GTL2034

4-bit GTL to GTL buffer

Rev. 1.1 — 20 December 2021 Product data sheet

1 General description

The GTL2034 is a 4-bit GTL-/GTL/GTL+ bus buffer.

The GTL2034 GTL inputs and outputs operate up to 3.6 V, allowing the device to be used in higher voltage open-drain output applications.

2 Features

- Operates as a 4-bit GTL-/GTL/GTL+ to GTL-/GTL/GTL+ bus buffer
- 3.0 V to 3.6 V operation
- GTL input and output 3.6 V tolerant
- V_{ref} adjustable from 0.5 V to V_{CC} / 2
- Partial power-down permitted
- ESD protection exceeds 2000 V HBM per JESD22-A114, 200 V MM per JESD22-A115, and 1000 V CDM per JESD22-CC101
- Latch-up protection exceeds 500 mA per JESD78
- Package offered: TSSOP14

3 Quick reference data

Table 1. Quick reference data

T_{amb} = 25 °C

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
t_{PLH}	LOW-to-HIGH propagation delay	GTL; BIn to BOn; C_L = 50 pF; V_{CC} = 3.3 V		-	3.1	8	ns
t_{PHL}	HIGH-to-LOW propagation delay			-	4.1	10	ns
C_i	input capacitance	GTL; outputs disabled; $V_{I/O}$ = 0 V or 3.0 V		-	4.5	-	pF

4 Ordering information

Table 2. Ordering information

Type number	Topside marking	Package		
		Name	Description	Version
GTL2034PW	GTL2034	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1

4.1 Ordering options

Table 3. Ordering options

Type number	Orderable part number	Package	Packing method [1]	Minimum order quantity	Temperature
GTL2034PW	GTL2034PW,118 [2]	TSSOP14	REEL 13" Q1/T1 NDP	2500	T_{amb} = -40 °C to +85 °C
	GTL2034PWZ	TSSOP14	REEL 13" Q1/T1 NDP SSB [3]	2500	T_{amb} = -40 °C to +85 °C

[1] Standard packing quantities and other packaging data are available at www.nxp.com/packages/.
[2] Discontinued in 202111031DN; drop in replacement is GTL2034PWZ
[3] This packing method uses a Static Shielding Bag (SSB) solution. Material should be kept in the sealed bag between uses.

5 Functional diagram

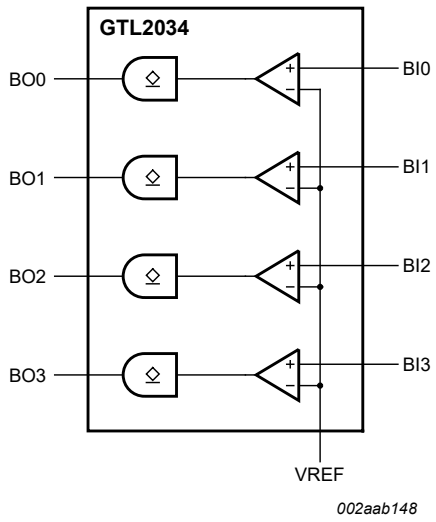


Figure 1. Logic diagram of GTL2034

6 Pinning information

6.1 Pinning

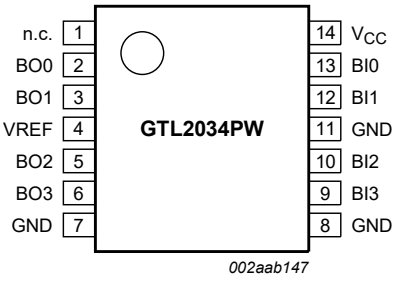


Figure 2. Pin configuration for TSSOP14

6.2 Pin description

Table 4. Pin description

Symbol	Pin	Description
n.c.	1	not connected
BO0	2	data outputs (GTL)
BO1	3	
BO2	5	
BO3	6	
BI0	13	data inputs (GTL)
BI1	12	
BI2	10	
BI3	9	
VREF	4	GTL reference voltage
GND	7, 8, 11	ground (0 V)
V_{CC}	14	positive supply voltage

7 Functional description

Refer to Figure 1.

