FAIRCHILD SEMICONDUCTOR™

June 2001
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GTLP1B151
1-Bit LVTTL/GTLP Transceiver with Separate LVTTL Port and Feedback Path

General Description

The GTLP1B151 is a 1-bit transceiver that provides LVTTL-to-GTLP signal level translation. Individual LVTTL and GTLP driver enables are also available. The GTLP1B151 offers separate LVTTL inputs and outputs, and can provide a feedback path for control and diagnostics monitoring.

High-speed backplane operation is a direct result of GTLP's reduced output swing (<1V), reduced input threshold levels and output edge rate control. The edge rate control minimizes bus-settling time. GTLP is a Fairchild Semiconductor derivative of the Gunning Transistor Logic (GTL) JEDEC standard JESD8-3.

Fairchild's GTLP has internal edge-rate control and is process, voltage and temperature compensated. GTLP's I/O structure is similar to GTL and BTL but offers different output levels and receiver threshold. Typical GTLP output voltage levels are: V_{OL} = 0.5V, V_{OH} = 1.5V, and V_{REF} = 1V.

Features

- Separate LVTTL inputs and outputs
- A feedback path for control and diagnostics monitoring
- Bidirectional interface between GTLP and LVTTL logic levels
- Designed with edge rate control circuitry to reduce output noise on the GTLP port
- V_{REF} pin provides external supply reference voltage for receiver threshold adjustibility
- Special PVT compensation circuitry to provide consistent performance over variations of process, supply voltage and temperature
- TTL compatible driver and control inputs
- Designed using Fairchild advanced BiCMOS technology
- Bushold data inputs on A port to eliminate the need for external pull-up resistors for unused inputs
- Power up/down and power off high impedance for live insertion
- Open drain on GTLP to support wired-or connection
- Flow through pinout optimizes PCB layout
- A Port source/sink –24mA / +24mA
- B Port sink +50mA

Ordering Code:

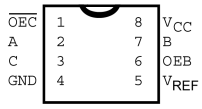
Order Number	Package Number	Package Description
GTLP1B151M	M08A	8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow [TUBE]
GTLP1B151MX	M08A	8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow [TAPE and REEL]
GTLP1B151K8X	MAB08A (Preliminary)	8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide [TAPE and REEL]

Pin Descriptions

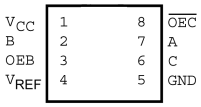
Pin Names	Description
OEB, $\overline{OEC}$	LVTTL Individual Output Enable Controls ($\overline{OEC}$ is Active LOW)
V_{CC}, GND, V_{REF}	Device Supplies
A	A Port LVTTL Input
B	B Port GTLP Input/Output
C	C Port LVTTL Output

Connection Diagrams

US8



SOIC



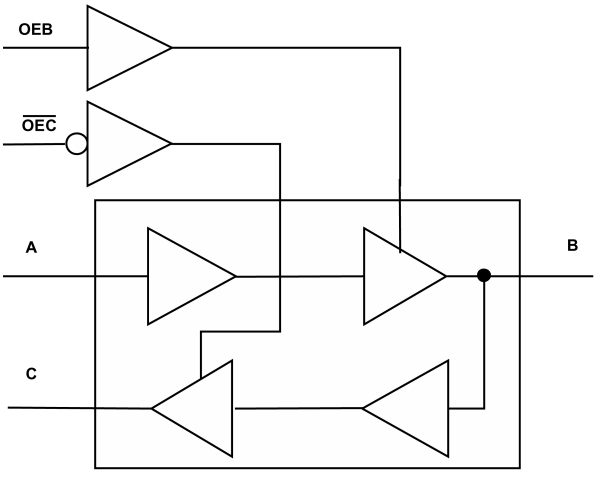
Functional Description

The GTLP1B151 is a 1-bit transceiver that supports GTLP and LVTTL signal levels. Data polarity is non-inverting with separate LVTTL inputs and outputs and there are individual GTLP and LVTTL output enable controls.

