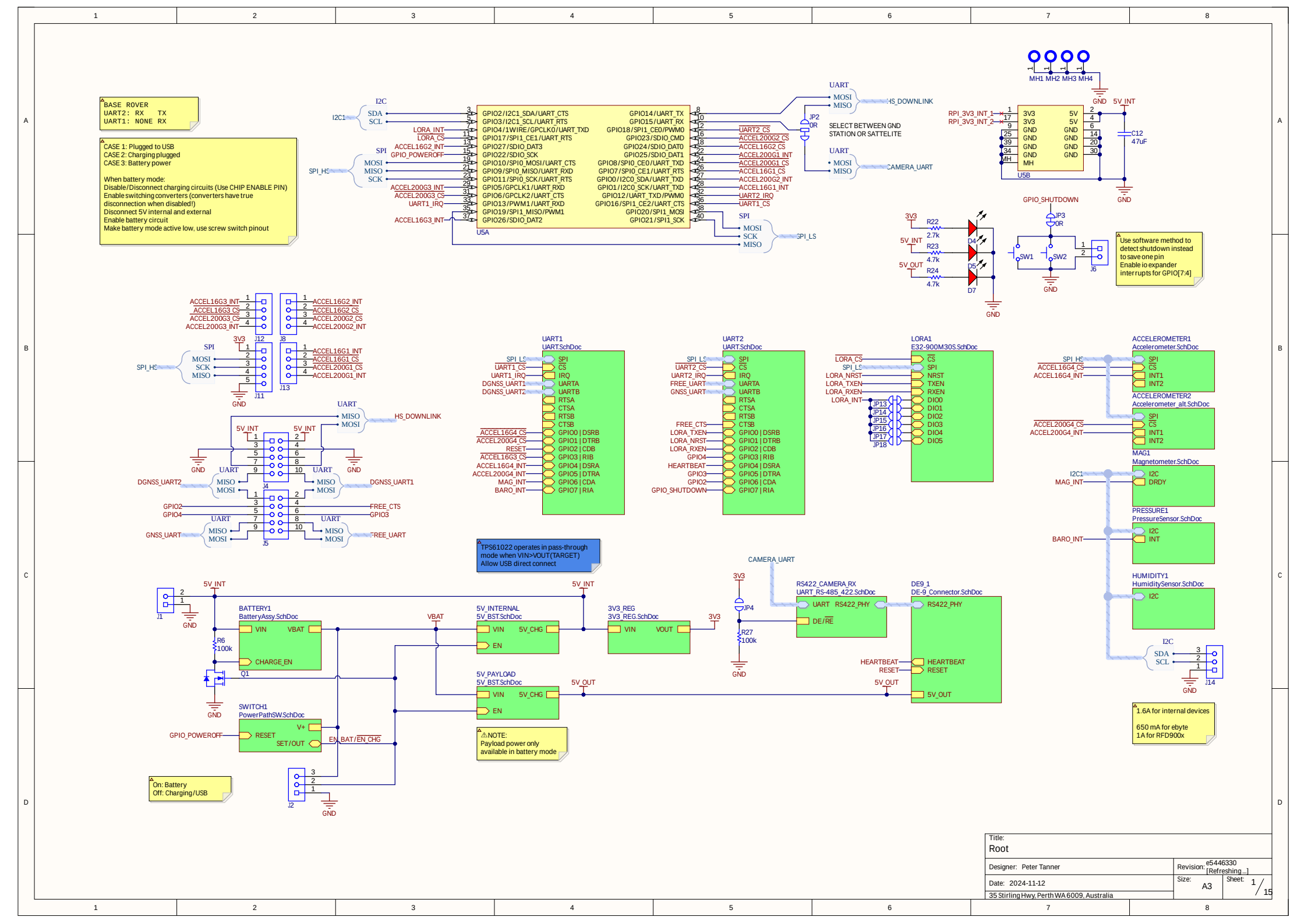

BASE ROVER
UART2: RX TX
UART1: NONE RX
CASE 1: Plugged to USB
CASE 2: Charging plugged
CASE 3: Battery power
When battery mode:
Disable/Disconnect charging circuits (Use CHIP ENABLE PIN)
Enable switching converters (converters have true disconnection when disabled!)
Disconnect 5V internal and external
Enable battery circuit
Make battery mode active low, use screw switch pinout
U5A
SELECT BETWEEN GND STATION OR SATTELITE
HS_DOWNLINK
CAMERA_UART
MH1 MH2 MH3 MH4
U5B
C12 47uF
GPIO_SHUTDOWN
Use software method to detect shutdown instead to save one pin
Enable io expander interrupts for GPIO[7:4]
TPS61022 operates in pass-through mode when VIN>VOUT(TARGET)
Allow USB direct connect
BATTERY1 BatteryAssy.SchDoc
SWITCH1 PowerPathSW.SchDoc
5V_INTERNAL 5V_BST.SchDoc
5V_PAYLOAD 5V_BST.SchDoc
3V3_REG 3V3_REG.SchDoc
On: Battery
Off: Charging/USB
⚠NOTE:
Payload power only available in battery mode
UART1 UART.SchDoc
UART2 UART.SchDoc
LORA1 E32-900M30S.SchDoc
RS422_CAMERA_RX UART_RS-485_422.SchDoc
DE9_1 DE-9_Connector.SchDoc
ACCELEROMETER1 Accelerometer.SchDoc
ACCELEROMETER2 Accelerometer_alt.SchDoc
MAG1 Magnetometer.SchDoc
PRESSURE1 PressureSensor.SchDoc
HUMIDITY1 HumiditySensor.SchDoc
1.6A for internal devices
650 mA for ebyte
