

Acute MSO3000

6-in-1 Instrument

DAQ, DSO, DVM, Frequency Counter,
Logic Analyzer, Protocol Analyzer



150 x 123 x 33 mm³
Device Weight: 400g

- PC-based, USB3.0 interface / powered (Type-A / Type-C)
- Record length : 128 (256) Mpts / Analog (Digital) CH
- ❶ Data Logger : HDD / SSD Storage
- ❷ DSO : 4 Channels, 1 GS/s S/R, 200 MHz bandwidth
- ❸ Digital Voltmeter : 3 digits
- ❹ Frequency Counter : 5 digits
- ❺ Logic Analyzer : 16 Channels, 2 GS/s Timing Analysis, 250 MHz State Analysis
Protocol Decode : CAN 2.0B/CAN FD, DP_Aux^[1], eSPI, I²C, I²S, MII, MIPI I3C 1.1, MIPI SoundWire, MIPI SPMI 2, SPI Flash, SVI3^[2], SVID^[3], UART, USB PD 3.1, ... (100+)
Protocol Trigger : CAN2.0B/CAN FD, eSPI, MII, MIPI I3C 1.1, RGMII, SVI3^[2], SVID^[3], ... (30+)
- ❻ Protocol Analyzer: CAN2.0B/CAN FD, eSPI, MII, MIPI I3C 1.1, RGMII, SVI3^[2], SVID^[3], ... (20+)

| Model | Vertical Resolution (DSO) | DSO Trigger / Protocol Trigger (DSO) | Protocol Trigger (Logic Analyzer) | Electrical Validation ^[*] |
|----------|---------------------------|--------------------------------------|-----------------------------------|--------------------------------------|
| MSO3124E | 8 bits | I / - | I | - |
| MSO3124B | 8 bits | I, II / I | I, II | - |
| MSO3124H | 8, 12~16 bits | I, II / I | I, II, III | - |
| MSO3124V | 8, 12~16 bits | I, II / I, II | I, II, III | I2C, I3C, ... |

Software Window



System Requirements

- USB 3.0 port
- Windows 7/8/10/11 (64-bit)
Linux Ubuntu (64-bit)*
macOS*
- PC RAM 16GB (recommended) or 8GB at least

* Free update by year end 2023.

Acute®

PC-based T&M Instruments

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DSO Specifications (Main Device)

