

### Product Features

- Maximum rated frequency: 133 MHz
- Low cycle-to-cycle jitter
- Input to output delay, less than 200ps
- Internal feedback allows outputs to be synchronized to the clock input
- 5V tolerant input\*
- Operates at 3.3V  $V_{DD}$
- Space-saving Packages:  
150-mil SOIC (W)  
173-mil TSSOP (L)

\*  $FB_{IN}$  and  $CLKIN$  must reference the same voltage thresholds for the PLL to deliver zero delay skewing

### Functional Description

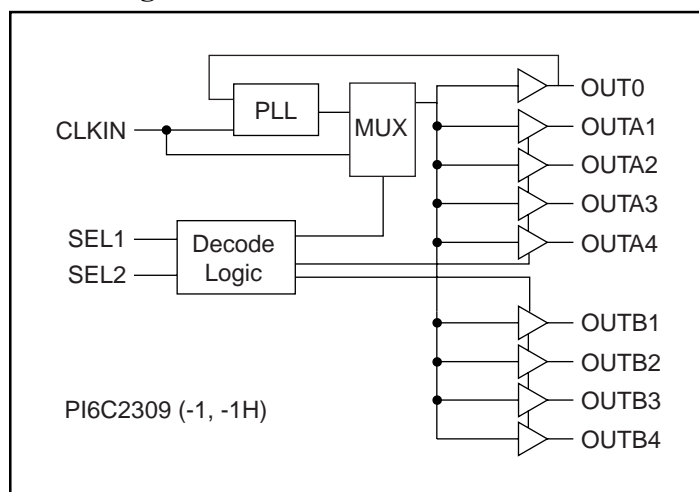
The PI6C230x is a PLL based, zero-delay buffer, with the ability to distribute five outputs on PI6C2305, nine outputs on PI6C2309 of up to 133MHz at 3.3V. All the outputs are distributed from a single clock input  $CLKIN$  and output  $CLK0$  performs zero delay by connecting a feedback to PLL.

PI6C2309 has two banks of four outputs that can be controlled by the selection inputs,  $SEL1$  &  $SEL2$ . It also has a powersparing feature: when input  $SEL1$  is 0 and  $SEL2$  is 1, PLL is turned off and all outputs are referenced from  $CLKIN$ . PI6C2305 is an 8-pin version of PI6C2309 without selection inputs. PI6C230X is available in high drive and industrial environment versions.

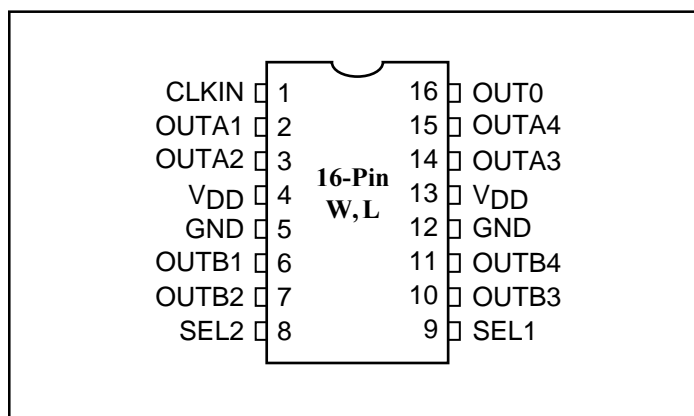
An internal feedback on  $OUT0$  is used to synchronize the outputs to the input; the relationship between loading of this signal and the outputs determines the input-output delay. PI6C230X are characterized for both commercial and industrial operation

**Notice:** This device is subject to import restriction. Please refer to the Import Restriction Notice under the Ordering Information section.

