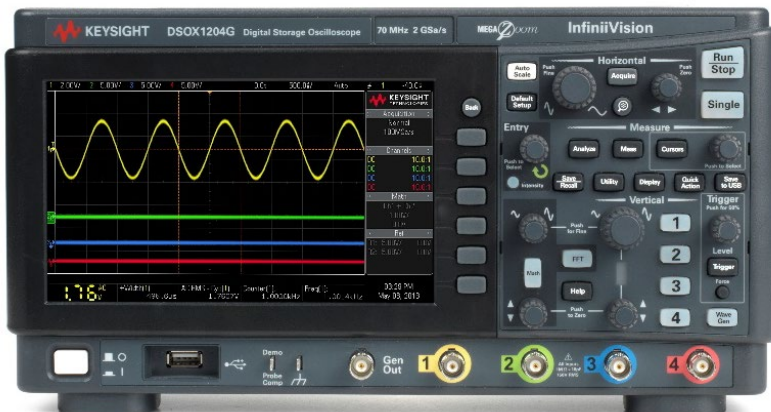# InfiniiVision 1000 X-Series Oscilloscopes

2 Channel: EDUX1002A; EDUX1002G; DSOX1102A; DSOX1102A

4 Channel: DSOX1204A; DSOX1204G

Performance Characteristics

Oscilloscopes overview

	EDUX1002A/EDUX1002G	DSOX1102A/DSOX1102G	DSOX1204A/DSOX1204G
Bandwidth (–3 dB) [1, 2]	50 MHz	70 MHz	70 MHz
		100 MHz (option DSOX1B7T102)	100 MHz (option D1200BW1A)
			200 MHz (option D1200BW2A)
Calculated rise time (10 to 90%)	≤ 7 ns	≤ 5 ns (70 MHz model)	≤ 5 ns (70 MHz model)
		≤ 3.5 ns (100 MHz model)	≤ 3.5 ns (100 MHz model)
			≤ 1.7 ns (200 MHz model)
Input channels	2	2	4
Maximum sample rate	1 GSa/s	2 GSa/s	2 GSa/s half-channel interleaved 1 GSa/s per channel
Maximum memory depth	100 kpts	1 Mpts	1 Mpts
Waveform update rate	≥ 50,000 waveforms/sec	≥ 50,000 waveforms/sec	≥ 50,000 waveforms/sec

Vertical system analog channels

	EDUX1002A/EDUX1002G/DSOX1102A/DSOX1102G/DSOX1204A/DSOX1204G
Input coupling	DC, AC (10 Hz cutoff frequency)
Input impedance/capacitance	1 MΩ ± 2%/16 pF ±3 pF
Input sensitivity range [3]	500 µV/div to 10 V/div
Standard probes	N2142A 1/10 switchable 75 MHz (2 included in EDUX1002A/EDUX1002G) N2140A 1/10 switchable 200 MHz (2 included in DSOX1002A/DSOX1002G) N2140A 1/10 switchable 200 MHz (4 included in DSOX1204A/DSOX1204G)
Probe attenuation factor	0.1X to 1000X in 1-2-5 sequence; (–20 dB to +80 dB in 0.1 dB steps)
Hardware bandwidth limits	Approximately 20 MHz (selectable)
Vertical resolution	8 bits
Invert signal	Selectable
Maximum input voltage	150 Vrms, 200 Vpk
DC vertical accuracy	± [DC vertical gain accuracy + DC vertical offset accuracy + 0.25% full scale]
DC vertical gain accuracy [1]	+3% full scale (> 10 mV/div)
	+4% full scale (< 10 mV/div)
DC vertical offset accuracy	± 0.1 div ± 2 mV ± 1% of offset setting
Skew	Channel to channel: 1 ns (without deskew)
	Channel to external: 2 ns (without deskew)
Offset range	500 uV/div to 200 mV/div: ±2 V
	> 200 mV/div to 10 V/div: ±100 V

1. Denotes warranted specifications; All others are typical. Specifications are valid after a 30-minute warm-up period and from ± 10 °C user calibration temperature.
2. For 1 mV/div to 10 V/div settings, bandwidth is 20 MHz at the 500 µV/div setting.
3. 500 µV/div is a magnification of 1 mV/div setting.

