

### FEATURES

**Input voltage range:** 2.5 V to 5.5 V

**Output current range:** 0 mA to 500 mA

**Output voltage accuracy:**  $\pm 1\%$

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

### GENERAL DESCRIPTION

The ADP1715/ADP1716 evaluation board can be used to demonstrate the functionality of the ADP1715/ADP1716 series of linear regulators. Depending on the component combinations used, the evaluation board can be used for ADP1715 fixed output voltage devices with soft start, ADP1715 adjustable output voltage devices, and ADP1716 fixed output voltage devices with tracking.

Simple device measurements such as line and load regulation, dropout, and ground current can be demonstrated with just a single voltage supply, a voltage meter, a current meter, and load resistors.

For more details about the [ADP1715/ADP1716](http://www.analog.com) linear regulators, visit [www.analog.com](http://www.analog.com).

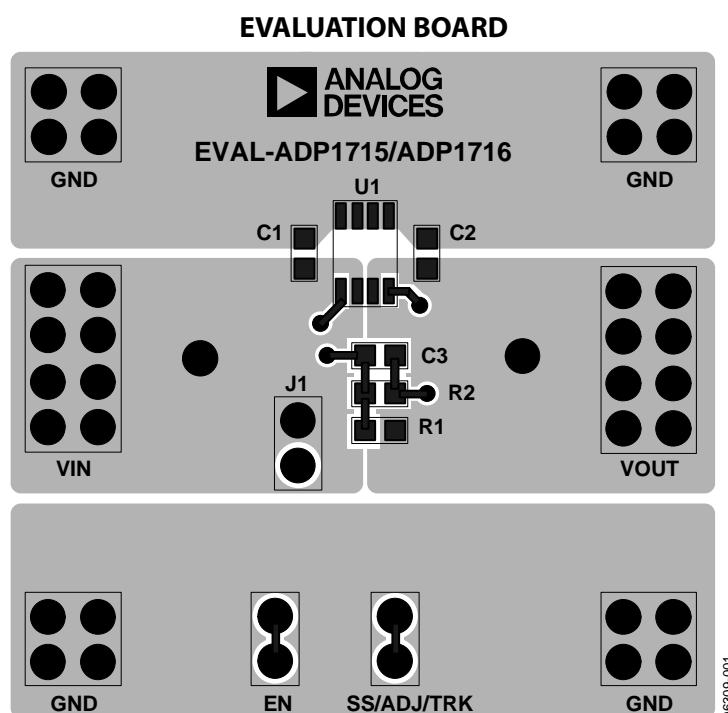


Figure 1.

### Rev. 0

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REVISION HISTORY

3/07—Revision 0: Initial Version

## EVALUATION BOARD HARDWARE AND SCHEMATIC

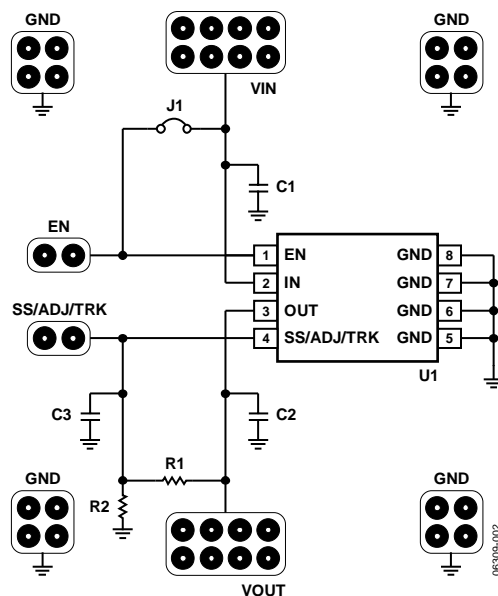


Figure 2. Evaluation Board Schematic

Table 1. Components Listing

Reference Designator	Function	Description
U1 <sup>1</sup>	Linear regulator	ADP1715/ADP1716 Low Dropout Linear Regulator.
C1	Input capacitor	2.2 $\mu$ F Input Bypass Capacitor.
C2	Output capacitor	2.2 $\mu$ F Output Capacitor. Required for stability and transient performance.
C3 <sup>2</sup>	Soft start capacitor	10 nF Soft Start Capacitor. Determines $V_{OUT}$ ramp-up time during startup.
R1, R2 <sup>3</sup>	Output voltage adjust resistors	External Resistors. Used to set $V_{OUT}$ with the ADP1715 adjustable version.
J1	Jumper	Jumper. Connects EN to VIN for automatic startup.

