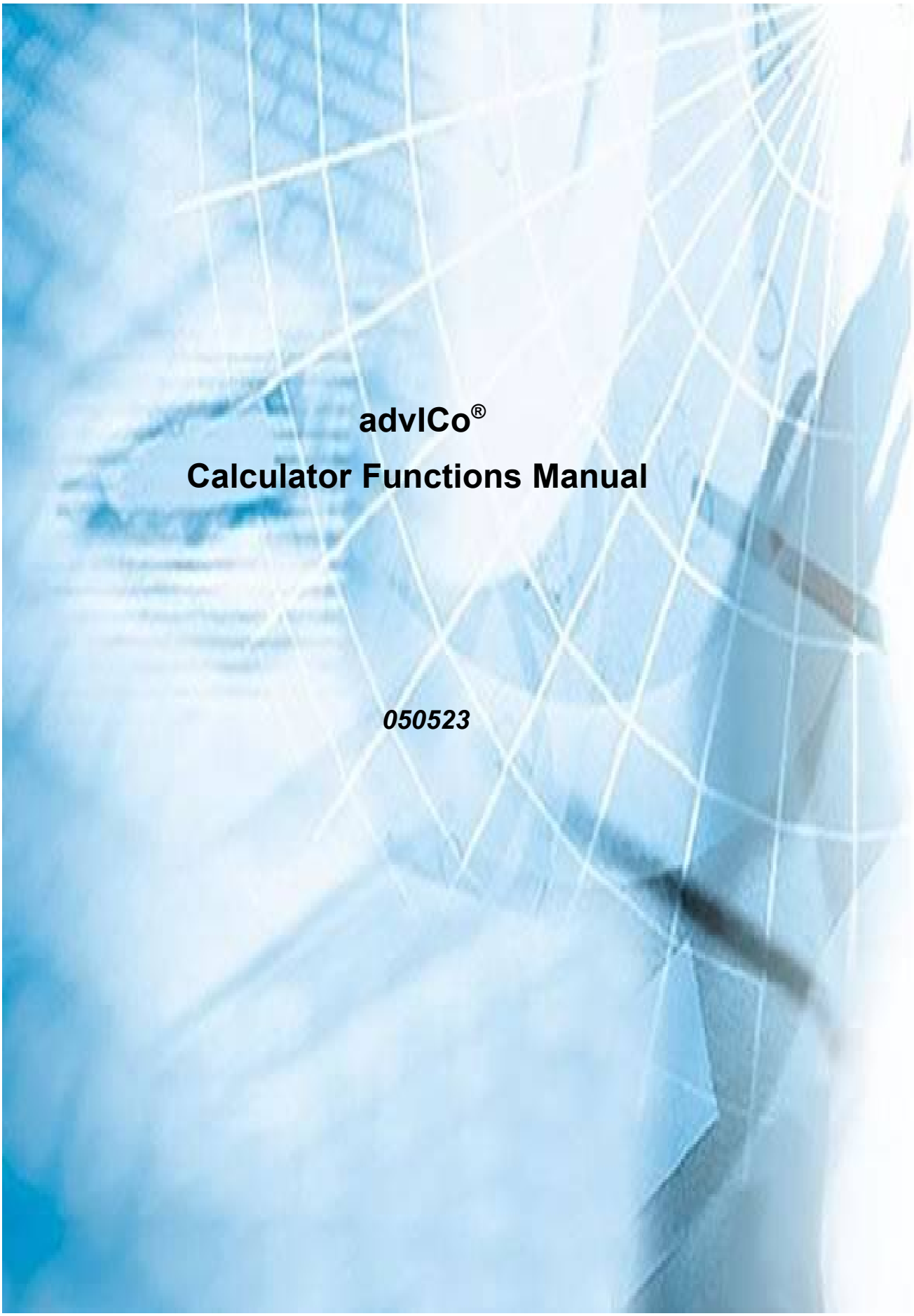

advICo®

Calculator Functions Manual

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What's that?

