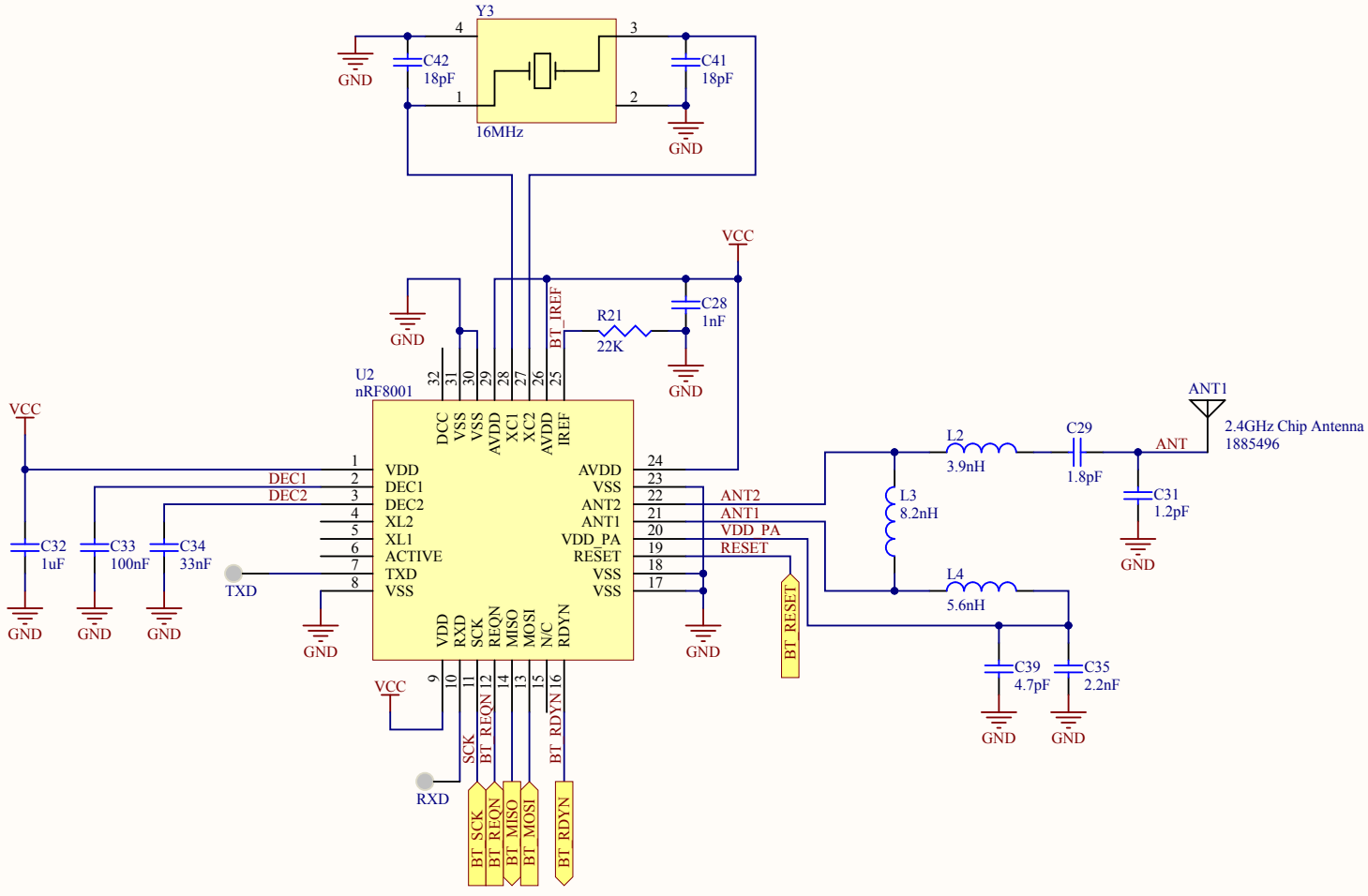


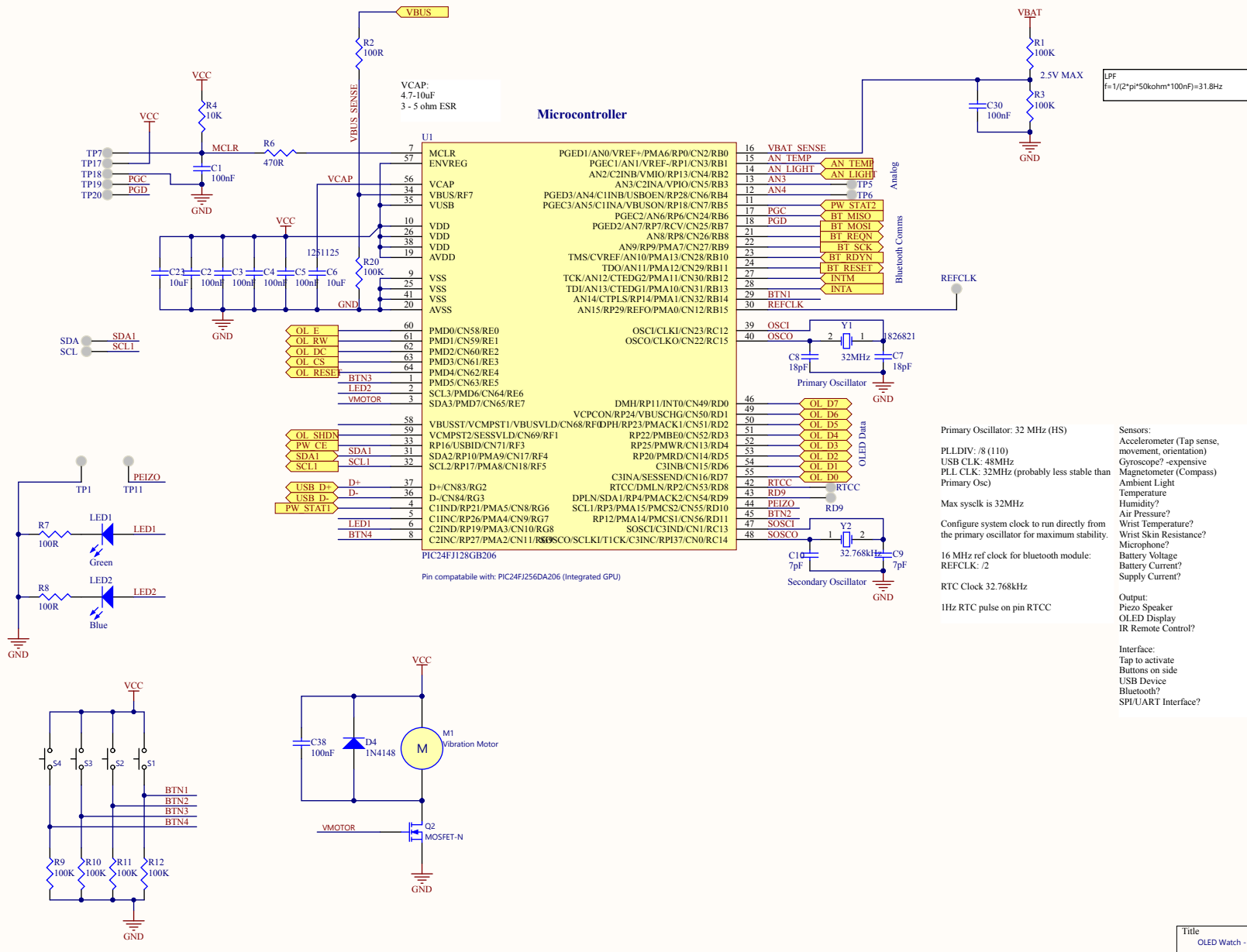
Keep length less than 1/10th of the wavelength
2.4GHz -> 26cm wavelength -> max 26mm trace length

Do not put any components or tracks underneath the antenna

The clock must be accurate to 40ppm (+-640Hz) for the RF to operate correctly

XL1/2 can use an internal RC oscillator

Title: OLED Watch - Bluetooth 4.0 LE		
Size: A4	Number:	Revision: R1
Date: 16/07/2014		Sheet of
File: C:\Users\..\bluetoothle.SchDoc		Drawn By: Jared Sanson



Revision 2 Changes:

OLED connector shifted to edge of PCB

USB connector protrudes off edge of PCB

Added bluetooth LE chip

Added capacitor to motor

Shifted components around on PCB

Added tank capacitors

Upgraded capacitor footprint size for 1uF+

Lengthened Y2 footprint

Shrinked LED footprints

Verified Y1 footprint size

Button footprint modified to be slightly bigger

Revision 2 TODO:

Add drill holes for buttons and usb connector?

