PI6C10804

1.8V/2.5V, 250MHz, 1:4 Networking Clock Buffer

Features

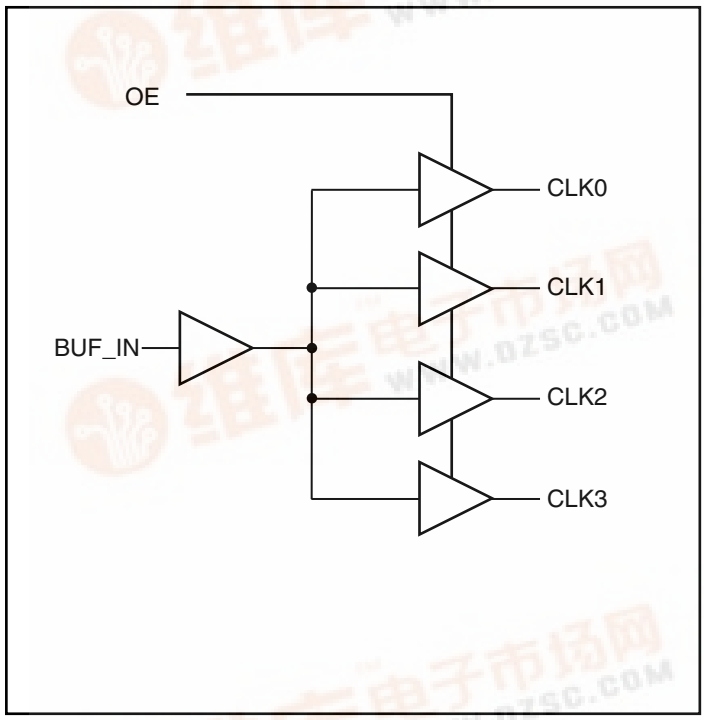
- High-speed, low-noise, non-inverting 1:4 buffer
- Maximum Frequency up to 250 MHz
- Low output skew < 150ps
- Low propagation delay < 3.0ns
- 1.8V or 2.5V supply voltage
- Packages (Pb-free & Green available):
  -8-pin SOIC (W)

Description

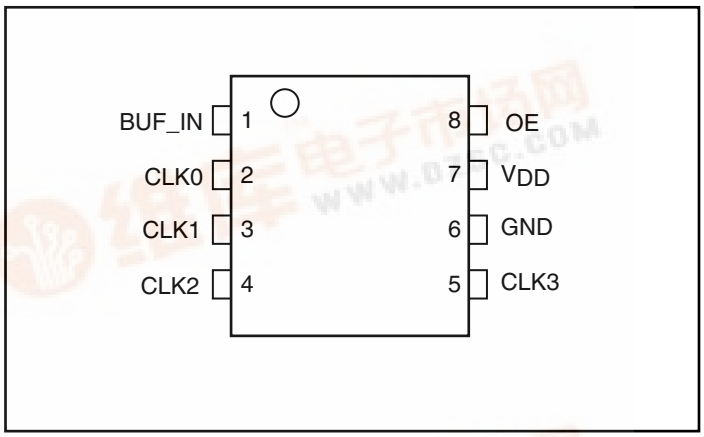
The PI6C10804 is a 1.8V or 2.5V high-speed, low-noise 1:4 non-inverting clock buffer. The key goal in designing the PI6C10804 is to target networking applications that require low-skew, low-jitter, and high-frequency clock distribution.

Providing output-to-output skew as low as 150ps, the PI6C10804 is an ideal clock distribution device for synchronous systems. Designing synchronous networking systems requires a tight level of skew from a large number of outputs.

Block Diagram



Pin Configuration



Pin Description

Pin Name	Description
BUF_IN	Input
CLK [0:3]	Outputs
GND	Ground
V_{DD}	Power
OE	Output Enable

2.5V Absolute Maximum Ratings (Above which the useful life may be impaired. For user guidelines only, not tested.)

Storage Temperature	–65°C to +150°C
V_{DD} Voltage	–0.5V to +3.6V
Output Voltage (max. 3.6V)	–0.5V to V_{DD}+0.5V
Input Voltage (max 3.6V)	–0.5V to V_{DD}+0.5V

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.

