

Project: STM32L4 Quadcopter

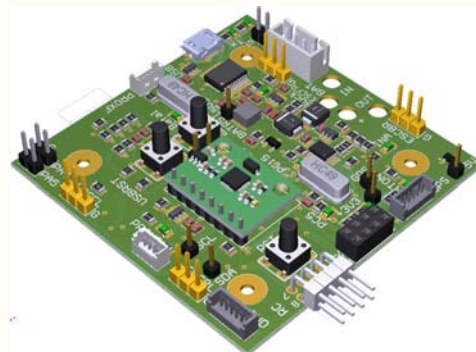
Description: Quadcopter Control Board

1/1/2018
Rev00

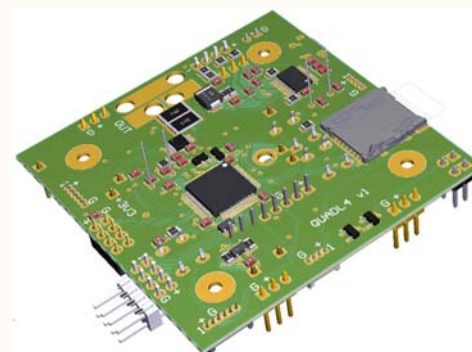
Built on Dec-2017

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TOP VIEW

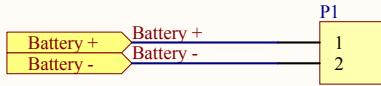


BOTTOM VIEW

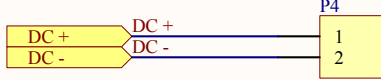


Title			[01] - Cover Page.SchDoc
Size	Number	Revision	
A3	STM32L4 Quadcopter	00	
Date:	1/1/2018	Sheet 1 of 12	
File:	\\.\M011 - Cover Page.SchDoc	Drawn By: GC	

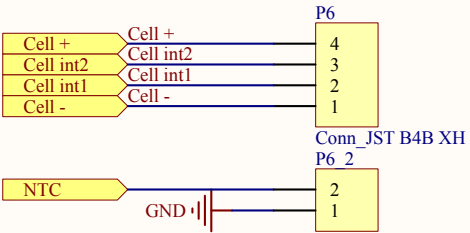
Battery Input
Passthrough for current/voltage measurement



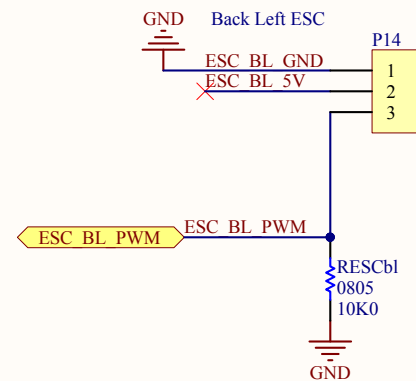
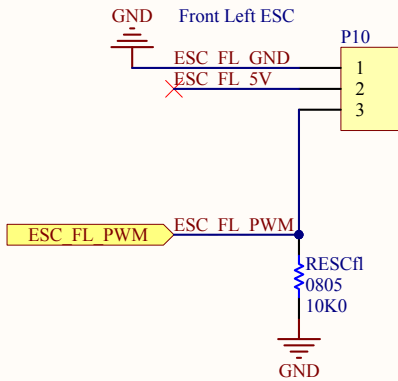
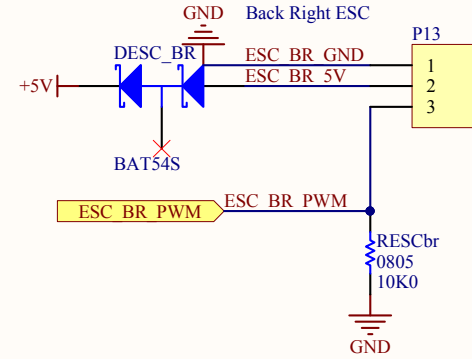
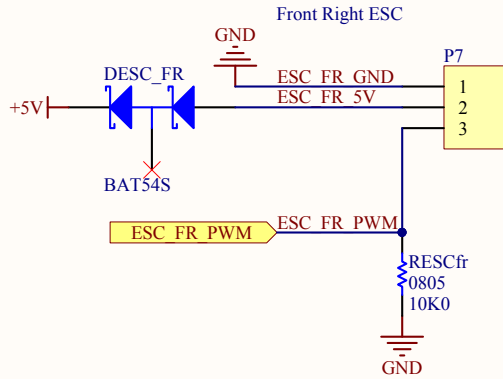
Battery Output



Battery Monitor
Connect to power board and 10k NTC



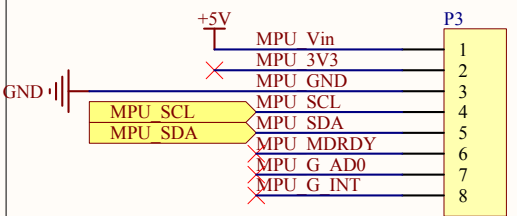
ESC Command
Period: 8ms, Control: 1ms to 2ms



Title			[02] - Battery and ESC Connections.SchDoc
Size	Number	Revision	
A	STM32L4 Quadcopter	00	
Date:	1/1/2018	Sheet 2 of 12	
File:	\\.\[02] - Battery and ESC Connections.SchDoc		

