Tools to Shrink Your Design Cycle Times

Bonnie C. Baker, Texas Instruments

Designers continue to face pressure from customers and competitors to produce products in a timely manner. Product planning and implementation is critical in this rapid pace environment. It is important to aggressively address implementation issues; however, all too often companies downplay or even overlook many steps in the planning stage. A critical step in the planning stage is creation and proof of design. Electrical and printed-circuit-board (PCB) level computer simulations are an important part of the proof of design exercise.

Simulations can be done with a variety of tools available from IC vendors. IC vendors help their customers reach aggressive goals by developing an array of tools that address the PCB designer's needs. These tools include analog circuit, digital circuit, and board level design tools.

Some design tools assist in determining the circuit topology for difficult blocks such as switching analog power-supply or analog filter designs, and provide critical circuit performance specifications. For example, one can use a power-supply design tool such as Texas Instruments' SwitcherPro™ in on-line or download versions to create the desired power-supply circuit (**Figure 1**).

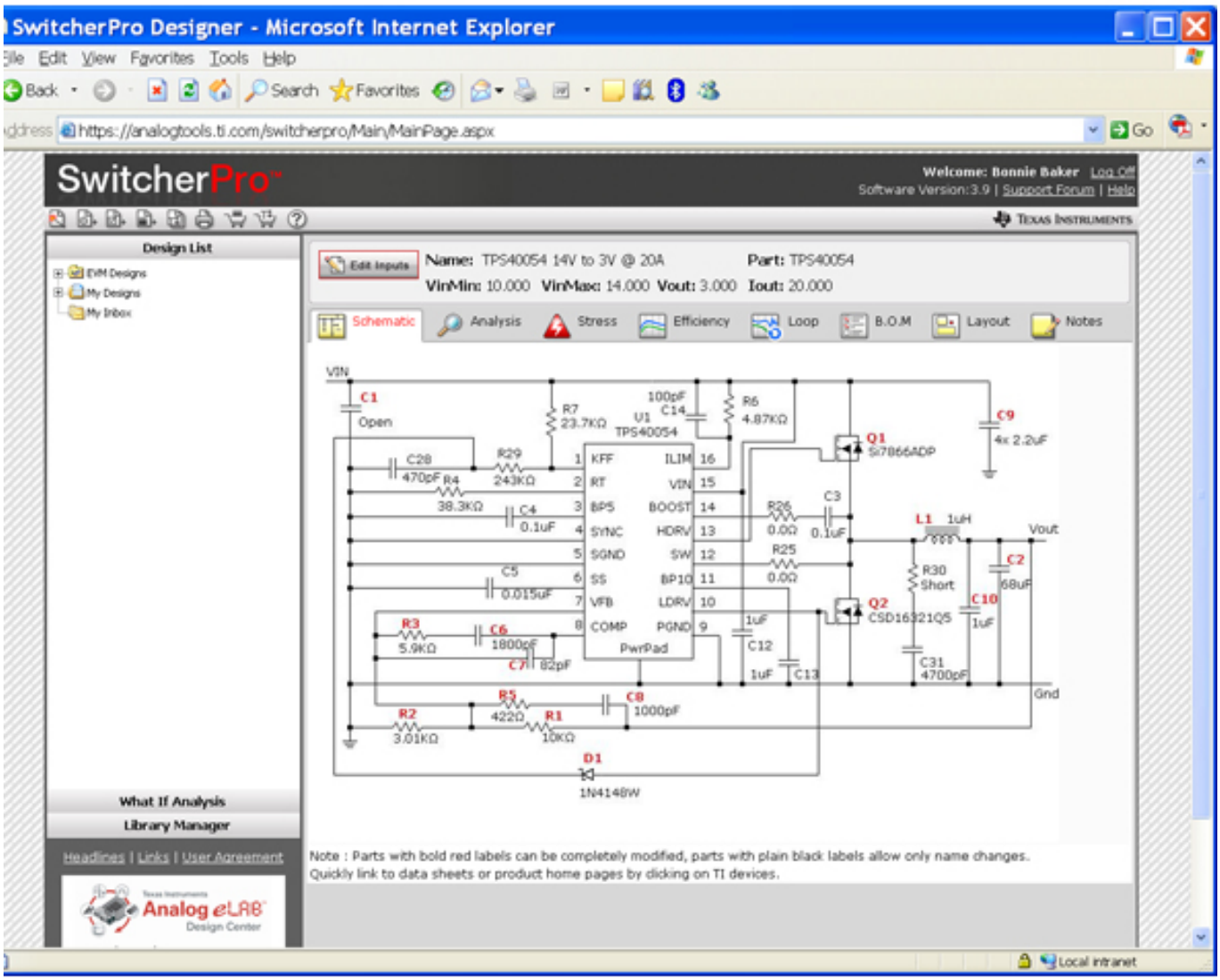

Figure 1. A power-supply design tool provides auxiliary components for the total design (1).

A power-supply design tool usually allows the user to create his own design, starting with desired specifications and an appropriate IC part number. These tools also can provide an overall analysis of the finished circuit's minimum and maximum performance as well as the effects of lossey components, maximum-junction-temperature conditions, circuit-efficiency, and circuit-loop stability. As the PCB designer proceeds to bread-board implementation, most power-supply design software provides a bill-of-material (BOM) and layout suggestions.

