

feature

ANALOG & POWER

# Double Your Output Current With Parallel Voltage Regulators

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Sense resistors in series with the load can force current sharing between regulators, but using low-side sense elements yields even better results.

To improve efficiency in high-power applications, voltage regulators can be used in parallel to double output current capability—a means of forcing current sharing is provided.

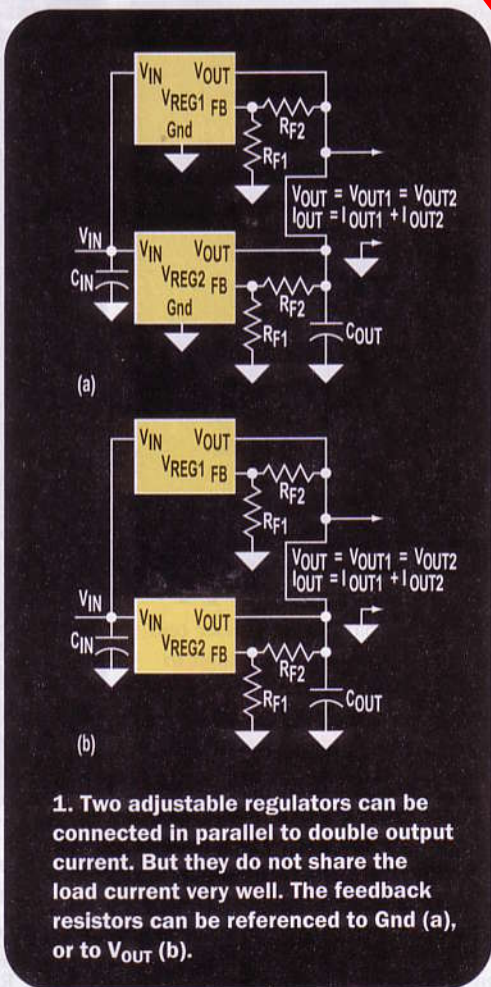
One circuit approach uses sense resistors in series with the load and is applicable to regulators of any type. With a slight modification, it can be placed ahead of the regulators sensing input current. Another method is most applicable to synchronous switchers since it requires the presence of a low-side sense element, which can be resistors or FETs.

There are times designers may want to parallel regulators to double current or improve efficiency. These include instances when:

1. One wants to use a linear regulator or IC switcher with integrated

power FETs, but its maximum current rating is exceeded.

2. A single IC's temperature rise is



**1. Two adjustable regulators can be connected in parallel to double output current. But they do not share the load current very well. The feedback resistors can be referenced to Gnd (a), or to VOUT (b).**



Don Tuite

## The Joy Of Tradeshows

Oh, the things you can learn trolling the aisles at tradeshows and talking to engineers! There was lots to check out last month at Power Systems World in Detroit.

Tabtronics CTO Victor Quinn presented a seminar about evaluating transformer dissipation and energy storage in switch-mode power supplies to evaluate transformer designs winding-layer by winding-layer. He developed a rigorous comparison of solenoidal and planar transformer performance and looked at several versions of planar conductor configurations, including pc-board, flex-circuit, and annular-wound magnet wire for offline applications. You can request copies of the presentation at [www.tabtronics.com](http://www.tabtronics.com).

At International Rectifier's booth, Carl Blake told me about the link in power supplies between upstream heat and downstream performance. He said cutting the heat the ac-dc rectifiers dump into the circuit board improves downstream dc-dc converter rectifier efficiency. You can do that if upstream rectifiers are in IR's DirectFET surface-mount (SMT) package—which has a metal lid bonded to the drain—instead of SO-8s. Of course, you need air flow.

Blake showed me several prototype supplies using the new 40- and 100-V DirectFETs. IR had measured temperatures and efficiencies with 400-LFM flows and found primary-side package temperatures around 40°C cooler than equivalent SO-8s and secondary-side package temperatures around 15°C cooler. Overall, efficiency was up better than a percent in that low-nineties range where further gains in efficiency are so hard to come by.

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