FDS Series Technical Specifications

Unless otherwise stated, all technical specifications apply to digital oscilloscope with the attenuation switch of the probe set to 10X.

- The instrument must be operated continuously for more than thirty minutes under the specified operating temperature.
- If the operating temperature range changes not less than 5℃, it is required to open the system function menu and execute “Self-calibration” program.

All specifications are guaranteed except those marked with “Typical”.

Oscilloscope

<table>
<tr><td colspan="2">Performance Characteristics</td><td colspan="5">Instruction</td></tr>
<tr><td colspan="2">Bandwidth</td><td colspan="5">100 MHz</td></tr>
<tr><td colspan="2" rowspan="2">Vertical Resolution</td><td colspan="2">FDS1102</td><td colspan="2">8 bits</td></tr>
<tr><td colspan="2">FDS1102A</td><td colspan="2">8 bits /12 bits /14 bits</td></tr>
<tr><td rowspan="9">Acquisition</td><td>Mode</td><td colspan="5">Normal, Peak detect, Average</td></tr>
<tr><td rowspan="8">Real-time Acquisition Rate</td><td rowspan="2">FDS1102</td><td>Dual CH</td><td rowspan="2">8 bits</td><td>500 MSa/s</td></tr>
<tr><td>Single CH</td><td>1 GSa/s</td></tr>
<tr><td rowspan="6">FDS1102A</td><td rowspan="3">Dual CH</td><td>8 bits mode</td><td>500 MSa/s</td></tr>
<tr><td>12 bits mode</td><td>250 MSa/s</td></tr>
<tr><td>14 bits mode</td><td>100 MSa/s</td></tr>
<tr><td rowspan="3">Single CH</td><td>8 bits mode</td><td>1 GSa/s</td></tr>
<tr><td>12 bits mode</td><td>500 MSa/s</td></tr>
<tr><td>14 bits mode</td><td>100 MSa/s</td></tr>
<tr><td colspan="2">Waveform Refresh Rate</td><td colspan="5">65,000 wfms/s</td></tr>
<tr><td colspan="2">Channel</td><td colspan="5">2</td></tr>
<tr><td colspan="2">Multi-level Gray Scale Display & Color Temperature Display(Use gray scale to indicate frequency of occurrence, where frequently occurring waveform are bright)</td><td colspan="5">Support</td></tr>
<tr><td colspan="2">Horizontal Accuracy</td><td colspan="5">±20 ppm (typical value, ambient temperature: +25℃)</td></tr>
<tr><td rowspan="3">Input</td><td>Input Coupling</td><td colspan="5">DC, AC, grounding</td></tr>
<tr><td>Input Impedance</td><td colspan="5">1 MΩ±2%, parallel with 15 pF±5 pF</td></tr>
<tr><td>Probe attenuation coefficient</td><td colspan="5">10uX-50kX,step by 1 – 2 - 5， support custom</td></tr>
</table>

	Maximum Input Voltage	1MΩ: ≤300 Vrms			
	Bandwidth limit	20 MHz，full bandwidth			
	Channel –channel isolation	50 Hz: 100:1 10 MHz: 40:1			
	Time delay between channel (typical)	150ps			
Horizon	**Sampling rate range**	FDS1102	Dual CH	8 bits mode	0.05 Sa/s ～ 500 MSa/s
			Single CH		0.05 Sa/s ～ 1 GSa/s
		FDS1102A	Dual CH	8 bits mode	0.05 Sa/s ～ 500 MSa/s
				12 bits mode	0.05 Sa/s ～ 250 MSa/s
				14 bits mode	0.05 Sa/s ～ 100 MSa/s
			Single CH	8 bits mode	0.05 Sa/s ～ 1 GSa/s
				12 bits mode	0.05 S/s ～ 500 MS/s
				14 bits mode	0.05 Sa/s ～ 100 MSa/s
	Interpolation	Sinx/x			
	Maximum Storage Depth	10M			
	Scanning speed (s/div)	2ns/div - 1000s/div, step by 1-2-5			
	Time base accuracy	±20 ppm (typical，environment temperature is +25℃)			
	Time interval(△T) measurement accuracy(DC ～100MHz)	Single: ±(1 interval time+|time base accuracy|×reading+0.6 ns) Average>16: ±(1 interval time +|time base accuracy|×reading+0.4 ns)			
Vertical	**Vertical Sensitivity**	1 mV/div～10 V/div			
	Displacement	±2V(1 mV/div - 50 mV/div) ±20 V (100 mV/div - 1 V/div) ±200 V (2 V/div - 10 V/div)			
	Analog bandwidth	100 MHz			

