# MORSE KOB HAT

This is based on the official Raspberry Pi spec to be able to call an extension board a HAT.
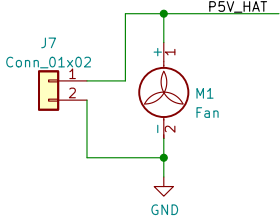https://github.com/raspberrypi/hats/blob/master/designguide.md

## 40-Pin HAT Connector

PI40HAT
Connector_PinSocket_2.54mm:PinSocket_2x20_P2.54mm_Vertical

| | | | |
|---|---|---|---|
| P3V3_HAT | 1 P3V3 | P5V 2 | P5V_HAT |
| SDA | 3 BCM2 | P5V 4 | P5V_HAT |
| SCL | 5 BCM3 | GND 6 | GND |
| | 7 BCM4 | BCM14 8 | |
| GND | 9 GND | BCM15 10 | |
| | 11 BCM17 | BCM18 12 | |
| | 13 BCM27 | GND 14 | GND |
| | 15 BCM22 | BCM23 16 | |
| | 17 P3V3 | BCM24 18 | |
| | 19 BCM10 | GND 20 | GND |
| | 21 BCM9 | BCM25 22 | |
| | 23 BCM11 | BCM8 24 | |
| GND | 25 GND | BCM7 26 | |
| ID_SD_EEPROM | 27 BCM0 | BCM1 28 | ID_SC_EEPROM |
| | 29 BCM5 | GND 30 | GND |
| | 31 BCM6 | BCM12 32 | |
| | 33 BCM13 | GND 34 | GND |
| | 35 BCM19 | BCM16 36 | |
| GPO26 | 37 BCM26 | BCM20 38 | |
| GND | 39 GND | BCM21 40 | GPI21 |

**STANDARD HAT EEPROM AND OTHER STUFF REMOVED**

## I2C Interface

J6 Conn_01x04
| | | |
|---|---|---|
| GND | 1 | |
| P3V3_HAT | 2 | |
| SCL | 3 | |
| SDA | 4 | |

HAT spec indicates to NEVER power the 3.3V pins on the Raspberry Pi from the HAT header. Only connect the 3.3V power from the Pi if the HAT does not have 3.3V on board.
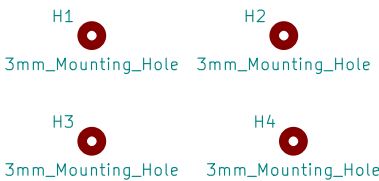
IF you are designing a board that could either be powered by the Pi or from the HAT the jumpers here can be used.

In most cases, either design the HAT to provide the 5V to the Pi and use the protection circuit above OR power the HAT from the Pi and directly connect the P3V3 and P5V to the P3V3_HAT and P5V_HAT pins.

