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

SMS03 thru SMS24C

SUBMINATURE MONOLITHIC TVS ARRAYS

APPLICATIONS

✔ Ethernet - 10 Base T
✔ Cellular Phones
✔ Handheld Electronics
✔ FireWire & USB Interfaces

SOT-23-6

IEC COMPATIBILITY (EN61000-4)

✔ 61000-4-2 (ESD): Air - 15kV, Contact - 8kV
✔ 61000-4-4 (EFT): 40A - 5/50ns

FEATURES

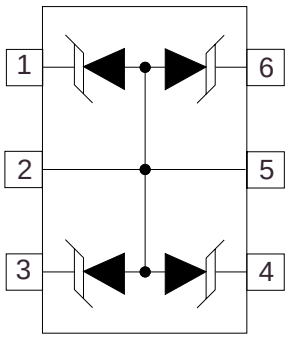
✔ ESD Protection > 25 kilovolts
✔ 350 Watts Peak Pulse Power per Line (8/20µs)
✔ Low Clamping Voltage
✔ Available in Multiple Voltage Types Ranging from 3V to 24V
✔ Unidirectional & Bidirectional Configurations
✔ Low Standby Current

MECHANICAL CHARACTERISTICS

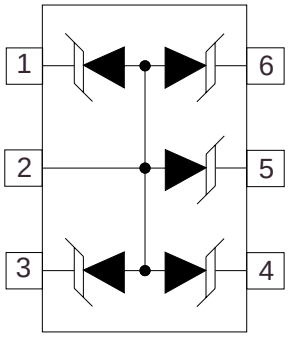
✔ Molded JEDEC SOT-23-6
✔ Weight 0.6 grams (Approximate)
✔ Flammability Rating UL 94V-0
✔ 8mm Tape and Reel Per EIA Standard 481-1-A
✔ Device Marking: Marking Code & Logo
✔ Pin One Defined By DOT on Top of Package

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}	350	Watts
Operating Temperature	T_J	-55°C to 150°C	°C
Storage Temperature	T_{STG}	-55°C to 150°C	°C

ELECTRICAL CHARACTERISTICS PER LINE @ 25°C Unless Otherwise Specified

PART NUMBER (See Notes 1, 2 & 3)	DEVICE MARKING	RATED STAND-OFF VOLTAGE V_{WM} VOLTS	MINIMUM BREAKDOWN VOLTAGE @ 1mA $V_{(BR)}$ VOLTS	MAXIMUM CLAMPING VOLTAGE (See Fig. 2) @ I_P = 1A V_C VOLTS	MAXIMUM CLAMPING VOLTAGE (See Fig. 2) @8/20µs V_C @ I_{PP}	MAXIMUM LEAKAGE CURRENT @V_{WM} I_D µA	TYPICAL CAPACITANCE (See Note 4) 0V @ 1 MHz C pF
SMS03	PRG	3.3	4.0	6.5	17.5V @ 20A	75	300
SMS03C	PRP	3.3	4.0	6.5	17.5V @ 20A	75	150
SMS05	PRH	5.0	6.0	9.8	21.0V @ 17.0A	20	150
SMS05C	PRL	5.0	6.0	9.8	21.0V @ 17.0A	20	75
SMS12	PRI	12.0	13.3	19	29.2V @ 12.0A	1	80
SMS12C	PRM	12.0	13.3	19	29.2V @ 12.0A	1	40
SMS15	PRJ	15.0	16.7	24	34.6V @ 10.0A	1	50
SMS15C	PRN	15.0	16.7	24	34.6V @ 10.0A	1	25
SMS24	PRK	24.0	26.7	40	58.3V @ 6.0A	1	40
SMS24C	PRO	24.0	26.7	40	58.3V @ 6.0A	1	20

Note 1: Part numbers with an additional "C" suffix are bidirectional devices, i.e., SMS05C.
Note 2: *Unidirectional Only:* Test between pin 1 to 2 or 5, 4 to 2 or 5, 6 to 2 or 5, 3 to 2 or 5.
Note 3: *Bidirectional Only:* Test between pin 5 to 1 or 3 or 4 or 6. Electrical characteristics apply in both directions.
Note 4: *Unidirectional Only:* Capacitance measured between pins 1, 3, 4, 6, to 2. *Bidirectional Only:* Capacitance measured between pins 1, 3, 4, 6 to 5.