<sup>1</sup> Component varies depending on which evaluation board model is ordered.<sup>2</sup> Component present only on boards with ADP1715 fixed output devices.<sup>3</sup> Components present only on boards with ADP1715 adjustable output devices.

## EVALUATION BOARD CONFIGURATIONS

The ADP1715/ADP1716 evaluation boards come supplied with different components depending on which version is ordered. Components common to all versions are C1, C2, and J1.

### ADP1715 FIXED OUTPUT WITH SOFT START

Evaluation boards that come supplied with ADP1715 fixed output voltage option devices have the C3 soft start capacitor included. This capacitor controls the rise time when the output voltage starts up. Figure 3 shows the schematic of this evaluation board configuration.

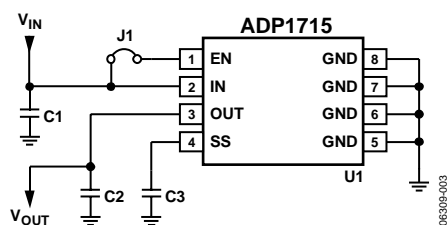


Figure 3. ADP1715 Fixed Output with Soft Start

### ADP1715 ADJUSTABLE OUTPUT

Evaluation boards that come supplied with ADP1715 adjustable output voltage option devices have the R1 and R2 resistors included. Figure 4 shows the schematic of this evaluation board configuration.

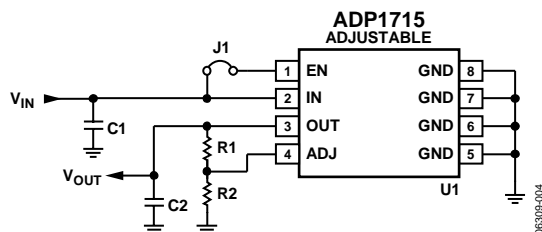


Figure 4. ADP1715 Adjustable Output

The output voltage is set based on the equation

$$V_{OUT} = 0.8 \text{ V} (1 + R1/R2) \quad (1)$$

For example, if  $R1 = 10 \text{ k}\Omega$  and  $R2 = 4.99 \text{ k}\Omega$ , then  $V_{OUT} = 2.403 \text{ V}$ .

### ADP1716 FIXED OUTPUT WITH TRACKING

Evaluation boards that come supplied with ADP1716 fixed output voltage option with tracking devices do not have C3, R1, or R2 populated. The user can instead connect an external voltage to the TRK pad of the evaluation board to see how the track feature works. Figure 5 shows the schematic of this evaluation board configuration.

