Evaluation Board for the ADES1830 16-Channel Multicell Battery Monitor

FEATURES

- Full featured demonstration board for the ADES1830
- Built features
  - Demonstrates the high performance measurements of the ADES1830
  - Two isoSPI® ports for reversible isoSPI® support
  - Daisy-chain capability
  - isoSPI® connections through simple RJ45 to RJ45 connectors or RJ45 to DuraClik® connectors
- Compatible boards
  - AD-APARD32690 microcontroller

EVALUATION BOARD CONTENTS

- EV-ADES1830CCSZ 16-channel multicell battery monitor
- isoSPI® DuraClik® to RJ45 cable
- Ethernet RJ45 cable
- 20-pin connector housing to connect to battery stack
- 2-pin header jumper

EQUIPMENT NEEDED

- AD-APARD32690-SL Arduino form factor development platform based on MAX32690 Arm® Cortex®-M4 microcontroller (available at AD-APARD32690-SL Evaluation Board | Analog Devices)

SOFTWARE NEEDED

- Evaluation software for the AD-APARD32690 microcontroller (available at analog.com).

FUNCTIONAL BLOCK DIAGRAM

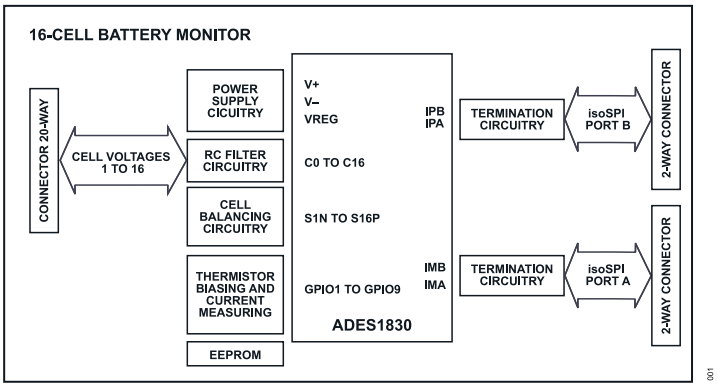

Figure 1. Functional Block Diagram

GENERAL DESCRIPTION

The EV-ADES1830CCSZ is a multicell battery stack monitor featuring the ADES1830, a 16-channel battery stack monitor. Multiple boards can be linked through a 2-wire isolated serial interface (isoSPI®) to monitor a long series of cells in a stack. The EV-ADES1830CCSZ also features reversible isoSPI enabling a ring communication path. The printed circuit board (PCB), components, and connectors are optimized for low electromagnetic interference (EMI) susceptibility and emissions.

The EV-ADES1830CCSZ can communicate with a PC by connecting to the AD-APARD32690 microcontroller via the SPI pins.

Design files for this circuit board are available.

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REVISION HISTORY

12/2024—Rev. 0 to Rev. A

Changed EV-ADES1830 to EV-ADES1830CCSZ (Throughout).....1

4/2024—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

Table 1. Specifications

Parameter	Min	Typ	Max	Unit
V^+ Supply Voltage	11	60	85	V
Cx Voltage	−0.3		+85	V
SxN, SxP Voltage (x = 1, 2, 3)	−0.3		+24	V
SxN, SxP Voltage (x > 3)	−0.3		+85	V
V_{REG} Supply Voltage	4.5	5	5.5	V
V_{REF1} First Reference Voltage, No Load	3.0	3.2	3.3	V
V_{REF2} Second Reference Voltage, 5 k Load to V−	2.995	3	3.005	V
C_{PIN} Input Range	−2.5		+5.5	V
Cell Count			16	

HARDWARE SETUP

When wiring the P3 connector, the following must be considered:

- The EV-ADES1830CCSZ board connection is critical, follow correct wiring to avoid damaging the evaluation board.
- Power for the EV-ADES1830CCSZ is provided by the BMS_VP pin (Pin 10). To connect the cell group, first populate the 20-pin female connector provided in the evaluation kit. Crimp 20 wires that attach to the battery stack and insert them into the 20-pin female connector referencing the appropriate evaluation board P3 connector pinout in Table 2. This connection provides the power and input stimulus for the battery stack monitor IC.
- Cell voltages are wired to P3 starting from Position 1 (most negative potential of the group). It is recommended to connect the ground of the evaluation board to the negative of the lowest cell of the stack first, before connecting the 20-pin connector.

Table 2. Pin Designations for the P3 20-Way Connector

Pin No.	Connection
1	C0 (stack-)
2	C2
3	C4
4	C6
5	C8
6	C10
7	C12
8	C16 (stack+)
9	CSENSE_P
10	BMS_VP
11	C1
12	C3
13	C5
14	C7
15	C9
16	C11
17	C13
18	C14
19	C15
20	CSENSE_N

JUMPERS

Set the isoSPI/SPI jumper to either VREG or V- depending on which form of communication is used.

VREG enables isoSPI communication while V- enables SPI communication.

SERIAL INTERFACE OPTIONS

There are two forms of communication to the EV-ADES1830CCSZ, isoSPI and SPI. Ethernet RJ45 connectors are provided for isoSPI communication between the two EV-ADES1830CCSZ boards. SPI connections to the AD-APARD32690 for the EV-ADES1830CCSZ are provided in Table 3.