2.5V DC Characteristics (Over Operating Range: V_{DD} = 2.5V ± 0.2V, T_A = -40° to 85°C)

Parameters	Description	Test Conditions(1)		Min.	Typ. (2)	Max.	Units
V_{DD}	Supply Voltage			2.3	2.5	2.7	V
V_{IH}	Input HIGH Voltage	Logic HIGH level		1.7		3.6	V
V_{IL}	Input LOW Voltage	Logic LOW level		-0.3		0.7	V
I_I	Input Current	V_{DD} = Max, Vin = V_{DD} or GND	I/O pins			15	µA
			non I/O pins			5	
V_{OH}	Output High Voltage	V_{DD} = Min., V_{IN} = V_{IH} or V_{IL}	I_{OH} = -1mA	2.0			V
			I_{OH} = -2mA	1.7			
			I_{OH} = -8mA	1.5			
V_{OL}	Output LOW Voltage	V_{DD} = Min., V_{IN} - V_{IH} or V_{IL}	I_{OL} = 1mA			0.4	
			I_{OL} = 2mA			0.7	
			I_{OL} = 8mA			0.7	V

Notes:
1. For Max. or Min. conditions, use appropriate operating range values.
2. Typical values are at V_{CC} = 2.5V, +25°C ambient and maximum loading.

2.5V AC Characteristics (Over Operating Range: V_{DD} = 2.5V ± 0.2V, T_A = -40° to 85°C)

Parameters	Description	Test Conditions(1)	Min.	Typ	Max.	Units
F_{IN}	Input Frequency		0		250	MHz
t_R/t_F	CLKn Rise/Fall Time	20% to 80%			1.0	ns
t_{PLH}, t_{PHL}(2)	Propagation Delay BUF_IN to CLKn	C_L = 5pF, 125 MHz Outputs are measured @ Vdd/2	1.0	1.5	2.0	ns
$t_{SK(O)}$(3)	Output to Output Skew between any two outputs of the same device @ same transition			100	150	ps
$t_{SK(P)}$(3)	Pulse Skew between opposite transitions (t_{PHL}-t_{PLH}) of the same output			100	200	
$t_{SK(T)}$(3)	Part to Part Skew between two identical outputs of different parts on the same board(4)				300	
t_{dc_in}	Duty Cycle In @ 1ns edge rate		40		60	%
t_{dc_out}	Duty Cycle Out		40		60	

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).
4. Identical conditions: loading, transitions, supply voltage, temperature, package type and speed grade.

1.8V Absolute Maximum Ratings (Above which the useful life may be impaired. For user guidelines only, not tested.)

Storage Temperature	–65°C to +150°C
V_{DD} Voltage	–0.5V to +2.5V
Output Voltage (max 2.5V)	–0.5V to V_{DD}+0.5V
Input Voltage (max 2.5V)	–0.5V to V_{DD}+0.5V

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.

1.8V DC Characteristics (Over Operating Range: V_{DD} = 1.8V ± 0.15V, T_A = -40° to 85°C)

Parameters	Description	Test Conditions(1)		Min.	Typ. (2)	Max.	Units
V_{DD}	Supply Voltage			1.65	1.8	1.95	V
V_{IH}	Input HIGH Voltage	Logic HIGH level		0.65*Vdd		2.7	V
V_{IL}	Input LOW Voltage	Logic LOW level		-0.3		0.35*Vdd	
I_I	Input Current(3)	V_{DD} = Max, Vin = V_{DD} or GND	I/O pins			15	µA
			non I/O pins			5	
V_{OH}	Output High Voltage	V_{DD} = Min., V_{IN} = V_{IH} or V_{IL}	I_{OH} = -2mA	1.3			V
			I_{OH} = -8mA	1.2			
V_{OL}	Output LOW Voltage	V_{DD} = Min., V_{IN} - V_{IH} or V_{IL}	I_{OL} = 2mA			0.45	
			I_{OL} = -8mA			0.45	

Notes:
1. For Max. or Min. conditions, use appropriate operating Vdd and Ta values.
2. Typical values are at V_{CC} = 1.8V, +25°C ambient and maximum loading.
3. This parameter is determined by device characterization but is not production tested.

1.8V AC Characteristics (Over Operating Range: V_{DD} = 1.8V ± 0.15V, T_A = -40° to 85°C)

Parameters	Description	Test Conditions(1)	Min.	Typ	Max.	Units
F_{IN}	Input Frequency		0		180	MHz
t_R/t_F	CLKn Rise/Fall Time	20% to 80%			1.0	ns
t_{PLH}, t_{PHL}(2)	Propagation Delay BUF_IN to CLKn	C_L = 5pF, 125 MHz Outputs are measured @ Vdd/2	1.0	2.0	3.0	ns
$t_{SK(O)}$(3)	Output to Output Skew between any two outputs of the same device @ same transition			100	150	ps
$t_{SK(P)}$(3)	Pulse Skew between opposite transitions (t_{PHL}-t_{PLH}) of the same output			200	275	
$t_{SK(T)}$(3)	Part to Part Skew between two identical outputs of different parts on the same board(4)				300	
t_{dc_in}	Duty Cycle In @ 1ns edge rate		40		60	%
t_{dc_out}	Duty Cycle Out		40		60	

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).
4. Identical conditions: loading, transitions, supply voltage, temperature, package type and speed grade.

