GUZIK PRODUCT BULLETIN

GSA 6000 Series

Guzik Signal Analyzers

New

- High-speed waveform digitizer with built-in processing hardware and fast data transfer to external computer
- Up to 13 GHz analog bandwidth of 8-bit A/D Converter with 40 GSPS sampling rate in 1 channel mode
- Up to 64 GBytes of acquisition memory
- Digital hardware-accelerated frequency response equalization, with custom programming capability
- FPGA-based reconfigurable digital signal processing with up to 7 GSPS processing speed
- High-speed data transfer to host computer and graphic processors (GPU) for fast signal processing
- Digital oscilloscope capability
- Up to 2.4 GByte/s data transfer rate to computer using PCI Express x8 Gen 2 link
- Optional PCI Express x16 Gen 2 link with up to 6.4 GByte/s, bringing the total combined data transfer rate to 8.8 GByte/s
- Disk drive measurements including Parametric, Spectrum Analysis, NLTS, Media Scanning, Media Noise, Jitter and Eye Diagram, 3D Pulse Profile
- Integration with Guzik RWA systems and WITE32 software
- 19” rack mount, 2U height and 200 watts typical power consumption
- Core ADC 6000 module compatible with AXIe standard

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Overview

Guzik GSA 6000 series Signal Analyzer combines high-speed waveform digitizer with built-in digital signal processing hardware and high-speed data transfer link to a computer. The Signal Analyzer comes in a space-saving display-less 2U 19” rack-mounted form factor.

The product addresses demanding ATE and OEM systems applications in semiconductors, military electronics, physics, astronomy, avionics, and a variety of other disciplines, as well as the disk drive head and media testing applications.

The waveform digitizer of GSA 6000 series features Agilent A/D converters with sampling rates up to 40 GSPS and analog bandwidth up to 13 GHz. GSA 6000 comes with up to 64 GBytes of acquisition memory that delivers the longest waveform capture time window available in a high bandwidth instrument.

GSA 6000 features an FPGA-based reconfigurable digital signal processor with up to 7 GSPS combined processing speed to convey massive time-critical computations directly inside the instrument.

The PCI Express Gen. 2 link provides fast transfer of the acquired data to the host computer’s GPU and CPU-based processing back-end. The x8 link delivers 2.4 GByte/s sustained data transfer rate, while optional x16 link delivers 6.4 Gbyte/s, bringing the total combined data transfer rate to 8.8 Gbyte/s ensuring that the communication to the host computer is not a bottleneck for your application.

A Software Development Kit is supplied to control the instrument and to integrate GSA into existing measurement systems. Guzik also supplies Signal Display application for signal capturing and visualization. Signal Display allows using GSA 6000 as a high-performance oscilloscope.

The block diagram below shows the main components of GSA 6000 system in four-channel configuration:

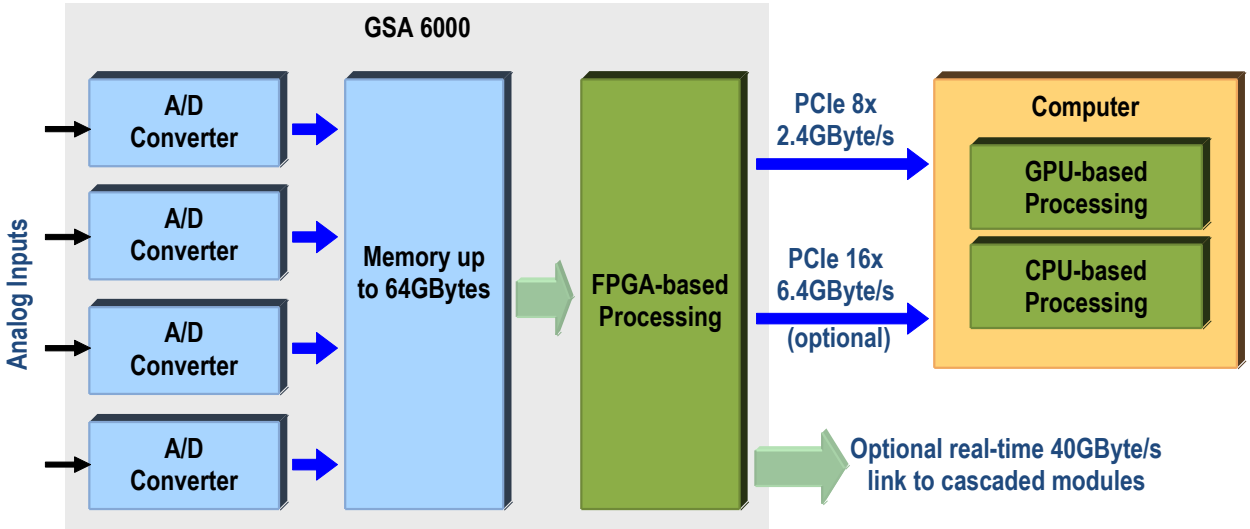


Figure 1. Block-diagram of four-channel GSA 6000 system

Guzik Signal Analyzer Models

GSA 6000 Series includes four models listed in the table below:

	GSA6131	GSA6082	GSA6044	GSA6042
Input Channels	1	2	4	2
Analog Bandwidth (-3db)	13 GHz	8 GHz	6.5 GHz (2-ch mode) 4 GHz (4-ch mode)	6.5 GHz (1-ch mode) 4 GHz (2-ch mode)
Sampling Rate (per channel)	40 GSPS	20 GSPS	20 GSPS (2-ch mode) 10 GSPS (4-ch mode)	20 GSPS (1-ch mode) 10 GSPS (2-ch mode)
Acquisition Memory (per channel)	8-64 GBytes[1]	4-32 GBytes	4-32 GBytes (2-ch mode) 2-16 GBytes (4-ch mode)	16 GBytes (1-ch mode) 8 GBytes (2-ch mode)
PCI Express Interface to computer	x8 standard x16 optional	x8 standard x16 optional	x8 standard x16 optional	x8
Integration with Guzik RWA and WITE32 software	Currently not available	Currently not available	Available	Available
Available in AXIe form-factor	Available	Available	Available	Not Available

Table 1. GSA 6000 Models

Acquisition System

At the heart of the GSA 6000 system are state of the art high-speed real-time analog to digital converter ASICs supplied by Agilent, which provide high speed waveform capture. The patented[2] digital hardware-accelerated frequency response equalization further improves the signal fidelity and effective number of bits.

