

# MSO7000X Series Mixed Signal Oscilloscope

# 10GSa/s | 2GHz | 1Gpts | 2,000,000wfms/s



# Datasheet REV 2.0

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#### Extraordinary performance contributes to high-quality testing

The MSO7000X series consists of two models, with bandwidth ranging from 1GHz to 2GHz, sample rate up to 10GSa/s, all equipped with 4 analog channels, adopting the brand-new UltraAcq<sup>®</sup> technology to achieve the industry-leading waveform capture rate of 800,000wfms/s. The integration of seven-in-one measurement instrument functions prepares you for future testing needs. The advanced measurement functions help you easily complete complex tests, and the simple and easy-to-use operation platform makes all the impossible possible.

#### The user-friendly and perfect design makes your experience easier

Ingenious product design, a brand-new touch and peripheral interaction mode, equipped with a 15.6-inch high-definition capacitive touch screen, an instrument control panel deeply optimized, shortcut keys that take into account the attributes of the instrument, an agile multi-window layout design to provide the maximum display for your waveforms and allow viewing multiple signals at once. At the same time, the easy-to-use WebServer remote debugging capability of MSO7000X, only requiring an instrument IP address, you will be able to debug the oscilloscope in any comfortable posture.

#### Rich-in-function test software speeds up your design pace

More than 6 kinds of advanced power analysis to accelerate the completion of the design and verification of power supply products. More than 11 kinds of industry protocol analysis to accelerate the diagnosis of system faults and the analysis of debugging. Jitter analysis and eye diagram test to accelerate the location of jitter in clock and data signals. Limit and mask tests to accelerate the incoming inspection at the production end.

MSO7000X Ser	ies key features	Integrated tools	Std/Option	
Bandwidth	1GHz/2GHz	Spectrum analyzer	Standard	
Sample rate	10GSa/s	Digital voltmeter	Standard	
Input channels	4+16	Frequency counter	Standard	
Maximum memory depth	1Gpts (standard)	Function/Arbitray waveform generator	MSO7000X-AWG	
Waveform capture rate	Up to 2,000,000wfms/s	Logic analyzer	MSO7000X-LA	
Trigger type	22+		Standard	
Measurements	48+	Protocol Analyzer	RS232/422/485/UART	
	15 6-inch EHD capacitive touch		SPI、CAN、LIN	
Display	screen		Optional:	
	Webserver instrument access		MSO7000X-CANFD	
Cross-platform access	control support for mobile	Protocol Analyzer	MSO7000X-FLEX	
cross platform access	devices		MSO7000X-SENT	
	Bower analysis litter analysis		MSO7000X-AUDIO	
	and ove diagram. Mask and		MSO7000X-AERO	
Advanced analysis tools	limit test Histogram Trace	Jitter analysis and eye diagram	MSO7000X-JITTER	
	and Tendency chart	Power analysis	MSO7000X-PWR	
	USB Host 3.0×4, USB Device	Mask and limit test	Standard	
	3.0×1, 10M Ref IN\Out, AUX	Upgrade suit	MSO7000X-BND	
Interface	In\Out, 10/100/1000LAN、 HDMI,	Bandwidth upgrade	MSO7000X-BW-10T20	

l²C ∖

# Extraordinary performance contributes to high-quality testing

The integration of the functions of many independent measurement instruments, any measurement task can be easily handled, and preparations are made for your future testing needs.



#### Oscilloscope

- Two bandwidth options: 1G/2G
- Input channel: 4+16
- Sample rate: 10GSa/S
- waveform capture rate reach to 800,000wfms/s at UltraAcq mode, 2,000,000wfms/s at sequence mode.



■ The memory depth: 1Gpts (single channel),250Mpts (full channel)

#### Function/Arbitrary Waveform Generator (opt)

- dual-channel function/arbitrary waveform generator with equal performance.
- The maximum output frequency is 60MHz, and the sample rate is 625MSa/s.
- Vertical resolution is 16 bits.

Built-in many kinds of standard waveforms: sine, square, pulse, ramp, noise, DC. Built-in more than 200 kinds of arbitrary waveforms. Support the modulation and sweep of various signals

#### Spectrum analyzer

- Enhanced FFT with a maximum of 1Mpts signal analysis
- Frequency analysis range: analog bandwidth of the oscilloscope
- Support multiple spectrum view displays:
   Amplitude spectrum, Power spectrum, Psd, Real part, Imaginary part, Phase spectrum.
- Two spectrum analysis windows can be added simultaneously to meet the visual display





DVM

Cymometer

under different window functions.

#### Digital voltmeter

■ 4-digit DC/AC RMS/DC + AC RMS voltage measurement

#### Frequency counter

■ 8-digit high-precision hardware frequency meter as standard

#### Logic analyzer (opt)

- Digital channel sample rate: 1.25GSa/s
- Digital channel memory depth: 125Mpts
- The minimum identifiable pulse width is as low as 3.2ns
- The digital probe provides a signal input socket with the upper eight bits separated from the lower eight bits, and simplifies the connection with the device under test. When connected with square pins, the UT-M15 can be directly connected to an 8X2 square pin header with pins of 2.54mm
- The UT-M15 provides excellent electrical characteristics, with an input impedance of  $101k\Omega \pm 1\%$

#### Protocol analyzer (opt)

MSO7000X provides various serial bus analysis and multiple protocol trigger modes, which can trigger specific packet contents, identify polarities, chip selects, etc. The trigger events are displayed in a list, and protocol search can be performed to accurately locate protocol frames.



It covers commonly used protocols in Computer\Embedded\Automotive\Aero\Audio design.

#### The patented UltraAcq® technology, perfectly captures, showing every detail

Different from before, the MSO7000X provides a unique physical button UltraAcq. With a gentle press, the oscilloscope enters the ultra-fast acquisition mode, increasing the real-time waveform capture rate to 800,000wfms/s, and reducing the dead time of the oscilloscope to the lowest < 1µs, which improves the probability of viewing common sporadic problems in digital systems, such as Runt pulses, Glitch, Timing issues etc. The MSO7000X can smoothly switch between DSO (Digital Storage) and UPO (Ultra Phosphor) through the UltraAcq mode. You can focus on the superimposed waveforms to quickly discover sporadic signal abnormalities, or switch to a single waveform to focus on the true signal quality of the waveform.



-4.049 mV

DC

1.0000000

kHz



The high capture rate in the UPO mode makes the oscilloscope capture sporadic waveform reflections



Under the DSO mode, there is no envelope of the fast-acquired quickly waveform, and you can easily see the point details of the waveform

#### Unparalleled triggering capability, also handles complex debugging with ease

The MSO7000X series is equipped with more than 22 kinds of advanced trigger modes, and all modes is equipped with memory depth of 1Gpts as standard. When you are debugging complex systems, you can easily find abnormalities in extremely long data. More than 11 kinds of serial trigger modes help you quickly debug in complex bus debugging, enabling you to have unprecedented in-depth insight into signal details. The flexibly configured zone trigger allows the waveform to roam in the configured area, quickly isolating irrelevant signals. The area trigger can reduce the workload during capture or manual search, quickly find key events in a very short time, and complete the debugging and analysis work.



Use the zone trigger to quickly isolate unconcerned signals, quickly find key information, and there is no need to spend too much time learning advanced trigger mode

#### Powerful mathematical waveform operation to finely process your signal

#### Digital filter, User-defined filter design

Any signal processing system can be regarded as a filter. such as the 20MHz bandwidth limit of an oscilloscope, can be regarded as a low-pass filter, which is used to filter high-frequency noise in the signal. Compared with analog oscilloscopes, digital oscilloscopes have obvious advantages. For example, analog oscilloscopes are affected by circuit components, and it is costly and difficult to achieve high-order filter design. High-order filtering can be easily achieved by digital filter. Digital filter can be implemented as infinite impulse response (IIR) and finite impulse response (FIR), and you can choose which filter designer to apply according to the design requirements. The MSO7000X can specify the filter to be applied to the mathematical waveform through the Math function, adding support for standard filters and user-defined applicationcentered filter designs.

