ADSY1100

4 Tx/4 Rx, 0.1 GHz to 20 GHz Apollo MxFE 3UVPX Tuner + Digitizer + Processor

FEATURES

- Four transmit (Tx) channels
  - Up to 28GSPS DACs
- Four receive (Rx) channels
  - Up to 20GSPS ADCs
- Swappable RF tuner personality cards
  - 0.1-20GHz tuning
  - Multiple tuner options
  - Phase and Hop Coherency
- Memory Options
  - 8 GB DDR4 Data Memory
  - 4 GB DDR4 Processing Memory
  - 270 Mb Ultra RAM
- Apollo MxFE™ Integrated DSP
  - DDC and DUC Up To 1,536x
  - RX to TX loopback
  - Fractional Sample Rate Converter
  - 512-point FFT Sniffer
- 12 V power supply
- Virtex™ VU11P
- Zynq™ ZU4EG
- Offload and Control Interfaces
  - 1 Gb Ethernet
  - 10 Gb Ethernet
  - 40 Gb Ethernet
  - 2x100 Gb Optical Ethernet
  - PCIe Gen. 3 interface x 8 lanes
- SOSA-aligned
  - 1” pitch 3UVPX form factor

APPLICATIONS

- Electronic test and measurement systems
- Radar and communications
  - Electronic warfare
  - Phased array system
  - Broadband communications systems

GENERAL DESCRIPTION

Analog Devices’ ADSY1100-series is a family of wideband multi-channel RF digitizers in a 3UVPX SOSA™-aligned format. The system is built around ADI’s next generation “Apollo” MXFE™ product (AD9084) featuring DAC sample rates up to 28 GSPS and ADC sample rates up to 20 GSPS in a 4Tx / 4Rx configuration. The AD9084 includes integrated digital signal processing such as digital decimation, interpolation, numerically controlled oscillators (NCO), FFT sniffers, RX to TX loopback, linearization algorithms, fractional rate samplers and more. These built-in power-efficient DSP features free up FPGA resources for user-defined mission-specific processing. The digitizer card pairs AD9084 with the AMD Virtex™ Ultrascale+ family of FPGAs. Depending on processing and power requirements, the user can vary settings options of the FPGA as needed. Swappable RF/Microwave Tuner Personality Cards mate to the digitizer card within the single 1" pitch chassis to allow optimized performance for a variety of applications. A Sensor Open Systems Architecture™ (SOSA™) aligned slot profile is used for the backplane connectors, allowing for a flexible system design which integrates well into customer prototype demonstrations. Software drivers are provided for enabling fast deployment.

