

# INA225 36-V, Programmable-Gain, Voltage-Output, Bidirectional, Zero-Drift Series Current-Shunt Monitor

## 1 Features

- Wide Common-Mode Range: 0 V to 36 V
- Offset Voltage:  $\pm 150 \mu\text{V}$  (Max, All Gains)
- Offset Voltage Drift:  $0.5 \mu\text{V}/^\circ\text{C}$  (Max)
- Gain Accuracy, Max Over Temperature:
  - 25 V/V, 50 V/V:  $\pm 0.15\%$
  - 100 V/V:  $\pm 0.2\%$
  - 200 V/V:  $\pm 0.3\%$
  - 10-ppm/ $^\circ\text{C}$  Gain Drift
- 250-kHz Bandwidth (Gain = 25 V/V)
- Programmable Gains:
  - G1 = 25 V/V
  - G2 = 50 V/V
  - G3 = 100 V/V
  - G4 = 200 V/V
- Quiescent Current: 350  $\mu\text{A}$  (Max)
- Package: MSOP-8

## 2 Applications

- Power Supplies
- Motor Control
- Computers
- Telecom Equipment
- Power Management
- Test and Measurement

## 3 Description

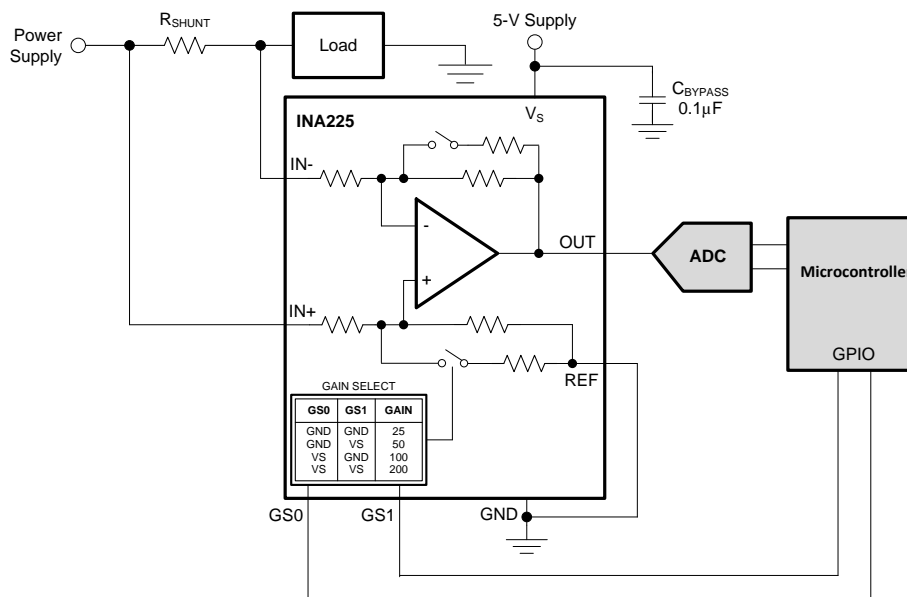
The INA225 is a voltage output current-sense amplifier that senses drops across current-sensing resistors at common-mode voltages that can vary from 0 V to 36 V, independent of the supply voltage. The device is a bidirectional current-shunt monitor that allows an external reference to be used to measure current flowing in both directions across a current-sensing resistor.

Four discrete gain levels are selectable using the two gain select terminals (GS0 and GS1) to program gains of 25 V/V, 50 V/V, 100 V/V, and 200 V/V. The low-offset, zero-drift architecture and precision gain values enable current sensing with maximum drops across the shunt as low as 10 mV of full-scale while maintaining very high accuracy measurements over the entire operating temperature range.

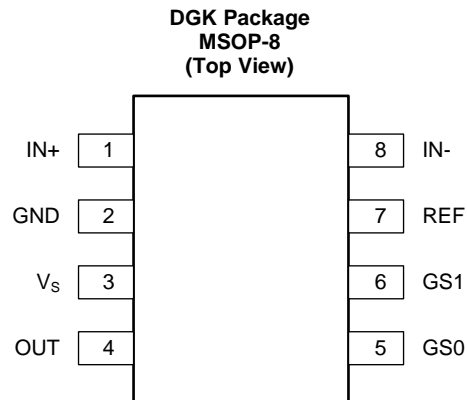
The device operates from a single +2.7-V to +36-V power supply, drawing a maximum of 350  $\mu\text{A}$  of supply current. The device is specified over the extended operating temperature range ( $-40^\circ\text{C}$  to  $+125^\circ\text{C}$ ), and is offered in an MSOP-8 package.

### Device Information

ORDER NUMBER	PACKAGE	BODY SIZE
INA225AIDGK	MSOP (8)	3,0 mm x 3,0 mm



## 4 Terminal Configuration and Functions



**Terminal Functions**

TERMINAL		I/O	DESCRIPTION
NAME	NO.		
IN+	1	Analog input	Connect to supply side of shunt resistor.
GND	2	Analog	Ground
V <sub>S</sub>	3	Analog	Power supply, 2.7 V to 36 V
OUT	4	Analog output	Output voltage
GS0	5	Digital input	Gain select. Connect to V <sub>S</sub> or GND. <a href="#">Table 1</a> lists terminal settings and the corresponding gain value.
GS1	6	Digital input	Gain select. Connect to V <sub>S</sub> or GND. <a href="#">Table 1</a> lists terminal settings and the corresponding gain value.
REF	7	Analog input	Reference voltage, 0 V to V <sub>S</sub>
IN-	8	Analog input	Connect to load side of shunt resistor.

**Table 1. Gain Select Settings**

GAIN	GS0	GS1
25 V/V	GND	GND
50 V/V	GND	V <sub>S</sub>
100 V/V	V <sub>S</sub>	GND
200 V/V	V <sub>S</sub>	V <sub>S</sub>

## 5 Device and Documentation Support

### 5.1 Trademarks

All trademarks are the property of their respective owners.

### 5.2 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

### 5.3 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms and definitions.

## 6 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 Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
INA225AIDGKR	PREVIEW	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAUAG	Level-2-260C-1 YEAR	-40 to 125	B32	
INA225AIDGKT	PREVIEW	VSSOP	DGK	8	250	Green (RoHS & no Sb/Br)	CU NIPDAUAG	Level-2-260C-1 YEAR	-40 to 125	B32	

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

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

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