The MSO7000X supports the filter response type:

#### UNI-T

- High pass
- Low pass
- Band pass
- Band stop

The MSO7000X supports the filter type

- Butterworth
- Chebyshev I
- Chebyshev II
- Elliptic
- Sampling
- Remez
- Window

#### Eres

Eres itself is also a kind of filter, mainly used in small signal amplitude measurement. FIR filter is used to low-pass filter the captured signal. Users can adjust the enhancement bits to select the FIR filter with corresponding length and bandwidth, and adjust the bit within the maximum sampling bandwidth range to match the bandwidth of the low-pass filter. Each channel can be set independently, with a maximum enhancement of 3 bits. If the trade-off between resolution and bandwidth is acceptable, then filter is the best method.

#### User-defined advanced function operation

The MSO7000X creates dozens of advanced mathematical function operations for users. Users only need to input according to the function parameter prompts to call the function formula to perform operation processing on the waveform.



The above figure uses the AVG function to average the waveform of channel 1, with an average number of 5 times.



Use the user-defined filter creation dialog box to graphically display the filter type, response, order, etc., and the filter design can be saved and recalled

#### Matlab embedded programming

Using the Matlab code compiler embedded in MSO7000X, users can directly write Matlab language and run the script code, and return the running result of the script to render it into the mathematical waveform of the oscilloscope. When the above advanced formulas and basic operation formulas still cannot meet your needs, you can directly write a script for mathematical operations, and the script can also be saved for the next recall.



The above figure uses the matlab script to perform differential processing on the sine waveform of channel 1, and then converts it into a square wave

#### Sequence mode provides you with more signal information

The sequence mode adopts the segment storage technology to efficiently utilize the memory depth of the oscilloscope, allowing you to effectively save enough trigger events within 1Gpts memory space, while eliminating the long intervals between events. In this mode, the oscilloscope does not render the waveform before the acquisition stops, greatly reducing the acquisition time interval (dead time) of the oscilloscope and increasing the waveform capture rate to 2,000,000wfms/s. After the acquisition is completed, you can view the waveform in a single frame or playback it frame by frame, or view the waveform within up to 40 continuous frames in the form of 45°/Stack/Superposition/splicing. The sequence mode supports the acquisition of up to 520,000 frames of triggered waveforms



Utilize the fast capture rate of the sequence mode to effectively capture 25 complete CAN protocol frames, and compare each frame. It is found that there is a timing error in the transmission bit. The blue part in the figure is the reference frame, the maroon is completely overlapped, and the yellow part has deviations

# The user-friendly and perfect design makes your experience easier

#### Truly born for product design, with a brand-new touch interaction experience

The use of touch screens on oscilloscopes is not uncommon, but most oscilloscopes still retain the original independent menu buttons and waste a lot of space. The MSO7000X provides a 15.6-inch high-definition capacitive touch screen, while optimizing the proprietary interface of the instrument. While providing the same touch experience as mobile phones and tablets, it retains the instrument's unique knobs and shortcut keys, taking into account the proprietary attributes of the instrument. It supports external Bluetooth mouse/keyboard, and easily turns into a personal workstation in seconds. At the same time, in terms of the instrument UI design, it is more in line with the thinking of engineers, and the expandability of multiple windows also enables engineers to handle measurement tasks more efficiently.



Multi-window, flexible layout, enhance cross-application collaboration capabilities

Have you ever been unable to switch between multiple tasks during the use of the oscilloscope; needed to frequently switch applications when multiple measurement items were carried out simultaneously; been distressed that the layout designed by the manufacturer did not meet your aesthetic standards; been limited by the number of windows and wanted to expand the task windows? The MSO7000X window design will help you solve such troubles. It is specially designed for engineers, and the thinking is more in line with the working habits of engineers. When using multiple windows, you can:

- Move and zoom the waveforms in a single window;
- Drag the window to change the layout and adjust the window size arbitrarily;
- Set the pop-up window to be pinned, the event table to be floating or embedded; reduce frequent switching between multiple windows;



- Set the pop-up window to be pinned, the event table to be floating or embedded; reduce frequent switching between multiple windows;
- Perform full screen/split screen for the independent window and maximize the display;
- Adjust the waveform brightness of the independent window arbitrarily;
- Perform cursor measurement on the waveform of the independent window;

#### WebServer remote debugging. You can use the oscilloscope in any position

Using the MSO7000X WebServer, you can connect the oscilloscope to your local network. Just enter the IP address of the instrument in the browser, and you can use the oscilloscope for realtime control and analysis on mobile device/PC. At the same time, WebServer also supports online SCPI programming commands, and you can directly export waveform data, take quick screenshots, and browse the instrument manual online on the client side. As long as the network permits, you can even use all the functions of the oscilloscope in any comfortable position.

	Welcome To U	se MSO7000X	
Base Info		Wel	come To Use MSO7000
Model	MSO7000X	LINE-T and the	
Manufacturer	Uni-Trend Technology (China) Co., Ltd.	and the second s	
Serial Number		and the second second	
Firmware Versions			
Network Info			
TCP IP	192.168.23.164	AL ADDRESS AND A DOCTOR	
MAC Address	CC-82-7F-2C-5A-C3	Base Info	
VISA Address	TCPIP0::192.168.23.164::inst0::INSTR	Mod	lel MS07000X
LXI Versions		Manufad	cturer
Current Time	5/11/2024 1:48:04 PM	Seri	al -
		Firmw Versie	vare -
		Network	Info
		TCP IF	192.168.23.164

#### Search and navigation

If the appropriate search tools are lacking, finding the corresponding events in a 1Gpts long record waveform may consume a significant amount of time. MSO7000X provides search and navigation functions. All search events are highlighted with different colored search markers when they occur. During pauses, simple navigation can be achieved using the previous ( $\leftarrow$ ) and next ( $\rightarrow$ ) buttons on the search box or the search markers on the display screen. You can define multiple unique search conditions simultaneously for searching, and the event table will display the time of each search occurrence and the search measurement parameters. Up to 10 search settings can be made simultaneously.



Search for the set conditions, such as pulse width search, and all pulse widths that meet the conditions can be found. The triangles with colors mark the positions, and the lengths of the searched pulse widths are displayed. If you are interested in pulse widths with too large differences, you can pause and navigate to the pulse width position for further analysis.

# **Rich-in-function test software speeds up your design pace** Advanced Power Analysis- MSO7000X-PWR

With the development of chip technology, the requirements for power supply systems are getting higher and higher. Currently, small voltage and large current in power supply networks have become a trend, especially for power supply networks composed of chips or precision components. It is required to ensure reliable power supply and noise suppression for each part of the circuit, as well as complete signal transmission between each chip. Power supply testing also faces greater challenges. Designers are more concerned about the energy saving and response speed of the power supply to ensure the stability and cleanliness of the power supply. The rich advanced power analysis software of MSO7000X helps engineers complete reliable power supply design and power integrity testing.

#### Input power quality test

By testing the voltage, current and power at the input terminal, the quality of the input AC line can be effectively evaluated. This test is for the optimization design of the industrial frequency and is also the first hurdle for the quality of the power input.



MSO7000X-PWR. The yellow one is the voltage waveform, the blue one is the current waveform, and the orange one is the power graph.

Voltage and current harmonic analysis test The harmonic situation of the voltage/current at the power input terminal is analyzed, and the input signal is subjected to FFT to obtain each harmonic component. It replaces the measurement of harmonics by the spectrum analyzer. The maximum number of harmonic measurements can reach 100 orders.



