Sheet: External Device Power

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

File: external_power.sch

Sheet: External Device Triggers

EXT_TRG_EN_1
EXT_TRG_EN_2
EXT_TRG_EN_3
EXT_TRG_EN_4

File: external_triggers.sch

Sheet: BeagleBone Black Cape

I2C_CLOCK
I2C_DATA
BQ_XALERT
EXT_PWR_EN_1
EXT_PWR_EN_2
EXT_PWR_EN_3
EXT_PWR_EN_4
EXT_TRG_EN_1
EXT_TRG_EN_2
EXT_TRG_EN_3
EXT_TRG_EN_4
12V_ENn
19V_ENn
UMB_CONn
ROCKET_READYn
IGN_RTL
ROCKET_IGNITE

File: beaglebone_cape.sch

TODO: make use of BQ_XALERT?

Sheet: DC-DC Converters

I2C_CLOCK
I2C_DATA
12V_ENn
19V_ENn

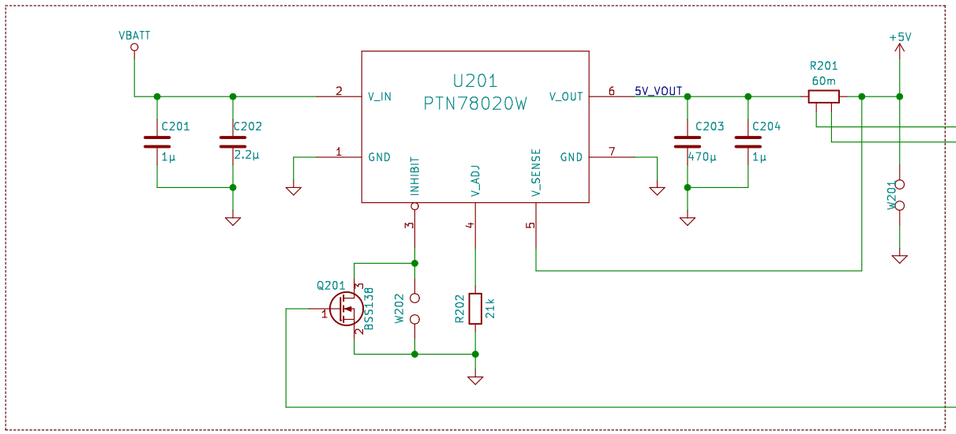
File: dcdc_converter.sch

Sheet: Rocket Umbilical & Ignition Control

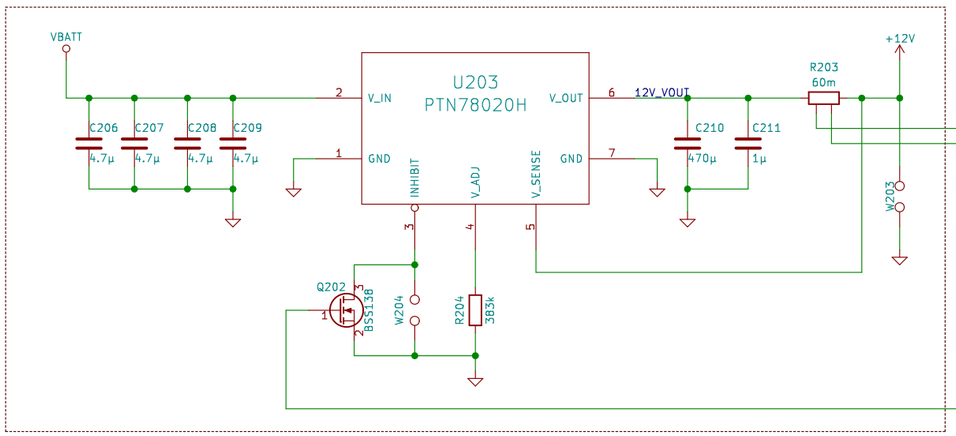
ROCKET_IGNITE
UMB_CONn
ROCKET_READYn
IGN_RTL

