Agilent U1068A
Acqiris High-Speed PCI Digitizers
DP211: 8-bit, 1 ch, 500 MHz, 2 GS/s
DP210: 8-bit, 1 ch, 500 MHz, 2 GS/s
Main Features

- 2 GS/s sampling rate
- 500 MHz bandwidth
- 256 kSample acquisition memory (16 Msamples optional)
- Single-channel or dual-input front-end, with internal calibration and input protection
- 50 Ω and 1 MΩ input impedance
- < ±2% DC accuracy for precise voltage measurement
- Complete pre- and post-triggering
- ±2 ppm clock accuracy
- Built-in 5 ps trigger time interpolator (TTI) for accurate timing measurements
- Low dead-time (< 800 ns) sequential recording with time stamps
- Device drivers for Windows®, VxWorks, LabViewRT, and Linux, with application code examples for MATLAB®, C/C++, Visual Basic, LabVIEW, and LabWindows/CVI

Windows is a U.S. registered trademark of Microsoft Corporation.
MATLAB is a U.S. registered trademark of The Math Works, Inc.
Acqiris High-Speed Digitizers

The proprietary ADC chipsets in Agilent Technologies Acqiris high-speed digitizers are designed for the specific purpose of optimizing high-speed ADC performance. The analog front-end technology provides the signal conditioning, amplification, and interleaving functions essential to achieving high-speed data acquisition at GS/s rates. The digital data handling components provide vital clock and synchronization signals, to capture and memorize acquired data with maximum throughput. Together these ASICs make low-power, high-fidelity, data acquisition much more accessible and provide maximum data throughput to the host PC or processor to reduce the time and cost of measurement.

The Acqiris product line provides a range of high-speed digitizer cards1 with 8-, 10-, and 12-bit resolution, wide bandwidths, and large acquisition memory. These products, in PCI, PXI, cPCI, and VME formats, are used in research, and in ATE and OEM applications in industries such as biotechnology, semiconductors, aerospace, physics, and astronomy.

Supreme PCI Performance

The Agilent Acqiris U1068A high-speed digitizer delivers 2 GS/s single-shot sampling rate, wide 500 MHz bandwidth, and long 256-k-sample acquisition memory (optional extension to 16 Msample). The high sampling rate and wide bandwidth combine to allow the accurate capture of signals up to 500 MHz in frequency. The long acquisition memory enables the digitizer to record complex signals over long periods of time.

Long memories are essential for maintaining fast sampling rates and therefore timing resolution. For example, a U1068A with 4 Msamples of acquisition memory can record a signal over 2 ms with a sampling rate of 2 GS/s (0.5 ns per point). The fast sampling rate ensures all high-frequency signal components, up to the full bandwidth of the digitizer, are accurately recorded, complete and in the correct order.

Mezzanine Front-end

The signal input of the U1068A-001 digitizer has programmable front-end electronics that provide a complete set of input voltage ranges (from 50 mV to 5 V, full scale, in a 1, 2, 5 sequence) and variable voltage offset. The input has selectable impedance (50 Ω or 1 MΩ) and is fully protected against over-voltage signals. The amplifiers feature internal calibration (no need to disconnect input signals) and very fast recovery from out-of-range signals. The input buffer is mounted on a removable mezzanine card so replacement is fast and efficient, in the event of accidental damage or as components fatigue over time (such as relays in high-duty-cycle automated testing applications).

Flexible Trigger

The digitizer includes a precision trigger system with full pre- and post-trigger adjustment. User-selectable coupling is combined with internal or external trigger sources for maximum flexibility. The digitizer also provides a sophisticated sequential trigger mode with less than 500 ns dead time between successive triggers. This extremely low dead time enables events, that may occur at high repetition rates, to be captured and stored in their correct arrival sequence. This trigger mode is perfect for “impulse-response” type applications (radar, sonar, LIDAR, ultrasonic, medical and biomedical research, etc.).

The sequential trigger mode and low dead time greatly extend the digitizers’ timing range and resolution. Each event can be individually time stamped and relative time measurements (between events) can be made with less than 1-ns resolution.

Precision Time Base

Each digitizer has its own crystal-controlled precision time base, and sample rates can be selected, in a 1, 2, 2.5, 4, 5 sequence, from 100 S/s to 2 GS/s. An internal time-to-digital converter (TDC) with high timing resolution is used to assist with timing calibration and trigger positioning. The TDC permits accurate positioning of the trigger signal with regard to the internal clock (sampling time). The sample rate can also be generated externally using the external input connector for applications where the sample rate must be synchronized with the signal to be acquired.

