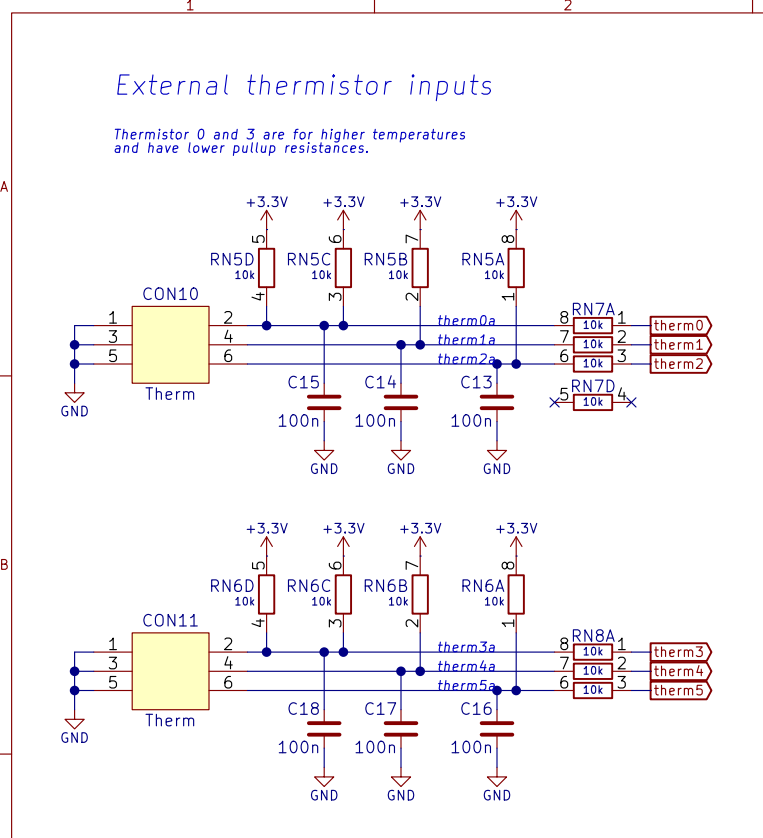


[illegible]

External thermistor inputs

Thermistor 0 and 3 are for higher temperatures and have lower pullup resistances.

The image shows two circuit diagrams for external thermistor inputs. Both diagrams feature a connector (CON10 and CON11) with pins 1, 3, and 5 connected to GND, and pins 2, 4, and 6 connected to a +3.3V supply through pullup resistors (RN5D, RN5C, RN5B, RN5A for CON10; RN6D, RN6C, RN6B, RN6A for CON11). The thermistors (therm0a, therm1a, therm2a for CON10; therm3a, therm4a, therm5a for CON11) are connected to the same +3.3V supply through pullup resistors (RN7A, RN7D for CON10; RN8A for CON11). The thermistors are also connected to the connector pins 2, 4, and 6. The thermistors are labeled therm0, therm1, therm2 for CON10 and therm3, therm4, therm5 for CON11. The thermistors are connected to the connector pins 2, 4, and 6. The thermistors are connected to the connector pins 2, 4, and 6. The thermistors are connected to the connector pins 2, 4, and 6.



Power PCB connectors

6V power is for servos
5V for OLED and LDO
12V for external outputs

The diagram illustrates the power and signal connections for three PCB connectors: CON1, CON5, and CON6.

- CON1 (PowerPCB2):** A 4-pin connector. Pins 1 and 3 are connected to +12V. Pins 2 and 4 are connected to GND.
- CON5 (PowerPCB3):** A 6-pin connector. Pins 1 and 3 are connected to +6V. Pins 2, 4, and 6 are connected to GND. Pins 5 and 6 are also connected to GND.
- CON6 (PowerPCB1):** An 8-pin connector.
 - Pins 1 and 3 are connected to +5V.
 - Pins 2, 4, 6, and 8 are connected to various signal lines: ESP_TxD, ESP_RxD, therm6, esp_en, esp_boot, cmd_heater, and heater_fb.
 - Pins 5 and 7 are connected to GND.

Additional components shown include a heater (R3, 10k) connected to the heater_fb signal line, and a resistor (R4, 1k) connected to the heater_fb signal line and GND.

