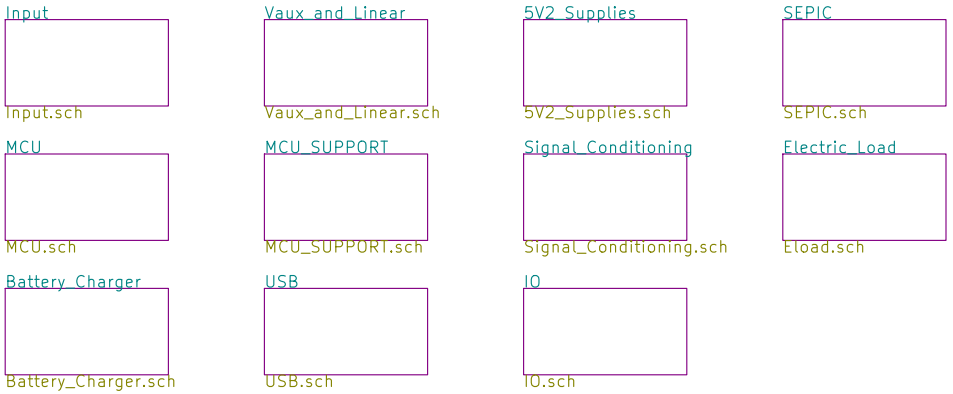

Sheet: /
File: NAS_Controller.sch

Title: NAS Controller

Size: A	Date: 2018-06-12	**Rev: 02**
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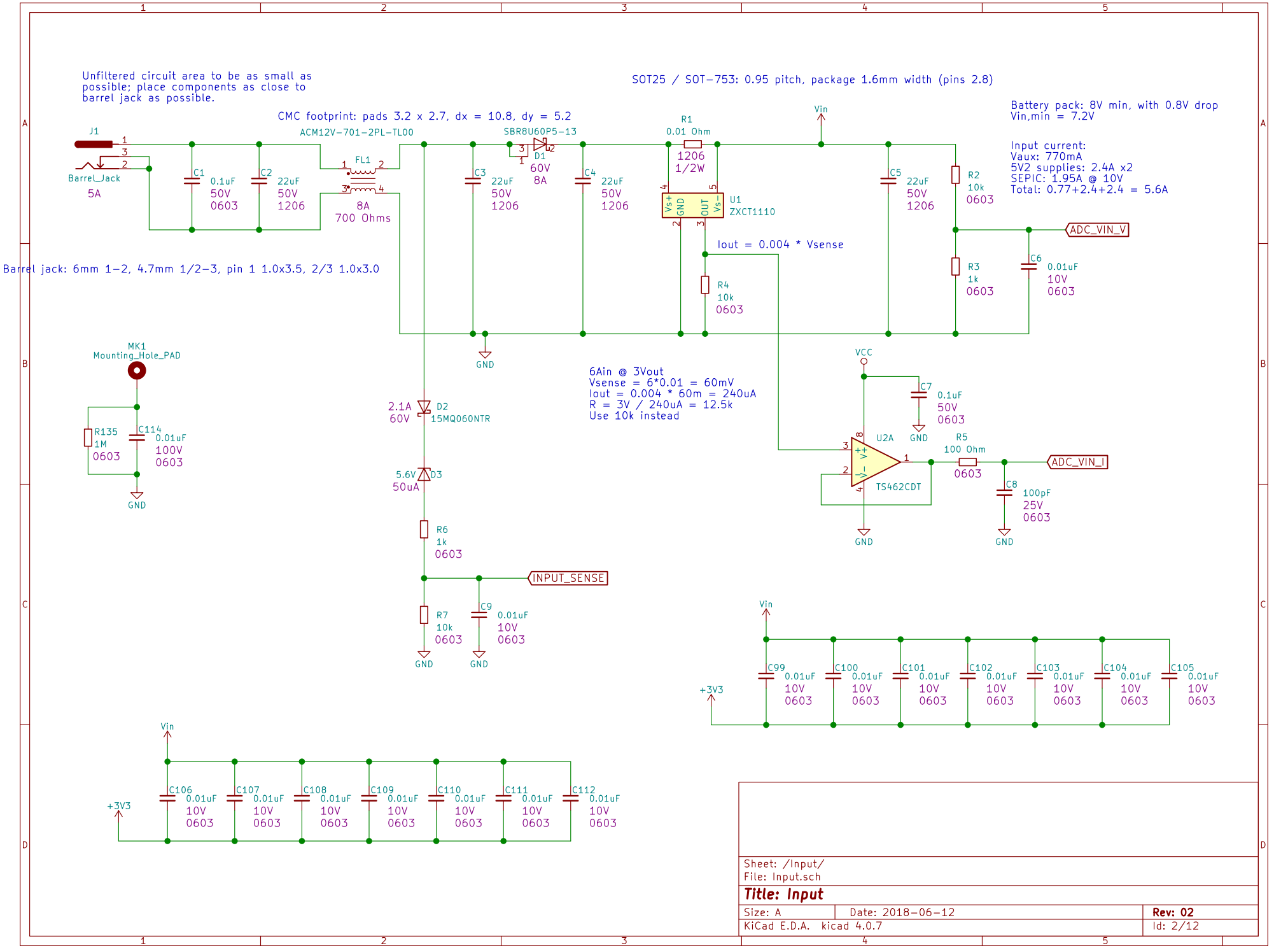
Unfiltered circuit area to be as small as possible; place components as close to barrel jack as possible.
CMC footprint: pads 3.2 x 2.7, dx = 10.8, dy = 5.2
SOT25 / SOT-753: 0.95 pitch, package 1.6mm width (pins 2.8)
Battery pack: 8V min, with 0.8V drop
Vin,min = 7.2V
Input current:
Vaux: 770mA
5V2 supplies: 2.4A x2
SEPIC: 1.95A @ 10V
Total: 0.77+2.4+2.4 = 5.6A
Barrel jack: 6mm 1-2, 4.7mm 1/2-3, pin 1 1.0x3.5, 2/3 1.0x3.0
J1
Barrel_Jack
5A
C1 0.1uF 50V 0603
C2 22uF 50V 1206
ACM12V-701-2PL-TL00
FL1
8A
700 Ohms
SBR8U60P5-13
D1
60V
8A
C3 22uF 50V 1206
C4 22uF 50V 1206
R1
0.01 Ohm
1206
1/2W
U1
ZXCT1110
Vs+
GND
OUT
Vs-
Iout = 0.004 * Vsense
R4 10k 0603
Vin
C5 22uF 50V 1206
R2 10k 0603
