

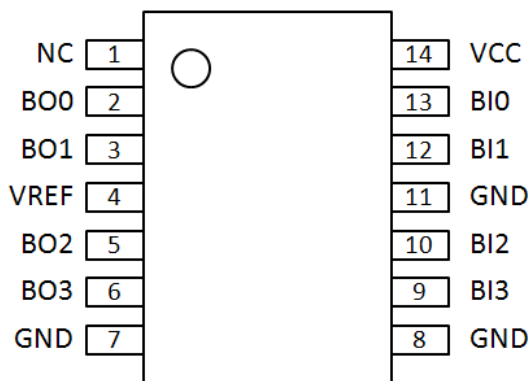
### Features

- Operates as a 4-bit GTL-/GTL/GTL+ to GTL-/GTL/GTL+ bus buffer
- 2.3 V to 3.6 V operation
- 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 500 mA per JESD78
- Package offered: TSSOP14

### 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.

### Pin Configuration



### Pin Description

|      |        |                         |
|------|--------|-------------------------|
| NC   | 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)            |
| VCC  | 14     | positive supply voltage |

### Maximum Ratings

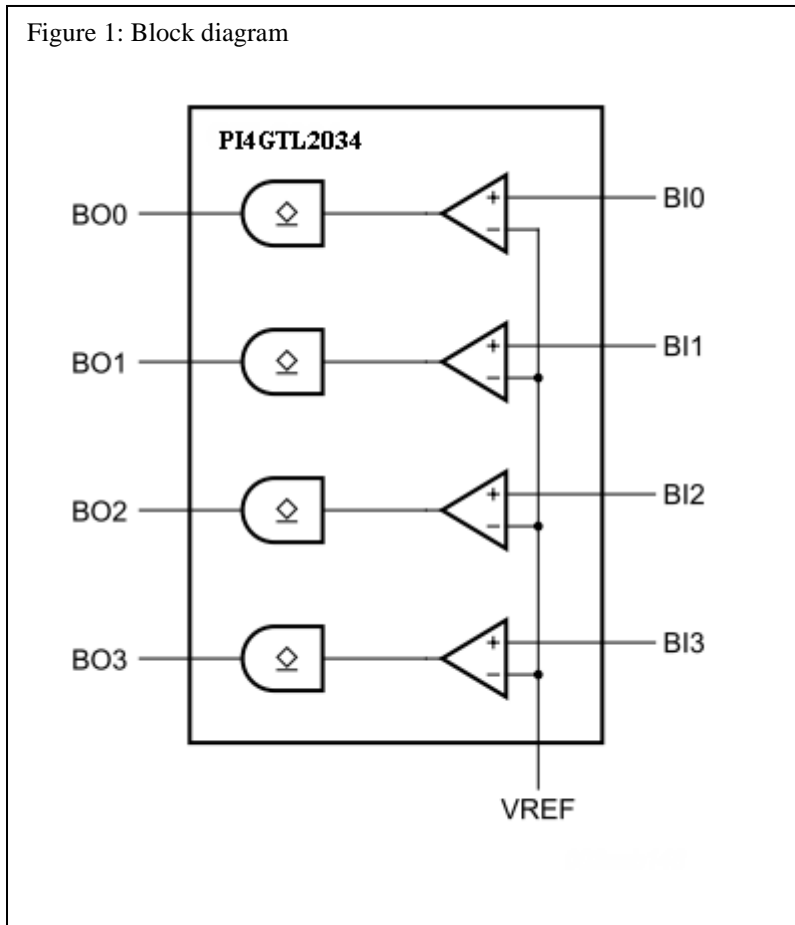
|   |                   |
|---|-------------------|
| Power supply.....                                       | -0.5V to +4.6V    |
| Voltage on an I/O pin.....                              | GND-0.5V to +7.0V |
| Supply current.....                                     | ±160mA            |
| Ground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

### PI4GTL2034 Block Diagram

Figure 1: Block diagram



Function Table:

|                 |                 |
|-----------------|-----------------|
| BI <sub>x</sub> | BO <sub>x</sub> |
| Input           | Output          |

