SILICON LABS

Si500D

DIFFERENTIAL OUTPUT SILICON OSCILLATOR

Features

- Quartz-free, MEMS-free, and PLL-free all-silicon oscillator
- 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 industry-standard 3.2 x 5.0 mm XOs
- CMOS, SSTL, LVPECL, LVDS, and HCSL 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	Commercial	0	—	70	°C
	Extended commercial	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

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. $V_{TT} = .45 \times V_{DD}$.

Parameters	Condition	Min	Typ	Max	Units
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 on each output, 200 MHz)	—	33	36	mA
	Differential CMOS(3.3 V option, 1 pFon each output, 40 MHz)	—	16	—	mA
	Differential SSTL-3.3	—	24.5	27.7	mA
	Differential SSTL-2.5	—	24.3	26.7	mA
	Differential SSTL-1.8	—	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}	%
Rise and Fall Times (20/80%)[3]	LVPECL/LVDS	—	—	460	ps
	HCSL/Differential SSTL	—	—	800	ps
	Differential CMOS, 15 pF, $\geq$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-1.8 Output Voltage[4]	V_{OH}	V_{TT} + 0.375	—	—	V
	V_{OL}	—	—	V_{TT} – 0.375	
SSTL-2.5 Output Voltage[4]	V_{OH}	V_{TT} + 0.48	—	—	V
	V_{OL}	—	—	V_{TT} – 0.48	
SSTL-3.3 Output Voltage[5]	V_{OH}	V_{TT} + 0.48	—	—	V
	V_{OL}	—	—	V_{TT} – 0.48	
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

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 x V_{DD}.
5. V_{TT} = .45 x V_{DD}.

Parameters	Condition	Min	Typ	Max	Units
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.
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Package Specifications

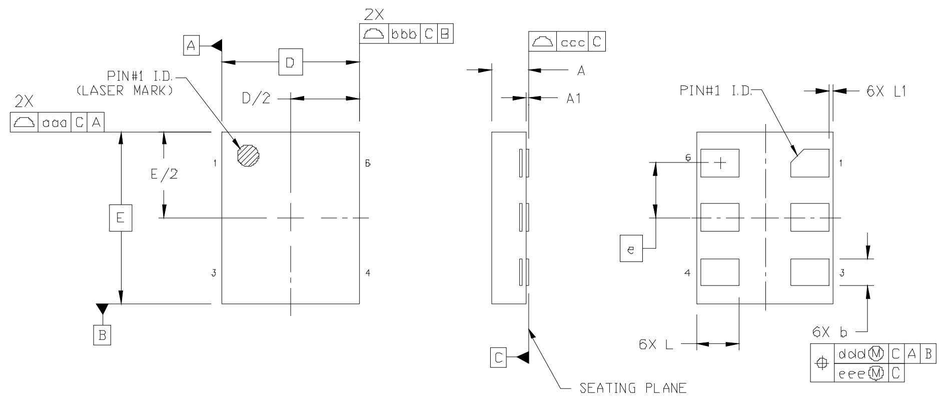


Table 1. Package Diagram Dimensions (mm)

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

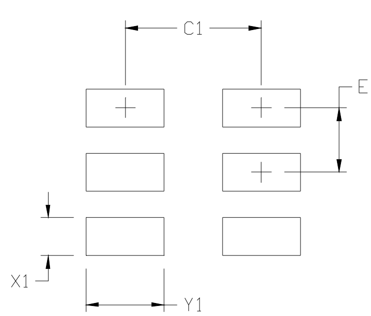
Dimension	Min	Nom	Max
L1	0.00	0.05	0.10
aaa	—	—	0.10
bbb	—	—	0.10
ccc	—	—	0.08
ddd	—	—	0.10
eee	—	—	0.05

Table 2. Pad Connections

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

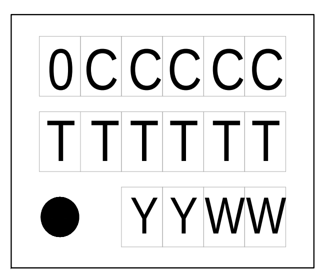
Table 3. Tri-State/Powerdown/Driver Stopped Function on OE (3rd Option Code)

