# Amulet Motion Controller

## Variant: NO_XT60

**2024-11-21**
**Rev 1.1**


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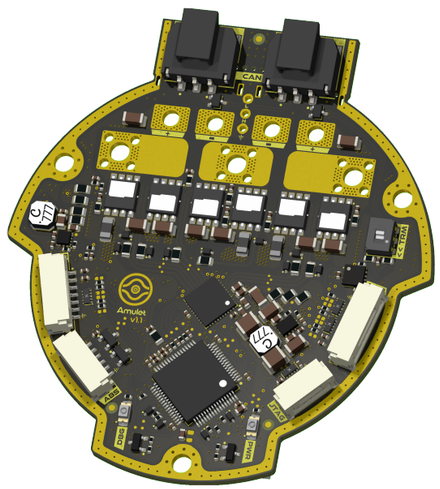
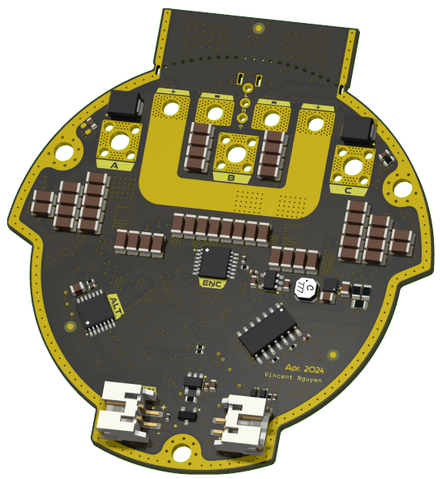
## TOP VIEW




## BOTTOM VIEW




## DESIGN CONSIDERATIONS

DESIGN NOTE: Example text for informational design notes.

DESIGN NOTE: Example text for debug notes.

DESIGN NOTE: Example text for cautionary design notes.

**DESIGN NOTE: Example text for critical design notes.**

**LAYOUT NOTE: Example text for critical layout guidelines.**

## NOTES

Schematic based off Josh Pieper's moteus controllers.

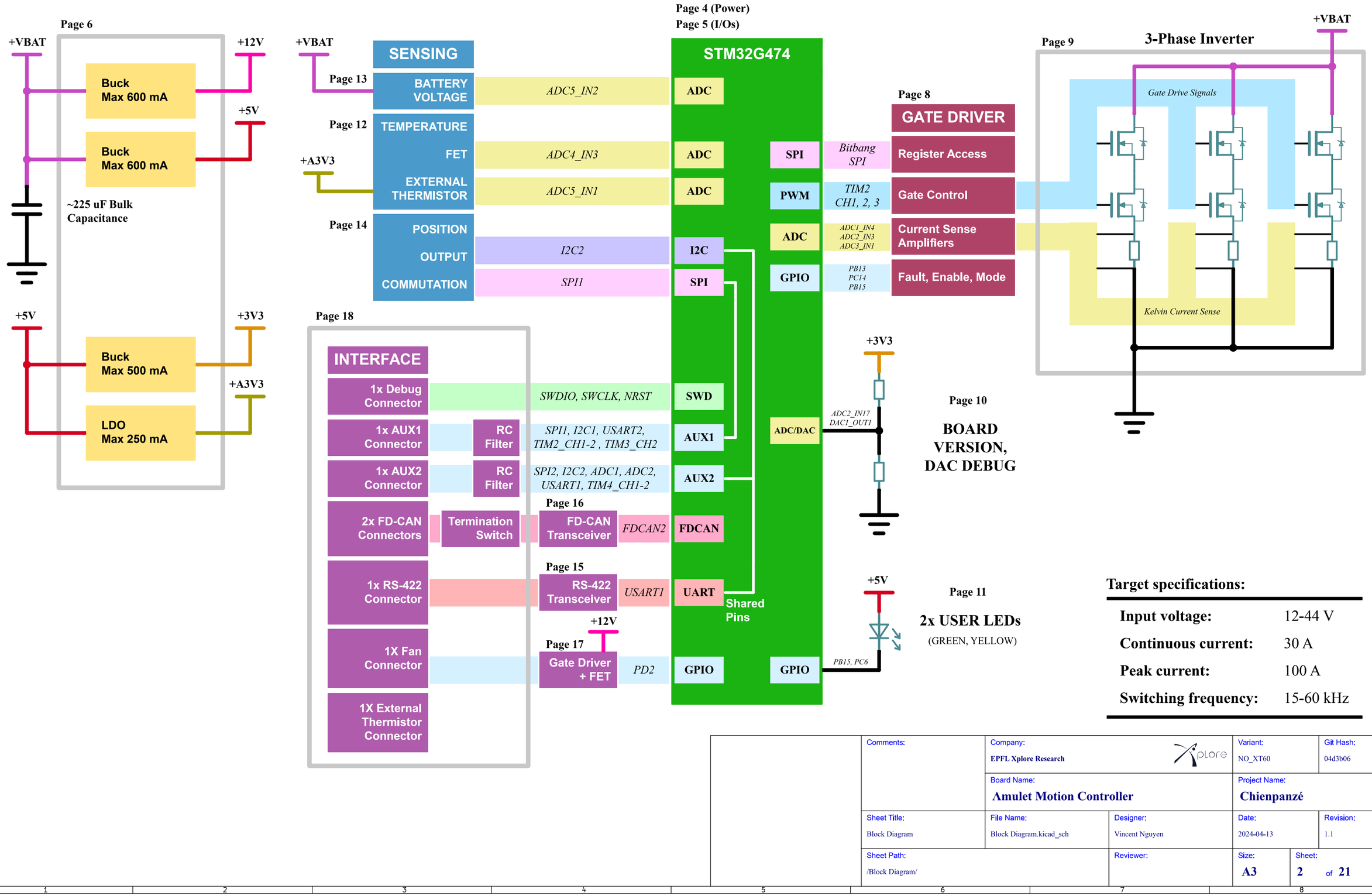
Not fitted components are marked as ✗

**DRAFT - Very early stage of schematic, ignore details.**
**PRELIMINARY - Close to final schematic.**
**CHECKED - There shouldn't be any mistakes. Contact the engineer if you find any.**
**RELEASED - A board with this schematic has been sent to production.**

**Date: 13-APR-2024**

| | | | | |
|---|---|---|---|---|
| | Comments: | Company: EPFL Xplore Research | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | | Board Name: Amulet Motion Controller | Project Name: Chienpanzé | |
| | Sheet Title: Cover Page | File Name: amulet_controller.kicad_sch | Designer: Vincent Nguyen | Date: 2024-04-13 / Revision: 1.1 |
| | Sheet Path: / | | Reviewer: | Size: A3 / Sheet: 1 of 21 |

# [2] Block Diagram

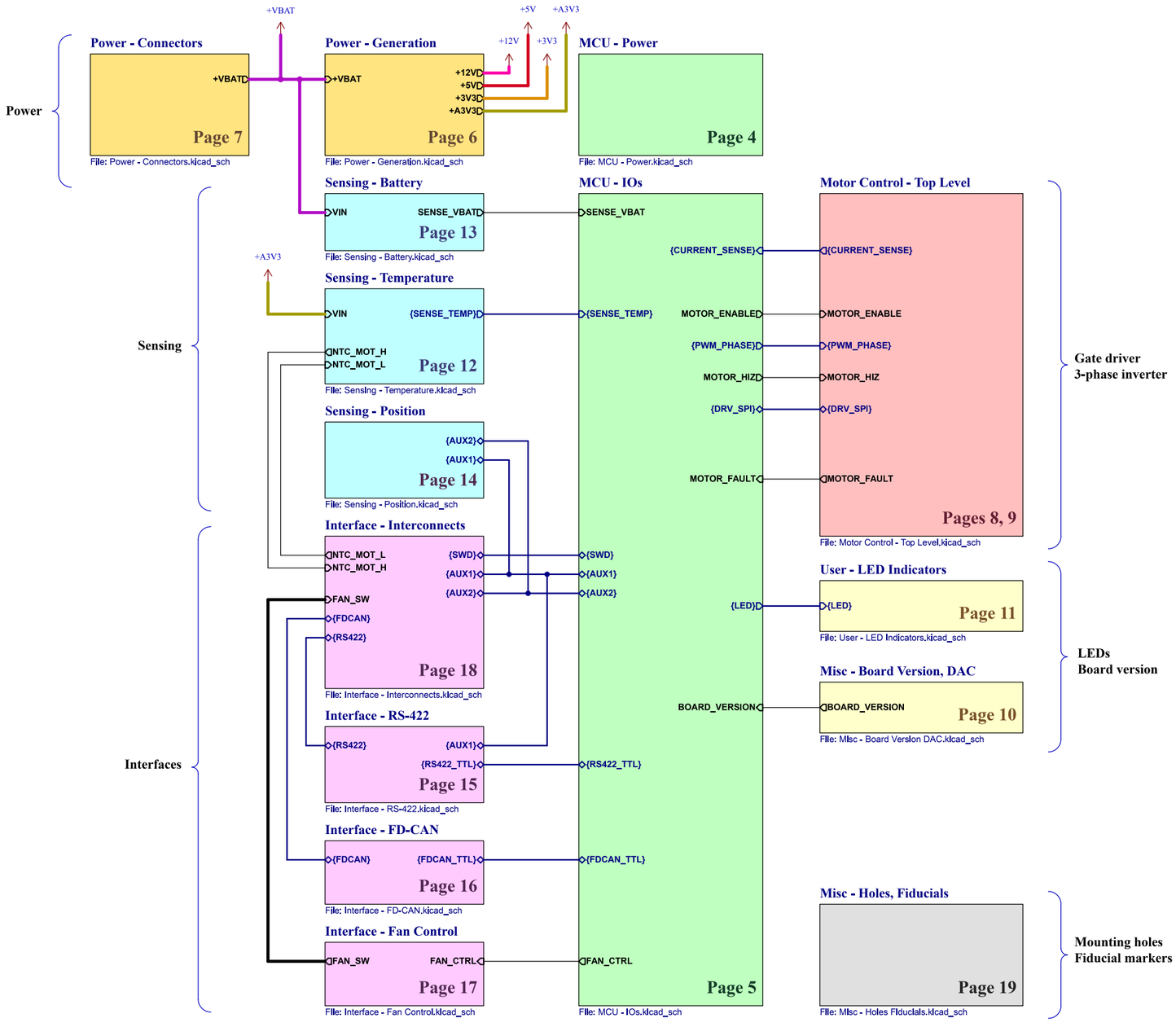



**Target specifications:**

| | |
|---|---|
| **Input voltage:** | 12-44 V |
| **Continuous current:** | 30 A |
| **Peak current:** | 100 A |
| **Switching frequency:** | 15-60 kHz |

