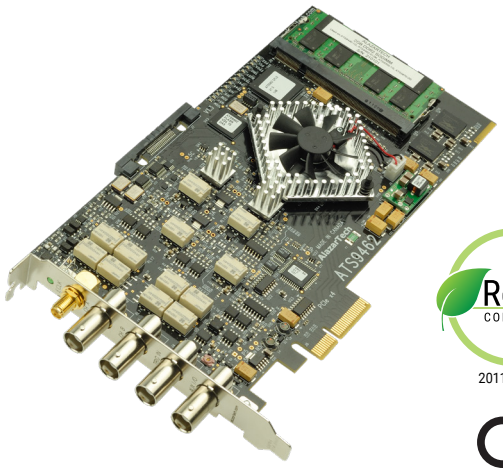
ATS9462

180 MS/s 16-Bit PCI Express Digitizer

- 720 MB/s PCI Express (4-lane) interface
- 2 channels sampled at 16-bit resolution
- 180 MS/s simultaneous real-time sampling rate on each input
- ±200 mV to ±16 V input range
- On-board dual-port memory up to 512 Megasamples per channel
- FPGA Based Input Processing Engine
- AlazarDSO oscilloscope software
- Software Development Kit supports C/C++, C#, Python, MATLAB®, LabVIEW®
- Support for Windows & Linux



RoHS 2 COMPLIANT 2011/65/EU

CE

Product	Bus	Operating System	Channels	Sampling Rate	Bandwidth	Memory Per Channel	Resolution
ATS9462	PCIe x4	Windows Linux 32-bit/64-bit	2	180 MS/s to 1 KS/s	65 MHz	64M, 512M	16 bits

Overview

ATS9462 is a 4-lane PCI Express (PCIe x4), dual-channel, high resolution, 16 bit, 180 MS/s waveform digitizer card capable of streaming acquired data to PC memory at rates up to 720 MB/s.

ATS9462 is available with up to 512 Megasamples of on-board, dual port memory per channel. This memory can be used as a very deep FIFO to mitigate system latencies during sustained data transfer.

Users can capture data from one trigger or a burst of triggers. Users can also stream very large datasets continuously to PC memory or hard disk.

ATS9462 allows users to build real-time data acquisition systems even under the Windows or Linux operating systems, as users are allowed to read acquired data while the next acquisition is in progress.

ATS9462 PCI digitizers are an ideal solution for cost-sensitive OEM applications that require a digitizer to be embedded into the customer's equipment.

ATS9462 is supplied with AlazarDSO software that lets the user get started immediately without having to go through a software development process.

Users who need to integrate the ATS9462 in their own program can purchase a software development kit, ATS-SDK, for C/C++, C#, Python, MATLAB, and LabVIEW for both Windows and Linux operating systems.

All of this advanced functionality is packaged in a low power, half-length PCI Express card.

Applications

Optical Coherence Tomography (OCT)

Ultrasonic & Eddy Current NDT/NDE

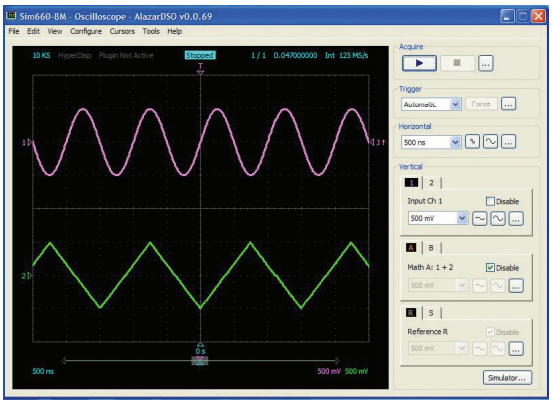
Radar/RF Signal Recording

Terabyte Storage Oscilloscope

High Resolution Oscilloscope

Spectroscopy

Multi-Channel Transient Recording



ATS9462
180 MS/s 16-Bit PCI Express Digitizer

PCI Express Bus Interface
ATS9462 interfaces to the host computer using a 4-lane PCI Express bus. Each lane operates at 2.5 Gbps. PCIe bus specification v1.0a and v1.1 are supported.

According to PCIe specification, a 4-lane board can be plugged into any 4-lane, 8-lane or 16-lane slot, but not into a 1-lane slot. As such, ATS9462 requires at least one free 4-lane, 8-lane or 16-lane slot on the motherboard.

The physical and logical PCIe x4 interface is provided by an on-board FPGA, which also integrates acquisition control functions, memory management functions and acquisition datapath. This very high degree of integration allows for optimum product reliability.

