ESDR7534

Low Capacitance TVS for LVDS Interfaces

The ESDR7534 transient voltage suppressor is designed to protect high speed data lines from ESD, EFT, and lightning.

Features

- Low Capacitance (3 pF Maximum Between I/O Lines and GND)
- Protection for the Following IEC Standards:
  IEC 61000−4−2 (ESD) Level 4 − ±8 kV (Contact); ±15 kV (Air)
- This is a Pb−Free Device

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Power Dissipation (Note 1)	P_{pk}	300	W
Maximum Peak Pulse Current 2 x 10 μS @ T_A = 25°C	I_{PP}	10	A
Operating Junction Temperature Range	T_J	−55 to +125	°C
Storage Temperature Range	T_{stg}	−55 to +150	°C
Lead Solder Temperature − Maximum (10 Seconds)	T_L	260	°C
IEC 61000−4−2 Contact (ESD)	ESD	8	kV
IEC 61000−4−2 Air (ESD)	ESD	15	kV

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. P_{pk} calculated. $P_{pk} = V_C \times I_{PP}$.

Table 1. PIN DESCRIPTIONS

4−Channel, 6−Lead SC70−6			
Pin	**Name**	**Type**	**Description**
1	CH1	I/O	ESD Channel
2	V_N	GND	Negative Voltage Supply Rail
3	CH2	I/O	ESD Channel
4	CH3	I/O	ESD Channel
5	V_P	PWR	Positive Voltage Supply Rail
6	CH4	I/O	ESD Channel

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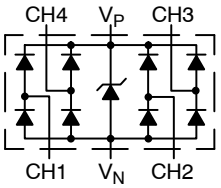
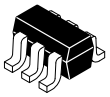
http://onsemi.com

PIN CONFIGURATION AND SCHEMATIC

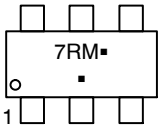


(Top View)



SC−88
S7 SUFFIX
CASE 419B

MARKING DIAGRAM



7R = Specific Device Code
M = Date Code
▪ = Pb−Free Package
(*Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
ESDR7534W1T2G	SC−88 (Pb−Free)	3,000 / Tape & Reel

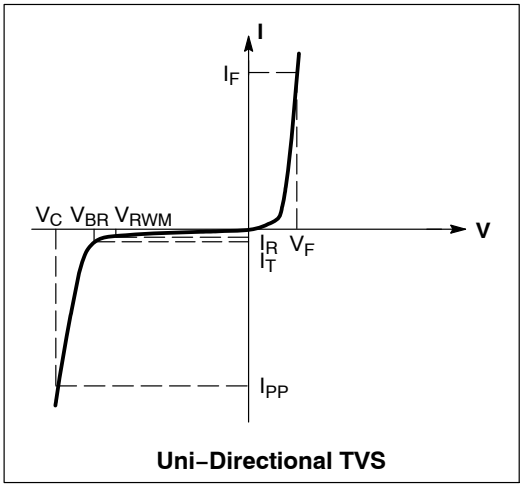
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted)

Symbol	Parameter
I_{PP}	Maximum Reverse Peak Pulse Current
V_C	Clamping Voltage @ I_{PP}
V_{RWM}	Working Peak Reverse Voltage
I_R	Maximum Reverse Leakage Current @ V_{RWM}
V_{BR}	Breakdown Voltage @ I_T
I_T	Test Current
I_F	Forward Current
V_F	Forward Voltage @ I_F
P_{pk}	Peak Power Dissipation
C	Capacitance @ V_R = 0 and f = 1.0 MHz

*See Application Note AND8308/D for detailed explanations of datasheet parameters.



