KEYSIGHT TECHNOLOGIES (AGILENT HP)

MSO6104A

The Keysight (Agilent) MSO6104A is a high-performance 4-channel, 1 GHz Mixed Signal Oscilloscope (MSO) from the InfiniiVision 6000 Series. Featuring MegaZoom III deep memory technology, a high-definition XGA display with 256 levels of intensity, and an ultra-fast update rate of 100,000 waveforms per second, the MSO6104A provides unmatched insight into analog, digital, and serial bus designs. Additionally, it integrates 16 digital timing channels fully time-correlated with the analog scope channels, making it a powerful tool for mixed-signal debugging.

SPECIFICATIONS

General

Interfaces	USB (host and device), LAN (10/100Base-T, LXI Class C), GPIB, XGA video output
Display	6.3-inch (160 mm) diagonal XGA color TFT LCD, 1024 x 768 resolution, with 256 intensity levels
Standard Probes Included	Four 10073D (10:1, 500 MHz) passive probes, one 16-channel digital probe kit (54620-68701)

Physical

Power Supply	100 - 240 V AC, 50/60 Hz; or 100 - 120 V AC, 400 Hz; 120 W maximum power consumption
Operating Temperature	0 °C to +55 °C °C
Dimensions (W×H×D)	354 mm × 188 mm × 282 mm mm
Weight	4.9 kg kg

Analog Channel Specifications

Analog Bandwidth (-3 dB)	1 GHz
Number of Analog Channels	4
Calculated Rise Time (10% to 90%)	350 ps
Hardware Bandwidth Limits	20 MHz
Input Coupling	AC, DC
Input Impedance	1 MΩ ± 1% (|| ~14 pF) or 50 Ω ± 1%
Vertical Resolution	8 bits
Input Sensitivity Range (1 MΩ)	2 mV/div to 5 V/div
Input Sensitivity Range (50 Ω)	2 mV/div to 1 V/div
DC Vertical Gain Accuracy	±2.0% of full scale
Maximum Input Voltage (1 MΩ)	CAT I 300 Vrms, 400 Vpk
Maximum Input Voltage (50 Ω)	5 Vrms
Channel-to-Channel Isolation	≥ 40 dB (from DC to 1 GHz)

Digital Channel Specifications

Number of Digital Channels	16
Maximum Input Toggle Rate	250 MHz
Minimum Detectable Pulse Width	2 ns
Input Impedance (Digital Pod)	100 kΩ ± 2% (|| ~8 pF)
Threshold Selections	TTL, CMOS, ECL, user-defined
User-Defined Threshold Range	±8.0 V in 10 mV steps
Threshold Accuracy	±(100 mV + 3% of threshold setting)
Maximum Input Voltage (Digital Pod)	±40 V peak CAT I
Channel-to-Channel Skew	2 ns typical, 3 ns maximum

Acquisition System

Real-Time Sample Rate (Analog, Half-Channel)	4 GSa/s
Real-Time Sample Rate (Analog, All-Channels)	2 GSa/s
Real-Time Sample Rate (Digital, Half-Pod)	2 GSa/s
Real-Time Sample Rate (Digital, All-Pods)	1 GSa/s
Standard Memory Depth (Half-Channel)	8 Mpts
Standard Memory Depth (All-Channels)	4 Mpts
Peak Detect / Glitch Capture	250 ps
Acquisition Modes	Normal, Peak Detect, Averaging, High Resolution, Segmented
Segmented Memory	Standard (up to 1000 segments)

Trigger System

Trigger Sources	Analog channels, digital channels, External, Line
Trigger Modes	Auto, Normal, Single
Trigger Coupling	AC, DC, LF Reject, HF Reject, Noise Reject
Trigger Holdoff Range	60 ns to 10 s
I2C/SPI Triggering	Standard
USB Triggering	Standard
Automotive Serial Triggering	CAN, LIN, FlexRay (option-dependent)
Pattern and Mixed Signal Triggering	Available across all analog and digital channels
External Trigger Input Impedance	1 MΩ ± 3% (|| 14 pF)
Analog Trigger Sensitivity	DC to 100 MHz: 0.6 div or 5 mV; 100 MHz to max bandwidth: 1.0 div or 10 mV
Digital Trigger Sensitivity	1 threshold increment + 50 mV
Trigger Level Range (Internal)	±6 divisions from screen center
External Trigger Input Range	±15 V
External Trigger Sensitivity	DC to 100 MHz: 100 mV; 100 MHz to 500 MHz: 200 mV; 500 MHz to 1 GHz: 500 mV

