

Virtuoso Visualization and Analysis

Optimized display, measurement, analysis, and debug of simulation results

Cadence® Virtuoso® Visualization and Analysis is a waveform display and analysis tool that efficiently and thoroughly analyzes the performance of analog, RF, and mixed-signal designs. Integrated with the industry-leading Virtuoso custom design platform, it provides a comprehensive set of capabilities to display, measure, analyze, and debug simulation results, and to create documentation for design reviews. Developed using the latest software technologies, Virtuoso Visualization and Analysis is optimized for fast loading of large datasets.

Virtuoso Custom Design Platform

The unified Virtuoso custom design platform utilizes the latest in modern user interfaces and design tool integration advances to bring unprecedented levels of productivity to design creation, verification, and implementation.

Backed by the largest number of process design kits (PDKs) available from the world’s leading foundries—for process nodes from 0.35µm to 20nm, and everything in between—the Virtuoso platform is built on the OpenAccess database, engineered by Cadence for industry-wide interoperability.

The Virtuoso platform accelerates the design of custom ICs across various process nodes. By selectively automating aspects of custom analog design and providing advanced technologies integrated on a common database, the platform allows engineers to focus on precision-crafting their designs—without sacrificing creativity to repetitive manual tasks.

Virtuoso Visualization and Analysis

Integrated with Virtuoso Analog Design Environment and Virtuoso Multi-Mode Simulation, Virtuoso Visualization and Analysis provides built-in support for all Virtuoso

simulators to completely analyze and fully explore analog, RF, and mixed-signal designs. With built-in measurement tools and toolboxes, designers can quickly visualize many design performance metrics, detect circuit problems, and accelerate design debug.

