

## 5A Gate Drive Optocoupler Evaluation Board

### User Guide

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#### Application Circuit Description

The Avago Technologies® ACNU-3430 is an isolated gate driver that provides 5A of output current in 11-mm/10.5-mm creepage and clearance package. The voltage and high peak output current supplied by this optocoupler make it ideally suited to direct-drive the IGBT with ratings up to 1200V/120A. It is also designed to drive different sizes of buffer stage that will make the class of IGBT scalable. This ACNU-3430 device provides a single isolation solution suitable for both low and high power ratings of motor control and inverter applications with working voltage as high as 1414 Vpk.

#### Quick Start

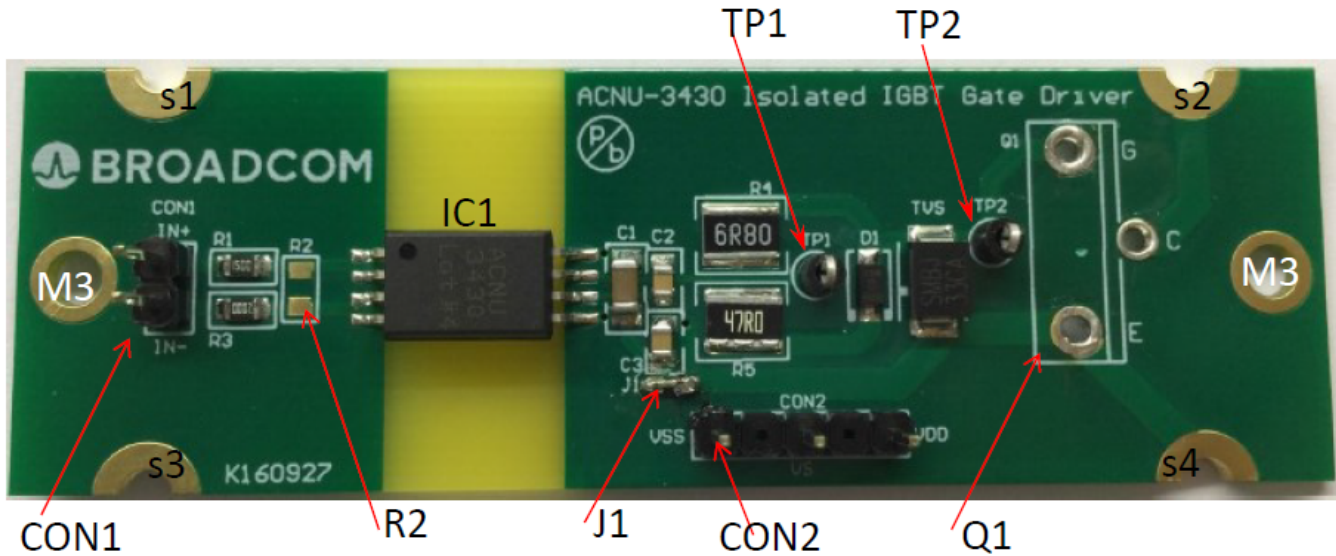
Visual inspect the ACNU-3430 evaluation board to make sure it has been received in good condition.

ACNU-3430 (IC1) is a 5A gate driver optocoupler suitable for driving 1200V, 120A IGBT or power MOSFET used in either power converters or motor drives. The evaluation board can be used as a reference design to provide necessary interface details between a PWM controller and an IGBT/Power MOSFET. The ACNU-3430 is a single-channel driver. For a dual-channel driver configured in a totem-pole arrangement, stack two evaluation board, one on top the other.

**NOTE** The PCB used for this evaluation board is a 4-layer PCB, which is required to minimize the output noise due to the 5A high output current at 50-kHz PWM switching signal.

