

DRF4380L

Small Form Factor 4-Channel A/D and D/A Board
based on the AMD Versal™ RF

Complete Small Form Factor Module

- High-bandwidth data streaming
- Waveform signal generator
- Communication receiver and transmitter
- Electronic Warfare transponder
- Analog I/O for digital recording and playback
- Sensor interfaces



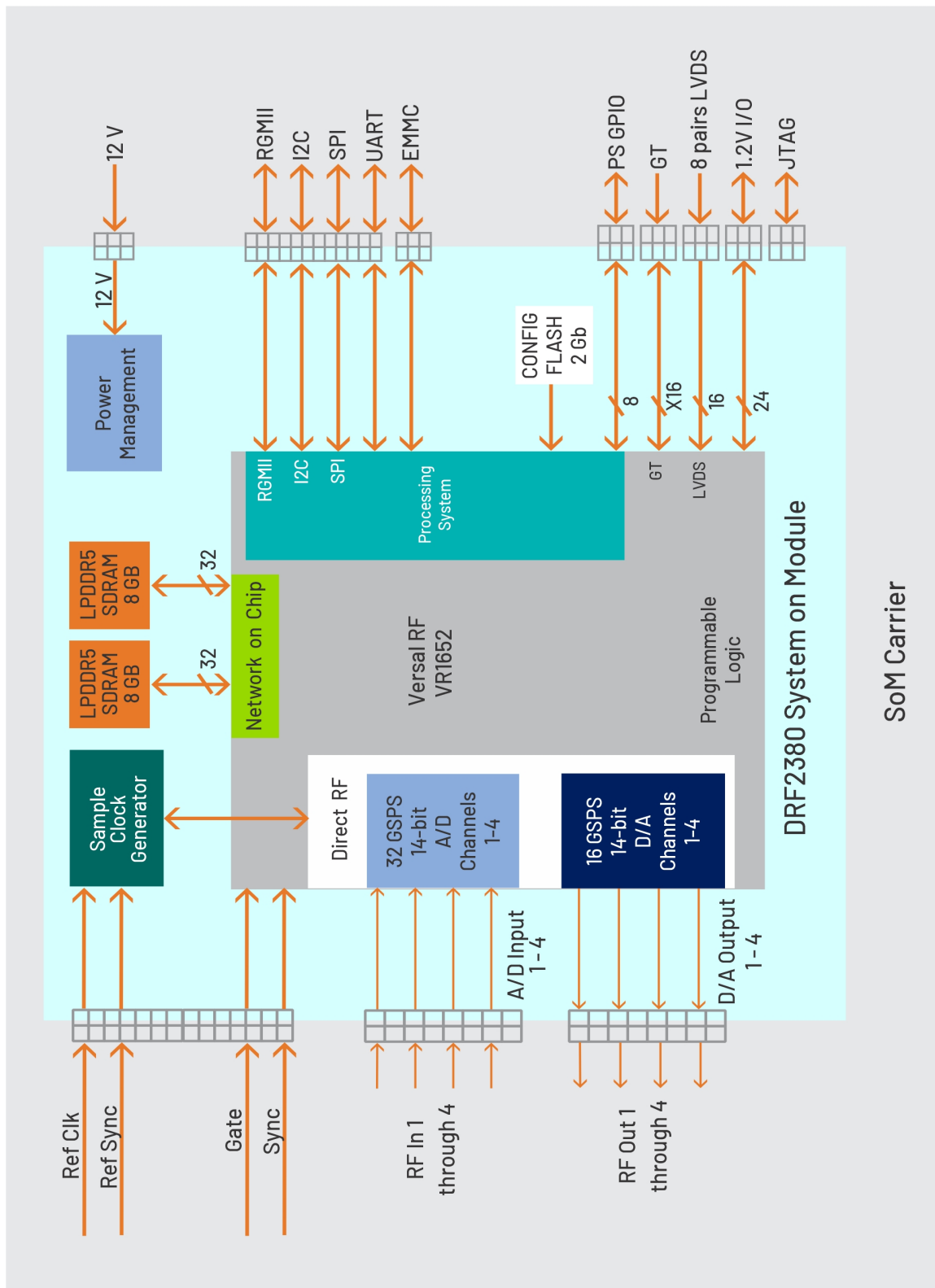
The DRF4380L is a high-performance, Small Form Factor board based on the Versal RF VR1652. Four 32 GSPS A/D and four 16 GSPS D/A converters are integrated into the VR1652's multiprocessor architecture, creating a multichannel data conversion and processing solution on a single chip. The DRF4380L brings Versal RF performance to a range of environments that can't be satisfied with traditional board/chassis deployment.

