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# Low Capacitance Transient Voltage Suppressors/ESD Protectors

## CM1249-04S9

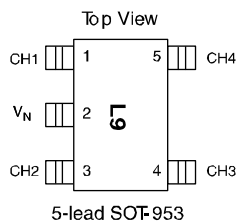
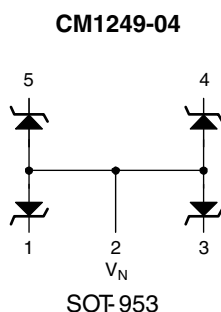
### Features

- Low I/O capacitance at 5pF typical
- In-system ESD protection to  $\pm 8\text{kV}$  contact discharge, per the IEC 61000-4-2 international standard
- Four channels of ESD protection
- Compact SOT-953 package saves board space and facilitates layout in space-critical applications
- Each I/O pin can withstand over 1000 ESD strikes
- RoHS (Restriction of Hazard Substances) compliant

### Applications

- High-speed consumer electronic ports
- ESD protection of PC ports, including USB ports, serial ports, parallel ports, IEEE1394 ports, docking ports, proprietary ports, etc.
- Protection of interface ports or IC pins which are exposed to high ESD levels

### Electrical Schematic



Note: This drawing is not to scale.

## PIN DESCRIPTIONS

| LEADS                                | NAME           | DESCRIPTION                                                                                                            |
|--------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------|
| (Refer to package / pinout diagrams) | CHx            | The cathode of the respective TVS diode, which should be connected to the node requiring transient voltage protection. |
| (Refer to package / pinout diagrams) | V <sub>N</sub> | The anode of the TVS diodes.                                                                                           |

## Ordering Information

## PART NUMBERING INFORMATION

| Leads | Package | Lead-free Finish                  |              |
|-------|---------|-----------------------------------|--------------|
|       |         | Ordering Part Number <sup>1</sup> | Part Marking |
| 5     | SOT953  | CM1249-04S9                       | L9           |

Note 1: Parts are shipped in Tape & Reel form unless otherwise specified.

## Specifications

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                 | RATING      | UNITS |
|---------------------------|-------------|-------|
| Storage Temperature Range | –65 to +150 | °C    |

## STANDARD OPERATING CONDITIONS

| PARAMETER             | RATING     | UNITS |
|-----------------------|------------|-------|
| Operating Temperature | −40 to +85 | °C    |

## ELECTRICAL OPERATING CHARACTERISTICS (NOTE 1)

| SYMBOL          | PARAMETER                                                                                                           | CONDITIONS                                                                                      | MIN                 | TYP        | MAX         | UNITS                |
|-----------------|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------|------------|-------------|----------------------|
| $C_{IN}$        | Channel Input Capacitance                                                                                           | $T_A = 25^{\circ}\text{C}$ , 0VDC, 1MHz                                                         |                     | 5          | 7           | pF                   |
| $\Delta C_{IN}$ | Differential Channel I/O to GND Capacitance                                                                         | $T_A = 25^{\circ}\text{C}$ , 2.5VDC, 1MHz                                                       |                     | 0.14       |             | pF                   |
| $I_{LEAK}$      | Leakage Current                                                                                                     | $V_{IN} = 3.5\text{VDC}$ , $T_A = 25^{\circ}\text{C}$                                           |                     |            | 0.75        | $\mu\text{A}$        |
| $V_{SIG}$       | Small Signal Clamp Voltage<br>Positive Clamp<br>Negative Clamp                                                      | $I = 5\text{mA}$ , $T_A = 25^{\circ}\text{C}$<br>$I = -5\text{mA}$ , $T_A = 25^{\circ}\text{C}$ | 6.1<br>−1.5         |            | 8.5<br>−0.4 | V<br>V               |
| $V_{ESD}$       | ESD Withstand Voltage<br>Contact Discharge per IEC 61000-4-2 standard<br>Human Body Model, MIL-STD-883, Method 3015 | Notes 3 and 4; $T_A = 25^{\circ}\text{C}$<br>Notes 2 and 4; $T_A = 25^{\circ}\text{C}$          | $\pm 8$<br>$\pm 15$ |            |             | kV<br>kV             |
| $R_D$           | Diode Dynamic Resistance<br>Forward Conduction<br>Reverse Conduction                                                | $T_A = 25^{\circ}\text{C}$ ; Note 2                                                             |                     | 0.7<br>2.1 |             | $\Omega$<br>$\Omega$ |

Note 1: All parameters specified at  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  unless otherwise noted.

Note 2: Human Body Model per MIL-STD-883, Method 3015,  $C_{Discharge} = 100\text{pF}$ ,  $R_{Discharge} = 1.5\text{K}\Omega$ ,  $V_N$  grounded.

