S1435 Series Signal Generator

(Frequency Range: 9kHz - 3GHz/ 6GHz/ 12GHz/ 20GHz/ 40GHz)

Key Features

- Wide frequency coverage
- High output power
- Excellent phase noise
- Extremely short frequency switching time
- High performance pulse modulation
- Built-in multi-function function generator
- Small size and light weight
- High-sensitivity LED touch screen

Overview

Based on innovative technologies, Saluki S1435 series signal generator achieves balance in terms of performance, economy and volumetric weight. It also has excellent spectral purity, with a single side band (SSB) phase noise of -136dBc/Hz (when the carrier is 1GHz and the frequency offset is 10kHz) or -116dBc/Hz (when the carrier is 10GHz and the frequency offset is 10kHz). It provides a high power output and a large dynamic range, with the maximum output power up to 20dBm@20GHz and an output power dynamic range greater than 150dB. It responds fast and switches to another frequency in only 1ms, which shortens the test time and improves

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test efficiency, meeting the needs of massive data testing; in addition, it also has excellent analog modulation and pulse modulation functions. By adopting advanced frequency synthesis and RF channel signal processing technologies, it can achieve high performance while reducing the cost. Besides, it is equipped with a 7-inch high-sensitivity LED touch screen, and supports operation by touch screen, panel buttons, rotary knobs, external mouse and keyboard, etc., which fully upgrades the users' operation experience. It adopts portable 3U chassis structure and is featured by small size and light weight, and thus is easy to carry. The S1435 series signal generator can meet both the test requirements for high performance in the R&D phase and the test requirements for high efficiency in the production phase.

Advantage Characteristics

1. Wide frequency coverage

The S1435A/B/C/D/F series signal generator provides a frequency range of 9kHz - 3GHz/6GHz/12GHz/20GHz/40GHz. Its lowest frequency can be as low as 9kHz and its highest frequency can be as high as 40GHz, which can meet the needs of wide frequency band testing.

2. High output power

When the H08 high-power output option is selected, the measured value of the full-band output power of the S1435A/B/C/D series signal generator can be above 20dBm and the full-band output power of the S1435F series signal generator can be above 17dBm. In the test where high-power excitation signals are required, the S1435 series signal generator can be used to obtain the required test signal without an external amplifier.