Uni−Directional TVS

ELECTRICAL CHARACTERISTICS (T_A=25°C unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse Working Voltage	V_{RWM}	(Note 1)			5.0	V
Breakdown Voltage	V_{BR}	I_T = 1 mA, (Note 2)	6.0	8.0	9.5	V
Reverse Leakage Current	I_R	V_{RWM} = 5 V			3.0	μA
Forward Voltage	V_F	I_F = 100 mA			1.6	V
Clamping Voltage	V_C	I_{PP} = 10 A (2 x 10 μs Waveform)			30	V
Maximum Peak Pulse Current	I_{PP}	2 x 10 μs Waveform			10	A
Junction Capacitance	C_J	V_R = 0 V, f = 1 MHz between I/O Pins and GND		1.9	3.0	pF
Junction Capacitance	C_J	V_R = 0 V, f = 1 MHz between I/O Pins		0.8	1.0	pF

1. TVS devices are normally selected according to the working peak reverse voltage (V_{RWM}), which should be equal or greater than the DC or continuous peak operating voltage level.
2. V_{BR} is measured at pulse test current I_T.

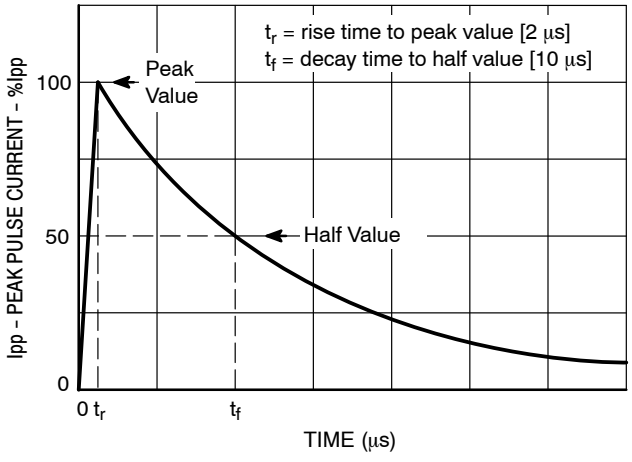


Figure 1. Exponential Decay Pulse Waveform

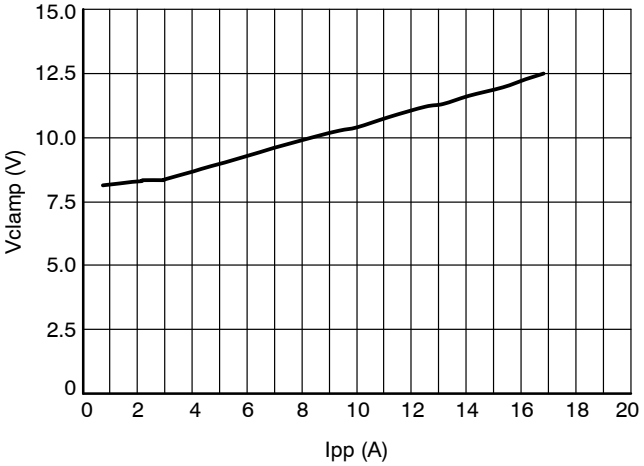


Figure 2. Clamping Voltage vs. Peak Pulse Current (tp = 2 x 10 μs, R = 8 Ω)

IEC 61000−4−2 Spec.

Level	Test Voltage (kV)	First Peak Current (A)	Current at 30 ns (A)	Current at 60 ns (A)
1	2	7.5	4	2
2	4	15	8	4
3	6	22.5	12	6
4	8	30	16	8

