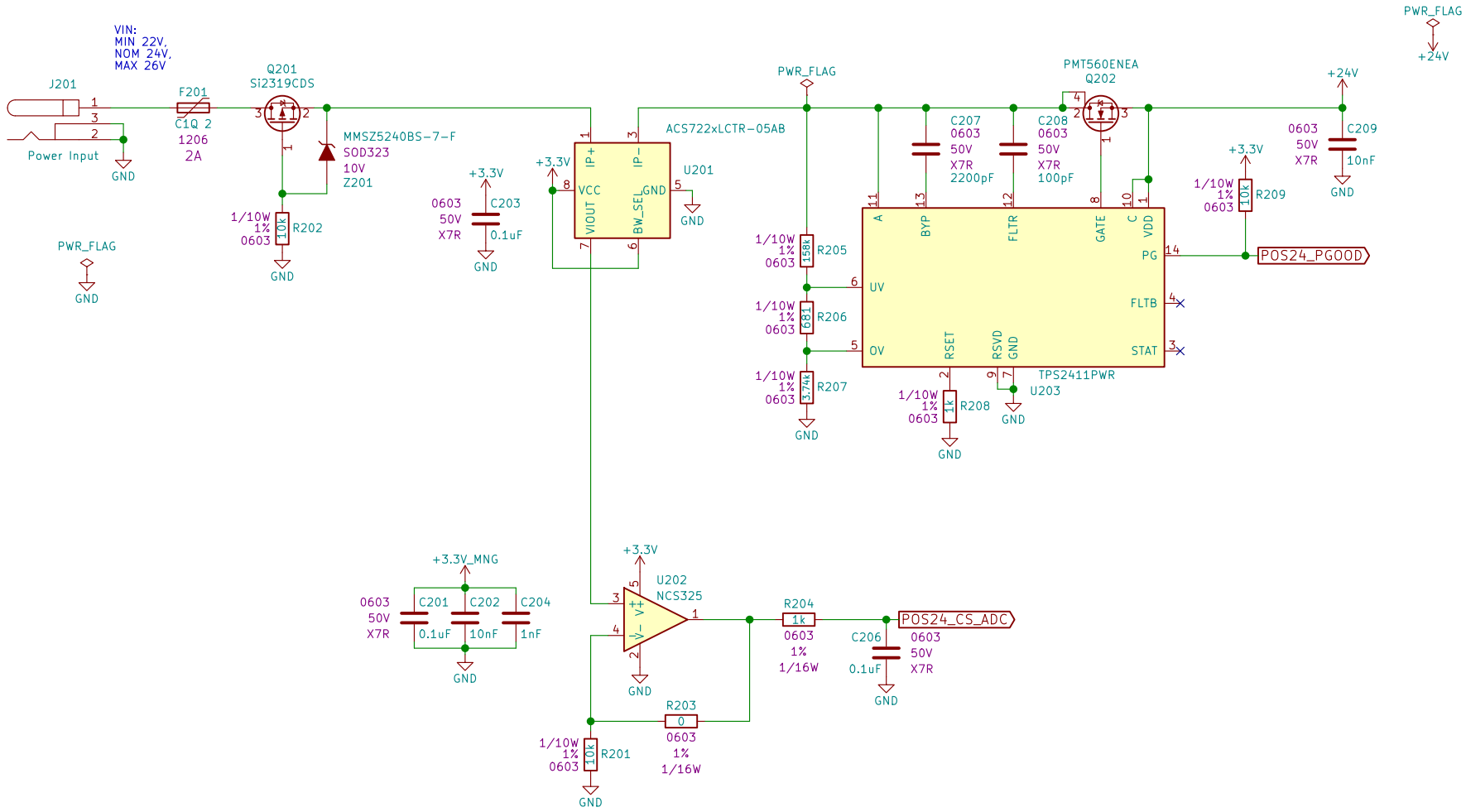
Vacuum Fluorescent Display Clock

02. Power Input — PowerInput.sch
03. Microcontroller — Microcontroller.sch
04. +3.3V Power Supply — POS3P3V_Power_Supply.sch
05. VAN Power Supply — VAN_Power_Supply.sch
06. VFF Power Supply — VFF_Power_Supply.sch
07. USB/UART Converter — USB_UART_Converter.sch
08. PGOOD Indicators — PGOOD_Indicators.sch
09. UART Isolation — UART_Isolation.sch
10. Status Indicators — Status_Indicators.sch
11. Anode Drivers — AnodeDrivers.sch
12. Grid Drivers — GridDrivers.sch
13. Pushbuttons — Pushbuttons.sch
14. Analog Inputs — AnalogInputs.sch
15. Firmware Notes — FirmwareNotes.sch
16. Programming — Programming.sch
17. Backup Supply — BackupSupply.sch
18. Serial Number — SerialNumber.sch
19. Display — Display.sch
20. Ambient Light Sensor — Ambient_Light_Sensor.sch
21. Temperature Sensors — Temperature_Sensors.sch
22. Tube Life Timer — Tube_Life_Timer.sch
23.
24.
25.

Sheet: /		
File: VFD_Clock.sch		
Title:		
Size: A	Date:	**Rev:**
KiCad E.D.A. kicad (5.0.0-rc3-dev-11-geaf938c7e)		Id: 1/22

Input Overvoltage/Undervoltage/Reverse Polarity Lockout



Drew Maatman		
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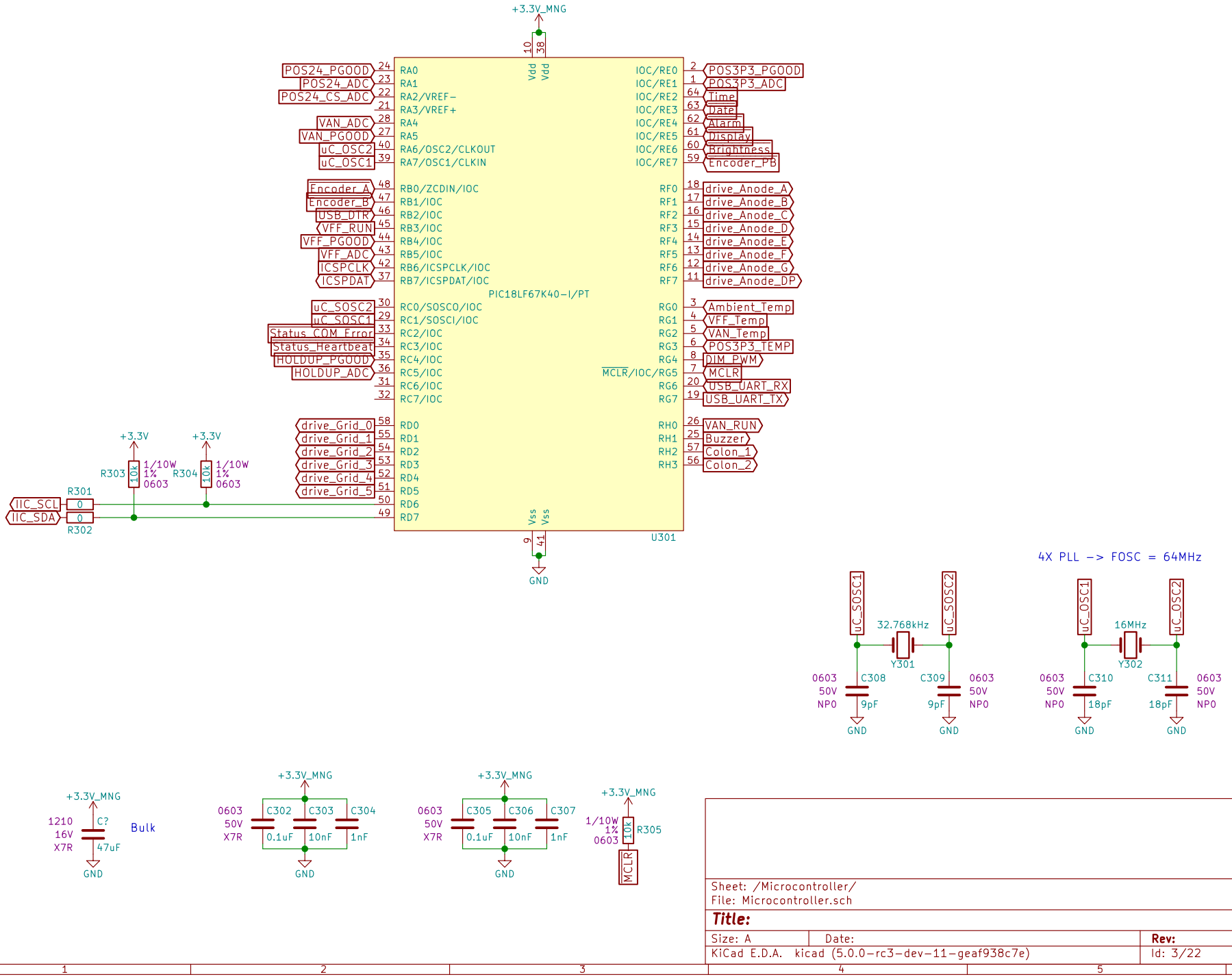
Size: A	Date: 2017-03-06	**Rev: 2**
KiCad E.D.A. kicad (5.0.0-rc3-dev-11-geaf938c7e)		Id: 2/22



