

### FEATURES

- Full-featured evaluation board for the ADP2108
- Standalone capability
- Simple device measurements, including line and load regulation, demonstrable with
  - A single voltage supply
  - A voltage meter
  - A current meter
  - Load resistors
- Easy access to external components
- Package options: 5-ball WLCSP and 5-lead TSOT

### GENERAL DESCRIPTION

The [ADP2108](#) evaluation board is a complete 600 mA, step-down regulator solution that tests the ADP2108, a high efficiency, low quiescent current step-down, dc-to-dc converter available in WLCSP and TSOT packages. The evaluation board is available in standard voltage options. See the Ordering Guide for available models.

The ADP2108 uses a proprietary high speed, current mode, constant frequency PWM control scheme for excellent stability and transient response. To ensure the longest battery life in portable applications, the ADP2108 features a power-saving, pulse frequency modulation (PFM) mode that reduces the switching frequency under light load conditions. The 3 MHz switching frequency minimizes the size of external components. Full details on the ADP2108 are provided in the ADP2108 data sheet available from Analog Devices, Inc., which should be consulted in conjunction with this data sheet.

### DIGITAL PICTURE OF THE EVALUATION BOARD

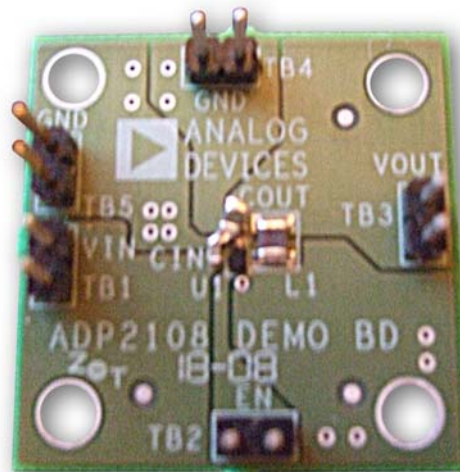


Figure 1.

#### Rev. A

Evaluation boards are only intended for device evaluation and not for production purposes. Evaluation boards are supplied "as is" and without warranties of any kind, express, implied, or statutory including, but not limited to, any implied warranty of merchantability or fitness for a particular purpose. No license is granted by implication or otherwise under any patents or other intellectual property by application or use of evaluation boards. Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Analog Devices reserves the right to change devices or specifications at any time without notice. Trademarks and registered trademarks are the property of their respective owners. Evaluation boards are not authorized to be used in life support devices or systems.

**TABLE OF CONTENTS**

Features .....	1	Typical Performance Characteristics .....	4
General Description .....	1	Evaluation Board Schematics and Artwork .....	6
Digital Picture of the Evaluation Board.....	1	Ordering Information.....	7
Revision History .....	2	Bill of Materials.....	7
Using the Evaluation Board.....	3	Ordering Guide .....	7
Powering Up the Evaluation Board.....	3	ESD Caution.....	7
Measuring Evaluation Board Performance .....	3		

**REVISION HISTORY**

**6/09—Rev. 0 to Rev. A**

Added Figure 12.....	6
Added Figure 13.....	6
Changes to Ordering Guide .....	7

**10/08—Revision 0: Initial Version**

## USING THE EVALUATION BOARD

### POWERING UP THE EVALUATION BOARD

The ADP2108 evaluation board is supplied fully assembled and tested. Before applying power to the evaluation board, follow the procedures in this section.

#### **Jumper TB2 (Enable)**

Jumper TB2 (EN) enables/disables the ADP2108. Connect a jumper between TB2 and TB1 ( $V_{IN}$ ) to enable the ADP2108. Connecting TB2 (EN) to TB4 (GND OUT) disables the ADP2108 and brings the current to  $< 1 \mu\text{A}$ .

#### **Input Power Source**

If the input power source includes a current meter, use that meter to monitor the input current. Connect the positive terminal of the power source to TB1 ( $V_{IN}$ ) on the evaluation board, and the negative terminal of the power source to TB4 (GND OUT) of the evaluation board.

If the power source does not include a current meter, connect a current meter in series with the input source voltage. Connect the positive lead (+) of the power source to the ammeter positive (+) connection, the negative lead (-) of the power source to TB4 (GND OUT) on the evaluation board, and the negative lead (-) of the ammeter to TB1 ( $V_{IN}$ ) on the board.

