

CLOCK AND OSCILLATOR PRODUCT SELECTOR GUIDE

SPRING 2013



SPRING 2013

Clocks and oscillators for communications, computing and consumer applications
www.silabs.com/timing



SILICON LABS

Engineering for a mixed-signal world.

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QUICK TIP

A red box in an application diagram represents a Silicon Labs solution

Silicon Labs
Solution

Clock Generation

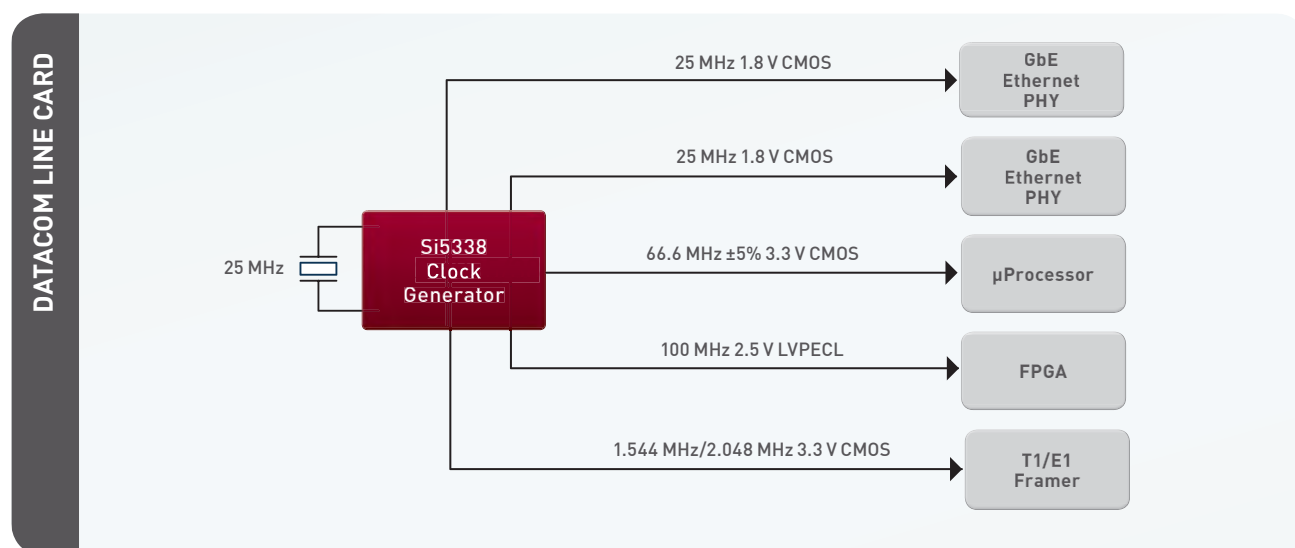
WEB-CONFIGURABLE FACTORY-CUSTOMIZED CLOCK GENERATORS AVAILABLE AT: www.silabs.com/custom-timing

Differential + LVCMOS Clocks

Silicon Labs' differential + LVCMOS clock generators provide any rate, any output frequency synthesis. Any combination of output frequencies can be generated exactly with 0 ppm error. Independent signal format and VDDO options provide integrated level translation, supporting LVPECL/LVDS/HCSL/LVCMOS clock generation up to 710 MHz with sub 1 ps rms phase jitter. Low jitter, low power PCI Express clocks with a wide variety of output options are also available.

Si5338 FEATURES

- Generates any frequency on any output, from 160 kHz to 350 MHz and select frequencies to 710 MHz
- Exact clock synthesis (0 ppm error)
- Crystal or clock input
- 4 differential outputs or 8 single-ended outputs
- Any format, on any output: LVPECL, LVDS, HCSL, LVCMOS, HSTL, SSTL and CML
- Independent VDDO per output eliminates external level translators (1.5, 1.8, 2.5, 3.3 V)
- Low phase jitter: 1 ps rms
- I²C programmable or pin-controlled
- Excellent PSRR, no discrete components
- Spread spectrum clock generation
- Spread modulation frequency: 16 to 128 kHz
- Spread percentage: 0.1 to 5%
- User-definable control pins: Powerdown, Output Enable, Frequency Select, Spread Select
- Programmable tr/tf options



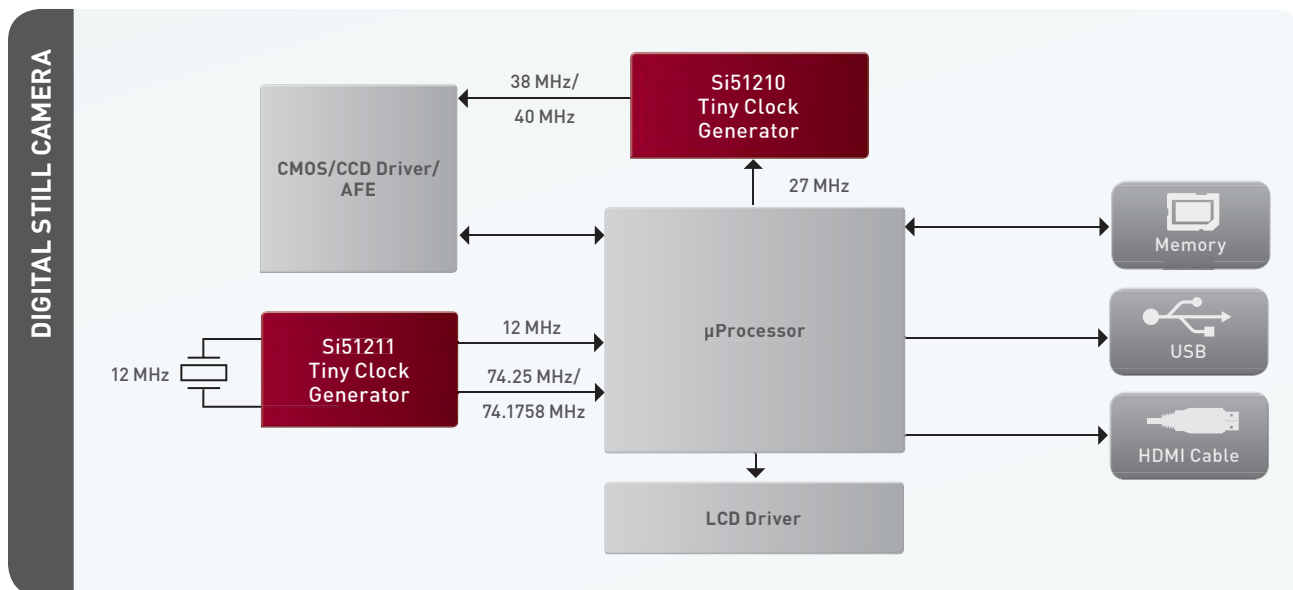
PART NUMBER	CONTROL	CLOCK INPUT/OUTPUTS	INPUT FREQUENCY (MHZ)	OUTPUT FREQUENCY (MHZ)	PHASE JITTER (RMS)	VDD	VDDO	OUTPUT	PACKAGE
Si5334	Pin	1/4	5 - 710 (Clock), 8 - 30 (Xtal)	0.16 - 710 MHz 0.16 - 350 MHz 0.16 - 200 MHz	1.0 ps	1.8, 2.5, 3.3 V	1.8, 2.5, 3.3 V	LVCMOS, LVDS, LVPECL, HCSL, SSTL, HSTL	QFN24
Si5335	Pin	1/4	10 - 350 (Clock), 25 or 27 (Xtal)	1 - 350 MHz	1.0 ps	1.8, 2.5, 3.3 V	1.8, 2.5, 3.3 V	LVCMOS, LVDS, LVPECL, HCSL, SSTL, HSTL, CML	QFN24
Si5338	I ² C	1/4	5 - 710 (Clock), 8 - 30 (Xtal)	0.16 - 710 MHz 0.16 - 350 MHz 0.16 - 200 MHz	1.0 ps	1.8, 2.5, 3.3 V	1.8, 2.5, 3.3 V	LVCMOS, LVDS, LVPECL, HCSL, SSTL, HSTL, CML	QFN24

LVC MOS Clocks (1-4 Outputs)

Silicon Labs' highly flexible, factory and I²C programmable tiny clock LVC MOS generators can be customized to generate multiple frequencies with significantly lower jitter, lower power and smaller size than competing solutions. Customization options are available to minimize EMI, including customizable spread percentage, modulation rate, output impedance and rise time/fall time.

Si512xx TINY CLOCK FEATURES

- Up to three customizable output frequencies from 3 to 200 MHz
- Accepts 8 to 48 MHz crystal or 3 to 166 MHz external reference clock
- Low cycle-to-cycle jitter: <150 ps
- Low power: 2.3 mA (typ) at 48 MHz output, 25 MHz xtal in and VDD = 3.3 V
- Center spread modulation from 0.25 to 1.0%, with 0.125% resolution
- Programmable spread modulation rate from 30 - 62 kHz
- Customizable drive strengths (four levels for each output)
- Customizable control pins (PD#/OE/SSON#/FS)
- Supply range: 1.8 V for Si51214; 2.5 to 3.3 V for other devices
- Ultra-compact packages
 - 6-pin TDFN (1.2 mm x 1.4 mm x 0.75 mm)
 - 8-pin TDFN (1.6 mm x 1.4 mm x 0.75 mm)
- Factory programmable OTP
- Two week sample lead time