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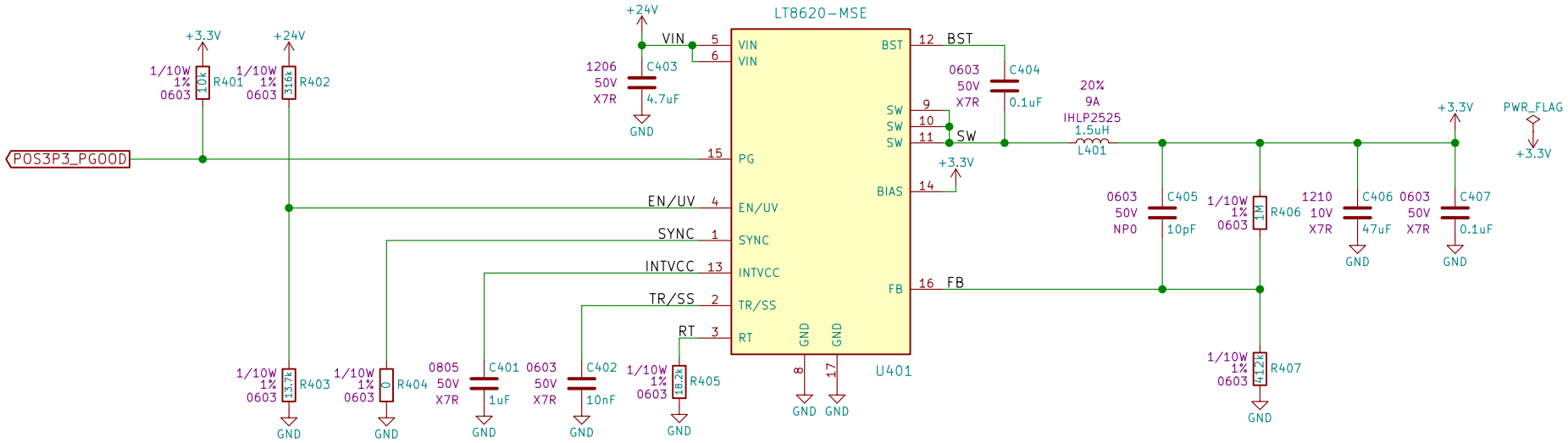
KiCad E.D.A. kicad (5.0.0-rc3-dev-11-geaf938c7e)	Id: 3/22



