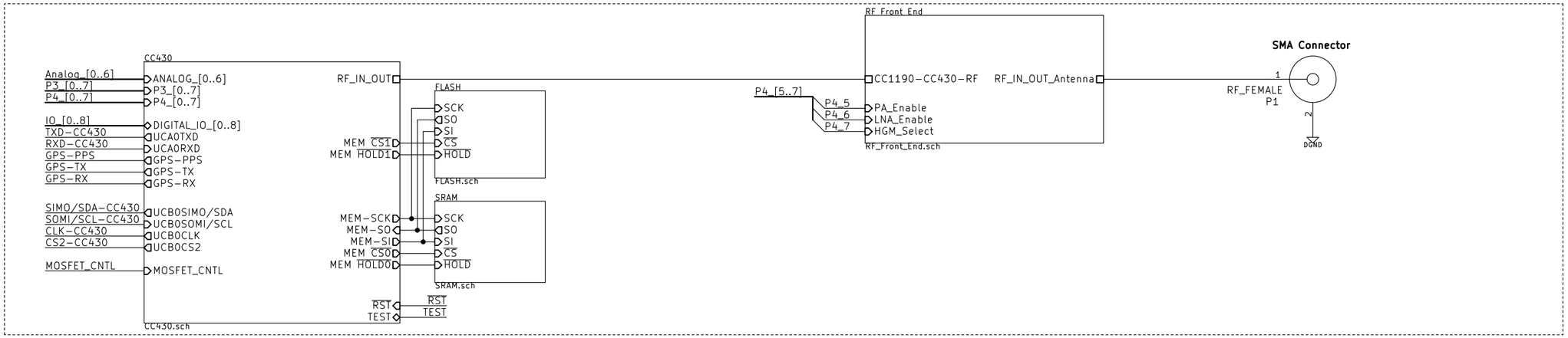
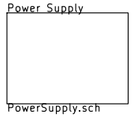
FaradayRF Wireless Node

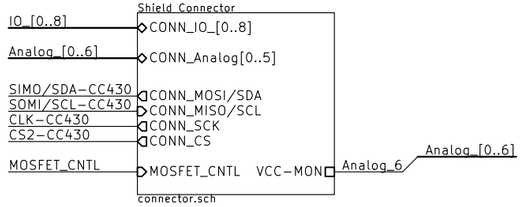
RF & Control Section



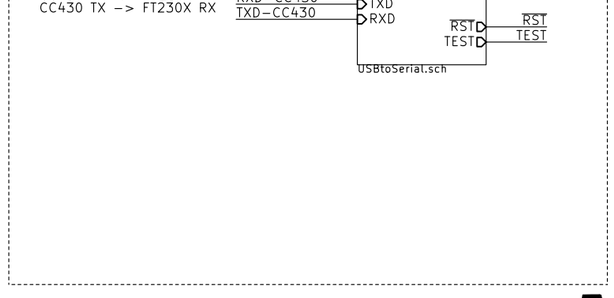
Voltage Regulator



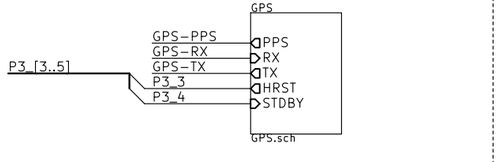
Connectors



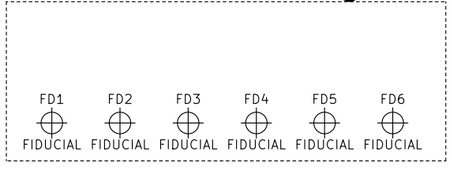
USB <-> UART



GPS Receiver



Manufacturing

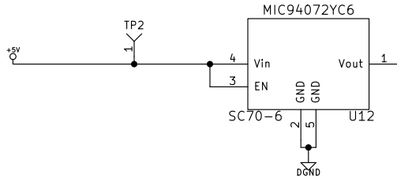


open source hardware

FaradayRF

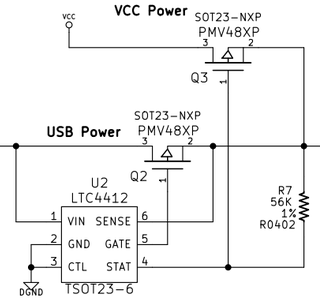
TAPR OHL V1.0: http://www.tapr.org/OHL Bryce Salmi (KB1LQC), Brenton Salmi (KB1LQD) www.FaradayRF.com *FaradayRF*		
File: Faraday.sch Sheet: /		
Title: Faraday Wireless Node		
Size: B	*Date: 19 nov 2016*	*Rev: D*
KiCad E.D.A.		Id: 1/11

