

## Chapter 16 Specifications

All the specifications are guaranteed except the parameters marked with "Typical" and the oscilloscope needs to operate for more than 30 minutes under the specified operation temperature.

### Sample

Sample Mode	Real-time Sampling
Real-time Sample Rate	1 GSa/s on both channels
Peak Detection	1 ns
Averaging	After all the channels have reached N times of sampling at the same time, N can be 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, or 8192.
High Resolution	12-bit resolution when $\geq 5 \mu\text{s}/\text{div}$ @ 1 GSa/s
Memory Depth	Auto, 7 kpts, 70 kpts, 700 kpts, 7 Mpts, and 28 Mpts

### Input

Number of Channels	2 analog channels
Input Coupling	DC, AC, or GND
Input Impedance	$(1 \text{ M}\Omega \pm 1\%)    (16 \text{ pF} \pm 3 \text{ pF})$ or $50 \Omega \pm 1.5\%$
Probe Attenuation Coefficient	0.01X-1000X, at 1-2-5 step
Maximum Input Voltage (1 M $\Omega$ )	CAT I 300 Vrms, CAT II 100 Vrms, Transient Overvoltage 1000 Vpk

### Horizontal

Timebase Scale	DS2102E: 5.000 ns/div to 1.000 ks/div DS2202E: 2.000 ns/div to 1.000 ks/div
Channel-to-Channel Skew	1 ns (typical), 2 ns (maximum)
Max Record Length	28 Mpts on both channels
Timebase Accuracy <sup>[1]</sup>	$\leq \pm 25 \text{ ppm}$
Clock Drift	$\leq \pm 5 \text{ ppm/year}$
Max. Delay Range	Negative delay: $\geq 1$ screen width Positive delay: 1 s to 100 ks

Time Base Mode	Y-T, X-Y, Roll
Number of X-Ys	1 path
Waveform Capture Rate <sup>[2]</sup>	50,000 wfms/s (dots display)

## Vertical

Bandwidth (-3 dB) (50 $\Omega$ )	DS2102E: DC to 100 MHz DS2202E: DC to 200 MHz
Single-shot Bandwidth (50 $\Omega$ )	DS2102E: DC to 100 MHz DS2202E: DC to 200 MHz
Vertical Resolution	8 bits
Vertical Scale <sup>[3]</sup>	When the input impedance is 50 $\Omega$ : 500 $\mu$ V/div to 1 V/div When the input impedance is 1 M $\Omega$ : 500 $\mu$ V/div to 10 V/div
Offset Range	When the input impedance is 50 $\Omega$ : 500 $\mu$ V /div to 50 mV/div: $\pm$ 2 V 51 mV/div to 200 mV/div: $\pm$ 10 V 205 mV/div to 1 V/div: $\pm$ 12 V When the input impedance is 1 M $\Omega$ : 500 $\mu$ V /div to 50 mV/div: $\pm$ 2 V 51 mV/div to 200 mV/div: $\pm$ 10 V 205 mV/div to 2 V/div: $\pm$ 50 V 2.05 V/div to 10 V/div: $\pm$ 100 V
Bandwidth Limit <sup>[1]</sup>	DS2102E: 20 MHz DS2202E: 20 MHz/100 MHz
Low Frequency Response (AC Coupling, -3 dB)	$\leq$ 5 Hz (on BNC)
Calculated Rise Time <sup>[1]</sup>	DS2102E: 3.5 ns DS2202E: 1.8 ns
DC Gain Accuracy <sup>[3]</sup>	$\pm$ 2% of full scale
DC Offset Accuracy	$\pm$ 0.1 div $\pm$ 2 mV $\pm$ 1% of offset value
Channel-to-Channel Isolation	DC to maximum bandwidth: >40 dB

**Trigger**

Trigger Level	Internal	$\pm 5$ div from the center of the screen
Range	EXT	$\pm 4$ V
Trigger Mode	Auto, Normal, Single	
Holdoff Range	100 ns to 10 s	
High Frequency Rejection <sup>[1]</sup>	75 kHz	
Low Frequency Rejection <sup>[1]</sup>	75 kHz	
Trigger Sensitivity	1 div (below 10 mV or noise rejection enabled) 0.3 div (above 10 mV and noise rejection disabled)	

**Edge Trigger**

Edge Type	Rising, Falling, Rising/Falling
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**Pulse Trigger**

Pulse Condition	Positive Pulse Width (greater than, smaller than, within a specific range) Negative Pulse Width (greater than, smaller than, within a specific range)
Pulse Width	2 ns to 4 s

