8.5 GHz Compact USB Real-Time Spectrum Analyzer

SAM-80

Product Brochure V1.0

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- 9 kHz~8.5 GHz real-time spectrum analyzer/receiver
- 100 kHz-6.3 GHz analog signal generator (opt.)
- 100 MHz analysis bandwidth, 300 GHz/sec spectrum sweep speed
- FPGA based digital signal processing
- 1 GHz Phase noise: -120 dBc/Hz @10kHz.
- Equipped with preamplifier, 1GHz DANL: -169 dBm/Hz.
- Core module supported, light as 168g, size:142×54×16mm, power consumption:8-11 W
- Highly compatible API interfaces and SAStudio4 GUI
- Compatible with ARM and x86 processors, Linux and Windows operating systems
- Operating temperatures range from -20 °C/-40 °C to 65 °C (option)
- Built-in OCXO (option), temperature drifting≤0.15 ppm
- USB 3.0/2.0 Type-C interface

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SAM-80 Technical Specifications * (typical value)				
Indicator test basis **Hardware Version: 0** API: 0.54.12 FPGA: 0.54.0 MCU: 0.54.11 SAS4: 1.54.43				
Frequency				
Frequency Range	9 kHz~8.5 GHz			
Initial Frequency Accuracy	<1 ppm, Supporting program manual correction			
Reference Clock	Internal or external, program-controlled switching; Internal 10 MHz TCXO aging<1 ppm/year, temperature drift<1 ppm; Internal OCXO (option), temperature drifting≤0.15 ppm			
GNSS disciplining	Support disciplining and recalculating of the built-in reference clock by an external GNSS component (option)			
Spectrum Purity				
SSB Phase Noise	dBc/Hz (with 01 opt. built-in OCXO)			
Carrier Frequency	500 MHz	1 GHz	3 GHz	8.5 GHz
1 kHz	-114.3	-110.8	-102.7	-93.3
10 kHz	-126.5	-120.0	-110.5	-102.5
100 kHz	-125.1	-120.1	-111.7	-102.4
1 MHz	-134.8	-133.5	-125.0	-117.1
Residual Response Spurious rejection on dBm RBW =1 kHz, positive peak detector	Frequency Range	R.L.=0 dBm	R.L.=-20 dBm	R.L.=-50 dBm
	100 kHz~100 MHz	< -101	< -107	< -127
	100 MHz~6.3 GHz	< -87	< -106	< -115
	6.3 GHz~8.5 GHz	< -83	< -96	< -117
Residual Response Spurious rejection off	100 kHz~100 MHz	< -87	< -102	< -123
	100 MHz~6.3 GHz	< -76	< -91	< -113
	6.3 GHz~8.5 GHz	< -81	< -94	< -115
Image Frequency Suppression	>90 dBc (spurious rejection on), >35 dBc (spurious rejection off, typical value)			
Local Oscillator Related Spurious	<-65 dBc (Offset Center Frequency +/- (N/M)*125MHz, N/M = 1,2,3,4,5…)			
Signal Processing				
Analysis Bandwidth	Maximum 100 MHz, Decimate Factor:1			
IQ Data	125 MSPS (standard). Support 120MSPS-125MSPS program adjustable (option 03), 1Hz step Decimate factor: 1,2,4,8,16,32,64, 128,256,512,1024,2048,4096 supported (FPGA), 13grades in total.			
Storage Depth	The built-in memory depth is 128 MBytes			
	Supports continuous and uninterrupted storage when the data generation rate is less than the bus bandwidth, and the storage depth is only limited by the hard disk capacity			
External Trigger Response	Maximum response frequency 500 times/sec			
Analog IF Output	Not available			
Amplitude				
Maximum safe input power (CW)	26dBm	30 MHz~8.5 GHz and the preamplifier off (R.L. ≥ 0 dBm)		
	10dBm	100 kHz~30 MHz or preamplifier on (R.L. <0 dBm)		
Maximum DC Voltage	±15 VDC			
Display Range	DANL~26 dBm			
Amplitude Accuracy	+/- 1.5 dB			
IF in-band spectrum ripple	±1.75 dB (100 MHz analog IF bandwidth)			
Reference level (R.L.)	-50 dBm~23 dBm			

