

PROTECTION PRODUCTS

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 61000-4-2, level 4. The low cost SOT23-6L package makes them ideal for use in portable electronics such as cell phones, PDA's, and notebook computers.

Features

- ◆ Transient protection for data lines to
IEC 61000-4-2 (ESD) 15kV (air), 8kV (contact)
IEC 61000-4-4 (EFT) 40A (5/50ns)
IEC 61000-4-5 (Lightning) 24A (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

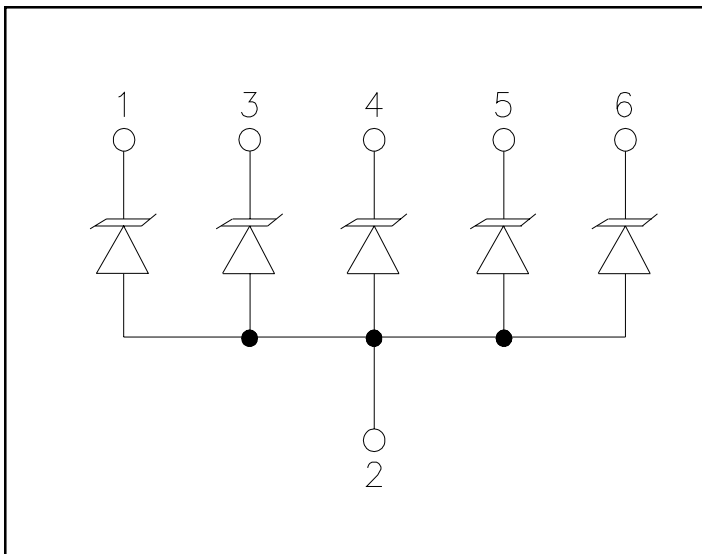
Mechanical Characteristics

- ◆ EIAJ SOT23-6L package
- ◆ Molding compound flammability rating: UL 94V-0
- ◆ Marking : Marking Code
- ◆ Packaging : Tape and Reel per EIA 481

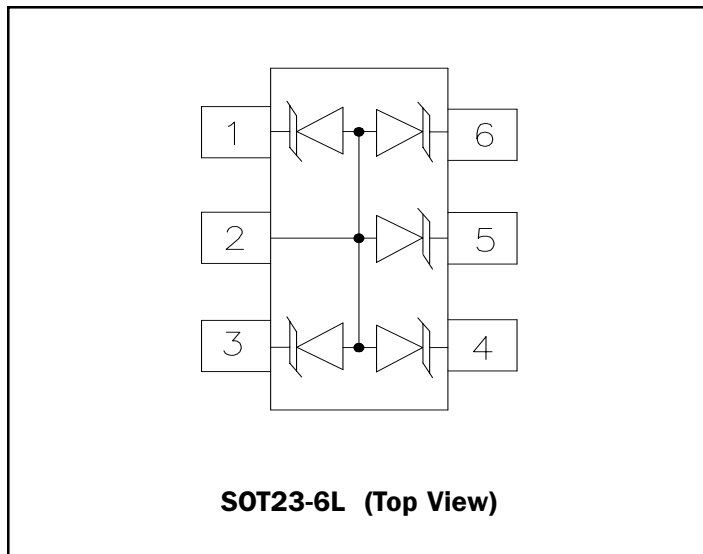
Applications

- ◆ Cell phone Handsets and Accessories
- ◆ Microprocessor Based Equipment
- ◆ Personal Digital Assistants (PDA's)
- ◆ Notebooks, Desktops, and Servers
- ◆ Portable Instrumentation
- ◆ Set Top Box
- ◆ Peripherals
- ◆ MP3 Players
- ◆ Cordless Phones

Circuit Diagram



Schematic & PIN Configuration



PROTECTION PRODUCTS
Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20μs)	P _{pk}	300	Watts
Peak Pulse Current (tp = 8/20μs)	I _{pp}	24	A
Peak Forward Voltage (IF=1A, tp=8/20μs)	V _{FP}	1.5	V
Lead Soldering Temperature	T _L	260 (10 sec.)	°C
Operating Temperature	T _J	-55 to +125	°C
Storage Temperature	T _{STG}	-55 to +150	°C

