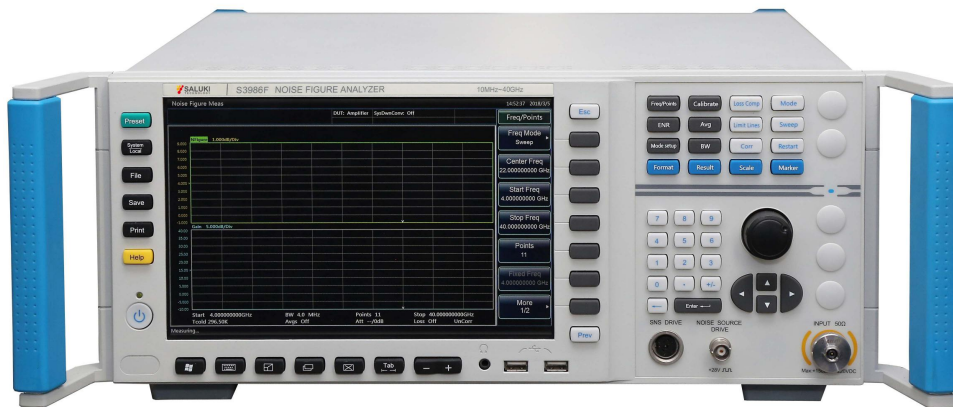




S3986 Series Noise Figure Analyzer Datasheet



Saluki Technology Inc.

The document applies to the noise figure analyzer of the following models:

- S3986A noise figure analyzer (10 MHz - 4 GHz)
- S3986D noise figure analyzer (10 MHz - 18 GHz)
- S3986E noise figure analyzer (10 MHz - 26.5 GHz)
- S3986F noise figure analyzer (10 MHz - 40 GHz)
- S3986H noise figure analyzer (10 MHz - 50 GHz)

Standard pack and accessories:

No.	Item
1	Main machine
2	Power cord
3	USB mouse
4	U disk (manual)
5	Certificate of quality

Options of the S3986 series noise figure analyzer:

Model No.	Item	Description
S3986-H01	S16603/16604 series noise source	As standard noise power for noise figure measurement
S3986-H02	Coaxial adapter	For connection between noise source and adapter interface of noise figure analyzer
S3986-H03	Multi-core cable	For connection between S16604 smart noise source drive interface of noise figure analyzer and noise source
S3986-H04	BNC(m)-BNC(m) cable	For connection between S16603 standard noise source drive interface of noise figure analyzer and noise source
S3986-H05	Alloy carrying case	High strength, lightweight alloy shipping case with handle and wheels for easier handling.

Preface

Thanks for choosing S3986 noise figure analyzer produced by Saluki Technology Inc.

We devote ourselves to meeting your demands, providing you high-quality measuring instrument and the best after-sales service. We persist with “superior quality and considerate service”, and are committed to offering satisfactory products and service for our clients.

Document No.

S3986-02-01

Version

Rev01 2021.03

Saluki Technology

Document Authorization

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Product Quality Assurance

The warranty period of the product is 36 months from the date of delivery. The instrument manufacturer will repair or replace damaged parts according to the actual situation within the warranty period.

Product Quality Certificate

The product meets the indicator requirements of the document at the time of delivery. Calibration and measurement are completed by the measuring organization with qualifications specified by the state, and relevant data are provided for reference.

Quality/Settings Management

Research, development, manufacturing and testing of the product comply with the requirements of the quality and environmental management system.

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1. Overview

S3986 Series Noise Figure Analyzers include five models with the frequency from 10 MHz to 50 GHz. Features of the product include wide-range frequency coverage, high-sensitivity reception, friendly user interface, big screen dual channel HD display, various external interfaces, and dual noise source drive etc. It can measure the noise figure and gain of amplifiers, up converters and down converters, as well as to support automatic measurement of noise figure of multi-stage converters. Guide interfaces are intuitive for setting measurement modes. The comprehensive loss compensation function can compensate loss induced in measurement channel before and/or after the device under test by means of fixed or table forms. The built-in noise figure measurement uncertainty calculator does quantitative analysis of the uncertainty of measurement noise figure. Limit line function that provides test passed/failed notification simplifies the determination of passed/failed test. User friendly features make it easy for engineering technicians to set measurements correctly, to observe and save measurement results in different forms. They can be widely used in R&D, manufacturing, testing and technical assurance tests of electronic equipment for radar, communication, navigation etc.

