



钰地半导体
Tudi Semiconductor

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Product Specification

TUDI-SN65HVD77

3.3V full-duplex RS-485 transceiver with $\pm 12\text{kV}$ IEC ESD

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用芯智造 · 卓越品质

**semiconductor device
manufacturer**

- Design
- research and development
- production
- and sales



Features

- 1/8 unit load option available
 - Up to 256 nodes on one bus
- Bus I/O protection
 - $\pm 30\text{kV}$ Human Body Model (HBM) protection
 - $> \pm 12\text{kV}$ IEC61000-4-2 discharge
 - $> \pm 4\text{kV}$ IEC61000-4-4 Fast transient pulse
- Industrial operating temperature range: -40°C to 125°C
- Large receiver hysteresis (70mV) for noise suppression
- Low power consumption
 - < 1.1 static current during operation
 - Low standby power current: 10nA (typical), $< 5\mu\text{A}$ (n)
- No-ference power up and power down protection for hot-plug applications
- 5V tolerant logic inputs compatible with 3.3V or 5V

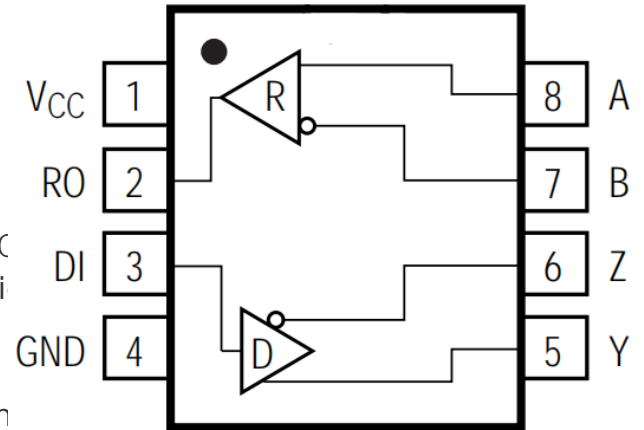


Figure 1. Pin Diagram

Description

The devices extend the RS-485 product offering to include a family of full-duplex transceivers with robust 3.3V drivers and receivers and advanced ESD protection. The devices feature larger receiver hysteresis to suppress conducted differential noise and a wide operating temperature range to maintain reliability in harsh operating environments. The device contains a differential driver and a differential receiver, both of which are powered and operated by a 3.3V single supply. Each driver and receiver has independent input and output for full-duplex bus communication designs. The devices feature a wide common mode voltage range, making them ideal for multi-point applications on long cables. The HVD77 is fully enabled, no external enable pin is required. The rated operating temperature range is -40°C to 125°C .

Applications

- Electronic meter
- Industrial automation
- Building automation
- Security and surveillance
- Encoder and decoder



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	I _{cc}	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	V _{IH}	DI	2.0			V
Low level input	V _{IL}	DI			0.8	V
Logic input current	I _{IN1}	DI	-2		2	μA
Differential output of the driver(non-loaded)	V _{oD1}			5		V
Drive differential output	V _{oD2}	Graph 2,RL=27Ω	1.5		VCC	V
		Graph 2,RL=50Ω	2		VCC	
The current output is short-circuited to high	I _{osD1}	Short circuit to 0V~12V	35		250	mA
The current output is short-circuited to low	I _{osD2}	Short circuit to -7V~0V	-250		-35	mA
Change in the amplitude of the output voltage (NOTE1)	ΔV _{oD}	Graph 2,RL=27Ω			0.2	V
Output common mode voltage	V _{oc}	Graph 2,RL=27Ω			3	V
Change in the amplitude of the common-mode output voltage(NOTE1)	ΔV _{oc}	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	V _{hys}	$-7V \leq V_{CM} \leq 12V$	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	I _{ozR}	$0.4V < V_o < 2.4V$			±1	μA
Receiver input resistance	RIN	$-7V \leq V_{CM} \leq 12V$	96			kΩ
Receiver short circuit current	I _{osR}	$0V \leq V_o \leq V_{CC}$	±7		±95	mA
High level output voltage	V _{oH}	I _{oUT} =-4mA, V _{ID} =+200 mV	VCC-1.5			V
Low level output voltage	V _{oL}	I _{oUT} =+4mA, V _{ID} =-200 mV			0.4	V