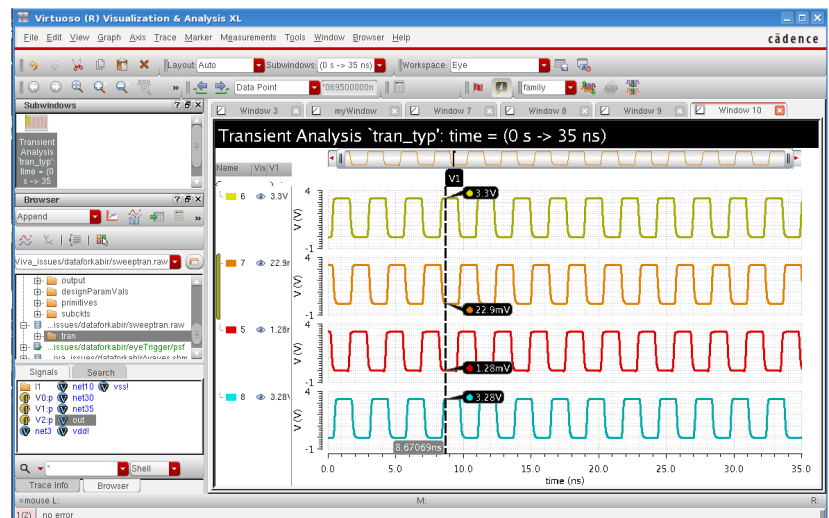


Figure 1: Virtuoso Visualization and Analysis advanced user interface

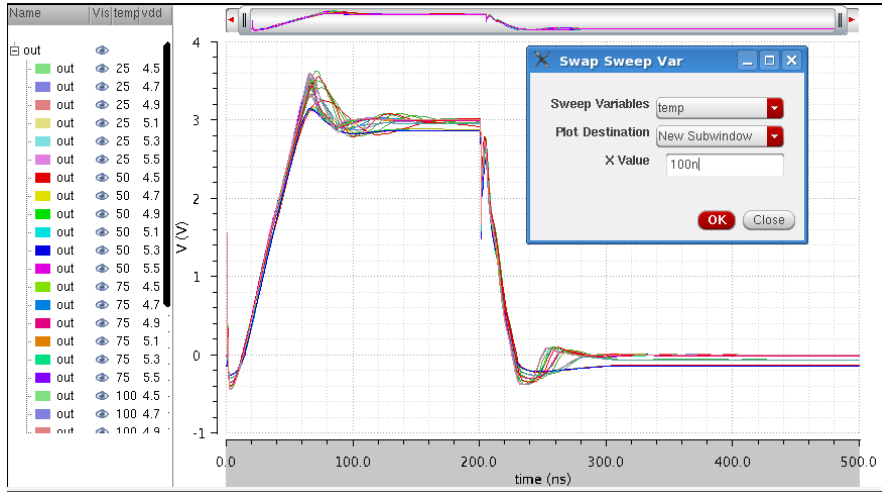


Figure 2: Variable sweeps

Benefits

- High-performance waveform database optimized for fast loading of large amounts of simulation data
- Extensive mixed-signal display capabilities for efficient data visualization
- Single waveform tool for all Virtuoso simulators
- Seamless integration with the industry-leading Virtuoso custom design platform
- Refresh plotting (customized waveform display set-up and refresh with new data set after each simulation)
- SKILL and OCEAN programming for complex user-developed post-processing scripts
- Customizable calculator with a rich set of functions and features

Key Features

Platform integration

Virtuoso Visualization and Analysis builds upon the features and infrastructure of the Virtuoso custom design platform, providing a technologically advanced and highly productive user experience. Seamless integration with Virtuoso Schematic Editor and Virtuoso Analog Design Environment provides users with a fast and efficient waveform display, analysis, and design debug tool.

Ease of use

Tight integration with Virtuoso Schematic Editor and Virtuoso Analog Design Environment enables users to easily plot a wide range of analog, RF, and mixed-signal design waveforms. An advanced user interface, drag-and-drop mechanism, built-in measurement toolboxes, customizable workspaces, and many more productivity-enhancing tools provide designers with an efficient waveform plotting and measurement tool.

Waveform display

Virtuoso Visualization and Analysis provides many advanced features to quickly plot and analyze waveforms.

Features such as spec markers, derived data plots (e.g. change-independent variables), automatic edge base measurements, scalar measurements, WREAL plotting, and refresh plotting enable users to easily calculate many design metrics used in analyzing a wide range of analog, RF, and mixed-signal designs.

Toolboxes and assistants

Measurement toolboxes and assistants allow users to simplify specific measurements for a wide range of waveform analysis tasks. They enable users to capture waveforms and create documents for design reviews more accurately and productively.

Post-processing and scripting

The Virtuoso custom design platform provides powerful scripting capabilities in the form of OCEAN (Open Command Environment for ANalysis) for fast and efficient analysis of waveforms. OCEAN scripts provide users with command line access to a rich set of functions to run simulations in batch mode and to perform extensive analysis of analog, RF, and mixed-signal designs. This, combined with built-in functions such as a calculator and equation builder, allows designers to measure complex design metrics and validate designs for a wide range of operating modes and conditions.