1) 500 MS/s, 1 GS/s, 2 GS/s, 4 GS/s and 8 GS/s high-speed digitizer cards
Quality Acquisitions

Acqiris digitizers are designed to provide superior measurement precision and accuracy. Key acquisition specifications (such as DC accuracy, integral and differential linearity) are optimized to deliver maximum measurement fidelity. Careful circuit layout, custom IC’s, and special packaging techniques are all used to reduce overall system noise. The low noise and low harmonic distortion are best demonstrated by the following Fourier transform performed on an acquired signal. Other important qualities of the digitizer include step response, frequency response, and high effective bit score. The following figures depict typical measurements.

Low Parts Count

A high level of integration is needed in order to achieve the level of performance obtained with the U1068A digitizer. By drastically reducing the number of components, the integration also has clear benefits for reliability and lowers the total power consumption. To maintain quality measurements in the severe, poorly-cooled PC environment can be very difficult. Agilent Acqiris digitizers use a proprietary-cooling scheme. This cooling method allows components to run at safe and stable operating temperatures. It helps to extend component life as well as minimize measurement errors caused by temperature variation.
Easily Integrated

In production test environments, the time taken to integrate all the required test modules needs to be minimized.

In semiconductor production testing for example, the addition of high speed functionalities in on-chip design, such as Ethernet, Wi-Fi®, and Bluetooth®, have led to a growing requirement for high-speed data conversion tools. It is important that the digitizer module chosen for this task can be simply integrated into the existing component testing system, minimizing down-time.

Agilent’s high-speed Acqiris digitizers are supplied with software drivers for Windows, Linux, LabVIEW RT and VxWorks, and application code examples for MATLAB, C/C++, VisualBasic, LabVIEW, and LabWindows/CVI.

These code examples provide digitizer setup and basic acquisition functionality, and are easily modified, so that the card can be quickly integrated into an existing measurement system. The flexibility of the driver means that, with minimum software adjustments, any Acqiris digitizer can be swapped out, replaced, or upgraded with the latest high-speed version.
## Acqiris High-Speed PCI Digitizers

### Model DP211
- Single-channel, dual-input, 8-bit, 2 GS/s, 500 MHz bandwidth

### Model DP210
- Single-channel, 8-bit, 2 GS/s, 500 MHz bandwidth

### Signal input
- **Channels**
  - U1068A-001: Single at 2 GS/s
  - U1068A-002: Single at 2 GS/s, two software selectable inputs
- **Bandwidth (-3 dB)**
  - 001: DC to 500 MHz in 50 Ω, DC to 400 MHz in 1 MΩ
  - 002: DC to 500 MHz with FS >50 mV, DC to 200 MHz with FS at 50 mV
- **Bandwidth limit filter**
  - None
- **Full scale (FS)**
  - 001: 50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2 V, and 5 V
  - 002: 50 mV, 100 mV, 200 mV, and 500 mV
- **Offset range**
  - 001: ±2 V for 50 mV to 500 mV FS
  - ±20 V for 1 V to 5 V FS
  - 002: ±2 V
- **Maximum input voltage**
  - 001: ±5 V DC (2 W) or 0.5 W RMS at 50 Ω
  - 100 V (DC + peak AC <10 kHz) at 1 MΩ
  - 002: ±5 V DC (2 W) or 0.5 W RMS
- **Coupling**
  - AC, DC
- **Impedance**
  - 001: 1 MΩ ± 0.5% // 8-14 pF
  - 50 Ω ± 1%
  - 002: 50 Ω ± 1%
- **Connectors**
  - BNC or SMA, gold plated

### Digital conversion
- **Sample rate**
  - 100 S/s to 2 GS/s
- **Resolution**
  - 8 bits
- **DNL**
  - ±0.7 LSB
- **Acquisition memory**
  - 256 kSamples
- **Optional memory**
  - 16 MSamples

### Time base
- **Clock accuracy**
  - Better than ±2 ppm
- **Acquisition modes**
  - Single shot
  - Sequence: 1 to 200 segments (8000 segments with 16 MSamples)
  - Dead time:
    - < 800 ns
- **Trigger time interpolator**
  - 5 ps resolution

### Internal and external trigger
- **External trigger input**
  - Threshold adjust range: -3/+3 V
  - Impedance: 50 Ω/1 MΩ
  - Maximum input voltage: ±5 V DC
  - Amplitude range: > 10% FS
- **Coupling**
  - DC, AC (50 kHz LF reject)
- **Modes**
  - Edge, positive and negative
- **Pre-trigger**
  - Adjustable to 100% of horizontal full scale
- **Post-trigger**
  - Adjustable up to 200 MSamples

### External clock and reference
- **External clock/ref input**
  - Impedance: 50 Ω/1 MΩ
  - Maximum input voltage: ±5 V DC
- **External clock frequency**
  - 10 MHz to 500 MHz
- **External ref frequency**
  - 9 MHz to 10.2 MHz
- **External clock/ref threshold**
  - Variable between -3 V and +3 V
- **External clock/ref amplitude**
  - >500 mV pkpk
System performance