Power PCB connectors

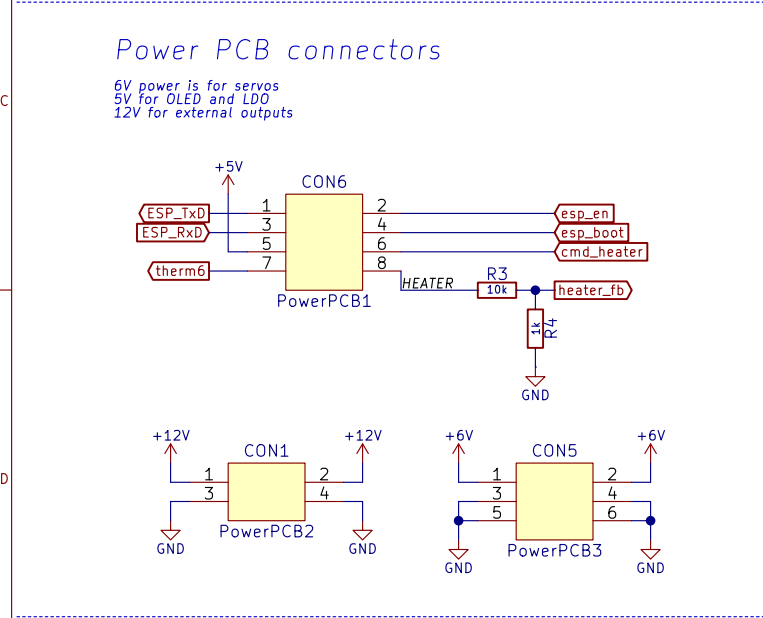
6V power is for servos
5V for OLED and LDO
12V for external outputs

The diagram illustrates the power connections for three PCB connectors:

- CON1 (PowerPCB2):** A 4-pin connector. Pins 1 and 3 are connected to +12V. Pins 2 and 4 are connected to GND.
- CON5 (PowerPCB3):** A 4-pin connector. Pins 1 and 3 are connected to +6V. Pins 2 and 4 are connected to GND. Pins 5 and 6 are connected to +6V.
- CON6 (PowerPCB1):** An 8-pin connector. Pins 1, 3, 5, and 7 are connected to +5V. Pins 2, 4, 6, and 8 are connected to GND. Specific components are connected to these pins:
 - Pins 1 and 3: ESP_TxD and ESP_RxD
 - Pins 5 and 7: therm6
 - Pins 2 and 4: esp_en and esp_boot
 - Pins 6 and 8: cmd_heater

Additional components and connections shown:

- A HEATER is connected to the +5V line between pins 5 and 7 of CON6.
- A resistor R3 (10k) is connected between the HEATER and the heater_fb signal.
- A resistor R4 (1k) is connected between the heater_fb signal and GND.



For uC only

3.3V \pm 3%
250mA max.
0.51W max.

U4
AMS1117-3.3

IN GND OUT

3 2

+5V

C7 100n

GND

+3.3V

C8 22u/6V3

GND

T491A226K006AT

For uC only

3.3V \pm 3%
250mA max.
0.51W max.

U4
AMS1117-3.3

IN GND OUT

3 2

+5V

C7 100n

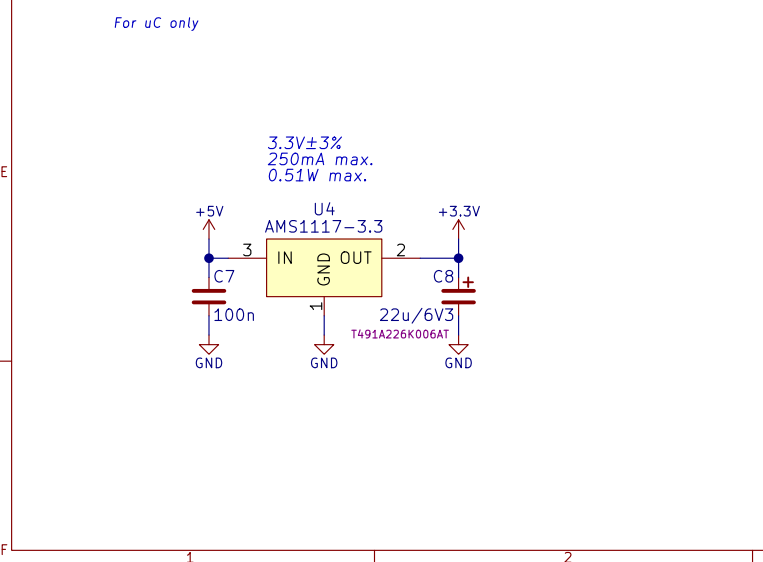
GND

+3.3V

C8 22u/6V3

GND

T491A226K006AT



The schematic diagram illustrates the pin connections for two STM32F103RBT6 microcontrollers, labeled U1A and U1B.

