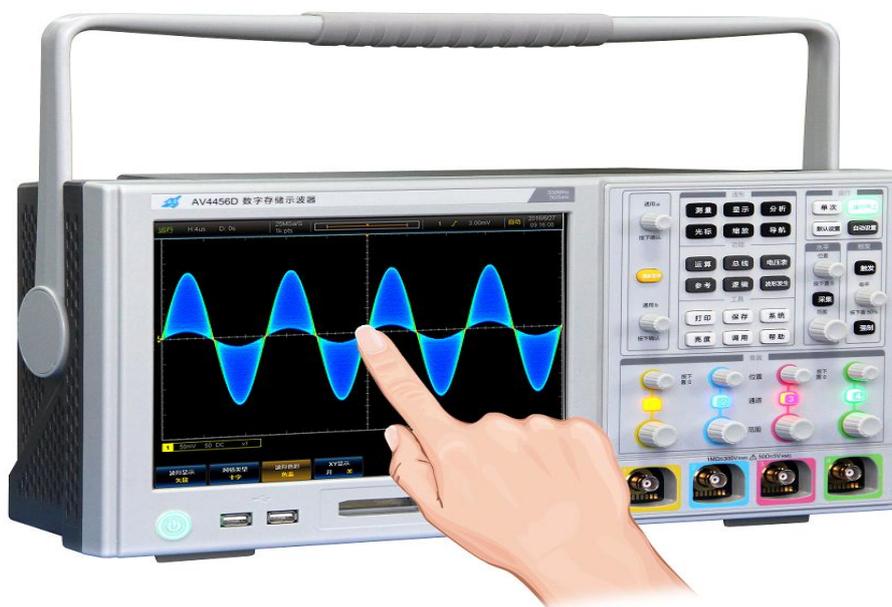




AV4456D DIGITAL FLUORESCENCE OSCILLOSCOPE



AnyAcq^P technique

-supplies fresh use experiences

- ✧ **Fast waveform capture rate of 70 million frames /sec**
- ✧ **256-grade gray scale and four palettes for display**
- ✧ **200Mpts/CH, deep storage**
- ✧ **Precise digital triggering**
- ✧ **Serial-bus triggering and analysis**
- ✧ **Capacitive screen, multi-point touch**

Product Overview:

AV4456D Digital Fluorescence Oscilloscope has four channels, 500MHz bandwidth and 5GSa/s sampling rate. The originally developed Any Acquire^{phosphor} technique provides brand-new use experiences of oscilloscope for clients.

AV4456D oscilloscope integrates digital oscilloscope, bus analyzer and digital voltmeter, has many functions including automatic waveform setup, automatic measurement of waveform parameter, marker measurement, histogram measurement, arithmetic operation and advanced mathematics, FFT analysis, serial-bus triggering and analysis, limit and template test, power measurement and analysis and so on, to support Ethernet remote control. Integrated development and application are easy and convenient.

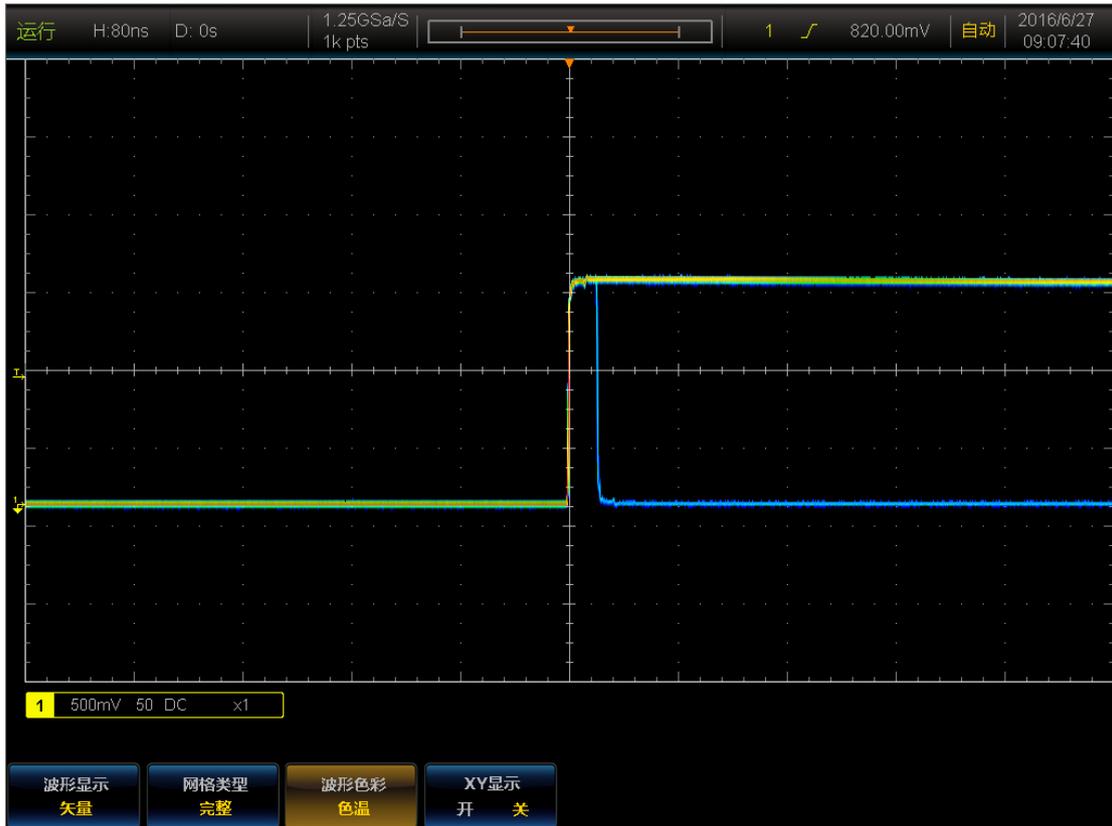


Three in one: integrates digital oscilloscope, bus analyzer and digital voltmeter

Main Characteristics:

(1) 70 million frames /sec waveform capture rate, fast identify and capture accidental events.

5GSa/s sampling rate and 200Mpts/CH deep storage, burr and contingency capture rate can be greatly improved. Users can review more waveform details in a longer collection period.



5GSa/s sampling rate, 70 million /sec waveform capture rate, fast identification of contingency



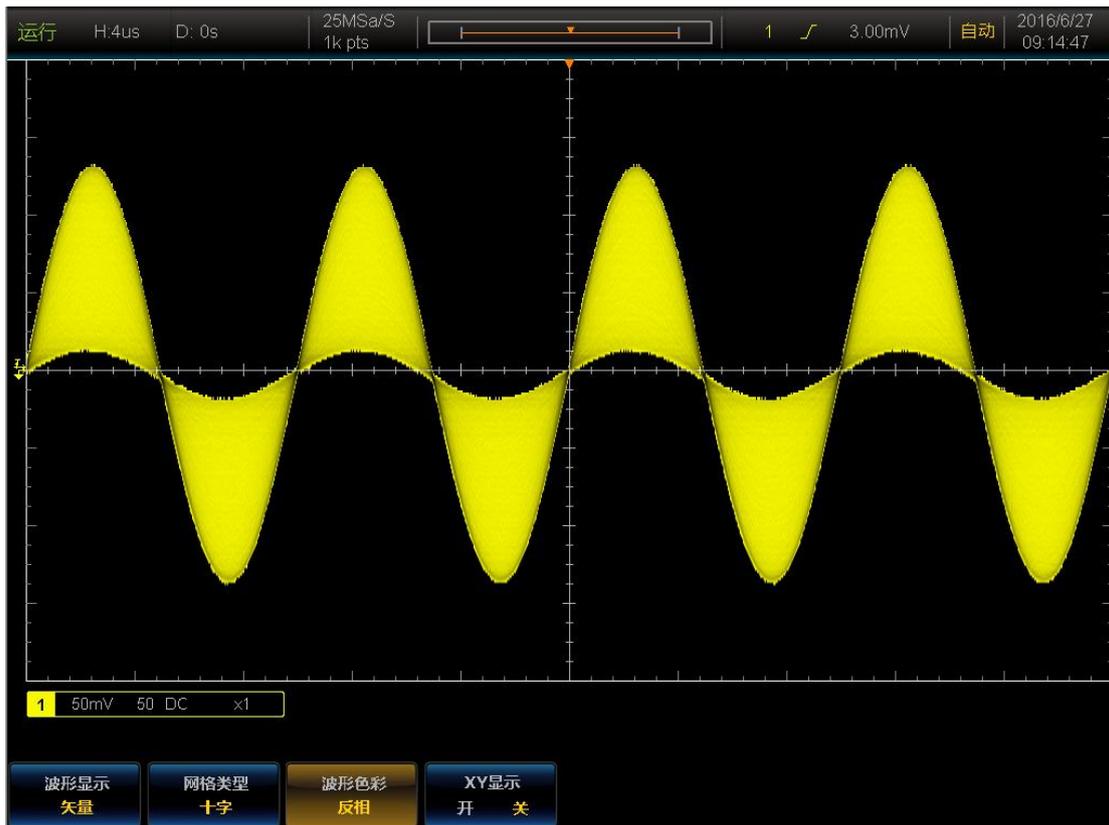
200Mpts/CH deep storage, maintains high sampling rate in a long capture period

(2) 256-grade gray scale and four types of waveform palettes for display, gives you extraordinary visual experience.。

AV4456D implements digital fluorescence three-dimensional display technique, to tell probability of event occurrence through lightness of color (256-grade gray scale) or temperature change (color grade) , and to provide 4 types of waveform palettes including normal, reverse, color temperature and spectrum, which enhances the capability of contingency view for superior visual experience.

