User Manual

ASEK37600 Evaluation Board

Introduction

The ASEK37600 Evaluation Kit provides a simple way to program and evaluate the Allegro ACS37600 current sensor IC. This kit consists of two blocks: ASEK37600-Programming Board (TED-0003016) and ASEK37600-EVB (TED-0003124).

The kit supports and is assembled by default with these ACS37600 devices:

- ACS37600KLUA-1P5B5-C
- ACS37600KLUA-003B5-C
- ACS37600KLUA-006B5-C
- ACS37600KLUA-013B5-C

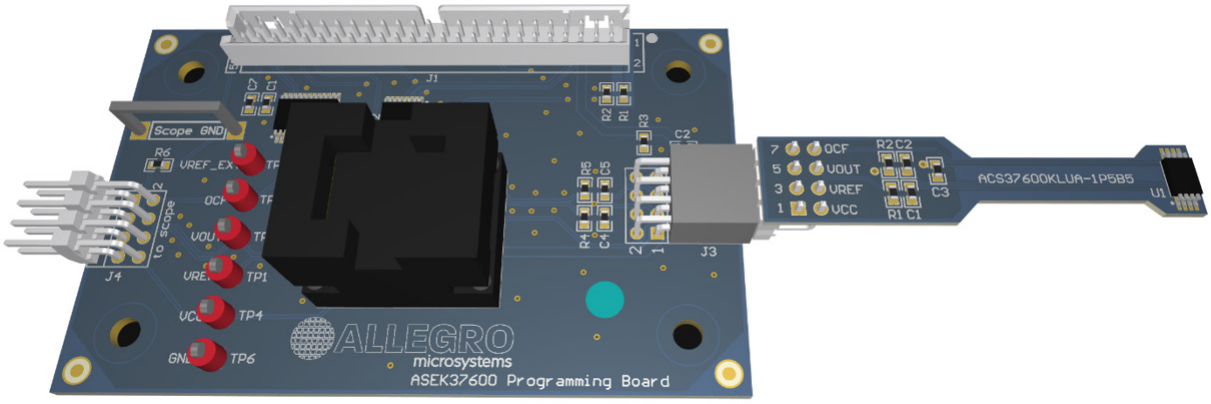

Figure 1: Typical Interconnection of Programming and Evaluation Board

ASEK37600 EVB Evaluation Board (TED-0003124)

The board is delivered as a panel of eight individual EVBs, with two layout options for evaluation of 90 degrees and 0 degrees of DUT orientation. Each has four different ACS37600 devices assembled.

