

# Electronics

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# Introduction

- Electronic systems have 3 parts
- Input
- Process
- Output
- There are 2 types of systems:
- Analogue
- Digital

# Output Devices

These turn  $E_E$  into some other form

Analogue

Motor, Bulb, Loudspeaker

Digital

LED, Relay, Solenoid

# Input Devices

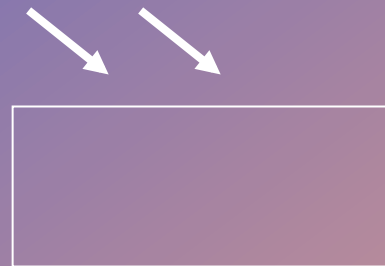
- 2 main types
- Change the size of the input voltage
- Switch, Capacitor,
- LDR, Thermistor
- and

# Input Devices

- Energy Changers
- Thermocouple, Microphone
- Solar Cell

# LDR

- As Light Intensity Increases Resistance Decreases



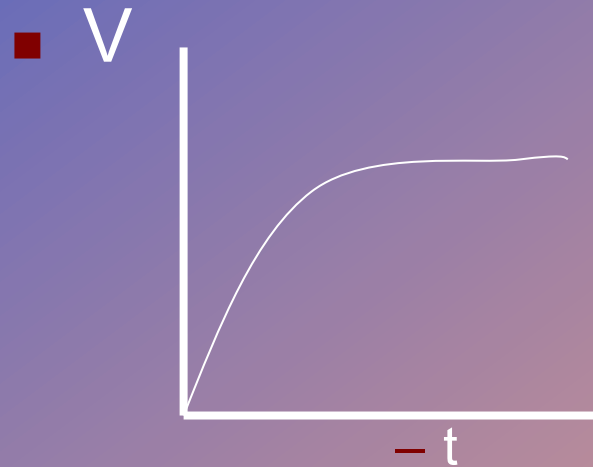
# Thermistor

- As Temperature increases the resistance decreases



# Capacitors

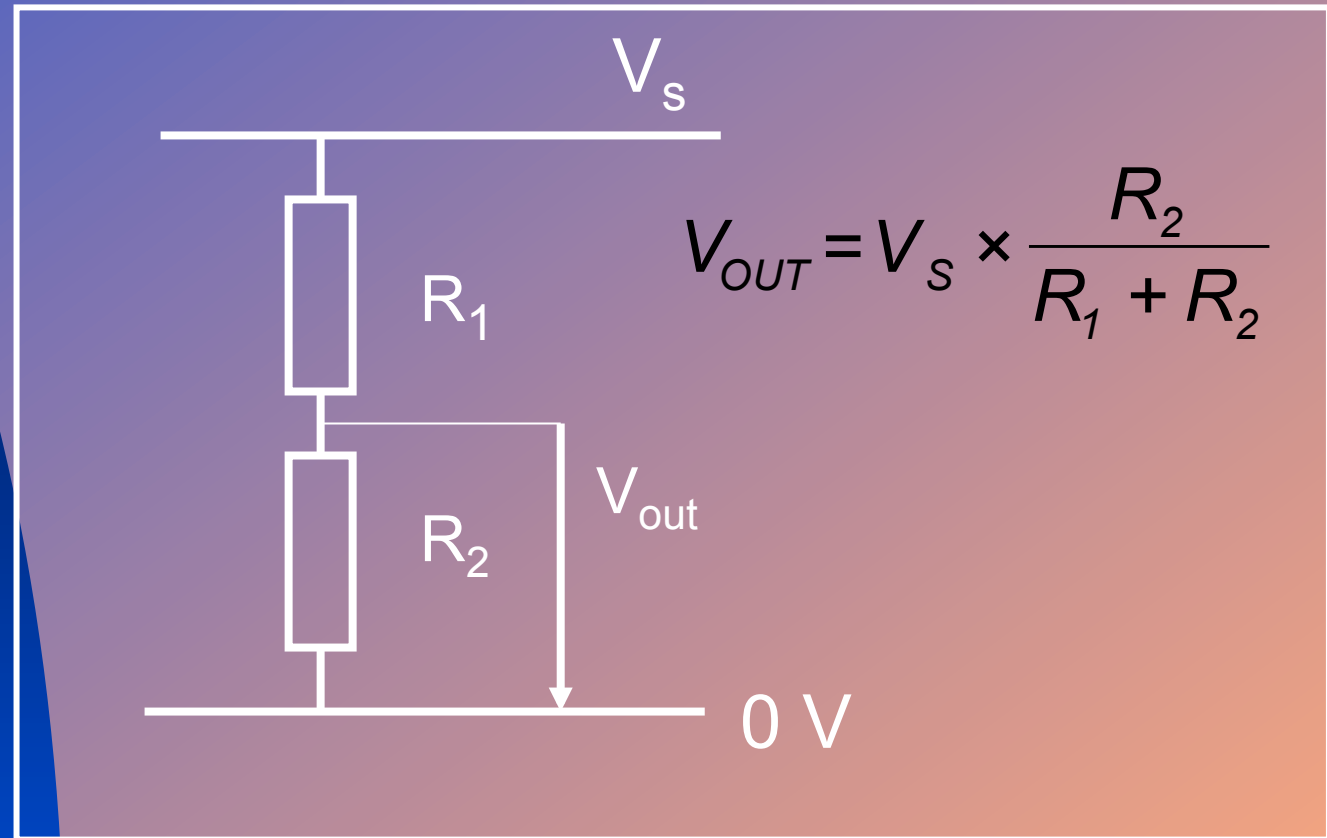
- Store Charge



- Provide timing delays

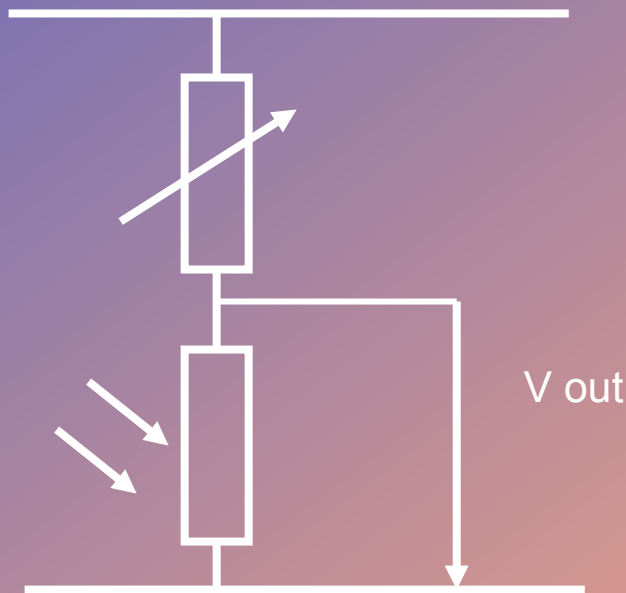


# Voltage Dividers



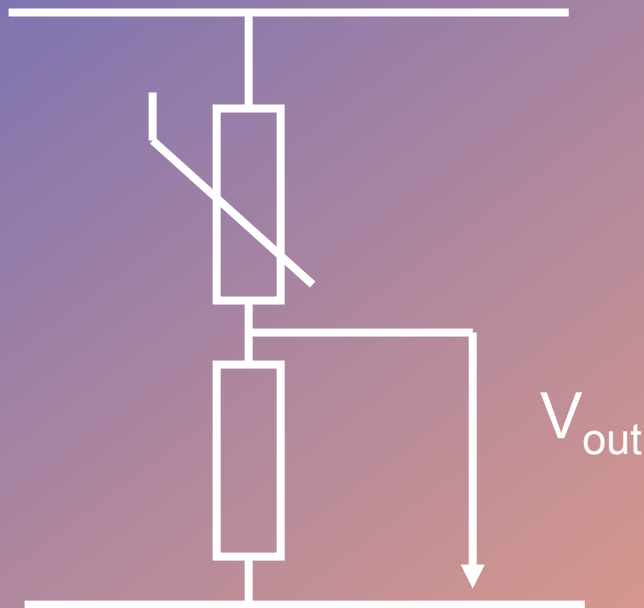
# LDR in Voltage Divider

- As light increases, resistance of LDR decreases, voltage across it decreases,



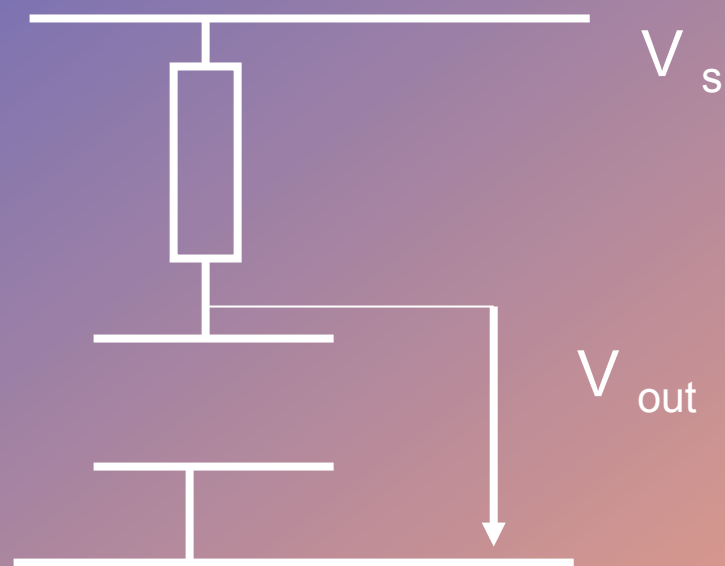
# Thermistor

- As temperature decreases, resistance of thermistor increases, voltage across thermistor increases,  $V_{out}$  decreases