U1A Pin Connections:

- Left Side:**
 - 14: esp_en
 - 15: esp_boot
 - 16: DBG_TxD
 - 17: DBG_RxD
 - 20: heater_fb
 - 21: therm6
 - 22: therm0
 - 23: therm1
 - 41: Servo0
 - 42: Servo1
 - 43: Servo2
 - 44: Servo3
 - 45: SWDIO
 - 46: SWCLK
- Right Side:**
 - 26: therm4
 - 27: therm5
 - 55: SW0
 - 57: BTN
 - 58: Servo4
 - 59: Servo5
 - 61: Servo6
 - 62: Servo7
 - 29: SCL
 - 30: SDA
 - 33: LED1
 - 34: LED2

U1B Pin Connections:

- Left Side:**
 - 7: NRST
 - 60: BOOT0
 - 1: VBAT
 - 13: VDDA
 - 32: VDD
 - 64: VDD
 - 48: VDD
 - 19: VDD
 - 12: VSSA
 - 31: VSS
 - 63: VSS
 - 47: VSS
 - 18: VSS
- Right Side:**
 - 8: PC0
 - 9: PC1
 - 10: PC2
 - 11: PC3
 - 24: PC4
 - 25: PC5
 - 37: PC6
 - 38: PC7
 - 39: PC8
 - 40: PC9
 - 51: PC10
 - 52: PC11
 - 53: PC12
 - 2: PC13-TAMPER-RTC
 - 3: PC14-OSC32_IN
 - 4: PC15-OSC32_OUT
 - 5: OSC_IN
 - 6: OSC_OUT

External Components and Connections:

- Resistors:** R1 (10k) is connected between VDDA and GND. R2 (10k) is connected between NRST and GND.
- Capacitors:** C1, C2, C3, C4, and C5 are 100nF capacitors connected to VDD, VSS, and VDDA pins to ground.
- Crystal:** Q1 is a Ceramic 3.7x3.1_8Mhz crystal connected to OSC_IN and OSC_OUT pins.
- Other Connections:**
 - therm2 and therm3 are connected to PC4 and PC5.
 - cmd_heater is connected to PC6.
 - Motor is connected to PC7.
 - Fan1 and Fan2 are connected to PC8 and PC9.
 - ESP_RxD and ESP_TxD are connected to PC10 and PC11.

The schematic diagram illustrates the pin connections for two STM32F103RBT6 microcontrollers, labeled U1A and U1B.

U1A Pin Connections:

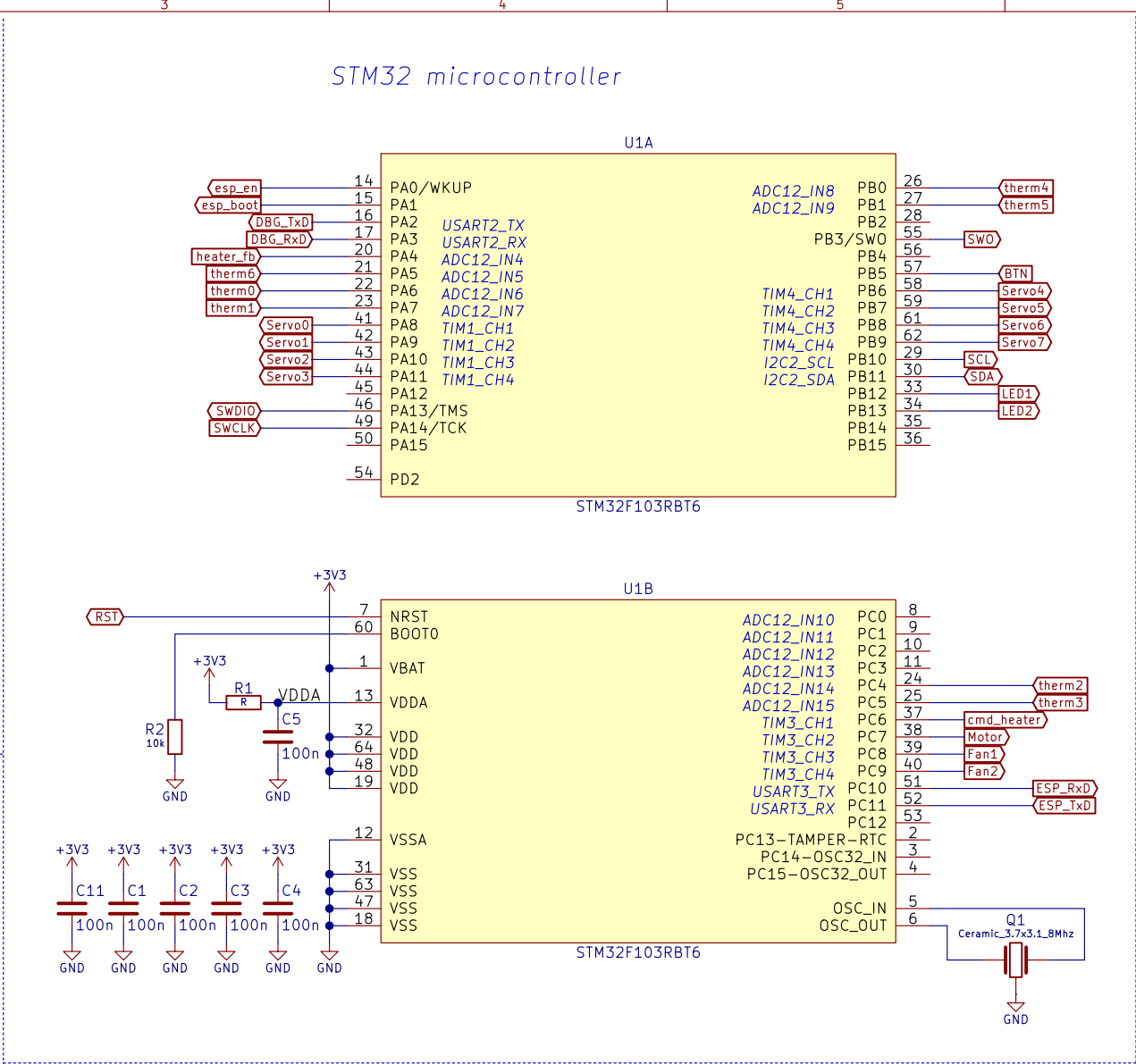
- Left Side:**
 - 14: esp_en
 - 15: esp_boot
 - 16: DBG_TxD
 - 17: DBG_RxD
 - 20: heater_fb
 - 21: therm6
 - 22: therm0
 - 23: therm1
 - 41: Servo0
 - 42: Servo1
 - 43: Servo2
 - 44: Servo3
 - 45: SWDIO
 - 46: SWCLK
- Right Side:**
 - 26: therm4
 - 27: therm5
 - 55: SW0
 - 57: BTN
 - 58: Servo4
 - 59: Servo5
 - 61: Servo6
 - 62: Servo7
 - 29: SCL
 - 30: SDA
 - 33: LED1
 - 34: LED2