Rev. PrA

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FUNCTIONAL BLOCK DIAGRAM

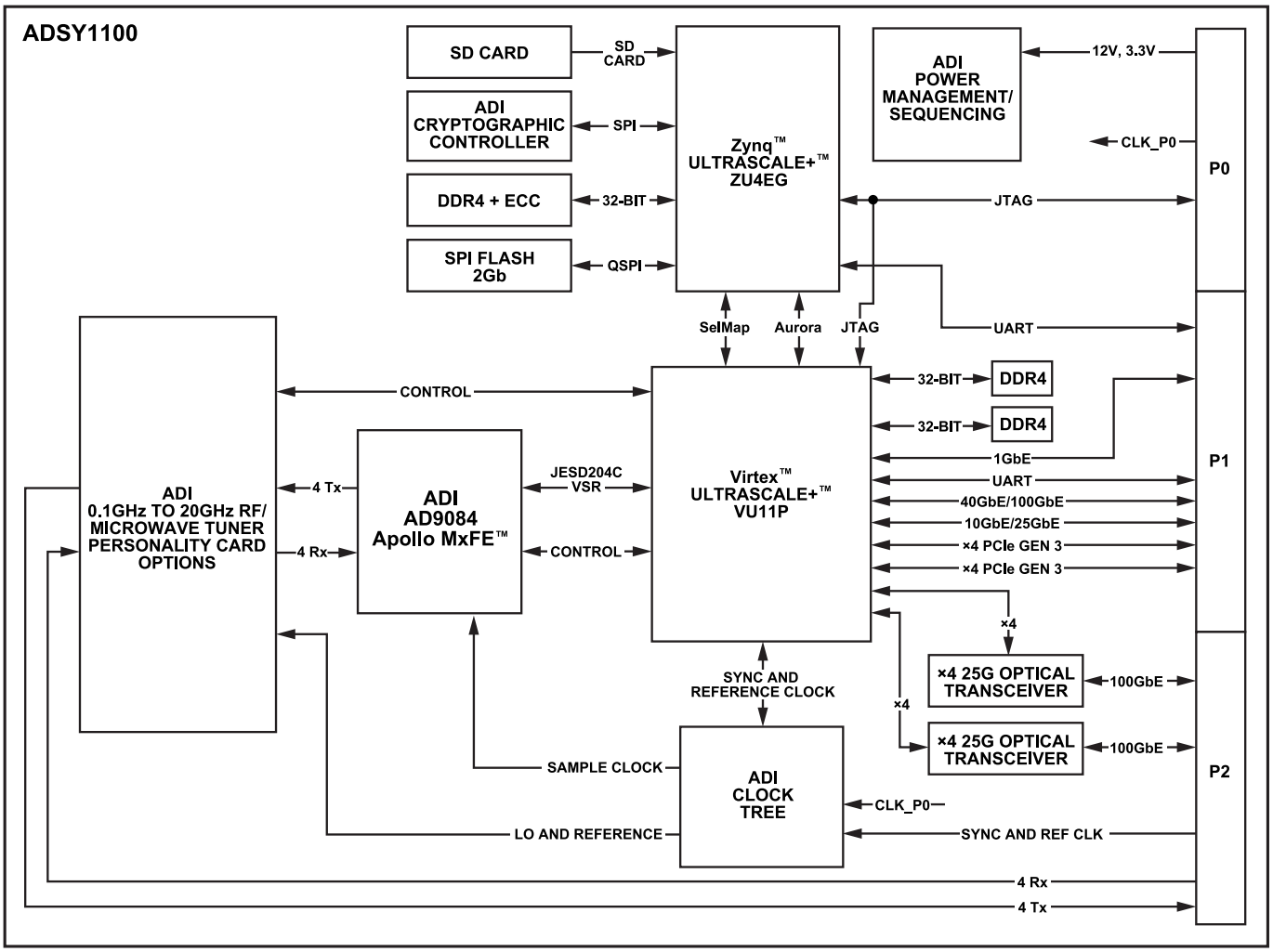

Figure 1. Functional Block Diagram

SPECIFICATIONS

Table 1. Specifications

Parameter	Test Conditions/Comments	Min	Typ	Max	Unit
SYSTEM DIGITAL OFFLOAD					
	ADSY1100-1Bxx		2x 100 GigE optical		
	ADSY1100-1Cxx		No optical		
ENVIRONMENTAL CLASS					
	ADSY1100-xx0x, intended for Lab Use		25		°C
	ADSY1100-xx1x, VITA 47 ECC1	0		55	°C
	ADSY1100-xx3x, VITA 47 ECC2	−40		+70	°C
TUNER PERSONALITY CARD					
Tx Channels			4		
Rx Channels			4		
Features and Frequency Range					
	ADSY1100-1xxA, 1st Nyquist digitizer	0.1		20	GHz
	ADSY1100-1xxB, 1st Nyquist digitizer	0.01		8.5	GHz
	ADSY1100-1xxD, passthru Tuner, 1st and/or 2nd Nyquist digitizer	TBD		TBD	GHz
	ADSY1100-1xxE, 1st and/or 2nd Nyquist digitizer	0.1		18	GHz
POWER SUPPLIES					
12_SYS			12		V
3V3_AUX			3.3		V
12_SYS Current			TBD		A
3V3_AUX Current			TBD		A

ABSOLUTE MAXIMUM RATINGS

Table 2. Absolute Maximum Rating

Parameter	Rating
Maximum Supply Voltage	TBD
Temperature	
Operating Range	
VITA 47, ECC1	0°C to 55°C
VITA 47, ECC3	−40°C to +70°C
Storage Range Maximum	
VITA 47, ECC1	−40°C to +70°C
VITA 47, ECC3	−50°C to +100°C

Stresses at or above those listed under Absolute Maximum Ratings may cause permanent damage to the product. This is a stress rating only; functional operation of the product at these or any other conditions above those indicated in the operational section of this specification is not implied. Operation beyond the maximum operating conditions for extended periods may affect product reliability.

ELECTROSTATIC DISCHARGE (ESD) RATINGS

The following ESD information is provided for handling of ESD-sensitive devices in an ESD-protected area only.

Human body model (HBM) per ANSI/ESDA/JEDEC JS-001.