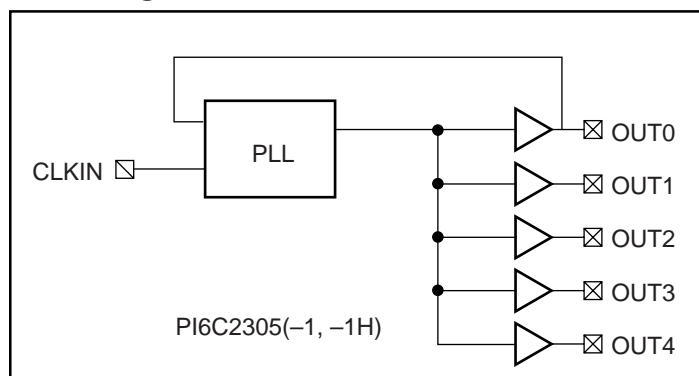
### Block Diagram: PI6C2309



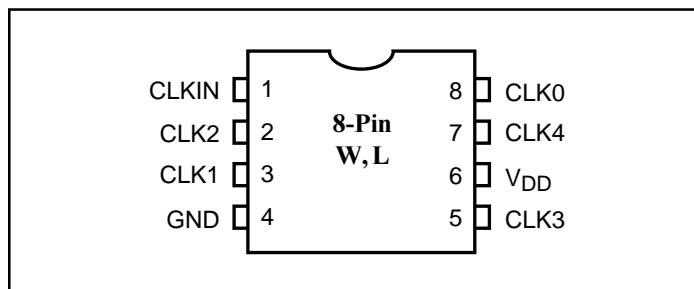
### Pin Configuration PI6C2309



### Block Diagram: PI6C2305



### Pin Configuration: PI6C2305



**Input Select Decoding for PI6C2309**

SEL2	SEL1	OUTA [1-4]	OUTB [1-4]	Output Source (OUT0)	PLL
0	0	3-State	3-State	PLL	ON
0	1	PLL	3-State	PLL	ON
1	0	CLKIN	CLKIN	CLKIN	OFF
1	1	PLL	PLL	PLL	ON

**Pin Description for PI6C2309**

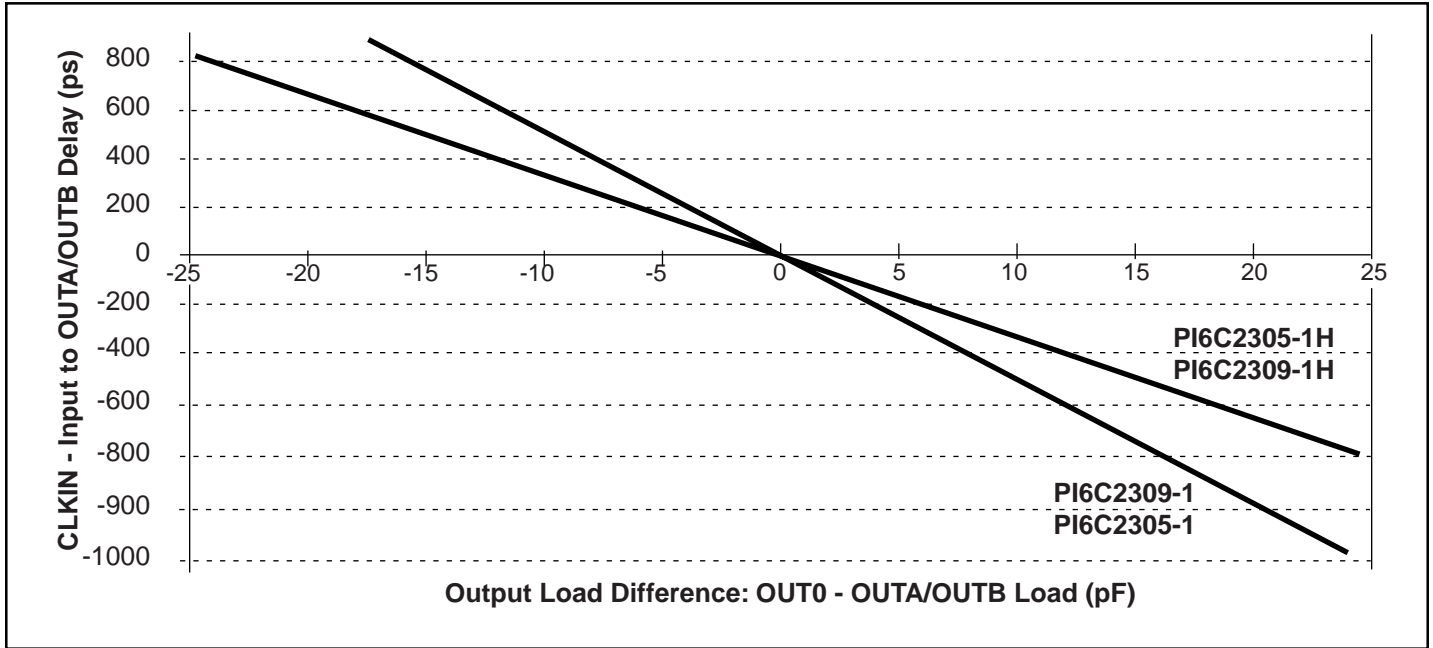
Pin	Signal	Description
1	CLKIN	Input clock reference frequency (weak pull-down)
2, 3, 14, 15	OUTA[1-4]	Clock output, Bank A (weak pull-down)
4, 13	V <sub>DD</sub>	3.3V supply
5, 12	GND	Ground
6, 7, 10, 11	OUTB[1-4]	Clock output, Bank B (weak pull-down)
8	SEL2	Select input, bit 2 (weak pull-up)
9	SEL1	Select input, bit 1 (weak pull-up)
16	OUT0	Clock Output , internal PLL feedback (weak pull-down)

