

PROTECTION PRODUCTS
Description

RailClamps are surge rated diode arrays designed to protect high speed data interfaces. The SR70 has been specifically designed to protect sensitive components which are connected to data and transmission lines from over-voltages caused by **ESD** (electrostatic discharge), **EFT** (electrical fast transients), and **lightning**. The SR70 has been optimized for use on ADSL and other high-speed interfaces.

The unique design of the SR70 integrates four surge rated, low capacitance steering diodes in a low profile SOT-143 package. It has a typical capacitance of only 5pF and may be used to protect two high-speed lines without sacrificing signal integrity. The SR70 is designed to replace "standard" rectifiers that are not rated for the high energy surges that are normally expected in telecommunications applications.

During transient conditions, the steering diodes direct the transient to either the positive side of the power supply line or to ground. The maximum clamping voltage seen by the protected circuit will be one diode drop (V_F) above the supply (reference) voltage. The SR70 may be used as a stand alone device or in conjunction with TVS diodes for enhanced protection.

Features

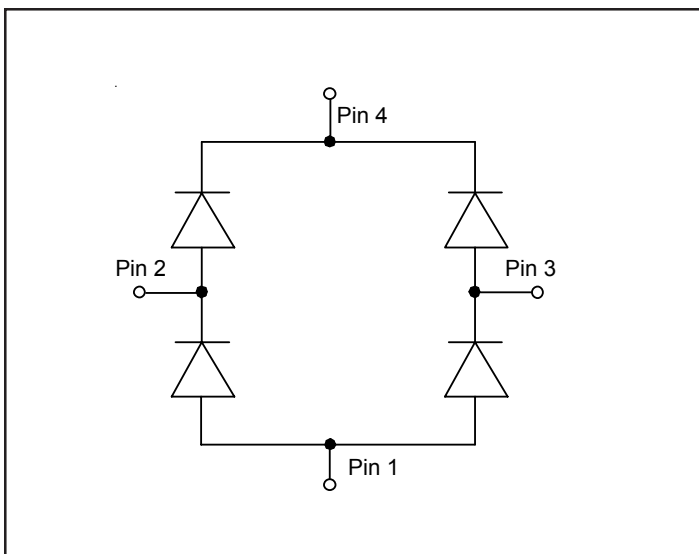
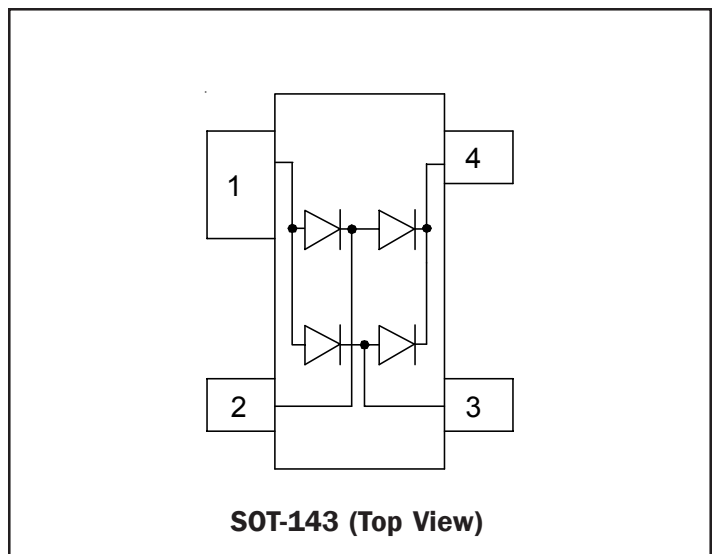
- ◆ Transient protection for high speed data lines to **IEC 61000-4-2 (ESD) $\pm 15kV$ (air), $\pm 8kV$ (contact)**
IEC 61000-4-4 (EFT) 40A (5/50ns)
IEC 61000-4-5 (Lightning) 1kV, 24A (8/20 μ s)
- ◆ Array of surge rated, low capacitance diodes
- ◆ Protects two I/O lines
- ◆ Low capacitance (5pF typical) for high-speed interfaces
- ◆ Low clamping voltage
- ◆ Solid-state silicon-avalanche technology

Mechanical Characteristics

- ◆ JEDEC SOT-143 package
- ◆ UL 497B listed
- ◆ Molding compound flammability rating: UL 94V-0
- ◆ Marking : R70
- ◆ Packaging : Tape and Reel per EIA 481

Applications

- ◆ ADSL Lines
- ◆ I²C Bus Protection
- ◆ Video Line Protection
- ◆ T1/E1 secondary IC Side Protection
- ◆ Portable Electronics
- ◆ Microcontroller Input Protection
- ◆ WAN/LAN Equipment
- ◆ ISDN S/T Interface

