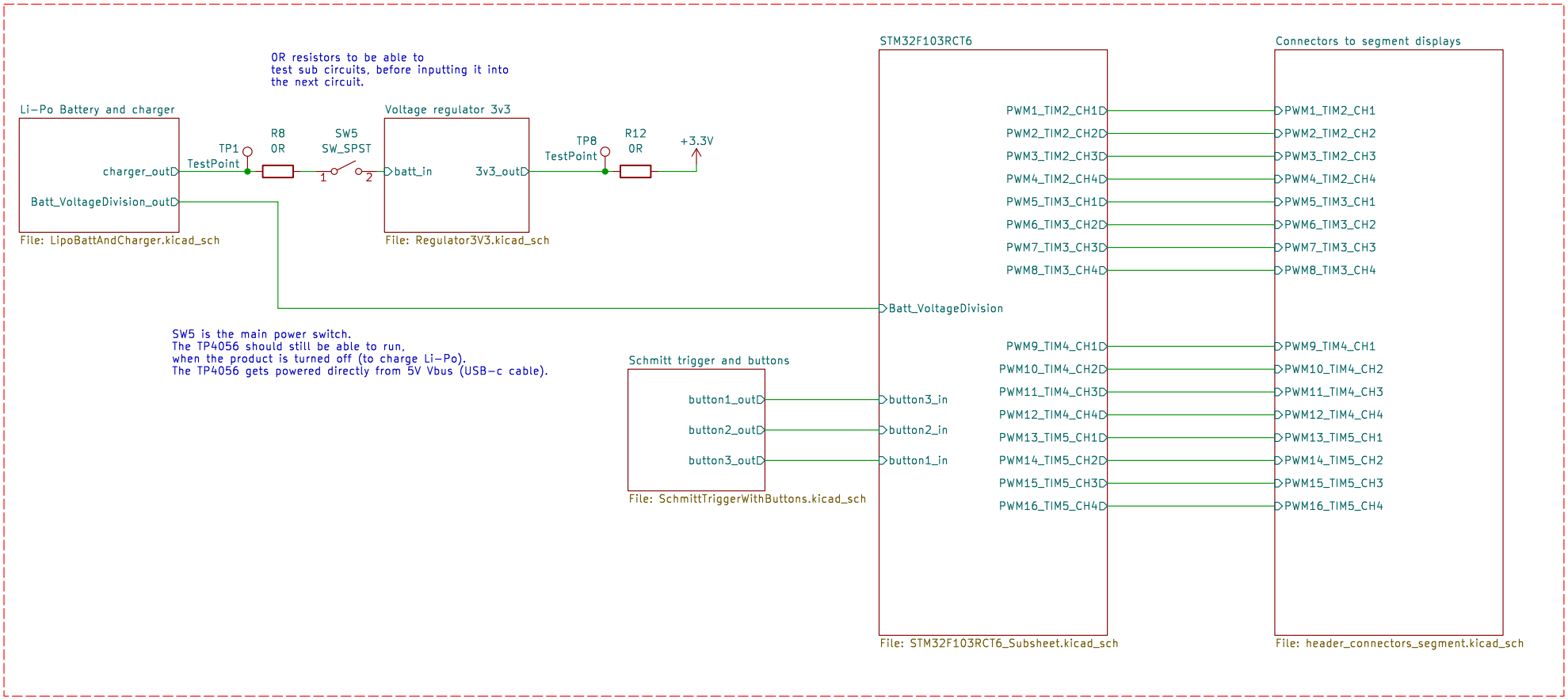
'Shotclock mainboard' root page



Sheet: /
File: ShotClockProject.kicad_sch

Title: Shotclock Mainboard

Size: A4	Date: 2023-06-28	**Rev: 1**
KiCad E.D.A.	eeschema 7.0.5-4d25ed1034~172~ubuntu22.04.1	Id: 1/6

STM32F103RCT6 with crystal, power, buzzer, status_led, USB connector, GPIO, UART and SWD

Should I connect VBat directly to the Li-ION batt?

