Fast CMOS Buffer/Clock Driver

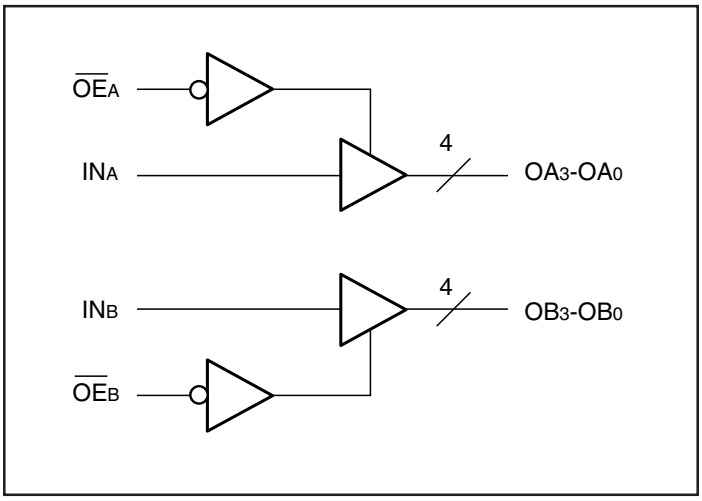
Product Features

- Low output skew: 0.8ns
- Clock busing with Hi-Z state control
- TTL input and output levels, reducing problematic "ground bounce"
- High output drive, I_{OL} = 64mA
- Extremely low static power (1mW, typ.)
- Hysteresis on all inputs
- Packages available:
  – 16-pin 300 mil wide plastic SOIC (S)

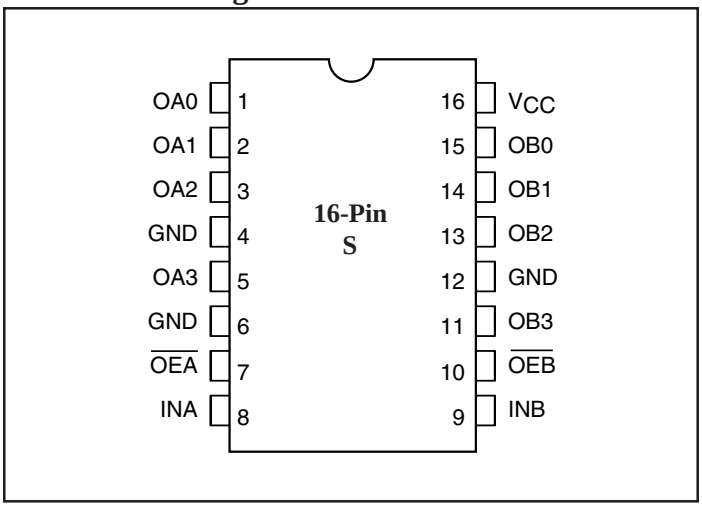
Product Description

The PI49FCT804T is a non-inverting clock driver designed with two independent groups of buffers. These buffers have Hi-Z state Output Enable inputs (active LOW) with a 1-in, 4-out configuration per group. Each clock driver consists of two banks of drivers, driving four outputs each from a standard TTL compatible CMOS input.

Logic Block Diagram



Product Pin Configuration



Product Pin Description

Pin Name	Description
$\overline{OE}_A$, $\overline{OE}_B$	Hi-Z State Output Enable Inputs (Active LOW)
IN_A, IN_B	Clock Inputs
OA_N, OB_N	Clock Outputs
GND	Ground
V_{CC}	Power

Truth Table(1)

Inputs		Outputs
$\overline{OE}_A$, $\overline{OE}_B$	IN_A, IN_B	OA_N, OB_N
L	L	L
L	H	H
H	L	Z
H	H	Z

Note:

1. H = High Voltage Level
   L = Low Voltage Level
   Z = High Impedance

Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature	–65°C to +150°C
Ambient Temperature with Power Applied	0°C to +70°C
Supply Voltage to Ground Potential (Inputs & Vcc Only)	–0.5V to +7.0V
Supply Voltage to Ground Potential (Outputs & D/O Only)	–0.5V to +7.0V
DC Input Voltage	–0.5V to +7.0V
DC Output Current	120mA
Power Dissipation	0.5W

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.