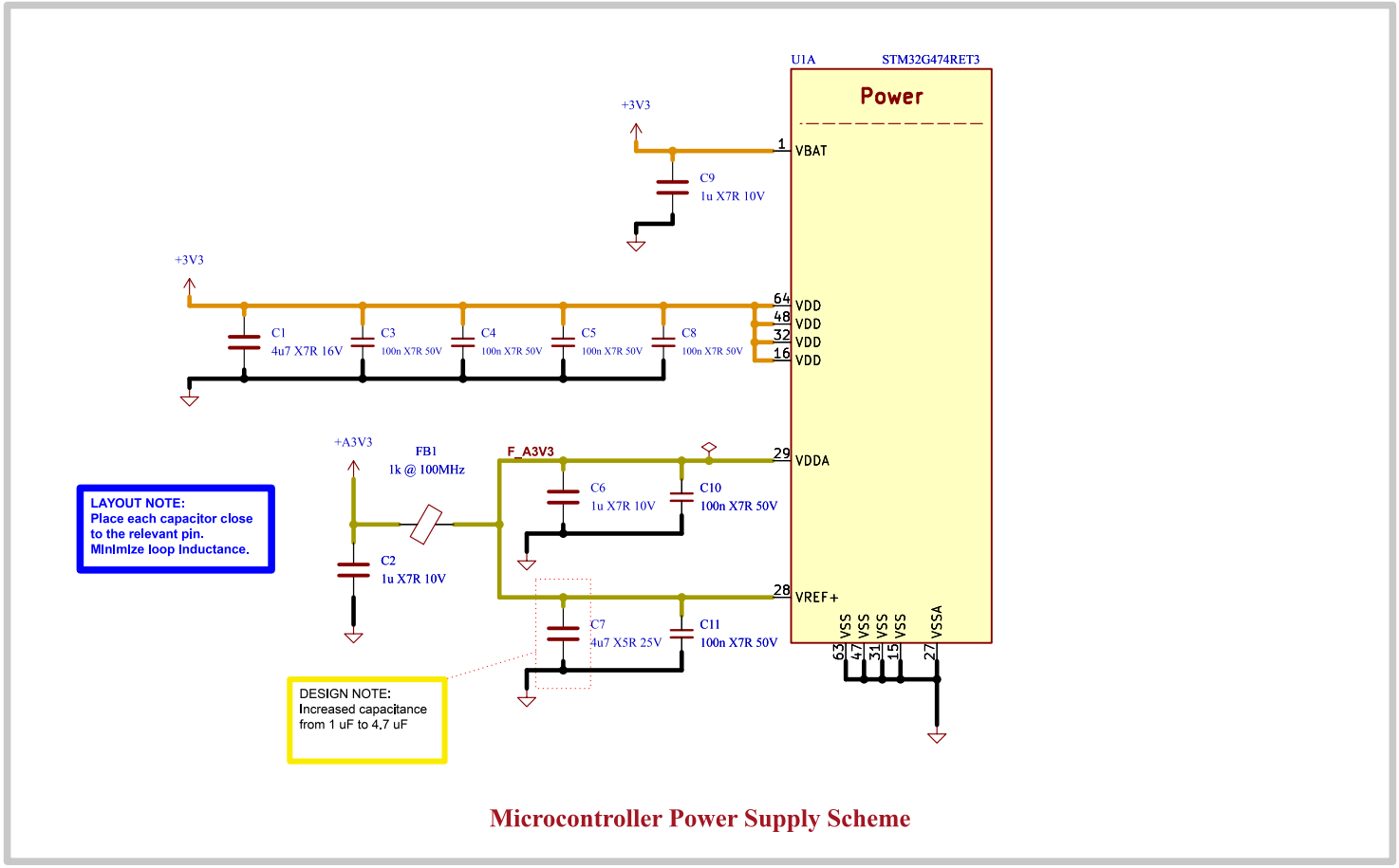
| | | | | |
|---|---|---|---|---|
| Comments: | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: Amulet Motion Controller | | Project Name: Chienpanzé | |
| Sheet Title: Block Diagram | File Name: Block Diagram.kicad_sch | Designer: Vincent Nguyen | Date: 2024-04-13 | Revision: 1.1 |
| Sheet Path: /Block Diagram/ | | Reviewer: | Size: A3 | Sheet: 2 of 21 |

# [3] Project Architecture




| | | | |
|---|---|---|---|
| Comments: | Company: EPFL Xplore Research | | Variant: NO_XT60 / Git Hash: 04d3b06 |
| | Board Name: **Amulet Motion Controller** | | Project Name: **Chienpanzé** |
| Sheet Title: Project Architecture | File Name: Project Architecture.kicad_sch | Designer: Vincent Nguyen | Date: 2023-12-22 / Revision: 1.1 |
| Sheet Path: /Project Architecture/ | | Reviewer: | Size: A3 / Sheet: 3 of 21 |

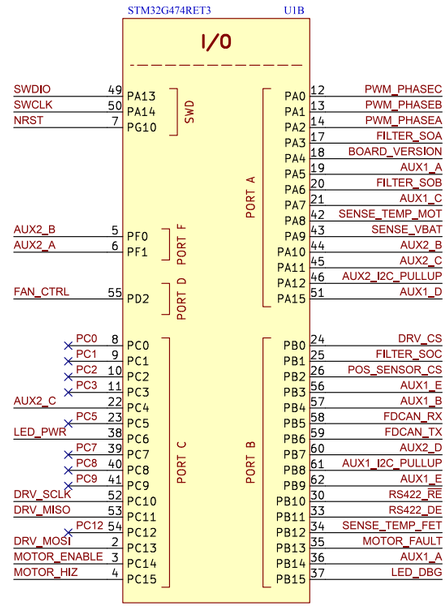
# [4] MCU - Power




**Microcontroller Power Supply Scheme**

| | | | | |
|---|---|---|---|---|
| Comments: AN5346; STM32G474 Datasheet p.81; J. Pieper ADC investigation | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: **Amulet Motion Controller** | | Project Name: **Chienpanzé** | |
| Sheet Title: MCU - Power | File Name: MCU - Power.kicad_sch | Designer: Vincent Nguyen | Date: 2023-12-18 | Revision: 1.1 |
| Sheet Path: /Project Architecture/MCU - Power/ | | Reviewer: | Size: **A4** | Sheet: **4** of **21** |

# [5] MCU - I/Os




DESIGN NOTE:
We use the LQFP64 version to have extra pins for controlling an external fan.

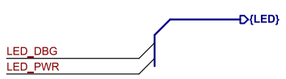
DESIGN NOTE:
Do not forget to flash option bytes when flashing for the first time.

**LAYOUT NOTE:**
**Footprint devlates from datasheet and IPC7351 to allow for soldermask sliver between pads according to PCBWay design rules.**

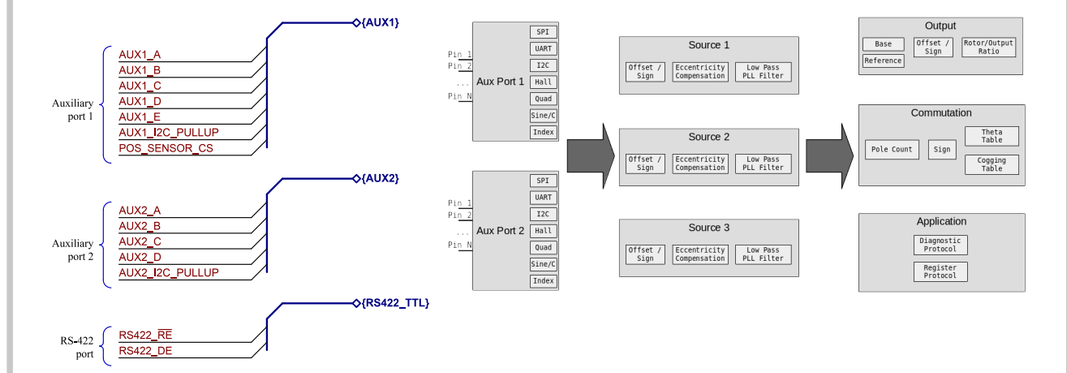
## Microcontroller I/O Domain



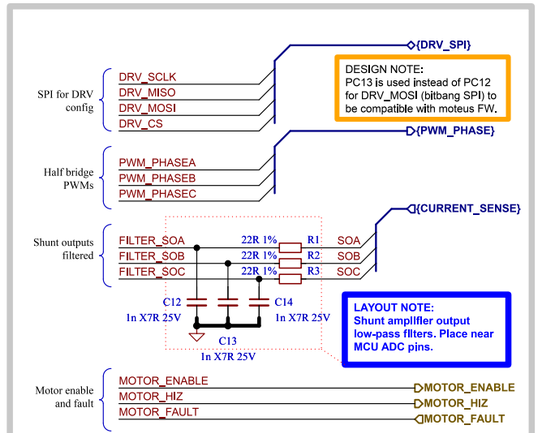

## SWD (Debug) Port




## User LEDs

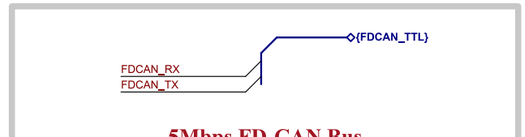



## Auxiliary Ports




## Connection to Gate Driver


## Board Version Selection




## 5Mbps FD-CAN Bus


## Temperature Sense




## Battery Voltage Sense




## Low-Side Fan Control

## Gate Driver

| | | |
|---|---|---|
| MOTOR_ENABLE | TP1 | MOTOR_ENABLE |
| MOTOR_HIZ | TP2 | MOTOR_HIZ |
| MOTOR_FAULT | TP3 | MOTOR_FAULT |
| DRV_SCLK | TP4 | DRV_SCLK |
| DRV_MISO | TP5 | DRV_MISO |
| DRV_MOSI | TP6 | DRV_MOSI |
| DRV_CS | TP7 | DRV_CS |
| PWM_PHASEA | TP8 | PWM_PHASEA |
| PWM_PHASEB | TP9 | PWM_PHASEB |
| PWM_PHASEC | TP10 | PWM_PHASEC |
| SOA | TP11 | SOA |
| SOB | TP12 | SOB |
| SOC | TP13 | SOC |

## Debug

| | | |
|---|---|---|
| SWDIO | TP14 | SWDIO |
| SWCLK | TP15 | SWCLK |
| NRST | TP16 | NRST |

## Auxiliary pins 1

| | | |
|---|---|---|
| AUX1_A | TP17 | AUX1_A |
| AUX1_B | TP18 | AUX1_B |
| AUX1_C | TP19 | AUX1_C |
| AUX1_D | TP20 | AUX1_D |
| AUX1_E | TP21 | AUX1_E |
| AUX1_I2C_PULLUP | TP22 | AUX1_I2C_PULLUP |
| POS_SENSOR_CS | TP23 | POS_SENSOR_CS |

## Auxiliary pins 2

| | | |
|---|---|---|
| AUX2_A | TP24 | AUX2_A |
| AUX2_B | TP25 | AUX2_B |
| AUX2_C | TP26 | AUX2_C |
| AUX2_D | TP27 | AUX2_D |
| AUX2_I2C_PULLUP | TP28 | AUX2_I2C_PULLUP |

