GUI User Guide
BMS Master

Version	0.2
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1 DOCUMENT DETAILS

1.1 Document History

Version	Author		Reviewer		Approver	
	Name	**Date (DD-MM-YYYY)**	**Name**	**Date (DD-MM-YYYY)**	**Name**	**Date (DD-MM-YYYY)**
Draft 0.1	Srikanth Reddy Ramidi	14-Feb-2022	Tejendra Joshi	16-Feb-2022		
Draft 0.2	Srikanth Reddy Ramidi	16-March-2022	Tejendra Joshi	16-March-2022		

Version	Description Of Changes
Draft 0.1	Newly Created
Draft 0.2	Update GUI user guide with respect to new layout

Table 1: Document History

1.2 Definition, Acronyms and Abbreviations

Definition/Acronym/Abbreviation	Description
BMS	Battery Management System
GPIO	General Purpose input/output
I2C	Inter-Integrated Circuit
UART	Universal Asynchronous Receiver-Transmitter
SPI	Serial Peripheral Interface
USB	Universal Serial Bus
CAN	Controlled Area Network
PC	Personal Computer

Table 2: Definition, Acronyms and Abbreviations

1.3 References

No.	Document	Version	Remarks

Table 3: References

2 INTRODUCTION

2.1 Purpose of the document

The main purpose of this document is to

- Describes detailed design of how GUI Interacts with Internal Project Firmware using USB

2.2 Intended Audience

Software developers
Team Leader
Testers

3 OVERVIEW

3.1 Hardware Overview

- The BMS Master board is based on MAX32626 Ultra-Low-Power Arm Cortex-M4 with FPU-Based Microcontroller (MCU) with 512KB Flash and 160KB SRAM.
- Multiple ADBMS1818 boards can be connected to BMS Master boards by daisy chaining.