At the maximum sampling rate of 40 Gsamples/sec (25 psec per point), the GSA 6000 can capture up to 1.6 seconds of a real-time waveform into its ultra-long acquisition memory – up to 64 Gpoints for single channel configuration.

[1] Various memory size options are available

[2] U.S. Patent 7,408,495

Trigger

The GSA 6000 features a digital processing trigger. This feature makes use of the real-time hardware waveform processing capability and allows you to define trigger parameters based on the actual waveform data. Trigger on any input channel or one of two external trigger source inputs is provided. Trigger conditions are set using the GSA 6000 Signal Display software tool or from your application.

External Clock and I/O

The GSA 6000 features a 1 GHz external clock input, which can be used in place of the internal ADC clock.

A 50 MHz sync reference input and output provides the means by which multiple GSA 6000 units can be synchronized together to perform synchronous acquisition with a high accuracy of sample alignment between units.

Additionally, a standard 10 MHz clock input is provided for synchronization of GSA 6000 with other equipment in large measurement installations.

Several test outputs are available for custom application support and system integration.

GSA 6000 provides a programmable calibrator output with a variety of test signals. You can connect this calibrator to any input channel and run an automatic calibration routine to ensure accurate operation of the instrument.

PCI Express Host Computer Interface

The GSA 6000 provides PCI Express Gen 2 x8 interface to the host computer running the GSA 6000 control software. The PCI Express bridge card installs in the host computer, and a standard PCI Express x8 cable connects the GSA 6000 to the computer. High speed waveform transfer with sustained data rates up to 2.4 GByte/sec is possible from this port back to the host computer.

GSA 6000 can be ordered with optional PCI Express Gen 2 x16 interface in addition to the standard x8 interface. The x16 interface allows for data transfer rates of up to 6.4 GByte/sec, bringing the combined data transfer rate up to 8.8 GByte/s[3].

The fast PCI Express link ensures that the communication to computer will not be a bottleneck for your application.

[3] Theoretical maximum; actual data transfer rate depends on the performance of the host computer hardware

Processing Overview and Capabilities

GSA 6000 provides various options for signal processing: FPGA, GPU, and CPU-based processing.

FPGA-based Processing

At the heart of the GSA 6000 are four industry-leading Altera Stratix™ IV FPGA's. These core processing elements combined with Guzik's implementation of customer-specified measurement algorithms provide end users with a truly tailored measurement solution where speed and throughput count. Once processed, results can be streamed via the GSA's PCI Express interface to a host computer at sustained data rates up to 8.8 Gbyte/sec.

The FPGA-based processor combined with Guzik's custom engineering capabilities provides you with the possibility to perform digital signal processing directly in GSA prior to sending waveform data out to computer. Many applications may require only processed results to be sent to the host computer rather than raw waveform data. Guzik will work directly with customers to implement custom processing capabilities drawing from years of experience in waveform analysis. Channel equalization, filtering, FFT, DFT, min/max, averaging, and parameter calculations among others are all available along with applications-specific requests. Guzik can provide custom services after a technical consultation regarding the specific application and required processing.

The combined FPGA processing resources are listed in the table below:

Processing Block	Number	Notes
Logic Cells	562,400	1 LUT and 1 flip-flop
Block RAM	3,800	9-Kbit blocks
	80	144-Kbit blocks
Multipliers	3680	18-bit x 18-bit multipliers

Table 2. FPGA Resources

GPU-based Processing

General-purpose computation on graphic hardware allows developers to reuse the computational algorithms available for GPU or develop their own algorithms on CUDA C or OpenCL. GSA 6000 is shipped with NVidia® GeForce GTX 570[4] GPU. It is possible to use any NVidia® GPU with computing capability 2.0 or higher, if its power requirements are satisfied by the host computer power supply.

[4] Current configuration. More powerful GPU cards may be shipped in the future

CPU-based Processing

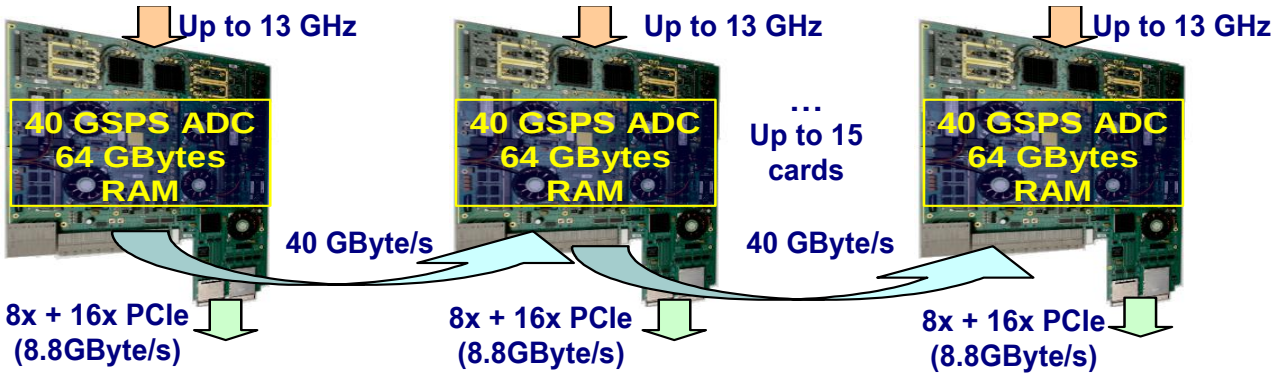
In addition to FPGA-based and GPU-based computation, customers have an option to perform signal processing using a computer CPU. Multi-core processing libraries, such as OpenMP, allow utilizing full power of modern 12-core CPU computers. Once more powerful computers with more cores are released, you can upgrade your computer keeping your existing signal analyzer. PCI Express data transfer rate of 8.8 GByte/s is sufficient to accommodate future computer and GPU generations for years to come, preserving your investment in digitizer.

