

PROTECTION PRODUCTS

Description

The SMF series TVS arrays are designed to protect sensitive electronics from damage or latch-up due to ESD and other voltage-induced transient events. They are designed for use in applications where board space is at a premium. Each device will protect up to four lines. 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 SMF series devices may be used to meet the immunity requirements of IEC 61000-4-2, level 4. The small SC70 package makes them ideal for use in portable electronics such as cell phones, PDA's, notebook computers, and digital cameras.

Features

- ◆ Transient protection for data lines to **IEC 61000-4-2 (ESD) 15kV (air), 8kV (contact) IEC 61000-4-4 (EFT) 40A (5/50ns)**
- ◆ Small package for use in portable electronics
- ◆ Protects four I/O lines
- ◆ Working voltage: 5V & 12V
- ◆ Low leakage current
- ◆ Low operating and clamping voltages
- ◆ Solid-state silicon-avalanche technology

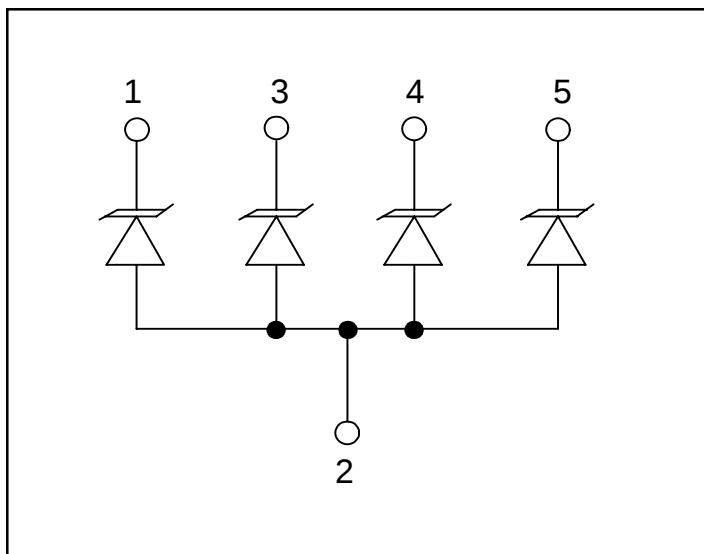
Mechanical Characteristics

- ◆ EIAJ SC70-5L package
- ◆ Molding compound flammability rating: UL 94V-0
- ◆ Marking : Marking Code
- ◆ Packaging : Tape and Reel per EIA 481

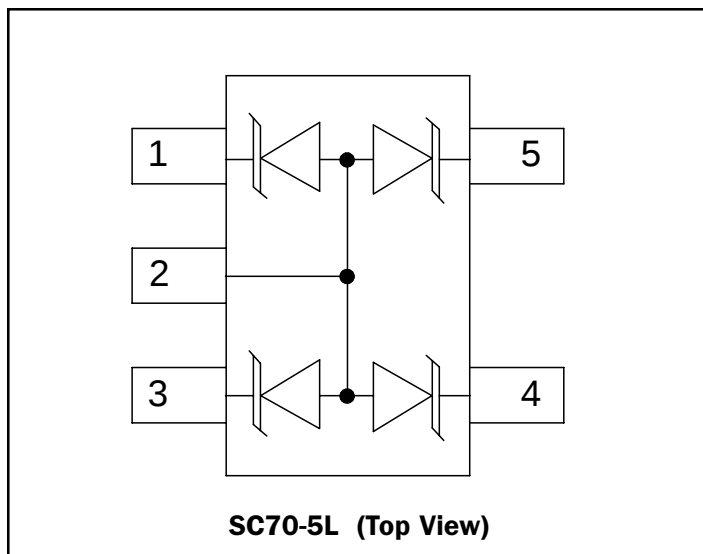
Applications

- ◆ Cellular Handsets & Accessories
- ◆ Cordless Phones
- ◆ Personal Digital Assistants (PDA's)
- ◆ Notebooks & Handhelds
- ◆ Portable Instrumentation
- ◆ Digital Cameras
- ◆ Peripherals
- ◆ MP3 Players

Circuit Diagram



Schematic & PIN Configuration



PROTECTION PRODUCTS
Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power ($t_p = 8/20\mu s$)	P_{pk}	200	Watts
Peak Pulse Current ($t_p = 8/20\mu s$)	I_{pp}	12	A
Peak Forward Voltage ($I_F = 1A$, $t_p = 8/20\mu s$)	V_{FP}	1.5	V
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	V_{ESD}	20 15	kV
Lead 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
SMF05

