ACT81460EVK1-101 User's Guide

Description

This document describes the characteristic and operation of the Active Semi ACT81460EVK1-101 evaluation kit (EVK). It provides setup and operation instructions, schematic, layout, BOM, and test data. This EVK demonstrates the ACT81460VM101 ActivePMU power management IC. Other ACT81460VMxxx options can be evaluated on this EVK by replacing the IC and any other necessary components.

Features

The EVK can be used as a standalone board if desired. However, to access the internal registers and to take full advantage of the IC's capability, the user must connect the EVK kit to a PC with Active Semi's USB-TO-I2C interface dongle and use the GUI software. The EVK provides full access to the each converter's input and output voltage, as well as all the digital control signals. This gives the user the flexibility to configure the EVK to match their real world system.

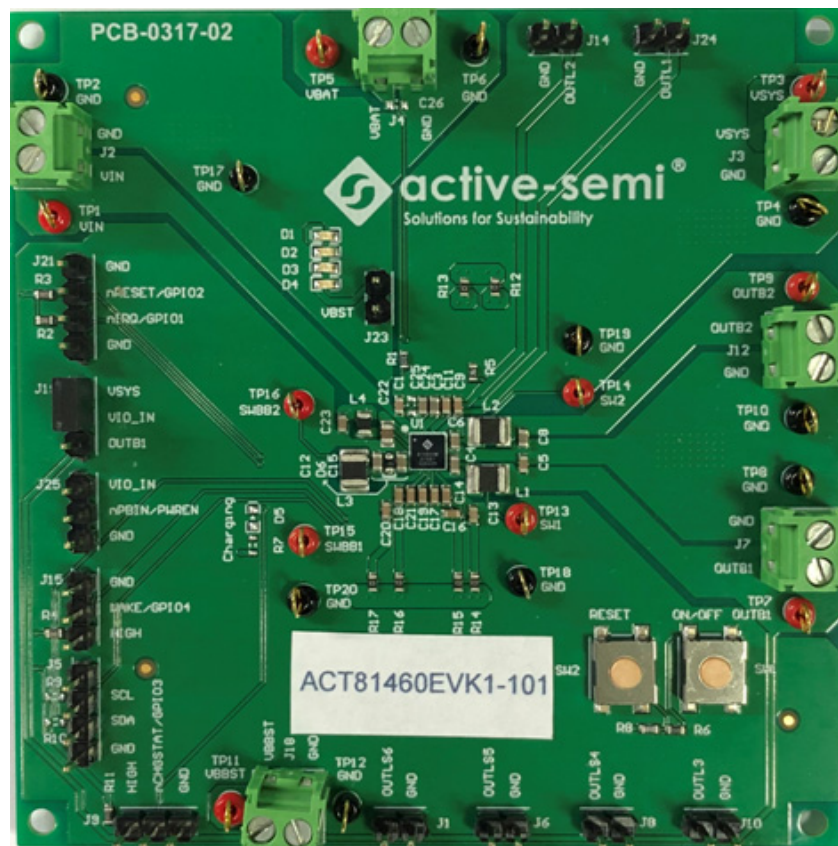Note that the ACT81460EVK1-101 is specifically configured for the ACT81460VM101.

Figure 1 – EVK Picture

Setup

Required Equipment

ACT81460 EVK

USB-TO-I2C Dongle

Power supply – 5V @ 4A for full power operation

Oscilloscope – >100MHz, >2 channels

Loads – Electronic or resistive. 1A minimum current capability.

Digital Multimeters (DMM)

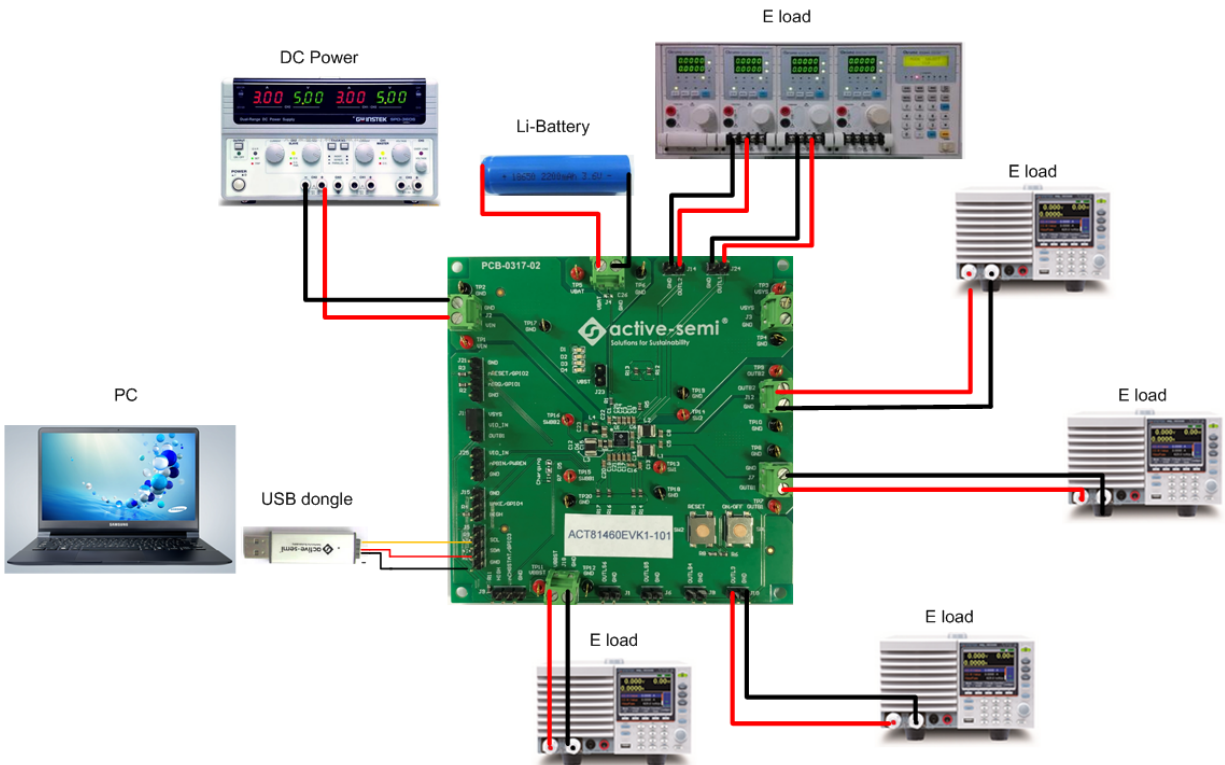Windows compatible computer with spare USB port.

