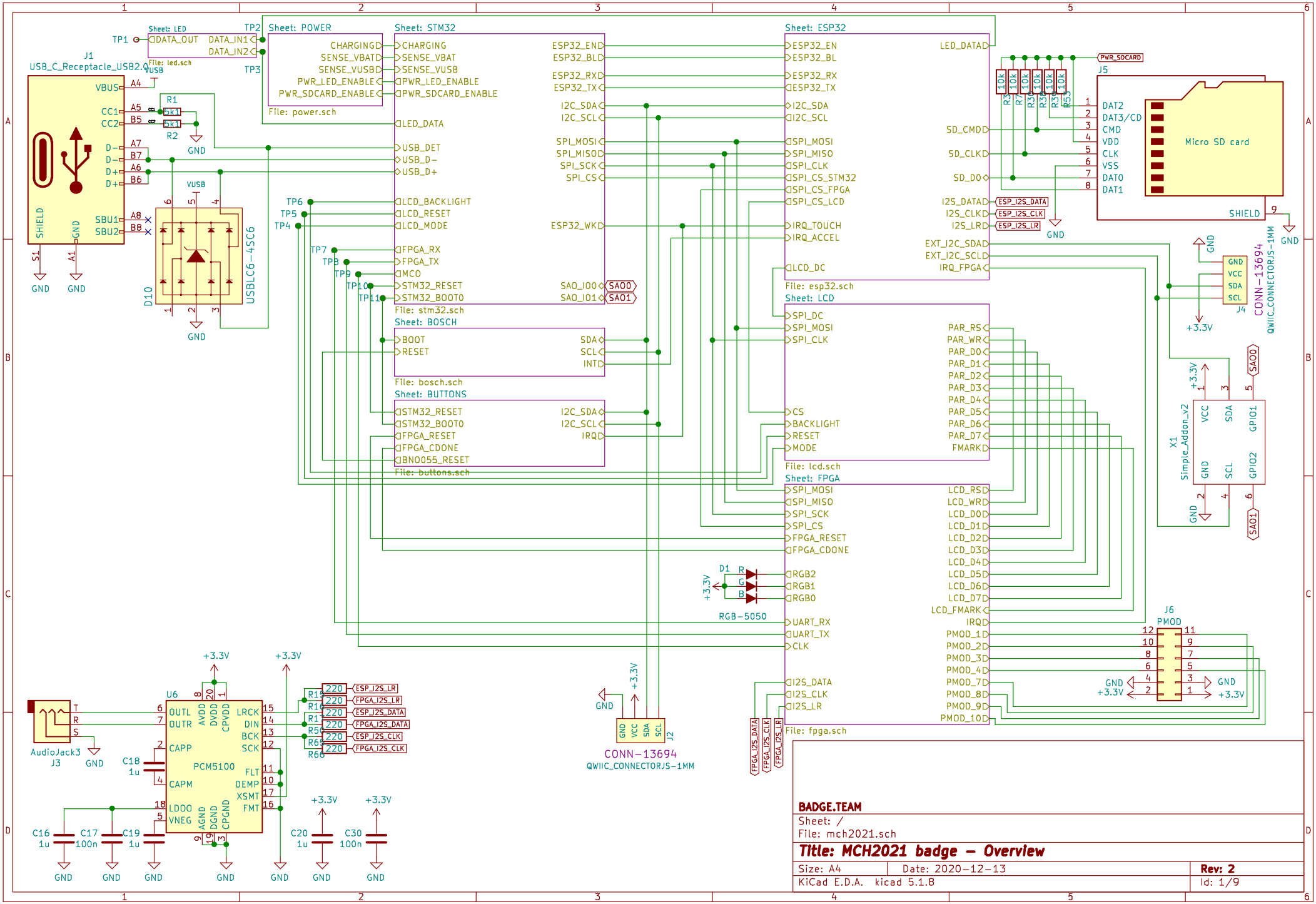
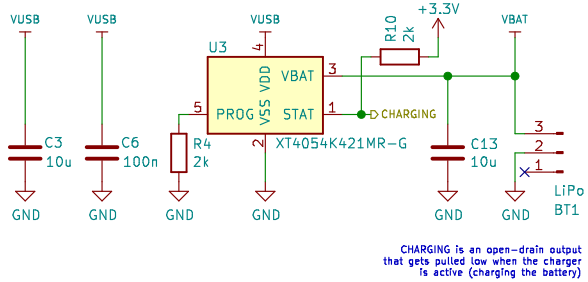
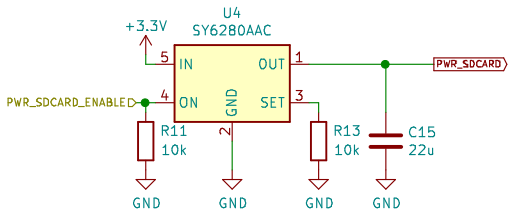

