BLE113 DEVELOPMENT KIT

DATASHEET

Tuesday, 07 May 2013

Version 1.2

blue giga

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VERSION HISTORY

Version	Comment
1.0	Release
1.1	Minor changes
1.2	Detailed information about the sensors, display and USB to UART converter

TABLE OF CONTENTS

1 Design Overview

BLE113 Development Kit is targeted for engineers evaluating BLE113 *Bluetooth 4.0* single mode modules and developing or prototyping *Bluetooth* 4.0 systems utilizing BLE113 module(s). BLE113 Development Kit features:

Evaluation board for BLE113 module containing

- o Switchable powering either from a coin cell battery or USB

- o UART interface through USB to UART converter

- o programming interface for upgrading the firmware and parameters

- o Display connected to SPI

- o Accelerometer connected to I2C

- o Altimeter conneted to I2C

- o Potentiometer for ADC input

- o Push buttons for 4 PIOs and reset

- o All the PIOs available at a pin header

- o Current measurement points for measuring peak currents of the module, DC current of the module and DC current of the whole board.
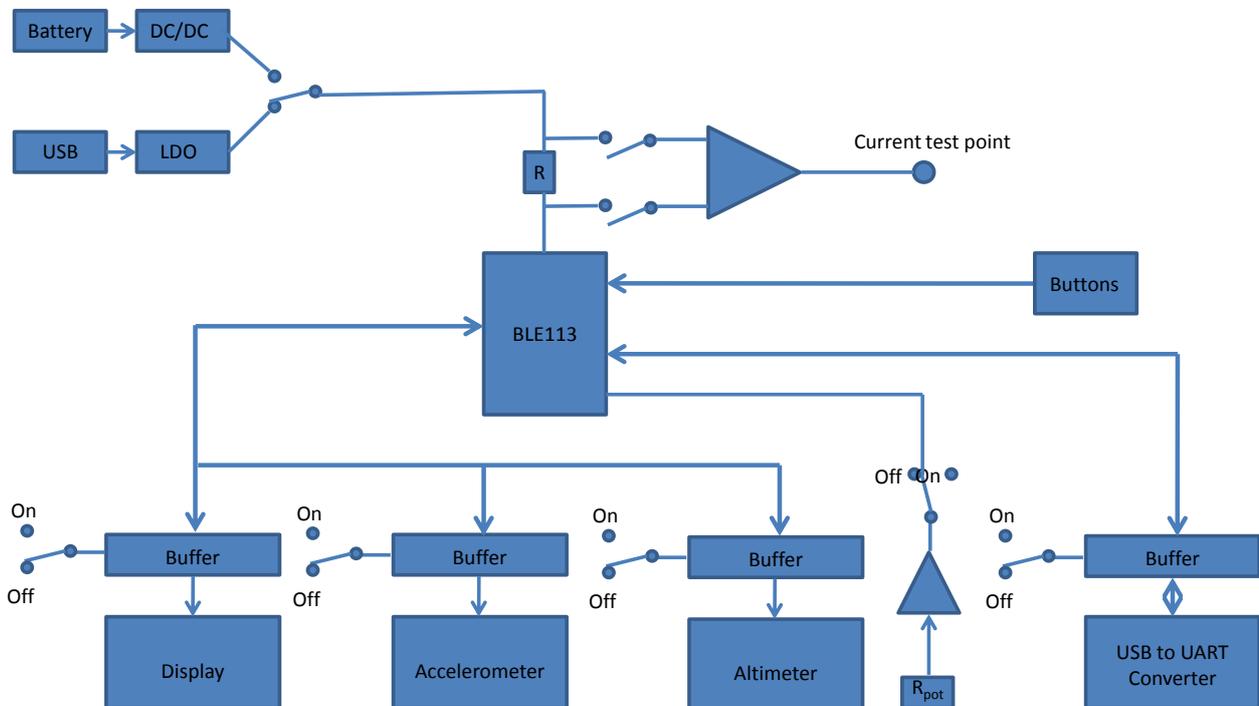