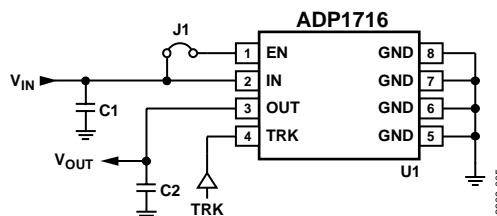


Figure 5. ADP1716 Fixed Output with Tracking

## OUTPUT VOLTAGE MEASUREMENTS

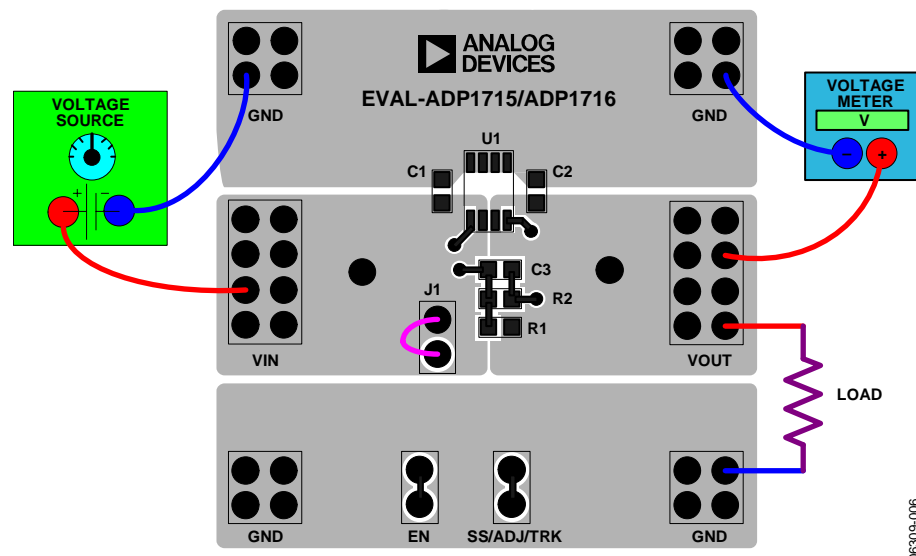


Figure 6.

Figure 6 shows how the evaluation board can be connected to a voltage source and a voltage meter for basic output voltage accuracy measurements. A resistor can be used as the load for the regulator. Ensure 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 the voltage source used can supply adequate current for the expected load levels.

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

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 voltage meter to one of the GND pads and the positive terminal (+) of the voltage meter to the VOUT pad.
5. The voltage source can now be turned on. If J1 is inserted (this connects EN to VIN for automatic startup), then the regulator powers up.

If large load currents are to be used, the user needs to connect the voltage meter as close to the output capacitor as possible, to reduce the effects of IR drops.

## LINE REGULATION

For line regulation measurements, the regulator 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 the device is not in dropout mode during this measurement, VIN must be varied between  $V_{OUT\_NOM} + 0.5\text{ V}$  (or 2.5 V, whichever is greater) and  $V_{IN\_MAX}$ . For an ADP1715 with a 3.3 V fixed output, this means VIN needs to be varied between 3.8 V and 5.5 V. This measurement can be repeated under different load conditions. Figure 7 shows the typical line regulation performance of an ADP1715 with 3.3 V fixed output.

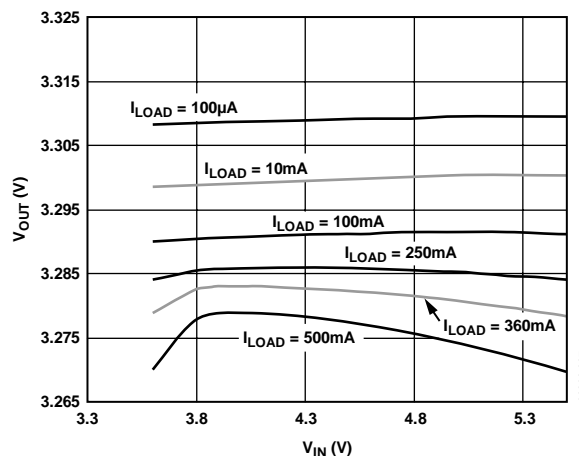


Figure 7. ADP1715 Line Regulation

## LOAD REGULATION

For load regulation measurements, the regulator output is monitored while the load is varied. For good load regulation, the output needs to change as little as possible with varying loads. The input voltage must be held constant during this measurement. The load current can be varied from 0 mA to 500 mA. Figure 8 shows the typical load regulation performance of an ADP1715 with 3.3 V fixed output for an input voltage of 3.8 V.

