ACT88329EVK1-101 User's Guide

Description

This document describes the characteristic and operation of the Qorvo ACT88329EVK1-101 evaluation kit (EVK). It provides setup and operation instructions, schematic, layout, BOM, and test data. This EVK demonstrates the ACT88329VU101 Qorvo PMU power management IC. Other ACT88329VUxxx 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 Qorvo's USB-TO-I2C interface dongle and use the GUI software. The EVK provides full access to 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 ACT88329EVK1-101 is specifically configured for the ACT88329VU101. This CMI does not use Push-Button.

Figure 1 – EVK Picture

Setup

Required Equipment

ACT88329 EVK

USB-TO-I2C Dongle

Power supply – 3.3V @ 4A for full power operation

Oscilloscope – >100MHz, >2 channels

Loads – Electronic or resistive. 3A minimum current capability.

Digital Multi-meters (DMM)

Windows compatible computer with spare USB port.

EVK Setup

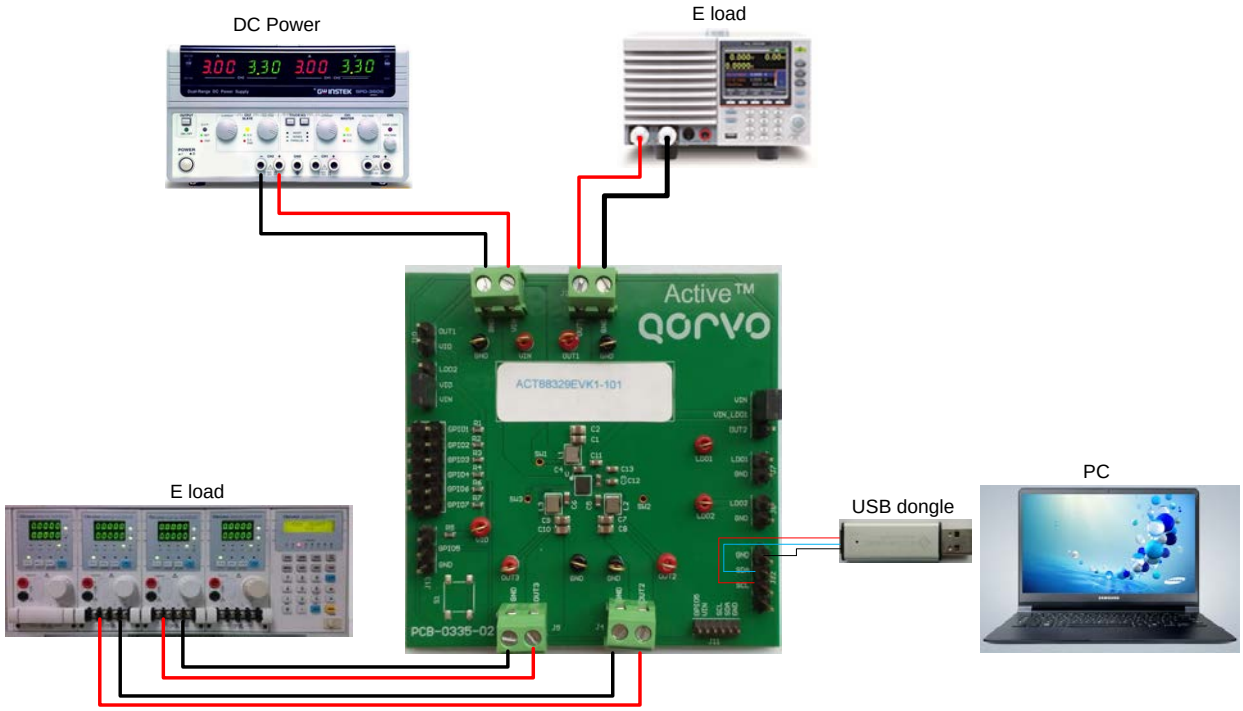


Figure 2 – EVK Setup

Hardware Setup

1. Decide which voltage will power VIO_IN. Qorvo recommends powering VIO_IN from the VIN input. Connect a shorting jumper between J9-2 and J9-3 header to power VIO_IN from the VIN input voltage.
2. Connect a jumper between J3-1 and J3-2 header to power VIN_LDO1 from VIN input voltage.

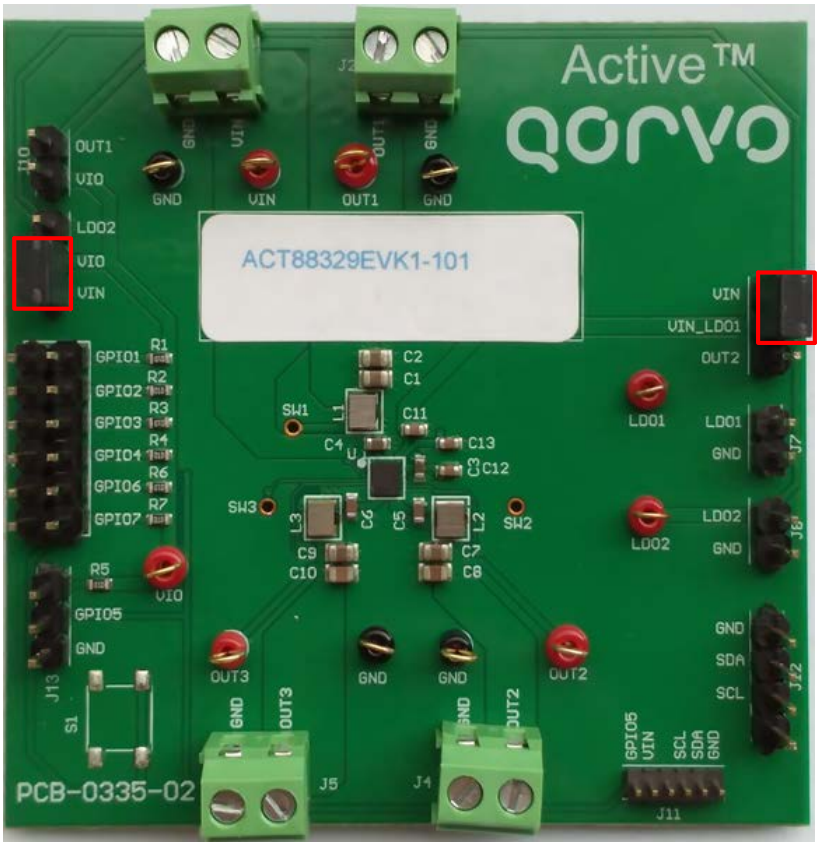


Figure 3 – Shorting Jumper Settings

3. Connect a jumper between J1-1 and J1-2 to power VIN.
4. Connect an appropriate load to each power supply output.
5. Note that the typical setup is to apply the same 3.3V 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 ACT88329 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 J12 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.