Figure 1: Block diagram of BLE113 evaluation board

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Please, refer to the latest BLE113 data sheet for information about BLE113 *Bluetooth 4.0* single mode module. The physical outlook, schematics, assembly and the PIN configurations of the interfaces of BLE113 Development Kit are described in this document.
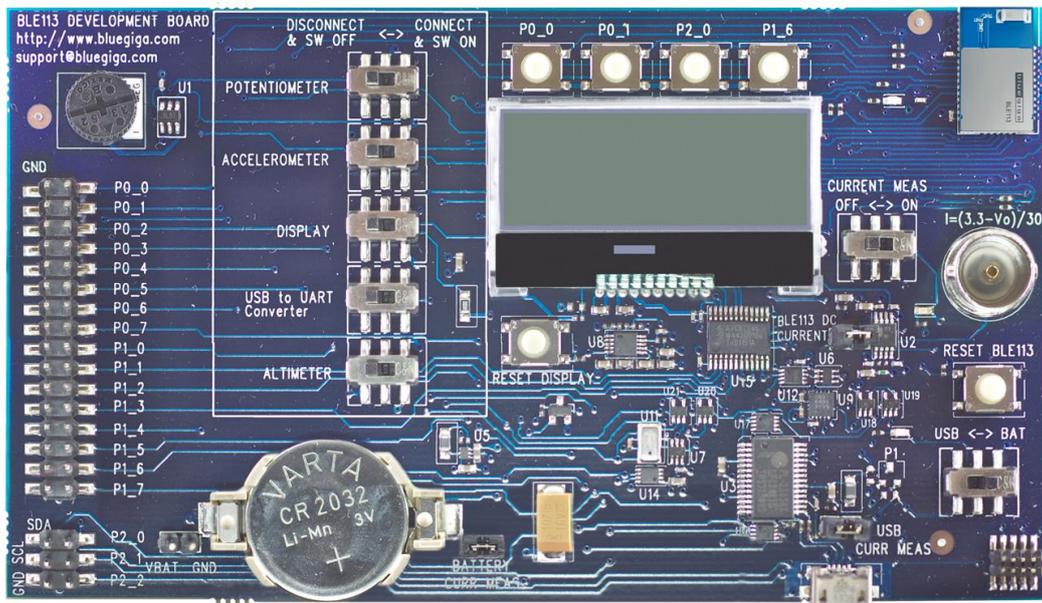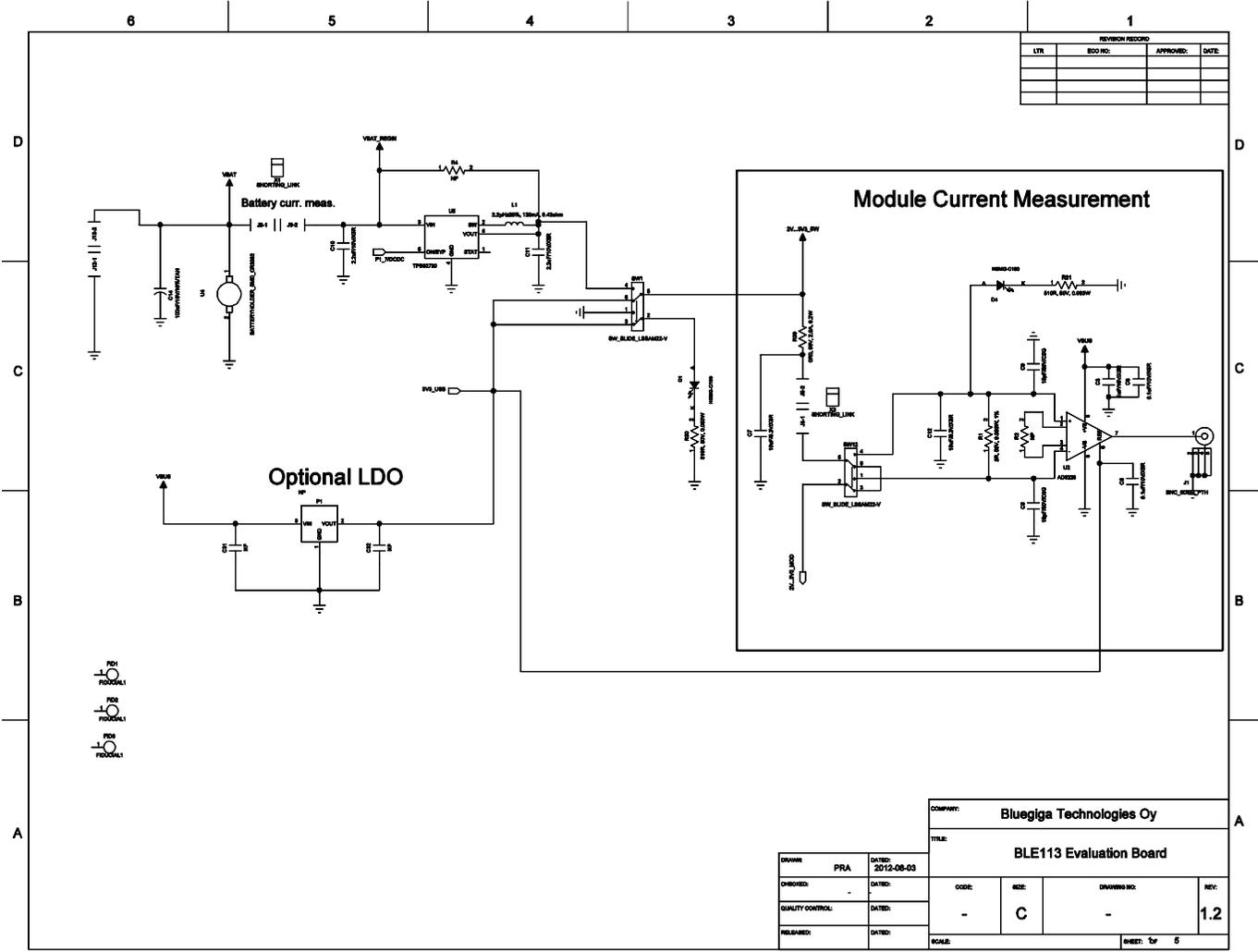

Figure 2: BLE113 Development Kit

1.1 Sensors, display and USB to UART converter

- USB to UART converter (U3)
    - o Manufacturer: Prolific
    - o Manufacturer part number: PL2303HX rev.D
    - o Datasheet: http://www.prolific.com.tw/US/ShowProduct.aspx?p_id=156&pcid=41
- Display
    - o Manufacturer: Newhaven Display Intl
    - o Manufacturer part number: NHD-C0216CZ-FSW-FBW-3V3
    - o Datasheet: http://www.newhavendisplay.com/specs/NHD-C0216CZ-FSW-FBW-3V3.pdf
- Altimeter (U11)
    - o Manufacturer: Freescale
    - o Manufacturer part number: MPL3115A2
    - o Datasheet: http://www.freescale.com/files/sensors/doc/data_sheet/MPL3115A2.pdf
- 3-axis accelerometer (U9)
    - o Manufacturer: Freescale
    - o Manufacturer part number: MMA8451QT
    - o Datasheet: http://www.freescale.com/files/sensors/doc/data_sheet/MMA8451Q.pdf

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2 Schematics

Module Current Measurement

Battery curr. meas.