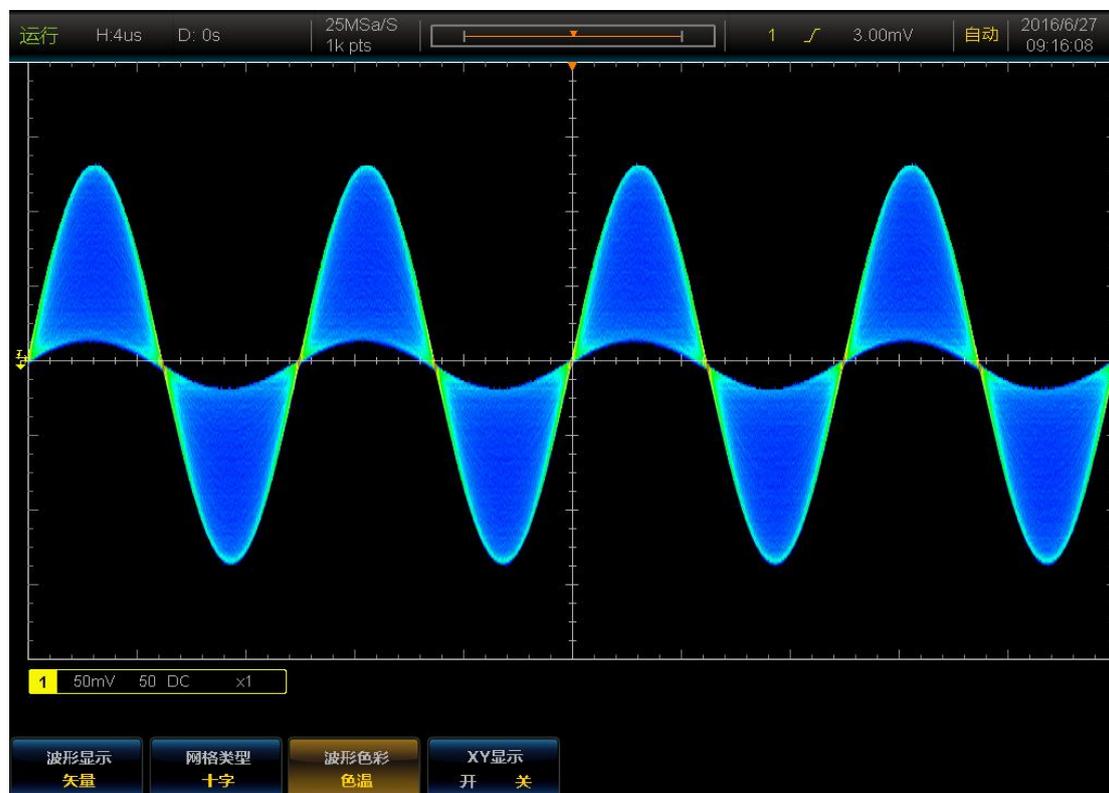


Normal: indicates event probability by default channel color and gray scale. Bright color indicates events of high occurrence probability.



Reverse: indicates probability of event occurrence by default channel color and gray scale.

Dark color indicates events of high occurrence probability.



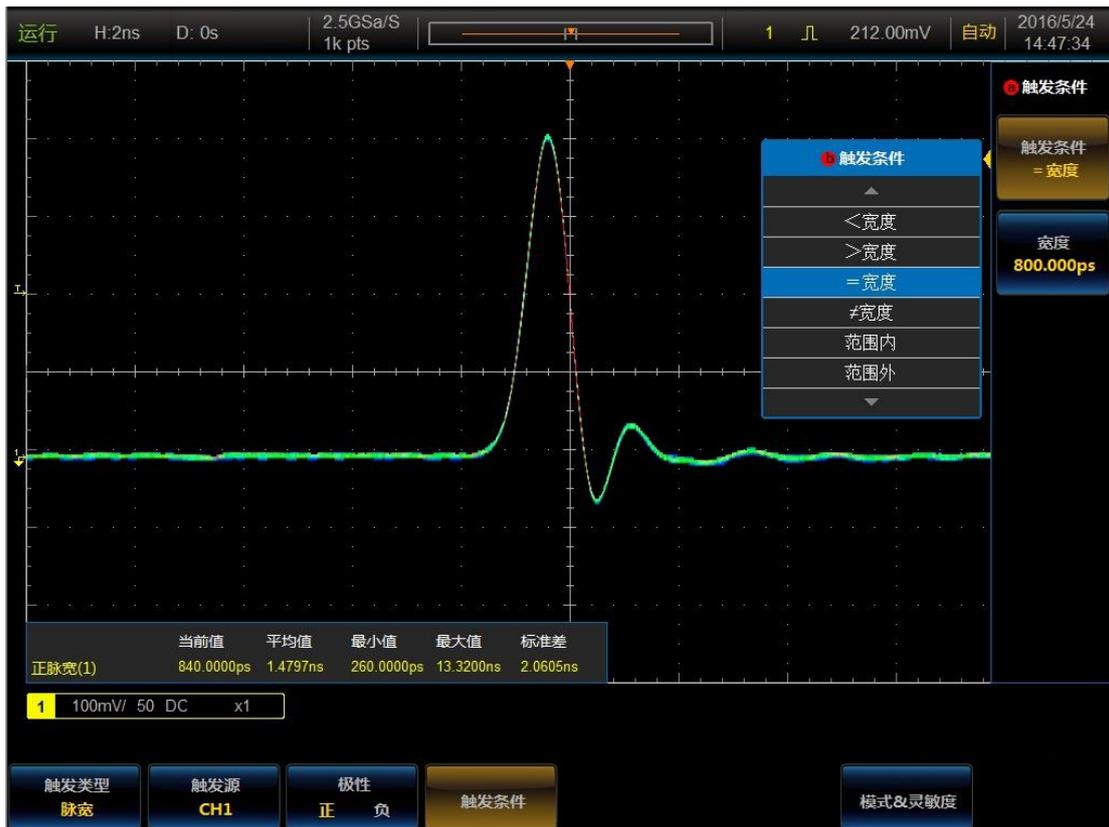
Color temperature: uses color grade to indicate event occurrence probability. Warm color (red or yellow) indicates events of high occurrence probability.



