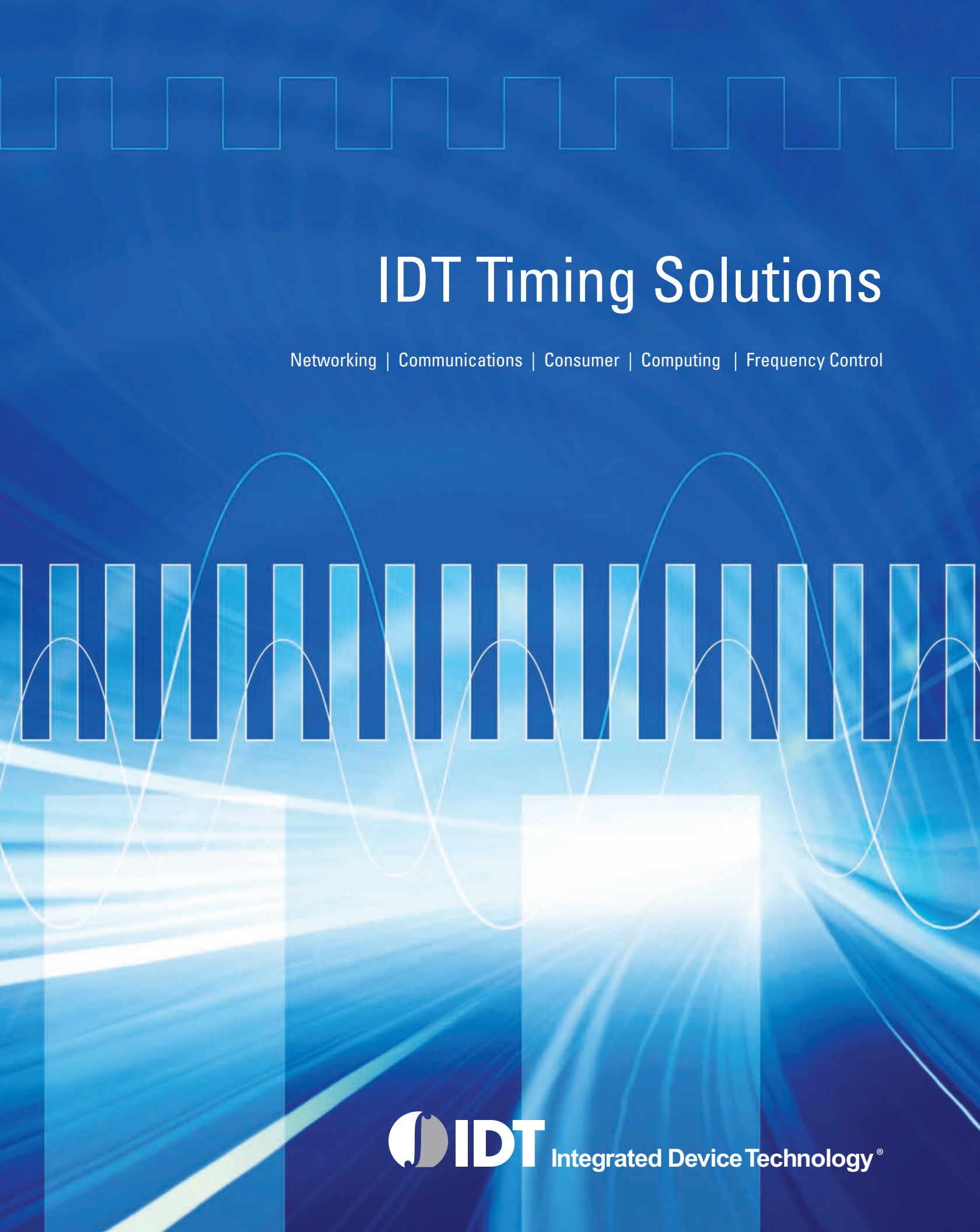
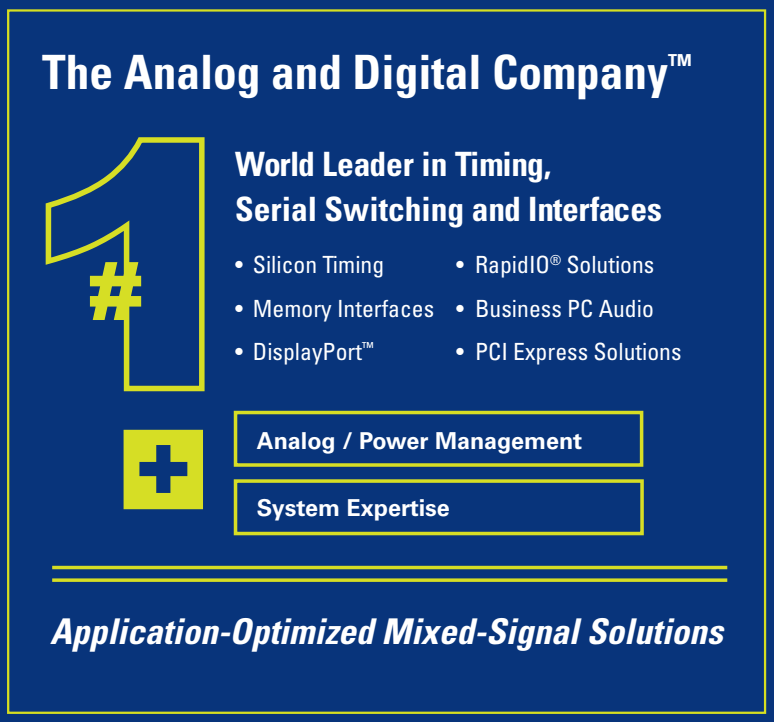

IDT Timing Solutions
Networking | Communications | Consumer | Computing | Frequency Control
IDT Integrated Device Technology®

IDT is the world's No. 1 provider of silicon timing devices and offers the industry's broadest silicon timing product portfolio for Networking and Communications, Consumer, and Computing applications. With a market share that encompasses 25% of the available silicon timing products and a portfolio that is 10 times greater than the nearest competitor, IDT is in a unique position to address your timing needs. IDT is the industry's only 'one-stop-shop' for timing, including RF and WAN PLLs, VCXO/VCSO, synthesizers, buffers, frequency translators and crystal oscillator replacements.



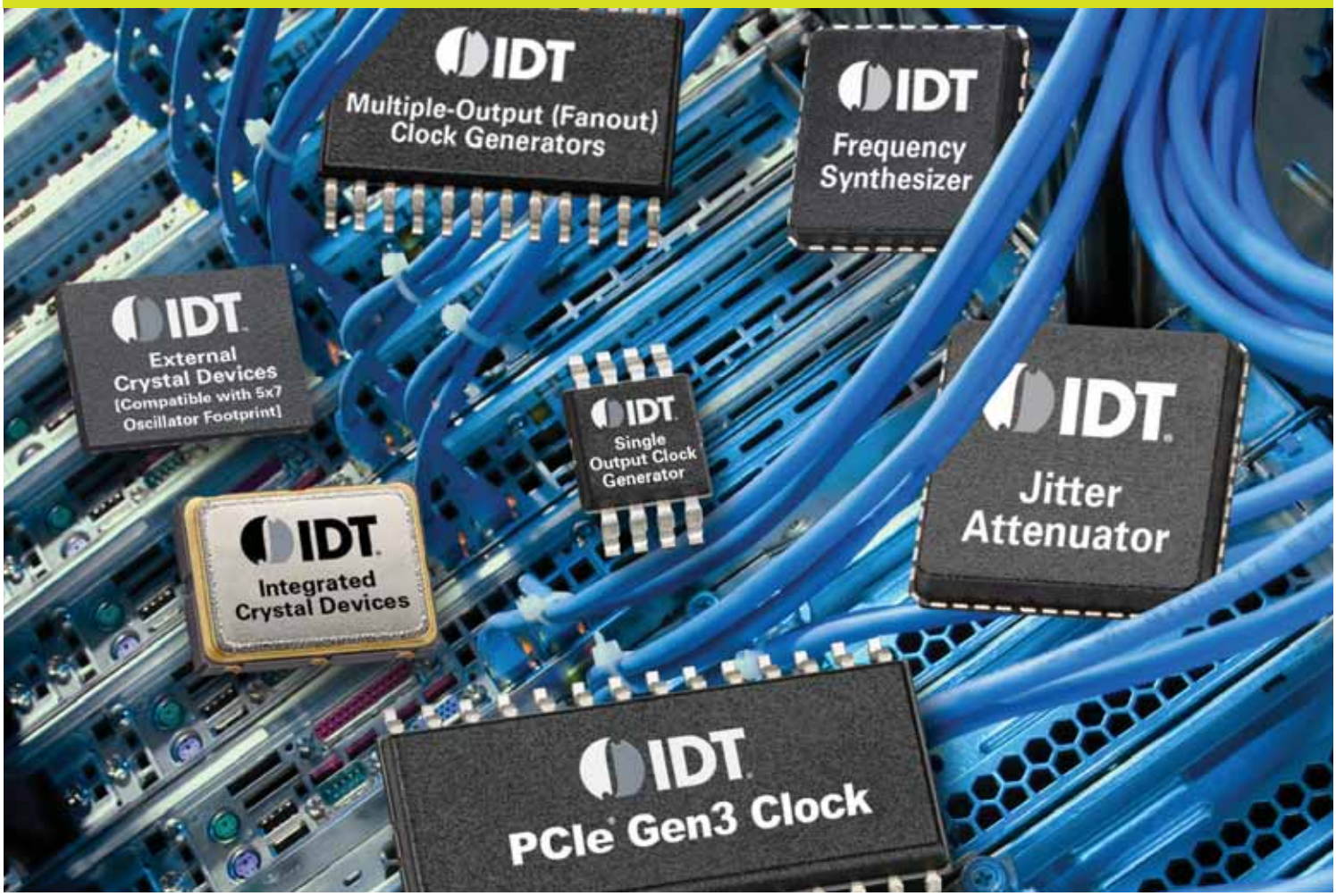
Networking/Communications Timing Solutions

Consumer Timing Solutions

Computing Timing Solutions

Frequency Control (Crystal/ Crystal Oscillator Replacements)

Timing Reference Designs



Networking / Communications Clocking Solutions

IDT Networking/Communications high performance silicon and SAW timing devices deliver exceptional flexibility and dependability, backed by expert service and worldwide support.

Introduction

Designers of today's enterprise class networking, communications and advanced computing systems have created the demand for high performance, ultra-dependable clock devices that ensure low jitter, phase noise and skew with minimal variation.

IDT meets this demand with its highest performing clock devices developed to the exacting specifications of the networking and communications industries.

IDT Networking/Communications Solutions: Robust, Flexible and Reliable

IDT Networking and Communications high performance clocking devices are the choice of advanced system designers seeking top performance, versatility, selection and value. Featuring over 1,000 silicon timing products, the IDT portfolio is the industry's largest, offering end-to-end solutions for complete network design.

An industry leader in timing device development, IDT is acclaimed for breakthrough products such as its FemtoClock® family, the largest array of general-purpose and application optimized sub-1 picosecond (ps) phase noise clock synthesizers.

All devices are field proven and compliant with IEEE, Telcordia, ITU, DOCSIS, JEDEC and other relevant standards to ensure high quality, customer confidence and swift time to market. Wafer fabrication, packaging and quality remain stable over time, providing long term availability.

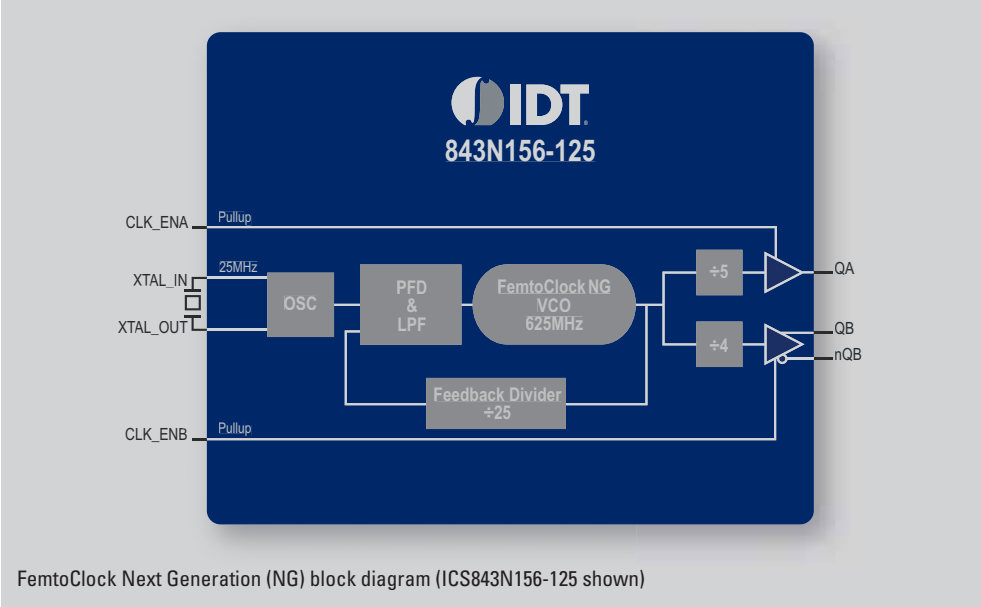
IDT support professionals provide in-depth application and systems understanding for all of your complex timing needs. Customers can depend on complete clock tree support and service from concept, architecting and prototyping to production and beyond.

Clock Sources

- FemtoClock NG Devices
- FemtoClock® Devices
- FemtoClock Universal Frequency Translators
- General-Purpose Synthesizers
- VCSO Modules

FemtoClock® Next Generation (NG)

IDT extends it technical leadership in high-performance clocking. Extending on the success of the FemtoClock products, NG is a new family of products with less than 0.5ps of RMS phase noise jitter.



FemtoClock Next Generation (NG) block diagram (ICS843N156-125 shown)

Leveraging the technology from IDT's incredibly successful line of FemtoClock frequency synthesizers, IDT has introduced the Next Generation (NG) family of FemtoClock devices, improving the performance and flexibility even more. These flexible frequency synthesizers provide extremely low jitter and improved power-supply noise rejection for high-performance networking and telecommunications applications.

This new family of clock synthesizers features very low phase-noise performance and significantly improved power-supply noise rejection, allowing for increased bandwidth when used with serial interfaces. The new FemtoClocks are fully customizable, stand-alone solutions that generate reference frequencies allowing them to replace crystal and SAW oscillators in high-performance applications. Additionally, the new FemtoClocks provide greater design flexibility in networking and telecommunications applications that utilize 10 Gigabit Ethernet, PCI Express, Fibre Channel and SONET interfaces by enabling multiple oscillators to be replaced with a single FemtoClock.

As with previous-generation FemtoClocks, the new IDT timing solutions are designed to work in conjunction with other devices on the board that require a reference clock, such as PHYs, switches, ASICs and network processors. The result of this cohesive nature between devices is a simplified board design and layout, as well as improved time-to-market. Moreover, the family meets the specification requirements of all interface standards, such as 10 Gigabit Ethernet, PCI Express, Fibre Channel and SONET.

The first device offered in this family, the 843N156-125, generates a 125MHz single-ended output and a 156.25MHz LVPECL output from a single 25MHz crystal. This replaces two crystal oscillators on the board with one device, providing application architects with increased design flexibility. The typical root-mean-square (RMS) phase noise jitter for both frequencies is 400fS, making these perfect for PCIe, Gigabit Ethernet and 10 Gigabit Ethernet applications, since it gives designers ample margin in their designs to meet the jitter requirements of these standards. Additional FemtoClock NG members will feature output frequencies of up to 1.3GHz, providing integrated silicon solutions with short lead times when compared to crystal and SAW oscillators.

PRODUCTS

- 8-pin TSSOP Family
- 10-pin QFN external crystal 4-frequency family
- Multi-output and multi-frequency families

BENEFITS / FEATURES

- <500 fs RMS phase noise jitter
- Improved power-supply noise rejection
- Flexible frequency selection
- Programmability

Part Number	# of Outputs	Output Type	Output Frequency (MHz)	# of Inputs	Input Type	Output Voltage (V)	Output Banks	RMS Phase Jitter (ps)
83PN148I	1	LVPECL	54 - 148.5	1	Crystal	3.3, 2.5	1	0.33
83PN156I	1	LVPECL	100 - 156.25	1	Crystal	3.3, 2.5	1	0.35
83PN187I	1	LVPECL	125 - 187.5	1	Crystal	3.3, 2.5	1	0.34
83PN625I	1	LVPECL	156.25 - 625	1	Crystal	3.3, 2.5	1	0.35
843N571	10	LVCMOS, LVPECL	25 - 156.25	2	LVCMOS, Crystal	3.3	5	0.28
843N252-45	2	LVCMOS, LVPECL	125, 156.25	1	Crystal	3.3	2	0.33
849N2505	4	LVPECL or LVDS	25 - 156.25	2	Differential, Crystal	3.3	2	0.33
844N255	6	LVDS	25 156.25	2	Crystal, LVCMOS	2.5V	5	0.27
841N4830	6	HCSL, LVPECL, LVCMOS	50 100	2	Crystal, Differential	3.3V	3	0.34

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

FemtoClock® Devices

The largest array of sub-1 picosecond (ps) phase noise devices in the clocking industry lets designers choose their ideal solution

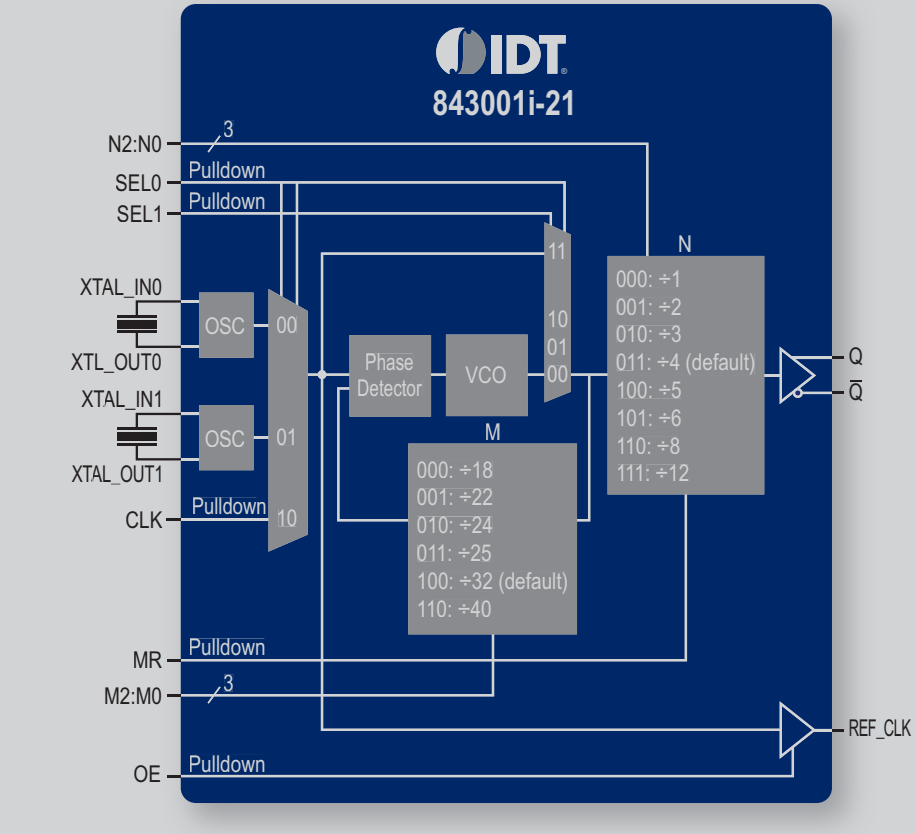
FUNCTIONS

IDT FemtoClock devices deliver integrated clock tree functions unavailable in traditional, fixed frequency oscillators:

- Multiple outputs or output styles
- Multiple frequencies produced from a single device
- Frequency margining (under-clocking and over-clocking in small percentage steps)
- Spread spectrum clocking for EMI reduction

BENEFITS / FEATURES

- Lower cost than oscillators
- Shorter lead time than oscillators
- Reduced part count



Typical FemtoClock block diagram (843001i-21 shown)

IDT FemtoClock devices are advanced clock frequency synthesizers employing a simple, low cost, fundamental-mode quartz crystal as the low frequency reference from which they synthesize high quality, high frequency clock signals. Yielding phase noise jitter of less than 1 picosecond (ps) RMS, they are ideal reference clocks for almost any jitter-sensitive application.

FemtoClocks provide output clocks up to 800 MHz. Often used to replace third overtone and high frequency fundamental (HFF, inverted mesa) crystal oscillators or expensive surface acoustic wave (SAW) oscillators traditionally used to generate high frequency clock signals, they are more reliable, cost less, and are more readily available. Unlike fixed frequency oscillators, FemtoClocks are a frequency-synthesis technology capable of multiple clock frequencies and more flexibility in any application. Because FemtoClocks are silicon IC-based clock devices, additional clock tree functions unavailable in a single function fixed frequency oscillator can be integrated into a single device.

The IDT FemtoClock family delivers a wide range of device packages and capabilities, starting with small 8-pin TSSOP devices that provide one clean, low jitter clock signal. Also available are devices with more integrated functions, multiple outputs, multiple frequencies and other more complex programmable synthesis functions. While generally optimized for synthesizing reference clock frequencies commonly used in communication applications, there are also a variety of FemtoClock devices with frequencies useful for CPU, memory, logic and other general-purpose clocking applications, including:

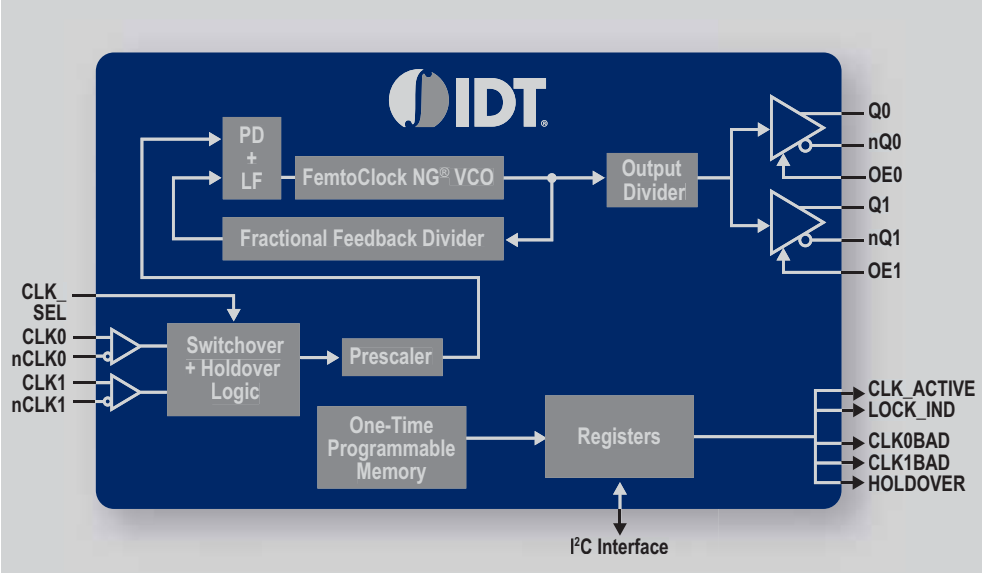
- ASICs, DSPs, CPUs and memory
- Communication (including SONET/SDH and SPI4.2)
- HDTV Video
- Networking (including 1 Gb, 10 Gb, XAUI and 12 Gb Ethernet)
- PCI Express®
- SERDES and PHY Reference Clocks
- Serial Storage (SAS, SATA, Fibre Channel 4, 8 and 10 Gb)
- Wireless Infrastructure (including CPRI, RP3)

Part Number	# of Outputs	Output Type	Output Frequency (MHz)	# of Inputs	Input Type	Output Voltage (V)	Output Banks	RMS Phase Jitter (ps)
840002	2	LVCMOS	53.125 - 212.5	2	LVCMOS, Crystal	3.3, 2.5	1	0.83
840004	4	LVCMOS	53.125 - 212.5	2	LVCMOS, Crystal	3.3, 2.5	1	0.49
840011	1	LVCMOS	100, 106.25	1	Crystal	3.3	1	0.78
840021	1	LVCMOS	125	1	Crystal	3.3	1	0.34
840051	1	LVCMOS	75 - 161.13	1	Crystal	3.3	1	0.48
842023	1	HSTL	250	1	Crystal	3.3, 2.5	1	0.36
843001	1	LVPECL	106.25, 187.5, 212.5	1	Crystal	3.3	1	0.74
843002	2	LVPECL	53.125 - 212.5	2	LVCMOS, Crystal	3.3, 2.5	1	0.72
843003	3	LVPECL	125 - 625	2	LVCMOS, Crystal	3.3	2	0.51
843004	4	LVPECL	53.125 - 212.5	2	LVCMOS, Crystal	3.3	1	0.72
843011	1	LVPECL	100, 106.25	1	Crystal	3.3	1	0.8
843022	1	LVPECL	62.5, 125	1	Crystal	3.3	1	0.39
843023	1	LVPECL	250	1	Crystal	3.3	1	0.39
843241	1	LVPECL	75 - 300	1	Crystal	3.3, 2.5	1	0.7
843252	2	LVPECL	62.5 - 625	1	Crystal	3.3	2	0.47
844001	1	LVDS	106.25, 187.5, 212.5	1	Crystal	3.3, 2.5	1	0.74
844002	2	LVDS	53.125 - 212.5	2	LVCMOS, Crystal	3.3, 2.5	1	0.65
844071	1	LVDS	75 - 159.375	1	Crystal	3.3, 2.5	1	0.45
844256	6	LVDS	62.5 - 625	1	Crystal	3.3, 2.5	1	0.43
810001-21	1	LVCMOS	26 - 175	2	LVCMOS	3.3	1	1.089
810001-22	1	LVCMOS	26 - 175	2	LVCMOS	3.3	1	1.01
813001I	1	LVPECL	40.83 - 640	4	LVCMOS, Differential, Crystal	3.3, 2.5	1	0.84
813321-04	1	LVPECL	155.52, 156.25	1	Crystal	3.3, 2.5	1	0.53
83PR226I-01	1	LVPECL	100 - 212.5	1	Crystal	3.3	1	0.47
840001-34	2	LVCMOS	100 - 212.5	1	Crystal	3.3, 2.5	1	0.38
840001I-25	1	LVCMOS	25 - 156.25	1	LVCMOS	3.3, 2.5	1	0.36
840001I-34	1	LVCMOS	100 - 212.5	1	Crystal	3.3, 2.5	1	0.38
840002-01	2	LVCMOS	62.5 - 156.25	2	LVCMOS, Crystal	3.3, 2.5	1	0.47
840002I	2	LVCMOS	53.125 - 212.5	2	LVCMOS, Crystal	3.3, 2.5	1	0.83
840002I-01	2	LVCMOS	62.5 - 156.25	2	LVCMOS, Crystal	3.3, 2.5	1	0.47
840004-01	4	LVCMOS	62.5 - 156.25	2	LVCMOS, Crystal	3.3, 2.5	1	0.52
840004-11	4	LVCMOS	62.5, 125	1	Crystal	3.3	1	0.7
840004I-01	4	LVCMOS	62.5 - 156.25	2	LVCMOS, Crystal	3.3, 2.5	1	0.52
840021I	1	LVCMOS	125	1	Crystal	3.3, 2.5	1	0.34
840022I-02	1	LVCMOS	62.5, 125	1	Crystal	3.3, 2.5	1	0.57
840031I	1	LVCMOS	98.304	1	Crystal	3.3, 2.5,1.8	1	0.75
840051I	1	LVCMOS	140_170	1	Crystal	3.3	1	0.48
8402015I	10	LVCMOS, LVDS	25, 50, 125	1	Crystal	3.3	4	0.37

Part Number	# of Outputs	Output Type	Output Frequency (MHz)	# of Inputs	Input Type	Output Voltage (V)	Output Banks	RMS Phase Jitter (ps)
840304I	5	LVCMOS	25, 33.3 - 133.3	2	LVCMOS, Crystal	3.3, 2.5	1	0.46
841604I	4	HCSL	100, 125	2	LVCMOS, Crystal	3.3	1	0.45
841604I-01	4	HCSL	100, 125	2	LVCMOS, Crystal	3.3	1	0.5
841654I	5	LVCMOS, HCSL	25, 100, 125	2	LVCMOS, Crystal	3.3	2	0.44
841664I	5	LVCMOS, HCSL	25, 125, 156.25	2	LVCMOS, Crystal	3.3	2	0.45
8421002I-01	2	HSTL	62.5 - 156.25	2	LVCMOS, Crystal	3.3, 1.8	1	0.44
843001I-23	1	LVPECL / LVCMOS	25, 75 - 625	3	LVCMOS, Crystal	3.3	1	0.9
843002-01	2	LVPECL	62.5, 125, 156.25	2	LVCMOS, Crystal	3.3	1	0.54
843002I-01	2	LVPECL	62.5 - 156.25	2	LVCMOS, Crystal	3.3, 2.5	1	0.55
843004-125	4	LVPECL	125	2	LVCMOS, Crystal	3.3	1	0.58
843004I-01	4	LVPECL	62.5 - 156.25	2	LVCMOS, Crystal	3.3, 2.5	1	0.54
843004I-04	4	LVPECL	155.52, 622.08	2	LVCMOS, Crystal	3.3	1	0.57
843020-01	1	LVPECL	70 - 680	2	LVCMOS, Crystal	3.3	1	0.49
843021I-01	1	LVPECL	125	1	Crystal	3.3, 2.5	1	0.41
843022I-02	1	LVPECL	62.5, 125	1	Crystal	3.3, 2.5	1	0.57
843022I-48	1	LVPECL	75, 125	1	Crystal	3.3, 2.5	1	0.72
843023I	1	LVPECL	250	1	Crystal	3.3, 2.5	1	0.39
8430252-45	2	LVCMOS, LVPECL	125, 156.25	1	Crystal	3.3	1	0.39
843031-01	2	LVPECL	312.5	1	Crystal	3.3, 2.5	1	0.46
843031I-01	1	LVPECL	312.5	1	Crystal	3.3, 2.5	1	0.46
843034-01	2	LVPECL	30 - 640	4	LVCMOS, Differential, Crystal	3.3, 2.5	2	0.61
843156I	10	LVPECL	156.25	2	LVCMOS, Crystal	3.3, 2.5	3	0.39
843204I	4	LVPECL	155.52, 156.25	4	LVCMOS, Crystal	3.3	4	0.98
843204I-01	4	LVPECL	155.52, 156.25	4	LVCMOS, Differential, Crystal	3.3	4	0.7
843207-350	7	LVPECL	87.5, 175, 350	2	LVCMOS, Crystal	3.3	7	1.48
843251-04	1	LVPECL	150 - 187.5	1	Crystal	3.3	1	0.39
843251I-12	1	LVPECL	312.5, 625	1	Crystal	3.3	1	0.36
843251I-14	1	LVPECL	156.25, 625, 666.6	1	Crystal	3.3, 2.5	1	0.49
843252-04	2	LVPECL	150 - 187.5	2	LVCMOS, Crystal	3.3	1	0.39
844002I-01	2	LVDS	62.5 - 156.25	2	LVCMOS, Crystal	2.5	1	0.41
844003-01	3	LVDS	62.5 - 625	2	LVCMOS, Crystal	3.3	2	0.56
844003BI-01	3	LVDS	62.5 - 625	2	LVCMOS, Crystal	3.3	2	0.56
844003I-02	3	LVDS	62.5 - 625	2	LVCMOS, Crystal	3.3	2	0.5
844004I-04	4	LVDS	155.52, 622.08	2	LVCMOS, Crystal	3.3	4	0.51
8440259D-45	9	LVCMOS, LVDS	3.9, 125, 156.25	2	LVCMOS, Crystal	3.3	3	0.34
844201I-45	1	LVDS	100, 125	1	Crystal	3.3, 2.5	1	0.77
844251I-15	1	LVDS	125 - 666.6	1	Crystal	3.3, 2.5	1	0.46
844252-04	2	LVDS	150 - 187.5	2	Crystal	3.3	1	0.36
845254I	4	CML	50 - 312.5	2	LVCMOS, Crystal	3.3	1	0.4

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

FemtoClock® NG Universal Frequency Translators



FUNCTIONS

IDT FemtoClock NG Universal Frequency Translator products offer:

- Frequency synthesis
- High-bandwidth frequency translation
- Low-bandwidth frequency translation and jitter attenuation

BENEFITS / FEATURES

- Fully programmable clock source
- Any frequency in to any frequency out
- Input frequency range: 8 kHz to 710 MHz
- Output frequency range: 1 MHz to 1300 MHz
- Two clock inputs with automatic hitless switching
- Two outputs, supporting single-ended, LVPECL or LVDS levels
- On-die non-volatile memory allows device to be fully functional at power-up without requiring complicated user programming
- Very low RMS jitter on all outputs
- I²C programming interface
- -40 C to +85 C temperature range
- 40-Lead VFQFN package, 6x6 mm
- Available in Lead-Free (RoHS 6) package

IDT FemtoClock® NG Universal Frequency Translators (UFT) cover all your frequency synthesis and translation needs. As a frequency synthesizer, a low-cost, readily-available fundamental-mode crystal can be used to generate any output frequency from 1MHz to 1.3GHz. The internal architecture of the device allows any frequency of crystal from 16MHz to 40MHz to be used regardless of the frequency desired.

As a frequency translator, this family of devices accepts 1 or 2 input reference clocks from 8 kHz to 710 MHz, switching between them as necessary and generates any output frequency from 1 MHz to 1.3 GHz with no frequency translation error in most cases. Two different pin-selectable configurations may be pre-loaded into the internal One-Time Programmable (OTP) non-volatile memory for automatic operation directly from power-up, or an I²C serial interface can be used to set the desired configurations.

In addition to a crystal input, the UFT features two clock inputs and provides two copies of the output frequency. Each output is individually programmable as LVPECL or LVDS. Versions of the UFT with single-ended outputs are also available. Selection between the two input references may be performed manually via either pin or register, or it may be performed automatically with revertive or non-revertive recovery.

Frequency Synthesizer Mode

Frequency Synthesizer Mode allows an arbitrary output frequency to be generated from a fundamental mode crystal input. The PLL feedback loop supports a second-order delta-sigma fractional feedback divider. This allows the VCO operating frequency to be a non-integer multiple of the crystal frequency.

High-Bandwidth Frequency Translator Mode

High-Bandwidth Frequency Translator Mode is used to translate one or two input clocks of the same nominal frequency into a specified output frequency, attenuating cycle-to-cycle jitter. As seen in the figure, only the High-Bandwidth PLL loop is used. A pre-divider stage is available, enabling input frequencies up to 710 MHz.

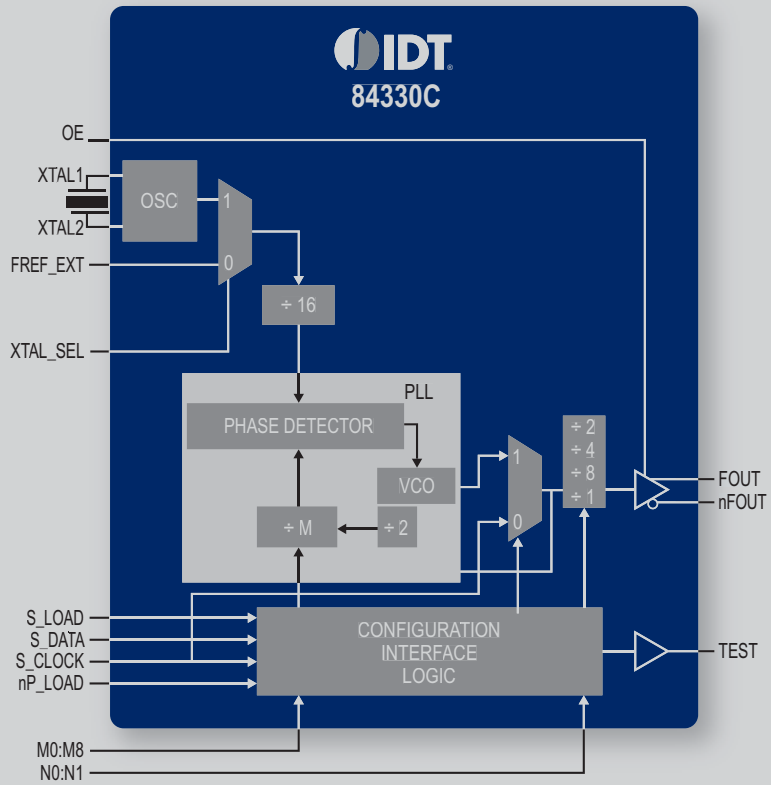
Low-Bandwidth Frequency Translator Mode (Jitter Attenuator Mode)

Low-Bandwidth Frequency Translator Mode involves two PLL loops and is typically used to achieve large output-to-input frequency translation ratios. The Low-Bandwidth PLL loop drives a digitally controlled crystal oscillator (DCXO) loop via an analog-to-digital converter. The phase detector is optimized to work with frequencies starting at 8 kHz. An external low-pass filter can be used.

Part Number	# of Outputs	Output type	Output Frequency (MHz)	Output Dividers	Input type	Input Frequency	Xtal	Output Voltage (V)	RMS Phase Jitter (ps)
849N202	2	LVDS, LVPECL	1 1300	Common for both	LVPECL, LVDS, LVHSTL, HCSL	8kHz 710MHz	Fundamental	2.5, 3.3	0.32
849N212	2	LVPECL/LVDS, LVCMOS	1 250	Common for both		8kHz 710MHz	Fundamental	2.5, 3.3	0.38
8T49N203	2	LVDS, LVPECL	1 1300	Common for both		8kHz 710MHz	Fundamental	2.5, 3.3	0.28
8T49N222	2	LVDS, LVPECL	1 1300	Independent		8kHz 710MHz	Fundamental	2.5, 3.3	0.31
8T49N205	2	LVDS, LVPECL	1 1300	Common for both		8kHz 710MHz	Fundamental	2.5, 3.3	0.32
8T49N488	8	LVDS, LVPECL	1 1300	4 Independent		8kHz 710MHz	Fundamental	2.5, 3.3	0.37

General Purpose Synthesizers

Designers can frequency tune and ease component management, using fewer device part numbers for more boards and applications



Typical frequency synthesizer (84330C shown)

General purpose synthesizers are asynchronous clock sources with output frequencies readily selected with very high resolution (very small frequency steps). They use a simple, low cost, fundamental-mode quartz crystal as the frequency reference, from which they synthesize low-jitter output clocks. Allowing on-the-fly configuration of the output frequency through either a parallel or serial interface, these flexible synthesizers support many wide frequency, low jitter clocking applications.

IDT CMOS synthesizers support frequencies up to 800 MHz, while our new ICs using SiGe technology support frequencies up to 3 GHz. Unlike many other frequency synthesis technologies, IDT synthesizers use a proprietary PLL architecture that simultaneously provides low jitter performance with a wide frequency range. Using silicon device integration techniques, they offer more functionality than fixed-frequency oscillators.

Designers can choose from a wide range of clock I/Os. Differential standards such as LVPECL, LVDS, HSTL, HCSL and CML are supported. For frequencies lower than 250 MHz, single-ended LVCMOS is available. Typically, IDT synthesizers use 2.5V or 3.3V supplies and are available in commercial and industrial temperature ranges.

The wide range of frequencies each device can cover and the flexibility and capability of each function make these synthesizers suitable for almost any general purpose, low-jitter application. They are often used to clock ASICs, CPUs and DSPs, as well as memory and logic, in applications ranging from high performance computing, storage, networking, communications and professional video.

FUNCTIONS

IDT Networking/ Communications general purpose synthesizers offer:

- Single and multiple frequencies
- Integrated fan-out
- Integer and fractional feedback architectures
- Spread spectrum and PLL lock indication

BENEFITS / FEATURES

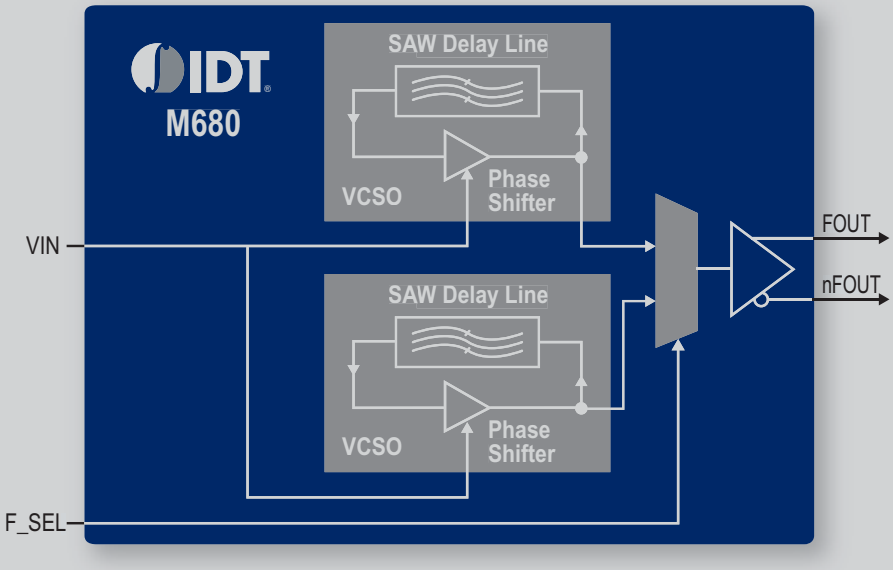
- Large range of output frequencies with high resolution programmability
- Available in multiple output styles

Part Number	Output Type	# of Outputs	Output Frequency (MHz)	Output Voltage (V)	Output Banks	C-C Jitter Max (ps)	Input Type	# of Inputs
8402	LVCMOS	2	125 - 350	3.3, 2.5	1	80	LVCMOS, Crystal	2
8442	LVDS	2	250 - 700	3.3, 2.5	1	45	LVCMOS, Crystal	2
84021	LVCMOS	2	206 - 260	3.3, 2.5,1.8	1	n/a	LVCMOS, Crystal	2
84314	LVPECL	4	125 - 350	3.3, 2.5	1	35	LVCMOS, Crystal	2
8402I	LVCMOS	2	125 - 350	3.3, 2.5	1	100	LVCMOS, Crystal	2
840S07I	LVCMOS	5	33.3 - 166.6	3.3, 2.5	3	90	LVCMOS, Crystal	2
841S012DI	LVCMOS, HCSL	10	25 - 166.6	3.3	3	65	LVCMOS, Crystal	2
8427-02	LVHSTL	6	250 - 500	1.8	1	50	LVCMOS, Crystal	2
842S02	HSTL	2	485 - 1125	3.3, 2.5	1	30	Differential	1
8430I-61	LVPECL	2	250 - 500	3.3, 2.5	1	100	LVCMOS, Crystal	2
8431-21	LVPECL	1	125 - 350	3.3	1	30	Crystal	1
84314-02	LVPECL	4	250 - 700	3.3, 2.5	1	60	LVCMOS, Crystal	2
84320I-01	LVPECL	2	620 - 780	3.3	1	n/a	LVCMOS, Crystal	2
8432-111	LVPECL	2	250 - 700	3.3	2	40	Differential	2
84321I	LVPECL	2	206.7 - 260	3.3	1	n/a	LVCMOS, Crystal	2
84329-01	LVPECL	1	200 - 700	3.3	1	35	LVCMOS, Crystal	2
8432I-101	LVPECL	2	250 - 700	3.3	1	25	LVCMOS, Differential	2
8432I-51	LVPECL	2	250 - 700	3.3	1	40	LVCMOS	1
84330-03	LVPECL	2	250 - 700	3.3	2	40	LVCMOS, Crystal	2
84330C	LVPECL	1	250 - 700	3.3	1	40	LVCMOS, Crystal	2
843S104I-133	LVPECL	4	133.33	3.3	1	n/a	Differential, Crystal	2
843S1066	LVPECL	1	1066.66, 1600	3.3	1	25	Crystal	1
843S1333	LVPECL	1	1333.33	3.3	1	25	Crystal	1
8442I	LVDS	2	250 - 700	3.3, 2.5	1	45	LVCMOS	1
844S012I-01	LVCMOS, LVDS	10	25 - 166.6	3.3	3	50	LVCMOS, Crystal	2
844S42I	LVPECL, LVDS	2	1296 - 2592	3.3	2	25	LVCMOS	1
MPC9229	LVPECL	1	200 - 400	3.3	1	90	Crystal	1
MPC9230	LVPECL	1	400 - 800	3.3	1	80	LVCMOS, Crystal	2
MPC92432	LVPECL	2	680 - 1360	3.3	2	15	LVCMOS, Crystal	2
MPC92433	LVPECL	2	680 - 1428	3.3	2	15	LVCMOS, Crystal	2
MPC92439	LVPECL	1	400 - 900	3.3	1	12	LVCMOS, Crystal	2
MPC92469	LVPECL	1	200 - 400	3.3	1	50	LVCMOS, Crystal	2

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

VCSO Modules

Delivering ultra low phase noise and stable high frequency operation



Typical voltage controlled SAW oscillator (M680 shown)

IDT offers a family of ultra-low jitter Voltage Controlled SAW Oscillator (VCSO) solutions geared towards today's most demanding optical platforms. Single or dual frequency VCSO solutions are available in 5x7.5mm hermetically sealed, ceramic surface mount or 9mm x 14mm j-lead type packages, while PLL based VCSOs are available in 9mm x 9mm SMT packages.

The high-Q quartz SAW delay lines that control the frequency of both the VCSOs and PLL based devices yield low phase noise and jitter, as well as an extremely stable frequency, over the operating temperature range (0ºC - 70ºC or -40ºC to +85ºC available). For applications requiring ultra-low phase noise or operation up to 3 GHz, IDT also offers devices in PCB based surface mount modules. Featuring a discrete RF design, these modules use analog frequency multiplication for output frequencies greater than 1GHz.

IDT VCSOs are well suited for high performance phase-locked loop circuits such as jitter attenuation and frequency translation, as well as other timing applications in telecom and optical networking systems, while the PLL based VCSOs offer the complete low-jitter attenuation/frequency translation solution in one package.

