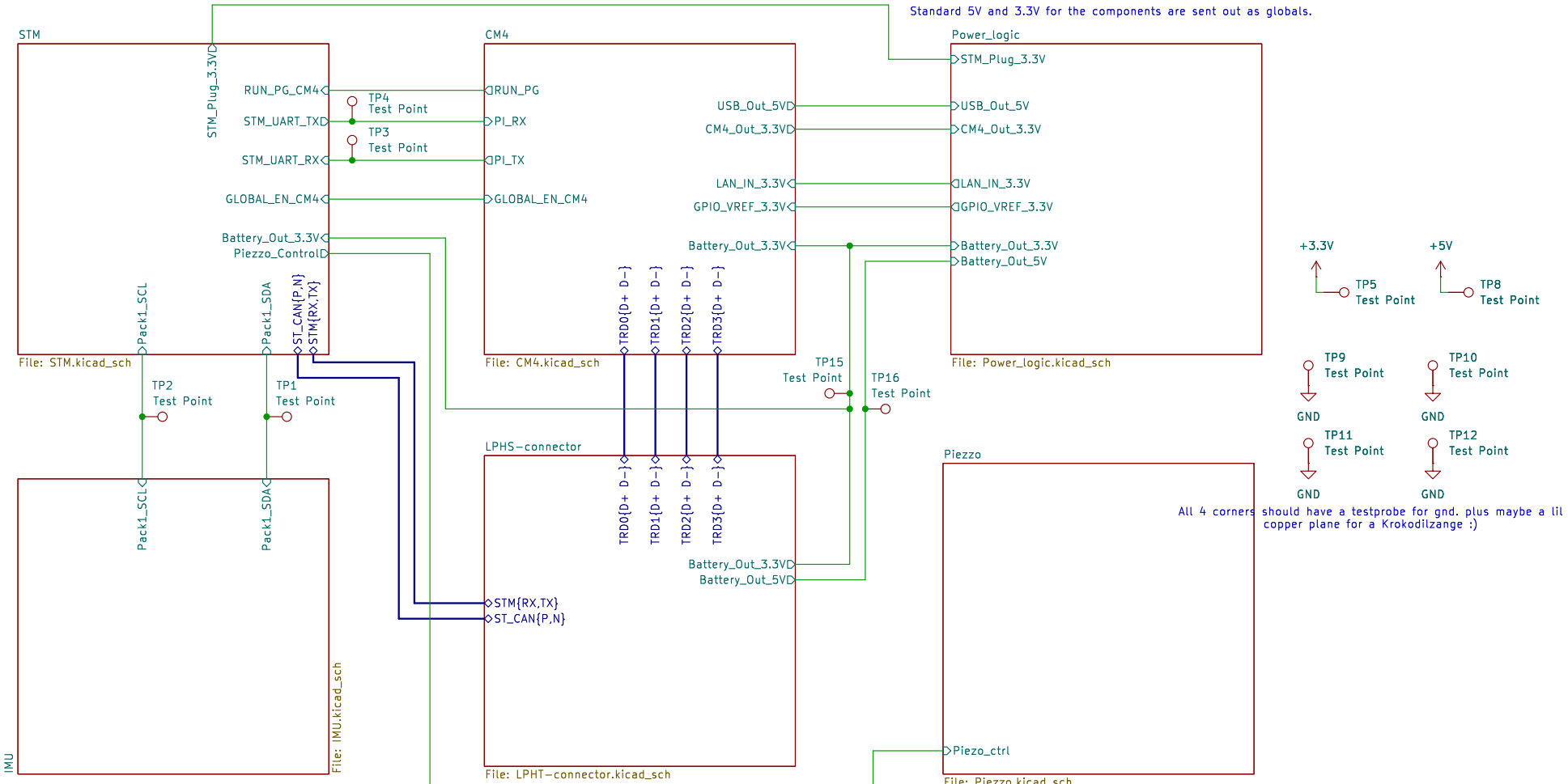



Changelog:

+ Added Bus where it seems reasonable.
+ Added unified LED symbol (Red power, Yellow data)
+ Added Buzzer logic and Buzzer
+ Added Sheet titles, Authors, Date, Revision
+ Added ESD protection on all Plugs (not sure if 3.3V is correct like that)

- Removed Overengineered Power distribution system
+ Implemented simpler Power distribution system
- Reduced Globals to a minimum, used +3.3V and +5V for voltage of parts
+ Introduced a lot of TestPoints with symbol that catches the eye fast.

* Redesigned some Symbols
* Cleaned up rubbish and wiring sphagetti

- Removed PCB for new layout. (WIP)

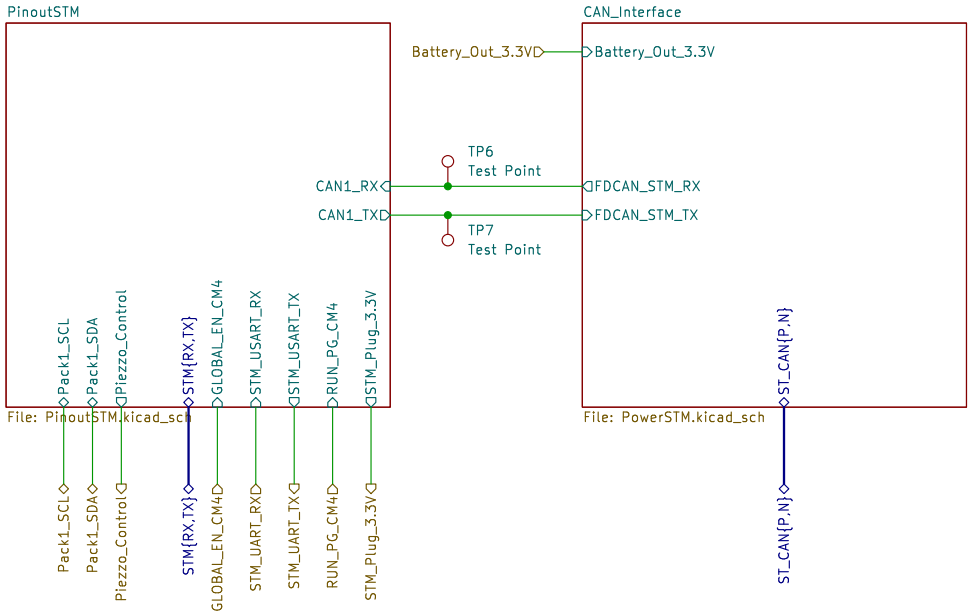
Notes:
-> Fan not yet updated, still a screw terminal.
-> Piezzo randomly connected to an STM Pin. Evan should check this.
-> PCB in the making.
Issue: Footprint and Model for SSD holder not present anymore @evan