| Model | | MSO3124E | MSO3124B | MSO3124H | MSO3124V |
|---|--|--|--|---|----------|
| Power | Power source | USB bus-power (+5V) | | | |
| | Static power consumption | 4.5W | | | |
| | Max power consumption | 7.7W | | | |
| Acquisition | Mode | Sample, Average, Envelope ^[*] , Peak detect ^[*] , High resolution ^[*] | | | |
| | Sampling @ 1Ch | 1 GS/s | | 1 GS/s 500 MS/s 100 MS/s | |
| | @ 2Ch | 500 MS/s | | 500 MS/s 250 MS/s 100 MS/s | |
| | (8 12 ≥14 bits) @ 4Ch | 250 MS/s | | 250 MS/s 125 MS/s 100 MS/s | |
| | Record length @ 1Ch | 512 Mpts | | 512 Mpts 256 Mpts | |
| @ 2Ch | 256 Mpts | | 256 Mpts 128 Mpts | | |
| @ 4Ch | 128 Mpts | | 128 Mpts 64 Mpts | | |
| Input | Input channels | 4 | | | |
| | Input coupling | AC/DC | | | |
| | Input impedance | 1 MΩ <19 pF | | | |
| | Overvoltage protection | ± 100 V (DC+AC peak) | | | |
| | Ch-Ch isolation | 50dB @DC to 100MHz; 40dB @ 100MHz to 200MHz | | | |
| | Ch-Ch skew | 100 ps between two channels with the same scale & coupling settings | | | |
| Temperature | Operating / Storage | 5°C~40°C (41°F~104°F) / -10°C~65°C (14°F~149°F) | | | |
| I/O port | Trig-In | Workable : 2.5V to 5V / Typical : TTL 3.3V (Rising/Falling) | | | |
| | Trigger pulse approval | > 8 ns | | | |
| | Trig-Out | TTL 3.3 V | | | |
| | Ref. Clock input | 10MHz, Vpp=3.3 to 5V | | | |
| | Ref. Clock output | 10MHz, TTL 3.3V | | | |
| | Connector type | MCX jack / female | | | |
| Vertical | Bandwidth | 200 MHz | | | |
| | Rise time | 1.75 ns @ 200 MHz; 3.5 ns @ 100 MHz; 7 ns @ 50 MHz | | | |
| | Resolution | 8 bits | | 8, 12, 14, 15, 16 bits | |
| | Input sensitivity | 2 mV/div to 10 V/div (Full-Scale: ±4 div/screen, ±1 div beyond screen) | | | |
| | Offset range | ±150 V @ 2, 5, 10 V/div; ±1.5 V @ 0.2, 0.5, 1 V/div; ±1.5 V @ 2, 5, 10, 20, 50, 100 mV/div | | | |
| | DC accuracy | ±3% of Full-Scale | | | |
| | Bandwidth limit | 20 MHz, 100 MHz or Full | | | |
| Horizontal | Time scale | 1 ns/div to 100 s/div (10 div/screen) | | | |
| | Time resolution | 125 ps | | | |
| | Time accuracy | ±10 ppm | | | |
| | Delay range | Pre-trigger: 0 to 100% of 1 screen; Post-trigger up to 50 sec. | | | |
| Trigger | Trigger mode | Auto, Normal, Single, Roll* | | | |
| | Source | Ch1, Ch2, Ch3, Ch4, Ext. (TTL only) | | | |
| | Coupling | DC, LF reject (50kHz), HF reject (50kHz), Noise reject | | | |
| | Trigger range | ±4 div from window center | | | |
| | Vertical sensitivity | 1 div or 5 mV @ <10 mV/div; 0.6 div @ ≥ 10 mV/div | | | |
| | Hold off range | ~60 ns to 10 sec. | | | |
| | DSO I | Edge, Either, External, Falling, Rising, Video, Width | | | |
| DSO II | --- | Runt, Pattern/State, Timeout, Transition, Setup/Hold, B-Trigger, B-Event, Window | | | |
| Protocol Trigger / Decode | I | --- | BiSS-C, CAN 2.0B/CAN FD, DALI, DP_Aux ^[1] , HID over I2C, I2C, I2S, LIN2.2, MDIO, Mini/Micro LED, MIPI I3C 1.1, MIPI RFFE 3, MIPI SPMI 2, Modbus, PMBus, Profibus, SENT, SMBus, SPI, SVI2, UART, USB PD 3, USB1.1 | | |
| | II | --- | --- | SVI3 ^[2] , SVID ^[3] | |
| Measurement/ Processing | Measurement | Frequency, Period, ±Duty, ±Period, Rise/ Fall Time, Delay, Phase; VMax, VMin, VHigh, VLow, Vpp, Vamp, VMid, VMean, VRMS, ±Overshoot, Rise/ Fall Preshoot; Edge Count, ±Pulse Count | | | |
| | Cursor | Time difference, Voltage difference | | | |
| | Math | +, -, x, ÷, XY, IA, √A, Log(A), Ln(A), fAdt, e ^A | | | |
| | FFT | Rectangular, Blackman, Hann, Hamming, Harris, Triangular, Cosine, Lanczos, Gaussian. (Vertical Scale: dBm RMS, dBV RMS, Linear RMS) | | | |
| | Export data | WORD, EXCEL, CSV, TEXT, HTML, MATLAB | | | |
| Electrical Validation (Protocol) ^[*] | | --- | --- | I2C, I3C, SPI, UART, ... | |
| Cascade | Max. channels expand | --- | 16 Ch (4x Device, 1 Master & 3 Slaves) | | |
| | Trigger source | --- | Main device only | | |
| | Skew between Master & Slave | --- | ±2ns @ 1 GS/s ±4ns @ 500 MS/s ±8ns @ 250 MS/s | | |
| Packing List | Device (150 x 123 x 33 mm ³) | 1 | | | |
| | USB3.0 Y cable (1.8M) | 1 | | | |
| | Type-C OTG Adapter | 1 | | | |
| | 250 MHz Probe | 4 | | | |
| | Stack cable (30cm) | 2 | | | |
| | Handbag | 1 | | | |
| | Total Weight | 1200g | | | |

[1] Optional DP_Aux adapter needed.

