

PROTECTION PRODUCTS

Description

The SMS series of TVS arrays are designed to protect sensitive electronics from damage or latch-up due to ESD, lightning, and other voltage-induced transient events. Each device will protect up to four lines operating at **3.3 volts**.

The SMS3.3 is a solid-state device designed specifically for transient suppression. It is constructed using Semtech's proprietary EPD process technology. The EPD process provides low standoff voltages with significant reductions in leakage currents and capacitance over traditional pn junction processes. They offer desirable characteristics for board level protection including fast response time, low clamping voltage and no device degradation.

The SMS3.3 may be used to meet the immunity requirements of IEC 61000-4-2, level 4 ($\pm 15\text{kV}$ air, $\pm 8\text{kV}$ contact discharge). 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) $\pm 15\text{kV}$ (air), $\pm 8\text{kV}$ (contact)**
- ◆ **IEC 61000-4-4 (EFT) 40A (5/50ns)**
- ◆ **IEC 61000-4-5 (Lightning) 12A (8/20 μ s)**
- ◆ Protects four I/O lines
- ◆ Working voltage: 3.3V
- ◆ Low leakage current ($< 1\mu\text{A}$)
- ◆ Low clamping voltage
- ◆ Low capacitance (35pF typical)
- ◆ Solid-state EPD TVS technology

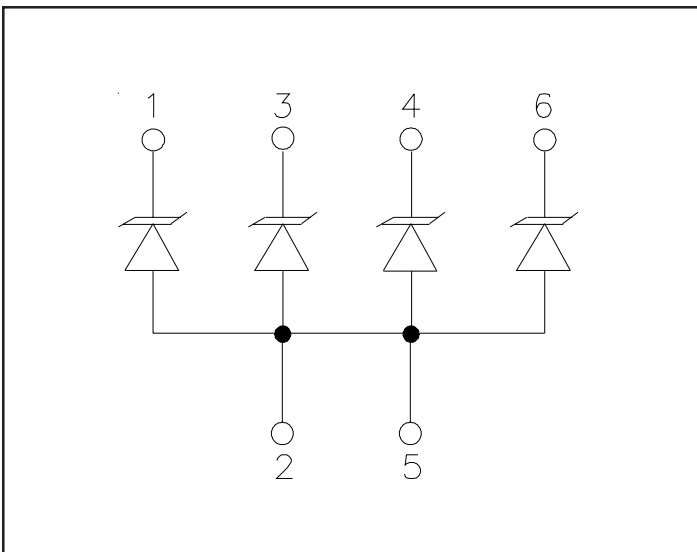
Mechanical Characteristics

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

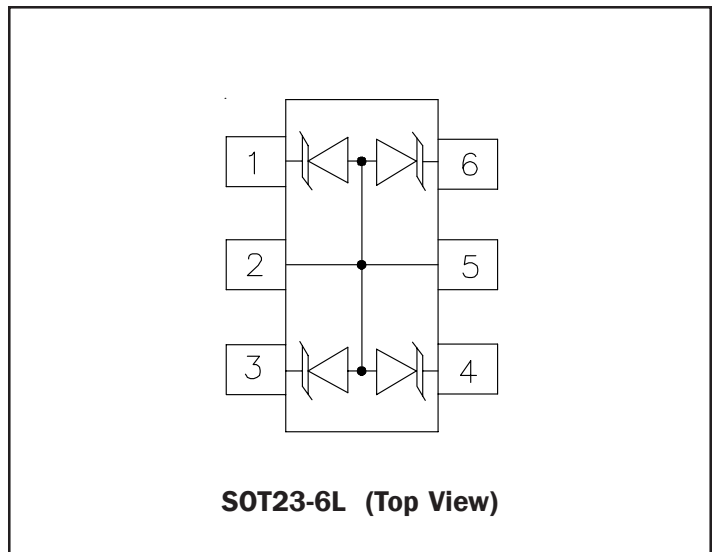
Applications

- ◆ Cell phone Handsets and Accessories
- ◆ Microprocessor Based Equipment
- ◆ Personal Digital Assistants (PDA's) and Pagers
- ◆ Desktops PC and Servers
- ◆ Notebook, Laptop, and Palmtop Computers
- ◆ Portable Instrumentation
- ◆ Peripherals
- ◆ MP3 Players
- ◆ Cordless Phones

