

PROTECTION PRODUCTS

Description

The SMF 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 SMF3.3 is a solid-state devices 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 SMF3.3 may be used to meet the immunity requirements of IEC 61000-4-2, level 4 (15kV air, 8kV contact discharge). The small SC70-5L package makes them ideal for use in portable electronics such as cell phones, PDA's, and notebook computers.

Features

- ◆ ESD protection for data lines to **IEC 61000-4-2 (ESD) 15kV (air), 8kV (contact)**
- ◆ Small package for use in portable electronics
- ◆ Protects four I/O lines
- ◆ Working voltage: 3.3V
- ◆ Low leakage current
- ◆ Low operating and clamping voltages
- ◆ Solid-state EPD TVS technology

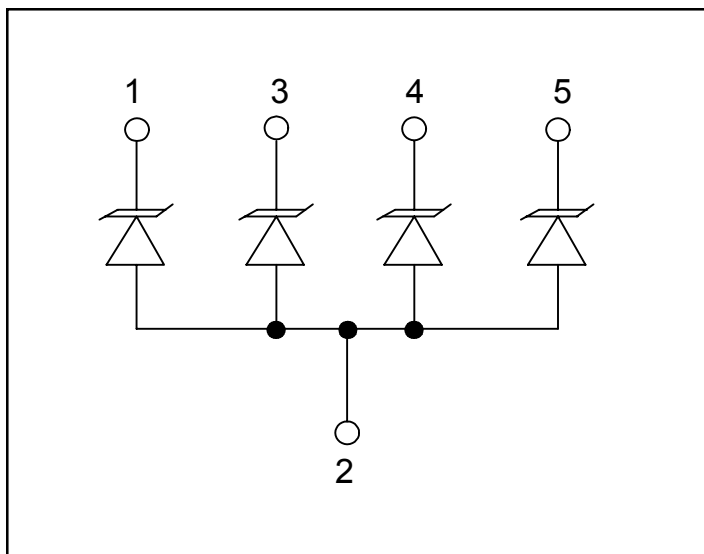
Mechanical Characteristics

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

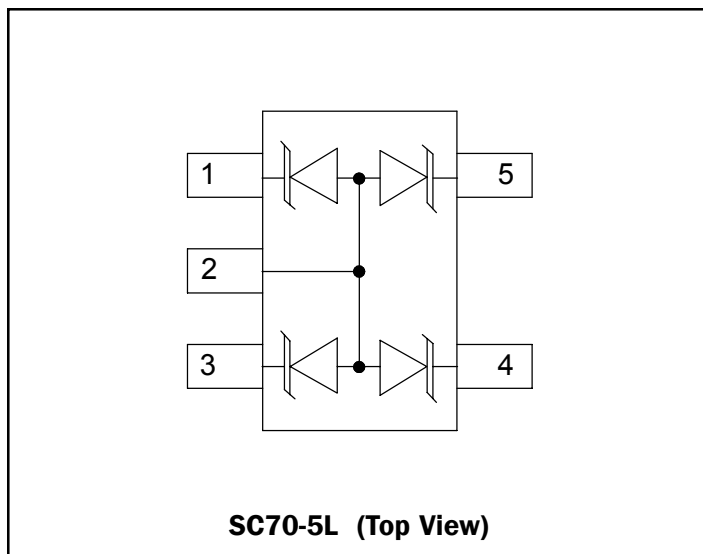
Applications

- ◆ 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} | 40 | Watts |
| Peak Pulse Current ($t_p = 8/20\mu s$) | I_{pp} | 5 | A |
| 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 |

