钍地半导体
Tudi Semiconductor

Product Specification

TUDI-SN65HVD3082E/SN75HVD3082E/ SN65HVD3085E/SN65HVD3088E

Low power RS-485 transceiver

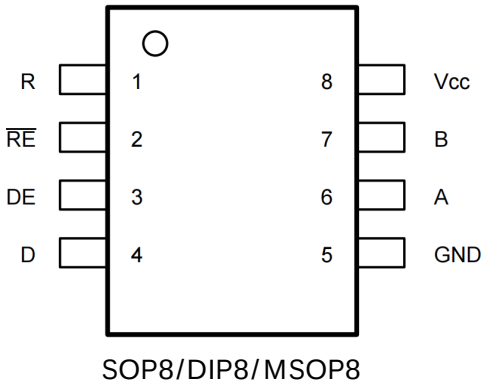
网址 www.sztdbdt.com

用芯智造·卓越品质

semiconductor device manufacturer

- Design
- research and development
- production
- and sales

Features



SOP8/DIP8/MSOP8

- Complies with or exceeds TIA/EIA-485A standard requirements
- Low static power
  - 0.3 in active mode
  - 1nA in shutdown mode
- 1/8 unit load, up to 256 nodes on a single bus
- Up to 5kV bus pin ESD protection
- Industry-standard SN75176 package
- Fail-safe receiver (bus open, bus short, bus idle)
- Interference- power-up and power-down bus inputs and outputs

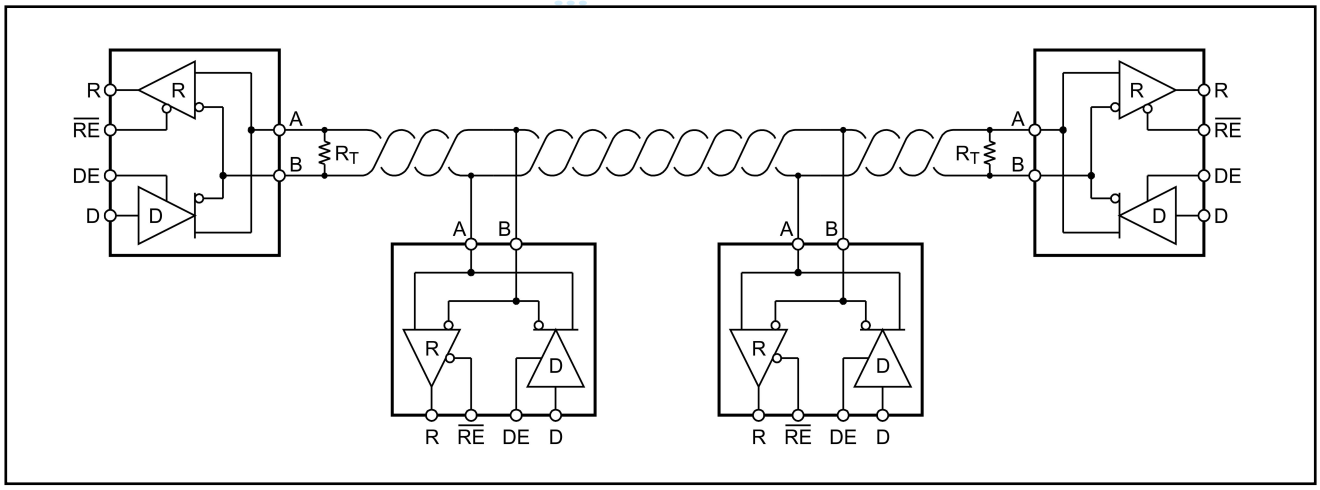
Description

The SNx5HVD308xE is a half-duplex transceiver designed specifically for RS-485 bus networks. These devices are powered by a 5V supply and are fully compliant with the TIA/EIA-485A standard. By controlling the conversion time, devices are suitable for transmitting data over long twisted-pair cables. The SN65HVD3082E and SN75HVD3082E are to support signal transmission rates up to 200kbps. The SN65HVD3085E is suitable for data transmission up to 1Mbps, while SN65HVD3088E is suitable for applications requiring signal transmission rates up to 20Mbps. These devices are designed to operate at very low supply currentstypically 0.3mA, excluding load). In the non-operating shutdown mode, the supply current can be reduced to a few nanoamps, making these devices an ideal choice for-sensitive applications.

These devices feature a wide common-mode range and high ESD protection levels, making them suitable for demanding applications such as smart meter networks, electrical inverters, and command signals on telecom racks, wired chassis interconnects, and industrial automation networks where noise immunity is critical. These devices are industry -standard in size, compatible with SN75176. The power-on reset circuit keeps the outputs in a high-impedance state until the supply voltage stabilizes. The thermal shutdown function protects the devices from damage caused by system failuresThe SN75HVD3082E features an operating temperature range of 0°C to 70°C, while the SN65HVD38xE features an operating temperature range of –40°C to 85°C. The D package version of the SN65HVD3082E an operating temperature range of –40°C to 105°C.

Applications

- Energy metering networks
- Motor control
- Power inverters
- Industrial automation
- Building automation networks
- Battery-powered applications
- Telecommunications



Simplify schematic

Pin Functions

PIN		TYPE	DESCRIPTION
NAME	NO.		
R	1	Digital output	Receive data output
RE	2	Digital input	Receiver enable,active low
DE	3	Digital input	Driver enable,active high
D	4	Digital input	Driver data input
GND	5	Reference potential	Local device ground
A	6	Bus input/output	Driver output or receiver input (complementary to B)
B	7	Bus input/output	Driver output or receiver input(complementary to A)
V_{cc}	8	Supply	4.5-V to 5.5-V supply

Specifications

Absolute Maximum Ratings

over operating free-air temperature range unless otherwise noted[(1) (2)]

	MIN	MAX	UNIT
Supply voltage,V_{cc}	-0.5	7	V
Voltage at A or B	-9	14	V
Voltage at any logic pin	-0.3	V_{cc}+0.3	V
Receiver output current	-24	24	mA
Voltage input,transient pulse,A and B,through 100 Ω(seeFigure13)	-50	50	V
Junction Temperature,T_J		170	℃
Storage temperature,T_{stg}	-65	150	℃

(1) Operation outside the Absolute Maximum Ratingss may cause permanent device damage. Absolute Maximum Ratings do not imply functional operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions. If used outside the Recommended Operating Conditions but within the Absolute Maximum Ratings, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime
(2) All voltage values, except differential I/O bus voltages, are with respect to network ground terminal.

ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$ Electrostatic discharge	Human body model(HBM),per ANSI/ ESDAJEDECJS-001(1)	Bus pins and GND	±15000	V
		All pins	±4000	
	Charged-device model (CDM),per JEDEC specification JESD22 -C101(2)		± 1000	
	Electrical Fast Transient/Burst,A,B,and GND(3)		±4000	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.
(3) Tested in accordance with IEC 61000-4-4.

