

### PROTECTION PRODUCTS

#### Description

The LC01-6 transient voltage suppressor is designed to protect components which are connected to high speed telecommunication lines from voltage surges caused by **lightning**, electrostatic discharge (**ESD**), and electrical fast transients (**EFT**).

TVS diodes are ideal for use as board level protection of sensitive semiconductor components. The LC01-6 is designed for metallic mode, secondary line side protection in digital line card applications. It features solid-state silicon-avalanche technology for unmatched transient protection without device degradation. The LC01-6 combines TVS diodes with low capacitance compensation diodes to provide an integrated, low capacitance protection solution. Additional features include sub-nanosecond response time, a low operating voltage of 6 volts, and low clamping voltage.

The LC01-6 is suitable for use on T1/E1 and xDSL interfaces in equipment such as base stations, routers, and channel service units. The LC01-6 meets the long-haul (outer-building) transient immunity requirements of **Bellcore 1089**, **FCC Part 68** (Type A and B surges), **ITU K.20 and K.21**, and **IEC 61000-4-5**.

#### Features

- ◆ 1500 watts peak pulse power ( $t_p = 10/1000\mu s$ )
- ◆ 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), 95A (8/20 $\mu s$ )**  
**Bellcore 1089 (Outer-Building),**  
**100A (10/1000 $\mu s$ ), 500A (2/10 $\mu s$ )**  
**FCC Part 68, 200A (10/160 $\mu s$ )**  
**ITU K.21, 100A (5/310 $\mu s$ )**  
**ITU K.20, 200A (5/310 $\mu s$ )**
- ◆ Differential protection for one Tip and Ring line pair
- ◆ Low capacitance for high speed interfaces
- ◆ Low operating and clamping voltage
- ◆ Integrated structure saves board space and increases reliability
- ◆ Solid-state silicon-avalanche technology

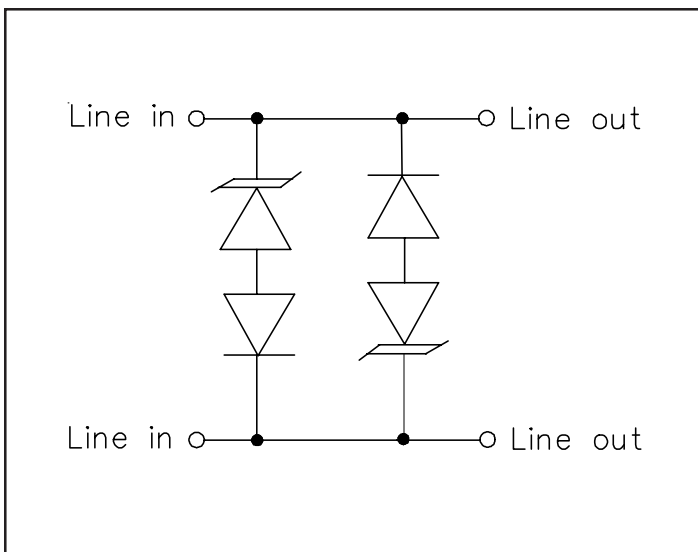
#### Mechanical Characteristics

- ◆ JEDEC SO-16W package
- ◆ UL 497B listed
- ◆ Molding compound flammability rating: UL 94V-0
- ◆ Marking : Part number, date code, logo
- ◆ Packaging : Tube or Tape and Reel per EIA 481

