

INA240 Wide Common-Mode Range, Voltage Output, High- or Low-Side Bidirectional, Zero-Drift, Current-Shunt Monitor

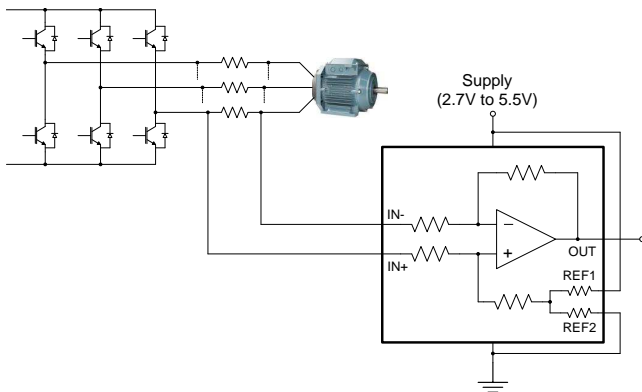
1 Features

- Enhanced PWM Rejection
- Excellent CMRR
 - > 120-dB DC CMRR
 - 93-dB AC CMRR at 50 kHz
- Wide Common-Mode Range: -4 V to 80 V
- Accuracy:
 - Gain:
 - Gain Error: 0.25% (max)
 - Gain Drift: 10 ppm/°C (max)
 - Offset:
 - Offset Voltage: $\pm 100 \mu\text{V}$
 - Offset Drift: $0.3 \mu\text{V}/^\circ\text{C}$ (max)
- Available Gains:
 - INA240A1: 20 V/V
 - INA240A2: 50 V/V
 - INA240A3: 100 V/V
 - INA240A4: 200 V/V
- Quiescent Current: 2.5 mA (max)

2 Applications

- Motor Controls
- Solenoid and Valve Controls
- Power Management
- Actuator Controls
- Pressure Regulators
- Telecom Equipment

Typical Application



3 Description

The INA240 is a voltage-output, current-sense amplifier with enhanced PWM rejection that can sense drops across shunt resistors over a wide common-mode voltage range from -4 V to 80 V, independent of the supply voltage. The negative common-mode voltage allows the device to operate below ground, accommodating the flyback period of typical solenoid applications. Enhanced PWM rejection provides high levels of suppression for large common-mode transients (dV/dt) in systems that use pulse width modulation (PWM) signals (such as motor drives and solenoid control systems). This feature allows for accurate current measurements without large transients and associated recovery ripple on the output voltage.

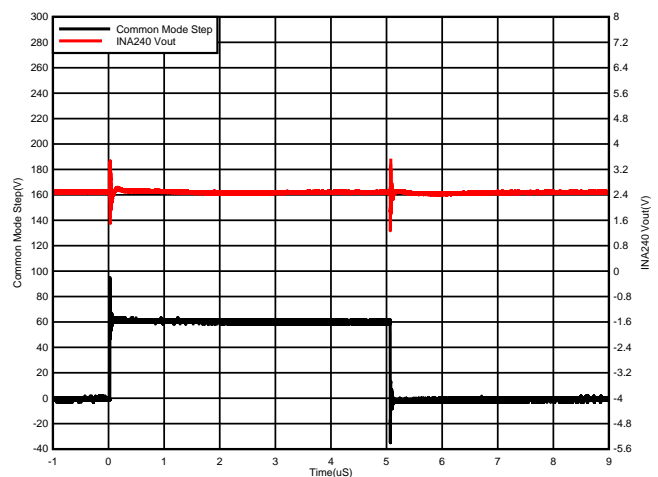
This device operates from a single 2.7-V to 5.5-V power supply, drawing a maximum of 2.5 mA of supply current. Four fixed gains are available: 20 V/V, 50 V/V, 100 V/V, and 200 V/V. The low offset of the zero-drift architecture enables current sensing with maximum drops across the shunt as low as 10-mV full-scale. All versions are specified over the extended operating temperature range (-40°C to +125°C), and are offered in an 8-pin TSSOP package.

Device Information⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
INA240	TSSOP (8)	3.00 mm x 4.40 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

Enhanced PWM Rejection



4 Device and Documentation Support

4.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

4.2 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

TI E2E™ Online Community *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support *TI's Design Support* Quickly find helpful E2E forums along with design support tools and contact information for technical support.

4.3 Trademarks

E2E is a trademark of Texas Instruments.
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4.4 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

4.5 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

5 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
INA240A1PW	PREVIEW	TSSOP	PW	8	150	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 125	I240A1	
INA240A1PWR	PREVIEW	TSSOP	PW	8	2000	TBD	Call TI	Call TI	-40 to 125		
INA240A1PWT	PREVIEW	TSSOP	PW	8	250	TBD	Call TI	Call TI	-40 to 125		
INA240A2PW	PREVIEW	TSSOP	PW	8	150	TBD	Call TI	Call TI	-40 to 125	I240A2	
INA240A2PWR	PREVIEW	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 125	I240A2	
INA240A2PWT	PREVIEW	TSSOP	PW	8	250	TBD	Call TI	Call TI	-40 to 125		
INA240A3PW	PREVIEW	TSSOP	PW	8	150	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 125	I240A3	
INA240A3PWT	PREVIEW	TSSOP	PW	8	250	TBD	Call TI	Call TI	-40 to 125		
INA240A4PW	PREVIEW	TSSOP	PW	8	150	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 125	I240A4	
INA240A4PWR	PREVIEW	TSSOP	PW	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 125	I240A4	
INA240A4PWT	PREVIEW	TSSOP	PW	8	250	TBD	Call TI	Call TI	-40 to 125		

(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.

