

1.8V to 3.3V XO IC's for 312.5kHz to 60MHz, with Standby

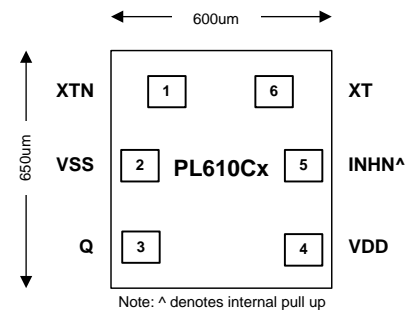
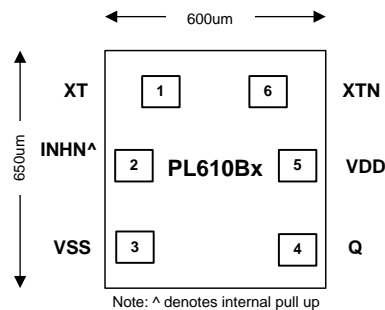
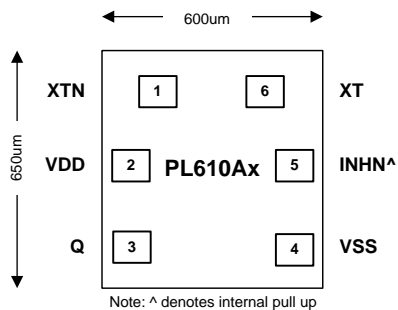
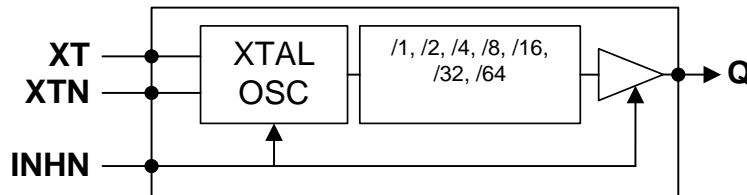
FEATURES

- Single IC to cover up to 60MHz output frequency.
- Direct oscillation operation
- Input Frequency: Fundamental crystal:
 - 10MHz to 60MHz
- Output Frequency: LVCMOS
 - 312.5KHz to 60MHz (2.5V & 3.3V)
 - 312.5KHz to 40MHz (1.8V)
- 3 pad layout options
 - PL610Ax series: for Flip Chip bonding
 - PL610Bx series: for wire bonding Type1
 - PL610Cx series: for wire bonding Type2
- Integrated Automatic Level Control (ALC) to maintain constant drive level
- 15pF output drive capability
- Very low Jitter and Phase Noise
- High impedance standby function, <5uA
- Low current consumption
- Single 1.8V to 3.3V \pm 10% power supply
- Operating temperature range from -40°C to 85°C

DESCRIPTION

The PL610 Series is a family of high performance general purpose oscillators to cover outputs from 312.5KHz up to 60MHz. Designed to fit in a small 2.0x1.6mm, or larger substrates, the PL610 Series offers the best phase noise and jitter performance, smallest die size, and lowest power consumption of any comparable IC. With its Standby function, the PL610 family of products draw <5 μ A.

BLOCK DIAGRAM



PAD ASSIGNMENT (Pad locations are measured from the center of the die)



PL610 Series

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Pad #	Pad Name			Pad Center*	
	PL610Ax	PL610Bx	PL610Cx	X	Y
1	XTN	XT	XTN	-177	231
2	VDD	INHNA	VSS	-215	41
3	Q	VSS	Q	-215	-186
4	VSS	Q	VDD	215	-186
5	INHNA	VDD	INHNA	215	41
6	XT	XTN	XT	177	231

PAD DESCRIPTION

Pad Name	Description
XT	Crystal input pad
VSS	GND connection
Q	Clock output
VDD	VDD connection
INHNA	Output control input. When activated (Logic "0") INHN will Tristate (HiZ), disabling the oscillator and the output. 10MΩ internal pull up resistor.
XTN	Crystal output pad

DIE SPECIFICATION

Parameter	Value
Chip size	0.65x 0.60mm
Chip thickness	130um, ±15um
Pad size	90µm
Chip base	GND level
Die back coating	Optional (see ordering information)