FUNCTIONS

IDT VCSOs offer:

- Single and multiple frequencies, tunable by VIN control pin
- Jitter attenuation and frequency translation

BENEFITS / FEATURES

- Output frequencies up to 3 GHz
- Better close-in phase noise than traditional crystal oscillators
- RMS phase noise performance that exceeds OC-192 standards

Part Number	Package	# Input(s)	Function	Output type	# Output(s)	Output Frequency Max (MHz)	RMS Jitter (ps)	Output Voltage (V)
M1020-1021	36-Pin Ceramic	2	PLL	LVPECL	2	175	0.4	3.3
M1033-1034	36-Pin Ceramic	2	PLL	LVPECL	2	175	0.4	3.3
M2006-02	36-Pin Ceramic	2	PLL	LVPECL	2	700	0.5	3.3
M2020-M2021	36-Pin Ceramic	2	PLL	LVPECL	2	700	0.5	3.3
M665	6-Pin J-Lead	NA	VCSO	LVPECL	1	708	0.16	3.3
M675	6-Pin SMT	NA	VCSO	LVPECL	1	708	0.16	3.3
M685	6-Pin SMT	NA	VCSO	LVPECL	1	708	0.16	3.3
M690	PCB SMT	NA	VCSO	10dBm SINE WAVE	1	2100	0.25	3.3

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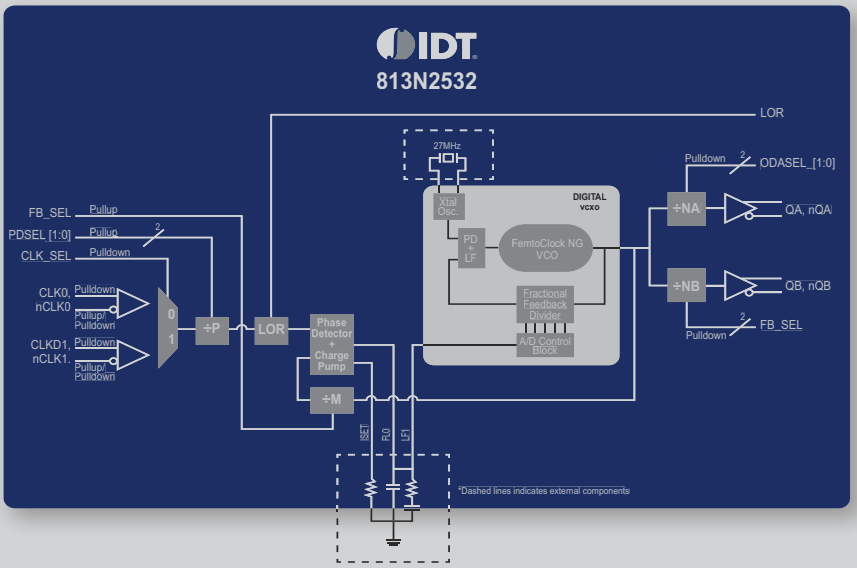
Synchronous Clocking

- VCXO PLL Jitter Attenuators
- WAN PLLs

VCXO PLL Jitter Attenuators

Replace expensive VCXO PLLs with high frequency, low noise FemtoClocks



Typical VCXO PLL + FemtoClock frequency translator and jitter attenuator

IDT Networking and Communications voltage-controlled crystal oscillator (VCXO) PLL + FemtoClock® and FemtoClock NG devices are synchronous jitter attenuation and frequency translation products featuring a VCXO-based PLL stage with either internal VCXO requiring only an external pullable crystal, or with an external low-frequency VCXO. Femtoclock NG devices use a fixed crystal and perform the frequency pulling digitally using DPLL technology. This PLL stage is typically configured with low loop bandwidth to provide jitter attenuation. It can also accommodate numerous pre, feedback, and output divider combinations to allow for frequency translation. The output frequency from the VCXO PLL stage is then followed by a FemtoClock or FemtoClock NG frequency multiplier. The FemtoClock versions provide the capability to generate output frequencies up to 800 MHz with typical random phase-noise jitter of 1 ps RMS, while the NG versions have a maximum output frequency of up to 1.3GHz and a typical random phase-noise jitter of less than 0.7 ps RMS.

These devices can be used in many applications to replace expensive VCSO PLLs. Applications for VCXO PLL + FemtoClocks include synchronous Ethernet, wireless infrastructure, SONET/SDH, telecom and professional video.

FUNCTIONS

IDT Networking/Commnications VCXO PLL + FemtoClock devices perform these and other functions:

- Jitter attenuation and frequency translation
- Synchronous clocking

Part Number	# of Outputs	Output Type	Output Frequency (MHz)	# of Inputs	Input Type	Output Voltage (V)	Output Banks	RMS Phase Jitter (ps)
810251I	1	LVCMOS	25	1	LVCMOS	3.3, 2.5	1	0.22
810252I-02	2	LVCMOS	25, 125, 156.25, 312.5	2	Differential	3.3, 2.5	2	1.3
813N252I-02	2	LVPECL	25, 125, 156.25, 312.5	2	Differential	3.3	2	0.63
813N252I-04	2	LVPECL, LVDS	25, 125, 156.25, 312.5	2	Differential	3.3	2	0.3
813N252I-09	2	LVPECL	25, 125, 156.25, 312.5	2	Differential	3.3	2	0.3
813N2532	2	LVPECL	19.44, 25, 155.52, 156.25	2	Differential	3.3	2	0.62
813N322I-02	2	LVPECL	19.44, 77.76, 155.52, 622.08	2	Differential	3.3	2	0.57
843002I-40	2	LVPECL	19.44, 77.76, 155.52	2	Differential	3.3, 2.5	2	0.81
843002I-41	2	LVPECL	19.44 - 622.08	2	Differential	3.3, 2.5	2	0.81
813078I	9	LVPECL, LVCMOS	30.72 - 614.4	2	LVCMOS, Differential	3.3	3	1.1
814075	5	LVDS	30.72 - 614.4	2	LVCMOS, Differential	3.3	2	1.5
810N322I-02	2	LVCMOS	19.44 622.08	2	LVPECL, LVDS, HCSL	3.3	2	0.624

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

FUNCTIONS

IDT WAN-PLLs offer:

- Compliance with Synchronous Ethernet, Stratum Level 2, 3, SMC, 4E and 4 timing requirements
- Jitter attenuation using internal analog PLL

BENEFITS / FEATURES

- Simplifies Synchronous Ethernet and Stratum compliant clock systems design
- Clock generation for IEEE-1588
- Monolithic solution for network synchronization in access, metro and core equipment
- Field proven to meet equipment standards from Telcordia, ITU, and others
- Master/slave support enhances high availability systems with failover
- Broad family of devices with software compatibility enhances design portability
- Offloads critical system processor tasks such as automatic switching of revertive clock inputs

WAN PLLs

Flexible, fully programmable and cost effective

These highly-integrated digital PLL devices feature Stratum compliance for use in communication systems. Key benefits include ease-of-use due to full compliance with telecommunication standards, a rich feature set including programmability for high flexibility, and the reduction of board component count.

Wide Area Network (WAN) PLLs generate and synchronize telecommunication-specific clock signals, achieve clock redundancy and circuit protection, attenuate clock signal phase noise and jitter generation, and convert standard telecommunication clock signals. Typically used on line cards and central timing cards, they use an architecture combining digital and analog PLLs on a single chip:

- The digital PLL provides compliance to telecom standards such as high frequency accuracy on Synchronous Ethernet, Stratum level 2, 3, SMC, 4E and 4 timing requirements and clock jitter attenuation. It provides circuit protection through integrated clock redundancy, including hitless switching, clock frequency holdover and phase build-out.
- The analog PLL converts clock frequencies, saving external components for frequency division and multiplication.

IDT WAN PLLs support three types of input clock sources: recovered clocks from Synchronous Ethernet, STM-n or OC-n, PDH network synchronization timing and external references. The wide input clock range covers telecommunication frequencies from 2 kHz to 622.08 MHz, 1PPS, and frame signals of 2 kHz, 4 kHz and 8 kHz. Clock outputs can be configured to generate frequencies from 1 kHz to 622.08 MHz, 1PPS, and additionally generate frame signals at 2 kHz and 8 kHz. The WAN-PLLs support T0 and T4 clock paths independently; there are also devices in this family that are specifically designed to support the synchronization on DS0 (8 kHz), T1 (1.544 MHz), E1 (2.048 MHz) or OC-n (19.44 MHz) timing signals. The newest development (82V3391) supports clock generation for IEEE-1588.

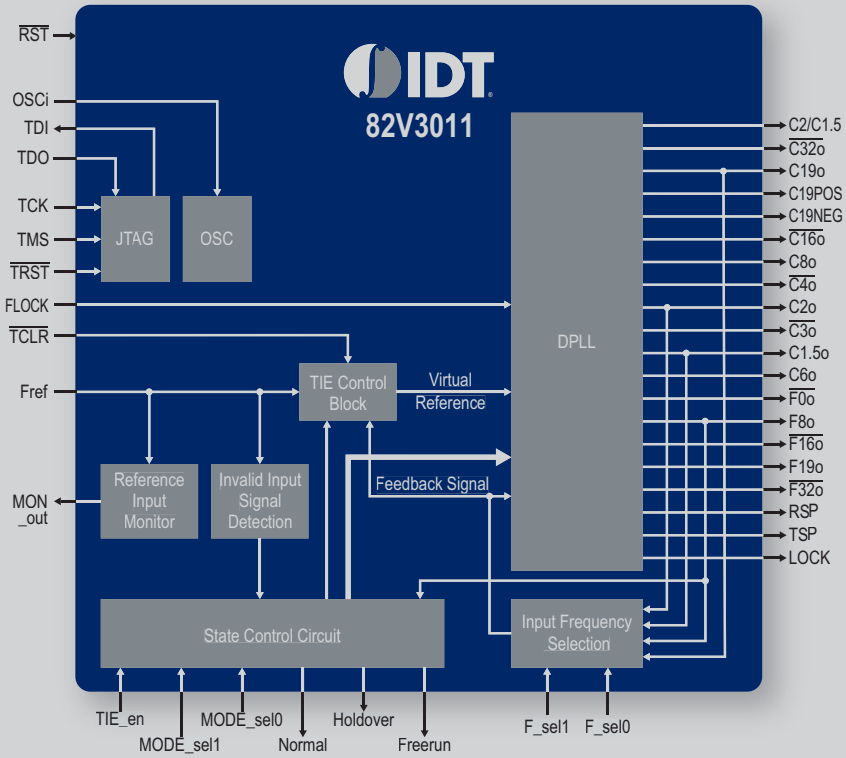
The portfolio of WAN PLLs consists of frequency programmable and fixed frequency devices. The programmable devices with up to 14 redundant inputs and up to 9 outputs, such as the 82V3391, are the most flexible solutions. These are targeted for applications requiring flexibility in output frequency configuration and maximum support of circuit protection and redundancy. The fixed frequency devices are optimized for cost and board space in specific applications that have a defined frequency plan, require fewer protection features or require a smaller number of I/Os.

The IDT WAN PLL family provides a variety of application specific integrated circuits (ASIC) targeted at wireless infrastructure and wireline, access, transmission and network core applications.

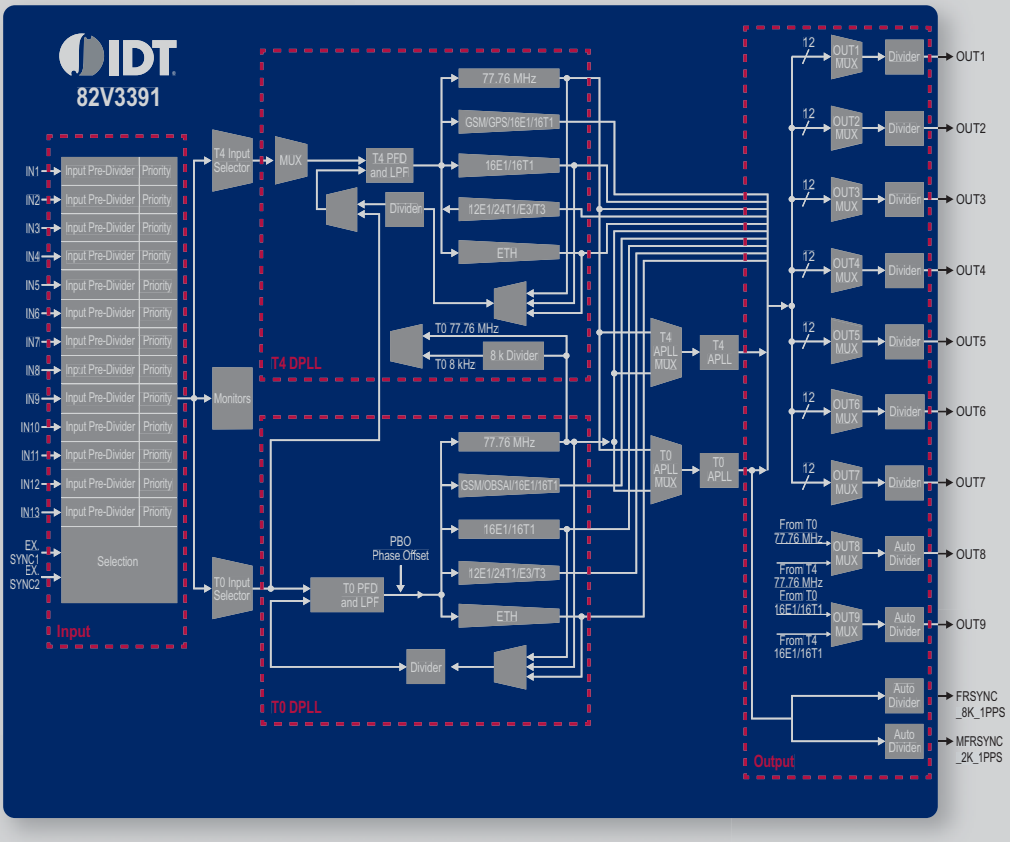
Part Number	# of Outputs	Output Type	Output Frequency Max (MHz)	# of Inputs	Input Frequency Max (MHz)	Function
82V3002A	14	LVCMOS, LVPECL	32.768	2	2.048	ST-BUS clock generation
82V3010	16	LVCMOS, LVDS	32.768	2	19.44	T1, E1, OC3, network synchronization
82V3011	16	LVCMOS, LVDS	32.768	1	19.44	T1, E1, OC3, network synchronization
82V3012	16	LVCMOS, LVDS	32.768	2	19.44	T1, E1, OC3, network synchronization
82V3155	16	LVCMOS, LVDS	155.52	2	19.44	T1, E1, OC3, network synchronization
82V3202	2	LVCMOS	155.52	4	155.52	Synchronous Equipment Timing Source
82V32021	2	LVCMOS	155.52	4	622.08	Synchronous Equipment Timing Source
82V3255	2	LVCMOS, LVPECL, LVDS	622.08	8	622.08	Synchronous Equipment Timing Source
82V3280	9	LVCMOS, LVPECL, LVDS	622.08	14	622.08	Synchronous Equipment Timing Source
82V3285	4	LVCMOS, LVPECL, LVDS	622.08	5	622.08	Synchronous Equipment Timing Source
82V3288	9	LVCMOS, LVPECL, LVDS	622.08	14	622.08	Synchronous Equipment Timing Source
82V3352	2	LVCMOS, LVPECL, LVDS	622.08	5	622.08	Synchronous Equipment Timing Source
82V3355	2	LVCMOS, LVPECL, LVDS	622.08	5	622.08	Synchronous Equipment Timing Source
82V3358	4	LVCMOS, LVPECL, LVDS	622.08	5	622.08	Synchronous Equipment Timing Source
82V3380	9	LVCMOS, LVPECL, LVDS	622.08	14	622.08	Synchronous Equipment Timing Source

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Simple WAN PLL
(82V3011 shown)



Full featured WAN PLL
(82V3391 shown)

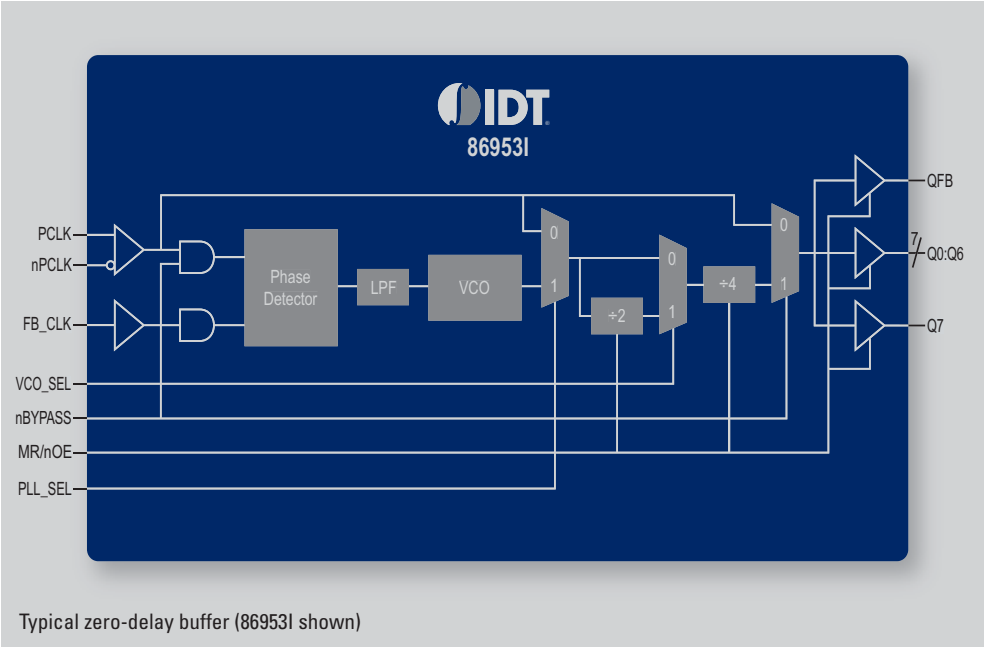


Clock Distribution

- Zero-Delay Buffers
- Clock Generators
- Dynamic Clock Switches (DCS)
- Fan-out Buffers
- Clock Dividers (Non-PLL)
- Multiplexers
- Programmable Skew Devices

Zero-Delay Buffers

Ideal for applications requiring synchronized clocking for FPGAs, CPUs, logic and synchronous memory



Typical zero-delay buffer (86953I shown)

Zero-delay buffers are PLL-based devices that regenerate the input clock signal with fan-out to drive multiple loads. The delay through the device can be adjusted through an external feedback path. This allows precise control of the timing of the clock signals to the loads.

Zero-delay buffers provide a synchronous copy of the input clock at the outputs, usually without frequency translation. Simple frequency translation is possible when a single divider is used for all outputs, including feedback output, to maintain clock synchronization.

The zero-delay buffer portfolio consists of many useful functions including devices with up to 18 outputs, differential outputs such as LVPECL, LVDS, and HSTL are supported for output frequencies up to 700 MHz and single-ended LVCMOS outputs for frequencies up to 250 MHz. Typically, IDT zero-delay buffers use 2.5V or 3.3V supply and are available in commercial and industrial temperature ranges.

FUNCTIONS

IDT Networking/Communications zero-delay buffers offer:

- Synchronous copy of input to all outputs with minimal delay error
- Adjustability through external delay line

BENEFITS/FEATURES

- Output frequencies up to 700 MHz
- 2.5V and 3.3V supply
- Wide variety of differential and single-ended output styles

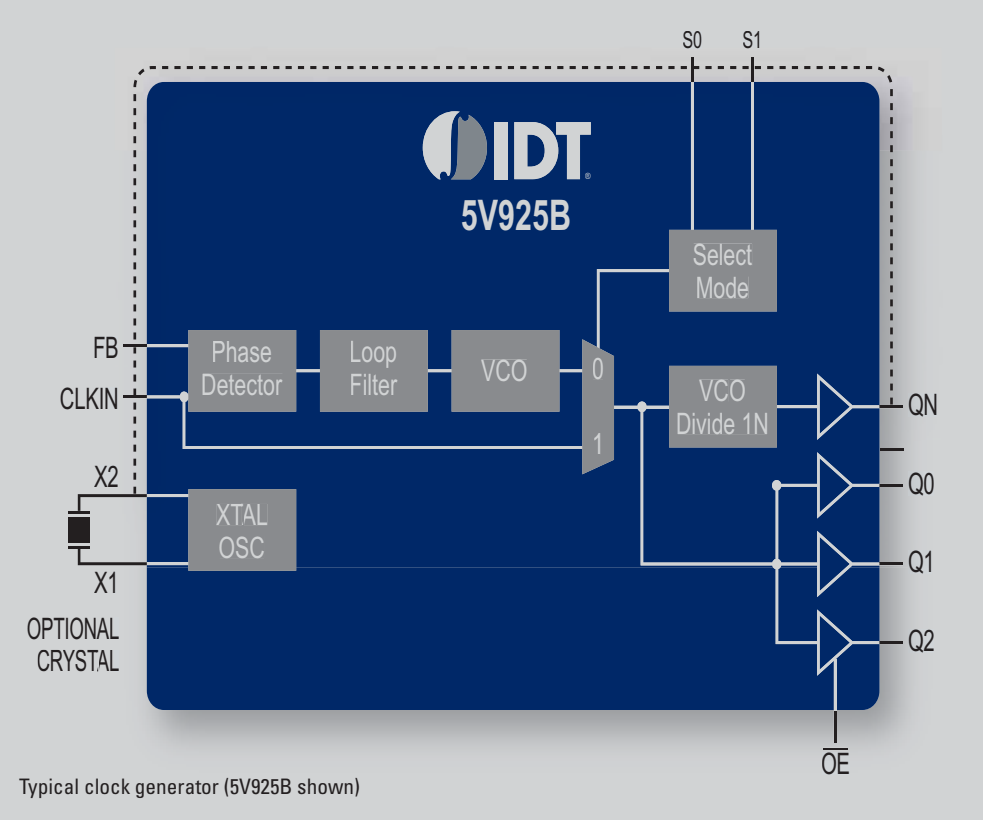
Part Number	# of Outputs	Output Type	Output Frequency (MHz)	Output Voltage (V)	# of Inputs	Input Type	Input Frequency (MHz)
87002-02	2	LVCMOS	15.625 - 250	3.3, 2.5	1	LVCMOS, Differential	15.625 - 205
87002-05	2	LVCMOS	11.28 - 24.60	3.3	1	LVCMOS	11.2783 - 24.6005
8633-01	3	LVPECL	31.25 - 700	3.3	2	Differential	31.25 - 700
86004-01	4	LVCMOS	62.5 - 250	3.3, 2.5	1	LVCMOS	62.5 - 250
86004I	4	LVCMOS	15.625 - 62.5	3.3, 2.5	1	LVCMOS	15.625 - 62.5
8624I	5	HSTL	31.25 - 630	3.3, 2.5	2	Differential	31.25 - 630
8634-01	5	LVPECL	31.25 - 700	3.3	2	Differential	31.25 - 700

Part Number	# of Outputs	Output Type	Output Frequency (MHz)	Output Voltage (V)	# of Inputs	Input Type	Input Frequency (MHz)
MPC962305	5	LVCMOS	10 - 133	3.3	1	LVCMOS	10 - 133
873995	6	LVPECL	490 - 640	3.3	2	Differential	49 - 213.33
87931I	6	LVCMOS	110 - 240	3.3	2	LVCMOS	<150
87931I-147	6	LVCMOS	110 - 240	3.3	2	LVCMOS	<240
873996	7	LVPECL	490 - 640	3.3	2	Differential	49 - 213.33
8752	8	LVCMOS	18.33 - 240	3.3, 2.5	2	LVCMOS	18.33 - 240
74FCT388915T	8	LVCMOS	<150	5, 3.3	2	LVCMOS	10 - 150
74FCT88915TT	8	LVCMOS	<133	5	2	LVCMOS	10 - 133
8752I	8	LVCMOS	18.33 - 240	3.3, 2.5	2	LVCMOS	18.33 - 240
MPC962308	8	LVCMOS	10 - 133	3.3	1	LVCMOS	10 - 133
86953I-147	9	LVCMOS	62.5 - 175	3.3	1	Differential	<175
87951I	9	LVCMOS	100 - 240	3.3	2	LVCMOS, Differential	<100
MPC962309	9	LVCMOS	10 - 133	3.3	1	LVCMOS	10 - 133
8624	10	HSTL	31.25 - 700	3.3, 2.5	2	Differential	31.25 - 700
8731-01	10	LVPECL	250 - 700	3.3	1	Differential	<200
5V9352	11	LVCMOS	100 - 200	3.3, 2.5	1	LVCMOS	200 - 400
87952I-147	11	LVCMOS	<180	3.3	1	LVCMOS	<100
MPC9608	11	LVCMOS	100 - 200	3.3	1	LVCMOS	100 - 200
MPC961C	11	LVCMOS	100 - 200	3.3	1	LVCMOS	100 - 200
5T2010	12	LVCMOS, HSTL	50 - 250	2.5, 1.8	2	LVCMOS, Differential	4.17 - 250
5T2110	12	LVCMOS, HSTL	50 - 250	2.5, 1.8	2	LVCMOS, Differential	4.17 - 250
87972I	13	LVCMOS	100 - 125	3.3	2	LVCMOS	5 - 120
87972I-147	13	LVCMOS	120 - 150	3.3	2	LVCMOS	6 - 150
87973I	13	LVCMOS	100 - 125	3.3	3	LVCMOS, Differential	5 - 120
87973I-147	14	LVCMOS	10 - 150	3.3	3	LVCMOS, Differential	10 - 150
MPC961P	18	LVCMOS	50 - 200	3.3, 2.5	1	Differential	50 - 200

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Clock Generators

Frequency translation and jitter attenuation for FPGAs, CPUs, logic and memory



Typical clock generator (5V925B shown)

FUNCTIONS

IDT Networking/Communications clock generators support:

- Devices with up to 21 outputs
- Differential outputs such as LVPECL, LVDS, HSTL and SSTL
- Output frequencies up to 1.125 GHz and single ended LVCMOS outputs for frequencies up to 250 MHz

BENEFITS/FEATURES

- Low cycle-to-cycle and period jitter
- External feedback for delay adjustments
- 2.5V or 3.3V supply modes

Clock generators are PLL-based products that regenerate the input clock signal with fan-out to drive multiple loads. They also allow for frequency translation—multiplication or division. The delay through these devices can be adjusted through an external feedback path, permitting precise control of clock signal timing to loads.

These frequency translation devices regenerate the clock signal and attenuate unwanted clock jitter. This is beneficial in systems where the reference clock contains an undesirable amount of jitter. Typically, IDT clock generators use 2.5V or 3.3V supplies and are available in commercial and industrial temperature ranges.

Part Number	# of Outputs	Output Type	Output Frequency (MHz)	Input Type	Input Frequency (MHz)	Output Voltage (V)	C-C Jitter Max (pS)
8735-21	1	LVPECL	31.25 - 700	Differential	31.25 - 700	3.3	25
8735I-21	1	LVPECL	31.25 - 700	Differential	31.25 - 700	3.3	40
8745-21	1	LVDS	31.25 - 700	Differential	31.25 - 700	3.3, 2.5	25
8725-21	2	HSTL	31.25 - 630	Differential	31.25 - 630	3.3, 2.5	35
874S02I	2	LVDS	62.5 - 1000	Differential	62.5 - 1000	3.3, 2.5	35
87004	4	LVCMOS	15.625 - 250	LVCMOS, Differential	15.625 - 250	3.3, 2.5	45
5V925B	4	LVCMOS	3.125 - 160	LVCMOS	12.5 - 80	3.3	300
5V927	4	LVCMOS	50 - 160	LVCMOS	50 - 160	3.3	155
8430S07I	4	LVCMOS, LVPECL	25 - 133.33	LVCMOS, Differential, Crystal	25	3.3, 2.5	270
87004I	4	LVCMOS	15.625 - 250	LVCMOS, Differential	15.625 - 250	3.3, 2.5	45
8745	5	LVDS	31.25 - 700	Differential	31.25 - 700	3.3, 2.5	25

Part Number	# of Outputs	Output Type	Output Frequency (MHz)	Input Type	Input Frequency (MHz)	Output Voltage (V)	C-C Jitter Max (pS)
8430S10I	5	LVCMOS	50 - 133.33	LVCMOS, Differential, Crystal	25	3.3, 2.5	365
8430S10I-02	5	LVCMOS, LVPECL	25 - 133.33	LVCMOS, Differential, Crystal	25	3.3, 2.5	120
8725B-01	5	HSTL	31.25 - 700	Differential	31.25 - 700	3.3, 2.5	25
8735-01	5	LVPECL	31.25 - 700	Differential	31.25 - 700	3.3	25
8735-31	5	LVPECL	15.625 - 350	Differential	15.625 - 850	3.3	60
8745BI	5	LVDS	31.25 - 700	Differential	31.25 - 700	3.3, 2.5	30
8745I	5	LVDS	31.25 - 700	Differential	31.25 - 700	3.3, 2.5	25
87604I	5	LVCMOS	83.33 - 166.66	LVCMOS	8.33 - 41.67	3.3, 2.5	120
870931I-01	6	LVCMOS	2.5 - 80	LVCMOS	2.5 - 80	3.3	320
MPC9330	6	LVCMOS	50 - 120	LVCMOS	200 - 480	3.3	300
MPC9331	6	LVCMOS	100 - 240	LVCMOS, Differential	200 - 480	3.3	200
MPC9819	6	LVCMOS	33.33 - 200	LVCMOS	0 - 25	3.3	100
MPC9992	7	LVPECL	200 - 400	Differential	5 - 16.67	3.3	79
8705	8	LVCMOS	15.625 - 250	Differential	15.625 - 250	3.3, 2.5	45
8705I	8	LVCMOS	15.625 - 250	LVCMOS, Differential	15.625 - 250	3.3, 2.5	45
870919I	8	LVCMOS	20 - 160	LVCMOS	20 - 80	3.3	415
870919I-01	8	LVCMOS	20 - 160	LVCMOS	20 - 80	3.3	320
8732-01	8	LVPECL	125 - 350	Differential	0 - 200	3.3	80
87608I	8	LVCMOS	66.66 - 166.66	LVCMOS	8.33 - 41.67	3.3, 2.5	120
MPC9315	8	LVCMOS	75 - 160	LVCMOS	100 - 160	3.3, 2.5	22
MPC9855	8	LVCMOS	16 - 200	LVCMOS, Differential	25, 33	3.3, 2.5	200
MPC9350	9	LVCMOS	100 - 200	LVCMOS	12.5 - 25	3.3, 2.5	300
MPC9351	9	LVCMOS	100 - 200	LVCMOS, Differential	100 - 200	3.3, 2.5	22
MPC93H51	9	LVCMOS	100 - 240	LVCMOS, Differential	50 - 120	3.3	40
MPC93R51	9	LVCMOS	100 - 240	LVCMOS, Differential	50 - 120	3.3	22
MPC9653A	9	LVCMOS	50 - 125	Differential	50 - 125	3.3	100
MPC9894	9	LVPECL	170 - 340	Differential	42.5 - 85	3.3, 2.5	15
MPC9824	9	LVCMOS, LVDS	33 - 200	LVCMOS, Differential	25	3.3, 2.5	200
MPC9850	11	LVCMOS, LVDS	16 - 200	LVCMOS, Differential	25	3.3, 2.5	200
MPC9352	11	LVCMOS	100 - 200	LVCMOS	200 - 400	3.3, 2.5	400
MPC9658	11	LVCMOS	100 - 250	Differential	100 - 250	3.3	80
873990	13	LVPECL	100 - 400	LVCMOS	12.5 - 133.33	3.3	50
873991	13	LVPECL	100 - 400	LVCMOS, Differential	6.25 - 125	3.3	50
879893I	13	LVCMOS	7.5 - 200	LVCMOS	15 - 100	3.3, 2.5	150
MPC9893	13	LVCMOS	7.5 - 200	LVCMOS	15 - 100	3.3, 2.5	425
873991-147	14	LVPECL	100 - 480	LVCMOS, Differential	6.25 - 120	3.3	55
87974I	15	LVCMOS	42 - 125	LVCMOS	8.33 - 125	3.3	100
87974I-01	15	LVCMOS	41.67 - 125	LVCMOS, Differential	8.33 - 125	3.3	50
MPC9773	15	LVCMOS	50 - 125	LVCMOS	4.16 - 62.5	3.3	90
MPC9774	15	LVCMOS	50 - 125	LVCMOS	4.16 - 62.5	3.3	90
8761I	17	LVCMOS	33 - 166	LVCMOS	12.5 - 83.33	3.3, 2.5	70

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Dynamic Clock Switches (DCS)

Seamless support for redundancy requirements on the clock level

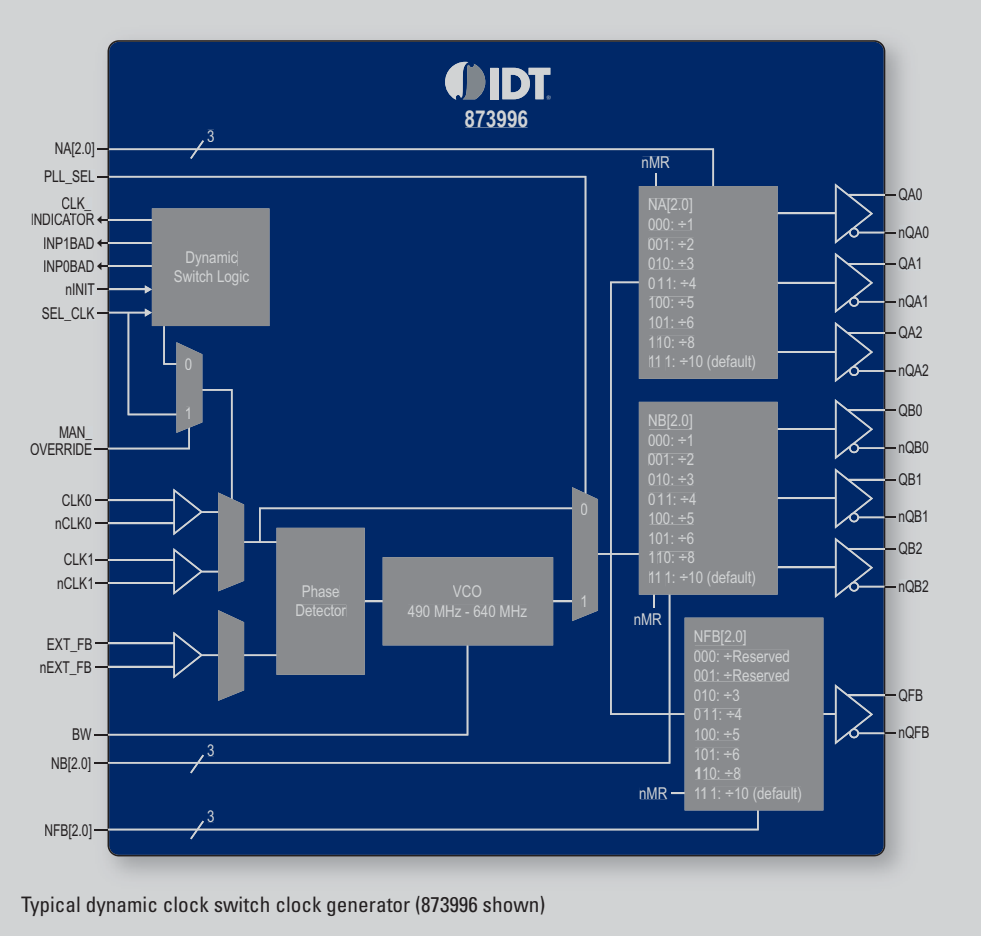
FUNCTIONS

IDT Networking/Communications dynamic clock switches deliver:

- Input clock monitoring circuitry
- Phase bump elimination during input switchover

BENEFITS/FEATURES

- Low phase noise FemtoClock PLL technology
- Minimal output period delta during clock switchover



Typical dynamic clock switch clock generator (873996 shown)

Dynamic clock switches (DCS) are PLL-based clock generators specifically designed for redundant clock distribution systems. They are most often used in master and slave clocking circuits of high reliability equipment, such as core and edge routers and switches in networking or in high-end servers. The devices monitor input clock signals to detect a failing reference clock signal and dynamically switch to a redundant clock signal. Smoothly controlling the output phase during the switching, they eliminate the phase bump typically caused by a clock failure. The switch from a failing clock to a redundant clock occurs without interruption of the output clock.

DCS offerings include LVPECL output parts for output frequencies up to 640 MHz and single-ended LVCMOS output parts for output frequencies up to 300 MHz. Typically, IDT dynamic clock switches use 2.5V or 3.3V supplies and are available in commercial and industrial temperature ranges.

Part Number	# of Outputs	Output Type	Output Frequency (MHz)	# of Inputs	Input Type	Output Voltage (V)
87993I	5	LVPECL	100-250	2	LVPECL LVHSTL SSTL LVDS HCSL	3.3
MPC9993	5	LVPECL	100-200	2	LVPECL	3.3
MPC99J93	5	LVPECL	100-180	2	LVPECL	3.3
873995	6	LVPECL	49-640	2	LVPECL, LVDS, LVHSTL, HCSL, SSTL	3.3
873996	6	LVPECL	49-640	2	LVPECL, LVDS, LVHSTL, HCSL, SSTL	3.3

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Fan-out Buffers

Designed for tight timing budgets, optimized for low skew, delay and jitter

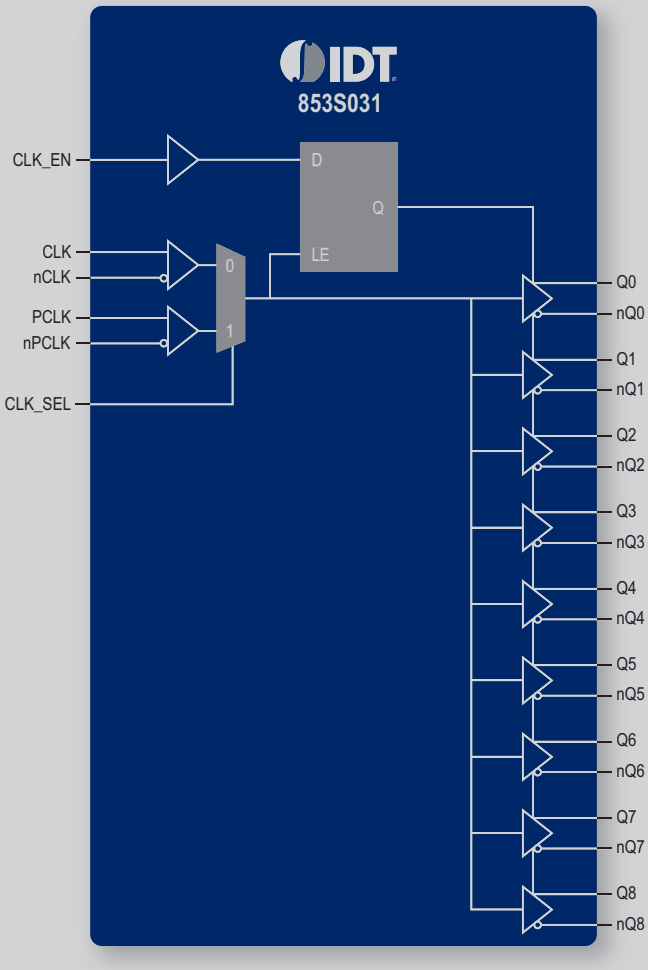
FUNCTIONS

IDT Networking/Communications fan-out buffers support:

- Devices with up to 27 outputs
- Differential outputs such as LVPECL, LVDS, HSTL, SSTL, and CML
- PCIe compliant HCSL outputs
- Differential output frequencies up to 3.2 GHz and single ended LVCMOS outputs for frequencies up to 350 MHz

BENEFITS/FEATURES

- Full differential internal architecture
- Wide variety of output styles
- 1.2V, 1.5V, 1.8V, 2.5V or 3.3V supply modes
- Crystal fan-out buffers have an internal oscillator



Typical fan-out buffer (853S031 shown)

Fan-out buffers are a useful building block of many clock trees, providing signal buffering and multiple copies of the input signal. Single output buffers are useful for translating a clock from one signaling standard to another (e.g. LVCMOS-in to LVPECL-out). Some devices have an integrated crystal oscillator, requiring only a low cost external fundamental-mode quartz crystal. The integrated oscillator provides an extremely low phase noise reference clock to drive jitter-sensitive devices such as the clock inputs of PHYs.

Almost all IDT fan-out buffers feature fully differential internal architecture—even devices with single-ended I/Os—reducing jitter caused by inherent common-mode noise rejection and improving output skew. The differential circuitry is constant-current and therefore injects less noise into system power supplies than single-ended solutions, reducing EMI compliance concerns.

The IDT fan-out buffer portfolio includes devices with up to 27 outputs. Differential outputs such as LVPECL, LVDS, DCM (HCSL), CML, HSTL, as well as selectable outputs, are supported for output frequencies up to 3200 MHz and single-ended LVCMOS outputs for frequencies up to 350 MHz. Some buffers are available with mixed output signaling. Typically, IDT buffers use 1.8V, 2.5V or 3.3V supplies and are available in the commercial and industrial temperature ranges.

If the exact buffer configuration is not found in the extensive IDT Networking/Communications fan-out buffer offerings, please also consider devices in the IDT non-PLL clock divider portfolio that, when used in divide-by-1 mode, can also function as a fan-out buffer.

Fan-out buffers are general-purpose clock building block devices that can be used in any number of applications. Their high performance makes them well suited for use in networking, communications and high-end computing systems.

Part Number	# of Outputs	Output Type	Output Frequency Max (MHz)	Output Voltage (V)	Output Skew (ps)	Additive Phase Jitter (ps)	# of Inputs	Input Type	Core Voltage (V)
830S21I-01	1	LVCMOS	350	3.3, 2.5	n/a	0.11	1	Differential	3.3, 2.5
8302	2	LVCMOS	200	3.3, 2.5	85	n/a	1	LVCMOS	3.3
85322	2	LVPECL	267	3.3, 2.5	n/a	n/a	2	LVCMOS	3.3, 2.5
8302-01	2	LVCMOS	250	3.3, 2.5	n/a	n/a	1	LVCMOS	1.8, 1.5
83026I-01	2	LVCMOS	350	3.3, 2.5, 1.8	15	0.03	1	Differential	1.8, 1.5
8302I	2	LVCMOS	200	3.3, 2.5	40	n/a	1	LVCMOS	1.8, 1.5
85102I	2	HCSL	500	3.3, 2.5	65	0.14	2	LVCMOS, Differential	3.3
85211BI-03	2	HSTL	700	1.8	30	n/a	1	Differential	3.3
85222-02	2	HSTL	350	3.3, 2.5	25	n/a	1	LVCMOS	3.3
85311I	2	LVPECL	1000	3.3, 2.5	20	0.14	1	Differential	3.3, 2.5
85411I	2	LVDS	650	3.3, 2.5	25	0.05	1	Differential	3.3
854S712I	2	LVDS	3000	3.3, 2.5	10	0.08	1	Differential	3.3
858S011I	2	CML	1500	3.3, 2.5	25	0.04	1	Differential	3.3, 2.5
8523	4	HSTL	650	3.3, 2.5	30	0.08	2	Differential	3.3
8525	4	HSTL	266	1.8	35	n/a	2	LVCMOS	3.3
854104	4	LVDS	700	3.3, 2.5	50	0.23	1	Differential	3.3
854105	4	LVDS	250	3.3, 2.5	55	0.16	1	LVCMOS	3.3
830154I-08	4	LVCMOS	160	3.3, 2.5, 1.8, 1.5	250	0.09	1	LVCMOS	1.8, 1.5
830154I-09	4	LVCMOS	150	1.8, 1.5	40	0.24	1	LVCMOS	1.8, 1.5
8305I	4	LVCMOS	350	3.3, 2.5 ,1.8	45	0.04	2	LVCMOS, Differential	3.3
83904I-02	4	LVCMOS	200	3.3, 2.5 ,1.8	40	0.16	1	LVCMOS	3.3, 2.5
85104I	4	HCSL	500	3.3, 2.5	100	0.22	2	LVCMOS, Differential	3.3
8523I-03	4	HSTL	650	1.8	50	n/a	2	Differential	3.3
8533I-01	4	LVPECL	650	3.3	30	0.06	2	Differential	3.3
8535I-31	4	LVPECL	266	3.3	30	0.05	1	LVCMOS	3.3
853S314I	4	LVPECL	2700	3.3, 2.5	50	0.14	2	Differential	3.3, 2.5
8543I	4	LVDS	650	3.3, 2.5	40	0.16	2	Differential	3.3
8545I	4	LVDS	650	3.3, 2.5	40	0.13	2	LVCMOS	3.3
854S204I	4	LVPECL / LVDS	3000	3.3, 2.5	15	0.15	2	Differential	3.3, 2.5
8S58021I	4	LVPECL	2500	3.3, 2.5	30	0.02	1	Differential	3.3, 2.5
8S89831I	4	LVPECL	2100	3.3, 2.5	30	0.31	1	Differential	3.3, 2.5
8S89832I	4	LVDS	2000	3.3, 2.5	25	0.09	1	Differential	2.5
85214	5	HSTL	700	3.3, 2.5	30	n/a	2	LVCMOS, Differential	3.3
85105I	5	HCSL	500	3.3, 2.5	100	0.24	2	LVCMOS, Differential	3.3

Part Number	# of Outputs	Output Type	Output Frequency Max (MHz)	Output Voltage (V)	Output Skew (ps)	Additive Phase Jitter (ps)	# of Inputs	Input Type	Core Voltage (V)
85214I	5	HSTL	700	3.3, 2.5	40	n/a	2	LVCMOS, Differential	3.3
85310I-21	5	LVPECL	700	3.3, 2.5	50	0.13	2	Differential	3.3, 2.5
853S014I	5	LVPECL	2000	3.3, 2.5	20	0.07	2	Differential	3.3, 2.5
5T9306	6	LVDS	1000	3.3, 2.5	1000	0.16	2	LVCMOS, Differential	3.3, 2.5
83905I	6	LVCMOS	40	3.3, 2.5 ,1.8	80	0.18	1	Crystal	3.3 ,2.5 ,1.8
8536-01	6	LVPECL	700	3.3, 2.5	55	0.19	2	LVCMOS, Differential	3.3, 2.5
8536I-33	6	LVCMOS, LVPECL	266	3.3, 2.5	80	0.32	1	LVCMOS	3.3, 2.5
853S013I	6	LVPECL	2000	3.3, 2.5	25	0.05	1	Differential	3.3, 2.5
854S006I	6	LVDS	1700	3.3, 2.5	55	0.067	1	Differential	3.3, 2.5
85408	8	LVDS	700	3.3, 2.5	50	0.167	1	Differential	3.3
8308I	8	LVCMOS	350	3.3, 2.5	160	n/a	2	LVCMOS, Differential	3.3, 2.5
83908I-02	8	LVCMOS	200	3.3, 2.5 ,1.8	70	0.39	3	LVCMOS, Crystal	3.3, 2.5
85108I	8	HCSL	500	3.3, 2.5	80	0.09	1	Differential	3.3
8538-31	8	LVPECL	266	3.3	50	n/a	2	LVCMOS, Crystal	3.3
8538I-26	8	LVCMOS, LVPECL	266	3.3, 2.5	112	0.19	2	LVCMOS, Crystal	3.3, 2.5
853S310I	8	LVPECL	2000	3.3	75	0.14	2	Differential	3.3
85408I	8	LVDS	700	3.3, 2.5	50	0.167	1	Differential	3.3
854104I	8	LVDS	700	3.3, 2.5	50	0.232	1	Differential	3.3
8521	9	HSTL	500	3.3, 2.5	50	0.17	2	Differential	3.3
83947I-147	9	LVCMOS	250	3.3, 2.5	130	0.2	2	LVCMOS	3.3, 2.5
8531-01	9	LVPECL	500	3.3	50	0.17	2	Differential	3.3
853S031I	9	LVPECL	1600	3.3, 2.5	55	n/a	2	Differential	3.3, 2.5
83210	10	HSTL	150	3.3, 2.5	110	n/a	1	LVCMOS	1.5
851010	10	HCSL	250	3.3, 2.5	165	0.24	1	Differential	3.3
5T907	10	LVCMOS, HSTL	250	2.5, 1.8	25	n/a	1	Differential	2.5, 1.8
5T9310	10	LVDS	1000	3.3, 2.5	25	n/a	2	Differential	3.3, 2.5