#### SMPS switching loss test:

Most of the losses of SMPS come from switching devices (MOSFETs and diodes), and a small part comes from inductors and capacitors. Devices with higher resistance will also increase the losses. MSO7000X is standardly equipped with 1Gpts memory depth, which can analyze multiple cycle waveforms in the ms time base range, complete the measurement of power and energy losses of switching devices, and ensure the power conversion efficiency



Use the MSO7000X-PWR software to capture multiple switching cycles and measure the power and energy losses of the power device during the turn-on / conduction / turn-off stages.

#### MOSFET\IGBT SOA mask test:

To ensure that the switching device can complete a reliable design, the SOA test of the power chip parameters must be carried out before designing the circuit to ensure that its working conditions such as voltage, current, load change, and junction temperature do not exceed the SOA stress template. Otherwise, forcibly adding to the design circuit will cause the device to burn out and make the device fail.



The SOA stress template test is conducted through the MSO7000X-PWR software to automatically collect waveform data and determine Pass/Fail.

#### Ripple test:

Low-frequency ripple: It comes from the period of the AC input. The power supply's suppression ratio for the input is not perfect. When the input changes, the output will also change.

High-frequency ripple: It comes from the period of the switch transition. Switching power supplies do not output energy linearly and continuously but transfer energy in packets. Therefore, there will be ripples corresponding to the switching period.



The ripple measured by MSO7000X in HD 12-bit

The MSO7000X HD mode with 12 bits can effectively suppress out-of-band noise and perfectly restore the real output ripple.

#### SMPS Loop stability test

By injecting a disturbance signal with a constantly changing frequency into the switching power supply and based on its output situation, the dynamic modulation ability of the circuit system for each disturbance signal at each frequency point can be judged. By using the Bode plot and gain/phase margin measurement, designers can determine the stability of the power supply control loop.



The loop analysis test is automatically carried out through the MSO7000X-PWR software, and the software automatically evaluates the phase margin and gain margin. To complete the loop stability test, the MSO7000X-AWG signal generator option and the UT-ISOT isolation transformer need to be selected.

#### Jitter analysis and eye diagram pre-test

In electronic devices and communication systems, jitter analysis and eye diagram pre-tests play important roles and their applications are also very extensive.

Using the MSO7000X-JITTER jitter analysis and eye diagram option, you can easily complete such as:

- Evaluate the clock jitter, data jitter and eye diagram openness of serial data communication systems;
- Test the signal integrity, clock synchronization and anti-interference ability of high-speed digital signal transmission systems;
- Evaluate the performance of clock and data recovery systems, including clock extraction, data demodulation and clock reconstruction, etc;
- Evaluate the transmission performance, timing consistency and signal integrity of high-speed interfaces;



■ Locate clock jitter, signal distortion and frequency interference;

The MSO7000X-JITTER jitter analysis and eye diagram option has complete jitter measurement algorithms and rich jitter analysis views

#### Industry serial protocol test

The MSO7000X provides a kit for industry serial data bus decode and trigger, which can measure more than 11 protocols including low-speed/high-speed RS232/422/485/UART, I2C, SPI, CAN, CAN-FD, LIN, AUDIO BUS (I2S, LJ, RJ, TDM), MIL-STD-1553, ARINC 429, etc. Protocol search enables you to search the long acquisition data of serial packets to find the packet parameters of specific content. You can also use the standard serial trigger function to find such events and search and navigate in the event list.

LINI-T Need	Single	Autoset H	2.00 µs/div	0 s	А	∬ IE	常,10MPts	, 10.00GSa/s	т	串行 Fle	xRay	$\sim$	<del>Щ</del> .	Acq 🖨		6 🖶	٢	88
B1 : FlexRay										] 🔅 🛇	事件列表					(	<b>1</b> 🗌	$\otimes$
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												-430.90µs		05 3D		05 E	8	
												-396.09µs		05 3D		05 D		
BleiD:53Dh	2:03h	H:5E8h	C:0Ah	Data:55	n 🖂 Da	ta:4Eh	D:49h	— D:2	Dh Data:54h	Data:21h		-361.29µs				05 D		
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P1 峰峰值 (1 2:297)/	+																	
C1 DC1M C2	DC1N C	2 DC1M C4	DC1M B1															_
500 mV/div1	1.00 W/div	2.00 V/div1	00 mV/div _Ele	xRay 5.00	Mbos													
20MHz			20MHz C1:	2.00V										数学	• 参考+	逻辑+	总线+	
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Trigger the FlexRay BP negative bus. The bus waveform provides time-correlated decoded packet contents, including ID, payload, frame header CRC, cycle counter, data, CRC check, etc. The event list shows all the packet contents collected

#### Limit and mask test

The MSO7000X allows the creation of limit templates through standard waveforms to achieve functions such as incoming material screening or quality control in the production line, and improve the consistency and reliability of product design. For example, noise limit tests help evaluate the sensitivity and anti-interference performance of the receiver, the signal-to-noise ratio test of the sensor, the clarity and quality of the audio signal, the safety of medical equipment, etc.



Create a test template using the worst limit of noise, and the waveform screening that meets the standard can be completed in a few seconds

#### Standard mask test

For your particular attention to signal integrity testing, the MSO7000X also offers industry standard mask as judgment criteria. Use the standard mask to make judgments on the eye diagram opening or conduct standard evaluations on time-domain signals.



#### probe

#### UT-PA2000 Active single-ended probe

UT-PA2000 is an active single-ended probe designed for high-frequency measurement, integrating many features required by today's common high-speed probes. Active single-ended probes are widely used in many high-speed fields such as high-speed digital circuits, bus analysis, and signal integrity analysis. UT-PA2000 can acquire signal information in the circuit more accurately and quickly, which helps to improve the working efficiency and accuracy of engineers.





Connected to the MSO7000X oscilloscope and a flexible front-end connector for connecting small DUTs

#### **Excellent** electrical performance

- 2GHz high bandwidth
- Rise time <175ps
- 1MΩ input impedance, <1pF input capacitance
- Dynamic range: ±4V
- Offset range: ±4V
- Transmission delay: <7ns
- 0.5W ultra-low power consumption

#### **Compatible** with oscilloscopes

- Probe front light control
- Run/Stop
- Clear
- Force
- Adapt to MSO7000X, MSO8000X, UPO7000L series

#### Easy-to-use probe function

- Automatic perception of attenuation multiples
- Automatic identification of probe Models
- Automatic reading of probe serial numbers
- Automatic adjustment of display scales and measured values

#### Outstanding mechanical design

- Compact probe head for testing small circuit components
- Various accessories for flexible connection to the DUT
- Unique probe headlamp design

# **Passive Probe**

Model	Туре	Description		
UT-P07		1X: DC ~ 8MHz		
	High impodance probe	10X: DC ~ 500MHz		
		Oscilloscope compatibility:		
		all series of <b>UNI-T</b>		
UT-P20		DC ~ 100MHz		
		Probe coefficient: 100:1		
	High impedance probe	Maximum operating voltage: 1500Vrms		
		Oscilloscope compatibility:		
		all series of <b>UNI-T</b>		
UT-V23		DC ~ 100MHz		
		Probe coefficient: 100:1		
	High voltage probe	Input resistance: $100M\Omega \pm 2\%$		
-		Maximum operating voltage: 2000Vpp		
		Oscilloscope compatibility:		
		all series of <b>UNI-T</b>		
UT-P21		DC ~ 50MHz		
		Probe coefficient: 1000:1		
	High voltage probe	Maximum operating voltage:		
	rligh voltage probe	DC 15kVrms, AC 10kV (sine wave)		
111		Oscilloscope compatibility:		
		all series of UNI-T		

