Integrated Device Technology

Clock Generation Overview

CONTENTS

The products in this guide represent just a portion of the IDT timing portfolio. For more information about our comprehensive portfolio of timing products or to request samples, please visit: **idt.com/go/timing**

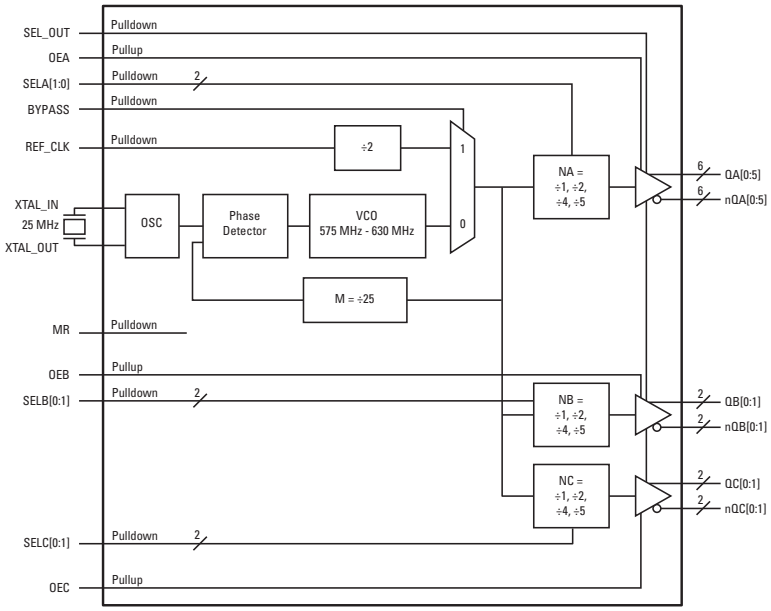
IDT clock generation products produce timing signals for use in synchronizing a system's operation. At its most basic level, a clock generator consists of a resonant circuit and an amplifier. The resulting timing signal (or clock signal) can range from a simple 50 percent duty cycle square wave to more sophisticated arrangements. The resonant circuit is usually a quartz piezo-electric oscillator, although simpler tank circuits and even RC circuits may be used in some cases.

As the timing output becomes more complex, devices may combine a frequency multiplier, frequency divider, and frequency mixer operations to produce the desired output signal. Frequency multipliers and dividers generate an output signal whose output frequency is a harmonic (multiple) of its input frequency, while the mixer generates sum and difference frequencies. Many devices are also known as phase-locked loop clocks (PLL clocks), which contain PLLs used to compare the phase of the input and adjust the frequency of its oscillator to keep the phases matched. Programmable clock generators allow the multiplier or divider values to be changed, allowing a wide variety of output frequencies to be selected without modifying the hardware.

As the industry-leader in timing solutions, IDT offers a rich portfolio of clock generation devices that satisfy a variety of performance and programmability requirements. From ultra-low jitter devices that offer less than 300 femtoseconds of RMS phase jitter over a 12 kHz to 20 MHz integration range, to highly flexible programmable devices that provide flexibility and performance in a single package.

IDT GENERAL PURPOSE CLOCK GENERATORS are PLL-based products that generate different output frequencies from a common input frequency. IDT clock generators produce clock output frequencies within strict tolerances to the application they are sourcing. They use a simple, low cost, fundamental-mode quartz crystal or reference clock as the frequency reference, from which they generate low-jitter output clocks. They also allow for frequency translation with output frequencies readily selected with very high resolution (very small frequency steps). IDT offers clock generators with both single ended and differential clock outputs. Many devices provide a programmable-skew feature allowing the user to adjust the timing of individual outputs. This provides flexibility for last minute clock skew management in the system.

General Purpose Clock Generators



849S625i Crystal to LVPECL/LVDS Clock Synthesizer

- Ten selectable differential LVPECL or LVDS outputs
- Output frequencies of 625 MHz, 312.5 MHz, 156.25 MHz or 125 MHz using a 25 MHz crystal
- RMS phase jitter at 156.25 MHz (1 MHz to 20 MHz): 0.375 ps (typical), LVDS outputs
- Cycle-to-cycle jitter: 25 ps (maximum)
- -40°C to 85°C ambient operating temperature
- Available in a 7 x 7 mm 48-TQFP package

Product ID	Product Title	Number of Outputs	Output Type	Output Freq Range (MHz)	Input Freq (MHz)	Input Type	Core Voltage (V)	Output Voltage (V)
841602i	FemtoClock® NG Crystal-to-HCSL Clock Generator	2	HCSL	100, 125	25	Crystal, LVCMOS	3.3	3.3
841604i-01	FemtoClock NG Crystal-to-HCSL Clock Generator	4	HCSL	100, 125	25	Crystal, LVCMOS	3.3	3.3
841608i	FemtoClock NG Crystal-to-HCSL Clock Generator	8	HCSL	100, 125	25	Crystal, LVCMOS	3.3	3.3
849S625i	Crystal-to-LVPECL/LVDS Clock Synthesizer	10	LVDS, LVPECL	125, 156.25, 312.5, 625	25	Crystal, LVCMOS	3.3	3.3
8V44N4614	FemtoClock NG Jitter Attenuator and Clock Synthesizer	13	LVDS, LVPECL, LVCMOS	25, 100, 125, 156	25, 50, 100, 200	Crystal, LVCMOS, LVDS, LVPECL	3.3	3.3
8413S12Bi	HCSL/LVCMOS Clock Generator	14	LVCMOS, HCSL	100, 125, 156.25, 312.5	25	Crystal, LVCMOS, LVTTL	3.3	2.5, 3.3

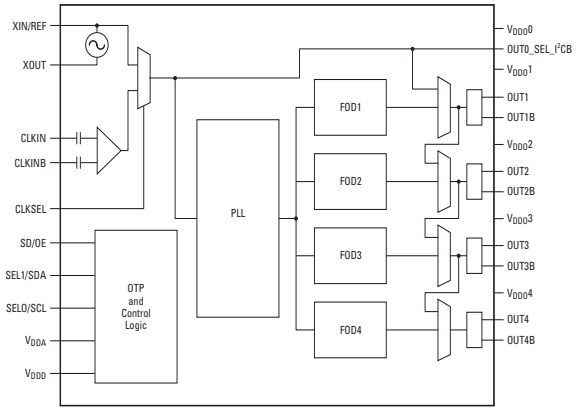
Programmable Clocks

PROGRAMMABLE CLOCK GENERATORS allow designers to save board space and cost by replacing crystals, oscillators (including programmable oscillators), and buffers with a single timing device, making them well-suited for consumer, data communications, telecommunications and networking applications. These devices are often referred to as programmable clock generators, or programmable PLL clock generators. Among others, IDT programmable clock generator families include third-generation Universal Frequency Translators (UFT™), FemtoClock® NG, and VersaClock 5, each providing a different level of jitter performance, power consumption, flexibility, and cost.