## RS-422

| | | |
|---|---|---|
| RS422_RE | TP29 | RS422_RE |
| RS422_DE | TP30 | RS422_DE |

## LEDs

| | | |
|---|---|---|
| LED_DBG | TP31 | LED_DBG |
| LED_PWR | TP32 | LED_PWR |

## FD-CAN

| | | |
|---|---|---|
| FDCAN_RX | TP33 | FD_CAN_RX |
| FDCAN_TX | TP34 | FDCAN_TX |

## Fan

| | | |
|---|---|---|
| FAN_CTRL | TP35 | FAN_CTRL |

## Sense

| | | |
|---|---|---|
| SENSE_TEMP_MOT | TP36 | SENSE_TEMP_MOT |
| SENSE_TEMP_FET | TP37 | SENSE_TEMP_FET |
| SENSE_VBAT | TP38 | SENSE_VBAT |

## Test Points

Comments:
**References:**
Flexible I/O worked examples
Flexible I/O source configuration

Company: **EPFL Xplore Research**

Variant: NO_XT60

Git Hash: 04d3b06

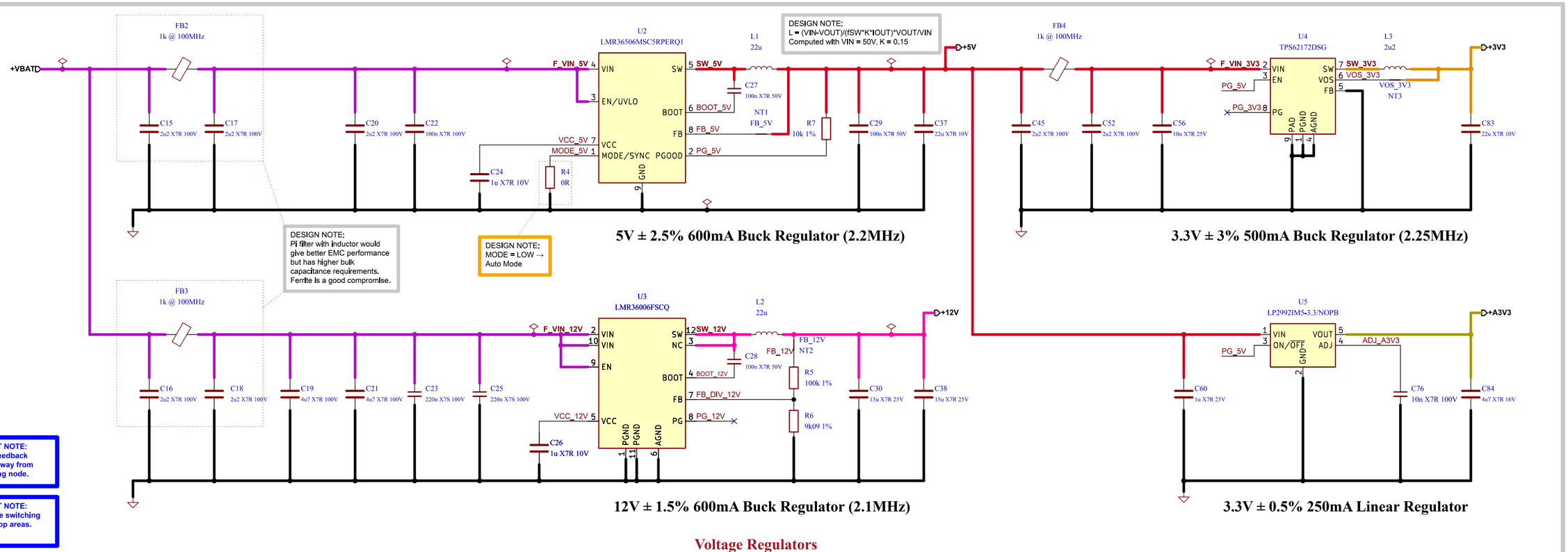
Board Name: **Amulet Motion Controller**

Project Name: **Chienpanzé**

| Sheet Title: | File Name: | Designer: | Date: | Revision: |
|---|---|---|---|---|
| MCU - I/Os | MCU - IOs.kicad_sch | Vincent Nguyen | 2023-12-20 | 1.1 |

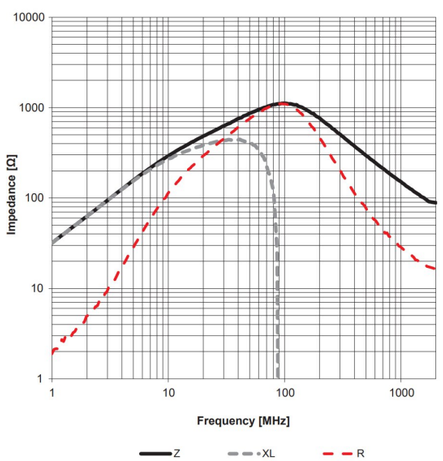
| Sheet Path: | Reviewer: | Size: | Sheet: |
|---|---|---|---|
| /Project Architecture/MCU - IOs/ | | A3 | 5 of 21 |

# [6] Power - Generation



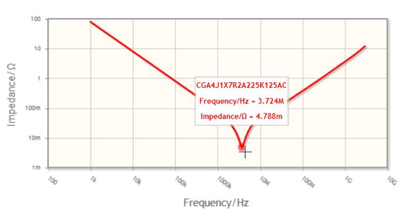

## Voltage Regulators

### Ferrite bead Impedance vs Frequency curve



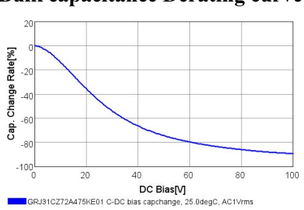

DESIGN NOTE:
XL drops around 45th harmonic.

### Pi filter capacitor Impedance vs Frequency curve




CGA4J1X7R2A225K125AC

### Bulk capacitance Derating curve




DESIGN NOTE:
Effective capacitance at 33V is approximately 2.1 uF

## Capacitor and Ferrite Bead Parameters

### Battery

| | | |
|---|---|---|
| +VBAT | TP39 | +VBAT |
| +VBAT | TP40 | +VBAT |
| +VBAT | TP41 | +VBAT |

### Filtered Power Rails

| | | |
|---|---|---|
| F_VIN_12V | TP42 | F_VIN_12V |
| F_VIN_5V | TP43 | F_VIN_5V |
| F_VIN_3V3 | TP44 | F_VIN_3V3 |

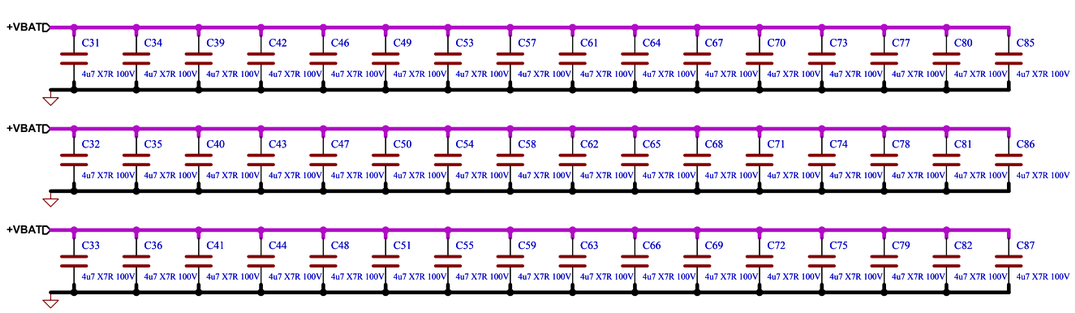
### Power Rails

| | | |
|---|---|---|
| +12V | TP45 | +12V |
| +5V | TP46 | +5V |
| +5V | TP47 | +5V |
| +3V3 | TP48 | +3V3 |
| +3V3 | TP49 | +3V3 |
| +3V3 | TP50 | +3V3 |
| +A3V3 | TP51 | +A3V3 |

### Ground

| | | |
|---|---|---|
| GND | TP52 | GND |
| GND | TP53 | GND |
| GND | TP54 | GND |
| GND | TP55 | GND |
| GND | TP56 | GND |
| GND | TP57 | GND |
| GND | TP58 | GND |

## Test Points



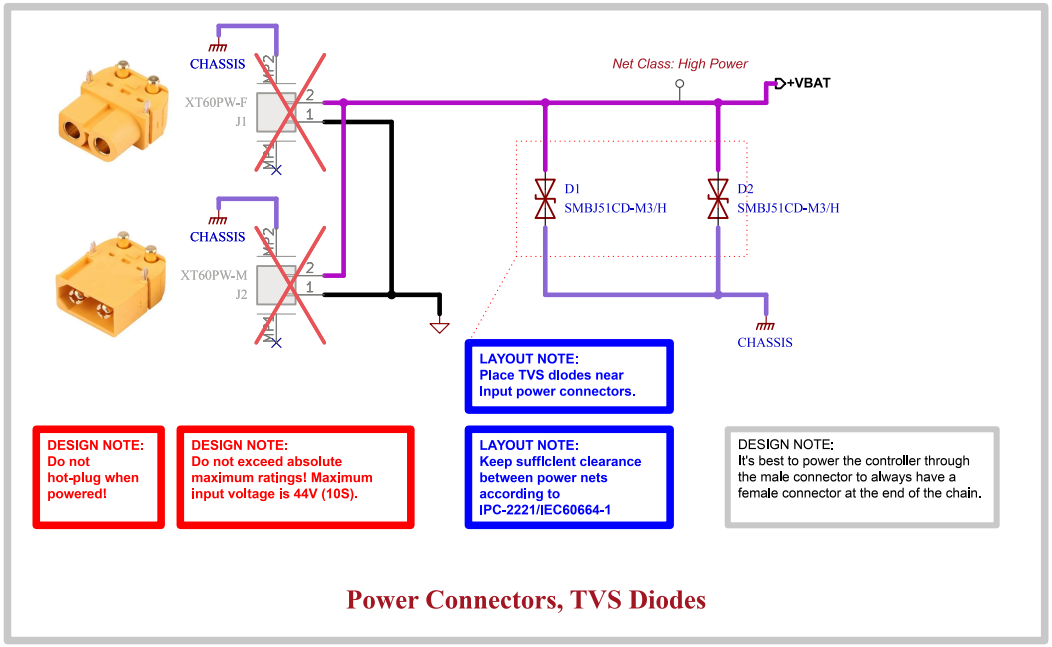

DESIGN NOTE:
An external precharge circuit is advised to charge the bulk capacitors if multiple boards are connected.

