Product Datasheet - Technical Specifications

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PROTEUS
Infinite possibilities

The world's first Arbitrary Waveform Transceiver

Introducing Tabor's all new Proteus series, the world's first Arbitrary Waveform Transceiver. In its benchtop platform, with a 9" touch display and on-board PC the system integrates the ability to transmit, receive and perform digital signal processing all in a single instrument. The fully standalone operated system, offers industry leading performance, various configuration options, an innovative task oriented programming, and user programmable FPGA. So whether it is for aerospace and defense, telecommunications, automotive, medical or high-end physics applications Proteus opens the door to a world of infinite possibilities.

Leading Features:
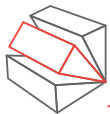
Dual, four, eight or twelve channel 1.25GS/s & 2.5 GS/s 16 bit, or dual, four or six channel 9GS/s 16 bit, AWG & AWT configurations
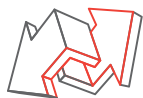
Integrated NCO for digital up-converting to microwave frequencies

Real time data streaming directly to the FPGA for continuous and infinite waveform generation

9GHz bandwidth, 2.7GS/s 12 bit digitizer option for feedback control system and conditional waveform generation

Innovative task oriented sequence programming for maximum flexibility to generate any imaginable scenario
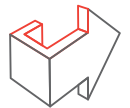
Excellent phase noise and spurious performance

User customizable FPGA for application specific solutions

Standalone 4U, 19" wide benchtop platform, with 9" touch display, USB 3.0, 10G Ethernet and thunderbolt high speed interfaces

Up to 16GS/s waveform memory with the ability to simultaneously generate and download waveforms.

WAVE DESIGN STUDIO
Simulate, Stimulate, Test

TABOR ELECTRONICS

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Standalone and easy to use

The benchtop version of the Proteus series offers up to 12 channels in a 4U, 19" benchtop box. With a 9" touch display and on-board PC the benchtop platform enables users to program the instrument without the need of an external PC. Users can program the instrument from the on-board PC using various programming environments such as Matlab, LabView, Python,and more. So for synchronized, phase coherent, multi-channel applications such as quantum physics and radar applications the Proteus arbitrary waveform transceiver is an ideal, high performance and cost effective solution.

Ultra-fast data transfer rates

Spending more time setting up your generated scenario than actually running it? The Proteus Benchtop platform utilizes PCI express Gen 3x8 lanes connection that enables up to 64Gb/s of data transfer speed. This enable the Proteus arbitrary waveform transceiver to offer the fastest waveform download available on the market today, saving you one of your most valuable resources, time.

Feedback control system

Many of today's applications, require conditional waveform generation depending on input signals from the environment. The Proteus arbitrary waveform transceiver flawlessly integrates both DAC and ADC in one system, controlled by a single FPGA for optimal synchronization and minimum latency. This high speed control system provides a feedback loop for fast decision making on the fly with minimum latency.
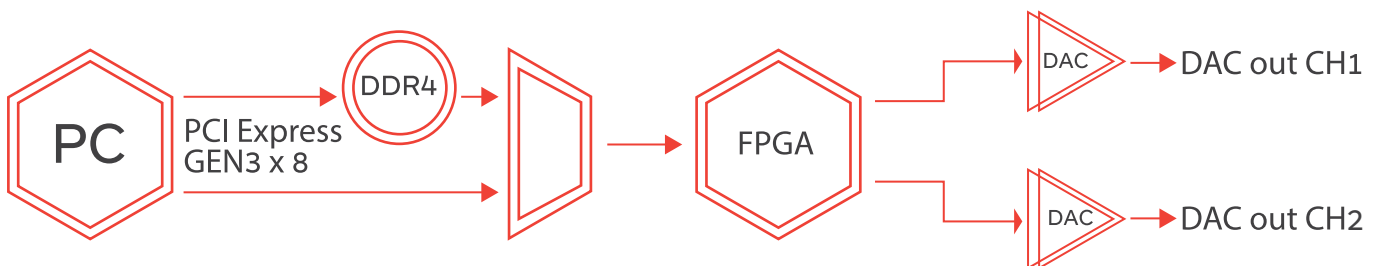
Generate any imaginable scenario

The new series offers an innovative task oriented sequence programming where user can change the full instrument set up at every line of the task table. In addition, not only can users of the Proteus series instruments generate and download waveforms simultaneously, they can stream data directly to the FPGA without the need to use the built in memory. This enables generating random, unique and infinitely long scenarios directly from the controlling PC at DAC speeds of up to 6GS/s. So no matter whether your scenario is extremely complex, infinite or even dynamic you can generate it with the Proteus series model.

