



钜地半导体
Tudi Semiconductor

Product Specification

TUDI-SN65HVD1471/1474/1477

±16kV IEC ESD 3.3V full-duplex RS-485 transceiver

网址 www.sztdbdt.com

用芯智造 · 卓越品质

**semiconductor device
manufacturer**

- Design
- research and development
- production
- and sales



Features

- Provides 1/8 unit load option
 - Up to 256 nodes on one bus
- Bus I/O protection
 - > $\pm 30\text{kV}$ Human Body Model (HBM) protection
 - > $\pm 16\text{kV}$ IEC 61000-4-2 Contact discharge
 - > $\pm 4\text{kV}$ IEC61000-4-4 Fast transient burst
- Extended industrial temperature range: -40°C to 125°C
- Larger receiver hysteresis for noise suppression
- Low power consumption
- No-interference power up and power down protection for hot plug applications
- 5V tolerant logic inputs compatible with 3.3V or 5V controllers
- Optimized for the following signal transmission rates:
 - 400 kbps HVD1471
 - 18 Mbps HVD1474
 - 40 Mbps HVD1477

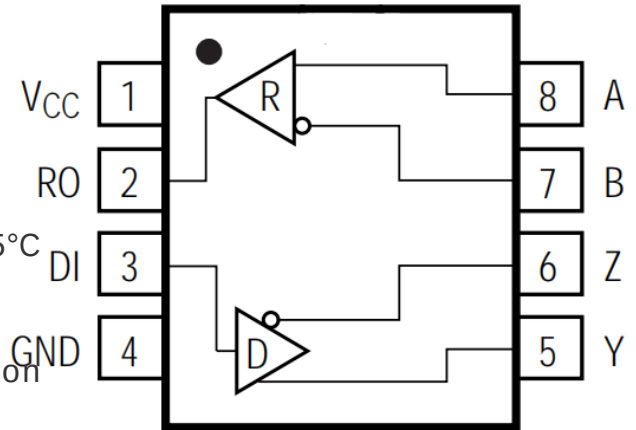


Figure 1. Pin Diagram

Description

The SN65HVD147x series of full-duplex transceivers feature the highest ESD protection available in an RS-485 product offering support for $\pm 16\text{kV}$ IEC 61000-4-2 contact discharge and greater than $\pm 30\text{kV}$ human body model (HBM) ESD protection. These RS-485 transceivers feature robust 3.3V drivers and receivers and are available in standard small outline integrated circuit (SOIC) as well as small surface-mount small outline (MSOP) packages. The larger receiver hysteresis of the SN65HVD147x devices provides immunity to conducted differential noise and the wide operating temperature range ensures stable device performance in harsh operating environments.

Applications

Industrial automation
Encoders and decoders
Building automation
Security and surveillance networks
Telecommunications



Pin description

Pin number	Pin name	Pin function
1	VCC	Power supply:3.0V VCC 5.5V
2	RO	Receiver output. If A-B is greater than or equal to +200mV,RO output is high level;if A-B is less than or equal to-200mV,RO output is low level.
3	DI	DI driver input.A low level on DI causes the in-phase terminal Y output to be low and the out-of-phase terminal Z output to be high;a high level on DI causes the in-phase terminal Y output to be high and the out-of-phase terminal Z output to be low.
4	GND	Landing
5	Y	Drive in-phase output terminal
6	Z	The inverting output of the driver
7	B	Receiver inverting input
8	A	Receiver in-phase input

Extreme parameter

Parameter	Symbol	Big or small	Unit
Welding temperature range		300	°C
Operating temperature range		-40~125	°C
Storage operating temperature range		-60~150	°C
Continuous power consumption	SOP8	400	mW
	DIP8	700	mW
Supply voltage	VCC	+7	V
Control the port voltage	DI	-0.3~VCC+0.3	V
Bus-side input vol-tage	A、B	-8~13	V
Receiver output vo-ltage	RO	-0.3~VCC+0.3	V

The maximum limit parameter value is the value beyond which irreversible damage to the device may occur. Under these conditions, the device will not function properly and continuous operation at the maximum allowable rating may affect the reliability of the device. All voltage reference points are ground.



Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
supply current						
Supply current	Icc	DI=0 or VCC		240	400	μA
ESD protect						
A、B、Y、Z		Mannequin (HBM)		±16		KV
Other ports		Mannequin (HBM)		±6		KV
Drive switch characteristics						
Drive input to output propagation delay(low to high)	tDPLH	RDIFF=54 Ω, CL1=CL2=100pF (see Figure 3 and Figure 4)		15	35	ns
Drive input to output propagation delay(high to low)	tDPHL			15	35	ns
tDPLH-tDPHL	tSKEW1			7	10	ns
Rise time /fall time	tDR,tDF			10	25	ns
Acceptor The propagation delay from input to output is from low to high	tRPLH	See Figure 5 and Figure 6 VID 2.0V; The rise and fall time VID is less than 15ns	20	60	90	ns
Acceptor The propagation delay from input to output is from high to low	tRPHL		20	60	90	ns
tRPLH-tRPHL	tSKEW2			7	10	ns
DC electrical characteristics of the driver						
High-level input	VIH	DI	2.0			V
Low level input	VIL	DI			0.8	V
Logic input current	IIN1	DI	-2		2	μA
Differential output of the driver(non-loaded)	VoD1			5		V
Drive differential output	VoD2	Graph 2,RL=27Ω	1.5		VCC	V
		Graph 2,RL=50Ω	2		VCC	
The current output is short-circuited to high	IosD1	Short circuit to 0V~12V	35		250	mA
The current output is short-circuited to low	IosD2	Short circuit to -7V~oV	-250		-35	mA
Change in the amplitude of the output voltage (NOTE1)	ΔVoD	Graph 2,RL=27Ω			0.2	V
Output common mode voltage	Voc	Graph 2,RL=27Ω			3	V
Change in the amplitude of the common-mode output voltage(NOTE1)	ΔVoc	Graph 2,RL=27Ω			0.2	V



Parameter	Symbol	Test condition	Minimum	Typical case	Maximum	Unit
DC electrical characteristics of the receiver						
Positive input threshold voltage	VIT+	$-7V \leq V_{CM} \leq 12V$			+200	mV
Reverse input threshold voltage	VIT-	$7V \leq V_{CM} \leq 12V$	-200			mV
Enter the hysteresis voltage	Vhys	$-7V \leq V_{CM} \leq 12V$	10	30		mV
Input current(A,B)	IIN2	VCC=0 or 3.3V VIN=12 V			125	μA
		VCC=0 or 3.3V VIN = -7 V	-100			μA
Three state input leakage current	IozR	$0.4V < V_o < 2.4V$			± 1	μA
Receiver input resistance	RIN	$-7V \leq V_{CM} \leq 12V$	96			k Ω
Receiver short circuit current	IosR	$0V \leq V_o \leq V_{CC}$	± 7		± 95	mA
High level output voltage	VoH	IoUT=-4mA, VID=+200 mV	VCC-1.5			V
Low level output voltage	VoL	IoUT=+4mA, VID=-200 mV			0.4	V

(If not otherwise specified, VCC=3.3V $\pm$ 10%, Temp=TMIN~TMAX, typical value is VCC=+3.3V, Temp = 25)

