

XCO

FAST TURNAROUND CLOCK OSCILLATOR

DESCRIPTION

The XCO clock series is a cutting edge family of low to high frequency, **low jitter output**, **single** or **multi - frequency** clock oscillators. The XCO clocks are available in **7.0 x 5.0**, **5.0 x 3.2**, and **3.2 x 2.5 mm** ceramic packages with output frequencies ranging from **10 MHz to 1.2 GHz**. Customer can select up to four output frequencies. Its outstanding flexibility significantly reduces design cycle time and overall cost. The XCO clock design incorporates a low frequency crystal along with low jitter frequency synthesizer to provide a wide range of frequencies. The XCO clocks are available in **LVCMOS**, **LVPECL** and **LVDS** outputs, allowing for a wide variety of applications.

This product is ideal for the time conscious customer as shipments are made within days of a placed order.

FEATURES

- **Fast Turnaround (Ships Within Days)**
- **Very Low Jitter (Typical 0.6 ps)**
- **10 MHz to 1.2 GHz Frequency Range**
- **Selectable Single, Dual, or Quadruple Frequencies**
- **Stability as low as ± 20 ppm ($-40 \sim 85^\circ\text{C}$)**
- **Available Sizes:**
 - ✓ **7.0 x 5.0 mm**
 - ✓ **5.0 x 3.2 mm**
 - ✓ **3.2 x 2.5 mm**

SELECTOR GUIDE	LVCMOS			LVDS			LVPECL		
Package Size (mm)	7.0x5.0	5.0x3.2	3.2x2.5	7.0x5.0	5.0x3.2	3.2x2.5	7.0x5.0	5.0x3.2	3.2x2.5
Family Part Number	XCO-74	XCO-54	XCO-34	XCO-78	XCO-58	XCO-38	XCO-79	XCO-59	XCO-39
Frequency Range (MHz)	10 – 250			10 – 1200			10 - 1200		
Frequency Stability (ppm)	± 20 , ± 25 , ± 50 , ± 100			± 20 , ± 25 , ± 50 , ± 100			± 20 , ± 25 , ± 50 , ± 100		
Number of Frequencies	1, 2, 4			1, 2, 4			1, 2, 4		
Supply Voltage (V)	2.5, 3.3			2.5, 3.3			2.5, 3.3		
Temperature Range ($^\circ\text{C}$)	$-20 \sim +70$			$-20 \sim +70$			$-20 \sim +70$		
	$-40 \sim +85$			$-40 \sim +85$			$-40 \sim +85$		
Enable/Disable Pin	Pin 1, Pin 2, or None			Pin 1, Pin 2, or None			Pin 1, Pin 2, or None		

OUTPUT CHARACTERISTICS

	PARAMETER	SYMBOL	CONDITION	VALUE			UNIT
				Min	Typ.	Max	
LVCMOS	Frequency Range	f_o	Up to 4 Available Frequencies	10		250	MHz
	Output Levels	V_{OH}		$0.9V_{cc}$			V
		V_{OL}				$0.1V_{cc}$	V
	Rise/Fall Time	T_r/T_f	20% - 80% (V_{OL} , V_{OH})			0.5	ns
	Supply Current	2.5V	10 – 50 MHz			30	mA
			51 – 135 MHz			45	
			136 – 250 MHz			55	
		3.3V	10 – 50 MHz			35	
			51 – 135 MHz			50	
			136 – 250 MHz			60	
	Output Load	O_{CL}	Standard			15	pF

