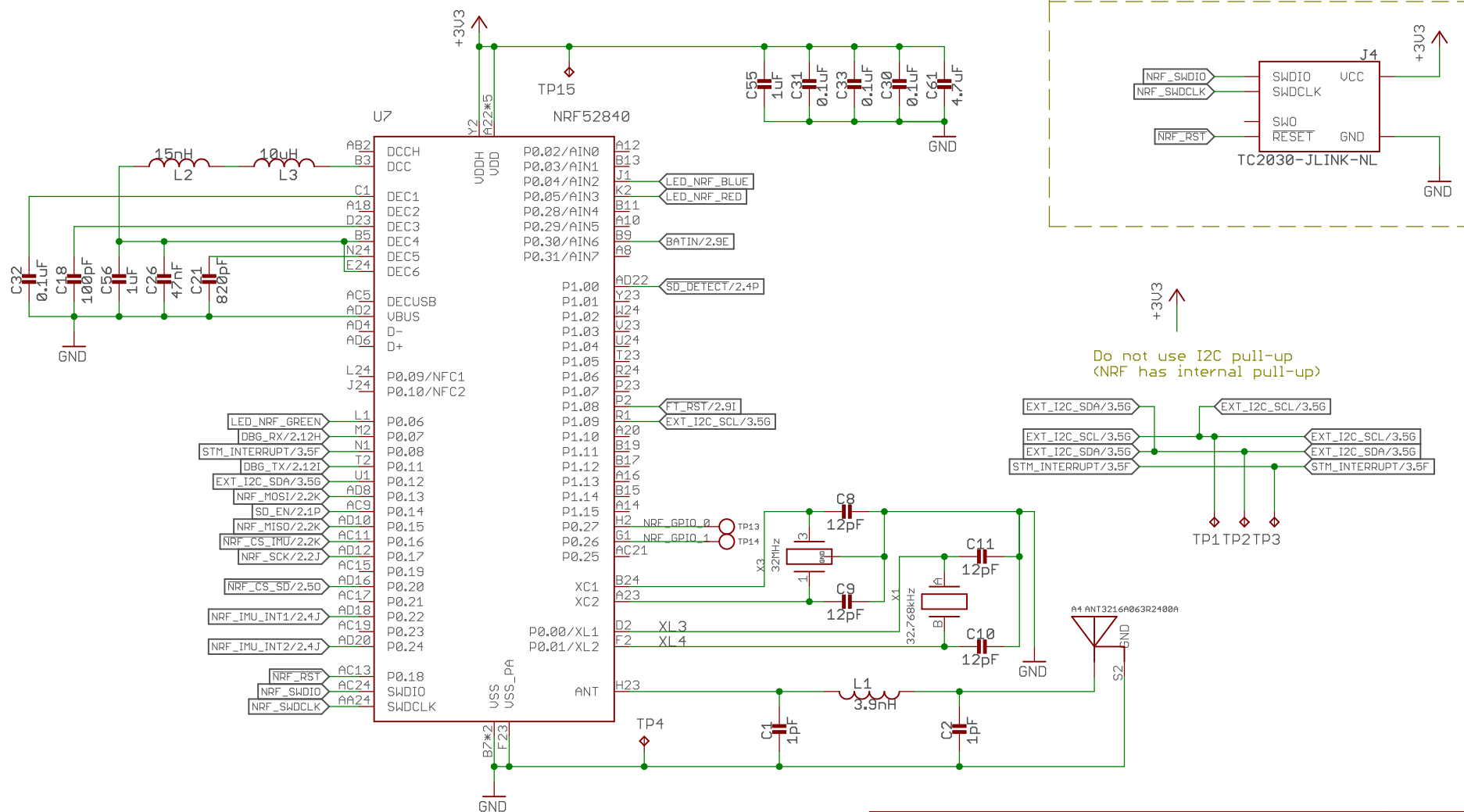


# nRF52840 BLE



Do not use I2C pull-up  
(NRF has internal pull-up)

TriTag

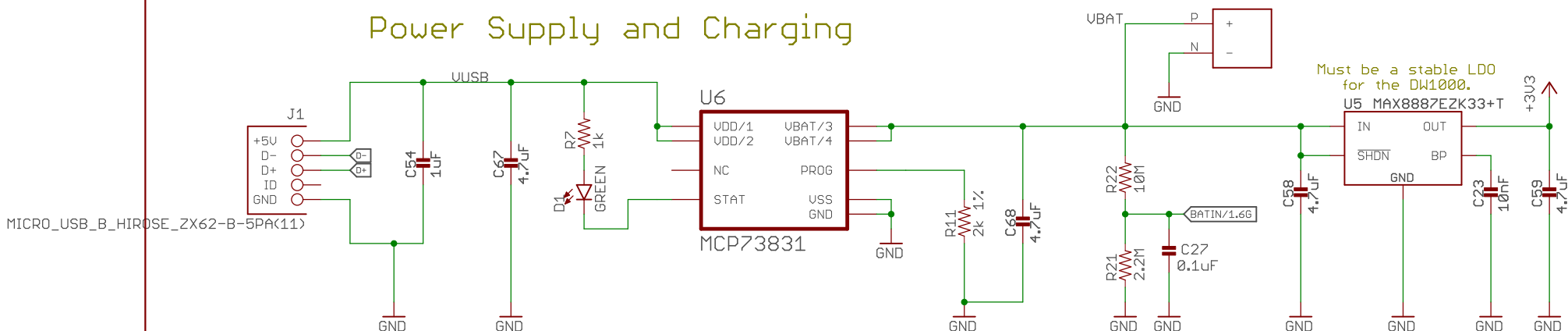
Author: Andreas Biri

Date: 11.10.18 16:51

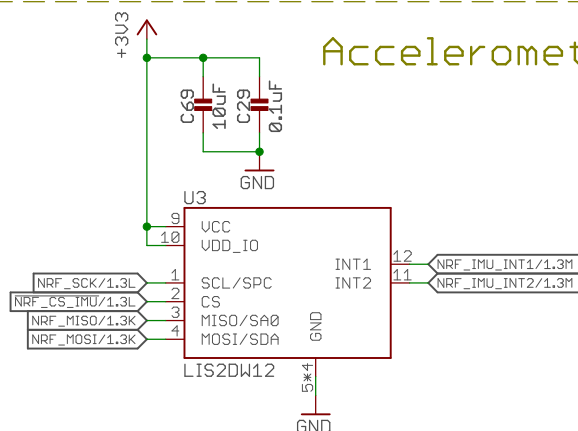
REV:  
E

Sheet: 1/4

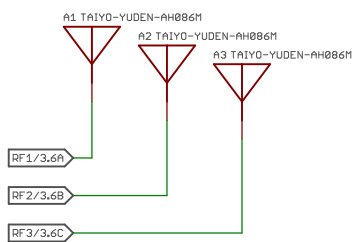
## Power Supply and Charging



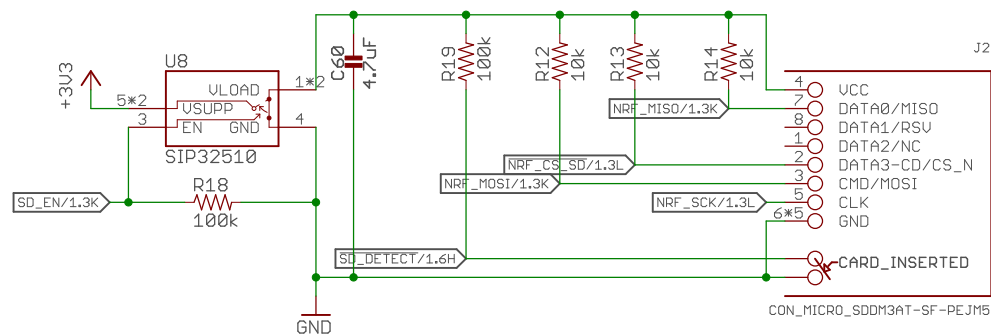
## Accelerometer



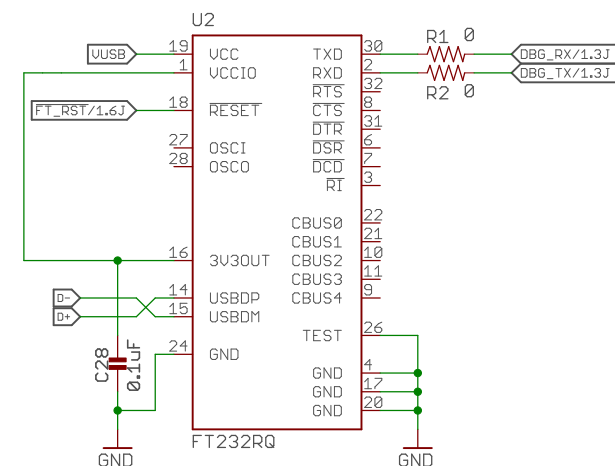
## Antennas



## SD Card Adapter



## USB-Serial



Mount 0-0hm resistors only if you intend to use the FTDI; this prevents unintentional power draws