Dongle Cable Connector (Black Wire Connected to GND of the J11 I2C Jumper on the ACT88329 EVK Board)

Figure 4 – USB-TO-I2C Dongle Connection

Recommended Operating Conditions

The ACT88329EVK1-101 is designed for a 3.3V 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

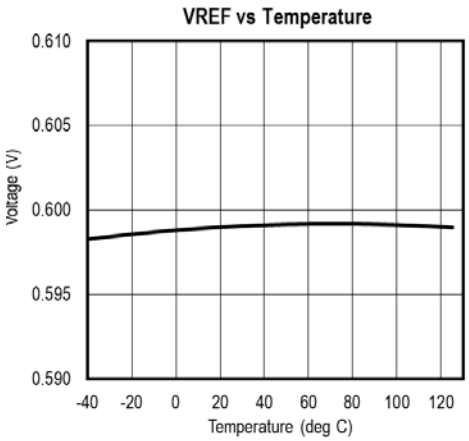
PARAMETER	VALUE	UNIT
All I/O and Power pins except PGND1, PGND2, PGND3, AGND	-0.3 to 6	V
Grounds: Any PGND referenced to AGND	-0.3 to +0.3	V
SW_Bx to PGNDx	-1 to VIN_Bx + 1	V
FB_Bx to PGNDx	-0.3 to AVIN + 0.3	V
LDO2 to AGND	-0.3 to AVINx + 0.3	V
LDO1 to AGND	-0.3 to VIN_LDO + 0.3	V
Junction to Ambient Thermal Resistance, CSP	37	°C/W
Operating Junction Temperature	-40 to 150	°C
Storage Temperature	-55 to 150	°C

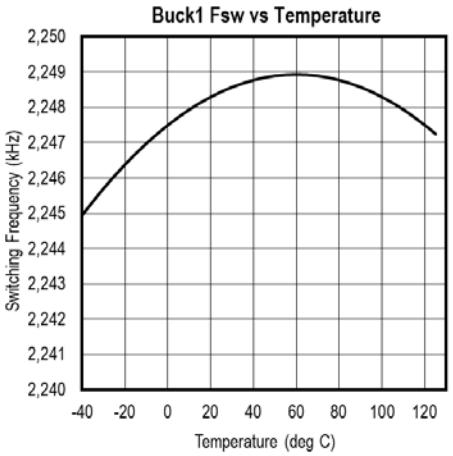
EVK Operation

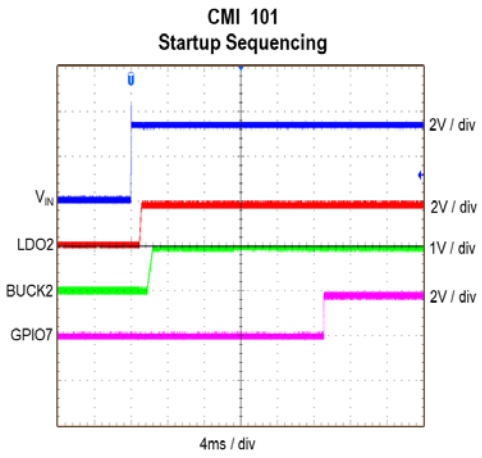
Turn-on

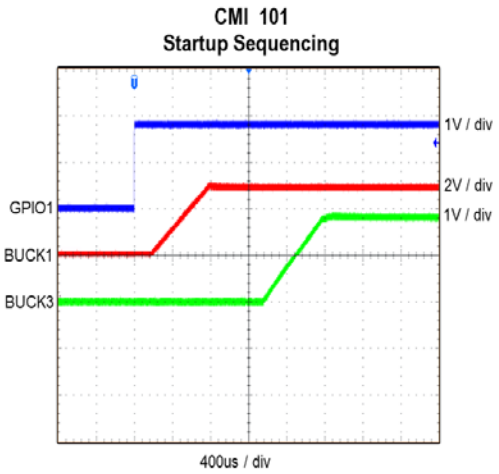
Apply the 3.3V input voltage. All outputs automatically turn on with the programmed startup sequence.

