Agilent Technologies
6000L Series Low-Profile Oscilloscopes

Data Sheet

The most space efficient, and affordable LXI C compliant oscilloscopes

Four channels in only 1U space

Industry-leading performance:

- 4-channel digital storage oscilloscope (DSO) models
- Low profile, high density 1U (4.45 cm, 1.75 inches) package
- LXI class C compliant
- 100 MHz, 500 MHz and 1 GHz analog bandwidth
- Up to 4 GSa/s sample rate
- Standard 2 Mpts MegaZoom III deep memory
- Full-scale connectivity – Standard USB, LAN, GPIB interface with XGA video output
- 8-bit vertical resolution (extensible to 12 bits)
- Mixed signal analysis option supporting integrated 4-scope and 16-logic channels
- Built-in Web browser control
- Optional secure environment mode
- IVI-COM driver
- 100% software compatible with 6000A Series portable oscilloscopes

The highest performance and lowest cost automated test oscilloscope in it's class.

Agilent Technologies

Low-profile, high-density package saves rack space

The 6000L Series oscilloscopes provide up to 1-GHz bandwidth in a space-saving 1U-high 19-inch wide package so it saves your valuable rack space. The oscilloscopes have side and rear air vents (no top or bottom air vents) so other instruments can be mounted directly above or below them. Rack mount brackets and rack rails are standard with every unit.

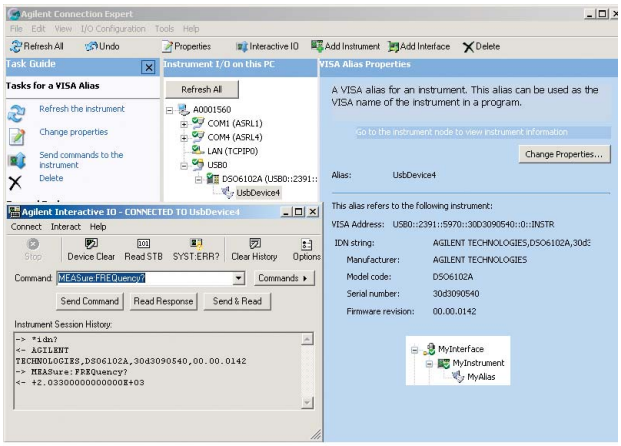
Make the most of your rack space with an Agilent 6000L Series oscilloscope.

LXI class C compliant

LAN eXtensions for Instrumentation (LXI) is the architecture for test systems that's based on proven, widely used standards such as Ethernet. By specifying the interaction of those standards, LXI enables fast, efficient, cost-effective creation and reconfiguration of test systems. The 6000L Series oscilloscopes are fully LXI class C compliant. The 6000L Series oscilloscopes follow specified LAN protocols, and adhere to LXI requirements such as a built-in Web control server, IVI driver software, and more.

Easy system integration and configuration

To simplify system development, the 6000L Series oscilloscopes come standard with an IVI-COM (Interchangeable Virtual Instruments) driver, and they support easy-to-use SCPI commands. The standard Agilent I/O Library Suite makes it easy to configure and integrate instruments into your system – even if your system includes instruments from other vendors.



Establish instrument connection faster with Agilent I/O Library Suite.

Built-in Web control

The built-in Web server provides remote access and control of the instrument via a standard Java™-enabled Web browser on your computer. You can communicate with the scope over the scope's built-in LAN interface. Using the Web browser you can set up measurements, monitor waveforms, capture screen images and operate the scope remotely. Through the remote front panel you have access to the built-in help system that is available in eleven languages. Simply right click on the soft keys to see help for that function. You can also send SCPI commands over the LAN to control your scope. Wherever you are, your 6000L Series scope is as close as the nearest Web browser.

Remotely display and control your 6000L oscilloscope from any Java-enabled web browser over the oscilloscope's built-in LAN interface.