Optional LDO

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Figure 4: BLE113 Evaluation Board Schematic (2/5)
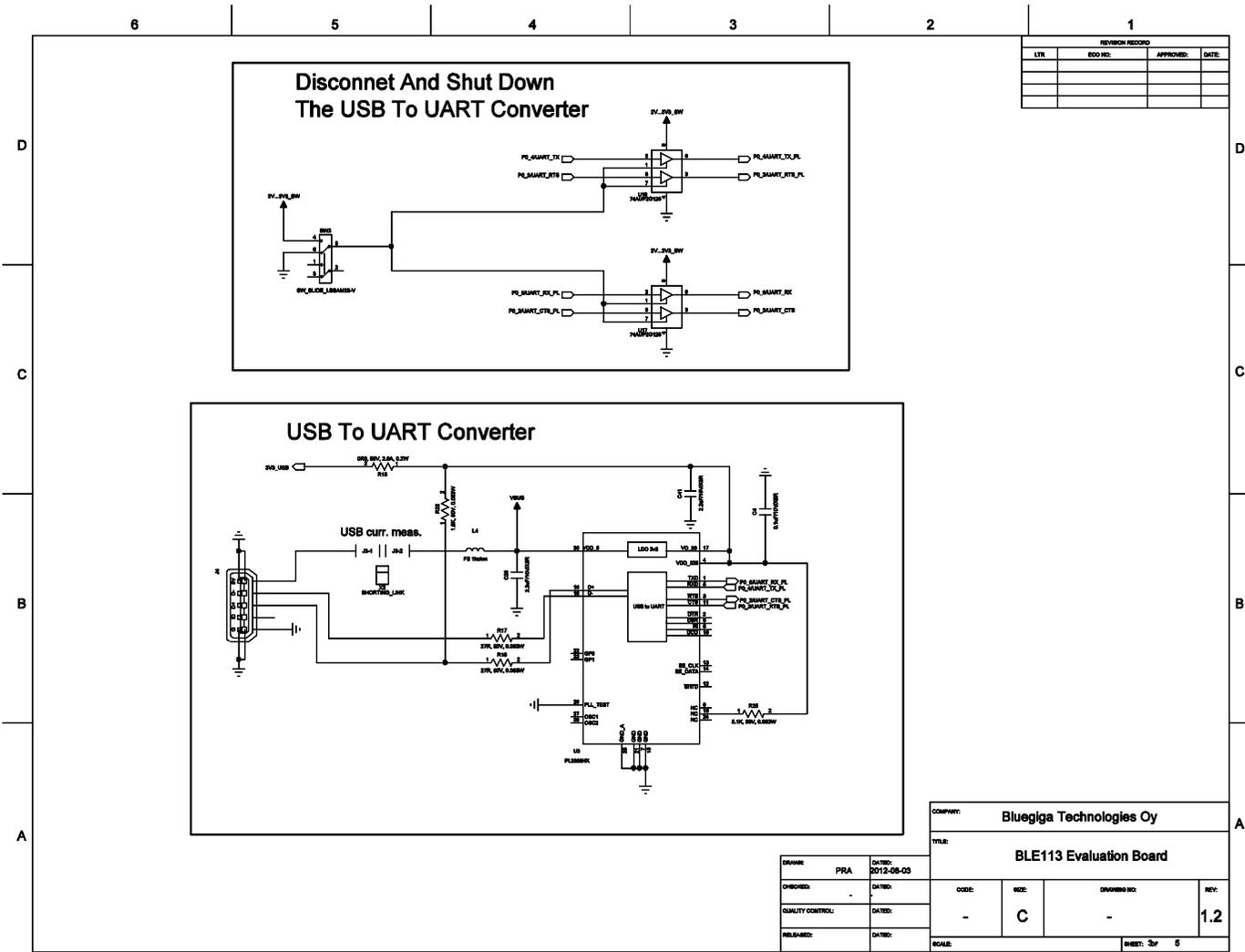
Figure 5: BLE113 Development Board Schematic (3/5)

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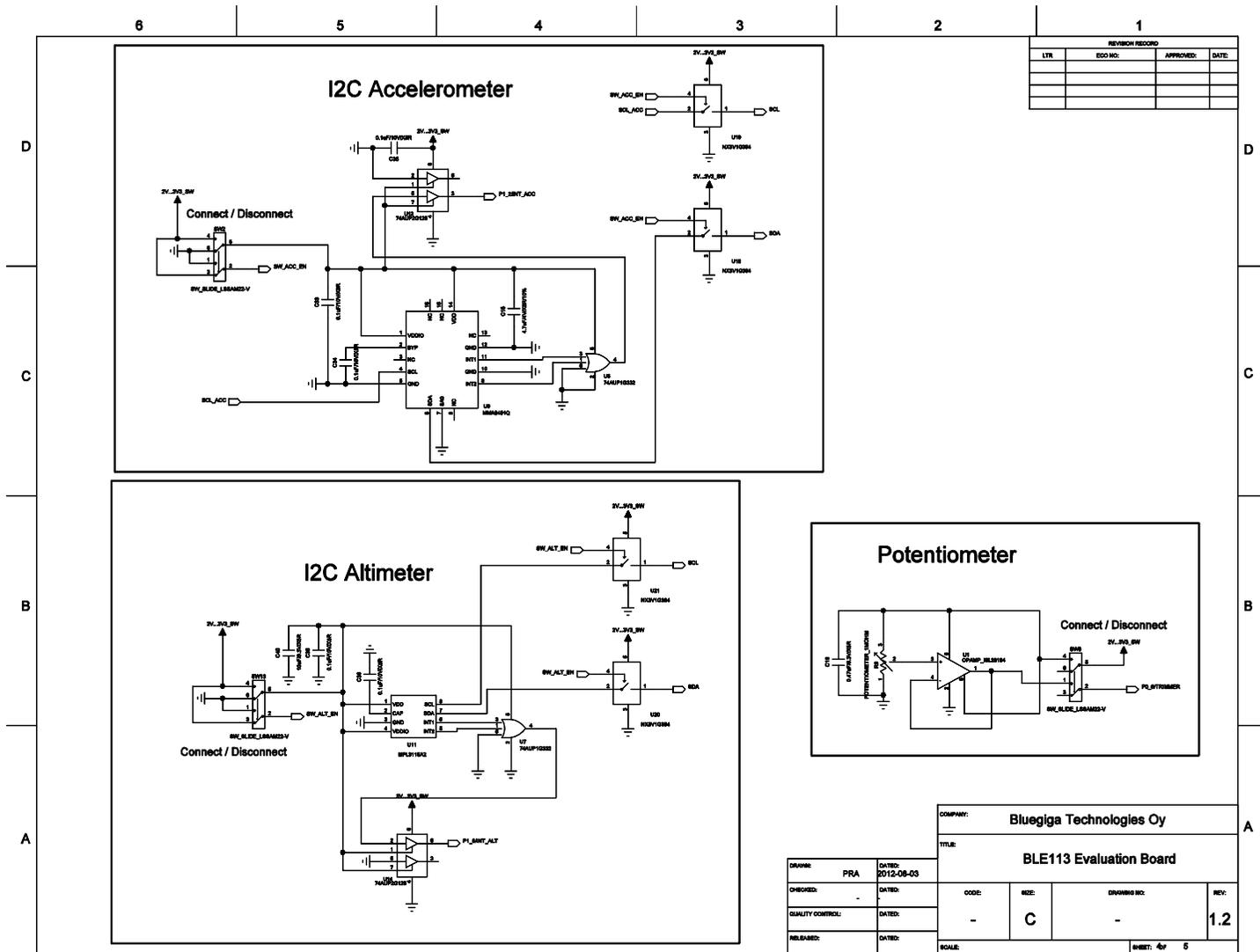
Figure 6: BLE113 Development Board Schematic (4/5)