FIGURE 1
PEAK PULSE POWER VS PULSE TIME

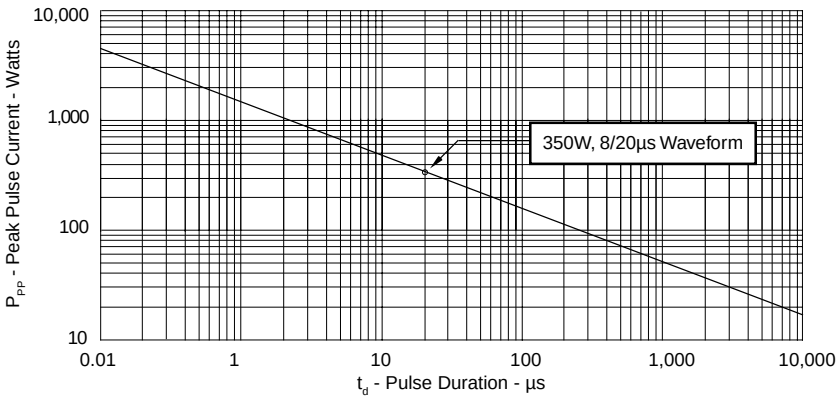
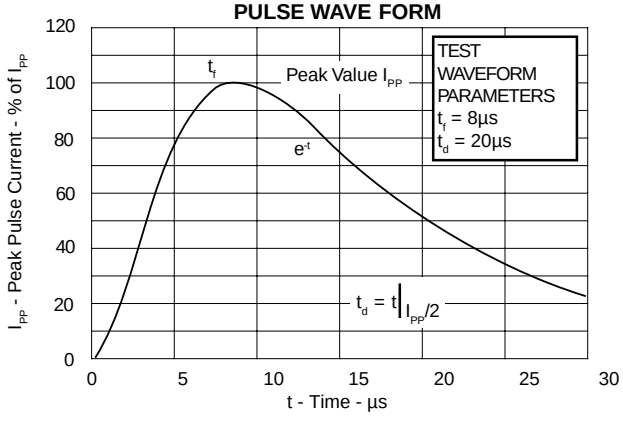


FIGURE 2
PULSE WAVE FORM



GRAPHS

FIGURE 3
POWER DERATING CURVE

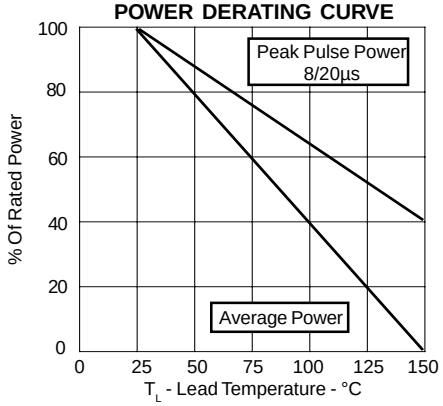
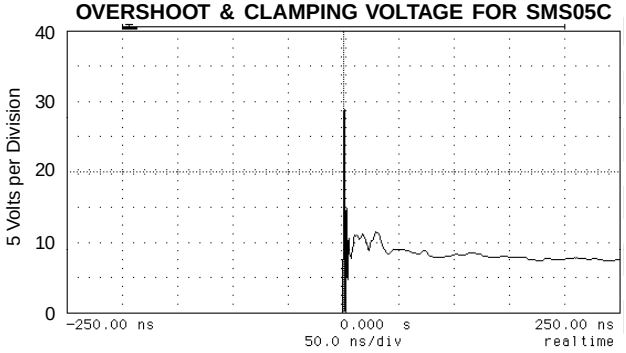
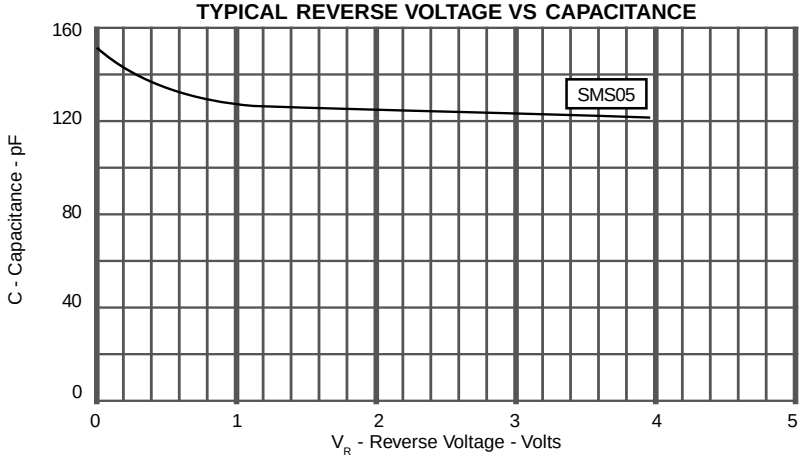