1A for RFD900x
Title: Root
Designer: Peter Tanner
Revision: e5446330 [Refreshing...]
Date: 2024-11-12
Size: A3
Sheet: 1/15
35 Stirling Hwy, Perth WA 6009, Australia

TPS61230ARNSR: 1.5A max, AUD 0.61/u, AUD 4.6 extended fee (~AUD 1 amortized)
TPS61022RWUR: 3A max, AUD 0.87/u, AUD 4.6 extended fee (~AUD 1.79 amortized)

Need >3 A since POEM can supply 1.5A or be upgraded for 3A, so need 2x 1.5A + ideal diodes or 1x 3A

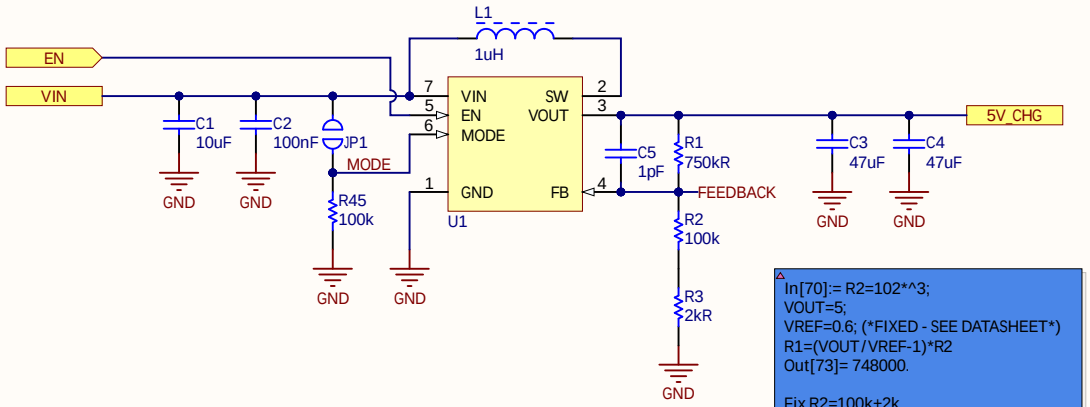
Either solution is cheaper than using a 2S li-ion battery and stepping it down to 5V, since battery chips are expensive (one board costs ~AUD 10, 20 per dual redundant unit)

```
In[31]:= (*8.2.2.2 Inductor Selection*)
VOUT=5;
IOUT=3;
VIN=3 ;(*Min voltage*)
\[Eta]=0.9; (*From datasheet*)
fSW=1*^6;
L=1*^-6;
DUTY=1-(VIN*\[Eta])/VOUT
IL$DC=(VOUT*IOUT)/(VIN*\[Eta])
DIL$PP=(VIN*DUTY)/(L*fSW)
IL$P=IL$DC+DIL$PP/2
Out[37]= 0.46
Out[38]= 5.55556
Out[39]= 1.38
Out[40]= 6.24556
```

6.24A peak inductor current

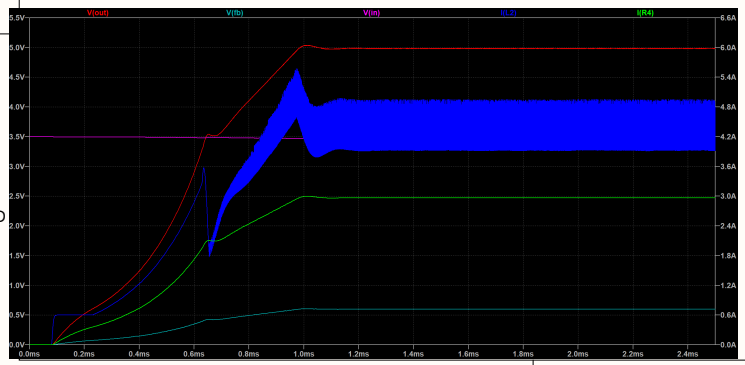
Normally, it is advisable to work with an inductor peak-to-peak current of less than 40% of the average inductor current for maximum output current (....) The saturation current of the inductor must be higher than the calculated peak inductor current