	Single bandwidth	Full bandwidth			
	Low Frequency (AC coupling, -3dB)	≥10 Hz(at BNC)			
	Rising Time(at BNC,typical)	≤3.5 ns			
	DC Gain Accuracy	FDS1102	8 bits mode	1 mV	4%
				≥2 mV	3%
		FDS1102A	8 bits mode	1 mV	4%
				≥2 mV	3%
			12 bits mode	1 mV	3%
			14 bits mode	≥2 mV	2%
	DC accuracy (average)	Delta Volts between any two averages of ≥16 waveforms acquired with the same scope setup and ambient conditions (△V): ±(3% rdg + 0.05 div)			
	Waveform inverted ON/OFF				
Trigger Type		Edge trigger, video trigger, pulsewidth trigger, slope trigger, under-amplitude trigger, over-amplitude trigger, timeout trigger, Nth edge trigger, logic trigger, RS232/UART, I2C, SPI, CAN and LIN			
Trigger Mode		Auto, Normal, Single			
Signal System and Line/Field Frequency (Video Trigger Mode)		Support NTSC, PAL and SECAM broadcasting system of any field frequency or line frequency			
Measurement	**Cursor Measurement**	△V, △T ,△T&△V between cursors, auto cursor, support XY/FFT/ZOOM window, based on screen percentage			
	Auto Measurement	Period, Frequency, +Width, -Width, Rise Time, Fall Time, ScrDuty, +Duty, -Duty, Vavg, Vpp, VRMS, Overshoot, Vmax, Vmin, Vtop, CycRms, Vbase, Vamp, Preshoot, StdDev, +PulseCnt, -PulseCnt, RiseCnt, FallCnt, Area, CycArea, Delay(1 – 1), Delay(2 – 2), Delay(1 – 2), Delay(2 – 1), Phase(1 – 1), Phase(2 – 2), Phase(1 – 2), Phase(2 – 1), FRR(1 1 -2 1), FRF(1 1 -2 2), FFR(1 2 -2 1), FFF(1 2 -2 2), LRR(1 1 -2 1), LRF(1 1 -2 2), LFR(1 2 -2 1), LFF(1 2 -2 2)			

	Mathematical operation	+,-,*,/,Intg,Diff,Sqrt,Function operation(Lg /Ln /Exp /Abs /Sine /Cosine /Tan), User Defined Function, digital filter (low pass, high pass, band pass, band reject), FFT(Vrms, dBVrms, Radians, Degrees)

Trigger

Performance Characteristics		**Instruction**
Trigger level range	Internal	±5 div from the screen center
	EXT	±2V
	EXT/5	±10V
Trigger level Accuracy (typical)the source is adapted to rising and falling time ≥20ns	Internal	±0.3 div
	EXT	±(10 mV+6% Set value)
	EXT/5	±(50 mV +6% Set value)
Trigger displacement	According to Record length and time base	
Trigger Holdoff range	100 ns – 10 s	
50% level setting (typical)	Input signal frequency ≥ 50 Hz	
Edge Trigger	slope	Rising, Falling
Video Trigger	Modulation	Support standard NTSC, PAL and SECAM broadcast systems
	Line number range	1-525 (NTSC) and 1-625 (PAL/SECAM)
Pulse Trigger	Trigger condition	Positive pulse:＞, ＜, ＝ Negative pulse:＞, ＜, ＝
	Pulse Width range	30 ns to 10 s
Slope Trigger	Trigger condition	Positive pulse:＞, ＜, ＝ Negative pulse:＞, ＜, ＝
	Time setting	30 ns to 10 s
Runt Trigger	Polarity	Positive, Negative
	Pulse Width Condition	>, =, <
	Pulse Width Range	30 ns to 10 s
Windows Trigger	Polarity	Positive, Negative
	Trigger condition	Positive pulse: superamplitude entry, superamplitude exit, and superamplitude time