File: rocket_interface.sch

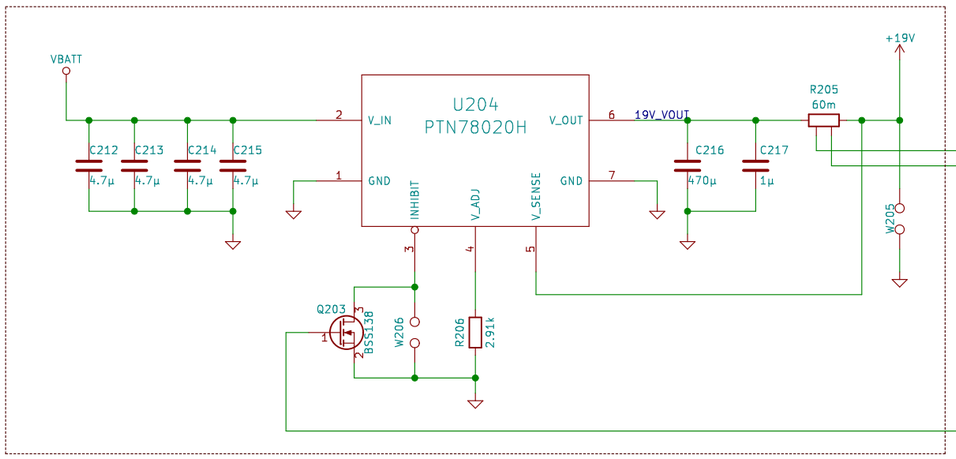
Portland State Aerospace Society <http://psas.pdx.edu/>		
Sheet: /		
File: LTC3.sch		
Title: Launch Tower Computer 3 (LTC3)		
Size: B	Date: 2016-08-01	**Rev: A**
KiCad E.D.A. kicad 4.0.2+dfsg1-stable		Id: 1/6



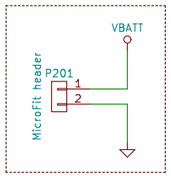
+5V DC Supply



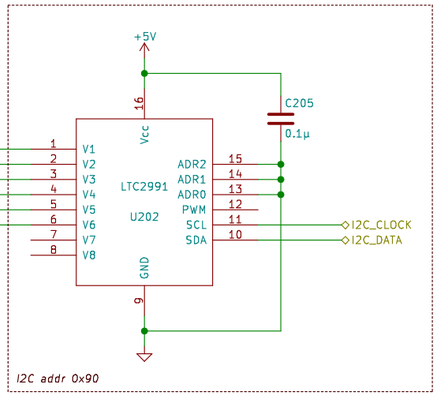
+12V DC Supply



+19V DC Supply

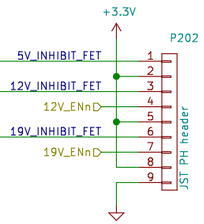


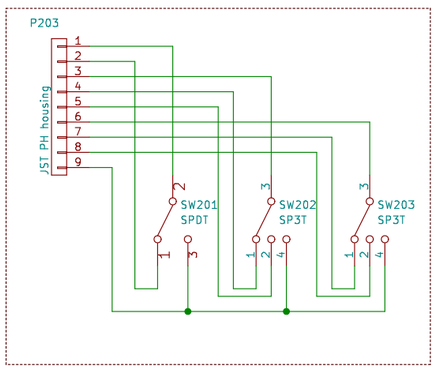
Power In



Voltage, Current, & Temp Sense

Current Sense Resistors
full-scale voltage = 0.300 V
R_sense_max = 0.300/Imax
5 A = 60mΩ





Manual Override Switches, Front Panel

Toggle 5V converter's INHIBIT FET between +3.3V and ground. Toggle 12V and 19V converters' INHIBIT FET between the BeagleBone, +3.3V, or ground.

NB: The 5V converter supplies the BeagleBone. We don't want the BB to be able to commit suicide, thus it does not get a connection to the 5V converter's INHIBIT FET.

NOTES
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.

