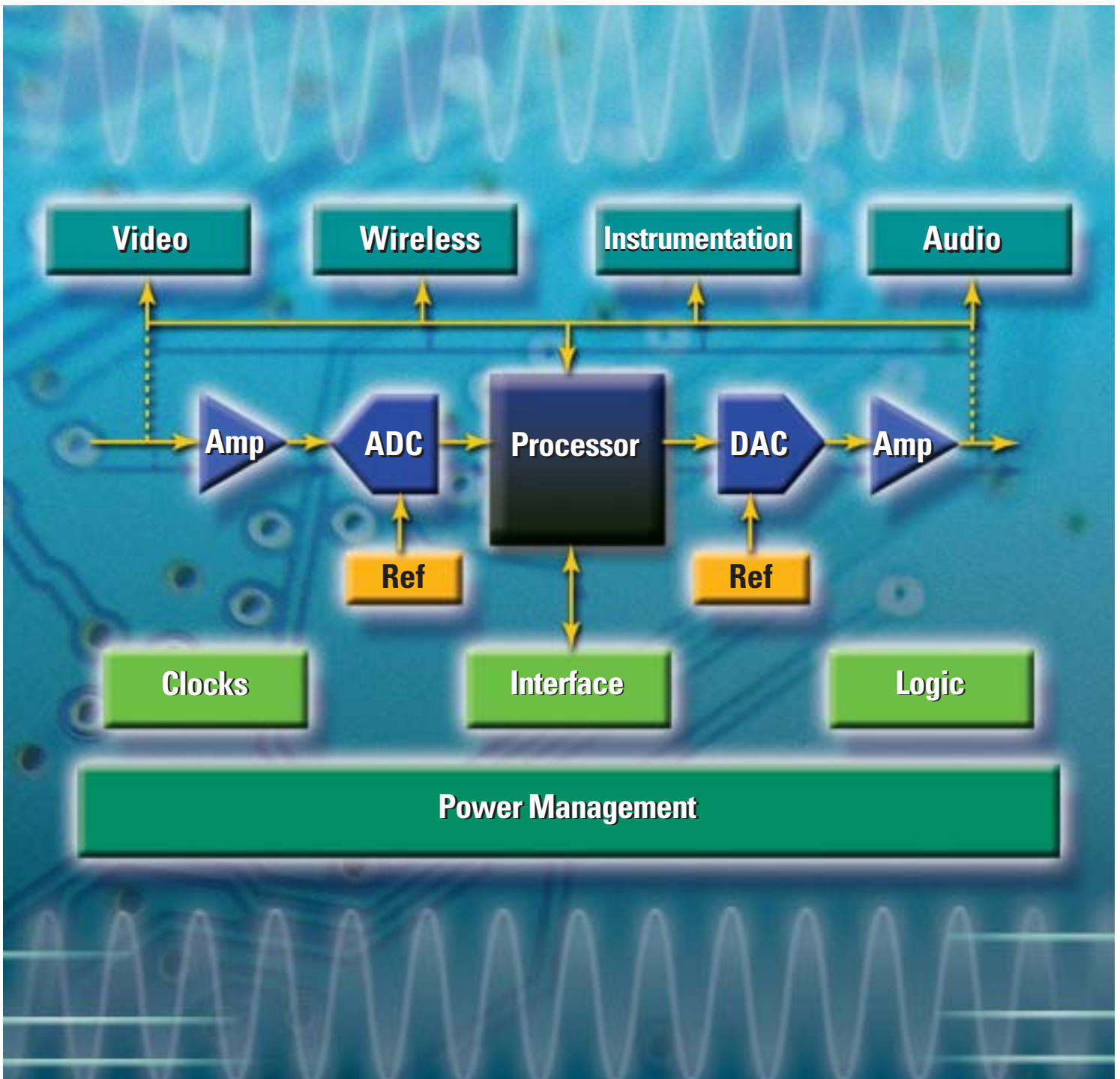# High-Performance Analog Design Tools Guide

2Q 2006

Includes Design and Development Tools for:

- Amplifiers
- Power Management
- Data Converters
- Wireless
- Audio

➔

amplifier.ti.com

TINA-TI™
Easy-to-Use, Powerful SPICE Simulation Tool

Downloadable software (freeware) at: **www.ti.com/tina-ti**

Based on a SPICE engine, TINA-TI provides all the conventional DC, transient and frequency domain analysis of SPICE and much more. TINA has extensive post-processing capability that allows you to format results the way you want them. Virtual instruments allow you to select input waveforms and probe circuit node voltages and waveforms. TINA's schematic drawing and capture is truly intuitive — a real "quickstart."
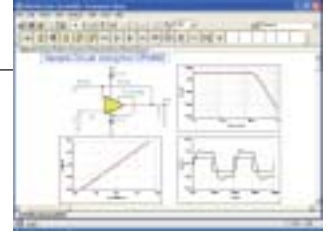
FilterPro™
Calculates Component Values for Linear Active Filter Designs, HPF and LPF

Downloadable software (freeware) at: **www.ti.com/filterpro**

FilterPro Multiple Feedback (MFB) and Sallen-Key Design Program is a Windows® operating system application that designs MFB and Sallen-Key low-pass and high-pass filters using voltage feedback op amps, resistors and capacitors. It also supports a fully differential version of the MFB circuit. This program includes Bessell, Butterworth, Chebychev, and linear phase filter types and can be used to design filters from 1 to 10 poles.

Anti-Aliasing Filter Tool for Data Converters
Tool for Quick Evaluation of a Filter for a Given Data Converter

Downloadable (Microsoft® Excel® spreadsheet) software at: **www.ti.com/filter_utilities**

This spreadsheet tool facilitates quick evaluation of a filter for a given data converter. Users enter converter resolution, sample rate, and order of filter, and can then view a graph showing response at an assumed 20-dB/decade rolloff per pole and the aliased spectrum around the sample rate.

Resistor/Capacitor Calculator for Filters
Automatic Calculation of Optimal R C Values for Passive Filters

Web-based software at: **www.ti.com/filter_utilities**

Use this utility to calculate the R and C values for one-pole filters at a given frequency.

Voltage Divider Calculator
Quickly Determine a Set of Resistors for a Voltage Divider

Web-based software at: **www.ti.com/single_out_utilities**

This utility can be used to find a set of resistors for a voltage divider to achieve the desired output voltage. This calculator can also be used to design non-inverting attenuation circuits.

Op Amp Gain and Offset Component Calculator
Resistor Selection Tool for Op Amp Design

Web-based software at: **www.ti.com/single_out_utilities**

This utility calculates the best resistor values required for any combination of op amp gain, attenuation, and/or offset.

Op Amp to ADC Circuit Topology Selection Tool
Tool to Assist in Design of ADC Input Interface Circuits

Web-based software at: **www.ti.com/single_out_utilities** and **www.ti.com/diff_out_utilities**

This tool facilitates selection of 24 different buffer op amp circuits for analog-to-digital converter (ADC) interface circuits. Includes a beginner mode to walk users through the process of defining a system architecture.

Op Amp Gain Stage Utility
Resistor Selection Tool for Op Amp Gain Stage

Web-based software at: **www.ti.com/single_out_utilities**

This calculator allows the designer to find the resistor values for both inverting and non-inverting op amp gain stages — with and without compensation for open-loop gain effects.

Component Calculator for Fully Differential Op Amps
For Calculation of Component Values for Single-Ended to Differential Amplifiers

Web-based software at: **www.ti.com/diff_out_utilities**

This application calculates the component values for a single-ended input to differential-output converter. It then simulates the outputs for a given input. This program is useful for circuits whose input is terminated with the characteristic impedance of the signal source while balancing the feedback paths of the fully differential amplifier.

Noise Calculator
Tool to Calculate Noise Over a Specified Bandwidth for Different Amplifier Topologies

Downloadable (Microsoft Excel spreadsheet) software at: **www.ti.com/noise_utilities**

The noise calculation tool is an Excel spreadsheet that calculates the spot noise and integrated noise over a user-specified bandwidth for inverting, non-inverting and transimpedance topology op amp circuits.

Noise Generator
LabView Tool for Noise Generation and Analysis

Downloadable Labview at: **www.ti.com/noise_utilities**

The noise generator tool is a Lab View 4 Run-Time executable that generates Gaussian white noise, uniform white noise, 1/f noise, shot noise, and 60-Hz line noise. Temporal data, spectrum and amplitude histogram are given.