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	$V_{RWM} = 5V$, $T = 25^\circ C$			10	μA
Clamping Voltage	V_C	$I_{pp} = 1A$, $t_p = 8/20\mu s$			9.5	V
Clamping Voltage	V_C	$I_{pp} = 12A$, $t_p = 8/20\mu s$			12.5	V
Junction Capacitance	C_J	Between I/O pins and Gnd $V_R = 0V$, $f = 1MHz$		150	175	pF

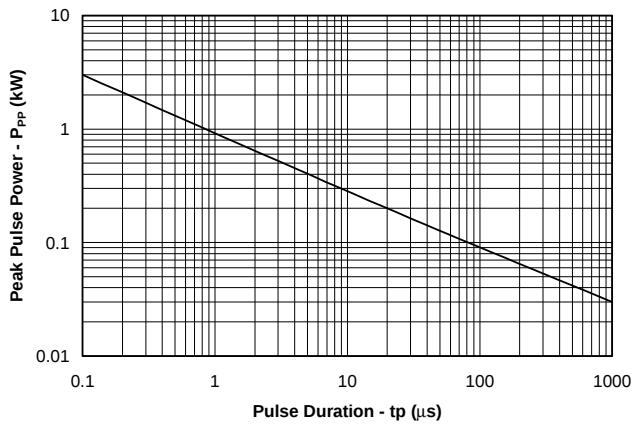
SMF12

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	$V_{RWM} = 12V$, $T = 25^\circ C$			1	μA
Clamping Voltage	V_C	$I_{pp} = 1A$, $t_p = 8/20\mu s$			19	V
Clamping Voltage	V_C	$I_{pp} = 8A$, $t_p = 8/20\mu s$			25	V
Junction Capacitance	C_J	Between I/O pins and Gnd $V_R = 0V$, $f = 1MHz$		60	75	pF

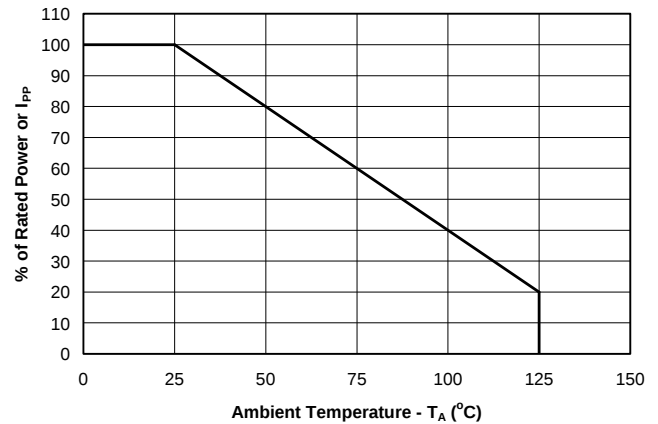
PROTECTION PRODUCTS

Typical Characteristics

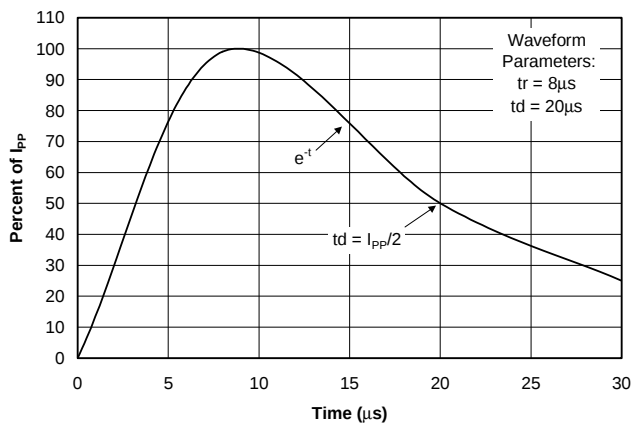
Non-Repetitive Peak Pulse Power vs. Pulse Time



