

## 3.3V LVDS High-Speed Differential Line Driver and Receiver

### Features

- Signaling Rates >660 Mbps (330 MHz)
- Single 3.3V Power Supply Design
- Driver:
  - $\pm 350\text{mV}$  Differential Swing into a 100-ohm load
  - Propagation Delay of 1.5ns Typ.
  - Low Voltage TTL (LVTTL) Inputs are 5V Tolerant
- Receiver:
  - Accepts  $\pm 50\text{mV}$  (min.) Differential Swing with up to 2.0V ground potential difference
  - Propagation Delay of 3.3ns Typ.
  - Low Voltage TTL (LVTTL) Outputs
  - Open, Short, and Terminated Fail Safe
- Industrial Temperature Operating Range:  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$
- Meets or Exceeds IEEE 1596.3 SCI Standard
- Meets or Exceeds ANSI/TIA/EIA-644 LVDS Standard
- Bus terminal ESD = 2KV HBM
- Packaging (Pb-free & Green available):
  - 8-pin SOIC or MSOP

### Description

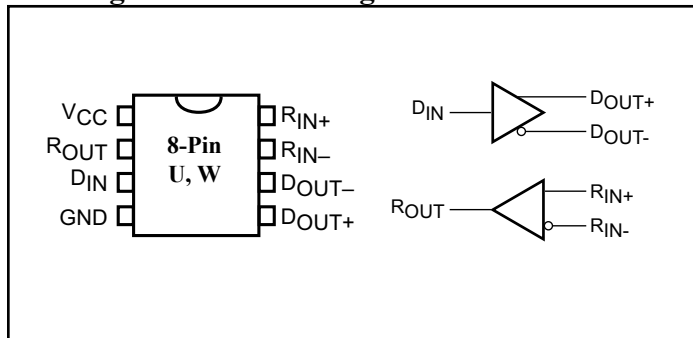
The PI90LV179 is a differential line driver and receiver (transceiver) that is compliant with the IEEE 1596.3 SCI and ANSI/TIA/EIA-644 LVDS standards. This device uses low-voltage differential signaling (LVDS) to achieve data rates in excess of 660 Mbps while being less susceptible to noise than single-ended transmission.

The driver translates a low-voltage TTL/CMOS input into a low-voltage (350mV typical) differential output signal. The receiver translates a differential 350mV input signal to a 3V CMOS output level.

### Applications

Applications include point-to-point and multidrop baseband data transmission over a controlled impedance media of approximately 100 ohms. These include intra-system connections via printed circuit board traces or cables, hubs and routers for data communications; PBXs, switches, repeaters and base stations for telecommunications and other applications such as digital cameras, printers and copiers.

### Pin Diagram & Block Diagram



## Function Tables

### PI90LV179 Receiver

Inputs	Output
$V_{ID} = V_{RIN+} - V_{RIN-}$	H
$V_{ID} \geq 50mV$	H
$-50mV < V_{ID} < 50mV$	?
$V_{ID} \leq -50mV$	L
open	H

### PI90LV179 Driver

Input	Output	
$D_{IN}$	$D_{OUT+}$	$D_{OUT-}$
L	L	H
H	H	L
open	L	H

**Notes:**

H = High Level, L = Low Level, ? = Indeterminate,  
Z = High-Impedance, X = Don't Care

## Pin Descriptions

Pin Name	Description
$D_{IN}$	TTL/CMOS driver input pin
$D_{OUT+}$	Non-inverting driver output pin
$D_{OUT-}$	Inverting driver output pin
$R_{OUT}$	TTL/CMOS receiver output pin
$R_{IN+}$	Non-inverting receiver input pin
$R_{IN-}$	Inverting receiver input pin
GND	Ground pin
$V_{CC}$	Positive power supply pin, +3.3V ±10%