Current Transmitter Calculator
Calculations for 4- to 20-mA Current Loop Transmitter Devices

Downloadable (Microsoft Excel spreadsheet) software at: **www.ti.com/design_calc**

This spreadsheet calculates values for the external components used with the XTR105, XTR112 and XTR114. It also predicts the linearity of output vs. temperature when the device is used with platinum RTDs.

Amplifiers

→ *amplifier.ti.com*

Common Mode Range Calculator
Calculates Input Common Mode Range for Instrumentation Amps

Downloadable software (freeware) at: **www.ti.com/design_calc**

This Windows operating system program calculates the input common mode range for instrumentation amplifiers. The indicated performance is typical for operation at 25°C.

Decibel Calculator
Tool to Easily Calculate and Convert Between Different Decibel, Voltage and Power Ratios

Web-based software at: **www.ti.com/design_calc**

Use this utility to calculate decibel ratios and easily convert between the different decibel, voltage and power ratios.

Frequency/Wavelength Calculator
Convenient Calculation of Frequency/Wavelength in Multiple Units

Web-based at: **www.ti.com/design_calc**

This tool can be used to calculate wavelength of a signal when the frequency is known and vice-versa.

Product-Level SPICE Macro Models
SPICE Op Amp Macro Model Library

Downloadable (.zip) software at: **amplifier.ti.com/spice**

Product-level models designed for use with SPICE allow efficient simulation of complex circuits without use of transistor-level models. The entire set of SPICE models available from TI can be obtained from this site. Note that all of these are macro models and cannot simulate all the minute details of part performance.

Power Management

→ *power.ti.com*

PoE Powered Device Controller Design-In Calculator
Simplifies the Calculation of External Component Values

Downloadable (Microsoft Excel Spreadsheet) software at: **focus.ti.com/docs/toolsw/folders/print/tps2375or77calc.html**

This calculator spreadsheet will aid in designing circuits with TI's TPS2375 and TPS2377 PoE powered device controllers. Simply enter the input voltage, the output power range, the output capacitance, and other application specifications, and the values of the required external design components are automatically generated by the calculation tool.

Hot-Swap Controller Design-In Calculator
Simplifies the Calculation of External Component Values

Downloadable (Microsoft Excel Spreadsheet) software for TI's hot-swap controllers available at: **power.ti.com**
under the "Hot-Swap Controllers (External FET)" product category for the following device families:
TPS230x, TPS231x, TPS232x, TPS233x, TPS2350, TPS239x and **TPS249x**

Developed to save customers time when designing with TI's family of hot-swap controllers, this tool accepts system-level parametric information and automatically calculates values for the external configuration components.

Power Quick Search
Quick and Simple Power Solution Selection Tool

Web-based software at: **power.ti.com**

Use the power quick search tool to enter basic design constraints including input voltage range, desired output voltage and current, and obtain a short list of devices that are potential solutions.

SWIFT™ DC/DC Converter Designer Software
Design Tool for TPS54xxx Family of Switchmode DC/DC Converters

Downloadable software (freeware) at: **www.ti.com/pol**

The SWIFT designer software tool assists in power supply design using the TPS54xxx family of DC/DC regulators with integrated FETs. The software accepts basic design requirements such as the input voltage range, output voltage and current, then produces a schematic, bill-of-materials and board layout. The tool also allows the user to optimize the design for space or efficiency, provides basic circuit performance analysis and supports both internally and externally compensated regulators.
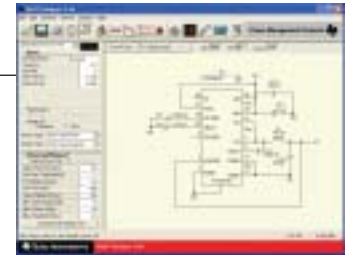
TPS62K Low-Power DC/DC Controller Designer Software
Design Tool for TPS62xxx Family of Low-Power DC/DC Controllers

Downloadable software (freeware) at: **www.ti.com/pol**

The TPS62K low-power DC/DC design software application assists in power supply design using the TPS62xxx family of DC/DC conversion devices. The software accepts design constraints such as input voltage range and the desired output voltage and current and produces a schematic and bill-of-materials. The software allows the user to optimize the design for space or efficiency and provides basic circuit performance analysis.