2. Key Features

➤ **Wide frequency coverage**

The coaxial integrated frequency of S3986 series Noise Figure Analyzers covers the range of 10 MHz - 50 GHz, where 5 frequency range configurations are selectable for different user's test demand of different band. With external MMW extended frequency modules, the noise figure measurement frequency range can be extended to 110GHz.

➤ **High-sensitivity reception and high-precision measurement performance**

The optimum reception sensitivity precedes -170 dBm/Hz, and the full-band reception sensitivity precedes -162 dBm/Hz. It adopts automatic adjustment and precise calibration technologies, which improve the channel gain. And the linearity within the range of noise power measurement precedes ± 0.1 dB.

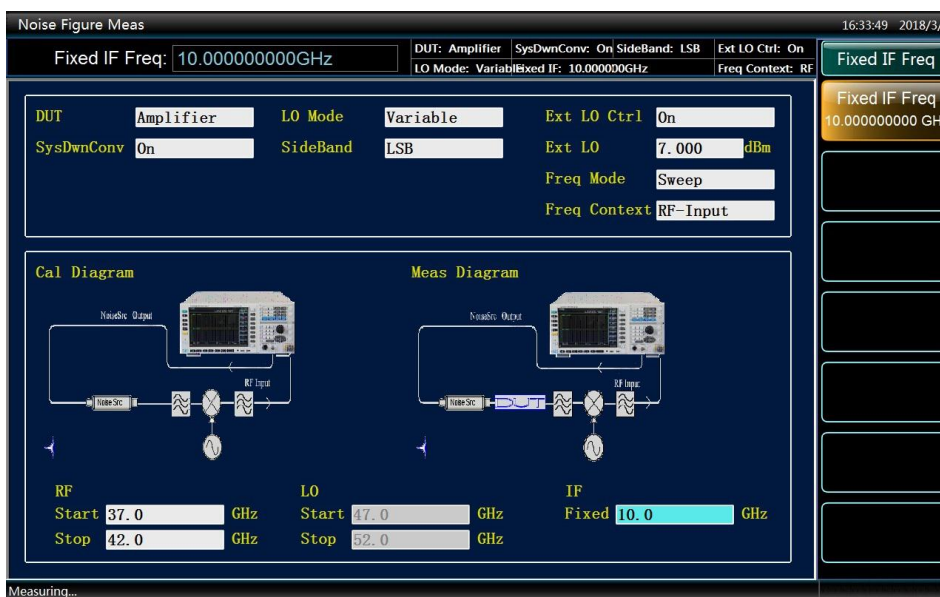
➤ **English operation interface, 10.1 inch big screen dual channel HD display**

English operation interface with 10.1 inch big screen LCD monitor that can display in three formats, i.e. graphs, tables and meter display. In the form of graph display, it can display in combination the measurement results of two arbitrary parameters which change along with frequency, such as noise figure, Y factor, gain, and equivalent input noise temperature.



➤ Amplifier, Up converter and down converter measurement mode

- (1) Basic amplifier measurement mode is used for noise figure and gain measurement of the device under test, which falls in the amplifier category within the frequency range of the Noise Figure Analyzers. The extended frequency range measurement in the down converter mode is used for noise figure and gain measurement of amplifier, of which the frequency exceeds the frequency range of the Noise Figure Analyzers.
- (2) They have noise figure and gain measurement functions of up converters and down converters, as well as to support automatic scanning measurement of noise figure of multi-stage converters.
- (3) Interface setting in measurement mode is intuitive. All measurement settings corresponding to measurement mode can be done in the same test interface.



