Evaluating the ADP1034 3-Channel, Isolated Micropower Management Unit with Seven Digital Isolators and Programmable Power Control

FEATURES

- Input voltage range: 4.5 V to 60 V
- Output voltage V_{OUT1}: 24 V
- Output voltage V_{OUT2}: 5.0 V
- Output voltage V_{OUT3}: −15 V
- Enable and disable controls
- Slew rate controls
- Access to SYNC pin for oscillator synchronization
- Access to all 7 data channels
- Access to PPC_IN pin for VOUT1 output control

EVALUATION KIT CONTENTS

- ADP1034CP-1-EVALZ evaluation board

EQUIPMENT NEEDED

- DC power supplies
- Multimeters for voltage and current measurements
- Electronic load or resistive loads
- Function generator or alternative digital driver
- Oscilloscope
- Linduino One (DC2026C), EVAL-ADICUP3029, or Aduino Uno (not included in the evaluation kit and must be ordered separately)

SOFTWARE NEEDED

- ADP1034CP-1-EVALZ graphic user interface (GUI) software

DOCUMENTS NEEDED

- ADP1034 data sheet

GENERAL DESCRIPTION

The ADP1034CP-1-EVALZ is a fully featured evaluation board that demonstrates the functionality of the ADP1034 dc-to-dc flyback regulator with programmable power control (PPC), buck and inverting buck-boost regulators, and the isolated data channels.

Users can evaluate ADP1034 device measurements, such as line regulation, load regulation, and efficiency with the evaluation board. The ADP1034CP-1-EVALZ board also assists in evaluating the functionality of the PPC and isolated digital channels. Device features including oscillator synchronization, soft start, sequencing, and slew rate control can be demonstrated on the evaluation board.

Full details about the ADP1034 are available in the ADP1034 data sheet, which must be consulted when using the ADP1034CP-1-EVALZ. Refer to the ADP1034 data sheet for more details about the dc-to-dc converters and isolated data channels.

ADP1034CP-1-EVALZ EVALUATION BOARD PHOTOGRAPH

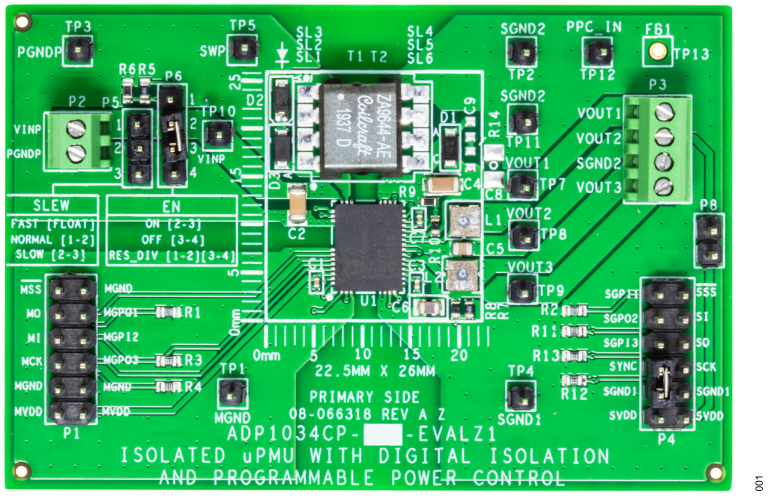

Figure 1.

Analog Devices is in the process of updating documentation to provide terminology and language that is culturally appropriate. This is a process with a wide scope and will be phased in as quickly as possible. Thank you for your patience.

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REVISION HISTORY

3/2022—Revision 0: Initial Version

EVALUATION BOARD CONFIGURATIONS

The evaluation board is preconfigured to the output voltages described in Table 1.

Table 1. ADP1034CP-1-EVALZ Evaluation Board Output Voltage Configurations

Output Voltage	Configuration[1]
V_{OUT1}	24 V (ADJ)
V_{OUT2}	5.0 V
V_{OUT3}	−15 V (ADJ)

[1] ADJ means that the output is adjusted to the specified voltage. If only the voltage is specified, without the ADJ, the output is fixed or factory programmed.

The ADP1034CP-1-EVALZ board is designed so that, if desired, the user can customize the converter design to output up to 52 V between the VOUT1 and VOUT3 terminals on the board. The user is responsible for ensuring that the board is suitably configured and that appropriate safety precautions are taken.

Figure 2 outlines the evaluation board features available for the user. Figure 3 provides information about both the ADP1034 and locations for optional components, which the user can use to modify the converter design.