		Negative pulse: superamplitude entry, superamplitude exit, and superamplitude time
	Windows Time	30 ns to 10 s
Timeout Trigger	Slope	Rising, Falling
	Idle Time	30 ns to 10 s
The Nth Edge Trigger	Slope	Rising, Falling
	Idle Time	30 ns to 10 s
	Edge Number	1 to 128
Logic trigger	Logic Mode	AND, OR, XOR,XNOR
	Input Mode	H, L, X, Rising, Falling
	Output Mode	Goes True, Goes False, Is True >, Is True <, Is True =
RS232/UART Trigger	Polarity	Normal, Inverted
	Trigger Condition	Start, Error, Check Error, Data
	Baud Rate	Common, Custom
	Data Bits	5 bits, 6 bits, 7 bits, 8 bits
I2C Trigger	Trigger Condition	Start, Restart, Stop, Ack Lost, Addr, Data, Addr/Data
	Address Bits /Address Range	7 bits---->0 to 127 8 bits----> 0 to 255 10 bits---->0 to 1023
	Byte Length	1 to 5
SPI Trigger	Trigger Condition	Timeout
	Timeout Value	30 ns to 10 s
	Data Bits	4 bits to 32 bits
	Slope	Rising, Falling
CAN Trigger	Signal Type	CAN_H, CAN_L, TX, RX
	Trigger Condition	Start,Type,Data,ID,ID/Data,End,Lost,Error
	Baud Rate	Common, Custom
	Sample Point	5% to 95%
	Frame Type	Data, Remote, Error, Overload
LIN Trigger	Condition	Break, ID, ID/Data, Data Error
	Baud Rate	Common, Custom

Waveform Generator

Bandwidth	50 MHz
Sample Rate	300 MSa/s

Vertical Resolution		14 bits
Channel		2
Waveforms		
Standard waveforms		Sine wave, square wave, ramp wave, pulse wave, noise
Arbitrary waveforms		exponential rise, exponential decline, Sinx/x, step wave etc 28 built-in waveforms
Frequency Feature		
Sine wave		1 μHz to 50 MHz
Square wave		1 μHz to 25 MHz
Ramp wave		1 μHz to 1 MHz
Pulse wave		1 μHz to 10 MHz
Noise wave(-3 dB)		20 MHz(Gaussian white noise)
Arbitrary wave(except DC)		1 μHz to 10 MHz
Frequency resolution		1 μHz or 7 significant figures
Frequency stability		±30 ppm at 0 to 40℃
Frequency aging rate		±30 ppm per year
Amplitude characteristic		
Output amplitude	High Z	2mVpp to 10Vpp
	50Ω	1mVpp to 5Vpp
Amplitude accuracy		±(1% of setting + 1 mVpp) (typical 1kHz sine,0V offset)
Amplitude resolution		1mVpp or 4 digits
DC offset range (AC+ DC)	High Z	±5 Vpk - Amplitude Vpp/2
	50Ω	±2.5 Vpk - Amplitude Vpp/2
	Note: When offset >2.5Vpp，amplitude ≥10mV(High Z) When offset >1.25Vpp，amplitude ≥5mV(50Ω)	
DC offset accuracy		±(1 % of |setting|+ 1 mV + amplitude Vpp * 0.5%)
Offset resolution		1mVpp
Output Impedance		50Ω(typical)
Waveforms characteristic		
Sine		