U1B Pin Connections:

- Left Side:**
 - 7: NRST
 - 60: BOOT0
 - 1: VBAT
 - 13: VDDA
 - 32: VDD
 - 64: VDD
 - 48: VDD
 - 19: VDD
 - 12: VSSA
 - 31: VSS
 - 63: VSS
 - 47: VSS
 - 18: VSS
- Right Side:**
 - 8: PC0
 - 9: PC1
 - 10: PC2
 - 11: PC3
 - 24: PC4
 - 25: PC5
 - 37: PC6
 - 38: PC7
 - 39: PC8
 - 40: PC9
 - 51: PC10
 - 52: PC11
 - 53: PC12
 - 2: PC13-TAMPER-RTC
 - 3: PC14-OSC32_IN
 - 4: PC15-OSC32_OUT
 - 5: OSC_IN
 - 6: OSC_OUT

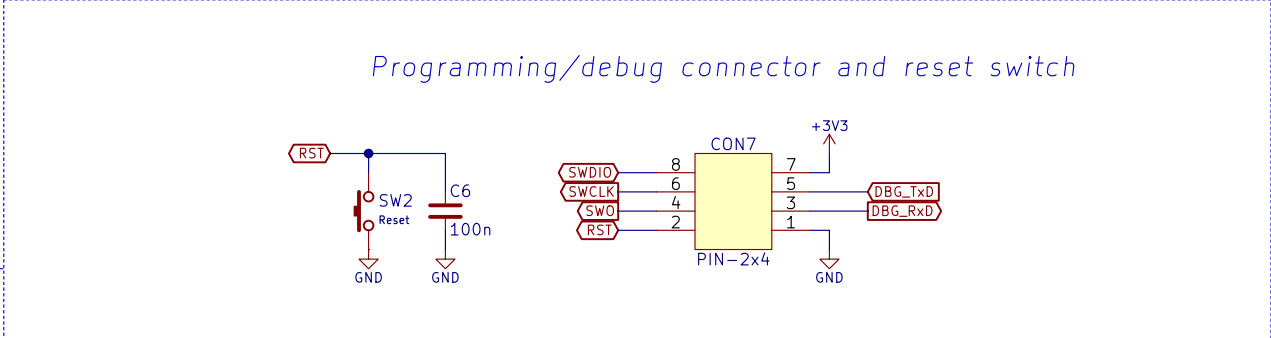
External Components and Connections:

- Resistors:** R1 (10k) is connected between VDDA and GND. R2 (10k) is connected between NRST and GND.
- Capacitors:** C1, C2, C3, C4, and C5 are 100nF capacitors connected to VDD, VSS, and VDDA pins to ground.
- Crystal:** Q1 is a Ceramic 3.7x3.1_8Mhz crystal connected to OSC_IN and OSC_OUT pins.
- Other Connections:**
 - therm2 and therm3 are connected to PC4 and PC5.
 - cmd_heater is connected to PC6.
 - Motor is connected to PC7.
 - Fan1 and Fan2 are connected to PC8 and PC9.
 - ESP_RxD and ESP_TxD are connected to PC10 and PC11.

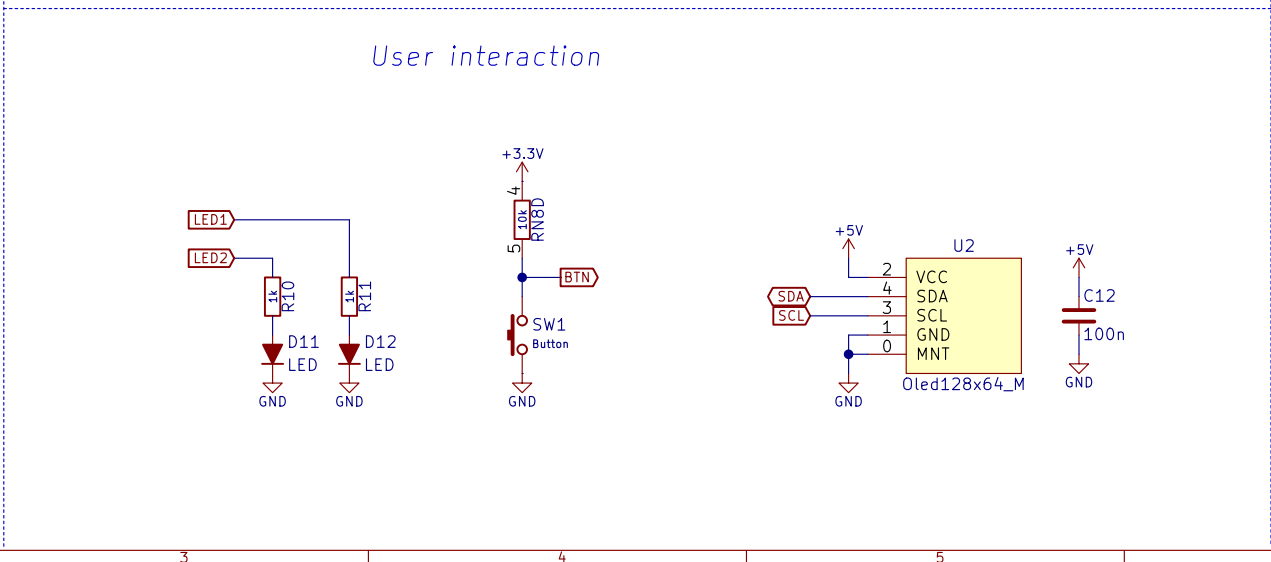


Programming/debug connector and reset switch

The diagram illustrates the hardware for programming and debugging. It features a reset switch (SW2) connected to a reset pin (RST) and a 100nF capacitor (C6) to ground. The connector (CON7) is a 2x4 pin header with pins 1-4 connected to RST, SWO, SWCLK, and SWDIO respectively, and pins 3-4 connected to DBG_RxD and DBG_TxD respectively. The connector is also connected to +3V3 and ground.



The diagram illustrates the user interaction components of the system. It includes two LEDs, LED1 and LED2, each connected to a 1k resistor (R10 and R11) and then to ground. A button (BTN) is connected to a 10k pull-up resistor (RNB0) to a +3.3V supply and to ground through a switch (SW1). An OLED display (U2, 0led128x64_M) is connected to a +5V supply for VCC and ground for GND. The SDA and SCL pins are connected to the microcontroller. A 100nF capacitor (C12) is connected between the +5V supply and ground.



Servo connectors

Servos powered from external BEC regulator

The diagram illustrates the wiring for three servo motors (Servo0 through Servo7) connected to three connectors (CON2A, CON2B, CON2C) and three connectors (CON3A, CON3B, CON3C). The servos are powered from an external BEC regulator, providing a +6V supply. The wiring includes ground connections and a 10uF/16V capacitor (C9) connected to the +6V supply.

