

September 17, 1998

TEL:805-498-2111 FAX:805-498-3804 WEB:http://www.semtech.com

## DESCRIPTION

The SMS series of TVS arrays are designed to protect sensitive electronics from damage or latch-up due to ESD and other voltage-induced transient events. Each device will protect up to five lines. They are available with operating voltages of 5V, 12V, 15V and 24V. They are unidirectional devices and may be used on lines where the signal polarities are above ground.

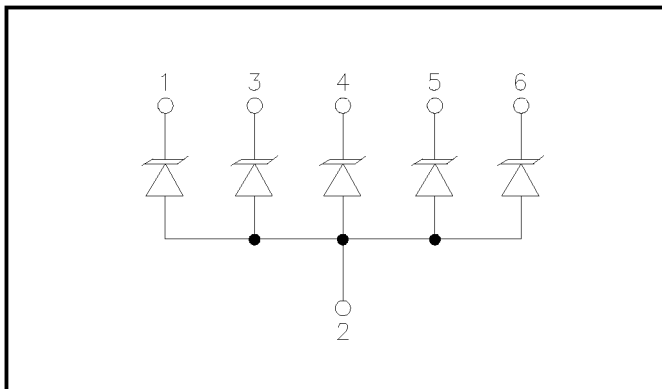
TVS diodes are solid-state devices designed specifically for transient suppression. They feature large cross-sectional area junctions for conducting high transient currents. They offer desirable characteristics for board level protection including fast response time, low operating and clamping voltage and no device degradation.

The SMS series devices may be used to meet the immunity requirements of IEC 1000-4-2, level 4. The low cost SOT-23 6L package makes them ideal for use in portable electronics such as cell phones, PDA's, and notebook computers.

## ORDERING INFORMATION

Part Number	Working Voltage	Qty per Reel	Reel Size
SMS05C.TB	5V	3,000	7"
SMS05C.TE	5V	10,000	13"
SMS12C.TB	12V	3,000	7"
SMS12C.TE	12V	10,000	13"
SMS15C.TB	15V	3,000	7"
SMS15C.TE	15V	10,000	13"
SMS24C.TB	24V	3,000	7"
SMS24C.TE	24V	10,000	13"

## CIRCUIT DIAGRAM



## FEATURES

- Transient protection for high speed data lines to **IEC 1000-4-2 (ESD) 15kV (air), 8kV (contact)**
- **IEC 1000-4-4 (EFT) 40A (tp = 5/50ns)**
- **IEC 1000-4-5 (Lightning) 12A (tp = 8/20µs)**
- Small package for use in portable electronics
- Protects five I/O lines
- Working voltages: 5V, 12V, 15V and 24V
- Low leakage current
- Low operating and clamping voltages
- Solid state silicon avalanche technology

## MECHANICAL CHARACTERISTICS

- JEDEC SOT-23-6 package
- Molding compound flammability rating: UL 94V-0
- Marking : Marking Code
- Packaging : Tape and Reel per EIA 481

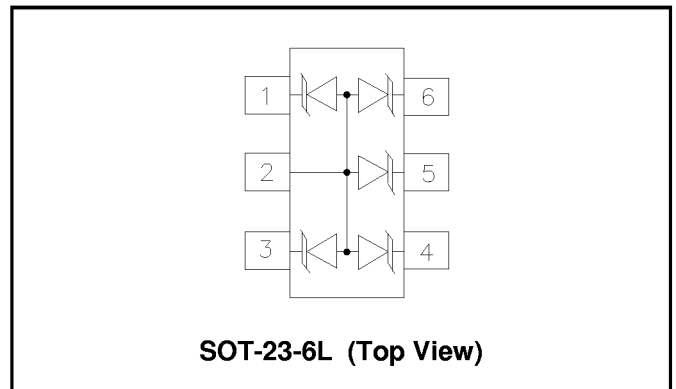
## APPLICATIONS

- RS-232, RS-423 data lines
- Microprocessor based equipment
- Personal Digital Assistants (PDA's)
- Notebooks
- Portable Instrumentation
- Cell phones
- Peripherals

## MARKING CODE

Part Number	Marking Code
SMS05C	C05
SMS12C	C12
SMS15C	C15
SMS24C	C24

## SCHEMATIC & PIN CONFIGURATION



September 17, 1998

**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Peak Pulse Power (tp = 8/20μs)	P <sub>pk</sub>	350	Watts
Peak Pulse Current (tp = 8/20μs)	I <sub>pp</sub>	24	A
Peak Forward Voltage (IF=1A, tp=8/20μs)	V <sub>FP</sub>	1.5	V
Lead Soldering Temperature	T <sub>L</sub>	260 (10 sec.)	°C
Operating Temperature	T <sub>stg</sub>	-55 to +125	°C
Storage Temperature	T <sub>j</sub>	-55 to +150	°C

