

DAQ411 – 2.4 GSPS 10-bit Data Acquisition Module

PRODUCT DESCRIPTION

The **DAQ411** modules digitize incoming signals at 2.4 GSPS. The on-board DRAMs provide up to 512M x 10 bits data memory. The DAQ modules can be controlled by a PC via a USB interface and a PCIe interface. The clock input is single-ended, 50-Ω terminated with a minimum power of 6 dBm. The digitized data can be downloaded, displayed, and analyzed on a PC. The module accepts a high-speed trigger signal for operations in burst modes. Two burst modes are offered: single burst and multiple-burst modes. The multiple-burst mode allows users to capture multiple folds of signals with trigger events. Optional hardware average/accumulation enhances dynamic performance under noisy conditions. The modules come with companion GUI and API.

KEY FEATURES

- 10-bit ADC
- ENOB: 8 bits
- Standard sampling rate: 2.4 GSPS
- Optional variable sampling rate: 1 ~ 2.4 GSPS with 100 MSPS interval
- 512M x 10-bit memory depth
- Up to 200 millisecond waveform at 2.4 GSPS
- Accepts external trigger
- Multiple-burst mode for acquiring multiple triggered signals
- Optional **On-board hardware average/accumulation**
- USB 2.0
- 1-lane PCIe interfaces for data upload
- 12V power supply (included)
- GUI for module controls and waveform display
- Companion API and software drivers for easy system development
- Aluminum enclosure: 8.25 x 3.5 x 10.7 (W x H x D) inches

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Min	Typical	Max	Unit
Operating Temperature	T_o		25		°C
Sampling Rate	f_{data}	1000	2400		MSPS
Clock Frequency	f_{CK}	1000	2400		MHz
Clock Input Power	P_{CK}	6			dBm
Input Frequency	F_{in}	0		1200	MHz
Input Swing ¹	V_{in}			500	mV
Clock Port Return Loss	RL_{CK}		15		dB
Output Port Return Loss	RL_{RF}		15		dB
Power Supply ²	+12V		+12		V
	I_{+12}		1.5		A

1. Differential with 50% duty cycle
2. Current consumption varies with clock frequency.

TERMINAL DESCRIPTION

Name	Function	I/O	Signal
GND	Ground		DC
+12V	Power, +12 V		DC
IP	Waveform Input Positive	I	RF
IN	Waveform Input Negative	I	RF
CK	Input Clock Source	I	RF
TRIG	Trigger	I	
SYNCO	Synchronize Output	O	

DETAILED SPECIFICATIONS

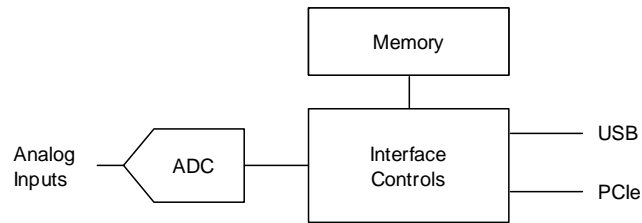
General	
Input Amplitude Resolution	10 bits
Running Modes	Continuous Burst Multiple Burst
User Interface	Windows Graphical User Interface, USB, PCIe
Input Clock	
Type	Single-ended, 50- Ω terminated
Connector Type	SMA
Frequency Range	Standard: 2.4 GHz Optional: 1 GHz to 2.4 GHz
Power Level	6 dBm to 12 dBm
Return Loss	15 dB
Input	
Type	Differential, 100- Ω terminated
Connector Type	SMA
Input Frequency Range	100 KHz to 1.2 GHz
Input Level	-250 ~ 250 mV
Input Return Loss	15 dB
Trigger	
Connector	SMA
Source	External or Software
Recommended External Trigger	LVC MOS25

DETAILED SPECIFICATIONS, (CONTINUED)

Capture Data	
Maximum Capture Length	536,870,912 samples
Minimum Capture Length	8,192 samples
Capture Length Incremental Step	32 samples
API	
CLR (Common Language Runtime) support languages targeting the runtime, such as C++/CLI, C#, Visual Basic, Jscript, and J#.	
GUI	
Available for Windows XP, Windows Vista and Windows 7	
Options	
Variable Clock Frequency Range from 1 GHz to 2.4 GHz	
On-Board Hardware Average/Accumulation	

