

AD-BMSE2E3W-SL Quick Start Guide

FEATURES

- ▶ Variable 72 V to 96 V Regulated Voltage Range, Suitable for E2W/E3W Applications
- ▶ ASIL-D Compliant and Automotive Grade BMS Chip
- ▶ Built-In Charge/Precharge, and Discharge Circuitry
- ▶ 1.8 mV Total Measurement Error for Cell Voltage Monitoring
- ▶ High Performance Cell/Pack Voltage and Current Monitoring
- ▶ On-Board isoSPI Communication
- ▶ Low Power Cell Monitoring (LPCM) Capability
- ▶ GPIO Controllable FET Monitoring
- ▶ ADBMS6830 GPIO Input Ready for NTC Sensors
- ▶ Low Power MAX32690 MCU
- ▶ UART and CAN Communication
- ▶ SOC and SOH Thru Enhanced Coulomb Counting Technique
- ▶ E2W/E3W Basic System Behavior Modes
- ▶ GUI Capable of the Following Measurements and Fault Detection:
 - ▶ Cell Monitoring
 - ▶ Voltage and Current Pack Monitoring
 - ▶ Charge Current Monitoring
 - ▶ Discharge Current Monitoring

EVALUATION BOARD PHOTOGRAPH

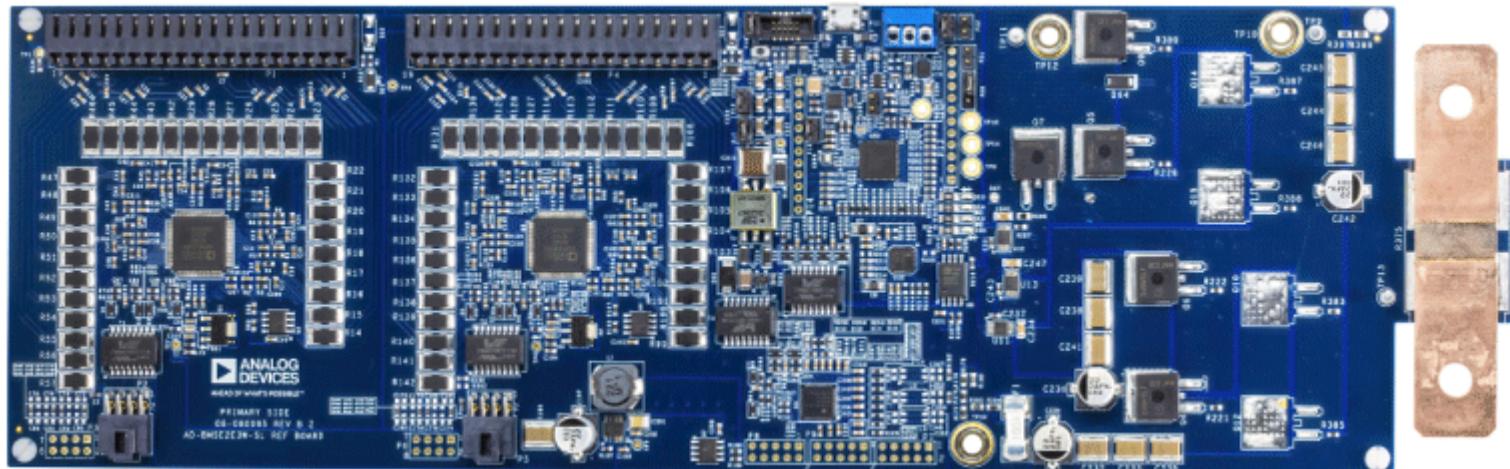


Figure 1. Evaluation Board Photograph

- ▶ Temperature Monitoring
- ▶ Cell OV/UV Detection
- ▶ Cell/GPIO Open-Wire Detection
- ▶ Cell Balancing

EQUIPMENT NEEDED

- ▶ 1x AD-BMSE2E3W-SL (Main Board)
- ▶ 2x Cell Connector Block
- ▶ 2x DC2472A Battery Emulator
- ▶ 1x MAX32625PICO Programmer with 10-Pin SWD Cable
- ▶ 4x USB Type B Cable
- ▶ 1x BU-P1166-12-2 (Red) Banana Plug to Alligator Clip
- ▶ 1x BU-P1166-12-0 (Black) Banana Plug to Alligator Clip
- ▶ Host PC Running Microsoft Windows 10

GENERAL DESCRIPTION

The AD-BMSE2E3W-SL is a complete BMS reference design suitable for light electric vehicles with a voltage range of 72 V to 96 V and a current capacity up to 100 A. This integrated single-board system features the ADBMS6830 16-cell monitor, ADBMS2950 pack current monitor, ADBMS6822 isoSPI transceiver, and MAX32690 microcontroller.