One small decoupling capacitor per Vdd pin and one larger one for the total

C2 10u
C5 100n
C6 100n
C7 100n
C8 100n
TP4 TestPoint
+3.3V
+3.3VA
TP5 TestPoint
C9 10n
C10 1u
FB1 120R
C11 1u
Ferrite Bead filter between Vdda and Vdd to filter high frequency power supply noise

U1 STM32F103RCT6
VBAT VDD VDD VDD VDD VDDA
VSS VSSA

NRST
BOOT0
C4 100n
SW1 SW_SPDT
R1 10k
TP11 TestPoint

HSE_IN
HSE_OUT
TP2 TestPoint
TP3 TestPoint
Y1 16MHz
C1 10p
C3 10p
YSX321SL 16MHz crystal
10pf caps because
MFTR recommends it

button1_in
button2_in
button3_in
D3 Orange LED
ORANGE_LED
R21 130R

BZ1 Buzzer
D4 1N4148
Q2 Q_NPN_BCE
BUZZER
R22 1k

PA0 PWM13_TIM5_CH1
PA1 PWM14_TIM5_CH2
PA2 PWM15_TIM5_CH3
PA3 PWM16_TIM5_CH4
PA4 Batt_VoltageDivision
PA5
PA6 PWM5_TIM3_CH1
PA7 PWM6_TIM3_CH2
PA8
PA9
PA10
PA11 USB_D-
PA12 USB_D+
PA13 SWDIO
PA14 SWCLK
PA15 PWM1_TIM2_CH1
PB0 PWM7_TIM3_CH3
PB1 PWM8_TIM3_CH4
PB2
PB3 PWM2_TIM2_CH2
PB4
PB5
PB6 PWM9_TIM4_CH1
PB7 PWM10_TIM4_CH2
PB8 PWM11_TIM4_CH3
PB9 PWM12_TIM4_CH4
PB10 PWM3_TIM2_CH3
PB11 PWM4_TIM2_CH4
PB12
PB13
PB14 USART1_TX
PB15 USART1_RX

R2 1k5
TP6 TestPoint
TP7 TestPoint

STM32 AN4879 says:
"To be compliant with the USB 2.0 full-speed electrical specification, the USB_DP (D+) pin must be pulled up to a voltage in the 3.0 to 3.6 V range with a 1.5 kΩ resistor"
This is R2

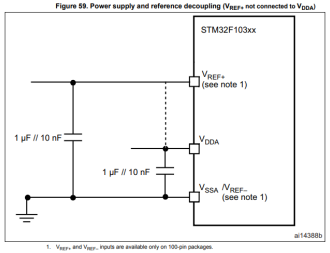
VBUS
A4 VBUS
A5 CC
B5 VCONN
A7 D-
A6 D+
GND
SHIELD
A1
S1
P1 USB_C_Plug_USB2.0
CC and VCONN are not needed in USB C as USB Type 2.0 right?
Do I connect SHIELD to GND, for better signal integrety?

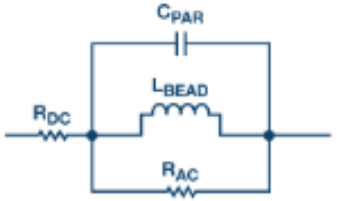
Samtec FTSH-107-01-F-DV-K
Would be preferable for J1, but is sold out almost everywhere or extremely expensive

