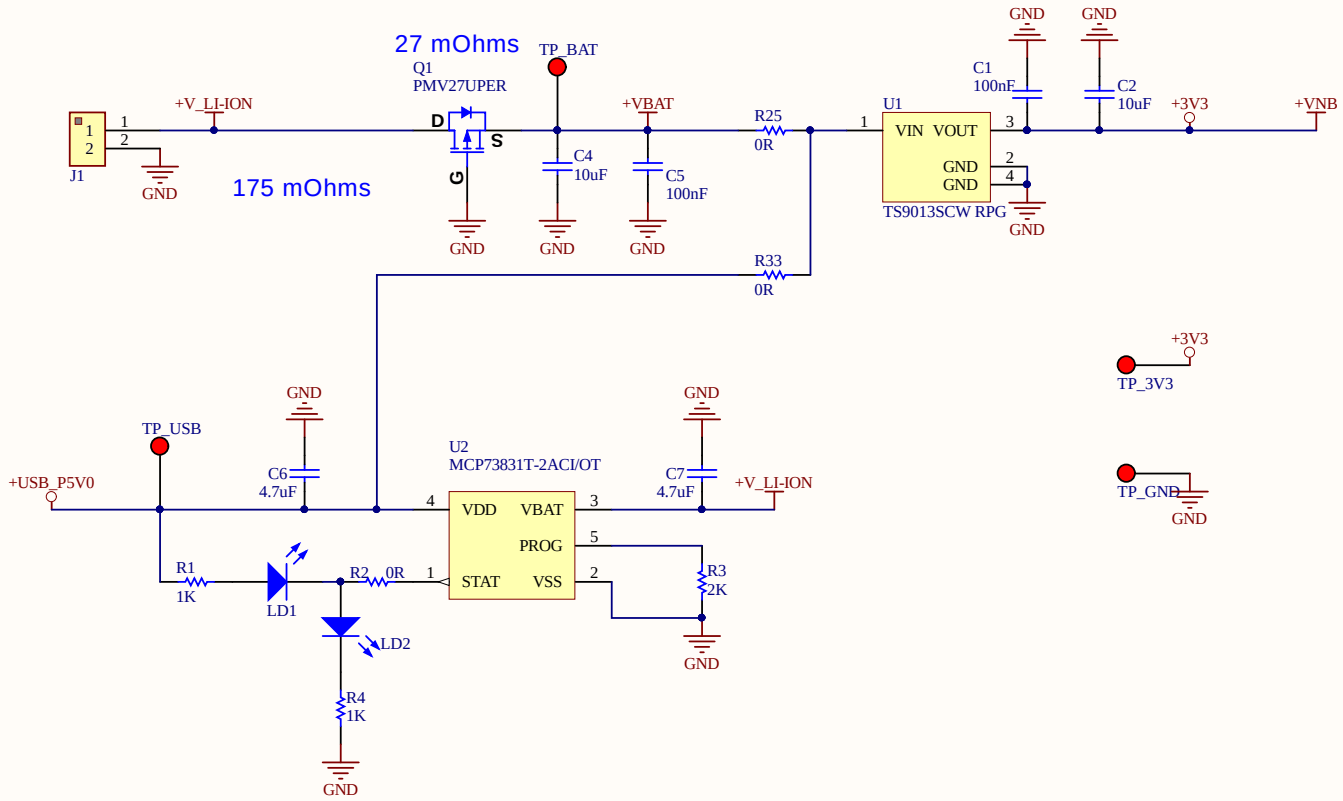
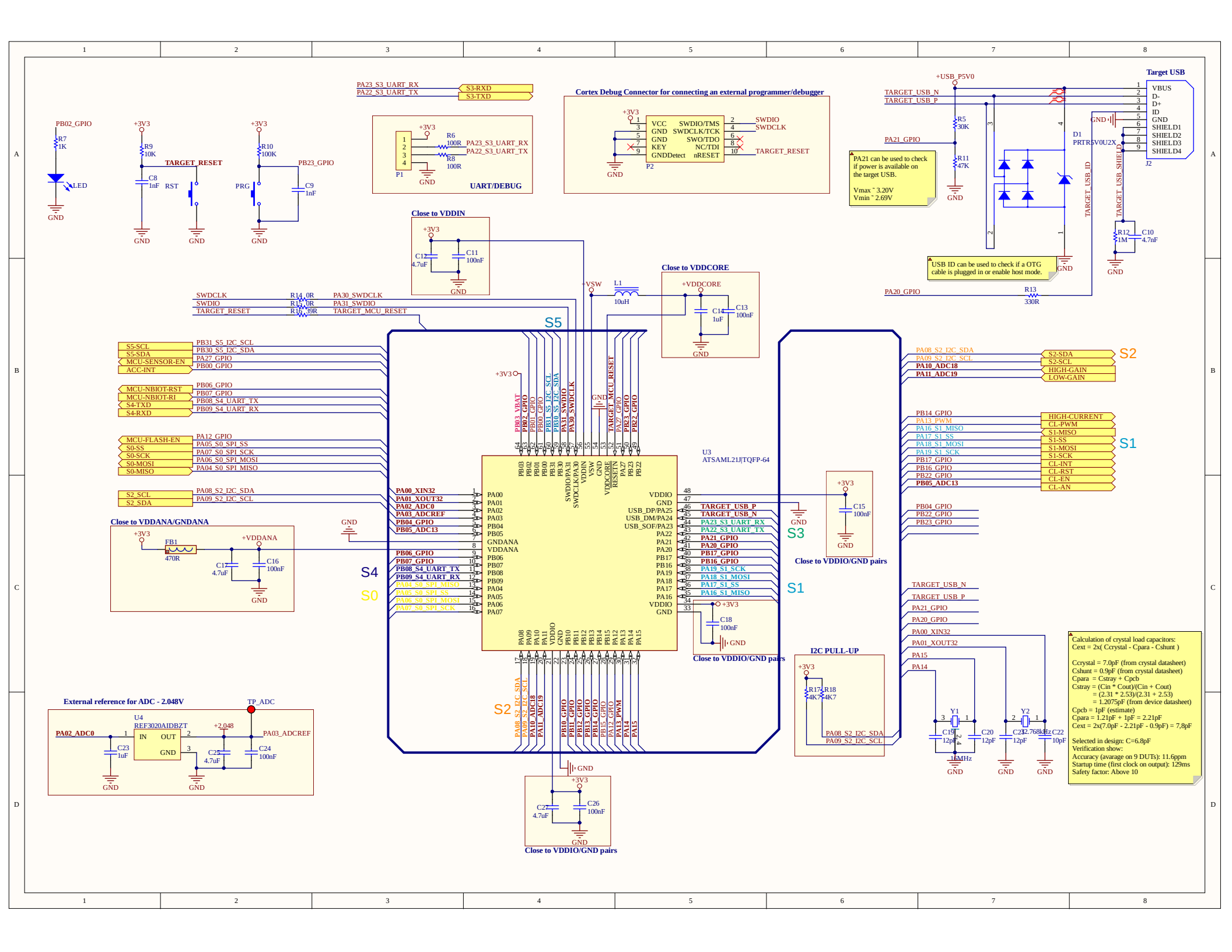
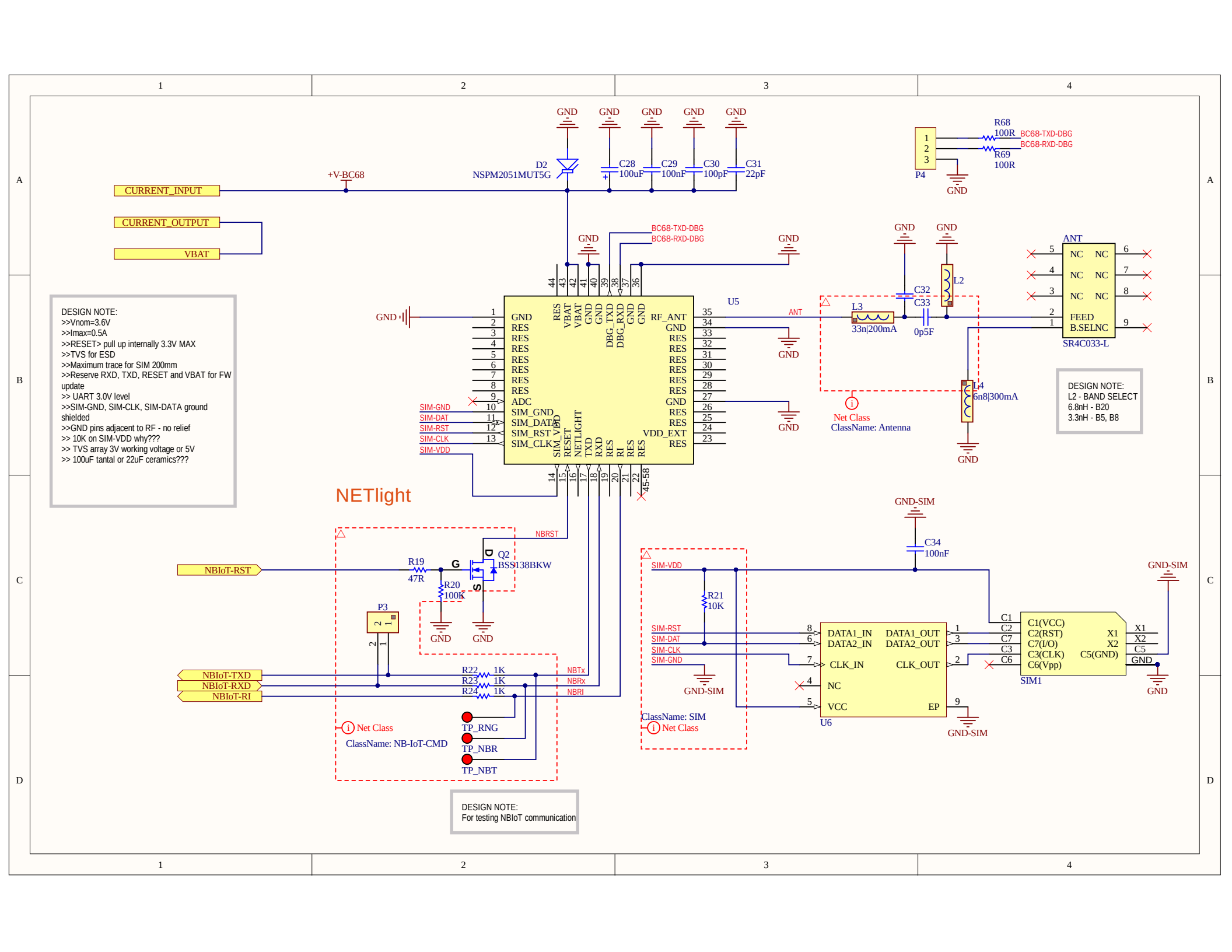
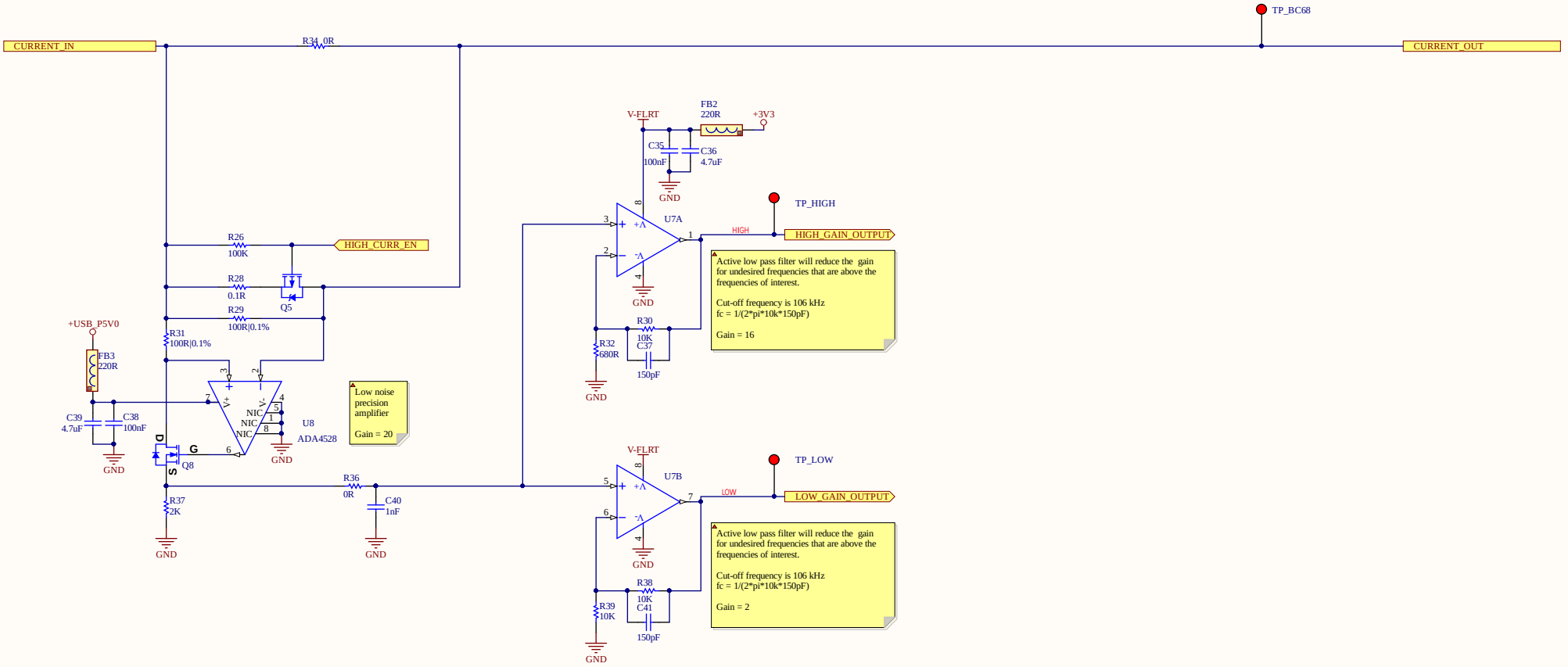
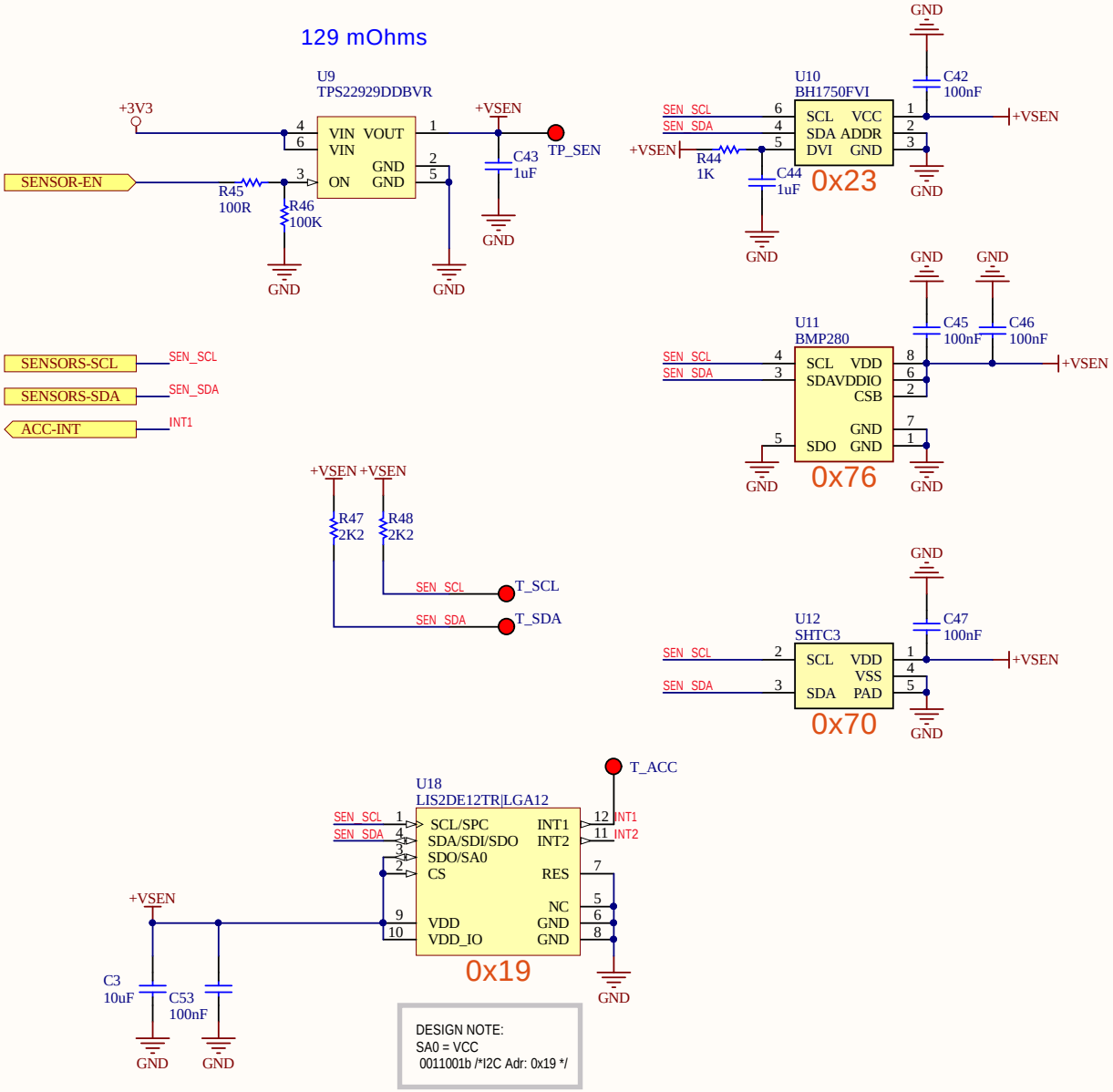
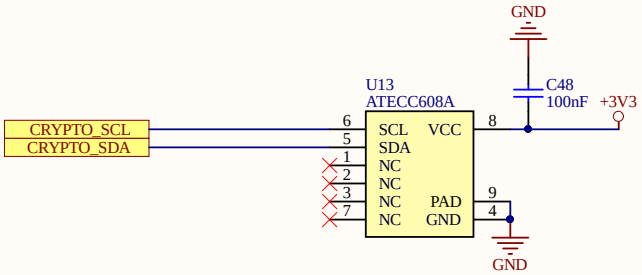

27 mOhms
175 mOhms
Q1
PMV27UPER
TP_BAT
+V_LI-ION
+VBAT
R25
0R
R33
0R
J1
C4
10uF
C5
100nF
