

PI90LV01/PI90LVB01

SOTiny LVDS High-Speed Differential Line Driver

Features

- Meets or Exceeds ANSI TIA/EIA-644-1955 Standard
- Signaling rates up to 660 Mbps
- Bus-Terminal ESD exceeds 2kV
- Low-Voltage Differential Signaling with typical Output Voltages of 350mV:
 - 100-ohm load (PI90LV01)
 - 50-ohm load (PI90LVB01)
- Typical Propagation Delay Times of 1.5ns
- Typical Power Dissipation of 20mW @200 MHz
- Low-Voltage TTL (LVTTTL) Level is 5V Tolerant
- Operates from a 3.3V supply
- Extended Industrial Temperature Operating Range: -40°C to 105°C
- Packaging (Pb-free & Green available):
 - 5-pin space-saving SOT23 (T)

Description

The PI90LV01 and PI90LVB01 are differential line drivers that use low-voltage differential signaling (LVDS) to support data rates up to 660 Mbps. These products are designed for applications requiring high-speed, low-power consumption, low-noise generation, and a small package.

The TIA/EIA-644 standard compliant electrical interface provides a minimum differential output voltage magnitude of 247mV into a 100-ohm load and receipt of 100mV signals with up to 1V of ground potential difference between a transmitter and receiver. The PI90LVB01 doubles the output drive current to achieve LVDS levels with a 50-ohm load.

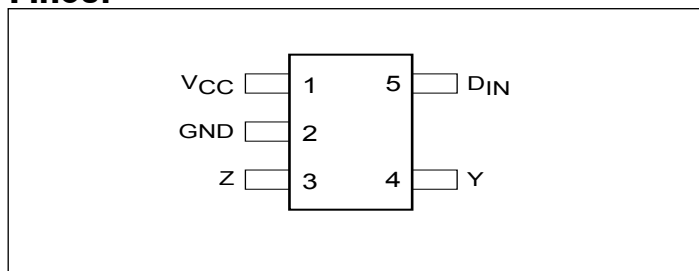
A low-voltage TTL/CMOS input level is translated by the device into a low-voltage (350mV) differential output signal.

Applications

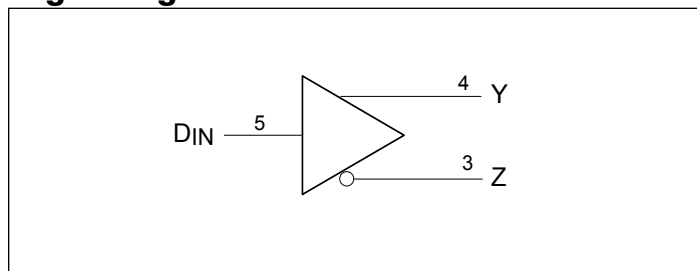
Applications include point-to-point (single termination) and multi-point (double termination) baseband data transmissions over controlled impedance media. The transmission media can be printed circuit board traces, backplanes, or cables.

The PI90LV01 and companion line receivers (PI90LV02 and PI90LVT02) provide new alternatives to RS-232, PECL and ECL devices for high-speed, point-to-point interface applications.

Pinout



Logic Diagram



Function Table

Inputs	Outputs	
D_{IN}	Y	Z
H	H	L
L	L	H
Open	L	H

Notes:

- H = High
- L = Low
- X = High or Low
- High Z = High Impedance

Absolute Maximum Ratings

(Over Operating Free-Air Temperature, unless otherwise noted)[†]

Supply Voltage Range, VCC(1).....	-0.5V to 4V
Input Voltage Range (DIN)	-0.5 to 6V
(Y or Z)	-0.5 to 4V
ESD Rating (HBM, 1.5K-Ohms, 100pF).....	≥ 2KV
Continuous total power dissipation.....	See dissipation rating table
Storage Temperature Range	-65°C to 150°C
Lead Temperature 1.6 mm (1/16 inch) from case for 10 seconds ..	250°C

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.