Optional secure environment mode

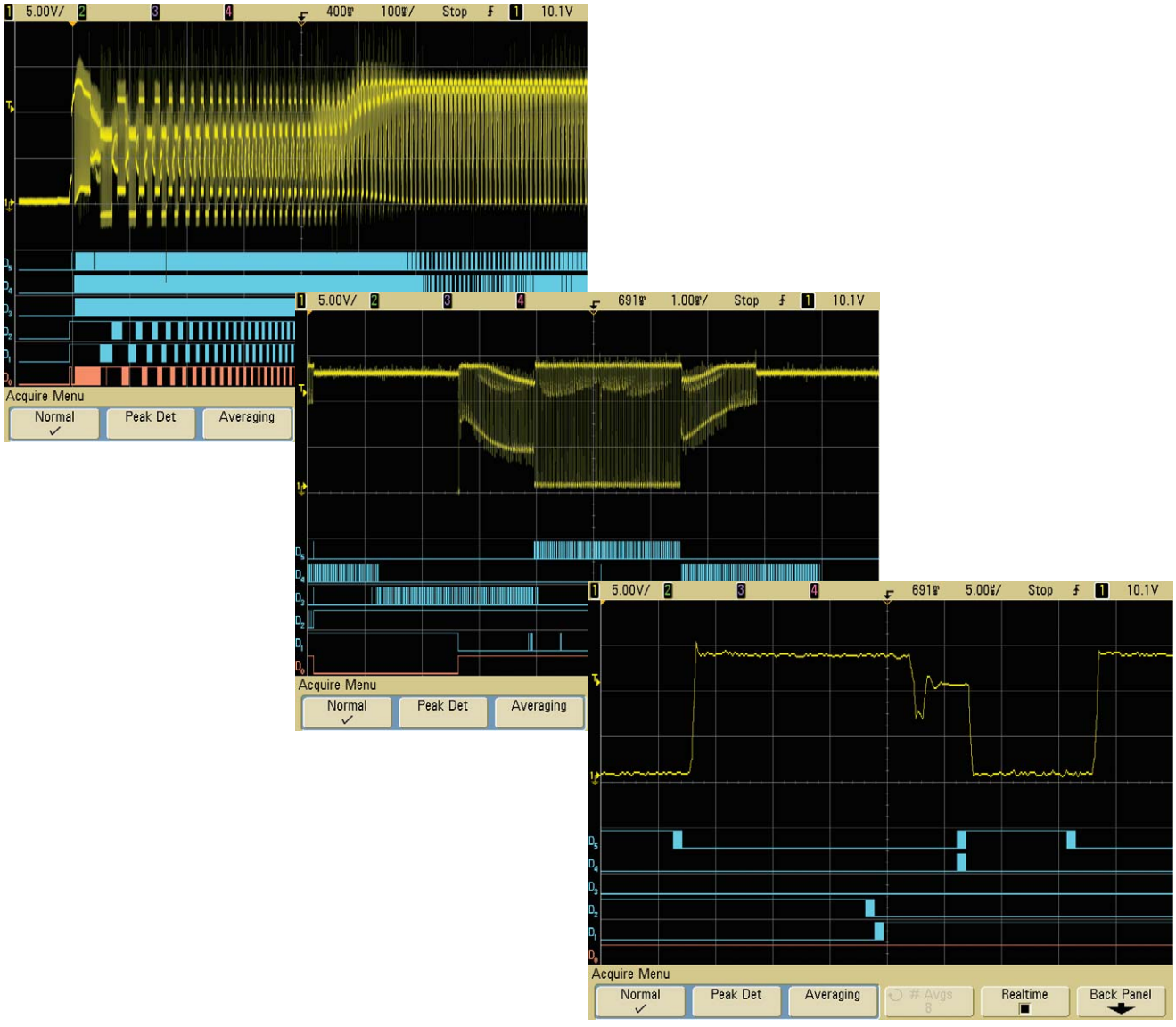
The optional secure environment mode provides the highest level of security by ensuring that internal memory is clear of all setup and trace settings in compliance with National Industrial Security Program Operating Manual (NISPOM) Chapter 8 requirements. You can move the instrument out of a secure area with confidence. When this option is installed, it will store setups and traces to internal volatile memory only. To permanently store data, you can save it to an external memory device via the oscilloscope's front-panel USB port.