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GENERAL CHARACTERISTICS	P9082/4/6B	P2582/4/8/12B	P1282/4/8/12B
MAX. SAMPLE RATE	9GS/s	2.5GS/s	1.25GS/s
RESOLUTION	16-bit[1]		
ENOB AT MAX. FREQUENCY	TBD		
NUMBER OF CHANNELS	2/4/6	2/4/8/12	2/4/8/12
BANDWIDTH	9GHz[2] 4.5GHz[3]	5GHz[2] 2.5GHz[3]	2.5GHz[2] 1.25GHz[3]
MEMORY	Up to 16GS	Up to 8GS	Up to 4GS
INTERFACE	USB 3.0, 10GE, Thunderbolt 3		
LATENCY / SYSTEM DELAY	200ns		
FINE DELAY	-5ns to 5ns		
DELAY RESOLUTION	5ps resolution		
COARSE DELAY	0 to wavelength in 1 sample point resolution		
INITIAL SKEW BETWEEN CHANNELS	0ps		

(1) Depending on sampling mode (2) Direct output option (3) DC output option

ARBITRARY / TASK TABLE	P9082/4/6B	P2582/4/8/12B	P1282/4/8/12B
MINIMUM SEGMENT LENGTH NORMAL FAST SEGMENT	2048 points 128 points	1024 points 64 points	
WAVEFORM GRANULARITY STANDARD OPTIONAL	64 points 32 points	32 points 16 points	
SEGMENTS	2^15		
SEGMENT LOOPS	2^20		
SEQUENCES	2^15		
SEQUENCE TABLE ENTRIES	2^15		
SEQUENCE LOOPS	2^20		
ADVANCED SEQUENCES TABLE ENTRIES	1024		

SIGNAL PURITY	DC OUTPUT	DIRECT OUTPUT
HARMONIC DISTORTION		
fout = 100 MHz	<-75 dBc (typ)	<-80 dBc (typ)
fout = 10 MHz - 500 MHz, DC to 2 GHz	<-70 dBc (typ)	<-75 dBc (typ)
fout = 10 MHz ... 3 GHz, DC to 4.5 GHz	<-65 dBc (typ)	<-70 dBc (typ)
fout = 10 MHz ... 7 GHz, 5 to 10 GHz		TBD
SFDR		
fout = 10 MHz...1 GHz DC to 1 GHz	-85 dBc (typ)	<-85 dBc (typ)
fout = 1 GHz...3 GHz , DC to 3 GHz	-75 dBc (typ	<-75 dBc (typ)
fout = 3 GHz...4.5 GHz , DC to 4.5 GHz	-65 dBc (typ)	<-65 dBc (typ)
fout = 3 GHz...4.5 GHz , DC to 4.5 GHz	100us Full bandwidth	-<70 dBc (typ)
fout = 7 GHz, 6 to 8 GHz (2nd Nyquist)	<6us Narrow bandwidth (<10% BW)	-<70 dBc (typ)
PHASE NOISE (@10kHz offset)		
fout = 187.5MHz	-130 dBc/Hz	
fout = 375MHz	-125 dBc/Hz	
fout = 750MHz	-120 dBc/Hz	
fout = 2GHz – 5GHz	-110 dBc/Hz	
fout = 5GHz - 7GHz	-105 dBc/Hz	

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DC OUTPUT	
OUTPUT TYPE	Single-ended or differential, DC-coupled
IMPEDANCE	50 Ω (nom)
AMPLITUDE	100 mVp-p to 1.2 Vp-p
AMPLITUDE RESOLUTION	±(3% of amplitude ±2 mV)
VOLTAGE WINDOW	±2V
OFFSET RESOLUTION	1mV
DC OFFSET ACCURACY	±(2.0% of offset±10 mV)
SKEW BETWEEN NORMAL AND COMPLEMENT OUTPUTS	0 ps
RISE/FALL TIME (20% TO 80%)	<150 ps (typ)
JITTER (PEAK-PEAK)	<15 ps (typ)
OVERSHOOT	<5% (typ)
CONNECTOR TYPE	SMA