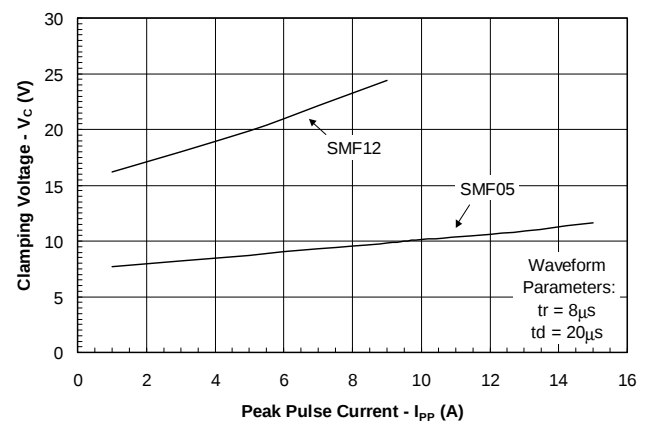
Power Derating Curve



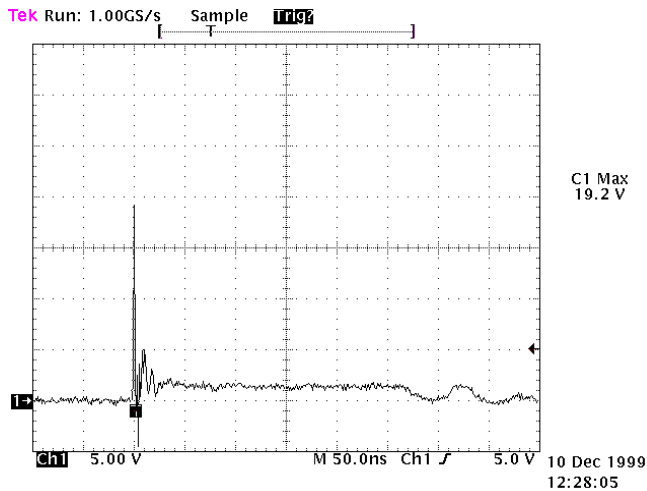
Pulse Waveform



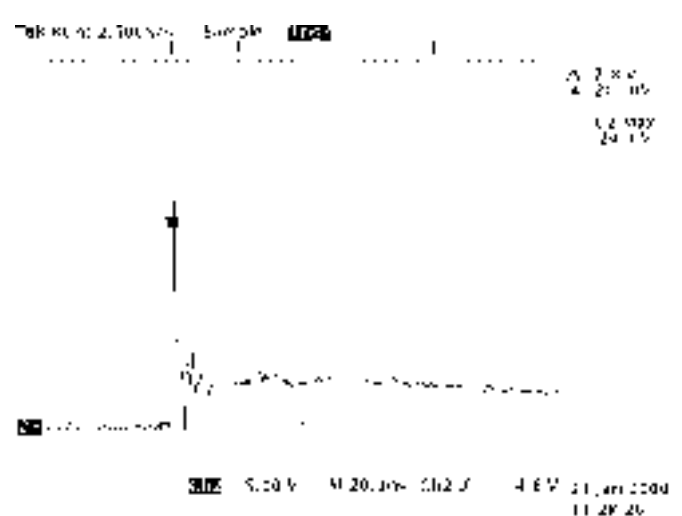
Clamping Voltage vs. Peak Pulse Current



**SMF05 ESD Clamping
(8kV Contact per IEC 61000-4-2)**



**SMF12 ESD Clamping
(8kV Contact per IEC 61000-4-2)**



PROTECTION PRODUCTS

Applications Information

Device Connection for Protection of Four Data Lines

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

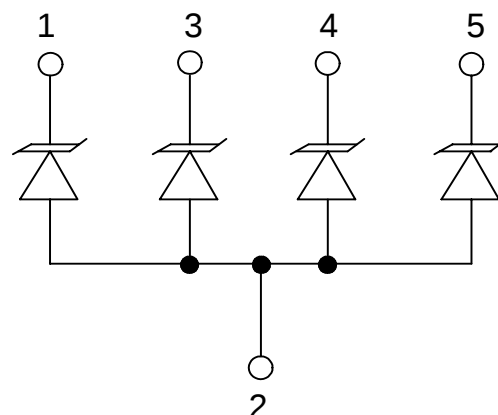
1. Unidirectional protection of four I/O lines is achieved by connecting pins 1, 3, 4, and 5 to the data lines. Pin 2 is connected to ground. The ground connection should be made directly to the ground plane for best results. The path length is kept as short as possible to reduce the effects of parasitic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

Circuit Board Layout Recommendations for Suppression of ESD.