Performance Characteristics (continued)

Horizontal system analog channels

	All Models
Time base range	5 ns/div to 50 s/div
Horizontal resolution	2.5 ps
Time base accuracy [4]	50 ppm ± 5 ppm per year (aging)
Time base delay time range	Pre-trigger: Greater of 1 screen width or 200 µs
	Post-trigger: 1 to 500 s
Channel to channel deskew range	± 100 ns
Δ Time accuracy (using cursors)	± (time base acc. x reading) ± (0.0016 x screen width) ± 200 ps (same channel)
Modes	Main, zoom, roll, XY
XY	X = channel 1, Y = channel 2, Z = external trigger, 1.4 V blanking
	Bandwidth: Maximum bandwidth. Phase error at 1 MHz: < 0.5 degree

Acquisition system

		EDUX1002A/EDUX1002G	DSOX1102A/DSOX1102G DSOX1204A/DSOX1204G
Maximum sample rate Maximum analog channels record length		1 GSa/s 100 kpts	2 GSa/s 1 Mpts
Acquisition mode	Normal	Default mode	Default mode
	Peak Detect	Capture glitches as narrow as 10 ns at all time base settings	Capture glitches as narrow as 10 ns at all time base settings
			Capture glitches as narrow as 5 ns at all time base settings (100 MHz model) 2.5 ns at all time base setting (200 MHz model)
	Averaging	Selectable from 2, 4, 8, 16, 64, ... to 65,536	Selectable from 2, 4, 8, 16, 64, ... to 65,536
	High Resolution	Real-time boxcar averaging reduces random noise and effectively increases vertical resolution to 12 bits of resolution when ≥ 20 µs/div at 1 GSa/s	Real-time boxcar averaging reduces random noise and effectively increases vertical resolution to 12 bits of resolution when ≥ 20 µs/div at 2 GSa/s
	Segmented	Not available	Segmented memory optimizes available memory for data streams that have long dead times between activity. Maximum segments = 50. Re-arm time = 19µs (minimum time between trigger events)
Time mode	Normal	Default mode	Default mode
	Roll	Displays the waveform moving across the screen from right to left. Available at the time base 50 ms/div or slower	Displays the waveform moving across the screen from right to left. Available at the time base 50 ms/div or slower
	XY	Displays the volts-versus-volts display	Displays the volts-versus-volts display
		X = Channel 1, Y = Channel 2	X = Channel 1, Y = Channel 2
		Z = External trigger, 1.4 V blanking	Z = External trigger, 1.4 V blanking
		Phase error at 1 MHz: < 0.5 degree	Phase error at 1 MHz: < 0.5 degree
Autoscale		Finds and displays all active channels and external trigger. Sets edge trigger mode on external trigger first then highest numbered active channel. Sets vertical sensitivity. Sets time base to display ~ 1.8 periods. Requires minimum voltage of 10 mVpp (channel)	Finds and displays all active channels and external trigger. Sets edge trigger mode on external trigger first then highest numbered active channel. Sets vertical sensitivity. Sets time base to display ~ 1.8 periods. Requires minimum voltage of 10 mVpp (channel)

4.   Denotes warranted specifications; All others are typical. Specifications are valid after a 30-minute warm-up period and from ± 10 °C user calibration temperature.

Performance Characteristics (continued)

Trigger system

	All Models
Trigger sources	Analog channels, line [5], external, WaveGen, WaveGen modulation FM/FSK
Trigger modes	Normal (triggered): Requires trigger event for oscilloscope to trigger
	Auto: Triggers automatically in absence of a trigger event
	Single: Triggers only once on a trigger event
	Force: Front panel button that forces a trigger
Trigger coupling	DC: DC coupled trigger
	AC: AC coupled trigger, cutoff frequency: ~ 10 Hz
	HF reject: High frequency reject, cutoff frequency ~ 50 kHz
	LF reject: Low frequency reject, cutoff frequency ~ 50 kHz
	Noise reject: Selectable OFF or ON, decreases sensitivity 2x
Trigger holdoff range	60 ns to 10 s

Trigger sensitivity

	EDUX1002A/EDUX1002G	DSOX1102A/DSOX1102G	DSOX1204A/DSOX1204G
Internal [6]	Greater of:	Greater of:	Greater of:
	0.6 div or 2.5 mV (≤ 10 MHz)	0.6 div or 2.5 mV (≤ 10 MHz)	0.6 div or 2.5 mV (≤ 10 MHz)
	0.9 div or 3.8 mV (10 to 50 MHz)	0.9 div or 3.8 mV (10 to 70 MHz)	0.9 div or 3.8 mV (10 to 70 MHz)
		1.2 div or 5 mV (70 to 100 MHz)	1.2 div or 5 mV (70 to 200 MHz)
External	≤ 10 MHz: 250 mVpp	≤ 10 MHz:	≤ 10 MHz:
		50 mVpp (1.6 V range)	20 mVpp (1.6 V range)
		250 mVpp (8 V range)	100 mVpp (8 V range)
	10 to 50 MHz: 500 mVpp	10 to 100 MHz:	10 to 200 MHz:
		100 mVpp (1.6 V range)	100 mVpp (1.6 V range)
		500 mVpp (8 V range)	500 mVpp (8 V range)

