

KEYSIGHT TECHNOLOGIES (AGILENT HP)

MSO6014A

The Keysight MSO6014A is an InfiniiVision 6000 Series 100 MHz Mixed Signal Oscilloscope. Combining 4 analog channels and 16 digital channels, it features Keysight's proprietary MegaZoom III technology to deliver standard deep memory of up to 8 Mpts, a high-definition color display with 256 levels of intensity, and an uncompromised update rate of up to 100,000 waveforms per second. Designed for debug of modern embedded designs, it integrates digital, analog, and serial bus testing capabilities.

SPECIFICATIONS

General

Interfaces	LAN, USB, GPIB, XGA video out
Display	6.3-inch diagonal color TFT LCD, VGA (640 x 480) resolution, 256 intensity levels
Probe Compensator Output Frequency	~1.2 kHz
Probe Compensator Output Voltage	~3 V

Physical

Operating Temperature	0 to +55 °C °C
Dimensions (W×H×D)	354 mm × 188 mm × 174 mm mm
Weight	4.9 kg kg

Vertical System - Analog Channels

Analog Channels	4
Analog Bandwidth (-3 dB)	100 MHz
Calculated Rise Time (10% to 90%)	3.5 ns
Input Coupling	AC, DC
Input Impedance	1 M Ω $\pm$ 1% (14 pF), 50 Ω $\pm$ 1.5% (selectable)
Input Sensitivity Range	2 mV/div to 5 V/div (1 M Ω), 2 mV/div to 1 V/div (50 Ω)
Vertical Resolution	8 bits
Hardware Bandwidth Limits	~20 MHz (selectable)
Maximum Input Voltage (1 M Ω)	CAT I 300 Vrms, CAT II 150 Vrms, $\pm$ 400 Vpk
Maximum Input Voltage (50 Ω)	5 Vrms
DC Vertical Gain Accuracy	$\pm$ 2% of full scale
DC Vertical Offset Accuracy	$\pm$ (1.5% of offset setting + 1.0% of full scale + 1 mV) for < 10 mV/div; $\pm$ (1.5% of offset setting + 0.5% of full scale + 1 mV) for $\geq$ 10 mV/div
Offset Range (2 mV/div to 200 mV/div, 1 M Ω)	$\pm$ 2 V (2 mV/div to 100 mV/div)
Offset Range (>200 mV/div to 5 V/div, 1 M Ω)	$\pm$ 50 V (>100 mV/div to 5 V/div)
Offset Range (2 mV/div to 200 mV/div, 50 Ω)	$\pm$ 2 V (2 mV/div to 100 mV/div)
Offset Range (>200 mV/div to 1 V/div, 50 Ω)	$\pm$ 12 V (>100 mV/div to 1 V/div)
Channel-to-Channel Isolation	$\geq$ 40 dB from DC to 100 MHz

Vertical System - Digital Channels

Digital Channels	16 (D0 to D15)
Threshold Grouping	Pod 1 (D7 to D0), Pod 2 (D15 to D8)
Threshold Selections	TTL (+1.4 V), CMOS (+2.5 V), ECL (-1.3 V), User-Defined
User-Defined Threshold Range	$\pm$ 8.0 V in 10 mV steps
Threshold Accuracy	$\pm$ (100 mV + 3% of threshold setting)
Maximum Input Voltage (Digital)	$\pm$ 40 V peak CAT I
Input Dynamic Range	$\pm$ 10 V about threshold
Minimum Input Voltage Swing	500 mVpp
Input Impedance (Digital Probe)	100 k Ω $\pm$ 2% ~8 pF

Horizontal System (Timebase)

Timebase Range	5 ns/div to 50 s/div
Timebase Accuracy	$\pm$ 15 ppm (0.0015%)
Delay Range (Pre-trigger)	Greater of 1 screen width or 25 ms
Delay Range (Post-trigger)	1 s to 500 s (dependent on sweep speed)
Channel-to-Channel Deskew Range	$\pm$ 75 ns
Horizontal Modes	Main, Zoom, Roll, XY

Acquisition System

Maximum Real-time Sample Rate (Analog)	2 GSa/s (half-channel interleaved), 1 GSa/s (all channels)
Maximum Real-time Sample Rate (Digital)	2 GSa/s (1 pod), 1 GSa/s (2 pods)
Maximum Memory Depth	8 Mpts (half-channel interleaved), 4 Mpts (all channels)
Acquisition Modes	Normal, Peak Detect, Averaging, High Resolution, Segmented
Peak Detect Resolution	500 ps (half-channel interleaved), 1 ns (all channels)
Averaging Factors	Selectable from 2 to 65536 (in powers of 2)
Segmented Memory Max Segments	1000 segments (with 8 Mpts)
Waveform Update Rate (Maximum)	100,000 waveforms/sec

