

## Evaluating the **ADM7170**, **ADM7171**, and **ADM7172**

### FEATURES

**Input voltage range:** 2.3 V to 6.5 V

**Output current range:** 0 mA to 2 A (500 mA for **ADM7170**, 1 A for **ADM7171**, 2 A for **ADM7172**)

**Output voltage accuracy:**  $\pm 0.75\%$  for **ADM7170**,  $-0.5\%/+1\%$  for **ADM7171/ADM7172**

**Operating temperature range:**  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$

**Output voltage can also be adjusted up with two external resistors from any fixed output voltage option**

$$V_{OUT} = V_{OUT(FIXED)} \times (1 + R1/R2)$$

### GENERAL DESCRIPTION

The **ADM7170ACP-EVALZ/ADM7171ACP-EVALZ/ADM7172ACP-EVALZ** is an evaluation board used to demonstrate the functionality of the **ADM7170**, **ADM7171**, and **ADM7172** linear regulators.

Simple device measurements, such as line and load regulation, dropout, and ground current, can be demonstrated with just a single voltage source, a voltmeter, an ammeter, and load resistors.

For more details about the linear regulators, visit [www.analog.com](http://www.analog.com).

### EVALUATION BOARD PHOTOGRAPH

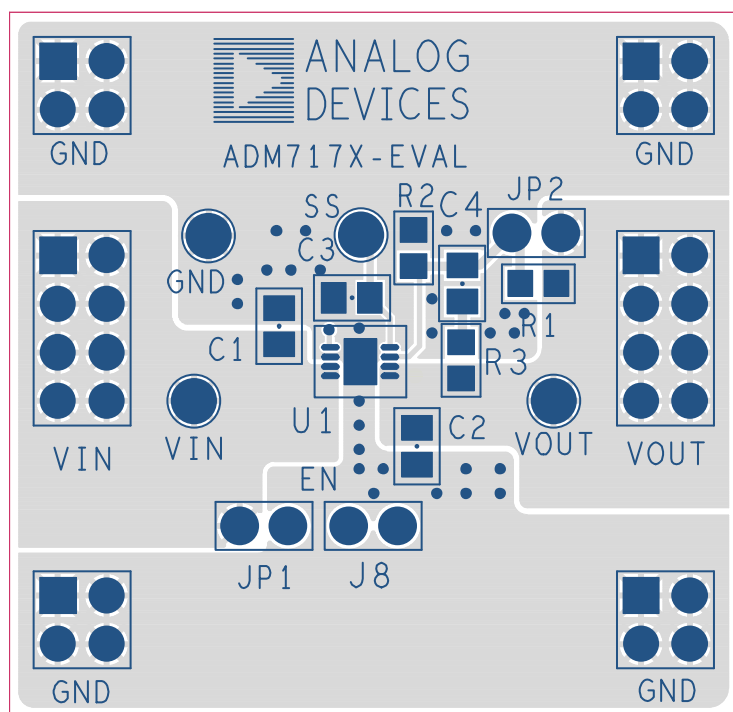


Figure 1.

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REVISION HISTORY

8/14—Revision 0: Initial Version

## EVALUATION BOARD HARDWARE AND SCHEMATIC

### EVALUATION BOARD CONFIGURATIONS

The evaluation board comes supplied with different components depending on which version is ordered. Components common to all versions are C1, C2, C3, JP1, and JP2. Resistor R1 and Resistor R2 are used to adjust the output voltage above any fixed voltage option. C4 and R3 are optional components for the noise reduction network.

The output voltage is set by

$$V_{OUT} = V_{OUT(FIXED)} \times (1 + R1/R2)$$

Figure 2 shows the schematic of this evaluation board configuration.

