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Specifications for UQD-Logic-16

UQD-Logic-16

The UQD-Logic is a versatile instrument that effectively provides all the needs for precise photon counting and timing correlation. It is originally developed for used in quantum optics research including quantum communications, long distance quantum entanglement, quantum key distribution, quantum random numbers. But it has also found applications in other areas such as detector characterization, time resolved fluorescence, single photon spectrometers, and many more areas.



The Core Capability: The UQD-Logic-16 unit efficiently combines a multi-channel and multi-stop timing analyzer, multi-event correlation and coincidence logic, and counter. Achieving high operation and processing speed is of highest priority for this unit, and it is capable of continuously processing hundreds of million input events per second, with a record timing coincidence window below one nano second. All possible logical combinations between the 16 input channels are analyzed and counted. The system has an USB interface for data exchange and parameter settings.



	Details	Value
Application	Ultra-fast, multi-channel coincidence logic counting	
Format and Power		NIM standard, +12V @ 1A from crate. Unit can be operated stand-alone with external power supply (User supplied, 12V DC, 1A).
Number of Inputs	Individual Channels	16 @156 ps resolution (8 @78ps with high-res firmware)
Input Definition		SMA, 50Ω Termination
Input Discriminator	adjustable via USB	±2V, rising or falling edge, 50mV minimum pulse amplitude
Number of Outputs	Pattern triggered output signals	3
Auxiliary Outputs	Periodic signal derived internal time base	1 (helpful for synchronisation of multiple units)
Ouput Signal	TTL pulse	> 2.5V high
Ouput pulse duration		100 ns
Cocidence Analysis	High-speed search for all possible combinations amongst the inputs	
Maximum Signal Rate	Continuous signal on each channel	200 MHz (burst)
Minimum Pulse Delay	Per each individual input channel	5 ns guaranteed
Maximum Coincidence Rate (burst)	Patterns processing	3.2 GHz combined input signals
Maximum Coincidence Rate (continuous)	Continuous patterns processing	100 MHz combined input signals
Pattern definition	Each input channel individually defined as	active - inactive - ignore
Coincidence Window	Relative timing window for successful pattern count	0.156 - 100 ns
Input delay	Relative delay for each input	± adjustable in steps of 0.156 ns (0.078 ns with high-res firmware)
Counters	Individual counters for single inputs and patterns	32 bit
Timing resolution		156 ps, (78ps with high-res firmware)
External time base	Input for timing reference signal	10 MHZ, sinusoidal, 1 KΩ termination
Maximum continuos transfer rate	limited by USB transfer and host computer.	10 MHz (rate depends on user PC and code optimization)
Filter time tags	Defined number of tags per time window, adjustable via USB	minimum 156 ps

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	Details	Value
Drivers	Drivers for Windows XP, 7, 8. Interfacing via .NET.	Samples for C#, VB, cpp, LabView provided. Linux drivers provided.
System Updates	Enables user to perform updates to unit, implementation of customized features, change of timing resolution	JTAG interface, update using Xilinx free software package
Provided User Software	Software for basic measurements and counting	TimeTagExplorer, on Windows

The UQD-logic-16 was developed and built in collaboration with DotFast Consulting, and is based on their propriety time-tagging technology implemented on high-speed FPGAs. We are also distributor of DotFast time-tagging solutions.