钍地半导体
Tudi Semiconductor

Product Specification

TUDI-ISL3259E

±15kV ESD Protected, 100Mbps, 5V, PROFIBUS, Full Fail-Safe, RS-485/RS-422 Transceiver

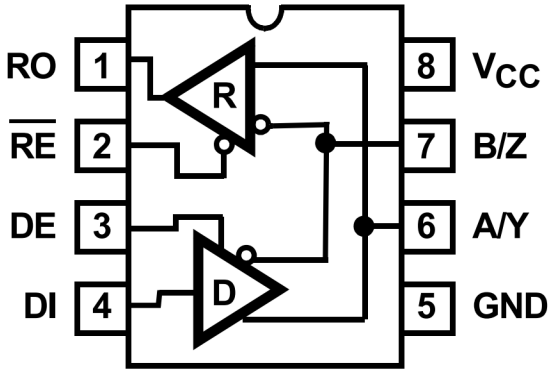
网址 www.sztdbdt.com

用芯智造·卓越品质

semiconductor device manufacturer

- Design
- research and development
- production
- and sales

Features



SOP8 MSOP8

- IEC61000 ESD protection on RS-485 I/O pins . . . . . ±15kV - Class 3 HBM ESD level on all other pins . . . . . >9kV
- Large differential VOUT . . . . 2.8V into 54Ω Better noise immunity, or drive up to 6 terminations
- Very high data rate. . . . . up to 100Mbps
- 11/13ns (maximum) Tx/Rx propagation delays; 1.5ns (maximum) skew
- 1/5 unit load allows up to 160 devices on the bus
- Full fail-safe (open, shorted, terminated/undriven) receiver
- High Rx IOL to drive opto-couplers for isolated applications
- Hot plug - Tx and Rx outputs remain three-state during power-up
- Low quiescent supply current. 4mA
- Low current shutdown mode 1μA
- -7V to +12V common mode input voltage range
- Three-State Rx and Tx outputs
- Operates from a single +5V supply
- Current limiting and thermal shutdown for driver overload protection
- Pb-free (RoHS compliant)

Applications

- PROFIBUS ®DP and FMS networks
- SCSI “fast 40” drivers and receivers
- Motor controller/position encoder systems
- Factory automation
- Field bus networks
- Security networks
- Building environmental control systems
- Industrial/process control networks

Description

The ISL3259E is a ±15kV IEC61000 ESD Protected, 5V powered, single transceiver that meets both the RS-485 and RS-422 standards for balanced communication. It also features the larger output voltage and higher data rate (up to 100Mbps) required by high speed PROFIBUS applications. The low bus currents (+220μA/-150μA) present a 1/5 unit load to the RS-485 bus. This allows up to 160 transceivers on the network without violating the RS-485 specification ' s load limit, and without using repeaters.

This transceiver requires a 5V supply, and delivers at least a 2.1V differential output voltage. This translates into better noise immunity (data integrity), longer reach, or the ability to drive up to six 120Ω terminations in " star " or other non-standard bus topologies.

SCSI applications benefit from the ISL3259E ' s low receiver and transmitter part-to-part skews. The ISL3259E is perfect for high speed parallel applications requiring simultaneous capture of large numbers of bits. The low bit-to-bit skew eases the timing constraints on the data latching signal.

Receiver (Rx) inputs feature a " Full Fail-Safe " design, which ensures a logic high Rx output if Rx inputs are floating, shorted, or terminated but undriven. Rx outputs feature high drive levels (typically >30mA @ V_{OL} = 1V) to ease the design of optically isolated interfaces.

Hot plug circuitry ensures that the Tx and Rx outputs remain in a high impedance state while the power supply stabilizes.

Driver (Tx) outputs are short-circuit protected, even for voltages exceeding the power supply voltage. Additionally, on-chip thermal shutdown circuitry disables the Tx outputs to prevent damage if power dissipation becomes excessive.

Truth Table

TRANSMITTING				
INPUTS			OUTPUTS	
RE	DE	DI	B/Z	A/Y
X	1	1	0	1
X	1	0	1	0
0	0	X	High-Z	High-Z
1	0	X	High-Z*	High-Z*

NOTE: *Shutdown Mode

Truth Table

RECEIVING			
INPUTS			OUTPUT
RE	DE	A-B	RO
0	0	VAB≥-0.05V	1
0	0	-0.05V>VAB>-0.2V	Undetermined
0	0	VAB≤-0.2V	0
0	0	Inputs Open/ Shorted	1
1	1	X	High-Z
1	0	X	High-Z*