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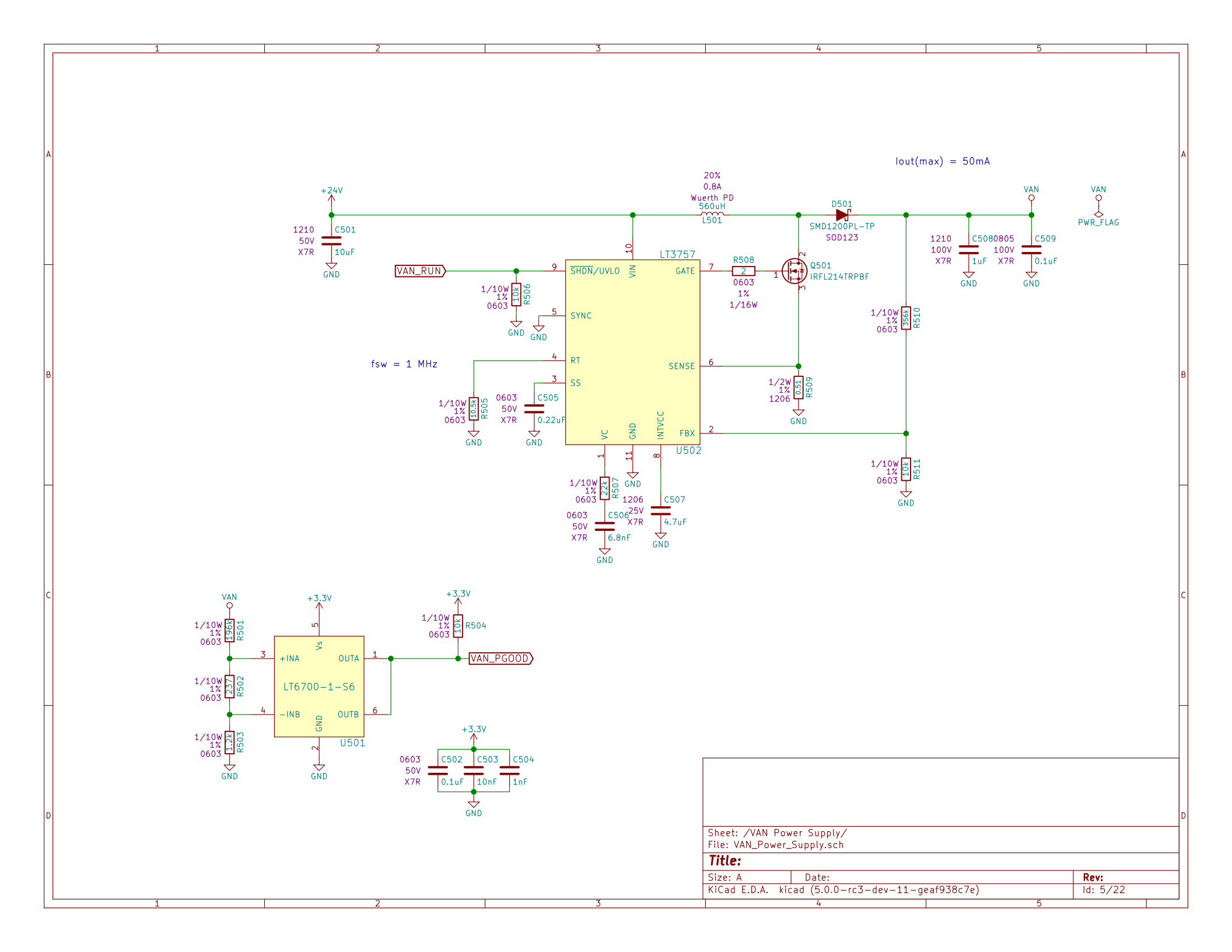
Iout(max) = 50mA
+24V
1210
50V
X7R
C501
10uF
GND
20%
0.8A
Wuerth PD
560uH
L501
D501
SMD1200PL-TP
SOD123
VAN
PWR_FLAG
1210
100V
X7R
C508
1uF
0805
100V
X7R
C509
0.1uF
VAN_RUN
LT3757
SHDN/UVLO
VIN
GATE
SYNC
RT
SS
SENSE
VC
GND
INTVCC
FBX
U502
1/10W
1%
0603
10K
R506
R508
2
0603
1%
1/16W
Q501
IRFL214TRPBF
1/10W
1%
0603
356K
R510
fsw = 1 MHz
1/10W
1%
0603
10.5K
R505
0603
50V
X7R
C505
0.22uF
1/2W
1%
1206
0.51
R509
1/10W
1%
0603
22K
R507
1206
25V
X7R
C507
4.7uF
0603
50V
X7R
C506
6.8nF
1/10W
1%
0603
10K
R511
VAN
+3.3V
1/10W
1%
0603
196K
R501
1/10W
1%
0603
237
R502
1/10W
1%
0603
1.2K
R503
LT6700-1-S6
Vs
+INA
-INB
OUTA
OUTB
GND
U501
+3.3V
1/10W
1%
0603
10K
R504
VAN_PGOOD
+3.3V
0603
50V
X7R
C502
0.1uF
C503
10nF
C504
1nF
GND
Sheet: /VAN Power Supply/
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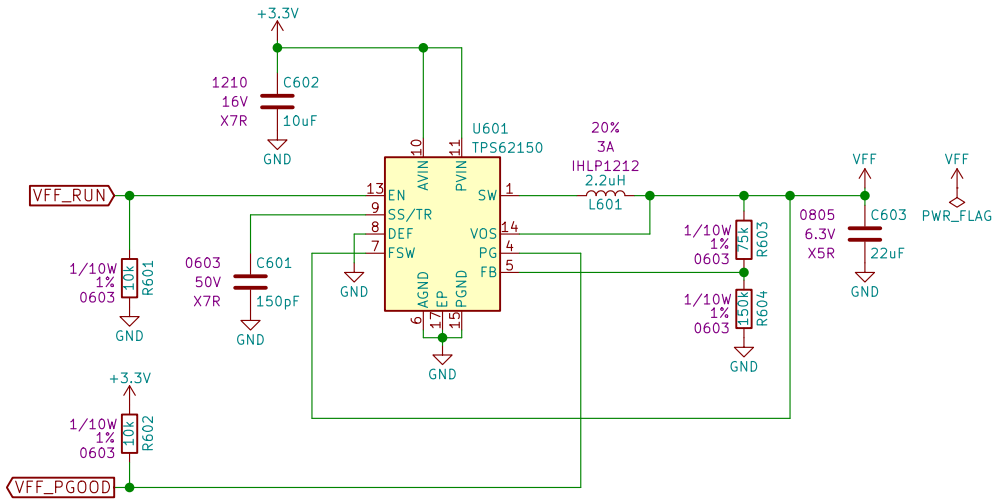
Title:
Size: A
Date:
Rev:
KiCad E.D.A. kicad (5.0.0-rc3-dev-11-geaf938c7e)
Id: 5/22

+1.2V Filament Voltage Power Supply



Sheet: /VFF Power Supply/		
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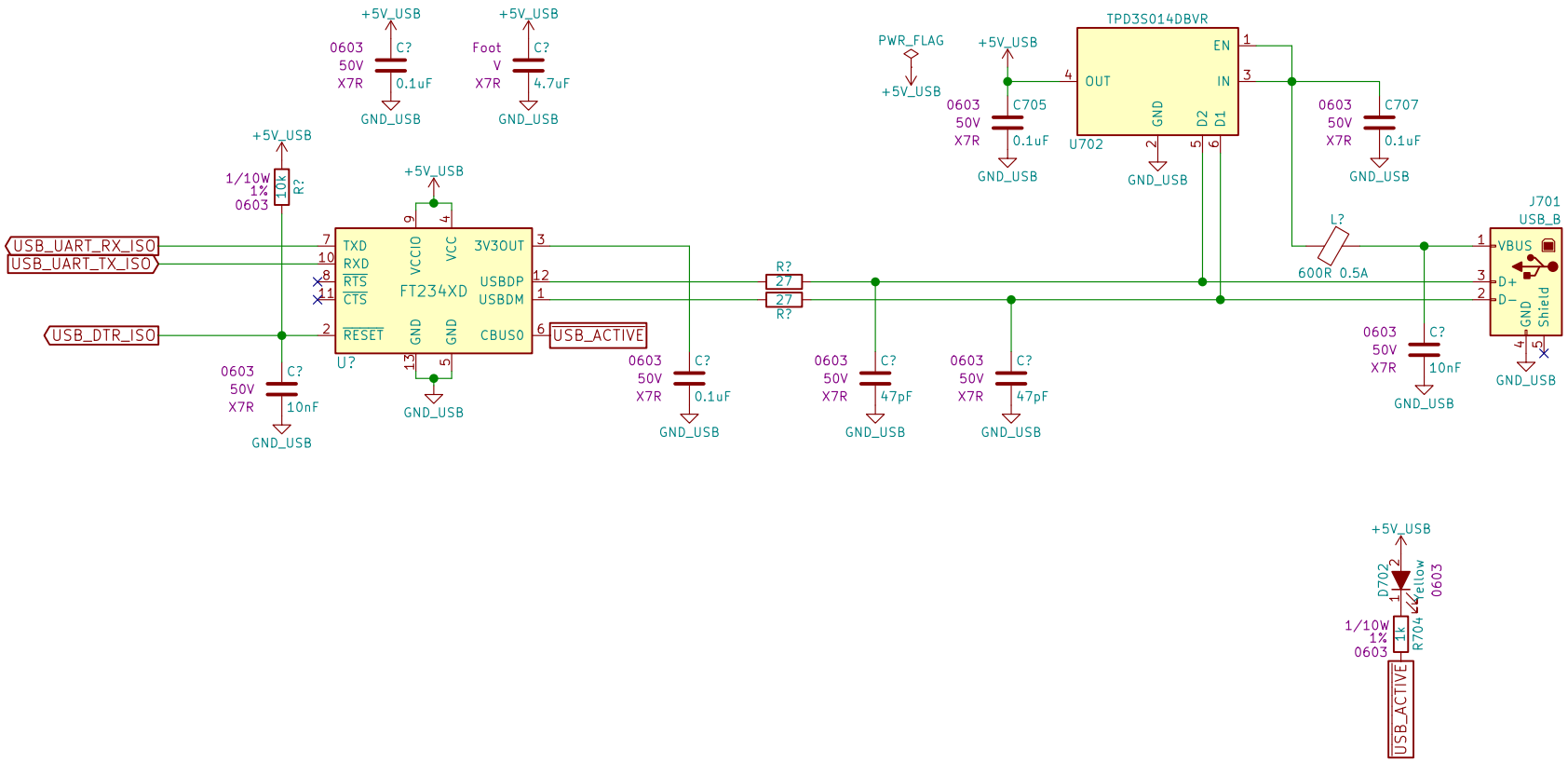