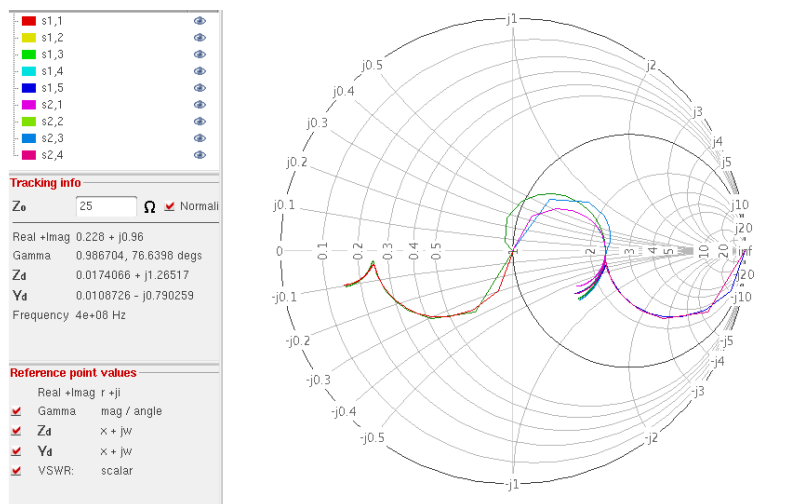


Figure 3: Smith chart

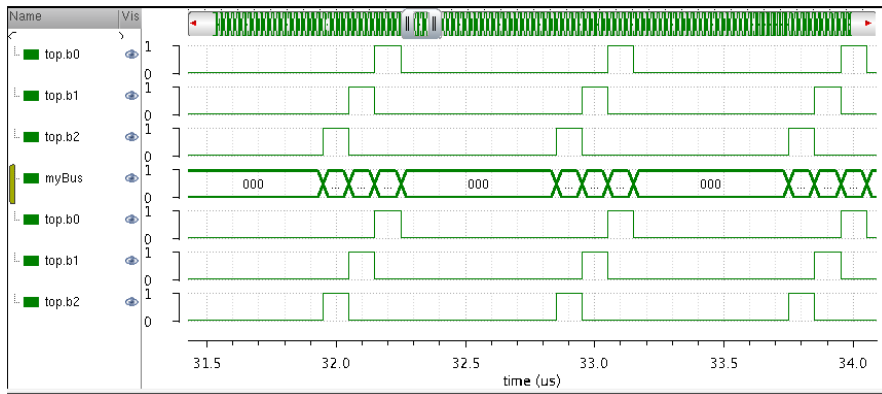


Figure 4: Bus waveforms

Waveform Display

A user-friendly, advanced interface allows users to easily access simulation results and plot waveform signals in the display window. The Virtuoso Visualization and Analysis display can be customized extensively, allowing designers to interactively select display panels, swap independent/dependent variables, create sub-windows, annotate markers, and plot data points in rows and columns in text format.

The waveform display includes:

- Hierarchy browser and signal list
- Recent files list
- Drag-and-drop signals onto waveform display windows
- Multiple windows, sub-windows, and strip configuration
- Zoom and pan capabilities
- Signal search capability with the ability to drag-and-drop from search results
- User-customizable bind keys
- Customizable workspaces (assistants, toolbars, display settings)
- Save and restore session

Virtuoso Visualization and Analysis supports time and frequency domain waveform types and statistical plots such as:

- Analog
- Digital
- Smith chart

- Polar plot
- Multi-dimensional sweep with ability to swap sweep variables
- Eye diagram
- Spectrum
- Histograms
- Scatter plots
- Y/Y plots
- A-to-D, D-to-A, and bus

Measurements

Markers

The advanced Virtuoso Visualization and Analysis user interface allows users to place multiple markers for interactive

on-screen measurement and analysis of waveforms. These markers can be locked to specific coordinates or moved around the waveform and display “X-at-Y” information on screen.

Monitors

An easy-to-use model allows users to place a wide range of markers on waveforms to perform complex on-screen measurements. These monitors include derivative, inverse derivative, delta value, cursor average, min/max/ave, peak-to-peak, and RMS values.

Waveform Post-Processing

A-to-D / D-to-A conversion

Analog waveforms can be converted to single-bit or multi-bit digital waveforms using user-specified threshold values. Also digital waveforms can be converted to analog waveforms based on user-specified analog signal levels using value transition sampling.

Data export

Users can save waveform data for export and save the data in different formats such as PSF, CSV, Virtuoso CSV (VCSV), SST2, SPICE PWL, and Matlab. Users can export the entire data or a subset of the data, helping them reduce the number of sample points.