THE UFT FAMILY of programmable timing devices is optimized for high-performance optical networks, wireless base stations, and 10 / 40 / 100 GbE applications. These devices are the industry's first single-chip programmable solutions capable of generating eight different output frequencies with less than 300 femtoseconds RMS phase jitter over the standard 12 kHz to 20 MHz integration range. The third-generation UFT family of timing devices offers eight independently-programmable clocking outputs with the flexibility to apply virtually any input frequency and select virtually any output frequency.

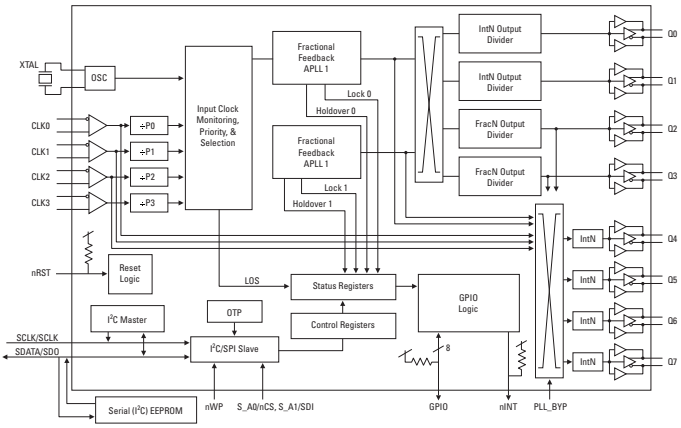
IDT FEMTOCLOCK NEXT GENERATION (NG) devices are stand-alone programmable clock generators that replace crystal and SAW oscillators in high-performance applications. Employing a simple, low-cost, fundamental-mode quartz crystal as the low frequency reference these devices synthesize high-quality, low-jitter clock signals with < 300 fs of RMS phase jitter, up to 1.3 GHz. In addition, this family offers significant power savings, and is optimized for 10 Gigabit Ethernet, PCI Express®, Fibre Channel and SONET.

VERSACLOCK® DEVICES are in-system programmable clock generators featuring universal output pairs capable of producing independent frequencies up to 350 MHz as HCSL, LVPECL, LVDS, or dual LVCMOS outputs. With RMS phase jitter of < 500 fs for VersaClock 6 and <700 fs for VersaClock 5, this family meets the stringent jitter requirements of PCI Express Gen 1/2/3, USB 3.0, and 1G/10G Ethernet. The high-performance clock generator operates at less than 100 mW core power (50 percent lower than competing devices), helping to ease system thermal constraints, reduce operating power expenses, and maximize battery life.



5P49V5901 VersaClock 5 Low Power Programmable Clock

- High performance, low phase noise PLL, <0.7 ps RMS typical phase jitter on outputs:
  - PCIe Gen 1/2/3 compliant clock capability
  - USB 3.0 compliant clock capability
  - Gigabit Ethernet clock capability (1GbE, 10GbE)
- Generates up to four independent output frequencies with four Fractional Output Dividers (FODs)
- Four banks of internal non-volatile in-system programmable or factory programmable OTP EPROM
- 4 x 4 mm 24-VFQFPN package



8T49N286 FemtoClock NG Universal Frequency Translator (4-in / 2-PLL / 8-out)

- Compliant with Telcordia GR-253-CORE (SONET) & ITU-T G.813/G.8262 (SDH/SONET & SyncE) when paired with a Synchronous Equipment Timing Source (SETS) device
- 8 LVPECL, LVDS, HCSL or 16 LVCMOS output clocks ranging from 8 kHz up to 1.0 GHz (diff), 8 kHz to 250 MHz (LVCMOS)
- 10 x 10 mm 72-VFQVN package

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Programmable Clocks, continued

