S3987B/D/E/F/H/L/P Noise Figure Analyzer

(10MHz-8GHz/18GHz/26.5GHz/40GHz/50GHz/67GHz/110GHz)

Overview

The S3987 series of Noise Figure Analyzers comprises seven distinct models: the S3987B (10 MHz – 8 GHz), S3987D (10 MHz – 18 GHz), S3987E (10 MHz – 26.5 GHz), S3987F (10 MHz – 40 GHz), S3987H (10 MHz – 50 GHz), S3987L (10 MHz – 67 GHz), and S3987P (10 MHz – 110 GHz). These instruments feature a wide frequency coverage range, flexible band selection, high reception sensitivity, a user-friendly interface, a large high-definition touchscreen display, and support for various noise source drivers. They are capable of measuring the noise figure and gain of amplifiers, up-converters, and down-converters, and support the automated measurement of noise figures for multi-stage frequency conversion receiver links. The series features an intuitive guided interface for setting measurement modes, offering multiple input interaction methods to simplify the configuration process. It includes comprehensive loss compensation capabilities, allowing for the compensation—either via fixed values or lookup tables—of losses introduced by the measurement channels positioned before and after the Device Under Test (DUT). A built-in noise figure measurement uncertainty calculator enables the quantitative analysis of measurement uncertainty, while a limit line function provides pass/fail notifications, thereby simplifying the determination of test compliance. The user-friendly design makes it easier for engineering professionals to correctly configure measurement settings, as well as to view and save measurement results in various formats. These products are widely applicable in the research and development, manufacturing, testing, and technical support of electronic equipment within sectors such as telecommunications and integrated circuits.

Features

- Wideband coaxial coverage from 10 MHz to 110 GHz, supporting full-band sweep measurements
- High-sensitivity reception and high-precision testing
- Wide dynamic measurement range
- Intuitive user interface with a brand-new interactive experience
- Measurement modes for amplifiers, upconverters, and downconverters
- Comprehensive loss compensation capabilities
- Limit line function with Pass/Fail test indications
- Single-sideband and double-sideband measurement capabilities
- Flexible file and table management functions
- Support for driving various noise sources

Wideband coaxial coverage spanning 10 MHz to 110 GHz, supporting full-band sweep measurements.

The S3987 Series Noise Figure Analyzer offers coaxial coverage spanning 10 MHz to 110 GHz, featuring seven selectable frequency bands to meet user testing requirements ranging from microwave to millimeter-wave frequencies; it supports full-band sweep measurements, enabling the comprehensive testing of broadband devices under test (DUTs) with a single connection.

High-Sensitivity Reception and High-Precision Measurement

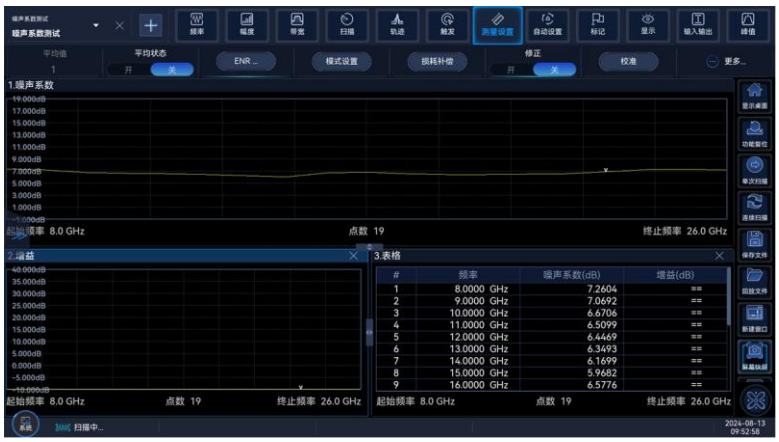
The S3987 series Noise Figure Analyzer features exceptional reception sensitivity, with an intrinsic noise figure as low as 4 dB. By employing real-time calibration for hardware drift and advanced error correction techniques, the measured uncertainty in noise figure measurements is better than 0.1 dB.

Wide Dynamic Measurement Range

Leveraging advanced automatic channel gain adjustment and precise calibration technologies—along with high-precision stepped gain control and frequency response compensation across both RF and IF stages—this system significantly enhances measurement dynamic range and accuracy. The combined measurement range for gain and noise figure extends up to 60 dB, while the actual measured uncertainty for gain is better than 0.15 dB.

Clean User Interface, Brand-New Interactive Experience

The S3987 series Noise Figure Analyzer features an 11.6-inch touch display, offering a more comprehensive and intuitive visual experience. It supports multiple display formats—including graphical, tabular, meter, and combined graphical-tabular views—enabling the simultaneous display of measurement results for parameters such as noise figure, gain, Y-factor, equivalent temperature, hot power, and cold power, plotted against frequency.