EVK Setup

Figure 2 – EVK Setup

Hardware Setup

1. Decide which voltage will power VIO_IN. Active Semi recommends powering VIO_IN from the VSYS input. Connect a shorting jumper between J19-1 and J19-2 header to power VIO_IN from the VSYS input voltage.

2. Connect a shorting jumper between J23-1 and J23-2 header to power the LEDs, D1-D4, if desired.
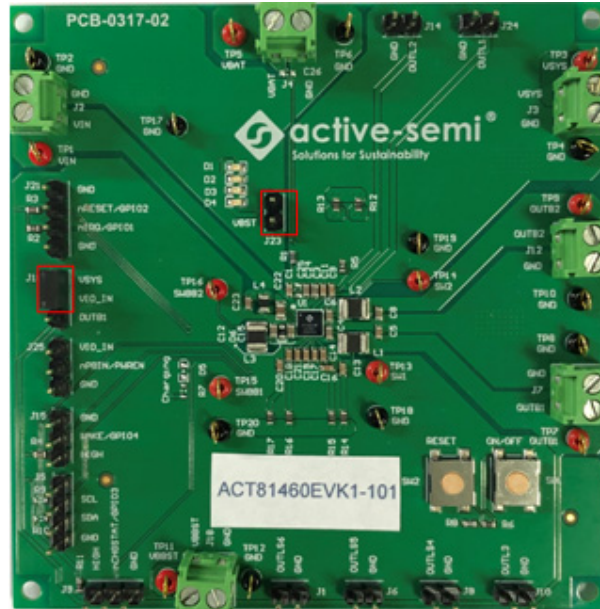

Figure 3 – Shorting Jumper Settings

3. Connect a lab supply between J2-1 and J2-2 to power VIN.

4. Connect an appropriate load to each power supply output.

5. Note that the typical setup is to apply the same 5V input voltage to all inputs. Using different input voltage sources requires careful consideration of startup sequencing.

GUI Setup (optional)

1. Refer to the end of this document for detailed instructions to install the ACT81460 GUI.

2. Connect the USB-TO-I2C dongle to the computer via a USB cable.

3. Connect the USB-TO-I2C dongle to the EVK J5 connector. Refer to Figure 4 to ensure the correct polarity of the connection. As a guide, use the "Active-Semi" logo on the top of the dongle so the black wire is connected toward the lower left corner of the Dongle.
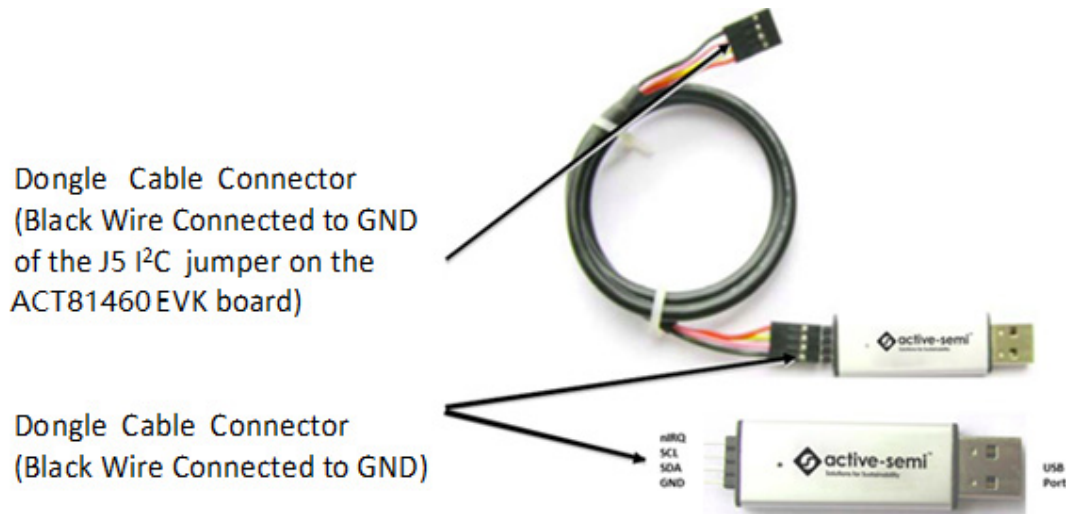
Figure 4 – USB-TO-I2C Dongle Connection