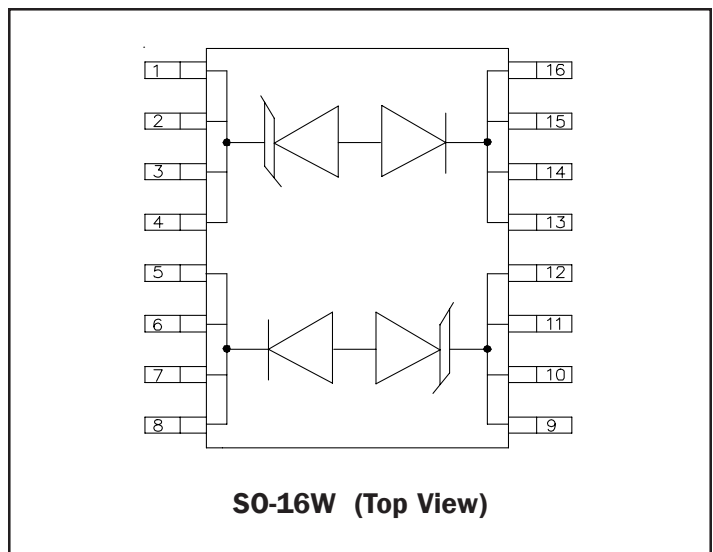
#### Applications

- ◆ T1/E1 Line Cards
- ◆ Base Stations
- ◆ WAN Interfaces
- ◆ xDSL Interfaces
- ◆ CSU/DSU Equipment

#### Circuit Diagram



#### Schematic & PIN Configuration



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

| Rating                                 | Symbol        | Value         | Units |
|--|---------------|---------------|-------|
| Peak Pulse Power (tp = 10/1000μs)      | $P_{pk}$      | 1500          | Watts |
| Peak Pulse Current (tp = 10/1000μs)    | $I_{pp}$      | 100           | A     |
| Peak Pulse Current (tp = 10/160μs)     | $I_{pp}$      | 200           | A     |
| Thermal Resistance Junction to Case    | $\theta_{JC}$ | 30            | °C/W  |
| Thermal Resistance Junction to Ambient | $\theta_{JA}$ | 95            | °C/W  |
| 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    |

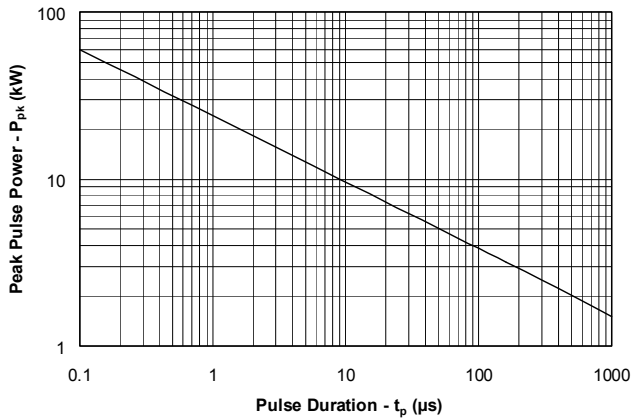
**Electrical Characteristics**

| <b>LC01-6</b>                                |                  |  |         |         |         |       |
|--|------------------|--|---------|---------|---------|-------|
| Parameter                                    | Symbol           | Conditions                             | Minimum | Typical | Maximum | Units |
| Reverse Stand-Off Voltage                    | $V_{RWM}$        |  |         |         | 6       | V     |
| Reverse Breakdown Voltage                    | $V_{BR}$         | $I_t = 1mA$                            | 8       |         |         | V     |
| Reverse Leakage Current                      | $I_R$            | $V_{RWM} = 6V, T=25^\circ C$           |         |         | 25      | μA    |
| Clamping Voltage                             | $V_C$            | $I_{pp} = 100A$<br>$tp = 10/1000\mu s$ |         |         | 15      | V     |
| Clamping Voltage                             | $V_C$            | $I_{pp} = 200A$<br>$tp = 10/160\mu s$  |         |         | 16      | V     |
| Temperature Coefficient of Breakdown Voltage | $\alpha T_{VBR}$ |  |         | 3       |         | mV/°C |
| Junction Capacitance                         | $C_j$            | $V_R = 0V, f = 1MHz$                   |         |         | 50      | pF    |

