

ABSTRACT

This user's guide describes the characteristics, operation, and use of the INA183EVM evaluation module (EVM). This EVM is designed to evaluate the performance of the [INA183](#) voltage output current shunt monitors. This document also includes a schematic, reference printed-circuit board (PCB) layouts, and a complete bill of materials.

Table of Contents

1 Trademarks	1
2 Introduction and Overview	2
2.1 INA183.....	2
2.2 INA183EVM.....	2
2.3 Hardware Included.....	3
3 Quick Start Setup and Use	4
3.1 Measurement With Shunt.....	4
3.2 Measurement Without Shunt.....	5
4 INA183EVM Circuit	6
4.1 Rx03.....	6
4.2 Rx01, Rx02, Cx01, Cx02, Cx03.....	6
4.3 U1, U2 and U3.....	6
4.4 Voltage Inputs.....	6
5 INA183EVM Schematic and PCB Layout	7
5.1 Schematic.....	7
5.2 PCB.....	8
6 Bill of Materials	9

1 Trademarks

All trademarks are the property of their respective owners.

2 Introduction and Overview

2.1 INA183

The INA183 devices are voltage output, high-side measurement, zero-drift current shunt monitors. This family of devices has gains that range from 50 V/V to 200 V/V. The voltage developed across the device inputs is amplified by the corresponding gain of the specific device and is presented at the output pin. These devices can sense voltage drops across shunts at common-mode voltages from 2.7 V to 26 V. These devices operate by drawing power from the IN+ pin drawing a maximum of 135 μ A of supply current. The low offset of the zero-drift architecture enables current sensing with maximum drops across the shunt as low as 10-mV full-scale.

The INA183 devices are currently available in an SOT23-5 surface-mount package. [Table 2-1](#) summarizes the available device options.

Table 2-1. INA183 Device Summary

Product	Gain
INA183A1	50
INA183A2	100
INA183A3	200

2.2 INA183EVM

The INA183EVM is intended to provide basic functional evaluation of this device family. 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 INA183EVM printed-circuit board (PCB) is designed to provide the following features:

- Easy handling of the small package
- Easy access to all device pins
- Space for optional input filtering capacitors and resistors
- Space for surface mount shunt resistors
- Evaluation of all gain options through provided device boards

The INA183EVM allows the user to install a shunt resistor, and then connect both the common-mode voltage and load to develop the input voltage, or omit the shunt resistor and apply a differential voltage directly to the device input. This flexibility allows a user to test the device operation in a simulated manner as well as an actual application.

2.3 Hardware Included

The INA183EVM is provided with all INA183 gain versions delivered, as [Figure 2-1](#) shows.

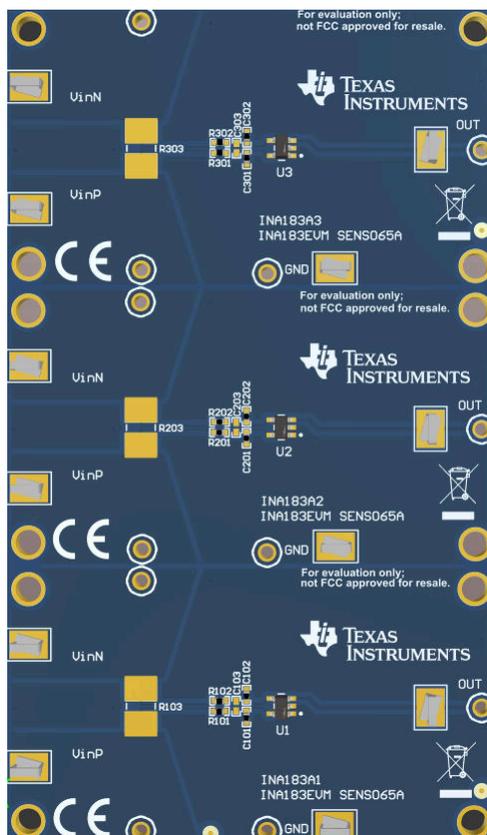


Figure 2-1. Hardware Included With the INA183EVM

The INA183EVM kit is shipped with the following items:

- Three breakaway PCB, one of each for INA183A1, INA183A2, and INA183A3

If any of these items are missing or damaged, please contact the Texas Instruments Product Information Center nearest you to inquire about a replacement.

3 Quick Start Setup and Use

Follow these procedures to set up and use the INA183EVM.

3.1 Measurement With Shunt

This connection method allows the user to install a shunt resistor on the EVM and connect the common-mode voltage and load to incorporate the test device directly into a sample application, as [Figure 3-1](#) shows. To configure a measurement evaluation with a shunt, follow these procedures.

