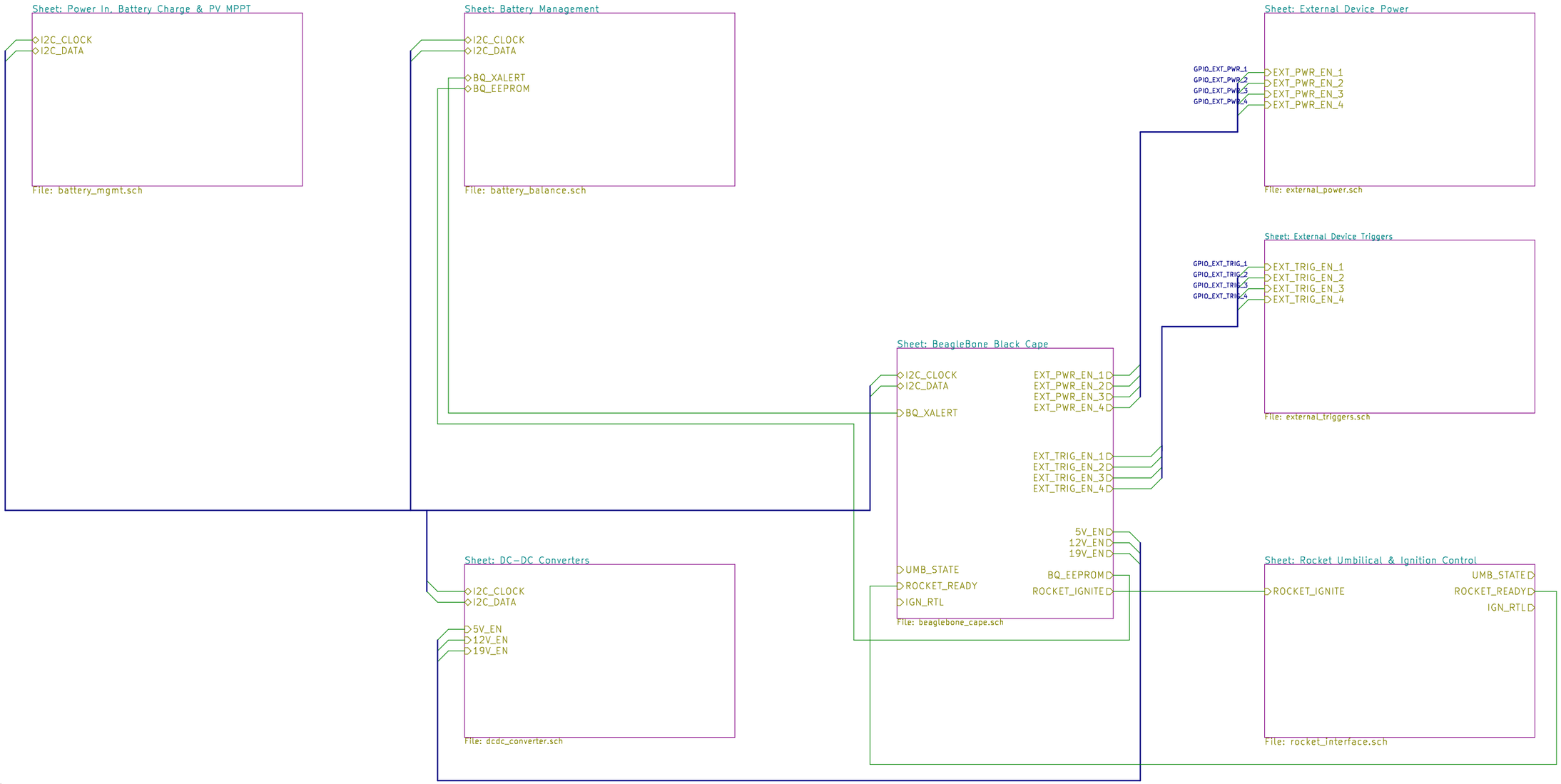

TODO:

- Finish wiring up sub-sheets.
  - Bus entries need labels on both sides!
- Create style legend.
- Consistent style:
  - No "embedded" multipliers in R vals.
- Add test points where appropriate.
  - Esp. around SMD packages, parts w/ no exposed leads, etc.
  - through-hole 2x1 pin header (1 to signal, other to gnd)

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Sheet: / File: Launch_Tower_Computer_III.sch		
Title: Launch Tower Computer 3 (LTC3)		
Size: B	Date: 2016-04-16	**Rev: A**
KiCad E.D.A. kicad 0.201604152103+669244ubuntu16.04.1-product		Id: 1/8

PV_IN:
Open Circuit = 17 V
Short Circuit = 2.4 A

Supply Detection (p.15, p.34)

Input Current Sense (p. 20)

Output Current Sense (p. 20)

Input Feedback (p.14)

Shutdown (p. 27)

Battery Charge Controller
w/ MPPT

LT8490

U204

Output Feedback (p. 17)

Temp Sense (p. 21)

Feedback Resistor Disconnect

Voltage, Current, & Temp Sense

I2C addr 0x98

TODO: label pull-up resistors as no-place?