PCI Express is a relatively new bus and, as such, throughput performance may vary from motherboard to motherboard. AlazarTech's 720 MB/s benchmarks were done using a Dell Precision 390 workstation.

Users must always be wary of throughput specifications from manufacturers of waveform digitizers. Some unscrupulous manufacturers tend to specify the raw, burst-mode throughput of the bus. AlazarTech, on the other hand, specifies the benchmarked sustained throughput. To achieve such high throughput, a great deal of proprietary memory management logic and kernel mode drivers have been designed.

Analog Input
An ATS9462 features two analog input channels with extensive functionality. Each channel has 65 MHz of full power analog input bandwidth. With software selectable attenuation, you can achieve an input voltage range of ±200 mV to ±16 V. Attenuating probes (not included) can extend the voltage range even higher.

Software selectable AC or DC coupling further increases the signal measurement capability. Software-selectable 50 Ω input impedance makes it easy to interface to high speed RF signals.

Amplifier Bypass Mode
To obtain optimum dynamic performance, choose the Amplifier Bypass Mode. This mode comes standard with the ATS9462.

Each channel can be independently bypassed using on-board DIP-switches.

Once the amplifier has been bypassed, the input for that channel has 50 Ω impedance, DC coupling and a ±800 mV full scale input range. Diode protection is still included, but users should avoid saturation of the input beyond 120% of full scale.

Wideband Input Upgrade
Some applications, such as Digital Video Broadcast (DVB), require analog input bandwidth to be higher than the standard bandwidth of ATS9462.

A Wideband Input Upgrade (order number ATS9462-005) can be purchased for such cases. Bandwidth can be extended to 120 MHz with minimal effect on noise performance.

Acquisition System
ATS9462 PCI digitizers use a pair of state of the art 180 MS/s, 16-bit ADCs to digitize the input signals. The real-time sampling rate ranges from 180 MS/s down to 1 KS/s. The two channels are guaranteed to be simultaneous, as they share the exact same clock.

An acquisition can consist of multiple records, with each record being captured as a result of one trigger event. A record can contain both pre-trigger and post-trigger data.

Infinite number of triggers can be captured by ATS9462 while operating in dual-port memory mode.

In between the multiple triggers being captured, the acquisition system is re-armed by the hardware within 32 sampling clock cycles.

This mode of capture, sometimes referred to as Multiple Record, is very useful for capturing data in applications with a very rapid or unpredictable trigger rate. Examples of such applications include medical imaging, ultrasonic testing, OCT and NMR spectroscopy.

Maximum Sustained Transfer Rate
PCI Express support on different motherboards is not always the same, resulting in significantly different sustained data transfer rates. The reasons behind these differences are complex and varied and will not be discussed here.

ATS9462 users can quickly determine the maximum sustained transfer rate for their motherboard by inserting their card in a PCIe slot and running the Tools:Benchmark:Bus tool provided in AlazarDSO software.

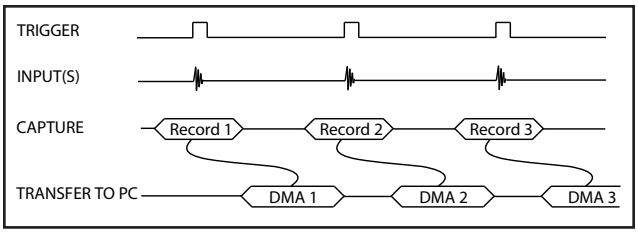
On-Board Acquisition Memory
ATS9462 supports on-board memory buffers of 64 Megasamples and 512 Megasamples.

There are two distinct advantages of having on-board memory:

First, a snapshot of the ADC data can be stored into this acquisition memory at full acquisition speed without any concern for the bus throughput.

Second, and more importantly, on-board memory can also act as a very deep FIFO between the Analog to Digital converters and PCI Express bus, allowing very fast sustained data transfers across the bus, even if the operating system or another motherboard resource temporarily interrupts DMA transfers.

Traditional AutoDMA
In order to acquire both pre-trigger and post-trigger data in a dual-ported memory environment, users can use Traditional AutoDMA.



Data is returned to the user in buffers, where each buffer can contain from 1 to 8191 records (triggers). This number is called RecordsPerBuffer.

As shown in the diagram above, each record is transferred to PC host memory as soon as it is acquired.

Users can also specify that each record should come with its own header that contains a 40-bit trigger timestamp.