20.11.2025
Switched R18 from 1k to 2.2k for equal led strength

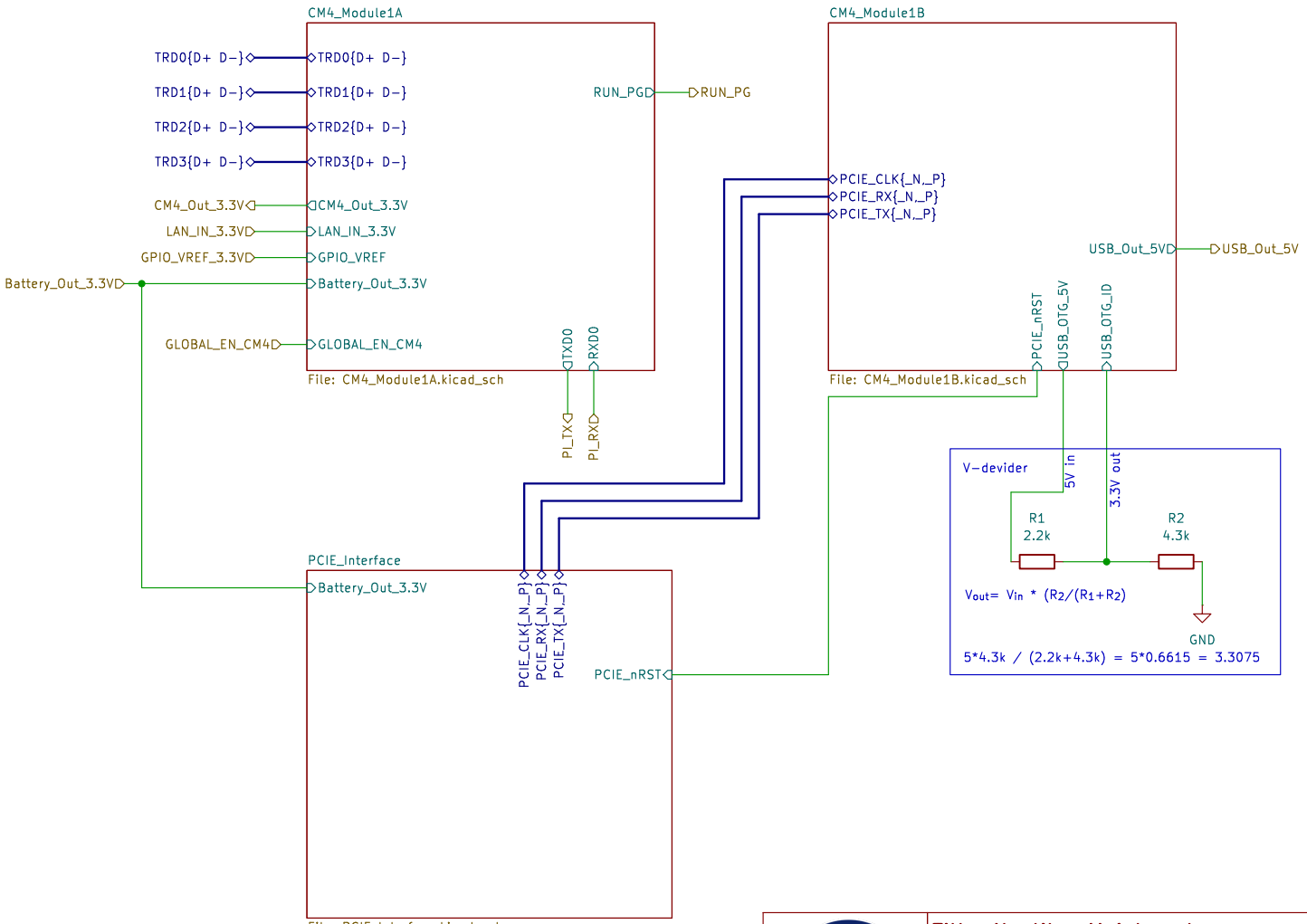
+ Added more routing in PCB.

**Title: Nautilus_Mainboard**

| | | |
|---|---|---|
| Sheet: / | | Rev: 0 |
| Author: Evan & Davide | | |
| Date: 2025-11-19 | Size: A4 | Id: 1/20 |
| File: nautilus_mainboard.kicad_sch | | |



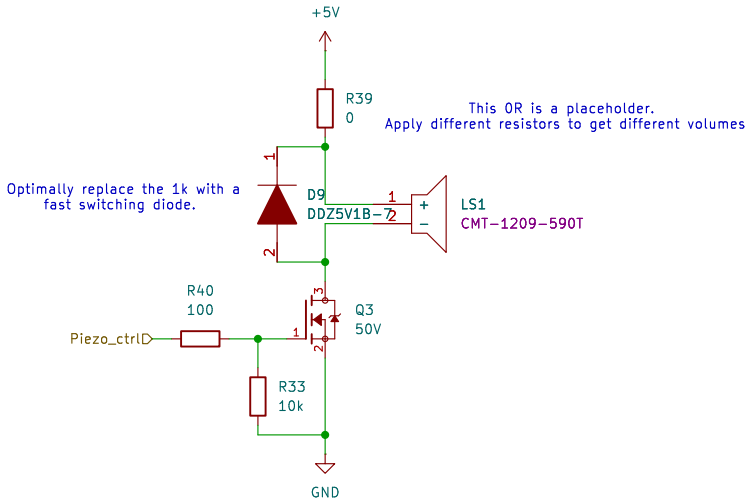

| | | |
|---|---|---|
| **Title: Nautilus_Mainboard** | | |
| Sheet: /STM/ | | Rev: 0 |
| Author: Evan | | |
| Date: 2025-11-19 | Size: A4 | Id: 2/20 |
| File: STM.kicad_sch | | |



