

# RASPBERRY PI ZERO POWER SENSOR HAT

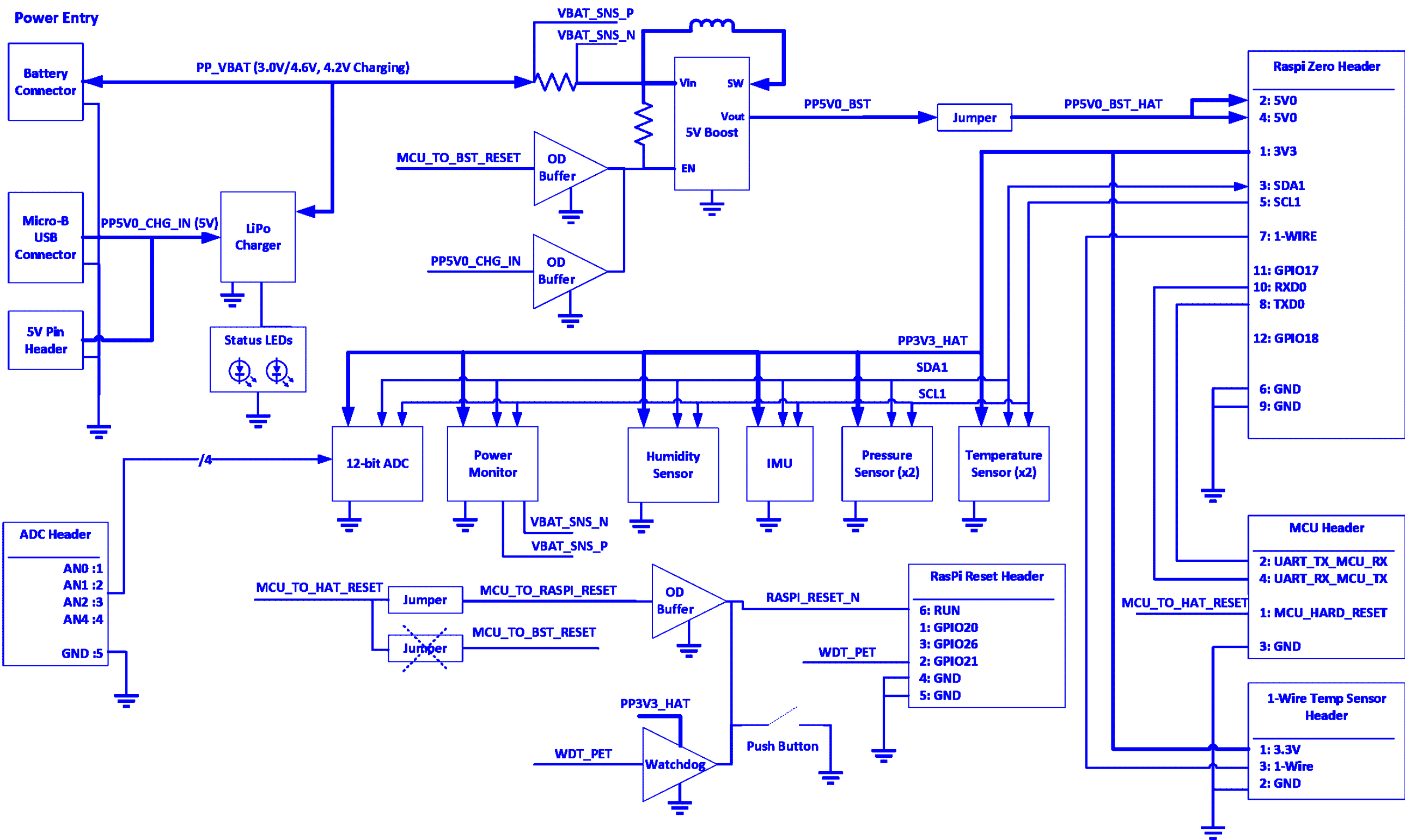
## TABLE OF CONTENTS

SHEET	SHEET NAME
1	TITLE_TOC
2	BLOCK_DIAGRAM
3	LIPO_CHARGER_AND_BCM_RESET
4	POWER_ENTRY_BOOST_LDO
5	SENSORS
6	PI_MCU_CONNECT_AND_MOUNTING
7	ASSEMBLY_COMPONENTS
8	
9	
10	

