Si510/Si511

100 kHz to 250 MHz Crystal Oscillator (XO) Series

Description

The Si510/511 XO utilizes Silicon Labs' advanced DSPLL technology to provide any frequency from 100 kHz to 250 MHz. Unlike a traditional XO, where a different crystal is required for each output frequency, the Si510/511 uses one fixed-frequency crystal and Silicon Labs' proprietary DSPLL synthesizer to generate any frequency across this range. This IC-based approach allows the crystal resonator to provide enhanced reliability, improved mechanical robustness, and excellent stability. In addition, this solution provides superior supply noise rejection, simplifying low-jitter clock generation in noisy environments. Crystal ESR and DLD are individually production-tested to guarantee performance and enhance reliability. The Si510/511 is factory-configurable for a wide variety of user specifications, including frequency, supply voltage, output format, output enable polarity, and stability. Specific configurations are factory-programmed at time of shipment, eliminating long lead times and non-recurring engineering charges associated with custom frequency oscillators.

Features

- Supports any frequency from 100 kHz to 250 MHz
- Low jitter: 0.8 ps RMS (12 kHz–20 MHz)
- Frequency stability: ±20/±30/±50 ppm including 10-year aging
- 2x tighter stability than SAW oscillators
- Programmable output enable pin location and polarity settings
- 1.8 V, 2.5 V, 3.3 V V_{DD} supply operation
- Differential (LVPECL, LVDS, HCSL) or CMOS output options
- Standard frequencies in stock and available for rapid delivery
- Custom frequencies available with < 2 week lead times

Applications

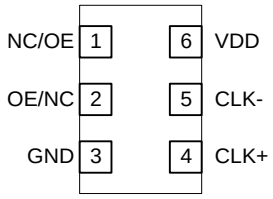
- SONET/SDH/OTN
- Gigabit Ethernet
- Fibre Channel/SAS/SATA
- 3G-SDI/HD-SDI/SDI
- FPGA/ASIC/SoC clocking

Product Selector Guide

XO Series	Description
Si510	Single frequency oscillator, OE pin 2
Si511	Single frequency oscillator, OE pin 1

A complete Si510-511 data sheet can be found here:
http://www.silabs.com/Support%20Documents/TechnicalDocs/si510-11.pdf

Pin-out



(top view)

Pin Description

Pin	Description
1	Si510: NC = No Connect Si511: OE = Output Enable
2	Si510: OE = Output Enable Si511: OE = No Connect
3	GND = Ground
4	CLK+ = Clock output
5	CLK- = Complementary Clock output
6	VDD = Power Supply

Selected Electrical Specifications

V_{DD} = 2.5 or 3.3 V ±10%, T_A = -40 to 85 ºC

Parameter	Symbol	Test Condition/Comment	Min	Typ	Max	Unit
Frequency Range	F_{CLK}	LVPECL/LVDS	0.1	—	250	MHz
Supply Voltage	V_{DD}	3.3 V option	2.97	3.3	3.63	V
		2.5 V option	2.25	2.5	2.75	V
Supply Current	I_{DD}	LVPECL (output enabled)	—	39	43	mA
		LVDS (output enabled)	—	19	23	mA
		Tristate (output disabled)	—	—	18	mA
Total Stability[1]	F_{STAB}	Temperature stability: ±25 ppm	-50	—	50	ppm
Rise/Fall Time	T_R/T_F	LVPECL option	—	—	565	ps
		LVDS option	—	—	800	ps
Phase Jitter (RMS)	ϕ_J	12 kHz to 20 MHz integration BW (brickwall)[2]	—	0.8	1.0	ps
Duty Cycle	DC	All formats	48	50	52	%
Output Enable (OE)	V_{IH}		0.8 x V_{DD}	—	—	V
	V_{IL}		—	—	0.2 x V_{DD}	V
LVPECL Output Option	V_{OC}	mid-level (50 Ω to VDD – 2 V, single-ended)	—	V_{DD} – 1.4	—	V
	V_O	swing (50 Ω to VDD – 2 V, single-ended)	0.55	0.8	0.9	V_{PP}
LVDS Output Option	V_{OC}	mid-level (100 Ω line-line, VDD = 3.3/2.5 V)	1.13	1.23	1.33	V
	V_O	swing (100 differential termination, single-ended)	0.25	0.35	0.45	V_{PP}

Notes:

1. Total stability includes initial accuracy, operating temperature, supply voltage change, load change, shock and vibration (not under operation), and 10 years aging at 40 ºC.
2. All Crystal Oscillator (XO) devices are screened for jitter at production test. Phase jitter specification applies to output frequencies: 100, 106.25, 125, 148.35165, 148.5, 155.52, 156.25, 212.5 MHz.