1. All voltage values, except differential I/O bus voltages, are with respect to ground terminal.

Dissipation Rating Table

Package	T _A ≤ 25°C Power Rating	Derating Factor Above T _A = 25°C*	T _A = 85°C Power Rating
T	385mW	3.1mW/°C	200mW

*This is the inverse of the junction-to-ambient thermal resistance when board-mounted (low-K) and with no air flow.

Recommended Operating Conditions

	Min.	Nom.	Max.	Units
Supply Voltage, V _{CC}	3.0	3.3	3.6	V
High-Level Input Voltage, V _{IH}	2		3.8	
Low-Level Input Voltage, V _{IL}			0.8	
Operating free-air temperature, T _A	-40		105	°C

PI90LV01/PI90LVB01
Electrical Characteristics (Over Operating Free-Air Temperature, unless otherwise noted)

Symbol	Parameter	Test Conditions		Min.	Typ. ⁽¹⁾	Max.	Units
$ V_{OD} $	Differential output voltage magnitude	$R_L = 100\text{ ohms ('LV01)}$ $R_L = 50\text{ ohms ('LVB01)}$ See Figure 1		247	350	454	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 2		1.125		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				25	100	
I_{CC}	Supply current	$V_I = 0V$ or V_{CC} , No Load			2	5.5	mA
		$V_I = 0V$ or V_{CC} , $R_L = 100\text{ ohms ('LV01)}$			5.5	8	
		$V_I = 0V$ or V_{CC} , $R_L = 50\text{ ohms ('LVB01)}$			7.0	14	
I_{IH}	High-level input current	$V_{IH} = 5V$			2	20	μA
I_{IL}	Low-level input current	$V_{IL} = 0.8V$			2	10	
I_{OS}	Short-circuit output current	V_{ODOUT+} or $V_{ODOUT-} = 0V$	LV		3	10	mA
			LVB		6	20	
		$V_{OD} = 0V$	LV			10	
			LVB			20	
$I_{O(OFF)}$	Power-off output current	$V_{CC} = 0V$, $V_O = 3.6V$				± 1	μA
C_{IN}	Input capacitance				3		pF

Note:

1. All typical values are at 25°C and with a 3.3V

PI90LV01/PI90LVB01
Switching Characteristics, $V_{CC} = 3V$ to $3.6V$ (Over Operating Free-Air Temperature, unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ. ⁽¹⁾	Max.	Units
t_{PLH}	Propagation delay time, low-to-high level output	PI90LV01, $R_L = 100\text{-ohms}$, $C_L = 10\text{pF}$ PI90LVB01, $R_L = 50\text{-ohms}$, $C_L = 10\text{pF}$ See Figure 3		1.5	2.7	ns
t_{PHL}	Propagation delay time, high-to-low level output			1.8	2.7	
t_r	Transition, low-to-high (PI90LV01)			0.6	1.5	
	Transition, low-to-high (PI90LVB01)			0.5	1.4	
t_f	Transition, high-to-low (PI90LV01)			0.7	1.5	
	Transition, high-to-low (PI90LVB01)			0.6	1.4	
$t_{sk(p)}$	Pulse skew ($ t_{PHL} - t_{PLH} $) ⁽²⁾			0.3	-	

Notes:

1. All typical values are at 25°C and with a 3.3V supply
2. $t_{sk(p)}$ is the magnitude of the time difference between the high-to-low and low-to-high propagation delay times at an output
3. f_{max} generator input conditions: 50% duty cycle, 0V to 3V. Output criteria: 45% to 55% duty cycle, $V_{OD} = 250\text{mV}$