R3 1k 0603
C6 0.01uF 10V 0603
ADC_VIN_V
GND
MK1
Mounting_Hole_PAD
R135 1M 0603
C114 0.01uF 100V 0603
6Ain @ 3Vout
Vsense = 6*0.01 = 60mV
Iout = 0.004 * 60m = 240uA
R = 3V / 240uA = 12.5k
Use 10k instead
2.1A
60V
D2
15MQ060NTR
5.6V
50uA
D3
R6 1k 0603
INPUT_SENSE
R7 10k 0603
C9 0.01uF 10V 0603
VCC
C7 0.1uF 50V 0603
U2A
TS462CDT
R5 100 Ohm 0603
ADC_VIN_I
C8 100pF 25V 0603
C99 0.01uF 10V 0603
C100 0.01uF 10V 0603
C101 0.01uF 10V 0603
C102 0.01uF 10V 0603
C103 0.01uF 10V 0603
C104 0.01uF 10V 0603
C105 0.01uF 10V 0603
+3V3
C106 0.01uF 10V 0603
C107 0.01uF 10V 0603
C108 0.01uF 10V 0603
C109 0.01uF 10V 0603
C110 0.01uF 10V 0603
C111 0.01uF 10V 0603
C112 0.01uF 10V 0603
Sheet: /Input/
File: Input.sch
Title: Input
Size: A
Date: 2018-06-12
Rev: 02
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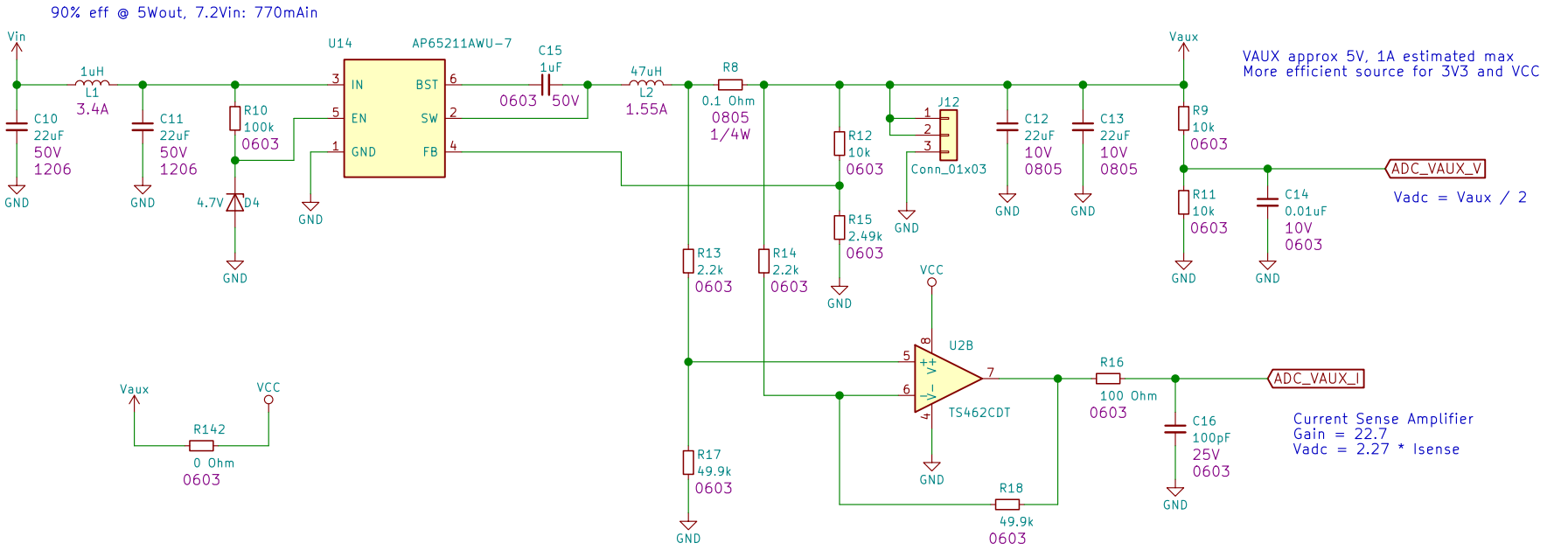
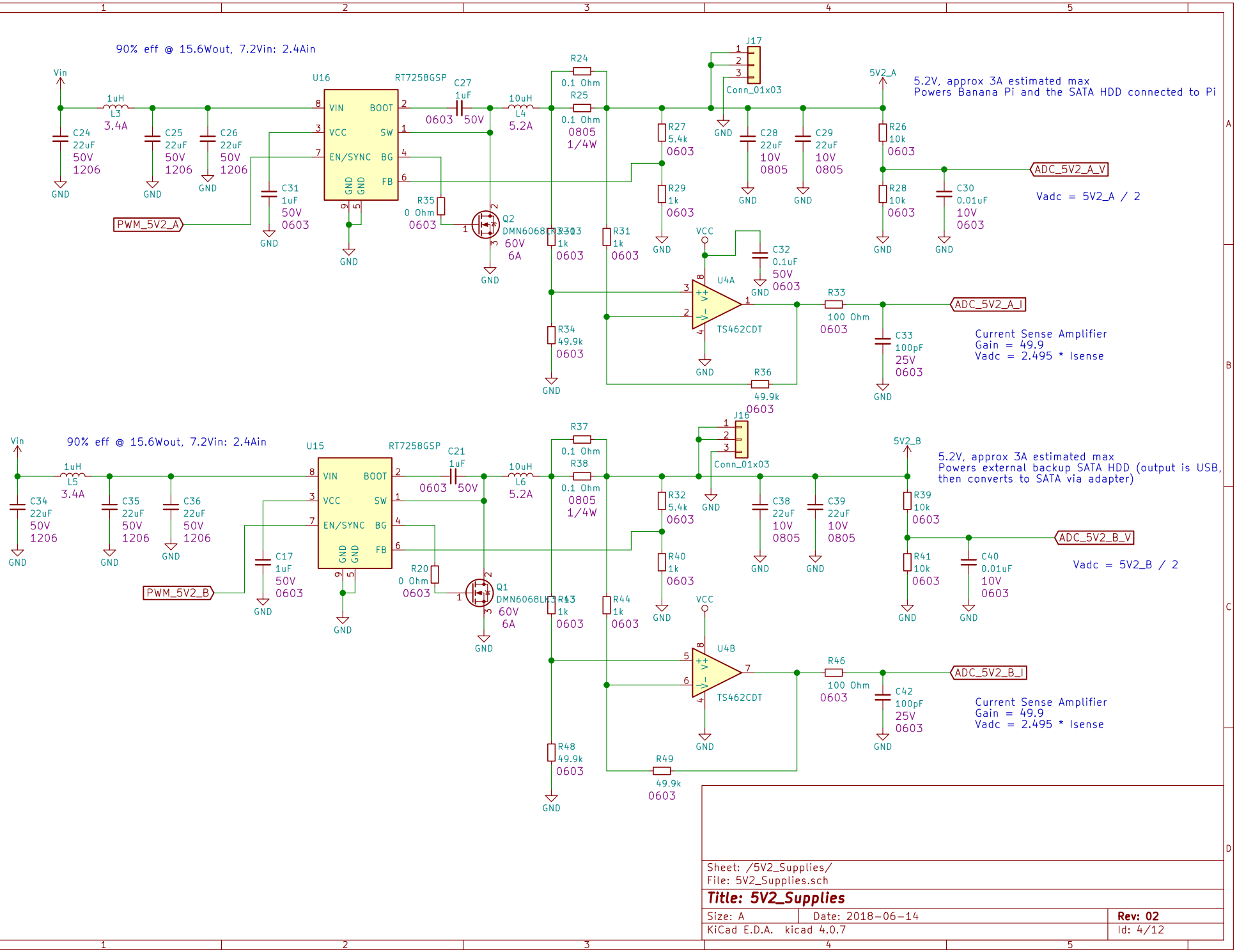
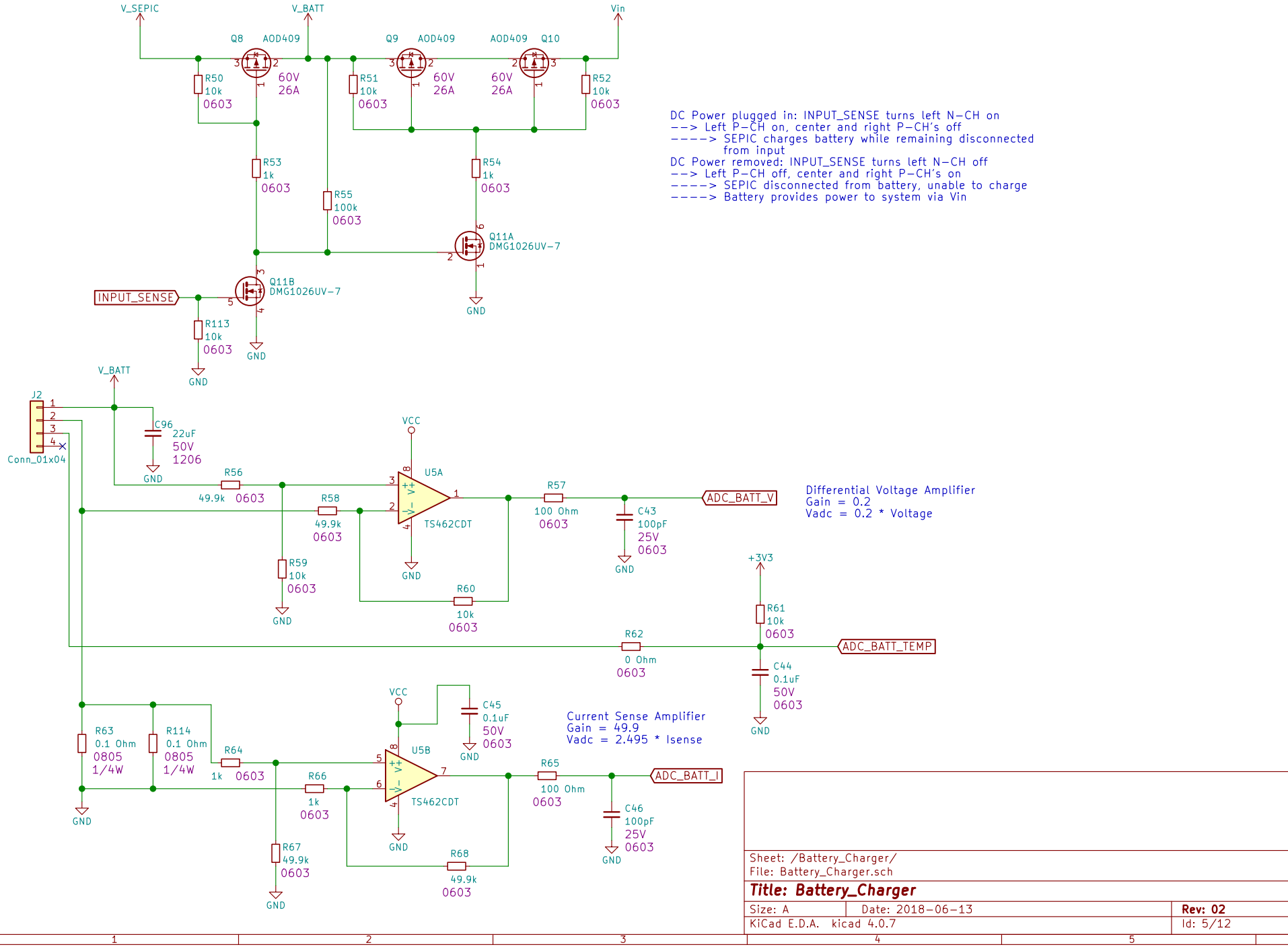