USB Soft-Start

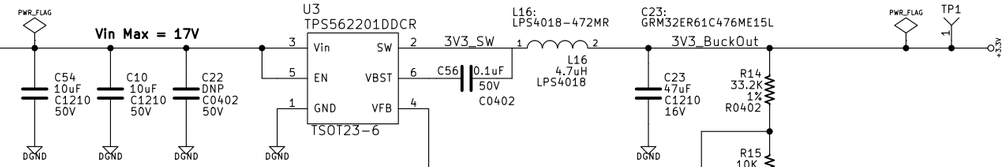


Decoupling capacitor makes no sense
Soft-start only relevant during startup transient...

Ideal Diode Controller



3.3V Buck Regulator - 0.5A



C54 & C10:
GRM32ER71H106KA12L

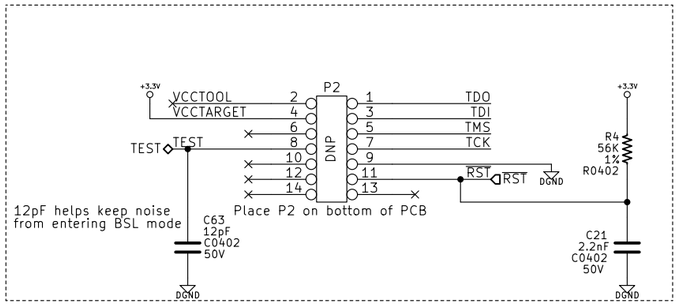
Cout: GRM32ER61C476ME15L

Provide kelvin connection
to switching DGND area

TAPR OHL V1.0: http://www.tapr.org/OHL Bryce Salmi (KB1LQC), Brenton Salmi (KB1LQD) www.FaradayRF.com *FaradayRF*		
File: PowerSupply.sch Sheet: /Power Supply/		
Title: Faraday Wireless Node		
Size: B	*Date: 19 nov 2016*	*Rev: D*
KiCad E.D.A.		Id: 2/11

TI Evaluation Module Schematic
http://www.ti.com/lit/ug/slau278t/slau278t.pdf

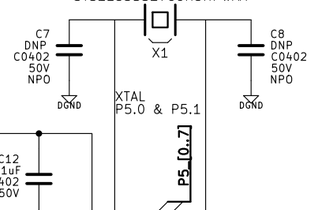
JTAG



http://processors.wiki.ti.com/index.php/File:JTAG_4_wire_pinout.JPG

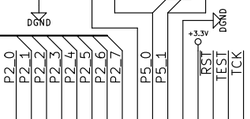
32.768KHz Watch Crystal

ST3215SB32768H5HPWAA



P4_[0..7]
P3_[0..7]
DIGITAL_IO_[0..8]

ANALOG_[0..6] — ADC_[0..6] — ADC Filters: ADC_[0..6] FILTER_OUT_[1..7] — ADC_Filters.sch — P2_[1..7]



P5_[0..7]

MOSFET_CNTL	P5_4	High Current MOSFET
UCA0RXD	P1_5	CC430 UCA UART
UCA0TXD	P1_6	
UCB0SIMO/SDA	P1_3	CC430 UCB SPI
UCB0SOMI/SCL	P1_2	
UCB0CLK	P1_4	
UCB0CS2	P1_1	
MEM-SO	P1_2	SPI SRAM & FLASH MEMORY – UCB0
MEM-SI	P1_3	
MEM-SCK	P1_4	
MEM CS0	P5_5	
MEM HOLD0	P5_6	
MEM CS1	P3_5	
MEM HOLD1	P5_7	
GPS-TX	P2_0	GPS
GPS-RX	P5_3	
GPS-PPS	P1_0	