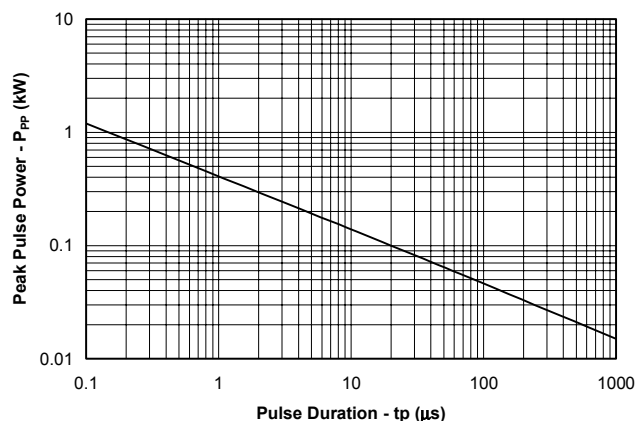
Electrical Characteristics

| SMF3.3 | | | | | | |
|---------------------------|-----------|---|---------|---------|---------|---------|
| 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 | $I_{pp} = 1A$, $t_p = 8/20\mu s$ | | | 5.5 | V |
| Clamping Voltage | V_C | $I_{pp} = 5A$, $t_p = 8/20\mu s$ | | | 8.0 | V |
| Reverse Clamping Voltage | V_{CR} | $I_{pp} = 1A$, $t_p = 8/20\mu s$ | | | 2.4 | V |
| Junction Capacitance | C_J | Each I/O pin and Gnd $V_R = 0V$, $f = 1MHz$ | | 25 | 30 | pF |
| | | I/O to I/O $V_R = 0V$, $f = 1MHz$ | | 12 | | pF |

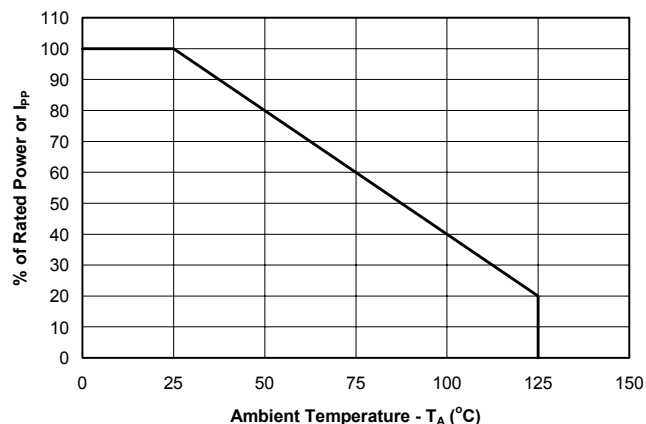
PROTECTION PRODUCTS

Typical Characteristics

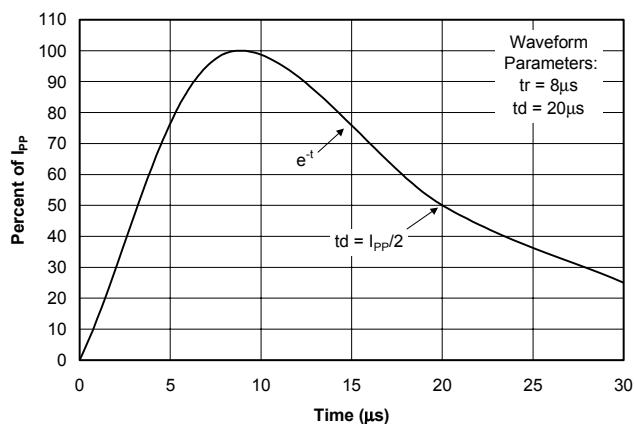
Non-Repetitive Peak Pulse Power vs. Pulse Time