Sheet: /Vaux_and_Linear/		
File: Vaux_and_Linear.sch		
Title: Vaux_and_Linear		
Size: A	Date: 2018-06-12	**Rev: 02**
KiCad E.D.A. kicad 4.0.7		Id: 3/12


90% eff @ 15.6Wout, 7.2Vin: 2.4Ain
Vin
1uH
L3
3.4A
C24
22uF
50V
1206
C25
22uF
50V
1206
C26
22uF
50V
1206
GND
U16
RT7258GSP
VIN
BOOT
VCC
SW
EN/SYNC
BG
GND
GND
FB
C27
1uF
0603
50V
10uH
L4
5.2A
R24
0.1 Ohm
R25
0.1 Ohm
0805
1/4W
J17
Conn_01x03
5V2_A
5.2V, approx 3A estimated max
Powers Banana Pi and the SATA HDD connected to Pi
R27
5.4k
0603
R29
1k
0603
C28
22uF
10V
0805
C29
22uF
10V
0805
R26
10k
0603
R28
10k
0603
C30
0.01uF
10V
0603
ADC_5V2_A_V
Vadc = 5V2_A / 2
PWM_5V2_A
C31
1uF
50V
0603
R35
0 Ohm
0603
Q2
DMN6068LK3
60V
6A
R30
1k
0603
R31
1k
0603
VCC
C32
0.1uF
50V
0603
U4A
TS462CDT
R33
100 Ohm
0603
ADC_5V2_A_I
R34
49.9k
0603
R36
49.9k
0603
C33
100pF
25V
0603
Current Sense Amplifier
Gain = 49.9
Vadc = 2.495 * Isense
90% eff @ 15.6Wout, 7.2Vin: 2.4Ain
Vin
1uH
L5
3.4A
C34
22uF
50V
1206
C35
22uF
50V
1206
C36
22uF
50V
1206
GND
U15
RT7258GSP
VIN
BOOT
VCC
SW
EN/SYNC
BG
GND
GND
FB
C21
1uF
0603
50V
10uH
L6
5.2A
R37
0.1 Ohm
R38
0.1 Ohm
0805
1/4W
J16
Conn_01x03
5V2_B
5.2V, approx 3A estimated max
Powers external backup SATA HDD (output is USB,
then converts to SATA via adapter)
R32
5.4k
0603
R40
1k
0603
C38
22uF
10V
0805
C39
22uF
10V
0805
R39
10k
0603
R41
10k
0603
C40
0.01uF
10V
0603
ADC_5V2_B_V
Vadc = 5V2_B / 2
PWM_5V2_B
C17
1uF
50V
0603
R20
0 Ohm
0603
Q1
DMN6068LK3
60V
6A
R43
1k
0603
R44
1k
0603
VCC
U4B
TS462CDT
R46
100 Ohm
0603
ADC_5V2_B_I
R48
49.9k
0603
R49
49.9k
0603
C42
100pF
25V
0603
Current Sense Amplifier
Gain = 49.9
Vadc = 2.495 * Isense
Sheet: /5V2_Supplies/
File: 5V2_Supplies.sch
Title: 5V2_Supplies
Size: A
Date: 2018-06-14
Rev: 02
KiCad E.D.A. kicad 4.0.7
Id: 4/12

