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**SEMTECH**

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## SMDA05 THRU SMDA24 Unidirectional TVS Array for Protection of Four Lines

### PROTECTION PRODUCTS

#### Description

The SMDAxx series of TVS arrays are designed to provide unidirectional protection for sensitive electronics from damage or latch-up due to ESD, lightning and other voltage-induced transient events. Each device will protect four data or I/O lines. They are available with operating voltages of 5V, 12V, 15V and 24V.

TVS diodes are solid-state devices designed specifically for transient suppression. They offer desirable characteristics for board level protection including fast response time, low operating and clamping voltage and no device degradation. The low profile SO-8 package allows the user to protect up to four independent lines with one package. The SMDAxx series is suitable protection for sensitive semiconductor components such as microprocessors, ASICs, transceivers, transducers, and CMOS memory.

The SMDAxx series devices may be used to meet the ESD immunity requirements of IEC 61000-4-2, level 4 for air and contact discharge.

#### 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) 12A (8/20μs)**
- ◆ Unidirectional protection
- ◆ Small SO-8 package
- ◆ 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

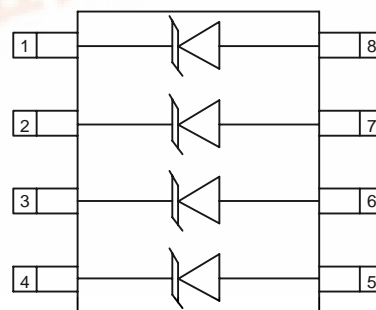
#### Mechanical Characteristics

- ◆ JEDEC SO-8 package
- ◆ Molding compound flammability rating: UL 94V-0
- ◆ Marking : Part number, date code, logo
- ◆ Packaging : Tube or Tape and Reel per EIA 481

#### Applications

- ◆ RS-232 data lines
- ◆ Microprocessor based equipment
- ◆ Notebooks, Desktops, & Servers
- ◆ Instrumentation
- ◆ LAN/WAN equipment
- ◆ Peripherals
- ◆ Serial and Parallel Ports

#### Schematic & PIN Configuration



**SO-8 (Top View)**

**PROTECTION PRODUCTS**
**Absolute Maximum Rating**

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20μs)	P <sub>pk</sub>	300	Watts
ESD Voltage (HBM per (IEC 61000-4-2)		>25	kV
Lead Soldering Temperature	T <sub>L</sub>	260 (10 sec.)	°C
Operating Temperature	T <sub>J</sub>	-55 to +125	°C
Storage Temperature	T <sub>STG</sub>	-55 to +150	°C

**Electrical Characteristics**
**SMDA05**

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> = 1A, tp = 8/20μs			9.8	V
Clamping Voltage	V <sub>C</sub>	I <sub>PP</sub> = 5A, tp = 8/20μs			11	V
Maximum Peak Pulse Current	I <sub>PP</sub>	tp = 8/20μs			17	A
Junction Capacitance	C <sub>J</sub>	V <sub>R</sub> = 0V, f = 1MHz			400	pF

**SMDA12**

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> = 1A, tp = 8/20μs			19	V
Clamping Voltage	V <sub>C</sub>	I <sub>PP</sub> = 5A, tp = 8/20μs			24	V
Maximum Peak Pulse Current	I <sub>PP</sub>	tp = 8/20μs			12	A
Junction Capacitance	C <sub>J</sub>	V <sub>R</sub> = 0V, f = 1MHz			150	pF

**PROTECTION PRODUCTS**
**Electrical Characteristics (Continued)**
**SMDA15**

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
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	$V_C$	$I_{PP} = 1\text{A}, t_p = 8/20\mu\text{s}$			24	V
Clamping Voltage	$V_C$	$I_{PP} = 5\text{A}, t_p = 8/20\mu\text{s}$			30	V
Maximum Peak Pulse Current	$I_{PP}$	$t_p = 8/20\mu\text{s}$			10	A
Junction Capacitance	$C_J$	$V_R = 0\text{V}, f = 1\text{MHz}$			100	pF