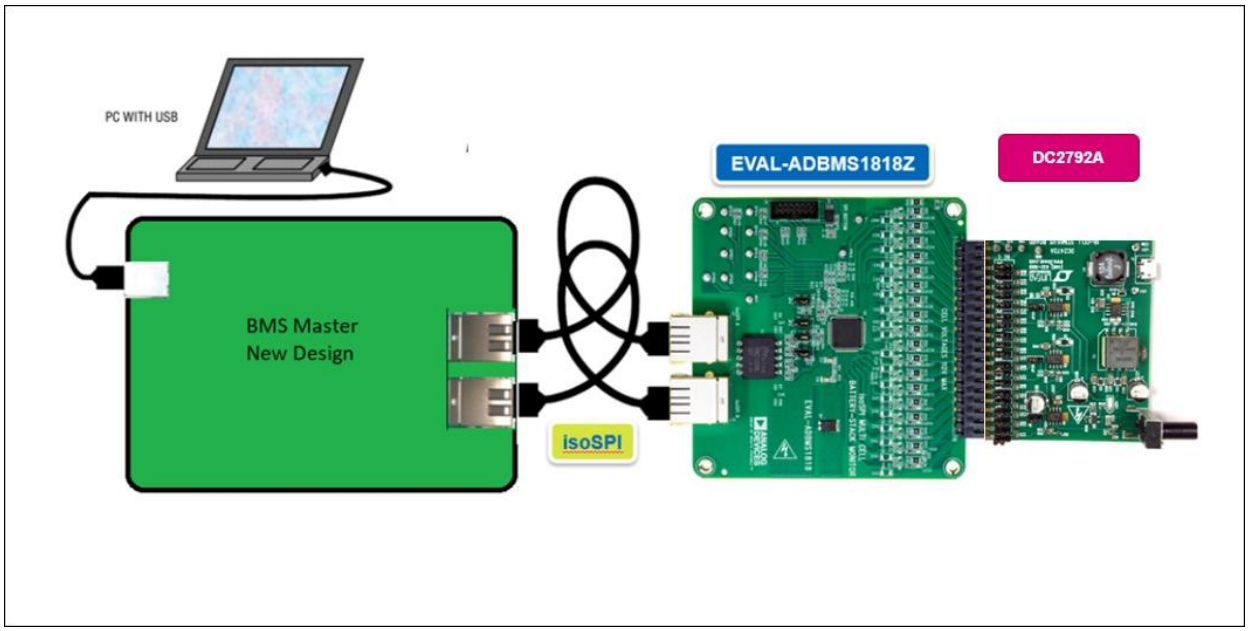

Figure 1: BMS Master Top Level Diagram

4 PRODUCT SETUP

4.1 Minimum required hardware Contents

- BMS Master board with Firmware flashed in it.
- At least 1 ADBMS1818 board.
- 1 RJ45 to 2 wire cable.
- RJ45 to RJ45 cables (count depends on number of ADBMS1818 boards).
- USB micro-B to type-A connectors (count depends on number of ADBMS1818 boards)..
- USB type-C male to USB Type-A male cable.

4.2 Hardware Installation

1. Connect BMS Master (DuraClik main port) to First EVAL-ADBMS1818 board using RJ45 to 2 wire cable.
2. Connect the first EVAL-ADBMS1818 board to second EVAL-ADBMS1818 board using RJ45 to RJ45 cable and so on.
3. Connect Battery stack simulator boards (DC2472A) to EVAL-ADBMS1818 boards using a connector.
4. Provide power supply to Battery stack simulator boards (DC2472A) by connecting it to PC (laptop) using USB micro-B to type-A connector.
5. Connect BMS Master board to PC (or laptop) with USB type-C male to USB Type-A male cable.
6. Then check device Manager in PC for the COM port which is created after connecting BMS Master board to PC.

NOTE: By default IsoSPI interface is selected, to select FRC Interface change **jumper 4.2** position to low and for IsoSPI change it back to high.

4.3 Firmware Configuration

By default the Interface direction is selected as **forward,** to change the direction of interface modify the below mentioned code.

In File : BMS_Master/Drivers/bms_dura_frc_spi.c , at Line 30

```
static dura_frc_direction spi_direction = FORWARD;
```

- select *FORWARD/REVERSE* as per the the requirement
- Then compile and re flash the image to board

5 GUI FLOW

The following figure shows the top-level GUI communication flow.