**Pin Description for PI6C2305**

Pin	Signal	Description
1	CLKIN	Input clock reference frequency (weak pull-down)
2, 3, 5, 7	OUTA[1-4]	Clock output, Bank A (weak pull-down)
4	GND	3.3V supply
6	V <sub>DD</sub>	Ground
8	OUT0	Clock output, internal PLL feedback (weak pull-down)

### Zero Delay and Skew Control

CLKIN Input to OUTA/OUTB Delay vs. Difference in Loading between OUT0 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	

**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		50.0	μA
I <sub>IH</sub>	Input HIGH Current	V <sub>IN</sub> = V <sub>DD</sub>		100.0	
V <sub>OL</sub>	Output LOW Voltage	I <sub>OL</sub> = 8mA (-1); I <sub>OL</sub> = 12mA (-1H)		0.4	V
V <sub>OH</sub>	Output HIGH Voltage	I <sub>OH</sub> = -8mA (-1); I <sub>OH</sub> = -12mA (-1H)	2.4		
I <sub>DD</sub> (PI6C2309)	Bypass, PLL OFF	SEL1 = 0, SEL2 = 1		25.0	μA
I <sub>DD</sub>	Supply Current	Unloaded outputs 100 MHz, Select inputs at V <sub>DD</sub> or GND		54.0	mA
		Unloaded outputs 66 MHz, CLKIN		39.0	

**AC Electrical Characteristics for Industrial Temperature Devices**

Parameters	Name	Test Conditions	Min.	Typ.	Max.	Units
F <sub>O</sub>	Output Frequency	30pF load (-1, -1H)	10.0		100	MHz
		20pF load, (-1H)			133	
		15pF load, (-1, -1H)				
t <sub>DC</sub>	Duty Cycle <sup>(1)</sup> (-1)	Measured at V <sub>DD</sub> /2, F <sub>OUT</sub> <66.67MHz 30pF load	40.0	50	60.0	%
		Measured at V <sub>DD</sub> /2, F <sub>OUT</sub> <45MHz 15pF load	45.0		55.0	
	Duty Cycle <sup>(1)</sup> (-1H)	Measured at V <sub>DD</sub> /2, F <sub>OUT</sub> <133MHz 15pF load	40.0		60.0	
		Measured at V <sub>DD</sub> /2V, F <sub>OUT</sub> <45MHz 30pF load	45.0		55.0	
t <sub>R</sub>	Rise Time <sup>(1)</sup> (-1, -2, -3, -4,)	Measured between 0.8V and 2.0V, 30pF load			2.2	ns
		Measured between 0.8V and 2.0V, 15pF load			1.50	
	Rise Time <sup>(1)</sup> (-1H)	Measured between 0.8V and 2.0V, 30pF load			1.50	
t <sub>F</sub>	Fall Time <sup>(1)</sup> (-1)	Measured between 0.8V and 2.0V, 30pF load			2.50	ns
		Measured between 0.8V and 2.0V, 15pF load			1.50	
	Fall Time <sup>(1)</sup> (-1H)	Measured between 0.8V and 2.0V, 30pF load			1.25	
t <sub>SK(O)</sub>	Output to Output Skew (-1, -1H) <sup>(1)</sup>	All outputs equally loaded			200	ps
t <sub>0</sub>	Delay, CLKIN Rising Edge to OUT0 Rising Edge <sup>(1)</sup>	Measured at V <sub>DD</sub> /2		0	±350	
t <sub>SK(D)</sub>	Device-to-Device Skew <sup>(1)</sup>	Measured at V <sub>DD</sub> /2 on OUT0 pins of devices		0	600	
t <sub>SLEW</sub>	Output Slew Rate <sup>(1)</sup>	Measured between 0.8V & 2.0V on -1H device using Test Crt #2	1			V/ns
t <sub>JIT</sub>	Cycle-to-Cycle Jitter <sup>(1)</sup> (-1, -1H)	Measured at 66.67 MHz, loaded 30pF load			200	ps
		Measured at 133 MHz, loaded 15pF load			100	
t <sub>LOCK</sub>	PLL Lock Time <sup>(1)</sup>	Stable power supply, valid clocks presented on CLKIN pin			1.0	ms

