

### Evaluation Board for AD8280 Lithium Ion Battery Safety Monitor

#### FEATURES

- Full featured evaluation board for the AD8280
- Standalone capability
- Isolators on board

#### GENERAL DESCRIPTION

This user guide describes the evaluation boards for the [AD8280](#), which is a complete back-up monitor for lithium ion battery monitoring, integrating multiple voltages, and temperature input channels. Full details of the part, its specifications and its operating parameters are available in the AD8280 data sheet available from Analog Devices Inc., and should be consulted in conjunction with this user guide when using the evaluation board.

#### EVALUATION BOARD CONNECTION DIAGRAM

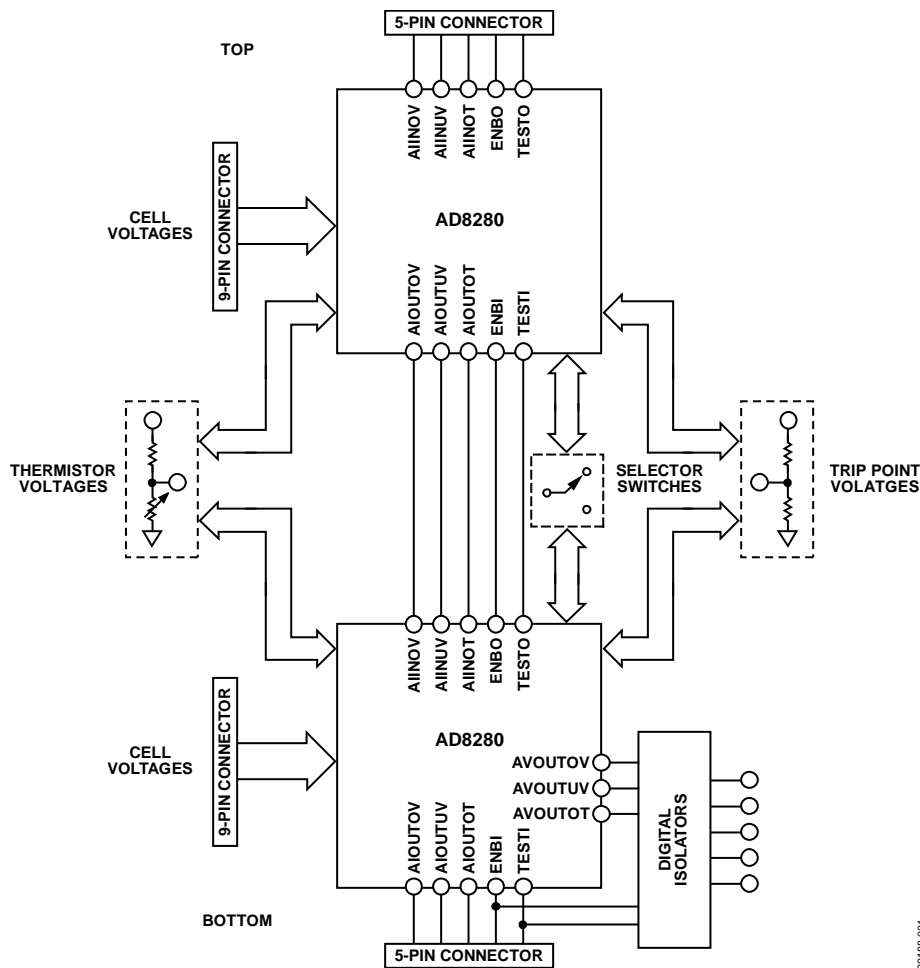


Figure 1.