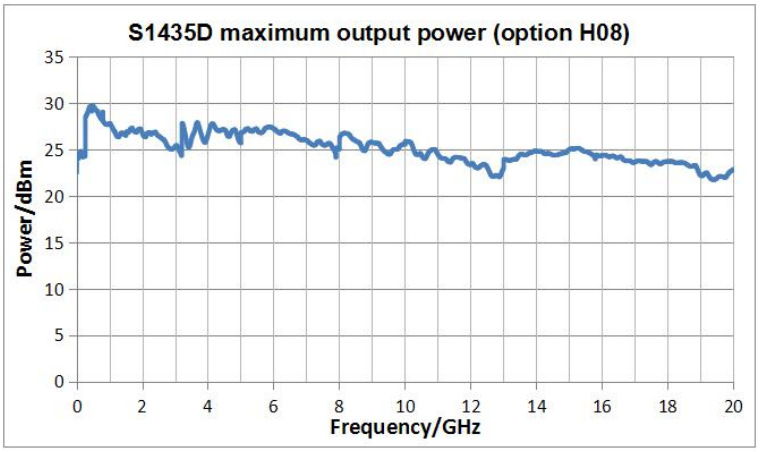


Fig.1 S1435D+H08 maximum output power

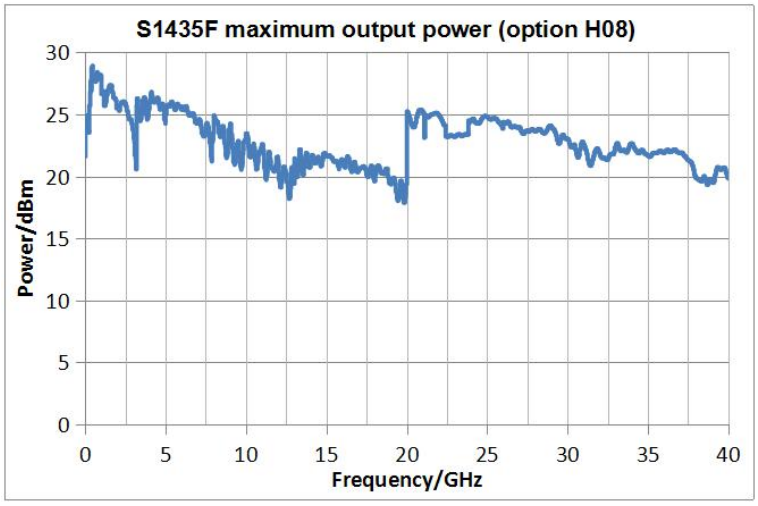


Fig.2 S1435F+H08 maximum output power

3. Excellent phase noise

The S1435 series signal generator provides two steps of phase noise for users. The standard phase noise is measured at -101dBc/Hz (10GHz@10kHz), and the phase noise can be as low as -116dBc/Hz (10GHz@10kHz) when the low phase noise option is selected. Users can select the phase noise as required to achieve the optimal cost performance.

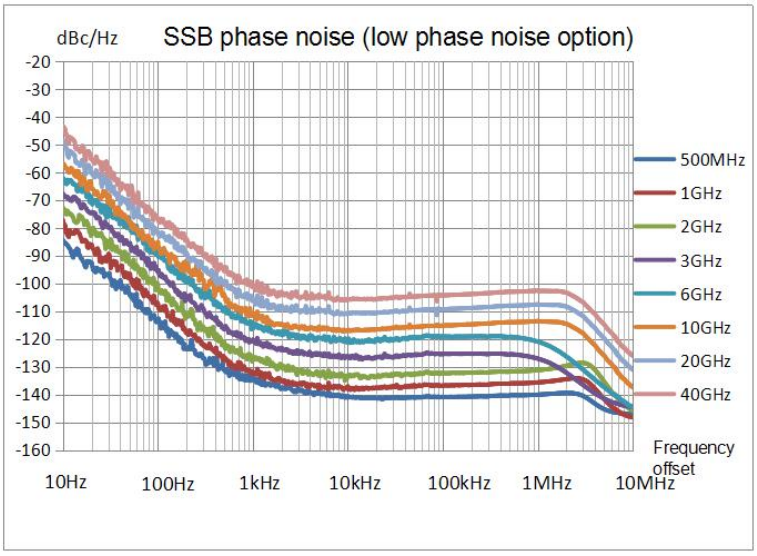


Fig.3 SSB phase noise

4. Extremely short frequency switching time

The S1435 series signal generator can realize fast frequency switching in the full frequency band, and the measured frequency switching time is 0.67ms, which can meet the test requirements for high speed.

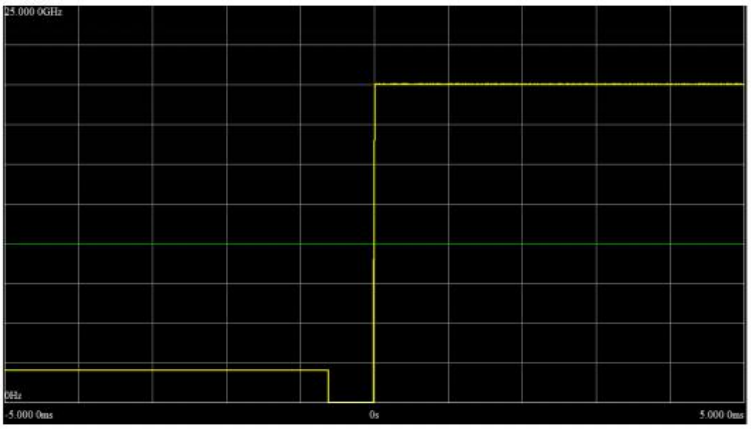


Fig.4 2GHz to 20GHz frequency switching time

5. High performance pulse modulation

The pulse switch ratio is greater than 80dB, and the rise and fall time is shorter than 10ns. When the narrow pulse option H04 with a minimum pulse width of 20ns, a pulse width range of 20ns-42s-10ns and a step of 10ns is selected, it supports various triggering modes such as gating and external triggering. It's also equipped with the pulse string required in radar test.