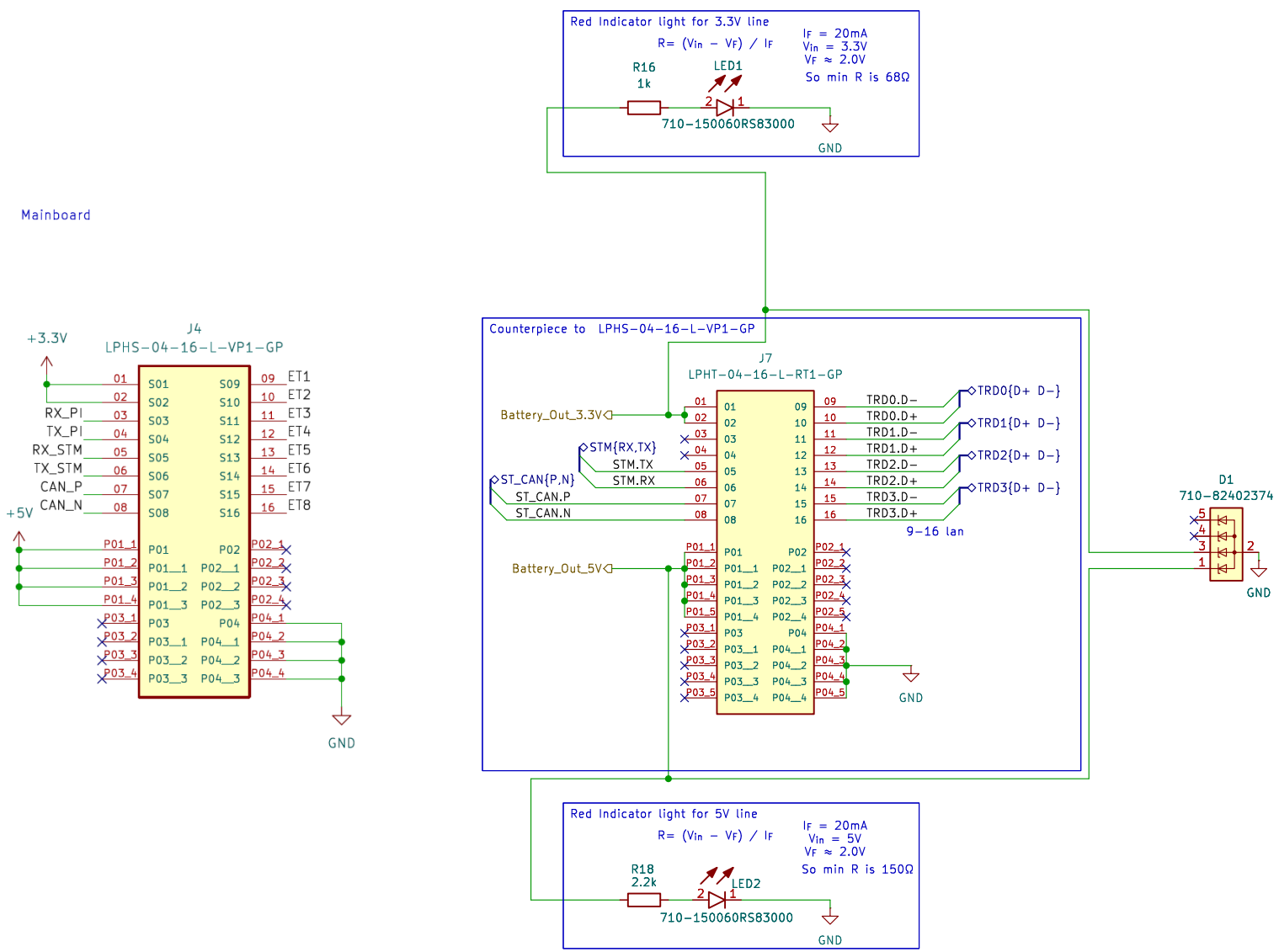

**Title: Nautilus_Mainboard**

| | | |
|---|---|---|
| Sheet: /CM4/ | | Rev: 0 |
| Author: Davide | | |
| Date: 2025−11−19 | Size: A4 | Id: 3/20 |
| File: CM4.kicad_sch | | |

Not in the PCB yet as we dont know if we actually need it.




| | | | |
|---|---|---|---|
| **Title: Nautilus_Mainboard** | | | |
| Sheet: /Piezzo/ | | | Rev: 0 |
| Author: Evan | | | |
| Date: 2025-11-19 | Size: A4 | | Id: 4/20 |
| File: Piezzo.kicad_sch | | | |




**Title: Nautilus_Mainboard**

| | | |
|---|---|---|
| Sheet: /LPHS−connector/ | | Rev: 1 |
| Author: Davide, Evan | | |
| Date: 2025−11−19 | Size: A4 | Id: 14/20 |
| File: LPHT−connector.kicad_sch | | |

some rules:
USB wont power the STM32.
STM_Plug wont power the CM4
The GPIO_VREF of the CM4 needs to be STM32's 3.3V
The Lan Vin is only powered when running on Battery
Battery preferrably powers everything.

Whenever the CM4 runs, also run the LED signals AND the SSD voltage. all "core" tasks tied to the CM4.

Different Power Sources.

Reference power sources

Battery

Battery_Out_3.3V

Battery_Out_5V

STM_Plug

STM_Plug_3.3V

CM4 Vout

CM4_Out_3.3V

USB Cable

USB_Out_5V

Lan only if plugged in (battery)

R46 0

place to deactivate

R47 0

3.3V_Logic

R44 0

Battery_Out_3.3V

R45 0

STM_Plug_3.3V

STM_In_3.3V

place to activate

File: 3.3V_Logic.kicad_sch

LAN_IN_3.3V

+3.3V

Red Indicator light for 3.3V line

R= (Vin − VF) / IF

IF = 20mA
Vin = 3.3V
VF ≈ 2.0V
So min R is 68Ω

R24 1k

LED9

710-150060RS83000

GND

R38 0

place to deactivate

R41 0

GPIO_REF3.3V

R42 0

STM_IN_3.3V

R43 0

CM4_OUT_3.3V

GPIO_VREF_3.3V

place to activate

File: GPIO_REF3.3V.kicad_sch

GPIO_VREF_3.3V

0

place to deactivate

0

5V_Logic

R35

R36 0

Battery_Out_5V

R37 0

USB_Out_5V

CM4_In_5V

place to activate

File: 5V_Logic.kicad_sch

+5V

Red Indicator light for 5V line

R= (Vin − VF) / IF

IF = 20mA
Vin = 5V
VF ≈ 2.0V
So min R is 150Ω

R25 1k

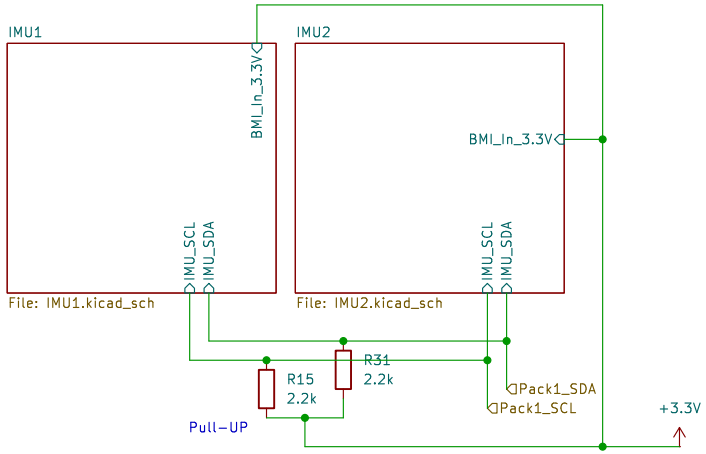
LED10

710-150060RS83000

GND

**Title: Nautilus_Mainboard**

| | | |
|---|---|---|
| Sheet: /Power_logic/ | | Rev: 1 |
| Author: Davide | | |
| Date: 2025-11-19 | Size: A4 | Id: 14/20 |
| File: Power_logic.kicad_sch | | |




| | | |
|---|---|---|
| **Title: Nautilus_Mainboard** | | |
| Sheet: /IMU/ | | Rev: 0 |
| Author: Davide | | |
| Date: 2025-11-19 | Size: A4 | Id: 18/20 |
| File: IMU.kicad_sch | | |

Module1A
DF40C-100DS-0.4V(51)

GPIO

NB SD signals are only available on modules without eMMC

connect Wlan to gnd if off, and leave floating for on.
Please use a 2 pin connector here with a jumper cap. (has to be done)

**GLOBAL_EN needs to be pulled low for >1ms after software shutdown.**

Ethernet connection

CM4_Ethernet

File: CM4_Ethernet.kicad_sch

GLOBAL_EN logic

Q2
50V

Decoupling for CM4 5V inputs

| | |
|---|---|
| Title: | Nautilus_Mainboard |
| Sheet: | /CM4/CM4_Module1A/ |
| Rev: | 0 |
| Author: | Davide |
| Date: | 2025-11-19 |
| Size: | A4 |
| Id: | 5/20 |
| File: | CM4_Module1A.kicad_sch |

Fan controller

J5
1792876

I am a fan.

+5V

R3
1k

Q1
50V

EXTERNALFAN5V1

J2
61300211121

Fan_ctrl

GND

Connected to PB7

fan only active when battery is connected.
Mby add an external power pin to externally power the fan for testing.

FAN

This part should be changed... implement directly a fan
not this 3 pin screw terminal that I randomly found @evan

External interfaces

GND

710-82402374
D4

FTSH-107-02-L-DV
J1

Vdd
JTAG_TMS/SWDIO
JTAG_TCK/SWCLK
JTAG_TDO/SWO
JTAG_ TDI
nRST
USART1_TX
USART1_RX
GND

710-82402374
D3

710-82402374
D2

3v3 ext was first implemented here

STM_Plug_3.3V
USART1_RX
USART1_TX
STM_BOOT0
GND

J4
22284054

R4
10k

SW1
B3F-1052

nRST
C19
100nF

IC1
STM32H7B0RBT6

Vdd
Vss
Pack1_SDA
Pack1_SCL
STM_BOOT0
Fan_ctrl
JTAG_TDO/SWO
JTAG_ TDI
JTAG_TCK/SWCLK

VBAT
PC13
PC14-OSC32_IN
PC15-OSC32_OUT
PH0-OSC_IN
PH1-OSC_OUT
NRST
PC0
PC1
PC2
PC3
VSSA
VDDA
PA0
PA1
PA2

VDD_3
VSS_3
VCAP_2
PA13
PA12
PA11
PA10
PA9
PA8
PC9
PC7
PC6
PB15
PB14
PB13
PB12

JTAG_TMS/SWDIO
CAN1_TX
CAN1_RX
USART1_RX
USART1_TX

CAN1_TX
CAN1_RX

C15
2.2pF

C9
15pF

Y1
32.768 kHz

OUTPUT_
GND
+VS
STANDBY_OPERATION

+3.3V

RUN_PG_CM4
GLOBAL_EN_CM4
STM{RX,TX}
STM.TX
STM.RX
USART2_TX
must be hiarchical table RX,TX

Piezzo_Control

Chose a Pin here please.
I chose 7 but please make sure its an actual pin evan. I just gambled.
For review: if this pin is incorrect, Im sorry. I just guessed
please let me know so that I can tell evan if it needs to be changed.

