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Evaluating the ADP197 Amber High-Side Power Switch

FEATURES

Ultrasmall 1.0 mm × 1.5 mm, 0.5 mm pitch, 6-ball WLCSP
Tiny 2.0 mm x 2.0 mm x 0.55 mm, 0.65 mm pitch, 6-lead LFCSP
Low RDS_{ON} of 12 mΩ for the WLCSP
Low input voltage range of 1.8 V to 5.5 V
3 A continuous operating current
Operating temperature range: T_J = −40°C to +85°C

GENERAL DESCRIPTION

The ADP197CB-EVALZ and ADP197CP-EVALZ are used to demonstrate the functionality of the ADP197 power switch.

Simple device measurements such as VIN to VOUT resistance (RDS_{ON}), ground current, and off state current can be demonstrated with just a single voltage supply, a voltmeter, a current meter, and load resistors.

Full details about the ADP197 switches are available in the ADP197 data sheet, which should be consulted when using the ADP197CB-EVALZ or ADP197CP-EVALZ.

EVALUATION BOARD SAMPLE LAYOUTS

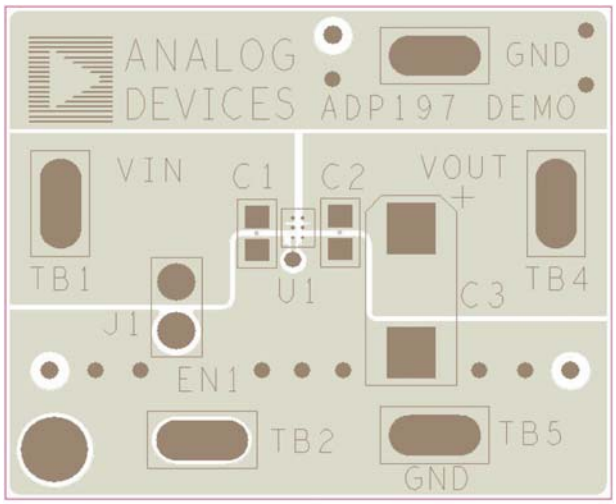

Figure 1. ADP197CB-EVALZ

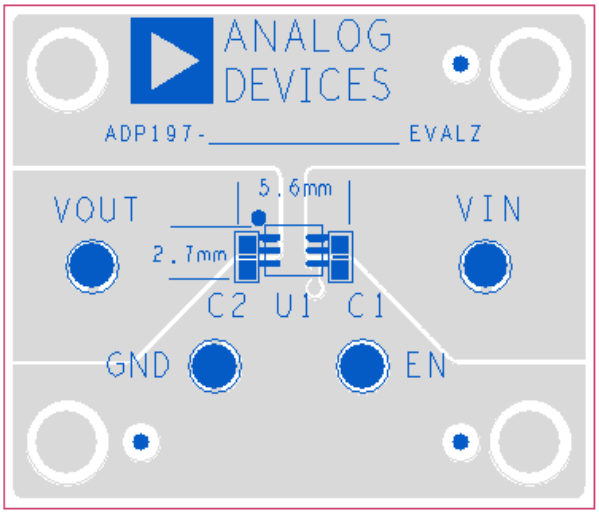

Figure 2. ADP197CP-EVALZ

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REVISION HISTORY

1/15—Rev. 0 to Rev. A

Added ADP197CP-EVALZ ..... Universal
Changes to Features Section 1
Added Figure 2; Renumbered Sequentially 1
Added Figure 4 3
Changes to Table 1 3
Changes to VIN to VOUT Resistance (RDS_{ON}) Section 4
Changes to Ground Current Measurement Section 5
Changes to Table 2 7