### Absolute Maximum Ratings

Supply Voltage ( $V_{CC}$ ).....	-0.5V to +4.0V
Driver	
Input Voltage ( $D_{IN}$ ) .....	-0.3V to ( $V_{CC} + 0.3V$ )
Output Voltage ( $D_{OUT+}$ , $D_{OUT-}$ ).....	-0.3V to +3.9V
Short Circuit Duration ( $D_{OUT+}$ , $D_{OUT-}$ ).....	Continuous
Receiver	
Input Voltage ( $R_{IN+}$ , $R_{IN-}$ ) .....	-0.3V to +3.9V
Output Voltage ( $R_{OUT}$ ) .....	-0.3V to ( $V_{CC} + 0.3V$ )
Storage Temperature Range .....	-65°C to +150°C
ESD Rating.....	2kV HBM

**Note:** Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

### Recommended Operating Conditions

	Min.	Typ.	Max.	Units
Supply Voltage ( $V_{CC}$ )	3	3.3	3.6	V
High Level Input Voltage, $V_{IH}$	2			
Low Level Input Voltage, $V_{IL}$			0.8	
Magnitude of Differential Input Voltage $V_{ID}$	0.1		0.6	
Common-mode Input Voltage, $V_{IC}$ (Fig 5)	$ V_{ID} /2$		2.4 $- V_{ID} /2$	
			$V_{CC} - 0.8$	
Operating Free Air Temperature $T_A$	-40		85	°C

### Electrical Characteristics (Over recommended operating conditions unless otherwise noted).

Parameter	Test Condition	Min.	Typ. <sup>(1)</sup>	Max.	Units
$I_{CC}^{(2)}$ Supply Current	No receiver load, Driver $R_L = 100$ ohms		8.0	10.8	mA

**Notes:**

- All typical values are at 25°C with a 3.3V supply
- $I_{CC}$  measured with all TTL input.  $V_{IN} = V_{CC}$  or GND.

### Electrical Characteristics (Over recommended operating conditions unless otherwise noted).

Parameter		Test Conditions	Min.	Typ.	Max.	Units
$ V_{OD} $	Differential output voltage magnitude	$R_L = 100$ ohms See Figures 1 and 2	247	390	470	mV
$\Delta V_{OD} $	Change in differential output voltage magnitude between logic states		-50		50	
$V_{OC(SS)}$	Steady-state common-mode output voltage	See Figure 3	1.125	1.25	1.375	V
$\Delta V_{OC(SS)}$	Change in steady-state common-mode output voltage between logic states		-50		50	mV
$V_{OC(PP)}$	Peak-to-peak common-mode output voltage			50	150	

Parameter		Test Conditions	Min.	Typ.	Max.	Units	
$I_{IH}$	High-level input current	$D_{IN}$	$V_{IH} = 5V$		2	20	$\mu A$
$I_{IL}$	Low-level input current	$D_{IN}$	$V_{IL} = 0.8V$		2	10	
$I_{OS}$	Short-circuit output current		$V_{OY}$ or $V_{OZ} = 0V$		-6	-9	$mA$
			$V_{OD} = 0V$		-8	-11	
$I_{O(OFF)}$	Power-off output current		$V_{CC} = 0V, V_O = 3.6V$			$\pm 1$	$\mu A$
$C_{IN}$	Input capacitance			7		$pF$	

**Receiver Electrical Characteristics** (Over recommended operating conditions unless otherwise noted).

Parameter		Test Conditions	Min.	Typ.	Max.	Units
$V_{ITH+}$	Positive-going differential input voltage threshold	See Figures 4 & Table 1			50	$mV$
$V_{ITH-}$	Negative-going differential input voltage threshold		-50			
$V_{OH}$	High-level output voltage	$I_{OH} = -8mA$	2.4			$V$
$V_{OL}$	Low-level output voltage	$I_{OL} = 8mA$			0.4	$V$
$I_I$	Input current ( $R_{IN+}$ or $R_{IN-}$ )	$V_I = 0$	-2	-11	-20	$\mu A$
		$V_I = 2.4V$	-1.2	-3		
$I_{I(OFF)}$	Power-off input current ( $R_{IN+}$ or $R_{IN-}$ )	$V_{CC} = 0$			$\pm 20$	
$I_{IH}$	High-level input current (enables)	$V_{IH} = 2V$			$\pm 10$	
$I_L$	Low-level input current (enables)	$V_{IL} = 0.8V$			$\pm 10$	
$C_I$	Input capacitance			5		$pF$

