参考資料

TEXAS INSTRUMENTS

INA183
JAJSL62 – FEBRUARY 2021

INA183 2.7V～26V 高精度電流検出アンプ

1 特長

- 広い同相電圧範囲：2.7V～26 V
- オフセット電圧：±170μV (最大値)
  (10mV フルスケールのシャント電圧降下に対応)
- 精度：
  - ゲイン誤差±0.4% (温度域全体での最大値)：
  - オフセット・ドリフト 0.5μV/℃ (最大値)
  - ゲイン・ドリフト 10ppm/℃ (最大値)
- 選択可能なゲイン
  - INA183A1：50V/V
  - INA183A2：100V/V
  - INA183A3：200V/V
- 静止電流：130μA 以下
- パッケージ：5 ピン SOT-23

2 アプリケーション

- サーバー
- 電源
- バッテリ管理
- 通信機器

3 概要

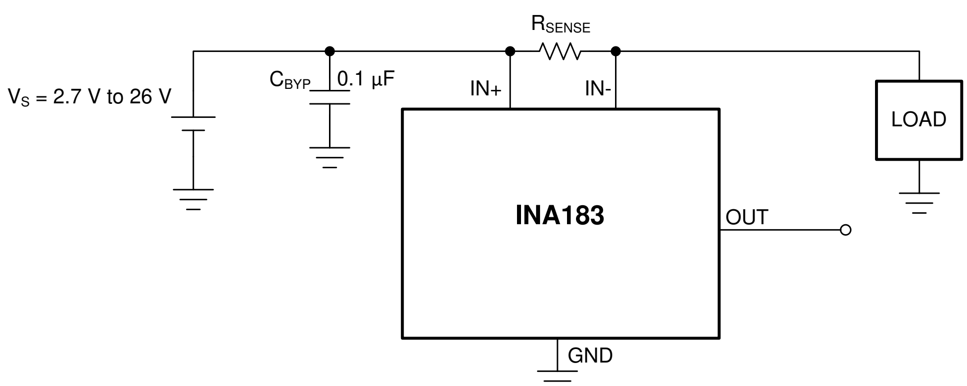
INA183 は高精度、電圧出力の電流シャント・モニタ (別称：電流センス・アンプ) です。通常、過電流からの保護、システム最適化を行うための高精度の電流測定、または閉ループ帰還回路などに使用されます。このデバイスにより、シャント抵抗両端での電圧降下を、同相電圧が 2.7 V～26 V の範囲で検出できます。以下の 3 種類の固定ゲインが使用できます：50 V/V、100V/V、200V/V。ゼロドリフト・アーキテクチャの低いオフセットにより、シャントでの電圧降下が 10mV フルスケール (最大) のレベルでも、電流センシングを可能にしています。

このデバイスは、IN+ ピンから最大 130μA の電源電流を引き込むことで動作します。すべてのバージョンについて、-40℃～125℃での動作が規定されており、5 ピンの SOT-23 パッケージで供給されます。

製品情報(1)

部品番号	パッケージ	本体サイズ (公称)
INA183	SOT-23 (5)	2.90mm × 1.60mm

(1) 利用可能なパッケージについては、このデータシートの末尾にある注文情報を参照してください。



代表的なアプリケーション

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4 Revision History

資料番号末尾の英字は改訂を表しています。その改訂履歴は英語版に準じています。

DATE	VERSION	NOTES
February 2021	*	Initial Release.

5 Device Comparison

表 5-1. Device Comparison

PRODUCT	GAIN
INA183A1	50
INA183A2	100
INA183A3	200

6 Pin Configuration and Functions

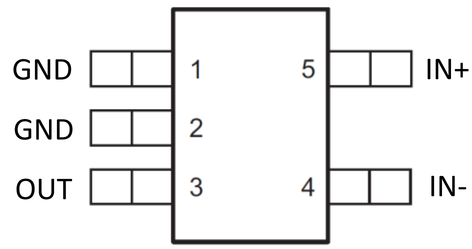


図 6-1. DBV Package 5-Pin SOT-23 Top View

表 6-1. Pin Functions

PIN		I/O	DESCRIPTION
NAME	SOT-23		
GND	1, 2	Analog	Device ground. Both pins must be connected to ground.
IN–	4	Analog input	Connect to load side of shunt resistor.
IN+	5	Analog input	Connect to supply side of shunt resistor.
OUT	3	Analog output	Output voltage.

7 Specifications

7.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
Analog inputs, , IN+, IN– [1]	Differential (V_{IN+}) – ($V_{IN–}$)	GND – 0.3	26	V
	Common-mode [2]	GND – 0.3	26	V
Output [2]		GND – 0.3	(IN+) + 0.3	V
Operating temperature		–55	150	°C
Junction temperature			150	°C
Storage temperature, T_{stg}		–65	150	°C

(1) V_{IN+} and $V_{IN–}$ are the voltages at the IN+ and IN– terminals, respectively.
(2) Input voltage at any terminal may exceed the voltage shown if the current at that terminal is limited to 5 mA.

7.2 ESD Ratings

			MIN	MAX	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001[1]		±3500	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101[2]		±1000	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

7.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

		MIN	NOM	MAX	UNIT
V_S	Supply voltage range, voltage at IN+ pin	2.7	12	26	V
T_A	Operating free-air temperature	–40		125	°C

7.4 Thermal Information

THERMAL METRIC [1]		INA183	UNIT
		DBV (SOT-23)	
		5 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	164.2	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	60.1	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	36.6	°C/W
Ψ_{JT}	Junction-to-top characterization parameter	10.3	°C/W
Ψ_{JB}	Junction-to-board characterization parameter	36.3	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	N/A	°C/W

(1) For more information about traditional and new thermal metrics, see the Semiconductor and IC Package Thermal Metrics application report.

7.5 Electrical Characteristics

at T_A = 25 °C, $V_{SENSE} = V_{IN+} – V_{IN–}$, and V_{IN+} = 12 V, unless otherwise noted.

