

# Product Description

## Arduino Battery Shield

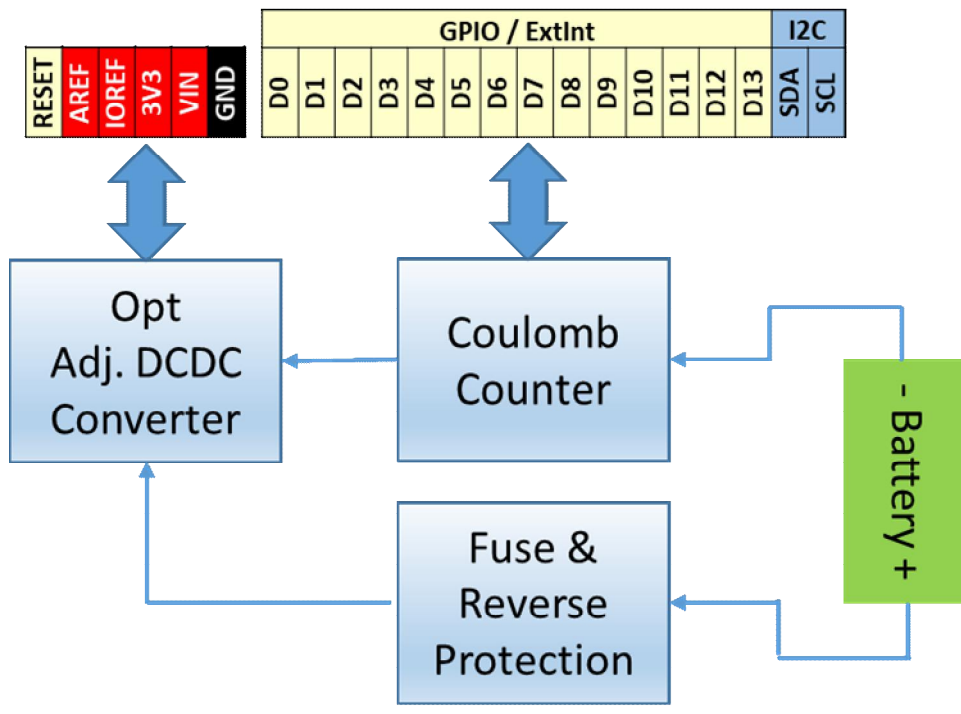
### Highlights

- Companion for ublox C030 Application Board
- Access TI Coulomb Counter ASIC via I2C
- Optional adjustable DCDC converter on-board
- Supports multiple battery sizes/shapes

### General Description

The Arduino Battery Shield is a primary battery source for the Arduino platform revision 3. The ABS is intended to work with Lithium chemistry batteries working voltages up to 4.2v . The ABS is the base mounting platform which other shields are plugged onto. It is capable of mounting several battery types depending on application.

### Block Diagram



*The ABS is designed as a companion shield to the ublox C030 Application Development board. Software control/communication is provided by the C030 application CPU. See ublox for more details on C030 on their website.*

Power ON/OFF switch is provided to connect both + & - battery wires to board circuitry. There are screw terminal posts to attach battery wires. There are no visible indicators as this would use excess energy, therefore the main CPU should provide power indication. Protection if the battery leads are reversed and switched is turned ON, there is a reverse protection diode that will cause the surface mount 2A fuse to expire if battery has the capacity.

Three different capacities/batteries are available. Please refer to the end of the document for their specifications.

On board is are two additional features: DC/DC converter & Coulomb counter ASIC.

The battery voltage passes from battery to Arduino connector interface pin **Vin**. An optional feature is to insert the DC/DC converter between the battery & **Vin**. This will stabilize **Vin** as the battery voltage drops as energy is depleted. DC/DC default voltage is 3.3 Volts. The output voltage of converter can be changed by feedback resistor. The DC/DC converter is Texas Instruments TPS63027. The default configuration without the DC/DC converter. To insert DC/DC converter requires solder remove and replace jumper resistors.

