

Advanced Wide Bandwidth Noise Analyzer

Introduction

Primarius 981X series are the industry's de-facto standard flicker noise ($1/f$ noise) measurement systems. Flicker noise is the dominant noise for deep sub-micron and nanometer CMOS, bipolar junction transistor (BJT), field effect transistor (FET) and heterojunction bipolar transistor (HBT) devices. 9812HF™ Advanced Wide Bandwidth Noise Analyzer features Primarius innovative architecture designed to break through measurement bandwidth frontier to very high frequency (VHF) and deliver impressive accuracy for test applications across advanced process optimization, modeling validation design and circuit performance evaluation.

With built-in application-oriented voltage and current amplifiers, the 9812HF™ delivers a wide bandwidth and high-accuracy measurements for $1/f$ noise, thermal noise, and random telegraph noise. It features a seamless amplifier switching design that achieves efficient performance for various voltage noise tests and current noise tests required by full device types under a wide range of operating conditions. The 9812HF™ supports wafer-level noise testing and sets a new record in measurement coverage for different types of measurement requirements from time-domain noise and frequency-domain noise across ultra-low frequencies to very high frequencies.

Additionally, the 9812HF™ can be used in conjunction with Primarius semiconductor parameter testing systems, providing a parallel testing framework solution that significantly improves testing efficiency and throughput.

Key Advantages

Advanced Design

- The hybrid architecture of current and voltage amplifiers incorporates a very high frequency (VHF) amplifier with low noise floor of $8.66 \text{ pA}/\sqrt{\text{Hz}}$ (@1MHz)
- Supports intelligent and application-driven seamless amplifier switching to achieve industry-leading measurement and analysis performance, providing testing bandwidth up to 0.03Hz-100MHz

Excellent Performance

- High accuracy: Current noise resolution up to $10^{-27} \text{ A}^2/\text{Hz}$
- High efficiency: Typical $1/f$ noise measurement speed up to 20 sec/bias

Efficient Testing

- $1/f$ parallel testing and RTN parallel testing enhance testing efficiency
- Rich ready-to-use test applications library offers comprehensive capabilities and convenient process
- Powerful data analysis and management based on intuitive and user-friendly GUI

Broad Application

- Wide coverage of operation conditions and impedance supporting wafer-level high accuracy and wide bandwidth testing
- Meets diverse requirements from semiconductor laboratories to manufacture users, such as process quality evaluation, SPICE modeling, noise-sensitive integrated circuit design and verification, particularly for thermal noise assessment in the very-high-frequency range and noise characteristic evaluation of RF devices



Applications

- MOSFET and BJT transistor
- Diode and PN junction
- FinFET and FD-SOI
- Photodetector
- High-voltage devices and automotive electronics
- SiC and GaN
- Noise-sensitive integrated circuits
- High-throughput parallel noise testing
- Noise characterization for advanced process
- Device characterization in the subthreshold region
- RTN analysis and non-destructive defect analysis
- Noise modeling and analysis
- Thermal noise analysis
- RF device noise analysis

Hardware Specifications

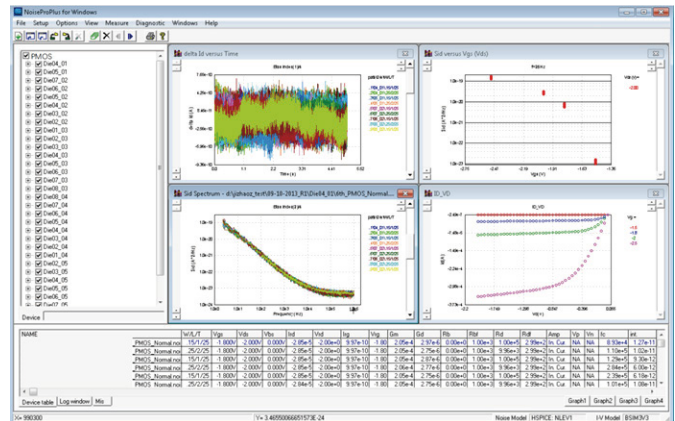
- Wide Bandwidth:** Maximum testing bandwidth: 0.03Hz-100MHz
- Wide Range:** Maximum SMU input: $\pm 100\text{V}$, $\pm 100\text{mA}$, 2W
- High Accuracy:** Minimum DC accuracy: 10pA
System noise current resolution: $<10^{-27} \text{ A}^2/\text{Hz}$
- High Speed:** 20 sec/bias for typical device $1/f$ noise
- Wide Impedance Range:** Impedance ranging from 3Ω to $30\text{M}\Omega$
16 Gate/Base options, 15 Drain/Collection options
- Key Features:** Voltage LNA: 0.03-10MHz, $0.65\text{nV}/\sqrt{\text{Hz}}$ (@5kHz)
Current LNA: 0.03-1MHz, $0.7\text{pA}/\sqrt{\text{Hz}}$ (@5kHz)
Wideband current LNA: 0.03-10MHz, $5\text{pA}/\sqrt{\text{Hz}}$ (@1MHz)
High accuracy current LNA: 0.03-20KHz, $60\text{fA}/\sqrt{\text{Hz}}$ (@5KHz)
Very high frequency LNA: 100KHz-100MHz, $8.66\text{pA}/\sqrt{\text{Hz}}$ (@1MHz)
Built-in ADC and DSA
ESD DUT Protections

