4-bit LVTTL to GTL transceiver

Features

- Operates as a 4-bit GTL – /GTL/GTL+ sampling receiver or as a LVTTL to GTL – /GTL/GTL+ driver
- 2.3 V to 3.6 V operation with 5 V tolerant LVTTL input
- GTL input and output 3.6 V tolerant
- Vref adjustable from 0.5 V to VCC/2
- Partial power-down permitted
- ESD protection exceeds 2000 V HBM per JESD22-A114 and 1000 V CDM per JESD22-CC101
- Latch-up protection exceeds 200 mA per JESD78
- Package offered: TSSOP14

Description

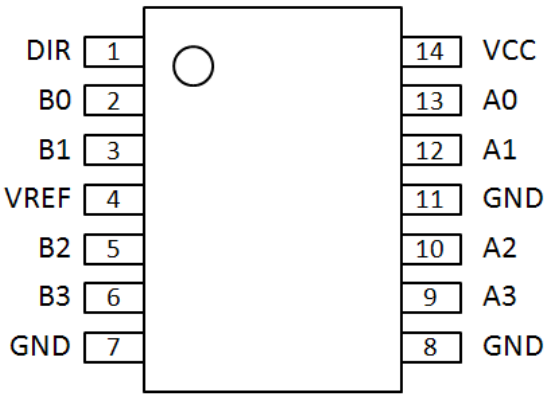
The PI4GTL2014 is a 4-bit translating transceiver designed for 3.3 V LVTTL system interface with a GTL – /GTL/GTL+ bus, where GTL – /GTL/GTL+ refers to the reference voltage of the GTL bus and the input/output voltage thresholds associated with it.

The direction pin allows the part to function as either a GTL to LVTTL sampling receiver or as a LVTTL to GTL interface.

The PI4GTL2014 LVTTL inputs (only) are tolerant up to 5.5 V allowing direct access to TTL or 5 V CMOS inputs. The LVTTL outputs are not 5.5 V tolerant.

The PI4GTL2014 GTL inputs and outputs operate up to 3.6 V, allowing the device to be used in higher voltage open-drain output applications.

Pin Configuration



Pin Description

Pin Name	Pin#	Description
DIR	1	Direction control input (LVTTL)
B0	2	Data inputs/outputs (GTL)
B1	3	
B2	5	
B3	6	
A0	13	Data inputs/outputs (LVTTL)
A1	12	
A2	10	
A3	9	
VREF	4	GTL reference voltage
GND	7,8,11	Ground (0 V)
VCC	14	Positive supply voltage

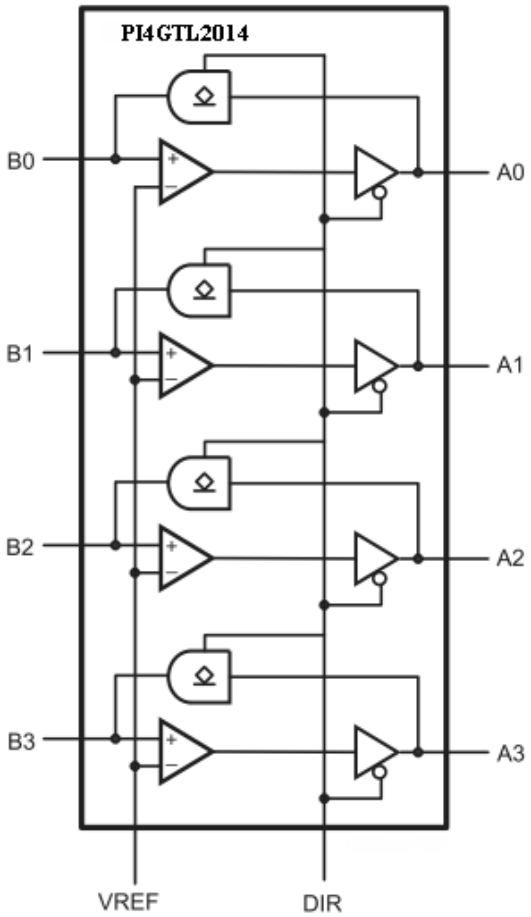
Maximum Ratings

Power supply	-0.5V to +4.6V
Voltage on an I/O pin	GND-0.5V to +7.0V
Supply current	±160mA
Ground supply current	400mA
Total power dissipation	200mW
Operation temperature	-40~85℃
Storage temperature	-65~150℃
Maximum Junction temperature ,T j(max)	125℃
Total power dissipation	200mW

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.