Ultra-fast GPU-based FFT Measurements

GSA 6000 performs frequency domain analysis using the Fast Fourier Transform (FFT) performed on GPU. Single NVIDIA® Tesla GPU card performs FFT calculations at a 2.5 GSPS processing speed. This means, for example, that if you collect data at 10 GSPS for 100 µs, process in 400 µs, you will get the full signal spectrum up to 5 GHz with resolution bandwidth 10 kHz – 500,000 spectral lines – in less than 0.5 ms.

Expandability

The core module of GSA 6000 is the ADC 6000 board, which features an optional real-time 40GByte/s link, which allows cascading multiple modules for increased memory, processing speed, and faster data streaming to computer. This is a special order configuration, which requires custom Guzik multi-slot chassis.



Possible applications of the cascaded arrangement:

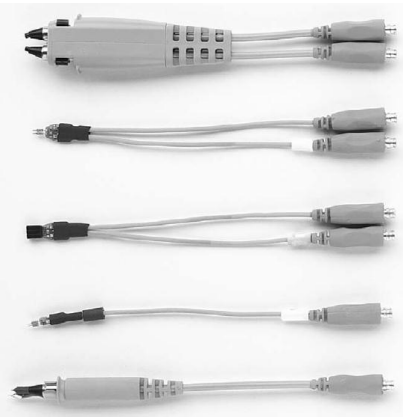
- Increased processing speed – acquire data by one board, transfer to and process by multiple boards, utilizing FPGA processors of several boards.
- Increased memory – acquire data by one board, transfer to multiple boards, utilizing memory of several boards. For example, combined memory of 15 boards is almost 1TByte.
- Real-time data streaming – acquire data by one board, transfer to other boards, and stream to an array of PCs in real time. To stream 40 GSPS data you would require five boards (combined PCI Express link speed 8.8 x 5 = 44 GByte/s).

ADC 6000 Module Designed for AXIe Standard

ADC 6000 board is designed in AXIe standard form factor. There are two assembly configurations for the ADC 6000:

- Standalone configuration for Guzik 2U chassis,
- AXIe configuration, designed for Agilent, Inc. This configuration can be used in an industry standard AXIe chassis together with other instruments, such as Agilent M8190A 12 GSPS Arbitrary Waveform Generator, and other modular instruments.

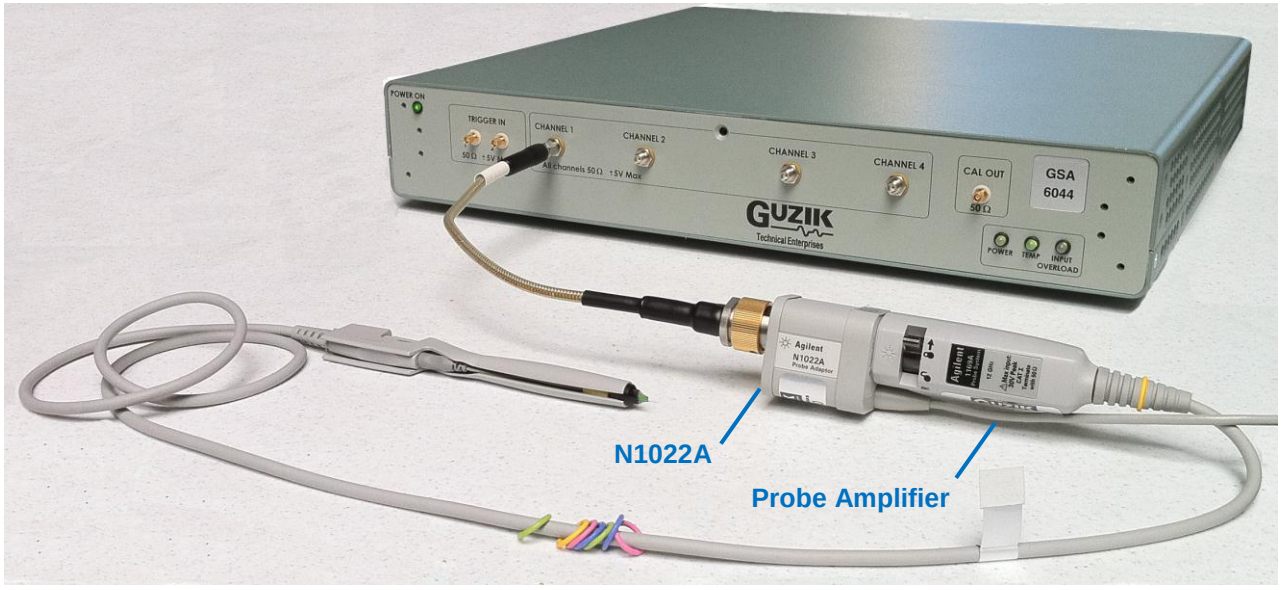
Signal Connection and Probing



For applications that require single ended or differential probing, Guzik recommends the **Agilent InfiniiMax** series of probing tools for use with the GSA 6000 Series. Detailed selection information can be found at the following link http://cp.literature.agilent.com/litweb/pdf/5968-7141EN.pdf. A wide variety of probe solutions up to 13 GHz in bandwidth can be purchased directly from Guzik.

