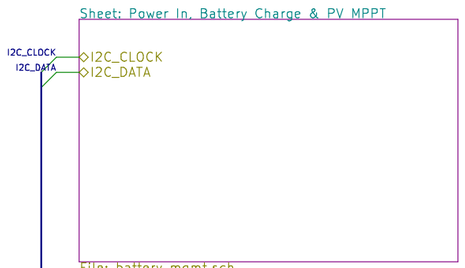
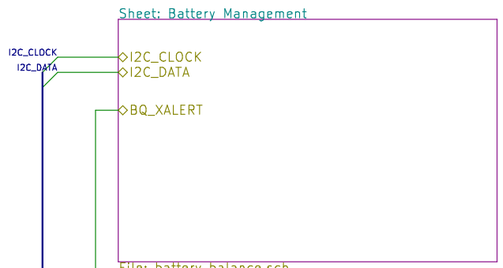
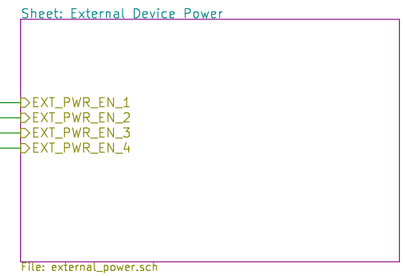
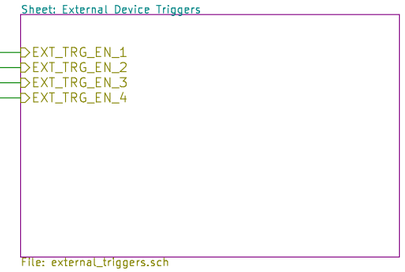
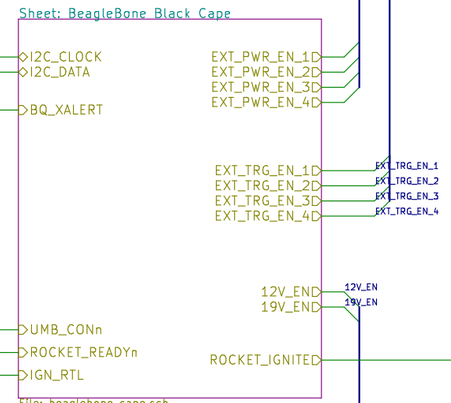
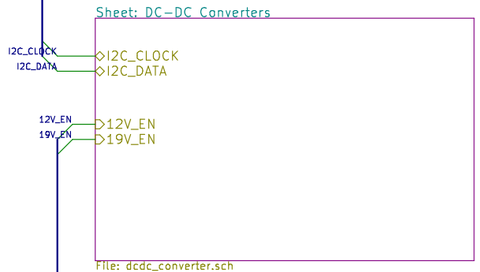