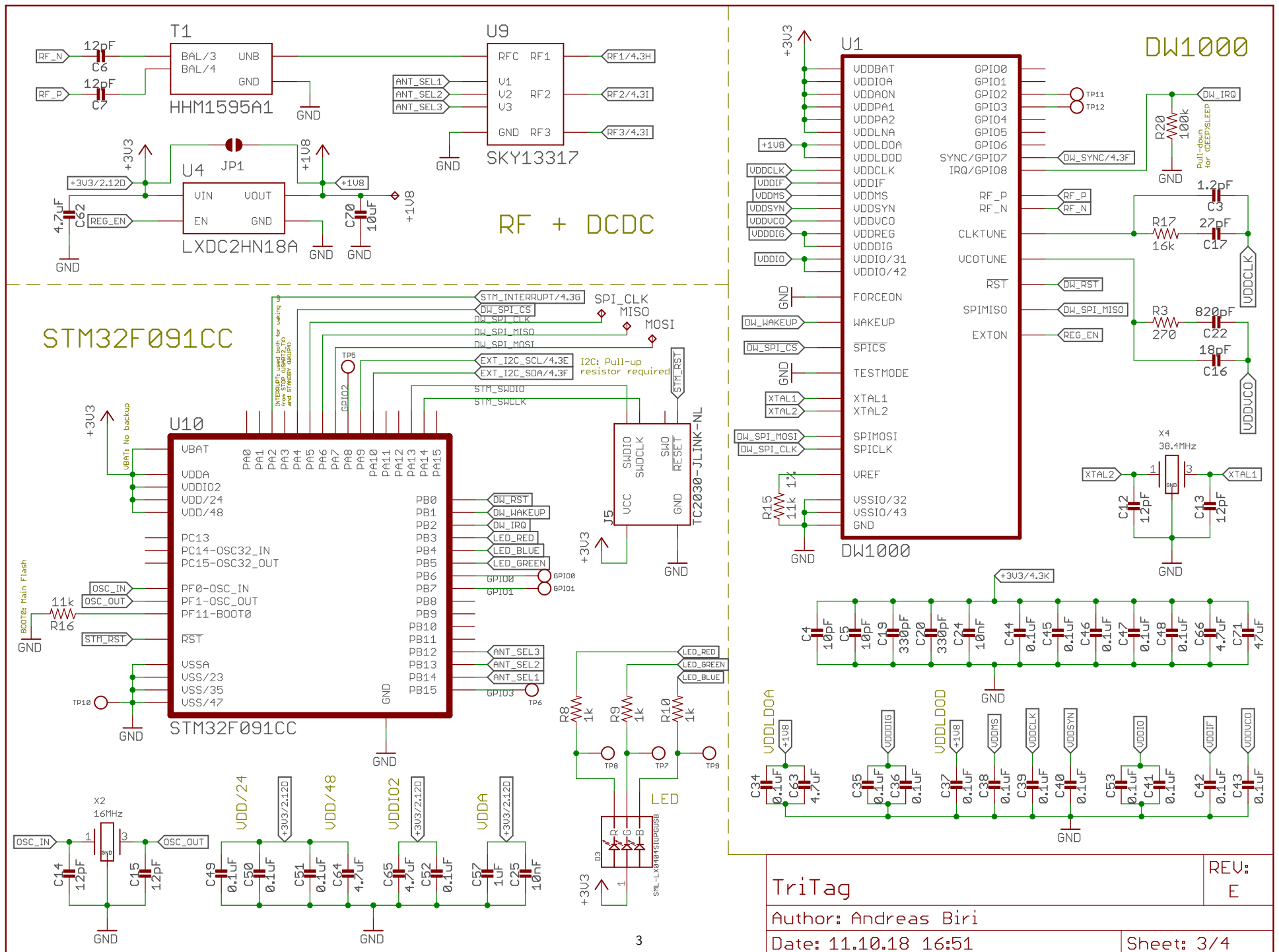
TriTag

Author: Andreas Biri

Date: 11.10.18 16:51

REV:  
E

Sheet: 2/4



TriTag

Author: Andreas Biri

Date: 11.10.18 16:51

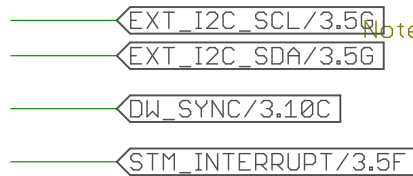
REV:  
E

Sheet: 3/4

## EXTERNAL SIGNALS

The following signals must be integrated into all designs using the design block:

### Signals



Note: Additional I2C pull-up resistors required to +3V3

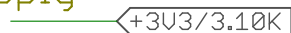
### Antennas



Guarantee 120° offset in-between antennas to maximize polarization difference and antenna diversity

RF traces should respect the keepout zones and be surrounded by a via shield. Furthermore, try to keep them as short and straight as possible

### Power Supply



Be aware that the DecaWave is very sensitive regarding its power supply.

We suggest using the "MAX8887EZK33+T" from Maxim Integrated.  
You can find a reference layout at [github.com/lab11/polypoint/pcb/tritag](https://github.com/lab11/polypoint/pcb/tritag).