DC Electrical Characteristics (Over the Operating Range, T_A = 0°C to +70°C, V_{CC} = 5.0V ± 5%)

Parameters	Description	Test Conditions[1]		Min.	Typ.[2]	Max.	Units
V_{OH}	Output HIGH Voltage	V_{CC} = Min., V_{IN} = V_{IH} or V_{IL}	I_{OH} = –24.0mA	2.4	3.3		V
V_{OL}	Output LOW Current	V_{CC} = Min., V_{IN} = V_{IH} or V_{IL}	I_{OL} = 64mA		0.3	0.55	V
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH Level		2.0			V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW Level				0.8	V
I_{IH}	Input HIGH Current	V_{CC} = Max.	V_{IN} = V_{CC}			1	µA
I_{IL}	Input LOW Current	V_{CC} = Max.	V_{IN} = GND			–1	µA
I_{OZH}	High Impedance	V_{CC} = Max.	V_{OUT} = V_{CC}			1	µA
I_{OZL}	Output Current		V_{OUT} = GND			–1	µA
I_I	Input HIGH Current	V_{CC} = Max., V_{IN} = V_{CC} (Max.)				20	µA
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., I_{IN} = –18 mA			–0.7	–1.2	V
I_{OS}	Short Circuit Current	V_{CC} = Max.[3], V_{OUT} = GND		–60	–120	–225	mA
V_H	Input Hysteresis	V_{CC} = 5V			200		mV

Capacitance (T_A = 25°C, f = 1 MHz)

Parameters[4]	Description	Test Conditions	Typ.	Max.	Units
C_{IN}	Input Capacitance	V_{IN} = 0V	6	10	pF
C_{OUT}	Output Capacitance	V_{OUT} = 0V	8	12	pF

Notes:
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at Vcc = 5.0V, +25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. This parameter is determined by device characterization but is not production tested.

Power Supply Characteristics

Parameters	Description	Test Conditions[1]		Min.	Typ.[2]	Max.	Units
I_{CC}	Quiescent Power Supply Current	V_{CC} = Max.	V_{IN} = GND or V_{CC}		3	30	µA
ΔI_{CC}	Supply Current per Input @ TTL HIGH	V_{CC} = Max.	V_{IN} = 3.4V[3]		0.5	2.0	mA
I_{CCD}	Supply Current per Input per MHz[4]	V_{CC} = Max., Outputs Open $\overline{OE}_A = \overline{OE}_B$ = GND Per Output Toggling 50% Duty Cycle	$V_{IN} = V_{CC}$ V_{IN} = GND		0.15	0.25	mA/ MHz
I_C	Total Power Supply Current[6]	V_{CC} = Max., Outputs Open f_I = 10 MHz 50% Duty Cycle $\overline{OE}_A = \overline{OE}_B$ = GND Four Outputs Toggling	$V_{IN} = V_{CC}$ V_{IN} = GND		6.2	11.2[5]	mA
			V_{IN} = 3.4V V_{IN} = GND		6.4	12[5]	
		V_{CC} = Max., Outputs Open f_I = 2.5 MHz 50% Duty Cycle $\overline{OE}_A = \overline{OE}_B$ = GND Eight Outputs Toggling	$V_{IN} = V_{CC}$ V_{IN} = GND		3.1	6.3[5]	
			V_{IN} = 3.4V V_{IN} = GND		3.5	7.6[5]	

Notes:

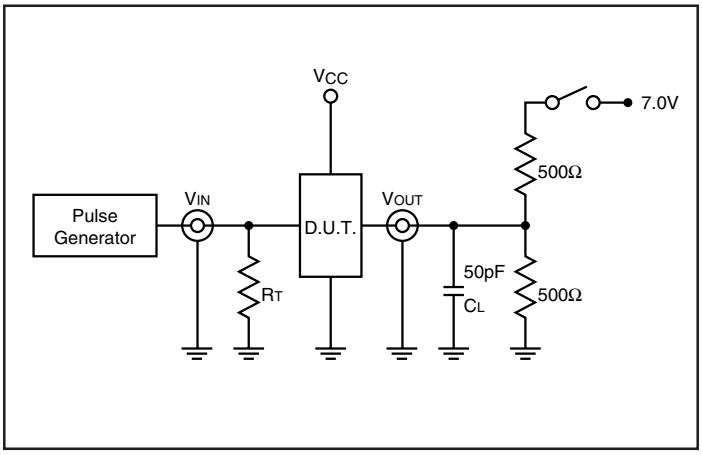
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at Vcc = 5.0V, +25°C ambient.
3. Per TTL driven input (V_{IN} = 3.4V); all other inputs at Vcc or GND.
4. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
5. Values for these conditions are examples of the Icc formula. These limits are guaranteed but not tested.
6. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_I N_I)$
   I_{CC} = Quiescent Current
   ΔI_{CC} = Power Supply Current for a TTL High Input (V_{IN} = 3.4V)
   D_H = Duty Cycle for TTL Inputs High
   N_T = Number of TTL Inputs at D_H
   I_{CCD} = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)
   f_{CP} = Clock Frequency for Register Devices (Zero for Non-Register Devices)
   f_I = Input Frequency
   N_I = Number of Inputs at f_I
   All currents are in milliamps and all frequencies are in megahertz.