#### **Current Probe**

Model	Туре	Description
UT-P40	Current probe	DC ~ 100kHz Range: 50mV/A, 5mV/A Current Range: 0.4A ~ 60A Maximum operating voltage: 600Vrms Oscilloscope compatibility: all series of <b>UNI-T</b>
UT-P41	Current probe	DC ~ 100kHz Range: 100mV/A, 10mV/A Current Range: 0.4A ~ 100A Maximum operating voltage: 600Vrms Oscilloscope compatibility: all series of <b>UNI-T</b>
UT-P42	Current probe	DC ~ 150kHz Range: 100mV/A, 10mV/A Current Range: 0.4A ~ 200A Maximum operating voltage: 600Vrms Oscilloscope compatibility: all series of <b>UNI-T</b>
UT-P43	Current probe	DC ~ 25MHz Range: 100mV/A Maximum measuring current: 20A Rise time: 14ns Oscilloscope compatibility: all series of <b>UNI-T</b>
UT-P44	Current probe	DC ~ 50MHz Range: 50mV/A Maximum measuring current: 40A Rise time: 7ns Oscilloscope compatibility: all series of <b>UNI-T</b>

UT-P4030D	Current probe	Bandwidth: DC ~ 100MHz Range: 1X:5A, 10X:30A Rise time: ≤3.5ns Maximum continuous current: 30Arms Resolution: 5A:1mA, 30 A:10mA Oscilloscope compatibility: all series of <b>UNI-T</b>
UT-P4150	Current probe	Bandwidth: DC ~ 12MHz Range: 10X:30A, 100X: 150A Rise time: ≤29ns Maximum continuous current:150Arms Resolution: 30A:10mA, 150A:100mA Oscilloscope compatibility: all series of <b>UNI-T</b>
UT-P4500	Current probe	Bandwidth: DC ~ 5MHz Range: 10X:75A, 100X:500A Rising time: ≤70ns Maximum continuous current:500Arms Resolution:75A: 10mA, 500A:100mA Oscilloscope compatibility: all series of <b>UNI-T</b>
UT-P4100A	Current probe	Bandwidth: DC ~ 600kHz Current range: low-scale 50mA-10A, high-scale 1A-100A Range sensitivity: low-scale 0.1V/A, high-scale 0.01V/A Oscilloscope compatibility: all series of <b>UNI-T</b>
UT-P4100B	Current probe	Bandwidth: DC ~ 2MHz Current range: low-scale 50mA-10A, high-scale 1A-100A Range sensitivity: low-scale 0.1V/A, high-scale 0.01V/A Oscilloscope compatibility: all series of <b>UNI-T</b>

Model	Туре	Description
UT-P30	High voltage differential probe	DC ~ 100MHz Attenuation ratio: 100:1, 10:1 Differential input voltage: ±800Vpp Oscilloscope compatibility: all series of <b>UNI-T</b>
UT-P31	High voltage differential probe	DC ~ 100MHz Attenuation ratio: 1000:1, 100:1 Differential input voltage: ±1.5kVpp Oscilloscope compatibility: all series of <b>UNI-T</b>
UT-P32	High voltage differential probe	DC ~ 50MHz Attenuation ratio: 1000:1, 100:1 Differential input voltage: ±3kVpp Oscilloscope compatibility: all series of <b>UNI-T</b>

# High voltage differential probe

UT-P33



High voltage differential probe DC ~ 120MHz Attenuation ratio: 100:1, 10:1 Differential input voltage: ±14kVpp Oscilloscope compatibility: all series of **UNI-T** 

		DC ~ 50MHz	
UT-P35		Attenuation ratio 500:1, 50:1	
		Rise time: 7ns	
		Accuracy: 2%	
	Ligh voltage	Differential input voltage:	
	High vollage	1/50: 130 (DC + peak AC);	
	differential probe	1/500: 1300 (DC + peak AC);	
		Common input voltage:	
		100Vrms, CATI; 600Vrms, CATII	
		Oscilloscope compatibility:	
		all series of <b>UNI-T</b>	
		DC ~ 50MHz	
UT-P36		DC ~ 50MHz Attenuation ratio 2000:1, 200:1	
UT-P36		DC ~ 50MHz Attenuation ratio 2000:1, 200:1 Rising time 3.5ns	
UT-P36		DC ~ 50MHz Attenuation ratio 2000:1, 200:1 Rising time 3.5ns Accuracy: 2%	
UT-P36	High voltage	DC ~ 50MHz Attenuation ratio 2000:1, 200:1 Rising time 3.5ns Accuracy: 2% Differential input voltage:	
UT-P36	High voltage	DC ~ 50MHz Attenuation ratio 2000:1, 200:1 Rising time 3.5ns Accuracy: 2% Differential input voltage: 1/200:560 (DC + peak AC);	
UT-P36	High voltage differential probe	DC ~ 50MHz Attenuation ratio 2000:1, 200:1 Rising time 3.5ns Accuracy: 2% Differential input voltage: 1/200:560 (DC + peak AC); 1/2000:5600 (DC + peak AC);	
UT-P36	High voltage differential probe	DC ~ 50MHz Attenuation ratio 2000:1, 200:1 Rising time 3.5ns Accuracy: 2% Differential input voltage: 1/200:560 (DC + peak AC); 1/2000:5600 (DC + peak AC); Common input voltage:	
UT-P36	High voltage differential probe	DC ~ 50MHz Attenuation ratio 2000:1, 200:1 Rising time 3.5ns Accuracy: 2% Differential input voltage: 1/200:560 (DC + peak AC); 1/2000:5600 (DC + peak AC); Common input voltage: 2800Vrms, CATI; 1400Vrms, CATII;	
UT-P36	High voltage differential probe	DC ~ 50MHz Attenuation ratio 2000:1, 200:1 Rising time 3.5ns Accuracy: 2% Differential input voltage: 1/200:560 (DC + peak AC); 1/2000:5600 (DC + peak AC); Common input voltage: 2800Vrms, CATI; 1400Vrms, CATII; Oscilloscope compatibility:	

# **Technical Parameter**

All specifications are guaranteed, except those marked "typical". The instrument must be operated continuously for at least thirty minutes at the specified operating temperature.

Main parameters	MS07204X	MS07104X		
Bandwidth (-3dB) @50Ω*1	2GHz	1GHz		
Bandwidth (-3dB) @1MΩ	500MHz			
Rise time @50Ω(typical)	175ps	350ps		
Analog channels	4+EXT			
Digital channels (option)	16 (option of MSO7000X-L	A is required to purchase)		
Sample rate*2	10GSa/s (Single channel);50 2.5GSa/s (Full channel)	GSa/s (Dual channel);		
Vertical resolution	8-bit (HD12-bit)			
Maximum memory depth	depth 1Gpts (Single channel); 500Mpts (Dual channel); 250Mpts (Full channel)			
Waveform capture rate* <sup>3</sup>	≥800,000wfms/s (UltraAcq®); 2,000,000wfms/s (Sequence mode)			
Function/Arbitrary waveform generator (option)	The Maximum frequency output of waveform: 60MHz, Sample rate: 625MSa/s, Supports arbitrary waveform and provides arbitrary waveform editor. Supports modulation and sween			
Digital voltmeter	4-bit, DC, AC RMS, DC+AC	RMS		
Frequency counter	8-bit			
Serial protocol analysis	Standard: RS-232/422/485/UART, SPI, I <sup>2</sup> C, CAN, LIN Option: CAN-FD, SENT, FlexRay, AudioBus(I <sup>2</sup> S/LJ/RJ/TDM MIL-STD-1553, ARINC429			
Measurement	Supports 48 kinds of automatic parameter measurement quick Meas; and statistical analysis, histogram, trend cha and trace analysis			
Mathematical operation	Up to 8 number of math waveforms at same time, Enhanced FFT, Basic mathematical operation, Filter, Advanced function editor, Embedded matlab programming operation and render, Enhanced resolution			
Analysis tool Histogram, Area histogram, Trend chart, Trace		Trend chart, Trace		