7.1 Function table

Table 5. Function table

Input/output	
BIn (GTL)	**BOn (GTL)**
Input	BOn = BIn

8 Limiting values

Table 6. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). [1]

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CC}	supply voltage			-0.5	+4.6	V
I_{IK}	input clamping current	$V_I < 0$ V		-	-50	mA
V_I	input voltage	B port		-0.5[2]	+4.6	V
I_{OK}	output clamping current	$V_O < 0$ V		-	-50	mA
V_O	output voltage	output in OFF or HIGH state; B port		-0.5[2]	+4.6	V
I_{OL}	LOW-state output current[3]	B port		-	80	mA
T_{stg}	storage temperature		[4]	-60	+150	°C

[1] Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under Section 9 is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
[2] The input and output negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.
[3] Current into any output in the LOW state.
[4] 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.

9 Recommended operating conditions

Table 7. Recommended operating conditions

Unused inputs must be held HIGH or LOW to prevent them from floating.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CC}	supply voltage			3.0	-	3.6	V
V_{TT}	termination voltage[1]	GTL-		0.85	0.9	0.95	V
		GTL		1.14	1.2	1.26	V
		GTL+		1.35	1.5	1.65	V
V_{ref}	reference voltage	overall		0.5	$^2/_3V_{TT}$	V_{CC} / 2	V
		GTL-		0.5	0.6	0.63	V
		GTL		0.76	0.8	0.84	V
		GTL+		0.87	1.0	1.10	V
V_I	input voltage	B port		0	V_{TT}	3.6	V
V_{IH}	HIGH-state input voltage	B port		V_{ref} + 0.050	-	-	V
V_{IL}	LOW-state input voltage	B port		-	-	V_{ref} - 0.050	V
I_{OL}	LOW-state output current	B port		-	-	40	mA
T_{amb}	ambient temperature	operating in free air		-40	-	+85	°C

[1] V_{TT} maximum of 3.6 V with resistor sized so I_{OL} maximum is not exceeded.

10 Static characteristics

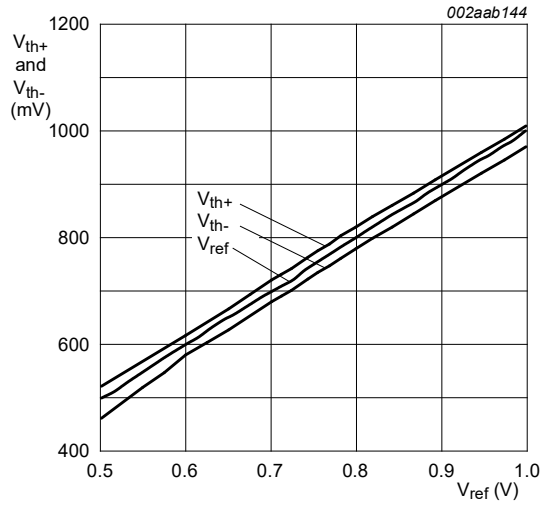
Table 8. Static characteristics

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

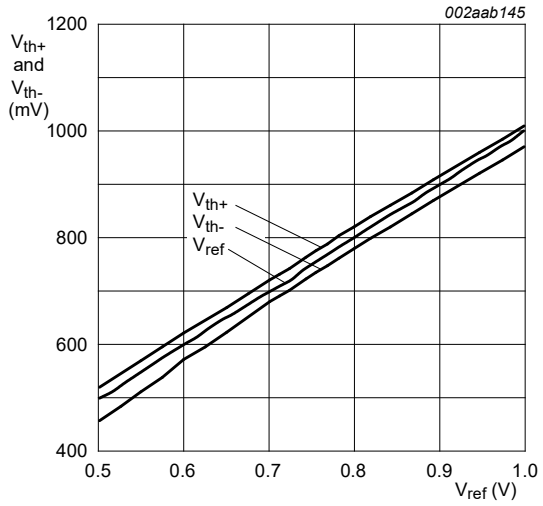
Symbol	Parameter	Conditions		Min	Typ[1]	Max	Unit
V_{OL}	LOW-state output voltage	B port; V_{CC} = 3.0 V; I_{OL} = 40 mA	[2]	-	0.2	0.4	V
I_I	input current	B port; V_{CC} = 3.6 V; V_I = V_{TT} or GND		-	-	±1	µA
I_{LO}	output leakage current	B port; V_{CC} = 3.6 V; V_O = V_{TT}		-	-	±1	µA
I_{CC}	quiescent supply current	B port; V_{CC} = 3.6 V; V_I = V_{CC} or GND; I_O = 0 mA		-	4	8	mA
C_i	input capacitance	port BIn; V_O = V_{TT} or 0 V		-	4.5	-	pF
C_o	output capacitance	port BOn; V_O = V_{TT} or 0 V		-	5.5	-	pF