Test Circuit

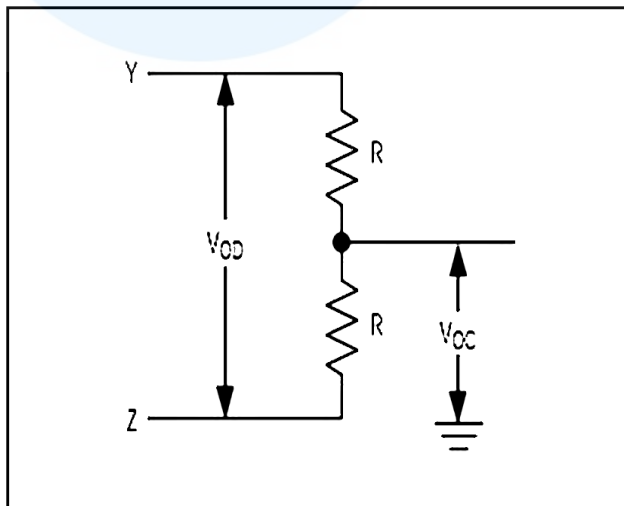


Figure 2 DC test load of the driver

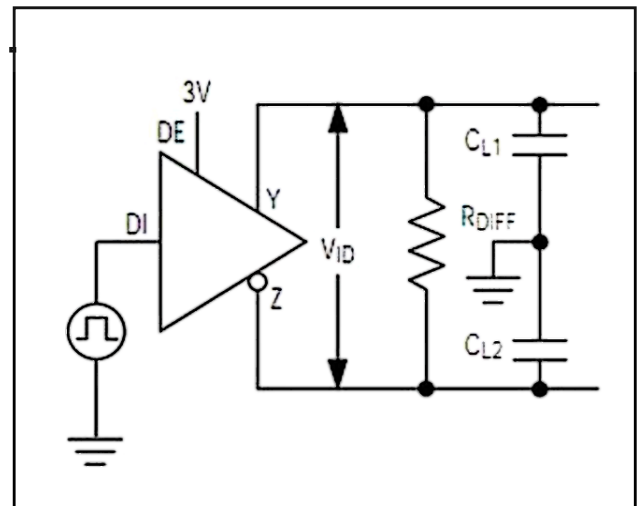


Figure 3 Driver timing test circuit

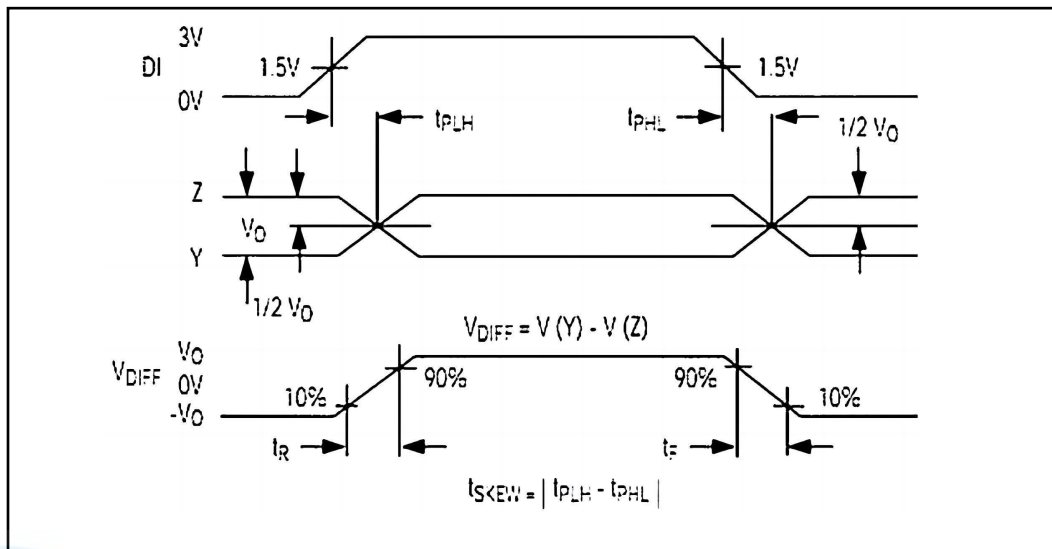


Figure 4 Driver propagation delay

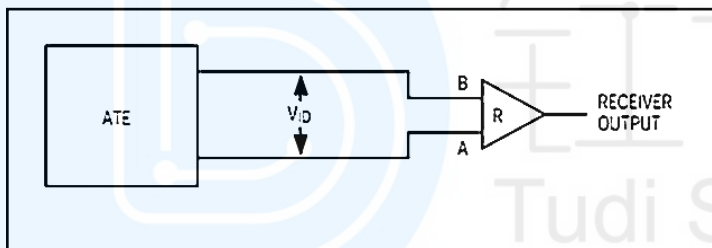


Figure 5 Receiver propagation delay test circuit

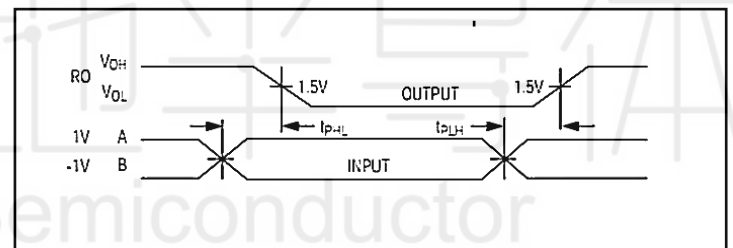


Figure 6 Receiver propagation delay timing

Additional description

resume

The HVD147x is a full-duplex, high-speed transceiver for RS-485/RS-422 communication, incorporating driver and a receiver. It features fail-safe, overvoltage protection, and overcurrent protection. The HVD147x achieves error-free data transmission up to 40Mbps.

The bus is connected to 256 transceivers

The input impedance of the standard RS485 receiver is 12kΩ (1 unit load), and the standard driver can drive up to 2 unit loads. The receiver of the