

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.

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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.

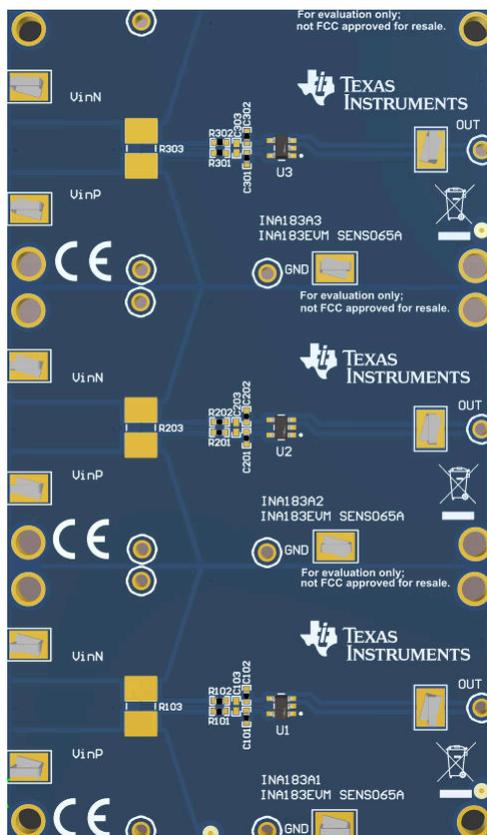


Figure 2-1. Hardware Included With the INA183EVM

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.

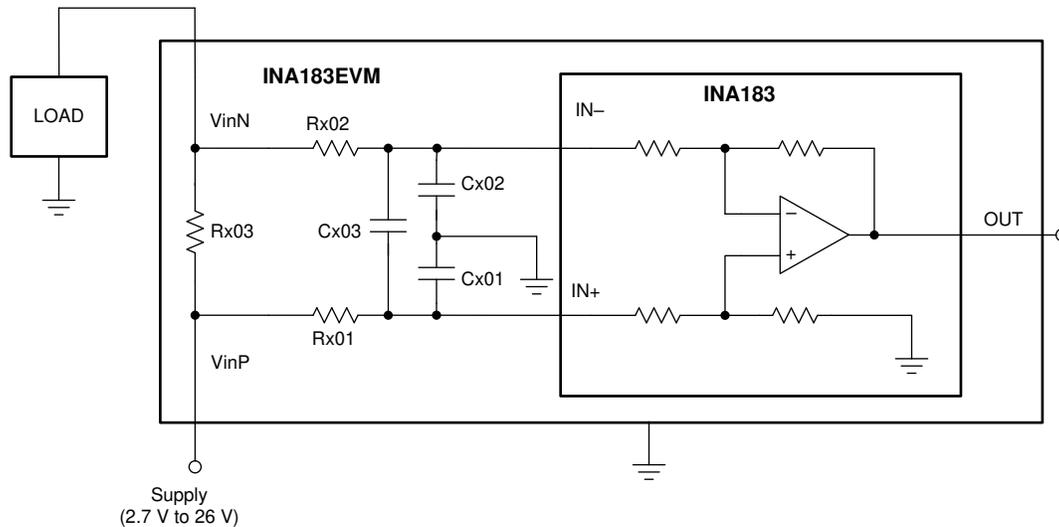


Figure 3-1. Measurement With Shunt

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.

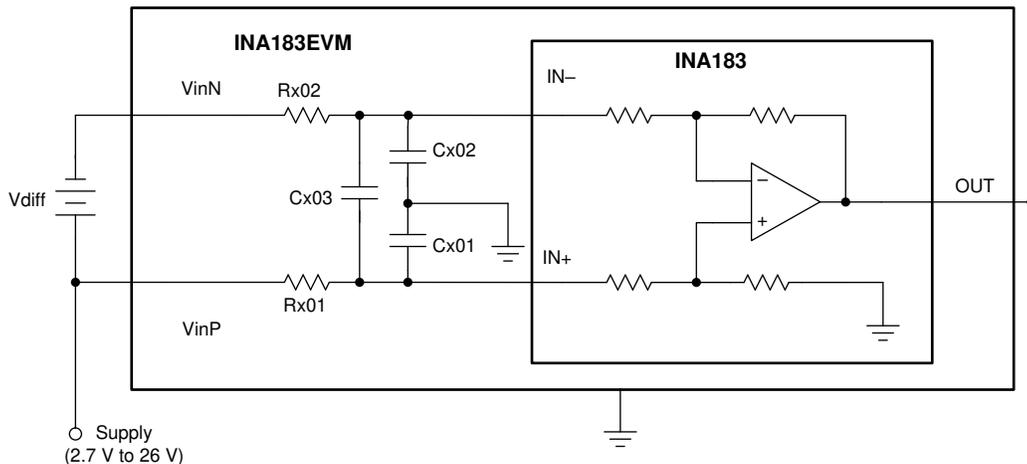


Figure 3-2. Measurement Without Shunt

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.

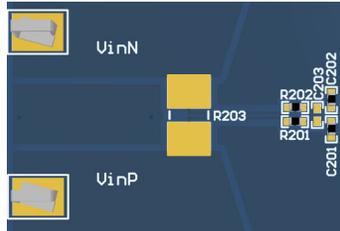


Figure 4-1. Sense Resistor Footprint

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.