CHARGING PARAMETERS:
Stage 2 Voltage: 33.6 V
Maximum Charging Current: 10 A?
Maximum Trickle Current: 1 A
Switching Frequency: 202 kHz

1% Resistors
75V Capacitors

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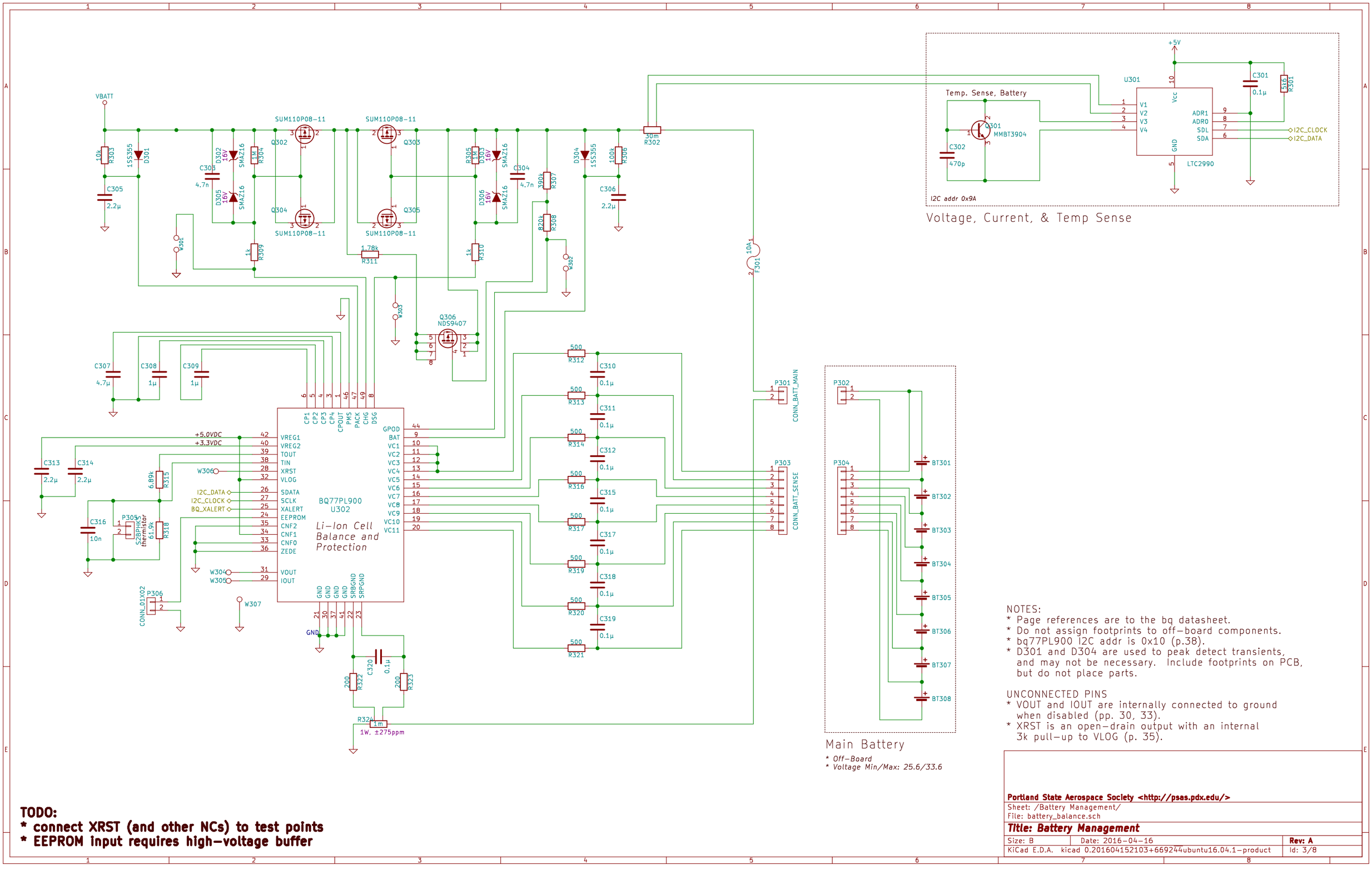
Sheet: /Power In, Battery Charge & PV MPPT/
File: battery_mgmt.sch

Title: Power In, Battery Charge, & PV MPPT

Size: B	Date: 2016-04-16	Rev: A
KiCad E.D.A. kicad 0.201604152103+669244ubuntu16.04.1-product		Id: 2/8



NOTES:
* Page references are to the bq datasheet.
* Do not assign footprints to off-board components.
* bq77PL900 I2C addr is 0x10 (p.38).
* D301 and D304 are used to peak detect transients, and may not be necessary. Include footprints on PCB, but do not place parts.

UNCONNECTED PINS
* VOUT and IOUT are internally connected to ground when disabled (pp. 30, 33).
* XRST is an open-drain output with an internal 3k pull-up to VLOG (p. 35).