PARAMETER			CONDITIONS	MIN	TYP	MAX	UNIT
INPUT							
V_{CM}	Common-mode input range		T_A = –40 °C to +125 °C	2.7		26	V
CMRR	Common-mode rejection ratio		V_{IN+} = 2.7 V to 26 V, V_{SENSE} = 10 mV, T_A = –40 °C to +125 °C	100	120		dB
V_{OS}	Offset voltage, RTI (1)		V_{CM} = 12 V		±25	±170	μV
dV_{OS}/dT	RTI vs temperature		T_A = –40 °C to +125 °C		0.1	0.5	μV/°C
I_{IB}	Input bias current (IB-)		V_{SENSE} = 0 mV		30	40	μA
OUTPUT							
G	Gain	A1 devices			50		V/V
		A2 devices			100		V/V
		A3 devices			200		V/V
E_G	Gain error		V_{OUT} = 0.5 V to V_{IN+} – 0.5 V, T_A = –40 °C to +125 °C		±0.1%	±0.4%	
	Gain error vs temperature		T_A = –40 °C to +125 °C		3	10	ppm/°C
	Nonlinearity error		V_{OUT} = 0.5 V to V_{IN+} – 0.5 V		±0.01%		
	Maximum capacitive load		No sustained oscillation		1		nF
VOLTAGE OUTPUT							
V_{SP}	Swing to IN+		R_L = 10 kΩ to GND, T_A = –40 °C to +125 °C		(V_{IN+}) – 0.05	(V_{IN+}) – 0.2	V
V_{SN}	Swing to GND		R_L = 10 kΩ to GND, V_{IN+} - V_{IN-} = -10 mV, T_A = –40 °C to +125 °C		(V_{GND}) + 0.005	(V_{GND}) + 0.05	V
FREQUENCY RESPONSE							
BW	Bandwidth	A1 devices	C_{LOAD} = 10 pF		80		kHz
		A2 devices	C_{LOAD} = 10 pF		30		kHz
		A3 devices	C_{LOAD} = 10 pF		14		kHz
SR	Slew rate				0.4		V/μs
NOISE, RTI (1)							
	Voltage noise density				25		$nV/\sqrt{Hz}$
POWER SUPPLY							
I_Q	Quiescent current, (IN+)		V_{SENSE} = 0 mV		83	130	μA
	I_Q over temperature		T_A = –40 °C to +125 °C			140	μA

(1) RTI = referred-to-input.

7.6 Typical Characteristics

T_A = 25 °C, V_S = V_{IN+} = 12 V (unless otherwise noted)

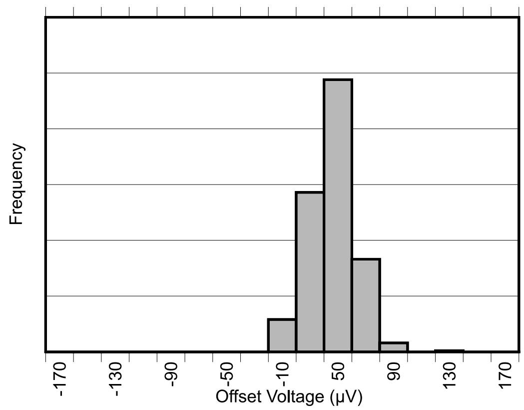


図 7-1. Input Offset Voltage Production Distribution

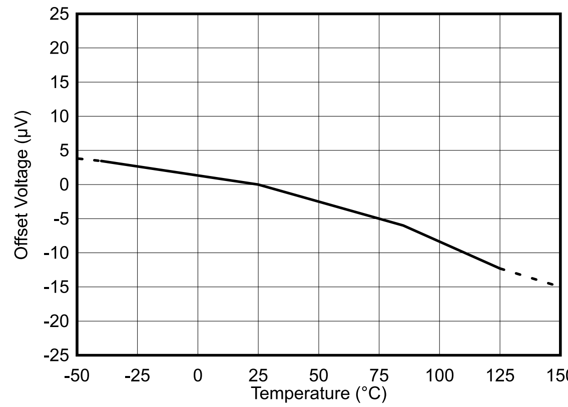


図 7-2. Offset Voltage vs. Temperature

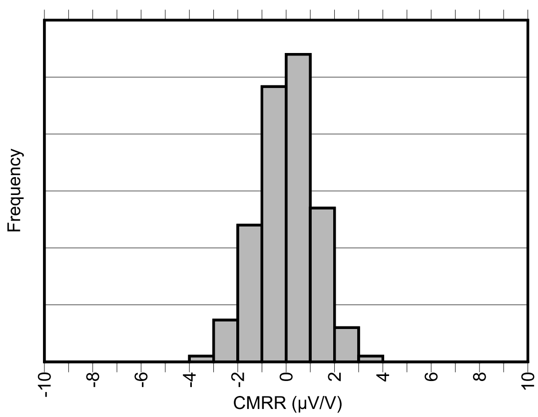


図 7-3. Common-Mode Rejection Production Distribution (A1 Devices)

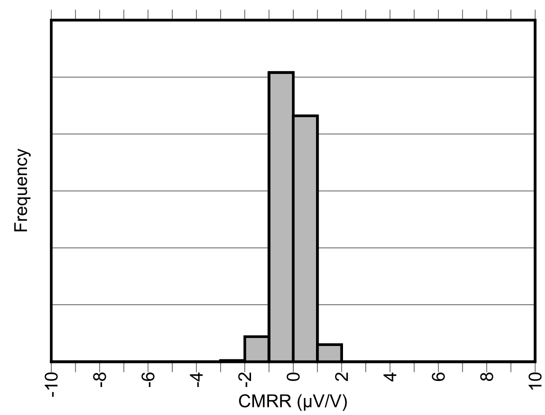


図 7-4. Common-Mode Rejection Production Distribution (A2 Devices)

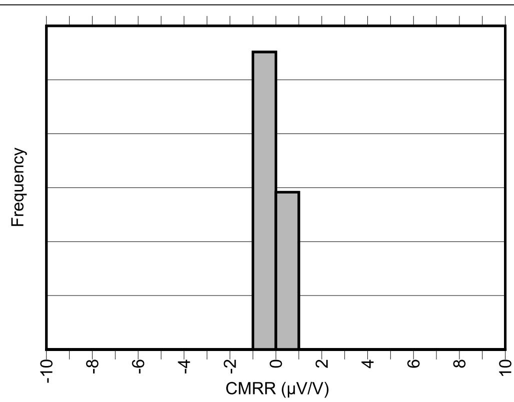


図 7-5. Common-Mode Rejection Production Distribution (A3 Devices)

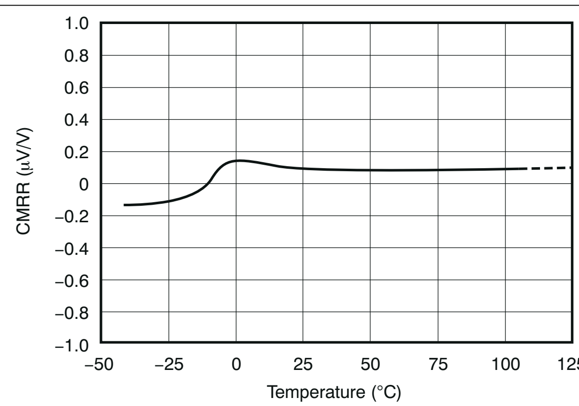


図 7-6. Common-Mode Rejection Ratio vs. Temperature

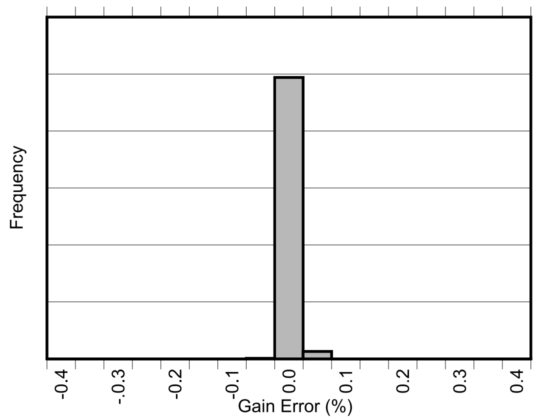


図 7-7. Gain Error Production Distribution (A1 Devices)