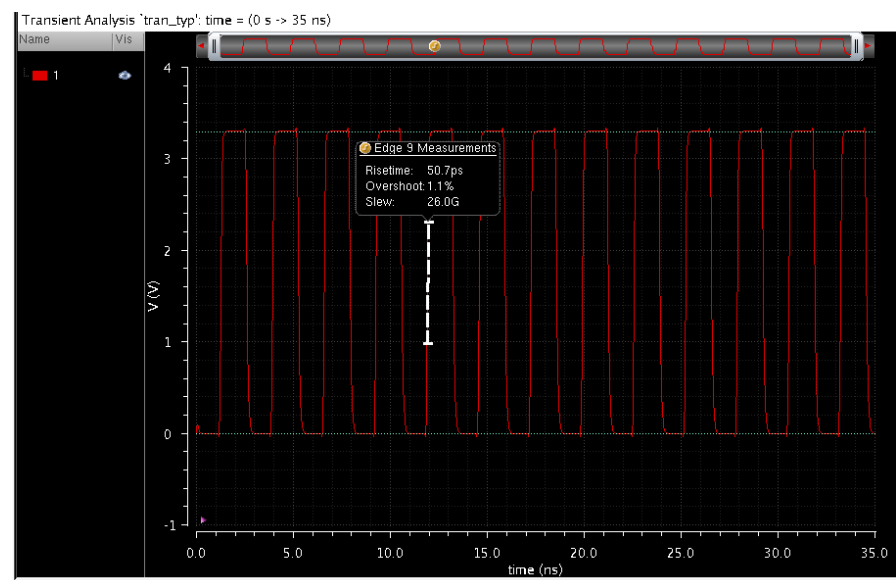


Figure 5: On-screen measurements

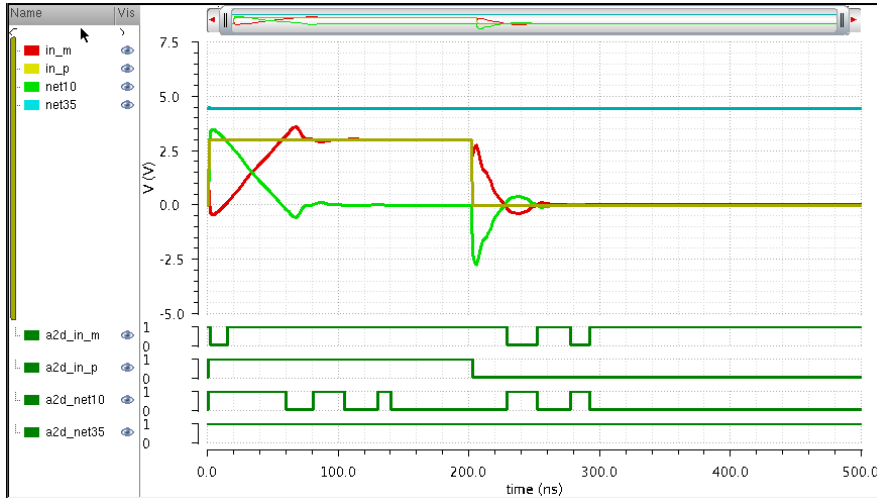


Figure 6: A-to-D conversion

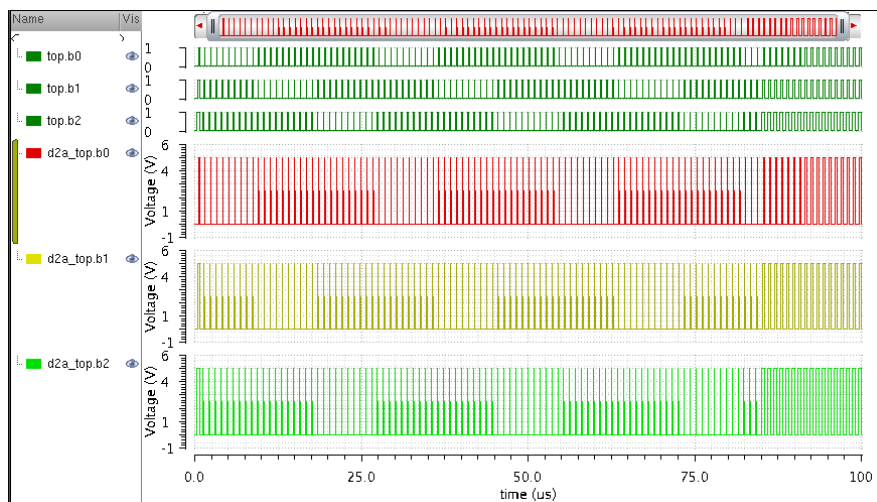


Figure 7: D-to-A conversion

Virtuoso Visualization and Analysis supports FFT and DFT operations on time-domain data using different windowing functions, allowing users to compute signal-to-noise ratio (SNR), total harmonic distortion (THD), signal-to-noise and distortion ratio (SNDR), and effective number of bits (ENB).