DIRECT OUTPUT (OPTIONAL)	
OUTPUT TYPE	Single-ended or differential, AC coupled
IMPEDANCE	50 Ω (nom)
AMPLITUDE	600mVpp, single-ended into 50 Ω
AMPLITUDE RESOLUTION	1mV
AMPLITUDE ACCURACY	±(3% of amplitude ±2 mV)
BANDWIDTH -3dB analog BW 2ND Nyquist zone BW	100 kHz to 4.5 GHz (typ) Up to 9GHz
CONNECTOR TYPE	SMA

REFERENCE CLOCK OUTPUT	
FREQUENCY	10MHz / 100MHz selectable
CONNECTOR	SMP

MARKER OUTPUTS	P9082/4/6B	P2582/4/8/12B	P1282/4/8/12 B
NUMBER OF MARKERS	8/16/24	8/8/16/24	4/4/8/12
OUTPUT TYPE	Single Ended		
OUTPUT IMPEDANCE	50 Ω (nom)		
LEVEL	100 mVp-p to 1.2 Vp-p with 40mV resolution		
RISE/FALL TIME (20% TO 80%)	<400ps		
MARKER TO DIRECT/DC OUT	<1SCLK		
WIDTH	User defined, in points		
DELAY CONTROL	Position control in points		
RANGE	0 - waveform length		
RESOLUTION	8 points	2 points	
CONNECTOR TYPE	SMP		

SYNC CLOCK OUTPUT	
FREQUENCY	1/64 of the sample clock frequency
CONNECTOR	SMP

SAMPLE CLOCK OUTPUT	
SOURCE	Selectable, internal synthesizer or sample clock input
FREQUENCY RANGE	SCLK Range
OUTPUT AMPLITUDE	400 mVpp (nom), fix
INPUT IMPEDANCE	50 Ω (nom), AC coupled
AMPLITUDE ACCURACY	±(3% of amplitude ±2 mV)
TRANSITION TIME (20% TO 80%)	20 ps (typ)
CONNECTOR	SMA

TRIGGER/GATE AND EVENT INPUT	
INPUT RANGE	±5 V
THRESHOLD RANGE RESOLUTION SENSITIVITY	−5 V to +5 V 100 mV 200 mV
JITTER @ MAX CLOCK	3.2ns (200ps optional)
POLARITY	Pos or Neg
DRIVE	Selectable channel 1, channel 2 or both
INPUT IMPEDANCE	1 k or 50 Ω (nom), DC coupled
MAX TOGGLE FREQUENCY	TBD
MINIMUM PULSE WIDTH	TBD
CONNECTOR TYPE	SMP

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FAST SEGMENT DYNAMIC CONTROL INPUT (OPTIONAL)	
NUMBER OF ADDRESSABLE SEGMENTS OR SEQUENCES	256
DATA RATE	TBD
SET-UP TIME	TBD
HOLD TIME	TBD

INPUT RANGE
    LOW LEVEL
    HIGH LEVEL
	0 V to +0.7 V
	+1.6 V to +3.6 V

IMPEDANCE	TBD
CONNECTOR	TBD

REFERENCE CLOCK INPUT	
INPUT FREQUENCIES	10MHz / 100MHz selectable
LOCK RANGE	± 1MHz
INPUT LEVEL	0.2 Vp-p to 3.0 Vp-p
IMPEDANCE	50 Ω, AC coupled (nom)
CONNECTOR TYPE	SMP

SAMPLE CLOCK INPUT	
FREQUENCY RANGE	SCLK Range
INPUT POWER RANGE	+0 dBm to +7 dBm
DAMAGE LEVEL	+8 dBm
INPUT IMPEDANCE	50 Ω nom, AC coupled
CONNECTOR TYPE	SMA

GENERAL	
Voltage Range:	90VAC to 264VAC
Frequency Range:	47Hz to 63Hz
Power Consumption:	550W max.
Display Type:	9" touch screen LCD

Interface:
USB
 	
    LAN
 	
    GPIB
	1 x front, USB host (type A)
	2 x rear USB host, (type A)
	1 x rear Thunderbolt 3 USB (type C)
	– Option TBolt
	1 (or 2 optional) x RG45 x rear 1000/100/10 BASE-T
	1 or 2 optional SFP+ 10G Optical
	IEEE 488.2 – Option GPIB

Storage	128GB removable

Dimensions:
    With feet
    Without feet
	440 X 176 x 425 mm (W x H x D)
	440 X 190 x 425 mm (W x H x D)