PI4GTL2014 Block Diagram

Figure 1: Block diagram



Function Table:
H = HIGH voltage level; L = LOW voltage level.

DIR	A (LVTTL)	B (GTL)
H	Input	Output
L	Output	Input

Limiting Values

Symbol	Parameter	Conditions	Min.	Max.	Unit
VCC	Supply voltage		−0.5	4.6	V
I_{IK}	Input clamping current	VI <0V	-	−50	mA
V_I	Input voltage	A port	−0.5[1]	7	V
		B port	−0.5[1]	4.6	V
I_{OK}	Output clamping current	A port; VO <0V	-	−50	mA
V_O	Output voltage	Output in OFF or HIGH state			
		A port	−0.5[1]	7	V
		B port	−0.5[1]	4.6	V
I_{OL}	LOW-level output current	Current into any output in the LOW state			
		A port	-	32	mA
		B port	-	80	mA
I_{OH}	HIGH-level output current	Current into any output in the HIGH state; A port	-	−32	mA
Tstg	Storage temperature		[2] −60	150	°C

Note:
[1] The input and output negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.
[2] The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150 °C.

Operating Conditions [1]

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
VCC	Supply voltage		2.3	-	3.6	V
V_{TT}	Termination voltage[2]	Lowest voltage	0.71	0.75	0.79	V
		GTL−	0.85	0.9	0.95	V
		GTL	1.14	1.2	1.26	V
		GTL+	1.35	1.5	1.65	V
Vref	Reference voltage	overall	0.43	$2/3V_{TT}$	VCC/2	V
		Lowest voltage	0.43	0.5	0.55	
		GTL−	0.5	0.6	0.63	V
		GTL	0.76	0.8	0.84	V
		GTL+	0.87	1	1.1	V
VI	Input voltage	B port	0	V_{TT}	3.6	V
		except B port	0	3.3	5.5[3]	V
VIH	HIGH-level input voltage	B port	Vref + 0.050	-	-	V
		except B port VCC=3.3V	2	-	-	V
		except B port VCC=2.5V	1.7			V
VIL	LOW-level input voltage	B port	-	-	Vref - 0.050	V
		except B port VCC=3.3V	-	-	0.8	V
		except B port VCC=2.5V			0.7	V
IOH	HIGH-level output current	A port VCC=3.3V	-	-	−16	mA
		A port VCC=2.5V			-6	mA
IOL	LOW-level output current	B port	-	-	40	mA
		A port VCC=3.3V	-	-	16	mA
		A port VCC=2.5V	-	-	12	mA
Tamb	Ambient temperature	operating in free-air	−40	-	-85	°C

Note:
[1] Unused inputs must be held HIGH or LOW to prevent them from floating.
[2] V_{TT} maximum of 3.6 V with resistor sized so IOL maximum is not exceeded.
[3] A0, A1, A2, A3 VI(max) is 3.6 V if configured as outputs (DIR = L).

