

## FEATURES/BENEFITS

- Flexible frequency configurations solve complex design problems
- Configurable to output any clock rate using two-wire I<sup>2</sup>C 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

## FUNCTIONS

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

## PERFORMANCE

- Phase noise <0.3-0.5 ps RMS
- Clock frequencies up to 1300 MHz

## APPLICATIONS

- Wireless infrastructure
- Serial RapidIO® 1.3 and 2.1
- Networking (Ethernet)
- PCIe® Generation 1,2 and 3
- Integrated SerDes of DSPs, microprocessors and FPGAs
- Telecommunication (SDH/SONET) optical interfaces
- Storage (SAS/SATA and FibreChannel)
- HDTV Video
- Instrumentation
- Clock frequency margin testing
- Phase noise sensitive reference clocks



FemtoClock NG (Next Generation) based programmable crystal oscillator devices outperform existing oscillator solutions in flexibility, low phase noise and high frequency operation, and offer much shorter lead times.

## Function and Flexibility

FemtoClock® NG 5mm x 7mm devices are clock frequency sources that provide frequencies from 15.48 to 1300 MHz with steps of 218 Hz or better. 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 I<sup>2</sup>C programming interface allows access to internal PLL registers for the reconfiguration of the output frequency. The VCXO devices also allows configuration of the absolute pull-range (APR) from  $\pm 7.5$  to  $\pm 757.5$  ppm. The VCXO polarity is configurable to either a positive or a negative slope. Compatible with the standard 6-pin 5mm x 7mm ceramic package, these devices are an ideal alternative to classic oscillators, XO, 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  $\pm 20$ ,  $\pm 50$  or  $\pm 100$  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

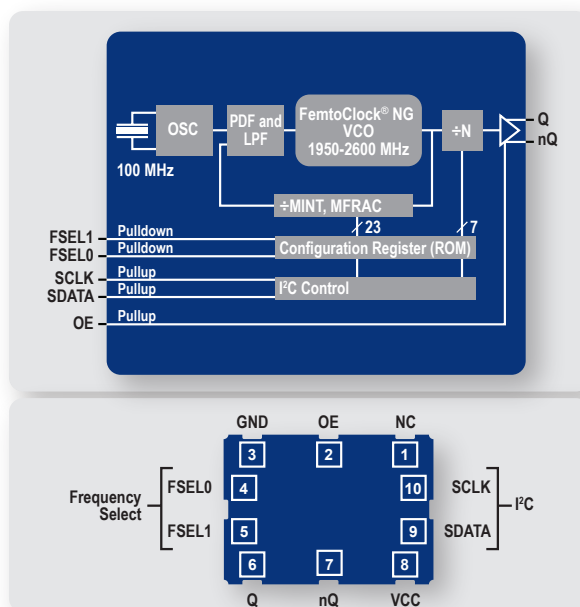
### Applications

FemtoClock NG devices can be used in standard 5mm x 7mm oscillator footprints. The optional connection of two or four additional frequency configuration pins enables the devices to have unmatched flexibility. The phase noise performance of the FemtoClock NG 5mm x 7mm family enables their use as reference clocks for phase-noise sensitive applications.

Yielding RMS phase noise of <0.5 ps RMS (XO: <0.3ps RMS), 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.

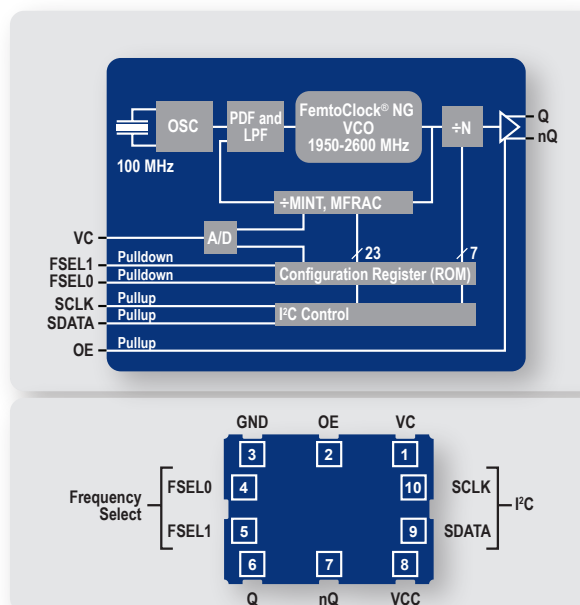
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**Figure 1 Configurable Frequency XO**

- 5mm x 7mm XO compatible
- Fractional-feedback PLL
- Any output frequency (<1.3 GHz)
- Single, dual, quad frequencies
- I²C programming interface
- 20, 50 and 100 ppm frequency accuracy
- <0.3-0.5 ps RMS phase jitter
- Part numbers:
  - 8N3Q001 (LVPECL)
  - 8N4Q001 (LVDS)
  - 8N0Q001 (LVCMOS)