U1
VIN VOUT
GND
GND
TS9013SCW RPG
C1
100nF
C2
10uF
+3V3
+VNB
TP_3V3
TP_GND
TP_USB
+USB_P5V0
C6
4.7uF
C7
4.7uF
U2
MCP73831T-2ACI/OT
VDD
VBAT
PROG
STAT
VSS
R1
1K
R2
0R
R3
2K
R4
1K
LD1
LD2
GND

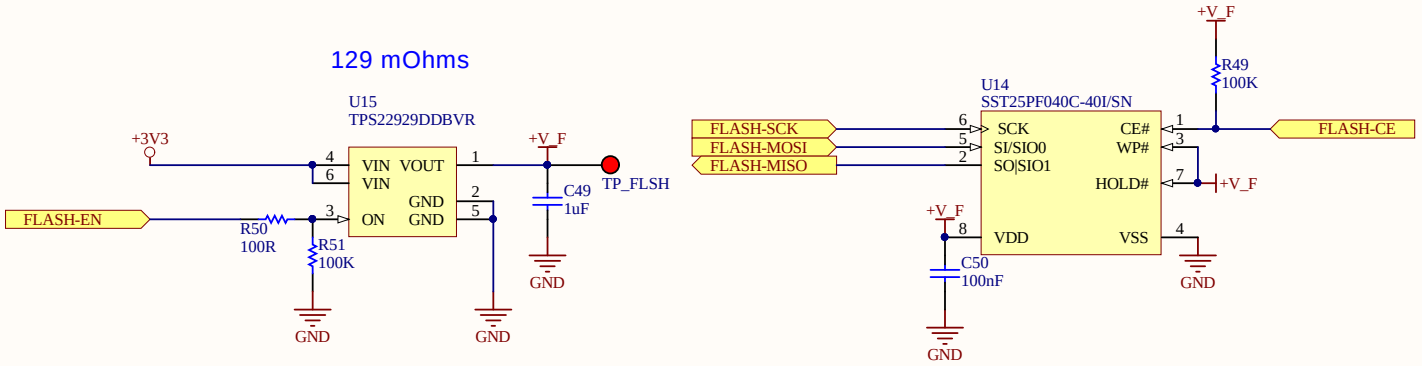

PB02_GPIO
R7 1K
LED
GND
+3V3
R9 10K
C8 1nF
RST
TARGET_RESET
GND
GND
+3V3
R10 100K
PRG
PB23_GPIO
C9 1nF
GND
PA23_S3_UART_RX
PA22_S3_UART_TX
S3-RXD
S3-TXD
+3V3
R6 100R
R8 100R
PA23_S3_UART_RX
PA22_S3_UART_TX
P1
GND
UART/DEBUG
Cortex Debug Connector for connecting an external programmer/debugger
+3V3
VCC
GND
GND
KEY
GNDDetect
SWDIO/TMS
SWDCLK/TCK
SWO/TDO
NC/TDI
nRESET
SWDIO
SWDCLK
TARGET_RESET
P2
GND
+USB_P5V0
TARGET_USB_N
TARGET_USB_P
R5 30K
PA21_GPIO
R11 47K
GND
PA21 can be used to check if power is available on the target USB.
Vmax ~ 3.20V
Vmin ~ 2.69V
D1
PRTR5V0U2X
Target USB
VBUS
D-
D+
ID
GND
SHIELD1
SHIELD2
SHIELD3
SHIELD4
J2
GND
TARGET_USB_SHIELD
TARGET_USB_ID
R12 1M
C10 4.7nF
GND
USB ID can be used to check if a OTG cable is plugged in or enable host mode.
