ASEK724KMA-30AB-T

ACS724KMA Evaluation Board User Guide

DESCRIPTION

Evaluation boards offer a method for quickly evaluating Allegro current sensors in a lab environment without needing a custom circuit board. This document describes the use of the ACS724KMA Evaluation Board. This evaluation board (TED-0001775) is intended for use with the ACS724KMA 16-pin SOIC current sensor IC.

FEATURES

- 2-layer PCB with 4 oz. copper weight on all layers
- Flexible instrument connection:
  - □ Standard Keystone test points, banana jack connectors are provided

EVALUATION BOARD CONTENTS

- Printed circuit board with populated components
- Recommended bill of materials (BOM) for all compatible current sensor are listed in the "Bill of Materials" section below.

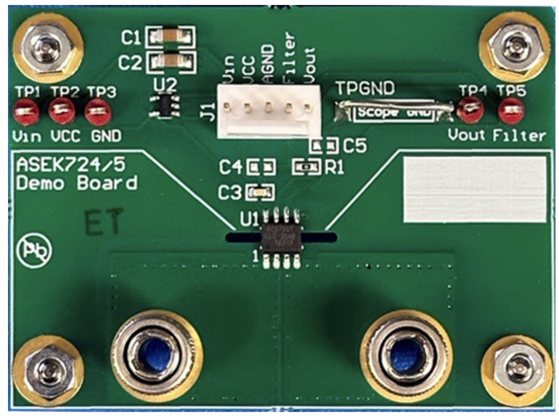

Figure 1: ASC724MA Evaluation Board

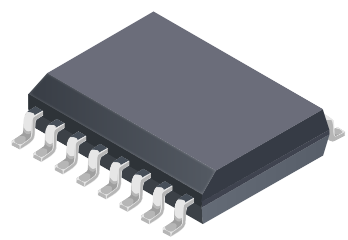

Figure 2: MA Package

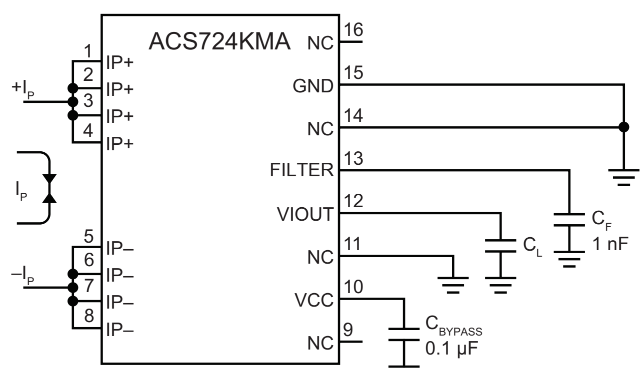

Figure 3: ACS724KMA Typical Application and Pinout

Table of Contents

USING THE EVALUATION BOARD

Evaluation Board Components

1. U1 is an MA package footprint (pin 1 is on bottom left side of U1; see the small green 1). The ACS724KMA should be populated here. See yellow highlight on Figure 4.
2. U2: Regulator on VCC highlighted in yellow.
3. U1 pins (9 to 16; see top view of EVB) allow the option to connect:
   - □ R1: Load resistor to GND.
   - □ C5: External filter capacitor can be placed to set different bandwidths. The FILTER pin can be used to decrease the bandwidth of the sensor in order to optimize noise performance.
   - □ C1/C2/C3: Bypass capacitor from VCC or VIN to GND
   - □ C4: Load capacitor on VIOUT, can also be used to filter the output and reduce bandwidth of the sensor.
   - □ See blue highlight on Figure 4 for above connection locations.
4. Test points allowing easy access to pins.
   - □ See J1 header highlighted in orange.
   - □ See Test Point locations (TP1 through TP5) highlighted in orange.
   - □ See TPGND allowing easy connection to GND highlighted in orange.
5. Standard banana jack connectors IP+ and IP- (primary current mounting position) highlighted in the bottom center of the evaluation board. Positive current flow direction is left to right.
6. RB1, RB2, RB3, and RB4: Rubber bumper mounting positions located in top and bottom left and right hand corners. Highlighted in gray.