Circuit Diagram

Schematic & PIN Configuration


PROTECTION PRODUCTS
Absolute Maximum Rating

| Rating | Symbol | Value | Units |
|--|-----------|---------------|-------|
| Peak Pulse Current ($t_p = 8/20\mu s$) | I_{PP} | 24 | A |
| Rectifier Repetitive Peak Reverse Voltage | V_{RRM} | 70 | V |
| ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact) | V_{ESD} | 15 8 | kV |
| Lead Soldering Temperature | T_L | 260 (10 sec.) | °C |
| Operating Temperature | T_J | -55 to +125 | °C |
| Storage Temperature | T_{STG} | -55 to +150 | °C |

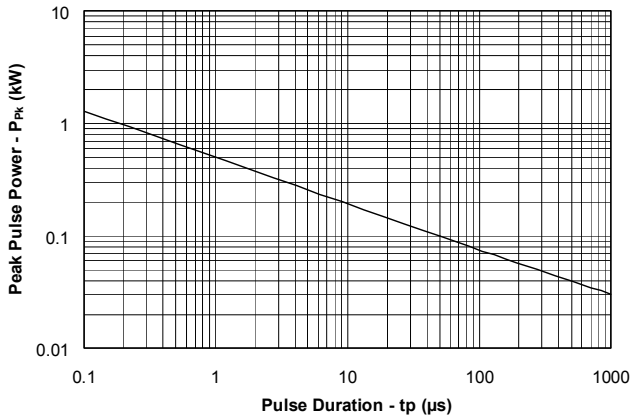
Electrical Characteristics (T=25°C)

| SR70 | | | | | | |
|--------------------------------|-----------|---|---------|---------|---------|---------|
| Parameter | Symbol | Conditions | Minimum | Typical | Maximum | Units |
| Peak Reverse Stand-Off Voltage | V_{RRM} | | | | 70 | V |
| Reverse Breakdown Voltage | V_{BR} | $I_t = 50\mu A$ | 85 | | | V |
| Reverse Leakage Current | I_R | $V_{RWM} = 70V, T=25^\circ C$ | | | 5 | μA |
| Forward Clamping Voltage | V_{FC} | $I_{PP} = 1A, t_p = 8/20\mu s$ | | | 1.5 | V |
| Forward Clamping Voltage | V_{FC} | $I_{PP} = 10A, t_p = 8/20\mu s$ | | | 3.3 | V |
| Forward Clamping Voltage | V_{FC} | $I_{PP} = 24A, t_p = 8/20\mu s$ | | | 7 | V |
| Junction Capacitance | C_j | Between I/O pins and Ground $V_R = 0V, f = 1MHz$ | | 5 | 10 | pF |
| | | Between I/O pins $V_R = 0V, f = 1MHz$ | | 3 | | pF |

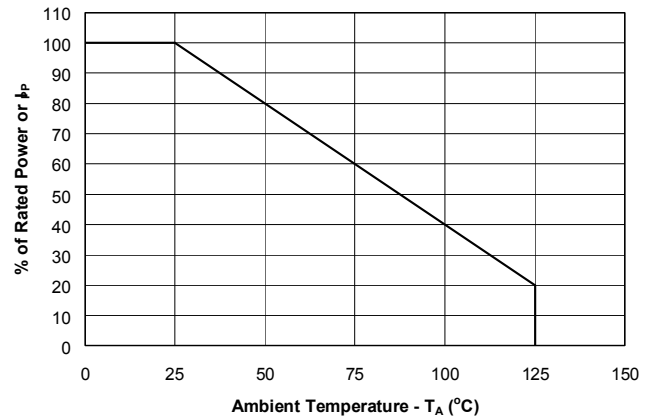
PROTECTION PRODUCTS

Typical Characteristics

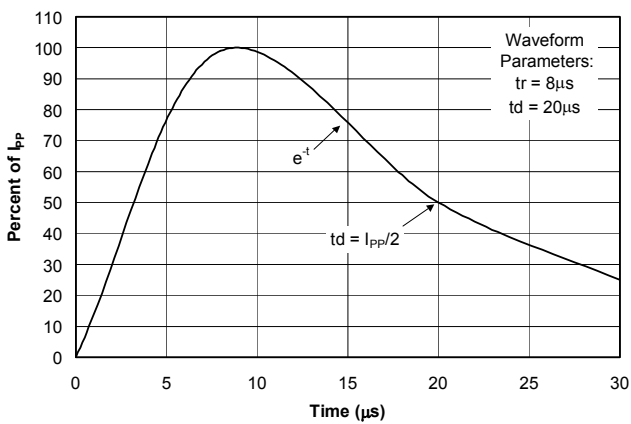
Non-Repetitive Peak Pulse Power vs. Pulse Time



