ACS37002 Evaluation Board User Guide

DESCRIPTION

This user guide documents the features, operation, and use of the ACS37002 current sensor with the ASEK37002 demo board. This evaluation kit provides users with a simple means of evaluating the ACS37002 current sensor in a lab environment without the need of a custom-designed evaluation board.

FEATURES

The ACS37002 is a fully integrated Hall-effect current sensor in a SOIC16 package with 0.85 mΩ integrated conductor. The sensor is factory-trimmed to provide high accuracy over the entire operating range. A fast overcurrent alert fault output has a user-configurable threshold via an analog input pin, providing short-circuit detection and enhanced system protection. The sensor also has four programmable gain settings.

EVALUATION BOARD CONTENTS

- ASEK37002 evaluation board

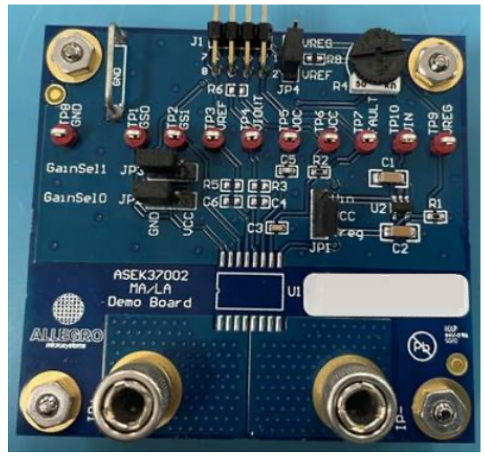

Figure 1: ASEK37002 Evaluation Board

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Table 1: ACS37002 Evaluation Board Configurations

Configuration Name	Part Number	Current Sensing Range, I_{PR} (A)	Sensitivity (mV/A)	Supply Voltage (V)
ASEK37002LMA-BB-3B	ACS37002LMA-BB-3B	–	–	3.3
ASEK37002LMA-BB-5B	ACS37002LMA-BB-5B	–	–	5
ASEK37002LMC-050B5	ACS37002LMC-050B5	±33.3, ±40, ±50, ±66.7	60, 50, 40, 30	5

USING THE EVALUATION BOARD

1. Prior to applying power to the ACS37002, configure the JP2 (GAIN_SEL0) and JP3 (GAIN_SEL1) shunts for the desired gain of the ACS37002.
2. Apply power to the board. V_{CC} of the ACS37002 device can be supplied directly or via an on board regulator. In either case, the user will provide power to the evaluation board through the TPVin test point.
   A. Powering the ACS37002 with the on-board regulator: With the JP1 shunt placed in the “Vreg” position, power is supplied to the device by the on-board regulator. To allow for the dropout voltage of the regulator, it is recommended that the voltage supplied to the TPVin test point is equal to V_{CC} + 1 V. For example, using the 5 V on board regulator to supply a 5 V version of the ACS37002 would require a voltage of >6 V supplied to the TPVin test point.
   B. Powering the ACS37002 directly: with the JP1 shunt placed in the “Vin” position, power is supplied to the ACS37002 directly via the TPVin test point. In this case, the user would provide a 5 V supply to a 5 V version of the device, or a 3.3 V supply to a 3.3 V version.
3. Configure JP4 to apply a voltage to the VOC pin of the ACS37002. The voltage applied to VOC selects the Overcurrent Fault trip point by applying a voltage to the VOC pin of the ACS37002. JP4 can be configured to ground VOC, apply a voltage from a resistive divider derived from Vref and the R4 potentiometer, or a directly driven voltage on the TPin test point.
4. Apply a current source to the IP+ and IP- banana jacks.
5. The ACS37002 output is monitored via the TPViout test point.
6. The Overcurrent Fault output is monitored via the TPFLT test point.

Refer to the ACS37002 datasheet for electrical and performance specifications as well as detailed functional operation guidelines.

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SCHEMATIC

The schematic for the ASEK37002 is shown in Figure 2. Boards will vary based on the version of the ACS37002 populated in the board and which a regulator is required to supply power to the ACS37002 (3.3 V or 5 V). These differences are reflected in the BOM (bill of materials).