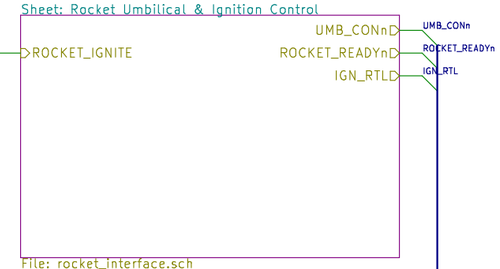












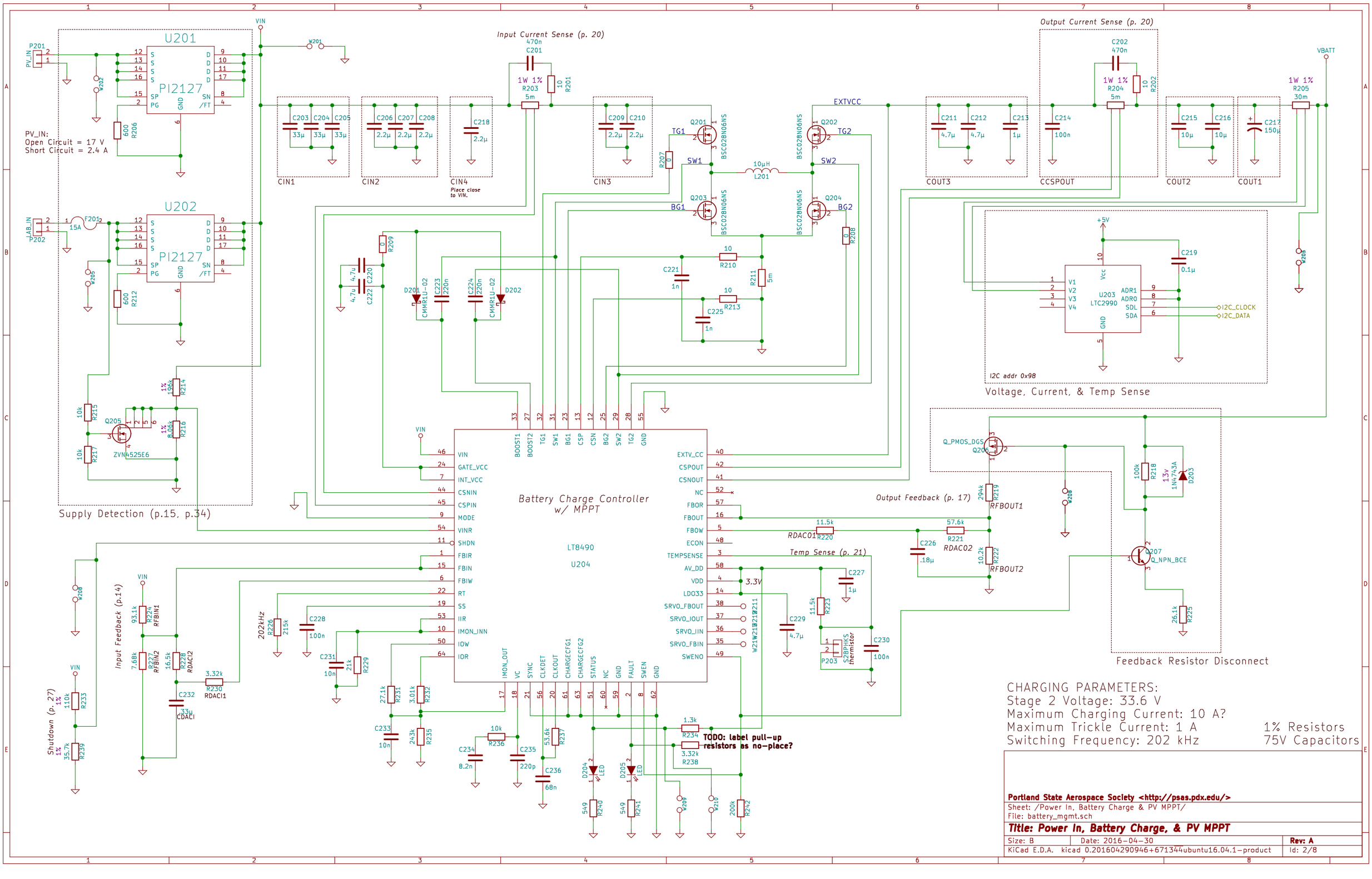
TODO:
* **Create style legend.**
* **Consistent style:**
  * **No "embedded" multipliers in R vals.**
* **Add test points where appropriate.**
  * **Esp. around SMD packages, parts w/ no exposed leads, etc.**
  * **through-hole 2x1 pin header (1 to signal, other to gnd)**