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Software Specifications

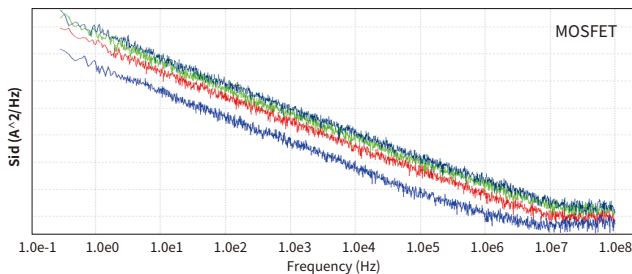
The 9812HF™ features NoiseProPlus as the built-in software. NoiseProPlus has powerful functionality for 1/f noise and RTN noise measurement and data analysis.

- Intuitive GUI based software features user-friendly test process and powerful data analysis and management
- Simultaneous 1/f and RTN noise characterization
- Comprehensive data management of various formats and supports test data exported into Primarius' advanced SPICE modeling platform BSIMProPlus™ and flexible RF modeling platform MeQLab™ for noise model extraction and characteristic analysis
- Multi-mode device and bias auto-measurement control
- Drivers for third-party test instruments
- Drivers for third-party probe stations

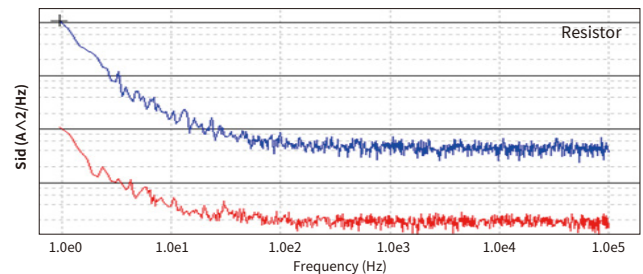


Application Examples

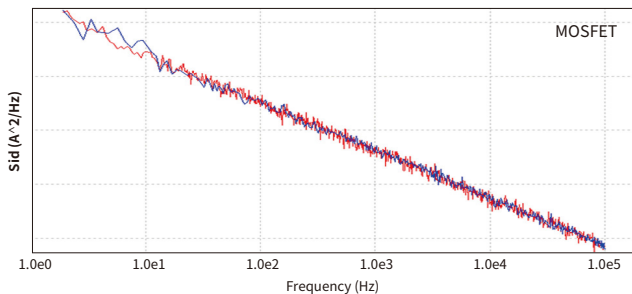
1/f Noise Testing, 100MHz Bandwidth



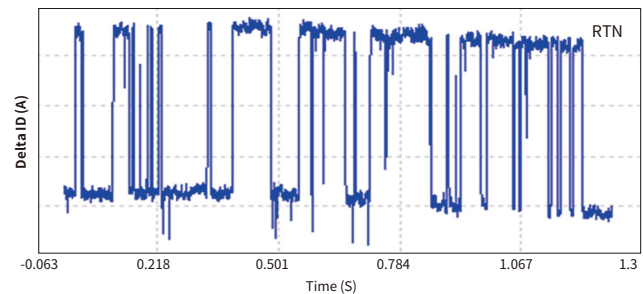
Thermal Noise Testing



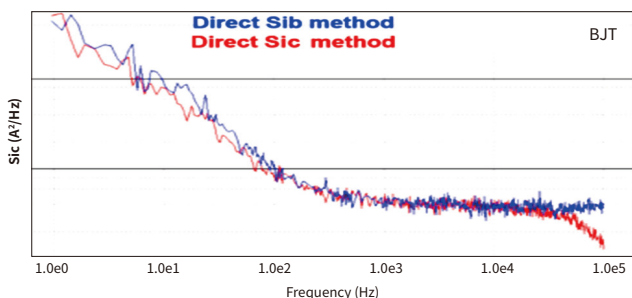
1/f Noise Testing, Current PSD



RTN Testing



1/f Noise Testing



1/f Noise Testing, Voltage PSD