+3.3V
logic handled in power section

STM_USART_RX
USART2_RX
SPI1_NSS
SPI1_SCK
SPI1_MISO
SPI1_MOSI

C10
2.2pF

C8 100nF
C11 100nF
C12 100nF
C13 100nF
C14 100nF
C17 100nF
C18 100nF
C16 10uF

**STDC14 for STLINK-V3MINI (STM32 JTAG/SWD and VCP)**

Figure 11. CN5 STDC14 connector (Top view)

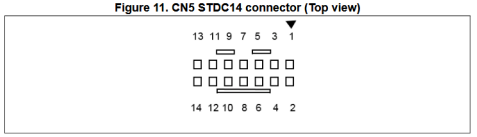



Table 4. CN5 STDC14 connector pinout

| STDC14 Pin # | ARM10 Pin # | Pin description | Type |
|---|---|---|---|
| 1 | - | Reserved(1) | - |
| 2 | - | Reserved(1) | - |
| 3 | 1 | T_VCC(2) | I |
| 4 | 2 | T_JTMS/T_SWDIO | I/O |
| 5 | 3 | GND | S |
| 6 | 4 | T_JCLK/T_SWCLK | O |
| 7 | 5 | GND | S |
| 8 | 6 | T_JTDO/T_SWO(3) | I |
| 9 | 7 | T_JCLK | O |
| 10 | 8 | T_JTDI/NC(4) | O |
| 11 | 9 | GNDDetect | O |
| 12 | 10 | T_NRST | O |
| 13 | - | T_VCP_RX | O |
| 14 | - | T_VCP_TX | I |

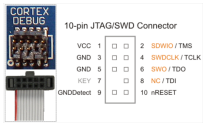
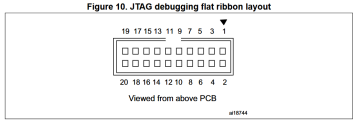



Figure 10. JTAG debugging flat ribbon layout



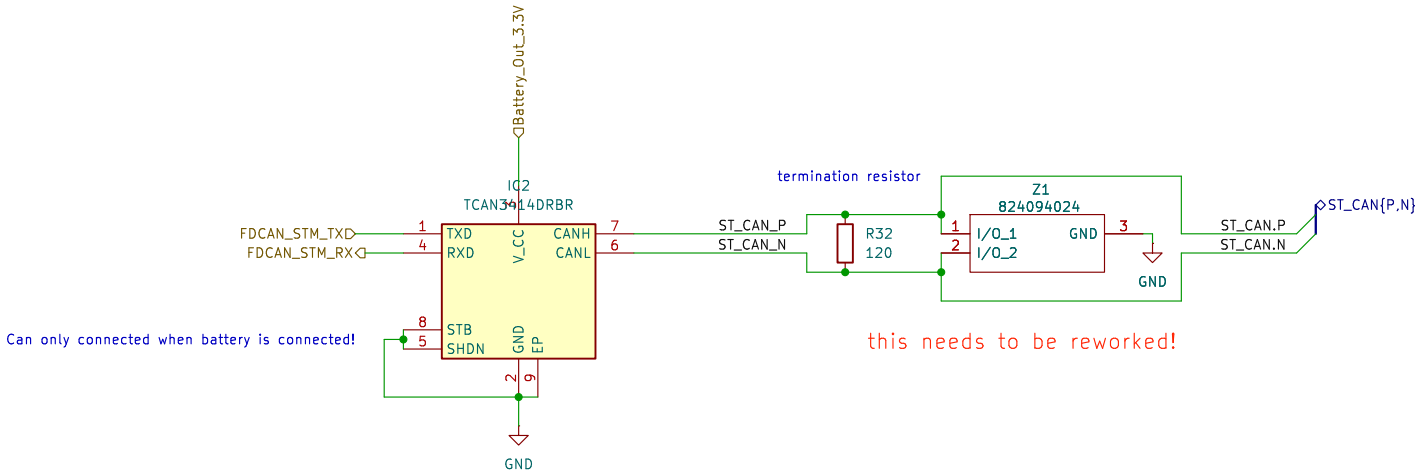

**Title: Nautilus_Mainboard**

Sheet: /STM/PinoutSTM/ | Rev: 0

Author: Evan

Date: 2025-11-19 | Size: A4 | Id: 6/20

File: PinoutSTM.kicad_sch




| | | |
|---|---|---|
| **Title: Nautilus_Mainboard** | | |
| Sheet: /STM/CAN_Interface/ | | Rev: 1 |
| Author: Evan & Davide | | |
| Date: 2025-11-19 | Size: A4 | Id: 7/20 |
| File: PowerSTM.kicad_sch | | |

Module1B
DF40C-100DS-0.4V(51)