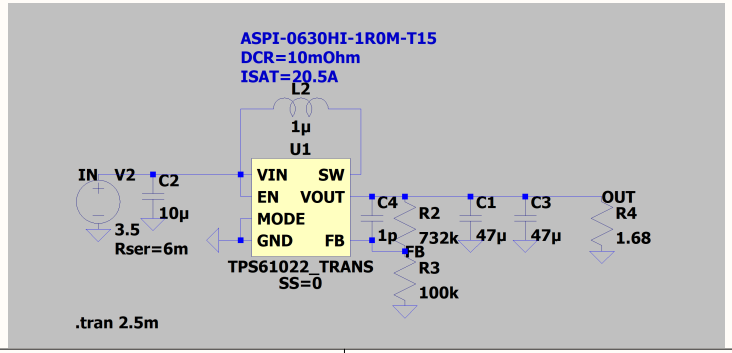
ISAT = 6.24/0.4 = 15.6A



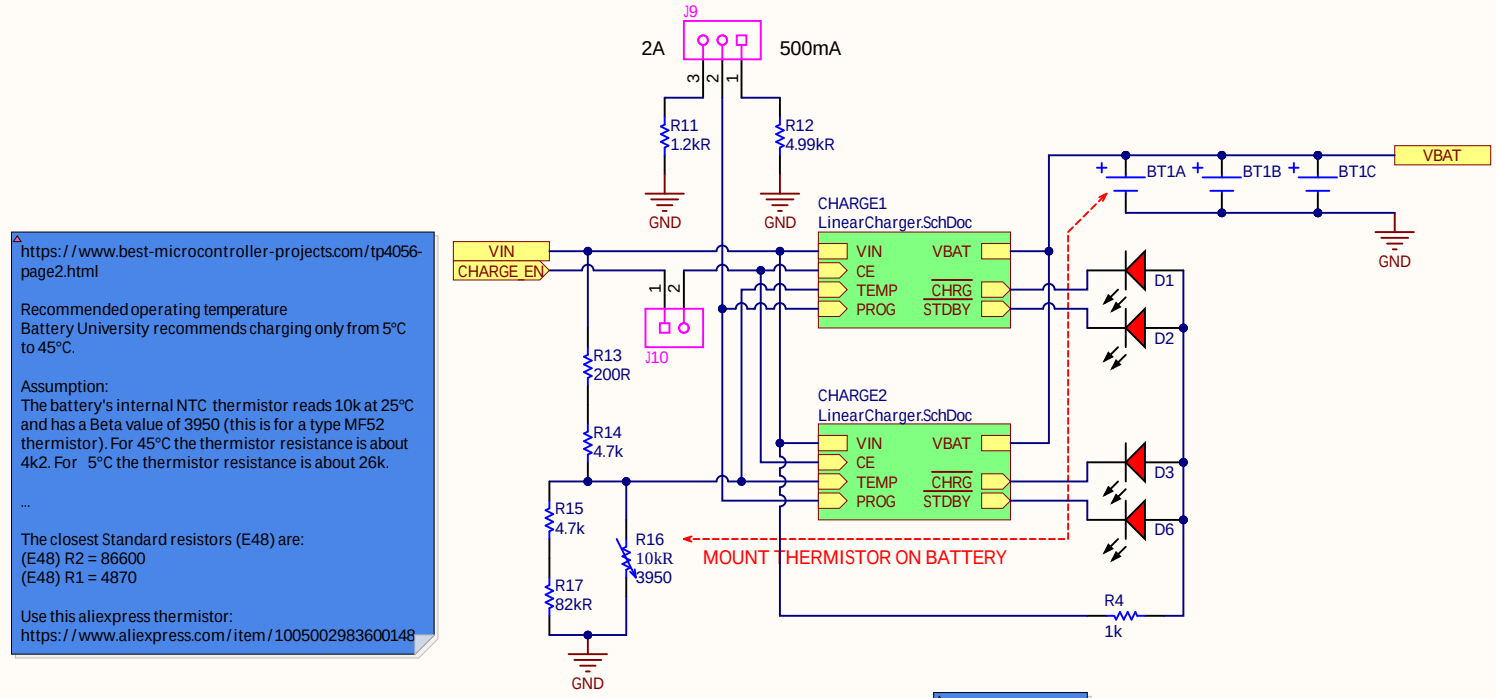

```
In[70]:= R2=102*^3;
VOUT=5;
VREF=0.6; (*FIXED - SEE DATASHEET*)
R1=(VOUT/VREF-1)*R2
Out[73]= 748000.
```

