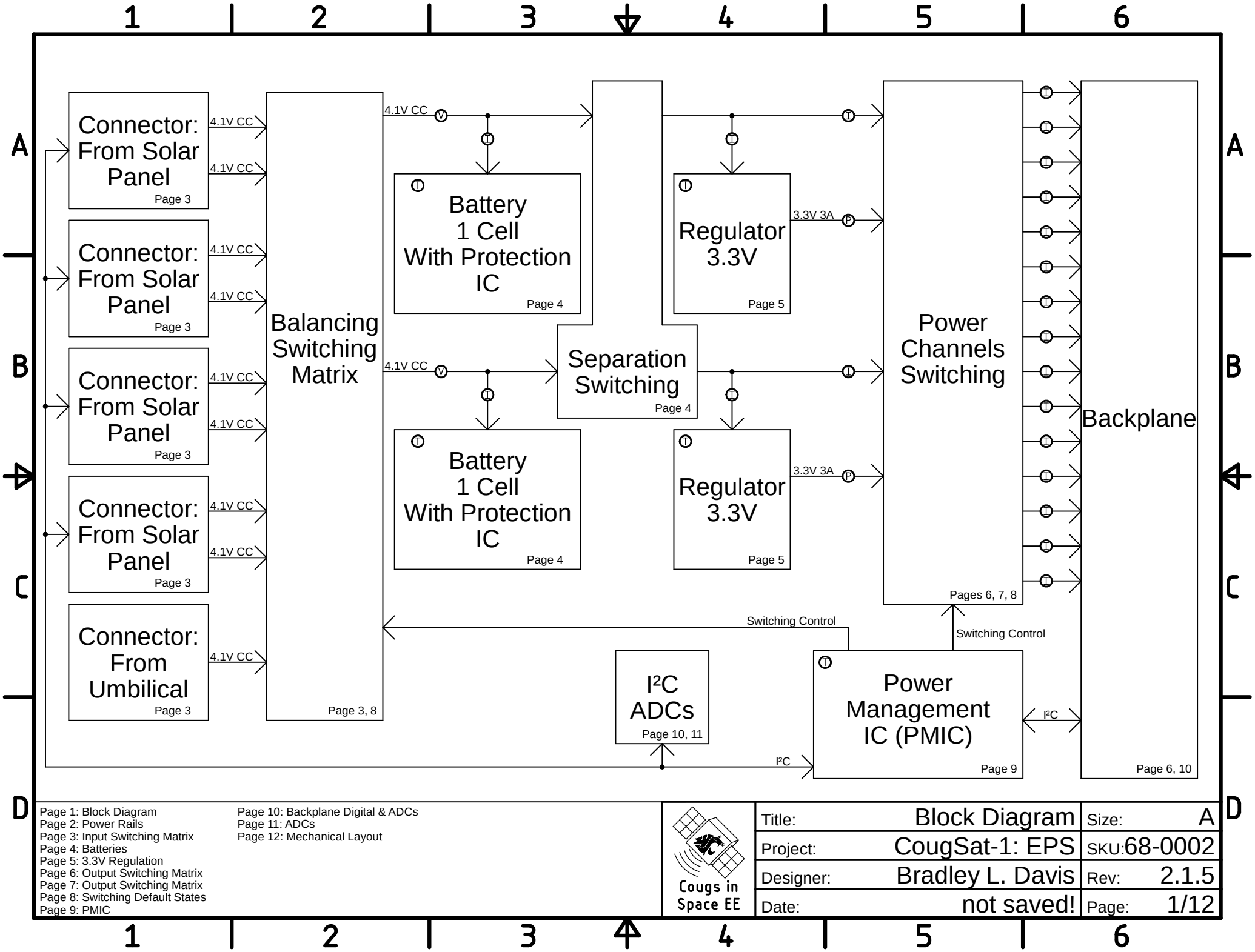
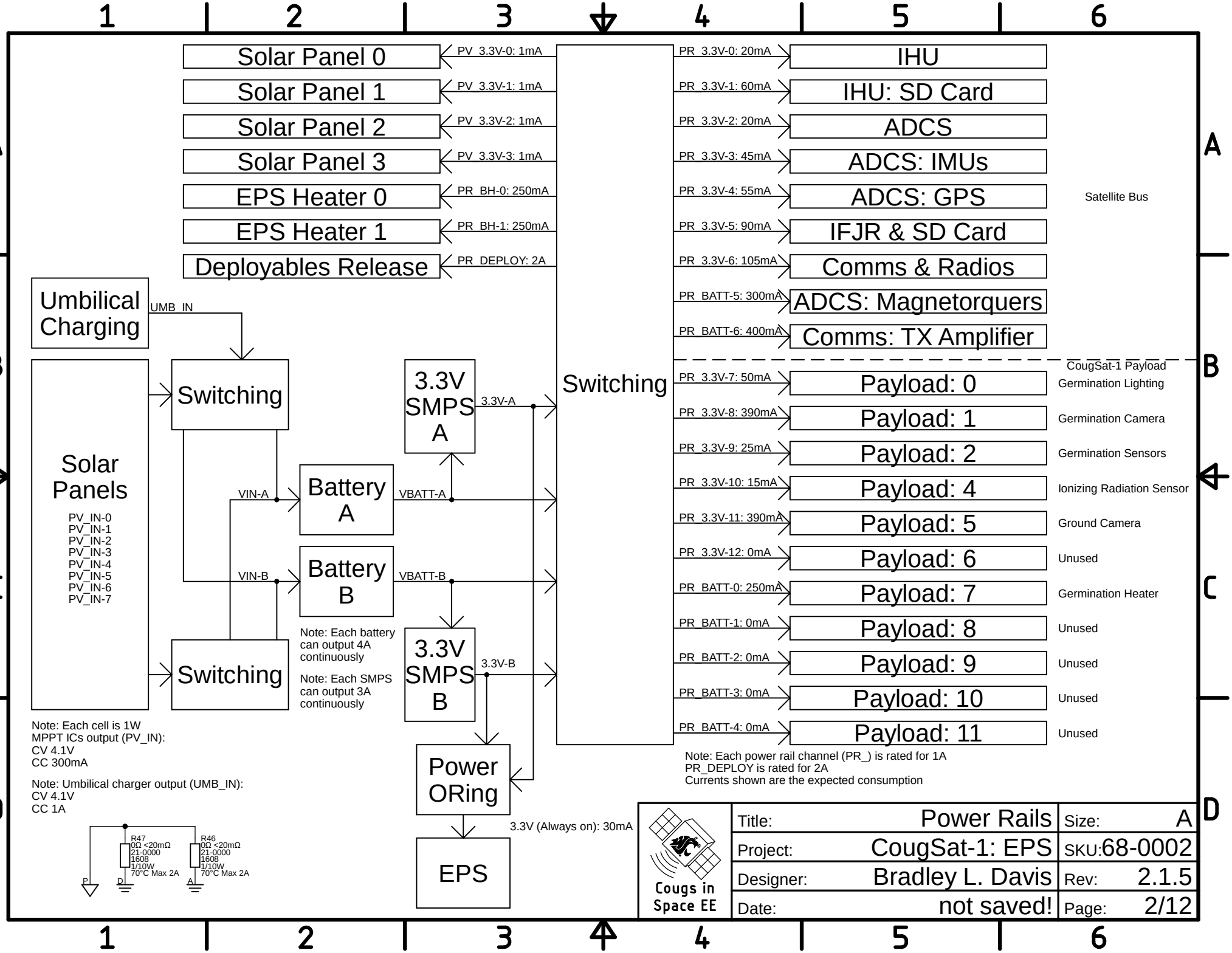
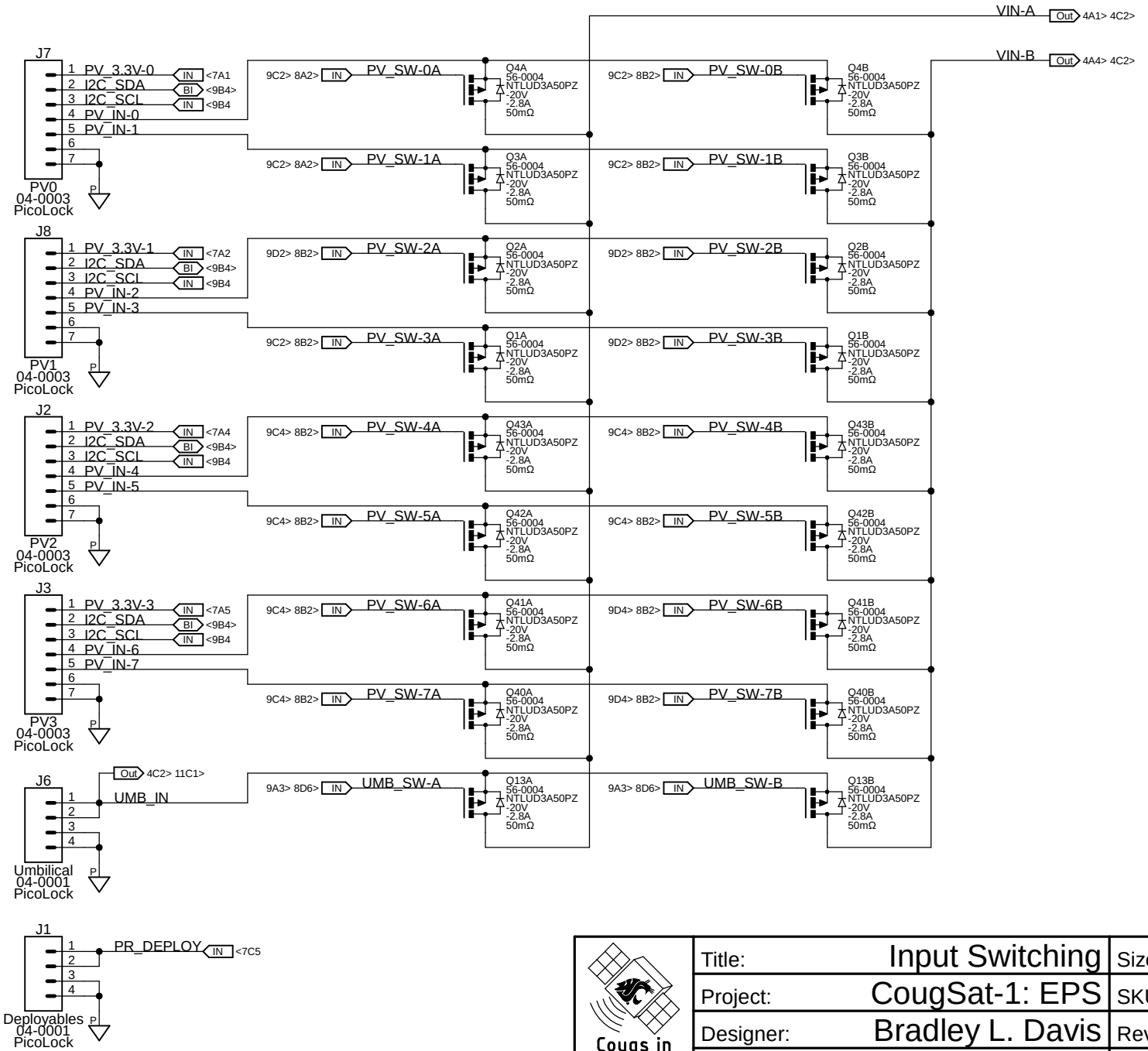


