PiRa-Smart

Power in Responsive Applications with BLE and RTC sleep mode.
Designed as a Raspberry Pi Zero HAT.

CONTENTS:

Version Revision:

v0.1   - 23.03.2018.

v0.2   - 11.05.2018.

POWER DIAGRAM

```
IN: 5 VDC →  Micro USB ┐
                       ├→ LiPo CHARGER → LiPo BATTERY → BUCK BOOST OUT: 5 VDC → 5VDC
IN: 6 VDC →  Solar panel ┘                            → BUCK OUT: 3.3VDC → 3.3VDC
```
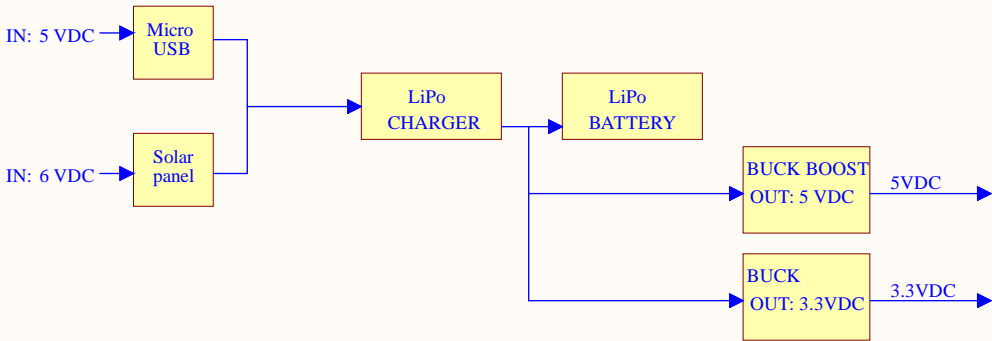
DESIGN CONSIDERATIONS

DESIGN NOTE:
Example text for informational design notes.

DESIGN NOTE:
Example text for critical design notes.

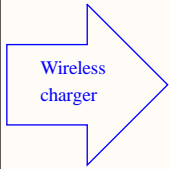**LAYOUT NOTE:**
Example text for critical layout guidelines.

IRNAS	irnas.eu
Title: pira-smart-PCB.PrjPcb	
Page Contents: PAGE1-CONTENTS.SchDoc	

Size:
DWG NO
Revision: v0.2

Date: ✱
Sheet 1 of 2

POWER, RTC, RPI

CHARGER INPUTS

Wireless charger

Solar panel

CON1 microUSB

11
9
7
5 VBUS
4 GND
3
2
10
8
6

GND

P3
2
1
Header 2

D3
D4
SE30AFG-M3/6A
SE30AFG-M3/6A

D5
BZT52C6V2

R12 10R

R10 10k

D6 3V

GND

R5 3k9

R1 470R
D2

R2 NP 0R
SCL
SDA

GND

T1 MMBT3904

R7 220R

R15 10k

R14 470R

GND

CHARGER

C1 10uF /16V

C3 47n

C2 4u7/16V

L1 1.5uH

C4 10uF /16V

C5 10uF /16V

GND

U1 BQ24296RGET

24 23 22 21 20 19
VBUS PMID REGN BTST SW SW

1 VBUS
2 PSEL
3 PG
4 STAT
5 SCL
6 SDA

PGND 18
PGND 17
SYS 16
SYS 15
BAT 14
BAT 13

7 8 9 10 11 12
INT OTG CE ILIM TS QON

PAD 25

R3 5k6

R6 10k

GND

R11 0R

R13 33k

GND

VBAT

C6 10uF /16V
C7 22u
C8 22u

GND

BATTERY CONNECTOR

VBAT
F1 3A

D1 RS1J-E3/61T..

