Sheet: Power In & Battery Charge Management

I2C_DATA
I2C_CLOCK

File: battery_mgmt.sch

Sheet: Battery, Balance & Protection

BQ_XALERT
BQ_EEPROM
BQ_SDATA
BQ_SCLK

BB_VSENSE_BATT-
BB_VSENSE_BATT+

BB_TEMP_BATT+
BB_TEMP_BATT-

File: battery_balance.sch

Sheet: DC-DC Converters

5V_EN
12V_EN
19V_EN

I2C_DATA
I2C_CLOCK

File: dcdc_converter.sch

Sheet: BeagleBone Black Cape

BB_VSENSE_PV+
BB_VSENSE_PV-
BB_VSENSE_BATT+
BB_VSENSE_BATT-

EXT_PWR_EN_1
EXT_PWR_EN_2
EXT_PWR_EN_3
EXT_PWR_EN_4

EXT_TRIG_EN_1
EXT_TRIG_EN_2
EXT_TRIG_EN_3
EXT_TRIG_EN_4

5V_END
12V_END
19V_END

BB_TEMP_BATT+
BB_TEMP_BATT-

ROCKET-READY

File: beaglebone_cape.sch

Sheet: Rocket Umbilical & Ignition Control

ROCKET-READY

File: rocket_interface.sch

Sheet: External Device Power & Triggers

GPIO_EXT_PWR_1
GPIO_EXT_PWR_2
GPIO_EXT_PWR_3
GPIO_EXT_PWR_4

EXT_PWR_EN_1
EXT_PWR_EN_2
EXT_PWR_EN_3
EXT_PWR_EN_4

GPIO_EXT_TRIG_1
GPIO_EXT_TRIG_2
GPIO_EXT_TRIG_3
GPIO_EXT_TRIG_4

EXT_TRIG_EN_1
EXT_TRIG_EN_2
EXT_TRIG_EN_3
EXT_TRIG_EN_4

File: external_devices.sch

TODO:
* Wire up sub-sheets.

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Sheet: /
File: Launch_Tower_Computer_III.sch

Title: Launch Tower Computer 3 (LTC3)

Size: B	Date: 2015-11-25	**Rev: A**
KiCad E.D.A. kicad 4.0.0rc1a-stable		Id: 1/7

FIXME: Safe to use one current-sense resistor
for both the LT8490 and the LTC2991?

Current Sense (p. 20)

Current Sense (p. 20)

Supply Detection (p.34)

p. 15, p. 34

Place close to VIN.

Voltage, Current, & Temp Sense

Input Feedback p.14

202kHz switch

Output Feedback (p. 17)

Temp Sense (p. 21)

TODO:
* Add feedback resistor disconnect circuit (datasheet fig. 27).