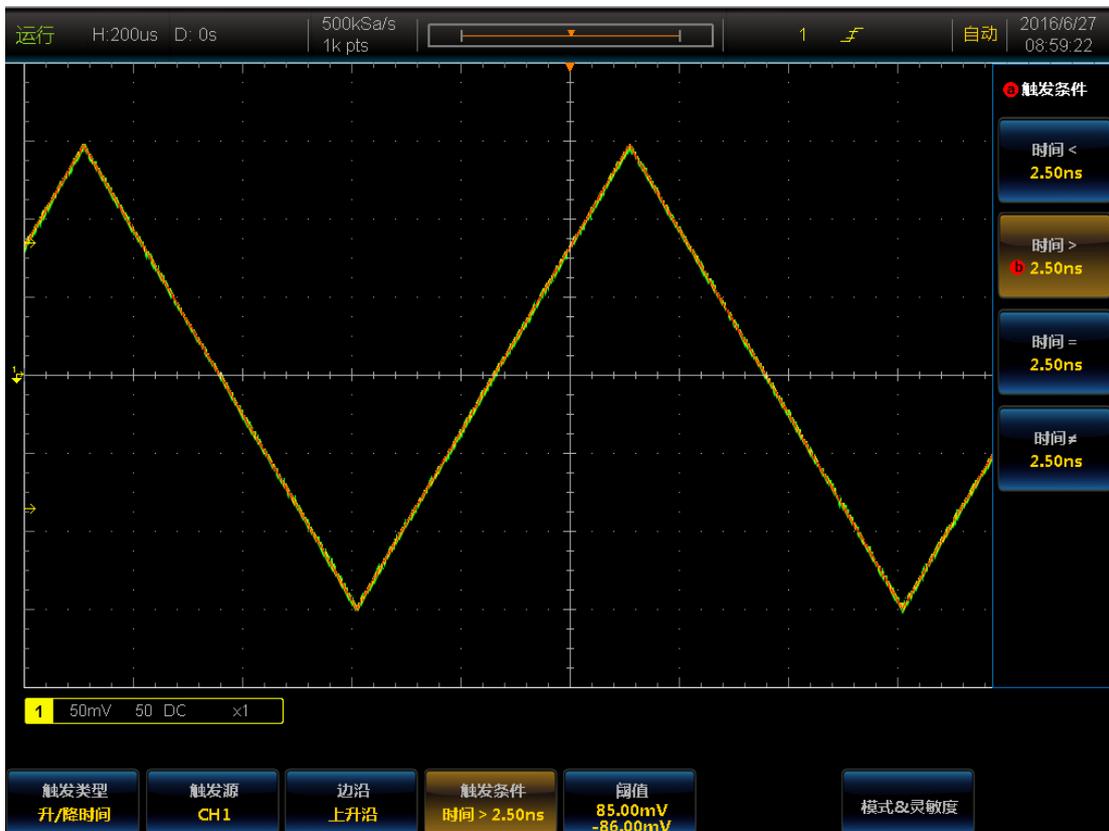
Spectrum: uses color grade to indicate event occurrence probability. Cold color(blue or green) indicates events of high occurrence probability.

(3) Multiple triggering functions, precise digital triggering locks up triggered events accurately.

AV4456D supplies users with rich triggering functions, including edge, pulse width, video, runt pulse, logic, sequence, establishment of maintenance time, rise and fall time, HD digital video, serial bus triggering, which help users locate events in which they have interest out of complicated sampling information.



Fundamental triggering: edge, pulse width, video



Advanced triggering: runt pulse, logic, sequence, establishment of maintenance time, rise and fall time



HD digital video: 480p、576p、720p、1080p、1080i

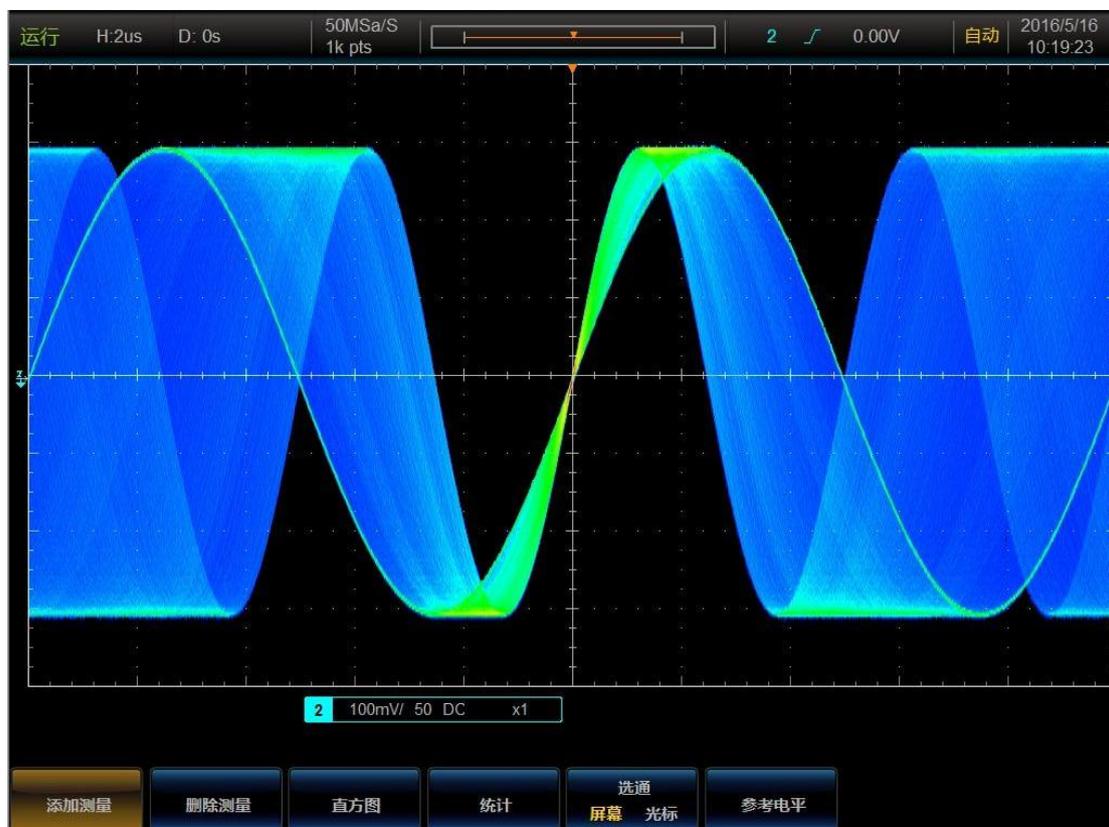


Serial bus triggering: I2C、SPI、RS232、CAN、LIN、FlexRay、Audio、USB

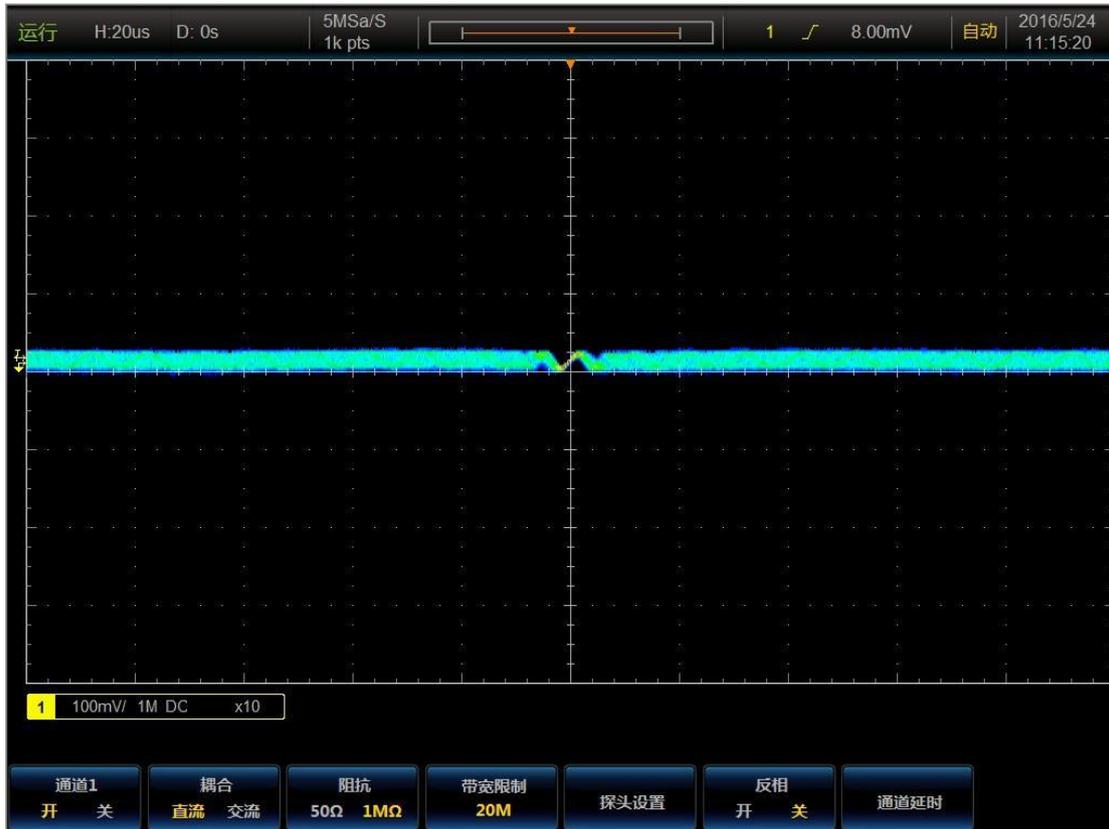
AV4456D implies the technique of precise digital triggering to perform triggering point determination against ADC samples collected, to restrain impact of interference signals, and to locate triggering events fast, to lay the foundation for accurate display and signal analysis of oscilloscope. Triggering jitter of the digital triggering is as low as $\pm 1\text{ps}$, highest triggering sensitivity reaches 0.1 measure, narrowest pulse test width is 200ps, and channel delay calibration step is 400ps.