**ELECTRICAL CHARACTERISTICS**

SMS05C						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V <sub>RWM</sub>				5	V
Reverse Breakdown Voltage	V <sub>BR</sub>	I <sub>t</sub> = 1mA	6			V
Reverse Leakage Current	I <sub>R</sub>	V <sub>RWM</sub> = 5V, T=25°C			20	μA
Clamping Voltage	V <sub>C</sub>	I <sub>pp</sub> = 5A, tp = 8/20μs			9.8	V
Clamping Voltage	V <sub>C</sub>	I <sub>pp</sub> = 24A, tp = 8/20μs			14.5	V
Junction Capacitance	C <sub>j</sub>	Between I/O pins and Gnd V <sub>R</sub> = 0V, f = 1MHz		325	400	pF

SMS12C						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V <sub>RWM</sub>				12	V
Reverse Breakdown Voltage	V <sub>BR</sub>	I <sub>t</sub> = 1mA	13.3			V
Reverse Leakage Current	I <sub>R</sub>	V <sub>RWM</sub> = 12V, T=25°C			1	μA
Clamping Voltage	V <sub>C</sub>	I <sub>pp</sub> = 5A, tp = 8/20μs			19	V
Clamping Voltage	V <sub>C</sub>	I <sub>pp</sub> = 15A, tp = 8/20μs			23	V
Junction Capacitance	C <sub>j</sub>	Between I/O pins and Gnd V <sub>R</sub> = 0V, f = 1MHz		135	150	pF



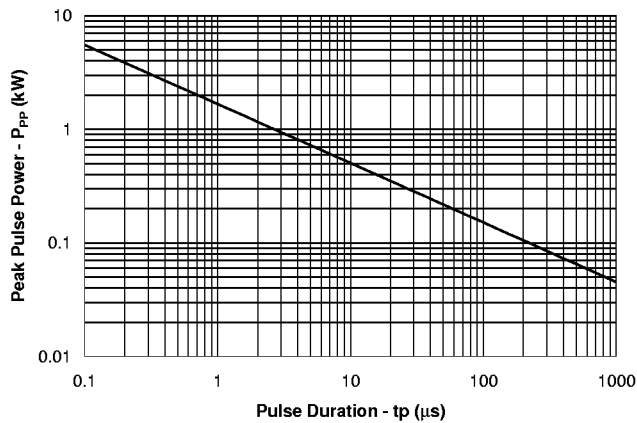
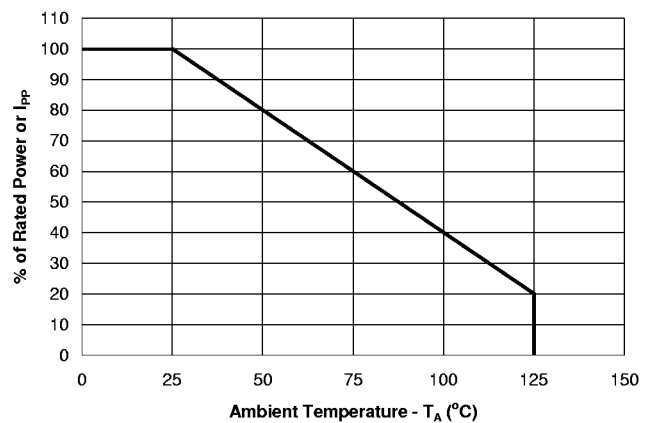
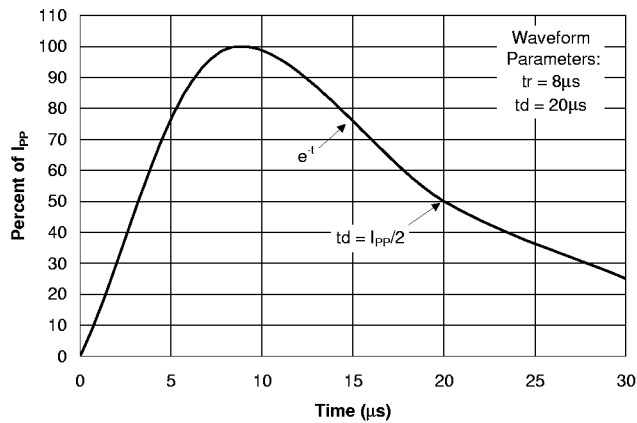
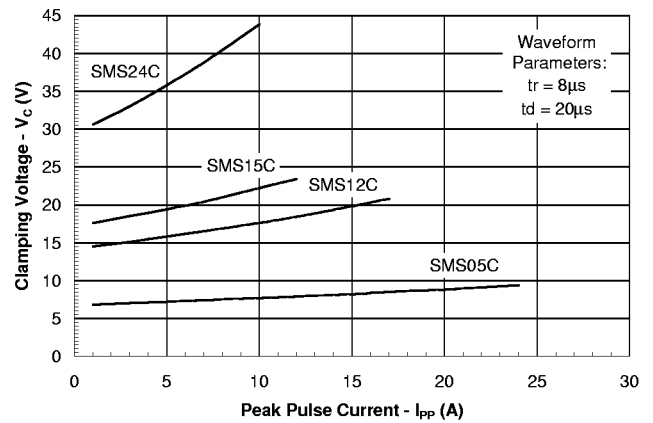
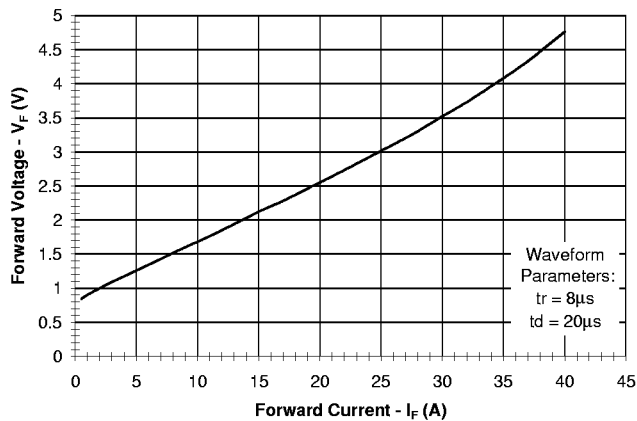
September 17, 1998

