PI49FCT3804

3.3V Fast CMOS Buffer/Clock Driver

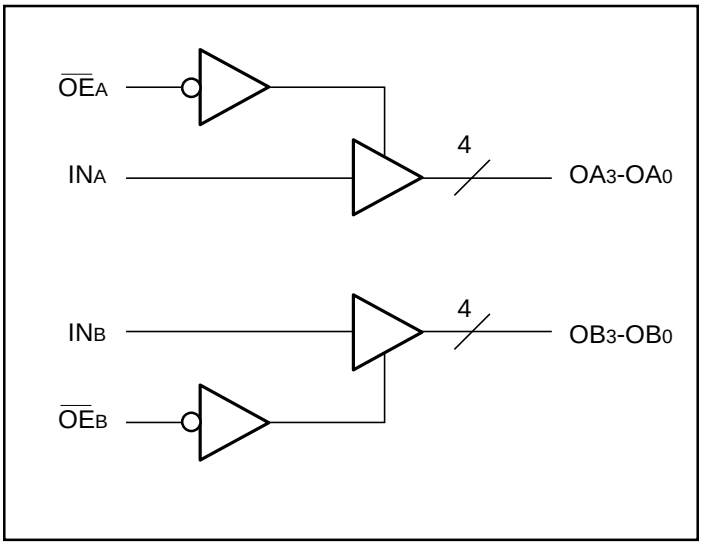
Features

- 3.3V version of PI49FCT804T
- Low output skew: 0.7ns
- Clock busing with Hi-Z state control
- TTL input and output levels, reducing problematic "ground bounce"
- Extremely low static power (1mW, typical)
- Hysteresis on all inputs
- ESD protection exceeds 2000V
- Industrial Operation: –40°C to 85°C
- Packaging (Pb-free & Green available):
  – 16-pin 300-mil wide plastic SOIC (S)

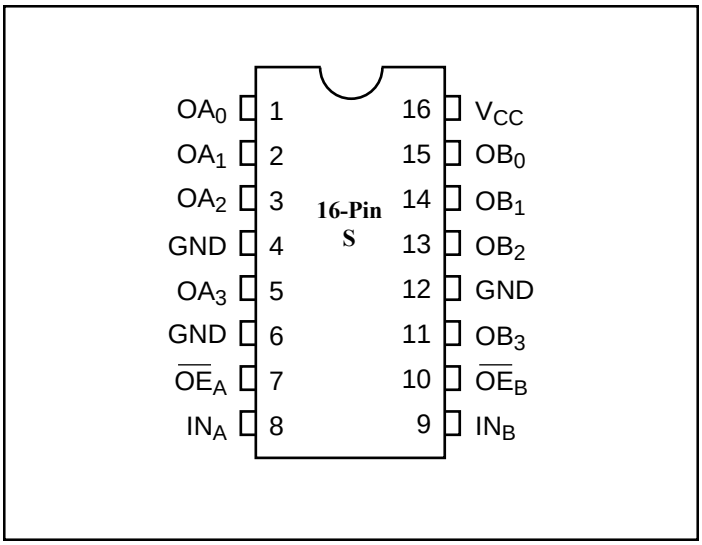
Description

Pericom Semiconductor's PI49FCT3804 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.

Block Diagram



Pin Configuration



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
$\overline{OEA}$, $\overline{OEB}$	INA, INB	OAN, OBN
L	L	L
L	H	H
H	L	Z
H	H	Z

Notes:
H = High Voltage Level
L = Low Voltage Level
Z = High Impedance

Capacitance (T_A = 25°C, f = 1 MHz)

Parameters(1)	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

Note:
1. This parameter is determined by device characterization but is not production tested.

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 ..... –40°C to +85°C
Supply Voltage to Ground Potential ..... –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.

Operating Range

Ambient Temperature = –40°C to +85°C
V_{CC} = 3.3V ± 0.3V

DC Electrical Characteristics (Over the Operating Range)