ESD Ratings for ADSY1100

Table 3. ADSY1100, 3U VPX

ESD Model	Withstand Threshold (V)	Class
HBM	TBD	TBD

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

The ADSY1100 backplane IO is aligned with VITA 65.0 payload slot profile: Figure 2. P2A/B pinning is described in Table 4.

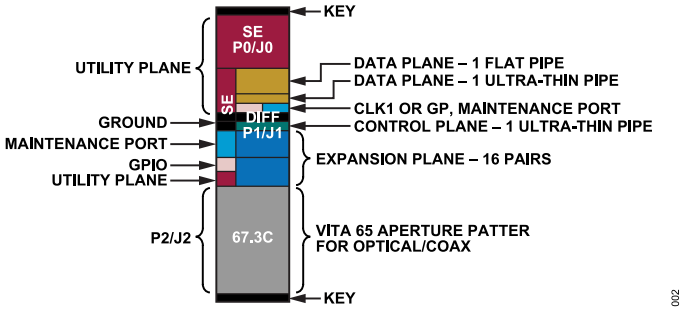

Figure 2. VITA 65.0 Payload Slot Profile SLT3-PAY-1F1U1S1S1U1U2F1H-14.6.11-12

Table 4. Pin Function Descriptions

Pin No.	Mnemonic	Type	Description
P2A-MT1	Optical A	Input Output	MT Ferrule A, 1x 100Gbps Optical Ethernet
P2A-B1	NIC	NIC	NIC
P2A-B2	NIC	NIC	NIC
P2A-B3	NIC	NIC	NIC
P2A-B4	NIC	NIC	NIC
P2A-C1	REF_N	Input	Reference Clock Input Negative, Matched to 50 Ω
P2A-C2	NIC	NIC	NIC
P2A-C3	NIC	NIC	NIC
P2A-C4	REF_P	Input	Reference Clock Input Positive, Matched to 50 Ω
P2A-D1	RX0	Input	Channel 0, RF Input, Matched to 50 Ω
P2A-D2	RX1	Input	Channel 1, RF Input, Matched to 50 Ω
P2A-D3	RX2	Input	Channel 2, RF Input, Matched to 50 Ω
P2A-D4	RX3	Input	Channel 3, RF Input, Matched to 50 Ω
P2B-MT1	Optical B	Input Output	MT Ferrule B, 1x 100Gbps Optical Ethernet
P2B-B1	NIC	NIC	NIC
P2B-B2	NIC	NIC	NIC
P2B-B3	NIC	NIC	NIC
P2B-B4	NIC	NIC	NIC
P2B-C1	SYNC_N	Input	SYNC Input Negative, Matched to 50 Ω
P2B-C2	NIC	NIC	NIC
P2B-C3	NIC	NIC	NIC
P2B-C4	SYNC_P	Input	SYNC Input Positive, Matched to 50 Ω
P2B-D1	TX0	Output	Channel 0, RF Output, Matched to 50 Ω
P2B-D2	TX1	Output	Channel 1, RF Output, Matched to 50 Ω
P2B-D3	TX2	Output	Channel 2, RF Output, Matched to 50 Ω
P2B-D4	TX3	Output	Channel 3, RF Output, Matched to 50 Ω

THEORY OF OPERATION

The ADSY1100 Digitizer Base Card houses the AD9084, Virtex™ UltraScale+™ FPGA and Zynq™ UltraScale+™ MPSoC, as well as optical transceivers, on-board memory, a power distribution network, clock conditioning and more. The P0 and P1 backplane connectors connect directly to the ADSY1100 Digitizer Base Card to provide a 12V power source, clock sources, auxiliary power, UART, JTAG, PCIe Gen3 data plane, 40 / 100Gb Ethernet data plane, 10 / 25Gb Ethernet data plane, 1Gb Ethernet SGMII control plane, Aurora expansion plane and more. An on-board phase-locked loop / synthesizer accepts a low-frequency reference clock and synthesizes two 20GHz low phase noise output signals used to serve as the sample clock for AD9084 and the Local Oscillator for some attached Tuner Personality Cards.