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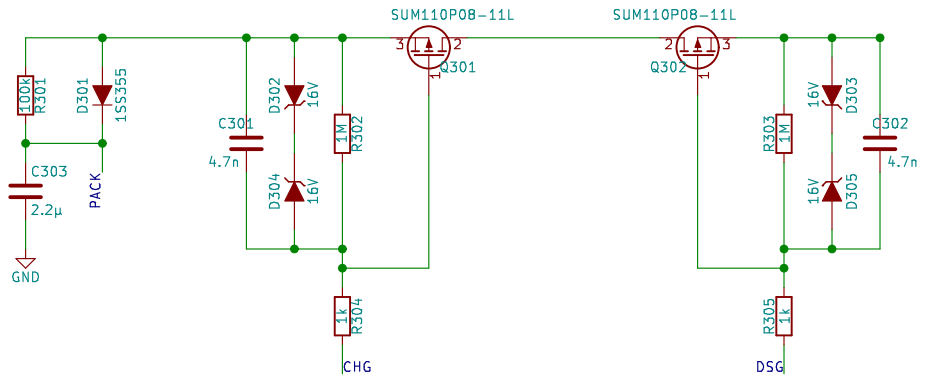
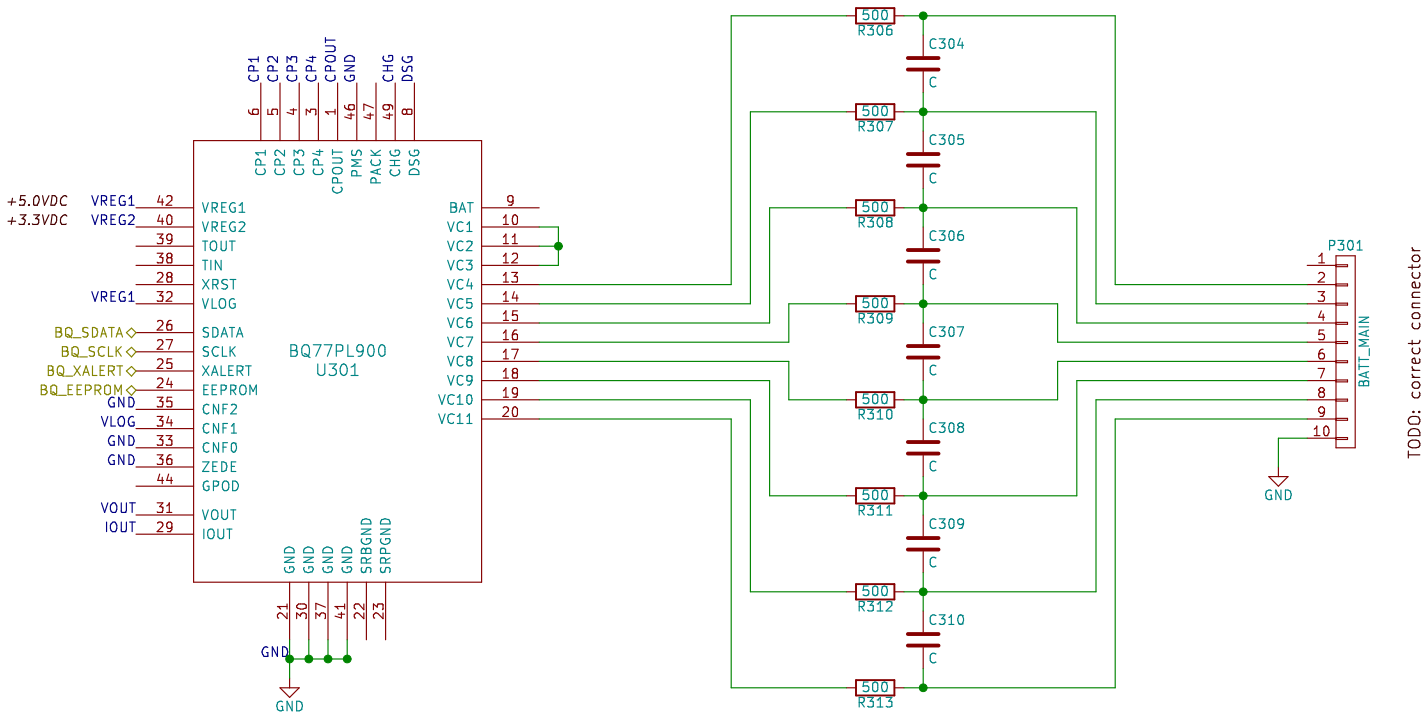
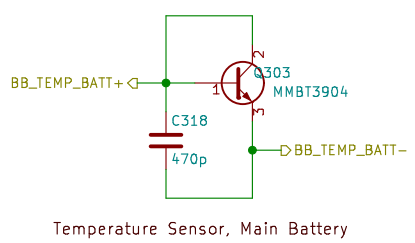
Sheet: /Power In & Battery Charge Management/
File: battery_mgmt.sch

Title: Power In, Battery Management

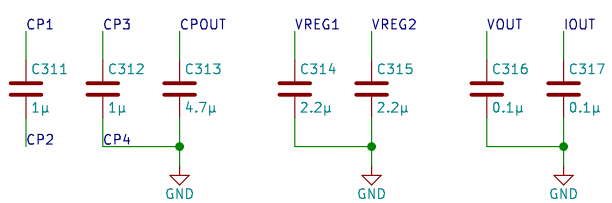
Size: B	Date: 2015-11-25	Rev: A
KiCad E.D.A. kicad 4.0.0rc1a-stable		Id: 2/7







Temperature Sensor, Main Battery



QUESTIONS:
* Can the bq and/or LT8490's batt temp sensing be accessed by the BeagleBone?
* Leave XRST unconnected (p.35)?
* Leave GPOD unconnected (p.34)?
* Are caps on VOUT and IOUT necessary if both outputs are disabled (pp.30,33)?
* Do we need multiple parallel switching FETs?