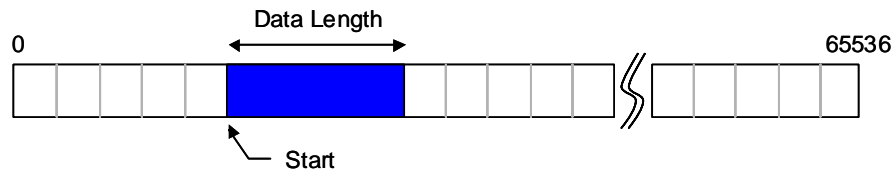
SWITCHING CHARACTERISTICS

PARAMETER	DESCRIPTION	MIN	TYP	MAX	UNITS
TRIG: LVCMOS25 Logic					
V_{IH}	Input Voltage High	1.7		2.8	V
V_{IL}	Input Voltage Low	-0.3		0.7	V
t_{Setup}	Setup Time		2		ns
t_{Hold}	Hold Time		-0.25		ns
SYNCO: LVCMOS25 Logic					
V_{OH}	Output Voltage High	2.9		3.3	V
V_{OL}	Output Voltage Low	0		0.4	V

OPERATION PRINCIPLE

DAQ411 is composed of a high-speed ADC, an interface/controls unit, and a memory unit. The ADC digitizes and multiplexes the captured data to the interface/controls unit. The captured data is processed and stored in the memory unit according to the operation mode, data start position and length. The stored data in the memory can be transferred to a PC host via PCIe or USB.

The memory unit is capable of 512 M x 10 bits storage. The 512M-point memory is divided into 65536 equal-length segments. Each segment stores 8192 data points. The captured data from the ADC can be stored in user pages, which are defined by the start address and data length as shown in the following figure. Different captured data can be stored in different user pages.

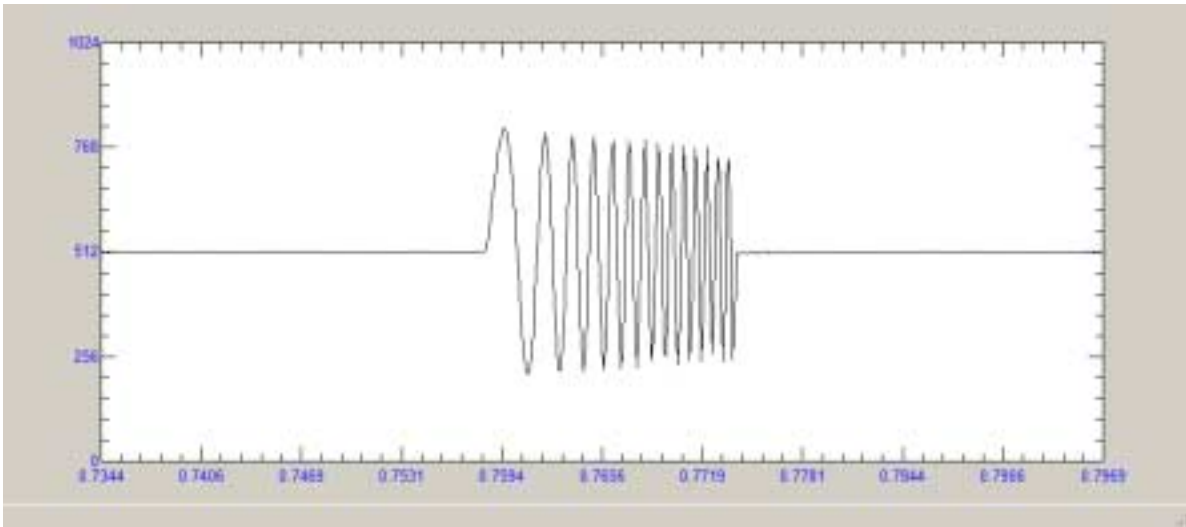


The stored data can be uploaded to a PC host for display and FFT analysis.