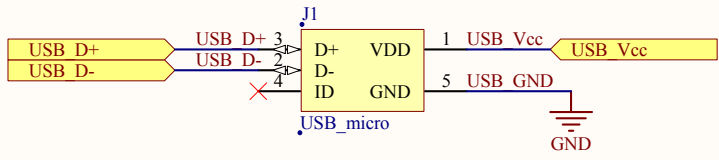
MPU Connector

Soldered to TOP



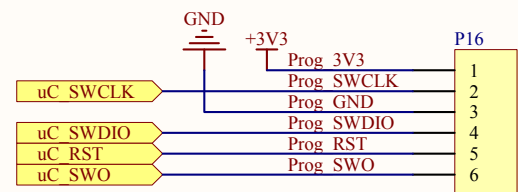
USB Mini Connector

used for power/comms



Programming Header

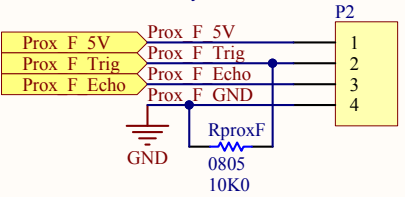
1.25mm 6way Picoblade



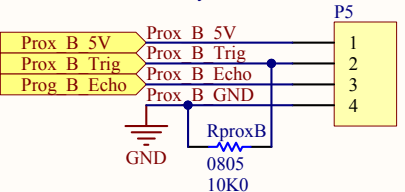
Proximity Sensors

1.25mm 4way Picoblade

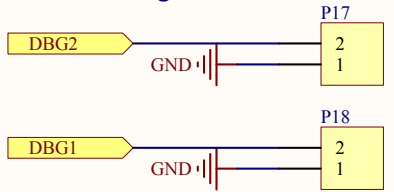
Front Proximity Sensor Connector



Bottom Proximity Sensor Connector

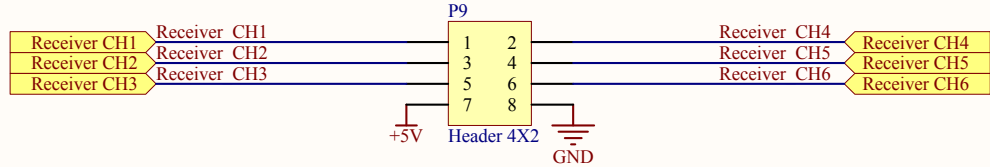


Debug Connectors



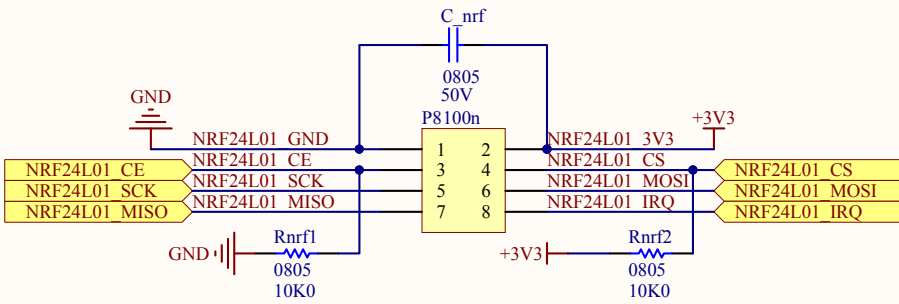
Receiver Connectors

2.54mm 2x4 Dupont, 3.3V I/O



