

## Using the ACS37800 Power Monitoring IC Bare Evaluation Boards with the Allegro Samples Programmer

Current Sensors System Engineering  
Allegro MicroSystems

### Description

Bare evaluation boards offer a method for evaluating Allegro current sensors in a lab environment. This document describes the use of the ACS37800 power monitoring IC evaluation boards for the MA/LA packages ACSEVB-MA16-LA16-POWER-IC (TED-0004290) and MC package ACSEVB-MC16-POWER-IC (TED-0004286) with the Allegro ACS37800 samples programmer. The ACS37800 pinout is shown in Figure 1 and the ACS37800 terminal list is shown in Table 1.

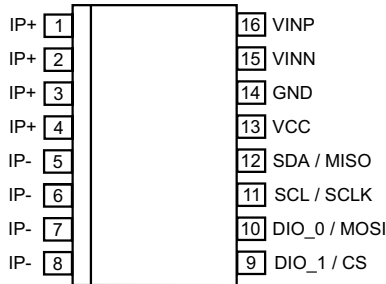


Figure 1: ACS37800 Pinout  
*Not to scale*

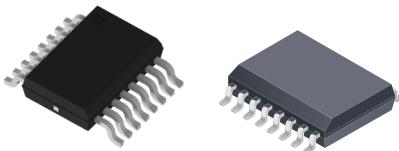


Figure 2: SOICW-16 MC (left) and MA Packages (right)

Table 1: ACS37800 Terminal List

Number	Name	Description	
		I <sup>2</sup> C	SPI
1, 2, 3, 4	IP+	Terminals for current being sensed; fused internally	
5, 6, 7, 8	IP-	Terminals for current being sensed; fused internally	
9	DIO_1/CS	Digital I/O 1	Chip Select (CS)
10	DIO_0/MOSI	Digital I/O 0	MOSI
11	SCL/SCLK	SCL	SCLK
12	SDA/MISO	SDA	MISO
13	VCC	Device power supply terminal	
14	GND	Device ground terminal	
15	VINN	Negative input voltage (always connect to GND)	
16	VINP	Positive input voltage	

### Bare Evaluation Board Features

- Enhanced thermal performance
- 6-layer PCB with 2 oz copper weight on all layers
  - Nonconductive-filled via-in-pad
  - High-performance FR4 material with 180°C glass transition temperature
- Flexible layout for user-installed connection points
  - Standard Keystone test points
  - SMA/SMB connector
  - 2-pin headers
- Integrated current loop resistance can be measured directly on the evaluation board after test point installation; voltage drop can be measured for approximating power loss in the package.

### Bare Evaluation Board Contents

- **NOTE:** It is up to the user to assemble the board with the desired current sensor and supporting circuitry. This board does not come populated with an Allegro current sensor or other components.

The ACS37800 bare evaluation boards are shown in Figure 3 and Figure 4.

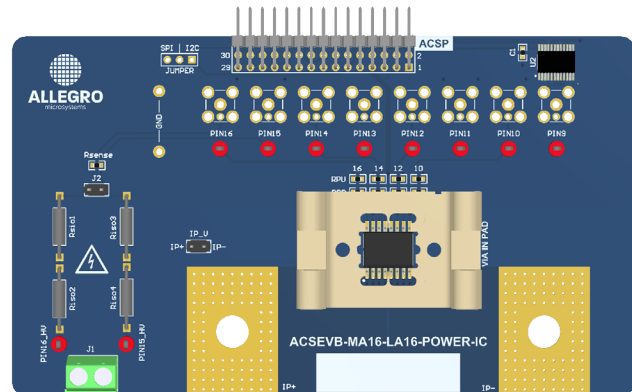
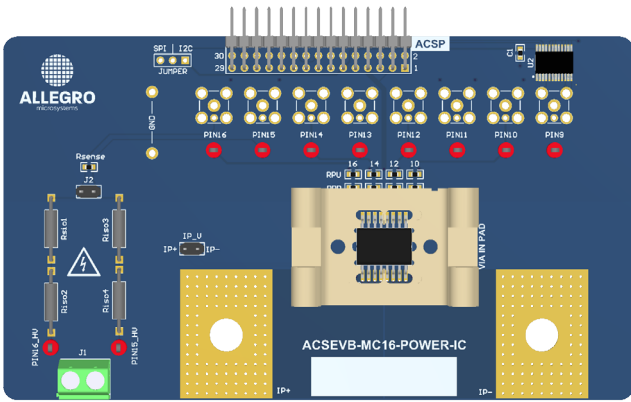


Figure 3: ACSEVB-MA16-LA16-POWER-IC (TED-0004290) Evaluation Board Layout

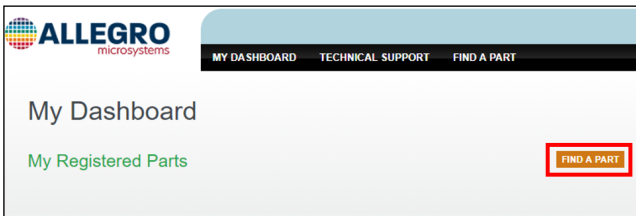


**Figure 4: ACSEVB-MC16-POWER-IC (TED-0004286) Evaluation Board Layout**

## Using the Evaluation Board

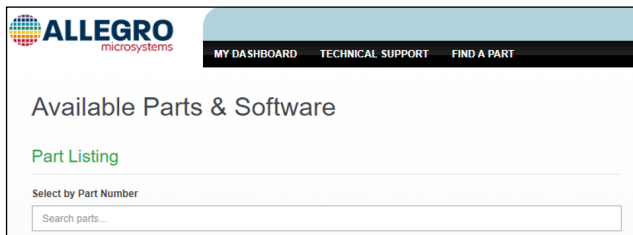
### DOWNLOADING THE PROGRAMMER

1. Register for software on the Allegro Software Portal: <https://registration.allegromicro.com/login>.
2. After registering and logging in to the software portal, the dashboard page is shown. Choose the “Find a Part” button highlighted in Figure 5.