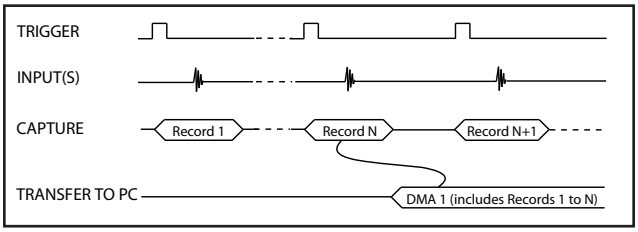
A BUFFER_OVERFLOW flag is asserted if more than 512 buffers have been acquired by the acquisition system, but not transferred to host PC memory by the AutoDMA engine.

While Traditional AutoDMA can acquire data to PC host memory at the maximum sustained transfer rate of the motherboard, a BUFFER_OVERFLOW can occur if more than 512 triggers occur in very rapid succession, even if all the on-board memory has not been used up.

No Pre-Trigger (NPT) AutoDMA

Many ultrasonic scanning and medical imaging applications do not need any pre-trigger data: only post-trigger data is sufficient.

NPT AutoDMA is designed specifically for these applications. By only storing post-trigger data, the memory bandwidth is optimized and the entire on-board memory acts like a very deep FIFO.



Note that a DMA is not started until RecordsPerBuffer number of records (triggers) have been acquired.

NPT AutoDMA buffers do not include headers. However, users can specify that each record should come with its own footer that contains a 40-bit trigger timestamp. The footer is called NPT Footer.

More importantly, a BUFFER_OVERFLOW flag is asserted only if the entire on-board memory is used up. This provides a very substantial improvement over Traditional AutoDMA.

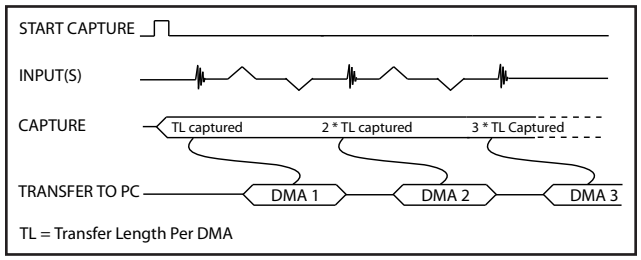
NPT AutoDMA can easily acquire data to PC host memory at the maximum sustained transfer rate of the motherboard without causing an overflow.

This is the recommended mode of operation for most ultrasonic scanning, OCT and medical imaging applications.

Continuous AutoDMA

Continuous AutoDMA is also known as the data streaming mode.

In this mode, data starts streaming across the PCI bus as soon as the ATS9462 is armed for acquisition. It is important to note that triggering is disabled in this mode.



Continuous AutoDMA buffers do not include headers, so it is not possible to get trigger time-stamps.

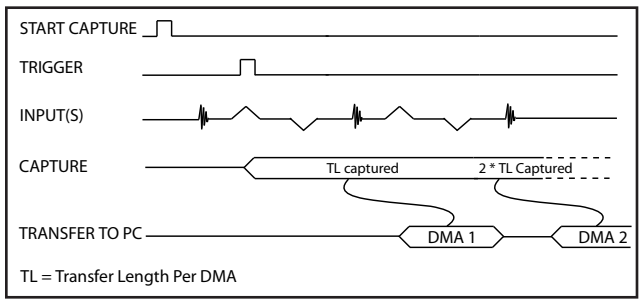
A BUFFER_OVERFLOW flag is asserted only if the entire on-board memory is used up.

The amount of data to be captured is controlled by counting the number of buffers acquired. Acquisition is stopped by an AbortCapture command.

Continuous AutoDMA can easily acquire data to PC host memory at the maximum sustained transfer rate of the motherboard without causing an overflow. This is the recommended mode for very long signal recording.

Triggered Streaming AutoDMA

Triggered Streaming AutoDMA is virtually the same as Continuous mode, except the data transfer across the bus is held off until a trigger event has been detected.



Triggered Streaming AutoDMA buffers do not include headers, so it is not possible to get trigger time-stamps.

A BUFFER_OVERFLOW flag is asserted only if the entire on-board memory is used up.

As in Continuous mode, the amount of data to be captured is controlled by counting the number of buffers

acquired. Acquisition is stopped by an AbortCapture command.

Triggered Streaming AutoDMA can easily acquire data to PC host memory at the maximum sustained transfer rate of the motherboard without causing an overflow. This is the recommended mode for RF signal recording that has to be started at a specific time, e.g. based on a GPS pulse.

FPGA Based Input Processing Engine

ATS9462 contains an Altera Stratix II FPGA that manages the datapath, the DDR2 memory interface and PCI Express bus interface.