Complementing the Versal RF on-chip resources are the DRF4380L's sophisticated clocking section for multichannel and multiboard synchronization, a modular front end for RF input and output, 16 GBytes of LPDDR5, a gigabit serial optical interface capable of supporting quad 100 GigE connections and general-purpose serial and parallel signal paths to the FPGA.

FEATURES

- Small Form Factor Module that can be conduction-cooled or air-cooled with an optional fan
- Incorporates AMD Versal RF VR1652
- 16 GB of LPDDR5 SDRAM
- 1 GigE Interface
- Four 100 GigE UDP interfaces
- Ruggedized and conduction-cooled
- Unique system-on-module design enables migration to other form factors
- Navigator MX Board Support Package (BSP) for software development
- Navigator MX FPGA Design Kit (FDK) for custom IP development

DRF4380L BLOCK DIAGRAM



BOARD ARCHITECTURE

The DRF4380L board design places the AMD Versal™ RF as the cornerstone of the architecture. All control and data paths are accessible by the programmable logic and processing system. A full suite of Mercury-developed IP and software functions utilize this architecture to provide data capture, waveform generation, and interface solutions for many of the most common application requirements.

A/D CONVERTER STAGE

The DRF4380L accepts analog RF inputs on four coax connectors. These inputs are transformer-coupled into the Versal RF's analog interface. Inside the Versal RF, the analog signals are routed to four 32 GSPS, 14-bit A/D converters.

The A/D digital outputs are delivered into the programmable logic and processor system for signal processing, data capture or for routing to other resources.

D/A CONVERTER STAGE

The Versal RF's four D/A converters accept baseband real or complex data streams from the FPGA's programmable logic. The analog output of each of the 16 GSPS, 14-bit D/As is transformer-coupled to a coax connection.

CLOCKING AND SYNCHRONIZATION

The DRF4380L's Timing Bus Circuit can generate all required clocking needed to operate all features of the board. In addition it can receive a 10 to 100 MHz reference clock from either an on-board synthesizer, a front panel coax connector or from the multi-signal sync bus connector. The Timing Bus Circuit includes a jitter cleaner and provides the reference clock and sync signals to the Clock Generator. A multifunction gate/trigger input is also available on a front panel coax connector for external control of data acquisition and playback. For larger systems requiring multiboard synchronization, a multisignal sync bus interface is provided on the sync bus connector. These signals include the reference clock and all required complementary timing signals to provide synchronization across multiple modules.

MEMORY RESOURCES

The DRF4380L architecture supports 2 8 GBytes banks of LPDDR5 SDRAM memory accessible from the Programmable Logic. User installed IP, together with the Mercury-supplied LPDDR5 controller core within the FPGA, can take advantage of the memory for custom applications. This memory is also

available to the Dual-core ARM Cortex-A72 processor as program memory and storage.

1 GIGE INTERFACE

The DRF4380L includes 1 GigE interface for control and data transfers. This interface is independent of the optical 100 GigE interfaces. The 1 GigE interface provides a direct connection to the ARM processor.

FLEXIBLE MODULAR DESIGN

While the DRF4380L is a Small Form Factor module, the unique modular design of the DRF2380 System on Module (SoM) provides the flexibility to deploy this solution in many different situations. The DRF2380 SoM contains all of the key components including the Versal RF, LPDDR5 SDRAM, and power and clock management.

