



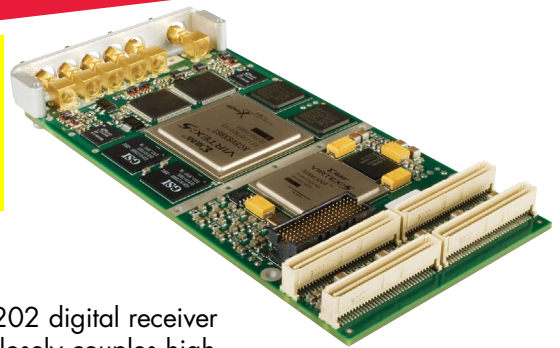
# XMC-E2202

## Quad Channel 160 MSPS

### Digital Receiver XMC/PMC

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#### Applications

- ◆ Software Radio
- ◆ Signal Intelligence
- ◆ Spectral Analysis
- ◆ RADAR

#### Features

- ◆ 2 or 4 Channels of 160 MSPS, 16-bit analog to digital conversion
- ◆ Xilinx® Virtex®-5 SX95T FPGA (user programmable)
- ◆ Firmware Development Kit (FDK)
- ◆ Two banks of 36Mbit ZBT RAM memory
- ◆ Capable of multi-board synchronization
- ◆ Front panel and/or User I/O triggering
- ◆ Comprehensive Built-In-Test (BIT)
- ◆ XMC/PMC form factor
- ◆ Rugged versions
- ◆ Windows®, VxWorks® and Linux® driver support

#### Benefits

- ◆ Combined acquisition and data processing
- ◆ Lower power solution
- ◆ Industry standard form factor
- ◆ PCI Express® provides high throughput to baseboard

#### Overview

The XMC-E2202 digital receiver PMC/XMC closely couples high-resolution analog to digital converters (ADCs) with a large capacity Xilinx Virtex-5 FPGA to deliver an extremely flexible solution to digital receiver requirements in software radio, signal intelligence and RADAR applications that need high dynamic ranges and sophisticated signal processing.

The XMC-E2202 uses two or four ADCs with 16-bit resolution to provide outstanding performance in signal to noise (SNR) and spurious free dynamic range (SFDR). Analog to digital conversion rates of up to 160 MSPS allow for direct sampling of the most popular IF frequencies for RADAR systems and the capture of instantaneous bandwidths greater than 60MHz: an important feature for communication applications. In addition, the high input bandwidth on each channel allows frequencies up to 350MHz to be digitized without the need for external down-conversion circuits.

The XMC/PMC-E2202 can be used either as a PCI-X (64-bit, 133MHz) PMC board, or an XMC providing either 4x or 8x PCI Express (PCIe).

#### Analog Input

Two or four analog inputs are supported through front panel SMC connectors. Each input is AC coupled via suitable transformers and has an impedance of 50Ω. Analog input bandwidth exceeds 350MHz allowing under-sampling of the input signals. No anti-aliasing filters are fitted. Advice about suitable external filtering to limit the input signal bandwidth to the user's requirements may be obtained from Curtiss-Wright's technical support engineers.

#### Learn More

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## Clock Input

The XMC/PMC-E2202 can be ordered with an internal clock source. Alternatively, a high-quality, stable external clock source from 1 to 160MHz can be input from the front panel SMC connector. This input has a 50Ω impedance.

## A/D Converters

The XMC/PMC-E2202 provides two or four Linear Technologies LTC2209 16-bit analog to digital converters sampling at clock rates of up to 160 MSPS. The board has been designed to support independent operation of the acquisition channels from collection right through to the host interface (PCI-X or PCIe).

The ADCs run continuously, removing the settling time problems and noise associated with switching ADCs on and off. Gating of the sample data is controlled by the trigger input.

## Trigger Signal

The front panel SMC connector will accept TTL level trigger signals. Alternatively, an external trigger may be provided across the PMC user I/O connector, P14. In this case, the user programmable FPGA will need to be configured to accept this input.

## Built-In-Test

The analog subsystem includes two or four AD9744 14-bit, 160MHz digital to analog converters (DACs). These DACs allow full testing of the input subsystem by allowing a digital test pattern to be converted to analog and looped back into the ADC input. Using test data containing a number of known tones spread over the full dynamic range and selectively filtering the tones, input integrity can be verified.

## FPGA

A Xilinx Virtex-5 SX95T FPGA provides the user-definable signal processing resource. Two banks of 36Mbit ZBT RAM are directly interfaced with the FPGA to support signal processing operations with high-speed interim storage. More than 90% of the Virtex-5 resource is available for user/application specific digital receiver and DSP algorithms.