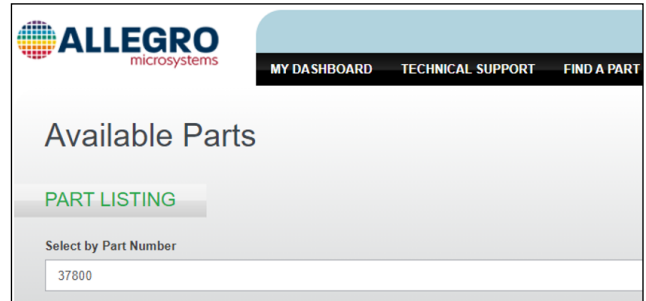
**Figure 5: “Find a Part” button allowing the user to register specific devices**

3. Click “Find a Part” to go to the “Available Parts & Software” page.
4. Search for “ACS37800” in the “Select by Part Number” search bar shown in Figure 6.



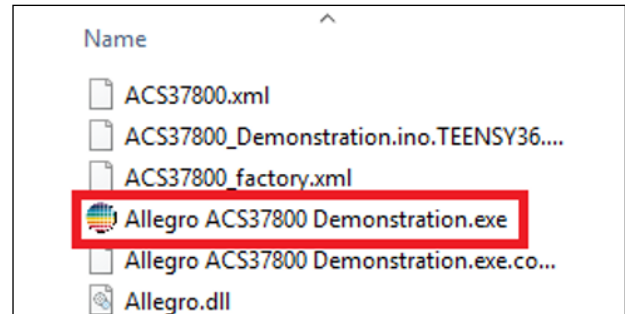
**Figure 6: “Select by Part Number” on the Available Parts and Software page**

5. Click “View” next to the ACS37800 search result as shown highlighted in Figure 7.



**Figure 7: “View” next to “ACS37800” search result**

6. Click “Download” next to the first result to open the Programming Application ZIP file.
7. Open and extract the downloaded ZIP file and save to a known location.
8. Open the extracted ZIP file and open the folder “Allegro ACS37800 Demonstration”.
9. Open the Allegro ACS37800 application file (EXE file extension) to open the samples programmer.



**Figure 8: Allegro ACS37800 Samples Programmer**

## ACS37800 Board and GUI Setup and Connection

### Powering-on the ACS37800

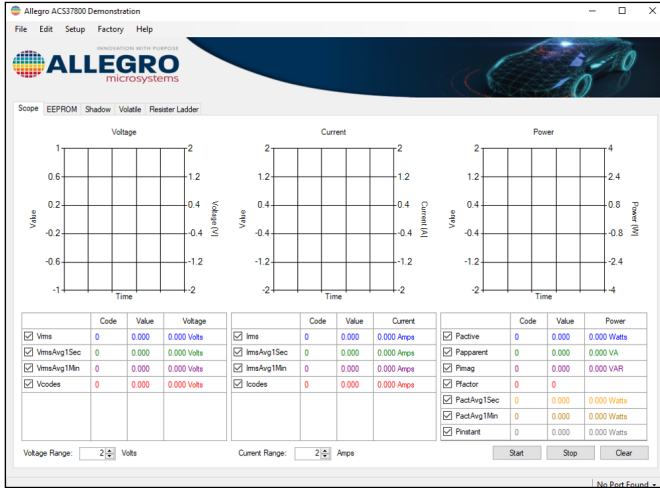
Use an external power supply and connect to the device VCC (Pin 13) and GND (Pin 14).

### Opening the GUI

Opening the programmer results in a window identical to Figure 8. Once the “Allegro ACS37800 Samples Programmer” application file has been opened and executed, the user must connect a USB cable from the USB port of a personal computer to the micro-USB port of the Teensy 3.2 (refer to Figure 8 for an image of the Teensy 3.2).

If connecting and programming the ACS37800 evaluation board

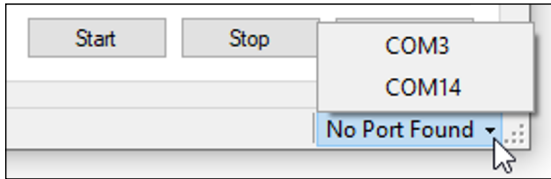
for the first time, the user must first update the Teensy firmware. Follow the steps in Updating Teensy Firmware section. If not using the ACS37800 evaluation board for the first time, skip to Selecting the COM Port section.



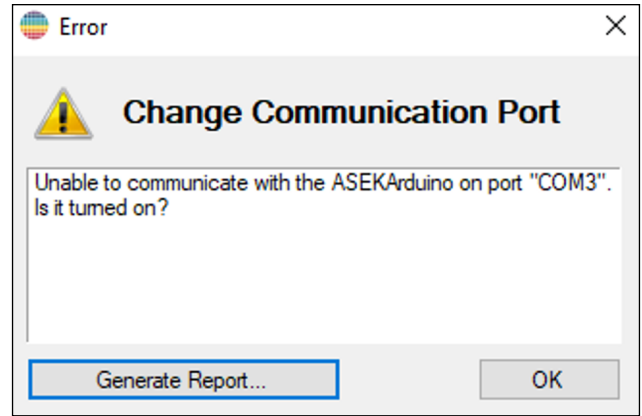
**Figure 9: ACS37800 Programmer Application**

### Selecting the COM Port

To select a COM port, navigate to the file bar on the bottom of the GUI, as shown in Figure 10. Upon startup, the GUI states “No Port Found”. Select the drop-down arrow and select the COM port the Teensy is connected to. If the wrong COM port is selected, an Error message dialog window appears (refer to Figure 11).



