

## Bi-directional ESD Protection Diode

### DESCRIPTIONS

The TESDA24VB28P2CX is a Bidirectional ESD rated clamping cell to protect power interfaces, or control line, or low speed data line in an electronic system. It has been specifically designed to protect sensitive electronic components which are connected to power and control lines from over-voltage damage by Electrostatic Discharging (ESD), and Lightning.

ESD protection device in a small SOT-23 Surface-Mounted Device (SMD) plastic package designed to protect two automotive In-vehicle network bus lines from the damage caused by Electrostatics discharge (ESD) and other transients.

The TESDA24VB28P2CX may be used to provide ESD protection up to  $\pm 30\text{kV}$ (contact and air discharge) according to IEC61000-4-2, and withstand peak pulse current up to 5A (8/20 $\mu\text{s}$ ) according to IEC61000-4-5.


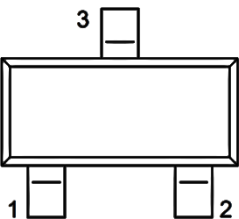
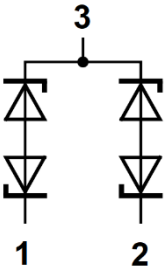
### FEATURES

- AEC-Q101 qualified
- ESD protects for 2 lines with bidirectional.
- Provide ESD protection for each channel to IEC61000-4-2 (ESD)  $\pm 30\text{kV}$  (air),  $\pm 30\text{kV}$  (contact) IEC61000-4-4 (EFT) 4kV (5/50ns) IEC61000-4-5 (Lightning) 5A (8/20 $\mu\text{s}$ )
- Suitable for 24V and below, operating voltage applications
- Protect I/O line or power line.
- Moisture sensitivity level: level 1, per J-STD-020
- RoHS Compliant
- Halogen-Free

### APPLICATION

- ESD protection for In-vehicle network lines in automotive environments
- CAN Bus
- General Purpose I/O
- Portable Instrumentation
- Mobile & Handhelds



PACKAGE: SOT-23	PIN CONFIGURATION	CIRCUIT DIAGRAM
		

<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted)			
<b>PARAMETER</b>	<b>SYMBOL</b>	<b>VALUE</b>	<b>UNIT</b>
Peak pulse power ( $t_p = 8/20\mu\text{s}$ )	$P_{PK}$	210	W
Peak pulse current ( $t_p = 8/20\mu\text{s}$ )	$I_{PP}$	5	A
ESD according to IEC61000-4-2 air discharge	$V_{ESD}$	$\pm 30$	kV
ESD according to IEC61000-4-2 contact discharge		$\pm 30$	kV
Junction temperature range	$T_J$	-55 to +150	$^\circ\text{C}$
Storage temperature range	$T_{STG}$	-55 to +150	$^\circ\text{C}$

<b>ELECTRICAL SPECIFICATIONS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted)						
<b>PARAMETER</b>	<b>CONDITIONS</b>	<b>SYMBOL</b>	<b>MIN</b>	<b>TYP</b>	<b>MAX</b>	<b>UNIT</b>
Reverse working voltage		$V_{RWM}$	-	-	24	V
Reverse breakdown voltage	$I_R = 1\text{mA}$ , $T_J = 25^\circ\text{C}$	$V_{BR}$	24.7	-	32.9	V
Reverse leakage current	$V_{RWM} = 24\text{V}$	$I_R$	-	-	100	nA
Clamping voltage <sup>(1)</sup>	$I_{PP} = 1\text{A}$ , $t_p = 8/20\mu\text{s}$	$V_C$	-	-	34	V
	$I_{PP} = 5\text{A}$ , $t_p = 8/20\mu\text{s}$		-	-	42	V
Clamping voltage <sup>(2)</sup>	$I_{TLP} = 4\text{A}$ , $t_p = 100\text{ns}$	$V_{CL}$	-	33.4	-	V
	$I_{TLP} = 16\text{A}$ , $t_p = 100\text{ns}$		-	39.0	-	V
Junction capacitance	1MHz, $V_R = 0\text{V}$	$C_J$	-	21	28	pF
Dynamic resistance <sup>(2)</sup>		$R_{DYN}$	-	0.46	-	$\Omega$