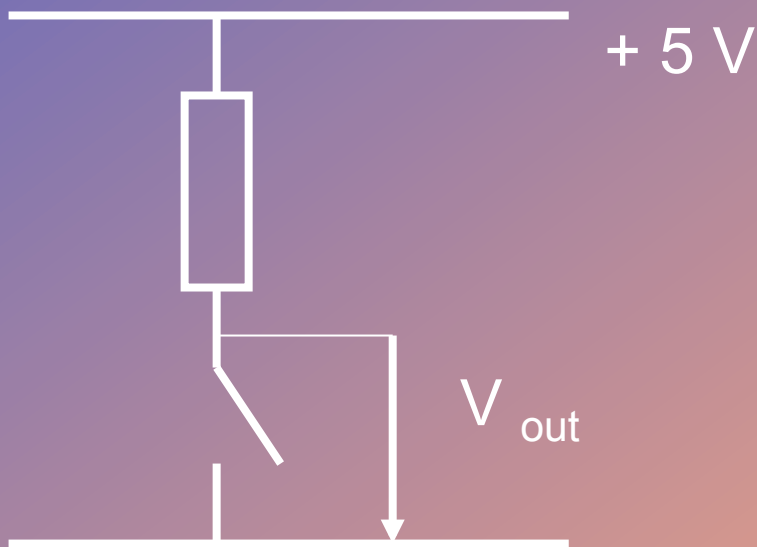
# Capacitor

- Capacitor charges up
- $V_{\text{out}}$  increases



# Switches

- When switch is closed
- $V_{\text{out}}$  is low

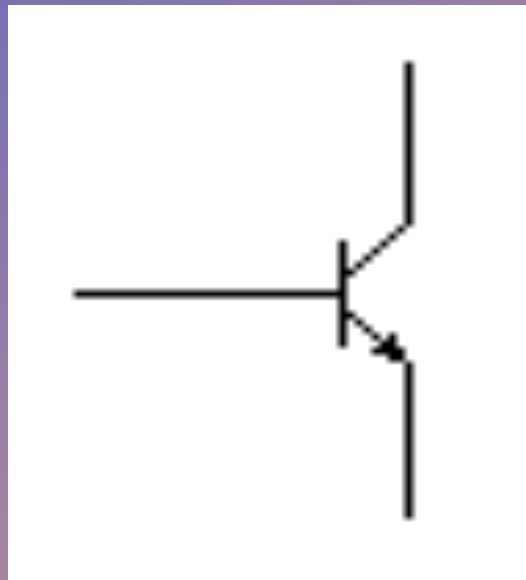


# Process Devices

- Analogue : Amplifier
- Digital : Transistor

# NPN Transistor

- $V_{be} > 0.7 \text{ V}$
- Transistor is switched on

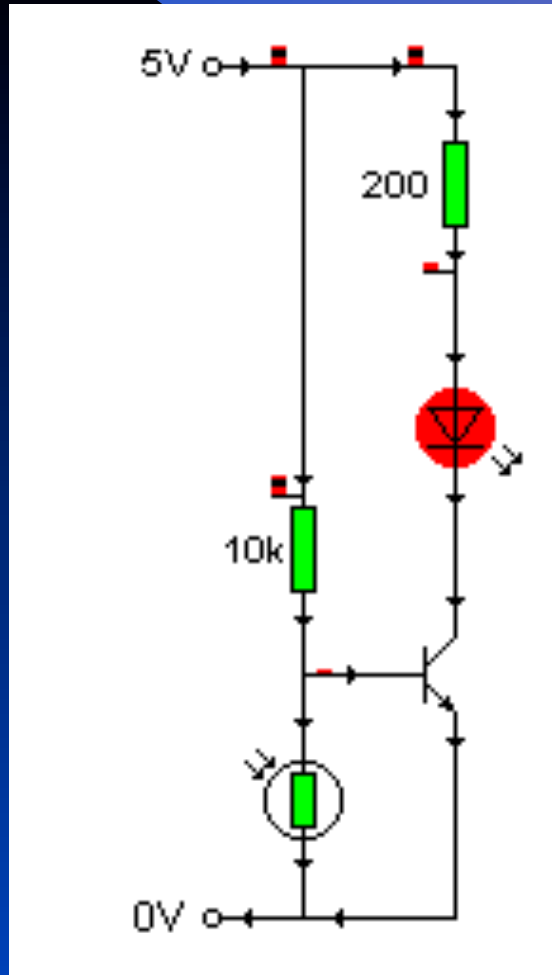


Collector

Base

Emitter

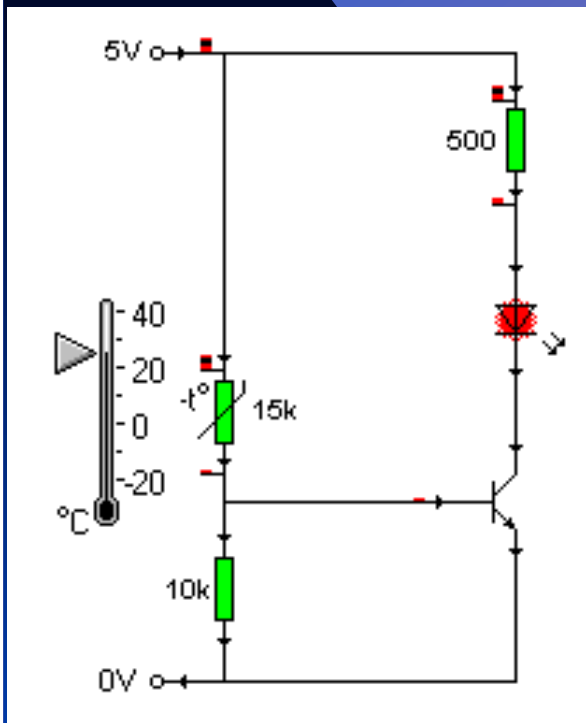
# Alarm Circuits



- Light Intensity decreases
- $R_{ldr}$  increases
- $V_{ldr}$  increases
- $V_{be}$  increases
- $V_{be} > 0.7 V$
- Transistor switches on
- Current flows through LED



# Alarm Circuits



- Temperature increases
- $R_{\text{thermistor}}$  decreases
- $V_{\text{thermistor}}$  decreases
- $V_{\text{resistor}}$  increases
- $V_{\text{be}}$  increases
- $V_{\text{be}} > 0.7 \text{ V}$
- Transistor switches on
- Current flows through LED