**Figure 10: COM Port Setup**

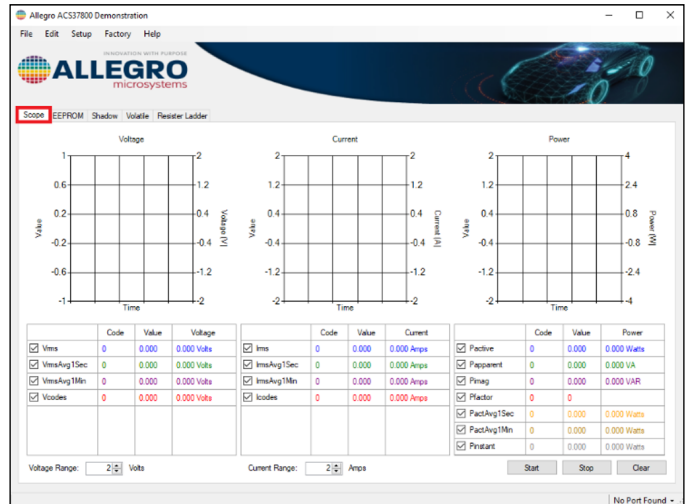


**Figure 11: Wrong COM Port Selection Error Window**

### Notable GUI Features

#### Scope Page

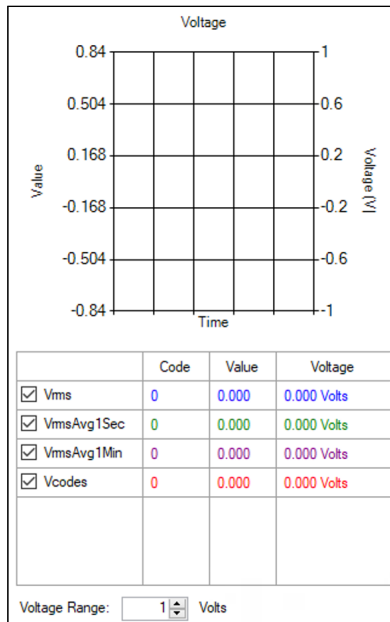
The first page of the ACS37800 GUI is the Scope mode page. Here, the user can plot and observe different fields. The fields are defined below. For more information about these fields, refer to the ACS37800 datasheet on the ACS37800 device page on the Allegro website.



**Figure 12: Default Scope Mode Page in the ACS37800 GUI**

## Voltage

1. Vrms: RMS voltage output
2. VrmsAvg1Sec: averaged voltage RMS value, duration set by RMS\_AVG\_1
3. VrmsAvg1Min: averaged voltage RMS value, duration set by RMS\_AVG\_2
4. Vcodes: instantaneous voltage measurement before any RMS calculations are done

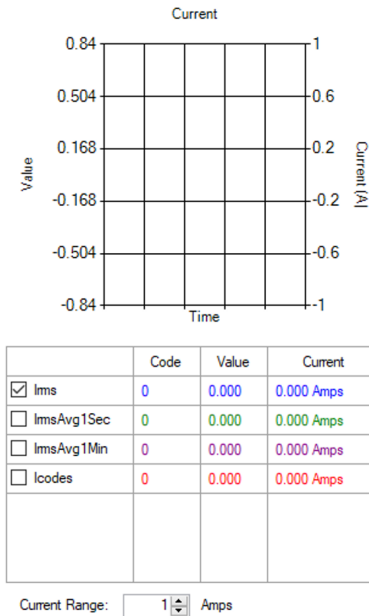


**Figure 13: Default Voltage Plot**

## Current

1. Irms: RMS current output
2. IrmsAvg1Sec: averaged voltage RMS value, duration set by RMS\_AVG\_1
3. IrmsAvg1Min: averaged voltage RMS value, duration set by RMS\_AVG\_2

4. Icodes: instantaneous current measurement before any RMS calculations are done



**Figure 14: Default Current Plot**

## Power

1. Pactive: active power output
2. Papparent: apparent power output magnitude
3. Pimag: reactive power output
4. Pfactor: power factor output
5. PactAvg1Sec: active power value averaged according to RMS\_AVG\_1.
6. PactAvg1Min: active power value averaged according to RMS\_AVG\_2.
7. Pinstant: this field contains the instantaneous power measurement before any RMS calculations are done

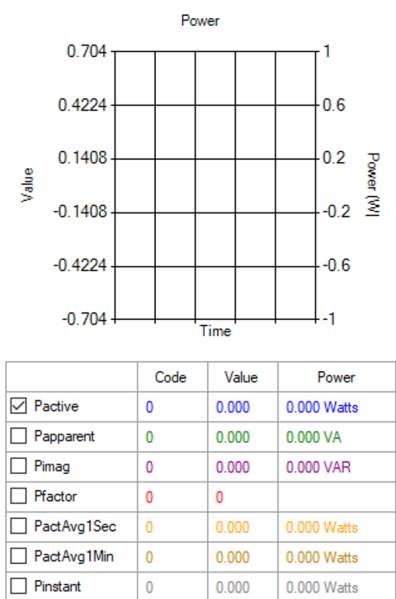


Figure 15: Default Power Plot

In the bottom right hand corner of the Scope mode window, there are three buttons: start (begin plotting), stop (end plotting), and clear (removes existing data from plots).

Refer to Figure 16 for an example of the scope mode.



Figure 16: Example Scope Mode

## EEPROM Page

The second page of the ACS37800 GUI is the EEPROM page. Here, the user can read and write to EEPROM.

