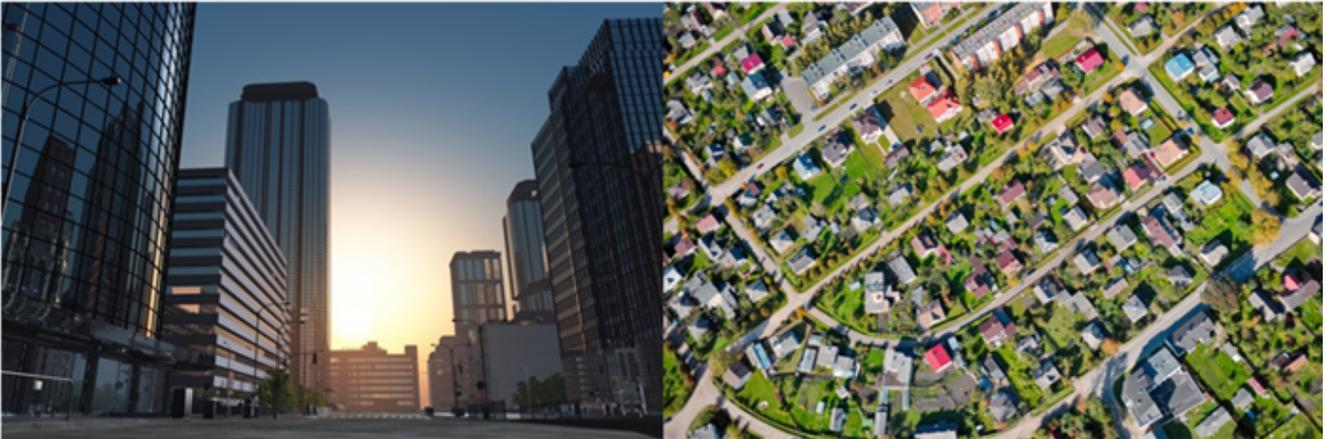


Downtown or the Suburbs? Considering Converters or Controllers for High-current Voltage Regulation



Sharadh Navale



Residents seeking more space generally give up living near downtown areas, with their likely proximity to work and city services, and move to the suburbs for bigger homes and spacious yards. Similarly, when engineers require higher currents for their point of load (POL) designs, they generally give up the conveniences of high-density converters (with integrated MOSFETs) and instead use a more sprawling solution involving controllers (with external MOSFETs). Controllers, like the suburbs, can offer relative flexibility and affordability, but take up more real estate – more board space, that is.

Until recently, applications requiring currents in excess of 10-15A generally relied on controllers with external MOSFETs. Converters – while enabling simpler designs with easier layout, fewer components in their bill of materials (BOM) and higher-density solutions with high reliability – traditionally delivered only a limited amount of power.

Applications such as network routers, switches, enterprise servers and embedded industrial systems are increasingly power-hungry – requiring 20A, 30A, 40A or more for their POL design. Yet these applications are extremely space-constrained and it is difficult to accommodate solutions involving controllers and external MOSFETs. The question is, how do you use converters rather than controllers in an application with large current requirements?

The answer primarily lies in recent advancements in MOSFET and packaging technologies. New-generation MOSFETs like TI's [NexFET™ power MOSFET](#) offer lower resistivity ($R_{ds(on)}$) in a given silicon area for higher current capability. [PowerStack™ packaging technology](#) stacks the integrated circuit (IC) and MOSFETs on top of one another – resembling a downtown building – to pack more in a given footprint.

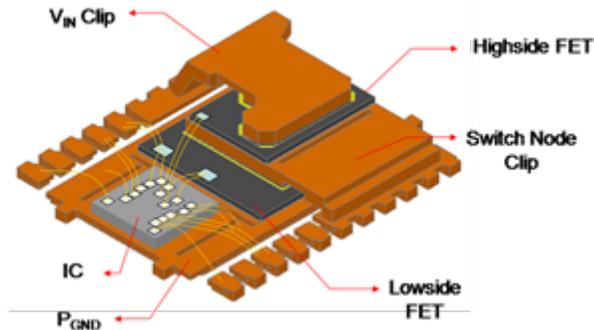


Figure 1. Controller IC and MOSFETs Vertically Stacked in the PowerStack Package

The unique combination of die stacking and clip bonding in PowerStack packages results in a more integrated quad flat no-lead (QFN) solution that delivers a smaller size, better thermal performance and higher current capabilities over traditional solutions that place MOSFETs side by side.

With recent advances in MOSFET and packaging technologies, TI now offers the option of using converters - with integrated FETs - for high-power, high-density POL applications. The [TPS548D22](#) joins TI's family of high-current synchronous [SWIFT™ DC/DC buck converters](#) to deliver up to 40A of continuous current and is offered in a 40-pin 5mm-by-7mm-by-1.5mm stack-clipped QFN PowerStack package. Visit the [DC/DC portal](#) for the comprehensive TI offering. Those of you who had to move to the suburbs can now consider moving back downtown!

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2023, Texas Instruments Incorporated