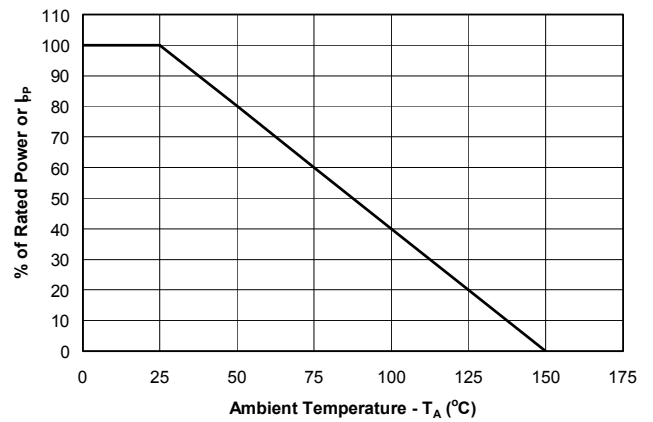
PROTECTION PRODUCTS

Typical Characteristics

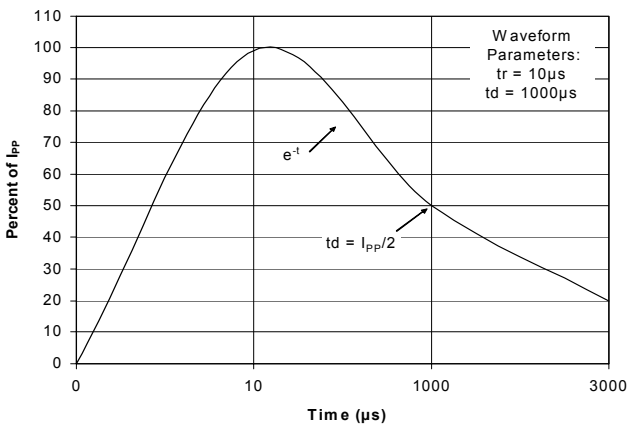
Non-Repetitive Peak Pulse Power vs. Pulse Time



