

Keysight DSOXT3FRA/DSOX4FRA/DSOX6FRA Frequency Response Analyzer (FRA) Option For Keysight 3000T, 4000A, and 6000A X-Series Oscilloscopes

Data Sheet



Introduction

Frequency Response Analysis (FRA) is often a critical measurement used to characterize the frequency response (gain and phase versus frequency) of a variety of today's electronic designs, including passive filters, amplifier circuits, and negative feedback networks of switch mode power supplies (loop response). Today, engineers typically use network analyzers or standalone low-frequency FRAs to perform these types of measurements. But for the first time in an oscilloscope, automatic frequency response analysis is available for Keysight InfiniiVision X-Series oscilloscopes. This frequency-domain measurement capability is achieved with a swept gain and phase measurement versus frequency (Bode plot). If licensed with the FRA option, InfiniiVision oscilloscope uses the scope's built-in waveform generator (WaveGen) to stimulate the circuit under test at various frequency settings and captures the input and output signals using two channels of the oscilloscope. At each test frequency, the scope measures, computes, plots gain ($20\log V_{OUT}/V_{IN}$) logarithmically and gain linearly.

- Dynamic range: > 80 dB (typical)
- Frequency range: 20 Hz to 20 MHz
- Sweep or single frequency test modes
- Fixed test amplitude or custom Amplitude Profile
- 10 to 50 points per decade
- Two pair of tracking gain and phase markers
- Plots gain and phase and tabular view of test results
- Easily export and/or save measurement results in .csv format for offline analysis

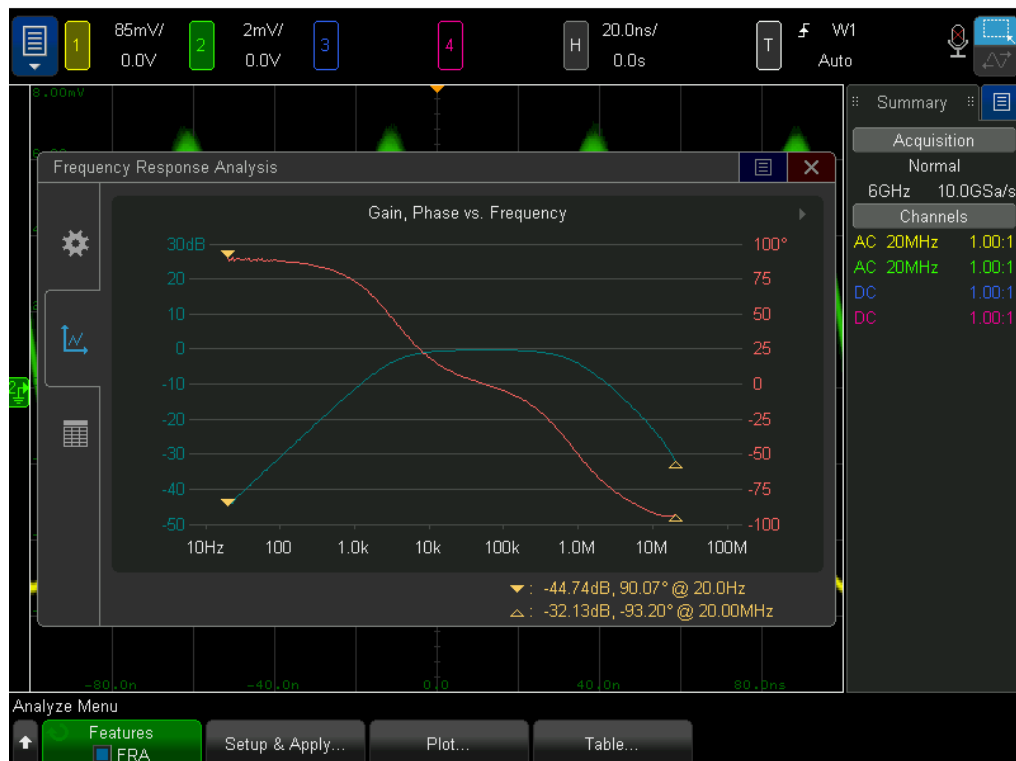


Figure 1. Gain and phase plot of a passive bandpass filter using InfiniiVision FRA option.