**ELECTRICAL CHARACTERISTICS**

<b>SMS15C</b>						
<b>Parameter</b>	<b>Symbol</b>	<b>Conditions</b>	<b>Minimum</b>	<b>Typical</b>	<b>Maximum</b>	<b>Units</b>
Reverse Stand-Off Voltage	$V_{RWM}$				15	V
Reverse Breakdown Voltage	$V_{BR}$	$I_t = 1\text{mA}$	16.7			V
Reverse Leakage Current	$I_R$	$V_{RWM} = 15\text{V}, T=25^\circ\text{C}$			1	$\mu\text{A}$
Clamping Voltage	$V_C$	$I_{PP} = 5\text{A}, t_p = 8/20\mu\text{s}$			24	V
Clamping Voltage	$V_C$	$I_{PP} = 12\text{A}, t_p = 8/20\mu\text{s}$			29	V
Junction Capacitance	$C_j$	Between I/O pins and Gnd $V_R = 0\text{V}, f = 1\text{MHz}$		100	125	pF

<b>SMS24C</b>						
<b>Parameter</b>	<b>Symbol</b>	<b>Conditions</b>	<b>Minimum</b>	<b>Typical</b>	<b>Maximum</b>	<b>Units</b>
Reverse Stand-Off Voltage	$V_{RWM}$				24	V
Reverse Breakdown Voltage	$V_{BR}$	$I_t = 1\text{mA}$	26.7			V
Reverse Leakage Current	$I_R$	$V_{RWM} = 24\text{V}, T=25^\circ\text{C}$			1	$\mu\text{A}$
Clamping Voltage	$V_C$	$I_{PP} = 5\text{A}, t_p = 8/20\mu\text{s}$			40	V
Clamping Voltage	$V_C$	$I_{PP} = 8\text{A}, t_p = 8/20\mu\text{s}$			44	V
Junction Capacitance	$C_j$	Between I/O pins and Gnd $V_R = 0\text{V}, f = 1\text{MHz}$		60	75	pF

September 17, 1998

**TYPICAL CHARACTERISTICS**
**Non-Repetitive Peak Pulse Power vs. Pulse Time**

**Power Derating Curve**

**Pulse Waveform**

**Clamping Voltage vs. Peak Pulse Current**

**Forward Voltage vs. Forward Current**


September 17, 1998

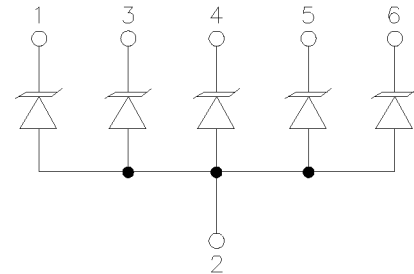
## APPLICATIONS INFORMATION

### Device Connection for Protection of Four Data Lines

The SMSxxC is designed to protect up to five unidirectional data lines. The device is connected as follows:

1. Unidirectional protection of five I/O lines is achieved by connecting pins 1, 3, 4, 5 and 6 to the data lines. Pin 2 is connected to ground. The ground connection should be made directly to the ground plane for best results. The path length is kept as short as possible to reduce the effects of parasitic inductance in the board traces.

