

Product Features

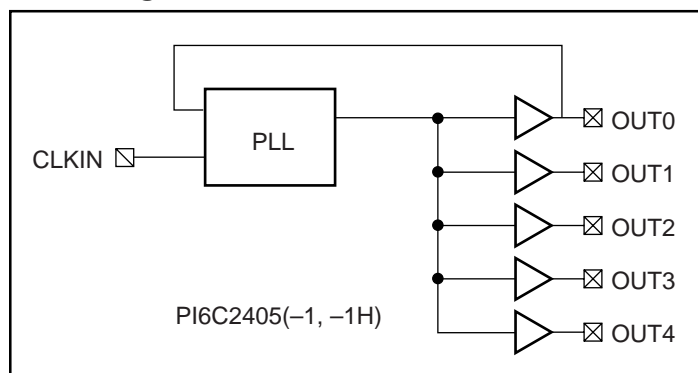
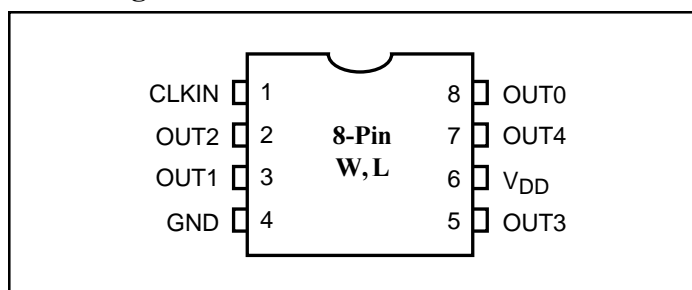
- Maximum rated frequency: 133 MHz
- Low cycle-to-cycle jitter
- Input to output delay, less than 300ps
- Internal feedback allows outputs to be synchronized to the clock input
- 5V tolerant input*
- Operates at 3.3V V_{DD}
- Space-saving Packages:
150-mil SOIC (W)
173-mil TSSOP (L)

* *CLKIN must reference the same voltage thresholds for the PLL to deliver zero delay skewing*

Functional Description

The PI6C2405 is a PLL based, zero-delay buffer, with the ability to distribute five outputs of up to 133MHz at 3.3V. All the outputs are distributed from a single clock input CLKIN and output OUT0 performs zero delay by connecting a feedback to PLL.