NOTE: *Shutdown Mode

Absolute Maximum Ratings

VCC to GND 7V
Input Voltages
DI, DE, RE. . . . . -0.3V to 7V
Input/Output Voltages
A/Y, B/Z . . . . . -9V to +13V
RO. . . . . -0.3V to (VCC +0.3V)
Short-circuit Duration
Y, Z . . . . . Continuous
ESD Rating . . . . . Refer to “ Electrical Specifications ”

Thermal Information

Thermal Resistance (Typical) θ_{JA} (° C/W)
8 Ld SOIC Package (Note 1). 105
8 Ld MSOP Package (Note 1). 140
Maximum Junction Temperature (Plastic Package) . . . . . +150 ° C Maximum Storage Temperature Range . . . . . .-65 ° C to +150 ° C

Operating Conditions

Temperature Range. . . . . .-40 ° C to +85 ° C

NOTE: 1. θ_{JA} is measured with the component mounted on a high-effective thermal conductivity test board in free air.

Pin Descriptions

PIN	FUNCTION
RO	Receiver output:If A-B≥-50mV,RO is high.If A-B≤-200mV,RO is low.If A and B are unconnected(floating)or shorted,or connected to a terminated bus that is undriven,RO is high.
RE	Receiver output enable.RO is enabled when RE is low.RO is high impedance when RE is high.If the Rx enable function isn't required,connect RE directly to GND.
DE	Driver output enable.The driver outputs,Y and Z,are enabled by bringing DEhigh.They are high impedance when DE is low.If the Txenablefunction isn't required,connect DE to Vcc through a 1kΩ or greater resistor.
DI	Driver input.A low on DI forces output Y low and output Z high.Similarly,a high on DI forces output Yhigh and output Z low.
GND	Ground connection.This is also the potential of the DFN thermal pad.
A/Y	±15KV IEC61000 ESD Protected RS-485,RS-422 level,noninverting receiver input and noninverting driver output.Pin is an input (A)if DEE=0;pin is an output(Y)if DE=1.
B/Z	±15kV IEC61000 ESD Protected RS-485,RS-422 level,inverting receiver input and inverting driver output.Pin is an input(B)if DE=0.Pin is an output(Z)if DE=1.
VCC	System power supply input(4.75V to 5.25V).
NC	No Connection.

Electrical Specifications

Test Conditions: V_{CC} = 4.75V to 5.25V; unless otherwise specified. Typical values are at V_{CC} = 5V, T_A = +25 ° C, (Note 3).

PARAMETER	SYMBOL	TEST CONDITIONS		TEMP (°°C)	MIN (Note 12)	TYP	MAX (Note 12)	UNITS
DC CHARACTERISTICS								
Driver Differential V_{OUT}	V_{OD}	No Load		Full	-	-	V_{CC}	
		R_L=100Ω(RS-422)(Figure 1A)		Full	2.6	3.4	-	V
		R_L=54Ω(RS-485)(Figure 1A)		Full	2.1	2.8	V_{CC}	V
		R_L=60Ω,-7V≤V_{CM}≤12V (Figure 1B)		Full	1.9	2.7		V
Change in Magnitude of Driver Differential V_{OUT} for Complementary Output States	△V_{OD}	R_L=54Ωor 100Ω(Figure 1A)		Full	-	0.01	0.2	V
Driver Common-Mode V_{OUT}	V_{OC}	R_L=54Ωor 100Ω(Figure 1A)		Full		2	3	V
Change in Magnitude of Driver Common-Mode V_{OUT} for Complementary Output States	△V_{OC}	R_L=54Ω or 100Ω(Figure 1A)		Full	-	0.01	0.2	V
Logic Input High Voltage	V_{IH}	DI,DE,RE		Full	2	-		V
Logic Input Low Voltage	V_{IL}	DI,DE,RE		Full	-	-	0.8	V
Logic Input Current	I_{IN1}	DI=DE=RE=0V or V_{CC}		Full	-2	-	2	μA
Input Current(A/Y,B/Z)	I_{IN2}	DE=0V,V_{CC}= 0V or 5.25V	V_{IN}=12V	Full	-		220	μA
			V_{IN}=-7V	Full	-160			μA
Driver Short-Circuit Current,V_O=High or Low	I_{OSD1}	DE=V_{CC},-7V≤V_Y or VZ≤12V (Note 5)		Full	-	-	±250	mA

Electrical Specifications (Continued)

Test Conditions: V_{CC} = 4.75V to 5.25V; unless otherwise specified. Typical values are at V_{CC} = 5V, T_A = +25 ° C, (Note 3).