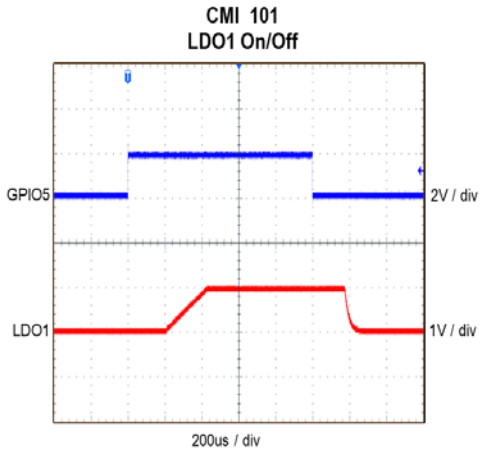
Test Results

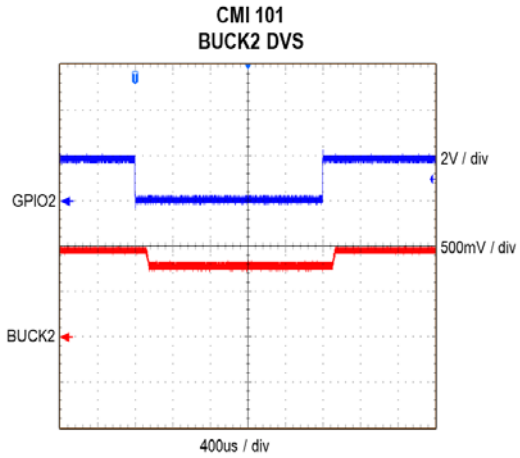


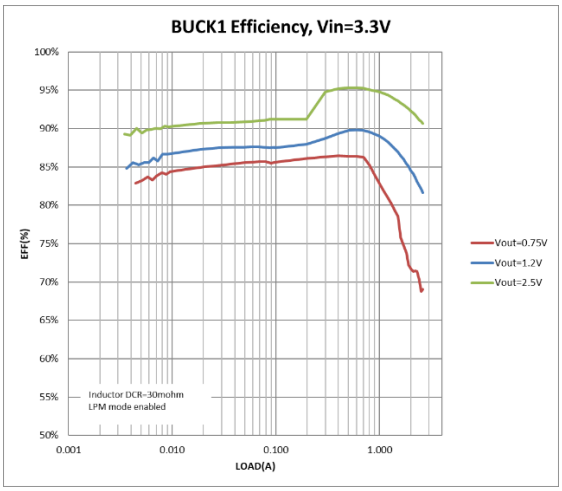


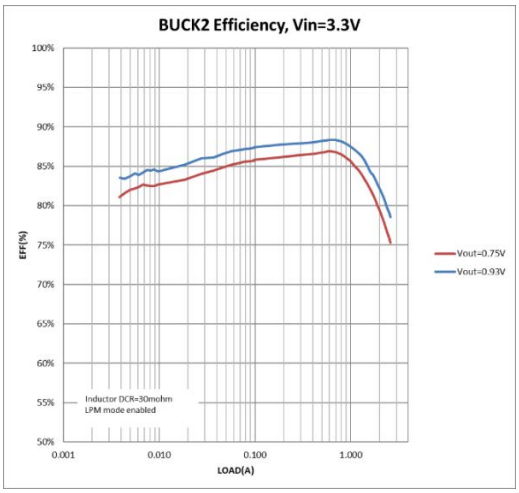


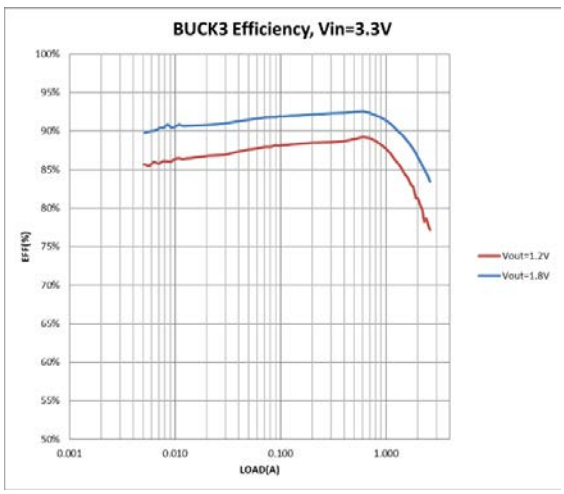


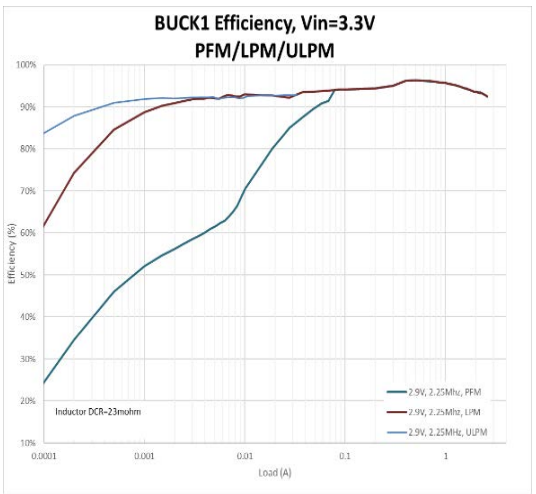

CMI 101
LDO1 On/Off
GPIO5
2V / div
LDO1
1V / div
200us / div


CMI 101
BUCK2 DVS
GPIO2
2V / div
500mV / div
BUCK2
400us / div

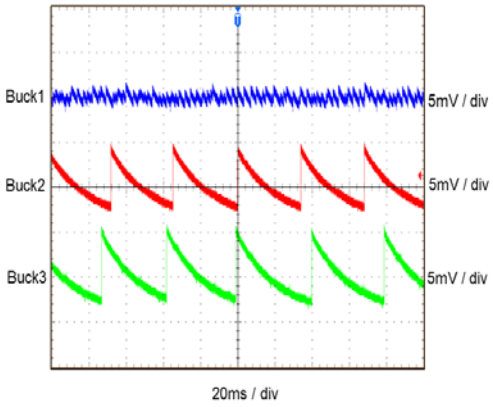

BUCK1 Efficiency, Vin=3.3V
EFF(%)
LOAD(A)
Vout=0.75V
Vout=1.2V
Vout=2.5V
Inductor DCR=30mohm
LPM mode enabled


BUCK2 Efficiency, Vin=3.3V
EFF(%)
LOAD(A)
Vout=0.75V
Vout=0.93V
Inductor DCR=30mohm
LPM mode enabled

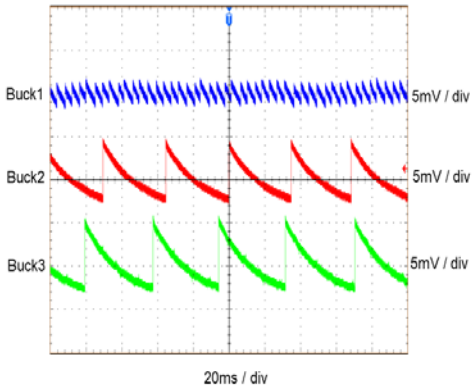

BUCK3 Efficiency, Vin=3.3V
EFF(%)
LOAD(A)
Vout=1.2V
Vout=1.8V


BUCK1 Efficiency, Vin=3.3V
PFM/LPM/ULPM
Efficiency (%)
Load (A)
Inductor DCR=23mohm
2.9V, 2.25Mhz, PFM
2.9V, 2.25MHz, LPM
2.9V, 2.25MHz, ULPM

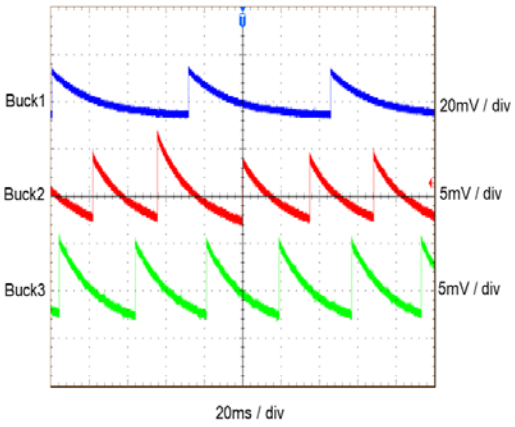
Output Voltage Ripple
PFM Mode - No Load