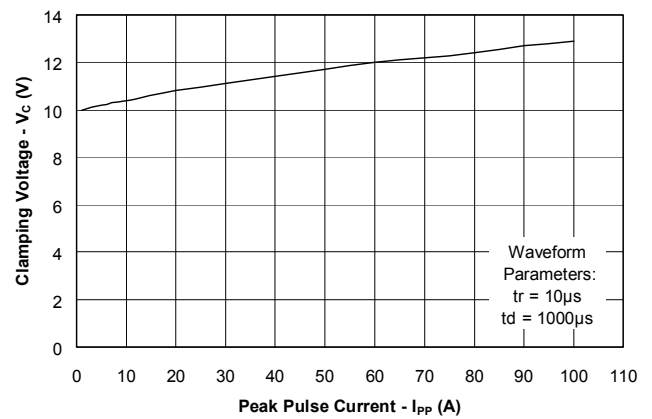
Power Derating Curve



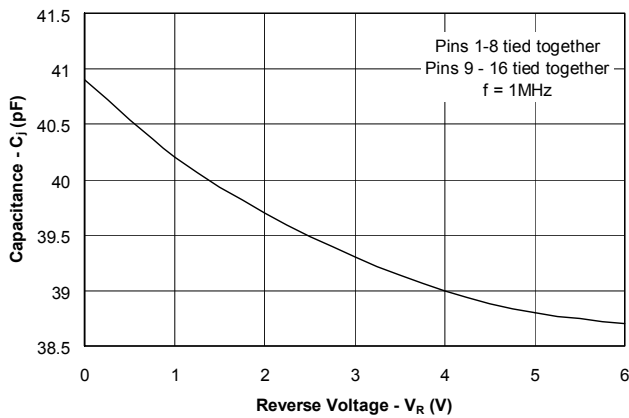
Pulse Waveform



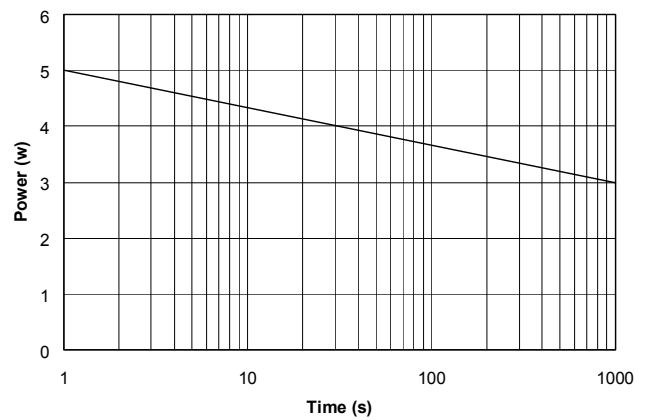
Clamping Voltage vs. Peak Pulse Current



Capacitance vs. Reverse Voltage



AC Power Dissipation



**PROTECTION PRODUCTS**

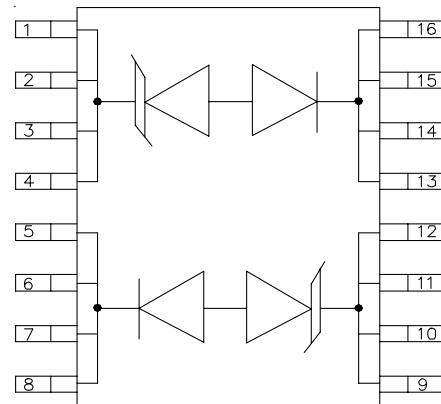
**Applications Information**

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

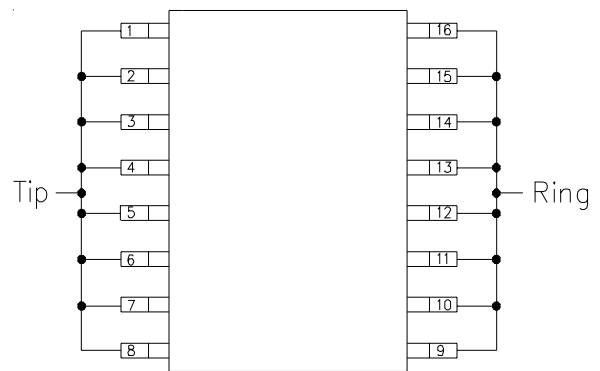
The LC01-6 is designed to protect high-speed data lines from transient over-voltages which result from lightning and ESD. The device is designed to protect one line pair in differential (Line-to-Line) mode. Pins 1-8 are connected to line 1 and pins 9-16 are connected to line 2 as shown. All pins should be connected for best results.

**T1/E1 Linecard Protection**

A typical long-haul T1/E1 linecard protection circuit is shown below. The LC01-6 is connected between Tip and Ring on the transmit and receive line pairs. It provides protection to metallic (line-to-line) lightning surges per Bellcore 1089 and FCC Part 68. Depending on the application, a high voltage crowbar device (not shown) such as a gas discharge tube (GDT) or TVS Thyristor may be used to suppress common mode (line-to-ground) surges. To complete the protection circuit, the SRDA05-4 (or SRDA3.3-4 for 3.3V supplies) is employed as the secondary IC side protection element. This device helps prevent the transceiver from latching up by providing fine clamping of transients that are coupled through the transformer. Positive temperature coefficient (PTC) resistors or fuses are also required for AC power cross protection. For further information, reference Semtech application note AN97-10.



