

# Solving Power Design Challenges in Enterprise SSD Applications



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Enterprise solid state drives (eSSD) are widely used in data center applications all over the world. eSSDs offer faster speeds and smaller sizes than the standard hard disk drives (HDD). Data centers involve millions of bytes of data being processed constantly around the clock for this, the eSSD must provide low-latency and must be accessible to a large number of users that need access to the data stored. Because of this the system power designs must be able to be optimized for performance and efficiency and be compact due to size constraints. This article discusses eSSD design challenges and how point of load buck regulators addresses them.

Table 1 lists devices that are highlighted for eSSD power management. Included are both digital and analog designs in discrete form factors. Digital designs include PMBus for voltage scaling and telemetry.

**Table 1. Enterprise SSD Power Management Devices**

GPN	V <sub>in</sub>	I <sub>out</sub>	Package
TPS544C26	4V to 16V	35A	5x6 QFN HR
TPS568231	3.8V to 17V	8A	3.5x3.5 QFN HR
TPS56C231	3.8V to 17V	12A	3.5x3.5 QFN HR
TPS54J060	2.7V to 16V	6A	2x3 QFN HR
TPS54J061	2.7V to 16V	6A	2x3 QFN HR
TPS548A28	2.7V to 16V	15A	3x4 QFN HR
TPS548B28	2.7V to 16V	20A	3x4 QFN HR
TPS548C26	4V to 16V	35A	5x6 QFN RLF
TPS548D26	4V to 16V	40A	5x6 QFN RLF
TPS54KB20	4V to 16V	25A	3x3.5 QFN HR
TPS54KC23	4V to 16V	30A	3x3.5 QFN HR
TPS566231	3V to 17V	6A	2x1.5 QFN HR
TPS62903	3V to 17V	3A	2x1.5 QFN HR
TPS548B23	4V to 16V	20A	3x3 QFN
TPS548A23	4V to 16V	12A	3x3 QFN
TPS82130	3V to 17V	3A	3x2.8 MicroSiP

## High-Efficiency in a Compact Form Factor Design

High-efficiency, power-dense designs benefit all kinds of SSD devices. When making Enterprise SSDs smaller, the challenge of creating high-efficiency compact designs becomes relevant. The limited board space in some equipment requires a greater emphasis on a small footprint power design. A key device family for this challenge can be the *TPS54J060* and *TPS54J061* family of converters. This family of devices come in a 2x3mm QFN 14-pin package that is easy to use with minimal external components. The key feature for these devices is the ability to provide high-efficiency while running FCCM or ECO MODE which also provides high light load efficiency. Another device to consider is *TPS548B23* and *TPS548A23* family. This family comes in 12A and 20A and offers high-efficiency even at heavy loads. *TPS548B23* comes in a 3x3mm QFN package which also allows for additional airflow allowing the best thermal performance. Figure 1 is an efficiency graph. Figure 2 is an image of the packages for the devices discussed.

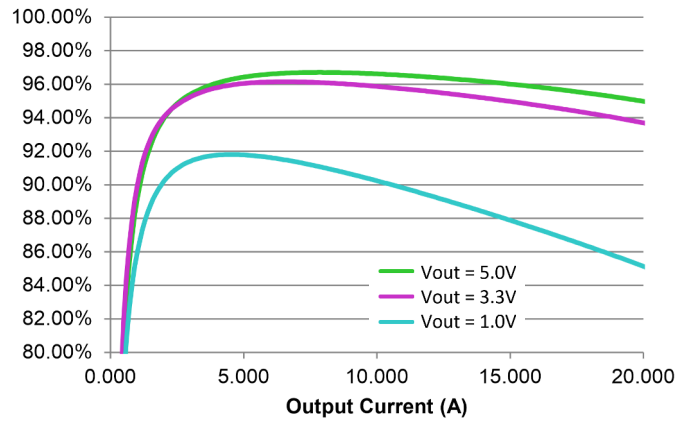


Figure 1. TPS548B23 Efficiency at VIN = 12V, external VCC = 3.3V, FCCM, Fsw = 800kHz