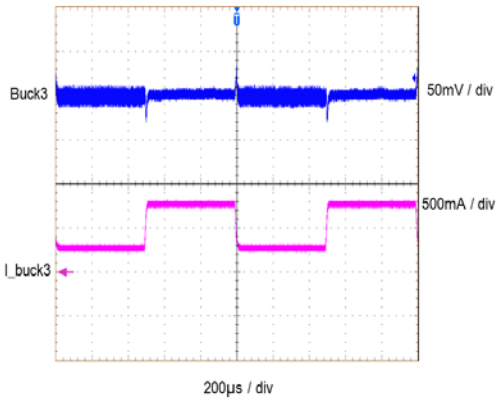
Output Voltage Ripple
LPM Mode - No Load



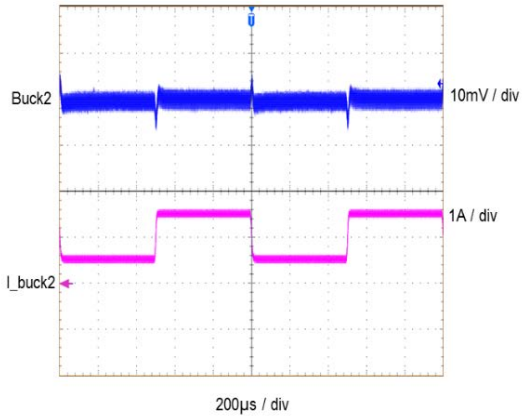
Output Voltage Ripple
ULPM Mode



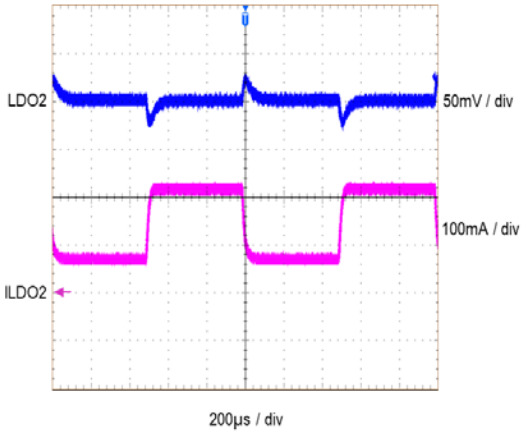
Load Transient
Buck3 Vout=1.8V
250mA to 750mA