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Size: A	Date:	**Rev:**
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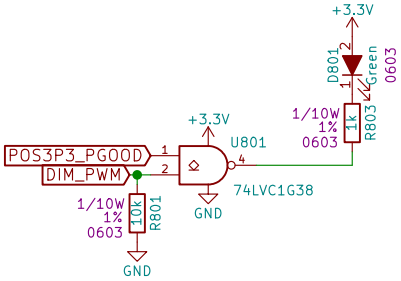

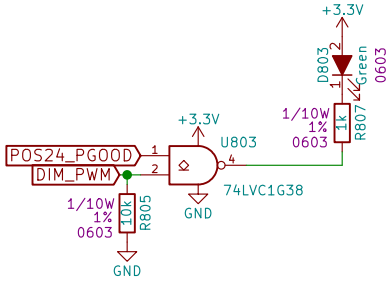

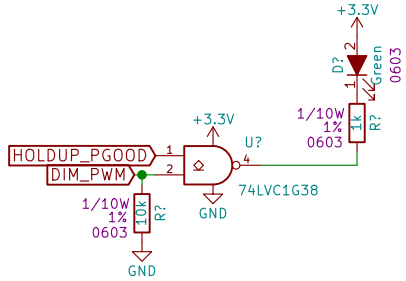

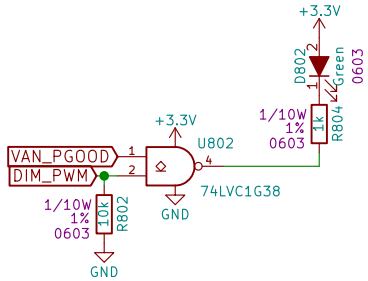

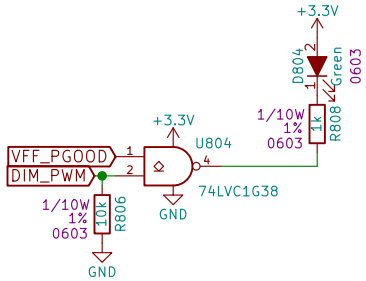

Sheet: /PGOOD Indicators/
File: PGOOD_Indicators.sch

Title:

Size: A	Date:	**Rev:**
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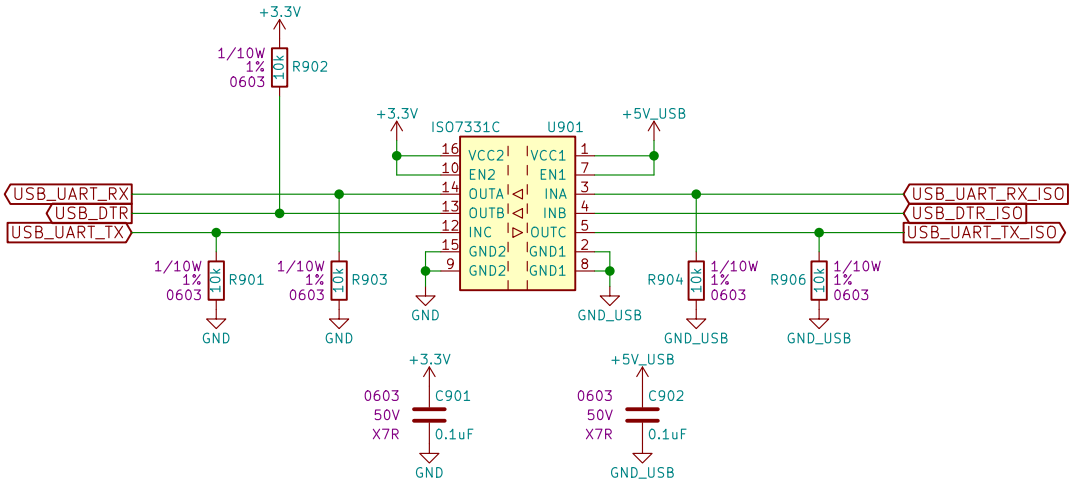

Sheet: /UART Isolation/		
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Title:		
Size: A	Date:	**Rev:**
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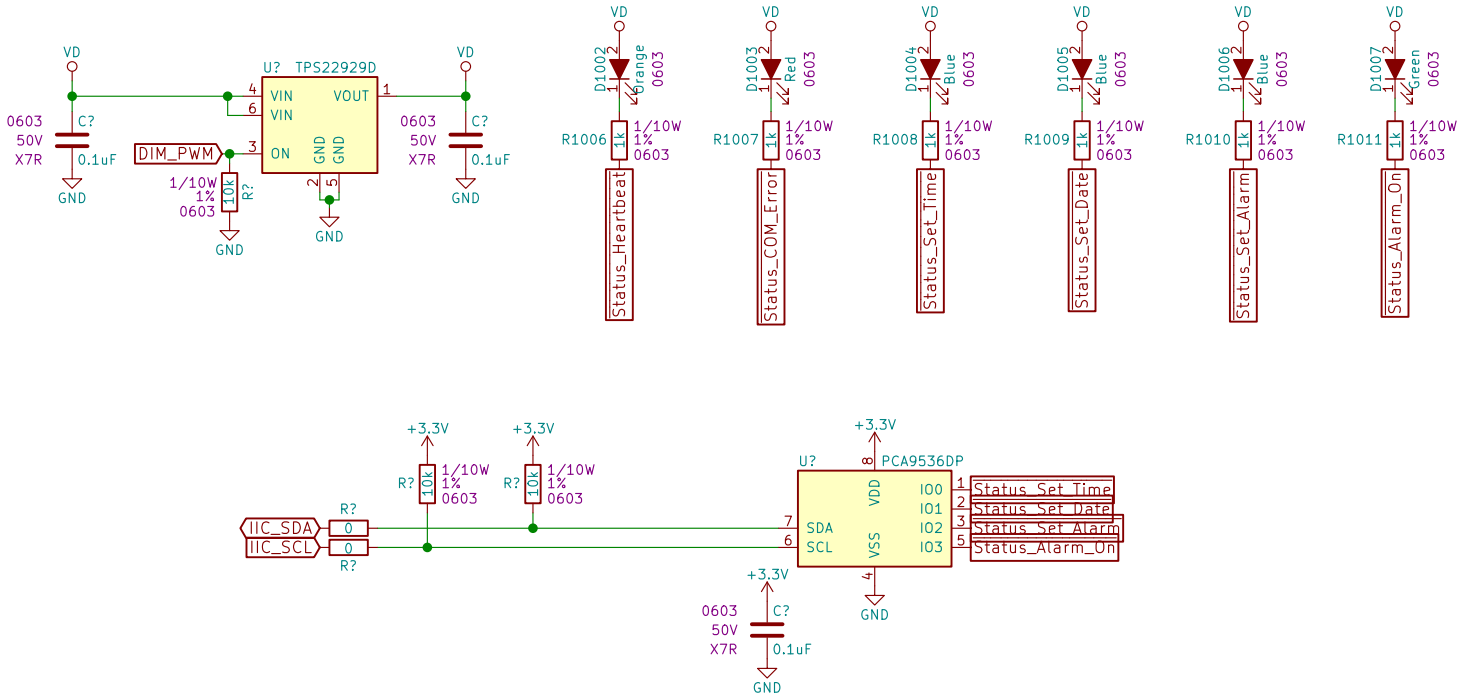