Weight:
    Without Package
    Shipping Weight
	8.5 Kg
	10 Kg

Temperature:
    Operating
    Storage
    Warm up time
	0°C to +40°C
	-40°C to +70°C
	15 minutes

Humidity:	85% RH, non-condensing
Safety:	CE Marked, EC61010-1:2010
EMC:	IEC 61326-1:2013
Calibration:	2 years
Warranty:	1/3year warranty plan

ORDERING INFORMATION	
MODEL	DESCRIPTION
P1282B	1.25GS/s, 16Bit, AWG, 1GS/s Memory, 2CH, 4 Markers
P1284B	1.25GS/s, 16Bit, AWG, 1GS/s Memory, 4CH, 4 Markers
P1288B	1.25GS/s, 16Bit, 2GS Memory, 8CH 8 Markers
P12812B	1.25GS/s, 16Bit, 2GS Memory, 12CH 12 Markers
P2582B	2.5GS/s, 16Bit, 2GS Memory 2CH, 8 Markers
P2584B	2.5GS/s, 16Bit, 2GS Memory, 4CH, 8 Markers
P2588B	2.5GS/s, 16Bit, 2GS Memory, 8CH 16 Markers
P25812B	2.5GS/s, 16Bit, 2GS Memory, 12CH, 24 Markers
P9082B	9GS/s 16Bit, 4GS Memory 2CH, 8 Markers
P9084B	9GS/s 16Bit, 4GS Memory 4CH, 16 Markers
P9086B	9GS/s 16Bit, 4GS Memory 6CH, 24 Markers
4M1	4GS Memory option for models P1282B & P2582B
4M2	4GS Memory option for models P1284B& P2584B
4M3	4GS Memory option for models P1288B,P2588B&P9084B
4M4	4GS Memory option for models P12812B,P25812B & P9086B
8M1	8GS Memory option for models P1282B &P2582B
8M2	8GS Memory option for models P1284B,P2584B & P9082B
8M3	8GS Memory option for models P1288B, P2588B & P9084B
8M4	8GS Memory option for models P12812B, P25812B & P9086B
16M1	16GS Memory option for models P9082B
16M2	16GS Memory option for models P9084B
16M3	16GS Memory option for models P9086B
DO1	9GHz BW Direct Output option for models P1282B & P2582B
DO2	9GHz BW Direct Output Opt. for models P1284B, P2584B & P9082B
DO3	9GHz BW Direct Output Opt. for models P1288B, P2588B &P9084B
DO4	9GHz BW Direct Out. option for P12812B, P25812B&P9086B
FS1	Fast Segment Control option for models P1282B & P2582B
FS2	Fast Segment Control opt. for models P1284B, P2584B & P9082B
FS3	Fast Segment Control Opt. for models P1288B, P2588B & P9084B
MRK1	x8 Extra Markers Opt. for models P1282B & P2582B
MRK2	x8 Extra Markers Opt. for models P1284B, P2584B & P9082B
MRK3	x16 Extra Markers option for models P1288B, P2588B & P9084B
LTJ1	Ultra Low Trigger Jitter (200ps typ.) Opt.for models P1282B &P2582B
LTJ2	Ultra Low Trigger Jitter (200ps typ.) Opt. for models P1284B, P2584B & P9082B
LTJ3	Ultra Low Trigger Jitter (200ps typ.) Opt. for models P1288B, P2588B & P9084B
LTJ4	Ultra Low Trigger Jitter (200ps typ.) Opt. for P12812B, P25812B &P9086B
G1	Low Waveform Granularity Opt. for models P1282B and P2582B
G2	Low Waveform Granularity Opt. formodels P1284B, P2584B & P9082B
G3	Low Waveform Granularity Opt. for models P1288B, P2588B & P9084B
G4	Low Waveform Granularity Opt. for models P12812B, P25812B & P9086B
AWT1	9GHz BW, 2.7GS/s 12 Bit 1CH Digitizer Opt. for models P1282B & P2582B
AWT2	9GHz BW, 2.7GS/s 12 Bit 1CH Digitizer Opt. for models P1284B, P2584B & P9082B
AWT3	9GHz BW, 2.7GS/s 12 Bit 2CH Digitizer Opt. for P1288B, P2588B &P9084B
FPGA PROG	FPGA Programming capability with high level code through decision blocks
FPGA Shell	FPGA full control & programming