

# Benefit from Highly Flexible and Easy to Use DC/DC Solution



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## New Technology Provides Additional Flexibility

Technology is indeed moving very fast, and behind the curtain, continuous innovation toward improved performance, novel features, and sleeker designs are the foundation for the development of next-generation consumer devices. This makes the electronics systems more and more integrated and complex. System engineers are facing more types of ICs and components than ever, and there would be more highly-differentiated power rails. For so many power rails, simplifying the power IC lectotype can save a lot of time for application and debugging to make the IC easier to use and flexible. It will lessen the part number to reduce the research and development cycle time as well. Maintaining fewer part numbers can also help customer by saving resource and time. Therefore, many designers are choosing to capitalize on demonstrated and verified power solutions using buck controllers that combine performance and flexibility.

To make buck solutions more flexible and easier to use, TI has been on the path to solve this pain with multiple tech and solutions, for example, internal compensation from design, simplify buck to basic 6/8 pins for ease of use. Meanwhile, facing different loading conditions and requirement at light loading, TI also releases advanced parts with precise enable and adjustable  $V_{IN}$  UVLO, selectable Eco-mode™ and FCCM (Forced Continuous Conduction Mode) operation, P2P family to make devices more flexible to use.

## Advantages Brought by High-Device Compatibility

Table 1 shows some easy to use buck solutions, providing the lowest external components count with very good efficiency and very fast load transient response, the devices are also highly flexible for different sockets needing a DC/DC buck converter on the board. This flexibility is due to pin-to-pin compatible between all devices and the ease with which to switch the devices on the board with minimal changes even if the load current requirement changes up to 5 A. The TPS56x201 series also provides very good light load efficiency with an advanced Eco-mode™ feature to support power consumption regulation during stand-by mode. And if this is not needed and operation at light load is preferred to be running in constant switching frequency, the TPS56x208 series would be able to cover this need as well. More compatible options are also listed to meet different requirements.

Table 1. Device Compatibility

	Input Voltage (V)	Load Current (A)	Fsw (KHz)	Mode at Light Load	Package
TPS54302	4.5-28	3	400	ECO	SOT-23(6)
TPS54308	4.5-28	3	350	FCCM	SOT-23(6)
TPS54202/H	4.5-28	2	500	ECO	SOT-23(6)
TPS56339	4.5-24	3	500	ECO	SOT-23(6)
TPS562201	4.5-17	2	580	ECO	SOT-23(6)
TPS562208	4.5-17	2	580	FCCM	SOT-23(6)
TPS563201	4.5-17	3	580	ECO	SOT-23(6)
TPS563208	4.5-17	3	580	FCCM	SOT-23(6)
TPS563240	4.5-17	3	1400	OOA	SOT-23(6)
TPS563249	4.5-17	3	1400	FCCM	SOT-23(6)
TPS564201	4.5-17	4	560	ECO	SOT-23(6)
TPS564208	4.5-17	4	560	FCCM	SOT-23(6)
TPS565201	4.5-17	5	500	ECO	SOT-23(6)
TPS565208	4.5-17	5	500	FCCM	SOT-23(6)

## Convenience Offered by Multi-function Pinout and Fsw Option Facing Different Applications

For some communication, industrial accounts, they would like to use PG (Power Good) and SS (Soft start) to adjust power up sequence. TI offers 8 pins buck solution for this kind use. For instance, our TPS56321x and TPS56221x parts provide selectable Eco-mode operation or FCCM operation and PG/SS with one MODE pin programmable. This is a kind of multi-function pinout when two or more features are integrated into one pin. The ability to reuse a design for various projects with minimal alteration saves time and development cost. Multi-functional pins are ideal when it comes to this copy and paste methodology – a simple resistor change could be all that is needed from one project to another. Multi-function pins help simplify a design with fewer external components to configure the feature sets. Fewer passives needed to design-in a given part results in a smaller total solution size and cost. Using the same device on multiple projects and a smaller BOM count both contribute to drastically simplifying the supply chain.

A table found in the device's data sheet is used to decipher what features are available with guidance of how to select the desired combination. [Table 2](#) is an example of the mode pin selection of [TPS563211](#) data sheet. There are two feature selections with a total of four combinations. A resistor value (in the range of acceptable values) strapped from ground to the mode pin is used to select both feature operations. A selectable Power-Good indicator or external soft start is also configurable through the MODE pin. Power sequencing is possible by correctly configuring Enable, Power-Good indicator, or external soft start.

**Table 2. Mode Pin Settings**

Mode Resistor Range	Recommended Mode Resistor Value	Operation Mode in Light Load	Function of PG/SS Pin
[0, 12] kΩ	0	ECO	Power Good
[30, 50] kΩ	47 kΩ	ECO	Soft Start
[83, 120] kΩ	100 kΩ	FCCM	Soft Start
[180, ∞] kΩ	Float	FCCM	Power Good

This family of parts offer two different kinds of frequency, allowing for efficiency and size optimization when selecting output filter components. It is also easy to design with different applications, offering smaller size consideration with higher frequency. [Table 3](#) offers a glance at the family.

**Table 3. Family Option**

	Input voltage (V)	Load current (A)	Fsw (KHz)	Mode at light load	PG/SS	Package
<a href="#">TPS563211</a>	4.2-18	3	600	Selectable	Selectable	SOT-583
<a href="#">TPS563212</a>	4.2-18	3	1200	Selectable	Selectable	SOT-583
<a href="#">TPS562211</a>	4.2-18	2	600	Selectable	Selectable	SOT-583
<a href="#">TPS562212</a>	4.2-18	2	1200	Selectable	Selectable	SOT-583

Additionally, the device provides fast transient response with true fixed switching frequency through the use of the Advanced Emulated Current Mode (AECM) control topology. The ease of use is reflected in such a way that with internal smart loop bandwidth control, the device provides fast transient response over a wide output voltage range without the need for external compensation. See [Additional Resources](#) for details.

Also, to bridge the divide between ease of use and high-performance power-conversion integrated circuits (ICs), TI offers a range of power design tools, including [WEBENCH®](#), PSPICE, and simulation models. And given the component inter dependencies and trade-offs inherent to high-performance solutions, an IC-specific quick-start calculator is another convenient tool to expedite and streamline the design process.

### Additional Resources

- Texas Instruments, [Achieve Fast Load-Transient Response and Low EMI with AECM DC/DC Control Topology](#) marketing white paper.

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