**Note:** All typical values are at 25°C with a 3.3V supply

**Driver Switching Characteristics** (Over recommended operating conditions unless otherwise noted).

Parameter		Test Conditions	Min.	Typ. <sup>(1)</sup>	Max.	Units
$t_{PLH}$	Propagation delay time, low-to-high-level output	$R_L = 100$ ohms $C_L = 10$ pF See Figure 2		1.9	2.5	ns
$t_{PHL}$	Propagation delay time, high-to-low-level output			1.9	2.5	
$t_r$	Differential output signal rise time			0.6	1.1	
$t_f$	Differential output signal fall time			0.6	1.1	
$t_{sk(p)}$	Pulse skew ( $t_{PHL} - t_{PLH}$ )			270		ps
$t_{sk(pp)}$	Part-part-part skew <sup>(2)</sup>				0.9	ns

**Notes:**

1. All typical values are at 25°C with a 3.3V supply.
2.  $t_{sk(pp)}$ : magnitude of difference in propagation delay times between any specific terminals of two devices (all things being equal).

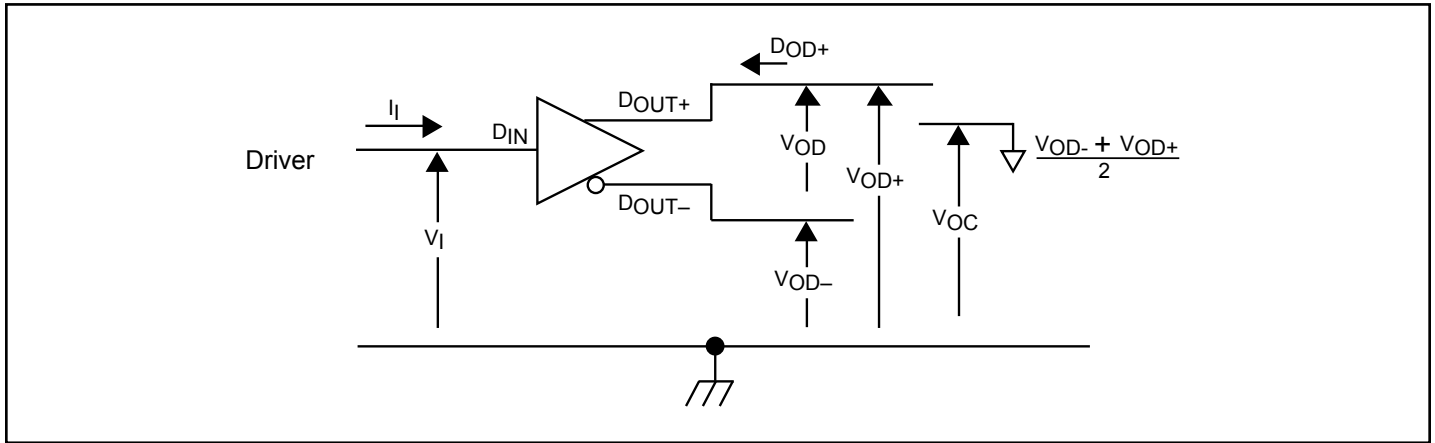
**Receiver Switching Characteristics** (Over recommended operating conditions unless otherwise noted).

Parameter		Test Conditions	Min.	Typ. <sup>(1)</sup>	Max.	Units
$t_{PLH}$	Propagation delay time, low-to-high-level output	$C_L = 10$ pF See Figure 5		2.0	3.1	ns
$t_{PHL}$	Propagation delay time, high-to-low-level output			2.2	3.1	
$t_{sk(pp)}^{(2)}$	Part-part-part skew <sup>(2)</sup>				1.3	
$t_{sk(p)}$	Pulse skew ( $t_{PHL} - t_{PLH}$ )			300	500	ps
$t_r$	Output signal rise time			0.9	1.5	ns
$t_f$	Output signal fall time			1.0	1.8	ns

