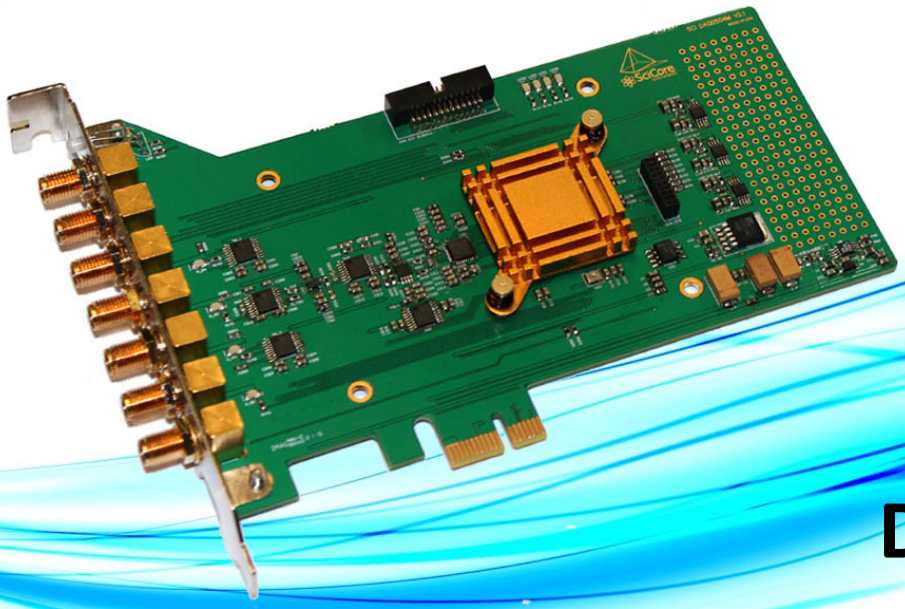
SciCore Instruments



DAQ0504M

Data Acquisition Card

- 4 multiplexed analog input channels
- 14 bit A/D resolution at 50MS/s
- < 1 ms channel switching time
- Selective gain x1, x10 and x100 input amplifier
- PCI express bus interface to PC
- 100 MB/s sustained data throughput
- Nearly 100% measurement duty cycle
- Simplified software programming interface

Product Functions

DAQ0504M accepts analog input signals connected to any of the four input SMA connectors on the board, performs the A/D conversion with 14-bit resolution at maximum sampling rate of 50MS/s, and transfers the digitized waveform data to an application software via the PCI express bus in a computer.

The four analog input channels are multiplexed to one A/D converter on the board. The channel switching is controlled by software commands with channel switching time less than 1 millisecond.

DAQ0504M supports high measurement duty cycle in continuous acquisition mode. When running at 50MS/s sampling rate with 14-bit A/D resolution, this board can achieve a sustained data transfer rate of nearly 100MB/s to the PC memory, which corresponds to nearly 100% duty cycle with no missing data between transferred data records.

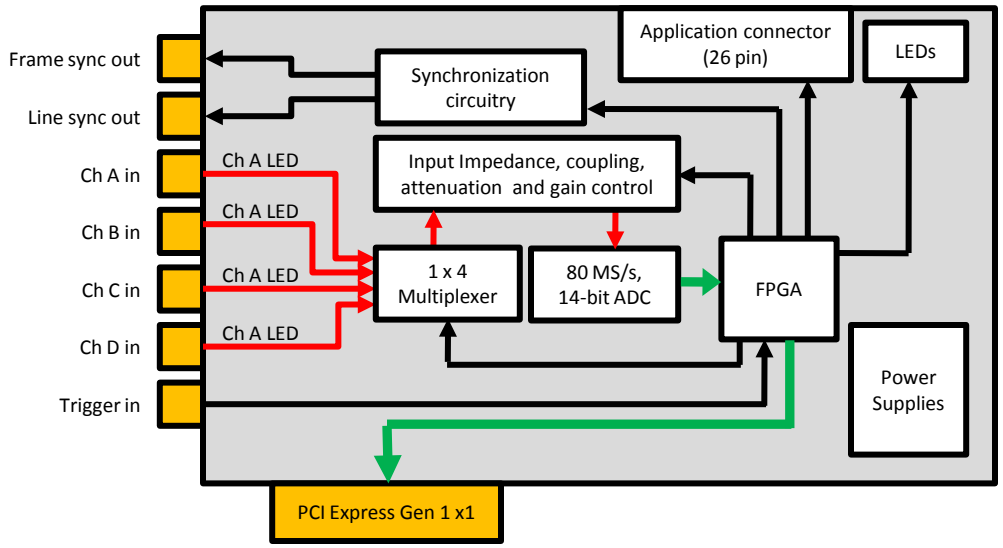
DAQ0504M has a simplified and optimized software programming interface. The digitized waveform data is transferred in the format of data frames. Each data frame consists of a number of data records and each data record consists of a number of data points. Both the number of data points per record and the number of records per frame can be programmed by the user. DAQ0504M supports various triggering methods including free-run and edge triggering (on either rising edge or falling edge). In the edge triggering mode, the data in every record is synchronized with the trigger event. After initialization, the application software only need to call a few library functions to start the acquisition and get the latest data frame. These library functions are non-blocking which means the application software can continue work on data processing and other important tasks, when the data acquisition process is running in parallel in the background. For rapid development of user application software, example software projects with source code samples compatible with Microsoft Visual Studio® software development tool are provided.

