Triboelectric Face mask

Team Members

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Slide Clips and Highlights

The Motivation

COVID-19 Business Regulations
- Mandatory mask wearing laws

Expensive temperature taking machines

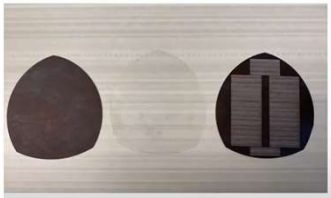
Feverish temperatures used as an early detection

Environmentally friendly

Drive towards micro/nanogenerators

Using easily-accessible materials

The Implementation

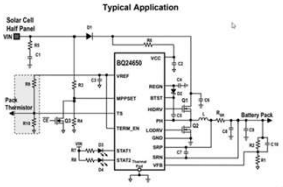


Objectives

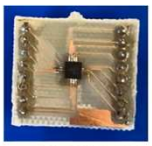
Create a self-powered face mask equipped with a triboelectric nanogenerator

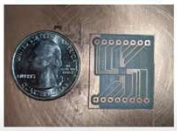
Use low-cost, common materials for the nanogenerator

Use Arduino coding to activate an LED at a set temperature read by the thermistor

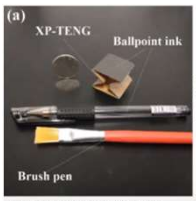


Design: The Battery Charger





BQ24650 Stand-Alone Synchronous Buck Battery Charge Controller for Solar Power With Maximum Power Point Tracking



The Background

Figure 1: Fabricated TENG using pen ink (Xia et al., 2018)

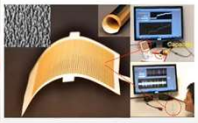


Figure 2: Rollable TENG for harvesting acoustic energy (Fan et al., 2015)

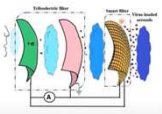


Figure 3: Design of a TENG face mask (Ghatak et al., 2020)

Design: The Temperature Sensor

NTC 3950 100k Thermistor

Thermistor Calculations
- The Steinhart-Hart Equation and Coefficients

The Steinhart-Hart equation:

$$\frac{1}{T} = C1 + (C2 * \ln(R)) + (C3 * (\ln(R))^3)$$

$$\begin{bmatrix} 1 & \ln(R1) & (\ln(R1))^3 \\ 1 & \ln(R2) & (\ln(R2))^3 \\ 1 & \ln(R3) & (\ln(R3))^3 \end{bmatrix} * \begin{bmatrix} C1 \\ C2 \\ C3 \end{bmatrix} = \begin{bmatrix} \frac{1}{T1 + 273.15} \\ \frac{1}{T2 + 273.15} \\ \frac{1}{T3 + 273.15} \end{bmatrix}$$

Figure 8: Paper-screen design using 200 µm holes (Credit: Barker, S.)

Figure 9: Paper-screen design using 200 µm x 20,000 µm slits (Credit: Barker, S.)

Design Progression

Figure 10: Insert-shape, paper-screen design using 200 µm slits x 20,000 µm slits (Credit: Barker, S.)

Design: The Arduino Set-up