

Nutaq PicoDigitizer 125-Series

16 or 32 Channels, 125 MSPS,
FPGA-Based DAQ Solution
PRODUCT SHEET



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Nutaq PicoDigitizer 125-Series

The PicoDigitizer 125-Series is a high channel density, phase coherent, FPGA-based table top DAQ solution. It incorporates up to 32 channels on a Virtex-6 FPGA, sampling at 125 MSPS, and offers an embedded version which includes an Intel Quad-Core i7 processor for standalone applications.

Key Features

- Up to 32 channels coupled to a large Virtex-6 FPGA
- High channel density yielding the lowest 125 MSPS cost per channel in the industry
- Optional Intel Quad-Core i7 (embedded version)
- 125 MSPS, 14 bit resolution
- Phase aligned channels and phase coherent sampling
- GigE and PCIe 4x high speed interfaces
- AC-DC coupling options, single-ended or differential
- Model-based design integration

Configurations

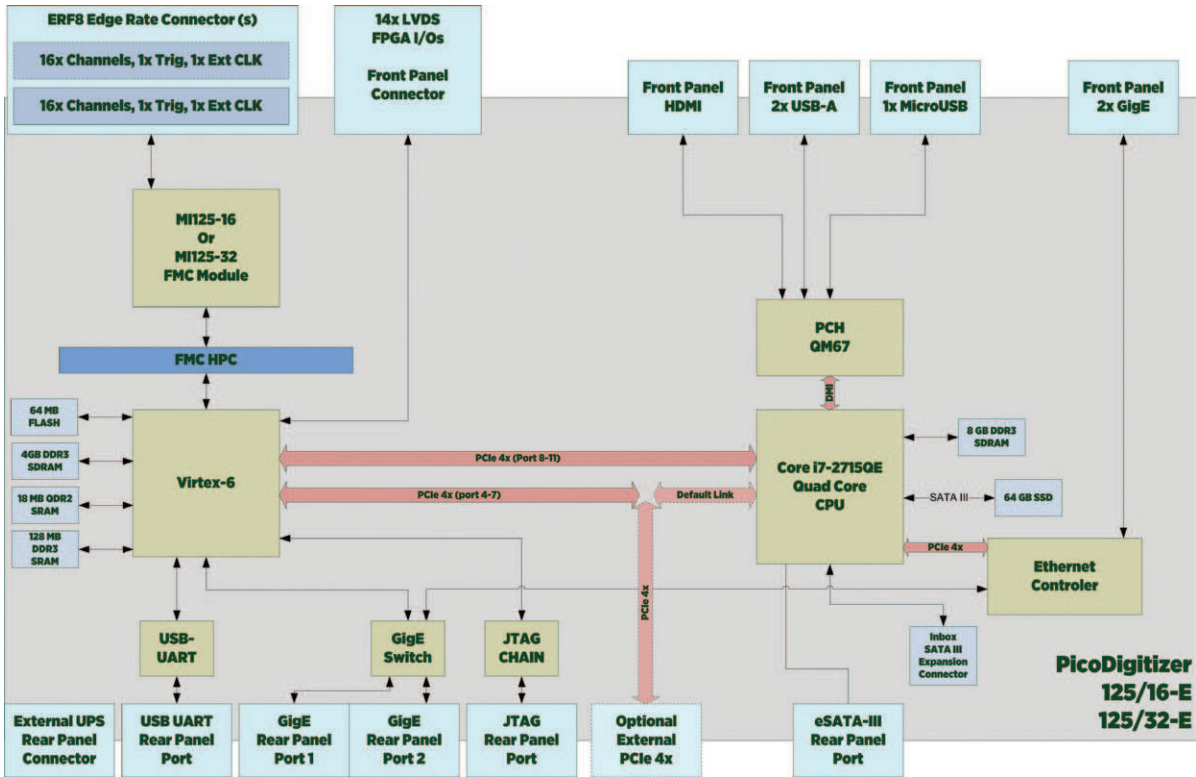
	16 Channel PicoDigitizer 125-Series	16 Channel PicoDigitizer 125-Series (Embedded)	32 Channel PicoDigitizer 125-Series	32 Channel PicoDigitizer 125-Series (Embedded)
Number Of Channels	16	16	32	32
Maximum Sampling Frequency	125 MSPS	125 MSPS	125 MSPS	125 MSPS
Resolution	14 bits	14 bits	14 bits	14 bits
FPGA*	Virtex-6	Virtex-6	Virtex-6	Virtex-6
Remote Host Interface	1x GigE 1x PCIe-4x	1x GigE Dual PCIe 4x (between Embedded i7 and Virtex-6) Or Single PCIe 4x (between Embedded i7 and Virtex-6) + Single PCIe 4x external	1x GigE 1x PCIe-4x	1x GigE Dual PCIe 4x (between Embedded i7 and Virtex-6) Or Single PCIe 4x (between Embedded i7 and Virtex-6) + Single PCIe 4x external
Embedded CPU	None	Intel Quad-Core i7-2715QE	None	Intel Quad-Core i7-2715QE
Embedded Storage **	N.A.	64 GB SSD +1x SATA external +1x 200 GB SATA internal (optional)	N.A. N.A.	64 GB SSD +1x SATA external +1x 200 GB SATA internal (optional)