Power Supply Characteristics

Parameters	Description	Test Conditions[1]		Min.	Typ. [2]	Max.	Units
I_{DDQ}	Quiescent Power Supply Current	V_{DD} = 2.7V	V_{IN} = GND or V_{DD}			10	µA
		V_{DD} = 1.95V				10	
I_{DD_TOT}	Total Power Supply Current	V_{DD} = 2.7V	All Outputs Toggling, C_L = 5pF, F_{IN} = 125MHz			20	mA
		V_{DD} = 1.95V				15	
ΔI_{CC}	Static Supply Current per inputs @ High Level	V_{DD} = 2.7V	V_{INx} = Vdd - 0.6V [3]			200	µA
		V_{DD} = 1.95V	V_{INx} = Vdd - 0.6V [3]			200	

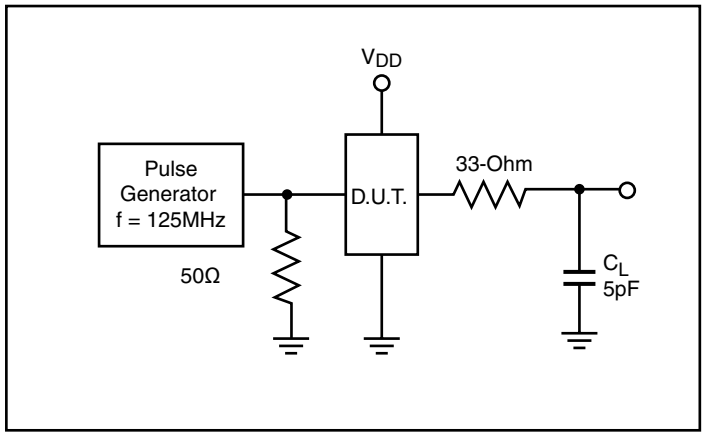
Notes:
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics.
2. Typical values are at V_{CC} = 1.8V or 2.5V, and +25°C ambient.
3. Per TTL driven input (V_{IN} = V_{DD} - 0.6V); all other inputs at V_{CC} or GND.

Capacitance (T_A = 25°C, f = 1 MHz)

Parameters[1]	Description	Test Conditions	Typ	Max.	Units
C_{IN}	Input Capacitance	V_{IN} = 0V	2.0	4	pF
C_{OUT}	Output Capacitance	V_{OUT} = 0V	1.7	6	

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

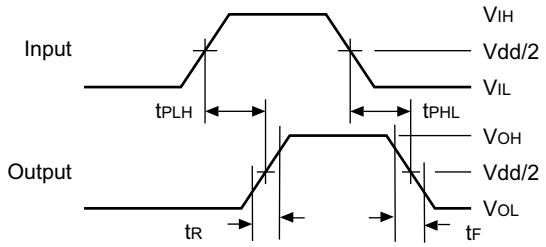
Test Circuits for All Outputs



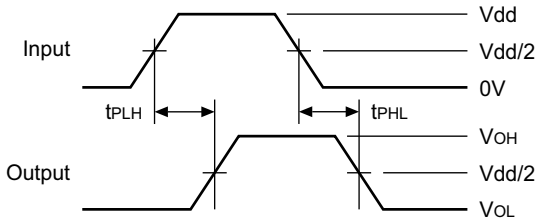
Definitions:
C_L = Load capacitance: includes jig and probe capacitance.

