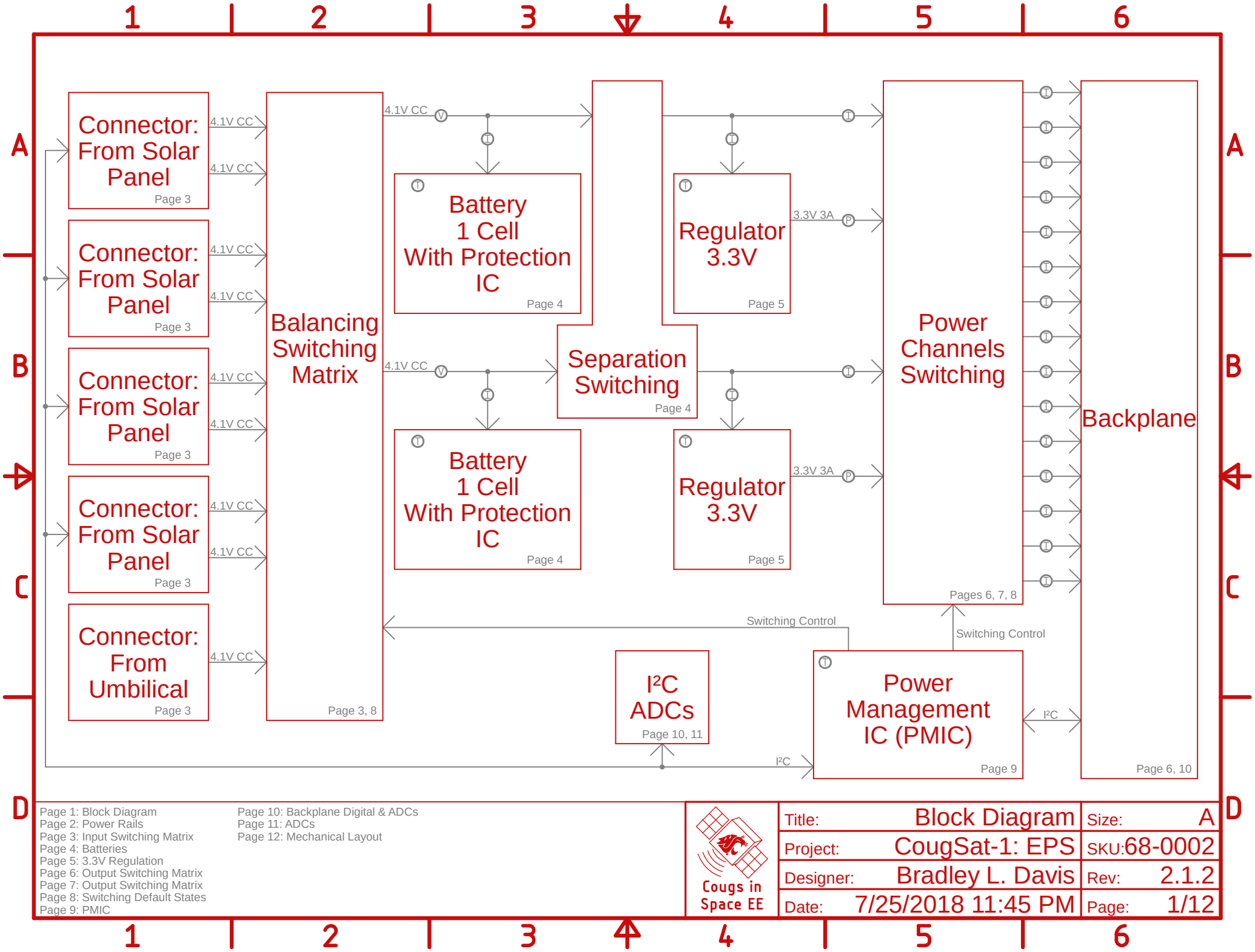


Page 1: Block Diagram
Page 2: Power Rails
Page 3: Input Switching Matrix
Page 4: Batteries
Page 5: 3.3V Regulation
Page 6: Output Switching Matrix
Page 7: Output Switching Matrix
Page 8: Switching Default States
Page 9: PMIC
Page 10: Backplane Digital & ADCs
Page 11: ADCs
Page 12: Mechanical Layout

Cougs in Space EE

Title:	Block Diagram	Size:	A
Project:	CougSat-1: EPS	SKU:	68-0002
Designer:	Bradley L. Davis	Rev:	2.1.2
Date:	7/25/2018 11:45 PM	Page:	1/12

Solar Panel 0
Solar Panel 1
Solar Panel 2
Solar Panel 3
EPS Heater 0
EPS Heater 1
Deployables Release

PV_3.3V-0: 1mA
PV_3.3V-1: 1mA
PV_3.3V-2: 1mA
PV_3.3V-3: 1mA
PR_BH-0: 250mA
PR_BH-1: 250mA
PR_DEPLOY: 2A

Switching

PR_3.3V-0: 20mA
PR_3.3V-1: 60mA
PR_3.3V-2: 20mA
PR_3.3V-3: 45mA
PR_3.3V-4: 55mA
PR_3.3V-5: 90mA
PR_3.3V-6: 105mA
PR_BATT-0: 300mA
PR_BATT-1: 400mA

IHU
IHU: SD Card
ADCS
ADCS: IMUs
ADCS: GPS
IFJR & SD Card
Comms & Radios
ADCS: Magnetorquers
Comms: TX Amplifier

Satellite Bus

CougSat-1 Payload

PR_3.3V-7: 50mA
PR_3.3V-8: 390mA
PR_3.3V-9: 25mA
PR_3.3V-10: 15mA
PR_3.3V-11: 390mA
PR_3.3V-12: 0mA
PR_BATT-2: 250mA
PR_BATT-3: 0mA
PR_BATT-4: 0mA
PR_BATT-5: 0mA
PR_BATT-6: 0mA

Payload: 0 — Germination Lighting
Payload: 1 — Germination Camera
Payload: 2 — Germination Sensors
Payload: 4 — Ionizing Radiation Sensor
Payload: 5 — Ground Camera
Payload: 6 — Unused
Payload: 7 — Germination Heater
Payload: 8 — Unused
Payload: 9 — Unused
Payload: 10 — Unused
Payload: 11 — Unused

Note: Each power rail channel (PR_) is rated for 1A
PR_DEPLOY is rated for 2A
Currents shown are the expected consumption

Umbilical Charging
UMB_IN

Solar Panels
PV_IN-0
PV_IN-1
PV_IN-2
PV_IN-3
PV_IN-4
PV_IN-5
PV_IN-6
PV_IN-7

Switching
Switching

VIN-A
VIN-B

Battery A
Battery B

VBATT-A
VBATT-B

3.3V SMPS A
3.3V SMPS B

3.3V-A
3.3V-B

Note: Each battery can output 4A continuously

Note: Each SMPS can output 3A continuously

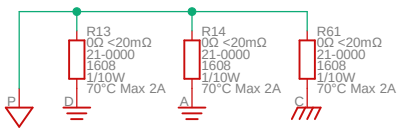
Power ORing

3.3V (Always on): 30mA

EPS

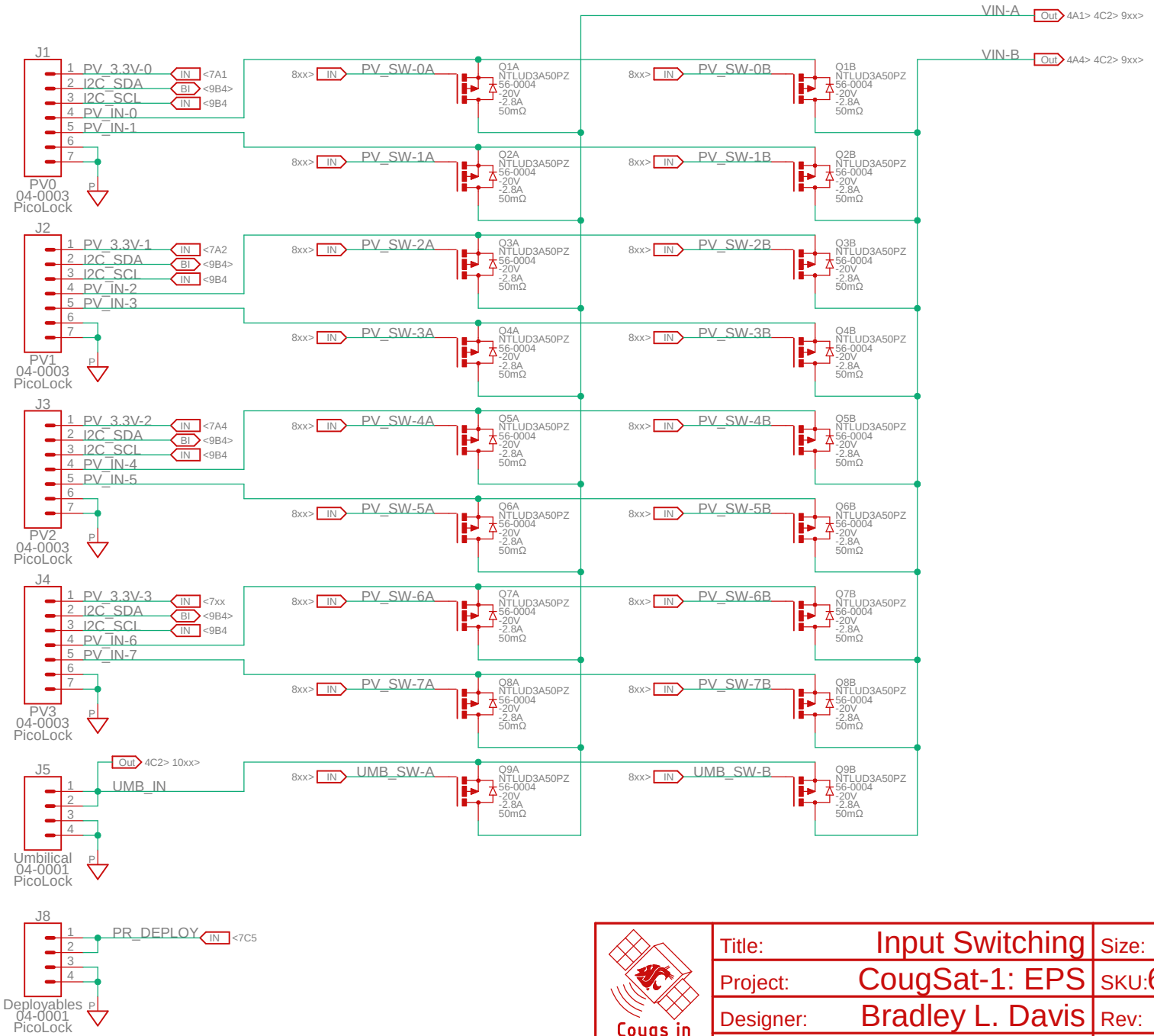
Note: Each cell is 1W
MPPT ICs output (PV_IN):
CV 4.1V
CC 300mA