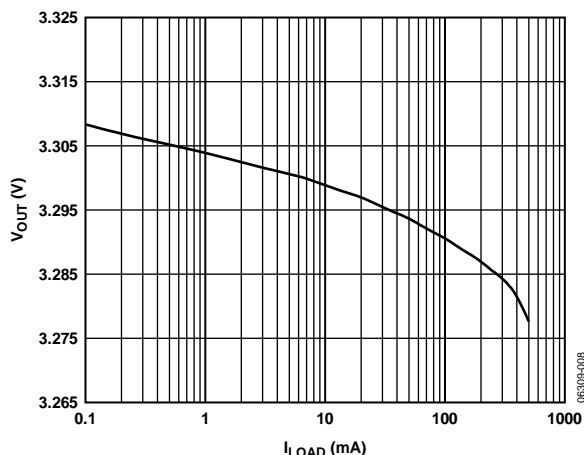


Figure 8. ADP1715 Load Regulation

## DROPOUT VOLTAGE

Dropout voltage measurements can also be performed using the configuration shown in Figure 6. 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 above 2.5 V. Dropout voltage increases with larger loads. For more accurate measurements, a second voltage meter 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 9 shows a typical curve of dropout voltage measurements with different load currents.

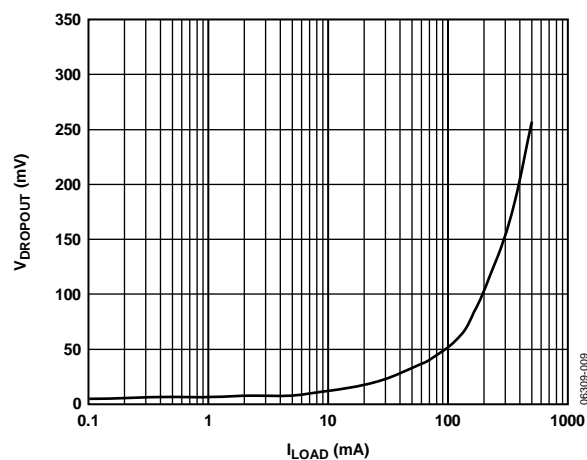


Figure 9. Dropout Voltage vs. Load Current

## GROUND CURRENT MEASUREMENTS

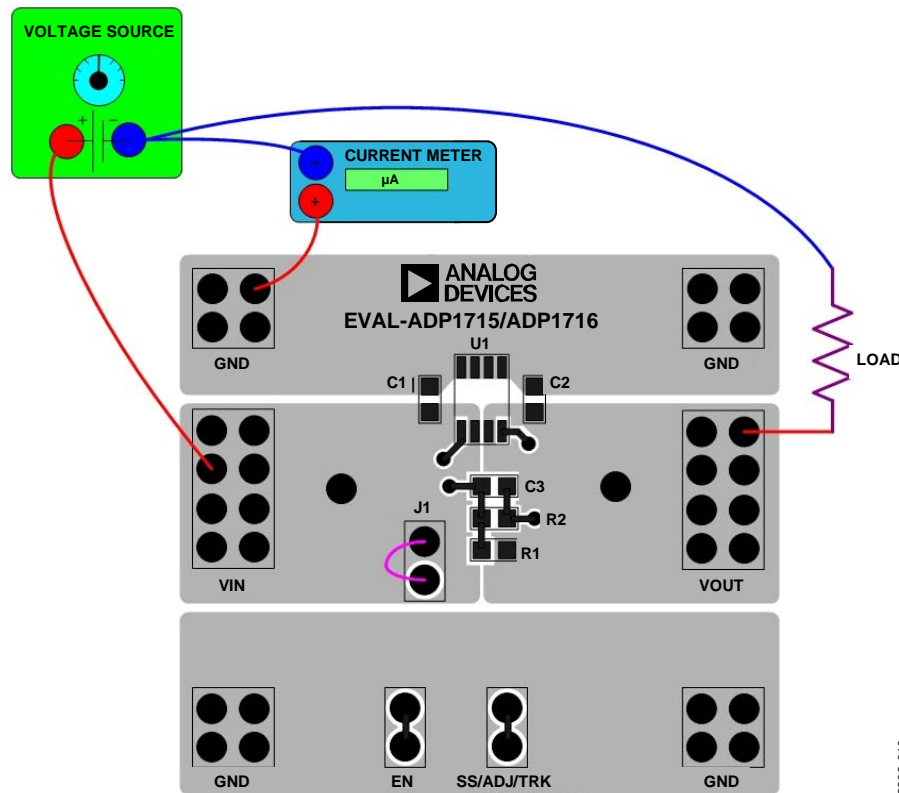


Figure 10.