**Limiting values**

| Symbol           | Parameter                | Conditions                         | Min                 | Max | Unit |
|------------------|--------------------------|------------------------------------|---------------------|-----|------|
| VCC              | supply voltage           |                                    | -0.5                | 4.6 | V    |
| I <sub>IK</sub>  | input clamping current   | V <sub>I</sub> < 0V                | -                   | -50 | mA   |
| V <sub>I</sub>   | input voltage            | B port                             | -0.5 <sup>[1]</sup> | 4.6 | V    |
| I <sub>OK</sub>  | output clamping current  | V <sub>O</sub> < 0V                | -                   | -50 | mA   |
| V <sub>O</sub>   | output voltage           | output in OFF or HIGH state B port | -0.5 <sup>[1]</sup> | 4.6 | V    |
| I <sub>OL</sub>  | LOW-level output current | B port                             | -                   | 80  | mA   |
| T <sub>stg</sub> | storage temperature      |                                    | <sup>[2]</sup> -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

| Symbol           | Parameter                          | Conditions            | Min                      | Typ                | Max                      | Unit |
|------------------|------------------------------------|-----------------------|--------------------------|--------------------|--------------------------|------|
| VCC              | supply voltage                     |                       | 2.3                      | -                  | 3.6                      | V    |
| V <sub>TT</sub>  | termination voltage <sup>[1]</sup> | 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    |
| V <sub>ref</sub> | reference voltage                  | overall               | 0.43                     | 2/3V <sub>TT</sub> | 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    |
| V <sub>I</sub>   | input voltage                      | B port                | 0                        | V <sub>TT</sub>    | 3.6                      | V    |
| V <sub>IH</sub>  | HIGH-level input voltage           | B port                | V <sub>ref</sub> + 0.050 | -                  | -                        | V    |
| V <sub>IL</sub>  | LOW-level input voltage            | B port                | -                        | -                  | V <sub>ref</sub> - 0.050 | V    |
| I <sub>OL</sub>  | LOW-level output current           | B port                | -                        | -                  | 40                       | mA   |
| T <sub>amb</sub> | ambient temperature                | operating in free-air | -40                      | -                  | -85                      | °C   |

Note:

[1] V<sub>TT</sub> maximum of 3.6 V with resistor sized so I<sub>OL</sub> maximum is not exceeded.

### Static characteristics

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

| Symbol   | Parameter                | Conditions  | Min | Typ <sup>[1]</sup> | Max     | Unit          |
|----------|--------------------------|---|-----|--------------------|---------|---------------|
| $V_{OL}$ | LOW-level output voltage | B port; $V_{CC} = 3.0\text{ V}$ ; $I_{OL} = 40\text{ mA}$                       |     | 0.23               | 0.4     | V             |
|          |                          | B port; $V_{CC} = 2.3\text{ V}$ ; $I_{OL} = 40\text{ mA}$                       |     | 0.26               | 0.4     | V             |
| $I_I$    | input current            | B port; $V_{CC} = 3.6\text{ V}$ ;<br>$V_I = V_{TT}$ or GND                      |     |                    | $\pm 1$ | $\mu\text{A}$ |
| $I_{LO}$ | output leakage current   | B port; $V_{CC} = 3.6\text{ V}$ ; $V_O = V_{TT}$                                |     |                    | $\pm 1$ | $\mu\text{A}$ |
| $I_{CC}$ | quiescent supply current | B port; $V_{CC} = 3.6\text{ V}$ ;<br>$V_I = V_{CC}$ or GND; $I_O = 0\text{ mA}$ |     | 4                  | 8       | mA            |
| $C_i$    | input capacitance        | B port; $V_O = V_{TT}$ or 0 V   |     | 4.5                |         | pF            |
| $C_o$    | input/output capacitance | B port; $V_O = V_{TT}$ or 0 V   |     | 5.5                |         | pF            |

Note:

[1] All typical values are measured at  $V_{CC} = 3.3\text{ V}$  and  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