PARAMETER	SYMBOL	TEST CONDITIONS	TEMP (°°C)	MIN (Note 12)	TYP	MAX (Note 12)	UNITS
Differential Capacitance	C_D	A/Y to B/Z	25	-	9	-	pF
Receiver Differential Threshold Voltage	V_{TH}	-7V≤V_{CM}≤12V	Full	-200	-	-50	mV
Receiver Input Hysteresis	△V_{TH}	V_{CM}=0V	25	-	28	-	mV
Receiver Output High Voltage	V_{OH}	I_O=-8mA,V_{ID}=-50mV	Full	V_{CC}-0.5	-		V
Receiver Output Low Voltage	V_{OL}	I_O=+10mA,V_{ID}=-200mV	Full	-	-	0.4	V
Receiver Output Low Current	I_{OL}	V_{OL}=1V,V_{ID}=-200mV	Full	25	40	-	mA
Three-State (High Impedance)Receiver Output Current	I_{OZR}	0.4V≤V_O≤2.4V	Full	-1	0.015	1	μA
Receiver Input Resistance	R_{IN}	-7V≤V_{CM}≤12V	Full	54	80	-	kΩ
Receiver Short-Circuit Current	I_{OSR}	0V≤V_O≤V_{CC}	Full	±20	-	±110	mA
SUPPLY CURRENT							
No-Load Supply Current(Note Z)	I_{CC}	DI=DE=0V or V_{CC}	Full	-	2.6	4	mA
Shutdown Supply Current	I_{SHDN}	DE=0V,RE=Vcc,DI=0V or V_{CC}	Full	-	0.05	1	μA
ESD PERFORMANCE							
RS-485 Pins(A/Y,B/Z)		IEC61000-42,Air-Gap Discharge Method	25	-	±15	-	kV
		IEC61000-4-2,Contact Discharge Method	25	-	±8	-	kV
		Human Body Model,From Bus Pins to GND	25	-	±16.5	-	kV

Electrical Specifications (Continued)

Test Conditions: V_{CC} = 4.75V to 5.25V; unless otherwise specified. Typical values are at V_{CC} = 5V, T_A = +25 ° C, (Note 3).

PARAMETER	SYMBOL	TEST CONDITIONS	TEMP (°°C)	MIN (Note 12)	TYP	MAX (Note 12)	UNITS
All Pins		HBM,per MIL-STD-883 Method 3015	25	-	>±9	-	kV
		Machine Model	25	-	>± 400	-	V
DRIVER SWITCHING CHARACTERISTICS							
Maximum Data Rate	f_{MAX}	V_{OD}≥±1.5V,R_D=54Ω,C_L= 100pF(Figure 4)	Full	100	-	-	Mbps
Driver Differential Output Delay	t_{DD}	R_D=54Ω,C_D=50pF(Figure 2)	Full	-	8	12	ns
Driver Differential Output Skew	t_{SKEW}	R_D=54Ω,C_D=50pF(Figure 2)	Full		0.5	1.5	ns
Prop Delay Part-to-Part Skew	t_{SKP-P}	R_D=54Ω,C_D=50pF(Figure 2), (Note 8)	Full	-	-	4	ns
Driver Differential Rise or FallTime	t_R,t_F	R_D=54Ω,C_D=50pF(Figure 2)	Full	2	5	8	ns
Driver Enable to Output High	t_{ZH}	R_L=110Ω,C_L=50pF,SW=GND (Figure 3),(Note 6)	Full	-	13	20	ns
Driver Enable to Output Low	t_{ZL}	R_L=110Ω,C_L=50pF,SW=Vcc (Figure 3),(Note 6)	Full	-	11	20	ns
Driver Enable Time Skew	t_{ENSKEW}	It_{ZH}(Y or Z)-t_{ZL}(Z or Y)I	Full	-	2.5	-	ns
Driver Disable from Output High	t_{HZ}	R_L=110Ω,C_L=50pF,SW=GND (Figure 3)	Full	-	14	20	ns
Driver Disable from Output Low	t_{LZ}	R_L=110Ω,C_L=50pF,SW=Vcc (Figure 3)	Full		12	20	ns
Driver Disable Time Skew	$t_{DISSKEW}$	It_{HZ}(Y or Z)-t_{LZ}(Z or Y)I	Full	-	3	-	ns
Time to Shutdown	t_{SHDN}	(Note 8)	Full	60	-	600	ns

Electrical Specifications (Continued)

Test Conditions: V_{CC} = 4.75V to 5.25V; unless otherwise specified. Typical values are at V_{CC} = 5V, T_A = +25 ° C, (Note 3).