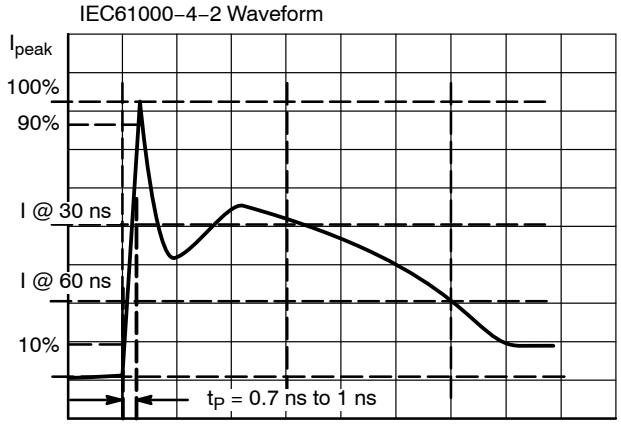


Figure 3. IEC61000−4−2 Spec

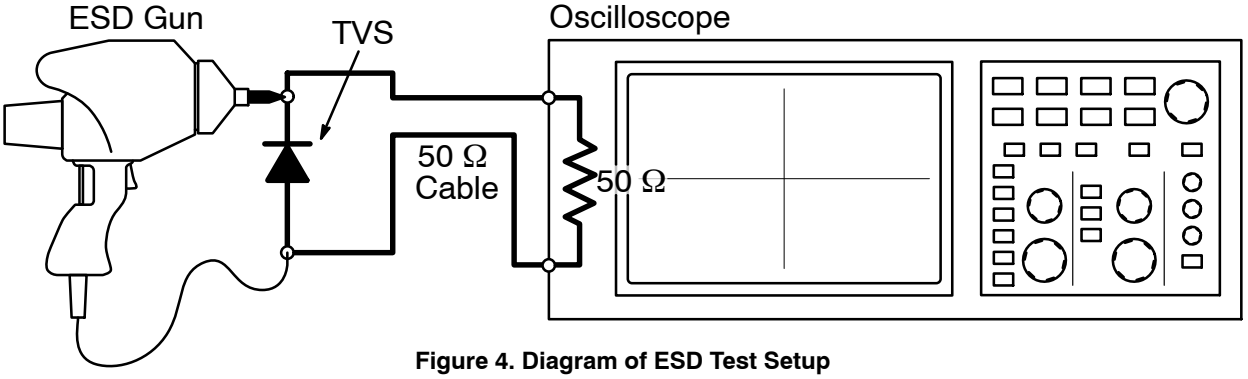


Figure 4. Diagram of ESD Test Setup

The following is taken from Application Note AND8308/D − Interpretation of Datasheet Parameters for ESD Devices.

ESD Voltage Clamping

For sensitive circuit elements it is important to limit the voltage that an IC will be exposed to during an ESD event to as low a voltage as possible. The ESD clamping voltage is the voltage drop across the ESD protection diode during an ESD event per the IEC61000−4−2 waveform. Since the IEC61000−4−2 was written as a pass/fail spec for larger systems such as cell phones or laptop computers it is not clearly defined in the spec how to specify a clamping voltage at the device level. ON Semiconductor has developed a way to examine the entire voltage waveform across the ESD protection diode over the time domain of an ESD pulse in the form of an oscilloscope screenshot, which can be found on the datasheets for all ESD protection diodes. For more information on how ON Semiconductor creates these screenshots and how to interpret them please refer to AND8307/D.