TODO:
* Finish circuit.

NB: Page references are to the bq datasheet.

BB_VSENSE_BATT+
BB_VSENSE_BATT-

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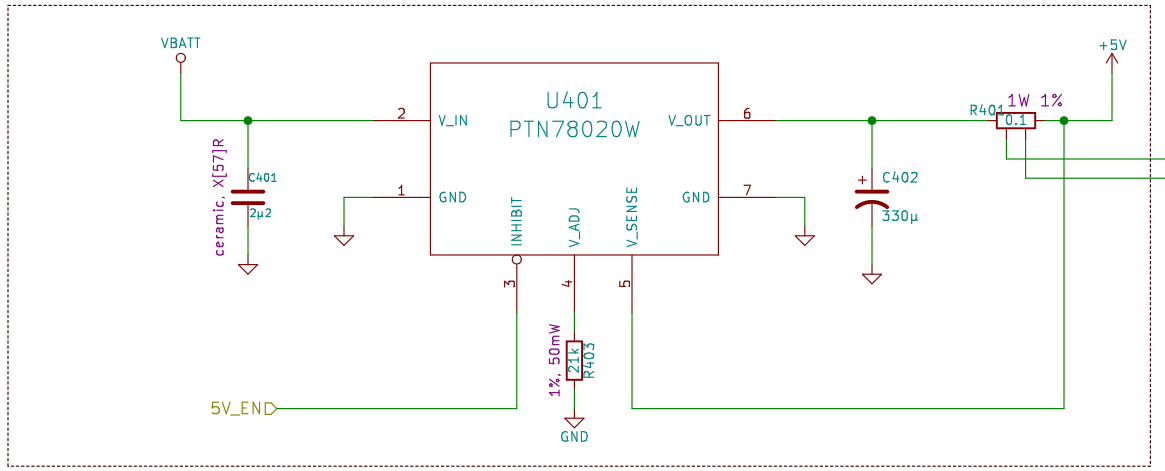
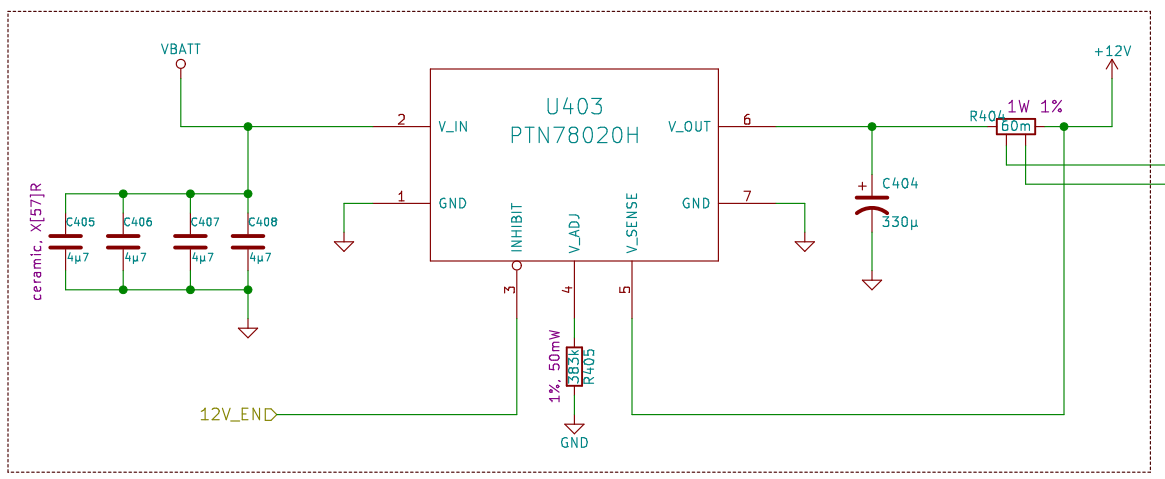
Sheet: /Battery, Balance & Protection/
File: battery_balance.sch

