

SCO ULTRA LOW JITTER CLOCK OSCILLATOR

DESCRIPTION

The SCO family of Rubyquartz clock oscillators is ideal for low-noise applications. It features typical RMS phase jitter of less than 0.2 ps, and is available in 7.0 x 5.0 mm or 5.0 x 3.2 mm surface mount ceramic packages.

Its high flexibility is driven by its wide range of available frequencies. The SCO clocks are available in LVPECL and LVDS outputs.

FEATURES

- Industry Leading Jitter (Typical <0.2 ps)
- High Flexibility of Customer Desired Outputs
- Stability as low as 20 ppm (-40 ~ 85 °C)
- Available Sizes: 7.0 x 5.0 mm or 5.0 x 3.2 mm

APPLICATIONS

- SONET / SDH
- Fiber Channel
- Ethernet
- Clock / Data Recovery
- Test and Measurement
- Networking

SELECTOR GUIDE	LVDS		LVPECL	
	Package Size (mm)	7.0 x 5.0	5.0 x 3.2	7.0 x 5.0
Family Part Number	SCO - 78	SCO - 58	SCO - 79	SCO - 59
Frequency Range (MHz)	75 – 622		75– 622	
Frequency Stability (ppm)	±20, ±25, ±50, ±100		±20, ±25, ±50, ±100	
Supply Voltage (V)	2.5, 3.3		2.5, 3.3	
Temperature Range (°C)	-20 ~ +70		-20 ~ +70	
	-40 ~ +85		-40 ~ +85	

OUTPUT CHARACTERISTICS

	PARAMETER	SYMBOL	CONDITION	VALUE			UNIT
				Min	Typ.	Max	
LVPECL	Frequency Range	f_o		75		622	MHz
	Output Levels	V_{OH}	Load 50 Ω to V_{cc} -2V	V_{cc} -1.35	V_{cc} -1.01	V_{cc} -0.8	V
		V_{OL}		V_{cc} -2.00	V_{cc} -1.78	V_{cc} -1.6	V
	Rise/Fall Time	T_r/T_f			0.30	ns	
	Output Voltage Swing	V_{p-p}	Output termination 50 Ω / V_{cc} -2.0V	0.65	0.77	0.95	V
	Supply Current	I_s	2.5V			120	mA
			3.3V			150	
Output Load	O_{CL}	Output termination 50 Ω / V_{cc} -2.0V			50	Ω	

	PARAMETER	SYMBOL	CONDITION	VALUE			UNIT
				Min	Typ.	Max	
LVDS	Frequency Range	f_o		75		622	MHz
	Differential Output Voltage	V_{OD}		0.247	0.350	0.454	V
	Offset Voltage	V_{OS}	V DC		1.3		V
	Common Mode Output Voltage	V_{CM}		1.125	1.2	1.375	V
	Rise/Fall Time	T_r/T_f				0.30	ns
	Supply Current	I_s	2.5V			120	mA
			3.3V			150	
Output Load	O_{CL}	Differential 100 Ω 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		< 0.2		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	0.7 (V _{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	
Aging		First year			±5	ppm
		Year thereafter			±2	
Operating Temperature ¹	T _a		-40		+85	°C
Storage Temperature	T _(stg)	Absolute max	-65		+150	°C
Absolute Voltage Range	V _{CC(abs)}				4.6	V
Moisture Sensitivity Level	MSL	JEDEC J-STD-2			1	
Termination Finish			Au			
ESD Sensitivity	HBM	Human body model JESD22-A114			3	kV

