ESD Protection - In-Vehicle Networks

Automotive Qualified Low Capacitance High Speed Data Network Protection

SZESD9902

The SZESD9902 protects sensitive automotive electronics from ESD, Surge, and other harmful transient events. This device is designed for compliance to OPEN Alliance 100/1000 BASE−T1 Ethernet, and other high speed data networks. Device is suitable for ESD protection on the connector side of the transceiver PHY.

Features

- High Trigger Voltage ≥ 100 V
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- Open Alliance 100/1000 BASE−T1 Ethernet
- In Vehicle Networking (IVN)
- High Speed Data Networks

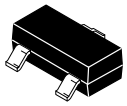
MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Operating Junction Temperature Range	T_J	−55 to +150	°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)* IEC 61000−4−2 Air (ESD)* ISO 10605 150 pF / 330 Ω Contact ISO 10605 330 pF / 330 Ω Contact ISO 10605 330 pF / 2 kΩ Contact ISO 10605 150 pF / 2 kΩ Contact * minimum number of discharges > 1000	ESD	±30 ±30 ±30 ±30 ±30 ±30	kV
Maximum Peak Pulse Current 8/20 μs	I_{pp}	2.2	A

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

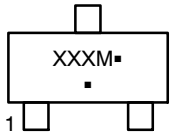
Complies with the Following Standards:

- ISO7637−2, Jumpstart, Load Dump
- Open Alliance 100/1000 BASE−T1 Ethernet
- ISO7637−3, Pulse 2a 85 V, 3a 3b 150 V



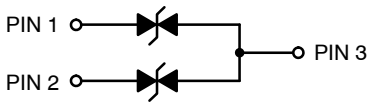
SOT−23
STYLE 27
CASE 318

MARKING DIAGRAM



XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

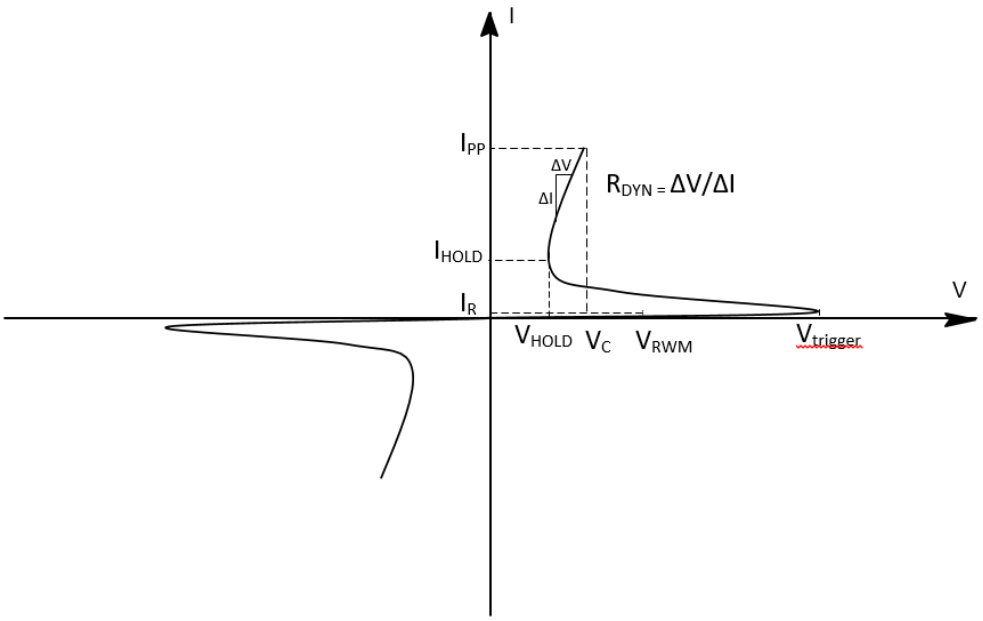
PIN CONNECTIONS



ORDERING INFORMATION

Device	Package	Shipping†
SZESD9902MLT1G	SOT−23 (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 specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse Working Voltage	V_{RWM}	I/O Pin to GND			25	V
Reverse Leakage Current	I_R	V_{RWM} = 25 V		1	200	nA
Reverse Holding Voltage	V_{HOLD}	I/O Pin to GND	25			V
ESD Trigger Voltage (Note 2)	$V_{trigger}$		100			V
Reverse Peak Pulse Current	I_{PP}	per IEC61000−4−5 (8x20 μs)			2.2	A
Channel Capacitance	$C_{Jio-gnd}$	V_R = 0 V, f = 1 MHz		2.3	2.6	pF
Dynamic Resistance (Note 2)	R_{DYN}	I/O to GND, GND to I/O		0.4		Ω

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. For test procedure see Figure 1 and application note AND8307/D.
2. ANSI/ESD STM5.5.1 − Electrostatic Discharge Sensitivity Testing using Transmission Line Pulse (TLP) Model.
   TLP conditions: Z_0 = 50 Ω, t_p = 100 ns, t_r = 1 ns, averaging window: t_1 = 70 ns to t_2 = 90 ns.