Recommended Operating Conditions

over operating free-air temperature range unless otherwise noted

		MIN	NOM	MAX	UNIT
Supply voltage,V_{CC}		4.5		5.5	V
Voltage at any bus terminal (separately or common mode),V_I		-7		12	
High-level input voltage(D,DE,or RE inputs),V_{IH}		2		V_{CC}	V
Low-level input voltage(D,DE,or RE inputs),V_{IN}		0		0.8	V
Differential input voltage,V_{ID}		-12		12	V
Output current,I_O	Driver	-60		60	mA
	Receiverr	-8		8	
Differential load resistance,RL		54	60		Ω
Signaling rate,1/t_{UI}	SN65HVD3082E,SN75HVD3082E			0.2	Mbps
	SN65HVD3085E			1	
	SN65HVD3088E			20	

Recommended Operating Conditions (Continued)

over operating free-air temperature range unless otherwise noted(1)

		MIN	NOM	MAX	UNIT
Operating free-airtemperature,T_A	SN65HVD3082E(D package)	-40		105	℃
	SN65HVD3082E(DGK and P packages),SN65HVD3085E, SN65HVD3088E	-40		85	
	SN75HVD3082E	0		70	
Junction temperature,T_J		-40		130	℃

(1) The algebraic convention, in which the least positive (most negative) limit is designated as minimum is used in this data sheet.

Thermal Information, SN65HVD308xE

THERMAL METRIC		SN65HVD3085E, SN65HVD3088E		SN65HVD3088E	UNIT
		D(SOIC)	DGK (VSSOP)	P(PDIP)	
		8 PINS	8 PINS	8 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	116.7	137.8	84.3	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	56.3	31.2	65.4	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	63.4	71.7	62.1	°C/W
ψ_{JT}	Junction-to-top characterization parameter	8.8	0.6	31.3	°C/W
ψ_{JB}	Junction-to-board characterization parameter	62.6	70.5	60.4	°C/W

Thermal Information, SNx5HVD3082E

THERMAL METRIC(1)		SN65HVD3082E, SN75HVD3082E		SN65HVD3082E	UNIT
		D (SOIC)	DGK (VSSOP)	P(PDIP)	
		8 PINS	8 PINS	8 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	114.4	142.2	88.1	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top)thermal resistance	55.1	35.8	65.9	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	61.6	75.6	69.0	°C/W
ψ_{JT}	Junction-to-top characterization parameter	8.8	0.8	35.2	°C/W
ψ_{JB}	Junction-to-board characterization parameter	60.8	74.8	64.3	°C/W

(1) For more information about traditional and new thermal metrics, see the Semiconductor and IC Package Thermal Metrics application report.

Electrical Characteristics: Driver

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP(1)	MAX	UNIT
$\|V_{OD}\|$	Differential output voltage	I_o=0,No Load	3	4.3		V
		R_L=54Ω(seeFigure1)	1.5	2.3		
		R_L=100 Ω	2			
		V_{TEST}=-7 V to 12V(seeFigure2)	1.5			
	Change in magnitude of differential output voltage	See Figure1 and Figure2	-0.2	0	0.2	V
$V_{oc(ss)}$	Steady-state common-mode output voltage	See Figure 3	1	2.6	3	V
$\triangle V_{oc(ss)}$	Change in steady-state common-mode output voltage		-0.1	0	0.1	

Electrical Characteristics: Driver (Continued)

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP(1)	MAX	UNIT
I_{oz}	High-impedance output current	See receiver input currents in Electrical Characteristics: Receiver				
I_I	Input current	D,DE	-100		100	μA
I_{os}	Short-circuit output current	-7V≤V_o≤12V(see Figure 7)	-250		250	mA

(1) All typical values are at 25°C and with a 5-V supply

Electrical Characteristics: Receiver

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	V	MAX	UNIT
V_{IT+}	Positive-going differential input threshold voltage	I_o=-8 mA		-85	-10	mV
V_{IT-}	Negative-going differential input threshold voltage	I_o=8mA	-200	-115		mV
V_{hys}	Hysteresi voltage(V_{IT+}-V_{IT-})			30		mV
V_{OH}	High-level output voltage	V_{ID}=200 mV,I_{oH}=-8 mA(see Figure8)	4	4.6		V
V_{OL}	Low-level output voltage	V_{ID} =-200 mV,Io=8 mA(see Figure8)		0.15	0.4	V
I_{OZ}	High-impedance-state output current	V_o=0 or V_{cc},RE=V_{cc}	-1		1	μA
I_I	Bus input current	V_{IH}=12V,V_{cc}=5V		0.04	0.1	mA
		V_{IH}=12V,V_{cc}=0V		0.06	0.125	
		V_{IH}=-7V,V_{cc}=5V	-0.1	-0.04		
		V_{IH}=-7V,V_{cc}=0V	-0.05	-0.03		

Electrical Characteristics: Receiver (Continued)

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	V	MAX	UNIT
I_{IH}	High-level input current,(RE)	V_{IH}=2V	-60	-30		μA
I_{IL}	Low-level input current,(RE)	V_{IL}=0.8V	-60	-30		μA
C_{diff}	Differential input capacitance	V_I=0.4 sin(4E6πt)+0.5V,DE at 0 V		7		pF

(1) All typical values are at 25°C and with a 5-V supply.

Electrical Characteristics

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP(1)	MAX	UNIT
I_{cc}	Driver and receiver enabled	D at V_{cc} or open,DE at V_{cc},RE at 0V,No load			425	900	μA
	Driver enabled, receiver disabled	D at V_{cc} or open,DE at V_{cc},RE at V_{cc},No load			330	600	μA
	Receiver enabled, driver disabled	D at V_{cc} or open,DE at 0V,RE at 0V,No load			300	600	μA
	Driver and receiver disabled	D at V_{cc} or open,DE at oV,RE at V_{cc}			0.001	2	μA
$P_{(AVG)}$	Average power dissipation	Input to D is a 50%duty cycle square wave at max specified signal rate R_L=54Ω V_{cc}=5.5V,T_J =130℃	ALL HVD3082E			203	mW
			ALL HVD3085E			205	
			ALL HVD3088E			276	

(1) All typical values are at 25°C and with a 5-V supply.

Switching Characteristics: Driver

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH} t_{PHL}	Propagation delay time, low-to-high-level output Propagation delay time,high-to-low-level output	R_L=54Ω,C_L=50pF (seeFigure4)	HVD3082E		700	1300	ns
			HVD3085E		150	500	
			HVD3088E		12	20	
t_r t_f	Differential output signal risetime Differential output signal fall time	R_L=54Ω,C_L=50pF (seeFigure4)	HVD3082E	500	900	1500	ns
			HVD3085E		200	300	
			HVD3088E		7	15	
$t_{sk(p)}$	Pulse skew(It$_{PHL}$-t$_{PLH}$I)	R_L=54Q,C_L=50pF (seeFigure4)	HVD3082E		20	200	ns
			HVD3085E		5	50	
			HVD3088E		1.4	2	
t_{PZH} t_{PZL}	Propagation delay time, high-impedance-to-high-level output Propagation delay time,high-impedance-to-low-level output	R_L=110Ω,RE at 0V (see Figure5 and Figure6)	HVD3082E		2500	7000	ns
			HVD3085E		1000	2500	
			HVD3088E		13	30	
t_{PHZ} t_{PLZ}	Propagation delay time, high-level-to-high-impedance output Propagation delay time, low-level-to-high-impedance output	R_L=110 Ω,RE at 0V (see Figure5 and Figure6)	HVD3082E		80	200	ns
			HVD3085E		60	100	
			HVD3088E		12	30	
$t_{PZH(SHDN)}$ $t_{PZL(SHDN)}$	Propagation delay time, shutdown-to-high-level output Propagation delay time,shutdown-to-low-level output	R_L=110Ω,RE at V_{cc} (see Figure5)	HVD3082E		3500	7000	ns
			HVD3085E		2500	4500	
			HVD3088E		1600	2600	