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} = –0.1mA I_{OH} = –8mA	V_{CC}–0.2 2.4[3]	— 3.0	—	V
V_{OL}	Output LOW Voltage	V_{CC} = Min., V_{IN} = V_{IH} or V_{IL}	I_{OL} = 0.1mA I_{OL} = 16mA I_{OL} = 24mA	— — —	— 0.2 0.3	0.2 0.4 0.5	V
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH Level	Input Pins	2.0	—	5.5	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW Level	Input Pins	–0.5	—	0.8	V
I_{IH}	Input HIGH Current	V_{CC} = Max.	V_{IN} = V_{CC} (Input Pins)	—	—	1	µA
I_{IL}	Input LOW Current	V_{CC} = Max.	V_{IN} = GND (Input & I/O Pins)	—	—	–1	µA
I_{OZH}	High Impedance	V_{CC} = Max.	V_{OUT} = V_{CC}	—	—	1	µA
I_{OZL}	Output Current	(Hi-Z State Output Pins)	V_{OUT} = GND	—	—	–1	
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., I_{IN} = –18mA		—	–0.7	–1.2	V
I_{ODH}	Output HIGH Current	V_{CC} = 3.3V, V_{IN} = V_{IH} or V_{IL}, V_{OUT} = 1.5V[4]		–35	–60	–110	mA
I_{ODL}	Output LOW Current	V_{CC} = 3.3V, V_{IN} = V_{IH} or V_{IL}, V_{OUT} = 1.5V[4]		50	90	200	mA
I_{OS}	Short Circuit Current[5]	V_{CC} = Max., V_{OUT} = GND[5]		–60	–135	–240	mA
V_H	Input Hysteresis			—	150	—	mV

Notes:
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V_{CC} = 3.3V, +25°C ambient and maximum loading.
3. V_{OH} = V_{CC} – 0.6V at rated current.
4. This parameter is determined by device characterization but is not production tested.
5. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.

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 Inputs @ TTL HIGH	V_{CC} = Max.	V_{IN} = V_{CC} – 0.6V[3]	—	2.0	300	µA
I_{CCD}	Supply Current per Input per MHz[4]	V_{CC} = Max., Outputs Open $\overline{OE}_A$ or $\overline{OE}_B$ = GND Per Output Toggling 50% Duty Cycle	V_{IN} = V_{CC} V_{IN} = GND	—	0.08	0.16	mA/ MHz
I_C	Total Power Supply Current[6]	V_{CC} = Max., Outputs Open f_O = 10 MHz 50% Duty Cycle $\overline{OE}_A$ or $\overline{OE}_B$ = GND Mon. Output Toggling	V_{IN} = V_{CC} V_{IN} = GND	—	3.3	9.0[5]	mA
			V_{IN} = V_{CC} – 0.6V V_{IN} = GND	—	3.3	10.0[5]	
		V_{CC} = Max., Outputs Open f_O = 2.5 MHz 50% Duty Cycle $\overline{OE}_A$ or $\overline{OE}_B$ = GND Eleven Outputs Toggling	V_{IN} = V_{CC} V_{IN} = GND	—	1.8	6.0[5]	
			V_{IN} = V_{CC} – 0.6V V_{IN} = GND	—	1.8	7.0[5]	

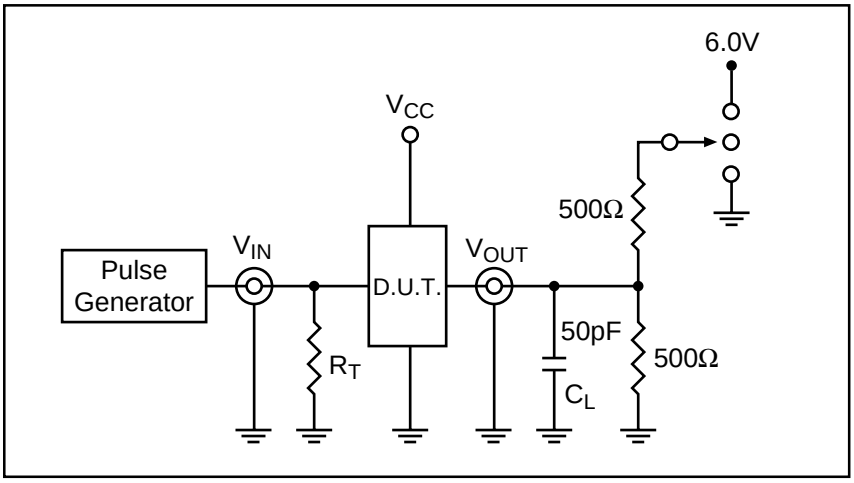
Notes:
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at V_{CC} = 3.3V, +25°C ambient.
3. Per TTL driven input (V_{IN} = V_{CC} – 0.6V); all other inputs at V_{CC} or GND.
4. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
5. Values for these conditions are examples of the I_C formula. These limits are guaranteed but not tested.
6. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_O N_O)$
   I_{CC} = Quiescent Current
   ΔI_{CC} = Power Supply Current for a TTL High Input (V_{IN} = V_{CC} – 0.6V)
   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_O = Output Frequency
   N_O = Number of Outputs at f_O
   All currents are in milliamps and all frequencies are in megahertz.

