

1.2V/1.5V, 250MHz, Low Skew 1:6 Crystal to LVCMOS Clock Buffer

Features

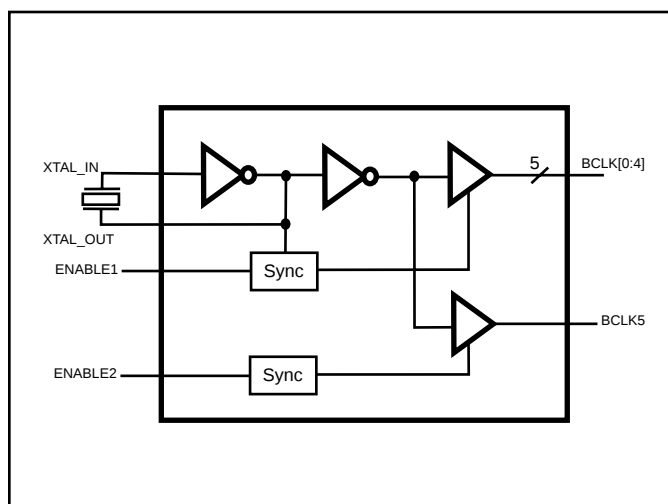
- Six low skew outputs: < 80ps
- Crystal oscillator input: 10MHz to 40MHz
- Switching frequency up to 250 MHz
- Fast output rise/fall time: < 800ps
- Synchronous output enables
- Industrial Temperature range: -40°C to +85°C
- 1.2 and 1.5V operation
- Packaging (Pb-free & Green available):
 - 16-pin 173-mil wide TSSOP (L)

Description

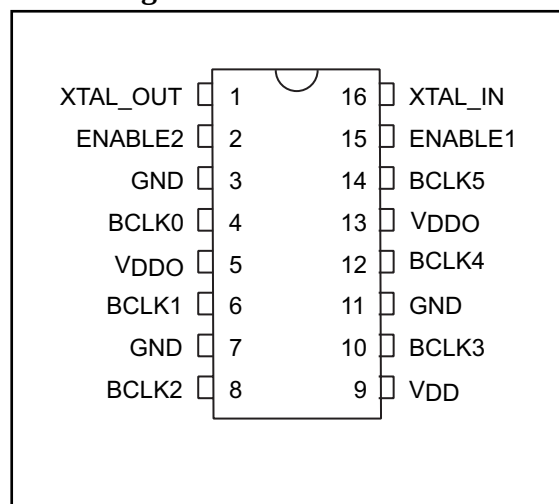
Pericom Semiconductor's PI6CL10806 is a low skew six output crystal oscillator drivers. Crystal oscillator input range is from 10MHz to 40MHz. If XTAL_IN is driven with a signal source, then the input frequency can be as high as 200MHz. PI6CL10806, the outputs are configured into 2 groups: a five output and a single output; each with independent output enable.

PI6CL10806 has a wide range of operating voltages: 1.2V and 1.5V. This feature paired with the low output-to-output and part-to-part skew makes the device ideal for low voltage, low power, high frequency single ended applications; such as networking

Block Diagram



Pin Configuration



Pin Description

Pin Name	Description
ENABLE1, ENABLE2	Active High Output Enable Inputs
XTAL_IN	Crystal interface
XTAL_OUT	Crystal interface
BCLK[0:5]	Clock Outputs
GND	Ground
VDD	Core Power
VDDO	Output Power

Truth Table⁽¹⁾

Inputs		Outputs	
ENABLE1	ENABLE2	BCLK[0:4]	BCLK5
L	L	L	L
L	H	L	Switching
H	L	Switching	L
H	H	Switching	Switching

Note:

1. H = High Voltage Level, L = Low Voltage Level

1.5V 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} , V _{DDO} 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.