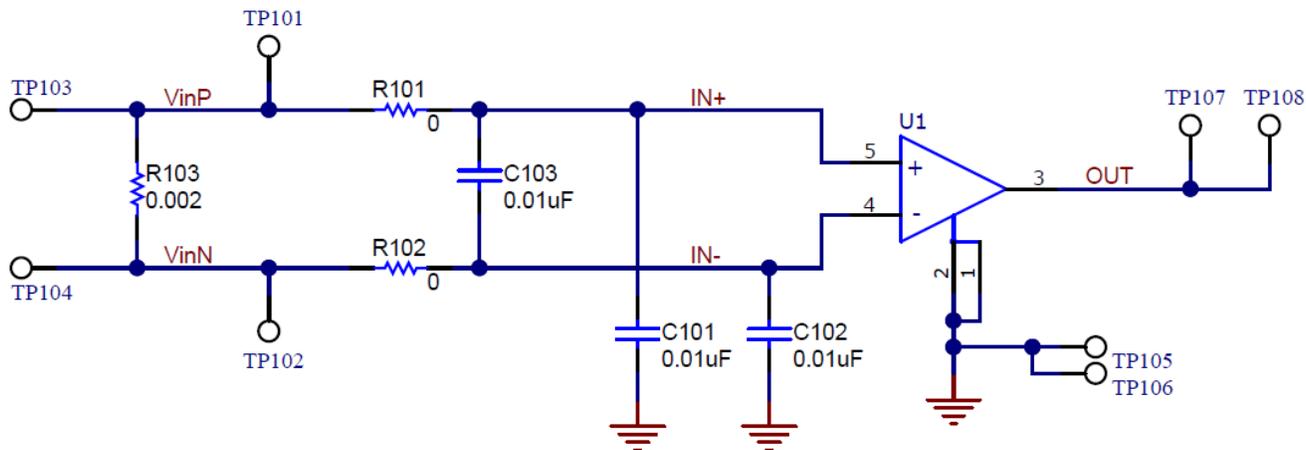


Figure 5-1. INA183EVM Schematic

5.2 PCB

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

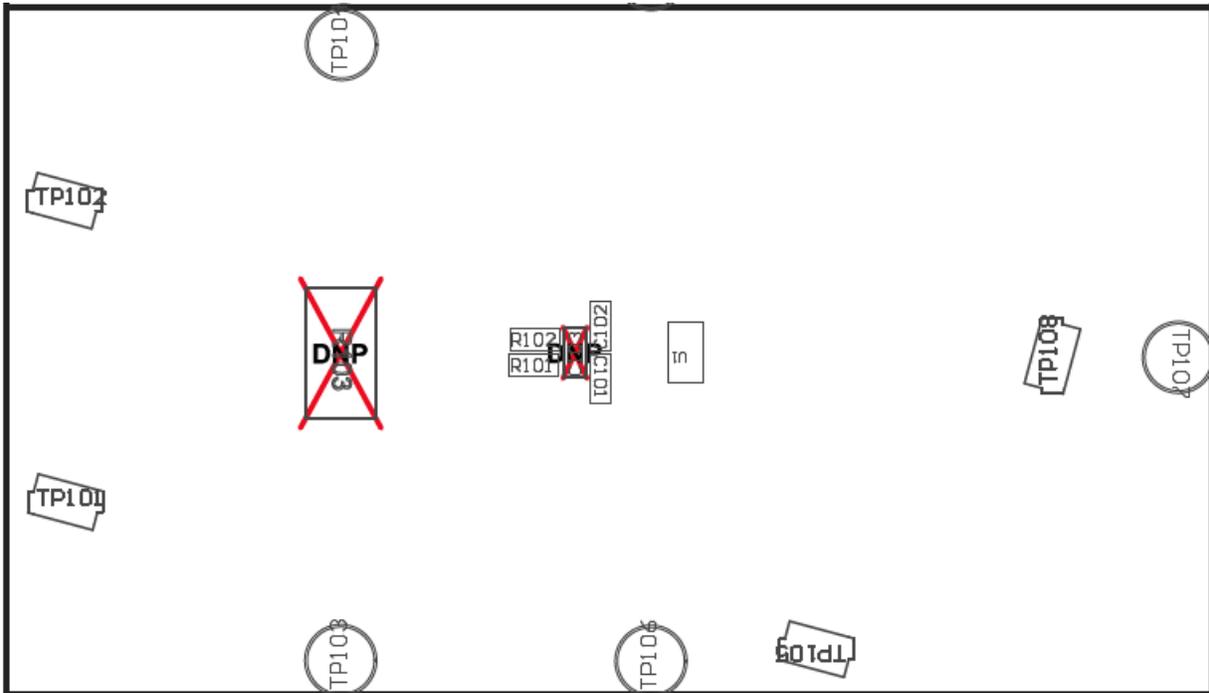


Figure 5-2. INA183EVM PCB

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

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User shall operate the Evaluation Kit within TI's recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI's recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI's instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

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3 Regulatory Notices:

3.1 United States

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FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

3.1.2 For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:

CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- 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.

3.2 Canada

3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

3.3 Japan

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page

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If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
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
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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