Although Cadence offers a huge library of functions to post-process your simulation data, there are things which you may be missing. Eye diagrams which require that the simulation is finished, frequency measurements which take an average of the simulation only, or histogram functions which don't exist may be examples why you may want to use **advICo**'s calculator functions.

All functions - **EyeDiag**, **MomAmp**, **MomFreq**, **MomTime**, **MomPhase**, **Resample**, **XHist**, **YHist** and **Write** - appear as plug-ins in Cadence® Calculator and are listed in the “Special Functions” menu of Cadence® Calculator. They are executed either by typing the commands at the Calculator command line or by using an input mask which is invoked from the “Special Functions” menu of the Cadence® Calculator.
All functions will already respond while the simulation is running. This allows an early check of the simulation results which may save you much time (in the waveform window, perform a Window|UpdateResults operation to re-read the last simulation results).

New: beginning with V0.7 all calculator functions can operate on single waveforms as well as on parametric plots!

EyeDiag

Description:

EyeDiag draws an **eye diagram** of the Signal (e.g. random data), beginning after T_{Delay}, with a bit period of T_{Per} . It will draw N eyes on the screen. The density of the diagram does not depend on the number of eyes, thus you can select a higher number and still need only a short simulation time. T_{delay} is used to remove possible settling processes from the eye diagram.

Execution:

Click in Calculator on “Special functions” -> “EyeDiag”

Or: Type in Calculator command line: EyeDiag(Signal, T_{Delay} , T_{Per} , N)

Example:

EyeDiag(VT("/out"),2n,25p,3)

This draws a 40Gbit/s eye diagram (25 ps per bit) with 3 eyes on the screen after 2ns simulation settling time.

MomAmp

Description:

MomAmp calculates the **instantaneous peak-to-peak amplitude** of the Signal which lies around threshold. Useful e.g. for VCOs or AM-modulated signals.

Execution:

Click in Calculator on “Special functions” -> “MomAmp”

Or: Type in Calculator command line:MomAmp(Signal, from, to, threshold)

Example:

MomAmp(VT("/out"),5n,50n,0)

MomFreq

Description:

MomFreq calculates the **instantaneous frequency** of the Signal between from and to time values, based on the rising edge of the signal, crossing threshold. Useful e.g. for VCO and PLL simulations.

Execution:

Click in Calculator on “Special functions” -> “MomFreq”

Or: Type in Calculator command line: MomFreq(Signal, from, to, threshold)

Example:

MomFreq(VT("/out"),5n,50n,0.0)

MomTime

Description:

MomTime calculates the **time difference between rising edges** of Signal1 crossing threshold1 to Signal2 crossing threshold2 in between from and to time values.
Useful for delay measurements or phase measurements (e.g. quadrature mixers: *MomTime(Sig_I,Sig_Q,...)*f_{ref}*360.0*)

NOTE: due to a limitation of the calculator, it is necessary to add Signal2 manually to the function string when using the Special Functions menu.

Execution:

Click in Calculator on “Special functions” -> “MomTime”
Or: Type in Calculator command line:
MomTime(Signal1, Signal2, from, to, threshold1, threshold2)

Example:

MomTime(VT("/ref"),VT("/out"),5n,50n,0.0,-0.1)

MomPhase

Description:

MomPhase calculates the **instantaneous phase** of the rising edge of the Signal crossing threshold and the reference signal with frequency f0 and initial phase phi0. Useful e.g. for VCO and PLL simulations.

Execution:

Click in Calculator on “Special functions” -> “MomPhase”

Or: Type in Calculator command line: MomPhase(Signal, f0, phi0, from , to, threshold)

Example:

MomPhase(VT("/out"),10G,180,5n,50n,0.0)

Resample

Description:

Resample **resamples the waveform** value at time intervals T0+N*T, based on linear interpolation. It is used by our statistical functions but may also be useful for data sampling in the calculator.

