

**Features**

- Maximum rated frequency: 133 MHz
- Low cycle-to-cycle jitter
- Input to output delay, less than 200ps
- External feedback pin allows outputs to be synchronized to the clock input
- 5V tolerant input\*
- Operates at 3.3V  $V_{DD}$
- Test mode allows bypass of the PLL for system testing purposes (e.g., IBIS measurements)
- Space-saving Packaging (Pb-free and Green Available):  
— 8-pin, 150-mil SOIC (W)

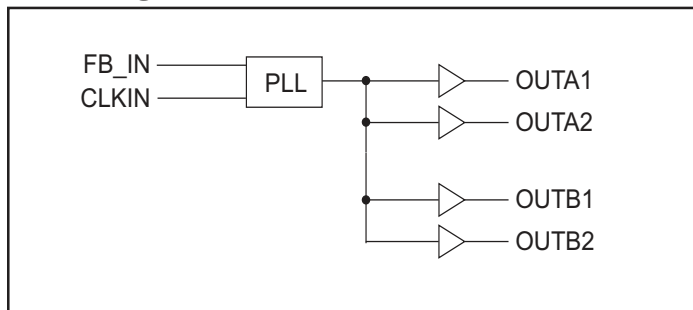
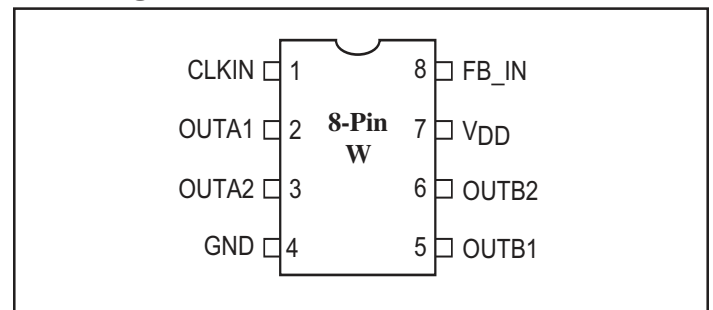
\*  $FB\_IN$  and  $CLKIN$  must reference the same voltage thresholds for the PLL to deliver zero delay skewing

**Description**

The PI6C2404A-1 is a PLL-based, zero-delay buffer, with the ability to distribute four outputs of up to 133 MHz at 3.3V. Two banks of two outputs exist,  $OUTA[1-2]$  and  $OUTB[1-2]$ .

An external feedback pin is used to synchronize the outputs to the input; the relationship between loading of this signal and the other outputs determines the input-output delay.

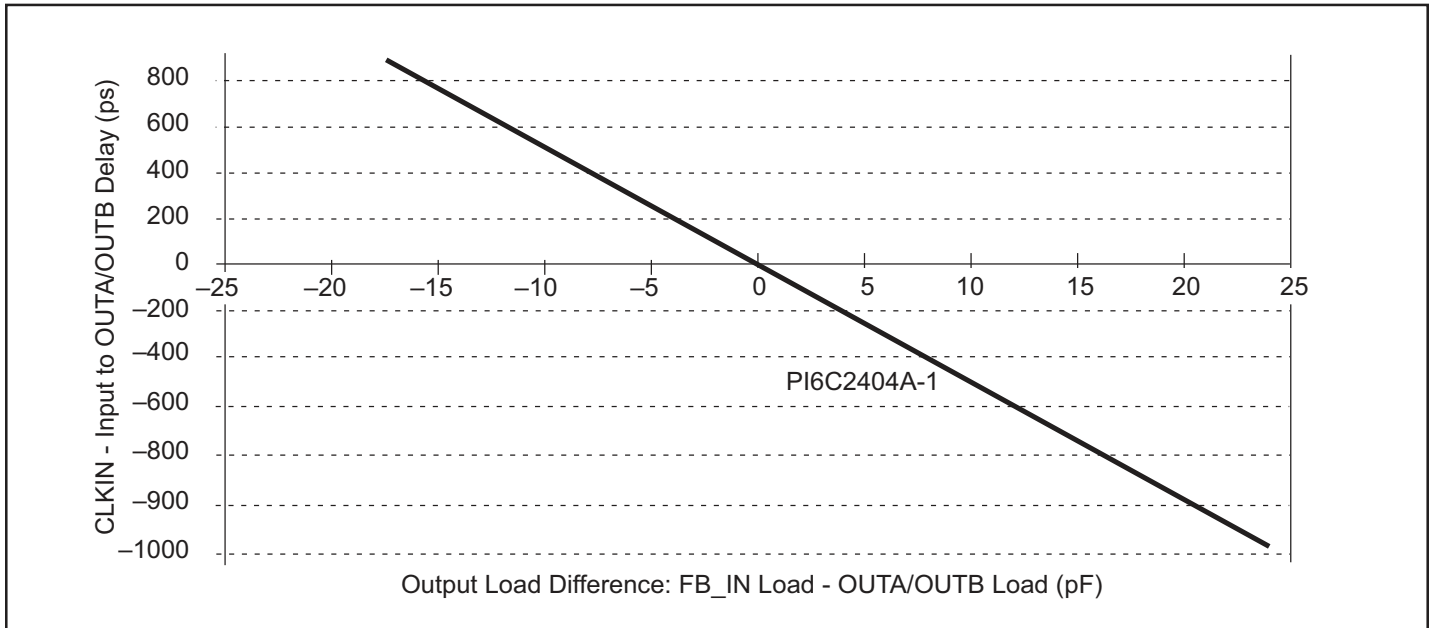
The PI6C2404A-1 is characterized for both commercial and industrial operation.

