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PESD1CAN

CAN bus ESD protection diode

1. Product profile

1.1 General description

PESD1CAN in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package designed to protect two automotive Controller Area Network (CAN) bus lines from the damage caused by ElectroStatic Discharge (ESD) and other transients.

1.2 Features

- Due to the integrated diode structure only one small SOT23 package is needed to protect two CAN bus lines
- Max. peak pulse power: $P_{PP} = 200 \text{ W}$ at $t_p = 8/20 \mu\text{s}$
- Low clamping voltage: $V_{CL} = 40 \text{ V}$ at $I_{PP} = 1 \text{ A}$
- Ultra low leakage current: $I_{RM} < 1 \text{ nA}$
- Typ. diode capacitance matching: $\Delta C_d/C_d = 0.1 \%$
- ESD protection up to 23 kV
- IEC 61000-4-2, level 4 (ESD)
- IEC 61000-4-5 (surge); $I_{PP} = 3 \text{ A}$ at $t_p = 8/20 \mu\text{s}$
- Small SMD plastic package

1.3 Applications

- CAN bus protection
- Automotive applications

1.4 Quick reference data

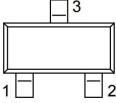
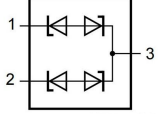
Table 1. Quick reference data
 $T_{amb} = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
V_{RWM}	reverse standoff voltage		-	-	24	V
C_d	diode capacitance	$f = 1 \text{ MHz}; V_R = 0 \text{ V}$	-	11	17	pF

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2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Symbol
1	cathode 1		
2	cathode 2		
3	common cathode		

006aaa155

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PESD1CAN	-	plastic surface-mounted package; 3 leads	SOT23

4. Marking

Table 4. Marking codes

Type number	Marking code ^[1]
PESD1CAN	*AN

- [1] * = -: made in Hong Kong
 * = p: made in Hong Kong
 * = t: made in Malaysia
 * = W: made in China

5. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
Per diode					
P _{PP}	peak pulse power	t _p = 8/20 μs	^{[1][2]} -	200	W
I _{PP}	peak pulse current	t _p = 8/20 μs	^{[1][2]} -	3	A
Per device					
T _j	junction temperature		-	150	°C
T _{amb}	ambient temperature		-65	+150	°C
T _{stg}	storage temperature		-65	+150	°C

[1] Non-repetitive current pulse 8/20 μs exponential decay waveform according to IEC 61000-4-5.

[2] Measured from pin 1 to 3 or 2 to 3.

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Table 6. ESD maximum ratings

Symbol	Parameter	Conditions	Min	Max	Unit
Per diode					
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2 (contact discharge)	[1][2] -	23	kV
		MIL-STD-883 (human body model)	-	10	kV

[1] Device stressed with ten non-repetitive ESD pulses.

[2] Measured from pin 1 to 3 or 2 to 3.

Table 7. ESD standards compliance

Standard	Conditions
Per diode	
IEC 61000-4-2; level 4 (ESD)	> 15 kV (air); > 8 kV (contact)
MIL-STD-883; class 3 (human body model)	> 4 kV

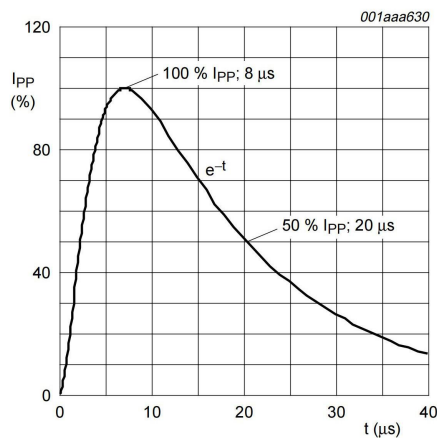


Fig 1. 8/20 μ s pulse waveform according to IEC 61000-4-5

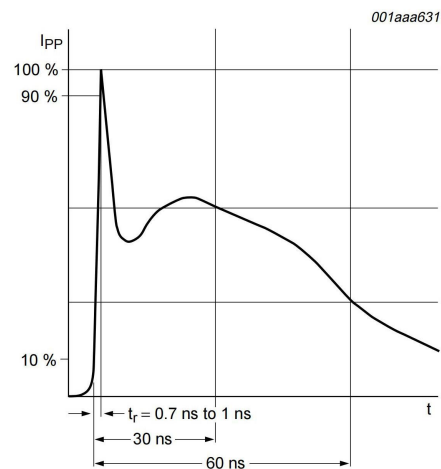


Fig 2. ESD pulse waveform according to IEC 61000-4-2

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6. Characteristics

Table 8. Characteristics

$T_{amb} = 25^{\circ}\text{C}$ unless otherwise specified.