PARAMETER	SYMBOL	TEST CONDITIONS	TEMP (°°C)	MIN (Note 12)	TYP	MAX (Note 12)	UNITS
Driver Enable from Shutdown to Output High	$t_{ZH(SHDN)}$	R_L=110Ω,C_L=50pF, SW=GND(Figure 3), (Notes 11,12)	Full		-	1000	ns
Driver Enable from Shutdown to Output Low	$t_{ZL(SHDN)}$	R_L=110Ω,C_L=50pF,SW=V_{CC} (Figure 3),(Notes 8.9)	Full	-	-	1000	ns
RECEIVER SWITCHING CHARACTERISTICS							
Maximum Data Rate	f_{MAX}	VID=±1.5V	Full	100	-	-	Mbps
Receiver Input to Output Delay	t_{PLH},t_{PHL}	(Figure 5)	Full	-	9	13	ns
Receiver Skew ItpLH-tPHLI	t_{SKD}	(Figure 5)	Full	-	0	1.5	ns
Prop Delay Part-to-Part Skew	t_{SKP-P}	(Figure 5),(Note 11)	Full	-	-	4	ns
Receiver Enable to Output High	t_{ZH}	R_L=1kΩ,C_L=15pF,SW=GND (Figure 6),(Note 8)	Full	-	-	12	ns
Receiver Enable to Output Low	t_{ZL}	R_L=1kΩ,C_L=15pF,SW=V_{CC} (Figure 6),(Note 8)	Full	-		12	ns
Receiver Disable from Output High	t_{HZ}	R_L=1kΩ,C_L=15pF,SW=GND (Figure 6)	Full	-	-	12	ns
Receiver Disable from Output Low	t_{LZ}	R_L=1kΩ,C_L=15pF,SW=V_{CC} (Figure 6)	Full	-	-	12	ns
Time to Shutdown	t_{SHDN}	(Notes 9)	Full	60	-	600	ns
Receiver Enable from Shutdown to Output High	$t_{ZH(SHDN)}$	R_L=1kΩ,C_L=15pF,SW=GND (Figure 6),(Notes 8,10)	Full	-	-	1000	ns
Receiver Enable from Shutdown to Output Low	$t_{ZL(SHDN)}$	R_L=1kΩ,C_L=15pF,SW=V_{CC} (Figure 6),(Notes 8,10)	Full	-	-	1000	ns

NOTES:
3. All currents into device pins are positive; all currents out of device pins are negative. All voltages are referenced to device ground unless otherwise specified.
4. Supply current specification is valid for loaded drivers when DE = 0V.
5. Applies to peak current.
6. Because of the shutdown feature, keep RE = 0 to prevent the device from entering SHDN.
7. Because of the shutdown feature, the RE signal high time must be short enough (typically <100ns) to prevent the device from entering SHDN.
8. These ICs are put into shutdown by bringing RE high and DE low. If the inputs are in this state for less than 60ns, the parts are guaranteed not to enter shutdown. If the inputs are in this state for at least 700ns, the parts are guaranteed to have entered shutdown.
9. Keep RE = VCC, and set the DE signal low time >700ns to ensure that the device enters SHDN.
10. Set the RE signal high time >700ns to ensure that the device enters SHDN.
11. This is the part-to-part skew between any two units tested with identical test conditions (Temperature, V_{CC}, etc.).
12. Parts are 100% tested at +25 ° C. Over-temperature limits are established by characterization and are not production tested.