P1
1
2
Header 2

GND

GND

BOOST CONVERTER

L2 1.5uH

GND

ENABLE_5V

U2 TPS630701RNMT

11 10 9
L2 PGND L2

12 VIN
13 VIN
14 EN
15 VSEL

VOUT 6
VOUT 7
FB2 5
FB

1 2 3 4
PS/S PG VAUX GND

R4 0R

C9 22u
C10 22u
C11 10uF /16V

+5V

GND

R9 10k
C12 100nF

R8 NP 50k

GND

MOSFET OUT

GPIO_FET

R19 100R

R20 100k
GND

VBAT

T2 Q1
Q2
DMG6602SVT

R17 100k
R18 100R

GND

FET_OUT

U3 TPS62740DSSR

1 VIN
12 EN
8 VSEL4
9 VSEL3
10 VSEL2
11 VSEL1
3 GND

SW 2
VOUT 5
PG 4
CTRL
LOAD 13
PAD

L3 2.2µH
R16 100k

VCC

C13 10uF /16V

C14 10uF /16V

PWR_PG

GND

BLE

P7
1
2
Header 2
SWCLK
RESET/SWDIO

M1 MDBT40

1 GND
2 GND

GND

VCC

3 AVDD
4 P0.21
5 P0.22
6 P0.23
7 P0.24
8 P0.25
9 P0.26/XL2
10 P0.27/XL1
11 P0.28
12 P0.29

GND
DEC2 44
P0.20 40
P0.19 39
P0.18 38
P0.17 37
SWCLK 36
nRESET/SWDIO 35
P0.16 34
P0.15 33
P0.14 32
P0.13 31
P0.12 30
P0.11 29
P0.10 28
P0.09 27
P0.08 26

GND 42

GPIO_BCM20
TXD
RXD
GPIO_BCM4
SWCLK
RESET/SWDIO
GPIO_BCM26
SPI_CSS
LORA_DIO2_BCM7
LORA_DIO1_BCM1
LORA_DIO0_BCM12
GPIO_BCM27
GPIO_BCM18
LORA_RST
MOSI