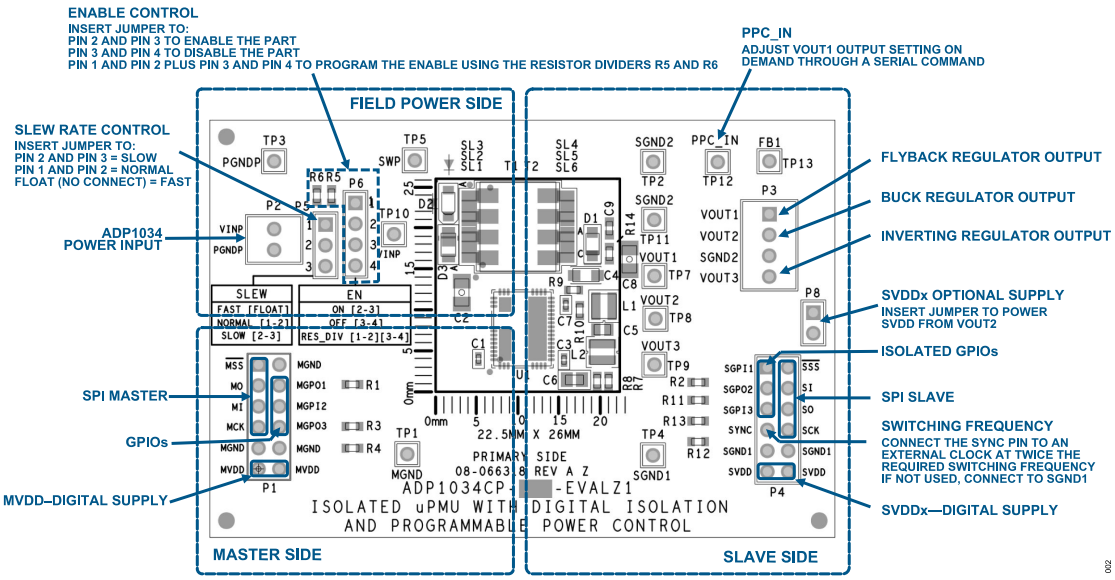

Figure 2. Outline of ADP1034CP-1-EVALZ Evaluation Board Features

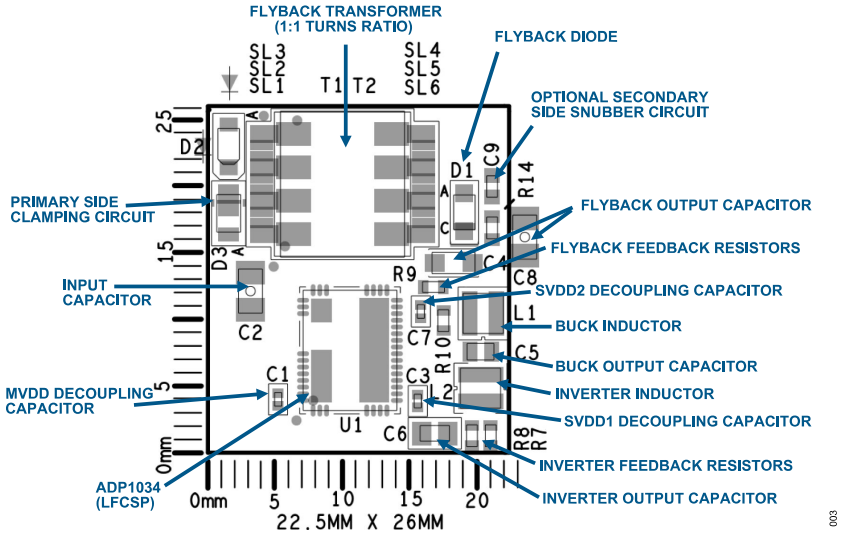

Figure 3. Outline of ADP1034CP-1-EVALZ Top Component Detail

EVALUATION BOARD CONFIGURATIONS

Table 2. Evaluation Board Function Descriptions

Jumper/Connector Designation	Jumper/Connector Pin Mnemonic	Description
P1	MVDD	Master side power input. The input voltage is between 2.3 V and 5.5 V.
	MCK	SPI clock input from the master controller. MCK drives SCK on the slave side.
	MI	SPI data output from the slave MI/SO line. MI is driven by SO on the slave side.
	MO	SPI data input to the slave MO/SI line. MO drives SI on the slave side.
	$\overline{\text{MSS}}$	SPI slave select input from the master controller. This signal uses an active low logic. $\overline{\text{MSS}}$ drives $\overline{\text{SSS}}$ on the slave side.
	MGPO1	General-Purpose Output 1. MGPO1 is paired with SGPI1.
	MGPI2	General-Purpose Input 2. MGPI2 is paired with SGPO2.
	MGPO3	General-Purpose Output 3. MGPO3 is paired with SGPI3.
	MGND	Master side ground return.
P2	VINP	Power input to the ADP1034 flyback regulator. The input voltage is between 4.5 V and 60 V.
	PGNDP	Field power side ground return.
P3	VOUT1	Output from the flyback regulator.VOUT1 is set to 24 V in default configuration.
	VOUT2	Output from the buck regulator. VOUT2 is factory set to 5.0 V in default configuration.
	VOUT3	Output from the inverting regulator. VOUT3 is set to −15 V in default configuration.
	SGND2	Slave side ground return. SGND2 is connected to SGND1.
P4	SVDD	Slave side power inputs for SVDD1 and SVDD2. This input voltage is between 1.8 V and 5.5 V.
	SCK	SPI clock output from the master MCK/SCK line. SCK is paired with MCK and driven by MCK on the master side.
	SO	SPI data input to the master MI/SO line. SO is paired with MI and drives MI on the master side.
	SI	SPI data output from the master MO/SI line. Paired with MO. Driven by MO on the master side.
	$\overline{\text{SSS}}$	SPI slave select output. Paired with $\overline{\text{MSS}}$. $\overline{\text{SSS}}$ is driven by $\overline{\text{MSS}}$ on the master side.
	SGPI1	General-Purpose Input 1. SGPI1 is paired with MGPO1.
	SGPO2	General-Purpose Output 2. SGPO2 is paired with MGPI2.
	SGPI3	General-Purpose Input 3. SGPI3 is paired with MGPO3.
	SYNC	Frequency setting and synchronization input. Connect the SYNC pin to an external clock with a frequency between 350 kHz and 750 kHz. The switching frequency of the flyback regulator is half of the external clock frequency. If SYNC is not used, connect to SGND1.
	SGND1	Slave side ground return. SGND1 is connected to SGND2.
P5	SLEW	Flyback regulator slew rate control. The SLEW pin sets the slew rate for the SWP driver. For the fastest slew rate (best efficiency), leave the SLEW pin open. For the normal slew rate, connect the SLEW pin to VINP with Pin 1 and Pin 2 shorted. For the slowest slew rate (lowest electromagnetic interference (EMI) performance), connect the SLEW pin to GNDP with Pin 2 and Pin 3 shorted.
P6	EN	Precision enable control. The EN pin is compared to an internal precision reference to enable the flyback regulator output. Connect a jumper to Pin 2 and Pin 3 to turn on the flyback regulator. Connect a jumper to Pin 3 and Pin 4 to turn off the flyback regulator. Connect a jumper to Pin 1 and Pin 2 together with another jumper to Pin 3 and Pin 4 to use the input as a programmable undervoltage lockout (UVLO) through the R5 resistive divider and R6 resistive divider.
P8	SVDDx optional supply	Option for VOUT2 to power SVDDx. Connect a jumper to P8 to power SVDDx from VOUT2.
TP1	MGND	MGND test point.
TP2, TP11	SGND2	SGND2 test points. Connected to SGND1.
TP3	PGNDP	PGNDP test point.
TP4	SGND1	SGND1 test point. Connected to SGND2.
TP5	SWP	Flyback regulator switching node test point.
TP7	VOUT1	VOUT1 test point.
TP8	VOUT2	VOUT2 test point.
TP9	VOUT3	VOUT3 test point.
TP10	VINP	VINP test point.
TP12	PPC_IN	PPC_IN input. Adjust the VOUT1 output setting on demand through a serial command.
TP13	FB1	FB1 test point.

ADP1034 PPC CONTROL QUICK SETUP GUIDE

SETUP

To set up the ADP1034 for PPC control, the requirements are as follows:

- Hardware requirements: Linduino® One (DC2062C), Arduino Uno, or EVAL-ADICUP3029
- Software platform: Windows® 10

The ADP1034CP-1-EVALZ evaluation board connects to Linduino One, Arduino Uno, or EVAL-ADICUP3029 via 1-wire serial communication. Linduino One, Arduino Uno, or EVAL-ADICUP3029 connects to the PC GUI via UART communication (USB).

Hardware Setup

Connect the Arduino Uno, Linduino One, or EVAL-ADICUP3029 as described in Table 3. For example, connect the PPC_IN pin of TP12 on the ADP1034CP-1-EVALZ to the GPIO9 pin on the Arduino Uno or Linduino One board, or to IO08 on the EVAL-ADICUP3029 using a pair of wires that is as short as possible.