**Block Diagram**

**Pin Configuration**

**Pin Description**

Pin	Signal	Description
1	CLKIN	Input clock reference frequency (weak pull-down)
2, 3	OUTA[1-2]	Clock output, Bank A
7	$V_{DD}$	3.3V supply
4	GND	Ground
5, 6	OUTB[1-2]	Clock output, Bank B
8	FB_IN	PLL feedback input

### Zero-Delay and Skew Control

#### CLKIN Input to Output Bank Delay vs. Difference in Loading between FB\_IN pin and OUTA/OUTB pins



The relationship between loading of the FB\_IN signal and other outputs determines the input-output delay. Zero delay is achieved when all outputs, including feedback, are loaded equally.

### Maximum Ratings

Supply Voltage to Ground Potential .....	-0.5V to +7.0V
DC Input Voltage (Except CLKIN) .....	-0.5V to V <sub>DD</sub> +0.5V
DC Input Voltage CLKIN .....	-0.5 to 7V
Storage Temperature .....	-65°C to +150°C
Maximum Soldering Temperature (10 seconds) .....	260°C
Junction Temperature .....	150°C
Static Discharge Voltage (per MIL-STD-883, Method 3015) .....	>2000V

### Operating Conditions (V<sub>CC</sub>=3.3V±0.3V)

Parameter	Description	Min.	Max.	Units
V <sub>DD</sub>	Supply Voltage	3.0	3.6	V
T <sub>A</sub>	Commerical Operating Temperature	0	70	°C
	Industrial Operating Temperature	-40	85	
C <sub>L</sub>	Load Capacitance, below 100 MHz	—	30	pF
	Load Capacitance, from 100 MHz to 133 MHz	—	15	
C <sub>IN</sub>	Input Capacitance	—	7.3	

**DC Electrical Characteristics for Industrial Temperature Devices**

Parameter	Description	Test Conditions	Min.	Max.	Units
V <sub>IL</sub>	Input LOW Voltage			0.8	V
V <sub>IH</sub>	Input HIGH Voltage		2.0		
I <sub>IL</sub>	Input LOW Current	V <sub>IN</sub> = 0V		50	μA
I <sub>IH</sub>	Input HIGH Current	V <sub>IN</sub> = V <sub>DD</sub>		112	
V <sub>OL</sub>	Output LOW Voltage	I <sub>OL</sub> = 8mA		0.4	V
V <sub>OH</sub>	Output HIGH Voltage	I <sub>OH</sub> = -8mA	2.4		
I <sub>DD</sub>	Supply Current	Unloaded outputs 100 MHz, Select inputs at V <sub>DD</sub> or GND		54	mA
		Unloaded outputs 66 MHz, CLKIN		39	
		Unloaded outputs 33MHz, CLKIN		22	