Part Number	# of Outputs	Output Type	Output Frequency Max (MHz)	Output Voltage (V)	Output Skew (ps)	Additive Phase Jitter (ps)	# of Inputs	Input Type	Core Voltage (V)
85210-31	10	HSTL	650	3.3, 2.5	50	n/a	2	Differential	3.3
85310I-11	10	LVPECL	700	3.3, 2.5	55	0.13	2	Differential	3.3, 2.5
853S6111I	10	LVPECL	2700	3.3, 2.5	35	0.12	2	Differential	3.3, 2.5
854110I	10	LVDS	200	3.3, 2.5	30	0.29	2	Differential	2.5
854S036	10	LVDS	2000	3.3	100	0.06	2	Differential	3.3
8312	12	LVCMOS	250	3.3, 2.5 ,1.8	150	0.04	1	LVCMOS	3.3 ,2.5 ,1.8
8312I	12	LVCMOS	250	3.3, 2.5 ,1.8	160	0.04	1	LVCMOS	3.3 ,2.5 ,1.8
83948I	12	LVCMOS	250	3.3	350	n/a	2	LVCMOS, Differential	3.3
83948I-147	12	LVCMOS	350	3.3, 2.5	160	0.14	2	LVCMOS, Differential	3.3, 2.5
853S12I	12	LVPECL	1500	3.3, 2.5	50	0.06	1	Differential	3.3, 2.5
8316	16	LVCMOS	150	1.2	380	n/a	1	LVCMOS	3.3
8501	16	HCSL	500	3.3, 2.5	100	n/a	1	Differential	3.3
8516	16	LVDS	700	3.3, 2.5	90	0.148	1	Differential	3.3
8530	16	LVPECL	500	2.5	50	n/a	1	Differential	3.3
83115	16	LVCMOS	200	3.3	250	0.09	1	LVCMOS	3.3
5T9316	16	LVDS	1000	3.3, 2.5	25	n/a	2	LVCMOS, Differential	3.3, 2.5
8343-01	16	LVCMOS	200	3.3, 2.5	250	n/a	1	LVCMOS	3.3, 2.5
8516I	16	LVDS	700	3.3, 2.5	90	0.148	1	Differential	3.3
8530I-01	16	LVPECL	500	3.3	75	0.162	1	Differential	3.3
8532-01	17	LVPECL	500	3.3	50	n/a	2	Differential	3.3
83940	18	LVCMOS	250	3.3, 2.5	200	n/a	2	LVCMOS, Differential	3.3, 2.5
83918I	18	LVCMOS	250	3.3, 2.5 ,1.8	50	0.4	1	LVCMOS, Crystal	3.3, 2.5
83940I-01	18	LVCMOS	250	3.3, 2.5	150	0.1	2	LVCMOS, Differential	3.3, 2.5
851021	21	HCSL	250	3.3, 2.5	395	0.2	1	Differential	3.3
8534-01	22	LVPECL	500	3.3	100	0.4	2	Differential	3.3
8344	24	LVCMOS	167	3.3, 2.5	275	n/a	2	Differential	3.3, 2.5
8344-01	24	LVCMOS	250	3.3, 2.5	200	0.21	2	Differential	3.3, 2.5
8SLVP1204I	4	LVPECL	2000	3.3, 2.5	5	0.04	2	LVDS, LVPECL, CML	2.5, 3.3
8SLVP1102I	2	LVPECL	2000	3.3, 2.5	5	0.05	1	LVDS, LVPECL, CML	2.5, 3.3

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Clock Dividers (Non-PLL)

The core building blocks of many clock trees

FUNCTIONS

The IDT Networking?Communications clock divider family offers:

- Devices with up to 20 outputs
- Differential outputs such as LVPECL, LVDS, HSTL and SSTL
- Output dividers up to divide-by-32

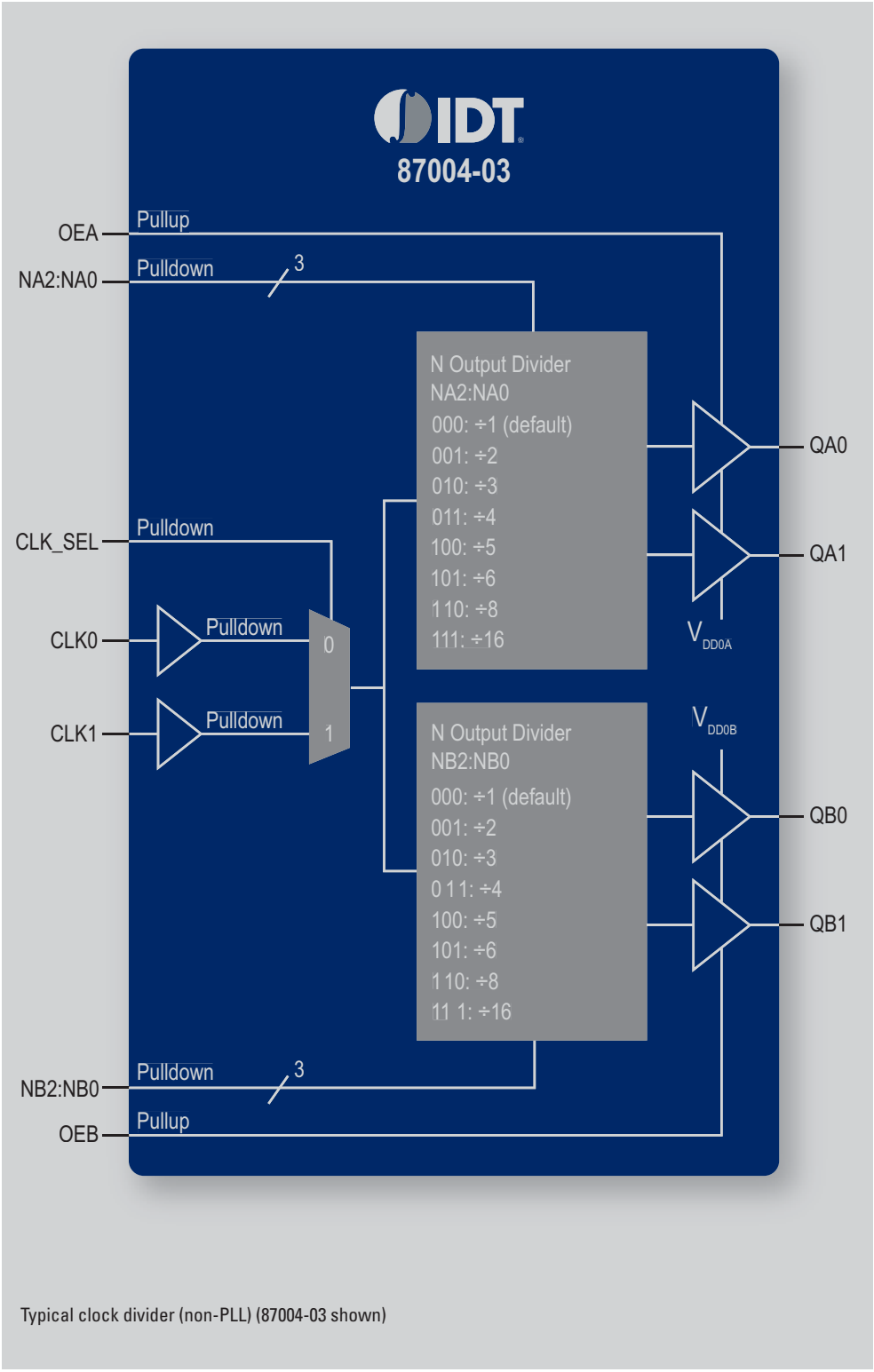
BENEFITS/FEATURES

- Full differential internal architecture
- Wide variety of output styles
- 1.8V, 2.5V or 3.3V supply modes

Clock dividers provide an output clock signal that is a divided frequency of the input. They can also be used to provide signal buffering and make multiple copies of the input signal. Clock divider devices, when used in divide-by-1 mode, can also function as a fan-out buffer.

Most IDT clock dividers—even those with single-ended I/Os—feature fully differential internal architecture. Inherent common-mode noise rejection reduces jitter and improves output skew. The differential circuitry is constant-current and therefore injects less noise into system power supplies than single-ended solutions. This decreases EMI compliance concerns.

The IDT clock divider portfolio includes devices with up to 20 outputs. Various divide ratios, from divide-by-1 through divide-by-32, are available. Differential outputs such as LVPECL, LVDS, and selectable outputs are supported for output frequencies up to 3 GHz and single-ended LVCMOS outputs for frequencies up to 250 MHz. Also available are HCSL and LVCMOS outputs for specific applications. Typically, IDT buffers use 1.8V, 2.5V, or 3.3V supplies and are available in commercial and industrial temperature ranges. Clock dividers are general-purpose clock building block devices that can be used in any number of applications. Due to their high performance, they are especially suited for use in networking, communications and high-end computing systems.



Typical clock divider (non-PLL) (87004-03 shown)

Part Number	# of Outputs	Output Type	Output Frequency (MHz)	# of Banks	Input Type	Divider	Output Voltage (V)	Vcc Core (V)
873034	1	LVPECL	350-1400	1	LVPECL SSTL LVDS CML	2	3.3, 2.5	3.3, 2.5
87321I	1	LVPECL	0-700	1	LVPECL LVHSTL SSTL LVDS HCSL	1	3.3, 2.5	3.3, 2.5
87421I	1	LVDS	500-1000	1	LVPECL LVHSTL SSTL LVDS HCSL	1	3.3, 2.5	3.3
87021I	2	LVCMOS	0-250	1	LVPECL LVHSTL SSTL LVDS HCSL	1	3.3, 2.5	3.3, 2.5
8S73034I	3	LVPECL	400-1600	1	LVPECL SSTL LVDS CML	2	3.3, 2.5	3.3, 2.5
8737-11	4	LVPECL	0-650	2	LVPECL LVHSTL SSTL LVDS HCSL CML	1	3.3	3.3
MC100ES6139	4	LVPECL	0-1000	1	LVPECL LVDS HSTL	2, 4, 6	3.3	3.3
87158	8	LVCMOS HCSL	0-600	1	LVPECL LVHSTL SSTL LVDS HCSL	1	3.3	3.3
87008I	8	LVCMOS	0-250	2	LVCMOS LVPECL LVHSTL SSTL LVDS HCSL	1	3.3, 2.5 ,1.8	3.3, 2.5
5V9351	9	LVCMOS	100-200	2	LVCMOS LVPECL	1	3.3, 2.5	3.3, 2.5
87950I	9	LVCMOS	120-250	1	LVCMOS	1	3.3	3.3
MC100ES6226	9	LVPECL	0-3000	1	LVPECL	1	3.3, 2.5	3.3, 2.5
MC100ES6226	9	LVPECL	0-3000	1	LVPECL	1	3.3, 2.5	3.3, 2.5
87159	10	LVCMOS HCSL	0-600	1	LVPECL LVHSTL SSTL LVDS HCSL	1	3.3	3.3
87946I-01	10	LVCMOS	0-250	1	LVPECL SSTL CML	1	3.3	3.3
87946I-147	10	LVCMOS	0-250	2	LVCMOS	1	3.3, 2.5	3.3
MPC9446	10	LVCMOS	125-250	2	LVCMOS	1	3.3, 2.5	3.3, 2.5
MPC9456	10	LVCMOS	125-250	2	LVCMOS	1	3.3, 2.5	3.3, 2.5
87322BI	15	LVPECL	0-750	2	LVPECL SSTL LVDS CML	1	3.3	3.3
87949I	15	LVCMOS	0-160	3	LVCMOS SSTL CML	1	3.3	3.3
MC100ES6222	15	LVPECL	0-3000	2	LVPECL	1	3.3, 2.5	3.3, 2.5
MC100ES6222	15	LVPECL	0-3000	2	LVPECL	1	3.3, 2.5	3.3, 2.5
MPC9449	15	LVCMOS	100-200	3	LVCMOS LVPECL	1	3.3, 2.5	3.3, 2.5
87016	16	LVCMOS	0-250	2	LVCMOS LVPECL LVHSTL SSTL LVDS HCSL	1	3.3, 2.5 ,1.8	3.3 ,2.5 ,1.8
87016I	16	LVCMOS	0-250	2	LVCMOS LVPECL LVHSTL SSTL LVDS HCSL	1	3.3, 2.5 ,1.8	3.3, 2.5
8701	20	LVCMOS	0-250	1	LVCMOS	1	3.3, 2.5	3.3
8702	20	LVCMOS	0-250	1	LVCMOS LVPECL LVHSTL SSTL LVDS HCSL	1	3.3, 2.5	3.3
8701I	20	LVCMOS	0-250	1	LVCMOS	1	3.3, 2.5	3.3
874328I-01	2	LVPECL LVDS	153.6-650	1	LVPECL SSTL LVDS HCSL	1	2.5	2.5

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Multiplexers

Fully differential internal architecture improves jitter

FUNCTIONS

The IDT Networking/Communications multiplexer family offers:

- Devices with up to 16 inputs
- Differential outputs such as LVPECL, LVDS, HSTL and SSTL
- Support for differential output frequencies up to 3.2 GHz and single ended LVCMOS outputs for frequencies up to 350 MHz

BENEFITS/FEATURES

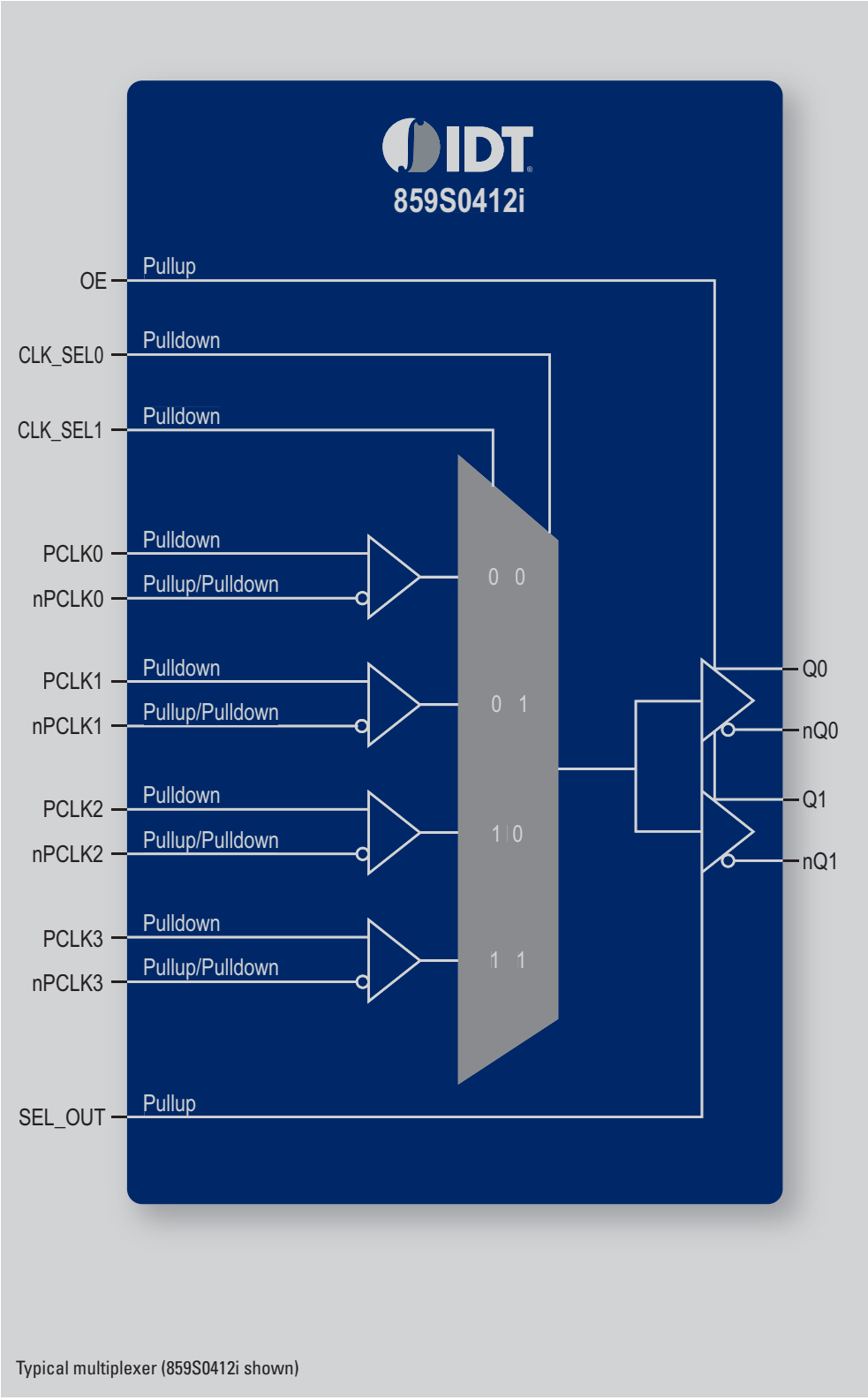
- Full differential internal architecture
- Wide variety of output styles
- 1.8V, 2.5V or 3.3V supply modes
- >-50 db MUX isolation between input paths

IDT Networking/Communications multiplexers allow the selection from multiple clock inputs to drive the output. Devices are available with fan-out capability of the output signal. Some devices have integrated crystal oscillators, requiring only low cost external fundamental-mode quartz crystals. The integrated oscillators provide an extremely low phase noise reference clock to drive jitter sensitive devices such as the clock inputs of PHYs.

Almost all IDT multiplexers, even devices with single-ended I/Os, feature fully differential internal architecture. This improves jitter due to inherent common-mode noise rejection and improves output skew. The differential circuitry is constant-current and therefore injects less noise into system power supplies than single-ended solutions, reducing noise and decreasing EMI compliance concerns.

The IDT multiplexer portfolio includes devices with up to 16 inputs. Differential outputs such as LVPECL, LVDS, and selectable outputs are supported for output frequencies up to 3.2 GHz and single-ended LVCMOS outputs for frequencies up to 350 MHz. Typically, IDT multiplexers use 1.8V, 2.5V or 3.3V supplies and are available in the commercial and industrial temperature ranges.

IDT Networking/Communications multiplexers are general-purpose clock building block devices for multiple applications. They are especially suited for use in networking, communications and high-end computing systems which require high performance.



Typical multiplexer (859S0412i shown)

Part Number	# of Outputs	Output Type	Output Frequency Max (MHz)	# of Inputs	Input Type	Output Voltage (V)
83052I	1	LVCMOS	250	2	LVCMOS	3.3, 2.5 ,1.8
83054I	1	LVCMOS	250	4	LVCMOS	3.3, 2.5 ,1.8
83056I	1	LVCMOS	250	6	LVCMOS	3.3, 2.5 ,1.8
83058I	1	LVCMOS	250	8	LVCMOS	3.3, 2.5 ,1.8
850S1201I	1	LVCMOS	250	12	LVCMOS	3.3, 2.5
850S1601I	1	LVCMOS	250	16	LVCMOS	3.3, 2.5
85357-01	1	LVPECL	750	4	Differential	3.3
85357-11	1	LVPECL	750	4	Differential	3.3
85357I-01	1	LVPECL	750	4	Differential	3.3
853S01I	1	LVPECL	2500	2	Differential	3.3, 2.5
853S057I	1	LVPECL	3000	4	Differential	3.3, 2.5
853S058I	1	LVPECL	2500	8	Differential	3.3, 2.5
854S01I	1	LVDS	2500	2	LVCMOS, Differential	3.3, 2.5
854S057BI	1	LVDS	2000	4	Differential	3.3, 2.5
854S057I	1	LVDS	2000	4	Differential	3.3, 2.5
854S058I	1	LVDS	2500	8	Differential	3.3, 2.5
855S54I	1	LVDS	2500	3	Differential	3.3, 2.5
889474	2	LVDS	2000	2	Differential	3.3, 2.5
83052I-01	2	LVCMOS	250	2	LVCMOS	3.3, 2.5 ,1.8
85356I	2	LVPECL	900	4	Differential	3.3
859S0412I	2	LVPECL / LVDS	3000	4	Differential	3.3, 2.5
MC100ES6056	2	LVPECL	3000	4	Differential	3.3, 2.5
85454	3	LVDS	2500	3	Differential	3.3, 2.5
853S54I	3	LVPECL	2500	3	Differential	3.3, 2.5
853S54I-01	3	LVPECL	2000	3	Differential	3.3, 2.5
85454-01	3	LVDS	2500	3	Differential	3.3, 2.5
854S54I	3	LVDS	2500	3	Differential	3.3, 2.5
854S54I-01	3	LVDS	2500	3	Differential	3.3, 2.5
854S54I-02	3	LVDS	1300	3	Differential	3.3, 2.5
83054I-01	4	LVCMOS	250	2	LVCMOS	3.3, 2.5 ,1.8
8S89834I	4	LVPECL	1000	2	LVCMOS	3.3, 2.5
MC100ES6130	4	LVPECL	2000	2	Differential	3.3, 2.5
83056I-01	6	LVCMOS	250	2	LVCMOS	3.3, 2.5 ,1.8
85352I	12	LVPECL	700	2	Differential	3.3, 2.5

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Programmable Skew Devices

Versatile building block devices for use in networking, communications and advanced computing systems

FUNCTIONS

The IDT family of programmable skew products offers:

- Devices with up to 16 outputs
- Selectable HSTL or LVCMOS outputs
- Programmable skew increments as small as 250 picoseconds

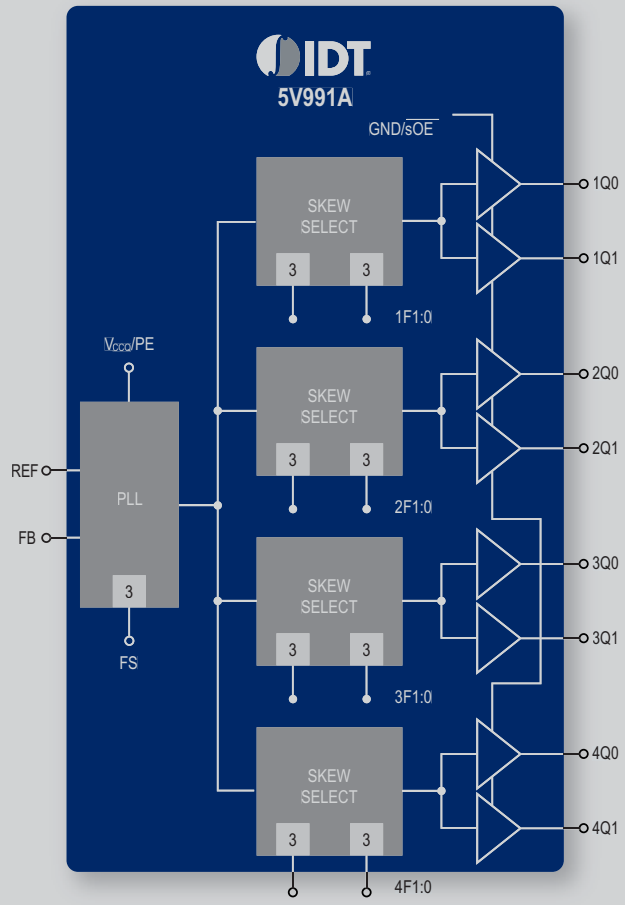
BENEFITS/FEATURES

- Frequency support up to 250 MHz
- LVCMOS or HSTL/LVCMOS outputs
- 2.5V, 3.3V or 5.0V supply modes

Programmable skew devices provide multiple copies of the clock input, where each bank of outputs can be individually programmed to different path delays to control skew. This provides flexibility for last minute clock skew management in the system.

The IDT programmable skew portfolio includes functions with up to 16 inputs, programmable output divide ratios up to divide-by-12, programmable skew increments as small as 250 picoseconds, and frequencies up to 250 MHz. Single-ended LVCMOS outputs and selectable HSTL/LVCMOS outputs are supported. Typically, IDT programmable skew devices use 2.5V, 3.3V or 5.0V supplies.

These high performance, general-purpose clock building block devices can be used in any number of applications, and are ideal for networking, communications and high-end computing systems.



Typical programmable skew buffer (5V991A shown)

Part Number	Function	# of Outputs	Output Type	Output Frequency (MHz)	# of Inputs	Input Type
5V991A	Programmable Skew	8	LVCMOS	3.75 - 85.00	1	LVCMOS, Differential
5V993A	Programmable Skew	8	LVCMOS	3.75 - 85.00	1	LVCMOS
5V995	Programmable Skew	8	LVCMOS	6.00 - 200.00	1	LVCMOS
5V996	Programmable Skew	7	LVCMOS	25.00 - 225.00	1	LVCMOS
5T9010	Programmable Skew	11	LVCMOS	12.50 - 250.00	2	LVCMOS, Differential
5T9110	Programmable Skew	10	LVCMOS or HSTL	12.50 - 250.00	2	LVCMOS, Differential

These products represent only a portion of IDT's extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Other Networking/ Communications Devices

- General Data Transceivers
- Programmable Delay Lines
- Clock and Data Recovery Devices

FUNCTIONS

IDT Networking/Communications general data transceivers deliver:

- MUX and DEMUX high speed data and clock paths
- Differential outputs such as LVPECL and LVDS

BENEFITS/FEATURES

- I²C programmability available on some devices
- Full differential internal architecture
- 2.5V or 3.3V supply modes

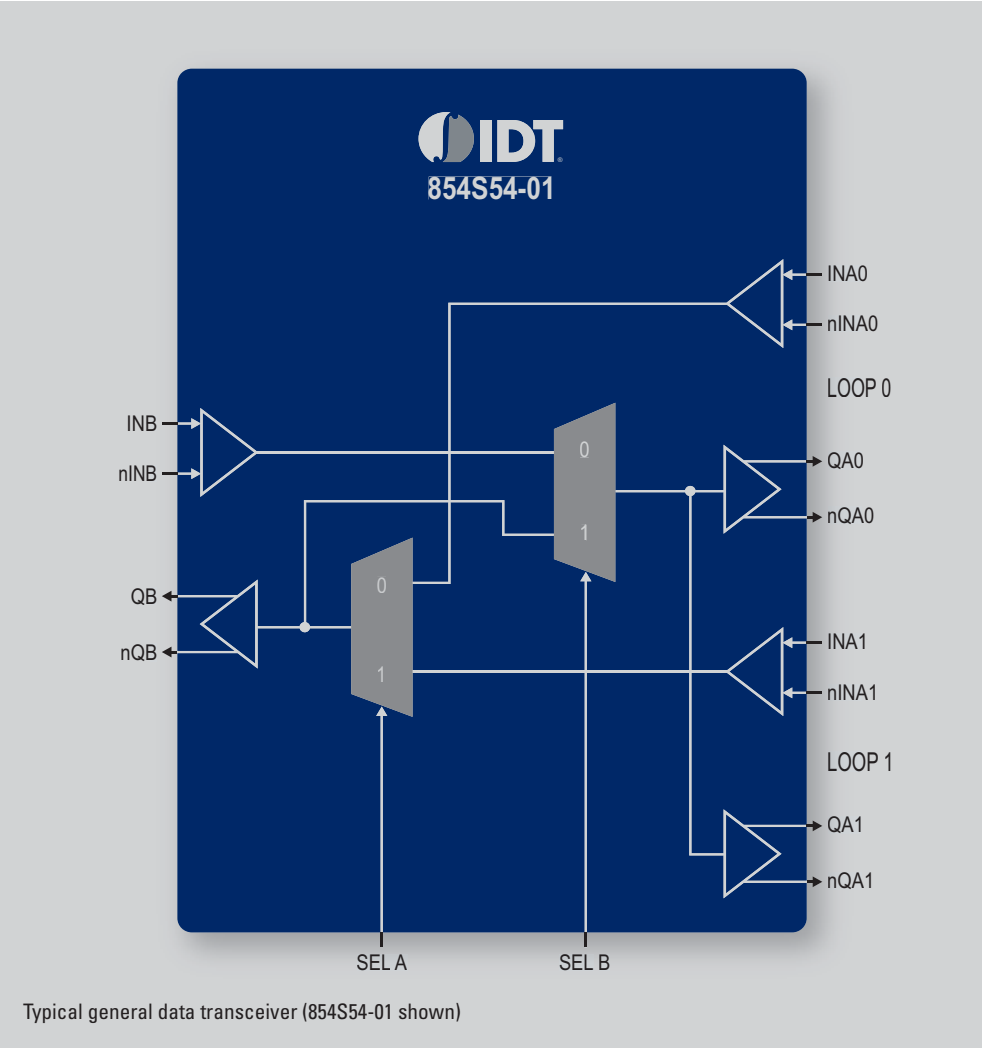
General Data Transceivers

IDT Networking/Communications general data transceivers are used for bi-directional switching of data signals in telecommunications, networking and Ethernet data transmission

General data transceivers are simple buffer/translator devices featuring fully differential internal architecture. This reduces jitter caused by inherent common-mode noise rejection and improves skew. The differential circuitry is constant-current and therefore injects less noise into system power supplies than single-ended solutions, resulting in less noise coupling and decreasing EMI compliance concerns.

The IDT general data transceiver portfolio includes functions with differential outputs such as MLVDS, LVPECL and LVDS. Typically, the transceivers use 2.5V or 3.3V supplies and are available in the commercial and industrial temperature ranges.

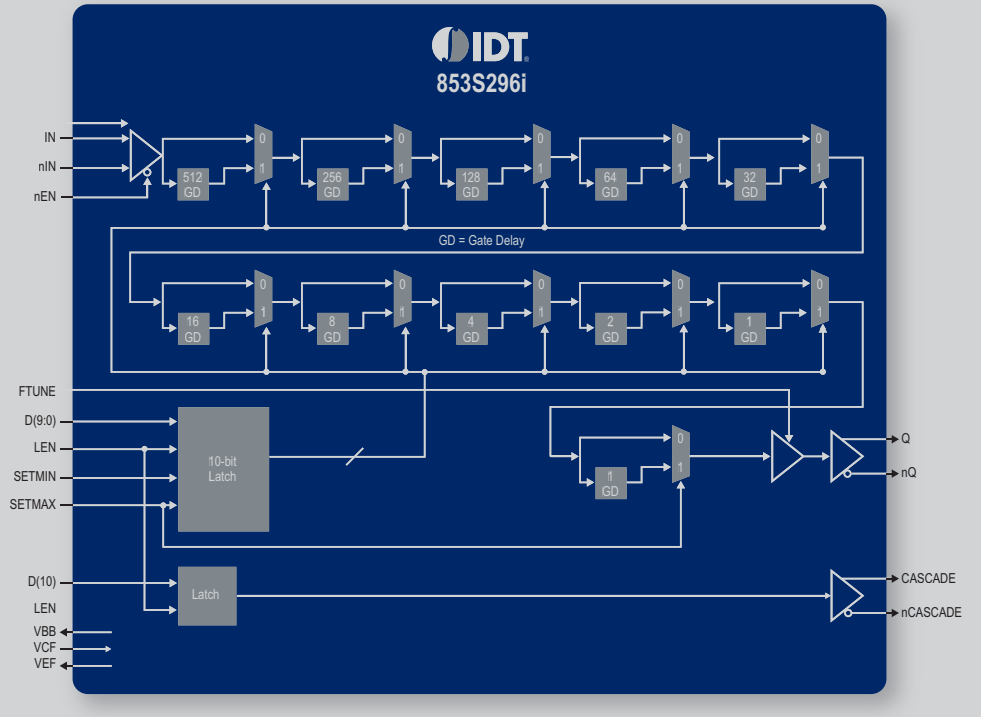
The MUX and DEMUX functions are designed for flexible configuration changes of intra-system, high speed data and clock paths. A typical use of these functions is the data interface between ATCA and AMC boards in telecommunication applications. The devices enable the multiplexing, de-multiplexing and loopback of serial data streams such as Ethernet and high speed SERDES ports. Various device options support a uni- and bi-directional data transfer of single and multiple channels. Typical applications for the MUX/DEMUX family are telecommunications, networking, Ethernet, data transmission and ATCA/AMC.



Typical general data transceiver (854S54-01 shown)

Programmable Delay Lines

Programmable delay lines provide variable delay of a differential input signal



Typical programmable delay line (853S296i shown)

High performance delay lines use an array of gates and multiplexers to provide programmable delay in precision circuits. Clock de-skewing and timing adjustment is accomplished using a digital control signal (10-bit long control word) which provides delay in 10 ps steps. Further enhancement of this 10 ps resolution for the delay is offered in versions which include a tunable gate (FTUNE).

The IDT Networking/Communications programmable delay portfolio includes devices with differential outputs such as LVPECL and LVDS. They offer extremely low jitter and are targeted for many different end-applications, including test systems. Typically, the devices will operate from a 2.5V or 3.3V supply and are available in the commercial and industrial temperature ranges.

FUNCTIONS

IDT Networking/Communications programmable delay lines provide:

- Clock de-skewing
- Timing and aperture adjustments

BENEFITS/FEATURES

- Resolution down to 10 ps steps
- Full differential internal architecture
- 2.5V or 3.3V supply modes

Clock and Data Recovery Devices

Clock and data recovery (CDR) circuits extract the clock signal from NRZ-coded input data signals

FUNCTIONS

IDT Networking/Communications clock and data recovery products provide:

- NRZ data input of 155.52 or 622.08 MBit/s
- Output clock signal of 155.52 or 622.08 MHz
- Low jitter clock outputs

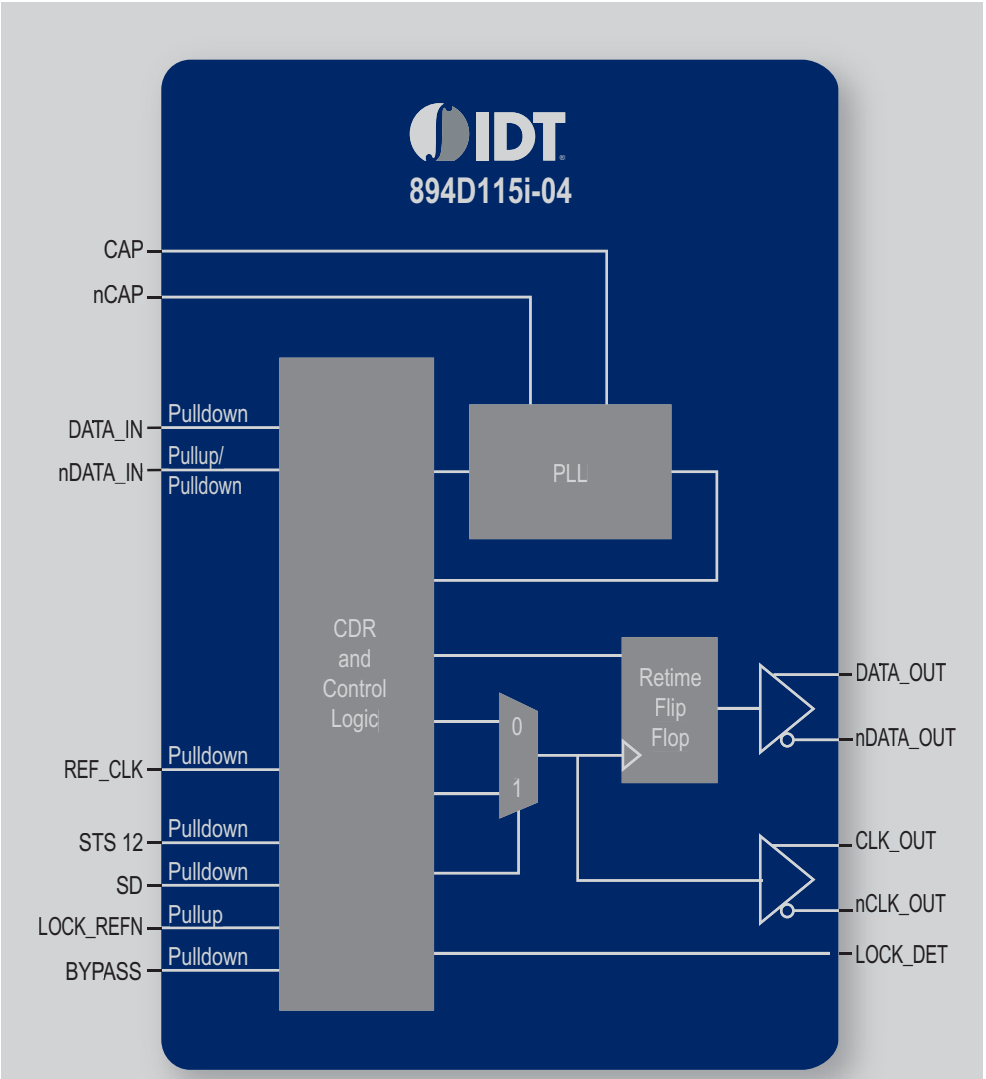
BENEFITS/FEATURES

- Proven solution for OC-3/-12 and STM-1/-4 clock/data recovery
- Differential clock inputs and outputs
- Lock reference input and PLL lock detect output
- 3.3V supply mode

CDR devices accept 622.08 or 155.52 MBit/s data signals and output both the recovered clock and re-timed data signals. Each device uses an internal phase-locked loop (PLL) based on the IDT proprietary FemtoClock® PLL technology.

CDR circuits use differential inputs and outputs to support high clock and data rates for the best signal integrity. All control panel inputs and outputs are single-ended signals. A signal-detect input and a lockdetect output are designed into each device, which enables users to interface with electro-optical modules.

IDT CDR devices can be used in STM-1/-4 (OC-3/-12) data streams, wireless infrastructure (transport and backhaul), wired communication, ADM equipment and any other application requiring direct interface with an electro-optical module.



Typical clock and data recovery device (894D115i-04 shown)

Part Number	Function	# of Outputs	Output Type	Output Frequency (MHz)	# of Inputs	Input Type
894D115I-01	Clock and Data Recovery	2	LVCMOS	155.52 - 622.08	2	LVCMOS, Differential
894D115I-04	Clock and Data Recovery	2	LVCMOS	155.52 - 622.08	2	LVCMOS, Differential

These products represent only a portion of IDT's extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Consumer Clocking Solutions

IDT provides clock and timing solutions that are optimized for consumer electronics, including STBs, TVs, Blu-ray products, cameras, handsets, and embedded products. Most electronic systems require many discrete timing components with multiple frequencies and IDT consolidates them all into a single device.

Introduction

IDT timing solutions allow customers the flexibility to program frequency, spread amount, output skew and more. This allows for easier board design and debug as well as easier inventory management, as one device can be used on multiple platforms. Using IDT silicon timing devices, designers can improve product reliability by reducing the number of quartz-based devices in their system. IDT clock generators also result in cost and space advantages.

IDT Consumer Clock Solutions: Largest Portfolio in the Industry, Providing a True One-Stop-Shop for Your Timing Needs.

In addition to clock generators and synthesizers, IDT offers many application specific low power timing devices for video and audio applications; clocks with Spread Spectrum to reduce EMI; general purpose VCXOs for jitter attenuation and clock recovery; and the industry's broadest portfolio of clock generation, buffering and multiplexers for PCI Express.

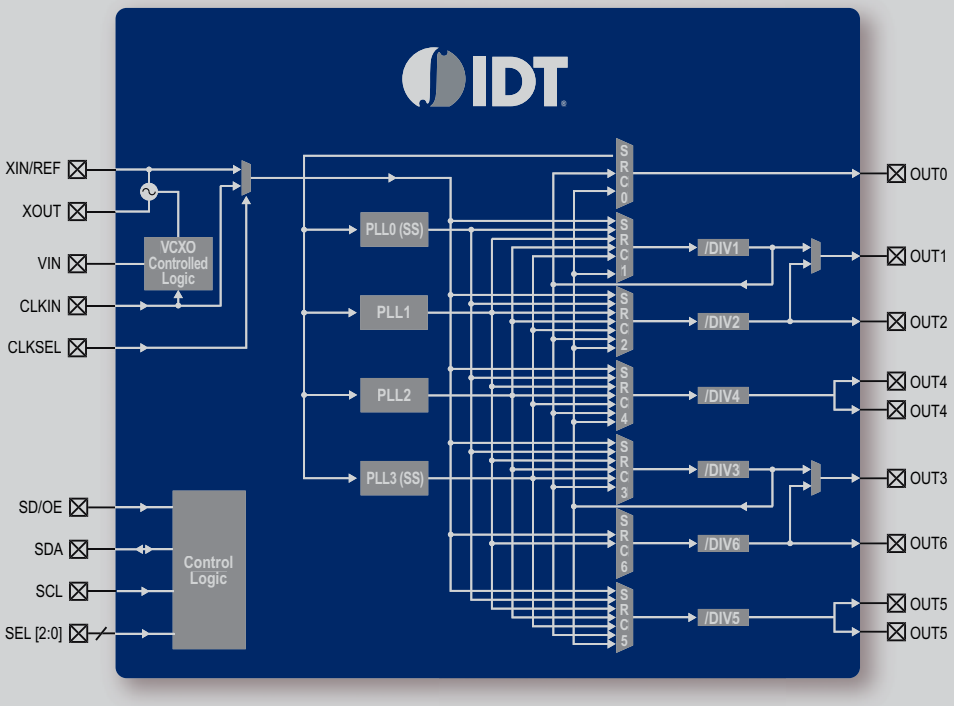
Timing is often the last piece of a designer's puzzle, but arguably one of the most important. IDT's extensive timing product portfolio can help a designer quickly address their timing needs.

Programmable Clocks

- VersaClock® III
- VersaClock LP (Low Power)
- JTAG Programmable Clocks
- SPI Programmable Clocks

VersaClock® III

IDT VersaClock products save cost, reduce board space and greatly increase versatility in consumer, data communications, telecommunications and networking applications.



Typical VersaClock III device

VersaClock products allow designers to save board space and cost by replacing crystals, oscillators and buffers with a single timing device. Exceptional versatility and configurability allow for maximum freedom in the design process.

There are four internal PLLs, each individually programmable, allowing for up to seven unique frequencies. These frequencies are generated from a single reference clock, which can come from one of two redundant clock inputs. A glitchless automatic or manual switchover function allows the redundant clock to be selected during normal operation.

VersaClock devices are highly configurable and can be programmed through the use of the I²C interface. The programming interface enables the device to be programmed when it is in normal operation. An internal EEPROM allows the user to save and restore the configuration of the device without having to reprogram it on power-up.

VersaClock products from IDT provide an almost universal solution for a variety of high performance clock applications.

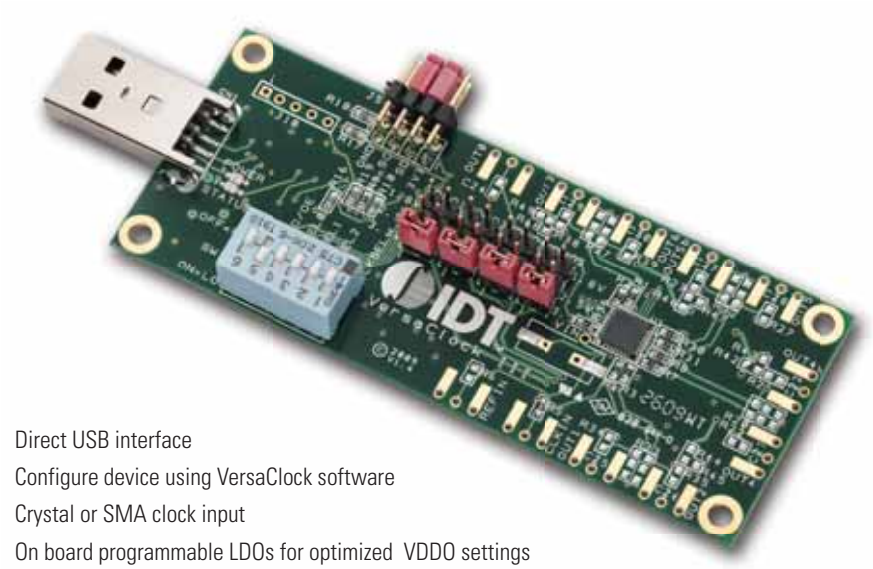
FEATURES

- 3.3V device with up to four independently controlled VDDO (1.8V - 3.3V)
- Two of four integrated PLLs support spread spectrum generation for EMI reduction
- Integrated VCXO
- Output frequency range: 4.9 kHz to 500 MHz
  - 1.8 - 3.3 V LVTTL/ LVCMOS
  - LVPECL, LVDS and HCSL
- Programmable loop bandwidth
- Programmable slew rate control,
- Redundant clock inputs with glitchless auto and manual switchover options
- Small 4x4mm and 5x5mm QFN and TSSOP packages

VERSACLOCK III SOFTWARE OPTIMIZES CONFIGURATIONS

- Automatic analysis and adjustment of spread spectrum, loop bandwidths and outputs
- Provides clock to pin locking and multi-register configuration
- Bit-level manipulation
- Direct software interface with VersaClock III evaluation board
- Free download from *www.idt.com/go/versaclock3*

VERSACLOCK® III EVALUATION BOARD



Direct USB interface
Configure device using VersaClock software
Crystal or SMA clock input
On board programmable LDOs for optimized VDDO settings
Matched differential output traces
Multiple daughtercards with sockets available to program additional devices

FEATURES

Four internal PLLs
Optional integrated VCXO
Internal non-volatile EEPROM
Each PLL has a 7-bit reference divider and a 12-bit feedback divider
Fast (400 kHz) mode I²C serial interface for device configuration
8-bit output divider clocks
Output frequency range: 4.9 kHz to 500 MHz
Programmable loop bandwidth settings
Input clock frequency range: 1 MHz to 200 MHz
Programmable output inversion to reduce jitter
Reference crystal input with programmable linear load capacitance
- Crystal frequency range: 8 to 50 MHz

I / O Standards:
- Outputs 1.8/2.5/3.3 V LVTTL / LVCMOS (device dependent)
- Outputs LVPECL, LVDS and HCSL
- Inputs LVTTL / LVCMOS

Two PLLs support spread spectrum generation
Redundant clock inputs with glitch-less auto switchover
Fractional divide capability on one PLL
-40 to +85 C industrial temperature operation

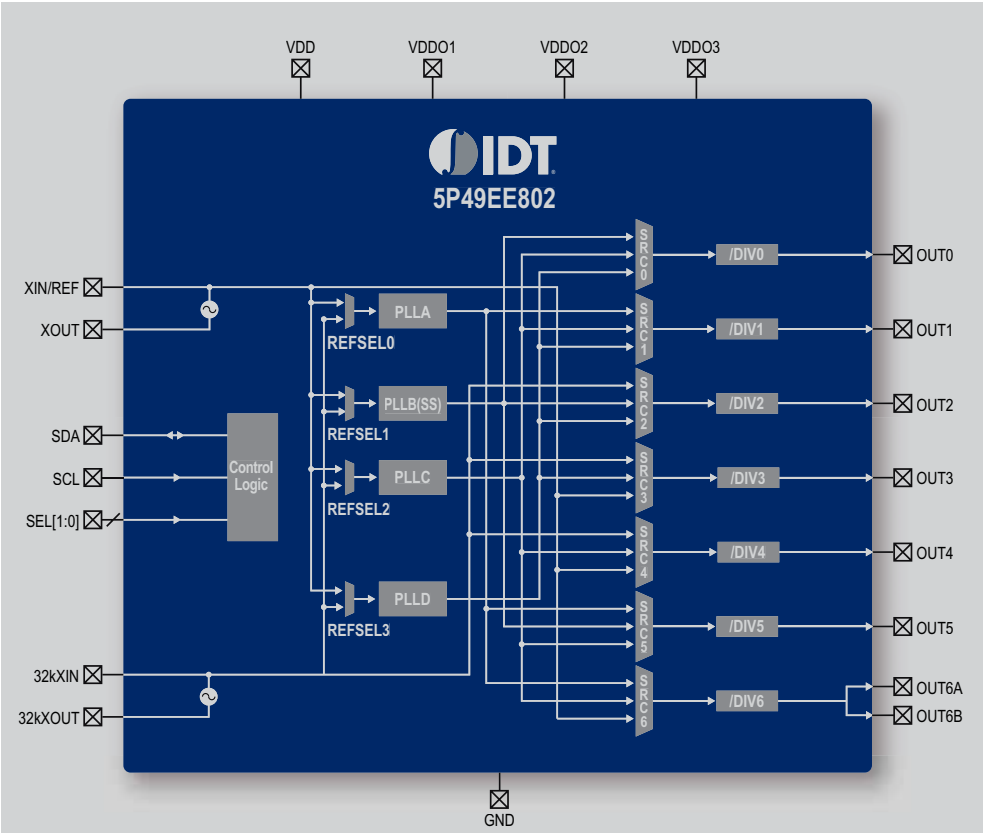
VersaClock III Parts

XO	Package	Number of Outputs	Output Type	VDDO
5V49EE901	TSSOP28, QFN32 (5x5mm)	9	LVTTL, LVPECL, LVDS, HCSL	No
5V49EE902	QFN32 (5x5mm)	9	LVTTL, LVPECL, LVDS, HCSL	Yes - 4
5V49EE903	TSSOP28, QFN32 (5x5mm)	9	LVTTL	No
5V49EE904	QFN32 (5x5mm)	9	LVTTL	Yes - 4
5V49EE701	QFN28 (4x4mm)	7	LVTTL, LVPECL, LVDS, HCSL	No
5V49EE702	QFN28 (4x4mm)	7	LVTTL, LVPECL, LVDS, HCSL	Yes - 3
5V49EE703	QFN28 (4x4mm)	7	LVTTL	No
5V49EE704	QFN28 (4x4mm)	7	LVTTL	Yes -3
5V49EE501	QFN24 (4x4mm)	5	LVTTL, LVPECL, LVDS, HCSL	No
5V49EE502	QFN24 (4x4mm)	5	LVTTL, LVPECL, LVDS, HCSL	Yes -2
5V49EE503	QFN24 (4x4mm)	5	LVTTL	No
5V49EE504	QFN24 (4x4mm)	5	LVTTL	Yes - 2
VCXO	**Package**	**Number of Outputs**	**Output Type**	**VDDO**
5V19EE901	TSSOP28, QFN32 (5x5mm)	9	LVTTL, LVPECL, LVDS, HCSL	No
5V19EE902	QFN32 (5x5mm)	9	LVTTL, LVPECL, LVDS, HCSL	Yes - 4
5V19EE903	TSSOP28, QFN32 (5x5mm)	9	LVTTL	No
5V19EE904	QFN32 (5x5mm)	9	LVTTL	Yes - 4
5V19EE603	QFN28 (4x4mm)	6	LVTTL	No
5V19EE604	QFN28 (4x4mm)	6	LVTTL	Yes - 3
5V19EE403	QFN24 (4x4mm)	4	LVTTL	No
5V19EE404	QFN24 (4x4mm)	4	LVTTL	Yes - 2

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

VersaClock® Low Power Programable Clocks

IDT VersaClock LP (Low-Power) products save cost, reduce power and board space and greatly increase versatility in battery powered consumer and computing applications.