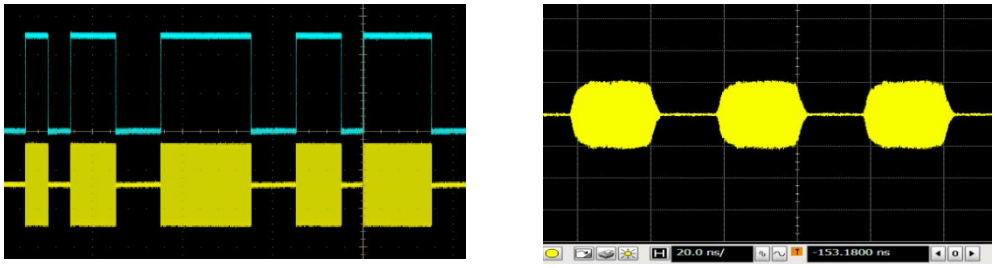
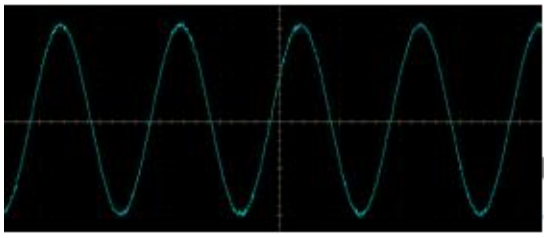


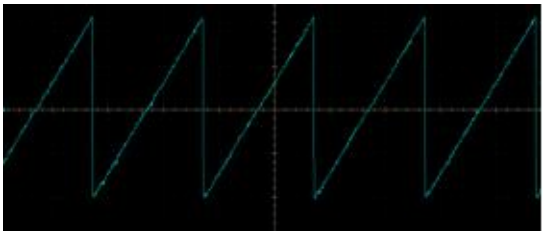
Fig.5 Pulse string is 5 and pulse width is 20ns

6. Multi-function function generator

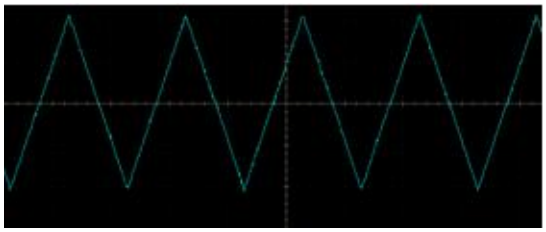
The multi-function function generator consists of seven waveform generators for generating AM/FM/ΦM modulated signals and low-frequency output signals. Two waveform generators can generate a dual-tone modulated signal by internal addition and are used for AM/FM/ΦM. The seven waveform generators include two standard function generators, one double-function generator, one scan function generator, two noise generators, and one DC generator. The DC generator generates DC levels, which can only be used for low frequency output. For the waveform generator, its sine wave frequency range is 0.1Hz - 10MHz, and its frequency range of triangle wave, square wave, sawtooth wave and pulse is 0.1Hz - 1MHz, and the frequency resolution is 0.1Hz.