Bandwidth flatness(1Vpp,relative 1kHz,50Ω)	≤10MHz:±0.3dB ≤50MHz:±0.5dB
Harmonic distortion	Typical value(0dBm) DC to 1MHz:<-65dBc 1MHz to 50MHz:<-60dBc
Total harmonic distortion	<0.2%, 10Hz to 20kHz, 1Vpp
Non-harmonic distortion	Typical value(0dBm) ≤10MHz:<70dBc; >10MHz:<70dBc+6c/sound interval
Phase noise	Typical value(0dBm, 10kHz offset) 10MHz:≤-110dBc/Hz
Square	
Rising falling time	<20ns
Jitter	200ps +30ppm
Overshoot	<5%
Ramp	
Linearity	<the 1% of maximum output(typical value 1 kHz, 1 Vpp, symmetry50%)
Symmetry	0% to 100%
Pulse	
Period	100ns to 1Ms
Pulsewidth	≥40ns
Overshoot	<5%
Jitter	200ps +30ppm
Noise	
Type	Gaussian white noise
Bandwidth (-3dB)	20 MHz
Arbitrary	
Bandwidth	10MHz
Waveforms length	2 to 8192 points
Sample rate	300 MSa/s
Amplitude accuracy	14bits
Modulation characteristic	
Modulate type	AM, FM,PM, FSK
AM	
Carrier	Sine, Square, Ramp, Arb(Except DC)
Internal modulation waveform	Sine, Square, Ramp, Noise

Internal amplitude modulation frequency	2 mHz to 20 kHz
Depth	0% to 100%
FM	
Carrier	Sine, Square, Ramp, Arb(Except DC)
Internal modulation waveform	Sine, Square, Ramp, Noise
Internal modulation frequency	2 mHz to 20 kHz
Frequency offset	2 mHz to Carrier frequent
PM	
Carrier	Sine, Square, Ramp, Arb(Except DC)
Internal modulation waveform	Sine, Square, Ramp, Noise
Internal phase modulation frequency	2 mHz to 20 kHz
Phase deviation range	0° to 180°
FSK	
Carrier	Sine, Square, Ramp, Arb(Except DC)
FSK rate	2 mHz to 100kHz
FSK hopfreq	1 μHz to Maximum frequency of corresponding carrier
Sweep	
Carrier	Sine, Square, Ramp, Arb(Except DC)
Min/Max start frequent	1μHz(minimum)/Maximum frequency of corresponding carrier
Max/Min stop frequent	1μHz(minimum)/Maximum frequency of corresponding carrier
Type	Line, Log
Sweep time	1 ms to 500 s ± 0.1%
Trigger source	Internal, Manual
Burst	
Waveforms	Sine, Square, Ramp, Pulse and Arb(Except DC)
Carrier frequency	1 μHz to Maximum frequency of corresponding carrier /2
Trigger source	Manual, Internal
N-cycle trigger cycle	1 us to 500s
N periodicity	1 to 400000 (Max =Burst Period / Period)/infinite

Voltage range and sensitivity(No modulation source)	
Input resistance	1M Ω

Power Supply

Rated output	
Voltage	0.1～15V / 0.1～30V
Current	0.1～3A[1]
Power	15W / 30W
Load Regulation	
Voltage	≤0.1%+3mV
Current	≤0.1%+3mA
Power Regulation	
Voltage	≤0.1%+3mV
Current	≤0.1%+3mA
Noise& Ripple(20Hz-20MHz)	
Voltage(Vp-p)	≤10mVp-p
Voltage(rms)	≤2mVrms
Current(rms)	≤5mArms
Settings Resolution	
Voltage	10mV
Current	10mA
Read Back Resolution	
Voltage	10mV
Current	1mA
Settings Accuracy(25℃±5℃)	
Voltage	≤0.8%+10mV
Current	≤1%+8mA
Read Back Accuracy(25℃±5℃)	
Voltage	≤0.3%+10mV
Current	≤0.3%+8mA
Response time	
Transient recovery time (50%～100% rated load)	≤1ms
Protect function	
OVP	0～16V / 0~31V
OCP	0～3.1A

[1] : When using a multimeter to measure the power supply output current, the multimeter should be set to the appropriate current range corresponding to the manual range for measurement.