	PARAMETER	SYMBOL	CONDITION	VALUE			UNIT
				Min	Typ.	Max	
LVPECL	Frequency Range	f_o	Up to 4 available frequencies	10		1200	MHz
	Output levels	V_{OH}	Load 50Ω to V_{cc} -2V	V_{cc} -1.03		V_{cc} -0.6	V
		V_{OL}		V_{cc} -1.85		V_{cc} -1.6	V
	Rise/Fall Time	T_r/T_f				0.25	ns
	Output Voltage Swing	V_{p-p}	Output termination 50Ω / V_{cc} - 2.0V	0.6		1.0	V
	Supply Current	2.5 V	10 – 50 MHz			35	mA
			51 – 215 MHz			45	
			216 – 640 MHz			65	
			641 – 1200 MHz			70	
		3.3V	10 – 50 MHz			85	
			51 – 215 MHz			95	
			216 – 640 MHz			115	
			641 – 1200 MHz			120	
	Output Load	O_{CL}	Output Termination 50Ω to V_{cc} -2V			50	Ω

	PARAMETER	SYMBOL	CONDITION	VALUE			UNIT
				Min	Typ.	Max	
LVDS	Frequency Range	f_o	Up to 4 available frequencies	10		1200	MHz
	Differential Output Voltage	V_{OD}	10 – 1200 MHz		0.6		V
	Offset Voltage	V_{OS}	V DC		1.3		V
	Rise/Fall Time	T_r/T_f				0.35	ns
	Supply Current	2.5V	10 – 50 MHz			25	mA
			51 – 215 MHz			30	
			216 – 640 MHz			43	
			641 – 1200 MHz			60	
		3.3V	10 – 50 MHz			65	
			51 – 215 MHz			72	
			216 – 640 MHz			83	
			641 – 1200 MHz			100	
	Output Load	O_{CL}	Differential 100Ω Load Connected Between Each Output			100	Ω

ELECTRICAL SPECIFICATIONS

PARAMETER	SYMBOL	CONDITION	VALUE			UNIT
			Min.	Typ.	Max.	
Supply Voltage ¹	V _{CC}			2.5 or 3.3		V
Duty Cycle	DC	Load depends on output type	45		55	%
RMS Phase Jitter	J	12 kHz – 20 MHz Bandwidth		0.6	1	ps
Overall Frequency Stability ^{1,2}	$\Delta f/f_c$	-10°C to +70°C			± 20 ± 25 ± 50	ppm
		-40°C to +85°C			± 25 ± 50 ± 100	
Start-Up Time	t _{start}	T _a =25°C			10	ms
Enable	En	Min (logic 1 or open) HCMOS levels	0.7V _{CC}			V
Disable ³	Dis	Max (logic 0) HCMOS levels			0.3	V
OE Function OE Pin Input LVCMOS/ LVTTTL	Input Capacitance	C _{IN}		4		pF
	Input High Voltage	V _{IH}	0.7V _{CC}			V
	Input Low Voltage	V _{IL}			0.3V _{CC}	V
	Input High Current	I _{IH}			5	μA
	Input Low Current	I _{IL}	-10			μA
	Equivalent Internal Pull-up Resistance	R _{PULLUP}		900		kΩ
Aging		First year			±5	ppm
		Year thereafter			±2	
Operating Temperature ¹	T _a		-40		+85	°C
Storage Temperature	T _(stg)	Absolute max	-45		+100	°C
Absolute Voltage Range	V _{CC(abs)}				4.6	V
Moisture Sensitivity Level	MSL	JEDEC J-STD-020			1	
Termination Finish			Au			
ESD Sensitivity	HBM	Human body model JESD22-A114			3	kV