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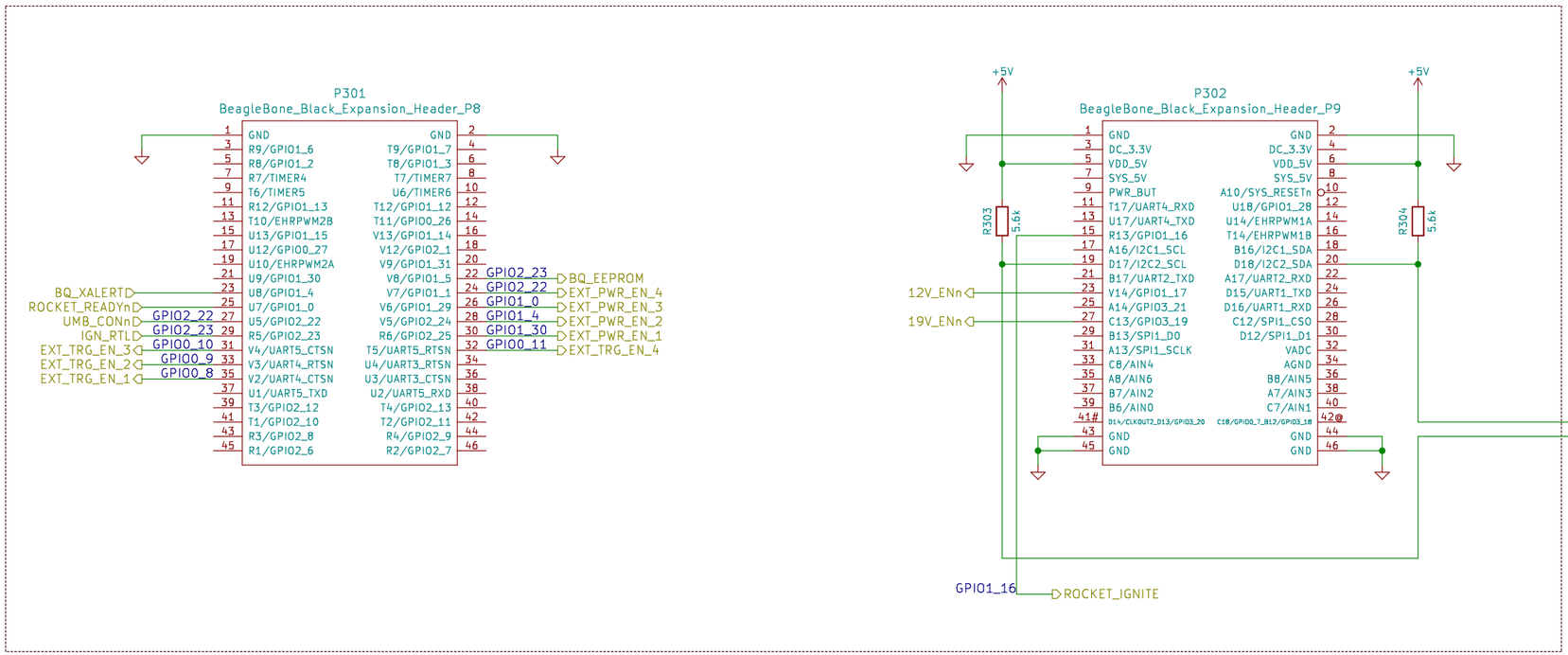
Sheet: /DC-DC Converters/
File: dcdc_converter.sch

Title: LTC3 DC-DC Converters

Size: B	Date: 2016-08-01	**Rev: A**
KiCad E.D.A. kicad 4.0.2+dfsg1-stable		Id: 2/6