Typical VersaClock LP device (5P49EE802 shown)

VersaClock LP products from Integrated Device Technology allow the designer to save board space, power consumption and cost by replacing crystals, oscillators and buffers with a single timing device. Exceptional versatility and configurability allow for maximum freedom in the design process. VersaClock LP devices may be used in any battery powered application, such as mobile handsets, digital cameras, camcorders, eBooks, or Smart books.

There are four internal PLLs, each individually programmable, allowing for up to eight unique frequencies. The frequencies are generated from a single reference clock or crystal. When used with a TCXO (Temperature Compensated Crystal Oscillator) input, all outputs will track the source accuracy, allowing consolidation of multiple TCXOs.

VersaClock devices can be programmed through the use of the I²C interfaces. The programming interface enables the device to be programmed when it is in normal operation. An internal EEPROM allows the user to save and restore the configuration of the device without having to reprogram it on power-up. VersaClock LP products from IDT provide an almost universal solution for a variety of high performance clock applications.

KEY FEATURES

- Low Power PLLs
  - 4-8mW per clock output
  - 20µW in power down mode
  - 200µW power down with 32.768 kHz active
- Supports clock input, TCXO on crystal input
- 32.768 kHz clock support
- Spread spectrum for EMI reduction
  - Unique video spread capability
- Small 3x3mm and 4x4mm QFN package
- Synthesizes kHz to120MHz outputs
- Less than 200ps (pico seconds) cycle-cycle jitter (typical)
- 1.8-3.3V LVTTL or LVDS outputs

TARGET APPLICATIONS

- Smart Books
- eBooks
- Mobile handsets
- Digital still cameras
- Camcorders
- MP3 or media player
- Portable medical equipment
- Point-of-sale terminals

VERSACLOCK® LP EVALUATION BOARD

Direct USB interface

Program device using VersaClock software

Crystal or TCXO clock input

On board programmable LDOs for optimized VDDO settings

Matched differential output traces

Interfaces to multiple socket daughtercards to program additional devices

FEATURES

Four internal PLLs

1 PLL supports spread spectrum generation, including video spread mode

Internal non-volatile EEPROM

Each PLL has a 7-bit pre-scaler and a 12-bit feedback divider

Outputs may be independently programmed to VDDO settings

On-chip 32.768 kHz oscillator provides real time clocksource and may be used for low power for processor clocks generation

Fast (400 kHz) mode I^2C serial interface for device configuration

additional devices

7-bit output divider clocks

Input frequency range: 1MHz to 50 MHz, 32 kHz crystal (on some devices)

Programmable loop bandwidth settings

Output frequency range: 5 kHz to 120 MHz

-40 to +85 C industrial temperature operation

Reference crystal input with programmable linear load capacitance

- Crystal frequency range: 8 to 50 MHz (maximum crystal range is best effort)

I/O Standards:

- Outputs: 1.8-3.3 V LVTTL / LVCMOS
- Outputs: 3.3 V LVDS
- Inputs: LVTTL / LVCMOS, Buffered Sine wave

VERSACLOCK LP SOFTWARE OPTIMIZES CONFIGURATIONS

Automatically optimizes spread spectrum, loop band widths and outputs

Provides lock to pin locking and simultaneous, multi-register con guration

Bit-level manipulation

Direct software interface with VersaClock LP evaluation board

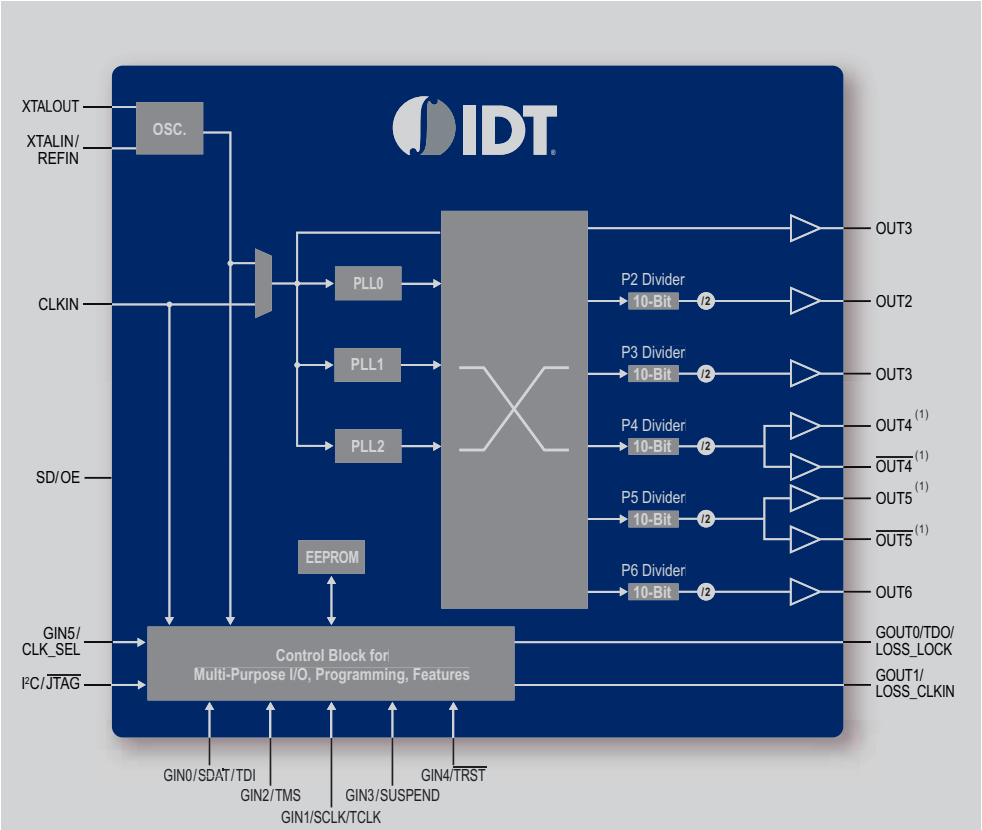
Free download from *www.IDT.com/go/VersaClockLP*

Part Number	Package	Number of Outputs	32 kHz Support	Output Type	Number of Outputs
5P49EE801	QFN28 (4x4mm)	8	Yes	LVTTL LVDS (1 pair)	3
5P49EE802	QFN28 (4x4mm)	8	Yes	LVTTL	3
5P49EE601	QFN24 (4x4mm)	6	Yes	LVTTL LVDS (1 pair)	3
5P49EE602	QFN24 (4x4mm)	6	Yes	LVTTL	3
5P49EE502	QFN20 (3x3mm)	5	No	LVTTL	2

These products represent only a portion of IDT s extensive timing portfolio.
For information on additional devices, please visit **www.idt.com/go/clocks**

JTAG Programmable Clocks

Programmable clock generators for high performance data-communications, telecommunications, consumer, and networking applications



Typical JTAG Programmable clock (5V9885T shown)

With three individually programmable internal PLLs, up to three unique non-integer-related frequencies may be generated from a single reference clock. The reference clock can come from one of the two redundant clock inputs. A glitchless automatic or manual switchover function allows any one of the redundant clocks to be selected during normal operation.

The devices can be programmed through the use of the I²C or JTAG interfaces. The programming interface enables the device to be programmed in-system. An internal EEPROM allows the user to save and restore the device configuration without having to reprogram it on power-up. JTAG boundary scan is also implemented.

Two of the six output banks may be configured to be LVTTL, LVPECL, or LVDS. The other four output banks are LVTTL.

FEATURES

- Three internal PLLs
- Internal non-volatile EEPROM
- JTAG and FAST mode I²C serial interfaces
- Input Frequency Ranges: 1MHz to 400MHz
- Output Frequency Ranges: 4.9kHz to 500MHz
- Reference Crystal Input with programmable oscillator gain and programmable linear load capacitance
  - Crystal Frequency Range: 8MHz to 50MHz
- Each PLL has an 8-bit pre-scaler and a 12-bit feedback-divider
- 10-bit post-divider blocks
- Fractional Dividers
- Two of the PLLs support Spread Spectrum Generation capability
- I/O Standards:
  - Outputs - 3.3V LVTTL/ LVCMOS, LVPECL, and LVDS
  - Inputs - 3.3V LVTTL/ LVCMOS
- Programmable Slew Rate Control
- Programmable Loop Bandwidth Settings
- Programmable output inversion to reduce bimodal jitter
- Redundant clock inputs with glitchless auto and manual switchover options
- JTAG Boundary Scan
- Individual output enable/disable
- Power-down mode
- 3.3V VDD
- Available in TQFP and VFQFPN packages

Part Number	Input Type	Input Frequency (MHz)	Output Type	Output #	Output Frequency (MHz)	p-p Jitter (ps)	Voltage Supply (V)	Package	Temp Range
5V9885T	Crystal, clock	1-400	CMOS, LVPECL, LVDS	9	0.0049 - 500	200	3.3	28QFN 32TQFP	Commercial, Industrial

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

SPI Programmable Clocks

Serially-programmable, one to three PLL timing generators

FEATURES

307-01/02

- Single PLL

307-03

- Single PLL
- Highly programmable loop filter
- VersaClock software configurable

308

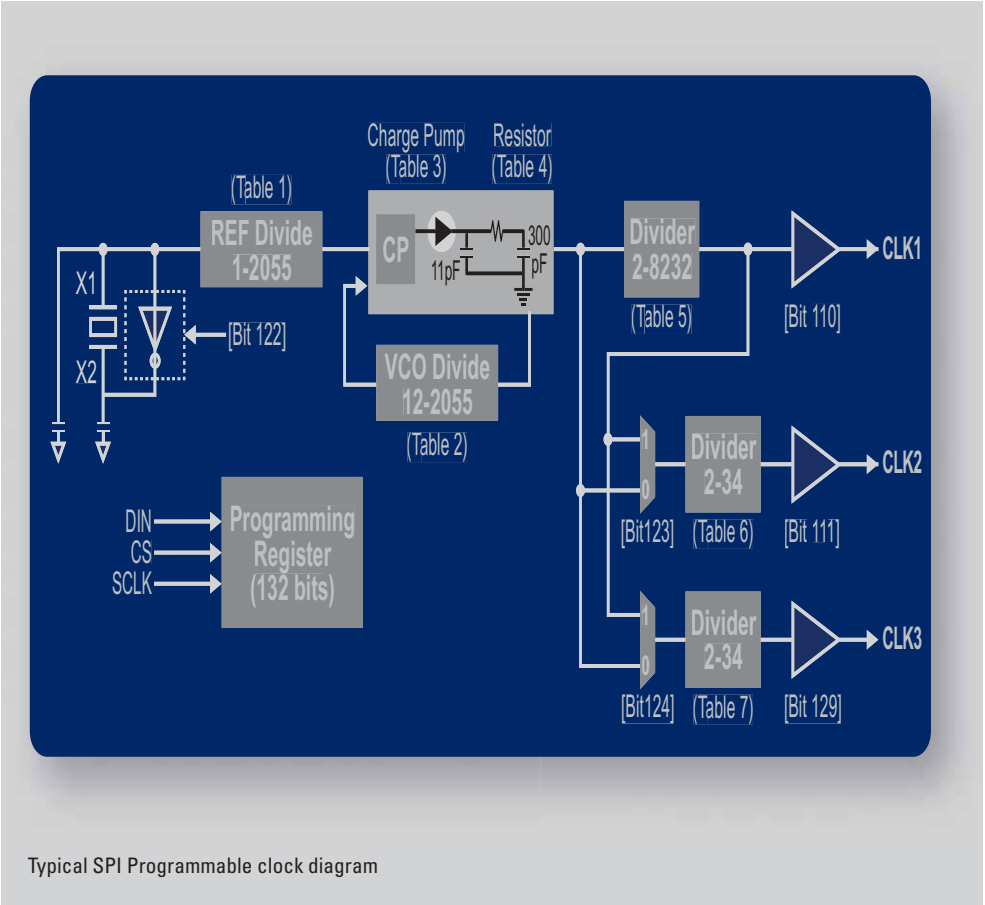
- Quad PLL
- 2 low-skew output banks
- VersaClock software configurable

309

- Triple PLL
- 2 low-skew output banks
- Spread Spectrum
- VersaClock software configurable

MK1716-01

- Single PLL
- 2 low-skew output banks
- Spread Spectrum
- VersaClock software configurable
- VDDO Control



Typical SPI Programmable clock diagram

The outputs of the IDT SPI Programmable clocks can be reprogrammed on-the-fly, and will lock to a new frequency in 10 ms or less.

To reduce system EMI emissions, spread spectrum is available on some devices that supports modulation frequencies of 31 kHz and 120 kHz.

IDT's VersaClock™ programming software is available to allow users to optimize outputs with target frequencies, spread spectrum capabilities or buffered reference clock outputs.

Part Number	Input Type	Input Frequency (MHz)	Output Type	Number of Outputs	Output Frequency (MHz)	p-p Jitter (ps)	Voltage Supply (V)	Package	Temp Range
307-01/02	Crystal, clock	5 - 50	CMOS	2	0.25 - 200	+120	3.3, 5	16 SOIC	Commercial, Industrial
307-03	Crystal, clock	0.1 - 300	CMOS	3	0.0002 - 270	+120	3.3	16 TSSOP	
308	Crystal, clock	5 - 50	CMOS	9	0.25 - 200	+300	3.3	20 QSOP	
309	Crystal, clock	5 - 50	CMOS	9	0.25 - 200	+300	3.3	20 QSOP	
MK1716-01	Crystal, clock	5 - 50	CMOS	9	0.25 - 133.33	+150	3.3	28 QSOP	

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Clock Synthesizers

- PCI Express® Clocks
- Video Clocks
- General Purpose Clock Synthesizers

IDT PCIe TIMING SOLUTION FEATURES

Clock Synthesizers
- Single-ended clock input to differential outputs
- Spread-spectrum options available for EMI reduction

Zero-Delay Buffers
- 2 to 19 outputs in a single device
- Selectable PLL bandwidth allows for device cascading

Non-PLL Fan-out Buffers
- 2 to 21 outputs per device
- Low Power options available

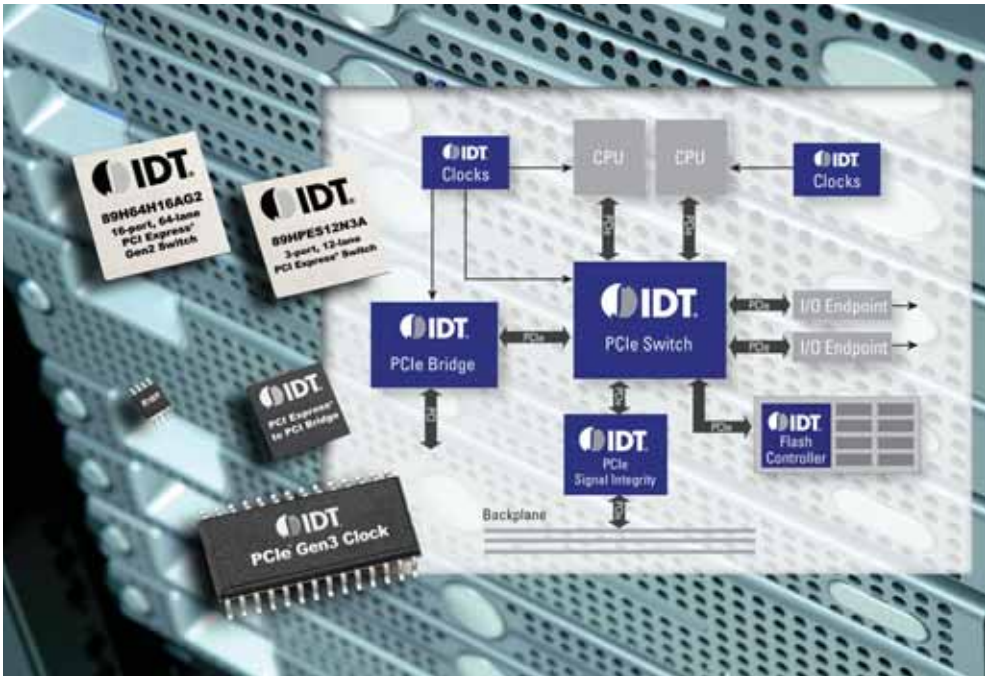
Muxes
- 1 to 4 outputs per device with 2 inputs

Jitter Attenuators
- Special purpose PLL reduces incoming clock jitter
- 2 to 6 outputs per device

PCIe TIMING SOLUTIONS

Industry s broadest offering of clock generation, buffering and muxing for PCIe Gen1, Gen2 and Gen3.
- World s first PCI Express Gen3 family of timing devices
- Industry s most accurate crystal-free CMOS oscillators
- Clock Synthesizers
- Spread-Spectrum Clock Synthesizers
- Zero-delay buffers
- Jitter Attenuators
- Frequency Translators
- Fan-out buffers
- Muxes
- Low Power Product offerings

PCI Express® Clocks



PCI Express (PCIe) is globally recognized as the general purpose I/O that unifies the component interconnect across many applications including desktop computing, servers, workstations, storage, networking, enterprise routers, industrial test and control equipment, aerospace, and many more.

IDT is the only vendor to provide all the major building blocks for PCIe, including switches, bridges, signal integrity products for increasing channel length, and timing devices. This document is focused on the industry's largest family of PCIe timing devices from IDT.

Standard-Power PCIe Clocking Devices

High-Peformance Clock Synthesizers

Part Number	Description	Inputs	PCIe Outputs	REF Outputs	Input Frequency (MHz)	Output Frequency (MHz)	Pins & Packages
557-01	PCIe Gen1 Clock Synthesizer	1	1	-	25	100	8-SOIC
557-03/05	PCIe Gen1 Clock Synthesizer, Spread Capable	1	2/4	-	25	25,100,125,200	16/20-TSSOP
5V41064/5/6	PCIe Gen2 Clock Synthesizer, Spread Capable	1	1/2/4	-	25	25,100,125,200	16-MLF, 16/20-TSSOP
9FG104/9FG108	PCIe Gen2 Clock Synthesizer, Spread Capable	1	4/8	1	14.318/25	100,125,133.33, 166.67,333.33,400	28/48-SSOP, 28/48 TSSOP
5V41234/5/6	PCIe Gen3 Clock Synthesizer, Spread Capable	1	1/2/4	-	25	25,100,125,200	16-MLF, 16/20-TSSOP
9FG430/9FG830	PCIe Gen3 Clock Synthesizer, Spread Capable	1	4/8	1	14.318/25	100,125,133.33, 166.67,333.33,400	28/48-SSOP, 28/48 TSSOP

Low-Power PCIe Clocking Devices

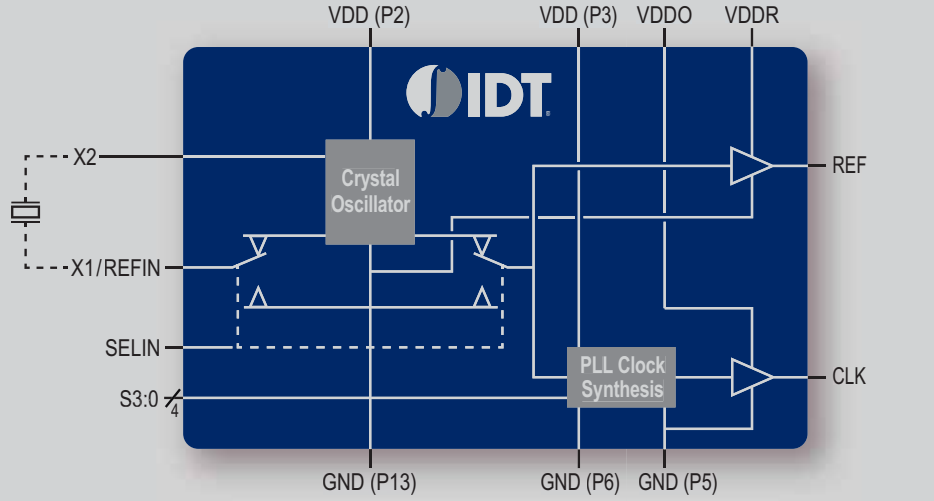
High-Peformance Clock Synthesizers

Part Number	Description	Inputs	PCIe Outputs	REF Outputs	Input Frequency (MHz)	Output Frequency (MHz)	Pins & Packages
9FGL639	Low-Power PCIe Gen2/3 Clock Synthesizer, Spread Capable	1	6		25	100	32 MLF

NOTE: IDT PCIe Gen 3 timing devices can be used in PCIe Gen1, Gen2 or Gen 3 applications. IDT PCIe Gen2 timing devices can be used in PCIe Gen1 or Gen2 applications.

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Video Clocks



Typical Video clock diagram

IDT video clocks are designed specifically for video applications which include GENLOCK clock synthesizers and general purpose audio/video clocks. They use a simple, low cost, fundamental-mode quartz crystal as the frequency reference to synthesize low jitter video clock outputs. PECL, SSTL and LVCMOS output standards are supported.

Applications for video clocks include digital televisions, projectors, LCD monitors, and embedded displays.

BENEFITS

- Consolidation of multiple clock frequencies into a single device
- Low cost
- Reduction in BOM components required

FUNCTIONS

IDT video clocks offer:

- Single and multiple frequencies
- I²C Programming
- GENLOCK clock support
- Support for HDTV, NTSC and PAL clock sources
- User programmable

Part Number	Function	Core Voltage (V)	Input Frequency (MHz)	Output Voltage (V)	Number of Outputs	Prog. Clock	Typical Jitter (ps)
1523MLF	Video Clock Synthesizer with I²C Programmable Delay	3.3	0.05-100	3.3	5	Yes	
1526GILF	Video Clock Synthesizer	3.3	0.008-100	3.3	3	Yes	200
1527G-110LF	Video Clock Synthesizer	3.3	0.008-10	3.3	3	Yes	200
1562BM-201-4LF	User Programmable Differential Output Graphics Clock Generator	5	5-20	5	3	Yes	
1562BM-201LF	User Programmable Differential Output Graphics Clock Generator	5	5-20	5	3	Yes	
1574BMLF	User Programmable Laser Engine Pixel Clock Generator	5	5-20	5	1	Yes	
660GI	Digital Video Clock Source	3.3	13.5,27,74.25,74.175824,16.9344, 125,14.3181818,106.25,27.027	2.5,3.3	2	No	125
661GI	Precision Audio Clock Source	3.3	27	1.8, 2.5, 3.3	2	No	175
662M-03	HDTV Audio/Video Clock Source	3.3	74.25,74.175824	3.3	1	No	75
663M	PLL Building Block	3.3,5	0.001-8	3.3,5	1	No	150
664G-01	Digital Video Clock Source	3.3	13.5,27,74.25,74.175824,54	3.3,2.5	1	No	100
664G-02	PECL Digital Video Clock Source	3.3	13.5,27,74.25,74.175824,54	3.3,2.6	2	No	70
664G-03	Digital Video Clock Source	3.3	13.5,27,74.25,74.175824,54	3.3,2.7	3	No	100
664G-05LF	Digital Video Clock Source	3.3	27,74.25,74.175824,54,67.5	3.3,2.8	4	No	100
810001-21	Video Clock Synthesizer	3.3	15 74	3.3	1	Yes	1.01
810001-22	Video Clock Synthesizer	3.3	15.6 67.5	3.3	1	Yes	1.01

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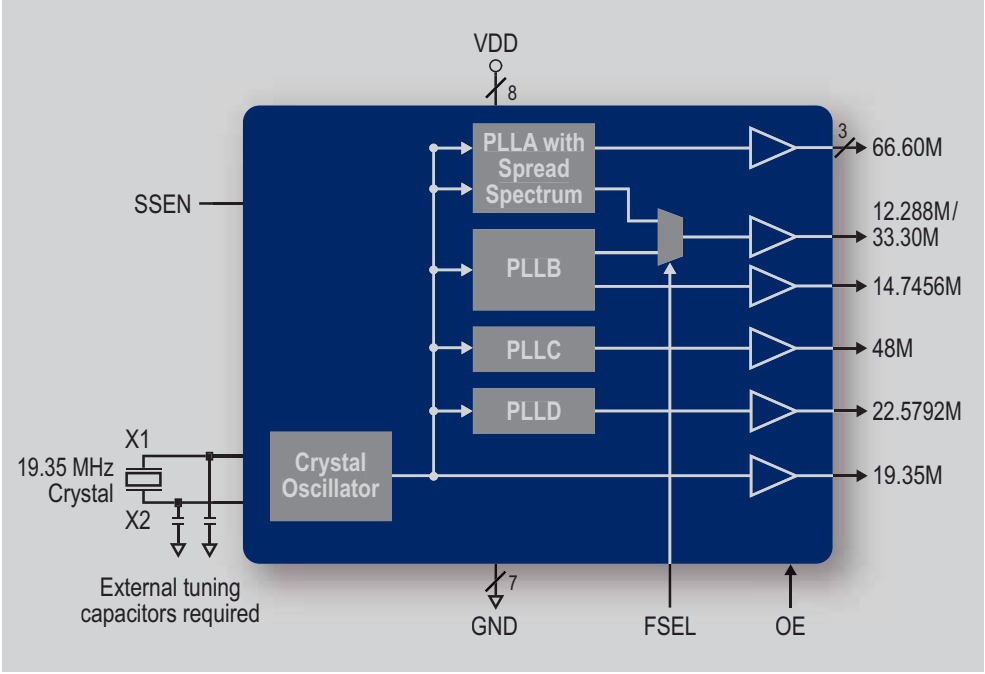
General Purpose Clock Synthesizers

FEATURES

- Improves Reliability by reducing number of quartz on board
- Reduces Cost, BOM and Inventory by replacing multiple crystals and oscillators with one device
- Reduces board space
- Reduces power consumption



IDT clock generators are PLL-based products that generate different output frequencies from a common input frequency. Each peripheral in a system requires different frequency operate. 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 synthesize low-jitter output clocks. Multiple copies of some frequencies may be provided to drive multiple loads. They also allow for frequency translation - either multiplication or division.

IDT offers clock generators with both single ended and differential clock outputs. Differential standards such as LVPECL and LVDS are supported. Typically, IDT synthesizers use 1.8V, 2.5V or 3.3V supplies and are available in commercial and industrial temperature ranges.

Using an IDT clock generator has many benefits. Reducing the number of quartz crystals on a board improves reliability because crystals are highly susceptible to shock and vibration. Using a clock generator also reduces a customer's board cost and space, Build of materials (BOM) and inventory levels by replacing multiple crystals and oscillators with one device.

Part Number	Core Voltage (V)	Input Frequency (MHz)	Divider Value	Clock Multiplication Value	Output Freqency (MHz)	Output type	Number of Outputs	p-p Jitter (typ) (ps)	Reference Output	Spread Spectrum Capability
1493-17	1.8	27			37,48,22.5792,24,27	LVCMOS	5	225 (cy-cy)	Y	Y
3771-18	3.3	27			27, 27.027, 74.25, 74.175824	CMOS,TTL	4	120	N	N
409	3.3	14.31818			25,40,80	CMOS,TTL	3	250	N	N
411	3.3	14.31818			25,24.576	CMOS,TTL	3	150	N	N
4231-03	5	10-33			10-33	CMOS,TTL	1	300(cy-cy)	N	Y
477-05	3.3	27			27, 24, 54.054, 74.175824	CMOS,TTL	5	200(cy-cy)	Y	N
487-25	3.3	27			18.432, 16.9344, 12.288, 24.576, 20, 48, 33	CMOS,TTL	5	350	N	N
501	3.3,5	2-50		4, 5.3125, 5, 6.25, 2, 3.125, 6, 3, 8	13-160	CMOS	1	70	N	N
501A	3.3	5-50		4, 5.333, 5, 10, 2, 12, 6, 3, 8	60-200	CMOS	1	70	N	N
501B	3.3,5.5	0.5-7.5		4, 5.3125, 5, 6.25, 2, 3.125, 6, 3, 8	4-15	CMOS	1	70	N	N
502	3-5.5	2-50		2, 5, 3, 3.33, 4, 2.5	14-190	CMOS	2	70	Y	N
503	3-5.5	2-50		10, 16, 1.1111, 2.4444, 2.4164, 2.4, 5.5873, 1.1827, 4.1905	14-160	CMOS	1	100	Y	N

Part Number	Core Voltage (V)	Input Frequency (MHz)	Divider Value	Clock Multiplication Value	Output Freqency (MHz)	Output type	Number of Outputs	p-p Jitter (typ) (ps)	Reference Output	Spread Spectrum Capability
507-01	3.3,5	5-52		2, 3, 4, 5, 6.25, 8, 9.72, 10, 12	10 - 200	PECL	1	75	N	N
511	3.3,5	2-50		4, 5.333, 5, 2.5, 2, 3.333, 6, 3, 8	14 - 160	CMOS	1	70	N	N
512	3-5.5	2-50		4, 5.333, 5, 2.5, 2, 3.333, 6, 3, 8	14 - 160	CMOS	2	200	Y	N
513	3.3-5.5	2-50		6.984, 1.676, 1, 3.353, 0.2576	14 - 140	CMOS	2	140	Y	N
514	3.3-5.5	2-50		1.746, 2.328, 2.794, 3.492, 4.656	14 - 140	CMOS	2	160	Y	N
525-02	3,5.5	2-50	1, 2, 3, 4, 5, 6, 7, 8		3.75 - 250	CMOS	2	85	Y	N
525-03	3,5.5	0.5-250	1, 2, 3, 4, 5, 6, 7, 8		0.5 - 250	PECL,CMOS	2	350	N	N
525-04	3.3,5	2-50	1, 2, 3, 4, 5, 6, 7, 8		1 - 120	PECL	2	50	N	N
525-11	3,5.5	2-50	2, 4, 5, 6, 7, 8, 9, 10		0.75 - 40	CMOS	2	85	Y	N
525-01	3,5.5	2-50	10, 2, 8, 4, 5, 7, 9, 6		1.2 - 160	CMOS	2	140	Y	N
548-05	3.3,5	1.544, 2.048			24.704, 37.056, 32.768, 49.152	CMOS	2	100	Y	N
552A-01	3.3,5	10-200		1.33, 2, 2.66, 3, 3.33, 4, 4.66, 5, 6	10 - 200	CMOS	8	75	N	N
601-01	3.3-5	10-27			0 - 156	3.3V LVCMOS,5.5V LVCMOS	2	18 max (cy-cy)	Y	N
601-21	3.3	10-27			10 - 220	3.3V LVCMOS	2	15 max (cy-cy)	N	N
601-02	2.5,3.3	10-27			0 - 170	3.3V LVCMOS	1	18 max (cy-cy)	N	N
601-25	3.3	10-27			0 - 156	3.3V LVCMOS	5	18 max (cy-cy)	N	N
613	2.5,3.3	25			125 - 157.5	2.5V-3.3V LVCMOS	2	36 max (cy-cy)	N	N
650	3.3	25			33.3, 33.333, 50, 66.666, 100, 125	CMOS	4	150(cy-cy)	N	N
650-40A	3.3	25			127, 133, 157, 189	CMOS	3	120(cy-cy)	N	N
650-40	3.3	25			127, 133, 157, 189	CMOS	2	200(cy-cy)	N	N
650-41	3.3	25			48, 50	CMOS	2	250	N	Y
650-44	3.3	25			50	CMOS	3	250	N	Y
650-47	3.3	25			50	CMOS	1	250	N	Y
650-01	3.3,5	14.31818			12.288, 24.576, 49.152, 12, 24, 48, 25, 50, 18.75, 40, 80, 20, 33.333, 66.666	CMOS	8	500 max (period)	N	N
650-07	3.3,5	12.5,25, 14.31818			100, 75, 33.333, 16.666, 66.666, 125, 83.333, 41.666, 133.333, 50, 37.5, 16.666, 8.333, 62.5, 37.5, 41.666, 20.833	CMOS	7	150	N	N
650-11	3.3	17.664			25, 33, 59.23, 80, 78.9, 70.6, 50.78, 17.664	CMOS	5	295(cy-cy)	N	N
650-12	3.3,5	27			12.288, 11.2896, 8.192, 24.576, 16.9344, 18.432, 20, 66.666, 108, 54,55, 27.5, 66.666, 33.333, 80, 40, 54, 27, 81, 40.5, 50, 25, 60, 30, 13.5	CMOS	6	400	N	N

Part Number	Core Voltage (V)	Input Frequency (MHz)	Divider Value	Clock Multiplication Value	Output Freqency (MHz)	Output type	Number of Outputs	p-p Jitter (typ) (ps)	Reference Output	Spread Spectrum Capability
650-21	3.3,5	25			12, 24, 48, 49.152, 24.576, 14.318, 25, 50, 40, 80, 33.333, 66.666, 20, 40, 100	CMOS	7	1000 max (period)	N	N
650-22	3.3	27			33.333, 48, 66.666, 100	CMOS	7	200	N	N
650-14	3.3,5	25			33.33, 66.66, 50, 75, 66.67, 100, 83.33, 125, 25, 62.5, 30, 27, 48, 83.33, 19.44, 80	CMOS	8	500	N	N
650-27	3.3	12.5,25			100,75,33.333,16.666,66.666,83.333,41.666,133.333,125,25,50,37.5,16.666,8.333,33.333,16.666,41.666,20.833,12.5	CMOS	7	250	N	N
660	3.3	13.5,27, 74.25, 74.175824, 16.9344, 125, 14.3181818, 106.25, 27.027			13.5,27,74.25,74.175824,125,14.3181818,106.25,27.027	CMOS,TTL	2	125	Y	Y
661	3.3	27			8.192,11.2896,12.288,24.576,16.9344,18.432,36.864,16.384,22.5792,49.152,33.8688,73.728	CMOS,TTL	2	175	Y	N
662	3.3	74.25, 74.175824			8.192, 11.2896, 12.288, 24.576, 16.9344, 18.432,36.864, 16.384, 22.5792, 49.152, 27	CMOS,TTL	1	75	N	N
663	3.3,5	0.001-8	2,8		0.25-120	CMOS,TTL	1	150	N	N
664-01	3.3	13.5, 27, 74.25, 74.175824, 54			13.5, 54, 74.25, 74.175824	CMOS	1	100	N	N
664-02	3.3	13.5, 27, 54, 74.25, 74.175824			13.5, 54, 74.25, 74.175824	PECL	1	70	N	N
664-03	3.3	13.5, 27, 74.25, 74.175824, 54			13.5, 27, 54, 74.25, 74.175824, 148.5, 148.351648	CMOS	1	100	N	N
664-05	3.3	27, 74.25, 74.175824, 54, 67.5			27, 54, 74.25, 74.175824, 148.5, 148.351648, 67.5	PECL	1	100	N	N
667-01	3.3	27			74.175824, 27	CMOS	1	200	Y	N
673-01	3.3,5	.001-30			.25-120	TTL,CMOS	2	150	N	N
MK1413	3-5	14.318			8.192-16.9344	TTL,CMOS	1	200	Y	N
MK1491-06	3.3	14.318			14.318-49.152	TTL,CMOS	10	250(cy-cy)	Y	Y
MK1491-09	3.3	14.318			14.318-66	TTL,CMOS	12	300 max (cy-cy)	Y	Y
MK1491E-14	3.3	14.318			14.318-75	TTL,CMOS	15	300 max (cy-cy)	Y	Y
MK1493-05	3.3	14.318			14.318-100	HCSL,TTL	2	80(cy-cy)	Y	Y
MK1581-01	3.3	0.008, 24.704, 24.576			1.544,2.048	TTL,CMOS	1	150(cy-cy)	N	N
MK2703	3.3,5	27			8.192-27	TTL,CMOS	2	300	Y	N
MK2704	3.3,5	27			16,9344-36.864	TTL,CMOS	2	450	Y	N
MK2705	3.3,5	27			8.192-24.576	TTL,CMOS	1	175	N	N
MK2712	3.3,5	27			14.318, 17.734, 28.636, 35.468	TTL,CMOS	1	270 max (period)	N	N
MK2716	3.3,5	27			27,74.25,74.175	TTL,CMOS	2	200 max (period)	Y	N

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Clock Distribution

- PCI Express® Clock Buffers
- Zero-Delay Buffers
- Fan-Out Buffers

PCI Express® Clock Buffers

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Standard-Power PCIe Clocking Devices

PLL Zero-Delay Buffers w/Fanout Mode

Part Number	Description	Inputs	PCIe Outputs	REF Outputs	Input Frequency (MHz)	Output Frequency (MHz)	Pins & Packages
9DB102/9DB106	PCIe Gen2 Buffer	1	2, 6		100	100	20 QSOP, 20/28 SSOP, 28 TSSOP
9DB403D/9DB803D	PCIe Gen2 Buffer	1	4, 8		100	100	28/48-SSOP, 28/48 TSSOP
9DB423/9DB823	PCIe Gen2/QPI 6.4Gb Buffer	1	4, 8		100,133	100,133	28/48-SSOP, 28/48 TSSOP
9DB1200	PCIe Gen2/QPI 6.4Gb Buffer	1	12		100,133.33, 166.67,200, 267,333.33,400	100,133.33, 166.67,200, 267,333.33,400	64-TSSOP
9DBx33	PCIe Gen3 Buffer	1	2, 4, 8, 12, 19		100	100	20/28/48/64/72 QSOP, TSSOP, MLF
9EX1501/9EX1801	PCIe Gen2 Buffer with 2-input mux	2	15, 18		100,133	100,133	62/72 MLF
9EX1531/9EX1831	PCIe Gen3 Buffer with 2-input mux	2	15, 18		100,133	100,133	62/72 MLF

PLL Zero-Delay Low-Drift Buffers w/Fanout Mode

Part Number	Description	Inputs	PCIe Outputs	REF Outputs	Input Frequency (MHz)	Output Frequency (MHz)	Pins & Packages
9ZX21200/9ZX21201	PCIe Gen3/QPI 9.6Gb Low-Drift Buffer	1	12		100,133	100,133	56/64 MLF
9ZX21501	PCIe Gen3/QPI 9.6Gb Low-Drift Buffer	1	15		100,133	100,133	64 MLF
9ZX21901	PCIe Gen3/QPI 9.6Gb Low-Drift Buffer	1	19		100,133	100,133	72 MLF

Non-PLL Fanout Buffers and Muxes

557-06	PCIe Gen1 clock mulitiplexing buffer	2	4		0-133.33	0-133.33	20 TSSOP
557-08	PCIe Gen1 clock mulitiplexing buffer	1	2		0-133.33	0-133.33	16 TSSOP
5V41067A	PCIe Gen2/3 clock mulitiplexing buffer	2	4		0-133.33	0-133.33	20 TSSOP
5V41068A	PCIe Gen2/3 clock mulitiplexing buffer	1	2		0-133.33	0-133.33	16 TSSOP

PCIe Jitter Attenuators

Part Number	Description	Inputs	PCIe Outputs	REF Outputs	Input Frequency (MHz)	Output Frequency (MHz)	Pins & Packages
9DS400/9DS800	PCIe Jitter Attenuator, w/ Spread Injection	1	4/8	4/8	100	100	28/48-SSOP, 28/48 TSSOP

Low-Power PCIe Clocking Devices

PLL Zero-Delay Low-Drift Buffers w/Fanout Mode

Part Number	Description	Inputs	PCIe Outputs	REF Outputs	Input Frequency (MHz)	Output Frequency (MHz)	Pins & Packages
9ZXL1230/9ZXL1231	Low-Power PCIe Gen3/QPI 9.6Gb Low-Drift Buffer	1	12		100,133	100,133	56/64 MLF
9ZXL1530	Low-Power PCIe Gen3/QPI 9.6Gb Low-Drift Buffer	1	15		100,133	100,133	64 MLF
9ZXL1930	Low-Power PCIe Gen3/QPI 9.6Gb Low-Drift Buffer	1	19		100,133	100,133	72 MLF

Non-PLL Fanout Buffers and Muxes

9DBL411	Low-Power PCIe Gen2/3 clock buffer	1	4		0-133.33	0-133.33	20 TSSOP, 20 MLF

NOTE: IDT PCIe Gen 3 timing devices can be used in PCIe Gen1, Gen2 or Gen 3 applications. IDT PCIe Gen2 timing devices can be used in PCIe Gen1 or Gen2 applications.

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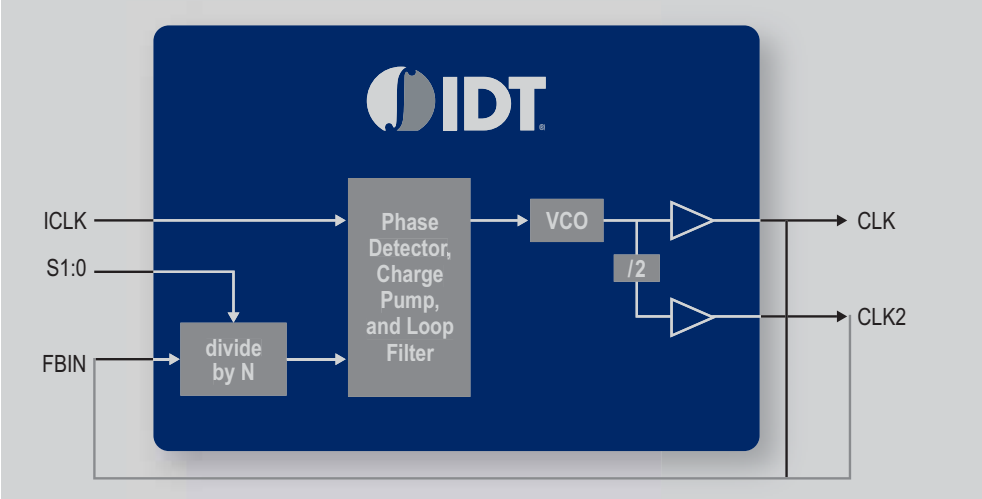
Zero Delay Buffers



IDT's family of zero delay buffers provide low jitter and low input to output delay for high speed clock distribution applications. The zero delay feature means that the rising edge of the input clock aligns with the rising edges of both output clocks, giving the appearance of no delay through the device. All parts have on-chip PLLs which lock to an input clock on the REF pin. The PLL feedback path eliminates the delay through other devices and can be on chip or external. On chip feedback is obtained from the CLKOUT pad. Some parts have the option to add multiplier or divider paths to the outputs. IDT's zero delay buffer family includes products supporting supply voltages from 2.5V to 5V, output frequencies 5 to 210MHz, and 1 to 9 outputs. Typical output types supported are CMOS and TTL.

Zero Delay buffers are ideal for synchronizing outputs in a large variety of systems, from personal computers to data communications to graphics/video.