Amplifier, Upconverter, and Downconverter Measurement Modes

1) The Basic Amplifier Measurement Mode is used for measuring the noise figure and gain of amplifier-type Devices Under Test (DUTs) whose frequency range falls within that of the Noise Figure Analyzer; the System Down-conversion Mode is used for measuring the noise figure and gain of amplifier-type DUTs whose frequency range extends beyond that of the Noise Figure Analyzer.

2) Features noise figure and gain measurement capabilities for both up-converters and down-converters, and supports automated swept measurements of noise figure and gain for multi-stage frequency conversion links.

3) Provides a highly intuitive interface for configuring measurement modes, allowing users to complete all relevant measurement settings for a selected mode within a single configuration screen.

Comprehensive Loss Compensation Function

It enables the compensation of losses within the pre- and post-measurement channels of the device under test (DUT)—either in a fixed or tabular format—thereby facilitating the precise measurement of noise figures in automated test systems or microwave/millimeter-wave bare dies.

Pass/Fail Test Indication: Limit Line Function

The Pass/Fail notification feature, utilizing limit lines, simplifies qualification testing and facilitates use on production lines. Limit line types include both upper and lower thresholds; each display channel can be individually configured with a pair of upper and lower limit lines. If a measurement result falls outside the set limit range, the instrument immediately displays a "Fail" notification in red text.

Single-Sideband and Double-Sideband Measurement Functions

It features single-sideband (including upper and lower sidebands) and double-sideband measurement settings, control, and data processing capabilities, perfectly matching the actual application sideband of the device under test.

Flexible File and Form Processing Capabilities

The S3987 series Noise Figure Analyzer supports a wide range of file and table types, primarily including Excess Noise Ratio (ENR) tables, instrument states, limit lines, frequency lists, loss compensation tables, traces, and screen images. Users can conveniently perform operations such as editing, saving, recalling, and deleting these files and tables.

Support for Multiple Noise Source Types

The device features both standard and intelligent noise source drive interfaces. The standard interface provides a +28V pulsed drive voltage, offering broad compatibility and support for noise sources manufactured by various vendors. The intelligent interface—comprising I2C and USB ports—automatically detects connected noise sources, automatically loads Excess Noise Ratio (ENR) data, and monitors ambient temperature fluctuations in real-time. This capability facilitates temperature-based correction of noise figure measurements, thereby enhancing both the speed and accuracy of the measurement process.

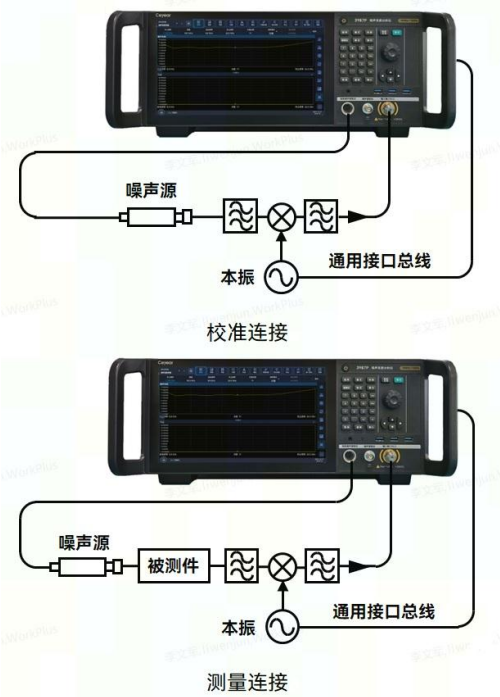
Typical Applications

Basic Amplifier Measurement Applications

Basic amplifier measurement is the most versatile measurement mode of a noise figure analyzer, used for measuring the noise figure and gain of devices under test (DUTs) that do not involve frequency conversion—including active and passive linear components or systems such as amplifiers, filters, and isolators.