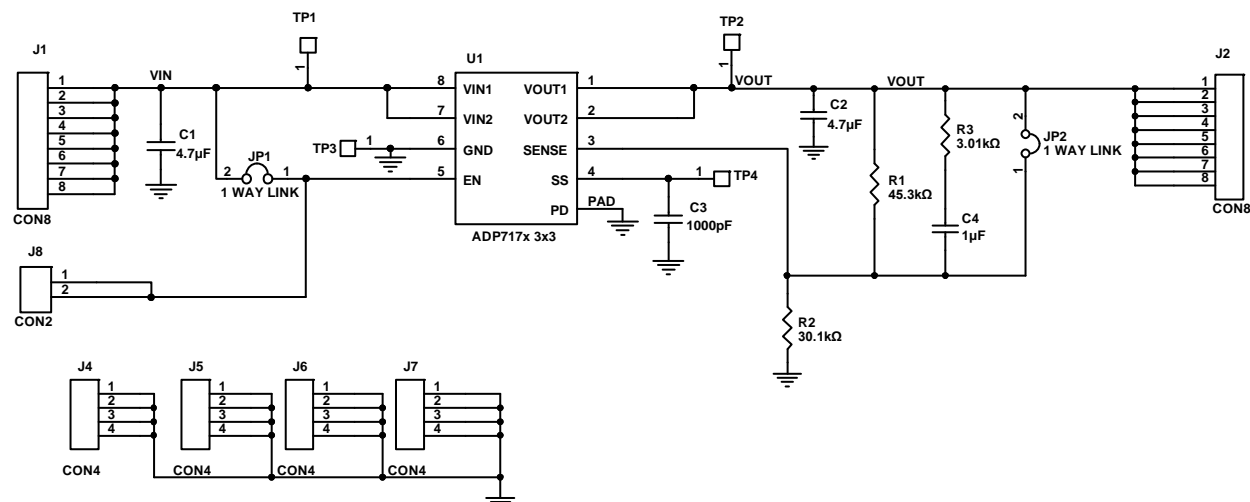


Figure 2. Evaluation Board Schematic

12252-002

Table 1. Evaluation Board Hardware Components

Component	Function	Description
U1	Linear regulator	<a href="#">ADM7170</a> , <a href="#">ADM7171</a> , or <a href="#">ADM7172</a> linear regulator. Component varies depending on the evaluation board type ordered.
C1	Input capacitor	4.7 µF input bypass capacitor.
C2	Output capacitor	4.7 µF output capacitor. Required for stability and transient performance.
C3	Soft start capacitor	Set soft start time to limit inrush current.
C4	Noise reduction capacitor	1 µF, noise reduction network with R3.
R1	Output divider	45.3 kΩ, sets output voltage to 3.0 V with R2.
R2	Output divider	30.1 kΩ, sets output voltage to 3.0 V with R1.
R3	Noise Reduction resistor	3.01 kΩ, noise reduction network with C4.
JP1	Jumper	Connects EN to VIN for automatic startup.
JP2	Jumper	Connects SENSE pin to output for fixed output options.

## OUTPUT VOLTAGE MEASUREMENTS

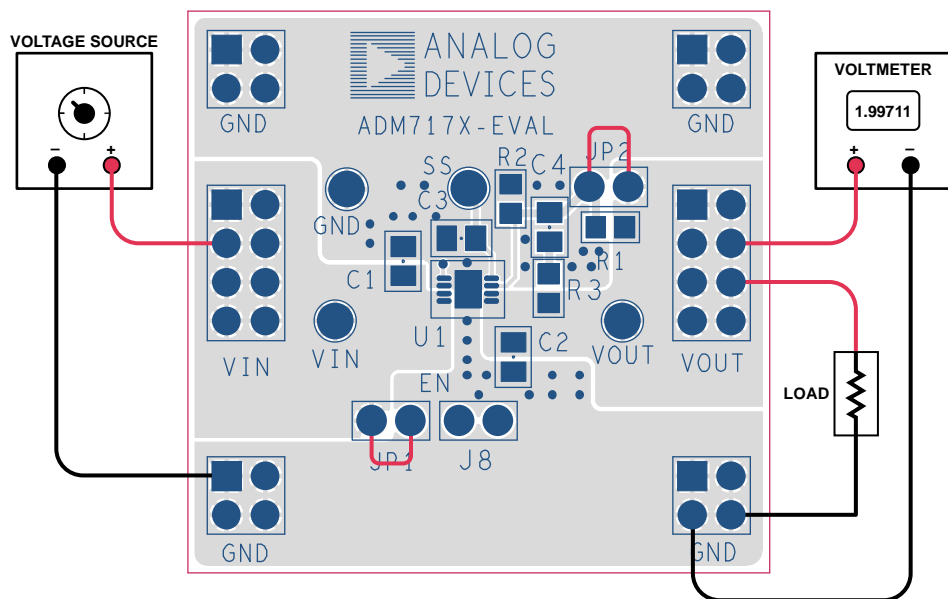


Figure 3. Output Voltage Measurement

Figure 3 show how the evaluation board can be connected to a voltage source and a voltmeter for basic output voltage accuracy measurements. A resistor can be used as the load for the regulator. Ensure that the resistor has a power rating adequate to handle the power expected to be dissipated across it. An electronic load can also be used as an alternative. Ensure that the voltage source can supply enough current for the expected load levels.

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 VIN pad of the evaluation board.
3. Connect a load between the VOUT pad and one of the GND pads.
4. Connect the negative terminal (–) of the voltmeter to one of the GND pads.
5. Connect the positive terminal (+) of the voltmeter to the VOUT pad.

The voltage source can now be turned on. If JP1 is inserted (connecting EN to VIN for automatic startup), the regulator powers up.

If the load current is large, the user needs to connect the voltmeter as close as possible to the output capacitor to reduce the effects of IR drops.