**Notes:**

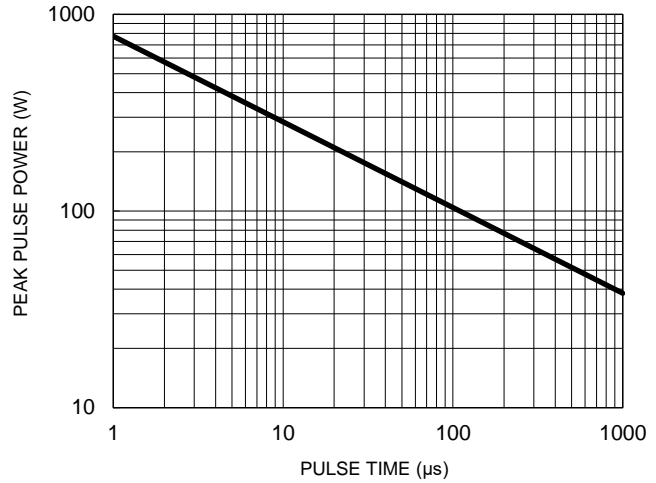
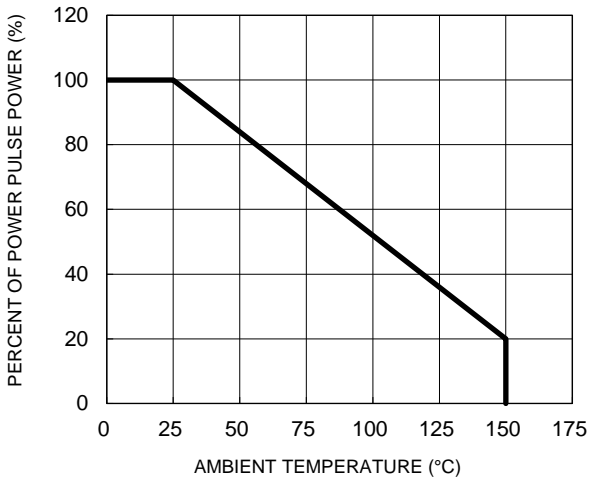
1. Non-repetitive current pulse, according to IEC61000-4-5.
2. TLP parameter:  $Z_0 = 50\ \Omega$ ,  $t_p = 100\text{ns}$ ,  $t_r = 2\text{ns}$ , averaging window from 60ns to 80ns.  $R_{DYN}$  is calculated from 4A to 16A.

<b>ORDERING INFORMATION</b>		
<b>ORDERING CODE</b>	<b>PACKAGE</b>	<b>PACKING</b>
TESDA24VB28P2CX RFG	SOT-23	3,000 / 7" Tape & Reel