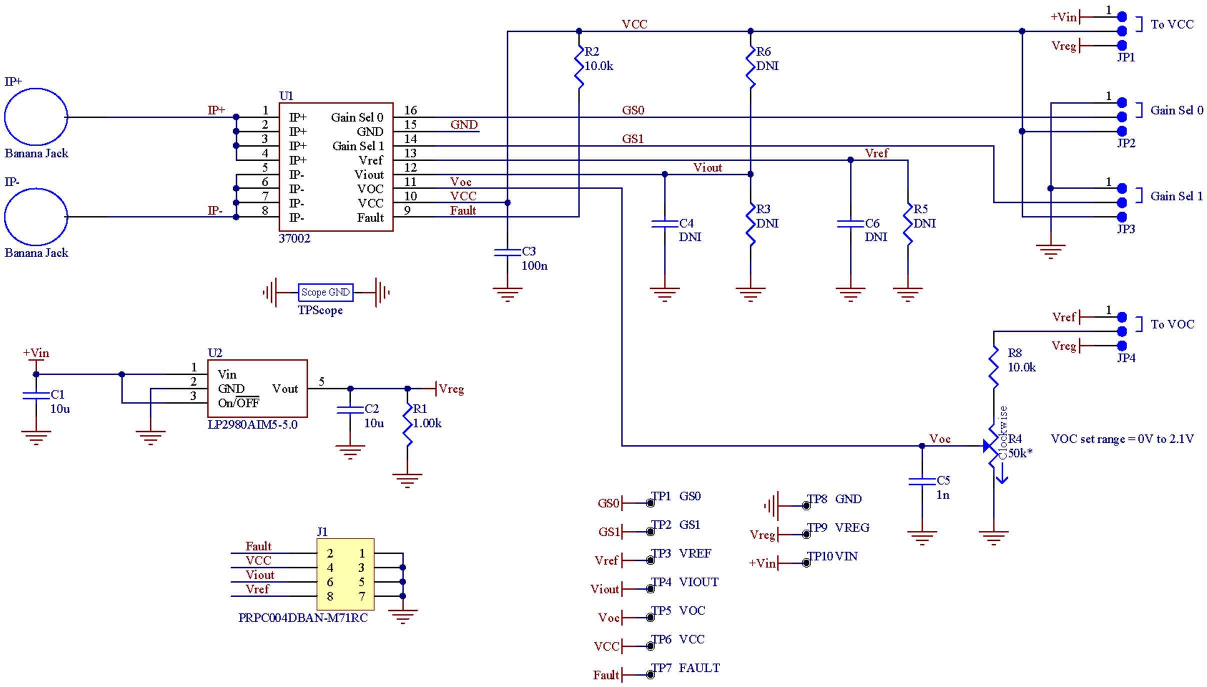

Figure 2: ASEK37002 Schematic

LAYOUT

The ASEK37002 demo board consists of two layers. Top and bottom layers are shown in Figure 3 and Figure 4, respectively.

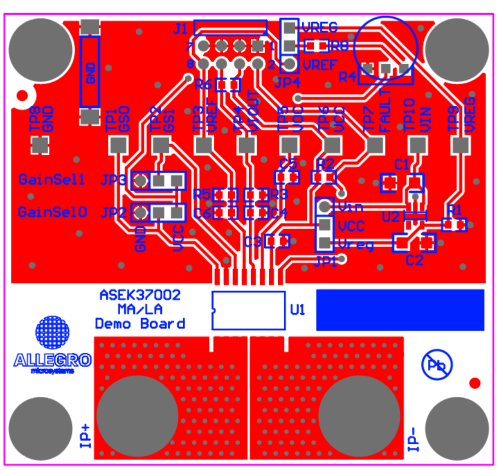

Figure 3: ASEK37002 Top Layer

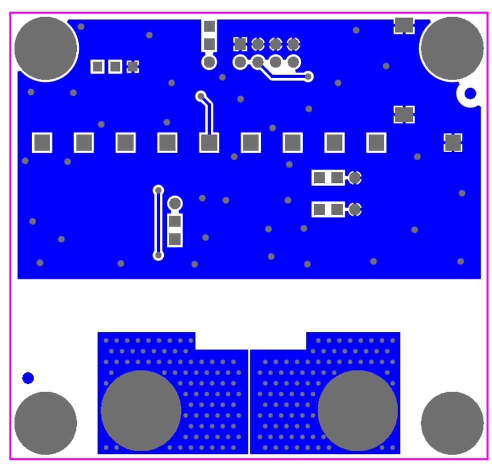

Figure 4: ASEK37002 Bottom Layer

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Bill of Materials

Table 2: ASEK37002 Bill of Materials

Reference Designator	Description
U1	ACS37002
U2	IC, LP2980AIM5, SOT-23-5, 3.3 V or 5 V regulator depending on ACS37002 version
C1, C2	Capacitor, 1206, X5R, 50 V, 10 µF
C3	Capacitor, 0603, X7R, 50 V, 100 nF
C5	Capacitor, 0603, C0G, 50 V, 1 nF
R1	Resistor, 0603, 1 kΩ
R2	Resistor, 0603, 10 kΩ
R4	Potentiometer, 50 kΩ
R5	Do Not Install
C4, R3, R6	Do Not Install
IP+, IP-	Banana jack
JP1, JP2, JP3, JP4	3 pin jumper to be used with 2-pin shunts
TPFLT, TPGND, TPGS0, TPGS1, TPIn, TPVCC, TPVin, TPViout, TPVOC, TPVref, TPVreg	Test points
TPScope	18ga wire jumper used as connection to PCB ground