Up to 12 bits of resolution

High resolution mode offers up to 12 bits of resolution in real-time mode, which reduces noise and increases vertical resolution. When operating at slow time base ranges, the 6000L Series oscilloscopes serially filter sequential data points and map the filtered results to the display. In certain situations, user-controlled averaging can also be used to obtain greater than 8-bits of resolution.

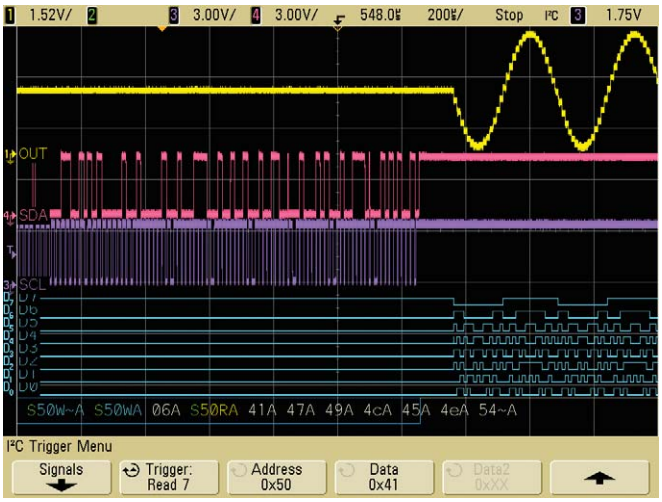
Time base	Bits of resolution
< 100 nsec/div	8
500 nsec/div	9
2 µsec/div	10
10 µsec/div	11
≥ 50 µsec/div	12

Powerful acquisition with MegaZoom III deep memory
2 Mpt of MegaZoom deep memory comes standard so you can capture long, non-repeating signals, while maintaining high sample rates and good timing resolution. This lets you quickly zoom in on areas of interest. In single-channel mode with 8 Mpts of memory, the DSO6104L can capture a signal over a 2 msec period with a sampling rate of 4 GSa/s (0.25 nsec period). The fast sample rate and deep memory ensure that all high-frequency signal components, up to the full bandwidth of the scope, are captured.



MegaZoom III deep memory helps you find details buried in complex signals. You can view fast waveform updates of signals by means of an external dislpay connected to the oscilloscope's XGA out port.

Mixed signal analysis option
If you work with both analog and digital circuitry, the Agilent 6000L Series oscilloscope can help you see more signal activity in your designs. You can upgrade the 6000L Series oscilloscope to a 4 scope +16 logic timing channel mixed signal oscilloscope (MSO). Both the MSO and the 4-channel DSO models are optimized with the capabilities you need for verifying and debugging designs that include embedded system components. With the MSO you can trigger on any combination of its scope and logic channels.



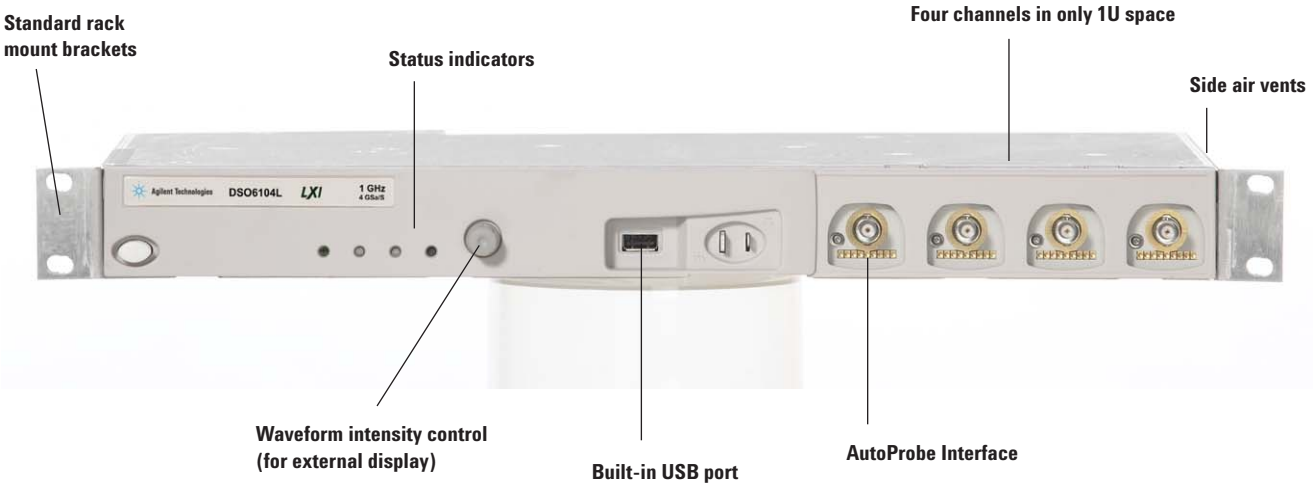
The MSO option lets you see the complex interactions among your signals on up to 20 channels at the same time.