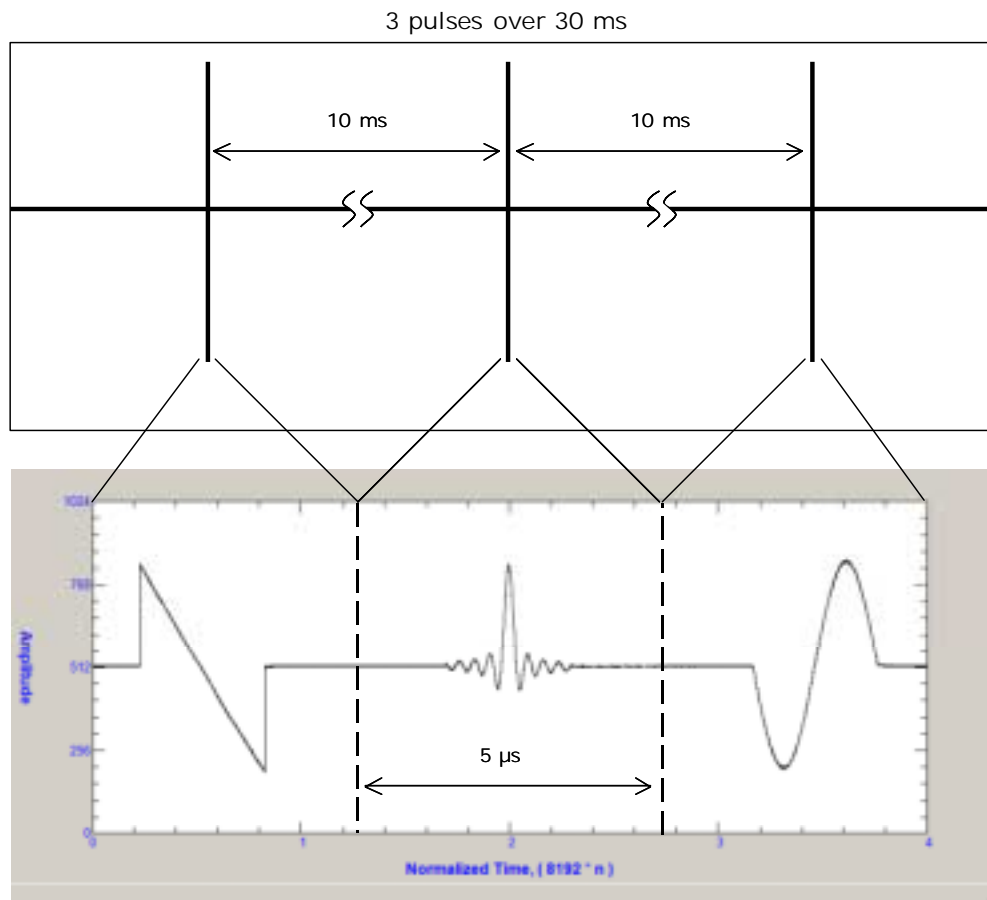
OPERATION MODE

The module can be operated in three modes: Continuous, Burst and Multiple-burst modes. In the continuous mode, right after snapshot is clicked, the module starts capturing the input data until the data length is met. Continuous mode is suitable for capturing repeating waveforms, where the starting time is not critical.

In the Burst mode, the module starts recording right after the trigger signal is received. The data is stored in the memory specified by the user pages. Afterward, the module is stopped and the data can be uploaded for processing. Alternatively, the module can be re-armed to record the next capture, which can be stored in a different user page.

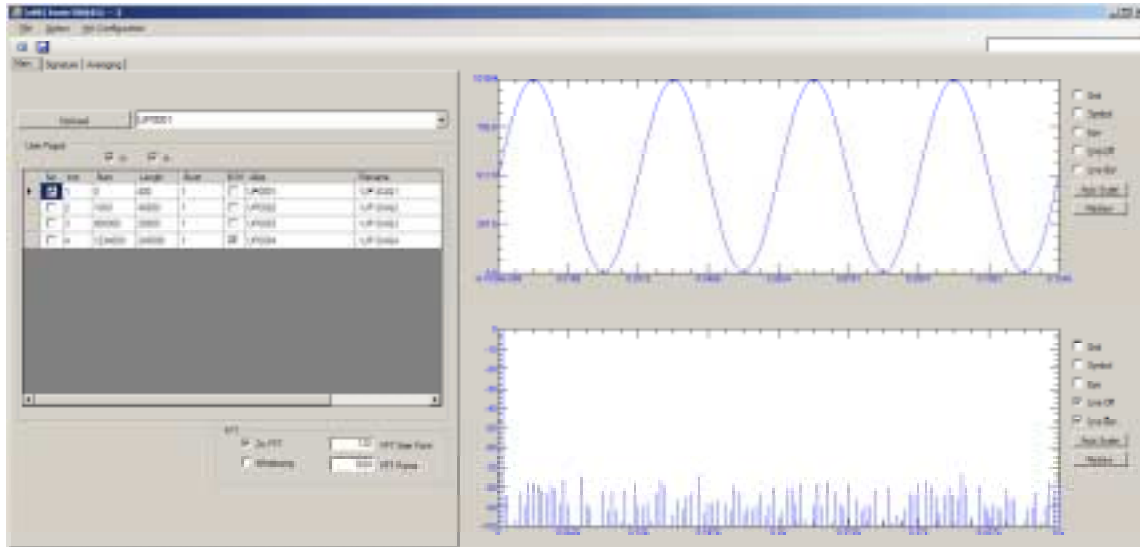


In the multiple-burst mode, the module records several captures with respect to the triggers. The burst number, the start position, and data length can be specified in the GUI. The total amount of memory used to store the captures is burst number times data length. This mode enables users to utilize a compact size of memory to capture widely separated pulsed signals. The following figure shows three-burst captures with 15 μs memory size for three widely spread pulses over 30 ms.