Switching Characteristics

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output	C_L=15pF(see Figure 9)	HVD3082E HVD3085E		75	200	ns
			HVD3086E			100	
t_{PHL}	Propagation delay time, high-to-low-level output		HVD3082E HVD3085E		79	200	ns
			HVD3088E			100	
$t_{sk(p)}$	Pulse skew(|t_{PHL}-t_{PLH}|)		HVD3082E HVD3085E		4	30	ns
			HVD3088E			10	
t_r	Output signal rise time	V_{ID}=-1.5V to 1.5V,C_L=15 pF (see Figure9)			1.5	3	ns
t_F	Output signal fall time				1.8	3	
t_{PZH}	Output enable time to highlevel	C_L=15 pF,DE at 3V (see Figure10 and Figure11)	HVD3082E HVD3085E		5	50	ns
			HVD3088E			30	
t_{PZL}	Output enable time to lowlevel		HVD3082E HVD3085E		10	50	ns
			HVD3088E			30	
t_{PHZ}	Output enable time from highlevel		HVD3082E HVD3085E		5	50	ns
			HVD3088E			30	
t_{PLZ}	Output disable time from lowlevel		HVD3082E HVD3085E		8	50	ns
			HVD3088E			30	
$t_{PZH(SHDN)}$	Propagation delay time, shutdown-to-high-level output	C_L=15 pF,DE at 0V,(see Figure12)			1600	3500	ns
$t_{PZL(SHDN)}$	Propagation delay time, shutdown-to-low-level output				1700	3500	

Parameter Measurement Information

Test load capacitance includes probe and jig capacitance (unless otherwise specified). Signal generator characteristics: rise and fall time < 6 ns, pulse rate 100 kHz, 50% duty cycle. Z_O = 50 Ω (unless otherwise specified)