Cougs in Space EE

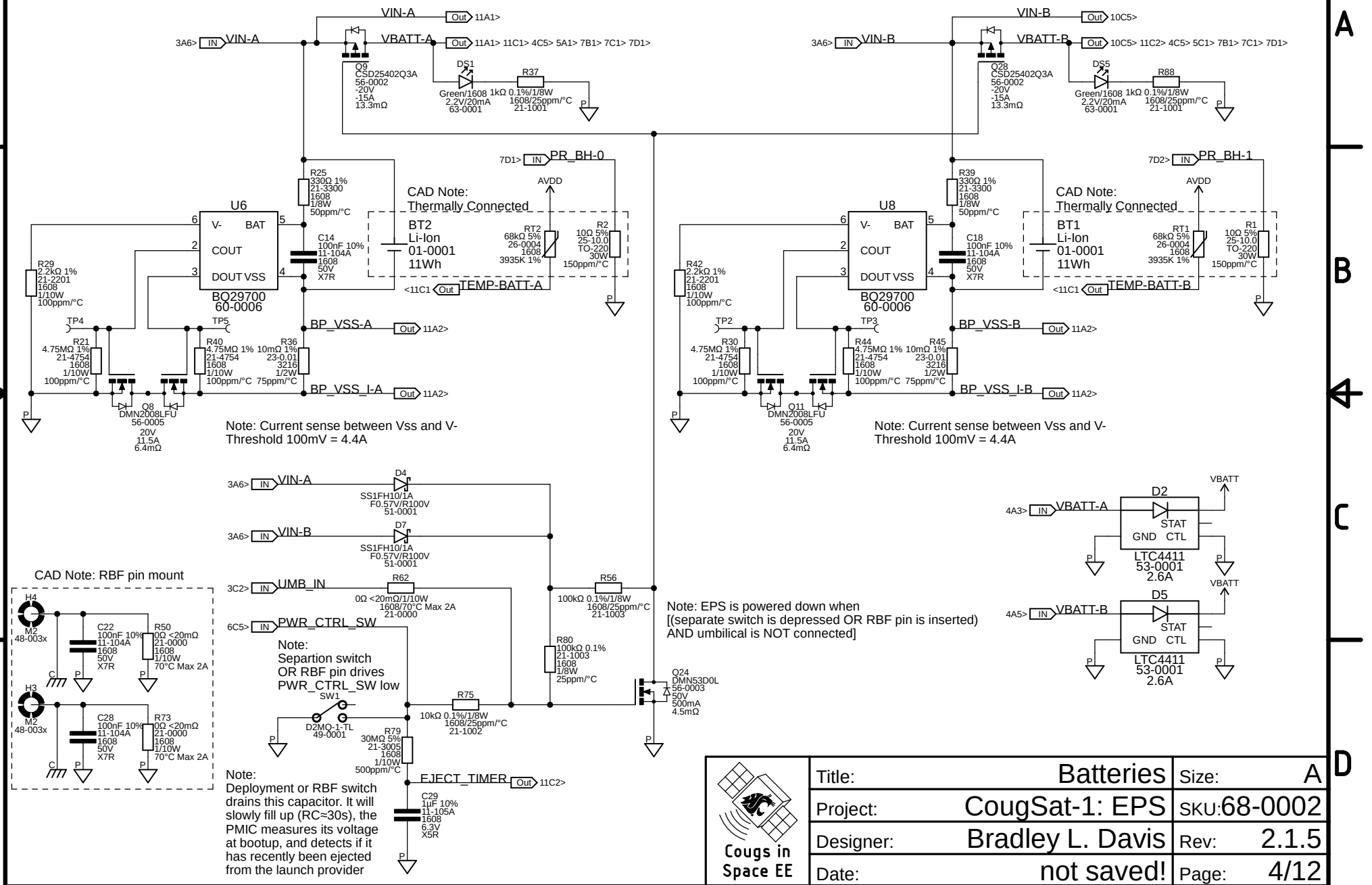
Title:	Block Diagram	Size:	A
Project:	CougSat-1: EPS	SKU:	68-0002
Designer:	Bradley L. Davis	Rev:	2.1.5
Date:	not saved!	Page:	1/12

