

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

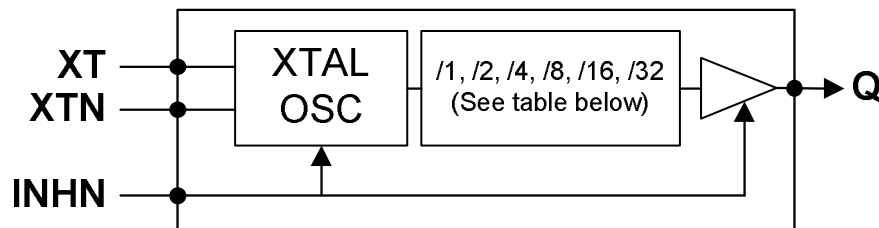
FEATURES

- 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)
- 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 PL610-6x is a family of high performance general purpose to cover outputs from 156.25kHz up to 60MHz. Designed to fit in a small 2.0x1.6mm, or larger substrates, the PL610-6x offer the best phase noise and jitter performance, smallest die size, and lowest power consumption of any comparable IC. With its Standby function the part draws <5uA.

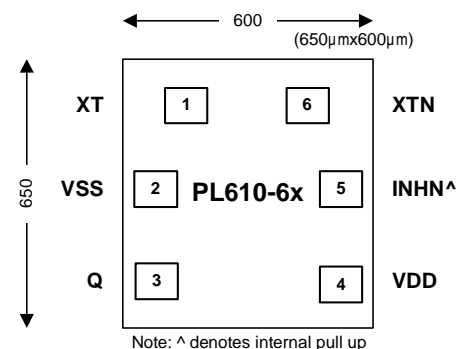
BLOCK DIAGRAM



DIE SPECIFICATION

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

PAD ASSIGNMENT



PL610-6x FAMILY CONFIGURATIONS

Part Number	Operating Voltage	Input Frequency	Output Frequency
PL610-61	1.8V to 3.3V, \pm 10%	F_{XT} = 10MHz to 60MHz (3.3V & 2.5V) F_{XT} = 10MHz to 40MHz (1.8V)	$Q = F_{XT}$
PL610-62			$Q = F_{XT}/2$
PL610-63			$Q = F_{XT}/4$
PL610-64			$Q = F_{XT}/8$
PL610-65			$Q = F_{XT}/16$
PL610-66			$Q = F_{XT}/32$

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PAD DESCRIPTIONS (Pad measurements are from die center)

Pad #	Pad Name	Pad Center Spacing		Description
		X	Y	
1	XT	-177	231	Crystal input pad
2	VSS	-215	41	GND connection
3	Q	-215	-186	Clock output
4	VDD	215	-186	VDD connection
5	INH N	215	41	Output control input. When activated (Logic "0") INHN will Tristate (HiZ) the output and disable the oscillator. 10M Ω internal pull up resistor.
6	XTN	177	231	Crystal output pad

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	$^{\circ}C$
Ambient Operating Temperature*		-40	85	$^{\circ}C$
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.

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)		12		pF
Maximum Sustainable Drive Level				100	μW
Operating Drive Level			25		μW
Crystal Shunt Capacitance	C_0			3	pF
Effective Series Resistance, Fundamental, (See MTC-4)	ESR			50	Ω

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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
Standby Enable Time	INH Function; $T_a=25^\circ C$, 15pF Load. Add one clock period for a useable output.			2	ms
V_{DD} Sensitivity	Frequency vs. V_{DD} , +/-10%	-0.5		0.5	ppm
Output Rise/Fall Time (See MTC-1)	3.3V, 15pF Load, 10/90% V_{DD}		1.2	1.7	ns
Output Rise/Fall Time (See MTC-1)	2.5V, 15pF Load, 10/90% V_{DD}		1.7	2	ns
Output Rise/Fall Time (See MTC-1)	1.8V, 15pF Load, 10/90% V_{DD}		2.6	3	ns
Output Rise/Fall Time (See MTC-1)	3.3V, 50pF Load, 10/90% V_{DD}		3	4.5	ns
Output Rise/Fall Time (See MTC-1)	2.5V, 50pF Load, 10/90% V_{DD}		3.5	5	ns
Output Rise/Fall Time (See MTC-1)	1.8V, 50pF Load, 10/90% V_{DD}		5	8	ns
Duty Cycle* (See MTC-1)		45	50	55	%

* For 1.8V operation, the 50% \pm 5% duty cycle is guaranteed for frequencies \leq 40MHz.