FEATURES

- Clock outputs from 10 to 133 MHz
- Zero input-output delay
- Low skew outputs
- Low Device-to-device skew <700 ps
- Full CMOS outputs with 25 mA output drive capability at TTL levels
- 5 V tolerant CLKIN
- Tri-state mode for board-level testing available
- Industrial temperature range available
- Packaged in 8-pin SOIC

Part Number	Number of Outputs	Input Frequency (MHz)	Multipliers	Accepts Spread Spectrum Input	C-C Jitter Max (ps)	Core Voltage (V)	Output Banks	Output Skew (ps)	Output Type	High Drive
2305-1	5	10-133	1	No	200	3.3	1	250	CMOS, TTL	No
2305-1H	5	10-133	1	No	200	3.3	1	250	CMOS, TTL	Yes
2305-1	5	10-133	1	No	200	3.3	1	250	CMOS, TTL	No
2305A-1H	5	10-133	1	No	200	3.3	1	250	CMOS, TTL	Yes
2305B-1H	5	10-133	1	No	200	3.3	1	250	CMOS, TTL	Yes
2305B-1	5	10-133	1	No	200	3.3	1	250	CMOS, TTL	No
2308-1	8	10-133	1	No	200	3.3	2	250	CMOS, TTL	No
2308-1H	8	10-133	1	No	200	3.3	2	250	CMOS, TTL	Yes
2308-2	8	10-133	1,2	No	200	3.3	2	250	CMOS, TTL	No
2308-2H	8	10-133	1,2	No	200	3.3	2	250	CMOS, TTL	Yes
2308-3	8	10-133	2,4	No	200	3.3	2	250	CMOS, TTL	No
2308-4	8	10-133	2	No	200	3.3	2	250	CMOS, TTL	No
2308-4	8	10-133	2	No	200	3.3	2	250	CMOS, TTL	No
2308-5H	8	10-133	2	No	200	3.3	2	250	CMOS, TTL	Yes
2308-2H	8	10-133	1,2	No	200	3.3	2	250	CMOS, TTL	Yes
2308A-1	8	10-133	1	No	200	3.3	2	250	CMOS, TTL	No
2308A-1	8	10-133	1	No	200	3.3	2	250	CMOS, TTL	No
2308A-1H	8	10-133	1	No	200	3.3	2	250	CMOS, TTL	Yes

Part Number	Number of Outputs	Input Frequency (MHz)	Multipliers	Accepts Spread Spectrum Input	C-C Jitter Max (ps)	Core Voltage (V)	Output Banks	Output Skew (ps)	Output Type	High Drive
2308A-2	8	10-133	1,2	No	200	3.3	2	250	CMOS, TTL	No
2308A-2H	8	10-133	1,2	No	200	3.3	2	250	CMOS, TTL	Yes
2308A-3	8	10-133	2,4	No	200	3.3	2	250	CMOS, TTL	No
2308A-4	8	10-133	2,1	No	200	3.3	2	250	CMOS, TTL	No
2308A-5H	8	10-133	1	No	200	3.3	2	250	CMOS, TTL	Yes
2308B-1	8	10-133	1	No	200	3.3	2	250	CMOS, TTL	No
2308B-1H	8	10-133	1	No	200	3.3	2	250	CMOS, TTL	Yes
2308B-2	8	10-133	1,2	No	200	3.3	2	250	CMOS, TTL	No
2308B-4	8	10-133	2,1	No	200	3.3	2	250	CMOS, TTL	No
2309-1	9	10-133	1	No	200	3.3	2	250	CMOS, TTL	No
2309-1H	9	10-133	1	No	200	3.3	2	250	CMOS, TTL	Yes
2309A-1	9	10-133	1	No	200	3.3	2	250	CMOS, TTL	No
2309A-1H	9	10-133	1	No	200	3.3	2	250	CMOS, TTL	Yes
2309B-1	9	10-133	1	No	200	3.3	2	250	CMOS, TTL	No
2309B-1H	9	10-133	1	No	200	3.3	2	250	CMOS, TTL	Yes
23S05-1	5	10-133	1	Yes	200	3.3	1	250	CMOS, TTL	No
23S05-1H	5	10-133	1	Yes	200	3.3	1	250	CMOS, TTL	Yes
23S05E-1	5	10-133	1	Yes	200	3.3	1	250	CMOS, TTL	No
23S05E-1H	5	10-133	1	Yes	200	3.3	1	250	CMOS, TTL	Yes
23S05T-1	5	10-133	1	Yes	200	2.5	1	250	CMOS, TTL	No
23S08-1	8	10-133	1	Yes	200	3.3	2	200	CMOS, TTL	No
23S08-1H	8	10-133	1	Yes	200	3.3	2	200	CMOS, TTL	Yes
23S08-2	8	10-133	1,2	Yes	200	3.3	2	200	CMOS, TTL	No
23S08-2H	8	10-133	1,2	Yes	200	3.3	2	200	CMOS, TTL	Yes
23S08-3	8	10-133	2,4	Yes	200	3.3	2	200	CMOS, TTL	No
23S08-4	8	10-133	2,1	Yes	200	3.3	2	200	CMOS, TTL	No
23S08E-1	8	10-133	1	Yes	200	3.3	2	200	CMOS, TTL	No
23S08E-1H	8	10-133	1	Yes	200	3.3	2	200	CMOS, TTL	Yes
23S08E-2	8	10-133	1,2	Yes	200	3.3	2	200	CMOS, TTL	No
23S08E-2H	8	10-133	1,2	Yes	200	3.3	2	200	CMOS, TTL	Yes
23S08E-3	8	10-133	2,4	Yes	200	3.3	2	200	CMOS, TTL	No
23S08E-4	8	10-133	2,4	Yes	200	3.3	2	200	CMOS, TTL	No
23S08E-5H	8	10-133	1	Yes	200	3.3	2	200	CMOS, TTL	Yes
23S08T-1	8	10-133	1	Yes	200	2.5	2	200	CMOS, TTL	No
23S09-1	9	10-133	1	Yes	200	3.3	2	250	CMOS, TTL	No
23S09-1H	9	10-133	1	Yes	200	3.3	2	250	CMOS, TTL	Yes
23S09E-1	9	10-133	1	Yes	200	3.3	2	250	CMOS, TTL	No
23S09E-1H	9	10-133	1	Yes	200	3.3	2	250	CMOS, TTL	Yes
23S09T-1	9	10-133	1	Yes	200	2.5	2	250	CMOS, TTL	No
MK2302-01	2	10-166	1	No	200	3.3,5	2	200	CMOS, TTL	No
MK2304-1	4	10-133	1	No	200	3.3	2	200	CMOS, TTL	No
MK2304-2	4	10-133	1	No	200	3.3	2	200	CMOS, TTL	No
MK2308-1H	8	10-133	1	No	200	3.3	2	200	CMOS, TTL	Yes

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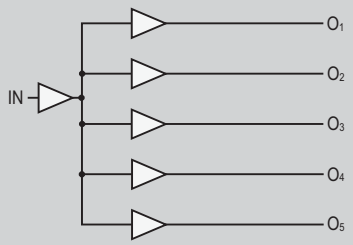
Fan-Out Buffers

IDT's family of Fanout buffers provides multiple low skew copies of the reference input. The large fanout from a single input reduces loading on the preceding driver and provides an efficient clock distribution network. IDT's fanout buffer family includes products supporting supply voltages from 1.2V up to 5V, output frequencies from 0 to 200MHz, and 1 to 16 outputs. Typical output types supported are CMOS, TTL, and LVCMOS.

Fanout buffers are ideal for clock and signal distribution in a large variety of systems, from personal computers to consumer electronics or industrial systems.

FUNCTIONAL BLOCK DIAGRAM



Part Number	Industrial Temp Available	Package	Accepts Spread Spec Input	Core Voltage (V)	Input Freq. (MHz)	S-E Input Signaling	Output Banks	Output Frequ. (MHz)	Output Skew (ps)	Output Type	Output Voltage (V)	Number of Outputs	Spread Spectrum	Supply Voltage (V)
2304NZG-1LF	Yes	TSSOP	No	3.3	0-140			0-140	100			4	N	3.3
49FCT20805	Yes	SSOP, QSOP	No	2.5	0-166	TTL	2	0-166	200	TTL	2.5	10	No	2.5
49FCT3805A	Yes	SSOP, QSOP, SOIC	NO	3.3,5	0-166	TTL	2	0-166	500	TTL	3.3,5	10	No	3.3,5
49FCT3805	Yes	SSOP, QSOP, SOIC	NO	3.3,5	0-166	TTL	2	0-166	500	TTL	3.3,5	10	No	3.3,5
49FCT3805B	Yes	SSOP, QSOP, SOIC	NO	3.3,5	0-166	TTL	2	0-166	500	TTL	3.3, 5	10	No	3.3,5
49FCT3805DPYGI	Yes	SSOP, QSOP	NO	3.3,5	0-166	TTL	2	0-166	500	TTL	3.3, 5	10	No	3.3,5
49FCT3805EPYGI	Yes	SSOP, QSOP	NO	3.3,5	0-166	TTL	2	0-166	500	TTL	3.3, 5	10	No	3.3,5
49FCT805A	Yes	SSOP, SOIC	NO	5	0-166	CMOS, TTL	2	0-166	700	CMOS, TTL	3.3, 5	10	No	5
49FCT805PYG	Yes	SSOP, SOIC	NO	5	0-166	CMOS, TTL	2	0-166	700	CMOS, TTL	3.3, 5	10	No	5
49FCT805BT	No	SSOP, QSOP, SOIC	NO	5	0-166	CMOS, TTL	2	0-166	700	CMOS, TTL	3.3, 5	10	No	5
49FCT805CT	No	SSOP, QSOP, SOIC	NO	5	0-166	CMOS, TTL	2	0-166	700	CMOS, TTL	3.3, 5	10	No	5
49FCT806A	No	SSOP, SOIC	NO	5	0-166	CMOS, TTL	2	0-166	700	CMOS, TTL	3.3, 5	10	No	5
49FCT806	No	SSOP, SOIC	NO	5	0-166	CMOS, TTL	2	0-166	700	CMOS, TTL	3.3, 5	10	No	5
508	Yes	SOIC	N		0-250					CMOS		1	N	2.375-5.5
524	Yes	SOIC	N		0-200			0-200	50	CMOS		4	N	
551	Yes	SOIC	N	3.3,5	0-160			0-160	250	CMOS		4	N	3.3,5
552G-02	Yes	TSSOP	N		0-200		1	0-200	50	CMOS		8	N	2.5-5
552AR-01	Yes	SSOP	N	3.3,5	10-200			10-200	250	CMOS		8	N	3.3,5
553	Yes	SOIC	N		0-200			0-200	50	CMOS	2.5, 3.3, 5	4	N	
554G-01A	Yes	TSSOP	N	3.3,5	0-200			0-200	50	PECL		4	N	3.3,5
556M-04	Yes	SOIC	N		5-27			5-27	50	CMOS		4	N	2.5-5

Part Number	Industrial Temp Available	Package	Accepts Spread Spec Input	Core Voltage (V)	Input Freq. (MHz)	S-E Input Signaling	Output Banks	Output Frequ. (MHz)	Output Skew (ps)	Output Type	Output Voltage(v)	Number of Outputs	Spread Spectrum	Supply Voltage (V)
557G-08	Yes	TSSOP	Yes	3.3	100		1	1-200	0	Flowthrough	0.8	1		3.3
5T30553	Yes	SOIC	YES	2.5,3.3	0-200	3.3V LVCMOS, 2.5V LVCMOS		0-200			2.5,3.3	4	NO	2.5,3.3
5V2305	Yes	TSSOP, QFN	No	2.5, 3.3	0-200	CMOS, TTL		0-200	75	CMOS,TTL	2.5, 3.3	5	No	2.5, 3.3
5V2310	Yes	TSSOP, QFN	No	2.5, 3.3	0-200	CMOS, TTL	2	0-200	100	CMOS,TTL	2.5, 3.3	10	No	2.5, 3.3
621	Yes	SOIC, DFN	Yes	1.2, 1.5, 1.8	0-200	3.3V LVCMOS		0-200		1.2V-1.8V LVCMOS	1.2-1.8	4	No	1.2-1.8
651	Yes	SOIC	No	1.5, 1.8, 2.5	0-200	CMOS, TTL		0-200	250	CMOS,TTL	1.5, 1.8, 2.5	4	Yes	1.5, 1.8, 2.5
6P30006A	Yes	QFN	No	1.8	12.6-13.4	LVCMOS, Sine		12.6-13.4		LVCMOS, Sine	1.8	8	No	1.8
6T39007A	Yes	QFN	No	2.5	12.6-13.4	LVCMOS, Sine		12.6-13.4		LVCMOS, Sine	2.5,3.3	4	No	2.5,3.3
74FCT20807	Yes	TSSOP, QSOP	NO	2.5	0-166	CMOS, TTL	1	0-166	700	CMOS,TTL	2.5	10	No	2.5
74FCT3807A	Yes	TSSOP, QSOP, SOIC	NO	2.5	0-166	CMOS, TTL	1	0-166	700	CMOS,TTL	2.5	10	No	2.5
74FCT3807D	Yes	TSSOP	No	3.3	0-133	CMOS, TTL	1	0-133	100	CMOS,TTL	3.3	10	No	3.3
74FCT3807E	Yes	TSSOP	No	3.3	0-133	CMOS, TTL	1	0-133	100	CMOS,TTL	3.3	10	No	3.3
74FCT3807	Yes	SSOP, QSOP, SOIC	No	3.3	0-133	CMOS, TTL	1	0-133	100	CMOS,TTL	3.3	10	No	3.3
74FCT38072	Yes	SOIC	No	3.3	0-166	CMOS, TTL	1	0-166	100	CMOS,TTL	3.3	2	No	3.3
74FCT38074	Yes	SOIC	No	3.3	0-166	CMOS, TTL	1	0-166	100	CMOS,TTL	3.3	4	No	3.3
74FCT38075	Yes	SOIC	No	3.3	0-166	CMOS, TTL	1	0-166	100	CMOS,TTL	3.3	5	No	3.3
74FCT3807D	Yes	SSOP, QSOP	No	3.3	0-133	CMOS, TTL	1	0-133	100	CMOS,TTL	3.3	10	No	3.3
74FCT3807E	Yes	SSOP, QSOP	No	3.3	0-133	CMOS, TTL	1	0-133	100	CMOS,TTL	3.3	10	No	3.3
74FCT807BT	Yes	SSOP, QSOP, SOIC	No	5	0-100	CMOS, TTL	1	0-100	350	CMOS,TTL	5	10	No	5
74FCT807CT	Yes	SSOP, QOP, SOIC	No	5	0-100	CMOS, TTL	1	0-100	350	CMOS,TTL	5	10	No	5
LV810	Yes	SSOP, DFN	No	1,5,2.5	1-133	1.5V LVTTL, 2.5V LVTTL	3	1-133	200	TTL,CMOS	1,5,2.5	10	No	1.5-2.5
MK74CB218	Yes	DFN	No	3.3	0-200	3.3V TTL	2	0-200		TTL,CMOS	3.3	16	no	3.3

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VCXO

- General Purpose VCXO
- VCXO + PLLs

General Purpose VCXO

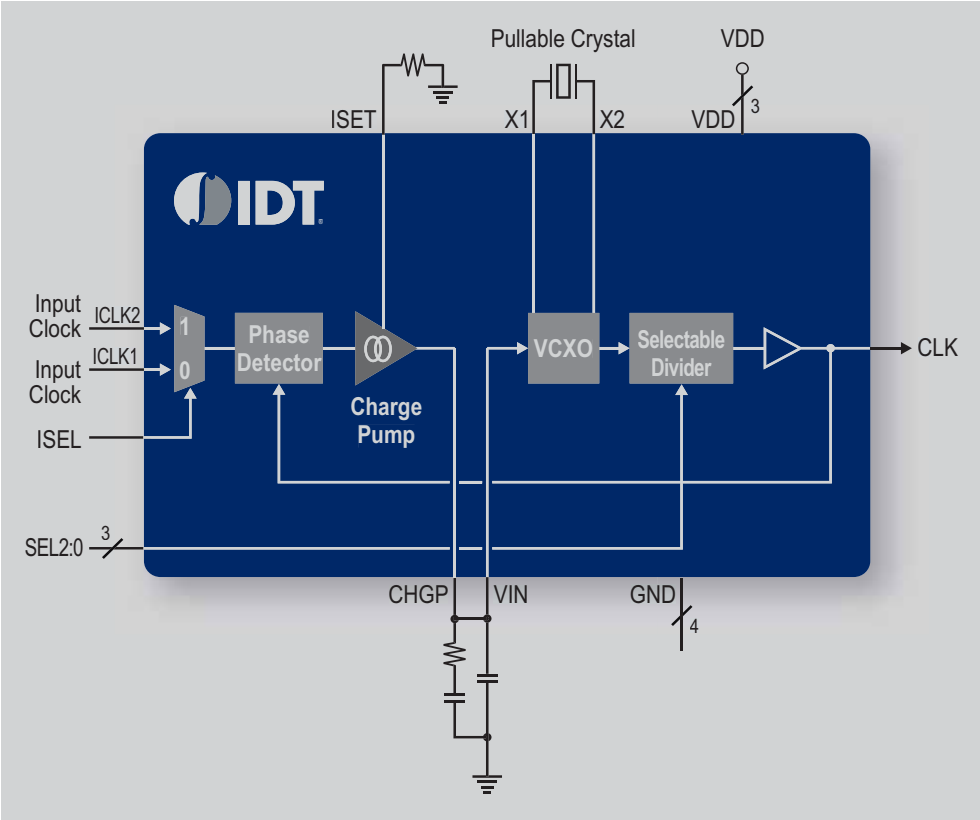
BENEFITS

- PLL filters input jitter while locking to the input reference
- Low phase noise
- Frequency multiplication

FUNCTIONS

IDT VCXO jitter attenuator devices perform these and other functions:

- Jitter attenuation and frequency translation
- Synchronous clocking
- Clock recovery

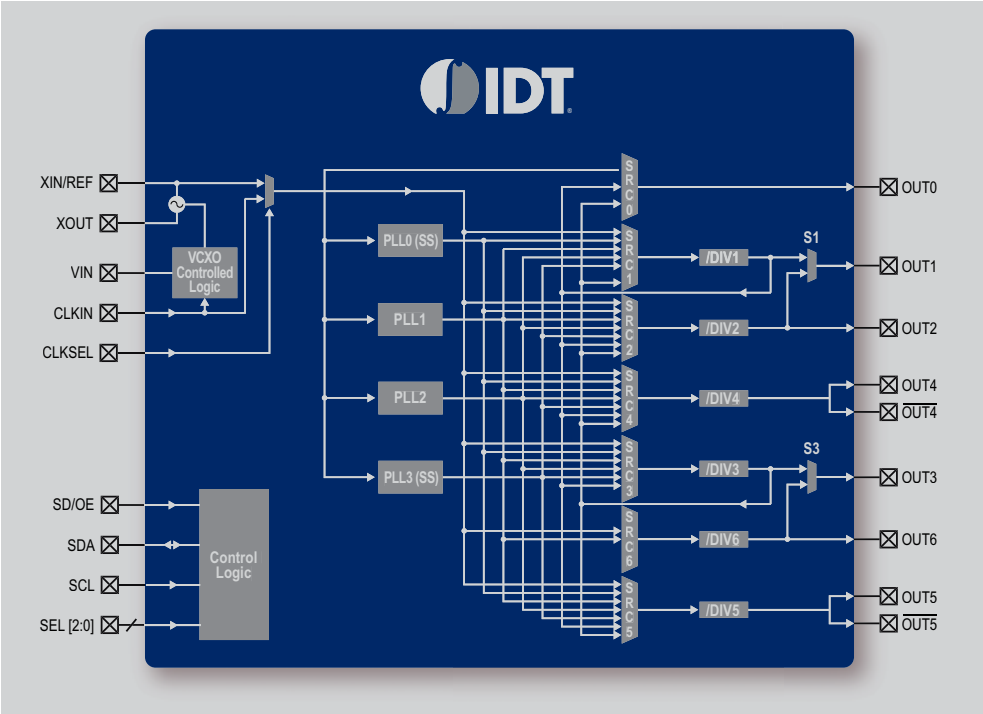


IDT voltage-controlled crystal oscillator (VCXO) jitter attenuators are synchronous jitter attenuation and frequency translation products featuring a VCXO based PLL stage requiring only an external pullable crystal. This PLL stage is typically configured with low loop bandwidth to provide jitter attenuation. It can also accommodate numerous pre, feedback, and output divider combinations to allow for frequency translation. The output frequency from the VCXO PLL stage is then followed by a frequency multiplier.

Part Number	Operating Voltage (V)	Number of Inputs	Min Input CLK (MHz)	Max Input CLK (MHz)	Input Type	Min Output Frequency (MHz)	Max Output Frequency (MHz)	Numer of Outputs	Output Type
MK1581-01	3.3	1	0.008	0.008	Clock	1.544	2.048	1	LVCMOS
MK2049-34A	3.3	1	0.008	0.008	Clock	0.008	77.76	3	LVCMOS
MK2049-45A	3.3	1	0.008	50	Clock	0.008	51.84	3	LVCMOS
MK2058-01	3.3	2	0.0033	27	Clock	0.0033	27	1	LVCMOS
MK2059-01	3.3	2	0.008	0.008	Clock	1.544	25.92	1	LVCMOS
MK2069-01	3.3	3	0.001	170	Clock	0.5	160	4	LVCMOS
MK2069-04	3.3	1	0.001	170	Clock	0.5	160	4	LVCMOS

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

VCXO + PLLs



FUNCTIONS

IDT VCXOs and VCXOs plus PLL products offer:

Single and multiple frequencies, tunable by a VIN control pin

BENEFITS/FEATURES

Lower cost and shorter lead time than oscillators

Reduced part count

Programmability through Versaclock Software

IDT voltage controlled crystal oscillator (VCXO) plus PLL devices provide variable clock outputs that can be used to adjust, or pull, the local oscillator to the same frequency as the upstream clock for decoding.

VCXOs use a pullable fundamental-mode crystal to buffer to multiple outputs. IDT also has VCXO plus PLL products that can integrate the same fundamental mode VCXO and provide multiple outputs of different frequencies. All products can be used in many applications to replace expensive single frequency oscillators.

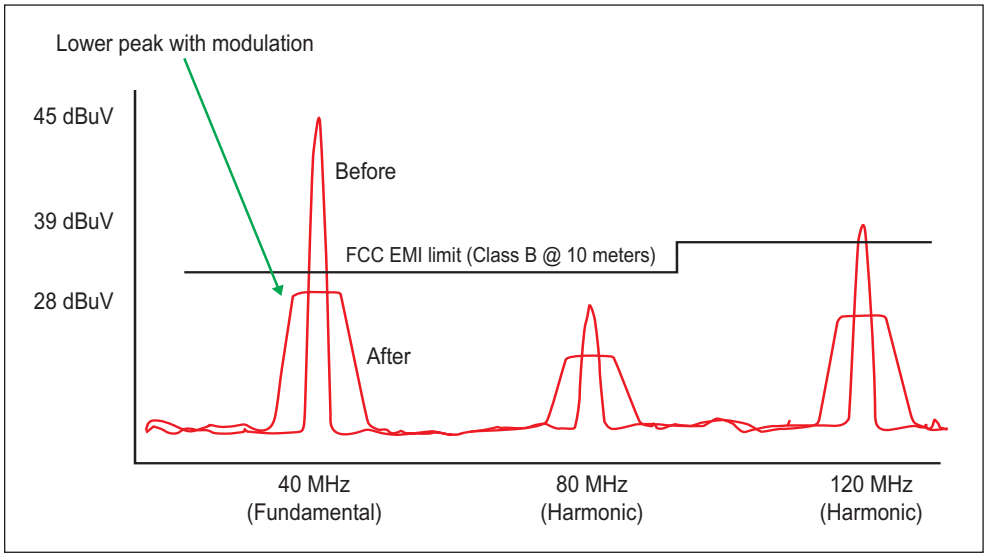
Part Number	Operating Voltage (V)	Input Type	Integrated PLL	Min Input CLK (MHz)	Max Input CLK (MHz)	Min Output Frequency (MHz)	Max Output Frequency (MHz)	Number of Outputs	Output Type
477-05	3.3	Crystal	Yes	27	27	27	74.175	5	LVCMOS
722	3.3	Crystal	No	16.2	28	16.2	28	1	LVCMOS
726A	3.3	Crystal	No	12	36	12	36	1	LVCMOS
MK3711D	3.3	Crystal	No	8	16	8	16	1	LVCMOS
MK3721D	3.3	Crystal	No	16.2	28	16.2	28	1	LVCMOS
MK3727D	3.3	Crystal	Yes	12	18	24	36	1	LVCMOS
MK3754D	3.3	Crystal	Yes	13.5	13.5	54	54	1	LVCMOS
270	3.3	Crystal	Yes	5	27	0.314	200	8	LVCMOS
271	3.3	Crystal	Yes	5	27	0.314	200	6	LVCMOS
275	3.3	Crystal	Yes	5	27	0.314	200	4	LVCMOS
276	3.3	Crystal	Yes	5	27	0.314	200	3	LVCMOS
5V10017	3.3	Crystal	Yes	27	27	27	54	2	LVCMOS
5V19EE403	3.3	Crystal	Yes	8	50	0.0049	200	4	LVCMOS
5V19EE404	3.3	Crystal	Yes	8	50	0.0049	200	4	LVCMOS
5V19EE603	3.3	Crystal	Yes	8	50	0.0049	200	6	LVCMOS
5V19EE604	3.3	Crystal	Yes	8	50	0.0049	200	6	LVCMOS
5V19EE901	3.3	Crystal	Yes	8	50	0.0049	200	9	LVCMOS, LVPECL, LVDS, HCSL
5V19EE902	3.3	Crystal	Yes	8	50	0.0049	200	9	LVCMOS, LVPECL, LVDS, HCSL
5V19EE903	3.3	Crystal	Yes	8	50	0.0049	200	9	LVCMOS
5V19EE904	3.3	Crystal	Yes	8	50	0.0049	200	9	LVCMOS

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Other Consumer Clock Devices

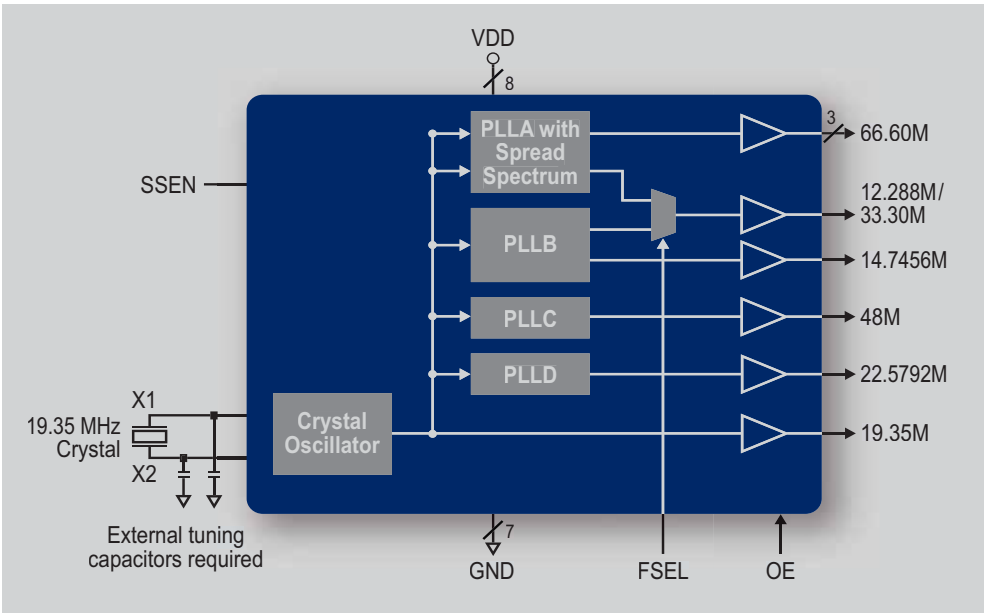
- Spread Spectrum Clock Generators
- Real Time Clocks

Spread Spectrum Clock Generators



Electromagnetic Interference (EMI) is a major challenge for designers of electronic devices. Strict guidelines enforced by the FCC and European Union regulate the amount of EMI a system can generate. Frequency references, whether crystal oscillators or silicon based PLLs, can be a major source of EMI on circuit boards. Employing spread spectrum on a clock is an efficient way to eliminate the EMI being generated by the clock to reduce the total EMI the system is generating. Spread spectrum is a technique where the output frequency is modulated slightly to lower the peak energy generated by a clock. Spread Spectrum is used to lower the EMI generated not only by the fundamental frequency, but also the subsequent harmonics. Without using spread spectrum, expensive shielding, chokes and ferrite beads would need to be used.

IDT has two different types of spread spectrum: down spread and center spread. Center spread modulates evenly around the clock frequency while down spread modulates below the clock frequency. The type of spread used depends on the specifications of the clock destination. Some destination chipsets, CPU's, etc have a maximum clock frequency specification that cannot be violated. In these cases, down spread should be applied.



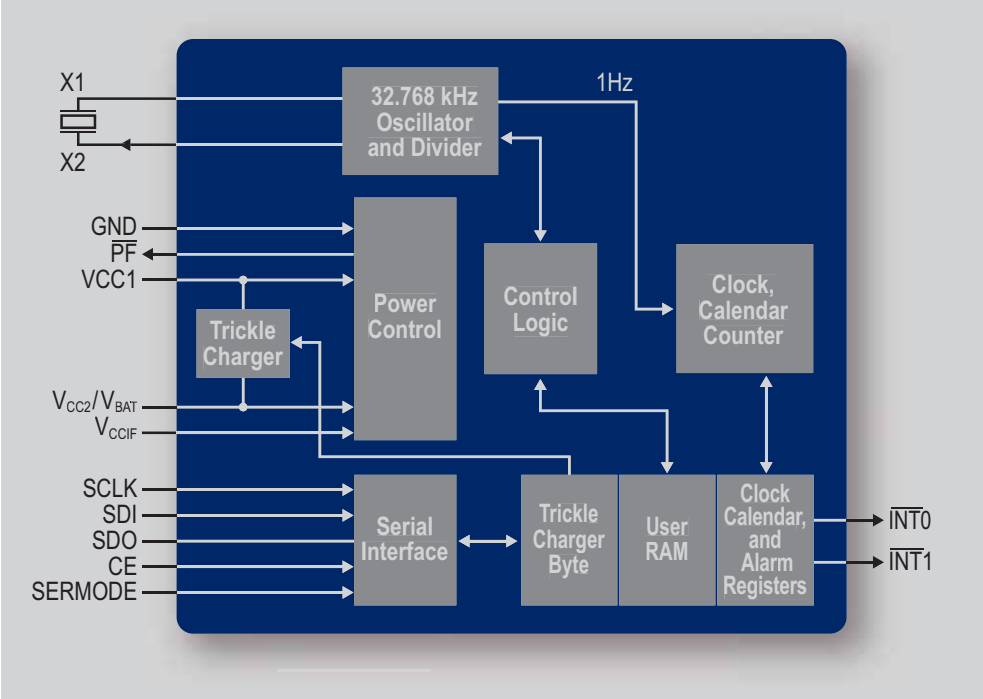
FEATURES

- Accepts a clock input and provides same frequency dithered output
- Center and down spread option available
- Low additive cycle to cycle jitter
- Peak reduction by 7dB - 14dB typical on 3rd - 19th odd harmonics
- Wide input frequency ranges available
- Available in many small packages minimizing board space

Part Number	Core Voltage (V)	Input Frequency (MHz)	Output Frequency (MHz)	Output Type	Number of Outputs	Period Jitter Max P-P (ps)	Reference Output
180-01	3.3,5	8-28	8-28	LVCMOS	1	300 (cy-cy)	N
180-03	3.3,5	15-28	15-28	LVCMOS	1	300 (cy-cy)	N
180-51	3.3,5	8-28	8-28	LVCMOS	1	300 (cy-cy)	N
180-52	3.3,5	8-15	8-15	LVCMOS	1	300 (cy-cy)	N
180-53	3.3,5	15-28	15-28	LVCMOS	1	300 (cy-cy)	N
181-01	3.3,5	28-75	28-75	LVCMOS	1	300 (cy-cy)	N
181-02	3.3,5	28-48	28-48	LVCMOS	1	301 (cy-cy)	N
181-03	3.3,5	46-75	46-75	LVCMOS	1	302 (cy-cy)	N
181-51	3.3,5	28-75	28-75	LVCMOS	1	303 (cy-cy)	N
181-52	3.3,5	28-48	28-48	LVCMOS	1	304 (cy-cy)	N
181-53	3.3,5	46-75	46-75	LVCMOS	1	305 (cy-cy)	N
5V50013	3.3	50-140	50-140	CMOS,TTL	1	150 (cy-cy)	N
5V50015	3.3	135-200	135-200	CMOS,TTL	1	100 (cy-cy)	N
7152-01	3.3	16.6-67	16.6-67	3.3V LVCMOS	1	150 (cy-cy)	N
7152-02	3.3	40-134	40-134	3.3V LVCMOS	1	151 (cy-cy)	N
7152-11	3.3	16.6-67	16.6-67	3.3V LVCMOS	1	250 (cy-cy)	N
7152-12	3.3	40-134	40-134	3.3V LVCMOS	1	251 (cy-cy)	N
7152A-02	3.3	40-134	40-134	3.3V LVCMOS	1	100 (cy-cy)	N
7152A	3.3	16.6-67	16.6-67	3.3V LVCMOS	1	100 (cy-cy)	N
MK1704	3.3,5	30-140	30-140	3.3V TTL, 3.3V CMOS	1		N
MK1705	3.3,5	40-167	40-167	TTL,CMOS	1		N
MK1707	3.3	25-108	25-108	TTL,CMOS	1		N
MK1709	3.3	40-165	40-165	TTL,CMOS	1		N
MK1709A	3.3	40-165	40-165	TTL,CMOS	1		N
MK1714-01	3.3,5	10-150	2-200	TTL,CMOS	2	300 (period)	Y
MK1714-02	3.3,5	10-150	2-200	TTL,CMOS	2	320 (period)	Y
MK1716-01	3.3	5-27,2-50	0.25-133.33	TTL,CMOS	9	600 (period)	Y
MK1725	3.3	20-34	20-160	TTL,CMOS	4	150 (period)	N
MK1726-08	3.3	16-32	16-32	TTL,CMOS	2	350 (cy-cy)	Y
MK1728A	2.5	4-8,8-16,16-36	4-8,8-16,16-36	LVTTL	1	300 (cy-cy)	N
MK5811	3.3	4-32	4-32	TTL,CMOS	1	450 (cy-cy)	Y
MK5811A	3.3	4-32	4-32	TTL,CMOS	1	450 (cy-cy)	Y
MK5811C	3.3	4-32	4-32	TTL,CMOS	1	520 (cy-cy)	Y
MK5812	3.3	4-32	8-64	TTL,CMOS	1	380 (cy-cy)	N
MK5814	3.3	4-32	16-128	TTL,CMOS	1	380 (cy-cy)	N
MK5814C	3.3	4-32	16-128	TTL,CMOS	1	380 (cy-cy)	N
MK5818	3.3	8-16	8-16	TTL,CMOS	1	350 (cy-cy)	Y

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Real Time Clocks



A Real-time Clock (RTC) with a 32.768kHz quartz tuning-fork crystal is the standard timekeeping reference for most electronic applications. The RTC maintains the time and date by counting sections, which requires a 1Hz clock signal derived from the 32.768kHz crystal oscillator. The current time and date information is stored in a set of registers which is access through a communication interface, typically I²C. RTCs often have an alternate source of power so they can keep time while the primary source of power is off or unavailable. The IDT RTCs that have this Vbat pin, automatically detect the loss of the primary source of power and switch over to running the device off of the battery. The dual power supplies support a programmable trickle charge circuit that allows a rechargeable energy source such as a super capacitor or rechargeable battery. IDT RTCs have programmable time-of-day alarms that can generate an interrupt on a programmable combination of seconds, minutes, hours and day. IDT RTCs also have additional battery-backed non-volatile RAM (NVRAM) to store critical data.

FEATURES

- Real-Time Clock (RTC) counts seconds, minutes, hours, day, date, month, and year with leap-year compensation valid up to 2100
- Operating voltage of 1.8 to 5.5 V
- Fast mode I²C Serial interface
- Automatic power-fail detect and switch circuitry
- Programmable square-wave output
- Packaged in 8-pin MSOP, 8-pin SOIC, or 16-pin SOIC (with an integrated crystal)

RTC WITH TEMPERATURE COMPENSATION BENEFITS AND FEATURES

- Battery backup input for continuous timekeeping
- Accuracy ±3.5 ppm from -40 to +85 C
- Packaged in 16-pin SOIC (with an integrated crystal)
- Tamper Detection
- Register for Aging Trim
- Battery Low (BATLOW) output trips when low battery level is detected
- Operating Voltage 2.3 V to 5.5 V

Part Number	Operating Voltage (V)	Time of Day Alarms	Extra Battery Backed nVRAM	Trickle Charge	VBAT	Option with Crystal packaged inside
1337G	1.8 - 5.5	2	0	N	N	Y
1338-18	1.8 - 5.5	0	56	N	Y	Y
1338-31	2.7 - 5.5	0	56	N	Y	Y
1339-2	1.8 -5.5	2	0	Y	Y	Y
1339-31	2.7 - 5.5	2	0	Y	Y	Y
5P90005B	2.0 - 5.5	0	0	N	Y	N
5P90011	2.0 - 5.5	1	96	Y	Y	N

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Computing Clocking Solutions

IDT Computing Clock Solutions offer a portfolio of high performance and fully integrated frequency synthesizers for today's enterprise, mobile, desktop and embedded computing platforms

Introduction

In today's computing systems, with so many built-in interfaces, (DMI, SATA, PCIe, USB …) and concerns on power consumption, BOM cost and board space, having a high performance, low power and highly integrated frequency generator is essential to the success of the program.

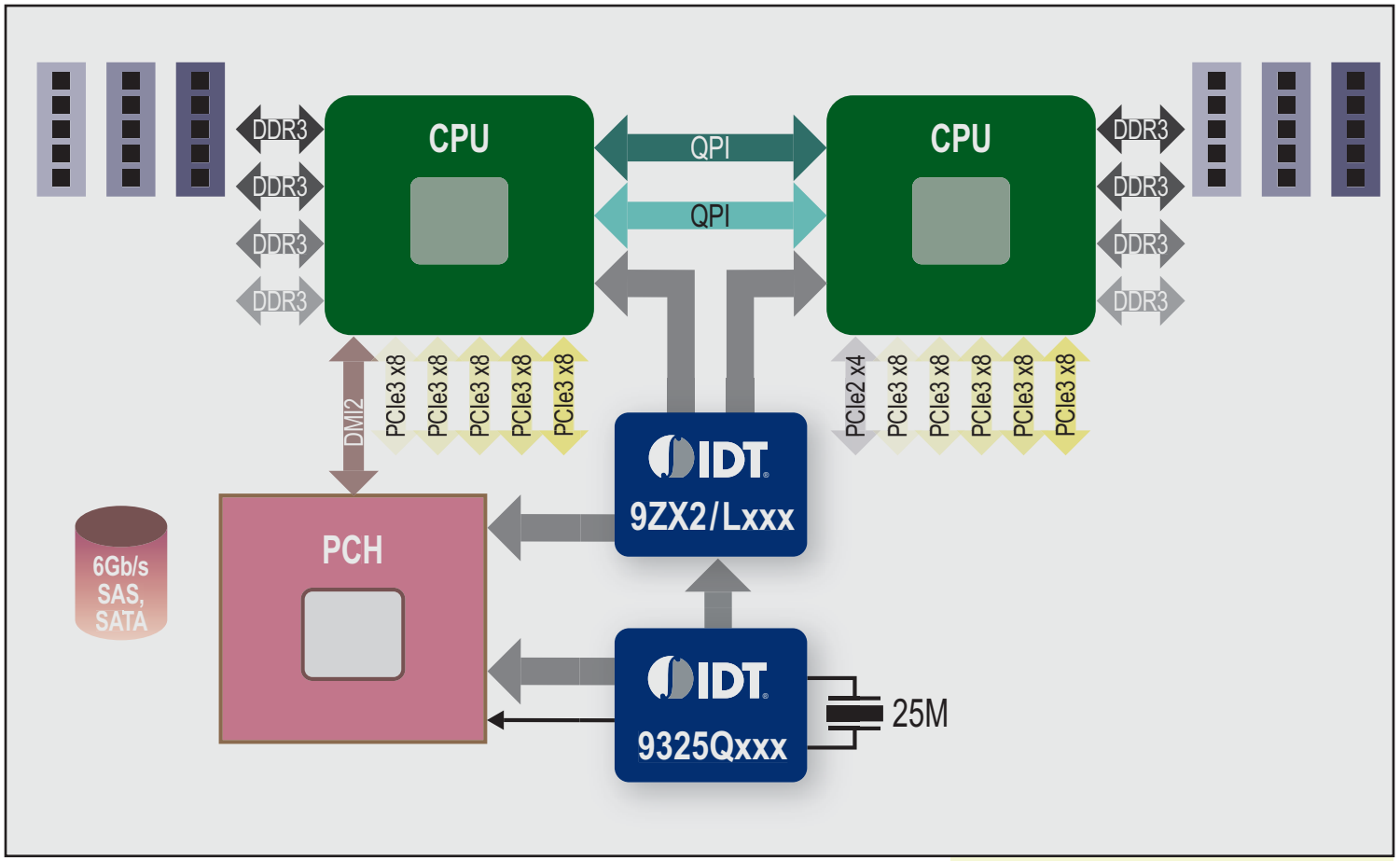
IDT has a long term partnership with Intel, AMD and all other chipset vendors. We have the largest portfolio of reference design clock solutions in the industry covering all computing platforms.

IDT Computing Clock Solutions: Leader in Innovation

IDT is the leader in innovation for computing clocks. IDT is the first clock vendor to introduce low power outputs to replace HSCL; provide dynamic frequency control; incorporate multiple PLLs to save system cost and board space.

Working closely with our OEM/ODM partners, IDT is also providing the widest variety of value-added computing clocks on top of the reference design solutions. We pride ourselves in providing the best fit in frequency synthesizers for today's system needs.

IDT Server Clock Solutions



Intel-Architecture (IA) servers are used in applications ranging from traditional data-centers, to routers and storage arrays, to embedded communications systems. IDT has provided timing solutions for every generation of Intel Architecture (IA) servers for over a decade. The unmatched expertise obtained supporting these demanding applications allows IDT to offer the broadest portfolio of server timing solutions, allowing our customers to "right-size" their timing solutions, whether "right-size" means trading off board space, component count, cost, performance or power.

MAIN CLOCK SYNTHESIZERS

- Spread-Spectrum Capable
- Meet Stringent Phase Jitter requirements
  - PCIe Gen1/2/3 compliant PCIe outputs
  - QPI/SMI 9.6GB/s CPU outputs (Intel)
  - SAS 6G (Intel)
- Low-power differential outputs with and without integrated terminations
- Low Drift PCIe outputs on some parts for Non-Transparent Bridging Support

PLL ZERO-DELAY W/FANOUT MODE AND FANOUT-ONLY BUFFERS

- 2 to 19 outputs
- 20 to 72 pin packages
- HCSL and Low-Power HCSL-compatible output types
- PCIe Gen1/2/3 and QPI/SMI 9.6GB/s devices available
- External feedback on some devices allows for input to output delay tuning
- Drive 85Ω or 100Ω differential traces

IDT Server Clock Solutions

(Patsburg / Tylersburg / Seaburg / Boxboro)

Clocking Solutions for Intel® C600 Series Server Chipsets (Patsburg)

High Performance Main-Clock Synthesizers for Patsburg

Part Number	Description	Clock Spec	PCIe Outputs	CPU Outputs	PCI Outputs	Pins & Packages	Notes
932SQ420	PCIe Gen3 and QPI 9.6G Main Clock	CK420BQ	3-spread/ 4-non-spread	4	5	64-TSSOP/MLF	All devices in this section are electrically compliant to the CK420BQ specifications
932SQ425	PCIe Gen3 and QPI 9.6G Main Clock		2-spread/ 3-non-spread	3	3	56-MLF	
932SQ428	PCIe Gen3 and QPI 9.6G Main Clock		3-spread/ 2-non-spread	0	5	48-MLF	

System Management Clocks for Patsburg

Part Number	Description	Clock Spec	Other Freq. (MHz)	CPU Outputs	Input Frequency (MHz)	Pins & Packages	Notes
9FGP204	Server Peripheral Clock Synthesizer	CK-MNG+	25, 33, 50, 96, 125	1 @ 100Mhz	25	40-MLF	
9FGP205	Server Peripheral Clock Synthesizer	CK-MNG+	25, 33, 50, 96, 125	1 @ 100Mhz	25	40-MLF	Ethernet clocks run in S-states to support Wake-On_Lan

PLL Zero-Delay Low-Drift Buffers w/Fanout Mode for Patsburg

Part Number	Description	Clock Spec	PCIe Outputs	Inputs	Input Frequency (MHz)	Pins & Packages	Notes
9ZX21200, 9ZX21201	PCIe Gen3/QPI 9.6Gb Low-Drift Buffer	DB1200Z	12	1	100,133	56/64-MLF	All devices in the section are elecrically compliant to the DB1900Z specification. The 9ZX21200 has 12 outputs and 4 OE# pins in a 56-MLF package.
9ZX21501	PCIe Gen3/QPI 9.6Gb Low-Drift Buffer		15	1	100,133	64-MLF	7 OE# pins
9ZX21901	PCIe Gen3/QPI 9.6Gb Low-Drift Buffer	DB1900Z	19	1	100,133	72-MLF	8 OE# pins

Low-Power PLL Zero-Delay Low-Drift Buffers w/Fanout Mode for Patsburg

Part Number	Description	Clock Spec	PCIe Outputs	Inputs	Input Frequency (MHz)	Pins & Packages	Output Frequency (MHz)
9ZXL1230, 9ZXL1231	Low-Power PCIe Gen3/ QPI 9.6Gb Low-Drift Buffer	DB1200ZL	12	1	100,133	56/64 MLF	All devices in the section are elecrically compliant to the DB1200ZL specification. The 9ZX2L230 has 12 outputs and 4 OE# pins in a 56-MLF package.
9ZXL1530	Low-Power PCIe Gen3/ QPI 9.6Gb Low-Drift Buffer		15	1	100,133	64 MLF	100,133
9ZXL1930	Low-Power PCIe Gen3/ QPI 9.6Gb Low-Drift Buffer		19	1	100,133	72 MLF	100,133

IDT Server Clock Solutions, continued

Clocking Solutions for Intel® 5500 and 7500 Series Server Chipsets (Tylersburg, Seaburg, Boxboro)

High Performance Main-Clock Synthesizers for Tylersburg, Seaburg & Boxboro

Part Number	Description	Clock Spec	PCIe Outputs	CPU Outputs	PCI Outputs	Pins & Packages	Notes
932S421	PCIe Gen2 and QPI 6.4G Main Clock	CK410B+	5	4	7	56-TSSOP	All CK410B+ are backward-compatible to 5000 series chipsets
932S422	PCIe Gen2 and QPI 6.4G Main Clock	CK410B+	4	5	7	56-TSSOP	
932S431	PCIe Gen2 and QPI 6.4G Main Clock	CK410B+	5	4	7	56-TSSOP	Low-Drift non-spread PCIe for Non-Transparent Bridging

System Management Clocks for Tylersburg, Seaburg & Boxboro

Part Number	Description	Clock Spec	Other Freq. (MHz)	CPU Outputs	Input Frequency (MHz)	Pins & Packages	Notes
9FGP202	Server Peripheral Clock Synthesizer	CK-MNG	25, 33, 50, 96	1 @ 133Mhz	25	40-MLF	

PLL Zero-Delay Buffers w/Fanout Mode for Tylersburg, Seaburg & Boxboro

Part Number	Description	Clock Spec	PCIe Outputs	Inputs	Input Frequency (MHz)	Pins & Packages	Notes
9DB102, 9DB106	PCIe Gen2 Buffer		2/6	1	100	20-QSOP, 20/28-SSOP, 28-TSSOP	Any devices in this section are electrically interchangeable and can be substituted for each other depending on application requirements.
9DB803	PCIe Gen2 Buffer	DB400v2E, DB800v2E	4/8	1	100	28/48-SSOP, 28/48-TSSOP	
9DB423, 9DB823	PCIe Gen2/QPI 6.4Gb Buffer	DB400Q, DB800Q	4/8	1	100,133	28/48-SSOP, 28/48-TSSOP	
9DB1200	PCIe Gen2/QPI 6.4Gb Buffer	DB1200	12	1	100,133, 166,200, 267,333.33,400	100,133, 166,200, 267,333.33,400	
9EX1501, 9EX1801	PCIe Gen2 Buffer with 2-input mux		15/18	2	100,133	62/72-MLF	Internal Mux

These products represent only a portion of IDT's extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

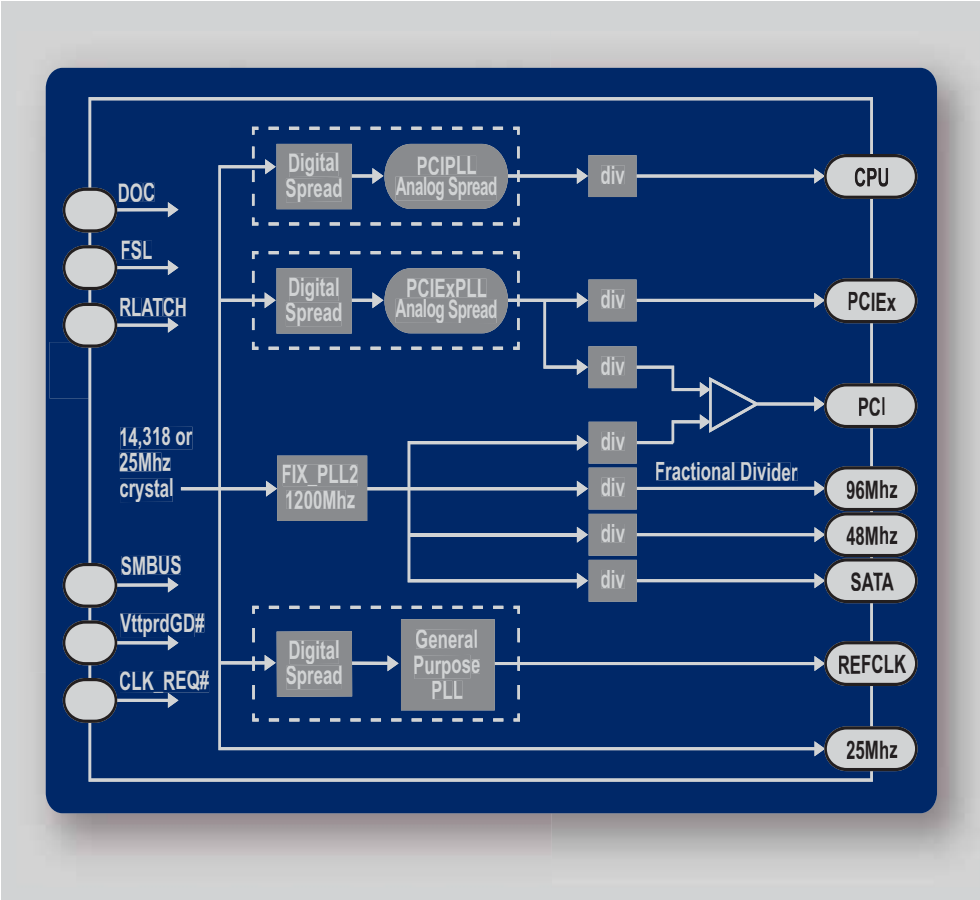
Desktop Platform Clocks

FUNCTIONS

- 0.8V push-pull differential CPU pair
- 0.8V push-pull differential PCIEX pair
- 0.8V push-pull differential SATA pair
- 0.8V push-pull differential DOT96 pair
- USB, 24Mhz, 48MHz
- REF, 14.318MHz
- LAN, 25MHz
- Graphic, 27MHz
- Latch or Real time Frequency select pin
- I^2C, SMBUS interface
- CLKREQ# control pins

FEATURES/BENEFITS

- Supports tight ppm accuracy clocks for Serial-ATA and PCIEX
- Uses external 14.318 or 25Mhz crystal
- Low power differential clock outputs
- Integrated 33Ω series resistor on all differential outputs
- Meets PCIEX Gen1, 2, 3 and QPI specification
- Dynamic Over Clocking capability
- Programmable Spread Spectrum to reduce system EMI
- Up to 5 PLLs integration to save board space
- Supports Wake_On_LAN
- Support SRC power management by CLKREQ# pins;
- User fully programmable PLL



IDT PC Desktop clock synthesizers are advanced PC system timing integration solutions. As highly integrated and low power devices, they can replace up to 10 or more on-board crystal or oscillator components.

