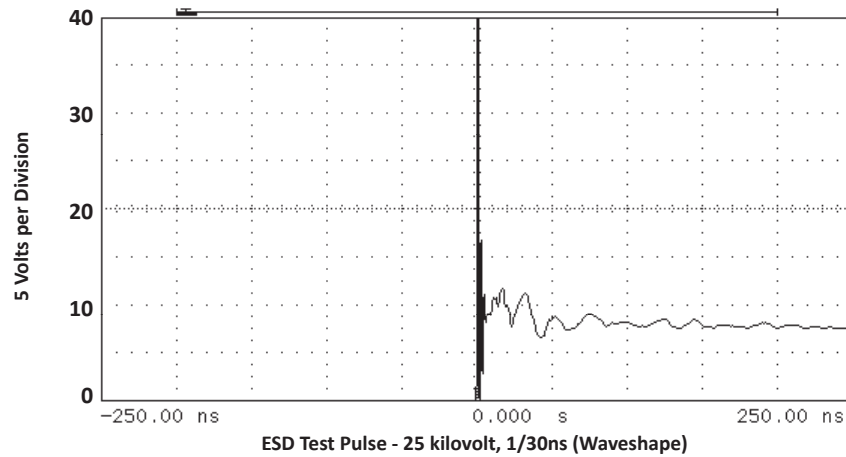


FIGURE 5
INSERTION LOSS - SM16LC12

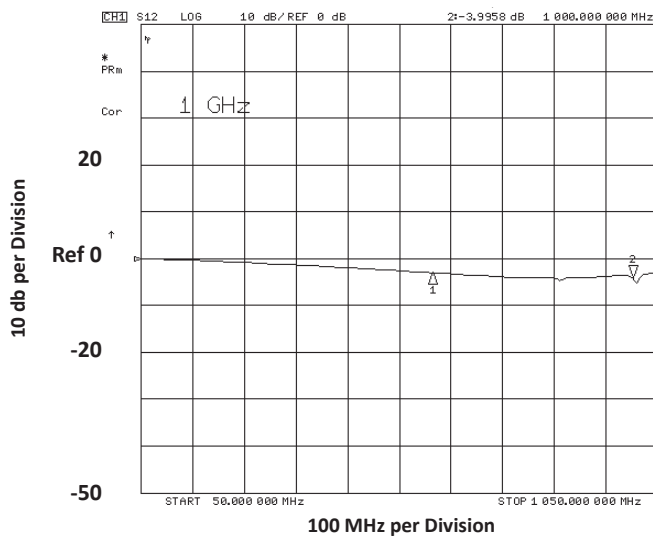
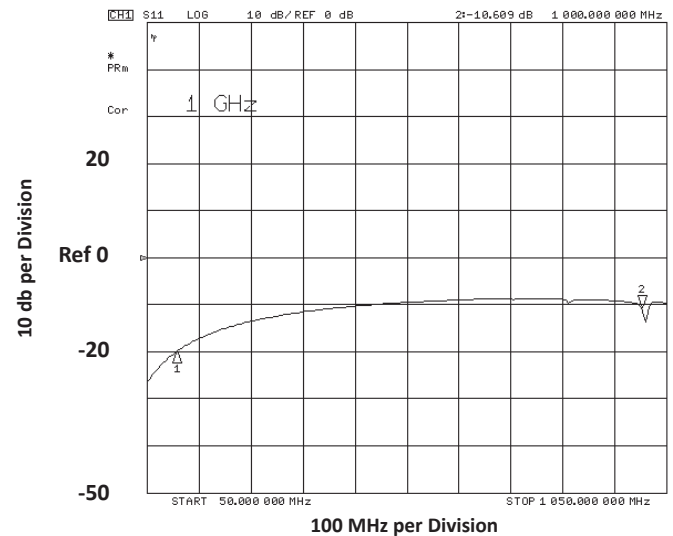
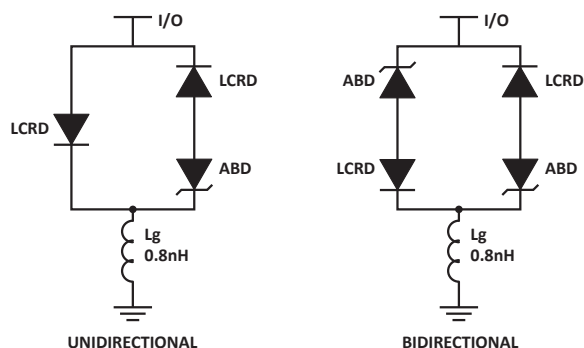