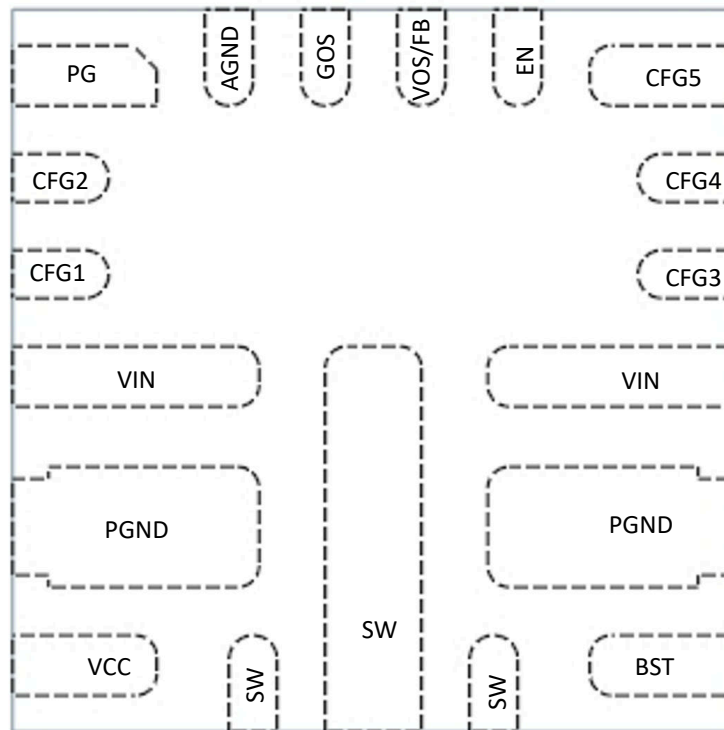
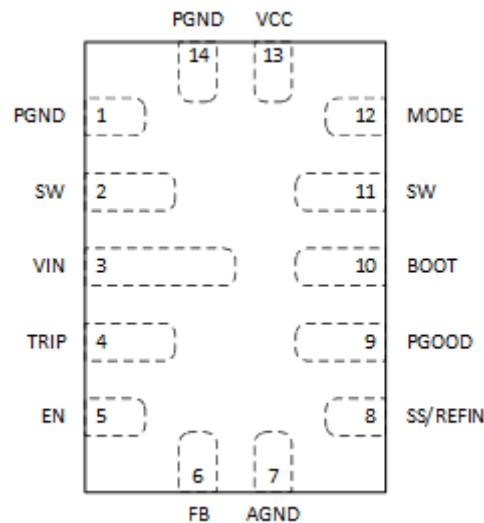
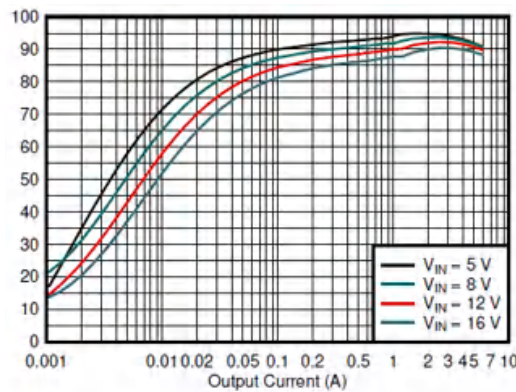


Figure 2. TPS548B23 Package Top View



**Figure 3. TPS54J060 Package Top View**



**Figure 4. TPS54J060 Efficiency at VIN = 12V, External VCC = 1.8V, FCCM, Fsw = 600kHz**

### Output Voltage Accuracy

Output voltage accuracy is the ability of a voltage regulator IC to maintain a specific output voltage within a tolerance range while in various operating conditions. The output voltage accuracy of a device is crucial for performance and to maintain that the design receives the correct voltage while also maintaining stability. If the output voltage is inaccurate, the voltage can lead to improper performance as well as damage to the build. If the output voltage is too high the voltage can cause overheating and system failure. On the contrary if the output voltage is too low, the voltage can cause malfunctions as well as unreliability. A device that supports high output voltage accuracy allows for minimal damage or risk of malfunction. Looking at our portfolio there are many devices with high output voltage accuracy since this is a standard feature for most devices. Devices like the *TPS54KB20* family offer high output voltage accuracy while also being a high efficiency compact device in 3 x 3.5mm butterfly package. Lower current options are also available with similar features. Devices like *TPS82130* also provide high output voltage accuracy at lower current ranges coming in at 3A.

### Conclusion

When looking into power management designs for enterprise SSDs, several key requirements involved need to be considered to choose the most optimized device. Power dense buck converters and modules help the equipment as well as optimize your devices. The high-efficiency, small form-factor devices highlighted helps with space constraints and allows for better performance in general. Lastly, having devices with high-output-voltage accuracy allows for better and more stable performance while lowering the risk of damage or malfunction for the device.

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