Display and User Interface

Waveform Update Rate	100,000 waveforms/sec
Graticule	8 x 10 grid

Measurement and Analysis

Automatic Voltage Measurements	Peak-to-Peak, Maximum, Minimum, Amplitude, Top, Base, Overshoot, Preshoot, Average, RMS
Automatic Time Measurements	Period, Frequency, Rise Time, Fall Time, +Width, -Width, Duty Cycle, Delay, Phase
Waveform Math Operators	Addition, Subtraction, Multiplication, FFT
FFT Window Types	Hanning, Flat Top, Rectangular
FPGA Dynamic Probe Support	Xilinx, Altera (option-dependent)

Connectivity and Interfaces

LAN Interface	10/100Base-T, LXI Class C
USB Ports	1x USB 2.0 device (rear), 2x USB 2.0 host (front/rear)
GPIB Interface	Optional (via N5427A module)
Video Output Port	VGA (XGA resolution), 15-pin D-sub
10 MHz Reference Input/Output	BNC connector
Auxiliary Output	Trigger Out / Calibration Out

Power and Physical

Power Consumption	120 W maximum

Environmental and Standards

Non-Operating Temperature Range	-40 °C to +70 °C
Operating Humidity	95% RH at 40 °C (non-condensing)
Operating Altitude	Up to 4,600 m (15,000 ft)
Safety Standards	UL61010-1, CAN/CSA-C22.2 No. 61010-1, EN61010-1
Electromagnetic Compatibility (EMC)	IEC 61326-1, EN 61326-1

Horizontal System

Timebase Range	500 ps/div to 50 s/div
Timebase Accuracy	±15 ppm
Timebase Modes	Main, Zoom, Roll, XY
Timebase Delay Range (Pre-trigger)	Greater of 1 screen width or 250 µs
Channel-to-Channel Deskew Range	±100 ns

Vertical System - Analog

DC Vertical Offset Accuracy	±(0.1 div + 2 mV + 0.5% of offset) for 2 mV/div to 200 mV/div; ±(0.1 div + 10 mV + 1.5% of offset) for >200 mV/div to 5 V/div

Display System

Display Resolution	640 × 480 pixels

Environmental

Vibration - Operating	Random vibration 5 to 500 Hz, 10 minutes per axis, 0.3 g (rms)
Vibration - Non-operating	Random vibration 5 to 500 Hz, 10 minutes per axis, 2.41 g (rms)
Shock - Operating	Half-sine 30 g, 11 ms duration
Shock - Non-operating	Half-sine 50 g, 11 ms duration

Vertical System

Vertical Offset Range	±5 V (2 mV/div to 200 mV/div, 1 MΩ), ±1 V (2 mV/div to 200 mV/div, 50 Ω), ±50 V (202 mV/div to 5 V/div, 1 MΩ), ±8 V (202 mV/div to 5 V/div, 50 Ω)
Dynamic Range	±8 divisions from screen center
Probe Interface	Agilent AutoProbe interface (compatible with active, differential, and current probes)

Acquisition

High-Resolution Mode	Up to 12 bits of vertical resolution (boxcar averaging, sample-rate dependent)

Display

Display Intensity Levels	256 levels of intensity-graded mapping

Triggering & Analysis

Optional Serial Protocols	I2C, SPI, CAN, LIN, RS-232/UART, MIL-STD-1553, FlexRay (software options dependent)

TECHNOLOGY

Mixed Signal Oscilloscope

APPLICATIONS

Electronic design, debugging, automotive serial buses, FPGA troubleshooting, and education