



GTLP/TTL 1:2/1:6 CLOCK DRIVER

IDT74GTLP816

FEATURES:

- 5V or 3.3V operation
- Interface between GTLP and TTL logic levels
- GTLP to TTL 1:6 fanout
- TTL to GTLP 1:2 fanout
- Edge Rate Control Circuit reduces output noise on GTLP port
- VREF pin provides reference voltage for receiver threshold
- CMOS technology for low power dissipation
- Special PVT Compensation circuitry to provide consistent performance over variations of process, supply voltage, and temperature
- 5V tolerant inputs and outputs on TTL ports
- TTL-compatible Driver and Control inputs
- High Output source/sink $\pm 24\text{mA}$ on TTL ports
- High Output sink $+34\text{mA}$ on GTLP ports
- Open drain on GTLP to support wired-or connection
- Available in TSSOP package

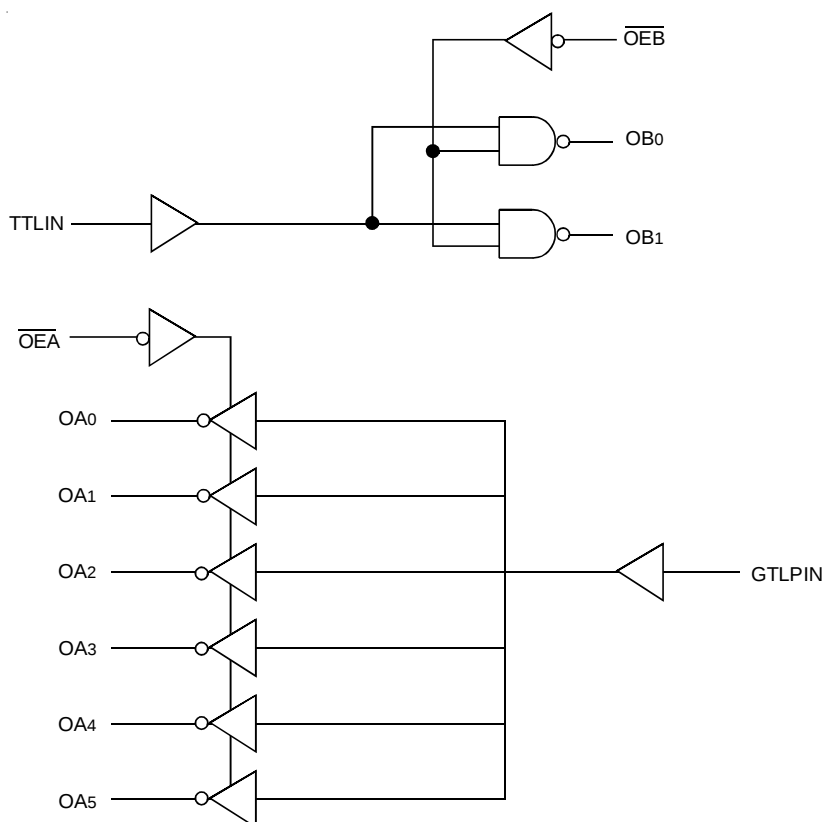
DESCRIPTION:

The GTLP816 is a GTLP to TTL (1:6) and TTL to GTLP (1:2) clock driver with inverting outputs. The clock driver provides a high-speed interface between cards operating at TTL logic levels and back-planes operating at GTLP logic levels. GTLP provides reduced output swing ($<1\text{V}$), reduced input threshold levels, and output edge-rate control to minimize signal settling times. The GTLP816 is a derivative of the Gunning Transceiver Logic (GTL) JEDEC standard JESD8-3 and incorporates internal edge-rate control, which is process, voltage, and temperature (PVT) compensated.

