

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: $<2\ \Omega$
- Low propagation delay: $<51\ \text{ns}$
- Operating temperature range: -40°C to $+125^\circ\text{C}$
- 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

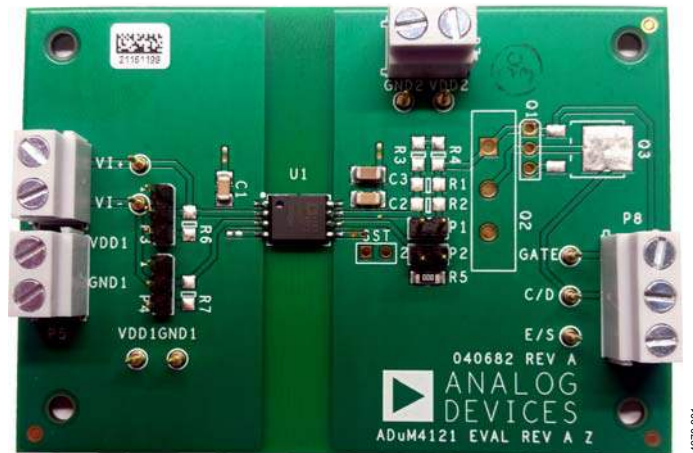


Figure 1.

TABLE OF CONTENTS

Features	1	Initial Configuration	3
Evaluation Kit Contents.....	1	Pad Layout for the Device Under Test (DUT).....	3
Equipment Needed.....	1	Power Connections	3
General Description	1	Input/Output Connections	3
EVAL-ADuM4136EBZ Evaluation Board.....	1	Evaluation Board Schematics and Artwork	4
Revision History	2	Ordering Information.....	5
Setting Up the EVAL-ADuM4121EBZ or EVAL-ADuM4121-1EBZ.....	3	Bill of Materials.....	5

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.