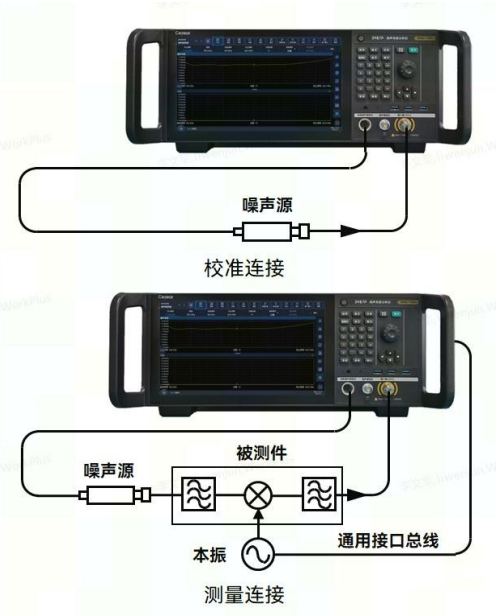
System Down-conversion Mode Measurement Applications

The system down-conversion mode is designed for performing extended-range noise figure measurements on amplifier-type devices under test (DUTs). When the operating frequency range of an amplifier DUT exceeds the frequency range of the noise figure analyzer, an external mixer is utilized to facilitate these extended-range measurements. This external mixer functions as an integral component of the test system throughout both the calibration and measurement processes. To minimize uncertainty in the noise figure measurement, it is highly recommended to select a mixer characterized by low conversion loss and a low noise figure; furthermore, the mixer's IF output port must exhibit excellent isolation from the local oscillator (LO) signal.



Up- and Down-Converter Measurement Applications

The Device Under Test (DUT) consists of up-conversion or down-conversion assemblies—such as an up-converter paired with a transmitter, or a down-converter paired with a receiver—whose Intermediate Frequency (IF) output falls within the frequency range of the Noise Figure Analyzer. For measurements involving up-converters and down-converters, the S3987 series Noise Figure Analyzer offers two distinct configuration modes: "Fixed IF / Variable LO" and "Fixed LO / Variable IF." These modes are designed to facilitate the testing of the DUT's RF response characteristics and IF response characteristics, respectively.



Technical Specifications

Product Model Name	S3987B/D/E/F/H/L/P Noise Figure Analyzer
Frequency Range	10MHz-8GHz/18GHz/26.5GHz/40GHz/50GHz/67GHz/110GHz
Frequency Reference Accuracy	±＜2×10^{-7}
Frequency Tuning Accuracy	±＜90kHz 10MHz≤f≤8GHz ±＜300kHz 8GHz＜f≤110GHz
Noise Figure Measurement Range	0 dB – 30 dB (Excess Noise Ratio: 12 dB – 17 dB) 0 dB – 35 dB (Excess Noise Ratio: 20 dB – 22 dB)
Noise Figure Measurement Uncertainty	± <0.10 dB (Measurement Range: 0 dB – 30 dB) ± <0.15 dB (Measurement Range: 0 dB – 35 dB)
Gain Measurement Range	-20dB-+40dB
Gain Measurement Uncertainty	±＜0.17dB
Input Port Standing Wave Ratio	S3987B
	≤1.90:1 10MHz≤f≤8GHz
	S3987D
	≤1.90：1 10MHz≤f≤8GHz
	≤2.20：1 8GHz＜f≤18GHz
	S3987E
	≤1.90：1 10MHz≤f≤8GHz
	≤2.20：1 8GHz＜f≤26.5GHz
	S3987F
	≤1.90：1 10MHz≤f≤8GHz
	≤2.20：1 8GHz＜f≤40GHz
	S3987H
	≤1.90：1 10MHz≤f≤8GHz
	≤2.20：1 8GHz＜f≤40GHz
	≤2.50：1 40GHz＜f≤50GHz
	S3987L
	≤1.90：1 10MHz＜f≤8GHz
	≤2.20：1 8GHz＜f≤50GHz
	≤2.50：1 50GHz＜f≤67GHz
Intrinsic Noise Figure	S3987B
	＜9.0dB 10MHz≤f≤8GHz
	S3987D
	＜9.0dB 10MHz≤f≤8GHz
	＜8.5dB 8GHz＜f≤18GHz
	S3987E

