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Evaluating the ADP196 High-Side Load Switch

FEATURES

Low RDS_{ON}: 27 mΩ (LFCSP)
Wide input voltage range: 1.8 V to 5.5 V
Quick output discharge (QOD) circuit option (ADP196ACPZN-01-R7)
3 A continuous operating current to 70°C
Tiny, 2.0 mm × 2.0 mm × 0.55 mm, 0.65 mm pitch, 6-lead LFCSP
Operating temperature range: T_J = −40°C to +85°C

GENERAL DESCRIPTION

The ADP196 evaluation board, ADP196CP-EVALZ, is used to demonstrate the functionality of the ADP196 high-side load switch.

Simple device measurements such as V_{IN} to V_{OUT} resistance (RDS_{ON}), ground current, and off-state current can be demonstrated with only a single voltage source, a voltage meter, a current meter, and a load resistor.

Complete information about the ADP196 high-side load switch is available in the ADP196 data sheet, which should be consulted when using the ADP196CP-EVALZ.

LAYOUT OF EVALUATION BOARD

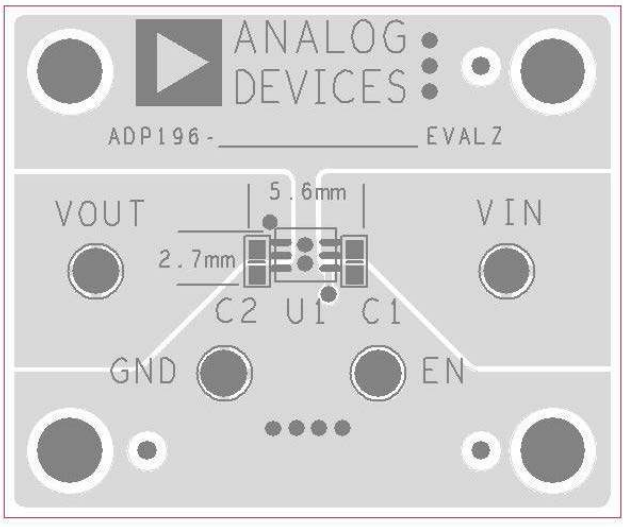

Figure 1. Evaluation Board Layout

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REVISION HISTORY

4/13—Revision 0: Initial Version

EVALUATION BOARD SCHEMATIC AND HARDWARE

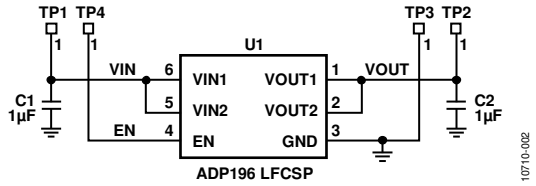

Figure 2. Evaluation Board Schematic

Table 1. LFCSP Evaluation Board Hardware Components

Component	Function	Description
U1	Load switch	ADP196ACPZN-R7 high-side load switch.
C1	Input capacitor	Optional input bypass capacitor, 1 µF. Used to improve transient performance. Connect C1 from VIN to GND.
C2	Output capacitor	Optional output capacitor, 1 µF. Used to improve transient performance. Connect C2 from VOUT to GND.

V_{IN} TO V_{OUT} RESISTANCE (RDS_{ON}) MEASUREMENTS

RDS_{ON} is defined as the input-to-output voltage differential divided by load current. The voltage meter (voltmeter) reading divided by the load current value gives the equivalent RDS_{ON} value.

RDS_{ON} can be measured using the configuration shown in Figure 4. 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 3 shows a typical curve of RDS_{ON} measurements with different load currents.

Follow these steps to connect the evaluation board to a voltage source and voltmeter for RDS_{ON} measurements:

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

The voltage source can now be turned on. If EN is connected to VIN for automatic startup, the switch powers up.

