

**To design and build a smartwatch and evaluate it against commercial alternatives.**

Jake Drew

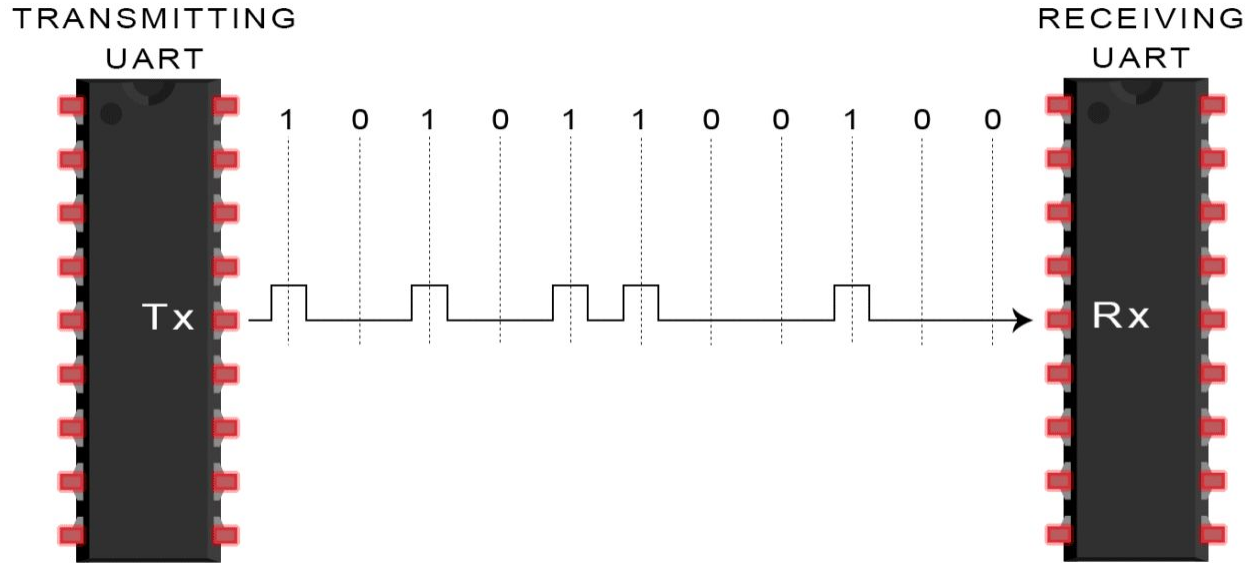
# What is a Smartwatch?

A SmartWatch is a wearable computing device that resembles a wristwatch or other timekeeping device, many smartwatches are able to extend the capabilities of the wearer's smartphone to the watch.

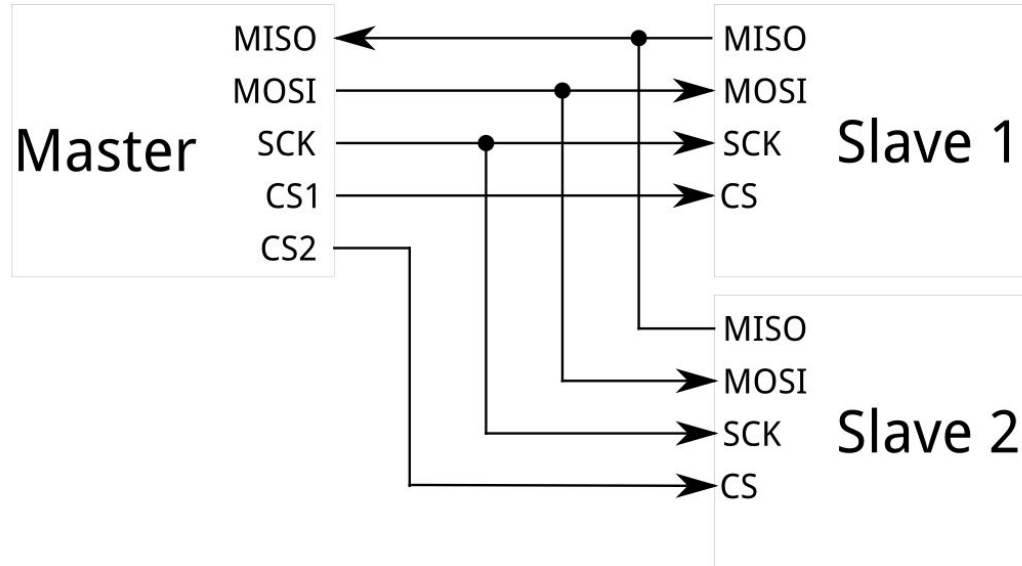
# What features do other Smartwatches have?