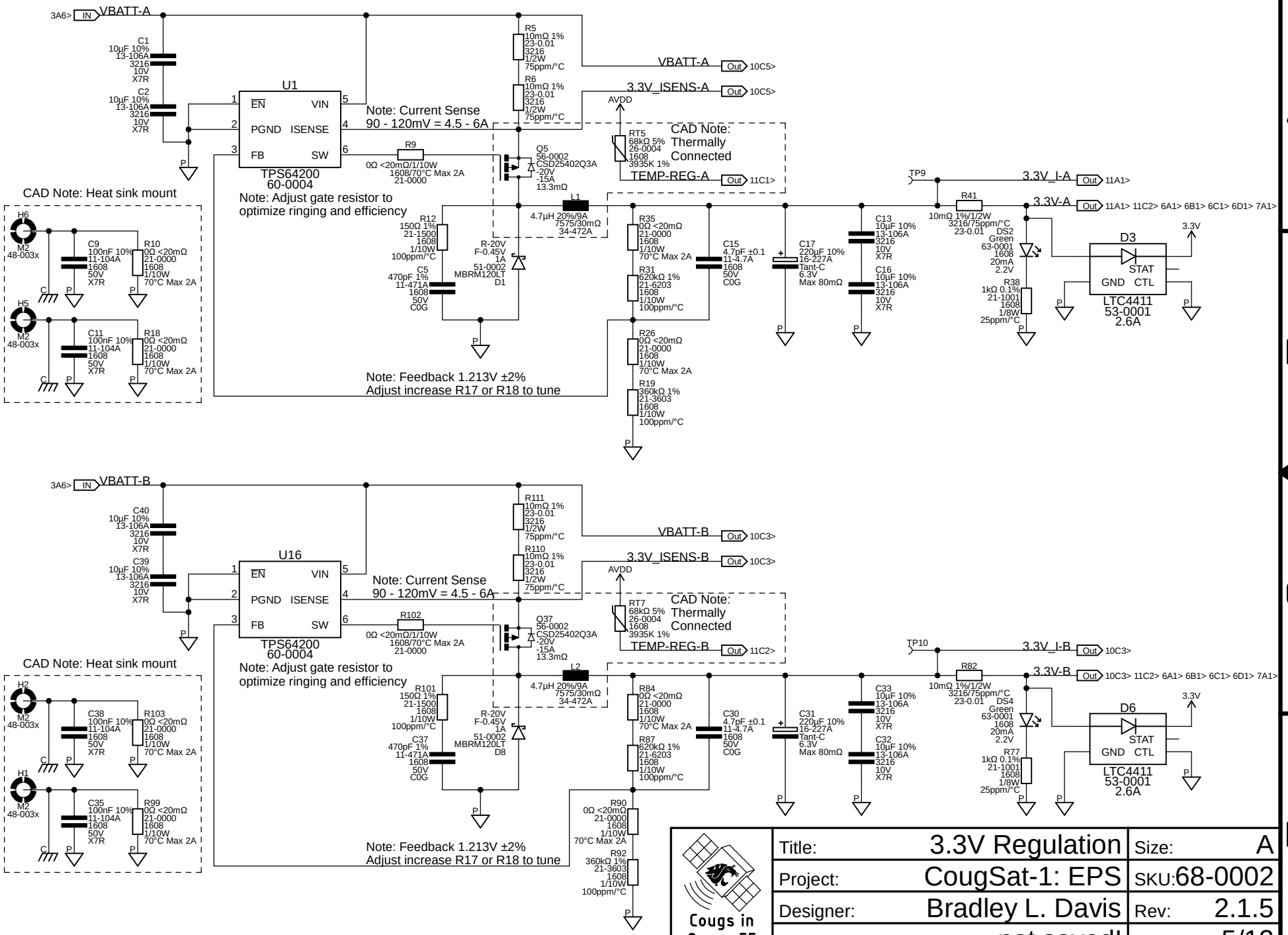

Solar Panel 0
Solar Panel 1
Solar Panel 2
Solar Panel 3
EPS Heater 0
EPS Heater 1
Deployables Release
PV_3.3V-0: 1mA
PV_3.3V-1: 1mA
PV_3.3V-2: 1mA
PV_3.3V-3: 1mA
PR_BH-0: 250mA
PR_BH-1: 250mA
PR_DEPLOY: 2A
Umbilical Charging
UMB_IN
Solar Panels
PV_IN-0
PV_IN-1
PV_IN-2
PV_IN-3
PV_IN-4
PV_IN-5
PV_IN-6
PV_IN-7
Switching
Switching
3.3V SMPS A
3.3V-A
VIN-A
Battery A
VBATT-A
VIN-B
Battery B
VBATT-B
Note: Each battery can output 4A continuously
Note: Each SMPS can output 3A continuously
3.3V SMPS B
3.3V-B
Power ORing
3.3V (Always on): 30mA
EPS
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-5: 300mA
PR_BATT-6: 400mA
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-0: 250mA
PR_BATT-1: 0mA
PR_BATT-2: 0mA
PR_BATT-3: 0mA
PR_BATT-4: 0mA
IHU
IHU: SD Card
ADCS
ADCS: IMUs
ADCS: GPS
IFJR & SD Card
Comms & Radios
ADCS: Magnetorquers
Comms: TX Amplifier
Satellite Bus
CougSat-1 Payload
Payload: 0
Payload: 1
Payload: 2
Payload: 4
Payload: 5
Payload: 6
Payload: 7
Payload: 8
Payload: 9
Payload: 10
Payload: 11
Germination Lighting
Germination Camera
Germination Sensors
Ionizing Radiation Sensor
Ground Camera
Unused
Germination Heater
Unused
Unused
Unused
Unused
Note: Each power rail channel (PR_) is rated for 1A
PR_DEPLOY is rated for 2A
Currents shown are the expected consumption
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
R47
0Ω <20mΩ
21-0000
1608
1/10W
70°C Max 2A
R46
0Ω <20mΩ
21-0000
1608
1/10W
70°C Max 2A
P
D
A
Cougs in Space EE
Title: Power Rails
Size: A
Project: CougSat-1: EPS
SKU: 68-0002
Designer: Bradley L. Davis
Rev: 2.1.5
Date: not saved!
Page: 2/12

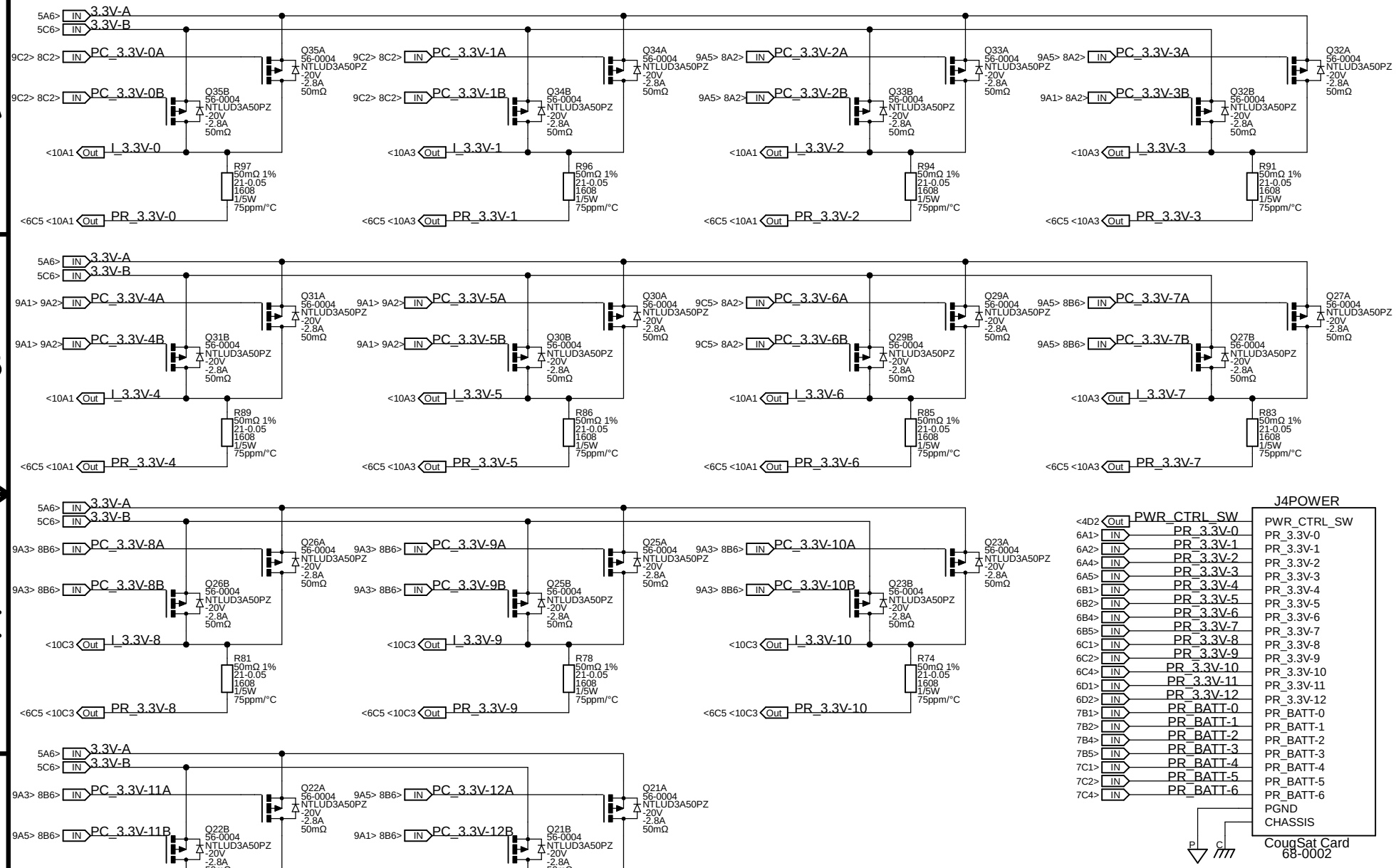


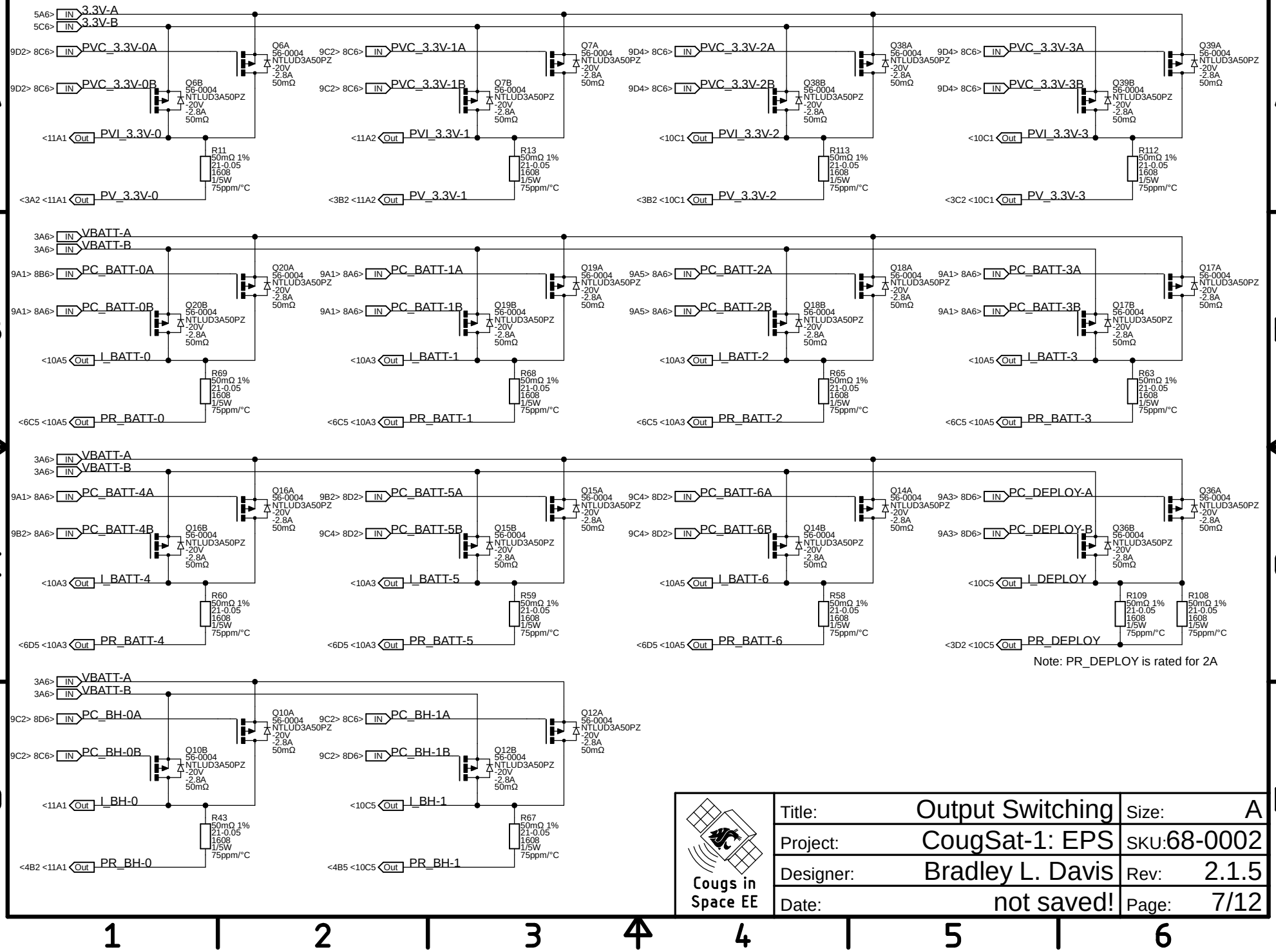
Cougs in Space EE

Title:	Input Switching	Size:	A
Project:	CougSat-1: EPS	SKU:	68-0002
Designer:	Bradley L. Davis	Rev:	2.1.5
Date:	not saved!	Page:	3/12