Table 3. Hardware Connections

ADP1034CP-1-EVALZ	Arduino Uno or Linduino One	EVAL-ADICUP3029
PPC_IN (TP12)	GPIO9	IO08
SGND2 (TP2)	GND	GND

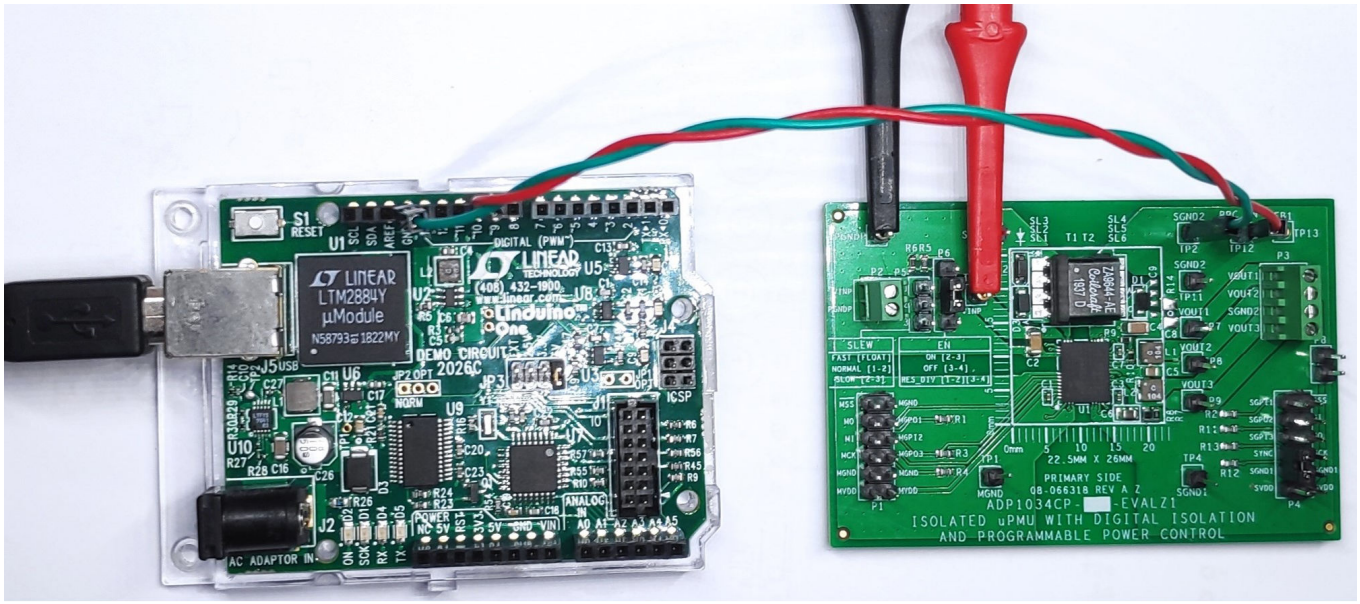

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Figure 4. Linduino One and ADP1034CP-1-EVALZ Connection Setup

ADP1034 PPC CONTROL QUICK SETUP GUIDE

PC Software Setup

Package Details

The ADP1034CP-1-EVALZ GUI software package contains the files shown in Figure 5. Download the software package from www.analog.com/eval-adp1034.

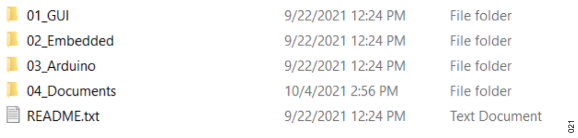

Figure 5. ADP1034CP-1-EVALZ GUI Software Package Contents

HEX File Upload

Download the integrated development environment (IDE) for AVR® downloader uploader (AVRDUDE) from the Arduino website or the Crosscore® serial flash programmer.

To upload hexadecimal (HEX) files for Arduino Uno, Linduino One (DC2026C), or EVAL-ADICUP3029, refer to the Uploading HEX File section.

The available HEX files include the following, where Vx_xx_xx represents the version:

- **ADP1034_ARD_Vx_xx_xx.ino.hex** (Arduino Uno or Linduino One; shown as **ADP1034_ARD_V2_20_54.ino.hex** in Figure 10)
- **ADP1034_3029_Vx_xx_xx.hex** (EVAL-ADICUP3029)

Package Installation

To install the ADP1034CP-1-EVALZ GUI software package to the PC, follow these steps:

1. Double click the ADP1034 GUI software package executable file that is available for download from www.analog.com/eval-adp1034.
2. Select the destination location (see Figure 6).

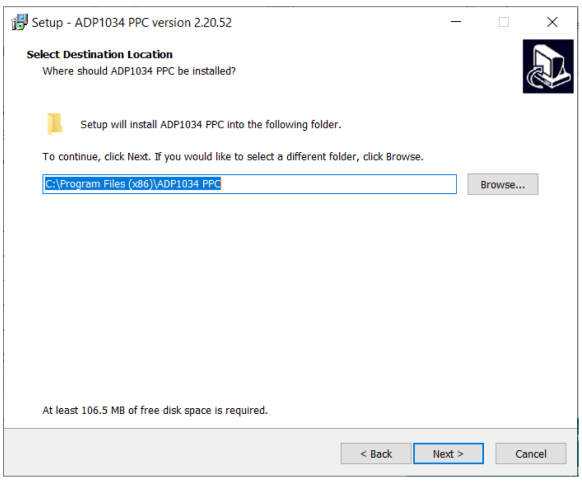

Figure 6. Select Destination Location Window

3. Select the **Create a desktop shortcut** box, and click **Next** (see Figure 7).

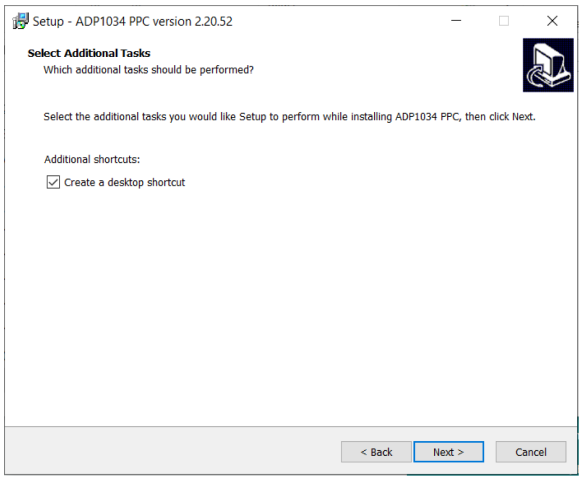

Figure 7. Select Additional Tasks Window

4. Click **Install** (see Figure 8).

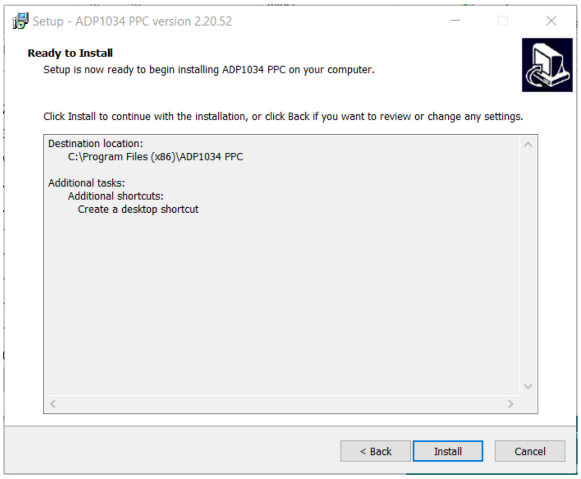

Figure 8. Install Window

ADP1034 PPC CONTROL QUICK SETUP GUIDE

USAGE INSTRUCTIONS

After the hardware is set up (see the Hardware Setup section), open the **ADP1034 PPC Control** GUI. The following sections describe the contents of the GUI and how to use the GUI.