1. Tell the time
2. Wi-Fi
3. GPS
4. Minimum of 1 day battery life with rechargeable battery.
5. Weather
6. Track movement for steps
7. Receive notifications from the user's phone
8. Touchscreen
9. Respond to text messages and answer calls

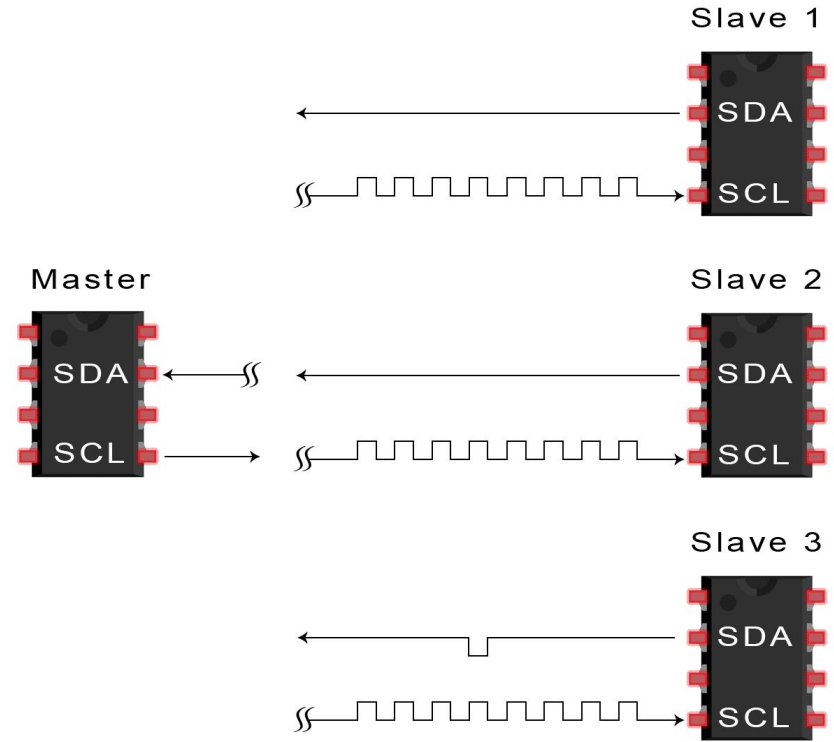
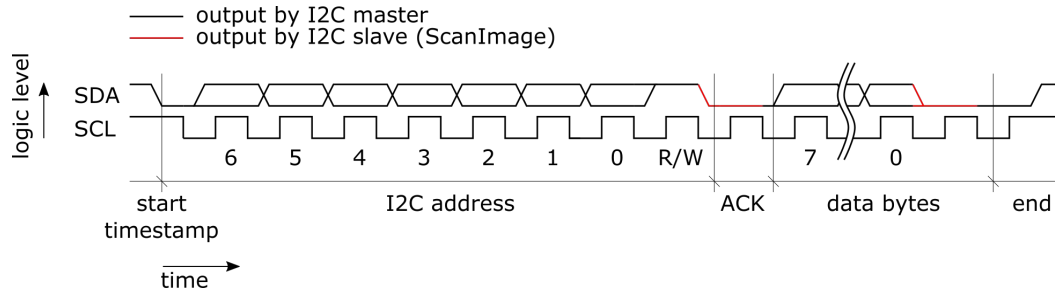
# UART (Universal asynchronous receiver-transmitter)



