Agilent U1083A-003
Acqiris RVM4400 High-Speed 6U VME/VXS ADC/DAC Module
10-bit ADC, 14-bit DAC, 1.2 GS/s
High-Resolution, High-Sample-Rate Data Conversion with Real-Time Processing

Based on a modular platform, the Agilent Acqiris RVM4400 features a single channel 10-bit 1.2 GS/s ADC and a single channel 14-bit 1.2 GS/s DAC coupled with a processing engine capable of up to 300 GigaMAC/s.

Based on a scalable, modular architecture, the VME/VXS board family comes with two Xilinx Virtex-4 FPGAs, one SX55 targeted at digital signal processing, and one FX100 for data flow control. The embedded FLASH memory allows the platform to be easily reconfigured to perform user defined applications.

This architecture makes the new platform ideal for wide-band, high-dynamic-range demanding applications such as electronic warfare (EW) ECM applications, radar digital receiver/transmitter, telecommunications, and semiconductor testing, where high sample rate, high data-processing capabilities, and high throughput are mandatory.

The RVM4400 incorporates proprietary data conversion chipsets, designed for the specific purpose of optimizing high-speed ADC and DAC performances.

The RVM4400 uses one single channel 10-bit 1.2 GS/s ADC mezzanine based on the E2V AT84AS008 ADC and one single channel 14-bit 1.2 GS/s DAC based on the Analog Devices AD9736 DAC. The board supports eight 3.125 Gbps serial links on the VXS backplane and two optical links on the front panel supporting up to 3.125 Gbps. It includes a fully compliant VME64x interface with support for 2eSST protocol, providing a substantial aggregate data bandwidth of more than 3.5 GB/s.

A comprehensive firmware development kit (FDK), software drivers, and application examples make it easier to develop your applications.
Data-Flow-Optimized Architecture

The VME/VXS board family has been designed to optimize both internal and external data throughput. Associated with other members of the family, the RVM4400 allows building complete systems with fewer resources.

Easy Customer Application Development

Firmware development kit

The VME/VXS board family comes with an optional firmware development kit (FDK) to make application development easier on the SX55 and FX100 FPGAs. The FDK includes a set of cores to easily interface to the underlying hardware, a base design for each family member to provide very simple, ready-to-use designs, and a test-bench environment for design and simulation.

An embedded FLASH memory can store up to seven bitstreams for each FPGA for complex, multimode applications.

Software drivers and examples

The RVM4400, as other members of the family, comes with software drivers and applications examples for Wind River VxWorks (Pentium® and PPC), Linux (Pentium and PPC) and Windows (Pentium).
Extended Functionality

Clock and clock distribution
The RVM4400 features an external clock or 10-MHz reference input with very low added jitter that provides direct access to the digitizer’s on-board COS201 clock distribution circuit. Moreover, a very-low-phase-noise PLL is used to generate the internal clock at fixed frequencies. A sophisticated internal clock distribution scheme to all internal resources allows for fine control of processing and I/O synchronization.

Trigger
The external trigger circuitry includes a switchable 50 Ω/1 M Ω front end coupled with a very-high-speed comparator chip and a 12-bit DAC for threshold adjustment.

Analog mezzanines
The RVM4400 includes one 10-bit 1.2 GS/s ADC analog mezzanine based on the E2V AT84AS008 ADC and one 14-bit 1.2 GS/s DAC analog mezzanine based on the Analog Devices AD9736 DAC.

JTAG
The RVM4400 features a JTAG connector that can be used for on board firmware debug using ChipScope probe (requires option U1091A-CB1).

Auxiliary I/O mezzanine
The RVM4400 features a custom auxiliary I/O mezzanine to support control and command functions. It includes one 12-bit 65 MS/s ADC, one 12-bit 130 MS/s DAC, and 14 digital I/Os.