VIN-A
VBATT-A
Q9 CSD25402Q3A 56-0002 -20V -15A 13.3mΩ
DS1 Green/1608 2.2V/20mA 63-0001
R37 1kΩ 0.1%/1/8W 1608/25ppm/°C 21-1001
U6 BQ29700 60-0006
R25 330Ω 1% 21-3300 1608 1/8W 50ppm/°C
C14 100nF 10% 11-104A 1608 50V X7R
R29 2.2kΩ 1% 21-2201 1608 1/10W 100ppm/°C
R21 4.75MΩ 1% 21-4754 1608 1/10W 100ppm/°C
R40 4.75MΩ 1% 21-4754 1608 1/10W 100ppm/°C
R36 10mΩ 1% 23-0.01 3216 1/2W 75ppm/°C
Q8 DMN2008LFU 56-0005 20V 11.5A 6.4mΩ
BT2 Li-Ion 01-0001 11Wh
RT2 68kΩ 5% 26-0004 1608 3935K 1%
R2 10Ω 5% 25-10.0 TO-220 30W 150ppm/°C
CAD Note: Thermally Connected
PR_BH-0
TEMP-BATT-A
BP_VSS-A
BP_VSS_I-A
Note: Current sense between Vss and V-
Threshold 100mV = 4.4A
VIN-B
VBATT-B
Q28 CSD25402Q3A 56-0002 -20V -15A 13.3mΩ
DS5 Green/1608 2.2V/20mA 63-0001
R88 1kΩ 0.1%/1/8W 1608/25ppm/°C 21-1001
U8 BQ29700 60-0006
R39 330Ω 1% 21-3300 1608 1/8W 50ppm/°C
C18 100nF 10% 11-104A 1608 50V X7R
R42 2.2kΩ 1% 21-2201 1608 1/10W 100ppm/°C
R30 4.75MΩ 1% 21-4754 1608 1/10W 100ppm/°C
R44 4.75MΩ 1% 21-4754 1608 1/10W 100ppm/°C
R45 10mΩ 1% 23-0.01 3216 1/2W 75ppm/°C
Q11 DMN2008LFU 56-0005 20V 11.5A 6.4mΩ
BT1 Li-Ion 01-0001 11Wh
RT1 68kΩ 5% 26-0004 1608 3935K 1%
R1 10Ω 5% 25-10.0 TO-220 30W 150ppm/°C
CAD Note: Thermally Connected
PR_BH-1
TEMP-BATT-B
BP_VSS-B
BP_VSS_I-B
Note: Current sense between Vss and V-
Threshold 100mV = 4.4A
D4 SS1FH10/1A F0.57V/R100V 51-0001
D7 SS1FH10/1A F0.57V/R100V 51-0001
UMB_IN
R62 0Ω <20mΩ/1/10W 1608/70°C Max 2A 21-0000
R56 100kΩ 0.1%/1/8W 1608/25ppm/°C 21-1003
PWR_CTRL_SW
Note: Separtion switch OR RBF pin drives PWR_CTRL_SW low
SW1 D2MQ-1-TL 49-0001
R75 10kΩ 0.1%/1/8W 1608/25ppm/°C 21-1002
R80 100kΩ 0.1% 21-1003 1608 1/8W 25ppm/°C
Q24 DMN53D0L 56-0003 50V 500mA 4.5mΩ
R79 30MΩ 5% 21-3005 1608 1/10W 500ppm/°C
EJECT_TIMER
C29 1µF 10% 11-105A 1608 6.3V X5R
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
CAD Note: RBF pin mount
H4 M2 48-003x
H3 M2 48-003x
C22 100nF 10% 11-104A 1608 50V X7R
R50 0Ω <20mΩ 21-0000 1608 1/10W 70°C Max 2A
C28 100nF 10% 11-104A 1608 50V X7R
R73 0Ω <20mΩ 21-0000 1608 1/10W 70°C Max 2A
Note: EPS is powered down when [(separate switch is depressed OR RBF pin is inserted) AND umbilical is NOT connected]
VBATT-A
D2 LTC4411 53-0001 2.6A
VBATT-B
D5 LTC4411 53-0001 2.6A
VBATT
STAT
GND CTL
Cougs in Space EE
Title: Batteries
Size: A
Project: CougSat-1: EPS
SKU:68-0002
Designer: Bradley L. Davis
Rev: 2.1.5
Date: not saved!
Page: 4/12


3A6> IN VBATT-A
C1 10µF 10% 13-106A 3216 10V X7R
C2 10µF 10% 13-106A 3216 10V X7R
U1
EN VIN
PGND ISENSE
FB SW
TPS64200
60-0004
R5 10mΩ 1% 23-0.01 3216 1/2W 75ppm/°C
R6 10mΩ 1% 23-0.01 3216 1/2W 75ppm/°C
VBATT-A Out 10C5>
3.3V_ISENS-A Out 10C5>
AVDD
Note: Current Sense
90 - 120mV = 4.5 - 6A
R9 0Ω <20mΩ/1/10W 1608/70°C Max 2A 21-0000
Q5 56-0002 CSD25402Q3A -20V -15A 13.3mΩ
RT5 68kΩ 5% 26-0004 1608 3935K 1%
CAD Note: Thermally Connected
TEMP-REG-A Out 11C1>
CAD Note: Heat sink mount
H6 M2 48-003x
H5 M2 48-003x
C9 100nF 10% 11-104A 1608 50V X7R
R10 0Ω <20mΩ 21-0000 1608 1/10W 70°C Max 2A
C11 100nF 10% 11-104A 1608 50V X7R
R18 0Ω <20mΩ 21-0000 1608 1/10W 70°C Max 2A
Note: Adjust gate resistor to
optimize ringing and efficiency
L1 4.7µH 20%/9A 7575/30mΩ 34-472A
R12 150Ω 1% 21-1500 1608 1/10W 100ppm/°C
C5 470pF 1% 11-471A 1608 50V C0G
R-20V F-0.45V 1A 51-0002 MBRM120LT D1
R35 0Ω <20mΩ 21-0000 1608 1/10W 70°C Max 2A
R31 620kΩ 1% 21-6203 1608 1/10W 100ppm/°C
R26 0Ω <20mΩ 21-0000 1608 1/10W 70°C Max 2A
R19 360kΩ 1% 21-3603 1608 1/10W 100ppm/°C
Note: Feedback 1.213V ±2%
Adjust increase R17 or R18 to tune
C15 4.7pF ±0.1 11-4.7A 1608 50V C0G
C17 220µF 10% 16-227A Tant-C 6.3V Max 80mΩ
C13 10µF 10% 13-106A 3216 10V X7R
C16 10µF 10% 13-106A 3216 10V X7R
TP9
R41 10mΩ 1%/1/2W 3216/75ppm/°C 23-0.01
3.3V_I-A Out 11A1>
3.3V-A Out 11A1> 11C2> 6A1> 6B1> 6C1> 6D1> 7A1>
DS2 Green 63-0001 1608 20mA 2.2V
R38 1kΩ 0.1% 21-1001 1608 1/8W 25ppm/°C
D3
STAT
GND CTL
LTC4411
53-0001
2.6A
3.3V
3A6> IN VBATT-B
C40 10µF 10% 13-106A 3216 10V X7R
C39 10µF 10% 13-106A 3216 10V X7R
U16
EN VIN
PGND ISENSE
FB SW
TPS64200
60-0004
R111 10mΩ 1% 23-0.01 3216 1/2W 75ppm/°C
R110 10mΩ 1% 23-0.01 3216 1/2W 75ppm/°C
VBATT-B Out 10C3>
3.3V_ISENS-B Out 10C3>
AVDD
Note: Current Sense
90 - 120mV = 4.5 - 6A
R102 0Ω <20mΩ/1/10W 1608/70°C Max 2A 21-0000
Q37 56-0002 CSD25402Q3A -20V -15A 13.3mΩ
RT7 68kΩ 5% 26-0004 1608 3935K 1%
CAD Note: Thermally Connected
TEMP-REG-B Out 11C2>
CAD Note: Heat sink mount
H2 M2 48-003x
H1 M2 48-003x
C38 100nF 10% 11-104A 1608 50V X7R
R103 0Ω <20mΩ 21-0000 1608 1/10W 70°C Max 2A
C35 100nF 10% 11-104A 1608 50V X7R
R99 0Ω <20mΩ 21-0000 1608 1/10W 70°C Max 2A
Note: Adjust gate resistor to
optimize ringing and efficiency
L2 4.7µH 20%/9A 7575/30mΩ 34-472A
R101 150Ω 1% 21-1500 1608 1/10W 100ppm/°C
C37 470pF 1% 11-471A 1608 50V C0G
R-20V F-0.45V 1A 51-0002 MBRM120LT D8
R84 0Ω <20mΩ 21-0000 1608 1/10W 70°C Max 2A
R87 620kΩ 1% 21-6203 1608 1/10W 100ppm/°C
R90 0Ω <20mΩ 21-0000 1608 1/10W 70°C Max 2A
R92 360kΩ 1% 21-3603 1608 1/10W 100ppm/°C
Note: Feedback 1.213V ±2%
Adjust increase R17 or R18 to tune
C30 4.7pF ±0.1 11-4.7A 1608 50V C0G
C31 220µF 10% 16-227A Tant-C 6.3V Max 80mΩ
C33 10µF 10% 13-106A 3216 10V X7R
C32 10µF 10% 13-106A 3216 10V X7R
TP10
R82 10mΩ 1%/1/2W 3216/75ppm/°C 23-0.01
3.3V_I-B Out 10C3>
3.3V-B Out 10C3> 11C2> 6A1> 6B1> 6C1> 6D1> 7A1>
DS4 Green 63-0001 1608 20mA 2.2V
R77 1kΩ 0.1% 21-1001 1608 1/8W 25ppm/°C
D6
STAT
GND CTL
LTC4411
53-0001
2.6A
3.3V
Cougs in Space EE
Title: 3.3V Regulation
Size: A
Project: CougSat-1: EPS
SKU:68-0002
Designer: Bradley L. Davis
Rev: 2.1.5
Date: not saved!
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
PC_3.3V-1A
PC_3.3V-1B
I_3.3V-1
PR_3.3V-1
PC_3.3V-2A
PC_3.3V-2B
I_3.3V-2
PR_3.3V-2
PC_3.3V-3A
PC_3.3V-3B
I_3.3V-3
PR_3.3V-3
PC_3.3V-4A
PC_3.3V-4B
I_3.3V-4
PR_3.3V-4
PC_3.3V-5A
PC_3.3V-5B
I_3.3V-5
PR_3.3V-5
PC_3.3V-6A
PC_3.3V-6B
I_3.3V-6
PR_3.3V-6
PC_3.3V-7A
PC_3.3V-7B
I_3.3V-7
PR_3.3V-7
PC_3.3V-8A
PC_3.3V-8B
I_3.3V-8
PR_3.3V-8
PC_3.3V-9A
PC_3.3V-9B
I_3.3V-9
PR_3.3V-9
PC_3.3V-10A
PC_3.3V-10B
I_3.3V-10
PR_3.3V-10
PC_3.3V-11A
PC_3.3V-11B
I_3.3V-11
PR_3.3V-11
PC_3.3V-12A
PC_3.3V-12B
I_3.3V-12
PR_3.3V-12
Q35A 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q35B 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q34A 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q34B 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q33A 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q33B 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q32A 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q32B 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q31A 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q31B 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q30A 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q30B 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q29A 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q29B 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q27A 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q27B 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q26A 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q26B 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q25A 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q25B 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q23A 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q23B 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q22A 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q22B 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q21A 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
Q21B 56-0004 NTLUD3A50PZ -20V -2.8A 50mΩ
R97 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
R96 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
R94 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
R91 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
R89 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
R86 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
R85 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
R83 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
R81 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
R78 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
R74 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
R72 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
R70 50mΩ 1% 21-0.05 1608 1/5W 75ppm/°C
J4POWER
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: 2.1.5
Date: not saved!
Page: 6/12