Advanced analysis function	Power analysis (option), Jitter analysis and eye diagram			
Advanced analysis function	(option), Mask and limit test, Sequence mode			
	USB Device, USB Host*4, LAN (10/100/1000Mb/s), HDMI,			
Interface	AuxIn (trigger sync input, AWG external trigger input),			
Interface	AuxOut (trigger sync output, pass the test result, AWG			
	trigger output), 10MHz REF In/Out			
Display coroop	15.6-inch FHD capacitive touch screen (1920*1080) +			
Display screen	Gesture touch			

Analog channel	MS07204X	MS07104X		
Channels	4+EXT			
Bandwidth limit @50Ω (typical)	1GHz, 500MHz, 20MHz	500MHz, 20MHz		
Bandwidth limit @1MΩ (typical)	20MHz			
Input consitivity range *4	1MΩ: 1mV/div ~ 10V/div			
input sensitivity range	50 $\Omega$ : 1mV/div ~ 1V/div			
Input coupling	AC, DC, GND			
Input impedance	1MΩ ± 1% (15 ± 3pF), 50Ω ± 2%			
DC gain accuracy *4	<ul> <li>50Ω: ± 1.5% (± 2.0% at ≤5mV/div) ± full scale division of 1%</li> <li>(≤5mV/div: ± full scale division of 1.5%)</li> <li>1MΩ: ± 1.2% (± 1.5% at ≤5mV/div) ± full scale division of 1%</li> <li>(≤5mV/div: ± full scale division of 1.2%)</li> </ul>			
Offset range	<b>50Ω:</b> 1mV/div-100mV/div: ±2V; 200mV/div-1V/div: ± 5V <b>1MΩ:</b> 1mV/div-50mV/div: ± 2V; 100mV/div-500mV/div: ± 20V; 1V/div: ± 40V; 2V/div-10V/div: ± 100V			
DC offset accuracy	≤ 200mV/div (± 0.1div ± 2mV > 200mV/div (± 0.1div ± 2mV	± offset of 1.5%) ± offset of 1.0%)		
Probe attenuation coefficient	1X, 10X, 100X, User: 0.001X~10	000X		
Maximum input voltage	1MΩ: ≤300Vrms, CAT I; 50Ω:	≤5Vrms		

#### Channel-to-channel isolation ≥500:1 (DC ~ 1GHz)

★ 1. Bandwidth of 2G is only suitable for single channel mode.

 $\star$  2. Dual channel mode: it can only open C1 and C2; or C3 and C4.

★ 3. Maximum waveform capture rate is used to open UltraAcq<sup>®</sup> and single channel mode.

\* 4. 1mV/div is a digital amplification of 2mV/div. For vertical accuracy calculations, the 1mV/div vertical sensitivity should be calculated as 2mV/div full scale using 16mV.

Digital channel (option)	
Digital input channels	16
Sample rate	1.25GSa/s
Memory depth	125Mpts
Maximum input toggle rate	500MHz
Minimum detectable pulse width	3.2ns
Thresholds	A total of 4 groups are adjustable, each group has 4 channels
Threshold selection	TTL (1.4V) /5.0V CMOS (+2.5V), 3.3V CMOS (+1.65V) /2.5V CMOS (+1.25V), 1.8V CMOS (+0.9V) ECL (-1.3V) / PECL (+3.7V) / LVDS (+1.2V) / 0V / User- defined (4 channel in one group, and the threshold can be adjusted)
Threshold range*	± 20.0V, 20mV stepping
Threshold resolution*	20mV
Threshold accuracy*	±(100mV + 3% of threshold setting after calibration)
Maximum input voltage*	±40Vpeak
Maximum input dynamic range*	±10V + threshold
Minimum voltage swing *	500mVpp
Input impedance*	100kΩ ± 2%
Vertical resolution	1 bit
Inter-channel delay*	1.6ns (typical value)

Notes: \* indicates the indicator after the oscilloscope is connected to the digital probe

Horizontal System	
Time base range	100ps/div - 1000s/div
Time base accuracy	$\pm$ (1.6+0.5* the number of years after calibration) ppm
Time base delay time range	Pre-trigger: ≥0.5 screen width; Post-trigger:≤5000s
Channel-to-channel deskew range	± 100ns, minimum stepping of 40ps
$\Delta$ time accuracy	≤100ps
Horizontal mode	Y-T/X-Y/ROLL

Acquisition System			
Peak detect	Captures glitches as narrow as 400ps		
High resolution	Real-time boxcar averaging reduces random noise and effectively increases vertical resolution 8~12 bits:		
Averaging	2 ~ 65536		
UltraAcq®	In UltraAcq mode, the waveform capture rate can reach to 800,000wfms/s		
ERes	Enhance bits: 0.5. 1. 1.5. 2. 2.5. 3		

Trigger System		
Trigger modes	Auto, Normal, Single	
	HF rejection	High-frequency reject, cutoff frequency ~ 40 kHz
	LF rejection	low-frequency reject, cutoff frequency ~ 40 kHz
Trigger coupling	Noise rejection	Adds hysteresis to the trigger circuitry; selectable OFF or ON
	DC	DC-coupled trigger
	AC	AC-coupled trigger

Trigger holdoff range	6.4ns ~ 10s	
Trigger sensitivity	Internal:C1 ~ C4	≤5mV: 1div; >5mV: 0.5div
		EXT: 100mVpp DC ~ 100MHz,
	<b>-</b>	150mVpp 100MHz ~ 200MHz
	External	EXT/5:500mVpp DC ~ 100MHz,
		750mVpp 100MHz~200MHz
	Internal	± 4divs from the center of the screen
Trigger level range	External	EXT: ±1V; EXT/5: ±5V
	AC Line	Fixed at about 50% of line voltage
Trigger Type		
	Source	C1-C4
Zone trigger	Zone	Up to 2 zones
	attribute	Intersect/Non-intersect
	Source	C1 ~ C4/EXT/(EXT/5)/D0 ~ D15/AC
Edge trigger	Slope	Rising edge, Falling edge, Any edge
	Source	C1 ~ C4/D0~D15
	Polarity	Positive pulse width,
Pulse width trigger		Negative pulse width
	Limit condition	Less than, greater than, within range
	Pulse width	3.2ns ~ 10s
	Source	C1 ~ C4
Slope trigger	Slope	Rise, Fall
Slope trigger	Limit condition	Less than, greater than, within range
	Time setting	3.2ns ~ 10s
	Source	C1 ~ C4
Video trigger	Standard	NTSC, PAL
	Trigger condition	All lines, specified line, odd field or even field
Pattern trigger	Source	C1 ~ C4

	Pattern setting	H, L, X, rising edge, falling edge
	Source	C1 ~ C4/D0~D15
Timeout trigger	Edge type	Rising edge, Falling edge, Any edge
	Time setting	3.2ns ~ 10s
	Source	C1 ~ C4
	Polarity	Positive pulse width, negative pulse width
Runt trigger	Limit condition	Less than, greater than, within range, outside the range
	Time setting	3.2ns ~ 10s
	Clock source	C1 ~ C4
	Clock edge	Rising edge, falling edge
Setup/Hold trigger	Data source	C1 ~ C4
	Condition	Setup, hold, setup & hold
	Time setting	3.2ns ~ 10s
	Source	C1 ~ C4
	Edge type	Rising edge, falling edge
Delay trigger	Delay type	Less than, Greater than, Within range, Outside the range
	Delay time	3.2ns to 10s
	Source	C1 ~ C4
Duration triager	pattern setting	H, L, X
Duration trigger	Trigger condition	Greater than, Less than, Within range
	Duration	3.2ns to 10s
	Source	C1 ~ C4/D0~D15
	Edge type	Rising edge, Falling edge
Nth edge trigger	Free time	3.2ns to 10s
	Edge number	1 to 65535
RS-232/422/485/UART trigger	Trigger mode	Start bit, Parity error, Data content, Stop bit