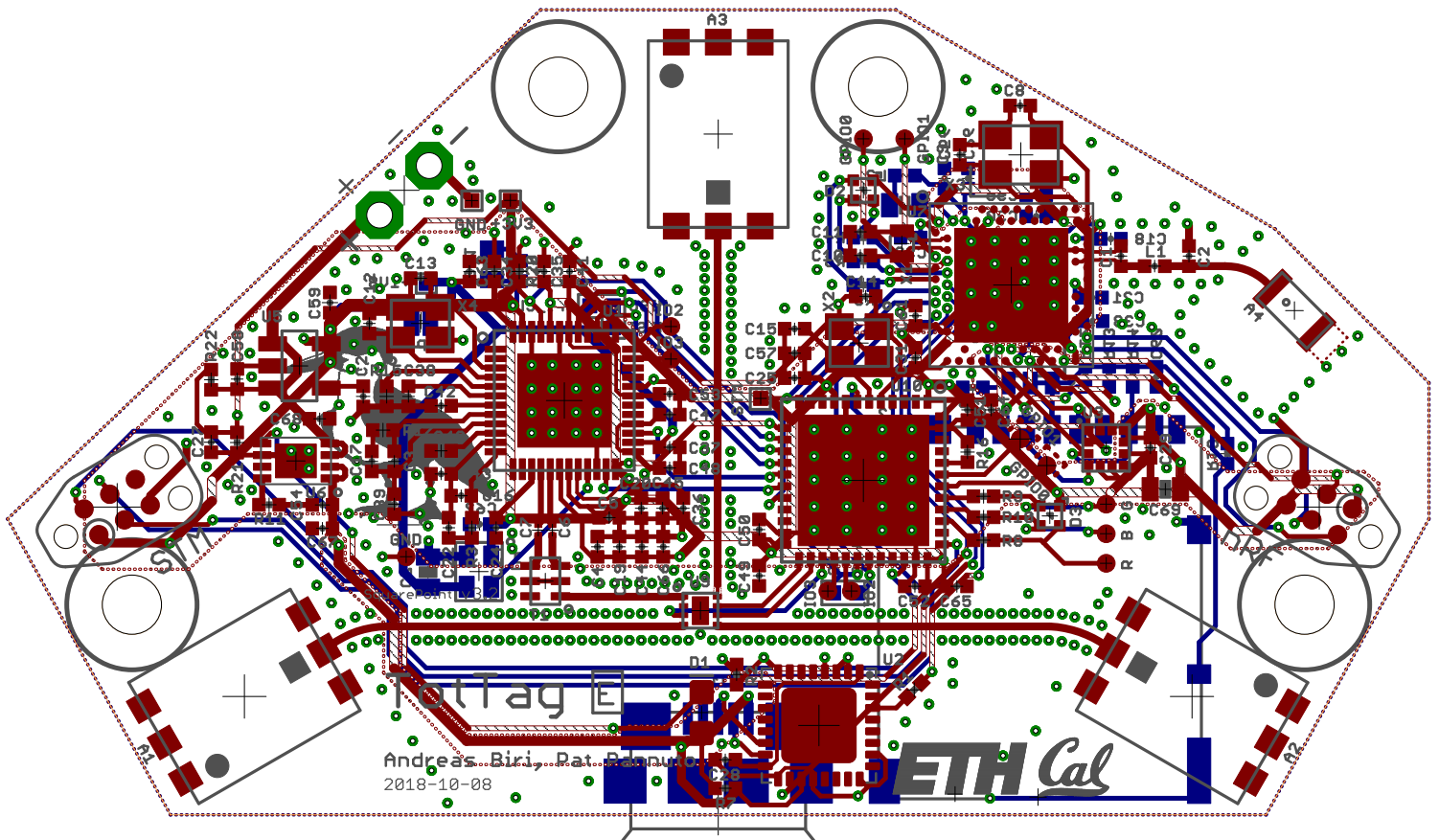
TriTag

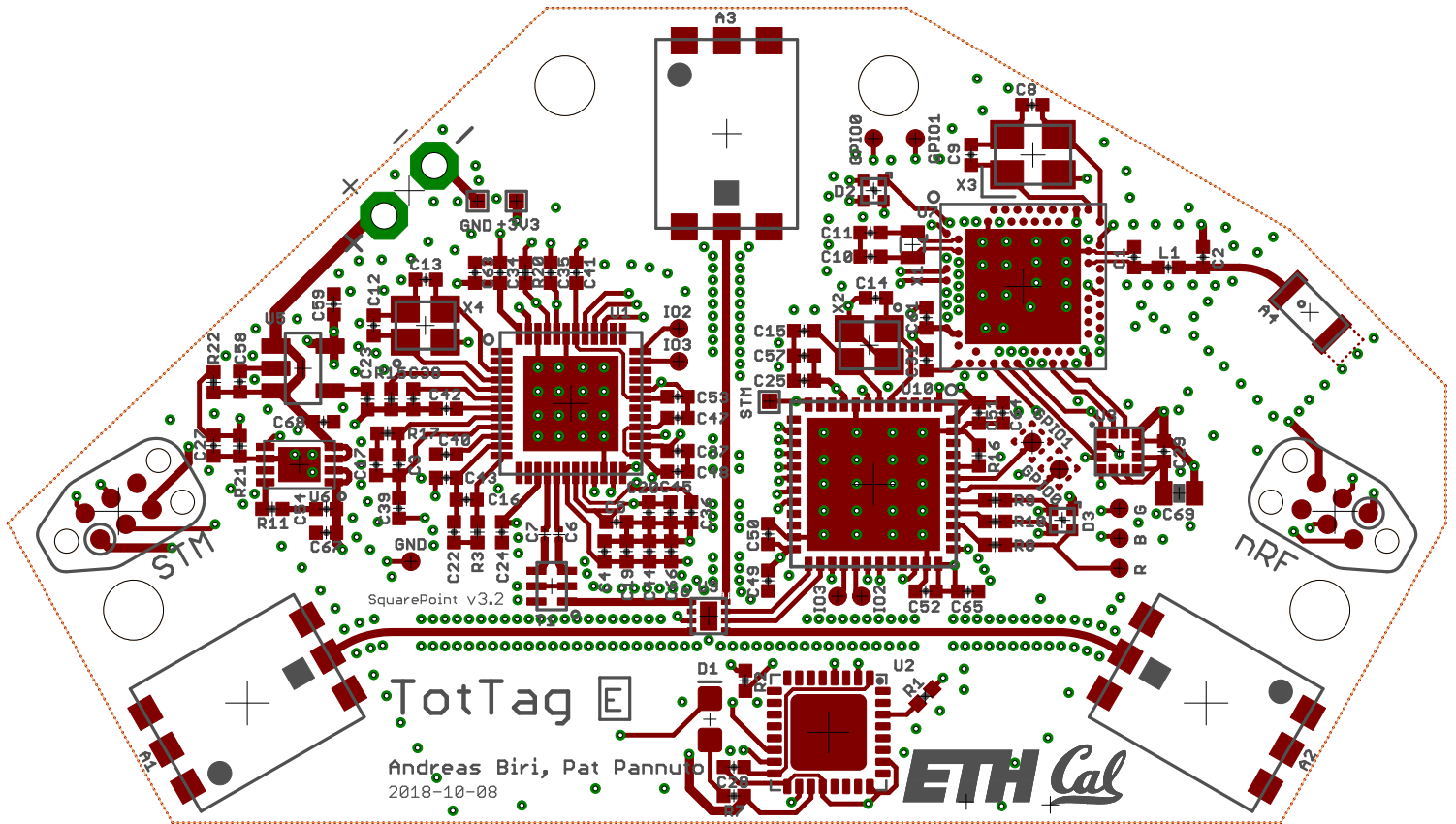
REV:  
E

Author: Andreas Biri

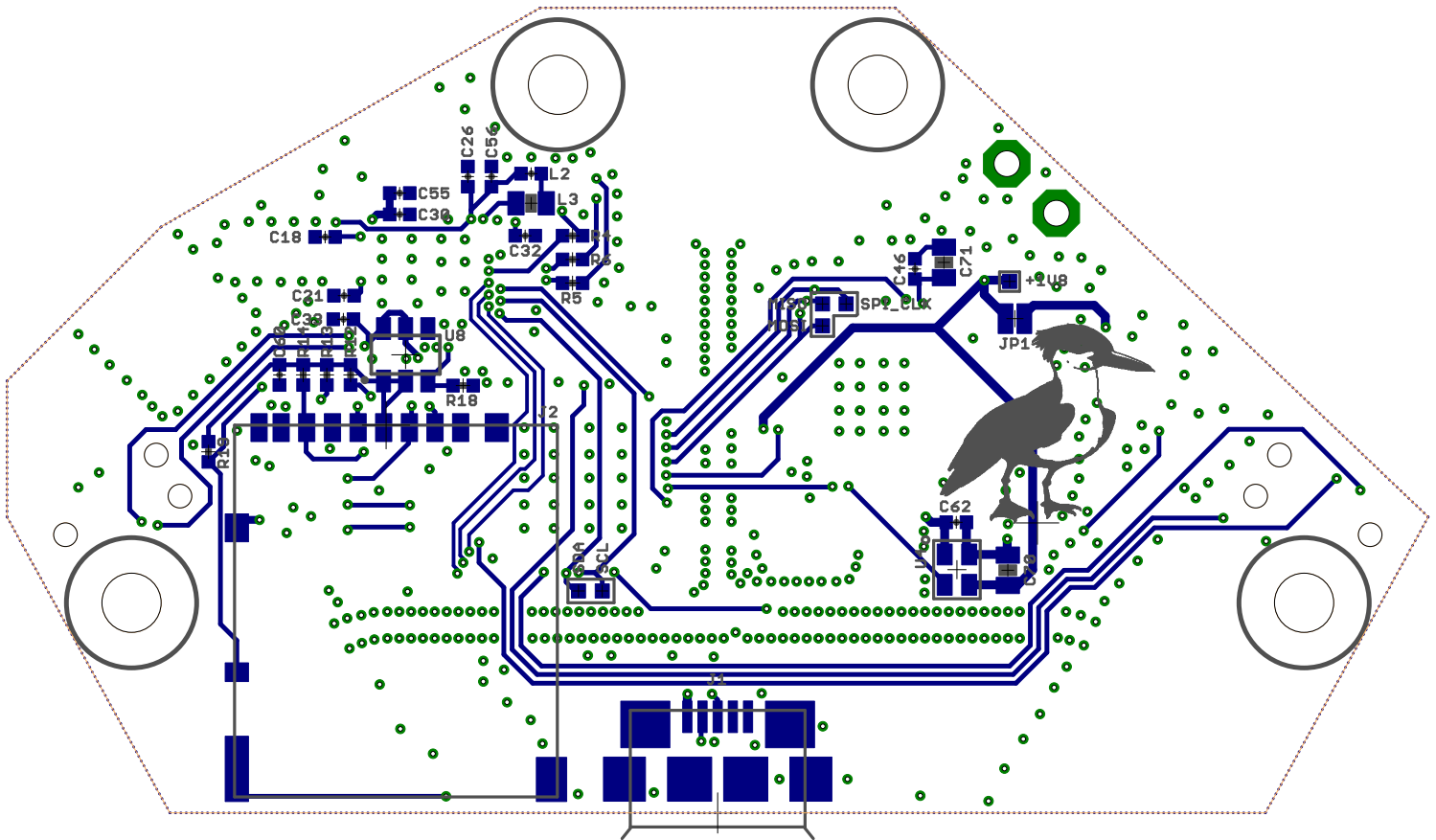
Date: 11.10.18 16:51

Sheet: 4/4

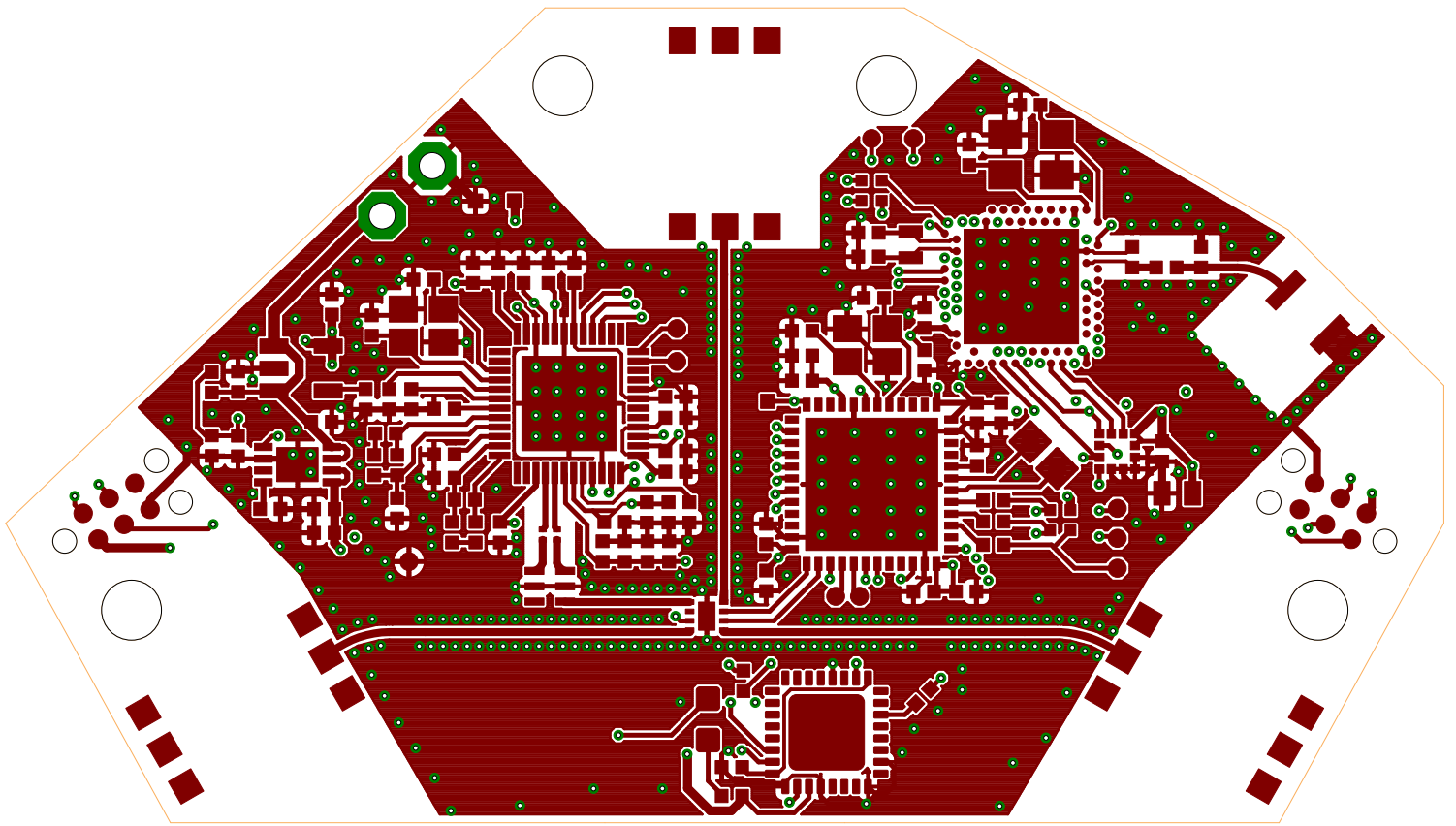




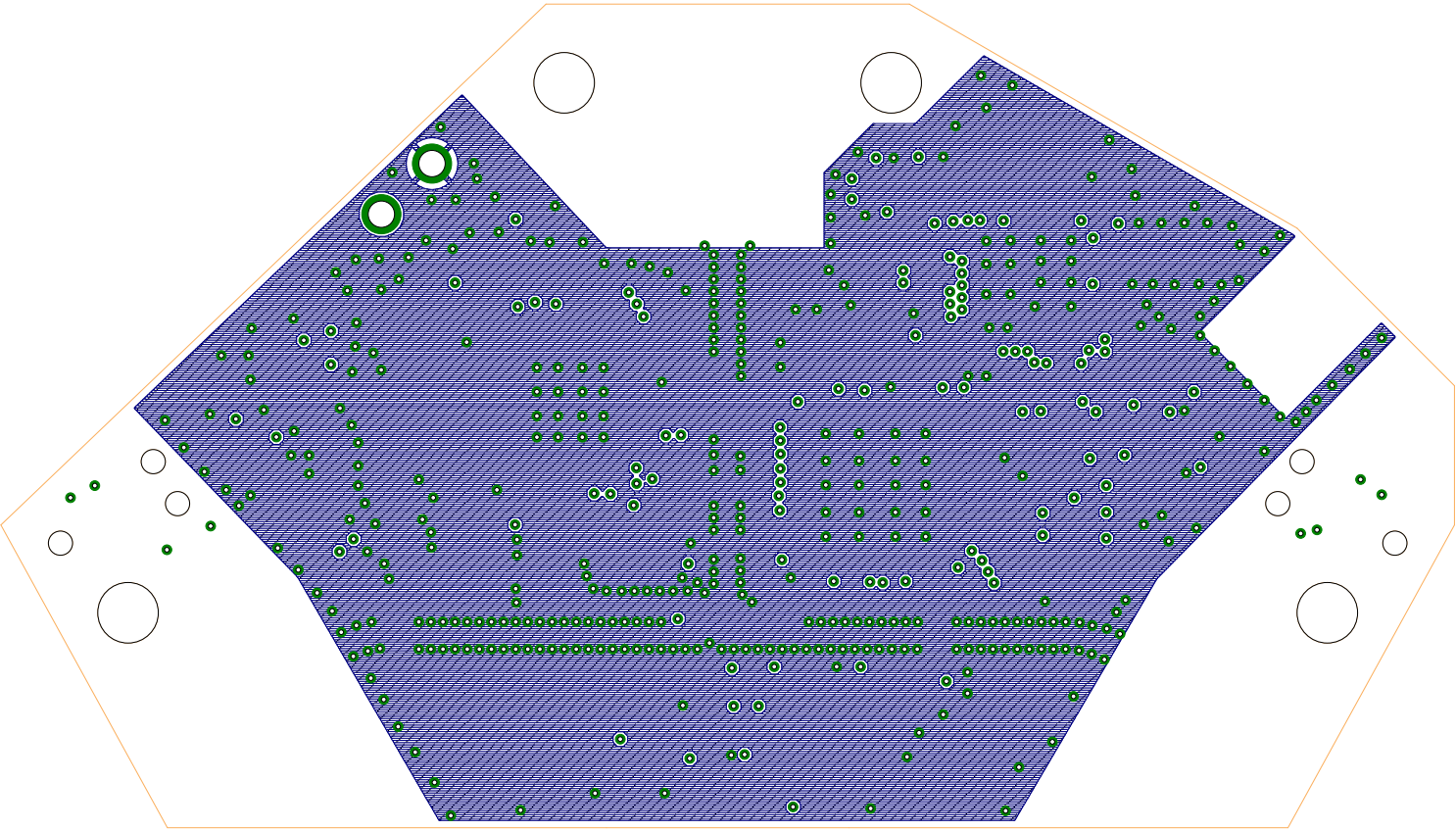
Bottom Layer

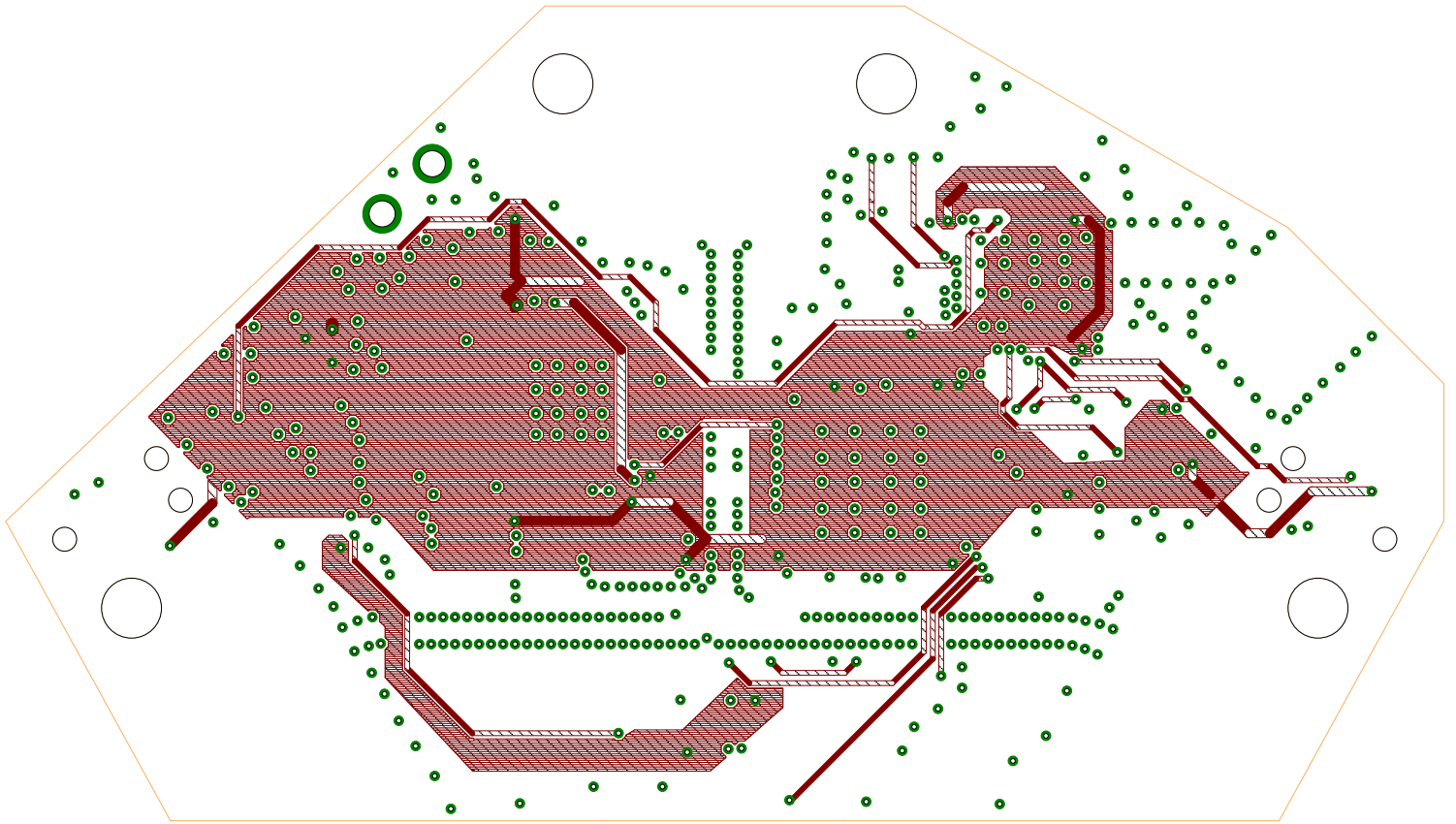


Top Copper Layer

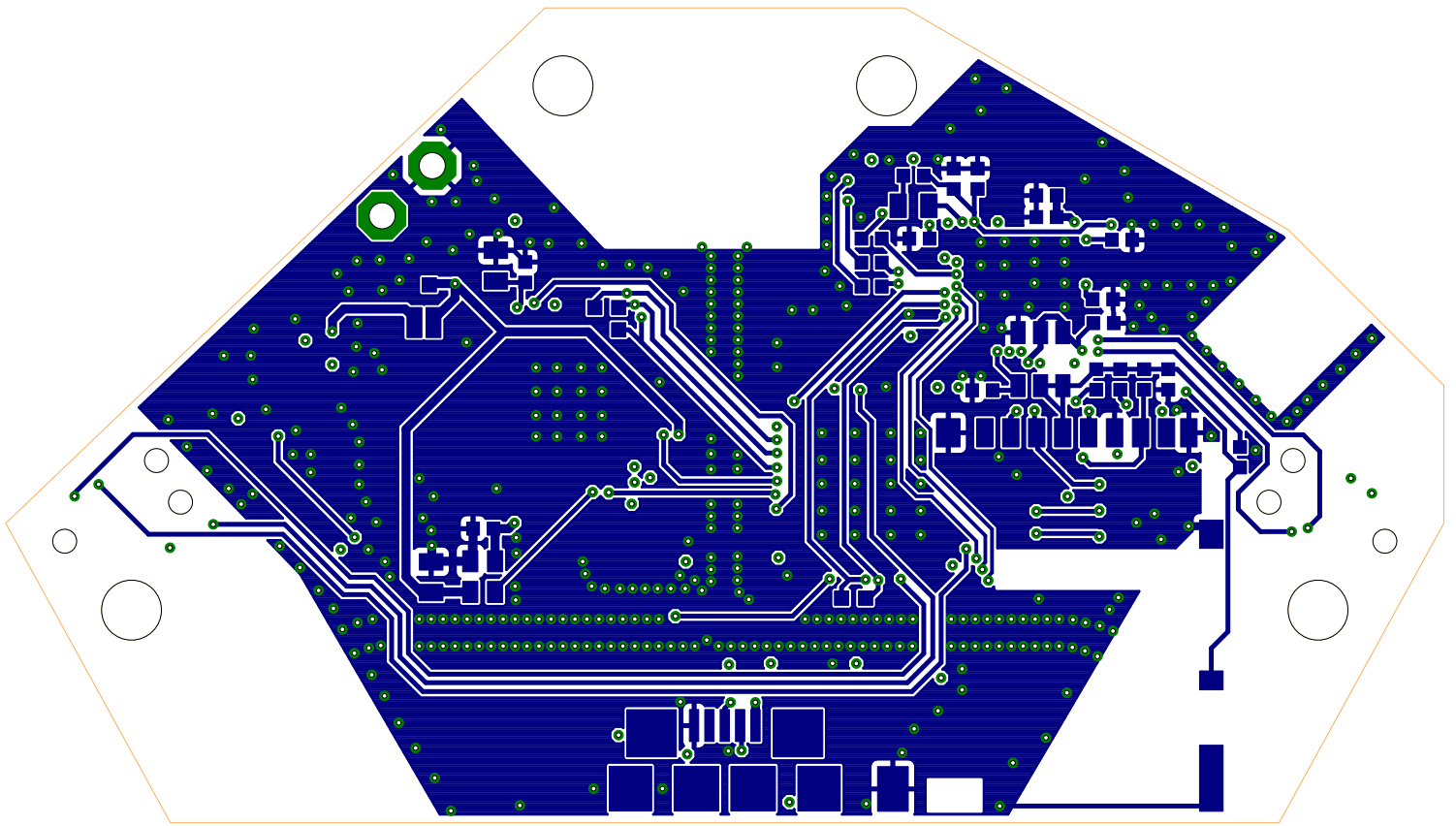


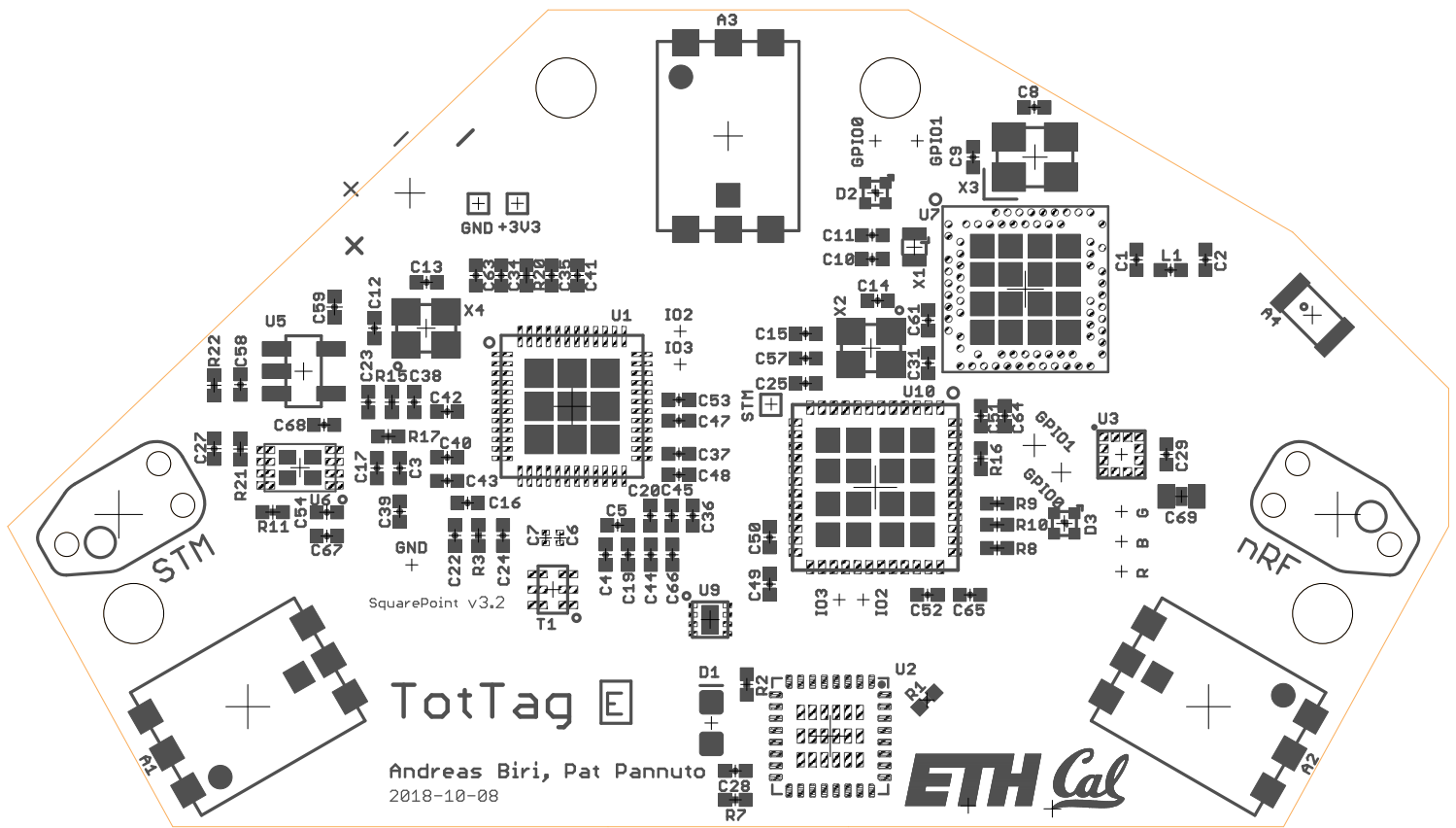




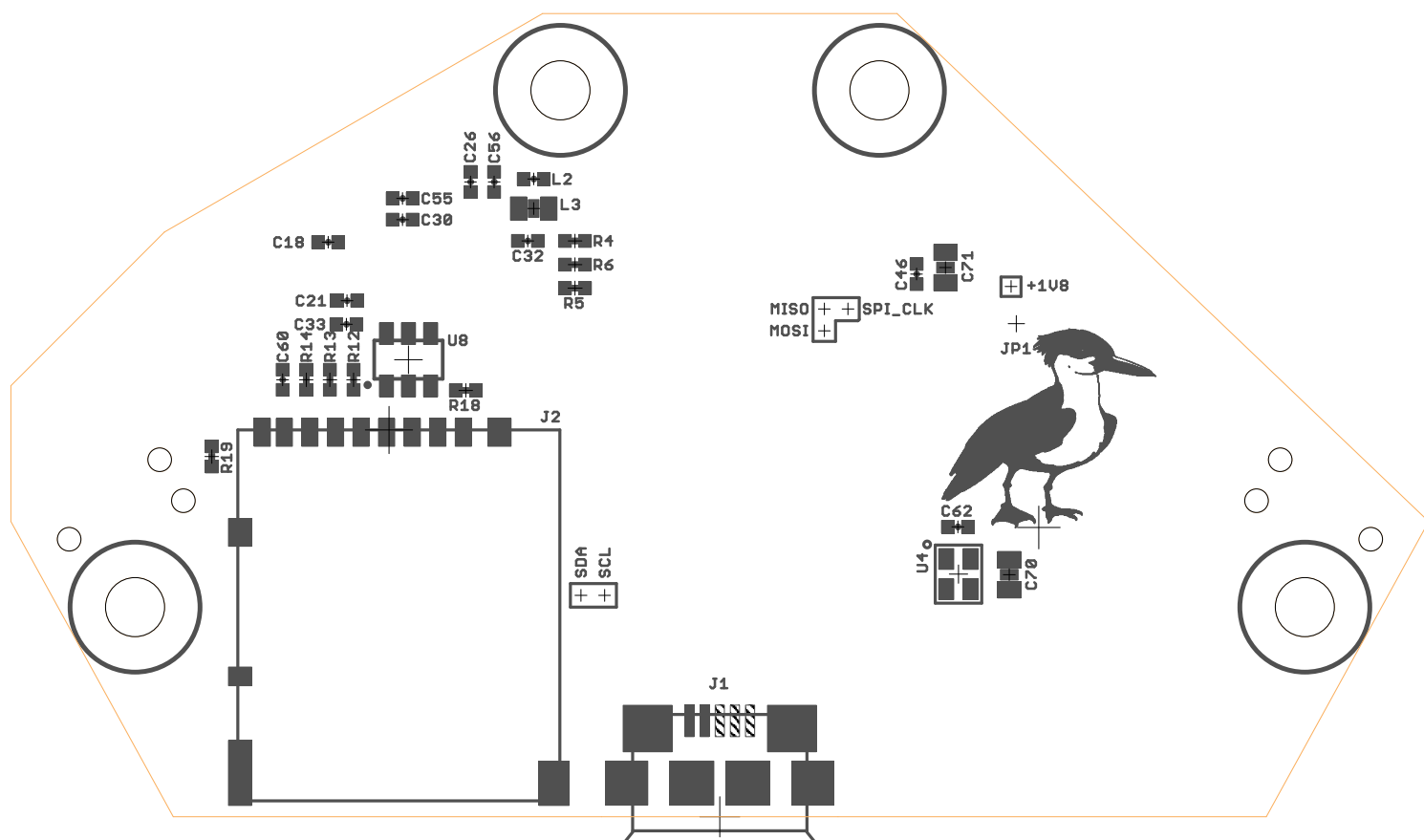


# Bottom Copper Layer

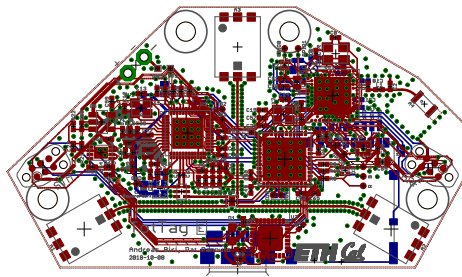




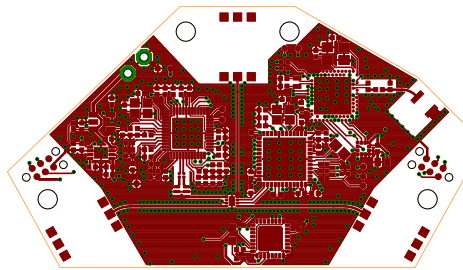
# Bottom Paste Layer with Silkscreen

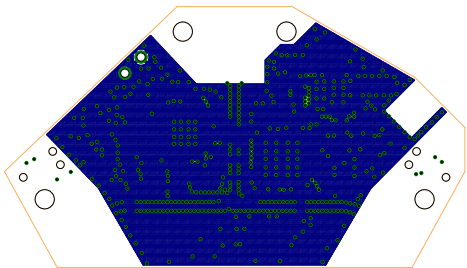


### Top and Bottom Layers 1:1 Scale



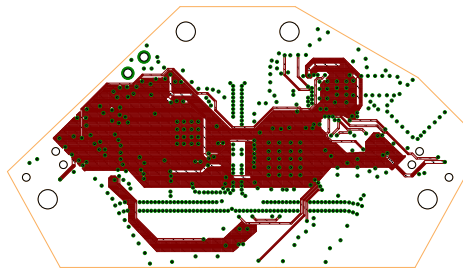
Top Layer 1:1 Scale



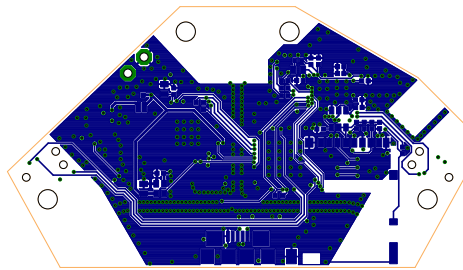




### Layer 3 Copper 1:1 Scale



Bottom Copper Layer 1:1 Scale



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Qty	Parts	Value	Can Substitute	Do not populate (DNP)