J3 Conn_01x06_Pin
TP9 TestPoint
TP10 TestPoint
USART1_RX
USART1_TX

SWDIO
SWCLK
+3.3V
J1 Conn_01x04_Pin

STM32F103RCT6 Typical application schematics & global notes



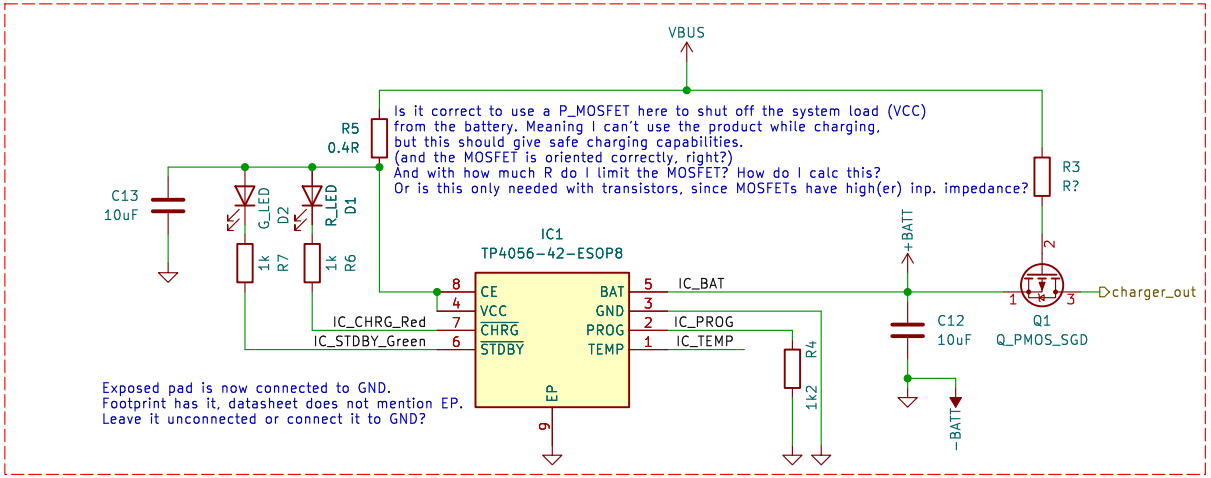


Sheet: /STM32F103RCT6/
File: STM32F103RCT6_Subsheet.kicad_sch

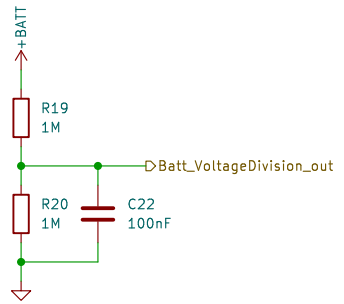
Title: Shotclock Mainboard

Size: A4	Date: 2023-06-28	**Rev: 1**
KiCad E.D.A.	eeschema 7.0.5-4d25ed1034~172~ubuntu22.04.1	Id: 2/6

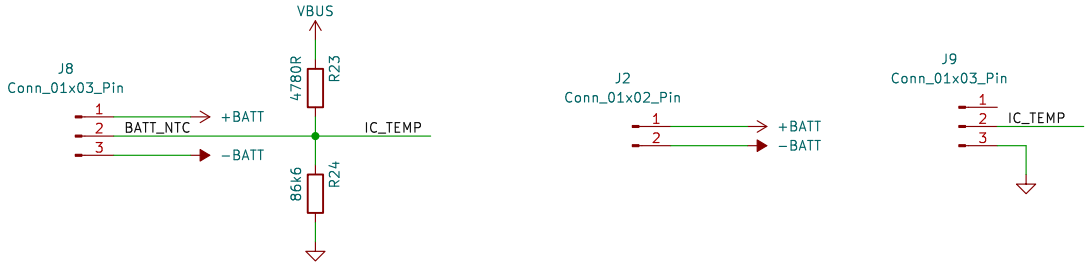
TP4056 Li-Po Charging Circuit



ADC Voltage readout

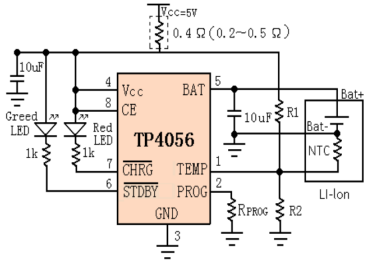


Battery Connections & jumper to disable/enable TEMP sensing of batt.



TP4056 Typical application schematic & global notes

TYPICAL APPLICATIONS



Rprog Current Setting

R_{PROG} (k)	I_{BAT} (mA)
10	130
5	250
4	300
3	400
2	580
1.66	690
1.5	780
1.33	900
1.2	1000

R4 is 1k2, because that is the max value the datasheet shows (or should I be able to extrapolate the R values to get a higher charge current?)
The batteries I want to use (and have at home), are 1500mAh. But charging 1500mAh with 0.66C should also be fine I guess?

R1 and R2 calculations are in attached PDF file.

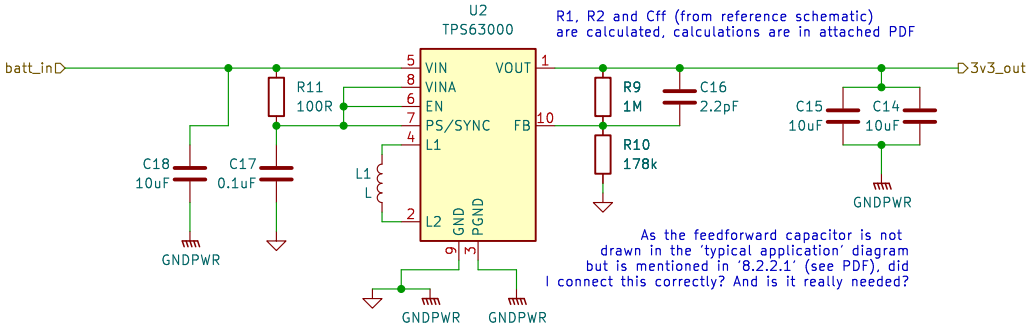
Make sure to add to silkscreen to never connect a battery to both connectors at the same time.
Jumper is only used to pull TEMP pin to GND. So adding two batteries would result in them unloading into each other