[2] Upon request by user who is approved by AMD. SVI3 Protocol Trigger / Decode are supported ONLY by MSO3124V.

[3] Upon request by user who has signed CNDA with Intel. SVID Protocol Trigger / Decode are supported ONLY by MSO3124V.

[*] Free update by year end

Logic Analyzer Specifications (LA POD)

| Device LA POD | MSO3124E LA16E | MSO3124B LA16B | MSO3124H LA16H | MSO3124V LA16V |
|--|--|---|---|-------------------|
| Timing analysis (Asynchronous, Max. sample rate) | 2 GS/s | | | |
| State clock rate (Synchronous, external clock) | 250MHz | | | |
| Storage | Conventional Timing, Transitional Timing | | | |
| Channels | 16 | | | |
| Record length | 256 Mpts per channel | | | |
| Timing vs. Channels | Timing analysis | Available channels (Conventional / Transitional Timing) - Memory per channel | | |
| vs. Channels | 2 GS/s | (8/7)-512 Mpts | | |
| vs. Memory | 1 GS/s | (16/14)-256 Mpts | | |
| | 500 MS/s | (16/16)-256 Mpts | | |
| | 250 MS/s | (16/16)-256 Mpts | | |
| Channel to channel skew | < 1ns | | | |
| Input | Input channels | 16 | | |
| | Input impedance | 75KΩ <2pF | | |
| | Maximum (Non-destructive) | ±50V | | |
| | Operation | ±30V | | |
| | Sensitivity | 0.25Vpp @50MHz, 0.5Vpp @150MHz, 0.8Vpp @250MHz | | |
| Threshold | Group | 2 (D0~D7, D8~D15 & CK0) | | |
| | Range | ±30V | | |
| | Resolution | 50mV | | |
| | Accuracy | ±100mV + 5%*Vth | | |
| Trigger | Resolution | 500ps | | |
| | Channels | 16 | | |
| | States | 8 | | |
| | Events | 8 | | |
| | Pre / Post | Yes | | |
| | Pass counter | Yes (0~1048575 times) | | |
| | Types | External, Manual, Multi Level, Setup/Hold Violation, Single Level, Timeout, Width | | |
| | Protocol I | BiSS-C, CAN2.0B/CAN FD, DP_Aux ^[1] , HID over I2C, I2C, I2S, LIN2.2, MIPI I3C 1.1, SENT, SPI, UART, USB PD 3.1 | | |
| | Protocol II | --- | DALI, LPC, MDIO, Mini/Micro LED, MIPI RFFE 3, MIPI SPMI 2, Modbus, PMBus, Profibus, SMBus, SVI2, USB1.1 | |
| | Protocol III | --- | eMMC 4.5, eSPI, MII, RGMII, RMII, SD 3.0 (SDIO 2.0), Serial Flash (SPI NAND), SVI3 ^[2] , SVID ^[3] | |
| Protocol Analyzer | I | BiSS-C, CAN2.0B/CAN FD, DP_Aux ^[1] , HID over I2C, I2C, I2S, LIN2.2, MIPI I3C 1.1, SPI, UART, USB PD 3.1 | | |
| | II | --- | DALI, MDIO, MIPI RFFE 3, Modbus, PMBus, Profibus, SMBus, USB1.1 | |
| | III | --- | eSPI, MII, RGMII, RMII, SVI3 ^[2] , SVID ^[3] | |
| Protocol Decode | 1-Wire, 3-Wire, 7-Segment, AccMeter, ADC, APLM, AVSBus, BiSS-C, BSD, BT1120, CAN 2.0B/FD, Close Caption, CODEC_SSI, DALI, DMX512, DP_Aux ^[1] , EDID, eMMC 5.1/MMC, eSPI, FlexRay, HD Audio, HDLC, HDQ, HID over I2C, HTSensor, HyperBus, I2C EEPROM, I2C, I2S (PCM, TDM), I80, IDE, IrDA, ITU-R BT.656 (CCIR656), JTAG, JVC IR, LCD1602, LED_Ctrl, LIN 2.2, Line Decoding, Line Encoding, Lissajous, LPC, LPT, Math, M-Bus, MDDI, MDIO, MHL CBUS, Microwire, MII, Mini/Micro LED, MIPI CSI LP, MIPI DSI LP, MIPI I3C 1.1, MIPI RFFE 3, MIPI SoundWire 1.2, MIPI SPMI 2, Modbus, NAND Flash, NEC IR, PDM, PECE 3.0, PMBus, Profibus, PS/2, PWM, QEI, QI, QSPI, RC-5, RC-6, RGB Interface, RGMII, RMII, S/PDIF, SD 3.0 (SDIO 2.0), SENT, Serial Flash, Serial IRQ, SGPIO, Smart Card, SMBus (SBS, SPD), SMI, SPI, SPI-NAND, SSI, ST7669, SVI2, SVI3 ^[2] , SVID ^[3] , SWD, SWIM, SWP, UART, ULPI, UNI/O, USB 1.1, USB4/TBT3 SB Channel, USB PD 3.1, Wiegand, ... | | | |
| Line Decoding | Biphase Mark, Differential-Manchester, Manchester (Thomas, IEEE802.3), Miller, Modified Miller, NRZI, ... | | | |
| Line Encoding | AMI(Standard, B8ZS, HDB3), Biphase Mark, CMI, Differential-Manchester, Manchester (Thomas, IEEE802.4), MLT-3, Miller, Modified Miller, NRZI, Pseudoternary, ... | | | |
| Packing List | LA POD | 1 | | |
| | Flying lead cables (LA20P) | 2 | | |
| | Gripper | 20 | | |