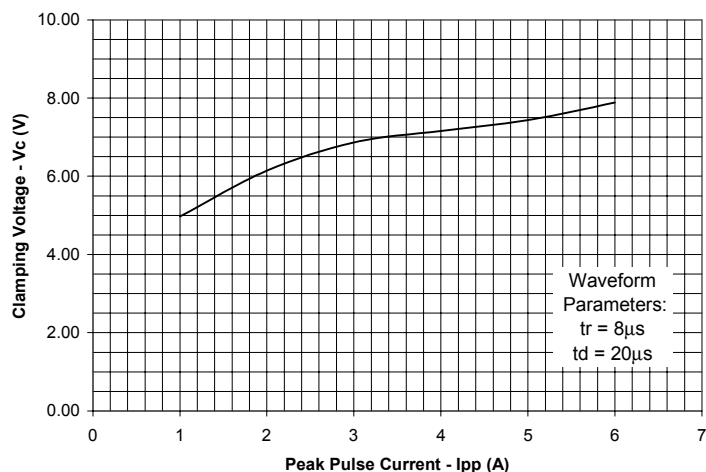
Power Derating Curve



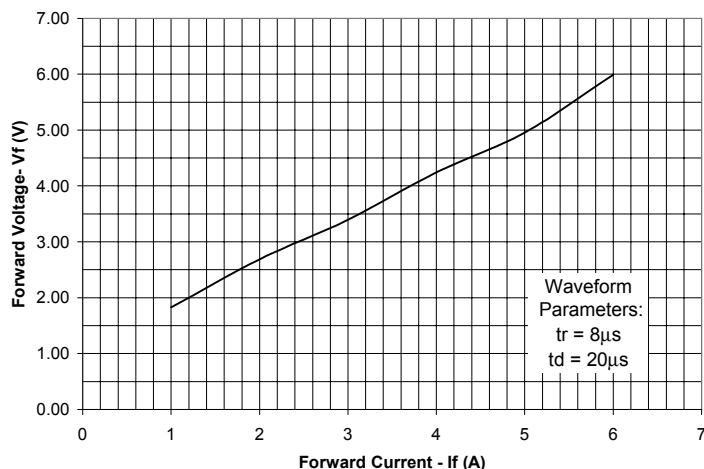
Pulse Waveform



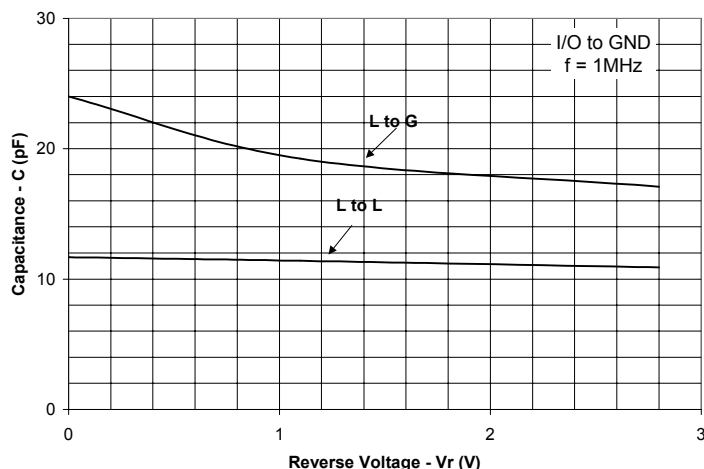
Clamping Voltage vs. Peak Pulse Current



Forward Voltage vs. Forward Current



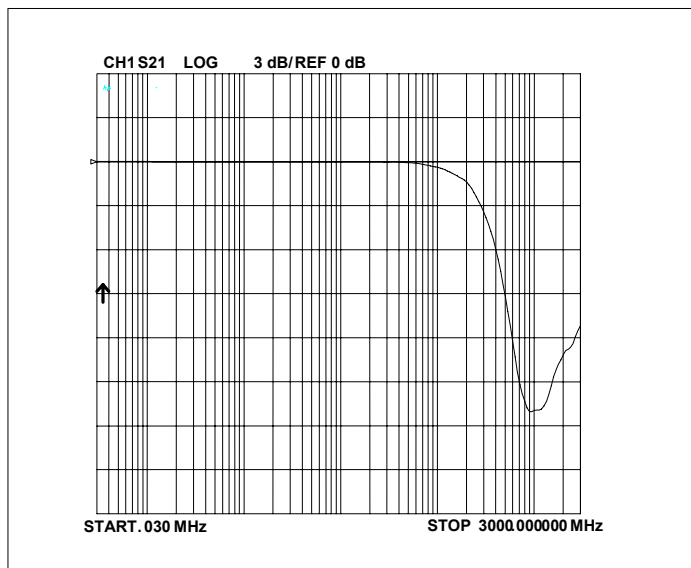
Variation of Capacitance vs. Reverse Voltage