Product ID	Product Title	Outputs (#)	Output Type	Output Freq Range (MHz)	Input Freq (MHz)	Output Voltage (V)	Phase Jitter Typical RMS (ps)	Programmable Interface	Spread Spectrum
5V19EE403	VersaClock 3 Programmable VCXO Clock Generator	4	LVCMOS	0.001 - 200	1 - 200	3.3	–	I²C, EEPROM	Yes
5V19EE604	VersaClock 3 Programmable VCXO Clock Generator	6	LVCMOS	0.001 - 200	1 - 200	1.8, 2.5, 3.3	–	I²C, EEPROM	Yes
5V49EE701	VersaClock 3 Programmable Clock Generator	7	LVCMOS, LVPECL, LVDS, HCSL	0.001 - 200	1 - 200	3.3	–	I²C, EEPROM	Yes
5P49V5901	VersaClock 5 Low Power Programmable Clock	5	LVCMOS, LVPECL, HCSL, LVDS	1 - 350	1 - 350	1.8, 2.5, 3.3	0.7	I²C, OTP	Yes
5P49V5913	VersaClock 5 Low Power Programmable Clock Generator	3	LVCMOS, LVPECL, HCSL, LVDS	1 - 350	1 - 350	1.8, 2.5, 3.3	0.7	I²C, OTP	Yes
5P49V5914	VersaClock 5 Low Power Programmable Clock Generator	4	LVCMOS, LVPECL, HCSL, LVDS	1 - 350	1 - 350	1.8, 2.5, 3.3	0.7	I²C, OTP	Yes
5P49V5923	VersaClock 5 Low Power Programmable Clock Generator	3	LVCMOS	1 - 200	1 - 200	1.8, 2.5, 3.3	0.7	I²C, OTP	Yes
5P49V5925	VersaClock 5 Low Power Programmable Clock Generator	5	LVCMOS	1 - 200	1 - 200	1.8, 2.5, 3.3	0.7	I²C, OTP	Yes
5P49V5927	VersaClock 5 Low Power Programmable Clock Generator	7	LVCMOS	1 - 200	1 - 200	1.8, 2.5, 3.3	0.7	I²C, OTP	Yes
5P49V5929	VersaClock 5 Low Power Programmable Clock Generator	9	LVCMOS	1 - 200	1 - 200	1.8, 2.5, 3.3	0.7	I²C, OTP	Yes
5P49V5933	VersaClock 5 Low Power Programmable Clock Generator withIntegrated Crystal	3	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 350	1.8, 2.5, 3.3	0.7	I²C, OTP	Yes
5P49V5935	VersaClock 5 Low Power Programmable Clock Generator with Integrated Crystal	5	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 350	1.8, 2.5, 3.3	0.7	I²C, OTP	Yes
5P49V5943	VersaClock 5 Low Power Programmable Clock Generator in Reduced-size Package	3	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 350	1.8, 2.5, 3.3	0.7	I²C, OTP	Yes
5P49V5944	VersaClock 5 Low Power Programmable Clock Generator in Reduced-size Package	3	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 200	1.8, 2.5, 3.3	0.7	I²C, OTP	Yes
5P49V5907	VersaClock 5 Low Power Programmable Clock Generator with Additional PCIe Outputs	8	HCSL, LP-HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 200	1.8, 2.5, 3.3	0.7	I²C, OTP	Yes
5P49V5908	VersaClock 5 Low Power Programmable Clock Generator with Additional PCIe Outputs	12	HCSL, LP-HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 350	1.8, 2.5, 3.3	0.7	I²C, OTP	Yes
5P49V6901	VersaClock 6 Low Power Programmable Clock Generator	5	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 350	1.8, 2.5, 3.3	0.5	I²C, OTP	Yes
5P49V6913	VersaClock 6 Low Power Programmable Clock Generator	3	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 350	1.8, 2.5, 3.3	0.5	I²C, OTP	Yes
5P49V6914	VersaClock 6 Low Power Programmable Clock Generator	4	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 350	1.8, 2.5, 3.3	0.5	I²C, OTP	Yes

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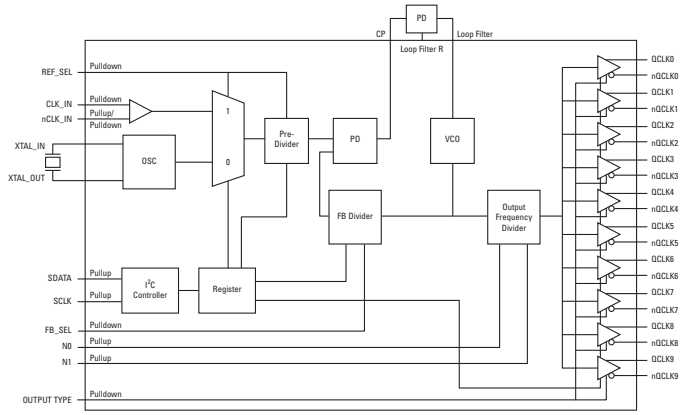
Programmable Clocks, continued

Product ID	Product Title	Outputs (#)	Output Type	Output Freq Range (MHz)	Input Freq (MHz)	Output Voltage (V)	Phase Jitter Typical RMS (ps)	Programmable Interface	Spread Spectrum
8T49N105i	FemtoClock NG Universal Frequency Translator	1	LVPECL, LVDS	0.98 - 1300	0.008 - 710	3.3, 2.5	0.285	I²C	Yes
8V97051	Low Power Wideband Fractional RF Synthesizer / PLL	2	RF_OUT	34.375 - 4400	5 - 310	3.3	0.126	SPI	No
8T49N004i	Programmable FemtoClock NG LVPECL/LVDS Clock Generator with 4-Outputs	4	LVPECL, LVDS	15.16 - 1250	10 - 312.5	3.3, 2.5	0.212	I²C	No
8T49N006i	Programmable FemtoClock NG LVPECL/LVDS Clock Generator with 6-Outputs	6	LVPECL, LVDS	15.16 - 1250	10 - 312.5	3.3, 2.5	0.212	I²C	No
8T49N008i	Programmable FemtoClock NG LVPECL/LVDS Clock Generator with 8-Outputs	8	LVPECL, LVDS	15.16 - 1250	10 - 312.5	3.3, 2.5	0.212	I²C	No
8T49N028i	Crystal-to-3.3V, 2.5V Multiple Frequency Clock Generator with a Fanout Buffer	8	LVPECL, LVDS	15.16 - 1250	10 - 312.5	3.3, 2.5	0.212	I2C	No
8T49N241	FemtoClock NG Universal Frequency Translator (2-in/1-PLL/4-out)	4	LVPECL, LVDS, HCSL, LVCMOS	0.008 - 1000	0.008 - 875	1.8, 2.5, 3.3	0.315	I²C, SPI	No
8T49N242	FemtoClock NG Universal Frequency Translator (2-in/1-PLL/4-out)	4	LVPECL, LVDS, HCSL, LVCMOS	0.008 - 1000	0.008 - 875	1.8, 2.5, 3.3	0.276	I²C, SPI	No
8T49N285	FemtoClock NG Universal Frequency Translator (2-in/1-PLL/8-out)	8	LVPECL, LVDS, HCSL, LVCMOS	0.008 - 1000	0.008 - 875	1.8, 2.5, 3.3	0.28	I²C, SPI	No
8T49N286	FemtoClock NG Universal Frequency Translator (4-in/2-PLL/8-out)	8	LVCMOS, LVDS, LVPECL, HCSL	0.008 - 1000	0.008 - 875	2.5, 3.3	0.28	I²C, SPI	No
8T49N287	FemtoClock NG Universal Frequency Translator (2-in/2-PLL/8-out)	8	LVCMOS, LVDS, LVPECL, HCSL	0.008 - 1000	0.008 - 875	2.5, 3.3	0.28	I²C	No
8T49N488i	FemtoClock NG QUAD Universal Frequency Translator	8	LVPECL, LVDS	0.98 - 1300	0.008 - 710	2.5	0.333	I²C	Yes
8T49N524i	Programmable FemtoClock NG LVPECL/LVDS Dual 4-Output Fractional Clock Generator	8	LVPECL, LVDS	15.5 - 650, 975 - 1300	5 - 800	3.3, 2.5	0.323	I²C	Yes
5V49EE902	VersaClock 3 programmable Clock Generator	9	LVCMOS, LVPECL, LVDS, HCSL	0.001 - 200	1 - 200	1.8, 2.5, 3.3	–	I²C, EEPROM	Yes
8T49NS010	Clock Synthesizer and Fanout Buffer / Divider	10	LVPECL, LVDS	156.25 - 1250	25 - 100	3.3	0.084	I²C	No
8T49N4811	I²C Programmable Ethernet Clock Generator	11	LVDS, LVPECL, LVCMOS	25, 50, 100, 125, 156.25, 312.5	25	2.5, 3.3	0.277	I²C	No
8T49N012i	FemtoClock NG Crystal-to-3.3V, 2.5V LVPECL/LVCMOS Clock Generator with a Fanout Buffer	12	LVPECL, LVDS, CMOS	15.16 - 1250	10 - 312.5	3.3, 2.5	0.19	–	No
82P33724	Port Synchronizer for IEEE 1588 and 10G/40G Synchronous Ethernet	11	LVCMOS, PECL, LVDS	0.000001 - 650	0.000001 - 650	3.3	0.25	I²C	No
82P33741	Port Synchronizer for IEEE 1588 and 10G/40G Synchronous Ethernet	11	LVCMOS, PECL, LVDS	0.000001 - 650	0.000001 - 650	3.3	1	I²C	No