➤ **Single sideband and double sideband measurement function**

S3986 has the capacity of setting, controlling and data processing for the measurement of single sideband (including upper sideband and lower sideband) and double sideband. During noise figure measurement, the sideband setting must be the same as that is actually applied of the device under test.

➤ **Comprehensive loss compensation function**

Loss in the measurement channel can be compensated by means of fixed or table form before and/or after the measurement, which would greatly benefit precise measurement of noise figure of automatic test system or microwave chips.

➤ **Flexible file and table processing functions**

The types of files and tables that can be processed by S3986 Series Noise Figure Analyzers include limit lines, excess noise ratio table, trace file, state file, frequency list, loss compensation table and screen images. For user data process purposes, files and tables can be edited, saved, loaded, and deleted.

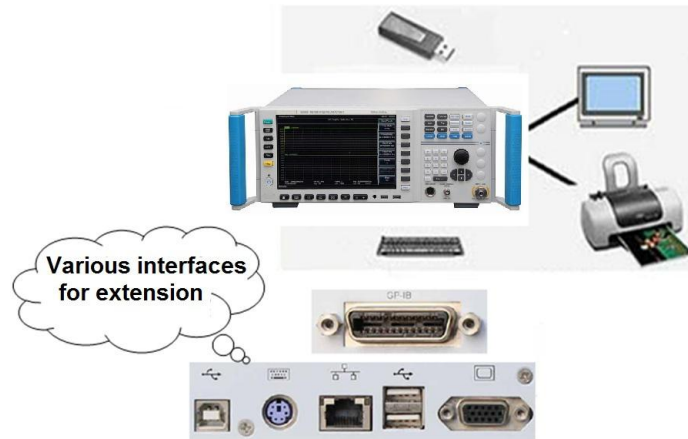
➤ **Passed/ failed test notification limit line function**

Limit line function of test passed/failed notification simplifies passed/failed test for the use of production line. Types of limit lines include upper limits and lower limits. A pair of upper and lower limit lines could be set individually for each display channel. When measurement results exceed limit range, the instrument would prompt "Limit Line Failed" notification in red.



➤ **Various external interfaces**

Various external interfaces enable high re-usability. Smart interfaces like GP-IB, LAN, USB and VGA can enable user function extension and reconstruction of the test system.



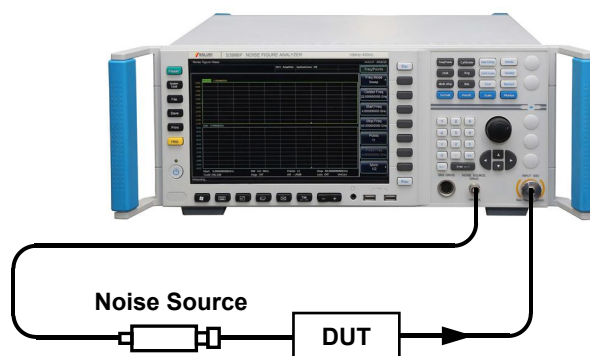
➤ **Dual noise source drive**

Standard and smart noise source drive interfaces provided. Standard noise source drive interface that provides +28V pulse drive voltage to support noise sources from multiple manufacturers. It's highly compatible. Noise Figure Analyzers can identify the connection of smart noise source and load excess noise ratio data automatically. It can also detect changes of environment temperature for temperature correction of noise figure to improve speed and accuracy of measurement.