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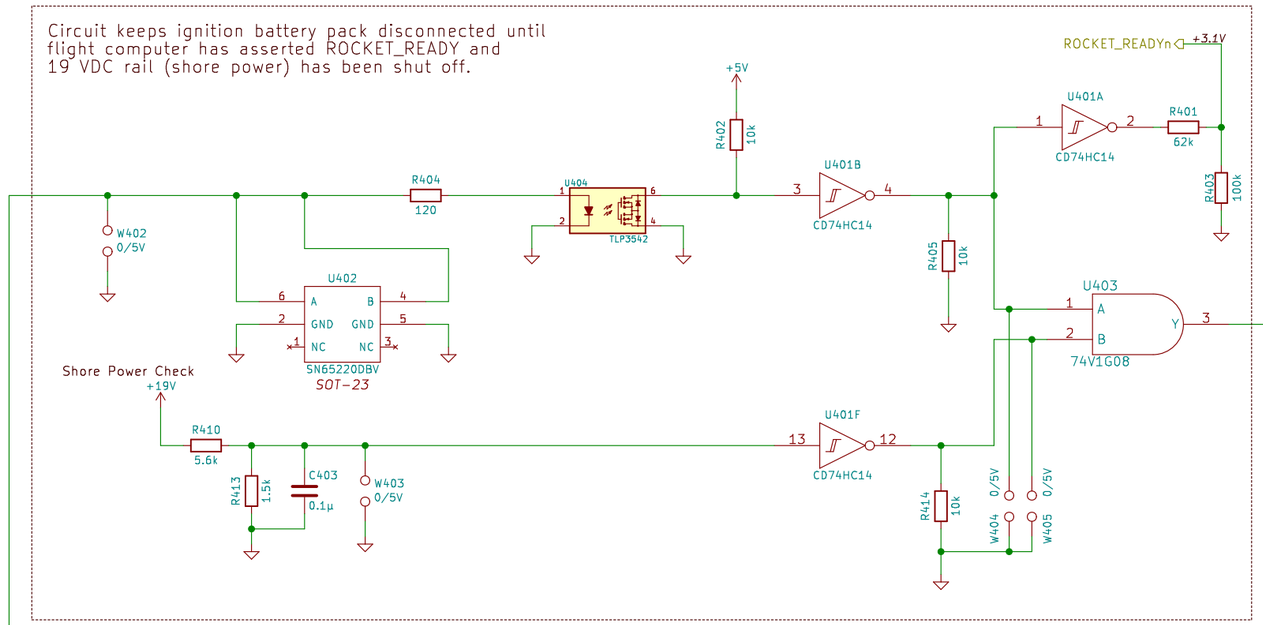
Sheet: /BeagleBone Black Cape/
File: beaglebone_cape.sch

Title: LTC3 BeagleBone Black Cape Interface

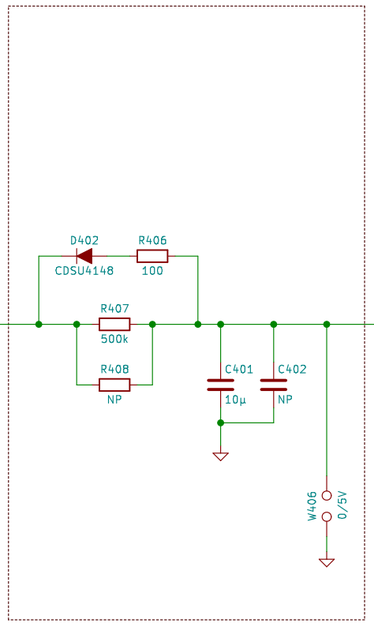
Size: B	Date: 2016-08-01	**Rev: A**
KiCad E.D.A. kicad 4.0.2+dfsg1-stable		Id: 3/6

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

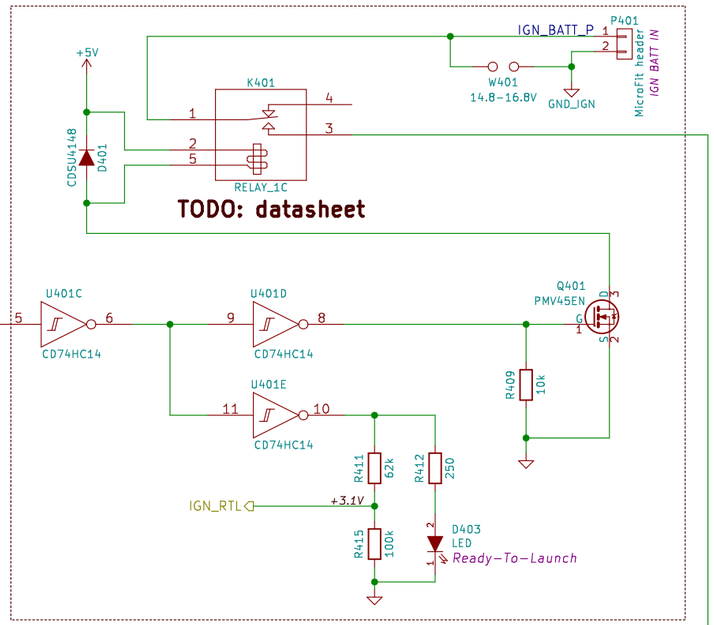
Input Logic



Delay (5s)