Revision 3 TODO:

Add RAM or FLASH chip?

Add current metering

Change accelerometer chip to MPU accelerometer/gyro combo chip

Reverse OLED connector pinout!!!

Vibration motor off-board using solder points?

Heart rate monitor?

Skin temperature sensor

Air pressure?

Humidity?

GPS?

Touch screen from old iPod nano?

Primary Oscillator: 32 MHz (HS)

PLLDIV: /8 (110)
USB CLK: 48MHz
PLL CLK: 32MHz (probably less stable than Primary Osc)

Max sysclk is 32MHz

Configure system clock to run directly from the primary oscillator for maximum stability.

16 MHz ref clock for bluetooth module: REFCLK: /2

RTC Clock 32.768kHz

1Hz RTC pulse on pin RTCC

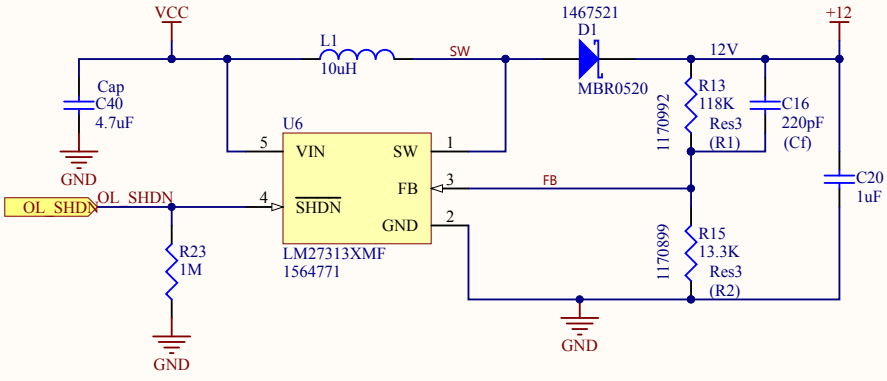
Sensors:
Accelerometer (Tap sense, movement, orientation)
Gyroscope? -expensive
Magnetometer (Compass)
Ambient Light
Temperature
Humidity?
Air Pressure?
Wrist Temperature?
Wrist Skin Resistance?
Microphone?
Battery Voltage
Battery Current?
Supply Current?

Output:
Piezo Speaker
OLED Display
IR Remote Control?

Interface:
Tap to activate
Buttons on side
USB Device
Bluetooth?
SPI/UART Interface?

Title: OLED Watch - Central Controller		
Size: A3	Number:	Revision: R2
Date: 16/07/2014		Sheet of
File: C:\Users\..\cpu.SchDoc		Drawn By: Jared Sanson