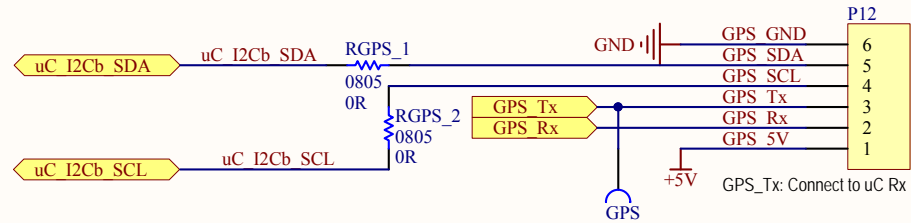
NRF24L01+ Connector

2.54mm 2x4 Dupont, 3.3V I/O



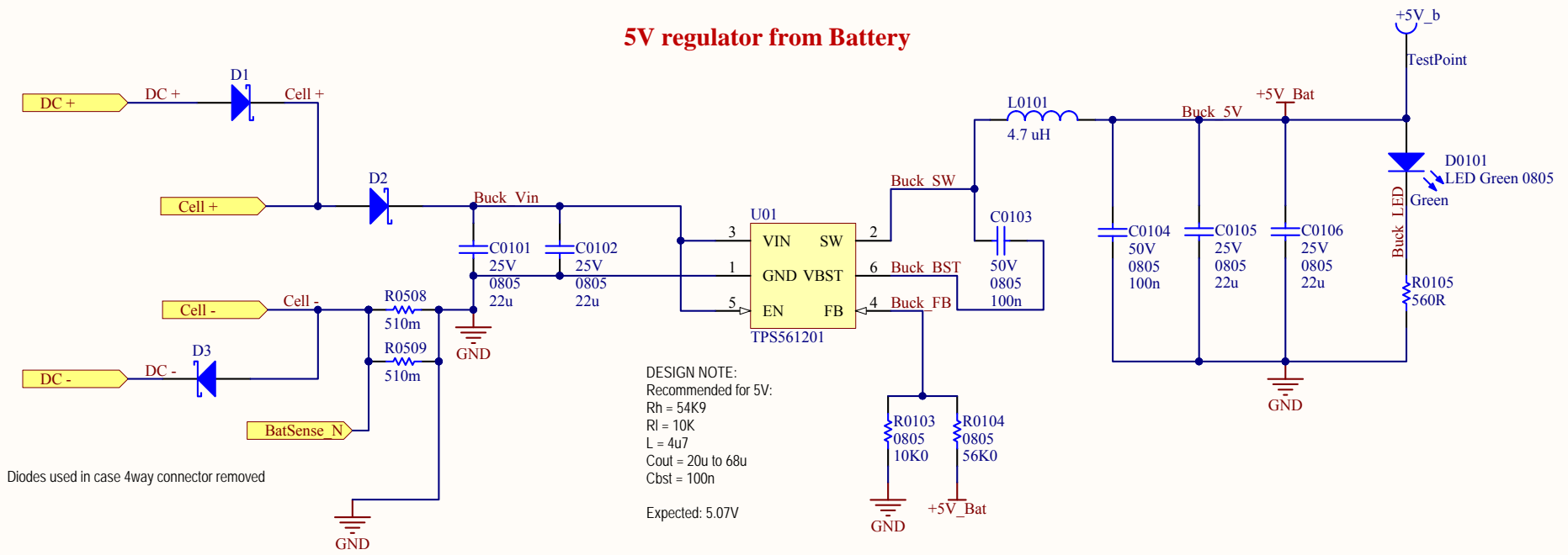
uBlox GPS Connector

1.25mm 6way Picoblade



Title			[03] - LV connections.SchDoc		
Size	Number	Revision			
A	STM32L4 Quadcopter	00			
Date:	1/1/2018	Sheet 3 of	12		
File:	\\.\[03] - LV connections.SchDoc	Drawn By:	GC		

5V regulator from Battery

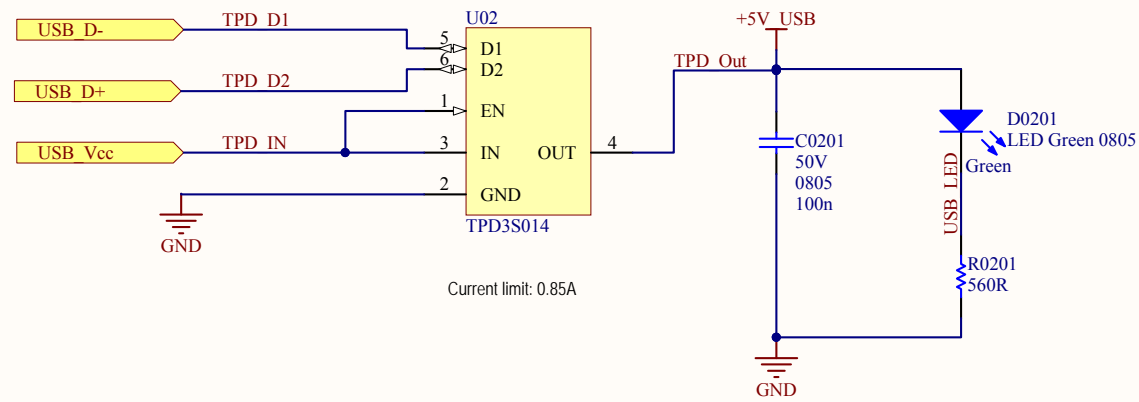


Diodes used in case 4way connector removed

DESIGN NOTE:
 Recommended for 5V:
 Rh = 54K9
 RI = 10K
 L = 4u7
 Cout = 20u to 68u
 Cbst = 100n
 Expected: 5.07V