GND
PA20_GPIO
R13 330R
Close to VDDIN
+3V3
C12 4.7uF
C11 100nF
GND
Close to VDDCORE
+VDDCORE
C14 1uF
C13 100nF
GND
+VSW
L1 10uH
SWDCLK
SWDIO
TARGET_RESET
R14 0R
R15 0R
R16 39R
PA30_SWDCLK
PA31_SWDIO
TARGET_MCU_RESET
S5
S5-SCL
S5-SDA
MCU-SENSOR-EN
ACC-INT
PB31_S5_I2C_SCL
PB30_S5_I2C_SDA
PA27_GPIO
PB00_GPIO
MCU-NBIOT-RST
MCU-NBIOT-RI
S4-TXD
S4-RXD
PB06_GPIO
PB07_GPIO
PB08_S4_UART_TX
PB09_S4_UART_RX
MCU-FLASH-EN
S0-SS
S0-SCK
S0-MOSI
S0-MISO
PA12_GPIO
PA05_S0_SPI_SS
PA07_S0_SPI_SCK
PA06_S0_SPI_MOSI
PA04_S0_SPI_MISO
S2_SCL
S2_SDA
PA08_S2_I2C_SDA
PA09_S2_I2C_SCL
U3
ATSAML21J|TQFP-64
PB03_VBAT
PB02_GPIO
PB01_GPIO
PB00_GPIO
PB31_S5_I2C_SCL
PB30_S5_I2C_SDA
PA31_SWDIO
PA30_SWDCLK
TARGET_MCU_RESET
PA27_GPIO
PB23_GPIO
PB22_GPIO
PA00_XIN32
PA01_XOUT32
PA02_ADC0
PA03_ADCREF
PB04_GPIO
PB05_ADC13
PB06_GPIO
PB07_GPIO
PB08_S4_UART_TX
PB09_S4_UART_RX
PA04_S0_SPI_MISO
PA05_S0_SPI_SS
PA06_S0_SPI_MOSI
PA07_S0_SPI_SCK
PA08_S2_I2C_SDA
PA09_S2_I2C_SCL
PA10_ADC18
PA11_ADC19
PB10_GPIO
PB11_GPIO
PB12_GPIO
PB13_GPIO
PB14_GPIO
PB15_GPIO
PA12_GPIO
PA13_PWM
PA14
PA15
TARGET_USB_P
TARGET_USB_N
PA23_S3_UART_RX
PA22_S3_UART_TX
PA21_GPIO
PA20_GPIO
PB17_GPIO
PB16_GPIO
PA19_S1_SCK
PA18_S1_MOSI
PA17_S1_SS
PA16_S1_MISO
S4
S0
S2
S3
S1
Close to VDDIO/GND pairs
Close to VDDANA/GNDANA
+3V3
FB1 470R
+VDDANA
C17 4.7uF
C16 100nF
GND
GND
+3V3
C15 100nF
GND
Close to VDDIO/GND pairs
+3V3
C18 100nF
GND
Close to VDDIO/GND pairs
S2
PA08_S2_I2C_SDA
PA09_S2_I2C_SCL
PA10_ADC18
PA11_ADC19
S2-SDA
S2-SCL
HIGH-GAIN
LOW-GAIN
S1
PB14_GPIO
PA13_PWM
PA16_S1_MISO
PA17_S1_SS
PA18_S1_MOSI
PA19_S1_SCK
PB17_GPIO
PB16_GPIO
PB22_GPIO
PB05_ADC13
HIGH-CURRENT
CL-PWM
S1-MISO
S1-SS
S1-MOSI
S1-SCK
CL-INT
CL-RST
CL-EN
CL-AN
PB04_GPIO
PB22_GPIO
PB23_GPIO
I2C PULL-UP
+3V3
R17 4K
R18 4K7
PA08_S2_I2C_SDA
PA09_S2_I2C_SCL