On-board processing FPGA
The RVM4400 offers on-board, high-performance, real-time data processing by means of two very large FPGAs, one Xilinx Virtex-4 SX55 and one Xilinx Virtex-4 FX100. The SX55 FPGA is capable of executing 512 multiplications/accumulation (18x18) at up to 450 MHz, leading to an impressive processing power of 230 GigaMAC/s, while offering more than 55,000 logic cells and up to 5 Mbits of on-chip RAM.

Optical data links
Two SFP front-panel optical transceivers provide for data transfer at rates of up to 3.125 Gbps per link, supporting Aurora protocol.
VME 2eSST interface
The RVM4400 is fully VME64x and 2eSST compliant. Designed to benefit from fast data interfaces, it can be integrated with other state-of-the-art VME boards.

Fast data throughput with large memories
The MAC200 memory and acquisition controller, is a digital CMOS integrated circuit. A high-speed data multiplexer/demultiplexer with on-board memory, it is designed for the capture and memorization of 10-bit or 20-bit digital data, at speeds of up to 2 GS/s or generation of 20-bit data streams at up to 1.2 GS/s.

VXS VITA 41 interface
The VXS VITA 41.0 standard gives the RVM4400 the very-high-data-throughput capability needed in EW, Radar, or ATE equipment. The eight serial links available on the P0 connector support up to 3.125 Gbps each, for an aggregate throughput of up to 2.5 GBytes/s. Protocols such as RapidIO, PCI-Express®, Infiniband or Gigabit Ethernet, as defined in the VITA 41 dot-standards, can be supported through off-the-shelf FPGA IP cores.

On-board communication controller FPGA
The Xilinx Virtex-4 FX100 FPGA is capable of executing up to 160 multiplications / accumulation (18x18) at up to 450 MHz, leading to an impressive processing power of 70 GigaMAC/s while offering more than 94,000 logic cells and up to 6.7 Mbits of on-chip RAM. Moreover, the FX100 includes two PPC cores and four 10/100/1000 Ethernet MAC blocks. The on-board FPGA-based Signal Processing Unit allows the platforms to be easily reconfigured to perform user-defined, on-board, real-time signal processing.

Large memory
The Xilinx Virtex-4 FX100 interfaces to two banks of DDR2-533 SDRAM, 32 MWords, each 64-bit wide, for a total of 512 MB. Full-speed read or write operations are allowed at up to 1.2 GS/s on each channel.
### Acqiris High-Speed VME/VXS Data Converters
#### Model RVM4400
Single-channel 10-bit 1.2 GS/s ADC, single-channel 14-bit 1.2 GS/s DAC

#### Signal input
- **Bandwidth (-3 dB)**: 3 GHz
- **Input voltage**: ± 0.5 V DC
- **Coupling**: DC
- **VSWR (typ.)**: < 1.5 DC to 3 GHz
- **Connectors**: SMA, gold-plated
- **Impedance**: 50 Ω ± 1% at DC

#### Signal output
- **Bandwidth (-3 dB)**: 10 to 500 MHz
- **Output power**: 1.5 dBm typical to 50 Ω
- **Coupling**: AC
- **Impedance**: 50 Ω ± 1% at 10 MHz
- **Connectors**: SMA, gold-plated

#### Digital conversion
- **Sample rate**
  - External clock: Up to 1.2 GS/s
  - Internal clock: 1 GS/s
- **Channels**: One ADC, one DAC
- **Resolution**
  - ADC: 10 bits (1:1024)
  - DAC: 14 bits (1:4096)

#### System performance ADC
- **Sampling rate**: 1.2 GS/s
- **SFDR (typ.)**: > 50 dB at 1 GHz
- **SNR (typ.)**: > 45 dB at 1 GHz
- **ENOB (typ.)**: > 6.9 at 1 GHz
- **Two tone intermodulation distortion (IMD)**: > 50 dB at 1 GHz