**AC Electrical Characteristics for Industrial Temperature Devices**

Parameters	Name	Test Conditions	Min.	Typ.	Max.	Units
F <sub>O</sub>	Output Frequency	30pF load	10		100	MHz
		15pF load			133	
t <sub>DC</sub>	Duty Cycle <sup>(1)</sup>	Measured at V <sub>DD</sub> /2, F <sub>OUT</sub> < 66.67MHz 30pF load	40	50	60	%
		Measured at V <sub>DD</sub> /2, F <sub>OUT</sub> < 50MHz 15pF load	45		55	
t <sub>R</sub>	Rise Time <sup>(1)</sup>	Measured between 0.8V and 2.0V, 30pF load			2.2	ns
		Measured between 0.8V and 2.0V, 15pF load			1.5	
t <sub>F</sub>	Fall Time <sup>(1)</sup>	Measured between 0.8V and 2.0V, 30pF load			2.2	ns
		Measured between 0.8V and 2.0V, 15pF load			1.5	
t <sub>SK(O)</sub>	Output to Output Skew within same bank <sup>(1)</sup>	All outputs equally loaded			200	ps
	OUTA to OUTB Skew <sup>(1)</sup>					
t <sub>0</sub>	Delay, CLKIN Rising Edge to FB_IN Rising Edge <sup>(1)</sup>	Measured at V <sub>DD</sub> /2			275	ps
t <sub>SK(D)</sub>	Device-to-Device Skew <sup>(1)</sup>	Measured at V <sub>DD</sub> /2 on FB_IN pins of devices		0	500	ps
t <sub>JIT</sub>	Cycle-to-Cycle Jitter <sup>(1)</sup>	Measured at 66.67 MHz, loaded 30pF load			200	ps
		Measured at 133 MHz, loaded 15pF load			150	
t <sub>LOCK</sub>	PLL Lock Time <sup>(1)</sup>	Stable power supply, valid clocks presented on CLKIN and FB_IN pins			1.0	ms

**Notes:**

1. CLKIN and FB\_IN inputs have a threshold voltage of V<sub>DD</sub>/2.

**DC Electrical Characteristics for Commercial Temperature Devices**

Parameter	Description	Test Conditions	Min.	Max.	Units
V <sub>IL</sub>	Input LOW Voltage		—	0.8	V
V <sub>IH</sub>	Input HIGH Voltage		2.0	—	
I <sub>IL</sub>	Input LOW Current	V <sub>IN</sub> = 0V	—	50	μA
I <sub>IH</sub>	Input HIGH Current	V <sub>IN</sub> = V <sub>DD</sub>	—	112	
V <sub>OL</sub>	Output LOW Voltage	I <sub>OL</sub> = 8mA	—	0.4	V
V <sub>OH</sub>	Output HIGH Voltage	I <sub>OH</sub> = -8mA	2.4	—	
I <sub>DD</sub>	Supply Current	Unloaded outputs 100 MHz Select Inputs @ V <sub>DD</sub> or GND	—	54	
I <sub>DD</sub>	Supply Current	Unloaded outputs, 66.67 MHz, Select inputs at V <sub>DD</sub> or GND	—	39	mA

**AC Electrical Characteristics for Commercial Temperature Device**

Parameters	Name	Test Conditions	Min.	Typ.	Max.	Units
F <sub>O</sub>	Output Frequency	30pF load	10		100	MHz
		15pF load,			133	
t <sub>DC</sub>	Duty Cycle <sup>(2)</sup>	Measured at V <sub>DD</sub> /2, F <sub>O</sub> < 66.67MHz, 30pF load	40	50	60	%
		Measured at V <sub>DD</sub> /2, F <sub>O</sub> < 50MHz, 15pF load	45	50	55	
t <sub>R</sub>	Rise Time <sup>(1)</sup> @ 30pF	Measured between 0.8V and 2.0V			2.2	ns
	Rise Time <sup>(1)</sup> @ 15pF				1.5	
t <sub>F</sub>	Fall Time <sup>(1)</sup> @ 30pF				2.2	
	Fall Time <sup>(1)</sup> @ 15pF				1.5	
t <sub>SK(O)</sub>	Output to Output Skew <sup>(1)</sup> within same bank	All outputs equally loaded, V <sub>DD</sub> /2			200	
	OUTA to OUTB Skew <sup>(1)</sup>	All outputs equally loaded, V <sub>DD</sub> /2			200	
t <sub>0</sub>	Input to Output Delay, CLKIN Rising Edge to FB_IN Rising Edge <sup>(1)</sup>	Measured at V <sub>DD</sub> /2			275	ps
t <sub>SK(D)</sub>	Device to Device Skew <sup>(1)</sup>	Measured at V <sub>DD</sub> /2 on FB_IN pins of devices		0	500	
t <sub>JIT</sub>	Cycle-to-Cycle Jitter <sup>(1)</sup>	Measured at 66.67 MHz, loaded 30pF outputs			200	
		Measured at 133 MHz, loaded 15pF outputs			150	
t <sub>LOCK</sub>	PLL Lock Time <sup>(1)</sup>	Stable power supply, valid clocks presented on CLKIN and FB_IN pins			1.0	ms