Recommended Operating Conditions

The ACT81460EVK1-101 is designed for a 5V input voltage. The maximum operating voltage is determined by the IC's maximum input voltage rating. The minimum operating voltages are determined by the buck converters' minimum input voltage and by the LDOs' dropout voltages. Maximum currents are determined by the IC's CMI settings, which can be changed via I2C after startup.

Table 1. Recommended Operating Conditions

Parameter	Description	Min	Typ	Max	Unit
VIN	System control input voltages	4	5	5.8	V
Ichg_max	Linear Charger Maximum charge current			800	mA
I_{B1_max}	Maximum Buck 1 load current	400			mA
I_{B2_max}	Maximum Buck 2 load current	400			mA
I_{BB_max}	Maximum Buck-Boost load current			250	mA
I_{BST_max}	Maximum Boost load current			39.3	mA
I_{LDO1_max}	Maximum LDO 1 load current	100			mA
I_{LDO2_max}	Maximum LDO 2 load current	100			mA
I_{LDO3_max}	Maximum LDO 3 load current	100			mA

EVK Operation

Turnon

Apply the 5V input voltage. Press the pushbutton (SW1) for longer than 32ms to automatically turn on all outputs with the programmed startup sequence.
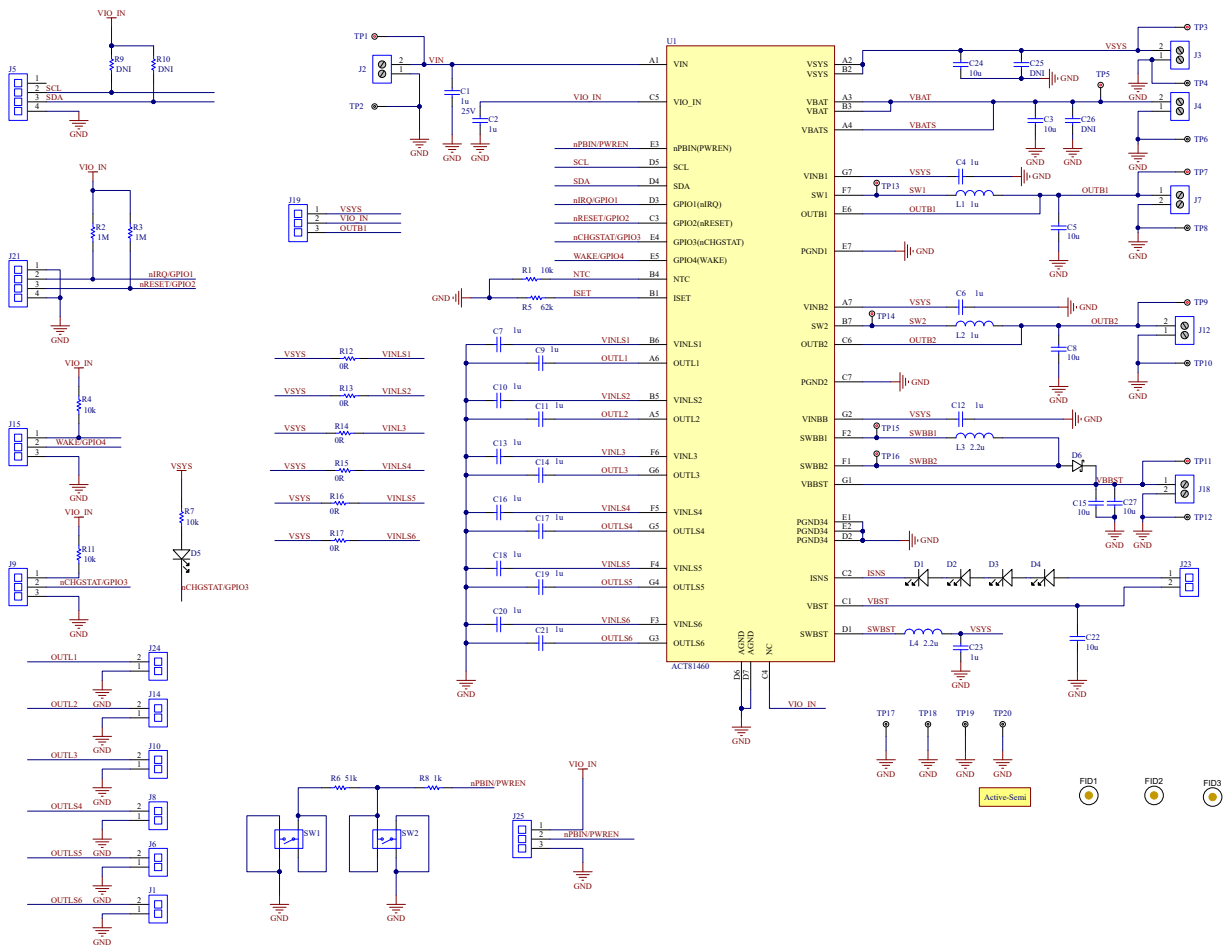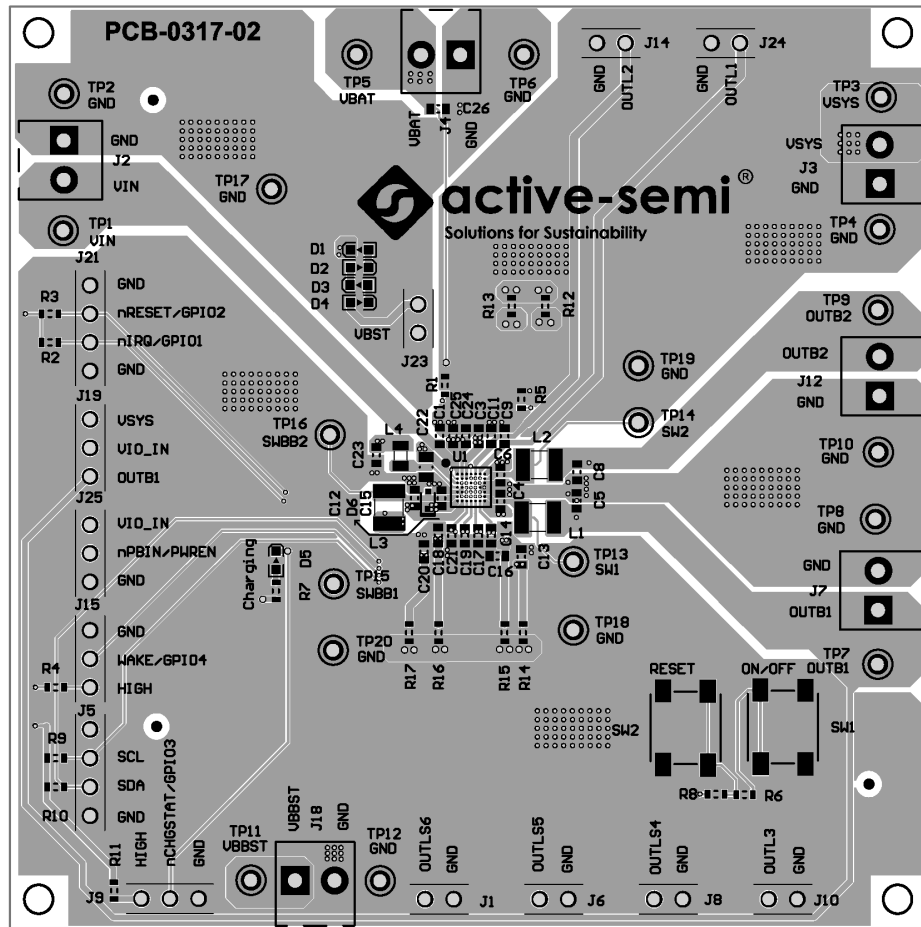
Schematic