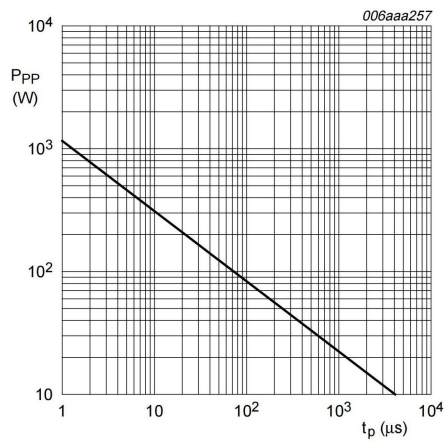
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
V_{RWM}	reverse standoff voltage		-	-	24	V
I_{RM}	reverse leakage current	$V_{RWM} = 24\text{ V}$	-	< 1	50	nA
V_{BR}	breakdown voltage	$I_R = 5\text{ mA}$	25.4	27.8	30.3	V
C_d	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}$	-	11	17	pF
$\Delta C_d/C_d$	diode capacitance matching		[1]			
		$f = 1\text{ MHz}; V_R = 0\text{ V}$	-	0.1	-	%
		$f = 1\text{ MHz}; V_R = 2.5\text{ V}$	-	0.1	-	%
V_{CL}	clamping voltage		[2][3]			
		$I_{PP} = 1\text{ A}$	-	-	40	V
		$I_{PP} = 3\text{ A}$	-	-	70	V
r_{dif}	differential resistance	$I_R = 1\text{ mA}$	-	-	300	Ω

[1] ΔC_d is the difference of the capacitance measured between pin 1 and pin 3 and the capacitance measured between pin 2 and pin 3.

[2] Non-repetitive current pulse 8/20 μs exponential decay waveform according to IEC 61000-4-5.

[3] Measured from pin 1 to 3 or 2 to 3.

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$T_{amb} = 25^\circ\text{C}$

Fig 3. Peak pulse power as a function of exponential pulse duration; typical values

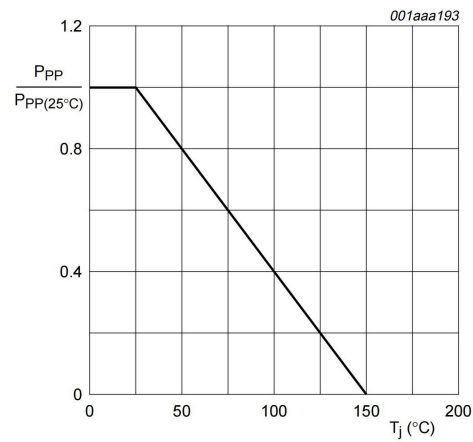
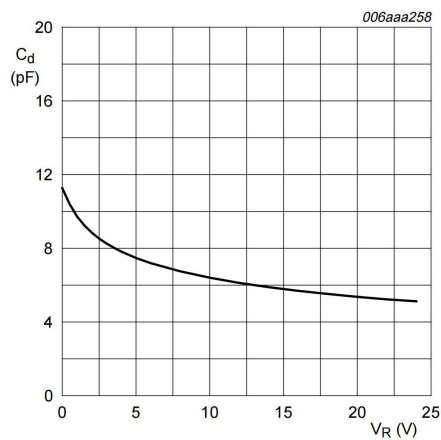


Fig 4. Relative variation of peak pulse power as a function of junction temperature; typical values