The Agilent InfiniiMax Series[5] features a variety of probe amplifier and body styles.

The interface to the GSA 6000's input connector is the Agilent N1022A Probe Adapter with an additional cable adapter pictured below.



The GSA 6000 Series features 50 ohm SMA connectors for inputs, and MCX connectors for trigger and control I/O connections.

[5] Agilent and InfiniiMax are registered trademarks of Agilent, Inc.

GSA Toolkit Software

To control the GSA 6000 Guzik provides a GSA Toolkit, which includes two software components:

1. GSA SDK – software development kit to create your custom standalone applications for GSA or to integrate GSA into your existing software environment; please refer to *"Guzik Signal Analyzer Software Development Kit User's Guide"* document P/N 02-107544 for more details.

2. Signal Display application designed for easy instrument setup, waveform acquisition and visualization. Signal Display provides oscilloscope-like graphical user interface to display multiple signal waveforms, control acquisition parameters (sampling rate, duration, trigger settings, etc), and perform multiple trigger (multi-sector) acquisitions. The application allows for saving acquired signals to files for importing into EXCEL, MATLAB or other computational and analysis programs. You can load and display signals from files in various formats, including the previously saved waveforms. One of the useful features of Signal Display is tracking (monitoring) acquired signals during GSA SDK-based application execution or WITE32 digital test execution. Please refer to *"Signal Display User's Guide"* document P/N 02-107548 for more details.

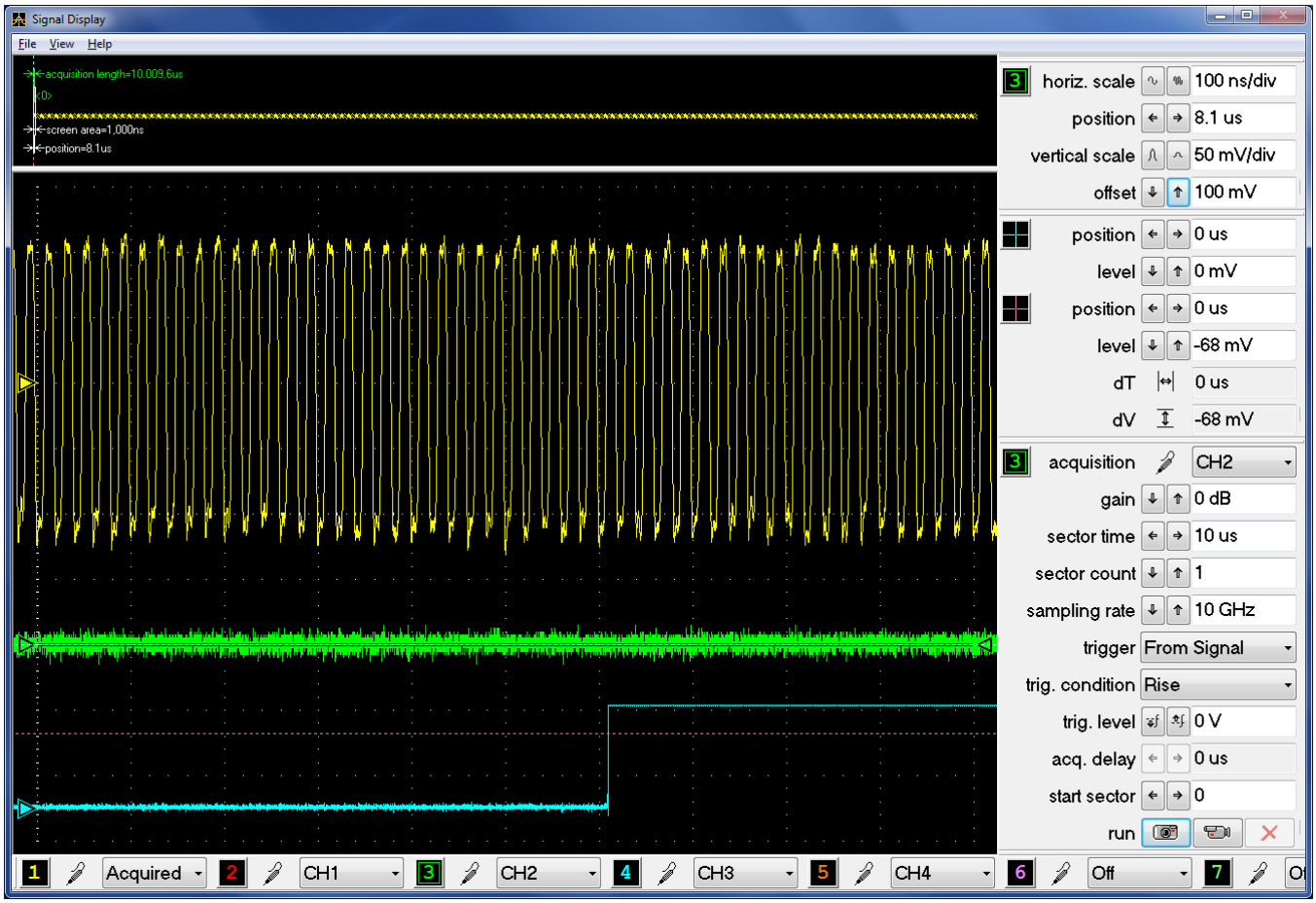


Figure 2. Signal Display Application

Integration with Guzik RWA Systems

For users of Guzik magnetic recording test systems, GSA 6044 works together with RWA 4000, RWA 3000 DTR, and RWA 2000 series of Read-Write Analyzers to provide a complete solution for testing HDD components.