HVD147x transceiver has an input impedance of 1/8 unit load (96kΩ), allowing up to 256 transceivers to be connected in parallel on the same communication bus. These devices can be combined arbitrarily, or combined with other RS485 transceivers as long as the total load does not exceed 32 unit loads, they can be connected to the same bus.

Drive output protection

Protection against excessive output current and dissipation by fault or bus contention is provided by overcurrent and overvoltage protection mechanisms, with fast short-circuit protection throughout the common-mode voltage range (see Typical Operating Characteristics).



Function table

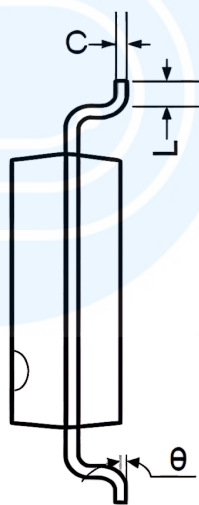
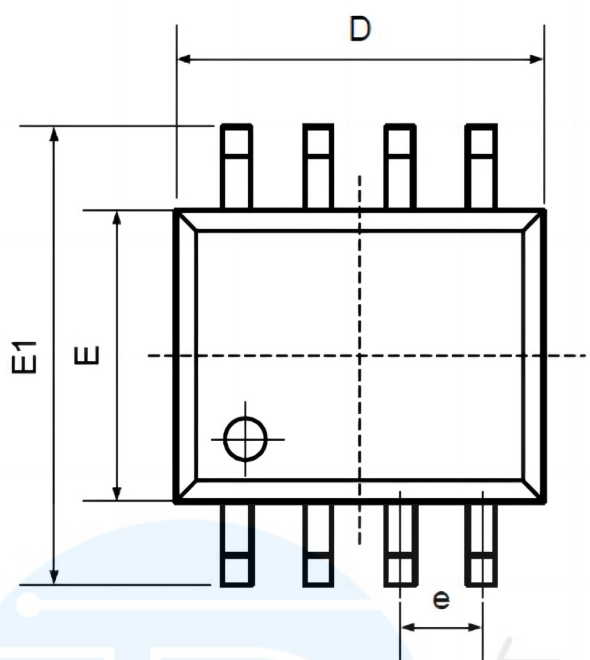
Send function table					Receiving function table			
input	A-B	$\geq +200\text{mV}$	$\leq -200\text{mV}$	Open/short circuit	input	DI	1	0
					output	Y	H	L
output	RO	H	L	H		Z	L	H