PL610 Series Configurations

Operating Voltage	Output Drive (mA)	Clload (pF)	Pad Layout	F _{XT}	F _{XT/2}	F _{XT/4}	F _{XT/8}	F _{XT/16}	F _{XT/32}	F _{XT/64}
1.8V to 3.3V (±10%)	8	8	Flip Chip Bonding	PL610A1	PL610A2	PL610A3	PL610A4	PL610A5	PL610A6	PL610A7
			Wire Bonding Type 1	PL610B1	PL610B2	PL610B3	PL610B4	PL610B5	PL610B6	PL610B7
			Wire Bonding Type 2	PL610C1	PL610C2	PL610C3	PL610C4	PL610C5	PL610C6	PL610C7

*Please contact Micrel sales for individual IC availability



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ELECTRICAL SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS

PARAMETERS	SYMBOL	MIN.	MAX.	UNITS
Supply Voltage Range	V_{DD}	-0.5	4.6	V
Input Voltage Range	V_I	-0.5	$V_{DD}+0.5$	V
Output Voltage Range	V_O	-0.5	$V_{DD}+0.5$	V
Storage Temperature	T_S	-65	150	°C
Ambient Operating Temperature*		-40	85	°C
ESD Protection, Human Body Model		2		KV

Exposure of the device under conditions beyond the limits specified by Maximum Ratings for extended periods may cause permanent damage to the device and affect product reliability. These conditions represent a stress rating only, and functional operations of the device at these or any other conditions above the operational limits noted in this specification is not implied. *Operating temperature is guaranteed by design. Parts are tested to commercial grade only.

AC SPECIFICATIONS

PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Crystal Input Frequency (XT)	Fundamental Crystal (2.5V & 3.3V)	10		60	MHz
	Fundamental Crystal (1.8V)			40	
Output Frequency	3.3V & 2.5V operation	0.3125		60	MHz
	1.8V operation			40	
Settling Time	At power-up ($V_{DD} > 90\%V_{DD}$)			2	ms
Output Disable Delay Time	Temp=25°C, 15pF Load			50	µs
Output Rise/Fall Time (See MTC-1)	3.3V, 15pF Load, 10/90% V_{DD}		1.7	2.2	ns
Output Rise/Fall Time (See MTC-1)	2.5V, 15pF Load, 10/90% V_{DD}		2	2.5	ns
Output Rise/Fall Time (See MTC-1)	1.8V, 15pF Load, 10/90% V_{DD}		3	3.5	ns
Duty Cycle* (See MTC-1)		45	50	55	%

* For 1.8V operation, the 50% ±5% duty cycle is guaranteed for frequencies ≤40MHz.



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DC SPECIFICATIONS

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Supply Current, Dynamic	I _{DD}	@V _{DD} =3.3V, 27MHz, No Load		1.2		mA
		@V _{DD} =3.3V, 40MHz, No Load		1.7		
		@V _{DD} =1.8V, 27MHz, No Load		0.6		
		@V _{DD} =1.8V, 40MHz, No Load		0.9		
Standby Supply Current	I _{DD_SB}	INH= "0", 3.3V		1		uA
Operating Voltage	V _{DD}		1.62		3.63	V
Power Supply Ramp	t _{PU}	Time for V _{DD} to reach 90% V _{DD} . Power ramp must be monotonic.	.001		100	ms
Output Low Voltage	V _{OL}	I _{OL} = +4mA			0.4	V
Output High Voltage	V _{OH}	I _{OH} = -4mA	V _{DD} - 0.4			V
Output Current(See MCT-2)	I _{OHD}	V _{OL} = 0.4V, V _{OH} = 2.4V		8		mA

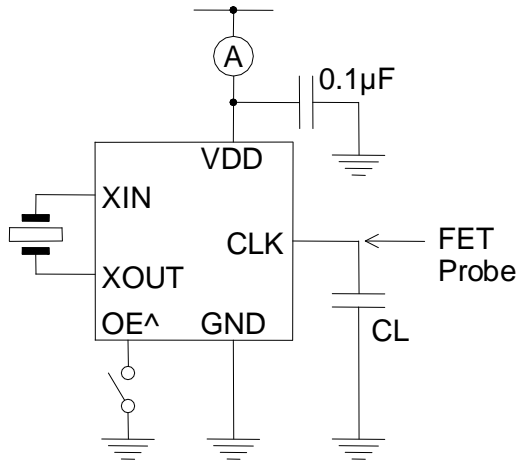
CRYSTAL SPECIFICATIONS

PARAMETERS	SYMBOL	MIN.	TYP.	MAX.	UNITS
Fundamental Crystal Resonator Frequency (2.5V & 3.3V)	F _{XT}	10		60	MHz
Fundamental Crystal Resonator Frequency (1.8V)				40	
Crystal Loading Rating	C _{L (xtal)}		8		pF
Maximum Sustainable Drive Level				100	μW
Operating Drive Level @ Frequency <40MHz			25		μW
Crystal Shunt Capacitance	C ₀			3	pF
Effective Series Resistance, Fundamental, (See MTC-3)	ESR			50	Ω