Functional Tables

Inputs				Outputs		Description
OEB	**$\overline{OEC}$**	**A_n**	**B_n**	**B_n**	**C_n**	
H	L	L	Output	L	L	B Bus Enabled, C Bus Enabled
H	L	H	Output	H	H	B Bus Enabled, C Bus Enabled
H	H	L	Output	L	Z	B Bus Enabled, C Bus Disabled
H	H	H	Output	H	Z	B Bus Enabled, C Bus Disabled
L	H	L	L	Z	Z	B Bus Disabled, C Bus Disabled
L	H	H	H	Z	Z	B Bus Disabled, C Bus Disabled
L	L	N/A	L	Z	L	B Bus Disabled, C Bus Enabled
L	L	N/A	H	Z	H	B Bus Disabled, C Bus Enabled

Logic Diagram



Absolute Maximum Ratings(Note 1)

Supply Voltage (V_{CC})	−0.5V to +4.6V
DC Input Voltage (V_I)	−0.5V to +4.6V
DC Output Voltage (V_O)	
Outputs 3-STATE	−0.5V to +4.6V
Outputs Active (Note 2)	−0.5V to +4.6V
DC Output Sink Current into	
C Port I_{OL}	48 mA
DC Output Source Current from	
C Port I_{OH}	−48 mA
DC Output Sink Current into	
B Port in the LOW State, I_{OL}	100 mA
DC Input Diode Current (I_{IK})	
$V_I < 0V$	−50 mA
DC Output Diode Current (I_{OK})	
$V_O < 0V$	−50 mA
ESD Rating	>2000V
Storage Temperature (T_{STG})	−65°C to +150°C

Recommended Operating Conditions

Supply Voltage V_{CC}	3.15V to 3.45V
Bus Termination Voltage (V_{TT})	
GTLP	1.47V to 1.53V
V_{REF}	0.98V to 1.02V
Input Voltage (V_I)	
on A Port and Control Pins	0.0V to V_{CC}
HIGH Level Output Current (I_{OH})	
C Port	−24 mA
LOW Level Output Current (I_{OL})	
C Port	+24 mA
B Port	+50 mA
Operating Temperature (T_A)	−40°C to +85°C

Note 1: Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum rating. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Note 2: I_O Absolute Maximum Rating must be observed.

DC Electrical Characteristics

Over Recommended Operating Free-Air Temperature Range, V_{REF} = 1.0V (unless otherwise noted).

Symbol		Test Conditions		Min	Typ (Note 3)	Max	Units
V_{IH}	B Port			V_{REF} + 0.05		V_{TT}	V
	Others			2.0			
V_{IL}	B Port			0.0		V_{REF} − 0.05	V
	Others					0.8	
V_{REF}	B Port			0.7V	1.0	1.3V	V
V_{TT}	B Port			V_{REF} + 50 mV	1.5	V_{CC}	V
V_{IK}		V_{CC} = 3.15V	I_I = −18 mA			−1.2	V
V_{OH}	C Port	V_{CC} = Min to Max (Note 4)	I_{OH} = −100 µA	V_{CC} −0.2			V
		V_{CC} = 3.15V	I_{OH} = −8 mA	2.4			
			I_{OH} = -24mA	2.2			
V_{OL}	C Port	V_{CC} = Min to Max (Note 4)	I_{OL} = 100 µA			0.2	V
		V_{CC} = 3.15V	I_{OL} = 8 mA			0.4	
		V_{CC} = 3.15V	I_{OL} = 24mA			0.5	
	B Port	V_{CC} = 3.15V	I_{OL} = 40 mA			0.4	V
			I_{OL} = 50 mA			0.55	
I_I	Control Pins	V_{CC} = 3.45V	V_I = 3.45V			5	µA
			V_I = 0V			−5	
	A Port	V_{CC} = 3.45V	V_I = 3.45V			10	µA
			V_I = 0V			−10	
	B Port	V_{CC} = 3.45V	V_I = 3.45			5	µA
			V_I = 0			−5	
I_{OFF}	A or C Ports, Control Pins	V_{CC} = 0	V_I or V_O = 0 to 3.45V			30	µA
	B Port	V_{CC} = 0	V_I or V_O = 0 to 3.45V			30	µA
$I_{I\ (HOLD)}$	A Port	V_{CC} = 3.15V	V_I = 0.8V	75			µA
			V_I = 2.0V			−75	
I_{OZH}	C Port	V_{CC} = 3.45V	V_O = 3.45V			10	µA
	B Port		V_O = 3.45V			5	
I_{OZL}	C Port	V_{CC} = 3.45V	V_O = 0V			−10	µA
	B Port		V_O = 0.0V			−5	

DC Electrical Characteristics (Continued)

Symbol		Test Conditions		Min	Typ (Note 3)	Max	Units
$I_{PU/PD}$	All Ports	V_{CC} = 0 to 1.5V	V_I = 0 to 3.45V			30	μA
I_{CC}	A or B Ports or C Port	V_{CC} = 3.45V	Outputs HIGH			11	mA
		I_O = 0	Outputs LOW			11	
		$V_I = V_{CC}/V_{TT}$ or GND	Outputs Disabled			11	
ΔI_{CC} (Note 5)	A Port and Control Pins	V_{CC} = 3.45V, A or Control Inputs at V_{CC} or GND	One Input at V_{CC} –0.6V			2	mA
C_i	Control Pins and A Port		$V_I = V_{CC}$ or 0			3	pF
C_O	C Port		$V_I = V_{CC}$ or 0			5	pF
$C_{I/O}$	B Port		$V_I = V_{TT}$ or 0			5.5	pF

Note 3: All typical values are at V_{CC} = 3.3V and T_A = 25°C.