[2] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

### Dynamic Characteristics

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

| Symbol                            | Parameter                     | Conditions  | Min | Typ | Max | Unit |
|-----------------------------------|-------------------------------|-------------|-----|-----|-----|------|
| GTL - ; Vref = 0.5V; VTT = 0.75 V |                               |             |     |     |     |      |
| t <sub>PLH</sub>                  | LOW to HIGH propagation delay | BIn to BOn; |     | 3.5 | 8   | ns   |
| t <sub>PHL</sub>                  | HIGH to LOW propagation delay | BIn to BOn; |     | 6.5 | 10  | ns   |
| GTL - ; Vref = 0.6 V; VTT = 0.9 V |                               |             |     |     |     |      |
| t <sub>PLH</sub>                  | LOW to HIGH propagation delay | BIn to BOn; |     | 3.5 | 8   | ns   |
| t <sub>PHL</sub>                  | HIGH to LOW propagation delay | BIn to BOn; |     | 6.5 | 10  | ns   |
| GTL - ; Vref = 0.8 V; VTT = 1.2 V |                               |             |     |     |     |      |
| t <sub>PLH</sub>                  | LOW to HIGH propagation delay | BIn to BOn; |     | 4.1 | 8   | ns   |
| t <sub>PHL</sub>                  | HIGH to LOW propagation delay | BIn to BOn; |     | 6.5 | 10  | ns   |
| GTL+; Vref = 1.0 V; VTT = 1.5 V   |                               |             |     |     |     |      |
| t <sub>PLH</sub>                  | LOW to HIGH propagation delay | BIn to BOn; |     | 4.6 | 8   | ns   |
| t <sub>PHL</sub>                  | HIGH to LOW propagation delay | BIn to BOn; |     | 6.5 | 10  | ns   |

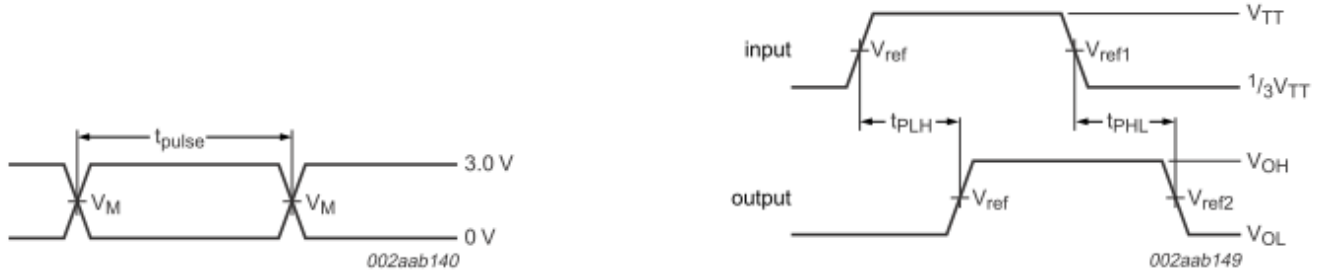
### Dynamic Characteristics

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

| Symbol                                   | Parameter                     | Conditions  | Min | Typ | Max | Unit |
|--|-------------------------------|-------------|-----|-----|-----|------|
| <b>GTL - ; Vref = 0.5V; VTT = 0.75 V</b> |                               |             |     |     |     |      |
| t <sub>PLH</sub>                         | LOW to HIGH propagation delay | BIn to BOn; |     | 4.2 | 8   | ns   |
| t <sub>PHL</sub>                         | HIGH to LOW propagation delay | BIn to BOn; |     | 8.6 | 12  | ns   |
| <b>GTL - ; Vref = 0.6 V; VTT = 0.9 V</b> |                               |             |     |     |     |      |
| t <sub>PLH</sub>                         | LOW to HIGH propagation delay | BIn to BOn; |     | 4.4 | 8   | ns   |
| t <sub>PHL</sub>                         | HIGH to LOW propagation delay | BIn to BOn; |     | 8.6 | 12  | ns   |
| <b>GTL - ; Vref = 0.8 V; VTT = 1.2 V</b> |                               |             |     |     |     |      |
| t <sub>PLH</sub>                         | LOW to HIGH propagation delay | BIn to BOn; |     | 5.3 | 9   | ns   |
| t <sub>PHL</sub>                         | HIGH to LOW propagation delay | BIn to BOn; |     | 8.9 | 13  | ns   |
| <b>GTL+; Vref = 1.0 V; VTT = 1.5 V</b>   |                               |             |     |     |     |      |
| t <sub>PLH</sub>                         | LOW to HIGH propagation delay | BIn to BOn; |     | 6.5 | 10  | ns   |
| t <sub>PHL</sub>                         | HIGH to LOW propagation delay | BIn to BOn; |     | 9.4 | 14  | ns   |

