

SVO

ULTRA LOW JITTER VCXO

DESCRIPTION

The SVO family of Rubyquartz voltage controlled crystal oscillators is ideal for low-noise applications. It features typical RMS phase jitter of less than 0.25 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 SVO are available in LVPECL, LVCMOS, HCSL and LVDS outputs.

FEATURES

- Industry Leading Jitter (Typical <0.25 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
- Enable high or low polarity

APPLICATIONS

- SONET / SDH
- Fiber Channel
- Ethernet
- VCXO for PLL Application
- Test and Measurement
- Networking

SELECTOR GUIDE	HCSL		LVCMOS		LVDS		LVPECL	
	7.0 x 5.0	5.0 x 3.2	7.0 x 5.0	5.0 x 3.2	7.0 x 5.0	5.0 x 3.2	7.0 x 5.0	5.0 x 3.2
Package Size (mm)	7.0 x 5.0	5.0 x 3.2	7.0 x 5.0	5.0 x 3.2	7.0 x 5.0	5.0 x 3.2	7.0 x 5.0	5.0 x 3.2
Family Part Number	XVO - 72	XVO - 52	XVO - 74	XVO - 54	XVO - 78	XVO - 58	XVO - 79	XVO - 59
Frequency Range (MHz)	12 - 870		12 - 250		12 - 870		12 - 870	
Absolute Pull Range (ppm)	±20, ±25, ±50, ±100		±20, ±25, ±50, ±100		±20, ±25, ±50, ±100		±20, ±25, ±50, ±100	
Supply Voltage (V)	3.3		3.3		3.3		3.3	
Temperature Range (°C)	-20 ~ +70		-20 ~ +70		-20 ~ +70		-20 ~ +70	
	-40 ~ +85		-40 ~ +85		-40 ~ +85		-40 ~ +85	

OUTPUT CHARACTERISTICS

	PARAMETER	SYMBOL	CONDITION	VALUE			UNIT
				Min	Typ.	Max	
LVPECL	Frequency Range	f_o		12		870	MHz
	Output Levels	V_{OH}	Load 50Ω 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 $50\Omega / V_{cc} -2.0V$	0.65	0.77	0.95	V
	Supply Current	I_s	3.3V			150	mA
	Output Load	O_{CL}	Output termination $50\Omega / V_{cc} -2.0V$			50	Ω

	PARAMETER	SYMBOL	CONDITION	VALUE			UNIT
				Min	Typ.	Max	
LVDS	Frequency Range	f_o		12		870	MHz
	Differential Output Voltage	V_{OD}		0.247	0.350	0.454	V
	Offset Voltage	V_{OS}	VDC		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	3.3V			130	mA
	Output Load	O_{CL}	Differential 100Ω Load Connected Between Each Output			100	Ω

	PARAMETER	SYMBOL	CONDITION	VALUE			UNIT
				Min	Typ.	Max	
HCSL	Frequency Range	f_o		12		870	MHz
	Output Levels	V_{OH}	Output termination 50 Ω to GND	0.66	0.700	0.850	V
		V_{OL}		-150	0		V
	Rise/Fall Time	T_r/T_f			0.30	ns	
	Output Voltage Swing	V_{p-p}	Output termination 50 Ω to GND	0.65	0.70	0.95	V
	Ringback Voltage	V_{rb}	Output termination 50 Ω to GND	0.2			V
	Absolute Crossing Point	V_{ox}	Output termination 50 Ω to GND	0.25	0.45	0.55	V
	Supply Current	I_s	3.3V			150	mA
	Output Load	O_{CL}	Output termination 50 Ω to GND			50	Ω

	PARAMETER	SYMBOL	CONDITION	VALUE			UNIT
				Min	Typ.	Max	
LVCMOS	Frequency Range	f_o		12		250	MHz
	Output Levels	V_{OH}	Load 15 pf, $V_{cc} = 3.3V \pm 10\%$	2.97			V
		V_{OL}				0.6	V
	Rise/Fall Time	T_r/T_f			0.35	ns	
	Supply Current	I_s	3.3V			120	mA
	Output Load	O_{CL}	Load 15 pf, $V_{cc} = 3.3V \pm 10\%$		15	30	pf