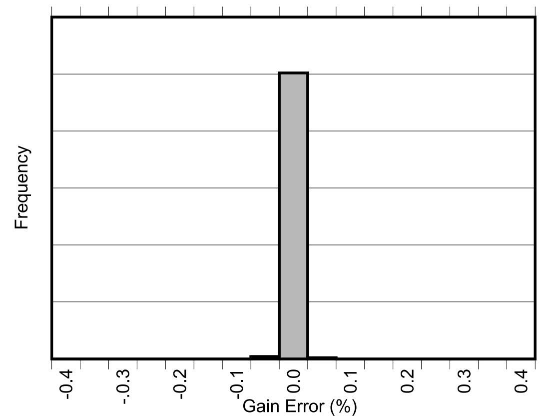


図 7-8. Gain Error Production Distribution (A2 Devices)

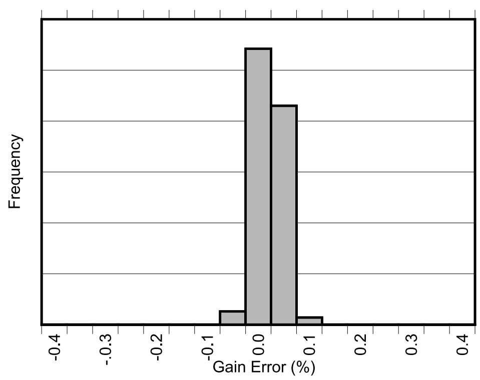


図 7-9. Gain Error Production Distribution (A3 Devices)