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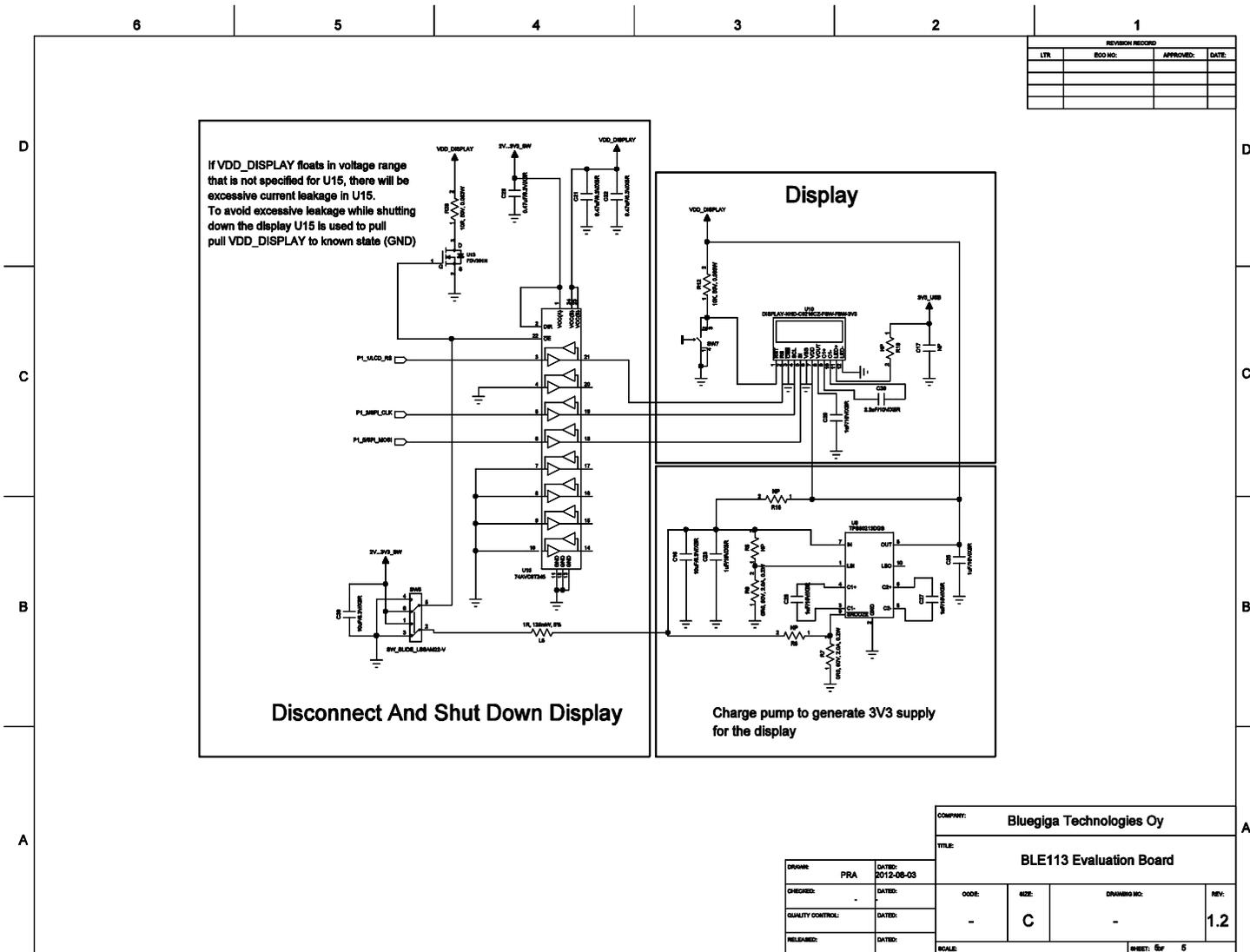
Figure 7: BLE113 Development Board Schematic (5/5)