As part of ongoing product improvement, an Input Processing Engine (IPE) has been introduced in the on-board FPGA, whereby data coming from the on-board A/D converter ICs goes through this IPE before being stored in on-board memory or being DMA'd to host computer memory.

The first part of the IPE consists of an FIR filter that acts as a band-pass filter by default, but can be modified to be low-pass or high-pass filter.

The next part of the IPE applies a windowing function to the acquired data. By default, a Hanning window is used, but user is allowed to download a different function.

Note that the windowing function can only be used for NPT AutoDMA acquisitions with up to 2048 point records.

Software Selectable Bandwidth Limit

A majority of applications for PCI digitizers require oversampling of input signal, i.e. the frequency of the analog signal being digitized is a factor of 5 or 6 lower than the sample rate or even the Nyquist rate.

ATS9462 features a software-controlled bandwidth limit switch, which reduces high frequency noise and improves signal to noise ratio. This switch is independently selectable for each input channel.

When selected, bandwidth limit switch can reduce the input bandwidth of a particular input to be approximately 20 MHz.

Triggering

The ATS9462 is equipped with sophisticated digital triggering options, such as programmable trigger thresholds and slope on any of the input channels or the External Trigger input.

While most oscilloscopes offer only one trigger engine, ATS9462 offers two trigger engines (called Engines X and Y). This allows the user to combine the two engines using a logical OR, AND or XOR operand.

The user can specify the number of records to capture in an acquisition, the length of each record and the amount of pre-trigger data.

A programmable trigger delay can also be set by the user. This is very useful for capturing the signal of interest in a pulse-echo application, such as ultrasound, radar, lidar etc.

Timebase

Timebase on the ATS9462 can be controlled either by on-board clock sources or by optional External Clock.

On-board clock sources consist of three different oscillators: a 10 MHz TCXO that is multiplied to produce the 180 MHz and 160 MHz sampling rate; a 125 MHz crystal oscillator that provides the 125 MS/s sample rate; and a 100 MHz crystal oscillator that provides 100 MS/s and lower sampling rates.

Sample rates lower than 100 MS/s are achieved by sampling at 100 MS/s and decimating the ADC data stream by an appropriate factor.

Optional External Clock

While the ATS9462 features low jitter, high reliability 125 MHz and 100 MHz crystal oscillators and a 10 MHz TCXO as the source of the timebase system, there may be occasions when digitizing has to be synchronized to an external clock source.

ATS9462 External Clock option provides an SMA input for an external clock signal.

The input stage of the External Clock circuit is an analog comparator that converts the incoming signal into an PECL clock signal that can be used by the on-board ADCs.

Note that the input impedance for the External Clock input is fixed at 50 Ω. Input coupling for the external clock input is user-programmable between AC and DC coupling.

Fast External Clock

If the user selects Fast External Clock mode, a new sample is taken by the on-board ADCs for each rising (or falling) edge of this External Clock signal.

In order to operate the ADC under optimal conditions, the user must set the appropriate frequency range for the external clock being supplied. The following ranges are supported:

External Clock: $1\ \text{MHz} < f_{EXT} < 180\ \text{MHz}$

The active edge of the external clock is software selectable between the rising or falling edge.

Slow External Clock

If the external clock frequency is less than 1 MHz, then users can select Slow External Clock.

Note that Slow External Clock signal must be a 3.3 Volt TTL signal.

In this mode, the on-board ADCs are run at a fixed 125 MS/s sample rate. Each time a rising (or falling) edge is detected on the external clock signal, one sample is stored.

Thus, there can be zero to 8 ns skew between the clock edge and the actual sampling of the signal. This skew can change from sample to sample, so this type of clock should be used only if this jitter is acceptable in your application.

10 MHz Clock Reference

It is possible to generate the sampling clock based on a 10 MHz reference input. This is useful for RF systems that use a common 10 MHz reference clock.

ATS9462 uses an on-board PLL to generate the high frequency clock. Clock frequencies in the range of 150 MHz to 180 MHz can be generated with a 1 MHz resolution.

AUX Connector - Trigger Output

ATS9462 provides an AUX (Auxiliary) BNC connector that is configured as a Trigger Output connector upon by default.

When configured as a Trigger Output, AUX BNC connector outputs a 5 Volt TTL signal synchronous to the ATS9462 Trigger signal, allowing users to synchronize their test systems to the ATS9462 Trigger.

When combined with the Trigger Delay feature of the ATS9462, this option is ideal for ultrasonic and other pulse-echo imaging applications.