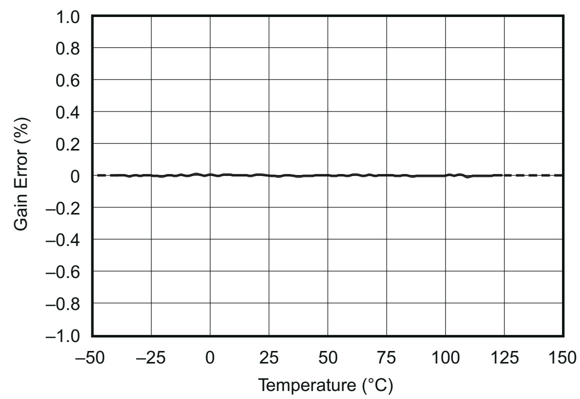


図 7-10. Gain Error vs. Temperature

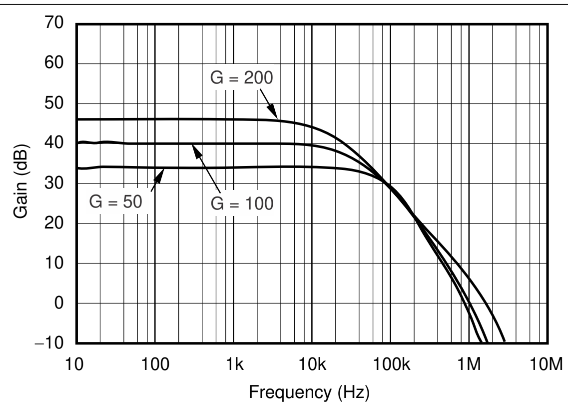


図 7-11. Gain vs. Frequency

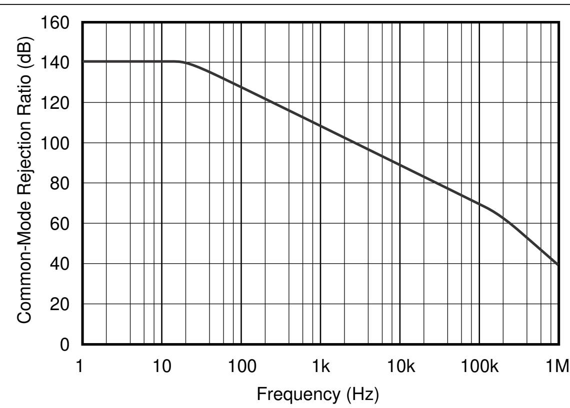


図 7-12. Common-Mode Rejection Ratio vs. Frequency

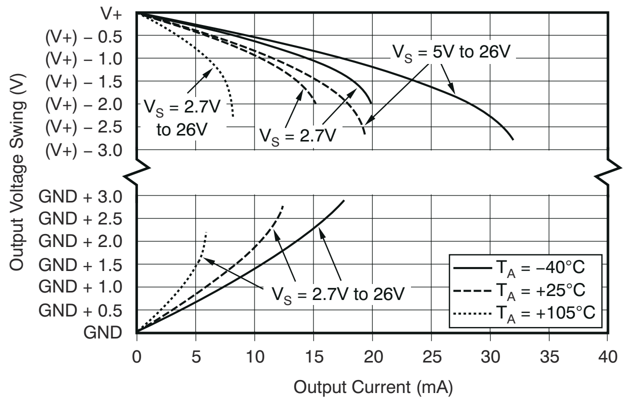


図 7-13. Output Voltage Swing vs. Output Current

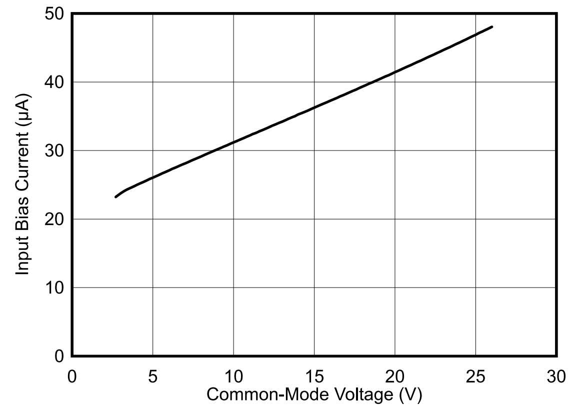


図 7-14. Input Bias Current vs. Common-Mode Voltage

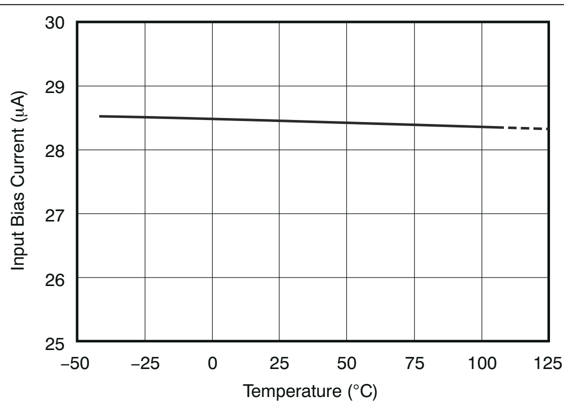


図 7-15. Input Bias Current vs. Temperature

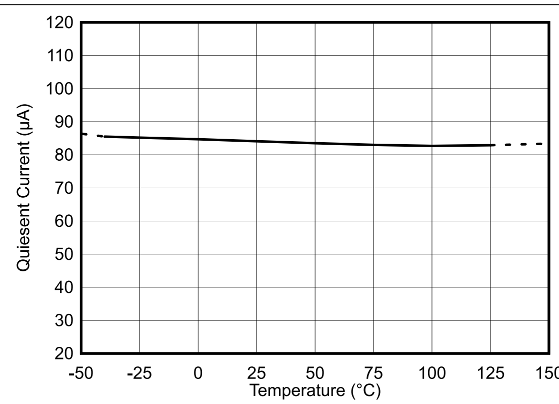


図 7-16. Quiescent Current vs. Temperature

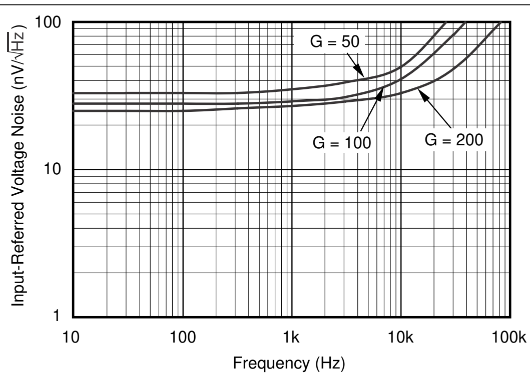


図 7-17. Input-Referred Voltage Noise vs. Frequency

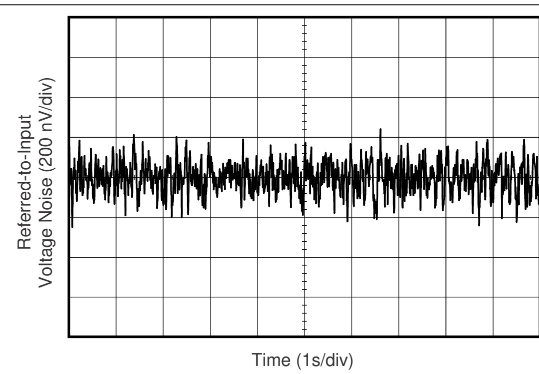


図 7-18. 0.1-Hz to 10-Hz Voltage Noise (Referred-to-Input)

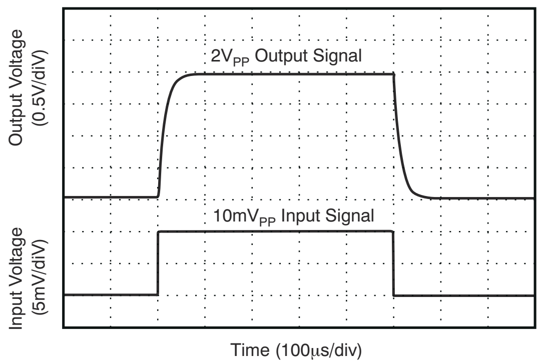


図 7-19. Step Response (10-mV$_{PP}$ Input Step)

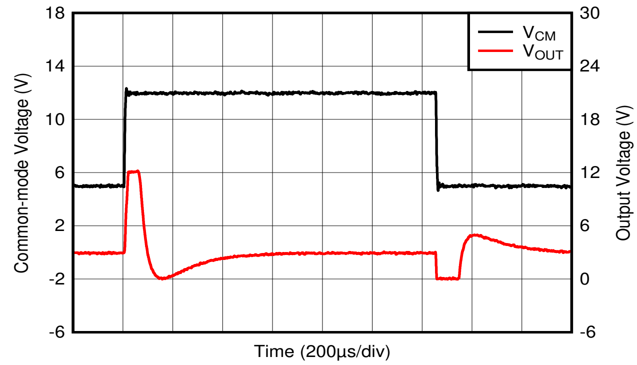


図 7-20. Common-Mode Voltage Transient Response

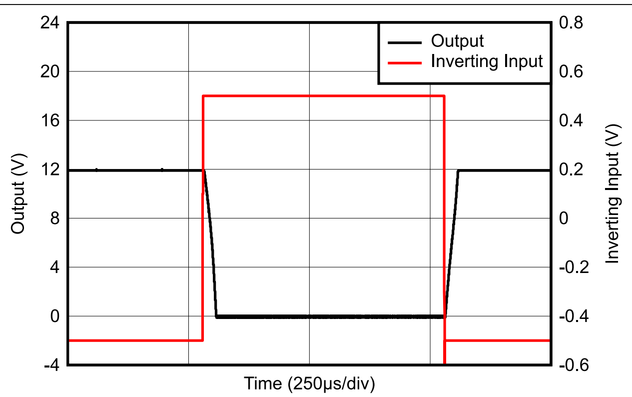
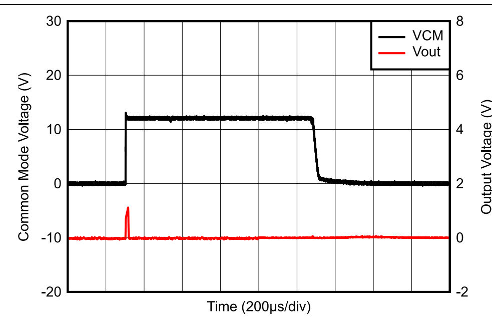


図 7-21. Inverting Differential Input Overload



V_{DIFF} = 0 V V_{CM} = 12-V Pulse

図 7-22. Start-Up Response

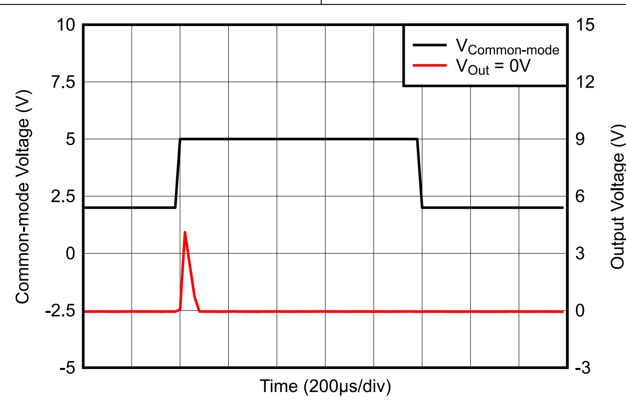


図 7-23. Brownout Recovery

8 Detailed Description

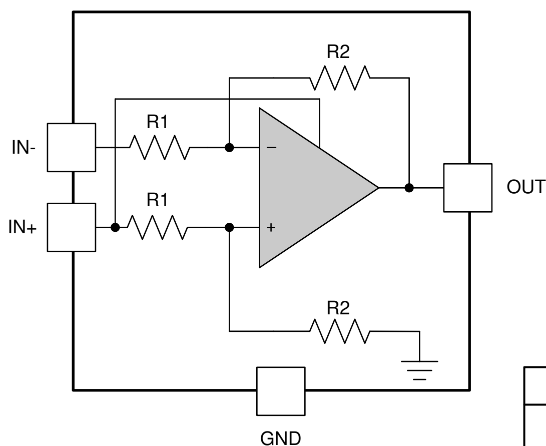
8.1 Overview

The INA183 is a 26-V common-mode, zero-drift topology, current-sensing amplifier meant for high-side, current-sensing applications. The device is a specially-designed, current-sensing amplifier that can accurately measure voltages developed across a current-sensing resistor. The device is capable of measuring current on input voltage rails as high as 26 V and as low as 2.7 V.