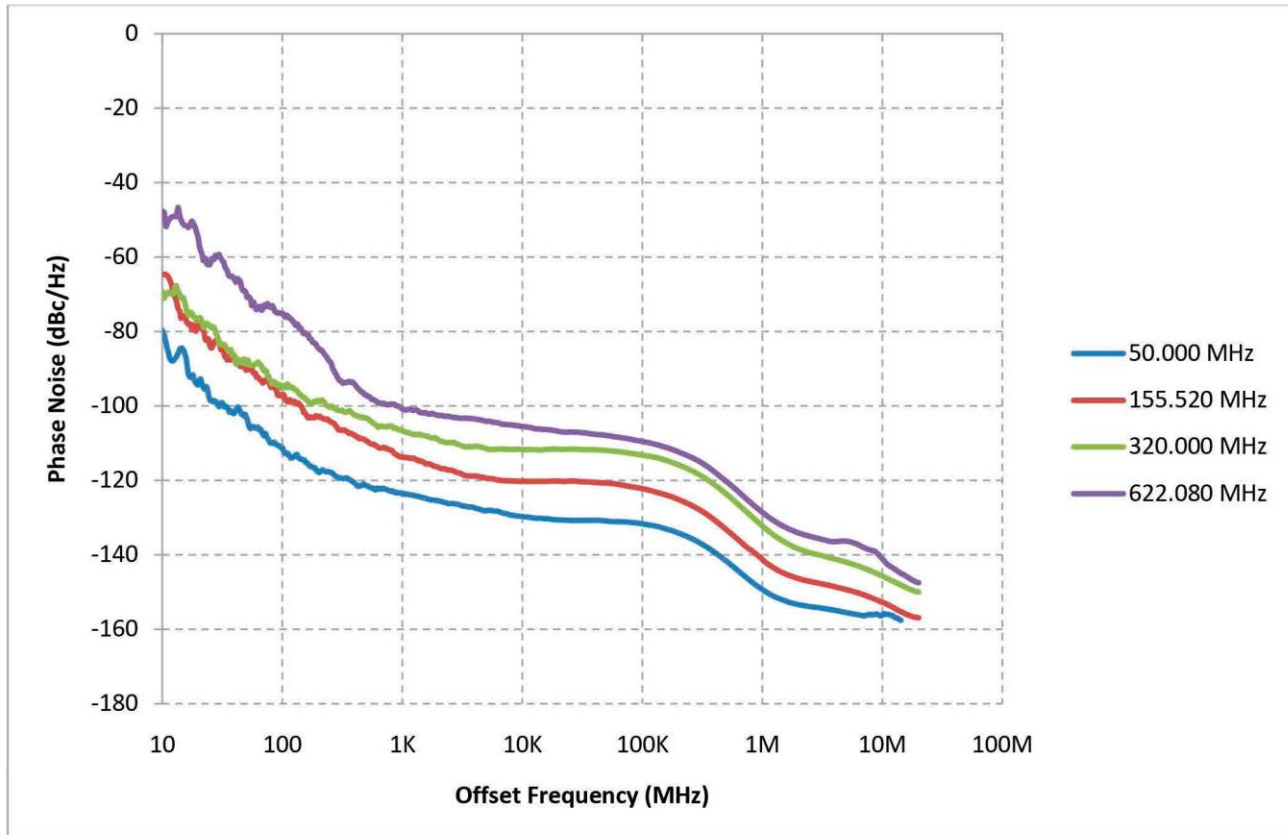
Notes

¹ See part numbering table

² Inclusive of 25°C calibration, tolerance, operating temperature range, input voltage variation, load change, aging, shock and vibration