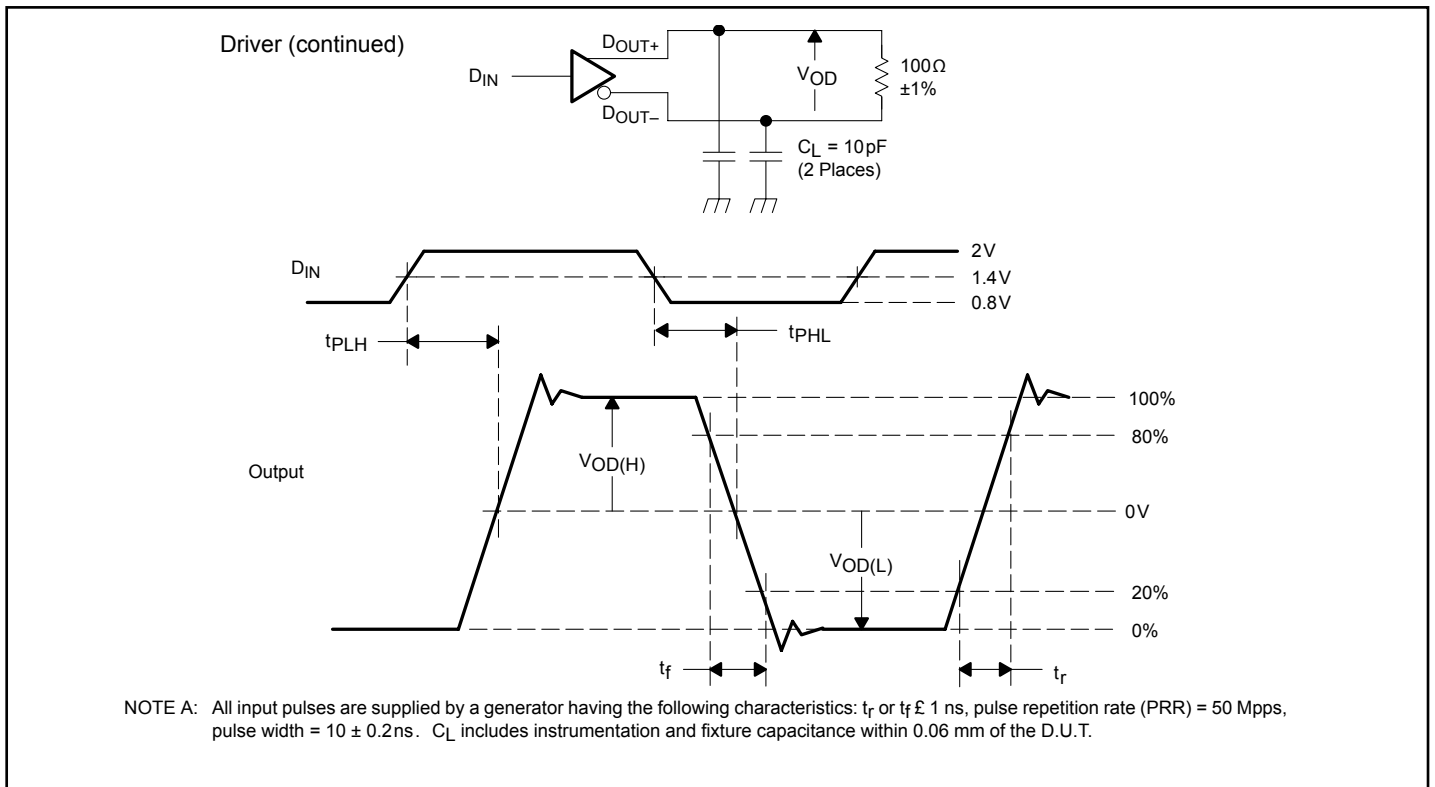
**Notes:**

1. All typical values are at 25°C with a 3.3V supply
2.  $t_{sk(pp)}$ : magnitude of difference in propagation delay times between any specific terminals of two devices (all things being equal)