The zero-drift topology enables high-precision measurements with maximum input offset voltages as low as 170 µV with a maximum temperature contribution of 0.5 µV/°C over the full temperature range of –40 °C to +125 °C.

8.2 Functional Block Diagram

The simplified functional diagram below shows the device power is provided by the voltage on the IN+ pin. This diagram also shows the nominal values for the internal gain set resistors. The nominal value of these resistors can vary by 20% or more; however, the matching between these resistors is tightly controlled. The matching of these internal resistors results in a precise fixed gain that varies very little over temperature.



DEVICE	GAIN	R1	R2
INA183A1	50	20 kΩ	1 MΩ
INA183A2	100	10 kΩ	1 MΩ
INA183A3	200	5 kΩ	1 MΩ

8.3 Feature Description

8.3.1 Single-Supply Operation from IN+

The INA183 does not have a dedicated power-supply. Instead, an internal connection to the IN+ pin serves as the power supply for this device. This allows the device to be used in applications where lower voltage or sub-regulated supply rails are not present. The operational voltage range on this pin is 2.7 V to 26 V and is designed for power-supply applications. The maximum current drawn from the IN+ pin is 130 µA, when the current sense voltage is zero.

8.3.2 Low Gain Error and Offset Voltage

The maximum gain error of the INA183 is 0.4% and is specified over the full operational temperature range. The low gain error allows for accurate measurements as the sense voltage increases, and is designed for applications that need to detect overcurrent conditions accurately. The offset voltage of the INA183 is specified to be ±170 µV for all gain options. The low offset voltage allows for increased accuracy when the sense voltage is small or allows for reduction in the size of the current sense resistor with less impact on the total measurement accuracy. Smaller value resistors reduce the power loss in the application which allows the use of lower wattage resistors that are generally lower cost.

8.3.3 Low Drift Architecture

The INA183 features low drift for both the gain error and offset voltage specifications. The low gain error drift of 10 PPM/ºC results from the well matched internal resistor network that sets the device gain. The low offset drift is due to the internal chopping architecture of the amplifier. Input chopping reduces both the offset and offset drift since any change in offset is canceled with each chopping cycle. The maximum input offset drift of the INA183 is 0.5 µV/ºC. The low drift of the gain error and offset voltage provides accurate current measurement over the operational temperature range of -40ºC to 125ºC that exceeds the performance of most discrete current sensing implementations.

8.4 Device Functional Modes

8.4.1 Normal Operation

The INA183 is in normal operation when the following conditions are met:

- The voltage at the IN+ pin is between 2.7 V and 26 V.
- The maximum differential input signal times the gain is less than V_{IN+} minus the output voltage swing to V_{IN+}.
- The minimum differential input signal times the gain is greater than the swing to GND.

During normal operation, this device produces an output voltage that is the *amplified* representation of the difference voltage from IN+ to IN–.

8.4.2 Unidirectional, High-Side Operation

The INA183 measures the differential voltage developed by current flowing through a resistor that is commonly referred to as a current shunt resistor or current-sensing resistor. The INA183 operates in high-side, unidirectional mode only, meaning it only senses current sourced from a power supply to a system load as shown in 図 8-1.

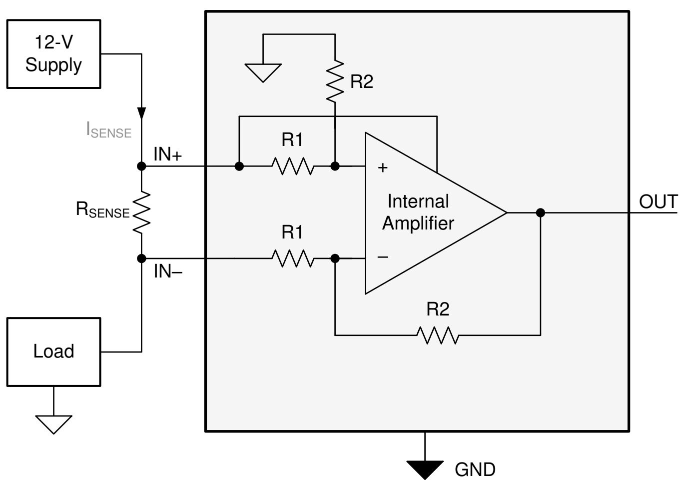


図 8-1. High-Side Unidirectional Application

8.4.3 Input Differential Overload

If the differential input voltage (V_{IN+} – $V_{IN–}$) times gain exceeds the voltage swing specification, the INA183 drives the output as close as possible to the IN+ pin or ground, and does not provide accurate measurement of the differential input voltage. If this input overload occurs during normal circuit operation, then reduce the value of the shunt resistor or use a lower-gain version with the chosen sense resistor to avoid this mode of operation. If a differential overload occurs in a fault event, then the output of the INA183 returns to the expected value approximately 30 µs after removal of the fault condition. When the input differential voltage is overloaded the bias currents will increase by a significant amount. The increase in bias currents will occur even with the device is powered down. Input differential overloads less than the absolute maximum voltage rating do not damage the device or result in an output inversion.

9 Application and Implementation

注

以下のアプリケーション情報は、TI の製品仕様に含まれるものではなく、TI ではその正確性または完全性を保証いたしません。個々の目的に対する製品の適合性については、お客様の責任で判断していただくことになります。また、お客様は自身の設計実装を検証しテストすることで、システムの機能を確認する必要があります。

9.1 Application Information

The INA183 measures the voltage developed across a current-sensing resistor when current passes through it. The ability to drive the reference pin to adjust the functionality of the output signal offers multiple configurations, as discussed throughout this section.

9.1.1 R_{SENSE} and Device Gain Selection

Choosing the largest possible shunt resistor will maximize the accuracy of any current-sense amplifier. A large sense resistor maximizes the differential input signal for a given amount of current flow and reduces the error contribution of the offset voltage. However, there are practical limits as to how large the current-sense resistor can be in a given application because of the resistor size and maximum allowable power dissipation. 式 1 gives the maximum value for the current-sense resistor for a given power dissipation budget:

$$R_{SENSE} < \frac{PD_{MAX}}{I_{MAX}^{2}} \tag{1}$$

where:

- PD_{MAX} is the maximum allowable power dissipation in R_{SENSE}.
- I_{MAX} is the maximum current expected to flow through R_{SENSE}.

