

## Evaluation Board for the **ADuM4135** *i*Coupler, Single-/Dual-Supply, High Voltage Isolated IGBT Gate Driver with Miller Clamp

### FEATURES

- 4 A peak output current**
- Desaturation protection circuitry**
- Integrated Miller clamp**
- CMOS input logic levels**
- 12 V to 30 V output drive**
- Supports multiple IGBT/MOSFET footprints**
- Bootstrap option**

### SUPPORTED *i*Coupler MODELS

**ADuM4135**

### GENERAL DESCRIPTION

The **EVAL-ADuM4135EBZ** supports the **ADuM4135** advanced isolated gate driver. Because the evaluation board has footprints for insulated gate bipolar transistors (IGBTs) and metal oxide semiconductor field effect transistors (MOSFETs) in TO-252, TO-220, and 0.100" spaced lead packages, the **ADuM4135** can be evaluated with many different power devices. The **EVAL-ADuM4135EBZ** comes with footprints to facilitate evaluating the desaturation detection, as well as the Miller clamp operation.

Complete information about the **ADuM4135** is available in the **ADuM4135** data sheet, which should be consulted in conjunction with this user guide when using the evaluation board.

### EVALUATION BOARD PICTURE

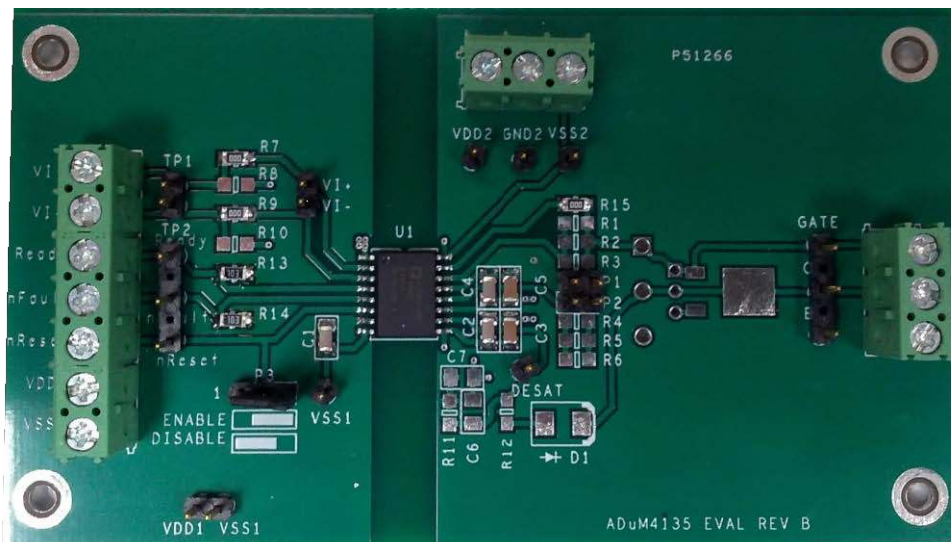


Figure 1.

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**REVISION HISTORY**

8/15—Revision 0: Initial Version

## SETTING UP THE EVAL-ADUM4135EBZ INITIAL CONFIGURATION

Before the first use, certain things must be completed to prepare the board for operation. In the stock configuration, the R1 to R6 resistors are not placed. These are the locations of the series external resistors for the charging and discharging paths to  $V_{OUT\_ON}$  and  $V_{OUT\_OFF}$ . It is recommended to use 1206 surface-mount resistors with values between approximately 1  $\Omega$  and 10  $\Omega$ , depending on the load being driven. An actual IGBT or MOSFET can be placed in the provided landing patterns to the right of P1 and P2. P1 and P2 allow shorting across the series external resistors to observe overshoot and/or allow the user to probe voltage to quantify peak currents.

