

# ESDONCAN1, SESDONCAN1

## CAN/CAN-FD Bus Protector

### Low Capacitance ESD Protection Diode for CAN/CAN-FD Bus

The S/ESDONCAN1 has been designed to protect the CAN transceiver from ESD and other harmful transient voltage events. This device provides bidirectional protection for each data line with a single compact SOT-23 package, giving the system designer a low cost option for improving system reliability and meeting stringent EMI requirements.

#### Features

- 200 W Peak Power Dissipation per Line (8 x 20  $\mu$ sec Waveform)
- Diode Capacitance Matching
- Low Reverse Leakage Current (< 100 nA)
- Low Capacitance High-Speed FlexRay Data Rates
- IEC Compatibility:
  - IEC 61000-4-2 (ESD): Level 4
  - IEC 61000-4-4 (EFT): 50 A – 5/50 ns
  - IEC 61000-4-5 (Lighting) 3.0 A (8/20  $\mu$ s)
- ISO 7637-1, Nonrepetitive EMI Surge Pulse 2, 8.0 A (1 x 50  $\mu$ s)
- ISO 7637-3, Repetitive Electrical Fast Transient (EFT) EMI Surge Pulses, 50 A (5 x 50 ns)
- Flammability Rating UL 94 V-0
- S Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These are Pb-Free Devices

#### Typical Applications

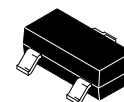
- Industrial
  - ◆ Smart Distribution Systems (SDS)
  - ◆ DeviceNet
- Automotive
  - ◆ Controlled Area Network – CAN 2.1 / CAN FD
  - ◆ Low and High Speed CAN



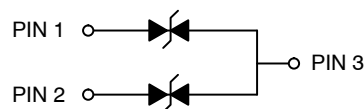
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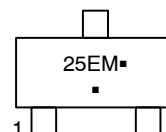
### SOT-23 DUAL BIDIRECTIONAL VOLTAGE SUPPRESSOR 200 W PEAK POWER



SOT-23  
CASE 318  
STYLE 27



#### MARKING DIAGRAM



25E = Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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## MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

Symbol	Rating	Value	Unit
PPK	Peak Power Dissipation, 8 x 20 $\mu\text{s}$ Double Exponential Waveform (Note 1)	200	W
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$
$T_J$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$T_L$	Lead Solder Temperature (10 s)	260	$^\circ\text{C}$
ESD	Human Body Model (HBM) Machine Model (MM) IEC 61000-4-2 Specification (Contact)	8.0 400 23	kV V kV

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.

1. Non-repetitive current pulse per Figure 1.

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{RWM}$	Reverse Working Voltage	(Note 2)	24	-	-	V
$V_{BR}$	Breakdown Voltage	$I_T = 1\text{ mA}$ (Note 3)	26.2	-	32	V
$I_R$	Reverse Leakage Current	$V_{RWM} = 24\text{ V}$	-	15	100	nA
$V_C$	Clamping Voltage	$I_{PP} = 1\text{ A}$ (8 x 20 $\mu\text{s}$ Waveform) (Note 4)	-	33.4	36.6	V
$V_C$	Clamping Voltage	$I_{PP} = 3\text{ A}$ (8 x 20 $\mu\text{s}$ Waveform) (Note 4)	-	44	50	V
$I_{PP}$	Maximum Peak Pulse Current	8 x 20 $\mu\text{s}$ Waveform (Note 4)	-	-	3.0	A
$C_J$	Capacitance	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ (Line to GND)	-	-	10	pF
$\Delta C$	Diode Capacitance Matching	$V_R = 0\text{ V}$ , 5 MHz (Note 5)	-	0.26	2	%

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.

2. Surge protection 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.
3.  $V_{BR}$  is measured at pulse test current  $I_T$ .
4. Pulse waveform per Figure 1.
5.  $\Delta C$  is the percentage difference between  $C_J$  of lines 1 and 2 measured according to the test conditions given in the electrical characteristics table.

## ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
ESDONCAN1LT1G	SOT-23 (Pb-Free)	3,000 / Tape & Reel
SESDONCAN1LT1G*	SOT-23 (Pb-Free)	3,000 / Tape & Reel
ESDONCAN1LT3G	SOT-23 (Pb-Free)	10,000 / Tape & Reel
SESDONCAN1LT3G*	SOT-23 (Pb-Free)	10,000 / Tape & Reel

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

\*S Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

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## TYPICAL PERFORMANCE CURVES

( $T_J = 25^\circ\text{C}$  unless otherwise noted)