Figure 5 – ACT81460EVK1-101 Schematic
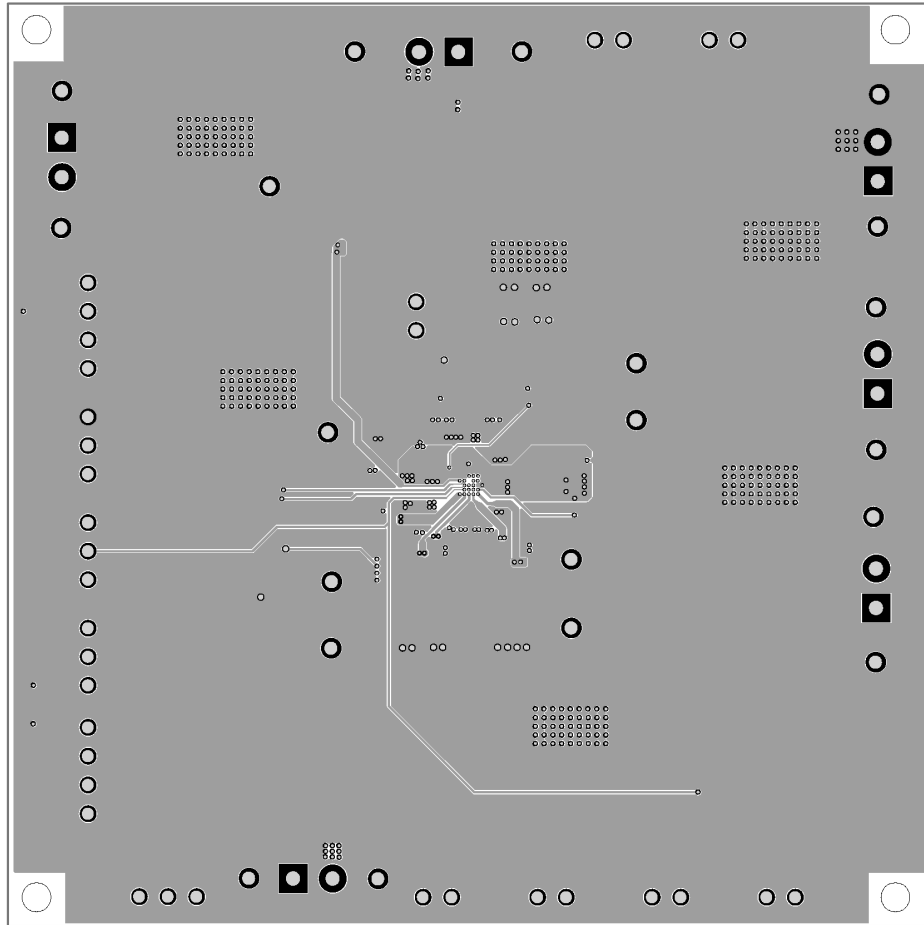
Layout