Note 4: For conditions shown as Min, use the appropriate value specified under recommended operating conditions.

Note 5: This is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND.

Note: GTLP V_{REF} and V_{TT} are specified to 2% tolerance since signal integrity and noise margin can be significantly degraded if these supplies are noisy. In addition, V_{TT} and R_{TERM} can be adjusted beyond the recommended operating to accommodate backplane impedances other than 50Ω, but must remain within the boundaries of the DC Absolute Maximum Ratings. Similarly, V_{REF} can be adjusted to optimize noise margin.

AC Electrical Characteristics

Over recommended range of supply voltage and operating free-air temperature, V_{REF} = 1.0V (unless otherwise noted).

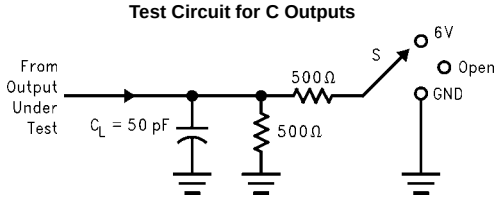
C_L = 30 pF for B Port and C_L = 50 pF for C Port.

Symbol	From (Input)	To (Output)	Min	Typ (Note 6)	Max	Unit
t_{PLH}	A	B	1.2	3.2	7.3	ns
t_{PHL}			0.8	2.3	4.5	
t_{PLH}	B	C	1.4	2.8	4.4	ns
t_{PHL}			1.6	2.9	5.0	
t_{PLH}	A	C	1.6	6.0	8.1	ns
t_{PHL}			2.0	5.1	7.5	
t_{RISE}	Transition Time, B Outputs (20% to 80%)			1.4		ns
t_{FALL}	Transition Time, B Outputs (80% to 20%)			2.0		ns
t_{RISE}	Transition Time, C Outputs (10% to 90%)			2.8		ns
t_{FALL}	Transition Time, C Outputs (90% to 10%)			2.5		ns
t_{PZH}, t_{PZL}	$\overline{OEC}$	C	1.2	2.7	5.3	ns
t_{PHZ}, t_{PLZ}			1.4	2.8	4.9	
t_{PLH}	OEB	B	1.7	3.5	5.9	ns
t_{PHL}			0.5	2.2	4.7	

Note 6: All typical values are at V_{CC} = 3.3V, and T_A = 25°C.

Test Circuits and Timing Waveforms

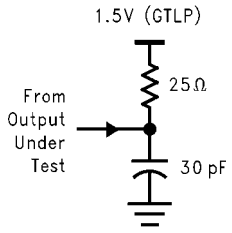
Test Circuit for C Outputs



Test	S
t_{PLH}/t_{PHL}	OPEN
t_{PLZ}/t_{PZL}	6V
t_{PHZ}/t_{PZH}	GND

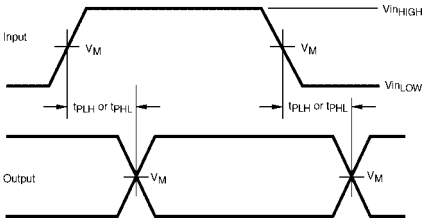
Note: C_L includes probes and Jig capacitance.

Test Circuit for B Outputs

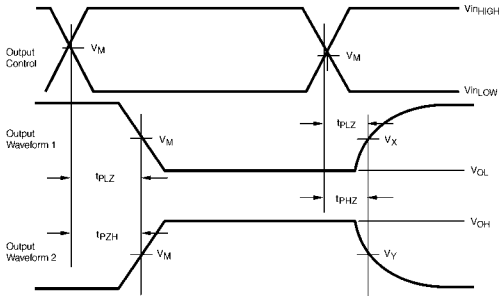


Note: C_L includes probes and Jig capacitance.
Note: For B Port, C_L = 30 pF is used for worst case.