PI49FCT804T Switching Characteristics over Operating Range

Parameters	Description	Conditions[1]	804T Com. Min.	804T Com. Max.	804AT Com. Min.	804AT Com. Max.	Units
t_{PLH} t_{PHL}	Propagation Delay IN_A to OA_N, OE_B to OB_N	CL = 50pF RL = 500Ω	1.5	6.5	1.5	5.8	ns
t_{PZH} t_{PZL}	Output Enable Time $\overline{OE}_A$ to $\overline{OA}_N$, OE_B to OB_N		1.5	8.0	1.5	8.0	
t_{PHZ} t_{PLZ}	Output Disable Time $\overline{OE}_A$ to $\overline{OA}_N$, OE_B to OB_N		1.5	7.0	1.5	7.0	
$t_{SKEW(O)}$[3]	Skew between two outputs of same package (same transition)		—	0.8	—	0.7	
$t_{SKEW(p)}$[3]	Skew between opposite transitions (t_{PHL}-t_{PLH})of the same package		—	1.0	—	0.8	
$t_{SKEW(t)}$[3]	Skew between two outputs of different packages at same temperature (same transition)		—	1.6	—	1.4	

Notes:
1. See test circuit and wave forms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. Skew measured at worse cast temperature (max. temp).

Tests Circuits For All Outputs[1]



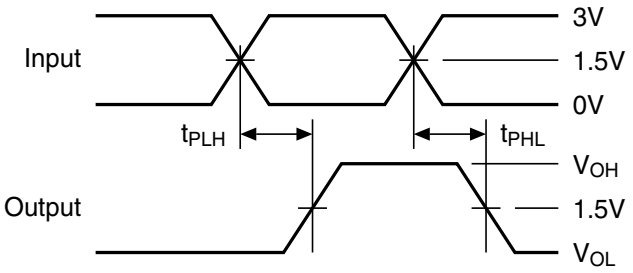
Switch Position

Test	Switch
Open Drain Disable LOW Enable LOW	Closed
All Other Inputs	Open

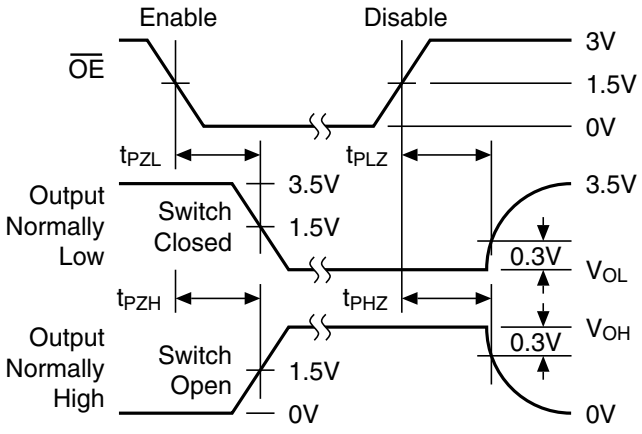
Definitions:
C_L = Load capacitance: includes jig and probe capacitance.
R_T = Termination resistance: should be equal to ZOUT of the Pulse Generator.