Sheet: LED
DATA_OUT
DATA_IN1
DATA_IN2
File: led.sch
Sheet: POWER
CHARGING
SENSE_VBAT
SENSE_VUSB
PWR_LED_ENABLE
PWR_SDCARD_ENABLE
File: power.sch
Sheet: STM32
LED_DATA
USB_DET
USB_D-
USB_D+
LCD_BACKLIGHT
LCD_RESET
LCD_MODE
FPGA_RX
FPGA_TX
MCO
STM32_RESET
STM32_BOOT0
ESP32_WK
SAO_IO0
SAO_IO1
File: stm32.sch
Sheet: BOSCH
BOOT
RESET
SDA
SCL
INT
File: bosch.sch
Sheet: BUTTONS
STM32_RESET
STM32_BOOT0
FPGA_RESET
FPGA_CDONE
BNO055_RESET
I2C_SDA
I2C_SCL
IRQ
File: buttons.sch
Sheet: ESP32
ESP32_EN
ESP32_BL
ESP32_RX
ESP32_TX
I2C_SDA
I2C_SCL
SPI_MOSI
SPI_MISO
SPI_CLK
SPI_CS_STM32
SPI_CS_FPGA
SPI_CS_LCD
IRQ_TOUCH
IRQ_ACCEL
LCD_DC
LED_DATA
SD_CMD
SD_CLK
SD_D0
I2S_DATA
I2S_CLK
I2S_LR
EXT_I2C_SDA
EXT_I2C_SCL
IRQ_FPGA
File: esp32.sch
Sheet: LCD
SPI_DC
SPI_MOSI
SPI_CLK
CS
BACKLIGHT
RESET
MODE
PAR_RS
PAR_WR
PAR_D0
PAR_D1
PAR_D2
PAR_D3
PAR_D4
PAR_D5
PAR_D6
PAR_D7
FMARK
File: lcd.sch
Sheet: FPGA
SPI_MOSI
SPI_MISO
SPI_SCK
SPI_CS
FPGA_RESET
FPGA_CDONE
RGB2
RGB1
RGB0
UART_RX
UART_TX
CLK
I2S_DATA
I2S_CLK
I2S_LR
LCD_RS
LCD_WR
LCD_D0
LCD_D1
LCD_D2
LCD_D3
LCD_D4
LCD_D5
LCD_D6
LCD_D7
LCD_FMARK
IRQ
PMOD_1
PMOD_2
PMOD_3
PMOD_4
PMOD_7
PMOD_8
PMOD_9
PMOD_10
File: fpga.sch
J1
USB_C_Receptacle_USB2.0
VBUS
CC1
CC2
D-
D-
D+
D+
SBU1
SBU2
SHIELD
R1
5k1
R2
5k1
D10
USBLC6-4SC6
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
TP10
TP11
J5
Micro SD card
DAT2
DAT3/CD
CMD
VDD
CLK
VSS
DAT0
DAT1
PWR_SDCARD
ESP_I2S_DATA
ESP_I2S_CLK
ESP_I2S_LR
J4
CONN-13694
QWIIC_CONNECTORJS-1MM
X1
Simple_Addon_v2
VCC
SDA
GPIO1
GND
SCL
GPIO2
SAO0
SAO1
D1
RGB-5050
J6
PMOD
U6
PCM5100
OUTL
OUTR
CAPP
CAPM
LDOO
VNEG
AVDD
DVDD
CPVDD
AGND
DGND
CPGND
LRCK
DIN
BCK
SCK
FLT
DEMP
XSMT
FMT
AudioJack3
J3
J2
CONN-13694
QWIIC_CONNECTORJS-1MM
FPGA_I2S_DATA
FPGA_I2S_LR
FPGA_I2S_CLK
+3.3V
GND
BADGE.TEAM
Sheet: /
File: mch2021.sch
Title: MCH2021 badge – Overview
Size: A4
Date: 2020-12-13
Rev: 2
KiCad E.D.A. kicad 5.1.8
Id: 1/9