Multimeter

Function		Measurement Range	Resolution	Function
DC Voltage (V)	mV	20.000 mV/200.00 mV	0.001mV	±(0.5%+10dig)
	V	2.0000V/20.000V/200.00V	0.1mV	±(0.3%+5dig)
		1000.0V	0.1V	±(0.5%+5dig)
AC Voltage (V)	mV	20.000 mV/200.00 mV	0.001mV	±(0.8%+10dig)
	V	2.0000V/20.000V/200.00V	0.1mV	±(0.8%+10dig)
		750.0V	0.1V	±(1%+10dig)
DC Current (A)	μA	200.00μA/2000.0μA	0.01μA	±(0.5%+10dig)
	mA	20.000mA/200.00mA	0.001mA	±(0.5%+10dig)
	A	20.000A [1]	0.001A	±(2%+10dig)
AC Current (A)	μA	200.00μA/2000.0μA	0.01μA	±(0.8%+10dig)
	mA	20.000mA/200.00mA	0.001mA	±(0.8%+10dig)
	A	20.000A [1]	0.001A	±(2.5%+10dig)
Resistance (Ω)		200.00Ω/2.0000kΩ/20.000kΩ/200.00kΩ/2.0000MΩ/20.000MΩ	0.01Ω	±(0.8%+10dig)
		100.00MΩ	0.01 MΩ	±(5%+10dig)
Capacitance (F)		2.0000nF/20.000nF/200.00nF/2.0000μF/20.000μF	0.1pF	±(4%+10dig)
		200.00μF/2.0000mF/20.000mF [2]	0.01μF	±(4%+10dig)
Duty Cycle (%)[3]		0.1% - 99.9% (Typical:Vrms=1 V, f=1 kHz)	0.1%	±(1.2%+3dig)
		0.1% - 99.9%(≥1 kHz)		±(2.5%+3dig)

[1] When measuring current, for 10 A to 15 A, the measuring duration should not be over 2 minutes within 10 minutes, and in this 10 minutes, no other current should flow through except within the measuring duration; for 15 A to 20 A, the measuring duration should not be over 10 seconds within 15 minutes, and in this 15 minutes, no other current should flow through except within the measuring duration.

[2] When measuring big capacitance, the measuring duration should be over 30 seconds.

[3] When measuring duty cycle, the typical waveform is Square.

Note:

- **Standard conditions: The environment temperature is 18℃ to 28℃, the relative humidity is less than 80%.**
- **When measuring AC voltage/current or capacitance, accuracy guarantee range is 5% to 100% of the range.**
- **When measuring resistance and capacitance, the influence of the resistance reactance of the pen itself on the measured value should be considered.**

Characteristics	Instruction
Display	19999
Frequency Response (Hz)	(40 - 1000) Hz
Sample rate for digital data	3 times/second
Auto ranging	√
True Virtual Value	√
Diodes Test	√
On-off Buzzer	√
Data Hold	√
Relative Measurement	√
Input Protection	√
Input Impedance	≥10 MΩ

General Technical Specifications

Display

Characteristics	Instruction
Display Type	10.4 inch Colored LCD (Liquid Crystal Display)
Display Resolution	1024 (Horizontal) ×768 (Vertical) Pixels
Display Colors	65536 colors，TFT

Output of the Probe Compensator

Characteristics	Instruction
Output voltage(typical)	About 5 V, with the Peak-to-Peak voltage ≥1
Frequent(typical)	Square wave of 1 KHz

Others

Characteristics	Instruction	
Communication Interface	HDMI; USB dev*1, USB Host *4; Trig Out(P/F); LAN interface; earphone jack	
Power Supply	100V – 240 VACRMS, 50/60 Hz, CAT Ⅱ	
Power Consumption	PWR empty load	＜30W
	PWR full load	＜120W
Fuse	2 A, T class, 250 V	
Touch Screen	Multi-touch capacitive touch screen	

Environment

Characteristics	Instruction
Temperature	Working temperature:0℃～40℃ Storage temperature:-20℃～+60℃
relative humanity	≤90%
Height	Operating: 3,000 m Non-operating: 15,000 m
Cooling Method	Fan cooling

Mechanical Specifications

Characteristics	Instruction
Dimension	421 mm × 221 mm × 115 mm (L*H*W)
Weight	Approx. 4.25 kg (without accessories)

Interval Period of Adjustment:

One year is recommended for the calibration interval period.

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