**Runt Trigger**

Pulse Condition	None, >, <, <>
Pulse Polarity	Positive, Negative
Pulse Width Range	2 ns to 4 s

**Windows Trigger (Optional)**

Windows Type	Rising, Falling, Rising/Falling
Trigger Position	Enter, Exit, Time
Windows Time	16 ns to 4 s

**Nth Edge Trigger (Optional)**

Edge Type	Rising, Falling
Idle Time	16 ns to 4 s
Number of Edges	1 to 65,535

**Slope Trigger**

Slope Condition	Positive Slope (greater than, smaller than, within a specific range) Negative Slope (greater than, smaller than, within a specific range)
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	range)
Time Setting	10 ns to 1 s
<b>Video Trigger</b>	
Polarity	Positive, Negative
Synchrony	All Lines, Line Num, Odd Field, Even Field
Standard	Standard: NTSC, PAL/SECAM, 480P, 576P Optional: 720P, 1080P, 1080I
<b>Pattern Trigger</b>	
Pattern Setting	H, L, X, Rising Edge, Falling Edge
<b>Delay Trigger (Optional)</b>	
Edge Type	Rising, Falling
Delay Type	>, <, <>, ><
Delay Time	2 ns to 4 s
<b>TimeOut Trigger (Optional)</b>	
Edge Type	Rising, Falling, Rising/Falling
Timeout time	16 ns to 4 s
<b>Duration Trigger (Optional)</b>	
Pattern Setting	H, L, X
Trigger Criteria	>, <, <>
Duration Time	2 ns to 4 s
<b>Setup/Hold Trigger</b>	
Edge Type	Rising, Falling
Data Type	H, L
Setup Time	2 ns to 1 s
Hold Time	2 ns to 1 s
<b>RS232/UART Trigger</b>	
Polarity	Normal, Invert
Trigger Condition	Start, Error, Check Error, Data
Baud Rate	2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, 230400 bps, 460800 bps, 921600 bps, 1 Mbps, and User
Data Bits	5 bits, 6 bits, 7 bits, 8 bits
<b>I2C Trigger</b>	
Trigger Condition	Start, Restart, Stop, Missing ACK, Address, Data, A&D
Address Bits	7 bits, 8 bits, 10 bits
Address Range	0 to 127, 0 to 255, 0 to 1,023

Byte Length	1 to 5
<b>SPI Trigger</b>	
Trigger Condition	Timeout
Timeout Value	100 ns to 1 s
Data Bits	4 bits to 32 bits
Data Setting	H, L, X
<b>CAN Trigger (Optional)</b>	
Signal Type	Rx, Tx, CAN_H, CAN_L, Differential
Trigger Condition	SOF, EOF, Frame Type, Frame Error
Signal Rate	10 kbps, 20 kbps, 33.3 kbps, 50 kbps, 62.5 kbps, 83.3 kbps, 100 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps, 1 Mbps, User
Sample Points	5% to 95%
Frame Type	Data, Remote, Error, OverLoad
Error Type	Bit Fill, Answer Error, Check Error, Format Error, Random Error
<b>USB Trigger (Optional)</b>	
Signal Speed	Low Speed, Full Speed
Trigger Condition	SOP, EOP, RC, Suspend, Exit Suspend

## Measure

Cursor	Manual Mode	Voltage Deviation between Cursors ( $\Delta V$ ) Time Deviation between Cursors ( $\Delta T$ ) Reciprocal of $\Delta T$ (Hz) ( $1/\Delta T$ )
	Track Mode	Voltage and Time Values of the Waveform Point
	Auto Mode	Allow to display cursors during auto measurement
Auto Measurement	Maximum, Minimum, Peak-Peak Value, Top Value, Bottom Value, Amplitude, Average, Vrms-N, Vrms-1, Overshoot, Pre-shoot, Area, Period Area, Frequency, Period, Rise Time, Fall Time, Positive Pulse Width, Negative Pulse Width, Positive Duty Cycle, Negative Duty Cycle, Delay $A_f \rightarrow B_f$ , Delay $A_t \rightarrow B_t$ , Delay $A_f \rightarrow B_t$ , Delay $A_t \rightarrow B_f$ , Phase $A_f \rightarrow B_f$ , Phase $A_t \rightarrow B_t$ , Phase $A_f \rightarrow B_t$ , Phase $A_t \rightarrow B_f$	
Number of Measurements	Display 5 measurements at the same time	