ELECTRICAL SPECIFICATIONS

PARAMETER	SYMBOL	CONDITION	VALUE			UNIT
			Min.	Typ.	Max.	
Supply Voltage	V _{CC}		2.97	3.3	3.63	V
Duty Cycle	DC	Load depends on output type	45		55	%
RMS Phase Jitter	J	12 kHz – 20 MHz Bandwidth		< 0.25		ps
Frequency Stability ¹	$\Delta f/f_c$	-20°C to +70°C			± 20	ppm
		-40°C to +85°C			± 50	
Voltage Control Input Range	V _c		0		3.3	V
Modulation Bandwidth	Bw	-3db		25		KHz
VC Input Impedance	Z _{in}	V _{CC} = 3.3, 0 ≤ V _c ≤ V _{CC}		100		MΩ
Pull Range	Pr	0 ≤ V _c ≤ V _{CC}	80		250	ppm
VC Transfer Function	K _{VCO}		50		167	ppm/V
VC Linearity	L _{in}	Positive slope		±5		%
Voltage Control Center	V _c	Centered = ½ (V _{CC})		1.65		V
Absolute Pull Range ³	APR $\Delta f/f_c$	Min. guaranteed frequency pull over $\Delta f/f_c$ -20°C to +70°C -40°C to +85°C			± 20 ± 50 ±100	ppm
Start-Up Time	t _{start}	T _a =25°C			10	ms
Enable ⁴	E _n	Min (logic 1 or open)	0.7 (V _{CC})		-	V
		Max (logic 0)	-		0.3	
Disable ²	Dis	Max (logic 0)	-		0.3	V
		Min (logic 1 or open)	0.7 (V _{CC})		-	
OE Function OE Pin Input LVCMOS/ LVTTL	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