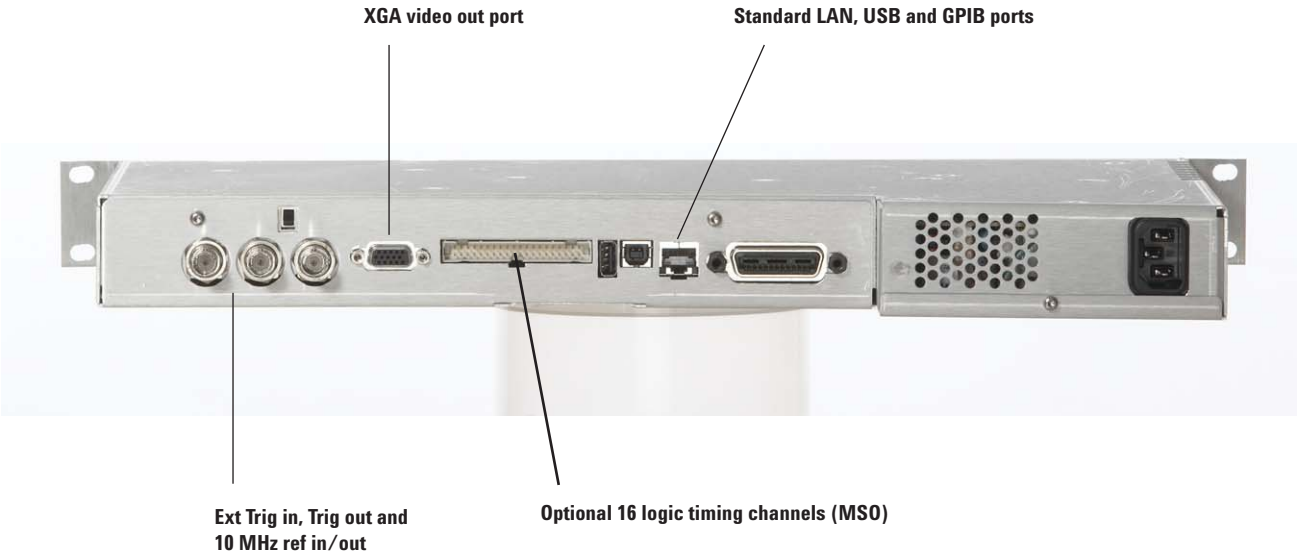
Easy transition from 6000A to 6000L
One of the biggest challenges in a new product's life cycle is the transition of its test system from development to manufacturing. With LXI, the transition can be achieved much more easily and cost effectively than with cardcage-based systems.

Engineers can use the LXI class C compliant 6000A Series portable oscilloscope during the R&D phase, using the display, keypad and knobs to quickly access a wealth of measurement capabilities. When your product moves to manufacturing, you can use a system-optimized 6000L Series LXI oscilloscope without a display. Because the 6000A and 6000L are 100% software compatible, your manufacturing system can use the software and test routines developed in R&D without any modification, while you save cost and rack space by moving from a standard bench-top oscilloscope to a 1U high oscilloscope without a display.