TPS40K™ DC/DC Controller Designer Software
Design Tool for TPS40xxx Family of Switchmode DC/DC Controllers

Downloadable software (freeware) at: **www.ti.com/pol**

TPS40K designer software provides a simple design tool for both novice and experienced designers using TI's TPS40xxx family of DC/DC controllers. The software includes advanced analysis tools to do worst-case loop response analysis and component characterization.

Advanced Gas Gauge Evaluation Software
Application for Comprehensive Evaluation of bq2084 Advanced Gas Gauge

Downloadable software (freeware) at: **www.ti.com/bq2084_sw**

TI's gas gauge evaluation software is a Windows® operating system application that works in conjunction with the bq2084 evaluation module. Also required is the EV2300 USB interface board. This program provides a comprehensive set of tools to allow easy evaluation of the bq2084 advanced gas gauge.

Power Reference Designs
Complete Turnkey Power Solutions for Multiple Applications

Downloadable literature at **power.ti.com/referencedesigns** or contact your local TI field representative for more information

A wide variety of reference designs developed by TI that vary greatly in their target applications and uses. The easy-to-use charts have multiple designs, categorized by V_{IN}, V_{OUT}, and I_{OUT}. Each reference design contains a schematic, bill-of-materials, and additional detailed technical information. In addition, when you visit our reference design home page you can download the Power Reference Design Cookbook and the Altera- and Xilinx-approved FPGA Solutions Guides.

Data Converters

→

dataconverter.ti.com

Data Converter Quick Search Tool
Quick and Simple ADC/DAC Solution Selection Tool

Web-orderable software at: **dataconverter.ti.com**

The ADC and DAC quick search grids can be used to quickly select appropriate devices using ranges for resolution and sample rate/settle time, respectively.

Data Converter Plug-In for Code Composer Studio™ IDE
Effortless Configuration and Simplified Programming of Data Converters

Downloadable software (freeware) at: **www.ti.com/sc/dcplug-in**

TI's data converter plug-in development tool allows the creation of initialization data and configuration software for TI data converters from within Code Composer Studio's IDE. It generates code that is to a great extent hardware-independent, so it can be used together with analog evaluation modules, DSP starter kits or custom boards.

Modular Data Converter Evaluation Modules
Create a Complete Data Acquisition Signal Chain Prototype in Minutes

Web-orderable software at: **www.ti.com/mod_evm**

TI data converter evaluation modules are now available in a modular system that allows developers to easily prototype signal conversion and processing blocks together in a plug-and-play fashion.

High-Speed ADC Capture Card
### Frequency/Time Domain Evaluation of High-Speed ADCs

Web-orderable software at: **www.ti.com/tsw1100**

The TSW1100 allows for high-speed digital data capture and software analysis from TI's high-speed, high-resolution ADCs. Performs FFT analysis for SFDR, SNR, THD and ENOB. Data capture speeds of up to 170 MSPS and depths of up to 16 x 1 million points.

ItoVpro™ Design Utility for MDAC Design
Design Tool for DAC88xx Family of Multiplying Digital-to-Analog Converters

Downloadable software (freeware) at: **www.ti.com/itovpro**

ItoVpro is an MDAC design utility that allows the user to enter design parameters including power supply voltage/s, output voltage, desired MDAC device and other circuit types. ItoVpro then displays the appropriate circuit configuration. The designer enters error tolerance and the program selects an appropriate op amp.
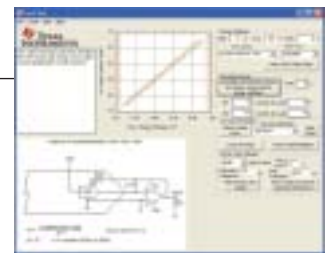
FPGA Deserialization Reference Design
Turnkey Deserializer Solution for Xilinx FPGAs

Downloadable literature at: **http://focus.ti.com/docs/toolsw/folders/print/ads527x-ref.html** or contact your local TI field representative for more information

The Xilinx deserializer solution includes ADS527x 8-channel, 12-bit analog-to-digital converters with serialized LVDS interfaces and sample rates from 40 MSPS to 70 MSPS. This family works well with the LVDS I/Os of Xilinx's Virtex-II™, Virtex-II Pro, and Spartan-3™ devices.