DC-Link Bulk Capacitors. 48 x 4.7 uF = 225.6 uF (100.8 uF at 33V)

DESIGN NOTE:
X6S 10uF is marginally better (but worse DC bias derating) at a higher price.

| | | | | |
|---|---|---|---|---|
| Comments: +12V (600 mA): Fan power<br>+5V (600 mA): Gate Driver, LEDs<br>+3V3 (500 mA): digital 3.3V<br>+3V3A (250 mA): analog 3.3V | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: Amulet Motion Controller | | Project Name: Chienpanzé | |
| Sheet Title: Power - Generation | File Name: Power - Generation.kicad_sch | Designer: Vincent Nguyen | Date: 2024-04-13 | Revision: 1.1 |
| Sheet Path: /Project Architecture/Power - Generation/ | | Reviewer: | Size: A3 | Sheet: 6 of 21 |

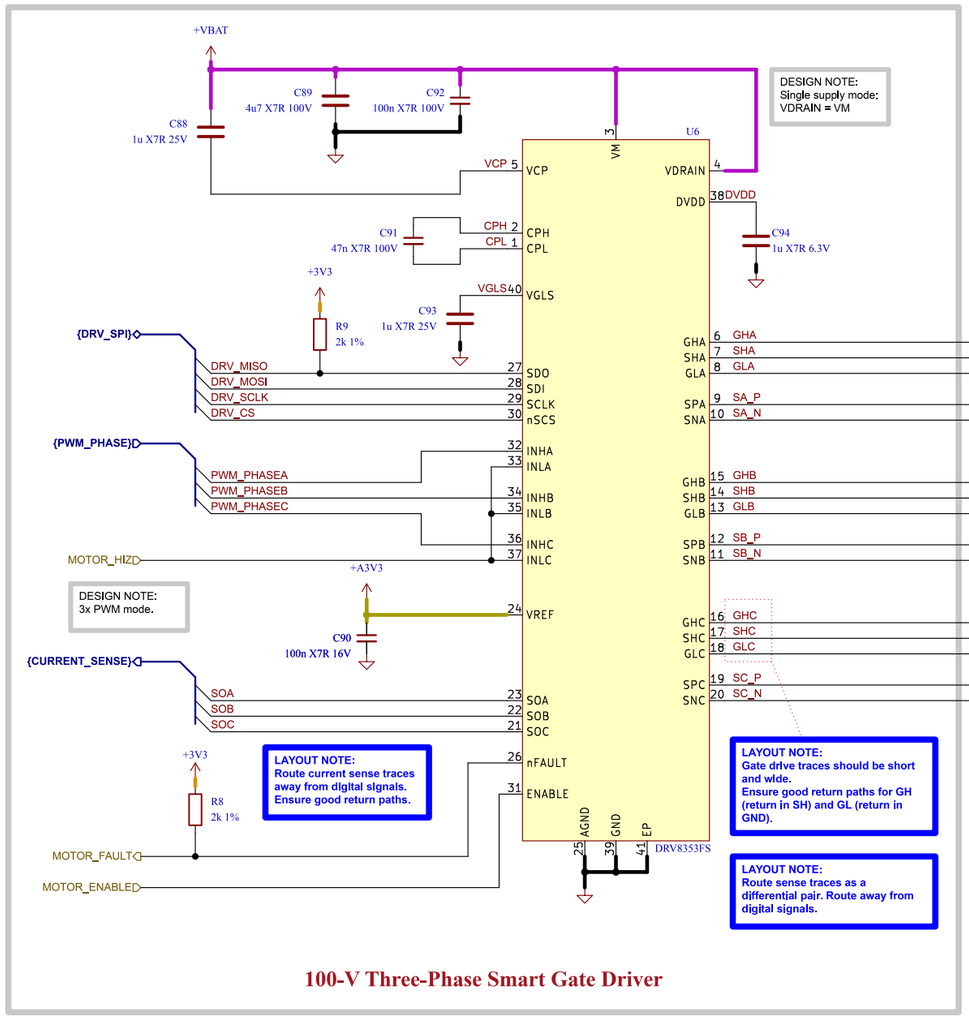
# [7] Power - Connectors



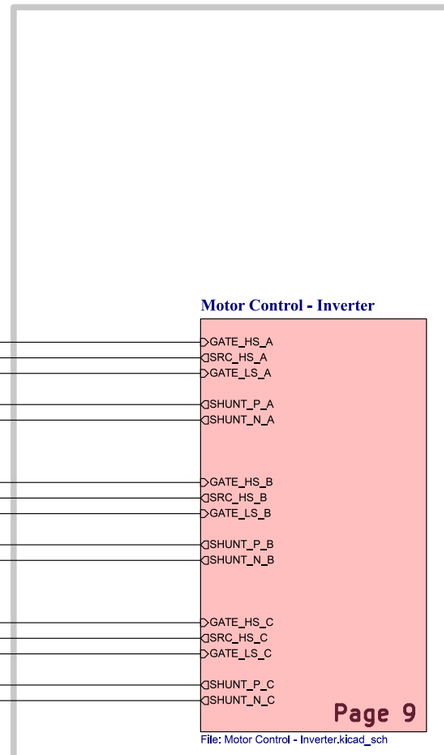

**Power Connectors, TVS Diodes**

| | | | | |
|---|---|---|---|---|
| Comments: | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: **Amulet Motion Controller** | | Project Name: **Chienpanzé** | |
| Sheet Title: Power - Connectors | File Name: Power - Connectors.kicad_sch | Designer: Vincent Nguyen | Date: 2023-12-31 | Revision: 1.1 |
| Sheet Path: /Project Architecture/Power - Connectors/ | | Reviewer: | Size: **A4** | Sheet: **7** of **21** |

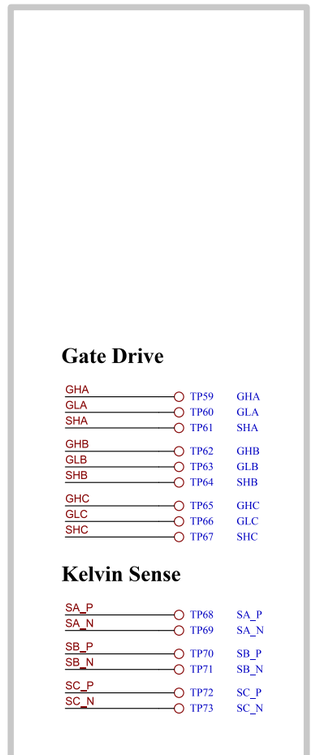
# [8] Motor Control - Top Level




## 100-V Three-Phase Smart Gate Driver



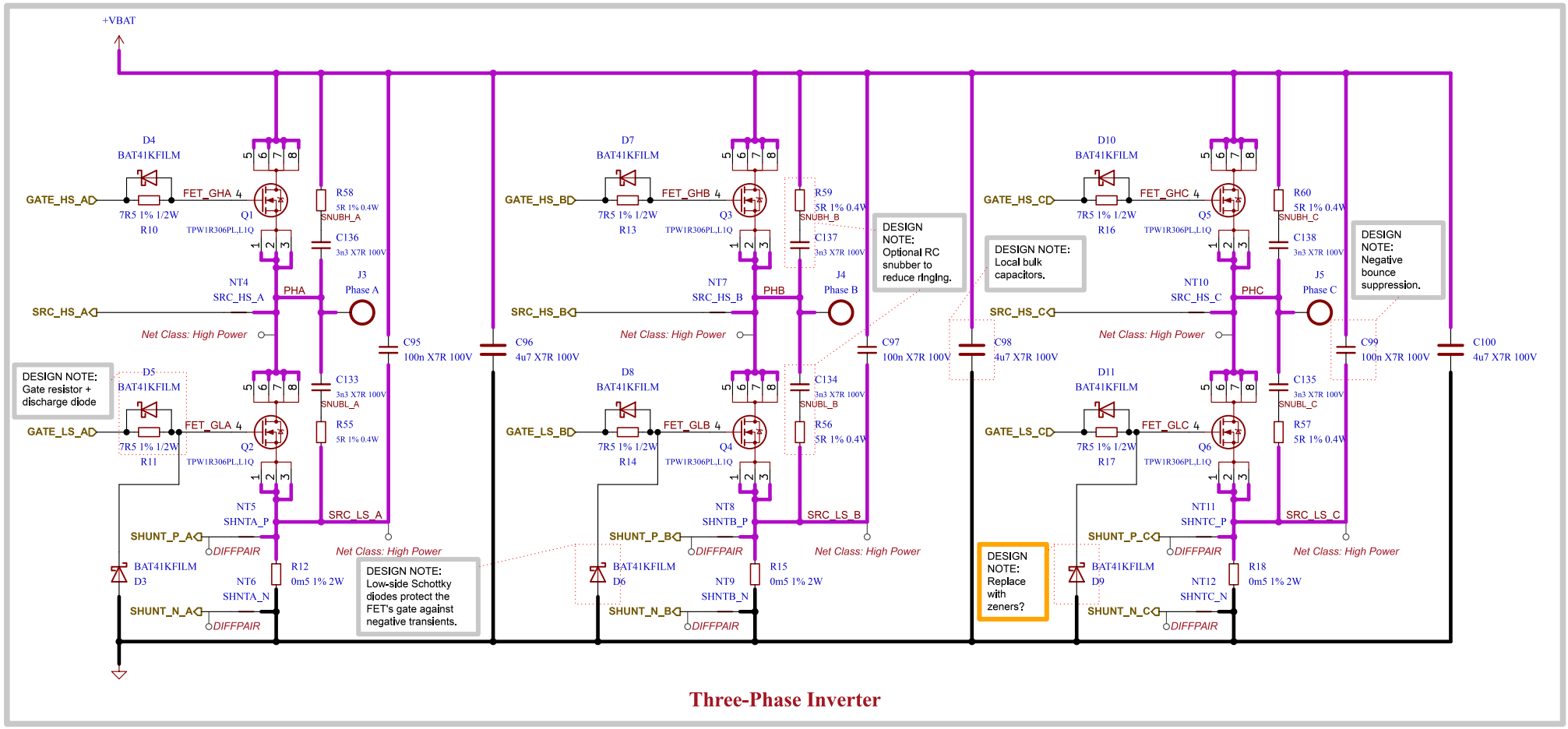

## Three-Phase Inverter




## Test Points

| | | | | |
|---|---|---|---|---|
| Comments: | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: **Amulet Motion Controller** | | Project Name: **Chienpanzé** | |
| Sheet Title: Motor Control - Top Level | File Name: Motor Control - Top Level.kicad_sch | Designer: Vincent Nguyen | Date: 2023-12-20 | Revision: 1.1 |
| Sheet Path: /Project Architecture/Motor Control - Top Level/ | | Reviewer: | Size: **A3** | Sheet: **8** of **21** |

# [9] Motor Control - Inverter




## Three-Phase Inverter

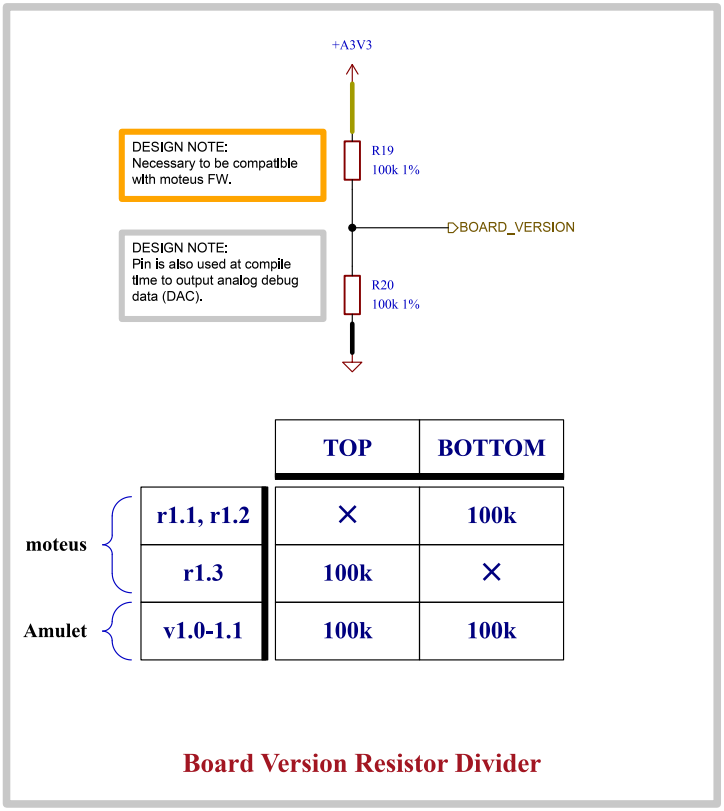
**LAYOUT NOTE:**
**High current traces must be carefully designed. Ensure ground return path does not cross sensitive parts of the board. Use multiple planes for higher current carrying capacity.**

**LAYOUT NOTE:**
**Keep sufficient clearance between power nets according to IPC-2221/IEC60664-1.**

**DESIGN NOTE:**
**A gate drive current that is too large can damage the FETs!**

| | | | | |
|---|---|---|---|---|
| Comments: System Design Considerations for High-Power Motor Driver Applications; Best Practices for Board Layout of Motor Drivers; Proper RC Snubber Design for Motor Drivers | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: **Amulet Motion Controller** | | Project Name: **Chienpanzé** | |
| Sheet Title: Motor Control - Inverter | File Name: Motor Control - Inverter.kicad_sch | Designer: Vincent Nguyen | Date: 2024-01-25 | Revision: 1.1 |
| Sheet Path: /Project Architecture/Motor Control - Top Level/Motor Control - Inverter/ | | Reviewer: | Size: **A4** | Sheet: **9** of **21** |

# [10] Misc - Board Version, DAC

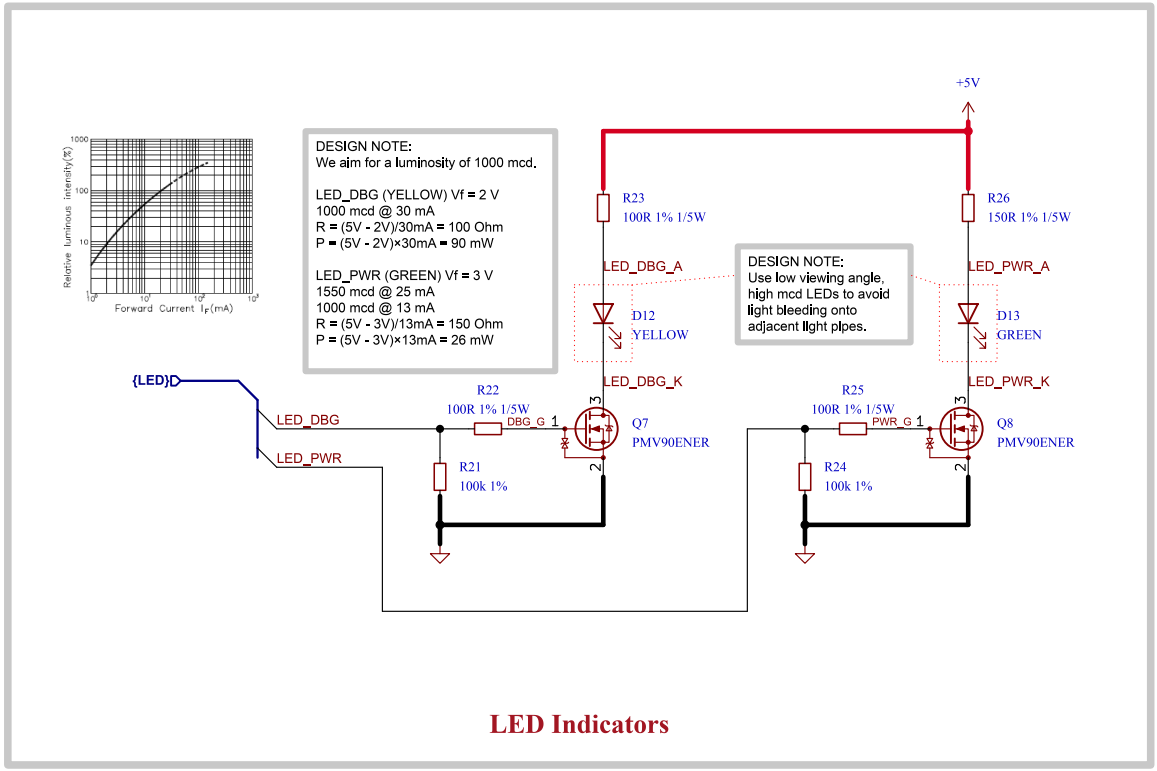



| | | TOP | BOTTOM |
|---|---|---|---|
| moteus | r1.1, r1.2 | × | 100k |
| moteus | r1.3 | 100k | × |
| Amulet | v1.0-1.1 | 100k | 100k |

**Board Version Resistor Divider**

| | | | | |
|---|---|---|---|---|
| Comments: | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: Amulet Motion Controller | | Project Name: Chienpanzé | |
| Sheet Title: Misc - Board Version, DAC | File Name: Misc - Board Version DAC.kicad_sch | Designer: Vincent Nguyen | Date: 2024-04-13 | Revision: 1.1 |
| Sheet Path: /Project Architecture/Misc - Board Version, DAC/ | | Reviewer: | Size: A4 | Sheet: 10 of 21 |

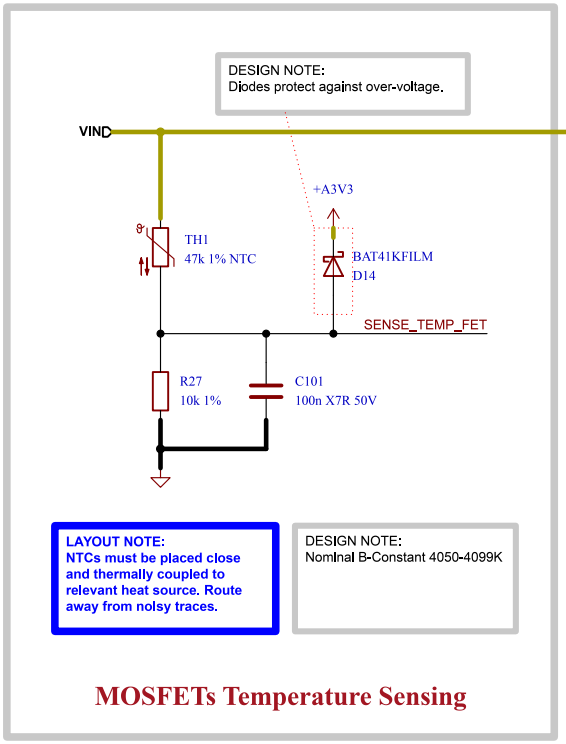
# [11] User - LED Indicators



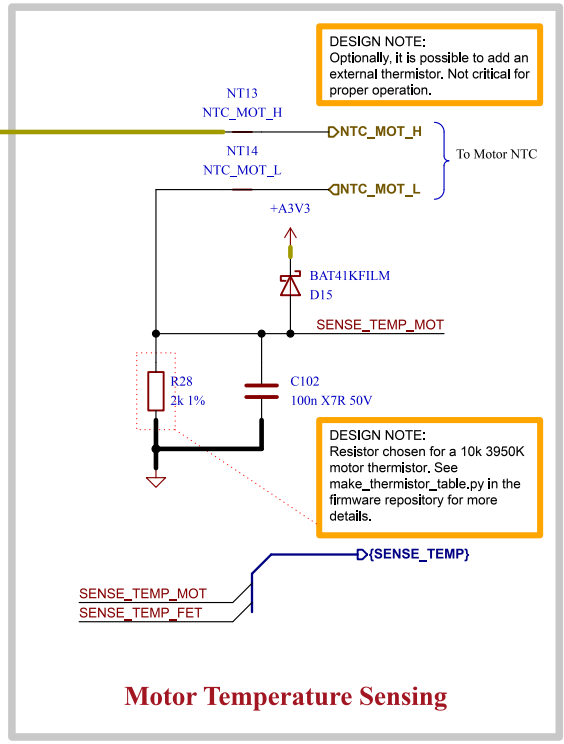

**LED Indicators**

| | | | | |
|---|---|---|---|---|
| | Comments: | Company: **EPFL Xplore Research** | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | | Board Name: **Amulet Motion Controller** | Project Name: **Chienpanzé** | |
| | Sheet Title: User - LED Indicators | File Name: User - LED Indicators.kicad_sch | Designer: Vincent Nguyen | Date: 2023-12-19 / Revision: 1.1 |
| | Sheet Path: /Project Architecture/User - LED Indicators/ | Reviewer: | Size: **A4** | Sheet: **11** of **21** |

# [12] Sensing - Temperature



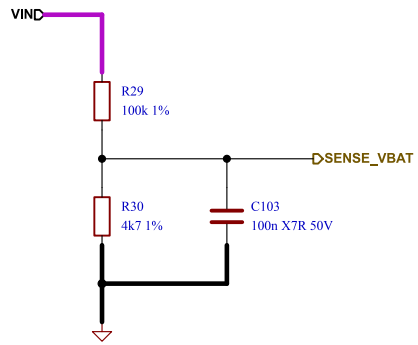

MOSFETs Temperature Sensing




Motor Temperature Sensing

| | | | | |
|---|---|---|---|---|
| Comments: | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: **Amulet Motion Controller** | | Project Name: **Chienpanzé** | |
| Sheet Title: Sensing - Temperature | File Name: Sensing - Temperature.kicad_sch | Designer: Vincent Nguyen | Date: 2024-04-13 | Revision: 1.1 |
| Sheet Path: /Project Architecture/Sensing - Temperature/ | | Reviewer: | Size: **A4** | Sheet: **12** of **21** |