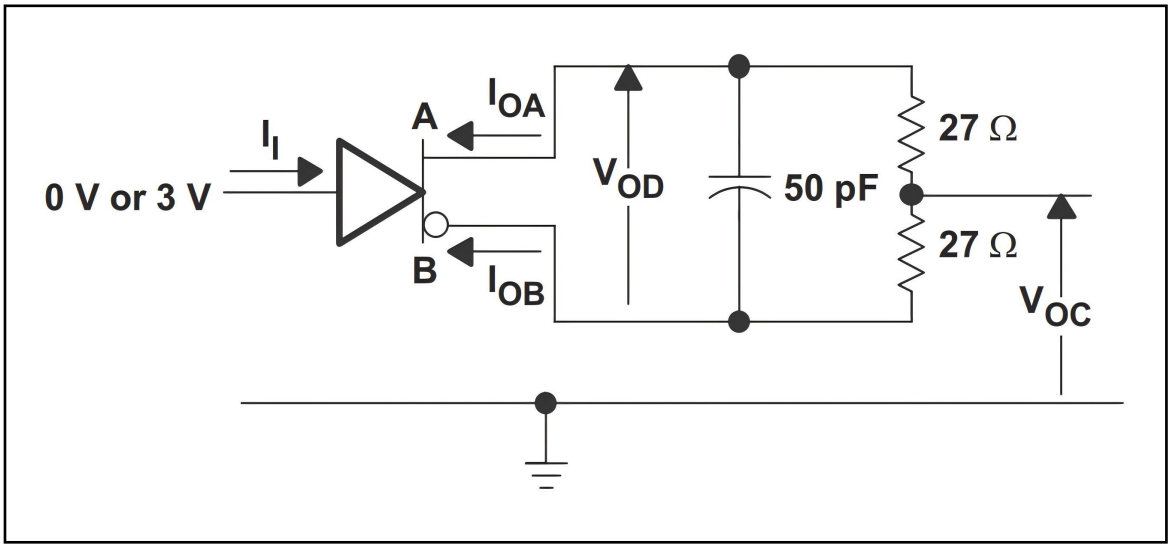


Figure 1. Driver Test Circuit, V_{OD} and V_{OC} Without Common-Mode Loading

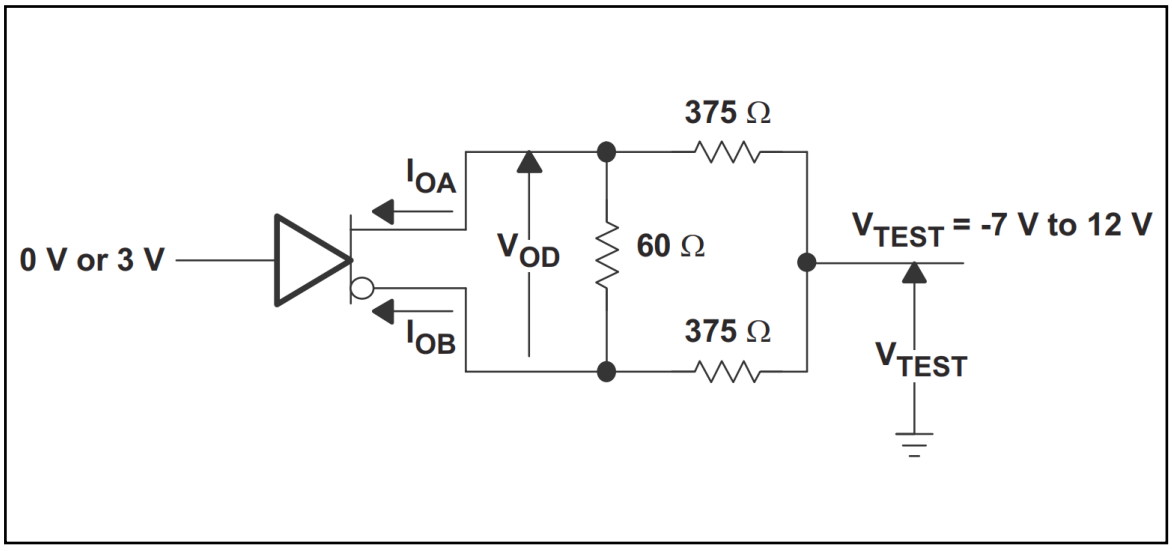


Figure 2. Driver Test Circuit, V_{OD} With Common-Mode Loading

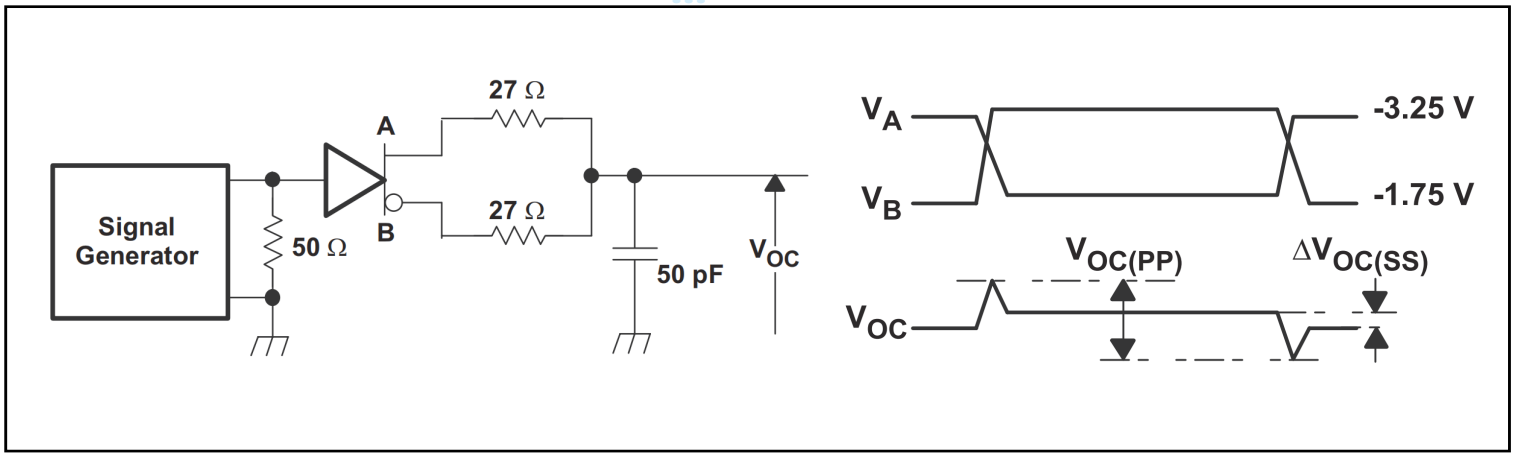


Figure 3. Driver Voc Test Circuit and Waveforms

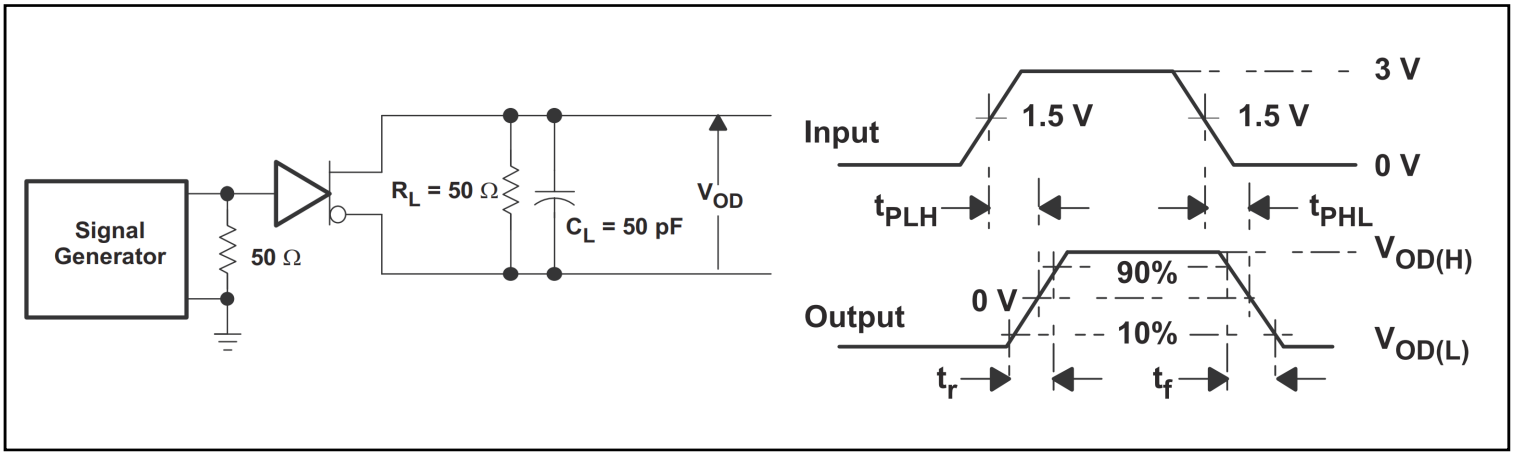


Figure 4. Driver Switching Test Circuit and Waveforms

