## Circuit description:

A credit card sized circuit (thickness as small as possible) that when it is near another card (if they are in a Bluetooth range) and detects audio (through a microphone), will record the audio on a SD card. Also, the device should be able to plot the movement the user has made with an accelerometer/gyroscope/magnetometer.
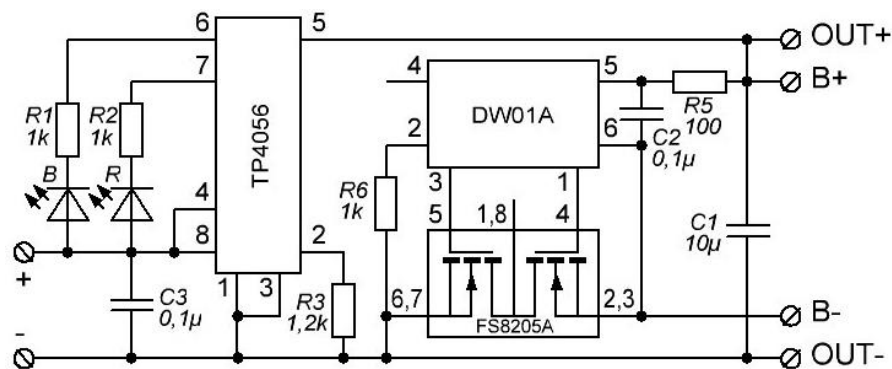
Main task:

Design a PCB with these main components:
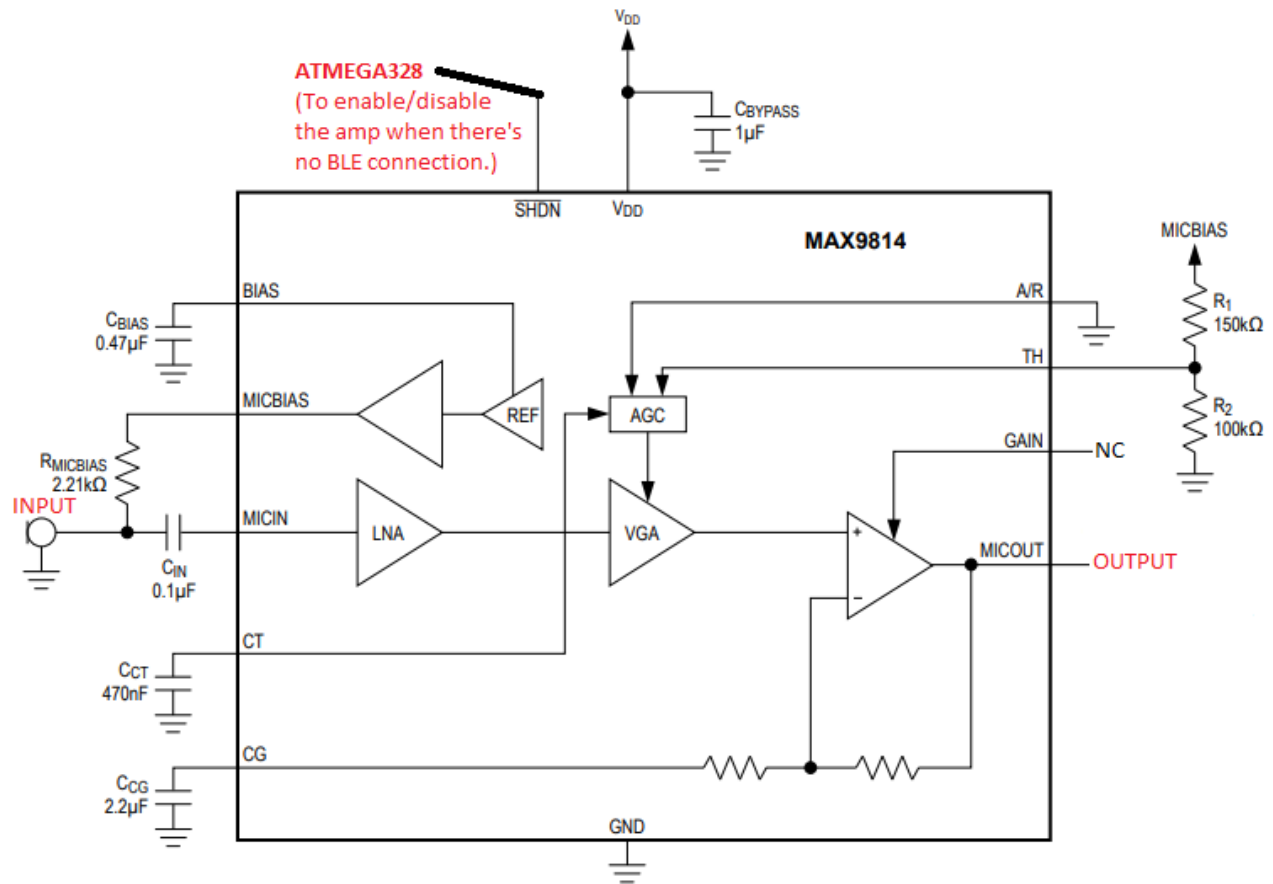
- MCU: Atmega328 (TQFP), it will be programmed externally.
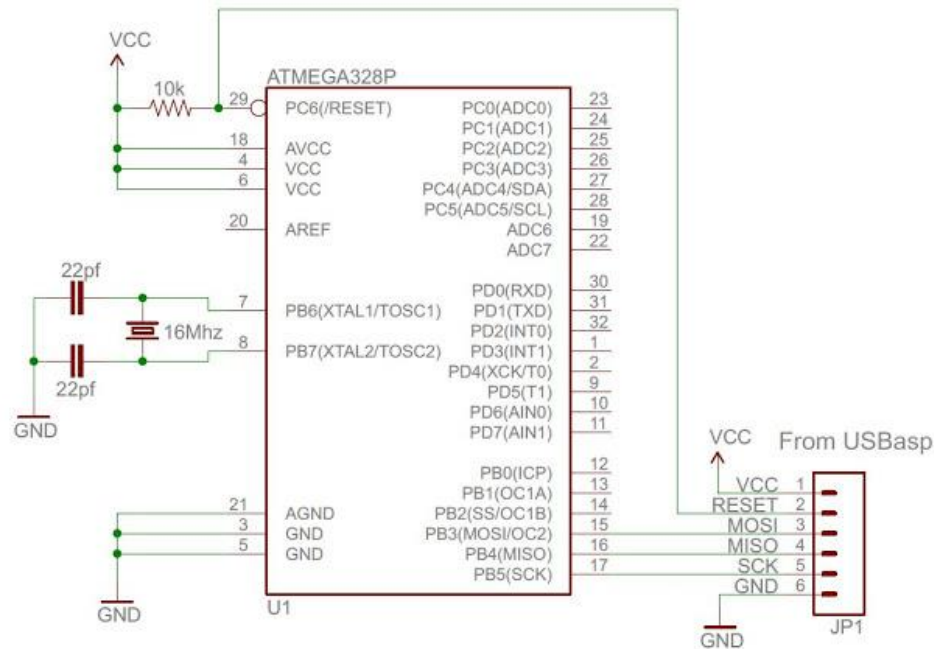
- Charging circuit with the TP4056, DW01A and FS8205A.

