ADP5075CB-EVALZ User Guide
UG-1138

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Evaluating the ADP5075 DC-to-DC Switching Regulator/Converter

FEATURES

Input voltage range: 3 V to 5.5 V
Output voltage: −5 V
Output current: 190 mA
Demonstrated compact 6 mm × 5 mm layout

EVALUATION KIT CONTENTS

ADP5075CB-EVALZ evaluation board

ADDITIONAL EQUIPMENT NEEDED

DC power supply
Multimeters for voltage and current measurement
Electronic or resistive loads

GENERAL DESCRIPTION

The ADP5075CB-EVALZ evaluation board demonstrates the functionality of the ADP5075 dc-to-dc converter.

The board can be used to evaluate simple device measurements, such as line regulation, load regulation, and efficiency. Device features, such as selectable operating frequency, soft start, and slew rate control can also be evaluated. The evaluation board accepts input voltages within the tolerance of standard 3.3 V to 5 V dc levels.

For more details about the dc-to-dc converter, refer to the ADP5075 data sheet, which must be consulted in conjunction with this user guide when using the evaluation board.

EVALUATION BOARD PHOTOGRAPH

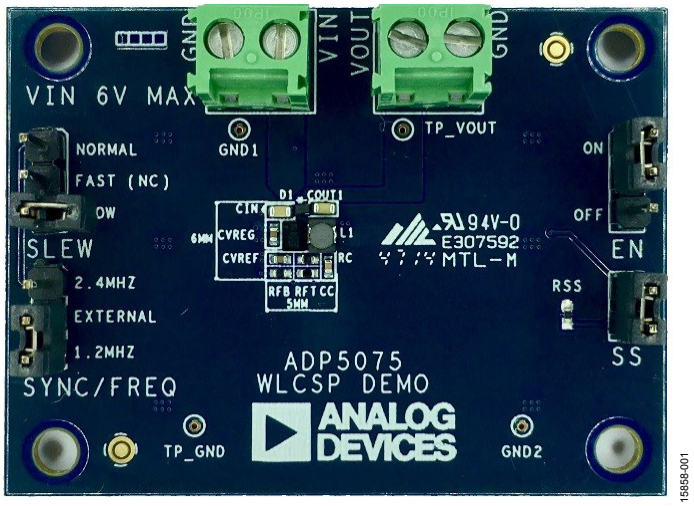

Figure 1. ADP5075CB-EVALZ Evaluation Board

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REVISION HISTORY

11/2017—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

EVALUATION BOARD CONFIGURATIONS

The ADP5075CB-EVALZ evaluation board is configured to provide a −5 V output from a 3 V to 5.5 V input. Table 2 in the Ordering Information section lists the components for the ADP5075CB-EVALZ board. The board allows the end user to customize the design. Refer to the ADP5075 data sheet or to the ADIsimPower tool to obtain alternative component values. Figure 2 outlines the board features available to the user.