FIGURE 4
OVERSHOOT & CLAMPING VOLTAGE FOR SMS05C



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

FIGURE 5
TYPICAL REVERSE VOLTAGE VS CAPACITANCE



APPLICATION NOTES

The SMS Series are TVS arrays designed to protect I/O or data lines from the damaging effects of ESD (> 25kV) or EFT. This product series provides both unidiretional and bidirectional protection, with a surge capability of 350 Watts P_{PP} per line for an 8/20µs waveform.

UNIDIRECTIONAL COMMON MODE CONFIGURATION (Figure 1)

The SMS Series provides up to four (4) lines of protection in a common mode configuration as depicted in Figure 1.
Circuit connectivity is as follows:

- ✔ Line 1 is connected to Pin 1.
- ✔ Line 2 is connected to Pin 3.
- ✔ Line 3 is connected to Pin 4.
- ✔ Line 4 is connected to Pin 6.
- ✔ Pin 5 is connected to ground.
- ✔ Pin 2 is not connected.

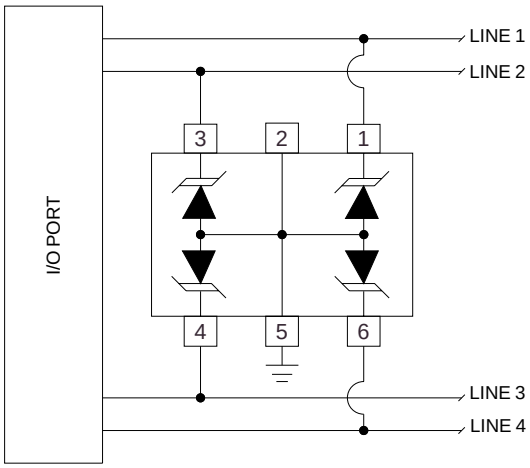


Figure 1 - Unidirectional Configuration Common-Mode I/O Port Protection

BIDIRECTIONAL COMMON MODE CONFIGURATION (Figure 1)

The SMSxxC Series provides up to four (4) lines of protection in a common mode configuration as depicted in Figure 2.
Circuit connectivity is as follows:

- ✔ Line 1 is connected to Pin 1.
- ✔ Line 2 is connected to Pin 3.
- ✔ Line 3 is connected to Pin 4.
- ✔ Line 4 is connected to Pin 5.
- ✔ Pin 6 is connected to ground.
- ✔ Pin 2 is not connected.

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.