³ Output goes to high impedance

PHASE NOISE AND JITTER PERFORMANCE

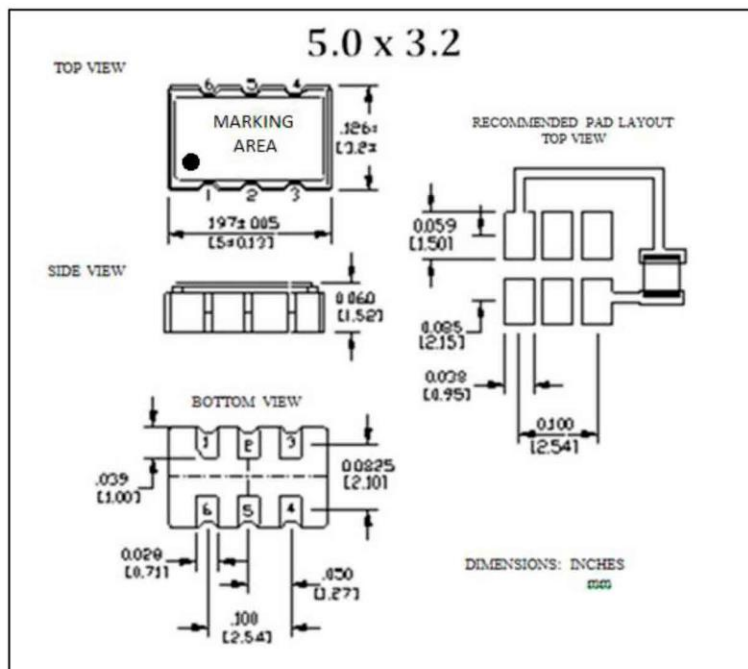
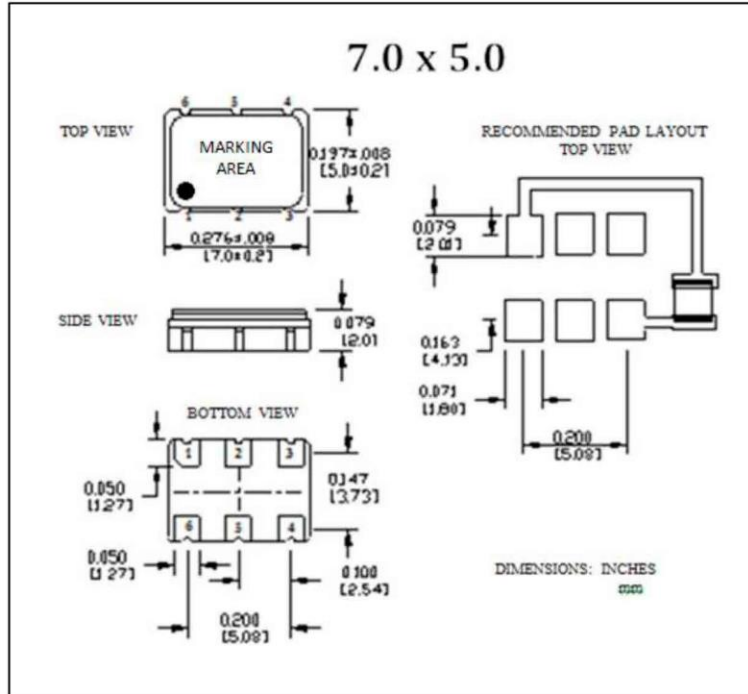


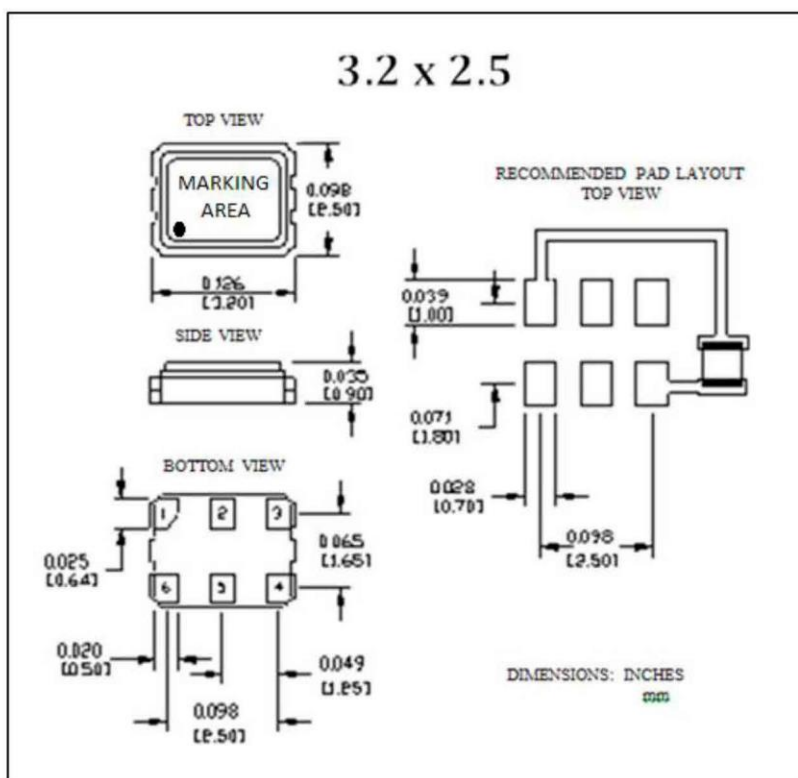
Data collected using Agilent E5052B signal source analyzer. $V_{cc} = 2.5V$.