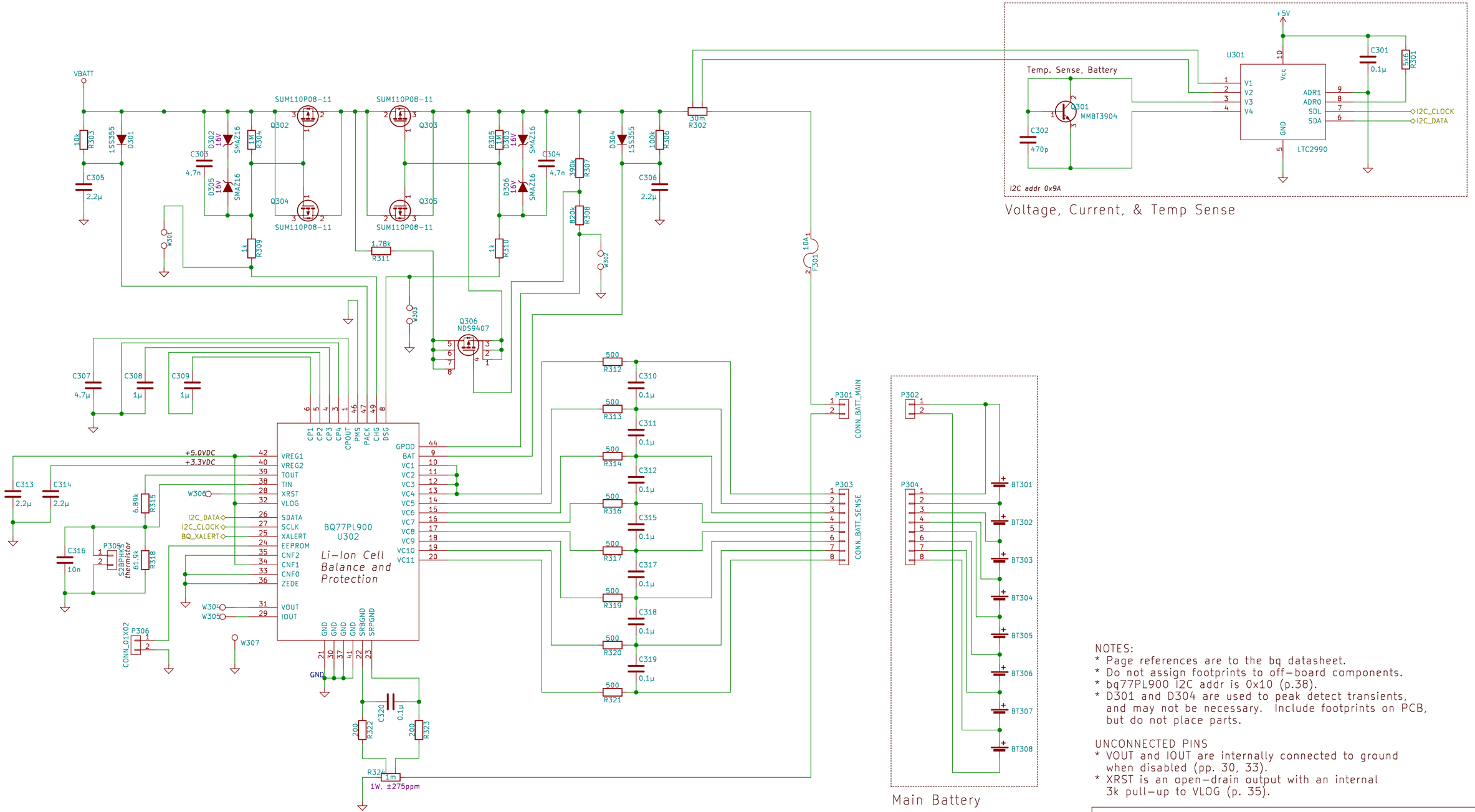
Portland State Aerospace Society <http://psas.pdx.edu/>

Sheet: /
File: Launch_Tower_Computer_III.sch

Title: Launch Tower Computer 3 (LTC3)

Size: B	Date: 2016-04-30	**Rev: A**
KiCad E.D.A. kicad 0.201604290946+671344ubuntu16.04.1-product		Id: 1/8


