PRELIMINARY

OPCARD 3.0
PCI-express Ultrasonic Card
with Integrated Pulser and Receiver

www.optel.eu

OPCARD 3.0 is a complete ultrasonic testing device, suitable for all type of ultrasonic measurements including: flaw detection, nondestructive testing, TOFD measurements, ranging and sizing applications, material properties characterization and many others.

Opcard can be used as master device to control various external devices like multiplexers, scanners, encoders, spray-guns and others in advanced measurement setups in labs or on production lines.

Device offer up to 125MHz sampling rate with 12-bit resolution, have massive onboard storage (256MB DDR) and high data throughput to PC using PCIe Gen2 link.

Settings sequence capability and advanced triggering modes help achieve high PRF and excellent performance of measurements in real-time.
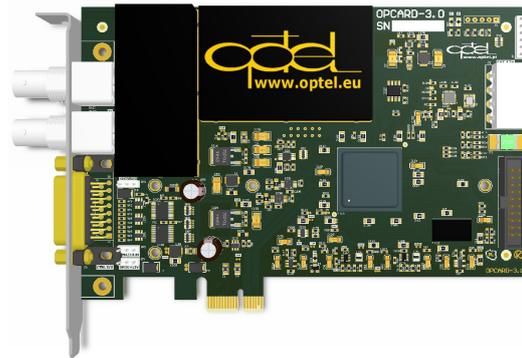
Features

- Single (PE) or dual (TT) probe operation
- Low noise, wide bandwidth amplifier
- High gain range (up to +90 dB)
- Switchable analog filters (16 settings)
- Input attenuator (-20dB)
- Advanced trigger capabilities
- High PRF (up to 100kHz)
- Precision 12-bit A/D Converter
- Up to 125MHz* sampling freq.
- Up to 256MB FIFO storage for acquisitions
- Real-time advanced Peak Detectors
- Up to 1024 setting sets onboard storage
- Flexible Sequence configuration
- Automatic settings change in Sequence
- Advanced gain modes functionalities
- Support fast TGC (time gain correction)
- Configurable DSP functions
- PCI-e interface with 500MB/s throughput
- Compact PCIe card format
- BNC or Lemo input/probe connectors
- I/O connector with TTL and power lines
- Expansion connector for extra functions
- Support for 2 incremental encoders
- Self-diagnostics for high reliability
- Low-power, no-fan operation

Technical Data

Analog parameters:

Ultra low-noise Pre-amplifier:	single-ended to differential output, voltage noise <1 nV/√(Hz)
Input impedance:	50Ω
Input Range:	550mVpp (4Vpp with -20dB)
Variable Gain Amplifier range:	-30dB to 65dB with 0.5dB step
Input Attenuator:	off or -20dB
Post-Amplifier:	off or +24dB
Full Bandwidth:	0.5 - 25MHz (-3dB)
High-pass Filters (-3dB):	0.5 MHz, 1 MHz, 2 MHz, 4 MHz
Low-pass Filters (-3dB):	6 MHz, 10 MHz, 15 MHz, 25 MHz

Pulser (on-board):

Pulse Voltage:	Off (0V) to 360V (positive pulse, short-circuit step pulser)
Charging Time:	0.0 to 6.3us 0.1us step
Fall Time:	<= 20 ns
Output impedance:	< 1 Ohm

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Technical Data – cont.

Trigger:

Trigger source:	software, PRF timers, external inputs, encoder position.
Trigger modes:	single or burst mode
PRF:	up to **20kHz** with onboard pulser, up to **100kHz** with external pulser (i.e. multiplexer).
PRF Timers:	2 modules, 24-bit, 10us to 16s period, 1us step.
Trigger monitor:	trigger counter, overrun counter, etc.

Other features:
  programmable trigger Hold-off,
  programmable external trigger divider,
  time-stamp capture, real PRF timer.

Acquisition

A/D resolution:	**12 bit**
A/D input range:	1Vpp or 2Vpp
Sampling freq.: (MHz)	125*, 100, 50.0, 33.3, 25.0, 20.0, 16.7, 14.3, 12.5, 11.1, 10.0, 9.1, 8.3, 7.7, 7.14, 6.67
Sample format:	16-bit, U2/Q15
Sampling Depth:	1 to 65536 (64k) samples, step of 4
Delay Time:	0 to 65535 sample periods in step of 1

Hardware data processing:

Representation:	RF, Abs, Env*
DSP functions:	FIR, Averaging*

Hardware Peak Detectors:
  ▪ Configurable 3 separate Gates
  ▪ Additional Gate for coupling comp.
  ▪ Real-time operation
    (no sample storage required)
  ▪ Abs/Relative gate position mode
  ▪ Peak Comparator modes:
    level, rising, falling or transition
  ▪ Zero-cross search feature
  ▪ Supplemental signal information

Arbitrary gain waveform (DAC/TGC):

Update rate:	100MHz (10ns)
Gain resolution:	0.5dB
Response time:	500ns (40dB step)

Inputs / Outputs

Analog:
2 x BNC or Lemo connectors

I/O connector (D-sub 15-pin):

Inputs:
  ▪ 6 TTL lines available for user or as hardware functions (incremental encoders inputs, external trigger, serial comm. etc)
  ▪ 2 lines can be configured as RS-485 differential pair
  ▪ 2 lines shared with power outputs

Outputs:
  ▪ 6 TTL lines available for user or as hardware function (trigger sync-out, burst outputs, serial communication, etc)
  ▪ 2 lines can be configured as RS-485 differential pair

Power:
  Fused power outputs for external devices or sensors (12V, 5V, 3.3V)

Expansion connector:
  ▪ 2x10pin 2.54mm onboard connector
  ▪ for special function daughter-boards
  ▪ direct I/O and analog pin to FPGA
  ▪ custom logic implementation
  ▪ serial comm. (RS232, SPI, I2C)
  ▪ power supply pins available

Incremental encoder support:
  ▪ 2 channels, 32-bit position registers
  ▪ 1x/2x/4x position mode
  ▪ support for A/B or A/B/Z TTL inputs
  ▪ trigger on position capability

PCI-express specification:
  ▪ compatible with PCIe 2.0 spec.
  ▪ single "x1" link 2.5/5.0 GT/s
  ▪ data throughput up to 500MB/s
  ▪ half-length card format

Physical data:
  ▪ dimensions (LxWxH):
    160x106x20mm (board only),
    180x127x20mm (with connectors)
  ▪ weight: approx. 160g

Note!
Preliminary specification are subject to change.