Copyright© 2013 by Silicon Labs

Absolute Maximum Ratings[1]

Parameter	Symbol	Rating	Unit
Maximum Operating Temp.	T_{AMAX}	85	ºC
Storage Temperature	T_S	-55 to 125	ºC
Supply Voltage	V_{DD}	-0.5 to 3.8	ºC
Input Voltage	V_{IN}	0.5 to V_{DD} +0.3	V
ESD HBM (JESD22-A114)	HBM	2	kV
Solder Temperature[2]	T_{PEAK}	260	ºC
Solder Time at T_{PEAK}[2]	T_P	20-40	sec

1. Stresses beyond those listed in this table may cause permanent damage to the device. Functional operation specification compliance is not implied at these conditions. Exposure to maximum rating conditions for extended periods may affect device reliability.
2. The device is compliant with JEDEC J-STD-020.

Environmental Compliance and Package Information

Parameter	Test Condition
Mechanical Shock	MIL-STD-883, Method 2002
Mechanical Vibration	MIL-STD-883, Method 2007
Solderability	MIL-STD-883, Method 2003
Gross and Fine Leak	MIL-STD-883, Method 1014
Resistance to Solder Heat	MIL-STD-883, Method 2036
Moisture Sensitivity Level (MSL)	1
Contact Pads	Gold over Nickel

Thermal Conditions

Parameter	Symbol	Test Condition	Value	Unit
Thermal Impedance	Θ_{JA}	Still air	110	ºC/W

Standard Frequency Orderable Part Numbers

Si510 5x7mm	74.1758 MHz	74.25 MHz	100 MHz	106.25 MHz	125 MHz	148.3517 MHz
3.3V LVPECL	510ABA000149AAG	510ABA74M2500AAG	510ABA100M000AAG	510ABA106M250AAG	510ABA125M000AAG	510ABA000110AAG
3.3V LVDS	510BBA000149AAG	510BBA74M2500AAG	510BBA100M000AAG	510BBA106M250AAG	510BBA125M000AAG	510BBA000110AAG
2.5V LVDS	510FBA000149AAG	510FBA74M2500AAG	510FBA100M000AAG	510FBA106M250AAG	510FBA125M000AAG	510FBA000110AAG
Si510 3.2x5mm	**74.1758 MHz**	**74.25 MHz**	**100 MHz**	**106.25 MHz**	**125 MHz**	**148.3517 MHz**
3.3V LVPECL	510ABA000149BAG	510ABA74M2500BAG	510ABA100M000BAG	510ABA106M250BAG	510ABA125M000BAG	510ABA000110BAG
3.3V LVDS	510BBA000149BAG	510BBA74M2500BAG	510BBA100M000BAG	510BBA106M250BAG	510BBA125M000BAG	510BBA000110BAG
2.5V LVDS	510FBA000149BAG	510FBA74M2500BAG	510FBA100M000BAG	510FBA155M520BAG	510FBA125M000BAG	510FBA000110BAG
Si511 5x7mm	**74.1758 MHz**	**74.25 MHz**	**100 MHz**	**106.25 MHz**	**125 MHz**	**148.3517 MHz**
3.3V LVPECL	511ABA000149AAG	511ABA74M2500AAG	511ABA100M000AAG	511ABA106M250AAG	511ABA125M000AAG	511ABA000110AAG
3.3V LVDS	511BBA000149AAG	511BBA74M2500AAG	511BBA100M000AAG	511BBA106M250AAG	511BBA125M000AAG	511BBA000110AAG
2.5V LVDS	511FBA000149AAG	511FBA74M2500AAG	511FBA100M000AAG	511FBA106M250AAG	511FBA125M000AAG	511FBA000110AAG
Si511 3.2x5mm	**74.1758 MHz**	**74.25 MHz**	**100 MHz**	**106.25 MHz**	**125 MHz**	**148.3517 MHz**
3.3V LVPECL	511ABA000149BAG	511ABA74M2500BAG	511ABA100M000BAG	511ABA106M250BAG	511ABA125M000BAG	511ABA000110BAG
3.3V LVDS	511BBA000149BAG	511BBA74M2500BAG	511BBA100M000BAG	511BBA106M250BAG	511BBA125M000BAG	511BBA000110BAG
2.5V LVDS	511FBA000149BAG	511FBA74M2500BAG	511FBA100M000BAG	511FBA106M250BAG	511FBA125M000BAG	511FBA000110BAG