Title: Battery Balance

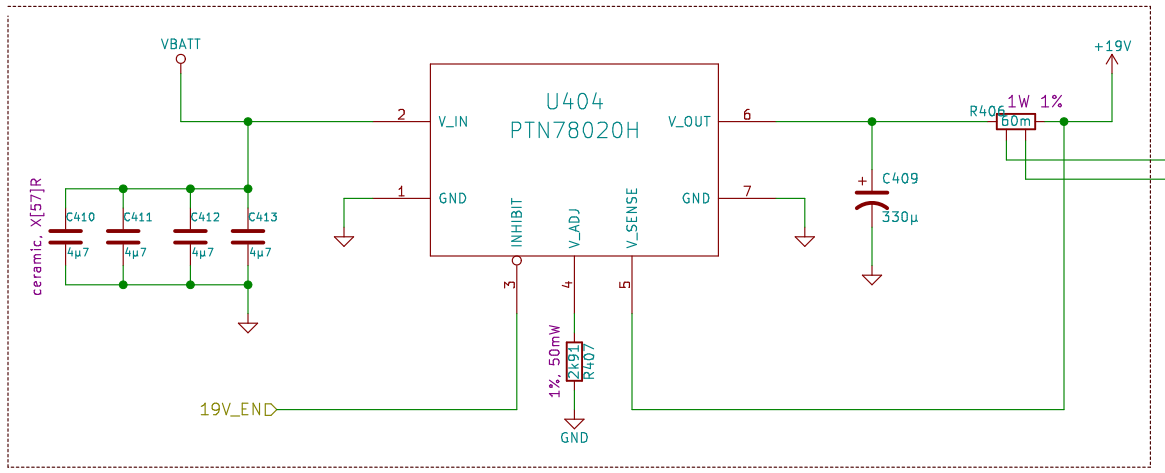
Size: B	Date: 2015-11-25	**Rev: A**
KiCad E.D.A. kicad 4.0.0rc1a-stable		Id: 3/7



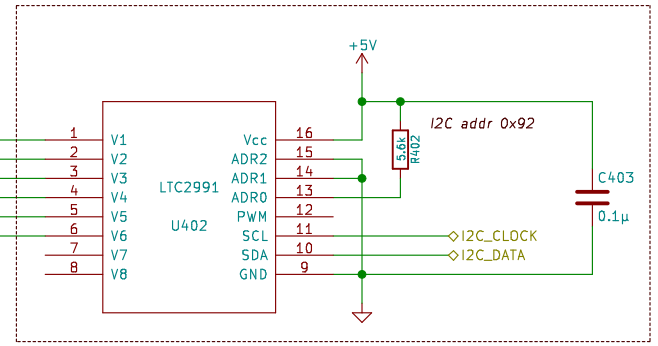
+5V DC Rail



+12V DC Rail



+19V DC Rail



Voltage, Power, & 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

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:
* Capacitor values are minimums. Consider increasing these. Consult datasheet for more info.