I²C trigger	Trigger mode	Start, Restart, Stop, Missing acknowledge, Address, Data, Address and Data
SPI trigger	Trigger mode	Chip selection active, Data
CAN trigger	Trigger mode	Start of frame, Frame type, Identifier ID, Data, Identifier ID & Data, End of Frame, Error
LIN trigger	Trigger mode	Start of frame, Sync frame ID, Data, ID parity error, Checksum error
CAN-FD trigger (option)	Trigger mode	Start of frame, Frame type, Identifier ID, Data, Identifier ID & Data, End of Frame, Error
SENT trigger (option)	Trigger mode	Sync, Frame start, Data, CRC check error
AudioBus trigger (option)	Trigger mode	Data, Sync
FlexRay trigger (option)	Trigger mode	Frame head, indicator, ID, Cycle count, data, ID & data, End of Frame, error
MIL-STD-1553 trigger (option)	Trigger mode	Command frame, Data frame, State frame, CRC check error
ARINC 429 trigger (option)	Trigger mode	Start of frame, Label, Source or Objective identifier, Data, Mark and State, Check error

#### **Waveform Measurement**

Cursor Measurement			
Source	C1 ~ C4, Math, Ref, Histogram		
_	Vertical cursor measuring time and voltage (X,Y ), reciprocal of $\triangle$ X (Hz ) (1/ $\triangle$ X ), $\triangle$ Y/ $\triangle$ X (V/s );		
Туре	Horizontal cursor measuring voltage (Y ) and $ riangle$ Y;		
	Supports automatic trace cursor;		

#### **Automatic Measurement**

Mallana	Maximum, Minimum, Peak-to-Peak, Top, Base, Middle, Amplitude,
	Average, RMS, AC RMS, Positive overshoot,
voltage	Negative overshoot, Maximum cycle, Minimum cycle, Cycle RMS,
measurements	Cycle average, Cycle Peak-to-Peak, Cycle middle, Positive pre-shoot,
	Negative pre-shoot

	Period, Frequency, Rise time, Fall time, + pulse width,- pulse width,		
Timina	+ duty cycle, - duty cycle, Time @Max, Time @Min, Rise time @Lv, Fall		
manuramente	time @Lv, Period @Lv, Frequency @Lv, Pulse width @Lv, Duty cycle @Lv,		
measurements	Phase different @Lv, RRD @Lv, FFD @Lv, RFD @Lv, FRD @Lv, Skew,		
	Data count, Setup time, Hold time, Cycle count		
Other			
measurements	Alea, Fellouic alea		
Histogram	$\mu \pm 1\sigma$ , $\mu \pm 2\sigma$ , $\mu \pm 3\sigma$ , mode, mean, standard deviation, maximum, minimum,		
parameter	median, peak-to-peak, peak count, total sample size		
Measurement	<u>C1~C4</u>		
source	C1~ C4		
Number of	48 kinds of automatic measurement, it can display 10 parameters at the		
measurements	same time		
Measurement range	Screen or Cursor		
Quick Meas	Display 34 measurement items of the current measurement source, the		
	source can be switched		
Measurement	Current value, Average value, Maximum value, Minimum value, Standard		
statistics	deviation, Measure the count, Histogram, Trend chart, Trace		

Waveform math			
Number of math waveforms	Supports 8 math waveforms and it can display at the same time		
Source	C1 ~ C4, P1 ~ P10, R1 ~ R4		
Advanced operation	supporting matlab embedded programming and data presentation		
Basic operation	Add, Subtract, Multiply, Divide, AND, OR, NOT, XOR, Average, Absolute value, Exp10, Exp, Differential, Integral, Ln, Lg, Square, Square root, common, Sine, cos, tan, Correlation, Convolution, extended-value, Extraction, Interpolation, maximum, minimum, user-defined function expression (editable and performs composite formula operations)		
Enhanced FFT	Function	Amplitude spectrum, Power spectrum, Psd, Real part, Imaginary part, Phase spectrum	
	Window functions	Rectangular/Hanning/Blackman-Harris/ Hamming/Flat top	
	Display	Full screen (spectrum view), multi-window	

	Vertical units	Vrms/dBrms
	Filters type	Low pass, High pass, Band pass, Band stop, User-defined filters
	User-defined the filter design method	FIR,IIR
	User-defined the filter type	Sampling, Window function, Lemmez,
		Butterworth, Chebyshev I, Chebyshev II,
Digital filter		Elliptical
	Response type	Low pass, High pass, Band pass, Band
		stop
	Filter order	FIR:2-1000;
		IIR:2-50;
	Filter characteristics	Amplitude-Frequency response, Phase-
		Frequency response, Impulse response
Enhanced	Enhanced bit: 0.5, 1, 1.5, 2, 2.5, 3bits	
resolution		

Measurement Analysis		
Digital voltmeter	Source	C1 ~ C4
	Mode	DC, AC RMS, DC+AC RMS
	Voltage resolution	4 digits
Frequency counter	Frequency resolution	8 digits
	Source	C1 ~ C4
Mask and limit testing	Test mask	User-defined test mask or load standard test mask
	Test failure	Stop, Save, Alarm, Pulse, Hard Copy
	Source	P1 ~ P10
Histogram	Туре	Horizontal, vertical and measurement
	Measurement item	μ±1σ, μ±2σ, μ±3σ, mode, mean, standard deviation, maximum, minimum, median, peak-to-peak, peak count, total sample size

	Source	C1 ~ C4, Ref
		Constant frequency: automatic/user-
	Clock recovery	defined
		PLL: First-order phase locked loop;
		Second-order phase-locked loop;
Jitter analysis and		Explicit clock: external clock;
eve diagram		TIE histogram, TIE trend chart,
	JILLEI VIEW	TIE spectrum, Bath-Tub Curve
	Jitter Measurement parameter	TIE, TJ@BER, RJ, DJ, PJ, DDJ, DCD
	Eye diagram measurement parameter	Eye amplitude, Eye Height, Eye Width,
		Level 1, Level 0, Q factor, Eye crossover
		ratio, Extinction ratio
5	Analysis item	Power quality, Harmonic analysis,
Power analysis		Switching loss, ripple analysis,
(option)		Loop analysis, Safe operation area
	Start frequency	50Hz~50MHz
Loop analysis (optional power	Stop frequency	60Hz~50MHz
	Points	1~1000
analysis)	Output amplitude	High Z: 20mVpp to 6Vpp
		50Ω: 10mVpp to 3Vpp

Serial Bus Decode		
Channels of decode	2-channel	
	Source	C1 ~ C4
	Data width	5-bit, 6-bit, 7-bit, 8-bit
RS-232/422/485/UART	Parity check	Odd, Even or None
decode	Stop bit	1-bit, 2-bit
	Polarity	Positive, Negative
	Bit sequence	LSB, MSB

	Baud rate	2400bps, 4800bps, 9600bps, 19200bps, 38400bps, 57600bps, 115200bps, User-defined
	Source	C1 ~ C4
l <sup>2</sup> C decode	Signal	SCL, SDA
	Data width	7-bit, 10-bit
	Source	C1 ~ C4
	Signal	MISO, MOSI, MOMI
SPI decode	Clock edge	Rise edge, Fall edge
	Chip selection edge	High level, Low level
	Bit sequence	LSB, MSB
	Source	C1 ~ C4
CAN decode	Signal	CAN_H, CAN_L, Send/Receive, Differential
	LIN protocol version	1.0, 2.0
	Source	C1 ~ C4
LIN decode	Baud rate	2400bps, 4800bps, 9600bps, 19200bps, User-defined
	Polarity	Positive, Negative
	Byte	1~8
	Source	C1 ~ C4
CAN-FD decode (option)	SD signal rate	10kbps, 20kbps, 33.3kbps, 50kbps, 62.5kbps, 83.3kbps, 100kbps, 125kbps, 1Mbps, User-defined
	FD signal rate	1Mbps, 2Mbps, 3Mbps, 4Mbps, 5Mbps, 6Mbps, 7Mbps, 8Mbps, User-defined
	Source	C1 ~ C4
SENT decode (option)	Baud rate	10kbps, 20kbps, 33.3kbps, 50kbps, 62.5kbps, 83.3kbps, 100kbps, 125kbps, 1Mbps, User-defined
	Data length	1Nibbles, 2Nibbles, 3Nibbles, 4Nibbles, 5Nibbles, 6Nibbles