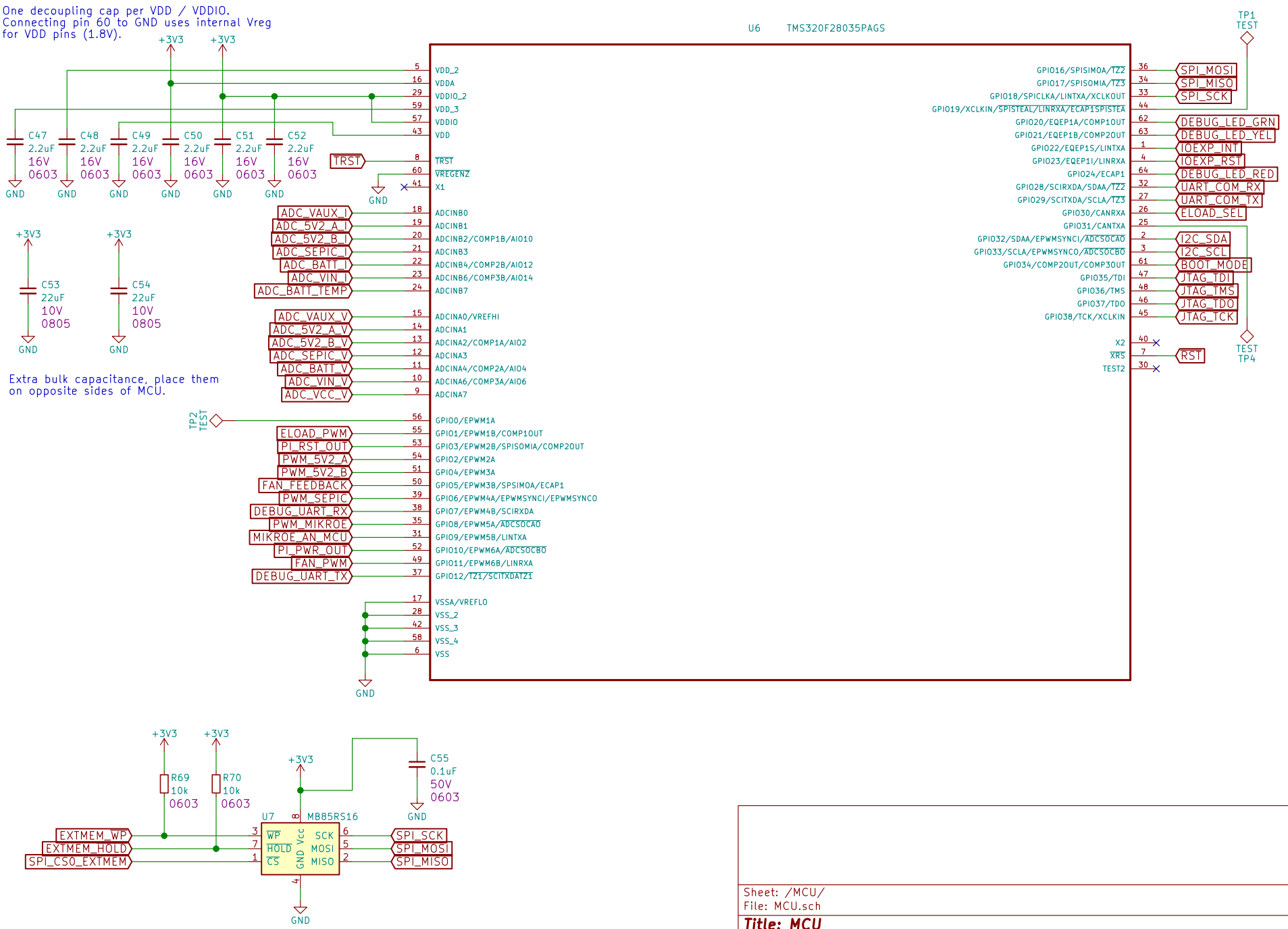


Sheet: /Battery_Charger/	
File: Battery_Charger.sch	
Title: Battery_Charger	
Size: A	Date: 2018-06-13
KiCad E.D.A. kicad 4.0.7	Id: 5/12