Toolboxes and Assistants

Spectrum toolbox

The Spectrum toolbox allows users to analyze various performance metrics of analog-to-digital converters (ADCs). It allows users to measure various DC static characteristics such as histogram, min/max values, and standard deviations.

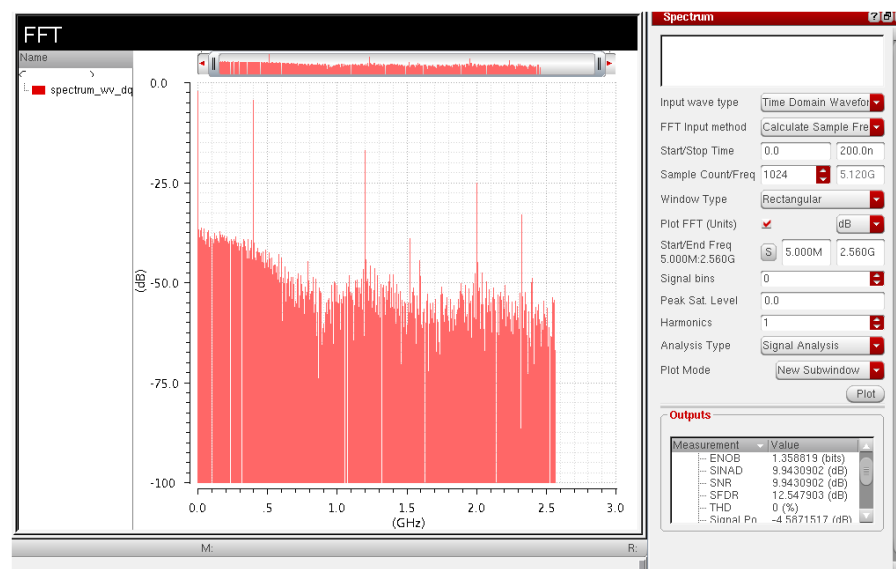


Figure 8: Spectrum toolbox

Using different sampling techniques, the ADC toolbox enables measurement of parameters SNR, SINAD, SFDR, ENB, noise floor/bin, noise floor/rHz, and total and peak harmonic power.

Eye diagram toolbox

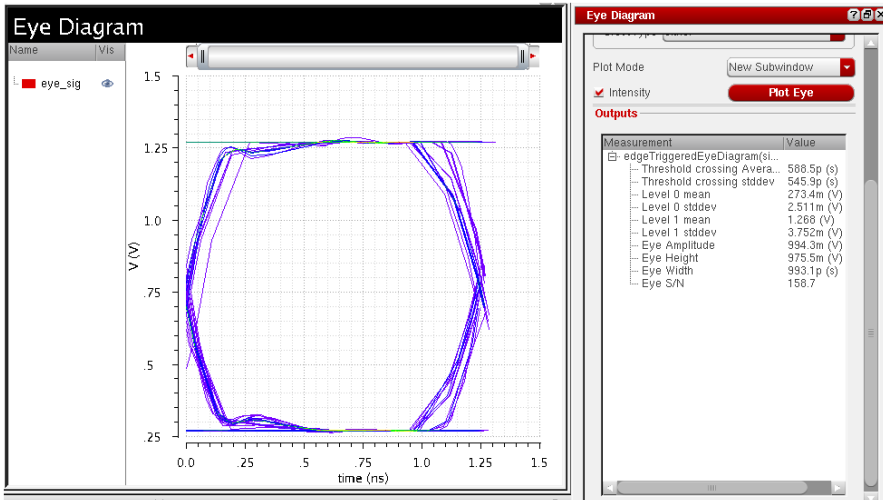
The eye diagram toolbox allows users to easily create eye diagrams from complex waveforms. The eye diagram is constructed by extracting the clock cycle, or by reference to an ideal clock, or to an external signal. The eye diagram assistant can automatically provide measurements such as eye width, height, amplitude, SNR, and level 1 and 0 standard deviation and mean. Once constructed, the automatic eye measurement tool can provide eye opening measurements as well as create a jitter histogram.