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RELATED LINKS

The ACS37002 product datasheet is available for download on the Allegro website. In addition, several application notes and related information is available. This information is listed in the table below.

Table 3: Related Documentation and Application Notes

Documentation	Summary	Location
ACS37002	Product datasheet defining common electrical characteristics and performance characteristics	https://www.allegromicro.com/-/media/files/datasheets/acs37002-datasheet.ashx
ACS37002 Purchasing	Purchasing homepage	https://www.allegromicro.com/en/products/sense/current-sensor-ics/zero-to-fifty-amp-integrated-conductor-sensor-ics/acs37002
An Effective Method for Characterizing System Bandwidth in Complex Current Sensor Applications	Application note describing methods used by Allegro to measure and quantify system bandwidth	https://allegromicro.com/en/insights-and-innovations/technical-documents/hall-effect-sensor-ic-publications/an-effective-method-for-characterizing-system-bandwidth-an296169
DC and Transient Current Capability/Fuse Characteristics of Surface Mount Current Sensor ICs	DC and Transient Current Capability/Fuse Characteristics of Surface Mount Current Sensor ICs	https://www.allegromicro.com/en/Insights-and-Innovations/Technical-Documents/Hall-Effect-Sensor-IC-Publications/DC-and-Transient-Current-Capability-Fuse-Characteristics.aspx
ACS37002 Gerber Files	Schematic files containing demo board layers	https://www.allegromicro.com/-/media/allegro/allegromicro/files/gerber-files/asek37002_gerber_files.ashx
High-Current Measurement with Allegro Current Sensor IC and Ferromagnetic Core: Impact of Eddy Currents	Application note focusing on the effects of alternating current on current measurement	https://allegromicro.com/en/insights-and-innovations/technical-documents/hall-effect-sensor-ic-publications/an296162_a1367_current-sensor-eddy-current-core
Secrets of Measuring Currents Above 50 Amps	Application note regarding current measurement greater than 50 A	https://allegromicro.com/en/insights-and-innovations/technical-documents/hall-effect-sensor-ic-publications/an296141-secrets-of-measuring-currents-above-50-amps
Allegro Hall-Effect Sensor ICs	Application note describing Hall-effect principles	https://allegromicro.com/en/insights-and-innovations/technical-documents/hall-effect-sensor-ic-publications/allegro-hall-effect-sensor-ics
Hall-Effect Current Sensing in Electric and Hybrid Vehicles	Application note providing a greater understanding of hybrid electric vehicles and the contribution of Hall-effect sensing technology	https://allegromicro.com/en/insights-and-innovations/technical-documents/hall-effect-sensor-ic-publications/hall-effect-current-sensing-in-electric-and-hybrid-vehicles
Hall-Effect Current Sensing in Hybrid Electric Vehicle (HEV) Applications	Application note providing a greater understanding of hybrid electric vehicles and the contribution of Hall-effect sensing technology	https://allegromicro.com/en/insights-and-innovations/technical-documents/hall-effect-sensor-ic-publications/hall-effect-current-sensing-in-hybrid-electric-vehicle-hev-applications
Achieving Closed-Loop Accuracy in Open-Loop Current Sensors	Application note regarding current sensor IC solutions that achieve near closed-loop accuracy using open-loop topology	https://allegromicro.com/en/insights-and-innovations/technical-documents/hall-effect-sensor-ic-publications/achieving-closed-loop-accuracy-in-open-loop-current-sensors
Allegro Current Sensor ICs Can Take the Heat! Unique Packaging Options for Every Thermal Budget	Application note regarding current sensors and package selection based on thermal capabilities	https://allegromicro.com/-/media/allegro/allegromicro/files/application-notes/an296190-current-sensor-thermals.ashx

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Revision History

Number	Date	Description
–	June 25, 2020	Initial Release
1	August 31, 2020	Updated links in Table 2
2	December 11, 2020	Updated Table 2
3	April 21, 2022	Updated Figure 1-4; minor editorial updates
4	April 18, 2023	Minor editorial updates

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