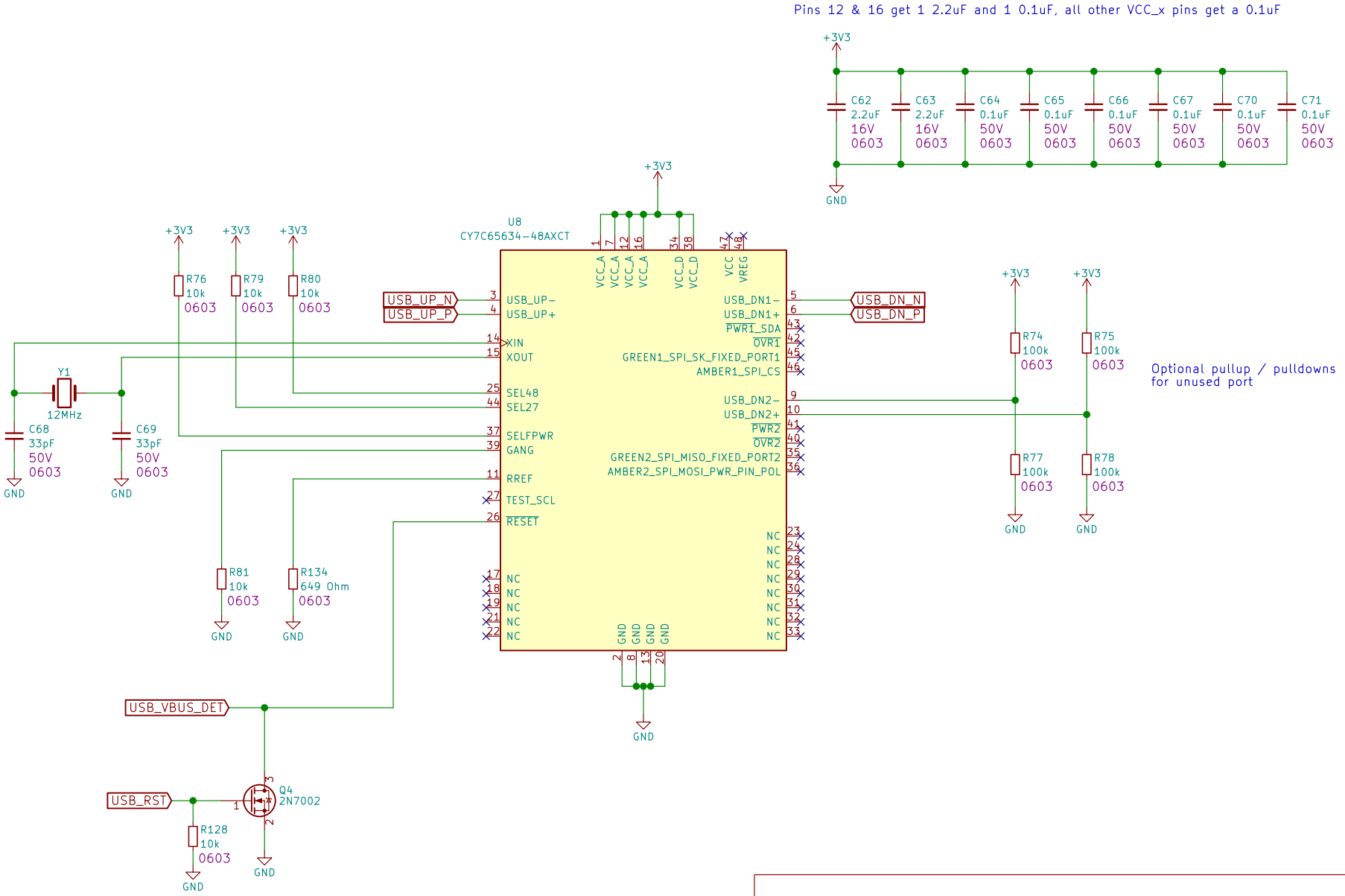
Rev: 02

One decoupling cap per VDD / VDDIO.
Connecting pin 60 to GND uses internal Vreg
for VDD pins (1.8V).

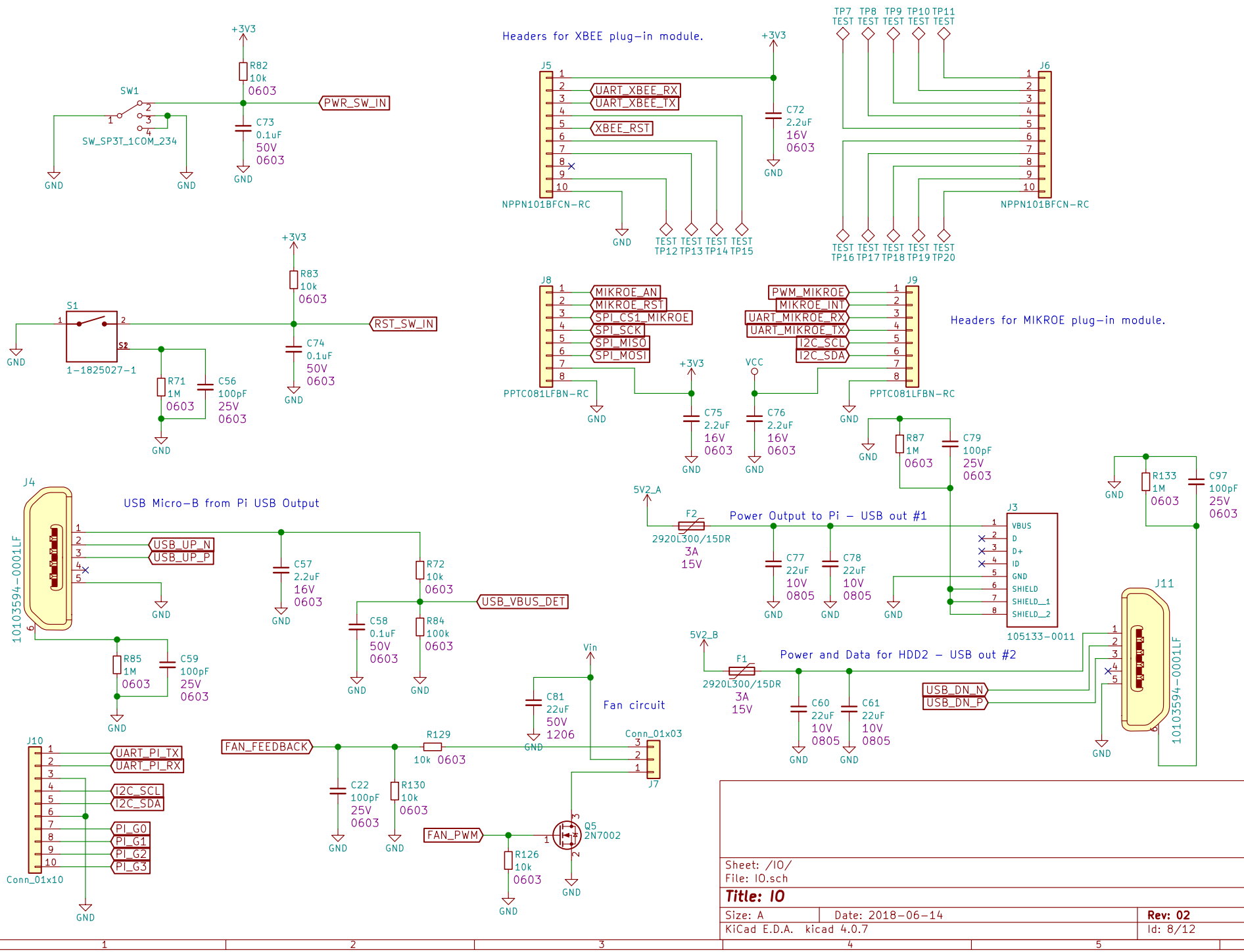
Extra bulk capacitance, place them
on opposite sides of MCU.