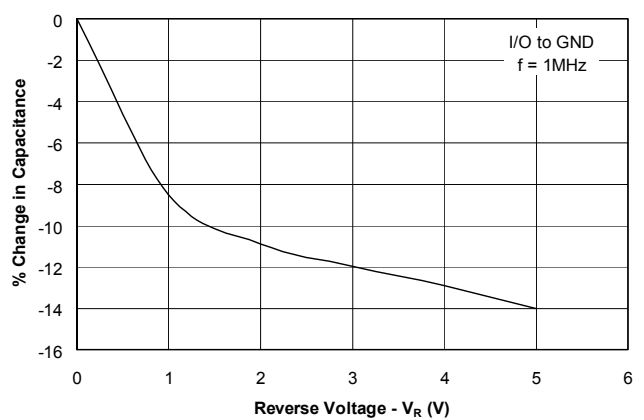
Power Derating Curve



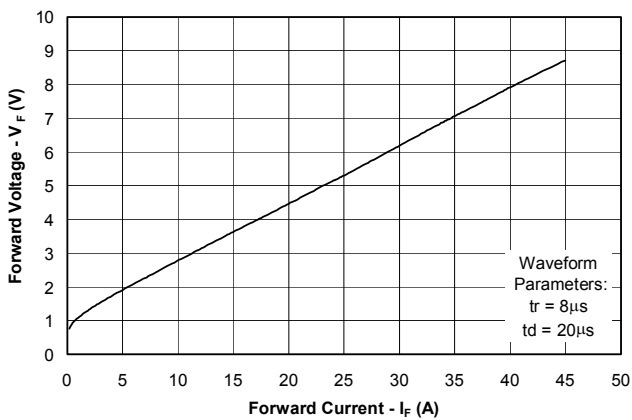
Pulse Waveform



Capacitance vs. Reverse Voltage



Forward Voltage vs. Forward Current



PROTECTION PRODUCTS

Applications Information

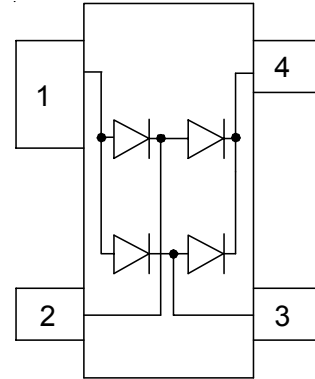
Device Connection Options for Protection of Two High-Speed Data Lines

The SR70 is designed to protect two data lines from transient over-voltages by clamping them to a fixed reference. When the voltage on the protected line exceeds the reference voltage (plus diode V_f) the steering diodes are forward biased, conducting the transient current away from the sensitive circuitry. Data lines are connected at pins 2 and 3. The negative reference (REF1) is connected at pin 1. This pin should be connected directly to a ground plane on the board for best results. The path length is kept as short as possible to minimize parasitic inductance.

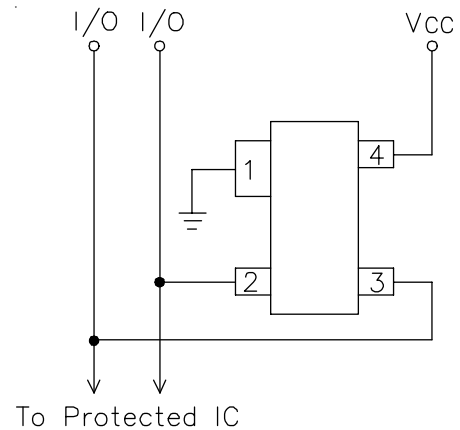
The positive reference (REF2) is connected at pin 4. The options for connecting the positive reference are as follows:

1. To protect data lines and the power line, connect pins 2 and 3 directly to the positive supply rail (V_{CC}). In this configuration the data lines are referenced to the supply voltage. An external TVS diode may be added between the supply rail and ground in order to prevent over-voltage on the supply rail.
2. In applications where no positive supply reference is available, or complete supply isolation is desired, an external TVS diode may be used as the reference. The steering diodes will begin to conduct when the voltage on the protected line exceeds the working voltage of the TVS (plus one diode drop).