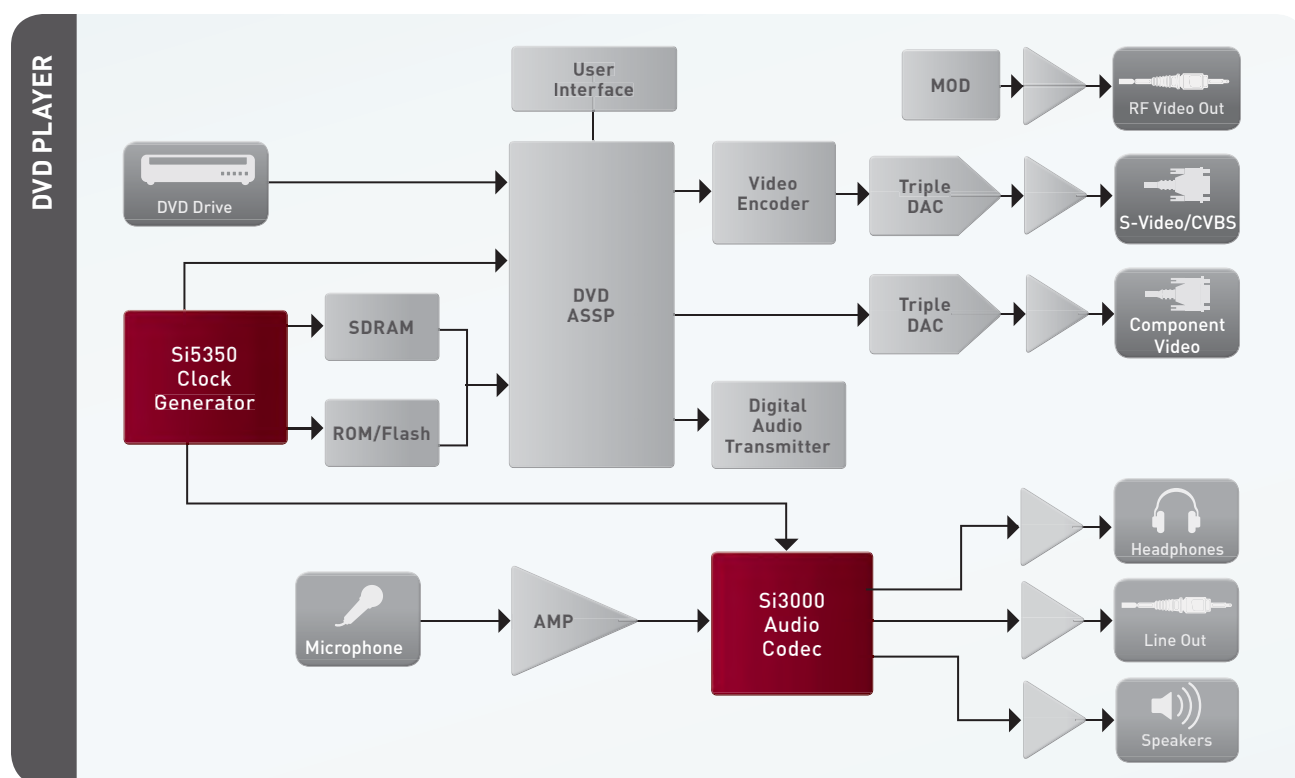
PART NUMBER	CONTROL	CLOCK INPUT/ OUTPUTS	INPUT FREQUENCY (MHZ)	OUTPUT FREQUENCY (MHZ)	PERIOD JITTER (PP)	VDD	VDDO	OUTPUT	PACKAGE
Si51210	Pin	1/2	3 - 166 (Clock), 8 - 48 (Xtal)	3 - 200 MHz	—	2.5 to 3.3 V	—	LVC MOS	TDFN6
Si51211	Pin	1/3	3 - 166 (Clock), 8 - 48 (Xtal)	3 - 200 MHz	—	2.5 to 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	TDFN8
Si51214	Pin	1/2	3 - 166 (Clock), 8 - 48 (Xtal)	3 - 133 MHz	—	1.8 V	—	LVC MOS	TDFN6
Si51219	Pin	1/3	3 - 166 (Clock), 8 - 48 (Xtal)	3 - 200 MHz	—	2.5 to 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	TSSOP8
SL15300	Pin	1/4	3 - 166 (Clock), 8 - 48 (Xtal)	3 - 200 MHz	—	1.8, 2.5, 3.3 V	—	LVC MOS	TSSOP8
Si5350C	Pin	1/3	10 - 100 (Clock), 25/27 (Xtal),	8 kHz - 160 MHz	100 ps	2.5, 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	MSOP10
Si5351A	I ² C	1/3	25/27 (Xtal)	8 kHz - 160 MHz	100 ps	2.5, 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	MSOP10

LVC MOS Clocks (5+ Outputs)

Silicon Labs' highly flexible factory and I²C programmable LVC MOS clock generators can be customized to generate multiple independent non-integer-related frequencies with equivalent frequency synthesis capability of 8 PLLs, with exact frequency synthesis (0 ppm error) significantly lower jitter, lower power and smaller size than competing solutions. Factory customization options are available to minimize EMI, including configurable edge rates, output impedance, output skew and spread spectrum.

Si5350 FEATURES

- Generates any frequency on any output, 8 kHz to 160 MHz
- Exact clock synthesis: 0 ppm error
- Similar frequency flexibility as 8 independent PLLs
- Crystal or clock input
- <100 ps pk-pk period jitter
- Glitchless switching between output frequencies
- I²C programmable or pin-controlled
- Excellent PSRR: no discrete components
- Two week sample lead time for any custom clock
- Integrated load capacitors
- Spread spectrum clock generation
-0.5 to -2.5% down, ± 0.1 to $\pm 1.5\%$ center
- User-definable control pins Powerdown, Output Enable, Spread Enable, Frequency Select control pins



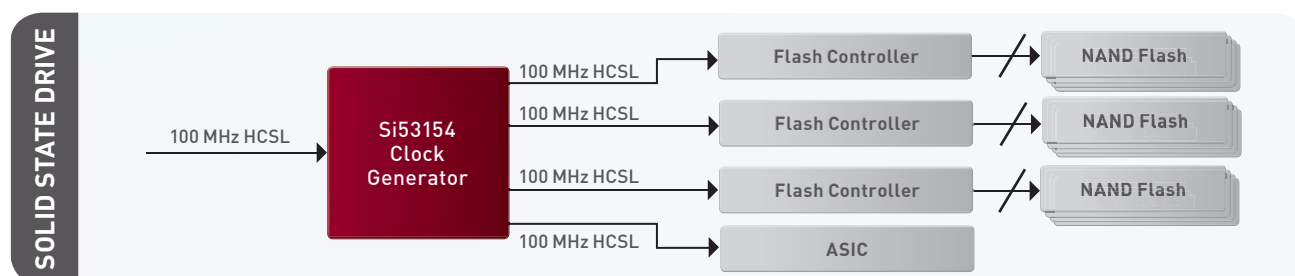
PART NUMBER	CONTROL	CLOCK INPUT/OUTPUTS	INPUT FREQUENCY (MHz)	OUTPUT FREQUENCY (MHz)	PERIOD JITTER (PP)	VDD	VDDO	OUTPUT	PACKAGE
Si5350A/51A	Pin/I ² C	1/8	25/27 (Xtal)	8 kHz - 160 MHz	100 ps	2.5, 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	QFN20/QSOP24
Si5350B/51B	Pin/I ² C	1/8	25/27 (Xtal)	8 kHz - 160 MHz	100 ps	2.5, 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	QFN20/QSOP24
Si5350C/51C	Pin/I ² C	1/8	10 - 100 (Clock), 25/27 (Xtal)	8 kHz - 160 MHz	100 ps	2.5, 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	QFN20/QSOP24
Si5355	Pin	1/8	5 - 200 (Clock) 25/27 (Xtal)	1 - 200 MHz	50 ps	1.8, 2.5, 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	QFN24
SL38160	Pin/I ² C	1/8	3 - 166 (Clock), 8 to 48 (Xtal)	3 - 200 MHz	—	1.8, 2.5, 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	TSSOP16

PCI Express (PCIe) Gen 1/2/3 Clocks and Buffers

Silicon Labs has the lowest jitter clocks and buffers for PCIe Gen 1/2/3. To optimize performance, the devices support programmable drive strength, rise/fall times and output impedance. Basic HCSL PCIe and high-performance differential clocks and buffers are available. Support for down and center spread spectrum clock generation is also provided.

PCIe CLOCK AND BUFFER FEATURES

- Full portfolio of PCI Express (PCIe) Gen 1/2/3 clocks and buffers
- Range of available external ref clock or crystal input frequencies
- Fully integrated termination resistors on PCIe outputs
- Low power consumption
- Programmable spread spectrum
- Available hardware strapping pin for spread enable
- I²C/SMBus programmable
- Externally convertible outputs to LVDS or LVPECL
- Support industrial temperature grade