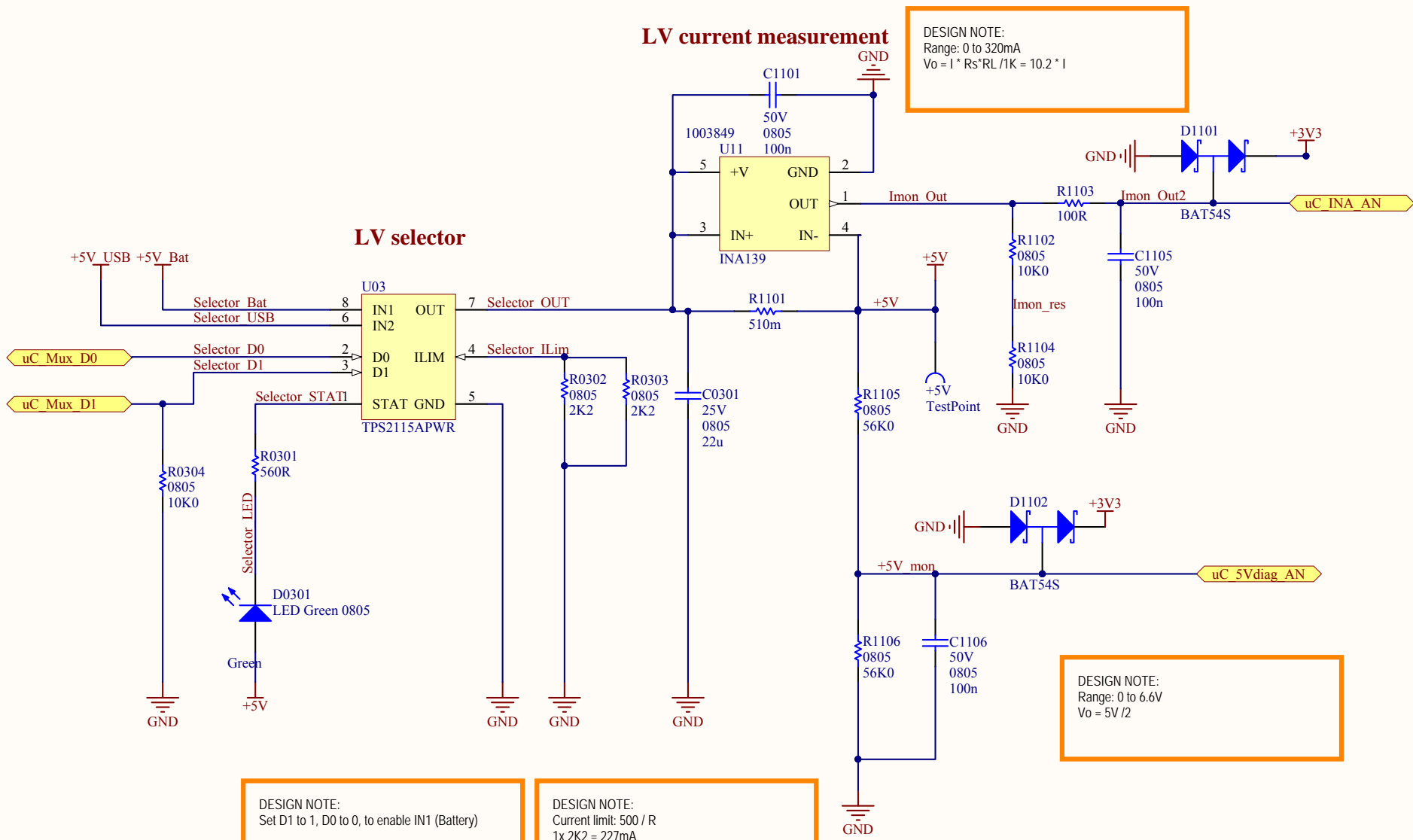
Title			[04] - Battery Power.SchDoc
Size	Number	Revision	
A	STM32L4 Quadcopter	00	
Date:	1/1/2018	Sheet 4 of 12	
File:	\\.\[04] - Battery Power.SchDoc	Drawn By: GC	

USB ESD protection and current limit



Title			[05] - USB Power.SchDoc		
Size	Number		Revision		
A	STM32L4 Quadcopter		00		
Date:	1/1/2018		Sheet 5 of 12		
File:	\\.\[05] - USB Power.SchDoc		Drawn By: GC		

LV source selector and current Measurement



DESIGN NOTE:
 Range: 0 to 320mA
 $V_o = I * R_s * R_L / 1K = 10.2 * I$

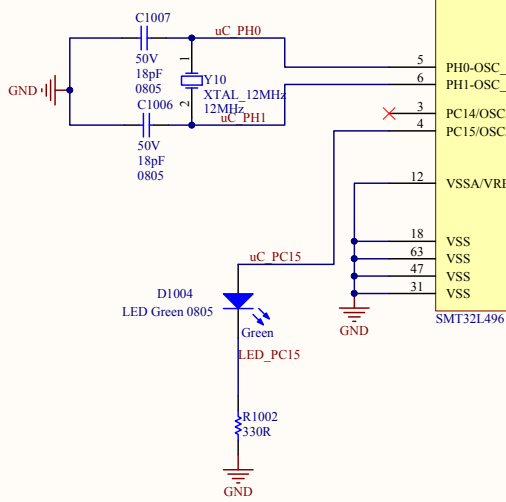
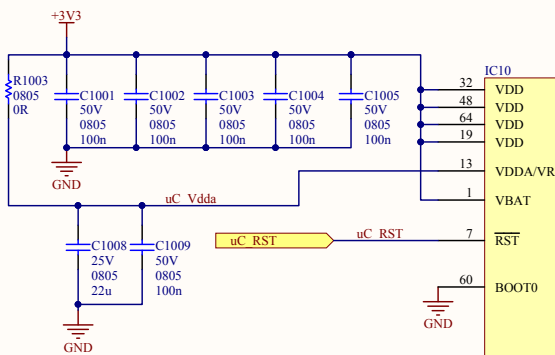
DESIGN NOTE:
 Set D1 to 1, D0 to 0, to enable IN1 (Battery)

DESIGN NOTE:
 Current limit: 500 / R
 1x 2K2 = 227mA
 2x 2K2 = 455mA

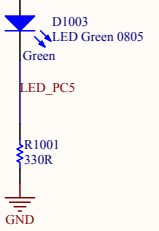
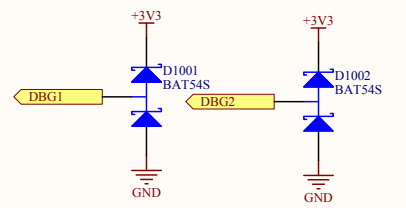
DESIGN NOTE:
 Range: 0 to 6.6V
 $V_o = 5V / 2$

Title			[06] - Power Selector.SchDoc		
Size	Number	Revision			
A	STM32L4 Quadcopter	00			
Date:	1/1/2018	Sheet 6 of 12			
File:	\\.\[06] - Power Selector.SchDoc	Drawn By: GC			