DC accuracy
±2% of FS for ≥ 100 mV FS
±1% of FS for 50 mV FS

Effective bits (max. SR)
>6.5 at 10.7 MHz
>6.0 at 99.5 MHz

INL
< ±1% FS

Current requirements
Without memory option
12 V  0.7 A
5 V   2.7 A
-12 V 0.02 A
With memory option
12 V  0.7 A
5 V   3.1 A
-12 V 0.02 A

Warranty
1 year

Environmental and physical

Operating temperature
0° to 50°C

Relative humidity
5 to 95% (non-condensing)

Dimensions
PCI short-length standard

Safety
Complies with EN61010-1

EMC immunity
Complies with EN61326-1

Certification and Compliance

System performance

General

Host computer and operating system:
PowerPC systems running Wind River VxWorks.
For more information on which specific processors and operating system versions are supported, please contact us.

Transfer speed:
High-speed PCI bus transfers data at sustained rates to host computer: Up to 100 Mbytes/s for 32-bit/33 MHz operation

Power consumption
Without memory option <22 W
With memory option <25 W

Front-Panel LEDs indicate digitizer status
Green: ready for trigger
Yellow: module identification
Red: trigger

Environment and physical

Operating temperature
0° to 50°C

Relative humidity
5 to 95% (non-condensing)

Dimensions
PCI short-length standard

Safety
Complies with EN61010-1

EMC immunity
Complies with EN61326-1

Industrial Environment

EMC emissions
Complies with EN61326-1 Class A for radiated emissions

Certification and Compliance
## Model Description

**U1068A Acqiris DP211 and DP210 high-speed 8-bit digitizers**

- **U1068A-001** Single-channel, 500 MHz, 2 GS/s, 256 kSample, DP210
- **U1068A-002** Single-channel dual-input, 500 MHz, 2 GS/s, 256 kSample, DP211
- **U1068A-M16** 16 MSample acquisition memory
- **U1068A-M4M** 4 MSample acquisition memory

### Accessories
- **U1068A-UK6** Calibration Certificate and Cal Data

---

<table>
<thead>
<tr>
<th>Contacts</th>
</tr>
</thead>
</table>

#### Acqiris Product Information

<table>
<thead>
<tr>
<th>Region</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>(800) 829-4444</td>
</tr>
<tr>
<td>Asia-Pacific</td>
<td>61 3 9210 2890</td>
</tr>
<tr>
<td>Europe</td>
<td>41 (22) 884 32 90</td>
</tr>
</tbody>
</table>

#### Agilent Americas

- **Canada** (877) 894-4414
- **Latin America** 305 269 7500
- **United States** (800) 829-4444

#### Agilent Asia Pacific

- **Australia** 1 800 629 485
- **China** 800 810 0189
- **Hong Kong** 800 938 693
- **India** 1 800 112 929
- **Japan** 0120 (421) 345
- **Korea** 080 769 0800
- **Malaysia** 1 800 888 848
- **Singapore** 1 800 375 8100
- **Taiwan** 0800 047 866
- **Thailand** 1 800 226 008

#### Agilent Europe and Middle East

- **Austria** 0820 87 44 11
- **Belgium** 32 (0) 2 404 93 40
- **Denmark** 45 70 13 15 15
- **Finland** 358 (0) 10 855 2100
- **France** 0825 010 700* 0.125 €/minute
- **Germany** 01805 24 6333
- **Ireland** 1890 924 204
- **Israel** 972-3-9288-504/544
- **Italy** 39 02 92 60 8484
- **Netherlands** 31 (0) 20 547 2111
- **Spain** 34 (91) 631 3300
- **Sweden** 0200-88 22 55
- **Switzerland** 0800 80 53 53
- **United Kingdom** 44 (0) 118 9276201
- **Other European Countries:** 41 (22) 884 32 90

Revised: March 27, 2008

---

### Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1068A</td>
<td>Acqiris DP211 and DP210 high-speed 8-bit digitizers</td>
</tr>
<tr>
<td>U1068A-001</td>
<td>Single-channel, 500 MHz, 2 GS/s, 256 kSample, DP210</td>
</tr>
<tr>
<td>U1068A-002</td>
<td>Single-channel dual-input, 500 MHz, 2 GS/s, 256 kSample, DP211</td>
</tr>
<tr>
<td>U1068A-M16</td>
<td>16 MSample acquisition memory</td>
</tr>
<tr>
<td>U1068A-M4M</td>
<td>4 MSample acquisition memory</td>
</tr>
</tbody>
</table>

### Accessories

- **U1068A-UK6** Calibration Certificate and Cal Data

---

www.agilent.com

For more information on Acqiris product line, sales or services, see our website at: www.agilent.com/find/acqiris

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2008

Printed in USA, November 4, 2008

5989-7113EN