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*i*Coupler ADuM3190 Isolated Error Amplifier Evaluation Board

FEATURES

- **Isolated error amplifier**
- **Stable over time and temperature**
  - **0.5% initial accuracy**
  - **1% accuracy over the full temperature range**
- **For Type II or Type III compensation networks**
- **Reference voltage: 1.225 V**
- **Low power operation: <7 mA total**
- **Wide supply voltage range**
  - **V_{DD1}: 3 V to 20 V**
  - **V_{DD2}: 3 V to 20 V**
- **Bandwidth: 400 kHz**
- **Isolation voltage: 2.5 kV rms**
- **Wide temperature range**
  - **−40°C to +125°C ambient operation**
- **150°C maximum junction temperature**

GENERAL DESCRIPTION

The EVAL-ADuM3190EBZ supports the ADuM3190 isolated error amplifier based on Analog Devices, Inc., *i*Coupler® technology. The ADuM3190 is ideal for linear feedback power supplies with primary side controllers enabling improvements in transient response, power density, and stability as compared to commonly used optocoupler and shunt regulator solutions. Included in the ADuM3190 is a wideband operational amplifier that can be used to set up a variety of commonly used power supply loop compensation techniques. The ADuM3190 is fast enough to allow a feedback loop to react to fast transient conditions and over current conditions. Also included is a high accuracy 1.225 V reference to compare with the supply output set point.

Complete specifications for the ADuM3190 are provided in the ADuM3190 data sheet available from Analog Devices, Inc., and should be consulted in conjunction with this user guide when using the evaluation board.

EVALUATION BOARD

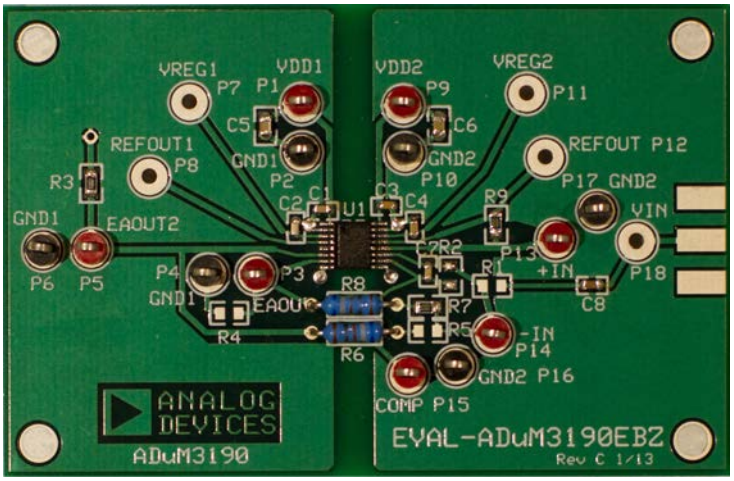

Figure 1. EVAL-ADuM3190EBZ

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REVISION HISTORY

2/13—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

ADuM3190 ISOLATED ERROR AMPLIFIER

The EVAL-ADuM3190EBZ board, shown in Figure 1, can be used to evaluate the performance and data sheet specifications of the ADuM3190. Figure 2 shows the schematic of the EVAL-ADuM3190EBZ circuit which can be used to test the accuracy of the ADuM3190 and perform other tests. The EVAL-ADuM3190EBZ is a 4-layer PC board, complete with ground and power layers as shown in the Evaluation Board Schematics and Artwork section.

EVAL-ADUM3190EBZ SCHEMATIC

Figure 2 shows the ADuM3190 schematic of the EVAL-ADuM3190EBZ evaluation board. U1 is the ADuM3190 in the center of the board and Pin 1 is the top-left pad with respect to the notch in the silkscreen's package outline. C1, C2, C3, and C4 are ceramic 0603 1 µF bypass capacitors provided for proper bypassing of the ADuM3190 internal 3 V regulators on both sides of part. Also added to the board are 10 µF 0805 ceramic capacitors to the VDD1 and VDD2 connections to provide additional bypassing in case long wires are used from power supplies to the evaluation board.

Test point connectors are provided for most of the important connections to pins of the ADuM3190. The following sections describe connections to make to power the EVAL-ADuM3190EBZ and make performance tests.

LEFT-SIDE POWER CONNECTIONS

Connect the left-side external power supply (3 V to 20 V) to P1 (labeled V_{DD1}) and return it to P2 (labeled GND_1).

RIGHT-SIDE POWER CONNECTIONS

Connect the right-side external power supply (3 V to 20 V) to P9 (labeled V_{DD2}) and return it to P10 (labeled GND_2).

ACCURACY TEST CONNECTIONS

In the EVAL-ADuM3190EBZ schematic (see Figure 2), a blue line outlines the EA_{OUT} accuracy circuit. Capacitor C7 (2.2 nF) together with R8 (680 Ω) and R7 (0 Ω) resistors form an integrator circuit to close the loop from the −IN input to the EA_{OUT} output. A ±1% accurate internal reference voltage of 1.225 V at REF_{OUT} is connected to the noninverting op amp input +IN through a 0 Ω resistor, R9, providing the reference for the accuracy test circuit. See Figure 3, ADuM3190 Test Circuit 1, or the ADuM3190 data sheet for more information about the operation of the ADuM3190.