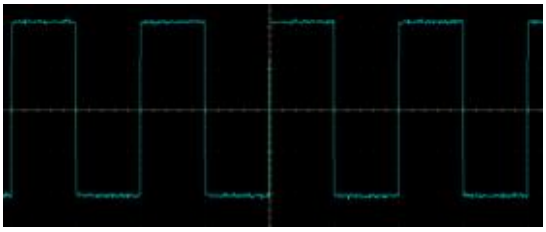
Sine wave



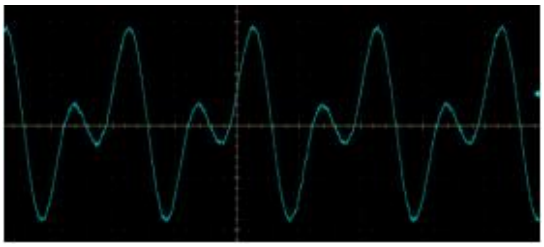
Sawtooth wave



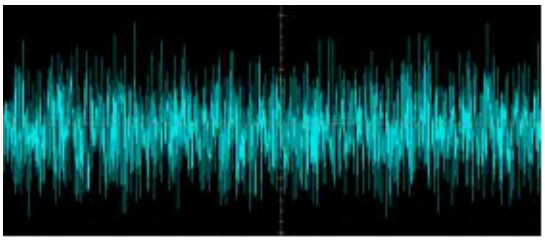
Triangle wave



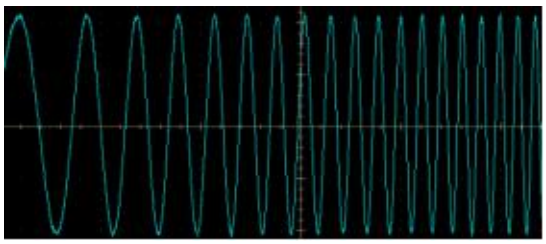
Square wave



Double sine wave



Noise



Frequency sweep sine

Fig.6 Seven waveforms

7. Small size and light weight

By adopting the portable 3U-high chassis design, the S1435ABCDF series signal generator has its weight and volume greatly reduced (compared to bench instruments). The heaviest model of this series is 10.9kg, and the lightest model is 7.4kg.

8. High-sensitivity LED touch screen

The 7-inch wide LED display which supports a resolution of 800 × 480 pixels clearly shows the instrument status information. The combination of the capacitive screen

and the tailored window interface enables the S1435ABCDF series signal generator to respond sensitively and accurately to users' touch operations. In addition to the touch screen, the user can also operate the instrument by the panel buttons, the rotary knobs (with the Enter function), and the external keyboard and mouse conveniently and quickly.

Typical Applications

1. General test

The S1435 series signal generator provides complete functions and a frequency range of 9kHz - 40GHz. It provides AM, FM, ΦM, and PM analog modulation functions and supports step scan and list scan. Also, it has excellent performance. By adopting a design which realizes the balance between performance, economy and volumetric weight, it supports free configuration of various options, which makes it widely available. In respect of cost, it can be used for teaching; in respect of performance, it can be used in laboratory tests.

2. Defense test

The S1435 series signal generator supports high-performance pulse modulation, with a pulse-to-modulation switch ratio greater than 80dB, the rise and fall time less than 10ns, and the minimum pulse width of 20ns. It supports various pulse patterns such as pri stagger, prf jittering and pulse string, which is suitable for radar system testing. It has excellent phase noise performance and is available for receiver testing. It has a small size and can be carried along for field testing.

3. Production line test

The S1435 series signal generator takes only 1ms to switch to another frequency. It provides a high test speed, shortens the test time, and improves the test efficiency, thus meeting the requirements of massive data test. It provides a high power output and needs no external power amplifier, thus saving the space and cost. It supports multiple control interfaces such as USB, LAN and GPIB, which facilitates the formation of an automated test system and is suitable for production line test.