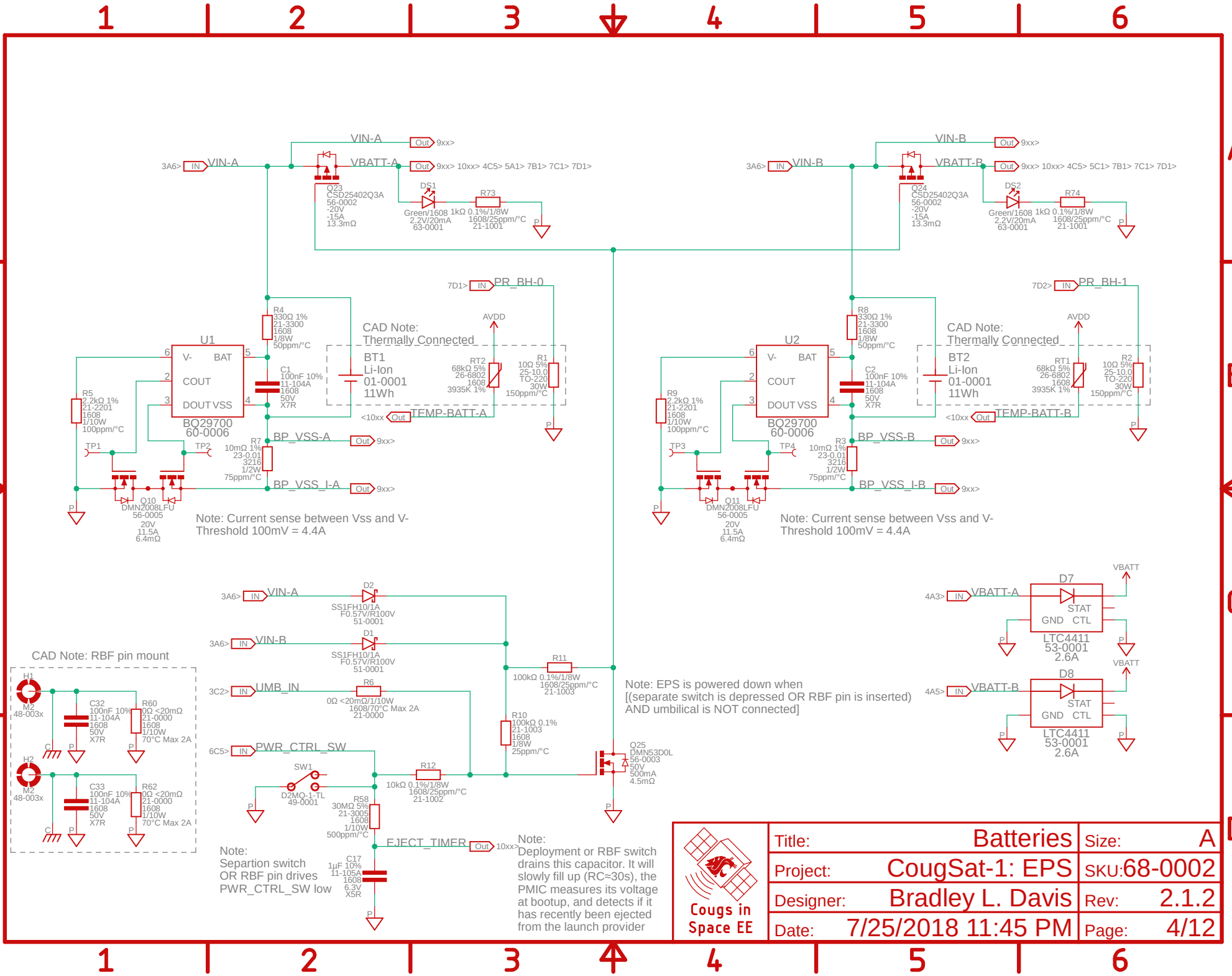
Note: Umbilical charger output (UMB_IN):
CV 4.1V
CC 1A