DESIGN: 001-001-01  
TEAM: P17105  
ENGINEER: CHRIS SCHWAB

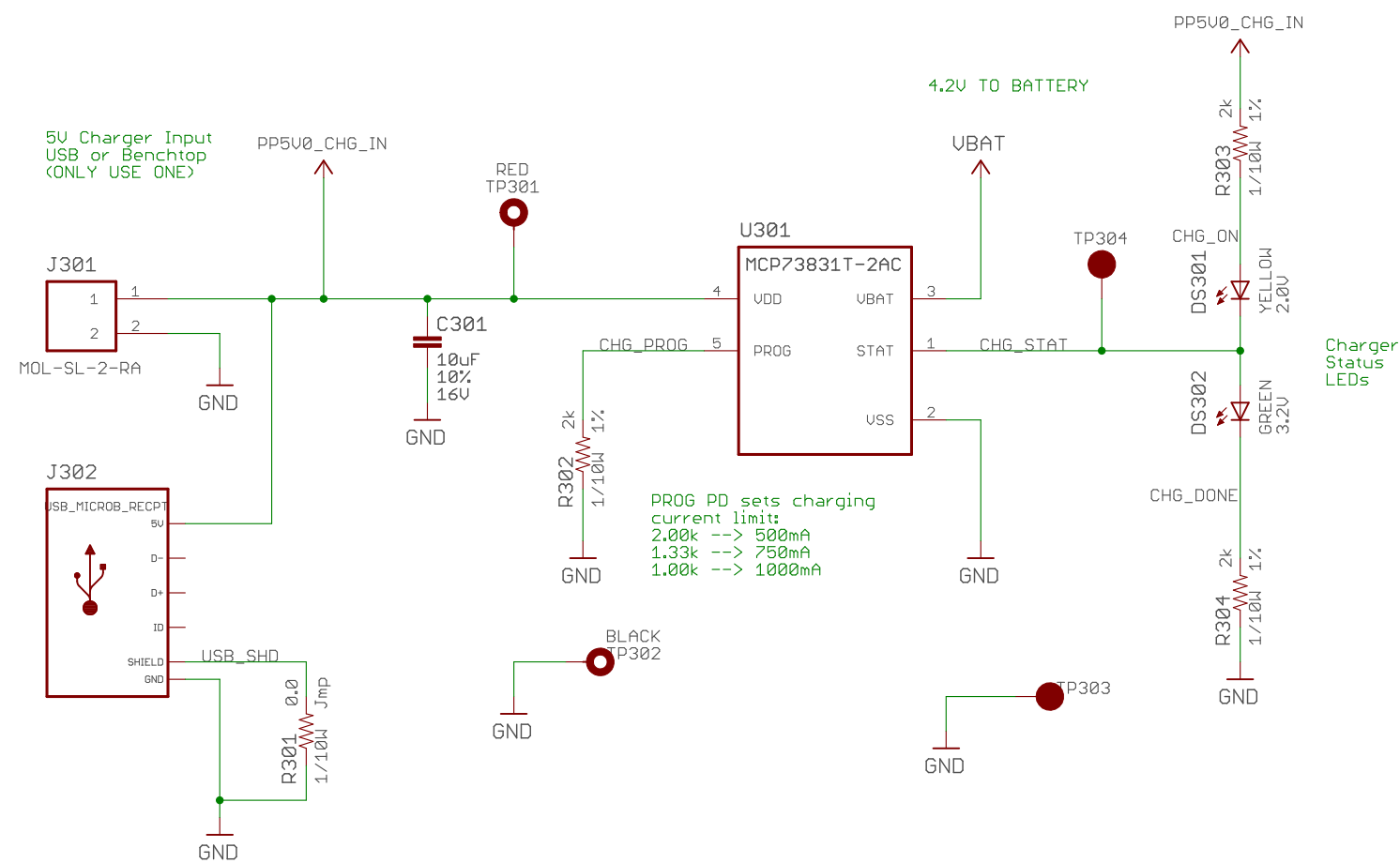
TITLE_TOC	
TITLE:  raspi_zero_power_sensor_hat	
Document Number:	REV: 1
Date: not saved!	Sheet: 1/7

