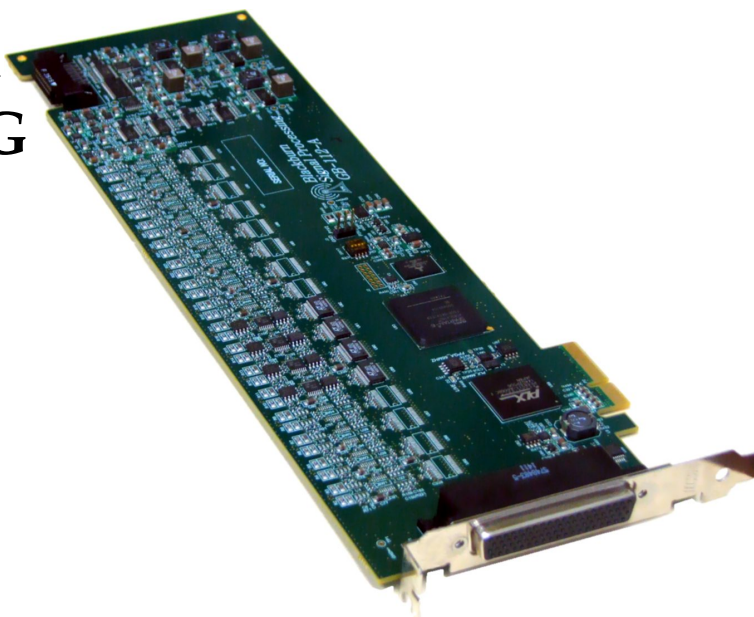


BLACKBURN

SIGNAL PROCESSING

GB112

32-Channel Acoustic
DAC for PCIe Systems



Product Description

The GB112 is a digital to analog converter card which allows server class PCs to be deployed in a wide variety of acoustic signal generator applications, including sonar transmission, vibration analysis, geophysics, and other test and measurement applications. This full length PCI Express slot card provides 32 discrete analog output channels, each with a signal generated from 16 bit digital data. This product is unique in that it fills a niche not covered by Sigma Delta audio DACs, industrial R-2R DACs, or ultra-wideband radio communications DACs. The GB112 allows the user to generate signal frequencies much higher than commercially available Sigma Delta DACs, but with the benefits of high oversampling ratios normally associated with those parts. With signal images over 5 octaves away, the two pole reconstruction filtering included on the card is usually the only analog signal conditioning required before driving external devices. The modular design of the GB112 also includes the ability to precisely synchronize multiple cards, and systems can be expanded to support hundreds of channels.

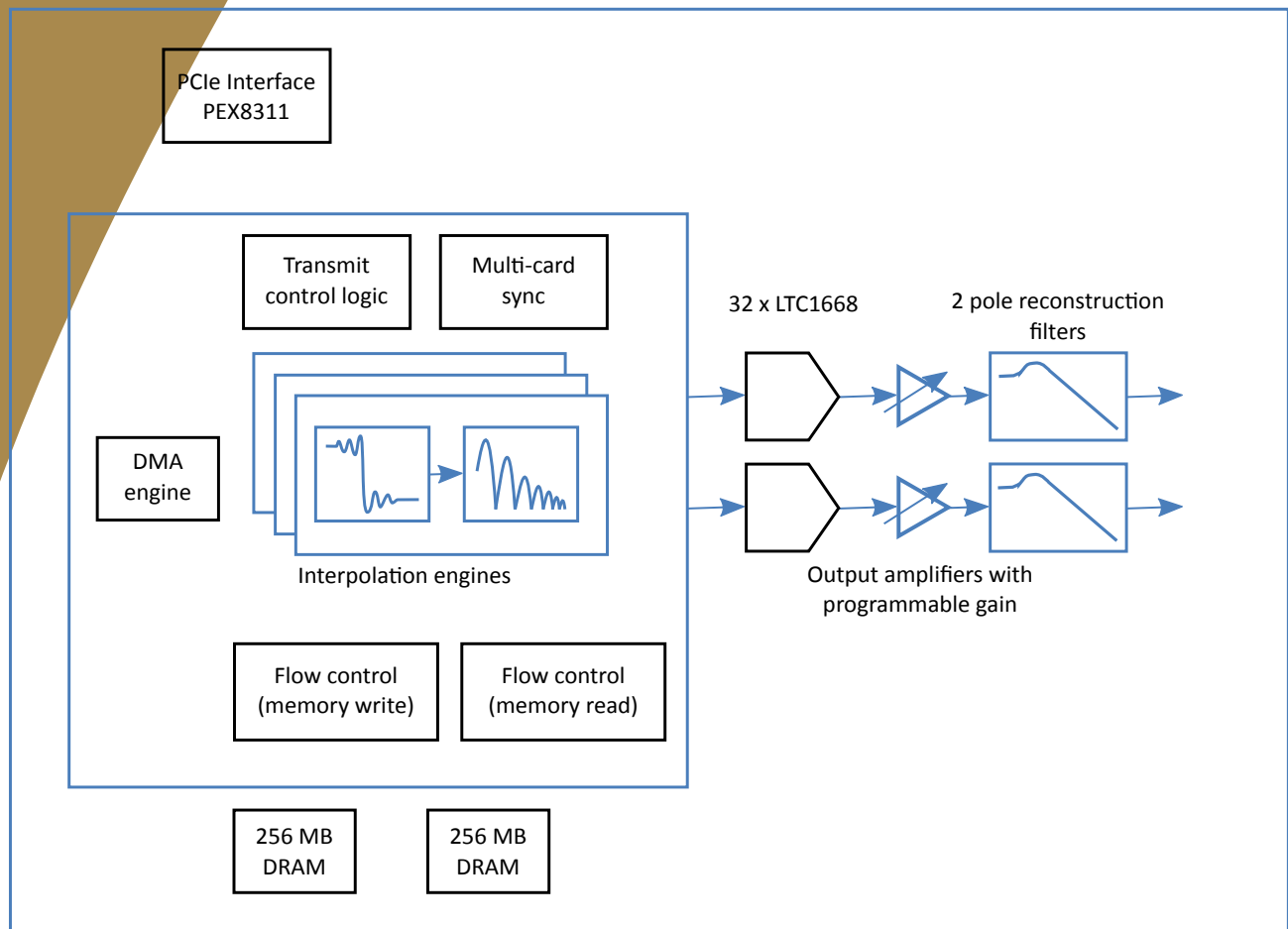
By using standard DACs, and a series of FPGA based interpolation engines, the GB112 provides highly oversampled analog outputs generated from 16 bit digital data. The oversampling ratio is programmable from 32 to 256. Sample rates up to 156kHz are achieved with 256x oversampling, while sample rates as high as 1.25MHz are achievable by reducing the oversampling ratio to 32. The analog output stage provided on the GB112 allows the user to adjust the maximum input voltage range at run time, selecting