[1] Optional DP_Aux adapter needed.

[2] Upon request by user who is approved by AMD. SVI3 decode, trigger and protocol analyzer are supported ONLY by MSO3124H or MSO3124V.

[3] Upon request by user who has signed CNDA with Intel. SVID decode, trigger and protocol analyzer are supported ONLY by MSO3124H or MSO3124V.

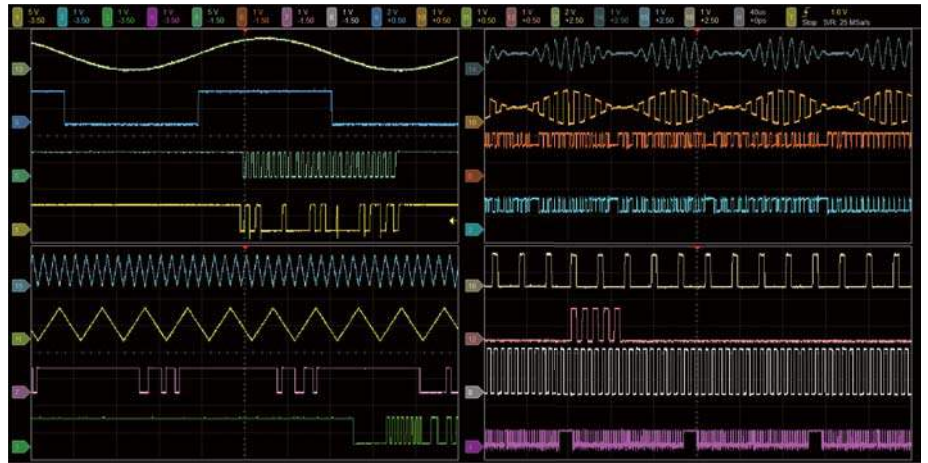
DAQ

For real-time signal data monitoring.

DSO

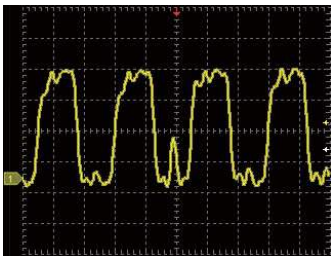
Multiple Devices Stack Mode :

Support DSO stack mode, up to 4 devices (16 channels) can be stacked together in the same time.