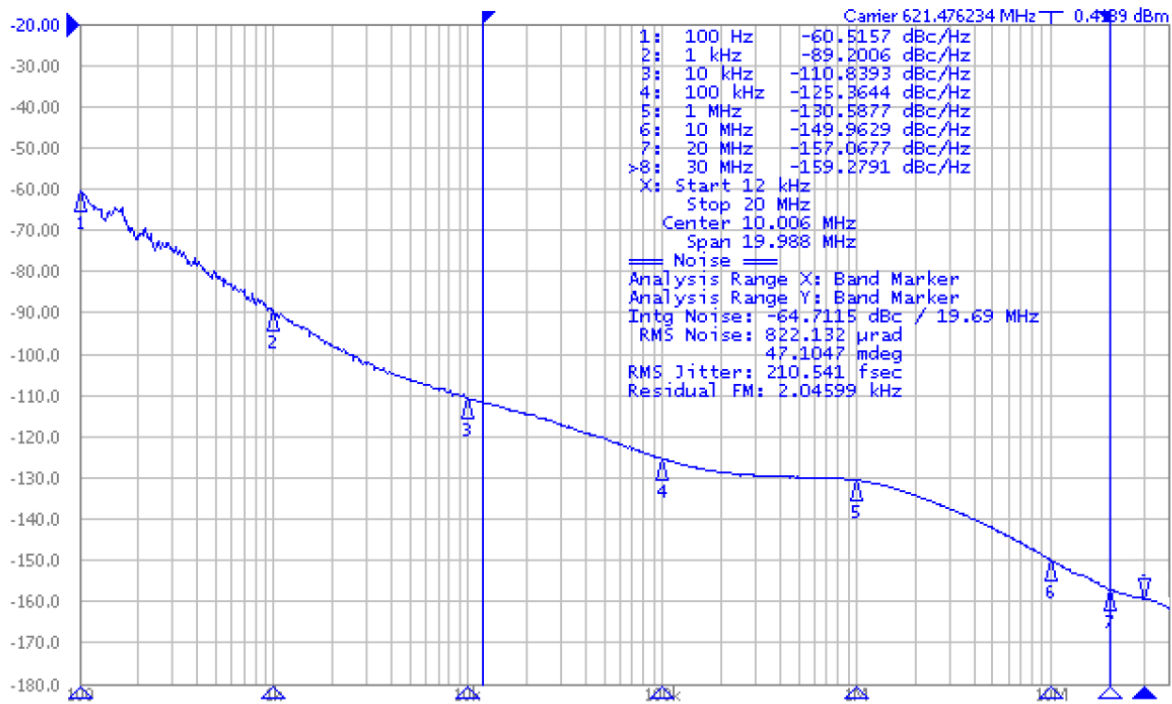
¹ Over the operating temperature range

² Output goes to high impedance

³ Inclusive of 25°C calibration, tolerance, operating temperature range, input voltage variation, load change, aging, shock and vibration

⁴ Enable low or high options are available

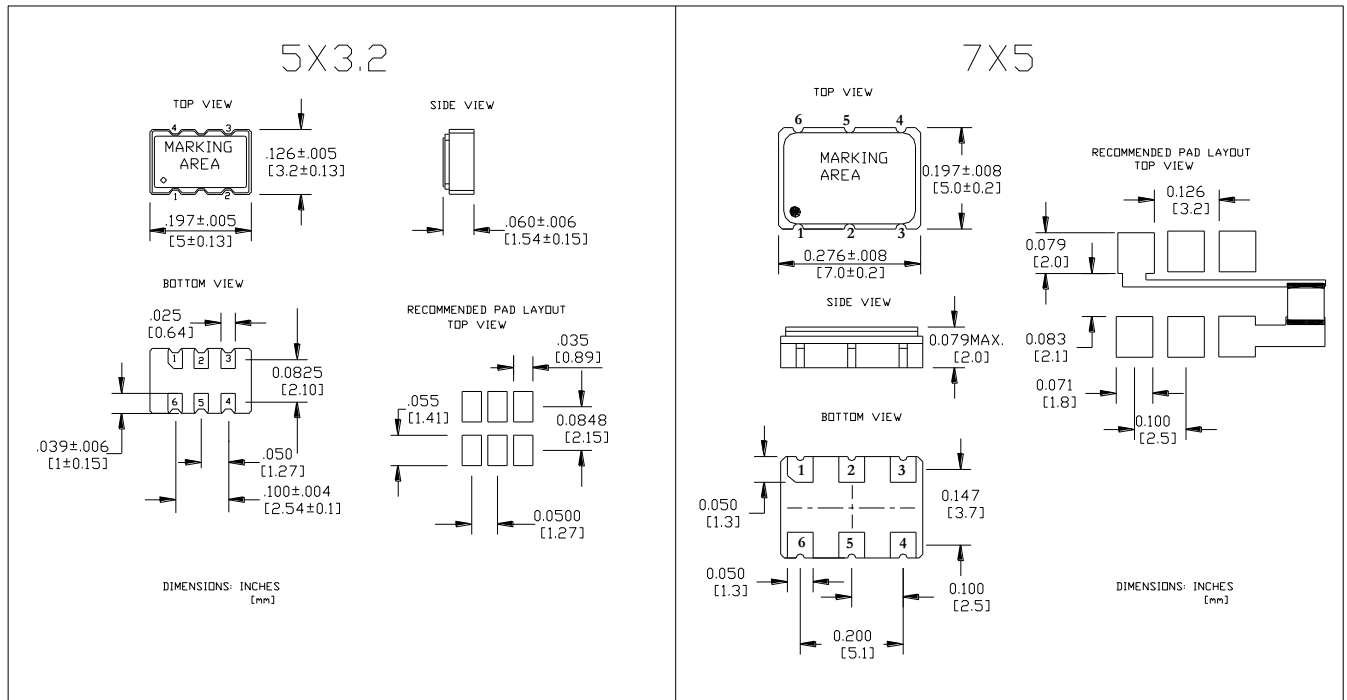
PHASE NOISE AND JITTER PERFORMANCE



➤ RMS Phase Jitter = 210 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	1.8	0.240
312.500	1.5	0.230
622.080	0.9	0.210