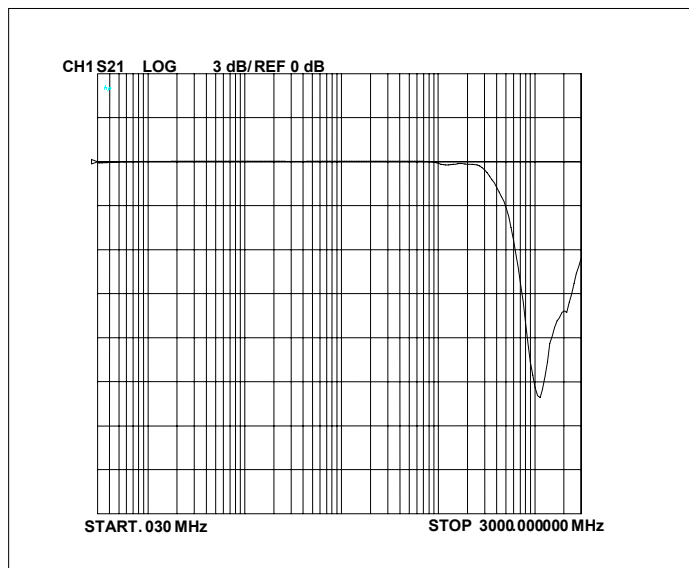
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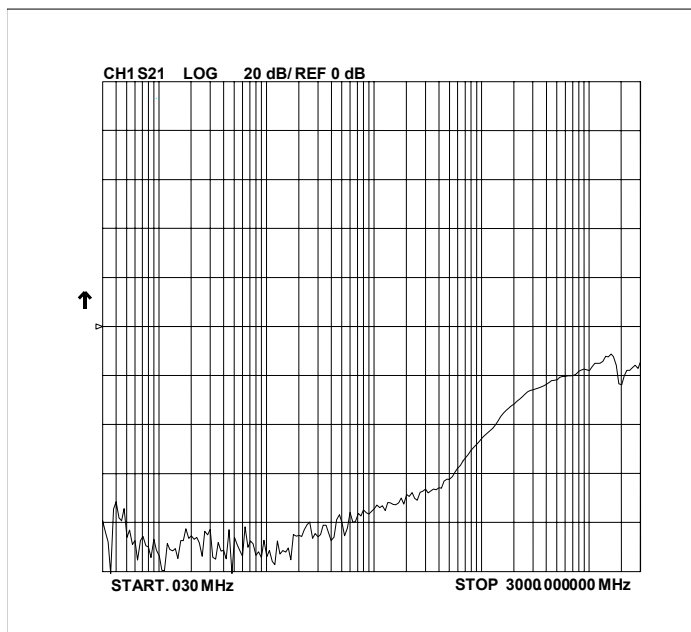
Insertion Loss S21, I/O to Ground



Insertion Loss S21, I/O to I/O



Analog Crosstalk (I/O to I/O)



PROTECTION PRODUCTS

Applications Information

Device Connection for Protection of Four Data Lines

The SMF3.3 is designed to protect up to four unidirectional data lines. The device is connected as follows:

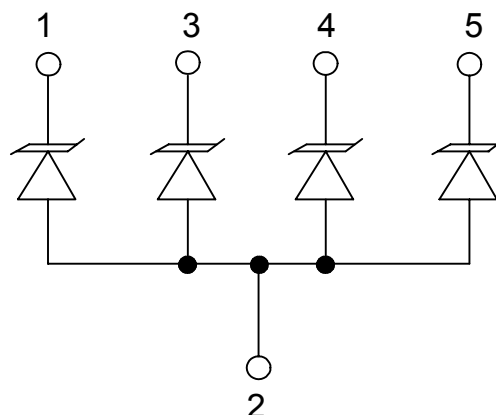
1. Unidirectional protection of four I/O lines is achieved by connecting pins 1, 3, 4, and 5 to the data lines. Pin 2 is connected to ground. The ground connection should be made directly to the ground plane for best results. The path length is kept as short as possible to reduce the effects of parasitic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

Circuit Board Layout Recommendations for Suppression of ESD.

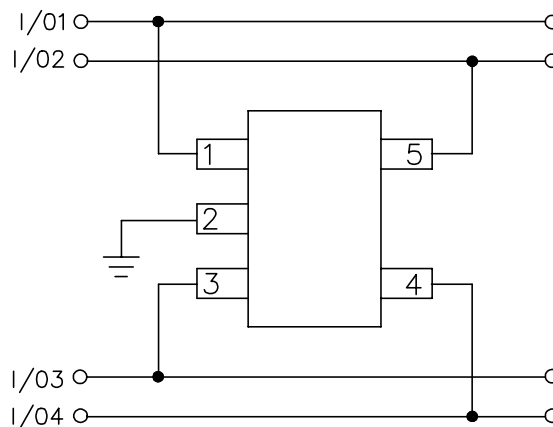
Good circuit board layout is critical for the suppression of ESD induced transients. The following guidelines are recommended:

- Place the 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.

