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Evaluating the ADP2126 Ultralow Profile, 6 MHz, Step-Down Converter

FEATURES

500 mA, 6 MHz, synchronous, step-down dc-to-dc converter
Low profile, tiny footprint ceramic inductor and capacitors
0.33 mm (maximum) height solution
Input voltage range: 2.1 V to 5.5 V
1.20 V fixed output voltage
EXTCLK pin compatible with clock and logic enable control

GENERAL DESCRIPTION

The ADP2126 evaluation board is a complete 6 MHz, low quiescent current, synchronous buck dc-to-dc converter solution that is capable of producing up to 500 mA of output current at a fixed 1.20 V output voltage. The converter operates with an input voltage in the 2.1 V to 5.5 V range. At high load currents, the device uses a voltage regulating pulse-width modulation (PWM) mode that maintains a constant frequency with excellent stability and transient response. For light load currents, the state of the MODE pin determines the operating mode of the converter. In forced PWM mode, the converter continues operating in PWM for light loads. In auto mode, the ADP2126 can automatically enter a power saving mode that utilizes pulse-frequency modulation (PFM) to reduce the effective switching frequency and ensure the longest battery life in portable applications.

The evaluation board demonstrates the operation and performance of the ADP2126, as well as its compatibility with tiny ceramic components for a small area solution.

This user guide includes I/O descriptions, setup instructions, the evaluation board schematic, and printed circuit board (PCB) layout drawings for the ADP2126 low profile step-down switching converter evaluation board.

Complete specifications for the ADP2126 can be found in the ADP2126 data sheet available from Analog Devices, Inc., and should be consulted in conjunction with this user guide when using the evaluation board.

APPLICATION CIRCUIT

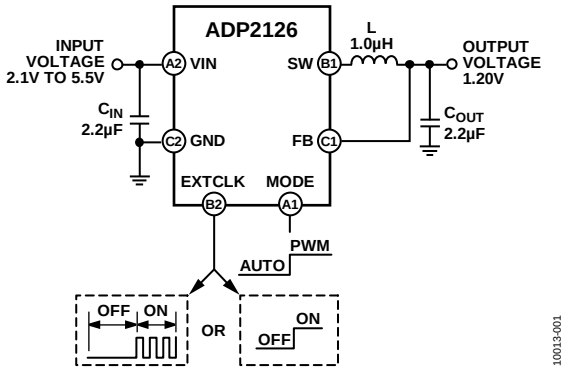


Figure 1. ADP2126 0.33 mm Maximum Height Solution

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REVISION HISTORY

12/11—Rev. 0 to Rev. A

Deleted ADP2127 ..... Universal
Changes to Features Section and General Description Section and Deleted Figure 2 1
Changes to EXTCLK Test Point Section 3
Deleted Figure 5 and Figure 6 5
Deleted Table 2 6

8/11—Revision 0: Initial Version

EVALUATION BOARD OVERVIEW

The ADP2126 evaluation board is fully assembled and tested. The following sections describe the various connectors on the board, the proper evaluation setup, and the testing capabilities of the evaluation board.

INPUT/OUTPUT CONNECTORS

MODE Jumper

The MODE connector controls the operating mode of the ADP2126. Use a jumper to connect the center pin to GND or VIN. Alternatively, connect to the center pin and control the MODE pin directly with an external device. See the specifications section in the ADP2126 data sheet for the high and low threshold voltage levels. Do not leave the MODE pin floating.

EXTCLK Test Point

This test point is used to enable or disable the converter. Connect the EXTCLK pin to GND to disable the converter. Apply a 6 MHz to 27 MHz clock signal or a logic high signal to the EXTCLK pin to enable the converter. See the specifications section in the ADP2126 data sheet for the high and low threshold voltage levels. Do not leave the EXTCLK pin floating.

VOUT Test Bus

The VOUT test bus provides access to the regulated output voltage and the FB (feedback) pin of the part. A load of up to 500 mA can be applied to this bus.

VIN Test Bus

The VIN test bus connects the positive input supply voltage to the VIN pin. Connect the power supply to this bus and keep the wires as short as possible to minimize the EMI transmission.

GND Test Bus

The GND test bus is the ground connection for the part and the external components via the GND pin. Attach ground connections from external equipment to this bus.

SW Test Point

The SW test point allows access to the switch node (SW pin) of the ADP2126 to monitor the switching behavior. An LC filter is connected to this pin on the board. Connect a BNC cable to measure the switching frequency to this test point.

The ADP2126 incorporates spread spectrum via a controlled variance of the switching frequency over a wider band of frequencies. This distribution of the frequency content spreads the spectral density over a wider bandwidth, resulting in lower peak emission levels.

EVALUATION SETUP

Follow these setup instructions to ensure proper operation of the ADP2126 evaluation board:

1. Connect the input supply ground to GND.
2. Connect the positive input supply to VIN.
3. Connect the desired load between VOUT and PGND. The ADP2126 can supply up to 500 mA.
4. Connect the EXTCLK pin to GND to disable the converter, or apply a 6 MHz to 27 MHz clock signal or a logic high signal to the EXTCLK pin to enable the converter.
5. Apply an input voltage between 2.1 V and 5.5 V (6.0 V absolute maximum.)

PERFORMANCE EVALUATION

Typical performance characteristic graphs and oscilloscope waveforms are provided in the ADP2126 data sheet.

Output Accuracy

The output accuracy is verified by monitoring the output voltage at VOUT while testing both the line and load regulation.