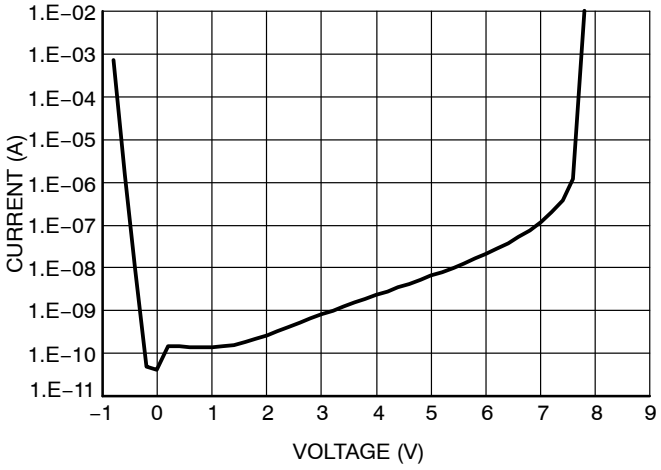


Figure 5. IV Characteristic Curve

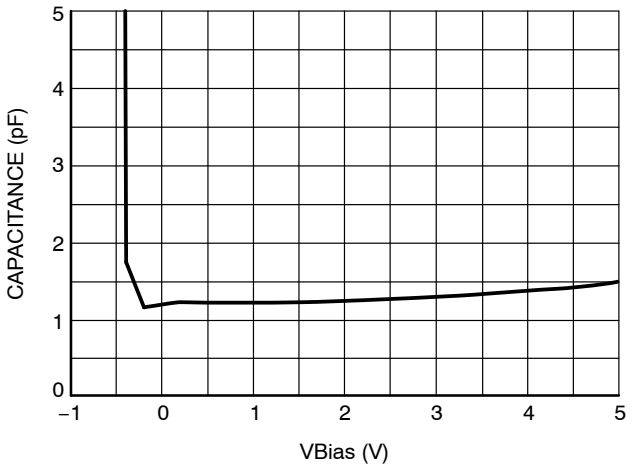


Figure 6. CV Characteristic Curve

APPLICATIONS INFORMATION

The new ESDR7534 is a low capacitance TVS diode array designed to protect sensitive electronics such as communications systems, computers, and computer peripherals against damage due to ESD events or transient overvoltage conditions. Because of its low capacitance, it can be used in high speed I/O data lines. The integrated design of the ESDR7534 offers low capacitance steering diodes and an internal TVS diode (V_P diode) integrated in a single package. If a transient condition occurs, the steering diodes will drive the transient to the positive rail of the power supply or to ground. The TVS device protects the power line against overvoltage conditions to avoid damage to the power supply and any downstream components.

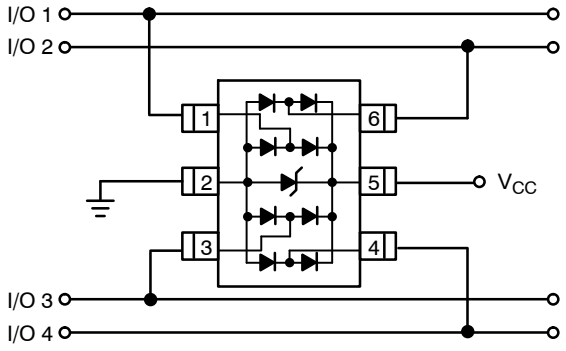
ESDR7534 Configuration Options

The ESDR7534 is able to protect up to four data lines against transient overvoltage conditions by driving them to a fixed reference point for clamping purposes. The steering diodes will be forward biased whenever the voltage on the protected line exceeds the reference voltage (V_f or $V_{CC} + V_f$). The diodes will force the transient current to bypass the sensitive circuit.

Data lines are connected at pins 1, 3, 4 and 6. The negative reference is connected at pin 2. This pin must be connected directly to ground by using a ground plane to minimize the PCB's ground inductance. It is very important to reduce the PCB trace lengths as much as possible to minimize parasitic inductances.

Option 1

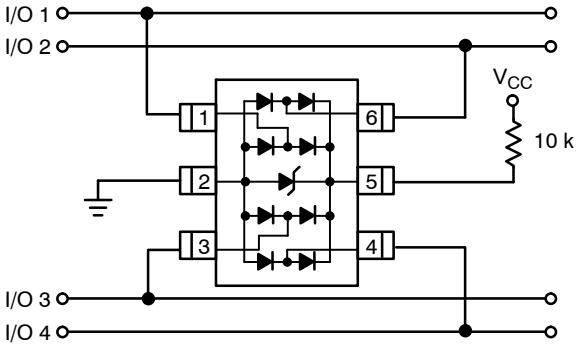
Protection of four data lines and the power supply using V_{CC} as reference.



For this configuration, connect pin 5 directly to the positive supply rail (V_{CC}), the data lines are referenced to the supply voltage. The V_P diode prevents overvoltage on the supply rail. Biasing of the steering diodes reduces their capacitance.