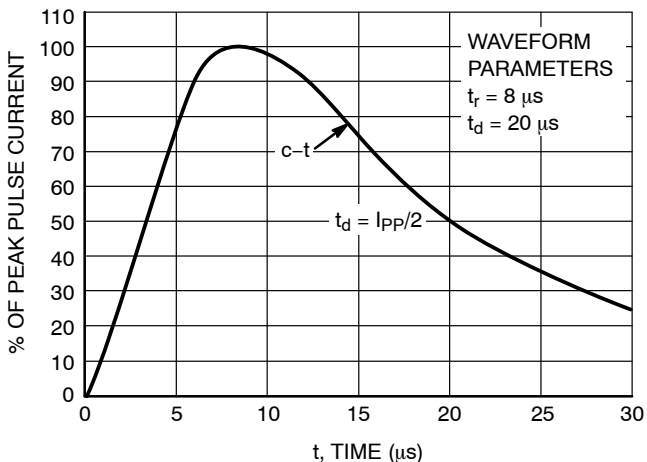


Figure 1. Pulse Waveform,  $8 \times 20 \mu\text{s}$

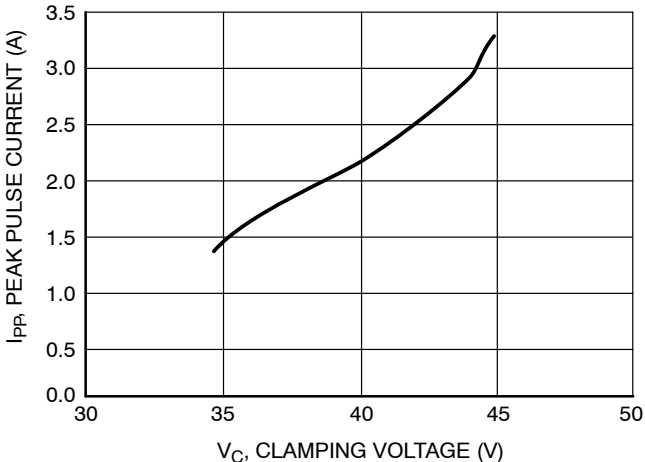


Figure 2. Clamping Voltage vs Peak Pulse Current

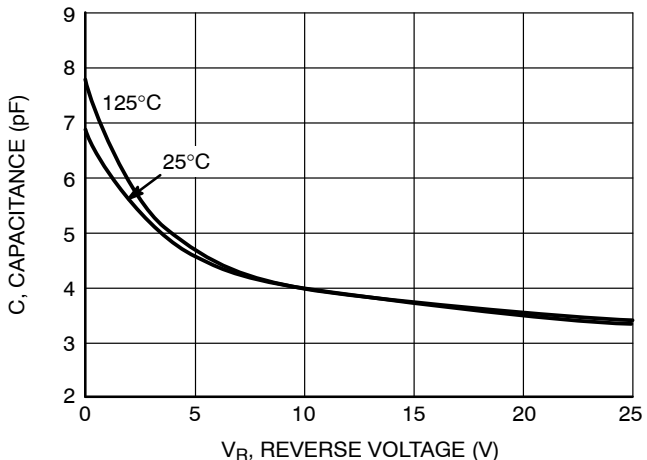


Figure 3. Typical Junction Capacitance vs Reverse Voltage

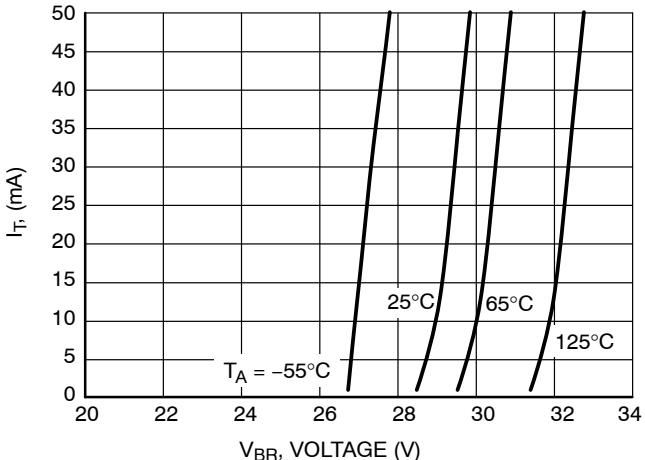


Figure 4.  $V_{BR}$  versus  $I_r$  Characteristics

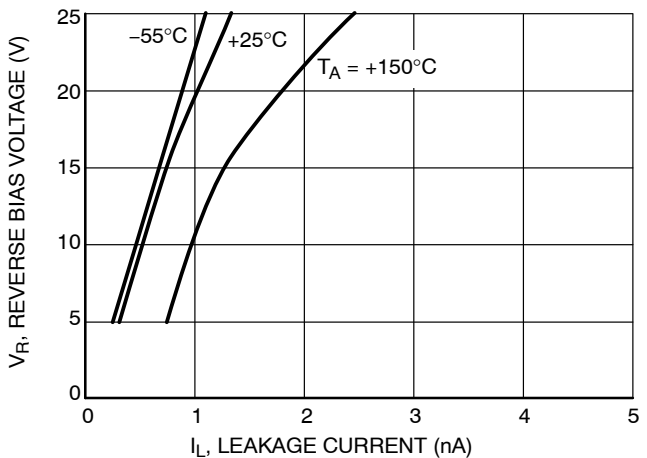


Figure 5.  $I_R$  versus Temperature Characteristics

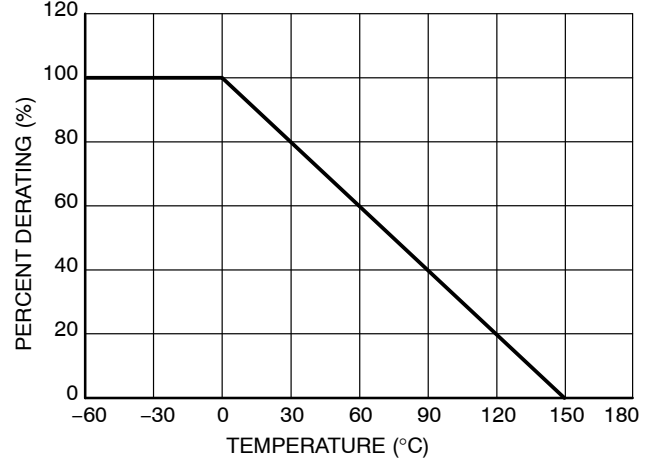


Figure 6. Temperature Power Dissipation Derating

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## APPLICATIONS

### Background

The Controller Area Network (CAN) is a serial communication protocol designed for providing reliable high speed data transmission in harsh environments. Surge protection diodes provide a low cost solution to conducted and radiated Electromagnetic Interference (EMI) and Electrostatic Discharge (ESD) noise problems. The noise immunity level and reliability of CAN transceivers can be easily increased by adding external surge protection diodes to prevent transient voltage failures. The ESDONCAN1 provides a surge protection solution for CAN data

communication lines. The ESDONCAN1 is a low capacitance dual bidirectional surge protection device in a compact SOT-23 package especially suitable for CAN2.1 (CAN-FD). This device is based on Zener technology that optimizes the active area of a PN junction to provide robust protection against transient EMI surge voltage and ESD. The ESDONCAN1 has been tested to EMI and ESD levels that exceed the specifications of popular high speed CAN networks.

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



**SOT-23 (TO-236)**  
CASE 318-08  
ISSUE AS

DATE 30 JAN 2018

SCALE 4:1



**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.

DIM	MILLIMETERS			INCHES		
	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