Sheet: /Li-Po Battery and charger/
File: LipoBattAndCharger.kicad_sch

Title: Shotclock Mainboard

Size: A4	Date: 2023-06-28	**Rev: 1**
KiCad E.D.A.	eeschema 7.0.5-4d25ed1034~172~ubuntu22.04.1	Id: 3/6

TPS63000 Variable Output Voltage Regulator



TPS63000 Typical application schematic & global notes

VLF4012-2R2 is recommended by datasheet for L1.
VLS3012HBX-2R2M seems to roughly have the same characteristics,
and is available. What is important to look for in this inductor?

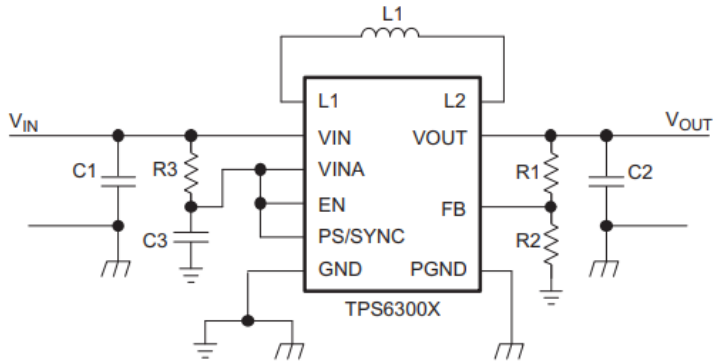
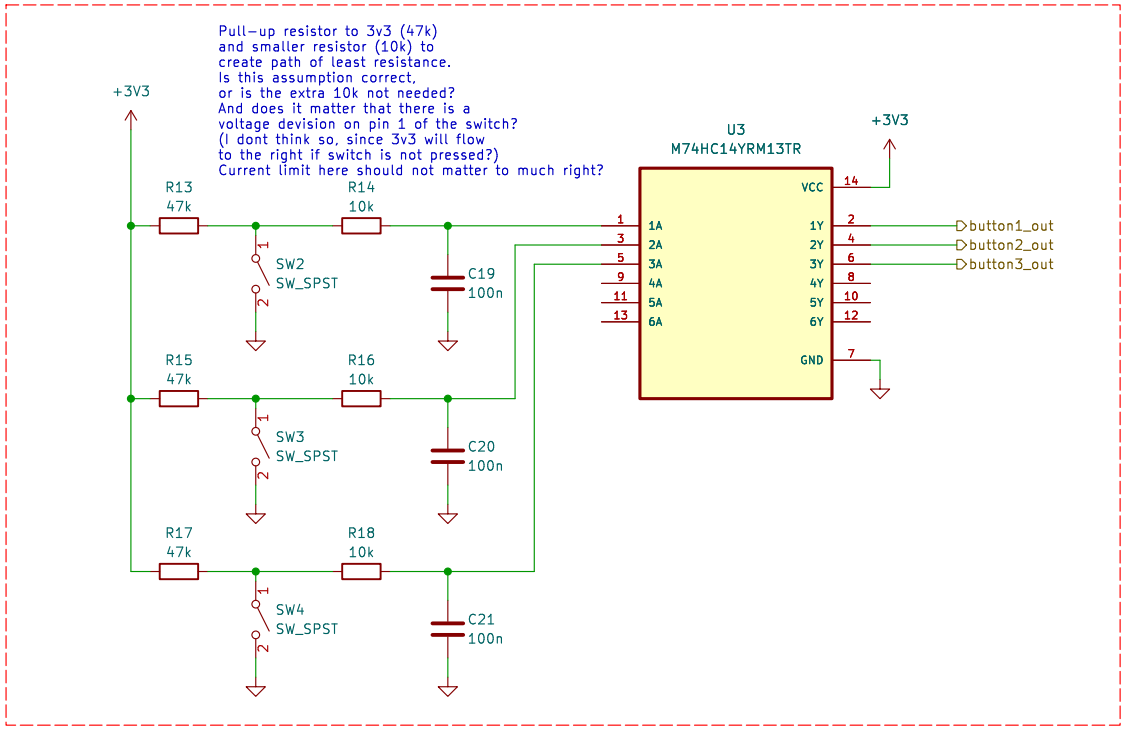