Figure 6 – Layout Top Assembly
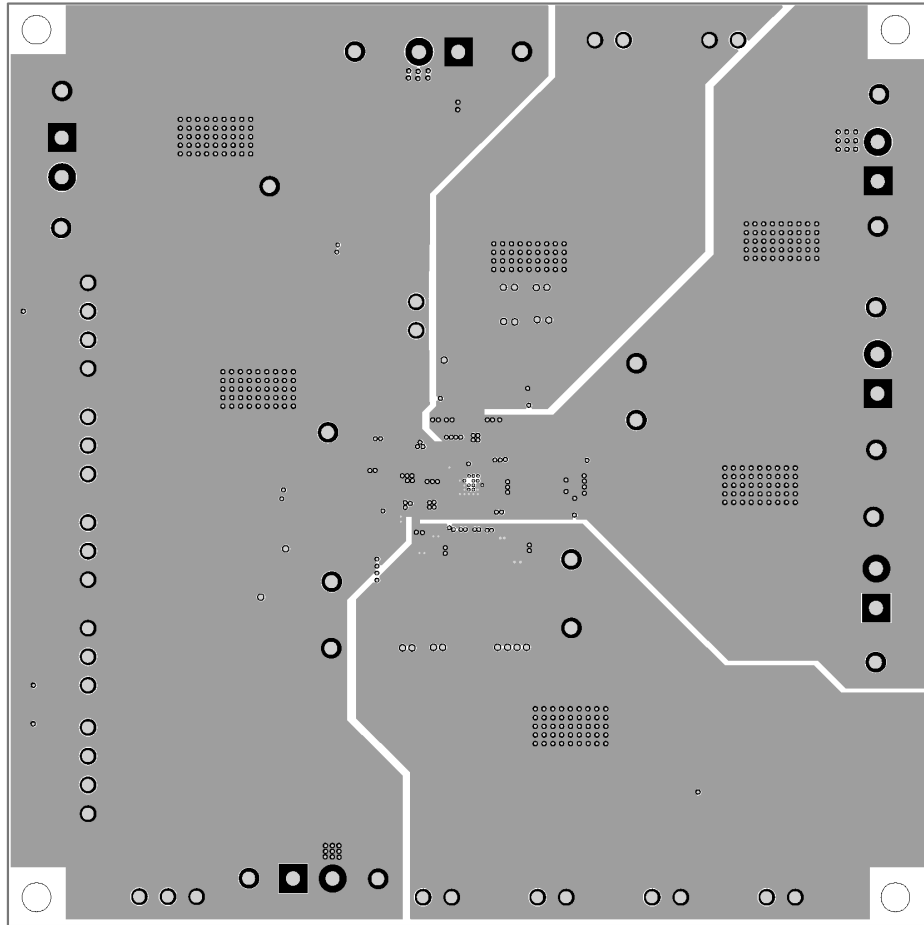
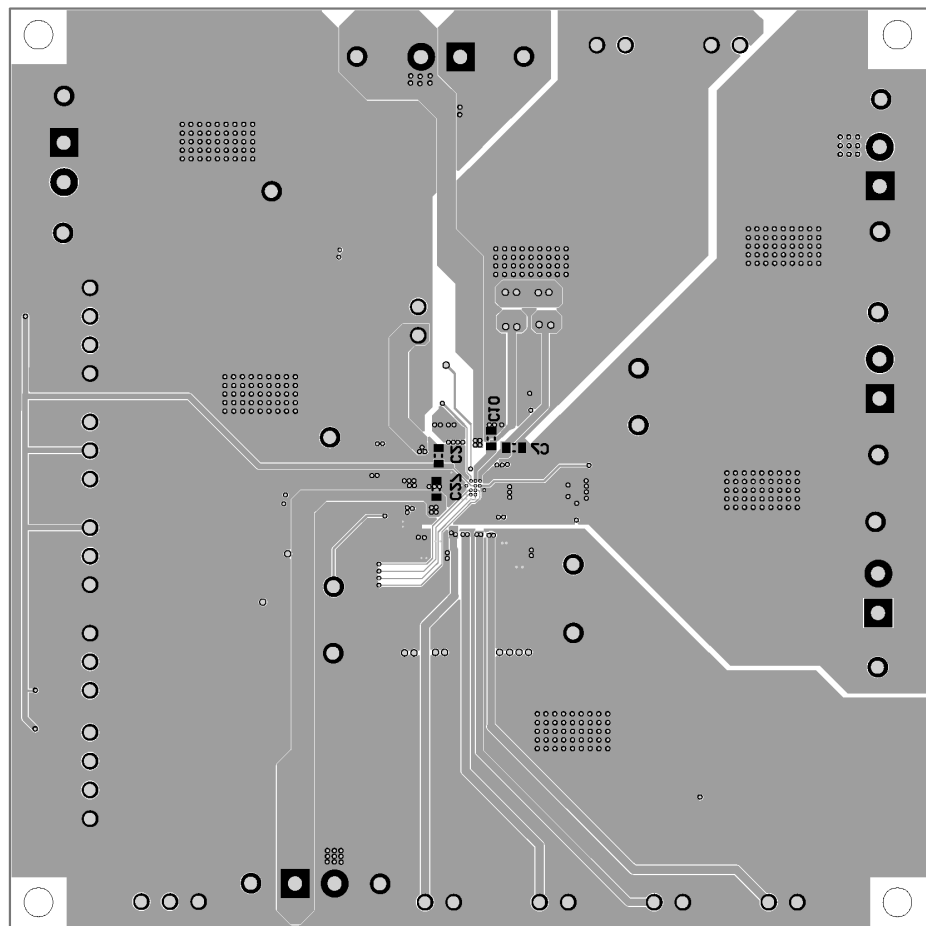**Figure 7 – Layout Layer2**

