Si500D

DIFFERENTIAL OUTPUT SILICON OSCILLATOR

Features

- Quartz-free, MEMS-free, and PLL-free all-silicon oscillator
- Any-rate 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
- 0 to 85 °C operation includes 10-year aging in hot environments
- Footprint compatible with industry-standard 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	Condition	Min	Typ	Max	Units
Frequency Range		0.9	—	200	MHz
Frequency Stability	Temperature stability, 0 to +70 °C	—	±10	—	ppm
	Temperature stability, 0 to +85 °C	—	±20	—	ppm
	Total stability, 0 to +70 °C operation[1]	—	—	±150	ppm
	Total stability, 0 to +85 °C operation[2]	—	—	±250	ppm
Operating Temperature		0	—	+85	C°
Storage Temperature		–55	—	+125	C°
Supply Voltage	1.8 V option	1.71	—	1.98	V
	2.5 V option	2.25	—	2.75	V
	3.3 V option	2.97	—	3.63	V
Supply Current	LVPECL	—	34.0	36.0	mA
	Low Power LVPECL	—	19.3	22.2	mA
	LVDS	—	14.9	16.5	mA
	HCSL	—	25.3	29.3	mA
	Differential CMOS(3.3 V option,10 pF,200 MHz)	—	29.0	31.8	mA
	Differential SSTL-3	—	24.5	27.7	mA
	Differential SSTL-2	—	24.3	26.7	mA
	Differential SSTL-18	—	22.2	25	mA
	Tri-State	—	9.7	10.7	mA
	Powerdown	—	1.0	1.9	mA
Output Symmetry	V_{DIFF} = 0	46 – 13 ns/T_{CLK}	—	54 + 13 ns/T_{CLK}	%

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. Min column entries are minima of VOH. Max column entries are maxima of VOL.

Parameters	Condition	Min	Typ	Max	Units
Rise and Fall Times (20/80%)[3]	LVPECL/LVDS	—	—	460	ps
	HCSL/Differential SSTL	—	—	800	ps
	Differential CMOS, 15 pF, ≥80 MHz	—	1.1	1.6	ns
LVPECL Output Option (DC coupling, 50 Ω to V_{DD} – 2.0 V)[3]	Mid-level	V_{DD} – 1.5	—	V_{DD} – 1.34	V
	Diff swing	.720	—	.880	V_{PK}
Low Power LVPECL Output Option (AC coupling, 100 Ω Differential Load)[3]	Mid-level	—	N/A	—	V
	Diff swing	.68	—	.95	V_{PK}
LVDS Output Option (2.5/3.3 V) (R_{TERM} = 100 Ω diff)[3]	Mid-level	1.15	—	1.26	V
	Diff swing	0.25	—	0.45	V_{PK}
LVDS Output Option (1.8 V) (R_{TERM} = 100 Ω diff)[3]	Mid-level	0.85	—	0.96	V
	Diff swing	0.25	—	0.45	V_{PK}
HCSL Output Option[3]	Mid-level	0.35	—	0.425	V
	Diff swing	0.65	—	0.82	V_{PK}
	DC termination per pad	45	—	55	Ω
CMOS Output Voltage[3]	V_{OH}, sourcing 9 mA	V_{DD} – 0.6	—	—	V
	V_{OL}, sinking 9 mA	—	—	0.6	V
SSTL Output Voltage[4]	SSTL-18	.5 x V_{DD} + 0.375	—	.5 x V_{DD} – 0.375	V
	SSTL-2	.5 x V_{DD} + 0.48	—	.5 x V_{DD} – 0.48	V
	SSTL-3	.45 x V_{DD} + 0.48	—	.45 V_{DD} – 0.48	V
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)	Non-CMOS	—	1	2	ps RMS
	CMOS, C_L = 7 pF	—	1	3	ps RMS
Integrated Phase Jitter	1.0 MHz – min(20 MHz, 0.4 x F_{OUT}),non-CMOS	—	0.6	1	ps RMS
	1.0 MHz – min(20 MHz, 0.4 x F_{OUT}),CMOS format	—	0.7	1.5	ps RMS

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. Min column entries are minima of VOH. Max column entries are maxima of VOL.

