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Evaluation Board for the ADuM4121 and ADuM4121-1 *i*Coupler, High Voltage, Isolated Gate Drivers with Internal Miller Clamp, 2 A Output

FEATURES

2 A peak drive output capability
Output power device resistance: <2 Ω
Low propagation delay: <51 ns
Operating temperature range: −40°C to +125°C
Output voltage range to 35 V
Output and input undervoltage lockout (UVLO)
Pad placement for multiple switch types
Screw terminals for easy connectivity

EVALUATION KIT CONTENTS

EVAL-ADuM4121EBZ evaluation board or the EVAL-ADuM4121-1EBZ evaluation board

EQUIPMENT NEEDED

Suggested test equipment
Primary side power supply: 0 V to 6 V at 100 mA
Secondary side supply: 0 V to 35 V at 250 mA
Square wave generator: 0 V to 5 V

GENERAL DESCRIPTION

The EVAL-ADuM4121EBZ and EVAL-ADuM4121-1EBZ evaluation boards support the ADuM4121/ADuM4121-1 single-channel gate drivers with an integrated miller clamp. Analog Devices, Inc., *i*Coupler® technology provides isolation between the input signal and the output gate driver. The EVAL-ADuM4121-1EBZ option is populated with the ADuM4121-1 which does not contain an internal thermal shutdown and does not shutdown the output in case of junction temperatures above 155°C (typical).

The ADuM4121 provides operation with voltages of up to 35 V. The integrated miller clamp activates on the falling edge of an edge transition to further clamp the output low to counteract miller turn on effects.

The EVAL-ADuM4121EBZ evaluation board facilitates testing of the propagation delay, drive strength, miller clamp functionality, and input logic of the device.

For complete information about the ADuM4121/ADuM4121-1, refer to the ADuM4121/ADuM4121-1 data sheet that should be consulted in conjunction with this user guide when using the evaluation board.

EVAL-ADUM4121EBZ EVALUATION BOARD

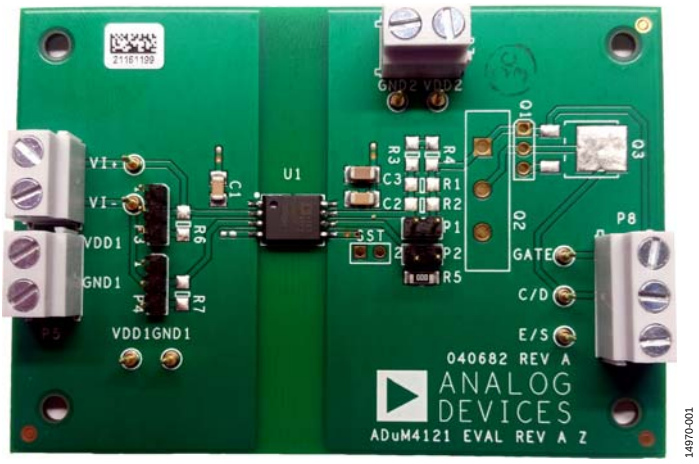

Figure 1.

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REVISION HISTORY

10/2016—Revision 0: Initial Version

SETTING UP THE EVAL-ADUM4121EBZ OR EVAL-ADUM4121-1EBZ

INITIAL CONFIGURATION

Before initial use, certain steps must be completed to prepare the EVAL-ADuM4121EBZ or EVAL-ADuM4121-1EBZ evaluation board for operation. In the stock configuration (see Figure 1), the R1 to R4 resistors are not placed. These are the locations of the series external resistors for the charging and discharging paths of the device being driven. It is recommended to use 1206 surface-mount resistors with values between approximately 1 Ω and 10 Ω, depending on the load being driven. R1 and R2 provide to parallel placements, while R3 and R4 are in series. An actual insulated gate bipolar transistor (IGBT) or metal-oxide semiconductor field effect transistor (MOSFET) can be placed in the provided Q1, Q2, or Q3 landing patterns. Jumper P1 allows shorting across the series external resistors to observe overshoot and/or allow the user to probe voltage to quantify peak currents.

Resistors R6 and R7 are provided if the user desires to terminate the inputs V_{I+} and V_{I-} with 50 Ω loads. R6 and R7 are not required, and, if not placed, the evaluation board accepts high impedance signal generator signals.

Pins accompany the screw terminals. The user decides which connection mechanism to use. The screw terminals aid in connecting wires for longer term measurements, but are not recommended for placement of the devices being driven. The distance to the screw terminals for Jumper P8 is far from the gate driver and introduces parasitic inductances to the measurement.