Analog filter design software also helps the PCB designer. You can find versions of this type of software on some analog IC manufacturer's websites. For example, TI offers FilterPro™ as its analog filter design program. These tools push the burden of laborious filter calculations into the computer. Filter-design software packages can frequently design some or all low-pass, high-pass, band-pass, band-stop (notch), and all-pass type filters. The software helps to define the filter specifications and response type. Once these variables are determined, the software provides a complete circuit, including the auxiliary components.

Once a design has been created (either by hand or design software), it can be

validated and tuned with the aid of a SPICE simulator. SPICE simulators such as TI's TINA-TITM ([1]) assist in designing and evaluating the performance of multiple sub-circuits in an application (Figure 1). In Figure 2, the goal is to find the difference in two-filter gains across frequency.

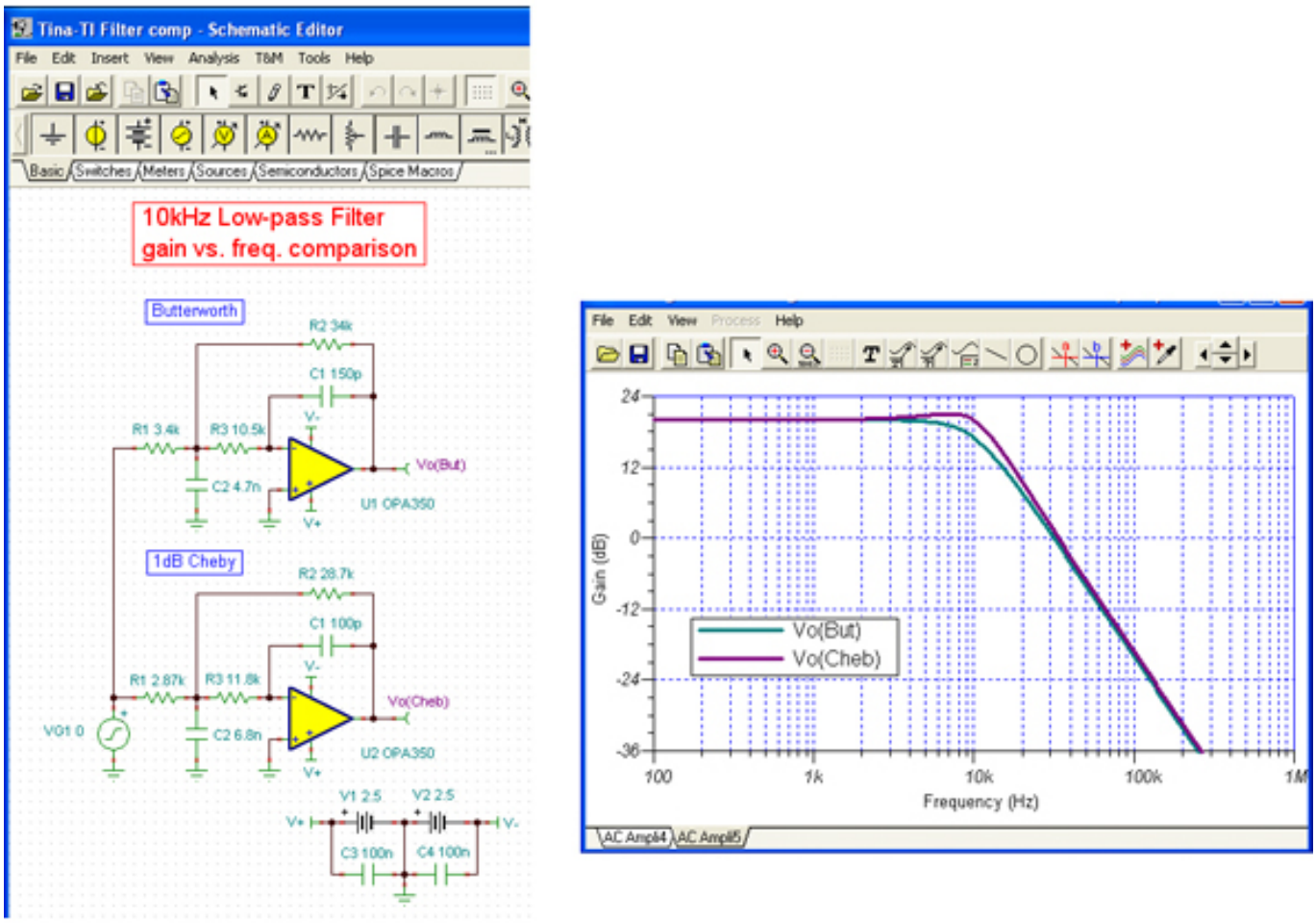

Figure 2. SPICE simulation compares the frequency performance of two low-pass filter circuits.

There are libraries of SPICE macromodels for analog circuits, I/O buffer information specification (IBIS), and bonding scan description language (BSDL) models for digital evaluations. Most IC manufacturer's websites have all of these types of models available. Additionally, various calculators are available that can be downloaded.

In summary, PCB designers have a wide array of tools that contribute to the success of the design-planning and creation process. Although the answers from these tools do not eliminate the bread-board phase, they will quickly provide proven solutions to take to the lab – ultimately reducing time-to-market.

References

1. SwitcherPro™ switching power supply design tool: www.ti.com/switcherpro-ca [1].

2. FilterPro™ analog filter design tool: www.ti.com/filterpro-ca [2].
3. TINA-TI™ SPICE-based analog simulation program: www.ti.com/tinati-ca [3].

About the Author

Bonnie C. Baker is a Senior Applications Engineer at Texas Instruments and can be reached at ti_bonniebaker@list.ti.com [4].

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