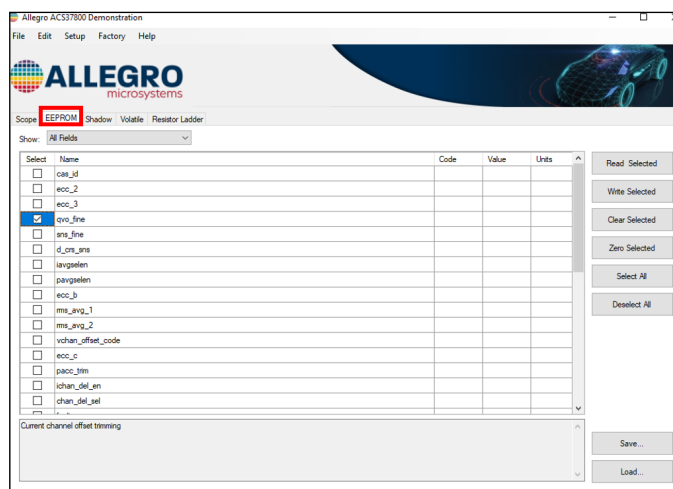


Figure 17: Default EEPROM Page

## Reading and Writing to the Part

Note before reading and writing to the part, the ACS37800 board must be powered and must be connected to the programmer GUI. Ensure the firmware of the Teensy is up to date.

It is recommended that the user save the memory to a tabular file before experimenting with programming so the user can return the device to its original factory programmed state if necessary. See the Saving and Loading Memory Files section for more information.

To read a field, select the desired field by checking the box under “Select” to the left of the register name (refer to Figure 18) and click the “Read Selected” button highlighted in red in Figure 19.

To write to a field, select the desired field by checking the box under “Select” to the left of the name. Change the value under “Code” to the desired value and press Enter. Click “Write Selected” button highlighted in blue in Figure 19.

To verify that field was written to the device, do the following: click “Clear Selected” causing the values in the “Code” and “Value” cells to disappear. Then click “Read Selected”. The values that were written reappear in the “Code” and “Value” cells verifying the user correctly wrote to the part.

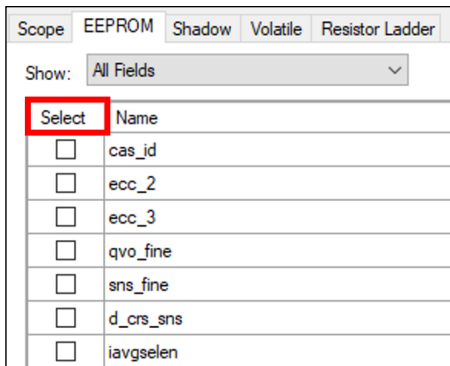


Figure 18: Select the Desired Field

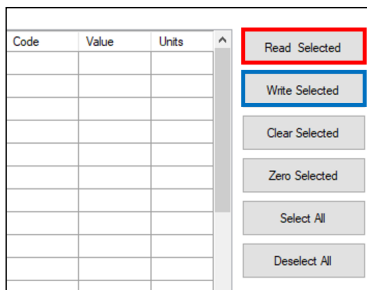


Figure 19: “Read Selected” and “Write Selected”

Below, each option on the programmer menu has been briefly defined:

1. Read Selected: reads value of the selected field
2. Write Selected: writes entered value to the part
3. Clear Selected: this option hides and clears the value of the selected field but does not change the value
4. Zero Selected: this option zeros the selected field but does not write zero to the device unless “Write Selected” is clicked
5. Select All: selects all fields
6. Deselect All: deselects all selected fields.

Note that clicking on the name of a selected field defines the field to the user. Hovering over a field with the PC cursor tells the user the address of that field (refer to Figure 20).

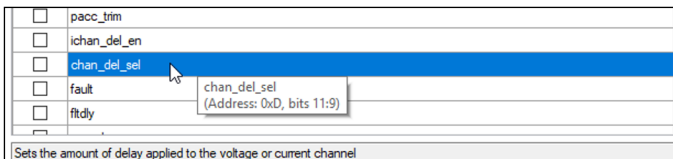


Figure 20: Field Definition by Clicking Desired Field

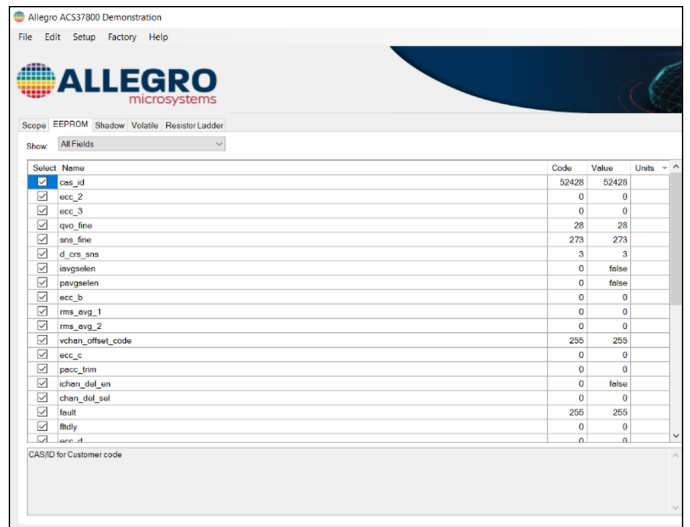


Figure 21: Example EEPROM Read

### Shadow Page

The third page of the ACS37800 GUI is the Shadow page. At power up, all shadow registers are loaded from EEPROM. The Shadow page has a “Load From EEPROM” option (refer to Figure 22).

The shadow registers, or the working memory of the device, can be written to in order to change the device behavior without having to perform an EEPROM write. Any changes made in shadow memory are temporary and do not persist through a reset event. When programming the ACS37800, shadow can be used to iterate and find the configuration that is desired, while EEPROM should be used as the final write.