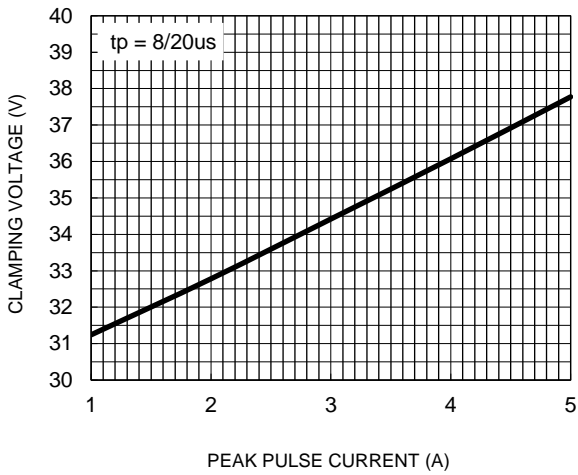
**CHARACTERISTICS CURVES**

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

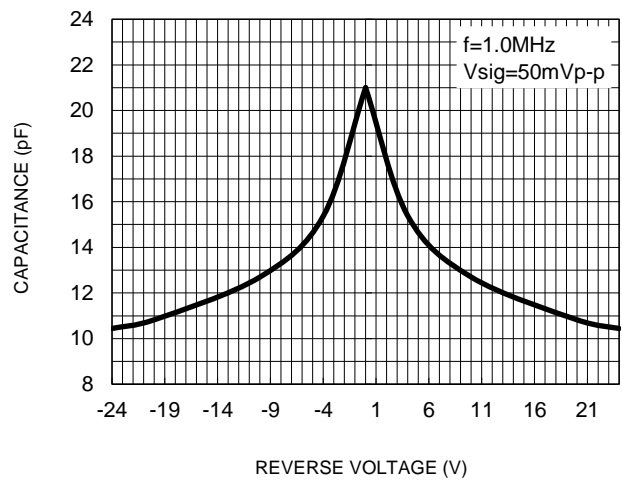
**Fig.1 Peak Pulse Power vs. Junction Temperature**    **Fig.2 Non-Repetitive Peak Pulse Power vs. Pulse Time**



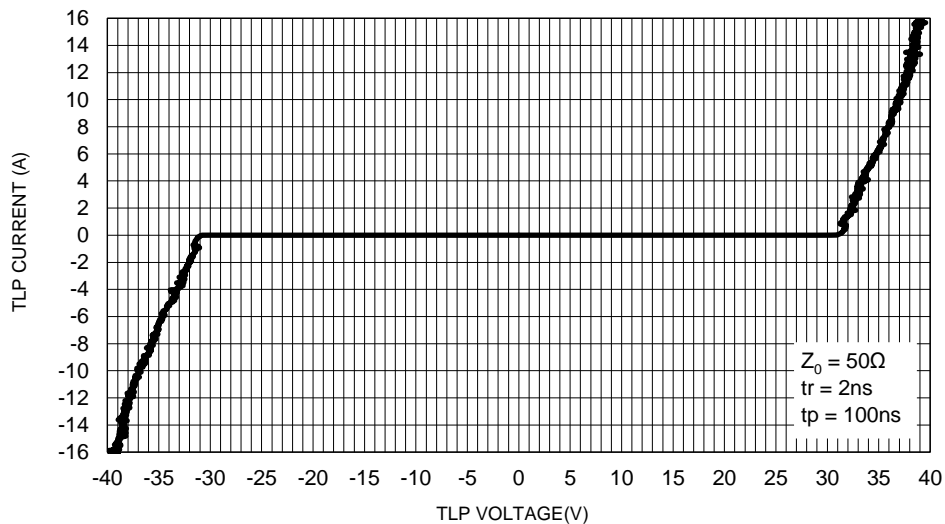
**Fig.3 Clamping Voltage vs. Peak Pulse Current**