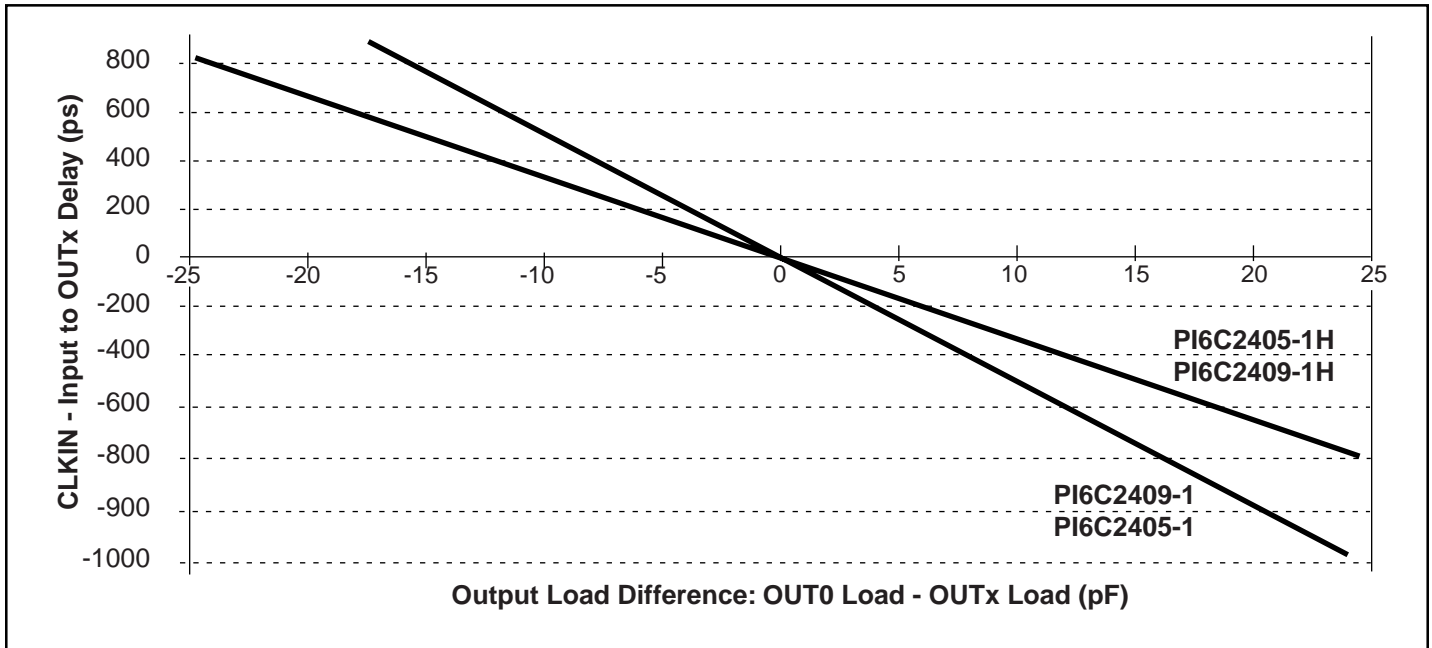
An internal feedback on OUT0 is used to synchronize the outputs to the input; the relationship between loading of this signal and the outputs determines the input-output delay. PI6C2405 is characterized for both commercial and industrial operation

Block Diagram: PI6C2405

Pin Configuration: PI6C2405

Pin Description for PI6C2405

Pin	Signal	Description
1	CLKIN	Input clock reference frequency (weak pull-down)
2, 3, 5, 7	OUT[1-4]	Clock outputs,
4	GND	3.3V supply
6	V_{DD}	Ground
8	OUT0	Clock output, internal PLL feedback (weak pull-down)

Zero Delay and Skew Control

CLKIN Input to OUTx Delay vs. Difference in Loading between OUT0 pin and OUTx pins



The relationship between loading of the OUT0 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 _{DD} +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_{CC}=3.3V±0.3V)

Parameter	Description	Min.	Max.	Units
V _{DD}	Supply Voltage	3.0	3.6	V
T _A	Commerical Operating Temperature	0	70	°C
	Industrial Operating Temperature	-40	85	
C _L	Load Capacitance, below 100 MHz	—	30	pF
	Load Capacitance, from 100 MHz to 133 MHz	—	15	
C _{IN}	Input Capacitance	—	7	