Test Circuits and Waveforms

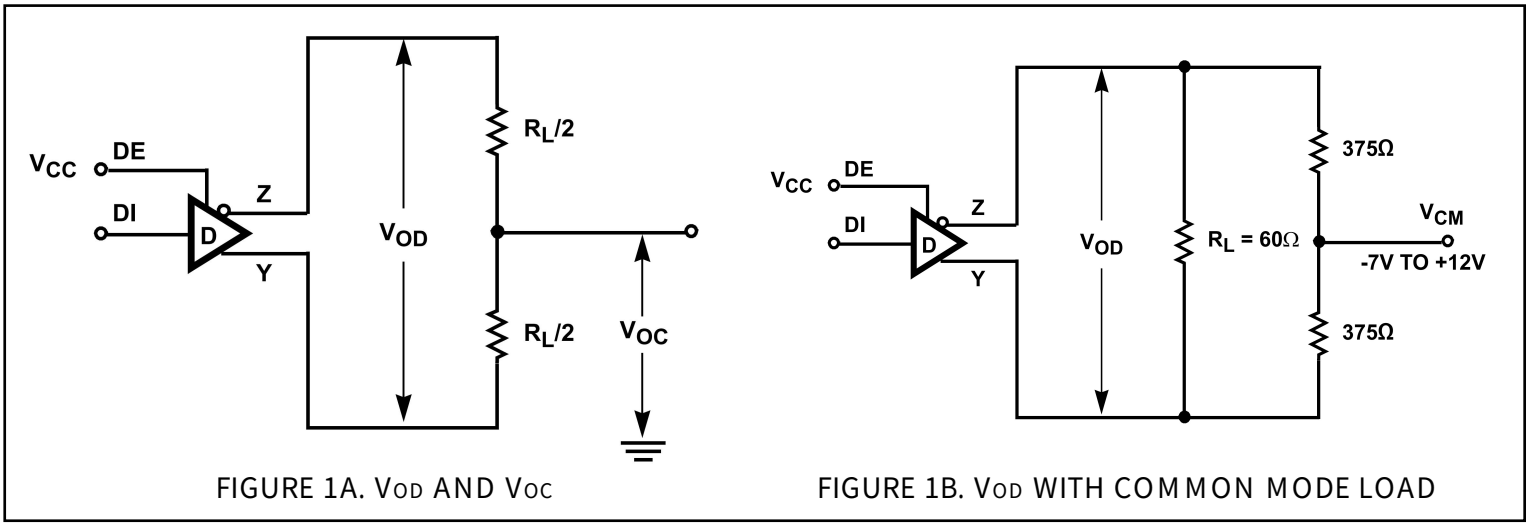


FIGURE 1A. V_{OD} AND V_{OC}

FIGURE 1B. V_{OD} WITH COMMON MODE LOAD

FIGURE 1. DC DRIVER TEST CIRCUITS

Test Circuits and Waveforms (Continued)

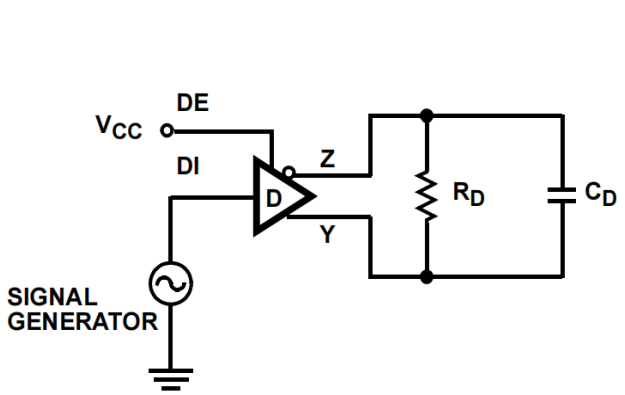


FIGURE 2A. TEST CIRCUIT

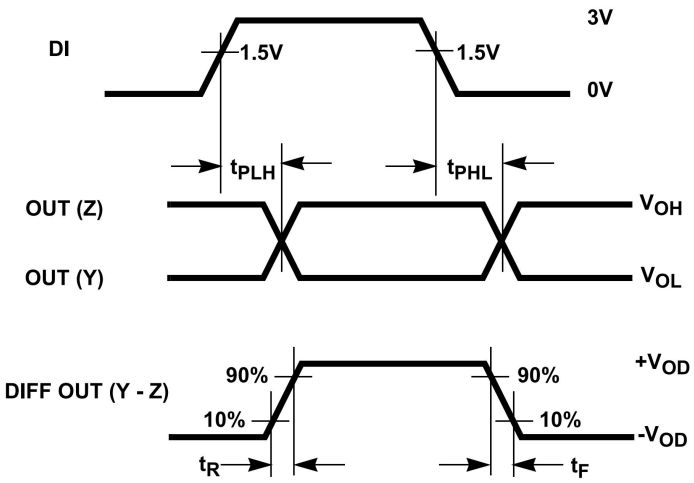
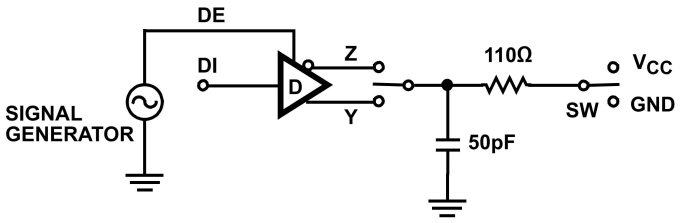


FIGURE 2B. MEASUREMENT POINTS

FIGURE 2. DRIVER PROPAGATION DELAY AND DIFFERENTIAL TRANSITION TIMES



PARAMETER	OUTPUT	RE	DI	SW
t_{HZ}	Y/Z	X	1/0	GND
t_{LZ}	Y/Z	X	0/1	Vcc
t_{ZH}	Y/Z	0(Note 6)	1/0	GND
t_{ZL}	Y/Z	0(Note 6)	0/1	Vcc
$t_{HZ(SHDN)}$	Y/Z	1(Note 9)	1/0	GND
$t_{LZ(SHDN)}$	Y/Z	1(Note 9)	0/1	Vcc