Fix R2=100k+2k
R1=748k~750k





Title: 5V boost converter	
Designer: Peter Tanner	Revision: e5446330 [No modification]
Date: 2024-10-10	Size: A4 Sheet: 2/15
35 Stirling Hwy, Perth WA 6009, Australia	



https://www.best-microcontroller-projects.com/tp4056-page2.html

Recommended operating temperature
Battery University recommends charging only from 5°C to 45°C.

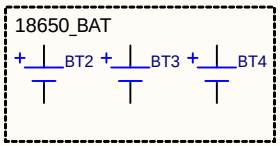
Assumption:
The battery's internal NTC thermistor reads 10k at 25°C and has a Beta value of 3950 (this is for a type MF52 thermistor). For 45°C the thermistor resistance is about 4k2. For 5°C the thermistor resistance is about 26k.

...

The closest Standard resistors (E48) are:
(E48) R2 = 86600
(E48) R1 = 4870

Use this aliexpress thermistor:
https://www.aliexpress.com/item/1005002983600148

RPROG (k)	IBAT (mA)
10	130
5	250
4	300
3	400
2	580
1.66	690
1.5	780
1.33	900
1.2	1000



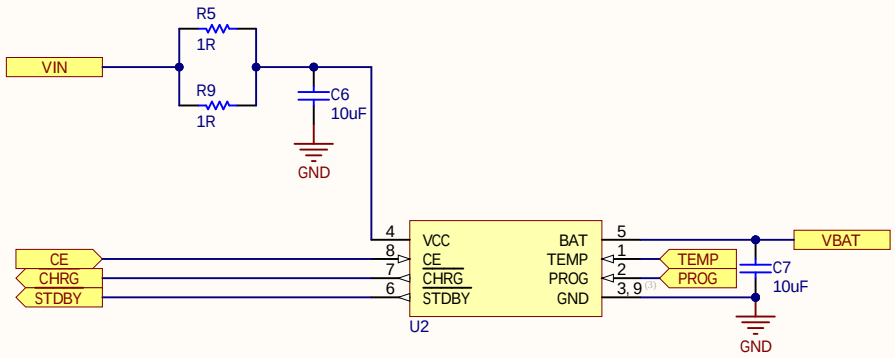
Title:
Battery assembly

Designer: Peter Tanner
Revision: e5446330 [Modified]
Date: 2024-10-16
Size: A4
Sheet: 3 / 15
35 Stirling Hwy, Perth WA 6009, Australia

0.5 ohm power dissipation resistor

AT 1A: 0.5V drop -> 4.5V

Max power dissipation of resistor: 0.25W
Current = 0.5A
P = 0.5^2*1 = 0.25A

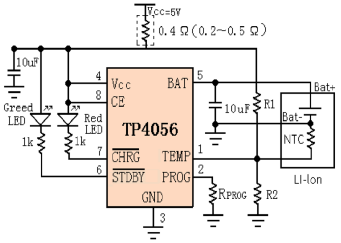


TP4057: 500mA, C\H\R\G\, S\T\B\Y\ pin
TP4056: 1000mA, C\H\R\G\, S\T\B\Y\, CE, TEMP pin
TP4054: 800mA, C\H\R\G\ pin

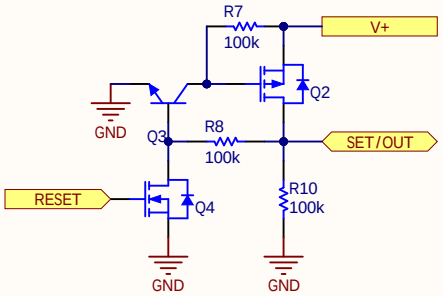
apparently you can parallel these things??
https://www.reddit.com/r/AskElectronics/comments/u0r1n4/can_a_tp4056_board_charge_multiple_18650

RPROG (k)	IBAT (mA)
10	130
5	250
4	300
3	400
2	580
1.66	690
1.5	780
1.33	900
1.2	1000

TYPICAL APPLICATIONS



Title: Linear charger	
Designer: Peter Tanner	Revision: e5446330 [No modification]
Date: 2024-10-10	Size: A4
35 Stirling Hwy, Perth WA 6009, Australia	Sheet: 4 / 15



