TEKTRONIX

MSO4104B

The Tektronix MSO4104B is a high-performance 1 GHz, 4-channel mixed signal oscilloscope from the MSO4000B Series. Tightly integrating 16 digital channels, it delivers a maximum sample rate of 5 GS/s on all analog channels and a standard 20 Mpoints record length. Equipped with Wave Inspector controls for effortless waveform navigation and MagniVu high-speed acquisition providing 60.6 ps fine timing resolution on digital channels, the MSO4104B is designed for rapid debugging and analysis of complex embedded systems.

SPECIFICATIONS

General

Interfaces	USB 2.0 Host (2 front, 2 rear), USB 2.0 Device, LAN (10/100/1000 Mb/s Ethernet), XGA Video Port, Auxiliary Input, Auxiliary Out, External Reference In, GPIB (via TEK-USB-488)
Display	10.4 inch (264 mm) liquid-crystal TFT color display, 1024 x 768 pixels (XGA)

Physical

Power Supply	100 to 240 V ±10% (50 to 60 Hz), 115 V ±10% (400 Hz); 250 W maximum power consumption
Operating Temperature	0 °C to +50 °C °C
Dimensions (W×H×D)	439 mm × 229 mm × 147 mm mm
Weight	5 kg kg
Cooling Clearance	51 mm (2 in.) required on left side and rear of instrument

Analog Channel Vertical System

Analog Input Channels	4
Analog Bandwidth (-3 dB)	1 GHz
Calculated Rise Time (typical)	350 ps
Hardware Bandwidth Limits	20 MHz or 250 MHz
Input Coupling	AC, DC, GND
Input Impedance	1 MΩ ±1%, 50 Ω ±1%
Vertical Resolution	8 bits (11 bits with Hi Res)
Maximum Input Voltage (1 MΩ)	300 Vrms CAT II with peaks ≤ ±425 V
Maximum Input Voltage (50 Ω)	5 Vrms with peaks < ±20 V

Digital Channel Vertical System (MSO)

Digital Input Channels	16
Threshold Groupings	Two 8-channel thresholds
Threshold Voltage Range	-20 V to +30 V
Maximum Input Voltage (Digital)	±42 Vpeak
Input Dynamic Range	±10 V about the threshold
Minimum Voltage Swing	400 mV
Input Impedance (Digital Probe)	100 kΩ
Probe Loading	3 pF
Vertical Resolution (Digital)	1 bit

Horizontal System and Acquisition

Maximum Sample Rate (Analog)	5 GS/s (all channels)
Maximum Record Length (Analog)	20 Mpoints (all channels)
Maximum Duration at Highest Sample Rate	4 ms
Time Base Range	400 ps to 1000 s
Channel-to-Channel Deskew Range	±125 ns
Maximum Sample Rate (Digital, Main)	500 MS/s (2 ns resolution)
MagniVu Fine Timing Resolution	60.6 ps
Maximum Record Length (Digital, Main)	20 Mpoints
Minimum Detectable Pulse Width (typical)	1 ns
Waveform Capture Rate	>50,000 wfm/s maximum
Acquisition Modes	Sample, Peak Detect, Averaging, Envelope, Hi Res, Roll
Peak Detect Glitch Capture	Captures glitches as narrow as 800 ps at all sweep speeds
Averaging Range	From 2 to 512 waveforms

Trigger System

Trigger Modes	Auto, Normal, and Single
Trigger Coupling	DC, AC, HF reject (attenuates >50 kHz), LF reject (attenuates <50 kHz), noise reject
Trigger Holdoff Range	20 ns to 8 s
Trigger Level Range (Any channel)	±8 divisions from center of screen
Trigger Level Range (Line)	Fixed at about 50% of line voltage
Edge Triggering	Standard
Sequence (B-Trigger) Triggering	Standard
Pulse Width Triggering	Standard
Timeout Triggering	Standard
Runt Triggering	Standard
Logic Triggering	Standard
Setup/Hold Violation Triggering	Standard
Rise/Fall Time Triggering	Standard
Video Triggering	Standard
Optional Bus Triggering	Extended Video, I2C, SPI, USB, Ethernet, CAN, LIN, FlexRay, RS-232/422/485/UART, MIL-STD-1553, I2S/LJ/RJ/TDM
Trigger Sensitivity (Internal, DC Coupled)	0.4 div from DC to 50 MHz, increasing to 1.5 div at 1 GHz
Digital Threshold Accuracy	±(100 mV + 3% of threshold setting)

Waveform Measurements and Analysis

Waveform Measurements	Cursors, 29 automatic measurements, statistics measurements, reference levels, gating, waveform histogram
Automated Measurements	29
Waveform Math	Arithmetic, integrate, differentiate, FFT, advanced algebraic expressions
Power Analysis	Optional
Limit Testing	Optional (Limit/mask testing)

Display and User Interface

Waveform Styles	Vectors, Dots, Variable Persistence, Infinite Persistence
Waveform Graticules	Full, Grid, Solid, Cross Hair, Frame, IRE, and mV
Display Format	YT and simultaneous XY/YT

Connectivity and Interfaces

Probe Compensator Output Amplitude	2.5 V
Probe Compensator Output Frequency	1 kHz
External Reference Input	Phase lock to external 10 MHz reference (10 MHz ±1%)
LXI Class Compliance	LXI Class C, V1.3

Physical Characteristics

Kensington Lock	Rear-panel security slot
VESA Mount	Standard (MIS-D 100) 100 mm mounting points

Environmental

Non-operating Temperature	-20 °C to +60 °C
Operating Humidity	High: 40 °C to 50 °C, 10% to 60% RH; Low: 0 °C to 40 °C, 10% to 90% RH
Non-operating Humidity	High: 40 °C to 60 °C, 5% to 55% RH; Low: 0 °C to 40 °C, 5% to 90% RH
Operating Altitude	Up to 3,000 m (9,843 ft.)
Non-operating Altitude	Up to 12,192 m (40,000 ft.)

Inputs & Outputs

Trigger Out Output Voltage	>= 2.5 V open circuit; >= 1.0 V into 50 Ω

Vertical System

Input Sensitivity Range (1 MΩ)	1 mV/div to 10 V/div
Input Sensitivity Range (50 Ω)	1 mV/div to 1 V/div
DC Gain Accuracy	±1.5% for 5 mV/div and above (derated at 0.10%/°C above 30°C)
Channel-to-Channel Isolation	≥100:1 at ≤100 MHz and ≥30:1 at >100 MHz up to 1 GHz

Horizontal System

Timebase Accuracy	±5 ppm over any ≥1 ms interval

Power

Power Consumption	250 W maximum

Safety & Compliance

Safety Certifications	UL61010-1, CAN/CSA-C22.2 No. 61010-1, EN61010-1
Electromagnetic Compatibility	EC Council Directive 2004/108/EC, EN61326-1:2006 Class A

TECHNOLOGY

Mixed Signal Oscilloscope (MSO)

APPLICATIONS

Embedded design, serial/parallel bus analysis, system-level debug, and power analysis