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

Test Circuit

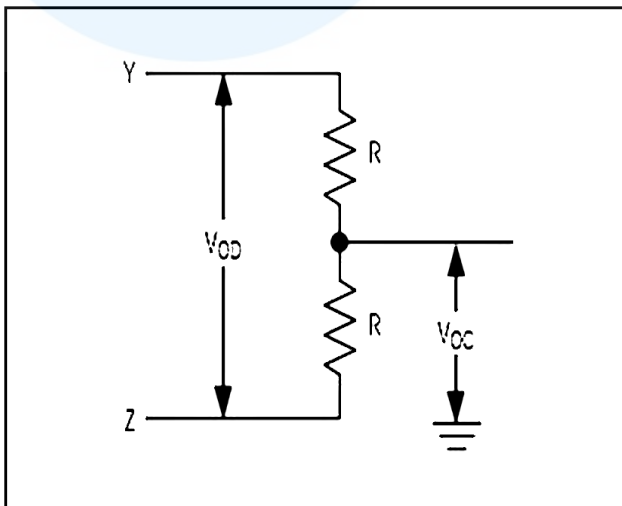


Figure 2 DC test load of the driver

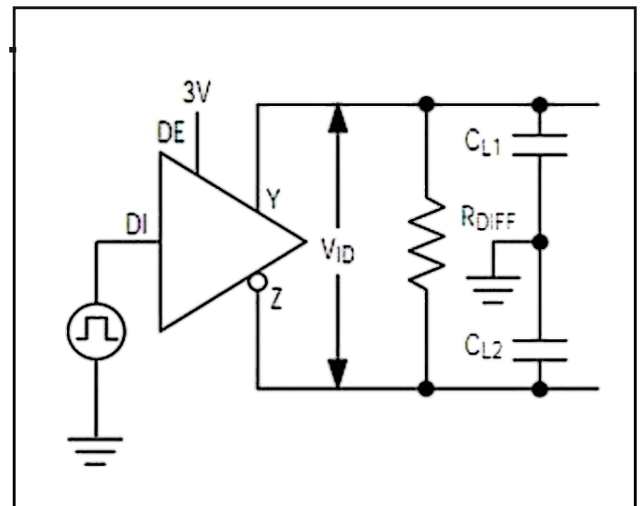


Figure 3 Driver timing test circuit

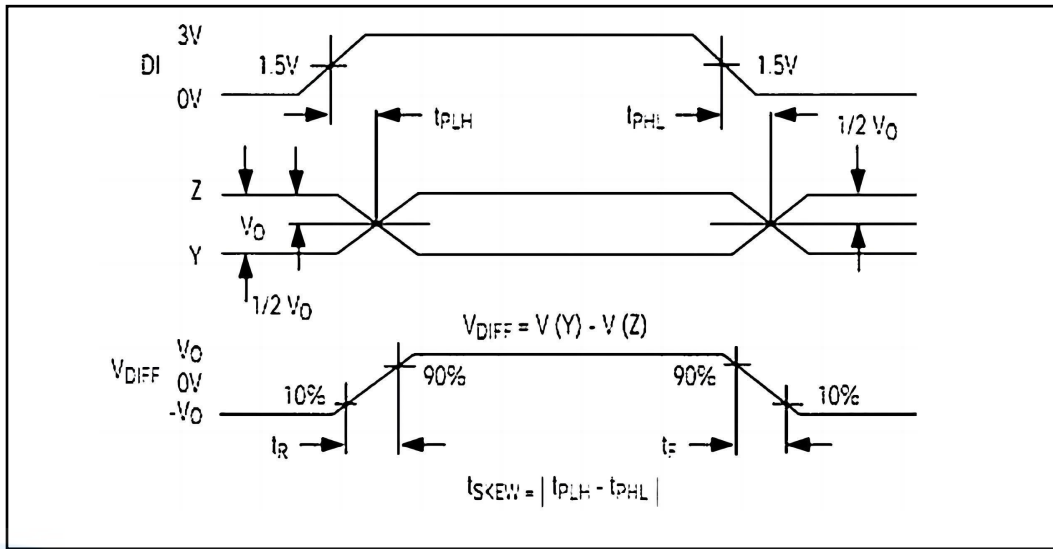


Figure 4 Driver propagation delay

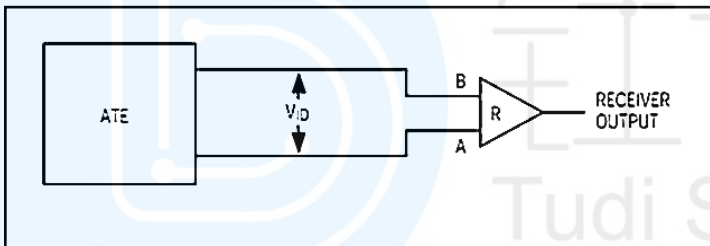


Figure 5 Receiver propagation delay test circuit

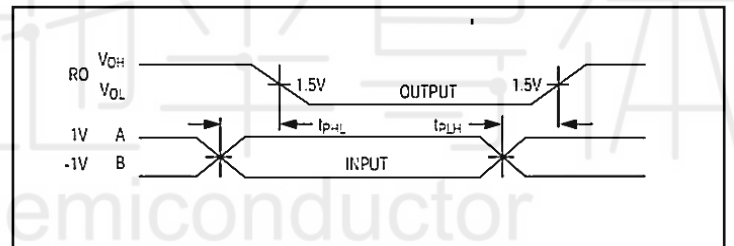


Figure 6 Receiver propagation delay timing

Additional description

resume

The HVD77 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 HVD77 achieves error-free data transmission up to 12Mbps.