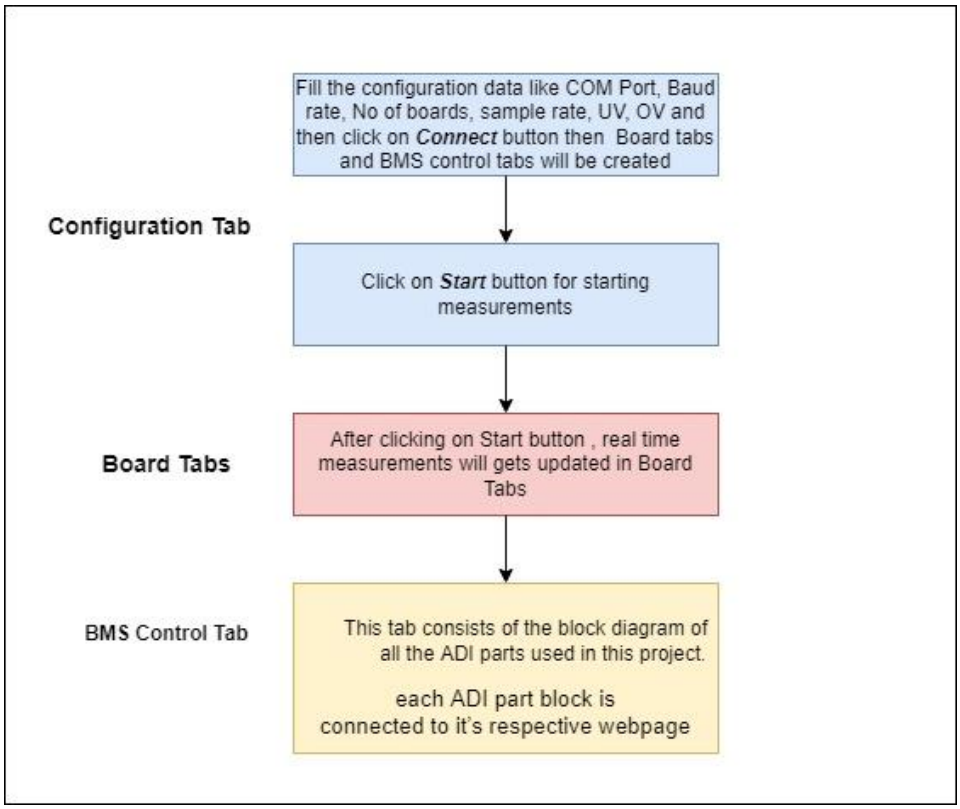

Figure 2: GUI Measurement Flow

5.1 PC/Host Configuration Tab

This is the first tab, use this tab for setting the required configuration data and then click **connect** button. NOTE: This UI works for atmost 3 boards, hence select boards is limited to 3 and and after disconnecting if different configuration data needs to be filled(specific to boards) then restart GUI.

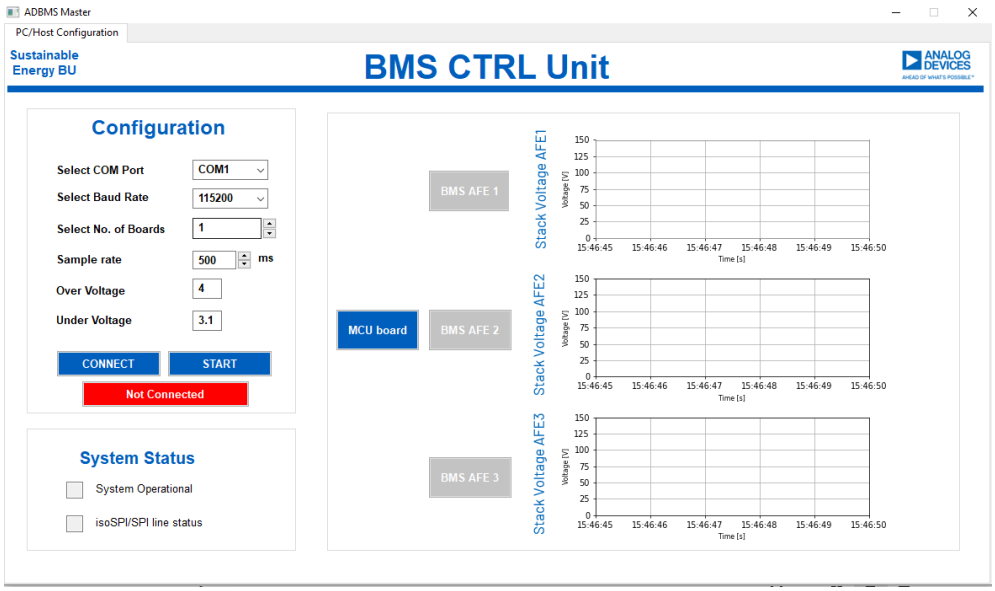

Figure 3: Configuration Tab

After Connect button is pressed the system tabs and board tabs will be created and Connect button name will change to Disconnect.

5.1.1 Configuration

5.1.1.1 COM Port

Use this field for setting the COM port which is created after hardware setup is done as mentioned in section *4.2 Hardware Installation*

5.1.1.2 Baud Rate

Baud rate (115200) is available for now and it will work fine.

5.1.1.3 No of Boards

Use this drop down for selecting the number of ADBMS boards you wish to connect and monitor.

5.1.1.4 Sample Rate

This field is for frequency of at which the readings need to be updated in GUI.