SR70 Pin Configuration

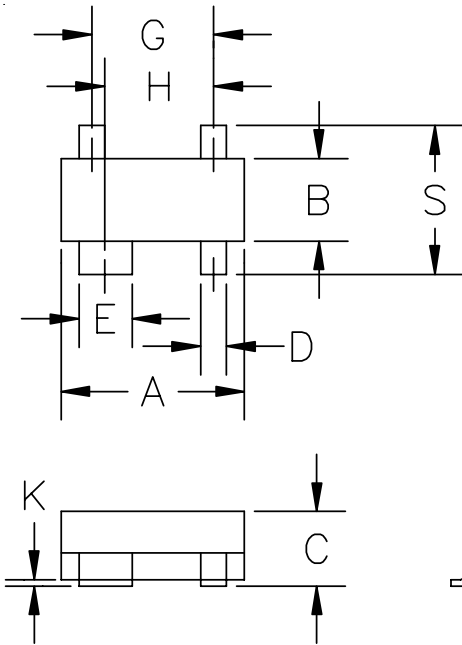


Data Line and Power Supply Protection Using V_{CC} as reference



PROTECTION PRODUCTS

Outline Drawing

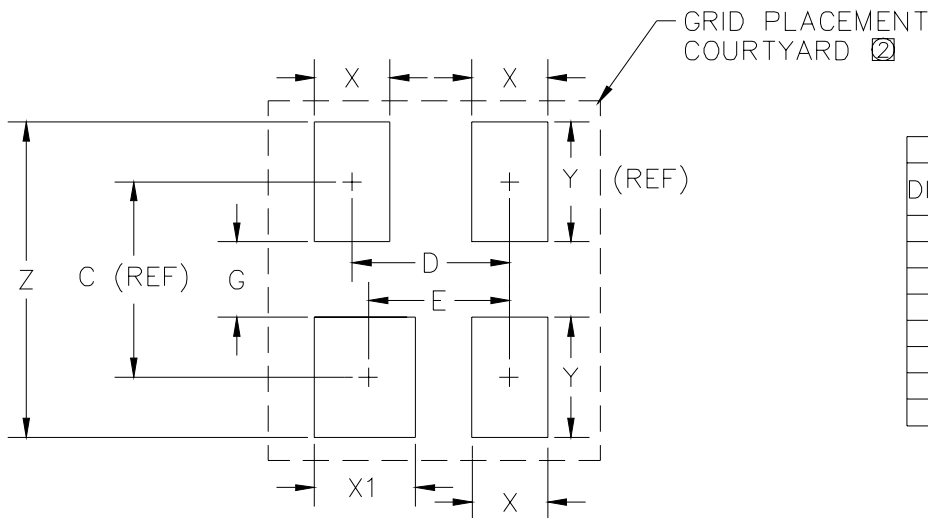


| DIM ^N | INCHES | | MM | | NOTE |
|------------------|--------|------|------|------|------|
| | MIN | MAX | MIN | MAX | |
| A | .110 | .120 | 2.80 | 3.04 | — |
| B | .047 | .055 | 1.20 | 1.40 | — |
| C | .031 | .047 | .80 | 1.20 | — |
| D | .014 | .018 | .37 | .510 | — |
| E | .030 | .035 | .76 | .940 | — |
| G | .076 | BSC | 1.92 | BSC | — |
| H | .068 | BSC | 1.72 | BSC | — |
| J | .003 | .005 | .085 | .180 | — |
| K | .002 | .005 | .013 | 0.10 | — |
| L | .010 | .022 | — | .55 | REF |
| S | .082 | .104 | 2.10 | 2.64 | — |

Notes:

- (1) Controlling dimension: Inch (unless otherwise specified).
- (2) Dimension A and B do not include mold protrusions. Mold protrusions are .006" max.

Land Pattern

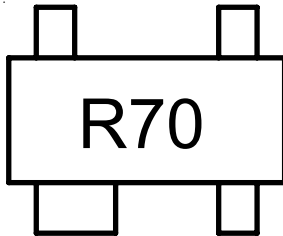


| DIM ^N | INCHES | | MM | | NOTE |
|------------------|--------|------|------|------|------|
| | MIN | MAX | MIN | MAX | |
| C | — | .087 | — | 2.20 | — |
| D | .075 | BSC | 1.90 | BSC | — |
| E | .067 | BSC | 1.70 | BSC | — |
| G | .032 | .040 | .80 | 1.00 | — |
| X | .032 | .040 | .80 | 1.00 | — |
| X1 | .040 | .048 | 1.00 | 1.20 | — |
| Y | — | .055 | — | 1.40 | — |
| Z | .134 | .140 | 3.40 | 3.60 | — |

- ② GRID PLACEMENT COURTYARD IS 8 X 8 ELEMENTS (4mm X 4mm) IN ACCORDANCE WITH THE INTERNATIONAL GRID DETAILED IN IEC PUBLICATION 97.
- ① CONTROLLING DIMENSION: MILLIMETERS.

PROTECTION PRODUCTS**Marking Codes**

| Part Number | Marking Code |
|-------------|--------------|
| SR70 | R70 |

**SR70 Marking (Top View)****Ordering Information**

| Part Number | Qty per Reel | Reel Size |
|-------------|--------------|-----------|
| SR70.TC | 3,000 | 7 Inch |
| SR70.TG | 10,000 | 13 Inch |

Contact Information

Semtech Corporation
Protection Products Division
200 Flynn Rd., Camarillo, CA 93012
Phone: (805)498-2111 FAX (805)498-3804