Note 3: Standard IEC 61000-4-2 with  $C_{Discharge} = 150\text{pF}$ ,  $R_{Discharge} = 330\Omega$ ,  $V_N$  grounded.

Note 4: These measurements performed with no external capacitor on CH.

## Performance Information

### Diode Capacitance

Typical diode capacitance with respect to positive TVS cathode voltage (reverse voltage across the diode) is given in Diode Capacitance vs. Reverse Voltage .

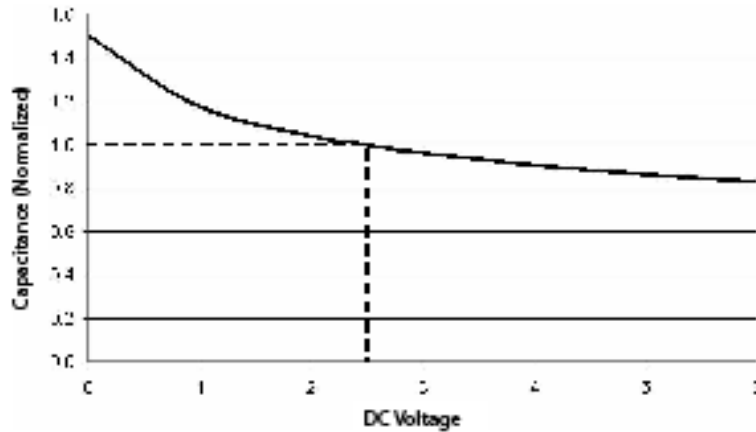
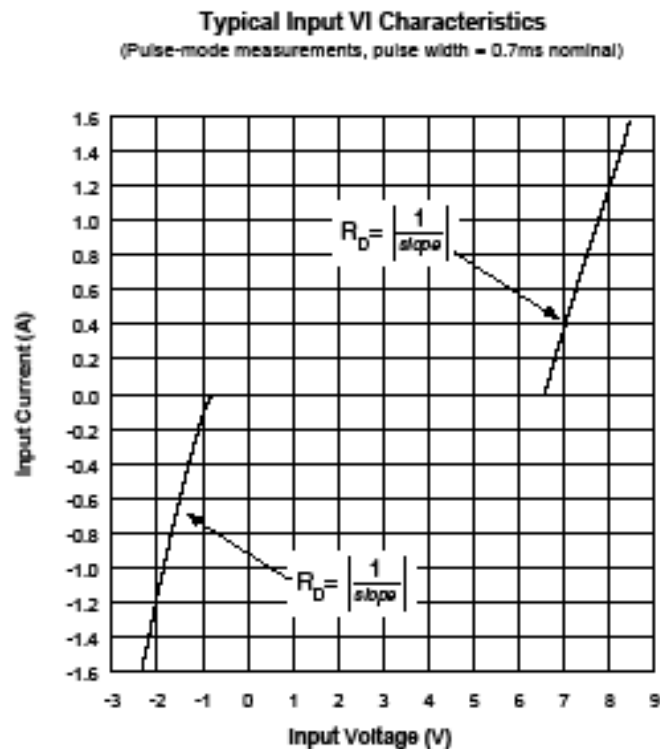


Figure 1. Diode Capacitance vs. Reverse Voltage

### Typical High Current Diode Characteristics

Measurements are made in pulsed mode with a nominal pulse width of 0.7ms.