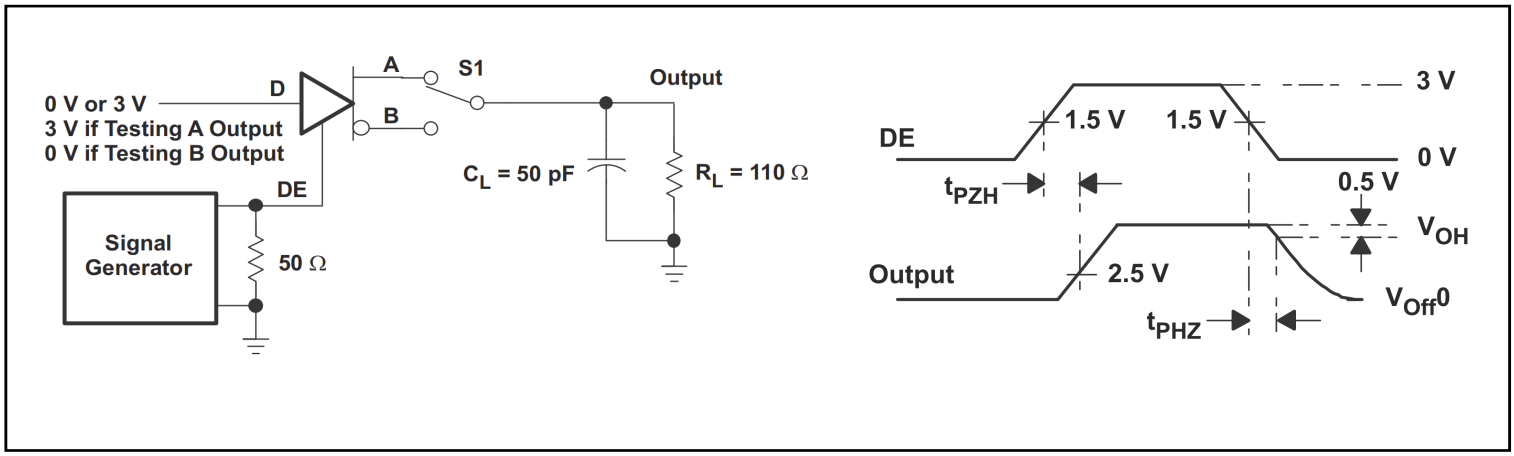


Figure 5. Driver Enable and Disable Test Circuit and Waveforms, High Output

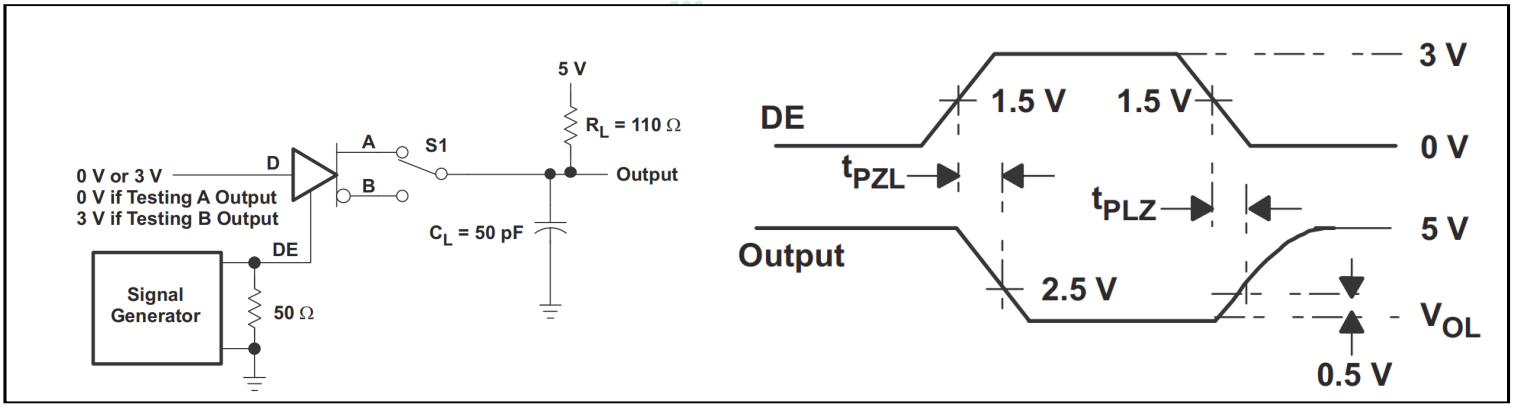


Figure 6. Driver Enable and Disable Test Circuit and Waveforms, Low Output

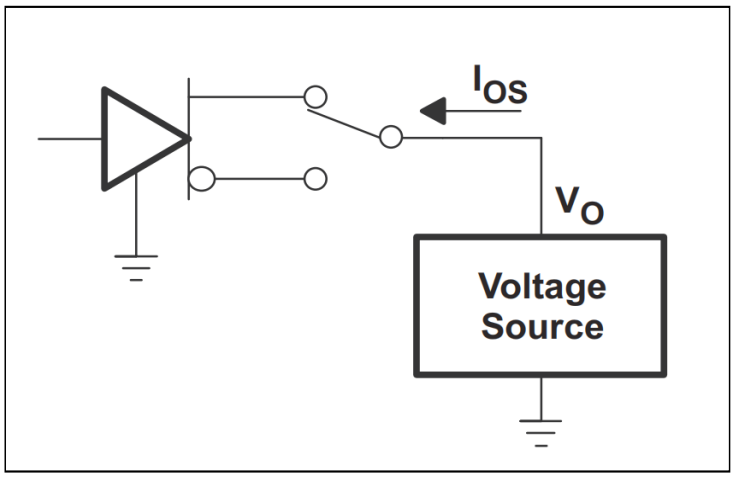


Figure 7. Driver Short-Circuit

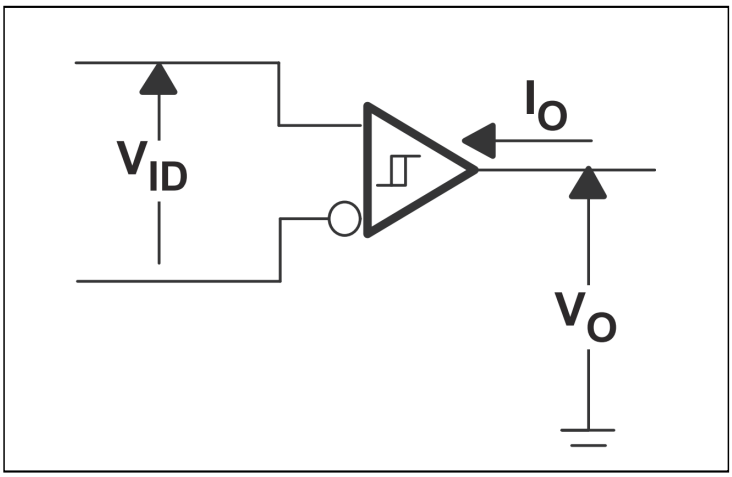