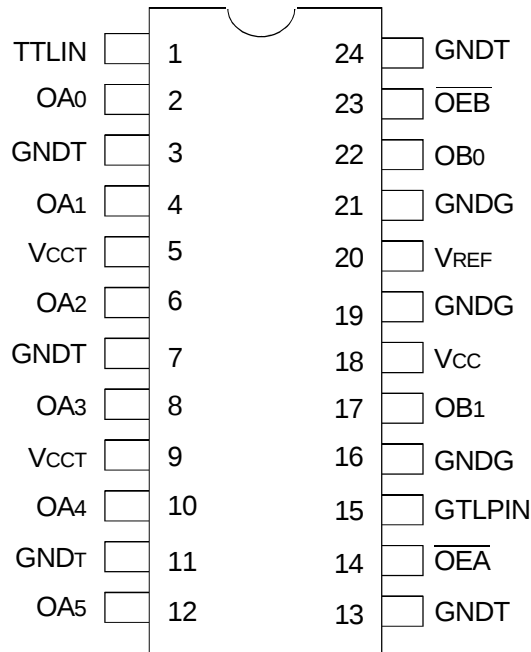
GTLP output low voltage is typically less than 0.5V . The output high is 1.5V , and the receiver threshold is 1V .

The GTLP816 is available in Industrial Temperature Range (-40°C to $+85^{\circ}\text{C}$). See Ordering Information for details.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



TSSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS^(1,2)

Symbol	Rating	Max.	Unit
V _{CC}	Supply Voltage	-0.5 to +7	V
V _{CCT}			
V _I	DC Input Voltage	-0.5 to +7	V
V _O	DC Output Voltage	3-State	V
		Active	
I _{OL}	DC Output Sink Current into OA	64	mA
I _{OH}	DC Output Source Current from OA	-64	mA
I _{OL}	DC Output Sink Current into OB (in the LOW state)	80	mA
I _{IK}	DC Input Diode Current	V _I < 0V	-50
I _{OK}	DC Output Diode Current	V _O < 0V	-50
		V _O > V _{CC}	+50
T _{STG}	Storage Temperature	-65 to +150	°C

NOTES:

- Stresses greater than those listed under ABSOLUTE 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.
- Unused inputs must be held HIGH or LOW.

CAPACITANCE (T_A = +25°C, f = 1.0MHz)

Symbol	Parameter ⁽¹⁾	Conditions	Typ. ⁽²⁾	Max.	Unit
C _{IN}	Control Pins/GTLPIN/TTLIN	V _I = V _{CC} or 0	3.7	—	pF
C _{OUT}	OAx	V _I = V _{CC} or 0	7	—	pF
	OBx	V _I = V _{CC} or 0	7	—	pF

NOTES:

- As applicable to the device type.
- All typical values are at V_{CC}, V_{CCT} = 5V, T_A = 25°C

FUNCTION TABLE⁽¹⁾

Inputs				Outputs ⁽²⁾	
OE̅B	OE̅A	GTLPIN	TTLIN	OAx	OBx
L	L	H	H	L	L
L	L	L	L	H	H
H	H	X	X	Z	Z

NOTES:

- H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care
Z = High Impedance
- Output polarity is inverting.

PIN DESCRIPTION

Pin Names	Description
TTLIN, GTLPIN	Clock Inputs (TTL and GTLP)
OE̅B	Clock Enable for GTLP Outputs. Set LOW for normal operation.
OE̅A	Clock Enable for TTL Outputs. Set LOW for normal operation.
V _{CCT}	Power Supply for TTL Clock Outputs
GNDT	Ground for TTL Clock Outputs
V _{CC}	Power Supply for Internal Circuitry
GNDG	Ground for GTLP Clock Outputs
V _{REF}	Voltage Reference Input
OA[5:0]	TTL Clock Outputs (Inverted)
OB[1:0]	GTLP Clock Outputs (Inverted)