For accuracy tests, add a wire between GND_1 and GND_2 for EA_{OUT} and EA_{OUT2} (see Figure 3). This connection is needed because the accuracy tests connect a 680 Ω resistor across the isolation barrier and creates a current path between the two isolated areas, so a ground return is needed for the accuracy tests. The accuracy of the EA_{OUT} output will be within ±1% of the reference voltage specified value of 1.225 V. Next, the EA_{OUT2} accuracy in Figure 4 (Test Circuit 2) can be performed by removing the R7 (0 Ω) resistor and placing a 0 Ω resistor at R5, completing the EA_{OUT2} circuit. Because the EA_{OUT2} circuit has a high gain and uses the same internal reference voltage to connect to the −IN input of the op amp, the accuracy of the EA_{OUT2} output is also within ±1% of the reference voltage specified value of 1.225 V.

For tests other than the accuracy tests, open the 680 Ω resistor connections by removing R5 and R7 (0 Ω), the C7 integrating capacitor, and the external wire connection made between GND_1 and GND_2. Once completed, other components may be added to the evaluation board per the schematic in Figure 2 to make circuits for other tests such as ADuM3190 data sheet specifications for the op amp, reference, UVLO, output characteristics, or power supply.

EVALUATION BOARD SCHEMATICS AND ARTWORK