AUX Connector - Trigger Enable

Another use of AUX connector is its use as a Trigger Enable Input in imaging applications.

In such applications, users must first configure AUX I/O as a Trigger Enable. A FRAME_START signal should be connected to AUX I/O and LINE_START signal to TRIG IN.

Once armed, ATS9462 will not trigger until a FRAME_START pulse has arrived. It will then accept a certain number of triggers and then wait for the next FRAME_START pulse before accepting any more triggers.

This mechanism guarantees full frame image acquisition.

Calibration

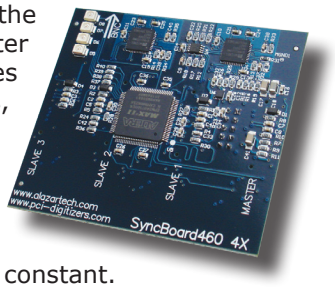
Every ATS9462 digitizer is factory calibrated to NIST- or CNRC-traceable standards.

To periodically recalibrate an ATS9462, the digitizer must either be shipped back to the factory or a qualified metrology lab.

Master/Slave Systems

Up to 8 inputs can be sampled simultaneously using multiple ATS9462 boards configured as a Master/Slave system by using a SyncBoard 9462 of appropriate width.

SyncBoard 9462 is a mezzanine board and plugs into the connector located along the top edge of the ATS9462 boards.



A SyncBoard 9462 uses the clock output from a Master board and delivers copies of that clock to all boards, using equal length traces. Note that no PLL is used for clock buffering, thus ensuring truly simultaneous sampling even if the clock frequency is not constant.

SyncBoard 9462 also allows any of the boards to trigger the entire Master/Slave system.

It should be noted that PCI Express is not a shared bus. As such, the data throughput is not shared between multiple boards in a Master/Slave system

AlazarDSO Software

ATS9462 is supplied with the powerful AlazarDSO software that allows the user to setup the acquisition hardware and capture, display and archive the signals.

The Stream-To-Memory command in AlazarDSO allows users to stream a large dataset to motherboard memory.

AlazarDSO software also includes powerful tools for benchmarking the computer bus and disk drive.

Software Development Kits

AlazarTech provides easy to use software development kits for customers who want to integrate the ATS9462 into their own software.

A Windows and Linux compatible software development kit, called ATS-SDK, includes headers, libraries and source code sample programs written in C/C++, C#, Python, MATLAB, and LabVIEW. These programs can fully control the ATS9462 and acquire data in user buffers.

ATS-GPU

ATS-GPU is a software library developed by AlazarTech to allow users to do real-time data transfer from ATS9462 to a GPU card at rates up to 720 MB/s.

Modern GPUs include very powerful processing units and a very high speed graphical memory bus. This combination makes them perfectly suited for signal processing applications.

ATS-GPU-BASE is supplied with an example user application in source code. The application includes GPU kernels that use ATS-GPU to receive data, do very simple signal processing (data inversion), and copy the processed (inverted) data back to a user buffer. All this is done at the highest possible data transfer rate.

Programmers can replace the data inversion code with application-specific signal processing kernels to develop custom applications.

ATS-GPU-OCT is the optional OCT Signal Processing library for ATS-GPU. It contains floating point FFT routines that have also been optimized to provide the maximum number of FFTs per second. Kernel code running on the GPU can do zero-padding, apply a windowing function, do a floating point FFT, calculate the amplitude and convert the result to a log scale. It is also possible to output phase information.

FFTs can be done on triggered data or on continuous gapless stream of data. It is also possible to do spectral averaging. Our benchmarks showed that it was possible to do 180,000 FFTs per second when capturing data in single-channel mode and using a NVIDIA GeForce GTX Titan X GPU.

ATS-GPU supports Windows and Linux for CUDA-based development.

Linux Support

AlazarTech offers ATS9462 binary drivers for most of the popular Linux distributions, such as CentOS, Ubuntu,...

Users can download the binary driver for their specific distribution by choosing from the available drivers here:

ftp://release@ftp.alazartech.com/outgoing/linux

Also provided is a GUI application called AlazarFrontPanel that allows simple data acquisition and display.

ATS-SDK includes source code example programs for Linux, which demonstrate how to acquire data programmatically using a C compiler.

If customers want to use ATS9462 in any Linux distribution other than the one listed above, they can have the AlazarTech engineering team generate an appropriate driver for a nominal fee, if applicable.