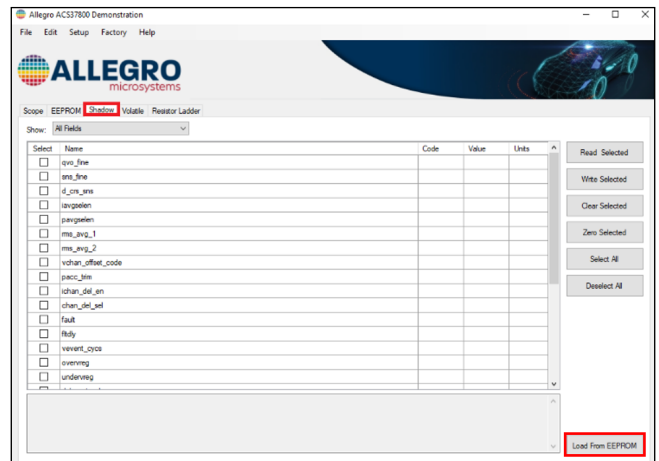


Figure 22: Shadow Default Page

## Volatile Page

The fourth page of the GUI is the Volatile page. Data in the volatile fields are maintained while the device is powered on.

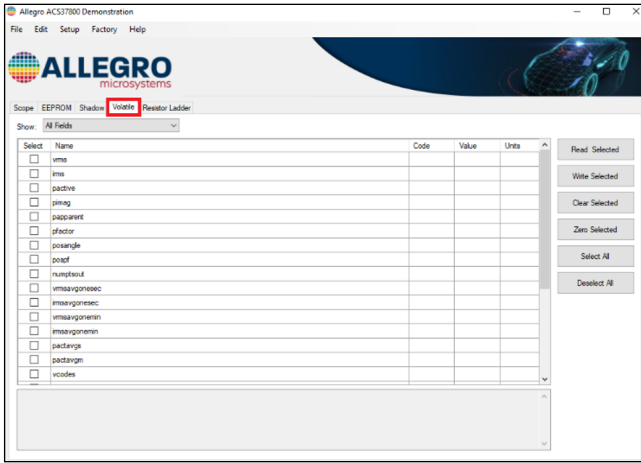


Figure 23: Default Volatile Page

## Resistor Ladder Page

The final page in the ACS37800 programmer is the Resistor Ladder page. Here, the user can calculate the maximum RSENSE value based on the application specific VLINE voltage (V\_line\_peak [V] in the GUI) and isolation resistor values R\_iso\_total [MΩ], the total resistance of the isolation resistors).

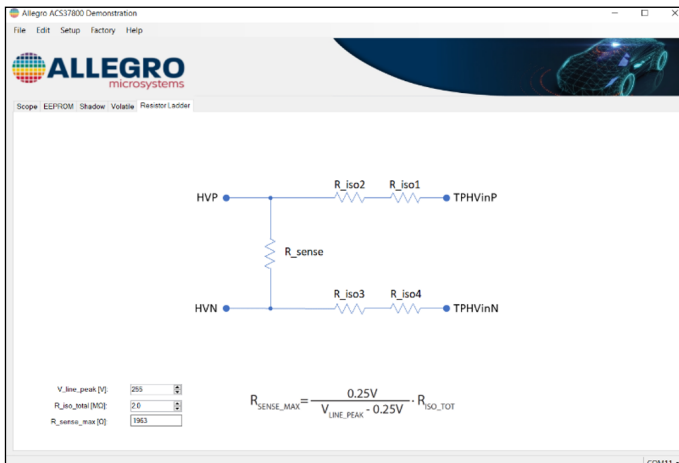


Figure 24: Resistor Ladder Page

The Resistor Ladder application circuit is based on the typical AC application circuit from the ACS37800 datasheet where  $R_{iso\_total} = R_{ISO1} + R_{ISO2} + R_{ISO3} + R_{ISO4}$ .

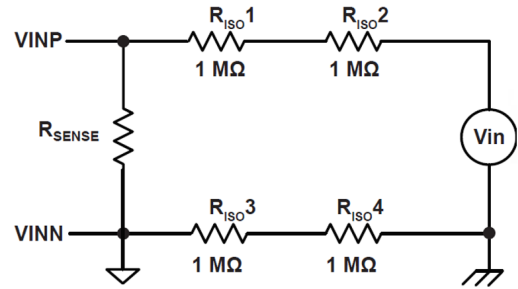


Figure 25: Typical Voltage Channel Application; Device GND is Isolated from Neutral

If the application requires device GND to be connected to Neutral,  $R_{iso\_total} = R_{ISO1} + R_{ISO2}$  ( $R_{ISO3} = R_{ISO4} = 0 \Omega$ ).

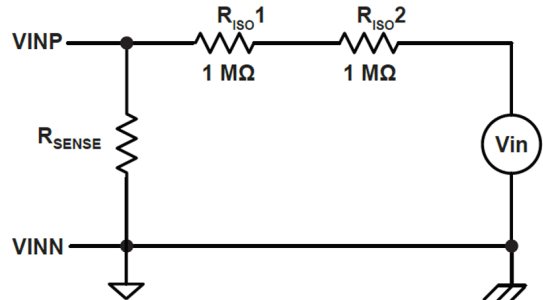


Figure 26: Typical Voltage Channel Application Circuit; Device GND is Connected to Neutral

## Demo Board Information

To access the Demo Board Information, hover over “Setup” on the menu bar. Select “Demo Board Information...”. This opens a dialog window identical to the window in Figure 28.