* Virtex-6 options available: LX240T, LX550T, SX315T or SX475T

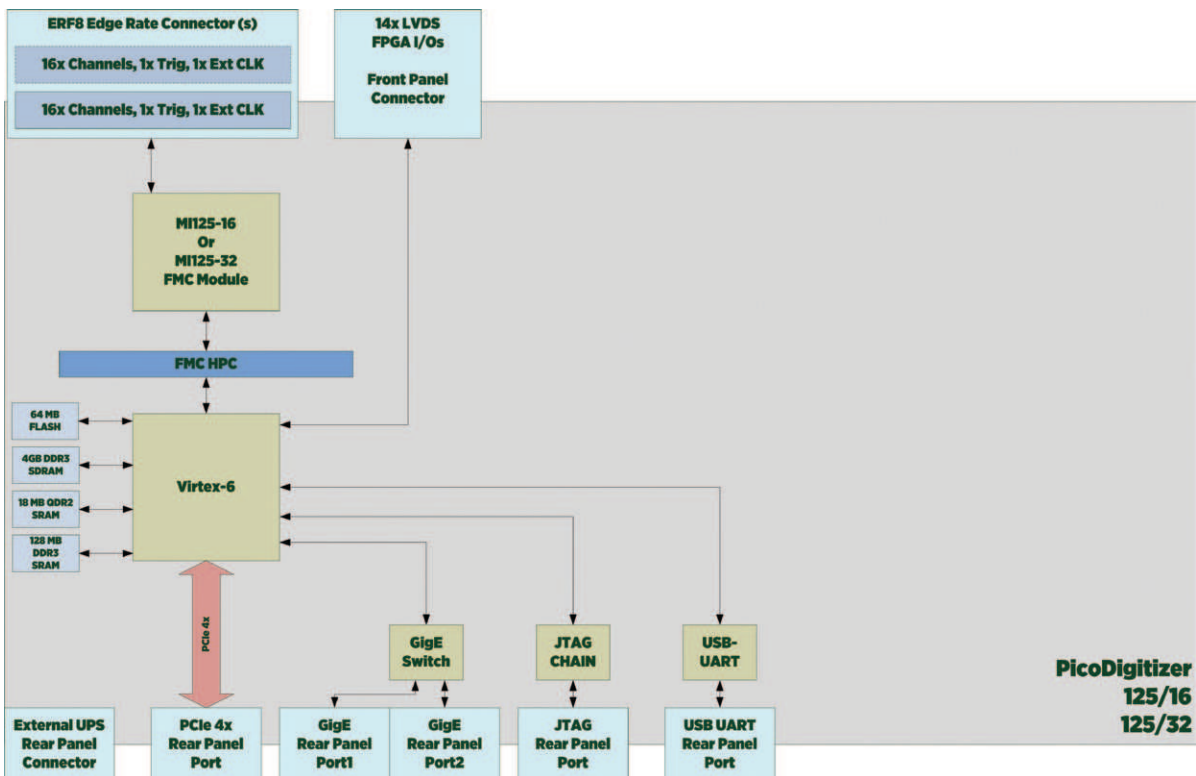
** 1x eSATA connection Rear PicoDigitizer panel, 1x SATA for internal 1.8inch SSD Drive.

Block Diagrams

PicoDigitizer 125-Series: Embedded Version



PicoDigitizer 125-Series: Non-Embedded Version



FPGA Recording Core

The FPGA recording IP core enables storage of very high speed multichannel bursts of data in the FPGA-attached SDRAM. This data can then be transferred to a host device for storage and/or real-time analysis.

The FPGA recording IP core comes with standard trigger mechanisms (single shot, normal, software-defined). The trigger sources can either come from the host processor, a user defined FPGA signal or from the PicoDigitizer 125-Series trigger front panel input.

The user can define the number of channels to record, as well as the acquisition rate so that the available recording memory bandwidth is efficiently used. Note that FPGA preprocessing on the channels can be performed before recording to potentially reduce recording bandwidth needs.

- DDR3 FPGA memory size = 4 GB
- Maximum data throughput = 5.7 GBps
- Recorded time at full rate = 720 millisecond
- Maximum number of channels recorded at full speed (125 MHz) = 22 (125 MHz, 2B per sample)

Application Example:

FPGA-based filtering on 32 channels sampled at 125 MSPS on the FPGA (decimation by 16), then record for all channels. Each channel can be recorded for 8 seconds.

RTDEx (Real Time Data Exchange)

Nutaq's RTDEx IP core provides users with a framework to exchange data with a host device through either the GigE or PCIe links, yielding the highest bandwidth and lowest possible latency.