09168-001

**TABLE OF CONTENTS**

Features .....	1	Selector Pin Options .....	3
General Description .....	1	Power Supply Connections .....	3
Evaluation Board Connection Diagram .....	1	Connecting Multiple Boards.....	3
Revision History .....	2	Schematics/Layout Drawings/Bill of Materials .....	3
Evaluation Board Hardware.....	3	Selector Switch Options.....	4
Battery Connections .....	3	Evaluation Board Schematics and Artwork .....	5
Thermistor Inputs .....	3	Ordering Information.....	9
Inputs and Outputs .....	3	Bill of Materials.....	9

**REVISION HISTORY**

6/10—Revision 0: Initial Version

## EVALUATION BOARD HARDWARE

### BATTERY CONNECTIONS

The AD8280 evaluation board contains two daisy-chained AD8280s and the necessary support components. Connector P1 and Connector P2 (9-pin connectors) are used to connect to the 12 battery cells. The six highest potential cells connect to P1 (near the 8280 TOP label in Figure 4) while the six lowest potential cells connect to P2 (near the 8280 BOTTOM label in Figure 4).

Pin 9 and Pin 8 of P1 and Pin 9 and Pin 8 of P2 connect to the highest potential cells of each six-cell stack, respectively. While Pin 1 and Pin 2 of P1 and Pin 1 and Pin 2 of P2 connect to the lowest potential cells of each six cell stack, respectively.

### THERMISTOR INPUTS

Thermistor inputs are simulated with resistor dividers on the board (R8/R9, R10/R11, R36/R37, and R38/R39). If the user so chooses, either NTC or PTC thermistors could be substituted for R9, R11, R37, or R39. When doing so, the resistance values of R8, R10, R36, and R38 may need to be adjusted to ensure that the inputs stay within the allowable range of the overtemperature (OT) trip point settings over the temperature range of interest.

### INPUTS AND OUTPUTS

The alarm outputs, AVOUTOV, AVOUTUV, and AVOUTOT, are available on the low voltage side of the isolators at the ALRM\_OV, ALRM\_UV, and ALRM\_OT connectors, respectively. Inputs for TESTI and ENBI should be brought in through the TEST\_IN and ENBL\_IN connectors, respectively, also on the low voltage side of the isolators.

### SELECTOR PIN OPTIONS

Refer to Table 1 and Table 2, as well as the AD8280 data sheet, to determine the position of the selector pins for various configurations. One option available that is not described on the data sheet is the ability to power up the thermistor divider with either the REF output or the LDO output at the selector pins labeled TOT and BOT (see Table 2).

### POWER SUPPLY CONNECTIONS

Power for the AD8280s is supplied via the battery connections. Power for the high voltage side of the isolators is supplied by the LDO output of the AD8280. The 5 V power for the low voltage side of the isolators must be supplied by the user.

### CONNECTING MULTIPLE BOARDS

Multiple boards can be daisy-chained via the P21 and P22 connectors if the user desires to work with more than 12 cells. When connecting multiple boards together, CR10 to CR14 must be added to the appropriate locations adjacent to P22 (see Figure 2).

### SCHEMATICS/LAYOUT DRAWINGS/BILL OF MATERIALS

Schematics for the AD8280 evaluation board are shown in Figure 2 and Figure 3.

Layout drawings are shown in Figure 4, Figure 5, and Figure 6.

The bill of materials for the board is shown in Table 6.

## SELECTOR SWITCH OPTIONS

**Table 1. Programming Selector Pins**

Selector Pin <sup>1</sup>	High	Low
xNPTC	Selects positive temperature coefficient thermistor	Selects negative temperature coefficient thermistor
xALRMSEL	Selects three separate alarms	Selects one shared alarm
xDGT2, xDGT1, xDGT0	Refer to Table 5	Refer to Table 5
xSELO, xSEL1	Refer to Table 3	Refer to Table 3
xTOP, xBOT	Refer to Table 4	Refer to Table 4

<sup>1</sup> x = T for top part or B for bottom part.

**Table 2. Programming xOT Selector Pins**

Selector Pin <sup>1</sup>	LDO	REF
xOT	Select to power the OT trip point divider by the LDO	Select to power the OT trip point divider by the REF

<sup>1</sup> x = T for top part or B for bottom part.

**Table 3. SELx Pin Programming**

Desired Condition	SELO	SEL1
6 Cells	0	0
5 Cells (VIN5 Shorted)	0	1
4 Cells (VIN4 and VIN5 Shorted)	1	0
3 Cells (VIN3, VIN4, and VIN5 Shorted)	1	1

**Table 4. Top/Bottom Part in Daisy-Chain Designation**

Desired Condition	TOP <sup>1</sup>	BOT <sup>1</sup>
Middle Potential Part	0	0
Part at Lowest Potential	0	1
Part at Highest Potential	1	0
Single Part (Both Highest and Lowest Potential)	1	1

<sup>1</sup> For TOP and BOT only, Logic 0 is VBOT, and Logic 1 is VTOP.

