

Acute MSO2000 series



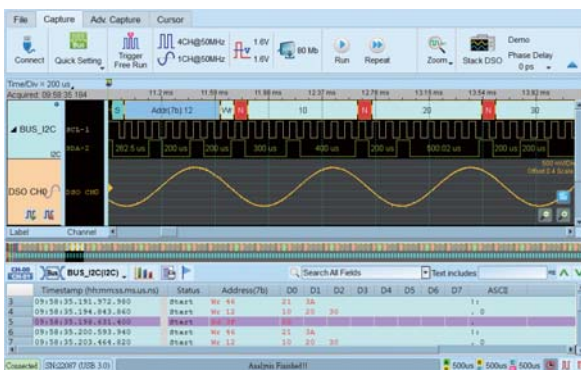
3-in-1 Analyzer

Logic Analyzer, Protocol Analyzer, Simple DSO

- PC-based, USB3.0 interface / power
- 8 / 16 Channels (display digital and analog waveforms of the same channel)
- Digital Inputs : 2 GHz Timing, 200MHz State Analysis (Max.)
- Analog Inputs : 200 MS/s (Max.), Bandwidth 40 MHz
- 8 Gb Memory (Max.)
- PC RAM storage for streaming mode
- Bus Decode : BiSS-C, CAN 2.0B/CAN FD, DP_Aux¹, eSPI, I²C, I²S, MII, MIPI I3C 1.1, Serial Flash, SPI, SVID², UART (RS232), USB PD 3, USB1.1, ... (100+)
- Bus Trigger I : I2C, MIPI I3C 1.1, SPI, UART (RS232)
- Bus Trigger II : BiSS-C, CAN2.0B/CAN FD, DP_Aux¹, LIN2.2, MIPI SoundWire 1.2, SENT, USB PD 3,...
- Bus Trigger III : DALI, MDIO, MIPI RFFE 2.1, MIPI SPMI 2.0, Modbus, PMBus, SMBus, USB1.1,...
- Bus Trigger IV : eMMC 4.5, eSPI, MII, RGMII, RMII, SD 2.0 (SDIO 2.0), Serial Flash (SPI NAND), SVID³
- Protocol Analyzer I : I2C, MIPI I3C 1.1, SPI, UART (RS232)
- Protocol Analyzer II : BiSS-C, CAN2.0B/CAN FD, DP_Aux¹, HID over I2C, I2S, LIN2.2, USB PD 3
- Protocol Analyzer III : DALI, MDIO, MIPI RFFE 2.1, Modbus, PMBus, Profibus, PWM, SMBus, USB1.1
- Protocol Analyzer IV : eSPI, MII, RGMII, RMII, SVID³

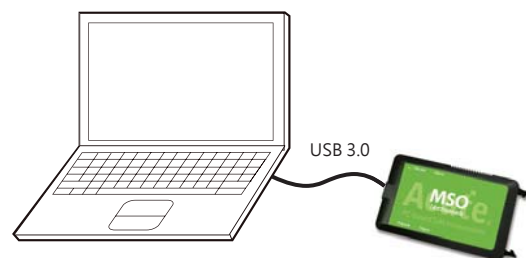
Model	Channels	Sample Rate	Memory	Bus Trigger/ Protocol Analyzer	Power Sequence Channels
MSO2008E	8	2 GHz	2 Gb	I	8
MSO2116E	16	2 GHz	4 Gb	I, II	16
MSO2116B	16	2 GHz	4 Gb	I, II, III	16 (128/ 8 sets cascaded)
MSO2216B	16	2 GHz	8 Gb	I, II, III, IV	16 (128/ 8 sets cascaded)

Software Window



System Requirements

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



Acute

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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 displays the software interface with several key components highlighted by red boxes and arrows:

- Protocol Analyzer Mode:** Indicated by an arrow pointing to the 'Protocol Analyzer' button in the top toolbar.
- Real-time Data Search:** Indicated by an arrow pointing to the search bar in the toolbar.
- Stack DSO:** Indicated by an arrow pointing to the 'Stack DSO' button in the toolbar.
- Real-time Data Statistics:** A red box highlights the 'Navigator' panel on the right, which shows transaction details for an I2C bus, including address, direction, and byte counts.
- Hide Items for Easy View:** A red box highlights the 'Hide Items' button at the bottom of the Navigator panel.
- Protocol Report:** A red box highlights the table of captured transactions, which includes columns for Timestamp, Status, Address, RW, Data, and ASCII.
- Show Waveforms with Bus Decodes:** A red box highlights the waveform view at the bottom, which shows the raw signal and overlaid protocol decodes for SCL-0 and SDA-1 channels.