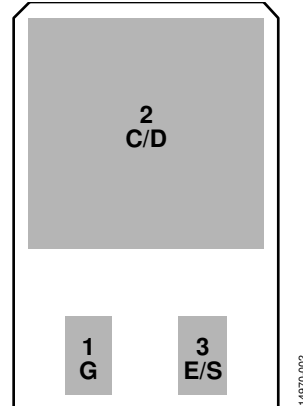


Figure 2. IGBT/MOSFET Footprint

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

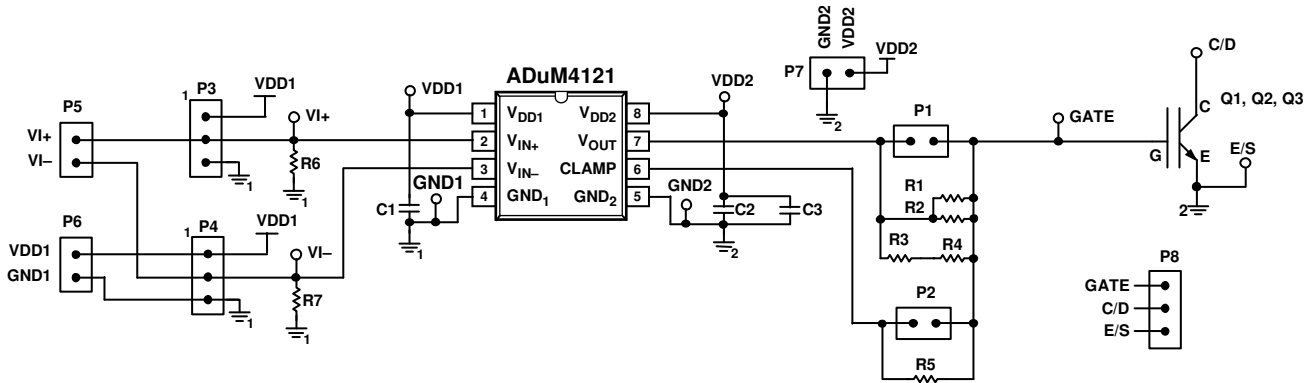


Figure 3. Schematic of the EVAL-ADuM4121EBZ

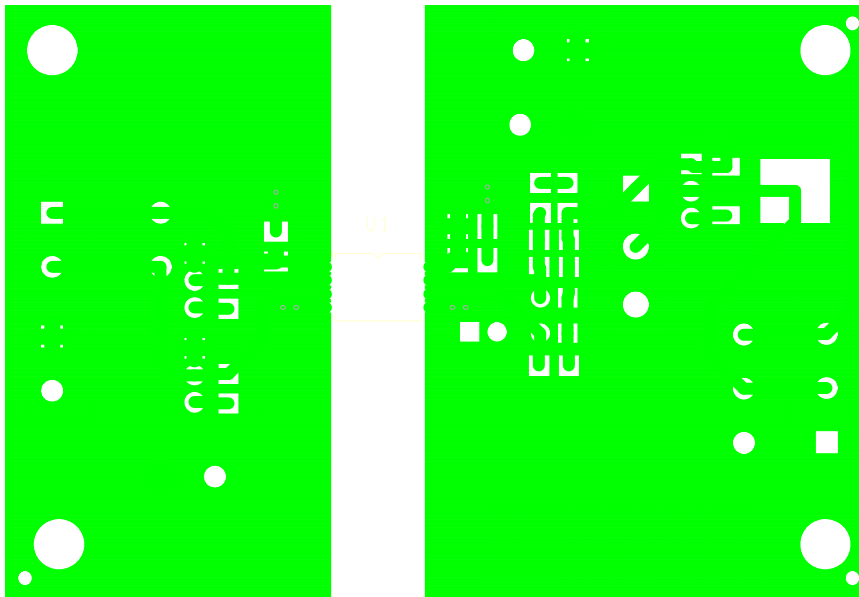


Figure 4. EVAL-ADuM4121EBZ Evaluation Board Top Layer

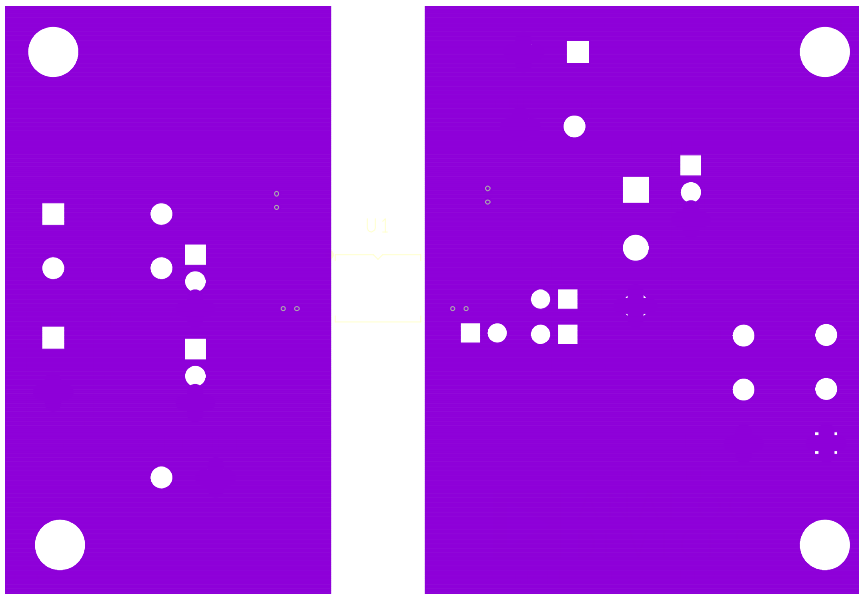


Figure 5. EVAL-ADuM4121EBZ Evaluation Board Bottom Layer

ORDERING INFORMATION

BILL OF MATERIALS

Table 1.

Reference Designator	Description
U1	ADuM4121 or ADuM4121-1
R5	Resistor, 0 k Ω , 1206
C1, C2	Capacitor, 0.1 μ F, 25 V, 10%, 1206
C3	Capacitor, 10 μ F, 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.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.