Confirm that the default connections of the evaluation board are as follows (see [Figure 1](#)):

1. R2 is not mounted. R2 (usually set to carry less than 10 percent of the LED current) can be mounted if regulating the LED forward voltage  $V_F$  is required ( $V_F$  varies if the temperature drifts) when the input voltage across CON1 pins is fixed.
2. J1 is shorted by default. This J1 link, will short the  $V_S$  and  $V_{SS}$  terminals together if negative supply is not needed.  $V_S$  is also connected to the emitter/source terminal of the IGBT/power MOSFET inside the board.
3. Q1 is not mounted by default. A suitable IGBT/power MOSFET can be mounted here.
4. The CON1 connector allows for the connection of the PWM input signal with  $V_{pp}$  of 5V.
5. The CON2 connector allows for the connection of positive (across  $V_{DD}$  and  $V_S$ ) and negative (across  $V_{SS}$  and  $V_S$ ) supplies.
6. TP1 and TP2 test points monitor the output voltages at pin-7 of the IC1 and the gate of Q1, respectively.
7. Two M3 holes allow for the evaluation board to be mounted on external platform, such as a chassis.

**Figure 1 Actual ACNU-3430 Evaluation Board Showing Default Connections**

No component is mounted on the solder side (bottom layer), so it is not shown in the figures.

To power up the evaluation board, perform these steps:

1. Connect a 1200V, 120A IGBT (with gate capacitance about 25 nF) at Q1.
2. Connect a 50 kHz +5V PWM signal with a 50 percent duty cycle
3. Connect a +15V DC supply across  $V_{DD}$  and  $V_S$ .

When the preceding steps have been performed, you can observe the output drive signal behavior at TP1 point, TP2 point, or both points. If the proper 1200V, 120A is not available yet, you can simulate the performance of the gate driving signals of the board by connecting an external 25-nF capacitor across the G and E terminals of Q1.

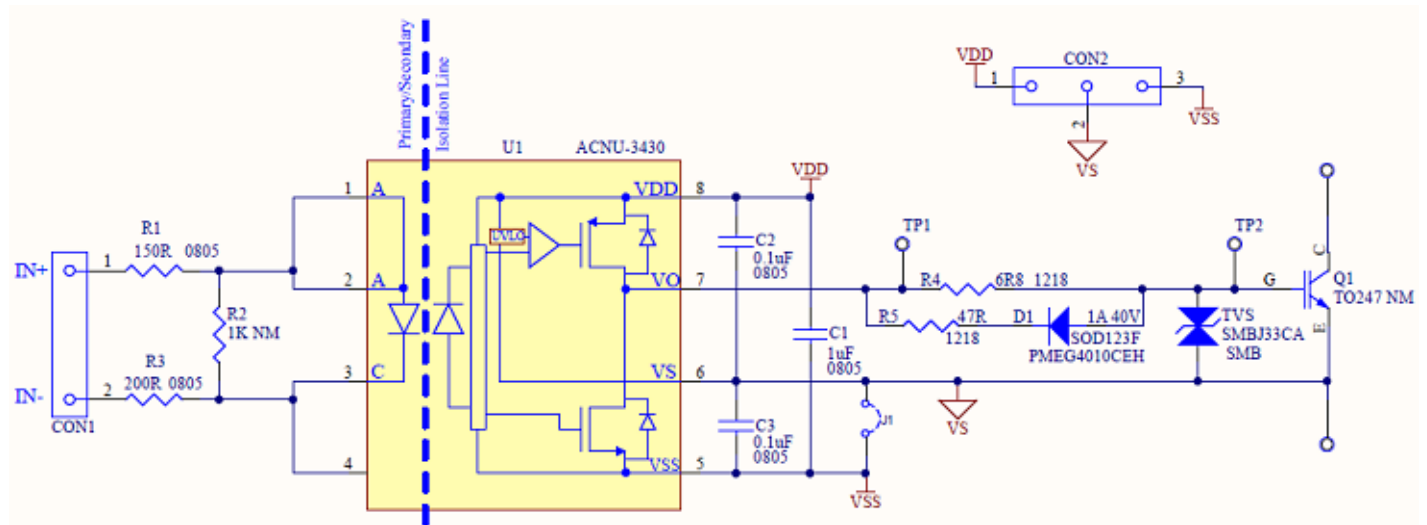
The following sections describe how the evaluation board can be powered up in more detail.