Specifications

Product	**DAQ-0504M**
Descriptions	PCI express data acquisition card
Analog Input	
Channels	4 (time multiplexing)
Sampling Rate	50 MS/s, 40 MS/s, 30 MS/s, 25 MS/s, 24 MS/s, 20 MS/s, 15 MS/s, 12.5 MS/s, 12 MS/s, 10MS/s, 8.0 MS/s, 7.5 MS/s, 6.0 MS/s, 5.0 MS/s, 4.0 MS/s, 3.0 MS/s, 2.5 MS/s, 2.0 MS/s, 1.5 MS/s, 1.0 MS/s, 0.5 MS/s
Vertical Resolution	14 bit
Input Impedance	50 Ohm or 1M Ohm
Input Coupling	DC or AC
Input Bandwidth (-3 dB)	25 MHz
Input Attenuation	/1, /2
Input Amplifier Gain	x1, x10, x100
Input Connector	SMA (Female) x 4
SNR	60 dB
Channel switching time	1 millisecond
Channel crosstalk	-65 dB
Trigger Input	
Trigger Methods	rising edge, falling edge, line
Input Connector	SMA (Female) x 1
Synchronization output	
Sync signals	line sync, frame sync
Output connector	SMA (Female) x 2
Data Transfer (DMA)	
Record Length	32 – 16,384
Record Number	1 – 32,768
Maximum Data Transfer Rate	100 MB/s
PC Requirements	
Data Interface	PCI express x1
PC Operating System supported	Windows 7 64 bit, Windows 8, Windows 10
CPU	Quad-core, >1GHz
Memory	4GB
Power and Environment	
Power Supply Voltage	3.3V, 12V
Power Connector	PCI express x1 edge connector
Power Consumption	15 W
Mechanical Dimensions	162 mm x 121 mm x 21.5 mm (L x W xH)
Net Weight	350 g

*** All specifications are subject to change without notice.**

Block Diagram

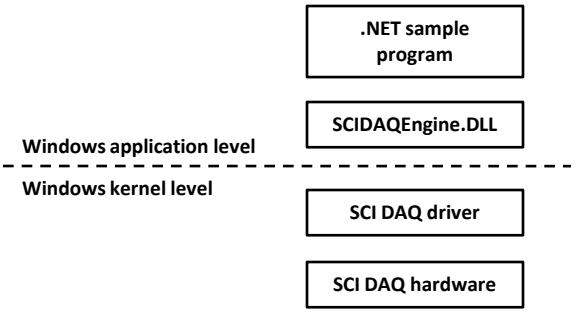


The diagram above shows the details of the data and control signal paths on the data acquisition card. The user needs to supply analog signals that are connected to the analog input connected marked "Ch A in" to "Ch D in", and a trigger signal connected to the "Trigger in" connector. One of four analog input signals is selected by the 1x4 multiplexer to an analog front end module. A LED is lit when the corresponding analog input channel is selected. The analog front end module contains input impedance selection, DC and AC coupling selection, attenuation and gain selection, and other signal conditioning circuits of the analog input signals. The conditioned analog signals are digitized by a 14 bit A/D converter running at 50 MS/s which sends the digital data stream to the memory inside a FPGA chip. The FPGA chip has a PCI express gen 1 x1 interface with the computer to transfer the acquired data at 100% duty cycle to the PC memory, at sustained data transfer rate of nearly 100MB/s.