Load Transient
Buck2 Vout=0.93V
500mA to 1500mA



Load Transient
LDO2 Vout=1.8V
75mA to 225mA



Schematic

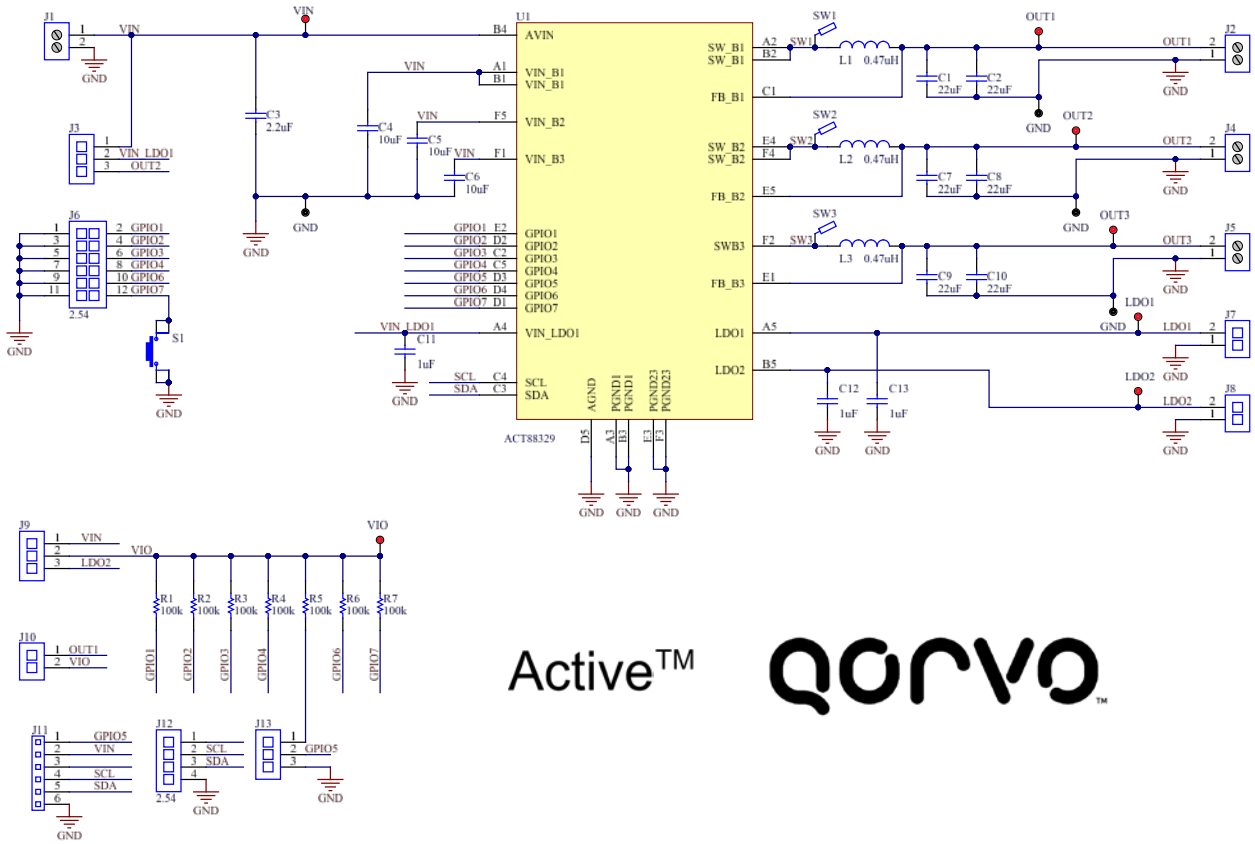


Figure 5 – ACT88329EVK1-101 Schematic

Bill of Materials

Table 2 - BOM

Item	Designator	Quantity	Description	Package	Manu facturer	Part Number
1	C1, C2, C7, C8, C9, C10	6	Cap, Ceramic, 22uF, 16V, 20%, X5R	0805	std	std
2	C3	1	Cap, Ceramic,2.2uF, 16V, 20%, X5R	0603	std	std
3	C4, C5, C6	3	Cap, Ceramic, 10uF, 16V, 20%, X5R	0603	std	std
4	C11, C12, C13	3	Cap, Ceramic, 1uF, 16V, 20%, X5R	0603	std	std
5	J1, J2, J4, J5	4	CON, Screw Terminal, 3.50, 2P, KF350		Wurth Elektronik	691214110002
6	J3, J9	2	Header, Unshrouded, 2.54, Male, 3P	CON3	Wurth Elektronik	61300211121
7	J6	1	Header, Unshrouded, 2.54, Male, 7x2P	CON7x2	Wurth Elektronik	61301421121
8	J7, J8, J10	3	Header, Unshrouded, 2.54, Male, 2P	CON2	Wurth Elektronik	61300211121
9	J11	1	Header, Unshrouded, 1.27, Male, 6P	CON6	Digekey	GRPB061VW VN-RC
10	J12	1	Header, Unshrouded, 2.54, Male, 4P	CON4	Wurth Elektronik	61300211121
11	L1, L2, L3	3	Inductor, 0.47uH	2512	Wurth Elektronik	744383240047
12	R1, R2, R3, R4, R5, R6, R7	7	Res, 100kΩ, 5%	0603	std	std
13	S1	0	Switch, TSW, TE-1437565-0		N/A	std
14	TP1, TP2, TP3, TP5, TP8, TP10, TP11	7	TEST POINT PC MINI .040"D RED	0.063"	KeyStone	5000
15	TP4, TP6, TP7, TP9	4	TEST POINT PC MINI .040"D BLK	0.063"	KeyStone	5001
16	U1	1	IC, ACT88329	CSP	Qorvo	ACT88329VU 101