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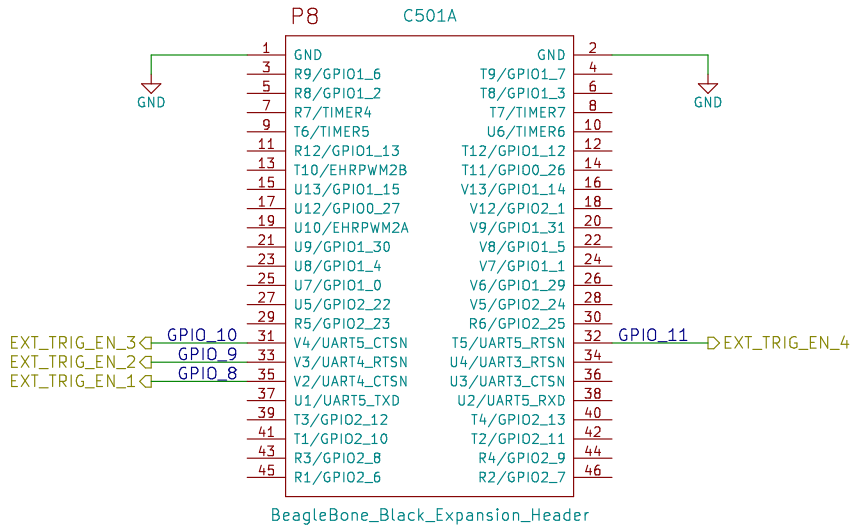
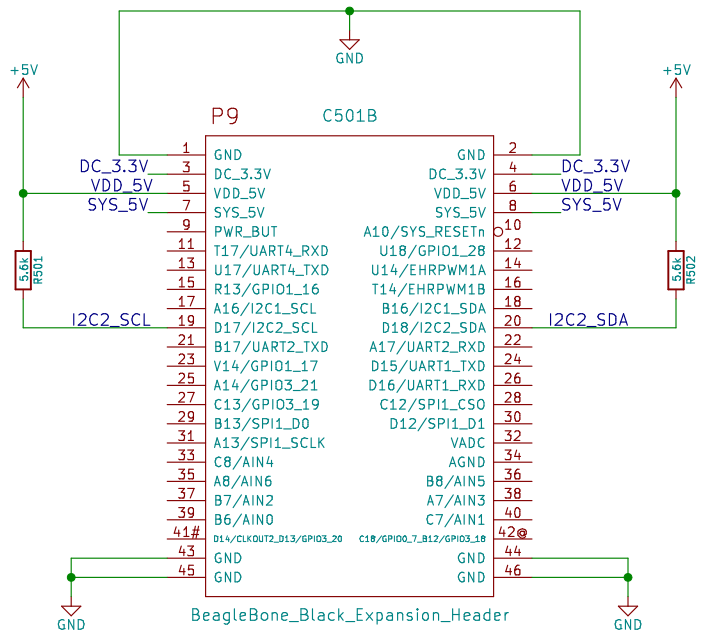
Sheet: /DC-DC Converters/
File: dcdc_converter.sch

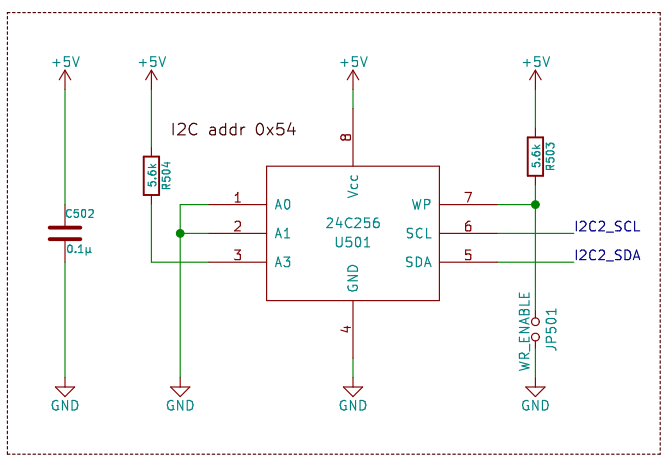
Title: LTC3 DC-DC Converters

Size: B	Date: 2015-11-25	**Rev: A**
KiCad E.D.A. kicad 4.0.0rc1a-stable		Id: 4/7





BeagleBone Expansion Headers



Cape EEPROM

TODO: connect these labels
to BBB GPIO pins.