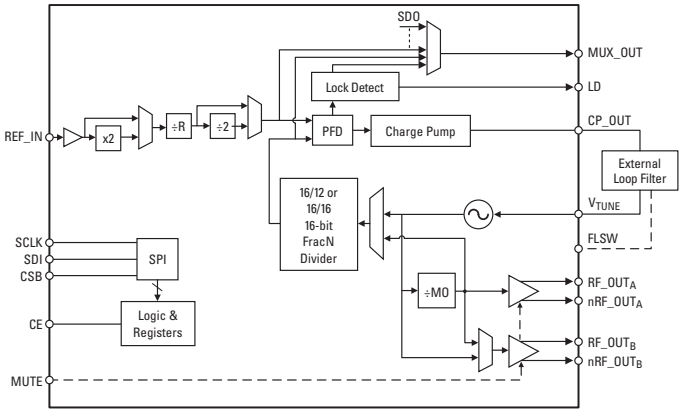
IDT'S ULTRA-LOW JITTER CLOCK GENERATORS meet the phase jitter requirements for demanding serial data applications such as 100 Gigabit Ethernet. These devices use IDT's patented FemtoClock technology to and are often used to replace third overtone and high frequency fundamental (HFF, inverted mesa) crystal oscillators or expensive surface acoustic wave (SAW) oscillators. They are more reliable, cost less, and are more readily available with shorter lead times.

Ultra-low Jitter Clocks (<300 fs RMS)



8T49NS010 Clock Synthesizer and Fanout Buffer / Divider

- Ten differential outputs
- Input operates in full differential mode (LVPECL or LVDS) or single-ended LVCMOS mode
- Supports output power down for power sensitive applications
- Output frequency of 156.25 MHz, 312.5 MHz, 625 MHz or 1250 MHz
- 8 x 8 mm 56-VFQFN package



8V97051 Low-Power Wideband RF Synthesizer / PLL

- GSM-grade wideband RF synthesizer / PLL
- Generate frequencies from 34.375 MHz to 4.4 GHz
- 380 mW typ power consumption
- Excellent phase noise performance -143 dBc/Hz at 1 MHz offset for a 1.1 GHz output
- Excellent spurious performance including integer boundary spurs
- 5 x 5 mm 32-VFQFN package

Product ID	Product Title	Outputs (#)	Output Type	Output Freq Range (MHz)	Input Freq (MHz)	Core Voltage (V)	Output Voltage (V)	Phase Jitter Typ RMS (ps)
8T49N105i	FemtoClock NG Universal Frequency Translator	1	LVPECL, LVDS	0.98 - 1300	0.008 - 710	3.3, 2.5	3.3, 2.5	0.285
8V44N003i	FemtoClock NG LVDS Clock Synthesizer	2	LVDS	50 - 1200	20 - 500	3.3	3.3	0.3
8V97051	Low Power Wideband Fractional RF Synthesizer / PLL	2	RF_OUT	34.375 - 4400	5 - 310	3.3	3.3	0.126
841N254i	FemtoClock NG Crystal-to-LVDS/ HCSL Clock Synthesizer	4	LVDS, HCSL	100, 125, 156.25, 250	25	2.5, 3.3	2.5, 3.3	0.27
8T49N004i	Programmable FemtoClock NG LVPECL/LVDS Clock Generator with 4-Outputs	4	LVPECL, LVDS	15.16 - 1250	10 - 312.5	3.3, 2.5	3.3, 2.5	0.212
8V41N004i	FemtoClock NG Crystal-to-HCSL Clock Generator	5	HCSL	100, 125, 156.25, 312.5	25	3.3	3.3	0.217
8V41N012i	Clock Generator for Cavium Processors	14	LVCMOS, HCSL	100, 125, 156.25, 312.5	25	2	2.5, 3.3	0.3

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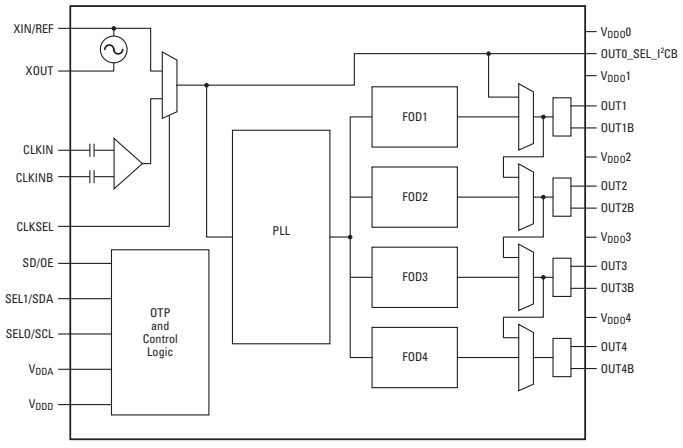
Ultra-low Jitter Clocks (<300 fs RMS), continued

Product ID	Product Title	Outputs (#)	Output Type	Output Freq Range (MHz)	Input Freq (MHz)	Core Voltage (V)	Output Voltage (V)	Phase Jitter Typ RMS (ps)
844N255i	FemtoClock NG Crystal-to-LVDS Clock Synthesizer	6	LVDS	25, 50, 100, 125, 156.25	25	2.5	2.5	0.25
8T49N008i	Programmable FemtoClock NG LVPECL/LVDS Clock Generator with 8-Outputs	8	LVPECL, LVDS	15.16 - 1250	10 - 312.5	3.3, 2.5	3.3, 2.5	0.212
8T49N028i	Crystal-to-3.3V, 2.5V Multiple Frequency Clock Generator with Fanout Buffer	8	LVPECL, LVDS	15.16 - 1250	10 - 312.5	3.3, 2.5	3.3, 2.5	0.212
8T49N242	FemtoClock NG Universal Frequency Translator	4	LVCMOS, LVDS, LVPECL, HCSL	0.008 - 1000	0.008 - 875	2.5, 3.3	1.8, 2.5, 3.3	0.276
8T49N285	FemtoClock NG Universal Frequency Translator (2-in/1-PLL/8-out)	8	LVPECL, LVDS, HCSL, LVCMOS	0.008 - 1000	0.008 - 875	2.5, 3.3	1.8, 2.5, 3.3	0.28
8T49N286	FemtoClock NG Universal Frequency Translator (4-in/2-PLL/8-out)	8	LVCMOS, LVDS, LVPECL, HCSL	0.008 - 1000	0.008 - 875	2.5, 3.3	2.5, 3.3	0.28
8T49N287	FemtoClock NG Universal Frequency Translator (2-in/2-PLL/8-out)	8	LVCMOS, LVDS, LVPECL, HCSL	0.008 - 1000	0.008 - 875	2.5, 3.3	2.5, 3.3	0.28
843N571i	FemtoClock NG Clock Synthesizer	10	LVCMOS, LVPECL	25, 33.33, 100, 125, 156.25	25	3.3	3.3	0.212
8T49NS010	Clock Synthesizer and Fanout Buffer / Divider	10	LVPECL, LVDS	156.25 - 1250	25 - 100	3.3	3.3	0.084
8T49N012i	FemtoClock NG Crystal-to-3.3V, 2.5V LVPECL/LVCMOS Clock Generator with Fanout Buffer	12	LVPECL, LVDS, CMOS	15.16 - 1250	10 - 312.5	3.3, 2.5	3.3, 2.5	0.19

Low Jitter Clocks (<700 fs RMS)

LOW JITTER CLOCK GENERATORS meet the phase jitter requirements for most serial data applications. Separate output banks in many of the devices provide unique output frequencies independent of each other. The number of these banks is variable depending on the specific clock generator. Some of these devices are highly programmable and are also listed as programmable clocks, providing both performance and flexibility for a wide variety of applications.



5P49V6901 VersaClock 6 Low Power Programmable Clock Generator

- High performance, low phase noise PLL, <0.5 ps RMS typical phase jitter on outputs:
- PCIe Gen1/2/3 compliant clock capability
- USB 3.0 compliant clock capability
- Gigabit Ethernet clock capability (1 GbE, 10 GbE)
  - Generates up to four independent output frequencies with four fractional output dividers (FODs)
  - Four banks of internal non-volatile in-system programmable or factory programmable OTP EPROM
- 4 x 4 mm 24-VFQFPN package

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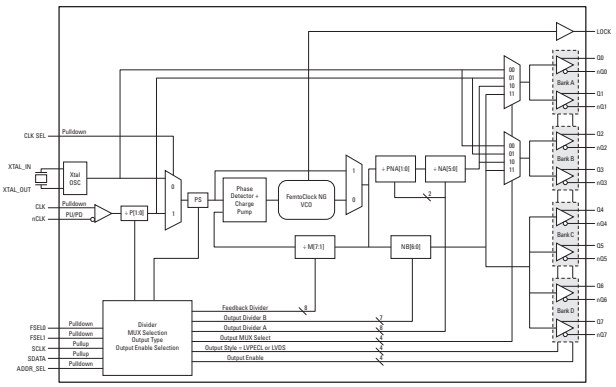
Low Jitter Clocks, continued



8T49N028i Crystal-to-3.3 V, 2.5 V Multiple Frequency Clock Generator with Fanout Buffer

- Fourth Generation FemtoClock NG PLL technology
- Eight selectable LVPECL or LVDS outputs (bank selectable, two output channels per bank)
- CLK, nCLK input pair can accept the following differential input levels: LVPECL, LVDS, HCSL
- FemtoClock NG VCO Range: 1.92 GHz to 2.5 GHz
- Bank A and B output frequencies are mux selectable from internal crystal oscillator, reference clock input, output divider A or output divider B
- 7 x 7 mm 48-QFN package