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Layout

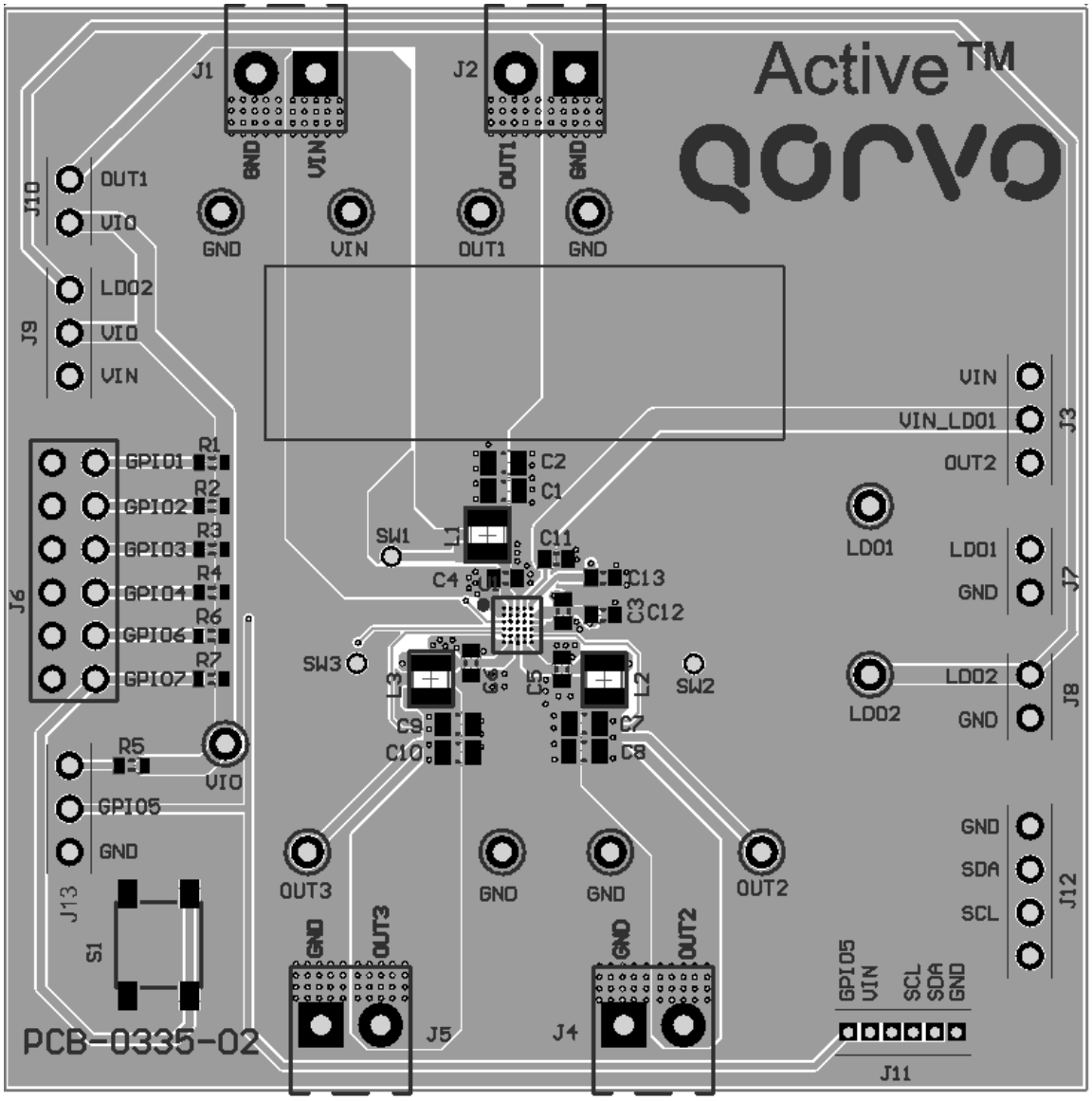


Figure 6 – Layout Top Assembly

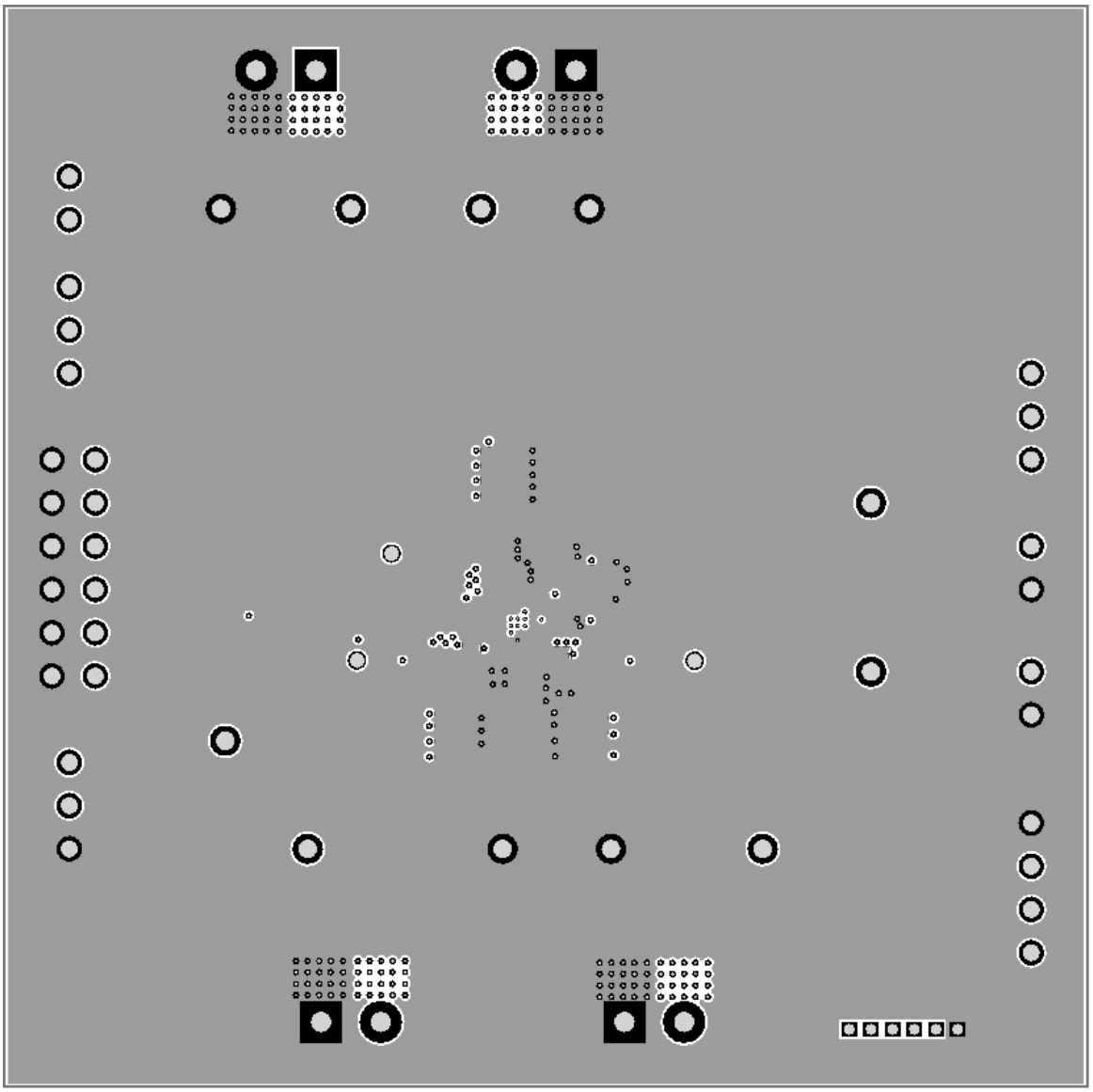


Figure 7 – Layout Layer 2

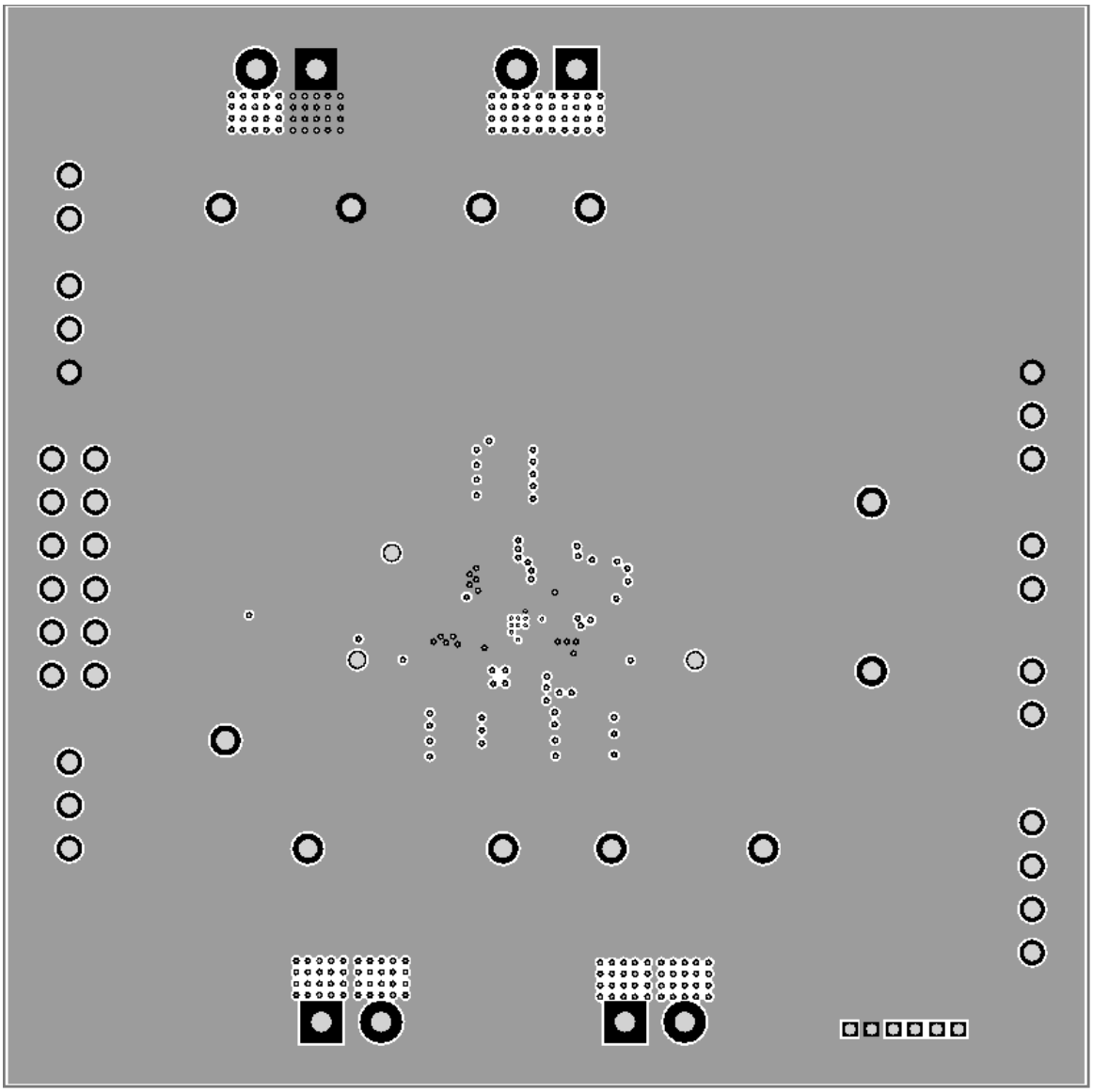


Figure 8 – Layout Layer 3

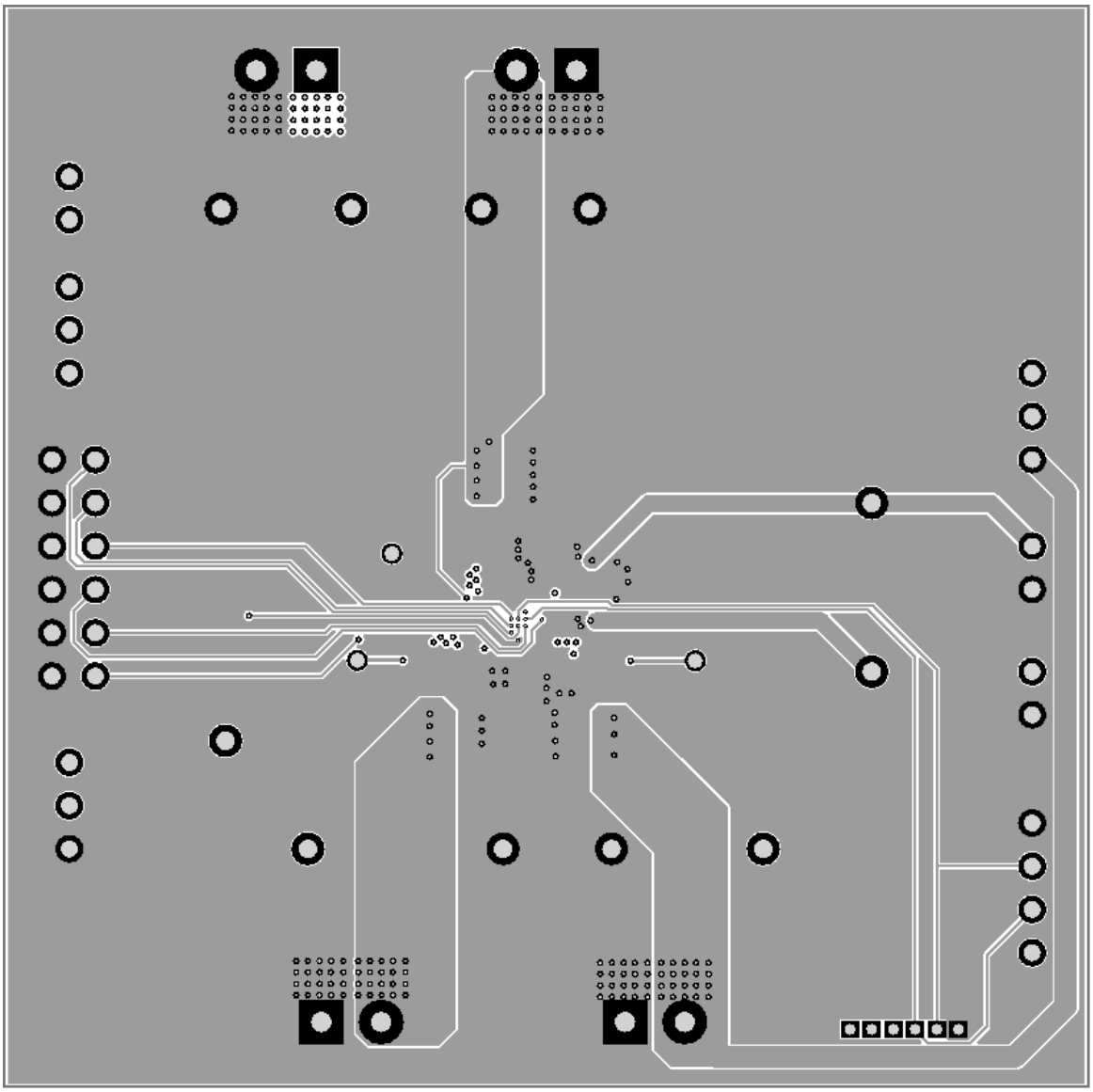


Figure 9 – Layout Bottom Layer

GUI Installation

1. Download the GUI files from Qorvo's website and save them on your computer.
2. Plug the USB-TO-I2C dongle into a free USB port.
3. Double click on the ACT88329 GUI.exe to start the ACT88329 GUI.

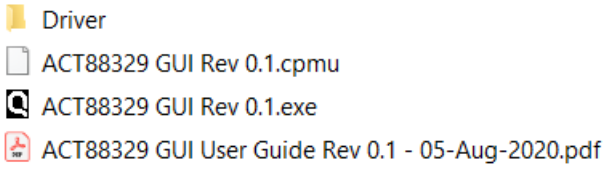


Figure 10 – Dongle Driver

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 contains 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.