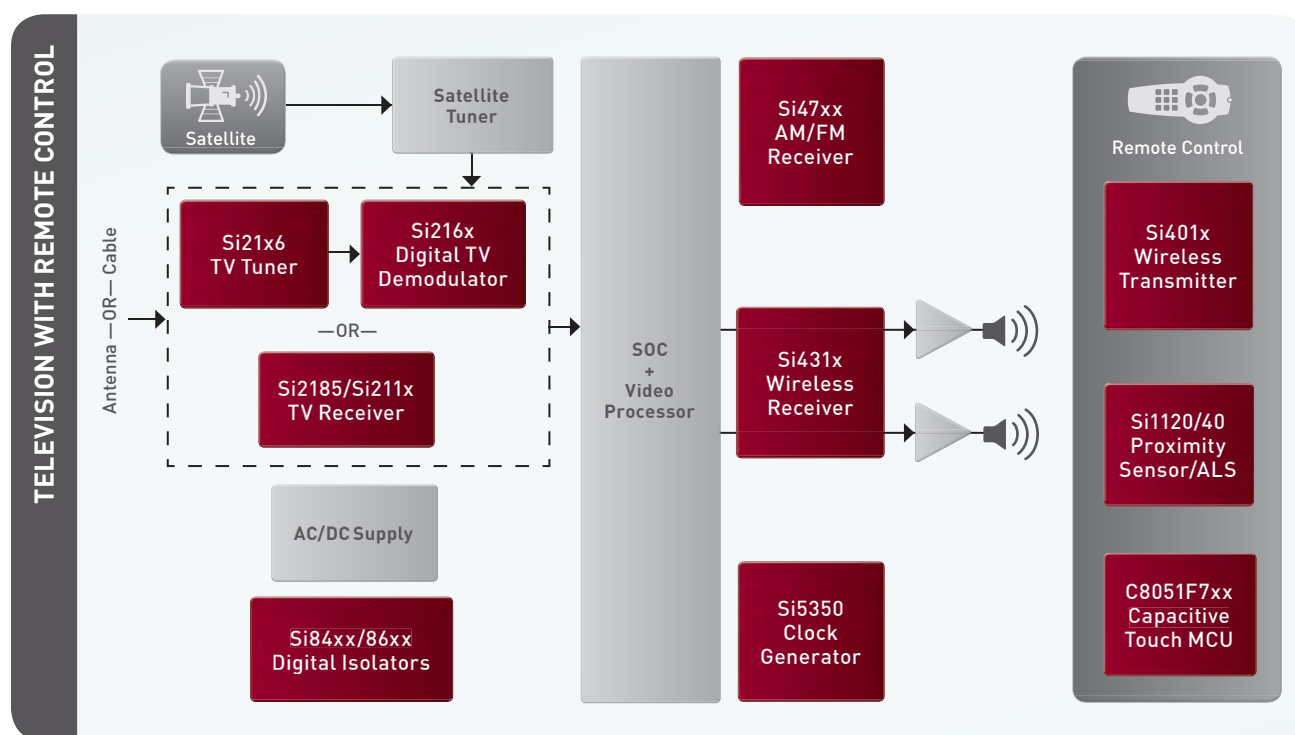
PART NUMBER	CONTROL	CLOCK INPUT/OUTPUTS	INPUT FREQUENCY [MHz]	OUTPUT FREQUENCY [MHz]	PHASE JITTER (RMS)	VDD	VDDO	OUTPUT	PACKAGE
Si52111	—	1/1	25 MHz	100 MHz	1.0 ps	3.3 V	—	HCSL	TSSOP8/TDFN10
Si52112	—	1/2	25 MHz	100 MHz	1.0 ps	3.3 V	—	HCSL	TSSOP8/TDFN10
Si52142	Pin/I ² C	1/3	25 MHz	100 MHz, 25 MHz	1.0 ps	3.3 V	3.3 V	HCSL, LVCMOS	QFN24
Si52143	Pin/I ² C	1/5	25 MHz	100 MHz, 25 MHz	1.0 ps	3.3 V	3.3 V	HCSL, LVCMOS	QFN24
Si52144	Pin/I ² C	1/4	25 MHz	100 MHz	1.0 ps	3.3 V	3.3 V	HCSL	QFN24
Si52146	Pin/I ² C	1/6	25 MHz	100 MHz	1.0 ps	3.3 V	3.3 V	HCSL	QFN32
Si52147	Pin/I ² C	1/9	25 MHz	100 MHz	1.0 ps	3.3 V	3.3 V	HCSL	QFN48
SL28PC1e14	Pin/I ² C	2/4	25 MHz/100 MHz	100 MHz	1.0 ps	3.3 V	3.3 V	HCSL	QFN32
SL28SRC01	Pin	1/1	14.318 MHz	100 MHz	1.0 ps	3.3 V	3.3 V	HCSL	TSSOP16
SL28SRC02	Pin	1/2	14.318 MHz	100 MHz	1.0 ps	3.3 V	3.3 V	HCSL	TSSOP20
SL28SRC04	Pin	1/4	14.318 MHz	100 MHz	1.0 ps	3.3 V	3.3 V	HCSL	TSSOP24
Si53102 (Buffer)	—	1/2	100 MHz	100 MHz	0.5 ps	2.5, 3.3 V	—	HCSL	TDFN8
Si53152 (Buffer)	Pin/I ² C	1/2	100 MHz	100 MHz	1.0 ps	3.3 V	3.3 V	HCSL	QFN24
Si53154 (Buffer)	Pin/I ² C	1/4	100 MHz	100 MHz	1.0 ps	3.3 V	3.3 V	HCSL	QFN24
Si53156 (Buffer)	Pin/I ² C	1/6	100 MHz	100 MHz	1.0 ps	3.3 V	3.3 V	HCSL	QFN32
Si53159 (Buffer)	Pin/I ² C	1/9	100 MHz	100 MHz	1.0 ps	3.3 V	3.3 V	HCSL	QFN48
CY28400-2 (Buffer)	Pin/I ² C	1/4	100 MHz	100 MHz	—	3.3 V	3.3 V	HCSL	SSOP28/TSSOP28
CY28800 (Buffer)	Pin/I ² C	1/8	100 MHz	100 MHz	—	3.3 V	3.3 V	HCSL	SSOP48
Si5334	Pin	1/4	5 - 710 (Clock), 8 - 30 (Xtal)	0.16 - 710 MHz	1.0 ps	1.8, 2.5, 3.3 V	1.8, 2.5, 3.3 V	LVCMOS, LVDS, LVPECL, HCSL, SSTL, HSTL	QFN24
Si5335	Pin	1/4	10 - 350 (Clock), 25/27 (Xtal)	1 - 350 MHz	1.0 ps	1.8, 2.5, 3.3 V	1.8, 2.5, 3.3 V	LVCMOS, LVDS, LVPECL, HCSL, SSTL, HSTL, CML	QFN24
Si5338	I ² C	1/4	5 - 710 (Clock) 8 - 30 (Xtal)	0.16 - 710 MHz	1.0 ps	1.8, 2.5, 3.3 V	1.8, 2.5, 3.3 V	LVPECL, LVDS, LVCMOS, HCSL, SSTL, HSTL	QFN24

Integrated Clock + VCXO Solutions

These integrated clock + VCXO devices feature an integrated voltage controlled oscillator (VCXO), while eliminating the need for custom, pullable crystals. Free-running and VCXO clocks can be generated by one device, making them ideal for cost-sensitive consumer applications.

Si5350B/51B FEATURES

- Generates any frequency on any output, 8 kHz to 160 MHz
- Exact clock synthesis: 0 ppm error
- Similar frequency flexibility as 8 independent PLLs
- Accepts crystal and analog control voltage input (VCXO)
- <100 ps pk-pk period jitter for any configuration
- Glitchless switching between output frequencies
- Integrated VCXO uses standard non-pullable crystal
- I²C programmable or pin-controlled
- Excellent PSRR: no discrete components
- Two week sample lead time for any custom clock
- Integrated load capacitors
- Spread spectrum clock generation
-0.5 to -2.5% down, ± 0.1 to $\pm 1.5\%$ center
- User-definable control pins Powerdown, Output Enable, Spread Enable or Frequency Select control pins



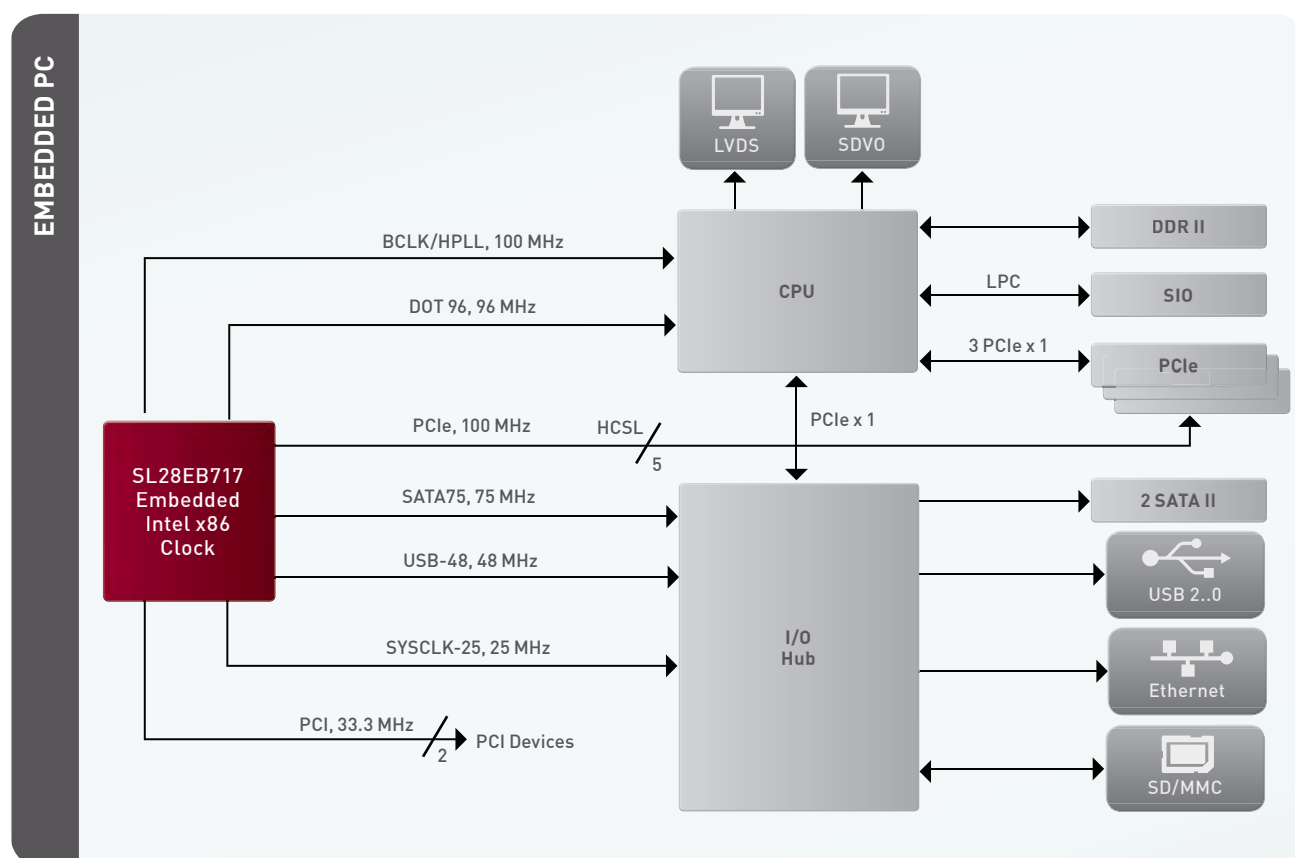
PART NUMBER	CONTROL	CLOCK INPUT/OUTPUTS	INPUT FREQUENCY [MHz]	OUTPUT FREQUENCY [MHz]	PERIOD JITTER [PP]	VDD	VDDO	OUTPUT	PACKAGE
Si5350B	Pin	1/3 or 8	25/27 (Xtal) VCXO	8 kHz - 160 MHz	100 ps	2.5, 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	MSOP10/QSOP24/QFN20
Si5351B	I ² C	1/8	25/27 (Xtal) VCXO	8 kHz - 160 MHz	100 ps	2.5, 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	QSOP24/QFN20
SL38000	Pin/I ² C	1/12	3 - 166 (Clock), 8 - 48 (Xtal)	3 - 200 MHz	—	1.8, 2.5, 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	TSSOP28
SL38160	Pin/I ² C	1/8	3 - 166 (Clock), 8 - 48 (Xtal)	3 - 200 MHz	—	1.8, 2.5, 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	TSSOP16

Embedded Intel x86 Clocks

Silicon Labs offers an extensive family of Intel-compliant x86 clocks for embedded computing, communications and industrial applications. These system main clock generators support a wide variety of chipsets and processors. They provide all the necessary clock generation for the CPU, memory controller (chipset north bridge), I/O controller (chipset south bridge) as well as the latest timing requirements for industry standards such as SATA, USB, LAN, PCI Express, and legacy PCI.