Product ID	Product Title	Outputs (#)	Output Type	Output Freq Range (MHz)	Input Freq (MHz)	Input Type	Output Voltage (V)	Phase Jitter Typ RMS (ps)
5P49V5901	VersaClock 5 Low Power Programmable Clock Generator	5	LVCMOS, LVPECL, HCSL, LVDS	1 - 350	1 - 350	Crystal, LVCMOS, LVPECL, LVDS, HCSL	1.8, 2.5, 3.3	0.7
5P49V5913	VersaClock 5 Low Power Programmable Clock Generator	3	LVCMOS, LVPECL, HCSL, LVDS	1 - 350	1 - 350	Crystal, LVCMOS, LVPECL, LVDS, HCSL	1.8, 2.5, 3.3	0.7
5P49V5914	VersaClock 5 Low Power Programmable Clock Generator	4	LVCMOS, LVPECL, HCSL, LVDS	1 - 350	1 - 350	Crystal, LVCMOS, LVPECL, LVDS, HCSL	1.8, 2.5, 3.3	0.7
5P49V5923	VersaClock 5 Low Power Programmable Clock Generator	3	LVCMOS	1 - 200	1 - 200	Crystal, LVCMOS, LVPECL, LVDS, HCSL	1.8, 2.5, 3.3	0.7
5P49V5925	VersaClock 5 Low Power Programmable Clock Generator	5	LVCMOS	1 - 200	1 - 200	Crystal, LVCMOS, LVPECL, LVDS, HCSL	1.8, 2.5, 3.3	0.7
5P49V5927	VersaClock 5 Low Power Programmable Clock Generator	7	LVCMOS	1 - 200	1 - 200	Crystal, LVCMOS, LVPECL, LVDS, HCSL	1.8, 2.5, 3.3	0.7
5P49V5929	VersaClock 5 Low Power Programmable Clock Generator	9	LVCMOS	1 - 200	1 - 200	Crystal, LVCMOS, LVPECL, LVDS, HCSL	1.8, 2.5, 3.3	0.7
5P49V5933	VersaClock 5 Low Power Programmable Clock Generator with Integrated Crystal	3	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 350	Crystal (integrated), HCSL, LVCMOS, LVDS, LVPECL	1.8, 2.5, 3.3	0.7
5P49V5935	VersaClock 5 Low Power Programmable Clock Generator with IntegratedCrystal	5	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 350	Crystal (integrated), HCSL, LVCMOS, LVDS, LVPECL	1.8, 2.5, 3.3	0.7
5P49V5943	VersaClock 5 Low Power Programmable Clock Generator in Reduced-size Package	3	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 350	HCSL, LVCMOS, LVDS, LVPECL	1.8, 2.5, 3.3	0.7
5P49V5944	VersaClock 5 Low Power Programmable Clock Generator in Reduced-size Package	3	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 200	Crystal, LVCMOS	1.8, 2.5, 3.3	0.7
5P49V5907	VersaClock 5 Low Power Programmable Clock Generator with Additional PCIe Outputs	8	HCSL, LP-HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 200	Crystal, LVCMOS	1.8, 2.5, 3.3	0.7
5P49V5908	VersaClock 5 Low Power Programmable Clock Generator with Additional PCIe Outputs	12	HCSL, LP-HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 350	Crystal, LVCMOS	1.8, 2.5, 3.3	0.7
5P49V6901	VersaClock 6 Low Power Programmable Clock Generator	5	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 350	Crystal, HCSL, LVCMOS, LVDS, LVPECL	1.8, 2.5, 3.3	0.5
5P49V6913	VersaClock 6 Low Power Programmable Clock Generator	3	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 350	Crystal, HCSL, LVCMOS, LVDS, LVPECL	1.8, 2.5, 3.3	0.5
5P49V6914	VersaClock 6 Low Power Programmable Clock Generator	4	HCSL, LVCMOS, LVDS, LVPECL	1 - 350	1 - 350	Crystal, HCSL, LVCMOS, LVDS, LVPECL	1.8, 2.5, 3.3	0.5
841N4830i	FemtoClock NG Crystal-to-HCSL Frequency Synthesizer	6	LVCMOS, LVPECL, HCSL	25 - 100	25	Crystal, HCSL, LVPECL, LVDS	3.3	0.34
843N252-45	FemtoClock NG Crystal-to-3.3V LVPECL Frequency Synthesizer	2	LVCMOS, LVPECL	125, 156.25	25	Crystal	3.3	0.33
8T49N241	FemtoClock NG Universal Frequency Translator	4	HCSL, LVCMOS, LVDS, LVPECL	0.008 - 1000	0.008 - 875	LVPECL, LVTTL, LVDS, LVHSTL, HCSL, LVCMOS	1.8, 2.5, 3.3	0.315

Continued next page

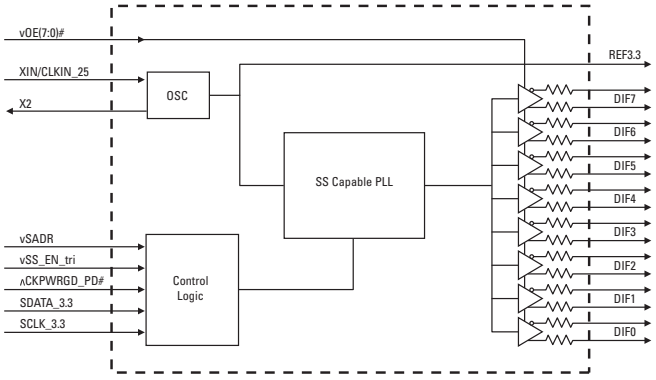
Low Jitter Clocks, continued

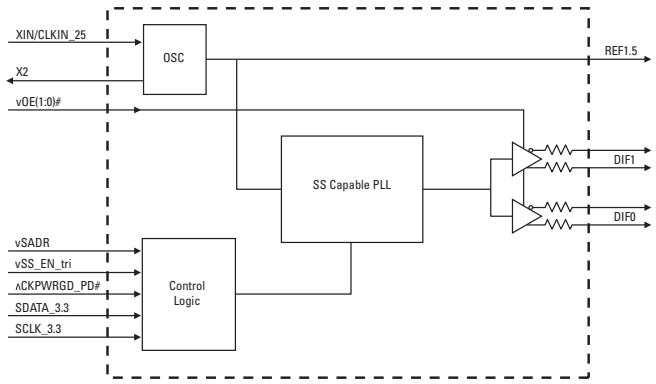
Product ID	Product Title	Outputs (#)	Output Type	Output Freq Range (MHz)	Input Freq (MHz)	Input Type	Output Voltage (V)	Phase Jitter Typ RMS (ps)
8T49N488i	FemtoClock NG Quad Universal Frequency Translator	8	LVCMOS	0.98 - 1300	0.008 - 710	LVCMOS, LVTTL, HCSL, LVHSTL, LVDS, LVPECL	2.5	0.333
8T49N524i	Programmable FemtoClock NG LVPECL/LVDS Dual 4-Output Fractional Clock Generator	8	LVPECL, LVDS	15.5 - 650, 975 - 1300	5 - 800	HCSL, LVDS, LVPECL	3.3, 2.5	0.323
82P33724	Port Synchronizer for IEEE 1588 and 10G/40G Synchronous Ethernet	11	LVCMOS, PECL, LVDS	0.000001 - 650	0.000001 - 650	LVPECL, LVDS, LVCMOS	3.3	1
82P33741	Port Synchronizer for IEEE 1588 and 10G/40G Synchronous Ethernet	11	LVCMOS, PECL, LVDS	0.000001 - 650	0.000001 - 650	LVPECL, LVDS, LVCMOS	3.3	0.25