Microcontroller



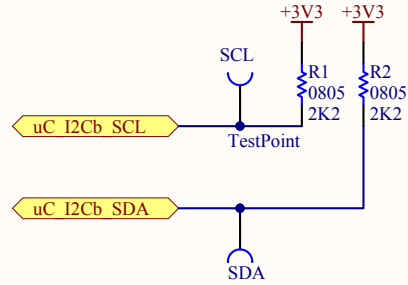
Pin	Signal	Component
14	uC PA0	GPS Rx
15	uC PA1	Prox F Echo
16	uC PA2	Prox B Echo
17	uC PA3	Prox F Trig
20	uC PA4	DBG1
21	uC PA5	DBG2
22	uC PA6	uC Mux D0
23	uC PA7	uC Mux D1
41	uC PA8	Receiver CH5
42	uC PA9	Receiver CH2
43	uC PA10	Receiver CH6
44	uC PA11	Receiver CH3
45	uC PA12	uC USB CTS
46	uC PA13	uC SWDIO
49	uC PA14	uC SWCLK
50	uC PA15	Prox B Trng
26	uC PB0	ESC FR PWM
33	uC PB12	NRF24L01 CE
57	uC PB5	uC ProximityCommand
27	uC PB1	ESC BR PWM
28	uC PB2	NRF24L01 CS
55	uC PB3	uC SWO
56	uC PB4	uC USB RTS
58	uC PB6	uC USB Rx
59	uC PB7	uC USB Tx
61	uC PB8	MPU SCL
62	uC PB9	MPU SDA
29	uC PB10	uC I2Cb SCL
30	uC PB11	uC I2Cb SDA
34	uC PB13	NRF24L01 SCK
35	uC PB14	Receiver CH4
36	uC PB15	Receiver CH1
8	uC PC0	uC 5Vdiag AN
9	uC PC1	uC INA AN
10	uC PC2	NRF24L01 MISO
11	uC PC3	NRF24L01 MOSI
24	uC PC4	NRF24L01 IRQ
25	uC PC5	
37	uC PC6	ESC BL PWM
38	uC PC7	ESC FL PWM
39	uC PC8	uC SD D0
40	uC PC9	uC INA Alert
51	uC PC10	uC SD sw
52	uC PC11	GPS Tx
53	uC PC12	uC SD CLK
2	uC PC13	
54	uC PD2	uC SD CMD



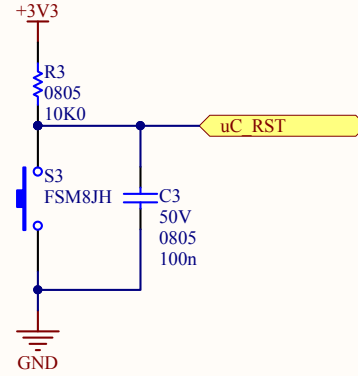
Title		
[07] - Microcontroller.SchDoc		
Size	Number	Revision
B	STM32L4 Quadcopter	00
Date:	1/1/2018	Sheet 7 of 12
File:	\\.\[07] - Microcontroller.SchDoc	Drawn By: GC