Figure 8. Receiver Switching Test Circuit and Waveforms

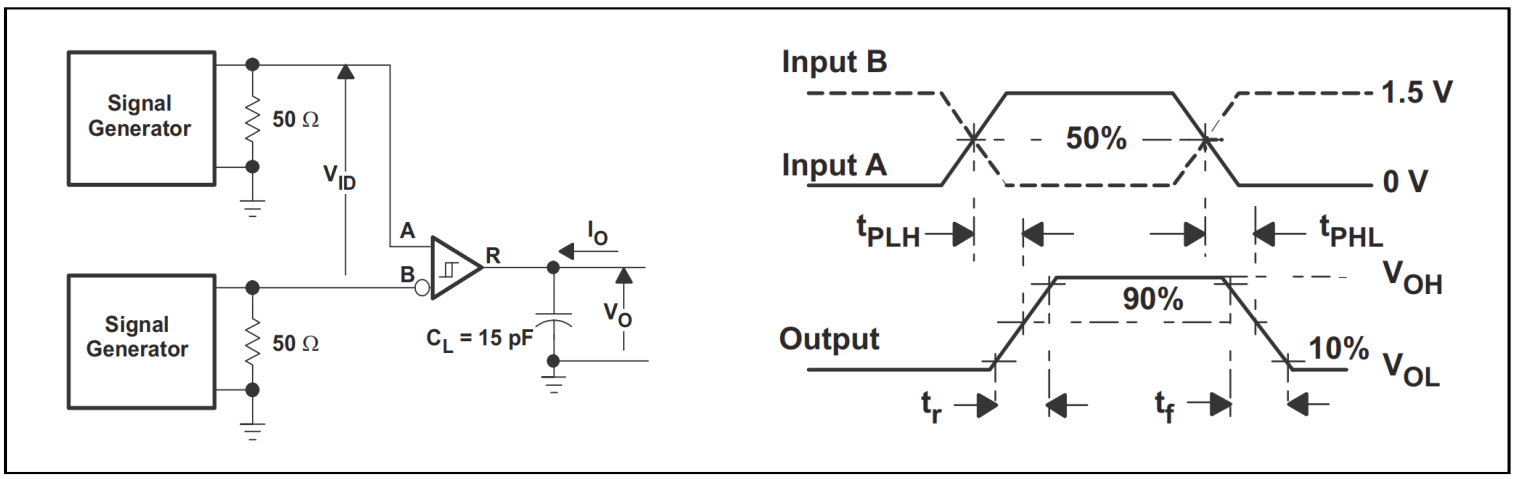


Figure 9. Receiver Switching Test Circuit and Waveforms

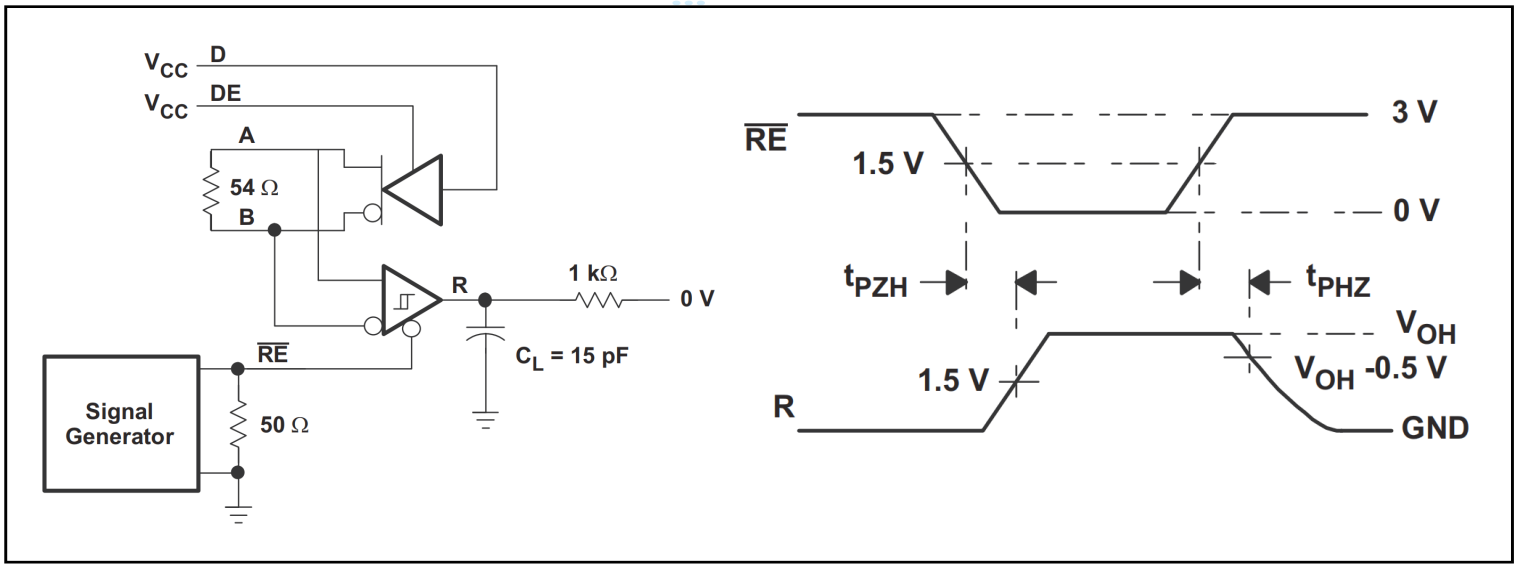


Figure 10. Receiver Enable and Disable Test Circuit and Waveforms, Data Output High

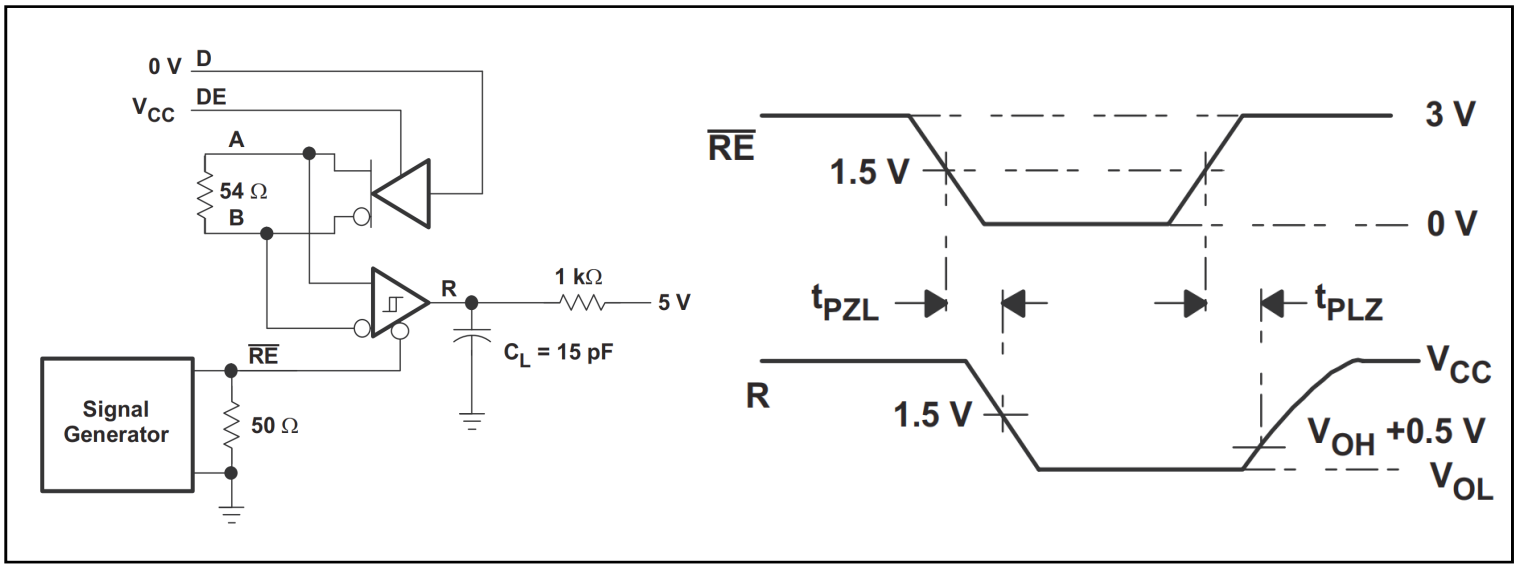


Figure 11. Receiver Enable and Disable Test Circuit and Waveforms, Data Output Low