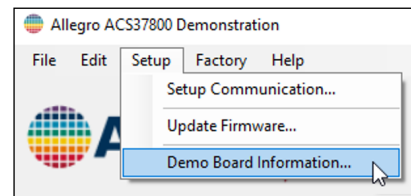


Figure 27: “Setup” → “Demo Board Information...”

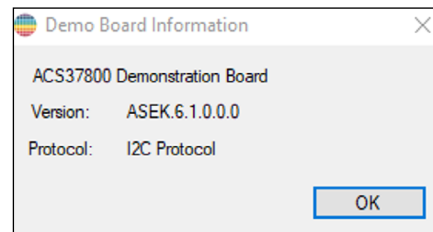


Figure 28: Demo Board Information Dialog Window Example

## Accessing the Register Diagram

To access the register diagram, hover over “Help” on the menu bar. Select “ACS37800 Register Diagram” (refer to Figure 29). This opens a dialog window identical to the window in Figure 30. Here, the user can view both the EEPROM register diagram and the Volatile register diagram. See the appendix section for larger register diagrams.

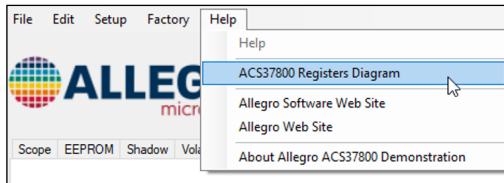


Figure 29: “Help” → “ACS37800 Registers Diagram”

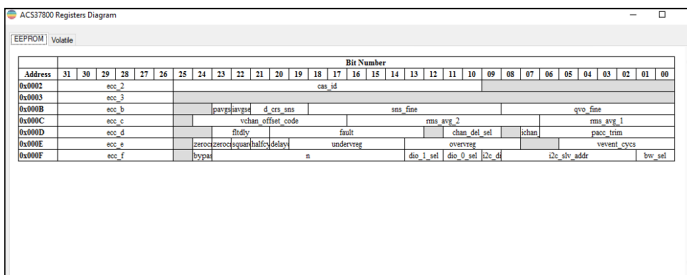


Figure 30: ACS37800 Register Diagram with EEPROM and Volatile Pages

## Saving and Loading Memory Files

To save the memory as a tabular data file (.csv, Excel) or text file (.txt), click “Save...” in the bottom right side of the GUI as highlighted in red in Figure 33. Clicking “Save...” opens a file explorer where the user can save the memory information as a “.csv” file or “.txt” file. Saving the memory is recommended before experimenting with programming so the user can return the device to its original factory programmed state if necessary. The user can also save the memory by clicking “File” → “Save Memory...”.

To load a previously saved file containing memory information, click “Load...” as highlighted in green in Figure 31. Clicking “Load...” opens a file explorer where the user can navigate to a previously saved “.csv” file or “.txt” file. The user can also load a memory file by clicking “File” → “Load Memory...”.