Trigger level range

	EDUX1002A/EDUX1002G	DSOX1102A/DSOX1102G DSOX1204A/DSOX1204G
Internal	± 6 div from center screen	± 6 div from center screen
External [7]	± 8 V	± 1.6 V or ± 8 V selectable

5. Line trigger to ≤ 60 Hz.
6. Denotes warranted specifications; All others are typical. Specifications are valid after a 30-minute warm-up period and from ± 10 °C firmware calibration temperature.
7. Input voltage must remain within these limits for proper operation.

Performance Characteristics (continued)

Trigger type selections

	EDUX1002A/EDUX1002G	DSOX1102A/DSOX1102G DSOX1204A/DSOX1204G
Trigger types	Edge, pulse width, video, pattern/state	Edge, pulse width, video, rise/fall time, setup and hold, pattern/state
Edge	Trigger on a rising, falling, alternating or either edge of any source	
Pattern/state	Trigger when a specified pattern/state on any combination inputs is entered[8]	
Pulse width	Trigger on a pulse of a selected channel with a time duration that is 'less than a value,' 'greater than a value' or 'inside a time range' Range minimum: 10 ns, 10 s max	
Setup and hold	Not available	Trigger and clock/data setup and/or hold time violation. Setup time can be set from –7 ns to 10 s. Hold time can be set from 0 s to 10 ns
Rise/fall time	Not available	Trigger on rise-time or fall-time edge speed violations (< or >) based on a user-selectable threshold
		Select from (< or >) and time settings range between Minimum: 5 ns Maximum: 10 s
Video	Trigger on all lines or individual lines; odd/even or all fields from the composite video; or broadcast standards (NTSC, PAL, SECAM, and PAM-M)	
I^2C – EDUX1EMBD option – DSOX1EMBD option – D1200EMBA option	Trigger at a start/stop condition or user-defined frame with address and/or data values. Also, trigger on missing acknowledge, restart, EEPROM read and 10-bit write	
RS-232/422/485/UART – EDUX1EMBD option – DSOX1EMBD option – D1200EMBA option	Trigger on Rx or Tx start bit, stop bit, data content or parity error	
SPI – DSOX1EMBD option – D1200EMBA option	Not available	Trigger on SPI (Serial Peripheral Interface) data pattern during a specific framing period. Supports positive and negative chip select framing as well as clock idle framing. Supports MOSI or MISO (4-channel models) data as half duplex data
CAN – DSOX1AUTO option – D1200AUTA option	Not available	Trigger on CAN (controller area network) version 2.0A and 2.0B signals. Trigger on the start of frame (SOF) bit, remote frame ID (RTR), data frame ID (~RTR), remote or data frame ID, data frame ID and data, error frame, all errors, acknowledge error, and overload frame.
LIN – DSOX1AUTO option – D1200AUTA option	Not available	Trigger on LIN (Local Interconnect Network) sync break, sync frame ID or frame ID and data, parity error, checksum error and frame

8. The pattern must have stabilized for a minimum of 5 ns to qualify as a valid trigger condition.

Performance Characteristics (continued)

Waveform measurements

	All Models
Cursors	Single cursor accuracy: ± [DC vertical gain accuracy + DC vertical offset accuracy + 0.25% full scale]
	Dual cursor accuracy: ± [DC vertical gain accuracy + 0.5% full scale]
	Units: Seconds(s), Hz (1/s), phase (degrees)
Automatic measurements	Measurements continuously updated with statistics.
	Cursors track last selected measurement. Select up to four measurements from the list below:
	Snapshot: Measure all single waveform measurements (24)
	Voltage:
	Peak-to-peak, maximum, minimum, amplitude, top, base, overshoot, pre-shoot, average- N cycles,
	average-full screen, DC RMS-N cycles, DC RMS-full screen, AC RMS-N cycles, AC RMS-full screen (standard deviation)
	Time:
	Period, frequency, counter, + width, - width, +duty cycle, -duty cycle, bit rate, rise time, fall time, delay, phase,
	X at min Y, X at max Y
	Automatic measurement logging:
	Available via BenchVue BV0004B

Waveform math

	All Models
Arithmetic	Add, subtract, multiply, divide, FFT (magnitude), FFT (phase), low-pass filter
FFT	Record Size: Up to 64 kpts resolution
	Window types: Hanning, Flat top, Rectangular, Blackman-Harris

Performance Characteristics (continued)

WaveGen – Built-in function generator (specifications are typical)

Note: Only available on WaveGen models EDUX1002G, DSOX1102G, and DSOX1204G. WaveGen is not upgradeable.