A family of Tuner Personality Cards mate to the ADSY1100 Digitizer Base Card to allow for optimized performance based on user case. Typical Tuner Personality Card functions include variable gain and attenuation, RF filtering, optional RF frequency conversion, and switched paths. Among these, the 0.01-8.5 GHz personality card employs a simple RF chain to operate in the 1st Nyquist. However, if a higher frequency range is needed, a 0.1-18GHz personality card implements a switchable filter bank to operate in the 1st and 2nd Nyquist. For a different high frequency option, a 0.1-20GHz personality card uses an integrated up-converter and down-converter to operate in the 1st Nyquist. Additionally, a Pass-thru personality card is available that omits the front-end signal chain and instead enables direct signal flow into the base card. Detected and synthesized signals arrive on the ADSY1100 Digitizer Base Card via RF / Microwave connectors which are delivered from the Tuner Personality Card.

Data is offloaded from the ADSY1100 Digitizer Base Card either by means of a 2x 100Gb Ethernet optical transceiver interface, which feeds P2A and P2B connectors, or by storing the digitized data to on-board memory and subsequently querying the memory from the SGMII interface.

OUTLINE DIMENSIONS

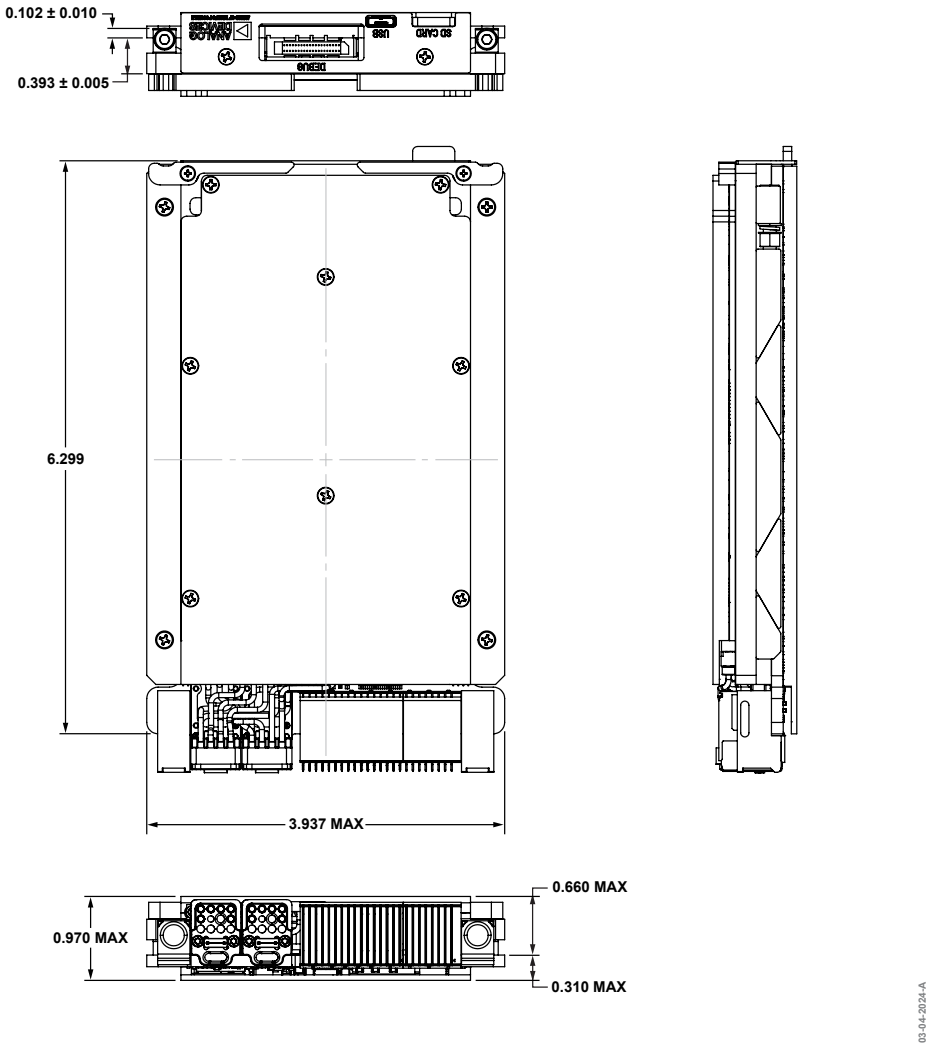

Figure 3. 40-Lead Module with Connector Interface [MODULE]
(ML-40-1)
Dimensions shown in inches