Servo0 through Servo3 (Top Section):

- Servo0: Pin 4 (1k) to 5, Pin 3 (1k) to 6, Pin 2 (1k) to 7, Pin 1 (1k) to 8.
- Servo0a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.
- Servo1a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.
- Servo2a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.
- Servo3a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.

Servo4 through Servo7 (Bottom Section):

- Servo4: Pin 4 (1k) to 5, Pin 3 (1k) to 6, Pin 2 (1k) to 7, Pin 1 (1k) to 8.
- Servo4a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.
- Servo5a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.
- Servo6a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.
- Servo7a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.

Connectors and Power:

- CON2A, CON2B, CON2C: Servo connectors for the bottom section.
- CON3A, CON3B, CON3C: Servo connectors for the top section.
- +6V: External BEC regulator supply.
- GND: Ground connections.
- C9: 10uF/16V capacitor connected to the +6V supply.

Servo connectors

Servos powered from external BEC regulator

The diagram illustrates the wiring for three servo motors (Servo0 through Servo7) connected to three connectors (CON2A, CON2B, CON2C) and three connectors (CON3A, CON3B, CON3C). The servos are powered from an external BEC regulator, providing a +6V supply. The wiring includes ground connections and a 10uF/16V capacitor (C9) connected to the +6V supply.

Servo0 through Servo3 (Top Section):

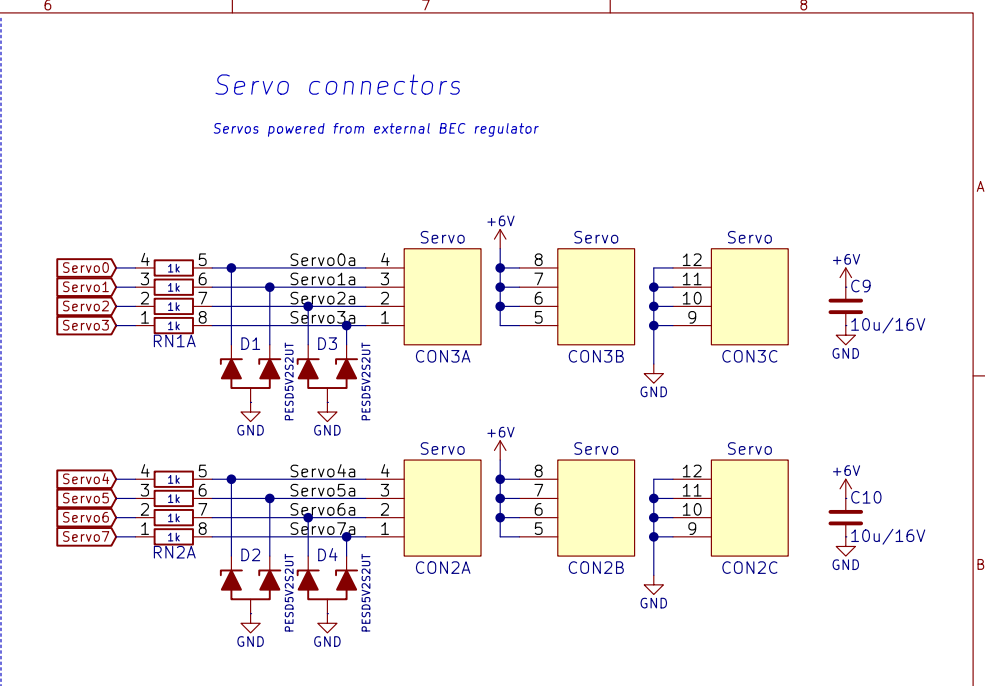
- Servo0: Pin 4 (1k) to 5, Pin 3 (1k) to 6, Pin 2 (1k) to 7, Pin 1 (1k) to 8.
- Servo0a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.
- Servo1a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.
- Servo2a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.
- Servo3a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.

Servo4 through Servo7 (Bottom Section):

- Servo4: Pin 4 (1k) to 5, Pin 3 (1k) to 6, Pin 2 (1k) to 7, Pin 1 (1k) to 8.
- Servo4a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.
- Servo5a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.
- Servo6a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.
- Servo7a: Pin 4 to 5, Pin 3 to 6, Pin 2 to 7, Pin 1 to 8.

Connectors and Power:

- CON2A, CON2B, CON2C: Servo connectors for the bottom section.
- CON3A, CON3B, CON3C: Servo connectors for the top section.
- +6V: External BEC regulator supply.
- GND: Ground connections.
- C9: 10uF/16V capacitor connected to the +6V supply.