5.1.1.5 Under Voltage

Use this field for setting under voltage threshold that should be given in units V, with respect to this UV faults will occur

5.1.1.6 Over Voltage

Use this field for setting over voltage threshold that should be given in units V, with respect to this OV faults will occur

5.1.1.7 Connect/Disconnect

- For connect operation fill in the required configuration details and click on **Connect** button.
- After clicking on **Connect** button, it will change to Disconnect button and board tabs, BMS-CTRL tabs will be created.
- For disconnect operation click on **Disconnect** button.
- After clicking on **Disconnect** button, it will change to Connect button.

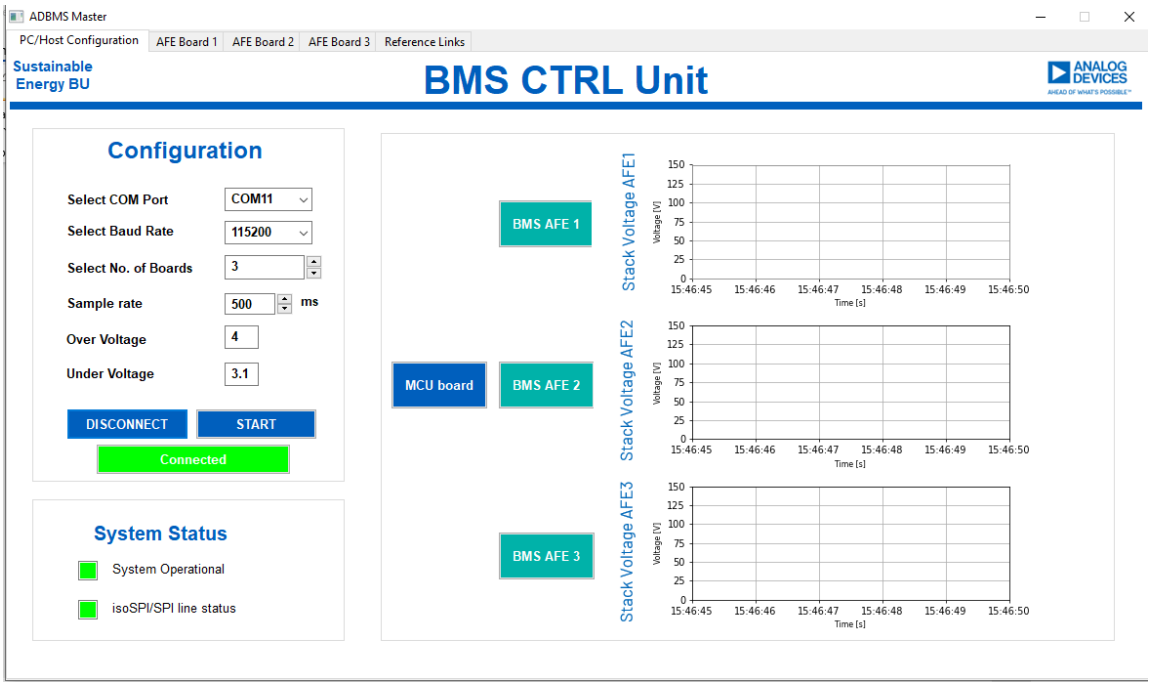

Figure 4: Configuration Tab After Connect

5.1.1.8 Start/Stop

- Click on the **Start** button for starting the measurement
- After clicking on **Start** button, it will change to Stop button and Stack graph in Host configuration starts plotting with respect to the board's stack voltage, readings and graph in the board tabs will be updated as per its value.
- For stop operation click on **Stop** button.
- After clicking on **Stop** button, it will change to Start button.