Static Characteristics

Recommended operating conditions; voltages are referenced to GND (ground = 0 V). T_{amb} = −40 °C to +85 °C

Symbol	Parameter	Conditions	Min.	Typ.[1]	Max.	Unit
V_{OH}	HIGH-level output voltage	A port; VCC = 2.3 V to 3.6 V; IOH = −100 μA[2]	VCC − 0.2			V
		A port; VCC = 3.0 V; IOH = −16 mA[2]	2.0			V
		A port; VCC = 2.3 V; IOH = −6 mA[2]	1.7			V
V_{OL}	LOW-level output voltage	B port; VCC = 3.0 V; I_{OL} = 40 mA[2]		0.23	0.4	V
		B port; VCC = 2.3V; I_{OL} = 40 mA[2]		0.26	0.4	V
		A port; VCC = 3.0 V; I_{OL} =8 mA[2]		0.28	0.4	V
		A port; VCC = 3.0 V; I_{OL} =12mA[2]		0.4	0.55	V
		A port; VCC = 3.0 V; I_{OL} =16 mA[2]		0.55	0.8	V
		A port; VCC = 2.3V; I_{OL} =8 mA[2]		0.3	0.45	V
		A port; VCC = 2.3V; I_{OL} =12 mA[2]		0.47	0.7	V
I_I	Input current	control inputs; VCC = 3.6 V; V_I = VCC or GND			±1	uA
		B port; VCC = 3.6 V; V_I = V_{TT} or GND			±1	uA
		A port; VCC = 0 V or 3.6 V; V_I = 5.5 V			10	uA
		A port; VCC = 3.6 V; V_I = VCC			±1	uA
		A port; VCC = 3.6 V; V_I = 0 V			-5	uA
I_{OZ}	OFF-state output current	A port; VCC =0 V; V_I or V_O = 0 V to 3.6 V			±100	uA
I_{CC}	Quiescent supply current	A port; VCC = 3.6 V; V_I = VCC or GND; IO =0 mA		4	10	mA
		B port; VCC = 3.6 V; V_I = V_{TT} or GND; IO =0 mA		4	10	mA
ΔICC[3]	Additional quiescent current (per input)				500	uA
Ci	Input capacitance	control inputs; V_I = 3.0 V or 0V		2		pF
Cio	Input/output capacitance	A port; V_O = 3.0V or 0 V		4.6		pF
		B port; V_O = V_{TT} or 0 V		3.4		pF

Note:
[1] All typical values are measured at VCC = 3.3 V and Tamb = 25 ° C.
[2] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[3] This is the increase in supply current for each input that is at the specified TTL voltage level rather than VCC or GND.

Dynamic Characteristics

All typical values are at VCC = 3.3 V and Tamb = 25 ° C.

Symbol	Parameter	Conditions	Min.	Typ.[1]	Max.	Unit
GTL − ; Vref = 0.5V; VTT = 0.75 V						
t_{PLH}	LOW to HIGH propagation delay	An to Bn		2.1	5	ns
t_{PHL}	HIGH to LOW propagation delay	An to Bn		4.1	7	ns
t_{PLH}	LOW to HIGH propagation delay	Bn to An		6	9	ns
t_{PHL}	HIGH to LOW propagation delay	Bn to An		4.8	8	ns
GTL − ; Vref = 0.6 V; VTT = 0.9 V						
t_{PLH}	LOW to HIGH propagation delay	An to Bn		2.0	5	ns
t_{PHL}	HIGH to LOW propagation delay	An to Bn		4.2	7	ns
t_{PLH}	LOW to HIGH propagation delay	Bn to An		6	9	ns
t_{PHL}	HIGH to LOW propagation delay	Bn to An		4.8	8	ns
GTL − ; Vref = 0.8 V; VTT = 1.2 V						
t_{PLH}	LOW to HIGH propagation delay	An to Bn		2.0	5	ns
t_{PHL}	HIGH to LOW propagation delay	An to Bn		4.9	8	ns
t_{PLH}	LOW to HIGH propagation delay	Bn to An		6	9	ns
t_{PHL}	HIGH to LOW propagation delay	Bn to An		4.7	8	ns
GTL+; Vref = 1.0 V; VTT = 1.5 V						
t_{PLH}	LOW to HIGH propagation delay	An to Bn		2.0	5	ns
t_{PHL}	HIGH to LOW propagation delay	An to Bn		5.1	8	ns
t_{PLH}	LOW to HIGH propagation delay	Bn to An		6.1	9	ns
t_{PHL}	HIGH to LOW propagation delay	Bn to An		4.5	7	ns