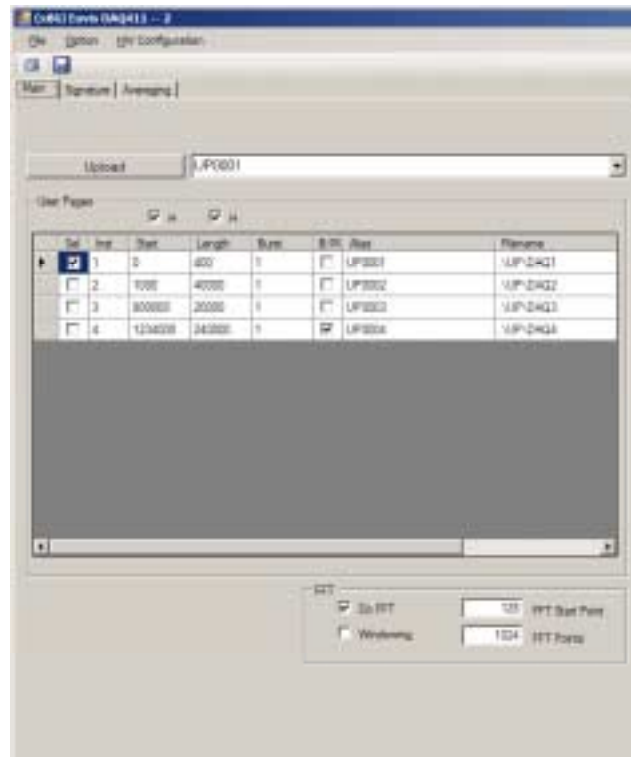


COMPANION GRAPHICAL USER INTERFACE

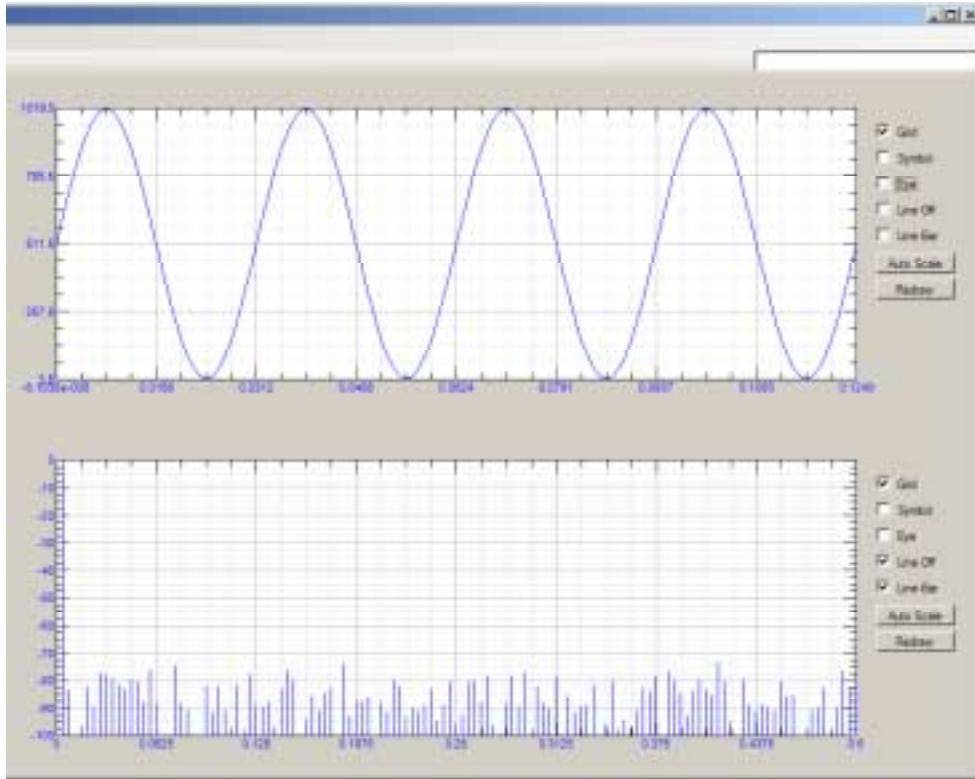
The GUI is composed of two sections: the Main controls section and the Data display section.