#### System performance DAC
- **Sampling rate**: 1.2 GS/s
- **SFDR (typ.)**: > 50 dB at 500 MHz
- **SNR (typ.)**: > 60 dB full bandwidth
- **Two tone intermodulation distortion (IMD)**: > 50 dB at 500 MHz

#### Time base
- **Clock accuracy**: Better than ±2 ppm
- **Sampling jitter (internal)**: < 1 ps RMS integrated over 10 ms
- **Generation modes**: Continuous / software triggered

#### Trigger (external)
- **Sensitivity**: Sensitivity > 5% Full Scale
  - DC to 1 GHz at 50 Ω
  - DC to 300 MHz at 1 MΩ
- **Impedance**: 50 Ω ±1%, 1 MΩ ±1% at DC
- **Connector**: SMA, gold-plated
- **Full scale**: ±5 V
- **Modes**: Edge, positive and negative

#### Auxiliary I/O
- **Digital signals**: 14 I/O configurable as 7 LVDS pairs μDB15 connector
- One digital I/O LVTTL 3.3V, 5V tolerant, MMCX gold plated connector (I/O P1)
Default analog IOs

Analog input
12-bit 65 MS/s ADC
± 1 V DC 50 Ω input
MMCX, gold-plated connector

Analog output
12-bit 130 MS/s DAC
± 1 V DC into 50 Ω
MMCX, gold-plated connector

Option -DM1 analog IOs

Analog input
Dual 12-bit 150 MS/s ADC
± 1 V DC 50 Ω input
MMCX, gold-plated connector

Optical data links

Transceiver
Transceiver: 2 x Small Form Pluggable Multimode 850 nm

Connector
LC™ Duplex

Throughput
3.125 Gbps/link

Host interface

VME
Full VME64x and 2eSST compliant

VXS
8 x serial links on P0
3.125 Gbps/link
Aggregate: up to 25 Gbps

Digital IO
12 LVDS pairs on P0
20 LVDS pairs on P2
One SPI interface on P2

Supported host and OS¹

Single board computers
Kontron:
PowerNode3, PowerEngine (Linux, VxWorks)
PentXM, PentXM2 (Linux)
Concurrent Technologies: VP337 (Linux)
VP426 (WinXP)
GE Fanuc:
V7812 (WinXP)

Interfaces
GE Fanuc Bus Adapter 810 (WinXP)

General and physical

Power consumption
< 75 W

Dimensions
6U VME standard
233.35 mm x 160 mm x 20.02 mm

Safety
Complies with EN61010-1
Front panel complies with IEEE1101.10

Safety Certification and Compliance

Current requirements (typ.)²
+12 V 0.02 A
+5 V 7.1 A
+3.3 V 8.6 A
-12 V 0.005 A

EMC immunity
Complies with EN61326-1
Industrial Environment

Warranty
1 year

EMC emissions
Complies with EN61326-1 Class A for radiated emissions

Environmental

Operating temperature
0° to 55°C

Non operating temperature
-40° to 85°C

Required airflow
>2 m/s at sea level

Vibration
5-100 Hz PSD +3 dB/octave
100-1000 Hz 0.04 g²
1000-2000 Hz PSD -6 dB/octave

Shock
20 G, half-sine pulse

Relative humidity
5 to 95% (non-condensing)

Altitude
-1,000 to 15,000 Ft

1) For other configurations, please contact factory.

2) RVM4400 sampling at 1.2 GS/s, 100 MHz repeat signal using FPGA with base design. Depending on FPGA customer usage.
Model Description
U1083A-003 10-bit ADC - 14-bit DAC, 1.2 GS/s RVM4400 module
U1083A-FDK Firmware development kit for VME-VXS platform

Options
U1083A-DM1 Dual ADC auxiliary IO mezzanine

Accessories
U1092A-CB1 MMCX to BNC, 1 m cable
U1091A-CB1 Chipscope cable and connector

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Printed in USA, May 2, 2009
5989-7830EN