TODO:
*** connect XRST (and other NCs) to test points**
*** EEPROM input requires high-voltage buffer**

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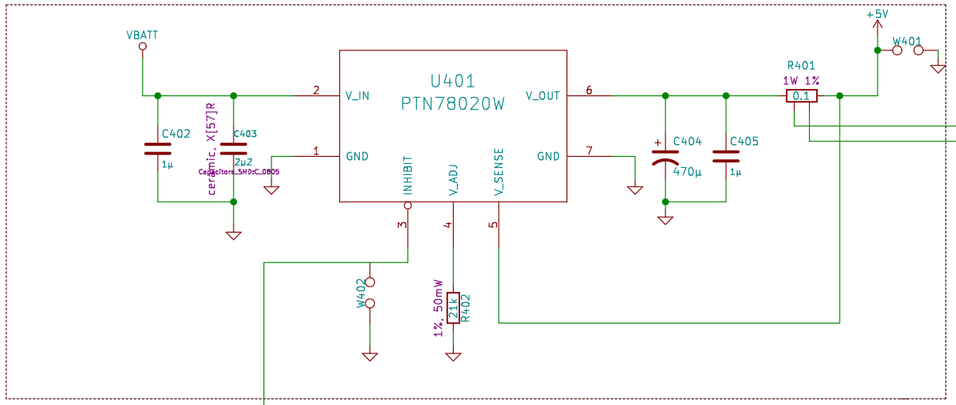
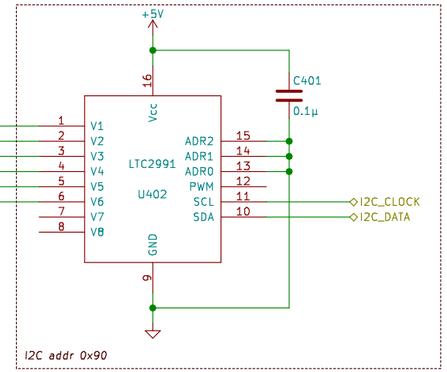
Sheet: /Battery Management/
File: battery_balance.sch

Title: Battery Management

Size: B	Date: 2016-04-16	**Rev: A**
KiCad E.D.A.	kicad 0.201604152103+669244ubuntu16.04.1-product	Id: 3/8