Figure 10 shows how the evaluation board can be connected to a voltage source and a current meter 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 the voltage source used can supply adequate current for the expected load levels.

Follow these steps to connect to a voltage source and current meter:

1. Connect the positive terminal (+) of the voltage source to the VIN pad on the evaluation board.
2. Connect the positive terminal (+) of the current meter to one of the GND pads of the evaluation board.
3. Connect the negative terminal (-) of the current meter to the negative terminal (-) of the voltage source.
4. Connect a load between the VOUT pad of the evaluation board and the negative terminal (-) of the voltage source.
5. The voltage source can now be turned on. If J1 is inserted (this connects EN to VIN for automatic startup), then the regulator powers up.

### GROUND CURRENT CONSUMPTION

Ground current measurements are a way of determining how much current the regulator internal circuits are consuming while performing the regulation function. To be efficient, the regulator must consume as little current as possible. Typically,

the regulator consumes maximum current when supplying its largest load level (500 mA). Figure 11 shows typical ground current consumption for various load levels.

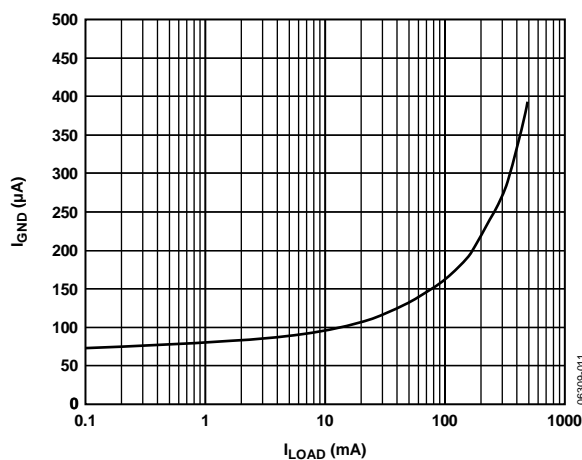


Figure 11. Ground Current vs. Load Current

When the device is disabled ( $EN = 0\text{ V}$ ), ground current is reduced to less than  $1\text{ }\mu\text{A}$ .

Note that larger ground current levels are observed when using an evaluation board with R1 and R2 present.

# EVAL-ADP1715/ADP1716

## ORDERING INFORMATION

### BILL OF MATERIALS

Table 2.

Qty	Reference Designator	Description	Manufacturer/Vendor	Vendor Part Number
2	C1, C2	Capacitor, MLCC, 2.2 $\mu$ F, 16 V, 0805, X5R	Murata or equivalent	GRM21BR61C225KA88
1	C3	Capacitor, MLCC, 10 nF, 100 V, 0805, X7R	Murata or equivalent	GRM21BR72A103KA01
1	R1	Resistor, 10 k $\Omega$ , 1%, 0805	Vishay Dale or equivalent	CRCW080510K0FKEA
1	R2	Resistor, 4.99 k $\Omega$ , 1%, 0805	Vishay Dale or equivalent	CRCW08054K990FKEA
1	J1	Header, single, STR, 2 pins	Digi-Key, Corp.	S1012E-36-ND
1	U1	IC, LDO regulator	Analog Devices, Inc.	ADP1715ARMZ-R7 ADP1715ARMZ-3.3-R7 ADP1715ARMZ-1.8-R7 ADP1716ARMZ-2.5-R7

### ORDERING GUIDE

Model	Description
ADP1715-EVALZ <sup>1</sup>	Evaluation Board with Adjustable Output ADP1715
ADP1715-3.3-EVALZ <sup>1</sup>	Evaluation Board with 3.3 V Fixed Output ADP1715
ADP1715-1.8-EVALZ <sup>1</sup>	Evaluation Board with 1.8 V Fixed Output ADP1715
ADP1716-2.5-EVALZ <sup>1</sup>	Evaluation Board with 2.5 V Fixed Output ADP1716

<sup>1</sup> Z = RoHS Compliant Part.

### 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.