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

Performance Characteristics		Instruction			
Bandwidth		FDS1102 FDS1102A FDS3102	100 MHz		
		FDS3202	200 MHz		
		FDS3302	300 MHz		
Vertical Resolution		FDS1102 FDS3102 FDS3202 FDS3302	8 bits		
		FDS1102A	8 bits /12 bits /14 bits		
Acquisition	**Mode**	Normal, Peak detect, Averaging			
	Real-time Acquisition Rate	FDS1102	Dual CH	8 bits	500 MS/s
			Single CH		1 GS/s
		FDS1102A FDS3102	Dual CH	8 bits mode	500 MS/s
				12 bits mode	250 MS/s
				14 bits mode	100 MS/s
			Single CH	8 bits mode	1 GS/s
				12 bits mode	500 MS/s
				14 bits mode	100 MS/s
		FDS3202 FDS3302	Dual CH		1.25 GS/s
			Single CH		2.5 GS/s
Waveform Refresh Rate		FDS1102 FDS1102A FDS3102 FDS3202 FDS3302	65,000 wfms/s		
Channel		2			

Multi-level Gray Scale Display & Color Temperature Display(Use gray scale to indicate frequency of occurrence,where frequently occurring waveform are bright.)	Support			
Horizontal Accuracy	±20 ppm (typical value, ambient temperature: +25℃)			

Input	**Input Coupling**	DC, AC, grounding		
	Input Impedance	FDS1102 FDS1102A	1 MΩ±2%, parallel with 15 pF±5 pF	
		FDS3102 FDS3202 FDS3302	1 MΩ±2%, parallel with 15 pF±5 pF,50 Ω±2%	
	Probe attenuation coefficient	10uX-50kX,step by 1 – 2 - 5，support custom		
	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 S/s ～500 MS/s
			Single CH		0.05 S/s ～1 GS/s
		FDS1102A FDS3102	Dual CH	8 bits mode	0.05 S/s ～500 MS/s
				12 bits mode	0.05 S/s ～250 MS/s
				14 bits mode	0.05 S/s ～100 MS/s
			Single CH	8 bits mode	0.05 S/s ～1 GS/s
				12 bits mode	0.05 S/s ～500 MS/s
				14 bits mode	0.05 S/s ～100 MS/s
		FDS3202	Dual CH		0.05 S/s ～1 GS/s
			Single CH		0.05 S/s ～2 GS/s

		FDS3302	Dual CH	0.05 S/s ～1.25 GS/s
			Single CH	0.05 S/s ～2.5 GS/s
	Interpolation	(Sinx)/x		
	Maximum Storage Depth	10M		
	Scanning speed (S/div)	FDS1102 FDS1102A	2ns/div - 1000s/div,step by 1-2-5	
		FDS3102 FDS3202 FDS3302	500ps/div - 1000s/div,step by 1-2-5	
	Relay time accuracy	±20 ppm(typical，environment temperature is +25℃)		
	Time interval(△T) measurement accuracy(CD ～100MHz)	Single: ±(1 interval time+1 ppm×reading+0.6 ns); Average>16: ±(1 interval time +1 ppm×reading+0.4 ns)		
Vertical	**Vertical Sensitivity**	1 mV/div～10 V/div		
	Displacement	FDS1102 FDS1102A	±2V(1 mV/div - 50 mV/div); ±20 V (100 mV/div - 1 V/div); ±200 V (2 V/div - 10 V/div)	
		FDS3102 FDS3202 FDS3302	±2V(1 mV/div - 50 mV/div); ±20 V (100 mV/div - 500 V/div); ±200 V (1 V/div - 10 V/div)	
	Analog bandwidth	100 MHz,200 MHz,300 MHz		
	Single bandwidth	Full bandwidth		
	Low Frequency(AC coupling，-3dB)	≥10 Hz(at BNC)		
	Rising Time(at BNC,typical)	FDS1102 FDS1102A FDS3102	≤3.5 ns	
		FDS3202	≤1.75 ns	
		FDS3302	≤1.17 ns	
	DC Gain Accuracy	FDS1102 FDS3102 FDS3202 FDS3302	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(⌐-⌐),Delay(L-L),Delay(⌐-L),Delay(L-⌐),Phase(⌐-⌐),Phase(L-L),Phase(⌐-L),Phase(L-⌐),FRR,FRF,FFR,FFF,LRR,LRF,LFR,LFF		
	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、FFTrms		

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 Position	Enter, Exit, Time
	Windows Time	30 ns to 10 s
Timeout Trigger	Edge Type	Rising, Falling
	Idle Time	30 ns to 10 s
The Nth Edge Trigger	Edge Type	Rising, Falling
	Idle Time	30 ns to 10 s
	Edge Number	1 to 128
Logic trigger	Logic Mode	AND, OR, XNOR, XOR
	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 bit, 6 bit, 7 bit, 8 bit
I2C Trigger	Trigger Condition	Start, Restart, Stop, ACK Lost, Address, Data, Addr/Data
	Address Bits	7 bit, 8 bit, 10 bit
	Address	0 to 127, 0 to 255, 0 to 1023

	Range	
	Byte Length	1 to 5
SPI Trigger	Trigger Condition	Timeout
	Timeout Value	30 ns to 10 s
	Data Bits	4 bit to 32 bit
	Edge	Rising、Falling
CAN Trigger	Signal Type	CAN_H, CAN_L, TX, RX
	Trigger Condition	Start of Frame, Type of Frame, Identifier, Data, ID & Data, End of Frame, Missing Ack, Bit Stuffing Error
	Baud Rate	Common, Custom
	Sample Point	5% to 95%
	Frame Type	Data, Remote, Error, Overload
LIN Trigger	Condition	Interval、ID、ID/Data、Data Error
	Baud Rate	Common, Custom

Waveform Generator

Bandwidth	50 MHz		
Sample Rate	300M Sa/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,Sin(x)/x、 step wave、 noise etc 28 build-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	FDS1102	High Z	2mVpp to 10Vpp
	FDS1102A	50Ω	1mVpp to 5Vpp
	FDS3102	High Z	2mVpp to 20Vpp

FDS3202 FDS3302		50Ω	1mVpp to 10Vpp
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)	
AG input protection		FDS1102 FDS1102A	None
		FDS3102 FDS3202 FDS3302	Yes
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	300M Sa/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
Current	0.1～3A
Power	15W
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		
0CP	0～3.1A		

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)

[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.

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);EXT Trig In; LAN interface; earphone jack	
Power Supply	100V – 240 VACRMS, 50/60 Hz, CAT Ⅱ	
Power Consumption	PWR empty load	＜30W
	PWR full load	＜90W
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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