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 :



MSO2008/2116E



MSO2000B



8.5cm Lead Cable
MSO2216B only



18.5cm
Lead Cable



USB 3.0 cable



Grippers

Stack cable

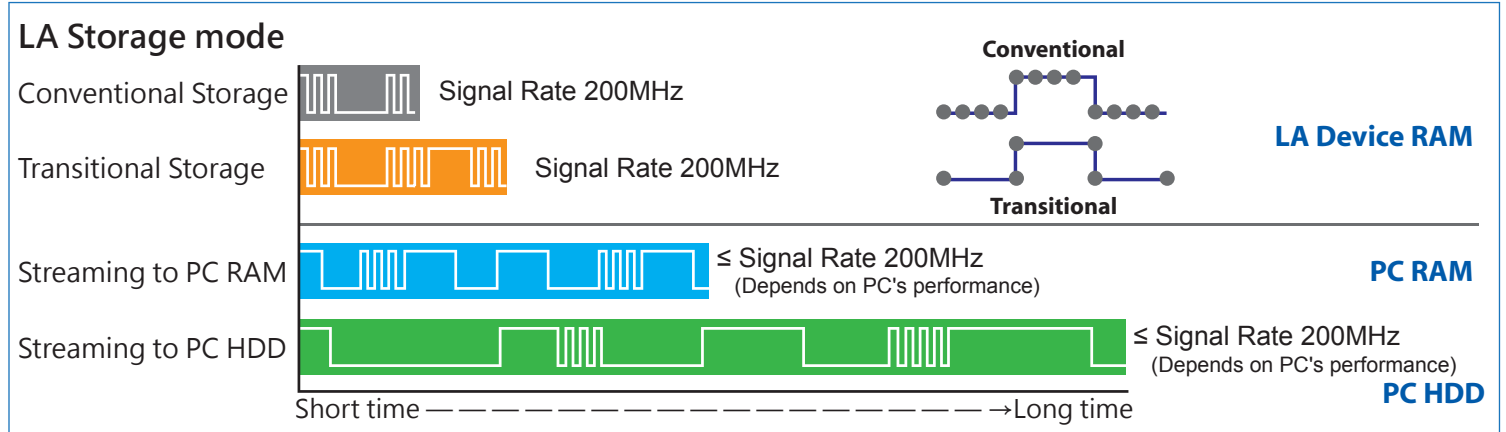


Handbag

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.



Each channel supports both digital and/or analog waveforms measurements, voltage resolution can be changed between 2 levels for all channels at the same time.

Digital waveform

CH-00 CH-01 CH-02 CH-03 CH-04 CH-05 CH-06 CH-07
CH-08 CH-09 CH-10 CH-11 CH-12 CH-13 CH-14 CH-15

Threshold Auto Quick Setup

CH 00 - 07 1.60 V

CH 08 - 15 1.60 V

Enable Extra Hysteresis

CH 00 - 07

CH 08 - 15

Analog waveform

CH-00 CH-01 CH-02 CH-03 CH-04 CH-05 CH-06 CH-07
CH-08 CH-09 CH-10 CH-11 CH-12 CH-13 CH-14 CH-15

Input Sensitivity

CH 00 - 07 10 mV/Div 5 mV/Div

CH 08 - 15 10 mV/Div 5 mV/Div

— Extra Hysteresis OFF (More sensitive)

— Extra Hysteresis ON (Lesser noise)

