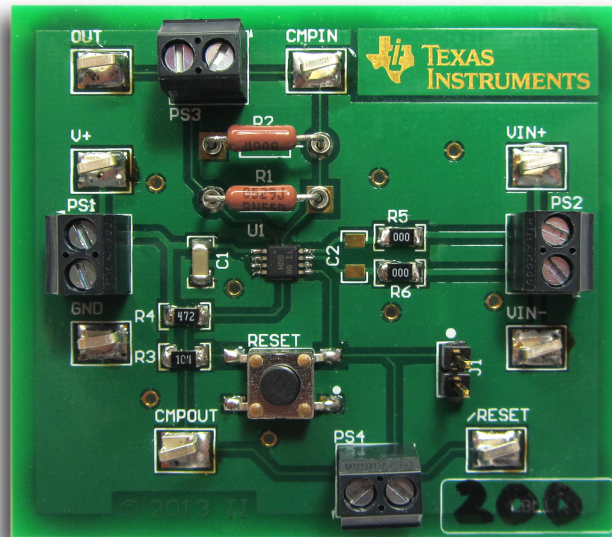


INA200EVM User's Guide



This user's guide describes the characteristics, operation, and use of the INA200EVM evaluation module. It discusses how to set up and configure the software and hardware, and reviews various aspects of the program operation. Throughout this document, the terms evaluation board, evaluation module, and EVM are synonymous with the INA200EVM. This document also includes an electrical schematic, printed circuit board (PCB) layout drawings, and a parts list for the EVM.

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1 Overview

The [INA200](#) is a high-side, current-shunt monitor with an open-drain comparator and reference. The INA200EVM has one PCB. The EVM consists of the INA200 device, screw-terminals and test points for external hardware connections, placeholder pads to add components for filtering, pin-socketed resistors to adjust the comparator input voltage, and a comparator reset button with an optional jumper to hold reset low.

1.1 INA200EVM Kit Contents

[Table 1](#) summarizes the contents of the INA200EVM kit. The included hardware is pictured on the front page. Contact the nearest [Texas Instruments Product Information Center](#) if any component is missing. Make sure to check the [INA200 product folder](#) on the TI web site at www.ti.com for any further information regarding this product.

Table 1. INA200EVM Kit Contents

Item	Quantity
INA200 test board	1

1.2 Related Documentation from Texas Instruments

The following documents provide information regarding Texas Instruments' integrated circuits used in the assembly of the INA200EVM. This user's guide is available from the TI web site under literature number [SBOU135](#). Any letter appended to the literature number corresponds to the document revision that is current at the time of the writing of this document. Newer revisions may be available from the TI web site (<http://www.ti.com>), or call the Texas Instruments' Literature Response Center at (800) 477-8924 or the Product Information Center at (972) 644-5580. When ordering, identify the document by both title and literature number.

Table 2. Related Documentation

Document	Literature Number
INA200 product data sheet	SBOS374

2 INA200EVM Hardware

The INA200EVM requires a 2.7-V to 18-V power supply. Connect the VIN+ and VIN– pins across an external shunt resistor in series with a –16-V to 80-V supply to find the current flowing through that resistor. Use a voltmeter on the OUT pin to measure the voltage output. The comparator input (CMP_IN) is directly connected to the OUT pin through an optional resistor network in order to drive the comparator high and low appropriately for the comparator voltage level.

2.1 Theory of Operation for the INA200EVM

A block diagram of the INA200 test board hardware is shown in [Figure 1](#). The INA200 test board contains four, two-pin headers, giving access to all eight pins of the INA200 for evaluation. Support circuitry is included on the PCB but can be removed or bypassed if needed.