Package Specifications

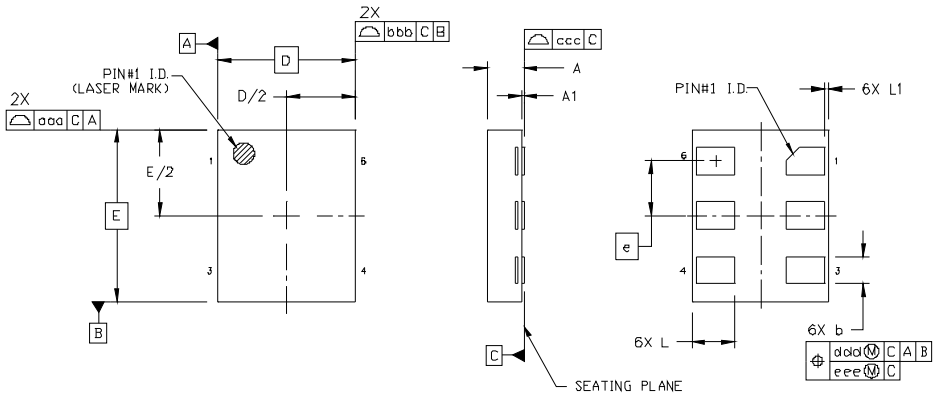


Table 1. Package Diagram Dimensions (mm)

Dimension	Min	Nom	Max
A	0.80	0.85	0.90
A1	0.00	0.03	0.05
b	0.59	0.64	0.69
D	3.20 BSC.		
e	1.27 BSC.		
E	4.00 BSC.		
L	0.95	1.00	1.05

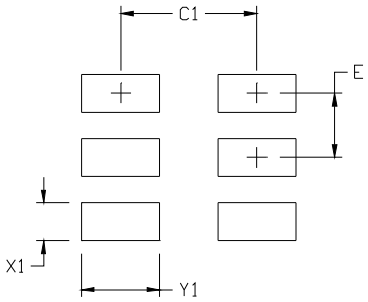
Dimension	Min	Nom	Max
L1	0.00	0.05	0.10
aaa	—	—	0.10
bbb	—	—	0.10
ccc	—	—	0.08
ddd	—	—	0.10
eee	—	—	0.05

Table 2. Pad Connections

1	OE
2	NC—Make no external connection to this pin
3	GND
4	Output
5	Complementary Output
6	VDD

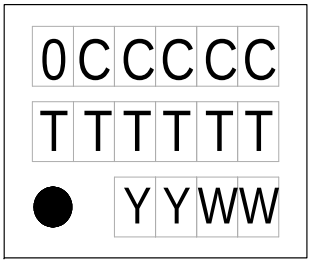
Table 3. Tri-State/Powerdown/Driver Stopped Function on OE (3rd Option Code)

	A	B	C	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



Dimension	(mm)
C1	2.70
E	1.27
X1	0.75
Y1	1.55

Figure 1. Recommended Land Pattern



0 = Si500
CCCCC = mark code
TTTTTT = assembly manufacturing code
YY = year
WW = work week