EMBEDDED INTEL x86 CLOCK FEATURES

- Clocking support for Intel processors
- Multi-PLL platform for independent, asynchronous signal generation
- Low power consumption push-pull differential buffers
- Available true differential current steering buffers
- Signal power management for notebook applications
- Dynamic enable/disable for PCIe hot plug applications
- Integrated voltage regulator and damping resistors on differential clocks
- Integrates external graphics clocking requirements
- Available center spread LCD clock for optimized display screen EMI reduction
- Integrated LAN clock for cost/space/component savings
- Integrated IEEE1394 clock for cost/space component savings
- 8-step programmable slew rate control for rise time and fall time control
- Dynamic independent PLL overclocking for enthusiast applications
- Underclocking capabilities for power management support and debugging
- Best in the industry pread pectrum technology for optimum system EMI reduction



Embedded Intel x86 Clocks (cont.)

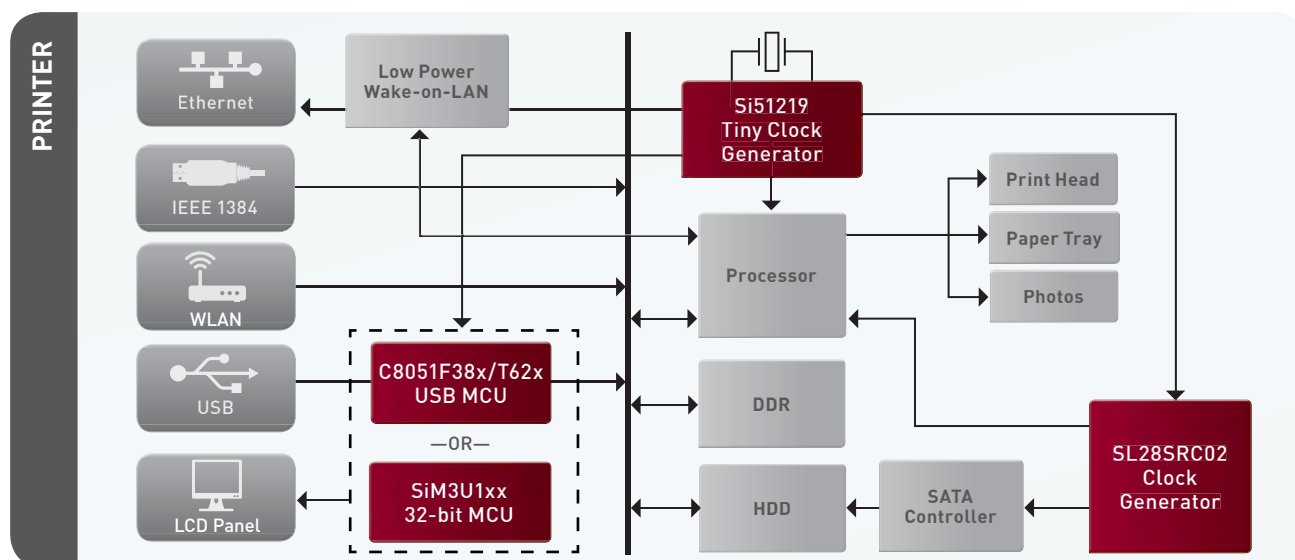
PART NUMBER	CONTROL	CLOCK INPUT/ OUTPUTS	INPUT FREQUENCY [MHz]	OUTPUT FREQUENCY [MHz]	VDD	VDDO	OUTPUT	PACKAGE
CY28442-2	Pin/I ² C	1/20	14.318 MHz	14.3 MHz, 33 MHz, 48 MHz, 96 MHz, 100 MHz, 100 MHz - 200 MHz	3.3 V	3.3 V	LVC MOS, HCSL	TSSOP56
CY28548	Pin/I ² C	1/22	14.318 MHz	14.318 MHz, 24.576 MHz, 25 MHz, 33 MHz, 48 MHz, 96 MHz, 100 MHz, 133.33 MHz, 166.67 MHz, 200 MHz, 266 MHz, 333 MHz, 400 MHz	3.3 V	3.3 V - 1.05 V	LVC MOS	TSSOP64
CY28551	Pin/I ² C	1/23	14.31818 MHz	14.3 MHz, 24 MHz, 33 MHz, 48 MHz, 96 MHz, 100 MHz - 167 MHz, 100 MHz - 400.65 MHz	3.3 V	3.3 V	LVC MOS, HCSL	QFN64
CY505YC64DT	Pin/I ² C	1/25	14.31818 MHz	14.3 MHz, 24 MHz, 33 MHz, 48 MHz, 96 MHz, 100 MHz - 167 MHz, 100 MHz - 400.65 MHz	3.3 V	0.8 V	LVC MOS, HCSL	TSSOP64
CYI9530	Pin/I ² C	1/11	25 - 33 MHz	25 MHz - 133 MHz	3.3 V	3.3 V	LVC MOS	SSOP48/TSSOP48
CYI9531	Pin/I ² C	1/6	25 - 33 MHz	25 MHz - 133 MHz	3.3 V	3.3 V	LVC MOS	SSOP28/TSSOP28
SL28504	Pin/I ² C	1/20-23	14.318 MHz	14.318 MHz, 24.576 MHz, 25 MHz, 33 MHz, 48 MHz, 96 MHz, 100 MHz	3.3 V	3.3 V - 1.05 V	LVC MOS, HCSL	TSSOP64
SL28504-2	Pin/I ² C	1/20-21	14.318 MHz	14.318 MHz, 24.576 MHz, 25 MHz, 33 MHz, 48 MHz, 96 MHz, 100 MHz	3.3 V	3.3 V - 1.05 V	LVC MOS, HCSL	TSSOP56
SL28506	Pin/I ² C	1/20-23	14.318 MHz	14.318 MHz, 25 MHz, 27 MHz, 33 MHz, 48 MHz, 96 MHz, 100 MHz, 100 MHz-400 MHz	3.3 V	3.3 V - 1.05 V	LVC MOS, HCSL	TSSOP64
SL28506-2	Pin/I ² C	1/19-20	14.318 MHz	14.318 MHz, 25 MHz, 27 MHz, 33 MHz, 48 MHz, 96 MHz, 100 MHz, 100 MHz-400 MHz	3.3 V	3.3 V - 1.05 V	LVC MOS, HCSL	TSSOP56
SL28541	Pin/I ² C	1/20-23	14.318 MHz	14.318 MHz, 25 MHz, 27 MHz, 33 MHz, 48 MHz, 96 MHz, 100 MHz, 100 MHz-400 MHz	3.3 V	3.3 V - 1.05 V	LVC MOS, HCSL	TSSOP64
SL28541-2	Pin/I ² C	1/18-19	14.318 MHz	14.3 MHz, 27 MHz, 33 MHz, 48 MHz, 96 MHz, 100 MHz, 133 MHz, 166 MHz, 200 MHz, 266 MHz, 333 MHz, 400 MHz	3.3 V	3.3 V - 1.05 V	LVC MOS, HCSL	TSSOP56
SL28610	Pin/I ² C	1/9	14.318 MHz	14.318 MHz, 96 MHz, 100 MHz, 100 MHz-200 MHz	1.5 V	3.3 V - 1.05 V	LVC MOS, HCSL	QFN48
SL28640	Pin/I ² C	1/26	14.318 MHz	14.3 MHz, 27 MHz, 33 MHz, 48 MHz, 96 MHz, 100 MHz, 133 MHz, 166 MHz, 200 MHz, 266 MHz, 333 MHz, 400 MHz	3.3 V	3.3 V	LVC MOS, HCSL	QFN72
SL28748	Pin/I ² C	1/8	14.318 MHz	14.3 MHz, 27 MHz, 96 MHz, 100 MHz, 133 MHz	3.3 V	3.3 V - 1.05 V	LVC MOS, HCSL	QFN32
SL28779	Pin/I ² C	1/9	14.318 MHz	14.318 MHz, 27 MHz, 48 MHz, 96 MHz, 100 MHz, 133 MHz	3.3 V	3.3 V - 1.05 V	LVC MOS, HCSL	QFN32
SL28EB717	Pin/I ² C	1/13	25 MHz	12 MHz, 14.318 MHz, 25 MHz, 27 MHz, 33 MHz, 48 MHz, 75 MHz, 96 MHz, 83.33 MHz - 166 MHz, 100 MHz	3.3 V	3.3 V	LVC MOS, HCSL	48QFN
SL28EB719	Pin/I ² C	1/13	25 MHz	12 MHz, 14.318 MHz, 25 MHz, 27 MHz, 33 MHz, 48 MHz, 75 MHz, 96 MHz, 83.33 MHz-166 MHz, 100 MHz	3.3 V	3.3 V	LVC MOS, HCSL	TSSOP48
SL28EB740	Pin/I ² C	1/16	25 MHz	12 MHz, 14.318 MHz, 25 MHz, 33 MHz, 48 MHz, 75 MHz, 96 MHz, 83.33 MHz - 166 MHz, 100 MHz	3.3 V	3.3 V	LVC MOS, HCSL	TSSOP56
SL28EB742	Pin/I ² C	1/16	14.318 MHz	14.3 MHz, 33 MHz, 48 MHz, 96 MHz, 100 MHz, 133 MHz, 166 MHz	3.3 V	3.3 V	LVC MOS, HCSL	QFN56

EMI Reduction Clocks

Silicon Labs' programmable spread spectrum clock generators feature a wide range of programming options allowing system designers to minimize EMI at the application level. Configurable parameters include spread spectrum percentage/modulation rate, programmable edge rates, programmable output impedance and programmable skew.