1.5V I/O DC Characteristics (Over Operating Range: V_{DD} = 1.5V ± 0.1V, T_A = -40° to 85°C)

Parameters	Description	Test Conditions ⁽¹⁾		Min.	Typ. ⁽²⁾	Max.	Units
V _{DDO}	I/O Supply Voltage			1.4	1.5	1.6	
V _{IH}	Input HIGH Voltage	Logic HIGH level		0.65 x V _{DD}		V _{DD}	V
V _{IL}	Input LOW Voltage	Logic LOW level		-0.3		0.33 x V _{DD}	
V _{OH}	Output High Voltage	V _{DDO} = Min., V _{IN} = V _{IH} or V _{IL}	I _{OH} = -1mA	1.05			V
			I _{OH} = -8mA	0.75			
V _{OL}	Output LOW Voltage	V _{DDO} = Min., V _{IN} = V _{IH} or V _{IL}	I _{OL} = 1mA			0.35	
			I _{OL} = 8mA			0.65	

Notes:

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

1.5V I/O AC Characteristics (Over Operating Range: V_{DD}/V_{DDO} = 1.5V ± 0.1V, T_A = -40° to 85°C)

Parameters	Description	Test Conditions ⁽¹⁾	Min.	Typ	Max.	Units
f _{OUT}	Output Frequency	Using Crystal	10		40	MHz
		External Clock ⁽²⁾	0		200	
t _{DC}	Output Duty Cycle	@ V _{DDO} /2	47		53	%
t _R /t _F	CLKn Rise/Fall Time	20% to 80%	150		3500	ps
t _{SK(O)} ⁽³⁾	Output to Output Skew between any two outputs of the same device @ same transition	@V _{DDO} /2			80	ps
t _{DIS} , t _{EN} ⁽⁴⁾	Output Enable/Disable	@V _{DDO} /2			4	cycles

Notes:

- Unless noted otherwise, all parameters are tested with xtal @ f ≤ F_{xtal_max}; outputs are terminated @ 50Ω to V_{DDO}/2, see waveforms.
- External clock source is driving XTAL_IN input
- Identical conditions: loading, transitions, supply voltage, temperature, package type and speed grade.
- These parameters are guaranteed, but not tested.
Min & Max delay is 4 cycles.

1.82V 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 _{DDO} , 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.

1.2V I/O DC Characteristics (Over Operating Range: T_A = -40° to 85°C)

Parameters	Description	Test Conditions ⁽¹⁾	Min.	Typ. ⁽²⁾	Max.	Units
V _{DD}	1.2V Core Supply		1.4	1.5	1.6	V
V _{DDO}	I/O Supply Voltage		1.4	1.5	1.6	
V _{IH}	Input HIGH Voltage	Logic HIGH level	0.65*V _{dd}		V _{dd}	
V _{IL}	Input LOW Voltage	Logic LOW level	-0.3		0.35*V _{dd}	
V _{OH}	Output High Voltage	V _{DD} = Min., V _{IN} = V _{IH} or V _{IL}	I _{OH} = -2mA	0.85		
			I _{OH} = -8mA	0.55		
V _{OL}	Output Low Voltage	V _{DD} = Min., V _{IN} = V _{IH} or V _{IL}	I _{OL} = 2mA		0.35	
			I _{OL} = 8mA		0.45	

Notes:

- For Max. or Min. conditions, use appropriate operating V_{dd} and T_a values.
- Typical values are at V_{CC} = 1.2V, +25°C ambient and maximum loading.

1.2V I/O AC Characteristics (Over Operating Range: V_{DDO} = 1.2V ± 0.1V, T_A = -40° to 85°C)

Parameters	Description	Test Conditions ⁽¹⁾	Min.	Typ	Max.	Units
V _{DD}	2.5V Core Supply		1.1	1.2	1.3	V
f _{OUT}	Output Frequency	Using Crystal	10		40	MHz
		External Clock ⁽²⁾	0		200	
t _{DC}	Output Duty Cycle	@ V _{DDO} /2	47		53	%
t _R /t _F	CLKn Rise/Fall Time	20% to 80%	150		350	ps
t _{SK(O)} ⁽³⁾	Output to Output Skew between any two outputs of the same device @ same transition	@V _{DDO} /2			80	ps
t _{DIS} , t _{EN} ⁽⁴⁾	Output Enable/Disable	@V _{DDO} /2			4	cycles

Notes:

- Unless noted otherwise, all parameters are tested with xtal @ f ≤ F_{xtal_max}; outputs are terminated @ 50Ω to V_{DDO}/2, see waveforms.
- External clock source is driving XTAL_IN input
- Identical conditions: loading, transitions, supply voltage, temperature, package type and speed grade.
- These parameters are guaranteed, but not tested.
Min & Max delay is 4 cycles.