Advantages of digital triggering:

- more precise triggering ●more flexible triggering
- higher triggering sensitivity ●lower triggering jitter
- narrower pulse test width ●more precise channel delay calibration



Multi-phase digit interpolation: precise location of triggering point is at 1 difference point. Lowest triggering jitter reaches $\pm 1\text{ps}$.



Triggering sensitivity can be adjusted continuously, the highest reaches 0.1 measure.



The smallest pulse test width is 200ps



Adjustment range of channel delay calibration is $\pm 150\text{ns}$, delay adjustment step is 400ps

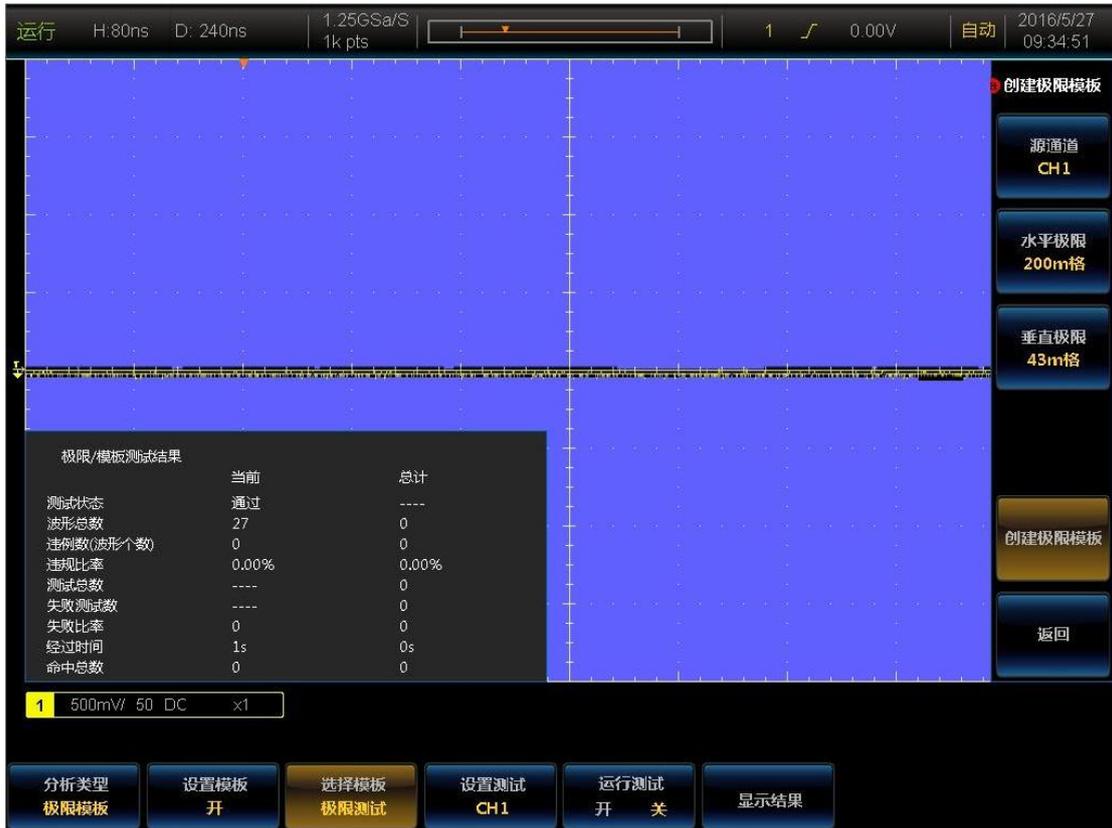
(4) Strong calculation and analysis tools enable deep data digging and analysis. AV4456D provides a complete set of analysis tools for users, including markers based on waveform and screen, 29 kinds of parameter automatic measurements, mathematical operation, FFT analysis, advanced mathematics, waveform histogram, statistics, limit template test, power measurement and analysis, serial bus decode and analysis, etc.



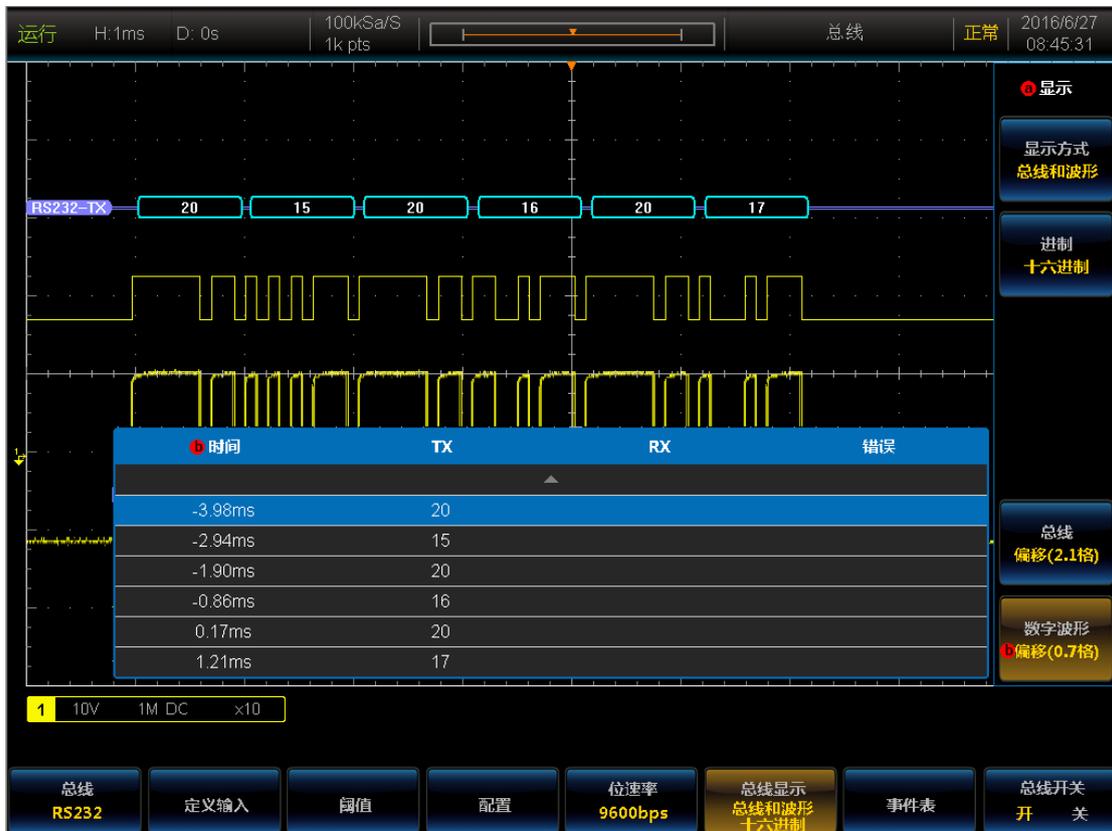
Advanced mathematics: with equation editor, users can free edit.



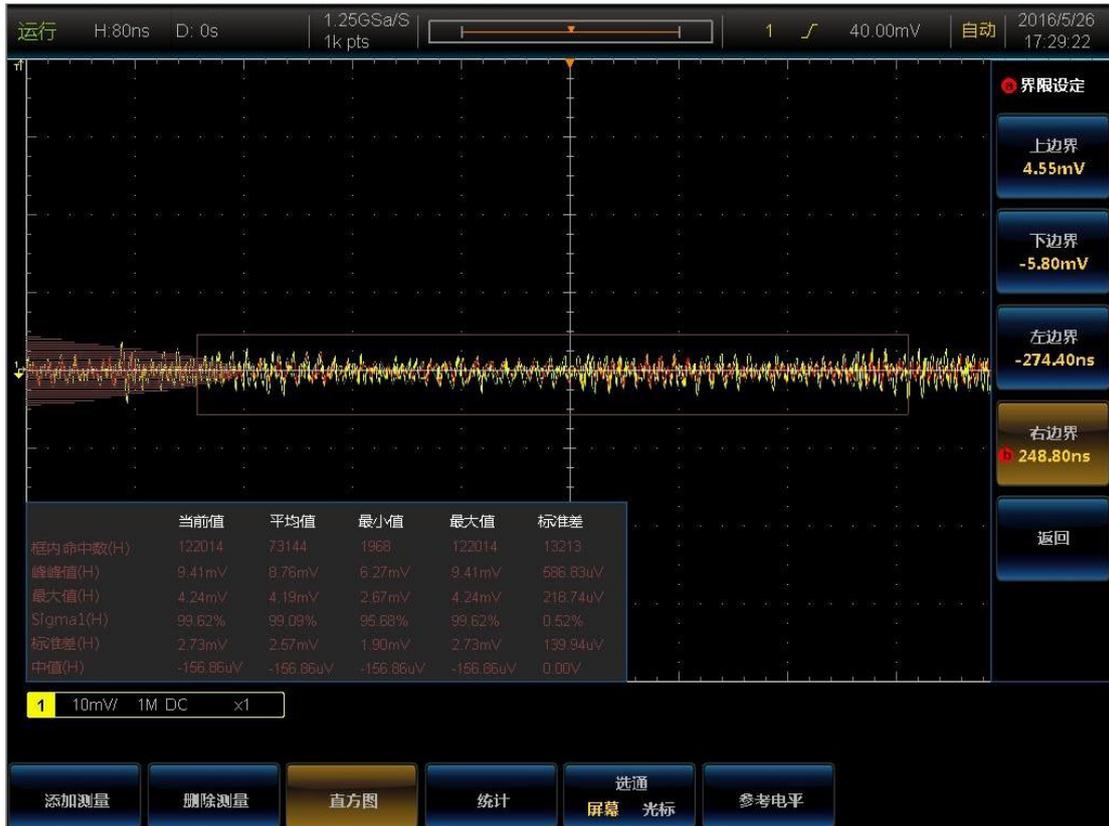
FFT analysis: observe frequency domain and characteristics of signals