Figure 8 – Layout Layer 3

Figure 9 – Layout Bottom Assembly

Bill of Materials

Table 2 - BOM

Item	Ref Des	Description	Package	Part number
1	C1	Cap, Ceramic, 1uF, 25V, 20%, X7R	0603	std
2	C2, C7, C9, C10, C11, C13, C14, C16, C17, C18, C19, C20, C21	Cap, Ceramic, 1uF, 10V, 20%, X7R	0603	std
3	C3, C4, C5, C6, C8, C12, C15, C23, C24, C27	Cap, Ceramic, 10uF, 10V, 20%, X7R	0603	std
4	C22	Cap, Ceramic, 10uF, 25V, 20%, X7R	0805	std
5	C25	DNP	0603	std
6	C26	DNP	0603	std
7	D1,D2,D3,D4	LED, BLUE	0603	150060VS75000
8	D5	DNP	0603	150060VS75000
9	D6	Schottky diode 40V 0.2A	0603	SD0603S040S0R2
10	J1, J6, J8, J10, J14, J23, J24	Header, 2 pin,100mil	2.5mm	61300211121
11	J2, J3, J4, J7, J11, J12, J18	Connector, 2 pin	3.5mm	691214110002S
12	J5, J21	Header, 4 pin,100mil	2.5mm	61300411121
13	J9, J15, J19, J25	Header, 3 pin,100mil	2.5mm	61300311121
14	L1, L2	Inductor, 1uH, 2.2A, SMD	1210	74479299210
15	L3	Inductor, 2.2uH, 1.5A, SMD	1210	74479299222
16	L4	Inductor, 2.2uH, 1A, SMD	0805	74479275222
17	R1	Res, 10kOhm, 5%	0603	std
18	R2, R3, R4, R11	Res, 100kOhm, 5%	0603	std
19	R5	Res, 60.4kOhm, 5%	0603	std
20	R6	Res, 51kOhm, 5%	0603	std
21	R7 ,R9, R10	DNP	0603	std
22	R8	Res, 1kOhm, 5%	0603	std
23	R12, R13, R14, R15 R16, R17	Res, 0Ohm, 5%	0603	std
24	SW1, SW2	SMT Tact switch 6mmx6mm	6mmx6mm	430453025836

25	TP1, TP3, TP5, TP7, TP9, TP11, TP13, TP14, TP15, TP16	Test Point, Red	0.063"	Keystone5000
26	TP2, TP4, TP6, TP8, TP10, TP12, TP17, TP18, TP19, TP20	Test Point, Black	0.063"	Keystone5001
27	U1	ACT81460VM101-T	CSP	ACT81460
28	--	Shunt,100mil,Black	n/a	60900213421
29	PCB	PCB-0317-02	n/a	n/a

GUI Installation

1. Contact Active Semi for the GUI files and save them on your computer.

2. Plug the USB-TO-I2C dongle into a free USB port.

3. Follow the instructions in the "Active Semi's GUI and Dongle Driver Installation" file.

4. Double click on the ACT81460 GUI.exe to start the ACT81460 GUI.

GUI Overview

The GUI has 2 basic function buttons allocated in top-left of the Tool Bar which are Read and Write I2C. The GUI contains 2 setting modes: Basic Mode and Advanced Mode. In Basic Mode screen it displays basic user programmable configuration options are programmed using the drop-down boxes or check boxes. Advanced Mode contain the button text for changing setting for every single bit.