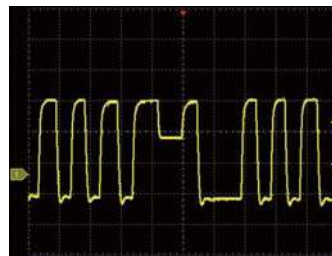


Functions :

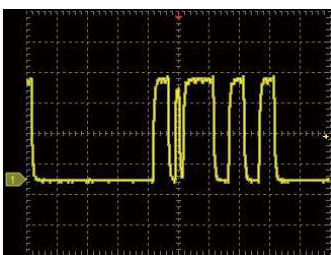
- **Edge Trigger** : Trigger on a rising/falling/either.
- **Pattern Trigger** : Trigger when logic inputs cause the selected function goes true.
- **Trigger Hold off** : Hold off time adjustable up to 10s.
- **Runt Trigger** : Use 2 voltage thresholds and pulse width to trigger on either/ positive or negative runt signals.



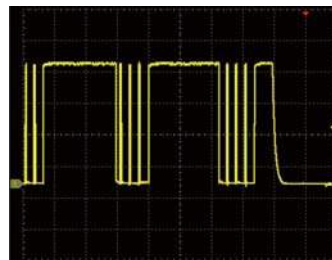
Positive Runt



Negative Runt

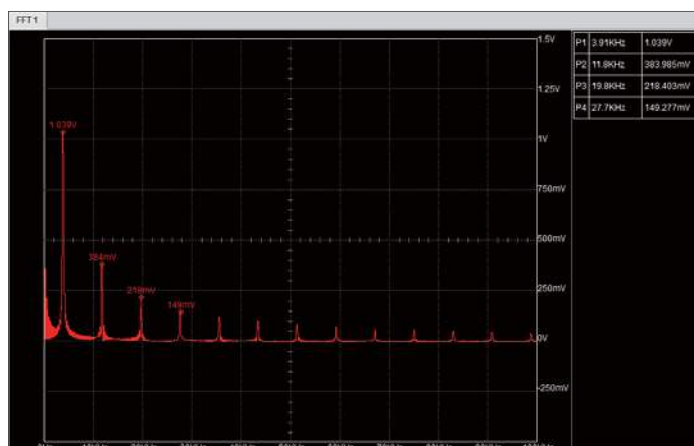


• **Pulse Width Trigger**
Pulse width range from 8ns to 50s.



• **Timeout Trigger**
Trigger when no pulse is detected within a specified time, range from 8ns to 50s.

- **Spectrum analysis**
(Fast Fourier transform, FFT)
Apply FFT to the selected channel.



- **Math**

Add, Subtract, Multiple, Divide, XY, Absolute, Square Root, LogA, LnA, Exponential, Integral



Math 1 On / Off

| Math | Description |
|-------------|-------------|
| Subtract | |
| Multiple | |
| Divide | |
| XY | |
| Absolute | |
| Square Root | |
| LogA | |
| LnA | |
| Exponential | |
| Integral | |

Settings

Source 1: Channel 1 Source 2: Channel 2

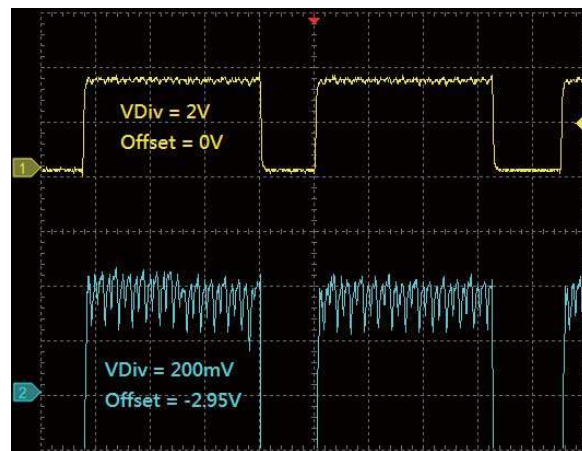
Stretch

SCALE: 2V POSITION: +0.00 Div
+0V

- **Vertical Offset**

Right-press the mouse to offset the voltage vertically with the resolution from 2mV/Div to 10V/Div for both channels.

The 16-bits resolution MSO3124H provides more noise details for this vertical offset function.