Battery & battery charger



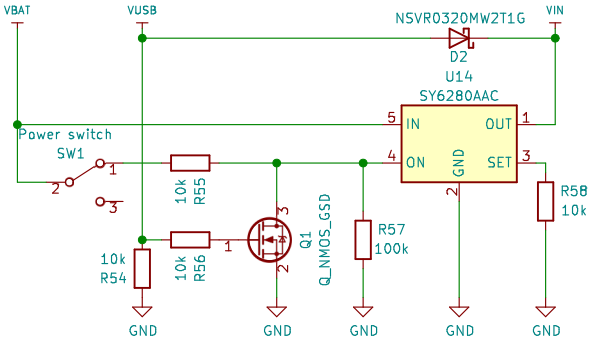
Switched power: 3.3v for SDCARD

Iset = 0.68A = 6800 / 10kOhm



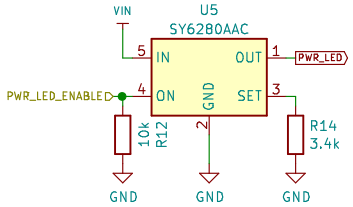
Note:
All control signals are hierarchical labels while all power rails are global

Power switch

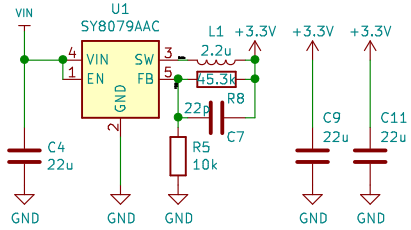


Switched power: Vin for LEDs

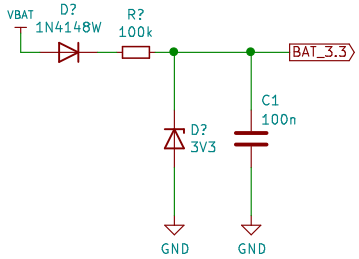
Iset = 2A = 6800 / 3.4kOhm



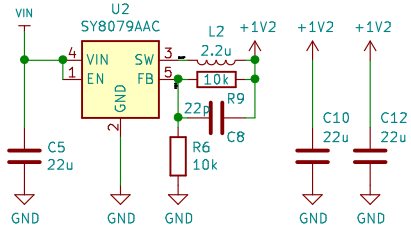
3.3v voltage regulator



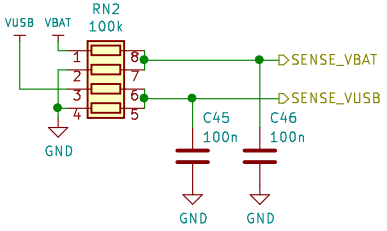
3.3v voltage regulator for RTC backup



1.2v voltage regulator



Voltage sensing



BADGE.TEAM

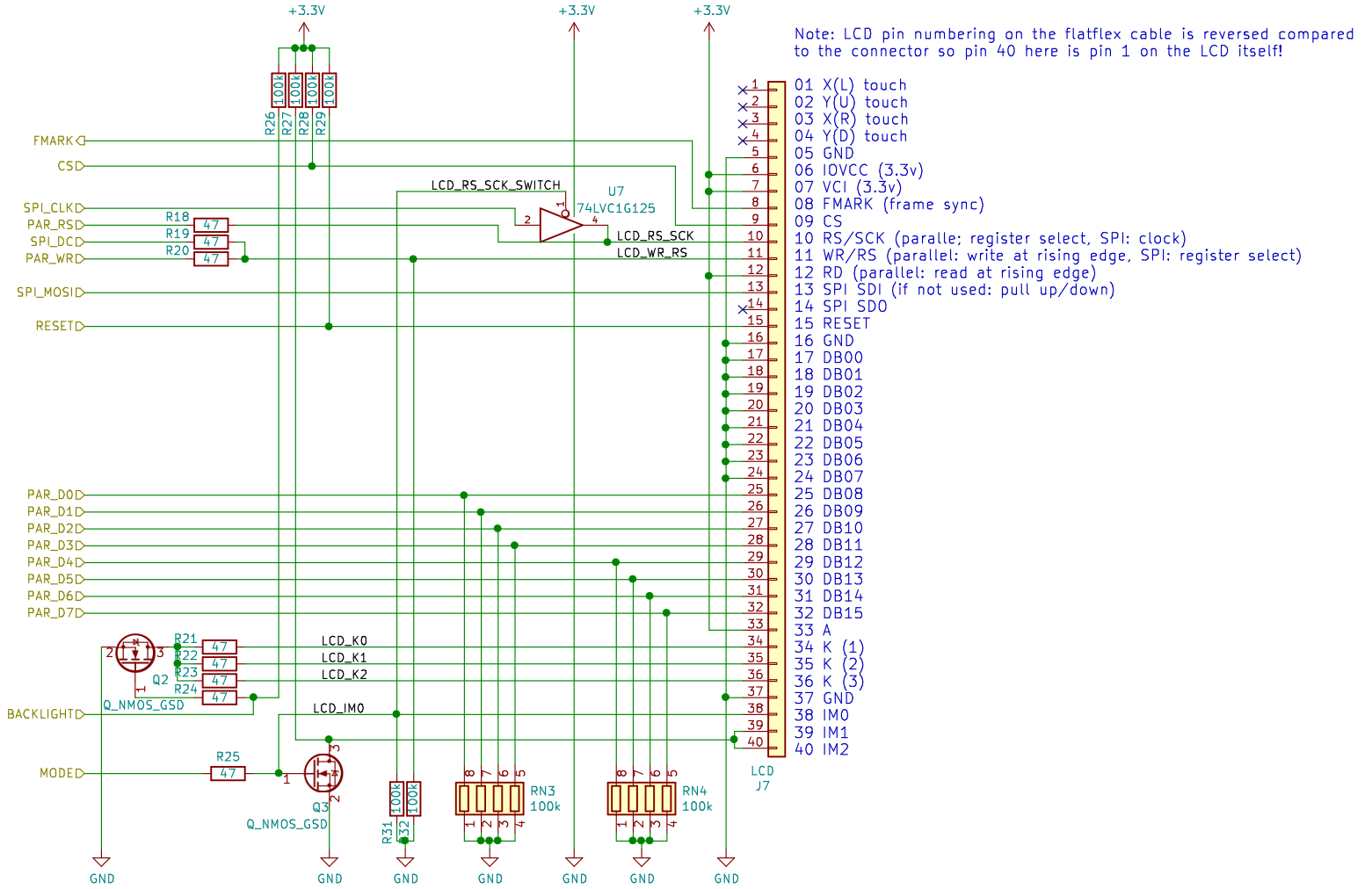
Sheet: /POWER/
File: power.sch

Title: MCH2021 badge – Power management

Size: A4	Date: 2020-12-13	**Rev: 2**
KiCad E.D.A. kicad 5.1.8		Id: 2/9

LCD

Type: Z240IT008
Controller: ILI9341
Size: 2.4 inch



Note: LCD pin numbering on the flatflex cable is reversed compared to the connector so pin 40 here is pin 1 on the LCD itself!

