mercury systems™

DATASHEET

*Ensemble*Series™ DCM6112

Configurable, low-latency, coherent 6U OpenVPX Rx/Tx module

- **Designed for System Security Engineering (SSE)**
- **Multi-channel, highly configurable Rx/Tx module**
- **Coherent and spectrally pure for EW applications**
- **Kintex® UltraScale™ FPGA processing power**
- **Low-latency ADC and DAC performance**
- **Multi-channel/Multi-card synchronization**
- **Built-in IPMI controller**

Mercury's EnsembleSeries™ DCM6112 is a versatile OpenVPX FPGA-based, Rx/Tx module designed for agile system integration and optimized to support system security engineering (SSE). This digital transceiver/processor includes Kintex® UltraScale™ FPGA processing power, low-latency ADC/DAC performance and is ideal for operating in harsh environments. For a complete EW solution, the DCM6112 can be integrated with Mercury's ultra-wideband microwave transceivers; such as the RFM3101.

Mercury's BuiltSECURE™ technology was developed to counter nation-state reverse engineering using advanced SSE principles. BuiltSECURE is built-in SSE that enables turn-key or personalized security solutions to be quickly configured. The extensive nature of Mercury's BuiltSECURE SSE delivers system-wide security that evolves over time, enabling future-proofing of your current investment. As countermeasures are developed to offset the emerging threats of tomorrow, Mercury's security framework keeps pace, maintaining system-wide integrity.

Built*SECURE*™

Specifications

OpenVPX Packaging
OpenVPX (VITA 65) encompasses: VITA 46.0, 46.3, 46.4, 46.6, 46.11 and VITA 48.1, 48.2 (REDI)

Data Planes
PCIe
VITA 49.1

Backplane Interface
VITA 65.0 SLT6-PAY-4F1Q2U2T-10.2.1 Slot Profile

Processor
Kintelx Ultrascale KU115 FPGA
16,560 DSP slices
PCIe Gen3 x8 to P1
MGT x8 to P1

Memory
16 GB DDR4 (512M x 16)
36 MB QDR4 (4M x36)

ADC
4 12-bit ADCs up to 3.2 GSPS

DAC
4 12-bit DACs up to 3.2 GSPS

Configurable Options
Front I/O or Vita 76 rear I/O
Air-cooled or Conduction-cooled

Security
System Security Engineering Ready

Other
Integrated IPMI controller
Manufactured in an AS9100D facility

www.mrcy.com

Mercury Systems is a leading commercial provider of secure sensor and safety-critical processing subsystems. Optimized for customer and mission success, Mercury's solutions power a wide variety of critical defense and intelligence programs.
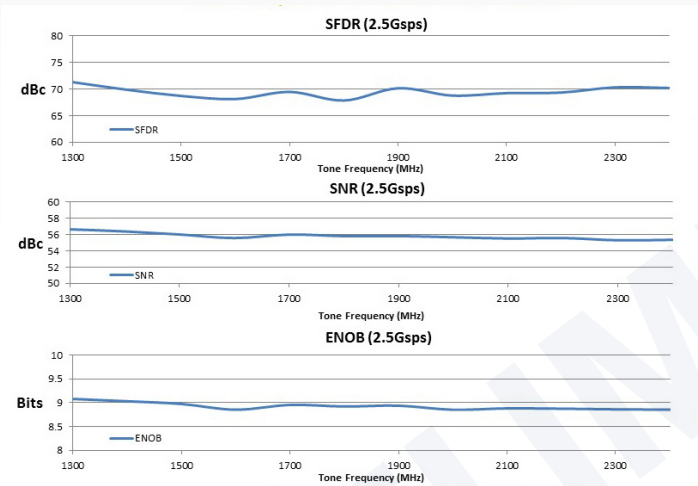
ACQUIRE DIGITIZE PROCESS STORAGE EXPLOIT DISSEMINATE
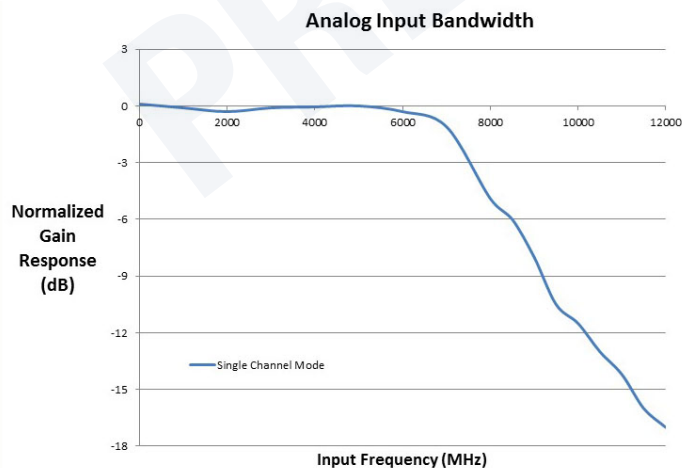
Low-latency ADC/DAC Performance

Mercury's low-latency ADC/DAC products are developed to support EW applications that require real-time IF digitization and processing in harsh environments. Four 12-bit ADC channels offer individual sampling rates up to 3.2 GSPS. On the transmit side, four 12-bit, LVDS based DACs can operate up to 3.2 GSPS. Each of these DACs have convenient, user-selectable output modes to provide multi-nyquist signal projection.

