

New Product Update

Integrated shunt current sensing
with EZShunt™ Technology

Cierra Cowley

Product marketing engineer

Agenda

- TI Current sensing overview
- EZShunt™ Technology overview
- Integrated shunt current sensing benefits
- TI Current sensing integrated shunt portfolio

Current sensing overview

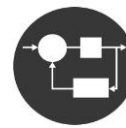
Accurately
monitor current
for:



Real-time overcurrent
protection (OCP)



Current and power monitoring
for system optimization



Current measurement
for closed loop circuits

Current Shunt Monitors

325 Products; 1860 Orderables

Product Portfolio

- Current sense amplifiers
- Digital power monitors
- Integrated shunt

Applications



Industry's highest accuracy Current Shunt Monitors
and widest portfolio breadth

Magnetic Current Sensing

19 Products; 174 Orderables

Product Portfolio

- In-package Hall-effect current sensors
- Ambient sensors



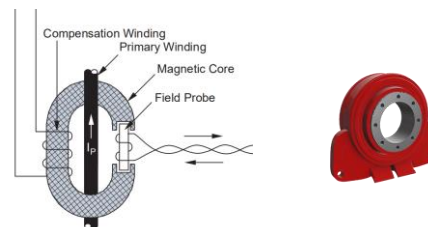
Industry's leading zero-drift Hall-effect current
sensing

Analog Front Ends

8 Products; 20 Orderables

Product Portfolio

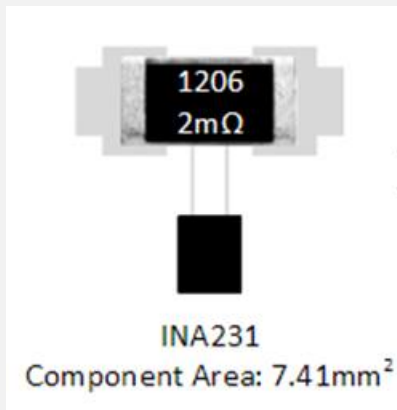
- Closed-loop current sensors



Product & Orderable count includes evaluation modules

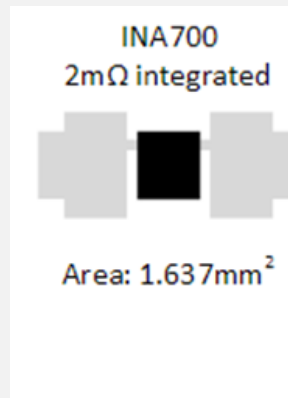
What is EZShunt™ Technology?

The standard discrete current sensing solution requires an external shunt resistor



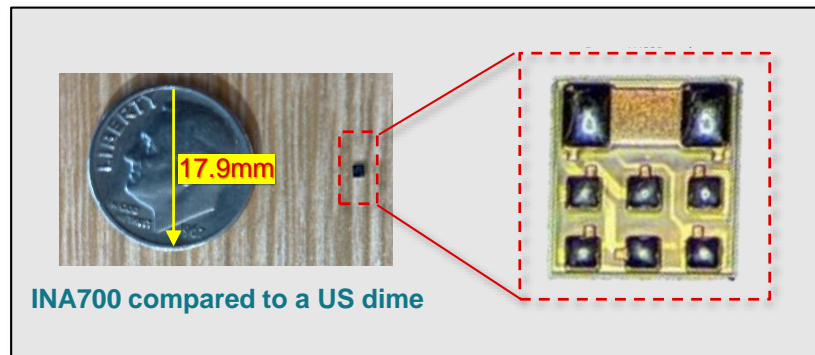
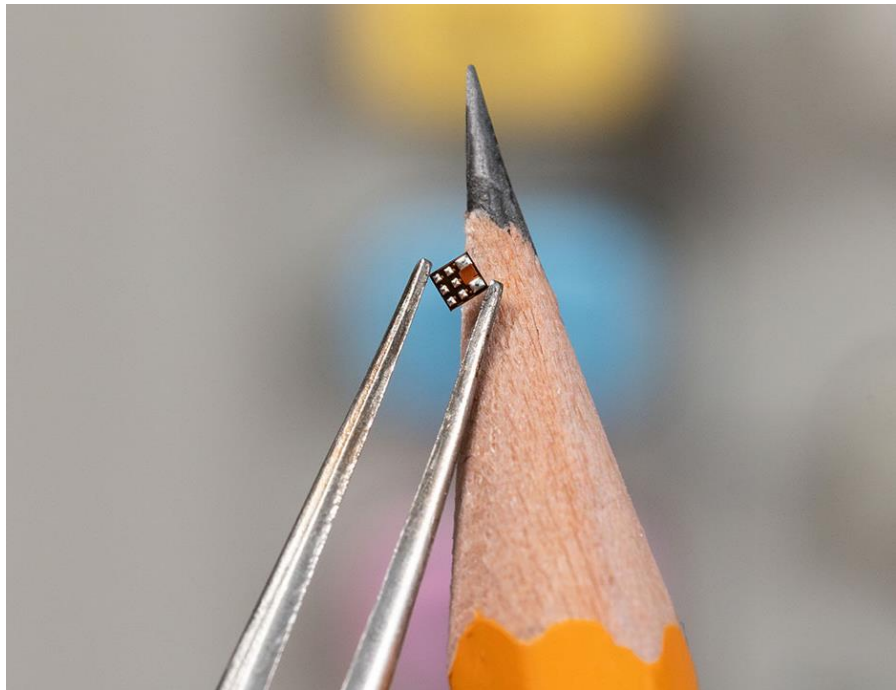
~84% area reduction
over smallest existing
solution!

