

1-10 Clock Buffer for Networking Applications

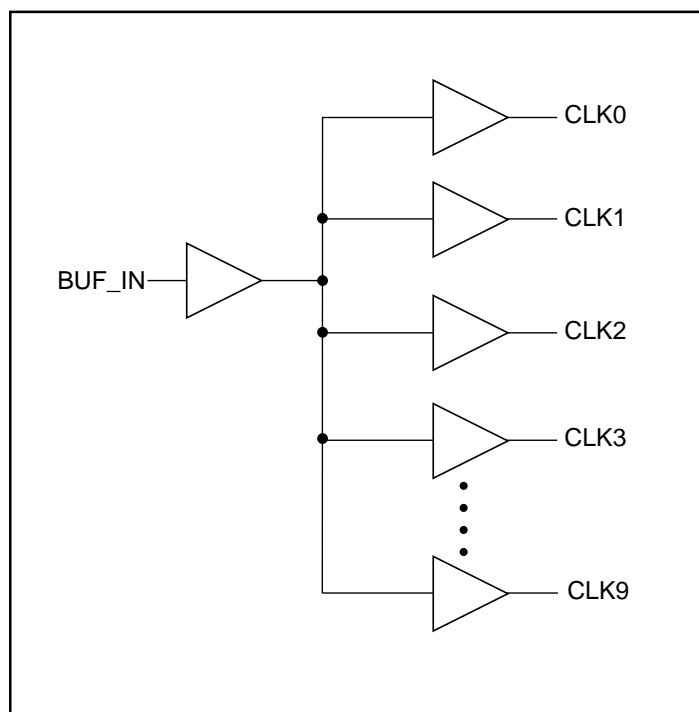
**Product Features**

- High Frequency >156 MHz
- High-speed, low-noise, non-inverting 1-10 buffer
- Low-skew (<250ps) between any two output clocks
- Low duty cycle distortion <250ps
- Low propagation delay <2.5ns
- Multiple V<sub>DD</sub>, GND pins for noise reduction
- 3.3V supply voltage
- Available in SOIC, SSOP, and QSOP packages

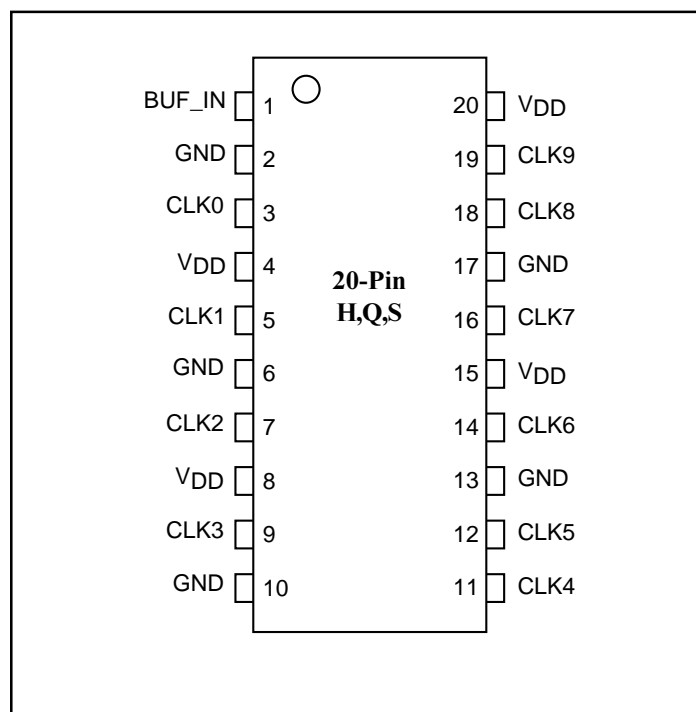
**Description**

The PI49FCT3807D is a 3.3V compatible, high-speed, low-noise 1-10 non-inverting clock buffer. The key goal in designing the PI6C3807D 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 PI49FCT3807D 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**



**Maximum Ratings**

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

Storage Temperature .....	-65°C to +150°C
V <sub>DD</sub> Voltage .....	-0.5V to +4.6V
Output Voltage .....	-0.5V to V <sub>DD</sub> +0.5V
Input Voltage .....	-0.5V to +7.0V
DC Output Current .....	-60mA to +60mA
Power Dissipation .....	500mW

**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**

V <sub>DD</sub> Voltage .....	3.3V ± 0.3V
Commercial Temperature .....	-0°C to +70°C
Industrial Temperature .....	-40V to +85V
Input Frequency .....	DC to 156 MHz
Capacitive Loading .....	10pF to 50pF