Microcontroller Peripherals

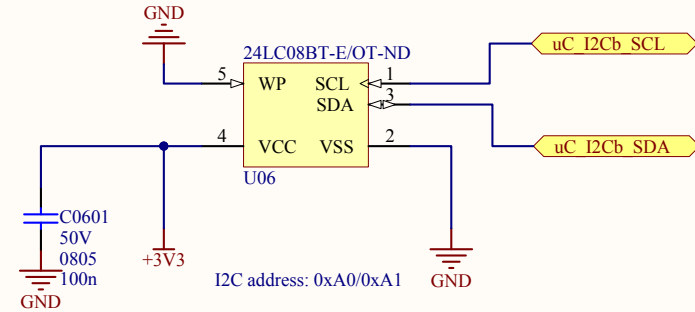
I2Cb pullups



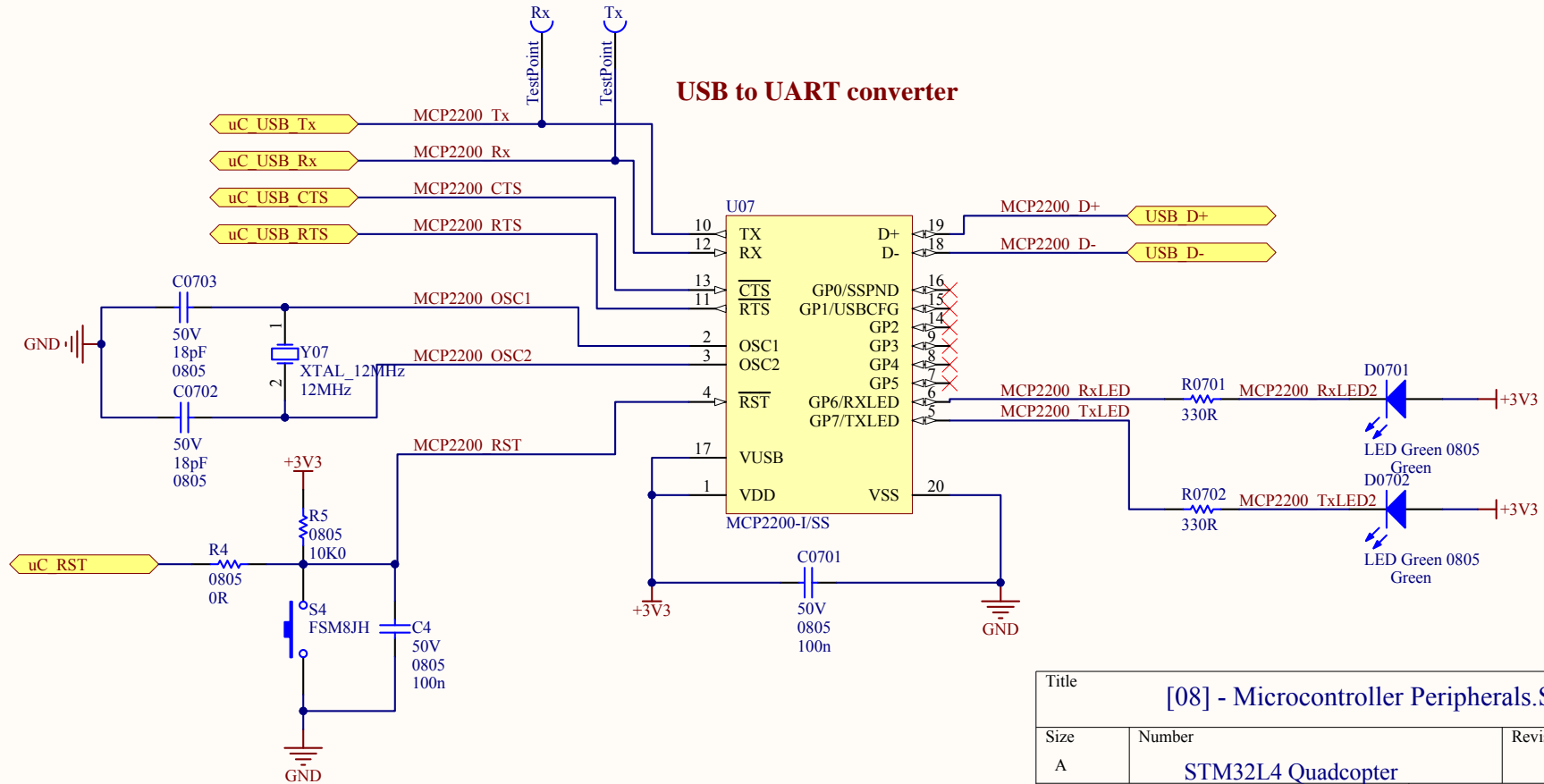
Reset



8kbit I2C EEPROM

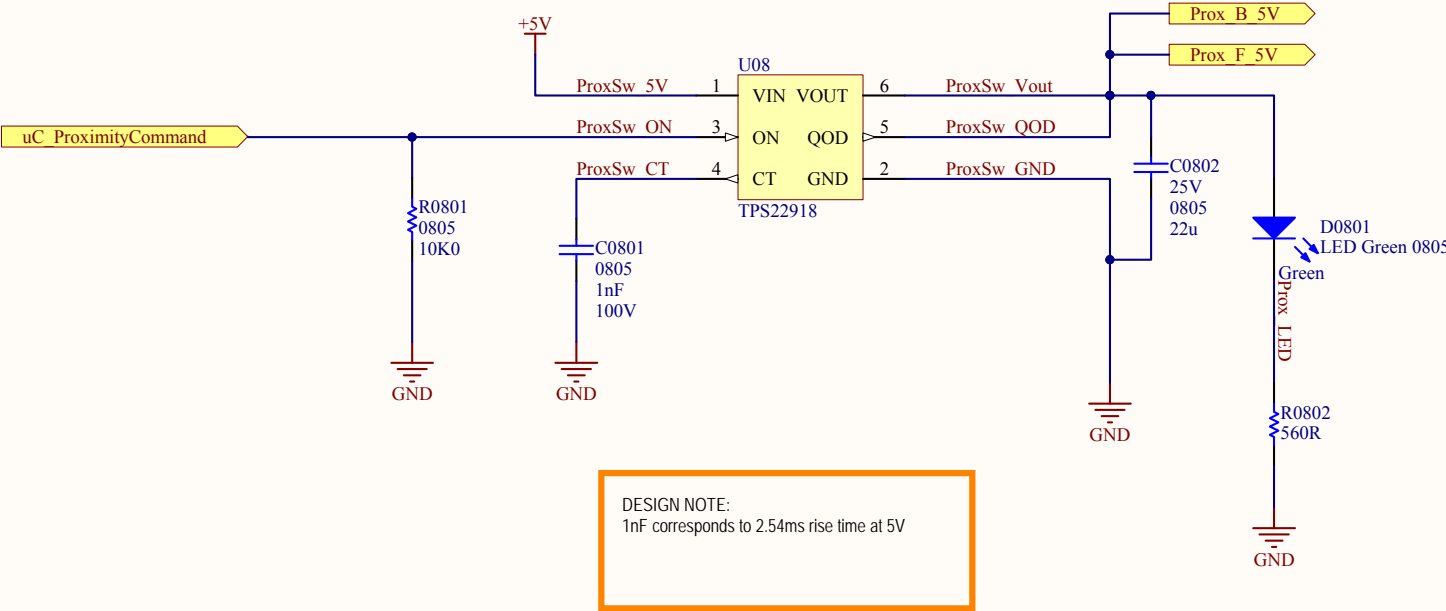


USB to UART converter



Title		
[08] - Microcontroller Peripherals.SchDoc		
Size	Number	Revision
A	STM32L4 Quadcopter	00
Date:	1/1/2018	Sheet 8 of 12
File:	\\.\[08] - Microcontroller Peripherals.SchDoc Drawn By: GC	