Optimized for EW systems, these highly configurable Rx/Tx modules deliver excellent spectral purity and efficiency, coherent multi-channel functionality and exceptional LPOI (low probably of intercept) signal detection capability. The customizable architecture can support a variety of applications including DRFM systems, beamforming, and SIGINT.
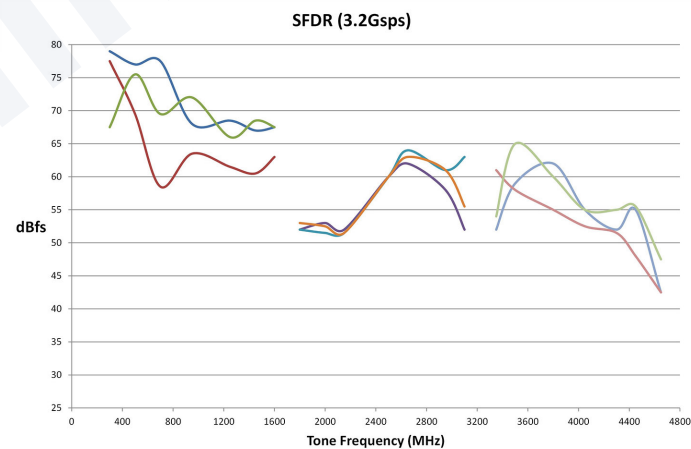
Advanced FPGA Functionality

Each digitized stream is passed down to Xilinx Kintex UltraScale KU115 FPGAs, each with 4GB of external DDR4 memory with an additional 18MB of QDR4 SRAM. Behind these FMC-site ingesting KU115 FPGAs lies a third Xilinx Kintex UltraScale KU115 FPGA with 8GB of external DDR4 memory along with a Xilinx Zynq UltrScale+ ZU9EG with 2GB of external DDR4 memory; offering further data processing and control prowess.

Mercury's digital Rx/Tx modules are built around our EchoCore® FPGA IP to provide basic infrastructure functionality right out of the box. EchoCore IP allows customers to focus on their application while building upon the groundwork provided.

Mercury uses a simple AXI4-Stream interface for the data plane with AXI4-Stream switches for routing data within the FPGA and to external interfaces, such as PCIe. Our customers can choose their tool of choice, such as parameterizable Xilinx IPs, HLS, or RTL to generate signal processing algorithms. The cores are then instantiated into a reserved user block and compiled into the FPGAs.

Preliminary ADC Performance @ 2.5GSPS

Preliminary ADC Analog Input Bandwidth

Preliminary DAC SFDR Performance @ 3.2GSPS

Micro DB9

System MGT RS232

Front Panel RS232

10/100/1000Base T

RJ45 Front Panel

2GB DDR4 SDRAM Memory

NOR FLASH

Power Conversion

12V

Ethernet Switch

SEQ/CTRL

SGMII Control Plane

SGMII Control Plane

1000 BaseT Control Plane

Zynq RGMII Control Plane

SPI CONFIG BUS

UMP3 System Management Smart Fusion

I2C Management Plane

P0

32 Data

JTAG

18MB QDR4 SRAM Memory

4GB DDR4 SDRAM Memory

"Local Control Bus"

Zynq Ultrascale+ ZU9EG

LPC Bus

Data Plane

P1

4 MGTs

4 MGTs

4 MGTs

36 Data 36 Data

64 Data

Pro1 GPIO 24 pairs

Pro1toGov 20 SE I/O

"Local Control Bus"

24 MGTs

Prosecutor 1 FPGA XCKU115

4 MGTs
8 MGTs
12 MGTs

12 MGTs

4 MGTs

12 MGTs

4 MGTs
4 MGTs
4 MGTs
4 MGTs

Expansion Plane

P2

ZYNQ RS232
IPMI RS232
Pro1 GPIO 8 Pairs
Pro2 GPIO 8 Pairs

P3

FMC+ Connector

110 LVDS pairs

4x40 Seam

24 LVDS Pairs

16Gb/s 12 Lanes

Pro1toGov 20 SE I/O

"Local Control Bus"