**DC Electrical Characteristics** (Over the Operating Range)

Parameters	Description	Test Conditions <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	Max.	Units
V <sub>IH</sub>	Input HIGH Voltage	Guaranteed Logic HIGH Level (Input Pins)		2.0	—	5.5	V
V <sub>IL</sub>	Input LOW Voltage	Guaranteed Logic LOW Level (Input Pins)		-0.5	—	0.8	
I <sub>IH</sub>	Input HIGH Current	V <sub>DD</sub> = Max.	V <sub>IN</sub> = V <sub>DD</sub>	—	—	1	μA
I <sub>IL</sub>	Input LOW Current	V <sub>DD</sub> = Max.	V <sub>IN</sub> = GND	—	—	-1	
V <sub>IK</sub>	Clamp Diode Voltage	V <sub>DD</sub> = Min., I <sub>IN</sub> = -18mA		—	-0.7	-1.2	V
V <sub>OH</sub>	Output HIGH Voltage	V <sub>DD</sub> = Min., V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -0.1mA	V <sub>DD</sub> - 0.2	—	—	
			I <sub>OH</sub> = -12mA	2.4 <sup>(3)</sup>	3.0	—	
V <sub>OL</sub>	Output LOW Voltage	V <sub>DD</sub> = Min., V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 0.1mA	—	—	0.2	
			I <sub>OL</sub> = 12mA	—	0.3	0.5	
I <sub>OH</sub>	Output HIGH Current	V <sub>DD</sub> = 3.0V, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>OUT</sub> = 1.5V <sup>(4)</sup>		-45	-75	-180	mA
I <sub>OL</sub>	Output LOW Current	V <sub>DD</sub> = 3.0V, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>OUT</sub> = 1.5V <sup>(4)</sup>		50	92	200	

**Notes:**

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at V<sub>CC</sub> = 3.3V, +25°C ambient and maximum loading.
- V<sub>OH</sub> = V<sub>CC</sub> - 0.6V at rated current.
- This parameter is determined by device characterization but is not production tested.
- 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 <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	Max.	Units
$I_{DDQ}$	Quiescent Power Supply Current	$V_{DD} = \text{Max.}$	$V_{IN} = \text{GND or } V_{DD}$	—	0.1	30	$\mu\text{A}$
$\Delta I_{DD}$	Supply Current per Inputs @ TTL HIGH	$V_{DD} = \text{Max.}$	$V_{IN} = V_{DD} - 0.6\text{V}^{(3)}$	—	47	300	
$I_{DD}$	Dynamic Supply Current	$V_{DD} = 3.6\text{V},$ No Load	50 MHz	—	43	—	mA
			67 MHz	—	56	—	
			80 MHz	—	66	—	
			100 MHz	—	81	—	
			125 MHz	—	97	—	
			156 MHz	—	121	—	

**Notes:**

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at  $V_{DD} = 3.3\text{V}$ ,  $+25^\circ\text{C}$  ambient.
3. Per TTL driven input ( $V_{IN} = V_{DD} - 0.6\text{V}$ ); all other inputs at  $V_{DD}$  or GND.

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

Parameters <sup>(1)</sup>	Description	Test Conditions	Typ	Max.	Units
$C_{IN}$	Input Capacitance	$V_{IN} = 0\text{V}$	3.0	4	pF
$C_{OUT}$	Output Capacitance	$V_{OUT} = 0\text{V}$	—	6	

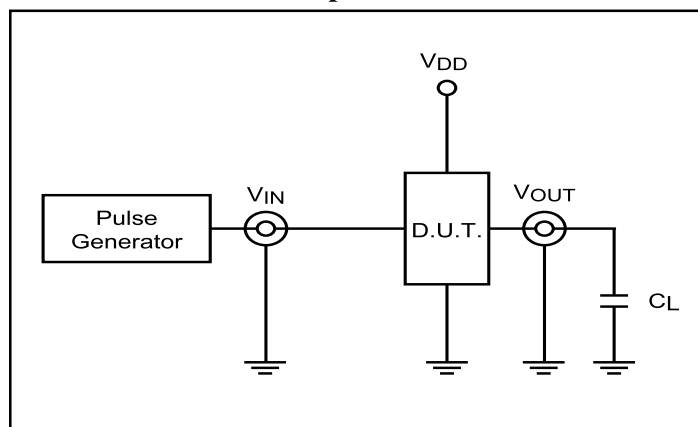
**Note:**

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

### Product Pin Description

Pin Name	Description
BUF_IN	Input
CLK[0:9]	Outputs
GND	Ground
$V_{DD}$	Power

### Test Circuits for All Outputs



**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 Characteristics ( $V_{CC} = 3.3V \pm 0.3V$ ,  $T_A = 85^\circ C$ )**