**Waveforms**

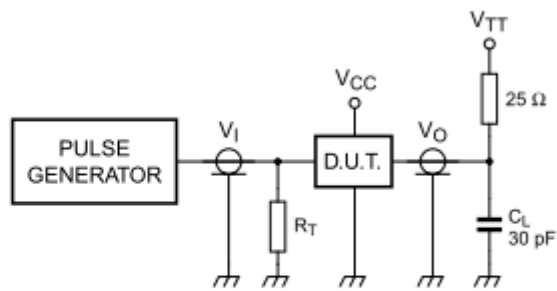
VM=Vref for B ports



a. Pulse duration

b. Propagation delay times

Fig 2. Voltage waveforms



$C_L$  = load capacitance; includes jig and probe capacitance.

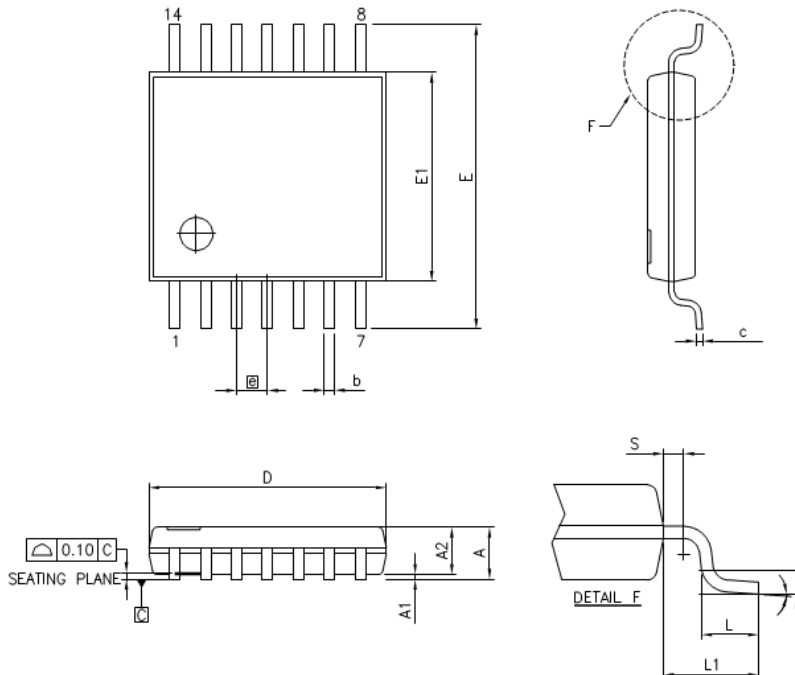
$R_T$  = termination resistance; should be equal to  $Z_o$  of pulse generator.

Fig 3. Load circuit for B outputs




### Mechanical Information

TSSOP-14(L)



| VARIATIONS (ALL DIMENSIONS SHOWN IN MM) |          |      |      |
|---|----------|------|------|
| SYMBOLS                                 | MIN.     | NOM. | MAX. |
| A                                       | —        | —    | 1.20 |
| A1                                      | 0.05     | —    | 0.15 |
| A2                                      | 0.80     | —    | 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                                       | 6.40 BSC |      |      |
| e                                       | 0.65 BSC |      |      |
| L1                                      | 1.00 REF |      |      |
| L                                       | 0.45     | 0.60 | 0.75 |
| S                                       | 0.20     | —    | —    |
| $\theta$                                | 0°       | —    | 8°   |

**Notes:**  
 1. JEDEC: MO-153F/AB-1  
 2. Controlling dimensions in millimeters  
 3. Package Outline Exclusive of mold flash and metal burr

|  |                |
|--|----------------|
| <br>Enabling Serial Connectivity | DATE: 05/03/12 |
| DESCRIPTION: 14-pin, 173mil Wide TSSOP   |                |
| PACKAGE CODE: L  |                |
| DOCUMENT CONTROL #: PD-1309  | REVISION: D    |

### Ordering Information

| Part No.      | Package Code | Package                                 |
|---------------|--------------|---|
| PI4GTL2034LE  | L            | 14-Pin, 173 mil Wide TSSOP              |
| PI4GTL2034LEX | L            | 14-Pin, 173 mil Wide TSSOP, Tape & Reel |

**Note:**

- E = Pb-free and Green
- Adding X Suffix= Tape/Reel

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