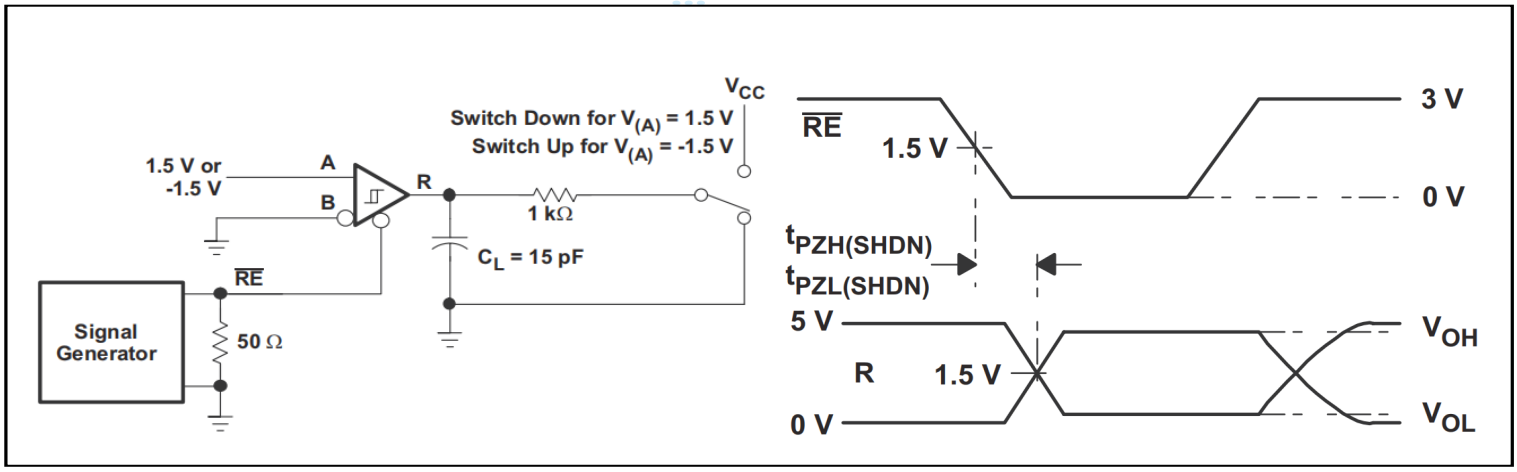


Figure 12. Receiver Enable From Shutdown Test Circuit and Waveforms

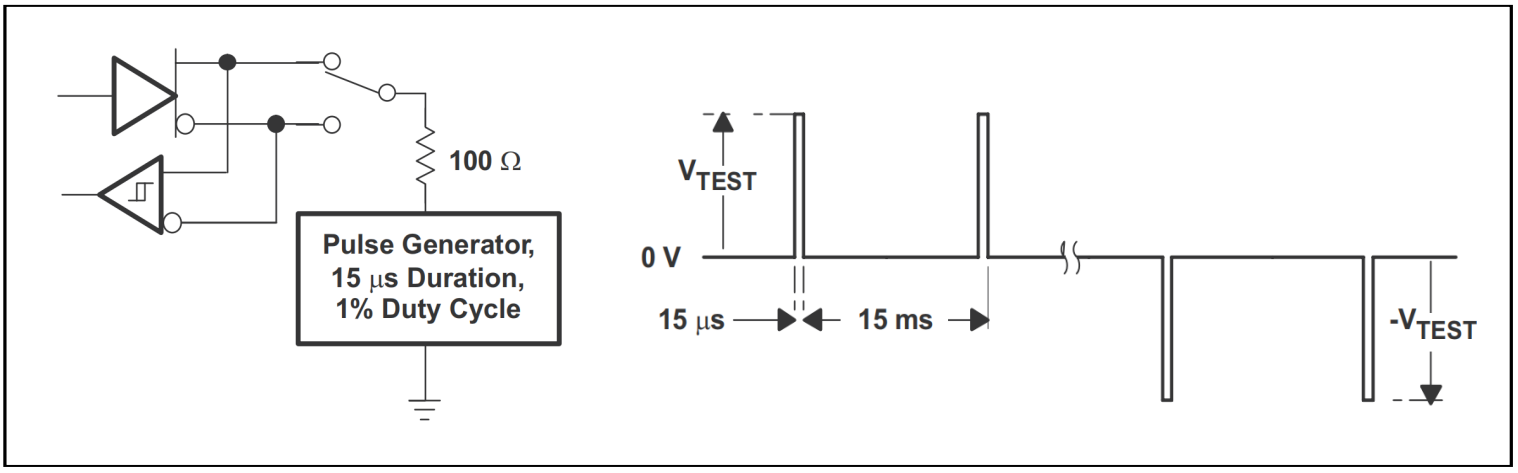


Figure 13. Test Circuit and Waveforms, Transient Overvoltage Test

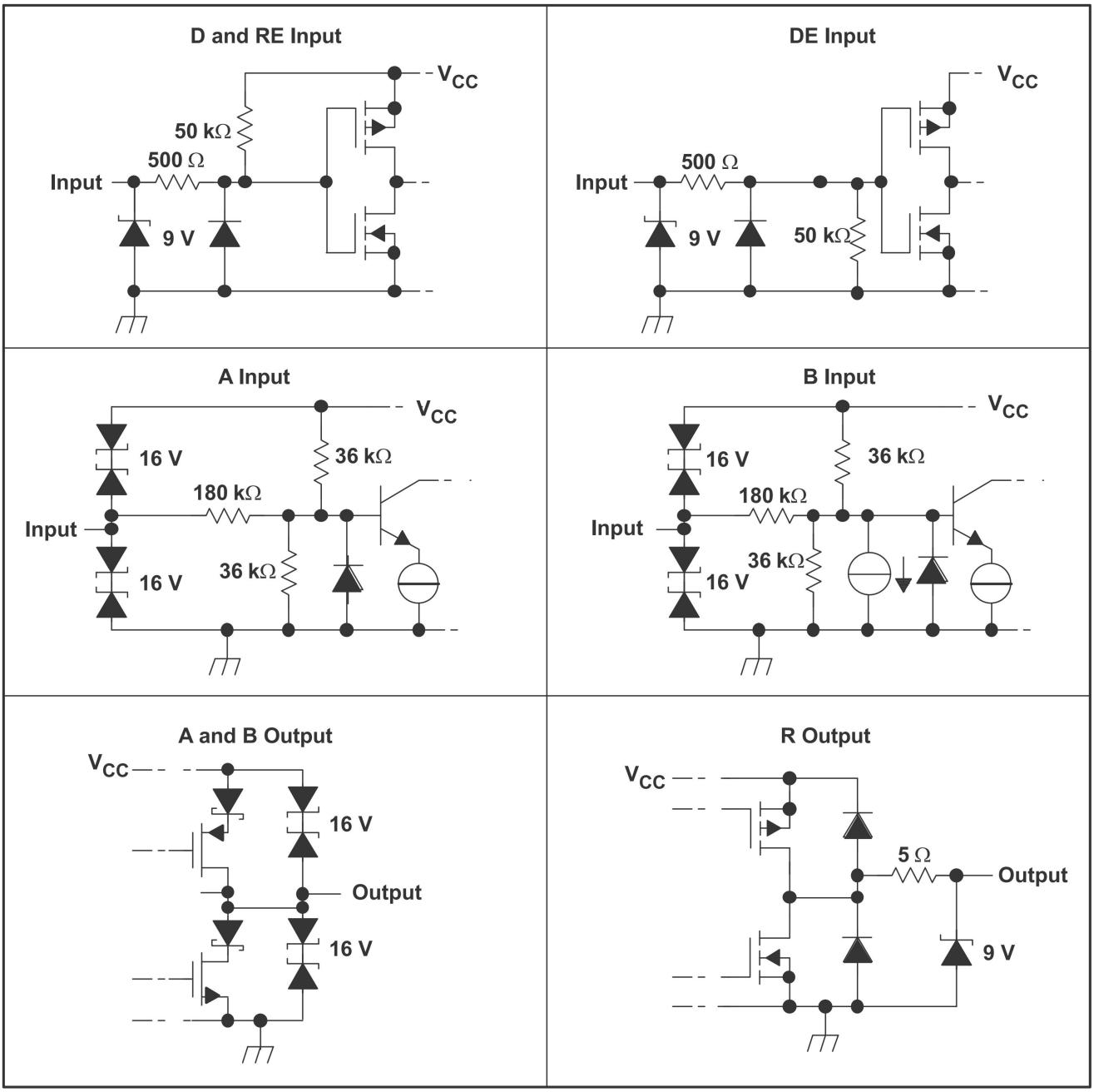


Figure 14. Equivalent Input and Output Schematic Diagrams

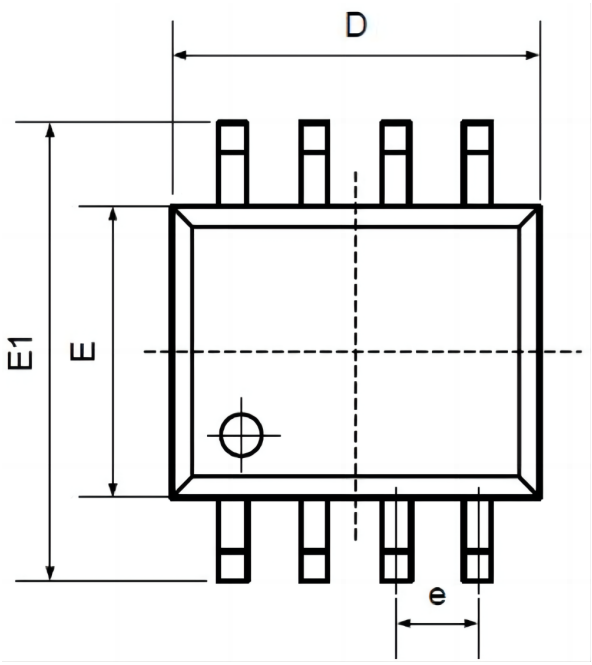
Order information

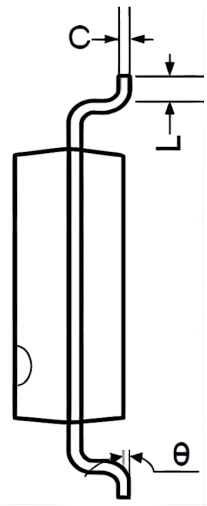
Order Number	Package	Package Quantity	Marking On The park	Temperature
SN65HVD3082EDGKR-TUDI	MSOP8	Tape,Reel,4000	NWN 3082G	-40℃ to 85℃
SN65HVD3082EDR-TUDI	SOP8	Tape,Reel,4000	VP3082	
SN65HVD3082EP-TUDI	DIP8	Tube,50,A box of 2000	65HVD3082	
SN65HVD3085EDGKR-TUDI	MSOP8	Tape,Reel,4000	NWK 3085G	
SN65HVD3085EDR-TUDI	SOP8	Tape,Reel,4000	VP3085	
SN65HVD3088EDGKR-TUDI	MSOP8	Tape,Reel,4000	NWH 3088G	
SN65HVD3088EDR-TUDI	SOP8	Tape,Reel,4000	VP3088	
SN75HVD3082EDGKR-TUDI	MSOP8	Tape,Reel,4000	NWM 3082E	0℃ to 70℃
SN75HVD3082EDR-TUDI	SOP8	Tape,Reel,4000	VN3082	