Parameter Measurement Information

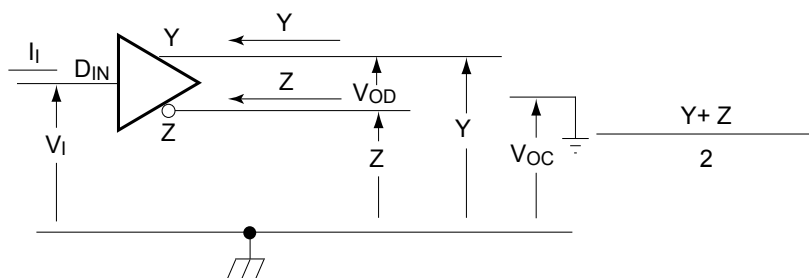


Figure 1. Driver Voltage and Current Definitions

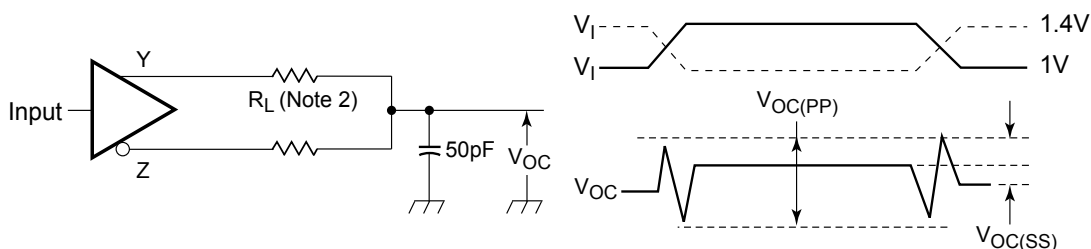
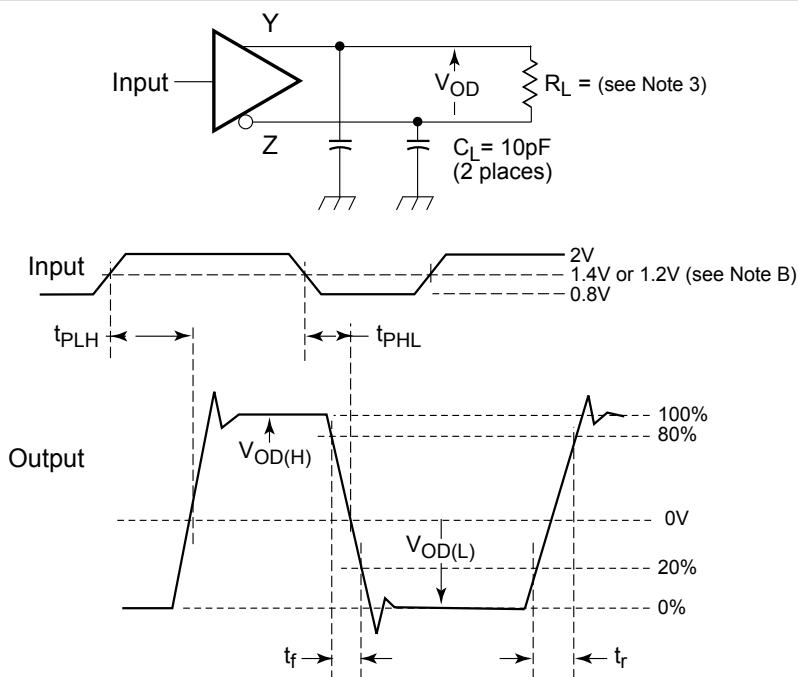


Figure 2. Test Circuit and Definitions for the Driver Common-Mode Output Voltage

Note:

1. All input pulses are supplied by a generator having the following characteristics: t_r or $t_f \leq 1\text{ns}$, Pulse Repetition Rate (PRR) = 0.5 Mpps, Pulse width = $500 \pm 10\text{ns}$. C_L includes instrumentation and fixture capacitance within 0.06mm of the D.U.T. The measurement of $V_{OC(PP)}$ is made on test equipment with a -3dB bandwidth of at least 300MHz.
2. $R_L = 49.9\text{ ohms} \pm 1\%$ for PI90LV01 or $24.9\text{ ohms} \pm 1\%$ for PI90LVB01.

Parameter Measurement Information



Note:

1. All input pulses are supplied by a generator having the following characteristics: t_r or $t_f \leq 1\text{ns}$, Pulse Repetition Rate (PRR) = 50 Mpps, Pulse width = $10 \pm 0.2\text{ns}$. CL includes instrumentation and fixture capacitance within 0.06m of the D.U.T.
2. This point is 1.4V with $V_{CC} = 3.3\text{V}$
3. $R_L = 100\text{ ohms}$ for PI90LV01 or $50\text{ ohms} \pm 1\%$ for PI90LVB01.