3. Typical Applications

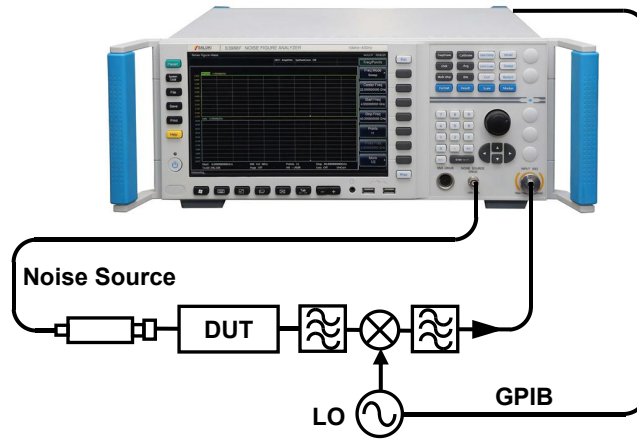
➤ **Basic amplifier measurement**

Basic amplifier measurement is the most common measurement mode. It is used for noise figure and gain measurement of the device under tests without frequency conversion (including active or passive linear units or systems like amplifiers, filters, and isolators).



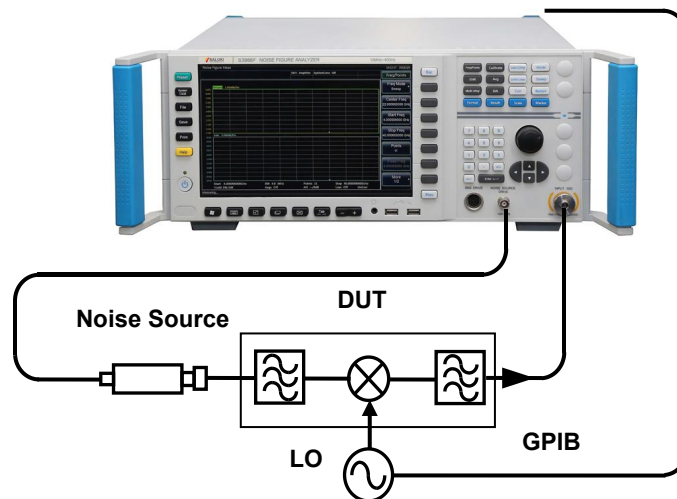
➤ **System down converter measurement mode**

The down converter mode focuses on extended frequency range measurement of amplifier. When the frequency range of an amplifier exceeds that of the Noise Figure Analyzers, extended frequency range measurement of the noise figure is realized by an external mixer. External mixer is used during calibration and measurement as a part of the test system. To reduce the uncertainty of noise figure measurement, frequency conversion loss and noise figure of the chosen mixer should be as small as possible. Besides, the intermediate frequency output port of the mixer should be well isolated to local oscillation signals.



➤ **Up/down converter measurement**

The device under test is an up/down converter installation, up converter and transmitter or down converter and receiver for instance, then the output intermediate frequency would be in the frequency range of the Noise Figure Analyzers. During up/down converter measurement, S3986 series Noise Figure Analyzers provide two modes of settings, fixed intermediate frequency, variable local oscillation and fixed local oscillation, variable intermediate frequency, which are used for measuring the RF response characters and intermediate frequency response characters of the device under test, respectively.



4. Technical Specifications

Major Technical Specifications	
Frequency Range	S3986A noise figure analyzer: 10 MHz - 4 GHz S3986D noise figure analyzer: 10 MHz - 18 GHz S3986E noise figure analyzer: 10 MHz - 26.5 GHz S3986F noise figure analyzer: 10 MHz - 40 GHz