IDT PC clock synthesizers are compliant with chipset makers timing specification, such as Intel CK408, 409, 410, etc, CK505 or other vendors chipset specifications. Many of these devices are qualified by the chipset makers and are in their reference schematics.

IDT PC clock synthesizers provide a single chip with multiple low power output clocks – up to 400Mhz or higher frequency as system CPU reference clock or outputs, and 100Mhz differential clock as PCI-Express reference clock. They also provide other single-ended clocks for several on-board device clock sources such as LAN chip 25Mhz, USB controller 24Mhz or 48Mhz, PCI device 33.33Mhz, Graphic chip 27Mhz or other clocks with spread spectrum to reduce EMI.

They offer fully programmable registers for PLL VCO frequency, spread spectrum range, output enable/disable, output clock drive strength control, clock ramp up/down slew rate control, output amplitude control, output to output skew adjustments, and clock requests control pin support system. They also offer better power management and many other proprietary functions or interfaces such as Serial InterFace (SIF), Overshoot Reduction Technology (ORT), and Dynamic Overclock Control (DOC), to name a few.

IDT PC clock synthesize has optimal PLL design to support industrial standard such as Intel CK spec, PCIEXpress Gen1, 2, 3 and QPI, SATA spec.

Part Number	C-C Jitter (ps)	Chipset Mfg	Clock Spec.	Core Voltage (V)	Input Frequency (MHz)	Output Frequency (MHz).	Output Skew (ps)	Output Voltage (V)	Number of Outputs	PCIe Gen.	Phase Noise Max. PSPP (ps)	Spread Spectrum	Supply Voltage (V)
9248DF-39LF	250			3.3	14.318	14.31818-150	175	2.5, 3.3	26			Yes	3.3
9248BF-81LF	250			3.3	14.318	14.31818-133	175	2.5,3.3	28			Yes	3.3
9250CF-10LF	250			3.3	14.318	14.31818-133	175	2.5,3.3	27			Yes	3.3
9250BF-12LF	150			3.3	14.318	14.31818-133	175	2.5,3.3	24			Yes	3.3
9250BF-27LF	250			3.3	14.318	14.31818-133	175	2.5,3.3	27			Yes	3.3
9250BF-28LF	250			3.3	14.318	14.31818-133	175	2.5,3.3	24			Yes	3.3
94201DFLF	250	Intel	810815	3.3	14.318-200	14.318-200		3.3	30			Yes	3.3
94211AFLF	250	ALI	1631	3.3	14.318-150	14.318-150		2.5,3.3	26			Yes	2.5,3.3
94227AFLF	250	VIA	Apollo-Pro266	3.3	14.318-200	14.318-200		2.5,3.3	22			Yes	2.5,3.3
950201AGLF	150	Intel	CK408	3.3	14.318-200	14.318-200		3.3	22			Yes	3.3
950211BFLF	150	Intel	CK408	3.3	14.318-200	14.318-200		3.3	22			Yes	3.3
950218AFLF	150	Intel	CK408	3.3	14.318-200	14.318-200		3.3	21			Yes	3.3
950220AFLF	150	Intel	CK408	3.3	14.318-200	14.318-200		3.3	19			Yes	3.3
950810CGLF	150	Intel	CK408	3.3	14.318-200	14.318-200		3.3	22			Yes	3.3
950812CGLF	150	Intel	CK408	3.3	14.318-200	14.318-200		3.3	24			Yes	3.3
950908BGLF	250	VIA	PX266	2.5,3.3	14.318-200	14.318-200		2.5,3.3	18			Yes	2.5,3.3
951402AGLF	150	ATI	K7	3.3	14.318-210	14.318-210		3.3	19			Yes	3.3
951462AGLF	85	ATI	RS690, RD690	3.3	14.318-240	14.318-240		3.3	20			Yes	3.3
951901AFLF	250	SiS	550	2.5,3.3	14.318-140	14.318-140		2.5,3.3	28			Yes	3.3
952001AFLF	250	SiS	645650	3.3	14.318-200	14.318-200		3.3	20			Yes	3.3
952601EGLF	125	Intel	CK409	3.3	14.318-200	14.318-200		3.3	23			Yes	3.3
952906BGLF	125	VIA	VN800, CN700, P4M800	3.3	14.318-400	14.318-400		2.5,3.3	22			Yes	2.5,3.3
952926CGLF	125	VIA	VX700, CX700	3.3	14.318-400	14.318-400		2.5,3.3	22			Yes	2.5,3.3
953002DFLF	85	VIA	PT890	3.3	14.318-400	14.318-400		3.3	21			Yes	3.3
953008BFLF	85	VIA	PT890	3.3	14.318-400	14.318-400		3.3	23			Yes	3.3
954101DGLF	85	Intel	CK410	3.3	14.318-400	14.318-400		3.3	21			Yes	3.3

Part Number	C-C Jitter (ps)	Chipset Mfg	Clock Spec.	Core Voltage (V)	Input Frequency (MHz)	Output Frequency (MHz).	Output Skew (ps)	Output Voltage (V)	Number of Outputs	PCIe Gen.	Phase Noise Max. PSPP (ps)	Spread Spectrum	Supply Voltage (V)
954119DFLF	85	Intel	CK410	3.3	14.318-400	14.318-400		3.3	22			Yes	3.3
954129BFLF	85	Intel	CK410	3.3	14.318-400	14.318-400		3.3	20			Yes	3.3
954141CFLF	85	Intel	CK410	3.3	14.318-400	14.318-400		3.3	21			Yes	3.3
9EMS9633BKLF	85	Intel	CK633	3.3	14.31818	14.31818-200	100	3.3,0.7	9			Yes	1.5-3.3
9EPRS488CKLF	125	AMD	M690, M780	3.3	14.31818	14.31818-234.33	100	3.3,0.7	25			Yes	1.05-3.3
9EPRS525AGLF	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	19	Gen1, Gen2	86	Yes	1.05-3.3
9ERS3125BKLF	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	18	Gen1, Gen2	86	Yes	1.05-3.3
9ERS3165BKLF	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	21	Gen1, Gen2	86	Yes	1.05-3.3
9LP505-1HGLF	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	22	Gen1	86	Yes	1.05-3.3
9LP505-2HGLF	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	19	Gen1	86	Yes	1.05-3.3
9LP525BG-2LF	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	19	Gen1, Gen2	86	Yes	1.05-3.3
9LPR462AGLF	125	AMD,ATI	RD600, RS600	3.3	14.31818	14.31818-240	100	3.3,0.7	20			Yes	3.3
9LPR501SGLF	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	22	Gen1	86	Yes	1.05-3.3
9LPR502SGLF	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	19	Gen1	86	Yes	1.05-3.3
9LPR600CGLF	85	SiS	662	3.3	14.31818	14.31818-200	100	3.3,0.7	23			Yes	3.3
9LPRS462AGLF	125	AMD,ATI	RD600, RS600	3.3	14.31818	14.31818-240	100	3.3,0.7	20			Yes	3.3
9LPRS464AGLF	125	AMD,ATI	RD600, RS600	3.3	14.31818	14.31818-240	100	3.3,0.7	16			Yes	3.3
9LPRS471CKLF	85	AMD,ATI	RS790	3.3	14.31818	14.31818-355	100	3.3,0.7	21	Gen1, Gen2	86	Yes	3.3
9LPRS478CKLF	85	AMD,ATI	RS790	3.3	14.31818	14.31818-355	100	3.3,0.7	21	Gen1, Gen2	86	Yes	3.3
9LPRS501SKLF	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	22	Gen1	86	Yes	1.05-3.3
9LPRS502SKLF	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	19	Gen1	86	Yes	1.05-3.3
9LPRS511EGLF	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	22	Gen1	86	Yes	1.05-3.3
9LPRS525AGLF	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	19	Gen1, Gen2	86	Yes	1.05-3.3
9UMS9633BKLF	85	Intel	CK633	3.3	14.31818	14.31818-200	100	3.3,0.7	9			Yes	1.05-3.3

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Notebook Platform Clocks

Asynchronously generate one or more clock signals within an application

As the features of netbooks and notebook PCs expands, so does the need for longer battery life, higher bandwidth and faster processing speeds. IDT timing devices provide cost-effective performance solutions that meet the needs of mobile PC designs today and tomorrow.

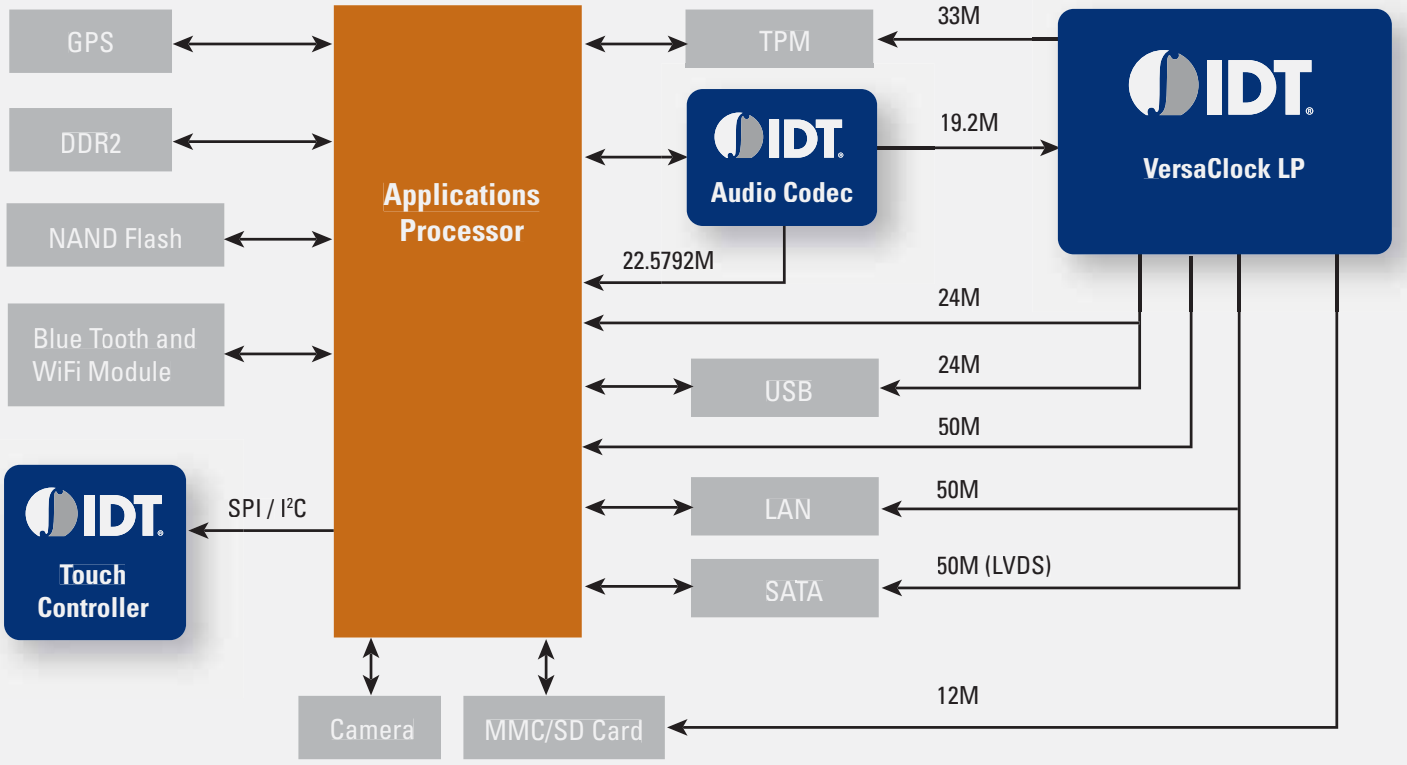
Part Number	C-C Jitter (ps)	Chipset Mfg.	Clock Spec.	Core Voltage (V)	Input Frequency (MHz)	Output Frequency (MHz)	Output Skew (ps)	Output Voltage (V)	Number of Outputs	PCIe Gen.	Phase Noise Max PSPP (ps)	Spread Spectrum	Supply Voltage (V)
950405AFLFT	200	AMD	K8	3.3	14.318-300	14.318-300		3.3	20			Yes	3.3
950410AFLFT	200	AMD	K8	3.3	14.318-300	14.318-300		3.3	20			Yes	3.3
950410AGLFT	200	AMD	K8	3.3	14.318-300	14.318-300		3.3	20			Yes	3.3
950602CFLFT	200	VIA	PL133T, PLE133T	2.5,3.3	14.318-200	14.318-200		2.5,3.3	21			Yes	2.5,3.3
950602CGLFT	200	VIA	PL133T, PLE133T	2.5,3.3	14.318-200	14.318-200		2.5,3.3	21			Yes	2.5,3.3
951412BFLFT	100	ATI	RS480	3.3	14.318-220	14.318-220		3.3	16			Yes	3.3
951412BGLFT	100	ATI	RS480	3.3	14.318-220	14.318-220		3.3	16			Yes	3.3
952909AKLFT	125	VIA	PT880, PM880	3.3	14.318-400	14.318-400		2.5,3.3	22			Yes	2.5,3.3
952909BKLFT	125	VIA	PT880, PM880	3.3	14.318-400	14.318-400		2.5,3.3	22			Yes	2.5,3.3
954201BFLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	19			Yes	3.3
954201BGLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	19			Yes	3.3
954204CGLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	18			Yes	3.3
954204CGLNT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	18			Yes	3.3
954206AGLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	19			Yes	3.3
954206BFLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	19			Yes	3.3
954206BGLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	19			Yes	3.3
954218BGLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	19			Yes	3.3
954226AGLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	19			Yes	3.3
954226AKLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	19			Yes	3.3
954227CGLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	19			Yes	3.3
954229AGLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	18			Yes	3.3
954270AGLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	16			Yes	3.3

Part Number	C-C Jitter (ps)	Chipset Mfg.	Clock Spec.	Core Voltage (V)	Input Frequency (MHz)	Output Frequency (MHz)	Output Skew (ps)	Output Voltage (V)	Number of Outputs	PCIe Gen.	Phase Noise Max PSPP (ps)	Spread Spectrum	Supply Voltage (V)
954305DKLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	23			Yes	3.3
954305EKLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	23			Yes	3.3
954306BGLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	23			Yes	3.3
954309BKLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	20			Yes	3.3
954310BGLFT	85	Intel	CK410M	3.3	14.318-400	14.318-400		3.3	22			Yes	3.3
9LPR363DGLFT	85	Intel	CK410M	3.3	14.31818	14.31818-400	100	3.3,0.7	22			Yes	3.3
9LPR363EGLFT	85	Intel	CK410M	3.3	14.31818	14.31818-400	100	3.3,0.7	22			Yes	3.3
9LPRS355BGLFT	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	21	Gen1	86	Yes	1.05-3.3
9LPRS365BGLFT	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	21	Gen1	86	Yes	1.05-3.3
9LPRS365BKLFT	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	21	Gen1	86	Yes	1.05-3.3
9LPRS436CGILFT	85	Intel	CK505	3.3	25	14.31818-166.66	100	3.3,0.7	14	Gen1, Gen2	86	Yes	3.3
9LPRS436CGLFT	85	Intel	CK505	3.3	25	14.31818-166.66	100	3.3,0.7	14	Gen1, Gen2	86	Yes	3.3
9LPRS436CKILF	85	Intel	CK505	3.3	25	14.31818-166.66	100	3.3,0.7	14	Gen1, Gen2	86	Yes	3.3
9LPRS436CKILFT	85	Intel	CK505	3.3	25	14.31818 - 166.66	100	3.3,0.7	14	Gen1, Gen2	86	Yes	3.3
9LPRS436CKLFT	85	Intel	CK505	3.3	25	14.31818 - 166.66	100	3.3,0.7	14	Gen1, Gen2	86	Yes	3.3
9LRS3165BGLFT	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	21	Gen1, Gen2	86	Yes	1.05-3.3
9LRS3165BKLFT	85	Intel	CK505	3.3	14.31818	14.31818-400	100	3.3,0.7	21	Gen1, Gen2	86	Yes	1.05-3.3
9LRS3187BKILF	85	Intel	CK505	3.3	14.31818	14.31818 - 133.33	100	3.3,0.7	7	Gen1, Gen2	86	Yes	1.05-3.3
9LRS3187BKILFT	85	Intel	CK505	3.3	14.31818	14.31818 - 133.33	100	3.3,0.7	7	Gen1, Gen2	86	Yes	1.05-3.3
9LRS3187BKLFT	85	Intel	CK505	3.3	14.31818	14.31818 - 133.33	100	3.3,0.7	7	Gen1, Gen2	86	Yes	1.05-3.3
9LRS4103BKLFT	85	Intel	CK505	3.3	14.31818	14.31818 - 133.33	100	3.3,0.7	6	Gen1, Gen2	86	Yes	3.3

These products represent only a portion of IDT s extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Netbook, Smartbook, Tablet and UMPC Platform Clocks

Typical Smartbook Application Diagram



NETBOOK PLATFORM CLOCKS

Part Number	C-C Jitter (ps)	Chipset Mfg	Clock Spec	Core Voltage (V)	Input Frequency (MHz)	Output Frequency (MHz)	Output Skew (ps)	Output Voltage	Number of Outputs	PCIe® Gen	Phase Noise Max, pspp (ps)	Spread Spectrum	Supply Voltage (V)
9VRS4338DKLF	85	Intel	CK-NET	1.5,3.3	14.31818	14.318-200	500	3.3,0.7	15	Gen1, Gen2	86		1.05-3.3
9VRS4339BKLF	85	Intel	CK-NET	1.5,3.3	25	14.318-200	500	3.3,0.7	19	Gen1, Gen2	86		1.05-3.3
9LRS3165BKLF	85	Intel	CK505	3.3	14.31818	14.318-400	3000	3.3,0.7	21	Gen1, Gen2	86		1.05-3.3
9LPRS365BKLF	85	Intel	CK505	3.3	14.31818	14.318-400	3000	3.3,0.7	21	Gen1, Gen2	86	Yes	1.05-3.3
9LPRS431AGLF	85	Intel	CK505	3.3	14.31818	14.318-400	3000	3.3,0.7	16	Gen1, Gen2	86		1.05-3.3
9LPRS436CKLF	85	Intel	CK505	3.3	14.31818	14.318-166.66	250	3.3,0.7	14	Gen1, Gen2	86		1.05-3.3
9LRS4850AKLF	125	AMD	Brazos	3.3	25	24.576-170	3000	3.3,0.7	24	Gen1, Gen2	86		1.05-3.3

TABLET PLATFORM CLOCKS

Part Number	C-C Jitter (ps)	Chipset Mfg	Clock Spec	Core Voltage (V)	Input Frequency (MHz)	Output Frequency (MHz)	Output Skew (ps)	Output Voltage	Number of Outputs	PCIe® Gen	Phase Noise Max, pspp (ps)	Spread Spectrum	Supply Voltage (V)
9VRS4338DKLF	85	Intel	CK-NET	1.5,3.3	14.31818	14.318-200	500	3.3,0.7	15	Gen1, Gen2	86	Yes	1.05-3.3
9VRS4339BKLF	85	Intel	CK-NET	1.5,3.3	25	14.318-200	500	3.3,0.7	19	Gen1, Gen2	86		1.05-3.3
9LPRS436CKLF	85	Intel	Tunnelcreek	3.3	14.31818	14.318-166.66	250	3.3,0.7	14	Gen1, Gen2	86		1.05-3.3
9LRS4850AKLF	125	AMD	Brazos	3.3	25	24.576-170	3000	3.3,0.7	24	Gen1, Gen2	86		1.05-3.3
5P49EE502NDGI	125	Intel	Oaktrail	1.8	25	0.032768-100		1.8-3.3	5	Gen1	86		1.8-3.3
5P49EE602NLGI	125	Intel	Oaktrail	1.8	0.032768, 25	0.032768-100		1.8-3.3	6	Gen1	86		1.8-3.3
5P49EE802NDGI	125	Intel	Oaktrail	1.8	0.032768, 25	0.032768-100		1.8-3.3	8	Gen1	86		1.8-3.3
5P49EE502NDGI	125	ARM-base	ARM-base	1.8	25	0.032768-100		1.8-3.3	5	Gen1	86		1.8-3.3
5P49EE602NLGI	125	ARM-base	ARM-base	1.8	0.032768, 25	0.032768-100		1.8-3.3	6	Gen1	86		1.8-3.3
5P49EE802NDGI	125	ARM-base	ARM-base	1.8	0.032768, 25	0.032768-100		1.8-3.3	8	Gen1	86		1.8-3.3

UMPC Platform Clocks

Part Number	C-C Jitter (ps)	Chipset Mfg	Clock Spec	Core Voltage (V)	Input Frequency (MHz)	Output Frequency (MHz)	Output Skew (ps)	Output Voltage	Number of Outputs	PCIe® Gen	Phase Noise Max, pspp (ps)	Spread Spectrum	Supply Voltage (V)
9UM709BGLF	85	VIA	VX900	3.3,1.8	14.31818	14.318-293.33	100-1460	3.3,0.7	17	Gen1, Gen2	86	Yes	1.05-3.3
9UM700CGLF	85	VIA	VX800	3.3,2.5	14.31818	14.318-400	100-2560	3.3,0.7	21	Gen1	86		1.05-3.3
9UM701AKLF	85	VIA	VX800U	3.3	14.31818	14.318-400	100-2560	3.3,0.7	9	Gen1	86		1.05-3.3
9UM702BKLF	85	VIA	VX800	3.3	14.31818	14.318-400	100-2560	3.3,0.7	15	Gen1	86		1.05-3.3
9UMS9001AKLF	85	Intel	CK540	3.3	14.31818	14.318-200	100-250	3.3,0.7	14	Gen1, Gen2	86		1.05-3.3
9UMS9633BKLF	85	Intel	CK633	3.3	14.31818	14.31818-200	100-250	3.3,0.7	9	Gen1, Gen2	86		1.05-3.3
9UMS9633BFLF	85	Intel	CK633	3.3	14.31818	14.31818-200	100-250	3.3,0.7	9	Gen1, Gen2	86		1.05-3.3
9UMS9610BKLF	85	Intel	CK610	3.3,1.5	14.31818	14.31818-200	100-250	3.3,0.7	9	Gen1	86		1.5-3.3

These products represent only a portion of IDT's extensive timing portfolio. For information on additional devices, please visit **www.idt.com/go/clocks**

Silicon Frequency Control Products

IDT Frequency Control Products include award winning CrystalFree™ solutions for crystal and crystal oscillator replacement along with proven FemtoClock® NG based clock sources.

Introduction

Frequency Control Products (FCP) are asynchronous clock sources in industry-standard form factors. These devices are internally referenced and do not require any external frequency reference, such as a crystal. Generally, only a single-output frequency and one control pin are required to utilize these simple functions. Since they are available in industry standard footprints and pinouts, these devices can be second-sourced with common crystal oscillator products.

IDT 3L CrystalFree™ Solid State Oscillators

FEATURES

- Output frequencies from 24 MHz up to 125 MHz
- Wide temperature range to support variety of applications
- ±50 ppm total frequency accuracy
- < 30 ps cycle-to-cycle jitter @ 3.3 V
- 400 µs start-up time
- Operating voltage of 2.5 V or 3.3 V

BENEFITS

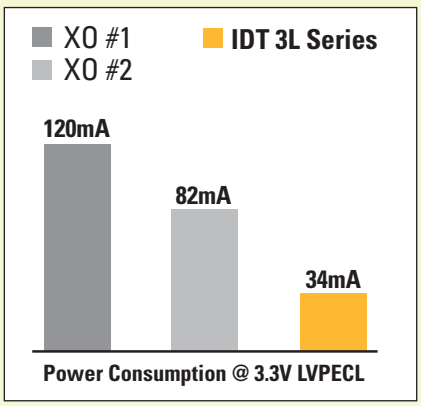
- Ultra-low power consumption
- Pin-compatible to industry standard packages
- No aging effects on performance
- No sensitivity to shock and vibration

APPLICATION EXAMPLES

- Portable/Consumer
- Server/Storage
- Computing
- Wireless Communication
- Telecom and Networking

INTERFACE EXAMPLES

- Ethernet, LAN
- PCI, PCIe, S-RIO, GbE, 10 GbE
- Memory, CPU, GPU

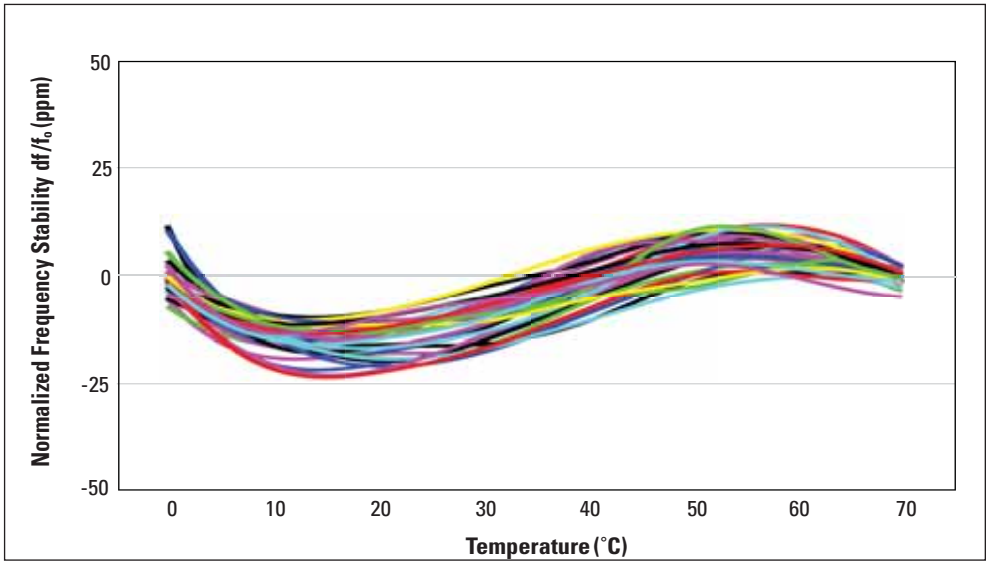


Low Power, High-Performance Oscillator

IDT's 3L Series of oscillators are ideal replacements to traditional crystal oscillators (XOs) due to their highly flexible and precise output frequencies, short lead-times, and industry leading low power consumption.

Available in LVDS, LVPECL or HCSL differential output styles, the 3L series oscillators are available with frequencies ranging from 24 MHz to 125 MHz. Using CrystalFree Solid-State Technology, these crystal oscillator replacements offer <1 ps RMS phase noise (12 kHz - 20 MHz integration range) and ultra-low power consumption of about 11 mA for LVDS and 34 mA for LVPECL across the full range of available voltages, 2.5 V to 3.3 V.

With these performance and power benefits, coupled with the industry standard 6-pin footprint, the IDT 3L series makes for an effortless change in improving overall system margin and reliability.



Part Number	Packages	Freq. (MHz)	Accuracy (ppm)	Temp. (°C)	Output
3LG	5.0 x 3.2 mm 6 pin	24-125	± 50	0 - 70	LVDS, LVPECL, HCSL
	7.0 x 5.0 mm 6 pin				

IDT 3C CrystalFree™ Solid State Oscillators

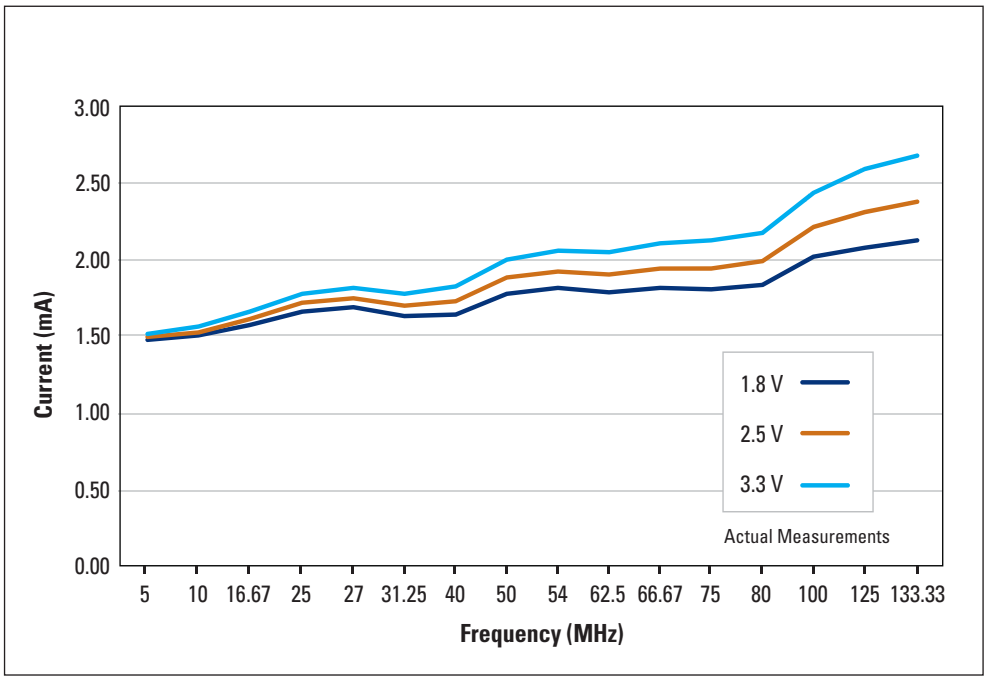
World's Lowesr ±100 ppm Oscillator

Low Power, High-Performance Oscillator

IDT's CrystalFree 3C solid state crystal-oscillator (XO) replacement products have ±100 ppm frequency accuracy and are based on over 35 patents (granted or filed). They consume as low as 1/10th the power of XO products using approximately 2 mA or less at 1.8 V over the entire frequency range from 4MHz to 133MHz. The 3C series provides significant price saving, lead time, and performance improvements as compared to quartz-crystal oscillators

Unlike traditional XOs, the 3C Series is an all-silicon solution in plastic packaging. It is pin-to-pin compatible with standard 4-pin and 6-pin XO footprints, with packages ranging from 5 mm x 7 mm down to 2.0 mm x 1.6 mm.

With power, pricing and performance benefits, coupled with industry standard footprints, the IDT 3C series makes for an effortless change in improving overall system margin and reliability.

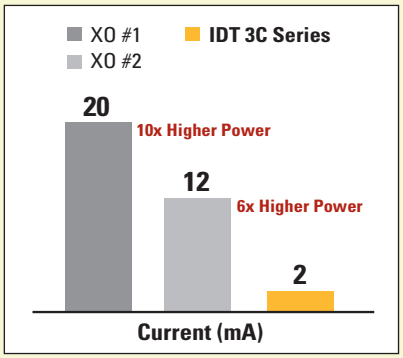


FEATURES

- Output frequencies from 4 MHz up to 133 MHz
- Two temperature ranges to support a wide variety of applications
  - Commercial: 0 to 70 C
  - Extended Commercial: -20 to 70 C
- ±100 ppm total frequency accuracy
- 40 ps max cycle-to-cycle jitter (@ 3.3 V)
- 400 µs start-up time
- Operating voltage from 1.8 V to 3.3 V

BENEFITS

- Pin-compatible to industry standard packages
- Ultra-low power consumption
- No aging effects on performance
- No sensitivity to shock and vibration



APPLICATION EXAMPLES

- Portable/Consumer
- Storage
- Computing
- Communications
- Industrial
- Medical
- Security

INTERFACE EXAMPLES

- MIPI, HDMI, VGA, DVR, MPEG, Video
- Memory, CPU
- LAN, GbE

Specifications

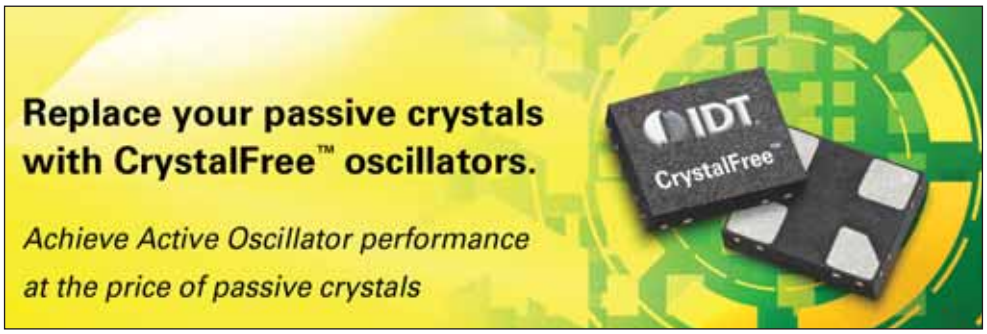
Part	Package (Length x Width x Height in mm)	Frequency (MHz)	Accuracy (ppm)	Temperature (˚C)	Output
3CN	5.0 x 3.2 x 0.85 mm – 4 pins	4-133	±100	0 to 70, -20 to 70	CMOS
	2.5 x 2.0 x 0.85 mm – 4 pins				
3CL	5.0 x 3.2 x 0.85 mm – 4 pins	26, 27, 54	±100	0 to 70 -20 to 70	CMOS
	2.5 x 2.0 x 0.85 mm – 4 pins				
	7.0 x 5.0 x 0.85 mm – 4 pins	1-200			
	3.2 x 2.5 x 0.85 mm – 4 pins				
	2.0 x 1.6 x 0.85 mm – 4 pins				

5.0 x 3.2 x 0.85 mm – 4 pins

2.5 x 2.0 x 0.85 mm – 4 pins

3D/3N CrystalFree™ Solid-State Oscillators

±50 ppm Initial Frequency Accuracy Crystal Replacements



IDT CrystalFree™ Solid-State products provide performance, integration, and lead-time advantages over crystal resonators with no cost penalty using Solid-State active oscillator technology.

Passive quartz-crystal resonators (XTALs) have historically been desirable due to their low cost, but present a multitude of problems for the designer. XTAL performance is frequently dependant on a specific complex board layout and they are susceptible to induced electrical noise. In addition, XTALs can have start-up issues (especially for exotic high-frequency devices), and lead times can be problematic, particularly for non-standard frequencies. Finally, the frequency accuracy budget of crystals is unbounded, with degradation occurring over time. CrystalFree Solid-State devices resolve all of these concerns.

IDT offers the 3FN and 3DN series of single-ended-output products with ±50 ppm initial frequency accuracy. The IDT CrystalFree Solid-State products are active oscillators that resolve the complexity and difficulty of working with passive resonators and provide output-frequency ranges up to 133 MHz with much lower jitter and faster start-up time.

Additionally, CrystalFree Solid-State oscillator output frequency accuracy is immune to degradation over time, contrasting with the unbounded frequency drift of quartz-crystals. And as with the CrystalFree Solid-State XO replacement devices, IDT's CrystalFree Solid-State crystal-resonator replacement products are available with standard semiconductor lead times in any frequency.

40% Lower Jitter in SATA HDD: Production 3.5" HDD with Read Channel SOC

Part	Packages	Freq. (MHz)	Accuracy (ppm)	Temp. (°C)
3FN	2.5x2.0x0.55 mm 5.0x3.2x0.85 mm	4-133	Ini = ±50 Temp = ±100	0 C to 70 C 0 C to 85 C -20 C to 70 C
3DN			Ini = ±50 Temp = ±400	-40 C to 85 C

PRODUCT FEATURES

- 4 - 133 MHz frequency
- LVCMOS output
- ±50 ppm initial tolerance @ 25 C
- 400 µs start-up time
- Variety of ultra-small packages, down to 2.5 x 2.0 mm
- Wide range of operating temperatures
- 1.8 V to 3.3 V Supply Voltages

PRODUCT BENEFITS

- Fewer Components = simpler BOM
- Miniature plastic packages
- Short lead time
- Fast ramp to production
- No aging effects on performance
- No sensitivity to shock and vibration

TARGET APPLICATIONS

- Portable/Consumer
- Server/Storage
- Computing

FUNCTIONS

- Fully programmable clock sources
- Programmable crystal-oscillator and VCXO
- 5mm x 7mm compatible, ceramic packages

FEATURES/BENEFITS

- Flexible frequency configurations solve complex design problems
- Configurable to output any clock rate using two-wire I²C serial interface
- Up to four user defined, factory-programmed output frequencies stored within the device
- Short lead times compared to traditional crystal oscillators
- Reduces overall component count and inventory management
- Dynamic frequency changes enable board and system test and diagnosis by clock frequency margining

Programmable Frequency, Low Phase-Noise FemtoClock® NG Crystal-Oscillator Family

FemtoClock® NG 5mm x 7mm devices are clock frequency sources that provide frequencies from 15.48 to1300 MHz. The devices use IDT's 4th generation fractional-feedback PLL technology and integrate the crystal within the package. Each device features a set of up to four user defined frequencies that are pre-programmed from the factory. An additional I2C programming interface allows access to internal PLL registers for reconfiguring the output frequency. The VCXO devices also allow configuration of the absolute pull-range (APR) from ±7.5 to ±757.5 ppm. Compatible with the standard 6-pin 5mm x 7mm ceramic package, these devices are an ideal alternative to classic oscillators, SO, VCXOs and VCSOs, with the additional benefit of a 4-pin interface for output frequency programming. The devices use standard outputs such as differential LVPECL, LVDS and single ended LVCMOS. These devices can be ordered with integrated crystals with an accuracy of ±20, ±50 or ±100 ppm.

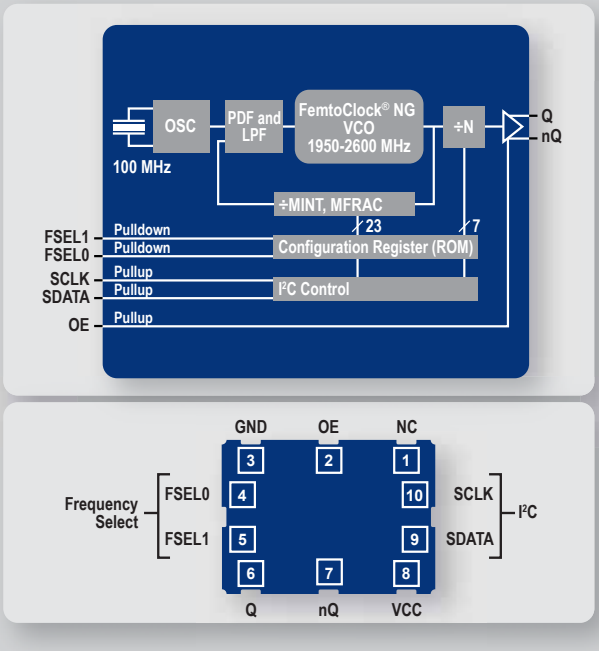
Performance

FemtoClock NG devices are the choice of the advanced system designer seeking a clock source with top performance and unmatched flexibility in a standard oscillator footprint. Using IDT's new 4th generation fractional feedback synthesizer architecture, the devices offer low phase-noise characteristics (<0.5 ps RMS) that are required for reference clocks in applications that cannot compromise in signal quality, conversion error and bit error rate. The linearity of the VCXO outperforms most existing tunable oscillators.

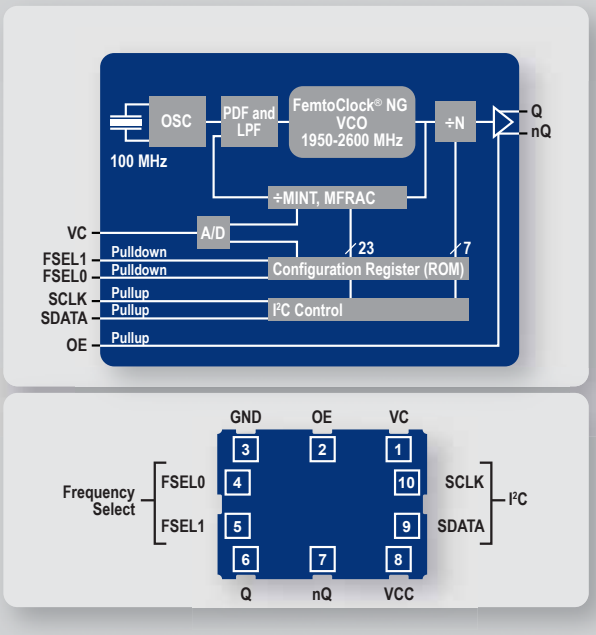
Programmable FemtoClock® NG Oscillators

FemtoClock NG devices can be used in standard 5mm x 7mm oscillator footprints. The phase noise performance of the FemtoClock NG 5mm x 7mm family enables their use as reference clocks for phase-noise sensitive applications. They are ideal for clock applications where low phase noise reference clocks improve transmission distance or reduce bit error rates and conversion errors. Additional examples of application uses can be found in wireless infrastructure radio and base-band processing units, high-speed SerDes clocking (for instance S-RIO 1.3 and 2.1), PCI Express® Generation 1, 2 and 3, various Ethernet interfaces (Gigabit Ethernet, XAUI and 10 Gbit Ethernet), optical interfaces in SDH/SONET applications (OC-12, OC-48 and OC-192) and in driving DAC/ADC devices in instrumentation applications.

Configurable Frequency XO



Configurable Frequency VCXO



Ordering Information for FemtoClock NG Crystal-Oscillator Family

The programmable VCXO and XO devices support a variety of options such as the output type, number of default frequencies, internal crystal frequency, power supply voltage, ambient temperature range and the frequency accuracy. The device options, default frequencies and VCXO pull range must be specified at the time of order and are programmed by IDT before shipment.

The example order code 8N3QV01FD-1014CDI specifies a programmable, quad default-frequency VCXO with a voltage supply of 2.5V, a LVPECL output, a ±50 ppm crystal frequency accuracy, contains a 100MHz internal crystal as frequency source, industrial temperature range, a lead-free (6/6 RoHS) 10-lead ceramic 5mm x 7mm x 1.55mm package and is factory-programmed to the default frequencies of 625, 312.5, 156.25 and 125MHz and to the VCXO pull range of min. ±100 ppm.

The table below shows the default frequency ordering codes available today using the integer feedback PLL and 100MHz crystal as its input. Please refer to the document, "Default Frequency and VCXO Pull Range Order Information for Ceramic 5x7 Devices" on the IDT website for a complete list of pre-defined frequency codes.

Default Frequency Ordering Codes for Integer Feedback PLL Options using a 100MHz crystal input

Code (dddd)	FSEL[1:0]=00	FSEL[1:0]=01	FSEL[1:0]=10	FSEL[1:0]=11
1014	625	312.5	156.25	125
1015	156.25	187.5	200	250
1018	212.5	250	300	312.5
1020	106.25	125	156.25	212.5
1024	100	125	156.25	250
1027	400	400	400	400
1028	156.25	156.25	156.25	156.25
1030	312.5	312.5	312.5	312.5
1031	80	100	125	156.25
1033	100	125	156.25	250
1036	100	125	250	312.5
1037	500	125	250	1000
1043	496	496	496	496
1045	100	125	100	125
1046	200	50	100	125
1049	150	75	300	150
1052	425	212.5	106.25	159.375
1053	160	160	160	160
1054	25	33.33	50	62.5
1064	106.25	100	106.25	100
1065	212.5	212.5	212.5	212.5
1069	250	250	250	250
1073	312.5	156.25	125	100
1074	100	106.25	100	106.25
1075	150	75	150	75
1076	200	200	200	200
1078	100	200	300	400
1080	125	125	125	125
1086	350	350	350	350
1088	156.25	156.25	156.25	156.25
1095	100	125	133	156.25
1098	130	100	80	25

Default Frequency Ordering Codes for Integer Feedback PLL Options using a 100MHz crystal input

Code (dddd)	FSEL[1:0]=00	FSEL[1:0]=01	FSEL[1:0]=10	FSEL[1:0]=11
1099	187.5	250	287.5	312.5
1102	25	50	100	125
1103	240	240	240	240
1104	425	425	425	425
1105	110	110	110	110
1107	187.5	150	300	300
1108	100	100	100	100
1111	500	500	500	500
1113	156.25	175	200	312.5
1115	175	175	175	175
1118	100	100	100	100
1120	166.6667	166.6667	166.6667	166.6667
1121	180	180	180	180
1122	320	320	320	320
1124	75	75	75	75
1127	25	33.3333	50	125
1128	25	33.3333	62.5	125
1129	187.5	187.5	187.5	187.5
1133	480	480	480	480
1134	100	156.25	250	312.5
1135	25	40	50	100
1136	100	312.5	100	312.5
1141	156.25	133.3333	137.5	156.25
1145	100	200	333	400
1146	100	95	105	125
1147	100	400	1000	1000
1149	350	312.5	175	156.25
1150	100	400	1000	250
1151	150	156.25	212.5	150
1153	100	40.5	67.5	135
1154	50	50	50	50
1155	100	83.33	100	83.33

Reference Designs

- Altera FPGAs
- Broadcom Switch/PHY
- Broadcom BCM54382
- Cavium Designs
- Freescale QorIQ
- Freescale iMx
- Intel Atom
- Xilinx FPGAs

IDT Reference Clocks for Altera FPGAs

IDT has the industry's broadest portfolio of timing solutions, supporting many Networking and Communication applications. With products that uniquely complement Altera designs, IDT provides the performance, design expertise, reliability and delivery necessary to achieve design success. IDT's PLL-based clock generators and high performance fanout buffers offer sub picosecond jitter, low-skew clock outputs, and edge rates that meet the input specifications of Altera's existing and next generation FPGA products.