	CRC	V2008, V2010
	Source	C1 ~ C4
AudioBus decode (option)	Protocol type	I <sup>2</sup> S, LJ, RJ, TDM
	Audio track type	Left channel, Right channel
	Source	C1 ~ C4
FlexRay decode (option)	Signal	BP, BM, RX/TX, Differential
	Baud rate	1Mbps, 5Mbps, 10Mbps, User-defined
MIL-STD-1553 decode	Source	C1 ~ C4
(option)	Baud rate	1Mbps, 10Mbps, User-defined
	Source	C1 ~ C4
	Signal type	Single-end, Differential
ARINC 429 decode (option)	Signal rate	12.5kbps, 100kbps, User-defined
	Decoding mode	19-bit, 23-bit

Function/Arbitrary Waveform Generator (option)		
Channels	2	
Sample rate	625MSa/s	
Vertical resolution	16-bit	
Maximum frequency	60MHz	
Standard waveform	Sine, Square, Pulse, Ramp, Noise and DC	
Modes of operation	Continuous, Modulation, Sweep	
Built-in Wave		
	Frequency range: 1µHz to 60MHz	
Sine	Amplitude flatness: typical value (sine waveform, 0dBm) <30MHz:±	
	0.5dB ≤60MHz:±0.8dB	
	Harmonic distortion: -40dBc	
	Spurious(nonharmonic):-40dBc	

	Total harmonic distortion: 1%	(DC ~ 20kHz, 1Vpp)	
	SNR (Signal to Noise Ratio):4	0dB	
Square wave/Pulse	Frequency range: Square wave: 1µHz to 25MHz; Pulse : 1µHz to 25MHz;		
	Rise/Fall time: <7ns		
	Overshoot: <2% (1kHz, 1Vpp, 50Ω)		
	Duty cycle: 0.01% to 99.99%, it can be adjusted		
	Minimum pulse width: 20ns		
	Jitter: 2ns		
	Frequency range: 1µHz to 1M	Hz	
Ramp wave	Variable symmetry: 0.01% ~ 99.99%		
	Linearity: < 1% of peak output (typical value, 1kHz, 1Vpp, symmetry 100%)		
Noise	Bandwidth: 60MHz (typical va	alue)	
	Frequency range: 100mHz to 5MHz		
Arbitrary waveform	Waveform length: 8 to 512k points (play mode)		
	Type: supports over 200 kinds of arbitrary waveforms, such as Sinc/ Exponential Rise/Fall/Cardiac/Gaussian/Lorentz/Haversine and etc.		
Modulation			
	Carrier waveform	Sine/Square/Ramp/Arbitrary waveform	
	Source	Internal	
AM modulation	Modulation waveform	Sine/Square/Ramp/Noise/ Arbitrary waveform	
	Modulation frequency	2mHz ~ 200kHz	
	Modulation depth	0% ~ 120%	
	Carrier waveform	Sine/Square/Ramp/Arbitrary waveform	
	Source	Internal	
FM modulation	Modulation waveform	Sine/Square/Ramp/Noise/ Arbitrary waveform	
	Modulation frequency	2mHz ~ 200kHz	

	Frequency deviation	DC ~ 30MHz	
PM modulation	Carrier waveform	Sine/Square/Ramp/Arbitrary waveform	
	Source	Internal	
	Modulation waveform	Sine/Square/Ramp/Noise/ Arbitrary waveform	
	Modulation frequency	2mHz ~ 200kHz	
	Phase deviation	0° ~ 360°	
Sweep			
	Carrier wave	Sine/Square/Ramp/Arbitrary waveform	
<u> </u>	Туре	Lin, log	
Sweep	Sweep time	1ms ~ 500s	
	Trigger source	Internal, external, manual	
Frequency Charact	eristics		
	Accuracy: ± 0.5ppm, 25°C Annual aging rate ± 1ppm		
Signal frequency	$\frac{1}{2} = \frac{1}{2} = \frac{1}$		
	Resolution: 1µHz		
Output Characteris	tics		
	Amplitude (50 Ω)	≤30MHz: 10mVpp ~ 3Vpp	
		≤60MHz: 10mVpp ~ 1.5Vpp	
	Amplitude ≤ (High Z) ≤	≤30MHz: 20mVpp ~ 6Vpp	
Signal amplitude		≤60MHz: 20mVpp ~ 3Vpp	
	Resolution: 1mV		
	Accuracy: typical value (sine waveform of 1kHz, 0V offset, > 20mVpp) ± (2% of setting value + 2mVpp)		
	Range ± (Peak AC + DC) ±	±1.5V (50 Ω)	
		±3V (High Z)	
DC offset	Resolution: 1mV		
	Offset accuracy: ±2% o setting value	f offset setting value ± 2%±2mV of amplitude	

	Impedance: 50Ω (typical)
Waveform output	Protection: over voltage protection (the waveform output is closed
	when overvoltage occurs, and reminder will prompt in the screen)

Display	
Display	15.6-inch FHD capacitive touch screen
resolution	1920*1080 (H*V)
Zoom	Horizontal and vertical zooming is supported in all waveform, supports gesture control and zooming
Graticules	10 horizontal scale division × 8 vertical scale division
Intensity gradation	256
Display mode	Point, Vector
Waveform color	Waveform color can set by user-defined
Persistence	Off, automatic, infinite

Computer	
CPU	Inter <sup>®</sup> core™ i5-6500(3.2GHz,64-bit)
Operating system	Windows 10 IoT Ent LTSC (64bit)
Memory	8GB
Hard disk (SSD)	128GB
Interface and Protocol	
High-definition audio/video output	One HDMI interface on the rear panel
USB host	Four interfaces, two interface on the front panel and two on the rear panel
USB device	One USB device interface on the rear panel
LAN port	One Ethernet interface (10/100/1000Mb/s) on the rear panel
Probe compensator	Square waveform of 1kHz, 3Vpp

output

	In/Out can be opened individually and simultaneously
	In: BNC connector on the rear panel, A reference clock that provides
10 MHz reference	sampling for the oscilloscope.
clock Input/output	Out: BNC connector on the rear panel, It can output its own 10MHz
	reference clock and provide it to other external instruments for inter-
	instrument clock synchronization.
	BNC connector on the rear panel
Aux output	1. Trigger sync output; 2. Pass the test result;
	3. AWG trigger output
Auxinput	1. Trigger sync output
	2. AWG external trigger output
EXT Trig	BNC connector on the front panel
Lock of	Standard lock key of Kensington
Kensington	
	Built-in WebServer: Support to input the oscilloscope IP address to enter
Remote control	the web interface through the web browser, it can view the instrument
	state, view and update the network state, view help manual and
	programming manual, download drive program, save the oscilloscope
	setting, export waveform, screenshot and remote control the instrument
	by keyboard and mouse
USBTMC	Supports standard USBTMC interface protocol
SCPI	Supports standard SCPI

Power Supply	
Power voltage	100V ~ 240VAC (fluctuate ± 10% ) 50Hz/60Hz
Power	Maximum 200W
Fuse	6.3A, Time-lag, 250V