Figure 3. Test Circuit, Timing, & Voltage Definitions for the Differential Output Signal

PI90LV01/PI90LVB01

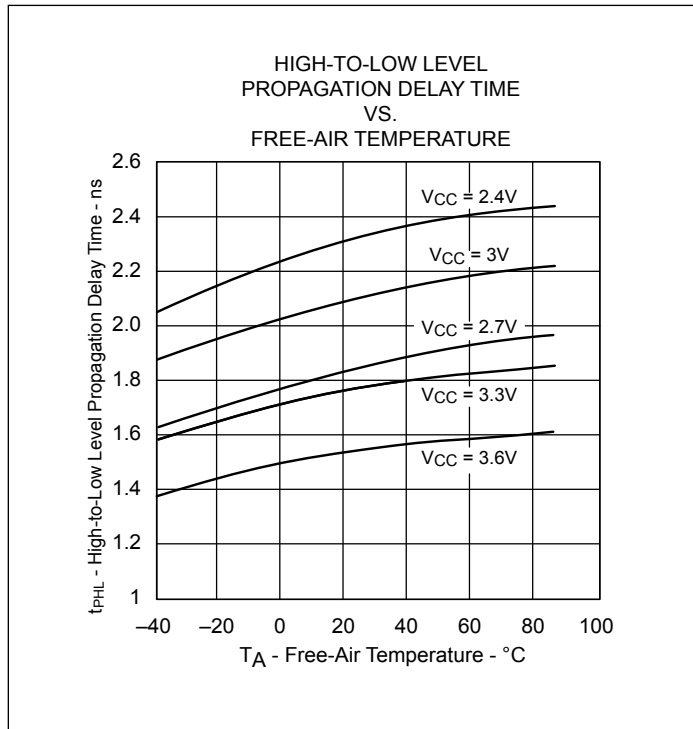


Figure 4.