Trigger System

Trigger Sources	Ch 1, Ch 2, Ch 3, Ch 4, Line, External, D0 to D15
Trigger Modes	Auto, Normal, Single
Trigger Coupling	AC (~10 Hz), DC, LF Reject (~50 kHz), HF Reject (~50 kHz), Noise Reject
Trigger Level Range (Analog)	±6 div from center screen
Trigger Level Range (External)	±1.0 V (range 1), ±8.0 V (range 2)
Trigger Sensitivity (Analog)	< 10 mV/div: greater of 1 div or 5 mV; ≥ 10 mV/div: 0.6 div
Trigger Sensitivity (External)	100 mV (range 1), 500 mV (range 2) (DC to 100 MHz)
Trigger Holdoff Range	60 ns to 10 s
Standard Trigger Types	Edge, Pulse Width, Pattern, TV/Video, Duration, Sequence, Nth Edge (CAN, LIN, USB, I2C, SPI optional)

Waveform Measurements and Analysis

Automatic Voltage Measurements	Peak-to-Peak, Max, Min, Amplitude, Top, Base, Overshoot, Preshoot, Average, RMS
Automatic Time Measurements	Period, Frequency, Rise Time, Fall Time, +Width, -Width, Duty Cycle, Delay, Phase, X at Min, X at Max
Measurement Statistics	Mean, Min, Max, Standard Deviation, Count
Built-in Cursors	Manual, Track Waveform, Auto-measure
Waveform Math Functions	A+B, A-B, A*B, FFT, d/dt, ∫dt
FFT Window Functions	Hanning, Flat Top, Rectangular, Blackman-Harris
FFT Vertical Scale	dB, VRMS

Connectivity and Interfaces

USB Host Port	1 x USB 2.0 High-speed on front panel (supports flash drives)
USB Device Port	1 x USB 2.0 High-speed on rear panel (supports PC connection and PictBridge printing)
LAN Port	1 x RJ-45 10/100Base-TX (LXI Class C compliant)
GPIO Port	IEEE-488.2 GPIO interface
External Trigger Input	BNC on rear panel
Trigger Out / Auxiliary Output	BNC on rear panel (0 to 5 V into high impedance, 0 to 2.5 V into 50 Ω)
Video Output Port (VGA)	DB-15 female, VGA (640 x 480) resolution
Calibration Output / Probe Compensator	Front panel terminals (~1.2 kHz, ~3 Vpp)

Power and Physical Characteristics

Line Voltage Range	100 V to 240 V AC ($\pm 10\%$)
Line Frequency Range	45 Hz to 440 Hz
Power Consumption (Maximum)	120 W
Weight (Shipping)	9.2 kg
Kensington Security Slot	Standard on rear panel

Environmental and Safety Compliance

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)
Electromagnetic Compatibility (EMC)	IEC 61326-1, EN 61326-1, CISPR 11 Class A
Safety Standards	UL 61010-1, CAN/CSA-C22.2 No. 61010-1, EN 61010-1

Ordering Information and Upgrades

Included Probes (Analog)	4 x 10074C 10:1 passive probes (150 MHz)
Included Probe Kit (Digital)	1 x 54620-68701 16-channel digital probe kit
Memory Depth Upgrades	Standard MegaZoom III (no upgrades required)
Serial Decode Software Options	N5424A (CAN/LIN), N5423A (I2C/SPI), N5432A (FlexRay), N5457A (RS-232/UART)
Rackmount Kit Accessory Part Number	N2916B

Digital Channels

Digital Channel Maximum Toggle Rate	250 MHz
Digital Channel Minimum Pulse Width	2 ns
Digital Channel Threshold Resolution	10 mV
Digital Probe Input Capacitance	8 pF
Digital Probe Input Resistance	100 k Ω

Triggering

Pulse Width Trigger Range	15 ns to 10 s
Duration Trigger Range	15 ns to 10 s
Sequence Trigger Delay Range	15 ns to 10 s (or 1 to 65,535 events)
External Trigger Maximum Input	300 Vrms CAT I, 150 Vrms CAT II

Storage

Internal Setup Storage	10 non-volatile setups
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Environmental

Operating Vibration	0.21 g grms, 5 Hz to 500 Hz (10 min per axis)
Non-operating Vibration	2.09 g grms, 5 Hz to 500 Hz (10 min per axis)
Operating Shock	30 g (half-sine, 11 ms)
Non-operating Shock	50 g (half-sine, 11 ms)

Connectivity

USB Host Port Speed	USB 2.0 High Speed
USB Device Port Speed	USB 2.0 High Speed
LAN Interface Speed	10/100Base-T

Display

Display Size	6.3 inches (160 mm) diagonal
Display Resolution	640 x 480 pixels (VGA)
Display Type	Color Active Matrix TFT LCD
Display Graticule	8 x 10 grid
Intensity Levels	256 levels

Interfaces & Control

LXI Compliance	LXI Class C
Command Language	SCPI

Horizontal System

Timebase Aging	±5 ppm per year
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Safety

Overvoltage Category	CAT II (1 M Ω input), CAT I (50 Ω input)
Pollution Degree	2

TECHNOLOGY

Mixed Signal Oscilloscope (MSO)

APPLICATIONS

Embedded hardware design, debug, and serial bus analysis