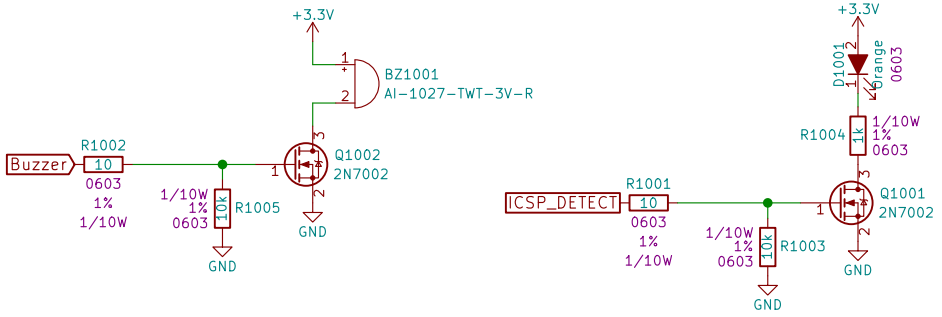

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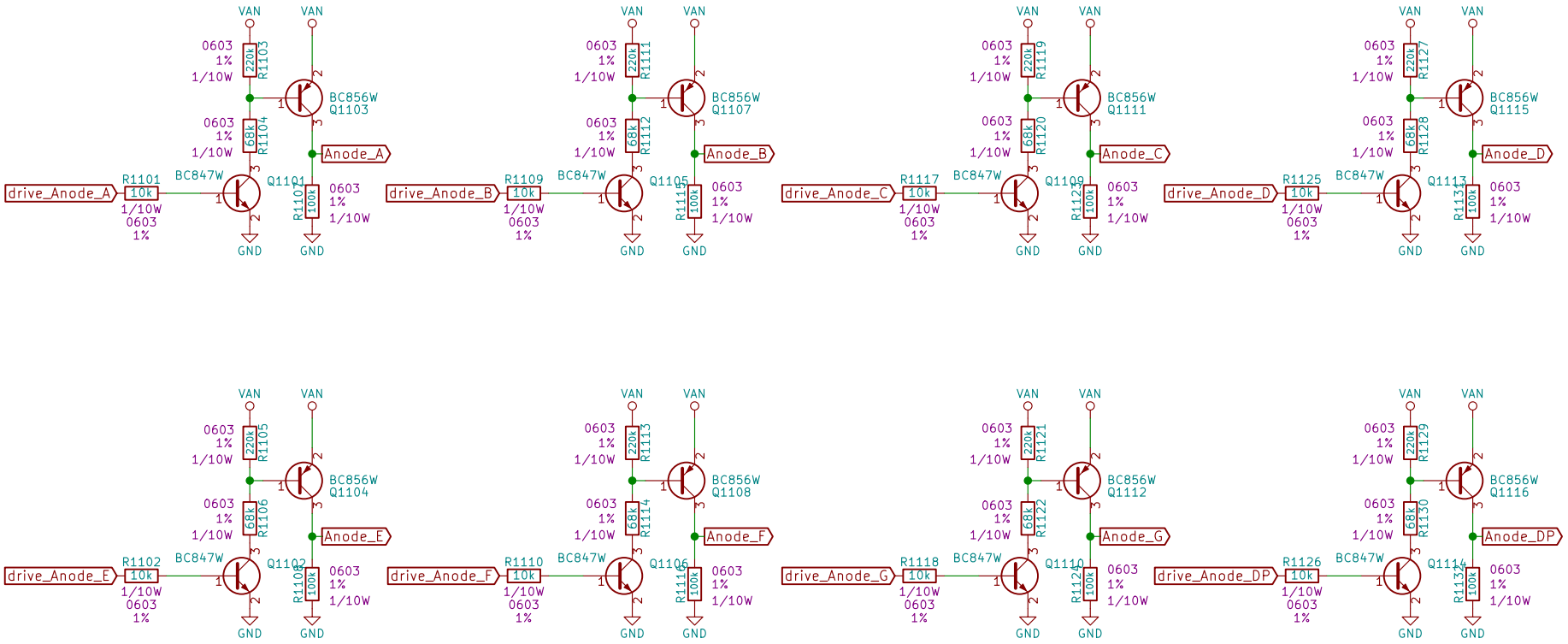

Sheet: /Anode Drivers/
File: AnodeDrivers.sch

Title:

Size: A	Date:	**Rev:**
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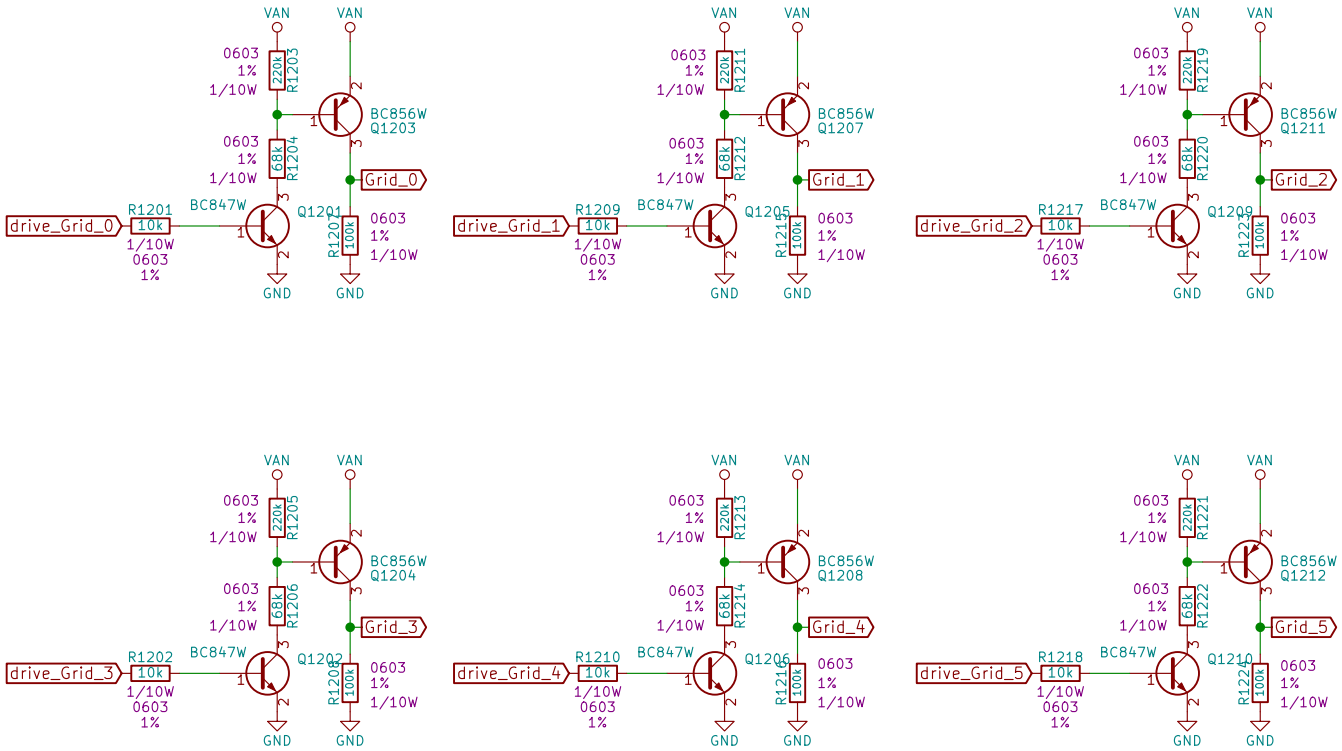