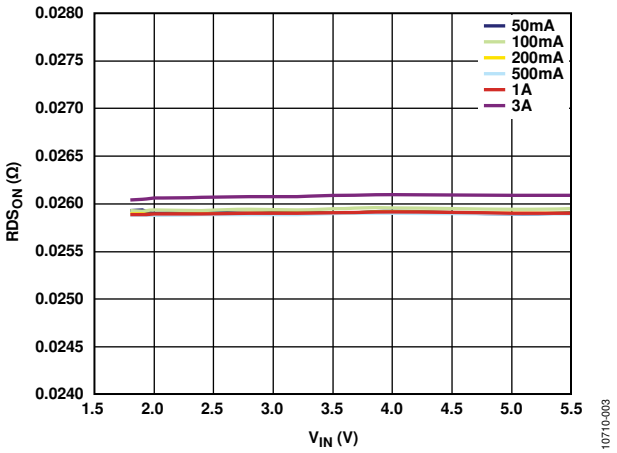

Figure 3. RDS_{ON} vs. Input Voltage, V_{IN}

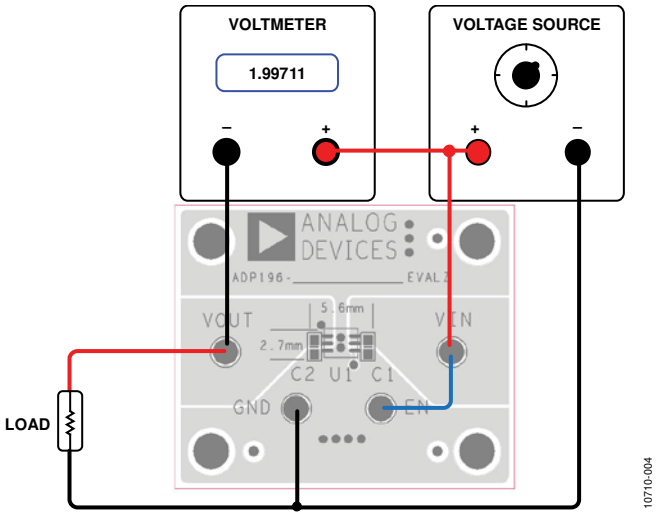

Figure 4. RDS_{ON} Measurement Configuration

GROUND CURRENT MEASUREMENTS

Figure 6 show how the evaluation board can be connected to a voltage source and a current meter (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 a voltmeter is connected at the input or output terminal, subtract the current resulting from the shunt resistance of the voltmeter for accurate ground current measurement.

Follow these steps to connect the evaluation board to a voltage source and ammeter for ground current measurements:

1. Connect the positive terminal (+) of the voltage source to the VIN pad on the evaluation board.
2. Connect the positive terminal (+) of the ammeter to the GND pad on 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 pad on the evaluation board and the negative (−) terminal of the voltage source.

The voltage source can now be turned on. If EN is connected to VIN for automatic startup, the switch powers up.

GROUND CURRENT CONSUMPTION

Ground current measurements can determine how much current the internal circuits of the switch consume while the circuits perform the load switch function. To be efficient, the load switch must consume as little current as possible. Figure 5 shows the typical ground current consumption for various load levels.