12V Boost

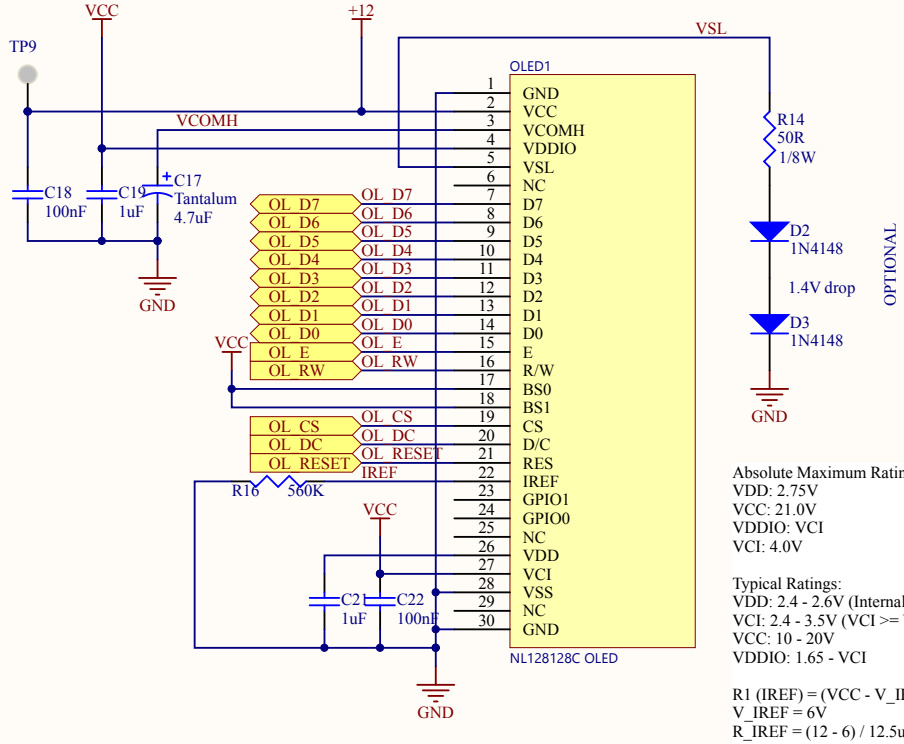


R1 = R2 * ((VOUT / VFB) - 1)
R2 current should be approx 92uA
VFB = 1.230V nominal

Cf = 1/ (2*pi*R1*fz), fz=8kHz

Rev 2.1:
R23 should be connected to GND, not VCC.

OLED Display

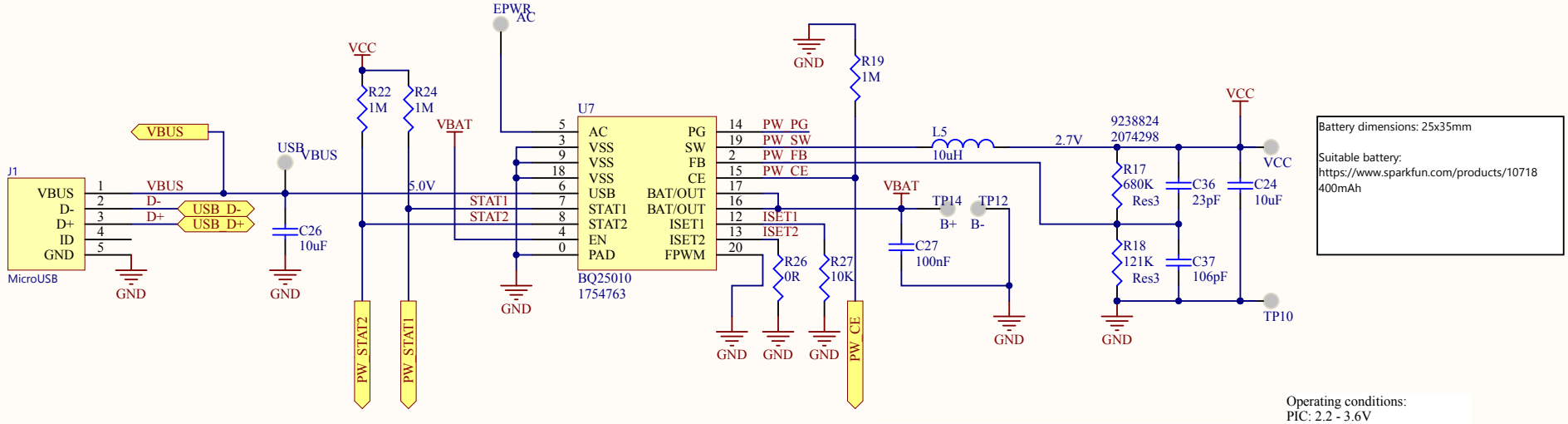


Absolute Maximum Ratings:
VDD: 2.75V
VCC: 21.0V
VDDIO: VCI
VCI: 4.0V

Typical Ratings:
VDD: 2.4 - 2.6V (Internally Regulated)
VCI: 2.4 - 3.5V (VCI >= VDD)
VCC: 10 - 20V
VDDIO: 1.65 - VCI

R1 (IREF) = (VCC - V_IREF) / 12.5uA
V_IREF = 6V
R_IREF = (12 - 6) / 12.5uA = 480k

Title: OLED Watch - OLED Interface		
Size: A4	Number:	Revision: R2.1
Date: 16/07/2014		Sheet of
File: C:\Users\..\oled.SchDoc		Drawn By: Jared Sanson



Battery dimensions: 25x35mm

Suitable battery:
https://www.sparkfun.com/products/10718
400mAh

EN (Enable): Input, Pull high to enable DC converter
PG (Power Good): Open drain output, activated when AC power is applied. Disabled in sleep mode
CE (Charge Enable): High disables charge and puts chip into low power mode