[1] All typical values are measured at V_{CC} = 3.3 V and T_{amb} = 25 °C.
[2] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

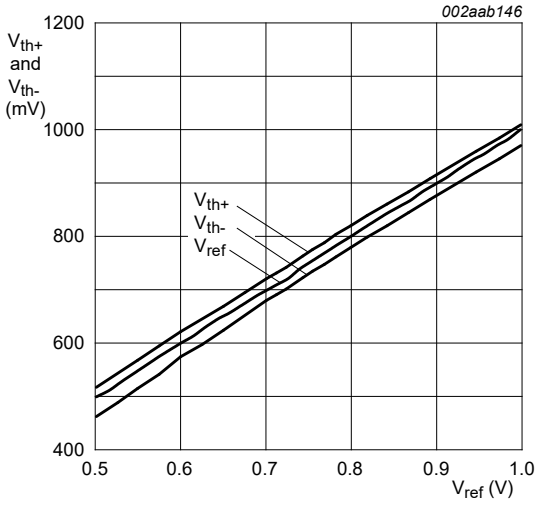
10.1 Performance curves



a. V_{CC} = 3.0 V; T_{amb} = -40 °C



b. V_{CC} = 3.3 V; T_{amb} = 25 °C



c. V_{CC} = 3.6 V; T_{amb} = 85 °C

Figure 3. GTL V_{th+} and V_{th-} versus V_{ref}

11 Dynamic characteristics

Table 9. Dynamic characteristics

V_{CC} = 3.3 V ± 0.3 V

Symbol	Parameter	Conditions		Min	Typ[1]	Max	Unit
GTL-; V_{ref} = 0.6 V; V_{TT} = 0.9 V							
t_{PLH}	LOW-to-HIGH propagation delay	BIn to BOn; see Figure 4		-	2.8	8	ns
t_{PHL}	HIGH-to-LOW propagation delay			-	5.2	10	ns
GTL; V_{ref} = 0.8 V; V_{TT} = 1.2 V							

Table 9. Dynamic characteristics...*continued*

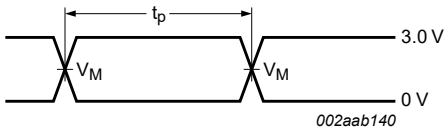
V_{CC} = *3.3 V ± 0.3 V*

Symbol	Parameter	Conditions		Min	Typ[1]	Max	Unit
t_{PLH}	LOW-to-HIGH propagation delay	BIn to BOn; see Figure 4		-	3.1	8	ns
t_{PHL}	HIGH-to-LOW propagation delay			-	4.1	10	ns
GTL+; V_{ref} = 1.0 V; V_{TT} = 1.5 V							
t_{PLH}	LOW-to-HIGH propagation delay	BIn to BOn; see Figure 4		-	3.3	8	ns
t_{PHL}	HIGH-to-LOW propagation delay			-	3.6	10	ns

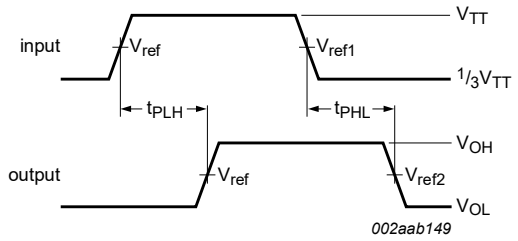
[1] All typical values are measured at V_{CC} = 3.3 V and T_{amb} = 25 °C.

11.1 Waveforms

$V_M = V_{ref}$ for B ports.