FIGURE 5
RETURN LOSS - SM16LC12



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-13
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)
SM16LC03	4.5	438	1E-11	0.21
SM16LC05	6.0	284	1E-11	0.14
SM16LC08	8.5	146	1E-11	0.28
SM16LC12	13.3	123	1E-13	0.40
SM16LC15	16.7	102	1E-13	0.52
SM16LC24	26.7	61	1E-13	1.54
SM16LC03C	4.5	438	1E-11	0.21
SM16LC05C	6.0	284	1E-11	0.14
SM16LC08C	8.5	146	1E-11	0.28
SM16LC12C	13.3	123	1E-13	0.40
SM16LC15C	16.7	102	1E-13	0.52
SM16LC24C	26.7	61	1E-13	1.54

APPLICATION INFORMATION

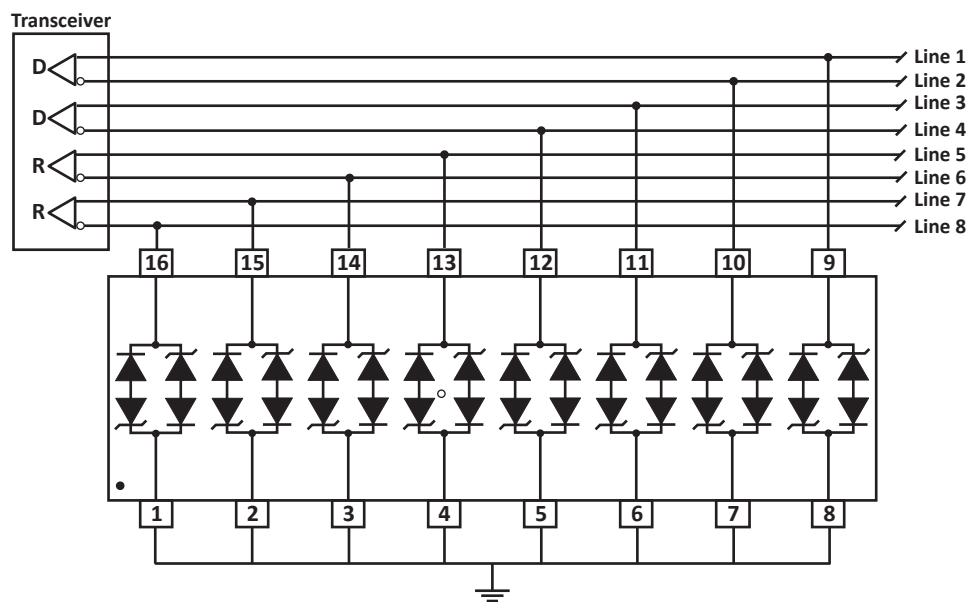


FIGURE 1 - BIDIRECTIONAL COMMON-MODE PROTECTION

Circuit connectivity is as follows:

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

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.