Based on a minimum annual business commitment, the Linux driver source code license (order number ATS9462-LINUX) may be granted to qualified OEM customers for a fee. For release of driver source code, a Non-Disclosure Agreement must be executed between the customer's organization and AlazarTech.

All such source code disclosures are made on an as-is basis with limited support from the factory.

Export Control Classification

According to the Export Controls Division of Government of Canada, ATS9462 is currently not controlled for export from Canada. Its export control classification is N8, which is equivalent to ECCN EAR99. ATS9462 can be shipped freely outside of Canada, with the exception of countries listed on the Area Control List and Sanctions List. Furthermore, if the end-use of ATS9462, in part or in its entirety, is related to the development or deployment of weapons of mass destruction, AlazarTech is obliged to apply for an export permit.

RoHS Compliance

ATS9462 is fully RoHS compliant, as defined by Directive 2011/65/EU (RoHS 2) of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

All manufacturing is done using RoHS-compliant components and lead-free soldering.

EC Conformity

ATS9462 conforms to the following standards:

Electromagnetic Emissions:
CISPR 22:2006/EN 55022:2006 (Class A):
Information Technology Equipment (ITE). Radio disturbance characteristics. Limits and method of measurement.

Electromagnetic Immunity:
CISPR 24:1997/EN 55024:1998 (+A1 +A2):
Information Technology Equipment Immunity characteristics — Limits and methods of measurement.

Safety:
IEC 60950-1:2005: Information technology equipment — Safety — Part 1: General requirements.

IEC 60950-1:2006: Information technology equipment — Safety — Part 1: General requirements.

ATS9462 also follows the provisions of the following directives: 2006/95/EC (Low Voltage Equipment); 2004/108/EC (Electromagnetic Compatibility).

FCC & ICES-003 Compliance

ATS9462 has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15, subpart B of the FCC Rules, and the Canadian Interference-Causing Equipment Standard ICES-003:2004.

Processing Using Multiple CPU Cores

Programmers can take advantage of multiple cores available in modern CPUs to speed up signal processing.

Benchmarks have shown that a quad-core CPU can perform real-time averaging at a rate of 1.0 GB/s and only use up 20% of CPU cycles. Increasing the number of cores or decreasing the sample rate reduces CPU usage even further.

One of the main applications of using multiple cores to do signal processing is Quantum Computing and Spectroscopy applications, where each record contains partial information about the signal of interest and a large number of records must be accumulated to gather a representative dataset.

ATS9462

180 MS/s 16-Bit PCI Express Digitizer

System Requirements

Personal computer with at least one free x4, x8 or x16 PCI Express (v1.0a or v1.1 or v2.0) slot, 512 MB RAM, 100 MB of free hard disk space, SVGA display adaptor and monitor with at least a 1024 x 768 resolution.

Power Requirements

+12 V	1.2 A, typical
+3.3 V	1.1 A, typical

Physical

Size	Single slot, half length PCI Express card (4.4 inches x 7.8 inches excluding the connectors protruding from the front panel)
Weight	250 g

I/O Connectors

CH A, CH B, TRIG IN, AUX I/O	BNC female connectors
ECLK	SMA female connector

Environmental

Operating temperature	0 to 55 degrees Celsius
Storage temperature	-20 to 70 degrees Celsius
Relative humidity	5 to 95%, non-condensing

Acquisition System

Resolution	16 bits
Bandwidth (-3 dB)	
DC-coupled:	DC - 65 MHz for all ranges, except ±4 V ±4 V: DC - 50 MHz
AC-coupled lower cut-off frequency:	
1 MΩ:	10 Hz
50 Ω:	100 kHz
Number of channels	2, simultaneously sampled
Maximum Sample Rate	180 MS/s single shot
Minimum Sample Rate	1 KS/s single shot for internal clocking
Full Scale Input ranges	
1 MΩ input impedance:	±200 mV, ±400 mV, ±800 mV, ±2 V, ±4 V, ±8 V, and ±16 V, software selectable
50 Ω input impedance:	±200 mV, ±400 mV, ±800 mV, ±2 V, and ±4 V, software selectable
DC accuracy	±2% of full scale in all ranges
Input coupling	AC or DC, software selectable
Input impedance	50 Ω or 1 MΩ ±1% in parallel with 50 pF ±10 pF, software selectable
Input protection	
1 MΩ	±28 V (DC + peak AC for CH A, CH B and EXT only without external attenuation)
50 Ω	±4 V (DC + peak AC for CH A, CH B and EXT only without external attenuation)