Can be kept floating. if no usb is connected

PCIE_CLK{_N,_P}
PCIE_CLK._P
PCIE_CLK._N
PCIE_RX{_N,_P}
PCIE_RX._P
PCIE_RX._N
PCIE_TX{_N,_P}
PCIE_TX._P
PCIE_TX._N

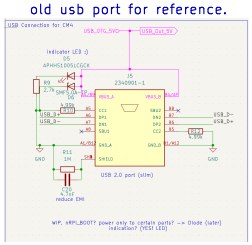
maybe RX and TX need to be switched

| | | | |
|---|---|---|---|
| 102 | PCIe_CLK_nREQ | USB_OTG_ID | 101 |
| 104 | Reserved | USB2_N | 103 |
| 106 | Reserved | USB2_P | 105 |
| 108 | GND | GND | 107 |
| 110 | PCIe_CLK_P | PCIe_nRST | 109 |
| 112 | PCIe_CLK_N | VDAC_COMP | 111 |
| 114 | GND | GND | 113 |
| 116 | PCIe_RX_P | CAM1_D0_N | 115 |
| 118 | PCIe_RX_N | CAM1_D0_P | 117 |
| 120 | GND | GND | 119 |
| 122 | PCIe_TX_P | CAM1_D1_N | 121 |
| 124 | PCIe_TX_N | CAM1_D1_P | 123 |
| 126 | GND | GND | 125 |
| 128 | CAM0_D0_N | CAM1_C_N | 127 |
| 130 | CAM0_D0_P | CAM1_C_P | 129 |
| 132 | GND | GND | 131 |
| 134 | CAM0_D1_N | CAM1_D2_N | 133 |
| 136 | CAM0_D1_P | CAM1_D2_P | 135 |
| 138 | GND | GND | 137 |
| 140 | CAM0_C_N | CAM1_D3_N | 139 |
| 142 | CAM0_C_P | CAM1_D3_P | 141 |
| 144 | GND | HDMI1_HOTPLUG | 143 |
| 146 | HDMI1_TX2_P | HDMI1_SDA | 145 |
| 148 | HDMI1_TX2_N | HDMI1_SCL | 147 |
| 150 | GND | HDMI1_CEC | 149 |
| 152 | HDMI1_TX1_P | HDMI0_CEC | 151 |
| 154 | HDMI1_TX1_N | HDMI0_HOTPLUG | 153 |
| 156 | GND | GND | 155 |
| 158 | HDMI1_TX0_P | DSI0_D0_N | 157 |
| 160 | HDMI1_TX0_N | DSI0_D0_P | 159 |
| 162 | GND | GND | 161 |
| 164 | HDMI1_CLK_P | DSI0_D1_N | 163 |
| 166 | HDMI1_CLK_N | DSI0_D1_P | 165 |
| 168 | GND | GND | 167 |
| 170 | HDMI0_TX2_P | DSI0_C_N | 169 |
| 172 | HDMI0_TX2_N | DSI0_C_P | 171 |
| 174 | GND | GND | 173 |
| 176 | HDMI0_TX1_P | DSI1_D0_N | 175 |
| 178 | HDMI0_TX1_N | DSI1_D0_P | 177 |
| 180 | GND | GND | 179 |
| 182 | HDMI0_TX0_P | DSI1_D1_N | 181 |
| 184 | HDMI0_TX0_N | DSI1_D1_P | 183 |
| 186 | GND | GND | 185 |
| 188 | HDMI0_CLK_P | DSI1_C_N | 187 |
| 190 | HDMI0_CLK_N | DSI1_C_P | 189 |
| 192 | GND | GND | 191 |
| 194 | DSI1_D3_N | DSI1_D2_N | 193 |
| 196 | DSI1_D3_P | DSI1_D2_P | 195 |
| 198 | GND | GND | 197 |
| 200 | HDMI0_SCL | HDMI0_SDA | 199 |

High Speed Serial

GND GND

old usb port for reference.



ESD protection for the USB

Super important to not differ lengths or curve a lot with D+ and D-. Also should have same hole counts (vias) and same length.

D5
595-TPD2EUSB30DRTR
GND D+ D-
USB_D-
USB_D+
GND

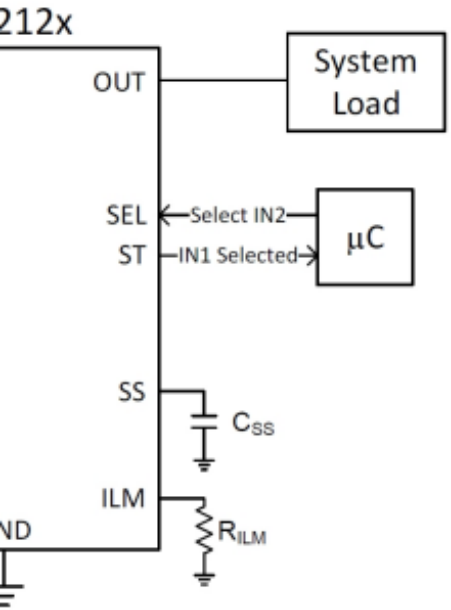
USB Connection for CM4

J3
179-UJ20CHC4SMTTR
VBUS VBUS
DN1 DP1 DN2 DP2
CC1 SBU1 CC2 SBU2
GND GND SHIELD SHIELD SHIELD SHIELD
A12_B1 B12_A1 SH1 SH2 SH3 SH4
USB_D-
USB_D+
USB_D-
USB_D+
4.99k R10
R12 4.99k
R11 1M
C20 4.7nF
GND GND

USB_OTG_5V
USB_Out_5V
710-150060RS83000 R9 1k
LED3
SMF5.0A-TP D6
GND

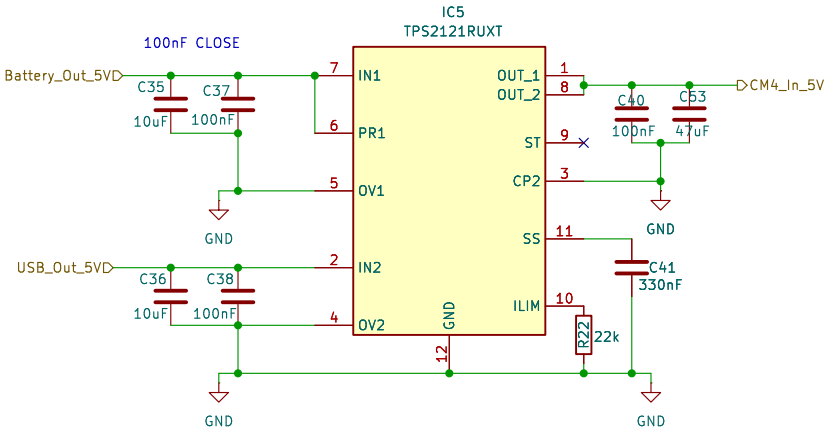
WIP, nRPI_BOOT? power only to certain parts? -> Diode (later)
indication? (YES! LED)

| | | |
|---|---|---|
| Title: Nautilus_Mainboard | | |
| Sheet: /CM4/CM4_Module1B/ | | Rev: 0 |
| Author: Davide | | |
| Date: 2025-11-19 | Size: A4 | Id: 11/20 |
| File: CM4_Module1B.kicad_sch | | |




for questions about wiring etc please consult the datasheet...
https://www.ti.com/lit/ds/symlink/tps2120.pdf?ts=1761678178328

PR1 > CP2 -> IN1 has prio




| | | Pins | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| $V_{IN1}$ , $V_{IN2}$ , $V_{OUT}$ | Maximum Power Pin Voltage | IN1, IN2, OUT | -0.3 | 24 | V |
| $V_{OV1}$ , $V_{OV2}$ | Maximum Overvoltage Pin Voltage | OV1, OV2 | -0.3 | 6 | V |
| $V_{PRI}$ , $V_{SEL}$ | Maximum Control Pin Voltage | PRI, SEL | -0.3 | 6 | V |
| $V_{ST}$ | Maximum Control Pin Voltage | ST | -0.3 | 6 | V |
| $I_{OUT}$ | Maximum Output Current | OUT | Internally Limited | | |
| $T_{J, MAX}$ | Maximum Junction Temperature | | Internally Limited | | |
| $T_{STG}$ | Storage temperature | | -65 | 150 | °C |