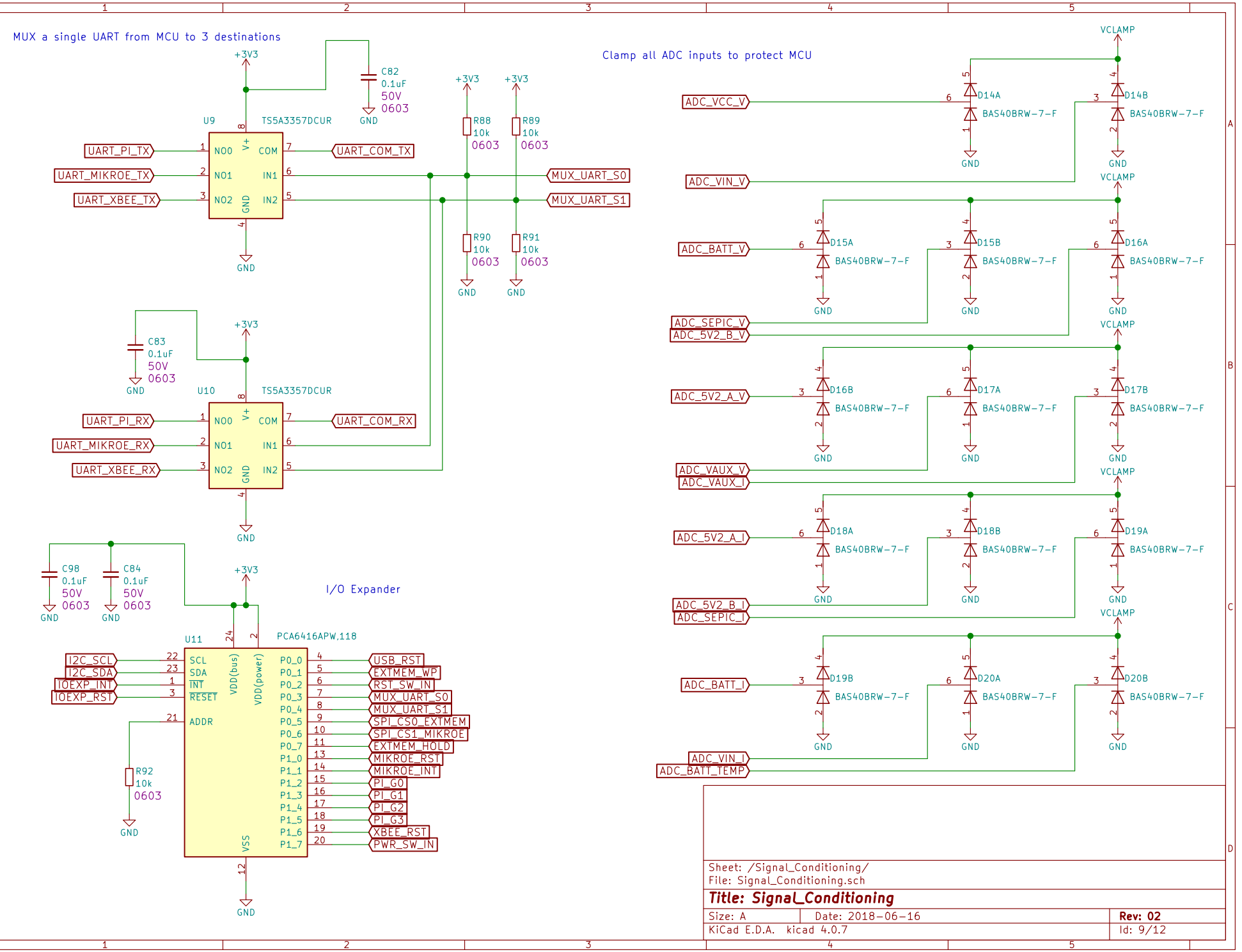
Sheet: /MCU/		
File: MCU.sch		
Title: MCU		
Size: A	Date: 2018-06-16	**Rev: 02**
KiCad E.D.A. kicad 4.0.7		Id: 6/12