Option 2

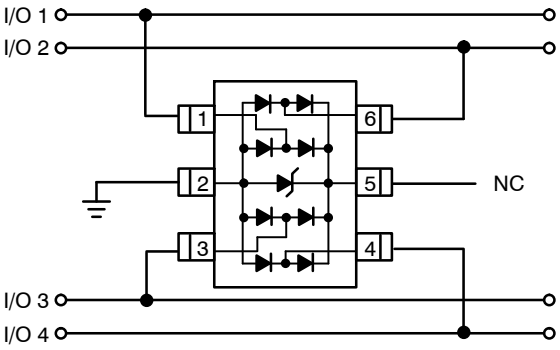
Protection of four data lines with bias and power supply isolation resistor.



The ESDR7534 can be isolated from the power supply by connecting a series resistor between pin 5 and V_{CC}. A 10 kΩ resistor is recommended for this application. This will maintain a bias on the V_P and steering diodes, reducing their capacitance.

Option 3

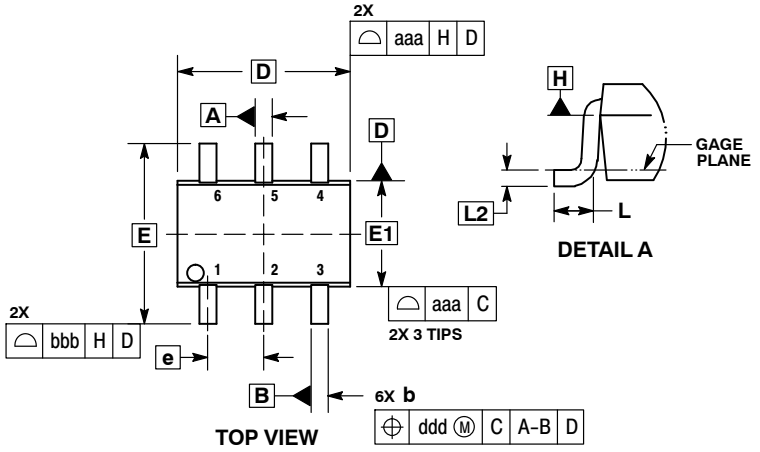
Protection of four data lines using the V_P diode as reference.

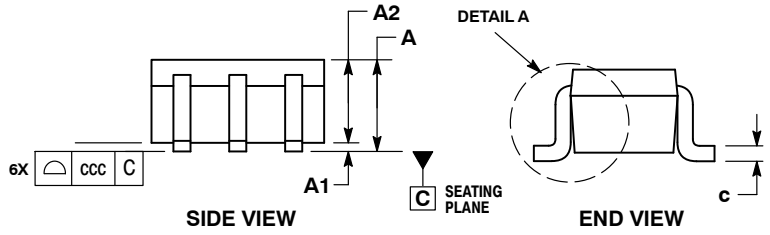


In applications lacking a positive supply reference or those cases in which a fully isolated power supply is required, the V_P can be used as the reference. For these applications, pin 5 is not connected. In this configuration, the steering diodes will conduct whenever the voltage on the protected line exceeds the V_{BR} of the I/O (CHX) pin.

PACKAGE DIMENSIONS

SC−88/SC−70−6/SOT−363
CASE 419B−02
ISSUE Y

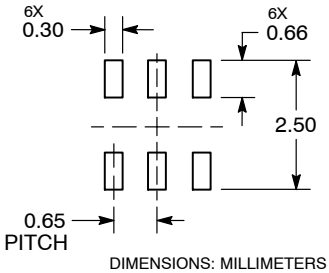




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	---	---	1.10	---	---	0.043
A1	0.00	---	0.10	0.000	---	0.004
A2	0.70	0.90	1.00	0.027	0.035	0.039
b	0.15	0.20	0.25	0.006	0.008	0.010
C	0.08	0.15	0.22	0.003	0.006	0.009
D	1.80	2.00	2.20	0.070	0.078	0.086
E	2.00	2.10	2.20	0.078	0.082	0.086
E1	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
L2	0.15 BSC			0.006 BSC		
aaa	0.15			0.006		
bbb	0.30			0.012		
ccc	0.10			0.004		
ddd	0.10			0.004		

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
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Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

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Japan Customer Focus Center
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