**Table 5. Fault Detection Time Pin Programming**

Desired Condition	DGT0	DGT1	DGT2
0.0 sec	0	0	0
0.1 sec	0	0	1
0.8 sec	0	1	0
1.6 sec	0	1	1
3.2 sec	1	0	0
6.4 sec	1	0	1
12.8 sec	1	1	0

# EVALUATION BOARD SCHEMATICS AND ARTWORK

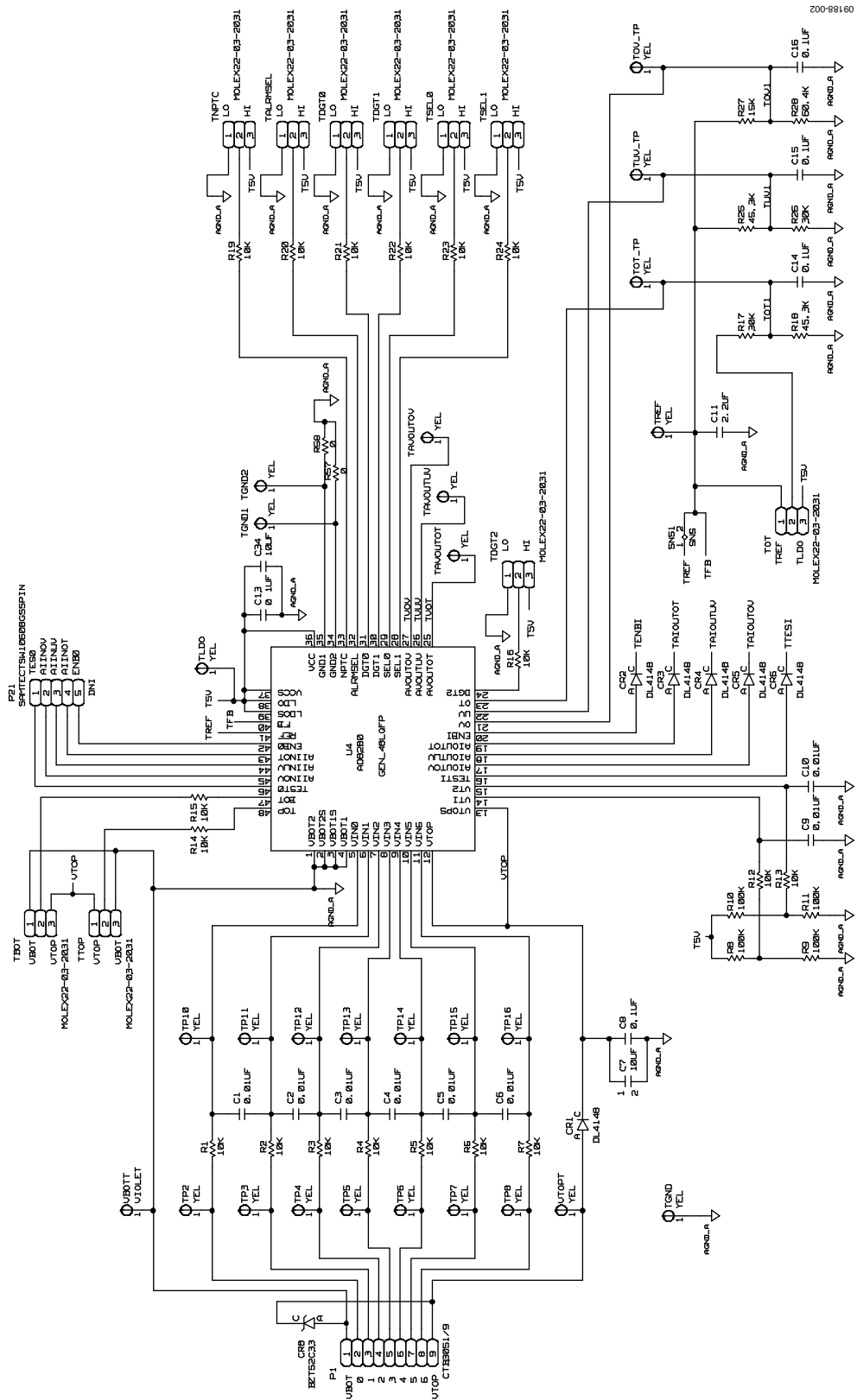


Figure 2. Schematic for U4 Circuit Labeled TOP Device



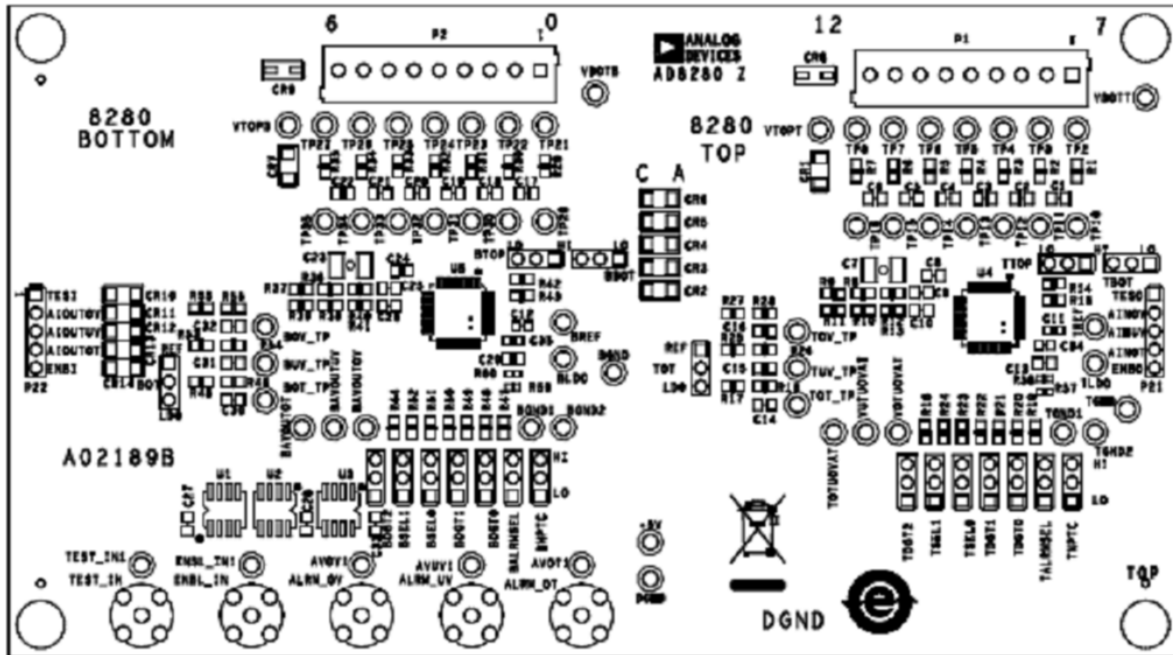


Figure 4. Component Layout of Evaluation Board

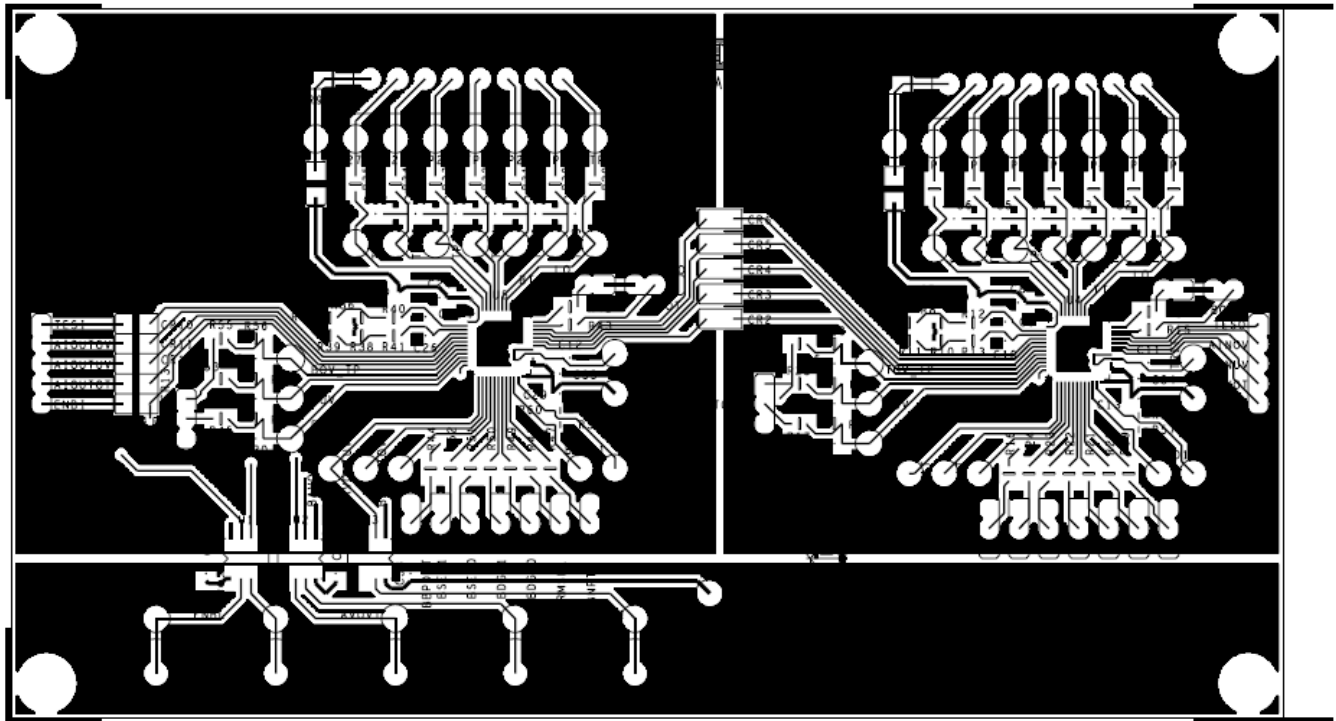


Figure 5. Board Connections—Top Layer of Evaluation Board

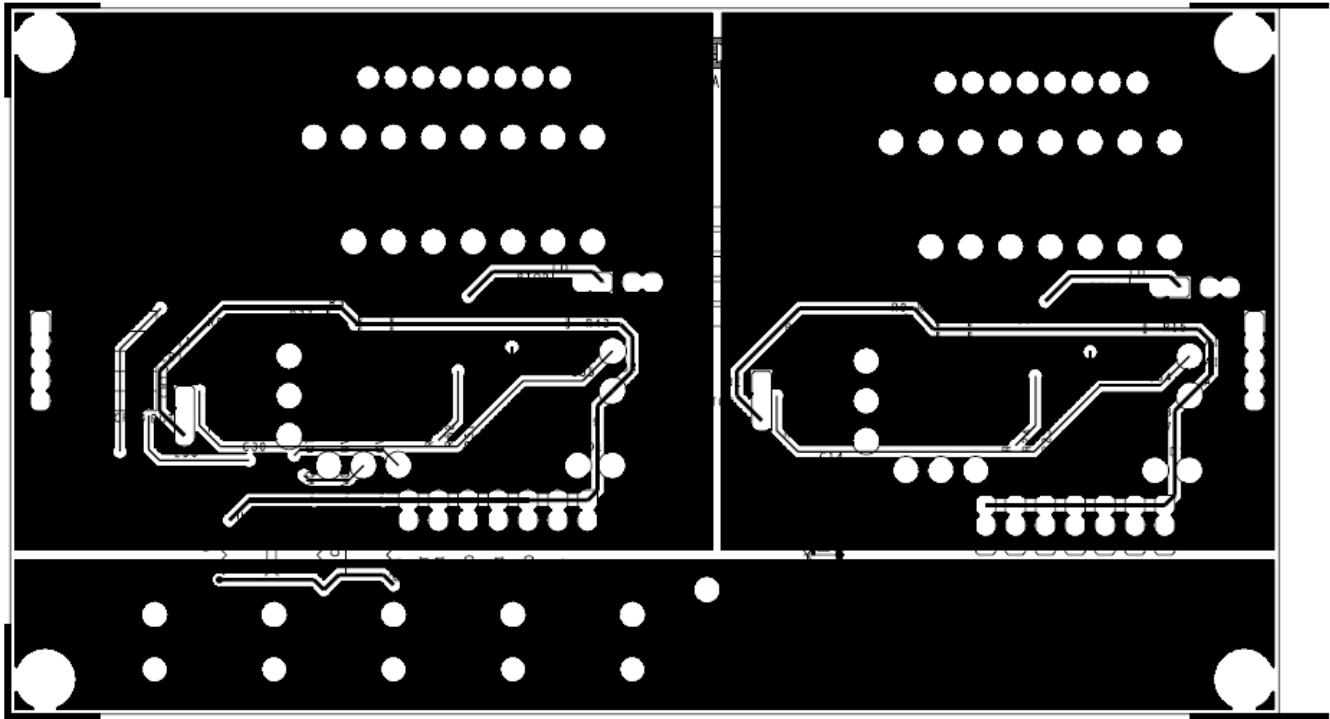


Figure 6. Board Connections—Bottom Layer of Evaluation Board