SPI: IM0 = 0, IM1 = 1, IM2 = 1
PAR: IM0 = 1, IM1 = 0, IM2 = 0

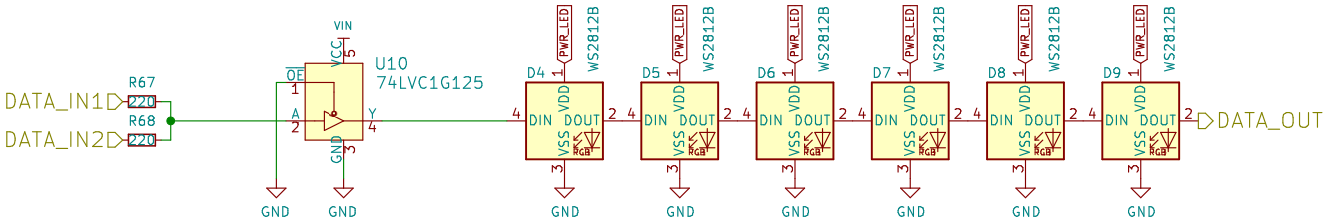
BADGE.TEAM

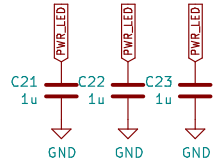
Sheet: /LCD/
File: lcd.sch