Table 3. Pin Designations for the P8 SPI Communications Connector

P8 Pin	Description
1	CSB_IMA
2	SCK-IPA
3	SDI
4	SDO
5	GND
6	GND

EVALUATION BOARD HARDWARE

AD-APARD32690 TO EV-ADES1830CCSZ TYPICAL ISOSPI/SPI CONNECTION

A typical isoSPI/SPI connection begins with the AD-APARD32690 microcontroller connected to the first or bottom EV-ADES1830CCSZ via the SPI pins. Additional EV-ADES1830CCSZ boards can be daisy-chained onto the isoSPI bus. Communication begins from the first or bottom EV-ADES1830CCSZ, then to the next or upper EV-ADES1830CCSZ and, finally, to the last or top EV-ADES1830CCSZ.

Figure 2 shows the following connections for two boards on a stack interfaced to a PC.

1. Connect a USB cable from the PC USB port to the AD-APARD32690 microcontroller (hereafter referred to as AD-APARD32690).
2. Connect the AD-APARD32690 to the EV-ADES1830CCSZ using the SPI pins on the AD-APARD32690. The EV-ADES1830CCSZ is the first or bottom board of the stack.
   - To connect through SPI on the EV-ADES1830CCSZ, refer to Table 3 in the Serial Interface Options section.
3. Connect or daisy-chain the EV-ADES1830CCSZ to another EV-ADES1830CCSZ board in isoSPI mode. The new EV-ADES1830CCSZ is the last or bottom board of a two-board stack. Multiple EV-ADES1830CCSZ upper boards can be daisy-chained together in the same manner.
   - Connect an ethernet cable from the bottom EV-ADES1830CCSZ P6 isoSPI A RJ45 connector to the next upper or top EV-ADES1830CCSZ P7 isoSPI B RJ45 connector.
4. Avoid any damage to the EV-ADES1830CCSZ. See Table 1 and confirm that the cell voltage connections to the 20-pin connector match the EV-ADES1830CCSZ P3 pinout.
   - Plug the 20-pin female connector with crimped wires into the P3 cell voltage connector/s.
5. To evaluate the EV-ADES1830CCSZ, review the AD-APARD32690 board and software available in the Equipment Needed section.

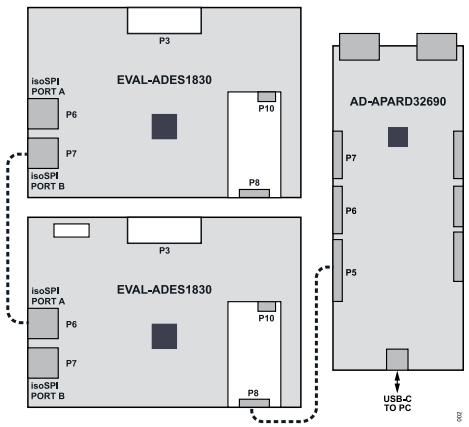

Figure 2. Typical isoSPI/SPI Connection to the Bottom

AD-APARD32690 TO EV-ADES1830CCSZ REVERSE ISOSPI/SPI CONNECTION

A reverse isoSPI connection begins with the AD-APARD32690 microcontroller connected to the last or top EV-ADES1830CCSZ. Additional EV-ADES1830CCSZ boards can be daisy-chained onto the isoSPI bus. Communication begins from the last or top EV-ADES1830CCSZ, then to the next lower EV-ADES1830CCSZ and, finally, to the first or bottom EV-ADES1830CCSZ.

Figure 3 shows the following connections for two boards on a stack interfaced to a PC.

1. Connect a USB cable from the PC USB port to the AD-APARD32690 microcontroller (hereafter referred to as AD-APARD32690).
2. Connect the AD-APARD32690 to the EV-ADES1830CCSZ using the SPI pins on the AD-APARD32690. The EV-ADES1830CCSZ is the last or top board of the stack.
   - To connect through SPI on the EV-ADES1830CCSZ, refer to Table 3 in the Serial Interface Options section.
3. Connect or daisy-chain the EV-ADES1830CCSZ to another EV-ADES1830CCSZ board in isoSPI mode. The new EV-ADES1830CCSZ is the first or bottom board of a two board stack. Multiple EV-ADES1830CCSZ lower boards can be daisy-chained together in the same manner.
   - Connect an ethernet cable from the top EV-ADES1830CCSZ P7 isoSPI B RJ45 connector to the next lower or bottom EV-ADES1830CCSZ P6 isoSPI A RJ45 connector.
4. Avoid any damage to the EV-ADES1830CCSZ. See Table 1 and confirm that the cell voltage connections to the 20-pin connector match the EV-ADES1830CCSZ P3 pinout.
   - Plug the 20-pin female connector with crimped wires into the P3 cell voltage connector/s.
5. To evaluate the EV-ADES1830CCSZ, review the AD-APARD32690 board and software available in the Equipment Needed section.

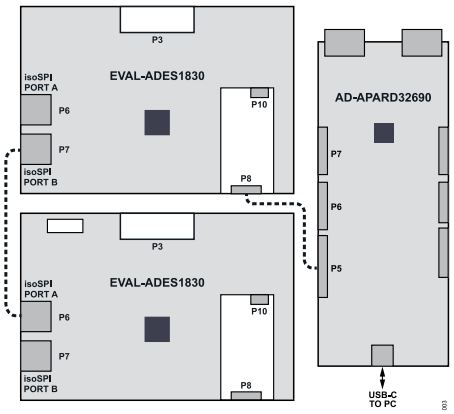

Figure 3. Reverse isoSPI/SPI Connection to the Top

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.