

SINGLE-ENDED OUTPUT SILICON OSCILLATOR

Features

- Quartz-free, MEMS-free, and PLL-free all-silicon oscillator
 Footprint compatible with industry-
- Any output frequencies from 0.9 to 200 MHz
- Short lead times
- Excellent temperature stability (±20 ppm)
- Highly reliable startup and operation
- High immunity to shock and vibration
- Low jitter: <1.5 ps rms
- 0 to 85 °C operation includes 10-year aging in hot environments
- Footprint compatible with industrystandard 3.2 x 5.0 mm XOs
- CMOS and SSTL versions available
- Driver stopped, tri-state, or powerdown operation
- RoHS compliant
- 1.8, 2.5, or 3.3 V options
- Low power
- More than 10x better fit rate than competing crystal solutions



Specifications

Parameters	ers Condition		Тур	Max	Units
Frequency Range		0.9	_	200	MHz
	Temperature stability, 0 to +70 °C	_	±10	_	ppm
Frequency Stability	Temperature stability, 0 to +85 °C	_	±20	_	ppm
Frequency Stability	Total stability, 0 to +70 °C operation ¹	_	_	±150	ppm
	Total stability, 0 to +85 °C operation ²	_	_	±250	ppm
Operating Temperature	Commercial	0	_	70	°C
Operating Temperature	Extended commercial	0		85	°C
Storage Temperature		-55	_	+125	°C
	1.8 V option	1.71	_	1.98	V
Supply Voltage	2.5 V option	2.25		2.75	V
	3.3 V option	2.97	<u> </u>	3.63	V

Notes:

- 1. Inclusive of 25 °C initial frequency accuracy, operating temperature range, supply voltage change, output load change, first-year aging at 25 °C, shock, vibration, and one solder reflow.
- 2. Inclusive of 25 °C initial frequency accuracy, operating temperature range, supply voltage change, output load change, ten-year aging at 85 °C, shock, vibration, and one solder reflow.
- **3.** See "AN409: Output Termination Options for the Si500S and Si500D Silicon Oscillators" for further details regarding output clock termination recommendations.
- **4.** $V_{TT} = .5 \times V_{DD}$.
- **5.** $V_{TT} = .45 \times V_{DD}$.

Si500S

Parameters	Condition	Min	Тур	Max	Units	
	1.8 V option, 40 pF, 40 MHz, CMOS	_	13.9	16	mA	
	1.8 V option, 10 pF, 200 MHz, CMOS	_	16.7	19	mA	
	2.5 V option, 40 pF, 40 MHz, CMOS	_	15.8	18	mA	
	2.5 V option, 10 pF, 200 MHz, CMOS	_	19.3	22	mA	
	3.3 V option, 40 pF, 40 MHz, CMOS	_	17.7	20	mA	
Complex Company	3.3 V option, 10 pF, 200 MHz, CMOS	_	21.5	24	mA	
Supply Current	SSTL-3.3, 200 MHz	_	18.1	20.2	mA	
	SSTL-2.5, 200 MHz	_	18.0	19.7	mA	
	SSTL-1.8, 200 MHz	_	16.8	18.7	mA	
	Output Stopped, CMOS	_	11.8	13.1	mA	
	Tri-State	_	9.7	10.7	mA	
	Powerdown	_	1.0	1.9	mA	
Output Symmetry	0.5 x V _{DD}	46 – 13 ns/T _{CLK}	_	54 + 13 ns/T _{CLK}	%	
Rise and Fall Times ³	CMOS, C _L = 15 pF measured from 20 to 80% of V _{DD}	_	1.4	2.0	ns	
	SSTL	_	_	0.6	ns	
CMOS Output Voltage	V _{OH} , sourcing 9 mA	V _{DD} – 0.5	_	_	V	
CiviO3 Output Voltage	V _{OL} , sinking 9 mA	_	_	0.5	V	
SSTL-1.8 Output Voltage ⁴	V _{OH}	V _{TT} + 0.375	_	_	V	
331E-1.0 Output Voltage	V_{OL}	_	_	V _{TT} – 0.375	V	
SSTL-2.5 Output Voltage ⁴	V _{OH}	V _{TT} + 0.48	_	_	V	
OOTE-2.5 Output Voltage	V_{OL}	_	_	V _{TT} – 0.48	٧	
SSTL-3.3 Output Voltage ⁵	V _{OH}	V _{TT} + 0.48	_	_	V	
COTE 5.5 Calput Vollage	V_{OL}	_	_	V _{TT} – 0.48	٧	
Powerup Time	From time V _{DD} crosses min spec supply	_	_	2	ms	
OE Deassertion to Clk Stop		_	_	250 + 3 x T _{CLK}	ns	
Return from Output Driver Stopped Mode		_	_	250 + 3 x T _{CLK}	ns	
Return from Tri-State Time		_	_	12 + 3 x T _{CLK}	μs	
Return from Powerdown Time		_	_	2	ms	
Period Jitter (1-sigma)	SSTL ³	_	1	2	ps RMS	
Integrated Phase Jitter	1 MHz – 0.4 x F_{OUT} , SSTL or CMOS and $C_L \le 7$ pF, $F_{OUT} > 2.5$ MHz	_	0.7	1.5	ps RMS	