Graphic User Interface

Table 4 describes the GUI options labeled in Figure 9.

Figure 9. Main Window

Table 4. Main Window GUI Options

Label in Figure 9	GUI Option	Description
1	**Port** button	Opens the **Connect to Port** window to connect to the port, or disconnects the port if it is already connected.
2	**Sweep** button	Sweeps all PPC codes with auto CRC or stops the sweep.
3	**Input Configuration** section	Allows users to input their desired VOUT1 at startup, target VOUT1, and PPC code with auto CRC.
4	**VOUT1 vs PPC Code** graph	Plots the computed VOUT1 vs. PPC code based on the input configuration. The graph also includes the warning sign for 4.5 V.
5	**VOUT1** and **PPC Code** calculated output	Displays the targeted VOUT1 and PPC code sent by the GUI to the microcontroller.
6	**Log Box**	Displays messages such as success, error, and response messages. Pause the mouse on the **Log Box** area to show the following buttons:
A		The clear button clears the contents of **Log Box**.
B		The verbose button shows/hides responses from the microcontroller.
C		The export button exports the contents of **Log Box** in the form of a text file.
7	**Load Hex** button	Loads the hex file to the microcontroller boards.

ADP1034 PPC CONTROL QUICK SETUP GUIDE

Running the Demo

Uploading HEX File

1. If the port is connected, click the **Port** button (Label 1 in Figure 9) to disconnect the port, which enables the **Load Hex** button.
2. Click the **Load Hex** button (Label 7 in Figure 9) to open the **Load Hex File** window (see Figure 10).

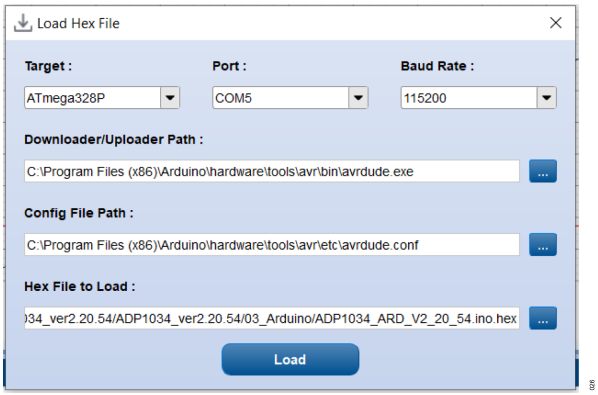

Figure 10. Load Hex File Window

3. Select the desired target, port, and baud rate. The recommended baud rate is **115200**.
4. Select the desired downloader or uploader path by clicking the **…** button for **Download/Uploader Path**. For ATmega328P (Arduino Uno or Linduino One), select the path for **avrdude.exe**. For the ADuCM3029 (EVAL-ADICUP3029), select the path for **ccsfp.exe**.
5. Select the desired configuration file path by clicking the **…** button for **Config File Path**. This GUI option is only available for ATmega328P (Arduino Uno or Linduino One).
6. Select the desired HEX file to upload by clicking the **…** button for **Hex File to Load**.
7. Click the **Load** button.
8. A success or error message displays in **Log Box** (Label 6 in Figure 9). If an error occurs stating **No autobaud response** when loading the HEX file into the ADuCM3029, press and hold the reset and boot buttons for 5 sec, and then upload the HEX file again.
9. After the HEX file loads to the ADuCM3029, press the reset button for 1 sec before connecting to the port.

Connecting to the Microcontroller

To connect the ADP1034CP-1-EVALZ board to the microcontroller, follow these steps:

1. Click the **Port** button (Label 1 in Figure 9) to open the **Connect to Port** window.

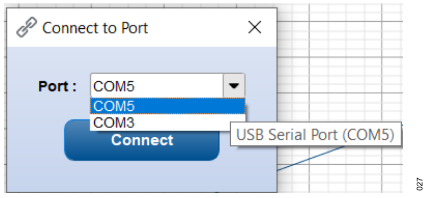

Figure 11. Connect to Port Window

2. Click the **Port** dropdown box, and pause the mouse over the available ports to display the descriptions.
3. Click the desired COM port.
4. Click the **Connect** button.
5. In the **Log Box** section (Label 6 in Figure 9), a success message shows when the GUI is connected to the COM port. Otherwise, the **Log Box** section shows an error message.

Sending PPC Code

To send the PPC code to the ADP1034 from the microcontroller, follow these steps:

1. In the **Input Configuration** section (Label 3 in Figure 9), configure the full-scale output voltage using **VOUT1 @ Startup**.
2. Configure either **Target VOUT1** or **PPC Code**. Editing **Target VOUT1** computes the equivalent PPC code before sending, whereas editing **PPC Code** directly sends the code.
3. The expected **VOUT1** and **PPC Code** sent by the GUI displays in the calculated output section (Label 5 in Figure 9).
4. In the **Log Box** section (Label 6 in Figure 9), status messages show that the PPC code was written, and the response was received.

Sweeping All PPC Codes

To sweep all PPC codes, follow these steps:

1. Click the **Sweep** button (Label 2 in Figure 9).
2. In the **Log Box** section (Label 6 in Figure 9), a status message appears that the sweep was executed.
3. To stop the sweep while running, click the **Sweep** button (Label 2 in Figure 9) again.

MEASUREMENT SETUP

REGULATOR OUTPUT MEASUREMENT

Figure 12 shows the recommended measurement setup to evaluate the ADP1034CP-1-EVALZ flyback regulator.

Figure 13 shows the recommended setup to evaluate the ADP1034CP-1-EVALZ buck regulator.

Figure 14 shows the recommended setup to evaluate the ADP1034CP-1-EVALZ inverting regulator.

V_{SUPPLY} is the power supplied to the ADP1034CP-1-EVALZ. V_{VINP} is the input supply voltage. I_{IN} is the input supply current.