The XMC version of the board routes 8x PCIe directly from the DSP FPGA to the P15 XMC connector forming a high-speed data path with off-board bandwidth up to 2GB/s. The PMC version primary data path is through the command and control FPGA and on to a PCI-X (64-bit, 133MHz) interface to the host.

## Development Support

The XMC/PMC-E2202 has device driver support for VxWorks, Linux and Windows XP. The driver support includes a broad function application programming interface (API) in C. The package also includes examples and utilities to capture data, run BIT and display information about the board.

A FDK is available that provides HDL source code for the hardware interfacing modules (such as the ADCs, BiFIFOs and Local Bus to the command and control Xilinx FPGA). The kit allows the user to develop proprietary algorithms using third-party tools and/or incorporate off-the shelf IP for DDCs and DSP algorithms in the form of IP cores.

### Example IP Core: Wideband DDC

Curtiss-Wright can deliver a Wideband Digital Down Converter (DDC) providing similar functionality to the TI GC1012B in a Xilinx® Virtex®-5 SX95T. It is available pre-configured for the XMC/PMC-E2202.

The core permits scaling of the input signal by up to 72dB with a granularity of 0.03dB. The NCO has a 32-bit accumulator and 21-bit output to the mixer delivering 120dB SFDR. The FIR Filter decimates and filters the complex output of the Mixer, supporting decimation rates of 2, 4, 8, 16, 32 and 64.

The pre-programmed filter sets can be reprogrammed at runtime, filter sets other than the set in use can be updated at runtime without disturbing the operation of the filter.

For complete specifications of this IP core, please consult the DDC001 datasheet.

