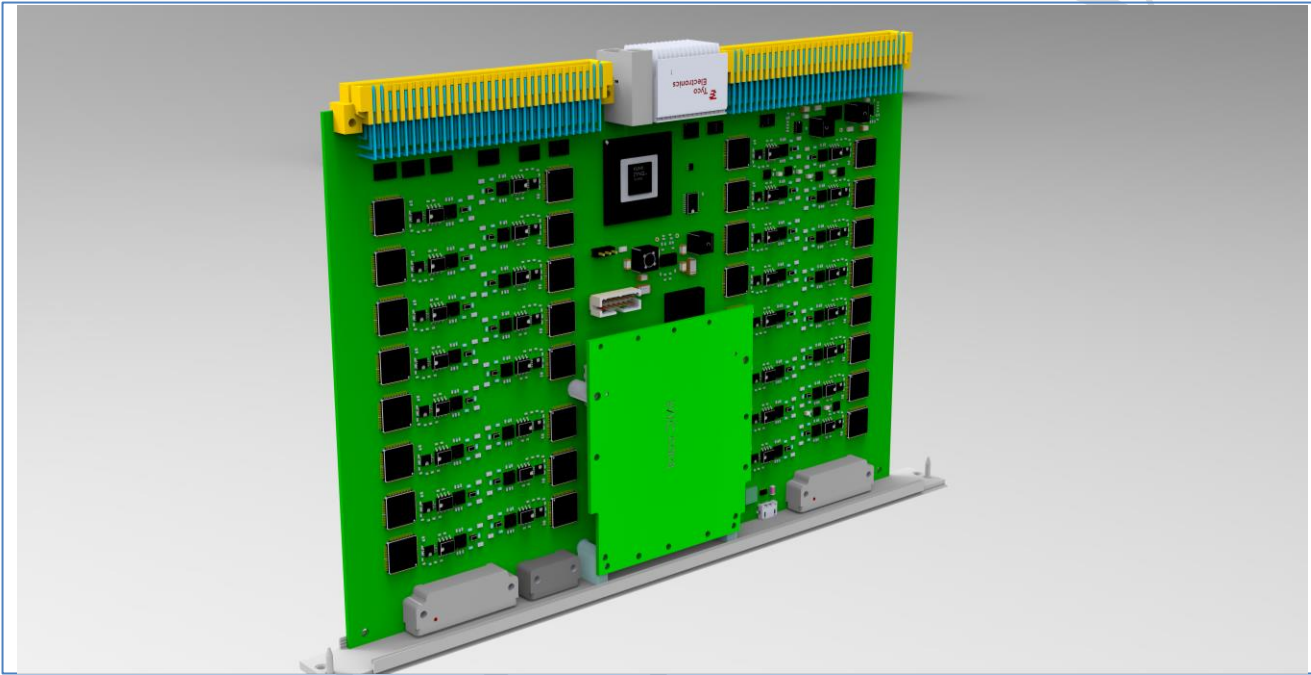


# BLACKBURN

## SIGNAL PROCESSING

### GB113: VME/VXS acoustic signal processor

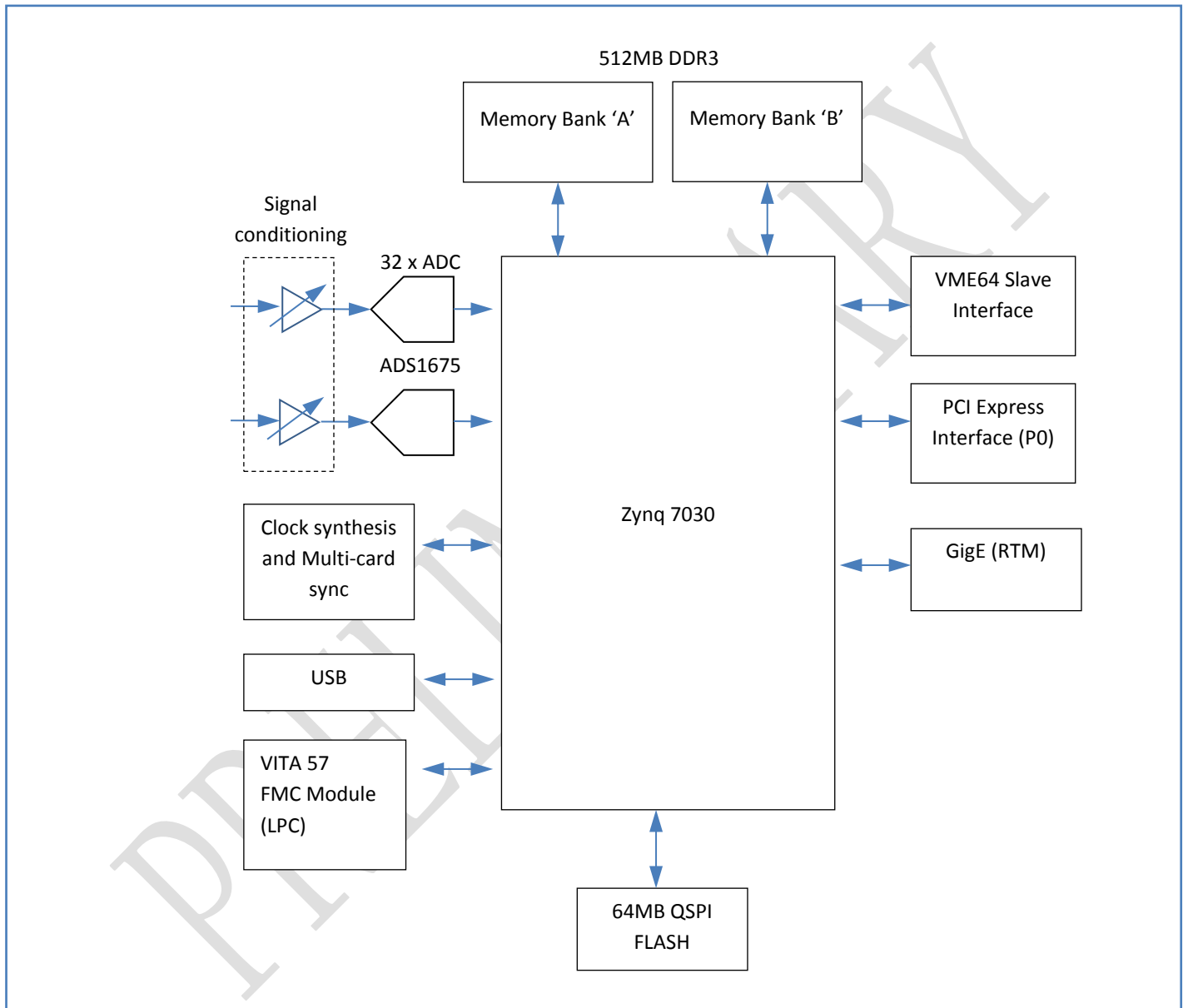


- ❖ 6U VME form factor. Convection and conduction cooled build options available.
- ❖ 32 analog inputs: 24 bit Sigma Delta ADC running at up to 4MS/sec.
- ❖ Xilinx Zynq 7030 embedded processor (7045 optional)
- ❖ 512 MB DDR3 SDRAM, 64MB QSPI FLASH
- ❖ Optional VXS (VITA 41) configuration: X4 GEN2 PCI Express over P0
- ❖ VITA 57 FMC daughter card site (low pin count)
- ❖ Multi-card synchronization allows creation of larger systems
- ❖ Linux Software development kit
- ❖ Open source HDK for custom FPGA core development

The GB113 is a 6U VME/VXS single board data acquisition and DSP module which enables a wide variety of acoustic and ultrasound signal processing functions, including active or passive sonar, vibration analysis, geophysics, and other test and measurement applications. The card features 32 analog input channels, which it converts to digital data with 24 bit resolution, at sample rates up to 4MHz. On board signal processing is provided by a Xilinx Zynq 7030 SoC, which includes two Arm A9 processors, as well as substantial programmable logic (PL) resources. The design includes the ability to precisely synchronize multiple GB113 cards, allowing systems to be expanded to support hundreds of channels. Anti-aliasing inherent in the Sigma-Delta converters minimizes

analog signal conditioning elsewhere in the design: the analog front end includes only adjustable gain and two pole anti-alias filtering. All other processing is performed using the on board FPGA resources.

In the simplest sense, the GB113 can serve as a VME slave module, providing analog sensor interfaces to a single board computer, or a larger HPC system. The GB113 is also capable of operation as a stand-alone module, running bare metal code, or a custom Linux image such as Yocto.