Title: Power latch	
Designer: Peter Tanner	Revision: e5446330 [No modification]
Date: 2024-10-10	Size: A4 / Sheet: 5 / 15
35 Stirling Hwy, Perth WA 6009, Australia	

STATUS: APPROVED FOR PRODUCTION
NEXT: PENDING FIELD TESTING, UPDATE THIS NOTE

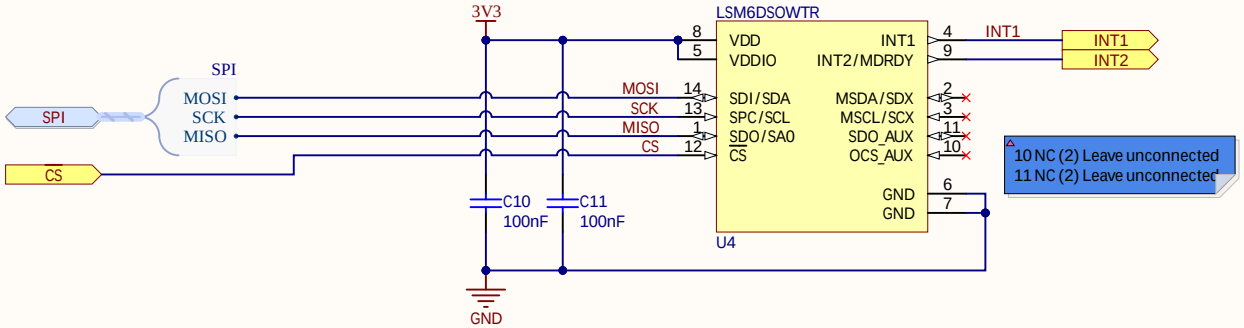
- [x] Checked pinout on schematic?
- [x] Checked pinout on footprint?
- [x] Decoupling capactiors placed?
- [x] Refer to one or more external designs to check for faults?
  - lsm6ds3tr_c-1761429.pdf
- [x] Searched up all pins to check for functionality?

Approval reason: Checklist complete

Other factors:
- Used on starcore design without issue

LSM6DSO	BMI270	
RangeA	+-2to16g	+-2to16g
ODRA	1.6to6664Hz	25to6400Hz
RangeGy	+-125to2000dps	+-125to2000dps
ODRGy	12.5to6664Hz	0.78to1600Hz
FIFO	9k	2k
V	1.71to3.6V	1.71to3.6V
I	0.55mA	0.97mA
Noise8G	0.08mg/(Hz)^.5	0.16mg/(Hz)^.5
NoiseGy	3.8mdps/(Hz)^.5	7mdps/(Hz)^.5
Price	$A4.31/5u	$A6.47/5u

Continue using the LSM6DSO

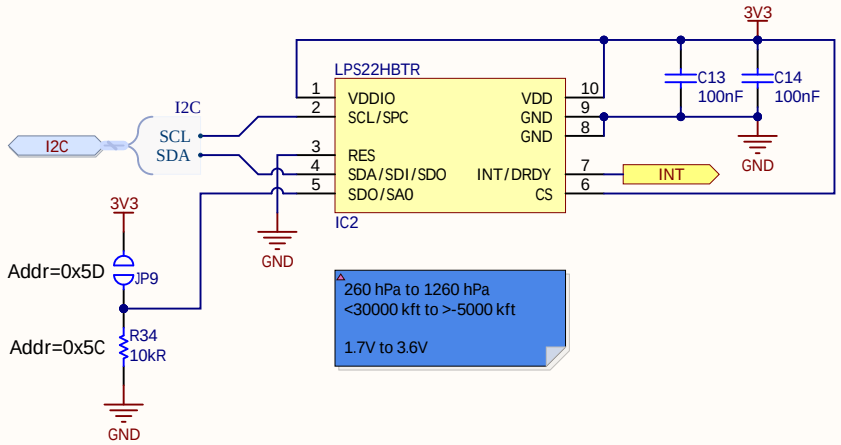


Title: Accelerometer	
Designer: Peter Tanner	Revision: e5446330 [No modification]
Date: 2024-10-10	Size: A4 / Sheet: 6 / 15
35 Stirling Hwy, Perth WA 6009, Australia	

STATUS: APPROVED FOR PRODUCTION
NEXT: PENDING FIELD TESTING, UPDATE THIS NOTE

- [x] Checked pinout on schematic?
- [x] Checked pinout on footprint?
- [x] Decoupling capactiors placed?
- [X] Checked application schematic?
  - Consulted lps22hb.pdf
  - Consulted Schematic-20268-MIKROE_LPS22HB_Click.pdf
- [X] Searched up all pins to check for functionality?