SMF Circuit Diagram

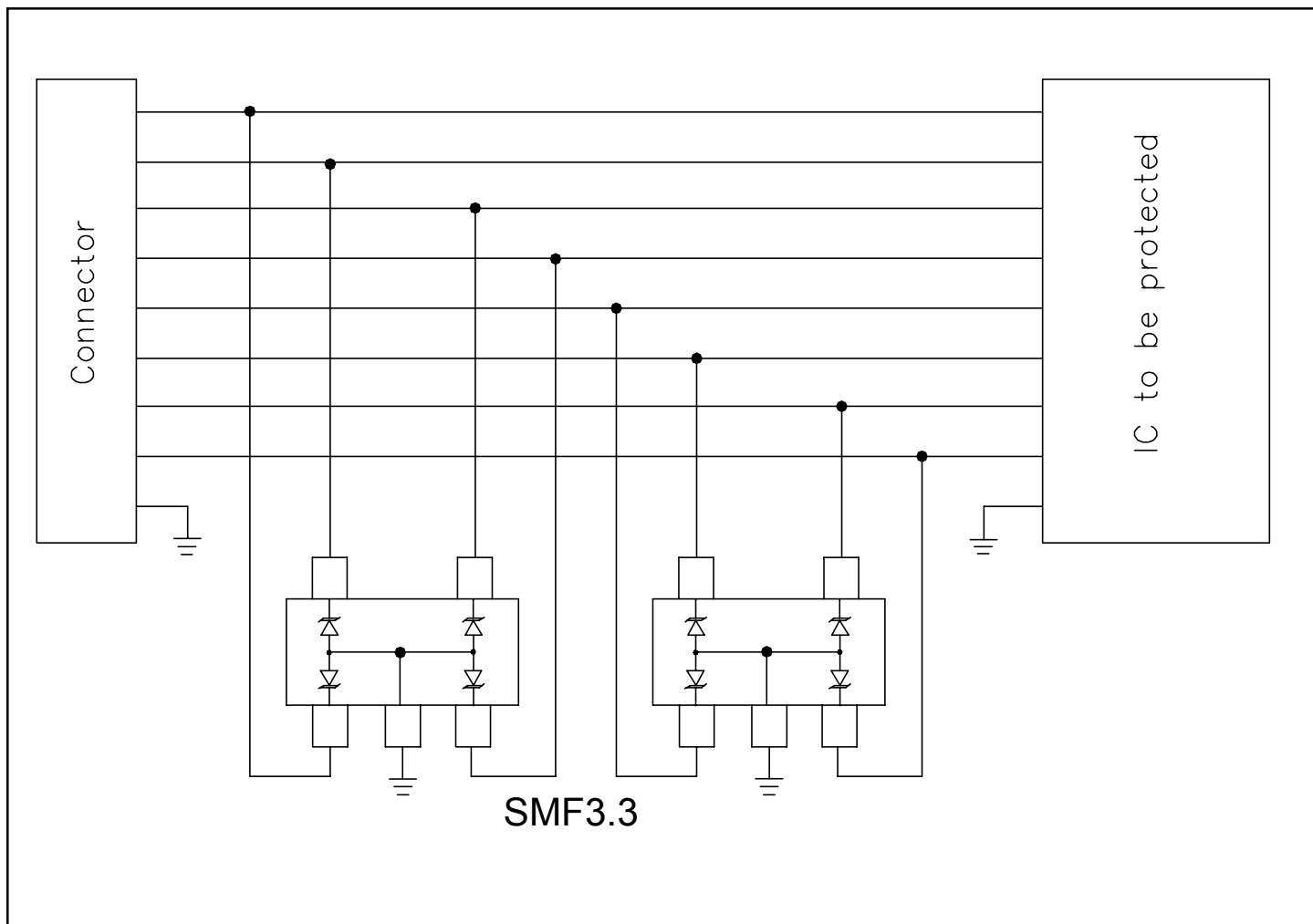


Protection of Four Unidirectional Lines



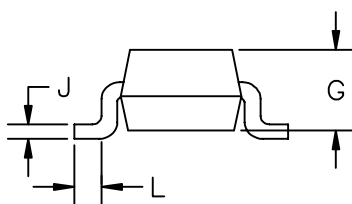
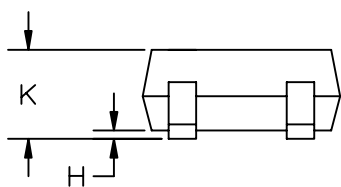
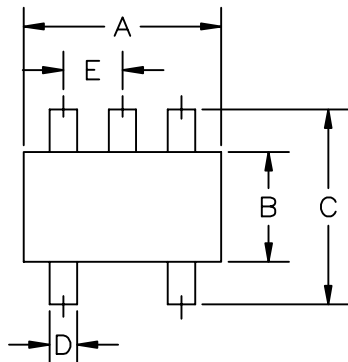
PROTECTION PRODUCTS

Typical Applications



PROTECTION PRODUCTS

Outline Drawing



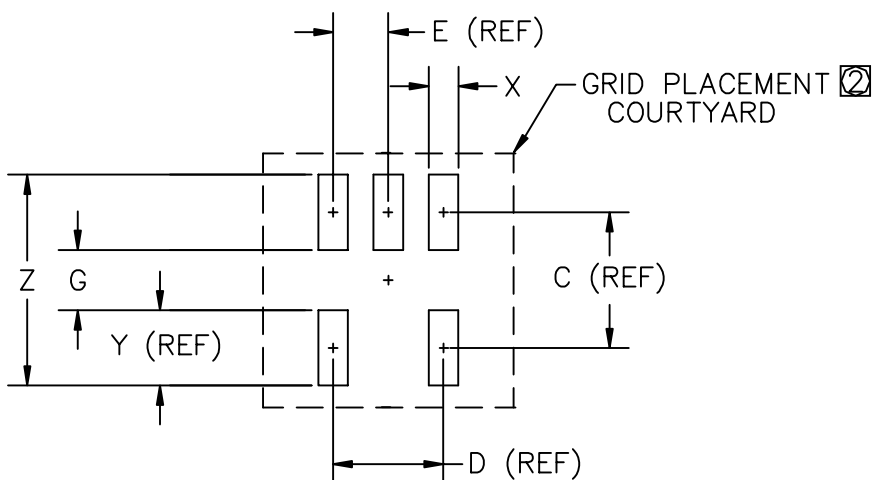
| DIMENSIONS ① | | | | | NOTE |
|------------------|--------|------|------|------|------|
| DIM ^N | INCHES | | MM | | |
| | MIN | MAX | MIN | MAX | |
| A | .071 | .087 | 1.80 | 2.20 | — |
| B | .045 | .053 | 1.15 | 1.35 | — |
| C | .071 | .094 | 1.80 | 2.40 | — |
| D | .006 | .012 | .150 | .300 | — |
| 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



| 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 DIMENSIONS: MILLIMETERS.

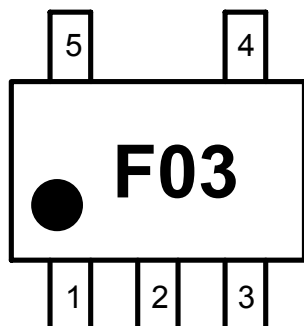
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Marking Codes

| Part Number | Marking Code |
|-------------|--------------|
| SMF3.3 | F03 |

Note:

(1) Pin 1 Identified with a dot



Ordering Information

| Part Number | Working Voltage | Qty per Reel | Reel Size |
|-------------|-----------------|--------------|-----------|
| SMF3.3.TC | 3.3V | 3,000 | 7 Inch |
| SMF3.3.TG | 3.3V | 10,000 | 13 Inch |

Contact Information for Semtech International AG

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| Semtech International AG is a wholly-owned subsidiary of Semtech Corporation, which has its headquarters in the U.S.A. | | Semtech Germany GmbH | Tel: 49-(0)8161-140-123 Fax: 49-(0)8161-140-124 |