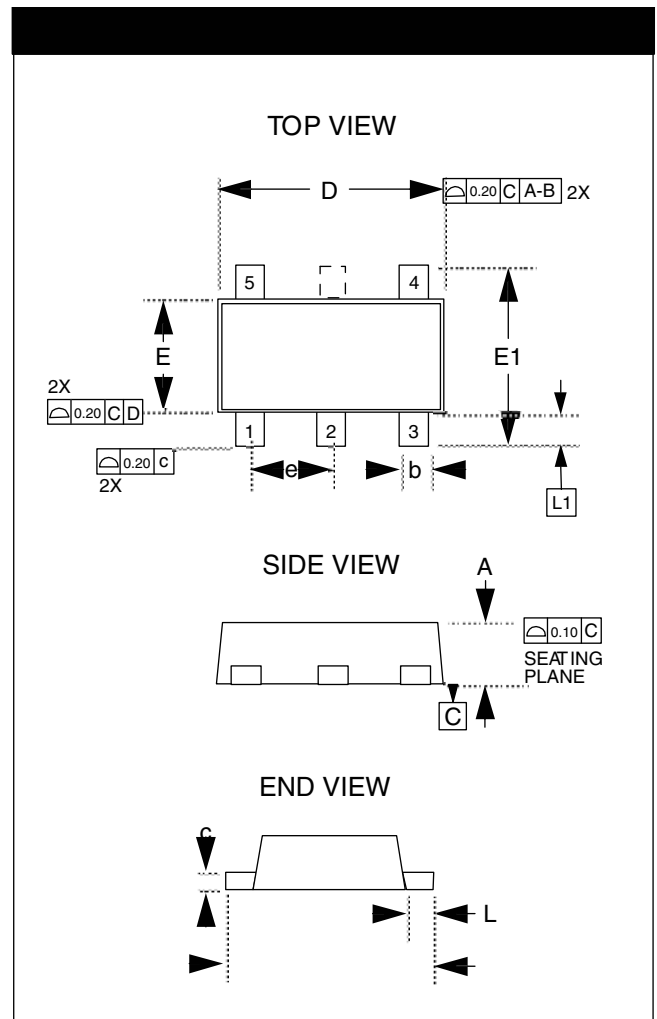


## Mechanical Details

### SOT-953 Mechanical Specifications

The 5-pin SOT-953 package dimensions are shown below.

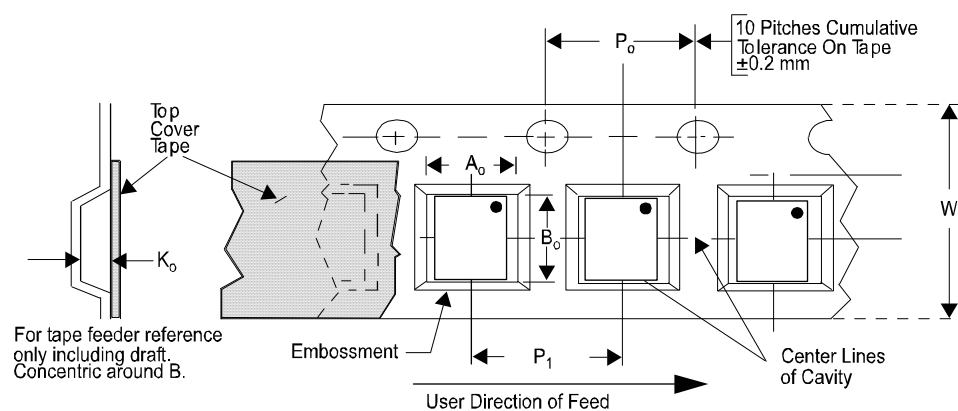
| PACKAGE DIMENSIONS                 |             |       |       |           |       |       |
|------------------------------------|-------------|-------|-------|-----------|-------|-------|
| Package                            | SOT-953/963 |       |       |           |       |       |
| Leads                              | 5           |       |       |           |       |       |
| Dim.                               | Millimeters |       |       | Inches    |       |       |
|                                    | Min         | Nom   | Max   | Min       | Nom   | Max   |
| A                                  | 0.400       | 0.450 | 0.500 | 0.016     | 0.018 | 0.020 |
| b                                  | 0.100       | 0.150 | 0.200 | 0.004     | 0.006 | 0.008 |
| c                                  | 0.050       | 0.100 | 0.150 | 0.002     | 0.004 | 0.006 |
| D                                  | 0.950       | 1.000 | 1.050 | 0.037     | 0.039 | 0.041 |
| E                                  | 0.750       | 0.800 | 0.850 | 0.029     | 0.031 | 0.033 |
| E1                                 | 0.950       | 1.000 | 1.050 | 0.037     | 0.039 | 0.041 |
| e                                  | 0.350 BSC   |       |       | 0.014 BSC |       |       |
| L                                  | 0.050       | 0.100 | 0.150 | 0.002     | 0.004 | 0.006 |
| L1                                 | 0.125       | 0.150 | 0.175 | 0.005     | 0.006 | 0.007 |
| # per tape and reel                | 8000 pieces |       |       |           |       |       |
| Controlling dimension: millimeters |             |       |       |           |       |       |



Package Dimensions for SOT-953

# Tape and Reel Specifications

| PART NUMBER | PACKAGE SIZE (mm)  | POCKET SIZE (mm)<br>$B_0 \times A_0 \times K_0$ | TAPE WIDTH<br>W | REEL<br>DIAMETER | QTY PER<br>REEL | $P_0$ | $P_1$ |
|-------------|--------------------|-------------------------------------------------|-----------------|------------------|-----------------|-------|-------|
| CM1249-04S9 | 1.00 X 0.80 X 0.45 | 1.16 X 1.16 X 0.63                              | 8mm             | 178mm (7")       | 8000            | 4mm   | 4mm   |



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