P2_0 P2_1 P2_2 P2_3 P2_4 P2_5 P2_6 P2_7 P5_0 P5_1 RST TEST TCK

U1
CC430F6137
RGC

64 P2.0/_PM_CBOUT1/_PM_TA1CLK/_CB0_(/A0)
63 P2.1/_PM_TA1CCR0A/_CB1(/A1)
62 P2.2/_PM_TA1CCR1A/_CB2(/A2)
61 P2.3/_PM_TA1CCR2A/_CB3_(/A3)
60 P2.4/_PM_RTCCLK/_CB4_(/A4/_VREF-/_VeREF-)
59 P2.5/_PM_SVMOUT/_CB5_(/A5/_VREF+/_VeREF+)
58 P2.6/_PM_ACLK/_CB6_(/A6)
57 P2.7/_PM_ADC12CLK/_PM_DMAE0/_CB7_(/A7)
56 AVCC
55 P5.0/_XIN
54 P5.1/_XOUT
53 AVSS
52 DVCC
51 RST/_NMI/_SBWTDIO
50 TEST/_SBWTCK
49 PJ.3/_TCK

P1_[0..7]

P1_7	1	P1.7/_PM_UCA0CLK/_PM_UCB0STE/_R03
P1_6	2	P1.6/_PM_UCA0TXD/_PMUCA0SIMO/_R13/LCDREF
P1_5	3	P1.5/_PM_UCA0RXD/_PM_UCA0SOMI/_R23
	4	LCDCAP/_R33
P5_7	5	COM0
P5_6	6	P5.7/_COM1/_S26
P5_5	7	P5.6/_COM2/_S25
P5_4	8	P5.5/_COM3/_S24
	9	P5.4/_S23
	10	VCORE
	11	DVCC
P1_4	12	P1.4/_PM_UCB0CLK/_PM_UCA0STE/_S22
P1_3	13	P1.3/_PM_UCB0SIMO/_PM_UCB0SDA/_S21
P1_2	14	P1.2/_PM_UCB0SOMI/_PM_UCB0SCL/_S20
P1_1	15	P1.1/_PM_RFGDO2/_S19
P1_0	16	P1.0/_PM_RFGDO0/_S18

P2.0/_PM_CBOUT1/_PM_TA1CLK/_CB0_(/A0)
P2.1/_PM_TA1CCR0A/_CB1(/A1)
P2.2/_PM_TA1CCR1A/_CB2(/A2)
P2.3/_PM_TA1CCR2A/_CB3_(/A3)
P2.4/_PM_RTCCLK/_CB4_(/A4/_VREF-/_VeREF-)
P2.5/_PM_SVMOUT/_CB5_(/A5/_VREF+/_VeREF+)
P2.6/_PM_ACLK/_CB6_(/A6)
P2.7/_PM_ADC12CLK/_PM_DMAE0/_CB7_(/A7)

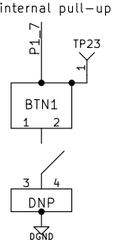
C45 470nF C0603 35V DGND

P1_[0..7]

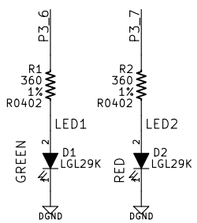
USCI_Ax modules support:
- UART mode
- Pulse shaping for IrDA communications
- Automatic baud-rate detection for LIN communications
- SPI mode

USCI_Bx modules support:
- I²C mode
- SPI mode

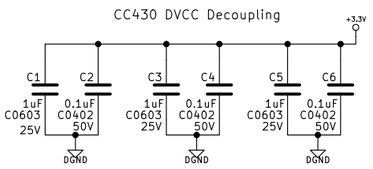
BTN1 uses internal pull-up resistor



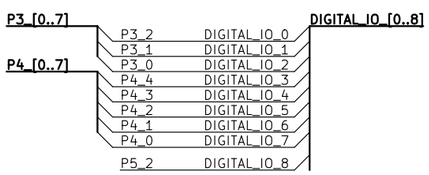
About 6mA per LED @ 3.3V



CC430 DVCC Decoupling



3.3V External GPIO Interface



P3_[0..7] P4_[0..7]

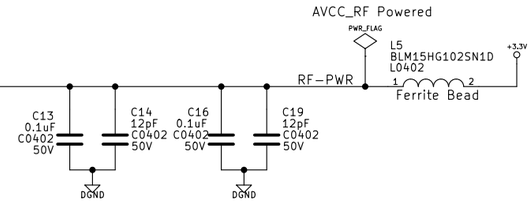
17 P3.7/_PM_SMCLK/_S17
18 P3.6/_PM_RFGDO1/S16
19 P3.5/_PM_TACCR4A/_S15
20 P3.4/_PM_TACCR3A/_S14
21 P3.3/_PM_TACCR2A/_S13
22 P3.2/_PM_TAOCCR1A/_S12
23 P3.1/_PM_TAOCCR0A/_S11
24 P3.0/_PM_CBOUT0/_PM_TACLK/_S10
25 DVCC
26 P4.7/_S9
27 P4.6/_S8
28 P4.5/_S7
29 P4.4/_S6
30 P4.3/_S5
31 P4.2/_S4
32 P4.1/_S3