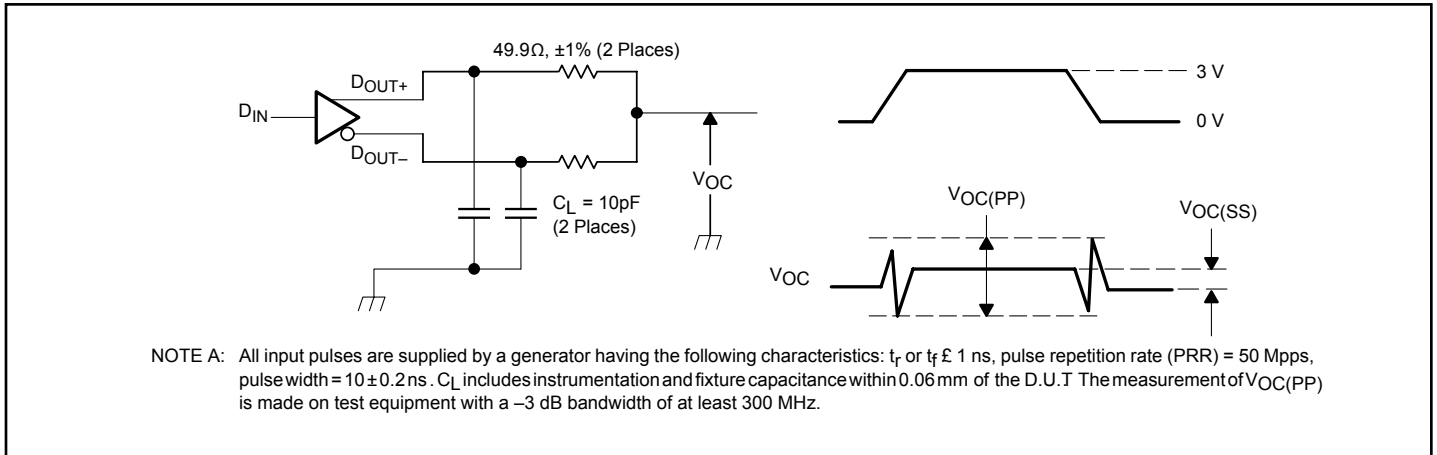
**Parameter Measurement Information**



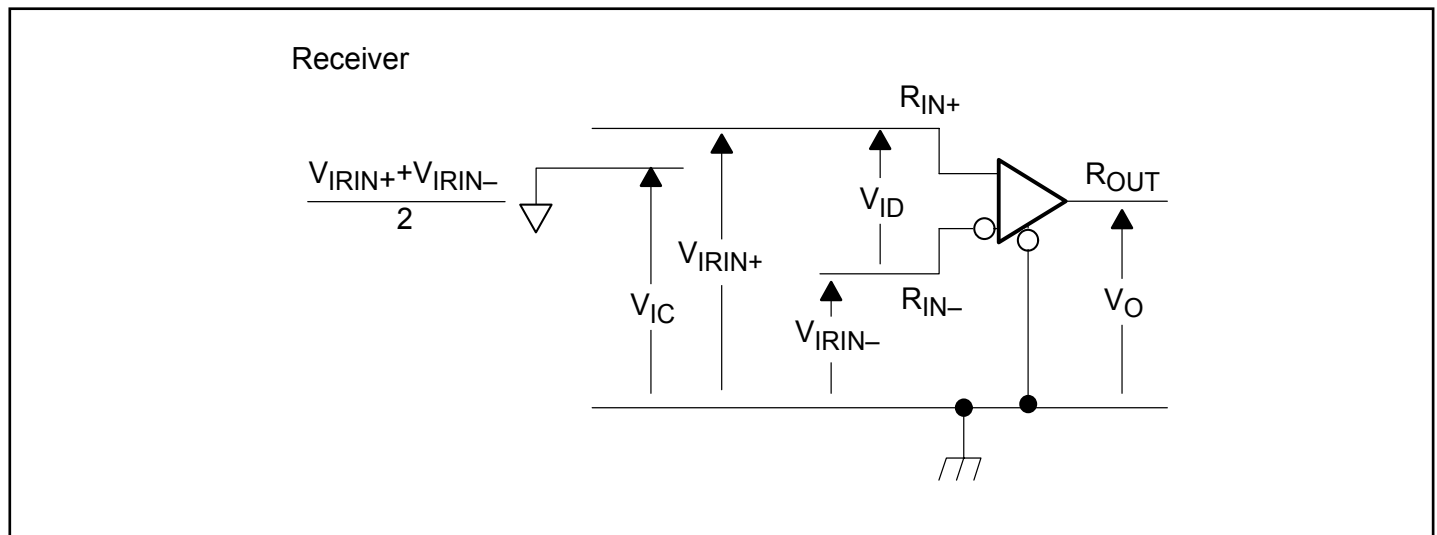
**Figure 1. Driver Voltage and Current Definitions**