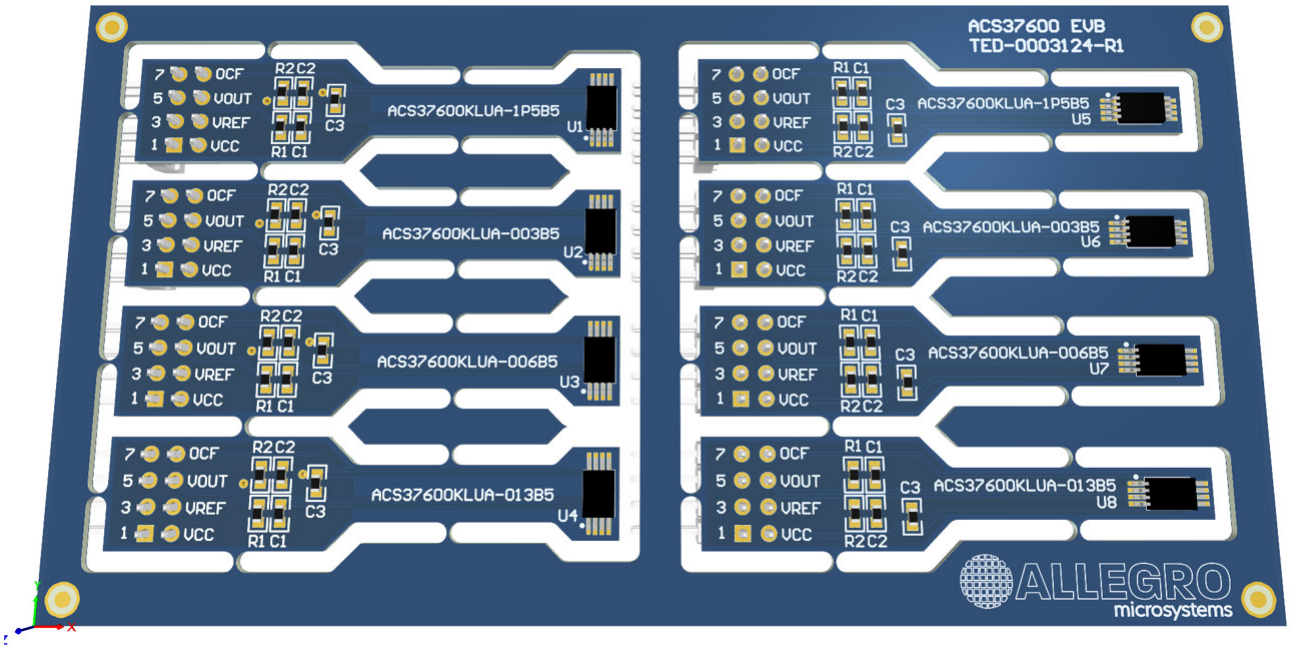

Figure 2: PCB Panel of Evaluation Boards

Table 1: ASEK37600 EVB Bill of Material (BOM)

Designator	Manufacturer	P/N	Description
U1, U5	Allegro MicroSystems	ACS37600KLUA-1P5B5-C	Hall current sensor
U2, U6	Allegro MicroSystems	ACS37600KLUA-003B5-C	Hall current sensor
U3, U7	Allegro MicroSystems	ACS37600KLUA-006B5-C	Hall current sensor
U4, U8	Allegro MicroSystems	ACS37600KLUA-013B5-C	Hall current sensor
P1, P2, P3, P4, P5, P6, P7, P8	Sullins Connector Solutions	PRPC004DBAN-M71RC	Connector Header Through Hole, Right Angle 8 position 0.100"
C1, C2, C3, R1, R2	Not assembled by default as all the passive components are present at the ASE37600 Programming board		

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ASEK37600 EVB Schematic and PCB Layout, Top View

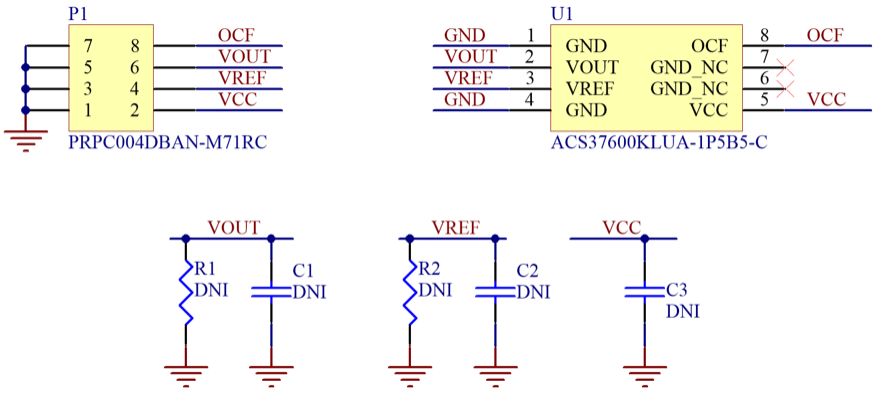

Figure 3: ASEK37600 Evaluation Board Schematic

Current Sensing Module Construction

There are two options for positioning the ACS37600 inside a current sensing module: 90 degrees or 0 degrees rotated, as shown in Figures 4 and 5, respectively. The 90-degree rotation allows for a shorter but wider module, whereas the 0-degree variant allows for a slimmer but longer module. EVBs are provided in both variants to simplify custom module development.