4/11—Revision 0: Initial Version

EVALUATION BOARD SCHEMATIC AND HARDWARE

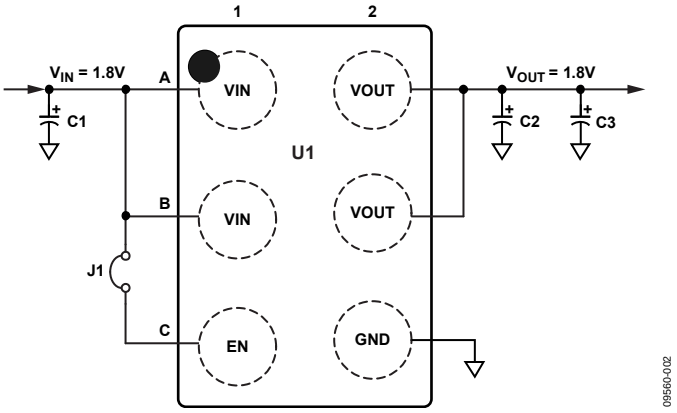

Figure 3. ADP197CB-EVALZ Evaluation Board Schematic

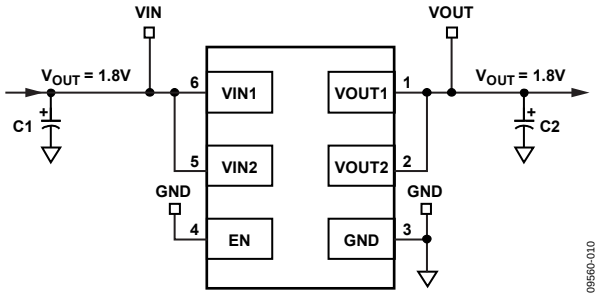

Figure 4. ADP197CP-EVALZ Evaluation Board Schematic

Table 1. Evaluation Board Hardware Components

Component	Function	Description
U1	Power switch	ADP197 high-side power switch. ADP197ACBZ-01 for the ADP197CB-EVALZ board. ADP197ACPZN-01 for the ADP197CP-EVALZ board.
C1	Input capacitor	1 µF input bypass capacitor. Optional to improve transient performance. Connect C1 from VIN to GND.
C2	Output capacitor	1 µF output capacitor. Optional to improve transient performance. Connect C2 from VOUT to GND.
C3	Output capacitor	Optional large value output capacitor. Connect C3 from VOUT to GND. For ADP197CB-EVALZ only.
J1	Jumper	Jumper. Connects EN to VIN for automatic startup. For ADP197CB-EVALZ only.

VIN TO VOUT RESISTANCE (RDS_{ON})

RDS_{ON} can be measured using the configuration shown in Figure 6. RDS_{ON} is defined as the input-to-output voltage differential divided by load current.

The voltmeter reading divided by the load current value gives the equivalent RDS_{ON} value. For more accurate measurements, a second voltmeter can be used to monitor the input voltage across the input capacitor. The input supply voltage may need to be adjusted to account for IR drops, especially if large load currents are used. Figure 5 shows a typical curve of RDS_{ON} measurements with different load currents.

Use the following steps to connect to a voltage source and voltmeter:

1. Connect the negative terminal (−) of the voltage source to one of the GND pads on the evaluation board.
2. Connect the positive terminal (+) of the voltage source to the positive terminal of an ammeter.
3. Connect the negative terminal of the ammeter to the VIN (TB1) pad of the evaluation board.
4. Connect a load between the VOUT (TB4) pad and one of the GND pads.
5. Connect the negative terminal (−) of the voltmeter to one of the GND pads.
6. Connect the positive terminal (+) of the voltmeter to the VOUT (TB4) pad.

When these steps are completed, the voltage source can be turned on. If J1 is inserted (connecting EN to VIN for automatic startup), the switch powers up. For the ADP197CP-EVALZ, the load switch automatically starts up if the EN test point is connected to VIN through a jumper or wire.