TARGET_USB_N
TARGET_USB_P
PA21_GPIO
PA20_GPIO
PA00_XIN32
PA01_XOUT32
PA15
PA14
Y1
C19 12pF
16MHz
C20 12pF
Y2
32.768kHz
C21 12pF
C22 10pF
GND
GND
GND
Calculation of crystal load capacitors:
Cext = 2x(Ccrystal - Cpara - Cshunt)
Ccrystal = 7.0pF (from crystal datasheet)
Cshunt = 0.9pF (from crystal datasheet)
Cpara = Cstray + Cpcb
Cstray = (Cin * Cout)/(Cin + Cout)
= (2.31 * 2.53)/(2.31 + 2.53)
= 1.2075pF (from device datasheet)
Cpcb = 1pF (estimate)
Cpara = 1.21pF + 1pF = 2.21pF
Cext = 2x(7.0pF - 2.21pF - 0.9pF) = 7,8pF
Selected in design: C=6.8pF
Verification show:
Accuracy (avarage on 9 DUTs): 11.6ppm
Startup time (first clock on output): 129ms
Safety factor: Above 10
External reference for ADC - 2.048V
TP_ADC
U4
REF3020AIDBZT
PA02_ADC0
IN
OUT
GND
+2.048
PA03_ADCREF
C23 1uF
C25 4.7uF
C24 100nF
GND
GND
+3V3
C27 4.7uF
C26 100nF
GND
Close to VDDIO/GND pairs

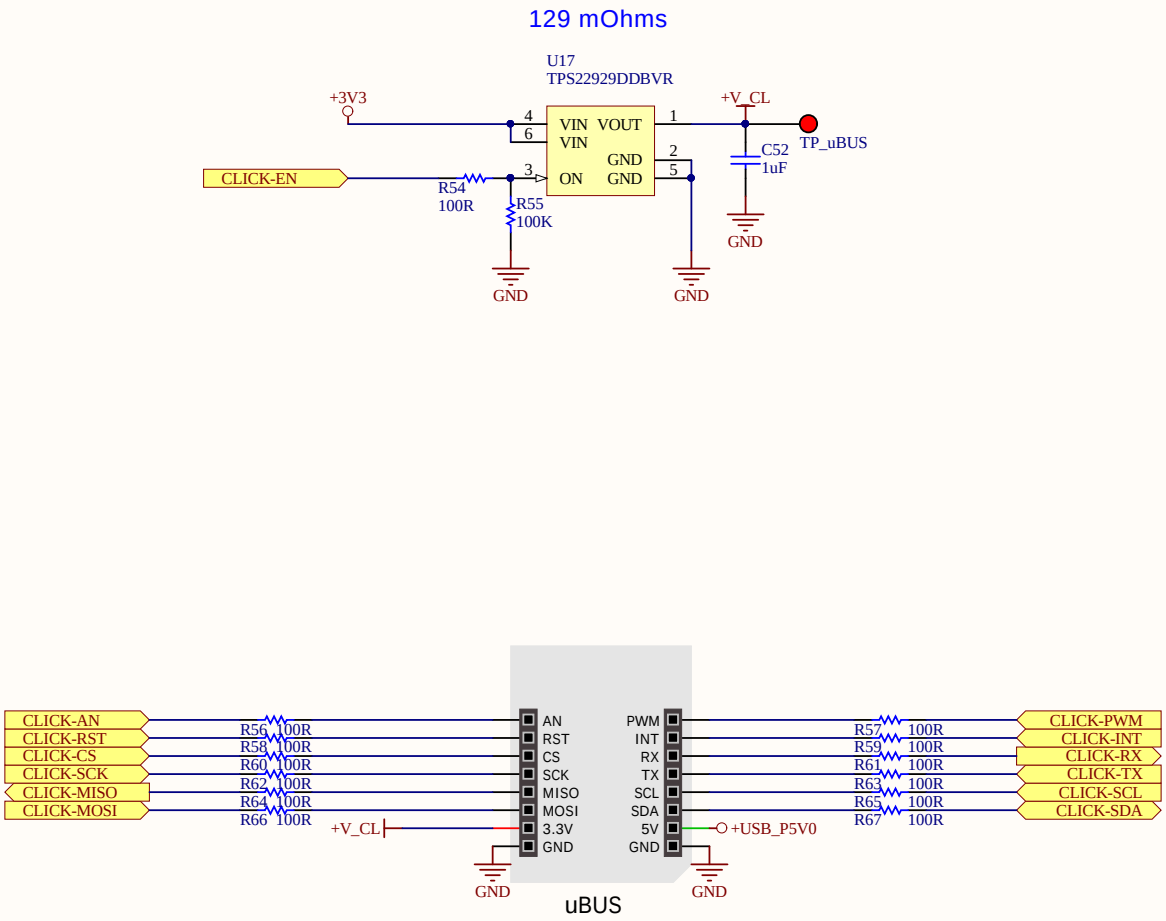

CURRENT_INPUT
CURRENT_OUTPUT
VBAT
+V-BC68
D2
NSPM2051MUT5G
C28
100uF
C29
100nF
C30
100pF
C31
22pF
GND
P4
R68
100R
R69
100R
BC68-TXD-DBG
BC68-RXD-DBG
U5
RF_ANT
ANT
L3
33n|200mA
C32
C33
0p5F
L2
L4
6n8|300mA
Net Class
ClassName: Antenna
SR4C033-L
DESIGN NOTE:
>>Vnom=3.6V
>>Imax=0.5A
>>RESET> pull up internally 3.3V MAX
>>TVS for ESD
>>Maximum trace for SIM 200mm
>>Reserve RXD, TXD, RESET and VBAT for FW update
>> UART 3.0V level
>>SIM-GND, SIM-CLK, SIM-DATA ground shielded
>>GND pins adjacent to RF - no relief
>> 10K on SIM-VDD why???
>> TVS array 3V working voltage or 5V
>> 100uF tantal or 22uF ceramics???
DESIGN NOTE:
L2 - BAND SELECT
6.8nH - B20
3.3nH - B5, B8
SIM-GND
SIM-DAT
SIM-RST
SIM-CLK
SIM-VDD
NETlight
NBRST
NBIoT-RST
R19
47R
R20
100K
Q2
BSS138BKW
P3
NBIoT-TXD
NBIoT-RXD
NBIoT-RI
R22 1K
R23 1K
R24 1K
NBTx
NBRx
NBRI
TP_RNG
TP_NBR
TP_NBT