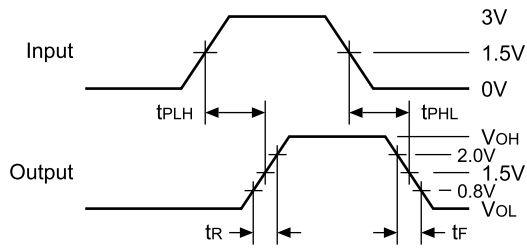
Parameters	Description	Test Conditions <sup>(1)</sup>	Min.	Typ.	Max.	Units
tR/F	CLKn Rise/Fall Time 0.8V~2.0V	$C_L = 15pF$ , 125 MHz	–	0.7	1.0	ns
tPLH tPHL	Propagation Delay BUF_IN to CLKn	$C_L = 15pF$ , 125 MHz	1.0	2.2	2.5	
tSK(o) <sup>(3)</sup>	Skew between two outputs of the same package (same transition)	$C_L = 15pF$ , 125 MHz	–	110	250	ps
tSK(p) <sup>(3)</sup>	Skew between opposite transitions (tPHL-tPLH) of the same output	$C_L = 15pF$ , 125 MHz	–	200	250	
tSK(t) <sup>(3)</sup>	Skew between two outputs of different package <sup>(4)</sup>	$C_L = 15pF$ , 125 MHz	–	–	0.55	ns

**Notes:**

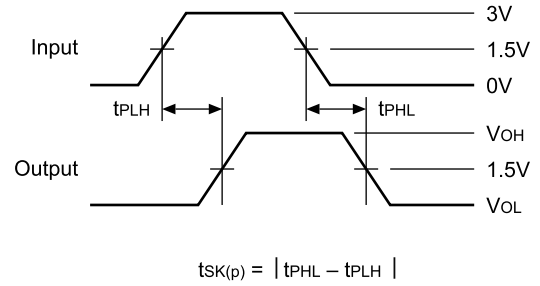
1. See test circuit and waveforms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. Skew measured at worse cast temperature (max. temp).
4. Identical conditions: loading, transitions, supply voltage, temperature, package type and speed grade.