VSS_-_EXPOSED_PAD 65 DGND

PJ.2/_TMS 48 TMS
PJ.1/_TDI/_TCLK 47 TDI
PJ.0/_TDO 46 TDO
GUARD 45
RBIAS 44 R3 56K 1% R0402 DGND
AVCC_RF 43
AVCC_RF 42
RF_N 41 RF_N
RF_P 40 RF_P
AVCC_RF 39
AVCC_RF 38
RF_XOUT 37
RF_XIN 36
P5.2/_S0 35 P5_2
P5.3/_S1 34 P5_3
P4.0/_S2 33 P4_0

P4_[0..7]
P5_[0..7]

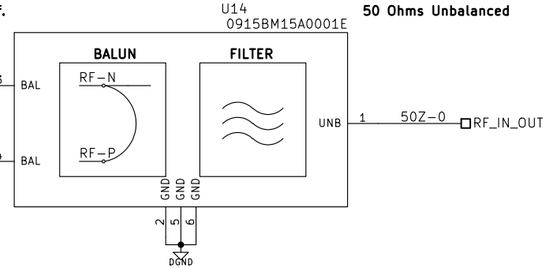
AVCC_RF Powered



100 Ohms Diff.

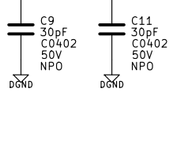
U14
0915BM15A0001E

50 Ohms Unbalanced



Application note for Balun/Filter is TI SWRA250A

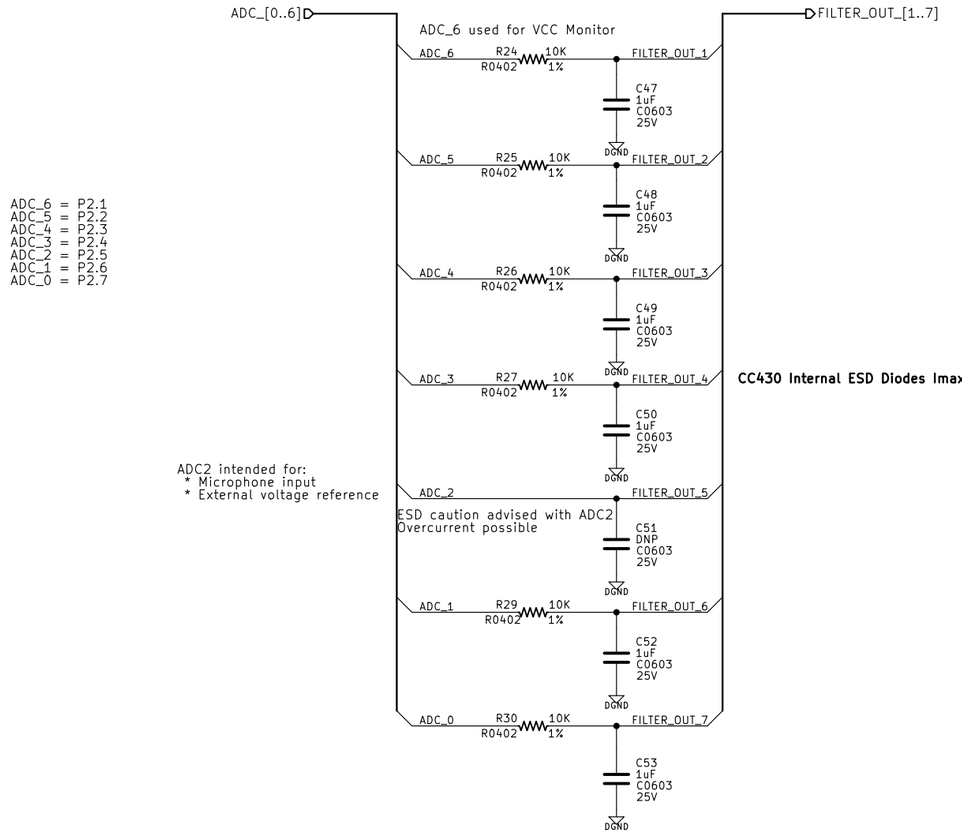
ABM8G
X2
ABM8G-26.000MHZ-18-D2Y-T



TAPR OHL V1.0: http://www.tapr.org/OHL		
Bryce Salmi (KB1LQC), Brenton Salmi (KB1LQD)		
www.FaradayRF.com		
FaradayRF		
File: CC430.sch		
Sheet: /CC430/		
Title: Faraday Wireless Node		
Size: B	*Date: 19 nov 2016*	*Rev: D*
KiCad E.D.A.		Id: 3/11

16 Hz ADC Filters

Filter channels flipped for routing!