Input Current Sense (p. 20)
Output Current Sense (p. 20)
VIN
VBATT
EXTVCC
U201
PI2127
PV_IN
PV_IN:
Open Circuit = 17 V
Short Circuit = 2.4 A
U202
PI2127
VAB_IN
F201
15A
P202
Supply Detection (p.15, p.34)
CIN1
CIN2
CIN4
Place close to VIN.
CIN3
COUT3
CCSPOUT
COUT2
COUT1
Q201
Q202
Q203
Q204
BSC028N06NS
TG1
TG2
BG1
BG2
SW1
SW2
10µH
L201
D201
D202
CMMR1U-02
Battery Charge Controller w/ MPPT
LT8490
U204
Temp Sense (p. 21)
3.3V
Output Feedback (p. 17)
RDAC01
RDAC02
RFBOUT1
RFBOUT2
Q_PMOS_DGS
Q206
Q207
Q_NPN_BCE
D203
1N4743A
13V
P203
S2BPHKS
thermistor
Feedback Resistor Disconnect
U203
LTC2990
I2C addr 0x98
I2C_CLOCK
I2C_DATA
Voltage, Current, & Temp Sense
Input Feedback (p.14)
202kHz
Shutdown (p. 27)
CDAC1
RDAC1
RDAC2
RFBIN1
RFBIN2
TODO: label pull-up resistors as no-place?
D204
D205
LED
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
Portland State Aerospace Society <http://psas.pdx.edu/>
Sheet: /Power In, Battery Charge & PV MPPT/
File: battery_mgmt.sch
Title: Power In, Battery Charge, & PV MPPT
Size: B
Date: 2016-04-30
Rev: A
KiCad E.D.A. kicad 0.201604290946+671344ubuntu16.04.1-product
Id: 2/8



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

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.

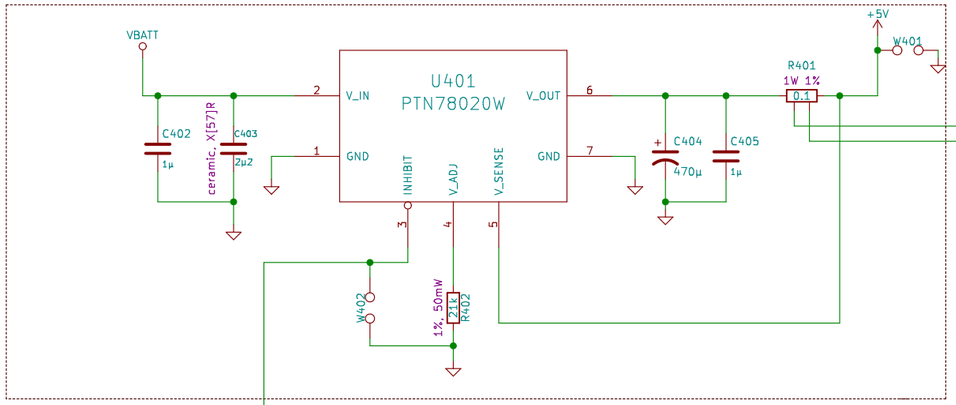
UNCONNECTED PINS
* VOUT and IOUT are internally connected to ground when disabled (pp. 30, 33).
* XRST is an open-drain output with an internal 3k pull-up to VLOG (p. 35).

Portland State Aerospace Society <http://psas.pdx.edu/>

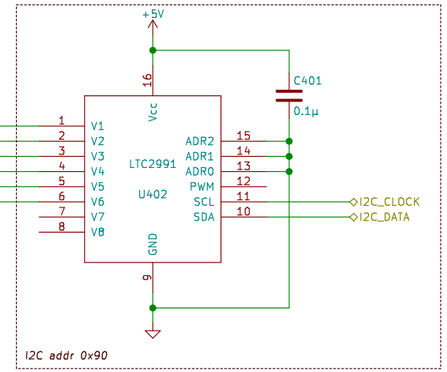
Sheet: /Battery Management/
File: battery_balance.sch

Title: Battery Management

Size: B	Date: 2016-04-30	**Rev: A**
KiCad E.D.A.	kicad 0.201604290946+671344ubuntu16.04.1-product	Id: 3/8