In the Main control section, users can define user pages by specifying 1) the starting address and data length, 2) burst mode and burst count, 3) aliases of the user pages, and 4) file name to be saved to disk. Users can select a user page and perform acquisition and upload data for displaying. The captured data can be saved to a file and processed by other software such as Matlab.

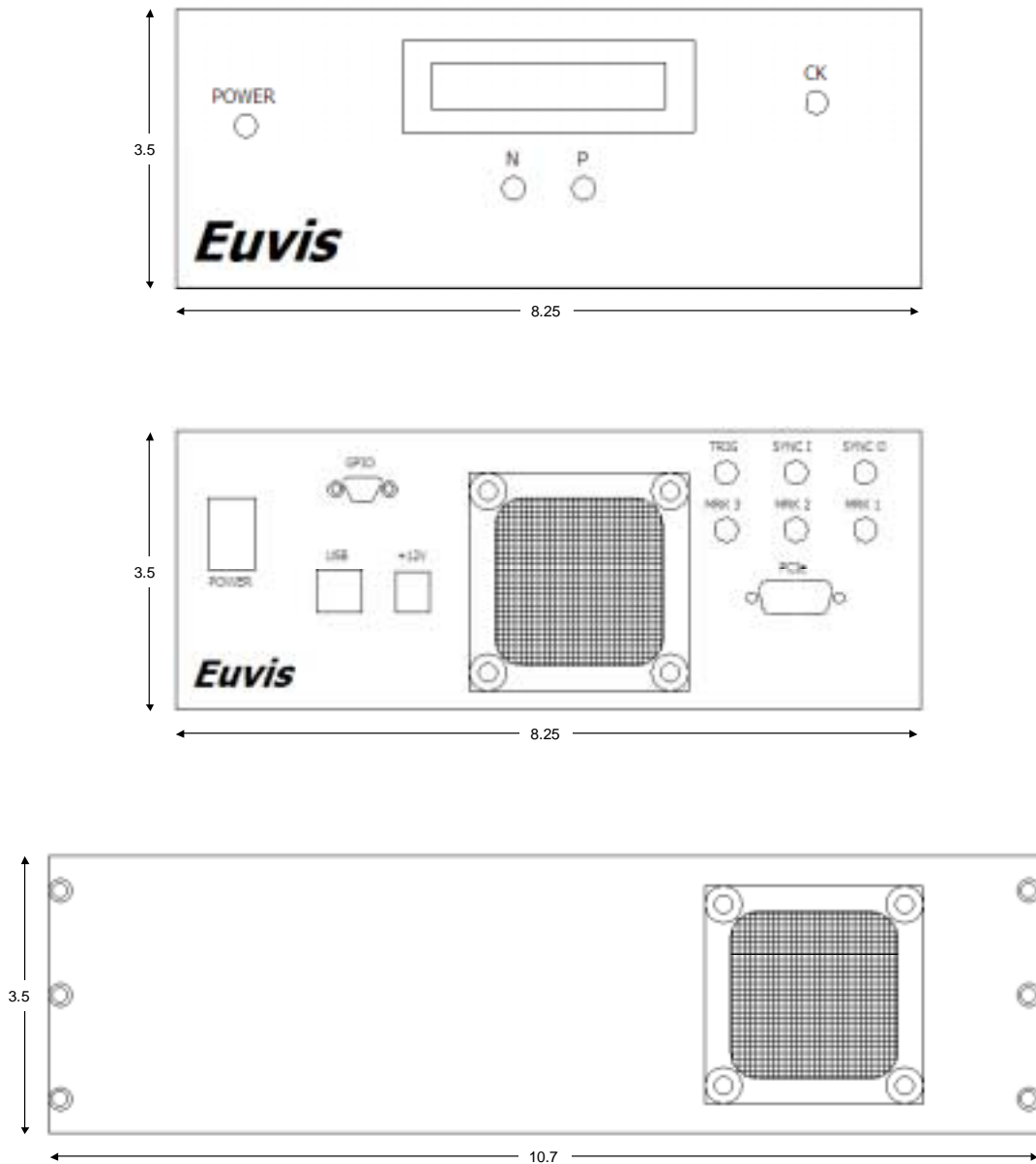


In the Data display section, users can view the captured data in the Time-domain display (top) and view the data analysis (FFT) in the Frequency-domain display (bottom).



ENCLOSURE DIMENSIONS

The enclosure dimensions are 8.25" (W) x 3.5" (H) x 10.7" (D). The front, back, and side views are shown in the following figure:



ORDERING INFORMATION:

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