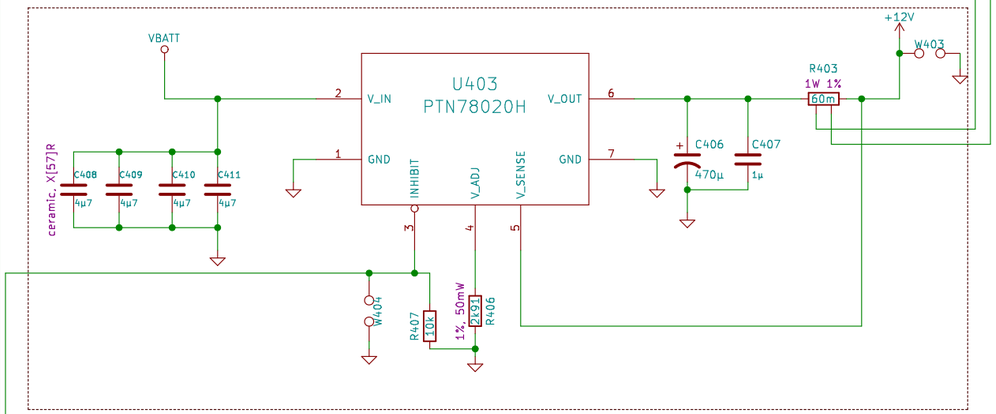


+5V DC Rail

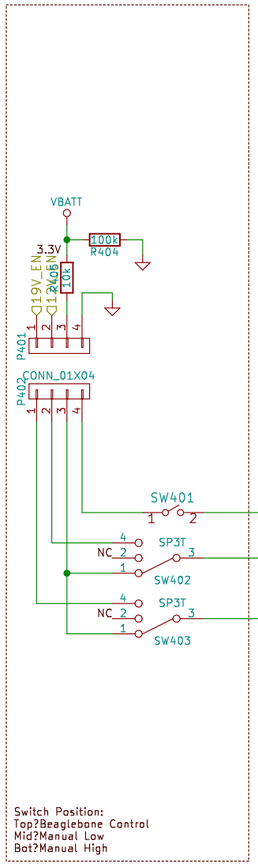


Voltage, Current, & Temp Sense

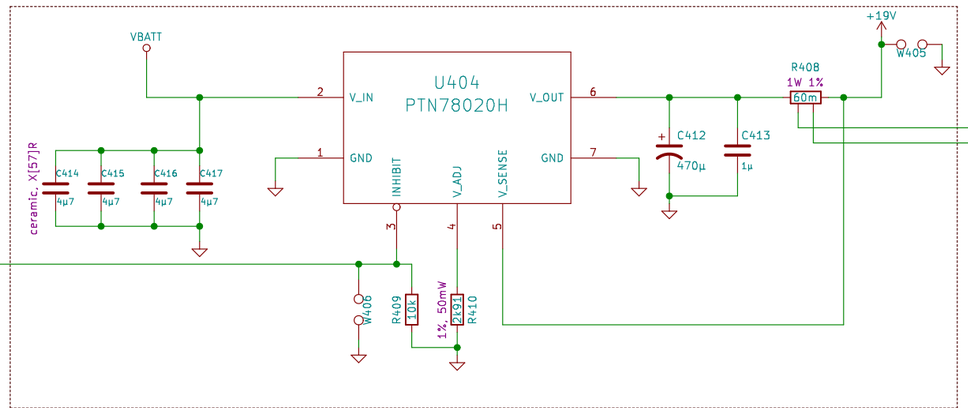
Current Sense Resistors
full-scale voltage = 0.300 V
R_sense_max = 0.300/Imax
1 A = 300mΩ
3 A = 100mΩ
5 A = 60mΩ
10 A = 30mΩ



+12V DC Rail



Inhibit Control



+19V DC Rail

NB:
1. V_sense should connect as close as possible to the largest load on the given power rail.
2. Place Rset resistors as close to package pins as possible.
3. Ceramic (Cin) capacitors should be located within 0.5 in of the input pins.
4. We may need heat sinks on the converters. The datasheet indicates a range of 2W to 5W of power dissipation given our specs.
5. Pay attention to the datasheet's recommendations regarding capacitor selection.

TODO:
* ~~jumpers on all INHIBIT pins~~
* ~~Values for converter enable pull-down resistors. Don't exceed the BB's low source max.!~~
* ~~Capacitor values are minimums. Consider increasing these. Consult datasheet for more info.~~

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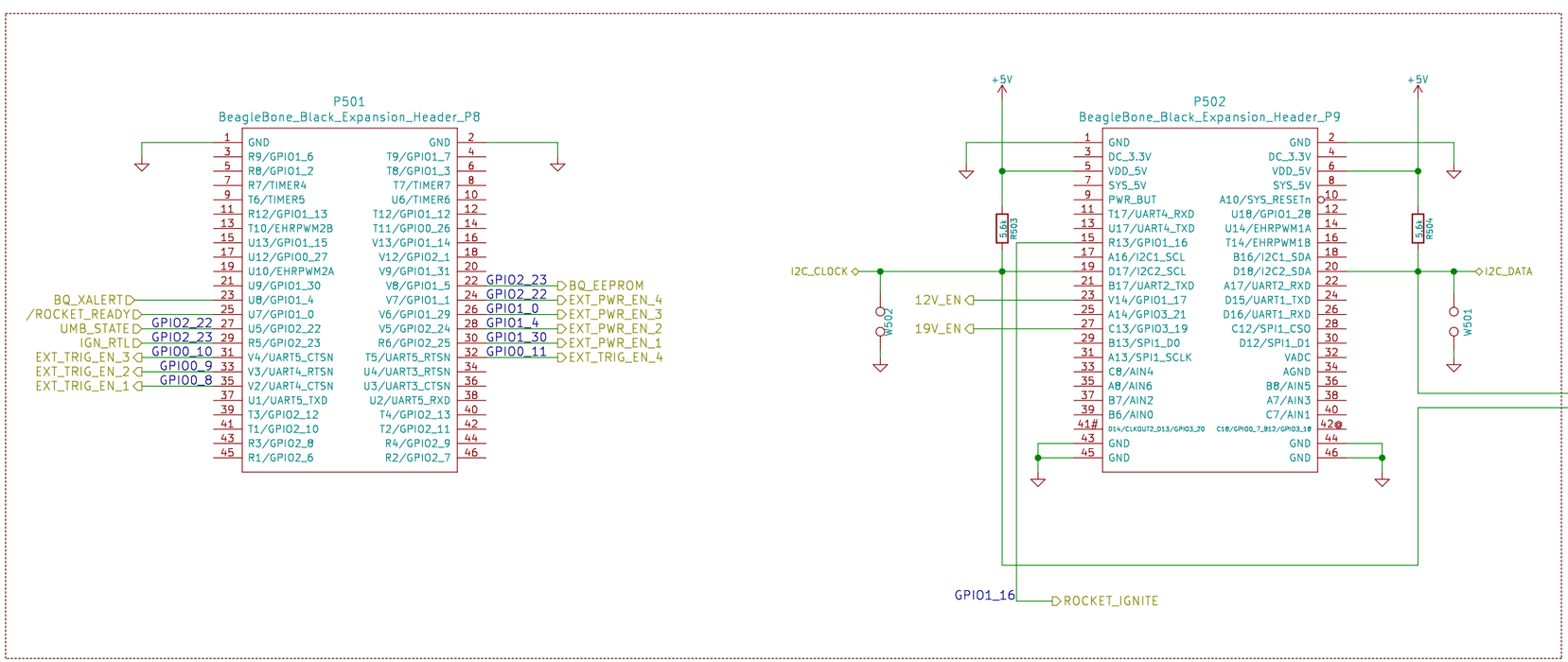
Sheet: /DC-DC Converters/
File: dcdc_converter.sch