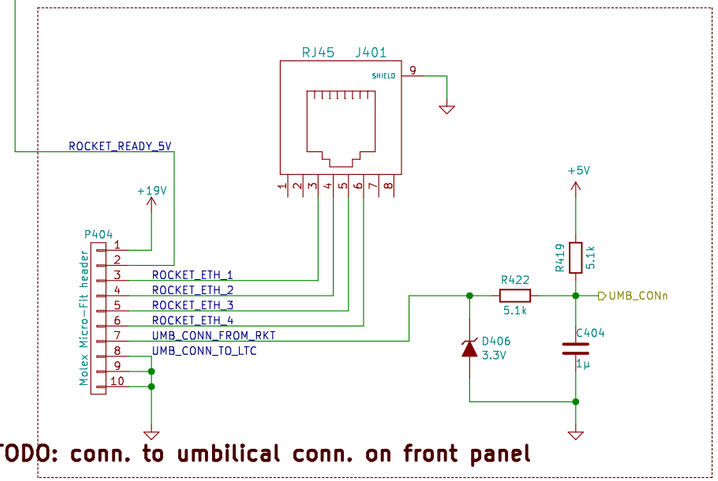


Ignition Battery Relay



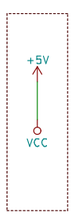
Rocket Umbilical

Rocket-to-BeagleBone Ethernet

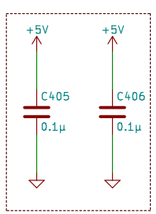


TODO: conn. to umbilical conn. on front panel

VCC for CD74HC14

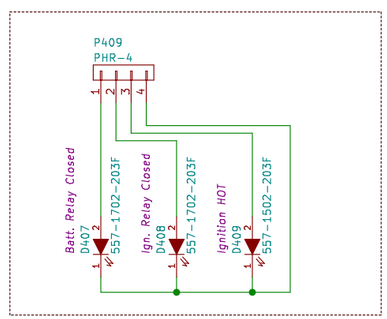


Bypass Capacitors (one per IC VCC)

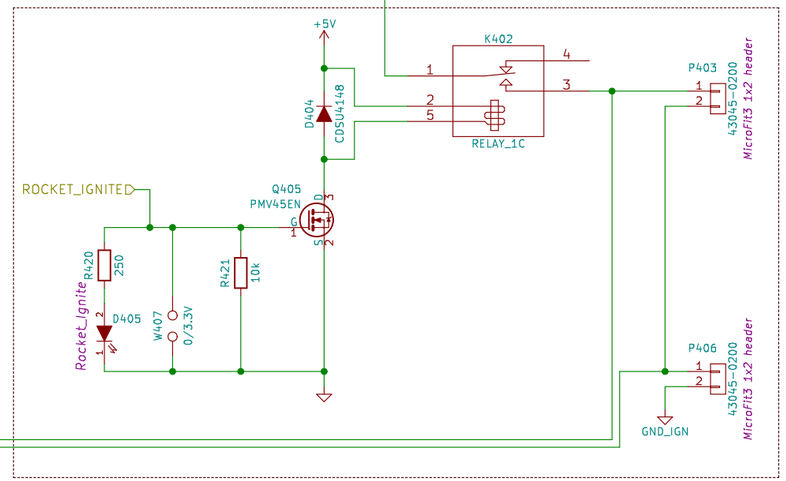


BAKERCON Hazard Gauge

(super-bright LEDs, exterior panel)



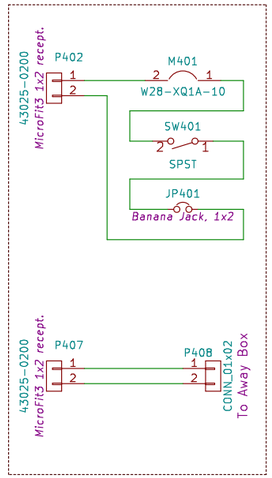
Rocket Ignition Relay



TODO: find out if Dialight 557 LED indicators require current-limiting resistor

Breaker, Arm Switch, Shorting Bar, & Ignition Connector

(front panel)