Electrical Characteristics
SMS05C

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V _{RWM}				5	V
Reverse Breakdown Voltage	V _{BR}	I _t = 1mA	6			V
Reverse Leakage Current	I _R	V _{RWM} = 5V, T=25°C			20	μA
Clamping Voltage	V _C	I _{pp} = 5A, tp = 8/20μs			9.8	V
Clamping Voltage	V _C	I _{pp} = 24A, tp = 8/20μs			14.5	V
Junction Capacitance	C _j	Between I/O Pins and Gnd V _R = 0V, f = 1MHz		325	400	pF

SMS12C

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V _{RWM}				12	V
Reverse Breakdown Voltage	V _{BR}	I _t = 1mA	13.3			V
Reverse Leakage Current	I _R	V _{RWM} = 12V, T=25°C			1	μA
Clamping Voltage	V _C	I _{pp} = 5A, tp = 8/20μs			19	V
Clamping Voltage	V _C	I _{pp} = 15A, tp = 8/20μs			23	V
Junction Capacitance	C _j	Between I/O Pins and Gnd V _R = 0V, f = 1MHz		135	150	pF

PROTECTION PRODUCTS
Electrical Characteristics (Continued)

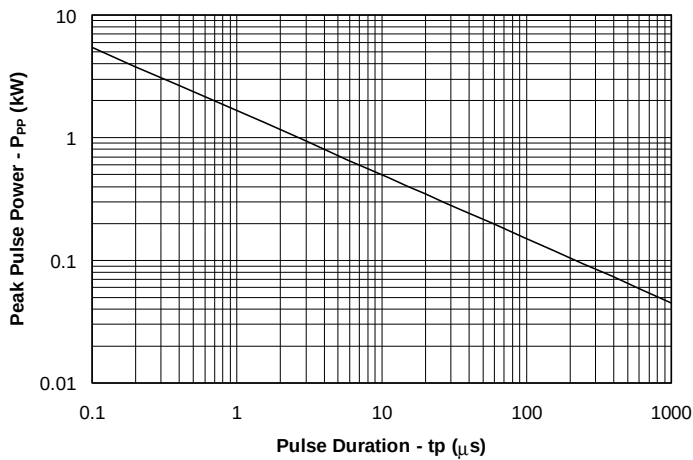
SMS15C						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V_{RWM}				15	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1mA$	16.7			V
Reverse Leakage Current	I_R	$V_{RWM} = 15V, T=25^{\circ}C$			1	μA
Clamping Voltage	V_C	$I_{PP} = 5A, tp = 8/20\mu s$			24	V
Clamping Voltage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

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

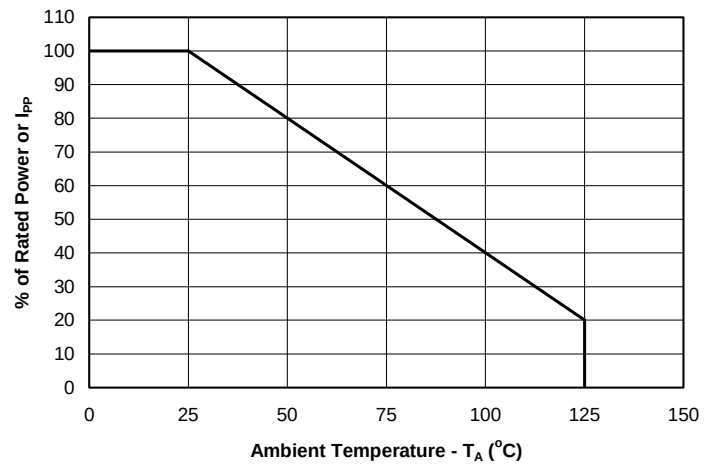
PROTECTION PRODUCTS

Typical Characteristics

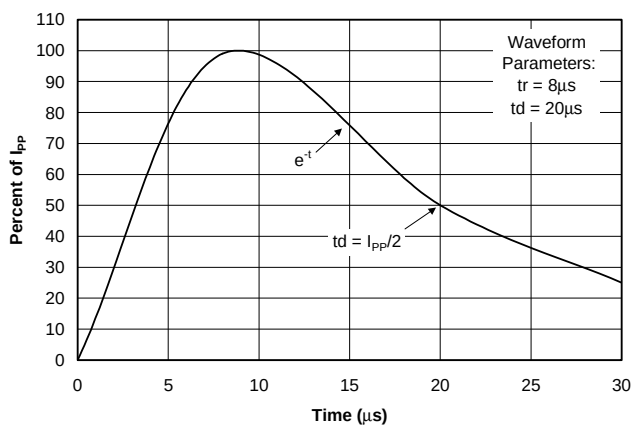
Non-Repetitive Peak Pulse Power vs. Pulse Time