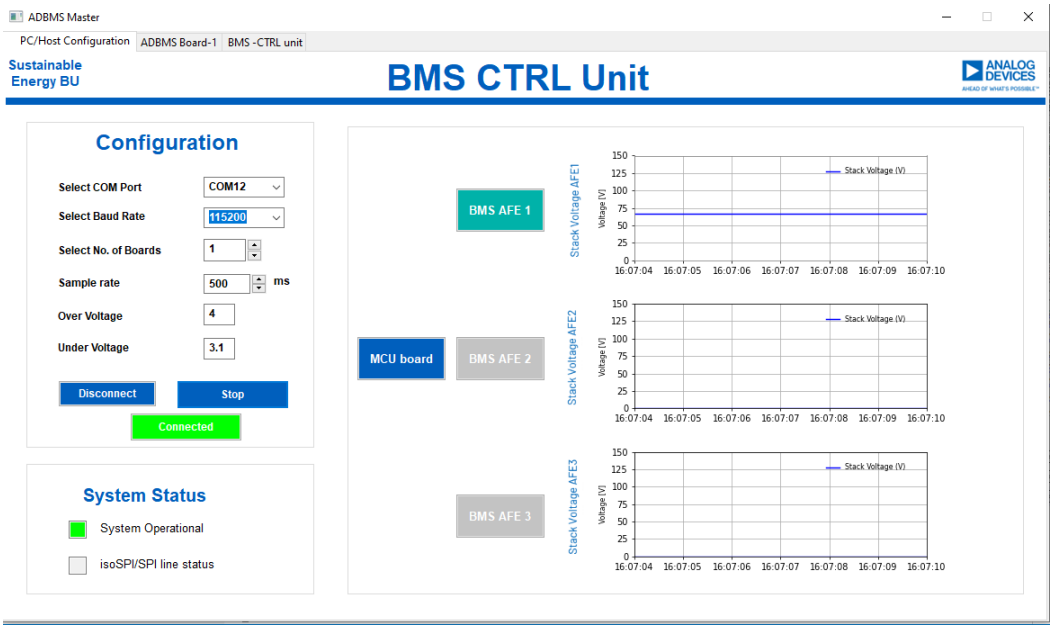

Figure 5: Configuration Tab After Start

5.1.2 System Status

This field indicates the whole system status with the following 2 sub fields.

5.1.2.1 Connection status button

This field indicates the connection status.

- NO AFE fail and no serial communication error then this button shows connected with green background.

- Serial communication error occurred then this button shows Serial communication error with red background.

- after Disconnect and before connect this button shows Not connected with Red background.

- After Disconnect

5.1.2.2 System Operational

This field indicates the communication fault.

- NO AFE fail and no serial communication error

- Either or both of AFE COM fail and Serial communication error occurred.

- After Disconnect

5.1.2.3 IsoSPI/SPI line status

This field indicates the IsoSPI communication fault.

- IsoSPI fault is occurred.

- No error SPI is working fine.

- After Disconnect

5.2 ADBMS Board Tab

- Maximum boards supported by this GUI is 3
- Depending on the board count specified in configuration data, that number of board tabs are created having one board selected for each tab.
- For monitoring a particular board, click on that numbered board tab.