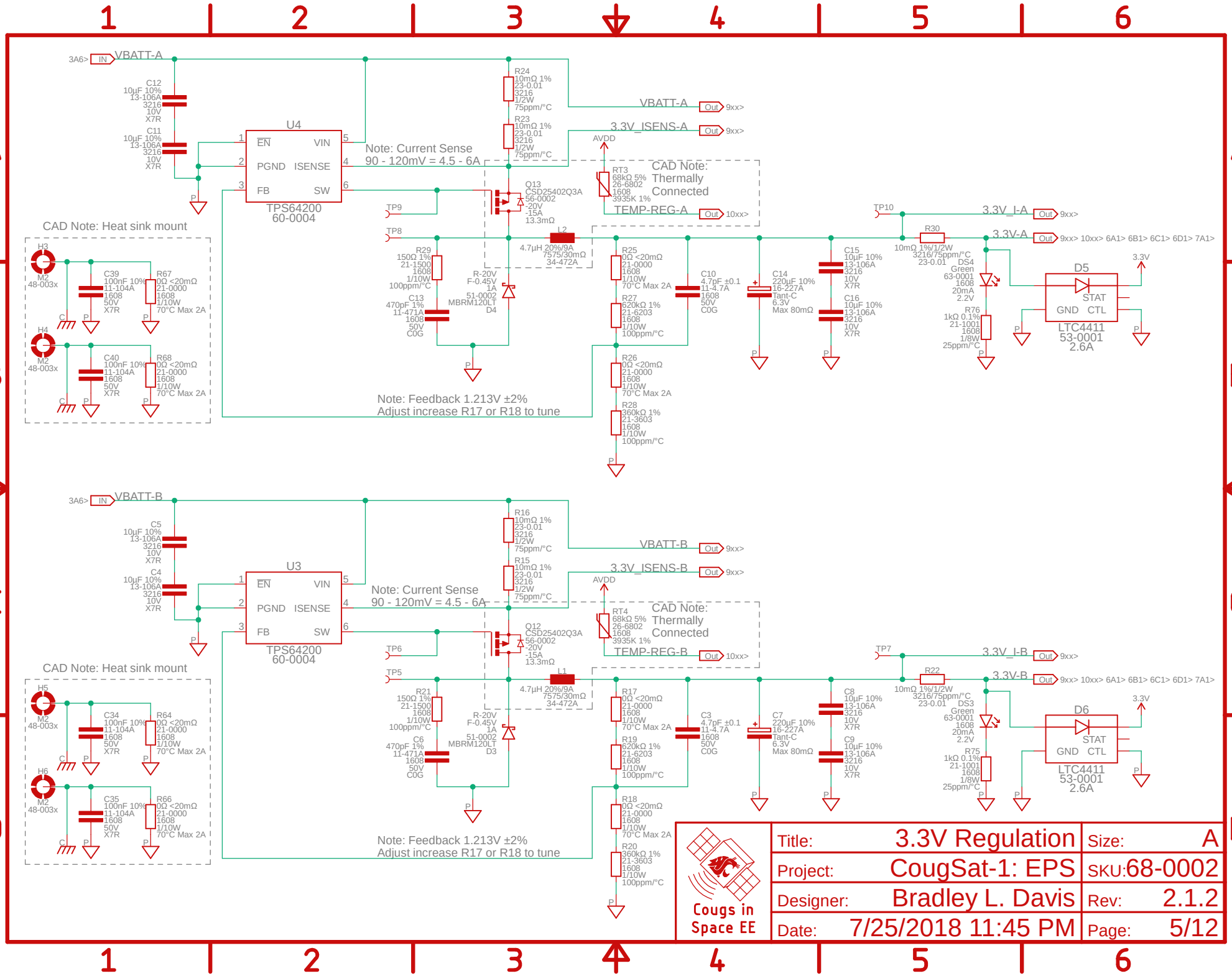


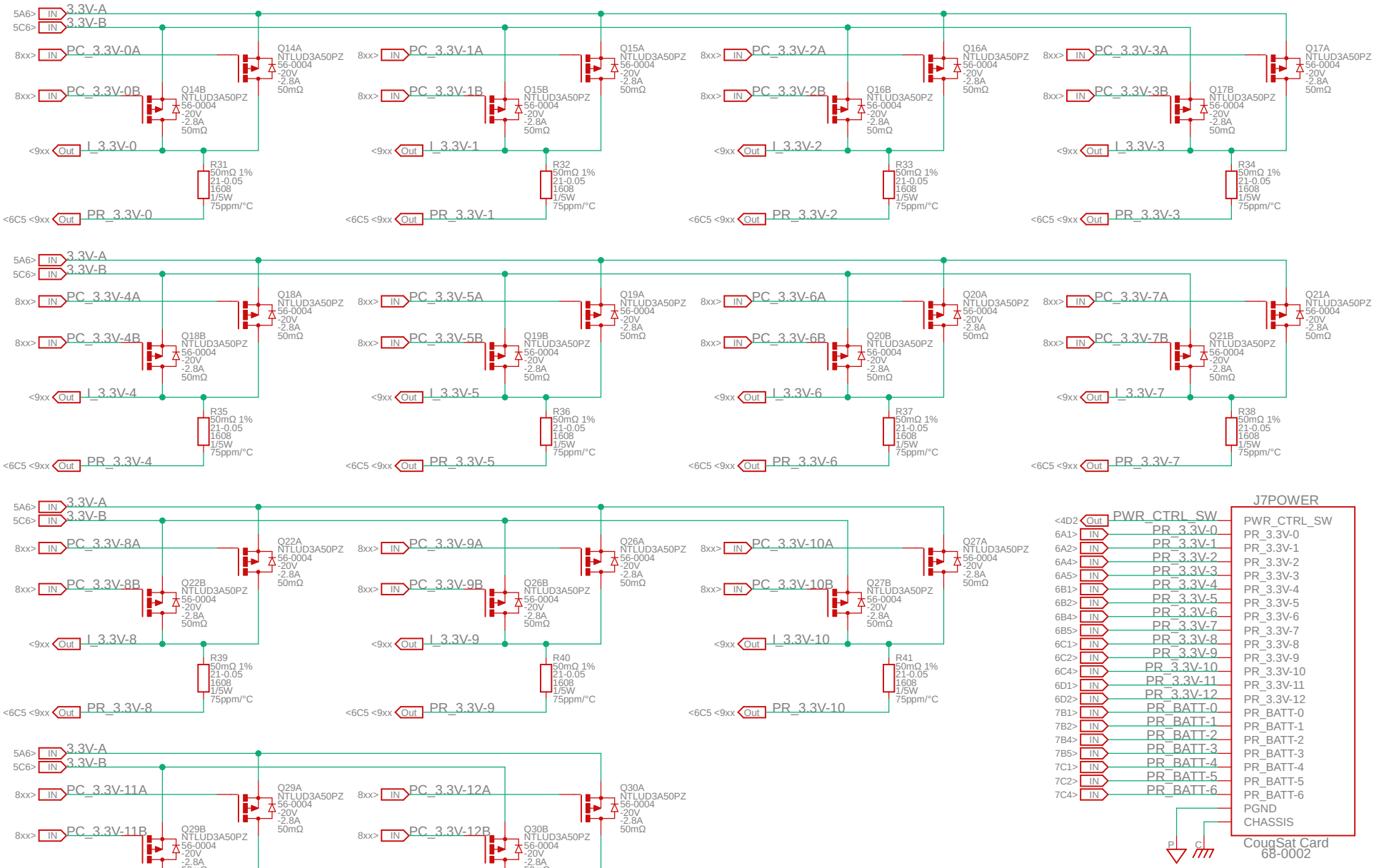
Cougs in Space EE

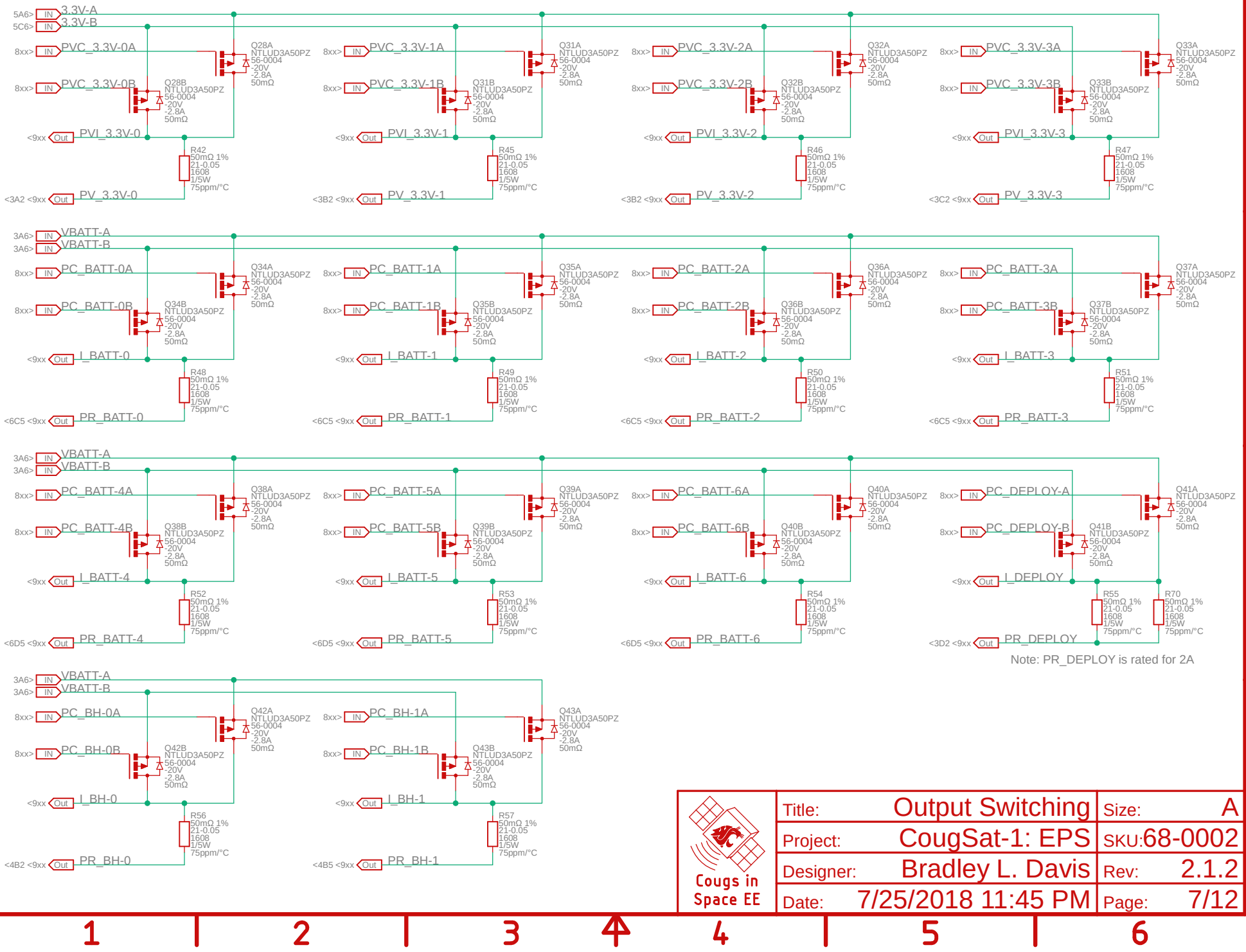
Title:	Power Rails	Size:	A
Project:	CougSat-1: EPS	SKU:	68-0002
Designer:	Bradley L. Davis	Rev:	2.1.2
Date:	7/25/2018 11:45 PM	Page:	2/12