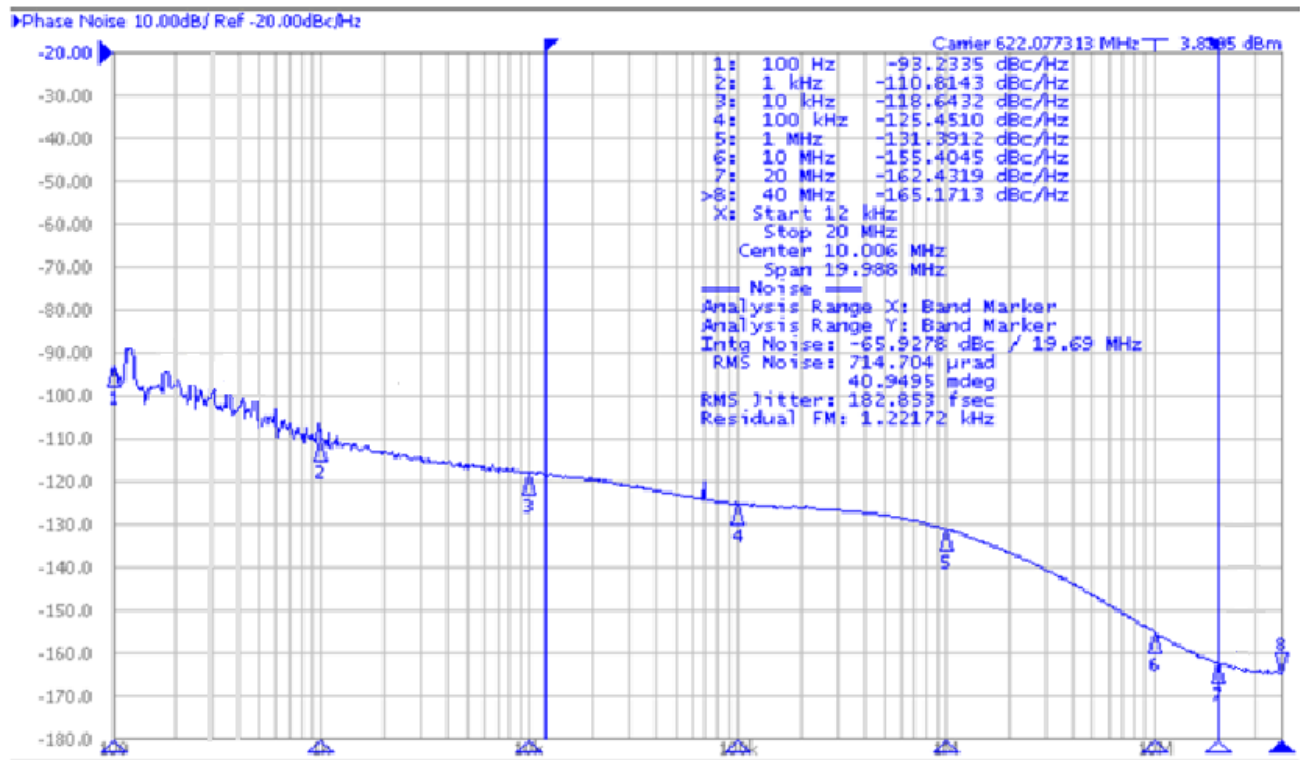
Notes

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

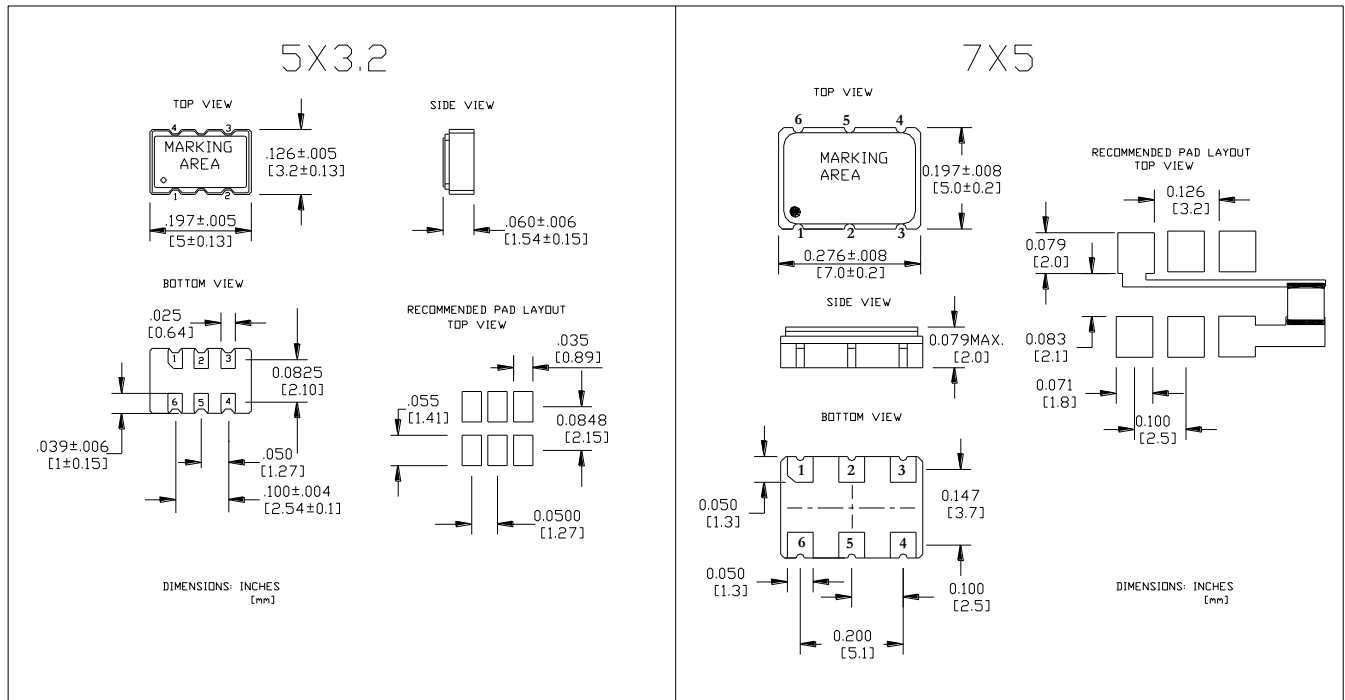
PHASE NOISE AND JITTER PERFORMANCE



➤ RMS Phase Jitter = 182 fs (12 kHz – 20 MHz bandwidth)