DC SPECIFICATIONS

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Supply Current, Dynamic	I_{DD}	@ $V_{DD}=3.3V$, 26MHz, No Load		1.2		mA
		@ $V_{DD}=3.3V$, 40MHz, No Load		1.65		
		@ $V_{DD}=1.8V$, 26MHz, No Load		0.58		
		@ $V_{DD}=1.8V$, 40MHz, No Load		0.9		
Standby Supply Current	I_{DD_SB}	INH="0", 3.3V			5	μA
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}	$I_{OL} = +4mA$ Standard Drive			0.4	V
Output High Voltage	V_{OH}	$I_{OH} = -4mA$ Standard Drive	$V_{DD} - 0.4$			V
Output Current(See MCT-2)	I_{OHD}	$V_{OL} = 0.4V$, $V_{OH} = 2.4V$	16			mA

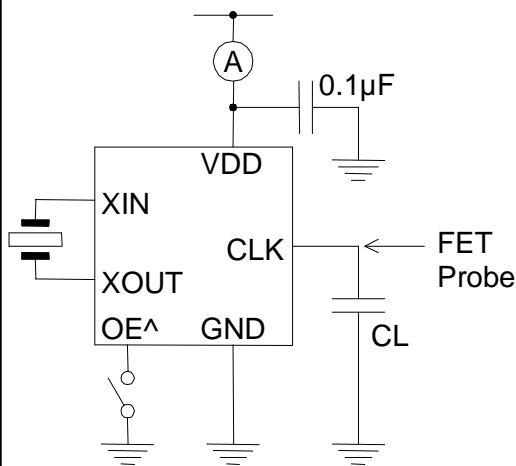
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PHASE NOISE SPECIFICATIONS, 3.3V (See MCT-3)

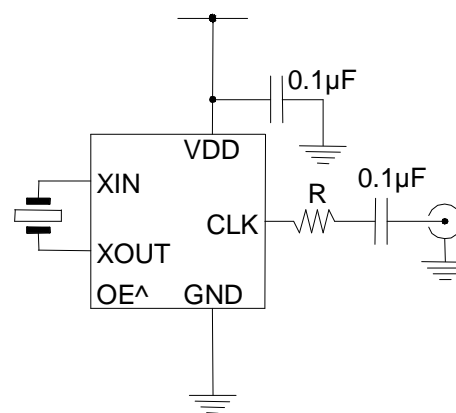
PARAMETERS	FREQ.	@10Hz	@100Hz	@1kHz	@10kHz	@100kHz	@1M	UNITS
Phase Noise relative to carrier (typical)	40.0MHz	-98	-126	-145	-151	-155	-156	dBc/Hz
	26.0MHz	-100	-127	-145	-151	-155	-155	

MEASUREMENT TEST CIRCUITS (MTC)

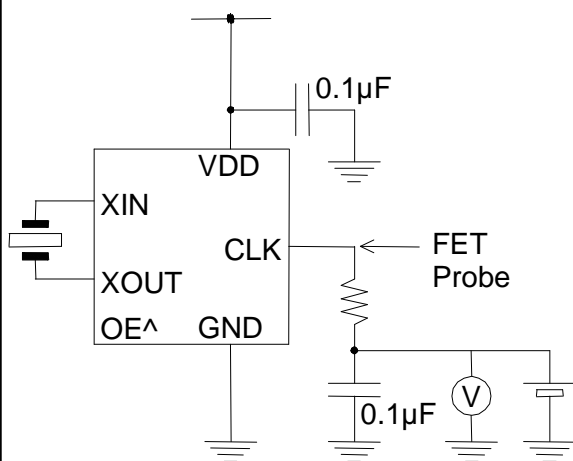
MTC-1: Rise Time, Fall Time, Duty Cycle, VOL, VOH, I_{dd}, Power Down Current, Output Enable/Disable