#### **Output Load**

Connect an electronic load or resistor to set the load current. If the load includes an ammeter, or if the current is not measured, connect the load directly to the evaluation board, with the positive (+) load connection to TB3 ( $V_{OUT}$ ) and the negative (-) load connection to TB4 (GND OUT).

If an ammeter is used, connect it in series with the load. Connect the positive (+) ammeter terminal to the evaluation board TB3 ( $V_{OUT}$ ), the negative (-) ammeter terminal to the positive (+) load terminal, and the negative (-) load terminal to the evaluation board TB4 (GND OUT).

#### **Input and Output Voltmeters**

Measure the input and output voltages with voltmeters. Make sure that the voltmeters are connected to the appropriate evaluation board terminals and not to the load or power source themselves. If the voltmeters are not connected directly to the evaluation board, the measured voltages are incorrect due to the voltage drop across the leads and/or connections between the evaluation board, the power source, and/or the load.

Connect the input voltage measuring voltmeter positive terminal (+) to the evaluation board TB1 ( $V_{IN}$ ), and the negative (-) terminal to the evaluation board TB4 (GND OUT). Connect the output voltage measuring voltmeter positive (+) terminal to the evaluation board TB3 ( $V_{OUT}$ ) and the negative (-) terminal to the evaluation board TB4 (GND OUT).

### **Turning On the Evaluation Board**

Once the power source and load are connected to the ADP2108 evaluation board, the board can be powered for operation. Perform the following steps:

1. Ensure that the power source voltage is  $> 2.3 \text{ V}$  and  $< 5.5 \text{ V}$ .
2. Ensure that TB2 (EN) is high and monitor the output voltage.

If the load is not already enabled, enable the load, check that it is drawing the proper current, and that the output voltage maintains voltage regulation.

### MEASURING EVALUATION BOARD PERFORMANCE

#### **Measuring Output Voltage Ripple**

To observe the output voltage ripple, place an oscilloscope probe across the output capacitor ( $C_{OUT}$ ) with the probe ground lead at the negative (-) capacitor terminal and the probe tip at the positive (+) capacitor terminal. Set the oscilloscope to ac, 20 mV/division, and 2  $\mu\text{s}$ /division time base.

#### **Measuring the Switching Waveform**

To observe the switching waveform with an oscilloscope, place the oscilloscope probe tip at the end of the inductor with the probe ground at GND OUT. Set the oscilloscope to dc, 2 V/division, and 2  $\mu\text{s}$ /division time base.

#### **Measuring Load Regulation**

The load regulation must be tested by increasing the load at the output and looking at the change in output voltage. To minimize voltage drop, use short low resistance wires, especially for loads approaching maximum current.

#### **Measuring Line Regulation**

Vary the input voltage and examine the change in the output voltage.

#### **Measuring Efficiency**

Measure the efficiency,  $\eta$ , by comparing the input power with the output power.

$$\eta = \frac{V_{OUT} \times I_{OUT}}{V_{IN} \times I_{IN}}$$

Measure the input and output voltages as close as possible to the input and output capacitors to reduce the effect of IR drops.

#### **Measuring Inductor Current**

The inductor current can be measured by removing one end of the inductor from its pad and connecting a current loop in series. A current probe can be connected onto this wire.

## TYPICAL PERFORMANCE CHARACTERISTICS

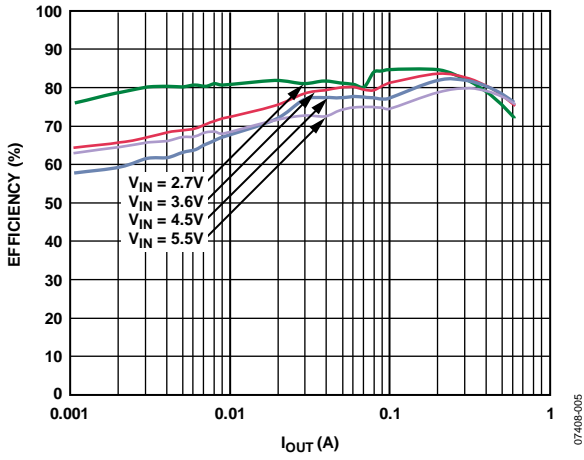


Figure 2. Efficiency vs. Output (1.8 V Model)