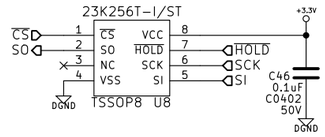
ADC_6 = P2.1
ADC_5 = P2.2
ADC_4 = P2.3
ADC_3 = P2.4
ADC_2 = P2.5
ADC_1 = P2.6
ADC_0 = P2.7

ADC2 intended for:
 * Microphone input
 * External voltage reference

CC430 Internal ESD Diodes Imax = 2mA

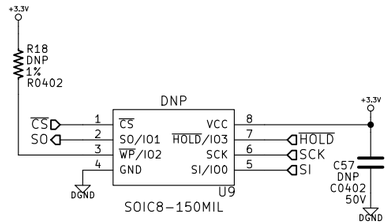
Bryce Salmi (KB1LQC), Brenton Salmi (KB1LQD)
www.FaradayRF.com
FaradayRF

File: ADC_Filters.sch		
Sheet: /CC430/ADC Filters/		
Title: Faraday Wireless Node		
Size: B	*Date: 19 nov 2016*	*Rev: D*
KiCad E.D.A.		Id: 4/11



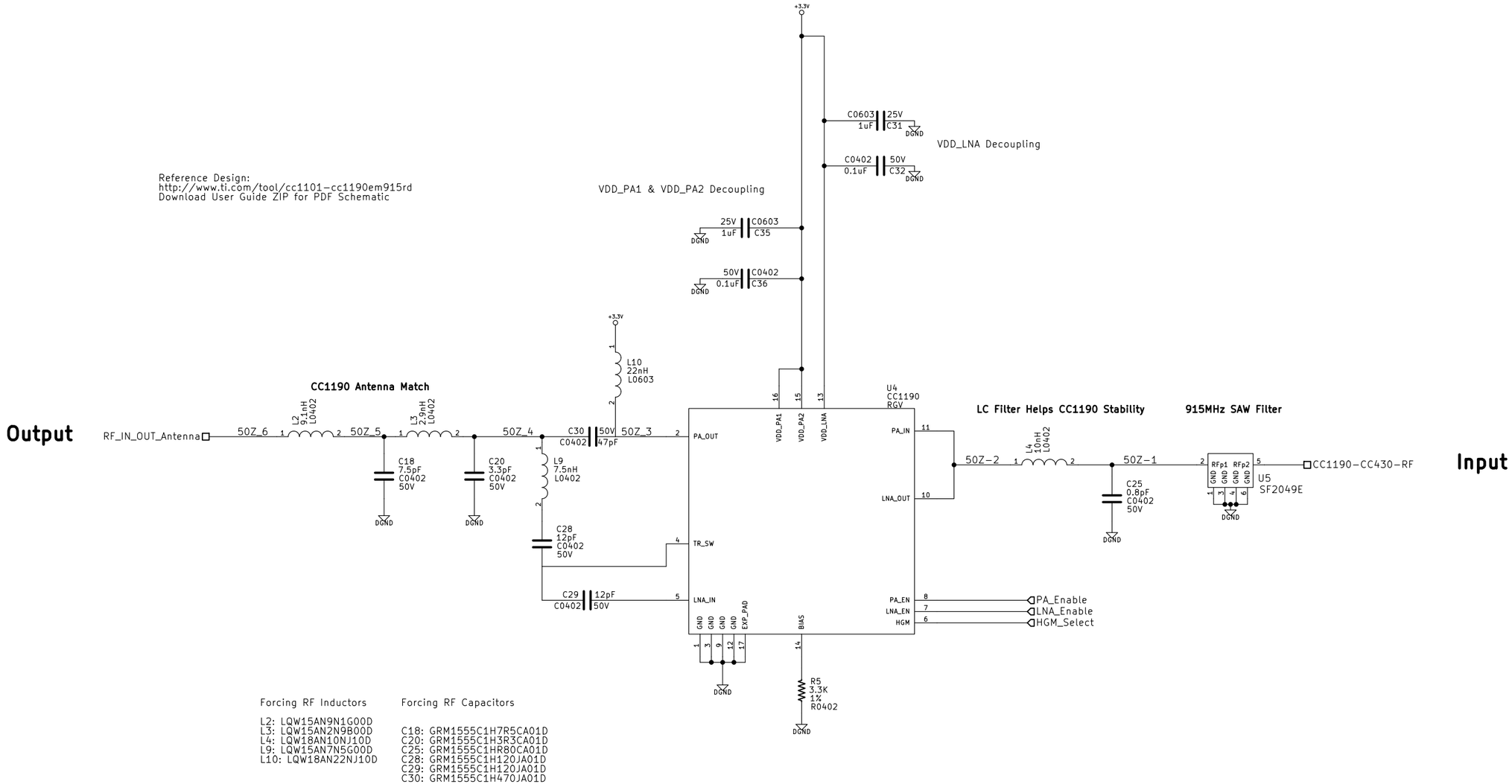
Bryce Salmi (KB1LQC), Brenton Salmi (KB1LQD)
www.FaradayRF.com
FaradayRF