You can stack two evaluation boards (from top to bottom) to form a half-bridge inverter arm by soldering S3 and S4 of the top arm to S1 and S2 of the bottom arm, respectively. You can do this action if the HV bus voltage is not more than 1200V. For more information about this configuration, see [Half-Bridge Inverter Configuration](#).

## Schematics

Schematics of the evaluation board are as shown in [Figure 2](#).

**Figure 2 Schematics of the ACNU-3430 Evaluation Board**

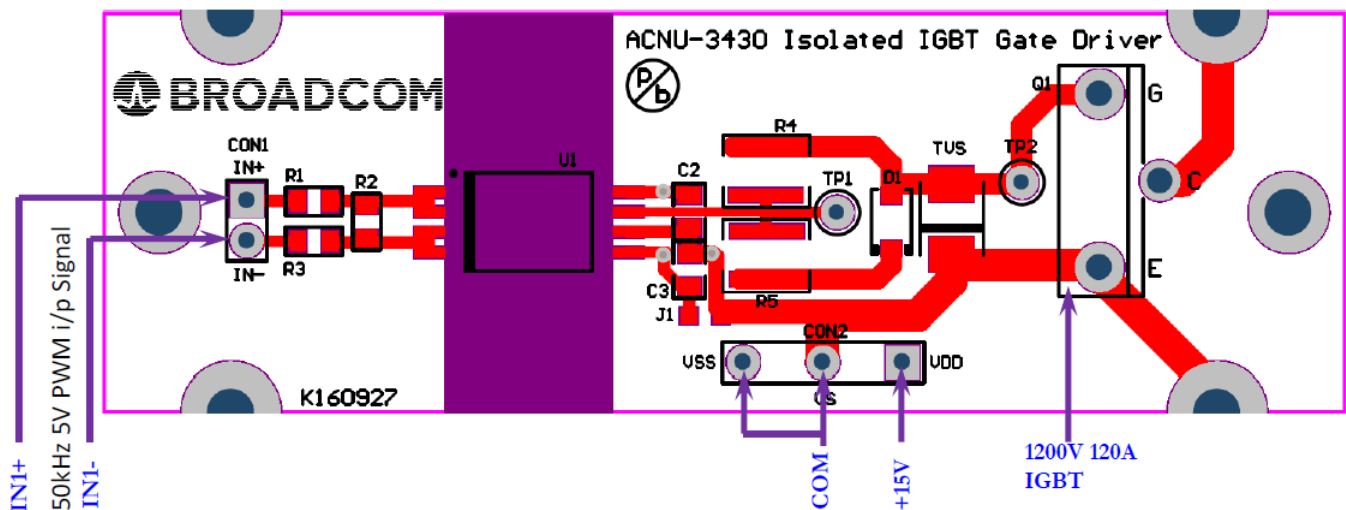


## Practical Connections of the Evaluation Board Using IGBT/Power MOSFET for an Actual Inverter Test

For connection details, see [Figure 3](#).

1. Solder an actual IGBT at Q1.
2. Connect a +15V DC isolated supply across  $V_{DD}$  and  $V_S$  terminals of CON2.  $V_{SS}$  is shorted to  $V_S$  by default. This +15V supply is required to power the driver side of the evaluation circuit.
3. Connect the signal output (up to 50 kHz) from the microcontroller to the PWM 5V signal input across pin IN1+ and IN1- of CON1.
4. Use a multi-channel digital oscilloscope to monitor the waveforms at the following points:
  - a. The LED signal across the IN1+ and IN1- pins, which represents the input PWM signal.
  - b.  $V_{OUT}$  across  $V_O$  (TP1) and  $V_S$  terminals, which is the output signal from the ACNU-3430 (a differential probe is needed).

**Figure 3 Connection of the Evaluation Board in Actual Applications**



Typical input and output signals are as shown in Figure 4 and Figure 5 (exploded view).