Figure 2. Tabular view of gain and phase measurements with exportable test results in .csv format.

Setting up a frequency response test doesn't have to be difficult. A single easy-to-use dialog box guides you through establishing all test parameters as shown in Figure 3.



Figure 3. Simple dialog box makes setting up a frequency response test easy.

Also available is test amplitude profiling. Improving dynamic range of frequency response measurements is often achieved by simply increasing a fixed test amplitude. However, this technique can sometimes induce waveform distortions and measurement errors during some frequency ranges due to overdriving sensitive electronic circuitry. But with the **Amplitude Profile** feature, you can optimize test amplitudes by establishing unique test amplitudes that ramp linearly between decade settings as shown in Figure 4.



Figure 4. Optimize test signal amplitudes with Amplitude Profile.

One advantage of performing frequency response analysis using an InfiniiVision X-Series oscilloscope is you can monitor V_{IN} and V_{OUT} time-domain waveforms during the swept test to look for possible waveform distortions. You can also “spot check” waveform quality (sinusoidal purity) at specific frequency settings using the **Single Frequency** test mode. At the completion of a **Single Frequency** test, you can close the FRA Test Results window to view repetitive V_{IN} and V_{OUT} waveforms to make appropriate WaveGen amplitude adjustments for optimization.

Performance Characteristics

	DSOXT3FRA/DSOX4FRA/DSOX6FRA
Frequency mode	Sweep or single
Frequency range	20 Hz to 20 MHz
Test amplitude modes	Fixed or amplitude profile
Test amplitude range	3000T:
	10 mVpp to 2.5 Vpp into 50-Ω load
	20 mVpp to 5.0 Vpp into high impedance load
	4000A/6000A:
	10 mVpp to 5 Vpp in 50-Ω load
	20 mVpp to 10.0 Vpp into high impedance load
Input and output sources	Channel 1, 2, 3, and 4
Number of test points	10 to 50 points per decade
Test results	Overlaid gain and phase plot and tabular view
Dynamic range	> 80 dB (typical) based on 0 dBm (630 mVpp) input into 50-Ω load
Measurements	Dual pair of tracking gain and phase markers
Plot scaling	Auto-scaled during test and manual setting after test

Ordering Information

The FRA option is available on all models of the 3000T, 4000A, and 6000A InfiniiVision X-Series oscilloscopes. The WaveGen option is recommended, but it is not required. If your InfiniiVision oscilloscope is licensed with the FRA option but not licensed with the WaveGen option, the FRA option will turn on the WaveGen temporarily for each swept or single frequency response test. For improved dynamic range, using a 1:1 passive, such as the N2870A is often recommended.

Note that frequency response analysis measurements (PSRR and Control Loop Response) are also available as part of the suite of measurements in the Power Measurements Option (DSOXT3PWR, DSOX4PWR, and DSOX6PWR). So if your frequency response measurement applications are primarily focused on power supply characterization, then it is recommended that you order the appropriate Power Measurement Option as opposed to ordering the FRA option. With the Power Measurements Option, not only are frequency response measurements available, but also a full suite of power characterization measurements including Switching Loss, Power Quality, Current Harmonics, Output Ripple, etc.

Product number	Description
DSOXT3FRA	Frequency Response Analysis option for InfiniiVision 3000T X-Series oscilloscopes
DSOX4FRA	Frequency Response Analysis option for InfiniiVision 4000 X-Series oscilloscopes
DSOX6FRA	Frequency Response Analysis option for InfiniiVision 6000 X-Series oscilloscopes
N2870A	35 MHz 1:1 passive probe