## LINE REGULATION

For line regulation measurements, the regulator's output is monitored while its input is varied. For good line regulation, the output must change as little as possible with varying input levels. To ensure that the device is not in dropout during this measurement,  $V_{IN}$  must be varied between  $V_{OUTNOM} + 0.5\text{ V}$  (or  $2.3\text{ V}$ , whichever is greater) and  $V_{INMAX}$ . For example, for an [ADM7170/ADM7171/ADM7172](#) with fixed  $2.5\text{ V}$  output,  $V_{IN}$  needs to be varied between  $3.0\text{ V}$  and  $6.5\text{ V}$ . This measurement can be repeated under different load conditions. Figure 4 shows the typical line regulation performance of an [ADM7170/ADM7171/ADM7172](#) with fixed  $2.5\text{ V}$  output.

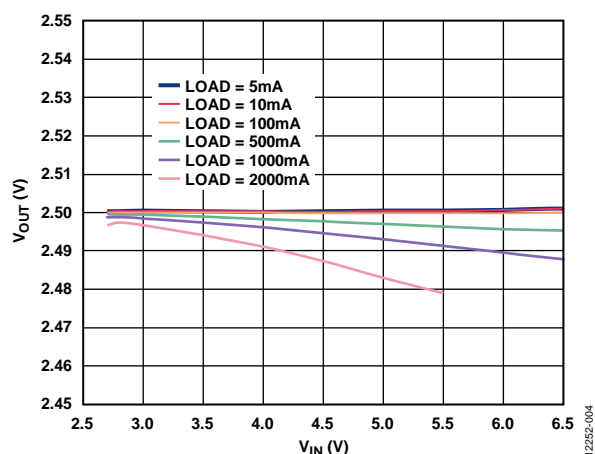


Figure 4. Output Voltage vs. Input Voltage

## LOAD REGULATION

For load regulation measurements, the regulator's output is monitored while the load is varied. For good load regulation, the output must change as little as possible with varying load. The input voltage must be held constant during this measurement. The load current can be varied from  $0\text{ mA}$  to  $2\text{ A}$ . Figure 5 shows the typical load regulation performance of an [ADM7170/ADM7171/ADM7172](#) with fixed  $2.5\text{ V}$  output for an input voltage of  $3.0\text{ V}$ .

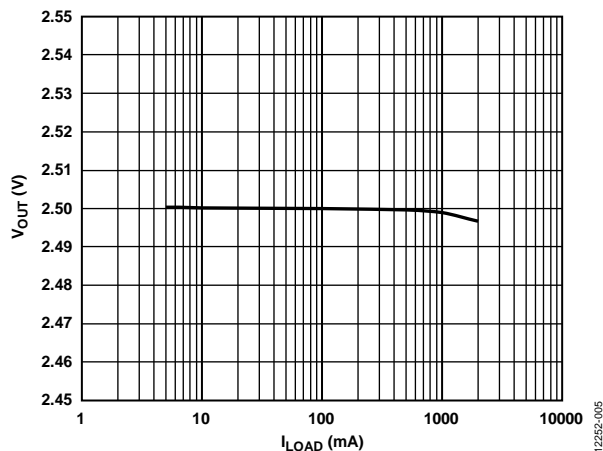


Figure 5. Output Voltage vs. Load Current

## DROPOUT VOLTAGE

Dropout voltage can be measured using the configuration shown in Figure 3. Dropout voltage is defined as the input-to-output voltage differential when the input voltage is set to the nominal output voltage. This applies only for output voltages greater than  $2.3\text{ V}$ . Dropout voltage increases with larger loads. 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 6 shows a typical curve of dropout voltage measurements with different load currents.