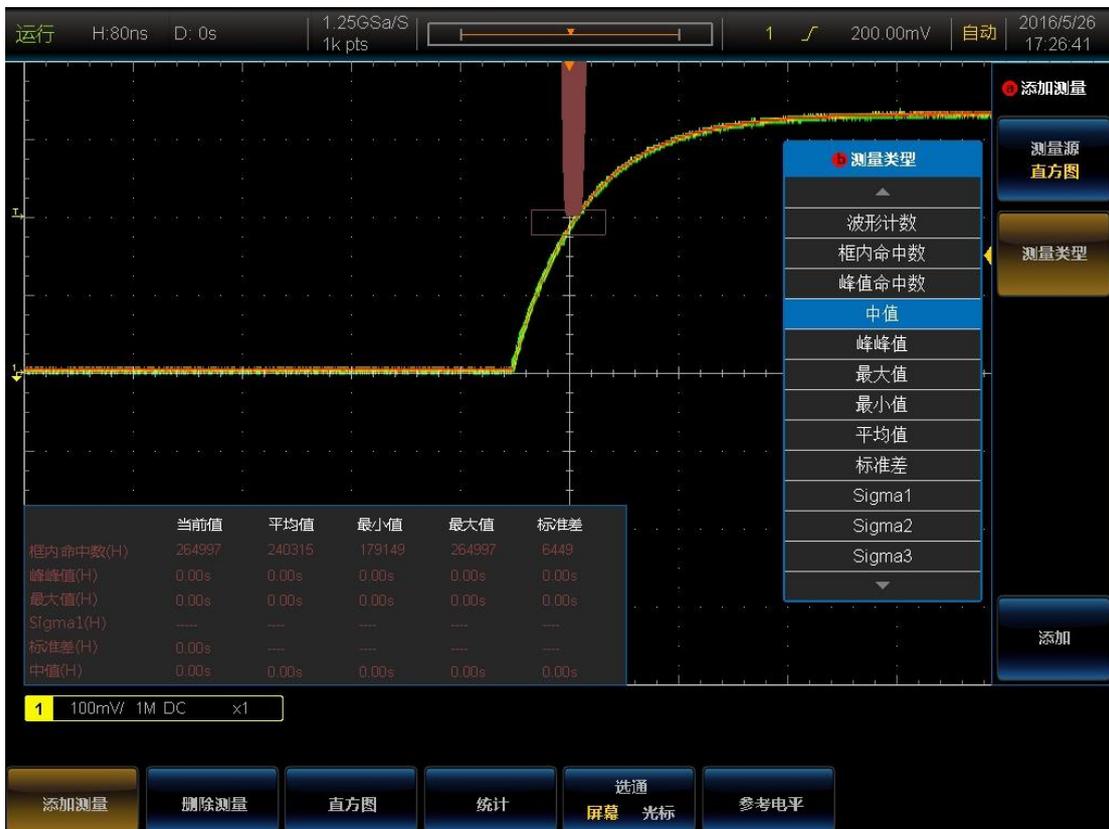
Limit template test: standard and custom templates, pass/fail test, result display



Serial bus analysis: display decode information through bus, digit waveform and event list



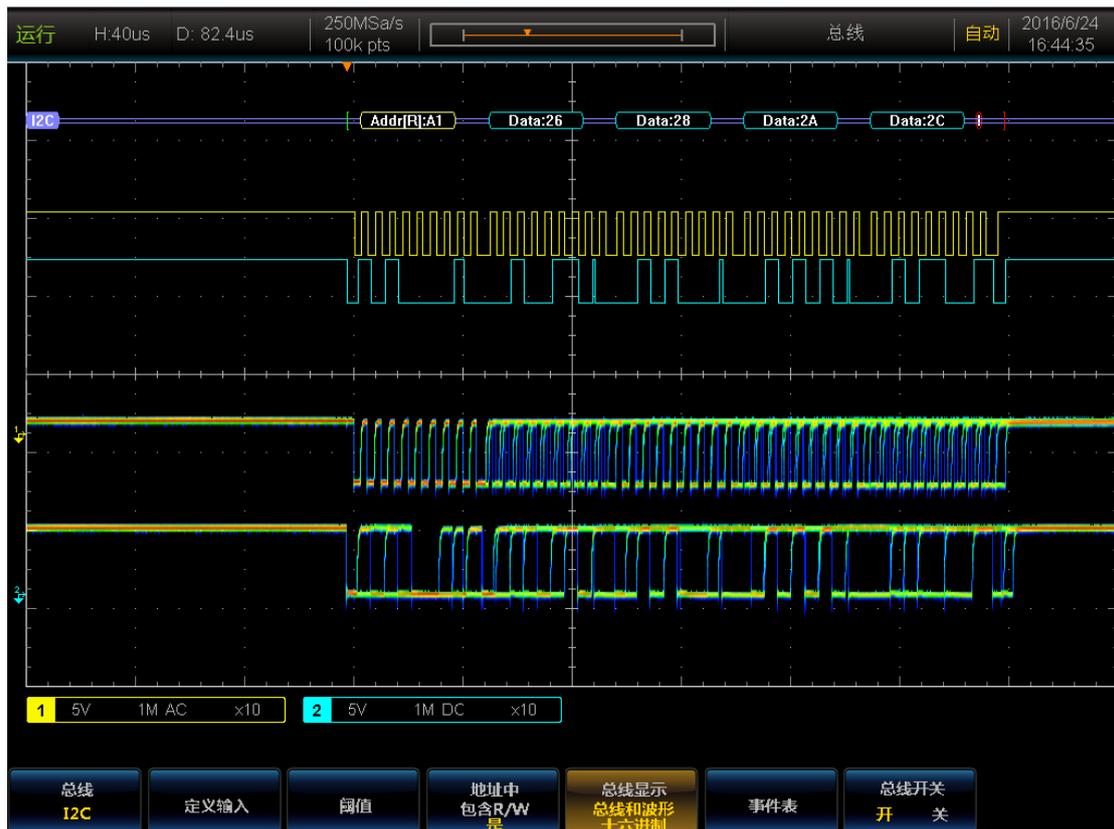
Vertical histogram: to observe noise and noise distribution of signals



