BQ25180 measurements with “bad” PCBA, Feb 16 & 17 /2023

Measurements done to understand how BQ25180 IC operates in some of the Innokas Medical PCBAs. In all measurements, the Vsys of the BQ25180 did not rise above 2.3V. Therefore, the power supply connected to Vsys never turned on, and the system was never powered on.

The Vsys of BQ25180 is connected on PCB to capacitor bank with a sum capacitance of 22uF.

The oscilloscope traces are connected as follows:

Blue trace = current from/to battery or charger (current probe in battery cable or charger cable).

Red trace = Vsys (BQ25180 output).

Green trace = Battery voltage measured from PCBA.

Yellow trace = Vin (BQ25180 charger input) measured from PCBA.

Case 1. Only Battery connected to supply board.

When battery (voltage 3.750V) is connected to PCBA, current of approx. 150mA was flowing from battery (blue trace). The output of BQ25180 (Vsys = Red trace) rises to approx. 2 volts. This voltage is not enough to turn on the power supply connected to Vsys and the PCBA gets no power at all.

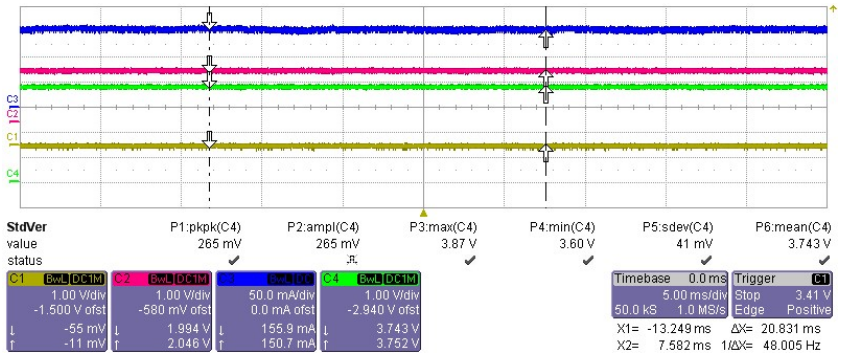

Figure 1. Only battery connected to BQ25180.

Case 2. 5V Charger connected to PCBA in addition to battery (Vin of BQ25180)

When external charger (5V) is connected to PCBA’s USB connector, 5V (yellow trace) is applied to the Vin line on PCB as shown in Figure 2. The current from charger (blue trace) shows only a small transient when charging a 4.7 microfarad input capacitor.

The output voltage Vsys of BQ25180 (red trace) does not react much to the charger, perhaps a 300mV change can be seen in the Vsys voltage. Also, there is no current drawn from the charger. It is the battery that continues to provide current for the system.

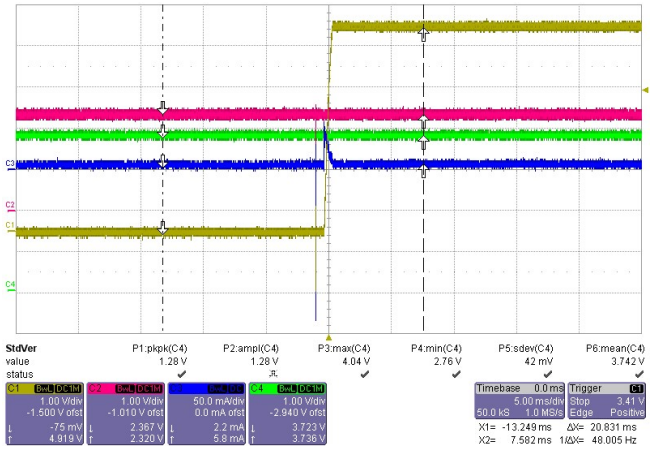

Figure 2. Charger (5V) connected to test PCB.

Case 3. Battery removed and only charger connected.

When battery was removed from PCBA and only charger was connected to PCBA, the 5V on PCBA's Vin line (yellow trace) was observed. Current from Charger (blue trace) was limited to transient needed to charge the input capacitor of 4.7uF. The output Vsys of BQ25180 (red trace) did not react to the charger at all. Slight voltage rise in VBat line (green trace) was observed.

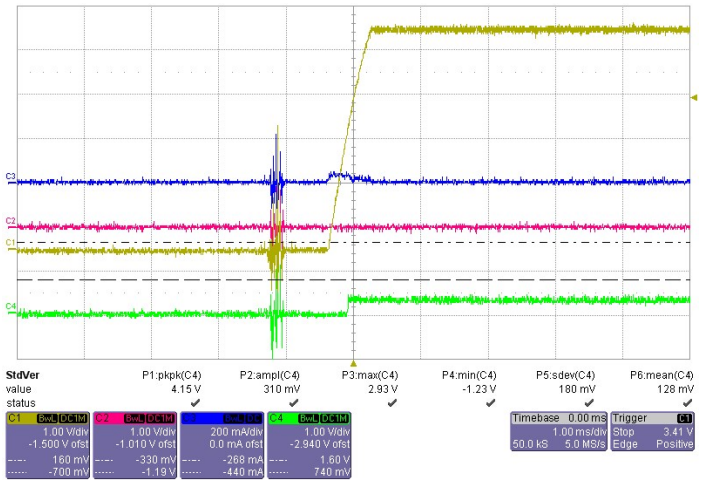

Figure 3. Only Charger connected to PCB.

Case 4. I2C Communication

Communication via I2C bus was tested with Aardvark I2C/SPI Host Adapter. The 7-bit I2C address 0x6A (01101010) given in data sheet of BQ25180 was used during communication attempts with BQ25180 as shown in Figure 4. The communication speed was set to 100kHz. A Li-ion battery with cell voltage of 3.750V was connected to power up the PCBA and the BQ25180.

The address 1101010 is seen clearly during the 7 clock pulses followed by the 1 (write) on 8th clock pulse in Figure 4. Also, it can be seen in Figure 4 that during the 9th clock pulse there is no acknowledgement bit from BQ25180. This suggests that BQ25180 is not responding to I2C communication as expected.

A funny detail was noted during the I2C testing. The Vsys voltage started to slowly drop from 2V to approximately 1.8V at some point during the I2C tests. So, it can be said that the communication attempts might have had some kind of effect on BQ25180.

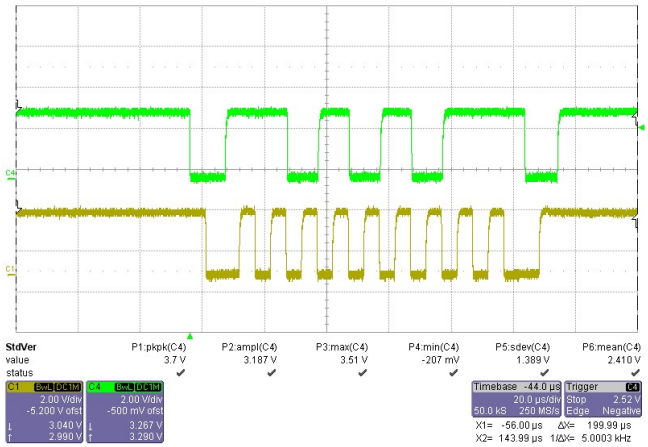

Figure 4. An example of communication via I2C bus at 100kHz bit rate.