



PI49FCT3804

3.3V Fast CMOS Buffer/Clock Driver

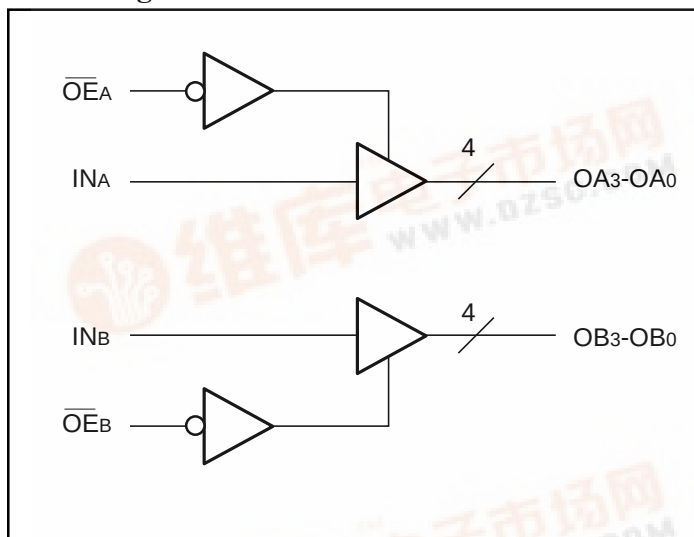
Features

- 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)

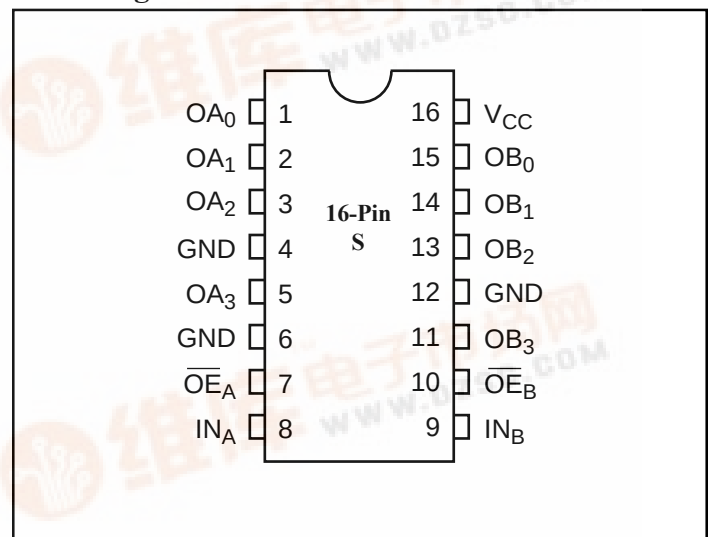
Description

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

Notes:

H = High Voltage Level

L = Low Voltage Level

Z = High Impedance

Capacitance ($T_A = 25^\circ\text{C}$, $f = 1\text{ MHz}$)

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	μA
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 OE _A or 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 OE _A or 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 OE _A or 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:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
- Typical values are at V_{CC} = 3.3V, +25°C ambient.
- Per TTL driven input (V_{IN} = V_{CC} − 0.6V); all other inputs at V_{CC} or GND.
- This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
- Values for these conditions are examples of the I_C formula. These limits are guaranteed but not tested.
- $$I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$$

$$I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_O N_O)$$

$$I_{CC} = \text{Quiescent Current}$$

$$\Delta I_{CC} = \text{Power Supply Current for a TTL High Input (V}_{IN} = V_{CC} - 0.6V)$$

$$D_H = \text{Duty Cycle for TTL Inputs High}$$

$$N_T = \text{Number of TTL Inputs at } D_H$$

$$I_{CCD} = \text{Dynamic Current Caused by an Input Transition Pair (HLH or LHL)}$$

$$f_O = \text{Output Frequency}$$

$$N_O = \text{Number of Outputs at } f_O$$

All currents are in milliamps and all frequencies are in megahertz.

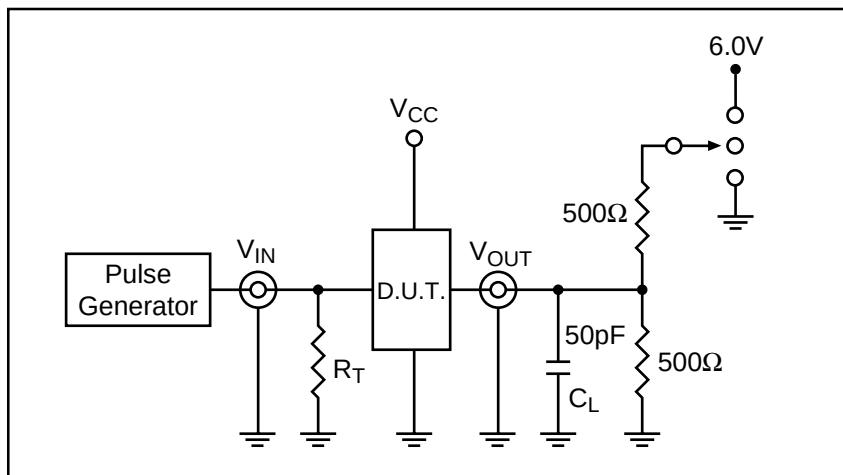
Switching Characteristics over Operating Range