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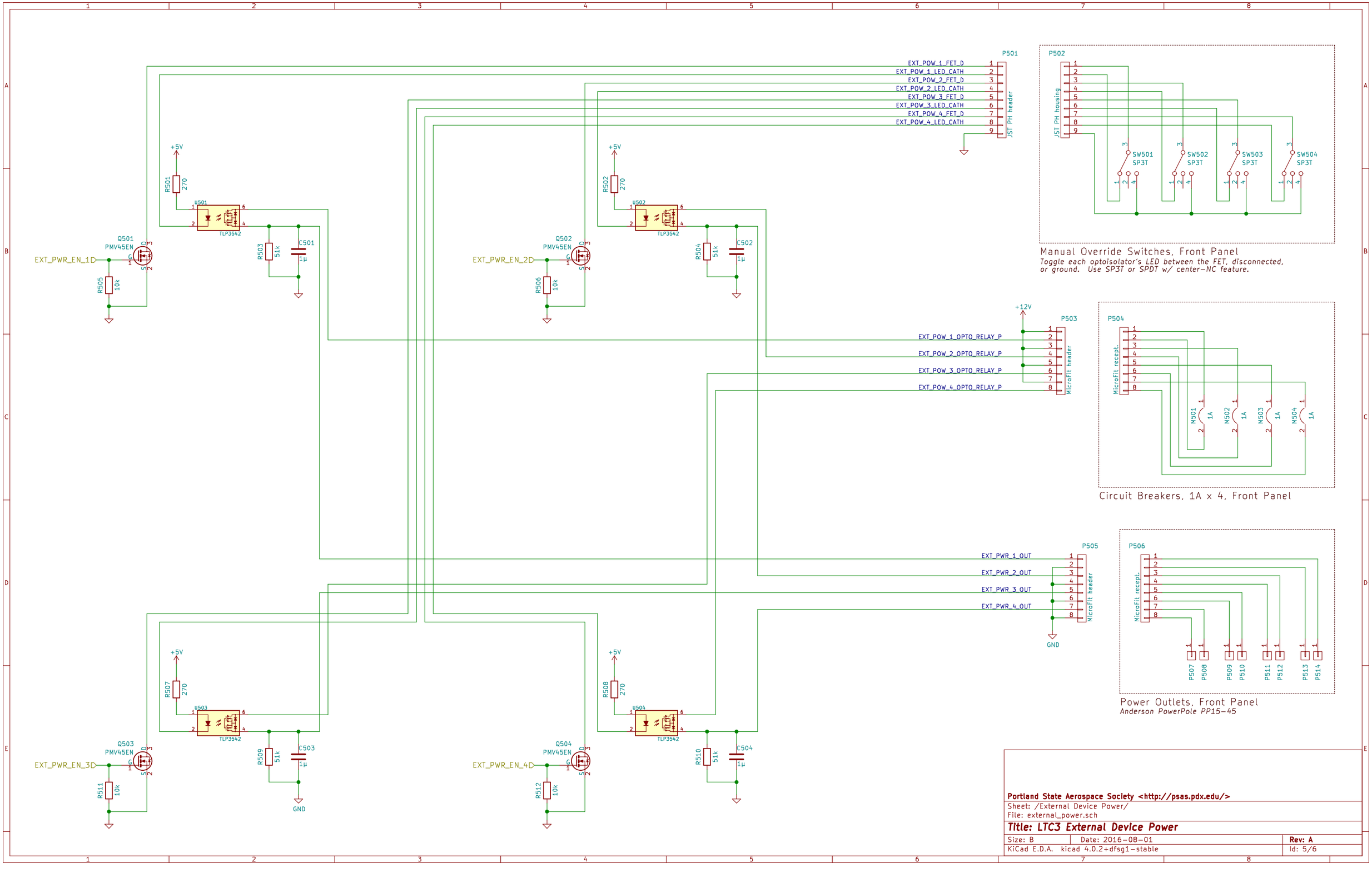