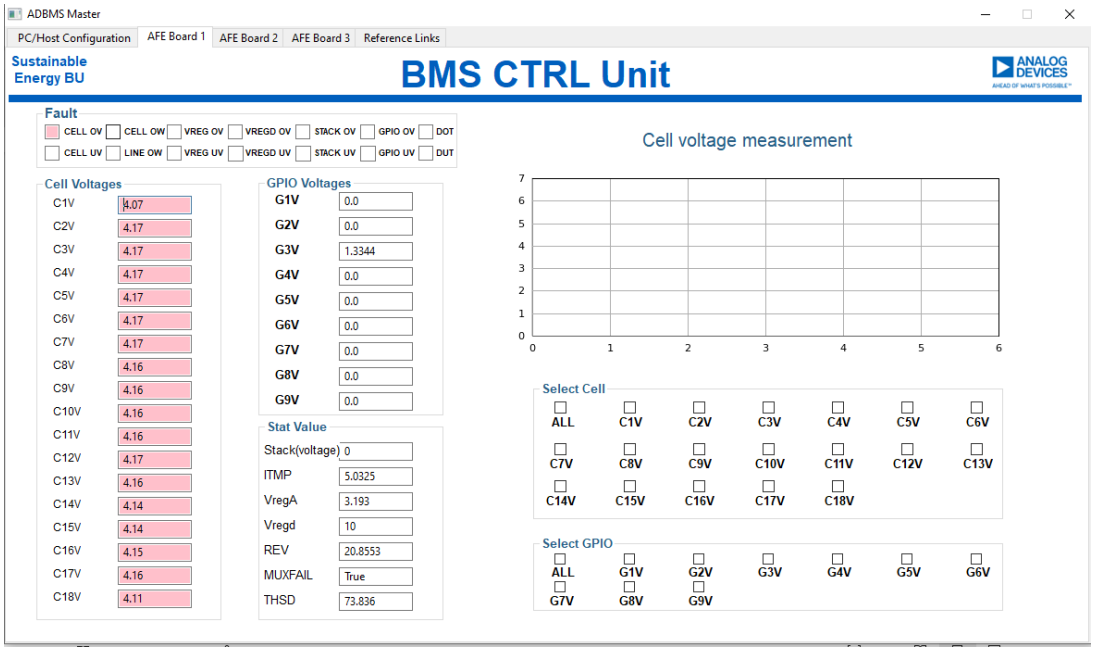

Figure 6: Board Tab with graph

5.2.1 Faults

- These faults are board specific faults.

5.2.1.1 CELL OV

- This field indicates Cell Over voltage fault.

- Cell OV fault is occurred.
- No error all cells are in threshold range.

5.2.1.2 CELL UV

- This field indicates Cell Under voltage fault.

- Cell UV fault is occurred.
- No error all cells are in threshold range.

5.2.1.3 VREG OV

- This field indicates Analog power supply Over voltage fault.

- VReg OV fault is occurred.
- No error.

5.2.1.4 VREG UV

- This field indicates Analog power supply Under voltage fault.

- VReg UV fault is occurred.
- No error.

5.2.1.5 VREGD OV

- This field indicates Digital power supply Over voltage fault.

- VRegD OV fault is occurred.
- No error.

5.2.1.6 VREGD UV

- This field indicates Digital power supply Under voltage fault.

- VRegD UV fault is occurred.
- No error.

5.2.1.7 STACK OV

- This field indicates stack Over voltage fault.
- This fault is not implemented as it is not applicable for ADBMS1818.

- Stack OV fault is occurred.
- No error.

5.2.1.8 STACK UV

- This field indicates stack Under voltage fault.
- This fault is not implemented as it is *not applicable for ADBMS1818*.

- Stack UV fault is occurred.
- No error.

5.2.1.9 GPIO OV

- This field indicates gpio Over voltage fault.

- gpio OV fault is occurred.
- No error.

5.2.1.10 GPIO UV

- This field indicates gpio Under voltage fault.

- gpio UV fault is occurred.
- No error.

5.2.1.11 DOT

- This field indicates die Over temperature fault.

- die OT fault is occurred.
- No error.

5.2.1.12 DUT

- This field indicates die under temperature fault.

- die UT fault is occurred.
- No error.

5.2.1.13 CELL OW

- This field indicates cell open wire fault.

- cell open wire fault is occurred.
- No error.

5.2.1.14 LINE OW

- This field indicates temperature sense line open wire fault.
- This fault is not implemented as it is *not applicable for ADBMS1818*.

- temperature sense line open wire fault is occurred.
- No error.

5.2.2 Cell Voltages

- The fields under this section displays the cell voltages of each cell from cell-1(C1V) to cell-18(C18V).

5.2.3 GPIO Voltages

- The fields under this section displays the gpio voltages of each gpio from gpio-1(G1V) to gpio-9(G9V).

5.2.4 Stat Value

5.2.4.1 Stack(voltage)

- This field indicates the current board's total cell voltage.

5.2.4.2 ITMP

- This field indicates the current board's Internal Die Temperature value.