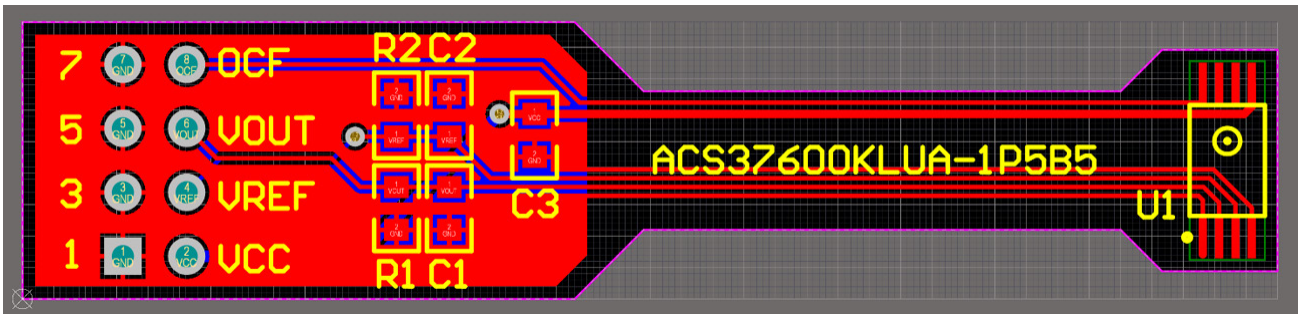

Figure 4: 90 Degree Rotated PCB Layout, Top View

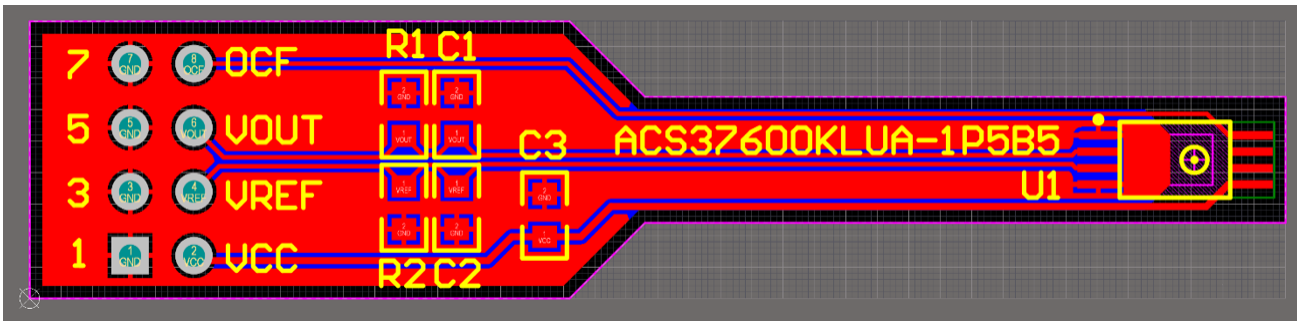

Figure 5: 0 Degree Rotated PCB Layout, Top View

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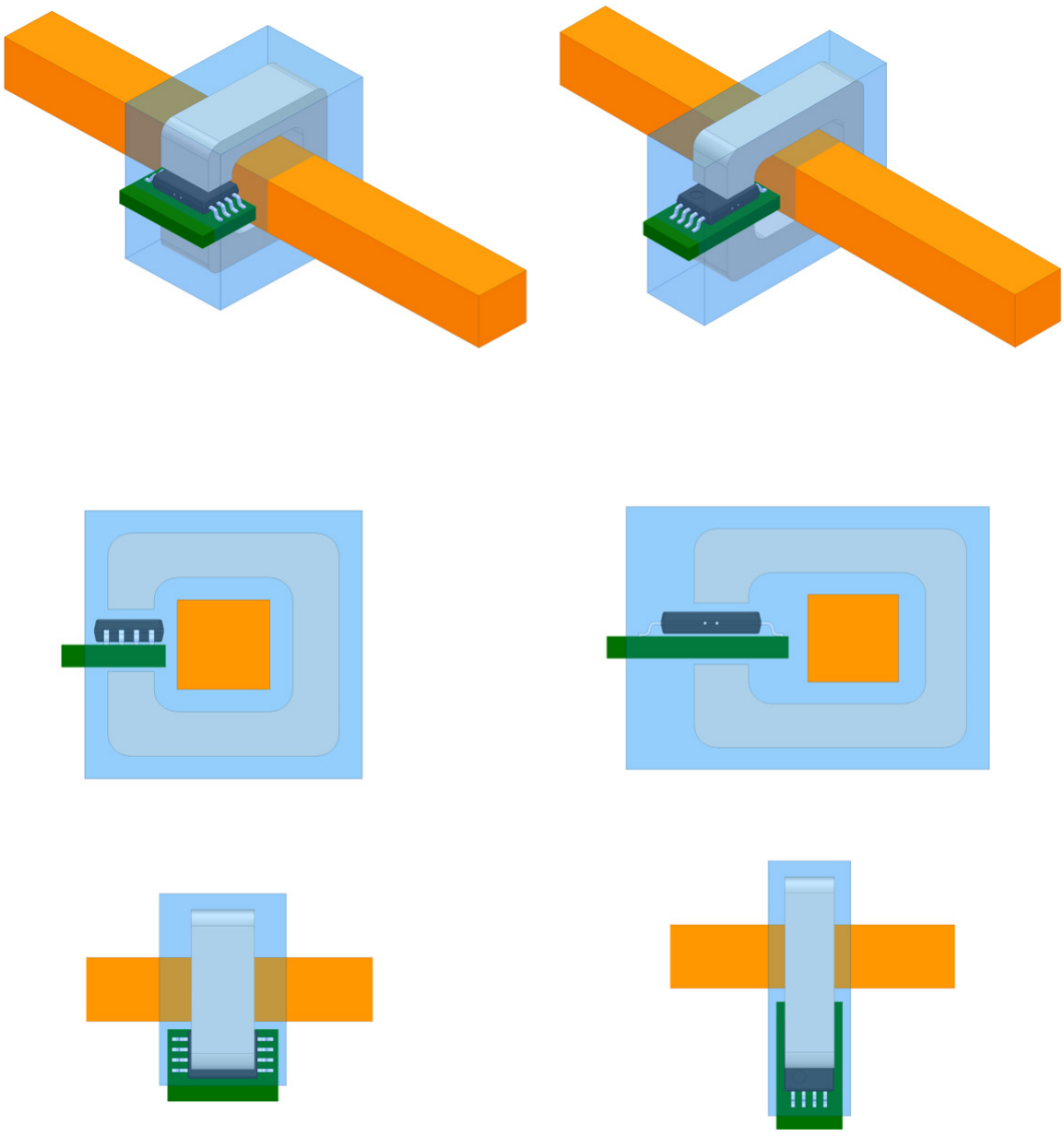

Figure 6: Comparison of Module Constructions; Left = 90° rotated; Right = 0° rotated.
Blue = module enclosure, green = PCB, orange = current conductor, grey = ferromagnetic core.

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ASEK37600 Programming Board (TED-0003016)

The ASEK37600 Programming board serial interface allows an external controller (ASEK-20) to read and write selected customer registers in the device using a point-to-point command/acknowledge protocol.