The second feature, monitoring current consumption is performed by Texas Instruments ASIC BQ35100. A sense resistor inserted in the (-) negative path from the battery to **Vin**. Power to BQ35100 is provided by the battery but can be disabled by /ENABLE line from main CPU. Configuration, control and monitor of BQ35100 is performed through I<sup>2</sup>C to main CPU. SDA & SCL lines have jumper pins to connect to Arduino interface. Jumper provisions to choose various digital IO for /ENABLE & /ALERT through D4 – D8. For detailed operation of the BQ35100, see the TI website. Each battery can be characterized by TI and becomes part of database available to download, provided the battery has been characterized. See TI or Geyer to determine is selected battery database information has been performed. It is possible to access the BQ35100 without the main CPU shield. CN6 provides I<sup>2</sup>C connection to TI EV2300 interface module to PC software to configure, control & monitor battery energy consumption. See TI website to order interface module.

Below are :

- Table of Jumper Name and Descriptions
- Table of Pinout connections
- Photos of ABS with mounted batteries
- Schematic of ABS

### Jumper Name and Designations

Jumper	Name	Description	ASIC	I/O
JP1	POWER SAVE MODE DISABLE	Jump for PWM mode Open for PFM mode	DC/DC	
JP2	CONVERTER ENABLE	Jump to enable Open to disable	DC/DC	
JP3	ALERT PULLUP	Jump to enable pullup from main CPU, 3.3V source Open no pullup	COULOMB Active low	O
JP4	GAUGE (GE) PULLUP	Jump to enable pullup from main CPU, 3.3V source Open no pullup	COULOMB	I
JP5	SDA ENABLE		COULOMB	I/O
JP6	SCL ENABLE		COULOMB	I
JP7A	GAUGE ENABLE SELECT	Position Jumper on JP7B to select one of D4 – D8	COULOMB	I
JP7B	COMMON	D4 – D8		
JP7C	ALERT ENABLE SELECT	Position Jumper on JP7B to select one of D4 – D8	COULOMB	O

### DC/DC CONVERTER ENABLE

Default is the converter is bypassed.

To enable requires removing and installing the resistors below.

Remove R5 and Install in R6 location

Remove R13 and install in R12 location

Remove R25 and install in R26 location

## ABS PIN CONNECTIONS

Conn	Pin	Description	Comments	
CN1	1	Battery Positive	Connect battery positive wire	
	3	Battery Negative	Connect battery negative wire	
CN2	1	NC		
	2	IOREF – Unused		
	3	RESET		
	4	3.3V	Input for pullup resistors	
	5	5V – Unused		
	6	GND – Battery Negative	Battery connection to main CPU	
	7	GND	Battery connection to main CPU	
	8	Vin – Battery Positive	Battery connection to main CPU	
CN3	1 - 6	Unused		
CN4	1	D0 – no connect		
	2	D1 – no connect		
	3	D2 – no connect		
	4	D3 – no connect		
	5	D4 – ENABLE OR ALERT	See JP7	
	6	D5 – ENABLE OR ALERT	See JP7	
	7	D6 – ENABLE OR ALERT	See JP7	
	8	D7 – ENABLE OR ALERT	See JP7	
CN5	1	D8 – ENABLE OR ALERT	See JP7	
	2 -6	Unused		
	7	GND	Ground	
	8	REF – Unused		
	9	SDA	Interface to main CPU	
	10	SCL	Interface to main CPU	
CN6	1	GND	Standalone operation with TI	
	2	SCL ENABLE	EVK to interface with PC	
	3	SDA ENABLE	Application / Evaluation SW	
	4	Unused	Main CPU shield not required	