An additional limitation on the size of the current-sense resistor and device gain is due to the power-supply voltage at the IN+ pin, and device swing-to-rail limitations. To ensure that the current-sense signal is properly passed to the output, both positive and negative output swing limitations must be examined. 式 2 provides the maximum values of R_{SENSE} and GAIN to keep the device from exceeding the positive swing limitation.

$$I_{MAX} \times R_{SENSE} \times GAIN < V_{SP} \tag{2}$$

where:

- I_{MAX} is the maximum current that will flow through R_{SENSE}.
- GAIN is the gain of the current-sense amplifier.
- V_{SP} is the positive output swing as specified in the data sheet.

Positive output swing limitations should be considered when selecting the value of R_{SENSE}. There is always a trade-off between the value of the sense resistor and the gain of the device under consideration. If the sense resistor selected for the maximum power dissipation is too large, then it is possible to select a lower-gain device to avoid positive swing limitations.

The negative swing specification limits how small the sense resistor value can be for a given application. 式 3 provides the limit on the minimum value of the sense resistor.

$$I_{MIN} \times R_{SENSE} \times GAIN > V_{SN} \tag{3}$$

where:

- I_{MIN} is the minimum current that will flow through R_{SENSE}.
- GAIN is the gain of the current-sense amplifier.
- V_{SN} is the negative output swing of the device.

9.2 Typical Application

図 9-1 shows the basic connections for the INA183. The input pins, IN+ and IN–, must be connected as close as possible to the shunt resistor to minimize any resistance in series with the shunt resistor.

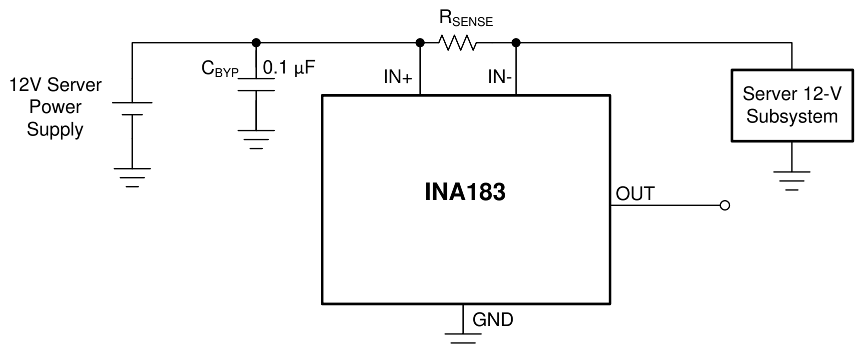


図 9-1. Typical Server Application

A power-supply bypass capacitor is required on the IN+ pin. Applications with noisy or high-impedance power supplies may require additional decoupling capacitors to reject power-supply noise. Connect bypass capacitors close to the device pins.

In server applications, the INA183 typically monitors the current on the 12-V bus that is distributed to various server sub-systems like memory, storage, or CPU power. The monitored current can be used by the server for fault detection or sub-system power optimization.

9.2.1 Design Requirements

表 9-1 lists the design setup for this application.

表 9-1. Design Parameters

DESIGN PARAMETERS	EXAMPLE VALUE
High-side supply voltage (V_{IN+})	12 V
Maximum sense current (I_{MAX})	5 A
Gain option	50 V/V

9.2.2 Detailed Design Procedure

The maximum value of the current-sense resistor is calculated based on choice of gain, the value of the maximum current the be sensed (I_{MAX}), and the power-supply voltage (V_{IN+}). When operating at the maximum current, the output voltage must not exceed the positive output swing specification, V_{SP}. Under the given design parameters, 式 4 calculates the maximum value for R_{SENSE} as 47.2 mΩ.

$$R_{SENSE} < \frac{V_{SP}}{I_{MAX} \times GAIN} \tag{4}$$

For this design example, a value of 40.2 mΩ is selected because, while the 40.2 mΩ is less than the maximum value calculated, 40.2 mΩ is still large enough to give an adequate signal at the current-sense amplifier output. To reduce resistor power losses or to operate over a reduced output range, smaller value resistors can be used as the expense of dynamic range and low current accuracy.

9.2.3 Application Curve

図 9-2 shows the output response of the device to a sinusoidal current.

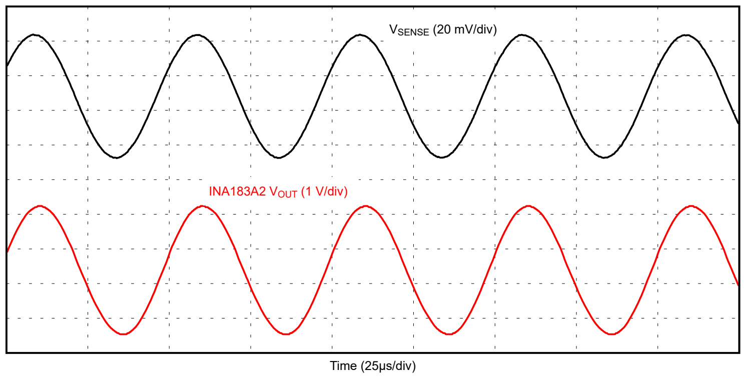


図 9-2. INA183 Output Response

10 Power Supply Recommendations

The device is powered from the IN+ pin with a voltage from 2.7 V to 26 V. The voltage at the output will also be limited by this voltage during overload or fault conditions. Also, the INA183 can withstand the full input signal range up to 26 V on the IN– pin, regardless of whether the device has power applied or not.

11 Layout

11.1 Layout Guidelines

- Connect the input pins to the sensing resistor using a kelvin or 4-wire connection. This connection technique ensures that only the current-sensing resistor impedance is detected between the input pins. Poor routing of the current-sensing resistor commonly results in additional resistance present between the input pins. Given the very low ohmic value of the current resistor, any additional high-current carrying impedance can cause significant measurement errors.
- Place the power-supply bypass capacitor as close as possible to the IN+ pin and ground pins. TI recommends using a bypass capacitor with a value of 0.1 µF. Additional decoupling capacitance can be added to compensate for noisy or high-impedance power supplies.

11.2 Layout Example

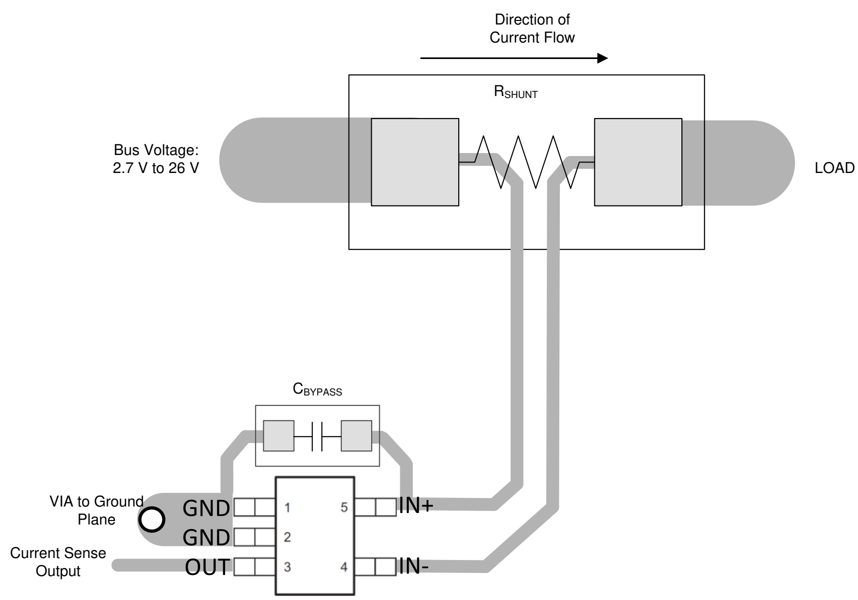


図 11-1. Recommended Layout

12 Device and Documentation Support

12.1 Documentation Support

12.1.1 Related Documentation

For related documentation see the following:

- *INA183A1-A3EVM User's Guide*
- *TIDA-00302 Transient Robustness for Current Shunt Monitor*

12.2 ドキュメントの更新通知を受け取る方法

ドキュメントの更新についての通知を受け取るには、ti.com のデバイス製品フォルダを開いてください。*「更新の通知を受け取る」をクリック*して登録すると、変更されたすべての製品情報に関するダイジェストを毎週受け取れます。変更の詳細については、修正されたドキュメントに含まれている改訂履歴をご覧ください。

12.3 サポート・リソース

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12.6 用語集

TI 用語集　　この用語集には、用語や略語の一覧および定義が記載されています。

13 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
INA183A1IDBVR	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 125	2BRQ
INA183A1IDBVR.B	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 125	2BRQ
INA183A1IDBVT	Obsolete	Production	SOT-23 (DBV) | 5	-	-	Call TI	Call TI	-40 to 125	2BRQ
INA183A2IDBVR	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 125	2BSQ
INA183A2IDBVR.B	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 125	2BSQ
INA183A2IDBVT	Obsolete	Production	SOT-23 (DBV) | 5	-	-	Call TI	Call TI	-40 to 125	2BSQ
INA183A3IDBVR	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 125	2BTQ
INA183A3IDBVR.B	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 125	2BTQ
INA183A3IDBVT	Obsolete	Production	SOT-23 (DBV) | 5	-	-	Call TI	Call TI	-40 to 125	2BTQ

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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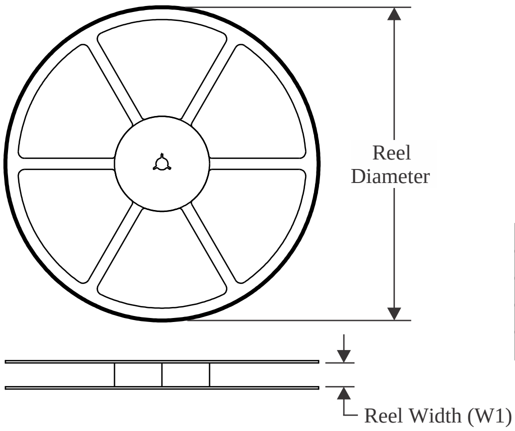
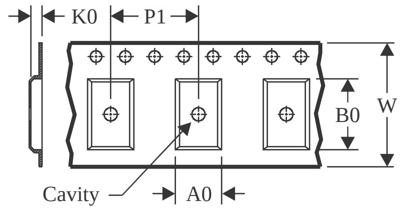
TAPE AND REEL INFORMATION

REEL DIMENSIONS

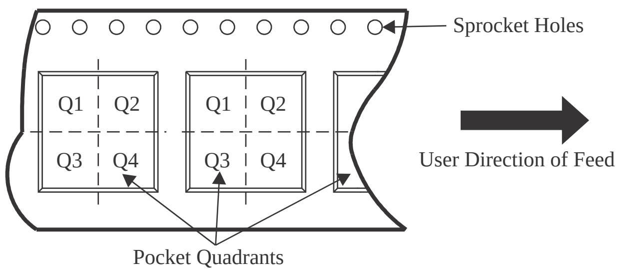


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

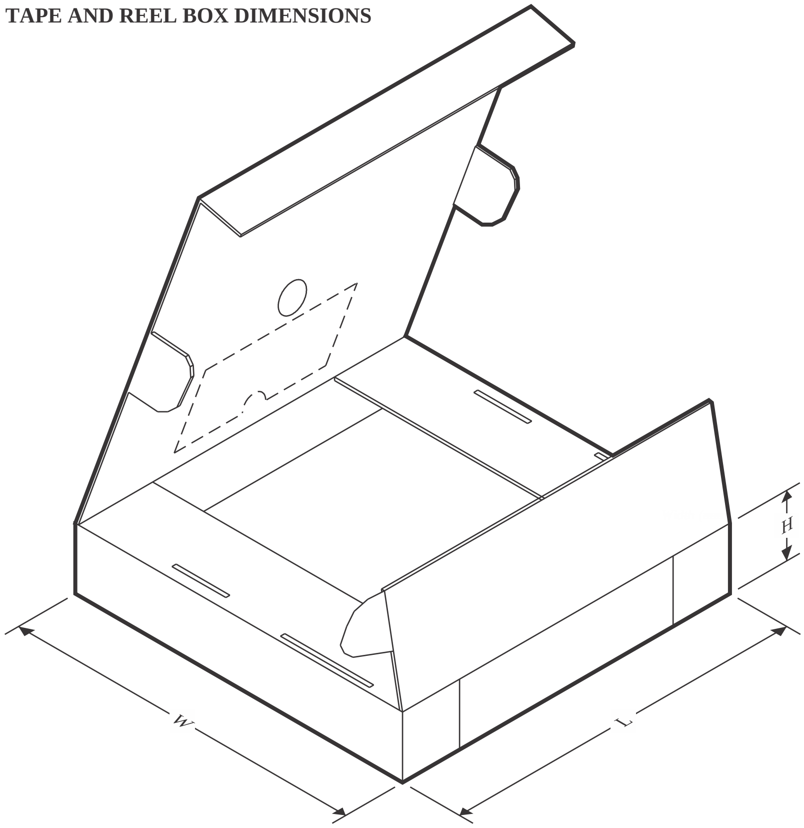
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