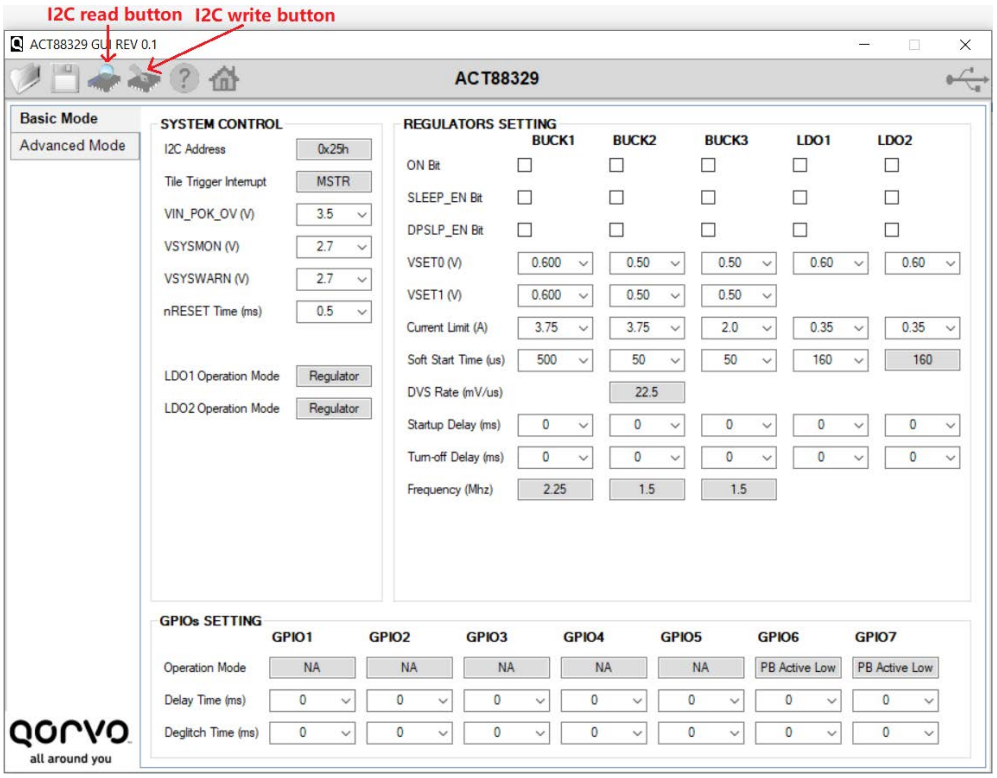


Figure 11 – GUI Basic Mode

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 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.

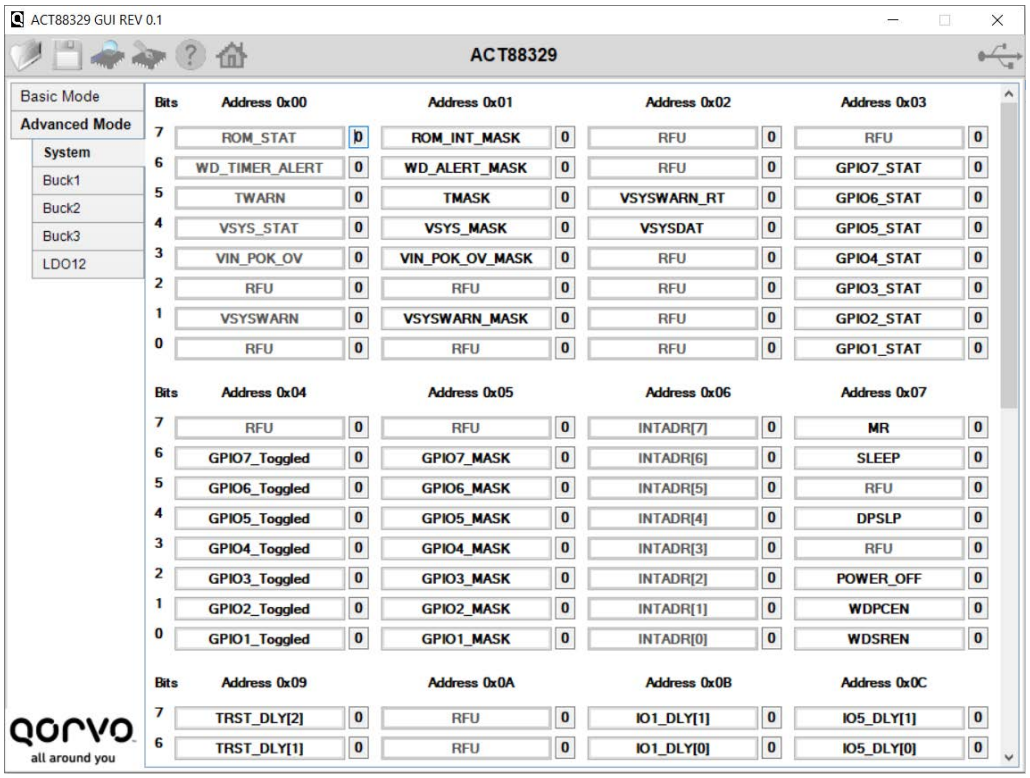
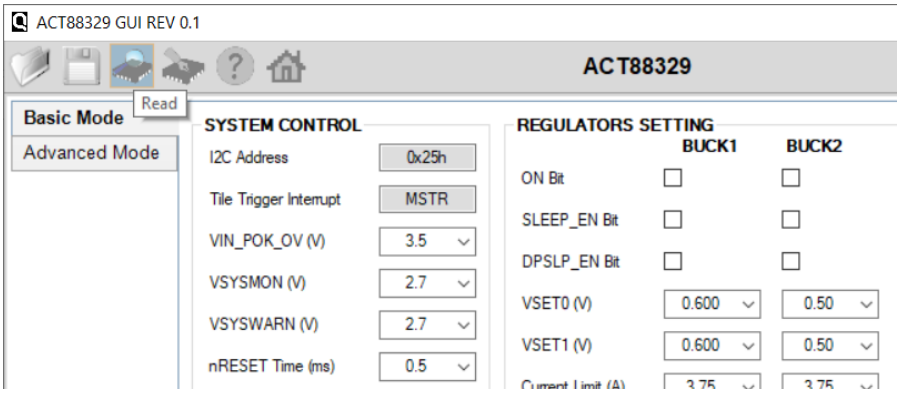


Figure 12 – GUI Advanced Mode

Button Descriptions

Read: Clicking on this button reads the ACT88329 registers and displays them in the GUI. Note that this reads all registers. Qorvo recommend spreading registers each time the ACT88329 powers-up to acquire the initial register settings. Qorvo also recommends reading registers after making changes to them. Immediately reading the registers after a write confirms the changes were properly stored.



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