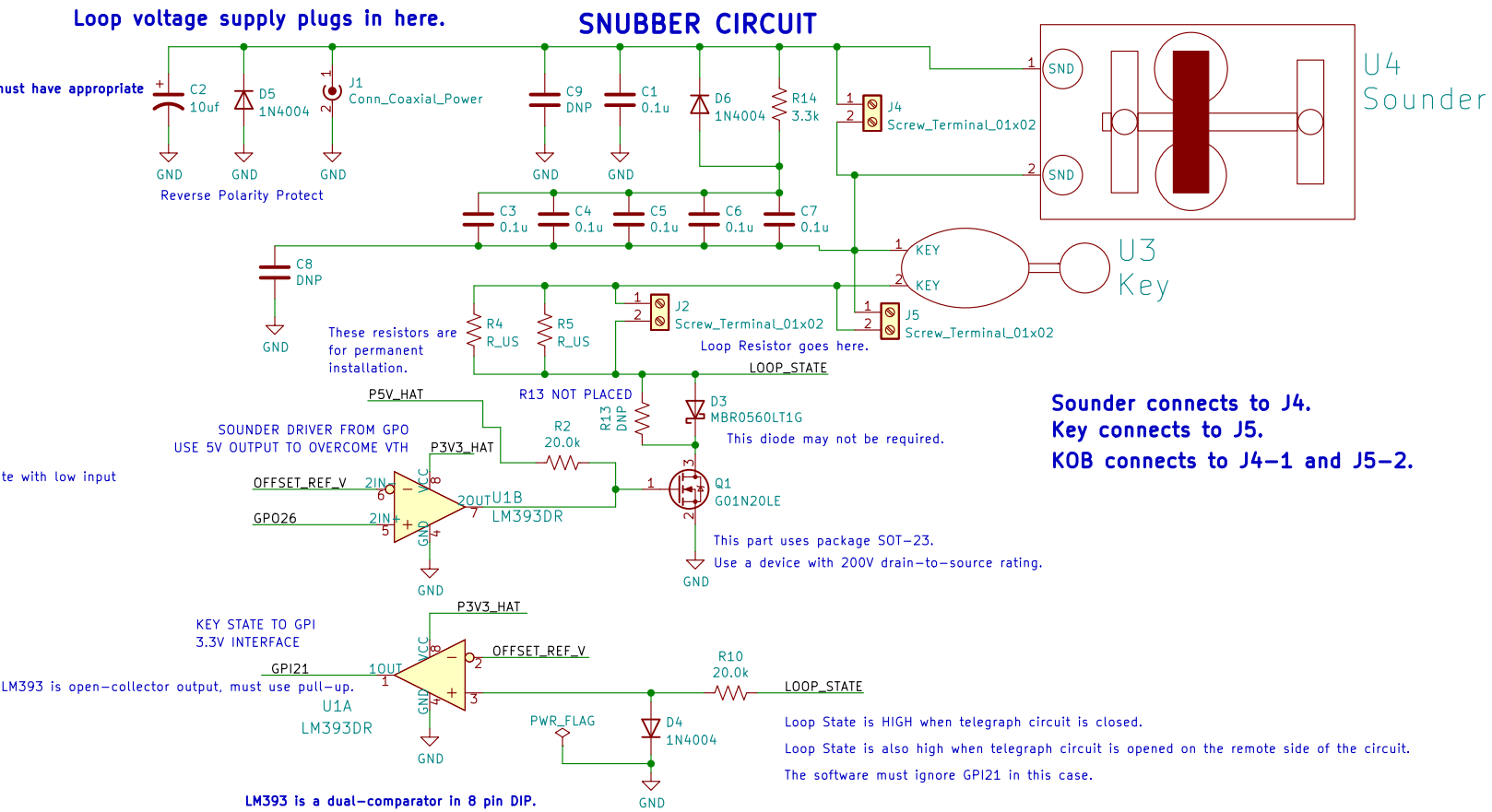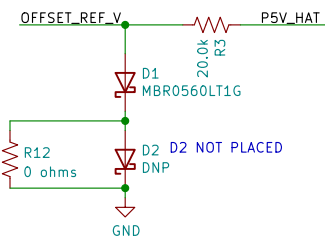Used screw terminals instead of binding posts. Just more practical.

## 20 MM COOLING FAN FOR RPI4

P5V_HAT
J7 Conn_01x02
M1 Fan
GND

## Mounting Holes

H1 3mm_Mounting_Hole
H2 3mm_Mounting_Hole
H3 3mm_Mounting_Hole
H4 3mm_Mounting_Hole

Generate an offset voltage to make sure the comparators are in low state with low input
May need only one diode in reference circuit.

SCHOTTKY DIODES

OFFSET_REF_V
R3 20.0k
P5V_HAT
D1 MBR0560LT1G
D2 DNP  D2 NOT PLACED
R12 0 ohms
GND

Loop voltage supply plugs in here.

This capacitor must have appropriate voltage rating.

C2 10uf
D5 1N4004
J1 Conn_Coaxial_Power
GND GND GND
Reverse Polarity Protect

## SNUBBER CIRCUIT

C9 DNP
C1 0.1u
D6 1N4004
R14 3.3k
J4 Screw_Terminal_01x02
GND GND

C3 0.1u
C4 0.1u
C5 0.1u
C6 0.1u
C7 0.1u

C8 DNP
GND

These resistors are for permanent installation.

R4 R_US
R5 R_US
J2 Screw_Terminal_01x02
Loop Resistor goes here.
LOOP_STATE

## 4-150 OHM SOUNDER

U4 Sounder
SND SND

U3 Key
KEY KEY
J5 Screw_Terminal_01x02

Sounder connects to J4.
Key connects to J5.
KOB connects to J4-1 and J5-2.

R13 NOT PLACED

P5V_HAT
SOUNDER DRIVER FROM GPO
USE 5V OUTPUT TO OVERCOME VTH
P3V3_HAT

OFFSET_REF_V  2IN-
GPO26  2IN+
U1B LM393DR
2OUT

R2 20.0k
R13 DNP
D3 MBR0560LT1G
This diode may not be required.

Q1 G01N20LE
This part uses package SOT-23.
Use a device with 200V drain-to-source rating.
GND

## KEY STATE TO GPI
## 3.3V INTERFACE

GPI21  1OUT
U1A LM393DR
P3V3_HAT
1IN-  OFFSET_REF_V
R10 20.0k
LOOP_STATE
PWR_FLAG
D4 1N4004
GND

LM393 is open-collector output, must use pull-up.

LM393 is a dual-comparator in 8 pin DIP.

Loop State is HIGH when telegraph circuit is closed.

Loop State is also high when telegraph circuit is opened on the remote side of the circuit.

The software must ignore GPI21 in this case.