# [13] Sensing - Battery



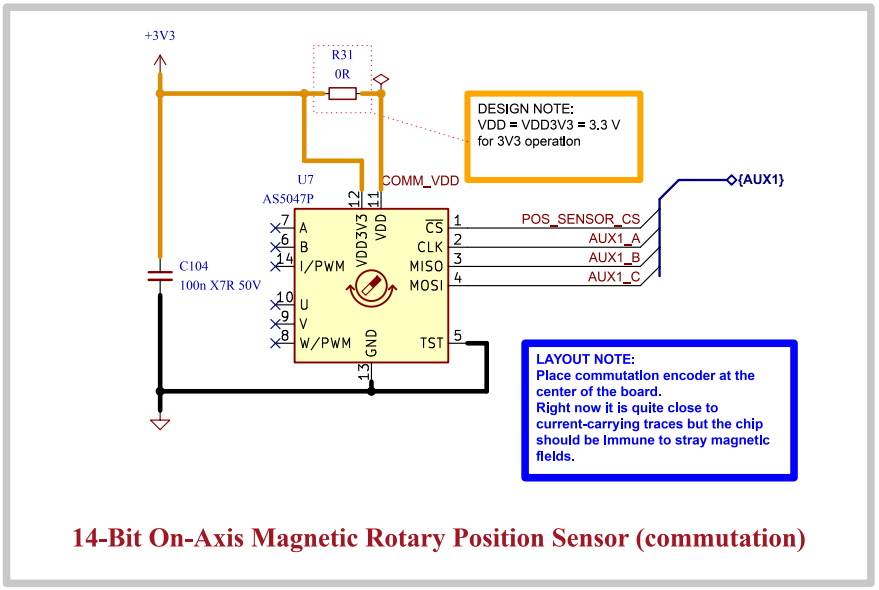

DESIGN NOTE:
1/23 temperature stable voltage divider. Use low ppm resistors.

12S: max voltage: 2.19 V
8S: max voltage: 1.95 V
6S: max voltage: 1.46 V

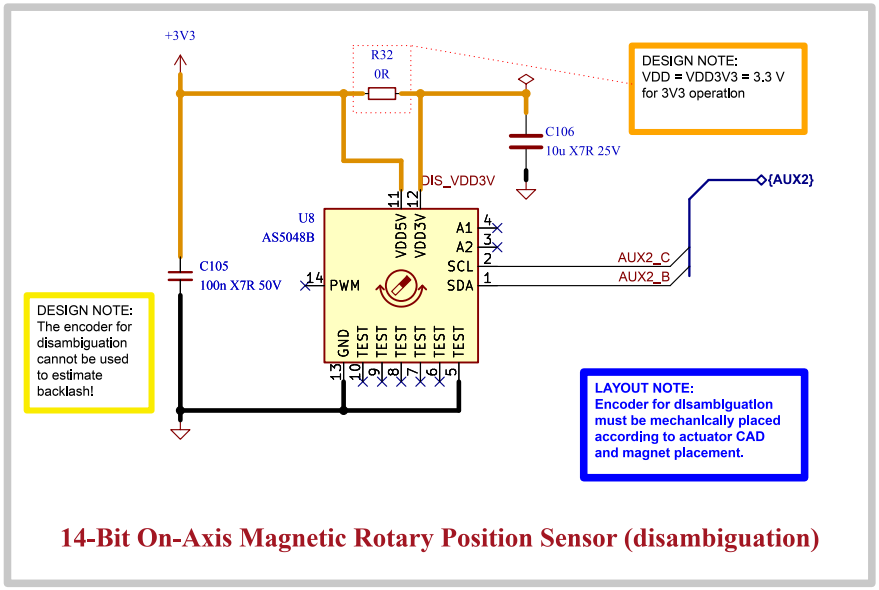
**Battery Voltage Sensing**

| | | | | |
|---|---|---|---|---|
| Comments: | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: Amulet Motion Controller | | Project Name: Chienpanzé | |
| Sheet Title: Sensing - Battery | File Name: Sensing - Battery.kicad_sch | Designer: Vincent Nguyen | Date: 2023-10-14 | Revision: 1.1 |
| Sheet Path: /Project Architecture/Sensing - Battery/ | | Reviewer: | Size: A4 | Sheet: 13 of 21 |

# [14] Sensing - Position




14-Bit On-Axis Magnetic Rotary Position Sensor (commutation)

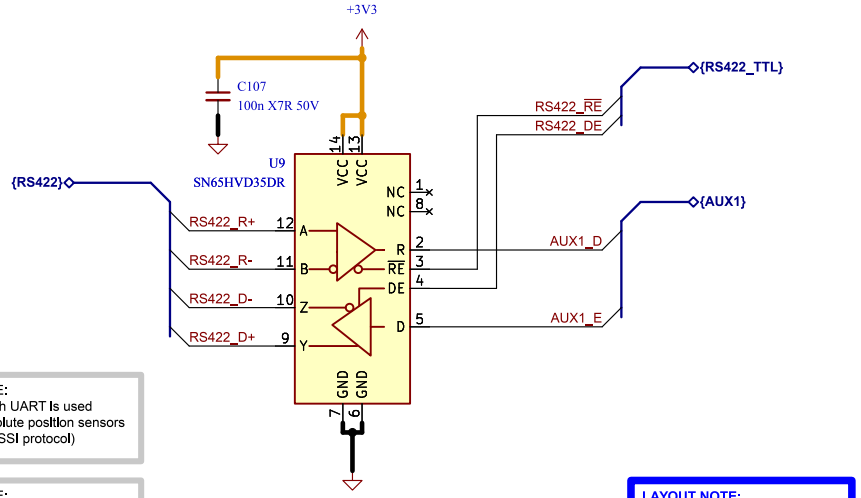



14-Bit On-Axis Magnetic Rotary Position Sensor (disambiguation)

DESIGN NOTE:
AS5047P senses magnet mounted on planetary sun gear, for commutation.
AS5048B senses magnet mounted on shaft with same reduction factor as planetary gearbox for disambiguation.

| | | | | |
|---|---|---|---|---|
| Comments: | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: Amulet Motion Controller | | Project Name: Chienpanzé | |
| Sheet Title: Sensing - Position | File Name: Sensing - Position.kicad_sch | Designer: Vincent Nguyen | Date: 2023-10-14 | Revision: 1.1 |
| Sheet Path: /Project Architecture/Sensing - Position/ | | Reviewer: | Size: A4 | Sheet: 14 of 21 |

# [15] Interface - RS-422




DESIGN NOTE:
RS-422 through UART is used mostly for absolute position sensors (e.g. Aksim-2, SSI protocol)

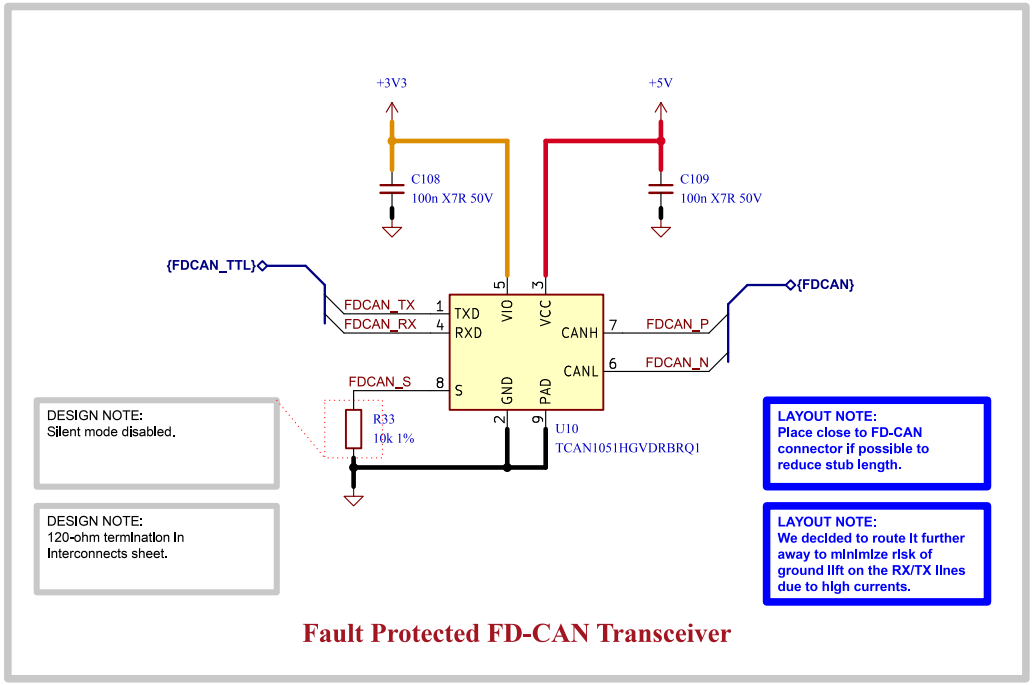
DESIGN NOTE:
100-ohm termination in Interconnects sheet.

LAYOUT NOTE:
Place close to RS-422 connector.

**3.3-V Full-Duplex RS-422 Interface**

| | | | | |
|---|---|---|---|---|
| Comments: | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: Amulet Motion Controller | | Project Name: Chienpanzé | |
| Sheet Title: Interface - RS-422 | File Name: Interface - RS-422.kicad_sch | Designer: Vincent Nguyen | Date: 2023-10-15 | Revision: 1.1 |
| Sheet Path: /Project Architecture/Interface - RS-422/ | | Reviewer: | Size: A4 | Sheet: 15 of 21 |

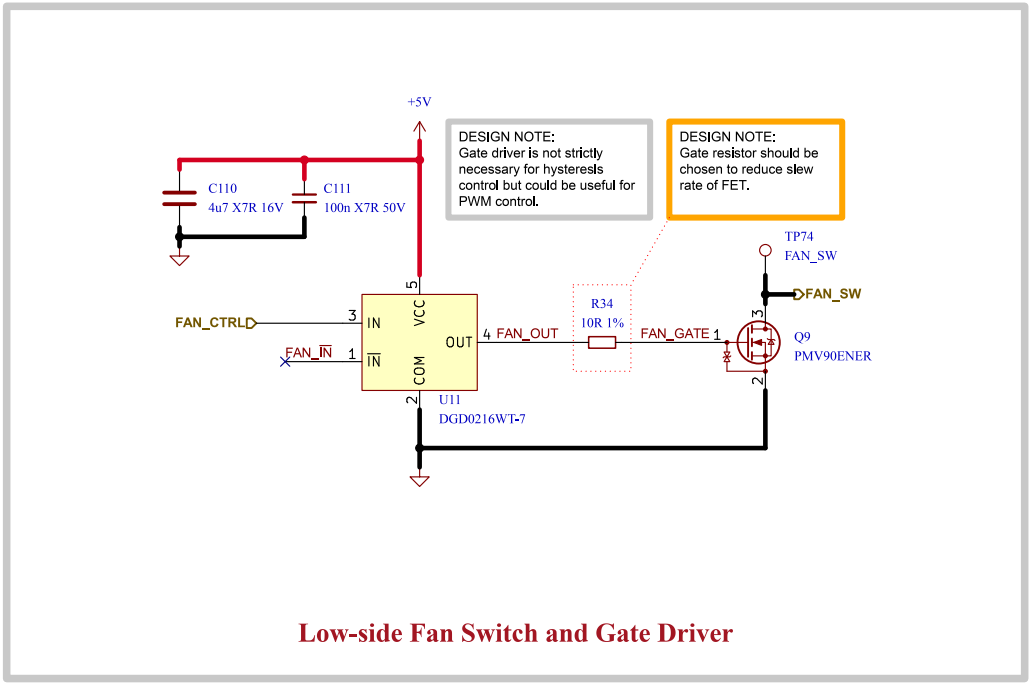
# [16] Interface - FD-CAN




**Fault Protected FD-CAN Transceiver**

| | | | | |
|---|---|---|---|---|
| Comments: | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: Amulet Motion Controller | | Project Name: Chienpanzé | |
| Sheet Title: Interface - FD-CAN | File Name: Interface - FD-CAN.kicad_sch | Designer: Vincent Nguyen | Date: 2023-10-15 | Revision: 1.1 |
| Sheet Path: /Project Architecture/Interface - FD-CAN/ | | Reviewer: | Size: A4 | Sheet: 16 of 21 |