ROCKET_READY

EXT_PWR_EN_1
EXT_PWR_EN_2
EXT_PWR_EN_3
EXT_PWR_EN_4

5V_EN
12V_EN
19V_EN

TODO:
* Pick GPIO for rocket-ready signal.
* Buffer btw rocket-ready signal and BB, ign. board, etc?
* Umbilical connection state
* Ignition fuse state

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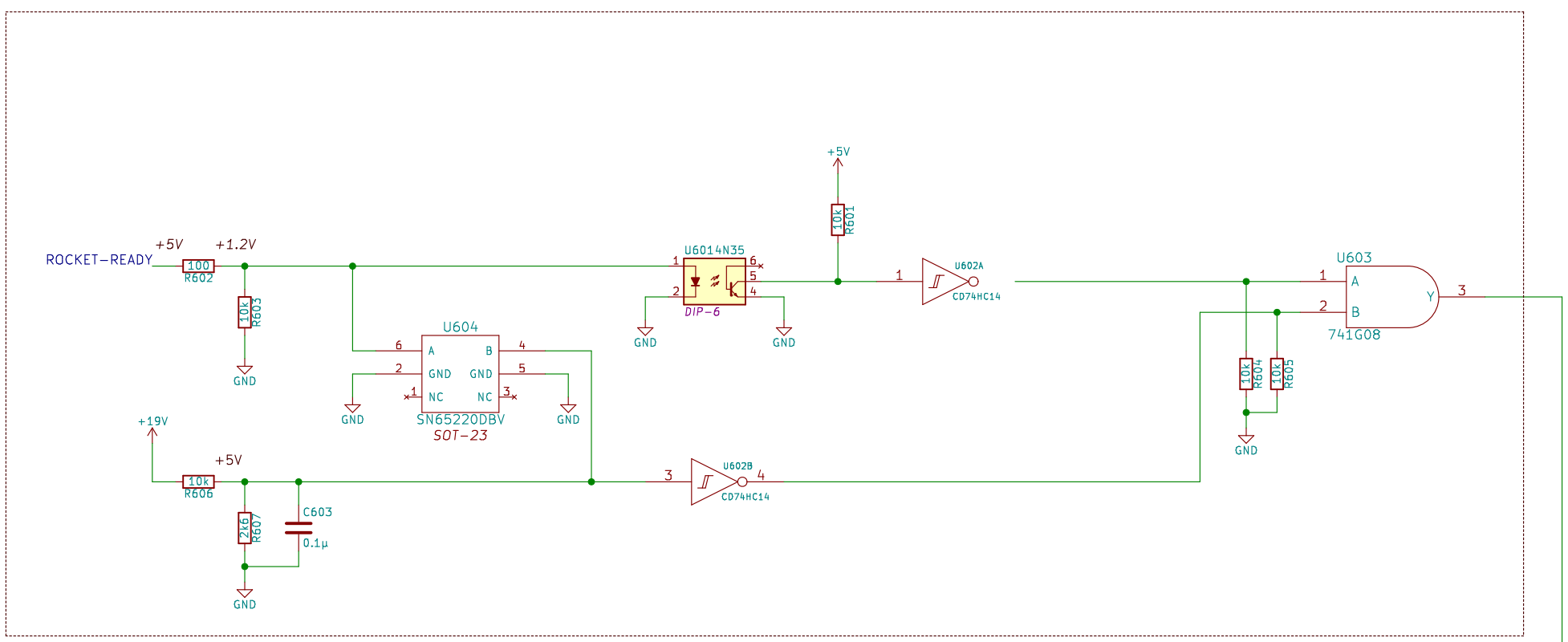
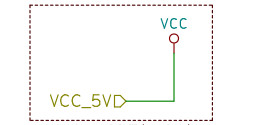
Sheet: /BeagleBone Black Cape/
File: beaglebone_cape.sch

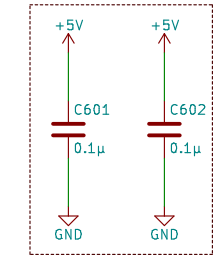
Title: LTC3 BeagleBone Black Cape Interface

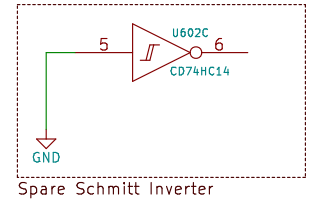
Size: B	Date: 2015-11-25	Rev: A
KiCad E.D.A. kicad 4.0.0rc1a-stable		Id: 5/7