Approval reason: Checklist complete

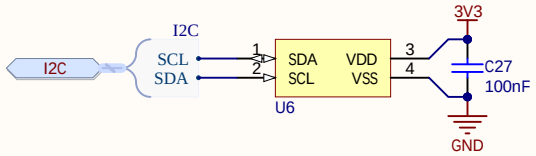


Title: Pressure sensor	
Designer: Peter Tanner	Revision: e5446330 [No modification]
Date: 2024-10-10	Size: A4 / Sheet: 7 / 15
35 Stirling Hwy, Perth WA 6009, Australia	

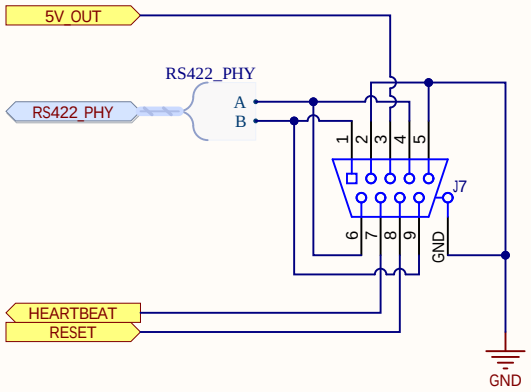
Parameter	HDC1080	HDC2010	SHT40	SHT45
RH accuracy	+-2%	+-2%	+-1.8%	+-1.0%
RH range	0->100%	0->100%	0->100%	0->100%
T accuracy	+-0.2K	+-0.2K	+-0.2K	+-0.1K
T range	-40->125*C	-40->125*C	-40->125*C	-40->125*C
Bits	14 bit	14 bit	???	???
Sample rate max	1 Hz	5 Hz	???	???
Voltage	2.7->5.5	1.62->3.6	1.08->3.6	1.08->3.6
Cost per unit	$A2.09/5u	$A2.38/5u	$A4.00/u	$A11.27/u
Other	Heater	Heater, Int	Heater	Heater

Select HDC2010, not worth spending $9 more to get 1% RH accuracy
Make sure to use JLCPCB assembly to save money and time

Layout app note
https://www.ti.com/lit/an/snaa297a/snaa297a.pdf?



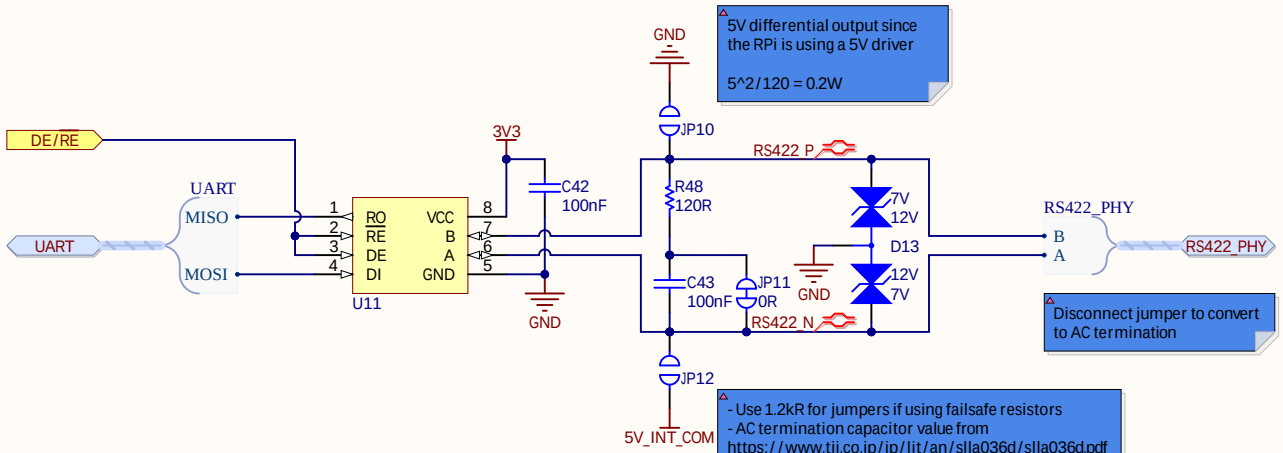
Title: Humidity sensor	
Designer: Peter Tanner	Revision: e5446330 [No modification]
Date: 2024-10-10	Size: A4 / Sheet: 8 / 15
35 Stirling Hwy, Perth WA 6009, Australia	



Title: DE-9 connector	
Designer: Peter Tanner	Revision: e5446330 [No modification]
Date: 2024-10-10	Size: A4 / Sheet: 9 / 15
35 Stirling Hwy, Perth WA 6009, Australia	

If the MCU is powered by 1.6V supply and this driver is powered by 3.3V supply, the driver should not fry the MCU UART, since all pins can tolerate 4V at minimum.