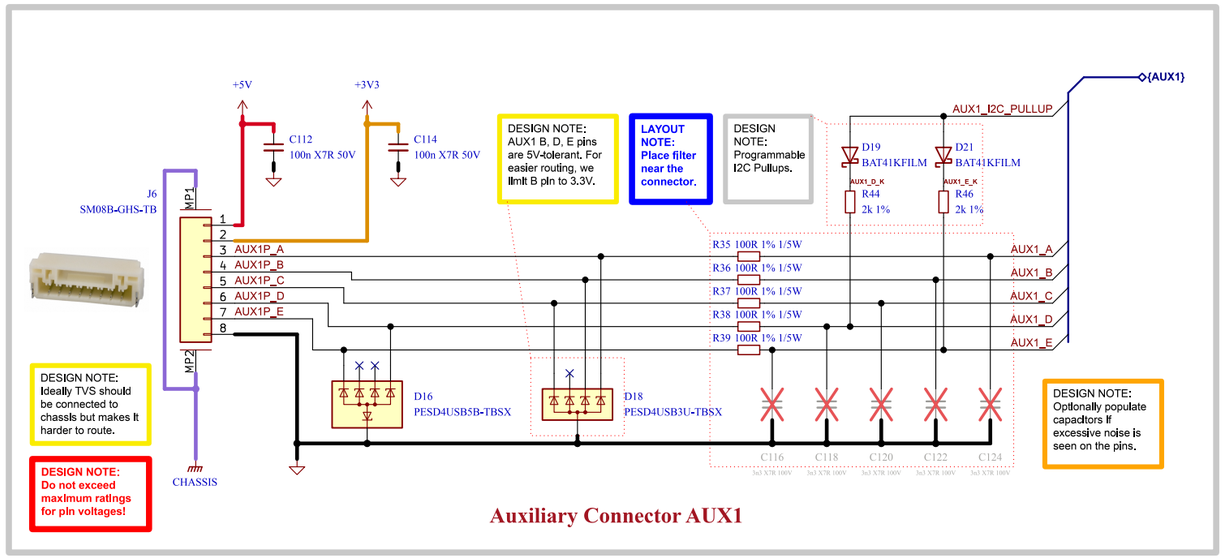
# [17] Interface - Fan Control



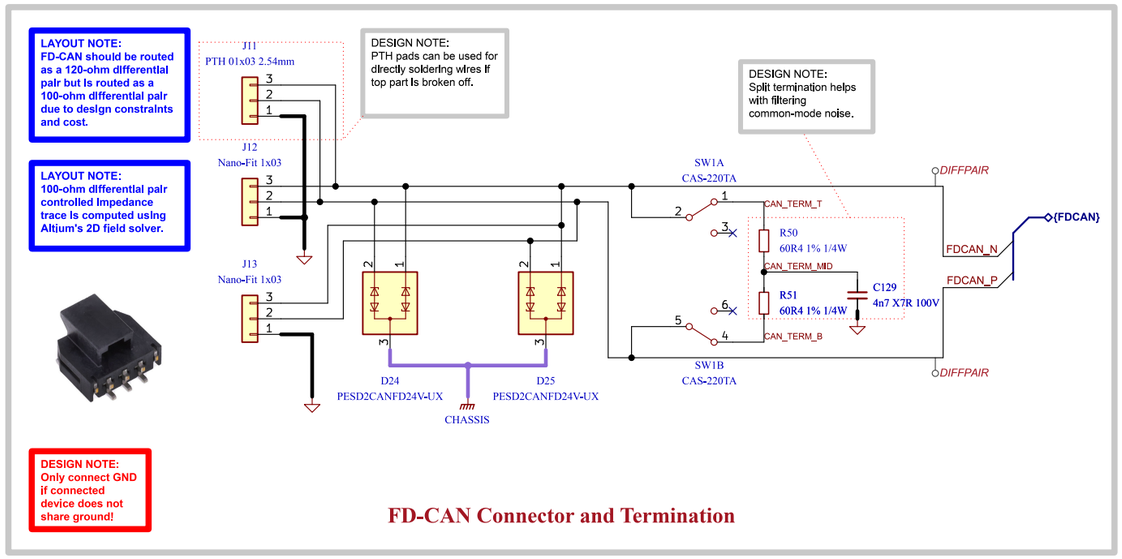

**Low-side Fan Switch and Gate Driver**

| | | | | |
|---|---|---|---|---|
| Comments: | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: **Amulet Motion Controller** | | Project Name: **Chienpanzé** | |
| Sheet Title: Interface - Fan Control | File Name: Interface - Fan Control.kicad_sch | Designer: Vincent Nguyen | Date: 2023-11-19 | Revision: 1.1 |
| Sheet Path: /Project Architecture/Interface - Fan Control/ | | Reviewer: | Size: **A4** | Sheet: **17** of **21** |

