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# ICS-1650

## PCI Express x4 High-Speed 4-Channel ADC with User-Programmable Virtex-5 FPGA

### Features

- 4-Ch, 250 MHz 12-bit ADC
- Transformer-coupled inputs
- 50 ohm input impedance
- Xilinx Virtex-5 SX95T user-programmable FPGA
- 62 dB SNR, 76 dB SFDR
- PCIe x4 interface, 1.25 GByte/s
- QDR II SRAM 16 MBytes
- Hardware Development Kit (HDK) included
- Microsoft® Windows® and Linux® Software Development Kits

The ICS-1650 is a high-speed data acquisition and DSP engine intended for PCI Express based desktop PCs and servers deployed in signal intelligence, radar, medical imaging, and aerospace applications.

For some time, server class PCs have provided exceptional processing power at very reasonable price points, but data I/O was limited by PCI bus bottlenecks. The widespread adoption of PCI Express high-speed serial connections has doubled or quadrupled data I/O capabilities of PCs.

The ICS-1650 provides data acquisition and DSP capabilities designed to match the bandwidth increases provided by PCI Express and the processing capabilities of multi-core CPUs. This card features four 250 MHz 12-bit analog input channels. Higher channel count systems can be assembled by synchronizing up to four cards together. These ADC inputs allow the host PC to be interfaced to a wide variety of communications, radar, and imaging equipment.

The four-lane PCI Express interface provides up to 1.25 GByte/s net payload data rate. This is sufficient to allow continuous data acquisition at sample rates exceed-

ing 200 MHz on all four channels, but still provides mechanical compatibility with small form factor mother boards. This is important for users of micro ATX systems, which usually do not provide x8 or wider auxiliary PCIe slots.

In addition to class leading data acquisition capability, the ICS-1650 also provides a user-programmable Xilinx Virtex-5 FPGA (SX95T) for signal processing. A second Virtex-5 is used for control, thus leaving the first almost entirely free for the implementation of application code.

A Hardware Development Kit (HDK) is supplied with the board at no additional charge to support customer DSP development for the signal processing FPGA based on the Xilinx ISE tool set.

The control FPGA is a Xilinx Virtex-5 LX50T device. As shipped from the factory, this FPGA contains the PCI Express interface, the logic used for QDR SRAM control, and the register map and control logic.

Software Development Kits are available for Windows and Linux operating systems.



# ICS-1650 – PCI Express x4 High-Speed 4-Channel ADC

## Specifications

### Analog Inputs

- Four AC-coupled analog inputs, SSMC connectors
- 50 ohm input impedance
- Sample resolution: 12-bits
- Full scale input voltage: -8.2 dBm to -4.5 dBm, programmable (0.5 Vpp to 0.75 Vpp)
- Input signal bandwidth: 0.1 to 100 MHz (-3 dB) (higher bandwidth options available for undersampling applications)
- Maximum sample rate: 250 MHz/ch.
- Minimum sample rate: 75 MHz/ch.
- Internal sample clock oscillator programmable in steps of 1 Hz
- Clock reference: 10 MHz  $\pm$ 1.5 ppm
- Sampling on rising edge of internal or external clock
- External trigger LVTTTL/LVCMOS, software selectable rising/falling edge
- External sync LVTTTL/LVCMOS, software selectable rising/falling edge
- External clock LVTTTL/LVCMOS, -3dBm to +6dBm
- SINAD: >62 dB
- SFDR: >76 dB @ 70 MHz Fin, 250 MHz Fs

### General

- Short form factor, PCIe x4

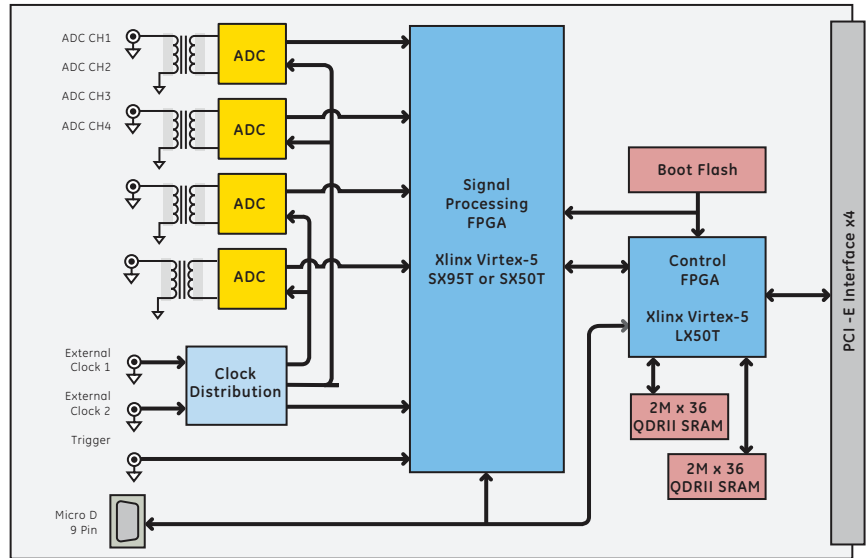
### Onboard Resources

- Xilinx Virtex-5 SX95T or SX50T user-programmable Signal Processing FPGA
- Xilinx Virtex-5 LX50T Control FPGA
- 16 MBytes QDR SRAM
- 16 MBytes Flash

### Software

- Microsoft Windows and Linux Software Development Kits
- Software Development Kit (SDK) includes API level source code, and application examples
- Hardware Development Kit (HDK) includes VHDL source code, all timing constraints, and Test Bench and ISE projects.

## Block Diagram



## Ordering Information

ICS-1650A-000	ICS-1650, 2-channel, SX95T
ICS-1650A-001	ICS-1650, 4-channel, SX95T
ICS-1650-SDK-LX	Software Development Kit for Linux operating system
ICS-1650-SDK-WIN	Software Development Kit for Microsoft Windows operating system
HDK-1650	Hardware Development Kit for FPGA development by user, including default cores (included with board)

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