Equivalent Circuit Diagram



Schematic & PIN Configuration



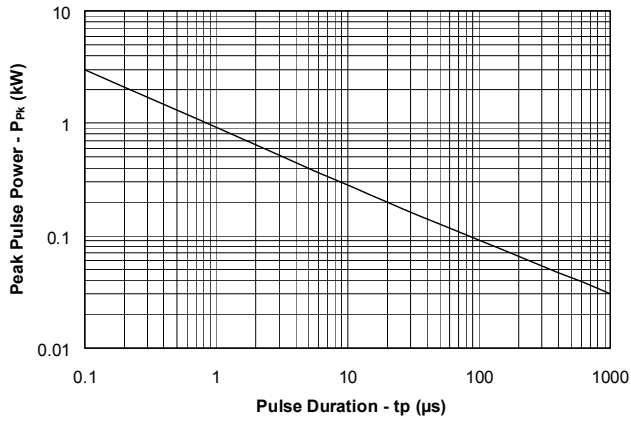
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Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20μs)	P_{pk}	200	Watts
Peak Pulse Current (tp = 8/20μs)	I_{pp}	12	A
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	V_{ESD}	>25 >15	kV
Soldering Temperature	T_L	260 (10 seconds)	°C
Operating Temperature	T_J	-55 to +125	°C
Storage Temperature	T_{STG}	-55 to +150	°C

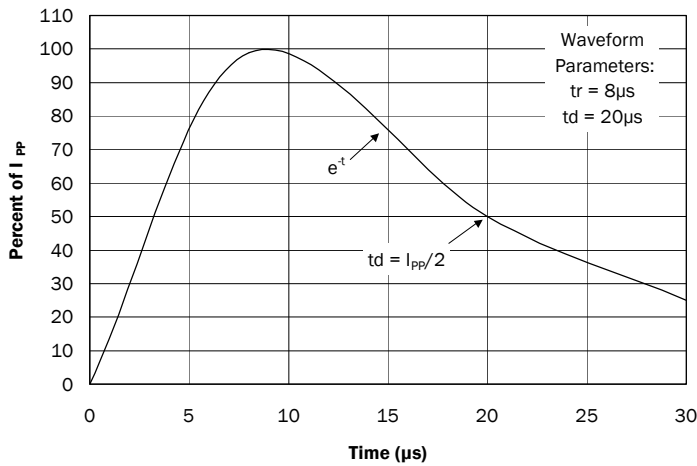
Electrical Characteristics

SMS3.3						
Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Reverse Stand-Off Voltage	V_{RWM}				3.3	V
Punch-Through Voltage	V_{PT}	$I_{PT} = 2\mu A$	3.5			V
Snap-Back Voltage	V_{SB}	$I_{SB} = 50mA$	2.8			V
Reverse Leakage Current	I_R	$V_{RWM} = 3.3V, T=25^\circ C$		0.05	0.5	μA
Clamping Voltage	V_C	$I_{pp} = 1A, tp = 8/20\mu s$ Any I/O to Ground			4.5	V
Clamping Voltage	V_C	$I_{pp} = 5A, tp = 8/20\mu s$ Any I/O to Ground			6.8	V
Clamping Voltage	V_C	$I_{pp} = 12A, tp = 8/20\mu s$ Any I/O to Ground			8.7	V
Steering Diode Forward Voltage (Reverse Clamping Voltage)	V_F	$I_{pp} = 1A, tp = 8/20\mu s$ Any I/O to Ground			1.7	V
Junction Capacitance	C_j	Each I/O pin and Ground $V_R = 0V, f = 1MHz$		35	40	pF