Title: MCH2021 badge – LCD

Size: A4	Date: 2020-12-13	**Rev: 2**
KiCad E.D.A. kicad 5.1.8		Id: 3/9

WS2812B LEDs



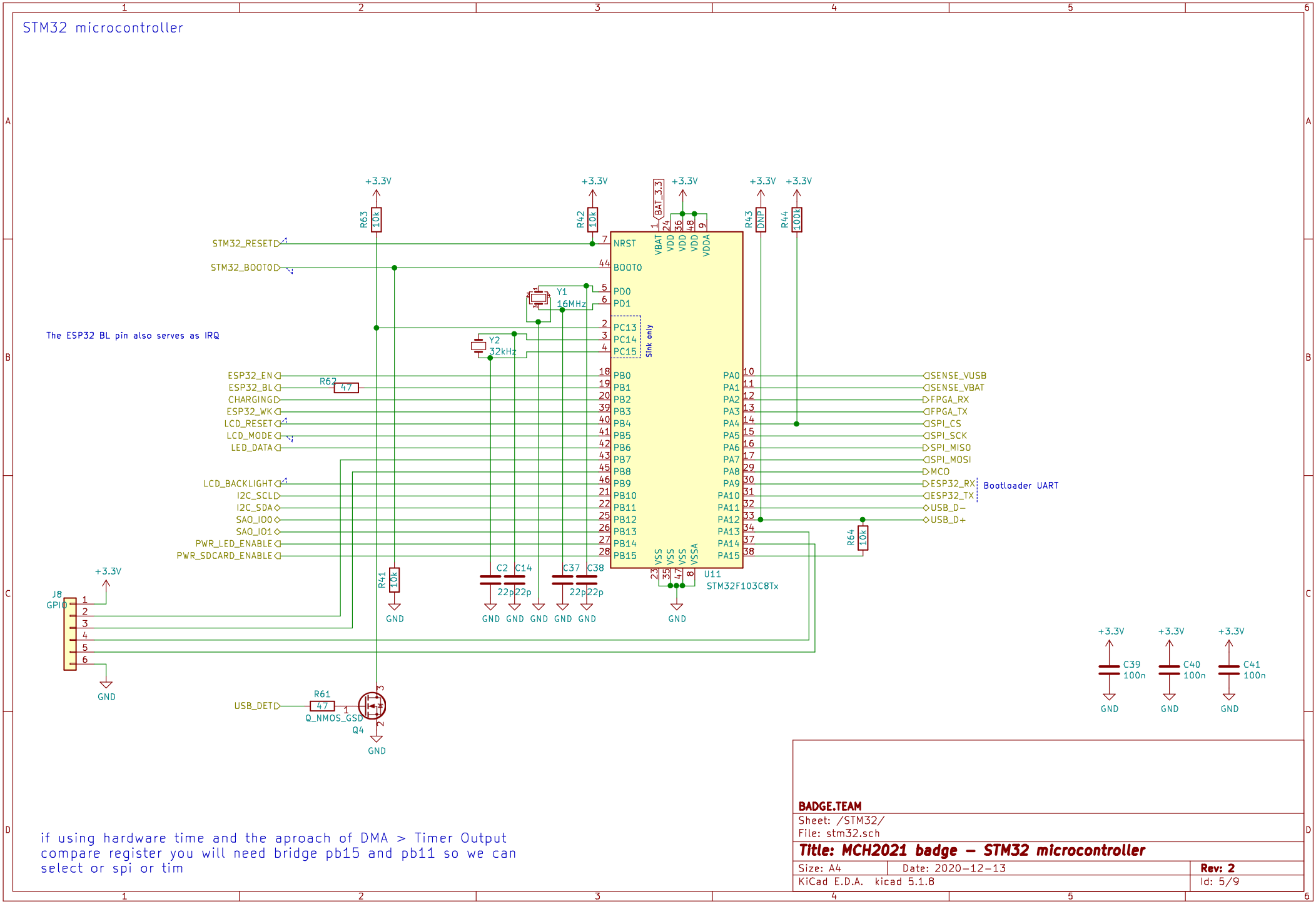


BADGE.TEAM