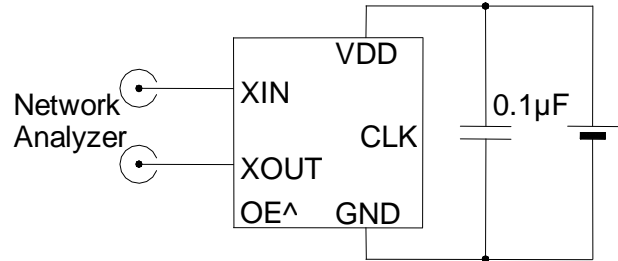
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MEASUREMENT TEST CIRCUITS (MTC)

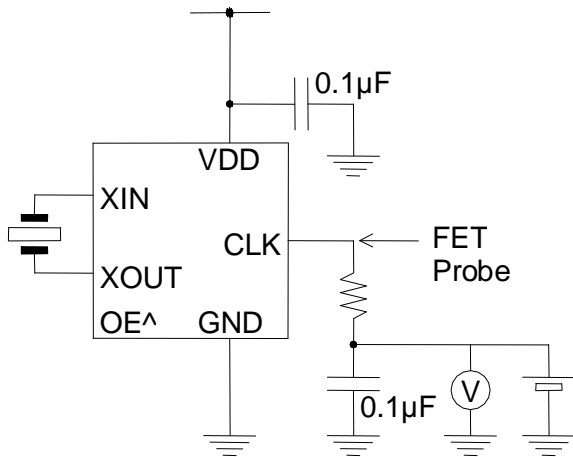
MTC-1: Rise Time, Fall Time, Duty Cycle, VOL, VOH, I_{dd}, Power Down Current, Output Enable/Disable



MTC-3: Negative Resistance

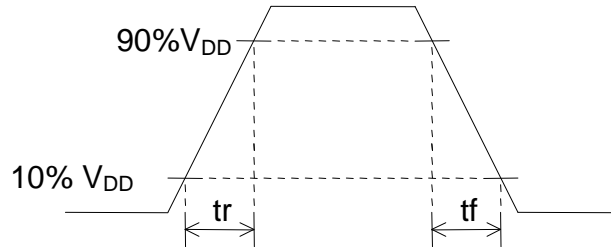


MTC-2: Output Drive Current and Output Impedance

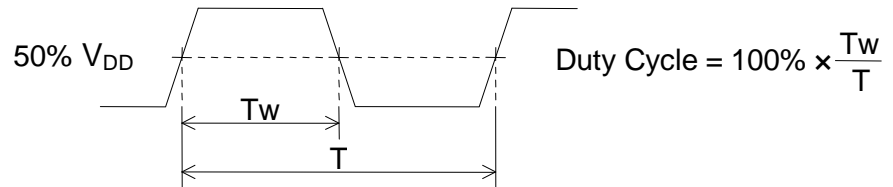


WAVEFORM SWITCHING CHARACTERISTICS

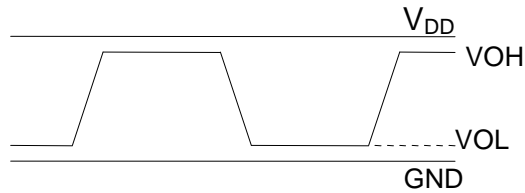
Rise and Fall time:



Duty Cycle:



VOH, VOL:





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ORDERING INFORMATION

For part ordering, please contact our Sales Department:

2180 Fortune Drive, San Jose, CA 95131, USA

Tel: (408) 944-0800 Fax: (408) 474-1000

PART NUMBER

The order number for this device is a combination of the following:

Part number, Package type and Operating temperature range

PL610XX-XX

Pad Layout

A: flip chip

B: wire bonding type 1

C: wire bonding type 2

Divider Selection

D5: Die form with 5mil thickness

W5: Sawed wafer with 5mil thickness

W8: Un-sawed wafer with 8mil thickness

Q8: ¼ wafer with 8mil thickness

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