among 1, 2, 5, 10, and 20Vp-p (differential).

The GB112 includes a high precision frequency synthesizer which allows the user to generate a master clock of virtually any required frequency, with sub-hertz precision. It can also accept an external clock for frequency coherent synchronization to peripheral equipment.

When using the GB112, data conversion may be performed in pulsed, loop, or continuous mode. In pulsed mode a specific number of samples are converted following a trigger event, after which conversion stops. Re-triggering is permitted. In loop mode, a set of data is written to the card once, and then repetitively converted to analog waveforms. Conversion is controlled by software commands or gated by an external trigger input. Continuous mode is intended for playback of large quantities of data. In this mode, an initial quantity of data is written to the card, and conversion is initiated. As each memory bank is emptied, the card can generate a "data required" interrupt, or initiate a "demand mode" DMA transfer based on DMA chain information queued by the driver. Conversion is terminated by software command.

BBSP provides the user with a software development kit which supports application development under either the Windows or Linux operating system. A sophisticated API provides high level hardware control functions and operating examples.



Basic Architecture and Functionality

- 32 channel oversampling DAC card in long PCI Express form factor, full height
- Dual DRAM banks. 512MB total storage
- Phase coherent operation across multiple cards guaranteed
- Supports loop, continuous and pulsed modes of operation
- Control and primary data interface: x1 PCI Express. Includes demand mode DMA engine
- Spartan 6 FPGA for data routing, memory control, in-band filtering, etc.
- Estimated maximum power dissipation approximately 35W
- Analog connector: 78 pin D-SUB female

Analog Performance (target)

- 16 bit resolution DACs
- Differential outputs with programmable voltage range. (1, 2, 5, 10, 20V p-p differential)
- Less than 5 Ohm output impedance. Other values may be supported as custom build options
- Programmable DAC sample rate: 10KSPS to 1MSPS. Sampling frequency accurate to less than 1Hz
- Two pole low pass reconstruction filter. Nominal F_c 1.1MHz. Contact factory for other frequencies
- >77dB SNR
- >74dB SINAD
- >89dB SFDR

Integration Support

- Software Development Kit for Windows or Linux, 32 and 64 bit
- Application examples written in 'C'
- Analog connector breakout jig for lab use available convection cooling

Environmental

- Specifications guaranteed from 0 to 50 °C
- Storage temperature -40 to +85 °C
- Approximately 500LFM airflow required for convection cooling

Configuration and Ordering Details

GB112-000	PCI Express Acoustic DAC - 32 channels
GB112-XXX/YYY	PCI Express Acoustic DAC - custom configuration. Contact factory for details
GB112-BRK	Analog connector breakout jig
GB112-SDK	Software Development Kit. Includes drivers and API for Windows and Linux with example code

Who is BBSP

The engineers who make up *BBSP* are sensor processing specialists. Our expertise lies in connecting sensors to computers, and processing the raw sensor data to extract signals of interest. This functionality is critical to the operation of radar, sonar, telecommunications, imaging, and test and measurement systems. Each of the members of *BBSP* brings over 10 years of experience interfacing the digital processing capabilities of high performance computing systems with the analog signals produced by antennae, hydrophones, accelerometers, etc. Our portfolio of past work includes products produced by *Interactive Circuits and Systems*, *Radstone Embedded Computing*, and *General Electric Intelligent Platforms*. Our designs ensure synchronous sampling on every channel, and robust buffering against data loss, regardless of operating system latency. And by using industry standard form factors such as PMC, XMC and VPX, our products are widely compatible with Commercial Off-The-Shelf (COTS) equipment made by third party vendors.

**Blackburn
Signal Processing**

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Additional Resources

For more information, please visit the *Blackburn Signal Processing* web site at: <http://www.blackburnsp.com/>