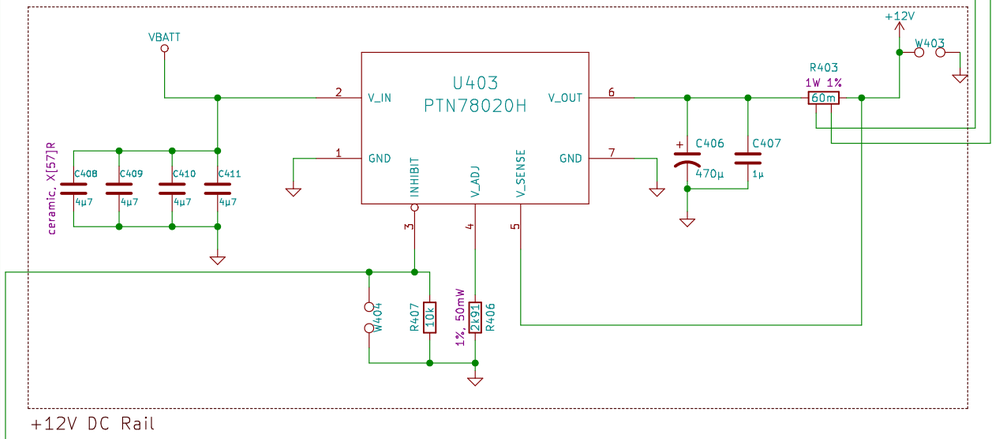


+5V DC Rail



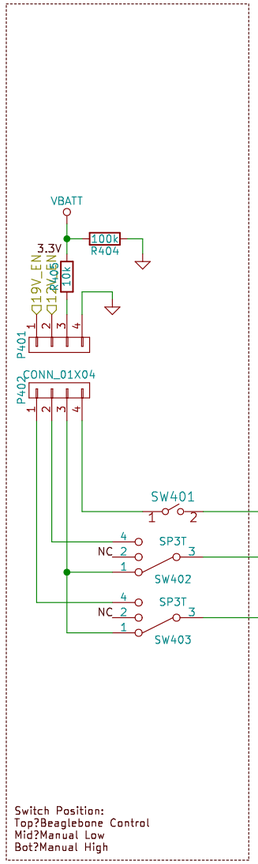
Voltage, Current, & Temp Sense

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

+19V DC Rail



Inhibit Control

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.

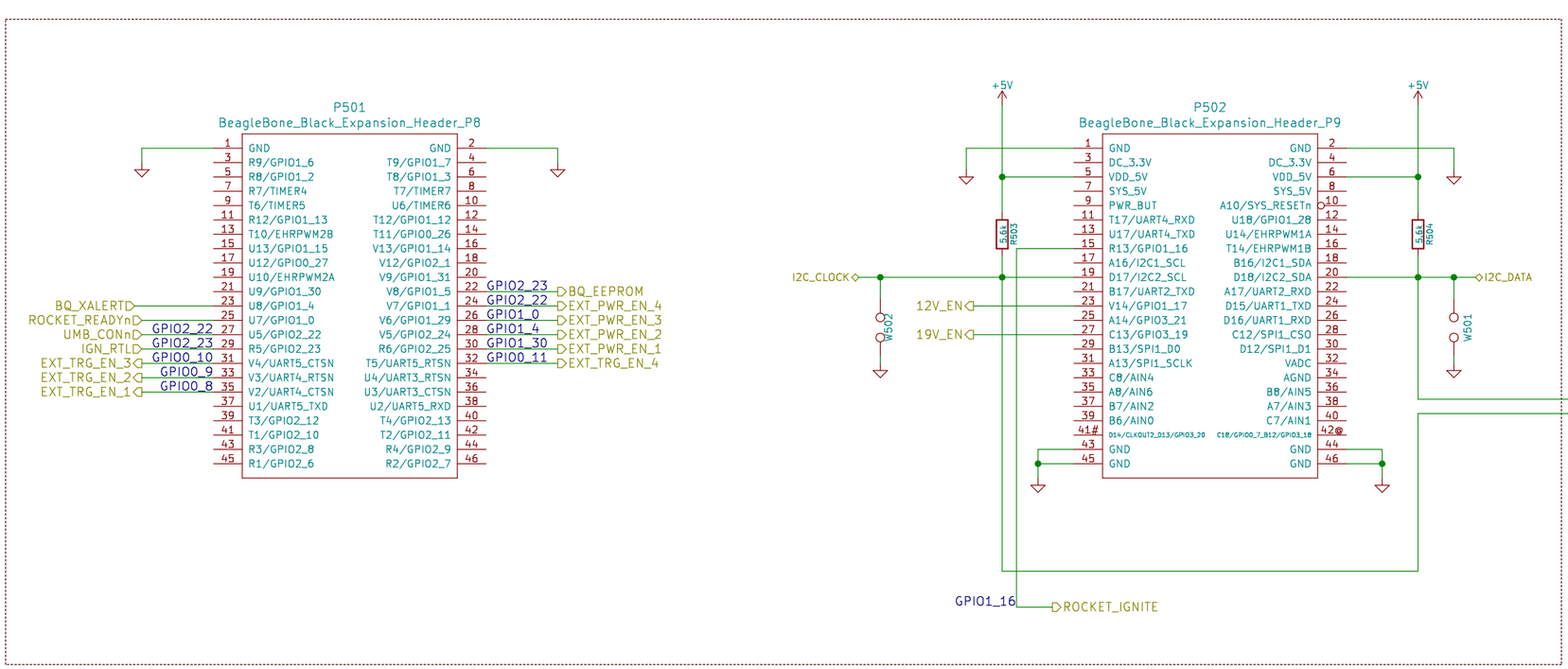
TODO:
* ~~jumpers on all INHIBIT pins~~
* ~~Values for converter enable pull-down resistors. Don't exceed the BB's low source max.!~~
* ~~Capacitor values are minimums. Consider increasing these. Consult datasheet for more info.~~