Figure 4 IN+ and Vo (TP1) Signals

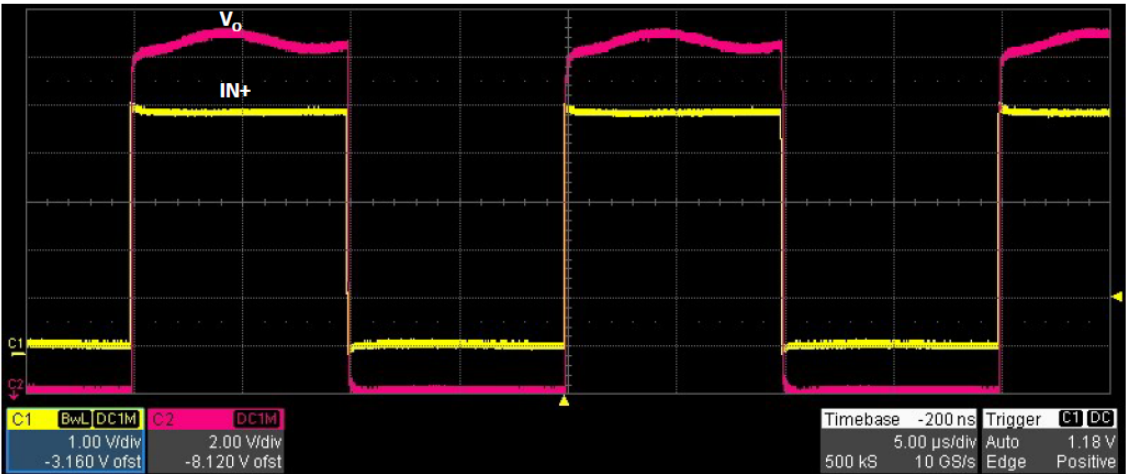


Figure 5 IN+ and Vo (TP1) Signals in an Exploded View

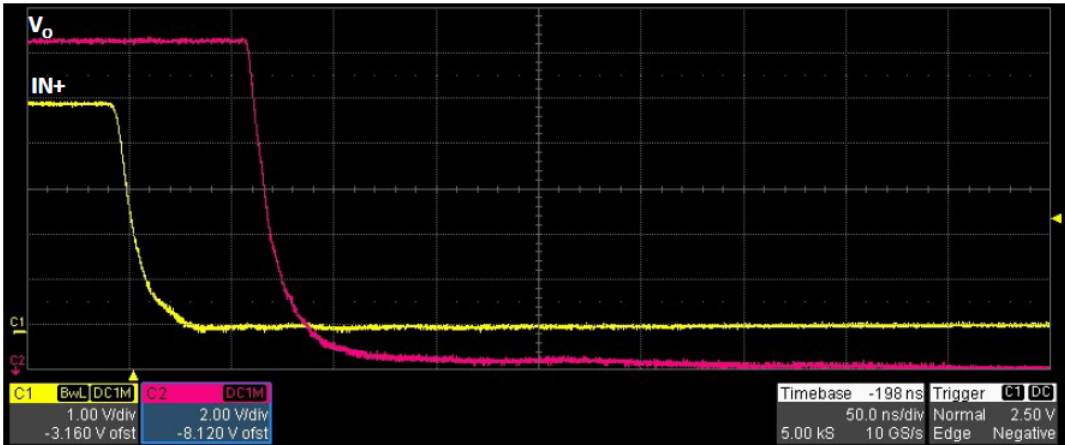
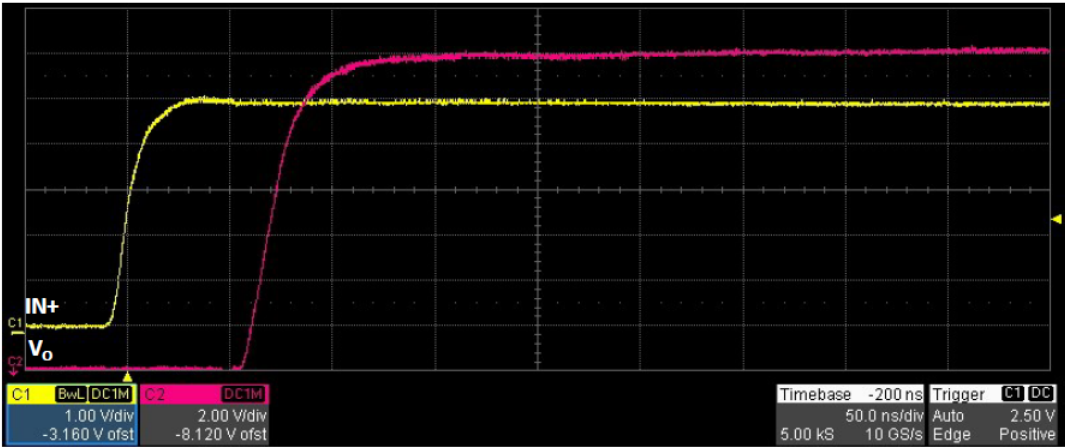