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Technical Specifications

Frequency Features			
Frequency Range	S1435A: 9kHz - 3GHz S1435B: 9kHz - 6GHz S1435C: 9kHz - 12GHz S1435D: 9kHz - 20GHz S1435F: 9kHz - 40GHz	Frequency	N (number of fundamental and harmonic waves)
		9kHz≤f<250MHz	1/8
		250MHz≤f≤375MHz	1/16
		375MHz<f≤750MHz	1/8
		750MHz<f≤1.5GHz	1/4
		1.5GHz<f≤3GHz	1/2
		3GHz<f≤6GHz	1
		6GHz<f≤12GHz	2
		12GHz<f≤24GHz	4
		24GHz<f≤40GHz	8
Frequency Resolution	0.001Hz		
Frequency Switching Time	≤1ms (typical value [2])		
Time Base Aging Rate (Typ.)	Standard: $\pm5\times10^{-7}$/year (after continuous switch-on for 30 days) High stability time base option H10: $\pm5\times10^{-8}$/year (after continuous switch-on for 30 days), $\pm5\times10^{-10}$/day(after continuous switch-on for 30 days)		
Reference Output	Frequency	10MHz	
	Power	>+4dBm, to 50Ω load	
Reference Input	Frequency	1MHz - 50MHz, step 1Hz	
	Power	0dBm to +7dBm, impedance 50Ω	
Scanning Features			
Scanning Mode	Step scan, list scan		
Scan Dwell Time	100μs - 100s		

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Power Features					
Minimum Power	Standard		Option H01		
	-15dBm (can be set -20dBm)		-110dBm (can be set -135dBm)		
Maximum Power (25±10°C)	Frequency range	Standard	High power output (option H08)		
	S1435A/B				
	9kHz≤f≤3GHz	18dBm	22dBm		
	3GHz<f≤5GHz	16dBm	20dBm		
	5GHz<f≤6GHz	15dBm	18dBm		
	S1435C/D				
	9kHz≤f≤3GHz	16dBm	21dBm		
	3GHz<f≤20GHz	15dBm	20dBm		
	S1435F				
	9kHz≤f≤3GHz	14dBm	20dBm		
	3GHz<f≤17GHz	13dBm	17dBm		
	17GHz<f≤40GHz	11dBm	15dBm		
Power Accuracy (25±10°C)	Standard				
	Frequency Power (dBm)	10 - max. power	-10 to 10	-15 to -10	
	9kHz≤f≤2GHz	±0.8dB	±0.6dB	±1.5dB	
	2GHz<f≤20GHz	±0.9dB	±0.7dB	±1.5dB	
	20GHz<f≤40GHz	±0.9dB	±0.8dB	±1.8dB	
	H01A/B programmable step attenuator option				
	Frequency Power (dBm)	10 - max. power	-10 to 10	-70 to -10	-90 to -70
	9kHz≤f≤2GHz	±0.8dB	±0.6dB	±0.7dB	±1.4dB
	2GHz<f≤20GHz	±0.9dB	±0.7dB	±0.7dB	±1.6dB
	20GHz<f≤40GHz	±0.9dB	±0.8dB	±1.1dB	±2.0dB
Power Resolution	0.01dB				

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Output Impedance	50Ω (rated value[3])		
Source Standing Wave Ratio, VSWR (Internal Fixed Amplitude) (Typ.)	9kHz≤f≤3GHz	<1.7	
	3GHz<f≤13GHz	<1.6	
	13GHz<f≤20GHz	<1.8	
	20GHz<f≤40GHz	<1.6	
Maximum Reverse Power	0.5W (0V DC) (rated value)		
Spectral Purity [4]			
Harmonic Wave (at +10dBm)	9kHz≤f≤10MHz	<-23dBc	
	10MHz<f≤2GHz	<-30dBc	
	2GHz<f≤6GHz (S1435B)	<-30dBc	
	2GHz<f≤20GHz	<-55dBc	
	20GHz<f≤40GHz	<-50dBc (typ.)	
Subharmonic Wave (at +10dBm)	9kHz≤f≤6GHz	None	
	6GHz<f≤12GHz	<-60dBc	
	12GHz<f≤24GHz	<-55dBc	
	24GHz<f≤40GHz	<-50dBc	
Non-Harmonic Wave (at 0dBm, 10kHz Frequency Offset)	Frequency	Standard	
	9kHz≤f≤250MHz	<-54dBc	
	250MHz<f≤3GHz	<-62dBc	
	3GHz<f≤6GHz	<-56dBc	
	6GHz<f≤12GHz	<-50dBc	
	12GHz<f≤24GHz	<-44dBc	
	24GHz<f≤40GHz	<-38dBc	
SSB Phase Noise (dBc/Hz at +10dBm)	Standard		
	Frequency	100Hz	10kHz
	100MHz	-83	-115