### SMSxxC Circuit Diagram

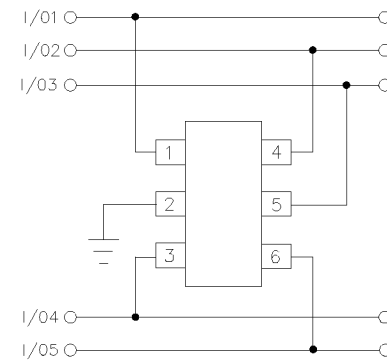


### Circuit Board Layout Recommendations for Suppression of ESD.

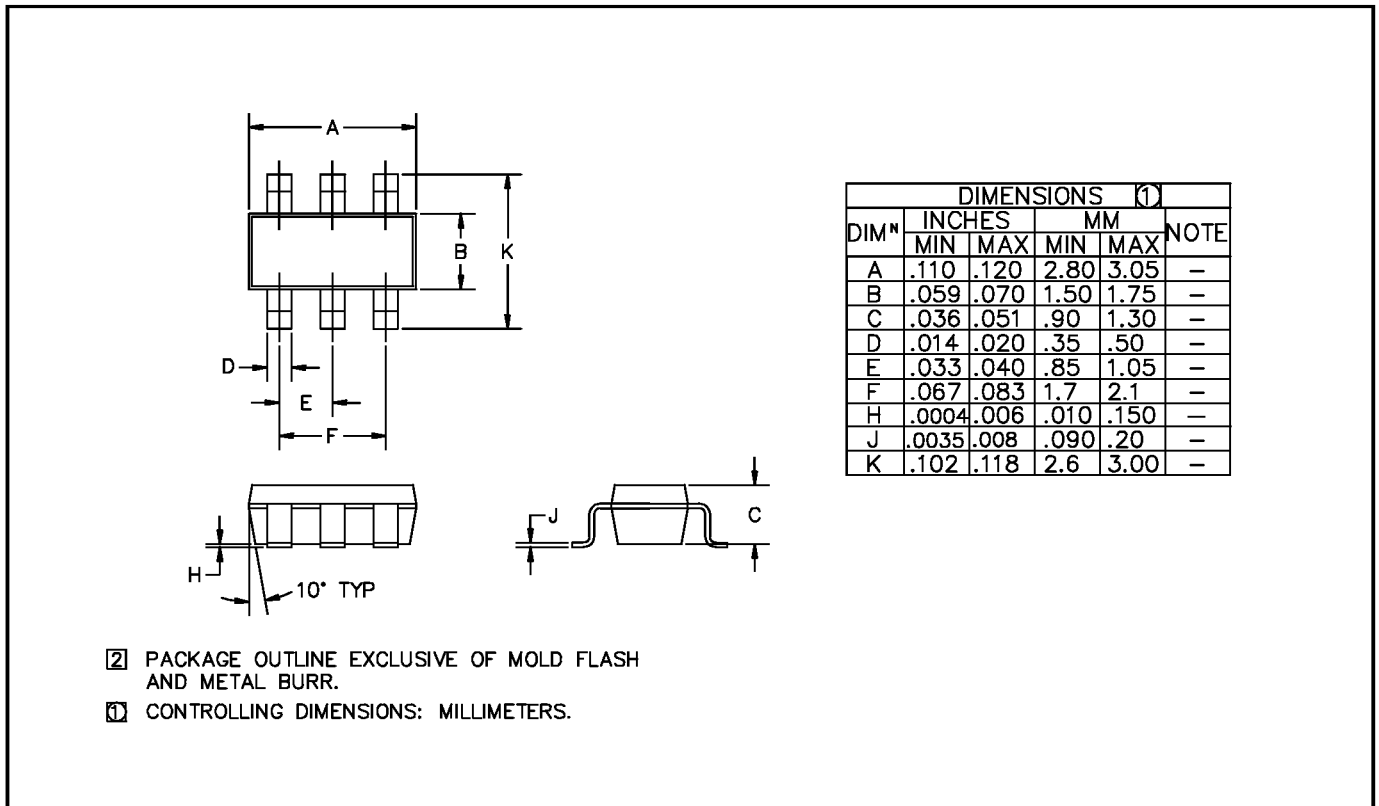
Good circuit board layout is critical for the suppression of ESD induced transients. The following guidelines are recommended:

- Place the SMSxxC near the input terminals or connectors to restrict transient coupling.
- Minimize the path length between the SMSxxC and the protected line.
- Minimize all conductive loops including power and ground loops.
- The ESD transient return path to ground should be kept as short as possible.
- Never run critical signals near board edges.
- Use ground planes whenever possible.

### Protection of Five Unidirectional Lines



September 17, 1998

**OUTLINE DRAWING SOT23-6L**

**LAND PATTERN SOT23-6L**