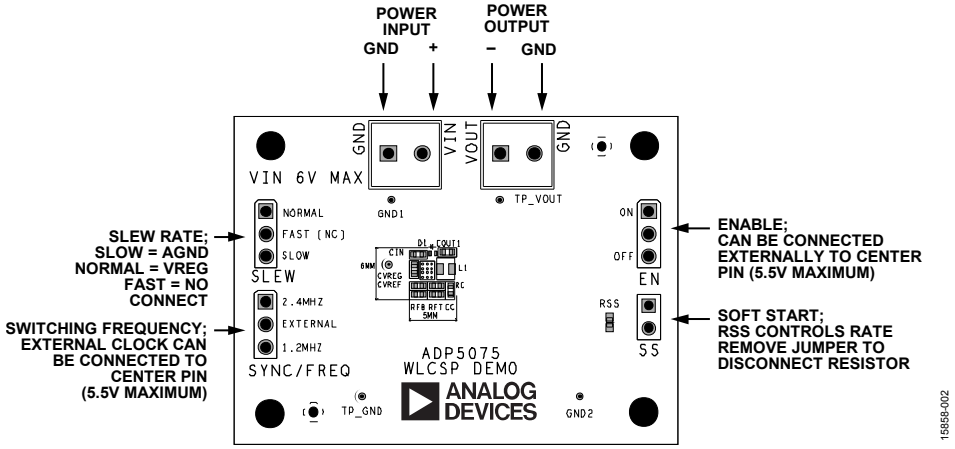

Figure 2. Outline of ADP5075CB-EVALZ Evaluation Board Features

Table 1. ADP5075CB-EVALZ Evaluation Board Function Descriptions

Jumper/Connector Mnemonic	Description
VIN	Power supply to the ADP5075. In the default configuration, this ranges from 3 V to 5.5 V.
VOUT	Output from the ADP5075. −5 V in the default configuration.
EN	Precision enable. The EN pin is compared to an internal precision reference to enable the inverting regulator output. Connect this jumper to the on position to turn on the regulator. Connect this jumper to the off position or remove this jumper to turn the regulator off. (An internal pulldown is present in the ADP5075.) An external enable can be connected to the center pin with a voltage from 1.2 V to 5.5 V.
SYNC/FREQ	Synchronization input and frequency setting. To set the switching frequency to 2.4 MHz, pull the SYNC/FREQ pin high. To set the switching frequency to 1.2 MHz, pull the SYNC/FREQ pin low. To synchronize the switching frequency, connect the SYNC/FREQ pin to an external clock (5.5 V maximum).
SLEW	Driver stage slew rate control. The SLEW pin sets the slew rate for the SW pin driver. For the fastest slew rate (best efficiency), leave the SLEW pin open. For a normal slew rate, connect the SLEW pin to VREG. For the slowest slew rate (best electromagnetic interference (EMI) performance), connect the SLEW pin to GND.
SS	Soft start programming. Leave the SS pin open to obtain the fastest soft start time. To program a slower soft start time, connect this jumper. This jumper connects the RSS resistor between the SS pin and GND.

OUTPUT VOLTAGE MEASUREMENTS

For basic output voltage accuracy measurements, connect the evaluation board to a voltage source and a voltmeter. Use a resistor as the load for the regulator.

Ensure that the resistor has an adequate power rating to handle the expected power dissipation. Use an electronic load as an alternative. Ensure that the voltage source supplies enough current for the expected load levels, taking into account the device efficiency.

To connect to a voltage source and voltmeter use the following steps:

1. Connect the negative (−) terminal of the voltage source to the GND terminal of the power input connector.
2. Connect the positive (+) terminal of the voltage source to the VIN terminal of the power input connector.
3. Connect a load between the VOUT terminal and GND terminal at the output connector.
4. Connect the voltmeter across the output terminal and ground in parallel with the load resistor.

Turn the voltage source on and move the EN jumper to the ON position.

If the load current is large, the user must connect the voltmeter as close as possible to the output capacitor to reduce the effects of voltage drops due to the printed circuit board (PCB) trace impedance.

If long power leads are used from the power supply, especially at higher loads, connect a large capacitor (10 µF or more) across the VIN terminals to prevent losses from lead inductance. Measure the input voltage at these terminals or use a power supply with a 4-wire supply and sense arrangement.

Keep power leads short when performing any output voltage measurement.

LINE REGULATION

For line regulation measurements, monitor the regulator output while the input is varied. For good line regulation, the output must change as little as possible with varying input levels. It is possible to repeat this measurement under different load conditions. Figure 3and Figure 4 show the typical line regulation performance of the ADP5075.