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SSB Phase Noise (dBc/Hz at +10dBm)	250 MHz	-93	-127		
	500MHz	-89	-121		
	1 GHz	-83	-115		
	2 GHz	-77	-109		
	3 GHz	-74	-105		
	4 GHz	-71	-103		
	6 GHz	-68	-99		
	10 GHz	-63	-95		
	20 GHz	-57	-89		
	40 GHz	-51	-83		
	Low phase noise (option H06)				
	Frequency	100Hz	1kHz	10kHz	100kHz
	100MHz	-83	-112	-131	-131
	250 MHz	-93	-123	-139	-139
	500MHz	-89	-119	-135	-135
	1 GHz	-83	-113	-132	-132
	2 GHz	-77	-107	-126	-126
	3GHz	-74	-104	-121	-121
	4 GHz	-71	-101	-120	-120
	6 GHz	-68	-98	-115	-115
	10 GHz	-63	-93	-113	-113
	20 GHz	-57	-87	-107	-107
	40 GHz	-51	-81	-101	-101
Modulation Features					
Frequency Modulation (Option H02)	Maximum frequency offset: N × 16MHz (N is the number of fundamental harmonic wave)				
	Accuracy (1kHz modulation rate, frequency offset: N × 500kHz): ± (2% × set frequency offset + 20Hz)				

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	Modulation rate (3dB bandwidth, frequency offset: N × 500kHz): DC - 7MHz	
	Distortion (1kHz rate, frequency offset: N × 500kHz): <0.4%	
Phase Modulation (Option H02)	Maximum phase offset: N × 16rad (N is the number of fundamental harmonic wave)	
	Accuracy (1kHz modulation rate, frequency offset: N × 500kHz): ± (2% × set phase offset + 0.01rad)	
	Modulation rate (3dB bandwidth, phase offset: N × 8rad): DC - 1MHz	
	Distortion (1kHz modulation rate, phase offset: N × 8rad): <0.4%	
Amplitude Modulation (Option H02)	Maximum depth: >90%	
	Modulation rate: (1kHz modulation rate, 30% modulation depth): ± (4% × set depth +1%)	
	Modulation rate (bandwidth: 3dB; modulation depth: 30%; frequency test points: 1GHz, 5GHz, 20GHz, 40GHz): DC - 100kHz	
	Distortion: (1kHz modulation rate, linear mode, total harmonic distortion, 30% modulation depth): <2%	
Pulse Modulation [5] (Option H03)	Switching ratio	>80dB
	Rise and fall time	<10ns
	Minimum pulse of internal fixed amplitude	1μs
	Minimum pulse of non-fixed amplitude	100ns
Narrow Pulse Modulation [5] (Option H04)	Switching ratio	>80dB
	Rise and fall time	<10ns
	Minimum pulse of internal fixed amplitude	1μs
	Minimum pulse of non-fixed amplitude	20ns
Internal Analog Modulation Signal Generator (Option H02)	It provides three independent signals for frequency/phase modulation, amplitude modulation and low frequency output signals Waveform: sine wave, square wave, triangle wave, sawtooth wave Frequency range: sine wave 0.1Hz - 10MHz Square wave, triangle wave, sawtooth wave 0.1Hz - 1MHz	