File: SRAM.sch		
Sheet: /SRAM/		
Title: Faraday Wireless Node		
Size: B	*Date: 19 nov 2016*	*Rev: D*
KiCad E.D.A.		Id: 5/11



TAPR OHL V1.0: http://www.tapr.org/OHL Bryce Salmi (KB1LQC), Brenton Salmi (KB1LQD) www.FaradayRF.com *FaradayRF*		
File: FLASH.sch Sheet: /FLASH/		
Title: Faraday Wireless Node		
Size: B	*Date: 19 nov 2016*	*Rev: D*
KiCad E.D.A.		Id: 6/11

Reference Design:
http://www.ti.com/tool/cc1101-cc1190em915rd
Download User Guide ZIP for PDF Schematic



Forcing RF Inductors

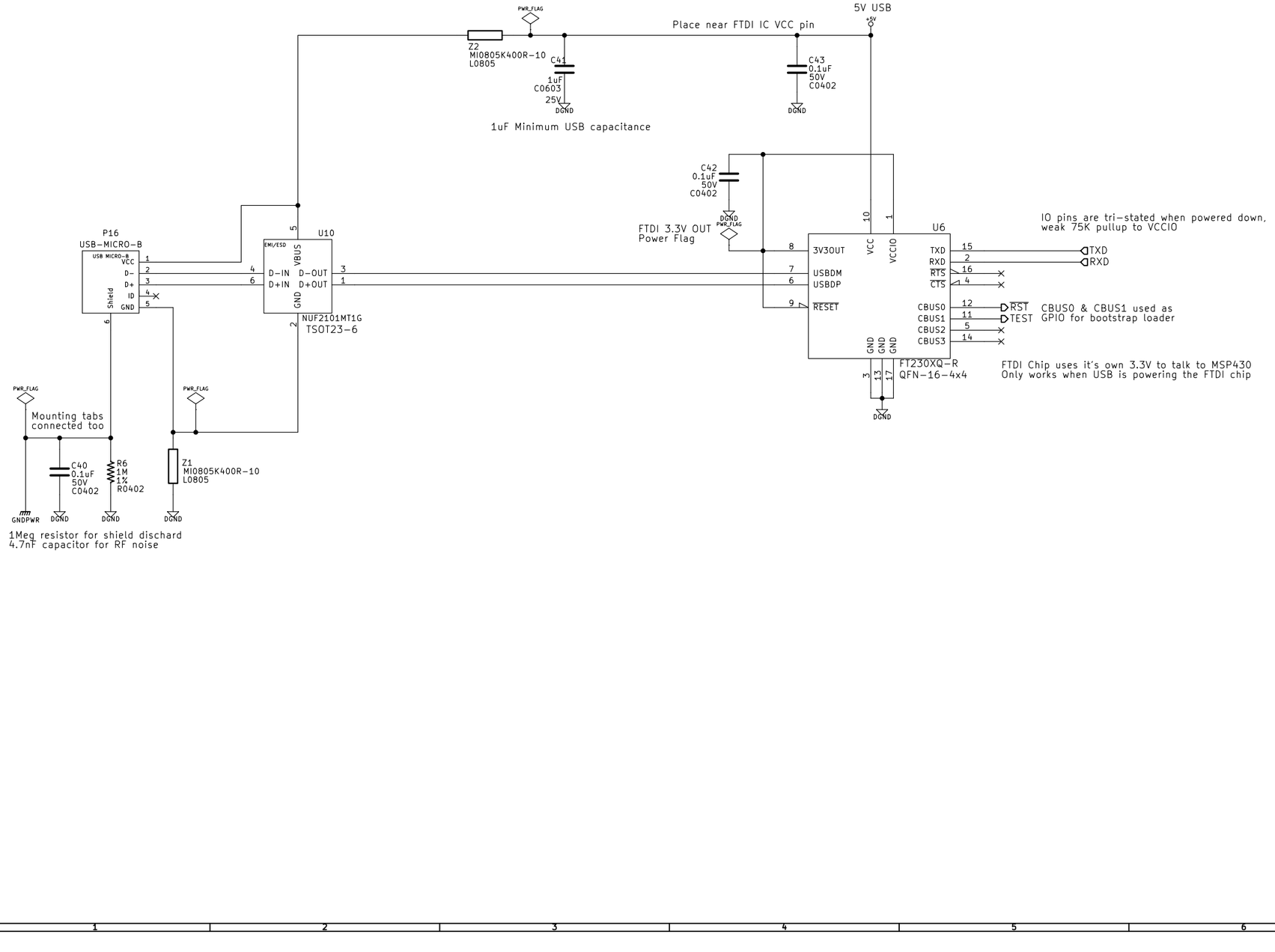
L2: LQW15AN9N1G00D
L3: LQW15AN2N9B00D
L4: LQW18AN10NJ10D
L9: LQW15AN7N5G00D
L10: LQW18AN22NJ10D