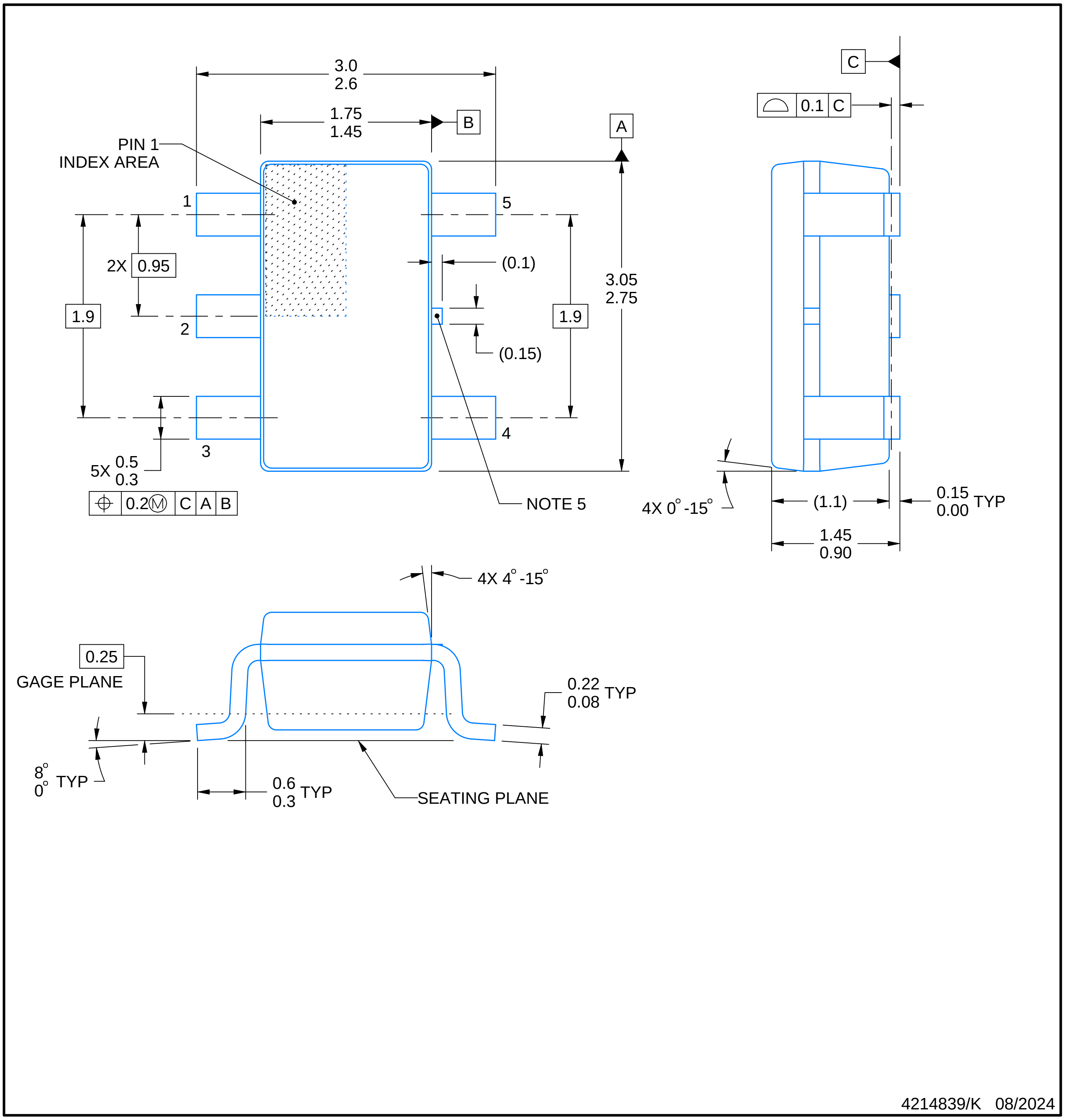
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
INA183A1IDBVR	SOT-23	DBV	5	3000	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
INA183A2IDBVR	SOT-23	DBV	5	3000	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
INA183A3IDBVR	SOT-23	DBV	5	3000	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS



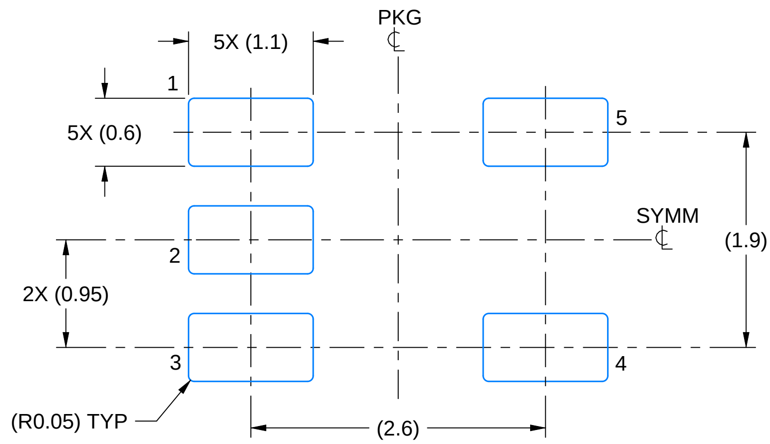
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
INA183A1IDBVR	SOT-23	DBV	5	3000	190.0	190.0	30.0
INA183A2IDBVR	SOT-23	DBV	5	3000	190.0	190.0	30.0
INA183A3IDBVR	SOT-23	DBV	5	3000	190.0	190.0	30.0

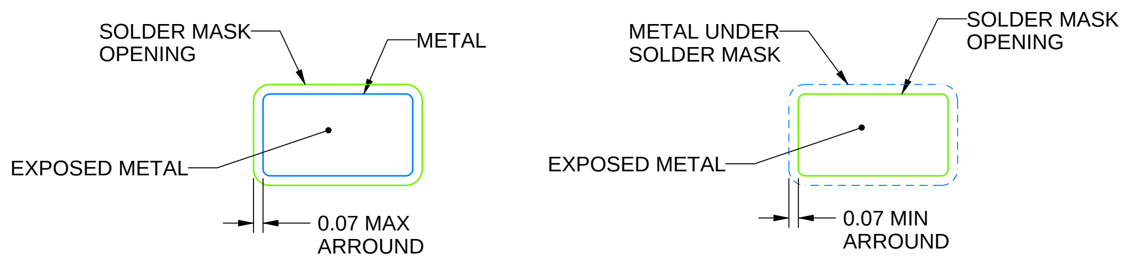


NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Refernce JEDEC MO-178.
4. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25 mm per side.
5. Support pin may differ or may not be present.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



NON SOLDER MASK DEFINED (PREFERRED)

SOLDER MASK DEFINED

SOLDER MASK DETAILS

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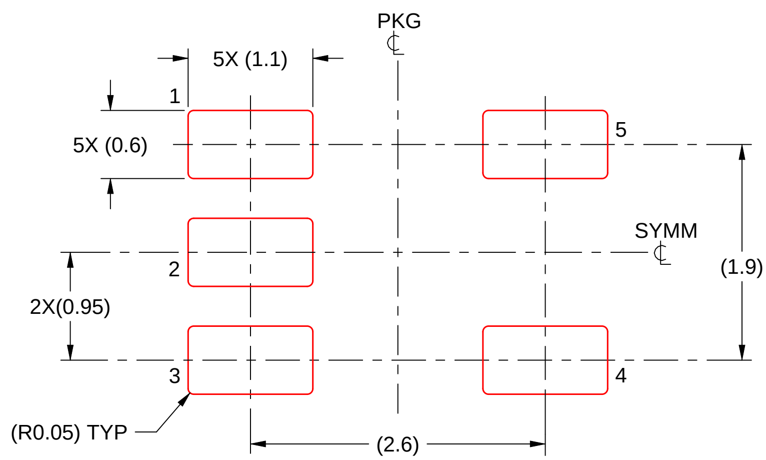
NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:15X

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NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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