GPIO_BCM19
GPIO_BCM16
GPIO_BCM23
GPIO_BCM22
ENABLE_5V

GPIO_BCM6
GPIO_BCM5

R28 470R
R29 470R

D7
D8

GND

VCC

VBAT
R32 249k

R33 100k
C15 33nF

GND

R34 0R
PWR_PG

X1 32.768KHZ

CON4
BATTERY

U5 ISL1208IU8Z-T7A

1 X1
2 X2
3 VBAT
4 GND

VDD 8
IRQ/FOUT 7
SCL 6
SDA 5

VCC
SCL
SDA

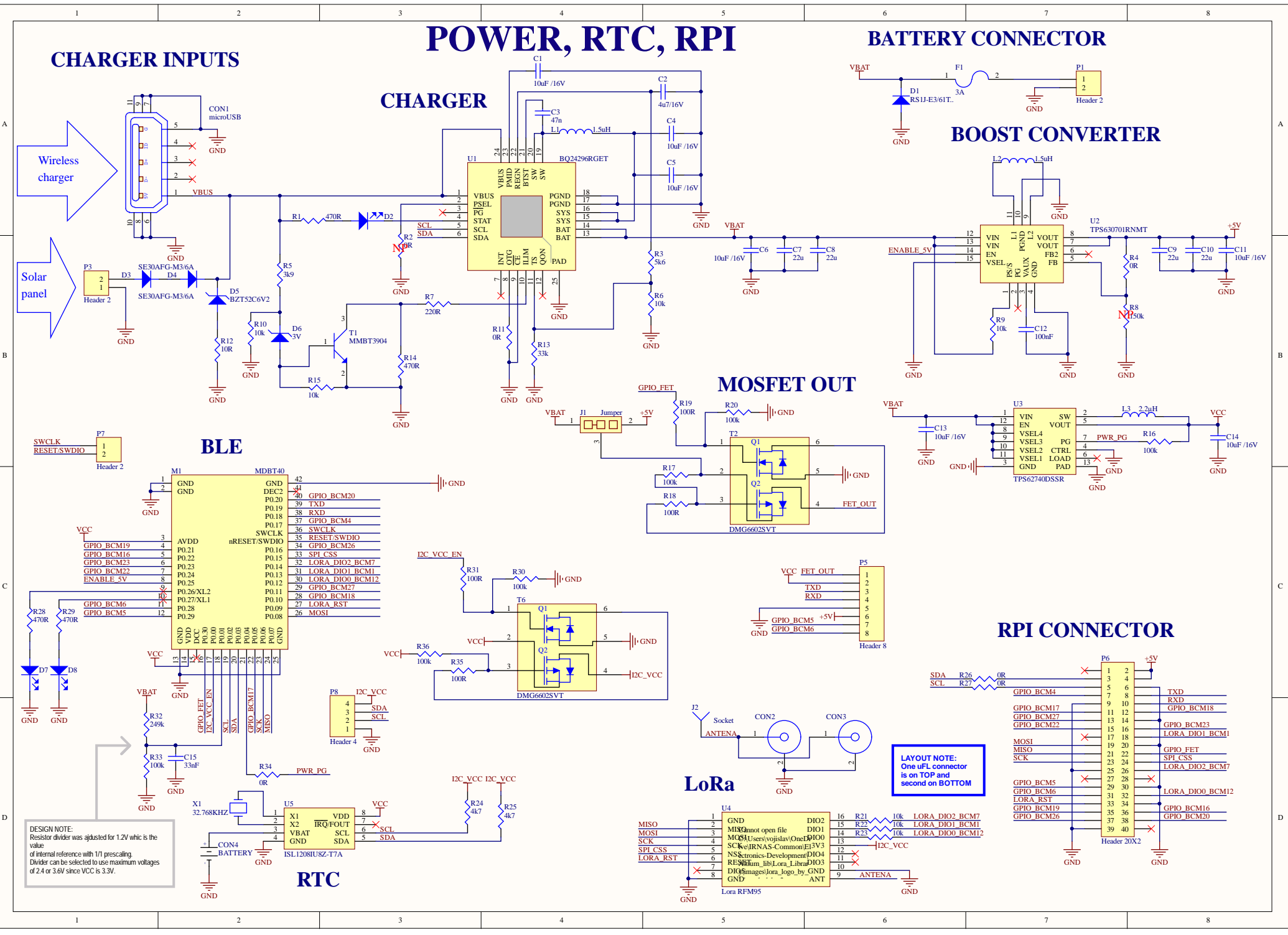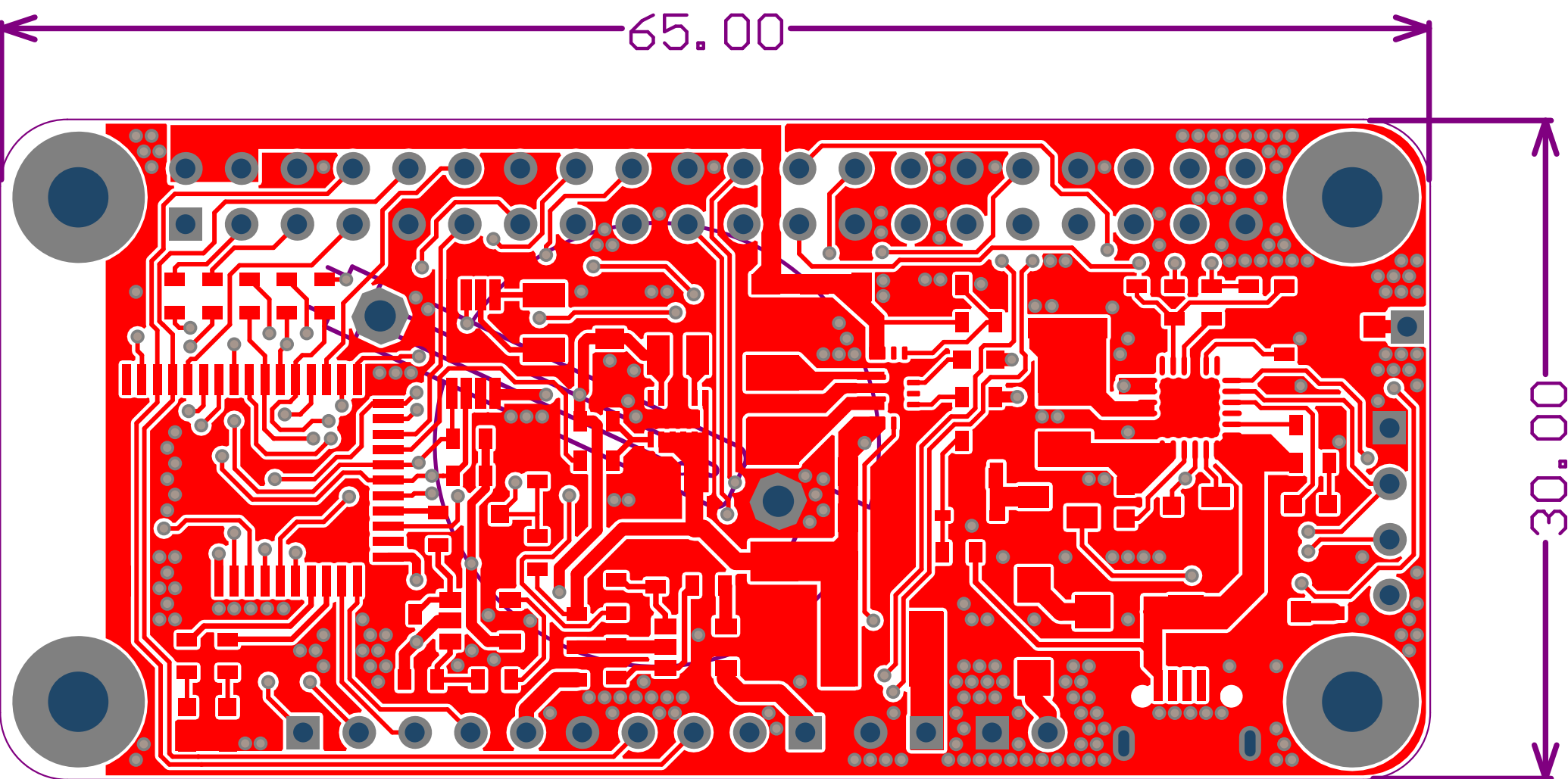## RTC

