

## Component-based power reduces time-to-market

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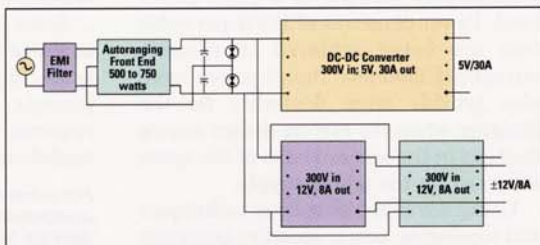
Since the mid 1980s modular power components have increasingly been seen as an alternative to developing a custom power supply using traditional discrete components. Today, component-power designs are growing at three to four times the rate of discrete designs.

In a straight hardware cost comparison, a conventional approach can cost less than components for some applications. Designers have to consider, however, the available design and development resources and the total budget. Total costs over the lifetime of the power supply are likely, especially lately, to be comparable. Costs for design and development time should be included in any comparison. The cost impact of quality and reliability, both and positive, should also be a factor. Most important and difficult to quantify is the lost or gained market opportunity resulting from the use of custom discrete power versus modular component power.

Modular power components offer a number of clear advantages for the power supply design engineer. In spite of being very sophisticated devices, they do not require experienced power architects to use them in designs. They use the most advanced materials, packaging techniques, and automated manufacturing and have high efficiency and optimized thermal management. What's more, in most cases, power components already meet safety and regulatory requirements, potentially a real time consumer at the end of a project.

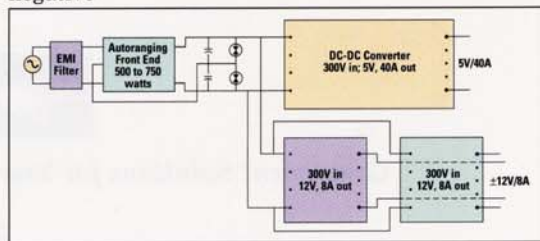
When time to market is important the decision is simple: a component-based power solution is the better choice.

The traditional approach to power system design usually results in a custom effort, done either in-house or by an outside company, made up of discrete components. The development cycle typically requires six to nine, 12, or even 18 months to design, breadboard, troubleshoot, lay out, prototype, debug,

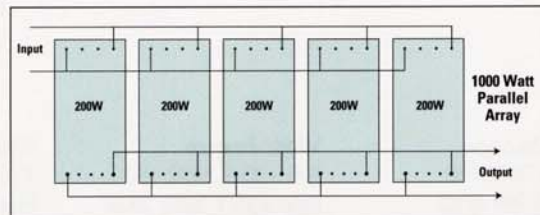


Typical 350-watt supply can be implemented with four modules and very few additional discrete components.

obtain agency approvals, etc. By definition, the designer of a custom power solution is starting at the beginning.



For high power requirements, multiple converter modules can be combined for a single output.



Fast design change: this 400W supply substitutes a 200W module for the 150W module in the 350-watt example, to provide more power from the 5V output.

System development is the typical critical path, so the power supply is usually the last subassembly to be specified. Some concurrent design may be undertaken, but started too early this can

result in unnecessary redesign, adding cost and delays. System modifications can change the power supply specifications, and custom solutions are more prone to unexpected problems. Both are likely to result in lost time.

A component-based solution is intrinsic

### Standard Input Voltages

Nominal	Range
12V	10 - 20V
24V	21 - 32V
24V wide	18 - 36V
28V mil.	18 - 50V
36V	21 - 56V
48V	42 - 60V
48V wide	36 - 76V
72V	55 - 100V
110V	66 - 160V
150V	100 - 200V
155V mil.	100 - 210V
270V mil.	125 - 400V
300V	200 - 400V
150/300V	100 - 375V

### Standard Output Voltages

2V, 3.3V, 5V, 12V, 15V, 24V, 28V, 48V

### Specials

Input voltages from 4.5-450V  
Output voltages from 1-95V

A wide variety of standard inputs and outputs are readily available.

sically faster to do than a custom, discrete one because most of the design work is already done. Elements of any design are already complete and proven many times over in the marketplace. Assembling the components into a functioning, probably unique, power supply follows well-designed and verified rules. The designer simply specifies the desired input and output voltage, output power, and operating temperature.

A typical 350-watt supply can be implemented using four modules and some discrete components. Additional output voltages can be achieved by adding a dc-dc converter module for each output voltage needed. Usually, the ac front end is capable of driving multiple converters, so there is no need to add

# Power Sources

front ends until the power output limit is reached. For higher power levels, multiple converter modules can simply be paralleled to provide a single high-power output.

With a component solution, a simplified set of inputs and outputs are all a designer needs. Connecting modules, and following simple rules for layout and filtering, the power supply designer can quickly produce a working design. Such simplicity belies the sophisticated electronics inherent in modular components. High power switching devices, integrated magnetics, and precise control loops all work together to provide a stable, highly regulated output.

Often built in highly automated, advanced manufacturing facilities, component power modules are produced more consistently and with higher quality than conventional power supplies.

Field MTBFs in the tens of millions of hours are not uncommon. High quality modules designed to work together mean fewer problems for the power supply designer. Debugging time for conventional designs frequently adds significant time to the development cycle.

High frequency operation, a characteristic of modular power components, results in smaller converter modules. Due mostly to the smaller magnetic components needed, the package size is dramatically reduced for a given power level. Power densities of 120W per cubic inch are being achieved in recently introduced modules. Small power modules provide more flexibility for the designer when the system design causes changes in the size or shape of the space allocated for the power supply.

Using advanced switching techniques and topologies, power modules generally

produce much higher conversion efficiencies than discrete designs, resulting in much less heat being generated. Thermal management, always an important design consideration, is much easier with modular components.

Modules allow a designer to shape the power supply to fit the available space. Industry-standard full-size module packages (2.2x4.6x0.5-inches or 117x56x12,7mm), as well as half-size mini and third-size micro packages, allow considerable flexibility.

Some manufacturers also produce modules of different power levels in the same physical package with identical pinouts. If a specification change requires more power, a higher power module can easily be substituted.

*For more information on modular power components from Vicor, circle Reader Service Number 515.*



## Component Solutions for Your Power System

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