Chapter 16 Specifications

All the specifications (except the parameters marked with "Typical") are guaranteed when the instrument has been working for more than 30 minutes under the specified operating temperature.

Sample

Sample Mode	Real-time sample
Max. Real-time Sample Rate	2.0 GSa/s for each channel
Max. Memory Depth	14 Mpts for each channel
Peak Detect	500 ps
Averaging	After all the channels finish 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 bits when ≥10 μs/div @ 2 GSa/s.

Input

Number of Channels	4 analog channels
Input Coupling	DC, AC, or GND
Input Impedance	(1 MΩ±1%) || (15 pF±3 pF) or 50 Ω±1.5%
Probe Attenuation Coefficient	0.01X to 1000X, in 1-2-5 step
Maximum Input Voltage (1 MΩ)	CAT I 300 Vrms, CAT II 100 Vrms, transient overvoltage 1000 Vpk with RP2200 10:1 probe: CAT II 300 Vrms with RP3300A 10:1 probe: CAT II 300 Vrms with RP3500A 10:1 probe: CAT II 300 Vrms with RP5600A 10:1 probe: CAT II 300 Vrms

Horizontal

Time Base Scale	DS4024E: 2 ns/div to 1 ks/div DS4014E: 5 ns/div to 1 ks/div
Deviation between Channels	1 ns (typical), 2 ns (maximum)
Max. Recording Length	14 Mpts for each channel
Time Base Accuracy[1]	≤ ±4 ppm
Clock Drift	≤ ±2 ppm/year
Delay Range	Pre-trigger (negative delay): Memory Depth/Sample Rate Post-trigger (positive delay): 1 s to 100 ks
Time Base Mode	Y-T, X-Y, Roll, Delayed
Number of X-Ys	2 paths at the same time
Waveform Capture Rate[2]	60,000 wfms/s
Zero Offset	±0.5 div*minimum time base scale

Vertical

Bandwidth (-3 dB) (50 Ω)	DS4024E: DC to 200 MHz DS4014E: DC to 100 MHz
Single Bandwidth (50 Ω)	DS4024E: DC to 200 MHz DS4014E: DC to 100 MHz
Vertical Resolution	8 bits
Vertical Scale	1 MΩ input impedance: 1 mV/div to 5 V/div 50 Ω input impedance: 1 mV/div to 1 V/div
Offset Range	1 MΩ input impedance: 1 mV/div to 225 mV/div: ±2 V 230 mV/div to 5 V/div: ±40 V 50 Ω input impedance: 1 mV/div to 124 mV/div: ±1.2 V 126 mV/div to 1 V/div: ±12 V
Dynamic Range	±5 div
Bandwidth Limit[1]	DS4024E: 20 MHz/100 MHz DS4014E: 20 MHz

Low Frequency Response (AC coupling, -3 dB)	≤5 Hz (on BNC)
Calculated Rise Time[1]	DS4024E: 1.8 ns DS4014E: 3.5 ns
DC Gain Accuracy	±2% full scale
DC Offset Accuracy	200 mV/div to 5 V/div: ±0.1 div ± 2 mV ± 0.5% offset 1 mV/div to 195 mV/div: ±0.1 div ± 2 mV ± 1.5% offset
ESD Tolerance	±2 kV
Channel-to-Channel Isolation	DC to maximum bandwidth: >40 dB

Trigger

Trigger Level Range	Internal: ±6 div from the center of the screen EXT: ±0.8 V
Trigger Mode	Auto, Normal, Single
Holdoff Range	100 ns to 10 s
High Frequency Rejection[1]	50 kHz
Low Frequency Rejection[1]	5 kHz
Edge Trigger	
Edge Type	Rising, Falling, Rising&Falling
Pulse Trigger	
Pulse Condition	Positive Pulse Width (greater than, lower than, within the specific interval); Negative Pulse Width (greater than, lower than, within the specific interval)
Pulse Width Range	4 ns to 4 s
Runt Trigger	
Pulse Polarity	Positive, Negative
Qualifier	None, >, <, <>
Pulse Width Range	4 ns to 4 s
Nth Edge Trigger	
Edge Type	Rising, Falling

Idle Time	40 ns to 1 s
Number of Edges	1 to 65535
Slope Trigger	
Slope Condition	Positive Slope (greater than, lower than, within the specific interval); Negative Slope (greater than, lower than, within the specific interval)
Time Setting	10 ns to 1 s
Video Trigger	
Polarity	Positive, Negative
Synchrony	All Lines, Line Num, Odd Field, Even Field
Standard	NTSC, PAL/ECAM, 480P, 576P, 720P, 1080P, and 1080I
Pattern Trigger	
Pattern Setting	H, L, X, Rising Edge, Falling Edge
RS232/UART Trigger	
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, 1Mbps, User
Data Bits	5 bit, 6 bit, 7 bit, 8 bit
I2C Trigger	
Trigger Condition	Start, Restart, Stop, Missing ACK, Address, Data, A&D
Address Bits	7 bits, 8 bits, 10 bits
Address Range	0 to 127, o to 255, 0 to 1023
Byte Length	1 to 5
SPI Trigger	
Trigger Condition	CS, Timeout
Timeout Value	100 ns to 1 s
Data Bits	4 bit to 32 bit
Data	H, L, X
Clock Edge	Rising Edge, Falling Edge
CAN Trigger	
Signal Type	Rx, Tx, CAN_H, CAN_L, Differential
Trigger Condition	SOF, EOF, Frame Type, Frame Error
Baud Rate	10 kb/s, 20 kb/s, 33.3 kb/s, 50 kb/s, 62.5 kb/s, 83.3