3	A1,A2,A3	TAIYO-YUDEN-AH086M	N	
1	A4	ANT3216A063R2400A	N	
2	C1,C2	1pF	Y	
1	C3	1.2pF	N	
2	C4,C5	10pF	Y	
2	C6,C7	12pF	N	
8	C8,C9,C10,C11,C12	12pF	N	
1	C16	18pF	N	
1	C17	27pF	N	
1	C18	100pF	Y	
2	C19,C20	330pF	Y	
2	C21,C22	820pF	N	
3	C23,C24,C25	10nF	Y	
1	C26	47nF	Y	
27	C27,C28,C29,C30,C0	1uF	Y	
4	C54,C55,C56,C57	1uF	Y	
11	C58,C59,C60,C61,C4	7uF	Y	
2	C69,C70	10uF	Y	
1	C71	47uF	Y	
1	D1	GREEN	Y	
2	D2,D3	SML-LX0404SIUPGUSB	Y	
1	J1	MICRO_USB_B_HIROS	N	
1	J2	CON_MICRO_SDDM3A	N	
1	L1	3.9nH	Y	
1	L2	15nH	Y	
1	L3	10uH	Y	
2	R1,R2	0	Y	
1	R3	270	N	
3	R4,R5,R6	470	Y	
4	R7,R8,R9,R10	1k	Y	
1	R11	2k 1%	Y	
3	R12,R13,R14	10k	Y	
2	R15,R16	11k 1%	Y	
1	R17	16k	N	
3	R18,R19,R20	100k	Y	
1	R21	2.2M	Y	
1	R22	10M	Y	
1	T1	HHM1595A1	N	
1	U1	DW1000	N	
1	U2	FT232RQ	N	
1	U3	LIS2DW12	N	
1	U4	LXDC2HN18A	N	
1	U5	MAX8887EZK33+T	N	
1	U6	MCP73831	N	
1	U7	NRF52840	N	
1	U8	SIP32510	N	
1	U9	SKY13317	N	
1	U10	STM32F091CC	N	
1	X1	32.768kHz	N	
1	X2	16MHz	N	
1	X3	32MHz	N	
1	X4	38.4MHz	N	

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9 +1V8,MISO,MOSI,STPTP06SQ  