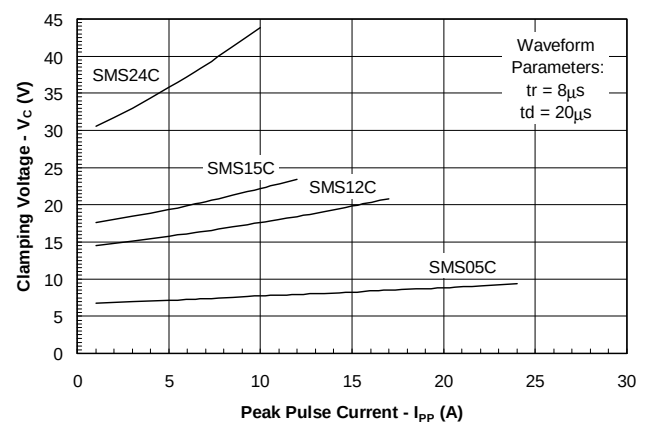
Power Derating Curve



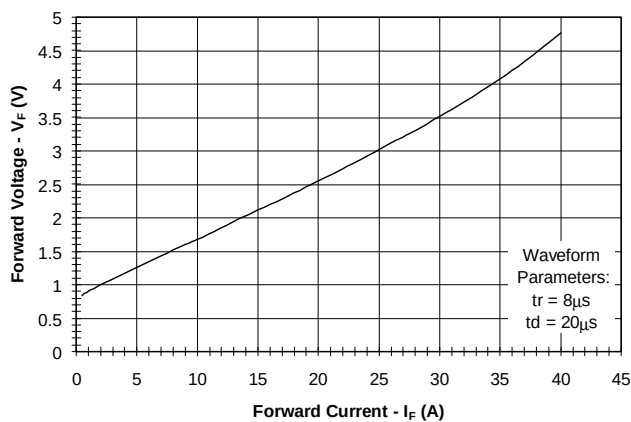
Pulse Waveform



Clamping Voltage vs. Peak Pulse Current



Forward Voltage vs. Forward Current



PROTECTION PRODUCTS

Applications Information

Device Connection for Protection of Five Data Lines

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

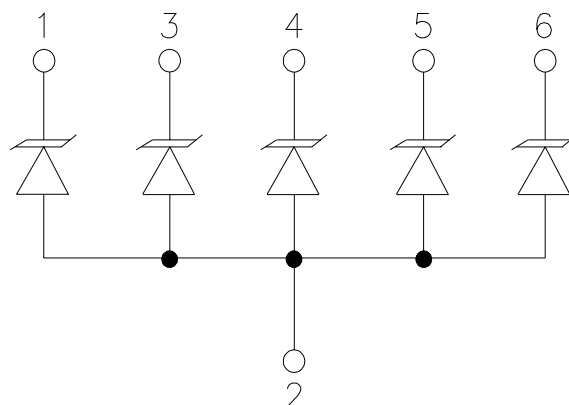
1. Unidirectional protection of five I/O lines is achieved by connecting pins 1, 3, 4, 5 and 6 to the data lines. Pin 2 is connected to ground. The ground connection should be made directly to the ground plane for best results. The path length is kept as short as possible to reduce the effects of parasitic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

Circuit Board Layout Recommendations for Suppression of ESD.

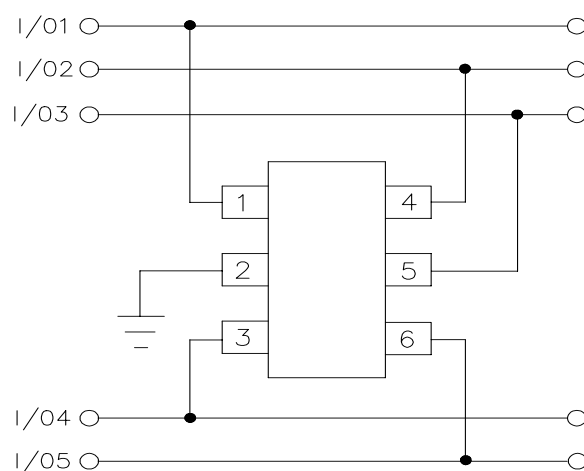
Good circuit board layout is critical for the suppression of ESD induced transients. The following guidelines are recommended:

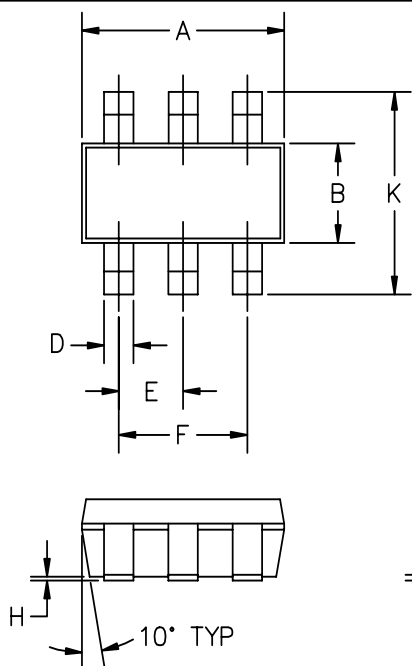
- Place the SMSxxC near the input terminals or connectors to restrict transient coupling.
- Minimize the path length between the SMSxxC and the protected line.
- Minimize all conductive loops including power and ground loops.
- The ESD transient return path to ground should be kept as short as possible.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

SMSxxC Circuit Diagram



Protection of Five Unidirectional Lines

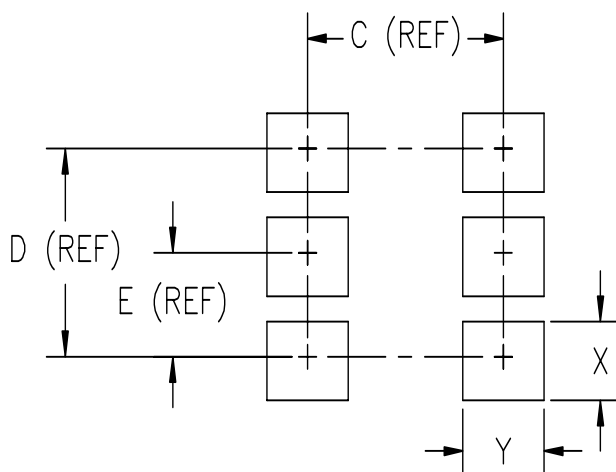


PROTECTION PRODUCTS
Outline Drawing - SOT23-6L


DIMENSIONS ①					NOTE
DIM ^N	INCHES		MM		
	MIN	MAX	MIN	MAX	
A	.110	.120	2.80	3.05	—
B	.059	.070	1.50	1.75	—
C	.036	.051	.90	1.30	—
D	.014	.020	.35	.50	—
E	.033	.040	.85	1.05	—
F	.067	.083	1.7	2.1	—
H	.0004	.006	.010	.150	—
J	.0035	.008	.090	.20	—
K	.102	.118	2.6	3.00	—

② PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH AND METAL BURR.

① CONTROLLING DIMENSIONS: MILLIMETERS.

Land Pattern - SOT23-6L


DIMENSIONS			
DIM ^N	INCHES	MM	NOTE
C	.094	2.4	—
D	.074	1.9	—
E	.037	.95	—
X	.028	.7	—
Y	.039	1.0	—

PROTECTION PRODUCTS**Marking Codes**

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

Note:

Pin 1 Identified with a dot.

Ordering Information

Part Number	Working Voltage	Qty per Reel	Reel Size
SMS05C.TC	5V	3,000	7 Inch
SMS05C.TG	5V	10,000	13 Inch
SMS12C.TC	12V	3,000	7 Inch
SMS12CTG	12V	10,000	13 Inch
SMS15C.TC	15V	3,000	7 Inch
SMS15C.TG	15V	10,000	13 Inch
SMS24C.TC	24V	3,000	7 Inch
SMS24C.TG	24V	10,000	13 Inch

Note:

(1) No suffix indicates tube pack.

Contact Information

Semtech Corporation
Protection Products Division
652 Mitchell Rd., Newbury Park, CA 91320
Phone: (805)498-2111 FAX (805)498-3804