The bus is connected to 256 transceivers

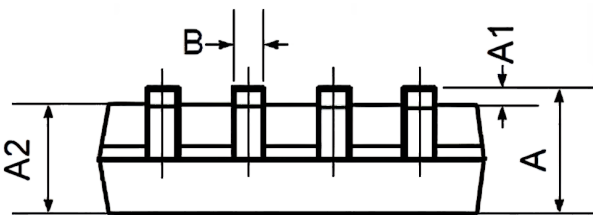
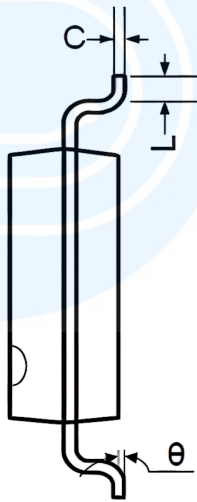
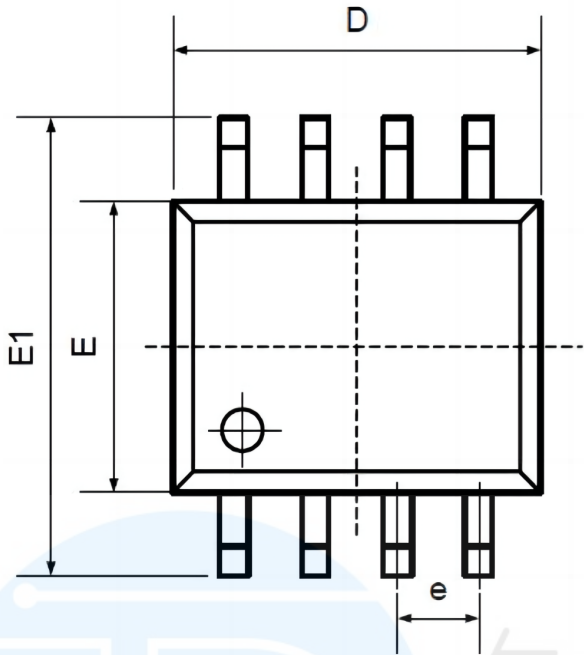
The input impedance of the standard RS485 receiver is 12k (1 unit load), and the standard driver can drive up to 2 unit loads. The receiver of the HVD77 transceiver has an input impedance of 1/8 unit load (96k), allowing up to 256 transceivers to be connected in parallel on the same communication bus. 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).