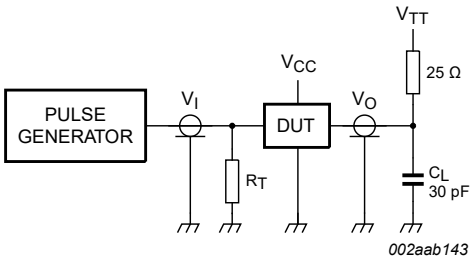
a. Pulse duration



b. Propagation delay times

Figure 4. Voltage waveforms

12 Test information



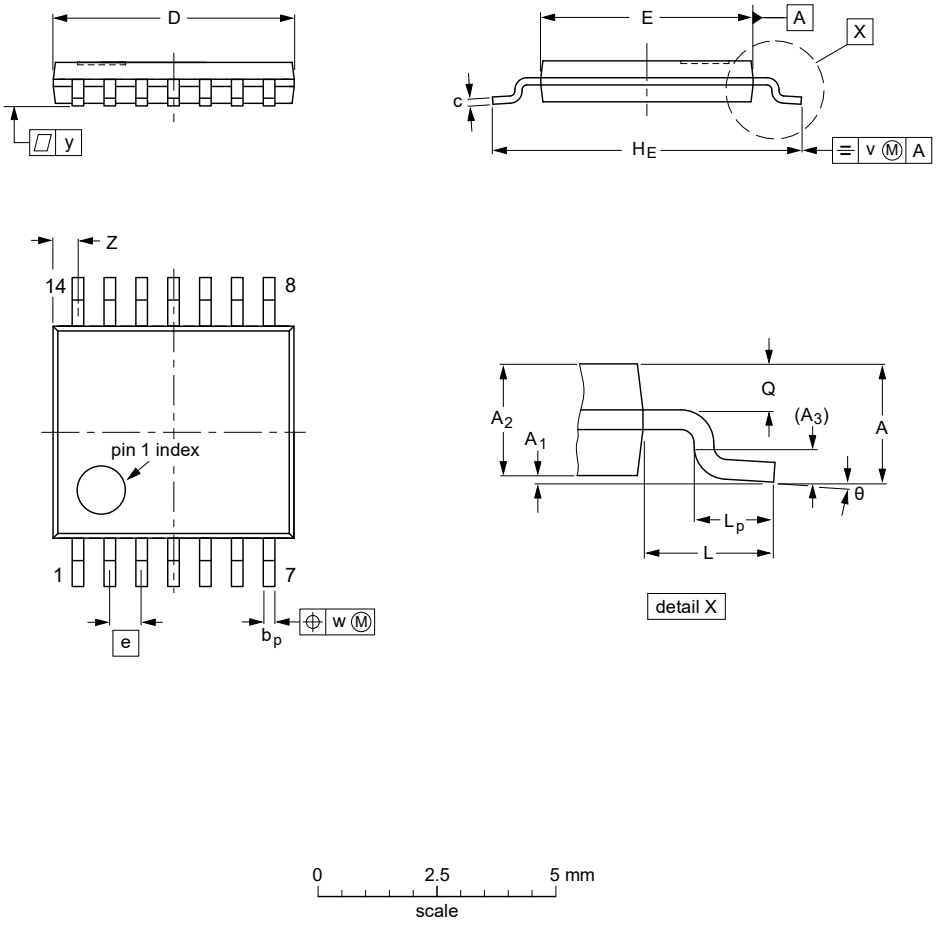
C_L = load capacitance; includes jig and probe capacitance.

R_T = termination resistance; should be equal to Z_o of pulse generator.

Figure 5. Load circuit for B outputs

13 Package outline

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm **SOT402-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (2)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.72 0.38	8° 0°

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT402-1		MO-153				~~99-12-27~~ 03-02-18

Figure 6. Package outline SOT402-1 (TSSOP14)

14 Soldering

This text provides a very brief insight into a complex technology. A more in-depth account of soldering ICs can be found in Application Note *AN10365 "Surface mount reflow soldering description"*.

14.1 Introduction to soldering

Soldering is one of the most common methods through which packages are attached to Printed Circuit Boards (PCBs), to form electrical circuits. The soldered joint provides both the mechanical and the electrical connection. There is no single soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and Surface Mount Devices (SMDs) are mixed on one printed wiring board; however, it is not suitable for fine pitch SMDs. Reflow soldering is ideal for the small pitches and high densities that come with increased miniaturization.

14.2 Wave and reflow soldering

Wave soldering is a joining technology in which the joints are made by solder coming from a standing wave of liquid solder. The wave soldering process is suitable for the following:

- Through-hole components
- Leaded or leadless SMDs, which are glued to the surface of the printed circuit board

Not all SMDs can be wave soldered. Packages with solder balls, and some leadless packages which have solder lands underneath the body, cannot be wave soldered. Also, leaded SMDs with leads having a pitch smaller than ~0.6 mm cannot be wave soldered, due to an increased probability of bridging.