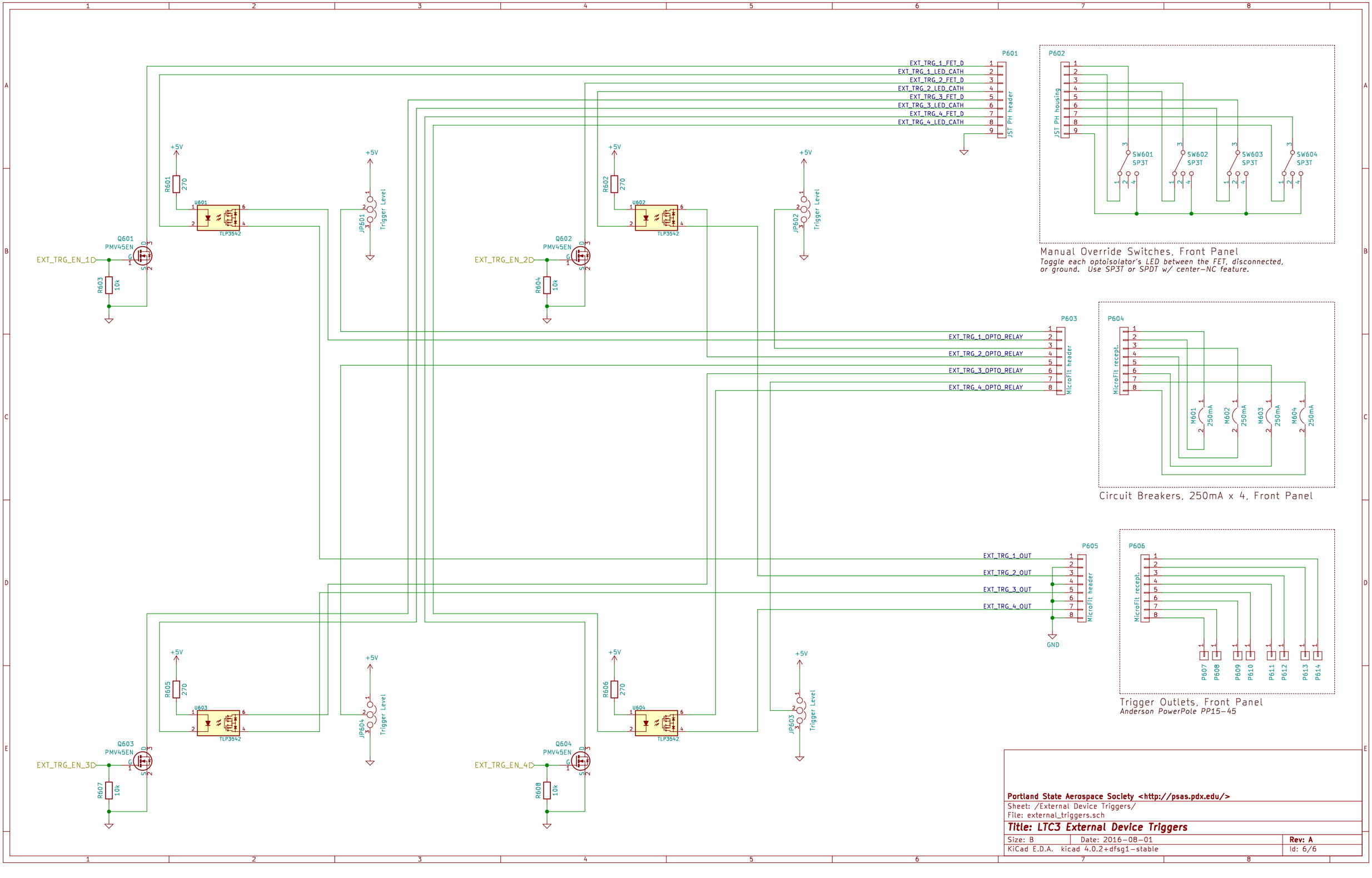
Sheet: /Rocket Umbilical & Ignition Control/
File: rocket_interface.sch