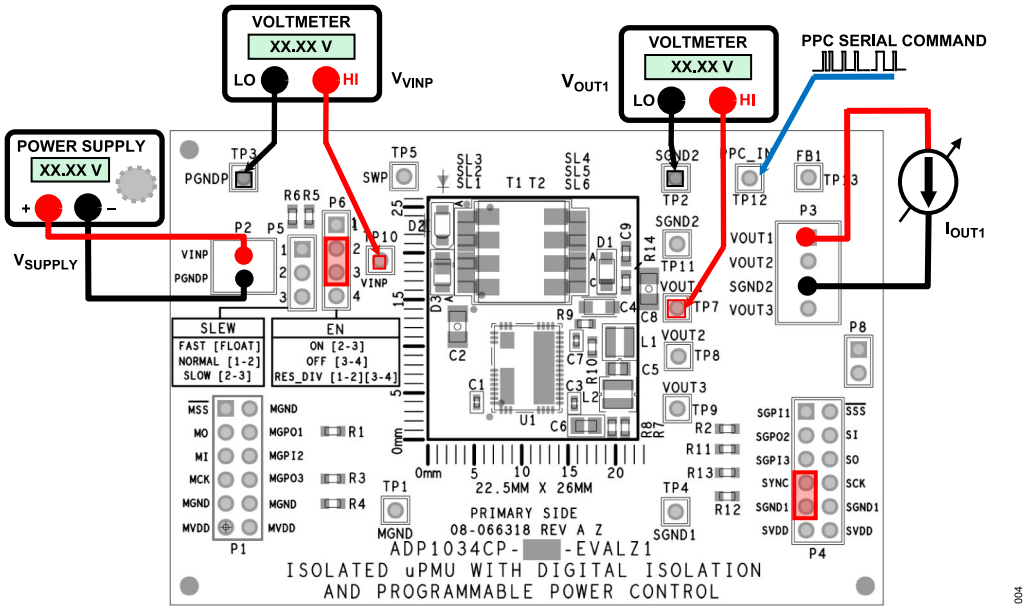

Figure 12. Flyback Regulator Measurement Setup

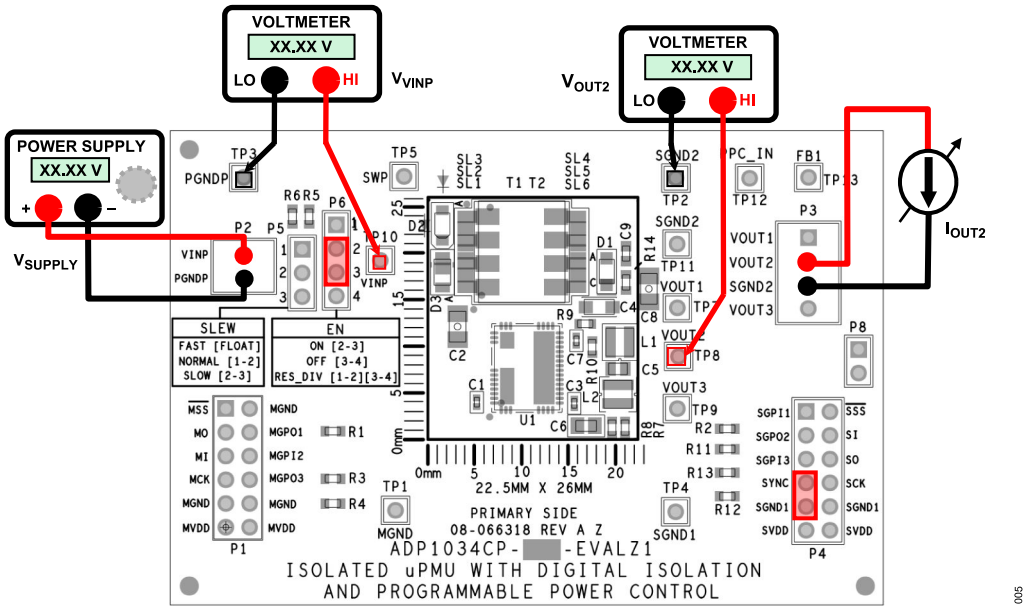

Figure 13. Buck Regulator Measurement Setup

MEASUREMENT SETUP

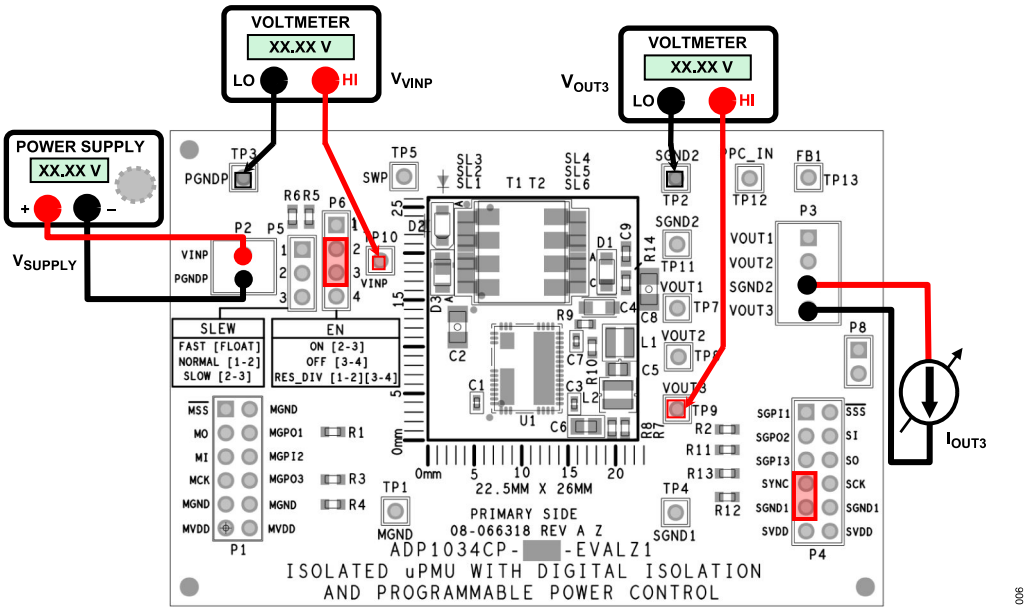

Figure 14. Inverting Regulator Measurement Setup

MEASUREMENT SETUP

POWER DOMAIN EFFICIENCY MEASUREMENT

Measure the actual input voltage and output voltage from the evaluation board for overall efficiency measurements. Figure 15 shows the recommended setup for the overall efficiency measurement for the ADP1034CP-1-EVALZ.

The overall efficiency is calculated using the following equation:

$$\eta_{OVERALL} = \frac{((V_{OUT1} \times I_{OUT1}) + (V_{OUT2} \times I_{OUT2}) + (V_{OUT3} \times I_{OUT3}))}{(V_{VINP} \times I_{IN})}$$

where:

$\eta_{OVERALL}$ is the overall efficiency of the ADP1034.
V_{OUT1} is the output voltage of the flyback regulator.
I_{OUT1} is the output current on the flyback regulator.
V_{OUT2} is the output voltage of the buck regulator.
I_{OUT2} is the output current on the buck regulator.
V_{OUT3} is the output voltage of the inverting regulator.
I_{OUT3} is the output current on the inverting regulator.
V_{VINP} is the input supply voltage.
I_{IN} is the input supply current.

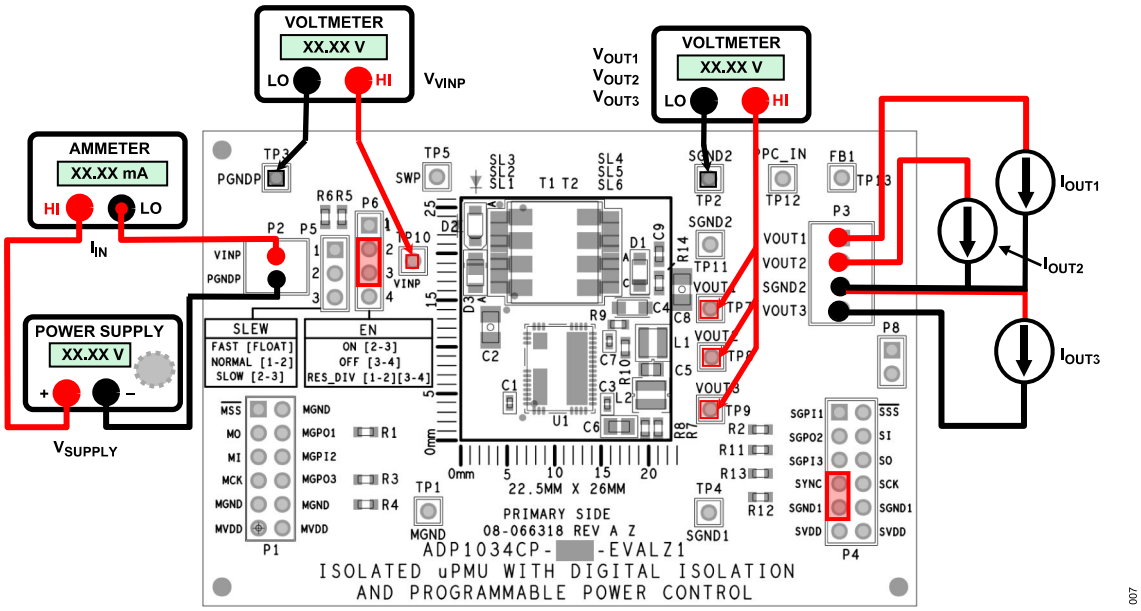

Figure 15. Overall Efficiency Measurement Setup

MEASUREMENT SETUP

DATA INPUT/OUTPUT (I/O) MEASUREMENT

Each data channel and its associated power supply input are accessed through the P1 header connector and P4 header connector. Each side of the ADP1034CP-1-EVALZ isolator requires an off board power source. The power sources must be independent from each other to apply common-mode voltages across the isolation barrier. Sharing a single power supply for MVDD and SVDDx does not harm the isolator. Sharing a power supply is also useful for testing the ADP1034 digital isolators when common-mode voltages are not present.

A 100 kΩ pull-down resistor to ground is installed on each digital input.

To properly operate the SPI channels and GPIO channels, refer to the ADP1034 data sheet.

HIGH VOLTAGE CAPABILITY

Take appropriate care when using the evaluation board at high voltages. Do not rely on the printed circuit board (PCB) for safety functions because the PCB has not been high potential tested (also known as hipot tested or dielectric withstanding voltage tested) nor certified for safety.

OUTPUT VOLTAGE MEASUREMENTS

For accurate output voltage measurements from the evaluation board, connect the evaluation board to a voltage source and a voltmeter. Use a resistor or an electronic load as the load for the regulators.

Ensure that the resistor has an adequate power rating to handle the expected power dissipation. Taking into account the device efficiency, ensure that the power supply has enough current for the expected load levels.

Use the following steps to connect the power supply and voltmeter to the evaluation board (refer to Figure 12 through Figure 15 for the setup diagrams):

1. Connect the negative terminal (−) of the power supply and voltmeter to the PGNDP power terminal of Connector P2 on the left side of the evaluation board.
2. Connect the positive terminal (+) of the power supply to the VINP terminal of Connector P2 on the left hand side of the evaluation board.
3. Connect the HI terminal of the voltmeter to VINP at TP10, and connect the LO terminal to PGNDP at TP3 to monitor the actual input voltage supplied to the ADP1034.
4. Connect a load between the VOUT1, VOUT2, or VOUT3 pin and the SGND2 pin at the output connector (P3) on the right side of the evaluation board.
5. Connect the voltmeters to the output test points (TP7 for VOUT1, TP8 for VOUT2, and TP9 for VOUT3) in reference to SGND2 or SGND1.

Turn on the voltage source for VINP by pressing the power button. The regulators power up if Pin 2 and Pin 3 of the EN jumper (P6) are connected.

If long power leads are used from the power supply, especially with higher loads, users are recommended to use a large capacitor (100 µF or more) connected across the VINP terminals and PGNDP to prevent losses from lead inductance. Likewise, adjust the input voltage to ensure that the supply voltage is within the user specified target range. A power supply with a 4-wire supply and sense arrangement can be used as an alternative to manually adjusting the supply voltage to be within the user specified range.

LINE REGULATION

For line regulation measurements, the voltmeter measures the regulator output while the input supply is varied. The line regulation measurement can be repeated under different load conditions. During line regulation tests, the leads to the power supply must be short, and any additional input capacitor must be removed. Figure 16 shows the typical line regulation performance of the ADP1034 flyback regulator output.

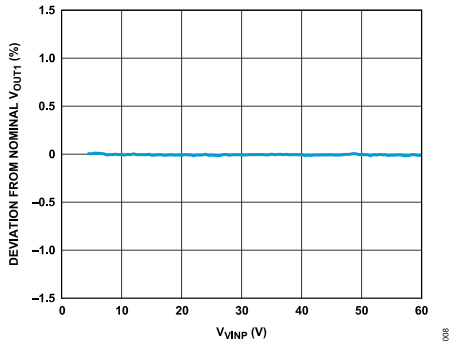

Figure 16. Flyback Regulator Line Regulation, V_{OUT1} = 24 V, I_{OUT1} = 25 mA, T_A = 25°C, Nominal = V_{OUT1} with V_{VINP} = 24 V

LOAD REGULATION

For load regulation measurements, monitor the regulator output while the load is varied. The input voltage must be held constant during the load regulation measurement. Figure 17, Figure 18, and Figure 19 show the typical ADP1034 load regulation performance of the flyback regulator, buck regulator, and inverting regulator, respectively. Keep power leads short during this test, and ensure that the supply voltage is constant under all load conditions.

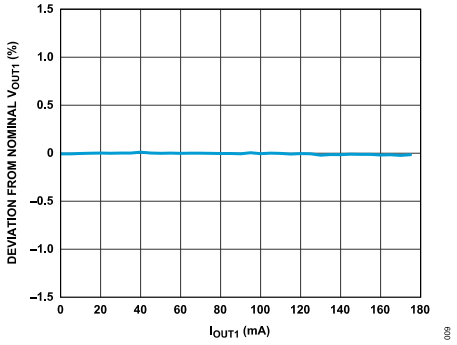

Figure 17. Flyback Regulator Load Regulation, V_{OUT1} = 24 V, T_A = 25°C, Nominal = V_{OUT1} at 25 mA Load

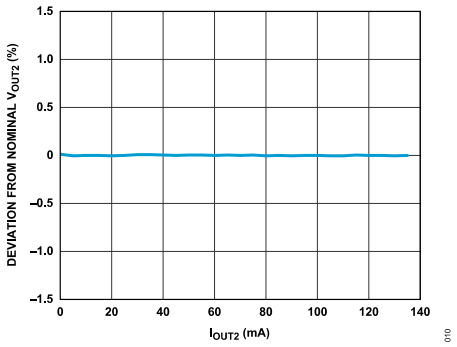

Figure 18. Buck Regulator Load Regulation, V_{OUT1} = 24 V, V_{OUT2} = 5 V, T_A = 25°C, Nominal = V_{OUT2} at 10 mA Load