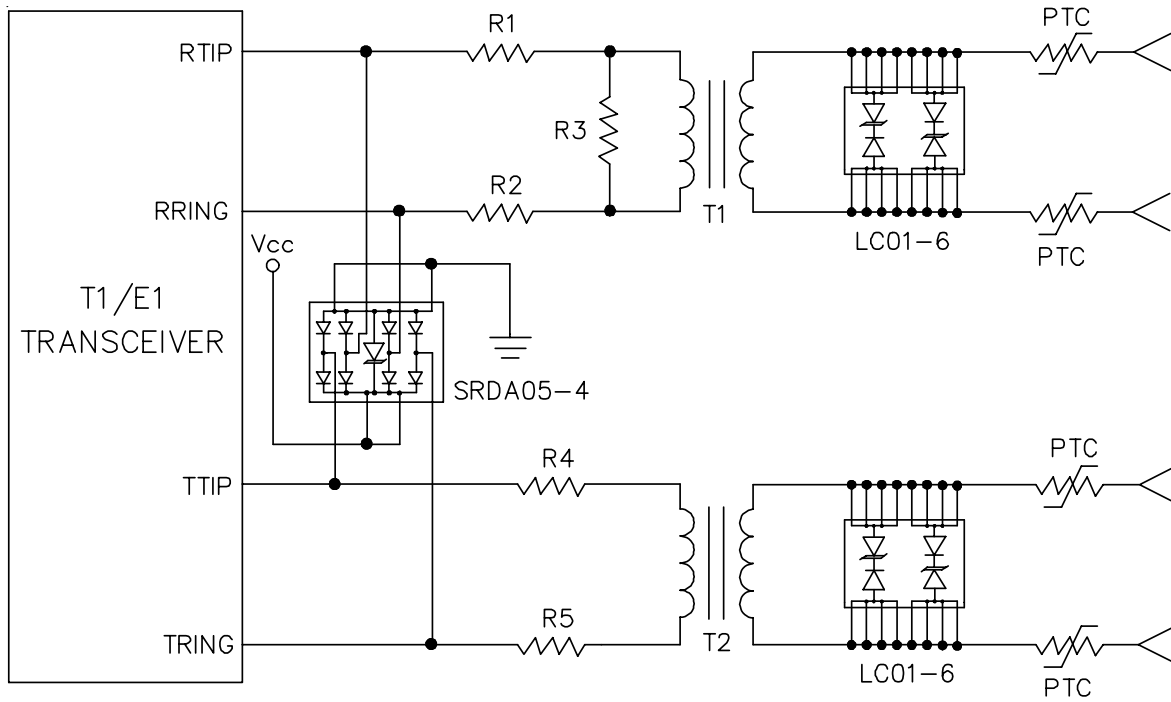
**Figure 1 - Schematic and Pin Configuration**