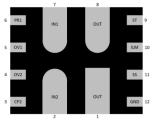


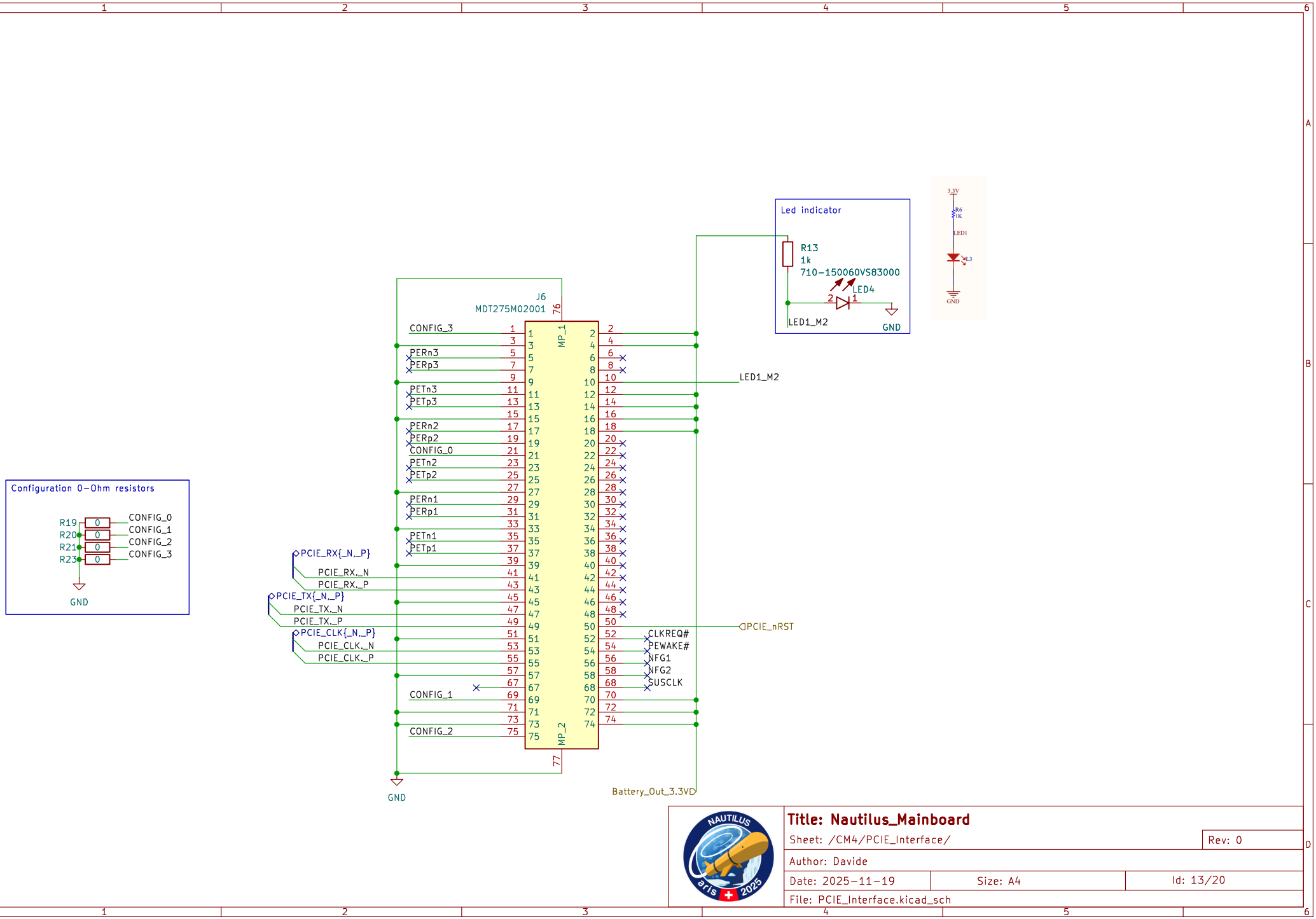
Figure 6-2. TPS2121 (RUX) Package 12-Pin VQFN-HR Bottom View

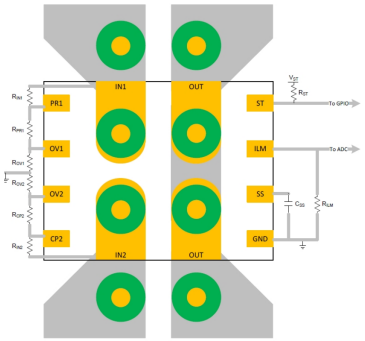
Pin Functions

| PIN | | | I/O | DESCRIPTION |
|---|---|---|---|---|
| NAME | TPS2120 WCSP | TPS2121 VQFN-HR | | |
| IN1 | B1, B2, C1 | 7 | I | Power Input for Source 1 |
| IN2 | B3, B4, C4 | 2 | I | Power Input for Source 2 |
| OUT | C2, C3, D1, D2, D3, D4 | 1, 8 | I | Power Output |
| ST | E1 | 9 | O | Status output indicating which channel is selected. Connect to GND if not required. |
| ILIM | E2 | 10 | O | Output Current Limiting for both channels. |
| SS | E3 | 11 | O | Adjusts Input Setting Delay Time and Output Soft Start Time |
| GND | E4 | 12 | — | Device Ground |
| PR1 | A1 | 6 | I | Enables Priority Operation. Connect to IN1 to set switchover voltage. Connect to GND if not required. |
| OV1 | A2 | 5 | I | Active Low Enable Supervisor for IN1 Overvoltage Protection. Connect to GND if not required. |
| OV2 | A3 | 4 | I | Active Low Enable Supervisor for IN2 Overvoltage Protection. Connect to GND if not required. |
| SEL | A4 | — | I | Active low Enable for IN1. Allows GPIO to override priority operation and manually select IN2. TPS2120 only. |
| CP2 | — | 3 | I | Enables Comparator Operation and is compared to PR1 to set switchover voltage. Connect to GND if not required. TPS2121 only. |

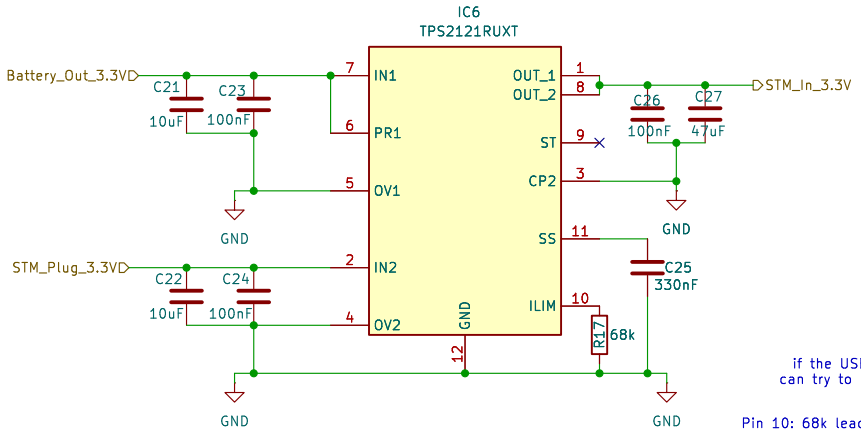
if the USB-only cold start "disconnects" we can try to bump SS to 470nF instead of 330nF.

Title: Nautilus_Mainboard
Sheet: /Power_logic/5V_Logic/
Rev: 0
Author: Davide
Date: 2025-11-19
Size: A4
Id: 12/20
File: 5V_Logic.kicad_sch


Configuration 0-Ohm resistors
R19 0 CONFIG_0
R20 0 CONFIG_1
R21 0 CONFIG_2
R23 0 CONFIG_3
GND
J6
MDT275M02001
MP_1
MP_2
CONFIG_3
PERn3
PERp3
PETn3
PETp3
PERn2
PERp2
CONFIG_0
PETn2
PETp2
PERn1
PERp1
PETn1
PETp1
CONFIG_1
CONFIG_2
PCIE_RX{_N,_P}
PCIE_RX._N
PCIE_RX._P
PCIE_TX{_N,_P}
PCIE_TX._N
PCIE_TX._P
PCIE_CLK{_N,_P}
PCIE_CLK._N
PCIE_CLK._P
LED1_M2
PCIE_nRST
CLKREQ#
PEWAKE#
NFG1
NFG2
SUSCLK
GND
Battery_Out_3.3VD
Led indicator
R13
1k
710-150060VS83000
LED4
LED1_M2
GND
3.3V
R6
1K
LED1
GND
Title: Nautilus_Mainboard
Sheet: /CM4/PCIE_Interface/
Rev: 0
Author: Davide
Date: 2025-11-19
Size: A4
Id: 13/20
File: PCIE_Interface.kicad_sch