Exclude the LEDs in final design to save power. The resistor from TP4056 must comply with the charging current from the used battery. Recommended battery: PRT-13854 (850mAh).

- Audio: CMC-5042PF-AC is recommended with the MAX9814 amplifier. The inverted OUTPUT pin goes to an ADC pin on the MCU, for example, the ADC0/pin 23.

VDD

ATMEGA328
(To enable/disable
the amp when there's
no BLE connection.)

CBYPASS
1µF

SHDN VDD

MAX9814

MICBIAS

BIAS

CBIAS
0.47µF

A/R

R₁
150kΩ

TH

MICBIAS

REF AGC

RMICBIAS
2.21kΩ

INPUT

R₂
100kΩ

GAIN — NC

MICIN

LNA VGA

CIN
0.1µF

MICOUT — OUTPUT

CT

CCT
470nF

CG

CCG
2.2µF

GND

- MicroSD card: Besides the card mount, this will need a **3.3V regulator** (like the LM1117MPX-3.3/NOPB) and a **bidirectional logic level translator** such as the ADG3304 for between the SCK, CS, MISO and MOSI pins and the microcontroller SPI pins.

LM1117−XX

5V — VIN VOUT — 3.3V
GND

10 µF *
Tantalum

10 µF
Tantalum
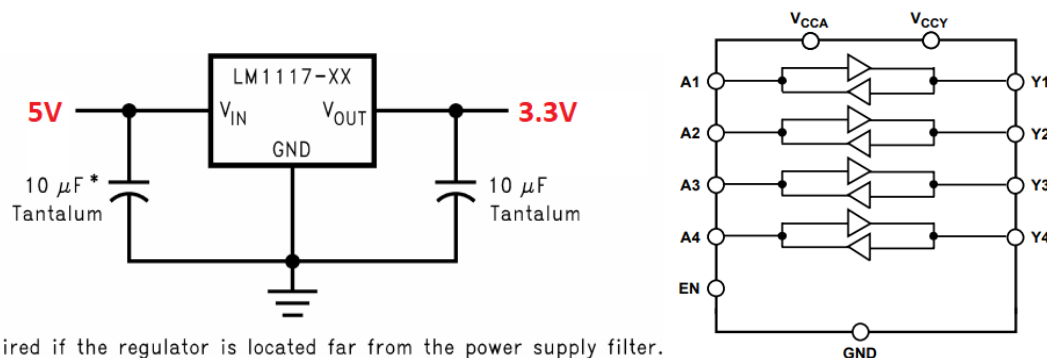
* Required if the regulator is located far from the power supply filter.

VCCA VCCY

A1 — Y1
A2 — Y2
A3 — Y3
A4 — Y4
EN

GND

- Bluetooth: Either CYBLE-012011-00, CYBLE-012012-10 or the CYBLE-022001-00 is fine. Given that these may work on **3.3V** it can share the previous regulator described. These modules may have several communication protocols like SPI, I2C and UART.

- Accelerometer/gyroscope/magnetometer: LSM9DS1TR, which communicates with either SPI or I2C. This device may share the 3.3V regulator previously described. The following image is the application hint as described by the datasheet: