

vDAQ™

Datasheet



April 7, 2021 (Rev. A4)



Introduction

vDAQ™ is an-all-in one data acquisition / control system platform designed for applications that require high bandwidth analog signal digitization combined with high accuracy analog output. Combining various IO options onto a single FPGA platform enables low latency closed-loop control regimes. vDAQ™ offers a powerful Xilinx Kintex UltraScale FPGA for high performance real-time processing of data. On-board DDR3 DRAM and a high-speed PCI Express host interface provide flexible options for storing and transferring high bandwidth data streams. vDAQ™ comes with required cables and breakout accessory for signal connections.

Technical Specifications

Xilinx Kintex Ultrascale FPGA

vDAQ™ is powered by a Xilinx Kintex UltraScale XCKU035 FPGA. The cutting edge UltraScale architecture is the first to offer ASIC-like clock distribution. Efficient routing resources facilitate higher device logic utilization to maximize computing potential.

Connection to the host PC is provided through a PCI Express Gen. 3 x4 interface, which offers up to 4 GB/s data throughput. vDAQ™ software supports 64 bit scatter-gather DMA data transfer.

vDAQ™ includes 4 GB of onboard DDR3 DRAM operating at 1600 MHz. Memory interface is capable of 12 GB/s throughput for local buffering of data.

High-speed Analog Input

vDAQ™ includes high-speed analog input channels accessible from SMB terminals on the rear connector panel of the PCI Express card installed in the PC. Channels support switchable input ranges and an optional low pass filter that can be enabled by software with a variable cutoff frequency. Table 1 details the specifications of the high speed analog input channels.

Table 1: vDAQ™ high speed analog input specifications

Specification	Unit	
Number of Channels		4
Channel Resolution	Bits	14
Sampling Rate Range	MHz	62.5 – 125
Timing/Synchronization		Simultaneously Sampled
Input Range	Vpp	0.5 – 2
Input Impedance	Ω	50
Low Pass Filter Cutoff Frequency	MHz	1 – 63, FBW (Bypass)
Overvoltage Protection	V	± 10

Precision Analog Input

vDAQ™ includes precision analog input channels accessible from BNC connectors on the breakout accessory. Table 2 details the specifications of the precision analog input channels.

Table 2: vDAQ™ precision analog input specifications

Specification	Unit	
Number of Channels		12
Channel Resolution	Bits	16
Max. Sampling Rate	MHz	1
Timing/Synchronization		Independent
Input Range	V	±10
Input Impedance	GΩ	5
Overvoltage Protection ¹	V	±25

1. Overvoltage protection rating only valid when vDAQ is powered on

Precision Analog Output

vDAQ™ includes precision analog output channels accessible from BNC connectors on the breakout accessory. Table 3 details the specifications of the analog output channels.

Table 3: vDAQ™ analog output specifications

Specification	Unit	
Number of Channels		12
Channel Resolution	Bits	16
Max. Sampling Rate	MHz	2
Timing/Synchronization		Independent
Output Range	V	±10
Output Current Drive	mA	20

Digital Input/Output

vDAQ™ offers digital input/output lines divided into four groups. Two groups offer individual direction control for each line while the other two groups are group direction controlled. All DIO lines use 5V TTL logic level signaling. All digital lines are accessible from BNC connectors on the breakout accessory. Tables 4 and 5 detail the digital channel specifications.

Table 4: vDAQ™ digital input/output specifications (group 0 and 1)

Specification	Unit	Minimum	Typical	Maximum
Channels Per Group			8	
Direction Control			Independent	
Input Low Logic Level	V			1.0
Input High Logic Level	V	2.3		
Output Low Logic Level	V		0.0	0.6
Output High Logic Level	V	4.4	5.0	
Output current drive	mA	-16		16
Absolute Voltage Range	V	-0.5		5.5

Table 5: vDAQ™ digital input/output specifications (group 2 and 3)

Specification	Unit	Minimum	Typical	Maximum
Channels Per Group			8	
Direction Control			Group	
Input Low Logic Level	V			0.8
Input High Logic Level	V	2.0		
Output Low Logic Level	V		0.0	0.8
Output High Logic Level	V	4.0	5.0	
Output current drive	mA	-24		24
Absolute Voltage Range	V	-0.5		6.5

In addition to DIO lines, vDAQ™ includes a RTSI ribbon cable connector for connecting multiple DAQ cards inside the computer case. RTSI cable connector offers 16 individually direction controlled digital lines with 3.3 LVTTTL logic signaling.

Clock Synthesis

vDAQ™ includes an onboard clock synthesis module for synchronizing high-speed analog front end to external clock sources. An external clock source can be connected at the SMB terminal on the rear connector panel of the PCIe card installed in the PC. External clocks can be multiplied and delayed in 370ps steps. Table 6 details the specifications of the clock input.

Table 6: vDAQ™ external clock input specifications

Specification	Unit	
Input Frequency	MHz	1 – 425
Input Impedance	Ω	50
Input Voltage	Vpp	0.4 – 5.0

Compatibility Requirements

vDAQ™ requires a desktop PC with one PCI Express x8 slot. While a physical x8 slot is required, only x4 link width will be utilized. One six pin PCI Express power connector is required. Power capacity of PC power supply should also be considered when adding vDAQ™ to a PC. vDAQ™ will draw 5 – 20 W depending on design loaded on FPGA. The host PC must run Microsoft Windows 10 or Windows 11 operating system.