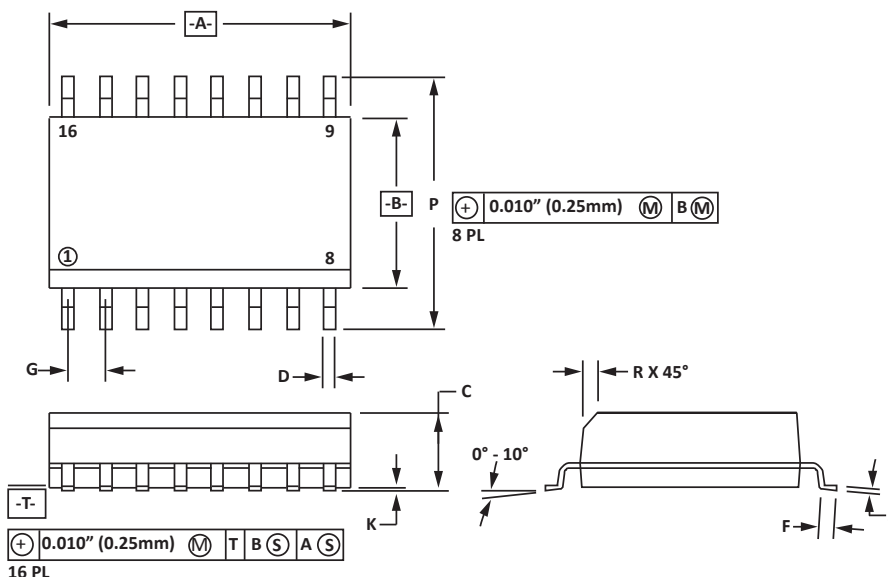
SO-16 PACKAGE INFORMATION

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

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.

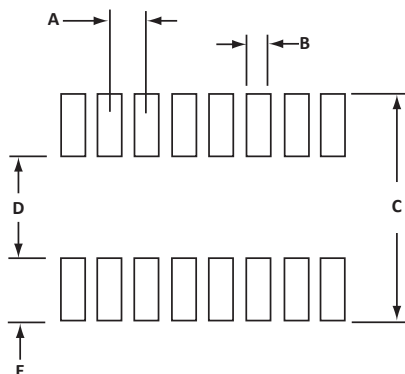


PAD LAYOUT DIMENSIONS

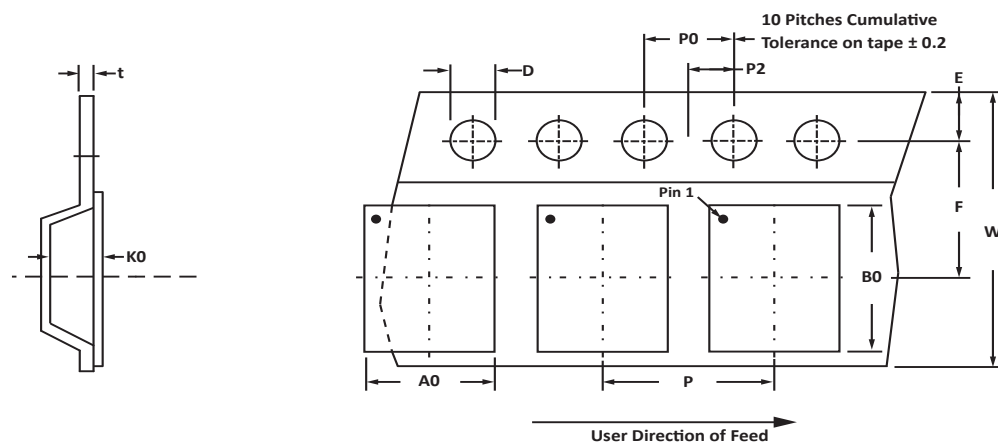
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.14	1.40	0.045	0.055
B	0.64	0.89	0.025	0.035
C	6.22	-	0.245	-
D	3.94	4.17	0.155	0.165
E	1.02	1.27	0.040	0.050

NOTES

1. Controlling dimension: inches.



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
SM16LCxx/SM16LCxxC	-LF	-T7	1,000	7"	48
SM16LCxx/SM16LCxxC	-LF	-T13	2,500	13"	48

COMPANY INFORMATION

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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