Help

Effective Number Of Bits Calculator (ENOB Calc) is a program that aids in the design and analysis of data converter application circuits. ENOB calculates the effective number of bits of an ideal data convertor. Each parameter can be entered or found.

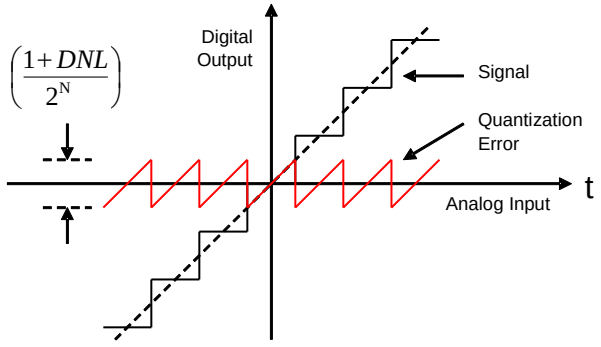
Parameters

1. Effective Number Of Bits, **ENOB,** in bits
2. Signal to Noise and Distortion, **SINAD,** in dB
3. Resolution, **N**, in bits
4. Bandwidth, **BW**, in % of the Nyquist frequency, or, Over Sample Ratio, **OSR**, as a multiple of the sample frequency
5. Average Differential Nonlinearity, **DNL**, in LSB
6. Clock Jitter, **Tj**, in PPMrms of the clock period
7. Analog Referred Noise, **Vn**, in LSBrms
8. Total Harmonic Distortion, **THD**, in % or dB.

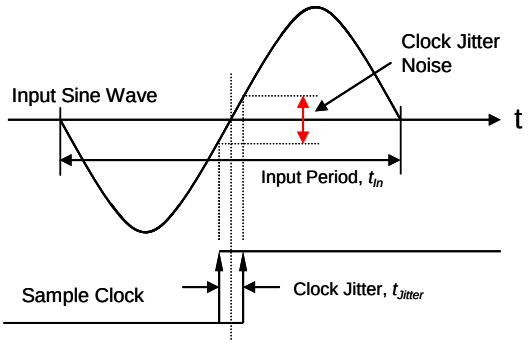
Parameter Descriptions

$$ENOB = \frac{SINAD - 10 \cdot Log\left(\frac{3}{2}\right)}{20 \cdot Log(2)}$$

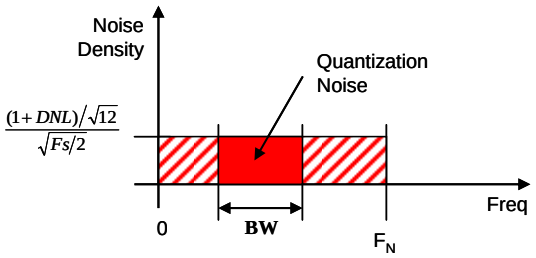
$$SINAD = -20\log\sqrt{\underbrace{\frac{2}{3}\left(\frac{\sqrt{\frac{BW}{100}}(1+DNL)}{2^N}\right)^2}_{\text{Quantization Noise}} + \underbrace{\left(2\pi\frac{Tj}{10^6}\right)^2}_{\text{Clock Jitter Noise}} + \underbrace{\left(\frac{2\cdot\sqrt{2}\cdot Vn}{2^N}\right)^2}_{\text{Analog Noise}} + \underbrace{\left(\frac{THD_{\%}}{100}\right)^2}_{\text{THD}}}$$



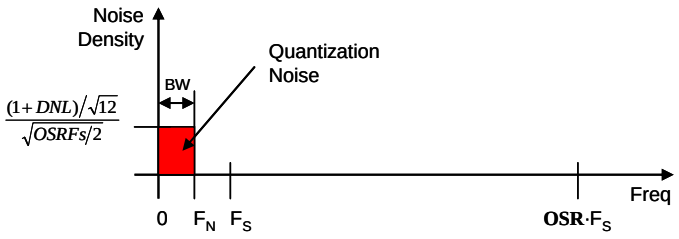
Quantization Noise (Res and DNL)