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REVISION HISTORY

6/2024—Revision 0: Initial Version

HARDWARE SETUP

Follow these steps to set up the AD-BMSE2E3W-SL hardware:

1. Screw the two cell connector blocks to the two DC2472A battery emulators. Note that the first two terminals and the last terminal of each DC2472A connector must be left hanging (see [Figure 2](#)).
2. Connect the DC2472A battery emulators to the AD-BMSE2E3W-SL board through the cell connector blocks.
3. Set the DC2472A battery emulators to the lowest voltage by fully turning the cell voltage adjustment potentiometer counter-clockwise (see [Figure 2](#)).
4. Connect a micro-USB Type B cable to each DC2472A battery emulator and power the board by connecting the other end of the cable to the Host PC.
5. Attach the MAX32625PICO programmer to the AD-BMSE2E3W-SL board (through the SWD connector) using the 10-pin ribbon SWD cable.
6. Power the MAX32625PICO board using a micro-USB to USB cable connected to the Host PC.
7. Connect the alligator clip cable (red) to the **VBATTP** Pin or the third of the Pin 17 header of the DC2472A battery emulator. Then, insert the other end of the cable (banana jack plug) to the **TP16 (VBAT+ terminal)** of the AD-BMSE2E3W-SL board. See [Figure 3](#) for the pin locations.
8. Connect the alligator clip cable (black) to the **GND (VBAT-)** supply of the DC2472A battery emulator. Then, connect the other end of the cable to the **Rsense** (top side) of the AD-BMSE2E3W-SL.
9. Set the DC2472A battery emulators to the highest voltage by fully turning the cell voltage adjustment potentiometer clockwise.
10. Check the supply for the test points. Make sure that the voltage levels are within the specified range stated in [Table 1](#).

Table 1. Hardware Supply Quick Test Points

Test Point	Description	Function	Voltage Range
TP2	U1 ADBMS6830 BMS1_VREG	U1 Input Voltage BMS1_VREG for ADBMS6830	Low voltage: 15 V to 20 V High voltage: 50 V to 58 V
TP4	U3 ADBMS6830 BMS2_VREG	U3 Input Voltage BMS2_VREG Input for ADBMS6830	0 V to 5 V
TP7	U6 LTC3639 Output	U6 LTC3639 Regulator Voltage Output	4.5 V to 5.5 V
TP8	U9 LT8303 Output	U9 LT8303 Switch Down Regulator Output	3.2 V to 3.5 V
3V3_VDD	U15 MAX25301A Output	U15 MAX25301A Output 3.3 V Going to MCU	3.2 V to 3.5V
TP16	VBAT+	Total Voltage Supply from Battery	72 V to 92 V (regulated)

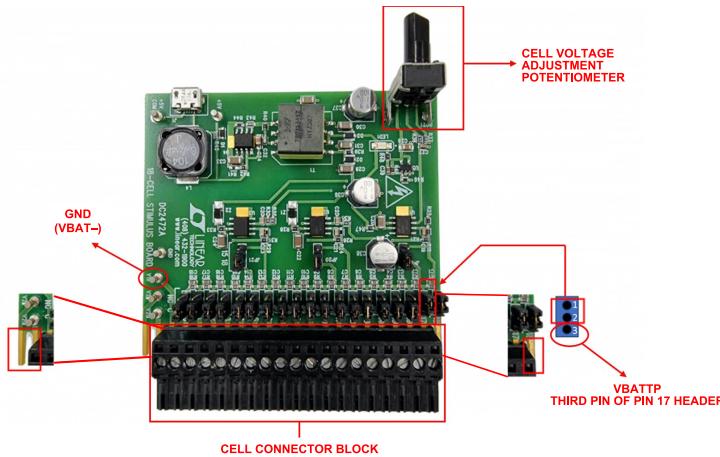
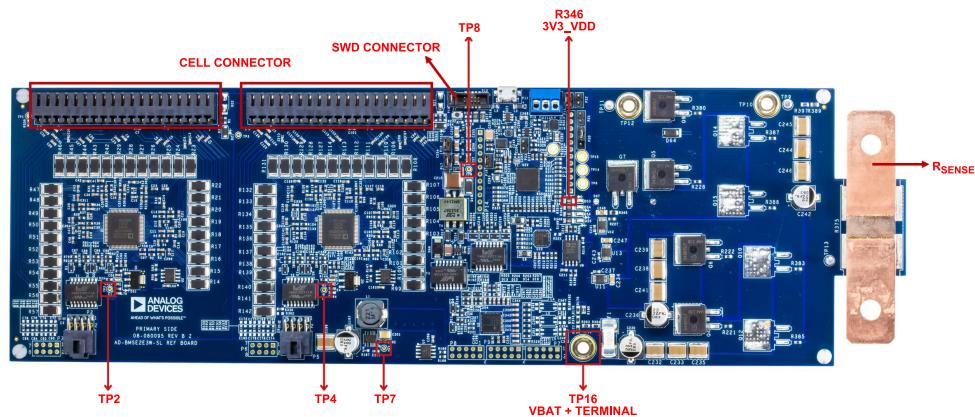