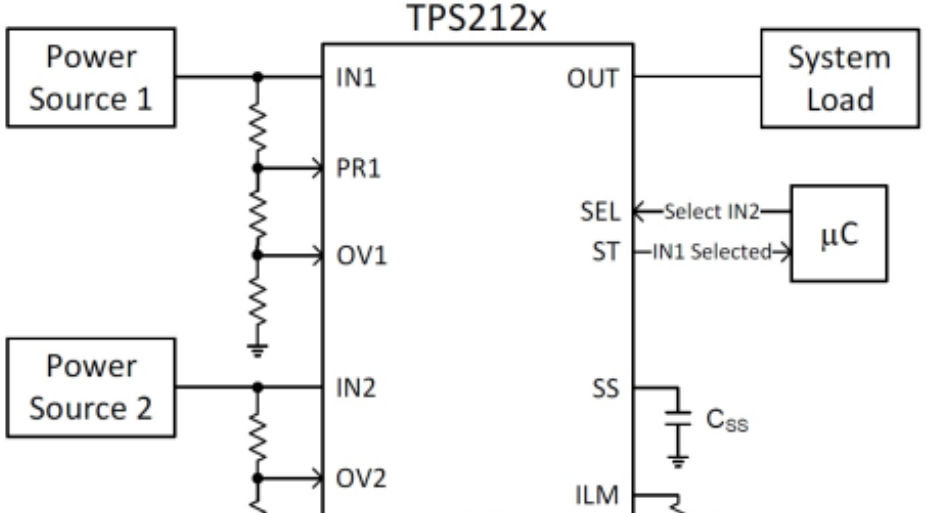

PR1 > CP2 -> IN1 has prio




if the USB-only cold start "disconnects" we can try to bump SS to 470nF instead of 330nF.

Pin 10: 68k leads to about 1.72A (should be enough for STM)

| | |
|---|---|
| [R] = [kOhm] | 22 kΩ → ~4.55 A |
| 65.2 / R^0.861 | 39 kΩ → ~2.78 A |
| | 50 kΩ → ~2.25 A |
| | 56 kΩ → ~2.04 A |
| | 68 kΩ → ~1.72 A |
| | 100 kΩ → ~1.24 A |



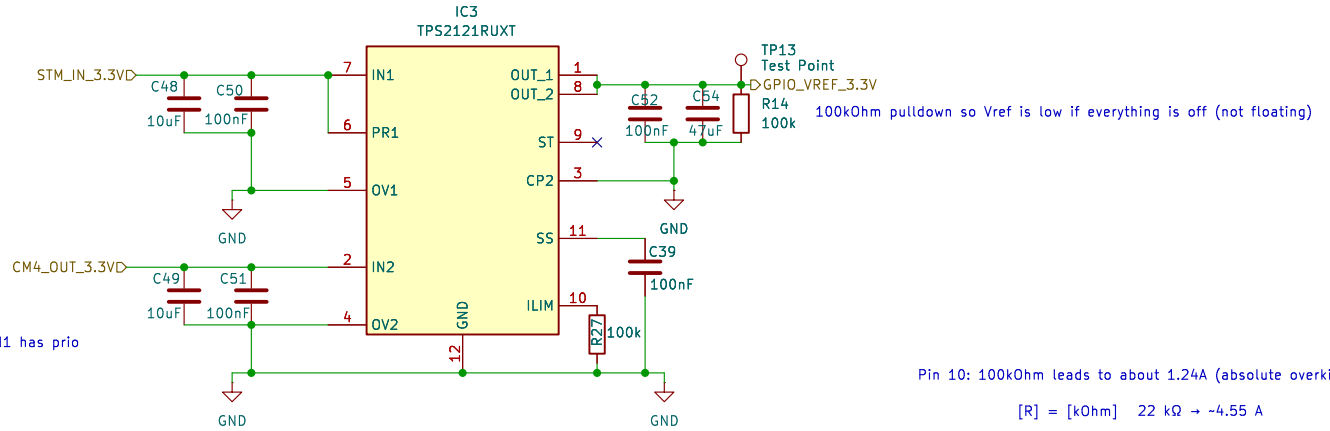

oard

_Logic/

Rev: 0

Size: A4

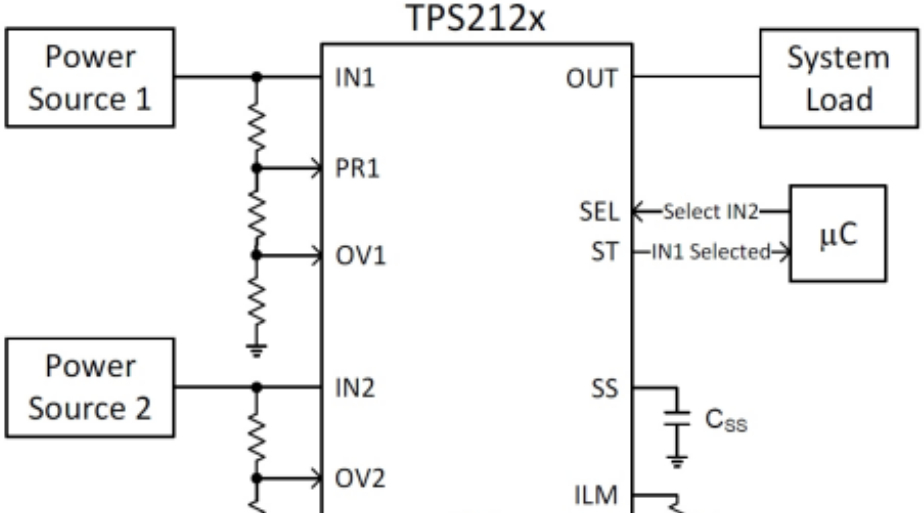
Id: 15/20




Pin 10: 100kOhm leads to about 1.24A (absolute overkill)

| | |
|---|---|
| [R] = [kOhm] | 22 kΩ → ~4.55 A |
| 65.2 / R^0.861 | 39 kΩ → ~2.78 A |
| | 50 kΩ → ~2.25 A |
| | 56 kΩ → ~2.04 A |
| | 68 kΩ → ~1.72 A |
| | 100 kΩ → ~1.24 A |

Pin SS (11): 100nF soft start cap more than enoug as virtually no load at all at vref