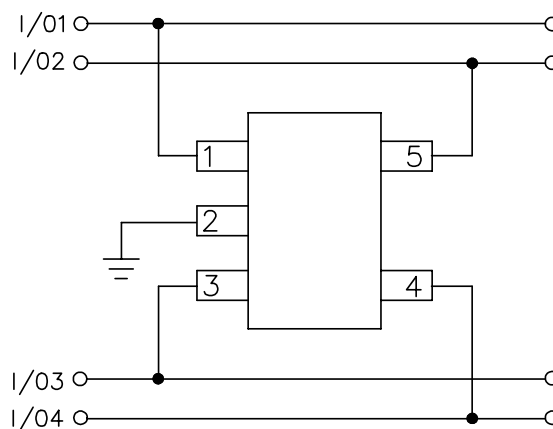
Good circuit board layout is critical for the suppression of ESD induced transients. The following guidelines are recommended:

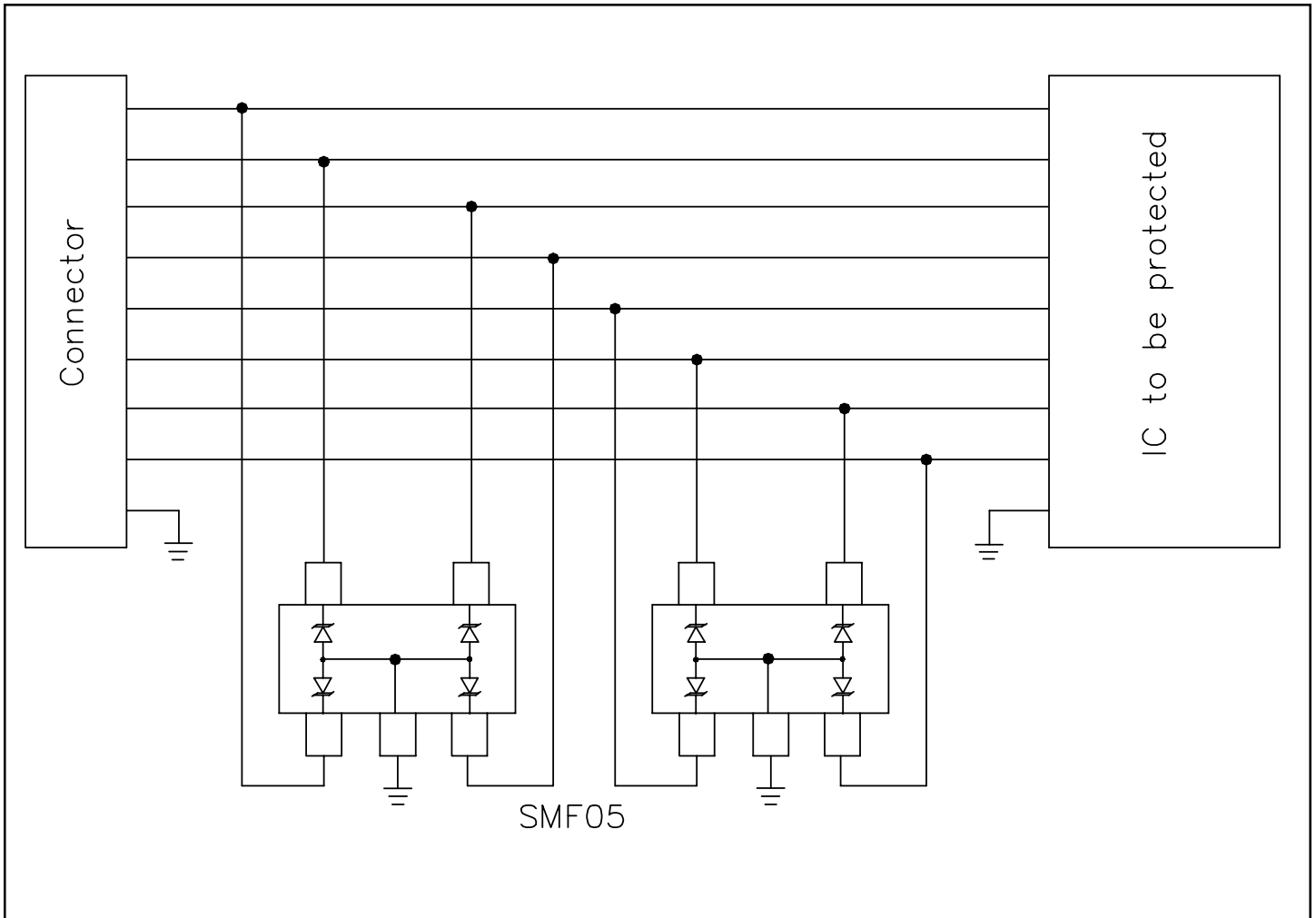
- Place the SMFxx near the input terminals or connectors to restrict transient coupling.
- Minimize the path length between the SMSxx and the protected line.
- Minimize all conductive loops including power and ground loops.
- The ESD transient return path to ground should be kept as short as possible.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