Amplifier Bypass Mode

Standard Feature	Yes
DIP Switch selectable	Yes, independently for each channel
Input Range	Approx. 550 mV rms
Input Coupling	DC, irrespective of the input coupling setting for the channel
Input Impedance	50 Ω, irrespective of the input impedance setting for the channel
Input bandwidth (-3 dB)	85 MHz

Timebase System

Timebase options	Internal Clock or External Clock (Optional)
Internal Sample Rates	180 MS/s, 160 MS/s, 125 MS/s, 100 MS/s, 50 MS/s, 20 MS/s, 10 MS/s, 5 MS/s, 2 MS/s, 1 MS/s, 500 KS/s, 200 KS/s, 100 KS/s, 50 KS/s, 20 KS/s, 10 KS/s, 5 KS/s, 2 KS/s, 1 KS/s
Internal Clock accuracy	±2 ppm for 180 MS/s & 160 MS/s ±25 ppm for 125 MS/s and lower

Dynamic Parameters

Typical values measured using a randomly selected ATS9462 with Amplifier Bypass Mode. Input was provided by a HP8656A signal generator, followed by a 9-pole, 1 MHz band-pass filter (TTE Q36T-1M-100K-50-720B). Input frequency was set at 1 MHz and output amplitude was 520 mV rms, which was approximately 95% of the full scale input.

SNR	72.9 dB
SINAD	72.3 dB
THD	-83 dB
SFDR	-82 dB

Note that these dynamic parameters may vary from one unit to another, with input frequency and with the full scale input range selected.

Optional Wideband Input

Analog Bandwidth using Amplifier Bypass Mode	120 MHz (-3 dB)

Optional ECLK (External Clock) Input

Signal Level	±200 mV to ±1 V sine wave
Input impedance	50 Ω
Maximum frequency	180 MHz for Fast External Clock 10 MHz for Slow External Clock
Minimum frequency	1 MHz for Fast External Clock DC for Slow External Clock
Decimation factor	Software selectable from 1 to 100,000
Sampling Edge	Rising or Falling, software selectable

ATS9462

180 MS/s 16-Bit PCI Express Digitizer

Optional 10 MHz Reference Input

Signal Level	±200 mV Sine wave or 3.3 V LVTTL
Input impedance	50 Ω
Input Coupling	AC coupled
Input Frequency	10 MHz ± 0.25 MHz
Sampling Clock Freq.	150 MHz to 180 MHz with 1 MHz resolution

Triggering System

Mode	Edge triggering with hysteresis
Comparator Type	Digital comparators for internal (CH A, CH B) triggering and analog comparators for TRIG IN (External) triggering
Number of Trigger Engines	2
Trigger Engine Combination	OR, AND, XOR, selectable
Trigger Engine Source	CH A, CH B, EXT, Software or None, independently software selectable for each of the two Trigger Engines
Hysteresis	±5% of full scale input, typical
Trigger sensitivity	±10% of full scale input range. This implies that the trigger system may not trigger reliably if the input has an amplitude less than ±10% of full scale input range selected
Trigger level accuracy	±5%, typical, of full scale input range of the selected trigger source
Bandwidth	65 MHz
Trigger Delay	Software selectable from 0 to 9,999,999 sampling clock cycles
Trigger Timeout	Software selectable with a 10 µs resolution. Maximum settable value is 3,600 seconds. Can also be disabled to wait indefinitely for a trigger event

TRIG IN (External Trigger) Input

Input impedance	1.01 MΩ ±10% in parallel with 50 pF ±10 pF
Bandwidth (-3 dB)	
DC-coupled	DC - 25 MHz
AC-coupled	10 Hz - 25 MHz
Input range	±5 V or ±1 V, software selectable
DC accuracy	±10% of full scale input
Input protection	±28 V (DC + peak AC without external attenuation)
Coupling	AC or DC, software selectable

TRIG OUT Output

Connector Used	AUX
Output Signal	5 Volt TTL
Synchronization	Synchronized to rising edge of sampling clock

Materials Supplied

ATS9462 PCI Card

ATS9462 Install Disk on USB flash drive

Certification and Compliances

RoHS 2 (Directive 2011/65/EU) Compliance

CE Marking — EC Conformity

FCC Part 15 Class A / ICES-003 Class A Compliance

All specifications are subject to change without notice

ORDERING INFORMATION

ATS9462-64M	ATS9462-002
ATS9462-512M	ATS9462-003
ATS9462: External Clock Upgrade	ATS9462-004
ATS9462: Wideband Input Upgrade	ATS9462-005
ATS9462: SyncBoard 2x	ATS9462-006
ATS9462: SyncBoard 4x	ATS9462-007
ATS9462: FIFO-only to 64M Upgrade	ATS9462-010
ATS9462: FIFO-only to 512M Upgrade	ATS9462-011
ATS9462: 64M to 512M Upgrade	ATS9462-012
ATS9462-64M: One Year Extended Warranty	ATS9462-061
ATS9462-512M: One Year Extended Warranty	ATS9462-062
Software Development Kit (Supports C/C++, Python, MATLAB, and LabVIEW)	ATS-SDK
ATS-GPU-BASE: GPU Streaming Library	ATSGPU-001
ATS-GPU-OCT: Signal Processing Library (requires ATSGPU-001)	ATSGPU-101