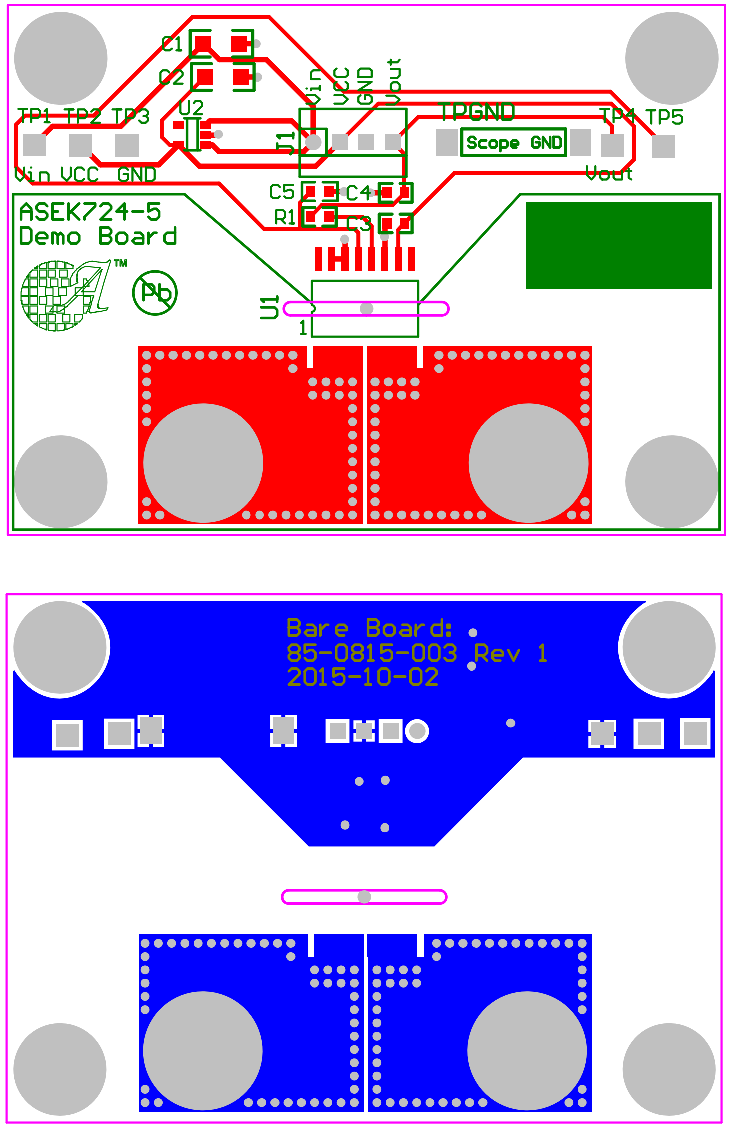

Figure 4: ASEK724KMA Evaluation Board Reference Images

Evaluation Board Procedure

CONNECTING TO THE EVALUATION BOARD

The best way to connect measurement instruments to the evaluation board is to use the provided Keystone test points and banana jack connectors for the applied current.