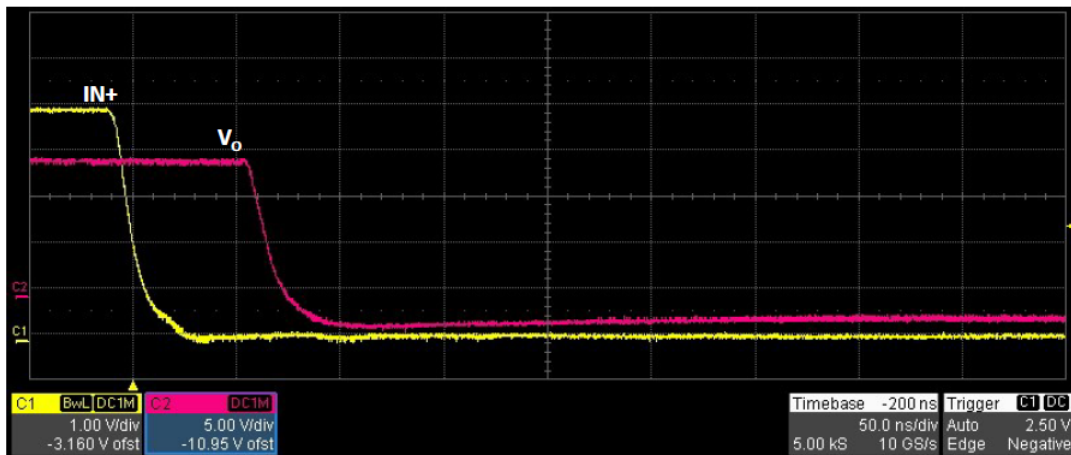
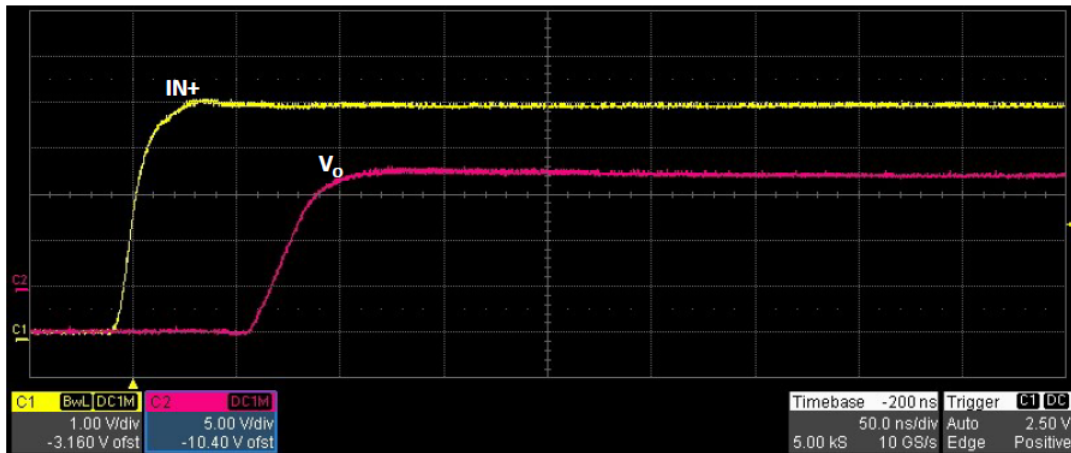


Figure 6 shows the corresponding  $IN+$  and  $V_o$  signals when J1 link is removed and A -5V supply is connected to  $V_{SS}$  terminal at CON2.