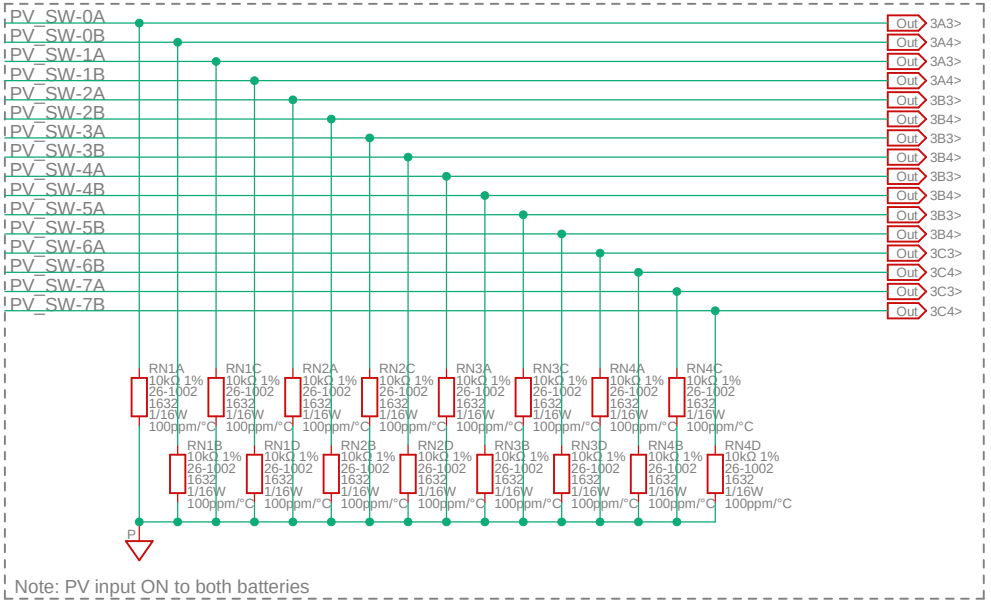

VIN-A
Out
4A1> 4C2> 9xx>
VIN-B
Out
4A4> 4C2> 9xx>
J1
1 PV_3.3V-0
2 I2C_SDA
3 I2C_SCL
4 PV_IN-0
5 PV_IN-1
6
7
IN <7A1
BI <9B4>
IN <9B4
PV0
04-0003
PicoLock
J2
1 PV_3.3V-1
2 I2C_SDA
3 I2C_SCL
4 PV_IN-2
5 PV_IN-3
6
7
IN <7A2
BI <9B4>
IN <9B4
PV1
04-0003
PicoLock
J3
1 PV_3.3V-2
2 I2C_SDA
3 I2C_SCL
4 PV_IN-4
5 PV_IN-5
6
7
IN <7A4
BI <9B4>
IN <9B4
PV2
04-0003
PicoLock
J4
1 PV_3.3V-3
2 I2C_SDA
3 I2C_SCL
4 PV_IN-6
5 PV_IN-7
6
7
IN <7xx
BI <9B4>
IN <9B4
PV3
04-0003
PicoLock
J5
Out 4C2> 10xx>
1 UMB_IN
2
3
4
Umbilical
04-0001
PicoLock
J8
1 PR_DEPLOY
2
3
4
IN <7C5
Deployables
04-0001
PicoLock
8xx> IN PV_SW-0A
8xx> IN PV_SW-0B
8xx> IN PV_SW-1A
8xx> IN PV_SW-1B
8xx> IN PV_SW-2A
8xx> IN PV_SW-2B
8xx> IN PV_SW-3A
8xx> IN PV_SW-3B
8xx> IN PV_SW-4A
8xx> IN PV_SW-4B
8xx> IN PV_SW-5A
8xx> IN PV_SW-5B
8xx> IN PV_SW-6A
8xx> IN PV_SW-6B
8xx> IN PV_SW-7A
8xx> IN PV_SW-7B
8xx> IN UMB_SW-A
8xx> IN UMB_SW-B
Q1A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q1B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q2A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q2B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q3A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q3B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q4A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q4B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q5A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q5B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q6A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q6B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q7A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q7B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q8A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q8B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q9A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q9B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Cougs in Space EE
Title: Input Switching
Size: A
Project: CougSat-1: EPS
SKU:68-0002
Designer: Bradley L. Davis
Rev: 2.1.2
Date: 7/25/2018 11:45 PM
Page: 3/12


VIN-A
VBATT-A
Q23 CSD25402Q3A 56-0002 -20V -15A 13.3mΩ
DS1 Green/1608 2.2V/20mA 63-0001
R73 1kΩ 0.1%/1/8W 1608/25ppm/°C 21-1001
PR_BH-0
R4 330Ω 1% 21-3300 1608 1/8W 50ppm/°C
U1 BQ29700 60-0006
V- BAT COUT DOUT VSS
C1 100nF 10% 11-104A 1608 50V X7R
R5 2.2kΩ 1% 21-2201 1608 1/10W 100ppm/°C
BT1 Li-Ion 01-0001 11Wh
CAD Note: Thermally Connected
RT2 68kΩ 5% 26-6802 1608 3935K 1%
R1 10Ω 5% 25-10.0 TO-220 30W 150ppm/°C
AVDD
TEMP-BATT-A
TP1
TP2
R7 10mΩ 1% 23-0.01 3216 1/2W 75ppm/°C
BP_VSS-A
BP_VSS_I-A
Q10 DMN2008LFU 56-0005 20V 11.5A 6.4mΩ
Note: Current sense between Vss and V- Threshold 100mV = 4.4A
VIN-B
VBATT-B
Q24 CSD25402Q3A 56-0002 -20V -15A 13.3mΩ
DS2 Green/1608 2.2V/20mA 63-0001
R74 1kΩ 0.1%/1/8W 1608/25ppm/°C 21-1001
PR_BH-1
R8 330Ω 1% 21-3300 1608 1/8W 50ppm/°C
U2 BQ29700 60-0006
V- BAT COUT DOUT VSS
C2 100nF 10% 11-104A 1608 50V X7R
R9 2.2kΩ 1% 21-2201 1608 1/10W 100ppm/°C
BT2 Li-Ion 01-0001 11Wh
CAD Note: Thermally Connected
RT1 68kΩ 5% 26-6802 1608 3935K 1%
R2 10Ω 5% 25-10.0 TO-220 30W 150ppm/°C
TEMP-BATT-B
TP3
TP4
R3 10mΩ 1% 23-0.01 3216 1/2W 75ppm/°C
BP_VSS-B
BP_VSS_I-B
Q11 DMN2008LFU 56-0005 20V 11.5A 6.4mΩ
Note: Current sense between Vss and V- Threshold 100mV = 4.4A
CAD Note: RBF pin mount
H1 M2 48-003x
H2 M2 48-003x
C32 100nF 10% 11-104A 1608 50V X7R
C33 100nF 10% 11-104A 1608 50V X7R
R60 0Ω <20mΩ 21-0000 1608 1/10W 70°C Max 2A
R62 0Ω <20mΩ 21-0000 1608 1/10W 70°C Max 2A
VIN-A
VIN-B
UMB_IN
PWR_CTRL_SW
D2 SS1FH10/1A F0.57V/R100V 51-0001
D1 SS1FH10/1A F0.57V/R100V 51-0001
R6 0Ω <20mΩ/1/10W 1608/70°C Max 2A 21-0000
R11 100kΩ 0.1%/1/8W 1608/25ppm/°C 21-1003
R10 100kΩ 0.1% 21-1003 1608 1/8W 25ppm/°C
R12 10kΩ 0.1%/1/8W 1608/25ppm/°C 21-1002
SW1 D2MQ-1-TL 49-0001
R58 30MΩ 5% 21-3005 1608 1/10W 500ppm/°C
C17 1µF 10% 11-105A 1608 6.3V X5R
EJECT_TIMER
Q25 DMN53D0L 56-0003 50V 500mA 4.5mΩ
Note: Separtion switch OR RBF pin drives PWR_CTRL_SW low
Note: Deployment or RBF switch drains this capacitor. It will slowly fill up (RC≈30s), the PMIC measures its voltage at bootup, and detects if it has recently been ejected from the launch provider
Note: EPS is powered down when [(separate switch is depressed OR RBF pin is inserted) AND umbilical is NOT connected]
VBATT-A
VBATT-B
D7 LTC4411 53-0001 2.6A
D8 LTC4411 53-0001 2.6A
STAT GND CTL
VBATT
Cougs in Space EE
Title: Batteries
Size: A
Project: CougSat-1: EPS
SKU:68-0002
Designer: Bradley L. Davis
Rev: 2.1.2
Date: 7/25/2018 11:45 PM
Page: 4/12

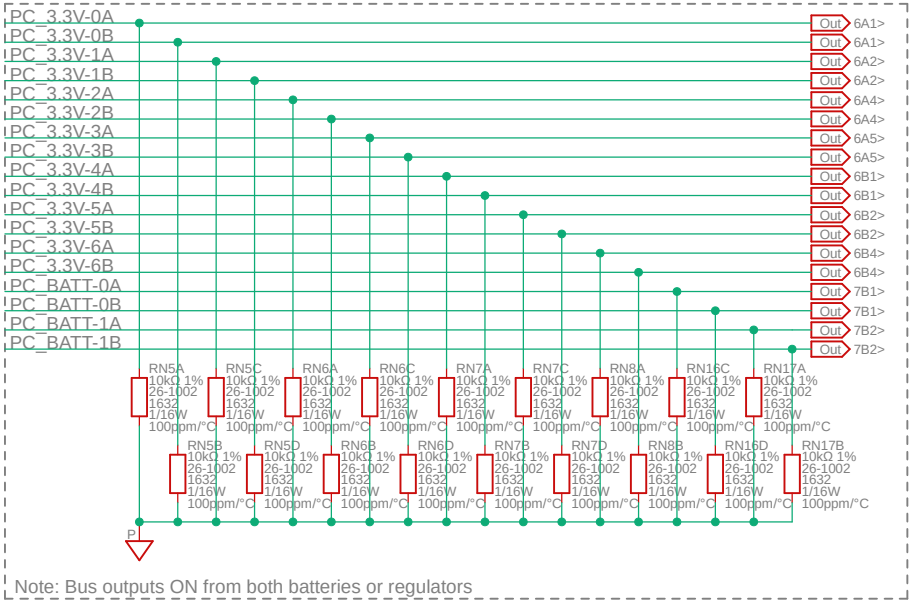

VBATT-A
U4
TPS64200
60-0004
Note: Current Sense
90 - 120mV = 4.5 - 6A
Note: Feedback 1.213V ±2%
Adjust increase R17 or R18 to tune
CAD Note: Heat sink mount
CAD Note: Thermally Connected
VBATT-A
3.3V_ISENS-A
TEMP-REG-A
3.3V_I-A
3.3V-A
LTC4411
53-0001
2.6A
VBATT-B
U3
3.3V_ISENS-B
TEMP-REG-B
3.3V_I-B
3.3V-B
Cougs in Space EE
Title: 3.3V Regulation
Size: A
Project: CougSat-1: EPS
SKU:68-0002
Designer: Bradley L. Davis
Rev: 2.1.2
Date: 7/25/2018 11:45 PM
Page: 5/12