ISM Band EasyRF Tool
Quick Calculation of Component Values Given User-Defined System Parameters

Downloadable software (freeware) at: **www.ti.com/ismrf**

This freeware GUI application for RF applications with the TRF6903/4903 transceivers calculates values for PLL filter, LNA, PA matching, crystal switch caps, IF matching, and S&H capacitors. Battery life and frequency plan calculators listed below are also included in this tool.

ISM Band RF Loop Filter Calculator
Easily Calculate Loop Filter Value for ISM RF Receiver Applications

Downloadable GUI at: **www.ti.com/ismrf**

This software tool calculates the loop filter value for TRF6900 and TRF6901 transceivers.

RF Transceiver Power Consumption Calculator
Quickly Obtain Power Consumption Estimates for RF Transceiver Applications

Downloadable (Microsoft Excel spreadsheet) software at: **www.ti.com/ismrf**

This spreadsheet tool calculates expected battery life for the TRF6903/4903 transceivers in Tx and Rx modes and can be used as a guideline for current consumption calculation for a defined baseband protocol.

Dolphin Wireless UART Chipset and Reference Design
Easy-to-Use Complete ISM Band RF UART Solution Combats Signal Interference

Downloadable schematic, Gerber files, literature and Web-orderable hardware (DBB03 and TRF6903) at: **www.ti.com/ismrf**

The Dolphin is a Frequency Hopping Spread Spectrum (FHSS) wireless UART chipset and reference design for the 902-928MHz US ISM band and consists of TI's TRF6903 RF transceiver and the digital baseband ASIC DBB03. Schematics and layout of the Dolphin can be used as an FCC-precertified reference design.

MSP430 – TRF6903 RF Data Link Evaluation Kit
Quick Evaluation of the TRF6903 and MSP430 as a Bi-directional RF Data Link Solution

Downloadable software at: **www.ti.com/ismrf**

This evaluation kit with the TRF6903 transceiver and MSP430 microcontroller can be used to demonstrate a bidirectional RF data link without the need for an external computer, and to prototype by downloading new software code to the MSP430F449 through the JTAG connector. The schematics and layout of the board can be used as a reference design if desired.

Digital Up/Down Converter Design Kit
Tools to Support Design and Evaluation with GC5016 Digital Up/Down Converter

Downloadable config file, programming tool, user guide, ibis model and orderable evaluation kit at: **www.ti.com/gc5016dk**

TI offers a complete design kit for its GC5016 digital up/down converter, which includes an evaluation module, software, and diagnostic, configuration and programming tools.

DAC5687 Component Calculator Tool
Quick and Easy Component Selection for the DAC5687

Downloadable (Microsoft Excel spreadsheet) software at: **www.ti.com/sc/device/dac5687**

This spreadsheet tool calculates appropriate external component values for the DAC5687 given a set of system parameters while highlighting intermediate calculations.

www.ti.com/wireless-tcom

TSW3000 RF Transmit Chain Demonstration Kit
Design Tool for Simplifying RF Signal Chain Evaluation

Web-orderable EVM, support software and literature at: **focus.ti.com/docs/toolsw/folders/print/tsw3000.html**

The TSW3000 is a high-performance RF transmit signal chain demonstration kit. This system performs the digital-to-analog conversion and RF modulation onto a carrier between 1.5 to 2.5 GHz. The TSW3000 is comprised of the DAC5687 for digital-to-analog conversion, CDCM7005 for clock generation, TRF3750 for PLL and LO generation, and the TRF3702 for the final IQ modulation to RF. This system demonstrates the use of TI circuits in a low-cost, high-performance RF transmit signal chain that can be adapted to meet the requirements of various RF systems.

Audio

www.ti.com/audio

Audio Quick Search Tool
Quick and Simple Audio Product Selection Tool

Web-based software at: **www.ti.com/audio**

TI offers quick search tools to assist in audio CODEC, power amplifier and converter selection.
(Select key performance requirements to view recommended parts.)

Audio Resources CD
Readily Available Comprehensive Technical Information on Audio Solutions

Downloadable software (freeware) at: **www.ti.com/tiaudio**

The latest technical documentation, application notes, training information and related resources on audio solutions are available on the Audio Resources CD.