5.2.4.3 VregA

- This field indicates the current board's analog power supply voltage value.

5.2.4.4 VregD

- This field indicates the current board's digital power supply voltage value.

5.2.4.5 REV

- This field indicates the current board's revision number.

5.2.4.6 MUXFAIL

- This field indicates the current board's mux fail status after having self-test.

5.2.4.7 THSD

- This field indicates the current board's thermal shutdown status.

5.2.5 Cell/Stack Voltage measurement

- Time[s] vs Voltage[V] is present on right side of the tab, to check the graph of a particular cell first click on the Start Graph button and check the required cell's field.
- For cell voltage within the range the cells color will be in white color and for UV and OV the cell will be filled with the respective fault's color.

5.3 BMS Control Unit

- This tab consists of the block diagram of all the ADI parts used in this project.
- Each ADI part block is connected to it's respective webpage.
- Click on a particular ADI part block takes to the product page.
- At left bottom corner a button with name "**Click here for Schematics"** is available

NOTE: Schematics link need to be updated for this button.(From source code need to assign link to variable "`link_of_Schematics_str`" from **constant.py** file)

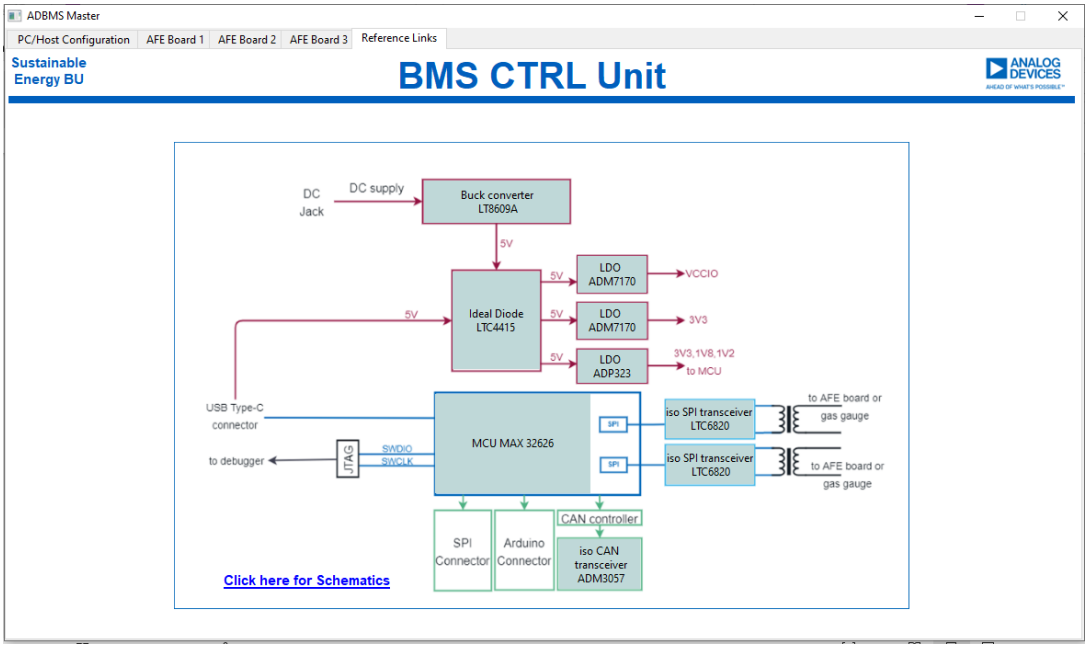

Figure 7: BMS Control Unit Reference

6 KNOWN ISSUES AND LIMITATIONS

1. The GUI works for a maximum of 3 boards.
2. For the first time, opening GUI application will take some time to load.
3. Once UI is started with specific configuration then to load a different configuration (COM port, no. of boards so on), restart the UI.
4. After hitting "Connect" button on the "PC Configuration Tab", GUI takes few seconds to update status and may be unresponsive for few seconds.
5. Cell Open Wire detection algorithm does not give expected results.