In the stock configuration, the DESAT circuitry is left open. Before the first use, if DESAT functionality is not used, it is recommended to short the DESAT pin to ground, either by a wire or by placing a 0  $\Omega$  resistor in the C6 component pad. Failure to do so results in a DESAT fault being observed on the first rising edge of the output.

If the DESAT circuitry is tested, an IGBT or MOSFET must be added to the circuit to allow for the DESAT pin to be pulled down during on times, preventing the DESAT fault. Additionally, C6, R12, and D1 must have appropriate components placed. For details about sizing, refer to the ADuM4135 data sheet. R11 is provided to allow extra DESAT blanking current by means of an external pull-up resistor. C7 can provide decoupling for this external pull-up current source, if desired.

R13 and R14 come with 10 k $\Omega$  resistors in place. These resistors provide pull ups to the READY and nFault pins. P3 allows for easy enabling and disabling of the device by means of jumper pins. A silkscreen reminder is included to show which pins to short to enable or disable the device. R8 and R10 allow for easy placement of 50  $\Omega$  terminating resistors, if desired.

Pins accompany the screw terminals. It is left to the user to decide which connection mechanism to use. Do not leave VSS2 floating. It must always be at or less than the potential of GND2. Shorting VSS2 and GND2 is a valid operating point.

During operation, if a fault is seen, the nFault pin is brought low. In this case, the device can be reset by either powering down VDD1 to VSS1 and powering back up, or by bringing the nRESET pin low then high again. The easiest way to toggle nRESET is to remove the jumper on P3 from Pin 2 and Pin 3 and then replace it. An internal pull-down resistor brings nRESET low on its own.

## PAD LAYOUT FOR THE DEVICE UNDER TEST (DUT)

Figure 4 shows the top layer artwork for the dual gate driver circuit.

- U1 is the footprint for the ADuM4135.
- C1, C2, and C4 are 0.1  $\mu$ F bypass capacitors; C3 and C5 are 10  $\mu$ F bypass capacitors.
- The available footprint can be populated with TO-252 MOSFETs or IGBTs with the pinout shown in Figure 2.
- R1 to R6 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  $\Omega$  to 10  $\Omega$  range.

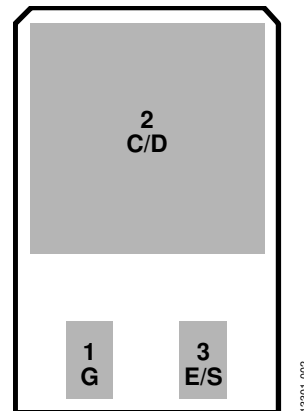


Figure 2. IGBT/MOSFET Footprint

## POWER CONNECTIONS

Follow these steps to connect the EVAL-ADuM4135EBZ evaluation board to the power supply:

1. Connect the 5 V or 3.3 V input supply with the positive terminal on VDD1 and the ground on VSS1.
2. Connect the ADuM4135 VDD2 supply voltage (12 V to 30 V) to the VDD2 pin and its return to the VSS2 pin.

VSS1 and VSS2 are functionally isolated. The emitter/source of the IGBT/MOSFET is tied to GND2.

## INPUT/OUTPUT CONNECTIONS

The VI+ and VI– pins are CMOS inputs. R8 and R10 are provided in case the user needs to terminate the inputs with a 50  $\Omega$  load.

R7 and R9 are provided as a place to put damping, if needed; however, in most cases, the 0  $\Omega$  resistors that comes in the stock configuration can remain on R7 and R9.

The EVAL-ADuM4135EBZ evaluation board comes with screw terminals for both the input and output connections. These are to 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 or MOSFET or a load capacitor, come from small loop measurements performed right at the load. Using the screw terminals as either the sensing node or for the connection of the load often results in overshoot being observed during measurement.

