SAT13N24AOT

CAN Bus TVS Protection

General Description

The SAT13N24AOT is a low-capacitance, bi-directional transient voltage suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for Controller Area Network (CAN) transceivers.

With a typical capacitance of 23pF, the device is designed to protect parasitic-sensitive systems against overvoltage and overcurrent transient events. It complies with IEC 61000-4-2 (ESD), (±30kV air, ±30kV contact discharge), and IEC 61000-4-5 (Surge) (8A, 8/20μs) standards.

The device can protect two automotive CAN bus lines. It is available in a compact SOT-23 package.

Features

- Transient Protection for Data Lines
  - IEC61000-4-2 (ESD) ±30kV (Air) ±30kV (Contact)
  - IEC61000-4-5 (Surge) 8A (8/20μs)
- Low Capacitance: 23pF (Typical)
- Low Leakage Current: 0.01μA at V_{RWM} (Typical)
- Can Be Used to Protect Data, Control, or CAN Bus Lines
- AEC-Q101 Qualified

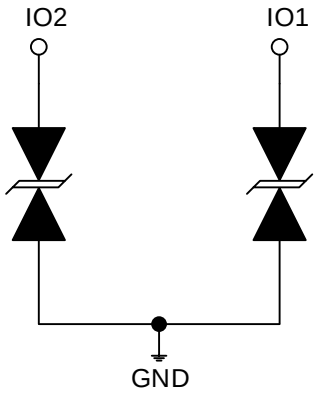
Applications

- CAN/CAN-FD Bus Protection
- Automotive Applications

Mechanical Characteristics

- SOT-23 Package
- Marking: Device Code, Date Code
- Packaging: Tape and Reel

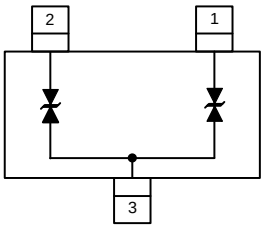
Circuit Diagram



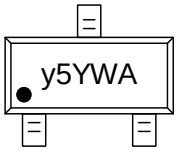
Ordering Information

Part Number	Package Type	Top Mark
SAT13N24AOT	SOT-23	y5YWA

Pinout (Top View)



Marking Codes



Notes: "y5" is device code, fixed.

"YWA" is date code.

Absolute Maximum Ratings (Note 1)				
Parameter	**Symbol**	**Min**	**Max**	**Unit**
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	V_{ESD}	-30 -30	30 30	kV
Peak Pulse Current (8/20μs)	I_{PP}		8	A
Peak Pulse Power (8/20μs)	P_{PK}		320	W
Junction Temperature	T_J	-55	+150	°C
Storage Temperature	T_{STG}	-55	+150	°C

Electrical Characteristics (Between IO and GND, T_A = 25°C, Note 4)						
Parameter	**Symbol**	**Test Condition**	**Min**	**Typ**	**Max**	**Unit**
Nominal Reverse Working Voltage	V_{RWM}				24	V
Reverse Leakage Current at V_{RWM}	I_R	V_{RWM} = 24V, T_A = 25°C		0.01	0.1	μA
Reverse Breakdown Voltage at I_T	V_{BR}	I_T = 1mA	26.7		35	V
Dynamic Resistance (Note 2, 5)	R_{DYN}	t_p = 10/100ns		0.2		Ω
Clamping Voltage at I_{PP} (Note 5)	V_C	I_{PP} =8A, t_p = 8/20μs			45	V
Clamping Voltage at I_{PP} (Note 5)	V_C	I_{PP} = 16A, t_p = 10/100ns			40	V
Parasitic Capacitance (Note 5)	C_{ESD}	V_R = 0V, f = 1MHz		23	30	pF

Note 1: Stresses beyond the "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Note 2: R_{DYN} calculated based on I_{PP}=8A to I_{PP}=16A, t_p = 10/100ns.

Note 3: The device is not guaranteed to function outside its operating conditions.

Note 4: Unless otherwise stated, limits are 100% production tested under pulsed load conditions such that $T_A \cong T_J$ =

25°C. Limits over the operating temperature range (see recommended operating conditions) and relevant voltage range(s) are guaranteed by design, test, or statistical correlation.

Note 5: Guaranteed by design or statistical correlation and not production tested.