HE	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	---	10°	0°	---	10°

**RECOMMENDED SOLDERING FOOTPRINT**



**GENERIC MARKING DIAGRAM\***



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

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

- |   |   |   |  |
|---|---|---|--|
| STYLE 1 THRU 5:<br>CANCELLED                                | STYLE 6:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR       | STYLE 7:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR       | STYLE 8:<br>PIN 1. ANODE<br>2. NO CONNECTION<br>3. CATHODE |
| STYLE 9:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE          | STYLE 10:<br>PIN 1. DRAIN<br>2. SOURCE<br>3. GATE           | STYLE 11:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE-ANODE | STYLE 12:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE      |
| STYLE 13:<br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE           | STYLE 14:<br>PIN 1. CATHODE<br>2. GATE<br>3. ANODE          | STYLE 15:<br>PIN 1. GATE<br>2. CATHODE<br>3. ANODE          | STYLE 16:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE      |
| STYLE 17:<br>PIN 1. NO CONNECTION<br>2. ANODE<br>3. CATHODE | STYLE 18:<br>PIN 1. NO CONNECTION<br>2. CATHODE<br>3. ANODE | STYLE 19:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE-ANODE | STYLE 20:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE         |
| STYLE 21:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN           | STYLE 22:<br>PIN 1. RETURN<br>2. OUTPUT<br>3. INPUT         | STYLE 23:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE         | STYLE 24:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE          |
| STYLE 25:<br>PIN 1. ANODE<br>2. CATHODE<br>3. GATE          | STYLE 26:<br>PIN 1. CATHODE<br>2. ANODE<br>3. NO CONNECTION | STYLE 27:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. CATHODE     | STYLE 28:<br>PIN 1. ANODE<br>2. ANODE<br>3. ANODE          |

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