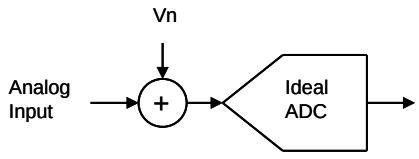
Clock Jitter Noise (Tj)



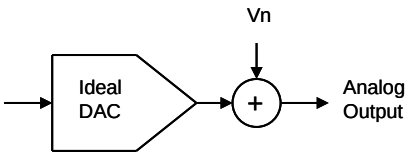
Quantization Noise (BW)



Quantization Noise (OSR)

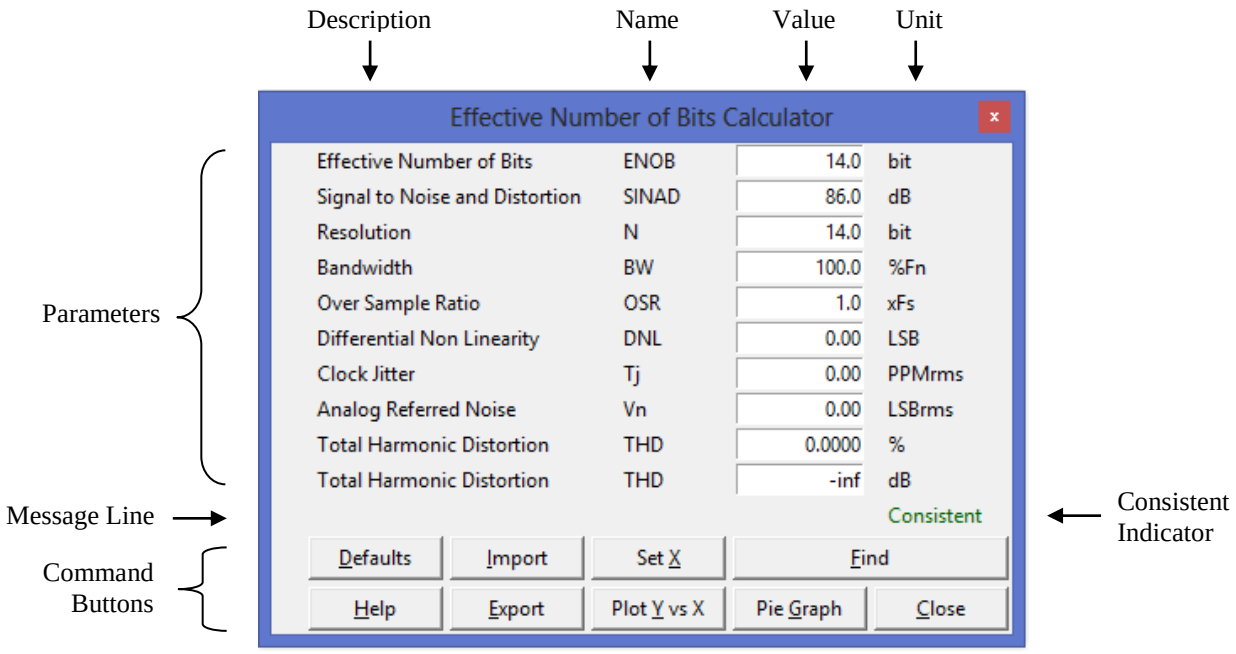


ADC Input Referred Noise (Vn)



DAC Output Referred Noise (Vn)