Basic Mode

The following figure shows the GUI in basic mode. This mode allows the user to easily change one or more IC settings.
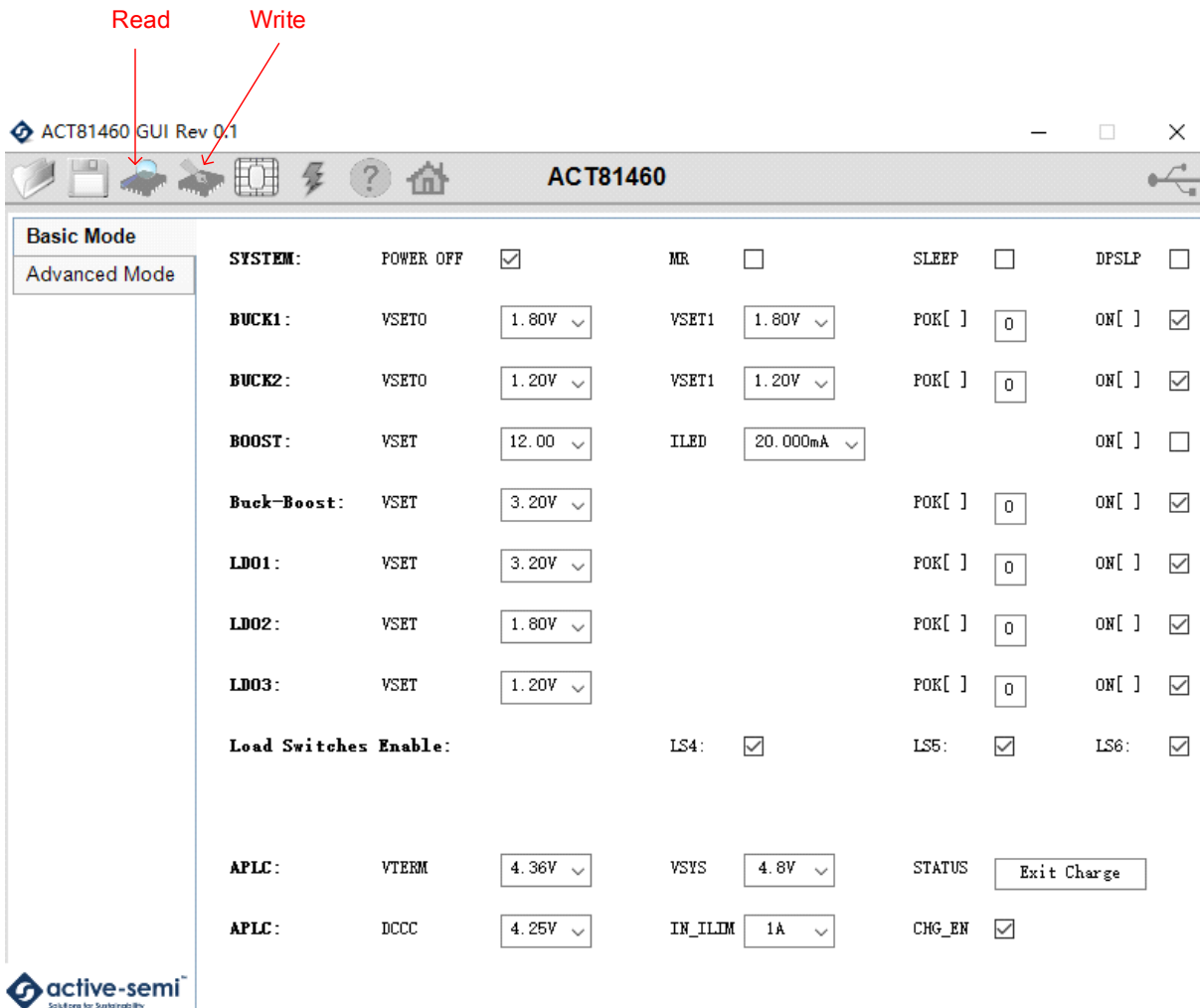

Figure 10 – GUI Basic Mode

Advanced Mode

Click the "Advanced Mode" button in the left of the GUI screen to see all available user programmable options. With Advanced Mode, additional user programmable features can be selected using the button text. In the left side of the Advanced Mode Screen, click on the Tiles Selector to display the register to view or change. Then change a register one bit at a time by clicking on the desired bit. The value of the bit is display right next to the bit-name button.