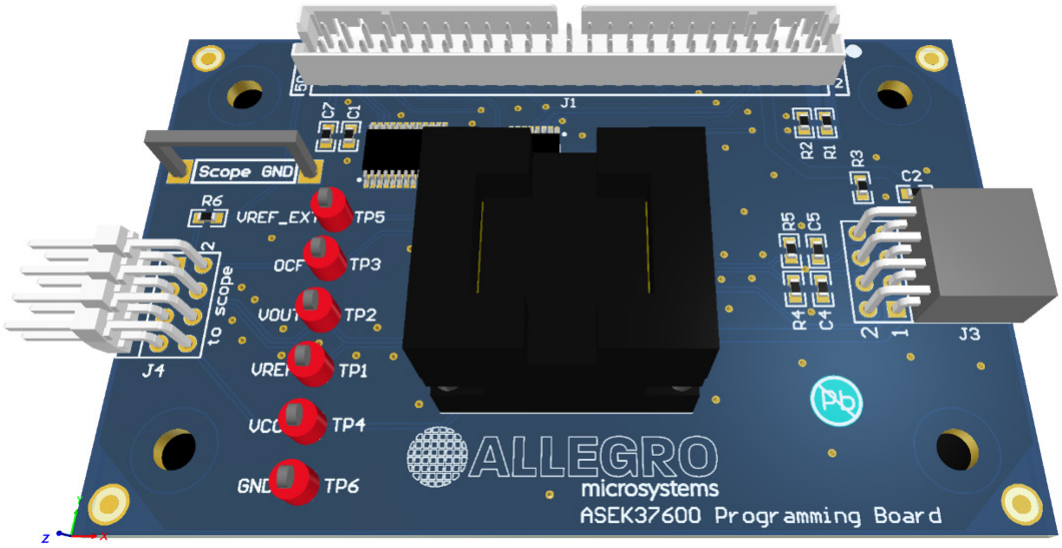

Figure 7: Programming Board 3D View

Prerequisites:

- ASEK-20 (Part #85-0540-004) Programmer Controller
- ACS37650 Programmer GUI from Allegro Software Portal

Figure 8: ASEK-20 Programmer and ASEK37600 GUI

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ASEK37600 Programming Board Schematic

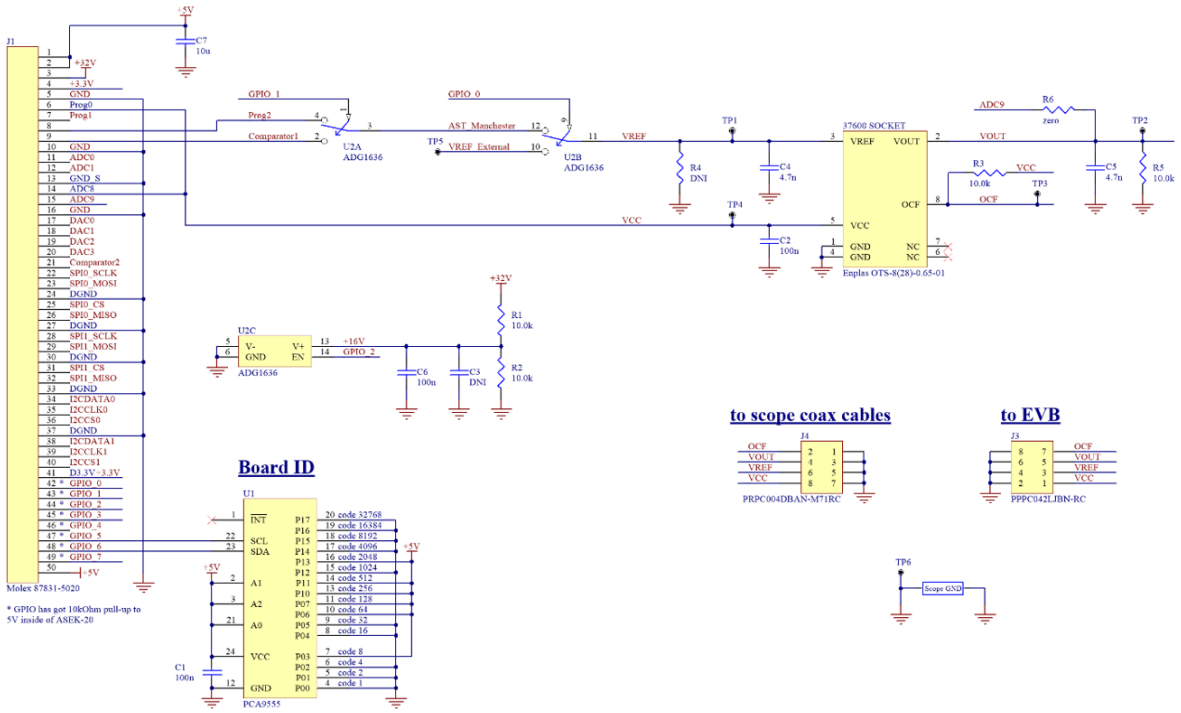

Figure 9: Programming Board Schematic

Board Features and Description

- The ASEK37600 Programming Board can be used either with ACS37600 device inserted into TSSOP8 socket or ASEK37600-EVB plugged in to J3 connector.
- V_{CC} is supplied and controlled by ASEK-20 via Programmer GUI.
- U2 switch (ADG1636) connects by default VREF node to VREF_External (TP5) while there is no active ASEK-20 communication. TP5 can be used to provide external reference voltage if ACS37600 VREF pin is configured as input or input/output.
- ASEK-20 ADC allows to read: VOUT, VCC and ICC current.
- R5, C5 represents VOUT resistive and capacitive load.
- R4, C4 represents VREF resistive and capacitive load.
- J4 header connector provides optimized instruments connection for high-speed magnetic field transient tests. (Field is applied to ASEK37600-EVB evaluation board).

