TVS Diode Array For ESD and Latch-Up Protection

SMS05 thru SMS24

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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 four 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.

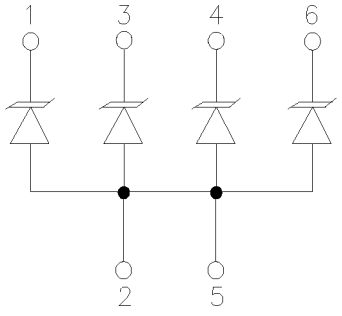
TVS diodes are solid-state devices designed specifically for transient surpression. They feature large cross-sectional area junctions for conducting high transient currents. They offer desirable characteristics for board level protection including fast response time, low operating and clamping voltage 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 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
SMS05.TB	5V	3,000	7"
SMS05.TE	5V	10,000	13"
SMS12.TB	12V	3,000	7"
SMS12.TE	12V	10,000	13"
SMS15.TB	15V	3,000	7"
SMS15.TE	15V	10,000	13"
SMS24.TB	24V	3,000	7"
SMS24.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) 24A (tp = 8/20µs)
- Small package for use in portable electronics
- Protects four 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

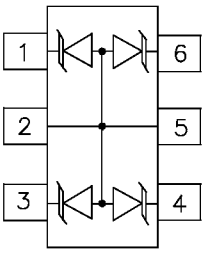
APPLICATIONS

- RS-232, RS-423 data lines
- Microprocessor based equipment
- Personal Digital Assistants (PDA's)
- Notebooks, Desktops, & Servers
- Portable Instrumentation
- Cell Phone Handsets and Accessories
- Peripherals

MARKING CODE

Part Number	Marking Code
SMS05	05
SMS12	12
SMS15	15
SMS24	24

SCHEMATIC & PIN CONFIGURATION



SOT-23-6L (Top View)

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MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Pulse Power (tp = 8/20μs)	P_{pk}	350	Watts
Peak Pulse Current (tp = 8/20μs)	I_{PP}	24	A
ESD Voltage	V_{PP}	30	kV
Lead Soldering Temperature	T_L	260 (10 sec.)	°C
Operating Temperature	T_{stg}	-55 to +125	°C
Storage Temperature	T_j	-55 to +150	°C

ELECTRICAL CHARACTERISTICS

SMS05

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

SMS12

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

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ELECTRICAL CHARACTERISTICS

SMS15

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°C			1	µA
Clamping Voltage	V_C	I_{PP} = 5A, tp = 8/20µs			24	V
Clamping Voltage	V_C	I_{PP} = 12A, tp = 8/20µs			29	V
Junction Capacitance	C_j	Between I/O pins and Gnd V_R = 0V, f = 1MHz		100	125	pF

SMS24

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°C			1	µA
Clamping Voltage	V_C	I_{PP} = 5A, tp = 8/20µs			40	V
Clamping Voltage	V_C	I_{PP} = 8A, tp = 8/20µs			44	V
Junction Capacitance	C_j	Between I/O pins and Gnd V_R = 0V, f = 1MHz		60	75	pF

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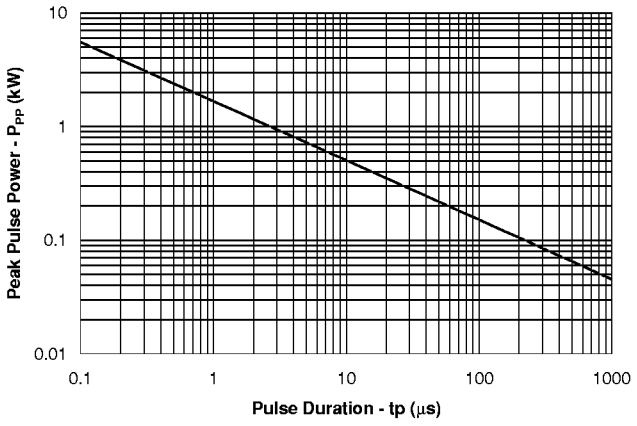
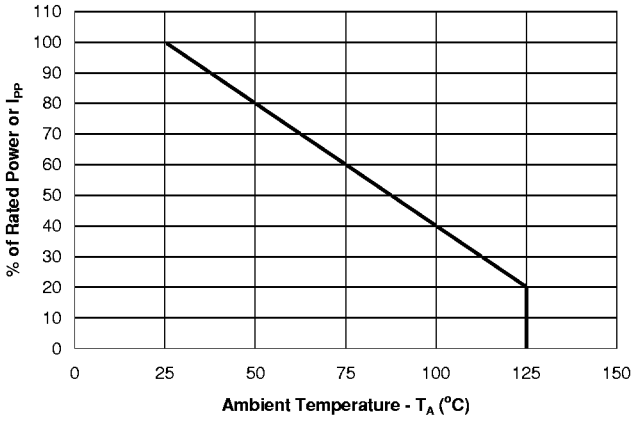
TYPICAL CHARACTERISTICS