Manufactured By:

Alazar Technologies Inc.

6600 TRANS-CANADA HIGHWAY, SUITE 310
POINTE-CLAIRE, QC, CANADA H9R 4S2

TOLL FREE: 1-877-7-ALAZAR
TEL: (514) 426-4899 FAX: (514) 426-2723

E-MAIL: sales@alazartech.com

DATASHEET REVISION HISTORY

Changes from version 1.5C (Oct 2017) to version 1.5D	Section, Page
Added note about NPT Footers	No Pre-Trigger (NPT) AutoDMA, pg. 3
Added CNRC as calibration standard	Calibration, pg. 5
Added -BASE and -OCT to ATS-GPU description for clarity	ATS-GPU, pg. 5
Corrected size of card	Physical, pg. 7
Updated email address	Manufactured By, pg. 8

Changes from version 1.5B (Oct 2017) to version 1.5C	Section, Page
Updated description for product ATSGPU-001 & ATSGPU-101	Ordering Information System, pg. 8

Changes from version 1.5A (Oct 2017) to version 1.5B	Section, Page
Added DC-coupled bandwidth for ±4 V range (DC - 50 MHz)	Acquisition System, pg. 7
Changed the way AC-coupled bandwidth is specified. Now showing AC-coupled lower cut-off frequency	Acquisition System, pg. 7
Removed Bandwidth flatness specification	Acquisition System, pg. 7

Changes from version 1.5 (Sept 2017) to version 1.5A	Section, Page
Corrected full scale input range for Amplifier Bypass Mode to ±800 mV	Amplifier Bypass Mode, pg. 2

Changes from version 1.4 (Nov 2013) to version 1.5	Section, Page
Added Python to list of SDK supported languages, and Support for Windows & Linux	Features, pg. 1
Removed deprecated basic model (FIFO-only) with no on-board memory	Overview, pg. 1
Added Python & LabVIEW to list of supported languages for ATS-SDK, removed ATS-VI	Overview, pg. 1
Specified that Attenuating probes are not included	Analog Input, pg. 2
Removed section *FIFO-Only Model*; product deprecated	FIFO-Only Model, pg. 2
Removed section on deprecated AlazarDSO plug-in: *Calibration Software*	Calibration Software, pg. 5
Modified AlazarDSO description	AlazarDSO Software, pg. 5
Removed deprecated items: *Optional Stream-To-Disk Software*; *Optional Acquire At Time Plug-In*	AlazarDSO Software, pg. 5
New section *Software Development Kits* to replace sections: *ATS-SDK Software Development Kit* and *ATS-VI Software Development Kit*	Software Development Kits, pg. 5
Replaced *GPU Based Signal Processing* section with new *ATS-GPU* section	ATS-GPU, pg. 5
Replaced section *ATS9462-Linux Software Development Kit* with new *Linux Support* section	Linux Support, pg. 6
Added Export Control Classification information	Export Control Classification, pg. 6
Added section on RoHS compliance	RoHS Compliance, pg. 6
Added section on EC Conformity	EC Conformity, pg. 6
Added section on FCC & ICES-003 Compliance	FCC & ICES-003 Compliance, pg. 6
Updated External Trigger Input Impedance to 1.01 MΩ ±10%	TRIG IN (External Trigger) Input, pg. 8
Updated list of Certification and Compliances	Certification and Compliances, pg. 8
Corrected product name for ATS-SDK	Ordering Information, pg. 8
Removed ATS-VI (ATS-SDK now supports LabVIEW)	Ordering Information, pg. 8
Removed products ATS9462-001, ATS9462-009, ATS9462-Linux, ATSGPU-WIN ATS-DSO-STR, ATS-DSO-AAT, ATS-DSO-CAL, ATS-DSO-PDK	Ordering Information, pg. 8
Added products ATS9462-061, ATS9462-062, ATSGPU-001, ATSGPU-101	Ordering Information, pg. 8