	＜9.0dB 10MHz≤f≤8GHz
	＜9.0dB 8GHz＜f≤26.5GHz
	S3987F
	＜9.0dB 10MHz≤f≤8GHz
	＜10.0dB 8GHz＜f≤40GHz
	S3987H
	＜9.0dB 10MHz≤f≤8GHz
	＜10.0dB 8GHz＜f≤40GHz
	＜12.0dB 40GHz＜f≤50GHz
	S3987L
	＜10.0dB 10MHz≤f≤8GHz
	＜16.0dB 8GHz＜f≤50GHz
	＜14.0dB 50GHz＜f≤67GHz
	S3987P
	＜18.5dB 10MHz≤f≤50GHz
	＜20.0dB 50GHz＜f≤110GHz
Jitter (Unevenness)	＜0.15dB
Noise Source Drive Voltage	< 1.0 V (Noise source off)
	+28.0 V ± 0.20 V (Noise source ON)
Dimensions (W × H × D)	Overall Dimensions: Width × Height × Depth: (474.6 ± 4) mm × (193 ± 2.5) mm × (559.5 ± 4) mm Nominal Dimensions: Width × Height × Depth: (426 ± 4) mm × (177 ± 2.5) mm × (450 ± 4) mm (Excluding the main external dimensions of handles, feet, rear frames, rotary knobs, rubber buttons, side carrying straps, latches, screws, grounding posts, fiber cages, patch cords, I/O connectors, and other localized protruding structural components.)
Weight	≤25kg
Power supply	Powered by a 110V－220V single-phase AC supply with a frequency of 50 Hz/60 Hz; the allowable steady-state voltage range is ±10% of the rated value, and the allowable steady-state frequency range is ±5% of the rated value.
Maximum Power Consumption	250W
Temperature Range	Operating Temperature: 0°C to +40°C; Storage Temperature: -40°C to +70°C
Input Port Configuration	S3987B/D/E: 3.5mm (Male), Impedance 50Ω S3987F/H: 2.4mm (Male), Impedance 50Ω S3987L: 1.85mm (Male), Impedance 50Ω S3987P: 1.0mm (Male), Impedance 50Ω

Ordering Information

- Host:

S3987B Noise Figure Analyzer: 10 MHz － 8 GHz

S3987D Noise Figure Analyzer: 10 MHz － 18 GHz

S3987E Noise Figure Analyzer: 10 MHz － 26.5 GHz

S3987F Noise Figure Analyzer: 10 MHz – 40 GHz

S3987H Noise Figure Analyzer: 10 MHz – 50 GHz

S3987L Noise Figure Analyzer: 10 MHz – 67 GHz

S3987P Noise Figure Analyzer: 10 MHz – 110 GHz

- Standard Configuration

Number	Name	Description
1	Power Cord	Standard 3-Core Power Cord
2	User Manual	
3	Product Certificate of Conformity	

- Options

Number	Option Number	Name	Function
1	S3987-H05	Aluminum Alloy Transport Case	High-strength, lightweight aluminum alloy transport case, equipped with handles and wheels for convenient transport.
2	S3987-H97	Mounting Kit	For rack-mounting the S3987 in a cabinet.
3	S3987-H98	English Kit	English control panel, English manual, English user interface, and English operating system.
4	S3987B-JL	Metrology Services	Metrology Calibration Service, providing a calibration report. Applicable to S3987B.
5	S3987D-JL	Metrology Services	Metrology Calibration Service, providing a calibration report. Applicable to S3987D.
6	S3987E-JL	Metrology Services	Metrology Calibration Service, providing a calibration report. Applicable to S3987E.
7	S3987F-JL	Metrology Services	Metrology Calibration Service, providing a calibration report. Applicable to S3987F.
8	S3987B-EWT1	1-Year Extended Warranty (Beyond the Standard Warranty Period)	A one-year warranty extension is available beyond the standard warranty period; a two-year extension option is also available, and so on. This service excludes calibration and covers only the one-way shipping cost of the item.
9	S3987D-EWT1	1-Year Extended Warranty (Beyond the Standard Warranty Period)	A one-year warranty extension is available beyond the standard warranty period; a two-year extension option is also available, and so on. This service excludes calibration and covers only the one-way shipping cost of the item.
10	S3987E-EWT1	1-Year Extended Warranty (Beyond the Standard Warranty Period)	A one-year warranty extension is available beyond the standard warranty period; a two-year extension option is also available, and so on. This service excludes calibration and covers only the one-way shipping cost of the item.
11	S3987F-EWT1	1-Year Extended Warranty (Beyond the Standard Warranty Period)	A one-year warranty extension is available beyond the standard warranty period; a two-year extension option is also available, and so on. This service excludes calibration and covers only the one-way shipping cost of the item.
12	S3987H-EWT1	1-Year Extended Warranty (Beyond the Standard Warranty Period)	A one-year warranty extension is available beyond the standard warranty period; a two-year extension option is also available, and so on. This service excludes calibration and covers only the one-way shipping cost of the item.
13	S3987L-EWT1	1-Year Extended Warranty (Beyond the Standard Warranty Period)	A one-year warranty extension is available beyond the standard warranty period; a two-year extension option is also available, and so on. This service excludes calibration and covers only the one-way shipping cost of the item.
14	S3987P-EWT1	1-Year Extended Warranty (Beyond the Standard Warranty Period)	A one-year warranty extension is available beyond the standard warranty period; a two-year extension option is also available, and so on. This service excludes calibration and covers only the one-way shipping cost of the item.