**Figure 2 Configurable Frequency VCXO**

- 5mm x 7mm VCXO compatible
- Fractional-feedback PLL
- Any output frequency (<1.3 GHz)
- Single, dual, quad frequencies
- I²C programming interface
- APR: ±7.5 to ±757.5 ppm
- <0.5 ps RMS phase jitter
- Part numbers:
  - 8N3QV01 (LVPECL)
  - 8N4QV01 (LVDS)
  - 8N4QV01 (LVCMOS)

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

## 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 2.5 V, a LVPECL output, a  $\pm 50$  ppm crystal frequency accuracy, contains a 100 MHz internal crystal as frequency source, industrial temperature range, a lead-free (6/6 RoHS) 10-lead ceramic 5 mm x 7 mm x 1.55 mm package and is factory-programmed to the default frequencies of 625, 312.5, 156.25 and 125 MHz and to the VCXO pull range of min.  $\pm 100$  ppm.

The table below shows the default frequency ordering codes available today using the integer feedback PLL and 100 MHz crystal as its input. Please refer to the document, "Default Frequency and VCXO Pull Range Order Information for Ceramic 5.7 Devices" on the IDT website (<http://www.idt.com/node/32897>), for a complete list of pre-defined frequency codes.

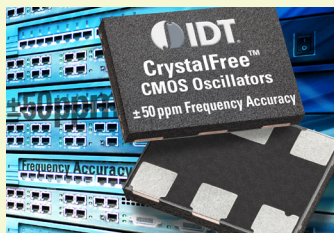
**Default Frequency Ordering Codes for Integer Feedback PLL Options using a 100MHz crystal input**

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

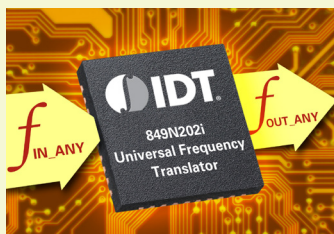




CrystalFree for the lowest power consumption



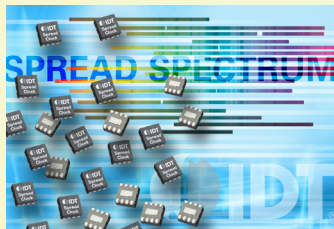
WAN PLL for Synchronous Ethernet timing



UFT family for frequency and Translation



MEMS offer Quartz performance with silicon reliability



Spread Spectrum devices reduce total system EMI

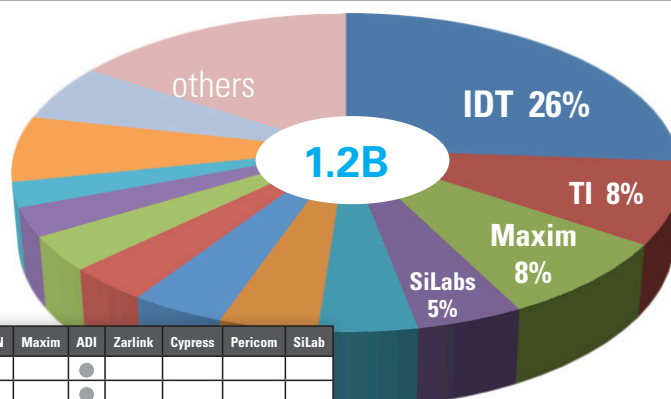
**Discover why IDT is the ONLY one-stop shop for timing solutions at: [www.idt.com/go/clocks](http://www.idt.com/go/clocks)**

## The Leader in Timing Solutions

- **Largest Market Share in Silicon Timing**
  - Twice as much as the next two competitors combined!
- **Largest Product Portfolio**
  - Over 1500 unique enterprise timing devices
  - 10 times more than nearest competitor (TI)!
- **Comprehensive documentation, including new Timing Solutions Guide**
- **New website with featured Clocks & Timing category**
- **Innovative CrystalFree™ Products for New Markets**
  - Solid State Oscillators
  - pMEMS™ Oscillators
  - XO Replacements with better power, pricing, lead times, and reliability

## Largest Market Share

**1500+ Unique Timing Devices**  
Next largest competitor at ~150 Unique Devices



	IDT	TI	ON	Maxim	ADI	Zarlink	Cypress	Pericom	SiLab
RF Card PLL	●	●			●				
RF Synthesizer	●	●			●				
Timing Card WAN PLL	●				●				
Prog. Freq. Translators	●				●	●			●
Oscillators	●		●	●			●	●	●
VCXO	●		●	●			●	●	●
VCSO	●						●	●	●
Synthesizer	●	●	●	●	●		●	●	●
Buffers	●	●	●	●	●		●	●	●

- 10 times better selection!
  - 10 times more optimized!
  - 10 times more flexible!
- IDT is the ONLY one-stop shop for Timing!**

## Visit the NEW IDT.com for more timing solutions

The screenshot shows the IDT website with a navigation bar and a main content area. A yellow box highlights the 'Clocks & Timing' page, which features the text 'World Leader in Timing Solutions #1' and 'Click here for IDT Timing Solutions guide'. A yellow arrow points to the 'Products' menu on the left, which includes 'Clocks & Timing'.