

LM5161 Wide Input 100-V, 1-A Synchronous Buck/Fly-Buck™ Converter

1 Features

- Wide 4.5-V to 100-V Input Voltage Range
- Integrated High and Low Side Switches
 - No Schottky Diode Required
- 1-A Maximum Load Current
- Constant On-Time Control
 - No External Loop Compensation
 - Fast Transient Response
- Selectable DCM Buck Operation at Light Load
- No External Ripple circuit needed (at FPWM = 0)
- CCM Option Supports Multi-Output Fly-Buck
- Nearly Constant Switching Frequency
- Frequency Adjustable up to 1 MHz
- Programmable Soft-Start Time
- Pre-Biased Startup
- Peak Current Limiting Protection
- Adjustable Input UVLO and Hysteresis
- $\pm 1\%$ Feedback Voltage Reference
- Thermal Shutdown Protection

2 Applications

- Industrial Programmable Logic Controller
- IGBT Gate Drive Bias Supply
- Telecom Primary/Secondary Side Bias
- E-meter Power Line Communication
- Low Power (<12W) Isolated DC-DC (Fly-Buck)
- Automotive Electronics

3 Description

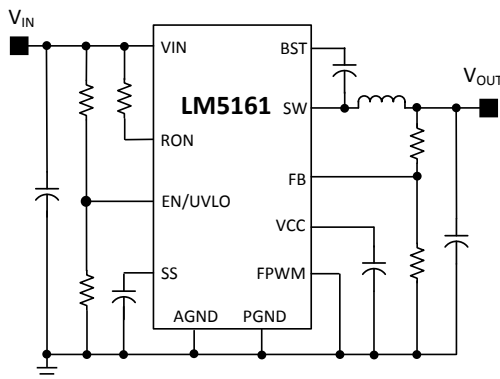
The LM5161 is a 100-V, 1-A synchronous step-down converter with integrated high-side and low-side MOSFETs. The constant-on-time control scheme requires no loop compensation and supports high step-down ratios with fast transient response. An internal feedback amplifier maintains $\pm 1\%$ output voltage regulation over the entire operating temperature range. The on-time varies inversely with input voltage resulting in nearly constant switching frequency. Peak and valley current limit circuits protect against overload conditions. The under-voltage lockout (EN/UVLO) circuit provides independently adjustable input under-voltage threshold and hysteresis. The LM5161 is programmed through the FPWM pin to operate in continuous conduction mode (CCM) from no load to full load or to automatically switch to discontinuous conduction mode (DCM) at light load for higher efficiency. The forced CCM option in the FPWM pin supports the multiple output and isolated Fly-Buck applications using a coupled inductor. In addition, the LM5161 can also be programmed through the FPWM pin to regulate over load without any additional external ripple injection circuit.

Device Information⁽¹⁾

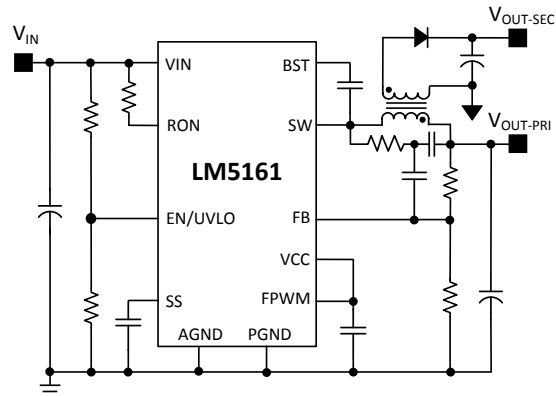
PART NUMBER	PACKAGE	BODY SIZE (NOM)
LM5161	HTSSOP (14)	4.4 mm x 5.0 mm

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

Typical Sync-Buck Application Circuit



Typical Fly-Buck Application Circuit



4 Device and Documentation Support

4.1 Related Documentation

[AN-2292](#) *Designing an Isolated Buck (Fly-Buck) Converter*

[AN-1481](#) *Controlling Output Ripple & Achieving ESR Independence in Constant On-Time Regulator Designs*

[SPRA953](#) *IC Package Thermal Metrics* application report,

4.2 Trademarks

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4.3 Community Resources

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TI E2E™ Online Community *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support *TI's Design Support* Quickly find helpful E2E forums along with design support tools and contact information for technical support.

4.4 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

4.5 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

5 Mechanical, Packaging, and Orderable Information

The following pages include mechanical packaging and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM5161PWP	PREVIEW	HTSSOP	PWP	14	94	TBD	Call TI	Call TI	-40 to 125		
LM5161PWPR	PREVIEW	HTSSOP	PWP	14	2500	TBD	Call TI	Call TI	-40 to 125		
LM5161PWPT	PREVIEW	HTSSOP	PWP	14	250	TBD	Call TI	Call TI	-40 to 125		

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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PWP (R-PDSO-G14)

PowerPAD™ PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusions. Mold flash and protrusion shall not exceed 0.15 per side.
 - This package is designed to be soldered to a thermal pad on the board. Refer to Technical Brief, PowerPad Thermally Enhanced Package, Texas Instruments Literature No. SLMA002 for information regarding recommended board layout. This document is available at www.ti.com <<http://www.ti.com>>.
 - See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
 - Falls within JEDEC MO-153

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