Title: LTC3 DC-DC Converters

Size: B	Date: 2016-04-16	**Rev: A**
KiCad E.D.A. kicad 0.201604152103+6692~~4~~ubuntu16.04.1-product		Id: 4/8



BeagleBone Expansion Headers

I2C Devices			
ADDR	Part	Type	Location
0x10	U203	BQ77PL900	B/PM
0x54	U501	EEPROM	BBB
0x90	U402	LTC2991	DC-DC
0x98	U203	LTC2990	Power In
0x9A	U301	LTC2990	B/PM

NOTES:
* Do NOT change ROCKET_IGNITE, pin default reset state is High-Z w/ pulldown resistor. Other pins can be configured in EEPROM at boot time.
* All I2C devices on LTC3 are slaves. The BBB is the only master so the LTC will not need arbitration.

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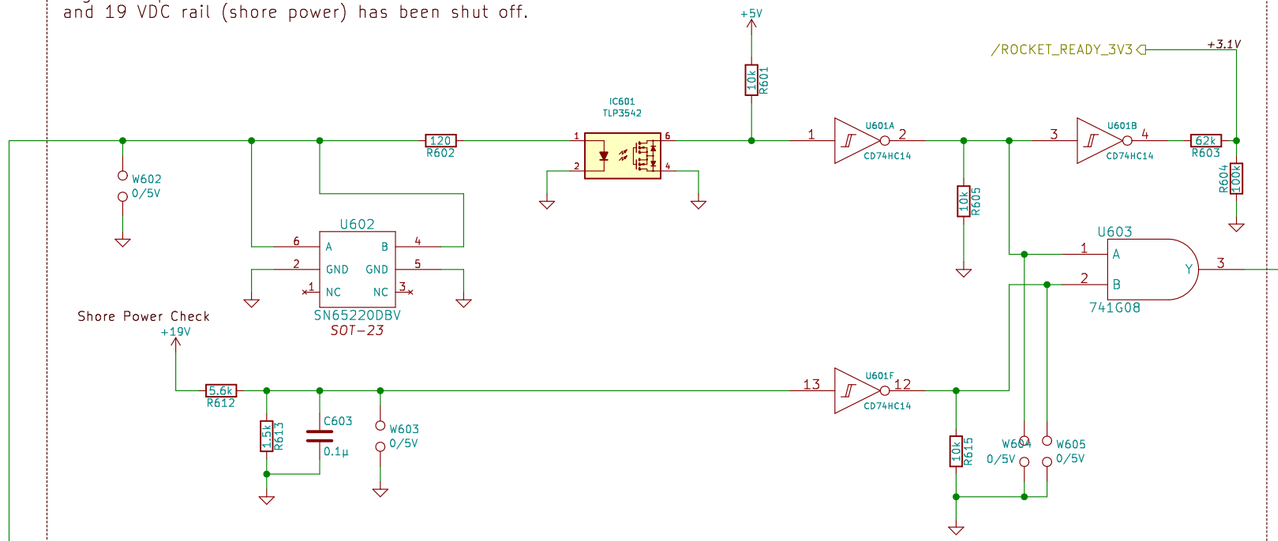
Sheet: /BeagleBone Black Cape/
File: beaglebone_cape.sch

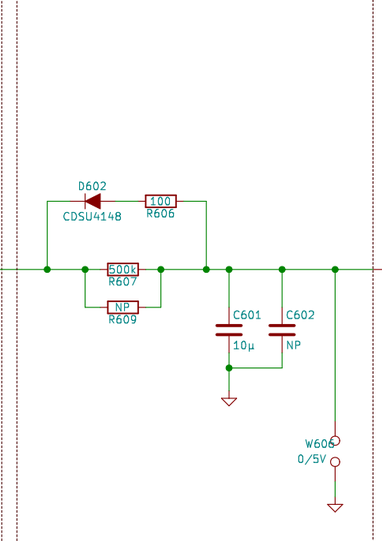
Title: LTC3 BeagleBone Black Cape Interface

Size: B	Date: 2016-04-16	**Rev: A**
KiCad E.D.A. kicad 0.201604152103+669244ubuntu16.04.1-product		Id: 5/8