3.3V-A
3.3V-B
PC_3.3V-0A
PC_3.3V-0B
I_3.3V-0
PR_3.3V-0
Q14A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q14B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R31 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
PC_3.3V-1A
PC_3.3V-1B
I_3.3V-1
PR_3.3V-1
Q15A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q15B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R32 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
PC_3.3V-2A
PC_3.3V-2B
I_3.3V-2
PR_3.3V-2
Q16A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q16B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R33 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
PC_3.3V-3A
PC_3.3V-3B
I_3.3V-3
PR_3.3V-3
Q17A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q17B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R34 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
PC_3.3V-4A
PC_3.3V-4B
I_3.3V-4
PR_3.3V-4
Q18A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q18B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R35 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
PC_3.3V-5A
PC_3.3V-5B
I_3.3V-5
PR_3.3V-5
Q19A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q19B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R36 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
PC_3.3V-6A
PC_3.3V-6B
I_3.3V-6
PR_3.3V-6
Q20A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q20B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R37 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
PC_3.3V-7A
PC_3.3V-7B
I_3.3V-7
PR_3.3V-7
Q21A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q21B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R38 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
PC_3.3V-8A
PC_3.3V-8B
I_3.3V-8
PR_3.3V-8
Q22A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q22B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R39 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
PC_3.3V-9A
PC_3.3V-9B
I_3.3V-9
PR_3.3V-9
Q26A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q26B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R40 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
PC_3.3V-10A
PC_3.3V-10B
I_3.3V-10
PR_3.3V-10
Q27A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q27B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R41 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
PC_3.3V-11A
PC_3.3V-11B
I_3.3V-11
PR_3.3V-11
Q29A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q29B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R43 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
PC_3.3V-12A
PC_3.3V-12B
I_3.3V-12
PR_3.3V-12
Q30A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q30B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R44 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
J7POWER
PWR_CTRL_SW
PR_3.3V-0
PR_3.3V-1
PR_3.3V-2
PR_3.3V-3
PR_3.3V-4
PR_3.3V-5
PR_3.3V-6
PR_3.3V-7
PR_3.3V-8
PR_3.3V-9
PR_3.3V-10
PR_3.3V-11
PR_3.3V-12
PR_BATT-0
PR_BATT-1
PR_BATT-2
PR_BATT-3
PR_BATT-4
PR_BATT-5
PR_BATT-6
PGND
CHASSIS
CougSat Card 68-0002
Cougs in Space EE
Title: Output Switching
Size: A
Project: CougSat-1: EPS
SKU:68-0002
Designer: Bradley L. Davis
Rev: 2.1.2
Date: 7/25/2018 11:45 PM
Page: 6/12

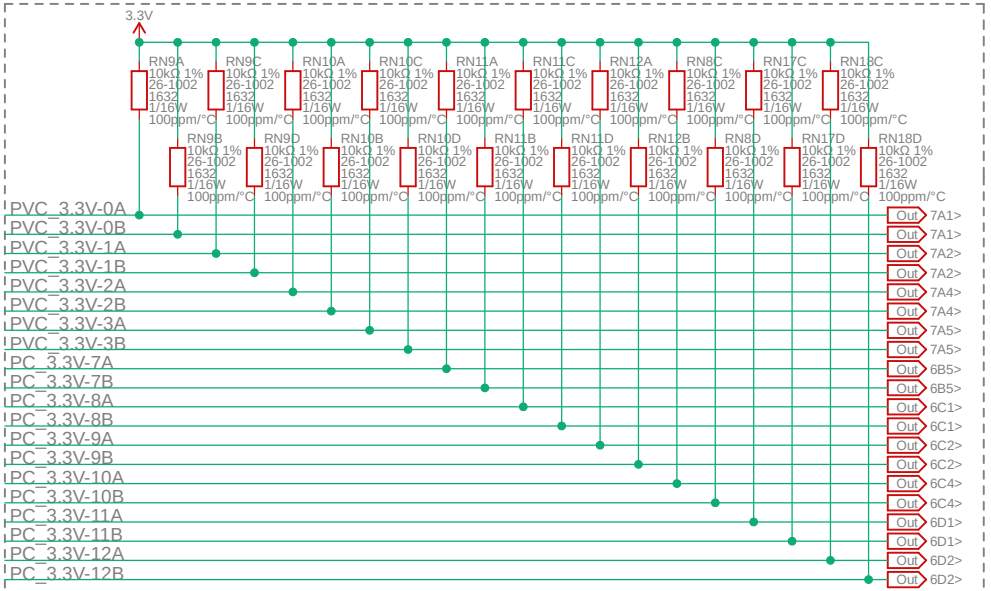

5A6> IN 3.3V-A
5C6> IN 3.3V-B
8xx> IN PVC_3.3V-0A
8xx> IN PVC_3.3V-0B
<9xx Out PVI_3.3V-0
<3A2 <9xx Out PV_3.3V-0
Q28A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q28B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R42 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
8xx> IN PVC_3.3V-1A
8xx> IN PVC_3.3V-1B
<9xx Out PVI_3.3V-1
<3B2 <9xx Out PV_3.3V-1
Q31A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q31B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R45 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
8xx> IN PVC_3.3V-2A
8xx> IN PVC_3.3V-2B
<9xx Out PVI_3.3V-2
<3B2 <9xx Out PV_3.3V-2
Q32A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q32B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R46 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
8xx> IN PVC_3.3V-3A
8xx> IN PVC_3.3V-3B
<9xx Out PVI_3.3V-3
<3C2 <9xx Out PV_3.3V-3
Q33A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q33B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R47 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
3A6> IN VBATT-A
3A6> IN VBATT-B
8xx> IN PC_BATT-0A
8xx> IN PC_BATT-0B
<9xx Out I_BATT-0
<6C5 <9xx Out PR_BATT-0
Q34A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q34B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R48 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
8xx> IN PC_BATT-1A
8xx> IN PC_BATT-1B
<9xx Out I_BATT-1
<6C5 <9xx Out PR_BATT-1
Q35A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q35B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R49 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
8xx> IN PC_BATT-2A
8xx> IN PC_BATT-2B
<9xx Out I_BATT-2
<6C5 <9xx Out PR_BATT-2
Q36A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q36B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R50 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
8xx> IN PC_BATT-3A
8xx> IN PC_BATT-3B
<9xx Out I_BATT-3
<6C5 <9xx Out PR_BATT-3
Q37A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q37B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R51 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
3A6> IN VBATT-A
3A6> IN VBATT-B
8xx> IN PC_BATT-4A
8xx> IN PC_BATT-4B
<9xx Out I_BATT-4
<6D5 <9xx Out PR_BATT-4
Q38A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q38B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R52 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
8xx> IN PC_BATT-5A
8xx> IN PC_BATT-5B
<9xx Out I_BATT-5
<6D5 <9xx Out PR_BATT-5
Q39A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q39B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R53 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
8xx> IN PC_BATT-6A
8xx> IN PC_BATT-6B
<9xx Out I_BATT-6
<6D5 <9xx Out PR_BATT-6
Q40A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q40B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R54 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
8xx> IN PC_DEPLOY-A
8xx> IN PC_DEPLOY-B
<9xx Out I_DEPLOY
<3D2 <9xx Out PR_DEPLOY
Q41A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q41B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R55 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
R70 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
Note: PR_DEPLOY is rated for 2A
3A6> IN VBATT-A
3A6> IN VBATT-B
8xx> IN PC_BH-0A
8xx> IN PC_BH-0B
<9xx Out I_BH-0
<4B2 <9xx Out PR_BH-0
Q42A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q42B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R56 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
8xx> IN PC_BH-1A
8xx> IN PC_BH-1B
<9xx Out I_BH-1
<4B5 <9xx Out PR_BH-1
Q43A NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
Q43B NTLUD3A50PZ 56-0004 -20V -2.8A 50mΩ
R57 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
Cougs in Space EE
Title: Output Switching
Size: A
Project: CougSat-1: EPS
SKU:68-0002
Designer: Bradley L. Davis
Rev: 2.1.2
Date: 7/25/2018 11:45 PM
Page: 7/12