Execution:

Click in Calculator on “Special functions” -> “Resample”

Or: Type in Calculator command line:

Resample(Signal, T, T0)

Example:

Resample(VT("/out"),25p,0)

XHist

Description:

XHist creates a normalized **histogram of Signal crossings** of Threshold. The simulation data is internally resampled for this operation. The signal period T is used to calculate the spread of the crossing times. Time resolution of the histogram is T/Resolution. For Edge=0 both rising and falling edges are taken into account, for +1 only rising edges, for -1 only falling edges.

Execution:

Click in Calculator on “Special functions” -> “XHist”

Or: Type in Calculator command line:

XHist(Signal, Threshold, T, Resolution, Edge)

Example:

Xhist(VT("/out"),0.0, 25p,100, 0)

YHist

Description:

YHist creates an **amplitude histogram** of the Signal. The Signal is internally resampled with a period T for this operation. Amplitude resolution is (ymax-ymin)/Resolution, based on the measured extrema of the Signal. For Flip=nil the x-axis contains the amplitude and y contains the normalized amplitude distribution, for Flip=t the axis are swapped.

Execution:

Click in Calculator on “Special functions” -> “YHist”

Or: Type in Calculator command line:

YHist(Signal, Resolution, T, Flip)

Example:

Xhist(VT("/out"), 200, t)

Write

Description:

Write writes an **ASCII data file** (gnuplot style) with x/y-pairs. For parametric plots the individual parameter values are listed as a comment. Comment is an ASCII string that may hold information about the meaning of the x/y values. This command is better executed in the CIW instead of the calculator.

Execution:

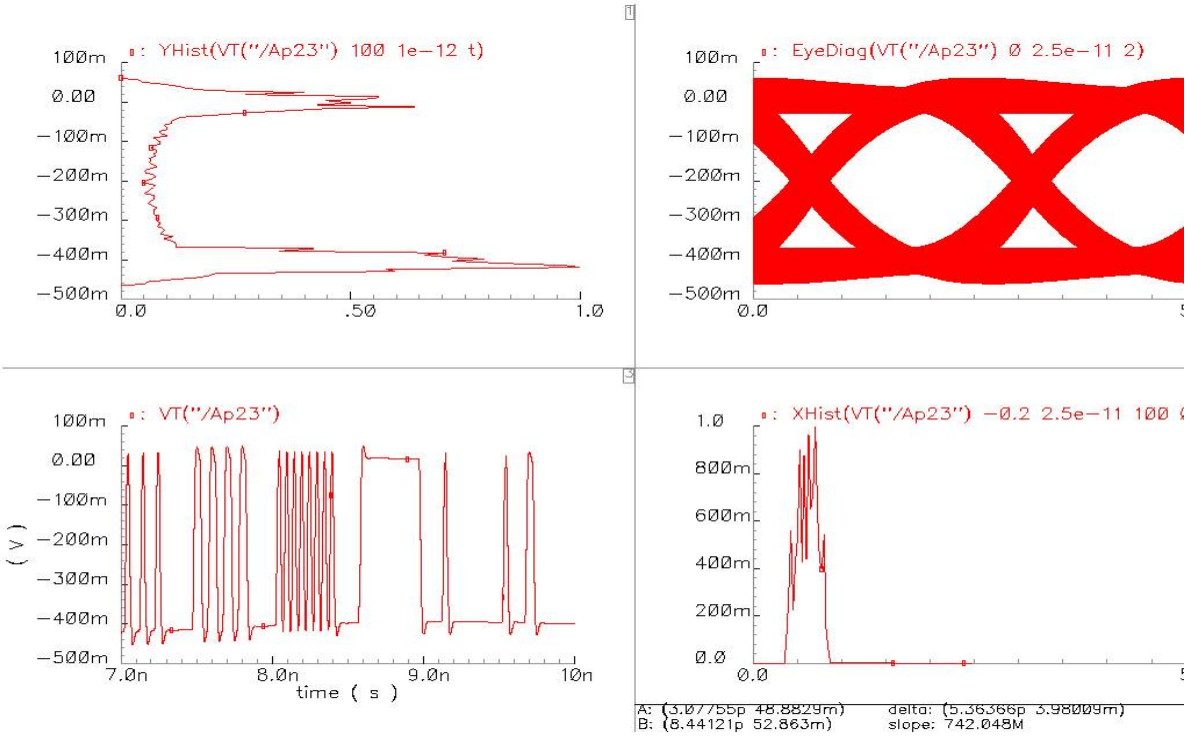
Click in Calculator on “Special functions” -> “Write”