Switching Waveforms

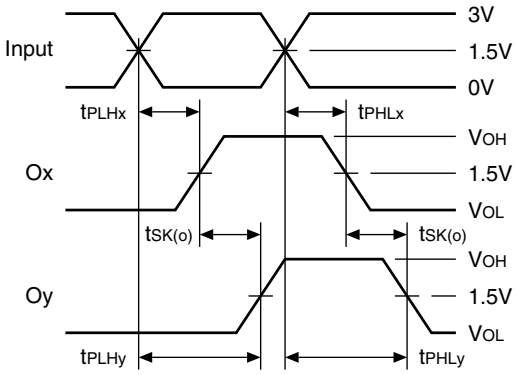
Propagation Delay



Enable and Disable Times

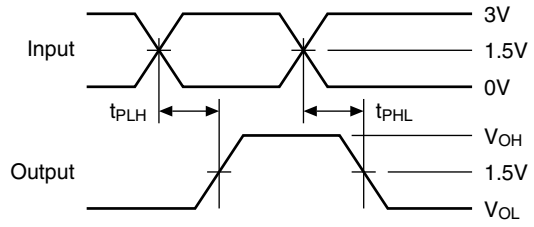


Output Skew – $t_{SK(o)}$



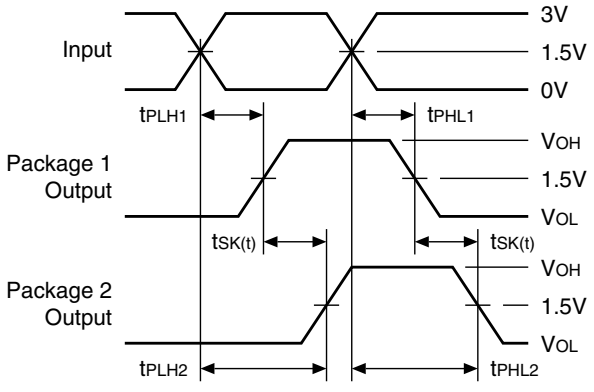
$t_{SK(o)} = | t_{PLHy} - t_{PLHx} |$ or $| t_{PHLy} - t_{PHLx} |$

Pulse Skew – $t_{SK(p)}$



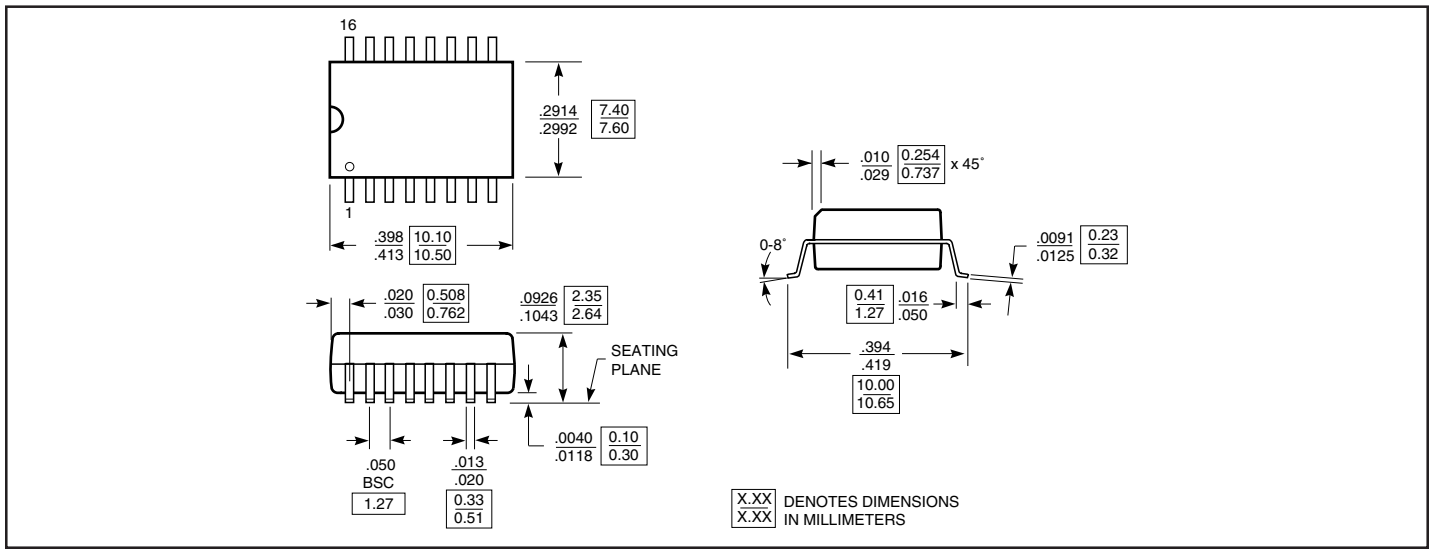
$t_{SK(p)} = | t_{PHL} - t_{PLH} |$

Package Skew – $t_{SK(t)}$



$t_{SK(t)} = | t_{PLH2} - t_{PLH1} |$ or $| t_{PHL2} - t_{PHL1} |$

16-Pin 300-Mil Wide SOIC (S)



Ordering Information

Part Number	Package
PI49FCT804TS	16-pin SOIC