1. Install a shunt resistor into the Rx03 (x=1, 2 or 3) location.
2. Connect the common-mode voltage to the V_{inP} terminal using either the surface mount or through hole test point. Solder test leads on to the test points when necessary for reliable connection.
3. Connect load to the V_{inN} terminal.

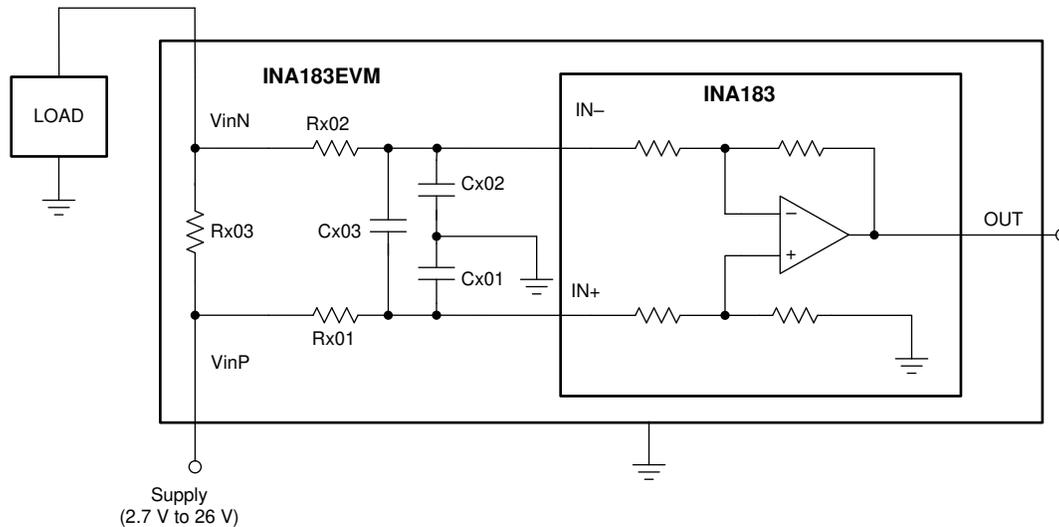


Figure 3-1. Measurement With Shunt

3.2 Measurement Without Shunt

This connection method allows the user to either simulate the voltage developed across a sense resistor based on a given set of system conditions, or to connect the INA183EVM remotely to an existing shunt already included in an example application. [Figure 3-2](#) illustrates a measurement configuration without a shunt.

To configure a measurement evaluation without a shunt, follow these procedures.

1. Connect a differential voltage to V_{inP} and V_{inN} . Ensure that the V_{inP} terminal is the more positive of the two inputs.
2. Measure the output voltage at the OUT terminal.

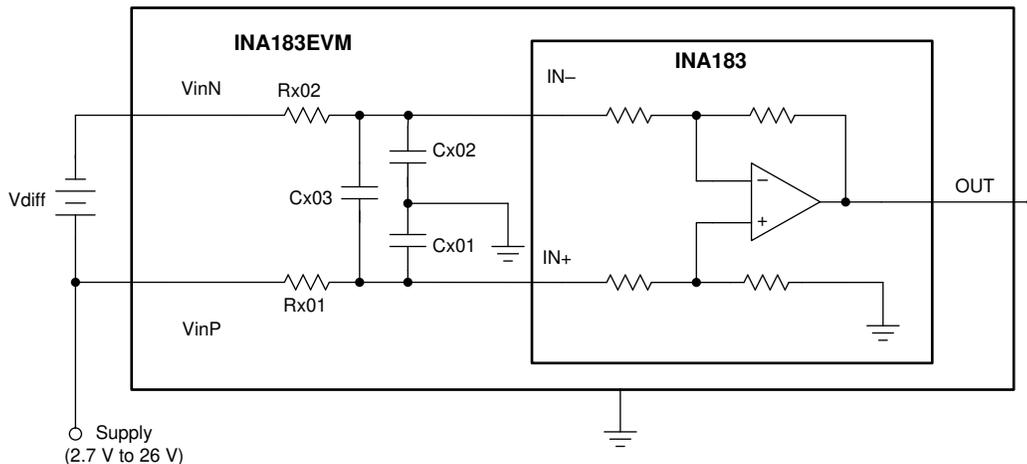


Figure 3-2. Measurement Without Shunt

Note

The output voltage is equal to the gain of the device multiplied by the differential voltage measured directly at the device input pins.

4 INA183EVM Circuit

This section summarizes the INA183EVM components.