The 6000A and 6000L Series oscilloscopes are 100% software compatible, enabling smooth test system transition.

Agilent 6000L Series Oscilloscopes:
The most space efficient LXI C compliant oscilloscopes





Performance characteristics

Scope input

Channels	Ch 1, 2, 3 and 4 simultaneous acquisition
Bandwidth (–3 dB)*	DSO6014L: DC to 100 MHz DSO6054L: DC to 500 MHz DSO6104L: DC to 1 GHz
Maximum input	CAT I 300 Vrms, 400 Vpk, CAT II 100 Vrms, 400 Vpk With 10073C/10074C 10:1 probe: CAT I 500 Vpk, CAT II 400 Vpk 5 Vrms with 50 Ω input
Full Scale range[1]	DSO6014L: 1 mV/div to 5 V/div (1 MΩ) DSO6054L: 2 mV/div to 5 V/div (1 MΩ or 50 Ω) DSO6104L: 2 mV/div to 5 V/div (1 MΩ), 2 mV/div to 1 V/div (50 Ω)
Input impedance	DSO6014L[2]: 1 MΩ ± 1% || 11pF DSO6054L/6104L: 1 MΩ ± 1% || 14pF or 50 Ω ± 1.5%, selectable
Coupling	AC, DC
Offset range	±5 V on ranges < 10 mV/div ±25 V on ranges 10 mV/div to 200 mV/div ±75 V on ranges ≥ 200 mV/div
Connector	BNC
BW limit	DSO6014L: 20MHz DSO6054L/6104L: 25 MHz selectable
Noise peak-to-peak	DSO6014L: 3% full scale or 2 mV, whichever is greater DSO6054L: 3% full scale or 3.6 mV, whichever is greater DSO6104L: 3% full scale or 4.5 mV, whichever is greater

* Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period and ±10 °C from firmware calibration temperature.

1 1 mV/div is a magnification of 2 mV/div. 2 mV/div is a magnification of 4 mV/div setting. For vertical accuracy calculations, use full scale of 16 mV for 1 mV/div sensitivity setting and 32 mV for 2 mV/div sensitivity setting.

2 Four 50 Ω termination adapters are supplied with DSO6014L.

Logic channels (with MSO option)

Number of channels	16 logic timing channels – labeled D15 - D0
Maximum input frequency	250 MHz
Sample rate	2 GSa/sec one pod*, 1 GSa/sec each pod
Memory depth Standard memory Optional 8Mpts	1 pod /both pod 2 Mpts/1 Mpts 8 Mpts/4 Mpts
Vertical resolution	1 bit
Threshold selections	TTL, CMOS, ECL, user-definable (selectable by pod)
Maximum input voltage	±40 V peak CAT I
Glitch detection	2 ns (min pulse width)

* A pod is a group of 8 digital channels. either 0-8 or 9-16

Performance characteristics (continued)

Analog to digital conversion

Vertical resolution	8 bits
Sample rate	DSO6014L: 2 GSa/sec DSO6054L/6104L: 4 GSa/sec half channel, 2 GSa/sec each channel Equivalent-time sample rate: 400 GSa/s (when realtime mode is turned off)
Memory depth Standard option 8 Mpts	2 channels/4 channels 2 Mpts/1 Mpts 8 Mpts/4 Mpts
Time range	5 nsec/div to 50 sec/div (DSO6014L) 1 nsec/div to 50 sec/div (DSO6054L) 500 psec/div to 50 sec/div (DSO6104L)

Acquisition

Acquisition mode	Normal, Peak Detect, Averaging, High Resolution
Peak detection	DSO6014L: 1 nsec peak detect DSO6054L/6104L: 250 psec peak detect
Averaging	Selectable from 2,4,8,16,32,64... to 65536
High resolution mode	Time base — Bits of resolution < 100 nsec/div — 8 500 nsec/div — 9 2 µsec/div — 10 10 µsec/div — 11 ≥ 50 µsec/div — 12
Filter	Sinx/x interpolation