Parameters	Description	Conditions ⁽¹⁾	3804		3804A		Units
			Com.		Com.		
			Min.	Max.	Min.	Max.	
t _{PLH} t _{PHL}	Propagation Delay I _N A to O _A N, I _N B to O _B N	C _L = 50pF R _L = 500Ω	1.5	6.5	1.5	5.8	ns
t _{PZH} t _{PZL}	Output Enable Time O _E A to O _A N, O _E B to O _B N		1.5	8.0	1.5	8.0	ns
t _{PHZ} t _{PLZ}	Output Disable Time O _E A to O _A N, O _E B to O _B 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

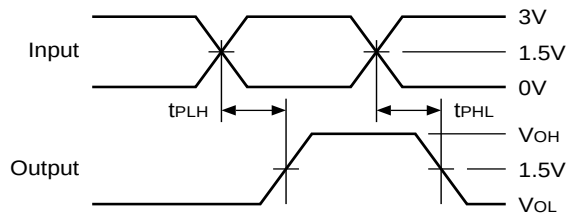
DEFINITIONS:

C_L = Load capacitance: includes jig and probe capacitance.

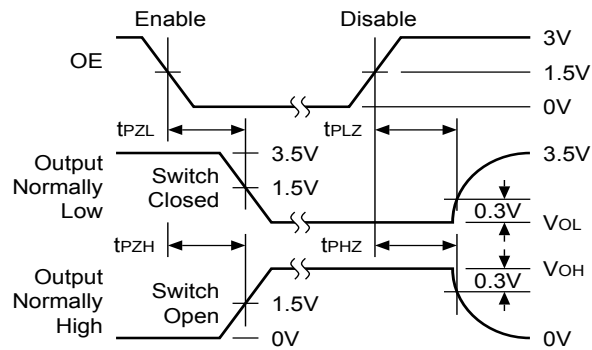
R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

Switching Waveforms

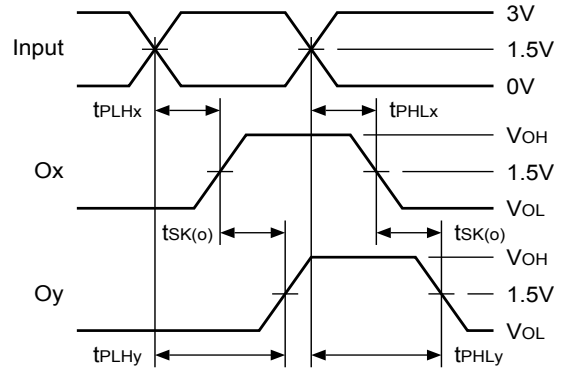
Propagation Delay



Enable and Disable Times

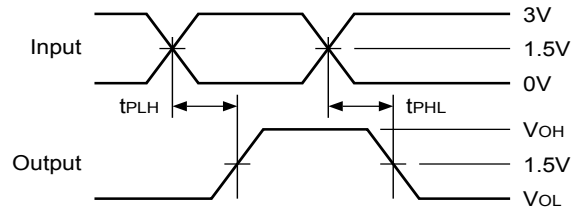


Output Skew – $t_{SK(o)}$



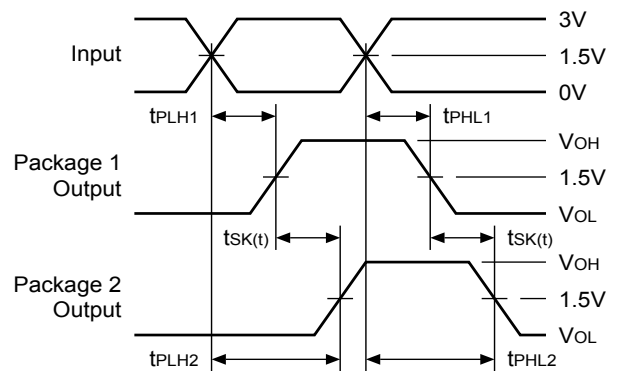
$$t_{SK(o)} = |t_{PLHy} - t_{PLHx}| \text{ or } |t_{PHLy} - t_{PHLx}|$$

Pulse Skew – $t_{SK(p)}$



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

Package Skew – $t_{SK(t)}$



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



The drawing illustrates the mechanical specifications of a 16-pin DIP package. The top view shows a rectangular body with 16 pins (8 on each side) and a notch on the left. Key dimensions include a body width of .398 to .413 inches (10.10 to 10.50 mm), a pin pitch of .050 inches (1.27 mm), and a pin width of .013 to .020 inches (0.33 to 0.51 mm). The side view shows a maximum height of .2914 to .2992 inches (7.40 to 7.60 mm) and a seating plane. The end view shows a pin thickness of .0040 to .0118 inches (0.10 to 0.30 mm) and a lead angle of 0-8°. A note specifies that dimensions in X.XX format are in millimeters.

16

1

.2914
.2992

7.40
7.60

.398
.413

10.10
10.50

.020
.030

0.508
0.762

.0926
.1043

2.35
2.64

SEATING PLANE

.0040
.0118

0.10
0.30

.050
BSC

1.27

.013
.020

0.33
0.51

.010
.029

0.254
0.737

x 45°

0-8°

.0091
.0125

0.23
0.32

.41
1.27

.016
.050

.394
.419

10.00
10.65

X.XX
X.XX

DENOTES DIMENSIONS
IN MILLIMETERS

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

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