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ASEK37600 Evaluation Kit Operating Instructions

1. Cut EVB out of the PCB panel.
2. Plug EVB board into ASEK Programming board using J3 connector.
3. Connect ASEK-20 Programmer ribbon cable to J1 connector on programming board.
4. Hook up ASEK-20 to PC via USB cable.
5. Power on ASEK-20 (ON/Off switch on chassis).
6. Launch Allegro 37600 Samples Programmer GUI.
7. Select ASEK-20 COM port (click bottom right button to open Communication Setup dialog).
8. Click “Power On” button; DUT is powered up and Manchester communication is up and running now.
9. Connect multimeter, oscilloscope, or other measurement instruments to VOUT, VREF, and OCF.
10. Generate magnetic field perpendicular to DUT package.
11. Read sensor output.

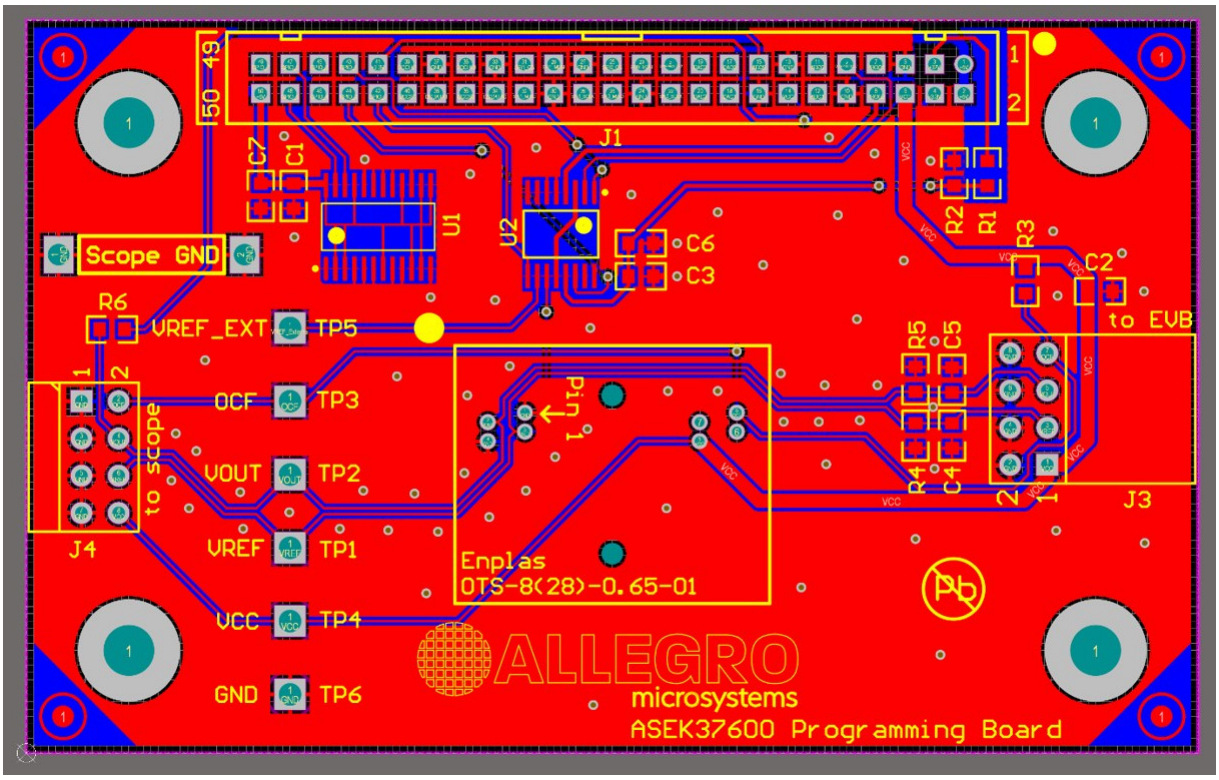

Figure 10: ASEK37600 Programming Board PCB Layout – Top View

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Two-Point Programming (2PP) Feature