Arduino Battery Shield photos

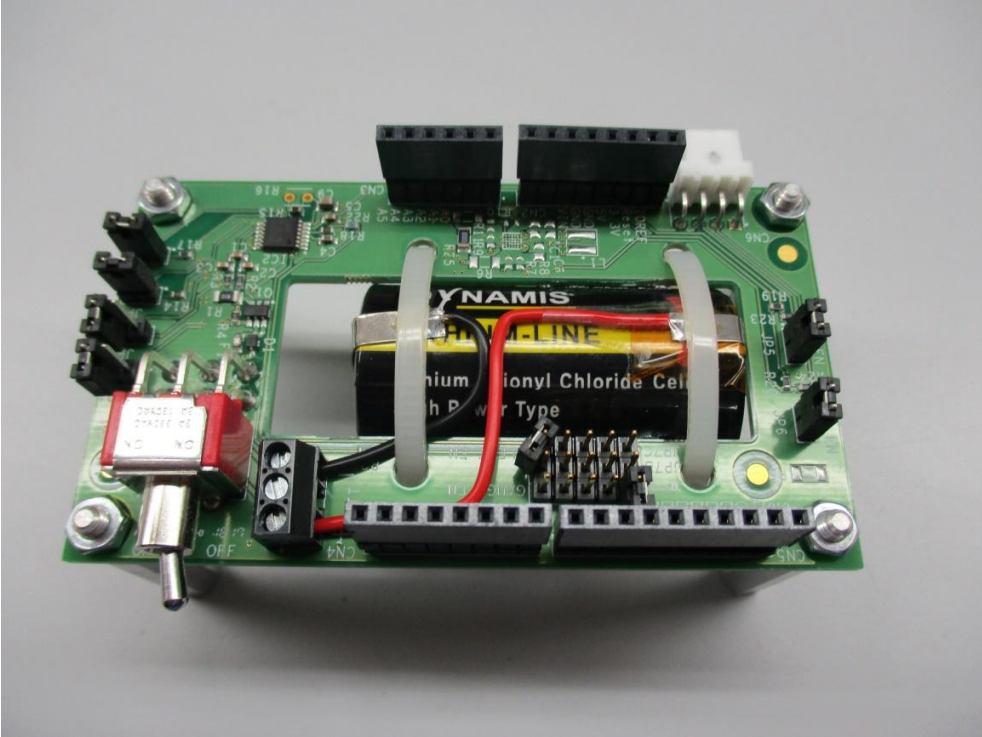


Figure 1 - ABS with C size Battery

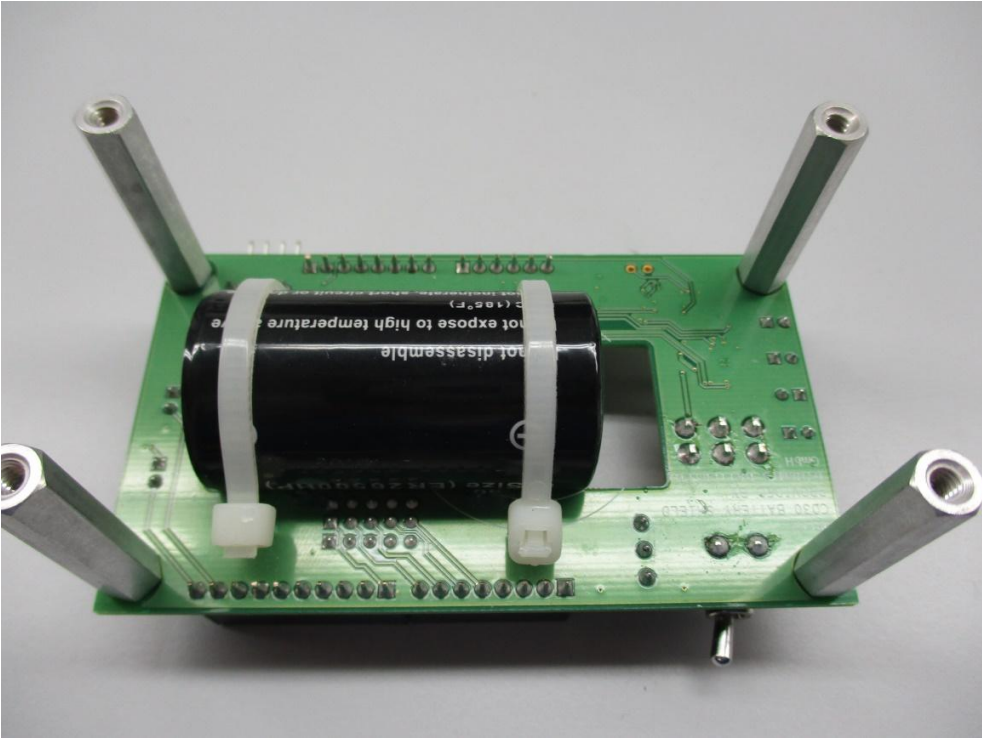
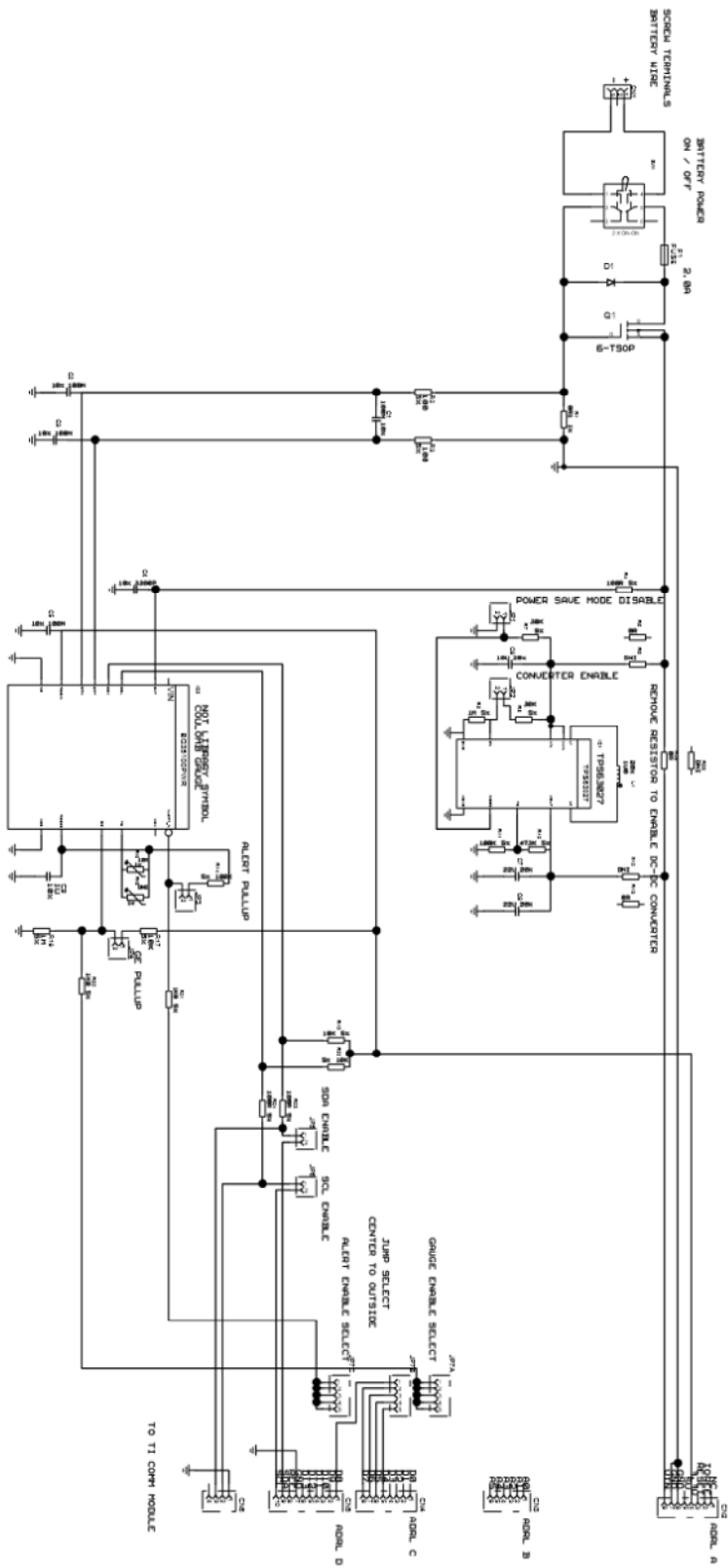


Figure 2 - ABS with C size Battery



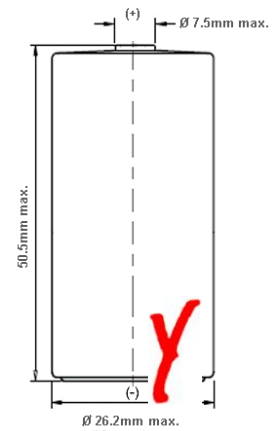
# DYNAMIS

## LITHIUM-LINE

### LI-250 /S (ER26500HP, Size C)

Lithium Thionyl Chloride Cell - High Rate Discharge Type (Spiral)

Drawing:



### Electrical characteristics

(Typical values for cells stored for one year or less at +25°C max.)