Portland State Aerospace Society <http://psas.pdx.edu/>

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

Title: LTC3 DC-DC Converters

Size: B	Date: 2016-04-30	**Rev: A**
KiCad E.D.A. kicad 0.201604290946+6713~~44~~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.

Portland State Aerospace Society <http://psas.pdx.edu/>

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

Title: LTC3 BeagleBone Black Cape Interface

Size: B	Date: 2016-04-30	**Rev: A**
KiCad E.D.A. kicad 0.201604290946+671344ubuntu16.04.1-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.

W602 0/5V

120 R602

IC601 TLP3542

+5V

10k R601

ROCKET_READYn

+3.1V

U601A CD74HC14

U601B CD74HC14

62k R603

100k R604

10k R605

U602 SN65220DBV SOT-23

Shore Power Check +19V

5.6k R612

4.5k R613

C603 0.1µ

W603 0/5V

U601F CD74HC14

10k R615

W604 0/5V

W605 0/5V

U603 741G08

D602 CDSU4148

100 R606

500k R607

NP R609

C601 10µ

C602 NP

W606 0/5V

Input Logic

Delay (5s)

+5V

CDSU4148 D601

K601 RELAY_1C

30 86 85 87a 87

IGN_BATT_P

P601 BATT-IN

W601 14.8–16.8V

GND_IGN

U601D CD74HC14

U601C CD74HC14

U601E CD74HC14

Q601 PMV45EN

560 R610

10k R608

62k R611

D603 LED

IGN_RTL +3.1V

LED: ROCKET_READY relay active

Ignition Battery Switch

Rocket–to–BeagleBone Ethernet

RJ45 J601

SHIELD

ROCKET_READY_5V

+19V

P603 UMBILICAL

ROCKET_ETH_1
ROCKET_ETH_2
ROCKET_ETH_3
ROCKET_ETH_4
UMB_CONN_FROM_RKT
UMB_CONN_TO_LTC

+5V

R616 5.1k

5.1k R621

UMB_CONn

C604 1µ

D609 3.3V

Rocket Umbilical

TODO: confirm R vals

R617 10k
R618 10k
R619 10k
R620 10k

D605 LED
D606 LED
D607 LED
D608 LED

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

+5V

CDSU4148 D604

K602 RELAY_1C

30 86 85 87a 87

TODO: replace fuse w/ breaker?

F601 FUSE

SW601 Ign. Arm

P602 CONN_01x02 To Away Box

GND_IGN

ROCKET_IGNITED

Q602 PMV45EN

W607 0/3.3V

10k R622

JP601

P604 CONN_01x02

Shorting Bar
(off board)