EZShunt™ Technology utilizes the package's *copper lead frame* to act as the shunt resistor



EZShunt™ Technology

Bringing the accuracy of a discrete solution with the simplicity of a single-chip



Why choose integrated shunt devices?



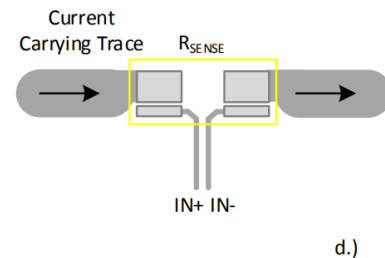
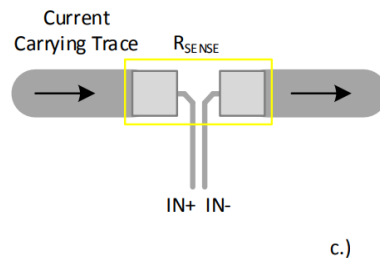
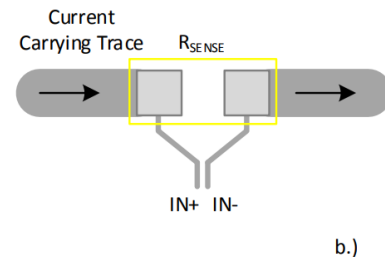
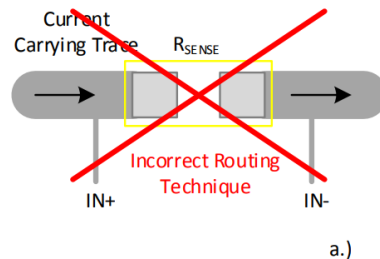
Key points:

- *No longer need* to select or procure a shunt resistor
- *Simplify* PCB layout and *reduce* PCB design revisions by integrating the Kelvin connections
- *Reduce* overall solution size on the PCB
- Achieve similar performance to the discrete alternative for a *competitive price*

Benefits | Ease of use

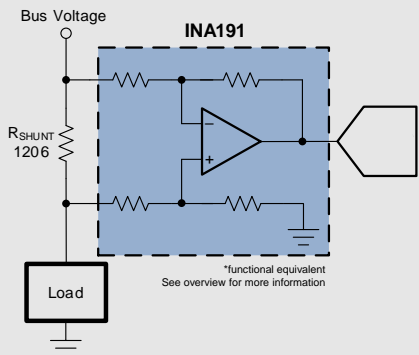
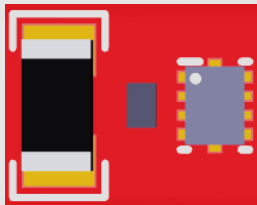
Key points:

- Resistor selection/layout is an important step in the design process
- You must consider:
 - Resistor tolerance
 - Resistor temperature coefficient
 - Layout
 - Procurement
- Using an integrated shunt solution removes these concerns



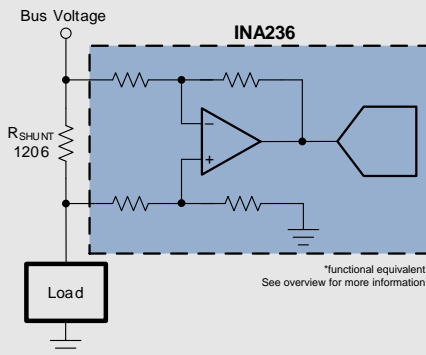
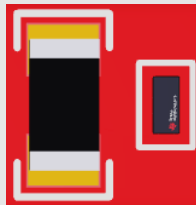
Benefits | Reduce solution size

Shunt + CSA + ADC



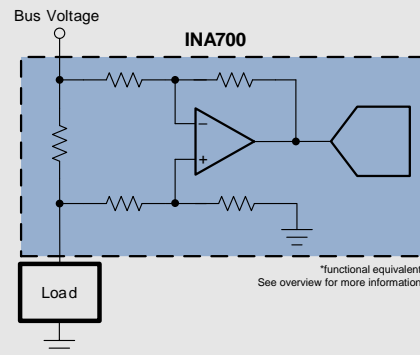
Component Count: 3
Component Area: 9.02 mm²