FIGURE 3A. TEST CIRCUIT

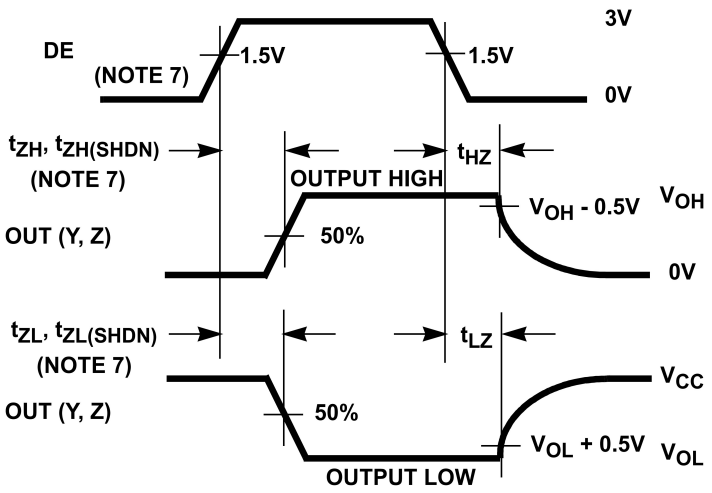


FIGURE 3B. MEASUREMENT POINTS

FIGURE 3. DRIVER ENABLE AND DISABLE TIMES

Test Circuits and Waveforms (Continued)

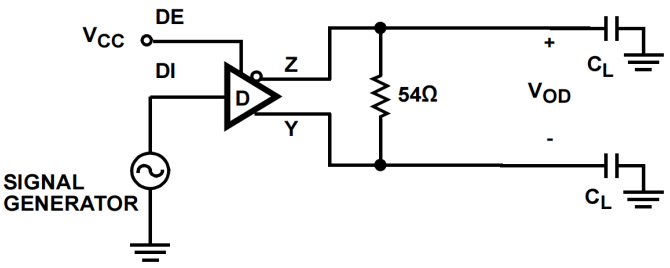


FIGURE 4A. TEST CIRCUIT

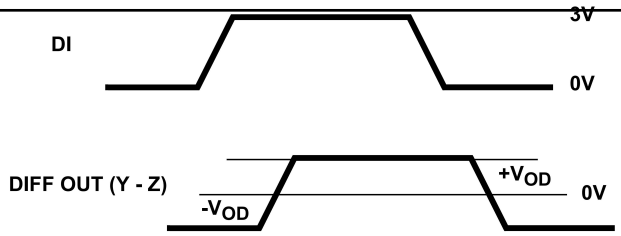


FIGURE 4B. MEASUREMENT POINTS

FIGURE 4. DRIVER DATA RATE

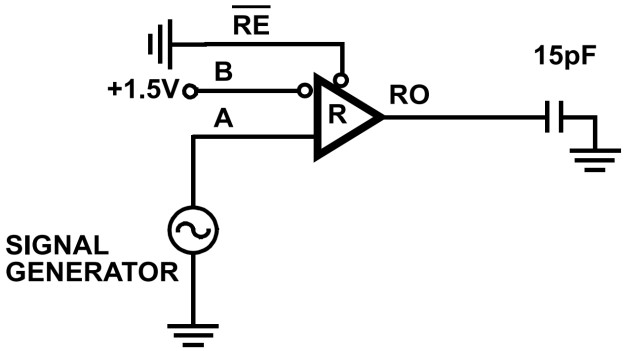


FIGURE 5A. TEST CIRCUIT

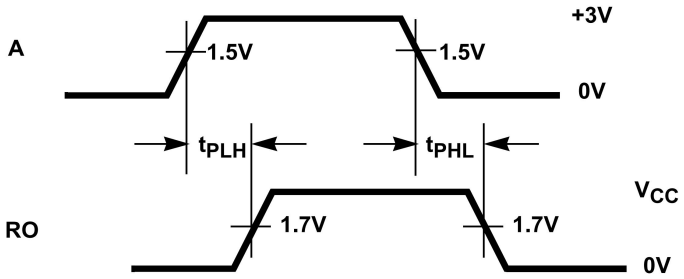
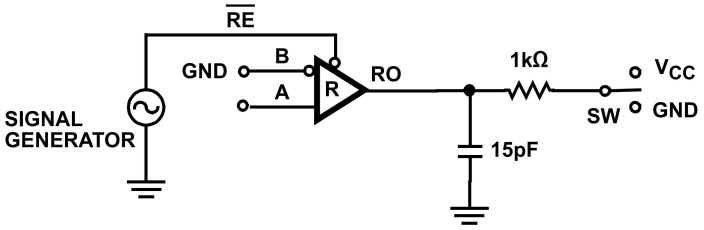