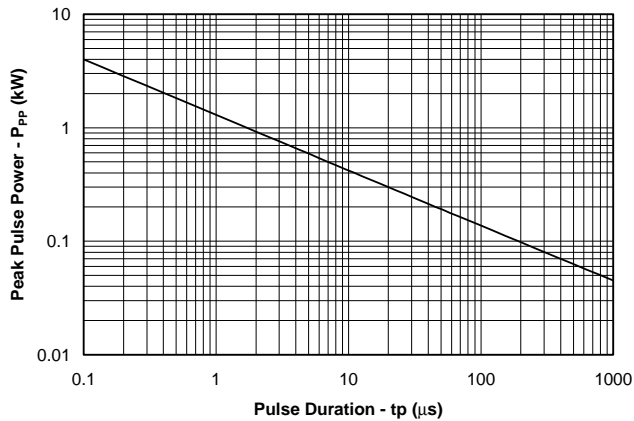
**SMDA24**

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
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	$V_C$	$I_{PP} = 1\text{A}, t_p = 8/20\mu\text{s}$			43	V
Clamping Voltage	$V_C$	$I_{PP} = 5\text{A}, t_p = 8/20\mu\text{s}$			55	V
Maximum Peak Pulse Current	$I_{PP}$	$t_p = 8/20\mu\text{s}$			5	A
Junction Capacitance	$C_J$	$V_R = 0\text{V}, f = 1\text{MHz}$			60	pF

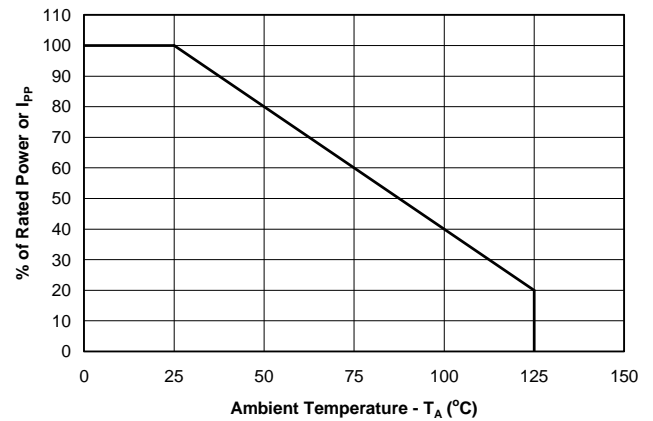
## PROTECTION PRODUCTS

### Typical Characteristics

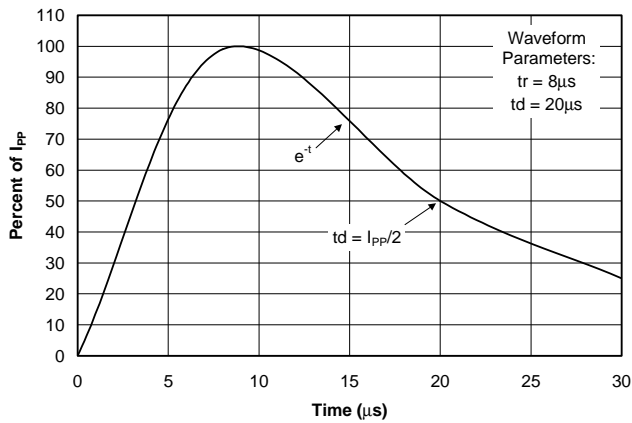
**Non-Repetitive Peak Pulse Power vs. Pulse Time**