EMI REDUCTION CLOCK FEATURES

- Output frequencies from 1 to 200 MHz
- CLKOUT, REFCLK or SSCLK output options
- CLKIN or XO input options
- 8 to 48 MHz crystal input range
- 1 to 166 MHz clock input range
- Spread percent from 0 to 5.0%
- Down or center spread options
- Spread modulation frequency from 16 to 128 kHz
- On-chip programmable crystal capacitive load (C_L): 8 to 20 pF
- User-definable control pins Powerdown, Output Enable, Spread Enable, Frequency Select, Spread Select control pins
- 7 programmable tr/tf options
- Smallest SSCG clock on the market (6TDFN 1.2 x 1.4 mm)



PART NUMBER	CONTROL	CLOCK INPUT/OUTPUTS	INPUT FREQUENCY (MHz)	OUTPUT FREQUENCY (MHz)	PHASE JITTER (RMS)	VDD	VDDO	OUTPUT	PACKAGE
SL15300	Pin	1/4	3 - 166 (Clock), 8 - 48 (Xtal)	3 - 200 MHz	—	1.8, 2.5, 3.3 V	—	LVC MOS	TSSOP8
SL16020DC	Pin/I ² C	1/2	27 (Xtal)	27 MHz, 100 MHz	—	3.3 V	—	LVC MOS	TDFN10
Si5335	Pin	1/4	10 - 350 (Clock), 25/27 (Xtal)	1 - 350 MHz	1.0 ps	1.8, 2.5, 3.3 V	1.8, 2.5, 3.3 V	LVC MOS, LVDS, LVPECL, HCSL, SSTL, HSTL, CML	QFN24
Si51210	Pin	1/2	3 - 166 (Clock), 8 - 48 (Xtal)	3 - 200 MHz	—	2.5 to 3.3 V	—	LVC MOS	TDFN6
Si51211	Pin	2/3	3 to 166 (Clock), 8 - 48 (Xtal)	3 - 200 MHz	—	2.5 to 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	TDFN8
Si51214	Pin	1/2	3 - 166 (Clock), 8 - 48 (Xtal)	3 - 200 MHz	—	1.8 V	—	LVC MOS	TDFN6
Si51219	Pin	2/3	3 - 166 (Clock), 8 - 48 (Xtal)	3 - 200 MHz	—	2.5 to 3.3 V	1.8, 2.5, 3.3 V	LVC MOS	TSSOP8
Si52142	Pin/I ² C	1/3	25 MHz	100 MHz, 25 MHz	1.0 ps	3.3 V	3.3 V	HSCL, LVC MOS	QFN24
Si52143	Pin/I ² C	1/5	25 MHz	100 MHz, 25 MHz	1.0 ps	3.3 V	3.3 V	HSCL, LVC MOS	QFN24
Si52144	Pin/I ² C	1/4	25 MHz	100 MHz	1.0 ps	3.3 V	3.3 V	HSCL	QFN24
Si52146	Pin/I ² C	1/6	25 MHz	100 MHz	1.0 ps	3.3 V	3.3 V	HSCL	QFN32
Si52147	Pin/I ² C	1/9	25 MHz	100 MHz	1.0 ps	3.3 V	3.3 V	HSCL	QFN48

Clock Buffers

WEB-CONFIGURABLE CUSTOM CLOCK BUFFERS AVAILABLE AT: www.silabs.com/ClockBuilder

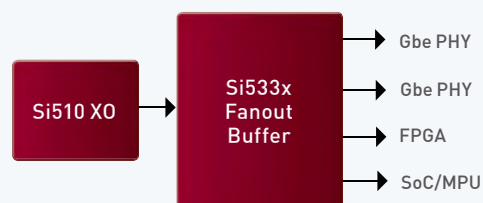
Fanout Buffers (non-PLL)

Silicon Labs' low jitter clock buffers produce multiple copies of an input clock at the same frequency with minimal additive jitter. LVDS, LVPECL, HCSL, CML, LVCMOS, SSTL and HSTL buffers are available, including devices that support multiple formats per device.

FANOUT BUFFER FEATURES

- Non-PLL based clock distribution
- 1:10 LVPECL, LVDS, HCSL, CML buffers
- 1:20 CMOS/SSTL/HSTL buffers
- 2:1 input mux with glitchless input clock switch
- Synchronous output enable
- Low jitter: as low as 45 fs typ (12 kHz – 20 MHz)
- Wide operation frequency from DC to 1.25 GHz
- Integrated level translation
- Low propagation delay
- Low output-to-output skew
- Low device-to-device skew
- Multiple drive strength options
- Wide operation frequency from DC to 1.25 GHz
- 1.8, 2.5, 3.3 V operation
- Multiple formats per device

GIGABIT ETHERNET SWITCH



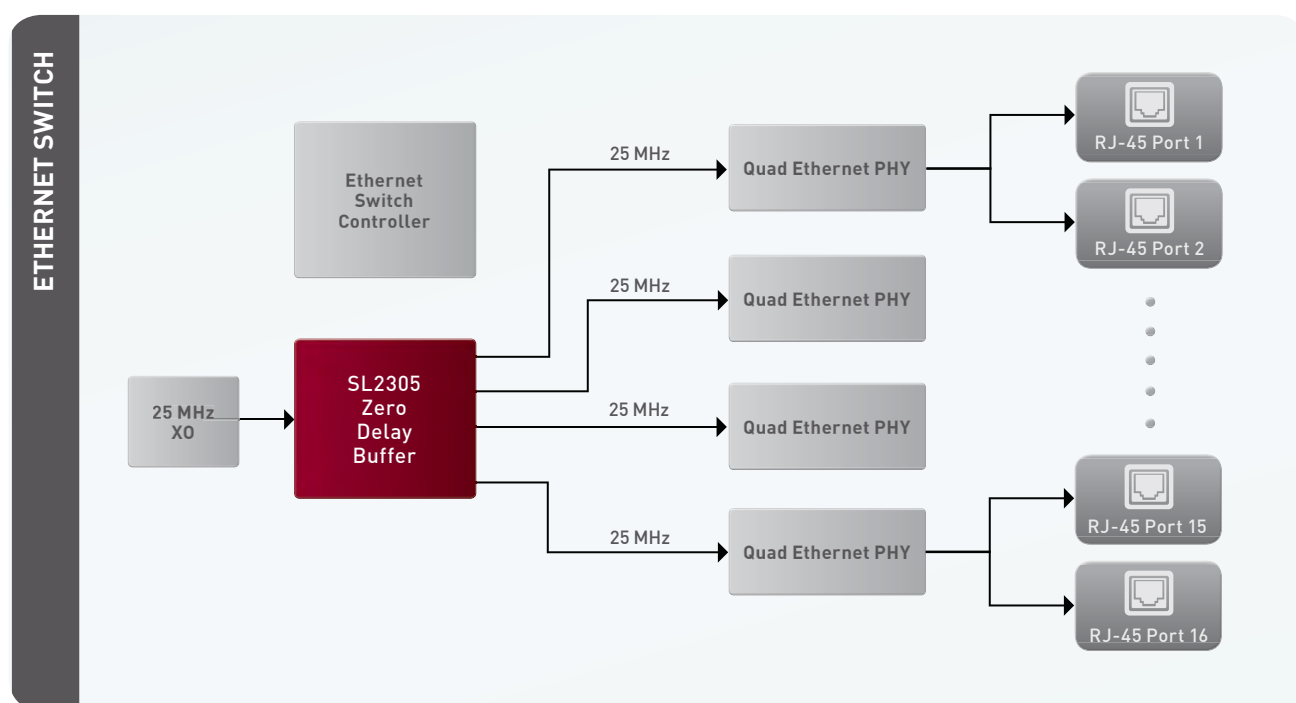
PART NUMBER	CONTROL	CLOCK INPUT/OUTPUTS	ADDITIVE JITTER (RMS)	INPUT FREQUENCY (MHz)	OUTPUT FREQUENCY (MHz)	VDD	VDDO	OUTPUT	PACKAGE
Si53302	Pin	2/10	45 fs	1 - 725 MHz	1 - 725 MHz	1.8, 2.5, 3.3 V	1.8, 2.5 V	LVCMOS, LVDS, LVPECL, HCSL, CML	QFN44
Si53303	Pin	2/10	45 fs	1 - 725 MHz	1 - 725 MHz	1.8, 2.5, 3.3 V	1.8, 2.5 V	LVCMOS, LVDS, LVPECL, HCSL, CML	QFN44
Si53315	Pin	2/10	45 fs	1 - 1250 MHz	1 - 1250 MHz	1.8, 2.5, 3.3 V	1.8, 2.5 V	LVCMOS, LVDS, LVPECL, HCSL, CML	QFN44
Si53320	Pin	2/10	45 fs	1 - 725 MHz	1 - 725 MHz	2.5, 3.3 V	2.5, 3.3 V	LVPECL	TSSOP20
Si53360	Pin	1/8	100 fs	1 - 200 MHz	1 - 200 MHz	1.8, 2.5, 3.3 V	1.8, 2.5 V	LVCMOS	TSSOP16
Si53152	Pin/I ² C	1/2	1.0 ps	100 MHz	100 MHz	3.3 V	3.3 V	HCSL	QFN24
Si53154	Pin/I ² C	1/4	1.0 ps	100 MHz	100 MHz	3.3 V	3.3 V	HCSL	QFN24
Si53156	Pin/I ² C	1/6	1.0 ps	100 MHz	100 MHz	3.3 V	3.3 V	HCSL	QFN32
Si53159	Pin/I ² C	1/9	1.0 ps	100 MHz	100 MHz	3.3 V	3.3 V	HCSL	QFN48
SL2304NZ	Pin	1/4	—	1 - 140 MHz	1 - 140 MHz	3.3 V	—	LVCMOS	8TSSOP/8SOIC
SL23EP04NZ	Pin	1/4	—	DC - 220 MHz	DC - 220 MHz	2.5 V, 3.3 V	—	LVCMOS	TSSOP8
SL2305NZ	Pin	1/5	—	1 - 140 MHz	1 - 140 MHz	3.3 V	—	LVCMOS	TSSOP8/SOIC8
SL2309NZ	Pin	1/9	—	DC - 140 MHz	DC - 140 MHz	3.3 V	3.3 V	LVCMOS	SOIC16
SL23EP09NZ	Pin	1/9	—	1 - 220 MHz	1 - 220 MHz	2.5 V, 3.3 V	—	LVCMOS	TSSOP16/SOIC16
SL28PC1e14	Pin/I ² C	2/4	1.0 ps	25 MHz/100 MHz	100 MHz	3.3 V	3.3 V	HCSL	QFN32
Si53306	Pin	1/4	45 fs	DC - 1250 MHz	DC - 1250 MHz	1.8, 2.5, 3.3 V	1.8, 2.5, 3.3 V	LVCMOS, LVDS, LVPECL, HCSL, CML	QFN16
Si5330F	Pin	1/8	—	5 - 200 MHz	5 - 200 MHz	1.8, 2.5, 3.3 V	1.8, 2.5, 3.3 V	LVCMOS	QFN24
Si5335	Pin	1/4	150 fs	1 - 350 MHz	1 - 350 MHz	1.8, 2.5, 3.3 V	1.8, 2.5, 3.3 V	LVCMOS, LVDS, LVPECL, HCSL, SSTL, HSTL, CML	QFN24
SL18860DC	Pin	1/3	—	10 - 52 MHz	10 - 52 MHz	1.8, 2.5, 3.3 V	—	LVCMOS	TDFN10