FIGURE 5B. MEASUREMENT POINTS

FIGURE 5. RECEIVER PROPAGATION DELAY

Test Circuits and Waveforms (Continued)



PARAMETER	DE	A	SW
t_{HZ}	0	+1.5V	GND
t_{LZ}	0	-1.5V	VCC
t_{ZH}(Note 7)	0	+1.5V	GND
t_{ZL}(Note 7)	0	-1.5V	VCC
$t_{HZ(SHDN)}$(Note 10)	0	+1.5V	GND
$t_{LZ(SHDN)}$(Note 10)	0	-1.5V	VCC

FIGURE 6A. TEST CIRCUIT

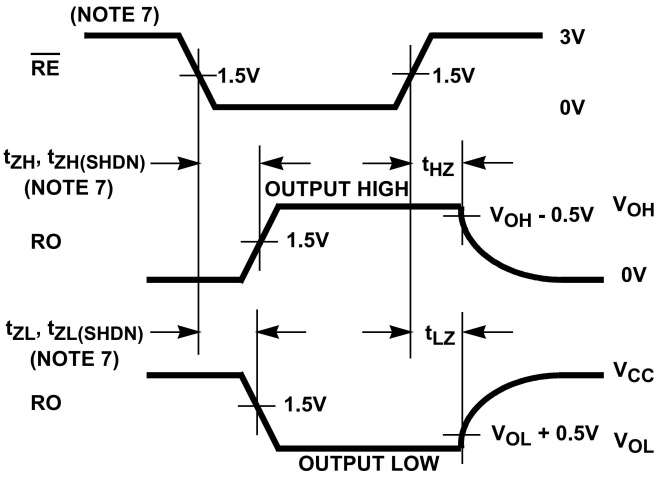
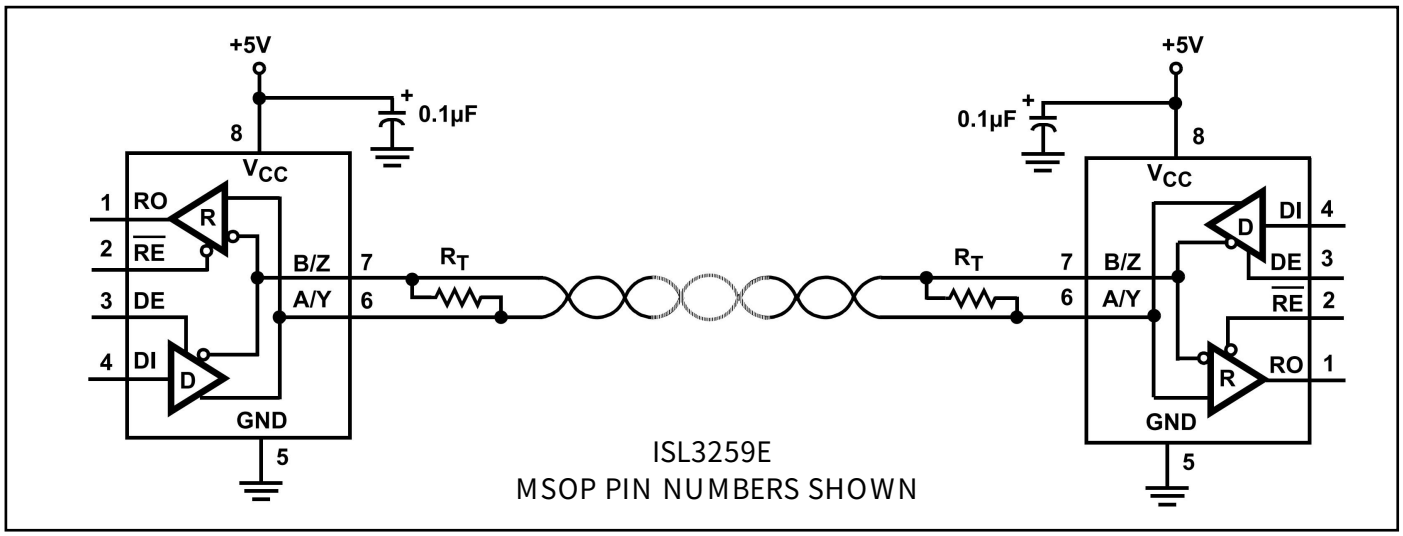