The reflow soldering process involves applying solder paste to a board, followed by component placement and exposure to a temperature profile. Leaded packages, packages with solder balls, and leadless packages are all reflow solderable.

Key characteristics in both wave and reflow soldering are:

- Board specifications, including the board finish, solder masks and vias
- Package footprints, including solder thieves and orientation
- The moisture sensitivity level of the packages
- Package placement
- Inspection and repair
- Lead-free soldering versus SnPb soldering

14.3 Wave soldering

Key characteristics in wave soldering are:

- Process issues, such as application of adhesive and flux, clinching of leads, board transport, the solder wave parameters, and the time during which components are exposed to the wave
- Solder bath specifications, including temperature and impurities

14.4 Reflow soldering

Key characteristics in reflow soldering are:

- Lead-free versus SnPb soldering; note that a lead-free reflow process usually leads to higher minimum peak temperatures (see Figure 7) than a SnPb process, thus reducing the process window
- Solder paste printing issues including smearing, release, and adjusting the process window for a mix of large and small components on one board
- Reflow temperature profile; this profile includes preheat, reflow (in which the board is heated to the peak temperature) and cooling down. It is imperative that the peak temperature is high enough for the solder to make reliable solder joints (a solder paste characteristic). In addition, the peak temperature must be low enough that the packages and/or boards are not damaged. The peak temperature of the package depends on package thickness and volume and is classified in accordance with Table 10 and Table 11

Table 10. SnPb eutectic process (from J-STD-020D)

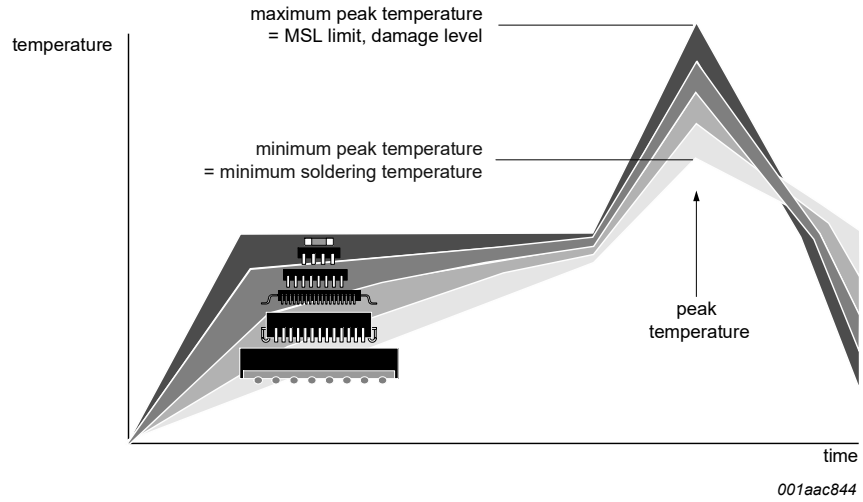
Package thickness (mm)	Package reflow temperature (°C)	
	Volume (mm³)	
	< 350	≥ 350
< 2.5	235	220
≥ 2.5	220	220

Table 11. Lead-free process (from J-STD-020D)

Package thickness (mm)	Package reflow temperature (°C)		
	Volume (mm³)		
	< 350	350 to 2000	> 2000
< 1.6	260	260	260
1.6 to 2.5	260	250	245
> 2.5	250	245	245

Moisture sensitivity precautions, as indicated on the packing, must be respected at all times.

Studies have shown that small packages reach higher temperatures during reflow soldering, see Figure 7.



MSL: Moisture Sensitivity Level

Figure 7. Temperature profiles for large and small components

For further information on temperature profiles, refer to Application Note *AN10365 "Surface mount reflow soldering description"*.

15 Abbreviations

Table 12. Abbreviations

Acronym	Description
CDM	Charged Device Model
ESD	ElectroStatic Discharge
GTL	Gunning Transceiver Logic
HBM	Human Body Model
TTL	Transistor-Transistor Logic

16 Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
GTL2034 v.1.1	20211220	Product data sheet	-	DOC_ID v.1.0
Modifications	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. Legal texts have been adapted to the new company name where appropriate. • Added orderable part number GTL2034PWZ.			
GTL2034 v.1.0	20051111	Product data sheet	-	-

17 Legal information

17.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
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