Vertical Range: $\pm 20V \rightarrow \pm 10V$

Resolution: 10mV \rightarrow 5mV

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

Time/Div = 2 us

Acquired: 15:20

192.8us

416.34 ms 416.34 ms 416.34 ms 416.34 ms 416.34 ms 416.35 ms 416.35 ms 416.35 ms

BUS_I2C 1:0

CH-00 0

CH-01 1

DSO CH0 DSO CH0

DSO CH1 DSO CH1

DSO CH8 DSO CH8

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

MSO series

Model	MSO2008E	MSO2116E	MSO2116B	MSO2216B
Power	Power Source	USB bus-power (+5V)		
	Static Power Consumption	0.9W		
	Max Power Consumption	<3.9W	<6W	
Hardware Interface		USB 3.0		
Channels (Data / Clock / Ground)		8/1/23	16/1/23	
Total Memory		2 Gb	4 Gb	8 Gb
Analog Inputs	Group	I (CH0~7)	I, II (CH0~7, CH8~15)	
	Sampling Rate in Group I or II	200MHz/1CH, 100MHz/2CH, 50MHz/4CH, 25MHz/8CH		
	Sampling Rate in Group I and II	--- Lower of Group I or II		
	Bandwidth	40MHz		
	ADC Bits	12		
Digital Inputs	Timing Analysis (Asynchronous)	Available channels (Conventional / Transitional Timing) - Memory per channel		
	2 GHz	(8/7) - 256Mb	(8/7) - 512Mb	(8/7) - 1Gb
	1 GHz	(8/8) - 256Mb	(16/14) - 256Mb	(16/14) - 512Mb
	500 MHz	(8/8) - 256Mb	(16/16) - 256Mb	(16/16) - 512Mb
	250 MHz and lower	(8/8) - 256Mb	(16/16) - 256Mb	(16/16) - 512Mb
State Clock Rate <small>(Synchronous, External Clock)</small>		200MHz		
Data Storage		Conventional Timing, Transitional Timing		
Channel to channel skew		< 1ns		
Threshold	Group	I (CH0~7 & CKI)	I, II (CH0~7 & CKI, CH8~15)	
	Range	+20V ~ -20V		
	Resolution	50mV		
	Accuracy	±100mV + 5%*Vth		
Input Voltage	Non-Destructive Operation (Standard / High Resolution)	over +/-42V DC & AC		
	Sensitivity (1Vpp)	-20V ~ +20V / -10V ~ +10V		
	Extra Hysteresis (On/Off)	200MHz		
		560mV / 80mV		
Impedance		1MΩ//2pF		
Temperature	Operating / Storage	5°C~45°C (41°F~113°F) / -10°C~65°C (14°F~149°F)		
	Trig-In	TTL 3.3V (Rising / Falling)		
	Trigger pulse approval	> 8 ns		
	Trig-Out	TTL 3.3V, Pulse Width		
	Ref. Clock Input	10MHz, Vpp=3.3 to 5V		
	Ref. Clock Output	10MHz, TTL 3.3V		
	Connector type	MCX jack / female		
Trigger	Resolution	500ps		
	Channels	8	16	
	States	16		
	Events	16		
	Pre / Post	Yes		
	Pass Counter	Yes (0~1048575 times)		
	Digital	Channel, Pattern, Single / Multi Level, Width, Time-out, Setup/Hold Timing Violation, External, Manual		
	Analog	Rising / Falling, Activity		
	Bus I	I2C, MIPI I3C 1.1, SPI, UART (RS232)		
	Bus II	---	BiSS-C, CAN2.0B/CAN FD, DP_Aux ¹ , HID over I2C, I2S, LIN2.2, MIPI SoundWire 1.2, SENT, USB PD 3	
Bus III	---	DALI, LPC, MDIO, Mini/Micro LED, MIPI RFFE 2.1, MIPI SPMI 2.0, Modbus, PMBus, Profibus, SMBus, SVI2, USB1.1		
Bus IV	---	eMMC 4.5, eSPI, MII, RGMII, RMII, SVID ³ , SD 2.0 (SDIO 2.0), Serial Flash (SPINAND)		
Protocol Analyzer	I	I2C, MIPI I3C 1.1, SPI, UART (RS232)		
	II	---	BiSS-C, CAN2.0B/CAN FD, DP_Aux ¹ , HID over I2C, I2S, LIN2.2, USB PD 3	
	III	---	DALI, MDIO, MIPI RFFE 2.1, Modbus, PMBus, Profibus, PWM, SMBus, USB1.1	
	IV	---	eSPI, MII, RGMII, RMII, SVID ³	
Software Features	Power Sequence Measurement	Input setup .CSV file for Timing Sequence and H/W Strap check.		
	Zoom / Report Window	Digital or Analog waveforms		
	Note editor	YES		
	Quick Bus Decode Setup	Edit notes on Waveform Window		
	Trigger / Auxiliary cursors	YES		
	Data Logger	1/25		
		Saved to Hard Disk Drive		
	Bus Decode	1-Wire, 3-Wire, 7-Segment, A/D Mux Flash, AccMeter, ADC, APML, AVSBus, BiSS-C, BSD, BT1120, CAN 2.0B/FD, CEC, Close Caption, CODEC_SSI, DALI, DMX512, DP_Aux ¹ , EDID, eMMC 4.5/MMC, eSPI, FlexRay, HD Audio, HDLC, HDQ, HID over I2C, I2C EEPROM, I2C, I2S (PCM, TDM), 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, Mini/Micro LED, MIPI CSI LP, MIPI DSI LP, MIPI I3C 1.1, MIPI RFFE 2.1, MIPI SoundWire 1.2, MIPI SPMI 2.0, Modbus, NEC IR, PECL 3.0, PMBus, Profibus, PS/2, PWM, QEL, QI, QSPI, RC-5, RC-6, S/PDIF, SD 2.0 (SDIO 2.0), SENT, Serial Flash, Serial IRQ, SGPIO, Smart Card, SMBus (SBS, SPD), SMI, SPI, SPI-NAND, SSI, ST7669, SVI2, SVID ² , SWD, SWIM, SWP, UART (RS232), ULPI, UNI/O, USB 1.1, USB PD 3, 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, IEEE802.3), MLT-3, Miller, Modified Miller, NRZI, Pseudoternary, ...		
Dimension	L x W x H (mm ³)	123 x 76 x 21		
Lead Cable	Data / CLK / NC / GND	8 / 1 / 8 / 23	16 / 1 / 0 / 23	
Grippers		10	20	
Stack cable	MCX to MCX (30cm)	1	2	

¹ Optional DP AUX adapter needed. ² Upon request ONLY by users who have signed CNDA with Intel, SVID decode supported by all MSO models

³ Upon request ONLY by users who have signed CNDA with Intel, SVID trigger & PA supported by MSO2216B ONLY.