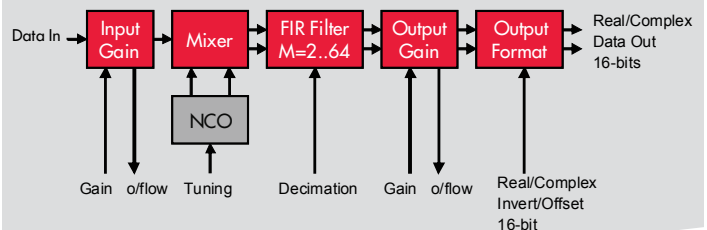




Figure 2: XMC-E2202 Block Diagram

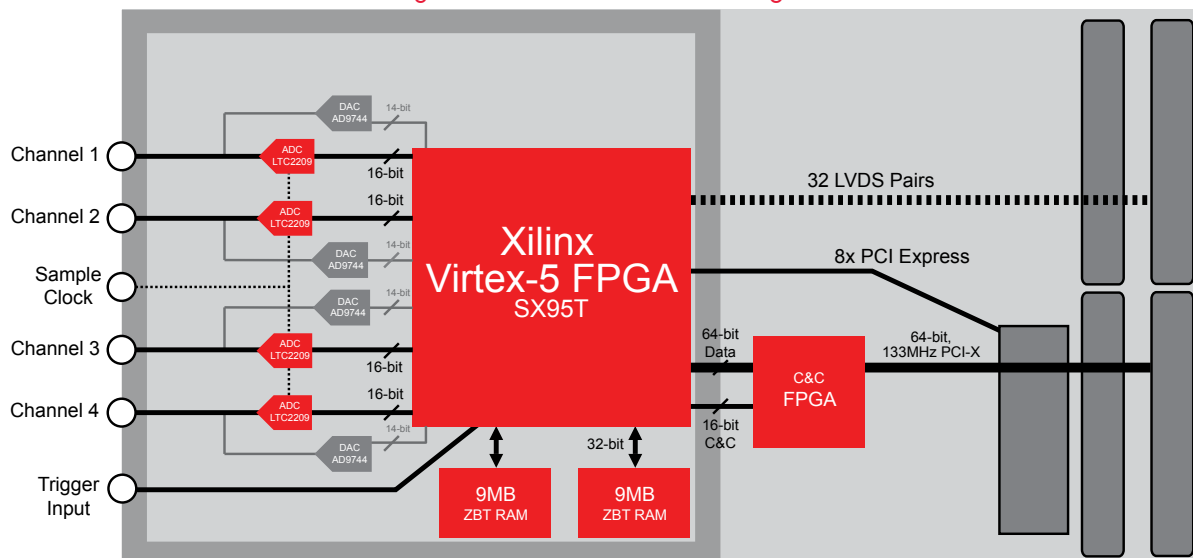


Table 1: Specifications

FPGA	
Device	Xilinx Virtex-5 SX95T (speed grade 2)
C&C FPGA	Xilinx Virtex-5 LX30T
ZBT RAM	2 banks of 36Mbit (9MB)
Analog Input	
ADC Device	Linear Technology LTC2209
Number of Channels	2 or 4 single-ended; synchronous
Sampling Frequency	Up to 160 MSPS
Resolution	16-bits
Input Bandwidth	> 700MHz (all channels)
Analog Input Power	+6 dBm (+14dBm Max)
Input Impedance	50 Ohm, AC coupled
SNR (device)	74 dBFS (140MHz, 1.5V range)
SINAD (device)	72 dBFS (140MHz, 1.5V range)
SFDR (device)	88 dBc (140MHz, 1.5V range)
ENOB (device)	16-bits
THD (device)	> 82 dB
Clock & Trigger Inputs	
External	Front panel SMC
Input Level (Max)	6 dBm
Sample Frequency Range	1 to 160 MSPS
Input Impedance	50 Ohm, AC coupled
Trigger Input/Output	TTL Single-ended, 10k Ohm impedance

PCI	
PCI Compliance	32/64-bit PCI 33/66MHz, PCI-X 66/100/133MHz, Master/slave/DMA, Interrupt support
PMC User I/O	32 LVDS signals (8 per bank). 2.5V signaling
XMC	
XMC P15	8x PCI Express
XMC P16	Not Fitted
Software/HDL Code	
Host Drivers	Windows, VxWorks 6.x, Linux
FDK	Analog input, memory interfaces, local bus
Miscellaneous	
Typical Power Consumption	25W

Table 2: Ordering Information

XMC-E2202-CT0200zz (XMC/PMC variant)		
PMC-E2202-CT0200zz (PMC only variant)		
Part Number	Description	
C	Cooling - Air- or Conduction-cooled (A/C)	
T	Temperature Range	0 = L0
		1 = L100
		2 = L200 (contact factory)
02	# Input Channels	
00	# Output Channels	
zz	Product Specific Variants	



**Table 3: Specifications**

Part number extension		Air-cooled			Conduction-cooled	
		Level 0	Level 100	Level 200 (Note 6)	Level 100	Level 200
Temperature	Operational (Air-cooled Note 4) (Conduction-cooled Note 7)	0°C to +50°C	-40°C to +71°C	-40°C to +85°C	-40°C to +71°C	-40°C to +85°C
	Non-operational (storage)	-40°C to +85°C	-55°C to +125°C	-55°C to +125°C	-55°C to +125°C	-55°C to +125°C
Vibration	Sine (Note 1)	2g peak 15-2k Hz	10g peak 15-2k Hz	10g peak 15-2k Hz	10g peak 15-2k Hz	10g peak 15-2k Hz
	Random (Note 2)	0.01g2/Hz 15-2k Hz	0.04g2/Hz 15-2k Hz	0.04g2/Hz 15-2k Hz	0.1g2/Hz 15-2k Hz	0.1g2/Hz 15-2k Hz
Shock (Note 3)	Operational	20g peak	30g peak	30g peak	40g peak	40g peak
Humidity	Operational	0-95% non-condensing	0-100% non-condensing	0-100% non-condensing	0-100% non-condensing	0-100% non-condensing
	Non-operational (storage)	0-95% non-condensing	0-100% condensing	0-100% condensing	0-100% condensing	0-100% condensing
Conformal Coat (Note 5)		No	Yes	Yes	Yes	Yes

**Notes:**

1. Sine vibration based on a sine sweep duration of 10 minutes per axis in each of three mutually perpendicular axes. May be displacement limited from 15 to 44Hz, depending on specific test equipment.
2. Random vibration 60 minutes per axis, in each of three mutually perpendicular axes.
3. Three hits in each axis, both directions, 1/2 sine and saw tooth. Total 36 hits.
4. Standard air-flow is 8 cfm at sea level. Some higher-powered products may require additional airflow. Consult the factory for details.
5. Conformal coating type is manufacturing site specific. Consult the factory for details.
6. This is a non-standard product. Consult factory for availability.
7. Temperature is measured at the card edge.

**Warranty**

This product has a one year warranty.

**Contact Information**

To find your appropriate sales representative, please visit:

Website: [www.cwembedded.com/sales](http://www.cwembedded.com/sales)

Email: [sales@cwembedded.com](mailto:sales@cwembedded.com)

For technical support, please visit:

Website: [www.cwembedded.com/support1](http://www.cwembedded.com/support1)

Email: [support1@cwembedded.com](mailto:support1@cwembedded.com)

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