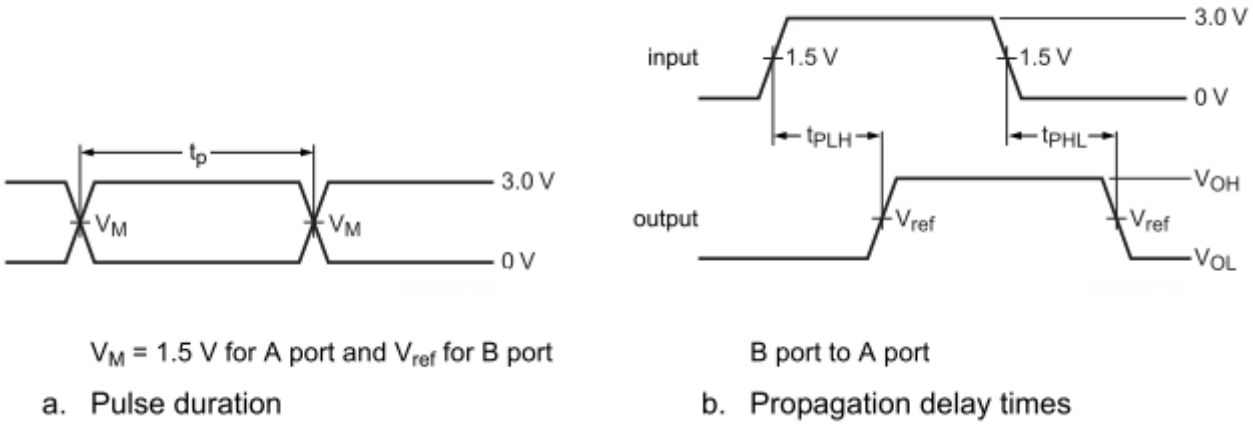
Dynamic Characteristics

All typical values are at VCC = 2.5 V and Tamb = 25 ° C.

Symbol	Parameter	Conditions	Min.	Typ.[1]	Max.	Unit
GTL − ; Vref = 0.5V; VTT = 0.75 V						
t_{PLH}	LOW to HIGH propagation delay	An to Bn		2.3	5	ns
t_{PHL}	HIGH to LOW propagation delay	An to Bn		6.5	10	ns
t_{PLH}	LOW to HIGH propagation delay	Bn to An		7.5	12	ns
t_{PHL}	HIGH to LOW propagation delay	Bn to An		5.8	9	ns
GTL − ; Vref = 0.6 V; VTT = 0.9 V						
t_{PLH}	LOW to HIGH propagation delay	An to Bn		2.3	5	ns
t_{PHL}	HIGH to LOW propagation delay	An to Bn		5.7	10	ns
t_{PLH}	LOW to HIGH propagation delay	Bn to An		7.5	12	ns
t_{PHL}	HIGH to LOW propagation delay	Bn to An		5.6	9	ns
GTL − ; Vref = 0.8 V; VTT = 1.2 V						
t_{PLH}	LOW to HIGH propagation delay	An to Bn		2.3	5	ns
t_{PHL}	HIGH to LOW propagation delay	An to Bn		7.5	12	ns
t_{PLH}	LOW to HIGH propagation delay	Bn to An		7.5	12	ns
t_{PHL}	HIGH to LOW propagation delay	Bn to An		5.6	9	ns
GTL+; Vref = 1.0 V; VTT = 1.5 V						
t_{PLH}	LOW to HIGH propagation delay	An to Bn		2.3	5	ns
t_{PHL}	HIGH to LOW propagation delay	An to Bn		8.6	12	ns
t_{PLH}	LOW to HIGH propagation delay	Bn to An		8.8	12	ns
t_{PHL}	HIGH to LOW propagation delay	Bn to An		5.6	9	ns