	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

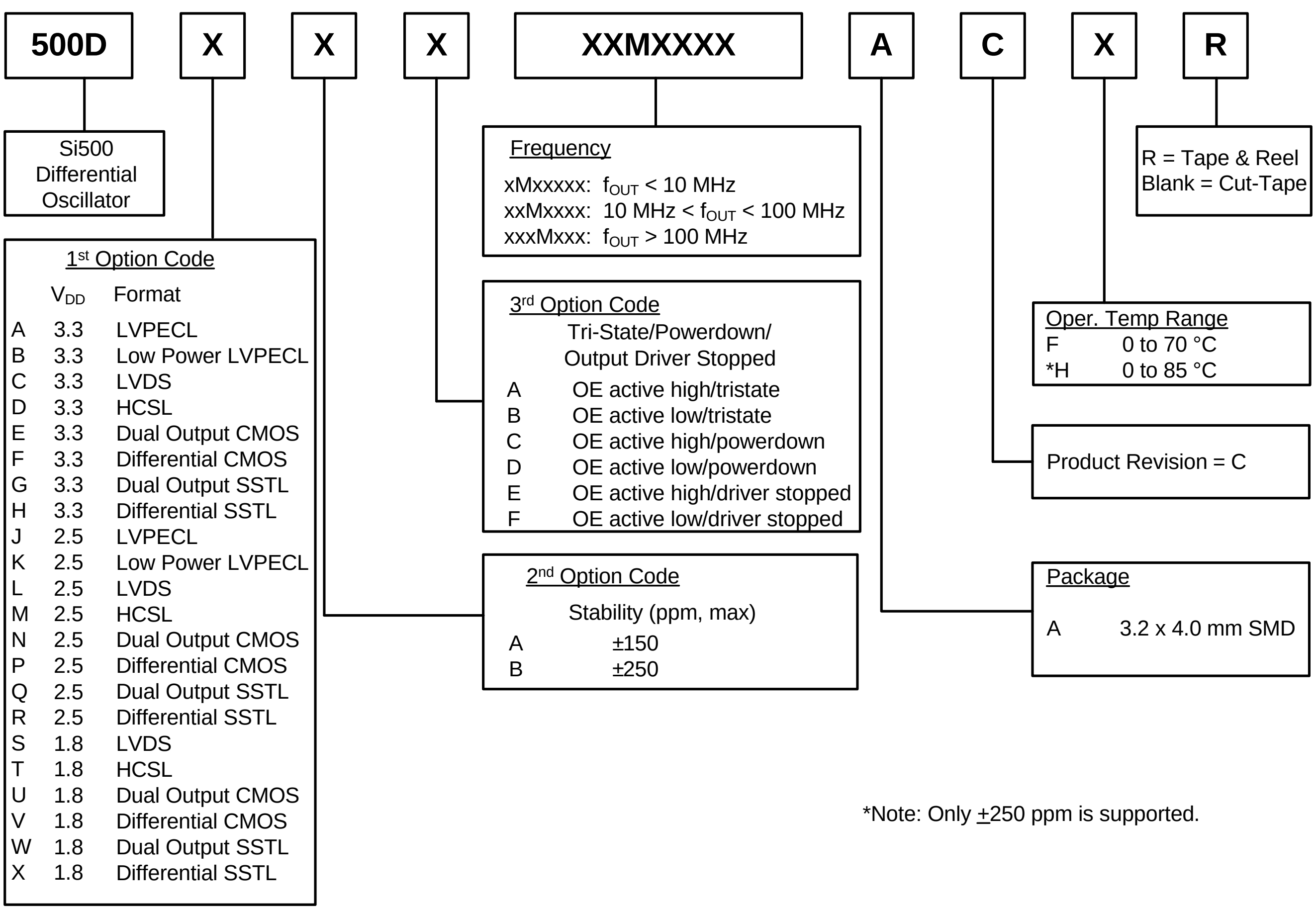
Figure 2. Top Mark

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

Revision 0.3 to Revision 1.0

- Clarified SSTL specifications.
- Revised Differential CMOS supply current values.
- Clarified Differential CMOS supply current loading conditions.

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.
- Updated features to include LVPECL, LVDS, and HCSL.

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ООО «ЛайфЭлектроникс» "LifeElectronics" LLC

ИНН 7805602321 КПП 780501001 Р/С 40702810122510004610 ФАКБ "АБСОЛЮТ БАНК" (ЗАО) в г.Санкт-Петербурге К/С 30101810900000000703 БИК 044030703

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