Forcing RF Capacitors

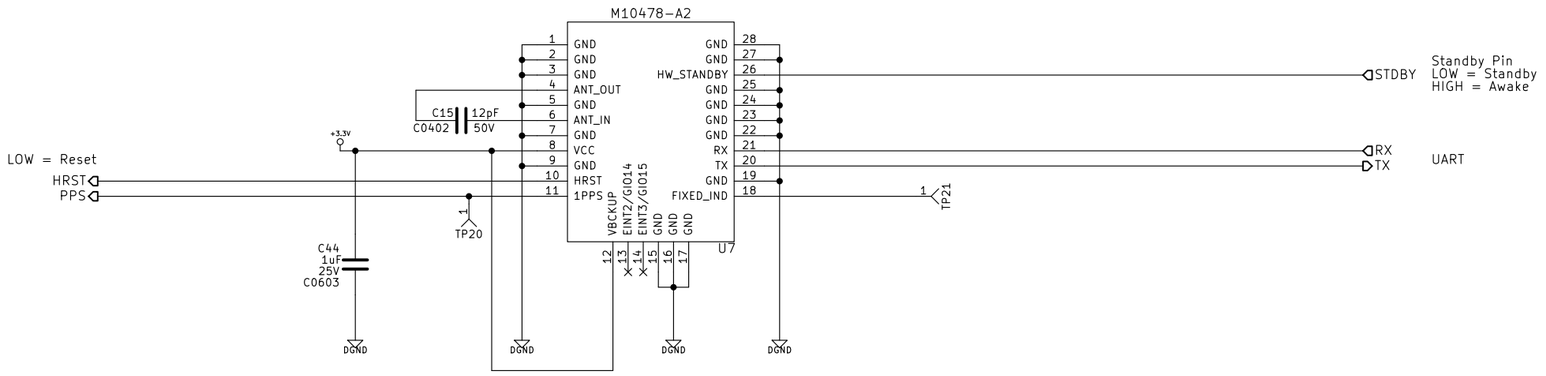
C18: GRM1555C1H7R5CA01D
C20: GRM1555C1H3R3CA01D
C25: GRM1555C1HR80CA01D
C28: GRM1555C1H120JA01D
C29: GRM1555C1H120JA01D
C30: GRM1555C1H470JA01D

Bryce Salmi (KB1LQC), Brenton Salmi (KB1LQD)
www.FaradayRF.com
FaradayRF

File: RF_Front_End.sch		
Sheet: /RF Front End/		
Title: Faraday Wireless Node		
Size: B	*Date: 19 nov 2016*	*Rev: D*
KiCad E.D.A.		Id: 7/11