# SPI (Serial Peripheral Interface)



# I<sup>2</sup>C (Inter-Integrated Circuit)



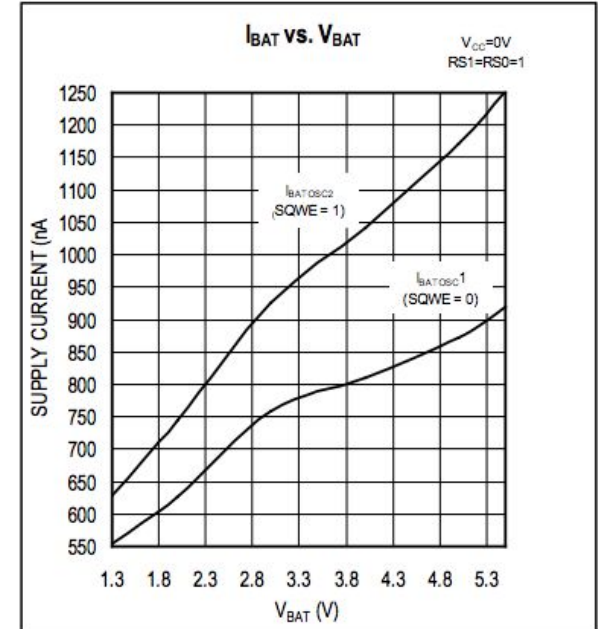
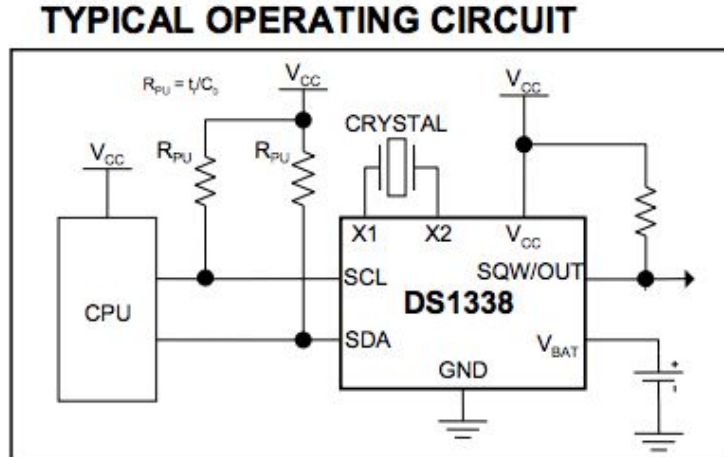
# ATMega328

1. 8 bit Microcontroller
2. 32KB Flash
3. 1KB EEPROM
4. 2KB SRAM
5. I2C
6. SPI
7. UART
8. Digital Interrupts
9. Arduino Bootloader



# Real Time Clock

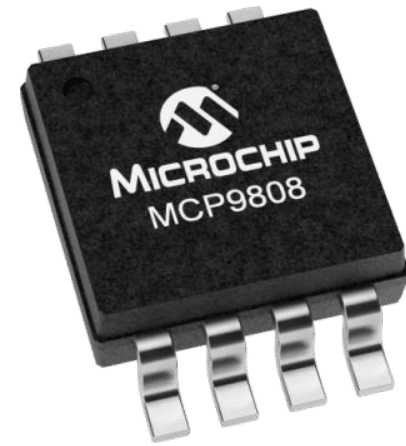
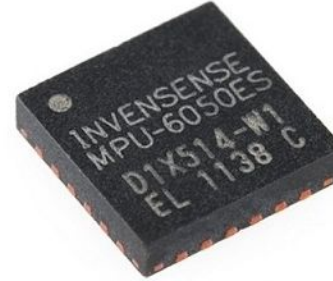
1. Around 650nA
2. CR1225 Backup battery (48mAh)