Table 5. Product Listing with Distinguishing Features

Model	System Digital Offload	Environmental Class	Tuner Personality Card
ADSY1100-1B0A	2x 100 GigE Optical	Intended for Lab Use	4Tx/4Rx, 0.1-20GHz, 1st Nyquist Digitizer
ADSY1100-1B0B	2x 100 GigE Optical	Intended for Lab Use	4Tx/4Rx, 0.01-8.5GHz, 1st Nyquist Digitizer
ADSY1100-1B0D	2x 100 GigE Optical	Intended for Lab Use	4Tx/4Rx, Passthru Tuner, 1st and/or 2nd Nyquist Digitizer
ADSY1100-1B0E	2x 100 GigE Optical	Intended for Lab Use	4Tx/4Rx, 0.1-18GHz, 1st and/or 2nd Nyquist Digitizer
ADSY1100-1B1A	2x 100 GigE Optical	Temperatures: VITA 47 ECC1	4Tx/4Rx, 0.1-20GHz, 1st Nyquist Digitizer
ADSY1100-1B1B	2x 100 GigE Optical	Temperatures: VITA 47 ECC1	4Tx/4Rx, 0.01-8.5GHz, 1st Nyquist Digitizer
ADSY1100-1B1D	2x 100 GigE Optical	Temperatures: VITA 47 ECC1	4Tx/4Rx, Passthru Tuner, 1st and/or 2nd Nyquist Digitizer
ADSY1100-1B1E	2x 100 GigE Optical	Temperatures: VITA 47 ECC1	4Tx/4Rx, 0.1-18GHz, 1st and/or 2nd Nyquist Digitizer
ADSY1100-1B3A	2x 100 GigE Optical	Temperatures: VITA 47 ECC3	4Tx/4Rx, 0.1-20GHz, 1st Nyquist Digitizer
ADSY1100-1B3B	2x 100 GigE Optical	Temperatures: VITA 47 ECC3	4Tx/4Rx, 0.01-8.5GHz, 1st Nyquist Digitizer
ADSY1100-1B3D	2x 100 GigE Optical	Temperatures: VITA 47 ECC3	4Tx/4Rx, Passthru Tuner, 1st and/or 2nd Nyquist Digitizer
ADSY1100-1B3E	2x 100 GigE Optical	Temperatures: VITA 47 ECC3	4Tx/4Rx, 0.1-18GHz, 1st and/or 2nd Nyquist Digitizer
ADSY1100-1C0A	No Optical	Intended for Lab Use	4Tx/4Rx, 0.1-20GHz, 1st Nyquist Digitizer

MODEL DESCRIPTIONS

Table 5. Product Listing with Distinguishing Features (Continued)

Model	System Digital Offload	Environmental Class	Tuner Personality Card
ADSY1100-1C0B	No Optical	Intended for Lab Use	4Tx/4Rx, 0.01-8.5GHz, 1st Nyquist Digitizer
ADSY1100-1C0D	No Optical	Intended for Lab Use	4Tx/4Rx, Passthru Tuner, 1st and/or 2nd Nyquist Digitizer
ADSY1100-1C0E	No Optical	Intended for Lab Use	4Tx/4Rx, 0.1-18GHz, 1st and/or 2nd Nyquist Digitizer
ADSY1100-1C1A	No Optical	Temperatures: VITA 47 ECC1	4Tx/4Rx, 0.1-20GHz, 1st Nyquist Digitizer
ADSY1100-1C1B	No Optical	Temperatures: VITA 47 ECC1	4Tx/4Rx, 0.01-8.5GHz, 1st Nyquist Digitizer
ADSY1100-1C1D	No Optical	Temperatures: VITA 47 ECC1	4Tx/4Rx, Passthru Tuner, 1st and/or 2nd Nyquist Digitizer
ADSY1100-1C1E	No Optical	Temperatures: VITA 47 ECC1	4Tx/4Rx, 0.1-18GHz, 1st and/or 2nd Nyquist Digitizer
ADSY1100-1C3A	No Optical	Temperatures: VITA 47 ECC3	4Tx/4Rx, 0.1-20GHz, 1st Nyquist Digitizer
ADSY1100-1C3B	No Optical	Temperatures: VITA 47 ECC3	4Tx/4Rx, 0.01-8.5GHz, 1st Nyquist Digitizer
ADSY1100-1C3D	No Optical	Temperatures: VITA 47 ECC3	4Tx/4Rx, Passthru Tuner, 1st and/or 2nd Nyquist Digitizer
ADSY1100-1C3E	No Optical	Temperatures: VITA 47 ECC3	4Tx/4Rx, 0.1-18GHz, 1st and/or 2nd Nyquist Digitizer