Sheet: /Grid Drivers/ File: GridDrivers.sch		
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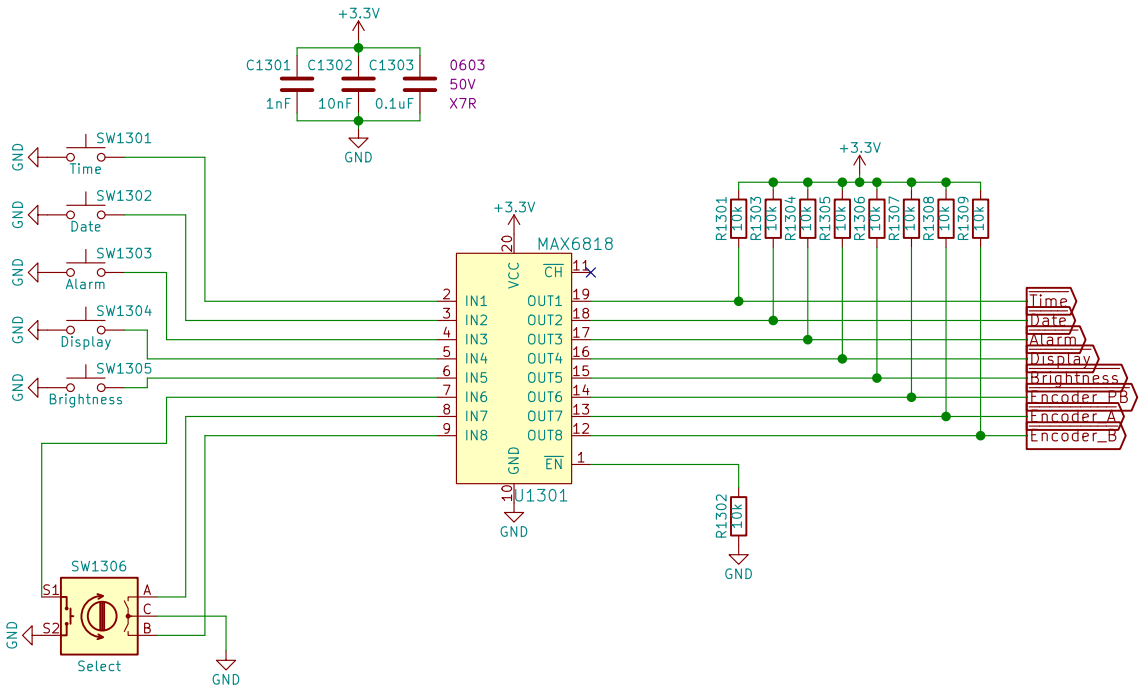

Sheet: /Pushbuttons/		
File: Pushbuttons.sch		
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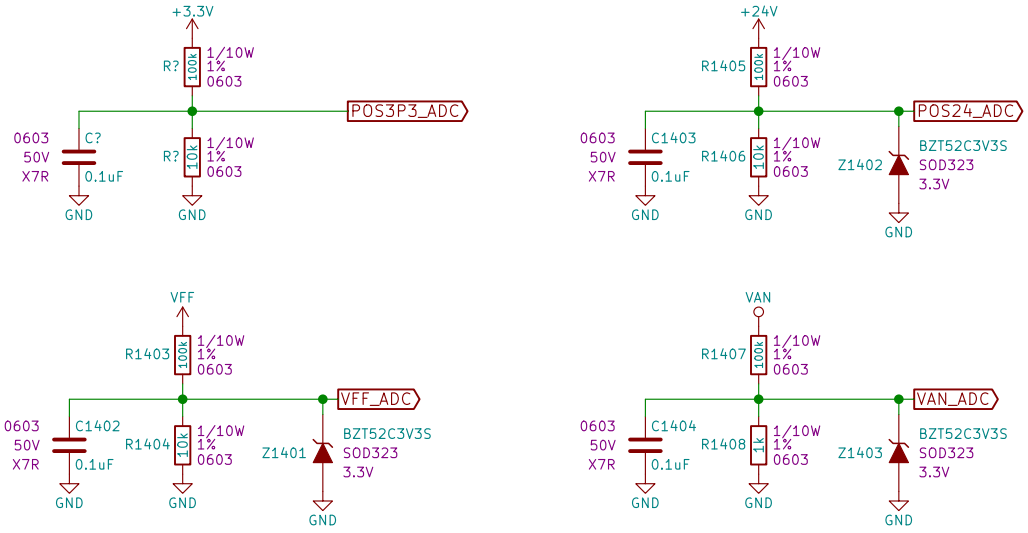
KiCad E.D.A. kicad (5.0.0-rc3-dev-11-geaf938c7e)		Id: 13/22



Sheet: /Analog Inputs/ File: AnalogInputs.sch		
Title:		
Size: A	Date:	**Rev:**
KiCad E.D.A. kicad (5.0.0-rc3-dev-11-geaf938c7e)		Id: 14/22

* All of PORTC should be configured as open drain outputs for sinking current from LEDs
* All of PORTA is used for ADC measurments/external oscillator
* Most of PORTD is used for driving grid switches, can be set up as a 6 bit structure located at the PORTC memory address
* All of PORTF is used for driving anode switches, so smae thing as above with 8 bits
* All of PORTE is used for measuring pushbuttons so all should be set as inputs with IOC's enabled
* Same with PORTB except with only 6 bits, and used for generic input logic signals
* RD0 and RD1 should be routed to SMT1 and SMT2 so that the signal measurement timers can be used to measure dipslay update rate and refresh rate
* RG3 should be configured as an output for a CCPx module to produce a PWM signal for dimming LEDs on the board. Display itself will be dimmed in software by adjusting the on time
* EUSART5 must be used for USB serial communication since only this module can be routed to PORTG
* RG0 and RG1 will be the inputs to CCPx modules to measure the switching frequency (maybe duty cycle as well) of VFF and VAN supplies
* RG4 should be set/cleared every other display refresh cycle, and the input snese ciruit queued when cleared, so that energy/charge per display cycle can be measured
* While operating, the external 16MHz clock with internal 4x PLL will yield an FOSC of 64MHz. While the display is off, FOSC should be switched to something slower internally to minimize power consumption

Sheet: /Firmware Notes/ File: FirmwareNotes.sch		
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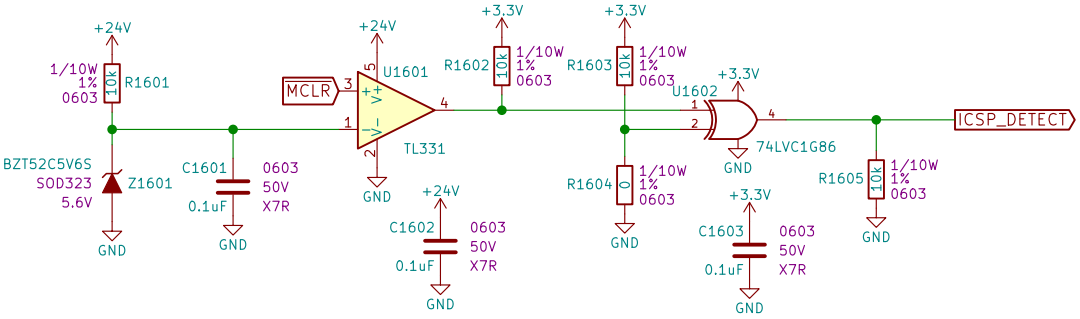