Notes:

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- 2. Inclusive of 25 °C initial frequency accuracy, operating temperature range, supply voltage change, output load change, ten-year aging at 85 °C, shock, vibration, and one solder reflow.
- 3. See "AN409: Output Termination Options for the Si500S and Si500D Silicon Oscillators" for further details regarding output clock termination recommendations.
- **4.** $V_{TT} = .5 \times V_{DD}$. **5.** $V_{TT} = .45 \times V_{DD}$.



2 Rev. 1.1

Package Specifications

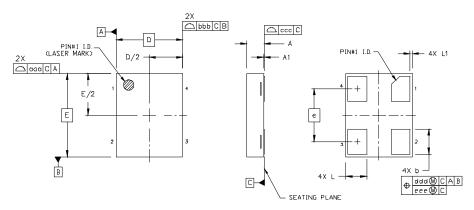


Table 1. Package Diagram Dimensions (mm)

Dimension	Min Nom		Max	
Α	0.80	0.90		
A1	0.00 0.03 0.0			
b	1.15 1.20 1.2			
D	3.20 BSC			
е	2.54 BSC			
E	4.00 BSC			
L	0.95 1.00 1.05			

Dimension	Min	Nom	Max
L1	0.00	0.05	0.10
aaa			0.10
bbb			0.10
CCC			0.08
ddd			0.10
eee			0.05

Table 2. Pad Connections

1	OE			
2	GND			
3	Output			
4	VDD			

Table 3. Tri-State/Powerdown/Driver Stopped Function on OE (3rd Option Code)

	Α	В	С	D	E	F
Open	Active	Active	Active	Active	Active	Active
1 Level	Active	Tri- State	Active	Power- down	Active	Driver Stopped
0 Level	Tri- State	Active	Power- down	Active	Driver Stopped	Active

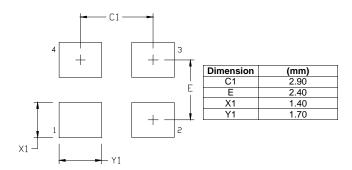
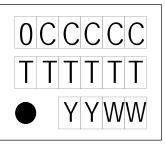