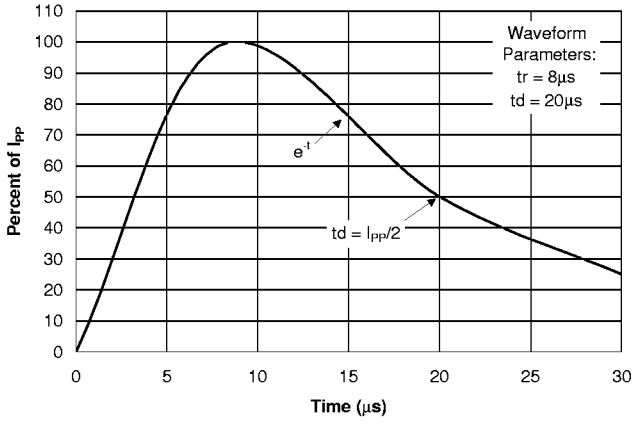
Non-Repetitive Peak Pulse Power vs. Pulse Time



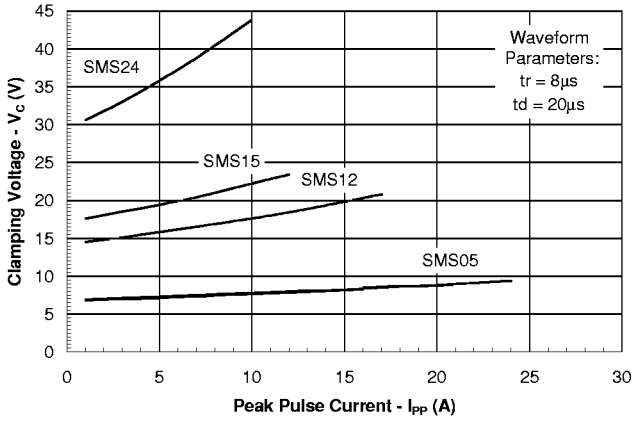
Power Derating Curve



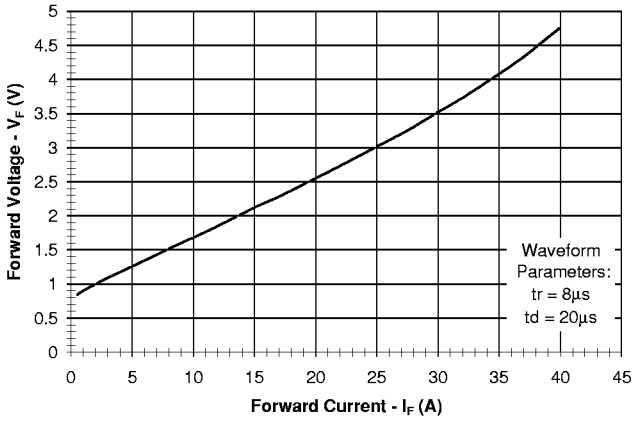
Pulse Waveform



Clamping Voltage vs. Peak Pulse Current



Forward Voltage vs. Forward Current



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APPLICATIONS INFORMATION

Device Connection for Protection of Four Data Lines

The SMSxx is designed to protect up to four unidirectional data lines. The device is connected as follows:

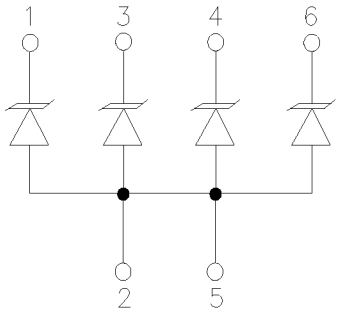
1. Unidirectional protection of four I/O lines is achieved by connecting pins 1, 3, 4 and 6 to the data lines. Pin 2 and 5 are connected to ground. The ground connections should be made directly to the ground plane for best results. The path length is kept as short as possible to reduce the effects of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

Circuit Board Layout Recommendations for Suppression of ESD.

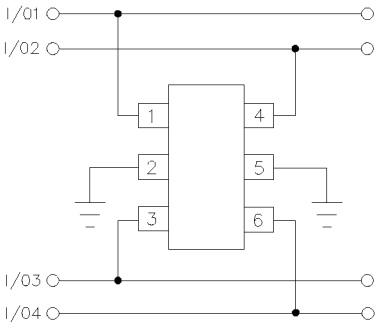
Good circuit board layout is critical for the suppression of ESD induced transients. The following guidelines are recommended:

- Place the SMSxx near the input terminals or connectors to restrict transient coupling.
- Minimize the path length between the SMSxx 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.

SMSxx Circuit Diagram



Protection of Four Unidirectional Lines



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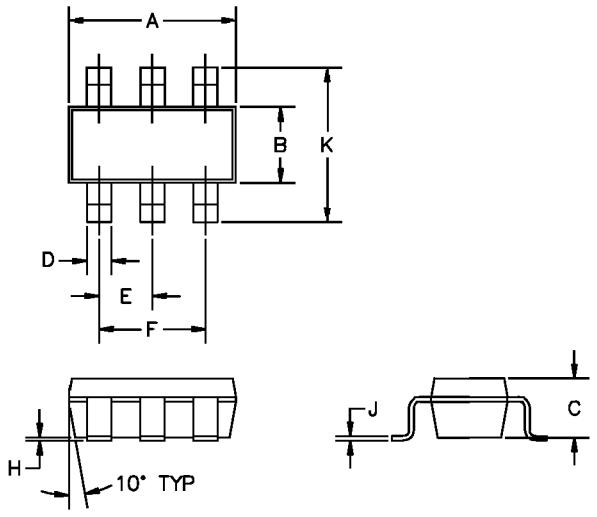
OUTLINE DRAWING SOT23-6L

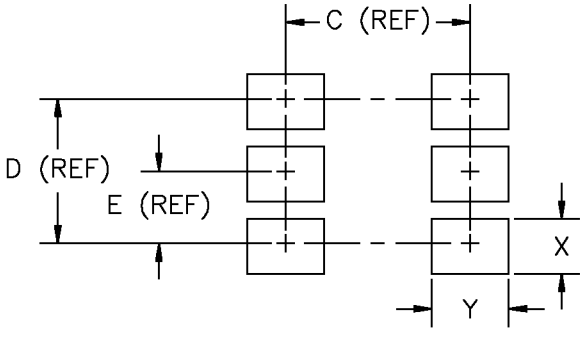


DIM[N]	DIMENSIONS [1] INCHES MIN	INCHES MAX	MM MIN	MM MAX	NOTE
A	.110	.120	2.80	3.05	–
B	.059	.070	1.50	1.75	–
C	.036	.051	.90	1.30	–
D	.014	.020	.35	.50	–
E	.033	.040	.85	1.05	–
F	.067	.083	1.7	2.1	–
H	.0004	.006	.010	.150	–
J	.0035	.008	.090	.20	–
K	.102	.118	2.6	3.00	–

[2] PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH AND METAL BURR.

[1] CONTROLLING DIMENSIONS: MILLIMETERS.

LAND PATTERN SOT23-6L



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