RECOMMENDED OPERATING CONDITIONS⁽¹⁾

Symbol	Rating		Min.	Typ.	Max.	Unit
V _{CC} , V _{CCCT}	Supply Voltage		4.75	5	5.25	V
V _{TT}	Bus Termination Voltage	GTLP	1.47		1.53	V
		V _{REF}	0.98		1.02	
V _I	Input Voltage on TTLIN and Control Pins		0	—	5.5	V
I _{OH}	HIGH Level Output Current (OAx)		—	—	-24	mA
I _{OL}	LOW Level Output Current (OAx)		—	—	+24	mA
I _{OL}	LOW Level Output Current (OBx)		—	—	+34	mA
T _A	Operating Temperature		-40	+25	+85	°C

NOTE:

1. Unused inputs must be held HIGH or LOW.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Industrial: T_A = -40°C to +85°C; V_{REF} = 1V; V_{CC}, V_{CCCT} = 5V ± 5%

Symbol	Parameter	Test Conditions		Min.	Typ. ⁽¹⁾	Max.	Unit
V _{IH}	GTLPIN			V _{REF} + 0.05	—	V _{TT}	V
	All Others			2	—	—	
V _{IL}	GTLPIN			0	—	V _{REF} - 0.05	V
	All Others			—	—	0.8	
V _{REF}	GTLP			—	1	—	V
	GTL			—	0.8	—	
V _{TT}	GTLP			—	1.5	—	V
	GTL			—	1.2	—	
V _{IK}		V _{CC} = Min, I _I = -18mA		—	—	-1.2	V
V _{OH}	OAx	V _{CC} = Min	I _{OH} = -100μA	V _{CC} - 0.2	—	—	V
			I _{OH} = -18mA	2.4	—	—	
			I _{OH} = -24mA	2.2	—	—	
V _{OL}	OAx	V _{CC} = Min	I _{OL} = 100μA	—	—	0.2	V
			I _{OL} = 18mA	—	—	0.4	
			I _{OL} = 24mA	—	—	0.5	
V _{OL}	OBx	V _{CC} = Min	I _{OL} = 100μA	—	—	0.2	V
			I _{OL} = 34mA	—	—	0.65	
I _I	TTLIN/Control Pins	V _{CC} = Max	V _I = 5.25V or 0V	—	—	±5	μA
	GTLPIN		V _I = V _{TT} or 0V	—	—	±5	
I _{OFF}	TTLIN	V _{CC} = 0	V _I or V _O = 0 to 5.25V	—	—	100	μA
I _{OZH}	OAx	V _{CC} = Max	V _O = 5.25 V	—	—	5	μA
	OBx		V _O = 1.5V	—	—	5	
I _{OZL}	OAx	V _{CC} = Max	V _O = 0	—	—	-5	μA
I _{CC}	OAx or OBx	V _{CC} = Max	Outputs HIGH	—	7	18	mA
			Outputs LOW	—	7	20	
		V _I = V _{CC} or GND	Outputs Disabled	—	7	20	
ΔI _{CC} ⁽²⁾	TTLIN	V _{CC} = Max	V _I = V _{CC} - 2.1	—	—	6	mA

NOTES:

- All typical values are at V_{CC}, V_{CCCT} = 5V, and T_A = 25°C.
- ΔI_{CC} is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND.

AC ELECTRICAL CHARACTERISTICS^(1,2)

Following Conditions Apply Unless Otherwise Specified:

Industrial: $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$; $V_{REF} = 1\text{V}$; V_{CC} , $V_{CCT} = 5\text{V} \pm 5\%$

Symbol	Parameter	Min.	Typ. ⁽³⁾	Max.	Unit
t _{PLH} t _{PHL}	TTLIN to OBx	1.5	3.8	6	ns
		1.5	2.8	5	
t _{PLH} t _{PHL}	$\overline{\text{OEB}}$ to OBx	1.5	6.4	10.5	ns
		1.5	3.2	6	
t _{PLH} t _{PHL}	GTLPIN to OAx	1.5	4.4	6.5	ns
		1.5	4	6	
t _r	OBx Output Rise Time (20% to 80%)	—	2.3	—	ns
t _f	OBx Output Fall Time (20% to 80%)	—	2.3	—	
t _r	OAx Output Rise Time (10% to 90%)	—	2	—	ns
t _f	OAx Output Fall Time (10% to 90%)	—	2	—	
t _{SK(o)}	Output Skew ⁽⁴⁾	—	0.2	1	ns
t _{PZH} t _{PZL}	$\overline{\text{OE}}\overline{\text{A}}$ to OAx	0.5	3.6	6.5	ns
t _{PHZ} t _{PLZ}		0.5	3.8	6.5	ns