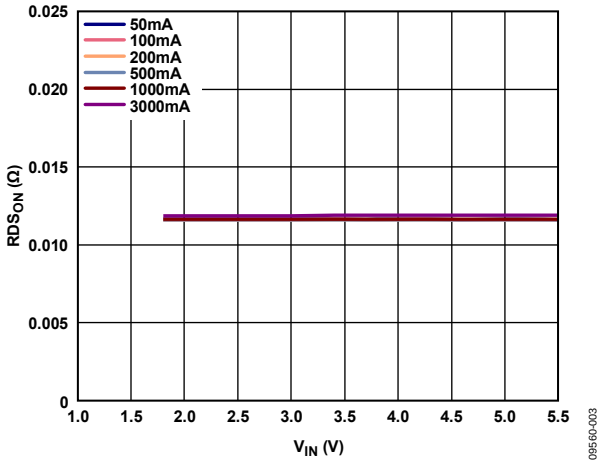

Figure 5. RDS_{ON} vs. Input Voltage (V_{IN}), Different Load Currents

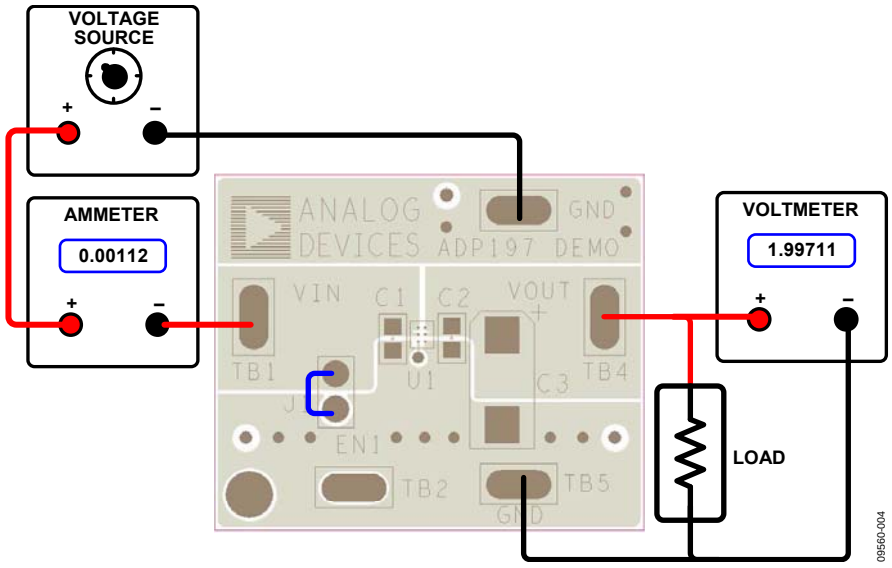

Figure 6. RDS_{ON} Measurement

GROUND CURRENT MEASUREMENT

Figure 8 shows how the evaluation board can be connected to a voltage source and an ammeter for ground current measurements. A resistor can be used as the load for the switch. Ensure that the resistor has a power rating adequate to handle the power expected to be dissipated across it. An electronic load can be used as an alternative. Ensure that the voltage source used can supply enough current for the expected load levels. If voltmeters are connected at the input or output terminals, subtract the current resulting from the shunt resistance of the voltmeter for accurate ground current measurement.

Follow these steps to connect to a voltage source and ammeter:

1. Connect the positive terminal (+) of the voltage source to the VIN (TB1) pad on the evaluation board.
2. Connect the positive terminal (+) of the ammeter to one of the GND pads of the evaluation board.
3. Connect the negative terminal (−) of the ammeter to the negative (−) terminal of the voltage source.
4. Connect a load between the VOUT (TB4) pad of the evaluation board and the negative (−) terminal of the voltage source.

The voltage source can now be turned on. If J1 is inserted (connecting EN to VIN for automatic startup), the switch powers up. For the ADP197CP-EVALZ, the load switch automatically starts up if the EN test point is connected to VIN through a jumper or wire.

GROUND CURRENT CONSUMPTION

Ground current measurement is a way of determining how much current the internal circuits of the switch are consuming, while performing the power switch function. To be efficient, the power switch needs to consume as little current as possible. Figure 7 shows the typical ground current consumption for various load levels.

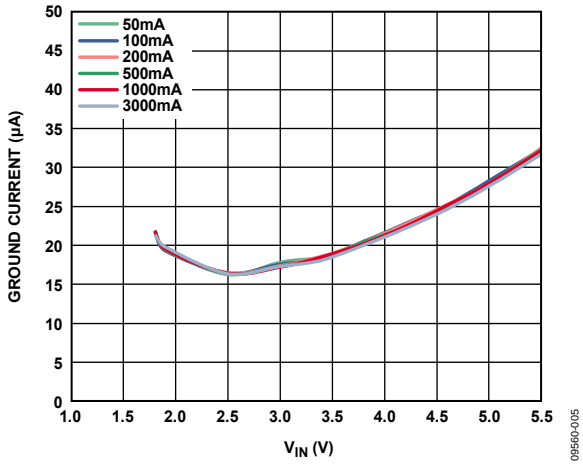

Figure 7. Ground Current vs. Input Voltage (V_{IN})