- **Trigger Coupling Mode**

Provide DC Coupling, Low Frequency (LF) Reject, High Frequency (HF) Reject and Noise Reject function:

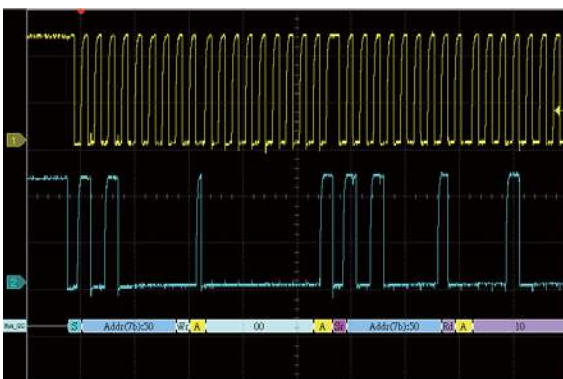
LF Reject: Apply 50 kHz high pass filter to the signal before entering the Trigger circuit.

HF Reject: Apply 50 kHz low pass filter to the signal before entering the Trigger circuit.

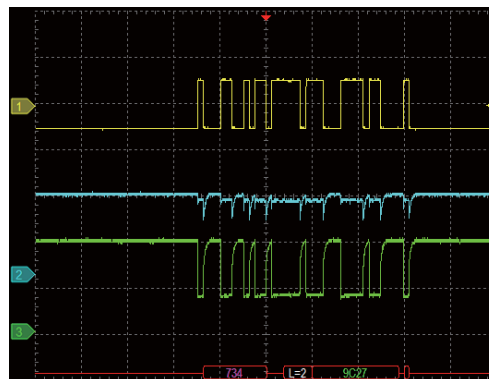
Noise Reject: Lower the Trigger sensitivity to avoid false triggering.

- **Protocol Decode & Trigger Function**

Provides, CAN/CAN-FD, I²C, LIN, MIPI I3C 1.1, ProfiBus, SPI, UART(RS232), USB1.1,... protocol decode and trigger function, which is able to trigger and decode on the specified Command/Address/Data...



Decode the I²C waveforms

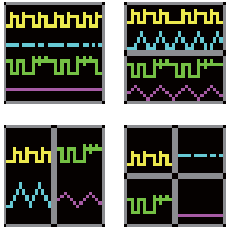


Decode the differential CAN signals with a differential probe.

(CH1: Differential Probe, CH2: CAN H, CH3: CAN L)

※ Supports CAN-FD, CAN2.0

• Multiple Windows

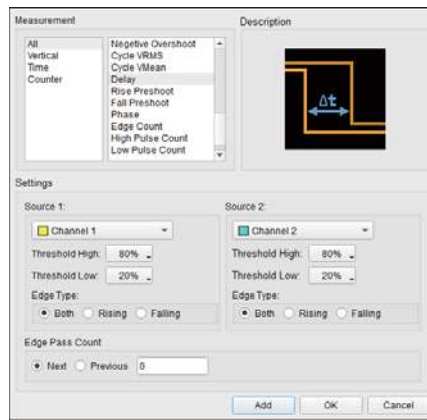


Multiple Window feature provides 4 display types (1x1, 2x1, 1x2, 2x2), which could displays 16 channels in maximum 4 different windows, provides clear waveform readability without lower the vertical resolution.

• Measurement :

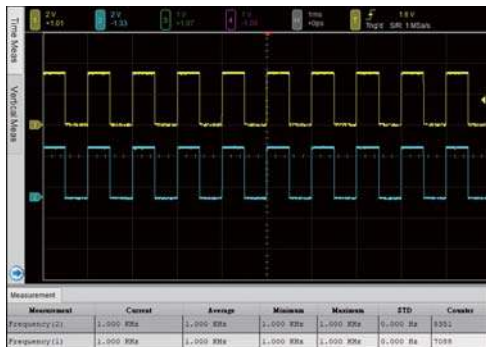
More than 20 types of waveform measurements with customized threshold settings features, provides real-time update for vertical, time and channel to channel timing measurements with statistic features.

- Time: Frequency, Period, \pm Duty, \pm Period, Rise /Fall Time, Delay, Phase
- Vertical: VMax, VMin, VHigh, VLow, Vpp, VAmp, VMid, VMean, VRMS, \pm Overshoot, Rise /Fall Preshoot
- Counter: Edge Count, \pm Pulse Count

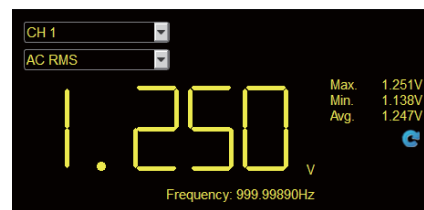


Digital Voltmeter (DVM) & Frequency Counter

Provides voltage root-mean-square, voltage average and frequency counter function for the selected channel.