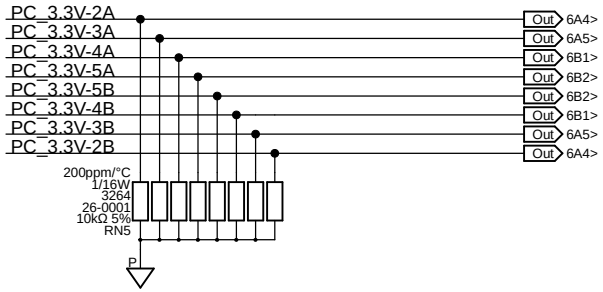


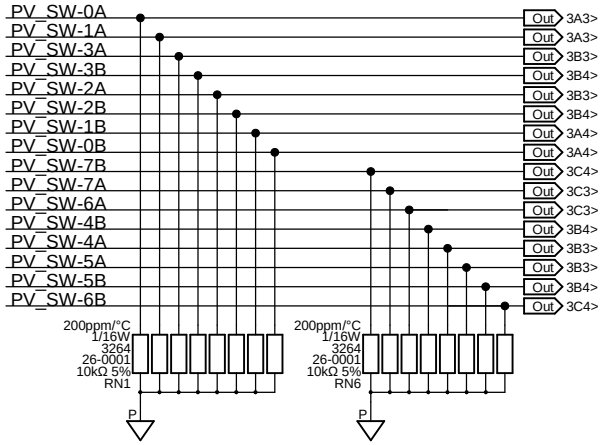
Note: PR_DEPLOY is rated for 2A

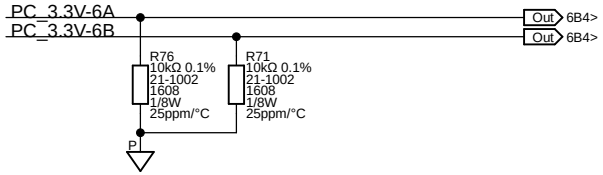
Cougs in Space EE

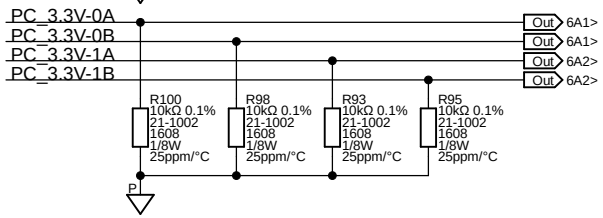
Title:	Output Switching	Size:	A
Project:	CougSat-1: EPS	SKU:	68-0002
Designer:	Bradley L. Davis	Rev:	2.1.5
Date:	not saved!	Page:	7/12

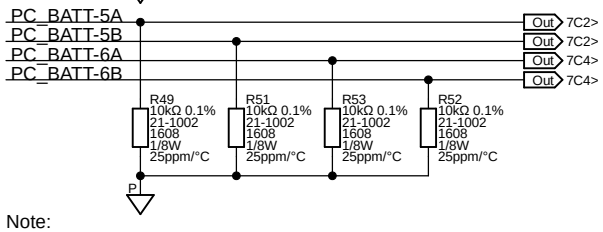
Default: On





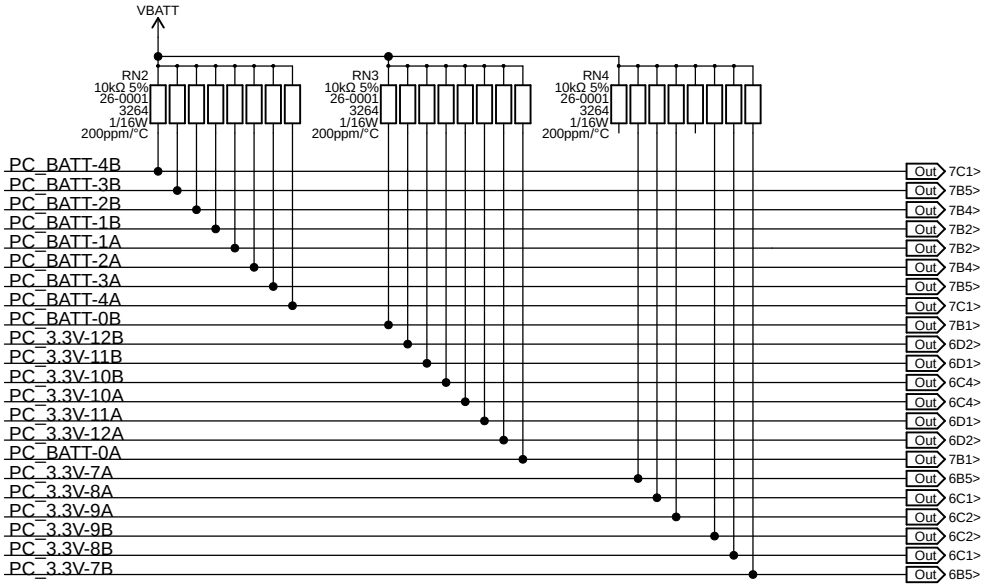


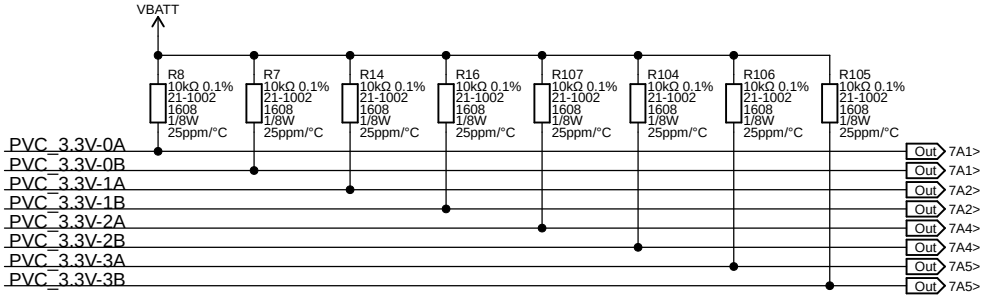


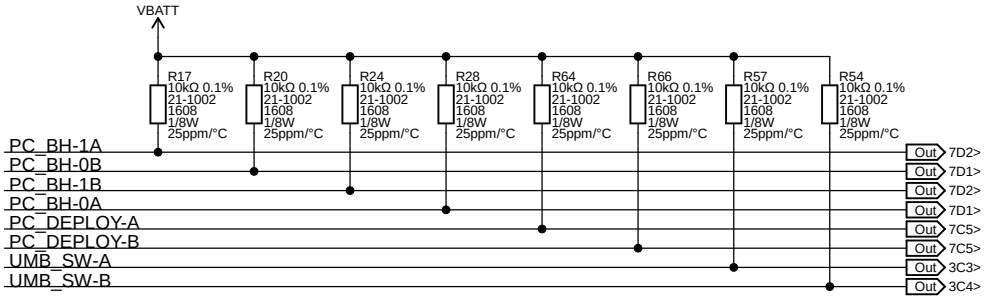


Note:
These are the default states of the power rails
When the PMIC does not drive the switches, these rails are on/off
This occurs when the PMIC is reset or being programmed

