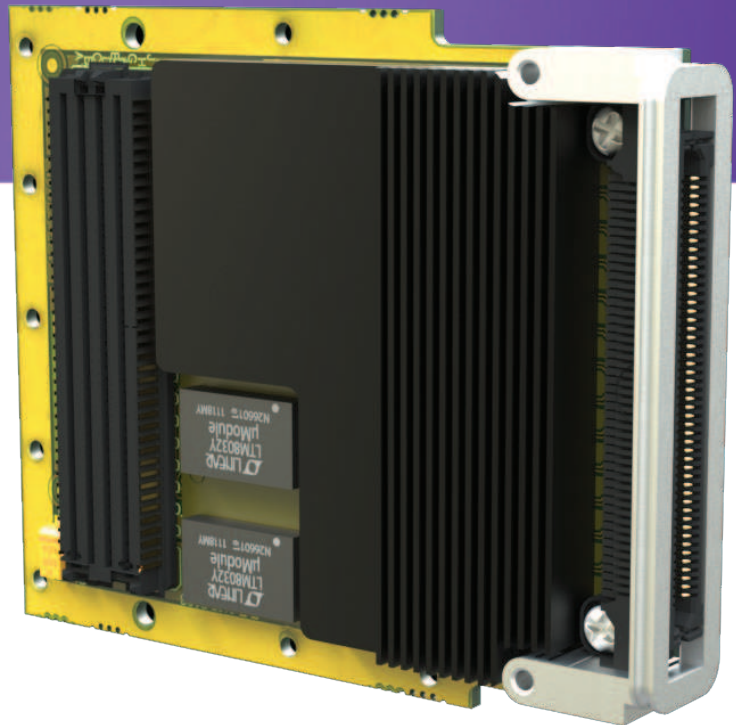
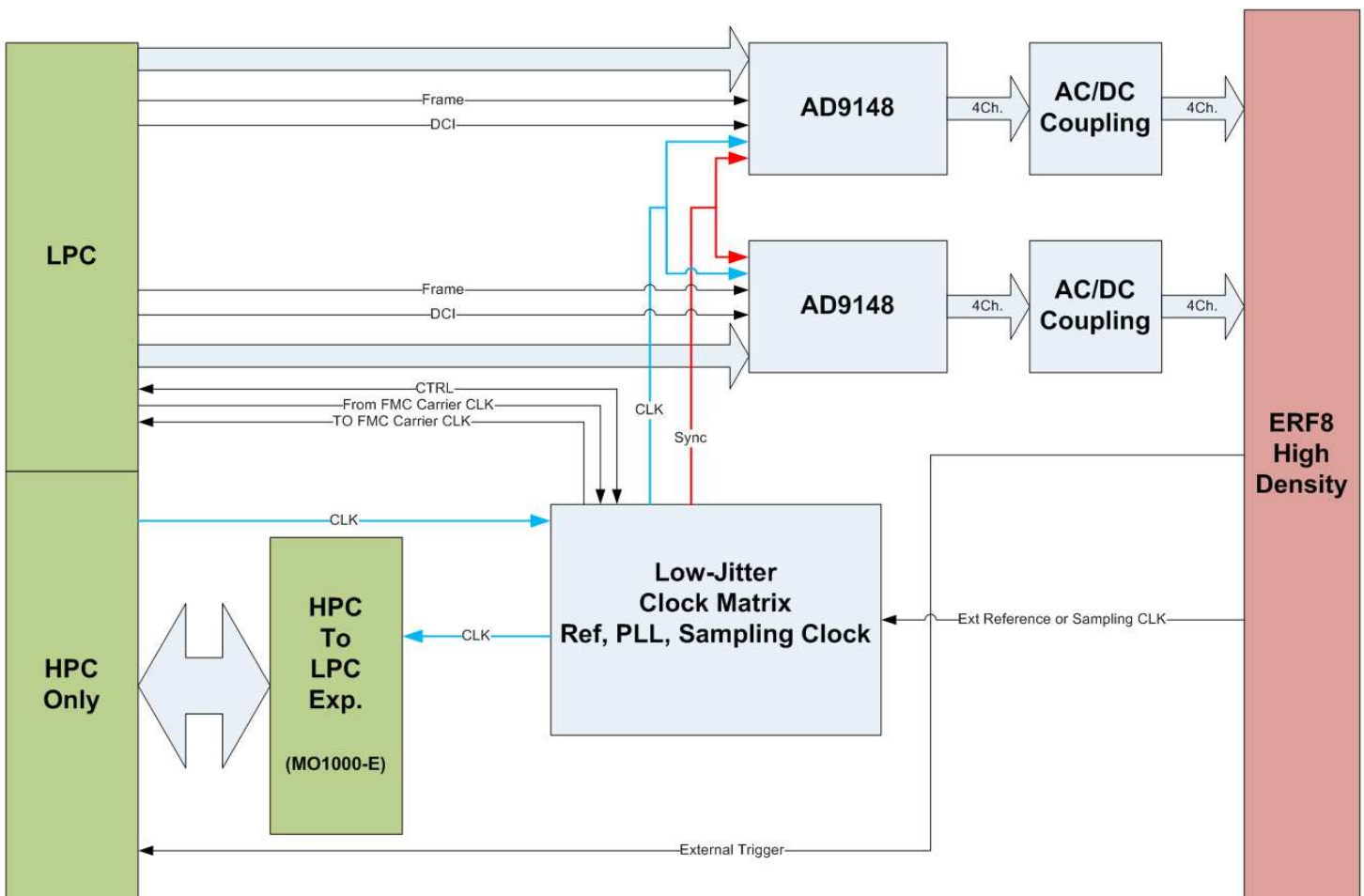