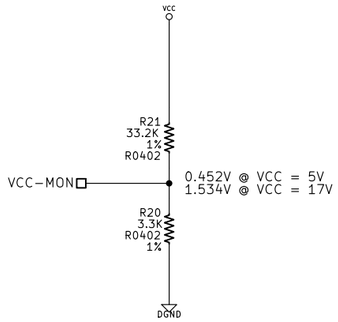


TAPR OHL V1.0: http://www.tapr.org/OHL	
Bryce Salmi (KB1LQC), Brenton Salmi (KB1LQD)	
www.FaradayRF.com	
FaradayRF	
File: USBtoSerial.sch	
Sheet: /USB to Serial/	
Title: Faraday Wireless Node	
Size: B	*Date: 19 nov 2016* — *Rev: D*
KiCad E.D.A.	Id: 8/11

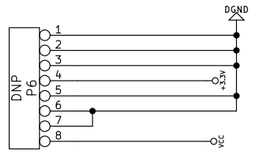


GPS can be DNP'd for cheap version w/ passives soldered allowing for customer to buy GPS afterwards if needed

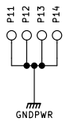
Bryce Salmi (KB1LQC), Brenton Salmi (KB1LQD)		
www.FaradayRF.com		
FaradayRF		
File: GPS.sch		
Sheet: /GPS/		
Title: Faraday Wireless Node		
Size: B	*Date: 19 nov 2016*	*Rev: D*
KiCad E.D.A.		Id: 9/11



Power

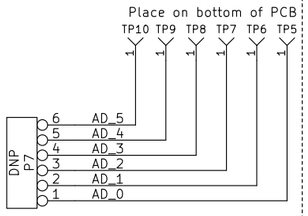


Mounting Holes 125 mil

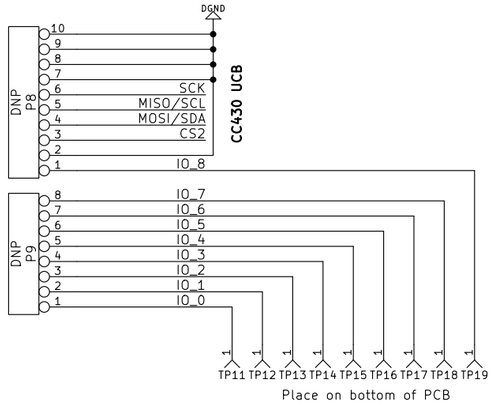


Connected to USB shield

Analog In



Digital



CONN_IO_[0..8] ◇— IO_[0..8]

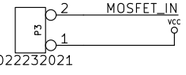
CONN_Analog[0..5] ◇— AD_[0..5]

CONN_MOSI/SDA ◇— MOSI/SDA
CONN_MISO/SCL ◇— MISO/SCL
CONN_SCK ◇— SCK
CONN_CS ◇— CS2

MOSFET_CNTL ▷ MOSFET_CNTL

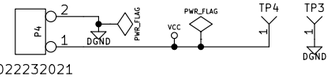
Ext. Power/MOSFET

Molex 2.54mm Pitch



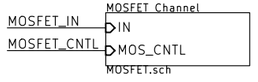
0022232021

Molex 2.54mm Pitch

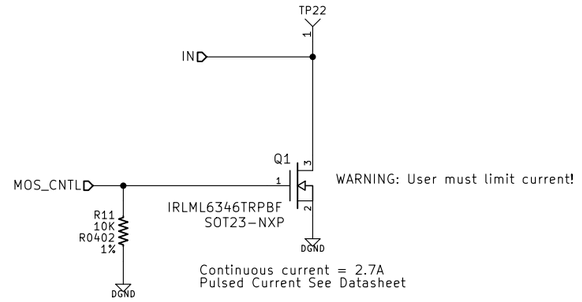


0022232021

Ground is driven



TAPR OHL V1.0: http://www.tapr.org/OHL Bryce Salmi (KB1LQC), Brenton Salmi (KB1LQD) www.FaradayRF.com *FaradayRF*		
File: connector.sch Sheet: /Shield Connector/		
Title: Faraday Wireless Node		
Size: B	*Date: 19 nov 2016*	*Rev: D*
KiCad E.D.A.		Id: 10/11



TAPR OHL V1.0: http://www.tapr.org/OHL Bryce Salmi (KB1LQC), Brenton Salmi (KB1LQD) www.FaradayRF.com *FaradayRF*		
File: MOSFET.sch Sheet: /Shield Connector/MOSFET Channel/		
Title: Faraday Wireless Node		
Size: B	*Date: 19 nov 2016*	*Rev: D*
KiCad E.D.A.		Id: 11/11