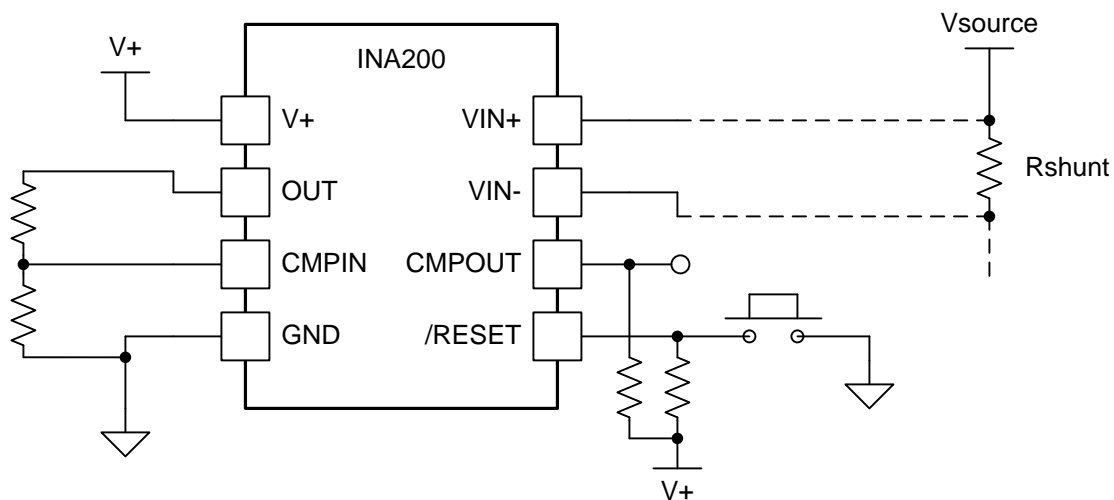


Figure 1. INA200 Test Board Block Diagram

2.2 INA200EVM Features

The INA200EVM provides basic functional evaluation of this device. The fixture layout is not intended to be a model for the target circuit, nor is it laid out for electromagnetic compatibility (EMC) testing.

The layout of the INA200EVM printed circuit board (PCB) is designed to provide the following features:

- Ease of access to all device pins
- Multiple input signal options
- Space for optional input filtering capacitors and resistors
- An adjustable resistor divider from the analog output to the comparator input
- A pushbutton reset for the comparator

The INA200EVM allows connection to both sides of a remote shunt resistor to measure current, or omit the shunt resistor and apply a differential voltage directly to the device input. This flexibility allows testing device operation in a simulated manner, as well as an actual application.

Refer to the [product data sheet](#) for comprehensive information about the [INA200](#), [INA201](#), and [INA202](#) family of devices.

2.3 Quick Start Setup and Use

Follow these procedures to set up and use the INA200EVM:

1. Connect an external dc supply voltage between 2.7 V and 18 V to the PS1 terminal.
2. Connect the desired input to the PS2 terminal. This input is either a remote shunt resistor or a differential voltage source with a common-mode voltage of -16 V to 80 V referenced to GND.

2.4 Voltage Inputs

The PS2 terminal (VIN+ and VIN-) is used to connect to a remote shunt resistor or a differential voltage source. The voltage differential is multiplied by the 20-V/V device gain of the INA200. Other devices in this family are the INA201 with 50-V/V gain, and the INA202 with 100-V/V gain. The full-scale sense input voltage (V_{SENSE}) is defined as $V_{\text{IN+}} - V_{\text{IN-}}$, and has a maximum input of $(V+ - 0.25) / \text{gain}$. V_{SENSE} must be greater than 20 mV for operation in the linear response range of the device.

2.5 Comparator Input, R1, and R2

To take advantage of the onboard comparator in the INA200, connect the analog output through a resistor divider to the comparator input. The negative input of the comparator is internally connected to a 0.6-V reference, and the positive comparator input is connected to the CMPIN pin of the device. Adjust R1 and R2 (shown in [Figure 2](#)) to set the comparator trip point for the intended application, where $\text{CMPIN} = (\text{OUT} \times R2) / (R1 + R2) = 0.6\text{ V}$.

For example, if measuring current across a 10-m Ω shunt resistor, and the comparator must be tripped if an excess of 10 A is measured, then: $10\text{ A} \times 10\text{ m}\Omega = 100\text{ mV}$, and $100\text{ mV} \times 20\text{ V/V gain} = 2\text{ V}$. To divide 2 V down to 0.6 V, select R1 and R2 so that $R2 / (R1 + R2) = 0.3$. A combination that works for this example is $R1 = 5.1\text{ k}\Omega$ and $R2 = 2.2\text{ k}\Omega$.

3 Schematic, PCB Layout, and Bill of Materials

3.1 Schematic

Figure 2 shows the complete schematic of the INA200 test board. R1 and R2 work as a voltage divider of the INA output to the comparator input. R3 is a pull-up resistor for the reset button. R4 is a pull-up resistor for the open-drain comparator output pin. C1 is a bypass capacitor for V+. C2 along with R5 and R6 create an optional filter for the VIN+ and VIN- inputs.