Figure 3. Complete RWA Test System with GSA 6044

GSA 6000 integrates seamlessly with our WITE32 Test Environment software package. WITE32 handles all instrument setups, data acquisition and analysis of results automatically as part of the various test routines.

The set of digital measurements available with GSA 6044 include:

- Digital parametric measurements, including pulse/slope average profile, with per-sector results. Signal processing is performed in FPGA with up to 7 GSPS processing speed.
- Digital spectrum component measurements based on DFT with per-sector results. Done in FPGA with up to 7 GSPS processing speed.
- FFT-based average power spectrum measurements in GPU with up to 1.5 GSPS processing speed.
- Jitter and Eye diagram measurements.
- Digital media scanning[6] with up to 16 independent defect detectors working in parallel in real time.
- 3D Pulse Profile[6] for nano-scale magnetic field imaging.

For more information please refer to Guzik product bulletins "*Read-Write Analyzer RWA 4000*" document P/N 02-107537 and "*Read-Write Analyzer Systems 4000 Series*" document P/N 02-107536.

[6] Optional Purchase License

Specifications[7]

Vertical System GSA6042			1 Channel Mode	2 Channel Mode
Input Channels			1, SMA Female	2, SMA Female
Analog Bandwidth (-3db) [a,b]			6.5 GHz	4 GHz
Vertical Resolution			8 bits	
Input Impedance			50 ohm ± 3%	
Input Coupling			DC	
Maximum Input Voltage			± 5 V	
Input Sensitivity			40 mV .. 8 V *(Full Scale)* 1 mV/div .. 1 V/div *(Scope UI)* [c]	
Bandwidth Flatness [a,b] **(-6 dBFs)**			± 0.5 dB to 5 GHz -3 dB at 6.5 GHz	± 0.5 dB to 3.5 GHz -3 dB at 4 GHz
Effective Bits [a] **(-3 dBFs, 50 mV/div)**	*Frequency*			
	100 MHz		5.5	5.7
	1 GHz		5.4	5.7
	2 GHz		5.3	5.5
	3 GHz		4.7	5.5
	4 GHz		5.4	5.3
	6 GHz		5.2	–
Rise / Fall Time (10-90%)			68 ps	104 ps
RMS Noise Floor [a]	*Sensitivity (Full Scale)*	*Sensitivity (Scope UI)*		
	40 mV	5 mV/div	410 uV	241 uV
	80 mV	10 mV/div	723 uV	426 uV
	160 mV	20 mV/div	1.35 mV	817 uV
	400 mV	50 mV/div	2.56 mV	1.86 mV
	800 mV	100 mV/div	4.54 mV	3.67 mV
	1.6 V	200 mV/div	13.1 mV	8.32 mV
	4 V	500 mV/div	24.3 mV	18.9 mV
	8 V	1 V/div	45.5 mV	36.9 mV

[7] Specification values are typical. Specifications are subject to change.

Spurious Free Dynamic Range (SFDR) [a] (-3 dBFs, 50 mV/div)	*Frequency* 100 MHz 1 GHz 2 GHz 3 GHz 4 GHz 6 GHz	 44 dBc 46 dBc 40 dBc 33 dBc 52 dBc 42 dBc	 45 dBc 47 dBc 47 dBc 47 dBc 47 dBc –
DC Gain Accuracy		± 2% of full scale at full resolution channel scale (± 2.5% for 5 mV/div)	
Offset Range	*Vertical Sensitivity* 0 … 40 mV/div 40 … 75 mV/div 75 … 130 mV/div 130 … 240 mV/div > 240 mV/div	 ± 0.4 V ± 0.9 V ± 1.6 V ± 3.0 V ± 4.0 V	
Offset Accuracy	Offset Range < 3.5 V > 3.5 V	 ± (2% of channel offset + 1% of full scale + 1 mV) ± (2% of channel offset + 1% of full scale)	
Dynamic range		± 4 div from center screen	
Channel to Channel Isolation (any two channels with equal V/div settings)	*Frequency* < 2 GHz 2 … 4 GHz	 N/A	 55dB 45dB
Return Loss		< -12 dB to 4 GHz	< -12 dB to 6 GHz

Acquisition System GSA6042

Maximum Real Time Sample Rate	20 GSps	10 GSps
Memory Depth per Channel	16 Gpoints	8 Gpoints
(with optional larger memory)	(32 Gpoints)	(16 Gpoints)
Maximum Acquired Time per Channel at Highest Real Time Sample Rate	800 ms (1.6 s with optional larger memory)	

Vertical System GSA6044			2 Channel Mode	4 Channel Mode
Input Channels			2, SMA Female	4, SMA Female
Analog Bandwidth (-3db) [a,b]			6.5 GHz	4 GHz
Vertical Resolution			8 bits	
Input Impedance			50 ohm ± 3%	
Input Coupling			DC	
Maximum Input Voltage			± 5 V	
Input Sensitivity			40 mV .. 8 V *(Full Scale)* 1 mV/div .. 1 V/div *(Scope UI)* [c]	
Bandwidth Flatness [a,b] **(-6 dBFs)**			± 0.5 dB to 5 GHz -3 dB at 6.5 GHz	± 0.5 dB to 3.5 GHz -3 dB at 4 GHz
Effective Bits [a] **(-3 dBFs, 50 mV/div)**	*Frequency*			
	100 MHz		5.5	5.7
	1 GHz		5.4	5.7
	2 GHz		5.3	5.5
	3 GHz		4.7	5.5
	4 GHz		5.4	5.3
	6 GHz		5.2	–
Rise / Fall Time (10-90%)			68 ps	104 ps
RMS Noise Floor [a]	*Sensitivity (Full Scale)*	*Sensitivity (Scope UI)*		
	40 mV	5 mV/div	410 uV	241 uV
	80 mV	10 mV/div	723 uV	426 uV
	160 mV	20 mV/div	1.35 mV	817 uV
	400 mV	50 mV/div	2.56 mV	1.86 mV
	800 mV	100 mV/div	4.54 mV	3.67 mV
	1.6 V	200 mV/div	13.1 mV	8.32 mV
	4 V	500 mV/div	24.3 mV	18.9 mV
	8 V	1 V/div	45.5 mV	36.9 mV
Spurious Free Dynamic Range (SFDR) [a] **(-3 dBFs, 50 mV/div)**	*Frequency*			
	100 MHz		44 dBc	45 dBc
	1 GHz		46 dBc	47 dBc
	2 GHz		40 dBc	47 dBc
	3 GHz		33 dBc	47 dBc
	4 GHz		52 dBc	47 dBc
	6 GHz		42 dBc	–
DC Gain Accuracy			± 2% of full scale at full resolution channel scale (± 2.5% for 5 mV/div)	

Offset Range	*Vertical Sensitivity*		
	0 … 40 mV/div	± 0.4 V	
	40 … 75 mV/div	± 0.9 V	
	75 … 130 mV/div	± 1.6 V	
	130 … 240 mV/div	± 3.0 V	
	> 240 mV/div	± 4.0 V	
Offset Accuracy	Offset Range		
	< 3.5 V	± (2% of channel offset + 1% of full scale + 1 mV)	
	> 3.5 V	± (2% of channel offset + 1% of full scale)	
Dynamic range		± 4 div from center screen	
Channel to Channel Isolation (any two channels with equal V/div settings)	*Frequency*		
	< 2 GHz	55dB	55dB
	2 … 4 GHz	55dB	45dB
	4 … 6 GHz	36	
Return Loss		< -12 dB to 4 GHz	< -12 dB to 6 GHz

Acquisition System GSA6044

Maximum Real Time Sample Rate	20 GSps	10 GSps
Memory Depth per Channel	16 Gpoints	8 Gpoints
(with optional larger memory)	(32 Gpoints)	(16 Gpoints)
Maximum Acquired Time per Channel at Highest Real Time Sample Rate	800 ms (1.6 s with 32G/16G option)	

Vertical System GSA6082			2 Channels
Input Channels			2, SMA Female
Analog Bandwidth (-3db) [a,b]			8 GHz
Vertical Resolution			8 bits
Input Impedance			50 ohm ± 3%
Input Coupling			DC
Maximum Input Voltage			± 5 V
Input Sensitivity			40 mV .. 8 V *(Full Scale)* 1 mV/div .. 1 V/div *(Scope UI)* [c]
Bandwidth Flatness [a,b] **(-6 dBFs)**			± 0.5 dB to 7 GHz -3 dB at 8 GHz
Effective Bits [a] **(-3 dBFs, 50 mV/div)**	*Frequency*		
	100 MHz		6.0
	1 GHz		5.9
	2 GHz		5.7
	3 GHz		5.6
	4 GHz		5.5
	6 GHz		5.1
	8 GHz		4.8
Rise / Fall Time (10-90%)			49 ps
RMS Noise Floor [a]	*Sensitivity (Full Scale)*	*Sensitivity (Scope UI)*	
	40 mV	5 mV/div	315 uV
	80 mV	10 mV/div	400 uV
	160 mV	20 mV/div	580 uV
	400 mV	50 mV/div	1.60 mV
	800 mV	100 mV/div	3.10 mV
	1.6 V	200 mV/div	6.00 mV
	4 V	500 mV/div	17.0 mV
	8 V	1 V/div	32.5 mV
Spurious Free Dynamic Range (SFDR) [a] **(-3 dBFs, 50 mV/div)**	*Frequency*		
	100 MHz		52 dBc
	1 GHz		52 dBc
	2 GHz		50 dBc
	3 GHz		52 dBc
	4 GHz		50 dBc
	6 GHz		45 dBc
	8 GHz		40 dBc
DC Gain Accuracy			± 2% of full scale at full resolution channel scale (± 2.5% for 5 mV/div)

Offset Range	*Vertical Sensitivity*	
	0 to 40 mV/div	± 0.4 V
	40 to 75 mV/div	± 0.9 V
	75 to 130 mV/div	± 1.6 V
	130 to 240 mV/div	± 3.0 V
	> 240 mV/div	± 4.0 V
Offset Accuracy	Offset Range	
	< 3.5 V	± (2% of channel offset + 1% of full scale + 1 mV)
	> 3.5 V	± (2% of channel offset + 1% of full scale)
Dynamic range		± 4 div from center screen
Channel to Channel Isolation (any two channels with equal V/div settings)	*Frequency*	
	< 8 GHz	48dB
Return Loss		< -14 dB to 8 GHz

Acquisition System GSA6082

Maximum Real Time Sample Rate	20 GSps
Memory Depth per Channel	16 Gpoints (32 Gpoints is optional)
Maximum Acquired Time per Channel at Highest Real Time Sample Rate	800 ms (1.6 s with 32 Gpoints option)

Vertical System GSA6131			1 Channel
Input Channels			1, SMA Female
Analog Bandwidth (-3db) [a,b]			13 GHz
Vertical Resolution			8 bits
Input Impedance			50 ohm ± 3%
Input Coupling			DC
Maximum Input Voltage			± 5 V
Input Sensitivity			40 mV .. 8 V *(Full Scale)* 1 mV/div .. 1 V/div *(Scope UI)* [c]
Bandwidth Flatness [a,b] **(-6 dBFs)**			± 0.5 dB to 11 GHz -3 dB at 13 GHz
Effective Bits [a] **(-3 dBFs, 50 mV/div)**	*Frequency*		
	100 MHz		5.6
	1 GHz		5.6
	2 GHz		5.5
	3 GHz		5.4
	4 GHz		5.2
	6 GHz		5.0
	8 GHz		4.6
	10 GHz		4.3
	13 GHz		4.2
Rise / Fall Time (10-90%)			32 ps
RMS Noise Floor [a]	*Sensitivity (Full Scale)*	*Sensitivity (Scope UI)*	
	40 mV	5 mV/div	485 uV
	80 mV	10 mV/div	550 uV
	160 mV	20 mV/div	670 uV
	400 mV	50 mV/div	2.10 mV
	800 mV	100 mV/div	3.80 mV
	1.6 V	200 mV/div	7.40 mV
	4 V	500 mV/div	21.6 mV
	8 V	1 V/div	45.8 mV
Spurious Free Dynamic Range (SFDR) [a] **(-3 dBFs, 50 mV/div)**	*Frequency*		
	100 MHz		52 dBc
	1 GHz		52 dBc
	2 GHz		52 dBc
	3 GHz		48 dBc
	4 GHz		45 dBc
	6 GHz		45 dBc
	8 GHz		42 dBc
	10 GHz		38 dBc

	13 GHz	32 dBc

DC Gain Accuracy		± 2% of full scale at full resolution channel scale (± 2.5% for 5 mV/div)
Offset Range	*Vertical Sensitivity*	
	0 … 40 mV/div	± 0.4 V
	40 … 75 mV/div	± 0.9 V
	75 … 130 mV/div	± 1.6 V
	130 … 240 mV/div	± 3.0 V
	> 240 mV/div	± 4.0 V
Offset Accuracy	Offset Range	
	< 3.5 V	± (2% of channel offset + 1% of full scale + 1 mV)
	> 3.5 V	± (2% of channel offset + 1% of full scale)
Dynamic range		± 4 div from center screen
Channel to Channel Isolation (any two channels with equal V/div settings)		N/A
Return Loss		< -12 dB to 12.5 GHz

Acquisition System GSA6131

Maximum Real Time Sample Rate	40 GSPS
Memory Depth per Channel	32 Gpoints (64 Gpoints is optional)
Maximum Acquired Time per Channel at Highest Real Time Sample Rate	800 ms (1.6 s with 64Gpoints option)

Parametric Measurements Accuracy

TAA		± 2%
Pulse Width / Rise / Fall Time		± 3% or 20 ps whichever is greater
SNR		± 0.5 dB
Crest Factor		± 2%
Modulation		± 2%
Overwrite		± 0.2 dB

Trigger

Trigger Types		Internal edge trigger on an input channel External edge trigger
External Trigger Input		2, MCX Female
	Impedance Voltage Range Level Range Max. Frequency	50 Ohm ± 5V ± 5V 100 MHz

Control Signal Connections

Calibrator Output		1, MCX Female
	Impedance	50 Ohm
External 10 MHz Reference Input		1, MCX Female
	Level Impedance Coupling	0 to +10 dBm 50 Ohm AC
External 50 MHz Reference Input		1, SMA Female
	Level Impedance Coupling	0 to +10 dBm 50 Ohm AC
External 50 MHz Reference Output		1, SMA Female
	Level Impedance Coupling	800 mV p/p nominal 50 Ohm AC

External 1 GHz Clock Input		1, MCX Female
	Level Impedance Coupling	0 to +10 dBm 50 Ohm AC
Test Outputs		4, MCX Female
	Level	LV TTL

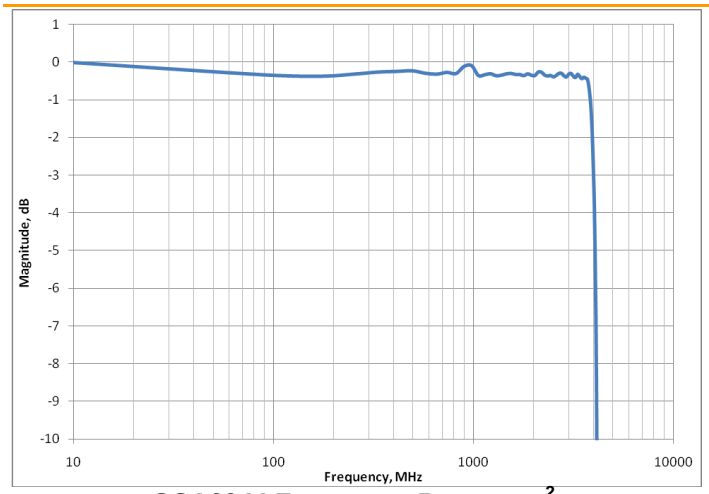
Host Computer

Transfer Interface	One x8 PCI-Express Generation 2 link via Guzik PCI-Express x8 switch card One x16 PCI-Express Generation 2 connector via Guzik PCI-Express x16 switch card (optional)
Transfer Speed	Up to 8.8 GBytes/s when both PCI-Express connectors are used 2.4 GBytes/s via x8 PCI-Express Generation 2 link
Operating System	32-bit Windows XP or Windows 7