CONN_01x02 P605

GND

W608 0/14.8–16.8V

Ignition Switch

+5V VCC

VCC for CD74HC14

C605 0.1µ

C606 0.1µ

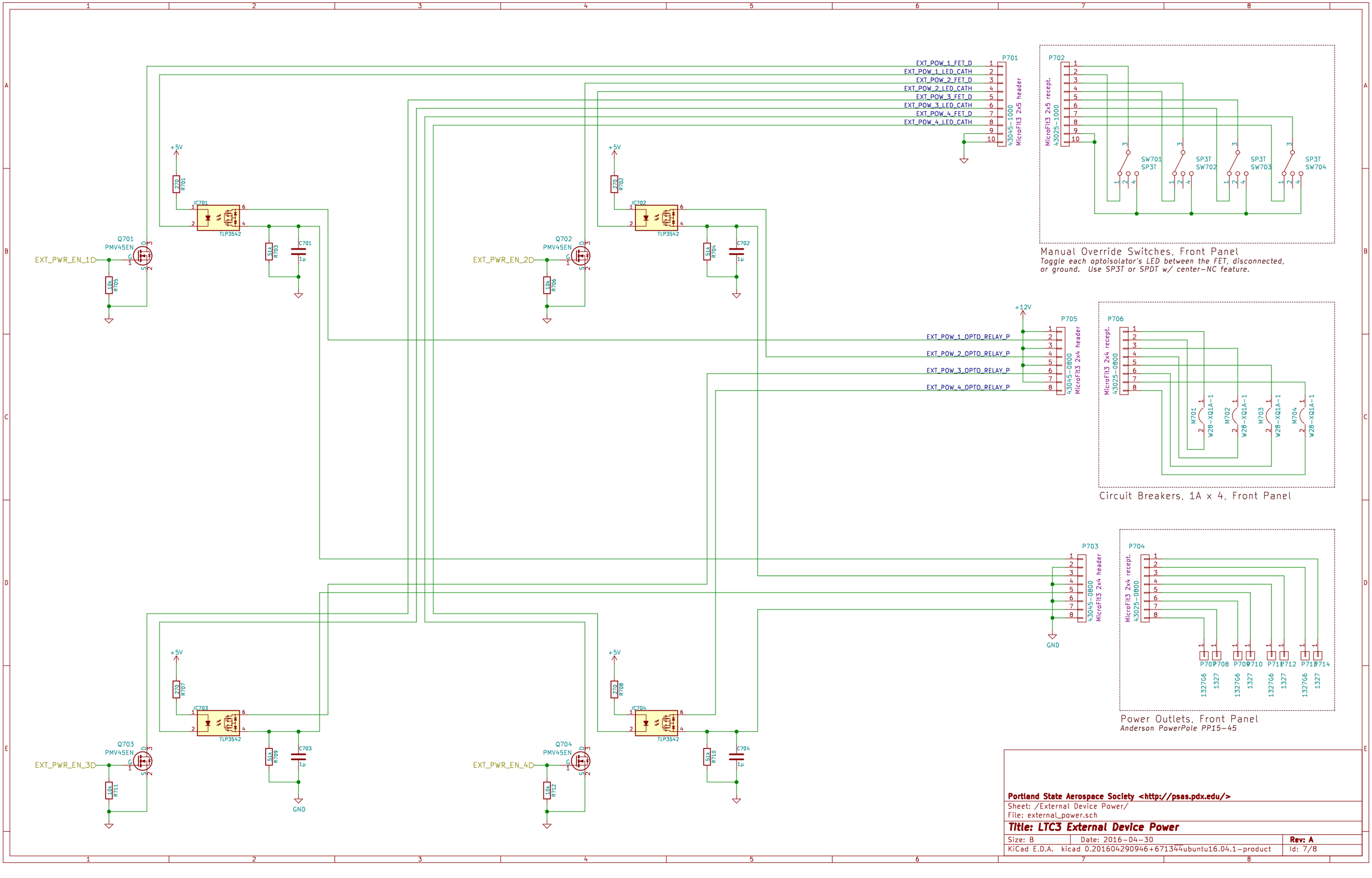
Bypass Capacitors
(one per IC VCC)

Portland State Aerospace Society <http://psas.pdx.edu/>

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

Title: LTC3 Rocket Umbilical & Ignition Control

Size: B	Date: 2016–04–30	**Rev: A**
KiCad E.D.A.	kicad 0.201604290946+671344ubuntu16.04.1–product	Id: 6/8