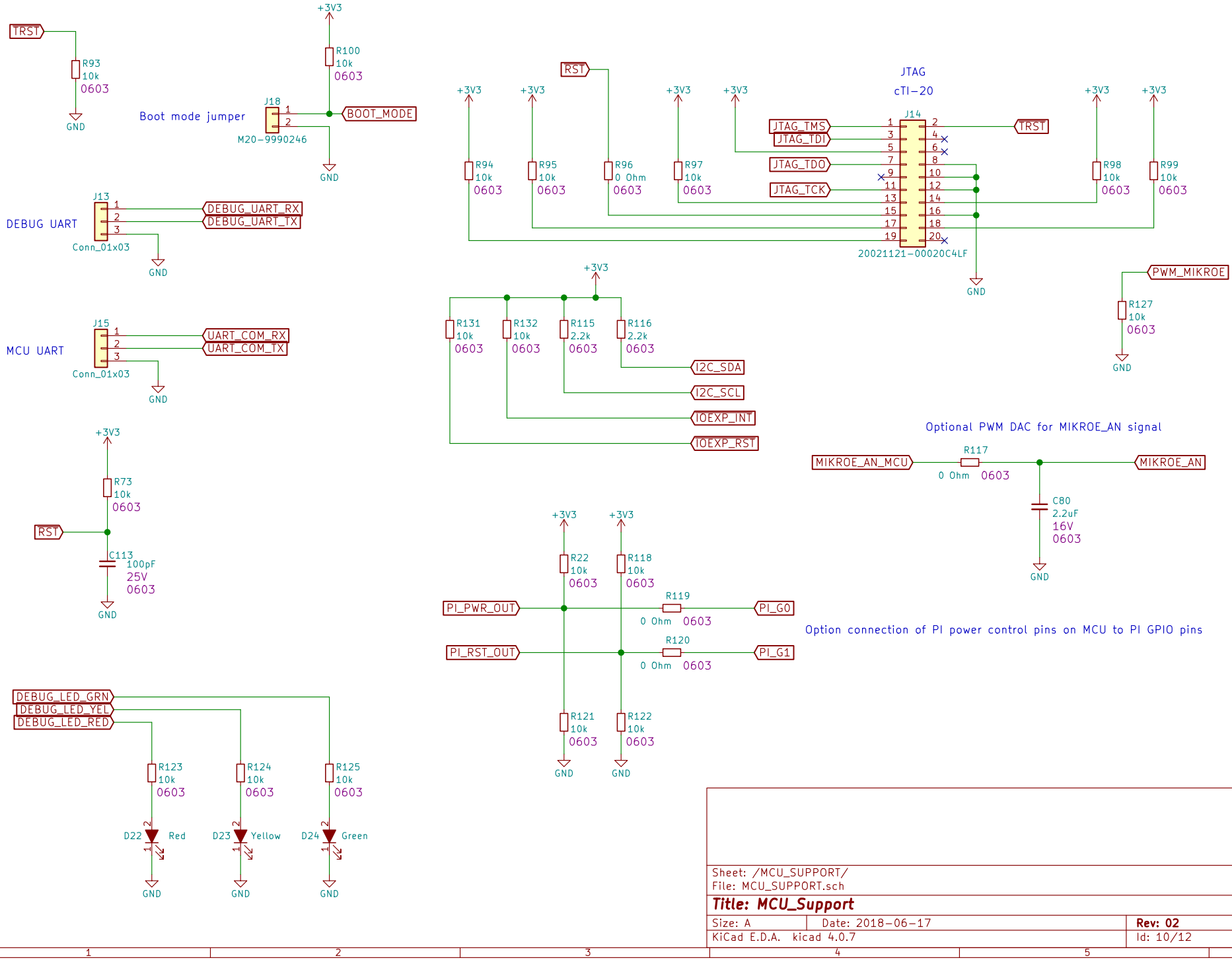


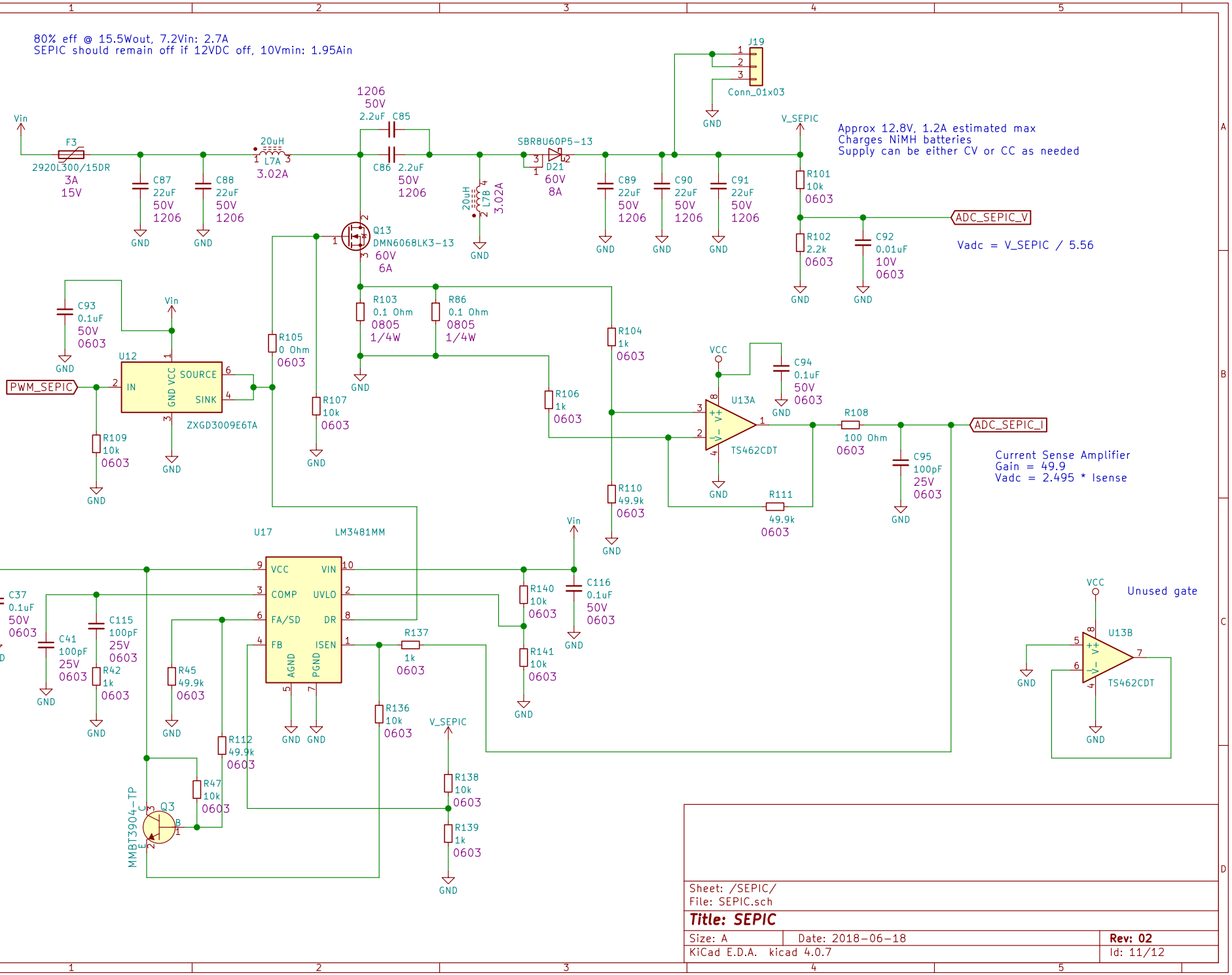
Sheet: /USB/		
File: USB.sch		
Title: USB		
Size: A	Date: 2018-06-13	**Rev: 02**
KiCad E.D.A. kicad 4.0.7		Id: 7/12



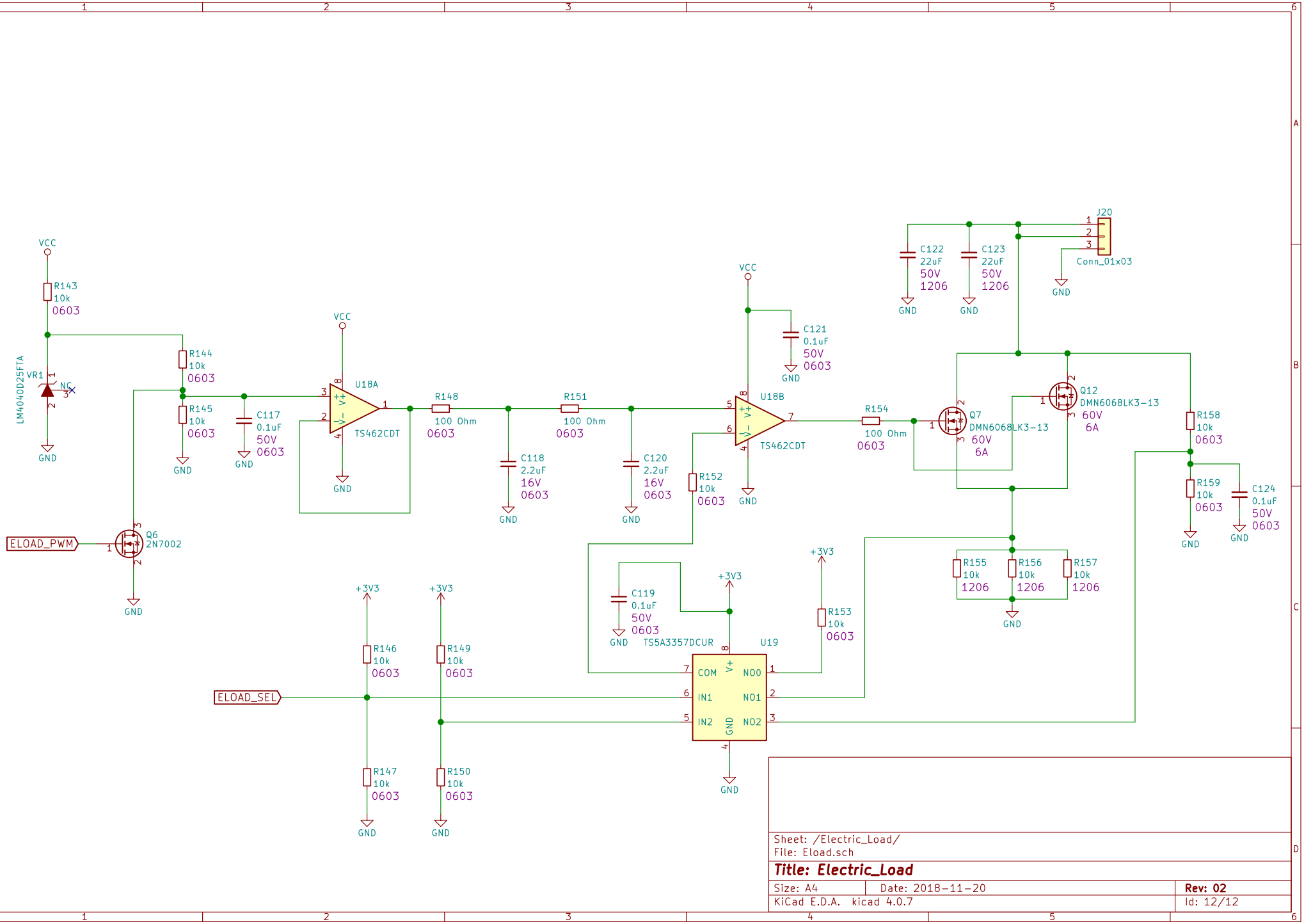
Sheet: /IO/		
File: IO.sch		
Title: IO		
Size: A	Date: 2018-06-14	**Rev: 02**
KiCad E.D.A. kicad 4.0.7		Id: 8/12