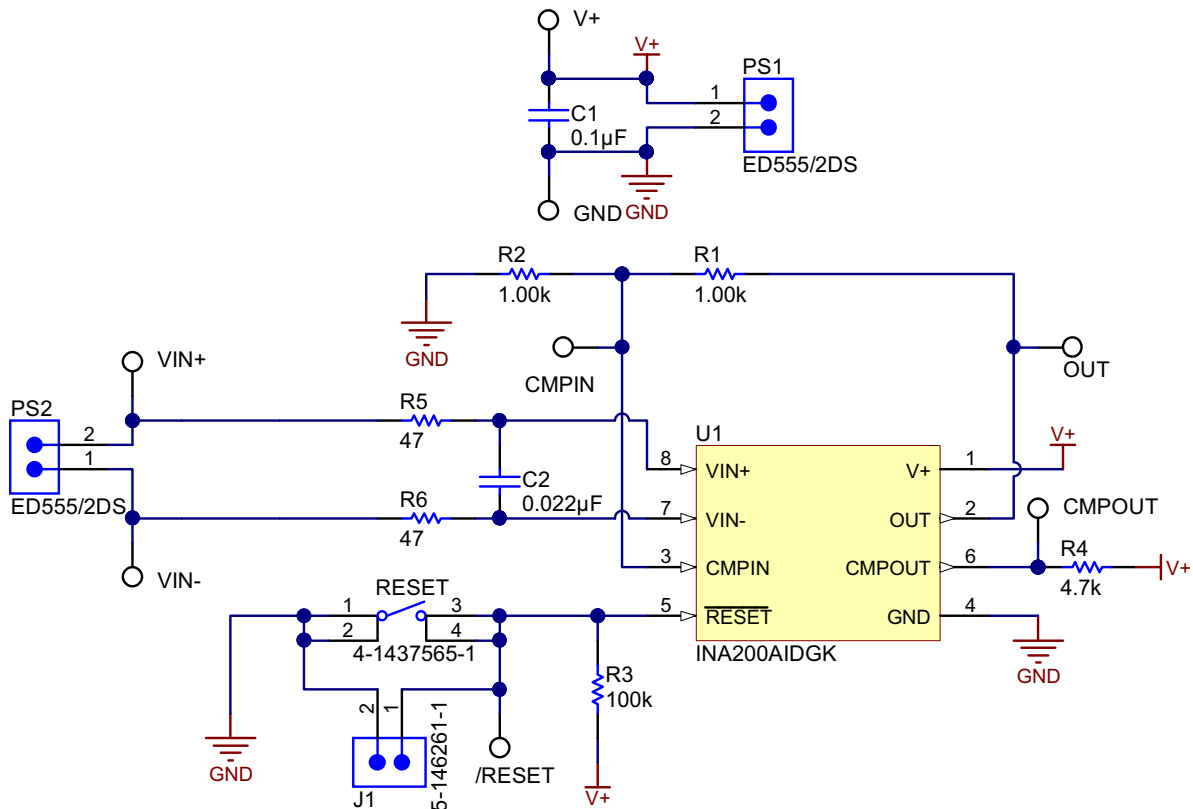


Figure 2. INA200 Test Board Schematic

3.2 PCB Layout

Figure 3 shows the component placement on the INA200EVM test board. There are no components on the bottom layer. Figure 4 and Figure 5 show the top and bottom layers, respectively, of the test board.