DESIGN NOTE:
Resistor divider was ajdusted for 1.2V whic is the value
of internal reference with 1/1 prescaling.
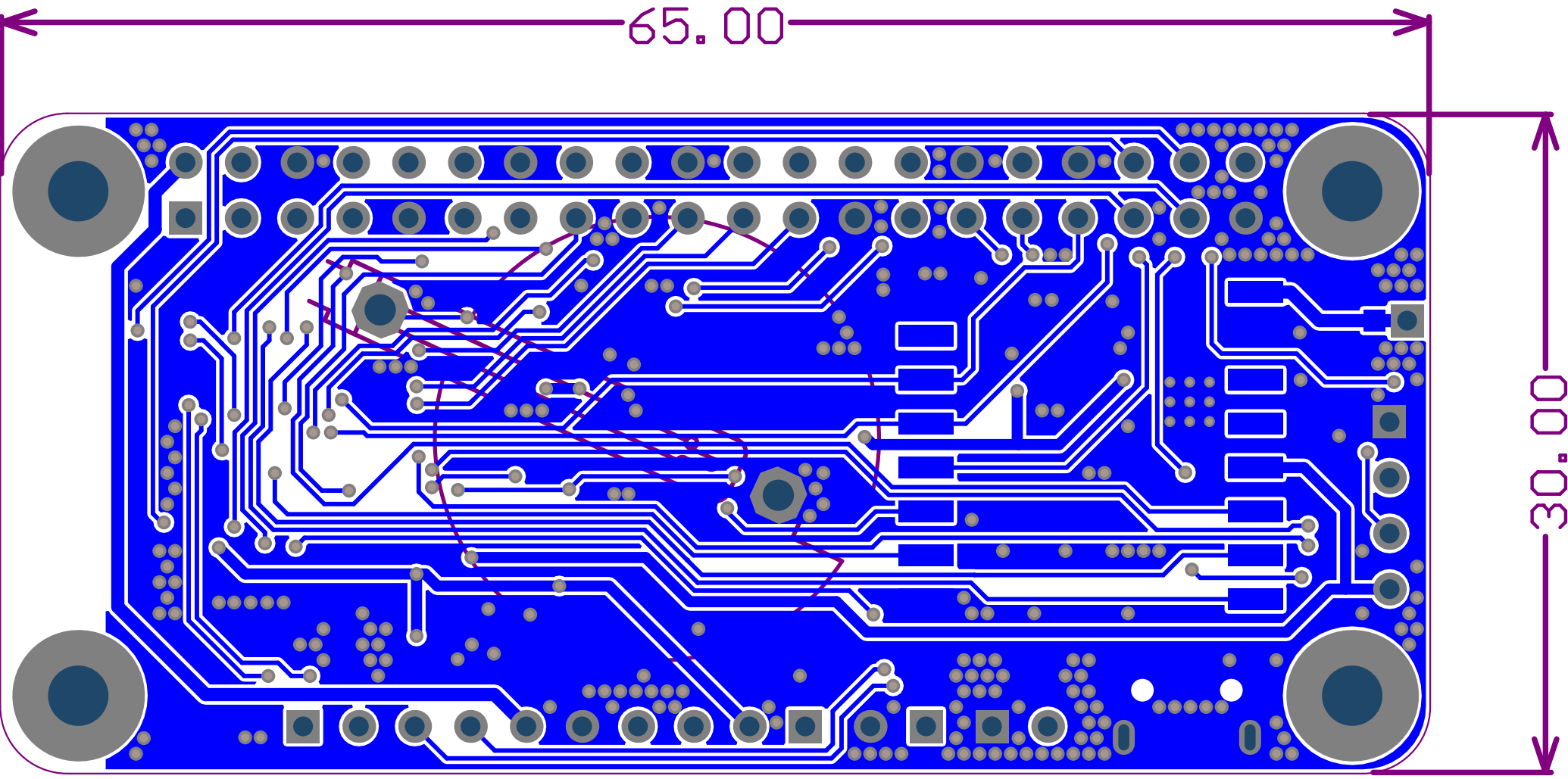Divider can be selected to use maximum voltages
of 2.4 or 3.6V since VCC is 3.3V.