Si510 5x7mm	148.5 MHz	155.52 MHz	156.25 MHz	200 MHz	212.5 MHz
3.3V LVPECL	510ABA148M500AAG	510ABA155M520AAG	510ABA156M250AAG	510ABA200M000AAG	510ABA212M500AAG
3.3V LVDS	510BBA148M500AAG	510BBA155M520AAG	510BBA156M250AAG	510BBA200M000AAG	510BBA212M500AAG
2.5V LVDS	510FBA148M500AAG	510FBA155M520AAG	510FBA156M250AAG	510FBA200M000AAG	510FBA212M500AAG
Si510 3.2x5mm	**148.5 MHz**	**155.52 MHz**	**156.25 MHz**	**200 MHz**	**212.5 MHz**
3.3V LVPECL	510ABA148M500BAG	510ABA155M520BAG	510ABA156M250BAG	510ABA200M000BAG	510ABA212M500BAG
3.3V LVDS	510BBA148M500BAG	510BBA155M520BAG	510BBA156M250BAG	510BBA200M000BAG	510BBA212M500BAG
2.5V LVDS	510FBA148M500BAG	510FBA155M520BAG	510FBA156M250BAG	510FBA200M000BAG	510FBA212M500BAG
Si511 5x7mm	**148.5 MHz**	**155.52 MHz**	**156.25 MHz**	**200 MHz**	**212.5 MHz**
3.3V LVPECL	511ABA148M500AAG	511ABA155M520AAG	511ABA156M250AAG	511ABA200M000AAG	511ABA212M500AAG
3.3V LVDS	511BBA148M500AAG	511BBA155M520AAG	511BBA156M250AAG	511BBA200M000AAG	511BBA212M500AAG
2.5V LVDS	511FBA148M500AAG	511FBA155M520AAG	511FBA156M250AAG	511FBA200M000AAG	511FBA212M500AAG
Si511 3.2x5mm	**148.5 MHz**	**155.52 MHz**	**156.25 MHz**	**200 MHz**	**212.5 MHz**
3.3V LVPECL	511ABA148M500BAG	511ABA155M520BAG	511ABA156M250BAG	511ABA200M000BAG	511ABA212M500BAG
3.3V LVDS	511BBA148M500BAG	511BBA155M520BAG	511BBA156M250BAG	511BBA200M000BAG	511BBA212M500BAG
2.5V LVDS	511FBA148M500BAG	511FBA155M520BAG	511FBA156M250BAG	511FBA200M000BAG	511FBA212M500BAG

For customized frequencies: http://www.silabs.com/custom-timing

CONTACT INFORMATION

Silicon Laboratories Inc.
400 West Cesar Chavez
Austin, TX 78701
Tel: 1+(512) 416-8500
Fax: 1+(512) 416-9669
Toll Free: 1+(877) 444-3032
Please visit the Silicon Labs Technical Support web page:
https://www.silabs.com/support/pages/contacttechnicalsupport.aspx
and register to submit a technical support request.

Patent Notice
Silicon Labs invests in research and development to help our customers differentiate in the market with innovative low-power, small size, analog-intensive mixed-signal solutions. Silicon Labs' extensive patent portfolio is a testament to our unique approach and world-class engineering team.

The information in this document is believed to be accurate in all respects at the time of publication but is subject to change without notice. Silicon Laboratories assumes no responsibility for errors and omissions, and disclaims responsibility for any consequences resulting from the use of information included herein. Additionally, Silicon Laboratories assumes no responsibility for the functioning of undescribed features or parameters. Silicon Laboratories reserves the right to make changes without further notice. Silicon Laboratories makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Silicon Laboratories assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. Silicon Laboratories products are not designed, intended, or authorized for use in applications intended to support or sustain life, or for any other application in which the failure of the Silicon Laboratories product could create a situation where personal injury or death may occur. Should Buyer purchase or use Silicon Laboratories products for any such unintended or unauthorized application, Buyer shall indemnify and hold Silicon Laboratories harmless against all claims and damages.

Silicon Laboratories and Silicon Labs are trademarks of Silicon Laboratories Inc.
Other products or brandnames mentioned herein are trademarks or registered trademarks of their respective holders.