Or: Type in Calculator or CIW command line: Write(Signal Filename, Comment)

Example:

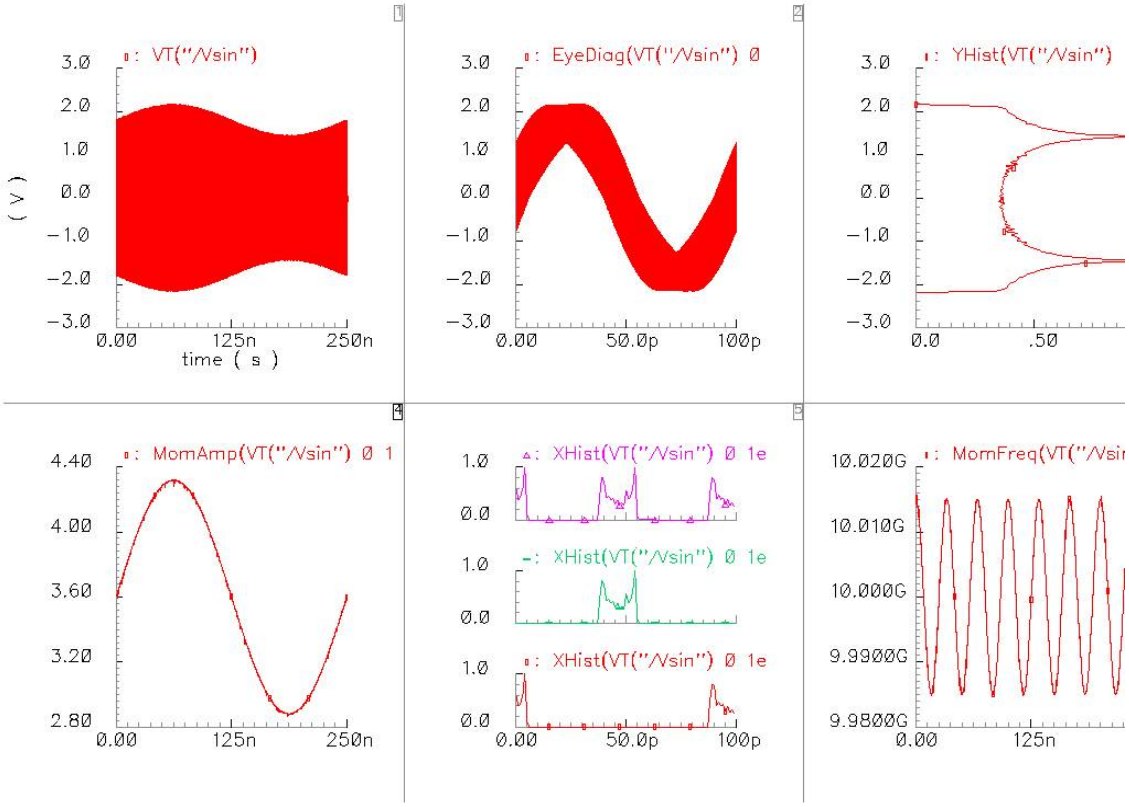
Write(VT("/out"),"//tmp/result.dat","x=time, y=V(out), param=VDD")