Note that the far right side of the screen contains a scroll down button to scroll down to additional registers since the Tile Screen can only display up to 8 bytes at once.
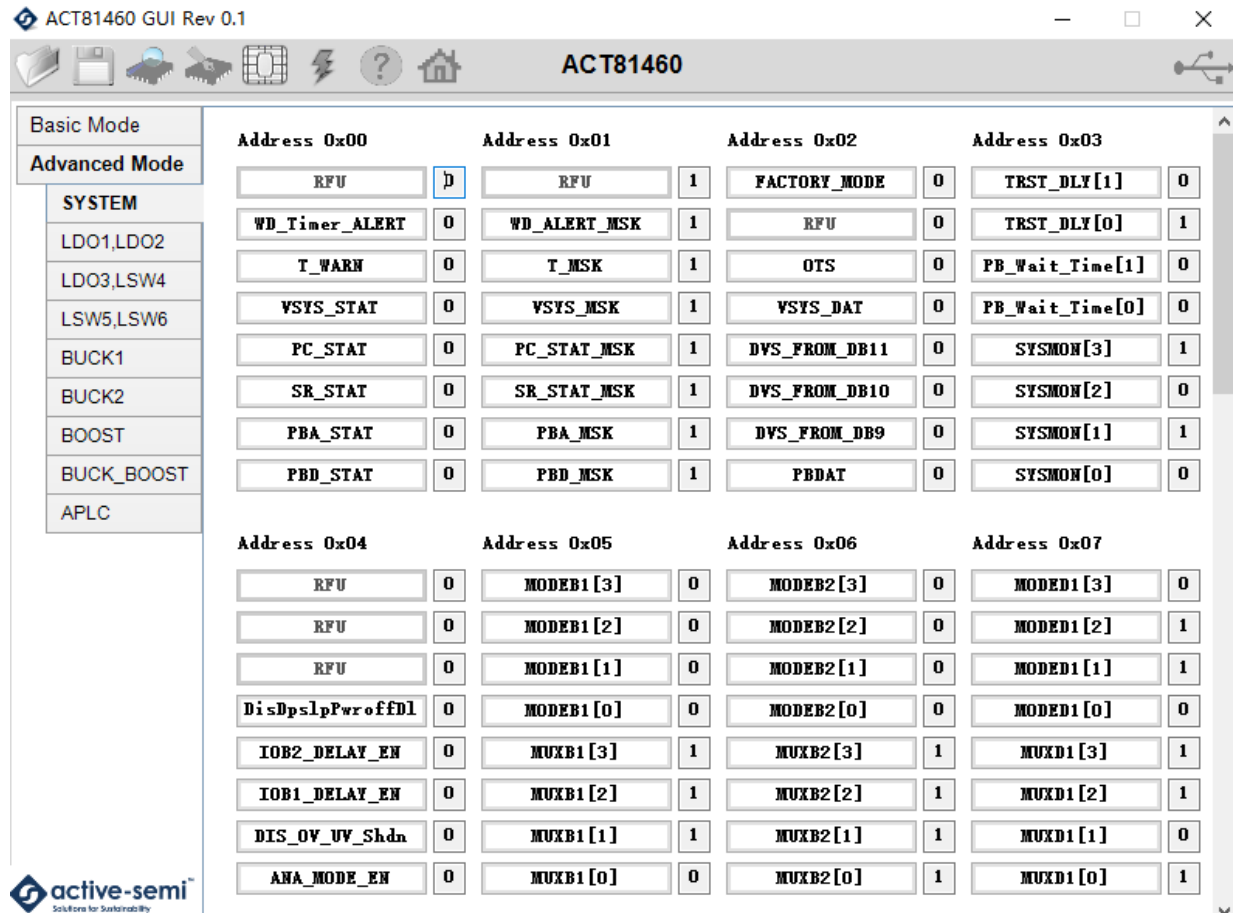

Figure 11 – GUI Advanced Mode

Button Descriptions

Read: Clicking on this button reads the ACT81460 registers and displays them in the GUI. Note that this reads all registers. Active-Semi recommends reading registers each time the ACT81460 powers-up to acquire the initial register settings. Active-semi also recommends reading registers after making changes to them. Immediately reading the registers after a write confirms the changes were properly stored.
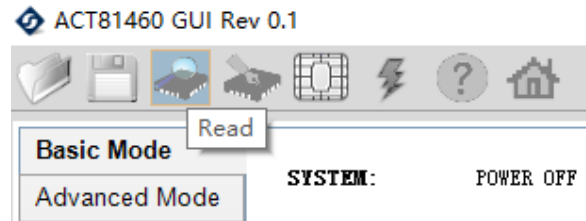
Figure 12 – Read Button

Write: Clicking on this button writes the GUI settings to the ACT81460's registers. All registers are written, regardless of whether or not they were changed.
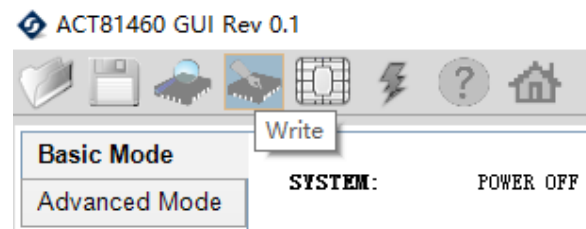

Figure 13 – Write Button

Dongle Connection Status: The GUI also contains a dongle is connected status which indicates that Active-Semi's USB-TO-I2C dongle is connected to the USB port of the driver installed. The figure below shows the two possible indication status graphics.
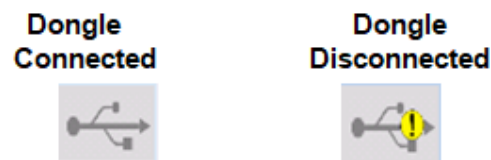

Figure 14 – Dongle Connection Status