Medium power outputs

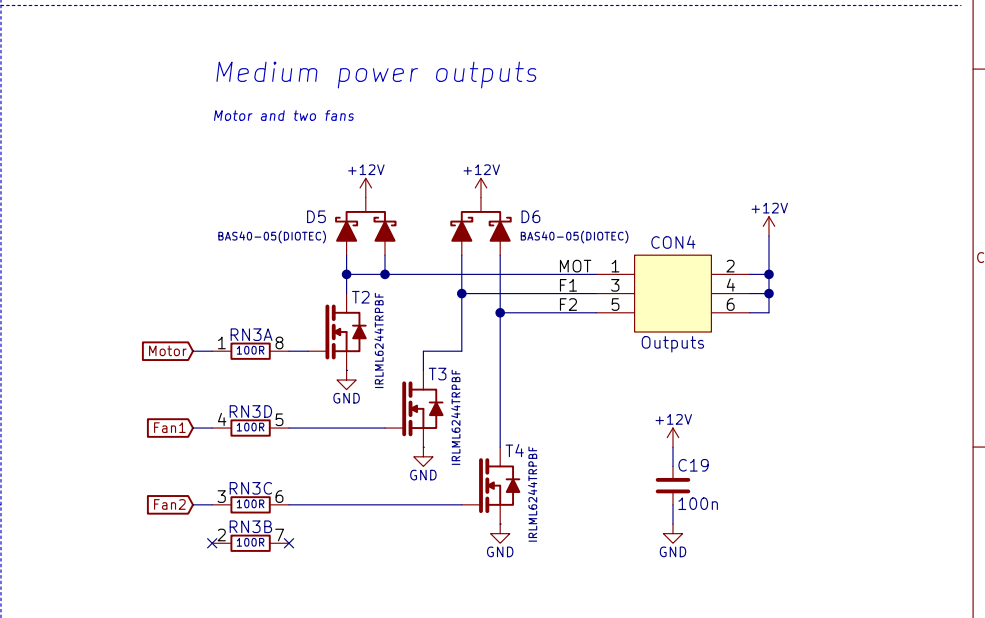
Motor and two fans

The diagram illustrates a medium power output stage designed to drive a motor and two fans. The circuit is powered by a +12V supply. The output stage consists of four MOSFETs (T2, T3, T4) and two diodes (D5, D6). The MOSFETs are configured in a half-bridge, with T2 and T3 driving the motor and T3 and T4 driving the fans. The diodes are used for rectification. The output is connected to a connector (CON4) with pins 1, 3, 5, 2, 4, 6. The circuit includes a 100nF capacitor (C19) and a 100R resistor (RN3A) for the motor, and 100R resistors (RN3D, RN3C, RN3B) for the fans.

