

TPS5433xA 4.5-V to 28-V Input, 3-A Output, Synchronous Step-Down DC-DC Converter

1 Features

- Synchronous 128-m Ω and 84-m Ω MOSFETs for 3-A Continuous Output Current
- TPS54335A: Internal 2-ms Soft-Start, 50-kHz to 1.5-MHz Adjustable Frequency
- TPS54336A: Adjustable Soft-Start, Fixed 340-kHz Frequency
- Low 2- μ A Shutdown, Quiescent Current
- 0.8-V Voltage Reference with $\pm 0.8\%$ Accuracy
- Current Mode Control
- Monotonic Startup into Pre-Biased Outputs
- Pulse Skipping for Light-Load Efficiency
- Hiccup Mode Overcurrent Protection
- Thermal Shutdown (TSD) and Overvoltage Transition Protection
- 8-Pin SO PowerPAD™ and 10-Pin VSON Package
- Create a Custom Design Using the TPS54335A with the [WEBENCH Power Designer](#)

2 Applications

- Consumer Applications such as a Digital TV (DTV), Set Top Box (STB, DVD/Blu-ray Player), LCD Display, CPE (Cable Modem, WiFi Router), DLP Projectors, Smart Meters
- Battery Chargers
- Industrial and Car Audio Power Supplies
- 5-V, 12-V, and 24-V Distributed Power Bus Supply

3 Description

The TPS5433xA family of devices are synchronous converters with an input-voltage range of 4.5 V to 28 V. These devices include This device has an integrated low-side switching FET that eliminates the need for an external diode which reduces component count.

Efficiency is maximized through the integrated 128-m Ω and 84-m Ω MOSFETs, low I_Q and pulse skipping at light loads. Using the enable pin, the shutdown supply current is reduced to 2 μ A. This step-down (buck) converter provides accurate regulation for a variety of loads with a well-regulated voltage reference that is 1.5% over temperature.

Cycle-by-cycle current limiting on the high-side MOSFET protects the TPS5433xA family of devices in overload situations and is enhanced by a low-side sourcing current limit which prevents current runaway. A low-side sinking current-limit turns off the low-side MOSFET to prevent excessive reverse current. Hiccup protection is triggered if the overcurrent condition continues for longer than the preset time. Thermal shutdown disables the device when the die temperature exceeds the threshold and enables the device again after the built-in thermal hiccup time.

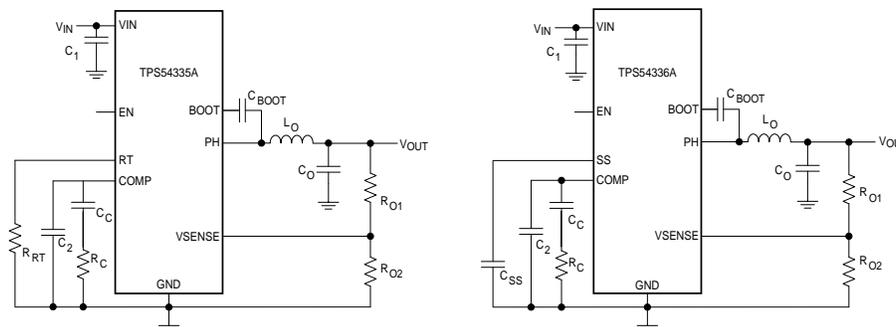
Device Information⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
TPS54335A	SO PowerPAD (8)	4.89 mm x 3.90 mm
TPS54336A	VSON (10)	3.00 mm x 3.00 mm
TPS54335-1A	VSON (10) ⁽²⁾	3.00 mm x 3.00 mm

(1) For all available packages, see the orderable addendum at the end of the datasheet.

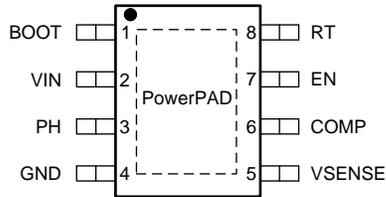
(2) The DRC package for the TPS54335-1A device has a narrower heat-pad for more clearance between the pins and heat pad. See the [Differences Between the Two DRC Packages](#) section.

Simplified Schematic

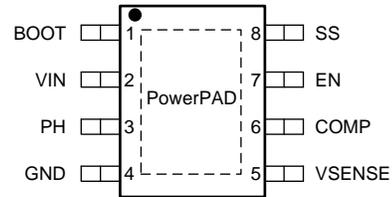


5 Pin Configuration and Functions

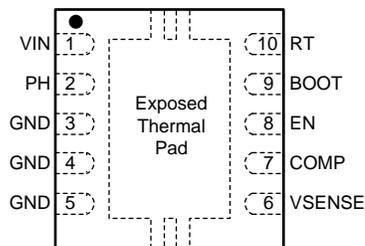
**DDA Package
8-Pin SO PowerPAD
TPS54335A Top View**



**DDA Package
8-Pin SO PowerPAD
TPS54336A Top View**



**DRC Package
10-Pin VSON With Exposed Thermal Pad
TPS54335A and TPS54335-1A Top View**



**DRC Package
10-Pin VSON With Exposed Thermal Pad
TPS54336A Top View**

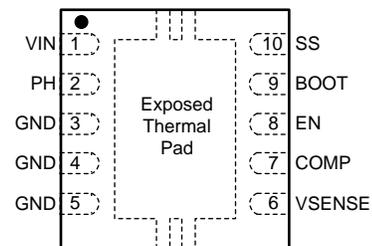


Table 1. Pin Functions

NAME	PIN		I/O	DESCRIPTION
	SO PowerPAD	VSON		
BOOT	1	9	O	A bootstrap capacitor is required between the BOOT and PH pins. If the voltage on this capacitor is below the minimum required by the output device, the output is forced to switch off until the capacitor is refreshed.
COMP	6	7	O	This pin is the error-amplifier output and the input to the output switch-current comparator. Connect frequency compensation components to this pin.
EN	7	8	I	This pin is the enable pin. Float the EN pin to enable.
GND	4	3	—	Ground
GND	4	4	—	Ground
GND	4	5	—	Ground
PH	3	2	O	The PH pin is the source of the internal high-side power MOSFET.
RT (TPS54335A and TPS54335-1A)	8	10	O	Connect the RT pin to an external timing resistor to adjust the switching frequency of the device.
SS (TPS54336A)	8	10	O	The SS pin is the soft-start and tracking pin. An external capacitor connected to this pin sets the internal voltage-reference rise time. The voltage on this pin overrides the internal reference.
VIN	2	1	—	This pin is the 4.5- to 28-V input supply voltage.
VSENSE	5	6	I	This pin is the inverting node of the transconductance (gm) error amplifier.
PowerPAD (SO only)			—	For proper operation, connect the GND pin to the exposed thermal pad. This thermal pad should be connected to any internal PCB ground plane using multiple vias for good thermal performance.
Thermal pad (VSON only)			—	