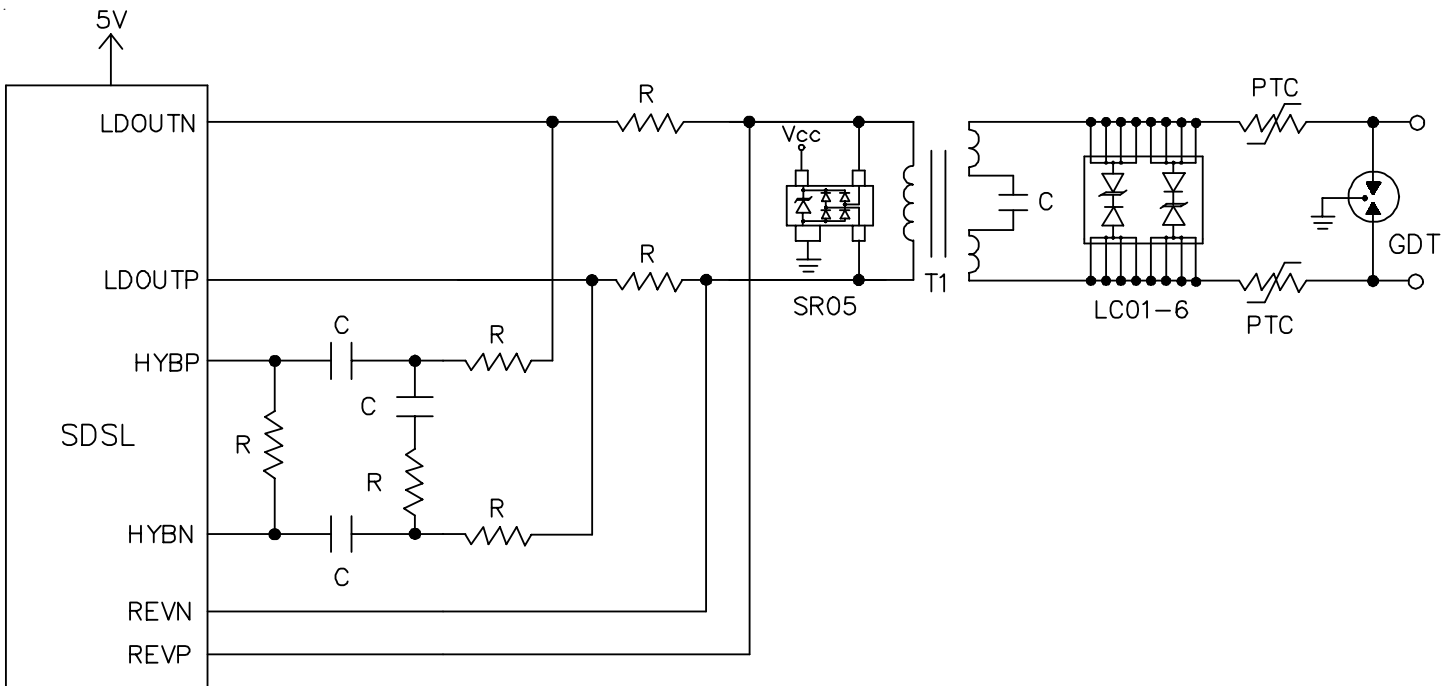
**Figure 2 - Connection for Differential Protection (Line-to-Line)**

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Typical Applications



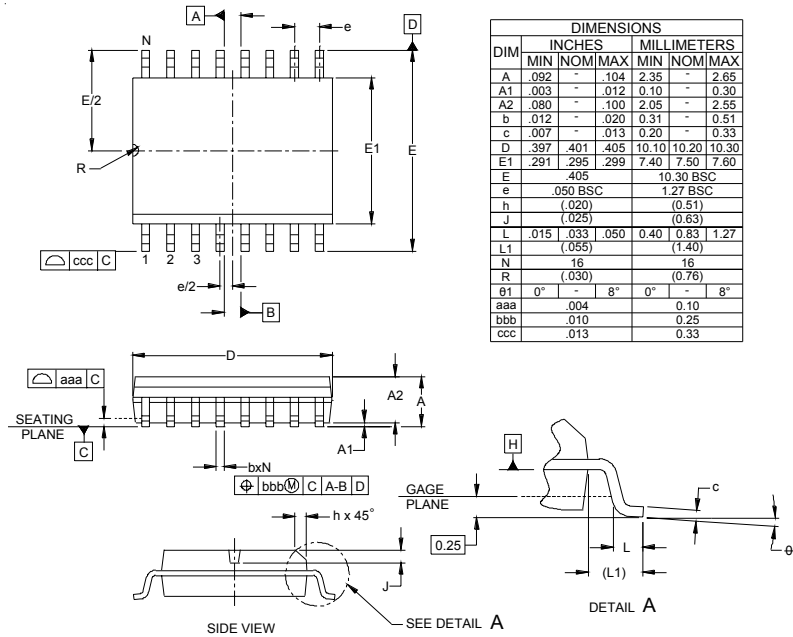
T1/E1 Line Card Protection (Long-Haul Applications)



SDSL Protection

PROTECTION PRODUCTS

Outline Drawing - S0-16W



- NOTES:
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
  2. DATUMS [A-] AND [B-] TO BE DETERMINED AT DATUM PLANE [B].
  3. DIMENSIONS "E1" AND "D" DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
  4. REFERENCE JEDEC STD MS-013, VARIATION AA.

Land Pattern - S0-16W