Governor Kintex Ultrascale XCKU115

GPIO 12 Pairs

SGMII Control Plane
SGMII Control Plane
1000 BaseT Control Plane

P4

4x40 Seam

110 LVDS pairs

Pro2toGov 20 SE I/O

12 MGTs

12 MGTs

8 MGTs

GPIO 12 Pairs

FMC+ Connector

12 MGTs

Prosecutor 2 FPGA XCKU115

4 MGTs
8 MGTs
12 MGTs

24 MGTs

64 Data

64 Data

Expansion Plane

P5

36 Data 36 Data

64 Data

Pro2 GPIO 24 pairs

Pro2toGov 20 SE I/O

"Local Control Bus"

4GB DDR4 SDRAM Memory

4GB DDR4 SDRAM Memory

Pro1 GPIO 16 Pairs

P6

18MB QDR4 SRAM Memory

4GB DDR4 SDRAM Memory

Pro2 GPIO 16 Pairs

DCM6112

Analog In 1

Analog In 2

ADC
ADC

2x 12-bits </= 3.2GSPS

FMC+ Connector

Analog Out 1

Analog Out 2

DAC
DAC

2x 12-bits </= 3.2GSPS

4x40 Seam

Reference Clock

SYNC IN

SYNC OUT

Clock/Sync Logic

LVDS

Analog In 3

Analog In 4

ADC
ADC

2x 12-bits </= 3.2GSPS

4x40 Seam

Analog Out 3

Analog Out 4

DAC
DAC

2x 12-bits </= 3.2GSPS

FMC+ Connector

DCM6112 functional block diagram

Environmental

		VITA - Standard Product Environmental Qualification Levels			
		Air-cooled	Conduction-cooled	Air Flow-By	Liquid Flow-By
Rugged Level		Rugged L1*	Rugged L3**	Rugged L4*	Rugged L7***
Temperature	Operating	-25ºC to +55ºC (at air intake)	-40ºC to +71ºC (at module edge)	-40ºC to +55ºC (at air intake)	-40ºC to +71ºC
	Storage	-55ºC to +85ºC	-55ºC to +125ºC	-55ºC to +125ºC	-55ºC to +125ºC
	Max Rate of Change	5ºC/min	10ºC/min	10ºC/min	10ºC/min
Humidity	Operating*	5-95%, non-condensing	5-95%, non-condensing	5-95%, non-condensing	5-95%, 100% condensing
	Storage	5-95%, non-condensing	100% condensing	100% condensing	5-95%, non-condensing
Altitude	Operating*	0-30,000ft	0-70,000ft	0-70,000ft	0-70,000ft
	Storage	0-50,000ft	0-70,000ft	0-70,000ft	0-70,000ft
Vibration	Random	0.04 g2/Hz; 20-2000 Hz, 1 hr/axis	0.1 g2/Hz; 5-2000 Hz, 1 hr/axis	0.1 g2/Hz; 5-2000 Hz, 1 hr/axis	0.1 g2/Hz; 5-2000 Hz, 1 hr/axis
	Sine	N/A	10G peak; 5-2000 Hz, 1 hr/axis	10G peak; 5-2000 Hz, 1 hr/axis	10G peak; 5-2000 Hz, 1 hr/axis
	Shock	z-axis: 50g; x and y-axes: 80g; (11ms, 1/2-sine pulse, 3 positive, 3 negative)			
Salt/Fog		Contact Factory	10% NaCl		
VITA 47		Contact Factory			

* Customer must maintain required cfm level. Consult factory for the required flow rates.

** Card edge should be maintained below 71ºC

*** Dependant upon flow rate and coolant

Storage Temperature is defined per MIL-STD-810F, Method 502.4, para 4.5.2, where the product under non-operational test is brought to an initial high temperature cycle to remove moisture. Then the unit under non-operational test will be brought to the low storage temperature. The low temperature test is maintained for 2 hours. The product is then brought to the high storage temperature and is maintained for 2 hours. The product is then brought back to ambient temperature. All temperature transitions are at a maximum rate of 10ºC/min. One cold/hot cycle constitutes the complete non-operational storage temperature test. This assumes that the board level products are individually packaged in accordance with ASTM-D-3951 approved storage containers. These tests are not performed in Mercury shipping containers, but in an unrestrained condition. Please consult the factory if you would like additional test details.

All products manufactured by Mercury meet elements of the following specifications: MIL-STD-454, MIL-STD-883, MIL-HDBK-217F, and MIL-I-46058 or IPC-CC-830, and various IPC standards. Mercury's inspection system has been certified in accordance with MIL-I-45208A.

5034.00E-0618-ds-DCM6112

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