Calculator Window



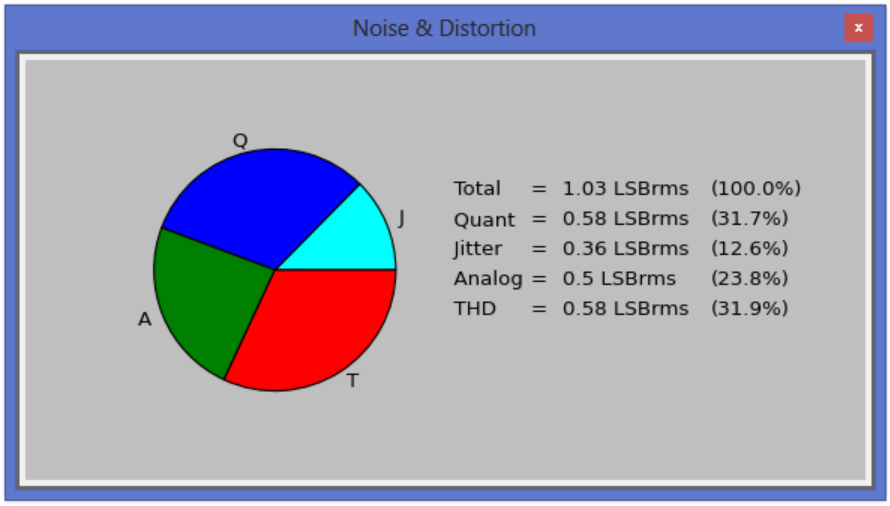
Commands

Find	Alt + F	Find the selected parameter
Pie Graph	Alt + G	Graph the noise spectral density curve specified by the parameters
Set X	Alt + X	Select the x-axis parameter to plot
Plot Y vs X	Alt + Y	Select and plot the y-axis parameter with respect to the x-axis parameter
Export	Alt + E	Export all parameters to a .cvs file
Import	Alt + I	Import all parameters from a .cvs file
Defaults	Alt + D	Load the default parameter values
Help	Alt + H	Display the help page
Close	Alt +C	Close the calculator

"Consistent" indicates that all parameters are consistent. It appears following a Find (Alt + F) command. "Inconsistent" indicates that all parameters may not be consistent. It appears following an entry or import command.

Pie Graph

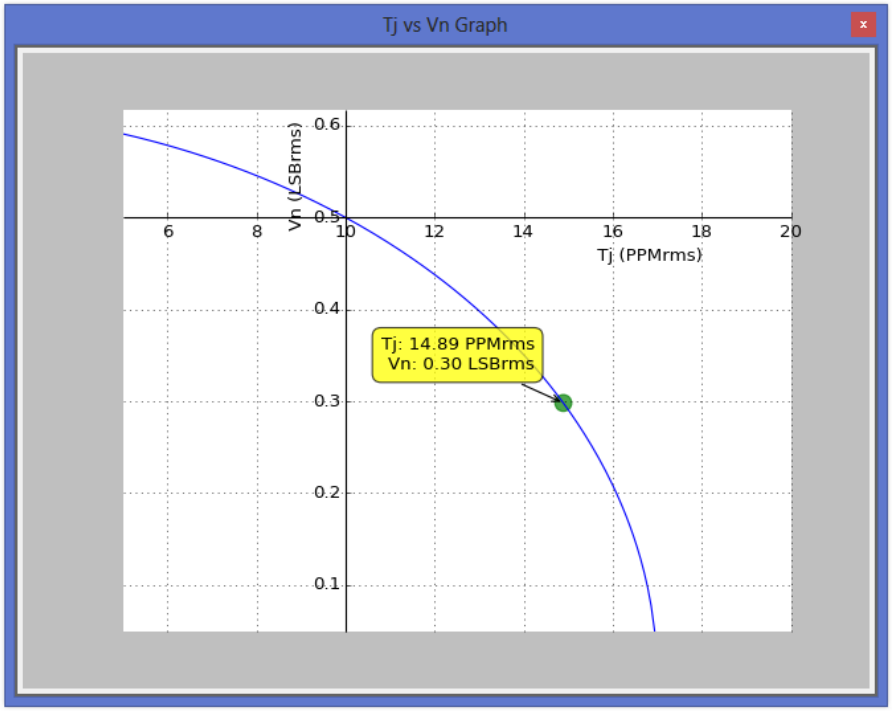
The pie graph command (Alt + G) displays a pie chart showing the contribution of each noise source in the data convertor or signal chain.



The noise and distortion components are plotted as a percentage their contributions to total noise when summed in RSS fashion. The amplitude of each component is given in LSBrms.

Parametric Plot

The “Plot X vs Y” command (Alt + Y) displays the following graph.



Moving the mouse over the plot window will reposition the green cursor showing the trade-offs that can be made between the two selected parameters and the remaining parameters values.

About

Version 1.1.0
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