Switching Waveforms

Propagation Delay

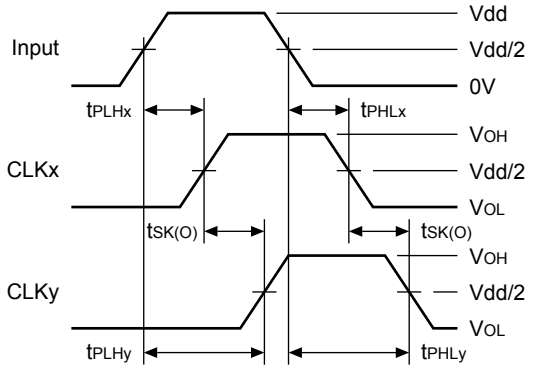


Pulse Skew – $t_{SK(P)}$



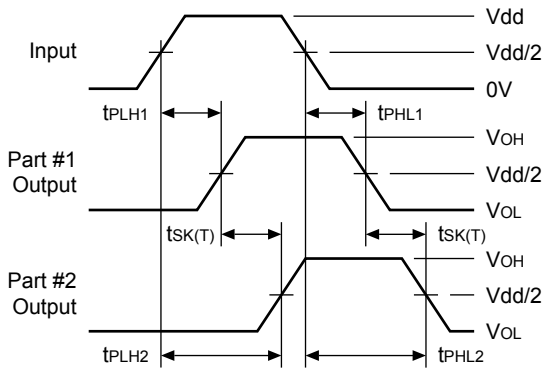
$t_{sk(p)} = | t_{PLH} - t_{PHL} |$

Output Skew – $t_{SK(O)}$



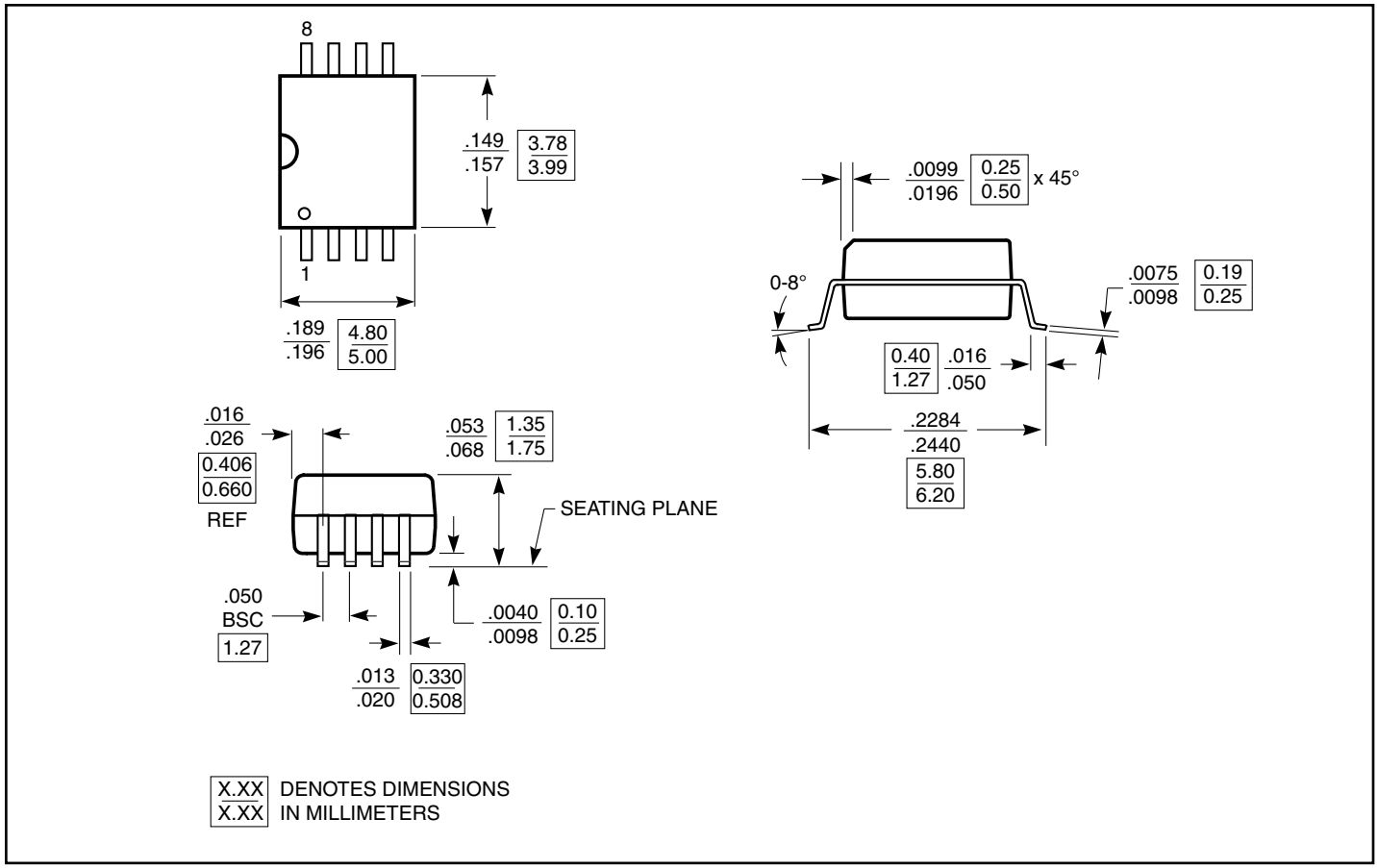
$t_{SK(O)} = | t_{PLHy} - t_{PLHx} |$ or $| t_{PHLy} - t_{PHLx} |$

Package Skew – $t_{SK(T)}$



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

Packaging Mechanical: 8-Pin SOIC (W)



Ordering Information[1,2,3]

Ordering Code	Package Code	Package Type
PI6C10804WE	W	Pb-free & Green, 8-pin 153-mil wide SOIC

Notes:
1. Thermal Characteristics can be found on the web at www.pericom.com/packaging/
2. E = Pb-free and Green
3. X suffix = Tape/Reel