OBSELETE: 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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OTHER QUALIFIED VERSIONS OF INA240 :

- Automotive: [INA240-Q1](#)

NOTE: Qualified Version Definitions:

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

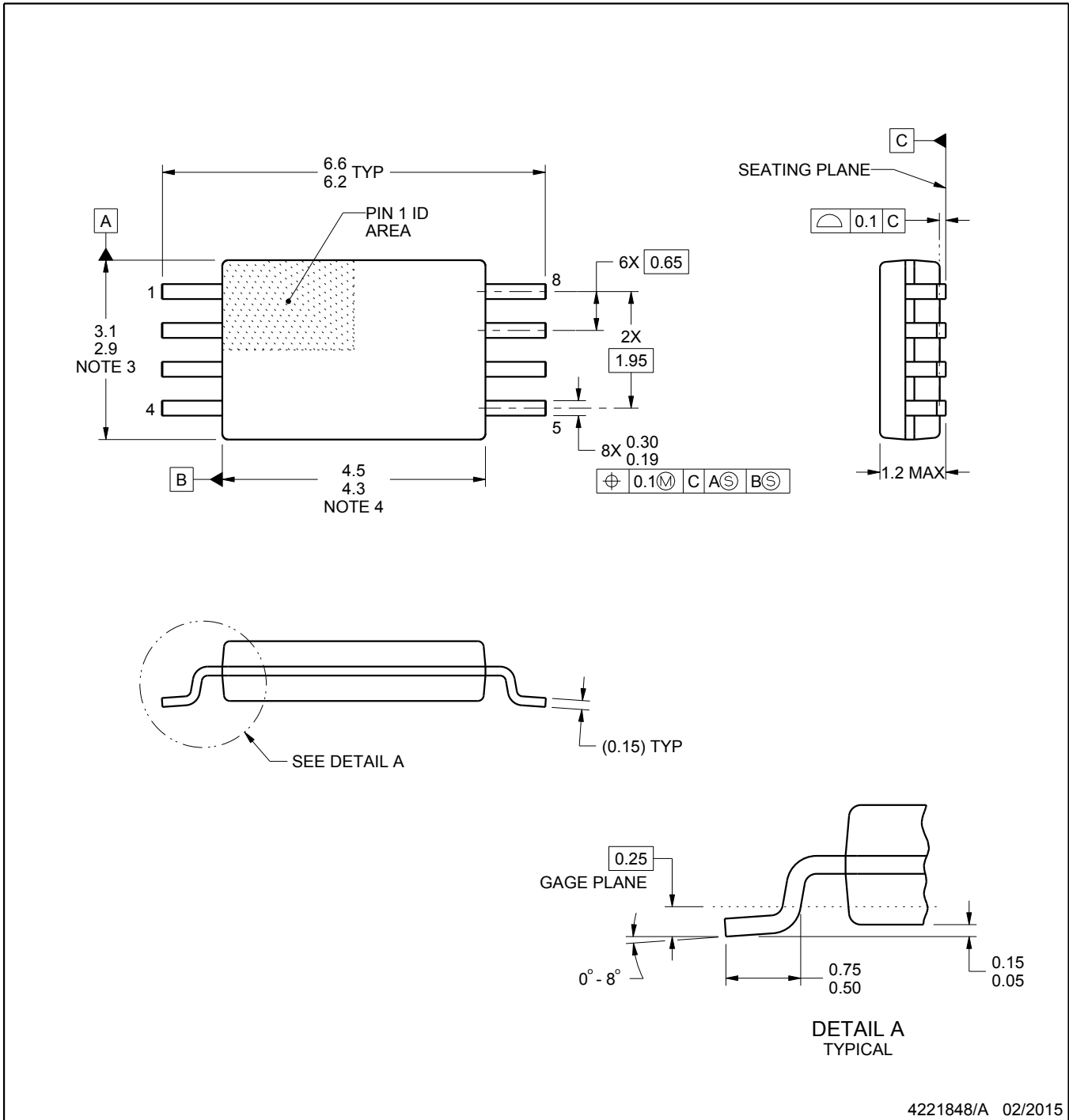
PW0008A



PACKAGE OUTLINE

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



4221848/A 02/2015

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. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153, variation AA.

EXAMPLE BOARD LAYOUT

PW0008A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
SCALE:10X



SOLDER MASK DETAILS
NOT TO SCALE

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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.

EXAMPLE STENCIL DESIGN

PW0008A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:10X

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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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