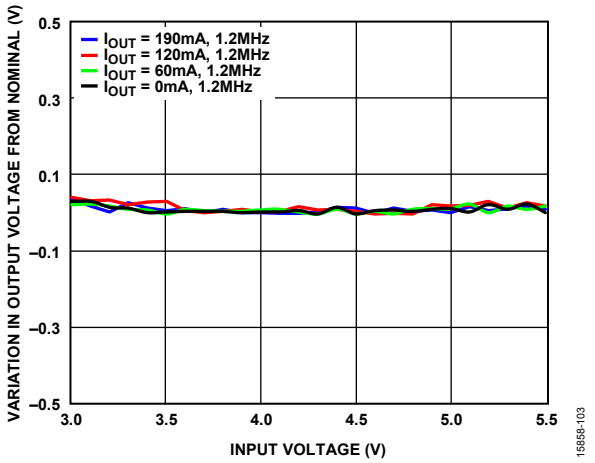

Figure 3. ADP5075 Line Regulation V_{NEG} = −5 V, f_{SW} = 1.2 MHz, T_A = 25°C

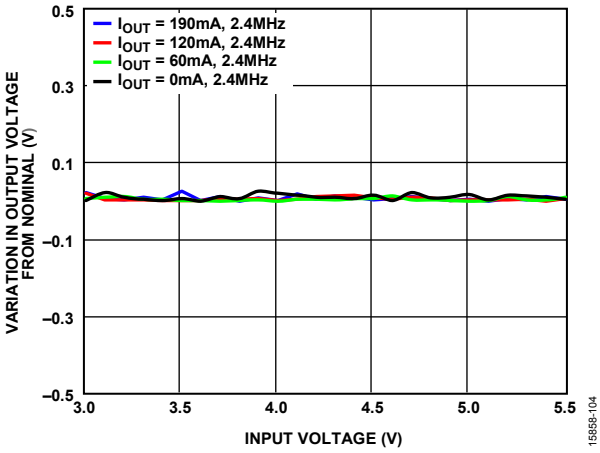

Figure 4. ADP5075 Line Regulation V_{NEG} = −5 V, f_{SW} = 2.4 MHz, T_A = 25°C

LOAD REGULATION

For load regulation measurements, monitor the regulator output while the load is varied. For good load regulation, the output must change as little as possible with varying loads. The input voltage must be held constant during this measurement. Figure 5 shows the typical load regulation performance of the ADP5075.

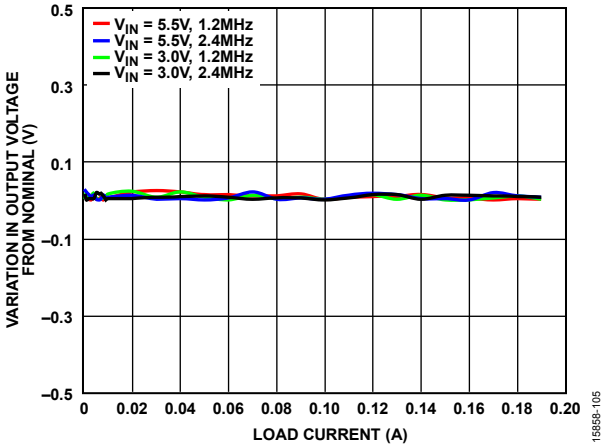

Figure 5. ADP5075 Load Regulation V_{NEG} = −5 V, T_A = 25°C

EFFICIENCY

For efficiency measurements, monitor the regulator input and output while the load is varied. The input voltage must be held constant during this measurement. Connect ammeters in series with the input and output. Connect voltmeters to the PCB side of the ammeter, and measure the voltage across the input and output terminals. For the best results, measure the voltage across the input and output capacitors. If possible, particularly at low current, trigger the meters simultaneously and set to average readings for a period of a few hundred milliseconds or more. Averaging the readings removes the switching ripple and skip mode effects. Figure 6 shows the typical efficiency curves of ADP5075 at the minimum and maximum input voltages, respectively.