Trigger system

Sources	DSO6xx4L: Ch 1, 2, 3, 4, line, ext and D0 - D15 for MSO enabled DSO
Modes	Auto, Normal, Single
Holdoff time range	~60 ns to 10 seconds
Trigger jitter	15 psec rms
Selections	Edge, pulse width, pattern, TV, duration, sequence, CAN, LIN, USB, I^2C, SPI, Nth edge burst

Scope channel triggering

Range (internal)	±6 div from center screen
Sensitivity*	< 10 mV/div: greater of 1 div or 5 mV ≥ 10mV/div: 0.6 div
Coupling	AC (~10 Hz), DC, noise reject, HF reject and LF reject (~ 50 kHz)

* Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period and ±10 °C from firmware calibration temperature.

Performance characteristics (continued)

Logic (D15 - D0) channel triggering (with MSO option)

Threshold range (user defined)	±8.0 V in 10 mV increments
Threshold accuracy*	±(100 mV + 3% of threshold setting)
Predefined thresholds	TTL = 1.4 V, CMOS = 2.5 V, ECL = –1.3 V

* Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm-up period and ±10 °C from firmware calibration temperature.

External (EXT) triggering

Input resistance	1.015 kΩ ± 5% (DSO6014L) 2.14 kΩ ± 5% (DSO6054L/6104L)
Maximum input	±15 V
Range	±5 V
Sensitivity	DC to 100 MHz: 500 mV (DSO6014L) DC to 500 MHz: 500 mV (DSO6054L/6104L)
Coupling	AC (~ 3.5 Hz), DC, noise reject, HF reject and LF reject (~ 50 kHz)
Probe ID	Auto probe sense (DSO6014L) Auto probe sense and AutoProbe interface (DSO6054L/6104L)

Measurement features

Automatic measurements	Measurements are continuously updated. Cursors track last selected measurement.
Voltage (scope channels only)	Peak-to-peak, maximum, minimum, average, amplitude, top, base, overshoot, preshoot, RMS, standard deviation (AC RMS)
Time	Frequency, period, + width, – width and duty cycle on any channels Rise time, fall time, X at max Y (time at max volts), X at min Y (time at min volts), delay, and phase on scope channels only
Counter	Built-in 5-digit frequency counter on any scope channel. Counts up to the scope's bandwidth (1 GHz max). The counter resolution can be increased to 8 digits with an external 10 MHz reference.
Threshold definition	Variable by percent and absolute value; 10%, 50%, 90% default for time measurements
Cursors	Manually or automatically placed readout of horizontal (X, ΔX, 1/ΔX) and vertical (Y, ΔY) Additionally logic or scope channels can be displayed as binary or hex values
Waveform math	One function of 1-2, 1x2, FFT, differentiate, integrate. square root Source of FFT, differentiate, integrate: scope channels, 1 or 2, 1-2, 1+2, 1x2

Performance characteristics (continued)

FFT

Points	Fixed at 1000 points
Source of FFT	Scope channels 1, 2, 3 or 4, 1+2, 1-2, 1x2
Window	Rectangular, flattop, Hanning
Noise floor	–50 to –90 dB depending on averaging
Amplitude	Display in dBV, dBm at 50 Ω
Frequency resolution	0.05/(time per div)
Maximum frequency	50/(time per div)

Storage

Save/recall (non-volatile)	10 setups and traces can be saved and recalled internally. Secure environment mode (-SEC) ensures setups and traces are stored to volatile memory.
Storage type and format	USB 1.1 drive on front (/drive0) and rear (/drive5) panels Image formats: BMP (8 bit), BMP (24 bit) and PNG (24 bit) Data formats: X and Y (time/voltage) values in CSV, ASCII XY and binary format Trace/setup formats: Recalled