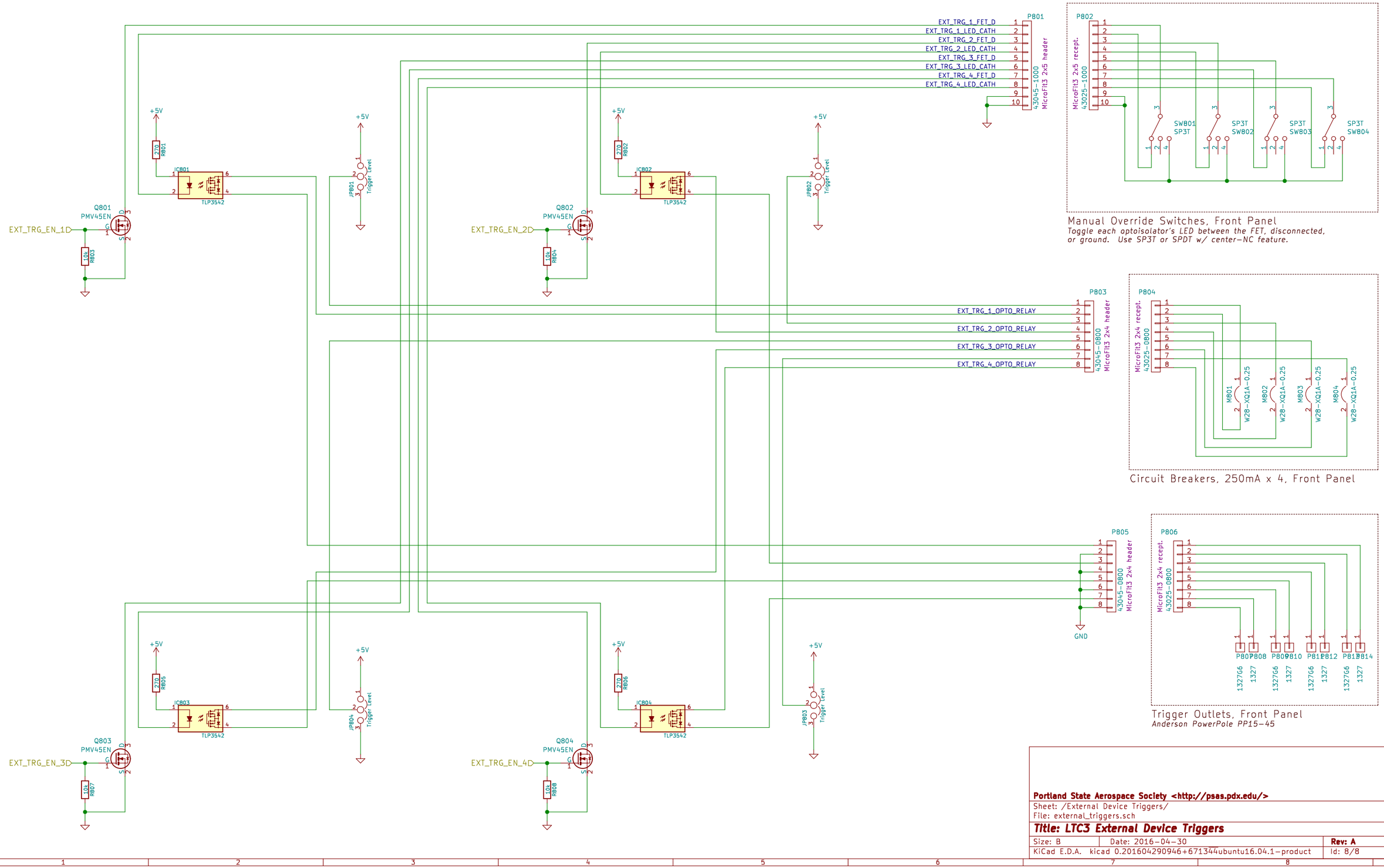


Portland State Aerospace Society <http://psas.pdx.edu/>

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

Title: LTC3 External Device Power

Size: B	Date: 2016-04-30	**Rev: A**
KiCad E.D.A. kicad 0.201604290946+6713~44ubuntu16.04.1-product		Id: 7/8



Portland State Aerospace Society <http://psas.pdx.edu/>

Sheet: /External Device Triggers/
File: external_triggers.sch

Title: LTC3 External Device Triggers

Size: B	Date: 2016-04-30	**Rev: A**
KiCad E.D.A. kicad 0.201604290946+6713~44ubuntu16.04.1-product		Id: 8/8