# Nutaq MO1000

Up to 16 Channels, 1000 MSPS D/A FMC  
PRODUCT SHEET



- 8 channels FMC LPC or 16 channel FMC HPC
- 1000 MSPS D/A, 16-bit width per channel
- 250 MSPS maximum sample rate from FMC carrier
- 2x, 4x and 8x available interpolating modes
- Integrated NCO for carrier frequency alignment within DAC bandwidth
- Multi-board phase aligned channels and phase coherent sampling
- Supports external or on-board low jitter clock
- DC or AC coupled output option
- Lowest cost per channel in the industry
- Plug and play with Nutaq's  $\mu$ TCA Perseus AMCs



The MO1000 FPGA mezzanine card (FMC) is an 8/16 channel phased aligned D/A card designed around the high-performance ADI AD9148 quad DAC from Analog Devices.

Offering multiple clocks and trigger modes, the MO1000 takes full advantage of the optimized features for direct conversion transmit applications, including gain, phase and offset compensation.

Additionally, low noise and low intermodulation distortion (IMD) enable high quality synthesis of wideband signals from baseband to high intermediate frequencies.

The MO1000 complies with VITA 57.1, a widely used standard in the FPGA-based digital signal processing industry, making it easier for developers to integrate FPGAs into embedded system designs.

The MO1000 can also be easily integrated with Nutaq's uTCA Perseus AMCs, or used with any other FMC carrier on the market. It is compatible with both low pin count (8 channel) or high pin count (16 channel) FMC interfaces.

## HARDWARE ARCHITECTURE

The VITA 57.1 standard offers unprecedented mechanical and electrical flexibility, along with standard specifications for small mezzanine modules designed to adapt an FPGA-based carrier card to different I/O requirements.

## FEATURES

- Lowest cost per channel in the industry
- FMC LPC – 8 channel D/A, 1000 MSPS, 16 bits
- FMC HPC – 16 channel D/A, 1000 MSPS, 16 bits (Nutaq's double-stacked FMCs)
- DC or AC coupled inputs ordering options
- Single-ended or differential coupling
- Equipped with an onboard, low-jitter clock
- Supports external sampling clocks for phase-coherent multiboard / multichannel applications
- External trigger input for event-based application
- Phased aligned analog output paths
- Phase-coherent sampling clock to all channels (8 LPC, 16 HPC)
- Complies with VITA 57.1
- Front panel, 8 channels, clock and trigger signals integrated within a unique robust connector Edge Rate Contact™ (ERF8-RA)
- Compatible with Nutaq's MI125 FMC card, enabling multichannel inputs and outputs on the same on the same HPC FMC connector, yielding 16 inputs and 8 outputs per connector (16 inputs, 8 outputs);  
info@nutaq.com for more information.