NOTES:

- See Test Circuits and Waveforms.
- Unless otherwise noted, $V_{REF} = 1\text{V}$, $C_L = 30\text{pF}$ for OBx, and $C_L = 50\text{pF}$ for OAx.
- Typical values are at V_{CC} , $V_{CCT} = 5\text{V}$, and $T_A = 25^{\circ}\text{C}$.
- Skew specs are given for specific, worst case V_{CC} temp. Skew values between the OBx outputs could vary on the backplane due to loading and impedance seen by the device.

RECOMMENDED OPERATING CONDITIONS⁽¹⁾

Symbol	Rating	Min.	Typ.	Max.	Unit
V _{CC} , V _{CCCT}	Supply Voltage	3.15	3.3V	3.45	V
V _{TT}	Bus Termination Voltage	GTLP	1.47	1.53	V
		V _{REF}	0.98	1.02	
V _I	Input Voltage on TTLIN and Control Pins	0	—	5.5	V
I _{OH}	HIGH Level Output Current (OAx)	—	—	−12	mA
I _{OL}	LOW Level Output Current (OAx)	—	—	12	mA
I _{OL}	LOW Level Output Current (OBx)	—	—	50	mA
T _A	Operating Temperature	−40	+25	+85	°C

NOTE:

- Unused inputs must be held HIGH or LOW.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Industrial: T_A = −40°C to +85°C; V_{REF} = 1V; V_{CC}, V_{CCCT} = 3.3V ± 0.15V

Symbol	Parameter	Test Conditions	Min.	Typ. ⁽¹⁾	Max.	Unit
V _{IH}	GTLPIN		V _{REF} + 0.05	—	V _{TT}	V
	All Others		2	—	—	
V _{IL}	GTLPIN		0	—	V _{REF} −0.05	V
	All Others		—	—	0.8	
V _{REF}	GTLP		—	1	—	V
	GTL		—	0.8	—	
V _{TT}	GTLP		—	1.5	—	V
	GTL		—	1.2	—	
V _{IK}		V _{CC} = Min, I _I = −18mA	—	—	−1.2	V
V _{OH}	OAx	V _{CC} = Min	I _{OH} = −100μA	V _{CC} −0.2	—	V
			I _{OH} = −6mA	2.4	—	
			I _{OH} = −12mA	2.2	—	
V _{OL}	OAx	V _{CC} = Min	I _{OL} = 100μA	—	—	V
			I _{OL} = 6mA	—	—	
			I _{OL} = 12mA	—	—	
V _{OL}	OBx	V _{CC} = Min	I _{OL} = 100μA	—	—	V
			I _{OL} = 50mA	—	—	
I _I	TTLIN/Control Pins	V _{CC} = Max	V _I = 5.25V or 0V	—	—	μA
	GTLPIN		V _I = V _{TT} or 0V	—	—	
I _{OFF}	TTLIN	V _{CC} = 0	V _I or V _O = 0 to 3.45V	—	—	10 μA
I _{OZH}	OAx	V _{CC} = Max	V _O = 3.45V	—	—	μA
	OBx		V _O = 1.5V	—	—	
I _{OZL}	OAx	V _{CC} = Max	V _O = 0	—	—	−5 μA
I _{CC}	OAx or OBx	V _{CC} = Max	Outputs HIGH	—	8	mA
			Outputs LOW	—	8	
		V _I = V _{CC} or GND	Outputs Disabled	—	7	
ΔI _{CC} ⁽²⁾	TTLIN	V _{CC} = Max	V _I = V _{CC} - 2.1	—	—	1 mA

NOTES:

- All typical values are at V_{CC}, V_{CCCT} = 3.3V, and T_A = 25°C.
- ΔI_{CC} is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND.