	kb/s, 100 kb/s, 125 kb/s, 250 kb/s, 500 kb/s, 800 kb/s, 1 Mb/s, User
Sample Point	5% to 95%
Frame Type	Data, Remote, Error, OverLoad
Error Type	Bit Fill, Answer Error, Check Error, Format Error, Random Error
FlexRay Trigger	
Baud Rate	2.5 Mb/s, 5 Mb/s, 10 Mb/s
Trigger Condition	Frame, Symbol, Error, TSS
USB Trigger	
Signal Speed	Low Speed, Full Speed
Trigger condition	SOP, EOP, RC, Suspend, Exit Suspend
LIN Trigger	
Version	1.X, 2.X, Both
Trigger Condition	Sync, Identifier, Data, ID&Data, Wakeup, Sleep, Error
ID Range	0 to 63
Data Comparison	=, ≠, <, >, ≤, ≥
Data Length	1 to 8
Data Level	H, L
Baud Rate	19200 bps, 10417 bps, 9600 bps, 4800 bps, 2400 bps, 1200 bps, User
Error Type	Sync, Even-Odd, Checksum

Measure

Cursor	Manual mode: Voltage deviation between cursors (△V), time deviation between cursors (△T), reciprocal of △T (Hz) (1/△T) Track mode: voltage and time values at 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, Period, Frequency, Rise Time, Fall Time, Positive Pulse Width,

	Negative Pulse Width, Positive Duty Cycle, Negative Duty Cycle, Delay A↓→B↓, Delay A↑→B↑, Delay A↓→B↑, Delay A↑→B↓, Phase A↓→B↓, Phase A↑→B↑, Phase A↓→B↑, Phase A↑→B↓
Number of Measurements	Displays 5 measurements at the same time.
Measurement Range	Screen Region, Cursor Region
Statistic Mode	Extremum, Difference
Measurement Statistic	Average, Max, Min, Standard Deviation, Number of Measurements
FontSize	Normal, Large, UltraLarge
DisItem	ON, OFF
Frequency Counter	6-digit hardware frequency counters

Math Operation

Waveform Operation	A+B, A-B, A×B, A÷B, FFT, Digital Filter, Editable Advanced Operation, Logic Operation
FFT Window	Rectangle, Hanning, Blackman, Hamming
FFT Display	Split, Full Screen
FFT Vertical Scale	Vrms, dB
Logic Operation	AND, OR, NOT, XOR
Math Function	Intg, Diff, Lg, Ln, Exp, Abs, Square, Sqrt, Sine, Cosine, Tangent

Decoding

Number of Buses	2
Decoding Type	Parallel (standard), RS232/UART (optional), I2C (optional), SPI (optional), CAN (optional), FlexRay (optional), LIN (optional)
Parallel	Combines the sample data of the source channel waveforms as a parallel multi-channel bus and displays the data as a single bus value
RS232/UART	Displays the input signal(s) of the TX source channel or/and RX source channel as bus

I2C	Displays the input signal of the SDA source channel as bus
SPI	Displays the input signal(s) of the MISO source channel or/and MOSI source channel as bus
CAN	Displays the input signal of the source channel (Rx, Tx, CAN_H, CAN_L, or differential) as bus
FlexRay	Displays the input signal of the source channel (BP, BM, or RX/TX) as bus
LIN	Displays the input signal of the source channel of LIN as bus

Display

Display Type	9-inch (229 mm) TFT LCD display
Display Resolution	800 horizontal×RGB×480 vertical pixel
Display Color	160,000 colors
Persistence Time	Min, 50 ms, 100 ms, 200 ms, 500 ms, 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	Dual USB HOST, USB DEVICE, LAN, VGA Output, 10 MHz Input/Output, Aux Output (TrigOut, Fast, PassFail, GND)
Printer Compatibility	PictBridge

General Specifications

Probe Compensation Output	
Output Voltage[1]	About 3 V, peak-peak
Frequency[1]	1 kHz
Power	
Power Voltage	100 to 127 V, 45 to 440Hz 100 to 240 V, 45 to 65Hz

Power	Maximum 120 W	
Fuse	3 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 meters	
	Non-operating: under 15,000 meters	
Physical Characteristics		
Size[3]	Width×Height×Depth = 440.0 mm×218.0 mm×130.0 mm	
Weight[4]	Packaging Excluded	4.8 kg±0.2 kg
	Packaging Included	7.1 kg±1.0 kg
Adjustment Interval		
The recommended calibration interval is one year.		
Regulatory Information		
EMC	2014/35/EU Execution standard EN 61326-1:2013	
Safety	EN 61010-1:2010 EN 61010-2-030:2010 IEC 61010-1:2010 (Third Edition) CAN/CSA C22.2 No.61010-1-12 UL 61010-1:2012	

Note[1]: Typical value.

Note[2]: Maximum value. Displayed in dots; a sine signal with 10 ns horizontal time base, 4 div input amplitude, and 10 MHz frequency; Edge trigger.

Note[3]: Supporting legs and handle folded, knob height included, front panel cover excluded.

Note[4]: Standard configuration.