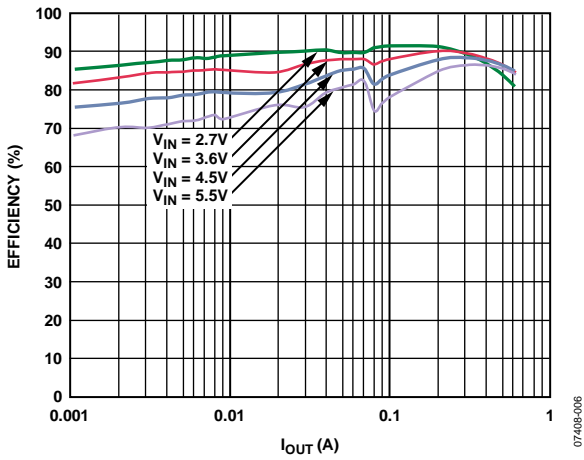


Figure 3. Efficiency vs. Output (1.0 V Model)

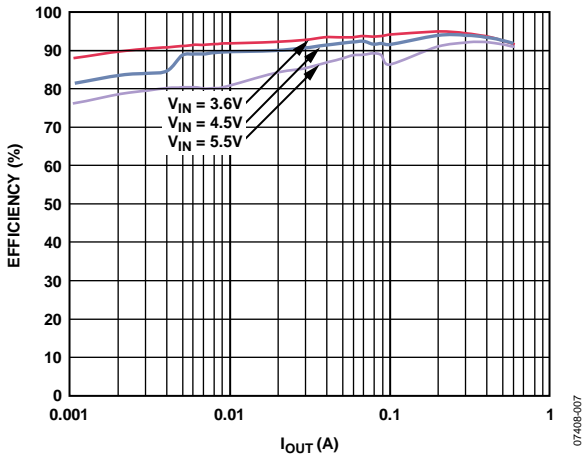


Figure 4. Efficiency vs. Output (3.3 V Model)

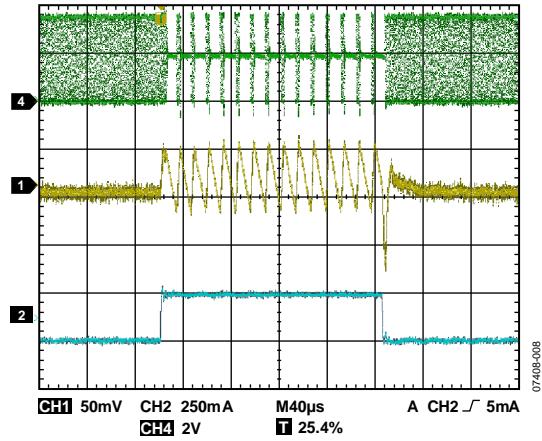


Figure 5. Load Transient Response (1.8 V Model)

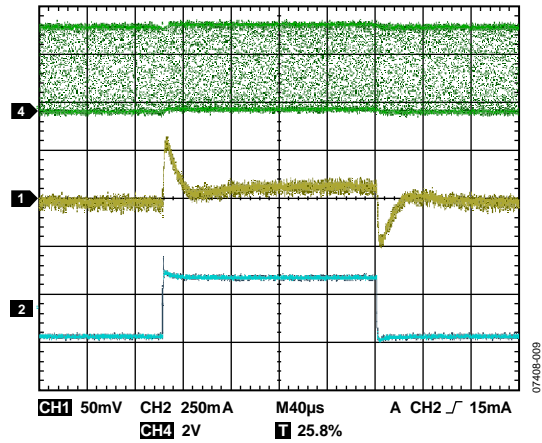


Figure 6. Load Transient Response (1.8 V Model)