# Raspberry Pi Zero Power/Sensor HAT Block Diagram



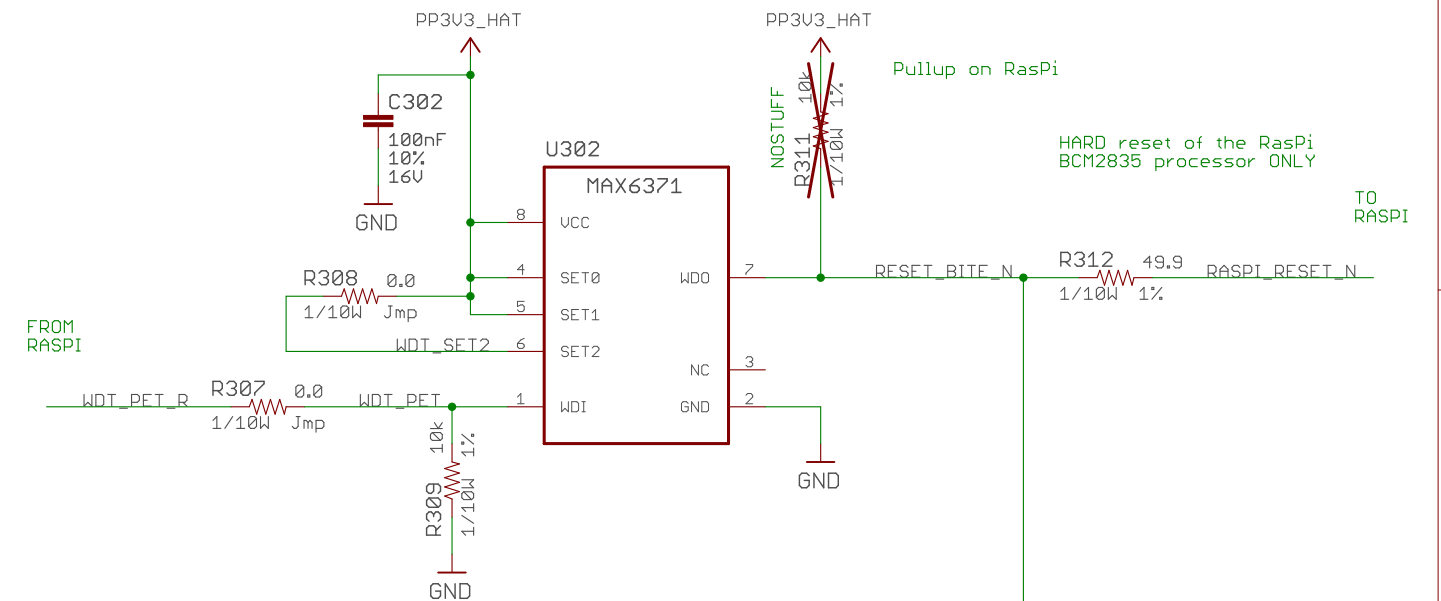
# LiPo Battery Charger and BCM Reset Circuitry