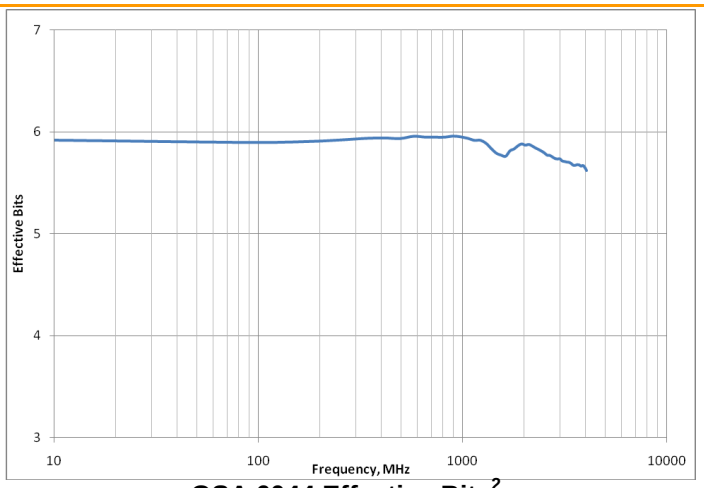
Physical

Size, W × D × H	17.5” × 15.8” × 3.2” 444 x 400 x 81 mm
Weight	15 lbs / 6.7 kg
Rack-Mount Installation Kit	Available
Power	110 VAC (± 10%, 50/60 Hz, 2.5A approx.) 230 VAC (± 10%, 50/60 Hz, 1.5A approx.)
Operating Temperature Range	+5 C to +40 C
Non-Operating Temperature	-40 C to +70 C
Operating Altitude	Up to 4,000 meters (12,000 feet)
Non-Operating Altitude	Up to 15,300 meters (50,000 feet)

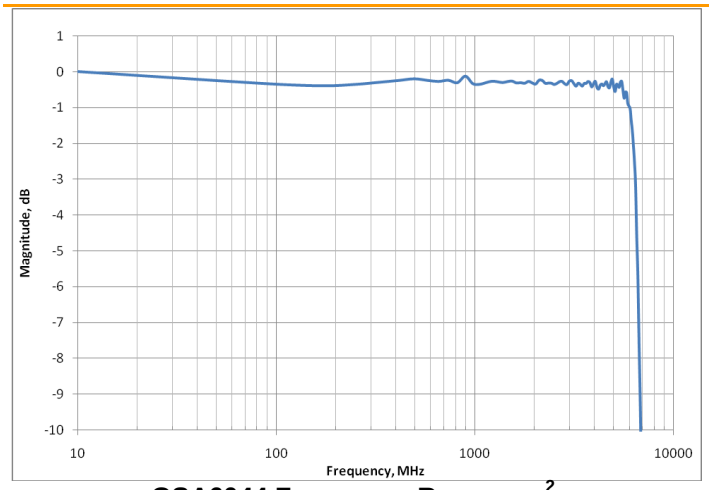
Performance Charts



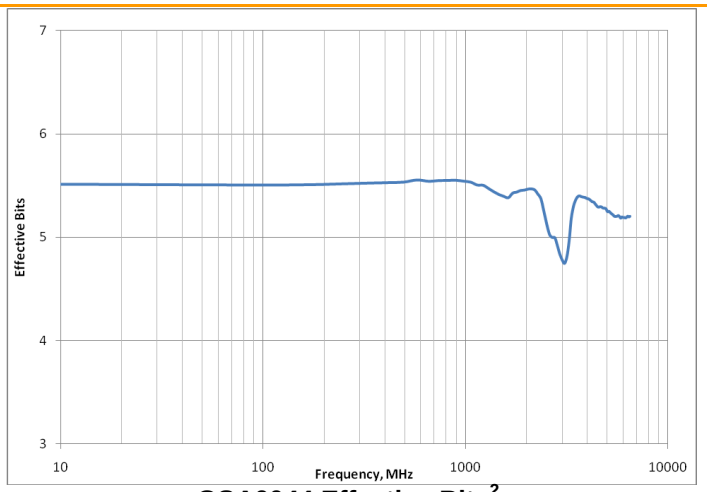
GSA6044 Frequency Response[2]. Sampling Rate 10 GS/Sec, Aanalog Bandwidth 4 GHz.



GSA 6044 Effective Bits[2]. Sampling Rate 10 GS/Sec, Analog Bandwidth 4 GHz.



GSA6044 Frequency Response[2]. Sampling Rate 20 GS/Sec, Analog Bandwidth 6.5 GHz.



GSA6044 Effective Bits[2]. Sampling Rate 20 GS/Sec, Analog Bandwidth 6.5 GHz.

[a] With digital equalization

[b] 6-pole Butterworth approximation

[c] Magnification is used below 5 mV/div. The major scale settings for Scope User Interface (UI) in Signal Display application are 5 mV/div, 10 mV/div, 20 mV/div, 50 mV/div, 100 mV/div, 200 mV/div, 500 mV/div, and 1 V/div. There are 8 vertical divisions on the screen.

Ordering and Availability

Base Unit	P/N	Price	Lead Time
GSA6131 with "basic" software	**S90-620183**	**$69,000**	**8-12 weeks**
GSA6082 with "basic" software	**S90-620184**	**$69,000**	**8-12 weeks**
GSA6044 with "basic" software	**S90-620181**	**$69,000**	**8-12 weeks**
GSA6044 with magnetic recording software	**S90-620182**	**Call**	**8-12 weeks**
GSA6042 with "basic" software		*TBD*	*Not Released*
GSA6042 with magnetic recording software		*TBD*	*Not Released*

Options

Software upgrade from "basic" to magnetic recording software package	**S87-888341**	**Call**	**1-2 days**
3D Pulse Profile software for WITE32	**S87-777555**	**Call**	**1-2 days**
Digital MSCAN software for WITE32	**S87-777556**	**Call**	**1-2 days**
PCI Express x16		**Call**	**8-12 weeks**
Multi-module Configuration		**Call**	**Call**

Software Packages

"Basic" software package includes:

- GSA SDK APIs: Acquisition, FFT, DFT
- Signal Display

Magnetic recording software package includes:

- Basic software package
- Additional GSA SDK APIs: Parametric, Jitter, Eye Diagram, Media Noise
- WITE32 integration, standard WITE32 tests and measurements, except for those with optional purchase license

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