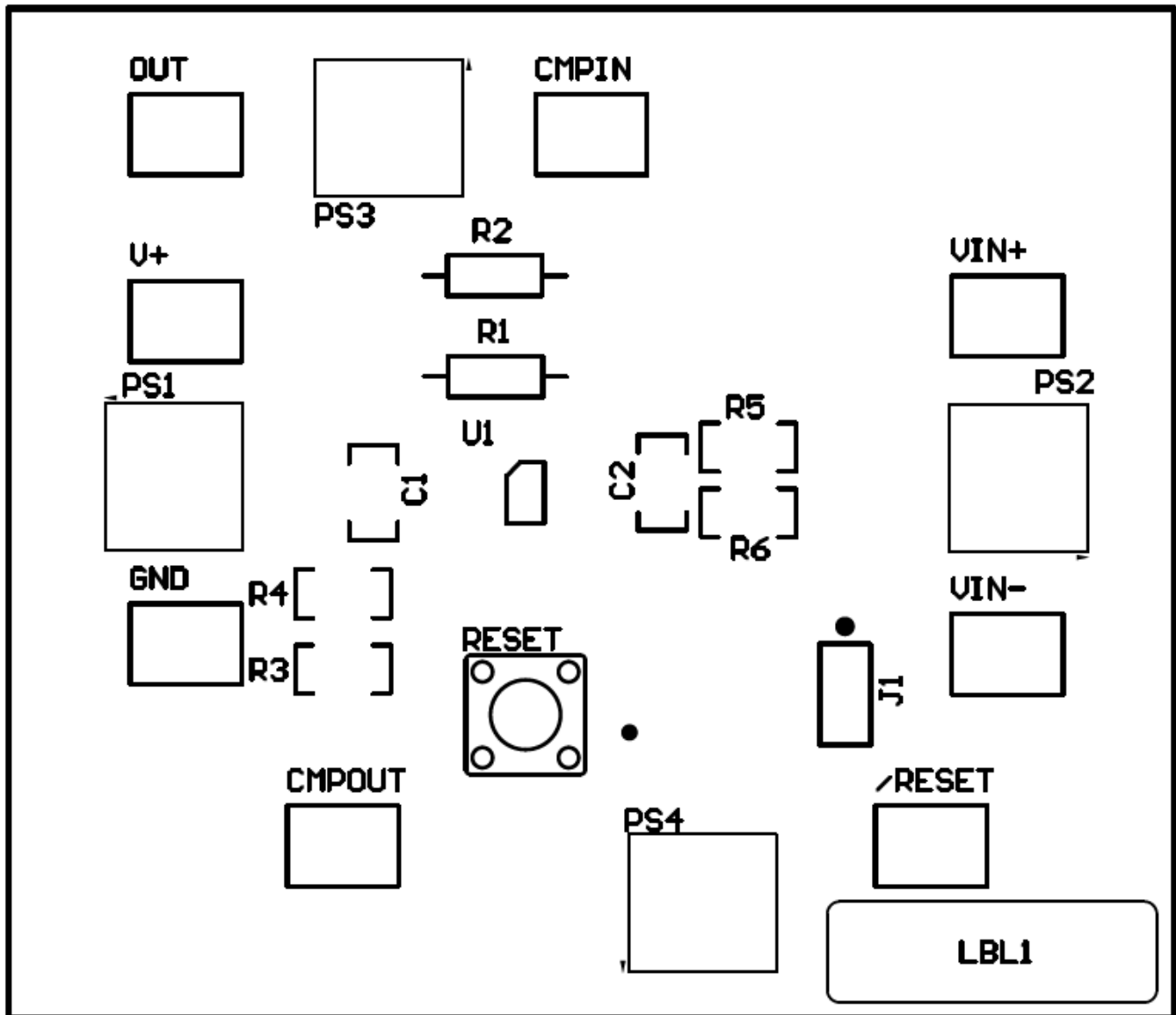


Figure 3. INA200EVM Component Placement

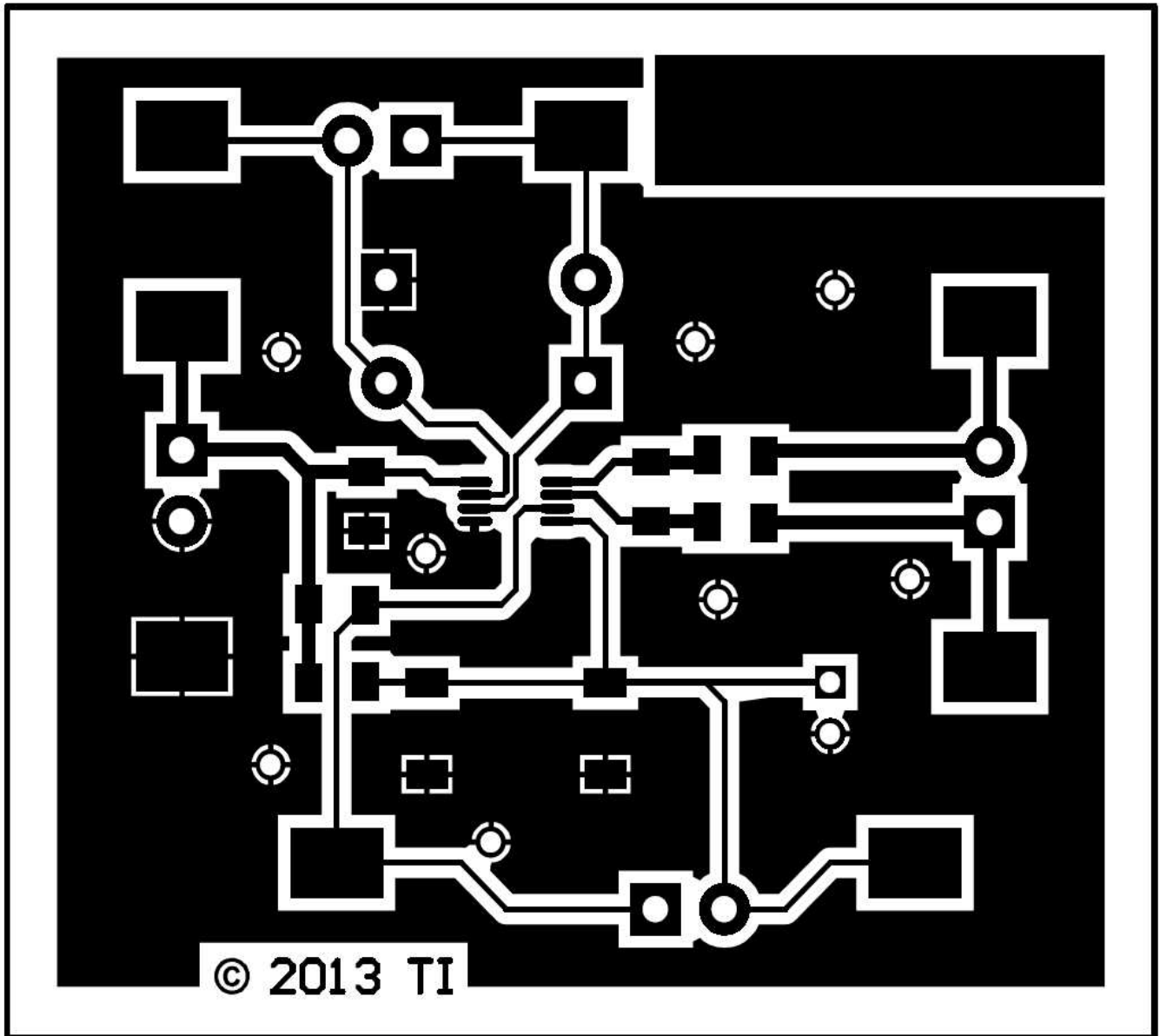


Figure 4. PCB Top Layer

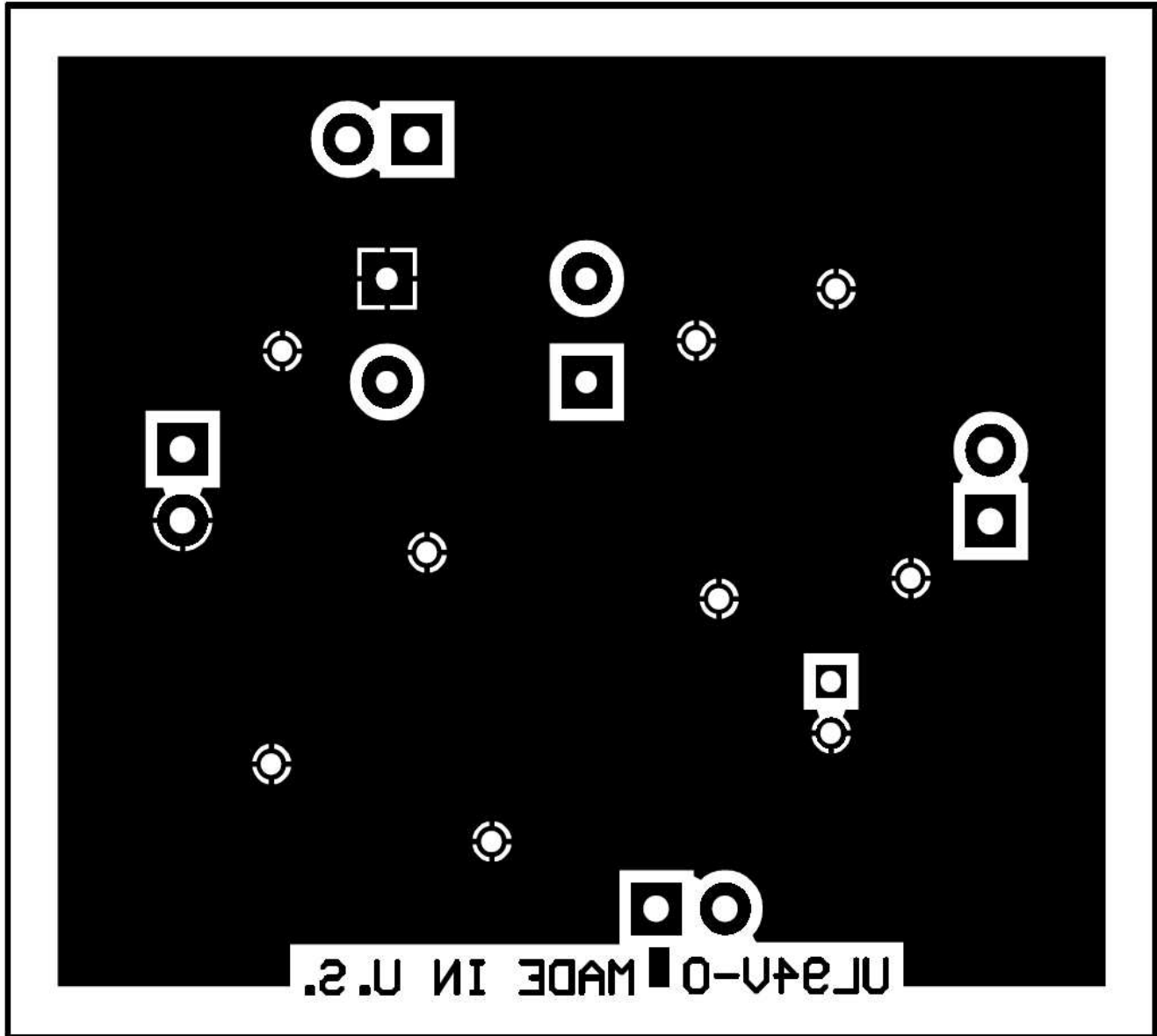


Figure 5. PCB Bottom Layer

3.3 Bill of Materials

Table 3 lists the bill of materials (BOM) for the INA200 test board.

Table 3. INA200 Test Board BOM

Qty	RefDes	Description	Part Number	MFR
8	/RESET, CMPIN, CMPOUT, GND, OUT, V+, VIN+, VIN-	Test Point, Compact, SMT	5016	Keystone
1	C1	CAP, CERM, 0.1uF, 50V, +/-20%, X7R, 1206	12065C104MAT2A	AVX Corp.