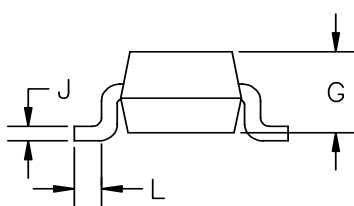
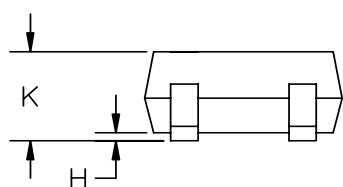
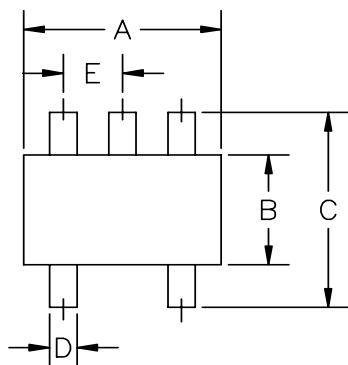
SMF Circuit Diagram



Protection of Four Unidirectional Lines



PROTECTION PRODUCTS**Typical Applications**

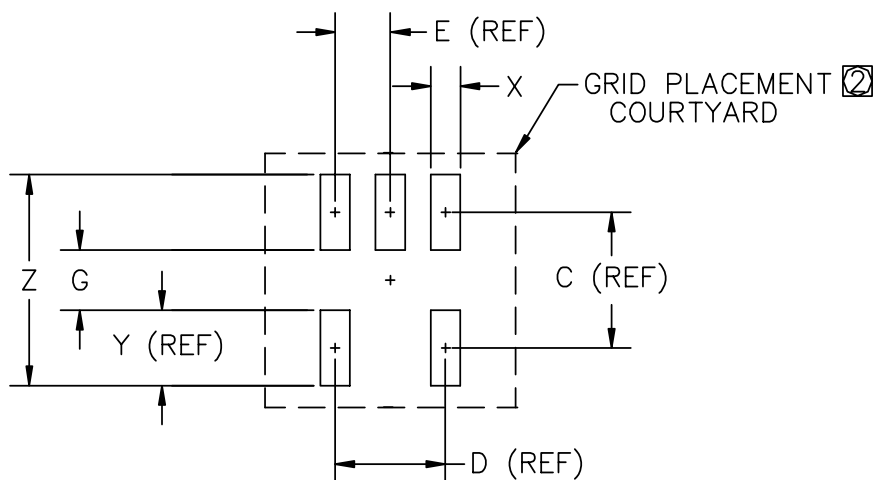
PROTECTION PRODUCTS
Outline Drawing - SC70-5L


DIMENSIONS ①					NOTE
DIM ^N	INCHES		MM		
	MIN	MAX	MIN	MAX	
A	.071	.087	1.80	2.20	—
B	.045	.053	1.15	1.35	—
C	.071	.094	1.80	2.40	—
D	.006	.012	.150	.300	—
E	.026	BSC	.650	BSC	—
G	.031	.039	.800	1.00	—
H	0.00	.004	0.00	.100	—
J	.004	.007	.100	.180	—
K	.031	.043	.800	1.10	—
L	.004	.012	.100	.300	—

JEDEC EIAJSC70

② PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH AND METAL BURR.

① CONTROLLING DIMENSIONS: MILLIMETERS.

Land Pattern - SC70-5L


DIMENSIONS ①					
DIM ^N	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
C	—	.063	—	1.60	—
D	—	.052	—	1.30	—
E	—	.026	—	.65	—
G	—	.028	—	.70	—
X	—	.014	—	.35	—
Y	—	.035	—	.90	—
Z	—	.098	—	2.50	—

② GRID PLACEMENT COURTYARD IS 6 x 6 ELEMENTS (3 mm X 3 mm) IN ACCORDANCE WITH THE INTERNATIONAL GRID DETAILED IN IEC PUBLICATION 97.

① CONTROLLING DIMENSION: MILLIMETERS

PROTECTION PRODUCTS**Marking Codes**

Part Number	Marking Code
SMF05	F05
SMF12	F12

Note:

(1) Pin 1 Identified with a dot

Ordering Information

Part Number	Working Voltage	Qty per Reel	Reel Size
SMF05.TC	5V	3,000	7 Inch
SMF05.TG	5V	10,000	13 Inch
SMF12.TC	12V	3,000	7 Inch
SMF12.TG	12V	10,000	13 Inch

Contact Information

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