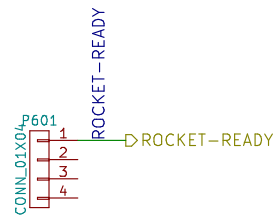


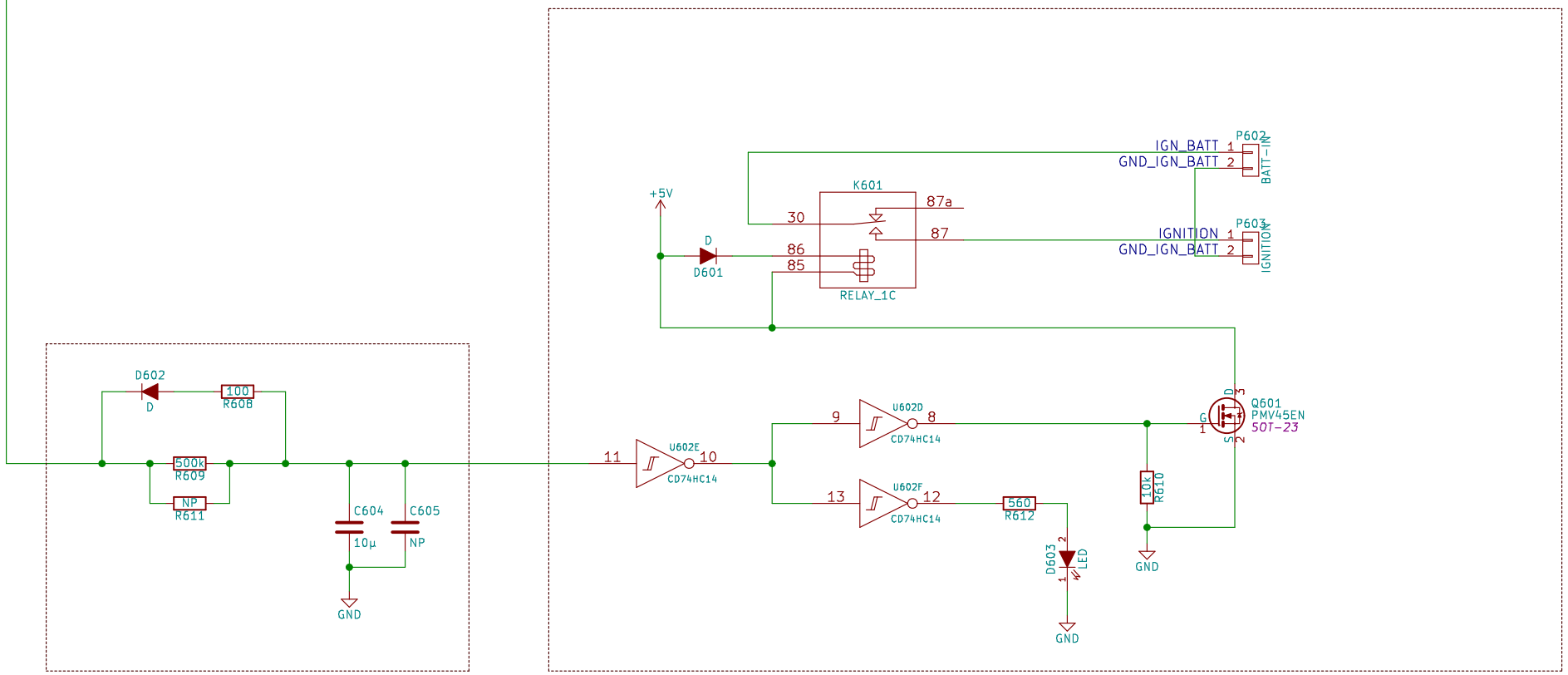
Input Logic











Delay (5s)

Ignition/Battery Control

TODO:
* Select appropriate component values.
* Move TVS upstream of voltage dividers.