Default: Off

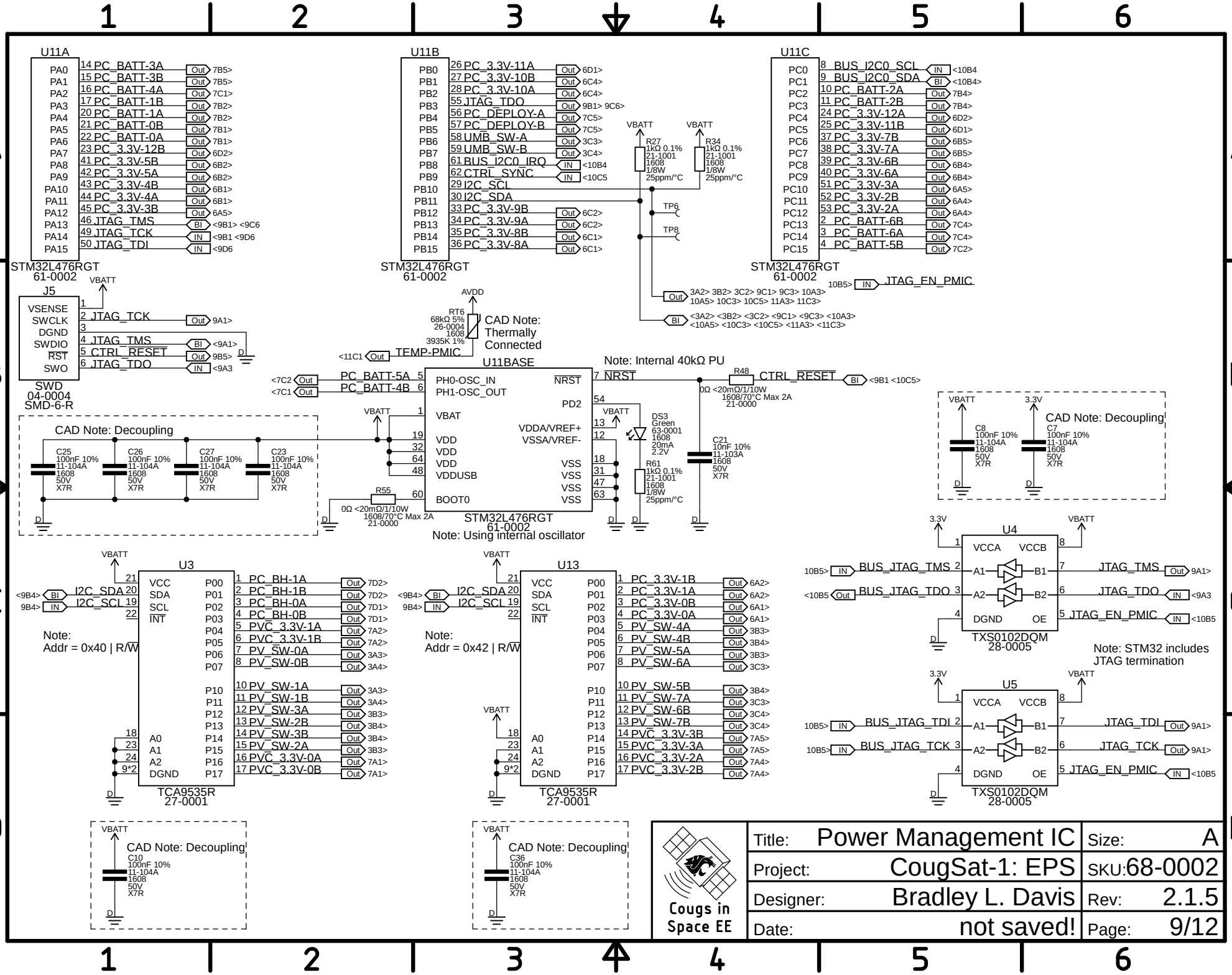


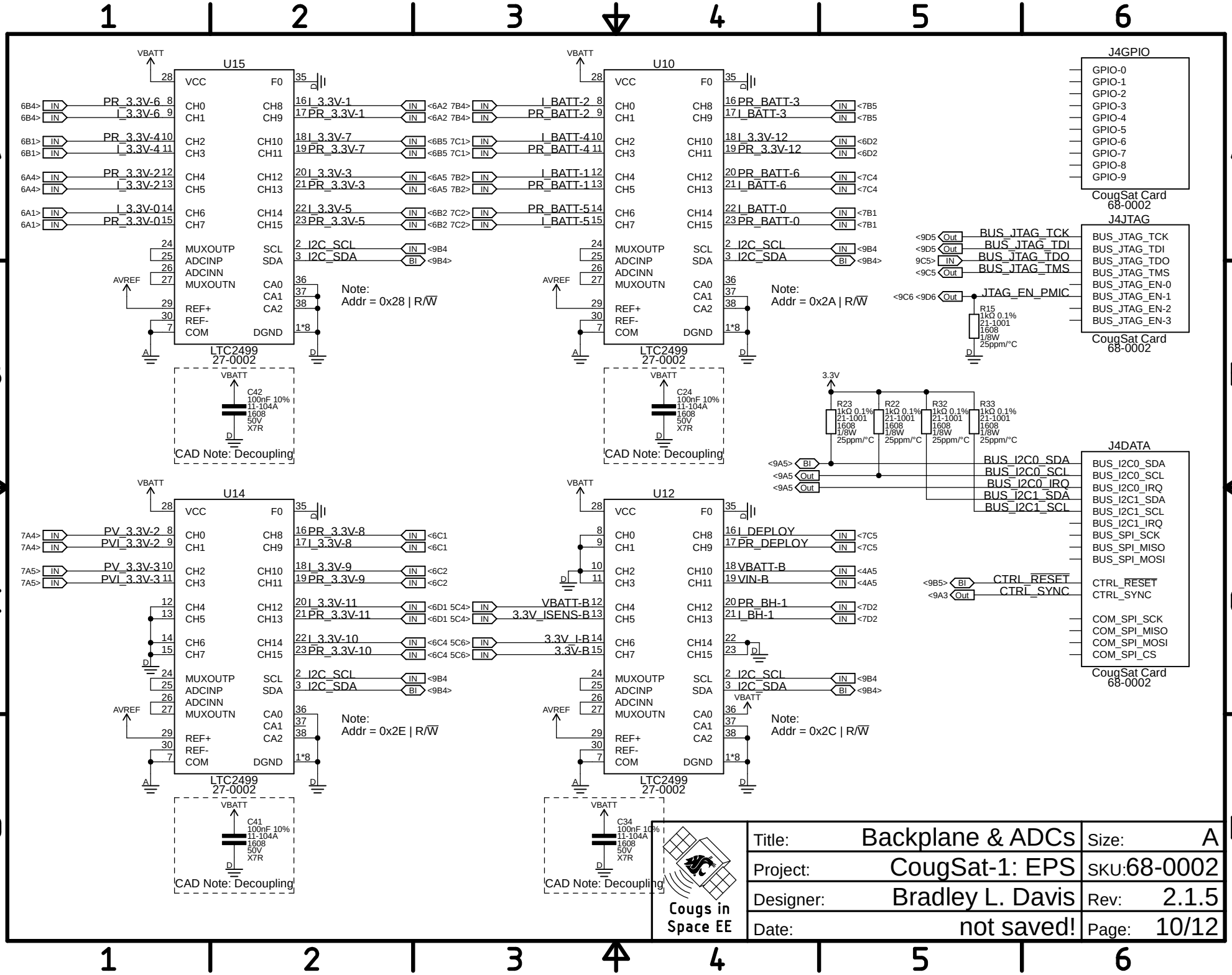


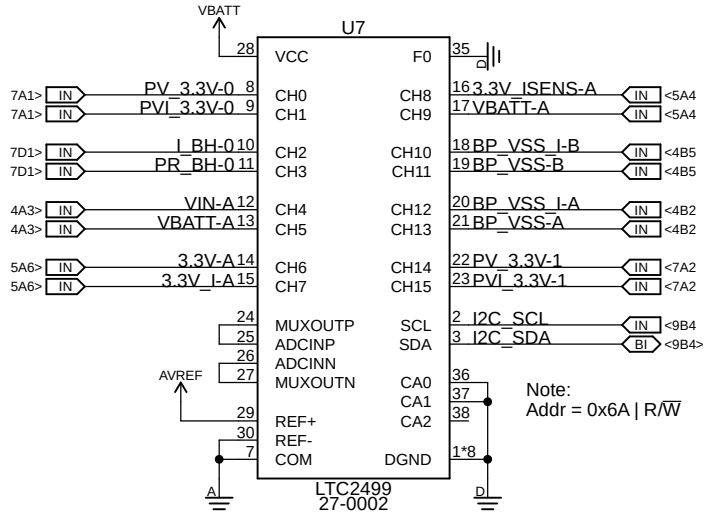


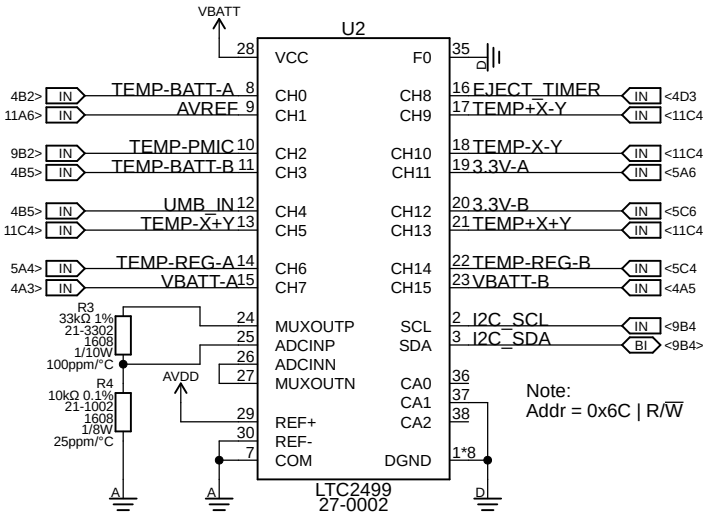
Cougs in Space EE

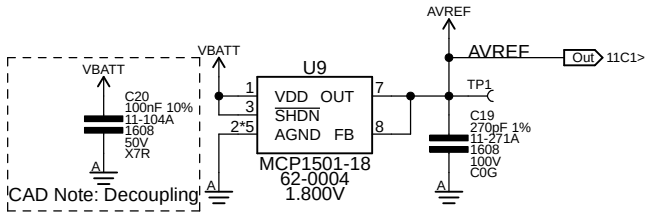
Title:	Switching Defaults	Size:	A
Project:	CougSat-1: EPS	SKU:	68-0002
Designer:	Bradley L. Davis	Rev:	2.1.5
Date:	not saved!	Page:	8/12


U11A
PA0 14 PC_BATT-3A Out 7B5>
PA1 15 PC_BATT-3B Out 7B5>
PA2 16 PC_BATT-4A Out 7C1>
PA3 17 PC_BATT-1B Out 7B2>
PA4 20 PC_BATT-1A Out 7B2>
PA5 21 PC_BATT-0B Out 7B1>
PA6 22 PC_BATT-0A Out 7B1>
PA7 23 PC_3.3V-12B Out 6D2>
PA8 41 PC_3.3V-5B Out 6B2>
PA9 42 PC_3.3V-5A Out 6B2>
PA10 43 PC_3.3V-4B Out 6B1>
PA11 44 PC_3.3V-4A Out 6B1>
PA12 45 PC_3.3V-3B Out 6A5>
PA13 46 JTAG_TMS BI <9B1> <9C6
PA14 49 JTAG_TCK IN <9B1 <9D6
PA15 50 JTAG_TDI IN <9D6
STM32L476RGT
61-0002
U11B
PB0 26 PC_3.3V-11A Out 6D1>
PB1 27 PC_3.3V-10B Out 6C4>
PB2 28 PC_3.3V-10A Out 6C4>
PB3 55 JTAG_TDO Out 9B1> 9C6>
PB4 56 PC_DEPLOY-A Out 7C5>
PB5 57 PC_DEPLOY-B Out 7C5>
PB6 58 UMB_SW-A Out 3C3>
PB7 59 UMB_SW-B Out 3C4>
PB8 61 BUS_I2C0_IRQ IN <10B4
PB9 62 CTRL_SYNC IN <10C5
PB10 29 I2C_SCL
PB11 30 I2C_SDA
PB12 33 PC_3.3V-9B Out 6C2>
PB13 34 PC_3.3V-9A Out 6C2>
PB14 35 PC_3.3V-8B Out 6C1>
PB15 36 PC_3.3V-8A Out 6C1>
STM32L476RGT
61-0002
VBATT
R27
1kΩ 0.1%
21-1001
1608
1/8W
25ppm/°C
R34
1kΩ 0.1%
21-1001
1608
1/8W
25ppm/°C
TP6
TP8
Out 3A2> 3B2> 3C2> 9C1> 9C3> 10A3> 10A5> 10C3> 10C5> 11A3> 11C3>
BI <3A2> <3B2> <3C2> <9C1> <9C3> <10A3> <10A5> <10C3> <10C5> <11A3> <11C3>
U11C
PC0 8 BUS_I2C0_SCL IN <10B4
PC1 9 BUS_I2C0_SDA BI <10B4>
PC2 10 PC_BATT-2A Out 7B4>
PC3 11 PC_BATT-2B Out 7B4>
PC4 24 PC_3.3V-12A Out 6D2>
PC5 25 PC_3.3V-11B Out 6D1>
PC6 37 PC_3.3V-7B Out 6B5>
PC7 38 PC_3.3V-7A Out 6B5>
PC8 39 PC_3.3V-6B Out 6B4>
PC9 40 PC_3.3V-6A Out 6B4>
PC10 51 PC_3.3V-3A Out 6A5>
PC11 52 PC_3.3V-2B Out 6A4>
PC12 53 PC_3.3V-2A Out 6A4>
PC13 2 PC_BATT-6B Out 7C4>
PC14 3 PC_BATT-6A Out 7C4>
PC15 4 PC_BATT-5B Out 7C2>
STM32L476RGT
61-0002
10B5> IN JTAG_EN_PMIC
J5
VSENSE 1
SWCLK 2 JTAG_TCK Out 9A1>
DGND 3
SWDIO 4 JTAG_TMS BI <9A1>
RST 5 CTRL_RESET Out 9B5>
SWO 6 JTAG_TDO IN <9A3
SWD
04-0004
SMD-6-R
VBATT
AVDD
RT6
68kΩ 5%
26-0004
1608
3935K 1%
CAD Note:
Thermally
Connected
<11C1 Out TEMP-PMIC
U11BASE
<7C2 Out PC_BATT-5A 5
<7C1 Out PC_BATT-4B 6
PH0-OSC_IN
PH1-OSC_OUT
VBAT 1
VDD 19
VDD 32
VDD 64
VDDUSB 48