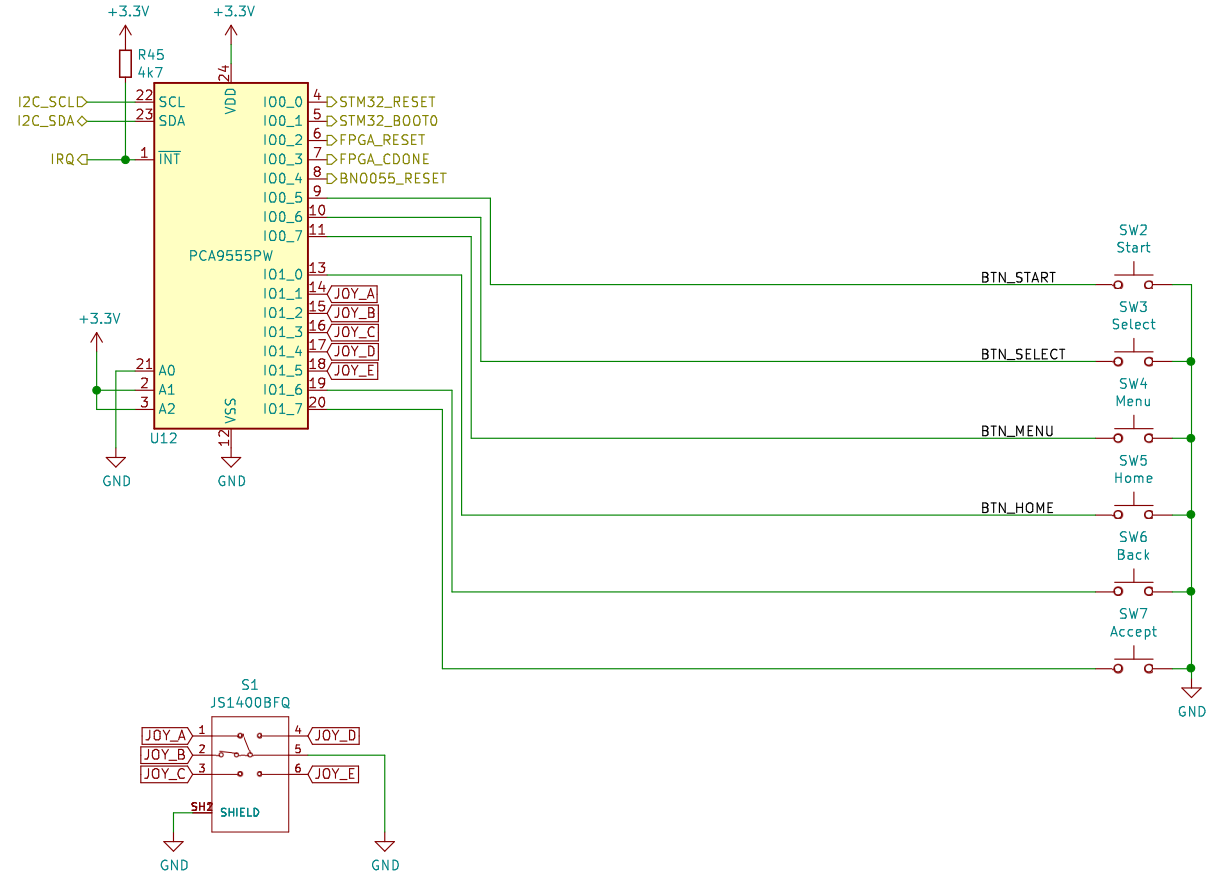
Sheet: /LED/
File: led.sch

Title:

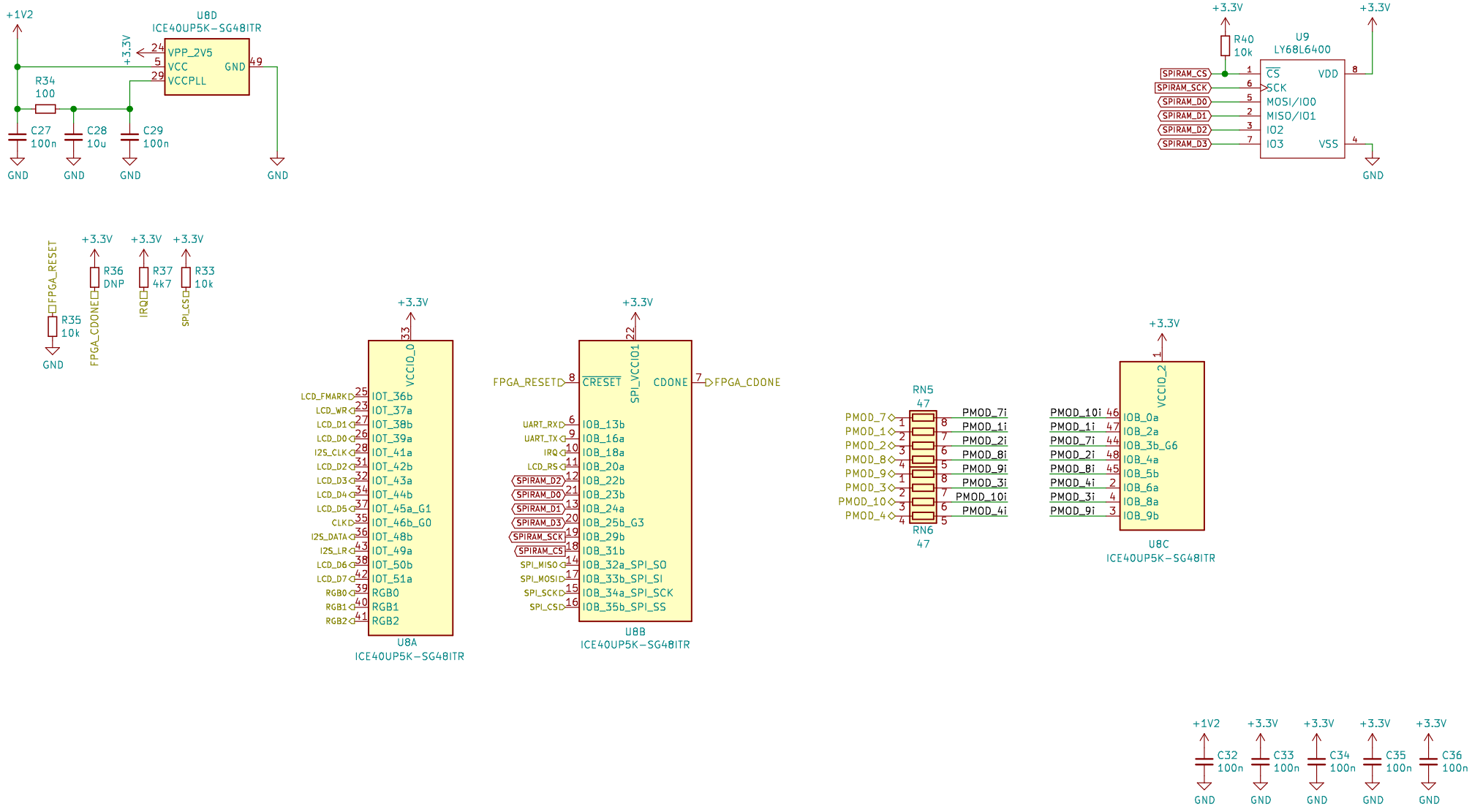
Size: A4	Date: 2020-12-13	**Rev: 2**
KiCad E.D.A. kicad 5.1.8		Id: 4/9