## 1-cell LiPo Battery Charger

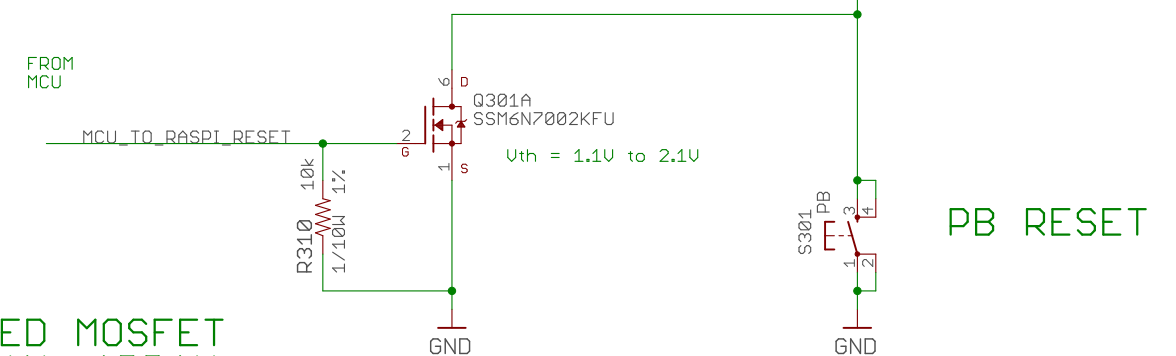


## WATCHDOG TIMER

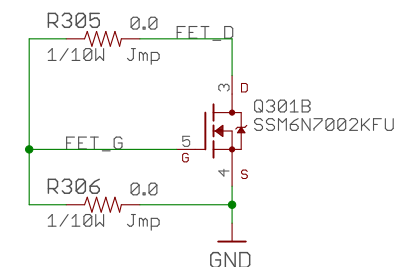
```
WDO is OD active low for at least 100us
Power-on delay is minimum of 60s
SET2 SET1 SET0 || Mode
VCC VCC VCC || 60s timeout
GND VCC VCC || Disabled
```



## MCU RESET



## UNUSED MOSFET IN DUAL ARRAY



## LIPO\_CHARGER\_AND\_BCM\_RESET

TITLE: raspi_zero_power_sensor_hat
------------------------------------

Document Number:

REV: 1

Date: not saved!

Sheet: 3/7

POWER ENTRY, 5V BOOST, AND 3.3V LDO

**BATTERY INPUT**  
LiPo Battery: ~3.0V-4.2V or  
3xAA Battery: ~3.7V to 4.6V  
Battery Current: ~425mA (AUG)  
~900mA (PEAK)

**BATTERY JUMPER**

**5V Boost SMPS**  
Vin UuLo: 2.1V (MAX)  
Fsw: ~2MHz

**POWER TO SYSTEM**  
System Current: ~275mA (AUG)  
~575mA (PEAK)

**POWER STATUS LEDS**

**BOOST MODES**

EN	Mode
GND	Shutdown, True Load Disconnect (SD)
VIN	Boost Operating Mode (BST)

**MCU TRIGGER BOOST DISABLE**  
NOSTUFF R611 to disable feature

**3.3V LDO (No RasPi Operation)**  
Placeholder for 3.3V rail supply if the board is used without a RasPi, since the RasPi supplies the 3.3V rail during operation