I/O

Standard ports	USB 2.0 high speed, 10/100-BaseT LAN, IEEE488.2 GPIB, XGA video output
Max transfer rate	IEEE488.2 GPIB: 500 kbytes/sec USB (USBTMC-USB488): 3.5 Mbytes/sec 100 Mbps LAN (TCP/IP): 1 Mbytes/sec
Remote front panel	
Built-in help	language support for English, German, French, Russian, Japanese, Traditional Chinese, Simplified Chines, Korean, Spanish, Portuguese and Italian
Throughput of scope channels	100,000 waveforms/sec in real-time mode to remote monitor
Resolution of video output	XGA
Waveform controls	Waveform intensity of 256 levels, vectors on/off, infinite persistence on/off

General characteristics

Rack mounting	Supplied with all necessary hardware (except tools) for installation into a standard EIA 19-inch rack
Physical size	43.5 cm W x 27 cm D x 4.2 cm H (without brackets)
Weight	Net: 2.45 kg (5.4 lbs.) Shipping: 6.2 kg (13.6 lbs.)
Probe comp output	Frequency ~2 kHz Amplitude ~5 V

Performance characteristics (continued)

General characteristics (continued)

Trigger out	
When Triggers is selected (delay ~17 ns)	0 to 5 V into high impedance 0 to 2.5 V into 50 Ω
When Source Frequency or Source Frequency/8 is selected	0 to 580 mV into high impedance 0 to 290 mV into 50 Ω
Max frequency output	350 MHz (in source frequency mode when terminated in 50 Ω) 125 MHz (in source frequency/8 mode when terminated in 50 Ω)
10 MHz ref in/out	TTL out, 180 mV to 1 V amplitude within 0 to 2 V offset

Power requirements

Line voltage range	96-144 V/48-440 Hz, 192-288V/48-66 Hz, automatic selection
Line frequency	50/60 Hz, 100-240 VAC; 440 Hz, 100-132 VAC
Power usage	100 W max

Environmental characteristics

Ambient temperature	Operating –10 °C to +50 °C; non-operating –65 °C to +71 °C
Humidity	Operating 95% RH at 40 °C for 24 hours; Non-operating 90% RH at 65 °C for 24 hours
Altitude	Operating to 4,570 m (15,000 ft); non-operating to 15,244 m (50,000 ft)
Vibration	Agilent class GP and MIL-PRF-28800F; Class 3 random
Shock	Agilent class GP and MIL-PRF-28800F; (operating 30 g, 1/2 sine, 11-ms duration, 3 shocks/axis along major axis. Total of 18 shocks)
Pollution degree 2	Normally only dry non-conductive pollution occurs. Occasionally a temporary conductivity caused by condensation must be expected.
Indoor use	This instrument is rated for indoor use only

Other

Installation categories	CAT I: Mains isolated CAT II: Line voltage in appliance and to wall outlet
EMC	IEC 61326-1:1997, EN 61326-1:1997
Safety	IEC 61010-1:2001, EN 61010-1:2001 Canada: CSA-C22.2 No. 1010.1:1992 UL 61010-1:2003
Supplementary information	The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC, and carries the CE-marking accordingly.

Ordering information

Model number	Description
DSO6104L	1 GHz 4-ch DSO
DSO6054L	500 MHz 4-ch DSO
DSO6014L	100 MHz 4-ch DSO

Accessories included:

Model number	DSO6104L/6054L	DSO6014L
User's guide, Service guide, Programmer's guide	√	√
Power cord	√	√
10:1 divider passive probe per scope channel	√	√
Agilent IO Libraries Suite 14.2	√	√
Standard 1 year warranty	√	√
GPIB extender	√	√
50 Ω termination adapter		√
Crossover LAN cable	√	√
Rack mount hardware	√	√

Available options

Option number	Description	DSO6014L	DSO6054L/6104L
N2914A*	MSO upgrade kit	√	
N2915A*	MSO upgrade kit		√
N2920A (-8ML)	8Mpts memory upgrade	√	
N2921A (-8MH)	8Mpts memory upgrade		√
N5427A(-SEC)	Secure environment mode	√	√
N5423A(-LSS)	I^2C/SPI decode option	√	√
N5424A(-AMS)	CAN/LIN decode option	√	√
N5432A	FlexRay automotive triggering and decode	√	√
N5406A	Xilinx FPGA dynamic probe	√	√
N5434A	Altera FPGA dynamic probe	√	√