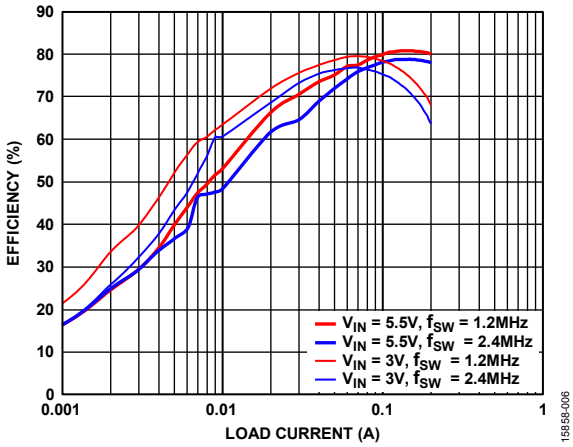

Figure 6. ADP5075 Efficiency vs. Load Current, V_{NEG} = −5 V

EVALUATION BOARD SCHEMATICS

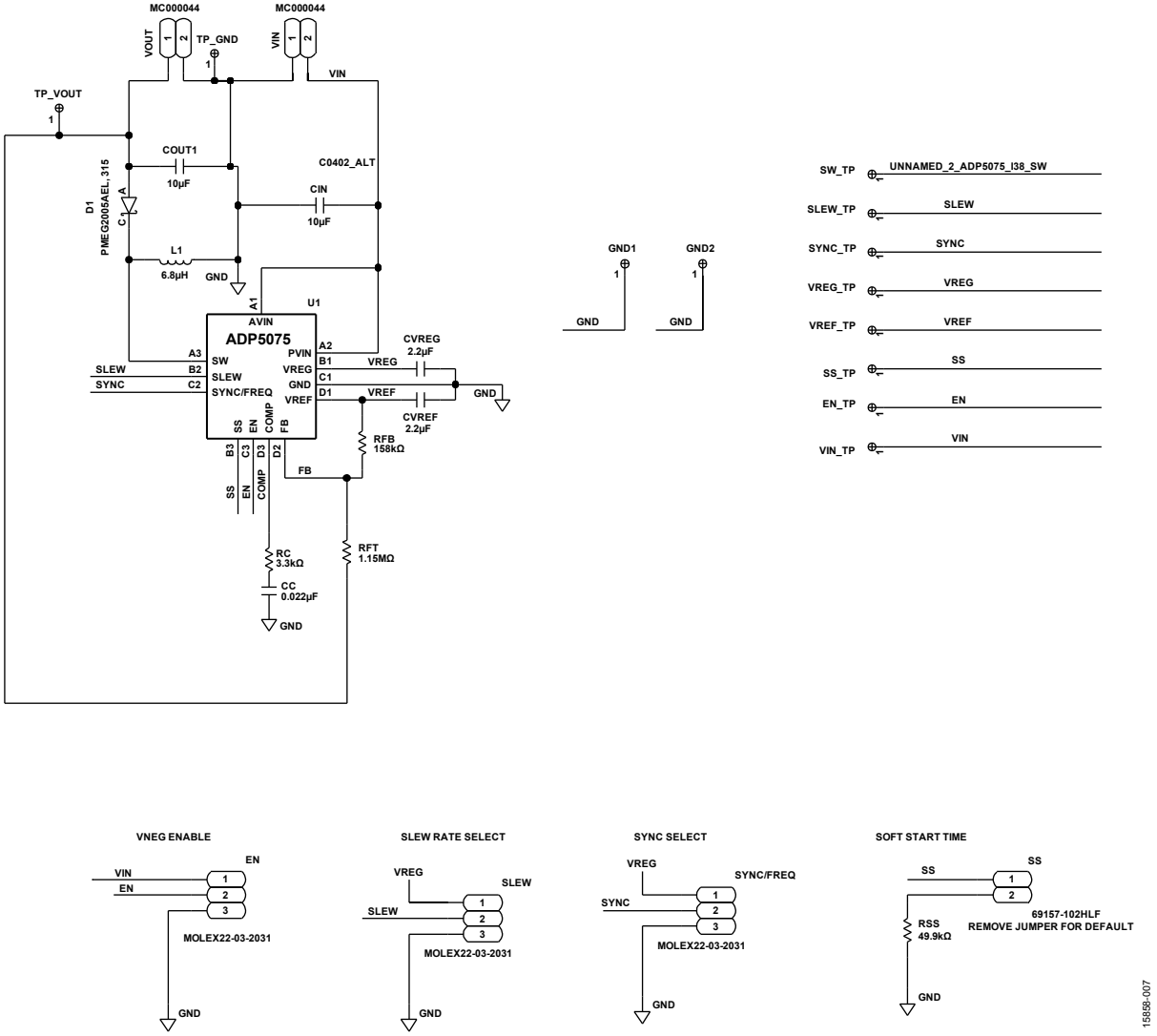

Figure 7. Evaluation Board Schematic for the ADP5075CB-EVALZ

ORDERING INFORMATION

BILL OF MATERIALS

Table 2. ADP5075CB-EVALZ Evaluation Board Components

Component	Package	Description	Value	Tolerance	Voltage	Part Number[1]	Manufacturer
U1	12-ball WLCSP	ADP5075 dc-to-dc inverting regulator		N/A	N/A	ADP5075ACBZ-R7	Analog Devices, Inc.
COUT1	0603	Output capacitor	10 µF	20%	6.3 V	GRM188R60J106ME84	Murata
L1	2.5 mm × 2 mm	Inverting regulator inductor	6.8 µH	20%	N/A	VLF252015MT-6R8M	TDK
D1	SOD882	Inverting regulator diode	0.5 A	N/A	20 V	PMEG2005AEL,315	Nexperia
CC	0402	Inverting regulator compensation capacitor	0.022 µF	10%	25 v	GRM155R71E223KA61D	Murata
RC	0402	Inverting regulator compensation resistor	3.3 kΩ	1%	N/A		
RFT	0402	Top feedback resistor	1.15 MΩ	1%	N/A		
RFB	0402	Bottom feedback resistor	158 kΩ	1%	N/A		
RSS	0402	Soft start programming resistor	49.9 kΩ	1%	N/A		
CIN	0603	Input capacitor	10 µF	20%	6.3 V	GRM188R60J106ME84	Murata
CVREG	0402	Internal regulator capacitor	2.2 µF	10%	6.3 V	GRM155R60J225KE95	Murata
CVREF	0402	Inverting regulator reference output capacitor	2.2 µF	10%	6.3 V	GRM155R60J225KE95	Murata

[1] Any blank part number and manufacturer is a common part and any part number will work as long as the value and package are correct.

NOTES

ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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