DC Electrical Characteristics for Industrial Temperature Devices

Parameter	Description	Test Conditions	Min.	Max.	Units
V _{IL}	Input LOW Voltage			0.8	V
V _{IH}	Input HIGH Voltage		2.0		
I _{IL}	Input LOW Current	V _{IN} = 0V		50.0	μA
I _{IH}	Input HIGH Current	V _{IN} = V _{DD}		100.0	
V _{OL}	Output LOW Voltage	I _{OL} = 8mA (-1); I _{OL} = 12mA (-1H)		0.4	V
V _{OH}	Output HIGH Voltage	I _{OH} = -8mA (-1); I _{OH} = -12mA (-1H)	2.4		
I _{DD} (PI6C2309)	Bypass, PLL OFF	SEL1 = 0, SEL2 = 1		25.0	μA
I _{DD}	Supply Current	Unloaded outputs 100 MHz, Select inputs at V _{DD} 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 _O	Output Frequency	30pF load (-1, -1H)	10.0		100	MHz
		20pF load, (-1H)			133	
		15pF load, (-1, -1H)				
t _{DC}	Duty Cycle ⁽¹⁾ (-1)	Measured at V _{DD} /2, F _{OUT} <66.67MHz 30pF load	40	50	60	%
		Measured at V _{DD} /2, F _{OUT} <45MHz 15pF load	45		55	
	Duty Cycle ⁽¹⁾ (-1H)	Measured at V _{DD} /2, F _{OUT} <100MHz 15pF load	40		60	
		Measured at V _{DD} /2V, F _{OUT} <45MHz 30pF load	45		55	
t _R	Rise Time ⁽¹⁾ (-1)	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 ⁽¹⁾ (-1H)	Measured between 0.8V and 2.0V, 30pF load			1.5	
t _F	Fall Time ⁽¹⁾ (-1)	Measured between 0.8V and 2.0V, 30pF load			2.2	ns
		Measured between 0.8V and 2.0V, 15pF load			1.5	
	Fall Time ⁽¹⁾ (-1H)	Measured between 0.8V and 2.0V, 30pF load			1.5	
t _{SK(O)}	Output to Output Skew (-1,-1H) ⁽¹⁾	All outputs equally loaded			200	ps
t ₀	Delay, CLKIN Rising Edge to OUT0 Rising Edge ⁽¹⁾	Measured at V _{DD} /2		0	±300	
t _{SK(D)}	Device-to-Device Skew ⁽¹⁾	Measured at V _{DD} /2 on OUT0 pins of devices		0	600	
t _{SLEW}	Output Slew Rate ⁽¹⁾	Measured between 0.8V & 2.0V on -1H device using Test Crt #2	1			
t _{JIT}	Cycle-to-Cycle Jitter ⁽¹⁾ (-1,-1H)	Measured at 66.67 MHz, loaded 30pF load			200	ps
		Measured at 133 MHz, loaded 15pF load			100	
t _{LOCK}	PLL Lock Time ⁽¹⁾	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 _{IL}	Input LOW Voltage	—	—	0.8	V
V _{IH}	Input HIGH Voltage	—	2.0	—	
I _{IL}	Input LOW Current	V _{IN} = 0V	—	50	μA
I _{IH}	Input HIGH Current	V _{IN} = V _{DD}	—	125	
V _{OL}	Output LOW Voltage	I _{OL} = 8mA (-1); I _{OL} = 12mA (-1H)	—	0.4	V
V _{OH}	Output HIGH Voltage	I _{OH} = -8mA (-1); I _{OH} = -12mA (-1H)	2.4	—	
I _{DD}	Supply Current	Unloaded outputs 100 MHz Select Inputs @ V _{DD} or GND	—	54	mA
I _{DD}	Supply Current	Unloaded outputs, 66.67 MHz, Select inputs at V _{DD} or GND	—	39	

AC Electrical Characteristics for Commercial Temperature Device

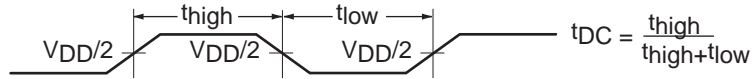
Parameters	Name	Test Conditions	Min.	Typ.	Max.	Units
F _O	Output Frequency	30pF load	10		100	MHz
		15pF load,			133	
t _{DC}	Duty Cycle (-1)	Measured at V _{DD} /2, F _O < 66MHz, 30pF	40	50	60	%
	Duty Cycle ⁽¹⁾ (-1H)	Measured at V _{DD} /2, F _O < 66MHz, 30pF	45	50	55	
t _R	Rise Time ⁽¹⁾ @30pF	Measured between 0.8V and 2.0V			2.2	ns
	Rise Time ⁽¹⁾ @15pF				1.5	
	Rise Time ⁽¹⁾ @30pF (-1H)				1.5	
t _F	Fall Time ⁽¹⁾ @30pF				2.2	
	Fall Time ⁽¹⁾ @15pF				1.5	
	Fall Time ⁽¹⁾ @30pF (-1H)				1.5	
t _{SK(O)}	Output to Output Skew ⁽¹⁾ (-1,-1H)	All outputs equally loaded, V _{DD} /2			200	ps
t ₀	Input to Output Delay, CLKIN Rising Edge to OUT0 Rising Edge ⁽¹⁾	Measured at V _{DD} /2		0	±300	
t _{SK(D)}	Device to Device Skew ⁽¹⁾	Measured at V _{DD} /2 on OUT0 pins of devices		0	600	
t _{SLEW}	Output Slew Rate ⁽¹⁾	Measured between 0.8V and 2.0V on -1H device using Test Circuit #2	1			V/ns
t _{JIT}	Cycle-to-Cycle Jitter (-1,-1H)	Measured at 66.67 MHz, loaded 30pF outputs			200	ps
		Measured at 133 MHz, loaded 15pF outputs			100	
t _{LOCK}	PLL Lock Time	Stable power supply, valid clocks presented on CLKIN pins			1.0	ms