Order information

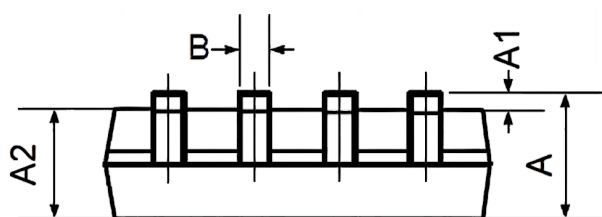
Order Number	Package	Package Quantity	Marking On The park	Temperature
SN65HVD1471DR-TUDI	SOP8	Tape,Reel,2500	VD1471	- 40°C to 125°C
SN65HVD1471DGKR-TUDI	MSOP8	Tube,25A box of 1000	1471	
SN65HVD1471P-TUDI	DIP8	Tube,50A box of 2000	65HVD1471	
SN65HVD1474DR-TUDI	SOP8	Tape,Reel,2500	VD1474	
SN65HVD1474DGKR-TUDI	MSOP8	Tube,25A box of 1000	1474	
SN65HVD1474P-TUDI	DIP8	Tube,50A box of 2000	65HVD1474	
SN65HVD1477DR-TUDI	SOP8	Tape,Reel,2500	VD1477	
SN65HVD1477DGKR-TUDI	MSOP8	Tube,25A box of 1000	1477	
SN65HVD1477P-TUDI	DIP8	Tube,50A box of 2000	65HVD1477	



Package SOP8

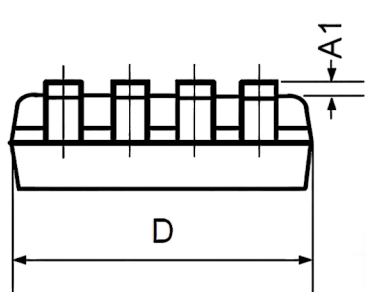
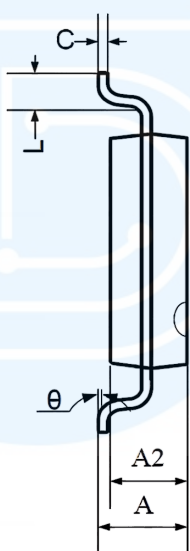
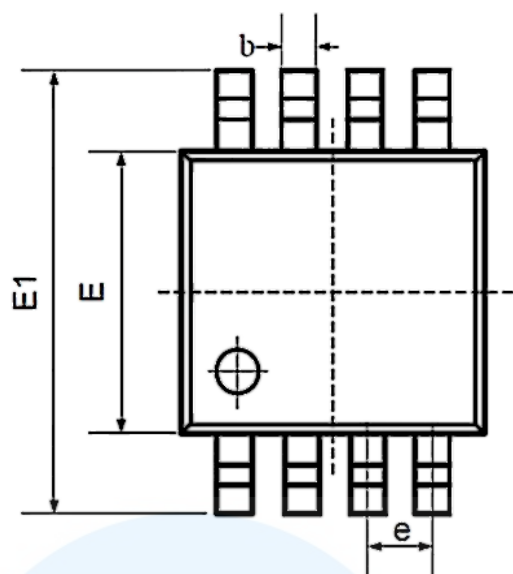