Shunt + DPM



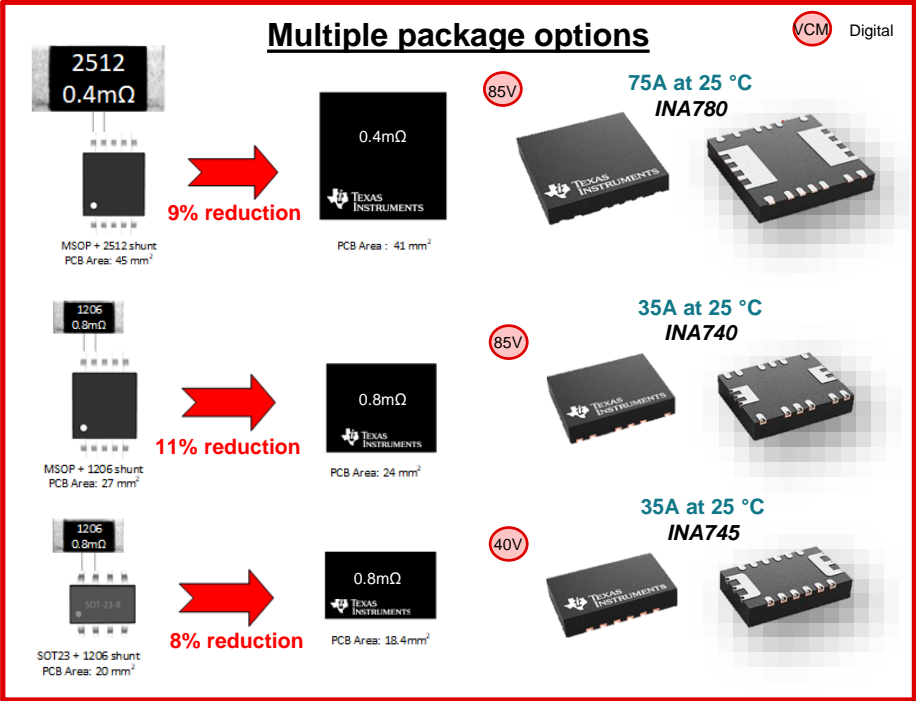
Component Count: 2
Component Area: 6.24 mm²

INA700



Component Count: 1
Component Area: 1.64 mm²

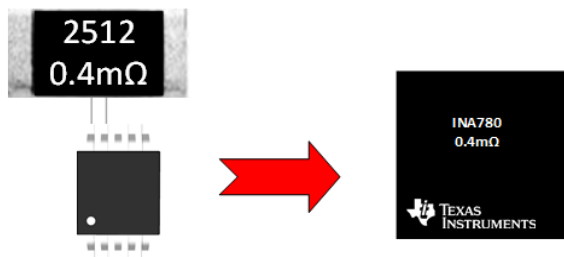
Benefits | Reduce solution size



Benefits | Competitive price and performance

Resistor	Digi Key 1ku	Digital power Monitor	TI.com 1ku	Solution Cost 1ku	EZShunt™ Product	EZShunt™ Product 1ku	DPM + Shunt error *	EZShunt™ Product error*
2mΩ 1% 75ppm/°C 1W 1206 case	~ \$0.183	INA234	\$0.650	\$0.833	INA700 40V/2.0mΩ	<u>\$0.797</u>	2.54% @ 5A	1.27% @ 5A
1mΩ 1% 75ppm/°C 1W 1206 case	~ \$0.183	INA232	\$0.840	\$1.023	INA745B 40V/0.8mΩ	<u>\$0.990</u>	1.91% @ 20A	1.78% @ 20A
1mΩ 1% 75ppm/°C 1W 1206 case	~ \$0.183	INA237	\$0.990	\$1.173	INA740B 85V/0.8mΩ	<u>\$1.090</u>	1.95% @ 20A	1.78% @ 20A
0.4mΩ 1% 75ppm/°C 3W 2512 case	~ \$0.409	INA237	\$0.990	\$1.399	INA780B 85V/0.4mΩ	<u>\$1.250</u>	1.95% @ 50A	1.77% @ 50A

* errors over temperature



Why choose **EZShunt™** Technology for cost?