FREQUENCY (MHz)	FULL BANDWIDTH PHASE JITTER (ps)	PHASE JITTER 12 kHz to 20 MHz INTEGRATED BANDWIDTH (ps RMS)
155.520	1.5	0.195
312.500	1.2	0.166
622.080	0.8	0.182

MECHANICAL DIMENSIONS AND PIN FUNCTIONING



Notes (Applicable To Both Packages)

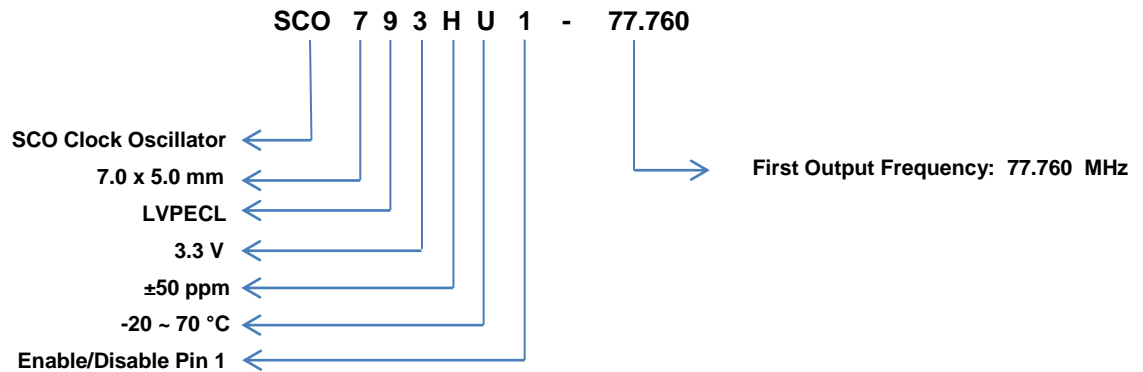
- ¹ Enable / Disable feature is available on either pin 1 or pin 2. See options on part numbering table.
- ² 0.01 μF external bypass capacitor is recommended as seen in solder pattern.

PIN	SYMBOL	FUNCTION
1	E/D or N/C	Enable/Disable or N/C
2	E/D or N/C	Enable/Disable or N/C
3	GND	Case and Electrical Ground
4	Output 1	Output 1
5	Output 2	Output 2
6	V_{cc}	Power Supply Voltage

PART NUMBERING

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

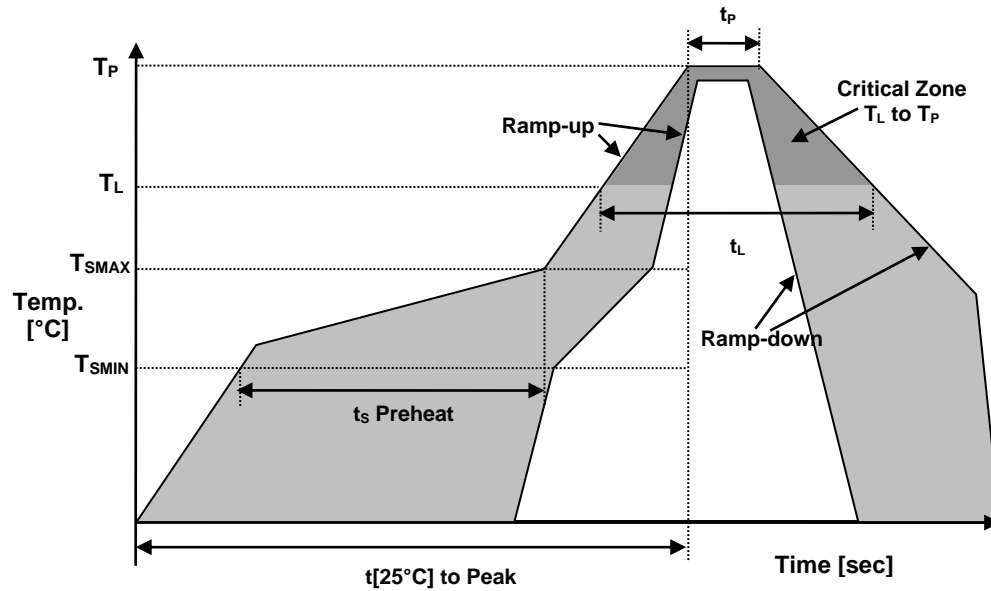
EXAMPLE:



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.