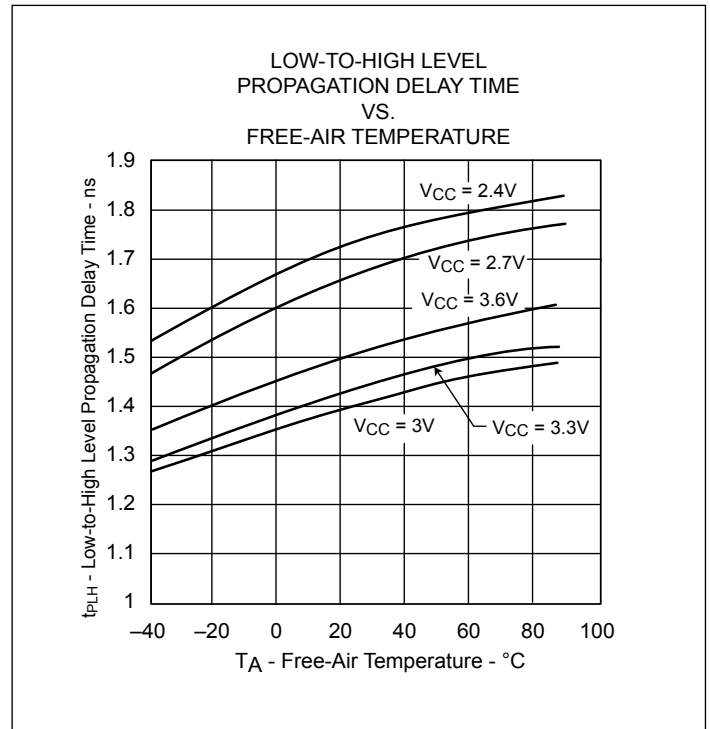
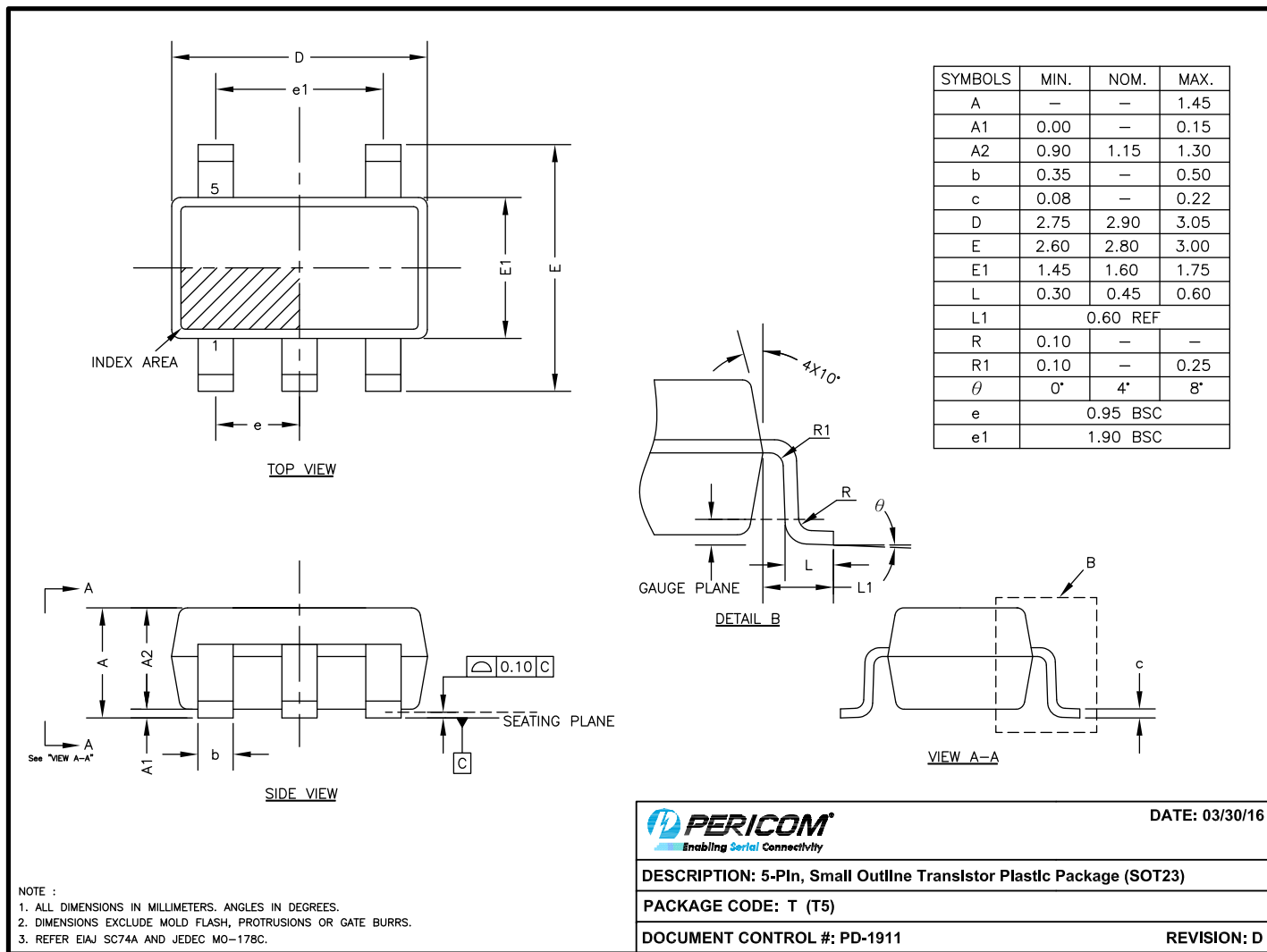


Figure 5.

PI90LV01/PI90LVB01
Packaging Mechanical: 5-Pin SOT23 (T)


For latest package info.

please check: <http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/>

Ordering Information

Ordering Number	Package Code	Package Description	Top Marking
PI90LV01TEX	T	5-Pin, Small Outline Transistor Plastic Package (SOT23)	$\bar{L}1$
PI90LVB01TEX	T	5-Pin, Small Outline Transistor Plastic Package (SOT23)	$\bar{L}2$

Notes:

- Thermal characteristics can be found on the company web site at www.diodes.com/design/support/packaging/
- E = Pb-free and Green
- X suffix = Tape/Reel

IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.

Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and definitive format released by Diodes Incorporated.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2016, Diodes Incorporated
www.diodes.com