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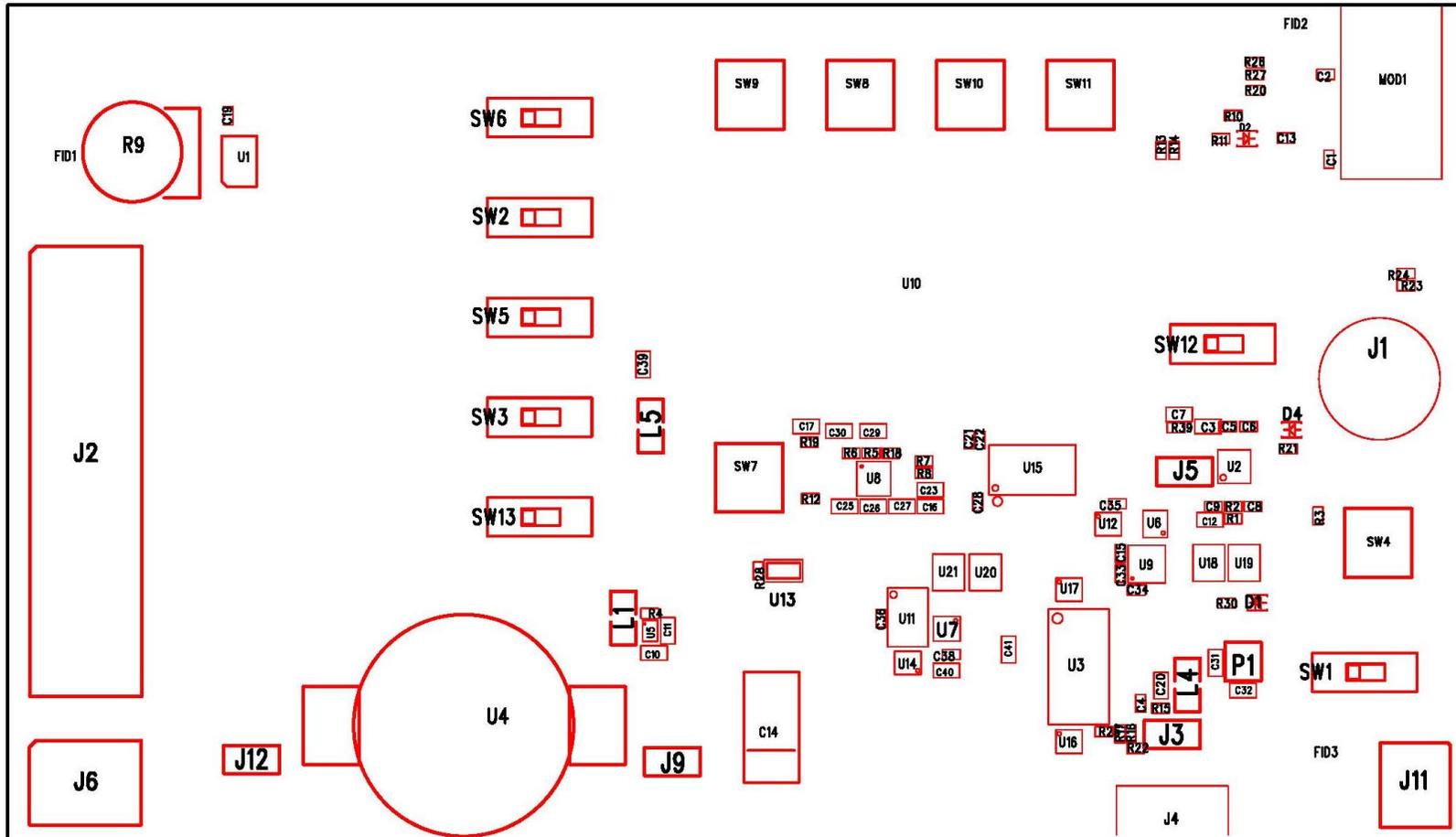
Figure 8: BLE113 Development Board Assembly Drawing

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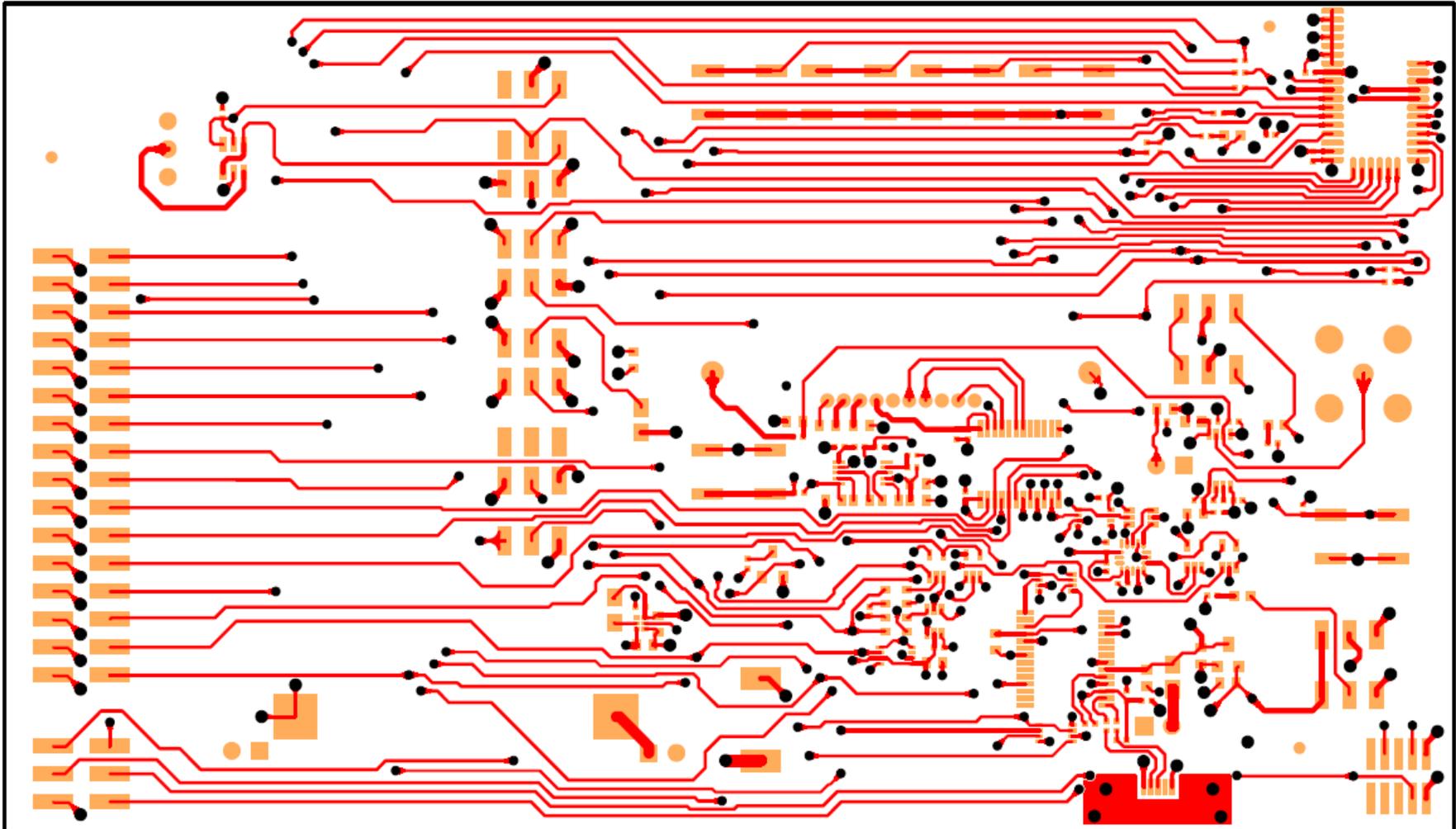
3 Layout

