ittyBMS Reference Manual

Theory of Operation:

Each ittyBMS Cell Module (CM) attaches to both the positive and negative post of a Lithium Iron Phosphate cell to monitor the voltage levels and:

- Bleed off charge if the voltage exceeds the preset limit (typically 3.6V)
- Acknowledge when the cell reaches full charge level (typically 50mV below bypass)
- Signal when the voltage goes above or below preset limits (typically 4.0V/2.5V)
- Signal when the voltage stays too low for too long (typically <2.7V for 15 seconds)

The LED on the top of the cell allows the user to identify the weakest cell(s) in the pack without any special tools. The light has the following patterns:

- 80% ON / 20% OFF, 5 second period: The CM has not reset since the cell was last fully charged nor has the cell gone below the lower limits. This is the normal state.
- 50% ON / 50% OFF, 1 second period: The cell is exceeding the voltage limit either high or low.
- 20% ON / 80% OFF, 5 second period: The cell has either never been fully charged since the CM has been installed, the CM has lost power since the cell has been fully charged, or the cell has exceeded its low voltage limit since it was last fully charged.

Thus, when the cells have experienced high power draws, you can easily identify the weakest cell in the pack by finding the CM with the short on-time flash.

There are four signal wires on the board; two are designed for a pigtail connector to be soldered to the board, the other two are for a shrouded header to receive the connector coming from the cell directly negative.

The labeled wires connecting to the pigtail are “UP” and “FFS”. UP is an open-collector transistor to cell negative used to transmit the full-charge signal up the line of BMS units. FFS is the Fast Fault Shutdown opto-isolated bi-directional signal line supporting voltages up to 50V.

The unlabeled posts for the shrouded header are the mates for the “UP” and “FFS” lines. The complement to “UP” is a signal input pulled to cell positive with a 10Kohm resistor, and protected against voltage inputs +/-12V with respect to cell negative. The complement to “FFS” is exactly the same as FFS, as the line is bidirectional, normally-closed connection between the two FFS lines. The two lines are disconnected from each other on a fault.