Waveform Post-Processing with Calculator

Users of Virtuoso Visualization and Analysis can perform post-processing calculations using:

- Graphical calculator
- Equation builder

The calculator contains a wide range of built-in mathematic, logarithmic, RF, and special functions and modifiers that can be applied on signals and waveforms to measure various design specifications. Users can save regularly used functions



Plot output file formats

- jpeg
- png
- bmp
- pdf
- svg
- eps
- tiff

Platform/OS

- X86 Linux
- Sun Solaris
- IBM AIX

Figure 9: Eye diagram toolbox

to a favorites folder for easy and efficient access. Virtuoso Visualization and Analysis is highly interactive and customizable, and it comes with a powerful equation builder that allows users to construct equations to perform complex measurements.

Scripting with OCEAN

OCEAN scripting capability can be used to perform regression scripting. This allows designers to make changes to their design and run a variety of analyses in batch mode, so they can work on other aspects of the design while the simulations are running. Users can run multiple testbenches and analyses in batch mode and open Virtuoso Visualization and Analysis at the end of each simulation to analyze results.

The ability to capture waveforms and create design documentation combined with the ability to share these scripts across design teams enables easy, error-free collection of data for design reviews and provides design teams with an efficient means of data management.

Support

Simulator/input file formats

- All Cadence and third-party simulators
- PSF
- PSF XL

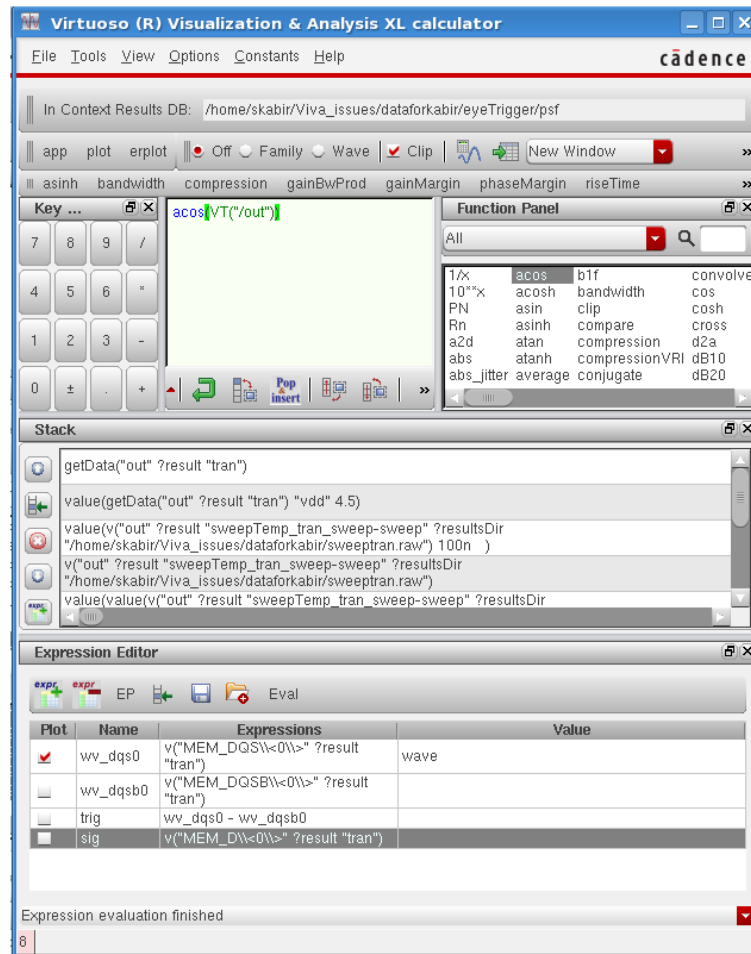


Figure 10: Calculator

Cadence Services and Support

- Cadence application engineers can answer your technical questions by telephone, email, or Internet—they can also provide technical assistance and custom training
- Cadence certified instructors teach more than 70 courses and bring their real-world experience into the classroom
- More than 25 Internet Learning Series (iLS) online courses allow you the flexibility of training at your own computer via the Internet
- Cadence Online Support gives you 24x7 online access to a knowledgebase of the latest solutions, technical documentation, software downloads, and more



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