Figure 9: Top Layer Layout

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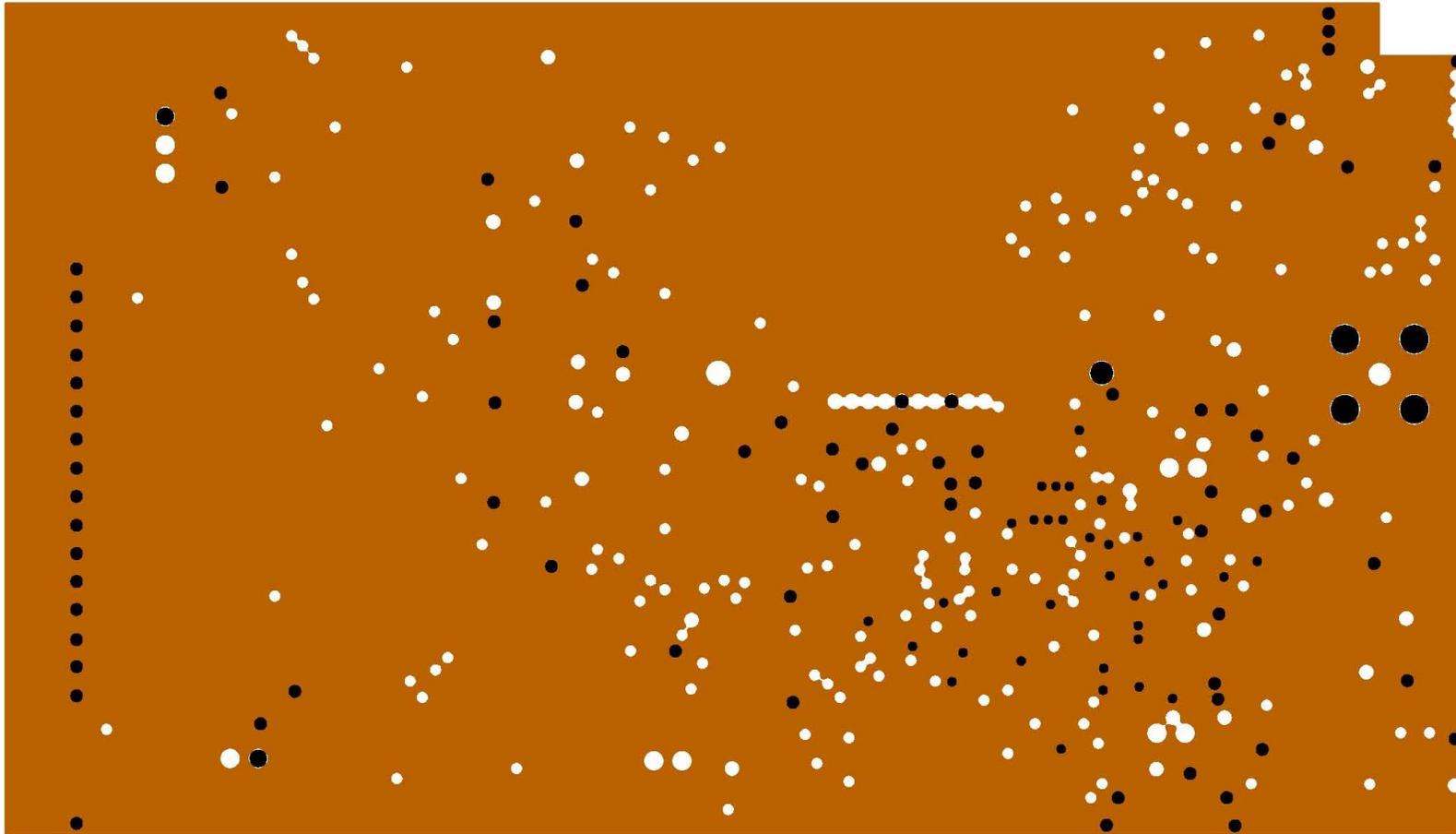
Figure 10: 2nd Layer Layout