STM32 microcontroller
The ESP32 BL pin also serves as IRQ
if using hardware time and the aproach of DMA > Timer Output compare register you will need bridge pb15 and pb11 so we can select or spi or tim
U11
STM32F103C8Tx
Y1
16MHz
Y2
32kHz
Q4
Q_NMOS_GSD
J8
GPIO
Bootloader UART
BADGE.TEAM
Sheet: /STM32/
File: stm32.sch
Title: MCH2021 badge – STM32 microcontroller
Size: A4
Date: 2020-12-13
Rev: 2
KiCad E.D.A. kicad 5.1.8
Id: 5/9

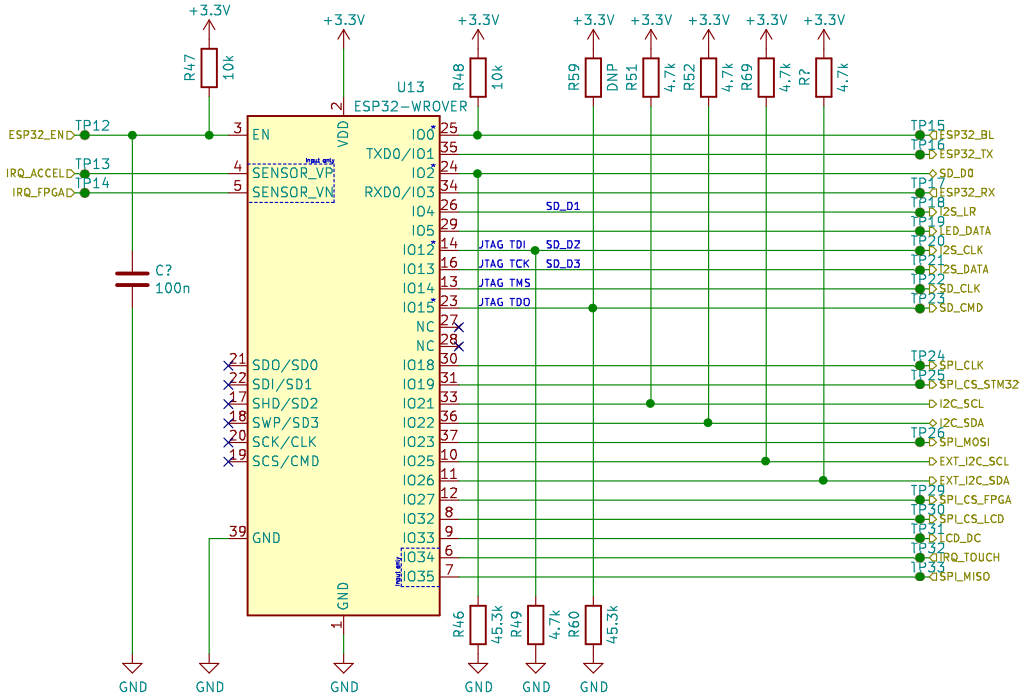
MPR121 touch button interface

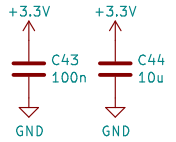


BADGE.TEAM		
Sheet: /BUTTONS/		
File: buttons.sch		
Title:		
Size: A4	Date: 2020-12-13	**Rev: 2**
KiCad E.D.A. kicad 5.1.8		Id: 6/9


