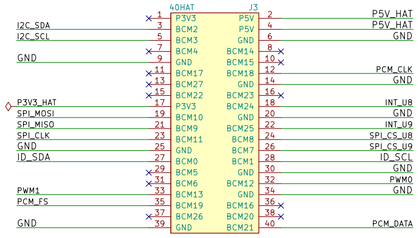
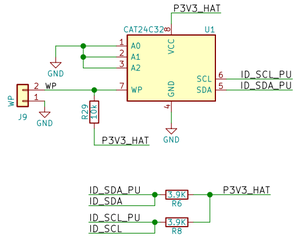
40-Pin HAT Connector



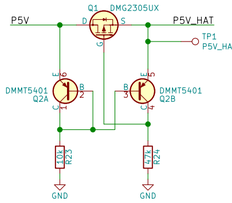
HAT ID-EEPROM

The HAT spec requires this EEPROM with system information to be in place in order to be called a HAT. It is set up as write protected (WP pin held high) and can be enabled for writing by placing a jumper on J9 or by bridging TP1.



5V Powered HAT Protection

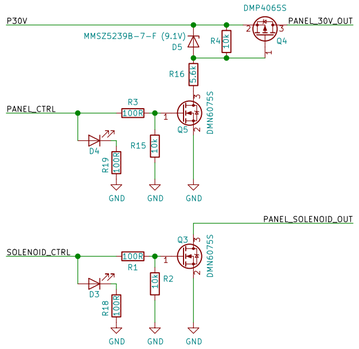
This is the recommended 5V rail protection for a HAT with power going to the Pi.
See https://github.com/raspberrypi/hats/blob/master/designguide.md#back-powering-the-pi-via-the-j8-gpio-header



Panel Power Switching

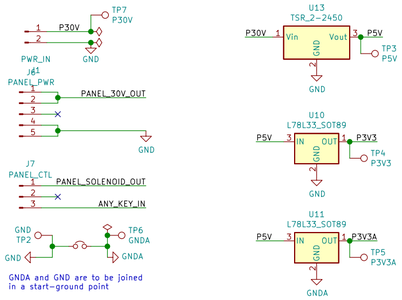
The Panel's Solenoid and Bulbs are driven from 30V.
During Standby the RaspberryPi turns of the Panel via Q4 and Q5.
D5 limits the Vgss of Q4 to 9.1V and R16 the Current across D5 to around 5mA.

Q3 controls the Selection-Solenoid. Normally Q3 is turned on and allows a Selection on the Panel. When Q3 is turned off for a brief Moment, the Selection is Ejected.

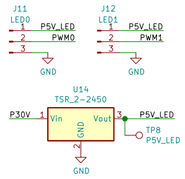


Power Section

The Hat is powered from an external 30V 2A Power-Brick.
P30V is directly switched to the Panel's Solenoid and Light Bulbs through Q4.
P5V is generated from P30V by U13 and passed to the RaspberryPi through the Protection Circuit around Q1.
P3V3 is generated from P5V5 by U10 for all the local, digital ICs.
P3V3A is generated from P5V5 by U11 for the Analog Portion of the Audio DAC U12.
GND and AGND is joined in a Star-Grounding-Point to minimize Crosstalk from the Digital to the Analog side.



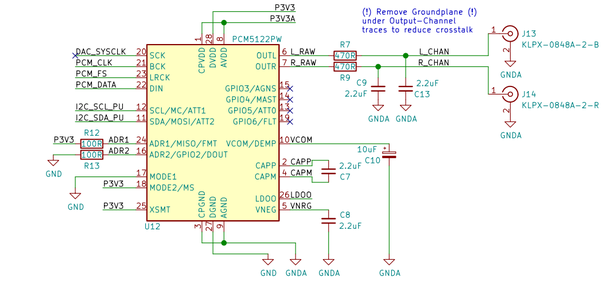
RGB-LED Section

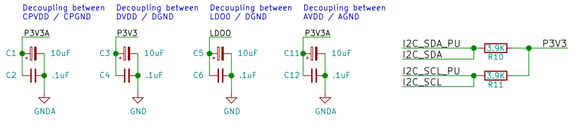


Audio DAC

The System-Clock SCK is generated with a PLL internally from PCM_FS. Alternatively one could add 2 extra Oscillatory to enhance the frequency stability. They are controlled by GPIO 3/6 from the Linux-Driver.

Audio Connector

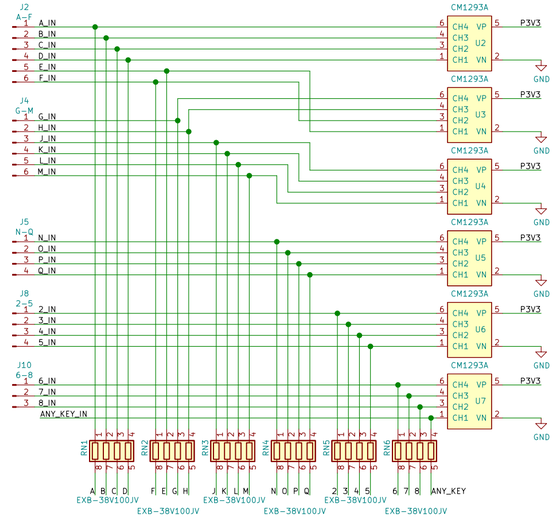




Mounting Holes

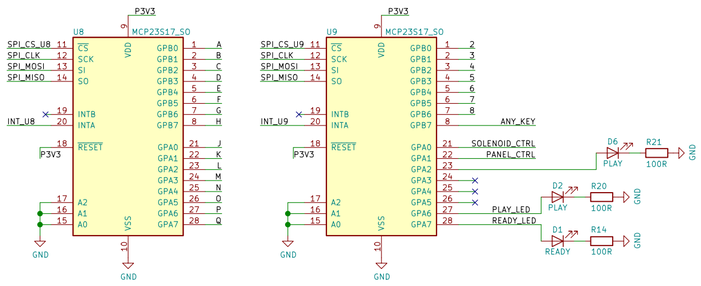
Panel Connectors & Input-Protection

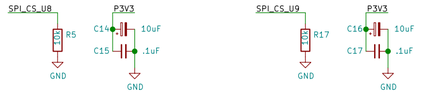
All Inputs are equipped with 3.3V Transient Suppression Diodes and series resistors to protect against ESD and inductive coupled Transients to support the the long cable runs and close high-current solenoids and incandescent bulbs.



GPIO Port Extender

Two MCP23S17 (SPI 16bit Port Extender) read from the Panel-IOs and to drive the FETs which control the Panel-Power. Q8 and Q9 each have their own Chip-Select and Interrupt-Line. The Interrupt-Mirror-Feature is used, to only have one Interrupt per Chip.





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Title: Raspberry Pi HAT

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