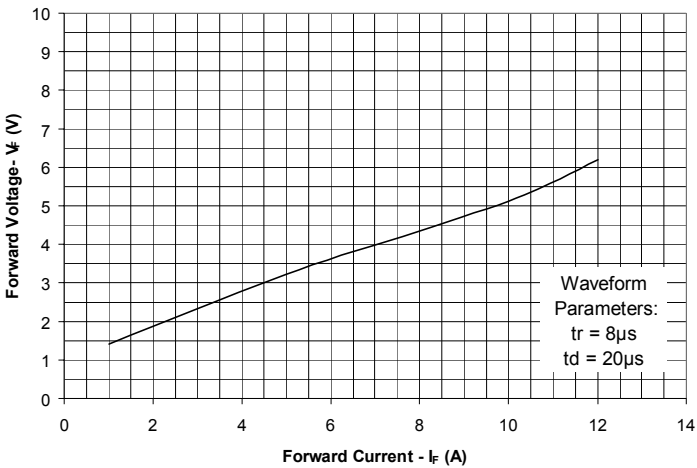
Non-Repetitive Peak Pulse Power vs. Pulse Time



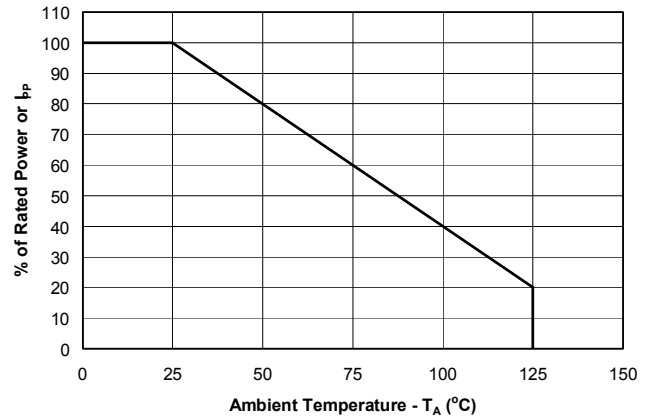
Pulse Waveform



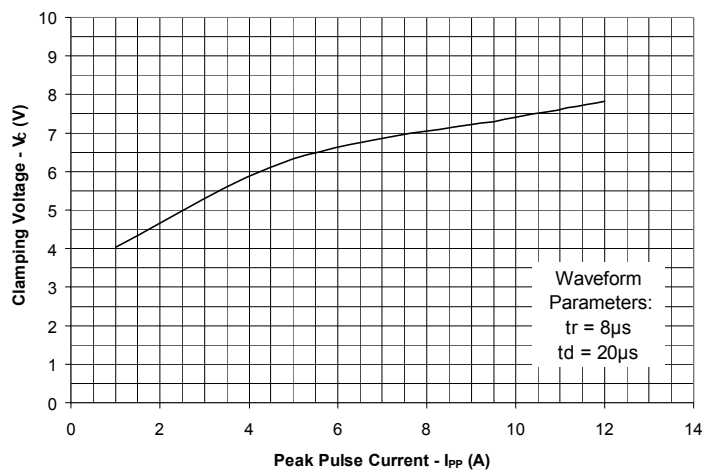
Forward Voltage vs. Forward Current



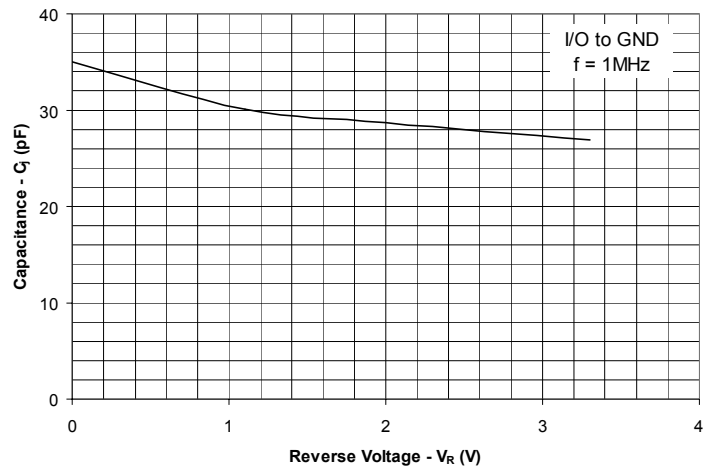
Power Derating



Clamping Voltage vs. Peak Pulse Current



Capacitance vs. Reverse Voltage



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Applications Information

Device Connection for Protection of Four Data Lines

The SMS3.3 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

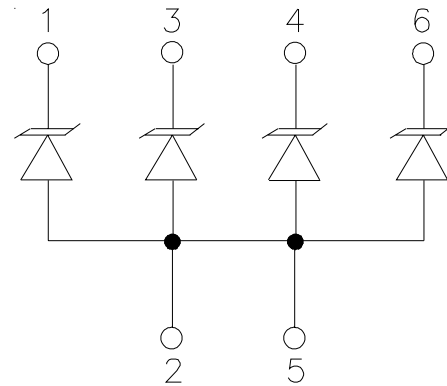
Good circuit board layout is critical for the suppression of ESD induced transients. The following guidelines are recommended:

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

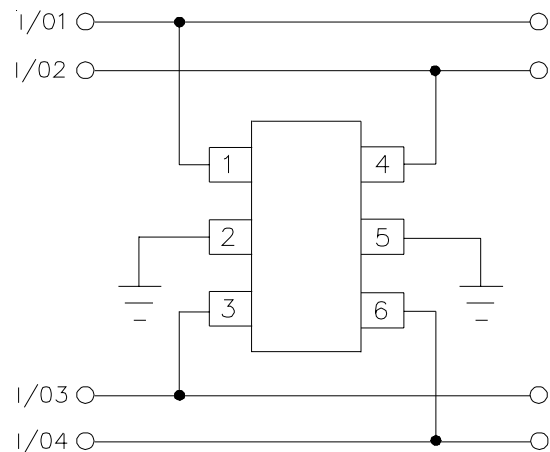
Matte Tin Lead Finish

Matte tin has become the industry standard lead-free replacement for SnPb lead finishes. A matte tin finish is composed of 100% tin solder with large grains. Since the solder volume on the leads is small compared to the solder paste volume that is placed on the land pattern of the PCB, the reflow profile will be determined by the requirements of the solder paste. Therefore, these devices are compatible with both lead-free and SnPb assembly techniques. In addition, unlike other lead-free compositions, matte tin does not have any added alloys that can cause degradation of the solder joint.