	EDUX1002G/ DSOX1102G/ DSOX1204G
WaveGen out	Front-panel BNC connector
Waveforms	Sine, square, ramp, pulse, DC, noise
Modulation	Modulation types: AM, FM, FSK
	Carrier waveforms: Sine, ramp
	Modulation source: Internal (no external modulation capability)
	AM:
	– Modulation: sine, square, ramp
	– Modulation frequency: 1 Hz to 20 kHz
	– Depth: 0 to 100%
	FM:
	– Modulation: sine, square, ramp
	– Modulation frequency: 1 Hz to 20 kHz
	– Minimum carrier frequency: 10 Hz
	– Deviation: 1 Hz to carrier frequency or (2e12 / carrier frequency), whichever is smaller
	FSK:
	– Modulation: 50% duty cycle square wave
	– FSK rate: 1 Hz to 20 kHz
	– Hop frequency: 2 x FSK rate to 10 MHz
Sine	Frequency range: 0.1 Hz to 20 MHz
	Amplitude flatness: ± 0.5 dB (relative to 1 kHz)
	Harmonic distortion: —40 dBc
	Spurious (non-harmonics): —40 dBc
	Total harmonic distortion: 1%
	SNR (50 Ω load, 500 MHz bandwidth): 40 dB (typical); 30 dB (min)
Square wave /pulse	Frequency range: 0.1 Hz to 10 MHz
	Duty cycle: 20 to 80%
	Duty cycle resolution: Larger of 1% or 10 ns
	Pulse width: 20 ns minimum
	Rise/fall time: 18 ns (10 to 90%)
	Pulse width resolution: 10 ns or 5 digits, whichever is larger
	Overshoot: < 2%
	Asymmetry (at 50% DC): ± 1% ± 5 ns
	Jitter (TIE RMS): 500 ps
Ramp /triangle wave	Frequency range: 0.1 Hz to 200 kHz
	Linearity: 1%
	Variable symmetry: 0 to 100%
	Symmetry resolution: 1%
Noise	Bandwidth: 20 MHz typical

Performance Characteristics (continued)

WaveGen – Built-in function generator (specifications are typical) (continued)

Note: Only available on WaveGen models EDUX1002G, DSOX1102G, and DSOX1204G. WaveGen is not upgradeable.

	EDUX1002G/ DSOX1102G/ DSOX1204G
Frequency	Sine wave and ramp accuracy:
	130 ppm (frequency < 10 kHz)
	50 ppm (frequency > 10 kHz)
	Square wave and pulse accuracy:
	[50 + frequency/200] ppm (frequency < 25 kHz)
	50 ppm (frequency ≥ 25 kHz)
	Resolution: 0.1 Hz or 4 digits, whichever is larger
Amplitude	Square, Pulse, Ramp:
	2 mVpp to 20 Vpp into Hi-Z (offset ≤ ±0.4 V)
	1 mVpp to 10 Vpp into 50 Ω (offset ≤ ±0.4 V)
	50 mVpp to 20 Vpp into Hi-Z (offset > ±0.4 V)
	25 mVpp to 10 Vpp into 50 Ω (offset > ±0.4 V)
	Sine:
	2 mVpp to 12 Vpp into Hi-Z (offset ≤ ± 0.4 V)
	1 mVpp to 9 Vpp into 50 Ω (offset ≤ ± 0.4 V)
	50 mVpp to 12 Vpp into Hi-Z (offset > ± 0.4 V)
	25 mVpp to 9 Vpp into 50 Ω (offset > ± 0.4 V)
	Resolution: ≤ 1% of the amplitude
	Accuracy: 2% (Frequency = 1 kHz)
DC offset	Square, Pulse, Ramp:
	± [10 V – ½ amplitude] into Hi-Z
	± [5 V – ½ amplitude] into 50 Ω
	Sine:
	± [8 V – ½ amplitude] into Hi-Z
	± [4.5 V – ½ amplitude] into 50 Ω
	Resolution: Larger of 250 uV or 3 digits
	Accuracy: ± 1.5% of offset setting ± 1.5% of amplitude ± 1 mV
Main output	Impedance: 50 Ω typical
	Isolation: Not available, main output BNC is grounded
	Protection: Overload automatically disables output
	Sine, square, ramp, pulse, DC, noise