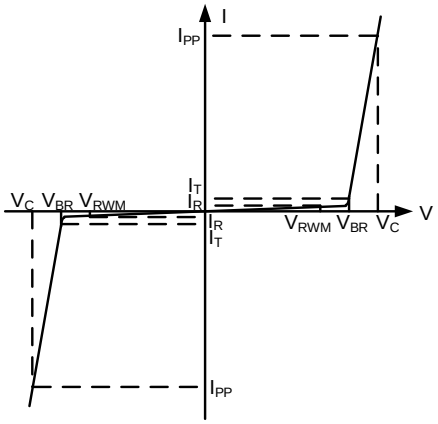
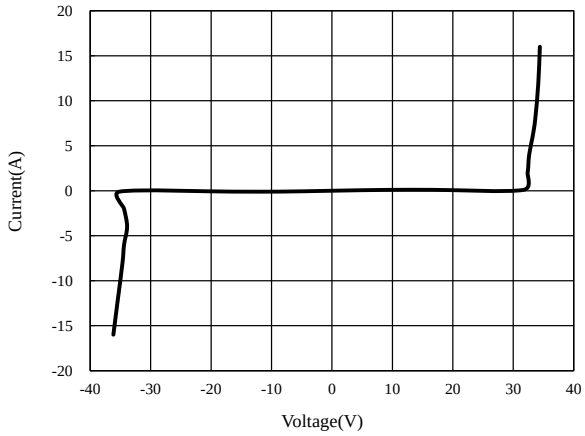


Figure 1. Bi-Directional TVS

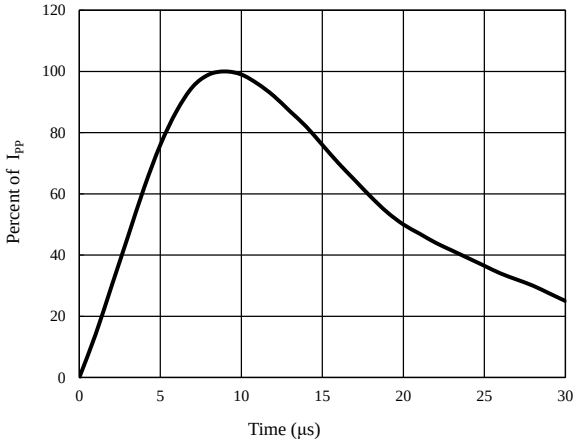
Typical Performance Characteristics, Between IO and GND

TLP Testing

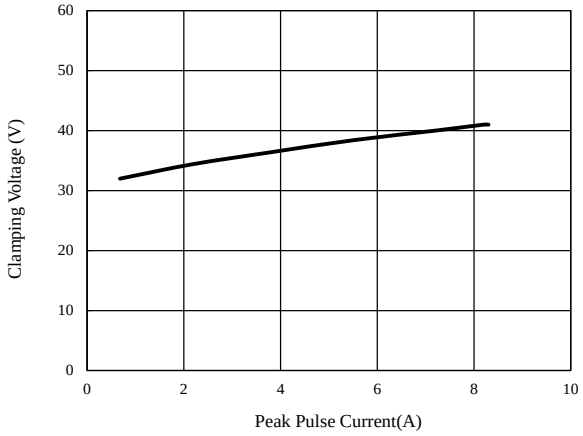


Capacitance vs. Voltage

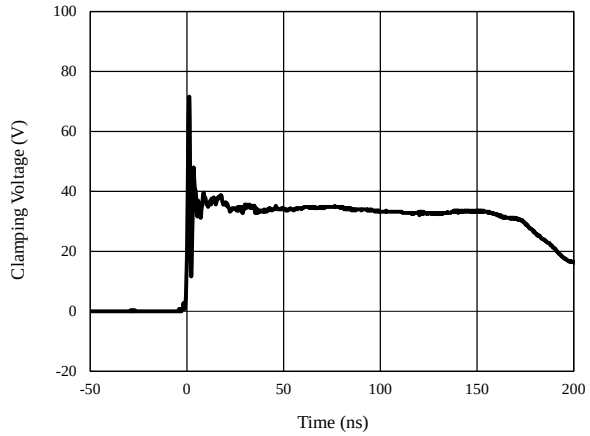
Pulse Waveform



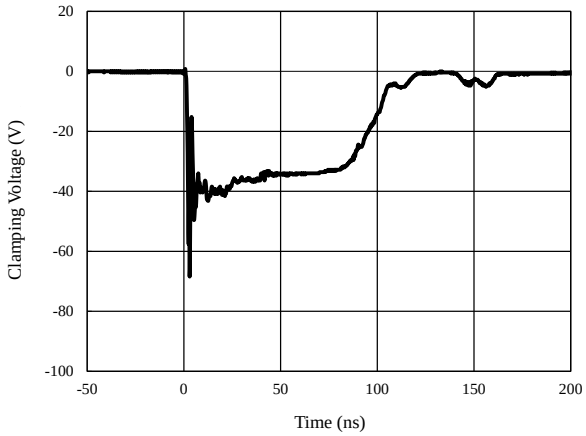
Clamping Voltage vs. Peak Pulse Current



ESD Clamping
(+8kV Contact per IEC 61000-4-2)



ESD Clamping
(-8kV Contact per IEC 61000-4-2)



Application Information

PCB Pin Connections

The SAT13N24AOT is designed to protect two CAN bus lines against overvoltage and overcurrent transient events by clamping them to an acceptable voltage level.

The SAT13N24AOT pin connections are shown in the figure below. The CAN bus lines are connected to Pin 1 and Pin 2. Pin 3 is the GND, which should connect to a ground plane on the board. All path lengths connected to pins of the SAT13N24AOT should be as short as possible to minimize the parasitic inductance.

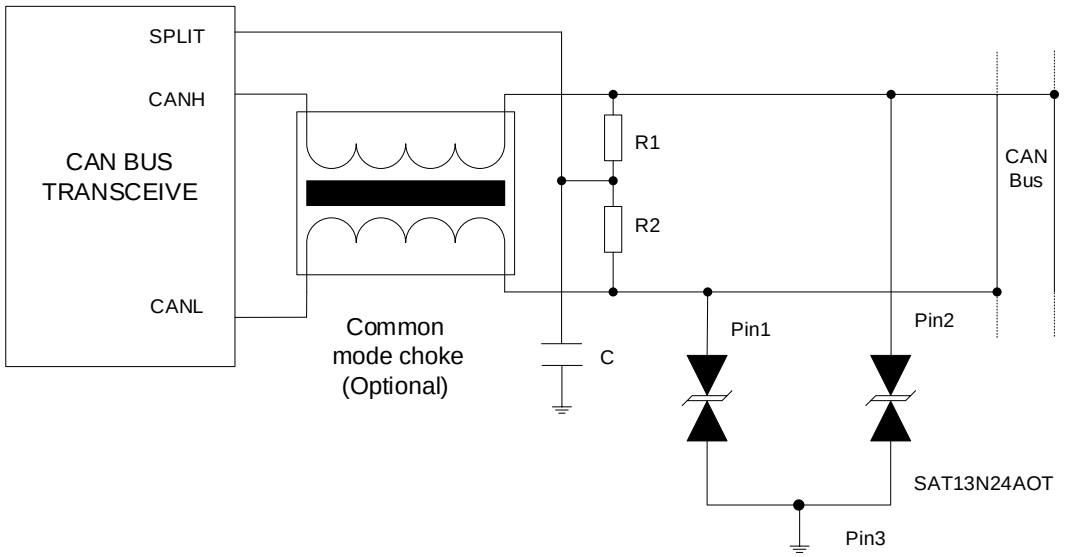


Figure 2. CAN Bus ESD/Surge Protection Circuit

PCB Layout Guidelines

For optimum ESD protection and circuit performance, the following PCB layout guidelines are recommended:

- Place the SAT13N24AOT as close to the connectors or terminal ports as possible.
- Use a wide trace or a large via to connect the SAT13N24AOT pin to the ground.
- Place the SAT13N24AOT near the protected lines.
- The distance between the SAT13N24AOT ground pin and the GND reference path should be as short as possible.

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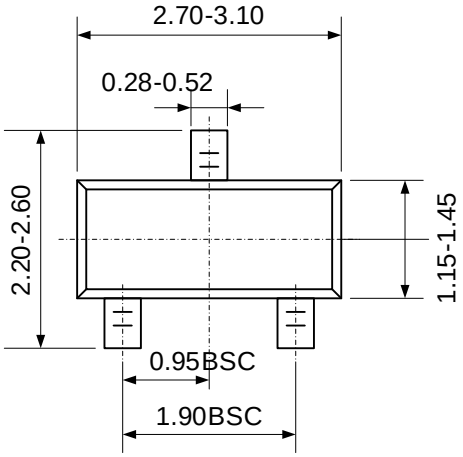
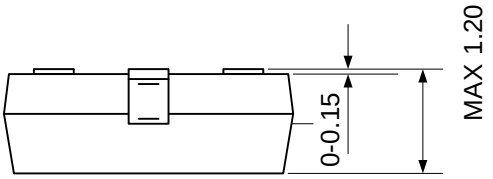
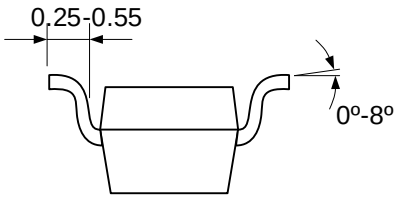
SOT-23 Package Outline