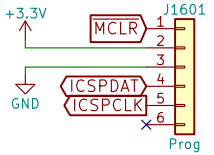

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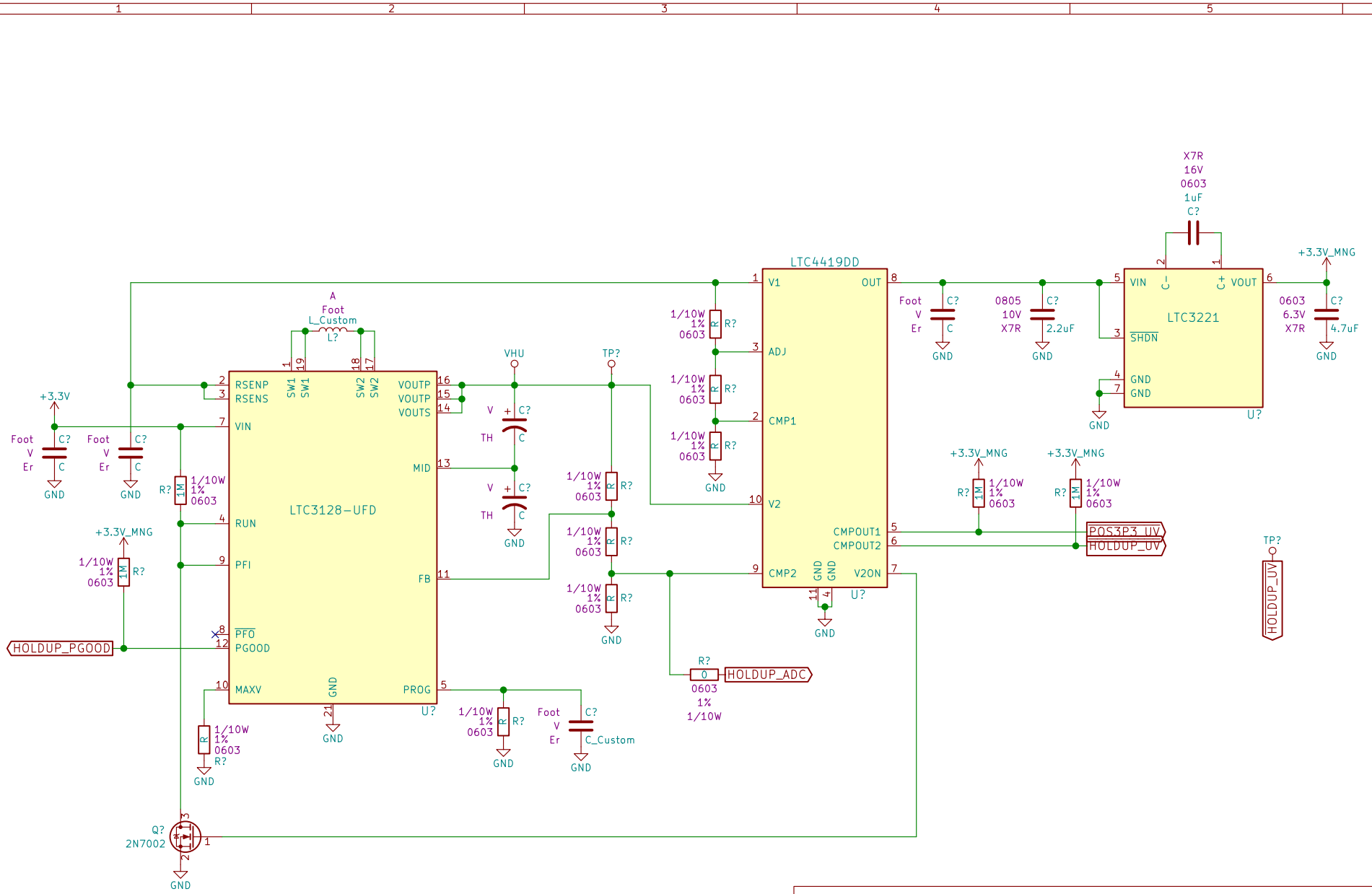
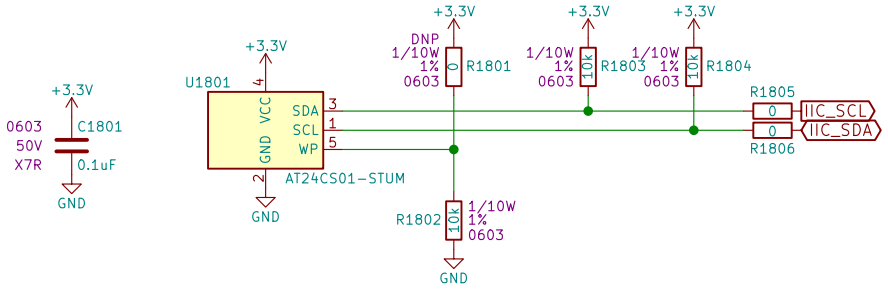
KiCad E.D.A. kicad (5.0.0-rc3-dev-11-geaf938c7e)		Id: 16/22


LTC3128-UFD
LTC4419DD
LTC3221
HOLDUP_PGOOD
HOLDUP_ADC
POS3P3_UV
HOLDUP_UV
2N7002
+3.3V
+3.3V_MNG
GND
VHU
TP?
Sheet: /Backup Supply/
File: BackupSupply.sch
Title:
Size: A
Date:
Rev:
KiCad E.D.A. kicad (5.0.0-rc3-dev-11-geaf938c7e)
Id: 17/22



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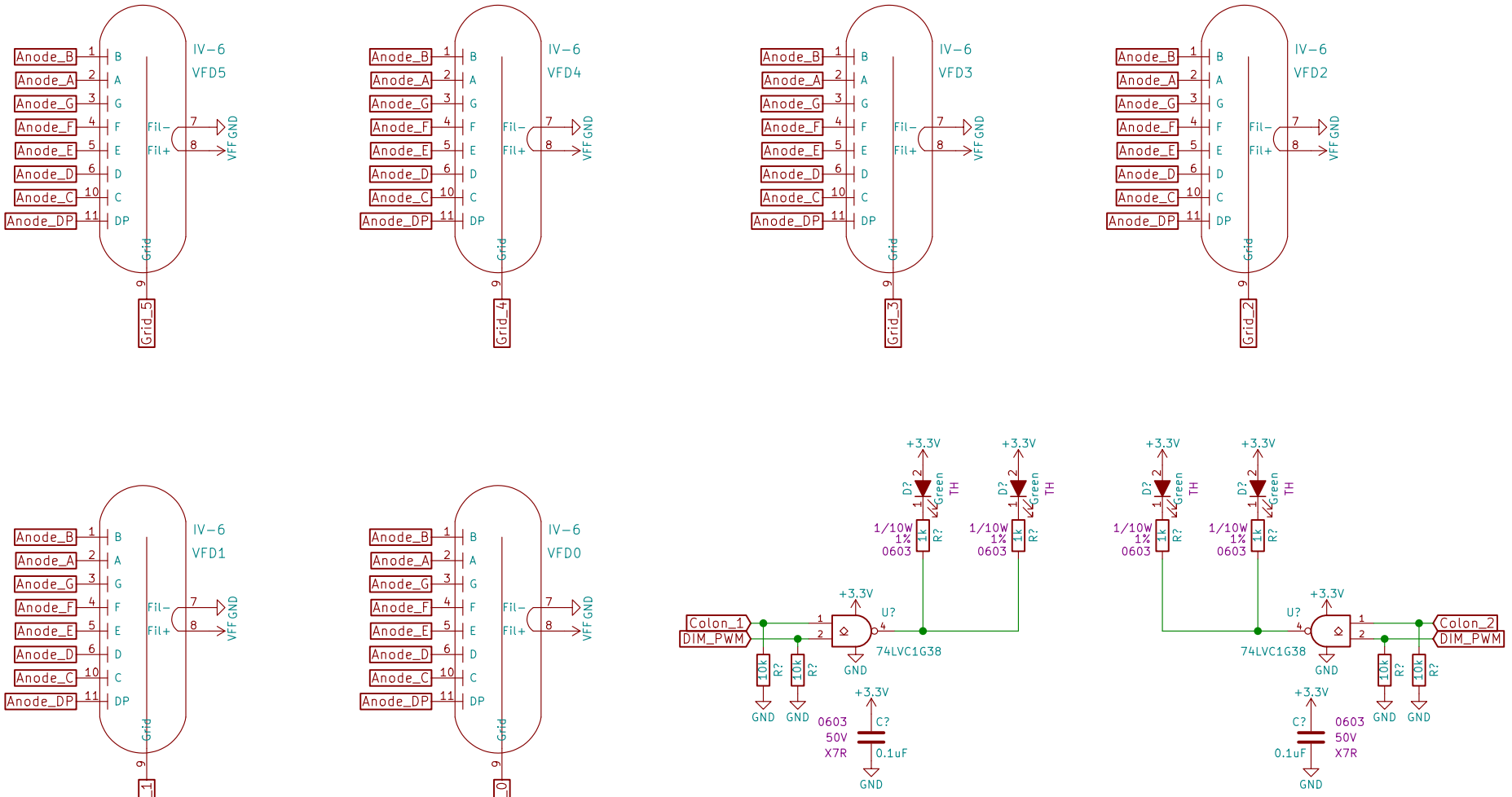
KiCad E.D.A. kicad (5.0.0-rc3-dev-11-geaf938c7e)		Id: 18/22