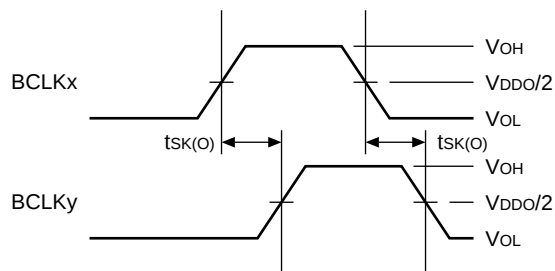
Phase Noise and Jitter

(Over Operating Range: $V_{DD} = V_{DDO} = 1.2V \pm 0.1V$, and $V_{DD} = V_{DDO} = 1.5V \pm 0.1V$, $T_A = -40^\circ$ to $85^\circ C$)

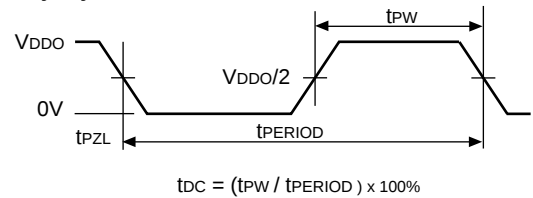
Symbol	Description	Test Conditions ⁽¹⁾	Min.	Typ	Max.	Units
t_{JIT}	Random RMS Phase Jitter	25MHz @ Integration Range 1MHz ~ 20MHz			2.5	ps
PN ₁	Phase Noise Power	Offset Range 10Hz			-60	dBc/Hz
PN ₂	Phase Noise Power	Offset Range 100Hz			-90	dBc/Hz
PN ₃	Phase Noise Power	Offset Range 1KHz			-120	dBc/Hz
PN ₄	Phase Noise Power	Offset Range 10KHz			-150	dBc/Hz

