

## Fundamental Components and Math

### 1. Fundamental Components

#### 1.1 LED/Light-Emitting Diode(发光二极管)

In a light emitting diode, the recombination of electrons and electron holes in a semiconductor produces light (infrared, visible or UV), a process called "electroluminescence". The wavelength of the light depends on the energy band gap of the semiconductors used.

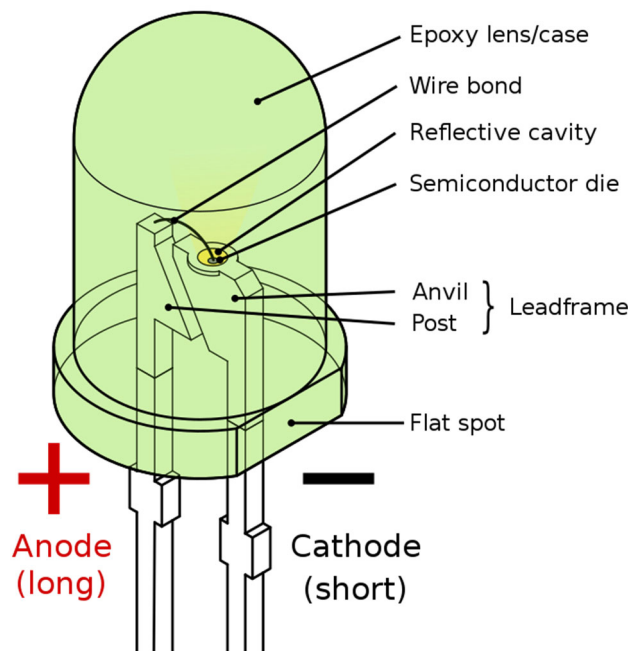


Figure 1.1 LED, 5mm, green

#### 1.2 Light Detector & Camera(Sensor Array)

#### 1.3 Microphone & Speaker

The sensitive transducer element of a microphone is called its element or capsule. Sound is first converted to mechanical motion by means of a diaphragm, the motion of which is then converted to an electrical signal. A complete microphone also includes a housing, some means of bringing the

signal from the element to other equipment, and often an electronic circuit to adapt the output of the capsule to the equipment being driven. A wireless microphone contains a radio transmitter.

## 1.4 Motor

Brush vs. Brushless

## 1.5 Inertial Measurement Unit(惯性测量系统/IMU)

Accelerometers + Gyroscopes + Magnetometers

## 2. Communication Protocols

通用的通信协议：

\*(Hardware)Socket != Protocols(Software)

\*串行/优先级协议/高速信号（差分等）

## 3. Math Fundamental – Complex variables

### 3.1 Impedance 阻抗

$$X_C = -j \frac{1}{\omega C}$$

$$X_L = j\omega L$$

$$X_R = R$$

### 3.2 Brief Introduction to Fourier Transform

- *Any periodic function can be written as sine and cosine!*