OUTPUT VOLTAGE MEASUREMENTS

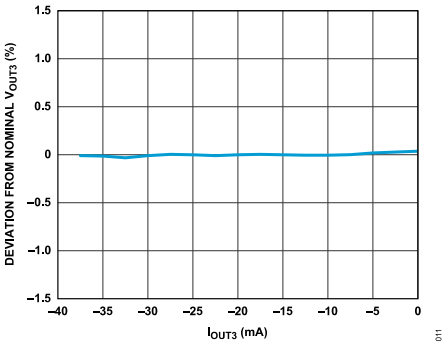

Figure 19. Inverting Regulator Load Regulation, V_{OUT1} = 24 V, V_{OUT3} = −15 V, T_A = 25°C, Nominal = V_{OUT3} at −5 mA Load

EFFICIENCY

For efficiency measurements, monitor the regulator input supply and output voltages while the load is varied. Keep power leads short during the efficiency measurement test, and use a power supply with remote sense. Connect ammeters in series with the input supply and the loads. Connect voltmeters to the test points provided for the input and the outputs of the regulators. For the most accurate results, measure the voltage across the input and output capacitors. If possible, particularly at a low current, trigger the meters simultaneously and set the meters to perform average readings for a period of a few hundred milliseconds. Figure 20 shows the typical overall efficiency curve for the ADP1034 with a varying output load on the flyback regulator and a constant load on the buck and inverting regulators.

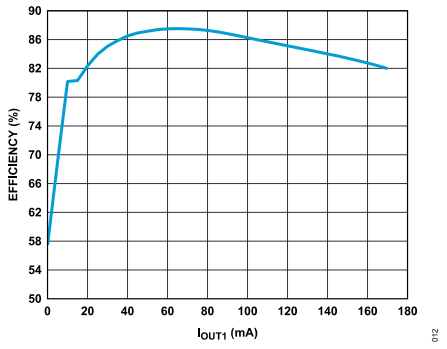

Figure 20. ADP1034 Overall Efficiency, V_{VINP} = 24 V, V_{OUT1} = 24 V, V_{OUT2} = 5 V, I_{OUT2} = 6 mA, V_{OUT3} = −15 V, I_{OUT3} = −4 mA, T_A = 25°C