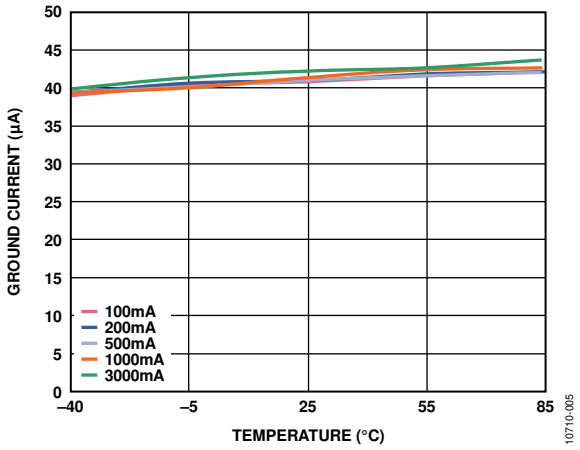

Figure 5. Ground Current vs. Temperature

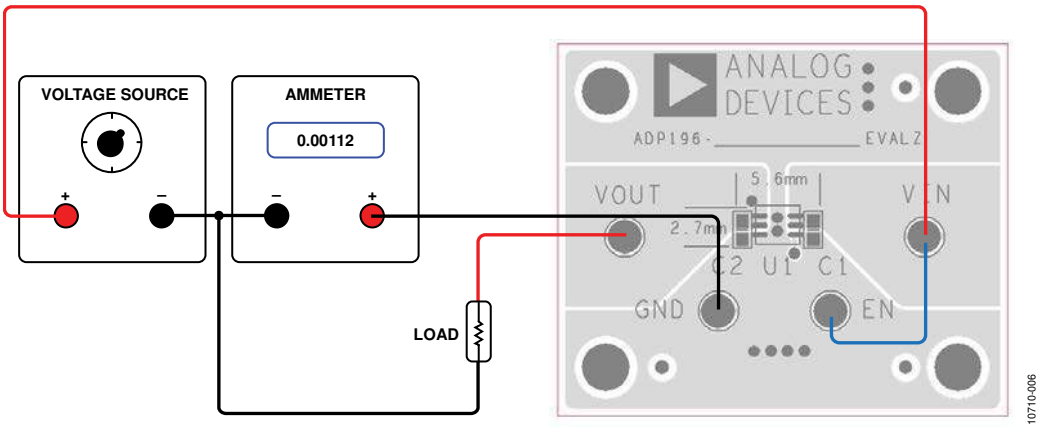

Figure 6. Ground Current Measurement Configuration

SHUTDOWN CURRENT MEASUREMENTS

Figure 8 show 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 VIN pad to measure the ground current, which is equal to the shutdown current when EN is tied to ground (or left open). Figure 7 shows the typical shutdown current consumption for various input voltages.

Follow these steps to connect the evaluation board to a voltage source and ammeter for shutdown current measurements:

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 the GND pad and the EN pad, or leave the EN pad floating to disable the part.
3. Connect the negative terminal (−) of the ammeter to the VIN pad on the evaluation board.

The voltage source can now be turned on.

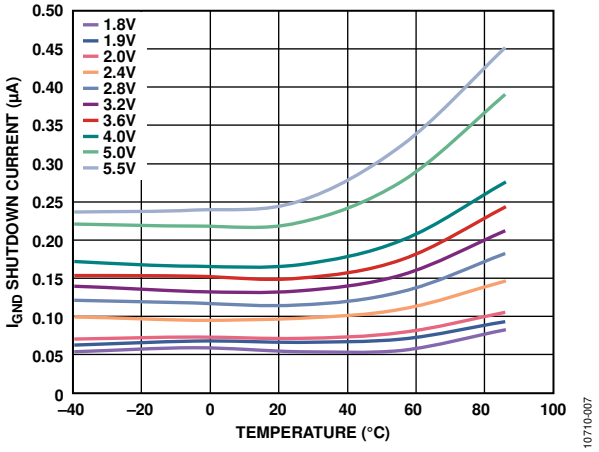

Figure 7. Shutdown Current vs. Temperature and Input Voltage (V_{IN})

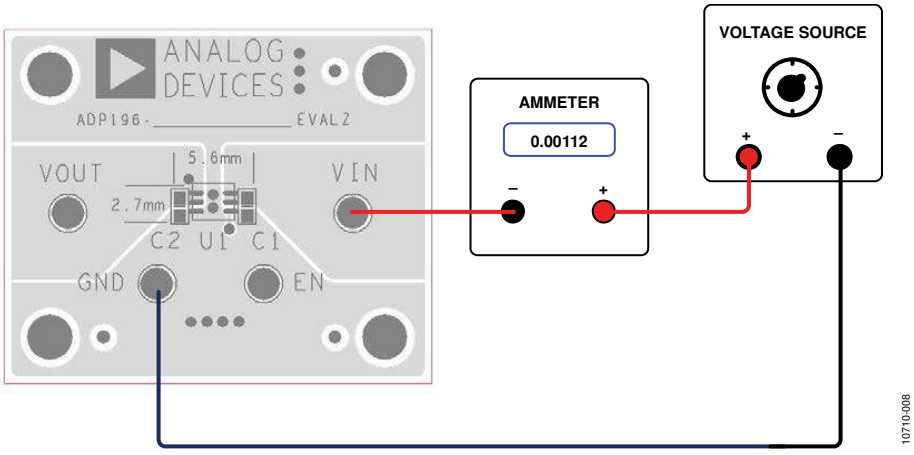

Figure 8. Shutdown Current Measurement Configuration

BILL OF MATERIALS

Table 2. Bill of Materials

Qty	Reference Designator	Description	Manufacturer/Vendor	Part No.
2	C1, C2	Capacitor, MLCC, 1 µF, 10 V, 0402, X5R	Murata or equivalent	GRM155R61A105KA01D
1	J2	Header, single, STR, two pins	Digi-Key Corp.	S1012E-02-ND
1	U1	IC, load switch	Analog Devices, Inc.	ADP196ACPZN-R7

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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