Measure 1 KHz, 2.5 Vpp square waveforms by the measurement function.



Measure 1 KHz, 2.5 Vpp square waveforms by the DVM function.

Packing List



Device



USB3.0 Y cable (1.8M)
Type-C OTG Adapter



250 MHz Probe



Stack cable

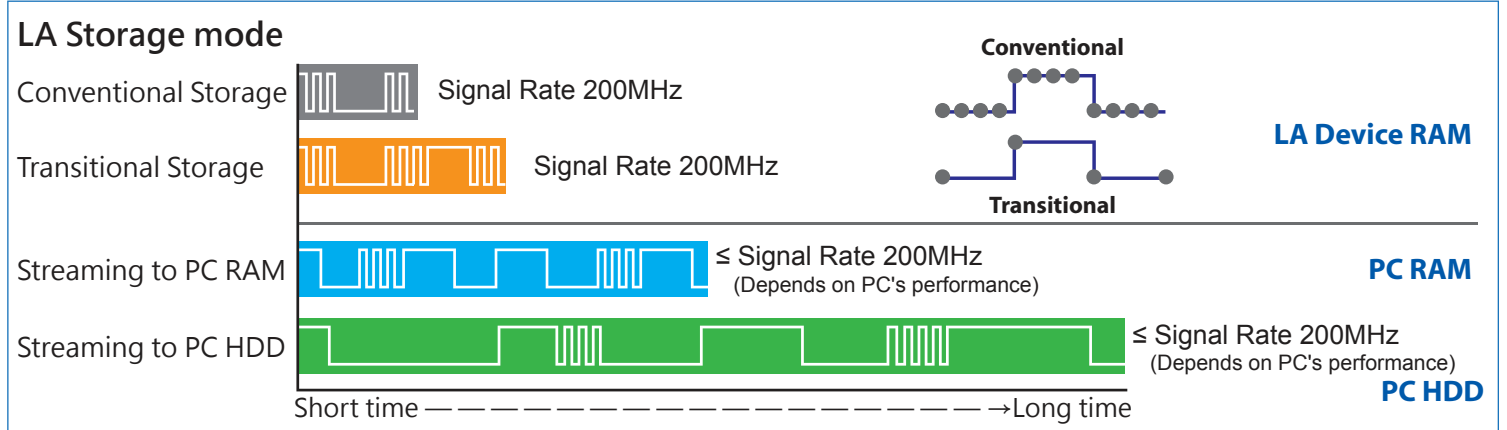


Handbag

Logic Analyzer

Built-in DSO to capture analog waveforms to compare with the digital waveforms.

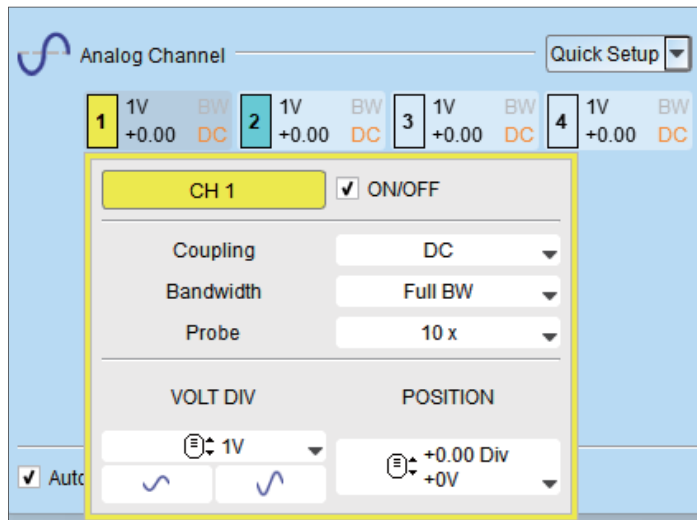
Provides multiple storage modes, users could select to have long time recording or precision acquisition.