* Includes a 54620-68701 logic cable kit, a label and an upgrade key code to activate the MSO features

Ordering information (continued)

Warranty and calibration options

All models include a standard 1-year warranty. Contact local sales office for prices of extended options:

Option number	Description
R-51B-001-3C	1-year return-to-Agilent warranty, extended to 3 years

Passive probes

Product number	Description
10070C	1:1 passive probe with ID
10074C	10:1 150MHz passive probe with ID (shipped standard with DSO6014L model)
10073C	10:1 500 MHz passive probe with ID (shipped standard with DSO6054L/6104L models)

Current probes

Product number	Description
1146A	100-kHz current probe, ac/dc
1147A	50-MHz/15A current probe, ac/dc with AutoProbe interface (power supply not required)
N2780A	2MHz/500A current probe, AC/DC
N2781A	10MHz/150A current probe, AC/DC
N2782A	50MHz/30A current probe, AC/DC
N2783A	100MHz/30A current probe, AC/DC
N2779A	Power supply for N278xA current probes

High-voltage probes

Product number	Description
10076A	100:1, 4 kV, 250-MHz probe with ID
N2771A	1000:1, 15 kV, 50-MHz high-voltage probe

Logic probes

Product number	Description
10085-68701	16:16 logic cable and terminator
54620-68701	16:2 x 8 logic input probe assembly

Ordering information (continued)

Active single-ended probes

Product number	Description
1144A	800-MHz active probe
1145A	2-channel 750-MHz active probe
1142A	Power supply for 1144A and 1145A
1156A	1.5-GHz active probe with AutoProbe interface (power supply not required)

Active differential probes

Product number	Description
N2772A	20 MHz differential probe
N2773A	Differential probe power supply for N2772A
1130A	1.5 GHz InfiniiMax differential probe amplifier with AutoProbe interface (Order one or more InfiniiMax probe heads or connectivity kits per amplifier.)

Related Literature

Publication Title	Publication Type	Publication Number
Agilent 6000 Series Oscilloscopes	Data Sheet	5989-2000EN/EUS
Agilent 6000 Series and 54600 Series Oscilloscope Probes and Accessories	Data Sheet	5968-8153EN/EUS
Option SEC N5427A Secure Environment Mode Option	Data Sheet	5968-5558EN
Next-Generation Test Systems	Application Note	5989-2802EN
LXI: Going Beyond GPIB, PXI and VXI	Application Note	5989-4371EN
Optimizing Test Systems for Highest Throughput, Lowest Cost and Ease of Integration with LXI Instruments	Application Note	5989-4886EN
Open the Door to Simpler System Creation	Brochure	5989-2042EN

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Agilent Open

www.agilent.com/find/open
Agilent Open simplifies the process of connecting and programming test systems to help engineers design, validate and manufacture electronic products. Agilent offers open connectivity for a broad range of system-ready instruments, open industry software, PC-standard I/O and global support, which are combined to more easily integrate test system development.

LXI

www.lxistandard.org
LXI is the LAN-based successor to GPIB, providing faster, more efficient connectivity. Agilent is a founding member of the LXI consortium.

Remove all doubt

Our repair and calibration services will get your equipment back to you, performing like new, when promised. You will get full value out of your Agilent equipment throughout its lifetime. Your equipment will be serviced by Agilent-trained technicians using the latest factory calibration procedures, automated repair diagnostics and genuine parts. You will always have the utmost confidence in your measurements.

Agilent offers a wide range of additional expert test and measurement services for your equipment, including initial start-up assistance onsite education and training, as well as design, system integration, and project management.

For more information on repair and calibration services, go to

www.agilent.com/find/removealldoubt

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For more information on Agilent Technologies' products, applications or services, please contact your local Agilent office. The complete list is available at:

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