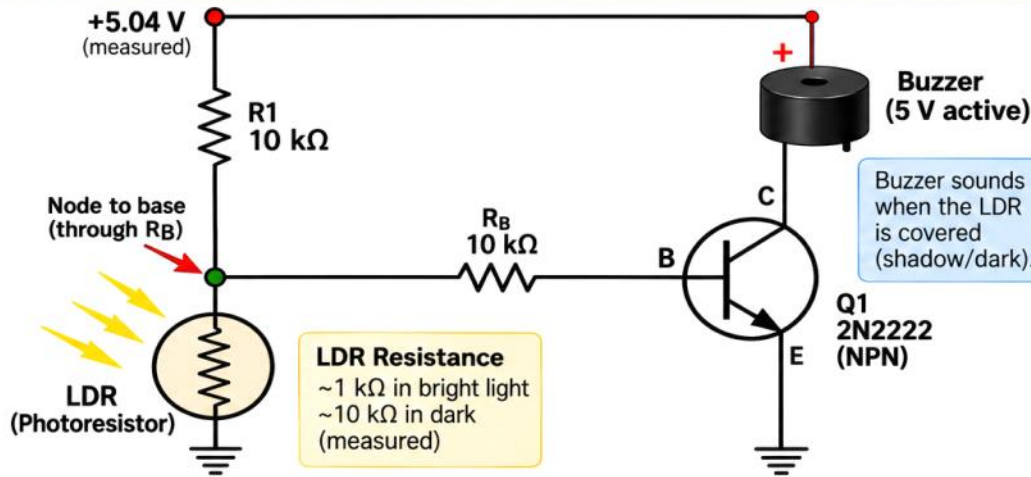


Shadow Alarm Using a Photoresistor

Schematic, Lab Values, and Calculations

Build Circuits
With Rich
Whoa Buddy!!



Typical 5 V Active Buzzer

- Rated voltage: 3–5 V
- Current: ~10–30 mA
- Internal oscillator/driver
- Produces a continuous tone when powered

Voltage Divider Equation (at the junction of R1 and LDR)

$$V_{\text{NODE}} = V_{\text{CC}} \cdot \frac{R_{\text{LDR}}}{R_1 + R_{\text{LDR}}}$$

Where:

V_{NODE} = voltage at divider junction (V)

$V_{\text{CC}} = 5.04 \text{ V}$ (measured)

$R_1 = 10 \text{ k}\Omega$

R_{LDR} = photoresistor resistance (Ω)

How It Works

1. In bright light, the LDR resistance is low (~1 k Ω), so the divider node voltage is low (~0.46 V). The transistor is OFF and the buzzer is silent.
2. In darkness (shadow), the LDR resistance is high (~10 k Ω), so the divider node voltage rises (~2.52 V), turning the transistor ON.
3. The 10 k Ω base resistor (R_B) limits base current and helps protect the transistor.
4. The transistor provides a ground path for the buzzer, and it sounds when ON.

Example Measurements and Calculations

(with $V_{\text{CC}} = 5.04 \text{ V}$, $R_1 = 10 \text{ k}\Omega$)

Condition	R_{LDR} (measured)	V_{NODE} (calc)	Result
Bright Light	1 k Ω	$\frac{5.04 \times 1\text{k}}{(10\text{k} + 1\text{k})} = 0.46 \text{ V}$	Transistor OFF Buzzer silent
Shadow/Dark	10 k Ω	$\frac{5.04 \times 10\text{k}}{(10\text{k} + 10\text{k})} = 2.52 \text{ V}$	Transistor ON Buzzer sounds

V_{NODE} is the voltage at the junction of R1 and the LDR.

This voltage is connected to the transistor base through R_B (10 k Ω).

Lab Values (Your Build)

- $V_{\text{CC}} = 5.04 \text{ V}$ (measured)
- $R_1 = 10 \text{ k}\Omega$
- $R_B = 10 \text{ k}\Omega$
- Q1 = 2N2222 (NPN)
- Buzzer = 5 V active type
- LDR = ~1 k Ω (bright), ~10 k Ω (dark) (measured)

Active Buzzer (Includes Internal Circuitry)



Active Buzzer
(actual part)

DC Voltage
(typically 3–5 V)

**Internal
Oscillator /
Driver Circuit**
Generates a changing
electrical signal
(at an audio frequency)

**Sound-Producing
Element**
Converts the electrical
signal to mechanical
vibrations



Sound

An active buzzer contains the circuitry needed to generate its own tone.
Apply the proper DC voltage, and the buzzer produces sound.
The exact internal construction can vary depending on the buzzer.