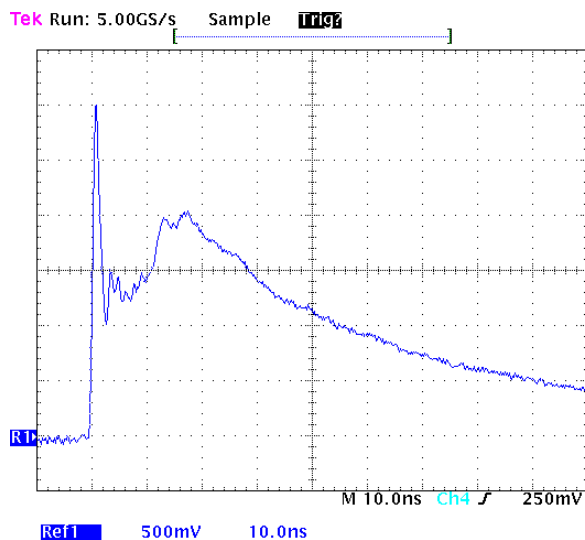
**Power Derating Curve**



**Pulse Waveform**



**ESD Pulse Waveform (IEC 61000-4-2)**



**IEC 61000-4-2 Discharge Parameters**

Level	First Peak Current (A)	Peak Current at 30 ns (A)	Peak Current at 60 ns (A)	Test Voltage (Contact Discharge) (kV)	Test Voltage (Air Discharge) (kV)
1	7.5	4	8	2	2
2	15	8	4	4	4
3	22.5	12	6	6	8
4	30	16	8	8	15

## PROTECTION PRODUCTS

### Applications Information

#### Device Connection for Protection of Four Data Lines

The SMDAxx series devices are designed to protect up to four data lines. The devices are connected as follows:

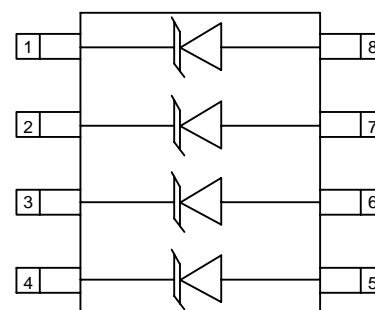
- The SMDAxx are unidirectional devices and are designed for use on lines where the normal operating voltage is above ground. Pins 1, 2, 3, and 4 are connected to the protected lines. Pins 5, 6, 7, and 8 are connected to ground. The ground connections should be made directly to the ground plane for best 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.

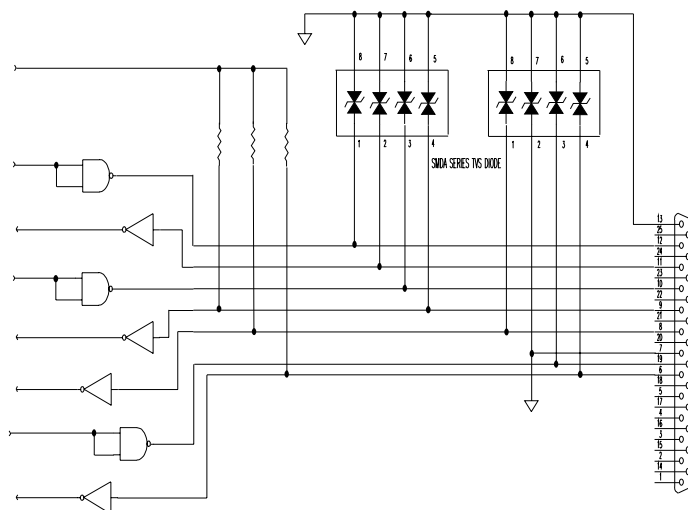
Good circuit board layout is critical for the suppression of ESD induced transients. The following guidelines are recommended:

- 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.