SMS3.3 Circuit Diagram

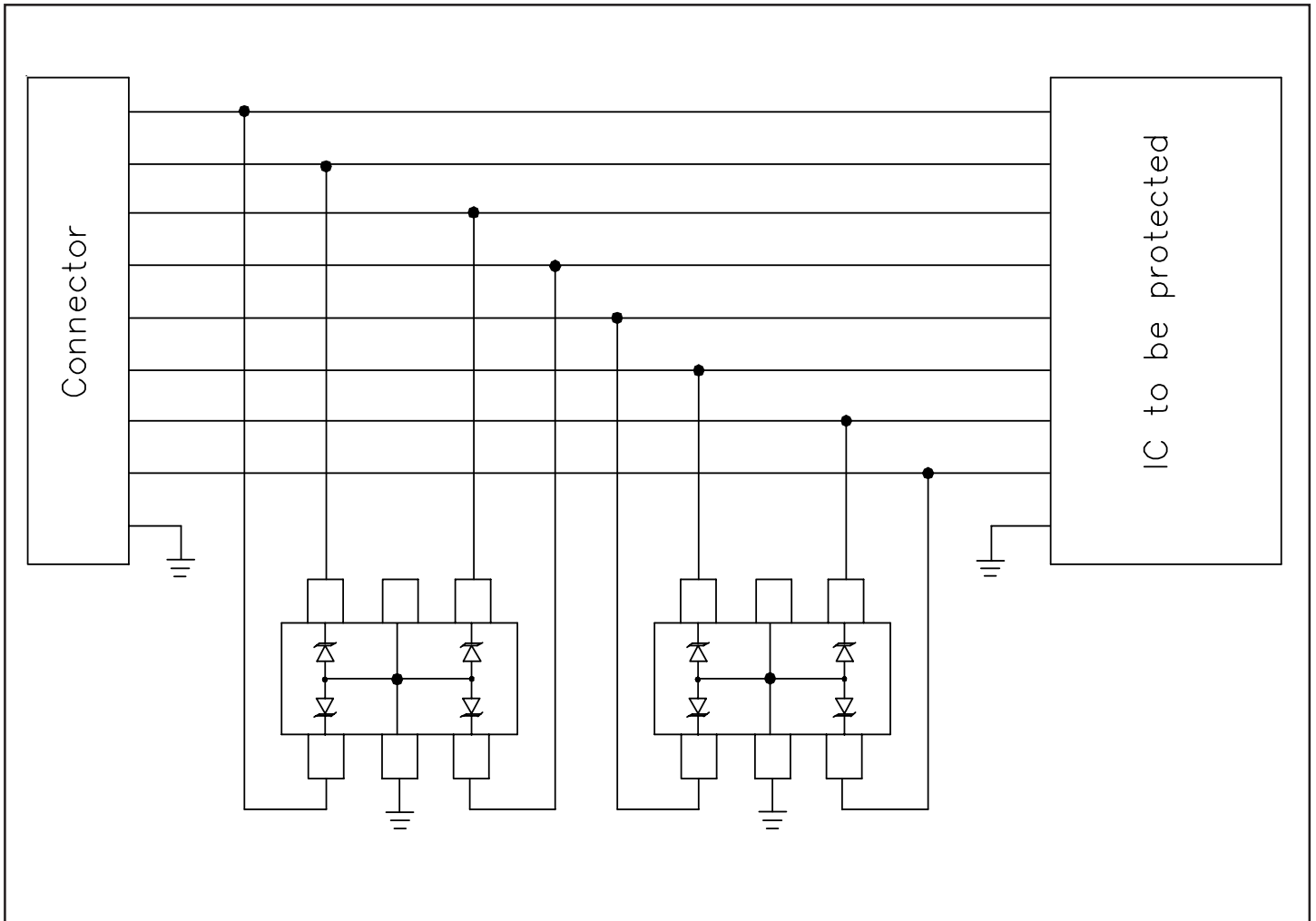


Protection of Four Unidirectional Lines



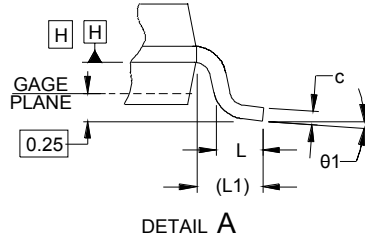
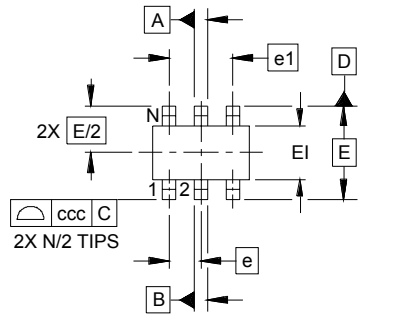
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Typical Applications