**Notes:** 1. See Switching Waveforms on page 6.

**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>	—	100	
V <sub>OL</sub>	Output LOW Voltage	I <sub>OL</sub> = 8mA (-1); I <sub>OL</sub> = 12mA (-1H)	—	0.4	V
V <sub>OH</sub>	Output HIGH Voltage	I <sub>OH</sub> = -8mA (-1); I <sub>OH</sub> = -12mA (-1H)	2.4	—	
I <sub>DD</sub> (PI6C2309)	Bypass, PLL off	SEL1 = 0 SEL2 = 1	—	25	μA
I <sub>DD</sub>	Supply Current	Unloaded outputs, 66.67 MHz, Select inputs at V <sub>DD</sub> or GND	—	39	mA
I <sub>DD</sub>	Supply Current	Unloaded outputs 100 MHz Select Inputs @ V <sub>DD</sub> or GND	—	54	

**AC Electrical Characteristics for Commercial Temperature Device**

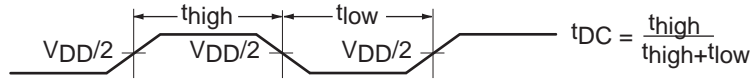
Parameters	Name	Test Conditions	Min.	Typ.	Max.	Units
F <sub>O</sub>	Output Frequency	30pF load (-1, -1H)	10		100	MHz
		20pF load, (-1H)			133	
		15pF load, (-1, -1H)				
t <sub>DC</sub>	Duty Cycle <sup>(1)</sup> (-1H)	Measured at V <sub>DD</sub> /2, F <sub>O</sub> < 66MHz, 30pF	45	50	55	%
	Duty Cycle (-1)	Measured at V <sub>DD</sub> /2, F <sub>O</sub> < 66MHz, 30pF	40	50	60	
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	
	Rise Time <sup>(1)</sup> @30pF (-1H)				1.5	
t <sub>F</sub>	Fall Time <sup>(1)</sup> @30pF				2.2	
	Fall Time <sup>(1)</sup> @15pF				1.5	
	Fall Time <sup>(1)</sup> @30pF (-1H)				1.25	
t <sub>SK(O)</sub>	Output to Output Skew <sup>(1)</sup> (-1, -1H)	All outputs equally loaded, V <sub>DD</sub> /2			200	ps
t <sub>0</sub>	Input to Output Delay, CLKIN Rising Edge to OUT0 Rising Edge <sup>(1)</sup>	Measured at V <sub>DD</sub> /2		0	±350	
t <sub>SK(D)</sub>	Device to Device Skew <sup>(1)</sup>	Measured at V <sub>DD</sub> /2 on OUT0 pins of devices		0	600	
t <sub>SLEW</sub>	Output Slew Rate <sup>(1)</sup>	Measured between 0.8V and 2.0V on -1H device using Test Circuit #2	1			V/ns
t <sub>JIT</sub>	Cycle-to-Cycle Jitter <sup>(1)</sup> (-1, -1H)	Measured at 66.67 MHz, loaded 30pF outputs			200	ps
		Measured at 133 MHz, loaded 15pF outputs			100	
t <sub>LOCK</sub>	PLL Lock Time <sup>(1)</sup>	Stable power supply, valid clocks presented on CLKIN pins			1.0	ms