12 GPIO0,GPIO1,TP5,TEST-POINT  
1 J3 BAT\_HOLE  
2 J4,J5 TC2030-JLINK-NL  
1 JP1 JUMPER-SMT\_2\_NO\_NO-SILK

DNP  
DNP  
DNP  
DNP  
DNP

Device	Package
TAIYO-YUDEN-AH086M	TAIYO-YUDEN-AH086M
ANT3216A063R2400A	ANT3216A063R2400A
CAPACITOR0402_CAP	0402_CAP
CAPACITOR0402_CAP	0402_CAP
CAPACITOR0402_CAP	0402_CAP
CAPACITOR0201_CAP	0201_CAP
CAPACITOR0402_CAP	0402_CAP
CAPACITOR0402_CAP	0402_CAP
CAPACITOR0402_CAP	0402_CAP
CAPACITOR0402_CAP	0402_CAP
CAPACITOR0402_CAP	0402_CAP
CAPACITOR0402_CAP	0402_CAP
CAPACITOR0402_CAP	0402_CAP
CAPACITOR0402_CAP	0402_CAP
CAPACITOR0402_CAP	0402_CAP
CAPACITOR0402_CAP	0402_CAP
CAPACITOR0603_CAP	0603_CAP
CAPACITOR0603_CAP	0603_CAP
LED0603	LED-0603
SML-LX0404SIUPGUSB	1MM_SQ_4PAD
MICRO_USB_B_HIROSE_USB_MICRO_B-HIROSE-	
CON_MICRO_SDDM3AT-S	DM3AT-SF-PEJM5
INDUCTOR0402	0402_CAP
INDUCTOR0402	0402_CAP
INDUCTOR0603	0603_CAP
RESISTOR0402_RES	0402_RES
RESISTOR0402_RES	0402_RES
RESISTOR0402_RES	0402_RES
RESISTOR0402_RES	0402_RES
RESISTOR0402_RES	0402_RES