Voltage Waveforms Propagation Delay



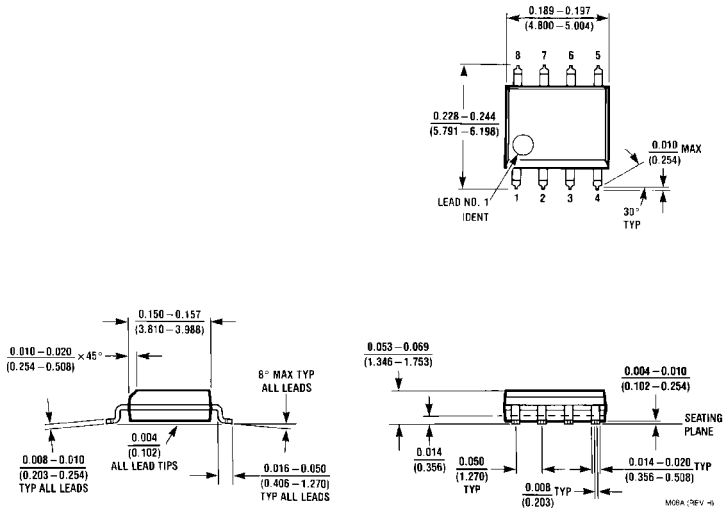
Voltage Waveform Enable and Disable Times



	A or LVTTL Pins	B or GTLP Pins
V_{INHIGH}	V_{CC}	1.5
V_{INLOW}	0.0	0.0
V_M	$V_{CC}/2$	1.0
V_X	V_{OL} + 0.3V	N/A
V_Y	V_{OH} − 0.3V	N/A

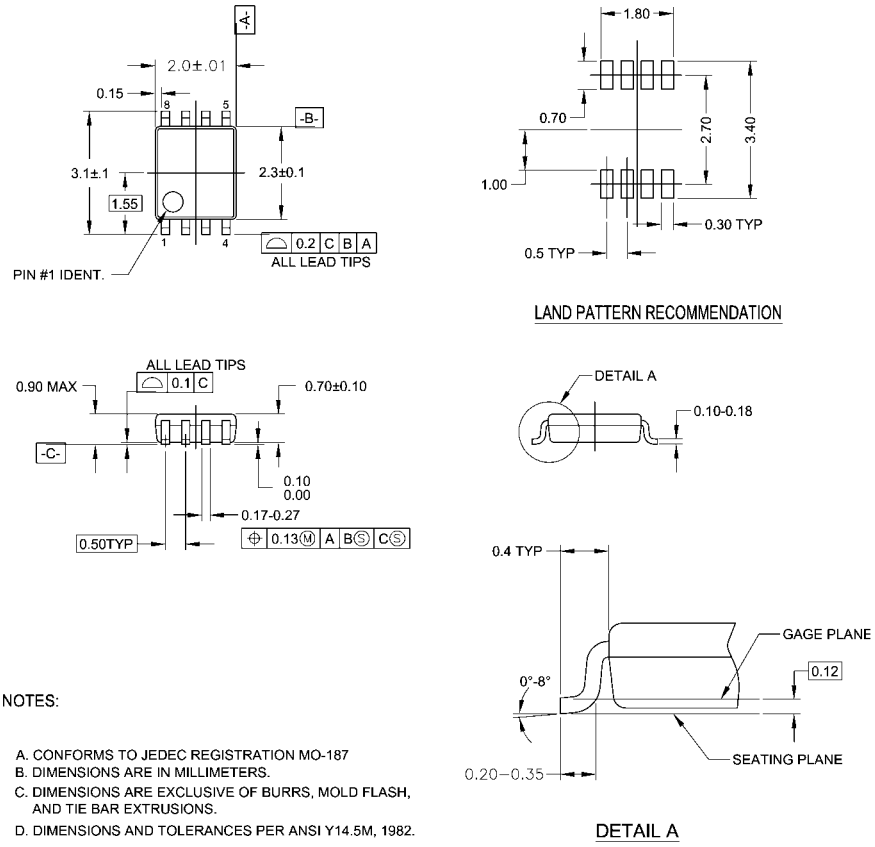
Note: Waveform 1 is for an output with internal conditions such that the output is LOW except when disabled by the output control.
Waveform 2 is for an output with internal conditions such that the output is HIGH except when disabled by the output control.
Note: All input pulses have the following characteristics:
Frequency = 10MHz, $t_{RISE} = t_{FALL}$ = 2 ns (10% to 90%), Z_O = 50Ω. The outputs are measured one at a time with one transition per measurement.

Physical Dimensions inches (millimeters) unless otherwise noted



8-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
Package Number M08A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-187
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MAB08AREVC

8-Lead US8, JEDEC MO-187, Variation CA 3.1mm Wide
Package Number MAB08A
Preliminary