PCI EXPRESS CLOCK GENERATORS: The PCIe data channel is a high speed serial communication interface with speeds up to 8 Gb/s, increasing to 16 Gb/s when PCIe Gen4 devices become available. As with any serial communication interface, the most critical clock parameter is phase jitter. This makes PCIe clock generators the heart of PCIe timing and the gating factor in system performance and reliability. A PCIe-based system with a lower-performance clock may completely fail to train. More insidiously, the link may train to less than the advertised throughput, or will experience many link errors thus requiring data be resent. These last two items are insidious because while the system will function, performance will be degraded due to the reduced link bandwidth.

IDT PCIe clock generators provide 1 to 8 outputs, exceeding the published PCIe specifications at each performance node, PCIe Gen1/2/3 (and soon to be Gen4). IDT also offers these high performance clock generators in 1.5 V, 1.8 V or 3.3 V versions, allowing the designer to power their PCIe clock generators from the same power supply as their FPGA or System on a Chip (SoC). The IDT PCIe Generators are offered with integrated terminations to allow direct connection of the outputs to the transmission line, thus saving significant board space.

PCI Express Clock Generators





9FGL08 8-output 3.3 V PCIe Gen1/2/3 Clock Generator

- 8 - 100 MHz Low-Power HCSL (LP-HCSL) DIF pairs
  - 9FGL0841 default Z_{OUT} = 100 Ω
  - 9FGL0851 default Z_{OUT} = 85 Ω
  - 9FGL08P1 factory programmable defaults
- 1 to 3.3 V LVCMOS REF output w/Wake-On-LAN (WOL) support
- Direct connection to 100 Ω (xx41) or 85 Ω (xx51) transmission lines; saves 32 resistors compared to standard PCIe devices
- 130 mW typical power consumption; eliminates thermal concerns
- SMBus-selectable features allows optimization to customer requirements:
- 6 x 6 mm 48-VFQFPN package

9FGU0241 – 2-output 1.5 V PCIe Gen1/2/3 Clock Generator with Zo = 100 Ω

- Direct connection to 100 Ω transmission lines; saves 16 resistors compared to standard PCIe devices
- 23 mW typical power consumption; reduced thermal concerns
- OE# pins; support DIF power management
- Programmable slew rate for each output; allows tuning for various line lengths
- Programmable output amplitude; allows tuning for various application environments
- 4 x 4 mm 24-VFQFPN package