STAT1=1, STAT2=1 -> Precharge in progress
STAT1=1, STAT2=0 -> Fast charge in progress
STAT1=0, STAT2=1 -> Charge done
STAT1=0, STAT2=0 -> Timer fault

Sleep mode is activated when USB and AC power is removed. DC converter will still operate if EN is high

ISET2 (USB charge current): High=500mA, Low=100mA, N/C=Disable USB Charge
ISET1 (Precharge and taper set point)

FPWM: Driving this high will force the DC converter to override the power save mode so it always runs in continuous conduction mode.

REV2.1:
Change R19 (CE pin) from VCC to GND, so it will charge by default.
Eg. battery is flat, no way to power on PIC to enable the charge!

ISET2 should be pulled high to VBAT (not VCC!), since the OLED operating uses slightly more than 100mA and the battery never charges.

EPWR should have a 1Mohm resistor to ground, or it won't power up when a battery is not present.

Solder a 100nF capacitor over C26, for stability. Regulator will not operate without it!!!

Resistor on ISET1 (R27) should be 1K, not 10K.

VOUT = 0.5V * (1+R1/R2)

(R1=R17, R2=R18)

For very low quiescent current:
R1 + R2 <= 1Mohm
C1 = 1/(2*pi*10kHz*R1)
C2 = (R1/R2) * C1

VOUT = 2.5V
R1 = 680K
R2 = R1 / (VOUT/0.5 - 1) = 170K (nearest: 150K, 169K)
-> VOUT = 2.77V (150k)
-> VOUT = ?? (169k)

For higher quiescent current:
R1 + R2 <= 100Kohm, omit capacitors

Rev 2.1: USB requires minimum 3.1V
VOUT = 3.3V
R1 = 680K
R2 = 121K

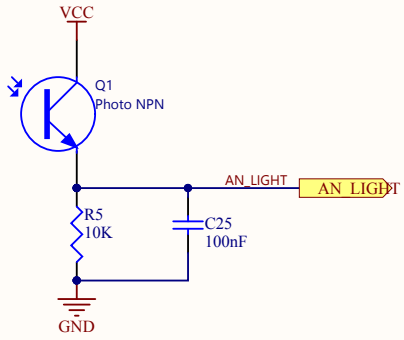
Operating conditions:
PIC: 2.2 - 3.6V
BT: 1.9 - 3.6V
OLED: 2.4 - 3.5V

Overall: 2.4 - 3.5V

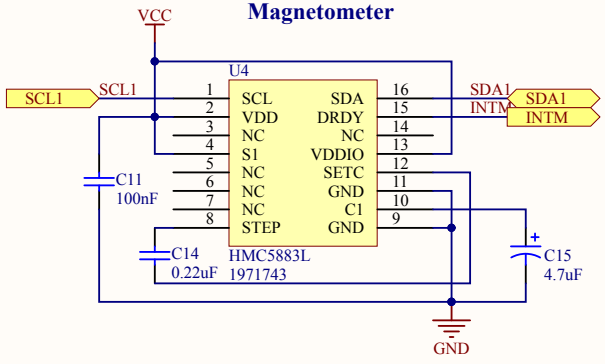
LiIon Battery: 2.7- 4.5V
Therefore set system voltage to be 2.5V

Title: OLED Watch - Power Supply & Management		
Size: A4	Number:	Revision: R2.1
Date: 16/07/2014		Sheet of
File: C:\Users\..\power.SchDoc		Drawn By: Jared Sanson