**CHARGER ATTACH BOOST DISABLE**  
NOSTUFF R403 to disable feature

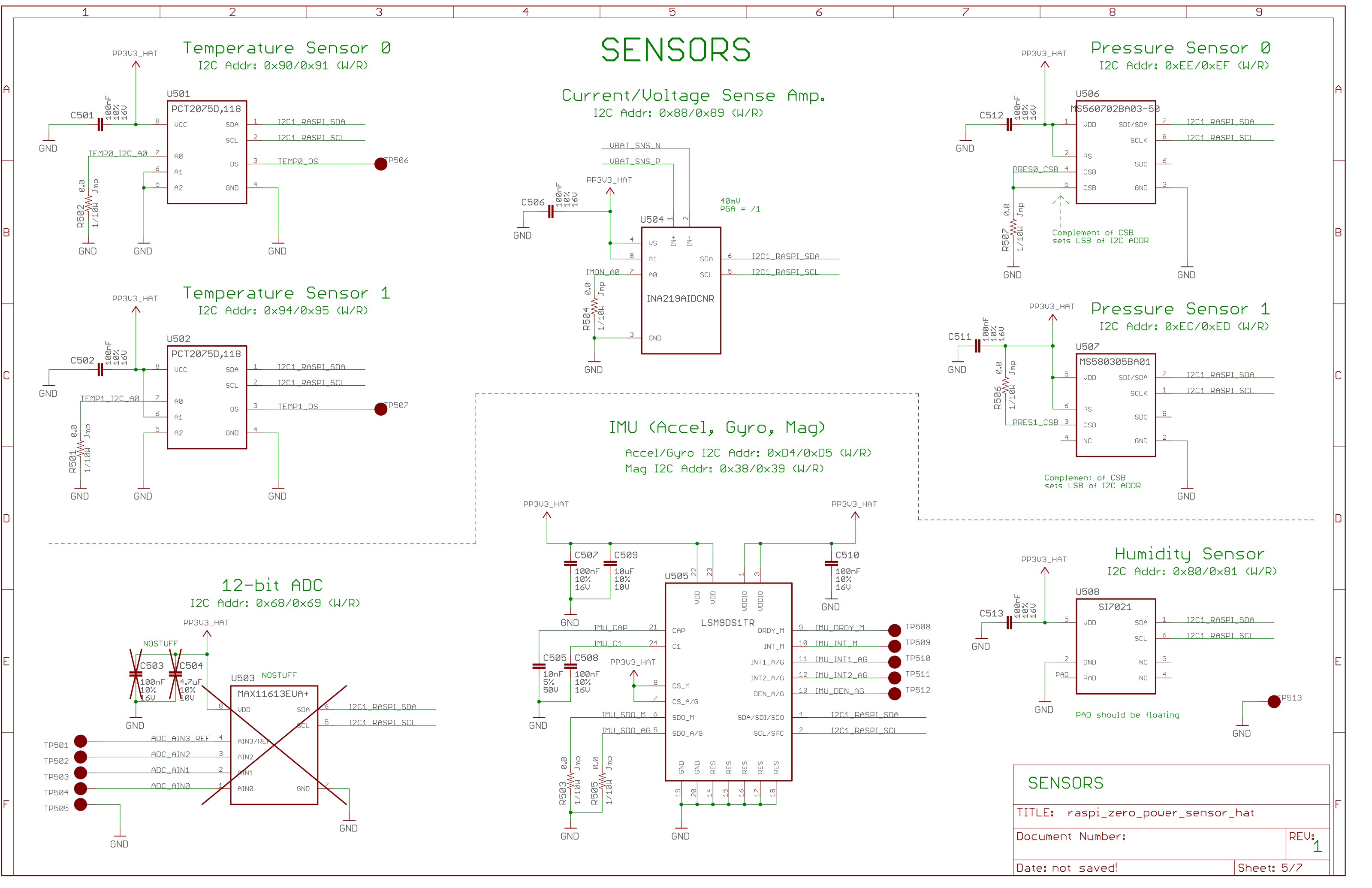
**POWER\_ENTRY\_BOOST\_LDO**

TITLE: raspi\_zero\_power\_sensor\_hat

Document Number: REV: 1

Date: not saved! Sheet: 4/7

Date: not saved! Sheet: 4/7



# SENSORS

Current/Voltage Sense Amp.  
I2C Addr: 0x88/0x89 (W/R)

IMU (Accel, Gyro, Mag)

Accel/Gyro I2C Addr: 0xD4/0xD5 (W/R)  
Mag I2C Addr: 0x38/0x39 (W/R)

## SENSORS

TITLE: raspi\_zero\_power\_sensor\_hat

Document Number:

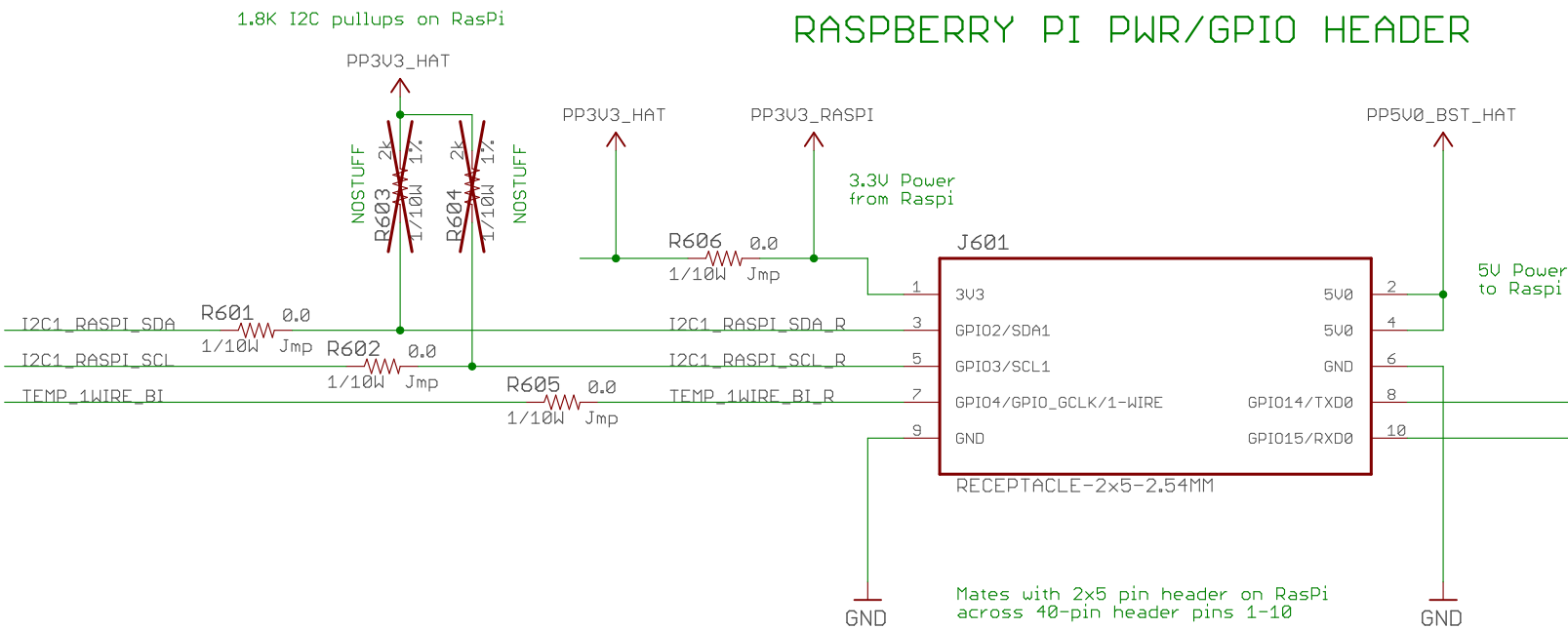
REV: 1

Date: not saved!