Waveforms

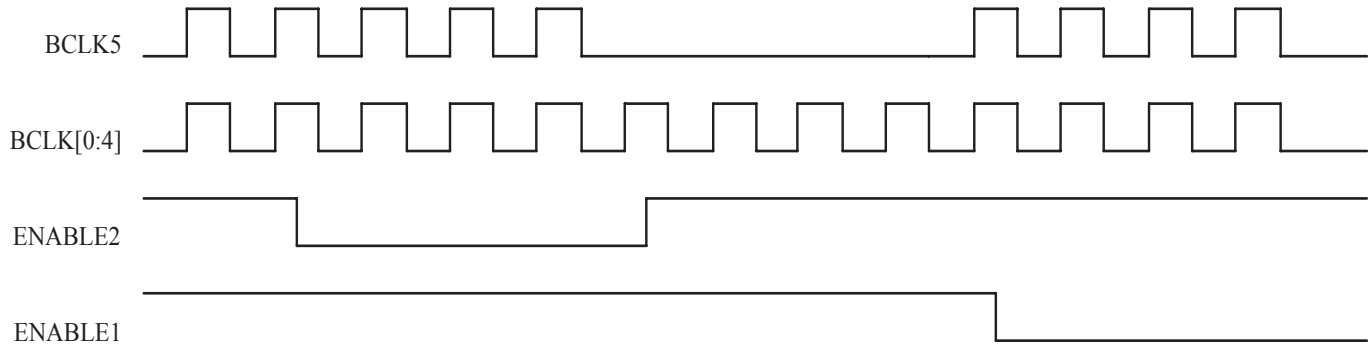
Output to Output Skew – $t_{sk(O)}$



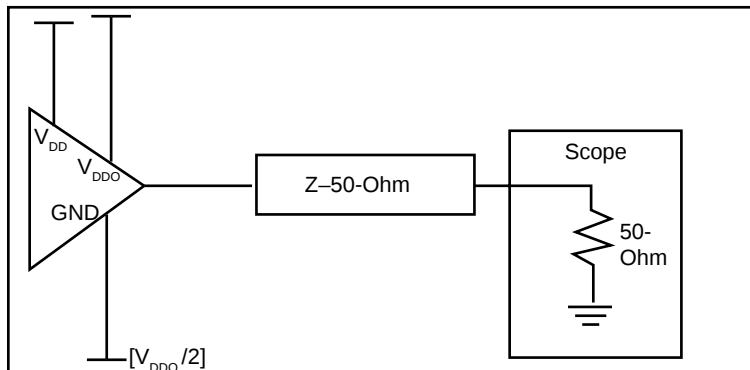
Duty Cycle – tDC



ENABLE1, ENABLE2 Timing Diagram



AC Test Circuit Load



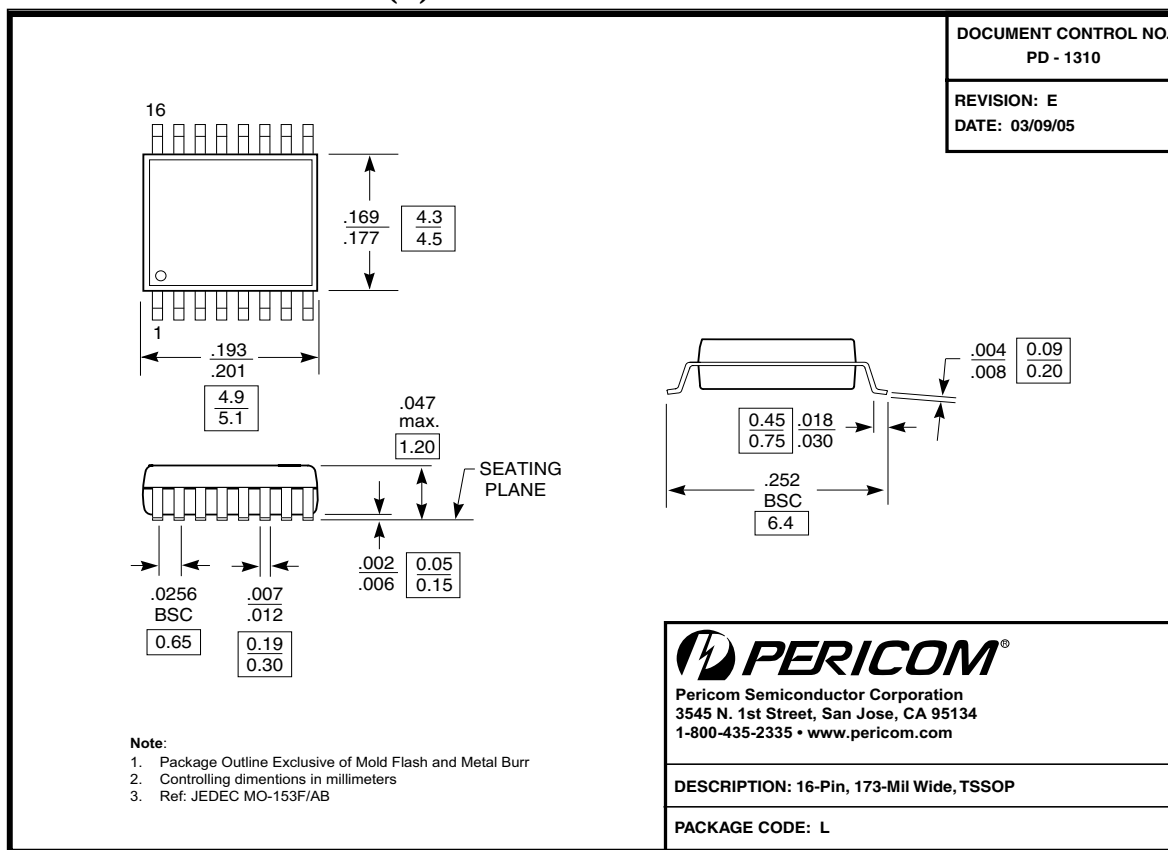
Note:
 $V_{DD}/V_{DDO} = 1.2V \pm 0.1V$,
 $1.5V \pm 0.1V$

Crystal Characteristic (link to "<http://www.pericom.com/saronix>" for more detailed crystal specifications)

Parameters	Description	Min	Typ	Max.	Units
OSCMODE	Mode of Oscillation	Fundamental			
FREQ	Frequency	10	25	40	MHz
ESR ⁽¹⁾	Equivalent Series Resistance	30		200	Ohm
CLOAD	Load Capacitance	16		32	pF
CSHUNT	Shunt Capacitance			7	pF
DRIVE	Operating Drive Level			0.5	mW
	Correlation Drive Level			0.1	mW

Note: 1. ESR value is dependent upon frequency of oscillation

Package Mechanical - 16-lead TSSOP (L)