Built to complement our "snapshot" FPGA recording capabilities, the RTDEx IP core provides a continuous data flow from the FPGA to the host computer, for further real-time computing or real-time PC recording.

HOST - FPGA Streaming	GigE	PCIe 1x	PCIe 4x
Data BW	1 Gbps	2.5 Gbps	10 Gbps
Sustained Data throughput	0.9 Gbps	1.5 Gbps	6 Gbps

Specifications

FPGA

Supports LX240T, LX550T, SX315T and SX475T FPGA devices
Supports GigE interface; Supports single PCIe (4x) non-embedded;
Supports up to 2 PCIe (4x) embedded;
4 GB SODIMM DDR3
18 MB QDR2 SRAM
64 MB NOR Flash

Embedded CPU Section

Intel Quad-core i7 Gen2 CPU, 2.1 GHz processor
8 GB DDR3 SDRAM
64 GB SSD +1x SATA external +1x 200 GB internal (optional)
GigE & Dual PCIe 4x support
SATA -II/III support
Embedded throughput (FPGA-CPU) : 1x PCIe 4x ~ 6 Gbps

Sampler Coupling

AC or DC coupled option
Single-ended or Differential inputs ordering option

Sampler Characteristics

14 bit
125 MSPS maximum
16 or 32 channels

Sampling Clock

Onboard crystal 125 MHz, 2 fsec RMS jitter
External sampling CLK input

Performance

Analog input bandwidth : 80 MHz (-3dB)
SNR (dB): 67 (@ 1 MHz) , 66 (@ 30 MHz), 64 (@ 70 MHz)
SFDR (dBc): 70 (@ 1 MHz) , 75 (@ 30 MHz), 75-AC / 72-DC (@ 70 MHz)
THD (dBc): 69 (@ 1 MHz) , 83 (@ 30 MHz), 80-AC / 73-DC (@ 70 MHz)
Worst inter-channel crosstalk (dBFS): 58-SE / 75-Diff (@ 30 MHz)

*AC = AC Coupled, DC = DC Coupled, SE = Single-Ended, Diff = Differential

Front Panel Connectors

Analog Inputs, CLK & Triggers (All digitizer models)

- 1x Edge Rate™ ERF8 contact (16-channel models)
- 2x Edge Rate™ ERF8 contact (32-channel models)

The rugged, high speed Edge Rate™ ERF8 contact allows you to connect up to 16 channels simultaneously, yielding easier manipulation and decreased maintenance costs due to potential breakage.

Edge Rate™ ERF8 Contact Signal Map

- 16x A/D channels
- 1x external trigger input
- 1x external sampling CLK input

Available ERF8 Cables

- Point to point ERF8
- ERF8 breakout to SMA
- Custom ERF8 breakout cable

Digital Inputs & Outputs (All digitizer models)

- 1x VHDCI connector

VHDCI Connector Signal Map

- 14x user LVDS I/O data
- 1x LVDS clock

Additional Front Panel Connectors (Embedded models only)

- 1x HDMI
- 2x GigE
- 1x Mini USB port
- 1x COM-port
- 1x USB 2.0 ports

Rear Panel Connectors

- 2x GigE ports
- 1x USB UART FPGA console port
- 1x external universal power supply
- 1x eSATA (Embedded models only)
- 1x PCIe 4x cable interface connector

Model-Based Design Integration

Rapid System Level FPGA Development in MATLAB and Xilinx System Generator for DSP

Built on top of Nutaq's BSDK, Nutaq's model-based design kit (MBDK) enables customers to design, simulate, test, debug and deploy applications from the Simulink graphical environment without the need of writing any VHDL or C code.

Nutaq MBDK advantages include:

- Significantly reducing the time customers spend on low value-added tasks such as programming IO interfaces, adjusting FPGA constraints, debugging drivers, etc.
- Providing host co-simulation tools, enabling real-life I/Os integration within simulation, step-by-step FPGA fabric design migration, easy FPGA-to-host interaction and data logging, etc.
- Nutaq tools such as record/playback, host IO control and data streaming libraries.

Ordering Information

PicoDigitizer125-A-B-C-D-E

A (# of channels)	0 = 16 channels	1 = 32 channels
B (Embedded CPU)	0 = No embedded CPU	1 = Embedded CPU
C (FPGA Option)	0 = LX240T	1 = LX550T
	2 = SX315T	3 = SX475T
D (Additional Embedded Storage)	0 = None	1 = 200 GB SSD (172 MBytes/s)
E (A/D Coupling)	0 = Single-ended AC 2 = Differential AC	1 = Single-ended DC 3 = Differential DC
F (External PCIe)	0 = No external PCIe	1 = PCIe 4x external link to FPGA
G (Model Based Design Software License)	0 = No software license	1 = 1x MBDK Workstation License

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2150 Cyrille-Duquet, Quebec City (Quebec) G1N 2G3 CANADA
T. 418-914-7484 | 1-855-914-7484 | F. 418-914-9477
info@nutaq.com