Figure 1. Recommended Land Pattern



0 = Si500

CCCCC = mark code

TTTTTT = assembly manufacturing code

YY = year

WW = work week

Figure 2. Top Mark



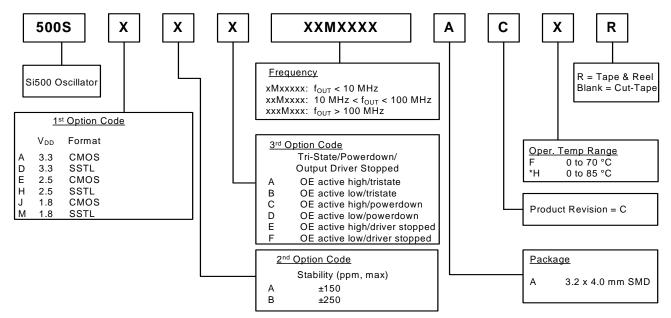
Rev. 1.1 3

Environmental Compliance

Parameter	Conditions/Test Method		
Mechanical Shock	MIL-STD-883, Method 2002.4		
Mechanical Vibration	MIL-STD-883, Method 2007.3 A		
Resistance to Soldering Heat	MIL-STD-202, 260 C° for 8 seconds		
Solderability	MIL-STD-883, Method 2003.8		
Damp Heat	IEC 68-2-3		
Moisture Sensitivity Level	J-STD-020, MSL 3		

Ordering Information

The Si500S supports a variety of options including frequency, output format, supply voltage, and tristate/powerdown/output driver stopped mode. Specific device configurations are programmed into the Si500S at time of shipment. Configurations are specified using the figure below. Silicon Labs provides a web-based part number utility that can be used to simplify part number configuration. www.silabs.com/SiliconXOPartnumber to access this tool. The Si500S silicon oscillator is supplied in a ROHScompliant, 4-pad, 3.2 x 4.0 mm package. Tape and reel packaging is available as an ordering option.



*Note: Only <u>+</u>250 ppm is supported.



4 Rev. 1.1

DOCUMENT CHANGE LIST

Revision 0.3 to Revision 0.4

- Revision B to Revision C updated in Ordering Information
- 0 to 85 C° Operating Temperature Range option added
- Multiple CMOS output format codes removed

Revision 0.4 to Revision 1.0

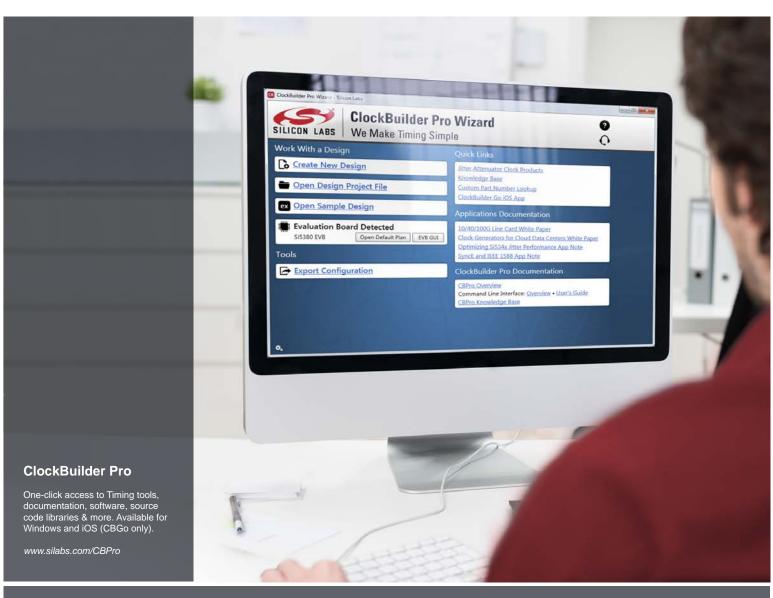
- Clarified SSTL specifications.
- Revised CMOS supply current max values .

Revision 1.0 to Revision 1.1

- Updated Ordering information for ±250 ppm from 0 to +85 °C.
- Updated jitter from 1.5 ps to 1.5 ps rms.
- Updated operating temperature to include extended commercial at 0 to +85 °C.



Rev. 1.1 5









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Disclaime

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