4.1 Rx03

Rx03 is intended for surface-mount packages (as [Figure 4-1](#) shows for the INA183A2 section of the EVM). A properly rated shunt resistor can be installed to monitor a current signal. The EVM is not designed to handle significant load current. It may experience significant temperature rise under such load current.

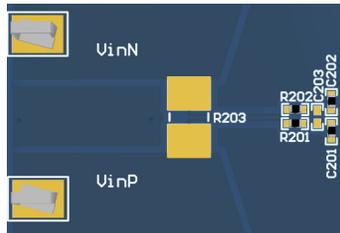


Figure 4-1. Sense Resistor Footprint

4.2 Rx01, Rx02, Cx01, Cx02, Cx03

Rx01 and Rx02 are factory-installed 0-Ω resistors. These resistors, in combination with the capacitors, form an input filter. Cx03 is not installed at the factory.

4.3 U1, U2 and U3

Ux is the device under test. Three device boards are supplied with the INA183EVM kit. Each board is populated with one of the available device gains. This allows users to test the devices and determine the gain setting that is best suited for a given application.

Here is a list of the factors involved in selecting the appropriate device.

- The INA183 devices are identical with the exception of different gain settings.
- The differential input voltage is either applied across the inputs or developed based on the load current that flows through the shunt resistor.
- The limiting factor that requires attention to be given to device selection is the output voltage.
- The selected device must allow the output voltage to remain within the acceptable range after the developed input voltage is amplified by the respective device gain. The output voltage must remain with the range of 50 mV above ground to 200 mV below the supply voltage.
- An output below the minimum allowable output requires the selection of a device with a higher gain. Likewise, an output above the maximum allowable output requires the selection of a device with a lower gain.

4.4 Voltage Inputs

The test points on V_{inP} and V_{inN} terminals are intended to be used if the designer is configuring the EVM for measurement without an onboard shunt resistor (see [Figure 3-2](#)). These inputs accept a differential voltage that is amplified by the selected device gain and is presented at the device output, or OUT terminal. These inputs could also be used to connect the differential voltage developed across an external shunt in an existing circuit. The acceptable differential input voltage range are determined by the supply voltage and gain of the selected device.

The user can configure the EVM for measurement with a shunt resistor (see [Figure 3-1](#)). This requires soldering a surface mount shunt resistor to the EVM. As in the setup for the measurement without a shunt resistor, the input voltage range is determined by the supply voltage and the gain of the selected device.

5 INA183EVM Schematic and PCB Layout

Note

Board layouts are not to scale. These figures are intended to show how the board is laid out; they are not intended to be used for manufacturing INA183EVM PCBs.

5.1 Schematic

Figure 5-1 shows the schematic for the INA183A1 section of the EVM. The schematics for A2 and A3 are identical.

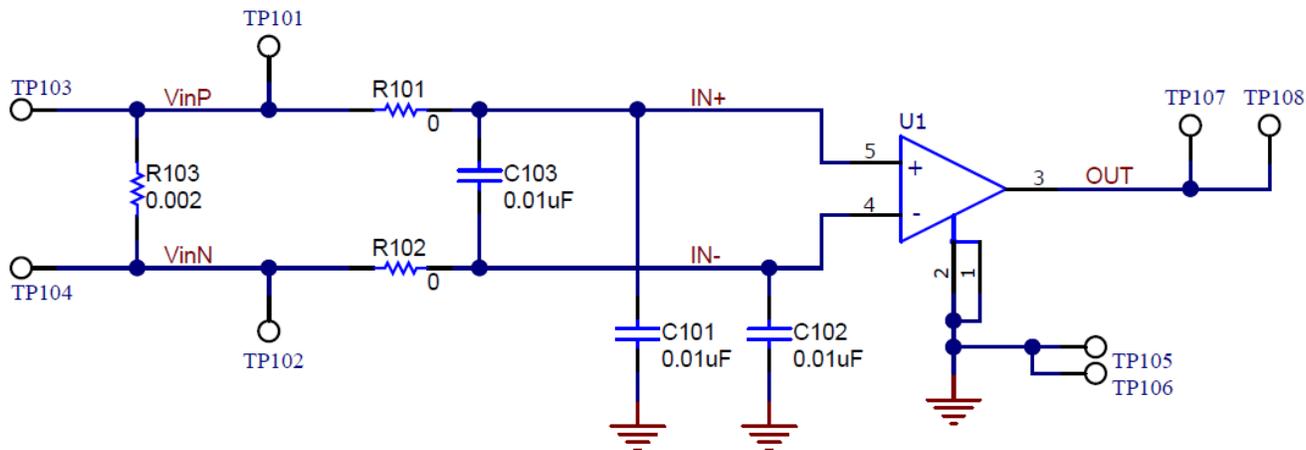


Figure 5-1. INA183EVM Schematic

5.2 PCB

Figure 5-2 illustrates the PCB and assembly for the INA183A1 section of the EVM.