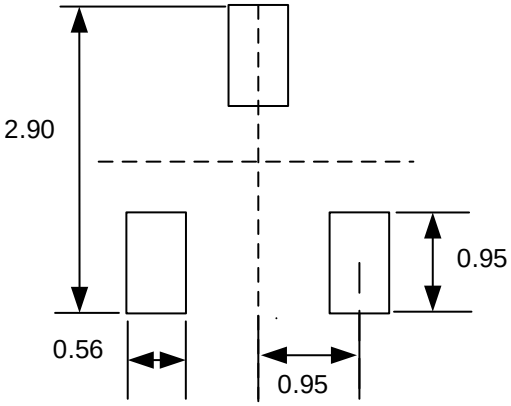
Top View



Side View



Side View

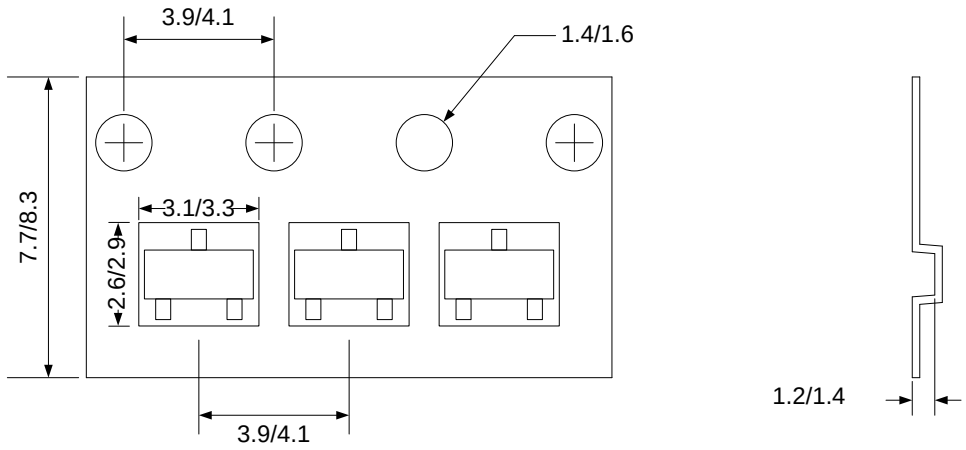


Recommended PCB Layout
(Reference only)

Note: All dimensions are in millimeters and exclude mold flash and metal burr.

Tape and Reel Information

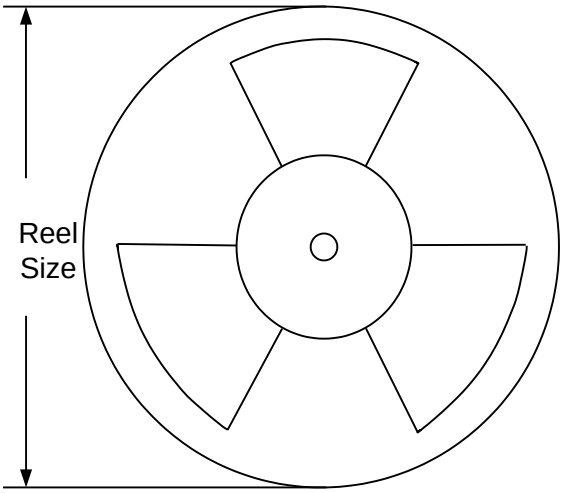
Tape Dimensions and Pin 1 Orientation



Dimensions In mm

Feeding direction ⟶

Reel Dimensions



Package Type	Tape Width (mm)	Pocket Pitch(mm)	Reel Size (Inch)	Qty per Reel (pcs)
SOT-23	8	4	7"	3000

Revision History

The revision history provided is for informational purposes only and is believed to be accurate; however, not warrantied. Please make sure that you have the latest revision.

Revision Number	Revision Date	Description	Pages changed
1.0	Sep.11, 2024	Initial Release	

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