Notes:

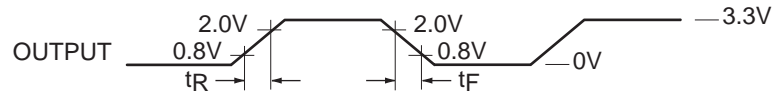
1. See Switching Waveforms on page 6

Switching Waveforms

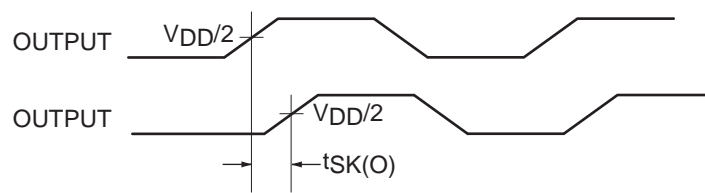
Duty Cycle Timing



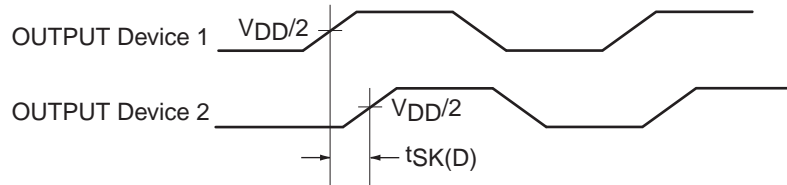
All Outputs Rise/Fall Time



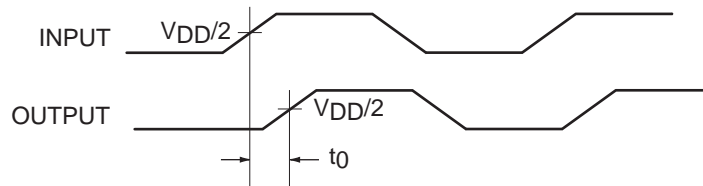