RF Preamplifiers	setting as automatically turn on or forcibly turn off			
VSWR	<1.7:1	30 MHz~8.5 GHz（R.L. ≥ 10 dBm）		
	<2.0:1	30 MHz~8.5 GHz（R.L. ≥ 0 dBm）		
	<2.5:1	30 MHz~8.5 GHz（R.L. ≥ -40 dBm）		
Display Average Noise Level (DANL) dBm/Hz RBW=10kHz RMS detector	Frequency Range	R.L.= 0 dBm （IFGainGrade = 3）	R.L.=-20 dBm （IFGainGrade = 3）	R.L.=-50 dBm （IFGainGrade = 3）
	9 kHz	-113.6	-122.2	-140.5
	1 MHz~100 MHz	-131.5	-137.2	-163.2
	100 MHz~3.0 GHz	-131.7	-149.5	-166.6
	3.0 GHz~6.3 GHz	-134.8	-144.4	-164.6
	6.3 GHz~7.5 GHz	-127.4	-140.1	-161.2
	7.5 GHz~8.5 GHz	-123.8	-137.5	-158.8
Standard Spectrum Analysis				
Detector	Positive peak, Negative peak, Sampling, Average, RMS, Max Power			
RBW	0.1 Hz~10 MHz			
VBW	0.1 Hz~10 MHz			
Trace Function	Sample, Positive Peak, Negative Peak, Local average, Maximum hold, Minimum hold, Average			
Data Chart	SAStudio4 software provides regular spectrum, waterfall chart, and historical trace			
Sweep speed - Standard Spectrum Analysis	310.3 GHz/s	FPGA	RBW≥250 kHz, B-Nuttal window, spurious rejection: Standard	
	150.2 GHz/s	FPGA	RBW=250 kHz, B-Nuttal window, spurious rejection: Enhanced	
	38.7 GHz/s	FPGA	RBW=30 kHz, B-Nuttal window, spurious rejection: Enhanced	
	1.8 GHz/s	CPU	RBW=1 kHz, B-Nuttal window, spurious rejection: Enhanced	
Detection Analysis/Zero Span				
Highest Time Resolution	8 ns			
Maximum Analysis Bandwidth	100 MHz			
Trace Detection	Positive peak, Negative peak, Sampling, Average, RMS, Max Power			
Real Time Spectrum Analysis				
FFT Analysis	Variable point FFT engine implemented by FPGA. frame rate compression and trace detection are supported. There is strictly no gap and overlap between FFT frames			
	FFT refresh rate=10 ^ 9 ns/(N * D * 8 ns); POI = 2*N*D*8ns N is the number of FFT points (2048, 1024,512,256,128,64,32), and D is the decimate factor (1, 2, 4, 8...)			
	Typical Settings	FFT Refresh Rate	POI	
	N = 2048, D = 1	61,035 times/sec	32.768 us	
	N = 32, D = 1	3,906,250 times/sec	0.512 us	
Real-time Analysis Bandwidth	100 MHz			
Window Function	B-Nuttall, FlatTop			
RBW	14.73 MHz-3.59 kHz (Flattop window); 7.81 MHz~1.90 kHz (B-Nuttall); 13 grades for each window type			
Amplitude Resolution	0.75 dB			
Signal generator（option）				
Frequency range	100 kHz~6.3 GHz, 10 Hz for each step			
Power range	-50 dBm~0 dBm, 0.25 dB for each step			