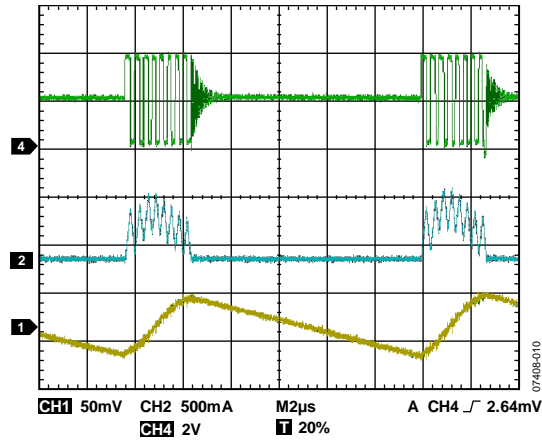


Figure 7. PFM Operation at Light Load (1.8 V Model)

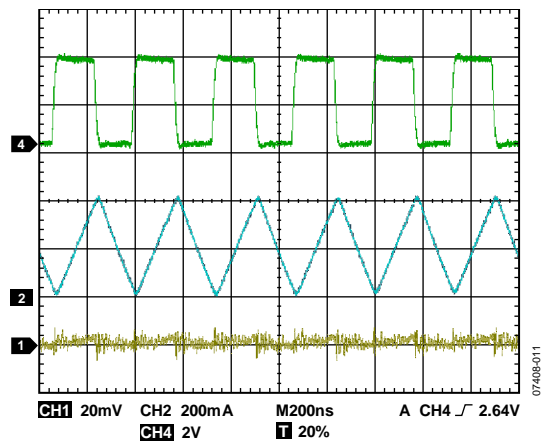


Figure 8. PWM Operation at Medium Load (1.8 V Model)