Output-Output Skew



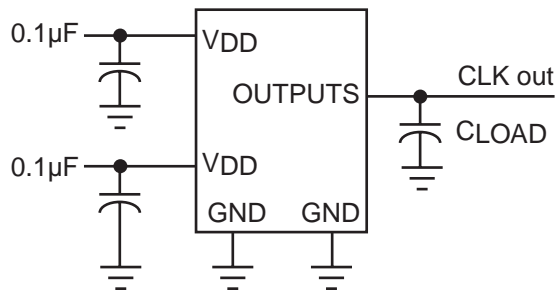
Device-Device Skew



Input-Output Propagation Delay

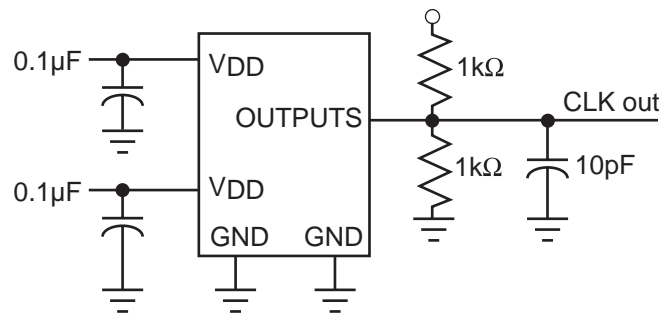


Test Circuit 1



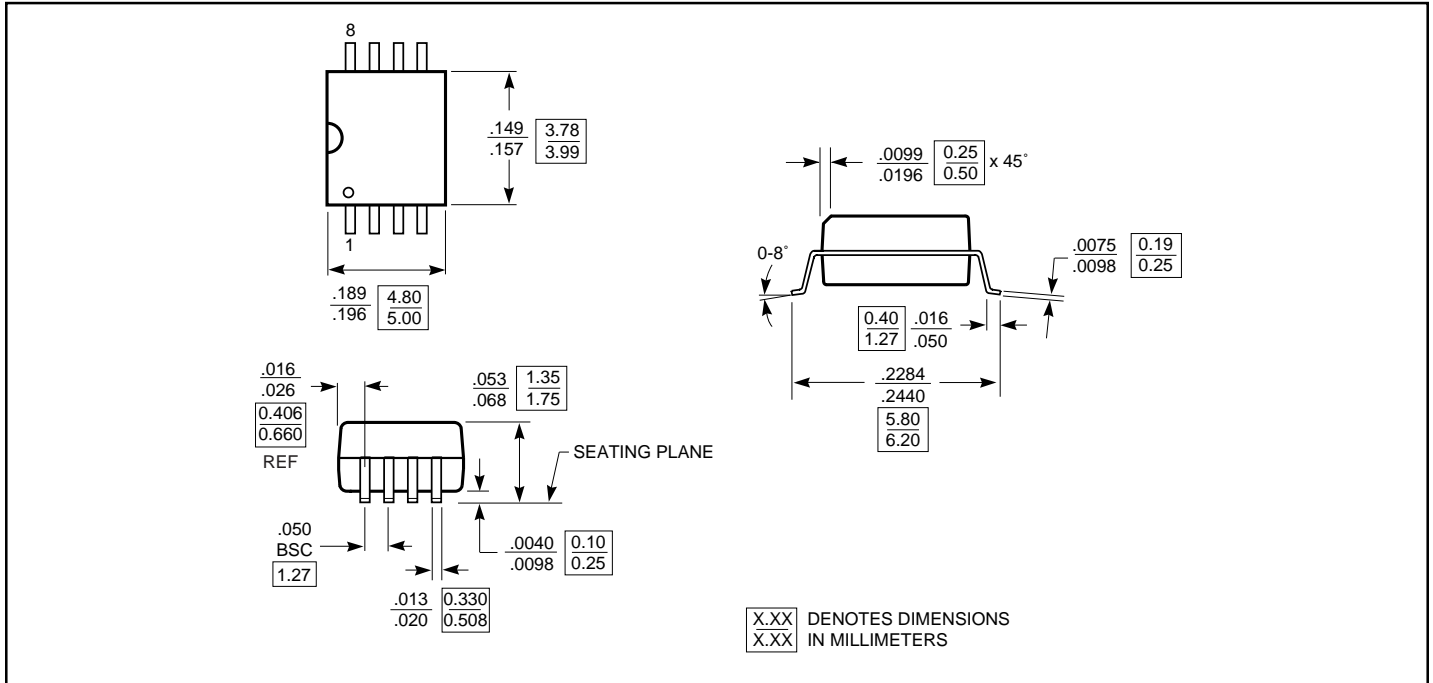
Test Circuit for all parameters except t_{SLEW}