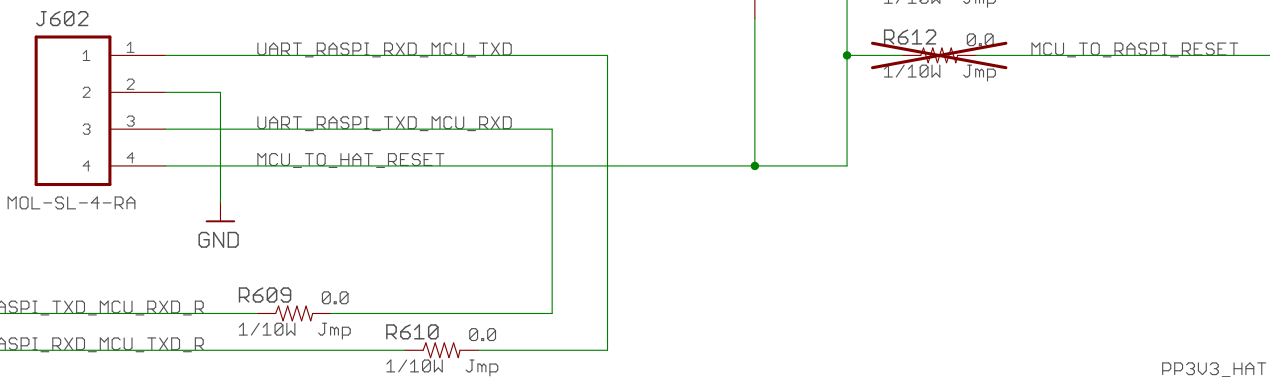
Sheet: 5/7

# HOST/RASPI CONNECTORS and MOUNTING

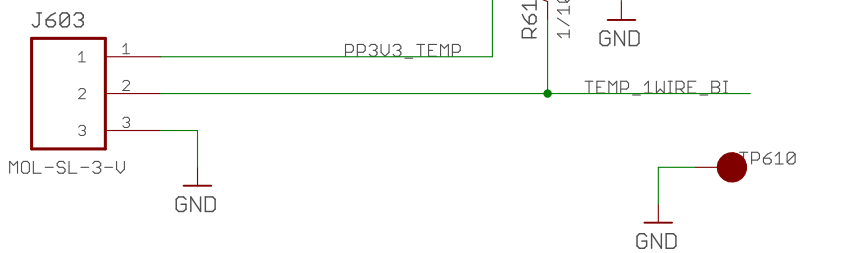
## RASPBERRY PI PWR/GPIO HEADER



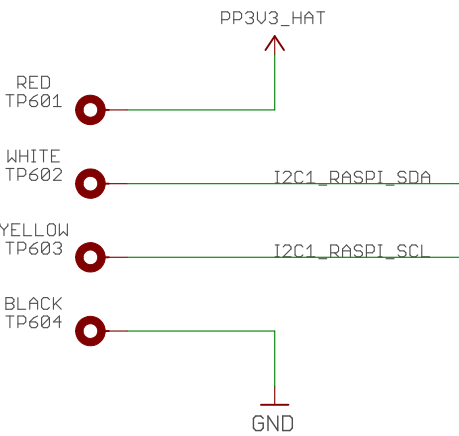
## HOST MCU CONNECTOR



## EXTERNAL TEMPERATURE SENSOR CONNECTOR



## I2C DEBUG HEADER



## RASPI ZERO HAT OUTLINE

Only using 3 mounting holes since the 2x6 pin connector stabilizes the upper left board quadrant.

This allows for easier routing of the boost output to the Pi's 5V0 pin.