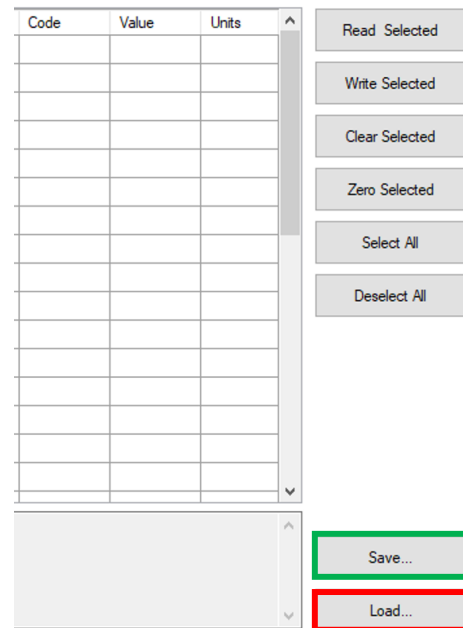


Figure 31: “Load” and “Save” the Memory to a Tabular File

# Appendix

## EVALUATION BOARD SCHEMATICS

### ACSEVB-MA16-LA16-POWER-IC, SOIC16 (MA and LA), Bare Board (TED-0004290)

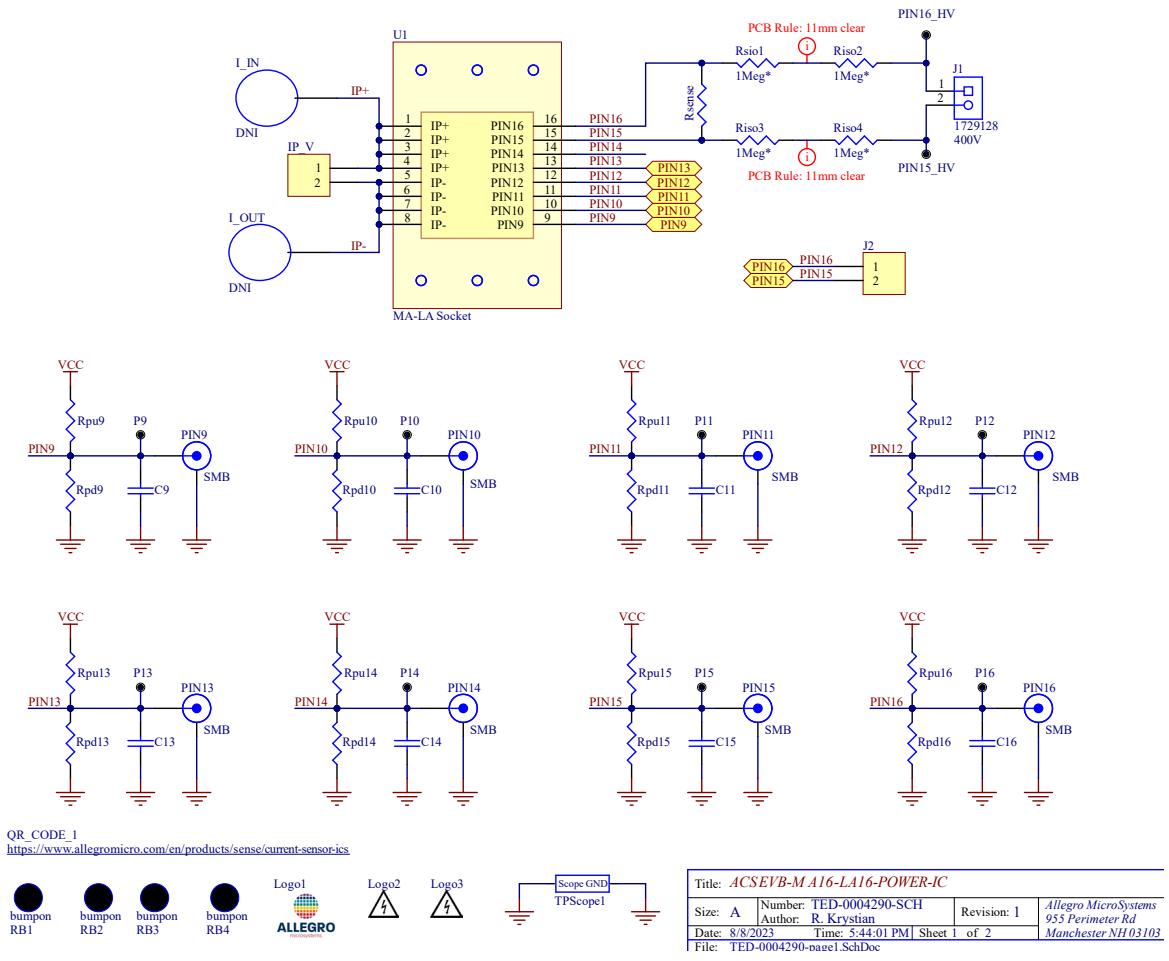


Figure 32: TED-0004290 Schematic

# EVALUATION BOARD SCHEMATICS

## ACSEVB-MC16-POWER-IC, SOIC16 (MC), Bare Board (TED-0004286)

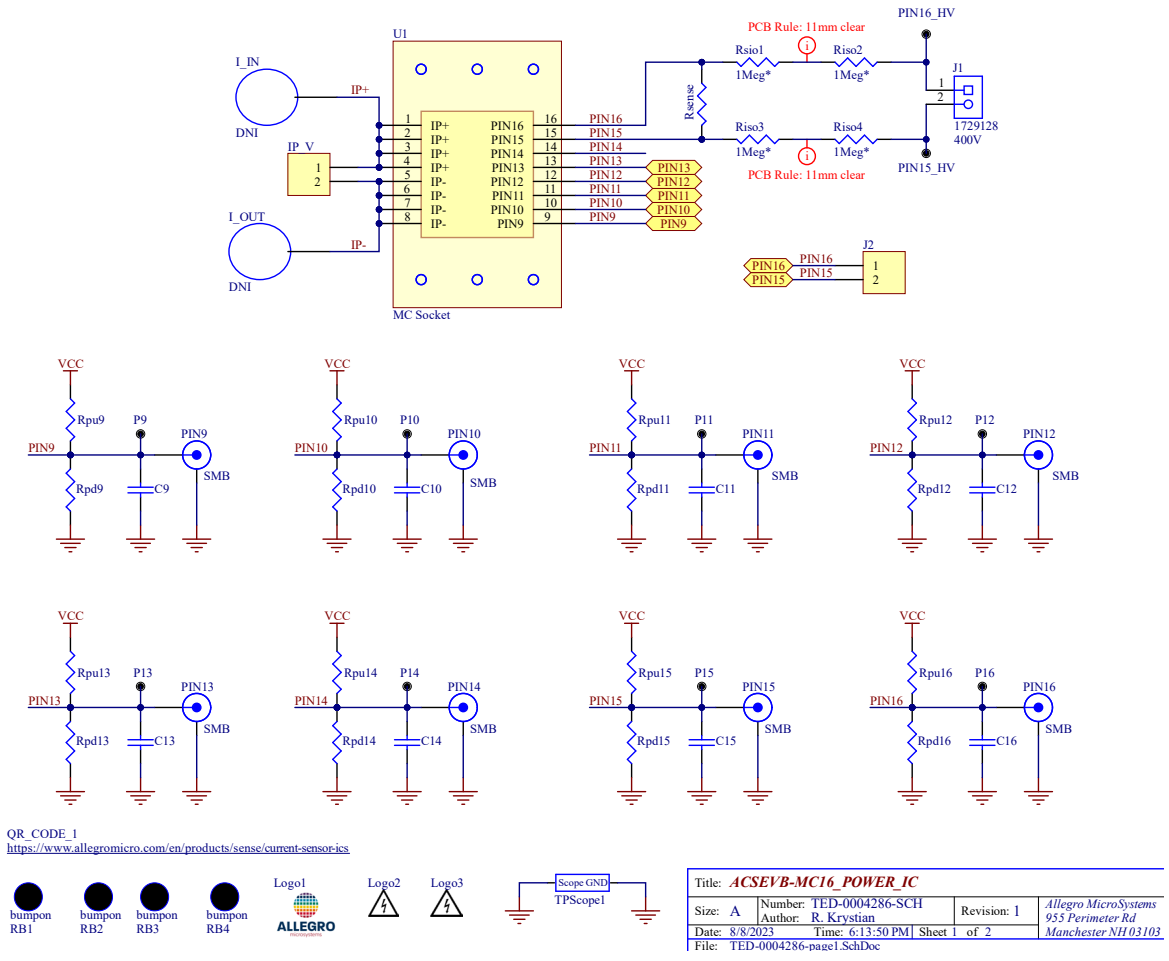


Figure 33: TED-0004286 Schematic

## EVALUATION BOARD LAYOUTS

### ACSEVB ACS37800, Bare Board (TED-0004286 and TED-0004290)

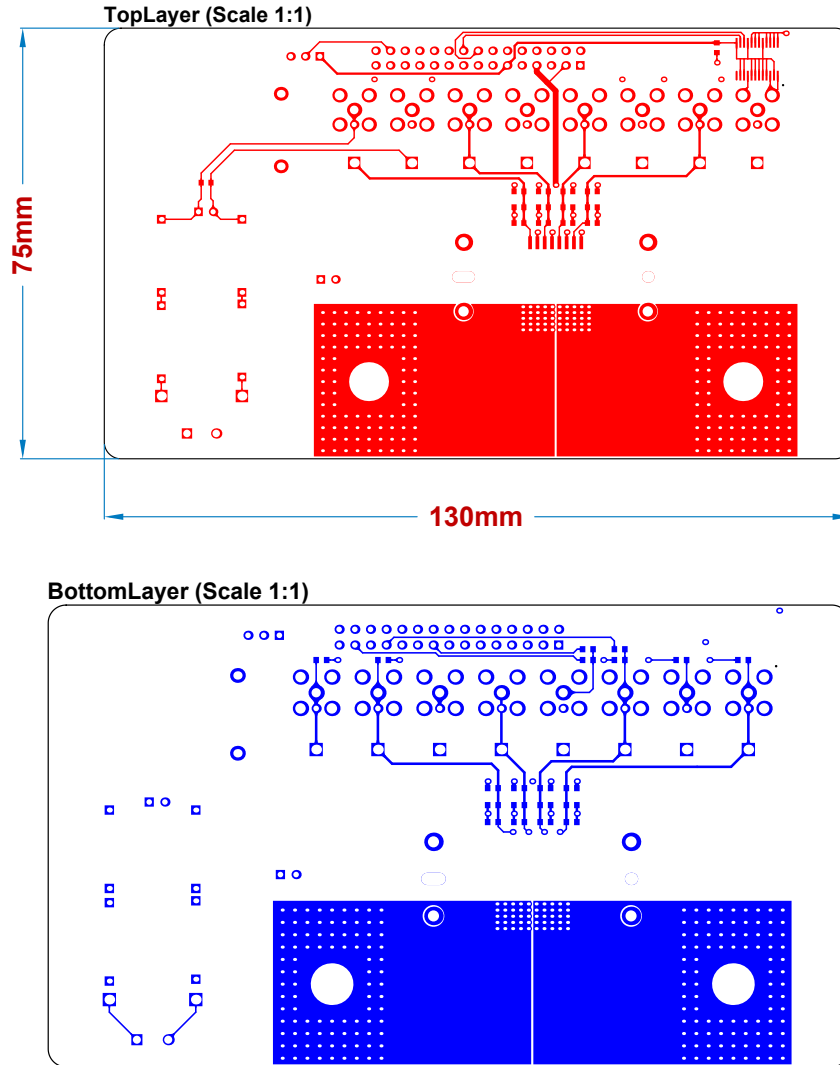


Figure 34: ACSEVB-Power-IC

## EEPROM Registers Map

Address	Bits																																			
	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0				
0x0B	ECC									PAVGSELEN	IAVGSELEN	CRS_SNS			SNS_FINE							QVO_FINE														
0x0C	ECC									VCHAN_OFFSET_CODE					RMS_AVG_2							RMS_AVG_1														
0x0D	ECC									FLTDLY			FAULT								CHAN_DEL_SEL		ICHAN_DEL_EN													
0x0E	ECC									ZEROCROSSEDGESEL	ZEROCROSSCHANSEL	SQUAREWAVE_EN	HALFCYCLE_EN	DELAYCNT_SEL	UNDERVREG					OVERVREG							VEVENT_CYCS									
0x0F	ECC									BYPASS_N_EN	N								DIO_1_SEL		DIO_0_SEL		I2C_DIS_SLV_ADDR	I2C_SLV_ADDR												

EEPROM

## Volatile Memory Map

Address	Bits																																				
	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0					
0x20	IRMS																VRMS																				
0x21	PIMAG																PACTIVE																				
0x22				POSPF	POSANGLE	PFACTOR																PAPPARENT															
0x23	[Reserved]																																				
0x24	[Reserved]																																				
0x25	[Reserved]																																				
0x26	IRMSAVGONESEC																VRMSAVGONESEC																				
0x27	IRMSAVGONEMIN																VRMSAVGONEMIN																				
0x28	[Reserved]																																				
0x29	[Reserved]																																				
0x2A	ICODES																VCODES																				
0x2B	[Reserved]																																				
0x2C	[Reserved]																																				
0x2D	[Reserved]																																				
0x2E	[Reserved]																																				
0x2F	ACCESS_CODE																																				
0x30	[Reserved]																																				
0x31	[Reserved]																																				

VOLATILE

---

## Revision History

Number	Date	Description
–	August 21, 2025	Initial release

Copyright 2025, Allegro MicroSystems.

The information contained in this document does not constitute any representation, warranty, assurance, guaranty, or inducement by Allegro to the customer with respect to the subject matter of this document. The information being provided does not guarantee that a process based on this information will be reliable, or that Allegro has explored all of the possible failure modes. It is the customer's responsibility to do sufficient qualification testing of the final product to ensure that it is reliable and meets all design requirements.

Copies of this document are considered uncontrolled documents.

For the latest version of this document, visit our website:

[www.allegromicro.com](http://www.allegromicro.com)