Sheet: /Display/		
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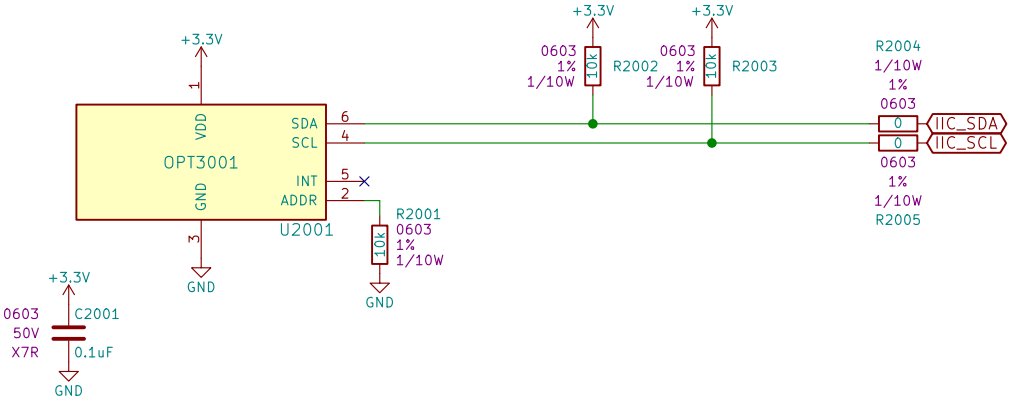

Sheet: /Ambient Light Sensor/ File: Ambient_Light_Sensor.sch		
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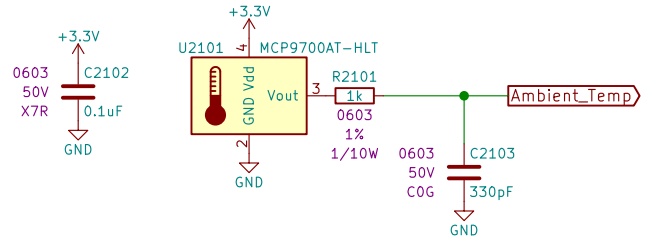
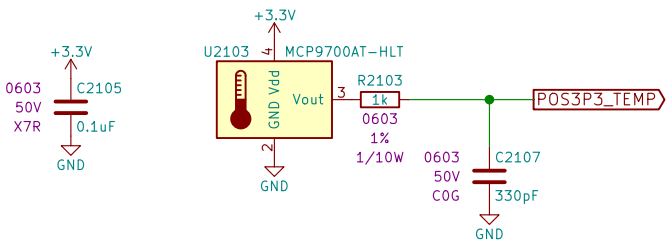
Size: A	Date:	**Rev:**
KiCad E.D.A. kicad (5.0.0-rc3-dev-11-geaf938c7e)		Id: 20/22

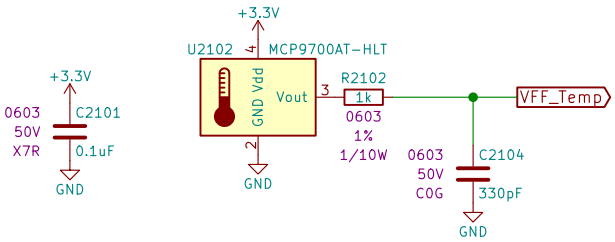
Place away from heating components



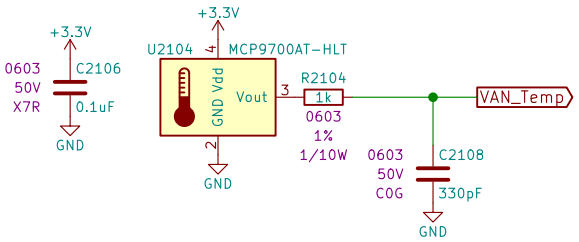
Place near POS3P3 power supply



Place near VFF power supply



Place near VAN power supply



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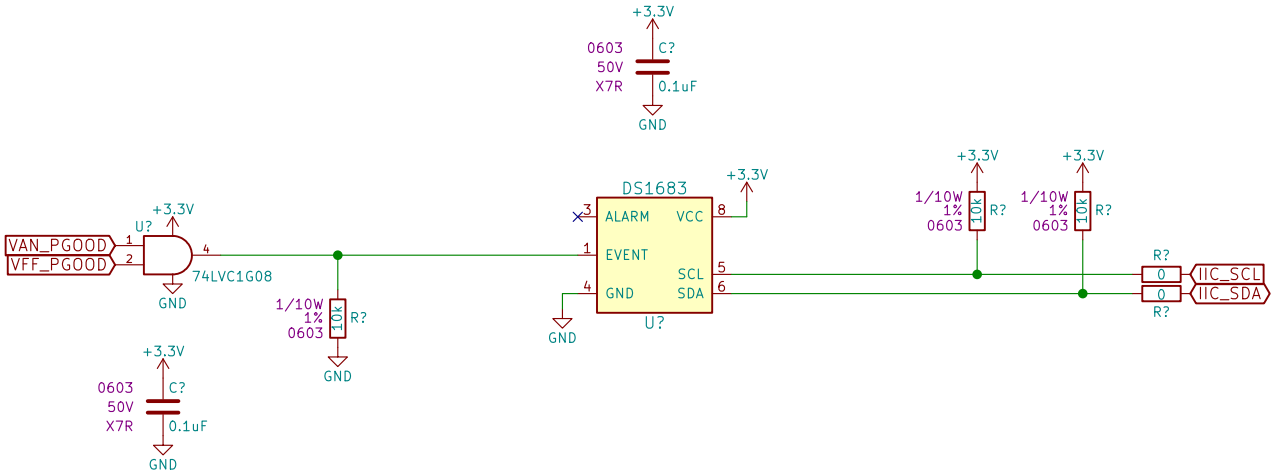

Sheet: /Tube Life Timer/		
File: Tube_Life_Timer.sch		
Title:		
Size: A	Date:	**Rev:**
KiCad E.D.A. kicad (5.0.0-rc3-dev-11-geaf938c7e)		Id: 22/22