Waveforms

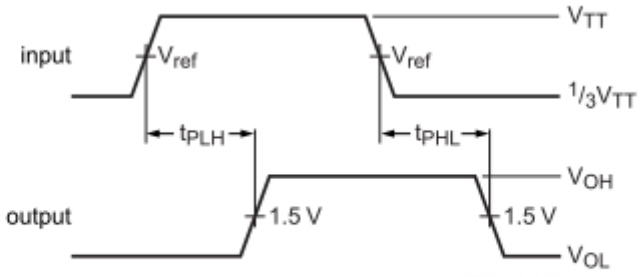
VM = 1.5 V at VCC ≥ 3.0 V; VM = VCC/2 at VCC ≤ 2.7 V for A ports and control pins;
VM = Vref for B ports.



V_M = 1.5 V for A port and V_{ref} for B port — B port to A port

a. Pulse duration — b. Propagation delay times

Fig 2. Voltage waveforms



PRR ≤ 10 MHz; Z_0 = 50 Ω; t_r ≤ 2.5 ns; t_f ≤ 2.5 ns

Fig 3. Propagation delay, Bn to An

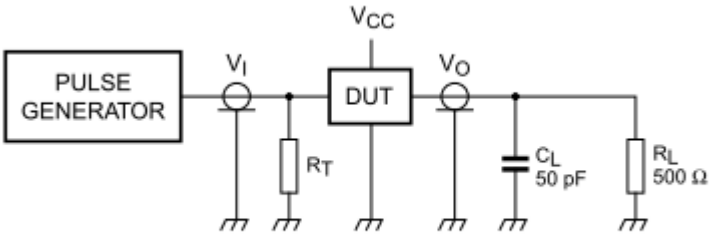


Fig 4. Load circuitry for switching times

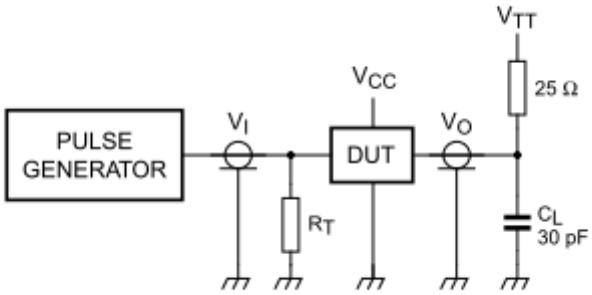


Fig 5. Load circuit for B outputs

RL — Load resistor
CL — Load capacitance; includes jig and probe capacitance
RT — Termination resistance; should be equal to output impedance of pulse generators.