Proximity Sensors Switch

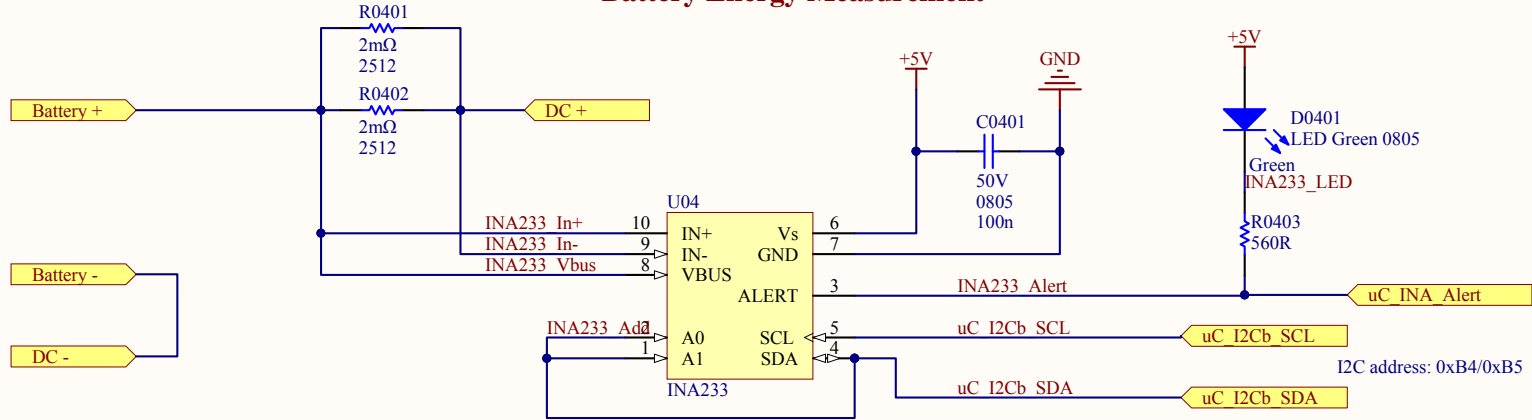


DESIGN NOTE:
 1nF corresponds to 2.54ms rise time at 5V

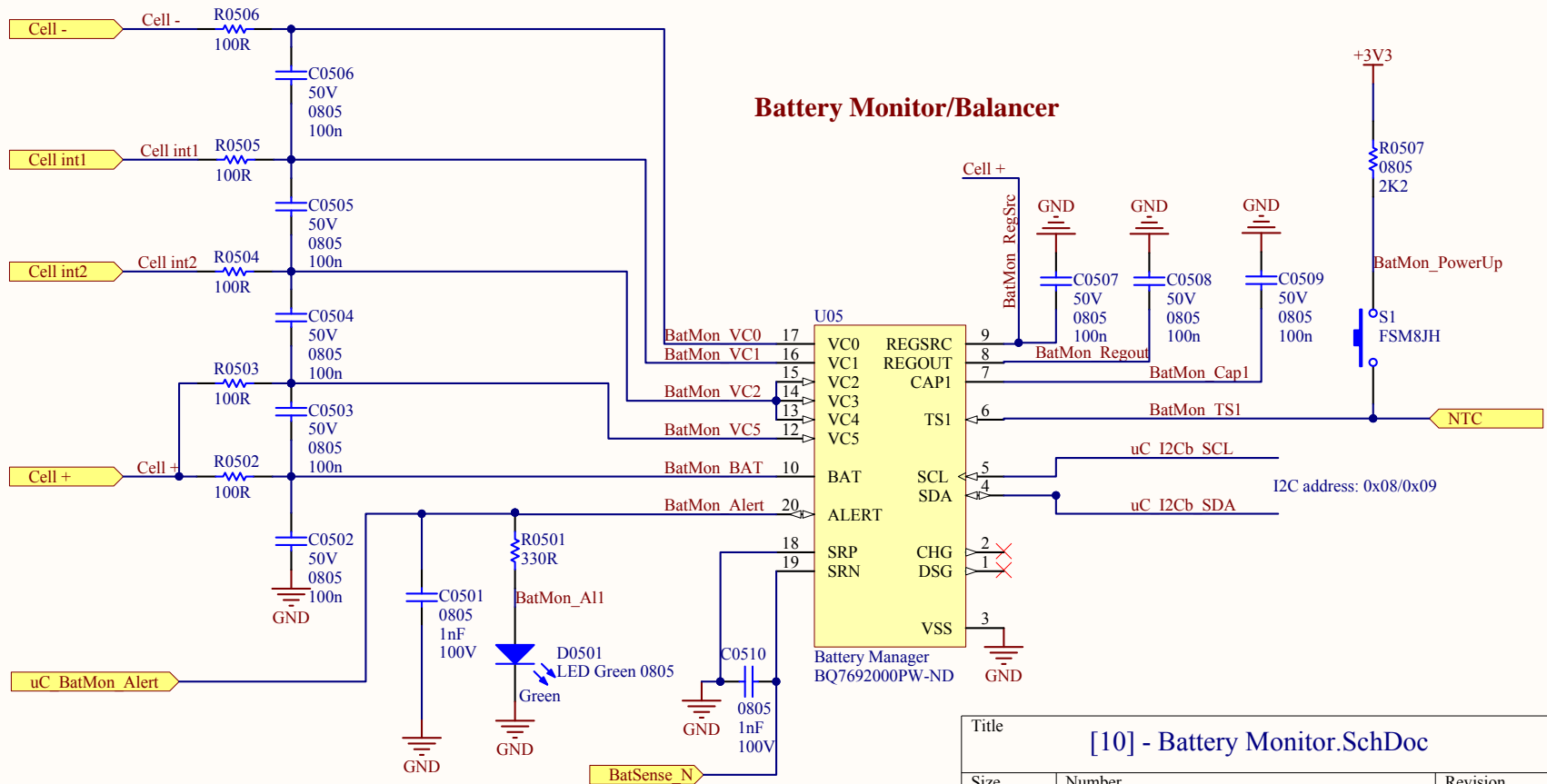
Title			[09] - Proximity Sensor Control.SchDoc
Size	Number	Revision	
A	STM32L4 Quadcopter	00	
Date:	1/1/2018	Sheet 9 of 12	
File:	\\.\[09] - Proximity Sensor Control.SchDoc	Drawn By: GC	

