FEATURES
Output current
- 600 mA for the ADP2503
- 1000 mA for the ADP2504
Input voltage range: 2.3 V to 5.5 V
Fixed output voltage range: 2.8 V to 5.5 V
Switching frequency: 2.5 MHz
1.5 μH inductor compatible
Typical quiescent current: 38 μA
Automatic pulse skip mode
Synchronization pin

GENERAL DESCRIPTION
The ADP2503/ADP2504 adjustable output voltage evaluation boards are complete buck-boost converter solutions that test the ADP2503/ADP2504, high efficiency, low quiescent current, step-up/step-down, dc-to-dc converters. These converters provide accurate (±2%) regulation for load currents up to 1 A. The ADP2503/ADP2504 evaluation boards are available for all output voltages. Additional voltage options are available upon request from your local Analog Devices, Inc., sales office.

At high load currents, the ADP2503/ADP2504 use a current mode, fixed frequency PWM control scheme for excellent stability and transient response. To ensure the longest battery life in portable applications, the ADP2503/ADP2504 feature an optional power-saving pulse skip mode that reduces the switching frequency under light load conditions to save power.
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# REVISION HISTORY

11/09—Revision 0: Initial Version
USING THE EVALUATION BOARD

The ADP2503/ADP2504 evaluation boards are supplied fully assembled and tested. Before applying power to the evaluation board, follow the procedures in this section and refer to Figure 8.

SETTING UP THE EVALUATION BOARD

**Jumper J6**

Jumper J6 enables the part. Connect the jumper between Position 1 and Position 2 to enable the ADP2503/ADP2504. Connect a jumper between Position 2 to Position 3 to disable the ADP2503/ADP2504 and bring the current to <1 μA.

**Jumper J5**

The ADP2503/ADP2504 can be configured to operate in low noise pulse width mode (PWM) or in power save mode (PSM), depending on the SYNC pin polarity. If the SYNC pin is pulled high (Position 1 and Position 2 of J5 connected together), the converter operates in forced PWM mode. If the SYNC pin is pulled low, pulse skip mode is turned on when the load current drops below approximately 75 mA.

**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 the VIN terminal on the evaluation board and connect the negative terminal of the power source to the PGND terminal 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. Then, connect the positive (+) lead of the power source to the ammeter positive (+) connection, the negative (−) lead of the power source to the PGND terminal on the board, and the negative (−) lead of the ammeter to the VIN terminal 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 the VOUT terminal and the negative (−) load connection to the PGND terminal.

**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 loads or power sources. 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 VIN terminal and the negative (−) terminal to the evaluation board PGND terminal. Connect the output voltage measuring voltmeter positive (+) terminal to the evaluation board VOUT terminal and the negative (−) terminal to the evaluation board PGND terminal.

POWERING UP THE EVALUATION BOARD

When the power source and load are connected to the ADP2503/ADP2504 evaluation board, it can be powered for operation. Ensure that the power source voltage is >2.5 V and <5.5 V. If using an ammeter, increase the range value to 1 A or 3 A for the initial startup.

Bring the EN pin high using J6 and monitor the output voltage. If the load is not already enabled, enable the load and verify 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 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 time base, and 2 μs/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 connected to the SW1 pin/SW2 pin with the probe ground at PGND. Set the oscilloscope to dc, 2 V/division time base, and 2 μs/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 the output voltage. To minimize voltage drop, use short low resistance wires, especially for heavy loads.

**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**

Measure the inductor current by removing one end of the inductor from its pad and connecting a current loop in series. Then, use a current probe to measure the current flowing through the current loop.
TYPICAL PERFORMANCE CHARACTERISTICS

Figure 2. Efficiency vs. \( I_{\text{OUT}} \), \( V_{\text{OUT}} = 3.3 \text{ V} \), PWM and PSM

Figure 3. Buck Boost, \( V_{\text{IN}} = 3.0 \text{ V} \), \( V_{\text{OUT}} = 3.3 \text{ V} \), PSM

Figure 4. Buck Boost, \( V_{\text{IN}} = 3.0 \text{ V} \), \( V_{\text{OUT}} = 3.3 \text{ V} \), PWM

Figure 5. Boost Operation, \( V_{\text{IN}} = 3.0 \text{ V} \), \( V_{\text{OUT}} = 3.3 \text{ V} \), PWM

Figure 6. Buck Operation, \( V_{\text{IN}} = 4.0 \text{ V} \), \( V_{\text{OUT}} = 3.3 \text{ V} \), PWM

Figure 7. Mode Change by Load Transients, Load Fall (\( V_{\text{OUT}} = 3.3 \text{ V} \))
EVALUATION BOARD SCHEMATIC AND ARTWORK

Figure 8. ADP2503/ADP2504 Adjustable Evaluation Board Schematic
Figure 9. Top Layer, Recommended Layout

Figure 10. Bottom Layer, Recommended Layout
## ORDERING INFORMATION

### BILL OF MATERIALS

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<thead>
<tr>
<th>Qty</th>
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<th>Description</th>
<th>Manufacturer</th>
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<tr>
<td>1</td>
<td>C1</td>
<td>Capacitor, 10 μF, 6.3 V 0603, X5R</td>
<td>Murata Manufacturing Co., Ltd</td>
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<td>Buck-boost regulator</td>
<td>Analog Devices</td>
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¹ Selected values for an output voltage of 3.0 V.
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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