+1V2
U8D
ICE40UP5K-SG48ITR
+3.3V
VPP_2V5
VCC
VCCPLL
GND
R34
100
C27
100n
C28
10u
C29
100n
GND
+3.3V
R40
10k
U9
LY68L6400
SPIRAM_CS
SPIRAM_SCK
SPIRAM_D0
SPIRAM_D1
SPIRAM_D2
SPIRAM_D3
CS
SCK
MOSI/IO0
MISO/IO1
IO2
IO3
VDD
VSS
FPGA_RESET
R35
10k
R36
DNP
FPGA_CDONE
R37
4k7
IRQ
R33
10k
SPI_CS
VCCIO_0
IOT_36b
IOT_37a
IOT_38b
IOT_39a
IOT_41a
IOT_42b
IOT_43a
IOT_44b
IOT_45a_G1
IOT_46b_G0
IOT_48b
IOT_49a
IOT_50b
IOT_51a
RGB0
RGB1
RGB2
LCD_FMARK
LCD_WR
LCD_D1
LCD_D0
I2S_CLK
LCD_D2
LCD_D3
LCD_D4
LCD_D5
CLK
I2S_DATA
I2S_LR
LCD_D6
LCD_D7
U8A
ICE40UP5K-SG48ITR
SPI_VCCIO1
CRESET
CDONE
IOB_13b
IOB_16a
IOB_18a
IOB_20a
IOB_22b
IOB_23b
IOB_24a
IOB_25b_G3
IOB_29b
IOB_31b
IOB_32a_SPI_SO
IOB_33b_SPI_SI
IOB_34a_SPI_SCK
IOB_35b_SPI_SS
U8B
ICE40UP5K-SG48ITR
RN5
47
RN6
47
PMOD_7
PMOD_1
PMOD_2
PMOD_8
PMOD_9
PMOD_3
PMOD_10
PMOD_4
PMOD_7i
PMOD_1i
PMOD_2i
PMOD_8i
PMOD_9i
PMOD_3i
PMOD_10i
PMOD_4i
VCCIO_2
IOB_0a
IOB_2a
IOB_3b_G6
IOB_4a
IOB_5b
IOB_6a
IOB_8a
IOB_9b
U8C
ICE40UP5K-SG48ITR
C32
100n
C33
100n
C34
100n
C35
100n
C36
100n
BADGE.TEAM
Sheet: /FPGA/
File: fpga.sch
Title:
Size: A4
Date: 2020-12-13
Rev: 2
KiCad E.D.A. kicad 5.1.8
Id: 7/9

ESP32 microcontroller





* Bootstrapping pins
IO 0:Low for UART DL mode, pull high for normal boot
IO 2: Pull down to select UART DL mode when GPIO 0 is LOW
IO 12: Selects internal flash/ram voltage. Pull-up for 1.8v, pull-down for 3.3v
IO 15: Pull down for silent bootloader

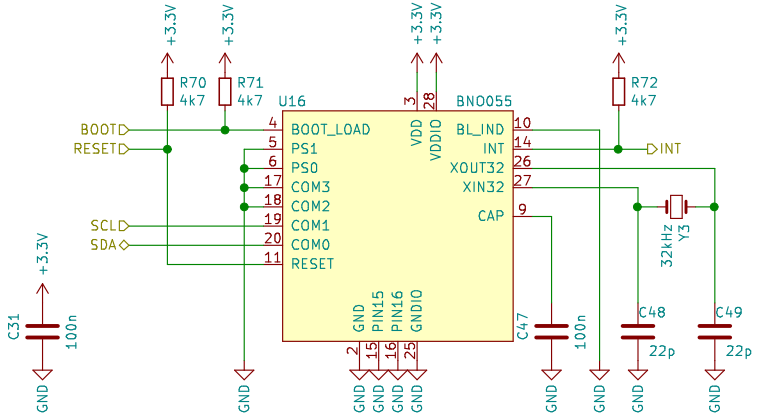
BADGE.TEAM

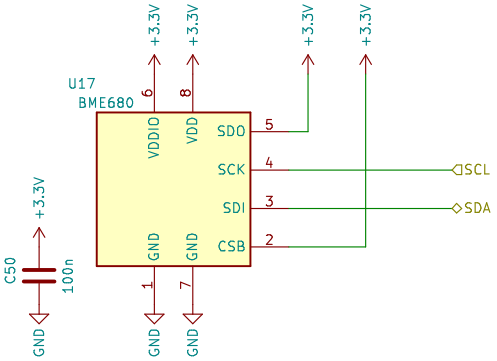
Sheet: /ESP32/
File: esp32.sch

Title: MCH2021 badge - ESP32 microcontroller

Size: A4	Date: 2020-12-13	**Rev: 2**
KiCad E.D.A. kicad 5.1.8		Id: 8/9

BOSCH BNO055 & BME680 SENSORS





BADGE.TEAM

Sheet: /BOSCH/
File: bosch.sch

Title: MCH2021 badge – BOSCH

Size: A4	Date: 2020-12-13	**Rev: 2**
KiCad E.D.A. kicad 5.1.8		Id: 9/9