Net Class
ClassName: NB-IoT-CMD
DESIGN NOTE:
For testing NBIoT communication
GND-SIM
C34
100nF
R21
10K
ClassName: SIM
U6
DATA1_IN
DATA2_IN
CLK_IN
NC
VCC
DATA1_OUT
DATA2_OUT
CLK_OUT
EP
SIM1
C1(VCC)
C2(RST)
C7(I/O)
C3(CLK)
C6(Vpp)
C5(GND)

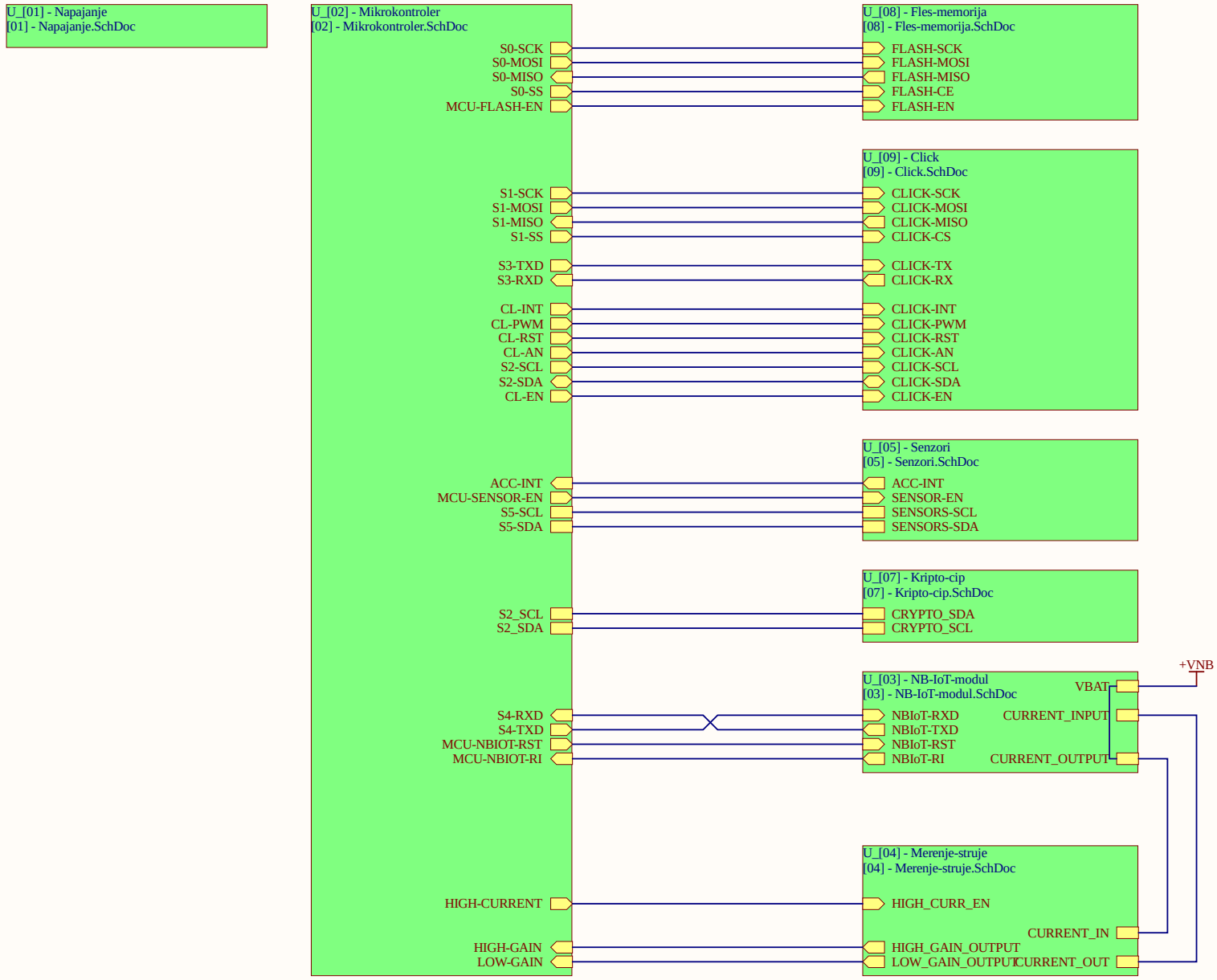

CURRENT_IN
R34 0R
TP_BC68
CURRENT_OUT
R26
100K
HIGH_CURR_EN
R28
0.1R
Q5
R29
100R|0.1%
+USB_P5V0
FB3
220R
R31
100R|0.1%
C39
4.7uF
C38
100nF
GND
Q8
R37
2K
R36
0R
C40
1nF
U8
ADA4528
NIC
NIC
NIC
V+
V-
Low noise precision amplifier
Gain = 20
V-FLRT
FB2
220R
+3V3
C35
100nF
C36
4.7uF
U7A
TP_HIGH
HIGH
HIGH_GAIN_OUTPUT
R30
10K
C37
150pF
R32
680R
Active low pass filter will reduce the gain for undesired frequencies that are above the frequencies of interest.
Cut-off frequency is 106 kHz
fc = 1/(2*pi*10k*150pF)
Gain = 16
U7B
TP_LOW
LOW
LOW_GAIN_OUTPUT
R38
10K
C41
150pF
R39
10K
Active low pass filter will reduce the gain for undesired frequencies that are above the frequencies of interest.
Cut-off frequency is 106 kHz
fc = 1/(2*pi*10k*150pF)
Gain = 2

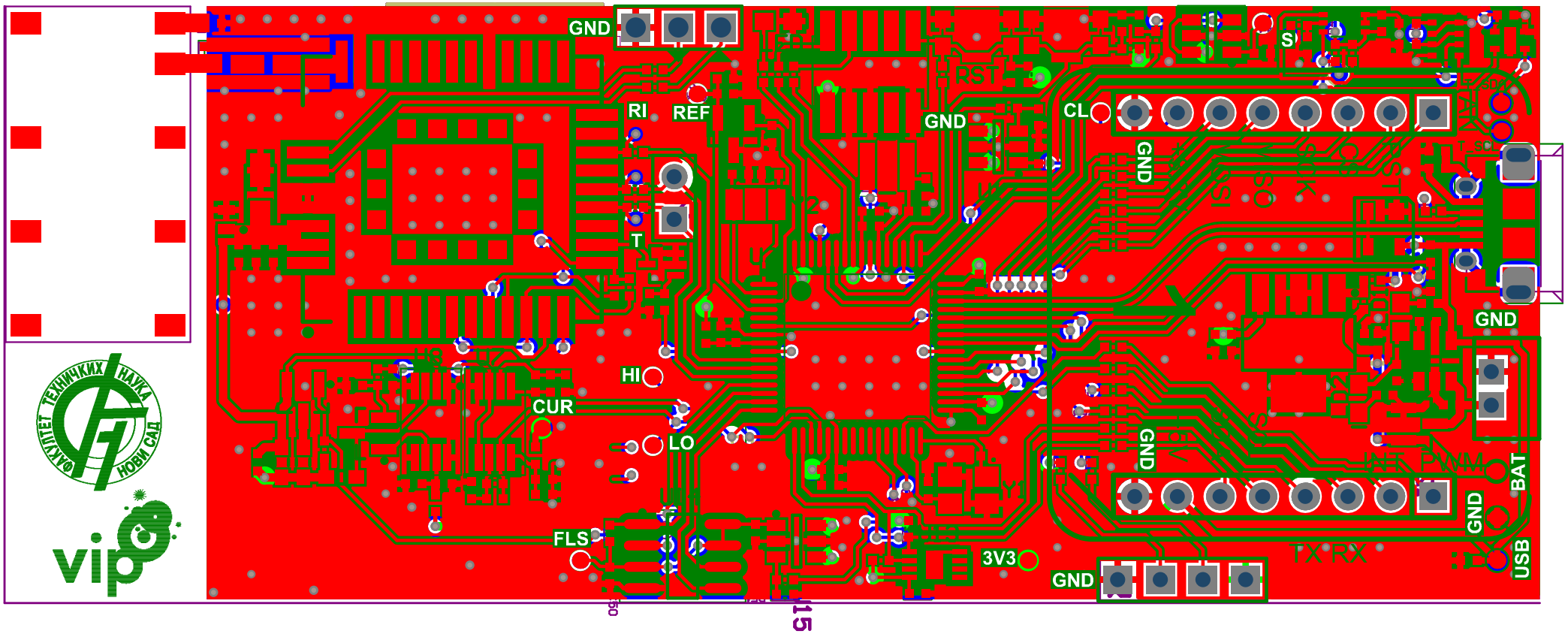

129 mOhms
U9
TPS22929DDBVR
+3V3
VIN
VIN
VOUT
GND
ON
GND
SENSOR-EN
R45
100R
R46
100K
+VSEN
C43
1uF
TP_SEN
GND
U10
BH1750FVI
SEN_SCL
SEN_SDA
+VSEN
R44
1K
C44
1uF
SCL
SDA
DVI
VCC
ADDR
GND
C42
100nF
0x23
U11
BMP280
C45
100nF
C46
100nF
SCL
SDA
CSB
VDD
VDDIO
GND
SDO
0x76
SENSORS-SCL
SENSORS-SDA
ACC-INT
SEN_SCL
SEN_SDA
INT1
R47
2K2
R48
2K2
T_SCL
T_SDA
U12
SHTC3
C47
100nF
SCL
SDA
VDD
VSS
PAD
0x70
T_ACC
U18
LIS2DE12TR|LGA12
SCL/SPC
SDA/SDI/SDO
SDO/SA0
CS
INT1
INT2
RES
NC
VDD
VDD_IO
GND
0x19
C3
10uF
C53
100nF
DESIGN NOTE:
SA0 = VCC
0011001b /*I2C Adr: 0x19 */


GND
U13
ATECC608A
C48
100nF
+3V3
CRYPTO_SCL
CRYPTO_SDA
6
5
1
2
3
7
SCL
SDA
NC
NC
NC
NC
VCC
PAD
GND
8
9
4
GND


129 mOhms
U15
TPS22929DDBVR