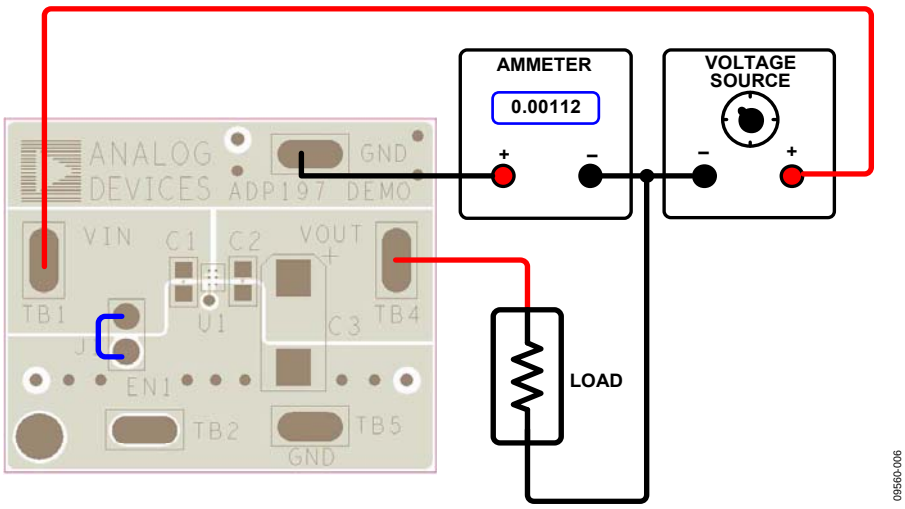

Figure 8. Ground Current Measurement

SHUTDOWN CURRENT MEASUREMENT

Figure 10 shows how the evaluation board can be connected to a voltage source and an ammeter for shutdown current measurements. The ammeter can also be connected to the GND terminal to measure the ground current, which is equal to the shutdown current when EN is tied to ground. Figure 9 shows the typical shutdown current consumption for various input voltages.

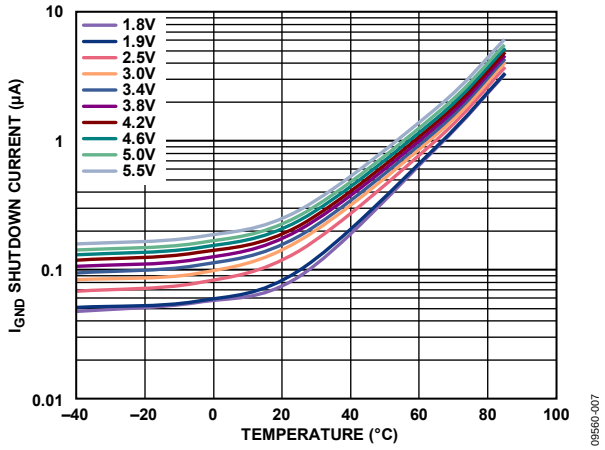

Figure 9. Shutdown Current vs. Temperature and Input Voltage

Follow these steps to connect to a voltage source and ammeter:

1. Connect the positive terminal (+) of the voltage source to the positive terminal (+) of the ammeter.
2. Connect the negative (–) terminal of the voltage source to GND pad and VOUT (TB4) pad on the evaluation board.
3. Connect the negative terminal (–) of the ammeter to the VIN (TB1) pad on the evaluation board.

The voltage source can now be powered on.

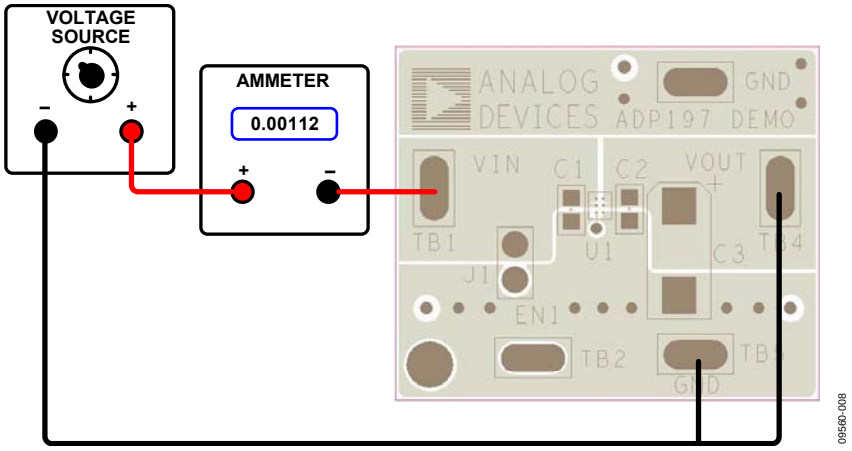

Figure 10. Shutdown Current Measurement

ORDERING INFORMATION

BILL OF MATERIALS

Table 2.

Qty	Reference Designator	Description	Manufacturer/Vendor	Vendor Part No.
2	C1, C2	Capacitor, MLCC, 1 µF, 10 V, 0402, X5R	Murata or equivalent	GRM188R61A105KA61D
1	J1	Header, single, STR, 2 pins; for ADP197CB-EVALZ only	Digi-Key Corp.	S1012E-36-ND
1	U1	IC, power switch	Analog Devices, Inc.	
		For ADP197CB-EVALZ only		ADP197ACBZ-01
		For ADP197CP-EVALZ only		ADP197ACPZN-01

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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