FREQUENCY (MHz)	FULL BANDWIDTH PHASE JITTER (ps)	PHASE JITTER 12 kHz to 20 MHz INTEGRATED BANDWIDTH (ps RMS)
50.000	3.0	0.9
155.520	2.1	0.6
320.000	3.2	0.7
622.080	3.3	0.7

Phase jitter integrated using Agilent E5052B signal source analyzer. $V_{cc} = 2.5V$ (LVCMOS, LVDS, LCPECL – load)

MECHANICAL DIMENSIONS AND PIN FUNCTIONING





Notes (Applicable To All Packages)

¹ Enable / Disable feature is available on either pin 1 or pin 2. See options on part numbering table.

² There is no enable/disable option when the number of output frequencies is four.

³ 0.01 μ F external bypass capacitor is recommended as seen in solder pattern for 7 x 5 mm, and required for 5 x 3.2 and 3.2 x 2.5 mm

PIN	SYMBOL	FUNCTION
1	see below	Refer to Pin Logic Table Below
2	see below	Refer to Pin Logic Table Below
3	GND	Case and Electrical Ground
4	Output 1	Output 1
5	Output 2 or NC	Complementary Output (LVPECL, LVDS) or N/C (LVCMOS)
6	V _{cc}	Power Supply Voltage

PIN LOGIC TABLE			
NUMBER OF FREQUENCIES	PIN 1	PIN 2	FREQUENCY OUTPUT
1	Enable/Disable	N/C	F ₁
	N/C	Enable/Disable	F ₁
2	Enable/Disable	"0" Logic Level	F ₁
		"1" Logic Level	F ₂
	"0" Logic Level	N/C	F ₁
	"1" Logic Level		F ₂
4	"0" Logic Level	"0" Logic Level	F ₁
	"0" Logic Level	"1" Logic Level	F ₂
	"1" Logic Level	"0" Logic Level	F ₃
	"1" Logic Level	"1" Logic Level	F ₄

PART NUMBERING

SERIES	PACKAGE (mm)	OUTPUT	SUPPLY VOLTAGE (V)	FREQUENCY STABILITY (ppm)	TEMP RANGE (°C)	NUMBER OF FREQUENCIES	ENABLE / DISABLE PIN	-	OUTPUT FREQUENCY (MHz)
XCO	7: 7.0 x 5.0 5: 5.0 x 3.2 3: 3.2 x 2.5	4: LVCMOS 8: LVDS 9: LVPECL	2: V _{cc} = 2.5 3: V _{cc} = 3.3	K: ±20 I: ±25 H: ±50 J: ±100 L: ±30	U: -20~70 V: -40~85 C: -40~105 ³	1: Single 2: Dual 4: Quad ¹	1: Pin 1 2: Pin 2 ²	-	F ₁ F ₁ - F ₂ F ₁ - F ₂ - F ₃ - F ₄