MUX a single UART from MCU to 3 destinations
U9
TS5A3357DCUR
UART_PI_TX
UART_MIKROE_TX
UART_XBEE_TX
UART_COM_TX
MUX_UART_S0
MUX_UART_S1
C82
0.1uF
50V
0603
R88
10k
0603
R89
10k
0603
R90
10k
0603
R91
10k
0603
U10
TS5A3357DCUR
C83
0.1uF
50V
0603
UART_PI_RX
UART_MIKROE_RX
UART_XBEE_RX
UART_COM_RX
I/O Expander
U11
PCA6416APW,118
C98
0.1uF
50V
0603
C84
0.1uF
50V
0603
I2C_SCL
I2C_SDA
IOEXP_INT
IOEXP_RST
R92
10k
0603
USB_RST
EXTMEM_WP
RST_SW_IN
MUX_UART_S0
MUX_UART_S1
SPI_CS0_EXTMEM
SPI_CS1_MIKROE
EXTMEM_HOLD
MIKROE_RST
MIKROE_INT
PI_G0
PI_G1
PI_G2
PI_G3
XBEE_RST
PWR_SW_IN
Clamp all ADC inputs to protect MCU
VCLAMP
D14A
D14B
D15A
D15B
D16A
D16B
D17A
D17B
D18A
D18B
D19A
D19B
D20A
D20B
BAS40BRW-7-F
ADC_VCC_V
ADC_VIN_V
ADC_BATT_V
ADC_SEPIC_V
ADC_5V2_B_V
ADC_5V2_A_V
ADC_VAUX_V
ADC_VAUX_I
ADC_5V2_A_I
ADC_5V2_B_I
ADC_SEPIC_I
ADC_BATT_I
ADC_VIN_I
ADC_BATT_TEMP
Sheet: /Signal_Conditioning/
File: Signal_Conditioning.sch
Title: Signal_Conditioning
Size: A
Date: 2018-06-16
Rev: 02
KiCad E.D.A. kicad 4.0.7
Id: 9/12


TRST
R93
10k
0603
GND
+3V3
R100
10k
0603
Boot mode jumper
J18
M20-9990246
BOOT_MODE
GND
DEBUG UART
J13
DEBUG_UART_RX
DEBUG_UART_TX
Conn_01x03
GND
MCU UART
J15
UART_COM_RX
UART_COM_TX
Conn_01x03
GND
+3V3
R73
10k
0603
RST
C113
100pF
25V
0603
GND
DEBUG_LED_GRN
DEBUG_LED_YEL
DEBUG_LED_RED
R123
10k
0603
R124
10k
0603
R125
10k
0603
D22
Red
D23
Yellow
D24
Green
GND
GND
GND
RST
+3V3
+3V3
+3V3
+3V3
JTAG
cTI-20
J14
JTAG_TMS
JTAG_TDI
JTAG_TDO
JTAG_TCK
TRST
20021121-00020C4LF
R94
10k
0603
R95
10k
0603
R96
0 Ohm
0603
R97
10k
0603
R98
10k
0603
R99
10k
0603
GND
+3V3
R131
10k
0603
R132
10k
0603
R115
2.2k
0603
R116
2.2k
0603
I2C_SDA
I2C_SCL
IOEXP_INT
IOEXP_RST
PWM_MIKROE
R127
10k
0603
GND
Optional PWM DAC for MIKROE_AN signal
MIKROE_AN_MCU
R117
0 Ohm
0603
MIKROE_AN
C80
2.2uF
16V
0603
GND
+3V3
+3V3
R22
10k
0603
R118
10k
0603
PI_PWR_OUT
R119
0 Ohm
0603
PI_G0
PI_RST_OUT
R120
0 Ohm
0603
PI_G1
R121
10k
0603
R122
10k
0603
GND
GND
Option connection of PI power control pins on MCU to PI GPIO pins
Sheet: /MCU_SUPPORT/
File: MCU_SUPPORT.sch
Title: MCU_Support
Size: A
Date: 2018-06-17
Rev: 02
KiCad E.D.A. kicad 4.0.7
Id: 10/12



Sheet: /SEPIC/		
File: SEPIC.sch		
Title: SEPIC		
Size: A	Date: 2018-06-18	**Rev: 02**
KiCad E.D.A. kicad 4.0.7		Id: 11/12


VCC
R143
10k
0603
R144
10k
0603
R145
10k
0603
VR1
LM4040D25FTA
NC
GND
C117
0.1uF
50V
0603
U18A
TS462CDT
R148
100 Ohm
0603
R151
100 Ohm
0603
C118
2.2uF
16V
0603
C120
2.2uF
16V
0603
U18B
C121
0.1uF
50V
0603
R152
10k
0603
R154
100 Ohm
0603
C122
22uF
50V
1206
C123
22uF
50V
1206
J20
Conn_01x03
Q7
DMN6068LK3-13
60V
6A
Q12
DMN6068LK3-13
60V
6A
R158
10k
0603
R159
10k
0603
C124
0.1uF
50V
0603
R155
10k
1206
R156
10k
1206
R157
10k
1206
ELOAD_PWM
Q6
2N7002
+3V3
R146
10k
0603
R149
10k
0603
R147
10k
0603
R150
10k
0603
ELOAD_SEL
C119
0.1uF
50V
0603
TS5A3357DCUR
U19
COM
IN1
IN2
V+
GND
NO0
NO1
NO2
R153
10k
0603
Sheet: /Electric_Load/
File: Eload.sch
Title: Electric_Load
Size: A4
Date: 2018-11-20
Rev: 02
KiCad E.D.A. kicad 4.0.7
Id: 12/12