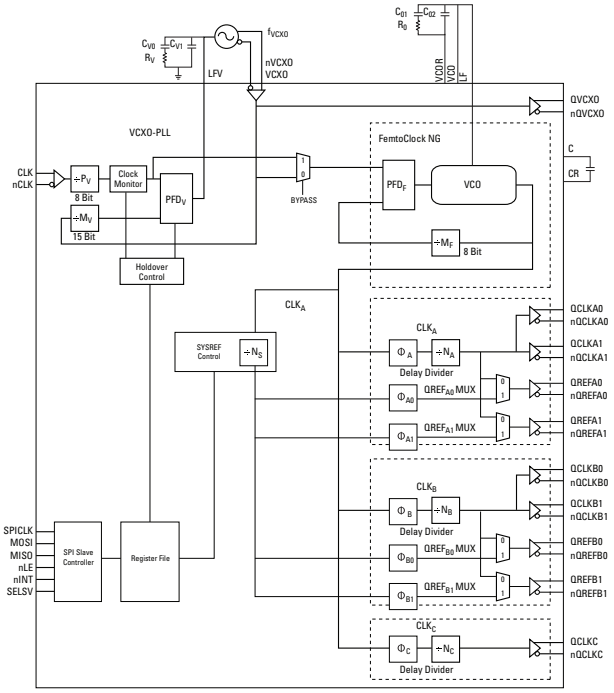
Continued next page

PCI Express Clock Generators, continued

Product ID	Product Title	Diff. Outputs	Diff. Output Signaling	Power Typ (mW)	Supply Voltage (V)	Advanced Features	Lead Count (#)	Package Area (mm^2)
9FGU0231	2-output 1.5V PCIe Gen 1/2/3 Clock Generator	2	LP-HCSL	23	1.5	Reference Output, Spread Spectrum	24	16
9FGU0241	2-output 1.5V PCIe Gen 1/2/3 Clock Generator with Zo=100 Ω	2	LP-HCSL	23	1.5	Reference Output, Spread Spectrum	24	16
9FGV0231	2-output 1.8V PCIe Gen 1/2/3 Clock Generator	2	LP-HCSL	45	1.8	Reference Output, Spread Spectrum	24	16
9FGV0241	2-output 1.8V PCIe Gen 1/2/3 Clock Generator with Zo=100 Ω	2	LP-HCSL	45	1.8	Reference Output, Spread Spectrum	24	16
9FGL02	2-output 3.3V PCIe Gen 1/2/3 Clock Generator	2	LP-HCSL	112	3.3	Reference Output, Spread Spectrum	24	16
9FGU0431	4-output 1.5V PCIe Gen 1/2/3 Clock Generator	4	LP-HCSL	39	1.5	Reference Output, Spread Spectrum	32	25
9FGU0441	4-output 1.5V PCIe Gen 1/2/3 Clock Generator with Zo=100 Ω	4	LP-HCSL	39	1.5	Reference Output, Spread Spectrum	32	25
9FGV0431	4-output 1.8V PCIe Gen 1/2/3 Clock Generator	4	LP-HCSL	58	1.8	Reference Output, Spread Spectrum	32	25
9FGV0441	4-output 1.8V PCIe Gen 1/2/3 Clock Generator with Zo=100 Ω	4	LP-HCSL	58	1.8	Reference Output, Spread Spectrum	32	25
9FGL04	4-output 3.3V PCIe Gen 1/2/3 Clock Generator	4	LP-HCSL	142	3.3	Reference Output, Spread Spectrum	32	25
9FGU0631	6-output 1.5V PCIe Gen 1/2/3 Clock Generator	6	LP-HCSL	45	1.5	Reference Output, Spread Spectrum	40	25
9FGU0641	6-output 1.5V PCIe Gen 1/2/3 Clock Generator with Zo=100 Ω	6	LP-HCSL	45	1.5	Reference Output, Spread Spectrum	40	25
9FGV0631	6-output 1.8V PCIe Gen 1/2/3 Clock Generator	6	LP-HCSL	54	1.8	Reference Output, Spread Spectrum	40	25
9FGV0641	6-output 1.8V PCIeGen 1/2/3 Clock Generator with Zo=100 Ω	6	LP-HCSL	54	1.8	Reference Output, Spread Spectrum	40	25
9FGL06	6-output 3.3V PCIe Gen 1/2/3 Clock Generator	6	LP-HCSL	78	3.3	Reference Output, Spread Spectrum	40	25
9FGU0831	8-output 1.5V PCIe Gen 1/2/3 Clock Generator	8	LP-HCSL	50	1.5	Reference Output, Spread Spectrum	48	36
9FGU0841	8-output 1.5V PCIe Gen 1/2/3 Clock Generator with Zo=100 Ω	8	LP-HCSL	50	1.5	Reference Output, Spread Spectrum	48	36
9FGV0831	8-output 1.8V PCIe Gen 1/2/3 Clock Generator	8	LP-HCSL	62	1.8	Reference Output, Spread Spectrum	48	36
9FGV0841	8-output 1.8V PCIe Gen 1/2/3 Clock Generator with Zo=100 Ω	8	LP-HCSL	62	1.8	Reference Output, Spread Spectrum	48	36
9FGL08	8-ouput 3.3V PCIe Gen 1/2/3 Clock Generator	8	LP-HCSL	100	3.3	Reference Output, Spread Spectrum	48	36

IDT'S LEADING RF CLOCK AND JESD204B CLOCK PORTFOLIO consists of devices designed for exceptional jitter performance (lowest phase noise). The RF-PLL-based clock devices support RF frequency generation, jitter attenuation, as well as frequency and phase manipulation. RF buffers with very low additive phase noise complement the RF-PLL clock generators with signal fanout functions. RF dividers perform frequency conversion. Specific RF clock devices are optimized for JESD204B standard. Output signaling levels supported by the RF buffers, RF dividers, RF-PLL oscillators devices as well as JESD204B clocks include LVPECL and LVDS.

RF Converter Clocks



8V19N407-24 FemtoClock NG Jitter Attenuator and Clock Synthesizer

- Cleans input jitter from any digital clock source with a performance of <100 fs RMS phase noise (12 kHz to 20 MHz)
- Flexible JESD204B timing source with single and dual VCO device options that offer a wide range of output frequencies
- Meets stringent phase noise requirements of converters and high-speed PHYs
- Up to 2.94912 GHz clock speeds
- Target applications include wireless infrastructure radio and base-band clocking, JESD204B converter clock and SYSREF signals, 10/40/100/400 GbE line cards
- 10 mm x 10 mm 72-VFQFN package

Product ID	Product Title	Outputs (#)	Inputs (#)	Input Freq (MHz)	Output Freq Range (MHz)	Frequency Plan	Output Skew (ps)	Output Type	Supply Voltage (V)
844S42i	Dual Output RF Frequency Synthesizer	2	2	16	81 - 2592	2500.0 / Output_divider	15	LVDS, LVPECL	3.3
8V19N407Z-19	FemtoClock NG Jitter Attenuator & Clock Synthesizer	10	1	0.01 - 250	19.792 - 2000	1920.0 / Output_divider, 1966.08 / Output_divider	65	LVDS, LVPECL	3.3
8V19N407Z-24	FemtoClock NG Jitter Attenuator & Clock Synthesizer	10	1	0.01 - 250	25 - 2500	2457.6 / Output_divider, 2500.0 / Output_divider	65	LVDS, LVPECL	3.3
8V19N408	FemtoClock NG Jitter Attenuator & Clock Synthesizer	10	1	0.01 - 250	25 -2949.12	2457.6 / Output_divider, 2500.0 / Output_divider, 2949.12 / Output_divider	65	LVDS, LVPECL	3.3

IDT's Timing Commander™ is an innovative Windows™-based software platform enabling system design engineers to configure, program, and monitor sophisticated timing devices with an intuitive and flexible graphical user interface.

The support tool empowers customers to expedite development cycles and optimize the configuration of IDT's industry-leading clocking solutions.

User-Friendly 'Personalities'

The Timing Commander platform is designed to serve user-friendly configuration interfaces, known as personalities, for various IDT products and product families. With a few simple clicks, the user is presented with a comprehensive, interactive block diagram offering the ability to modify desired input values, output values, and other configuration settings. The software automatically makes calculations, reports status monitors, and prepares register settings without the need to reference a datasheet. The tool also automatically loads the configuration settings over USB to an IDT evaluation board for immediate application in the circuit. Once the device has been configured and tuned for optimal system performance, the configuration file can be saved for factory-level programming prior to shipment.

Software Functionality

The Timing Commander software allows users to zoom in and out of a device's block diagram, and to click on various blocks to learn more about their functions and toggle key parameters. Hovering over input fields provides detailed information about the field without the need to reference the datasheet, while a fractional input syntax avoids issues with infinite decimals. Additional functionality includes the ability to protect input fields once they've been set, and directly view and modify register settings individually or collectively as desired for ultimate flexibility. Device-dependent advanced features include the ability to generate phase noise plots, generate the schematic symbol and termination circuit, and calculate estimated power consumption.