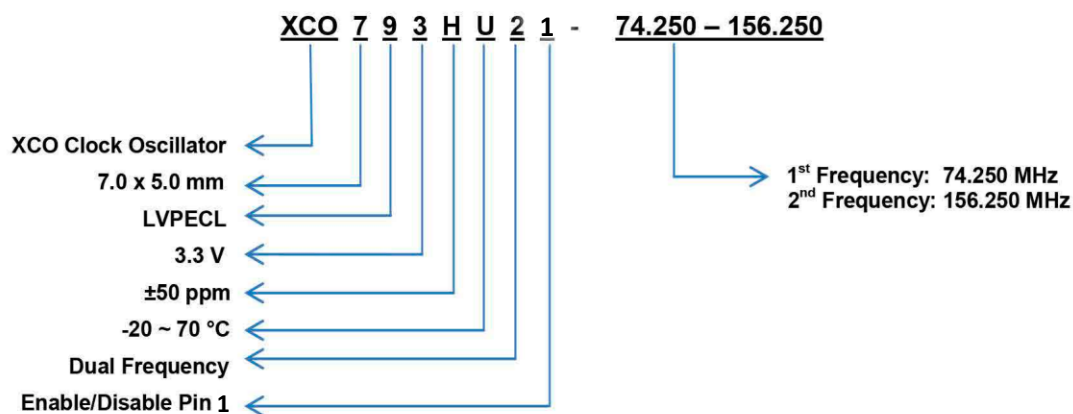
Notes

¹ There is no enable/disable option when the number of output frequencies is four. Enable/Disable pin option should be selected as 0.

² Available for 1 frequency only.

³ Available for 50 and 100 ppm only.

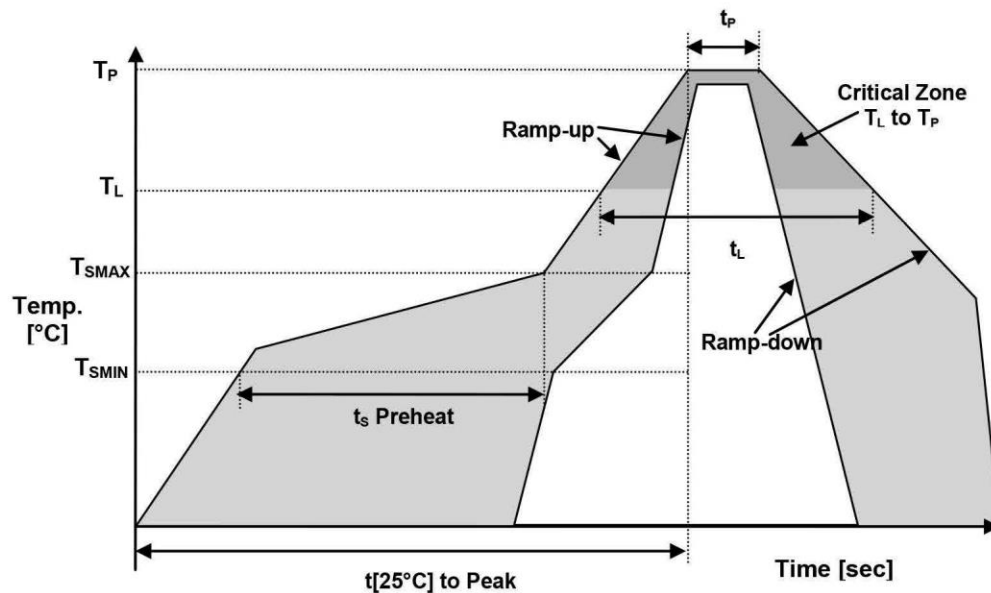
EXAMPLE:



MARKING

- A marking code will be issued by the sales department at order confirmation.

REFLOW PROFILE



Recommended Solder Reflow Profile

Temperature Min Preheat	T_{SMIN}	150°C
Temperature Max Preheat	T_{SMAX}	175°C
Time (T_{SMIN} to T_{SMAX})	t_s	60-180 sec.
Temperature	T_L	217°C
Peak Temperature	T_P	260°C
Ramp-up rate	R_{UP}	3°C/sec max.
Ramp-down rate	R_{DOWN}	6°C/sec max.
Time within 5°C of Peak Temperature	t_p	10 sec max.
Time $t[25^\circ\text{C}]$ to Peak Temperature	$t[25^\circ\text{C}]$ to Peak	480 sec.
Time	t_L	60-150 sec.