RESISTOR0402_RES	0402_RES
RESISTOR0402_RES	0402_RES
RESISTOR0402_RES	0402_RES
RESISTOR0402_RES	0402_RES
RESISTOR0402_RES	0402_RES
RESISTOR0402_RES	0402_RES
HHM1595A1	EIA-0805
DW1000	QFN-48-DW1000
FT232RQ	QFN32
LIS2DW12	LGA-12
LXDC2HN18A	LXDC2HN
MAX8887EZK33+T	SOT-23-5
MCP73831	DFN-8-MCP
NRF52840	AQFN73
SIP32510	TSOT23-6
SKY13317	MLPQ-UT-8
STM32F091CC	UFQFPN-48
ABS05-32.768KHZ-9-T	ABS05
FA-20H	FA-20H
7V-32.000MAHV-T	TXC-7V
FA-20H	FA-20H

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TPTP06SQ	TP06SQ
TEST-POINT	PAD.03X.03
BAT_HOLE	BATTERY_HOLE
TC2030-JLINK-NL	TC2030-IDC-NL
JUMPER-SMT_2_NO_NO	SMT-JUMPER_2_NO_NO

## Description

---

UWB Antenna - 3.1-8GHz

Yageo 2.4GHz

SMD Capacitor

SMD Capacitor

SMD Capacitor

SMD Capacitor

SMD Capacitor

SMD Capacitor

SMD Capacitor

SMD Capacitor

SMD Capacitor

SMD Capacitor

SMD Capacitor

SMD Capacitor

SMD Capacitor

SMD Capacitor

SMD Capacitor

SMD Capacitor

SMD Capacitor

LED (Generic)

1mm^2 RGB LED

Connector Receptacle USB - micro B 2.0 5 Position Surface Mount, Right Angle, Horizontal

CONN MICRO SD R/A PUSH-PUSH SMD

A very specific inductor

A very specific inductor

A very specific inductor

Resistor

Resistor

Resistor

Resistor

Resistor

Resistor

Resistor

Resistor

Resistor

Resistor

Resistor

Description: Symbol for HHM1595A1, a multilayer Balun from TDK.

Description: The DecaWave DW1000 chip, used for UWB two-way ranging.

Source: [http://www.ftdichip.com/Documents/DataSheets/DS\\_FT232R\\_v104.pdf](http://www.ftdichip.com/Documents/DataSheets/DS_FT232R_v104.pdf)

ultra low power 3 axis accelerometer

Description: Symbol for LXDC2HN18A-097, a DC-DC converter by Murata Electronics.

IC REG LDO 3.3V 0.3A TSOT23-5

Description: Device for MCP73831, a battery charge controller from Microchip.

ultra-low power 2.4 GHz wireless system on chip (SoC) integrating a multiprotocol 2.4 GHz

Load switch, slew rate controlled. By Vishay

Description: Device for SKY13317-373LF, an RF switch from Skyworks Inc.