SN75HVD3082EP-TUDI	DIP8	Tube,50,A box of 2000	75HVD3082	

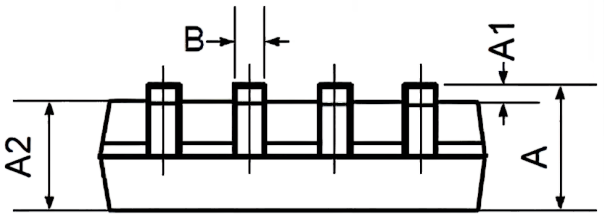
Revision history

	Date	Revision	Page
V1.0	2020/1	New	1-10
V1.1	2025-3	Update model and PDF template	1-21

Package SOP8

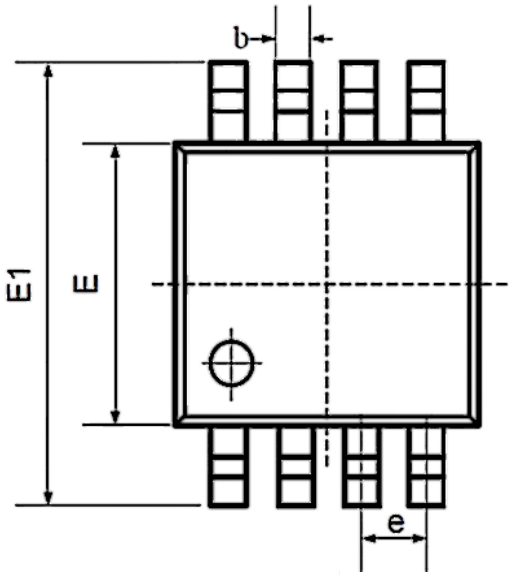


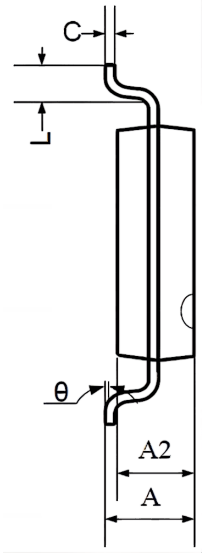


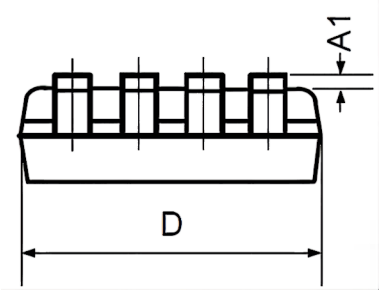


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP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

Package MSOP8

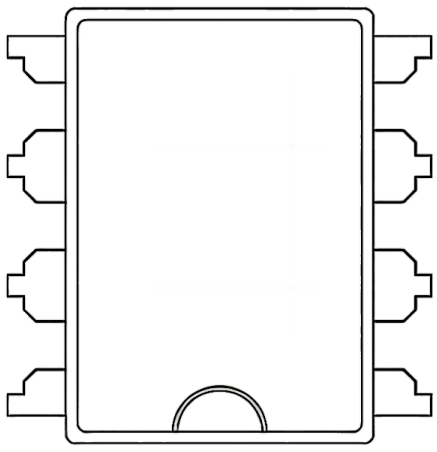


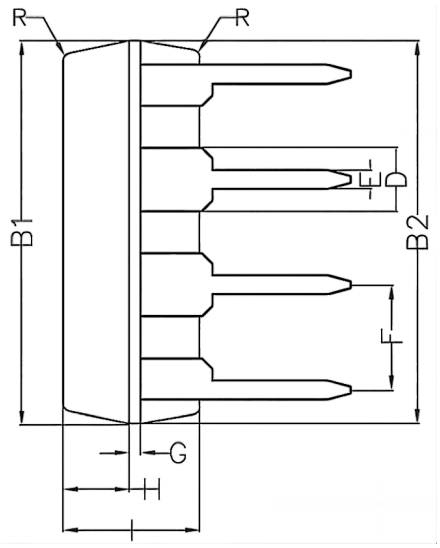


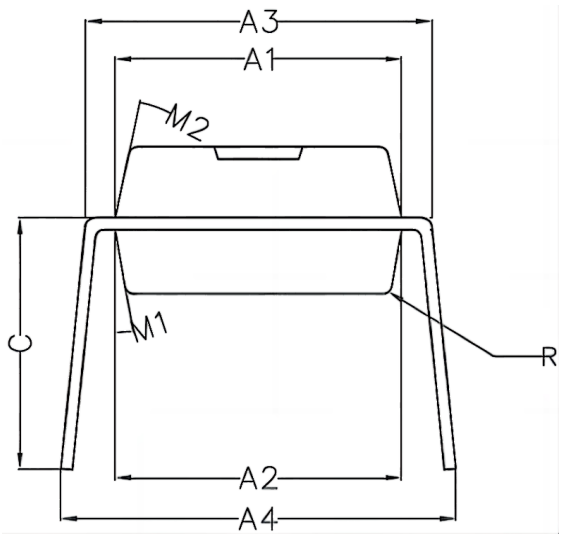


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.200	0.031	0.047
A1	0.000	0.200	0.000	0.008
A2	0.760	0.970	0.030	0.038
b	0.30 TYP		0.012 TYP	
C	0.15 TYP		0.006 TYP	
D	2.900	3.100	0.114	0.122
e	0.65 TYP		0.026 TYP	
E	2.900	3.100	0.114	0.122
E1	4.700	5.100	0.185	0.201
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
工	3.22	3.27	3.32
R		0.20	
M1	9°	10°	11°
M2	11°	12°	13°

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