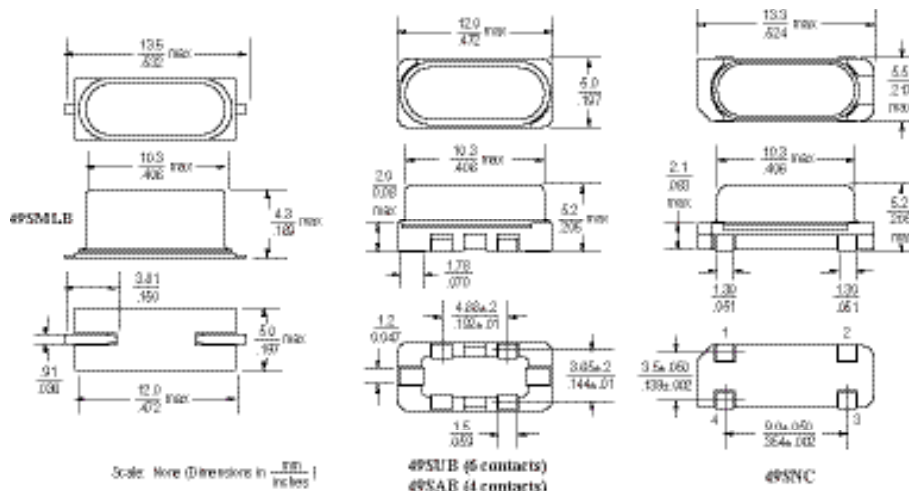
PI6C10806 Ordering Information^(1,2,3)

Ordering Code	Package Code	Package Description
PI6CL10806	L	Pb-Free and Green 16-pin 173-mil TSSOP

Notes:

- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- E = Pb-free and Green
- X suffix = Tape/Reel

Packaging Information: HC-49

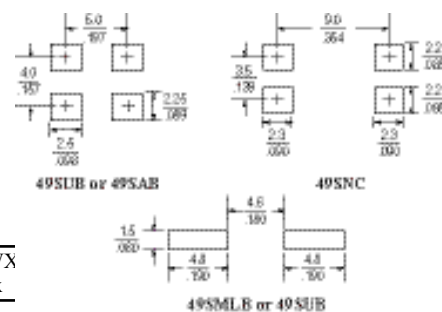


Package Marking Information

Line 1: S = SaRonix
 xxx = Calib/Stability/Temp Code
 YYWWX = Date Code

Line 2: Frequency (up to 7 digits, including decimal point)
 BT-cut = B or
 AT-cut Parallel = -(dash) or
 AT-cut Series = leave Blank
 xx = Load Capacitance (leave Blank if Series)

Land Pattern



SxxxYYWWX
 25.0000-xx

Pericom/Saronix Miniature Low Profile SMD Quartz Crystal Ordering Information

49xxx XXX = XX XXX X (X)

Type / Package
 49SMLB = 2 contact, 4mm high
 49SAB = 4 contact, 5 mm high
 49SNC = 4 contact, 5mm high
 49SUB = 6 contact, 5mm high

Frequency
 Frequency (in MHz) = 0x.xxxx, xx.xxxx
 (a zero is used in front of frequencies under 10 MHz)

B = BT-cut, 26.8 to 50 MHz
 - (dash) = AT-cut Parallel Resonance
 Blank = AT-cut Series Resonance

Load Capacitance
 xx = Parallel Resonance (specify load)
 Blank = Series Resonance

Options
 (T) = Tape and Reel (full increments only) 1000 pieces
 Blank = Bulk

-E (dash E) = Lead (Pb)-free RoHS Compliant Version
 Blank = Standard version

Calibration / Stability / Temp Range
 GGC = $\pm 30\text{ppm} / \pm 30\text{ppm} / -20$ to $+70^\circ\text{C}$
 GHE = $\pm 30\text{ppm} / \pm 50\text{ppm} / -40$ to $+85^\circ\text{C}$
 HJE = $\pm 50\text{ppm} / \pm 100\text{ppm} / -40$ to $+85^\circ\text{C}$
 *others available

Examples:

25.0000MHz, $\pm 30\text{ppm}$ calib, $\pm 30\text{ppm}$ stability, -20 to $+70^\circ\text{C}$ (Commercial), 16pF
 49SMLB25.0000-16GGC
 49SMLB25.0000-16GGC-E (for lead-free)

25.0000MHz, $\pm 30\text{ppm}$ calib, $\pm 30\text{ppm}$ stability, -40 to $+85^\circ\text{C}$ (Industrial), 16pF
 49SMLB25.0000-16GHE
 49SMLB25.0000-16GHE-E (for lead-free)

Pad Connection Configurations