+3V3
FLASH-EN
R50
100R
R51
100K
VIN
VIN
ON
VOUT
GND
GND
+V_F
C49
1uF
TP_FLSH
GND
GND
U14
SST25PF040C-40I/SN
FLASH-SCK
FLASH-MOSI
FLASH-MISO
SCK
SI/SIO0
SO|SIO1
VDD
CE#
WP#
HOLD#
VSS
+V_F
R49
100K
FLASH-CE
+V_F
C50
100nF
GND
GND


129 mOhms
U17
TPS22929DDBVR
+3V3
+V_CL
VIN
VIN
VOUT
GND
ON
GND
CLICK-EN
R54
100R
R55
100K
C52
1uF
TP_uBUS
GND
GND
GND
CLICK-AN
CLICK-RST
CLICK-CS
CLICK-SCK
CLICK-MISO
CLICK-MOSI
R56 100R
R58 100R
R60 100R
R62 100R
R64 100R
R66 100R
+V_CL
AN
RST
CS
SCK
MISO
MOSI
3.3V
GND
PWM
INT
RX
TX
SCL
SDA
5V
GND
+USB_P5V0
R57 100R
R59 100R
R61 100R
R63 100R
R65 100R
R67 100R
CLICK-PWM
CLICK-INT
CLICK-RX
CLICK-TX
CLICK-SCL
CLICK-SDA
GND
GND
uBUS


U_[01] - Napajanje
[01] - Napajanje.SchDoc
U_[02] - Mikrokontroler
[02] - Mikrokontroler.SchDoc
S0-SCK
S0-MOSI
S0-MISO
S0-SS
MCU-FLASH-EN
S1-SCK
S1-MOSI
S1-MISO
S1-SS
S3-TXD
S3-RXD
CL-INT
CL-PWM
CL-RST
CL-AN
S2-SCL
S2-SDA
CL-EN
ACC-INT
MCU-SENSOR-EN
S5-SCL
S5-SDA
S2_SCL
S2_SDA
S4-RXD
S4-TXD
MCU-NBIOT-RST
MCU-NBIOT-RI
HIGH-CURRENT
HIGH-GAIN
LOW-GAIN
U_[08] - Fles-memorija
[08] - Fles-memorija.SchDoc
FLASH-SCK
FLASH-MOSI
FLASH-MISO
FLASH-CE
FLASH-EN
U_[09] - Click
[09] - Click.SchDoc
CLICK-SCK
CLICK-MOSI
CLICK-MISO
CLICK-CS
CLICK-TX
CLICK-RX
CLICK-INT
CLICK-PWM
CLICK-RST
CLICK-AN
CLICK-SCL
CLICK-SDA
CLICK-EN
U_[05] - Senzori
[05] - Senzori.SchDoc
ACC-INT
SENSOR-EN
SENSORS-SCL
SENSORS-SDA
U_[07] - Kripto-cip
[07] - Kripto-cip.SchDoc
CRYPTO_SDA
CRYPTO_SCL
+VNB
U_[03] - NB-IoT-modul
[03] - NB-IoT-modul.SchDoc
VBAT
NBIoT-RXD
CURRENT_INPUT
NBIoT-TXD
NBIoT-RST
NBIoT-RI
CURRENT_OUTPUT
U_[04] - Merenje-struje
[04] - Merenje-struje.SchDoc
HIGH_CURR_EN
CURRENT_IN
HIGH_GAIN_OUTPUT
LOW_GAIN_OUTPUT
CURRENT_OUT


GND
RI
REF
T
HI
CUR
LO
FLS
3V3
GND
RST
GND
CL
S
GND
GND
GND
GND
BAT
USB
TX RX
J15