Battery Power/Energy Measurement, Monitor and Balancer

Battery Energy Measurement

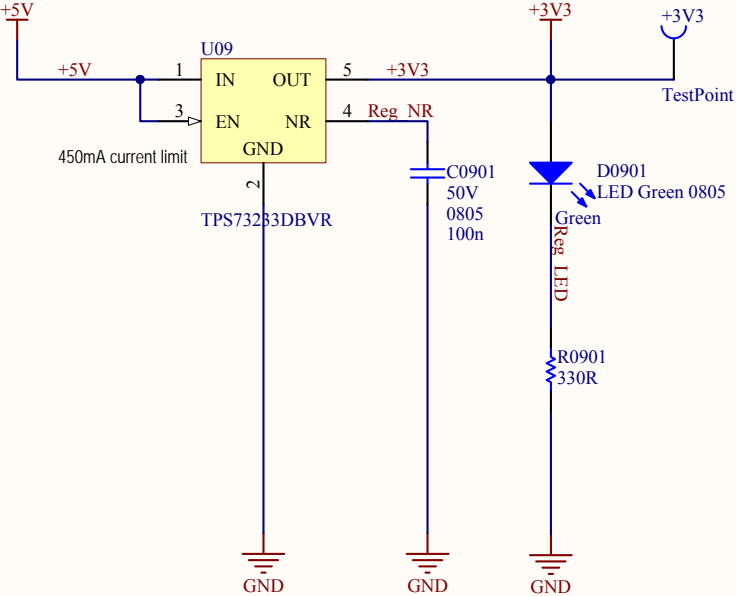


Battery Monitor/Balancer



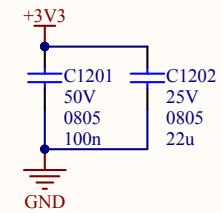
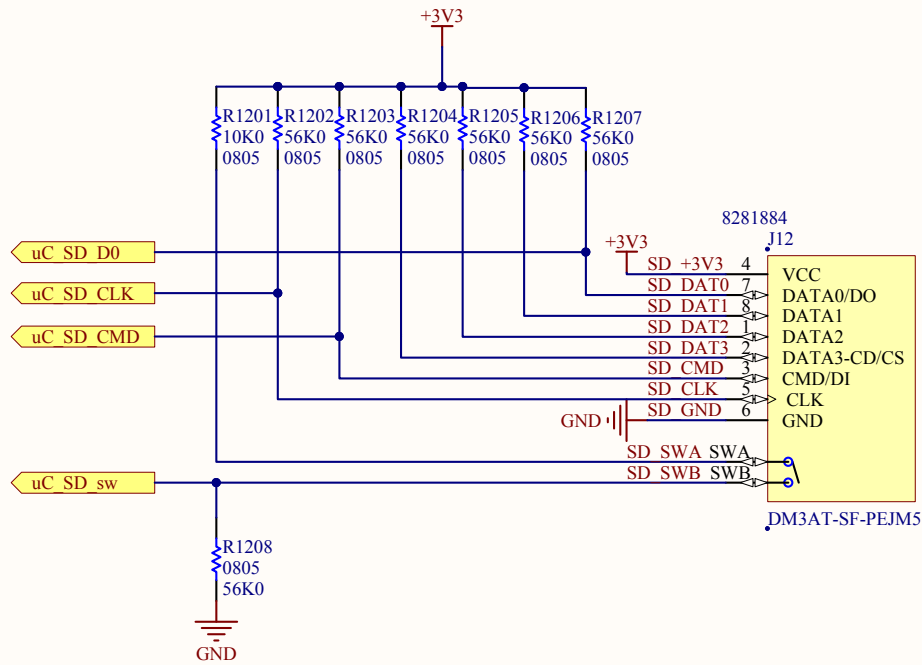
Title			[10] - Battery Monitor.SchDoc
Size	Number	Revision	
A	STM32L4 Quadcopter	00	
Date:	1/1/2018	Sheet10of 12	
File:	\\.\[10] - Battery Monitor.SchDoc	Drawn By:GC	

3V3 Regulator



Title			[11] - 3V3 Regulator.SchDoc		
Size	Number			Revision	
A	STM32L4 Quadcopter			00	
Date:	1/1/2018		Sheet 1 of 12		
File:	\\.\[11] - 3V3 Regulator.SchDoc		Drawn By: GC		

SDCard Slot



Title			[12] - SDCard.SchDoc		
Size	Number	Revision			
A	STM32L4 Quadcopter	00			
Date:	1/1/2018	Sheet 12 of	12		
File:	\\.\[12] - SDCard.SchDoc	Drawn By:	GC		