Figure 2. DC427A Battery Cell Emulator

HARDWARE SETUP

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Figure 3. AD-BMSE2E3W-SL Test Points and Connectors

SOFTWARE SETUP

The **AD-BMSE2E3W-SL GUI**, also referred as the **Light EV BMS GUI**, is a PC-based graphical user interface (GUI) tool designed to work in conjunction with the ADBMSE2E3W-SL board.

A **MyAnalog.com** account is required to download the software.

Follow these steps to create a **MyAnalog** account:

1. Go to [MyAnalog](#) and create an account using email. Select **Register with email** to get started.
2. Log in to [MyAnalog](#) using credentials.

Request for Software Access

To request for software access, send the following details to this email address: LEV_CSESupport@analog.com

- MyAnalog email address
- Company
- Country
- Purpose/Projects

DOWNLOAD

1. Click this link: [AD-BMSE2E3W-SL Version 1.0.0](#) .
2. The **Software Package Download** page opens. Tick the check box and click **I Accept** to accept the license agreement.
3. Click **Download** to download the installer.

Note: When software updates or new versions of the software are available, Analog Devices sends a notification to the email address associated with the MyAnalog account used to download the original software package.

GRAPHICAL USER INTERFACE (GUI) SETUP

1. Double-click on **ad-bmse2e3w-sl-rel1.0.0.exe** to install the program to your computer.
2. Accept the license terms and click **Next** to proceed with the installation. The default installation directory is in **C:\Analog Devices\AD-BMSE2E3W-SL-Rel1.0.0\Software\Firmware**.
3. Locate the **light_ev_bmsv1.0.0.hex** file inside the AD-BMSE2E3W-SL installer files folder. **C:\Analog Devices\AD-BMSE2E3W-SL-Rel1.0.0\Software\Firmware**
4. Drag and drop the .hex file into the DAPLink drive to flash the program on the MCU.
5. Find the **Light_EV_BMS_GUI.exe** file inside the AD-BMSE2E3W-SL installer files folder. **C:\Analog Devices\AD-BMSE2E3W-SL-Rel1.0.0\Software\GUI\Light_EV_BMS_GUI_v1.0.0**
6. Double-click the **Light_EV_BMS_GUI.exe** file to open the program. You should see a script running in the background separately and the landing page running in the browser.
7. Set the jumper configuration based on the communication mode being used: UART or CAN.

8. On the GUI landing page, hover to the **Communication Mode** dropdown menu. Select **UART COM** followed by the specific port number if using UART, or **CAN** if using CAN. Press the **RESET** button every time the hardware set up is changed.
9. Click the **Load Defaults** button to set the initial entry values for the different parameters needed for the State of Charge (SoC) and State of Health (SoH) calculations.
10. Click the **Start** button to begin the measurements.

Table 2. GUI Tabs

Tabs	Description
Overview	Features plots for stack voltage, module current, maximum charge current, maximum discharge current, cell voltages, cell temperatures, and state of the battery. This tab also allows setting of the vehicle state.
Graph tab	Enables checking the progression of the readings for different parameters such as the cell voltage, temperature, SoC, SoH, and pack current.
Console tab	Presents the actual numerical data being fetched by the UI in a tabular form.
Diagnostic tab	Allows to check any anomaly detected by the BMS. Some of these diagnostic functions are cell overvoltage and undervoltage, open-wire detection, and others. Indicators include green equals passed (or no issue detected), and red equals failed.

For more details on the hardware components, software controls, and application examples, refer to the [AD-BMSE2E3W-SL Wiki User Guide](#).

Visit [ADI Support](#) for more assistance on the AD-BMSE2E3W-SL.

NOTES**ESD Caution**

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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