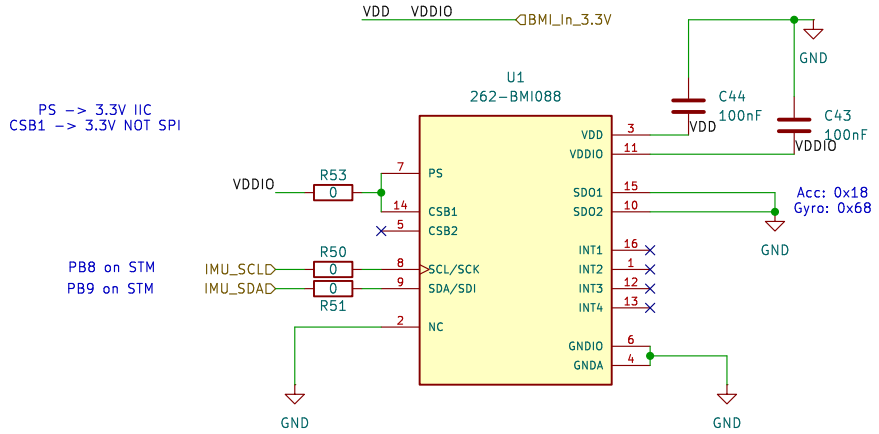



3V/

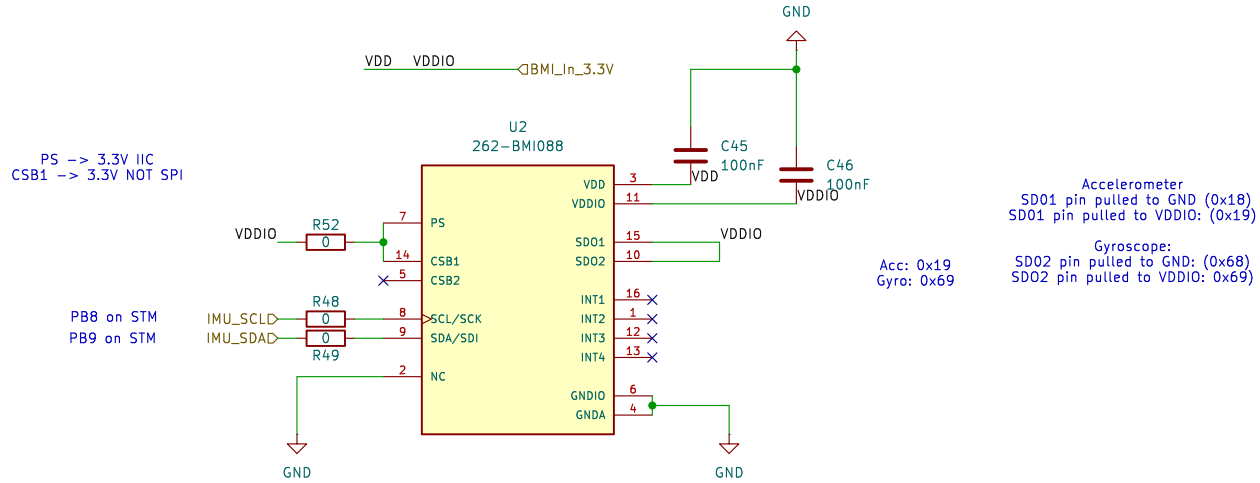
Rev: 0

Size: A4

Id: 16/20

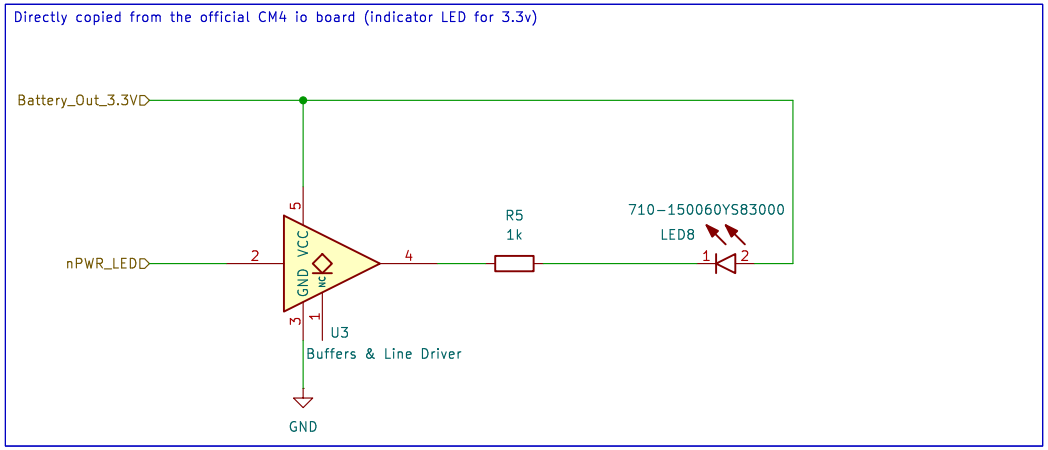



| | |
|---|---|
| Title: | Nautilus_Mainboard |
| Sheet: | /IMU/IMU1/ |
| Rev: | 0 |
| Author: | Davide |
| Date: | 2025-11-19 |
| Size: | A4 |
| Id: | 19/20 |
| File: | IMU1.kicad_sch |



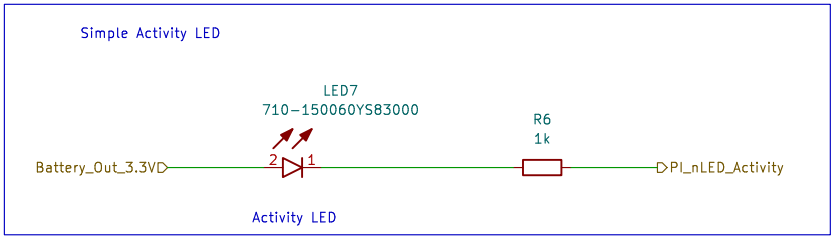

| | | |
|---|---|---|
| **Title: Nautilus_Mainboard** | | |
| Sheet: /IMU/IMU2/ | | Rev: 0 |
| Author: Davide | | |
| Date: 2025-11-19 | Size: A4 | Id: 20/20 |
| File: IMU2.kicad_sch | | |

Directly copied from the official CM4 io board (indicator LED for 3.3v)

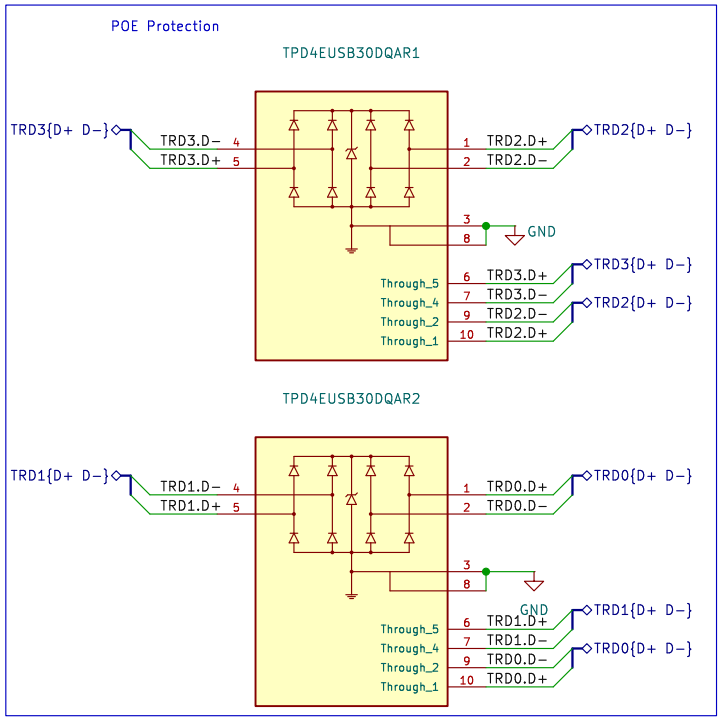


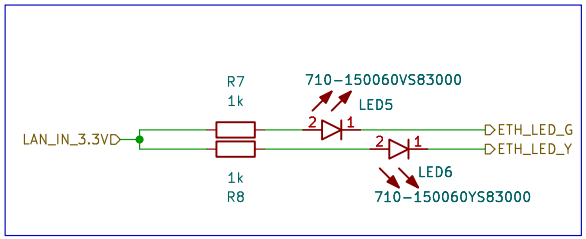

Screenshot
From the CM4 io board

| | | |
|---|---|---|
| Title: Nautilus_Mainboard | | |
| Sheet: /CM4/CM4_Module1A/CM4_LED1/ | | Rev: 0 |
| Author: Davide | | |
| Date: 2025-11-19 | Size: A4 | Id: 8/20 |
| File: CM4_LED1.kicad_sch | | |




| | | |
|---|---|---|
| **Title: Nautilus_Mainboard** | | |
| Sheet: /CM4/CM4_Module1A/CM4_LED2/ | | Rev: 0 |
| Author: Davide | | |
| Date: 2025-11-19 | Size: A4 | Id: 9/20 |
| File: CM4_LED2.kicad_sch | | |




| | | |
|---|---|---|
| **Title: Nautilus_Mainboard** | | |
| Sheet: /CM4/CM4_Module1A/CM4_Ethernet/ | | Rev: 0 |
| Author: Davide | | |
| Date: 2025−11−19 | Size: A4 | Id: 10/20 |
| File: CM4_Ethernet.kicad_sch | | |