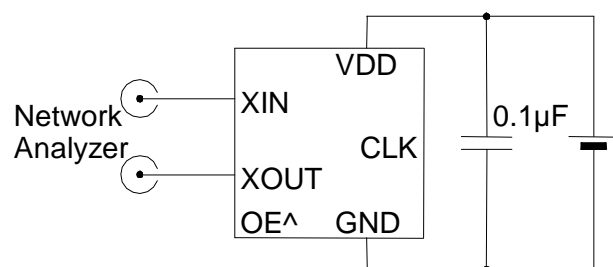
MTC-3: Jitter and Phase Noise



MTC-2: Output Drive Current and Output Impedance



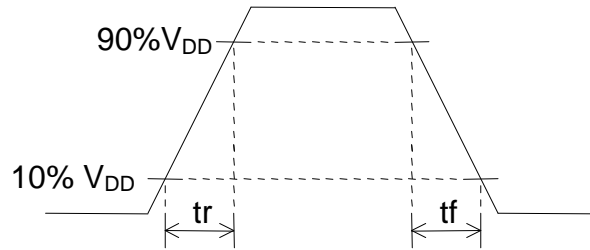
MTC-4: Negative Resistance



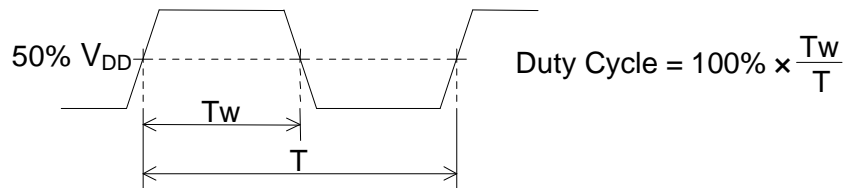
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WAVEFORM SWITCHING CHARACTERISTICS

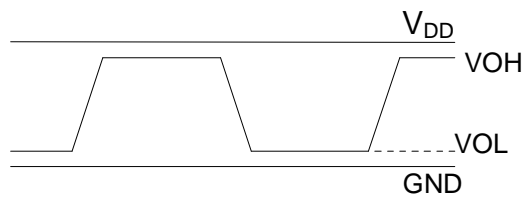
Rise and Fall times:



Duty Cycle:



VOH, VOL:



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ORDERING INFORMATION

For part ordering, please contact our Sales Department:

47745 Fremont Blvd., Fremont, CA 94538, USA

Tel: (510) 492-0990 Fax: (510) 492-0991

PART NUMBER

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

Part number, Package type and Operating temperature range

PL610-6x x x x

Part Number

- PL610-61 (Q=F_{Xt})
- PL610-62 (Q=F_{Xt}/2)
- PL610-63 (Q=F_{Xt}/4)
- PL610-64 (Q=F_{Xt}/8)
- PL610-65 (Q=F_{Xt}/16)
- PL610-66 (Q=F_{Xt}/32)

Temperature Range

C=Commercial (0°C to 70°C)

Package Type

- D = Die
- E = Die (with Non-Conductive Backcoating)
- V = Wafer (with Non-Conductive Backcoating)
- W = Wafer

Die Thickness

- 5 = 5 mils
- 6 = 6 mils
- 8 = 8 mils

Part / Order Number	Package Option	Temperature
PL610-6xDxC	Die (Waffle Pack)	0°C to +70°C
PL610-6xEC	Die (Waffle Pack)	0°C to +70°C
PL610-6xVxC	Wafer	0°C to +70°C
PL610-6xWxC	Wafer	0°C to +70°C

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