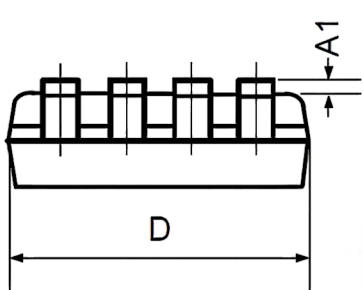
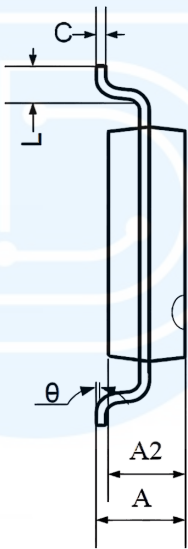
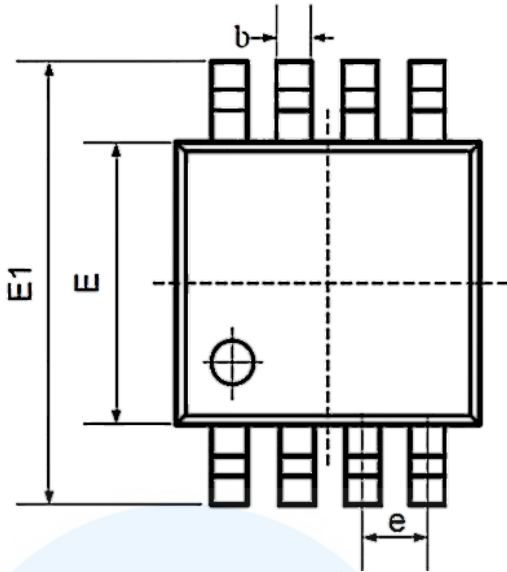
Package SOP8



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°



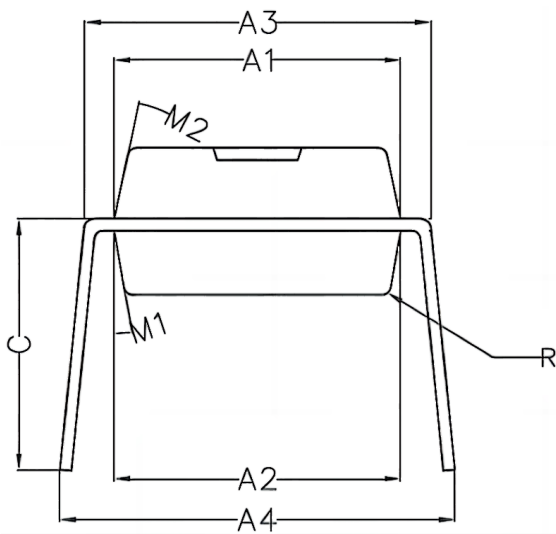
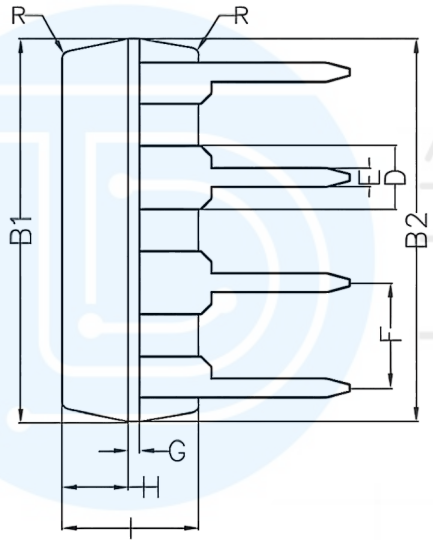
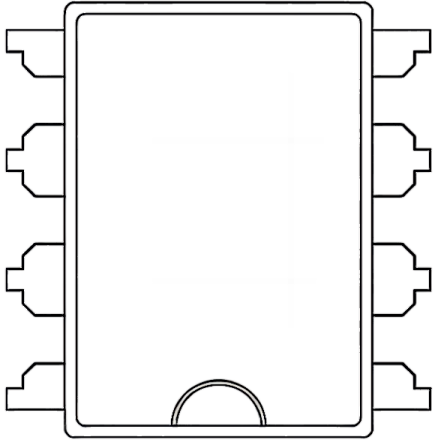
Package MSOP8



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°



Order information

Order Number	Package	Package Quantity	Marking On The park	Temperature
SN65HVD77DR-TUDI	SOP8	Tape,Reel,2500	HVD77	- 40°C to 125°C
SN65HVD77DGKR-TUDI	MSOP8	Tape,Reel,2500	VD77	
SN65HVD77P-TUDI	DIP8	Tube,50,A box of 2000	65HVD77	



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