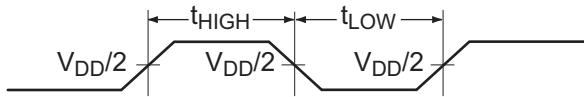
**Notes:**

1. CLKIN and FB\_IN inputs have a threshold voltage of V<sub>DD</sub>/2.

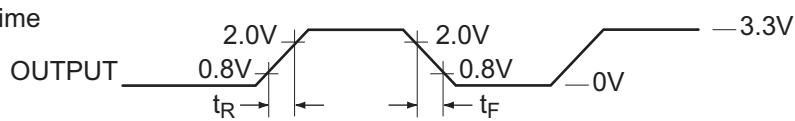
2.  $t_{DC} = \frac{t_{HIGH}}{t_{HIGH} + t_{LOW}}$

### Switching Waveforms

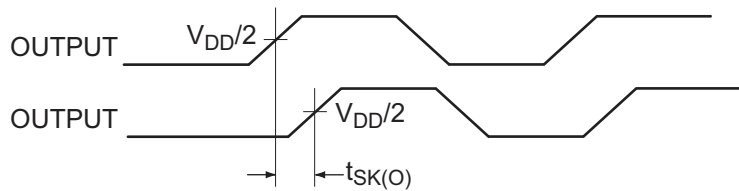
Duty Cycle Timing



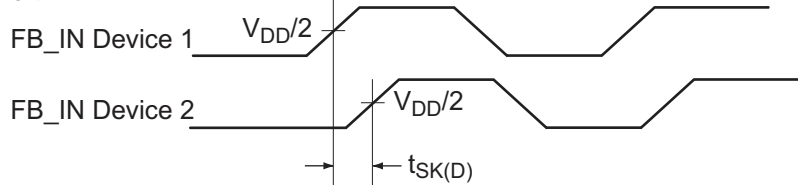
All Outputs Rise/Fall Time



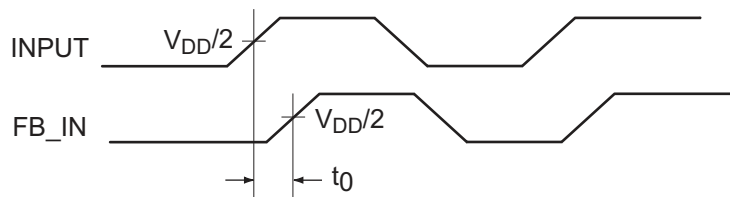
Output-Output Skew



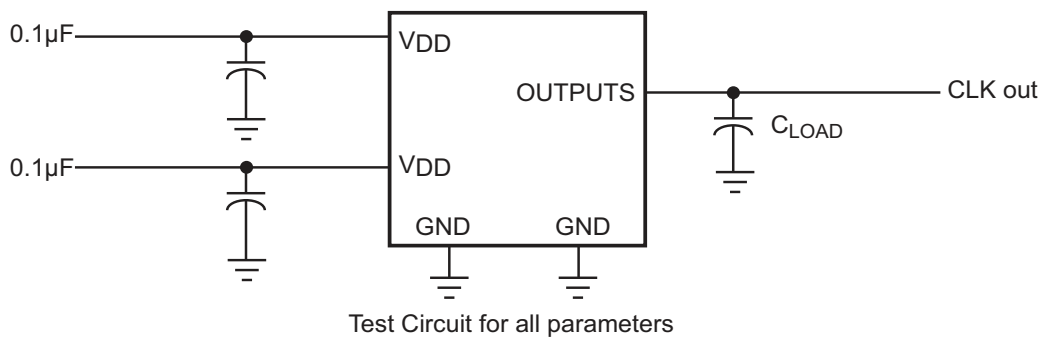
Device-Device Skew