The ACS37600 is a user-programable device where sensitivity can be set within limits shown in Table 2. The goal of 2PP is to calculate and set device sensitivity (sens_fine) in such a manner that the V_{OUT} signal would reach user-defined target voltage while a test magnetic field is applied to the device.

Table 2: ACS37600 Sensitivity Programming Range

Part Number	Factory-Trimmed Sensitivity (mV/G)	Factory-Trimmed Operating Range (G)	Programming Range			
			Min. Sensitivity (mV/G)	Operating Range (G)	Max. Sensitivity (mV/G)	Operating Range (G)
ACS37600KLUA-1P5B5-C	1.5	±1333	0.8	±2500	1.7	±1176
ACS37600KLUA-003B5-C	3	±667	1.7	±1176	3.5	±571
ACS37600KLUA-006B5-C	6	±333	3.5	±571	7.2	±278
ACS37600KLUA-013B5-C	13.5	±148	7.2	±278	18	±111

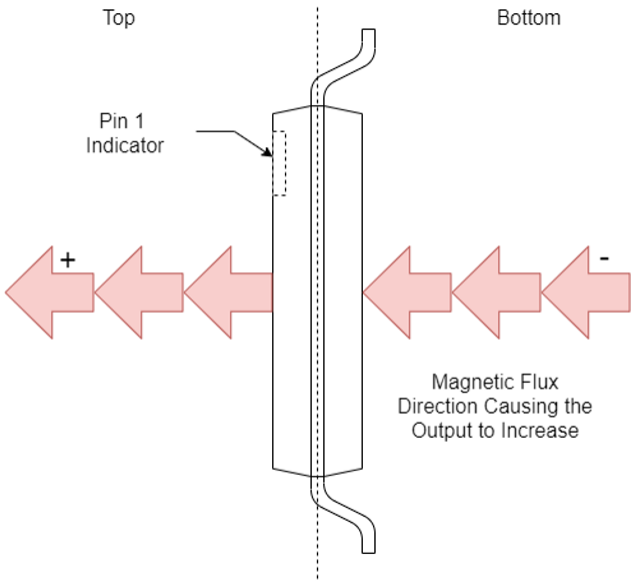

Figure 11: Direction of field creates positive V_{OUT} change while register gc_pol is 0

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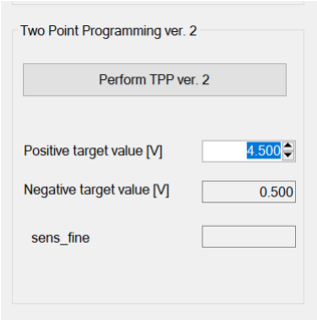
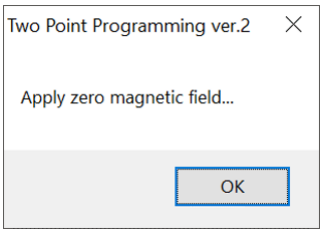
2PP Flow Example

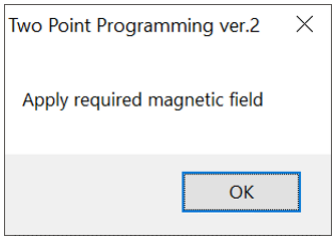
1. Prepare a test bench with ACS37600KLUA-1P5B5-C EVB, ferromagnetic core, and current-carrying conductor.
2. Enter positive target value for example 4.5 V (note: negative target voltage is calculated automatically).



3. Press the “Perform TPP ver. 2” button; following message box appears:



4. Set zero current flowing through a wire in the core and press OK. Offset of ASEK-20 ADC is calculated. Next message box is asking user to generate a magnetic field.



