The modularity of the DSPBrik allows system architects to define their applications using only required resources while providing flexibility for expansion. Built upon Commercial-of-the-Shelf (COTS) production methods, DSPBrik-based designs can provide cost-effective solutions for both prototyping and full production systems. The DSPBrik II family offers a collection of Analog-to-Digital Conversion (ADC), Digital-to-Analog Conversion (DAC), and Field Programmable Gate-Array (FPGA) Processing products.

DSPBrik modules can be interconnected to form various physical topologies, such as 2-dimensional arrays and 3-dimensional vertical stacks. Connections are made using high-speed matched-impedance connectors that provide greater than 80 gigabits/second of bandwidth per connector. Again with flexibility in mind, the direction (e.g., input, output, bidirectional) and function (e.g., data, control, status) of each data signal on the DSPBrik II connector is defined by the application developer and can be reconfigured as required. Finally, DSPBrik products can distribute high-bandwidth data and signals by interfacing with common networking standards, such as 1G/10G/40G Ethernet.

Application (i.e., firmware) development for DSPBrik products is accomplished using mature, industry-provided FPGA development tools (not included). By utilizing industry-provided tools and standards, developers can leverage a large user support base and Intellectual Property infrastructure which are significantly more limited for proprietary development flows. DSPBrik designs can be implemented using a wide variety of languages and tools, such as VHDL, Verilog, SystemC, OpenCL, and MATLAB™.

Finally, FPGAs are well-suited for embedded applications as they outperform conventional architectures (e.g., GPPs, GPUs) with respect to Size, Weight, and Power (SWaP).

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APPLICATION EXAMPLES

- Software-Defined Radios
- Satellite Communications
- Adaptive Arrays
- Digital Signal Processing
- High-Bandwidth Demodulation
- Radar Processing
- Digital IF Transport
- Radio Astronomy
- Radar Processing
- Network Packet Processing

Rincon Research Corporation's DSPBrik™ II product family is a modular, extensible, and reconfigurable computing architecture that targets high-performance computation and DSP applications. Building upon a 12 year legacy, the 2nd generation DSPBrik products enable higher bandwidth applications while reducing overall system cost.
**X6A1250 DSPBRIK™ II WIDEBAND A/D CONVERTER AND FPGA**

The X6A1250 is a 2.6 Gigasample-per-second, 10-bit A/D input module with a 5 GHz analog input bandwidth, a Xilinx Virtex®-6 FPGA, and a Freescale QorIQ P1010 PowerPC.

- Digitize over a GHz of signal bandwidth from an analog input range of 10 MHz to 5 GHz (via Nyquist sampling techniques and bandpass filtering).
- Programmable attenuator provides 31.5 dB of attenuation in 0.5 dB increments.
- 2 GB of DDR3-1600 SDRAM for capturing signal snapshots and user application processing.
- Support for precision time tagging of sampled data using a 1-PPS input and NMEA-0183, IRIG-B, or NTP time code signals.
- Programmable on-board synthesizer for sample clock generation (600 to 2600MHz) using either an onboard or external 10 MHz reference.
- High-speed SERDES connector attached to eight Virtex®-6 GTX transceivers capable of various serial formats (e.g., 1G/10G Ethernet, PCI).
- Reconfigurable Xilinx Virtex-6 LX240T FPGA for custom user applications.
- Integrated Freescale P1010 microprocessor running Linux and dual 1Gb Ethernet interfaces for Command/Control and user applications.

**X7D2285 DSPBRIK™ II WIDEBAND D/A CONVERTER AND FPGA**

The X7D2285 is a dual, 2.85 Gigasample-per-second 14-bit D/A Output Module with a 1.425 GHz analog output bandwidth, a Xilinx Virtex®-7 FPGA, and a Freescale QorIQ P1010 PowerPC.

- Dual Analog Devices AD9129 devices capable of 5.7 GHz update rate using 2x Interpolation (Mixed-Mode) -74dBc Two-Tone IMD3; -49dB NPR; 100dB+ Channel Isolation
- Programmable attenuator provides 31.5dB of attenuation in 0.5dB increments.
- Two 1 GB DDR3-1600 SDRAM interfaces for data buffering and user application processing.
- Support for precision time alignment of output sample data using a 1-PPS input and NMEA-0183, IRIG-B, or NTP time code signals.
- Programmable on-board synthesizer for sample clock generation using either an onboard or external 10 MHz reference.
- High-speed SERDES connector attached to eight Virtex®-7 GTX/GTH transceivers capable of various serial formats (e.g., 1G/10G/40G Ethernet, PCI).
- Integrated Freescale P1010 microprocessor running Linux and dual 1 Gb Ethernet interfaces for Command/Control and user applications.
- Standard: XC7VX485T device
  - 485,760 Logic Cells
  - 2,800 DSP Slices
  - 37,080 Kbit of Block RAM
- Option: XC7VX690T device
  - 693,120 Logic Cells
  - 3,600 DSP Slices
  - 52,920 Kbit of Block RAM

**X7F1000 DSPBRIK™ II VIRTEX®-7 FPGA PROCESSOR**

The X7F1000 is a Xilinx Virtex®-7 based FPGA with a Freescale QorIQ P1010 PowerPC for high-performance signal and data processing applications.

- Reconfigurable Xilinx Virtex®-7 FPGA for custom user applications.
- Two 1 GB DDR3-1600 SDRAM interfaces (32-bit) for user applications.
- High-speed SERDES connector attached to eight Virtex®-7 GTX/GTH transceivers capable of various serial formats (e.g., 1G/10G/40G Ethernet, PCI).
- Integrated Freescale P1010 microprocessor running Linux and dual 1 Gb Ethernet interfaces for Command/Control and user applications.
- Standard: XC7VX485T device
  - 485,760 Logic Cells
  - 2,800 DSP Slices
  - 37,080 Kbit of Block RAM
- Option: XC7VX690T device
  - 693,120 Logic Cells
  - 3,600 DSP Slices
  - 52,920 Kbit of Block RAM