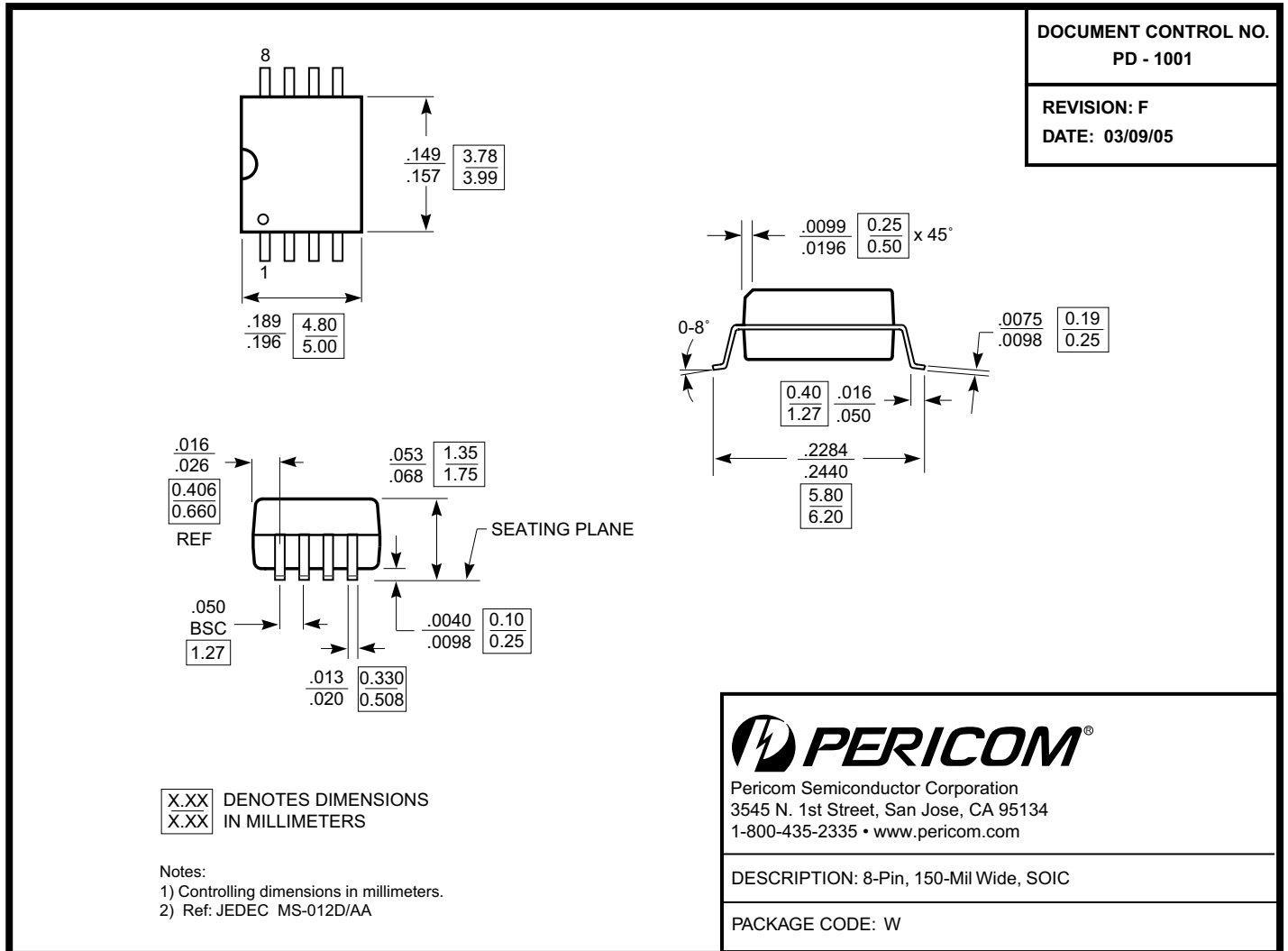
Input-Output Propagation Delay



### Test Circuit



Packaging Mechanical: 8-Pin SOIC (W)



Ordering Information

Ordering Code	Package Code	Package Description	Operating Range
PI6C2404A-1WE	W	Pb-free and Green 8-pin 150-mil SOIC	Commercial
PI6C2404A-1WIE	W	Pb-free and Green 8-pin 150-mil SOIC	Industrial

Notes:

- Thermal characteristics can be found on the company web site at [www.pericom.com/packaging/](http://www.pericom.com/packaging/)
- X = Tape/Reel
- E = Pb-free & Green