

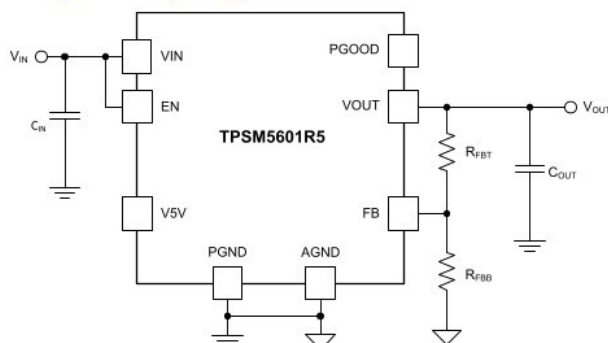
TPSM5601R5, 60-V Input, 1-V to 6-V Output, 1.5-A Power Module in an Enhanced HotRod™ QFN Package

1 Features

- Functional Safety-Capable
 - Documentation available to aid functional safety system design
- 5.0-mm × 5.5-mm × 4.0-mm Enhanced HotRod™ QFN
 - Excellent thermal performance: up to 18-W output power at 85°C, no airflow
 - Standard footprint: single large thermal pad and all pins accessible from perimeter
- Designed for reliable and rugged applications
 - Wide input voltage range: 4.2 V to 60 V
 - Input voltage transient protection up to 66 V
 - Operating junction range: –40°C to +125°C
 - EXT-suffix junction range: –55°C to +125°C
- Fixed 400-kHz switching frequency
- FPWM mode of operation
- Optimized for ultra-low EMI requirements
 - Integrated shielded inductor and high-frequency bypass capacitors
 - Meets EN55011 EMI standards
 - Spread spectrum option reduces emissions
- 26-μA nonswitching quiescent current
- Monotonic start-up into prebiased output
- No loop-compensation or bootstrap components
- Precision enable and input UVLO with hysteresis
- Thermal shutdown protection with hysteresis
- Create a custom design using the TPSM5601R5 with the WEBENCH® Power Designer

2 Applications

- Field transmitters and sensors, PLC modules
- Thermostats, video surveillance, HVAC systems
- AC and servo drives, rotary encoders
- Industrial transport, asset tracking
- Negative output applications



Typical Schematic

3 Description

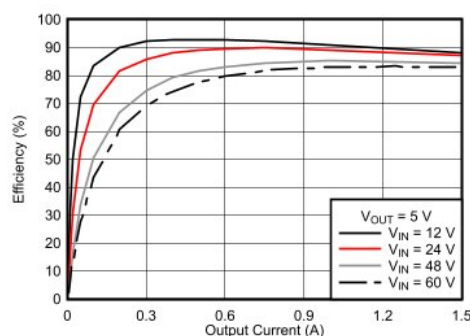
The TPSM5601R5 power module is a highly integrated 1.5-A power solution that combines a 60-V input, step-down DC/DC converter with power MOSFETs, a shielded inductor, and passives in a thermally enhanced QFN package. The 5-mm × 5.5-mm × 4-mm, 15-pin QFN package uses Enhanced HotRod QFN technology for enhanced thermal performance, small footprint, and low EMI. The package footprint has all pins accessible from the perimeter and a single large thermal pad for simple layout and easy handling in manufacturing.

The TPSM5601R5 is a compact, easy-to-use power module with a wide adjustable output voltage range of 1.0 V to 6 V. The total solution requires as few as four external components and eliminates the loop compensation and magnetics part selection from the design process. The full feature set includes power good, programmable UVLO, prebias start-up, overcurrent, and temperature protections, making the TPSM5601R5 an excellent device for powering a wide range of applications. Space-constrained applications benefit from the 5.0-mm × 5.5-mm package. Additionally, the TPSM5601R5S offers frequency spread-spectrum operation.