## SWITCHING WAVEFORMS

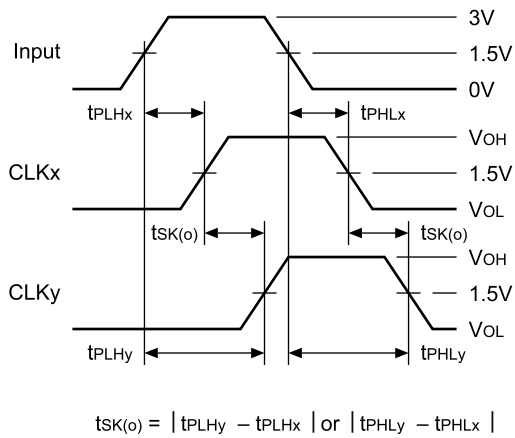
### Propagation Delay



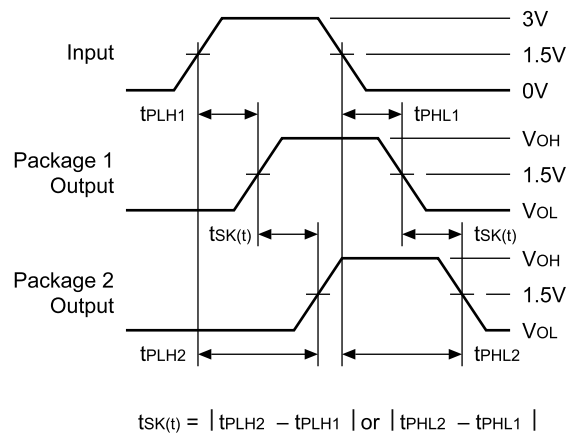
### Pulse Skew – $t_{SK(P)}$



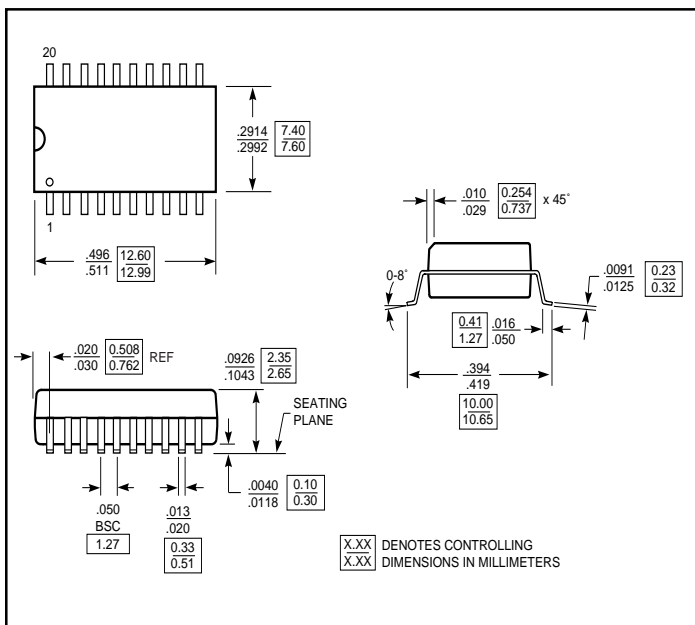
### Output Skew – $t_{SK(O)}$



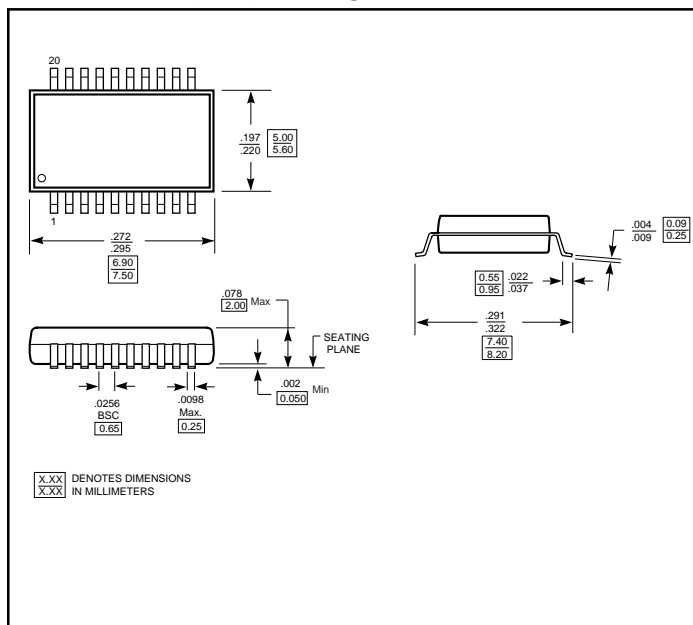
### Package Skew – $t_{SK(T)}$



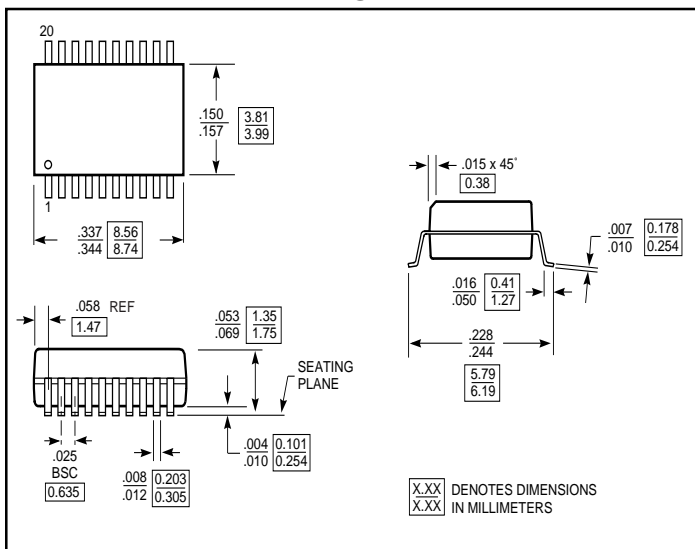
**20-Pin SOIC (S20) Package**



**20-Pin SSOP (H20) Package**



**20-Pin QSOP (Q20) Package**



**Ordering Information**

Ordering Code	Package Type
PI49FCT3807DS	20-pin 300 mil wide SOIC
PI49FCT3807DQ	20-pin 150 mil wide QSOP
PI49FCT3807DH	20-pin 209 mil wide SSOP