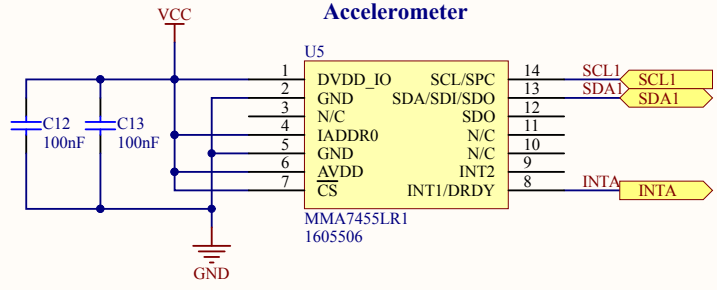
Ambient Light



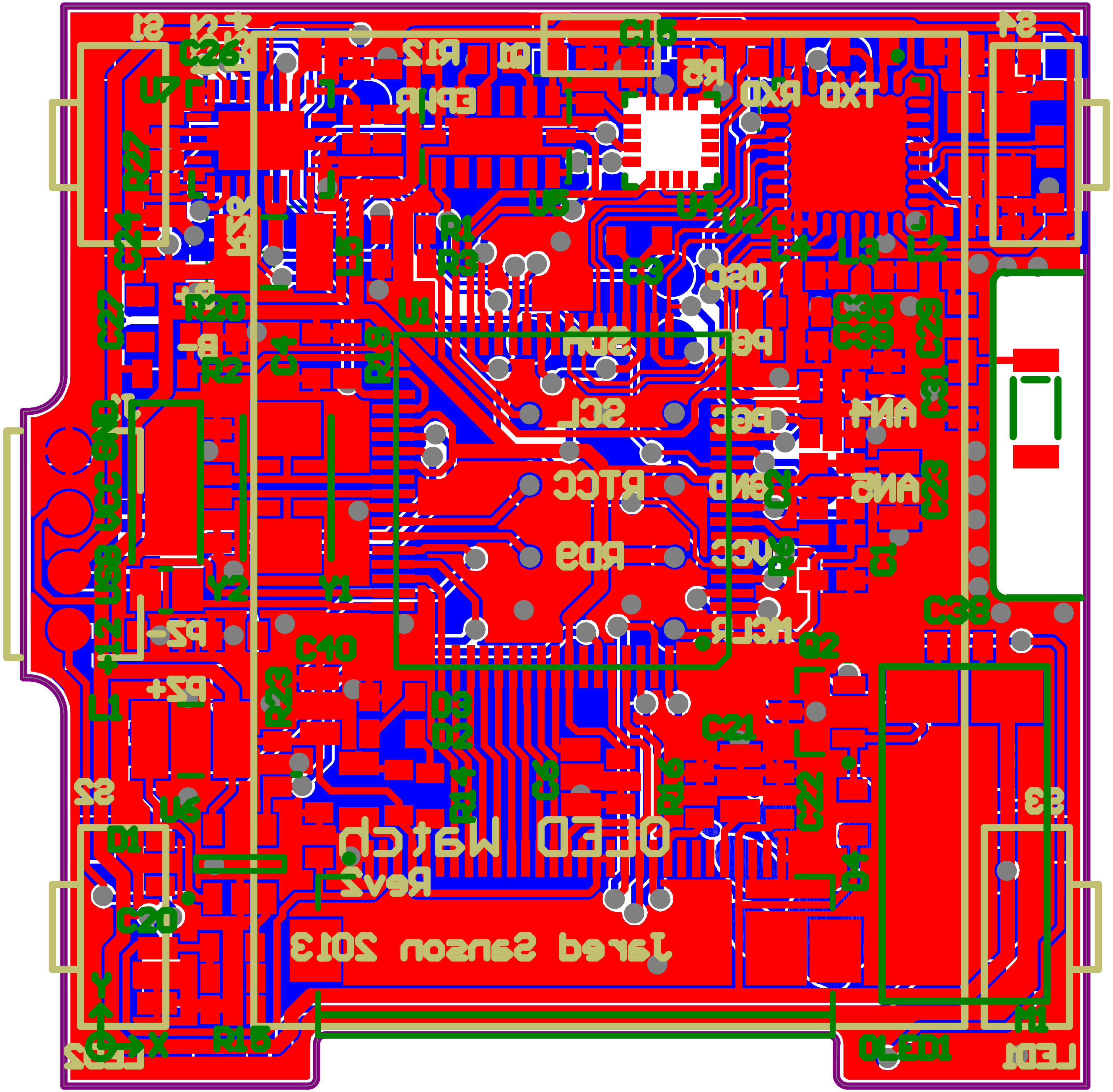
Magnetometer



Accelerometer



Title: OLED Watch - Sensors		
Size: A4	Number:	Revision: R1
Date: 16/07/2014		Sheet of
File: C:\Users\..\sensors.SchDoc		Drawn By: Jared Sanson


OLED Watch
Rev2
Jared Sanson 2013