Zero Delay Buffers (PLL)

Silicon Labs' zero delay clock buffers are used in applications that require zero propagation delay between the input and output clocks. Silicon Labs' zero delay buffers provide low power consumption and simplify the distribution of spread spectrum clocks.

ZERO DELAY BUFFER FEATURES

- Low propagation delay
- Low output-to-output skew
- Low device-to-device skew
- Low output jitter
- Drive strength options
- Wide operation frequency from 10 to 220 MHz
- 3.3 V to 2.5 V power supply range
- Low power dissipation



PART NUMBER	CONTROL	CLOCK INPUT/ OUTPUTS	INPUT FREQUENCY (MHz)	OUTPUT FREQUENCY (MHz)	PHASE JITTER (RMS)	VDD	VDD0	OUTPUT	PACKAGE
SL2305	Pin	1/5	1 - 140 MHz	1 - 140 MHz	—	3.3 V	—	LVC MOS	TSSOP8/SOIC8
SL2309	Pin	1/9	10 - 140 MHz	10 - 140 MHz	—	3.3 V	—	LVC MOS	TSSOP16/SOIC16
SL23EP04	Pin	1/4	10 - 220 MHz	10 - 220 MHz	—	2.5 V/3.3 V	—	LVC MOS	SOIC8
SL23EP05	Pin	1/5	10 - 220 MHz	10 - 220 MHz	—	2.5 V/3.3 V	—	LVC MOS	TSSOP8/SOIC8
SL23EP08	Pin	1/8	10 - 220 MHz	10 - 220 MHz	—	2.5 V/3.3 V	—	LVC MOS	TSSOP16/SOIC16
SL23EP09	Pin	1/9	10 - 220 MHz	10 - 220 MHz	—	2.5 V/3.3 V	—	LVC MOS	TSSOP16/SOIC16

Jitter Attenuators/Clock Cleaners

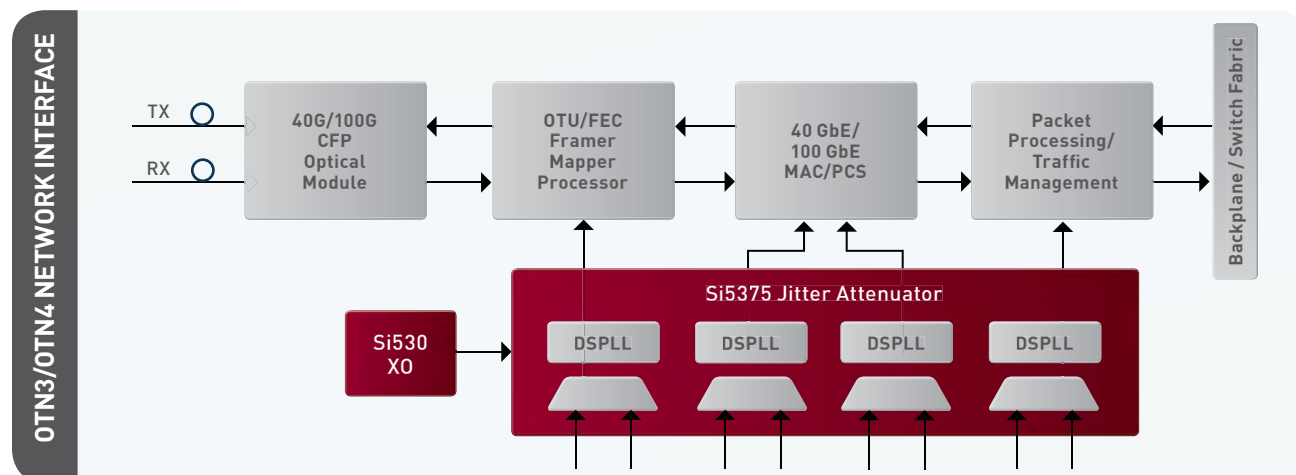
REQUEST SAMPLES AND DOWNLOAD DOCUMENTATION AT: www.silabs.com/clocks

Silicon Labs' precision clocks generate any output frequency from any input frequency while providing jitter attenuation and clock distribution in high-performance timing applications requiring sub 0.5 ps jitter performance. The devices accept multiple clock inputs ranging from 2 kHz to 710 MHz and generate multiple low jitter, independent, synchronous clock outputs ranging from 2 kHz to 945 MHz and select frequencies to 1.4 GHz. The precision clocks are based on Silicon Labs' proven third-generation DSPLL® technology, which generates any output frequency from any input frequency with 300 fs rms jitter performance in a highly integrated PLL solution that eliminates the need for external VCXO and loop filter components.

JITTER ATTENUATOR FEATURES

- Generates any output frequency from any input frequency
- Ultra-low jitter: 290 fs RMS
- 1-DSPLL and 4-DSPLL versions available
- Integrated loop filter with selectable loop bandwidth
- Hitless switching with phase buildout (auto/manual)
- Freerun or synchronous operating modes
- Best-in-class PSRR
- I²C/SPI or pin-controlled
- User-selectable output clock signal format (LVPECL, LVDS, CML, CMOS)
- Single supply: 1.8, 2.5 or 3.3 V $\pm$ 10% operation
- Easy-to-use DSPLLsim* configuration software

*see page 16 for more about our DSPLLsim software



PART NUMBER	# OF PLLS	CONTROL	CLOCK INPUTS/OUTPUTS	INPUT FREQUENCY (MHz)	OUTPUT FREQUENCY (MHz)	JITTER (12 KHz TO 20 MHz)	PLL BANDWIDTH	HITLESS SWITCHING	DIGITAL HOLD	FREE RUN	SIGNAL FORMAT	PACKAGE
Si5315	1	Pin	2/2	0.008 - 644	0.008 - 644	450 fs rms typ	60 Hz - 8 kHz	•	•		CMOS, LVDS, LVPECL, CML	QFN36
Si5317	1	Pin	1/2	1 - 710	1 - 710	290 fs rms typ	60 Hz - 8 kHz		•			QFN36
Si5319	1	I ² C/SPI	1/1	0.002 - 710	0.002 - 1417	300 fs rms typ	60 Hz - 8 kHz			•		QFN36
Si5324	1	I ² C/SPI	2/2	0.002 - 710	0.002 - 1417	290 fs rms typ	4 Hz - 525 Hz	•	•	•		QFN36
Si5326	1	I ² C/SPI	2/2	0.002 - 710	0.002 - 1417	300 fs rms typ	60 Hz - 8 kHz	•	•	•		QFN36
Si5327	1	I ² C/SPI	2/2	0.002 - 710	0.002 - 808	500 fs rms typ	4 Hz - 525 Hz	•	•	•		QFN36
Si5328	1	I ² C/SPI	2/2	0.008 - 808	0.008 - 808	300 fs rms typ	<0.1 Hz - 6 Hz	•	•	•		QFN36
Si5368	1	I ² C/SPI	4/5	0.002 - 710	0.002 - 1417	300 fs rms typ	60 Hz - 8 kHz	•	•	•		TQFP100
Si5369	1	I ² C/SPI	4/5	0.002 - 710	0.002 - 1417	300 fs rms typ	4 Hz - 525 Hz	•	•	•		TQFP100
Si5374	4	I ² C	8/8	0.002 - 710	0.002 - 808	410 fs rms typ	4 Hz - 525 Hz	•	•	•		BGA80
Si5375	4	I ² C	4/4	0.002 - 710	0.002 - 808	410 fs rms typ	60 Hz - 8 kHz		•	•		BGA80
Si5376	4	I ² C	8/8	0.002 - 710	0.002 - 808	410 fs rms typ	60 Hz - 8 kHz	•	•	•		BGA80