MOSFET / I2C

VBAT J1 Jumper +5V

1
2
3

I2C_VCC_EN

R31 100R

R30 100k
GND

T6 Q1
Q2
DMG6602SVT

VCC
R36 100k
R35 100R

I2C_VCC

GND

P8
4
3
2
1
Header 4

I2C_VCC
SDA
SCL

GND

LoRa

J2 Socket
ANTENA

CON2
CON3

GND

LAYOUT NOTE:
One uFL connector
is on TOP and
second on BOTTOM

U4 Lora RFM95

1 GND
2 MISO
3 MOSI
4 SCK
5 NSS
6 LORA_RST
7 DIO5
8 GND

DIO2 16
DIO1 15
DIO0 14
3V3 13
DIO4 12
DIO3 11
ANTENA 9

R21 10k LORA_DIO2_BCM7
R22 10k LORA_DIO1_BCM1
R23 10k LORA_DIO0_BCM12

I2C_VCC

GND

MISO
MOSI
SCK
SPI_CSS
LORA_RST

R24 4k7
R25 4k7

I2C_VCC

MOSFET OUT P5

VCC FET_OUT

P5
1
2
3
4
5
6
7
8
Header 8

TXD
RXD

GND
GPIO_BCM5
GPIO_BCM6

+5V

RPI CONNECTOR