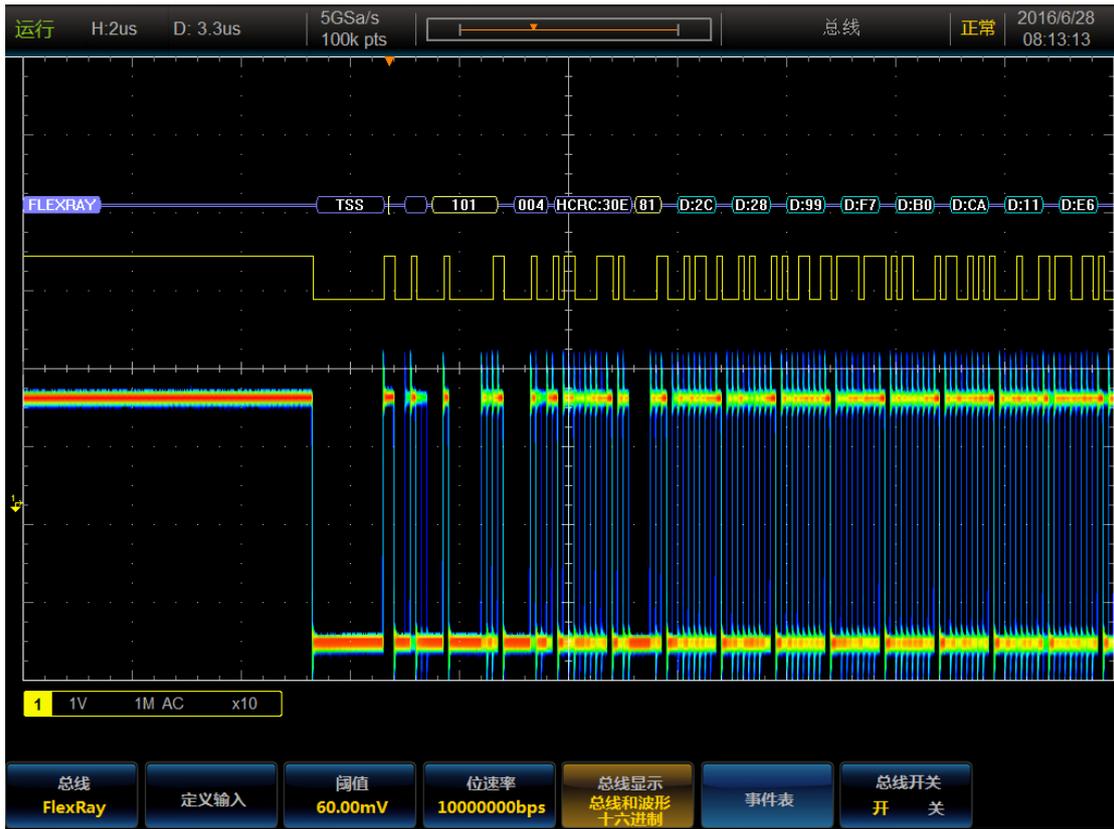
Horizontal histogram: to observe jitter and jitter distribution of signals

(5) Hardware triggering and analysis of serial bus: a test solution of serial bus.

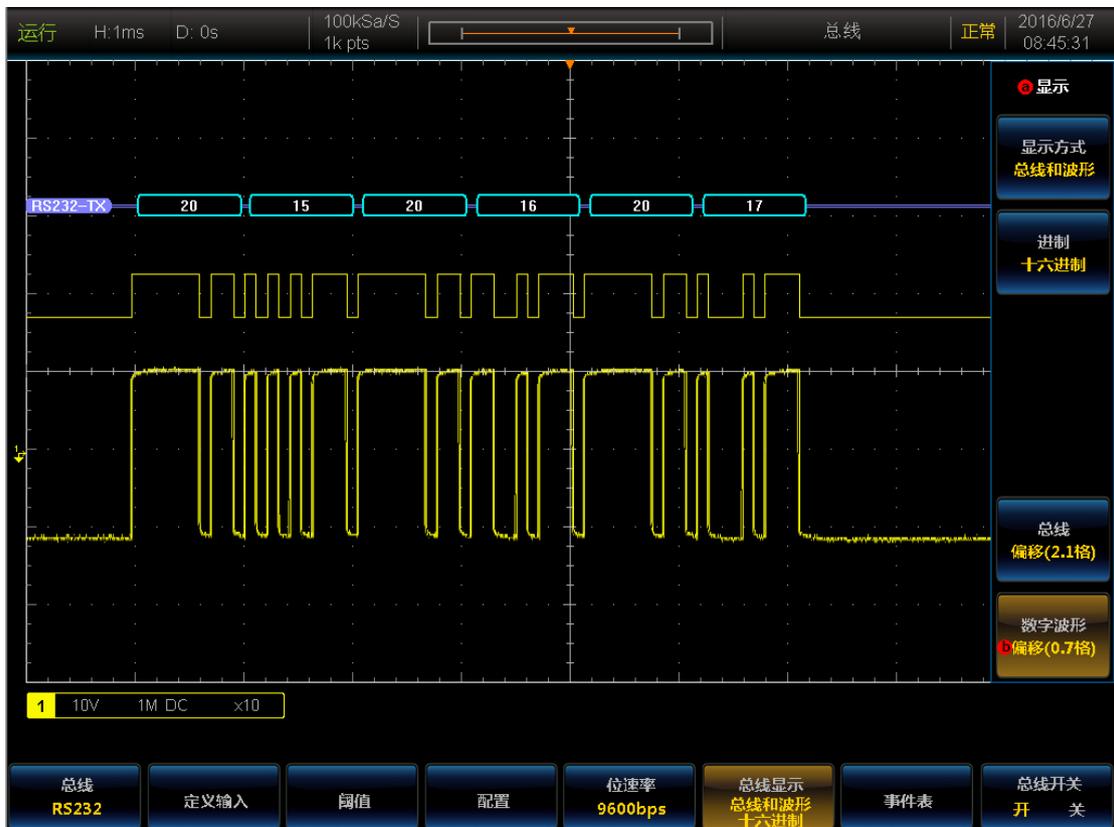
AV4456D supplies a powerful set of serial bus analysis tools, which support auto triggering and analysis of many buses like I2C, SPI, CAN, LIN, FlexRay, RS232, USB and Audio, provide serial bus test solutions of embedded, vehicle, computer, video and other serial buses. Based on FPGA whole hardware decoding technique, AV4456D improves the acquisition probability of random serial communication error codes.



Embedded bus: I2C、SPI



Vehicle bus: CAN、LIN、FlexRay



Computer bus: RS232、USB



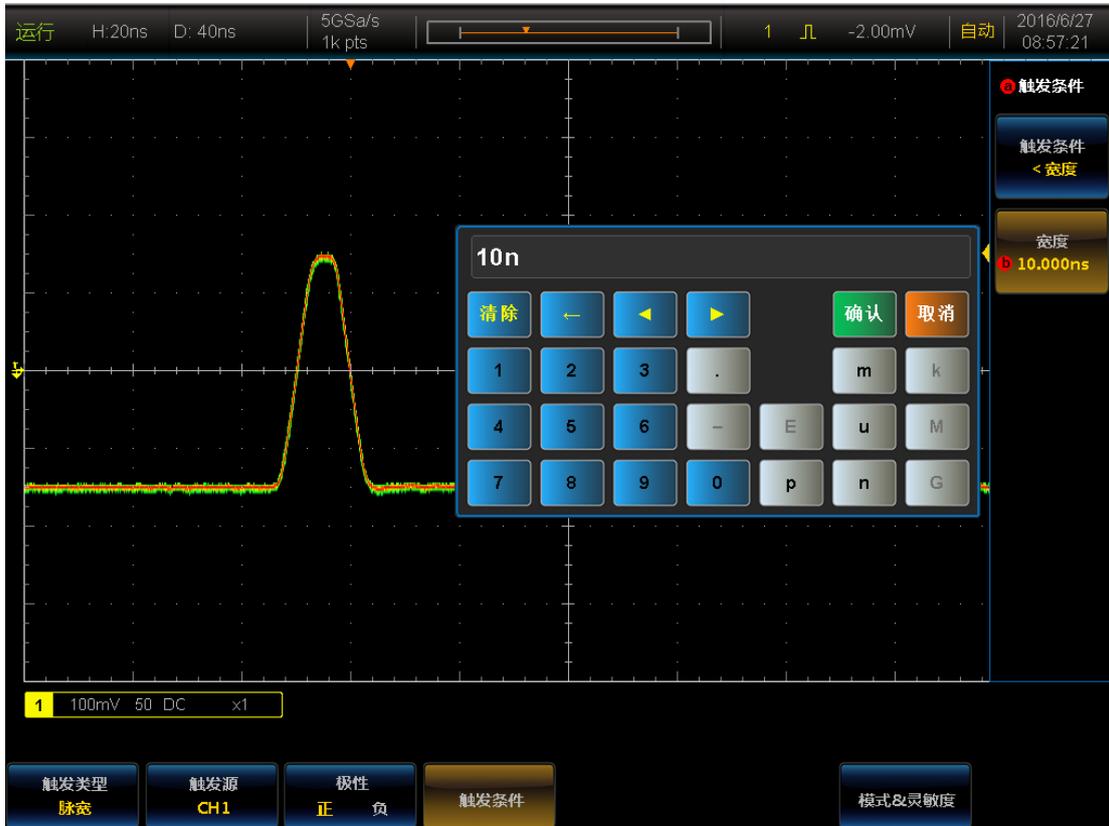
Video bus: I2S、LJ、RJ、TDM

(6) Brand-new capacitance touch screen, user-friendly design gives you excellent experience.

10.4 inch capacitance touch screen supports single-point and multi-point touch, can perform waveform scaling and movement swift. One-key zeroing design enables zeroing at horizontal, vertical and triggering positions. Digit and bus keypad greatly facilitates input speed. AV4456D supports touch operation and mouse, push-buttons operation at the same time.



Multi-point capacitance touch screen performs waveform scaling and movement fast.