Jumpers P3 and P4 allow the user to tie the V_{I+} and/or V_{I-} pins to VDD1 or GND1 quickly. If using P3 and/or P4, do not attempt to drive the pin that is jumpered by an external signal generator.

PAD LAYOUT FOR THE DEVICE UNDER TEST (DUT)

Figure 2 shows the top layer artwork for the dual-gate driver circuit. Evaluation board components include the following:

- U1 is the footprint for the ADuM4121 or ADuM4121-1.
- C1 and C2 are 0.1 µF bypass capacitors; C3 is a 10 µF bypass capacitor.
- Q1, Q2, and Q3 can be populated with TO-246, TO-252, or TO-220 MOSFETs or IGBTs (see Figure 2).
- R1 to R4 are gate resistors that control the edges of the outputs. By default, no resistors are installed; these resistors must be populated with low value 1206 resistors, generally in the 1 Ω to 10 Ω range.

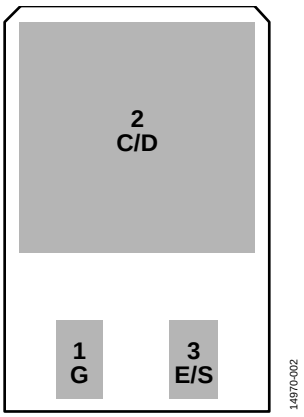

Figure 2. IGBT/MOSFET Footprint

POWER CONNECTIONS

Follow these steps to connect the ADuM4121 or ADuM4121-1 evaluation board to a power supply:

1. Connect the input supply (2.5 V to 5.5 V) with the positive terminal on VDD1 and the ground on GND1.
2. Connect the ADuM4121 or ADuM4121-1 VDD2 supply voltage (4.5 V to 35 V) to the VDD2 pin and return to the GND2 pin.

GND1 and GND2 are isolated. The emitter/source of the IGBT/MOSFET is tied to GND2.

INPUT/OUTPUT CONNECTIONS

The V_{I+} and V_{I-} pins are complementary metal oxide semiconductor (CMOS) inputs. To drive the gate driver with positive logic, tie V_{I-} to GND1 and connect the input signal to the V_{I+} pin. To drive the gate drive with negative logic, connect V_{I+} to VDD1, and connect the input signal to V_{I-}. V_{I-} can also be used as a disable pin. By driving V_{I-} high, the output remains low regardless of the signal at the V_{I+} pin.

The EVAL-ADuM4121EBZ evaluation board comes with screw terminals for both the input and output connections. These terminals facilitate connection options but are not the best option for high performance transient testing. The best measurements performed on the load, whether it is an IGBT, MOSFET, or load capacitor, come from small loop measurements performed at the load. Using the screw terminals as either the sensing node or for the connection of the load often results in observing overshoot during measurement.