BOOT0 60
NRST 7
PD2 54
VDDA/VREF+ 13
VSSA/VREF- 12
VSS 18
VSS 31
VSS 47
VSS 63
Note: Internal 40kΩ PU
R48
0Ω <20mΩ/1/10W
1608/70°C Max 2A
21-0000
NRST
CTRL_RESET BI <9B1 <10C5>
DS3
Green
63-0001
1608
20mA
2.2V
R61
1kΩ 0.1%
21-1001
1608
1/8W
25ppm/°C
C21
10nF 10%
11-103A
1608
50V
X7R
R55
0Ω <20mΩ/1/10W
1608/70°C Max 2A
21-0000
STM32L476RGT
61-0002
Note: Using internal oscillator
CAD Note: Decoupling
C25 100nF 10% 11-104A 1608 50V X7R
C26 100nF 10% 11-104A 1608 50V X7R
C27 100nF 10% 11-104A 1608 50V X7R
C23 100nF 10% 11-104A 1608 50V X7R
CAD Note: Decoupling
C8 100nF 10% 11-104A 1608 50V X7R
C7 100nF 10% 11-104A 1608 50V X7R
U3
VCC 21
SDA 20 <9B4> BI I2C_SDA
SCL 19 9B4> IN I2C_SCL
INT 22
A0 18
A1 23
A2 24
DGND 9*2
P00 1 PC_BH-1A Out 7D2>
P01 2 PC_BH-1B Out 7D2>
P02 3 PC_BH-0A Out 7D1>
P03 4 PC_BH-0B Out 7D1>
P04 5 PVC_3.3V-1A Out 7A2>
P05 6 PVC_3.3V-1B Out 7A2>
P06 7 PV_SW-0A Out 3A3>
P07 8 PV_SW-0B Out 3A4>
P10 10 PV_SW-1A Out 3A3>
P11 11 PV_SW-1B Out 3A4>
P12 12 PV_SW-3A Out 3B3>
P13 13 PV_SW-2B Out 3B4>
P14 14 PV_SW-3B Out 3B4>
P15 15 PV_SW-2A Out 3B3>
P16 16 PVC_3.3V-0A Out 7A1>
P17 17 PVC_3.3V-0B Out 7A1>
TCA9535R
27-0001
Note:
Addr = 0x40 | R/W
U13
VCC 21
SDA 20 <9B4> BI I2C_SDA
SCL 19 9B4> IN I2C_SCL
INT 22
A0 18
A1 23
A2 24
DGND 9*2
P00 1 PC_3.3V-1B Out 6A2>
P01 2 PC_3.3V-1A Out 6A2>
P02 3 PC_3.3V-0B Out 6A1>
P03 4 PC_3.3V-0A Out 6A1>
P04 5 PV_SW-4A Out 3B3>
P05 6 PV_SW-4B Out 3B4>
P06 7 PV_SW-5A Out 3B3>
P07 8 PV_SW-6A Out 3C3>
P10 10 PV_SW-5B Out 3B4>
P11 11 PV_SW-7A Out 3C3>
P12 12 PV_SW-6B Out 3C4>
P13 13 PV_SW-7B Out 3C4>
P14 14 PVC_3.3V-3B Out 7A5>
P15 15 PVC_3.3V-3A Out 7A5>
P16 16 PVC_3.3V-2A Out 7A4>
P17 17 PVC_3.3V-2B Out 7A4>
TCA9535R
27-0001
Note:
Addr = 0x42 | R/W
U4
VCCA 1
VCCB 8
A1 2 10B5> IN BUS_JTAG_TMS
A2 3 <10B5 Out BUS_JTAG_TDO
DGND 4
B1 7 JTAG_TMS Out 9A1>
B2 6 JTAG_TDO IN <9A3
OE 5 JTAG_EN_PMIC IN <10B5
TXS0102DQM
28-0005
3.3V
VBATT
Note: STM32 includes
JTAG termination
U5
VCCA 1
VCCB 8
A1 2 10B5> IN BUS_JTAG_TDI
A2 3 10B5> IN BUS_JTAG_TCK
DGND 4
B1 7 JTAG_TDI Out 9A1>
B2 6 JTAG_TCK Out 9A1>
OE 5 JTAG_EN_PMIC IN <10B5
TXS0102DQM
28-0005
CAD Note: Decoupling
C10 100nF 10% 11-104A 1608 50V X7R
CAD Note: Decoupling
C36 100nF 10% 11-104A 1608 50V X7R
Cougs in Space EE
Title: Power Management IC
Size: A
Project: CougSat-1: EPS
SKU: 68-0002
Designer: Bradley L. Davis
Rev: 2.1.5
Date: not saved!
Page: 9/12