**Notes:**

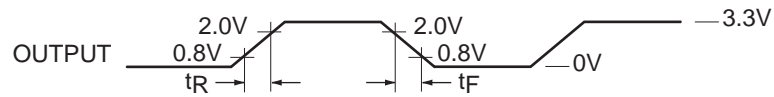
1. See Switching Waveforms on page 6

### Switching Waveforms

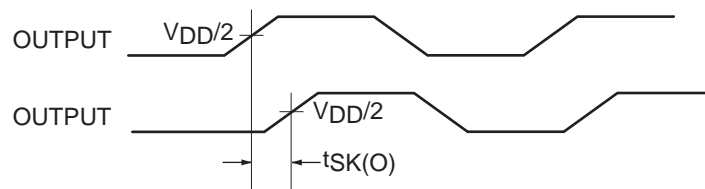
Duty Cycle Timing



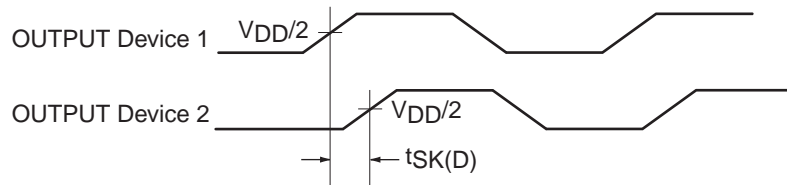
All Outputs Rise/Fall Time



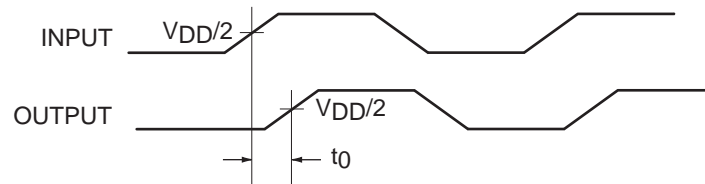
Output-Output Skew



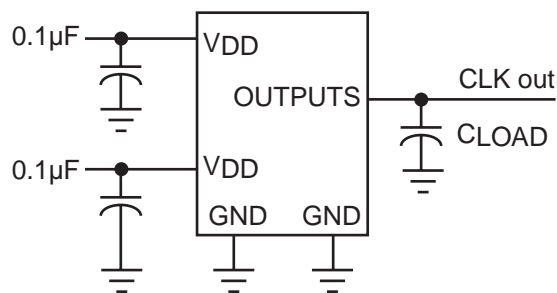
Device-Device Skew



Input-Output Propagation Delay

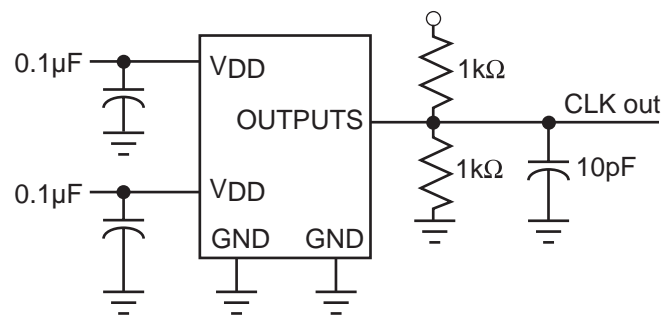


Test Circuit 1



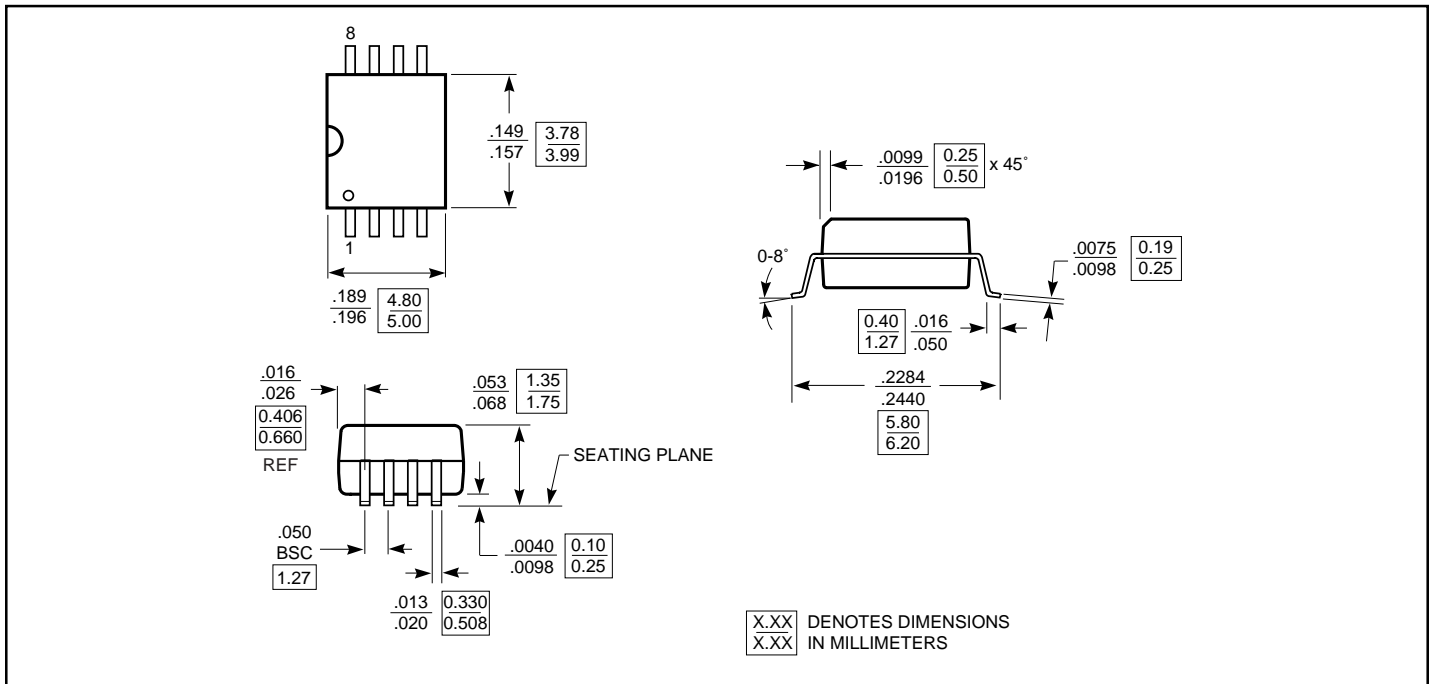
Test Circuit for all parameters except  $t_{SLEW}$