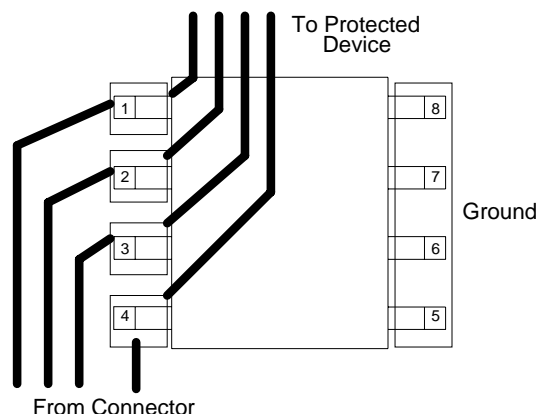
#### Circuit Diagram

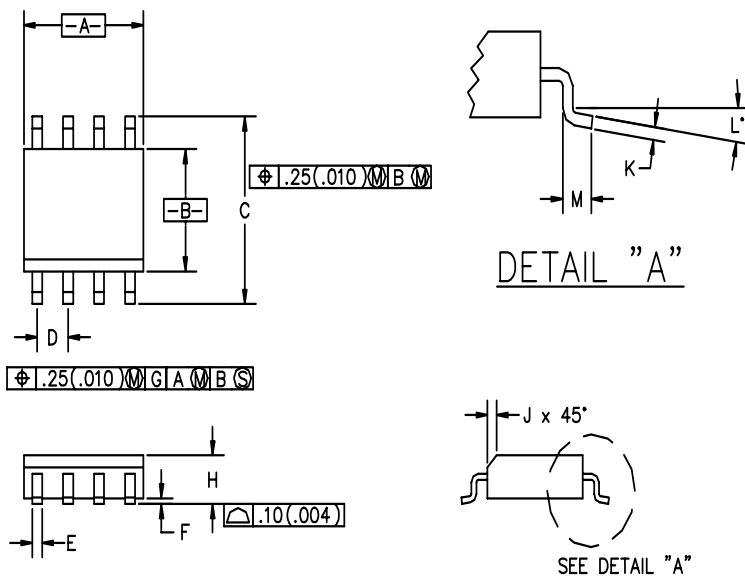


#### I/O Line Protection

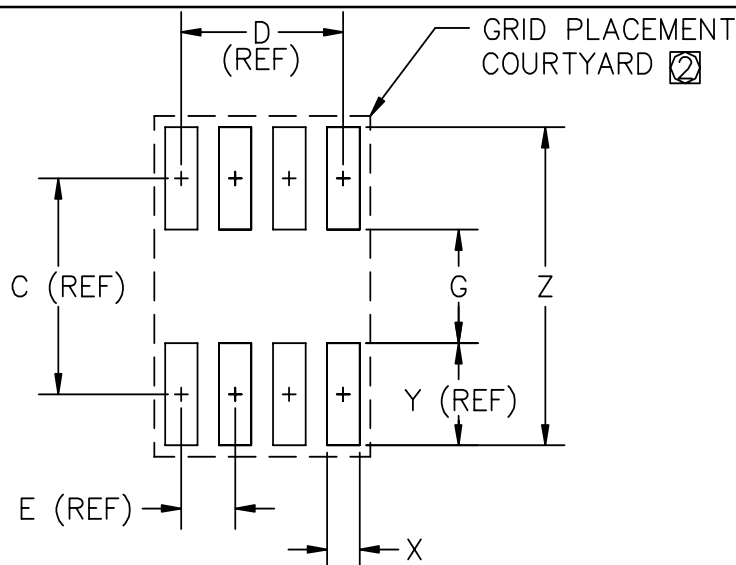


#### Typical Connection



**PROTECTION PRODUCTS**
**Outline Drawing - SO-8**


DIM <sup>N</sup>	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	.188	.197	4.80	5.00	
B	.149	.158	3.80	4.00	
C	.228	.244	5.80	6.20	
D	.050	BSC	1.27	BSC	
E	.013	.020	0.33	0.51	
F	.004	.010	0.10	0.25	
H	.053	.069	1.35	1.75	
J	.011	.019	0.28	0.48	
K	.007	.010	.19	.25	
L	0°	8°	0°	8°	
M	.016	.050	0.40	1.27	

**Land Pattern - SO-8**


DIM <sup>N</sup>	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
C	—	.19	—	5.00	—
D	—	.15	—	3.81	—
E	—	.05	—	1.27	—
G	.10	.11	2.60	2.80	—
X	.02	.03	.60	.80	—
Y	—	.09	—	2.40	—
Z	—	.29	7.20	7.40	—

② GRID PLACEMENT COURTYARD IS 12x16 ELEMENTS (6 mm X 8mm) IN ACCORDANCE WITH THE INTERNATIONAL GRID DETAILED IN IEC PUBLICATION 97.

① CONTROLLING DIMENSION: MILLIMETERS



## SMDA05 THRU SMDA24

### PROTECTION PRODUCTS

#### Ordering Information

Part Number	Working Voltage	Qty per Reel	Reel Size
SMDA05.TB	5V	500	7 Inch
SMDA12.TB	12V	500	7 Inch
SMDA15.TB	15V	500	7 Inch
SMDA24.TB	24V	500	7 Inch

**Note:**

- (1) No suffix indicates tube pack.
- (2) Consult factory for availability of 13 Inch reels.

#### Contact Information

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