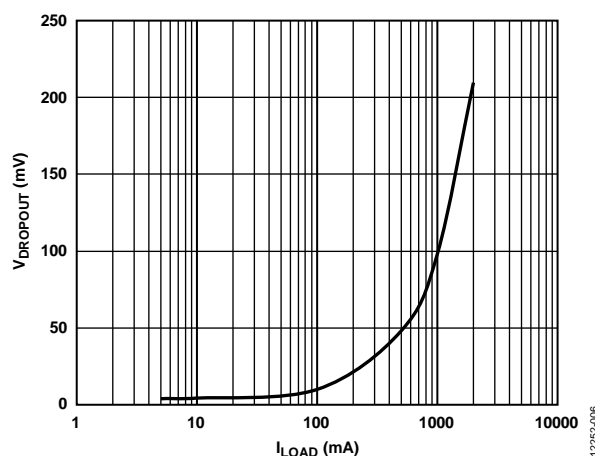


Figure 6. Dropout Voltage vs. Load Current

## GROUND CURRENT MEASUREMENTS

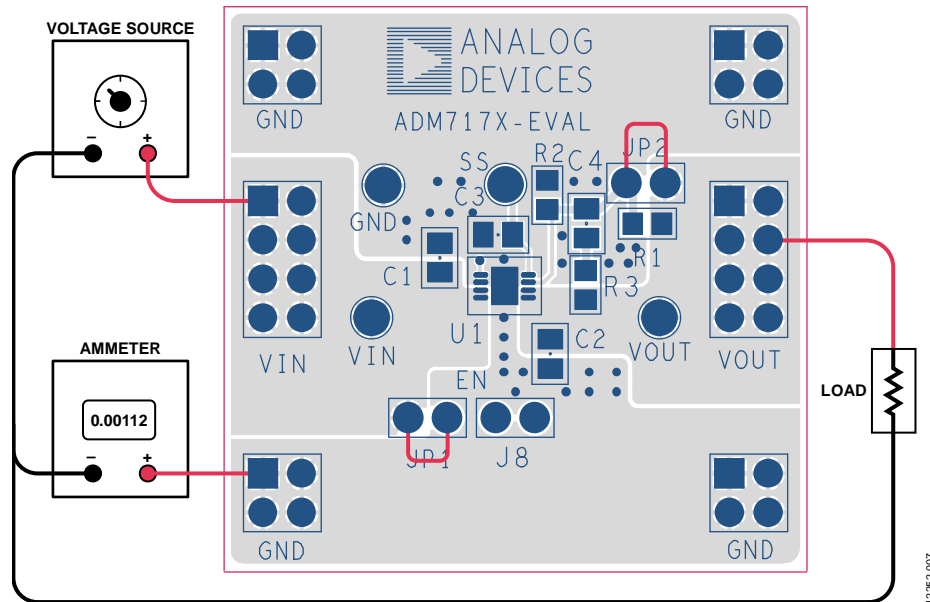


Figure 7. Ground Current Measurement

Figure 7 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 regulator. 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.

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

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 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 negative (–) terminal of the voltage source and the VOUT pad of the evaluation board.

The voltage source can now be turned on. If JP1 is inserted (connecting EN to VIN for automatic startup), the regulator powers up.

## GROUND CURRENT CONSUMPTION

Ground current measurements can determine how much current the internal circuits of the regulator are consuming while the circuits perform the regulation function. To be efficient, the regulator needs to consume as little current as possible. Typically, the regulator uses the maximum current when supplying its largest load level (2 A). Figure 8 shows the typical ground current consumption for various load levels at an input voltage of 3.0 V for an output voltage of 2.5 V.

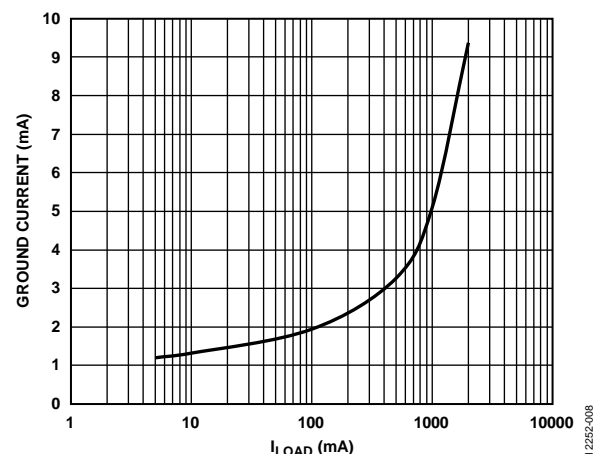


Figure 8. Ground Current vs. Load Current

When the device is disabled (EN = GND), the ground current drops to less than 3  $\mu$ A.

## ORDERING INFORMATION

### BILL OF MATERIALS

Table 2.

Qty	Reference Designator	Description	Manufacturer/Vendor	Vendor Part Number
1	U1	ADM7170, ADM7171, or ADM7172 linear regulator	Analog Devices, Inc.	ADM7170ACP, ADM7170ACP, or ADM7170ACP
2	C1, C2	Capacitor, MLCC, 4.7 $\mu$ F, 16 V, 0805, X5R	Murata (or equivalent)	
1	C3	Capacitor, MLCC, 0805 case		
1	C4	Capacitor, MLCC, 1 $\mu$ F, 16 V, 0805, X5R	Murata (or equivalent)	
2	JP1, JP2	Header, single, STR, 2 pins	Sullins Connector Solutions	PEC02SAAN CRCW0603xxxxF
1	R1	45.3 k $\Omega$ , resistor, 1%, 0603 case		
1	R2	30.1 k $\Omega$ , resistor, 1%, 0603 case		
1	R3	3.01 k $\Omega$ , resistor, 1%, 0603 case		



#### 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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