**Fig.4 Capacitance vs. Reverse Voltage**



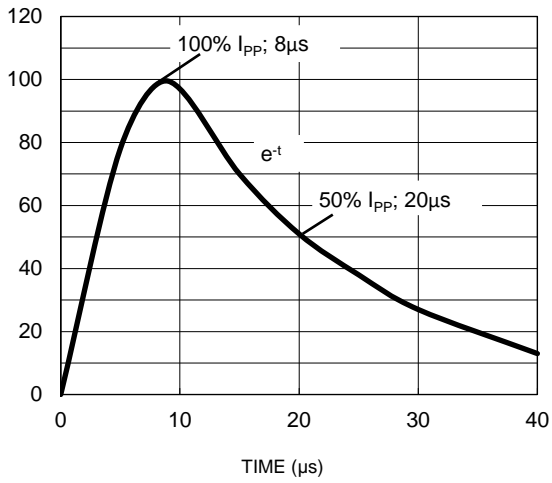
**Fig.5 TLP Curve**



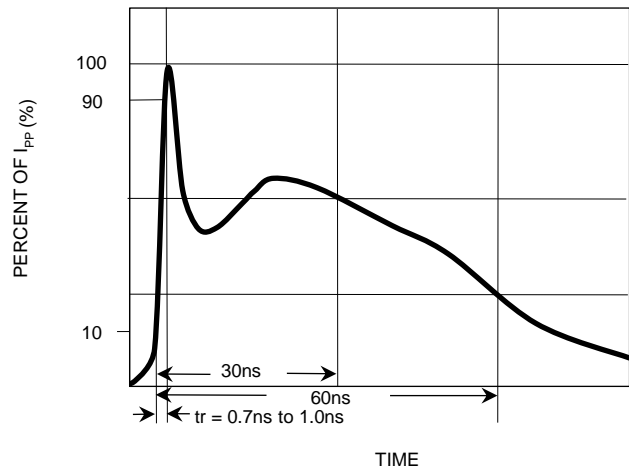
**CHARACTERISTICS CURVES**

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

**Fig.6 8/20 $\mu\text{s}$  pulse waveform per IEC61000-4-5**



**Fig.7 ESD pulse waveform per IEC61000-4-2**



**APPLICATION INFORMATION**

**Device Connection**

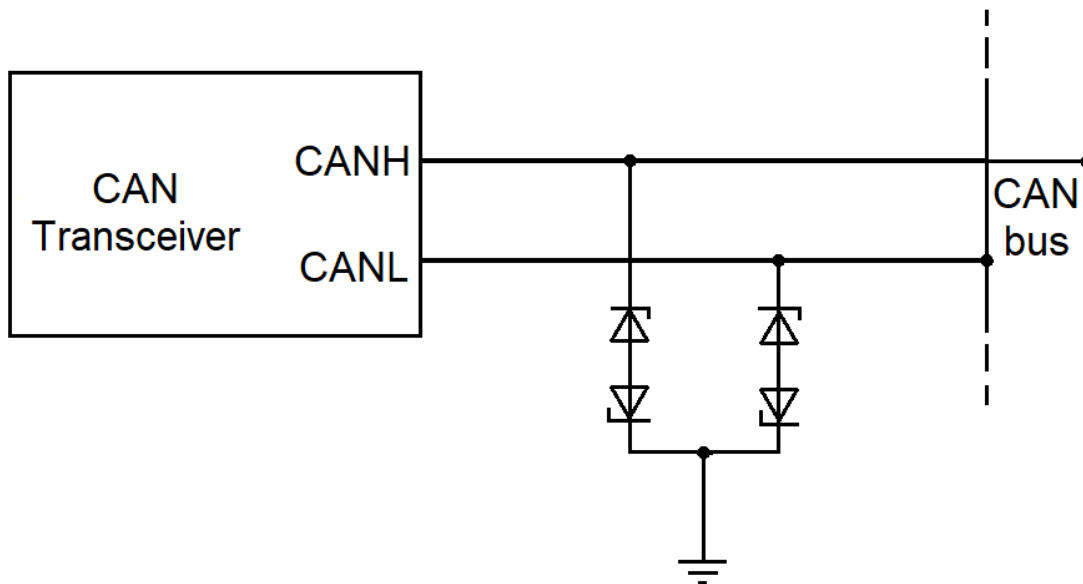
The TESDA24VB28P2CX is designed for the protection of two automotive IVN bus lines from the damage caused by ESD and surge pulses. It provides bidirectional protection.

The usage of the TESDA24VB28P2CX is shown in Fig1. Protected line. To minimize parasitic inductance in the board traces, all path lengths connected to the pins of TESDA24VB28P2CX should be kept as short as possible.