SCHEMATIC

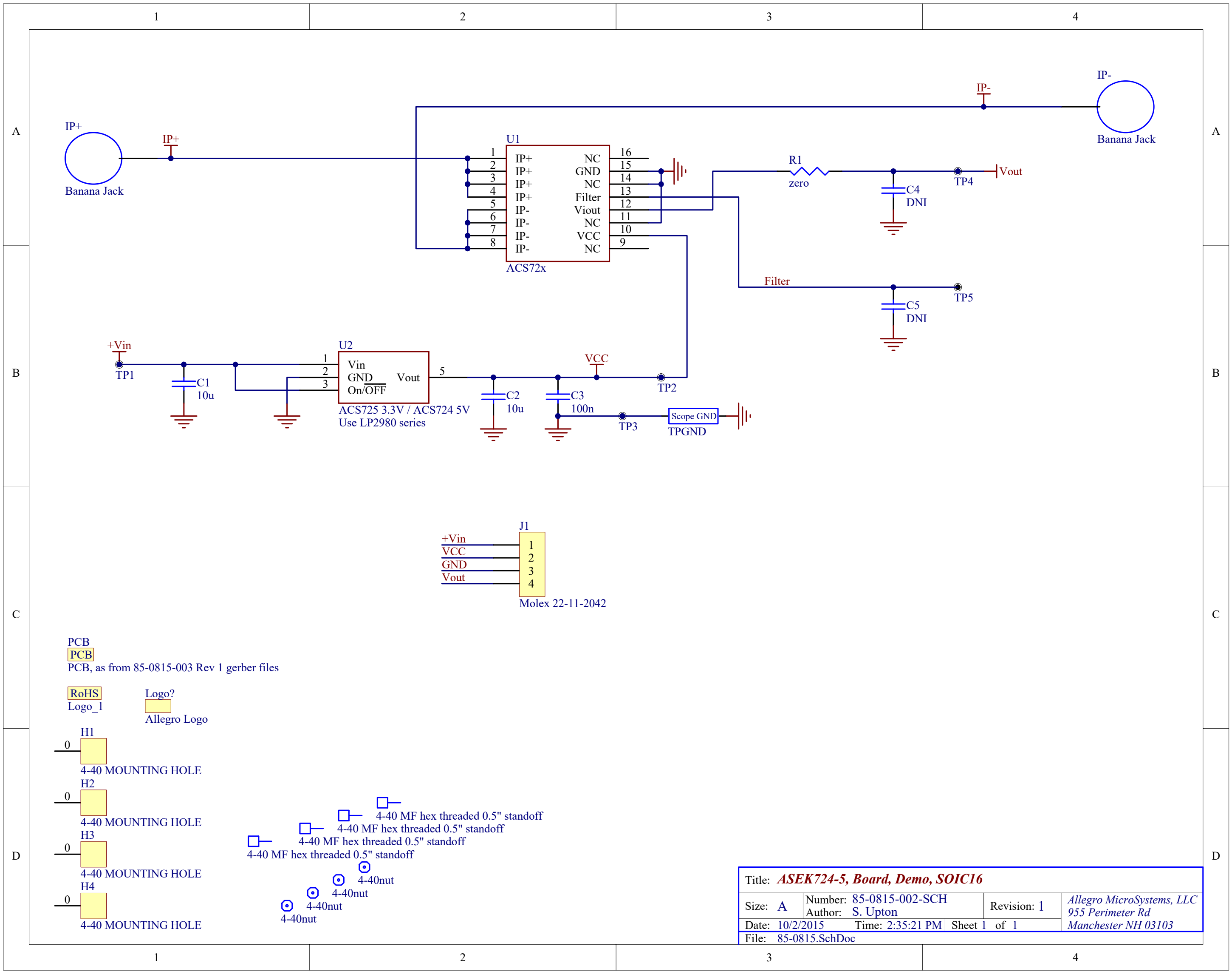

Figure 5: ASEK724KMA Evaluation Board Schematic

Allegro MicroSystems
955 Perimeter Road
Manchester, NH 03103-3353 U.S.A.
www.allegromicro.com

LAYOUT

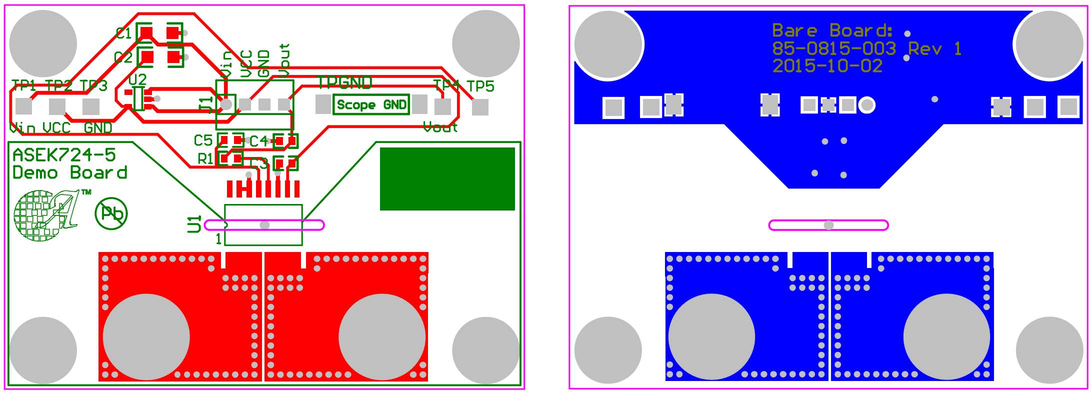

Figure 6: ASEK724KMA Evaluation Board Top Layer (left) and Bottom Layer (right)

Gerber files for the ASEK724 evaluation board are available for download from the Allegro website. See the technical documents section of the ACS724 device webpage.

Allegro MicroSystems
955 Perimeter Road
Manchester, NH 03103-3353 U.S.A.
www.allegromicro.com

THERMAL RISE VS. PRIMARY CURRENT

Self-heating due to the flow of current should be considered during the design of any current sensing system. The sensor, printed circuit board (PCB), and contacts to the PCB will generate heat as current moves through the system.

The thermal response is highly dependent on PCB layout, copper thickness, cooling techniques, and the profile of the injected current. The current profile includes peak current, current on-time, and duty cycle. While the data presented in this section was collected with direct current (DC), these numbers may be used to approximate thermal response for both AC signals and current pulses.

The plot in Figure 5 shows the measured rise in steady-state die temperature of the ACS724 versus continuous current at an ambient temperature, T_A, of 25 °C. The thermal offset curves may be directly applied to other values of T_A. Conversely, Figure 8 shows the maximum continuous current at a given T_A. Surges beyond the maximum current listed in Figure 8 are allowed given the maximum junction temperature, $T_{J(MAX)}$ (165°C), is not exceeded.

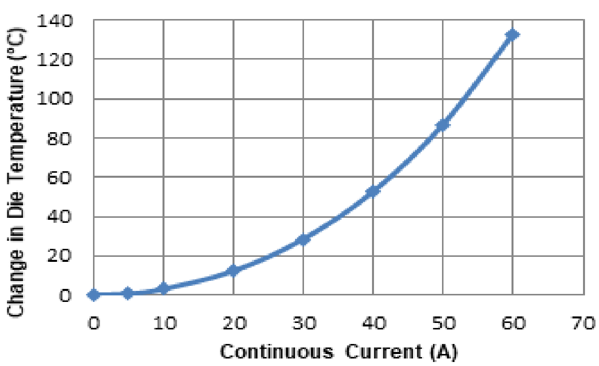

Figure 7: Self Heating in the MA Package Due to Current Flow

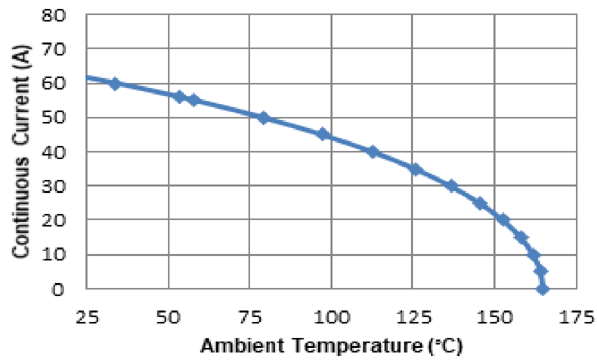

Figure 8: Maximum Continuous Current at a Given T_A

The thermal capacity of the ACS724 should be verified by the end user in the application specific conditions. Further information on this application testing is available in the DC and Transient Current Capability application note on the Allegro website.

Allegro MicroSystems
955 Perimeter Road
Manchester, NH 03103-3353 U.S.A.
www.allegromicro.com

BILL OF MATERIALS

Table 1: Evaluation Board Bill of Materials

Item	Qty	S	Manufacturer	P/N	Description	Designator
1	1				See ASY	U1
2	1				See ASY	U2
3	1	6	AVX	06035C104K4T2A	Capacitor, 0603, mono, X7R, 50 V, 100 nF	C3
4	2	6	TDK	C3216X5R1H106K	Capacitor, 1206, mono, X5R, 50 V, 10%, 10 μF	C1, C2
5	2	6			Do not install	C4, C5
6	1	6	Panasonic	ERJ-3GEY0R00V	Jumper, 0603, 0 Ω jumper	R1
7	2	6	Emerson	111-2223-001	Connector, through, banana jack (5 way binding post)	IP+, IP-
8	1	9	Molex	22-11-2042	Connector, through, header, Molex 100 mil, 4 circuit, gold	J1
9	5	6	Keystone	5005	Testpoint, through, compact, for 62 mil PCB, red	TP1, TP2, TP3, TP4, TP5
10	1	6			Jumper, through, used as scope gnd, bend from 18 g wire, install 0.25 inches above PCB	TPGND
11	4	6	Keystone	1944	Standoff, metal, hex-threaded, male-female, 4-40 × 0.5inch	standoff1, standoff2, standoff3, standoff4
12	4	6			Nut, metal, zinc-plated, hex, 4-40	n1, n2, n3, n4
13	1	10			PCB, as from 85-0815-003 Rev 1 gerber files	PCB

Allegro MicroSystems
955 Perimeter Road
Manchester, NH 03103-3353 U.S.A.
www.allegromicro.com

RELATED LINKS AND APPLICATION SUPPORT

Table 3: Related Documentation and Application Support

Documentation	Summary	Location
Allegro Current Sensors Webpage	Product datasheet defining common electrical characteristics and performance characteristics	https://www.allegromicro.com/en/products/sense/current-sensor-ics
Allegro Current Sensor Package Documentation	Schematic files, step files, package images	https://www.allegromicro.com/en/design-support/packaging
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
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/files/application-notes/an296190-current-sensor-thermals.pdf
Explanation Of Error Specifications For Allegro Linear Hall-Effect-Based Current Sensor Ics And Techniques For Calculating Total System Error	Application note describing error sources and their effect on the current sensor output	https://allegromicro.com/-/media/files/application-notes/an296181-acs72981-error-calculation.pdf

ALLEGRO microsystems
Allegro MicroSystems
955 Perimeter Road
Manchester, NH 03103-3353 U.S.A.
www.allegromicro.com

Revision History

Number	Date	Description
–	June 15, 2023	Initial release
1	June 25, 2024	Fixed broken link (page 5)

Allegro MicroSystems
955 Perimeter Road
Manchester, NH 03103-3353 U.S.A.
www.allegromicro.com