4	H1, H2, H3, H4	Bumpon, Hemisphere, 0.375 X 0.235, Black	SJ61A2	3M
1	J1	Header, 100mil, 2x1, Gold plated, TH	5-146261-1	TE Connectivity
4	PS1, PS2, PS3, PS4	Terminal Block, 6A, 3.5mm Pitch, 2-Pos, TH	ED555/2DS	ON Shore Technology
2	R1, R2	RES, 1.00k ohm, 1%, 0.25W, TH	CMF501K0000FHEB	Vishay Dale
4	R1-1, R1-2, R2-1, R2-2	Socket, Mini Spring, Tin, TH	5050935-2	TE Connectivity
1	R3	RES, 100k ohm, 5%, 0.25W, 1206	CRCW1206100KJNEA	Vishay Dale
1	R4	RES, 4.7k ohm, 5%, 0.25W, 1206	CRCW12064K70JNEA	Vishay Dale
2	R5, R6	RES, 0 ohm, 5%, 0.25W, 1206	CRCW12060000Z0EA	Vishay Dale
1	RESET	Switch, Tactile, SPST-NO, 0.05A, 12V, SMT	4-1437565-1	TE Connectivity
1	U1	High-Side Measurement Current-Shunt Monitor with Open-Drain Comparator and Reference, DGK0008A	INA200AIDGK	Texas Instruments

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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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2. Use EVMs only after user obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
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