# EVALUATION BOARD SCHEMATIC

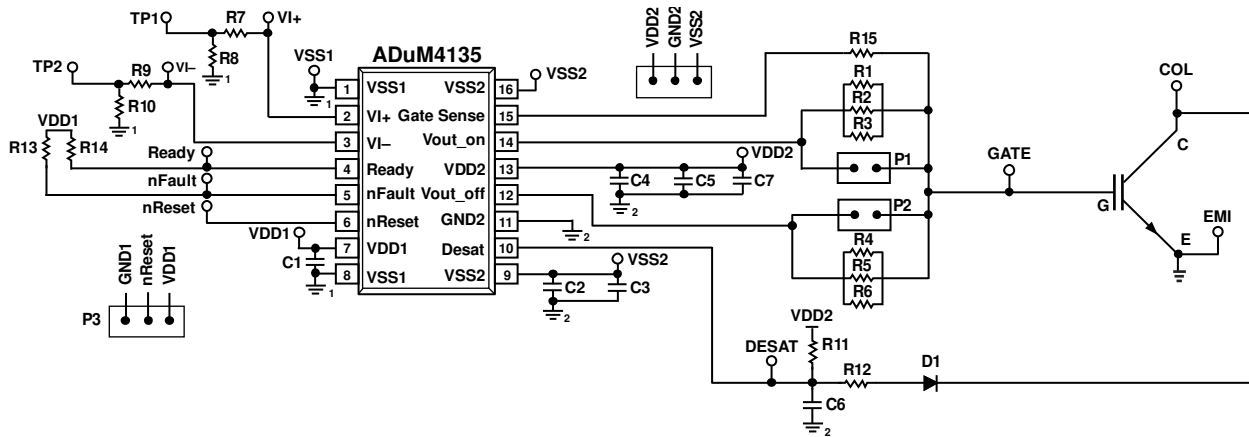


Figure 3. EVAL-ADuM4135EBZ Evaluation Board Schematic

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### EVALUATION BOARD LAYOUT

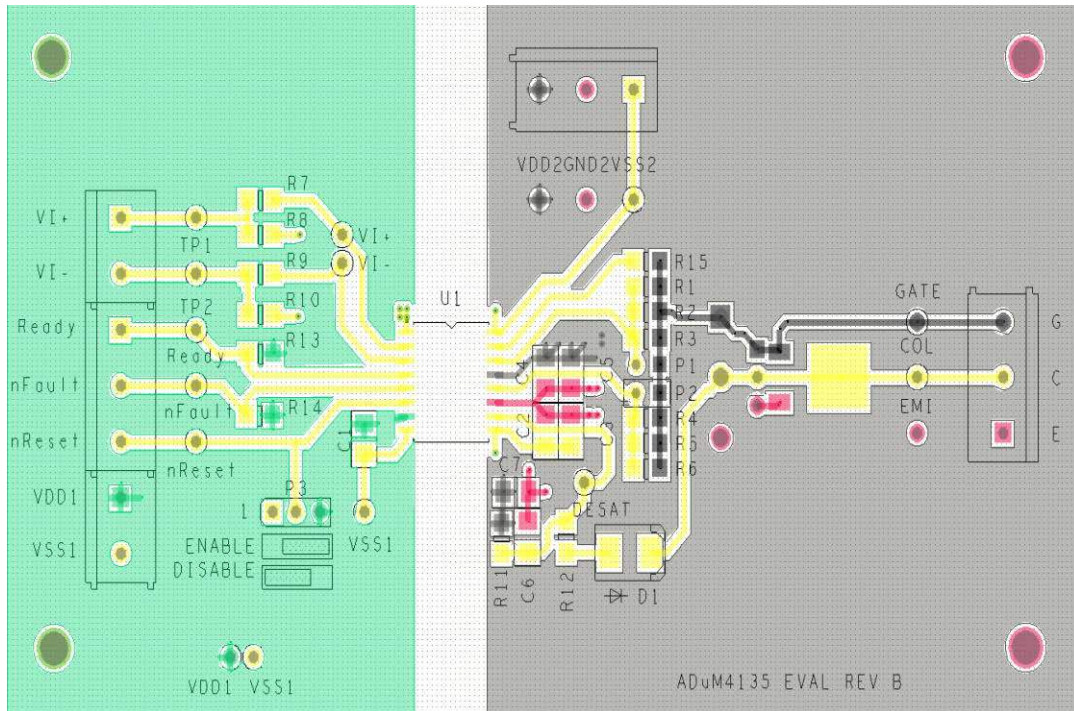


Figure 4. EVAL-ADuM4135EBZ Evaluation Board Top Layer

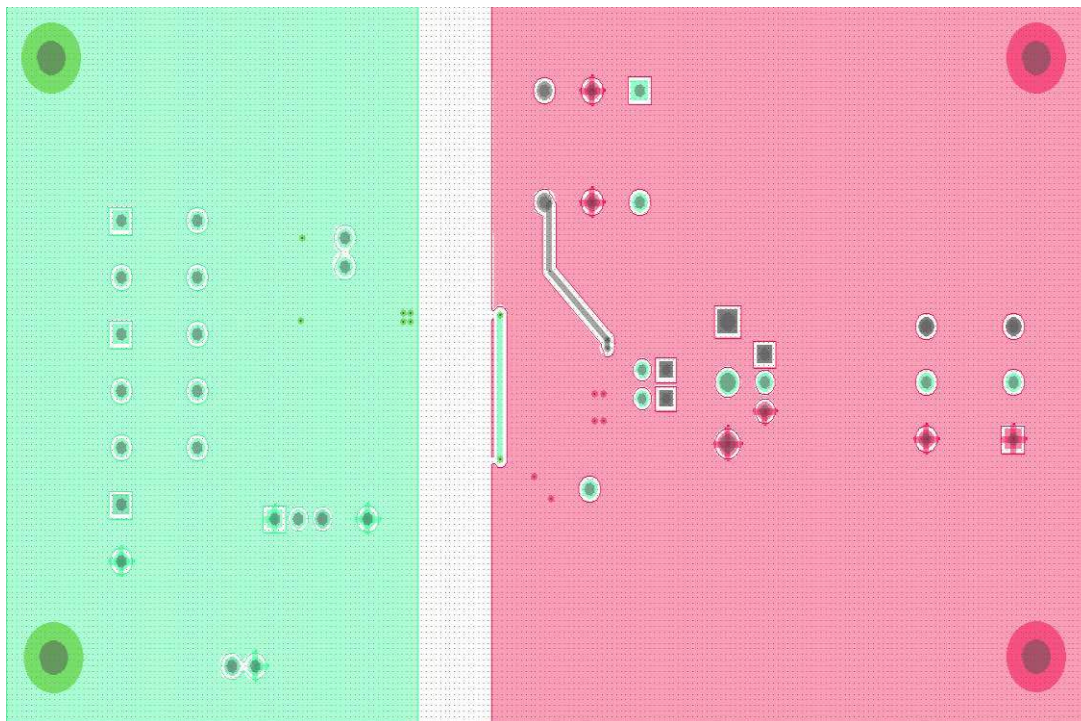


Figure 5. EVAL-ADuM4135EBZ Evaluation Board Bottom Layer

## ORDERING INFORMATION

### BILL OF MATERIALS

Table 1.

Quantity	Reference Designator	Description
1	U1	ADuM4135RWZ IC
3	C1, C2, C4	Capacitor, 0.1 $\mu$ F, 25 V, 10%, 1206
2	C3, C5	Capacitor, 10 $\mu$ F, 25 V, 10%, 1206
3	R7, R9, R15	Resistor, 0 $\Omega$ , 1/4 W, 1%, 1206
1	R13, R14	Resistor, 10 k $\Omega$ , 1/4 W, 1%, 1206
Not applicable	R1 to R6, R8, R10 to R12, D1, C6, C7	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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