VSWR	<2.0:1		30 MHz~6.3 GHz		
Non-harmonic spurs	<-50 dBc				
Harmonic wave	100 kHz~30 MHz	30 MHz~1.6 GHz	1.6 GHz~3 GHz	3 GHz~3.2 GHz	3 GHz~8.5 GHz
Second harmonic	<-10 dBc	<-10 dBc	<-20 dBc	<-20 dBc	<-20 dBc
Third harmonic and above	<-10 dBc	<-10 dBc	<-20 dBc	<-20 dBc	<-20 dBc
Signal leakage to receiver	100 kHz~30 MHz		>90 dBc		
	30 MHz~3 GHz		>80 dBc		
	3 GHz~6.3 GHz		>70 dBc		
	6.3 GHz~8.5 GHz		>60 dBc		
General					
Input and Output	Power Supply	Type-C (1), dedicated power supply port, please provide 5 V2 A peak power supply capacity Allowable voltage range: 4.75~5.25 V, ripple less than 200 mVpp			
	Data	Type-C (2), USB3.0 (USB2.0 Available but bandwidth limited)			
	RF input	SMA (F), Input impedance 50 Ω			
	External reference clock input	MCX (F) (1), amplitude ≥ 1.5 Vpp, input impedance 330 Ω			
	External reference clock output	Not available			
	External trigger input	Integrated in MUXIO, 3.3 V CMOS, input: high impedance			
	External trigger output	Integrated in MUXIO (type C), 3.3 V CMOS			
	Analog IF output	Not available			
Power Consumption	Peak: 11 W, typical: 8 W~11 W, Power port (5V2A Max), Data port (5V1A Max)				
Operating Temperature (ambient temperature /core temperature)	0~50 °C/0~70 °C (Standard temperature class)				
	-20~65 °C/-20~85 °C (Extended Temperature Class Option) (plastic enclosure and fan not included)				
	-40~65 °C/-40~85 °C (Wide Temperature Class Option) (plastic enclosure and fan not included)				
Storage Temperature (ambient temperature)	-20~70 °C (Standard temperature class)				
	-40~85 °C (Extended temperature class and wide temperature options) (plastic enclosure and fan not included)				
Size and Weight	142x54x16mm, 168 g (Excluding protective case and structural fittings, including connector length) 156x62x22mm, 296 g (Including protective case and structural fittings, including connector length)				
Packaging and Accessories	Flash drive * 1, USB 3.0 cable * 2, Power adapter * 1				

*The typical values of the indicators are applicable for the following conditions: (1) Start up and warm up for 20 minutes; (2) Ambient temperature 25 ℃ (core temperature 50 ℃); (3) Spurious rejection on; (4) 100MHz bandwidth and IFGainGrade=3; (5) The user shall provide the necessary heat dissipation conditions to ensure that the ambient temperature and the core temperature of the equipment are within the rated range at the same time.

Code	Option	Explanation
01	Built-in OCXO reference clock (hardware opt.)	Providing a reference clock with better stability than the standard configuration, with a temperature drift of<0.15 ppm, increasing the overall power consumption by 0.8 W.
02	Built-in analog signal generator	100 kHz-6.3 GHz signal generator
03	Variable ADC sample rate	Provides a variable ADC sampling rate, increasing the overall power consumption by 0.3W
10	IO extension board (accessory)	Converting the MUXIO interface into multiple MMCX and board to wire connector to facilitate the connection of trigger input, output, and other signals.
11	External GNSS (accessory)	Standard GNSS module connected to MUXIO.
12	External high precision GNSS (accessory)	High precision GNSS module connected to MUXIO.
13	External GNSS disciplined OCXO reference clock (accessory)	Providing GNSS disciplined reference clock and 1PPS, increasing the overall power consumption by 1.1W.
20	Extended temperature class (hardware opt.)	- 20~65 ℃/- 20~85 ℃(Extended temperature class opt.)
21	Wide temperature class (hardware opt.)	- 40~65 ℃/- 40~85 ℃(Wide temperature class opt.)

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SAM-80 Product Brochure