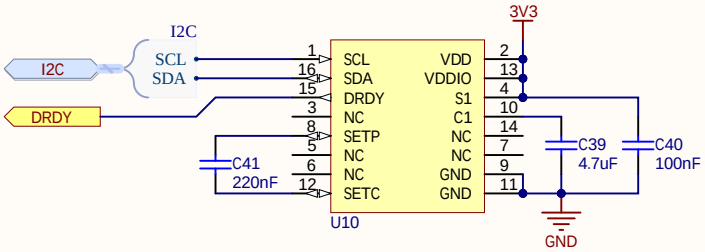
6.2 Absolute maximum ratings
Table 19. Voltage characteristics
Input voltage on FT_xxx pins: VSS-0.3 to min(VDD , VDDA , VDDIO2, VDDUSB , VLCD) + 4.0
Input voltage on TT_xx pins: VSS-0.3 to 4.0
Input voltage on BOOT0 pin: VSS to 9.0
Input voltage on any other pins VSS-0.3 to 4.0



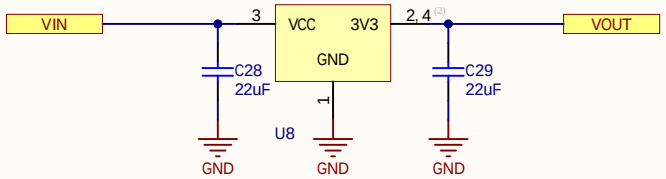
Title: RS-485 receiver	
Designer: Peter Tanne	Revision: e5446330 [No modification]
Date: 2024-10-10	Size: A4
35 Stirling Hwy, Perth WA 6009, Australia	Sheet: 10 / 15

Earth magnetic field strength is 0.5G at equator

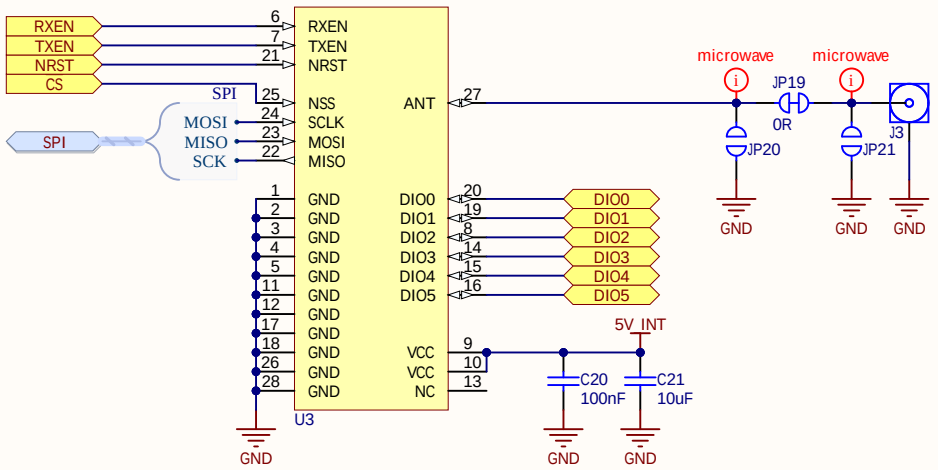
	LIS2MDL	LIS3MDL	QMC5883P	QMC5883L	HSCDTD008A
Range	+-49G	+-4to16G	+-2to30G	+-8G	+-49G
Sensitivity	1.5mG/LSB	0.15to0.58mG/LSB	0.067to1mG/LSB	0.083to0.33mG/LSB	1.5mG/LSB
Resolution	16bit	16bit	16bit	16bit	
ODR	150Hz	1000Hz	1500Hz	200Hz	
Price	$A2.1184	$A2.75	$A2.75	$A3.02	
Other				Temp. compensated, better accuracy	