The GB113 includes a high precision frequency synthesizer which allows the user to generate a sample clock of virtually any frequency, between 50kHz and 4 MHz, with sub-hertz precision. It can also accept an external clock for frequency coherent synchronization to peripheral equipment. When using the GB113, data acquisition may be performed in either capture or continuous mode. In capture mode a specific number of samples are acquired following a trigger event, while in continuous mode the amount data acquired is virtually unlimited. In this mode acquisition is initiated and terminated by software commands.

## Target Specifications:

### Basic Architecture and Functionality

- 32 channel sigma-delta ADC card in 6U VME form factor.
- Front panel micro USB connector, Gigabit Ethernet through rear IO (requires RTM)
- Configuration options:
  - 32 or 16 analog input channels
  - P0 connector to allow PCI Express interface in VXS (VITA 41) systems
  - Optional conduction cooled configuration requires zero airflow. (Front panel IO retained)
- Up to 512 MB DDR3 DRAM.
- 64MB flash memory for FPGA configuration, application code, boot loader, etc.
- Phase coherent operation across multiple cards guaranteed.
- Supports continuous and capture modes of operation. Capture mode includes pre-trigger storage capability.
- Primary control and data interface: VME A24/D32 slave interface
- Optional control/data interface: x4 PCI Express routed through P0. Includes demand mode DMA engine with 64 bit addressing capability.
- Optional auxiliary functions provided by FMC (VITA 57) modules. **Contact factory for details, and compatibility of third party hardware.**
- Xilinx Zynq 7030 SoC FPGA for data routing, memory control, in-band filtering, etc. **Contact factory to discuss upgrade to Zynq 7045.**
- Total power dissipation approximately 29W.

### Analog Performance (Target specifications)

- 24 bit Sigma Delta ADC running at up to 4MS/sec.
- Differential inputs with programmable voltage range. Can also accept single ended inputs.
- 4kOhm input impedance standard, other values may be supported as build options.
- Programmable ADC sample rate: 50kHz to 4MHz. Sampling frequency accurate to within 5Hz.
- Two pole low pass anti-alias filter. Nominal Fc 1.7MHz. Contact factory if different front end filtering is required.
- >90dB SNR
- >85dB SINAD
- >110dB SFDR