**Figure 2. Test Circuit, Timing, and Voltage Definitions for the Differential Output Signal**



**Figure 3. Test Circuit and Definitions for the Driver Common-Mode Output Voltage**

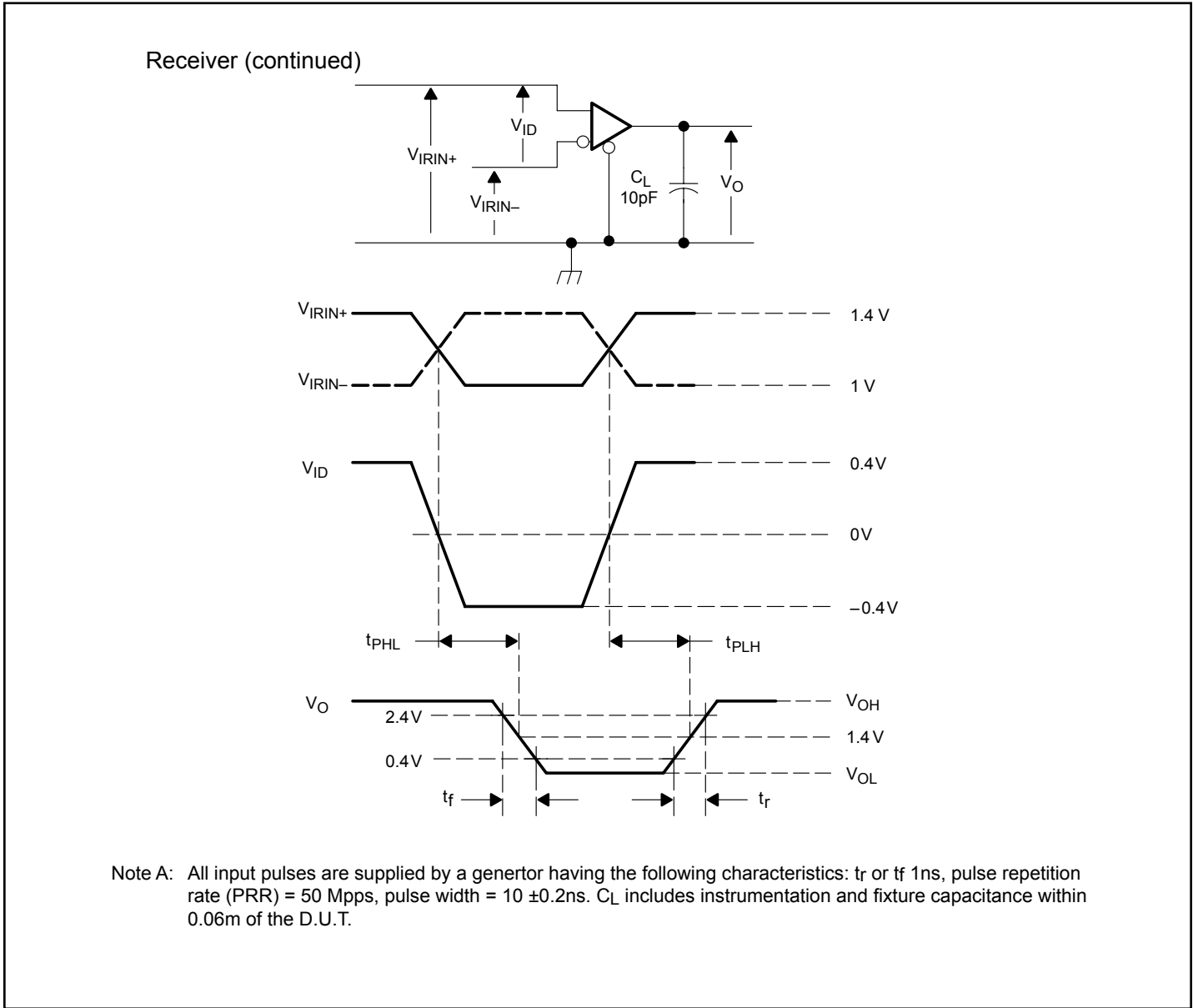


**Figure 4. Receiver Voltage Definitions**

**Table 1. Receiver Minimum and Maximum Input Threshold Test Voltages**

APPLIED VOLTAGES (V)		RESULTING DIFFERENTIAL INPUT VOLTAGE (mV)	RESULTING COMMON-MODE INPUT VOLTAGE (V)
$V_{IRIN+}$	$V_{IRIN+}$	$V_{ID}$	$V_{IC}$
1.225	1.175	50	1.2
1.175	1.225	-50	1.2
2.375	2.325	50	2.35
2.325	2.375	-50	2.35
0.1	0	50	0.05
0	0.05	-50	0.05
1.5	0.9	600	1.2
0.9	1.5	-600	1.2
2.4	1.8	600	2.1
1.8	2.4	-600	2.1
0.6	0	600	0.3
0	0.6	-600	0.3





**Figure 5. Timing Test Circuit and Waveforms**

**Packaging Mechanical: 8-Pin SOIC (W)**

SYMBOLS	MIN.	NOM.	MAX.
A	—	—	1.75
A1	0.10	—	0.25
A2	1.25	—	—
b	0.31	—	0.51
c	0.10	—	0.25
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
L	0.40	—	1.27
h	0.25	—	0.50
$\theta^\circ$	0	—	8

UNIT : mm

**NOTE :**  
 1. ALL DIMENSIONS ARE IN mm. ANGLES IN DEGREES  
 2. DIMENSIONS EXCLUDE BURRS, MOLD FLASH OR PROTRUSIONS  
 3. REFER JEDEC MS-012

		DATE: 02/21/14
DESCRIPTION: 8-Pin, 150mil-Wide, SOIC		
PACKAGE CODE: W (W8)		
DOCUMENT CONTROL #: PD-1001	REVISION: G	

15-0103