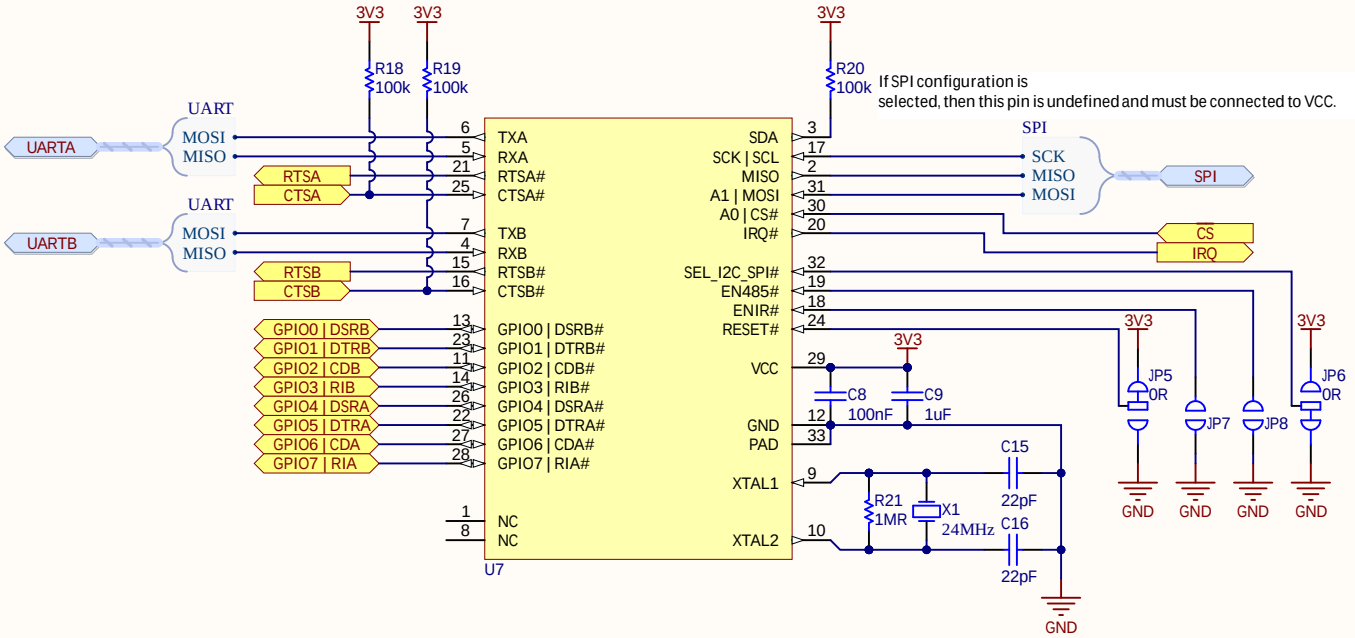
Title: Magnetometer	
Designer: Peter Tanner	Revision: e5446330 [No modification]
Date: 2024-10-10	Size: A4 / Sheet: 11 / 15
35 Stirling Hwy, Perth WA 6009, Australia	



Title: 3V3 regulator	
Designer: Peter Tanner	Revision: e5446330 [No modification]
Date: 2024-10-10	Size: A4 / Sheet: 12 / 15
35 Stirling Hwy, Perth WA 6009, Australia	



Title: E32-900M30S	
Designer: Peter Tanner	Revision: e5446330 [No modification]
Date: 2024-10-10	Size: A4 — Sheet: 13 / 15
35 Stirling Hwy, Perth WA 6009, Australia	



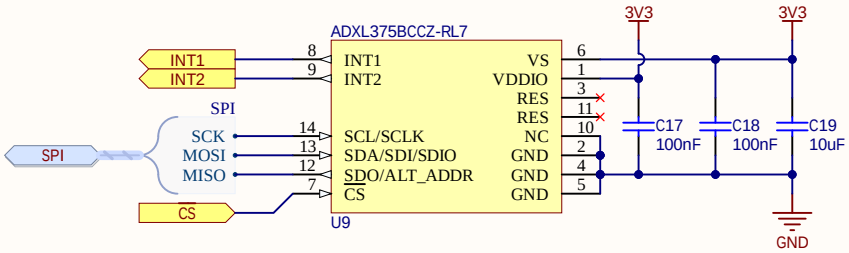
Title: External UART	
Designer: Peter Tanner	Revision: e5446330 [Modified]
Date: 2024-11-12	Size: A4
35 Stirling Hwy, Perth WA 6009, Australia	Sheet: 14 / 15

STATUS: APPROVED FOR PRODUCTION
NEXT: PENDING FIELD TESTING, UPDATE THIS NOTE

- [x] Checked pinout on schematic?
- [x] Checked pinout on footprint?
- [x] Decoupling capactiors placed?
- [x] Refer to one or more external designs to check for faults?
  - EVAL-ADXL375_User_Guide.pdf
  - adxl375.pdf
- [x] Searched up all pins to check for functionality?

Approval reason: Checklist complete

Other factors:
- Not critical for success



Title: Secondary accelerometer	
Designer: Peter Tanner	Revision: e5446330 [Modified]
Date: 2024-11-12	Size: A4 / Sheet: 15 / 15
35 Stirling Hwy, Perth WA 6009, Australia	