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

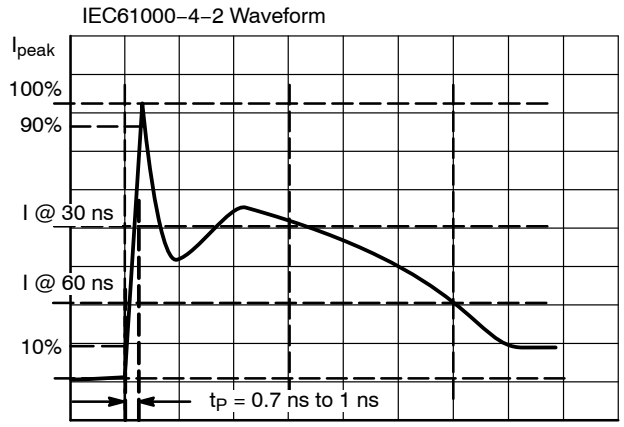


Figure 1. IEC61000−4−2 Spec

Transmission Line Pulse (TLP) Measurement

Transmission Line Pulse (TLP) provides current versus voltage (I−V) curves in which each data point is obtained from a 100 ns long rectangular pulse from a charged transmission line. A simplified schematic of a typical TLP system is shown in Figure 2. TLP I−V curves of ESD protection devices accurately demonstrate the product's ESD capability because the 10s of amps current levels and under 100 ns time scale match those of an ESD event. This is illustrated in Figure 3 where an 8 kV IEC 61000−4−2 current waveform is compared with TLP current pulses at 8 A and 16 A. A TLP I−V curve shows the voltage at which the device turns on as well as how well the device clamps voltage over a range of current levels.

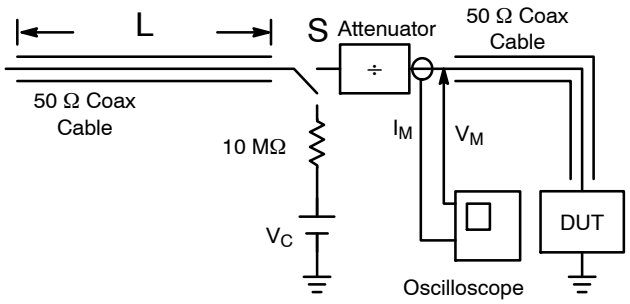


Figure 2. Simplified Schematic of a Typical TLP System

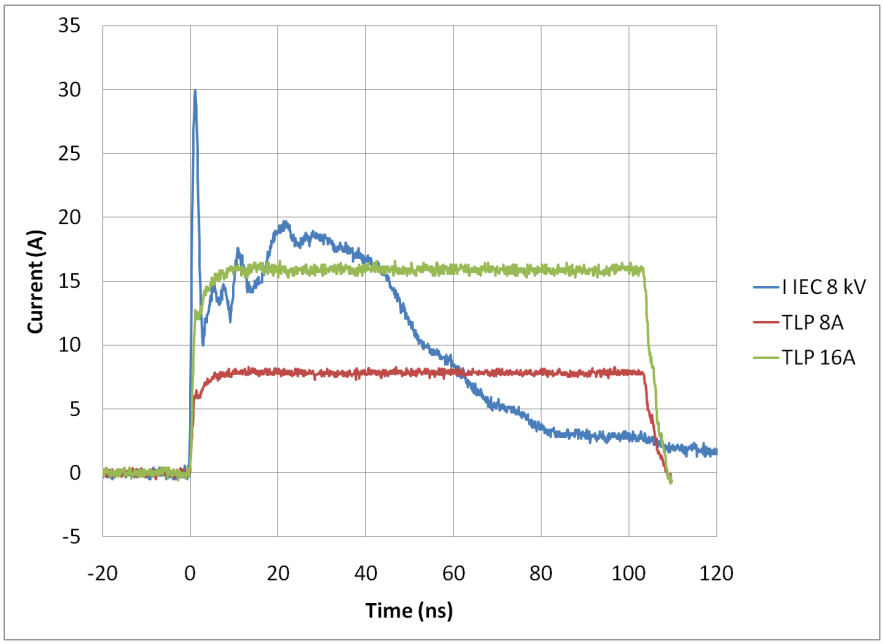
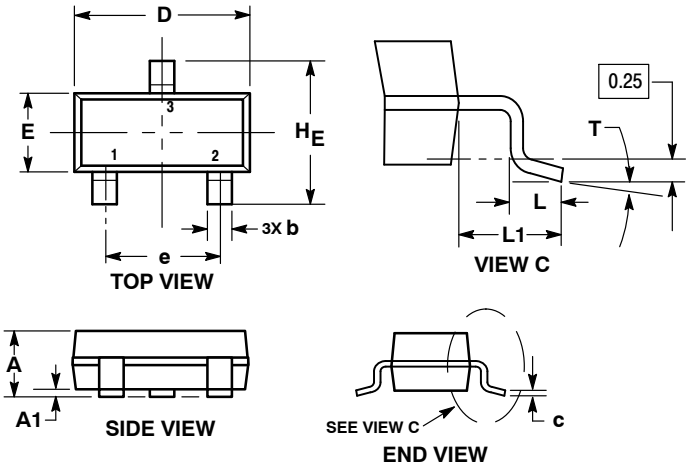


Figure 3. Comparison Between 8 kV IEC 61000−4−2 and 8 A and 16 A TLP Waveforms

SZESD9902

PACKAGE DIMENSIONS

SOT−23 (TO−236)
CASE 318−08
ISSUE AS

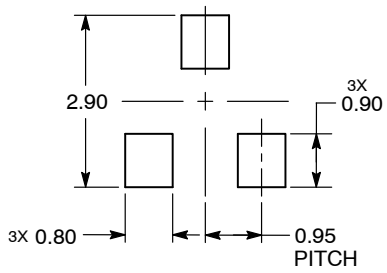


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.039	0.044
A1	0.01	0.06	0.10	0.000	0.002	0.004
b	0.37	0.44	0.50	0.015	0.017	0.020
c	0.08	0.14	0.20	0.003	0.006	0.008
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.080
L	0.30	0.43	0.55	0.012	0.017	0.022
L1	0.35	0.54	0.69	0.014	0.021	0.027
H_E	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	–––	10°	0°	–––	10°

STYLE 27:
PIN 1. CATHODE
2. CATHODE
3. CATHODE

RECOMMENDED SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

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Phone: 011 421 33 790 2910

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