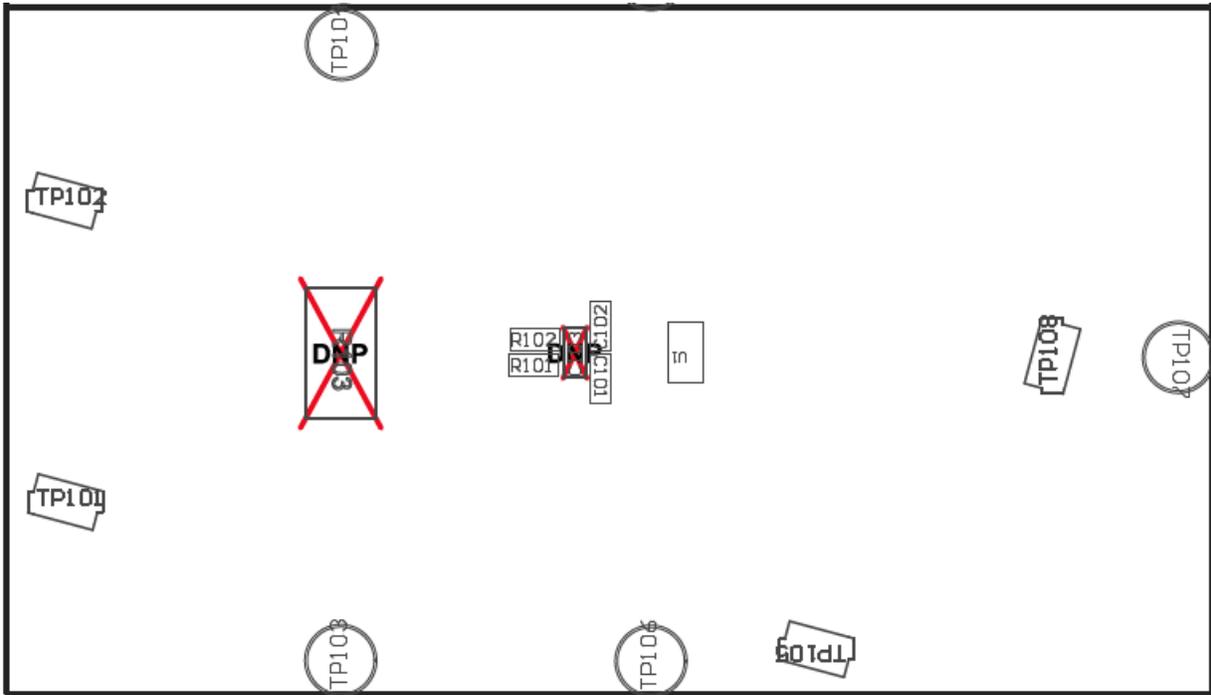


Figure 5-2. INA183EVM PCB

6 Bill of Materials

Table 6-1 provides the parts list for the INA183EVM.

Table 6-1. Bill of Materials

Count	RefDes	Value	Description	Part Number	MFR
6	C101,C102 C201,C202 C301,C302	0.01 uF	CAP, CERM, 0.01 uF, 100 V, +/- 10%, X7S, AEC-Q200 Grade 1, 0402	CGA2B3X7S2A103K050BB	TDK
4	H9, H10, H11, H12		Bumpon, Hemisphere, 0.375 X 0.235, Black	SJ61A2	3M
6	R101,R102,R201,R202, R301, R302	0Ω	RES, 0, 5%, 0.1 W, 0402	ERJ-2GE0R00X	Panasonic
12	TP101,TP102,TP105, TP108,TP201,TP202, TP205,TP208,TP301, TP302, TP305, TP308		Test Point, Compact, SMT	5016	Keystone
3	U1, U2, U3		INA183A1, INA183A2, INA183A4,	High side current sense amplifier	Texas Instruments
0	C103, C203, C303	0.01 uF	CAP, CERM, 0.01 uF, 100 V, +/- 10%, X7S, AEC-Q200 Grade 1, 0402	CGA2B3X7S2A103K050BB	TDK
0	R103, R203, R303	2mΩ	RES, 0.002, 1%, 3 W, AEC-Q200 Grade 0, 2512	CRE2512-FZ-R002E-3	Bourns
0	TP103,TP104, TP106,TP107, TP203,TP204, TP206,TP207, TP303,TP304, TP306, TP307		Test Point, Multipurpose, White, TH	5012	Keystone

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2022, Texas Instruments Incorporated