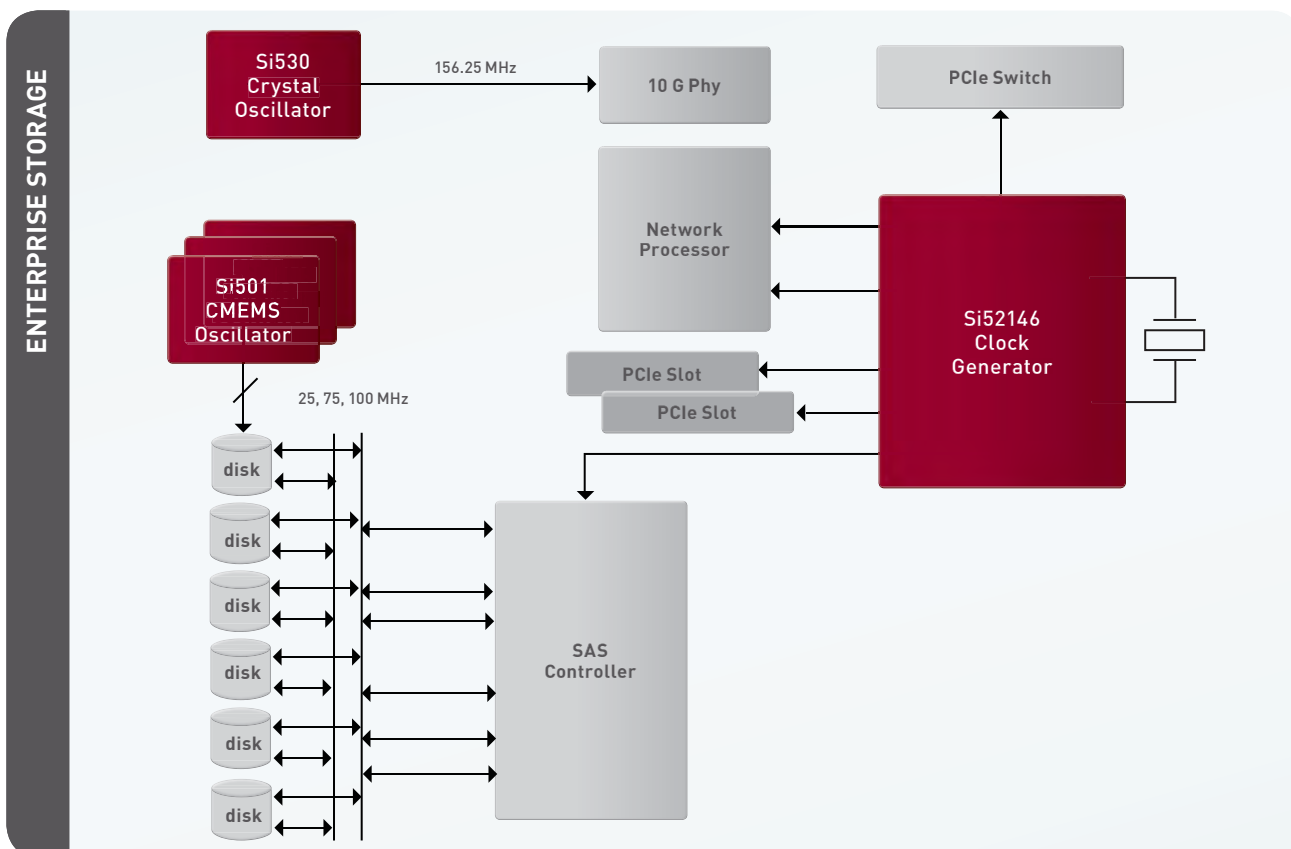
CMEMS® Oscillators

REQUEST CUSTOM PART NUMBERS AND SAMPLES AT: www.silabs.com/cmems

Silicon Labs' CMEMS® technology combines standard CMOS+MEMS in a single monolithic wafer and IC. The Si50x CMEMS oscillator leverages this technology to provide excellent reliability, stability and minimal aging for the general purpose oscillator market. The configurable part family supports custom samples in less than two weeks, and provides ± 20 ppm stability over the industrial temperature range for 10 years, guaranteed. It offers a low-cost, low-power general purpose oscillator to the industrial, embedded and consumer electronics markets. The Si50x family is not intended for high-speed communications applications where Silicon Labs' Si51x/3x/9x oscillators are sold today.

CMEMS OSCILLATOR FEATURES

- Short, two-week lead time to samples
- Any frequency from 32 kHz to 100 MHz
- $\pm 20/\pm 30/\pm 50$ frequency stability (including 10-yr aging)
- Continuous supply voltage range +1.71 V to +3.63 V
- Extended commercial temp: -20 to +70 °C
- Industrial temp: -40 to +85 °C
- Custom, programmable features and functionality via web or field programming
- Low period jitter/Low power
- Fully programmable with 1-pin interface (Si504)
- Glitchless start and stop
- RoHS compliant, Pb-free



PART NUMBER	CONTROL	FREQ.	FREQUENCY RANGE	STABILITY (PPM)	PERIOD JITTER (PkPk)	SUPPLY VOLTAGE	IDD (TYP)	OE	TEMP RANGE	OUTPUT FORMAT	PACKAGE
Si501	Pin	Single	0.032 - 100 MHz	± 20 ± 30 ± 50	11	1.8 V 2.5 V 3.3 V	1-5 mA (freq. dependent)	Pin 1	-40 to 85 °C, -20 to 70 °C	LVCMOS	3.2 mm x 5.0 mm 2.5 mm x 3.2 mm 2.0 mm x 2.5 mm DFN4
Si502	Pin	Dual						Pin 1			
Si503	Pin	Quad						Pin 1			
Si504	1-Pin	Any						—			

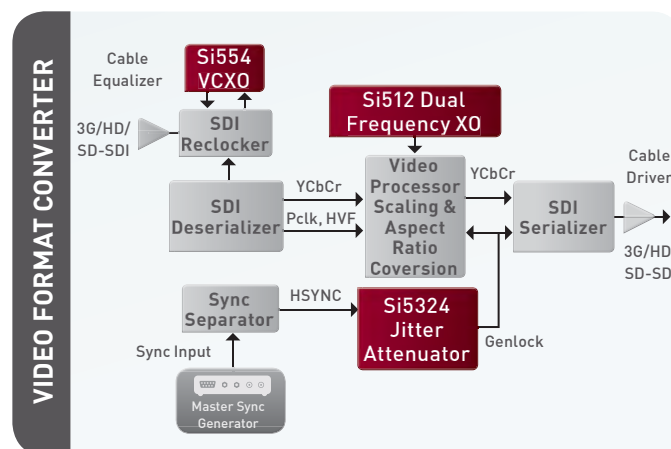
XOs/VCXOs

REQUEST CUSTOM PART NUMBERS AND SAMPLES AT: www.silabs.com/VCX0partnumber

Silicon Labs' crystal oscillators and voltage controlled crystal oscillators (XO/VCXOs) leverage advanced DSPLL® circuitry to provide a low jitter clock at any frequency from 100 kHz to 1.4 GHz. Unlike a traditional XO, where a different crystal is required for each output frequency, Silicon Labs' XO/VCXOs use one fixed frequency crystal to provide a wide range of output frequencies. This IC-based approach allows the crystal resonator to provide exceptional frequency stability and reliability, while providing best-in-class jitter performance and supply noise rejection, simplifying the task of generating low jitter clocks in noisy environments. All devices are factory configurable for a wide variety of user specifications including frequency, supply voltage, output format and stability, thereby eliminating long lead times associated with custom oscillators.

XO/VCXO FEATURES

- Wide frequency range: 100 kHz to 1.4 GHz
- Samples of any XO/VCXO available in 2 weeks
- Superior jitter performance: <0.3 ps rms
- Excellent frequency stability with superior initial accuracy
- Single, dual, quad and I²C programmable configurations
- LVPECL, LVDS, CML, HCSL and CMOS options
- 1.8, 2.5, or 3.3 V options
- Industry standard, ROHS-compliant 5 x 7 mm and 3.2 x 5 mm packages and pinouts
- Industrial temperature range: -40 to 85 °C



Fixed Frequency XO/VCXOs

PART NUMBER	TYPE	FREQUENCY	FREQUENCY RANGE	RMS PHASE JITTER	STABILITY/APR (PPM)	OUTPUT FORMAT	PACKAGE
Si510/1	XO	Single	0.1 - 250 MHz	0.8 ps	±30, ±50, ±100	LVPECL, LVDS, HCSL, Dual CMOS, LVCMOS,	5 mm x 7 mm and 3.2 mm x 5 mm 6-pad
Si512/3	XO	Dual		0.8 ps			
Si515	VCXO	Single		1.0 ps	±30 to ±100		
Si516	VCXO	Dual		1.0 ps			
Si530/1	XO	Single	10 - 1417 MHz	0.3 ps	±20, ±31.5, ±61.5	LVPECL, LVDS, CML, LVCMOS	5 x 7 mm 6-pad
Si532/3	XO	Dual		0.3 ps			5 x 7 mm 6-pad
Si534	XO	Quad		0.3 ps			5 x 7 mm 8-pad
Si535/6	XO	Single	100 - 312.5 MHz	0.19 ps rms	±20, ±31.5	LVPECL, LVDS	5 x 7 mm 6-pad
Si550	VCXO	Single	10 - 1417 MHz	0.5 ps	±12 to ±375	LVPECL, LVDS, CML, LVCMOS	5 x 7 mm 6-pad
Si552	VCXO	Dual		0.5 ps			5 x 7 mm 6-pad
Si554	VCXO	Quad		0.5 ps			5 x 7 mm 8-pad
Si590/1	XO	Single	10 - 810 MHz	0.5 ps	±20, ±30, ±50, ±100		5 x 7 mm 6-pad
Si595	VCXO	Single		0.7 ps	±10 to ±370		5 x 7 mm 6-pad
Si597	VCXO	Quad		0.7 ps			5 x 7 mm 8-pad

I²C Programmable XO/VCXOs

PART NUMBER	TYPE	FREQUENCY RANGE	TUNING RESOLUTION	RMS PHASE JITTER	STABILITY/APR (PPM)	OUTPUT FORMAT	SUPPLY VOLTAGE (V)	PACKAGE
Si514	XO	0.1 - 250 MHz	26 PPT	0.8 ps	±30, ±50, ±100	HCSL, LVPECL, LVDS, LVCMOS, Dual CMOS,	1.8, 2.5, 3.3 V	5 x 7 mm/ 3.2 x 5 mm 6-pad
Si570	XO	10 - 1417 MHz	80 PPT	0.3 ps	±20, ±31.5, ±62.5	LVPECL, LVDS, CML, LVCMOS	1.8, 2.5, 3.3 V	5 x 7 mm 8-pad
Si571	VCXO			0.5 ps	±12 to ±375			5 x 7 mm 8-pad
Si598	XO	10 - 810 MHz	28 PPT	0.5 ps	±30, ±50, ±100	LVPECL, LVDS, CML, LVCMOS	1.8, 2.5, 3.3 V	5 x 7 mm 8-pad
Si599	VCXO			0.7 ps	±10 to ±370			5 x 7 mm 8-pad