EVALUATION BOARD SCHEMATICS AND ARTWORK

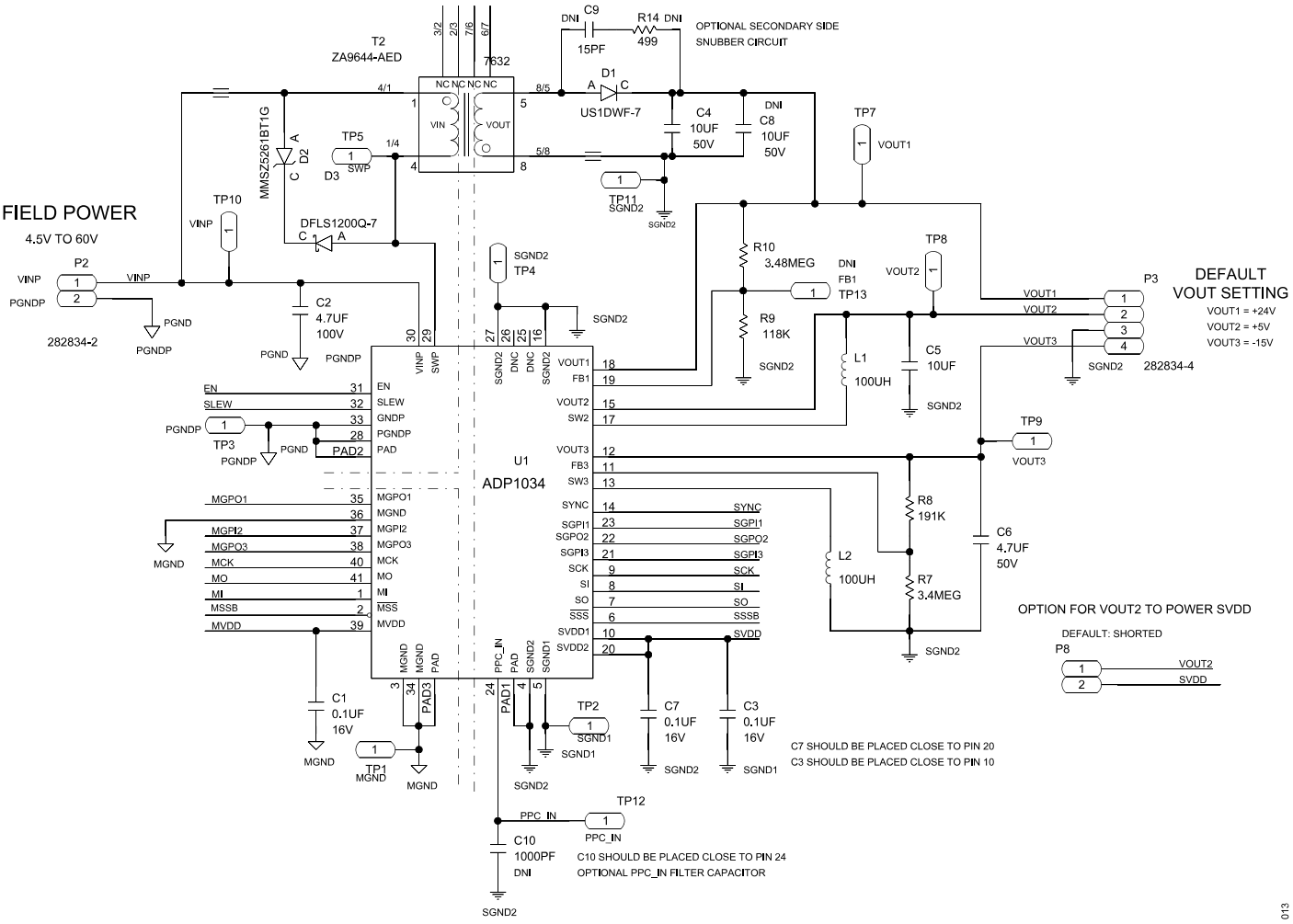

Figure 21. ADP1034CP-1-EVALZ Evaluation Board Schematic

EVALUATION BOARD SCHEMATICS AND ARTWORK

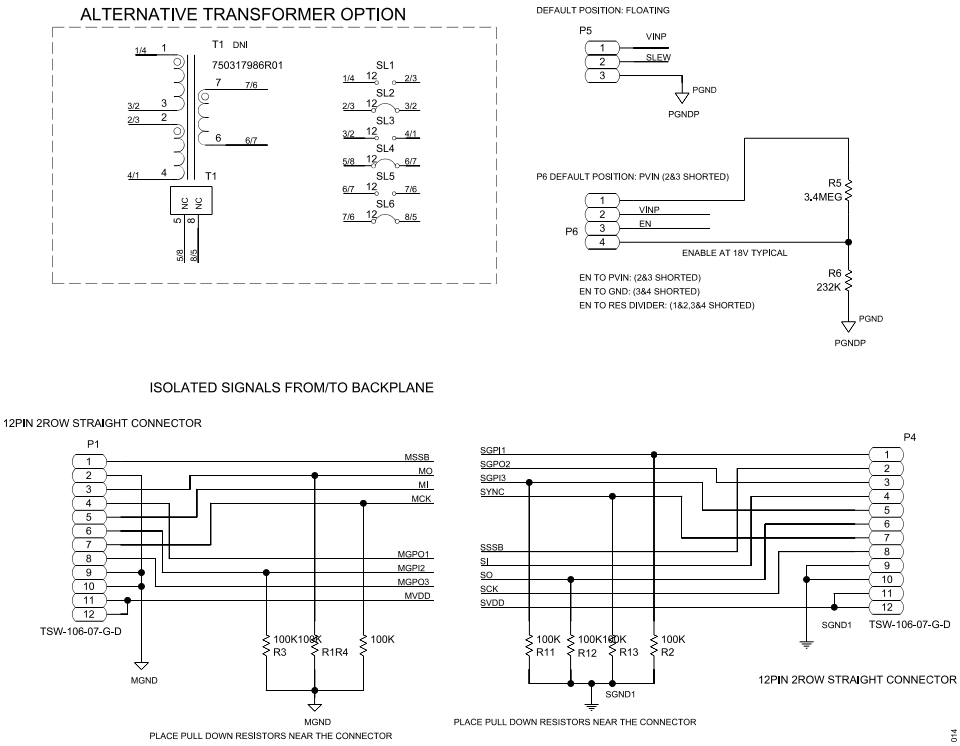

Figure 22. ADP1034CP-1-EVALZ Evaluation Board Schematic—Connectors and Peripherals

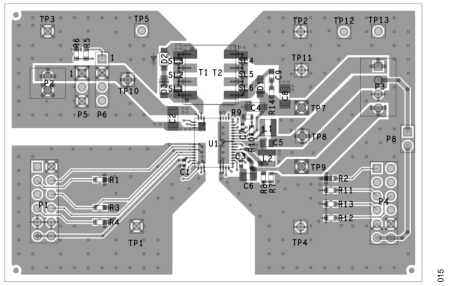

Figure 23. ADP1034CP-1-EVALZ Evaluation Board Top Layer

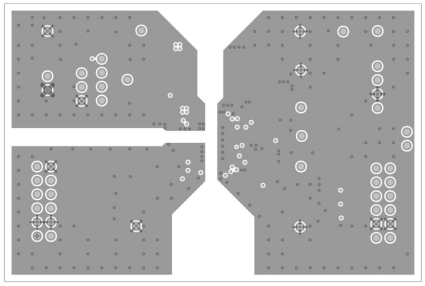

Figure 25. ADP1034CP-1-EVALZ Evaluation Board Layer 2—GND1

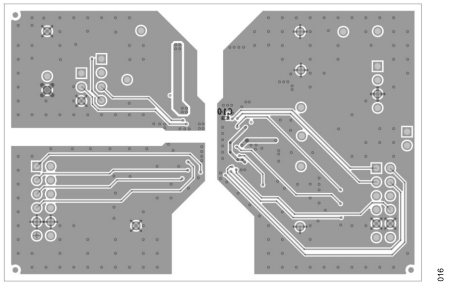

Figure 24. ADP1034CP-1-EVALZ Evaluation Board Bottom Layer

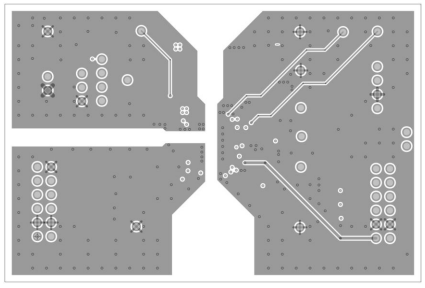

Figure 26. ADP1034CP-1-EVALZ Evaluation Board Layer 3—GND2

EVALUATION BOARD SCHEMATICS AND ARTWORK

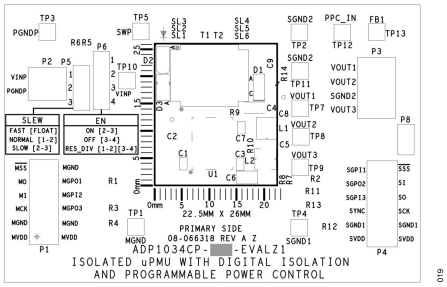

Figure 27. ADP1034CP-1-EVALZ Evaluation Board Silkscreen (Top)

ORDERING INFORMATION

BILL OF MATERIALS

Table 5. Bill of Materials

Quantity	Reference Designator	Description	Manufacturer/Part Number
3	C1, C3, C7	Capacitors, multilayer ceramic capacitor (MLCC), 0.1 µF, 16 V, 0402, X7R	Determined by the user
1	C2	Capacitor, MLCC, 4.7 µF, 100 V, 1206, X7S	Murata/GRM31CC72A475KE11L
1	C4	Capacitor, MLCC, 10 µF, 50 V, 1206, X7R	Samsung/CL31B106KBHNNNE
1	C5	Capacitor, MLCC, 10 µF, 16 V, 0805, X7R	Samsung/CL21B106KOQNNNE
1	C6	Capacitor, MLCC, 4.7 µF, 50 V, 0805, X7R	Murata/GRM21BZ71H475KE15L
1	D1	Diode, ultrafast rectifier, 1 A, 200 V, surface-mount device (SMD)	Diodes Incorporated/US1DWF-7
1	D2	Diode, Zener voltage regulator, 47 V, 0.5 W, SMD	ON Semiconductor/MMSZ5261BT1G
1	D3	Diode, Schottky rectifier, 1 A, 200 V, SMD	Diodes Incorporated/DFLS1200Q-7
2	L1, L2	Inductors, shielded, 100 µH, 0.39 A	Coilcraft/XFL3012-104MEB
2	P1, P4	Headers, 12-pin	Samtec/TSW-106-07-G-D
1	P2	Terminal block, 2-pin	TE Connectivity/282834-2
1	P3	Terminal block, 4-pin	TE Connectivity/282834-4
1	P5	Header, 3-pin	Samtec/TSW-103-07-F-S
1	P6	Header, 4-pin	Samtec/TSW-104-07-G-S
1	P8	Header, 2-pin	Samtec/TSW-101-07-G-D
7	R1, R2, R3, R4, R11, R12, R13	Resistors, 100 kΩ, 1/10 W, 1%, 0603, SMD	Determined by the user
2	R5, R7	Resistors, 3.4 MΩ, 1/10 W, 1%, 0603, SMD	Determined by the user
1	R6	Resistor, 232 kΩ, 1/10 W, 1%, 0603, SMD	Determined by the user
1	R8	Resistor, 191 kΩ, 1/10 W, 1%, 0603, SMD	Determined by the user
1	R9	Resistor, 118 kΩ, 1/10 W, 1%, 0603, SMD	Determined by the user
1	R10	Resistor, 3.48 MΩ, 1/10 W, 1%, 0603, SMD	Determined by the user
11	TP1, TP2, TP3, TP4, TP5, TP7, TP8, TP9, TP10, TP11, TP12	Headers, 1-pin	Samtec/TSW-101-07-G-S
1	T2	Transformer, 1:1 turn ratio, 470 µH	Coilcraft/ZA9644-AED
1	U1	3-channel isolated micropower management unit with seven digital isolators and PPC	Analog Devices/ADP1034ACPZ-1

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.