TECHNOLOGY DIFFERENTIATORS FOR IDT NETCOM

- World leader in Silicon Timing
- Largest portfolio of devices with differential levels: LVPECL, LVDS, HCSL, HSTL, CML
- Specializing in very low jitter for wireless infrastructure, SDH/SONET, Ethernet, PCIe, storage, instrumentation, phase-noise sensitive systems
- Largest portfolio of devices with mixed I/Os, voltage levels and frequencies
- Established design wins with major communication equipment manufacturers

CLOCK GENERATION

- 5x7 XO & SO
- Modules
- XO + Fanout
- FemtoClocks™
- PLL Synthesizers
- SSC Clocks
- QUICCclocks
- VCXO + Fanout
- VCXO + FemtoClock
- VCSO Modules

Part Numbers

8N3PN10I	843241	841654I	84xN161I-04
8N3Q001	8413S12	8535I-31	840S2306I
8N3QV01	841S101	83905	
8T49N Series	871S1022	843N252-45	
8T43N Series	8430S10-03	84xN161I-01	

Best In-Class Performance

- Low Jitter
  < 0.3 ps rms (FemtoNG™ in Integer mode)
  < 0.5 ps rms (FemtoNG™ in Fractional mode)
- Excellent PSNR (-80dBc)
  – Integrated Fanout from 1 to 16 outputs
  – 1GHz+ frequency support
- Field-proven standards compliance for IEEE, Telcordia, ITU, DOCSIS, JEDEC and others

CLOCK DISTRIBUTION

- Zero Delay Buffers
- Programmable Skew
- Frequency Translation (Dividers & Multipliers)
- Dynamic Clock Switches
- Clock Multiplexers
- Fanout Buffers

Part Numbers

8543	8535I-01	85108I
853S006	85411	5V5201
854S006	853S011	5V5206
8304	87339-01	5V5216
8308	85102I	5V5218
85310-01	85104I	
830154I-08	85105I	

Widest Selection of Densities and I/O

- Output densities from 1 to 44
- High performance fan-out buffers with speeds up to 3GHz
- Universal inputs support any logic type with AC or DC coupling
- LVPECL, LVDS, MLVDS, LVTTL, HCSL and HSTL output support
- LVCMOS (5V, 3.3V, 2.5V, 1.8V)
- Mixed voltage support
- Designed for tight timing budgets – optimized for low skew, delay, jitter
- Low additive jitter < 0.09 ps
- Low output Skew < 15 ps
- Propagation delays below 500ps (SiGe)

JITTER ATTENUATION & FREQUENCY TRANSLATION

- PLL Clock Generators
- VCXO + FemtoClock
- VCSO + PLL Modules
- Stratum WAN PLL
- IEEE1588 WAN PLL
- Sync-E Jitter Attenuators
- "Hitless" Switches

Part Numbers

82V3288	82V3155	810N322-02
82V3285	82V3012/3002	813N322-02
82V3280	82V3011/3001	814322-02
82V3255	82V3203A/B	

Synchronization enabling products for TDM and Wireless Infrastructure

- 1 PPS input and output
- SONET OC-12/48/192
- 10/40/100 GbE
- IEEE-1588 and Sync-E compliant clocks
- I/O frequency range from 1KHz to 900MHz
- Multiple FEC rate conversion
- Excellent wander and jitter performance
- Selectable Loop Bandwidth
- EEC-Option 1, EEC-Option 2, Stratum 3E, 3, SMC, 4E and 4 (ITU-T G.8262, ITU-T G.813, GR-253-CORE , and GR1244-CORE)
- Automatic hitless switching on failure
- Phase Build Out and Phase slope limiting support

Interconnect Protocol	Line Rate (Gbps)	Altera FPGA Family	Clock Generation		Clock Distribution	Level Translation	Jitter Attenuation & Frequency Translation
			Reference Clocks	Ref Clocks with Integrated Fanout			
1 GbE	1.25	Stratix V, Stratix IV, Arria V, Arria II, Cyclone V, Cyclone IV Cyclone IV GX	8N3PN10I	8T49N Series 8T43N Series 8535I-31, 83905	8304 830154I-08 8535I-01	85411 853S011 830S21	810251
40GbE 100GbE	10.3125	Stratix V, Stratix IV GT	8N3PN10I 8N3Q001(XO) 8N3QV01(VCXO)	8T49N Series 8T43N Series 8535I-31, 83905	87339-01, 8308, 854S006, 8543, 830154I-08, 8535I-01	85411 853S011 830S21	849N202
PCIe Gen1 Gen2	2.5 5.0	Stratix V, Stratix IV, Arria V, Arria II	841S101 8N3PN10I 871S1022	8T49N & 8T43N Series, 8413S12, 8430S10-03, 8535I-31, 83905	851021, 851041 851051, 851081	85411 853S011 830S21	874003-02 871S1022
PCIe Gen3	8	Stratix V, Stratix IV	841S101 8N3PN10I 871S1022	8T49N Series 8T43N Series 8535I-31, 83905	85102I, 85104I 85105I, 85108I	85411 853S011 830S21	874003-02
Serial RapidIO	1.25, 2.5 3.125, 5 6.25	Stratix V, Stratix IV, Arria V, Arria II, Cyclone V GX Cyclone IV GX	8N3PN10I	8T49N & 8T43N Series, 8413S12, 8430S10-03, 841654I, 8535I-31, 83905	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	849N202
Fibre Channel	1.0625 2.125, 4.25 8.5, 10.52	Stratix V, Stratix IV Arria V, Arria II	8N3PN10MDKI-020LF	8T49N Series 8T43N Series 8535I-31, 83905	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	849N202
SAS/ SATA	1.5, 3.0 6.0	Stratix V, Stratix IV, Arria V, Arria II	843241 8N3PN10	8T49N Series 8T43N Series 8535I-31, 83905	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	849N202
10GbE XAUI	3.125	Stratix V, Stratix IV, Arria V, Arria II, Cyclone V, Cyclone IV Cyclone IV GX	8N3PN10I 8N3Q001(XO) 8N3QV01(VCXO)	8T49N Series 8T43N Series 8535I-31, 83905	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	849N202
10GbE XFI	10.3125	Stratix V Stratix IV GT, Arria V, Arria II	8N3PN10I 8N3Q001(XO) 8N3QV01(VCXO)	8T49N Series 8T43N Series 8535I-31, 83905	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	849N202
SONET OC-48 OC-192	2.488 9.953	Stratix V Stratix IV Arria V Arria II	8N3PN10I 8N3Q001(XO) 8N3QV01(VCXO)	8T49N Series 8T43N Series 8535I-31 83905	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	82V3288, 82V3285, 82V3280, 82V3255, 82V3155, 82V301 2/3002, 82V3011/3001, 810N322-02, 813N322-02, 813N322-02, 814N322-02
OTN OTU-2	10.709	Stratix V Stratix IV GT Arria V Arria II	8N3PN10I 8N3Q001(XO) 8N3QV01(VCXO)	8T49N Series 8T43N Series 8535I-31 83905	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	82V3288, 82V3285, 82V3280, 82V3255, 82V3155, 82V301 2/3002, 82V3011/3001, 810N322-02, 813N322-02, 813N322-02, 814N322-02
OTN OTU-3 OTU-4	43.018 112	Stratix V Stratix IV Arria V Arria II	8N3PN10I 8N3Q001(XO) 8N3QV01(VCXO)	8T49N Series 8T43N Series 8535I-31 83905	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	82V3288, 82V3285, 82V3280, 82V3255, 82V3155, 82V301 2/3002, 82V3011/3001, 810N322-02, 813N322-02, 813N322-02, 814N322-02
CPRI	0.6144, 1.2288, 2.4876, 3.072, 4.9152, 6.144, 9.8304	Stratix V, Stratix IV, Arria V, Arria II, Cyclone V GX Cyclone IV GX	843N252-45, 84xN161I-01, 84xN161I-04, 840S2306I, 840S2316I, 840S2326I	819N422I-01 819N432I 844S012I	85310-01, 5V5201, 5V5206, 5V5216, 5V5218	85411 853S011 830S21	82V3216, 82V3218, 82V3288, 82V3280, 82V3255, 82V3203A/B
Video 3G-SDI HD-SDI Genlock	13.5, 14.3181818, 16.9344, 27, 27.027, 54, 67.5, 74.175824, 74.25, 106.25, 125 (MHz)	Spartan 6 Virtex 4/5/6/7	1574BMLF 8N3Q011(XO) 662M-03 663M 664G-01	664G-02 664G-05 660 1526GILFI	8543 853S006 854S006 8304 8308	85411 853S011 830S21	849N202

BROADCOM SWITCH/PHY REFERENCE DESIGNS

- BCM 56640
- BCM 56440 / 56441 / 56442 / 56443
- BCM 56445 / 56448
- BCM 88650
- BCM 88030
- BCM 56842 / 56844 / 56846
- BCM 56850

IDT SYNCHRONOUS ETHERNET SOLUTIONS

The IDT **8V89307 + 8V89308** clocking solution uniquely complements Broadcom Switch/PHY SyncE designs. The IDT 8V89307 + 8V89308 clocking solution fully supports the requirements laid out in ITU-T G.8262 for synchronous Ethernet Equipment Clocks and it meets the stringent phase noise requirements of 10GE/40GE SyncE applications.

IDT provides the performance, design expertise, reliability and delivery necessary to achieve design success.

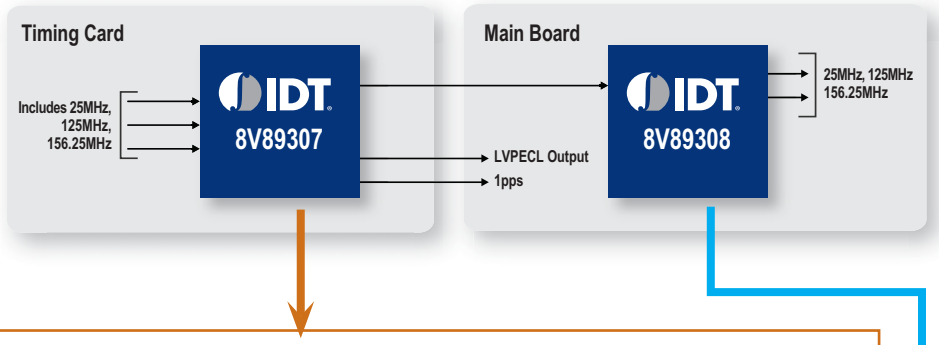
IDT SOLUTION FOR BCM 56640

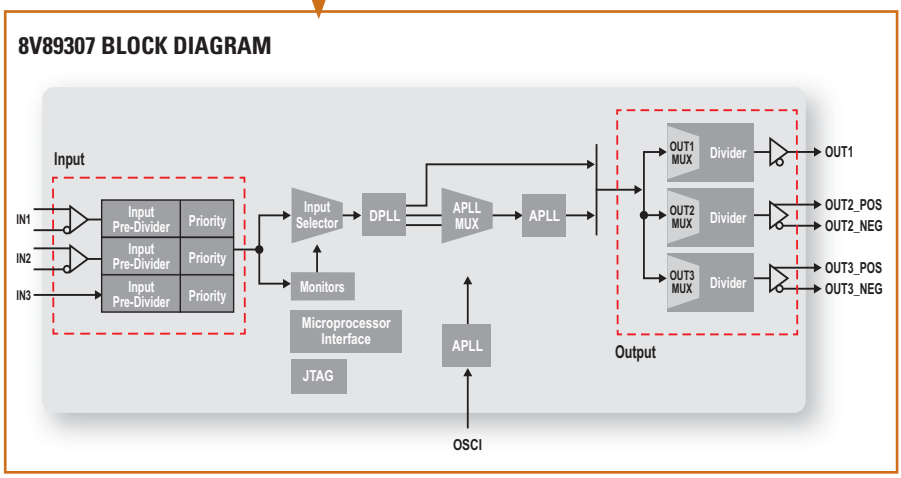
8V89307 + 8V89308

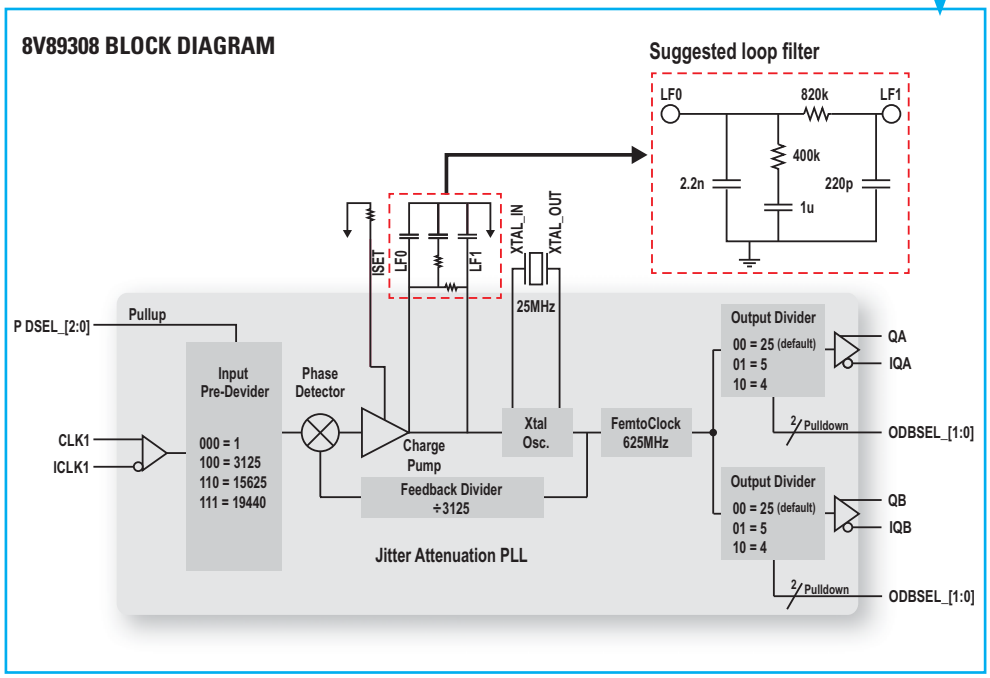
- Input frequencies: 10MHz – 156.25MHz
- Output frequencies: 1pps, 25MHz, 125MHz, 156.25MHz
- RMS jitter: <0.3ps
- Aligns outputs to reference input phase with offset control
- Automatic hitless switching with less than 0.61ns transient
- Automatic switching between free-run, locked, holdover
- I²C or SPI interface control
- IEEE 1149.1 JTAG Boundary Scan

Synchronous Ethernet Timing Reference Design for Broadcom Switch/PHY

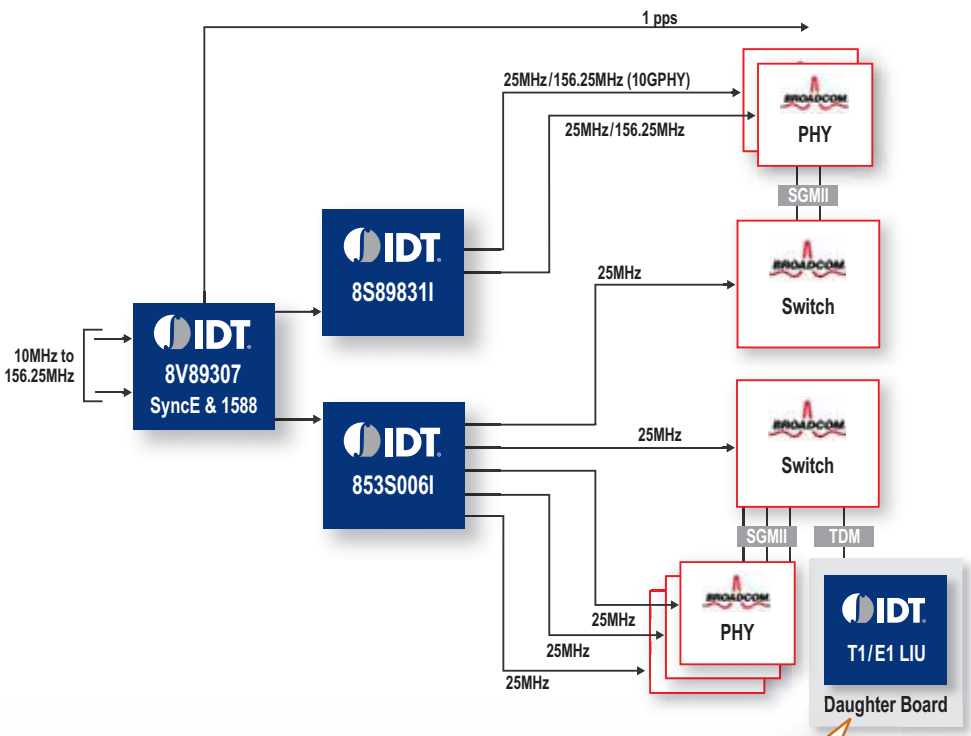
IDT SOLUTION FOR BCM 56640

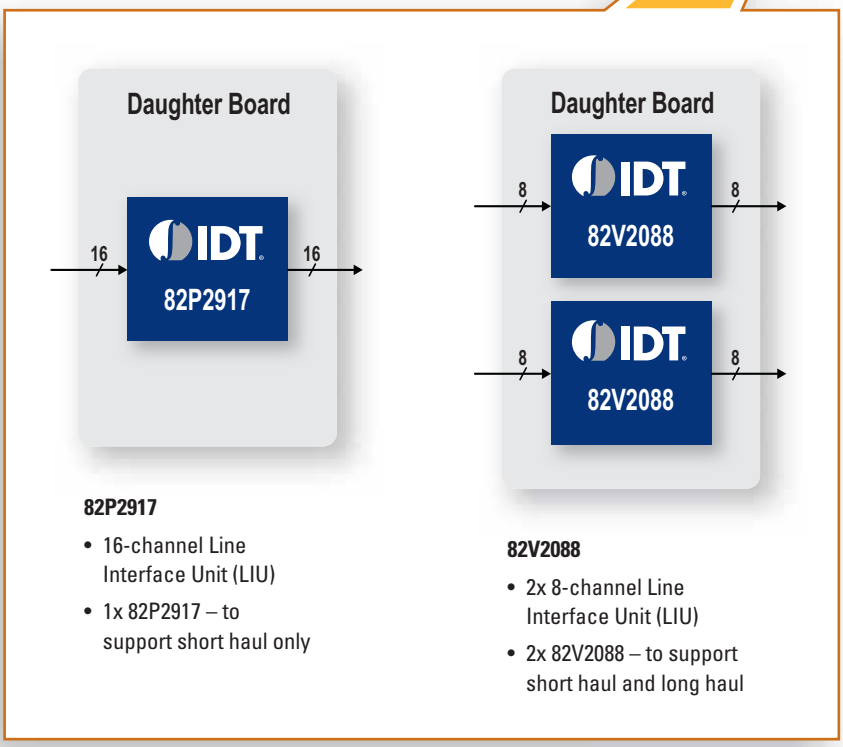






IDT SOLUTION FOR BCM 56440 / 56441 / 56442 / 56443





82P2917

- 16-channel Line Interface Unit (LIU)
- 1x 82P2917 – to support short haul only

82V2088

- 2x 8-channel Line Interface Unit (LIU)
- 2x 82V2088 – to support short haul and long haul

BROADCOM SWITCH/PHY REFERENCE DESIGNS

- BCM 56640
- BCM 56440 / 56441 / 56442 / 56443
- BCM 56445 / 56448
- BCM 88650
- BCM 88030
- BCM 56842 / 56844 / 56846
- BCM 56850

IDT SYNCHRONOUS ETHERNET SOLUTIONS

The IDT 8V89307 is a flexible clocking solution that fully supports the requirements laid out in ITU-T G.8262 for synchronous Ethernet Equipment Clocks and it meets the tight phase noise requirements of Broadcom Switch/PHY 1GE applications. No other external components are needed to achieve 1GE requirements.

IDT has a wide portfolio of fanout buffers to complement different design requirements to fanout multiple copies of the clock.

IDT has long been a leader in wireline market space. IDT has a complete portfolio of T1/E1/J1 products such as Line Interface Units (LIU), transceivers and framers. To support TDM in this reference design, designers can chooose from T1/E1 LIU in different number of port counts that can support long- and short-haul, and also short-haul only applications.

IDT SOLUTION FOR BCM 56440 / 56441 / 56442 / 56443

8V89307

- Input frequencies: 10MHz – 156.25MHz
- Output frequencies: 1pps, 25MHz, 125MHz, 156.25MHz
- 8V89307 will meet Broadcom requirements without jitter attenuator for 1GE applications

BUFFERS

8S89831I

- 1:4 Differential-to-LVPECL Fanout Buffer

853S006I

- 1:6 Differential to LVPECL Fanout buffer

Based on individual design requirements

For a complete selection of IDT Buffers, visit idt.com/go/clocks

IDT Timing Solutions for Broadcom BCM54382

IDT CLOCK SYNTHESIZER SOLUTION

IDT8R834242I clock synthesizer and the IDT8R89S212I clock multiplexer/buffer uniquely complement the Broadcom BCM54382 to 10/100/1000 Base-T Ethernet Transceiver designs. The IDT8R834242I is a flexible timing solution that provides excellent phase noise performance necessary to support 1GE applications. For applications that require precise and accurate synchronization, the IDT8R89S212I provides low propagation delay and ultra-low additive phase jitter of a recovered system clock. As the leader in timing solutions, IDT provides the performance, design expertise, reliability and delivery necessary to achieve design success.

APPLICATIONS

- Enterprise
- Data Center
- Industrial Power
- Smart Grid Automation

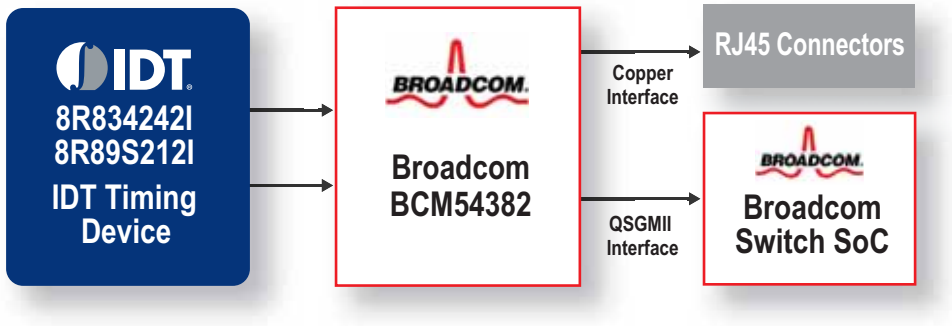
IDT SOLUTIONS FOR BCM54382

IDT8R834242I

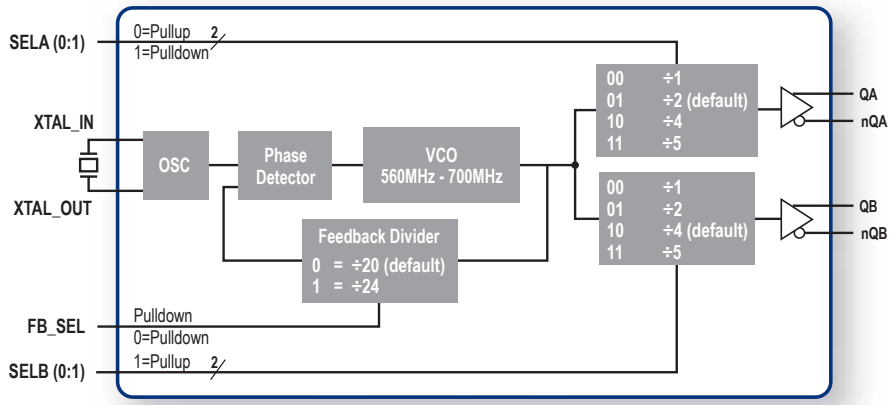
- Two 3.3V differential LVPECL output pairs
- Using a 31.25MHz or 26.041666 crystal, the two output banks can be independently set for 625MHz, 312.5MHz, 156.25MHz or 125MHz
- Crystal oscillator interface
- VCO range: 560MHz to 700MHz
- RMS phase jitter @ 625MHz (1.875MHz - 20MHz): 0.4ps (typical)

IDT8R89S212I

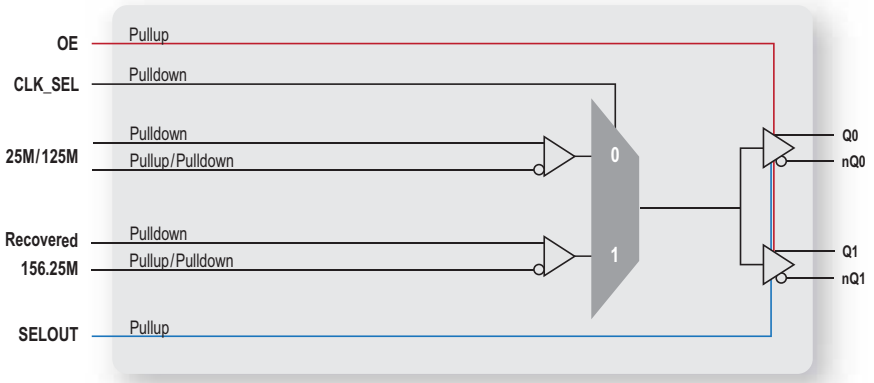
- High speed 2:1 differential multiplexer with a 1:2 fanout buffer
- Two differential LVPECL or LVDS output pairs
- Part-to-part skew: 25ps (typical)
- Propagation delay: 555ps (typical)
- Additive phase jitter, RMS: 0.16ps (typical)



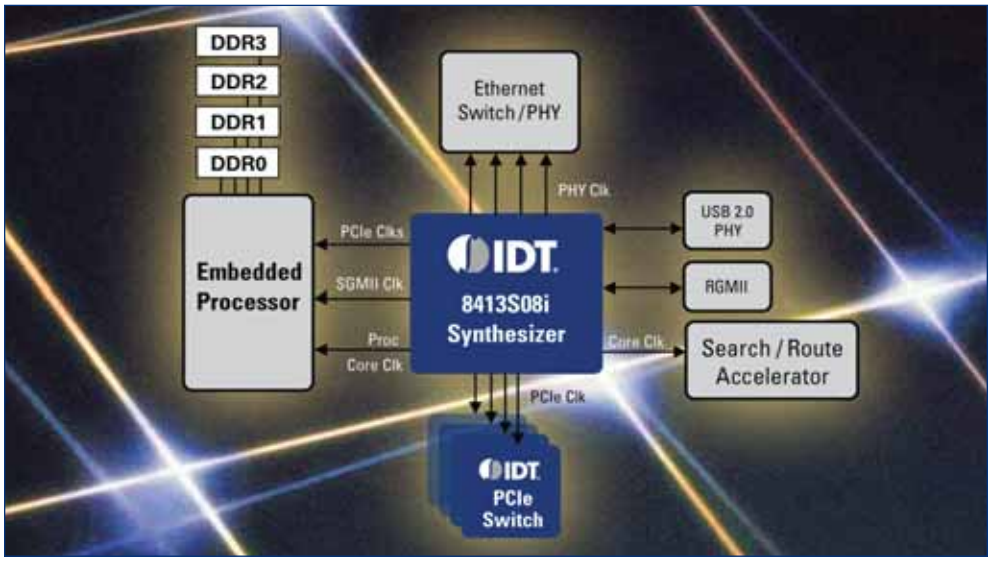
IDT8R834242I CLOCK SYNTHESIZER SOLUTION



IDT8R89S212I CLOCK RECOVERY SOLUTION



Timing Products for Cavium Designs



Networking / Communication Example

IDT Part Number	Reference Clock Outputs & Frequencies	Cavium Processor	Target Applications
8413S12I	**PCIe/sRIO/XAUI/10GbE ref clocks:** 100MHz, 125MHz, 156.25MHz, or 312.5MHz (x10 copies) **Processor ref clock:** 50MHz **Single-ended (S/E) ref clocks:** 25MHz (2x copies) & 125MHz (1x copy)	CN6xxx Series CN68xx CN67xx CN63xx	Secure datacenters, mobile internet, and borderless enterprise applications
8305I	**RGMII fanout ref clocks:** 125MHz (x4 copies)		
841N4830I	**HCSL ref clocks:** 100MHz (x3 diff) **S/E ref clock:** 100MHz **Selectable S/E ref clock:** 50MHz or 100MHz **Diff ref clock:** 25MHz		
841654I	**PCIe and/or sRIO ref clocks:** 100MHz or 125MHz (x4) **S/E ref clock:** 25MHz		
8413S08I	**PCIe and sRIO ref clocks**: 100MHz or 125MHz (x8 copies) **SGMII ref clock:** 156.25MHz **Processor Core clock:** 33.3MHz or 50MHz **Single-ended GbE PHY ref clock:** 25MHz **Diff GbE PHY ref clock:** 25 MHz (x3 copies)	CN5xxx Series CN58xx CN57xx CN56xx CN55xx CN54xx CN52xx CN50xx	Networking and storage equipment, including routers, switches, triple-play gateways, WLAN and 3G/4G access, storage arrays, storage networking equipment, servers, and intelligent NICs
8413S12I	**PCIe/sRIO/XAUI/10GbE ref clocks:** 100MHz, 125MHz, 156.25MHz, or 312.5MHz (x10 copies) **Processor ref clock:** 50MHz **Single-ended (S/E) ref clocks:** 25MHz (2x copies) & 125MHz (1x copy)		
8430S10I S8430S10I-02 8430S10I-03	**DDR400, DDR533, or DDR667 ref clock:** 83.3MHz, 100MHz, 125MHz, 133.3MHz **Processor Core clock:** 33.3MHz or 50MHz (x2 copies) **PCI or PCI-X ref clock:** 33.33MHz, 66.67MHz, 100MHz, or 133.33MHz **SPI4.2 ref clock:** 80MHz, 100MHz, 125MHz, or 400MHz (x2 copies) **Gigabit Ethernet MAC ref clock:** 125MHz **GbE PHY clocks:** 25MHz (x3 copies)		
840S06 840S07I	**Processor Core clock:** 33.3MHz or 50MHz **PCI or PCI-X ref clock:** 33.33MHz, 66.67MHz, 100MHz, or 133.33MHz **Gigabit Ethernet MAC ref clock:** 125MHz **GbE PHY clocks:** 25MHz (x3 copies)	CN3xxx Series CN38xx CN36xx CN31xx CN30xx	Intelligent, multi-gigabit networking, control plane, storage, and wireless applications
8430S07I 8430S07I-02	**DDR400, DDR533, or DDR667 ref clock:** 83.3MHz, 100MHz, 125MHz, 133.3MHz **Processor Core clock:** 33.3MHz or 50MHz **PCI or PCI-X ref clock:** 33.33MHz, 66.67MHz, 100MHz, or 133.33MHz **GbE PHY ref clock:** 25MHz (x3 copies) **Gigabit Ethernet MAC:** 125MHz		

IDT has the industry's broadest portfolio of timing solutions, supporting applications in communications, computing and consumer markets. With products that uniquely complement Cavium designs IDT provides the design expertise, reliability and delivery necessary to achieve design success. The following information identifies current IDT timing solutions for Cavium designs.

KEY BENEFITS

- Integrated solution optimized for Cavium Processors
- Low Jitter and skew meets Cavium requirements
- Phase noise of <0.8ps RMS (12k to 20M)
- Reduced Total Cost
- Reduced board space and Part count
- Better availability and lead times (4-8 weeks)
- Selectable frequencies for different processors
- Small foot print 5mm X 5mm
- LVPECL and LVCMOS output levels
- Full 3.3V or mixed 3.3V/2.5V operation mode

TARGET MARKETS & APPLICATIONS

- Networking
- Communication
- Computing
- System clock for Cavium NPU
- PCI Express® Switches
- Ethernet PHYs
- Search Accelerator

RELATED IDT PRODUCTS

- 8430S07
- 8430S07-02
- 8413S08
- 8430S10
- 8430S10-02
- 8430S10-03
- IDT PCIe Switches

IDT Clocks for Freescale™ QorIQ

IDT has the industry's broadest portfolio of timing solutions for Industrial, Networking, Consumer and Embedded applications. With products uniquely complimenting Freescale's QorIQ processors, IDT provides the performance, flexibility, design expertise, reliability and manufacturing capabilities to ensure customer success.

INTEGRATED CLOCK GENERATION

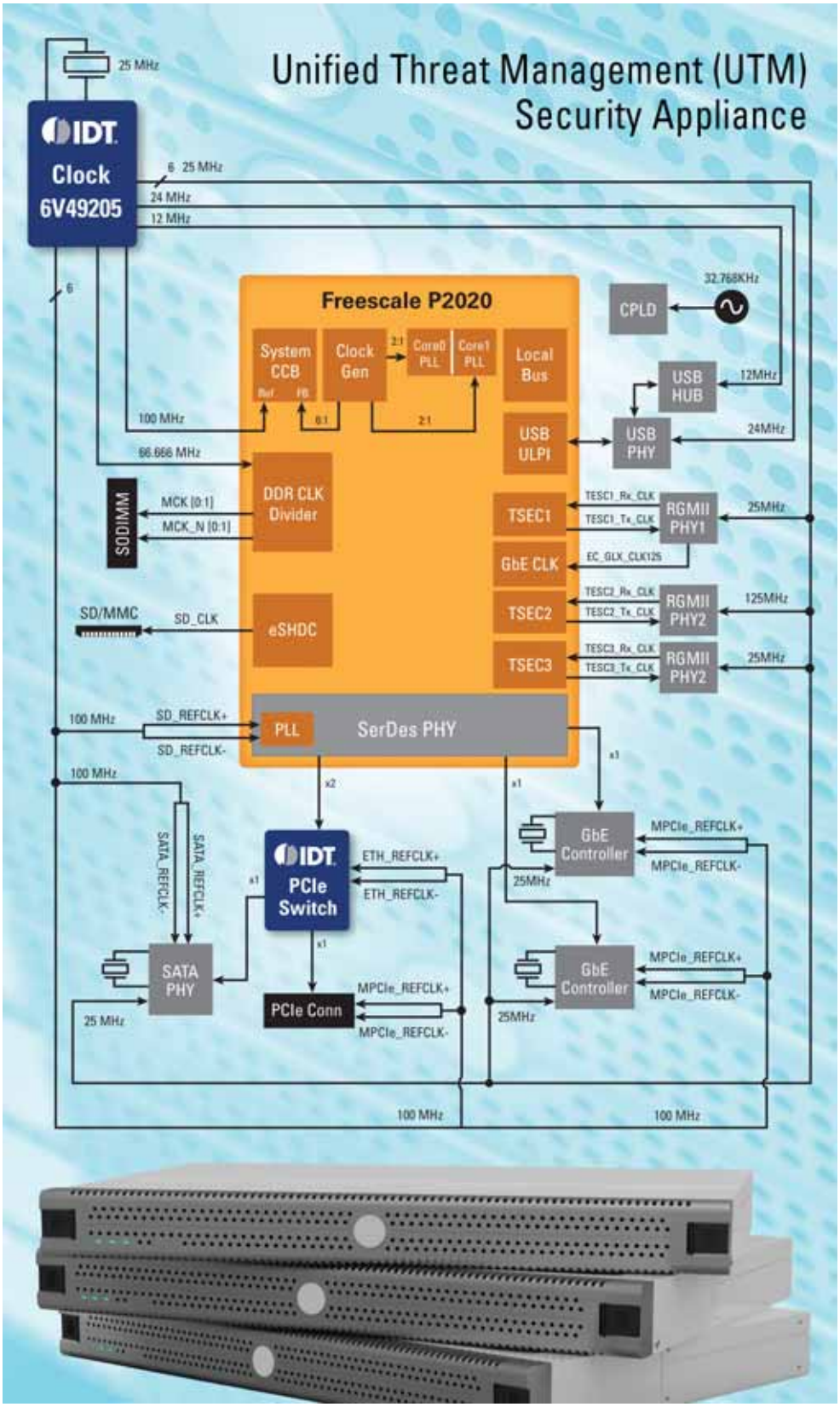
- Spread-Spectrum Capable for EMI reduction
- Highly-integrated single-chip solutions replace up to:
  - 11 Crystals
  - 2 Oscillators
  - 3 clock synthesizers
- Low-power PCIe outputs with integrated terminations
- PCIe Gen1/2/3 compliant PCIe outputs
- < 3ps RMS for 125M outputs
- Programmable Slew Rate
- As little as 400mW power dissipation

BUILDING BLOCK CLOCK GENERATION

- SERDES clocks support PCIe Gen3 and up to 10G XAUI
- Mix and match various clocks as long as the desired frequency and data rate are supported
- Supports HCSL, LP-HCSL, LVPECL, LVDS, LVCMOS, LVTTL signaling standards
- Low-Power HCSL outputs reduce power consumption by as much as 30mW per output compared to standard HCSL devices

CLOCK DISTRIBUTION

- Zero Delay/Fan out Buffers
- Clock multiplexers



Selecting clocks for QorIQ designs is straightforward. Once the "Qor" clocking requirements of the Freescale QorIQ processors are satisfied (SYS_CCB clock, etc.), product selection proceeds to other required clocks, such as USB or 25M for Ethernet. Then, the number of, the frequencies of and the desired date rates of the SERDES links are factored into the clock selection. IDT offers both integrated and building block approaches to QorIQ timing solutions as shown in the Product Selector Tables.

QorIQ Devices: P1 and P2 Series

CLOCK GENERATION	"Qor" Clocks			SERDES Clock Pairs			Other Clocks	
Part Number	SYS_CCB (MHz)	DDR_CLK (MHz)	GTX_CLK (MHz)	Pairs (MHz)	Standards	Data Rates (Gb/s)	USB_CLK (MHz)	Other Outputs (MHz)
6V49205A	1x 66.7 / 80/ 83.3 / 100 / LVCMOS / LVTTL	1x 66.7 LVCMOS / LVTTL	1x 125 LVCMOS / LVTTL	6x 100 LP-HCSL1	PCIe G1/G2, SGMII, sRIO 1x / 2x SATA / SATA3G	1.25 / 2.5 / 5 / 1.5 / 3	2 x 12 / 24 LVCMOS/ LVTTL	6 x 25 REF 2 x 2.048 LVCMOS/LVTTL

CLOCK GENERATION	"Qor" Clocks			Other Clocks
Part Number	SYS_CCB (MHz)	DDR_CLK (MHz)	GTX_CLK (MHz)	Other Outputs (MHz)
840S07	3x 33.33, 50, 66.67 / 83.33 / 100 / 125 / 133.33 / 166.67 LVCMOS / LVTTL	1x 33.33, 50, 66.67 / 83.33 / 100 / 125 / 133.33 / 166.67 LVCMOS / LVTTL	1x 125 LVCMOS / LVTTL	
MPC9855	3x 66.67 / 83.33 / 100 / 133.33 / 166.67 / 200 LVCMOS / LVTTL	3x 133.33 / 166.67 / 200 LVCMOS / LVTTL	2x 125 LVCMOS / LVTTL	2x 25 REF LVCMOS/LVTTL

CLOCK GENERATION	SERDES Clock Pairs			Other Clocks
Part Number	Pairs (MHz)	Standards	Data Rates (Gb/s)	Other Outputs (MHz)
5V41144	8x 100 / 125 / 156.25 / HCSL	PCIe G1/G2, SGMII 1x / 2.5x, sRIO 1x / 1.25x / 2x, SATA / SATA3G, XAUI	1.25 / 2.5 / 3.125 / 5 1.5 / 3	1x 25 REF LVCMOS / LVTTL
5V41145	4x 100 / 125 / 156.25 / HCSL		1.25 / 2.5 / 3.125 / 5 1.5 / 3	1x 25 REF LVCMOS / LVTTL
9FGL839	8x 100 LP-HCSL*		1.25 / 2.5 / 3.125 / 5 1.5 / 3	
8T49N222A-ddd (ddd= 100, 101, 102,...119)	2x 100/ 125 / 156.25 / 312.5 LVPECL / LVDS	PCIe G1/G2, SGMII 1x / 2.5x, sRIO 1x / 1.25x / 2x, SATA / SATA3G, XAUI, XAUI 10G	1.25 / 2.5 / 3.125 / 5 / 10 1.5 / 3	
8413S12	10x 100/ 125 / 156.25 / 312.5 HCSL		1.25 / 2.5 / 3.125 / 5 / 10 1.5 / 3	1x 25 REF / 1x 50 REF LVCMOS / LVTTL

QorIQ Devices: P3, B4, P4, T4, P5 Series

CLOCK GENERATION	"Qor" Clocks			Other Clocks	
Part Number	SYS_CCB (MHz)	DDR_CLK (MHz)	GTX_CLK (MHz)	USB_CLK (MHz)	Other Outputs (MHz)
840NT4	4x 66.67 / 100 / 125 / 133.33 LVCMOS/ LVTTL	4x 66.67 / 100/ 125 / 133.33 LVCMOS/ LVTTL			1x 25 REF, 1x 3.125 / 1.5625 LVCMOS/ LVTTL
840NT4-01			8x 125 LVCMOS/ LVTTL	1x 24 LVCMOS/ LVTTL	1x 25 REF

CLOCK GENERATION	SERDES Clock Pairs		
Part Number	Pairs (MHz)	Standards	Data Rates (Gb/s)
849N202	2x Any Rate, LVDS/ LVPECL Outputs fOUT= 0.98 to 1,300	PCIe G1/G2, SGMII 1x/2.5x, sRIO 1x/1.25x/2x SATA/ SATA3G, XAUI, XAUI 10G	1.25 / 2.5 / 3.125 / 5 / 10 1.5 / 3
8T49N222A-ddd (ddd = 100, 101, 102, ...119)	2x Any Rate Independently Selectable LVDS/ LVPECL Outputs, fOUT = 7.72 to 875		

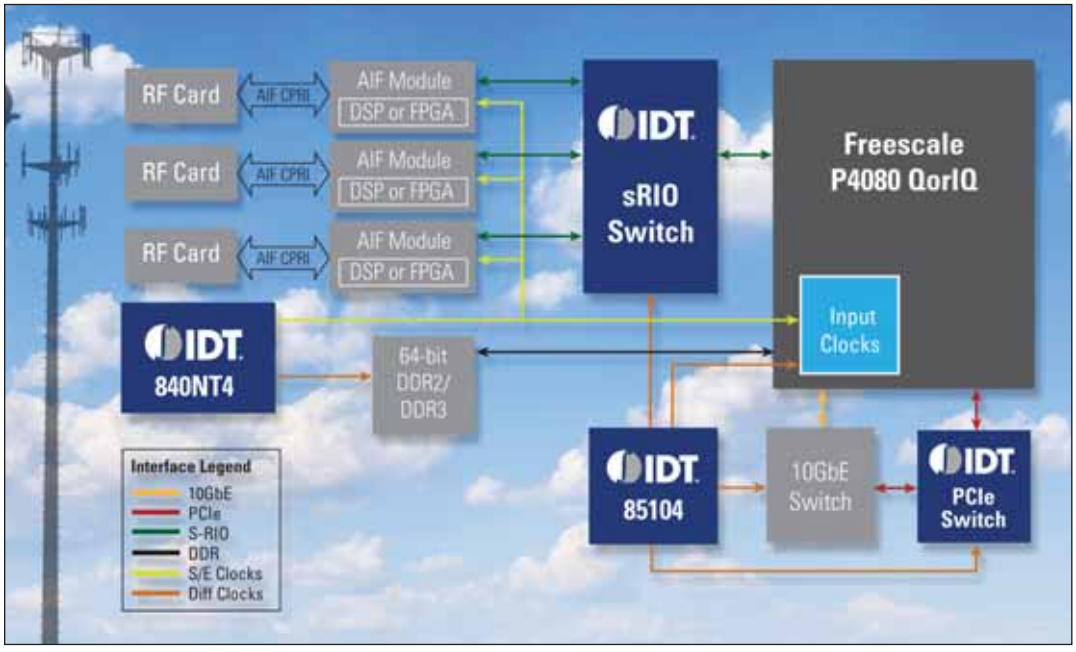
* LP-HCSL are Low-Power HCSL-compatible Differential Outputs

Non-PLL Fanout Buffers and Muxes

Part Number	Input Qty	Input Type	Output Qty	Output Type	Frequency (MHz)	Standards	Data Rates (Gb/s)
6V31021	1 DIF	HCSL	4 DIF	LP-HCSL*	15 - 167	PCIe G1/G2/G3, SGMII 1x/2.5x, sRIO 1x/1.25x/2x SATA/SATA3G, XAUI, XAUI 10G	1.25 /2.5 / 3.125 / 5 / 10, 1.5 / 3
85104	1 SE / 1 DIF	LVPECL / LVDS / LVHSTL / HCSL / SSTL or LVCMOS / LVTTL	4 DIF	HCSL	0 - 500		1.25 / 2.5 / 3.125 / 5 / 10; 1.5 / 3
853S011C	1 DIF	ECL / LVPECL / LVDS / CML / SSTL	2 DIF	LVPECL / ECL	0 -2500		1.25 / 2.5 / 3.125 / 5 / 10; 1.5 / 3
6V31023	2 DIF	HCSL	1 DIF	HCSL	0 - 200		1.25 / 2.5 / 3.125 / 5 / 10; 1.5 / 3
8535-01	2 SE	LVCMOS/LVTTL	4 DIF	LVPECL	0-266		1.25 / 2.5 / 3.125 / 5 / 10; 1.5 / 3
830154AGI-08	1 SE	1.8-3.3V; LVCMOS/LVTTL	4 SE	1.8-3.3V; LVCMOS/ LVTTL	0-160	N/A	N/A

PLL Differential Buffers and Jitter Attenuators (all devices can be configured as fanout buffer with PLL bypassed)

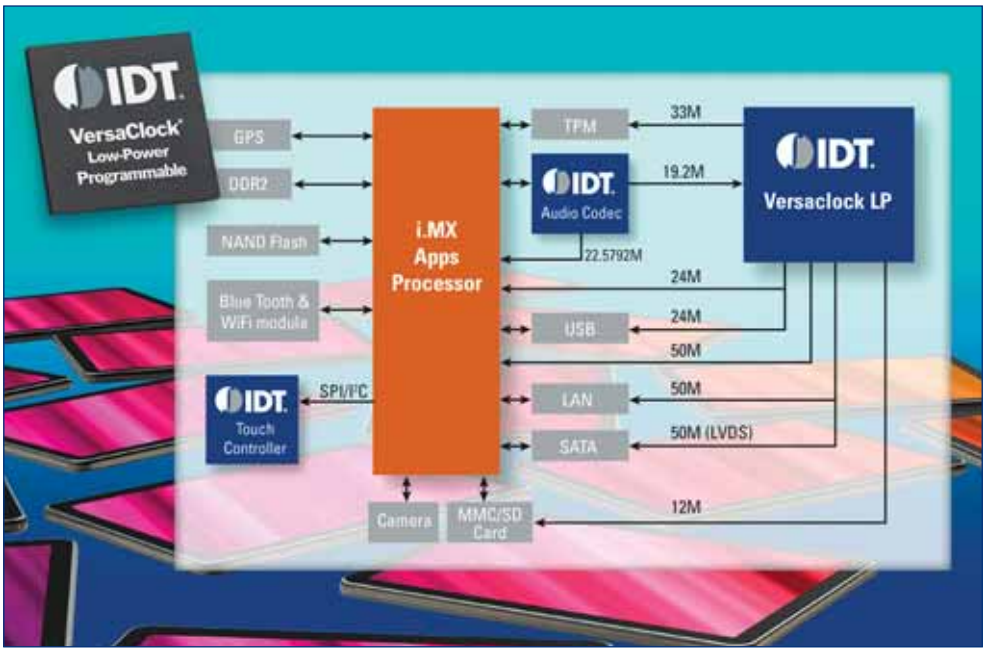
Part Number	Input Qty	Input Type	Output Qty	Output Type	Frequency (MHz)	Standards	Data Rates (Gb/s)
9DB433	1 DIF	HCSL	4 DIF	HCSL	5 - 166	PCIe G1/G2/G3, sRIO 1x/2x SATA/SATA3G	2.5 / 5/8; 1.5 / 3
9DB833	1 DIF	HCSL	8 DIF	HCSL	5 - 166		
871S1022	1 DIF/ 1 XTAL	LVPECL / LVDS / LVHSTL / HCSL	4 DIF	HCSL	125 / 100 / 250 / 500	PCIe G1/G2/G3, SGMII 1x/2.5x, sRIO 1x/1.25x/2x SATA/SATA3G, XAUI, XAUI 10G	1.25 / 2.5 / 3.125 / 5 / 8 / 10; 1.5 / 3.0 (SATA)
849N202	2 DIF/ 1 XTAL	LVPECL / LVDS / LVHSTL / HCSL	2 DIF	LVPEC L/ LVDS	0.98 to 1,300		



SERDES Data Rates vs Protocols

SERDES Data Rates (Gb/s)	SERDES Protocols
1.25	SGMII
1.5	SATA
2.5	PCIe G1; sRIO
3	SATA
3.125	2.5x SGMII; sRIO; XAUI
5	PCIe G2, sRIO
8	PCIe G3
10	XAUI 10G

Versaclock LP for Freescale i.MX Designs



Frescale i.MX Typical Application Diagram

Part Number	Input Type	# of Outputs	Output Type	VDDO	Package	i.MX Processor Family	Target Applications
5P49EE502	MHz TCXO, ICLK, Crytal	5	LVCMOS	1.8-3.3V	20-pin 3x3mm QFN	i.MX233 i.MX257 i.MX353 i.MX515	Ebooks
5P49EE505	MHz TCXO, ICLK, Crytal	5	LVCMOS/ Buffered Sine Wave	1.8-3.3V	20-pin 3x3mm QFN		
5P49EE601	MHz TCXO, ICLK, Crytal, 32.768kHz	6	LVCMOS / LVDS	1.8-3.3V	24-pin 4x4mm QFN		
5P49EE602	MHz TCXO, ICLK, Crytal, 32.768kHz	6	LVCMOS	1.8-3.3V	24-pin 4x4mm QFN		
5P49EE605	MHz TCXO, ICLK, Crytal, 32.768kHz	6	LVCMOS/ Buffered Sine Wave	1.8-3.3V	24-pin 4x4mm QFN		
5P49EE801	MHz TCXO, ICLK, Crytal, 32.768kHz	8	LVCMOS / LVDS	1.8-3.3V	28-pin 4x4mm QFN	i.MX233 i.MX31 i.MX353 i.MX355 i.MX515	Smartbooks, Tablets, Portable Navigation Devices
5P49EE802	MHz TCXO, ICLK, Crytal, 32.768kHz	8	LVCMOS	1.8-3.3V	28-pin 4x4mm QFN		
5P49EE805	MHz TCXO, ICLK, Crytal, 32.768kHz	8	LVCMOS/ Buffered Sine Wave	1.8-3.3V	28-pin 4x4mm QFN		

IDT has the industry's broadest portfolio of timing solutions, supporting applications in communications, computing and consumer markets. With products that uniquely complement Freescale™ i.MX designs, IDT provides the design expertise, reliability and delivery necessary to achieve design success. The following information identifies current IDT timing solutions for Freescale i.MX designs.