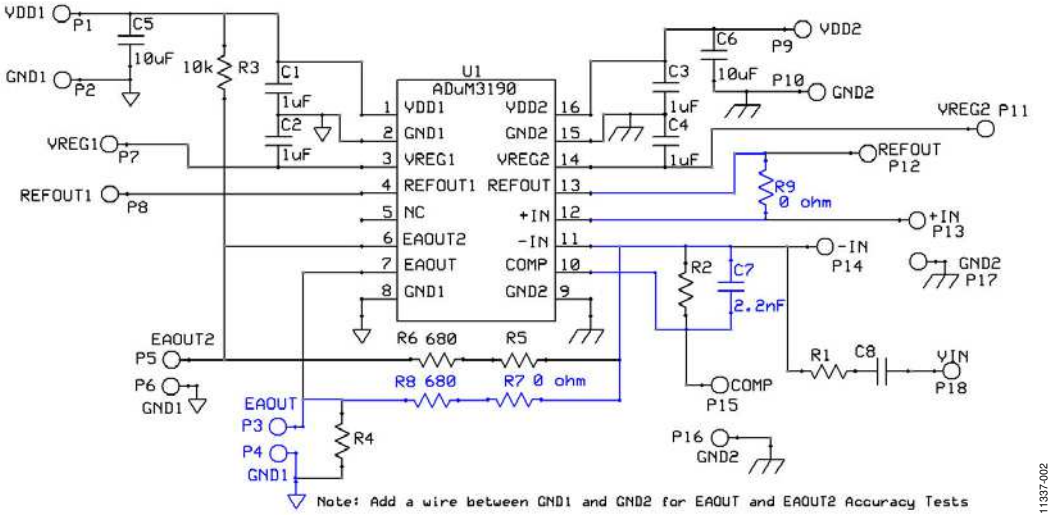

Figure 2. EVAL-ADuM3190EBZ Schematic

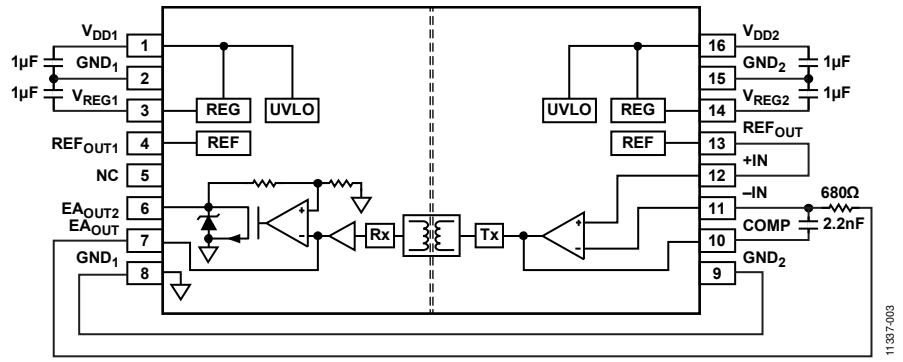

Figure 3. ADuM3190 Test Circuit 1

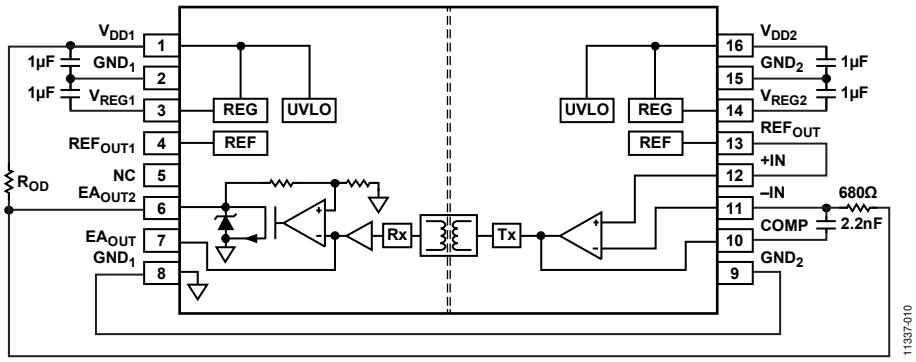

Figure 4. ADuM3190 Test Circuit 2

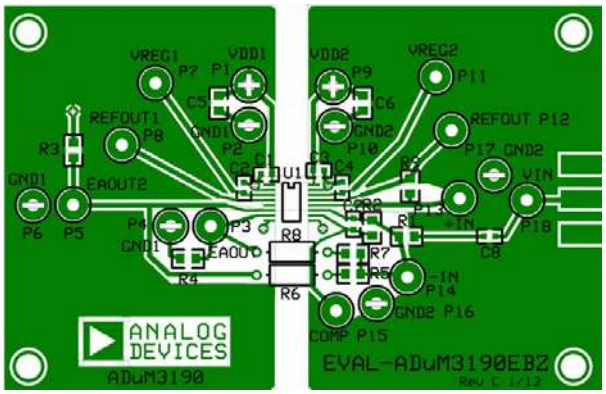

Figure 5. Top Layer—Power Fill

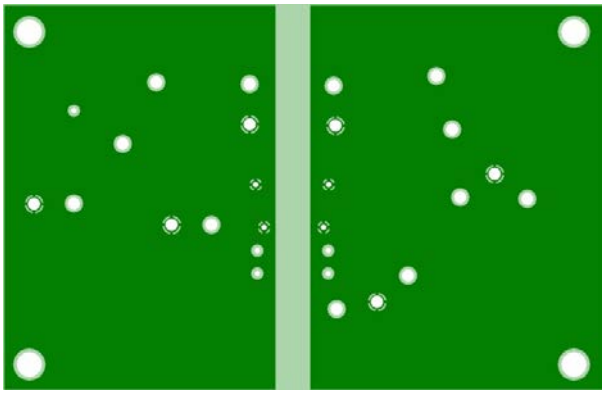

Figure 6. Layer 2—Ground Plane

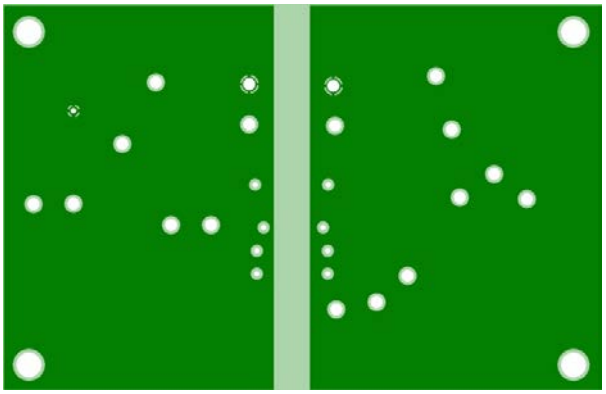

Figure 7. Layer 3—Power Plane

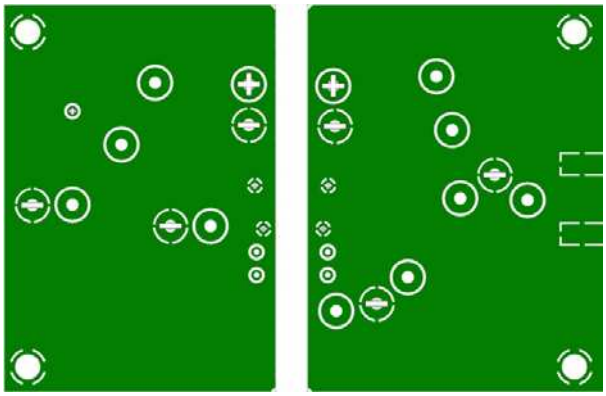

Figure 8. Bottom Layer—Ground Fill

ORDERING INFORMATION

BILL OF MATERIALS

Table 1.

Qty	Reference Designator	Description	Supplier/Part Number
6	P2, P4, P6, P10, P16, P17	TP-104 series test point, black	Components Corp./TP-104-01-00
7	P1, P3, P5, P9, P13, P14, P15	TP-104 series test point, red	Components Corp./TP-104-01-02
1	U1	ADuM3190TRQZ	Analog Devices, Inc.
4	C1, C2, C3, C4	Capacitor ceramic, X7R, SMD, 0603, 1 µF, 20%, 20 V	
2	C5, C6	Capacitor ceramic, X7R, SMD, 0805, 10 µF, 20%, 20V	
1	C7	Capacitor ceramic, X7R, SMD, 0603, 2.2 nF, 20% 16 V	
1	R3	Resistor chip, SMD 0805, 10 kΩ, 1/8 W, 1%	
2	R7, R9	Resistor chip, SMD 0805, 0 Ω, 1/8 W, 1%	
2	R6, R8	Resistor through hole, 680 Ω, 1/4 W, 5%	

NOTES

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.

UG11337-0-2/13(0)

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