## APPLICATIONS

- Multichannel DAQ systems
- MIMO RADAR
- Massive MIMO
- Phased Array Antennas
- Multichannel Low-Latency Control Loop Systems

## 8 OR 16 CHANNELS CONFIGURATIONS

The MO1000-8 (8 channels) is an LPC FMC that complies with all the electrical and mechanical specifications of VITA 57.1, making it possible to use on any FMC-LPC compliant carrier on the market. On Nutaq's Perseus AMC, it fits in a mid-size  $\mu$ TCA slot.

For the 16 channel option, a MO1000-8 and MO1000-8-E (a MO1000 HPC with an LPC on top) are stacked to become the 16 channel MO1000-16.

The MO1000-16 complies with all the electrical specifications of VITA 57.1, but the height of the module exceeds the mechanical specifications. An additional 10 mm in height must therefore be allotted when using the MO1000-16 on an FMC HPC carrier other than Nutaq's Perseus AMC. On the Perseus, it fits in a full-size  $\mu$ TCA slot.

Note: All 16 channels of the MO1000-16 can be clocked with the same selected phase synchronous clock, either external or onboard, which is supplied from the bottom board in the stack.

## SPECIFICATIONS

### DC-coupled single-ended option

- Analog output bandwidth (–3 dB): TBD MHz
- Full-scale output (dBm): 10 (50 ohms)
- Conditions:  
Fs = 1000 MSPS, Fout (MHz) = 1 30 50 150 300
  - Full-scale output (dBm): 10 (50 ohms)
  - SNR (dB): TBD
  - SFDR (dBc): TBD
  - Noise floor (dBFS): TBD
  - THD (dBc): TBD

### AC coupled single-ended option

- Analog output bandwidth (–3 dB): TBD MHz
- Full-scale output (dBm): 7 (50 ohms)
- Conditions:  
Fs = 1000 MSPS, Fout (MHz) = 1 30 50 150 300
  - SNR (dB): TBD
  - SFDR (dBc): TBD
  - Noise floor (dBFS): TBD
  - THD (dBc): TBD

### Differential option

- Contact info@nutaq.com

## SPECIFICATIONS

### General

- D/As: 1000 MSPS, 16 bits (Up to 8x interpolating modes)
- Maximum Digital Data Rate: 250 MSPS
- Number of channels: LPC: 8, HPC: 16

### Sampling clock

- Onboard reference, Onboard Interpolation PLL, TBD fsec RMS jitters
- External Reference or DACs sampling CLK input (for phase coherence application), up to 250 MHz

### FMC connectivity

#### **MO1000-8**

Low-pin-count connector

- LA (00–33), CLK0 (unused), CLK1 (required): M2C clocks

#### **MO1000-8-E**

Low-pin-count connector

- LA (00–33)

High-pin-count connector

- LA (00–33), HA (00–23), HB (00–10)

#### **MO1000-16**

High-pin-count connector

- LA (00–33), HA (00–23), HB (00–10)

### Front panel

#### **MO1000-8 / MO1000-8-E**

- 1x ERF8-RA Samtec Edge Rate Contact™
- 8x D/A channels
- 1x trigger input (for HPC carrier only)
- 1x sampling CLK or REF input

#### **MO1000-16**

- 2x ERF8-RA Samtec Edge Rate Contact™
- 16x D/A channels
- 1x trigger inputs
- 1x sampling CLK or REF input

### Mechanical

Rugged FMC form factor — designed for conduction cooling, but not tested or implemented.

Contact [info@nutaq.com](mailto:info@nutaq.com) for details.

#### **MO1000-8**

- Weight 76.2 g

#### **MO1000-8-E**

- Weight 79.8 g

#### **MO1000-16**

- Weight 156.0 g

### Standards compliance

#### **MO1000-8**

- VITA 57.1

#### **MO1000-8-E**

- VITA 57.1 electrical specifications
- Out of mechanical specifications by H = 5.4 mm

#### **MO1000-16**

- VITA 57.1 electrical specifications
- Out of mechanical specifications by H = 10 mm

### Electrical

- 12 V, 3V3 and 3V3MP

### Power consumption

- Total: typically TBD W (MO1000-8, all channels 1000 MHz)

Nutaq products are constantly being improved; therefore, Nutaq reserves the right to modify the information herein at any time and without notice. The FMC logo is a trademark of VITA.



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