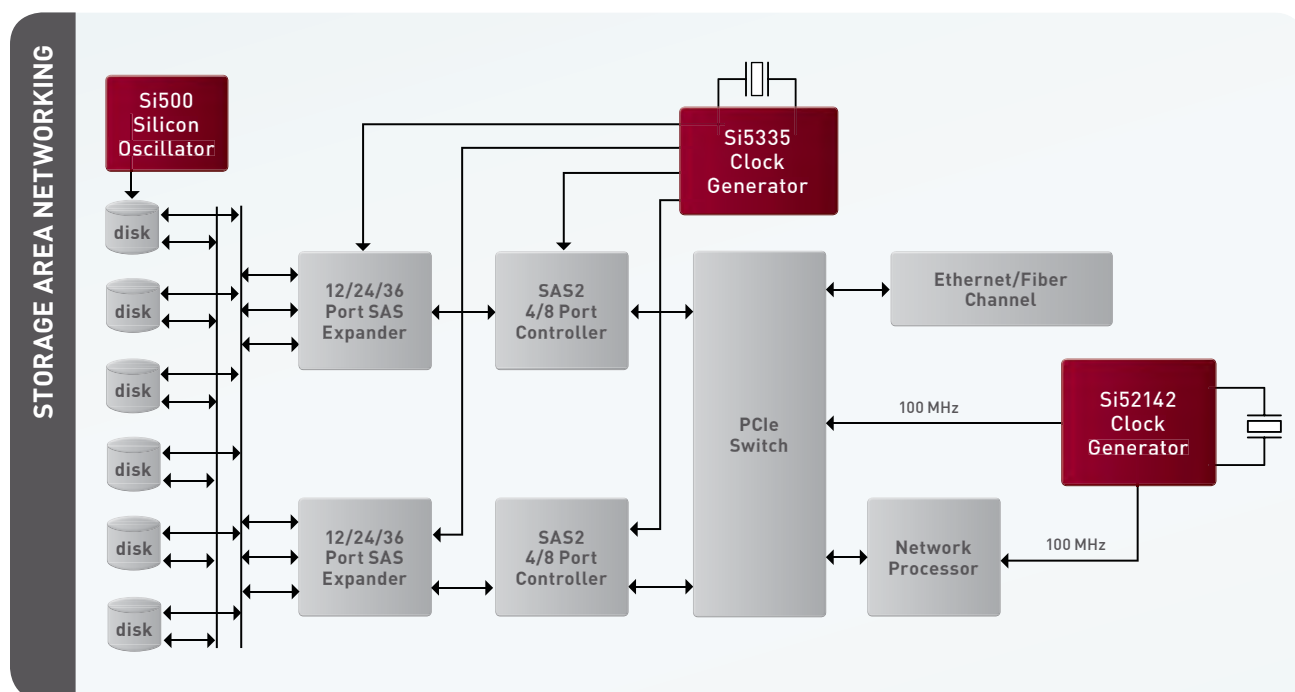
Silicon Oscillators

REQUEST CUSTOM PART NUMBERS AND SAMPLES AT: www.silabs.com/siliconXOpartnumber

The Si500 low cost silicon oscillator provides high reliability and excellent immunity to shock and vibration. Through the use of innovative stabilization circuitry, the need for a mechanical resonator (quartz, MEMs or SAW) is eliminated. An all-silicon solution delivers superior aging, 20 ppm temperature stability and reliable start up and operation. Given its CMOS-based architecture, the Si500 delivers significantly better failure in time (FIT) and mean time between failure (MTBF) than traditional crystal oscillators, minimizing the cost associated with field returns due to crystal quality issues. The Si500 leverages a standard CMOS IC manufacturing flow, eliminating the expensive packaging and mechanically intensive processing steps required by crystal oscillators. All devices are factory configurable for a variety of user specifications including frequency, supply voltage, and output format.

SILICON XO FEATURES

- Quartz-free, all silicon construction
- Generates any frequency from 0.9 to 200 MHz
- Samples of any frequency available in 2 weeks
- Low jitter: 1.5 ps RMS phase jitter, 2 ps RMS period jitter
- No internal PLL
- 3.3, 2.5 and 1.8 V options
- CMOS, LVPECL, LVDS, HCSL and SSTL options
- Driver stopped, tristate, and power down options
- Footprint compatible with 3.2 mm x 5.0 mm



PART NUMBER	TYPE	FREQUENCY	TEMPERATURE STABILITY	TOTAL STABILITY (PPM)	OUTPUT FORMAT	FOOTPRINT
Si500S	XO	0.9 - 200 MHz	± 20 ppm typ	± 150 (0-70 °C) ± 250 (0-85 °C)	LVC MOS, SSTL	3.2 x 5 mm 4-pad
Si500D	XO	0.9 - 200 MHz	± 20 ppm typ	± 150 (0-70 °C) ± 250 (0-85 °C)	LVPECL, LVDS, HCSL, dual output LVC MOS, diff LVC MOS, dual output SSTL, diff SSTL	3.2 x 5 mm 6-pad

Hardware and Software Support

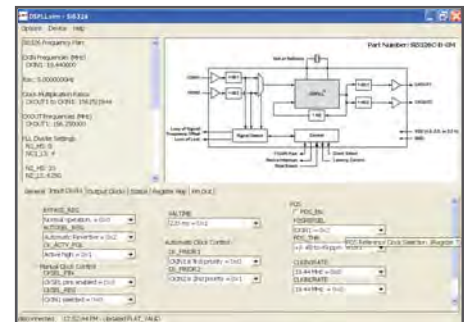
FULL DOCUMENTATION, SOFTWARE AND APPLICATION NOTES ARE AVAILABLE AT: www.silabs.com/timing

Clock and Oscillator Development Kits

Silicon Labs offers complete tools to help designers throughout the entire development process. Both clock and oscillator solutions offer hardware and software platforms to easily set up, configure and evaluate overall device performance.

DSPLLsim Software

DSPLLsim PC-based software utility assists users with frequency planning, loop bandwidth selection and overall device configuration of Silicon Labs Jitter Attenuating Clocks. The DSPLLsim software can be used in standalone mode or can be used directly to control the Si531x/2x/6x/7x in the device evaluation kit. The DSPLLsim software provides a listing of pin/register settings based on the user-specified configuration, significantly simplifying PLL design.



**Si5326 JITTER
ATTENUATING CLOCK
EVALUATION BOARD**



**Si52144 PCI EXPRESS
EVALUATION BOARD**



**Si50x CMEMS FIELD
PROGRAMMER BOARD**



**Si5xx VCXO
EVALUATION BOARD**

Silicon Labs Makes Finding the Right Part Easy!

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Clock and Oscillator Design Services

Silicon Labs offers the industry's broadest portfolio of embedded clocks and oscillators for communications, computing, broadcast video and consumer applications with the shortest lead times in the industry, with no minimum order quantities or NRE fees. Silicon Labs also provides a comprehensive clock tree design service to simplify component selection. Proposals are generated within three business days.

	Specify a Custom Oscillator Specify a custom silicon or crystal oscillator and build a part number in minutes. Need to reorder? Look up a currently existing product by part number.	Start >
	Build a Custom Clock - ClockBuilder™ Quickly develop custom, application-specific clock generators and buffers that support any combination of user-specified input/output frequencies.	Start >
	Get a Clock Tree Design Recommendation Fill out the web form or upload files, and Silicon Labs will return a custom clock tree proposal within 3 business days based on your design.	Start >

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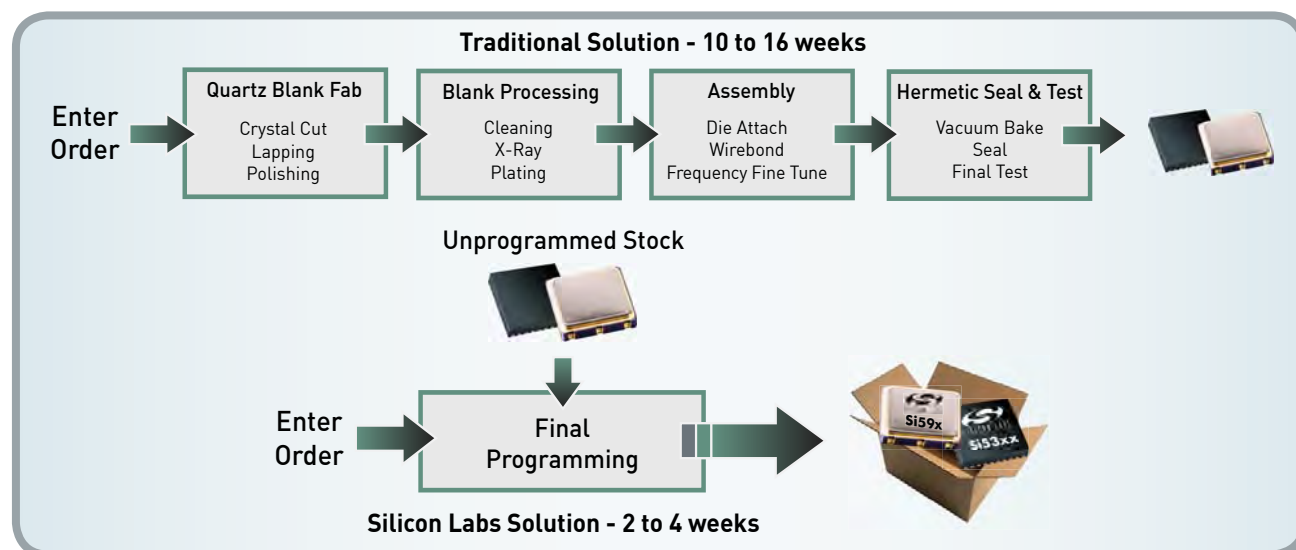
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Available on the
App Store

Industry's Shortest Lead Times

Low-jitter, high-performance, custom samples are available overnight, and to help you get to market faster, production quantities ship in less than 2–4 weeks. Silicon Labs' complete portfolio of industry-leading XO's, VCXO's, clock generators, jitter attenuating clocks and clock buffers set a new standard for flexibility, performance and lead time.



Silicon Labs' products are designed and manufactured to ISO 9001, ISO 14001 and ISO/TS 16949 standards.



ISO 9001

Quality Management System
Design and Manufacture of Integrated Circuits
Certificate Registration No: 951 08 4762



ISO 14001

Environmental Management System
Design and Manufacture of Integrated Circuits
Certificate Registration No: 951 09 4998



ISO/TS 16949

Quality Management System for
Manufacture of Integrated Circuits and Related
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Mixed Sources

Product group from well-managed
forests, controlled sources and
recycled wood or fiber

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