KEY BENEFITS

- Increased integration
- Reduced crystal and oscillator count
- Reduced board space and Part count
- Better availability and lead times
- Low jitter and skew
- Very low Active and Standby power
- Reduced total cost
- Selectable frequencies for different applications
- Small 4mm x 4mm footprint
- Buffered sine wave capability for lowest phase noise
- Spread spectrum and LVDS output capability for EMI reduction
- Full 1.8V core with 1.8V to 3.3V IO minimizes power and eliminates need for level translation

TARGET MARKETS & APPLICATIONS

- eBooks
- Smartbooks
- Tablets
- Personal Navigation Devices

RELATED IDT PRODUCTS

- 1894K-32LF 10/100 Ethernet PHY
- LDS61xx Capacitive Touch Buttons with LED Control
- LDS62xx Capacitive Touch Buttons with Proximity Sense
- ACS52201 Audio Codec w/ HiPerf Amp
- ACS422x00 Audio Codec w/ HiPerf Class D Amp

IDT Atomic* Clocks

*Clocks for Intel Atom-Based Embedded Systems

An enormous number of Internet connected devices use Intel's Atom™ CPU. While some of these devices are in familiar applications, like desktop and notebook PCs, many Atom CPUs are used in embedded applications such as communications equipment, industrial control, automotive In-Vehicle Infotainment (IVI), and micro-servers. IDT has the industry's broadest line of 'Atomic' clocks so that no matter what the application, IDT has the perfect clocking device.

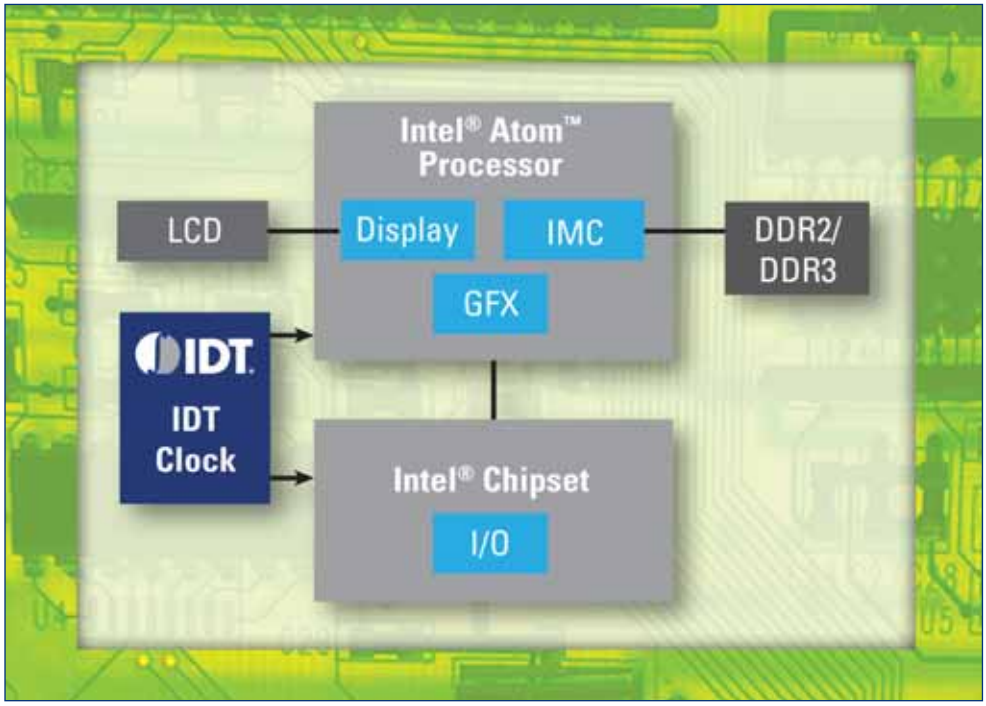
KEY BENEFITS

- Industry's Widest Selection of 'Atomic' Clocks – one-stop-shop for any application
- Industrial temperature grade parts available for systems that must function in demanding environments.
- Automotive AEC Q100 level devices available. Suitable for use in Automotive In-Vehicle Infotainment.
- Integrated series resistors and voltage regulators for differential outputs. Minimal external component count with maximum performance
- PCI Express® Gen 2 on many devices for higher performance and increased system margin.
- VDD_IO rail on many devices for maximum power savings
- 1.5 V core operation on some devices minimizes power consumption.
- Wide range of I/O configurations allows 'right-sizing' the clock to the design, resulting in the smallest footprint device for the application.

TARGET MARKETS & APPLICATIONS

- POS Terminals
- Embedded CPU cards
- Automotive IVI
- Micro-Servers
- Industrial Controllers
- Communication cards
- Internet Kiosks
- Digital Signage
- Home Energy Management
- Medical Instrumentation

Typical Application Diagram



Small Desktop	**Atom 230/330 (Diamondville)** 9UMS9001 (CK540) 9UMS9610 (CK610) 9UMS9633 (CK633) 9LPRS525 (CK505)	**Atom D4xx, D5xx Series (Tunnel Creek)** 9LPRS436 (CK505 derivative) 9LPS525 (CK505)	**Atom N26xx, N28xx Series (Cedarview)** 9VRS4338 (CK-NET) 9VRS4339 (CK-NET derivative) 9LPRS525 (CK505) 9DBL411 (Optional low power PCIe fanout buffer)
Small Notebook (Netbook)	**Atom N270/N280 (Diamondville)** 9UMS9001 (CK540) 9UMS9610 (CK610) 9UMS9633 (CK633)	**Atom D4xx, D5xx Series (Tunnel Creek)** 9LPRS436 (CK505 derivative) 9LPS525 (CK505)	
Embedded (including Industrial temp, Automotive)	**Atom N270/N280 (Diamondville)** 9UMS9633 (CK633)	**Atom E6xx Series (Tunnel Creek, Stellarton)** 9LPRS436 (CK505 derivative) 9LPS525 (CK505)	**Atom N26xx, N28xx Series (Cedarview)** 9VRS4338 (CK-NET) 9LPRS436 (CK505 derivative) 9LPRS525 (CK505) 9DBL411 (Optional low-power PCIe fanout buffer)
Mobile Internet Devices (Ultra Mobile PC)	**AtomZ5xx, Z6xx Series (Silverthorn, Lincroft)** 9UMS9001 (CK540) 9UMS9610 (CK610)	**Moorsetown** **HE Smartphones** **Lincroft SOC (45nm)** **Langwell I/O PCH (65nm)** Custom PMIC/SOC	**Medfield** Custom PMIC/SOC

Device	9UMS9001	9UMS9610	9UMS9633	9LPRS525	9LPRS436	9VRS4338	9VRS4339
Package	56 MLF[2] (8x8mm Body, 0.5mm pin pitch)	48 MLF[1] (6x6mm Body, 0.4mm pin pitch)	48 MLF[1] (6x6mm Body, 0.4mm pin pitch) 48SSOP[2,3] (300 mil Body, 25 mil pin pitch)	56SSOP[2] (300 mil Body, 25 mil pin pitch) 56 TSSOP[2] (6.1mm Body, 0.5mm pin pitch)	48 MLF[1] (6x6mm Body, 0.4mm pin pitch) 48TSSOP[2] (6.1mm Body, 0.5mm pin pitch)	48 MLF[1] (6x6mm Body, 0.4mm pin pitch)	56 MLF[1] (7x7mm Body, 0.4mm pin pitch)
Core Voltage	**3.3 V**	**1.5 V**	**3.3 V**	**3.3 V**	**3.3 V**	**1.5 V**	**1.5 V**
Separate VDD_IO rail for power savings	Yes (1.05 to 3.3 V)	Yes (1.5 V)	Yes (1.5 to 3.3 V)	Yes (1.05 to 3.3 V)	No	Yes (1.05 to 1.5 V)	Yes (1.05 to 1.5 V)
Fully integrated Voltage Regulator for VDD_IO	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Integrated Series Resistors on Differential Outputs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Operating Temperature Range	C	C	C, I, W3	C, I	C, I	C	C
Typical Power Consumption	190mW[4]	100mW[5]	215mW[6]	430mW[4]	330mw[8]	125mw[7]	150mw[7]
Target Applications	UMPC, Embedded, Portable Internet Devices	UMPC, Portable Internet Devices	Embedded, Industrial, Automotive	Embedded, Desktop, Netbook	Embedded, µServers	Ultrabook, Netbook, Desktop, Embedded, Servers	Ultrabook, Netbook, Desktop
PCIe Phase Noise Capability	Gen1	Gen1	Gen1	Gen2	Gen2	Gen2	Gen2

I/O Mix

	CK540	CK610/CK633	CK505 56-pin	CK505 Derivative	CK-NET	CK-NET Derivative
CPU pairs	2	3	2	2	2	2
SRC pairs	4	3	5	2	3	5
ITP/SRC pair	1 ITP	0	1	1	1	1
DOT96/SRC pair	1 DOT96	1 DOT96	1	1 DOT96	1	1
SATA/SRC pair	0	0	1	1 (SATA = 75 or 100 M)	1	1
LCD/SRC pair	1 LCD	1 LCD	1	0	1 LCD	1 LCD
Single-ended Outputs/SRC pair	0	0	1 muxed (with LCD/SCR pair)	12.288M, 25M	1 PCI/25 M output	1 25 M, 1 PCI/27 M
PCI outputs	3	0	6	2	3	3
USB48 output	1	0	1	2 (1 selectable 12M/48M)	1	2
REF output	1	1	1	1	1	1
CLKREQ#	4	3	6 muxed	3	1 muxed, 1 non-muxed	2 muxed, 1 non-muxed

1. HDI PCB technology required
2. HDI PCB technlogy NOT required
3. 48 SSOP is available in AECQ-100 Level 3 Grade for Automotive Applications
4. VDD = 3.3 V, VDD_IO = 1.05 V
5. VDD = 1.5 V, VDDREF = 3.3 V, VDD_IO = 1.5 V
6. VDD = 3.3 V, VDDREF = 3.3 V, VDD_IO = 1.5 V
7. VDD33 = 3.3 V, VDD=1.5 V, VDD_IO = -1.05 V
8. VDD = 3.3 V

IDT Reference Clocks for Xilinx FPGAs

IDT has the industry's broadest portfolio of timing solutions, supporting many Networking and Communication applications. With products that uniquely complement Xilinx designs, IDT provides the performance, design expertise, reliability and delivery necessary to achieve design success. IDT's PLL-based clock generators and high performance fanout buffers offer sub picosecond jitter, low-skew clock outputs, and edge rates that meet the input specifications of Xilinx's existing and next generation FPGA products.

IDT TECHNOLOGY DIFFERENTIATORS

- World leader in Silicon Timing
- Largest portfolio of devices with differential levels: LVPECL, LVDS, HCSL, HSTL
- Specializing in very low jitter for wireless infrastructure, SDH/SONET, Ethernet, PCIe, storage, instrumentation, phase-noise sensitive systems
- Largest portfolio of devices with mixed I/Os, voltage levels and frequencies
- Established design wins with major communication equipment manufacturers

IDT TIMING SOLUTIONS PORTFOLIO

CLOCK GENERATION

- 5x7 Crystal Oscillator, VCXOs
- SAW Oscillator, VCSO Modules
- FemtoClock® and FemtoClock NG
- PLL Synthesizers
- Spread Spectrum Clocks
- QUICCclocks
- VCXO + Fanout
- VCXO + FemtoClock

Best In-Class Performance

- Low Jitter
  < 0.3 ps rms (FemtoNG™ in Integer mode)
  < 0.5 ps rms (FemtoNG™ in Fractional mode)
- Excellent PSNR (-80dBc)
- Integrated Fanout from 1 to 16 outputs
- 1GHz+ frequency support
- Field-proven standards compliance for IEEE, Telcordia, ITU, DOCSIS, JEDEC and others

Part Numbers

8N3PN10I	843241	841654I	844N234	810001-21	844031i-01
8N3Q001	8413S12	843N252-45	844N236	874003-02	8430-11
8N3QV01	841S101	84xN161I-01	843001-21	874003-05	8442
8T49N Series	871S1022	814S208I	844003I-01	874001-05	844021-01
8T43N Series	8430S10-03	844256-24	8745-21	9DB202	

CLOCK DISTRIBUTION

- Zero Delay Buffers
- Frequency Translation (Dividers & Multipliers)
- Dynamic Clock Switches
- Clock Multiplexers
- Fanout Buffers

Part Numbers

8543	8535I-01	85108I
853S006	85411	5V5218
854S006	853S011	83905
8304	87339-01	8535i-31
8308	85102I	83908-02
85310-01	85104I	83904-02
830154I-08	85105I	83918

Widest Selection of Densities and I/O

- Output densities from 1 to 44
- High performance fan-out buffers with speeds up to 3GHz
- Universal inputs support any logic type with AC or DC coupling
- LVPECL, LVDS, HCSL and HSTL output support
- LVCMOS (1.2V, 1.5V, 1.8V, 2.5V, 3.3V)
- Mixed voltage support
- Designed for tight timing budgets – optimized for low skew, delay, jitter
- Low additive jitter < 0.09 ps
- Low output Skew < 15 ps
- Propagation delays below 500ps

JITTER ATTENUATION & FREQUENCY TRANSLATION

- PLL Clock Generators
- VCXO + FemtoClock
- Stratum WAN PLL
- IEEE1588 WAN PLL
- Sync-E Jitter Attenuators
- "Hitless" Switches

Part Numbers

82V3288	810N322-02	813N2532
82V3285	813N322-02	813N2560
82V3280	814322-02	813N252-02
82V3255	82V3388	814N252-02
82V3012/3002	82V3380	813N252-09
82V3011/3001	82V3385	82V3391

Synchronization enabling products for TDM and Wireless Infrastructure

- 1 PPS input and output
- SONET OC-12/48/192
- 10/40/100 GbE
- IEEE-1588 and Sync-E compliant clocks
- I/O frequency range from 1KHz to 900MHz
- Multiple FEC rate conversion
- Excellent wander and jitter performance
- Selectable Loop Bandwidth
- EEC-Option 1, EEC-Option 2, Stratum 3, SMC, 4E and 4 (ITU-T G.8262, ITU-T G.813, GR-253-CORE , and GR-1244-CORE)
- Automatic hitless switching on failure
- Phase Build Out and Phase slope limiting support

Interconnect Protocol	Line Rate (Gbps)	Xilinx FPGA Family	Clock Generation		Clock Distribution	Level Translation	Jitter Attenuation & Frequency Translation
			Reference Clocks	Ref Clocks with Integrated Fanout			
1 GbE	1.25	Spartan 6 Virtex 4 / 5 / 6 / 7 Artix 7, Kintex 7	8N3PN10I	8T49N & 8T43N Series 8535I-31, 83905, ICS843001-21, ICS8442, ICS844031i-01, ICS844021-01, ICS844003i-01	8304 830154I-08 8535I-01	85411 853S011 830S21	810251
40GbE 100GbE	10.3125	Virtex 6 HXT Virtex 7, Kintex 7	8N3PN10I 8N3Q001(XO) 8N3QV01(VCXO)	8T49N Series 8T43N Series 843003-01	87339-01, 8308, 854S006, 8543, 830154I-08, 8535I-01	85411 853S011 830S21	849N202
PCIe Gen1 Gen2	2.5 5.0	Spartan 6 Virtex 4 / 5 / 6 / 7, Artix 7, Kintex 7	841S101 8N3PN10I	8T49N & 8T43N Series 8413S12, 8430S10-03 871S1022, 874003-02 874003-05, 874001-05	85102I, 85104I 85105I, 85108I	85411 853S011 830S21	874003-02, 874003-05 874001-05, 871S1022
PCIe Gen3	8	Virtex 6 HXT Virtex 7, Kintex 7	841S101 8N3PN10I	8T49N & 8T43N Series 841S104 / 102	85102I, 85104I 85105I, 85108I	85411 853S011 830S21	874001-05 874003-05
Serial RapidIO	1.25, 2.5 3.125, 5, 6.25	Spartan 6 Virtex 4 / 5 / 6 / 7, Artix 7, Kintex 7	8N3PN10I	8T49N & 8T43N Series 844N255, 8413S12 843N252-45, ICS843001-21	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	849N202
Fibre Channel	1.0625 2.125, 4.25 8.5, 10.52	Virtex 4 / 5 / 6 / 7, Artix 7, Kintex 7	8N3PN10IMDKI-020LF	8T49N & 8T43N Series 8535I-31, 83905	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	849N202
SAS / SATA	1.5, 3.0 6.0	Virtex 5 / 6 / 7, Artix 7, Kintex 7	843241 8N3PN10	8T49N & 8T43N Series 843256, 844256	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	849N202
10GbE XAUI	3.125	Spartan 6 Virtex 4 / 5 / 6 / 7, Artix 7, Kintex 7	8N3PN10I 8N3Q001(XO) 8N3QV01(VCXO)	8T49N & 8T43N Series, 844N255, 8413S12, 843N252-45, ICS843001-21 ICS844003I-01	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	849N202
10GbE XFI	10.3125	Virtex 6 HXT Virtex 7 Kintex 7	8N3PN10I 8N3Q001(XO) 8N3QV01(VCXO)	8T49N Series 8T43N Series	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	849N202
SONET OC-48 OC-192	2.488 9.953	Virtex 6 HXT Virtex 7 Kintex 7	8N3PN10I 8N3Q001(XO) 8N3QV01(VCXO)	8T49N & 8T43N Series 843256, 844256, ICS843001-21	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	82V3391, 82V3390, 82V3399, 82V3395, 82V3380, 82V3355, 82V3288, 82V3285, 82V3280, 82V3255, 810N322-02, 813N322-02, 813N322-02, 814N322-02
OTN OTU-2	10.709	Virtex 6 HXT Virtex 7 Kintex 7	8N3PN10I 8N3Q001(XO) 8N3QV01(VCXO)	8T49N Series 8T43N Series	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	82V3391, 82V3390, 82V3399, 82V3395, 82V3380, 82V3355, 82V3288, 82V3285, 82V3280, 82V3255, 810N322-02, 813N322-02, 813N322-02, 814N322-02
OTN OTU-3 OTU-4	43.018 112	Virtex 6 HXT Virtex 7 Kintex 7	8N3PN10I 8N3Q001(XO) 8N3QV01(VCXO)	8T49N Series 8T43N Series	8543, 853S006, 854S006, 8304, 8308, 830154I-08, 8535I-01	85411 853S011 830S21	82V3391, 82V3390, 82V3399, 82V3395, 82V3380, 82V3355, 82V3288, 82V3285, 82V3280, 82V3255, 810N322-02, 813N322-02, 813N322-02, 814N322-02
CPRI	0.6144, 1.2288, 2.4876, 3.072, 4.9152, 6.144, 9.8304	Spartan 6 Virtex 4 / 5 / 6 / 7 Artix 7, Kintex 7	84xN161I-01 84xN161I-04	8T49N and 8T43N Series, 814S208, 844256-24, 844N234, 844N236	85310-01 853S9252	85411 853S011 830S21	819N422I-01 819N432I
Video 3G-SDI HD-SDI Genlock	13.5, 14.3181818, 16.9344, 27, 27.027, 54, 67.5, 74.175824, 74.25, 106.25, 125 (MHz)	Spartan 6 Virtex 4/5/6/7	1574BMLF 8N3Q011(XO) 662M-03 663M 664G-01	664G-02 664G-05 660 1526GILF	8543 853S006 854S006 8304 8308	85411 853S011 830S21	849N202

Resources

- Customized Timing Solutions
- Part Number Legend
- Glossary

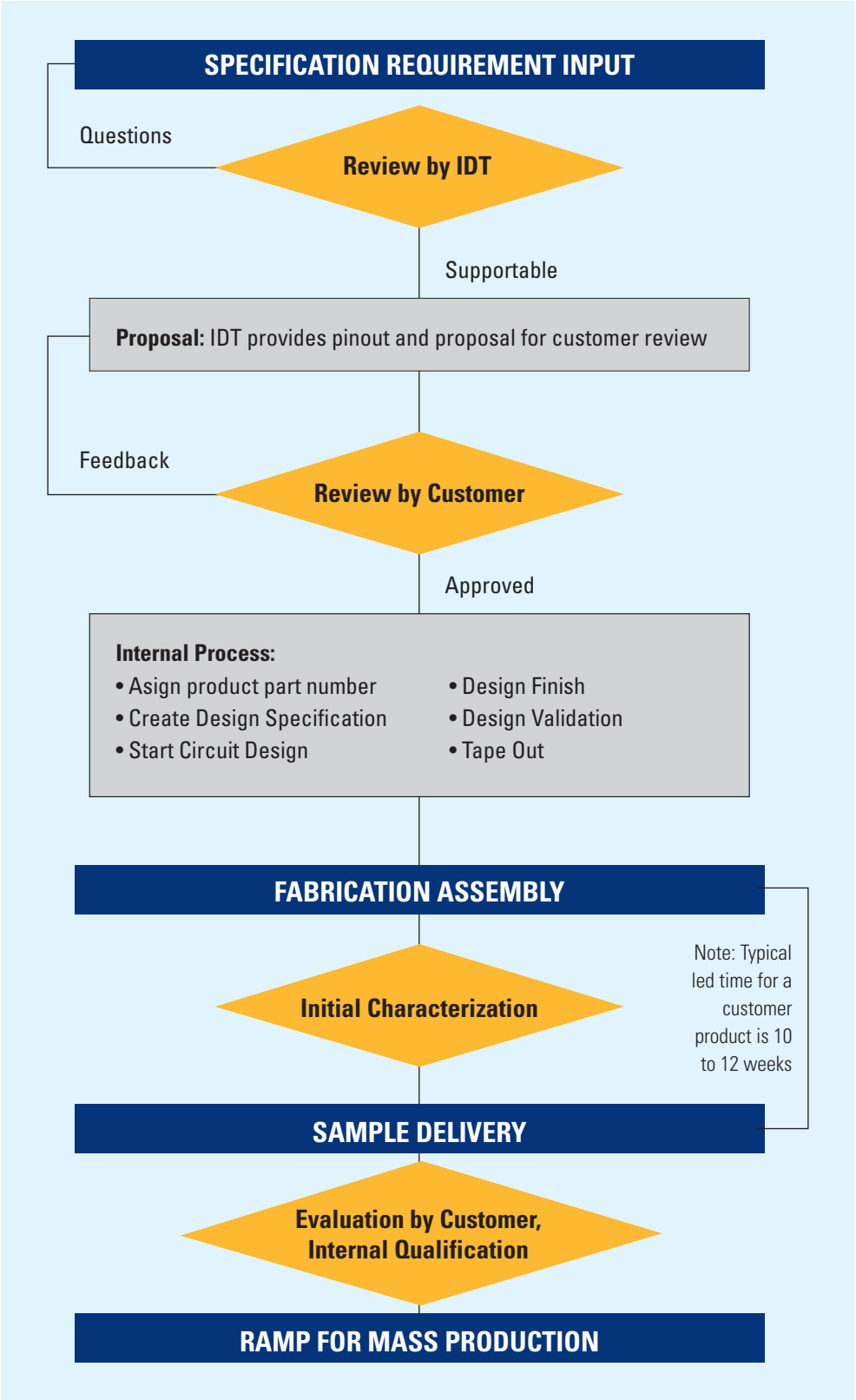
Customized Timing Solutions

IDT offers an unmatched portfolio of clock solutions for a wide variety of applications. The breadth of offerings provides customers with an off-the-shelf solution for the majority of designs. However, no two designs are the same and some requirements result in the need for optimized solutions to provide differentiation in the market place. Criteria that may dictate the use of a customized clocking solution include aggressive system cost, power dissipation, performance, or board space requirements. IDT provides clock solution customization capabilities and often works with customers to develop customized solutions to address specific needs. IDT's strong regional field applications teams can assist in proposal development for these customized solutions and custom prototype samples are typically available 10-12 weeks from the time specifications are finalized.

The following are some of the available customization options:

- **Supply Voltage:** 1.5V, 1.8V, 2.5V, 3.3V
- **Input/Output levels:** LVDS, LVPECL, HCSL, HSTL, LVCMOS, LVTTL, DDR
- **Number of outputs**
- **Output Levels**
- **Output frequencies:** up to 3GHz.
- **Electrical performance:** rise time, fall time, duty cycle, jitter performance, skew, propagation delay, low Idd
- **Additional Features:** output enable signals, power down modes, pin selectable frequencies, spread spectrum capability for EMI reduction, I²C or SPI programming, forward error correction (FEC) rates, output reference clocks, frequency margining
- **Packages type:** 8 pin to 144 pin, SOIC, TSSOP, SSOP, QFN etc.
- XO, VCXO and clock input support
- Jitter attenuation, frequency translation and level translation for reference clocks
- On-chip configuration storage via reprogrammable or one time programmable memory

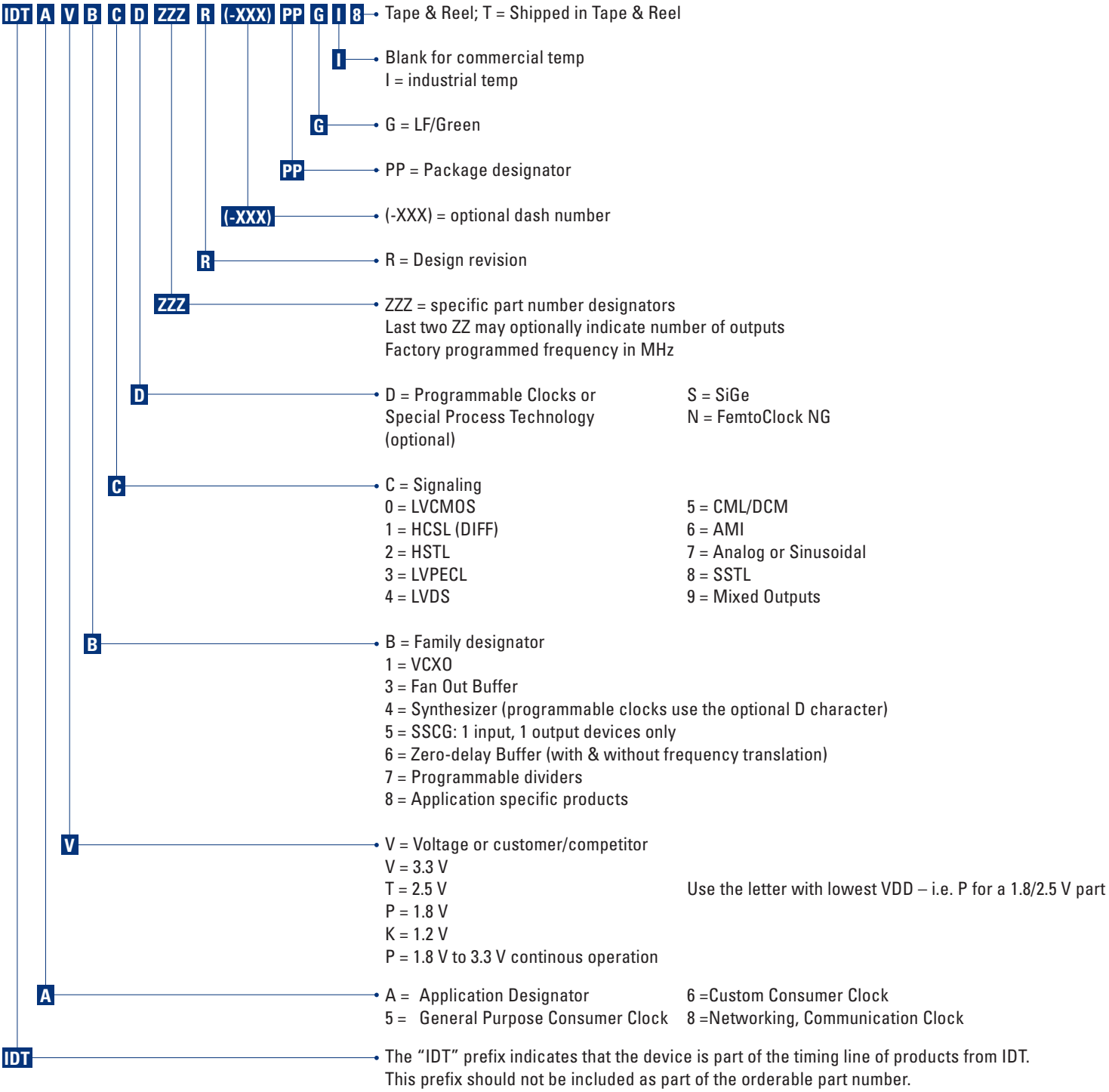
Contact IDT sales to explore the feasibility of customizing your clocking solution.



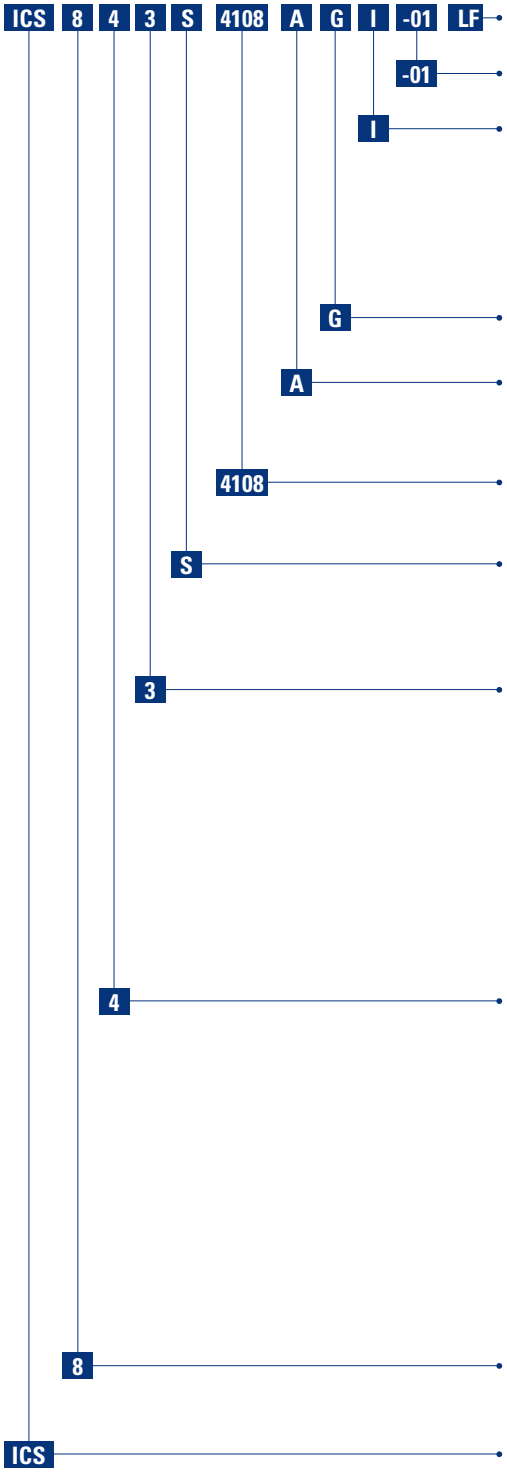
Part Number Legend

There are several part number types in the IDT high-performance clock nomenclature. IDT has acquired product lines from both ICS and Freescale and the established part numbers have been maintained. The clock families can be identified by their marketing part number prefix and are defined in the following charts.

TIMING NOMENCLATURE 1

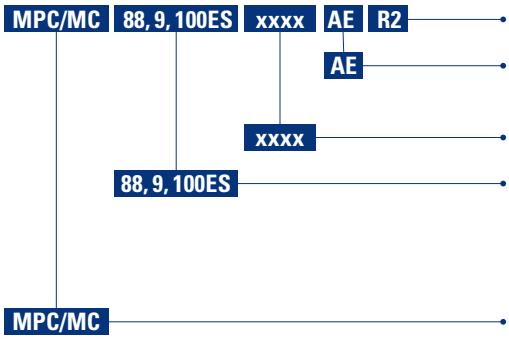


TIMING NOMENCLATURE 2



- **LF** — Optional LF suffix on the end of a part number indicates "Lead Free" packaging
- **-01** — Optional dash number indicates a different function
- **I** — Optional I suffix indicates "Industrial" (-40dC - 85dC) operating temperature range.
  Absence of "I" indicates "Commercial" (0dC - 70dC) operating temperature range.
  There are a series of bipolar timing devices that are Industrial operating temperature range but do not have "I" in the part number. See datasheet for details.
  Other non-standard temperature ranges indicated on the datasheet.
- **G** — The letter in this position indicates the package. See datasheet for package details.
- **A** — The first letter suffix is the device revision. Devices are initially provided at the "A" revision. Improvements are released using subsequent letters of the alphabet.
- **4108** — Function code. Usually one to four digits in length. A dash-number suffix can modify the function. In some products, the final one or two digits indicate the number of outputs.
- **S** — S = Device uses SiGe fab process. Absence of "S" indicates that the part is in another process, usually CMOS or Bipolar.
  D = Clock Data Recovery device.
- **3** — The third digit can be a part of the function code, but usually indicates the style of outputs:
  0 = LVCMOS
  1 = HCSL/DCM (PCI Express)
  2 = HSTL
  3 = LVPECL
  4 = LVDS
  5 = CML
  8 = SSTL
  9 = Selectable
- **4** — The second digit can be a part of the function code, but usually indicates the type of device:
  1 = VCXO based device
  2 = Internal use only
  3 = Non PLL Buffer, single-ended outputs
  4 = PLL frequency Synthesizer (internal feedback, input is usually a crystal)
  5 = Non PLL Buffer, differential outputs
  6 = PLL Zero Delay Buffer (no frequency multiplication/division)
  7 = a) Non PLL Buffer/Dividers
  b) PLL based frequency multiplication/division (external feedback, zero delay type PLLs. Usually use a reference clock rather than a crystal input.
  9 = Dual output device capable of either LVPECL or LVDS output levels
- **8** — An "8" in the first digit location indicates that the product is in the Networking/Communications line of timing products for enterprise-class applications.
- **ICS** — The Integrated Circuit Systems ("ICS") prefix indicates that the device is part of the timing line of products from IDT. This is a marketing prefix only, and is not contained in the orderable part number.

TIMING NOMENCLATURE 3

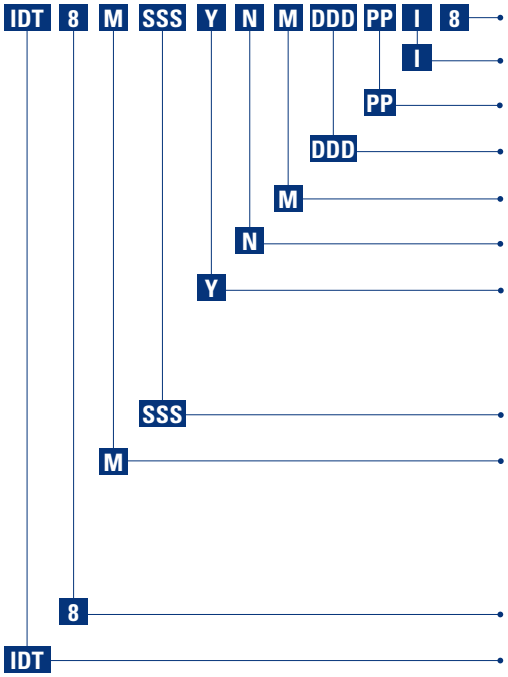


- Optional R2 suffix on the end of a part number indicates "Tape and Reel" packaging.
- The two alpha characters in this position indicates the package type. See datasheet for package details.
- Specific product definition. Three, four or five digits in length.
- 88 = Freescale "88K" Legacy devices.

  9 = LVCMOS PLL based clock or LVCMOS buffer.

  100ES = SiGe fab process and is a differential buffer.
- The "MPC" or "MC" prefix indicates that the device is part of the timing line of products that were obtained from Freescale Semiconductor. This prefix must be included as part of the orderable part number.

FEMTOCLOCK NG 5x7 CERAMIC



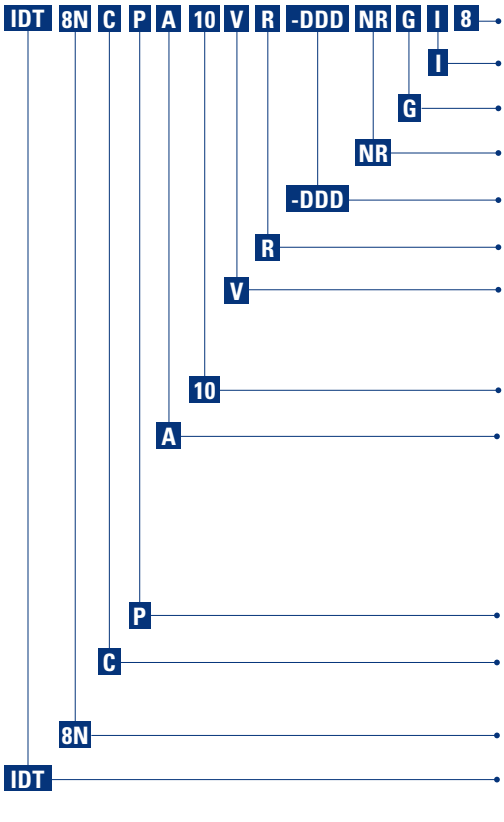
- 8 = Tape and Reel
- I = Temperature indicator (I = -40°C to +85°C)
- PP = package code (CD = ceramic 5x7). Note: no LF or G suffix required for RoHS6/6
- DDD = pre-set (default) frequency and APR code (see separate order info table)
- M = internal XTAL frequency (0=114.285MHz, 1=100MHz, 2=122.88MHz)
- N = die revision (letter)
- Y = option code

  A = 3.3 V and 100 ppm B = 2.5 V and 100 ppm
  E = 3.3 V and 50 ppm F = 2.5 V and 50 ppm
  K = 3.3 V and 20 ppm L = 2.5 V and 20 ppm
- SSS = sub part number (e.g 001 = XO, V01 = VCXO, V75 = 6pin VCXO, 270 = 6pin XO)
- M = Number of pre-set (default) frequencies

  S = Single Q = Quad
  D = Dual H = 16
  C = Signaling 4 = LVDS
  3 = LVPECL 0 = LVCMOS
- 8N = FemtoClock NG 5x7 ceramic-packaged parts
- The IDT prefix indicates that the device is part of the timing line of products from IDT. This prefix should not be included as part of the orderable part number.

Example: IDT 8N3Q001LG-0001CDI8 is a LVPECL FemtoClockNG programmable oscillator, quad output frequency (125, 100, 122.88, 156.25 MHz), 2.5 V, 20 ppm, G-revision, 114.285 MHz XTAL in a RoHS 6/6 ceramic 5x7 package with tape and reel.

FEMTOCLOCK NG 5x7 10QFN



8 = (optional) Tape and Reel

I = (optional) Industrial Temperature -40°C to +85°C

G = (optional) RoHS 6/6 package

NR = Package code (10QFN 5x7)

- DDD = Frequency, divider and programming code

R = Die revision

V = Supply voltage code:

V = 3.3 V	P = 1.8 V
T = 2.5 V	K = 1.2 V

10 = Identifier for the 10QFN-plastic packaged, programmable part platform

A = Architectural code

N = integer N PLL feedback and FM XTAL	F = fractional N PLL feedback and FM XTAL
M = integer N PLL and 3OT XTAL	U = Fractional-N with L=23 bits and 3OT XTAL
W = Fractional-N with L>23bits and 3OT XTAL	V = VCXO
T = Serial programming interface	G = differential reference and fractional N PLL feedback

P = Plastic package. Immutable identifier for the 10 QFN programmable parts

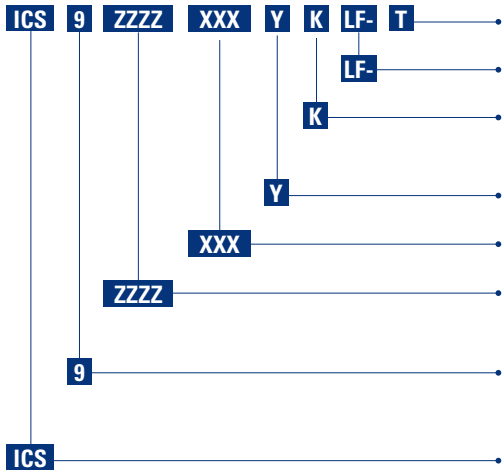
C = Signaling 4 = LVDS
3 = LVPECL 0 = LVCMOS

8N = FemtoClock NG 5x7 plastic-packaged parts

The IDT prefix indicates that the device is part of the timing line of products from IDT. This prefix should not be included as part of the orderable part number.

Example: IDT 8N3PN10VA-001NRGI8 is a LVPECL FemtoClockNG programmable clock generator with an internal integer-N feedback PLL, with the frequency coded by “001”, 3.3 V, A-revision, in a RoHS 6/6 plastic 5x7 package (10QFN), industrial temperature and with tape and reel.

IDT PC CLOCK NOMENCLATURE



T = Tape and Reel

LF- = Lead Free, RoHS Compliant

Package Type
K = MLF

Revision Designator (does not correspond with Data sheet revision number)

Device Type

ZZZZ – Series indicator. Combination of 1 to 4 alphabets or digits that indicate a series of clocks designated to a specific technology or chipset platform

9 – A ‘9’ in the first digit location indicates that the products is an highly integrated clock devices specially designed for computing or server applications

The Integrated Circuit Systems (“ICS”) prefix indicates that the device is part of the timing line of products from IDT. This is a marketing prefix only, and is not contained in the orderable part number

Glossary

3GPP	3rd Generation Partnership Project
ATCA/AMC	Advanced Telecommunications Computing Architecture / Advanced mezzanine card
CML	Current mode logic
CMOS	Complimentary metal oxide semiconductor
DOCSIS	Data over cable service interface specification
DSP	Digital signal processor
HCSL	Host clock signal level
HSTL	High-speed transceiver logic
IEEE	Institute of Electrical and Electronics Engineers
ITU	International Telecommunication Union
JEDEC	Joint Electronic Devices Engineering Council
LVCMOS	Low Voltage Complementary Metal Oxide Semiconductor
LVDS	Low voltage differential signal
LVPECL	Low-voltage positive emitter-coupled logic
MLVDS	Multipoint low voltage differential signal
NRZ	Not return to zero
PCIe®	Peripheral Component Interface Express
PHY	PHYsical, as in physical layer
PLL	Phase-locked loop
RMS	Root mean squared
SAW	Surface acoustic wave
SERDES	SERializer / DESerializer
SO	SAW oscillator
SONET/SDH	Synchronous optical NETwork / Synchronous Digital Hierarchy
SPI 4.2	SPI-4.2 is a version of the System Packet Interface
Telcordia	Telcordia Technologies (formerly Bell published by the Optical Internetworking Forum Communications Research, Inc. or Bellcore)
VCSO	Voltage-controlled saw oscillator
VCXO	Voltage-controlled crystal oscillator

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