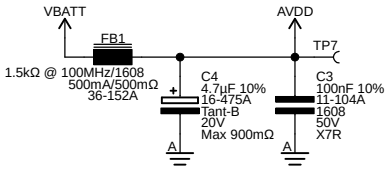

U15
U10
U14
U12
LTC2499
27-0002
VBATT
AVREF
MUXOUTP
MUXOUTN
ADCINP
ADCINN
REF+
REF-
COM
VCC
F0
DGND
SCL
SDA
CH0
CH1
CH2
CH3
CH4
CH5
CH6
CH7
CH8
CH9
CH10
CH11
CH12
CH13
CH14
CH15
CA0
CA1
CA2
1*8
PR_3.3V-6
I_3.3V-6
PR_3.3V-4
I_3.3V-4
PR_3.3V-2
I_3.3V-2
I_3.3V-0
PR_3.3V-0
I_3.3V-1
PR_3.3V-1
I_3.3V-7
PR_3.3V-7
I_3.3V-3
PR_3.3V-3
I_3.3V-5
PR_3.3V-5
I_BATT-2
PR_BATT-2
I_BATT-4
PR_BATT-4
I_BATT-1
PR_BATT-1
I_BATT-5
PR_BATT-5
PR_BATT-3
I_BATT-3
I_3.3V-12
PR_3.3V-12
PR_BATT-6
I_BATT-6
I_BATT-0
PR_BATT-0
I2C_SCL
I2C_SDA
PV_3.3V-2
PVI_3.3V-2
PV_3.3V-3
PVI_3.3V-3
PR_3.3V-8
I_3.3V-8
I_3.3V-9
PR_3.3V-9
I_3.3V-11
PR_3.3V-11
I_3.3V-10
PR_3.3V-10
VBATT-B
3.3V_ISENS-B
3.3V_I-B
3.3V-B
I_DEPLOY
PR_DEPLOY
VBATT-B
VIN-B
PR_BH-1
I_BH-1
Note:
Addr = 0x28 | R/W
Note:
Addr = 0x2A | R/W
Note:
Addr = 0x2E | R/W
Note:
Addr = 0x2C | R/W
CAD Note: Decoupling
C42
C24
C41
C34
100nF 10%
11-104A
1608
50V
X7R
J4GPIO
GPIO-0
GPIO-1
GPIO-2
GPIO-3
GPIO-4
GPIO-5
GPIO-6
GPIO-7
GPIO-8
GPIO-9
CougSat Card
68-0002
J4JTAG
BUS_JTAG_TCK
BUS_JTAG_TDI
BUS_JTAG_TDO
BUS_JTAG_TMS
BUS_JTAG_EN-0
BUS_JTAG_EN-1
BUS_JTAG_EN-2
BUS_JTAG_EN-3
JTAG_EN_PMIC
R15
1kΩ 0.1%
21-1001
1608
1/8W
25ppm/°C
3.3V
R23
R22
R32
R33
J4DATA
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_SPI_SCK
COM_SPI_MISO
COM_SPI_MOSI
COM_SPI_CS
Cougs in
Space EE
Title: Backplane & ADCs
Size: A
Project: CougSat-1: EPS
SKU:68-0002
Designer: Bradley L. Davis
Rev: 2.1.5
Date: not saved!
Page: 10/12



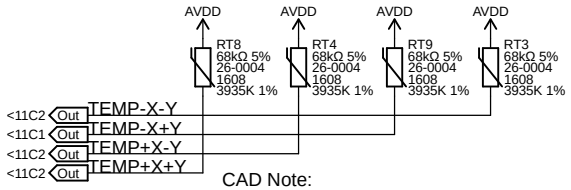




Note:
Differential ADC voltage reference is 1.800V
At 16b, 13.73µV/LSB
Maximum input is ±900mV

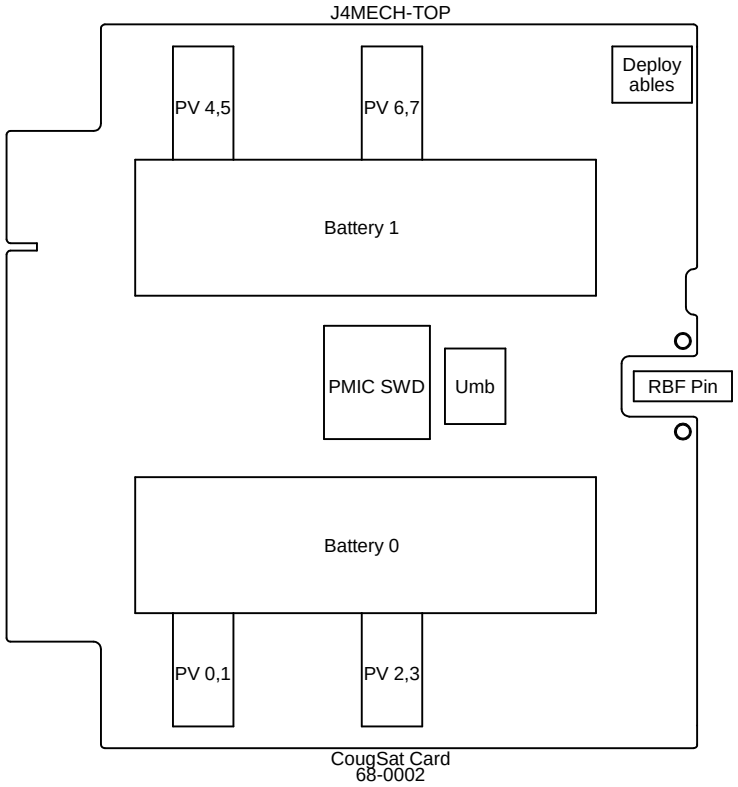


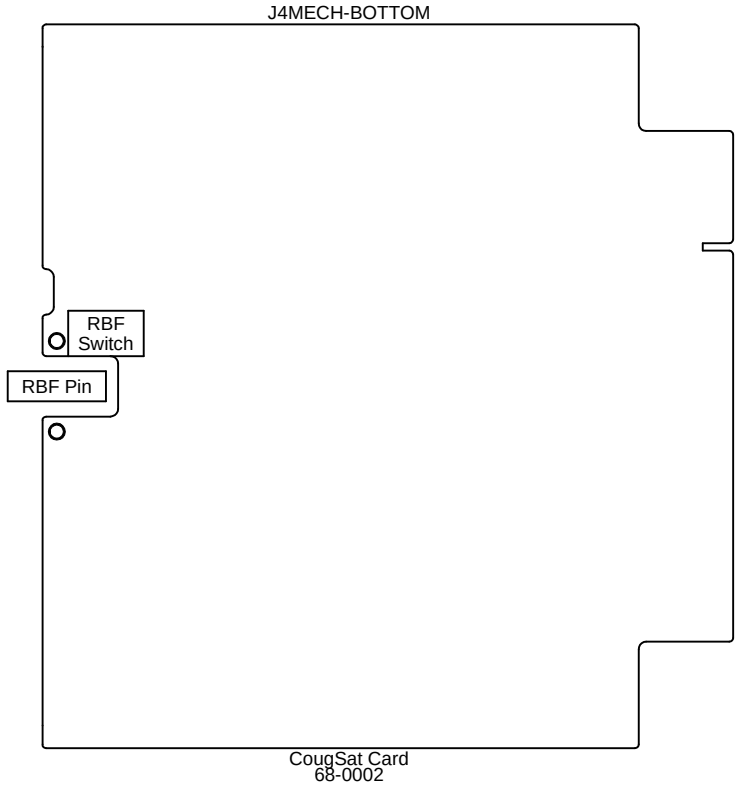
Note:
Single-Ended ADC voltage reference is 3.3V
At 16b, 25.18µV/LSB
Maximum input is ±1.65V



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

Cougs in Space EE	Title:	ADCs	Size: A
	Project:	CougSat-1: EPS	SKU:68-0002
	Designer:	Bradley L. Davis	Rev: 2.1.5
	Date:	not saved!	Page: 11/12





LOGO1
Satellite 16mm
Cougs in Space

LOGO2
Signature

Cougs in Space EE

Title:	Mechanical	Size:	A
Project:	CougSat-1: EPS	SKU:	68-0002
Designer:	Bradley L. Davis	Rev:	2.1.5
Date:	not saved!	Page:	12/12