Software Development Kit

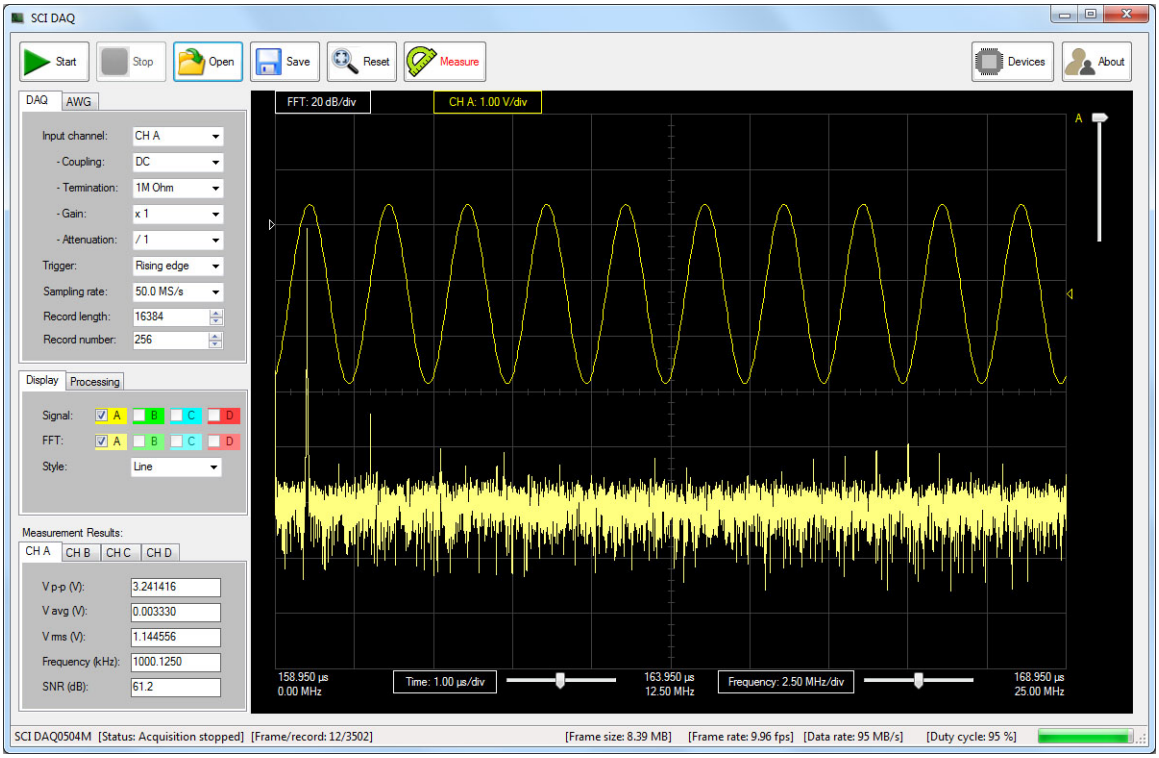
The software development kit (SDK) is included in the product package to allow rapid user application software development. The overall structure of the SDK is described in the diagram above. Located at the lowest level is the SCI DAQ hardware which is physically connected to the host PC via a PCI express bus. The SCI DAQ driver is responsible for direct reading and writing the control registers in the DAQ hardware to control the DMA (direct memory access) process, and transferring the acquired data from the DAQ hardware to the memory of the PC.

The communicator between the driver and Window applications is SCIDAQEngine.DLL, which is a dynamically linked library providing the application programming interface (API) for application software running on *Windows* operation system. Software projects based on Microsoft .NET development platform with source code in C++, C# and Visual Basic are provided, to demonstrate the simplified software programming interface to the DAQ hardware. See SCI-DAQ SDK user manual for details.



Control Software Interface

The “SCI DAQ” is a software program that allows the user to quickly test the functions of the DAQ board and evaluate its performance. The software screen below shows when acquiring of a 3.3 Vpp, 1 MHz sine wave at sampling rate of 50 MS/s, a 61 dB SNR has been achieved in the FFT spectrum using 16384 points per record from a single shot measurement.



Ordering Information

Part number	Description
DAQ0504M	50 MS/s data acquisition card, 14 bit A/D resolution, 4 channels multiplexing

Contact Information
SciCore Instruments, Inc.
P.O. Box 135
Long Valley, New Jersey 07853, USA
E-mail: info@scicoreinstruments.com
Web site: www.scicoreinstruments.com