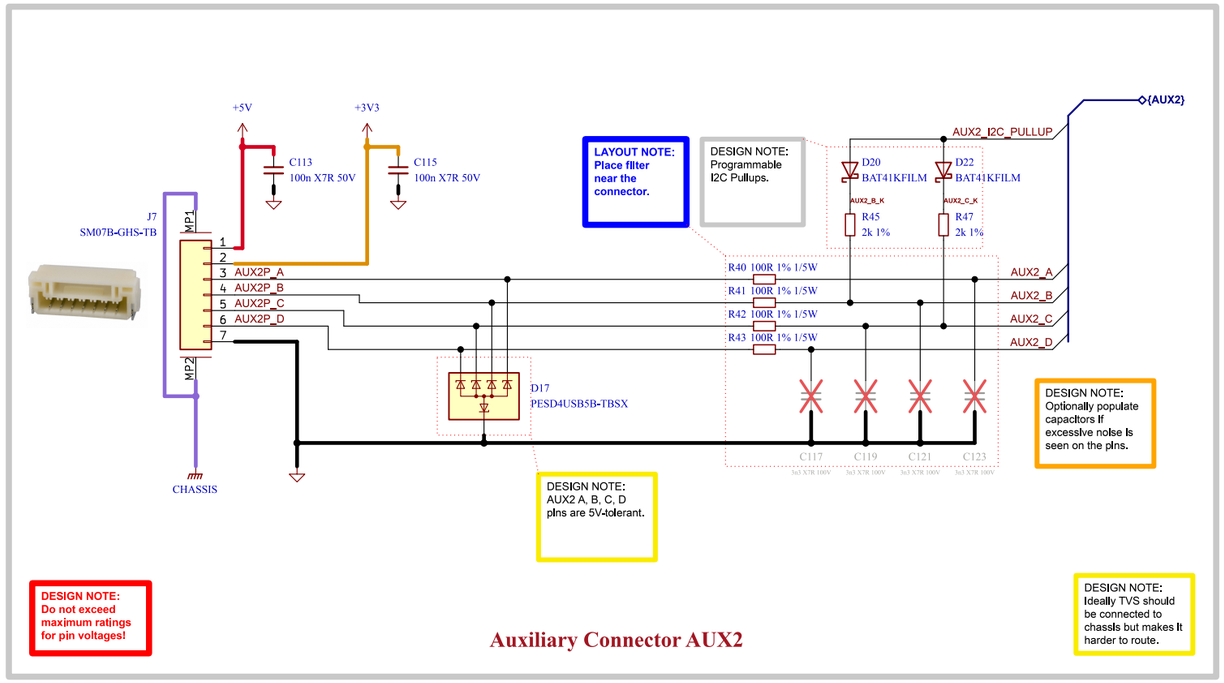
# [18] Interface - Interconnects



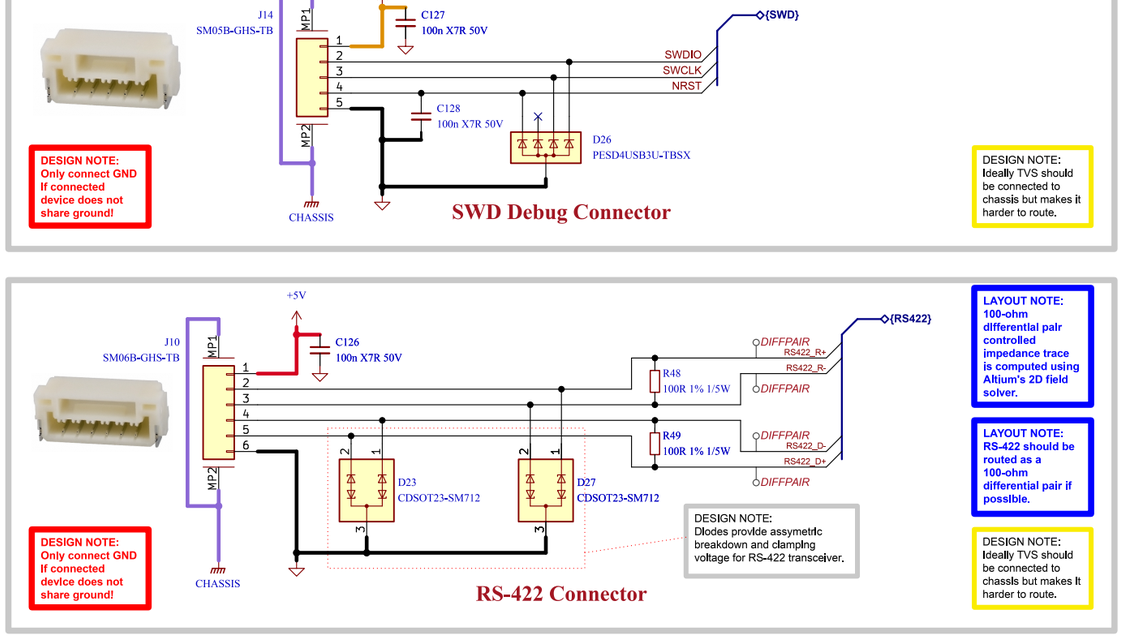

## Auxiliary Connector AUX1




## FD-CAN Connector and Termination



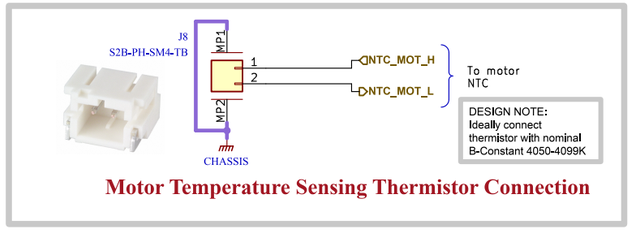

## Auxiliary Connector AUX2



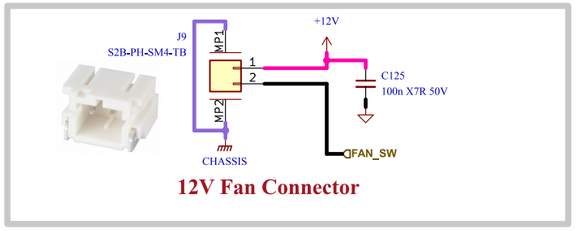

## SWD Debug Connector




## RS-422 Connector



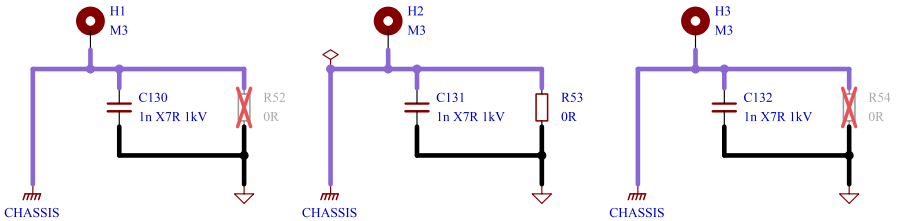

## Motor Temperature Sensing Thermistor Connection




## 12V Fan Connector

| | | | |
|---|---|---|---|
| Comments: **Reference:** Flexible I/O worked examples | Company: EPFL Xplore Research | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: **Amulet Motion Controller** | | Project Name: **Chienpanzé** |
| Sheet Title: Interface - Interconnects | File Name: Interface - Interconnects.kicad_sch | Designer: Vincent Nguyen | Date: 2023-12-31 / Revision: 1.1 |
| Sheet Path: /Project Architecture/Interface - Interconnects/ | | Reviewer: | Size: **A3** / Sheet: **18** of **21** |

# [19] Misc - Holes, Fiducials




DESIGN NOTE:
Optional RC filter for chassis grounding. Capacitors offer multi-point low-impedance connections at high-frequencies.

DESIGN NOTE:
0-Ohm resistor provides low-impedance bond between chassis and signal GND. Be aware of ground loops through cable shield.

## Mounting Holes and Chassis Connection

**Front**

FM1 FM3 FM5

**Back**

FM2 FM4 FM6

## Fiducial Markers

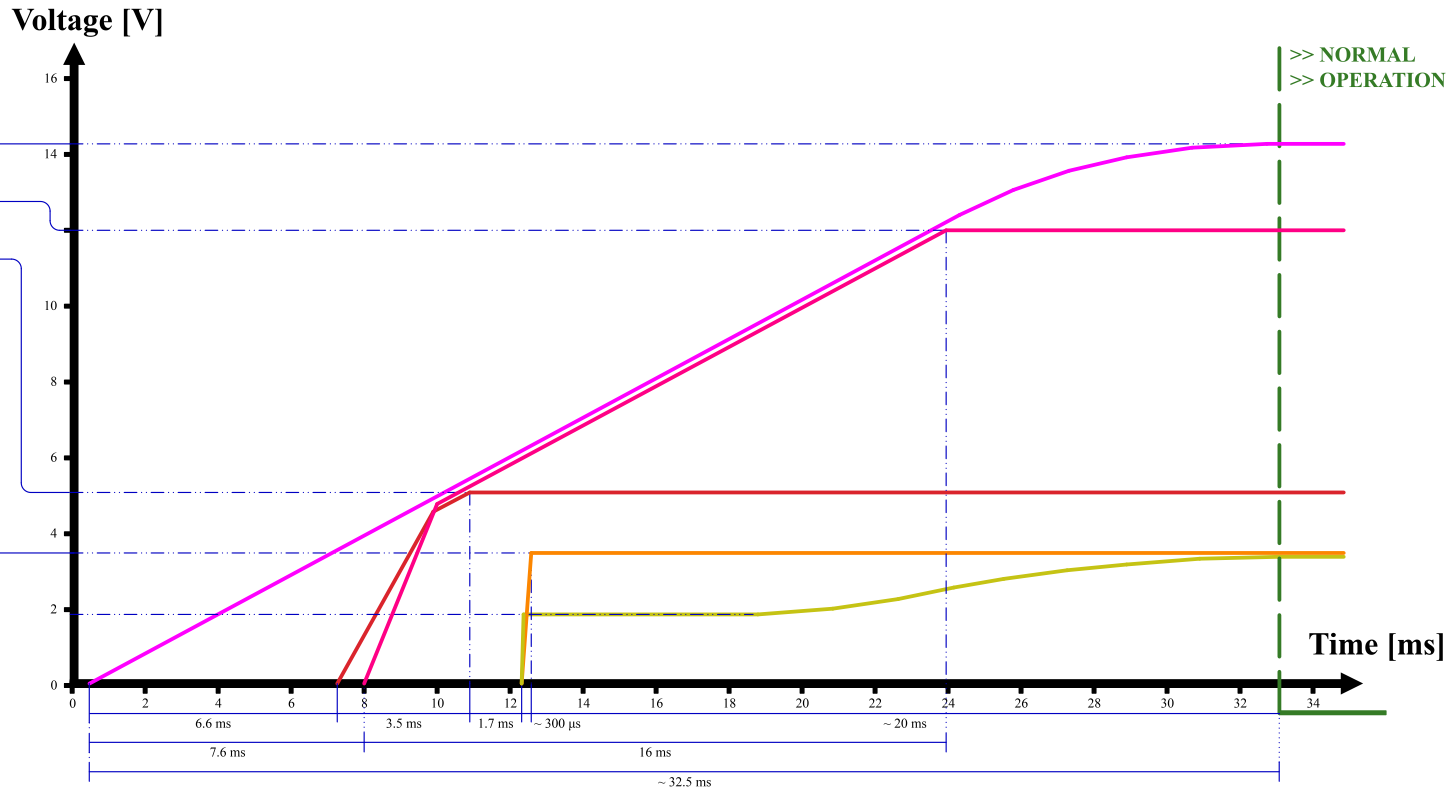
| | | | | |
|---|---|---|---|---|
| Comments: | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: **Amulet Motion Controller** | | Project Name: **Chienpanzé** | |
| Sheet Title: Misc - Holes, Fiducials | File Name: Misc - Holes Fiducials.kicad_sch | Designer: Vincent Nguyen | Date: 2023-10-22 | Revision: 1.1 |
| Sheet Path: /Project Architecture/Misc - Holes, Fiducials/ | | Reviewer: | Size: **A4** | Sheet: **19** of **21** |

# [20] Power - Sequencing

| NAME | SOURCE | LEVEL |
|---|---|---|
| +VBAT | BATTERY | 12 - 44V |
| +12V | LMR36006 | 12V ± 1.5% |
| +5V | LMR36506 | 5V ± 1.5% |
| +3V3 | TPS62172 | 3.3V ± 3% |
| +A3V3 | LP2992 | 3.3V ± 0.5% |

DESIGN NOTE:
Power sequencing graph measured experimentally.

DESIGN NOTE:
Start-up time of 12V rail depends on +VBAT charging time, which itself depends on the precharge circuit.




| | | | | |
|---|---|---|---|---|
| Comments: | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: Amulet Motion Controller | | Project Name: Chienpanzé | |
| Sheet Title: Power - Sequencing | File Name: Power - Sequencing.kicad_sch | Designer: Vincent Nguyen | Date: 2024-03-12 | Revision: 1.1 |
| Sheet Path: /Power - Sequencing/ | | Reviewer: | Size: A4 | Sheet: 20 of 21 |

# [21] Revision History

**12-DEC-2023 - Initial Release**
**Variant: v1.0 Preliminary**

- Changed CPH-CPL capacitor to 47nF (gate driver).
- Changed FD-CAN transceiver IC.
- Changed FETs for top cooled variant.
- Added TVS protection and termination switch to FD-CAN.
- Added low-side switched 12V 600mA source for external fan.
- Added LDO for analog supply.
- Changed input power TVS diode to bidirectional and added one diode per connector.
- Moved SOx low-pass filter to MCU section. Should be placed near MCU to avoid noise coupling into ADC lines.
- Added second onboard I2C magnetic encoder for disambiguation.
- Switched PWM_PHASEA with PWM_PHASEC on STM32G474 pinout for easier routing.
- Changed RS422 pinout on connector.
- Added ESD protection to all interfaces.
- Added overvoltage protection on thermistor ADC inputs.
- Changed buck regulators to optimize for low noise.
- Added Pi filters to inputs of buck regulators and MCU analog supply.
- Added decoupling caps next to power pins of connectors.

**25-JAN-2024 - First Revision**
**Variant: v1.0 Checked**

- Added controller target specifications.
- Replaced 5V 300mA buck converter with 600mA version.
- Added credits to moteus on cover page.
- Added optional RC-Snubber to power stage.
- Increased chassis length to go around the board.
- CAN and power TVS diodes now go to chassis.
- Changed clearance between nets to respect IEC60664-1 where possible.
- Rectified comment on precharge.
- Changed power TVS diode reference designator from "U" to "D".
- Replaced chassis-GND capacitor by 1nF 1kV.

**12-MAR-2024 - First Revision**
**Variant: v1.0 Released**

- Modified power sequencing graph according to experimental data.

**13-APR-2024 - Second Revision**
**Variant: v1.1 Released**

- Added RC snubber passive values.
- Added more vias for VBUS and LMR36006 GND pads.
- Changed board version voltage reference from +3V3 to +A3V3.
- Changed motor thermistor resistor divider to 2kOhm for a 10k 3950K thermistor.

| | | | | |
|---|---|---|---|---|
| Comments: | Company: EPFL Xplore Research | | Variant: NO_XT60 | Git Hash: 04d3b06 |
| | Board Name: Amulet Motion Controller | | Project Name: Chienpanzé | |
| Sheet Title: Revision History | File Name: Revision History.kicad_sch | Designer: Vincent Nguyen | Date: 2024-01-03 | Revision: 1.1 |
| Sheet Path: /Revision History/ | | Reviewer: | Size: A4 | Sheet: 21 of 21 |