Analog waveform

Input Sensitivity: 2mV/div to 10V/div; Max. Sampling Rate: 1GS/s @ 1Ch

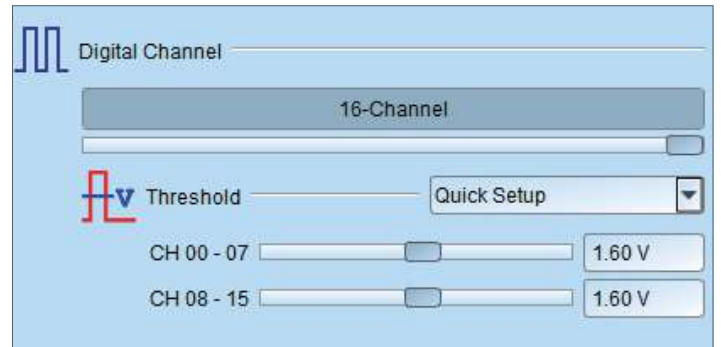
Can be used with High Voltage probe, Differential probe or Current probe.



Digital waveform

Operation Range: $\pm 30V$

Max. Timing Analysis: 2GS/s @ 8Ch



Compare digital and analog waveforms at the same channel for statistics.

Time/Div = 2 us

Acquired: 15:20

Time markers: 416.34 ms, 416.34 ms, 416.34 ms, 416.34 ms, 416.34 ms, 416.35 ms, 416.35 ms, 416.35 ms

192.8us

Labels: BUS_I2C, CH-00, CH-01, DSO CH0, DSO CH1, DSO CH8

Annotations: Bus Decode, Digital waveforms, Analog waveforms

| Measurement Type | Label Name A | Label Name B | From | To | Minimum | Maximum | Average |
|------------------|---------------|--------------|----------|----------|-----------|-----------|-----------|
| Frequency | CH-00 | | Begin | End | 961.391Hz | 77.519KHz | 49.852KHz |
| Edge Count | BUS_I2C (C... | | Cursor A | Cursor B | --- | --- | 19 |
| V Max. | DSO CH8 | | Begin | End | --- | --- | 2.543V |
| V Mean | DSO CH8 | | Begin | End | --- | --- | 1.246V |
| V Amplitude | DSO CH0 | | Begin | End | --- | --- | 4.373V |

Report window

Protocol Analyzer

It is hardware decoding, may log protocol data very long time if without waveforms.
Application timing: Preliminary protocol debug.

Support multiple protocols with different operating modes

Real-time data search

Stack with a DSO as an MSO in logic analyzer mode

The screenshot shows a logic analyzer software interface. At the top, there are buttons for 'Connect', 'Protocol', 'Protocol Analyzer', 'Show Waveforms', 'Run', 'Search', 'Search All Field', 'To bottom', 'Save to text', and 'Stack DSO'. Below these buttons is a table of protocol data with columns for Timestamp, Status, Address, RW, Data, and ASCII. To the right of the table is a 'Navigator' panel showing a tree view of I2C Bus transactions with columns for Description, Txns, and Bytes. Below the Navigator is a 'Statistics' panel. At the bottom of the screenshot is a 'Waveform' panel showing a digital signal trace with bus decodes overlaid. Red arrows point from the text labels above to specific features in the interface: 'Support multiple protocols with different operating modes' points to the 'Protocol Analyzer' button; 'Real-time data search' points to the 'Search' button; 'Stack with a DSO as an MSO in logic analyzer mode' points to the 'Stack DSO' button; 'Real-time data statistics' points to the 'Navigator' panel; 'Hide items for easy view' points to the 'Hide Items' button in the Navigator panel; 'Protocol report' points to the table of protocol data; and 'Show waveforms with bus decodes' points to the waveform panel.

Real-time data statistics

Hide items for easy view

Protocol report

Show waveforms with bus decodes



Protocol Analyzer

Show real-time protocol data

Application timing: massive protocol data with some idles in between



Protocol Logger

Like data logger, save massive data into SSD hard drive

Application timing: massive protocol data



Protocol Monitor

Like dash cameras, record protocol data by the device's memory only

Application timing: trigger event only happens in very long time

Packing List



LA POD



Flying lead cables (LA20P)



Gripper