Measurement Range	Screen region or cursor region
Measurement Statistics	Current, Average, Max, Min, Standard Deviation, Number of Measurements
Frequency Counter	Hardware 6-bit frequency counter (channels are selectable)

## Math Operation

Waveform Operation	A+B, A-B, A×B, A÷B, FFT, Digital Filter, Editable Advanced Operation, Logic Operation
FFT Window Function	Rectangle, Hanning, Blackman, Hamming
FFT Display	Split, Full Screen
FFT Vertical Scale	Vrms, dB
Logic Operation	AND, OR, NOT, XOR
Math Function	Intg, Diff, Log, Exp, Sqrt, Sine, Cosine, Tangent
Number of Buses for Decoding	2
Decoding Type	Parallel (standard), RS232/UART (optional), I2C (optional), SPI (optional), CAN (optional)

## Display

Display Type	8.0-inch (203 mm) TFT LCD
Display Resolution	800 Horizontal ×RGB×480 Vertical Pixel
Display Color	160,000 Color (TFT)
Persistence Time	Min, 50ms, 100ms, 200ms, 500ms, 1 s, 2 s, 5 s, 10 s, 20 s, Infinite
Display Type	Dots, Vectors
Real-time Clock	Time and Date (adjustable for users)

## I/O

Standard Ports	USB HOST (USB-GPIB supported), USB Device, LAN, Aux Output (TrigOut/PassFail)
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## General Specifications

### Probe Compensation Output

Output Voltage <sup>[1]</sup>	About 3 V, peak-peak
Frequency <sup>[1]</sup>	1 kHz

### Power

Power Voltage	100 V to 240 V, 45 Hz to 440 Hz
Power	Maximum 50 W
Fuse	2 A, T Degree, 250 V

### Environment

Temperature Range	Operating: 0°C to +50°C
	Non-operating: -40°C to +70°C
Cooling Method	Fan cooled
Humidity Range	0°C to +30°C: ≤95%RH
	+30°C to +40°C: ≤75%RH
	+40°C to +50°C: ≤45%RH
Altitude	Operating: under 3,000 m
	Non-operating: under 15,000 m

### Physical Characteristics

Dimensions <sup>[4]</sup>	Width×Height×Depth=361.6 mm×179.6 mm×130.8 mm	
Weight <sup>[5]</sup>	Package Excluded	3.9 kg ± 0.2 kg
	Package Included	4.5 kg ± 0.5 kg

### Calibration Interval

The recommended calibration interval is 18 months.

### Electromagnetic Compatibility and Safety

EMC	complies with EMC Directive 2014/30/EU, complies with or above the standard specified in IEC61326-1:2013/EN61326-1:2013 Group 1 Class A	
	CISPR 11/EN 55011	
	IEC 61000-4-2:2008/EN 61000-4-2	±4.0 kV (contact discharge), ±8.0 kV (air discharge)
	IEC 61000-4-3:2002/EN 61000-4-3	3 V/m (80 MHz to 1 GHz); 3 V/m (1.4 GHz to 2 GHz); 1 V/m (2.0 GHz to 2.7 GHz)

	IEC 61000-4-4:2004/EN 61000-4-4	1 kV power
	IEC 61000-4-5:2001/EN 61000-4-5	0.5 kV (phase-to-neutral voltage); 1 kV (phase-to-earth voltage); 1 kV (neutral-to-earth voltage)
	IEC 61000-4-6:2003/EN 61000-4-6	3 V, 0.15 to 80 MHz
	IEC 61000-4-11:2004/EN 61000-4-11	voltage dip: 0% UT during half cycle; 0% UT during 1 cycle; 70% UT during 25 cycles short interruption: 0% UT during 250 cycles
Safety	complies with IEC 61010-1:2010 (Third Edition)/EN 61010-1:2010, UL 61010-1:2012 R4.16 and CAN/CSA-C22.2 No. 61010-1-12+ GI1+ GI2	

**Note<sup>[1]</sup>:** Typical.

**Note<sup>[2]</sup>:** Maximum value. 10 ns, dots display, auto memory depth.

**Note<sup>[3]</sup>:** 500µV /div is a magnification of 1 mV/div. When calculating the DC Gain Accuracy, the full scale should be considered as 8 mV (calculated based on 1 mV/div).

**Note<sup>[4]</sup>:** Supporting legs and handle folded, knob height included.

**Note<sup>[5]</sup>:** Standard configuration.