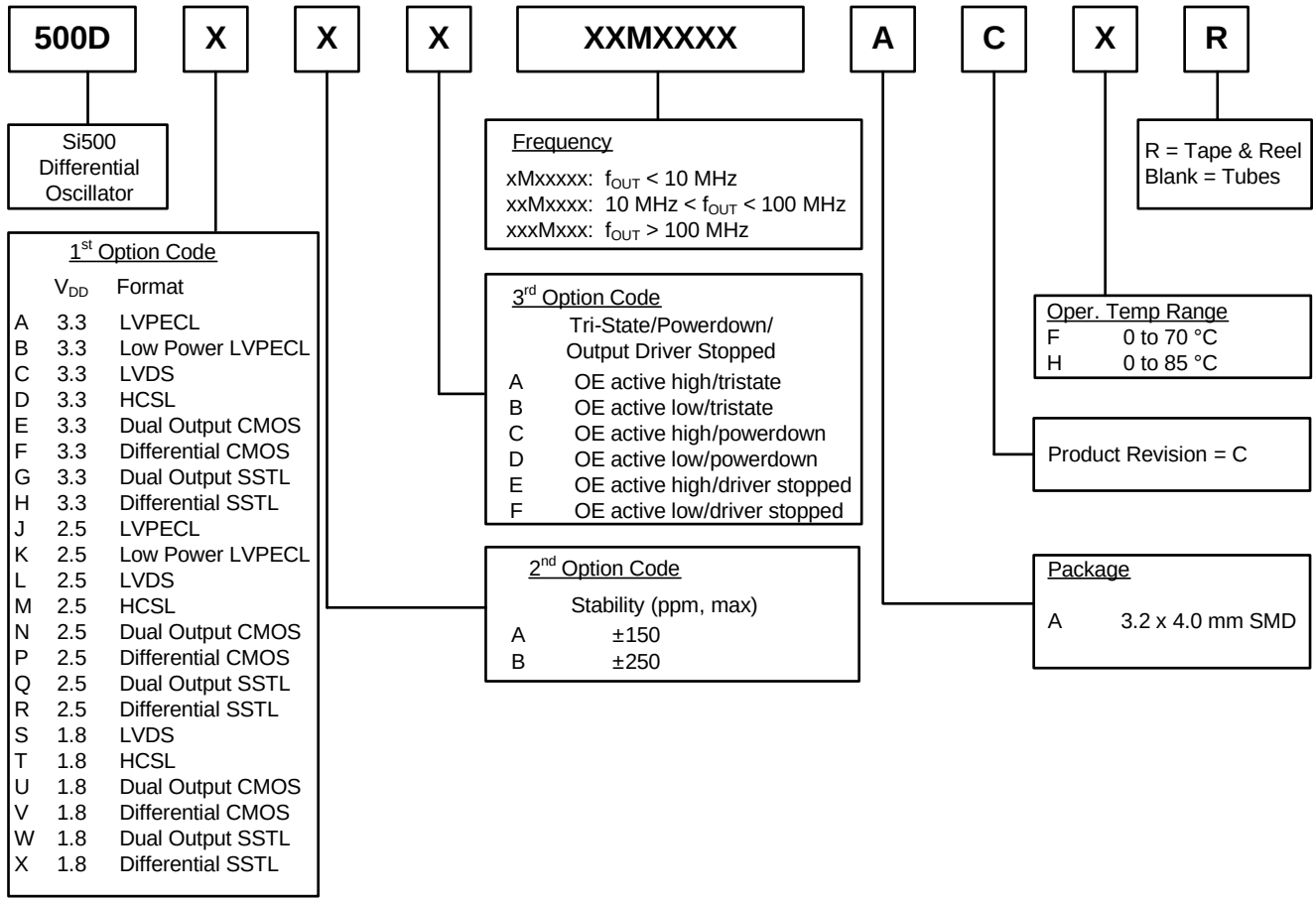
Figure 2. Top Mark

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 Si500D supports a variety of options including frequency, output format, supply voltage, and tri-state/powerdown. Specific device configurations are programmed into the Si500D 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. Refer to www.silabs.com/SiliconXOPartnumber to access this tool. The Si500D XO series is supplied in a ROHS-compliant, Pb-free, 6-pad, 3.2 x 4.0 mm package. Tape and reel packaging is available as an ordering option.



DOCUMENT CHANGE LIST

Revision 0.2 to Revision 0.3

- Revision B to Revision C updated in Ordering Information
- 0 to 85 C° Operating Temperature Range option added

CONTACT INFORMATION

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