Test Circuit 2

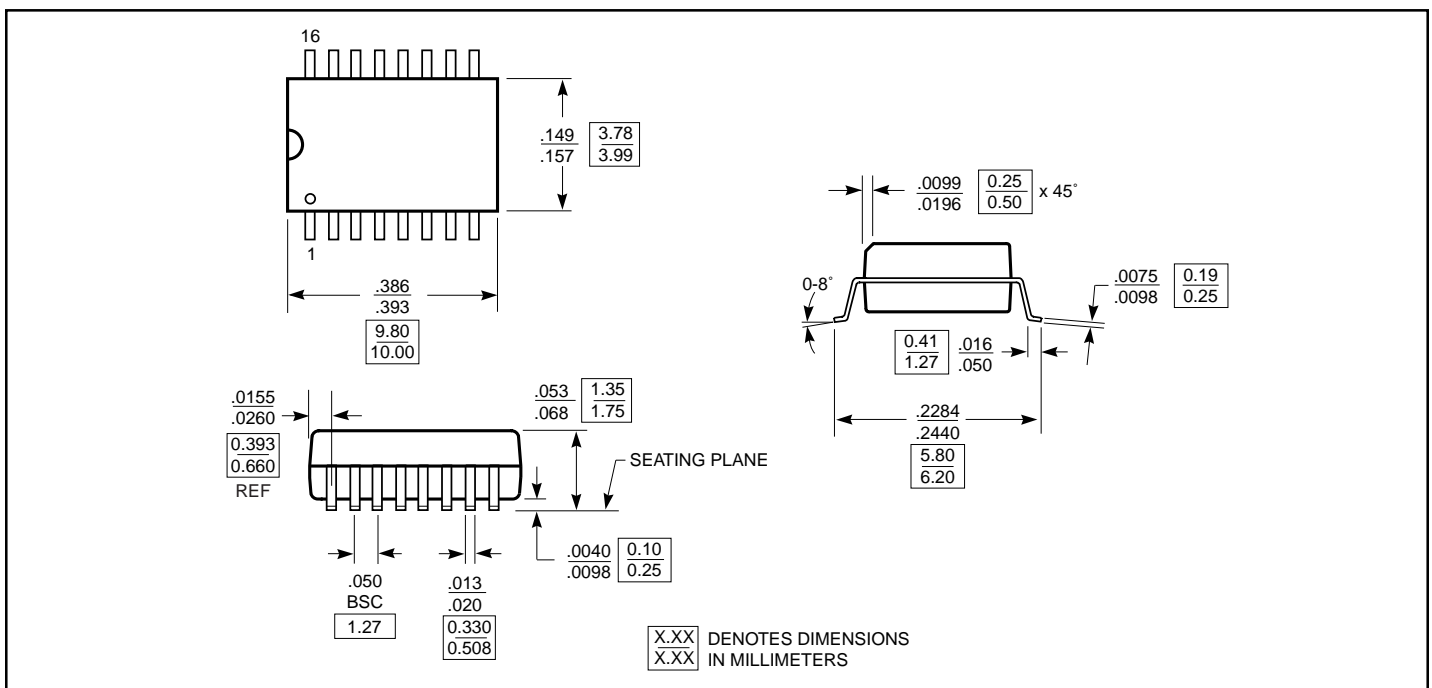


Test Circuit for  $t_{SLEW}$ , Output slew rate on -1H device

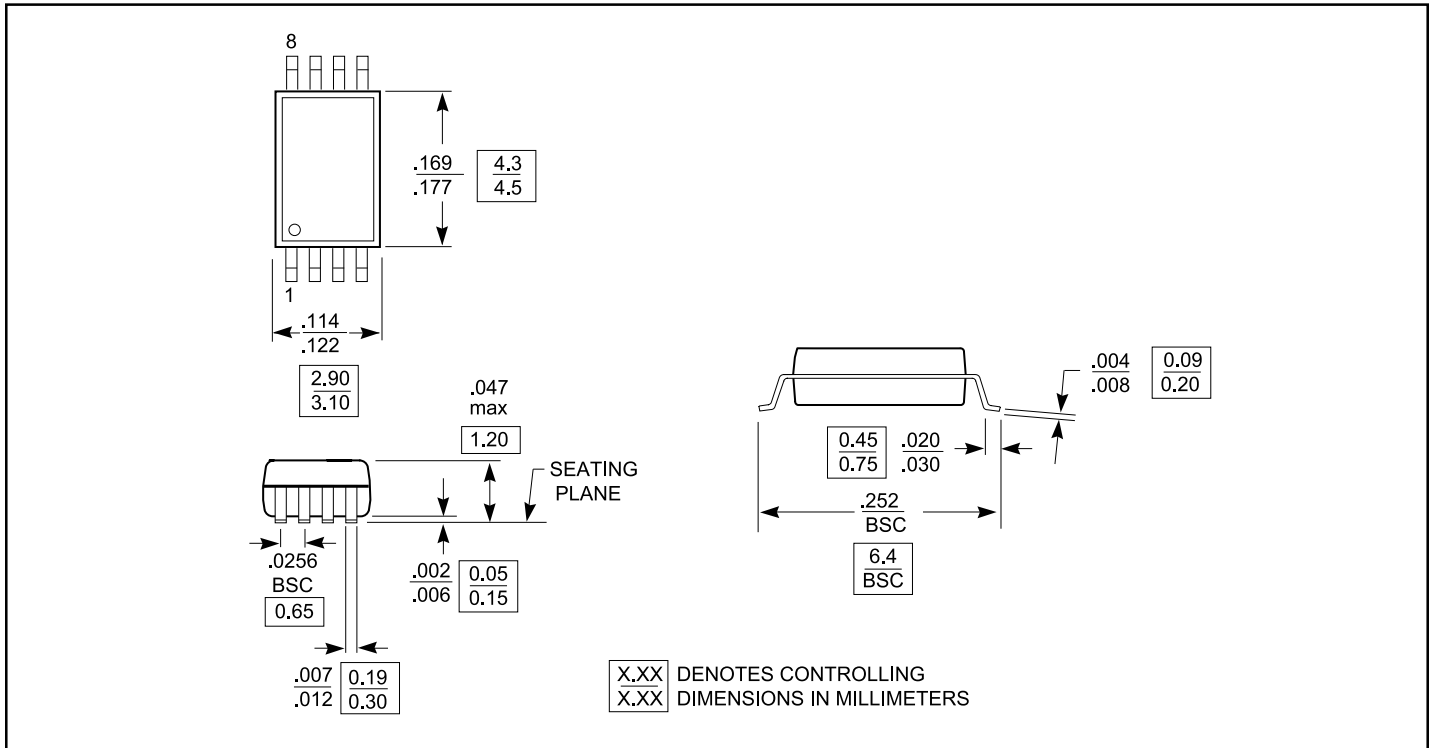
### 8-Pin SOIC (W) Package



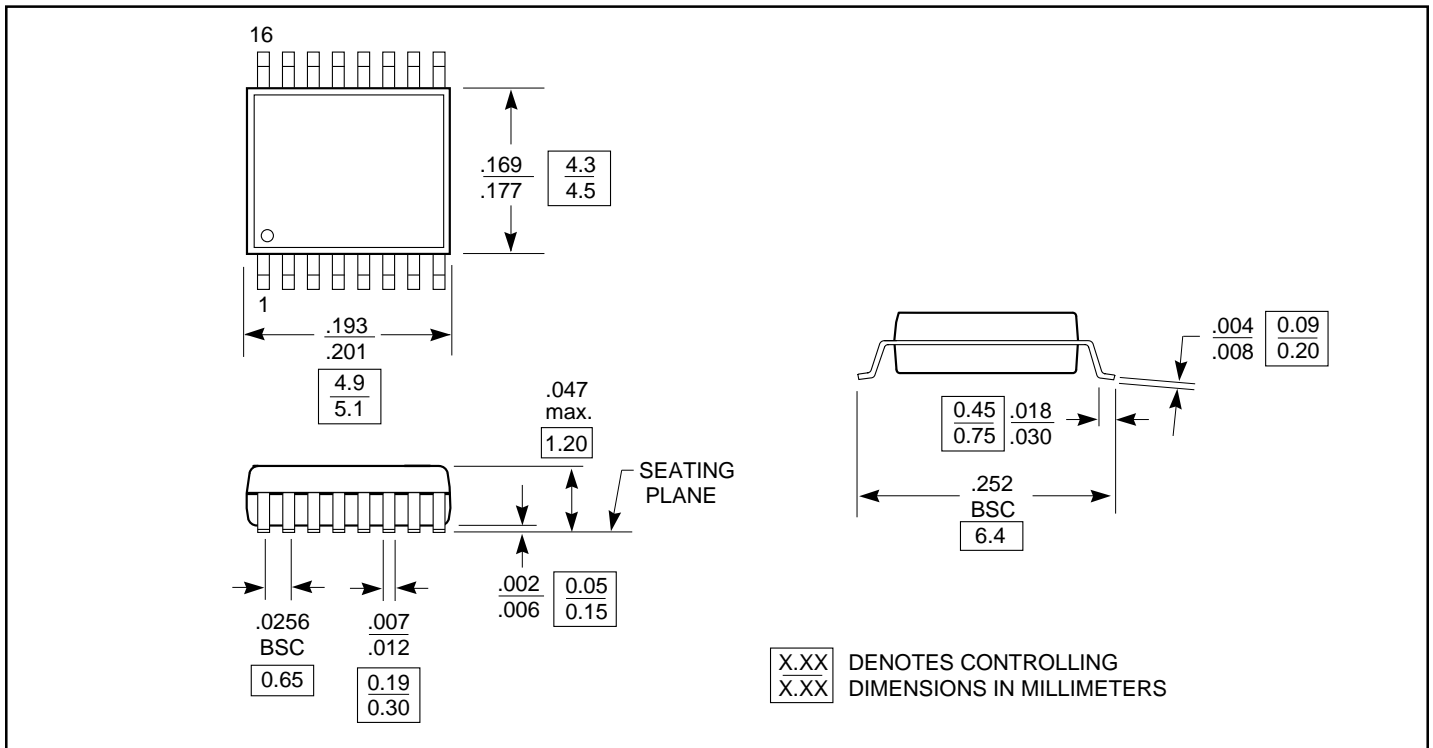
### 16-Pin SOIC (W) Package



### 8-Pin TSSOP (L) Package



### 16-Pin TSSOP (L) Package



Note: Controlling dimensions in millimeters. Ref: JEDEC MS - 012 AC



**Ordering Information PI6C2309**

Ordering Code	Package Name	Package Type	Operating Range
PI6C2309-1W	W16	16-pin 150-mil SOIC	Commercial
PI6C2309-1HW			
PI6C2309-1L	L16	16-pin TSSOP	
PI6C2309-1HL			
PI6C2309-1WI	W16	16-pin 150-mil SOIC	Industrial
PI6C2309-1HWI			
PI6C2309-1LI	L16	16-pin TSSOP	
PI6C2309-1HLI			

**Ordering Information PI6C2305**

Ordering Code	Package Name	Package Type	Operating Range
PI6C2305-1W	W8	8-pin 150-mil SOIC	Commercial
PI6C2305-1HW			
PI6C2305-1L	L8	8-pin TSSOP	
PI6C2305-1HL			
PI6C2305-1WI	W8	8-pin 150-mil SOIC	Industrial
PI6C2305-1HWI			
PI6C2305-1LI	L18	8-pin TSSOP	
PI6C2305-1HLI			

**Import Restriction Notice:**

*Due to an agreement to settle a patent dispute, this device is only available for sale outside of the US and may not be subsequently re-imported into the US as an individual component or as incorporated into equipment. Any sale is expressly conditioned on the customer's agreement not to export the device or any product or equipment containing the device to the United States. Pericom disclaims any liability for indemnity or other obligation or warranty if the devices or any product or equipment containing the devices are imported in violation of this agreement.*