- **Highly integrated** solution
- EZShunt™ Technology is **cost-effective**
- Similar **performance** to a discrete solution
- **Reduces time** for design, engineering and procurement

Benefits | Competitive price and performance

EZShunt™ Product	EZShunt™ Product 1ku	EZShunt™ Product with high-precision *
INA745A 40V/0.8mΩ	<u>\$1.290</u>	1% @ 20A
INA740A 85V/0.8mΩ	<u>\$1.500</u>	1% @ 20A
INA780A 85V/0.4mΩ	<u>\$1.750</u>	1% @ 50A
INA746 40V/0.8mΩ	<u>\$2.290</u>	0.6% @ 20A
INA741 85V/0.8mΩ	<u>\$2.490</u>	0.6% @ 20A
INA781 85V/0.4mΩ	<u>\$2.820</u>	0.6% @ 50A

* errors over temperature

TI current sensing integrated Shunt portfolio

		Current <= 10A	Current <= 25A		Current <= 50A	
Digital	>48V		<div>INA740A / B 4mm x 5mm<ul style="list-style-type: none">• 85V V_{CM}, Up to +/-35A• 16-Bit I/V/P/E/C/T• 6.25mA I_{OS} (Max)• 1% G.E. (Max @125C)• QFN-14</div>	<div>INA741 4mm x 5mm<ul style="list-style-type: none">• 85V V_{CM}, Up to +/-35A• 20-Bit I/V/P/E/C/T• 1.25mA I_{OS} (Max)• 0.75% G.E. (Max @125C)• QFN-14</div>	<div>INA780A / B 6mm x 6mm<ul style="list-style-type: none">• 85V V_{CM}, Up to +/-75A• 16-Bit I/V/P/E/C/T• 12.5mA I_{OS} (Max)• 1% G.E. (Max @125C)• QFN-15</div>	<div>INA781 6mm x 6mm<ul style="list-style-type: none">• 85V V_{CM}, Up to +/-75A• 20-Bit I/V/P/E/C/T• 2.5mA I_{OS} (Max)• 0.75% G.E. (Max @125C)• QFN-15</div>
	<48V	<div>INA700 1.2mm x 1.3mm<ul style="list-style-type: none">• 40V V_{CM}, Up to +/-15A• 16-Bit I/V/P/E/C/T• 25mA I_{OS} (Max)• 1% G.E. (Max Over Temp)• WCSP-8</div>	<div>INA260 5mm x 6.4mm<ul style="list-style-type: none">• 36V V_{CM}, Up to +/-15A• 16-Bit I/V/P Monitor• 5mA I_{OS} (Max)• 0.5% G.E. (Max @125C)• TSSOP-16</div>	<div>INA745A / B 3mm x 5mm<ul style="list-style-type: none">• 40V V_{CM}, Up to +/-35A• 16-Bit I/V/P/E/C/T• 6.25mA I_{OS} (Max)• 1% G.E. (Max @125C)• QFN-14</div>	<div>INA746 3mm x 5mm<ul style="list-style-type: none">• 40V V_{CM}, Up to +/-35A• 20-Bit I/V/P/E/C/T• 1.25mA I_{OS} (Max)• 0.75% G.E. (Max @125C)• QFN-14</div>	
Analog	>48V		<div>INA253 6.4mm x 6.5mm<ul style="list-style-type: none">• 80V V_{CM}, Up to +/-15A• 15mA I_{OS} (Max)• 0.85% G.E. (Max @125C)• 100kHz BW• TSSOP-20</div>		<div>INA254 9.7mm x 6.4mm<ul style="list-style-type: none">• 80V V_{CM}, Up to +/-100A• 62.5mA I_{OS} (Max)• 0.95% G.E. (Max @125C)• 100kHz BW• TSSOP-28</div>	
	<48V		<div>INA250 5mm x 6.4mm<ul style="list-style-type: none">• 36V V_{CM}, Up to +/-15A• 20mA I_{OS} (Max)• 0.75% G.E. (Max @125C)• 50kHz BW @ 500mV/A• TSSOP-16</div>			

Existing Int.
Shunt

EZShunt™
Technology

Getting started

You can start evaluating this device leveraging the following:

Content type	Content title
Product folder	<u>INA700</u> , <u>INA780A</u> , <u>INA780B</u> , <u>INA741</u> , <u>INA740A</u> , <u>INA740B</u> , <u>INA746</u> , <u>INA745B</u> , <u>INA745A</u> , <u>INA781</u> , <u>INA254</u>
Customer training series or webinar session	<u>TI Precision Labs: Current sense amplifiers</u>
Technical blog content or white paper	<u>Bringing design simplicity, low drift, and small size to integrated-shunt solutions</u>
Development tool or evaluation kit	<u>INA700EVM</u> , <u>INA780-INA781EVM</u> , <u>INA740-INA741EVM</u> , <u>INA745-INA746EVM</u>

Visit www.ti.com/npu

For more information on the New Product Update series, calendar and archived recordings



© Copyright 2023 Texas Instruments Incorporated. All rights reserved.

This material is provided strictly “as-is,” for informational purposes only, and without any warranty.
Use of this material is subject to TI’s **Terms of Use**, viewable at [TI.com](https://www.ti.com)

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 © 2023, Texas Instruments Incorporated