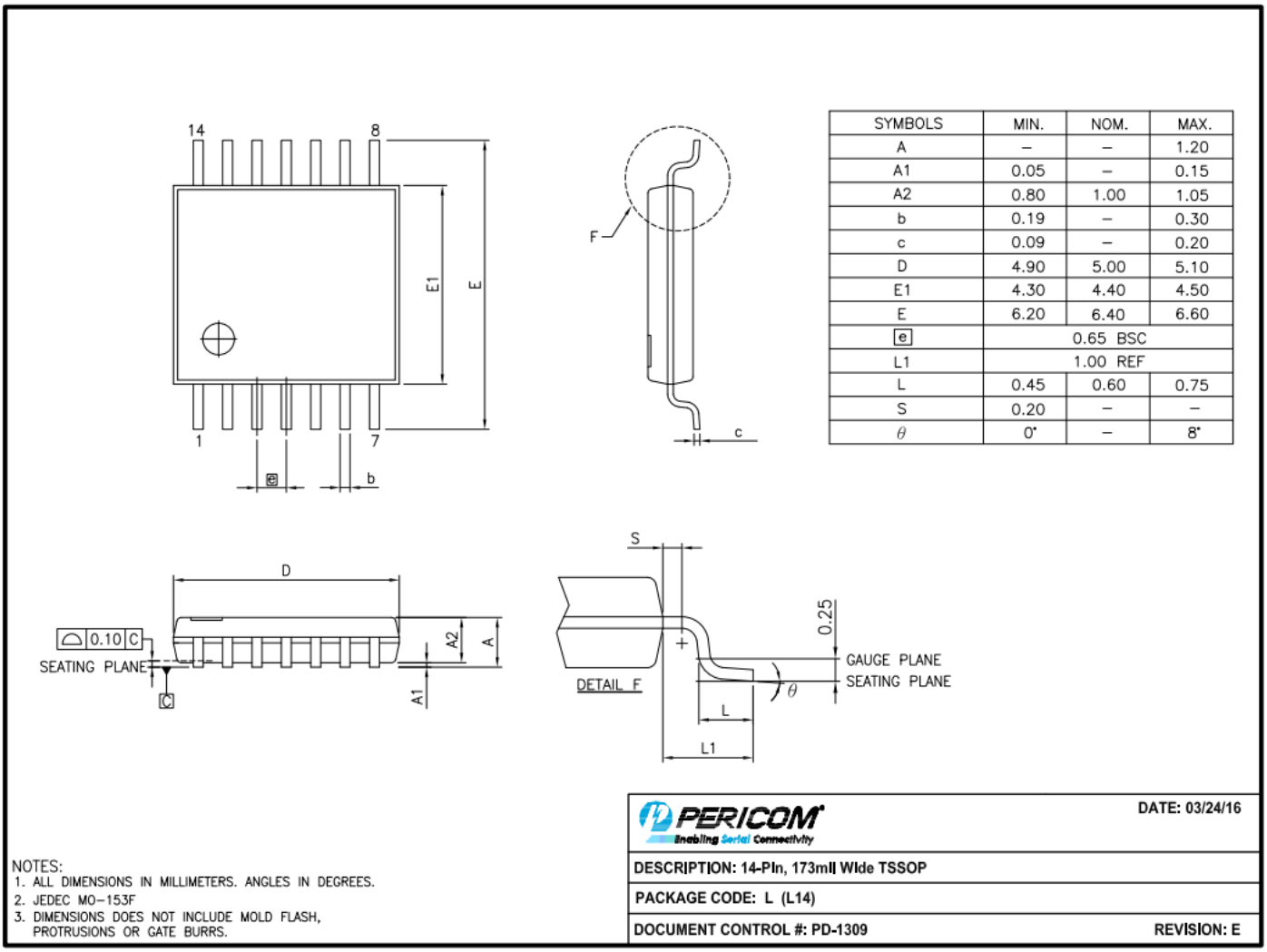
Part Marking

L Package

Z: Die Rev
YYWW: Year & Work week
1st X: Assembly Code
2nd X: Wafer Fab site Code

Package Mechanical

TSSOP-14(L)



SYMBOLS	MIN.	NOM.	MAX.
A	–	–	1.20
A1	0.05	–	0.15
A2	0.80	1.00	1.05
b	0.19	–	0.30
c	0.09	–	0.20
D	4.90	5.00	5.10
E1	4.30	4.40	4.50
E	6.20	6.40	6.60
e		0.65 BSC	
L1		1.00 REF	
L	0.45	0.60	0.75
S	0.20	–	–
θ	0°	–	8°

NOTES:
1. ALL DIMENSIONS IN MILLIMETERS. ANGLES IN DEGREES.
2. JEDEC MO-153F
3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

PERICOM Enabling Serial Connectivity — DATE: 03/24/16

DESCRIPTION: 14-Pin, 173mil Wide TSSOP

PACKAGE CODE: L (L14)

DOCUMENT CONTROL #: PD-1309 — REVISION: E

For latest package info.

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

Ordering Information

Part Number	Package Code	Package
PI4GTL2014LEX	L	14-Pin,173 mil Wide (TSSOP)

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

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