Performance Characteristics (continued)

Digital voltmeter (specifications are typical)

	All Models
Functions	ACrms, DC, DCrms
Resolution	ACV/DCV: 3 digits
Measuring rate	100 times/second
Autoranging	Automatic adjustment of vertical amplification to maximize the dynamic range of measurements
Range meter	Graphical display of most recent measurement, plus extrema over the previous 3 seconds

Frequency counter (specifications are typical)

	All Models
Functions	Frequency
Resolution	5 digits
Measuring rate	100 times/second
Autoranging	Automatic adjustment of vertical amplification to maximize the dynamic range of measurements
Range meter	Graphical display of most recent measurement, plus extrema over the previous 3 seconds

Frequency response analysis (Bode plot) (specifications are typical)

	EDUX1002G/ DSOX1102G/ DSOX1204G
Dynamic range	> 80 dB (typical)
Input and output sources	Output: WaveGen out
	Input 1 and 2 can be assigned to any channel
Frequency range	10 Hz to 20 MHz
Number of test points	Up to 1,000 total points
Test amplitude	10 mVpp to 9 Vpp into 50-Ω
	Fixed amplitude across the entire sweep
Test results	Logarithmic overlaid gain and phase plot
Manual measurements	A single pair of tracking gain and phase markers
Plot scaling	Auto-scaled during test and manual

Environmental

Connectivity

	EDUX1002A/EDUX1002G/DSOX1102A/DSOX1102G
Standard Ports	One USB 2.0 hi-speed device port on rear panel. Supports USBTMC protocol
	One USB 2.0 hi-speed host port on front panel. Supports memory devices, printers, and keyboards

	DSOX1204A/DSOX1204G
Standard Ports	One USB 2.0 hi-speed device port on rear panel. Supports USBTMC protocol
	One USB 2.0 hi-speed host port on front panel. Supports memory devices
	One Ethernet 1 Gb/s networking: RJ-45

General and environmental characteristics

	All Models
Power line consumption	50 W max
Power voltage range	100 to 120 V, 50/60/400 Hz; 100 to 240 V, 50/60 Hz
Environmental rating	0 to +50 °C, 3,000 m Max
	Maximum Relative Humidity (non-condensing): 95% RH up to 40°C, decreases linearly to 45% RH at 50°C [9]
Electromagnetic compatibility	Meets EMC directive (2004/108/EC), meets or exceeds IEC 61326-1:2005/EN61326-1:2013 (basic)
	IEC 61000-4-2/EN 61000-4-2
	IEC 61000-4-3/EN 61000-4-3
	IEC 61000-4-4/EN 61000-4-4
	IEC 61000-4-5/EN 61000-4-5
	IEC 61000-4-6/EN 61000-4-6
	IEC 61000-4-8/EN 61000-4-8
	IEC 61000-4-11/EN 61000-4-11
	Canada: ICES/NMB-001:2006
	Australia/New Zealand: AS/NZS CISPER 11:2011
Safety	ANSI/UL Std. No. 61010-1:2012; CAN/CSA-C22.2 No. 61010-1-12
	ANSI/UL Std. No. 61010-2-030:2012; CAN/CSA-C22.2 No. 61010-2-030-12
Dimensions (W x H x D)	314 mm (12.4 in) x 165 mm (6.5 in) x 130 mm (5.1 in)
Weight	Net: 3.23 kg (7.1 lbs), shipping: 4.2 kg (9.2 lbs)
Display	7.0" diagonal color TFT LCD WVGA

Nonvolatile storage

	All Models
Reference waveform display	Two internal waveforms or USB thumb drive
Waveform storage	Set up, .bmp, .png, .csv, ASCII XY, reference waveforms, .bin, mask, HDF5
Max USB flash drive size	Supports industry standard flash drives
Setups without USB flash drive	10 internal setups
USB drive format	FAT32
	NTFS, EXT2/3/4 (DSOX1204A/G only)

9. From 40 °C to 50 °C, the maximum % Relative Humidity follows the line of constant dew point.

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