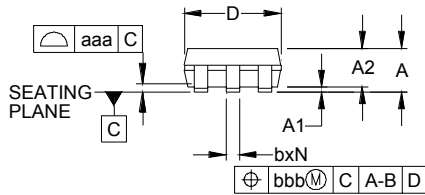


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Outline Drawing -SOT23 6L



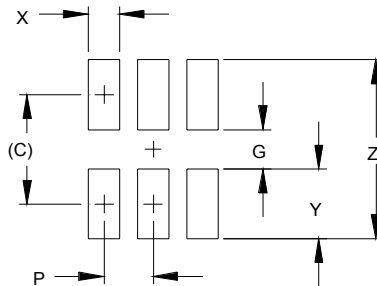
DIM	INCHES			MILLIMETERS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	.035	-	.057	0.90	-	1.45
A1	.000	-	.006	0.00	-	0.15
A2	.035	.045	.051	.90	1.15	1.30
b	.010	-	.020	0.25	-	0.50
c	.003	-	.009	0.08	-	0.22
D	.110	.114	.118	2.80	2.90	3.00
E1	.060	.063	.069	1.50	1.60	1.75
E	.110 BSC			2.80 BSC		
e	.037 BSC			0.95 BSC		
e1	.075 BSC			1.90 BSC		
L	.012	.018	.024	0.30	0.45	0.60
L1	(0.024)			(0.60)		
N	6			6		
theta1	0° - 10°			0° - 10°		
aaa	.004			0.10		
bbb	.008			0.20		
ccc	.008			0.20		



NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DATUMS **-A-** AND **-B-** TO BE DETERMINED AT DATUM PLANE **E-H**.
3. DIMENSIONS "E1" AND "D" DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

Land Pattern -SOT23 6L



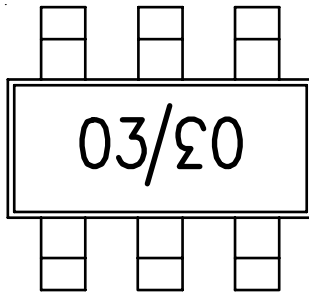
DIM	INCHES	MILLIMETERS
C	(.098)	(2.50)
G	.055	1.40
P	.037	0.95
X	.024	0.60
Y	.043	1.10
Z	.141	3.60

NOTES:

1. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.

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Marking



Top Side Mark

Ordering Information

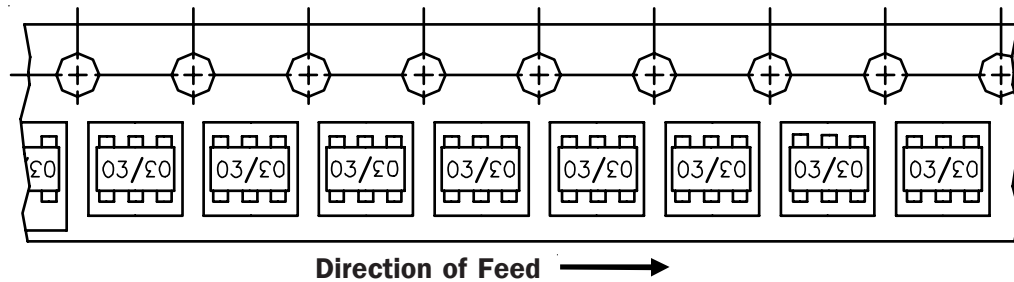
Part Number	Lead Finish	Qty per Reel	Reel Size
SMS3.3.TC	SnPb	3,000	7 Inch
SMS3.3.TCT	Pb free	3,000	7 Inch

Note:

(1) No suffix indicates tube pack.

Tape and Reel Specification

Device Orientation in Tape:



Tape Specifications (per EIA 481)

Reel Material: Static Dissipative
 Tape Material: Static Dissipative
 Tape Width: 8mm +/- 0.30mm
 Component Pitch (max.): 4mm +/- 0.10mm
 Component Cavity Play: 20°

Contact Information

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