

# 6.3 GHz Compact USB Real-Time Spectrum Analyzer

## SAM-60 M3

### Product Brochure V1.0

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- 9 kHz~6.3 GHz real-time spectrum analyzer
- Integrated 100 kHz-6.3 GHz analog signal generator (opt.)
- 100 MHz analysis bandwidth, 300 GHz/sec spectrum sweep speed , FPGA signal processing
- 1GHz phase noise: -114 dBc/Hz@10kHz
- Equipped with preamplifier, 1GHz DANL: -166.6 dBm/Hz
- Core module supported, weight 168g, size 142×54×16mm, power consumption 7-10W
- Highly compatible API interfaces and SASstudio4 GUI
- Compatible with ARM and x86 processors, Linux and Windows operating systems
- Operating temperatures range from -20 oC/-40 oC to 65 oC (option)
- Built-in OCXO (option), temperature drift≤0.15 ppm
- USB3.0/2.0 Type-C interface



從伸科技  
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SAM-60 M3 Technical Specifications * (typical value)					
Indicator test basis	Hardware Version: R5	API: 0.55.12	FPGA: 0.55.2	MCU: 0.55.9	SAS4: 1.55.57
Frequency					
Frequency Range	9 kHz~6.3 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; built-in OCXO (option), temperature drift<0.15 ppm				
Spectrum Purity					
SSB Phase Noise	dBc/Hz				
Carrier Frequency	500 MHz	1 GHz	3 GHz	6 GHz	
1 kHz	-112.8	-107.5	-99.3	-93.1	
10 kHz	-120.6	-114.2	-103.6	-101.2	
100 kHz	-120.1	-112.5	-101.8	-99.3	
1 MHz	-134.1	-132.8	-127.7	-122.7	
Residual Response Spurious rejection on	Frequency Range	R.L.=0 dBm	R.L.=-20 dBm	R.L.=-50 dBm	
	100kHz~100MHz	-90	-104	-132	
	100MHz~6.3GHz	-90	-103	-111	
Residual Response Spurious rejection	100kHz~100MHz	-79	-97	-120	
	100MHz~6.3GHz	-90	-103	-111	
Image Frequency Suppression	>90 dBc (spurious rejection on, typical value), >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	125MSPS, Decimate factor: 1,2,4,8,16,32,64,128,256,512,1024,2048,4096 supported (FPGA)				
Storage Depth	The built-in memory depth is 128 Mbytes				
	Supports continuous and uninterrupted storage when the data generation rate is less than				
External Trigger Response	Maximum response frequency 500 times/sec				
Analog IF Output	Not available				
Amplitude					
Maximum safe input power (CW)	26 dBm	30 MHz~6.3 GHz and the preamplifier off (R.L. ≥ 0 dBm)			
	10 dBm	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	Converting bands (frequency ≥ 30MHz) are equipped with preamplifier that can be set as				
VSWR	<1.7:1	30 MHz~6.3 GHz (R.L. ≥ 10 dBm)			
	<2.0:1	30 MHz~6.3 GHz (R.L. ≥ 0 dBm)			
	<2.5:1	30 MHz~6.3 GHz (R.L. ≥ -40 dBm)			

Display Average Noise Level (DANL) dBm/Hz RBW=10kHz RMS detector	Frequency Range	R.L.= 0 dBm ( IFGainGrade = 2 )	R.L.= -20 dBm ( IFGainGrade = 3 )	R.L.= -50 dBm ( IFGainGrade = 3 )	
	9 kHz	-122	-134	-149	
	100kHz	-132	-140	-152	
	100 MHz~3.0 GHz	-129	-145	-161	
	3.0 GHz~6.3 GHz	-129	-141	-158	
<b>Standard Spectrum Analysis</b>					
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,				
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-Nuttall window, spurious rejection: Standard		
	150.2 GHz/s	FPGA	RBW=250 kHz, B-Nuttall window, spurious rejection:		
	38.7 GHz/s	FPGA	RBW=30 kHz, B-Nuttall window, spurious rejection: Enhanced		
	1.8 GHz/s	CPU	RBW=1 kHz, B-Nuttall window, spurious rejection: Enhanced		
<b>Detection Analysis/Zero Span</b>					
Highest Time Resolution	8 ns				
Maximum Analysis Bandwidth	100 MHz				
Detector	Positive peak, Negative peak, Sampling, Average, RMS, Max Power				
<b>Real Time Spectrum Analysis</b>					
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= $10^9 \text{ ns}/(N \cdot D \cdot 8 \text{ ns})$ ; POI = $2 \cdot N \cdot D \cdot 8 \text{ ns}$ N is the number of FFT points (2048, 1024, 512, 256, 128, 64, 32), and D is the decimate factor (1, 2, 4,				
	Typical Settings	FFT Refresh Rate		POI	
	N = 2048 · D = 1	61,035 times /second		32.768 us	
N = 32 · D = 1	3,906,250 times /second		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				
Amplitude Resolution	0.75 dB				
<b>Signal generator (option)</b>					
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	30 MHz~1.6 GHz	1.6 GHz~3 GHz	3 GHz~3.2	3 GHz~6.3 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		

General		
Input and Output	Power Supply	Type-C (1), dedicated power supply port, please provide 5V 2A 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	MCX (F) (1), amplitude ≥ 1.5 Vpp, input impedance 330 Ω
	External reference clock	Not supported
	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 supported
Power Consumption	Peak: 10 W, typical: 7 W~10 W, Power port (5V 2A Max), Data port (5V 1A Max)	
Operating Temperature (ambient temperature /device 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)	-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 °C (core temperature 50 °C); (3) SWP-Spurious rejection on; (4) 100MHz analysis 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
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	Providing GNSS disciplined reference clock and 1PPS, increasing the
20	Extended temperature class (hardware opt.)	- 20~65 °C/- 20~85 °C(Extended temperature class opt.)
21	Wide temperature class (hardware opt.)	- 40~65 °C/- 40~85 °C(Wide temperature class opt.)

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