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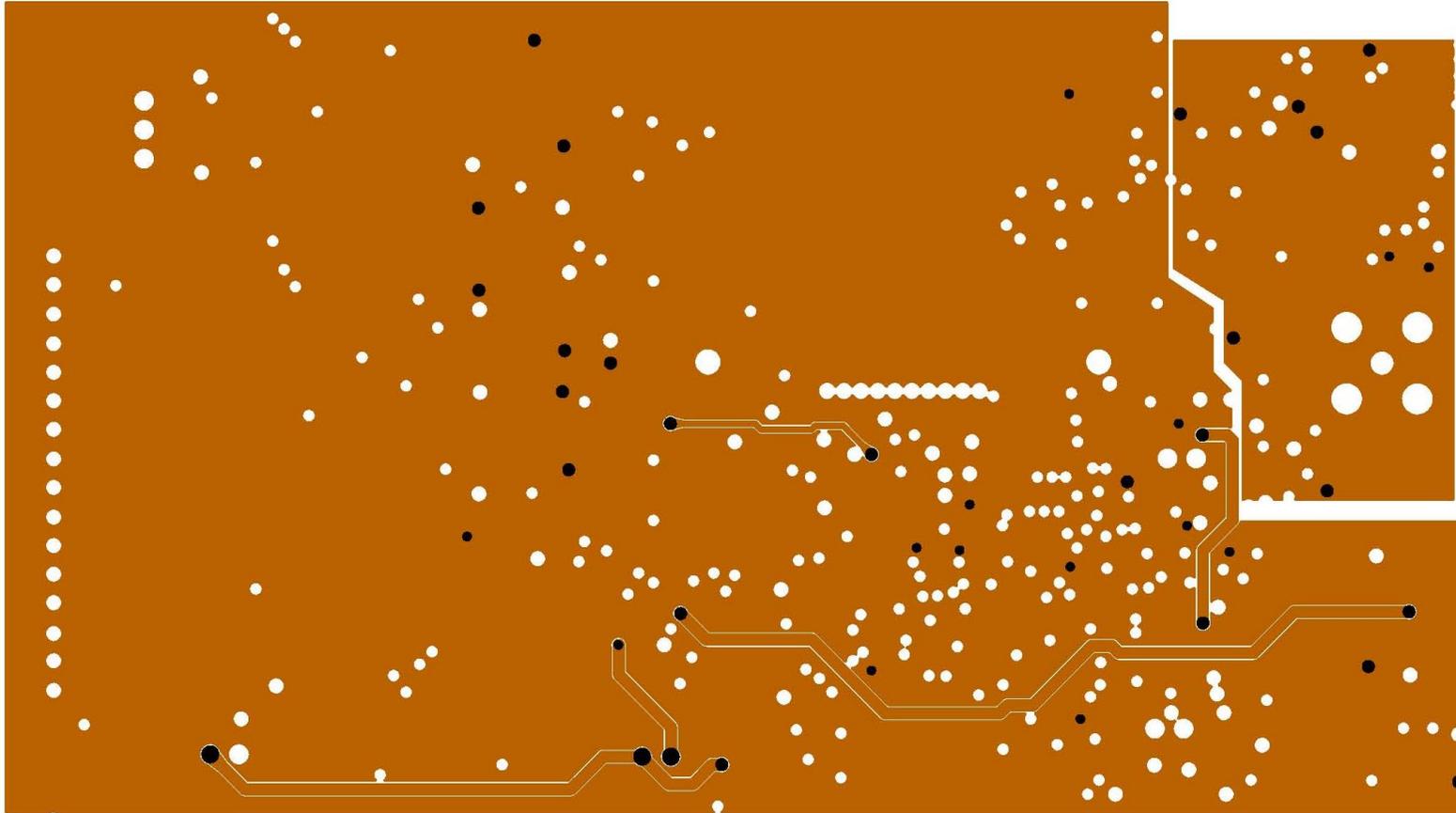
Figure 11: 3rd Layer Layout

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Figure 12: Bottom Layer Layout

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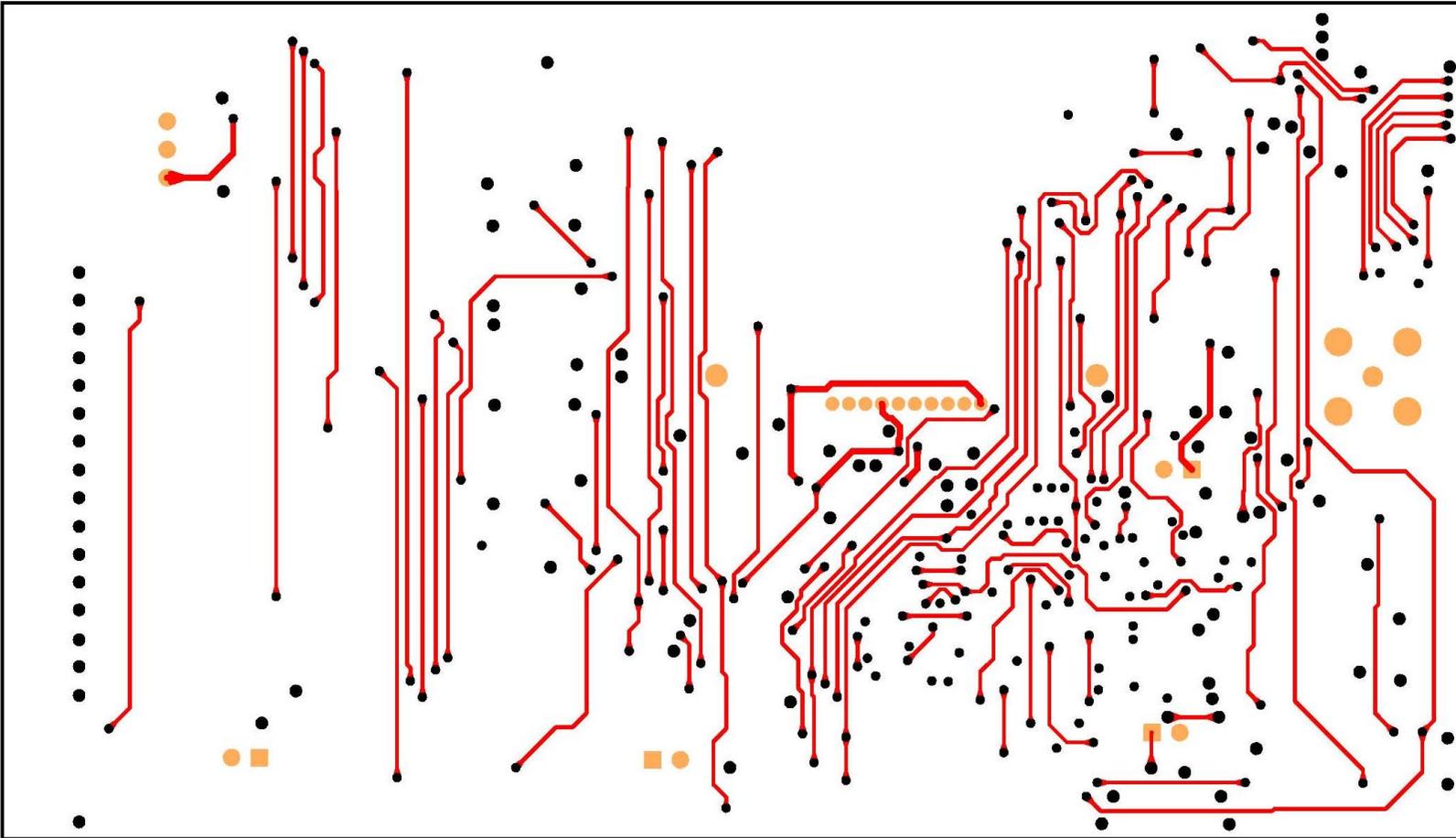
4 Interfaces