Figure 2. Typical Application Circuit for Adjustable Output Voltage Option

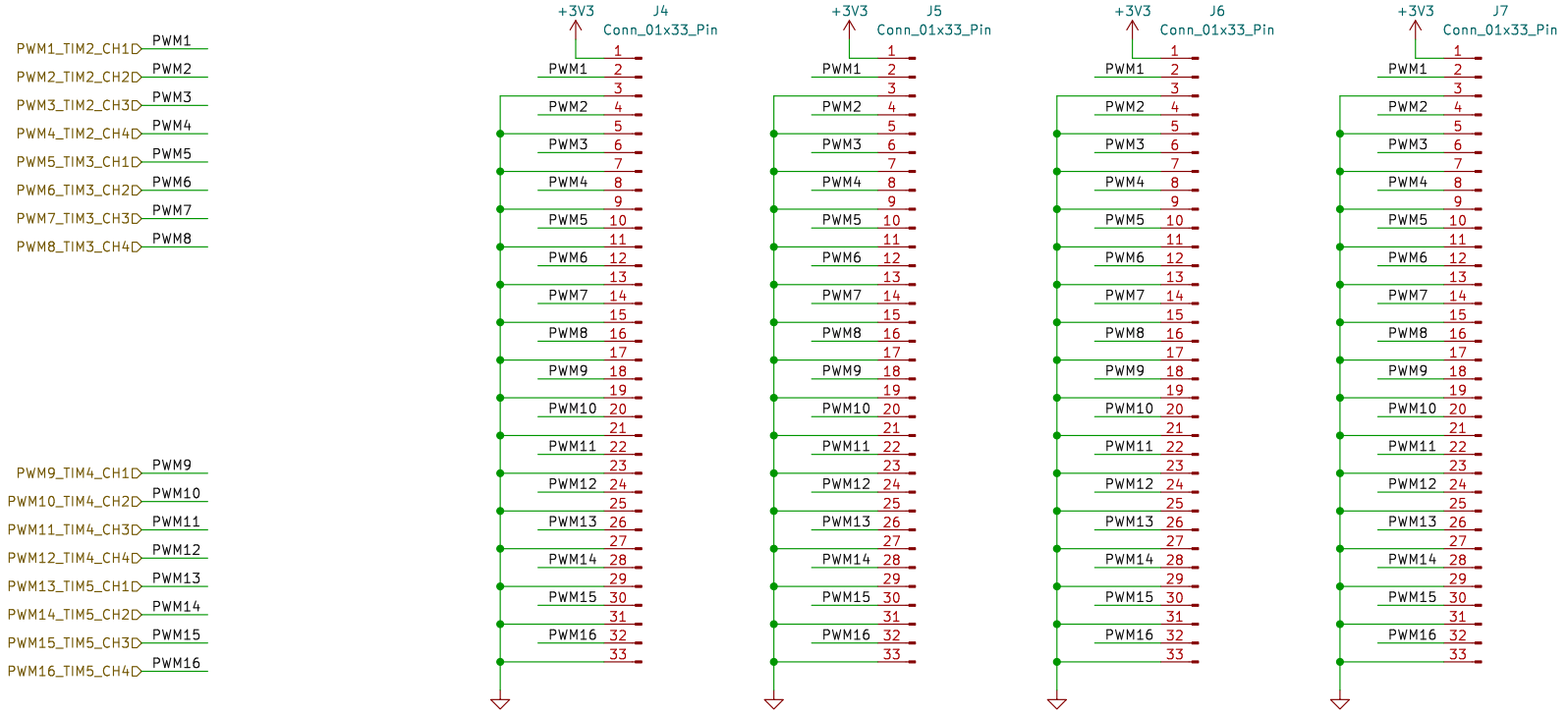
Sheet: /Voltage regulator 3v3/		
File: Regulator3V3.kicad_sch		
Title: Shotclock Mainboard		
Size: A4	Date: 2023-06-28	**Rev: 1**
KiCad E.D.A. eeschema 7.0.5-4d25ed1034~172~ubuntu22.04.1		Id: 4/6

Schmitt trigger with buttons



Sheet: /Schmitt trigger and buttons/		
File: SchmittTriggerWithButtons.kicad_sch		
Title: Shotclock Mainboard		
Size: A4	Date: 2023-06-28	**Rev: 1**
KiCad E.D.A. eeschema 7.0.5-4d25ed1034~172~ubuntu22.04.1		Id: 5/6

Connections to the seven (eight) segment display PCB's (4 connectors, each rotated 90° in the end product)



Sheet: /Connectors to segment displays/		
File: header_connectors_segment.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. eeschema 7.0.5-4d25ed1034~172~ubuntu22.04.1		Id: 6/6