$f = 1\text{ MHz}; T_{amb} = 25^\circ\text{C}$

Fig 5. Diode capacitance as a function of reverse voltage; typical values

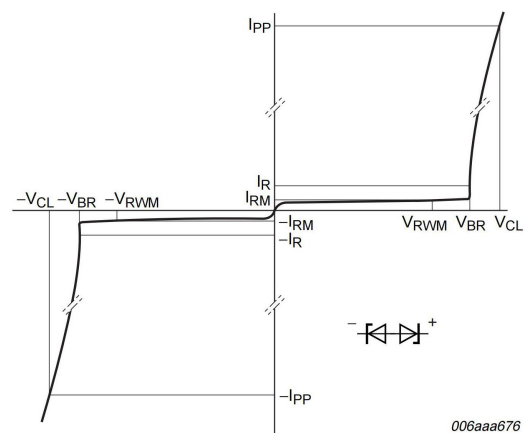


Fig 6. V-I characteristics for a bidirectional ESD protection diode

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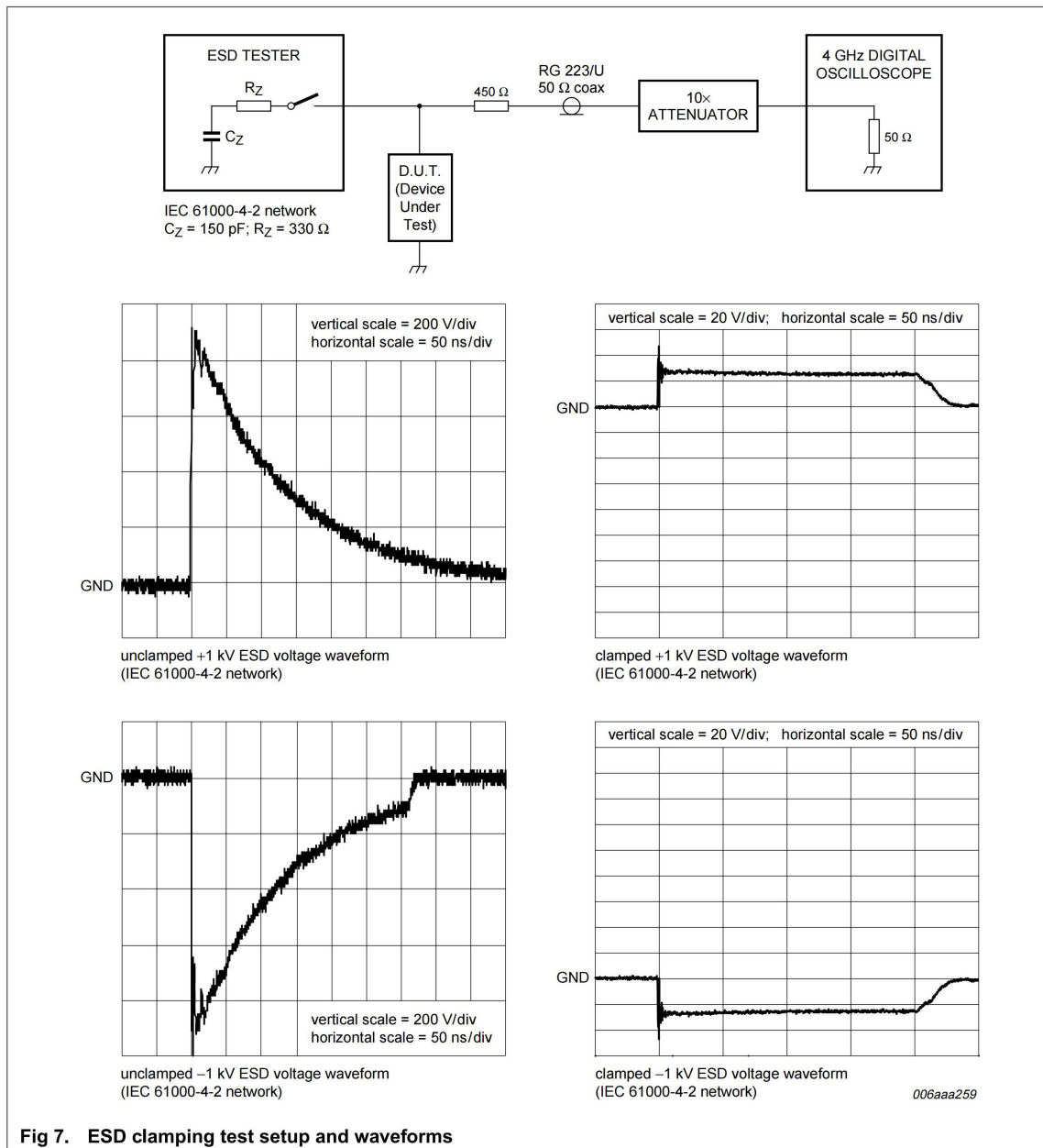


Fig 7. ESD clamping test setup and waveforms

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Ordering Information

PACKAGE	PACKAGE CODE	UNIT WEIGHT(g)	REEL(pcs)	BOX(pcs)	CARTON(pcs)	DELIVERY MODE
SOT-23	R1	0.008	3000	30000	240000	7"

Package Outline Dimensions (SOT-23)

Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.90	1.15	0.035	0.045
A1	-	0.10	-	0.004
A2	0.90	1.05	0.035	0.041
b	0.30	0.50	0.012	0.020
c	0.10	0.20	0.004	0.008
D	2.80	3.00	0.110	0.118
E	1.20	1.40	0.047	0.055
E1	2.25	2.55	0.089	0.100
e	0.950TYP		0.037TYP	
e1	1.80	2.00	0.071	0.079
L	0.550REF		0.022REF	
L1	0.30	0.50	0.012	0.020
θ	-	8°	-	8°

Suggested Pad Layout

Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
J	0.75	0.85	0.030	0.033
K	0.85	0.95	0.033	0.037
M	1.95	2.05	0.077	0.081
N	1.85	1.95	0.073	0.077