4.1 Powering the Development Board

The board can be powered either from USB or from a coin cell battery. Absolute maximum battery voltage is 3.6V. USB or battery can be chosen with SW1. When using battery, the current measurement should also be switched off to avoid excessive leakage current to the instrumentation amplifier U2. To minimize the leakage currents the display, accelerometer, altimeter and the potentiometer can be turned off and disconnected from the module by SW2, SW5, SW6 and SW13.

4.2 Indicator LED

There is a LED connected to the pin P1_0. The LED is powered directly from the battery so the brightness of it does not depend on if the DCDC is in use or not. However, if the module is not powered but the battery is in place, i.e. when USB not connected and the power switch is in USB position, there will be leakage through the LED and the LED is weakly lit. To prevent the LED draining the battery one should make sure either that the power switch is in BAT position and the module is in deep sleep, or that the battery is not connected when the power switch is in USB position.

4.3 UART

USB to UART converter creates a virtual COM port for accessing UART interface of the module. USB to UART converter is Prolific PL2303HX rev.D. Windows driver can be downloaded from Prolific web site:

(http://www.prolific.com.tw/US/ShowProduct.aspx?p_id=156&pcid=41).

Note: Because the board is using the regulator of the Prolific chip, it will be recognized by the USB as a virtual COM port even if the power switch is in BAT position. Switching the power switch to BAT position, or disconnecting the USB converter using SW3, does not turn off the USB top UART converter.

4.4 Accelerometer and Altimeter

The accelerometer and the altimeter share the same I2C bus.

4.5 Display

The display is connected to the SPI interface. Charge pump is generating 3.3V supply for the display.

4.6 Programming Interface

Module programming interface is available in J11. CC Debugger delivered with the kit can be used for SW updates and debugging of the module.

4.7 Pin Header and Buttons

All the PIOs are available and permanently connected in the pin header J2. In order to use certain PIOs through the pin header, that particular PIO must be disconnected from the device to which it is connected so that it is not actively driven by two devices. Following table shows the PIO connections in the evaluation board.

PIO number	Connection in the evaluation board
P0_0	Button 1
P0_1	Button 2
P0_2	UART CTS
P0_3	UART RTS
P0_4	UART TX
P0_5	UART RX
P0_6	Potentiometer
P0_7	Button 3
P1_0	LED
P1_1	Display RS
P1_2	Accelerometer interrupt
P1_3	SPI clock for the display
P1_4	-
P1_5	SPI MOSI for the display
P1_6	Button 3
P1_7	DCDC on/bypass control
P2_0	Button 4
P2_1	-
P2_2	-

Table 1: PIO connections in the development board

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5 Measuring Current Consumption

The DC current consumption of the whole board can be measured from the headers J3 and J9. The DC current consumption of the module alone can be measured from the header J5. The peak current consumption of the module can only be measured when powering the module from USB. When powering from a battery, the current measurement amplifier should be disconnected with SW12. The peak current consumption of BLE113 is measured over 3 ohm resistor using an instrumentation amplifier with a gain of 10. The instrumentation amplifier is powered from USB 5V line and the DC bias is from the 3V3 LDO. Because the amplifier is powered from the USB VBUS, it can't be used unless USB is connected. If USB is not connected then the instrumentation amplifier must be disconnected by SW12 to avoid excessive leakage current into the input of the amplifier.
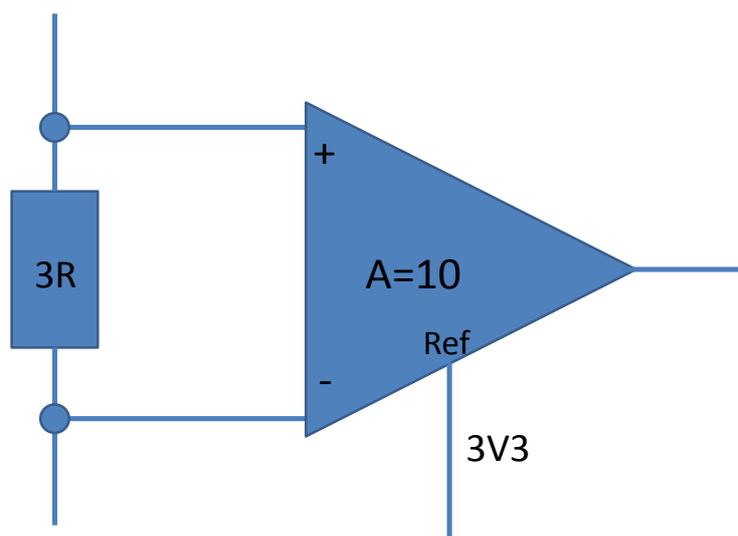
Figure 13: TX current measurement amplifier

To measure the TX current consumption of the module, connect a coaxial cable to the BNC connector in the board and to an oscilloscope. Set the oscilloscope

- Coupling: DC

- Vertical scale 500 mV/DIV

- Horizontal scale: 200 µs/DIV

- Level: 2.5 V

- Offset: -2.0 V

- Trigger: Normal, falling edge

The instrumentation amplifier inverts the signal. The current consumption is calculated by

$$I = \frac{3.3V - Vo}{30\Omega}$$

The DC current consumption of the whole board can be measured by connecting a current meter to header J8 if powering from USB or J9 if powering from a battery.

6 WEEE Compliance

The crossed-out wheeled bin means that within the European Union the product must be taken to separate collection at the product end-of-life. Do not dispose of these products as unsorted municipal waste.

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