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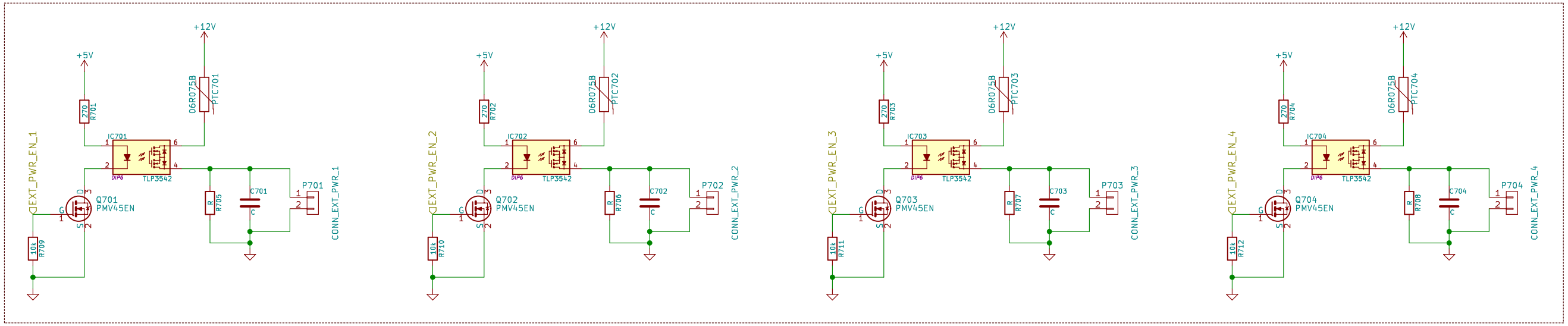
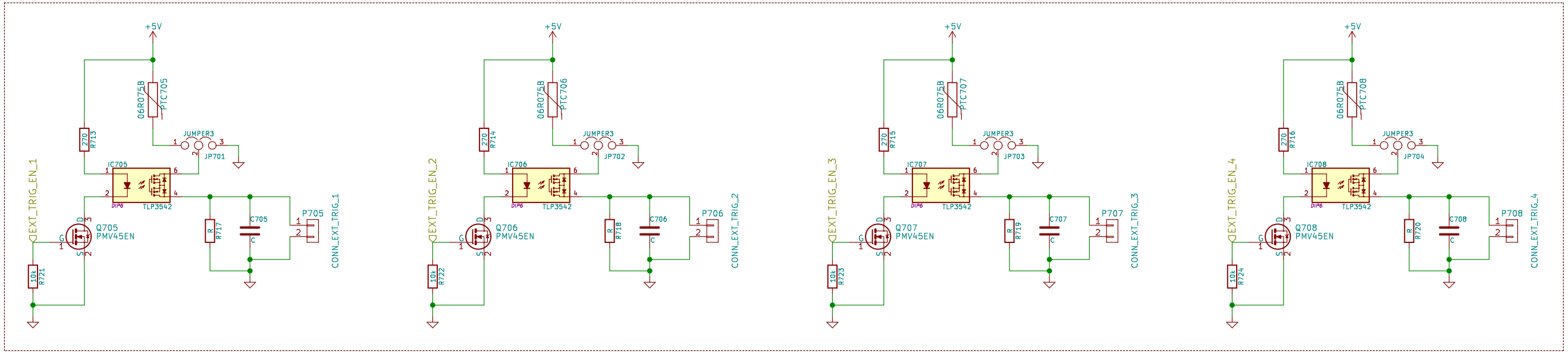
Sheet: /Rocket Umbilical & Ignition Control/		
File: rocket_interface.sch		
Title: LTC3 Rocket Umbilical & Ignition Control		
Size: B	Date: 2015-11-25	**Rev: A**
KiCad E.D.A. kicad 4.0.0rc1a-stable		Id: 6/7



External Device Power



External Device Triggers

TODO:
* Determine values for bleeder resistor and filter capacitor on each output connector.
* Pick new PolyFuses, 0.5–1.0A max.

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Sheet: /External Device Power & Triggers/
File: external_devices.sch

Title: LTC3 External Power & Triggers

Size: B	Date: 2015-11-25	**Rev: A**
KiCad E.D.A. kicad 4.0.0rc1a-stable		Id: 7/7