Device Information

PART NUMBER	PACKAGE ⁽¹⁾	BODY SIZE (NOM)
TPSM5601R5	QFN (15)	5.0 mm × 5.5 mm
TPSM5601R5S		

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



Typical Efficiency, $V_{OUT} = 5\text{ V}$



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4 Revision History

DATE	REVISION	NOTES
September 2021	*	Initial release

5 Device Comparison Table

DEVICE	DESCRIPTION
TPSM5601R5	60-V input voltage, 1-V to 6-V output voltage, 1.5-A power module, fixed 400-kHz switching, –40°C to +125°C operating junction temperature range
TPSM5601R5S	Equivalent to TPSM5601R5, but with spread spectrum operation

6 Pin Configuration and Functions

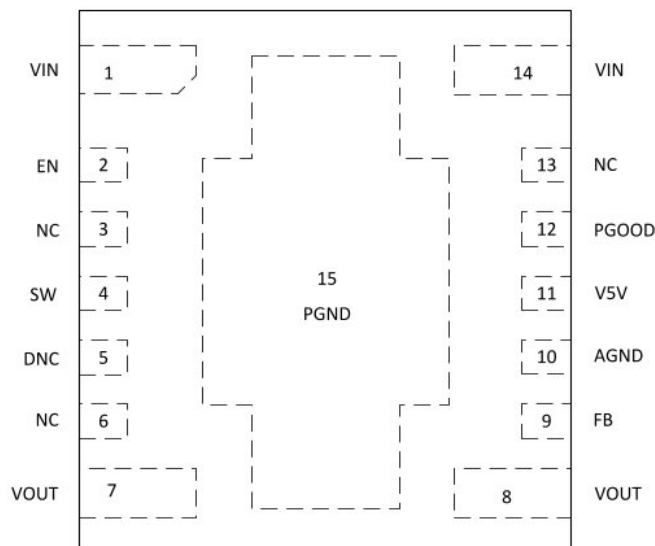


Figure 6-1. 15-Pin QFN RDA Package (Top View)

Table 6-1. Pin Functions

PIN		TYPE ⁽¹⁾	DESCRIPTION
NO.	NAME		
10	AGND	G	Analog ground. Zero voltage reference for internal references and logic. All electrical parameters are measured with respect to this pin. <i>This pin must be connected to PGND at a single point. See Section 11.2 for a recommended layout.</i>
5	DNC	—	Do not connect. Do not connect this pin to ground, to another pin, or to any other voltage. This pin is connected to the internal bootstrap capacitor. This pin must be soldered to an isolated pad.
2	EN	I	Enable pin. This pin turns the converter on when pulled high and turns off the converter when pulled low. This pin can be connected directly to VIN. <i>Do not float.</i> This pin can be used to set the input undervoltage lockout with two resistors. See Section 8.3.4.
9	FB	I	Feedback input. Connect the mid-point of the feedback resistor divider to this pin. Connect the upper resistor (R_{FBT}) of the feedback divider to V_{OUT} at the desired point of regulation. Connect the lower resistor (R_{FBB}) of the feedback divider to AGND.
3, 6, 13	NC	—	Not connected. These pins are not connected to any circuitry within the module. Leaving these pins unconnected to any other signal increases spacing near the high voltage pins (VIN, SW, EN, and DNC). However, if the high voltage spacing is not needed in the application, connecting these pins to the PGND plane can help enhance shielding and thermal performance.
15	PGND	G	Power ground. This is the return current path for the power stage of the device. Connect this pad to the input supply return, load return, and capacitors associated with the VIN and VOUT pins. See Section 11.2 for a recommended layout.
12	PGOOD	O	Power-good pin. Open-drain output that asserts low if the feedback voltage is not within the specified window thresholds. A 10-k Ω to 100-k Ω pullup resistor is required and can be tied to the V5V pin or other DC voltage less than 18 V. If not used, this pin can be left open or connected to PGND.
4	SW	O	Switch node. Do not place any external component on this pin or connect to any signal.
1, 14	VIN	I	Input supply voltage. Connect the input supply to these pins. Connect input capacitors between these pins and PGND in close proximity to the device.