Test Circuit 2

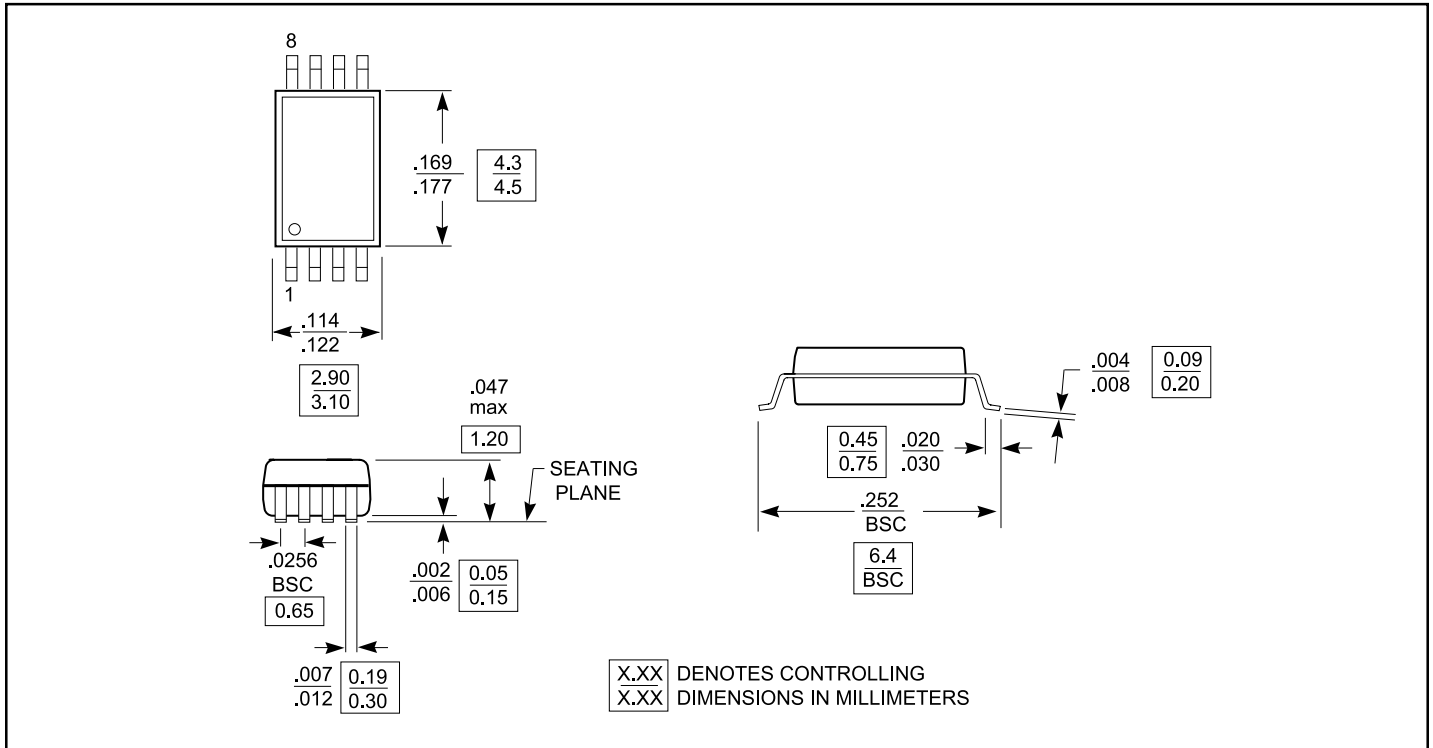


Test Circuit for t_{SLEW} , Output slew rate on -1H device

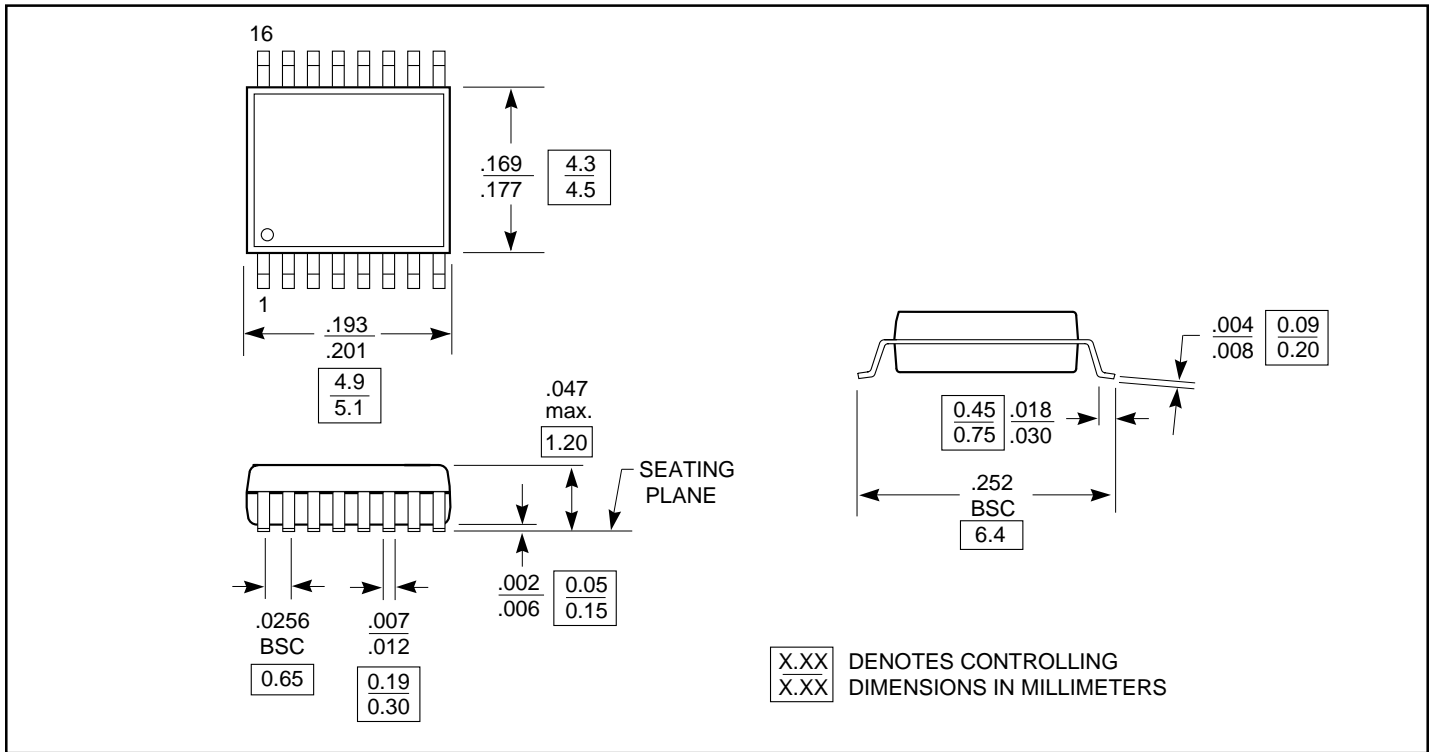
8-Pin SOIC (W) Package



8-Pin TSSOP (L) Package



16-Pin TSSOP (L) Package



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

Ordering Information PI6C2409

Ordering Code	Package Name	Package Type	Operating Range
PI6C2409-1W	W16	16-pin 150-mil SOIC	Commercial
PI6C2409-1HW			
PI6C2409-1L	L16	16-pin TSSOP	
PI6C2409-1HL			
PI6C2409-1WI	W16	16-pin 150-mil SOIC	Industrial
PI6C2409-1HWI			
PI6C2409-1LI	L16	16-pin TSSOP	
PI6C2409-1HLI			

Ordering Information PI6C2405

Ordering Code	Package Name	Package Type	Operating Range
PI6C2405-1W	W8	8-pin 150-mil SOIC	Commercial
PI6C2405-1HW			
PI6C2405-1L	L8	8-pin TSSOP	
PI6C2405-1HL			
PI6C2405-1WI	W8	8-pin 150-mil SOIC	Industrial
PI6C2405-1HWI			
PI6C2405-1LI	L8	8-pin TSSOP	
PI6C2405-1HLI			