In the case of the DRF4380L, the SoM is mounted on a Small Form Factor carrier which complements the design with a timing bus circuit, analog signal conditioning, and a 16x 25 Gbps optical transceiver. As a module and carrier board set, the DRF4380L becomes a complete, ready-to-deploy module that can be conduction- or air-cooled with an optional fan.

The DRF2380 can also be mounted on other carriers available from Mercury to support standard form factors; or for applications that require a non-standard footprint, Mercury supports the module with the Mercury Model 4808 Custom Carrier Design Kit for the DRF2380 SoM, which enables users to engineer and build a custom carrier. As a complete and tested module, the DRF2380 encapsulates best-in-class electrical and mechanical design, eliminating some of the most challenging aspects of embedded circuit design and allowing the user to focus on the application-specific carrier design.

EXTENDABLE IP DESIGN

For applications that require specialized functions, users can install their own custom IP for data processing. Mercury's Navigator MX FPGA Design Kit (FDK) includes the board's entire FPGA design that can be edited in AMD's Vivado Design Suite. For all supplied IP, all source code and complete IP core documentation is included. Developers can integrate their own IP along with the factory-installed functions or use Mercury's Navigator MX Design Suite to completely replace the IP provided by Mercury with their own. The suite consists of the Navigator MX FPGA Design Kit (FDK) and Navigator MX Board Support Package (BSP).

EXPANDABLE I/O

The DRF4380L supports 16 25 Gb/sec full duplex lanes to 4 QSFP28 sites for optical transceivers. With the built-in quad 100 GigE UDP interface or installation of a user-provided serial protocol, this optical interface enables a high-speed gigabit data streaming path between boards.

SPECIFICATIONS**Field Programmable Gate Array**

Type: AMD Versal RF VR1652

Agilex 9 RF Signal Chain

Analog Inputs

- Quantity: 4
- Connector: SMPM
- Input Type: Transformer-coupled

A/D Converters

- Quantity: 4
- Sampling Rate: 32 GSPS
- Resolution: 14 bits

Analog Outputs

- Quantity: 4
- Connector: SMPM
- Output Type: Transformer-coupled

D/A Converters

- Quantity: 4
- Sampling Rate: 16 GSPS
- Resolution: 14 bits

Reference Clock

- Source: Switchable between on-board synthesizer, external source, sync bus (used for multiboard sync)
- Connector Type: MMCX

Gate/Trigger

- Source: Programmable through software or external source
- Connector Type: MMCX
- Level: LVCMOS

Hard Processing System

ARM Cortex-A72:

- Quantity: 2

ARM Cortex-R5:

- Quantity: 2

Processor I/O:

- Interface: 1 GigE
- Location: Front panel
- Connector: RJ45

FPGA I/O

Parallel: 8 pairs of LVDS inputs, 24 single-ended 1.2V I/Os

Interface: Optical

- Quantity: 4 full duplex 4-lane interfaces
- Connector: QSFP28
- Speed: 25 Gb/sec
- Laser: 850 nm (standard multimode fiber, alternate QSFP28 interfaces may be installed)
- Protocol: Factory-installed quad 100 GigE UDP IP cores provide greater than 48 GB/sec data transfers. Other protocols are supported with user installed IP.

JTAG

Location: Front panel

Memory

- Type: LPDDR5 SDRAM
- Quantity: 2 banks
- Size: (each bank) 8 GB; 32-bit

FPGA Configuration FLASH:

- Type: QSPI NOR Flash
- Size: 2 x 1 Gbit

Physical

Dimensions:

- Depth: 162 mm (6.4 in)
- Height: 43 mm (1.7 in)
- Width: 162 mm (6.4 in)

Weight:

- With fan assembly: 6.40 lbs.
- Without fan assembly: 4.30 lbs.

ORDERING INFORMATION

Model	Description
DRF4380L	Small Form Factor 4-Channel A/D and D/A Board with AMD Versal RF

Model	Description
4831.02	Navigator MX FPGA Design Kit for DRF4380L
4834.02	Navigator MX Board Support Package for DRF4380L



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