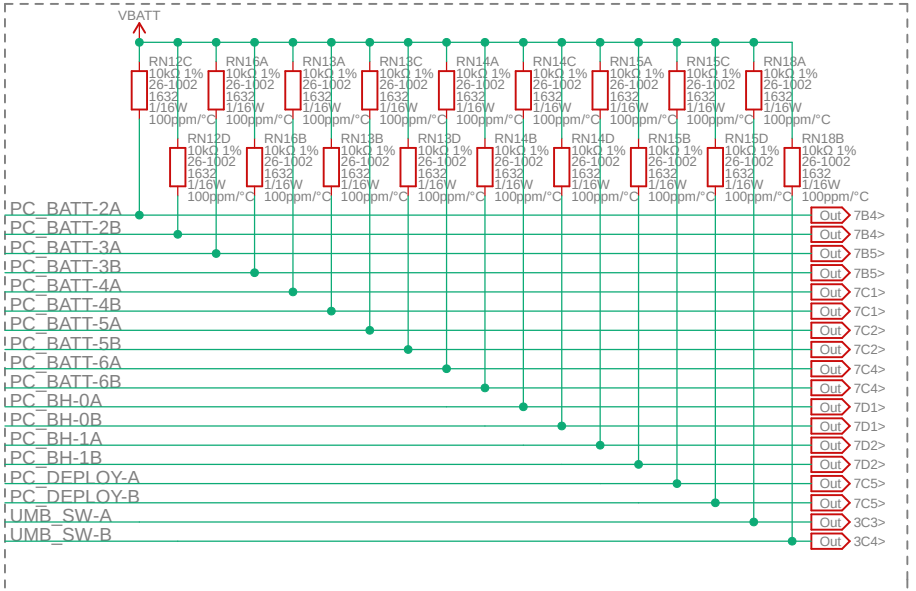
Note: PV input ON to both batteries



Note: Bus outputs ON from both batteries or regulators



Note: PV monitoring, & payload 3.3V OFF



Note: Payload Vbatt, battery heaters, deployables, & umbilical input OFF

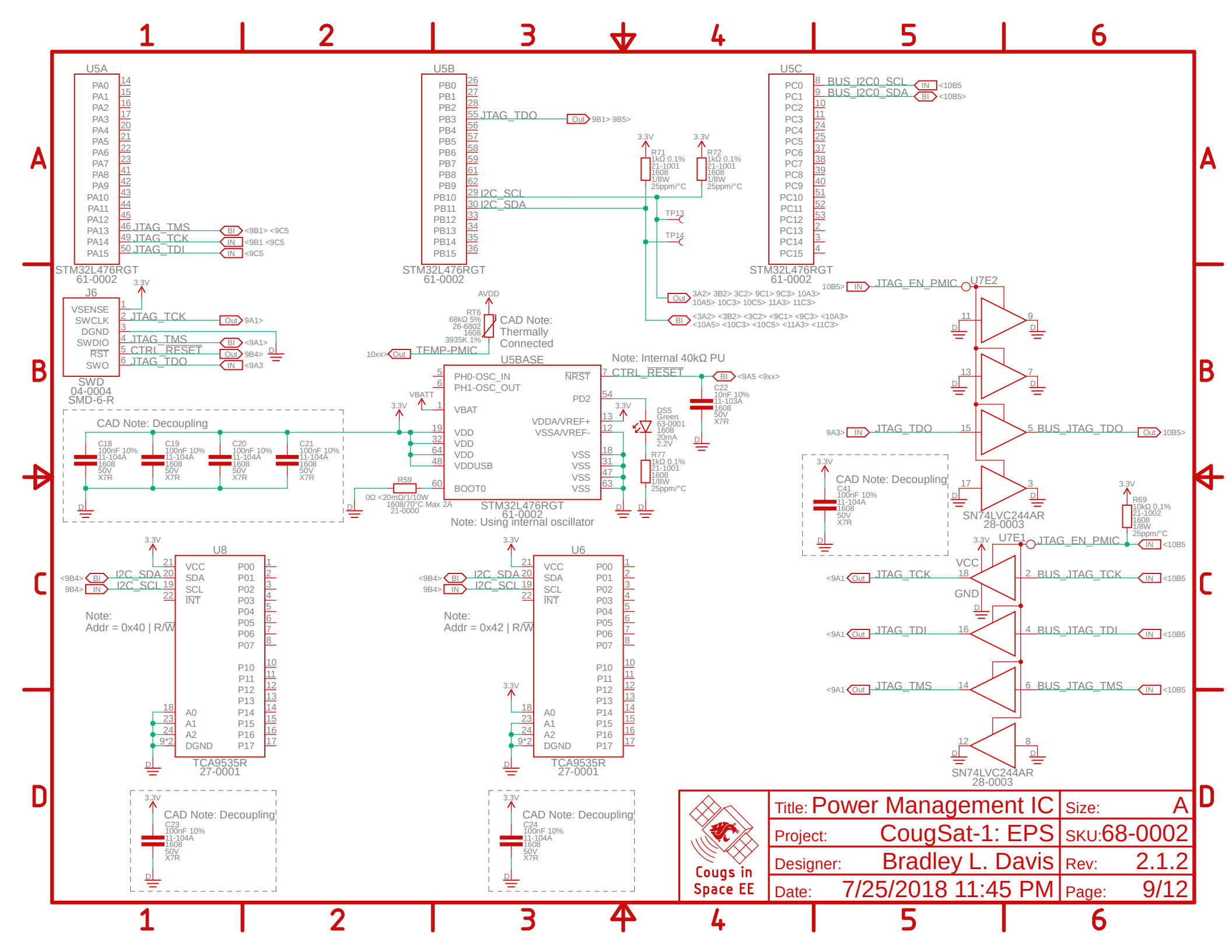
Note:
These are the default states of the power rails
When the PMIC does not drive the switches, these rails are on/off
This occurs when the PMIC is reset or being programmed

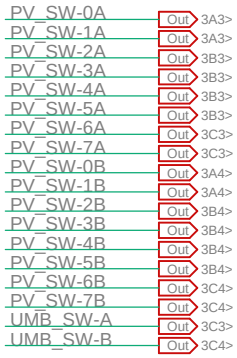
Cougs in Space EE

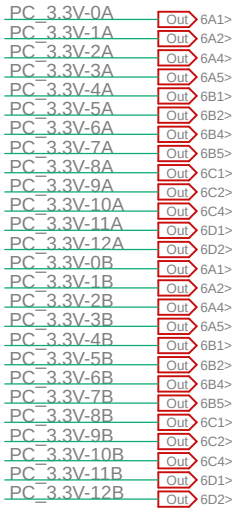
Title:	Switching Defaults	Size:	A
Project:	CougSat-1: EPS	SKU:	68-0002
Designer:	Bradley L. Davis	Rev:	2.1.2
Date:	7/25/2018 11:45 PM	Page:	8/12

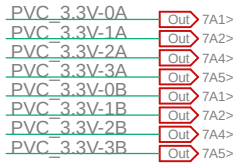
Note: Fix all off sheet designators linked to this sheet

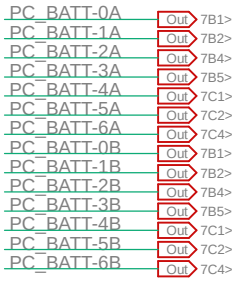
Note: Resistors can be rearranged or replaced with single resistors, whichever is best for routing

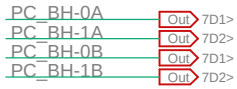

U5A
PA0 PA1 PA2 PA3 PA4 PA5 PA6 PA7 PA8 PA9 PA10 PA11 PA12 PA13 PA14 PA15
JTAG_TMS JTAG_TCK JTAG_TDI
STM32L476RGT
61-0002
U5B
PB0 PB1 PB2 PB3 PB4 PB5 PB6 PB7 PB8 PB9 PB10 PB11 PB12 PB13 PB14 PB15
JTAG_TDO
I2C_SCL
I2C_SDA
STM32L476RGT
61-0002
U5C
PC0 PC1 PC2 PC3 PC4 PC5 PC6 PC7 PC8 PC9 PC10 PC11 PC12 PC13 PC14 PC15
BUS_I2C0_SCL
BUS_I2C0_SDA
STM32L476RGT
61-0002
J6
VSENSE SWCLK DGND SWDIO RST SWO
JTAG_TCK
JTAG_TMS
CTRL_RESET
JTAG_TDO
SWD
04-0004
SMD-6-R
3.3V
AVDD
RT6
68kΩ 5%
26-6802
1608
3935K 1%
CAD Note:
Thermally
Connected
TEMP-PMIC
U5BASE
PH0-OSC_IN
PH1-OSC_OUT
VBAT
VDD
VDD
VDD
VDDUSB
BOOT0
NRST
PD2
VDDA/VREF+
VSSA/VREF-
VSS
VSS
VSS
VSS
CTRL_RESET
Note: Internal 40kΩ PU
VBATT
R59
0Ω <20mΩ/1/10W
1608/70°C Max 2A
21-0000
DS5
Green
63-0001
1608
20mA
2.2V
C22
10nF 10%
11-103A
1608
50V
X7R
R71
1kΩ 0.1%
21-1001
1608
1/8W
25ppm/°C
R72
1kΩ 0.1%
21-1001
1608
1/8W
25ppm/°C
R77
1kΩ 0.1%
21-1001
1608
1/8W
25ppm/°C
TP13
TP14
STM32L476RGT
61-0002
Note: Using internal oscillator
CAD Note: Decoupling
C18
100nF 10%
11-104A
1608
50V
X7R
C19
100nF 10%
11-104A
1608
50V
X7R
C20
100nF 10%
11-104A
1608
50V
X7R
C21
100nF 10%
11-104A
1608
50V
X7R
U8
VCC SDA SCL INT
P00 P01 P02 P03 P04 P05 P06 P07 P10 P11 P12 P13 P14 P15 P16 P17
A0 A1 A2 DGND
I2C_SDA
I2C_SCL
Note:
Addr = 0x40 | R/W
TCA9535R
27-0001
U6
VCC SDA SCL INT
P00 P01 P02 P03 P04 P05 P06 P07 P10 P11 P12 P13 P14 P15 P16 P17
A0 A1 A2 DGND
I2C_SDA
I2C_SCL
Note:
Addr = 0x42 | R/W
TCA9535R
27-0001
CAD Note: Decoupling
C23
100nF 10%
11-104A
1608
50V
X7R
CAD Note: Decoupling
C24
100nF 10%
11-104A
1608
50V
X7R
U7E2
JTAG_EN_PMIC
JTAG_TDO
BUS_JTAG_TDO
SN74LVC244AR
28-0003
CAD Note: Decoupling
C41
100nF 10%
11-104A
1608
50V
X7R
R69
10kΩ 0.1%
21-1002
1608
1/8W
25ppm/°C
U7E1
JTAG_EN_PMIC
VCC
GND
JTAG_TCK
BUS_JTAG_TCK
JTAG_TDI
BUS_JTAG_TDI
JTAG_TMS
BUS_JTAG_TMS
SN74LVC244AR
28-0003
Cougs in
Space EE
Title: Power Management IC
Size: A
Project: CougSat-1: EPS
SKU:68-0002
Designer: Bradley L. Davis
Rev: 2.1.2
Date: 7/25/2018 11:45 PM
Page: 9/12