P6 Header 20X2

SDA R26 0R
SCL R27 0R

GPIO_BCM4

GPIO_BCM17
GPIO_BCM27
GPIO_BCM22

MOSI
MISO
SCK

GPIO_BCM5
GPIO_BCM6
LORA_RST
GPIO_BCM19
GPIO_BCM26

1 2 +5V
3 4
5 6
7 8 TXD
9 10 RXD
11 12 GPIO_BCM18
13 14
15 16 GPIO_BCM23
17 18 LORA_DIO1_BCM1
19 20
21 22 GPIO_FET
23 24 SPI_CSS
25 26 LORA_DIO2_BCM7
27 28
29 30
31 32 LORA_DIO0_BCM12
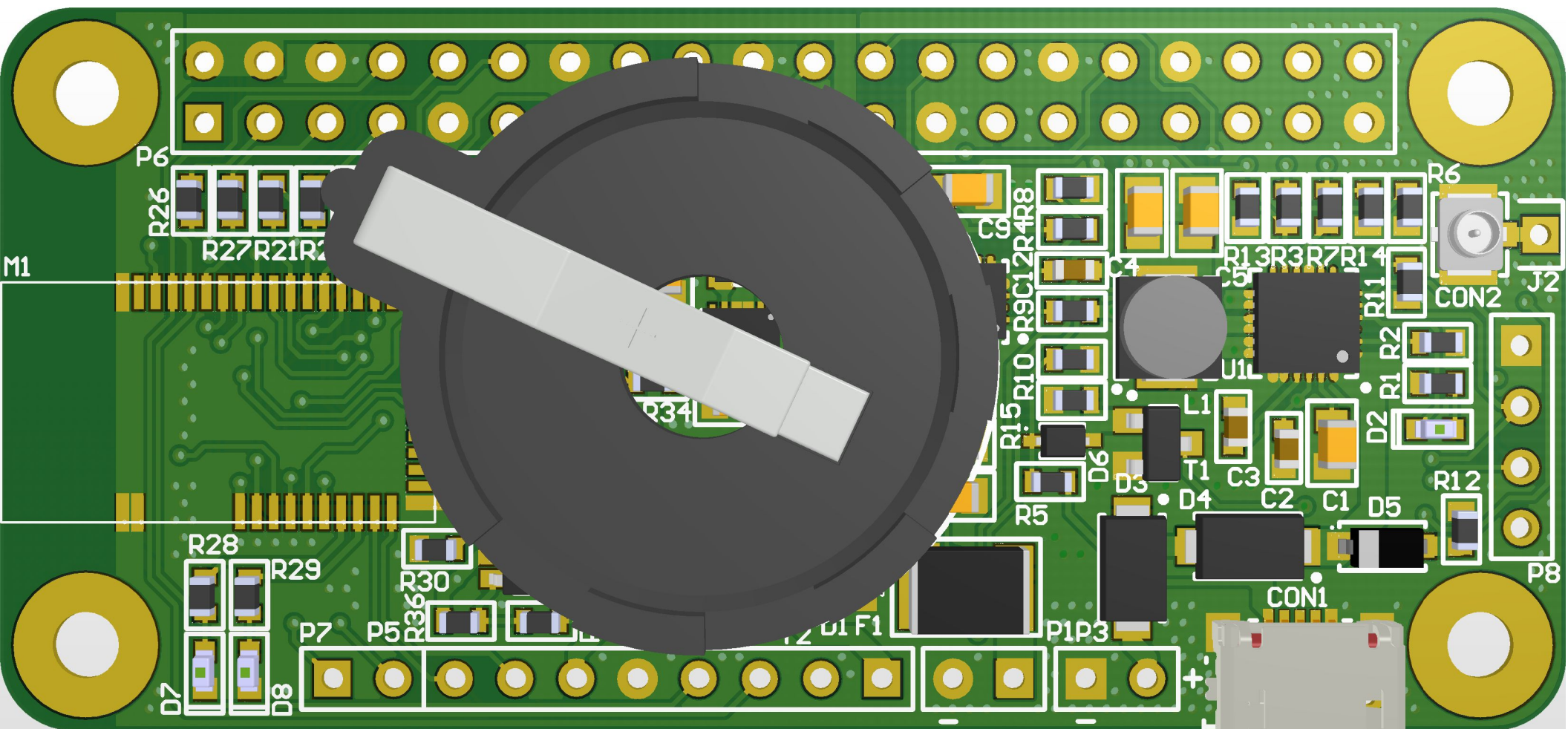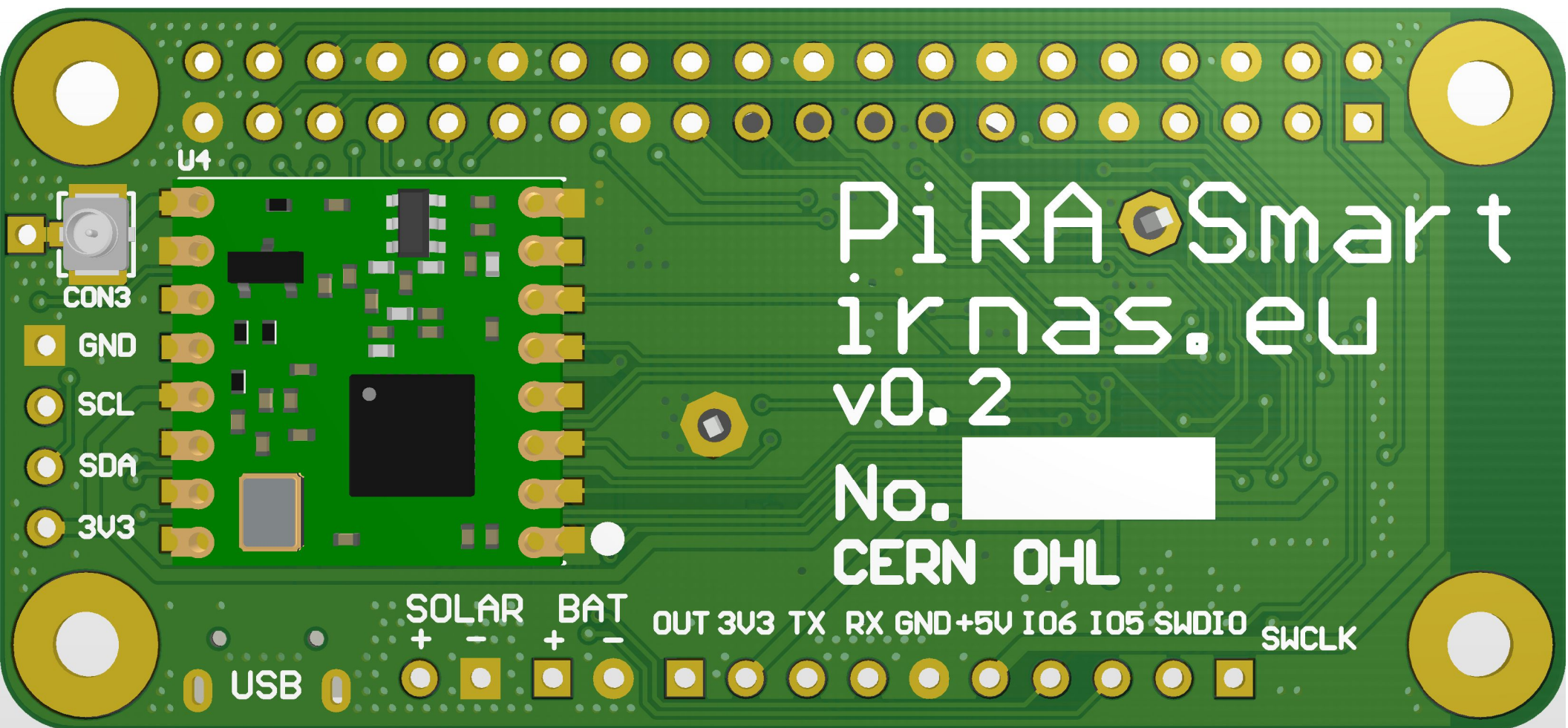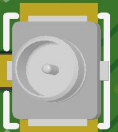33 34
35 36 GPIO_BCM16
37 38 GPIO_BCM20
39 40

GND

65.00

30.00

U4

CON3

GND

SCL

SDA

3V3

PiRA Smart
irnas. eu
v0.2
No.
CERN OHL

SOLAR BAT
+ -   + -

OUT 3V3 TX RX GND+5V IO6 IO5 SWDIO

SWCLK

USB