Description: STM32F091CC from STMicroelectronics, an ARM-based 32-bit MCU with 256 kE

32.768kHz Crystal

Description: Oscillator by EPSON from 12MHz to 54 MHz

TXC CRYSTAL SMD

Description: Oscillator by EPSON from 12MHz to 54 MHz

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Test pad

Normally open jumper



**DESCRIPTION**


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RF ANT 3.5GHZ/5.6GHZ CHIP SLD  
 RF ANT 2.4GHZ CHIP SOLDER SMD  
 CAP CER 1PF 50V C0G/NP0 0402  
 CAP CER 1.2PF 50V C0G/NP0 0402  
 CAP CER 10PF 100V C0G/NP0 0402  
 CAP CER 12PF 25V C0G/NP0 0201  
 CAP CER 12PF 50V C0G/NP0 0402  
 CAP CER 18PF 50V C0G/NP0 0402  
 CAP CER 27PF 50V C0G/NP0 0402  
 CAP CER SMD 0402 100PF 5% X7R 50  
 CAP CER 330PF 50V X7R 0402  
 CAP CER 820PF 25V NP0 0402  
 CAP CER 10000PF 25V X7R 0402  
 CAP CER 0.047UF 16V X7R 0402  
 CAP CER 0.1UF 16V X5R 0402  
 CAP CER 1UF 10V X6S 0402  
 CAP CER 4.7UF 10V X5R 0402  
 CAP CER 10UF 10V X5R 0603  
 CAP CER 47UF 6.3V X5R 0603  
 LED GREEN CLEAR SMD  
 LED RGB CLEAR SMD  
 CONN MICRO SD CARD PUSH-PUSH R/A  
 CONN RCPT USB MICRO B SMD R/A  
 FIXED IND 3.9NH 840MA 66 MOHM  
 FIXED IND 15NH 320MA 460 MOHM  
 FIXED IND 10UH 300MA 600 MOHM  
 RES SMD 0 OHM JUMPER 1/10W 0402  
 RES SMD 270 OHM 1% 1/16W 0402  
 RES SMD 470 OHM 1% 1/16W 0402  
 RES SMD 1K OHM 1% 1/5W 0402  
 RES SMD 2K OHM 1% 1/10W 0402  
 RES SMD 10K OHM 5% 1/10W 0402  
 RES SMD 11K OHM 1% 1/10W 0402  
 RES SMD 16K OHM 1% 1/16W 0402  
 RES SMD 100K OHM 1% 1/16W 0402  
 RES SMD 2.2M OHM 1% 1/16W 0402  
 RES SMD 10M OHM 5% 1/10W 0402  
 XFMR BALUN RF 3.0-8.0GHZ UWB SMD  
 IC RF TXRX 802.15.4 48-QFN  
 IC USB FS SERIAL UART 32-QFN  
 MEMS DIGITAL OUTPUT MOTION SENSOR  
 DC/DC CONVERTER SMD  
 IC REG LIN 3.3V 300MA TSOT23-5  
 IC CONTROLLER LI-ION 4.2V 8DFN  
 NRF52840-QIAA QFN 73L  
 IC LOAD SWITCH SOT23-6  
 IC SWITCH RF SP3T 8-MLP  
 IC MCU 32BIT 256KB FLASH 48QFPN  
 32.768kHz  $\pm 20$ ppm Crystal 9pF 90 kOhms 2-SMD, No Lead  
 16MHz  $\pm 10$ ppm Crystal 8pF 80 Ohms 4-SMD, No Lead  
 32MHz  $\pm 30$ ppm Crystal 8pF 60 Ohms 4-SMD, No Lead  
 38.4MHz  $\pm 10$ ppm Crystal 8.5pF 40 Ohms 4-SMD, No Lead

<b>DIGIKEY</b>	<b>MANUFACTURER</b>
587-2204-1-ND	Taiyo Yuden
311-1542-1-ND	Yageo
712-1266-1-ND	Johanson Technology Inc.
490-3085-1-ND	Murata Electronics North America
732-12054-1-ND	Würth Electronics Inc.
712-1208-1-ND	Johanson Technology Inc.
490-11190-1-ND	Murata Electronics North America
399-8828-1-ND	KEMET
490-16380-1-ND	Murata Electronics North America
399-17545-1-ND	KEMET
311-3768-1-ND	Yageo
399-15345-1-ND	KEMET
399-1279-1-ND	KEMET
445-1264-1-ND	TDK Corporation
1276-1234-1-ND	Samsung Electro-Mechanics
1276-6805-1-ND	Samsung Electro-Mechanics
490-14306-1-ND	Murata Electronics North America
490-10474-1-ND	Murata Electronics North America
490-13247-1-ND	Murata Electronics North America
160-1446-1-ND	Lite-On Inc.
67-2125-1-ND	Lumex Opto/Components Inc.
HR1964CT-ND	Hirose Electric Co Ltd
H125270CT-ND	Hirose Electric Co Ltd
AISC-0402-3N9G-TCT-ND	Abracon LLC
587-1521-1-ND	Taiyo Yuden
445-6755-1-ND	TDK Corporation
P0.0JCT-ND	Panasonic Electronic Components
1276-3970-1-ND	Samsung Electro-Mechanics
541-4072-1-ND	Vishay Dale
541-3240-1-ND	Vishay Dale
P2.00KLCT-ND	Panasonic Electronic Components
P10KJCT-ND	Panasonic Electronic Components
P11.0KLCT-ND	Panasonic Electronic Components
YAG5263CT-ND	Yageo
541-3960-1-ND	Vishay Dale
541-4083-1-ND	Vishay Dale
P10MJCT-ND	Panasonic Electronic Components
445-3387-1-ND	TDK Corporation
1479-1001-1-ND	Decawave Limited
768-1008-1-ND	FTDI, Future Technology Devices In
497-17718-6-ND	STMicroelectronics
490-12092-1-ND	Murata Electronics North America
MAX8887EZK33+TCT-ND	Maxim Integrated
MCP73831T-2ACI/MCCT-ND	Microchip Technology
1490-1071-1-ND	Nordic Semiconductor ASA
SIP32510DT-T1-GE3CT-ND	Vishay Siliconix
863-1056-1-ND	Skyworks Solutions Inc.
497-15813-ND	STMicroelectronics
535-11897-1-ND	Abracon LLC
SER4201CT-ND	EPSON
887-2568-1-ND	TXC CORPORATION
SER3631CT-ND	EPSON

MPN	MOUSER	Notes
AH086M555003-T		
ANT3216A063R2400A		
500R07S1R0BV4T		
GJM1555C1H1R2CB01D		
885012005074		
250R05L120GV4T		
GJM1555C1H120FB01D		
CBR04C180F5GAC		
GJM1555C1H270FB01D		
C0402C101J5RACAUTO		
CC0402JRX7R9BB331		
C0402C821J3GAC7867		
C0402C103J3RACTU		
C1005X7R1C473K050BC		
CL05A104KO5NNNC		
CL05X105KP5NNNC		
GRM155R61A475MEAAD		
GRM188R61A106KE69D		
GRM188R60J476ME15D	81-GRM188R60J476ME5D	
LTST-C191KGKT		
SML-LX0404SIUPGUSB		
DM3AT-SF-PEJM5		
ZX62-B-5PA(33)		
AISC-0402-3N9G-T		
HK100515NJ-T		
MLZ1608N100LT000		
ERJ-2GE0R00X		
RC1005F271CS		
CRCW0402470RFKEDC		
RCA04021K00FKEDHP		
ERJ-2RKF2001X		
ERJ-2GEJ103X		
ERJ-2RKF1102X		
AC0402FR-0716KL		
CRCW0402100KFKEDC		
CRCW04022M20FKEDC		
ERJ-2GEJ106X		
HHM1595A1		
DW1000-I-TR13		
FT232RQ		
LIS2DW12TR		
LXDC2HN18A-097		
MAX8887EZK33+T		
MCP73831T-2ACI/MC		
NRF52840		
SIP32510DT-T1-GE3		
SKY13317-373LF		
STM32F091CCU6		
ABS05-32.768KHZ-9-T		
FA-20H 16.0000MF10Z-AJ5		
7M-32.000MAHV-T		
FA-20H 38.4000MF10Z-AS3		