Switching Characteristics over Operating Range

Parameters	Description	Conditions[1]	3804 Com. Min.	3804 Com. Max.	3804A Com. Min.	3804A Com. Max.	Units
t_{PLH} t_{PHL}	Propagation Delay IN_A to OA_N, IN_B to OB_N	C_L = 50pF R_L = 500Ω	1.5	6.5	1.5	5.8	ns
t_{PZH} t_{PZL}	Output Enable Time $\overline{OE}_A$ to OA_N, $\overline{OE}_B$ to OB_N		1.5	8.0	1.5	8.0	ns
t_{PHZ} t_{PLZ}	Output Disable Time $\overline{OE}_A$ to OA_N, $\overline{OE}_B$ to OB_N		1.5	7.0	1.5	7.0	ns
$t_{skew(o)}$[3]	Skew between two outputs of same package (same transition)		—	0.8	—	0.7	ns
$t_{skew(p)}$[3]	Skew between opposite transitions (t_{PHL}-t_{PLH}) of the same output		—	1.0	—	0.8	ns
$t_{skew(t)}$[3]	Skew between two outputs of different package at same temperature (same transition)		—	1.6	—	1.4	ns

Notes:
1. See test circuit and waveforms.
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]



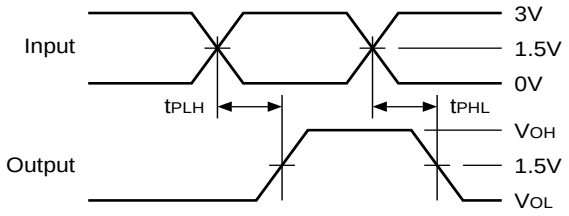
Switch Position

Test	Switch
Disable LOW Enable LOW	6V
Disable HIGH Enable HIGH	GND
All Other Inputs	Open

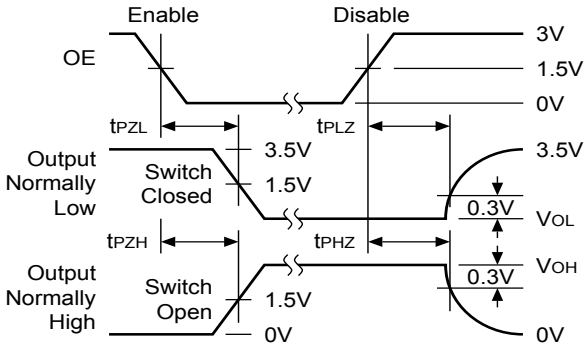
DEFINITIONS:
C_L = Load capacitance: includes jig and probe capacitance.
R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

Switching Waveforms

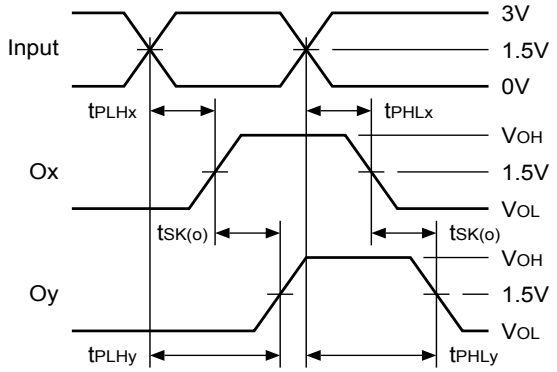
Propagation Delay



Enable and Disable Times

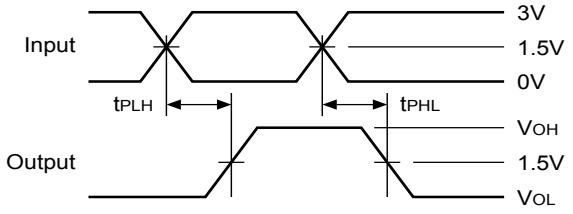


Output Skew – $t_{SK(o)}$



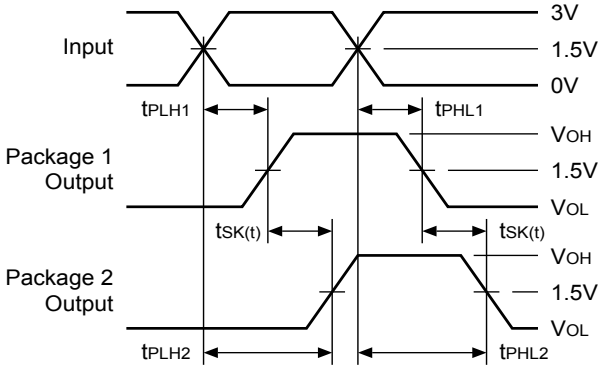
tSK(o) = | tPLHy - tPLHx | or | tPHLy - tPHLx |