In order to obtain enough suppression of ESD induced transient, good circuit board is critical. Thus, the following guidelines are recommended:

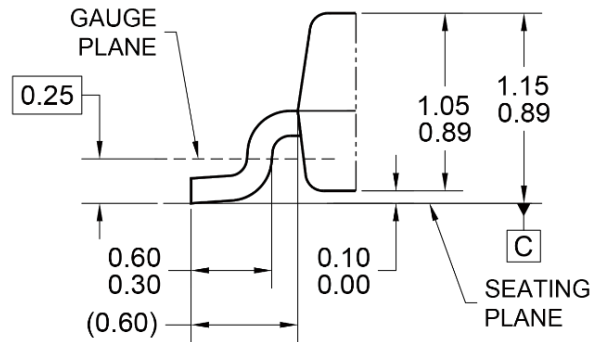
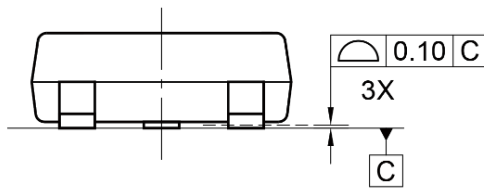
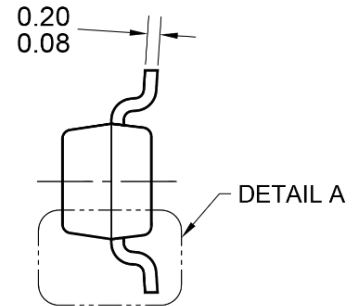
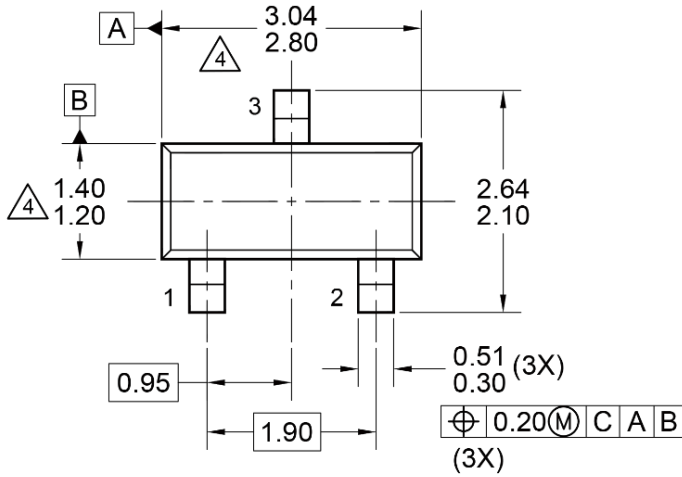
- Let the path length between the protected lines and the TESDA24VB28P2CX minimize.
- Place the TESDA24VB28P2CX near the input terminals or connectors to restrict transient coupling.
- The ESD current return path to ground should be kept as short as possible.
- Use ground planes whenever possible.

**Fig.1 ESD protection of two automotive CAN bus lines by TESDA24VB28P2CX**

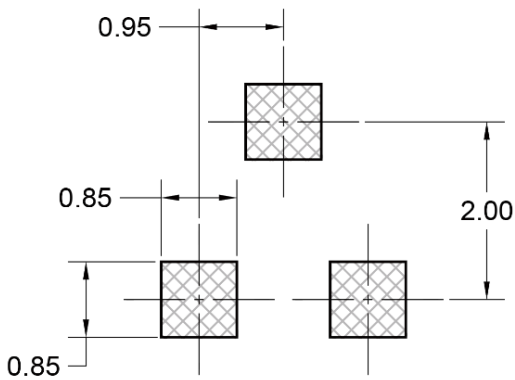


**PACKAGE OUTLINE DIMENSIONS**

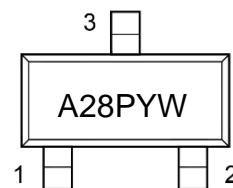
**SOT-23**



DETAIL A, ROTATED -90°  
(SCALE 2:1)



SUGGESTED PAD LAYOUT



MARKING DIAGRAM

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
3. PACKAGE OUTLINE REFERENCE: JEDEC TO-236, ISSUE H, VARIATION AA.
4. MOLDED PLASTIC BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
5. DWG NO. REF: HQ2SD07-SOT23JEDEC-104 REV B.

- A28P = Device code  
 Y = Year code  
 W = Bi-week code (A~Z)

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