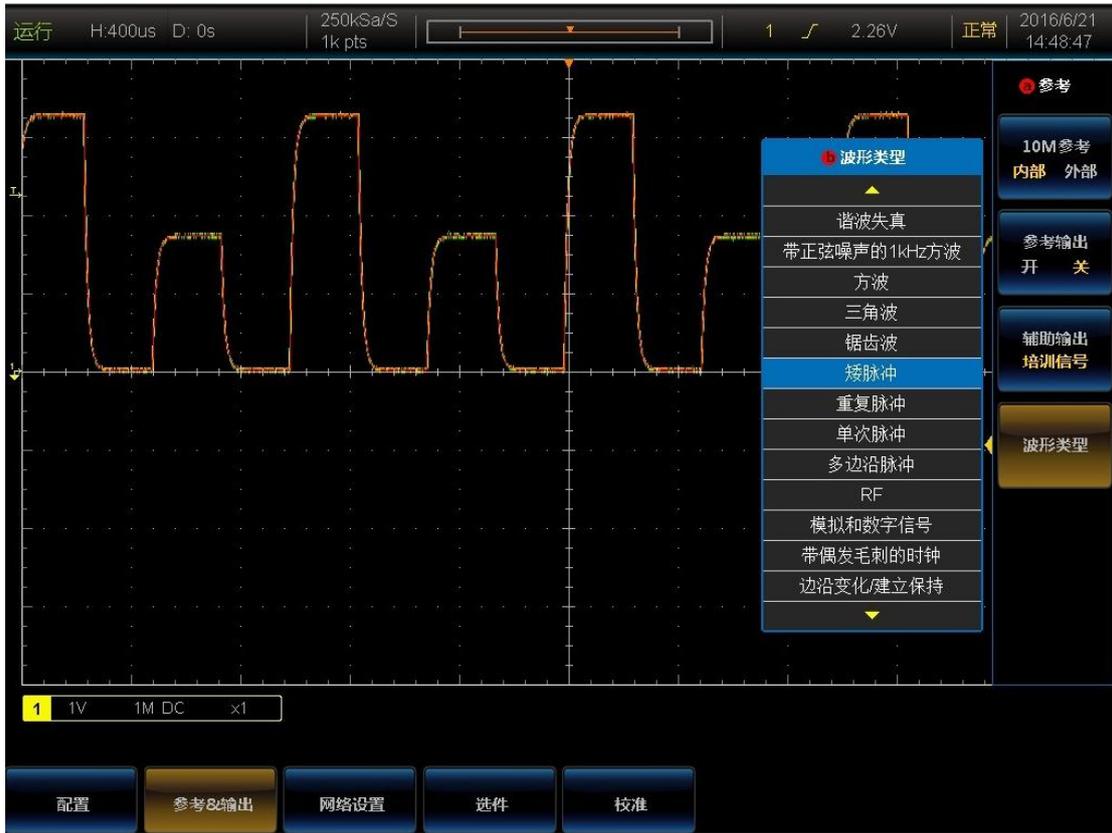
User-friendly keypad facilitates input speed greatly

(7) Over 20 types of built-in training signal output help educators equip and upgrade labs.

AV4456D oscilloscope provides over 20 types of free built-in training signals for educators, including sine wave, square wave, triangle wave, saw-tooth wave, runt pulse, repeated pulse, RF, digital burst, RS232, CAN, LIN, FlexRay and so on, which can help educators equip and upgrade labs.



Training signals: clock signals with occasional burr.



Training signal: runt pulse signal

(8) Standard 5U racket, multiple peripheral interfaces, convenient for device characterization.

Standard 5U racket and multiple peripheral interfaces, containing LAN, USB host, USB device, VGA, auxiliary input/output, 10MHz reference input/output, support Ethernet remote control, which is easy for function extension and system buildup.



Multiple peripheral interfaces, convenient for system buildup

Technical Specifications

Vertical system	Channel number	4	
	Bandwidth	500MHz Note: $\geq 5\text{mV/div}$	
	Rise time	<700ps	
	Bandwidth limit	20MHz、250MHz	
	Input impedance	1M Ω \pm 1%、50 Ω \pm 1%	
	Input coupling	DC、AC	
	Range of vertical sensitivity	1M Ω : 1mV/div~10V/div	
		50 Ω : 1mV/div~1V/div	
	DC gain accuracy	\pm 1.5% Note: $\geq 5\text{mV/div}$	
	Max. input voltage	1M Ω : 300Vrms CATII	
		50 Ω : 5Vrms	
	Vertical resolution	8 digits	
	Offset range	1mV/div~100m	\pm 1V
200mV/div~1V/		\pm 10V	
2V/div~10V/div		\pm 100V	
Channel isolation	\geq 40dB		
Horizontal system	Sampling rate	5GSa/s (Single, double)、2.5GSa/s (three, four)	
	Storage depth	200Mpts/CH	
	Collection mode	Normal: collection and sampling value	
		Peak: min. sampling burr is 200ps	
		Highest resolution: 11digits resolution, can reduce noise	
		Envelope: min. and max. envelopes indicate peak value after many times of collection	
		Average: contains 2-512 waveforms	
		Rolling: rolling waveform from right to left, time-base: 100ms/div~1000s/div	
	Time span of highest sampling rate	40ms	
	Time-base range	1ns/div~1000s/div	
	Time-base precision	\pm 5ppm	
Range of time-base	-10 measure to 5000s		
Range of channel delay adjustment	\pm 150ns, resolution: 400ps		

Triggering system	Triggering source	CH1、CH2、CH3、CH4、 exterior
	Triggering mode	Auto, normal, single time
	Range of triggering suppression release	16ns to 8s
	Range of triggering level	Interior (CH1~CH4): ± 4 measure
		Exterior: $\pm 0.4V$ 、 exterior/10: $\pm 4V$
	Triggering sensitivity	Interior(CH1~CH4): users can adjust, step by 0.1 measure
		Exterior: 50mV、 exterior /10: 500mV
	Triggering type	Edge: trigger at rise edge or fall edge in any channel or auxiliary input
		Sequence: prepare at a chosen edge, trigger at a chosen time or other chosen edge of the event
		Runt: trigger when a pulse crosses one threshold but fails in crossing a second threshold before it crosses the first threshold again. when the pulse
Pulse width: trigger at $>$ 、 $<$ 、 $=$ or \neq positive pulse or negative pulse width of certain time period, pulse width range: 0.8ns~10s, resolution: 0.8ns		
Logic: trigger when any logic code type in the channel turns false or the code remains true at a certain time. Any input can be taken as a clock, look for code type at clock edge. Appointed code(AND、 OR、 NAND、 NOR) types for four input channels are defined as high, low or irrelevant.		
Establishment and maintenance : trigger when establishment or maintenance time between clock and data has violation		
Rise time: trigger when pulse edge rate is faster or lower than the appointed value		
Video: trigger in all rows, odd fields, even fields of NTSC, PAL and SECAM video signals.		
HD video (Option S03) : 480p/60、 576p/50、 720p/50、 720p/60、 1080i/50、 1080i/60、 1080p/24、 1080p/25、		
I2C (Option S04): start at I2C bus within 10Mbps, trigger at repeated startup, stop, ACK lost, address, data, address and data		

		RS232 (Option S05): trigger at sending start bit, receiving start bit, end of packet sending, end of packet receiving, sending data, receiving data, sending odd and even errors and receiving odd and event data within 2Mbps.
		SPI (Option S06) : trigger at frame startup, MOSI, MISO, MOSI and MISO in SPI bus within 10Mbps.
		CAN (Option S07) : trigger at frame startup, frame type, identifier, data, identifier and data, end of frame , ACK lost, bit stuff error of CAN signals within 1Mbps.
		LIN (Option S08) : trigger at synchronization of LIN signal, identifier, data, identifier and data, wakeup frame, sleep frame and error within 100kbps.
		FlexRay(Option S09): trigger at frame header, frame type, identifier, cycle number, head field, data, identifier and data, end of frame and error within 10Mbps.
		Audio (Option S10) : trigger at word selection, frame synchronization or data. Data can be further appointed, trigger when the data is further appointed and when it is \leq , $<$, $=$, $>$, \geq or \neq certain special data, or it stays within some range or beyond the range.
		USB (Option S11): trigger at synchronous activation, frame startup, reset, hang-up, recovery, end of packet, token packet, data packet, handshake packet, special packet and error. Low speed is 1.5Mbps and whole speed is 12Mbps.
Digital voltmeter	Measurement source	CH1、CH2、CH3、CH4
	Measurement type	AC valid value, DC, AC+DC valid value, frequency
	Resolution	Digital voltmeter: 4 digits Frequency counter: 6 digits
Bus analysis	Decode channel	1 each
	Display format	Binary, hexadecimal system
	Display type	Bus view, digital view, event list with time scale information.
	I2C (Option S04)	Signal rate: ≤ 10 Mbps Protocol type: 7 digits /10 digits address
	RS232 (Option S05)	Signal rate: 50bps~2Mbps
	SPI (Option S06)	Signal rate: ≤ 10 Mbps
	CAN (Option S07)	Signal rate: 10kbps~1Mbps