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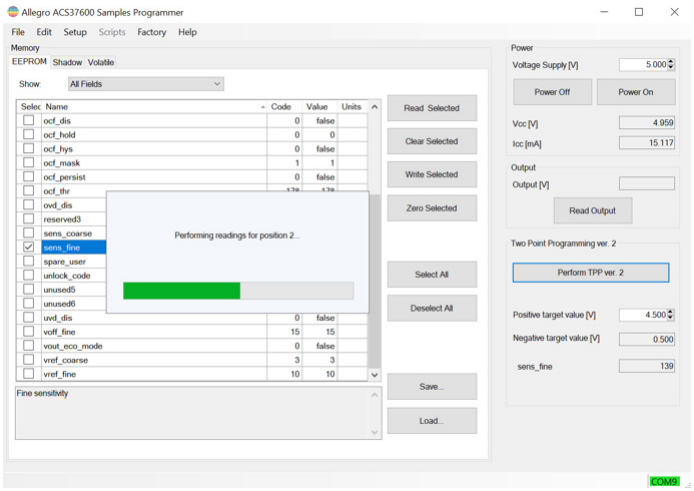
5. Set a current in such a manner to generate magnetic field within limits defined in Table 2 and press OK. For example, in case of ACS37600KLUA-1P5B5-C, the field supposed to be between 1176 gauss and 2500 gauss. If the core has a coupling factor of 4 mG/A and test current is 500 A, magnetic field applied to the device would be equal to 2000 gauss. To reach V_{OUT} = 4.5 V, the 2PP algorithm would calculate target sensitivity 1 mV/G and set 'sens_fine' register value accordingly. The 2PP progress is shown below.



6. Once the green progress bar disappears, 2PP calculation and setting is done, and the current stimulus can be turn off.
7. In case the applied test current is too low or too high for selected ACS37600 part number, an Out of Range error messages appears.

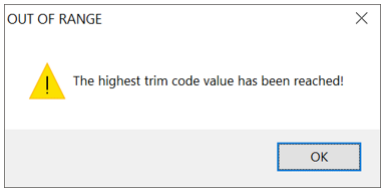


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Table 3: ASEK37600 Programming Board Bill of Material (BOM)

Designator	Manufacturer	P/N	Description
J3	Sullins Connector Solutions	PPPC042LJBN-RC	8-Position Header Connector Through Hole, Right Angle
J4	Sullins Connector Solutions	PRPC004DBAN-M71RC	Connector Header Through Hole, Right Angle 8-Position 0.100" (2.54 mm)
C4, C5	AVX	06035C472KAT2A	Capacitor, 0603, mono, X7R, 50 V, 4.7 nF
C1, C2, C6	AVX	06035C104K4T2A	Capacitor, 0603, mono, X7R, 50 V, 100 nF
C7	Murata	GRM188R61A106KE69D	Capacitor, 0603, mono, X5R, 10 V, 10%, 10 µF
C3, R4			Do not install
R1, R2, R3, R5	Panasonic	ERJ-3EKF1002V	Resistor, 0603, 100 mW, thick film, 1%, 10.0 kΩ
R6	Panasonic	ERJ-3GEY0R00V	Jumper, 0603, zero Ω jumper
U1	TI	PCA9555PWR	IC, TSSOP-24, I^2C bus extender
U2	Analog Devices	ADG1636BRUZ	IC, TSSOP16, dual FET switch
J1	Molex	87831-5020	Connector, through, straight, gold plating, 50 circuit, 2 mm × 2 mm
37600 SOCKET	Enplas	OTS-8(28)-0.65-01	Socket, through-hole, TSSOP8
TP6	Keystone	5006	Test point, thro, compact, for 62 mil PCB, black
TP1, TP2, TP3, TP4, TP5	Keystone	5005	Test point, thro, compact, for 62 mil PCB, red

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Revision History

Number	Date	Description
–	June 8, 2020	Initial Release
1	July 9, 2020	Added figure and table numbers, Current Sensor Module Construction section (pages 3-4), Two-Point Programming Feature description (page 8), and 2PP Flow Example (pages 9-10).

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