## EVALUATION BOARD SCHEMATICS AND ARTWORK

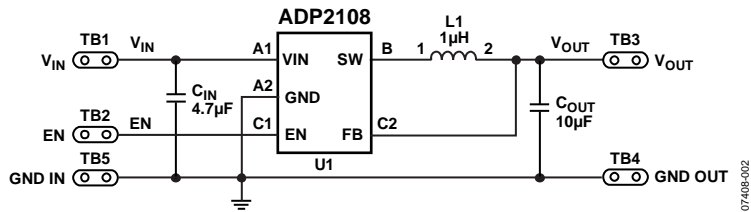


Figure 9. Evaluation Board Schematic of ADP2108

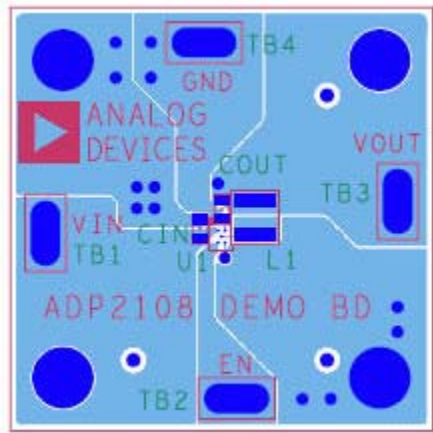


Figure 10. Top Layer, Recommended Layout for TSOT

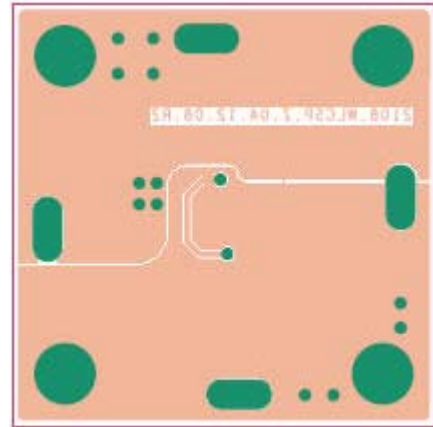


Figure 12. Bottom Layer, Recommended Layout for WLCSP

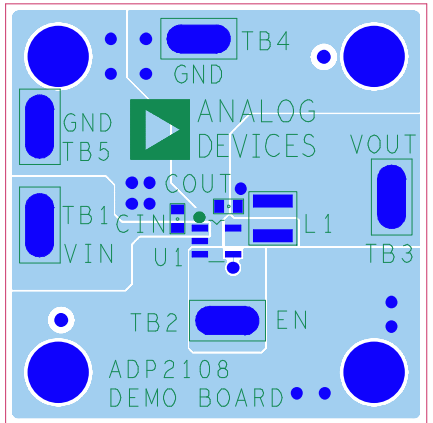


Figure 11. Top Layer, Recommended Layout for TSOT

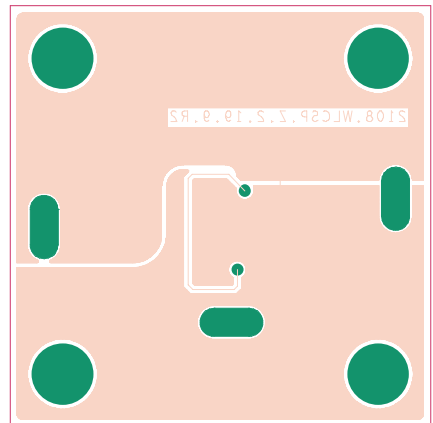


Figure 13. Bottom Layer, Recommended Layout for TSOT

## ORDERING INFORMATION

### BILL OF MATERIALS

Table 1.

Qty.	Reference Designator	Description	Manufacturer	Part Number
1	U1	ADP2108 Buck Boost Regulator	Analog Devices	ADP2108
1	C <sub>IN</sub>	Capacitor, MLCC, 4.7 $\mu$ F, 6.3 V, 0603, X5R	Murata Manufacturing Co., Ltd	GRM188R60J475
1	C <sub>OUT</sub>	Capacitor, MLCC, 10.0 $\mu$ F, 6.3 V, 0603, X5R	Murata Manufacturing Co., Ltd	GRM188R60J106106
1	L1	Inductor, 1.0 $\mu$ H, 0.8 A, 190 m $\Omega$	Murata Manufacturing Co., Ltd	LQM2HPN1R0MJ0L

### ORDERING GUIDE

Model	Description
ADP2108-1.0-EVALZ <sup>1</sup>	Evaluation Board for 1.0 V [WLCSP]
ADP2108-1.1-EVALZ <sup>1</sup>	Evaluation Board for 1.1 V [WLCSP]
ADP2108-1.2-EVALZ <sup>1</sup>	Evaluation Board for 1.2 V [WLCSP]
ADP2108-1.3-EVALZ <sup>1</sup>	Evaluation Board for 1.3 V [WLCSP]
ADP2108-1.5-EVALZ <sup>1</sup>	Evaluation Board for 1.5 V [WLCSP]
ADP2108-1.8-EVALZ <sup>1</sup>	Evaluation Board for 1.8 V [WLCSP]
ADP2108-1.82-EVALZ <sup>1</sup>	Evaluation Board for 1.82 V [WLCSP]
ADP2108-2.3-EVALZ <sup>1</sup>	Evaluation Board for 2.3 V [WLCSP]
ADP2108-2.5-EVALZ <sup>1</sup>	Evaluation Board for 2.5 V [WLCSP]
ADP2108-3.0-EVALZ <sup>1</sup>	Evaluation Board for 3.0 V [WLCSP]
ADP2108-3.3-EVALZ <sup>1</sup>	Evaluation Board for 3.3 V [WLCSP]
ADP2108UJ-1.0-EVALZ <sup>1</sup>	Evaluation Board for 1.0 V [TSOT]
ADP2108UJ-1.1-EVALZ <sup>1</sup>	Evaluation Board for 1.1 V [TSOT]
ADP2108UJ-1.2-EVALZ <sup>1</sup>	Evaluation Board for 1.2 V [TSOT]
ADP2108UJ-1.3-EVALZ <sup>1</sup>	Evaluation Board for 1.3 V [TSOT]
ADP2108UJ-1.5-EVALZ <sup>1</sup>	Evaluation Board for 1.5 V [TSOT]
ADP2108UJ-1.8-EVALZ <sup>1</sup>	Evaluation Board for 1.8 V [TSOT]
ADP2108UJ-1.82-EVALZ <sup>1</sup>	Evaluation Board for 1.82 V [TSOT]
ADP2108UJ-2.3-EVALZ <sup>1</sup>	Evaluation Board for 2.3 V [TSOT]
ADP2108UJ-2.5-EVALZ <sup>1</sup>	Evaluation Board for 2.5 V [TSOT]
ADP2108UJ-3.0-EVALZ <sup>1</sup>	Evaluation Board for 3.0 V [TSOT]
ADP2108UJ-3.3-EVALZ <sup>1</sup>	Evaluation Board for 3.3 V [TSOT]

<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.

**NOTES**