Order no. 60.08370

Nominal voltage	3.6 V
Nominal capacity at 15 mA with 2.0 V cut off voltage (25 °C). The capacity restored by the cell varies according to current drain, temperature and cut-off voltage).	6'500 mAh
Max. recommended continuous current	1'000 mA
Pulse capability Typically up to 2.000 mA / 0.1 second pulses, drained every 2 min. (25°C) from undischarged cells with 10 µA base current, yield voltage readings above 3.0 V. (The readings may vary according to the pulse characteristics, temperature, and the cell's previous history. Fitting cell with a capacitor is recommended in severe conditions applications.)	2'000 mA
Storage temperature (recommended for max. 60% rel. humidity, according other demands contact DYNAMIS)	30°C max.
Operating temperature range (Operation at temperature different from ambient may lead to reduced capacity and lower voltage plateau readings.)	-55°C ~ +85°C

### Physical characteristics

Height	50.5 mm
Diameter	26.2 mm
Weight ca.	56 g

### Warning

- Fire, explosion and severe burn hazard.
- Do not recharge, crush, disassemble, heat over 100°C or incinerate.
- Do not expose cell or contents to water

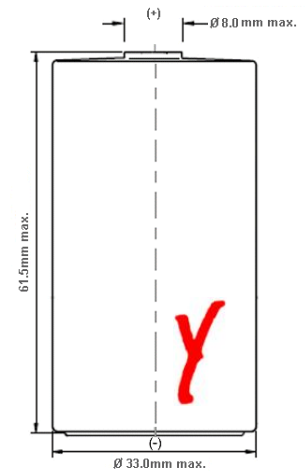
# DYNAMIS

## LITHIUM-LINE

### LI-260 /S (ER34615HP, Size D)

Lithium Thionyl Chloride Cell - High Rate Discharge Type (Spiral)

Drawing:



### Electrical characteristics

(Typical values for cells stored for one year or less at +25°C max.)

Order No. 60.08296

Nominal voltage	3.6 V
Nominal capacity at 15 mA with 2.0 V cut off voltage (25 °C). The capacity restored by the cell varies according to current drain, temperature and cut-off voltage).	13'000 mAh
Max. recommended continuous current	2'000 mA
Pulse capability Typically up to 4.000 mA / 0.1 second pulses, drained every 2 min. (25°C) from undischarged cells with 10 µA base current, yield voltage readings above 3.0 V. (The readings may vary according to the pulse characteristics, temperature, and the cell's previous history. Fitting cell with a capacitor is recommended in severe conditions applications.)	4'000 mA
Storage temperature (recommended for max. 60% rel. humidity, according other demands contact DYNAMIS)	30°C max.
Operating temperature range (Operation at temperature different from ambient may lead to reduced capacity and lower voltage plateau readings.)	-55°C ~ +85°C

### Physical characteristics

Height	61.5 mm
Diameter	33.0 mm
Weight ca.	110 g

### Warning

- n Fire, explosion and severe burn hazard.
- n Do not recharge, crush, disassemble, heat over 100°C or incinerate.
- n Do not expose cell or contents to water



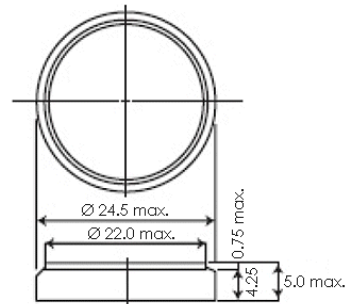
**DYNAMIS**

**LITHIUM-MANGAN-LINE**

### LM-2450

3.0V Primary Lithium Manganese Dioxide (Li-MnO<sub>2</sub>) coin cell

Drawing (mm):



### Electrical characteristics

(typical values relative to cells stored for one year or less at +30°C max.)

Order no. 60.08530

Nominal voltage	3.0 V
Nominal capacity at 7.5 K Ohm with 2.0 V cut off voltage (20 °C). (The capacity restored by the cell varies according to current drain, temperature and cut-off voltage).	600 mAh
Max. recommended continuous current	6 mA
Pulse capability (The readings may vary according to the pulse characteristics, temperature and the cell's previous history.)	25 mA
Operating temperature range (Operation at temperature different from ambient may lead to reduced capacity and lower voltage plateau readings.)	-20°C ~ +70°C
Service life	10 years

### Physical characteristics

Diameter	24.5 mm
Height	5.0 mm
Weight ca.	7.0 g

### Warning

- ⓘ Avoid / do not short-circuit or charge between "+" and "-"
- ⓘ Avoid deep discharge/over discharge, fire, damage
- ⓘ Sealing will break in less than 5 seconds at 200-250°C
- ⓘ Battery to be removed from equipment when discharge to cut-off voltage, dispose of properly