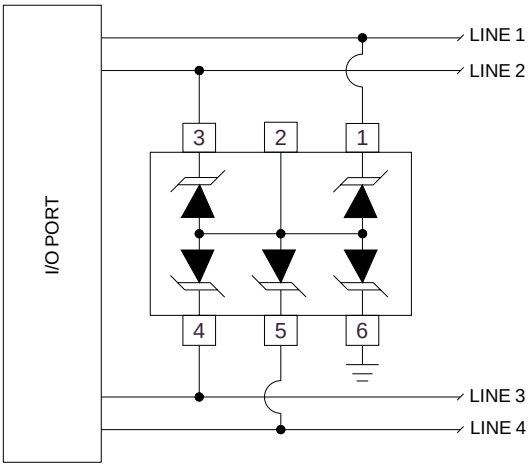
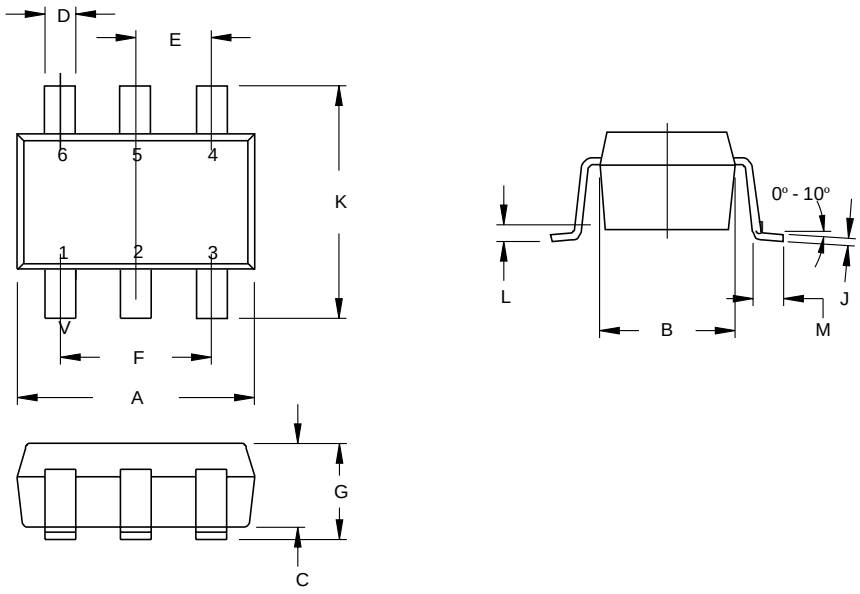


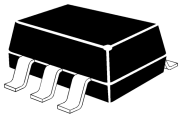
Figure 2 - Bidirectional Configuration Common-Mode I/O Port Protection

PACKAGE OUTLINE & DIMENSIONS

PACKAGE OUTLINE



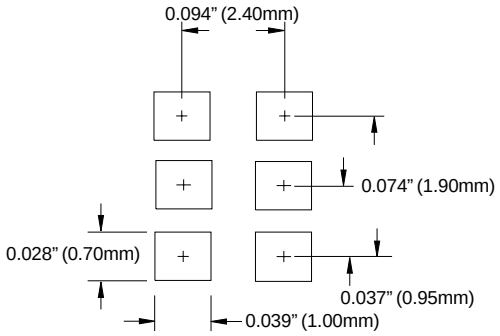
SOT-23-6



PACKAGE DIMENSIONS

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.80	3.05	0.110	0.120
B	1.50	1.75	0.059	0.070
C	0.90	1.30	0.036	0.051
D	0.35	0.50	0.014	0.020
E	0.85	1.05	0.033	0.040
F	1.70	2.10	0.067	0.083
G	0.90	1.45	0.036	0.057
J	0.090	0.20	0.0035	0.008
K	2.60	3.00	0.102	0.118
L	0.20 TYP	0.20 TYP	0.007 TYP	0.007 TYP
M	0.35	0.55	0.014	0.022

MOUNTING PAD



NOTES:
1. Dimensioning and tolerances per ANSI Y14.5M, 1985.
2. Controlling Dimension: Inches
3. Dimensions are exclusive of mold flash and metal burrs.

06013 Rev 1 - 11/01

TAPE & REEL PACKAGING:
Surface mount product is taped and reeled in accordance with EIA-481, reel quantites and sizes are as follows:
7 Inch Reel - 3,000 pieces per reel; 13 Inch Reel - 10,000 pieces per reel

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

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