AC ELECTRICAL CHARACTERISTICS^(1,2)

Following Conditions Apply Unless Otherwise Specified:

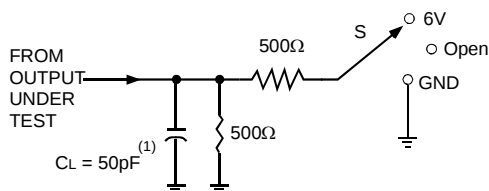
Industrial: $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$; $V_{REF} = 1\text{V}$; V_{CC} , $V_{CCT} = 3.3\text{V} \pm 0.15\text{V}$

Symbol	Parameter	Min.	Typ. ⁽³⁾	Max.	Unit
t _{PLH}	TTLIN to OBx	2	3.5	5	ns
t _{PHL}		2.2	3.7	5.5	
t _{PLH}	$\overline{\text{OEB}}$ to OBx	2	3.5	5	ns
t _{PHL}		2.3	3.8	5.5	
t _{PLH}	GTLPIN to OAx	2.5	4.3	6	ns
t _{PHL}		2	3.5	5	
t _r	OBx Output Rise Time (20% to 80%)	—	1.7	—	ns
t _f	OBx Output Fall Time (20% to 80%)	—	1.7	—	
t _r	OAx Output Rise Time (10% to 90%)	—	4	—	ns
t _f	OAx Output Fall Time (10% to 90%)	—	3	—	
t _{SK(o)}	Output Skew ⁽⁴⁾	—	0.1	0.5	ns
t _{PZH}	$\overline{\text{OE}}\overline{\text{A}}$ to OAx	2	4.3	6.5	ns
t _{PZL}					
t _{PHZ}		2.5	5	7	ns
t _{PLZ}					

NOTES:

- See Test Circuits and Waveforms.
- Unless otherwise noted, $V_{REF} = 1\text{V}$, $C_L = 30\text{pF}$ for OBx, and $C_L = 50\text{pF}$ for OAx.
- Typical values are at V_{CC} , $V_{CCT} = 3.3\text{V}$, and $T_A = 25^{\circ}\text{C}$.
- Skew specs are given for specific, worst case V_{CC} temp. Skew values between the OBx outputs could vary on the backplane due to loading and impedance seen by the device.

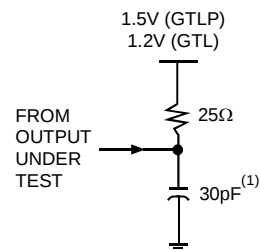
TEST CIRCUITS AND WAVEFORMS



NOTE:

1. CL includes probes and jig capacitance.

Test Circuit for OA Outputs



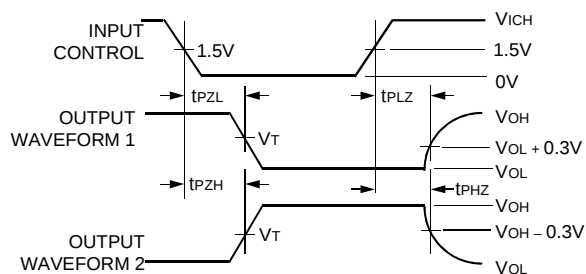
NOTE:

1. CL includes probes and jig capacitance. CL = 30pF is used for worst case.

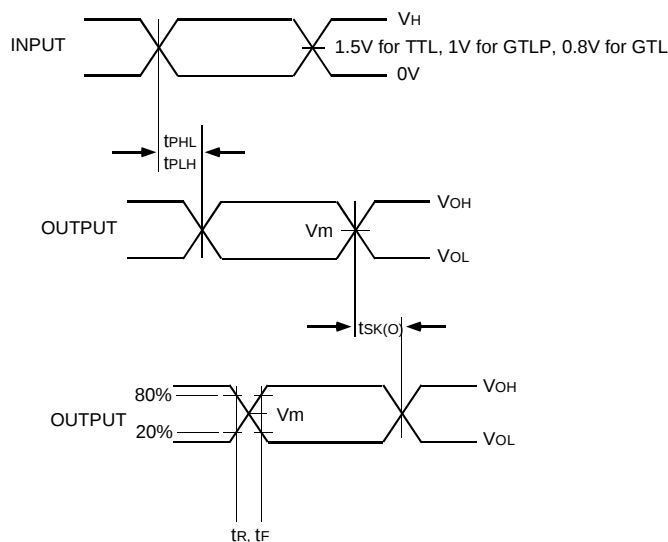
Test Circuit for OB Outputs

SWITCH POSITION

Test	Switch
Open Drain Disable Low Enable Low	6V
Disable High Enable High	GND
All Other Tests	Open



Voltage Waveforms Enable and Disable Times (OAx)
($V_{IH} = 5V$ for $V_{CC} = 5V$, $3V$ for $V_{CC} = 3.3V$)
($V_T = V_{CC}/2$ for $V_{CC} = 5V$, $1.5V$ for $V_{CC} = 3.3V$)



Voltage Waveforms Pulse Duration
($V_H = 5V$ for $V_{CC} = 5V$ and $3V$ for $V_{CC} = 3.3V$ for TTL,
 $1.5V$ for GTLP, $1.2V$ for GTL)
($V_M = V_{CC}/2$ for $V_{CC} = 5V$ and $1.5V$ for $V_{CC} = 3.3V$ for OAx,
 $1V$ for OBx)

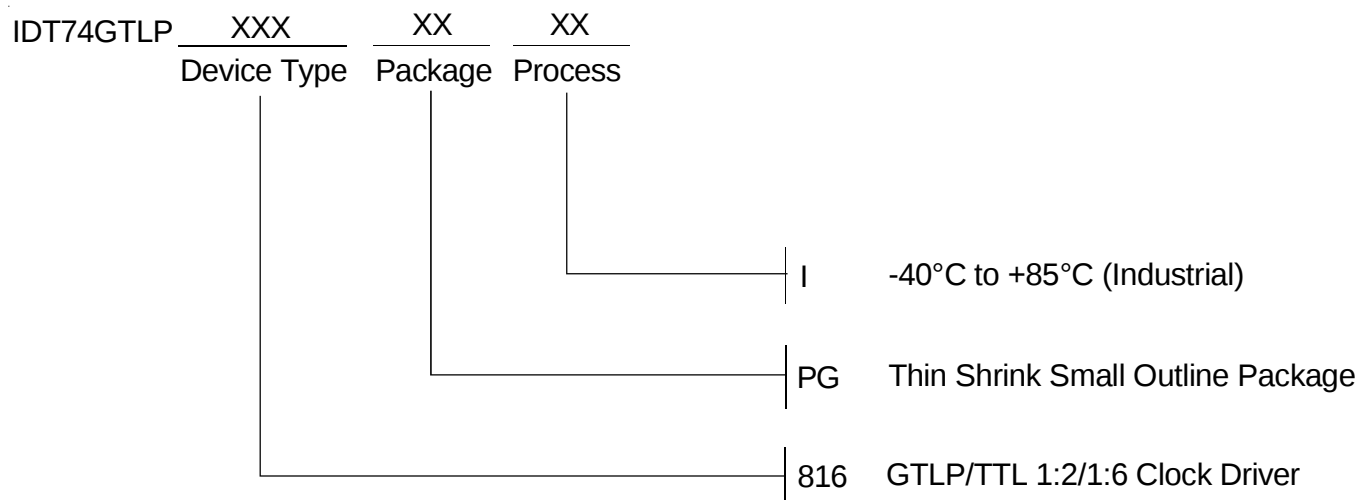
NOTES:

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.

All input pulses have the following characteristics: frequency = 10 MHz, $t_r = t_f = 2$ ns, $Z_o = 50\Omega$. The outputs are measured one at a time with one transition per measurement.

ORDERING INFORMATION



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