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**ORDERING INFORMATION****BILL OF MATERIALS**

Table 6.

Qty	Reference Designator	Description	Manufacturer	Manufacturer Product No.
16	C1 to C6, C9, C10, C17 to C22, C25, C26	0.01 $\mu$ F ceramic PPS capacitor	Panasonic	ECH-U1C103JB5
2	C11, C12	2.2 $\mu$ F, 0603, X5R capacitor	Panasonic	ECJ-1VB0J225K
13	C8, C13 to C16, C24, C27 to C33	0.1 $\mu$ F ceramic, X7R capacitor	Panasonic	ECJ-2YB1H104K
2	C7, C23	10 $\mu$ F ceramic capacitor	Panasonic	ECJ-5YF1V106Z
2	C34, C35	10 $\mu$ F, 0603, X5R capacitor	Panasonic	ECJ-1VB0J106M
7	CR1 to CR7	Diode signal DL4148	Microsemi Corp.	DL4148
2	CR8, CR9	33 V Zener diode	Diodes, Inc.	BZT52C33
2	P1, P2	Connector, PCB 3.5 mm, ultralow profile, screw termination	Camden Electronics, Ltd.	CTB3051/9
36	R1 to R7, R12 to R16, R19 to R24, R29 to R35, R40 to R44, R47 to R52	10 k $\Omega$ , precision thick film chip, 0805 resistor	Panasonic	ERJ-6ENF1002V
8	R8 to R11, R36 to R39	100 k $\Omega$ , precision thick film chip, 0805 resistor	Panasonic	ERJ-6ENF1003V
4	R17, R26, R46, R54	30 k $\Omega$ , film SMD, 0805 resistor	Panasonic	ERA-6YEB30K
4	R18, R25, R45, R53	45.3 k $\Omega$ , precision thick film chip, 0805 resistor	Panasonic	ERJ-6ENF4532V
2	R27, R55	15 k $\Omega$ , film SMD, 0805 resistor	Panasonic	ERA-6YEB153V
2	R28, R56	60.4 k $\Omega$ , precision thick film chip, 0805 resistor	Panasonic	ERJ-6ENF6042V
4	R57 to R60	0 $\Omega$ film, SMD, 0402 resistor	Panasonic	ERJ-2GE0R00X
1	U1	IC dual-channel isoPower <sup>®</sup> isolator	Analog Devices, Inc.	ADuM5240ARZ
2	U2, U3	IC dual-channel D isolator	Analog Devices, Inc.	ADuM1210BRZ
2	U4, U5	Lithium ion battery safety monitor	Analog Devices, Inc.	AD8280WASTZ

**NOTES**

## NOTES

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**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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