Example 1: PRBS sequence



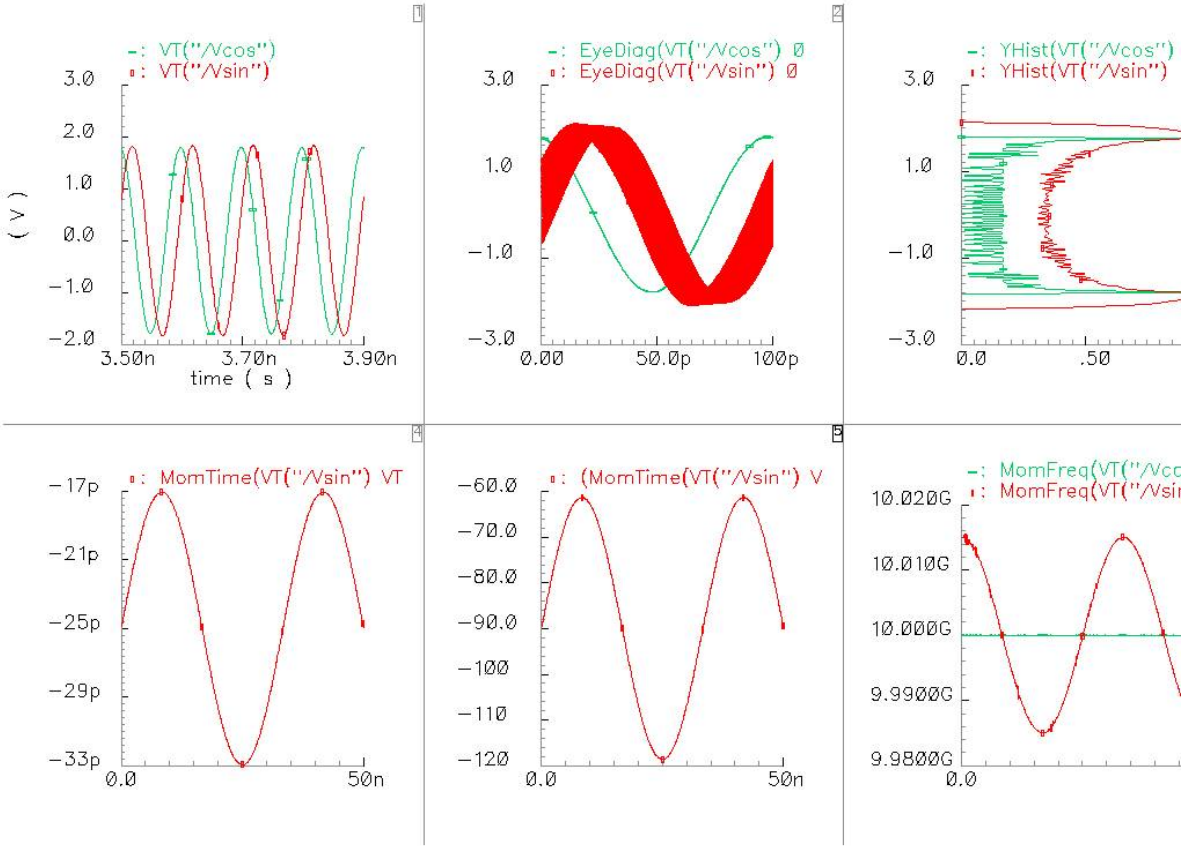
1) amplitude histogram, 2) eye diagram,
3) original y(t) data plot 4) jitter measurement, all edges

Example 2: AM and FM modulated sine wave



1) original y(t) data plot
2) eye diagram
3) amplitude histogram
4) instantaneous amplitude
5) jitter of all/falling/rising edges
6) instantaneous frequency

Example 3: IQ signals, one AM and FM modulated



1) original y(t) data plot
2) eye diagram
3) amplitude histogram
4) rising edge time delta
5) rising edge phase shift
6) instantaneous frequency

Disclaimer

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