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



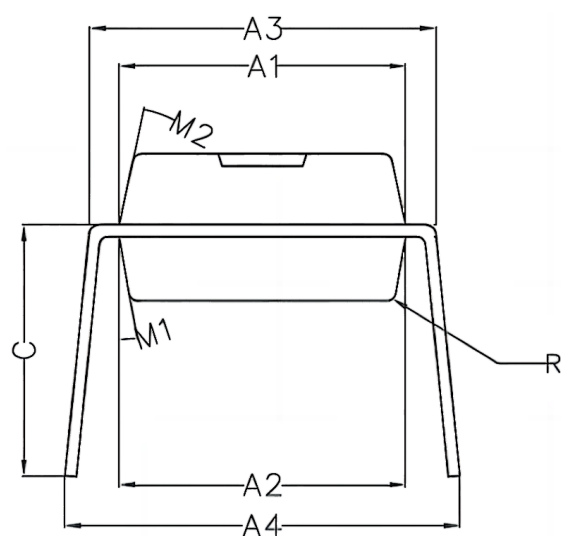
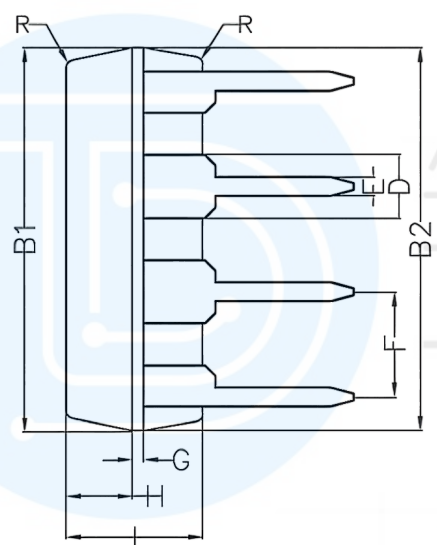
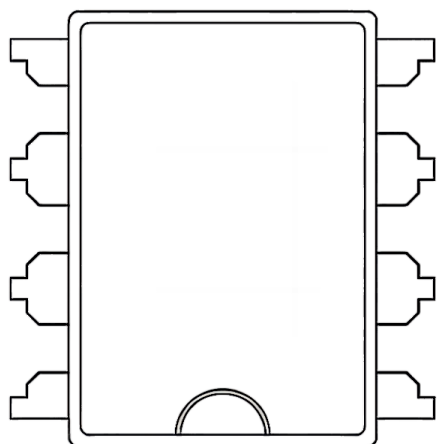


Package MSOP8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.200	0.031	0.047
A1	0.000	0.200	0.000	0.008
A2	0.760	0.970	0.030	0.038
b	0.30 TYP		0.012 TYP	
C	0.15 TYP		0.006 TYP	
D	2.900	3.100	0.114	0.122
e	0.65 TYP		0.026 TYP	
E	2.900	3.100	0.114	0.122
E1	4.700	5.100	0.185	0.201
L	0.410	0.650	0.016	0.026
θ	0°	6°	0°	6°

Package DIP8



Symbol	Min	Non	Max
A1	6.28	6.33	6.38
A2	6.33	6.38	6.43
A3	7.52	7.62	7.72
A4	7.80	8.40	9.00
B1	9.15	9.20	9.25
B2	9.20	9.25	9.30
C		5.57	
D		1.52	
E	0.43	0.45	0.47
F		2.54	
G		0.25	
H	1.54	1.59	1.64
I	3.22	3.27	3.32
R		0.20	
M1	9°	10°	11°
M2	11°	12°	13°



Important statement:

- TUDI Semiconductor reserves the right to modify the product manual without prior notice! Before placing an order, customers need to confirm whether the obtained information is the latest version and verify the completeness of the relevant information.
- Any semi-guide product is subject to failure or malfunction under specified conditions. It is the buyer's responsibility to comply with safety standards when using TUDI Semiconductor products for system design and whole machine manufacturing. And take the appropriate safety measures to avoid the potential in the risk of loss of personal injury or loss of property situation!
- TUDI Semiconductor products have not been licensed for life support, military, and aerospace applications, and therefore TUDI Semiconductor is not responsible for any consequences arising from the use of this product in these areas.
- If any or all TUDI Semiconductor products (including technical data, services) described or contained in this document are subject to any applicable local export control laws and regulations, they may not be exported without an export license from the relevant authorities in accordance with such laws.
- The specifications of any and all TUDI Semiconductor products described or contained in this document specify the performance, characteristics, and functionality of said products in their standalone state, but do not guarantee the performance, characteristics, and functionality of said products installed in Customer's products or equipment. In order to verify symptoms and conditions that cannot be evaluated in a standalone device, the Customer should ultimately evaluate and test the device installed in the Customer's product device.
- TUDI Semiconductor documentation is only allowed to be copied without any alteration of the content and with the relevant authorization. TUDI Semiconductor assumes no responsibility or liability for altered documents.
- TUDI Semiconductor is committed to becoming the preferred semiconductor brand for customers, and TUDI Semiconductor will strive to provide customers with better performance and better quality products.