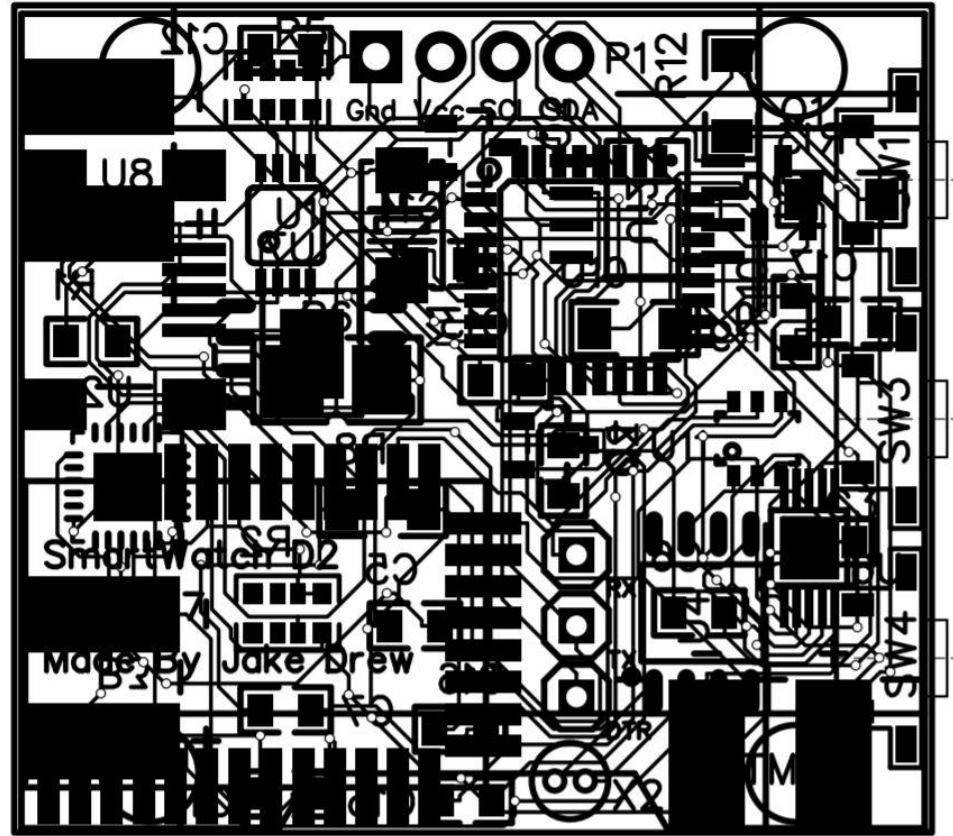
# MCP9808, MPU6050 and BLE112

1.  $\pm 0.5^{\circ}\text{C}$
2. 200uA
3. I2C
4. 8 Addresses
5. Acceleration (X,Y,Z)
6. Gyro (X,Y,Z)
7. 2 Addresses
8. UART



# Designing the Circuit and Board





# Technical Specifications

# Technical Specifications

Screen: 1.3", 128x64 Pixels OLED Display.

Height: 32.1mm\*

Width: 36.2mm\*

Depth: 11.1mm\*

Weight: ~45g\*

Bluetooth: Bluetooth 4.0 Low Energy, theoretical range 100m

Maximum Temperature Range: -20°C to +85°C

\*Not including case

# Power Consumption

Typical Consumption: 25.41mA, 15 Days and 18 Hours.

Standby Current: 6.46mA, 61 Days and 21 Hours

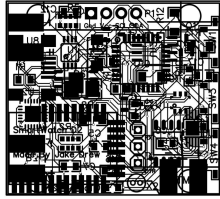
Real Time Clock: 650nA, 8 Years and 204 Days.

Maximum Time Tracking: 8 Years and 267 Days.

# Comparisons to alternatives



SmartWatch



Apple Watch 3



Pebble Time



LG G Watch

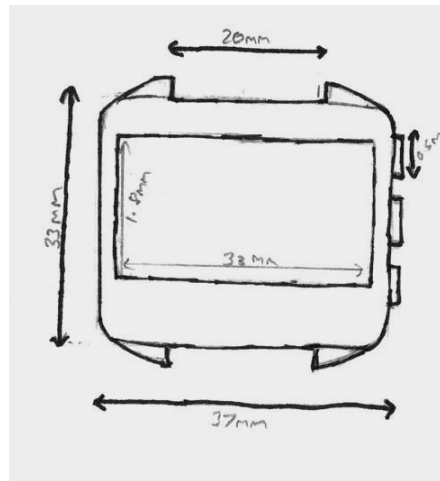
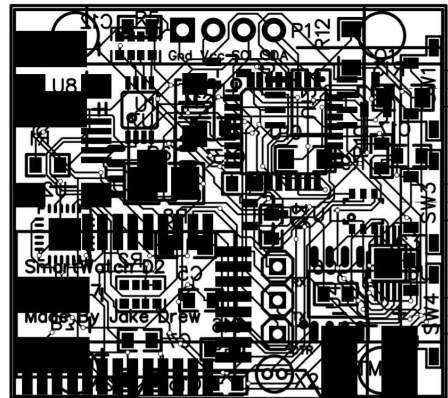


Processor Speed	16MHz	1200MHz	100MHz	1200MHz
Storage	2.03MiB	16GB	2MiB	4GB
RAM	2KiB	768MB	64KiB	512MB
Resolution (Px)	128x64	390x312	144x168	280x280
Battery Life	15.7 Days*	18 Hours	7 - 10 Days	24 Hours
Price (£)	£27.19**	£329	£149.99	£159

\*Typical Usage.

\*\*Price based off manufacturing 8000 units.

# Where next?



**Any Questions?**