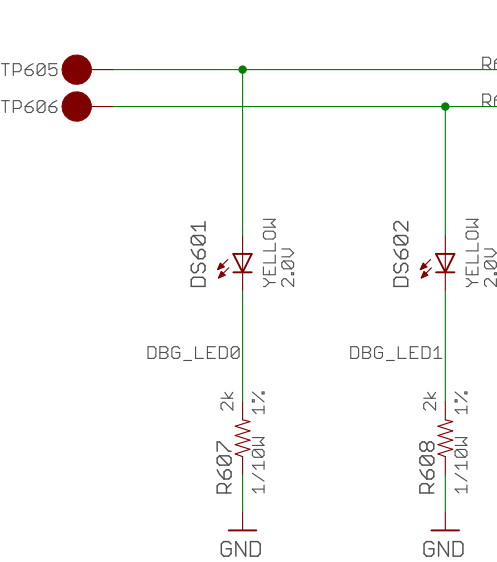
OUTLINE601

RASPI\_ZERO\_OUTLINE\_3S0C\_ONLY

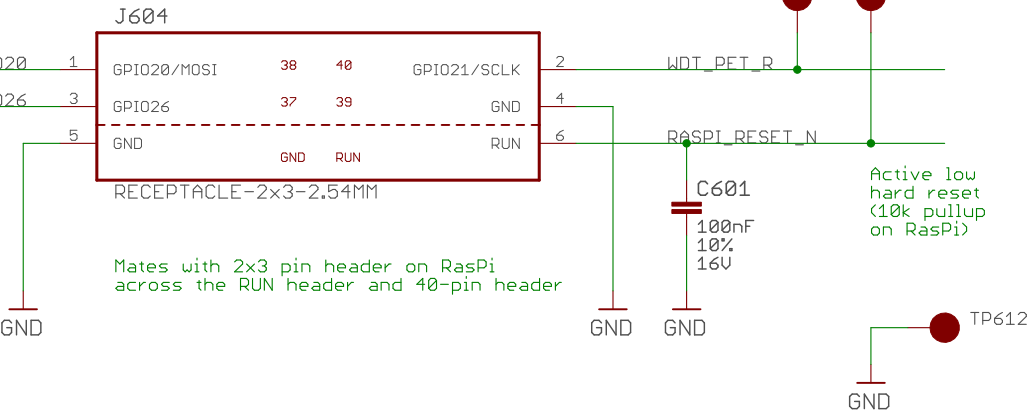
CMS  
LOGO

SQUAD  
LOGO

## DEBUG LEDs



## RASPBERRY PI RESET/GPIO HEADER



## PI\_MCU\_CONNECT\_AND\_MOUNTING

TITLE: raspi\_zero\_power\_sensor\_hat

Document Number:

REV: 1

Date: not saved!

Sheet: 6/7

# CONNECTOR ASSEMBLY and EXTERNAL SENSORS

## J301: 5V Charger Input

BOM701	SL 70066 2PIN HOUSING	Digi-key	WM2900-ND
BOM702	SL 70058 GOLD CRIMP	Digi-key	WM2512CT-ND
BOM703	SL 70058 GOLD CRIMP	Digi-key	WM2512CT-ND

3x 12mm Nylon Standoffs (Top Righ, Bottom Right, Bottom Left)  
Not listed on BOM, enough for 6 HATs (Amazon: B01HBYDH70)

## J401: 1-cell Li-Ion Battery Input

BOM704	SL 70066 2PIN HOUSING	Digi-key	WM2900-ND
BOM705	SL 70058 GOLD CRIMP	Digi-key	WM2512CT-ND
BOM706	SL 70058 GOLD CRIMP	Digi-key	WM2512CT-ND

2500mAh/2000mAh 3.7V Battery ordered from Adafruit (Part Number: 328/2011)

## J402: Battery Jumper

BOM707	SL 70066 2PIN HOUSING	Digi-key	WM2900-ND
BOM708	SL 70058 GOLD CRIMP	Digi-key	WM2512CT-ND
BOM709	SL 70058 GOLD CRIMP	Digi-key	WM2512CT-ND

## J601: RasPi Power/GPIO Header

BOM710	HEADER-RECT-MALE-2X5	Digi-key	952-2380-ND
--------	----------------------	----------	-------------

## J602: MCU IO

BOM711	SL 70066 4PIN HOUSING	Digi-key	WM2902-ND
BOM712	SL 70058 GOLD CRIMP	Digi-key	WM2512CT-ND
BOM713	SL 70058 GOLD CRIMP	Digi-key	WM2512CT-ND
BOM714	SL 70058 GOLD CRIMP	Digi-key	WM2512CT-ND
BOM715	SL 70058 GOLD CRIMP	Digi-key	WM2512CT-ND

## J603: 1-Wire Temperature Sensor

BOM716	SL 70066 3PIN HOUSING	Digi-key	WM2901-ND
BOM717	SL 70058 GOLD CRIMP	Digi-key	WM2512CT-ND
BOM718	SL 70058 GOLD CRIMP	Digi-key	WM2512CT-ND
BOM719	SL 70058 GOLD CRIMP	Digi-key	WM2512CT-ND
BOM720	1-Wire Temperature Sensor	Digi-key	DS18B20+-ND
BOM721	1-Wire Temperature Sensor	Digi-key	DS18B20+-ND

## J604: RasPi Reset/GPIO Header

BOM722	HEADER-RECT-MALE-2X3	Digi-key	952-2120-ND
--------	----------------------	----------	-------------

### ASSEMBLY\_COMPONENTS

TITLE: raspi\_zero\_power\_sensor\_hat

Document Number: REV: 1

Date: not saved! Sheet: 7/7