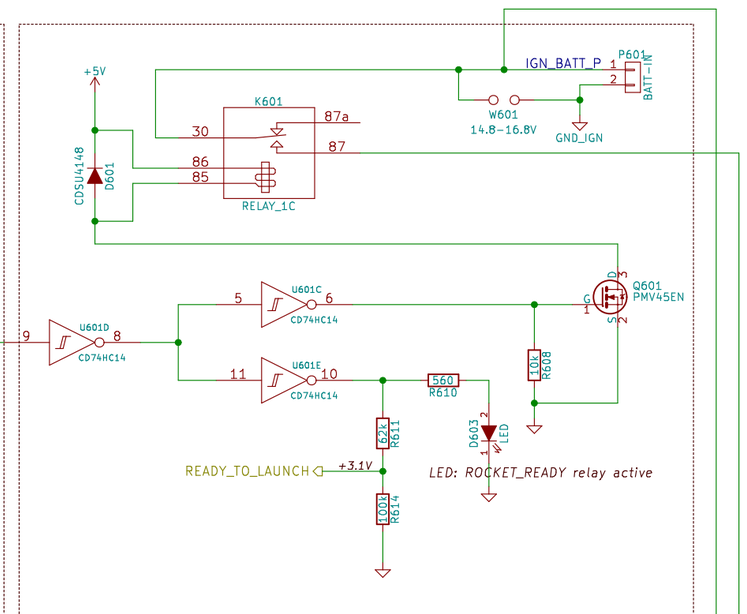
Ignition battery pack disconnected until
flight computer has asserted ROCKET_READY
and 19 VDC rail (shore power) has been shut off.



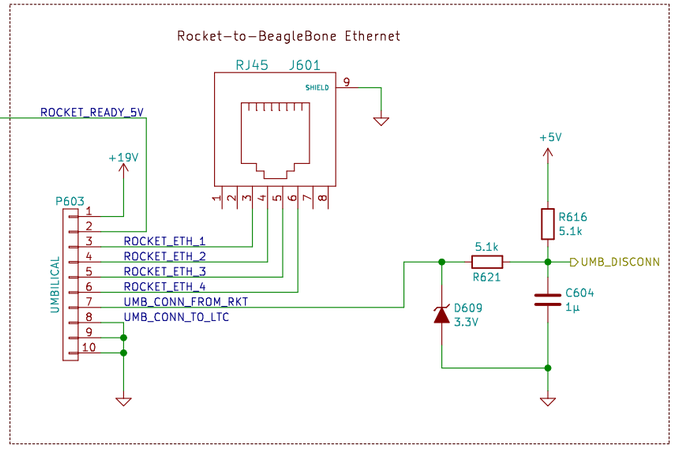
Input Logic



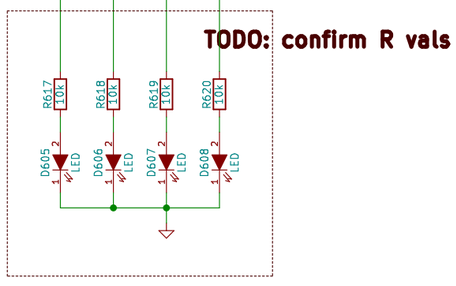
Delay (5s)



Ignition Battery Switch

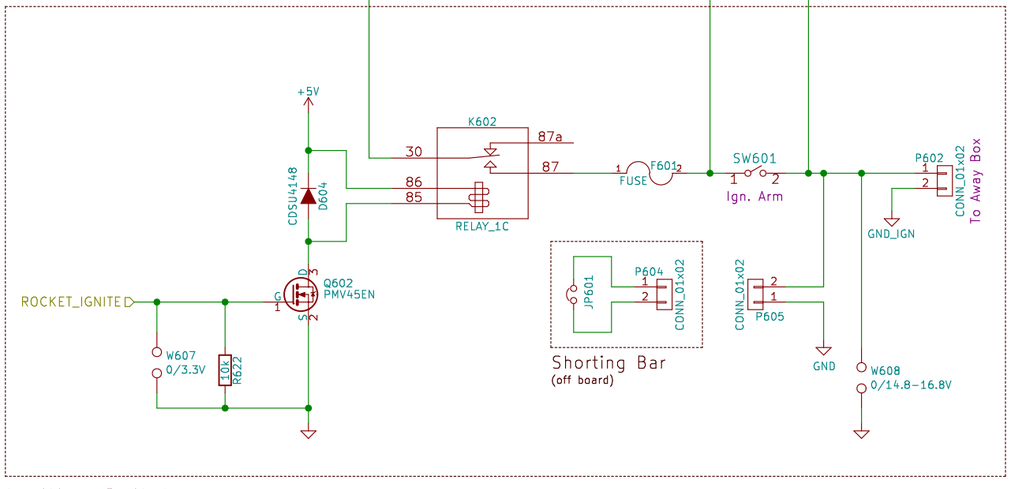


Rocket Umbilical

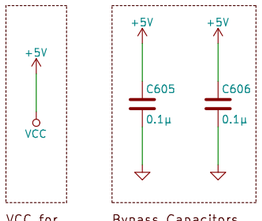


BAKERCON Indicator

1: Ignition battery present
2: RR asserted; power to ign relay
3: Ign relay closed; power to arm switch
4: Arm sw closed; power to shorting bar



Ignition Switch



VCC for
CD74HC14

Bypass Capacitors
(one per IC VCC)