	S3986H noise figure analyzer: 10 MHz - 50 GHz
Accuracy of Frequency Reference	< ± 0.2 ppm ($23^{\circ}\text{C} \pm 3^{\circ}\text{C}$)
Accuracy of Frequency Tuning	< \pm (Reference frequency error +100 kHz) 10 MHz - 4 GHz
	< \pm (Reference frequency error +400 kHz) 4 GHz - 18/ 26.5/ 40/ 50 GHz
Noise Figure Measurement Range	0 - 30 dB (ENR: 12 dB - 17 dB)
Noise Figure Measurement Uncertainty	< ± 0.1 dB
Gain Measurement Range	-20 dB to +40 dB
Gain Measurement Uncertainty	< ± 0.17 dB
Input VSWR	< 1.90: 1 10 MHz \leq f \leq 4 GHz
	< 2.10: 1 4 GHz < f \leq 18 GHz
	< 2.40: 1 18 GHz < f \leq 26.5 GHz
	< 2.40: 1 26.5 GHz < f \leq 40 GHz
	< 2.40: 1 40 GHz < f \leq 50 GHz
Main Unit's Self Noise Figure	< 8.0 dB 10 MHz \leq f \leq 4 GHz
	< 7.5 dB 4 GHz < f \leq 18 GHz
	< 8.0 dB 18 GHz < f \leq 26.5 GHz
	< 10.0 dB 26.5 GHz < f \leq 40 GHz
	< 12.0 dB 40 GHz < f \leq 50 GHz
Jitter (uneven)	< 0.17 dB (Y Factor Typical Value 5 dB)
Noise Source Drive Voltage	< 1.0 V Noise source off
	+28.0 \pm 0.10 V Noise source on
General Technical Specifications	
Temperature Range	Operation: 0 to +40°C Storage: -40 to +70°C
Altitude Range	4, 600 meters
Electromagnetic Compatibility	Comply with the following requirements of GJB 3947A-2009 provision 3.9.2: a) Conducted emission through CE102 power cable; b) Conducted susceptibility of CS101 power cable; c) Conducted susceptibility injected by CS114 harness; d) Radiated emission through RE102 electric field; e) Radiated susceptibility through RS103 electric field.
Safety	Comply with safety certificate requirements of GJB 3947A-2009 provision 3.10.

		<p>a) The resistance between power input end and the chassis (power switch on engaged position) shall be no less than 100 MΩ under standard atmosphere pressure and no less than 2 MΩ in damp environment.</p> <p>b) Apply 1500 VAC between the power input end and the chassis. And no symptom like breakdown, flash-over and flicker shall happen.</p> <p>c) In operation, leakage current between chassis and ground shall be no more than 3.5 mA.</p>
Power Requirements	Voltage and frequency (nominal value)	AC 220V/240V, 50/60 Hz
	Power consumption	<p>Max. power consumption: 250 W</p> <p>Max. standby: 20 W</p>
Monitor		10.1 inch 1280×800 HD screen, XGA
Data Storage		<p>160 G solid state disk</p> <p>Support USB 2.0 standard storage units</p>
Weight		< 25 kg
Size		<p>426 (W) × 177 (H) × 460 (D) mm (handle, bottom, pad and side strap excluded), allowed tolerance ±10 mm.</p> <p>510 (W) × 190 (H) × 534 (D) mm (handle, bottom, pad and side strap included), allowed tolerance ±10 mm.</p>
Reliability		MTBF (θ_0) ≥ 5000 h
Calibration Interval		A calibration interval of one year is recommended. Calibration service shall be provided by professional calibration institutions.
Front Panel Interfaces		
RF Input Connector		S3986A/D/E: 3.5 mm (m), 50 Ω impedance
		S3986F/H: 2.4 mm (m), 50 Ω impedance
Standard Noise Source Drive Output		BNC female adapter
Smart Noise Source Drive Output		Multi-core connector
USB2.0 Interface		For connecting mouse, keyboard, and updating software and backing up data.
Back Panel Interfaces		
Keyboard Interface		Standard PS/2 interface for connecting standard computer keyboard.
Video Interface		VGA interface (15-core D-SUB adapter) for connecting monitors

LAN Interface	StandardRJ-45 type, 1000Base-T for software update and remote control
GP-IB Interface	IEEE-488 Bus connector, 24-pin plug (GP-IB code: SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, C0) for remote control
USB2.0 Interface	For connecting mouse, keyboard, and updating software and backing up data.
10 MHz Reference Input	50 Ω impedance, BNC female adapter, amplitude range -5 dBm ~ +10 dBm
10 MHz Reference Output	50 Ω impedance, BNC female adapter, output amplitude ≥ 0 dBm
Trigger Input	BNC female adapter
Trigger Output1	BNC female adapter
Trigger Output2	BNC female adapter
Detection Output	BNC female adapter

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