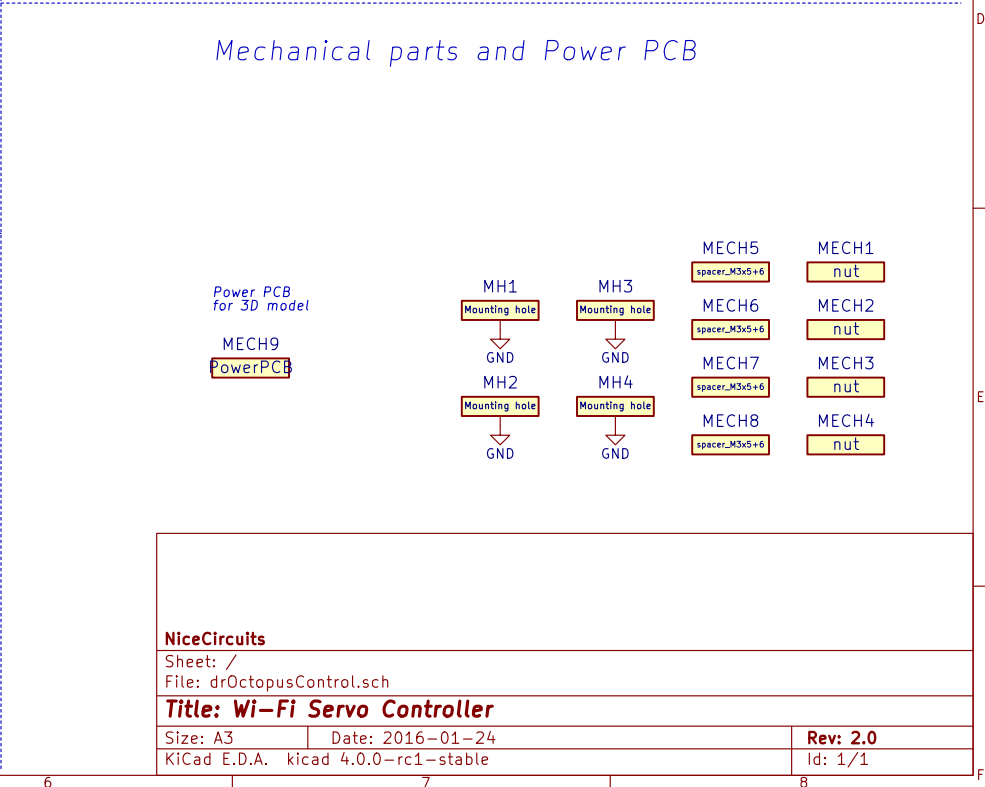
Medium power outputs

Motor and two fans

The diagram illustrates a medium power output stage designed to drive a motor and two fans. The circuit is powered by a +12V supply. The output stage consists of four MOSFETs (T2, T3, T4) and two diodes (D5, D6). The MOSFETs are configured in a half-bridge, with T2 and T3 driving the motor and T3 and T4 driving the fans. The diodes are used for rectification. The output is connected to a connector (CON4) with pins 1, 3, 5, 2, 4, 6. The circuit includes a 100nF capacitor (C19) and a 100R resistor (RN3A) for the motor, and 100R resistors (RN3D, RN3C, RN3B) for the fans.



The diagram illustrates the mechanical parts and Power PCB for a 3D model. It shows a central Power PCB with various mounting holes (MH1, MH2, MH3, MH4) and GND connections. The PCB is labeled MECH9 and PowerPCB. Surrounding the PCB are various mechanical parts, including spacers (spacer_M3x5+6) and nuts (nut), labeled MECH1 through MECH8. The parts are arranged in a symmetrical pattern around the central PCB.



The diagram illustrates the mechanical parts and Power PCB for a 3D model. It shows a central Power PCB with various mounting holes (MH1, MH2, MH3, MH4) and GND connections. The PCB is labeled MECH9 and PowerPCB. Surrounding the PCB are various mechanical parts, including spacers (spacer_M3x5+6) and nuts (nut), labeled MECH1 through MECH8. The parts are arranged in a symmetrical pattern around the central PCB.

The diagram illustrates the mechanical parts and Power PCB for a 3D model. It shows a central Power PCB with various mounting holes (MH1, MH2, MH3, MH4) and GND connections. The PCB is labeled MECH9 and PowerPCB. Surrounding the PCB are various mechanical parts, including spacers (spacer_M3x5+6) and nuts (nut), labeled MECH1 through MECH8. The parts are arranged in a symmetrical pattern around the central PCB.

The diagram illustrates the mechanical parts and Power PCB for a 3D model. It shows a central Power PCB with various mounting holes (MH1, MH2, MH3, MH4) and GND connections. The PCB is labeled MECH9 and PowerPCB. Surrounding the PCB are various mechanical parts, including spacers (spacer_M3x5+6) and nuts (nut), labeled MECH1 through MECH8. The parts are arranged in a symmetrical pattern around the central PCB.

The diagram illustrates the mechanical parts and Power PCB for a 3D model. It shows a central Power PCB with various mounting holes (MH1, MH2, MH3, MH4) and GND connections. The PCB is labeled MECH9 and PowerPCB. Surrounding the PCB are various mechanical parts, including spacers (spacer_M3x5+6) and nuts (nut), labeled MECH1 through MECH8. The parts are arranged in a symmetrical pattern around the central PCB.

The diagram illustrates the mechanical parts and Power PCB for a 3D model. It shows a central Power PCB with various mounting holes (MH1, MH2, MH3, MH4) and GND connections. The PCB is labeled MECH9 and PowerPCB. Surrounding the PCB are various mechanical parts, including spacers (spacer_M3x5+6) and nuts (nut), labeled MECH1 through MECH8. The parts are arranged in a symmetrical pattern around the central PCB.

The diagram illustrates the mechanical parts and Power PCB for a 3D model. It shows a central Power PCB with various mounting holes (MH1, MH2, MH3, MH4) and GND connections. The PCB is labeled MECH9 and PowerPCB. Surrounding the PCB are various mechanical parts, including spacers (spacer_M3x5+6) and nuts (nut), labeled MECH1 through MECH8. The parts are arranged in a symmetrical pattern around the central PCB.

The diagram illustrates the mechanical parts and Power PCB for a 3D model. It shows a central Power PCB with various mounting holes (MH1, MH2, MH3, MH4) and GND connections. The PCB is labeled MECH9 and PowerPCB. Surrounding the PCB are various mechanical parts, including spacers (spacer_M3x5+6) and nuts (nut), labeled MECH1 through MECH8. The parts are arranged in a symmetrical pattern around the central PCB.