Environment	
Temperature range	Operating: 0°C ~ + 40°C; non-operating: -20°C ~ + 70°C
Cooling method	Forced fan cooling

Humidity range	Operating: below +35°C, relative humidity ≤90%;
	non-operating: +35°C ~ +40°C, relative humidity ≤60%
Altitude	Operating: below 2000 meters; non-operating: below 15000 meters

#### **Mechanical Specifications**

	Size that not count foot pad and outer protective cover:
	445mm×302mm×200mm
Dimension	Size that count foot pad and outer protective cover:
(W×H×D)	452mm×309mm×216mm
	Size that adding rack accessories:
	485mm×356mm×209mm
Weight	< 10.5kg
Installation	7U (Optional MSO7000X-RM setup suit of rack mounting)

#### Standard

Compliance with EMC directive (2014/30/EU), compliance with or better than IEC 61326-1:2021/ EN61326-1:2021,

IEC 61326-2-1:2021/ EN61326-2-1:2021

		Conducted disturbance
	CISPR11/EN 55011	CLASS B group1, 150kHz-30MHz
		Radiation disturbance
		CLASS B group 1, 30MHz-1GHz
	IEC 61000-4-2/EN 61000-4-2	Electrostatic discharge (ESD)
		4.0kV (contact), 8.0kV (air)
Flectromagnetic		Radio-frequency electromagnetic field
compatibility	IEC 61000-4-3/EN 61000-4-3	immunity
		0V/m (80MHz to 1GHz)
		3V/m (1.4GHz to 2GHz)
		1V/m (2.0GHz to 2.7GHz)
	IEC 61000-4-4/EN 61000-4-4	Electrical fast transient (EFT)
		2kV (Input AC Power ports)
		Surges
	IEC 61000-4-5/EN 61000-4-5	1kV (live line to zero line);
		2kV (live/zero to ground)
	IEC 61000-4-6/EN 61000-4-6	Radio-frequency continuous conducted
		Immunity

		3V, 0.15-80MHz	
	IEC 61000-4-11/EN 61000-4-11	Voltage dips: 0% UT during 1 cycle; 40%	
		UT during 10/12 cycles; 70% UT during	
		25/30 cycles	
		Short interruption: 0% UT during	
		250/300 cycles	
Safety specification	EN 61010-1:2010+A1:2019		
	EN IEC61010-2-030:2021+A11:2021		
	BS EN61010-1:2010+A1:2019		
	BS EN IEC61010-2-030:2021+A11:2021		
	UL 61010-1:2012 Ed.3+ R:19 Jul2019		
	UL 61010-2-030:2018 Ed.2		
	CSA C22.2#61010-1:2012 Ed.3+	J1;U2;A1	
	CSA C22.2#61010-2-030:2018 E	Ed.2	

Calibration interval	1 year
Warranty	3 years

### **Order Information**

Product Mode
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MSO7204X	Bandwidth of 2GHz, the maximum sample rate is 10GSa/s
	(single channel 10GSa/s, dual channel 5GSa/s, 4-channel 2.5GSa/s ),
	4-channel oscilloscope
	Bandwidth of 1GHz, the maximum sample rate is 10GSa/s
MSO7104X	(single channel 10GSa/s, dual channel 5GSa/s, 4-channel 2.5GSa/s),
	4-channel oscilloscope

#### **Standard Accessories**

UT-D30	USB3.0 data cable x 1
UT-P07	500MHz passive high impedance probe x 4
UT-L45	BNC-BNC straight-through cable x 2
	Protective cover of front panel x 1
	National standard cable x 1

	Calibration certificate	
Optional Accessories		
MSO7000X-RM	Setup suit of rack mounting	
Option		
MSO7000X-BW-10T2	0 MSO7000X series 1GHz upgrade to 2GHz bandwidth	
MSO7000X-AWG	Dual channel 60 MHz function/arbitrary waveform generator	
MSO7000X-LA	16-channel logic analyzer option and probe	
MSO7000X-JITTER	Advanced jitter and eye diagram analysis	
MSO7000X-PWR	Advanced power analysis	
MSO7000X-CANFD	Automotive serial bus trigger and analysis (CAN-FD)	
MSO7000X-FLEX	Automotive serial bus trigger and analysis (FlexRay)	
MSO7000X-SENT	Automotive sensor bus trigger and annalysis (SENT)	
MSO7000X-AUDIO	Audio serial bus trigger and analysis (I <sup>2</sup> S, LJ, RJ, TDM)	
MSO7000X-AREO	Aerospace serial bus trigger and analysis (MIL-STD-1553, ARINC 429)	
MSO7000X-BND	Upgrade suit (JITTER, PWR, CANFD, FLEX, SENT, AUDIO, AERO)	
Probe		
UT-PA2000	Active single-end probe (2GHz;10X)	
UT-P07A	Passive high impedance probe (1X: 8MHz; 10X: 500MHz)	
UT-P20	Passive high voltage probe (100MHz; probe coefficient 100:1, 1.5kVrms)	
UT-V23	Passive high voltage probe (100MHz; 2kVpp)	
UT-P21	Passive high voltage probe (50MHz; maximum of operating voltage DC 15kVrms)	
UT-P40	Current probe (100kHz; 0.4A ~ 60A)	
UT-P41	Current probe (100kHz; 0.4A ~ 100A)	
UT-P42	Current probe (150kHz; 0.4A ~ 200A)	
UT-P43	Current probe (25MHz; maximum of measurement current 20A)	
UT-P44	Current probe (50MHz; maximum of measurement current 40A)	

UT-P4030D	Current probe (100MHz; maximum of measurement current 30A)
UT-P4150	Current probe (12MHz; maximum of measurement current 150A)
UT-P4500	Current probe (5MHz; maximum of measurement current 500A)
UT-4100A	Current probe (600kHz; maximum of measurement current 100A)
UT-4100B	Current probe (2MHz; maximum of measurement current 100A)
UT-P30	High voltage differential probe (100MHz; ±800Vpp)
UT-P31	High voltage differential probe (100MHz; ±1.5kVpp)
UT-P32	High voltage differential probe (50MHz; ±3kVpp)
UT-P33	High voltage differential probe (120MHz; ±14kVpp)
UT-P35	High voltage differential probe (50MHz; 1.3kV)
UT-P36	High voltage differential probe (50MHz; 5.6kV)
UT-M15	16-channel logic analyzer probe

Notes: Please order all hosts, accessories and options from your local UNI-T distributor.

#### **UNI-T**

# **Options ordering and installation**

- 1. **Purchase options:** Based on your requirements, please purchase the specified function options from Uni-t Sales Personnel and provide the serial number of the instrument that needs the option installed.
- 2. **Receive certificate:** You will receive the license certificate based on the address provided in the order.
- 3. **Register and obtain license:** Visit the Uni-t official website license activation session for registration. Use the license key and instrument serial number provided in the certificate to obtain the option license code and license file.
- 4. **Install the option:** Download the option license file to the root directory of a USB storage device, and connect the USB storage device to the instrument. Once the USB storage device is recognized, the Option Install menu will be activated. Press this menu key to begin installing the option.

# **Limited Warranty and Liability**

UNI-T guarantees that the Instrument product is free from any defect in material and workmanship within three years from the purchase date. This warranty does not apply to damages caused by accident, negligence, misuse, modification, contamination or improper handling. If you need warranty service within the warranty period, please contact your seller directly. UNI-T will not be responsible for any special, indirect, incidental or subsequent damage or loss caused by using this device. For the probes and accessories, the warranty period is one year. Visit instrument.uni-trend.com for full warranty information.

Learn more at: www.uni-trend.com





Register your product to confirm your ownership. You will also get product notifications, update alerts, exclusive offers and all the latest information you need to know.

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#### https://instruments.uni-trend.com/ContactForm/

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