Pulse Skew – $t_{SK(p)}$



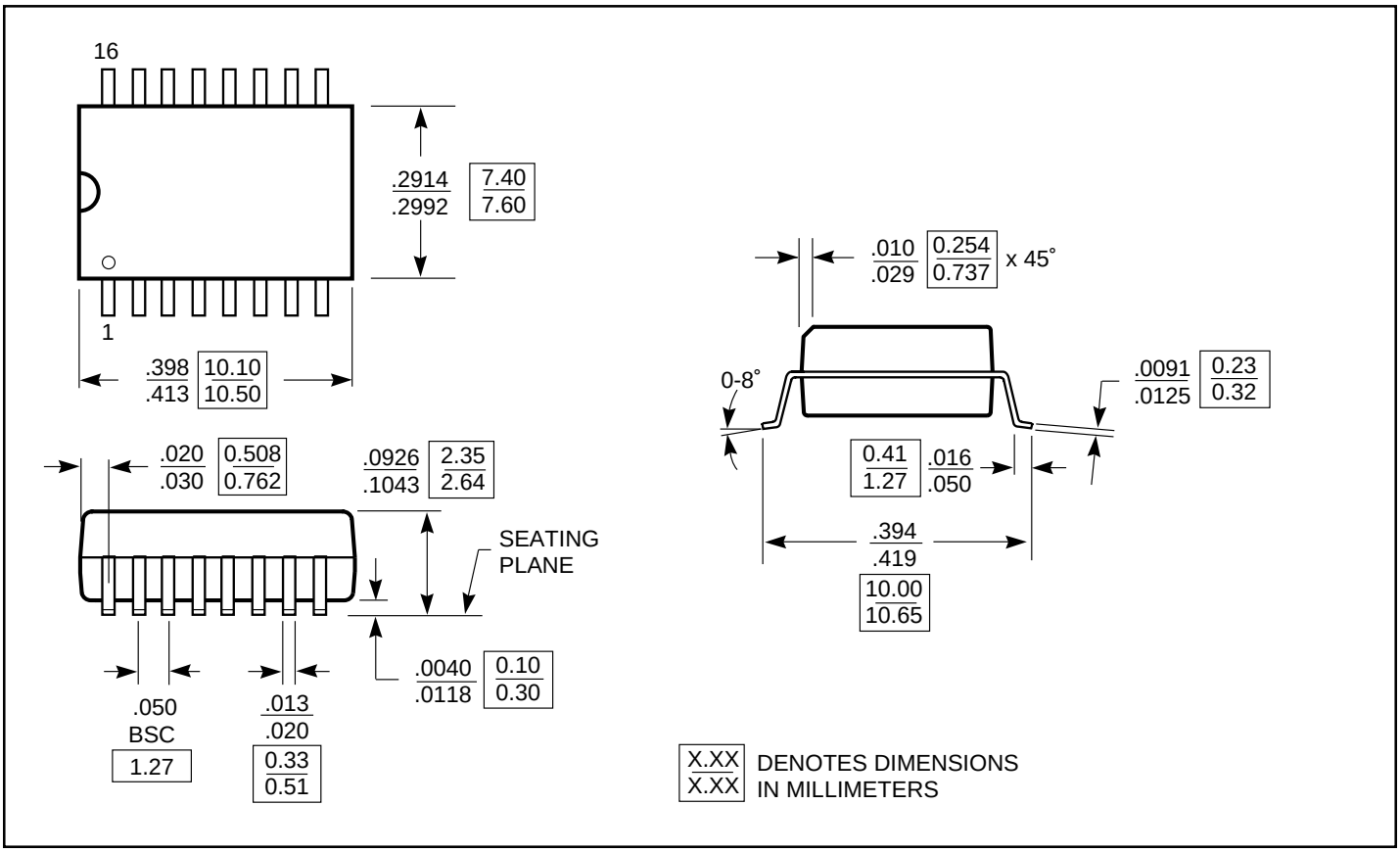
$t_{SK(p)} = | t_{PHL} - t_{PLH} |$

Package Skew – $t_{SK(t)}$



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

Packaging Mechanical: 16-pin 300-mil SOIC (S)



Ordering Information

Ordering Code	Package Code	Speed Grade	Package Type
PI49FCT3804S	S	Blank	16-pin 300-mil SOIC
PI49FCT3804SE	S	Blank	Pb-free & Green, 16-pin 300-mil SOIC
PI49FCT3804AS	S	A	16-pin 300-mil SOIC
PI49FCT3804ASE	S	A	Pb-free & Green, 16-pin 300-mil SOIC

Notes:
1. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/