**Packaging Mechanical: 8-Pin MSOP (U)**

PKG. DIMENSIONS(MM)		
SYMBOL	Min.	Max.
A	—	1.10
A1	0.00	0.15
A2	0.75	0.95
b	0.22	0.38
c	0.08	0.23
D	2.90	3.10
E	2.90	3.10
E1	4.65	5.15
e	0.65 BSC	
L	0.40	0.80
θ	0°	8°

<p><b>NOTE:</b></p> <p>1. ALL DIMENSIONS ARE IN MILLIMETERS.</p> <p>2. REFER JEDEC MO-187E/AA</p> <p>3. PACKAGE OUTLINE DIMENSIONS DO NOT INCLUDE MOLD FLASH AND METAL BURR.</p>	<div style="text-align: right;">DATE: 10/20/14</div> <p><b>DESCRIPTION:</b> 8-Pin, Mini Small Outline Package, MSOP</p> <p><b>PACKAGE CODE:</b> U (U8)</p> <p><b>DOCUMENT CONTROL #:</b> PD-1261</p> <div style="text-align: right;"><b>REVISION:</b> E</div>
--	---

Note: For latest package info, please check: <http://www.pericom.com/support/packaging/packaging-mechanicals-and-thermal-characteristics/>

**Ordering Information**

Ordering Number	Package Code	Package Description
PI90LV179WE	W	8-Pin, 150mil-Wide (SOIC)
PI90LV179WEX	W	8-Pin, 150mil-Wide (SOIC), Tape & Reel
PI90LV179UE	U	8-Pin, Mini Small Outline Package (MSOP)
PI90LV179UEX	U	8-Pin, Mini Small Outline Package (MSOP), Tape & Reel

**Notes:**

- Thermal characteristics can be found on the company web site at [www.pericom.com/packaging/](http://www.pericom.com/packaging/)
- E = Pb-free and Green
- X suffix = Tape/Reel