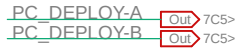








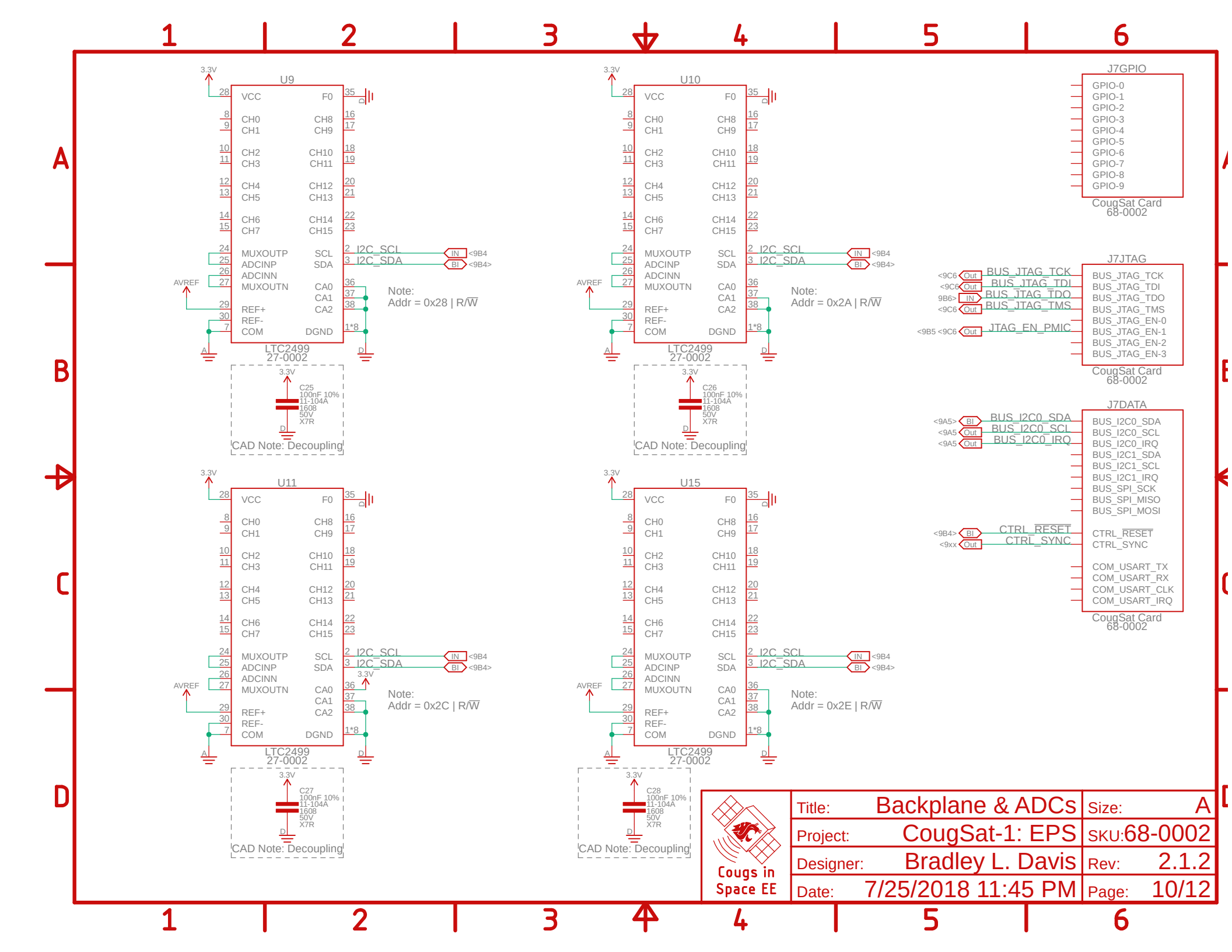


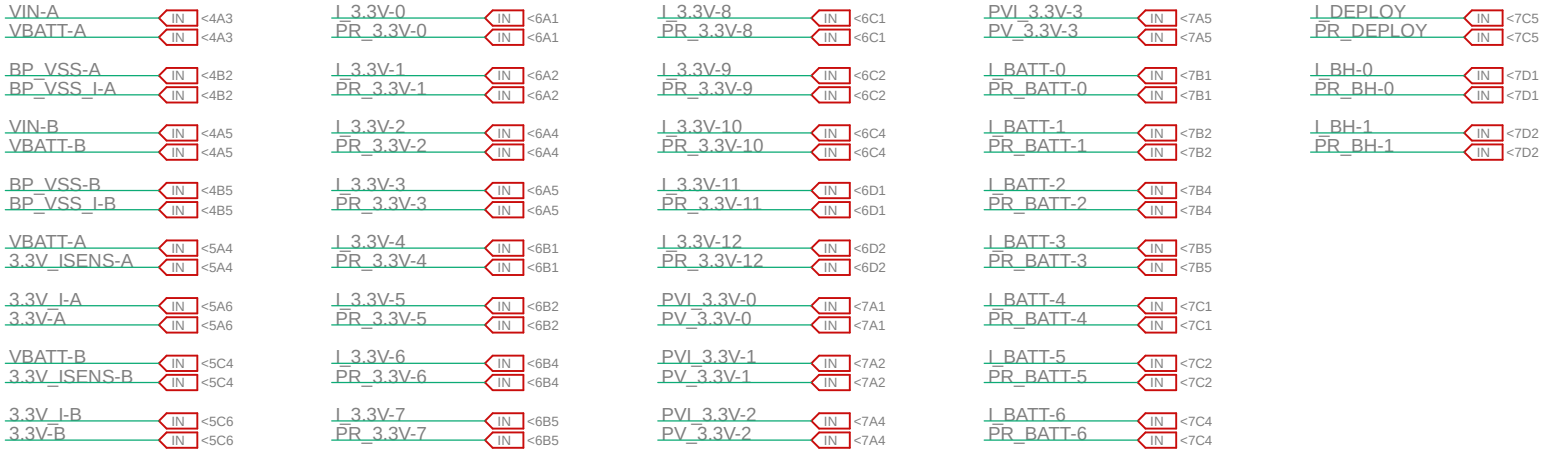


Note: Fix all off sheet designators linked to this sheet

Note: All signals above are GPIO, connect to any GPIO bank, whichever is best for routing

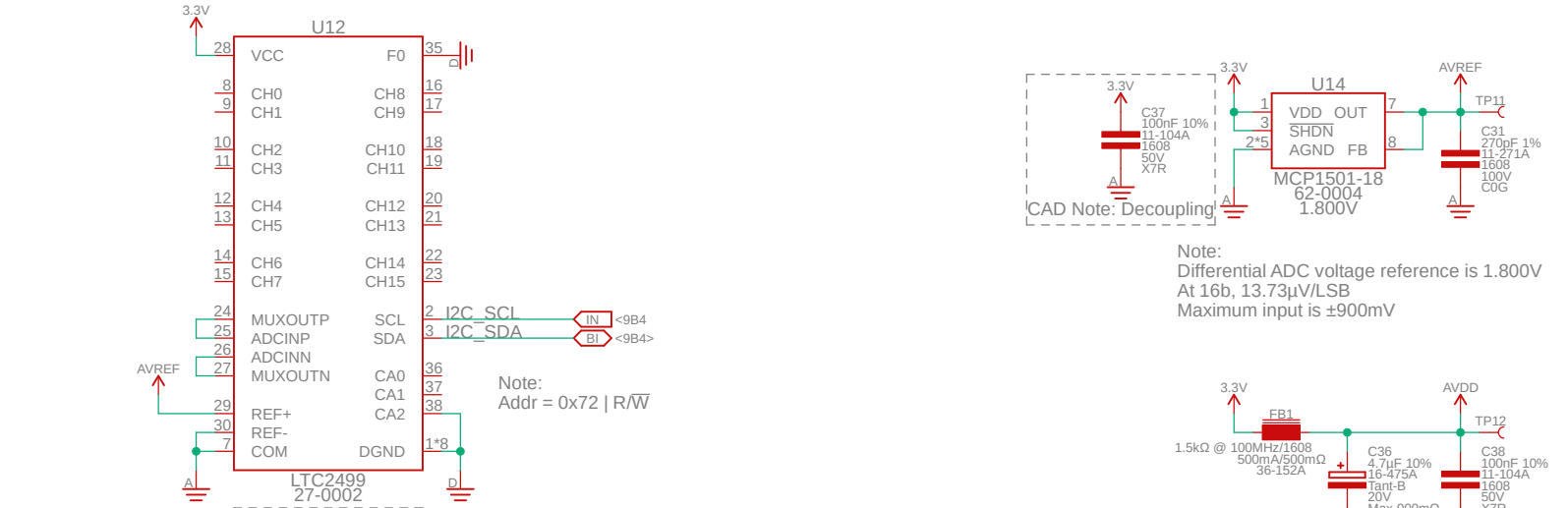
Note: Interrupt pins, place on different pin numbers (same port okay), ease for routing