MECHANICAL DIMENSIONS AND PIN FUNCTIONING



Note (Applicable To Both Packages)

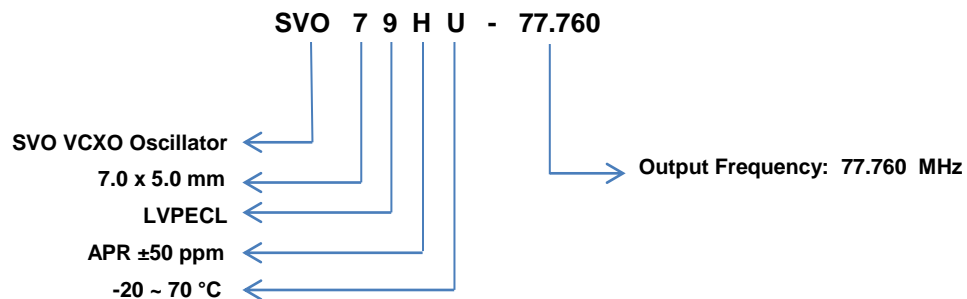
¹ 0.01 μF external bypass capacitor is recommended as seen in solder pattern.

PIN	SYMBOL	FUNCTION
1	V _c	Voltage Control
2	E/D or N/C	Enable/Disable or N/C
3	GND	Case and Electrical Ground
4	Q	Output
5	/Q	Complementary output
6	V _{cc}	Power Supply Voltage

PART NUMBERING

SERIES	PACKAGE (mm)	OUTPUT	ABSOLUTE PULL RANGE (ppm)	TEMP RANGE (°C)	-	OUTPUT FREQUENCY (MHz)	ENABLE/DISABLE POLARITY
SVO	7: 7.0 x 5.0 5: 5.0 x 3.2	2: HCSSL 4: LVCMOS 8: LVDS 9: LVPECL	K: ±20 I: ±25 H: ±50 J: ±100	U: -20~70 V: -40~85	-	F ₁	Blank: Enable High -EL: Enable Low

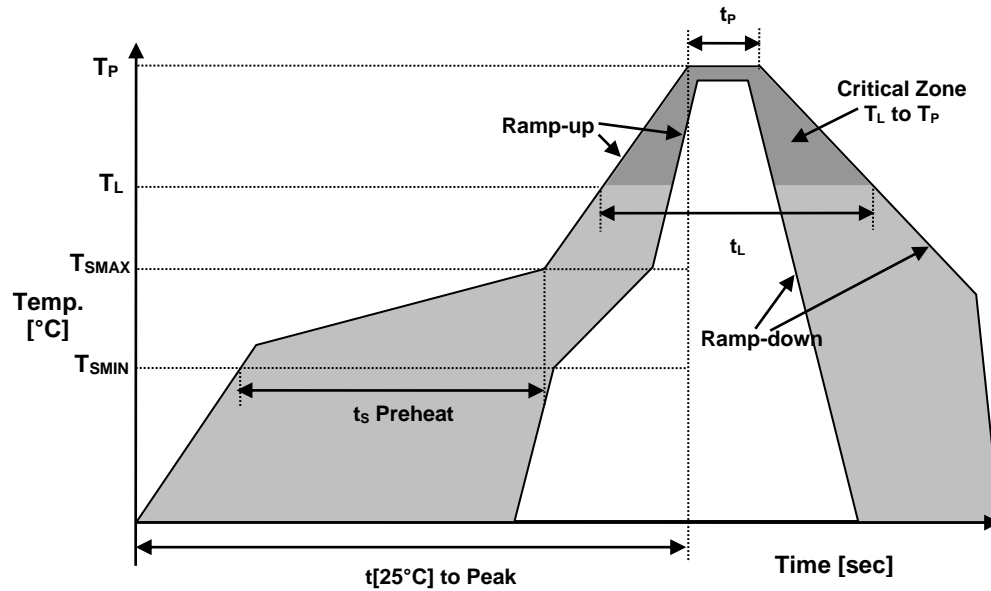
EXAMPLE:



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.

Last revision: 04/02/2012

- Added enable/disable polarity option