FIGURE 6B. MEASUREMENT POINTS

FIGURE 6. RECEIVER ENABLE AND DISABLE TIMES

Typical Operating Circuit



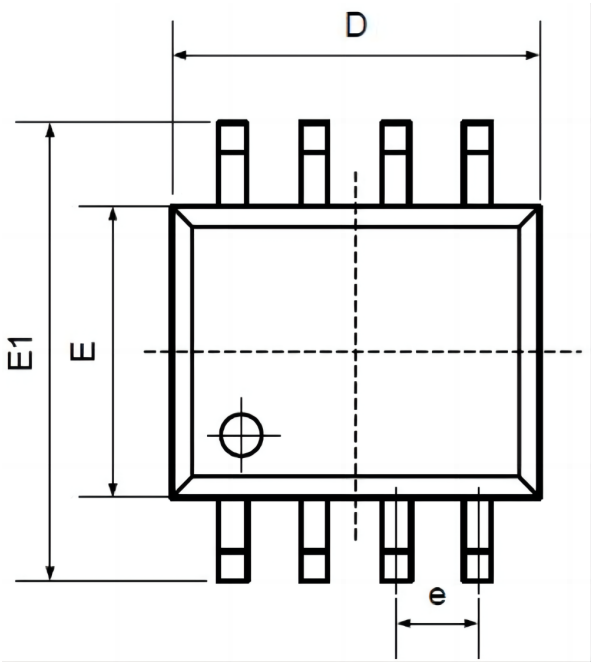
ORDERING INFORMATION

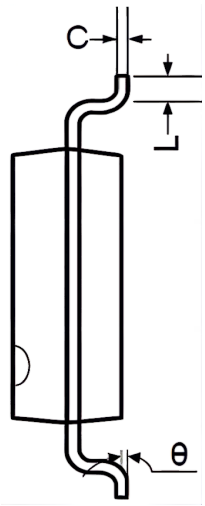
Order Number	Package	Package Quantity	Marking On The park	Temperature
ISL3259EIBZ-T-TUDI	SOP8	Tape,Reel,2500	3259EIBZ	-40℃ to +85℃
ISL3259EIUZ-T-TUDI	MSOP8	Tape,Reel,2500	3259Z	

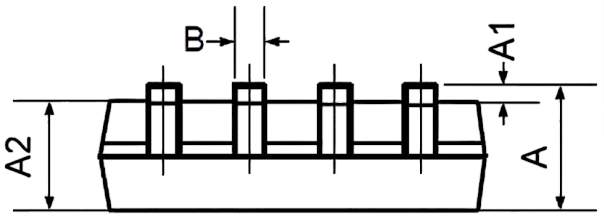
Revision history

	Date	Revision	Page
V1.0	2020/1	New	1-9
V1.1	2025-4	Update model and PDF template	1-17

Package SOP8

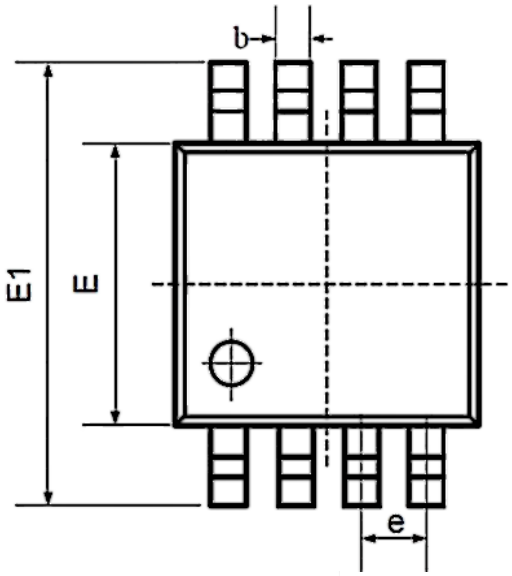


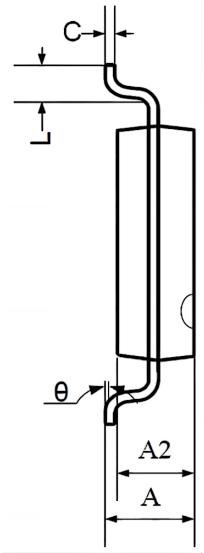


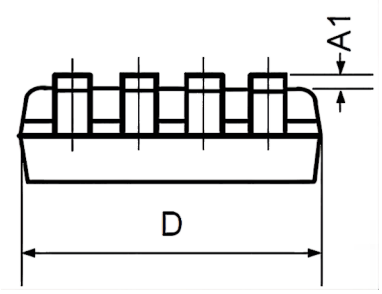


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP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

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