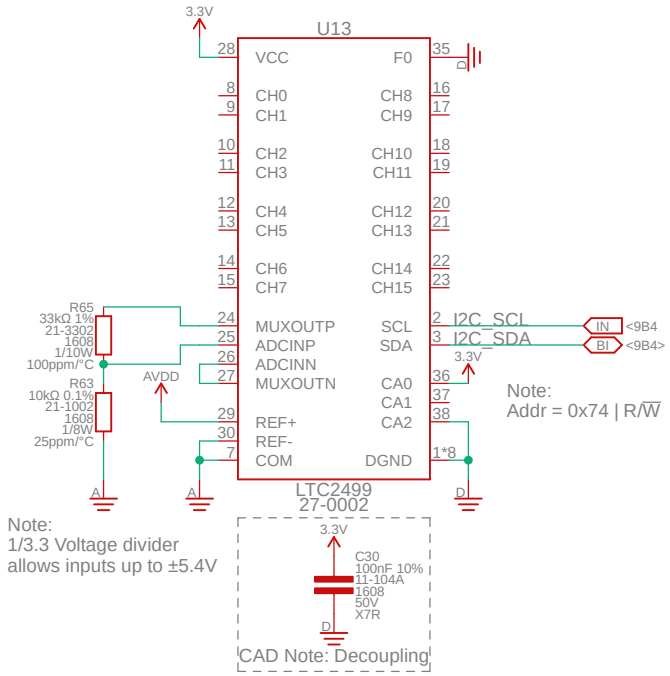

U9
U10
U11
U15
LTC2499
27-0002
VCC
F0
CH0
CH1
CH2
CH3
CH4
CH5
CH6
CH7
CH8
CH9
CH10
CH11
CH12
CH13
CH14
CH15
MUXOUTP
ADCINP
ADCINN
MUXOUTN
REF+
REF-
COM
SCL
SDA
CA0
CA1
CA2
DGND
3.3V
AVREF
I2C_SCL
I2C_SDA
Note:
Addr = 0x28 | R/W
Addr = 0x2A | R/W
Addr = 0x2C | R/W
Addr = 0x2E | R/W
C25
C26
C27
C28
100nF 10%
11-104A
1608
50V
X7R
CAD Note: Decoupling
J7GPIO
GPIO-0
GPIO-1
GPIO-2
GPIO-3
GPIO-4
GPIO-5
GPIO-6
GPIO-7
GPIO-8
GPIO-9
CougSat Card
68-0002
J7JTAG
BUS_JTAG_TCK
BUS_JTAG_TDI
BUS_JTAG_TDO
BUS_JTAG_TMS
JTAG_EN_PMIC
BUS_JTAG_EN-0
BUS_JTAG_EN-1
BUS_JTAG_EN-2
BUS_JTAG_EN-3
J7DATA
BUS_I2C0_SDA
BUS_I2C0_SCL
BUS_I2C0_IRQ
BUS_I2C1_SDA
BUS_I2C1_SCL
BUS_I2C1_IRQ
BUS_SPI_SCK
BUS_SPI_MISO
BUS_SPI_MOSI
CTRL_RESET
CTRL_SYNC
COM_USART_TX
COM_USART_RX
COM_USART_CLK
COM_USART_IRQ
Cougs in Space EE
Title: Backplane & ADCs
Size: A
Project: CougSat-1: EPS
SKU:68-0002
Designer: Bradley L. Davis
Rev: 2.1.2
Date: 7/25/2018 11:45 PM
Page: 10/12



Note: Fix all off sheet designators linked to this sheet

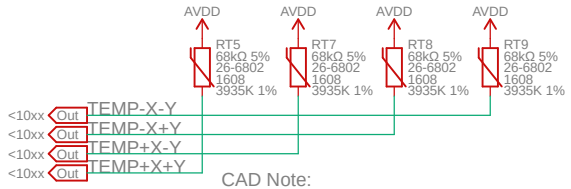
Note: All signals above are DS, connect to any DS input, whichever is best for routing, including the DS adc on page 10





Note:
Differential ADC voltage reference is 1.800V
At 16b, 13.73µV/LSB
Maximum input is ±900mV

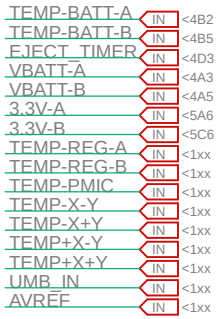
Note:
Single-Ended ADC voltage reference is 3.3V
At 16b, 25.18µV/LSB
Maximum input is ±1.65V



CAD Note:
Place in the corner of the PCB
that matches the connected
signal name, top side

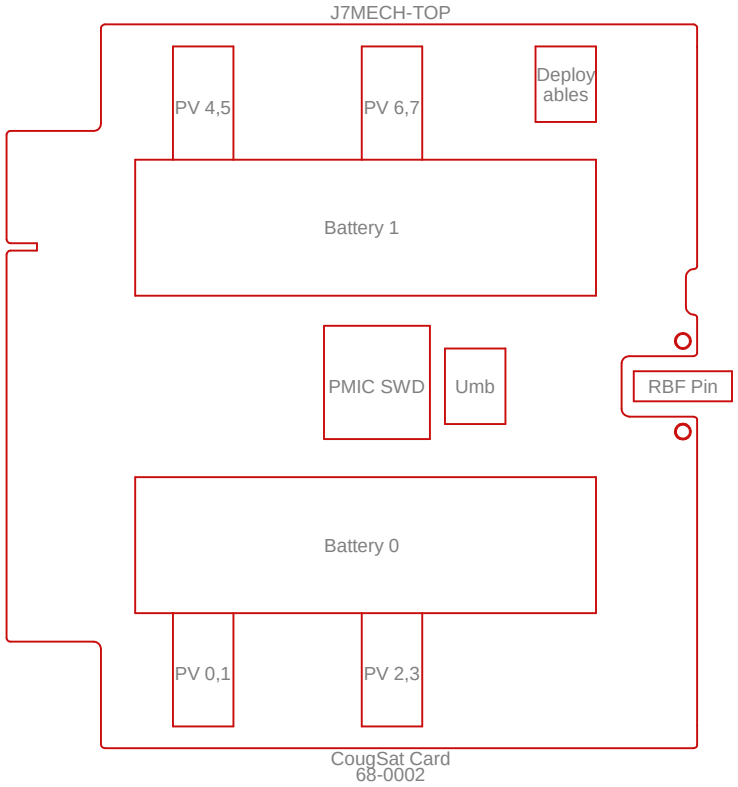
Cougs in Space EE

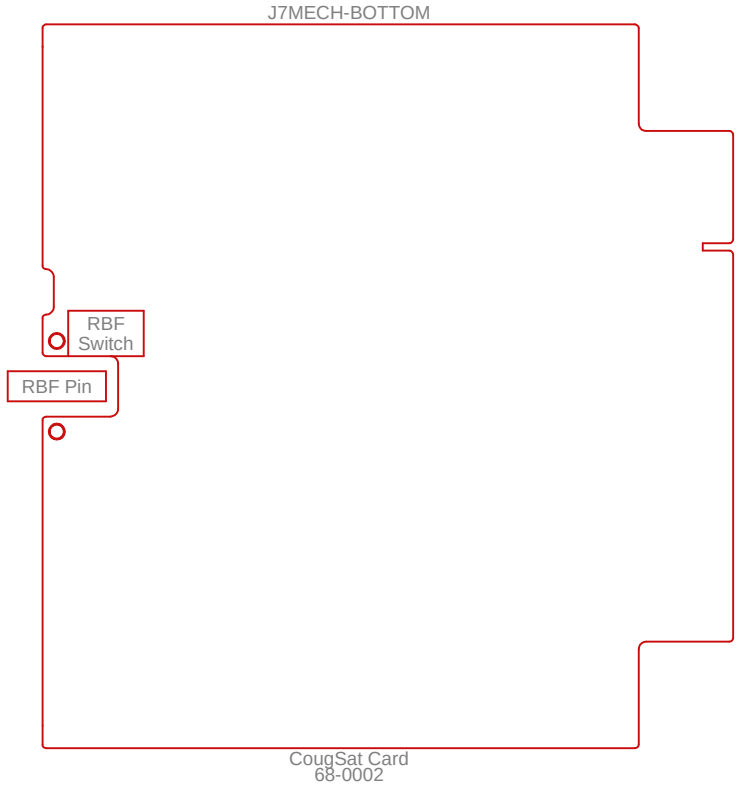
Title:	ADCs	Size:	
Project:	CougSat-1: EPS	SKU:	68-0
Designer:	Bradley L. Davis	Rev:	2
Date:	7/25/2018 11:45 PM	Page:	1



Note: Fix all off sheet designators linked to this sheet

Note: All signals above are SE, connect to any SE input, whichever is best for routing





Cougs in Space EE	Title:	Mechanical	Size: A
	Project:	CougSat-1: EPS	SKU:68-0002
	Designer:	Bradley L. Davis	Rev: 2.1.2
	Date:	7/25/2018 11:45 PM	Page: 12/12