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	Frequency resolution: 0.1Hz Low frequency output: amplitude 0 - 5V peak (rated value), to 50Ω load
Internal Pulse Generator (Option H03)	Pulse width: 20ns - (42s-10ns) (rated value)
	Pulse period: 40ns - 42s (rated value)
	Resolution: 10ns
Multi-Function Function Generator (Option H05)	The Multi-function generator consists of 7 waveform generators. The generator can be set separately or five generators can be set simultaneously by using the AM, FM/ΦM and the composite modulation features in the low-frequency output. Waveform: Function generator 1: sine wave, triangle wave, square wave, sawtooth wave, pulse Function generator 2: sine wave, triangle wave, square wave, sawtooth wave, pulse Dual function generator: sine wave, triangle wave, square wave, sawtooth wave, pulse, phase offset and amplitude ratio of audio 2 relative to audio 1; Scan function generator: sine wave, triangle wave, square wave, sawtooth wave; Noise generator 1: uniform, Gaussian; Noise generator 2: uniform, Gaussian; DC: LF output only; Frequency parameters: Sine wave: 0.1Hz to 10MHz; Triangle wave, square wave, sawtooth wave, pulse: 0.1Hz to 1MHz; Resolution: 0.1Hz;
General Features	
RF Output Port	S1435A/B/C: N type (negative), impedance 50Ω
	S1435D: 3.5mm (positive), N type (negative) (option H91), impedance 50Ω
	S1435F: 2.4mm (positive), impedance 50Ω
Max.Dimensions (W × H × D)	330mm × 147mm × 397mm (excluding the handle) 420mm × 147mm × 445mm (including the handle)
Weight	<12kg (the weight varies with the model and option configuration)

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Power Supply	100 - 120VAC, 50 - 60Hz; or 200 - 240VAC, 50 - 60Hz (self-adaptive)
Power Consumption	Less than 300W
Temperature Range	Operating temperature: 0°C to +50°C; storage temperature: -40°C to +70°C

Note:

1. The S1435 series signal generator can be stored at ambient temperature for 2 hours. After preheating for 30 minutes, the attenuator is automatically coupled (or ALC power is greater than -5dBm) to meet the performance of each indicator within a given working range.
2. The typical value is a supplementary feature given based on the stereotype value, which is only for user reference, and will not be assessed.
3. The rated value refers to the expected performance, or describes the product performance that is useful in the product but is not included in the product warranty.
4. The spectral purity indicates that the point frequency has no modulation mode.
5. The technical specifications of pulse modulation and narrow pulse modulation are applicable to frequencies above 50MHz.

Standard Package

Item	Name	Description
1	S1435 signal generator	S1435A: 9kHz - 3GHz S1435B: 9kHz - 6GHz S1435C: 9kHz - 12GHz S1435D: 9kHz - 20GHz S1435F: 9kHz - 40GHz
2	Power cord assembly	Standard three-core power cord
3	User manual	\
4	Programming manual	\
5	Product certificate	\

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Options

Part No.	Name	Description
S1435-H01-A	115dB programmable step attenuator	Expand the output power dynamic range.
S1435-H01-C		
S1435-H01-F		
S1435-H02	Analog modulation	Increase analog modulation functions, including AM, FM, ΦM, and low frequency output.
S1435-H03	Pulse modulation	Increase the pulse modulation function with a minimum pulse width of 100ns.
S1435-H04	Narrow pulse modulation	Increase the pulse modulation function with a minimum pulse width of 20ns.
S1435-H05	Multi-function function generator	Add a richer analog modulation signal format. (Note: The H05 option is available after the H02 analog modulation option is selected).
S1435-H06-A	Low phase noise	Optimize phase noise, 10GHz@10kHz: -113dBc/Hz.
S1435-H06-C		
S1435-H08	High power output	Increase the maximum output power.
S1435-H10	High stability time base option	Internal time base aging rate.
S1435-H50	Calibration certificate	Instrument calibration.
S1435-H91	N type connector for RF output	N type connector for RF output, applicable to S1435D.
S1435-H92	RF output moved to the rear panel	RF output on rear panel.
S1435-H93	Portable handle	3U handle.
S1435-H94	Rack mount kit	Mounting kit for the upper cabinet.
S1435-H95	Aluminum alloy transport case	High-strength lightweight aluminum alloy transport case with handle and universal roller for easy transportation.

Note: *Information will conduct the necessary updates, the contents of this document are subject to change without notice*

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