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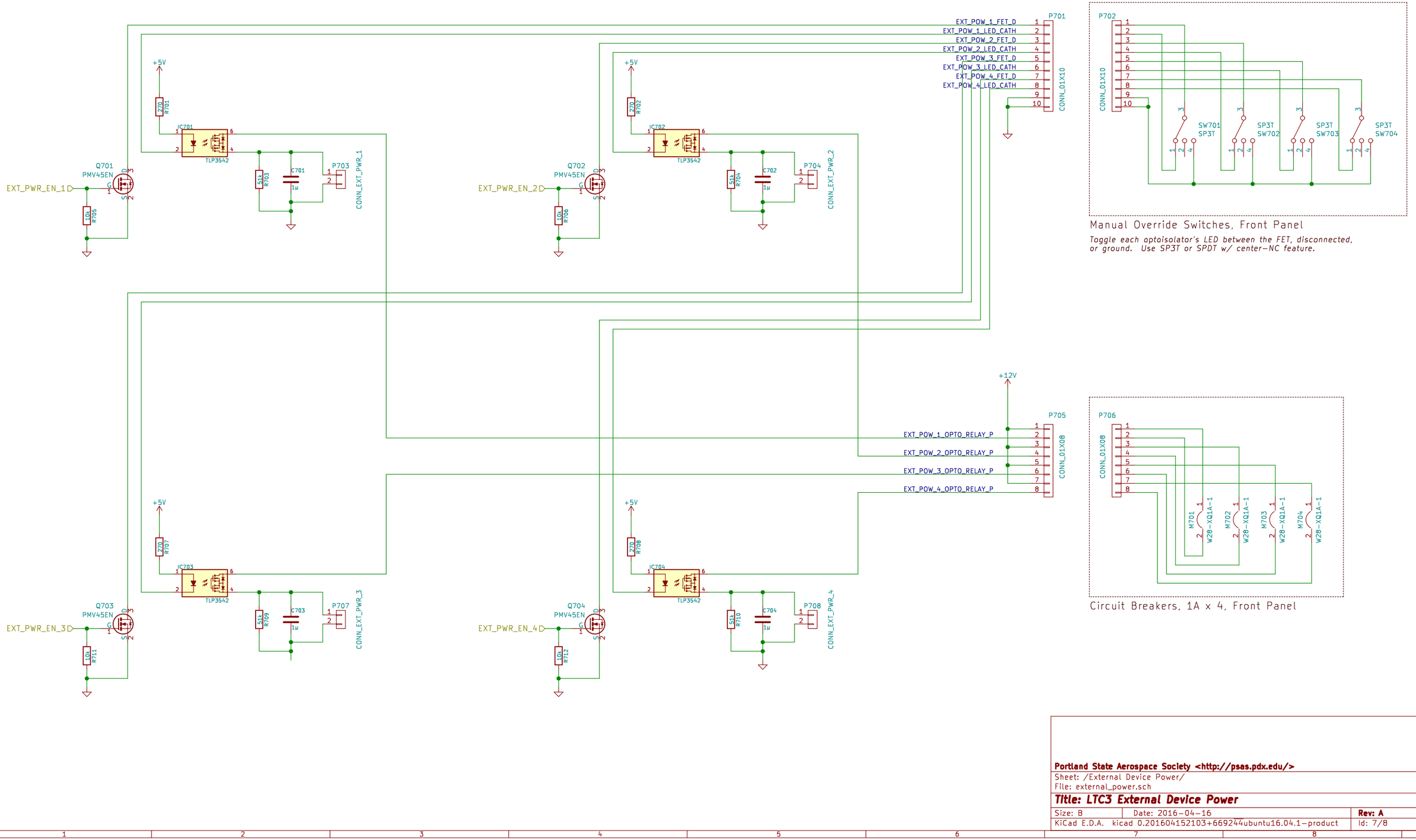
Sheet: /Rocket Umbilical & Ignition Control/
File: rocket_interface.sch

Title: LTC3 Rocket Umbilical & Ignition Control

Size: B	Date: 2016-04-16	**Rev: A**
KiCad E.D.A.	kicad 0.201604152103+669244ubuntu16.04.1-product	Id: 6/8