Title: LTC3 Rocket Umbilical & Ignition Control

Size: B	Date: 2016-08-01	Rev: A
KiCad E.D.A. kicad 4.0.2+dfsg1-stable		Id: 4/6


P501
EXT_POW_1_FET_D
EXT_POW_1_LED_CATH
EXT_POW_2_FET_D
EXT_POW_2_LED_CATH
EXT_POW_3_FET_D
EXT_POW_3_LED_CATH
EXT_POW_4_FET_D
EXT_POW_4_LED_CATH
JST PH header
P502
JST PH housing
SW501 SP3T
SW502 SP3T
SW503 SP3T
SW504 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.
+5V
R501 270
U501
TLP3542
Q501 PMV45EN
EXT_PWR_EN_1
R505 10k
R503 51k
C501 1µ
R502 270
U502
TLP3542
Q502 PMV45EN
EXT_PWR_EN_2
R506 10k
R504 51k
C502 1µ
+12V
P503
EXT_POW_1_OPTO_RELAY_P
EXT_POW_2_OPTO_RELAY_P
EXT_POW_3_OPTO_RELAY_P
EXT_POW_4_OPTO_RELAY_P
MicroFit header
P504
MicroFit recept.
M501 1A
M502 1A
M503 1A
M504 1A
Circuit Breakers, 1A x 4, Front Panel
P505
EXT_PWR_1_OUT
EXT_PWR_2_OUT
EXT_PWR_3_OUT
EXT_PWR_4_OUT
GND
MicroFit header
P506
MicroFit recept.
P507 P508 P509 P510 P511 P512 P513 P514
Power Outlets, Front Panel
Anderson PowerPole PP15-45
R507 270
U503
TLP3542
Q503 PMV45EN
EXT_PWR_EN_3
R511 10k
R509 51k
C503 1µ
R508 270
U504
TLP3542
Q504 PMV45EN
EXT_PWR_EN_4
R512 10k
R510 51k
C504 1µ
GND
Portland State Aerospace Society <http://psas.pdx.edu/>
Sheet: /External Device Power/
File: external_power.sch
Title: LTC3 External Device Power
Size: B
Date: 2016-08-01
Rev: A
KiCad E.D.A. kicad 4.0.2+dfsg1-stable
Id: 5/6


P601
EXT_TRG_1_FET_D
EXT_TRG_1_LED_CATH
EXT_TRG_2_FET_D
EXT_TRG_2_LED_CATH
EXT_TRG_3_FET_D
EXT_TRG_3_LED_CATH
EXT_TRG_4_FET_D
EXT_TRG_4_LED_CATH
JST PH header
P602
JST PH housing
SW601 SP3T
SW602 SP3T
SW603 SP3T
SW604 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.
+5V
R601 270
U601
TLP3542
JP601
Trigger Level
Q601
PMV45EN
EXT_TRG_EN_1
R603 10k
R602 270
U602
JP602
Q602
EXT_TRG_EN_2
R604 10k
P603
EXT_TRG_1_OPTO_RELAY
EXT_TRG_2_OPTO_RELAY
EXT_TRG_3_OPTO_RELAY
EXT_TRG_4_OPTO_RELAY
MicroFit header
P604
MicroFit receptacle
M601 250mA
M602 250mA
M603 250mA
M604 250mA
Circuit Breakers, 250mA x 4, Front Panel
P605
EXT_TRG_1_OUT
EXT_TRG_2_OUT
EXT_TRG_3_OUT
EXT_TRG_4_OUT
GND
P606
P607 P608 P609 P610 P611 P612 P613 P614
Trigger Outlets, Front Panel
Anderson PowerPole PP15-45
R605 270
U603
JP604
Q603
EXT_TRG_EN_3
R607 10k
R606 270
U604
JP603
Q604
EXT_TRG_EN_4
R608 10k
Portland State Aerospace Society <http://psas.pdx.edu/>
Sheet: /External Device Triggers/
File: external_triggers.sch
Title: LTC3 External Device Triggers
Size: B
Date: 2016-08-01
Rev: A
KiCad E.D.A. kicad 4.0.2+dfsg1-stable
Id: 6/6