Line Regulation

The line regulation is observed and measured by monitoring the output voltage at VOUT while varying the input voltage applied to the VIN test bus.

Load Regulation

The load regulation is observed and measured by monitoring the output voltage at VOUT while sweeping the applied load between VOUT and GND. To minimize voltage drop, use short low resistance wires, especially for heavy loads.

Efficiency

The efficiency, η, is calculated by comparing the input power to the output power.

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

Output Voltage Ripple

The output voltage ripple is visible by placing an oscilloscope across the output capacitor (COUT). Set the oscilloscope to ac coupling or apply a dc offset for proper resolution.

Line Transient

Generate a high speed transient in the voltage applied to VIN and observe the behavior of the evaluation board at the SW test point and the VOUT test bus. To see the most accurate line transient waveform, place a probe directly on the output capacitor terminal with a short path to ground to limit noise and stray inductance.

Load Transient

Generate a fast transient in the current applied to VOUT and observe the behavior of the evaluation board at the SW test point and the VOUT test bus. To see the most accurate load transient waveform, place a probe directly on the output capacitor terminal with a short path to ground to limit noise and stray inductance.

Oscillator Frequency

The oscillator frequency is measured by connecting an oscilloscope to the SW test point. To see the spread spectrum behavior, measure the oscillator frequency over time.

Inductor Current

The inductor current is made accessible by removing one side of the inductor from its pad and connecting a current loop in series. Place an oscilloscope current probe on the loop to view the current waveform.

EVALUATION BOARD SCHEMATIC AND LAYOUT

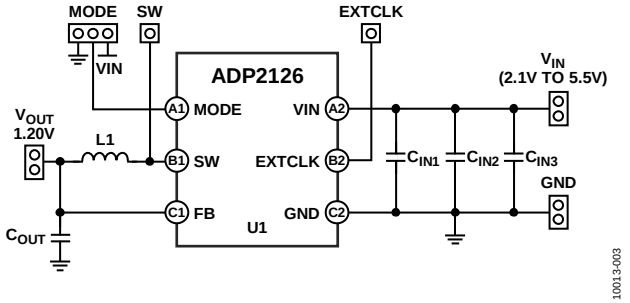


Figure 2. ADP2126 Evaluation Board Schematic

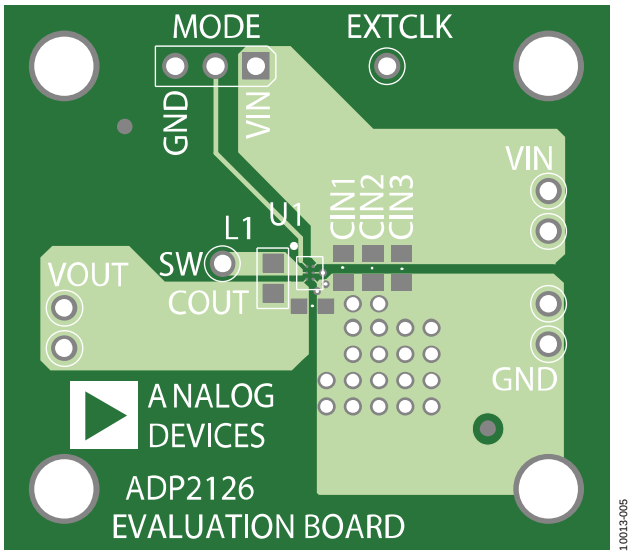


Figure 3. ADP2126

LAYOUT GUIDELINES

For high efficiency, good regulation, and stability with the ADP2126, a well-designed and manufactured PCB is essential. Use the following guidelines when designing PCBs:

- Keep the low ESR input capacitor, CIN, close to VIN and GND.
- Keep high current traces as short and as wide as possible.
- Avoid routing high impedance traces near any node connected to SW or near the inductor to prevent radiated noise injection.
- Keep the low ESR output capacitor, COUT, close to the FB and GND pins of the ADP2126. Long trace lengths from the part to the output capacitor add series inductance and may cause instability or increased ripple.

ORDERING INFORMATION

BILL OF MATERIALS

Table 1. ADP2126—0.33 mm Height Solution

Quantity	Reference Designator	Description	Manufacturer	Part Number
1	U1	ADP2126 low profile, 500 mA, 6 MHz, synchronous, step-down, dc-to-dc converter	Analog Devices	ADP2126ACDZ-1.20R7
1	CIN1	Input capacitor, MLCC, 2.2 µF, 6.3 V, 0402, X5R	Murata Manufacturing Co., Ltd.	GRM153R60J225ME95
Open	CIN2, CIN3	Extra input capacitor	Open	
1	COUT	Input capacitor, MLCC, 2.2 µF, 4 V, 0402, X5R	Murata Manufacturing Co., Ltd.	GRM153R60G225M
1	L1	Inductor, 1.0 µH, 0603	Taiyo Yuden	CKP1608S1R0M
2	SW, EXTCLK	Headers, 0.100 in, single, straight, 1-pin	Sullins Connector Solutions	PBC01SAAN[1]
3	VOUT, VIN, GND	Headers, 0.100 in, single, straight, 2-pin	Sullins Connector Solutions	PBC02SAAN[1]
1	MODE	Headers, 0.100 in, single, straight, 3-pin	Sullins Connector Solutions	PBC03SAAN[1]

[1] Alternatively, PBC36SAAN can be purchased and cut as necessary.

NOTES

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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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