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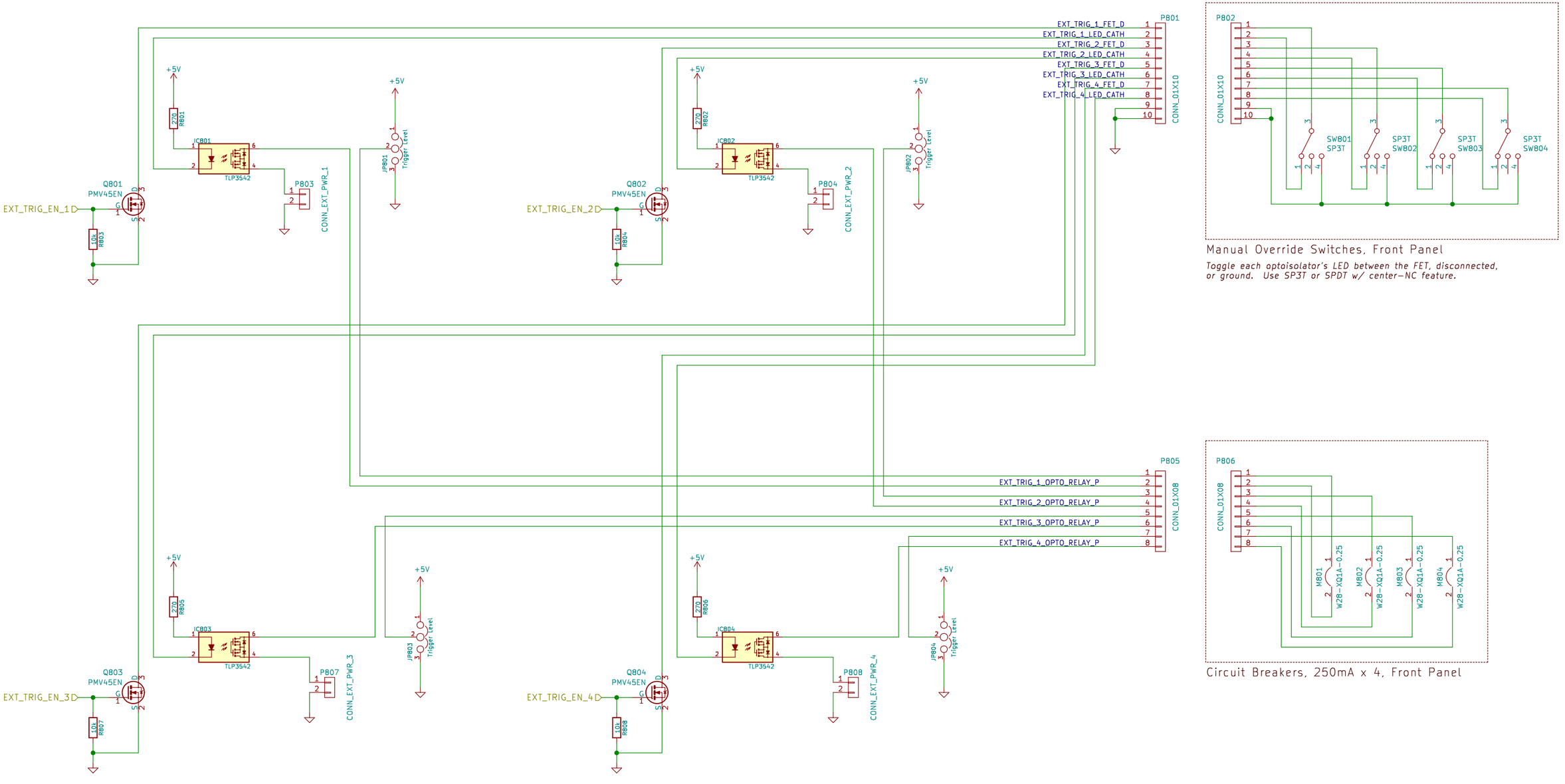
Sheet: /External Device Power/
File: external_power.sch

Title: LTC3 External Device Power

Size: B	Date: 2016-04-16	**Rev: A**
KiCad E.D.A. kicad 0.201604152103+669244ubuntu16.04.1-product		Id: 7/8


EXT_TRIG_1_FET_D
EXT_TRIG_1_LED_CATH
EXT_TRIG_2_FET_D
EXT_TRIG_2_LED_CATH
EXT_TRIG_3_FET_D
EXT_TRIG_3_LED_CATH
EXT_TRIG_4_FET_D
EXT_TRIG_4_LED_CATH
P801
CONN_01X10
+5V
270
R801
IC801
TLP3542
P803
CONN_EXT_PWR_1
JP801
Trigger Level
Q801
PMV45EN
EXT_TRIG_EN_1
10k
R803
R802
IC802
P804
CONN_EXT_PWR_2
JP802
Q802
EXT_TRIG_EN_2
R804
EXT_TRIG_1_OPTO_RELAY_P
EXT_TRIG_2_OPTO_RELAY_P
EXT_TRIG_3_OPTO_RELAY_P
EXT_TRIG_4_OPTO_RELAY_P
P805
CONN_01X08
R805
IC803
P807
CONN_EXT_PWR_3
JP803
Q803
EXT_TRIG_EN_3
R807
R806
IC804
P808
CONN_EXT_PWR_4
JP804
Q804
EXT_TRIG_EN_4
R808
P802
SW801
SW802
SW803
SW804
SP3T
Manual Override Switches, Front Panel
Toggle each optoisolator's LED between the FET, disconnected, or ground. Use SP3T or SPDT w/ center-NC feature.
P806
M801
M802
M803
M804
W28-XQ1A-0.25
Circuit Breakers, 250mA x 4, Front Panel
Portland State Aerospace Society <http://psas.pdx.edu/>
Sheet: /External Device Triggers/
File: external_triggers.sch
Title: LTC3 External Device Triggers
Size: B
Date: 2016-04-16
Rev: A
KiCad E.D.A. kicad 0.201604152103+669244ubuntu16.04.1-product
Id: 8/8