Figure 6  $IN+$  and  $V_o$  (TP1) Signals after Removing a J1 Short

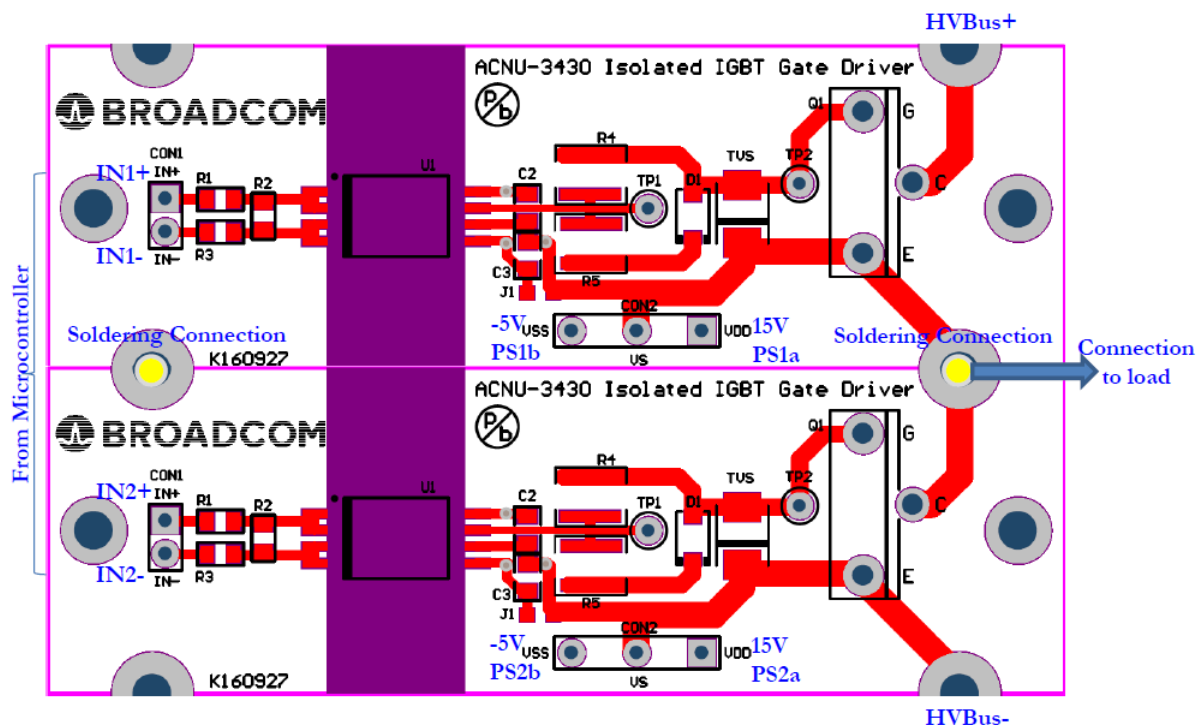


## Half-Bridge Inverter Configuration

The ACNU-3430 evaluation board, as shown in Figure 1, accommodates an ACNU-3430 IC. Therefore, to drive top and bottom arms of the half-bridge inverter, two evaluation boards are required. You can stack the two boards together as shown in Figure 7 (with proper connections). This stacking allows you to easily test the performance of gate driver in an actual application under real-life operating conditions.

**NOTE** As can be seen on the board, the isolation circuitry (at the far left) is easily contained within a small area while maintaining adequate spacing for good voltage isolation and easy assembly.

**Figure 7 Half-Bridge Inverter Configuration by Connecting Two Evaluation Boards**



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