Related Literature

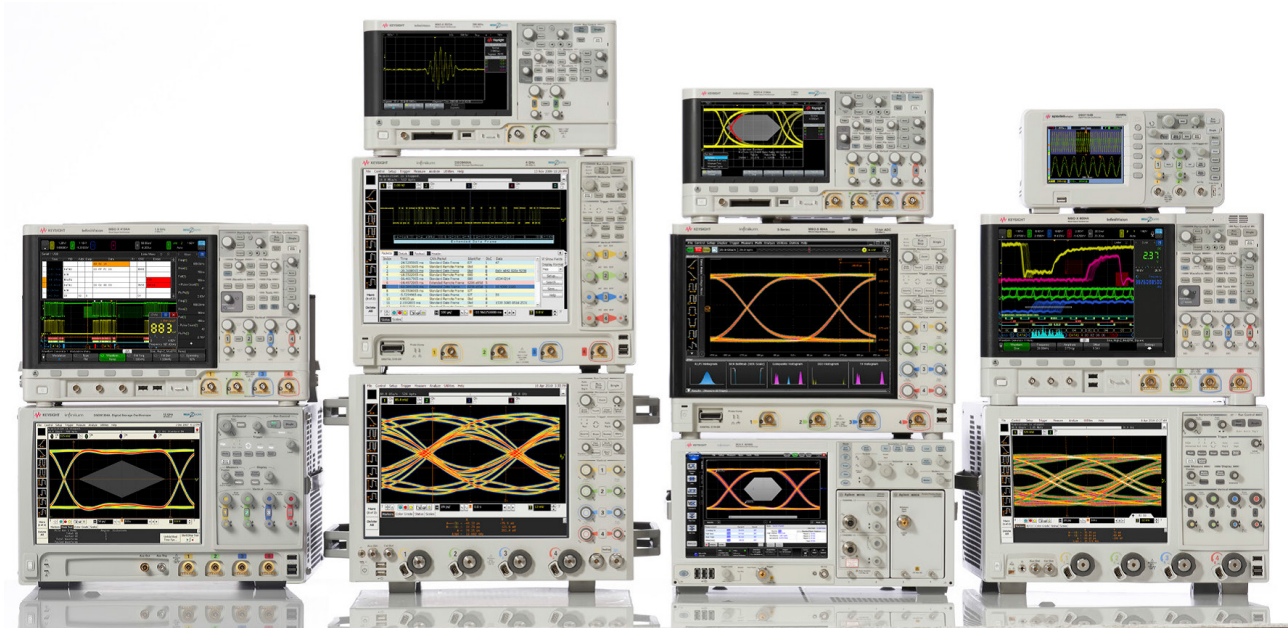
Publication title	Publication number
<i>InfiniiVision 3000T X-Series Oscilloscopes - Data Sheet</i>	5992-0140EN
<i>InfiniiVision 4000 X-Series Oscilloscopes - Data Sheet</i>	5991-1103EN
<i>InfiniiVision 6000 X-Series Oscilloscopes - Data Sheet</i>	5991-4087EN
<i>Power Supply Control Loop Response (Bode Plot) Measurements - Application Note</i>	5992-0593EN
<i>Power Supply Rejection Ratio (PSRR) Measurements - Application Note</i>	5992-0594EN

To download these documents, insert the publication number in the URL:
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Product Website

For the most up-to-date and complete application and product information, please visit our product Web sites at:

- www.keysight.com/find/3000TX-Series
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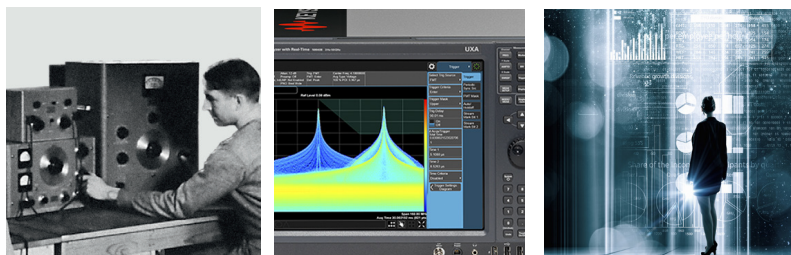


Keysight Oscilloscope

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