EVALUATION BOARD SCHEMATICS AND ARTWORK

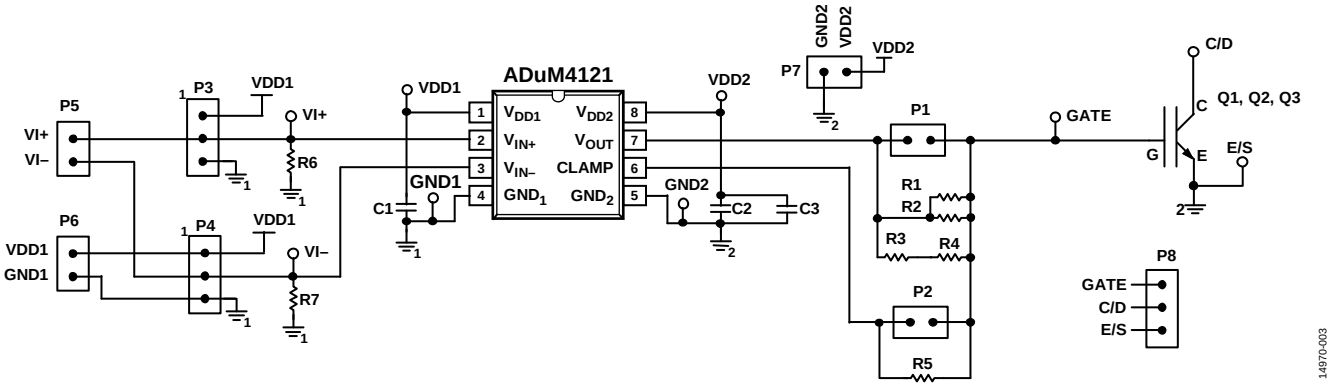

Figure 3. Schematic of the EVAL-ADuM4121EBZ

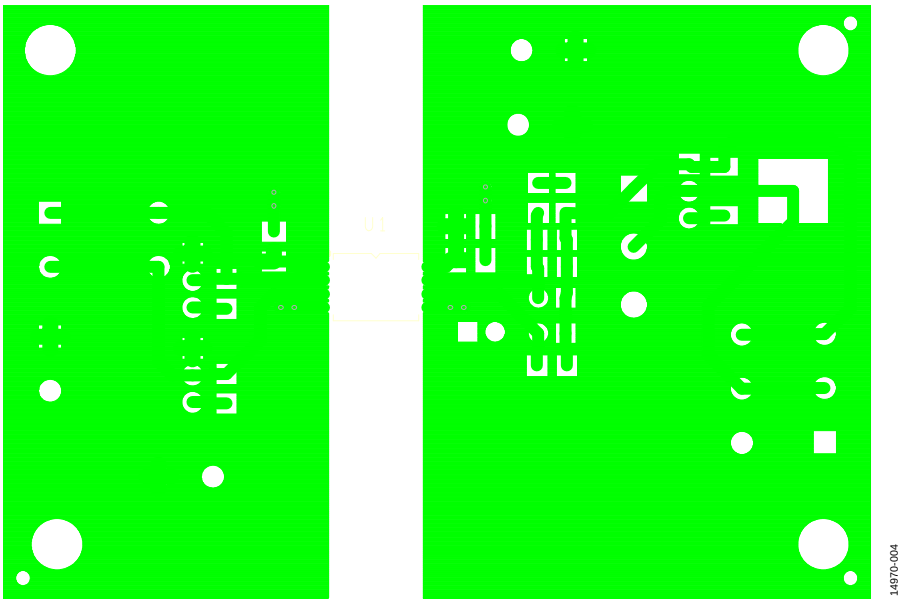

Figure 4. EVAL-ADuM4121EBZ Evaluation Board Top Layer

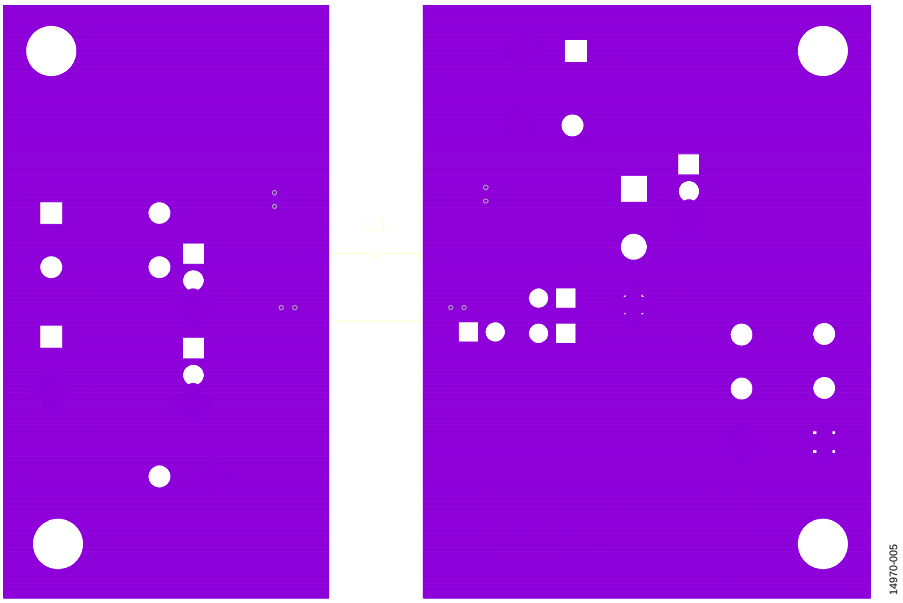

Figure 5. EVAL-ADuM4121EBZ Evaluation Board Bottom Layer

ORDERING INFORMATION

BILL OF MATERIALS

Table 1.

Reference Designator	Description
U1	ADuM4121 or ADuM4121-1
R5	Resistor, 0 kΩ, 1206
C1, C2	Capacitor, 0.1 µF, 25 V, 10%, 1206
C3	Capacitor, 10 µF, 50 V, 10%, 1206
R1 to R4, R6, R7, Q1, Q2, Q3	Not installed

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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