	LIN (Option S08)	Signal rate: 800bps~100kbps Protocol standard: 1.x、2.x
	FlexRay (Option S09)	Signal rate: 2.5Mbps、5Mbps、10Mbps
	Audio (Option S10)	Signal rate: ≤10Mbps Protocol type: I2S、LJ、RJ、TDM
	USB (Option S11)	Signal rate: low speed 1.5Mbps, full speed 12Mbps
Measurement and analysis system	Auto measurement	29 kinds, 8 can be showed in the screen at any time. Measurement includes: cycle, frequency, delay, rise time, fall time, positive mark-space ratio, negative mark-space ratio. Positive pulse width, negative pulse width, burst width, phase, positive overshoot, negative overshoot, peak-to-peak value, amplitude, high value, low value, average value, cycle average, RMS, cycle RMS, positive pulse number, negative pulse number, rise edge number, area, cycle area.
	Marker	Waveform and screen
	Measurement statistics	Average value, min. value, max. value, standard offset
	Reference level	Users can define reference level of auto measurement by percentage or unit.
	Gating	Isolate certain event and measure, use screen or waveform marker.
	Waveform histogram	Waveform histogram provides a data, indicates total hits in user defined range showed in the screen.
		Signal source: CH1~CH4, REF1~REF4, math
		Type: vertical, horizontal
		Measurement type: 12 kinds, including waveform number, in-frame hits, peak hits, intermediate value, max. value, min. value, peak-to-peak value, average value, standard offset, Sigma1, Sigma2, Sigma3.
	Waveform mathematics	Arithmetic: add, deduct, multiply, divide
Mathematical function: differential, integration, FFT		
FFT: set vertical scale as linear RMS or dBVRMS, set Window as rectangular, Hamming, Hanning, Blackman-Harris		

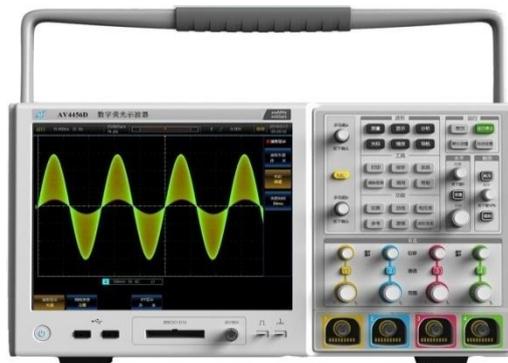
		Advanced mathematics: define a large number of algebraic expression: including waveform, reference waveform, mathematical function, scalar. Variable and reference measurement results can be adjusted by two users at most.
	Limit and template test (Option S01)	Including standard template: ITU-T, ANSI T1.102, USB
		Template test source: CH1~CH4
		Limit test source: CH1~CH4、REF1~REF4
		Template creation: vertical tolerance of limit test is 0~1 measure; horizontal tolerance of limit test is 0~500 milli-measure; can load standard template or tailored template.
		Template proportion: lockup to source unlock, lockup to source close.
		Test running time: min. waveform quantity (1~1000000; infinity)
		Violatetion threshold: 1~1000000
		Operation when test fails: stop collection, save the screen graph and the waveform in the file, trigger to output pulse.
		Operation when test accomplishes: trigger to output pulse
Result display: test status, voilation quantity, total number of waveforms, voilation ratio, total munber of tests, failure number of test, test failure ratio, tim-taken, hit number in each template segment		
Display system	Display type	10.4 inch color LCD
	Display resolution	1024×768
	Scale	Complete, grid, crosshair, frame
	Touch screen	Capacitive touch screen, supports waveform and menu operation.
	Waveform type	Point, vector, afterglow
	Display type	YT、XY
	Fastest waveform capturing rate	70M frames/sec
	Grey grade	256 grade
	Waveform color	Normal, reverse, color temperature and spectrum

	Voice	Chinese, English
Input and output ports	USB main control	2 each for front and rear panel
	USB equipment	1 each on the rear panel
	Ethernet	RJ-45 connector, 10/100/1000Mbps, supports network remote control
	Video output port	DB-15plug-and-jacktype connector, used to connect the oscilloscope to the external monitor.
	Auxiliary input	Rear panel BNC, 1M Ω input impedance; max. input: 300VrmsCATII
	Auxiliary output	Rear panel BNC, used for triggering pulse signal output, event output of limit template test, or built-in training signal output
	Reference input/output	Rear panel BNC, time base systems is used for input or output of reference clock, frequency is 10MHz.
	Sensor compensator output	Stitch on the front panel, frequency is 1kHz amplitude is approx. 3.3V.
Structure	Structure type	Portable
	Power	100V~240V _{AC} 、 50Hz~60Hz
		Max. power consumption: 120 W
	Working temp.	0 $^{\circ}$ C~+50 $^{\circ}$ C
	Dimensions (W×H×D)	426mm×221.5mm×160mm
Max. weight	6kg	

Ordering Information:

(1) Host equipment:

AV4456D Digital Fluorescence Oscilloscope: 4CH, 500MHz, 5GSa/s



AV4456D Digital Fluorescence Oscilloscope

(2) Standard accessories

Accessories

No.	Name	Remarks
1	P9550A high-impedance sensor	4 each, DC~500MHz bandwidth, 10:1 attenuation, 10M Ω input impedance, 300V CATII max. voltage
2	Power cord	1 piece, standard tri-core power cord
3	User manual	2 each
4	Programming manual	2 each

(3) Options

Option Table 1

Option No.	Name	Function	Remarks
AV4456-H03	P9558 voltage sensor	Bandwidth: DC~250MHz Attenuation: 100:1 Max. voltage: 3000V Length: 200cm	
AV4456-H04	P3258 voltage sensor	Bandwidth: DC~100MHz Attenuation: 100:1 Max. voltage: 1500V Length: 130cm	
AV4456-H05	P8050 High voltage difference sensor	Bandwidth: DC~50MHz Attenuation: 50:1、500:1 Precision: $\pm 2\%$ Max. voltage: 1300V (DC+ACpk) Supply: 9VDC	

AV4456-H06	P8100 High voltage difference sensor	Bandwidth: DC~100MHz Attenuation: 50:1、500:1 Precision: ±2% Max. voltage: 1300V (DC+ACpk) Supply: 9VDC	
AV4456-H07	A622 Current sensor	Bandwidth: DC~100kHz Measurement range: 50mA~100A peak Range: 10mV/A、100mV/A Supply: 9V alkaline batteries	
AV4456-H08	AP202 Current sensor	Bandwidth: DC~25MHz Precision: ±3% Max. current: 20A (DC+ACpk) Range: 100mV/A Supply: 9VDC	
AV4456-H09	Racket installation set	Framework installation set	
AV4456-H10	Aluminum transportation case	Aluminum transportation case	
AV4456-H11	English interface option	English tag, English rubber button	

Option Table 2

Option No.	Name	Function	Remarks
AV4456-S01	Limit template test module	Support ITU-T、ANSI T1.102、USB and other standard templates or user creation.	
AV4456-S03	HD video touch module	Support 480p, 576p, 720p, 1080p, 1080i and other formats	
AV4456-S04	I2C triggering and analysis module	Signal rate: ≤10Mbps Protocol type : 7 digits/10 digits address Signal type: single end	
AV4456-S05	RS232 triggering and analysis module	Signal rate: 50~2Mbps Signal type: single end	
AV4456-S06	SPI triggering and analysis module	Signal rate: ≤10Mbps Signal type: single end	
AV4456-S07	CAN triggering and analysis module	Signal rate: 10kbps~1Mbps Signal type: single end, difference CAN_L, CAN_H	
AV4456-S08	LIN triggering and analysis module	Signal rate: 800bps~100kbps Protocol standard: 1.X、2.X Signal type: single end	
AV4456-S09	FlexRay triggering and analysis module	Signal rate: 2.5Mbps、5Mbps、10Mbps Signal type: BP、BM、TX/RX	
AV4456-S10	Audio triggering and analysis module	Signal rate: ≤10Mbps Protocol standard: I2S、LJ、RJ、TDM Signal type: single end	
AV4456-S11	USB triggering and analysis module	Signal rate: 1.5Mbps、12Mbps Signal type: single end, difference	