

Lecture 09/26 Transistor

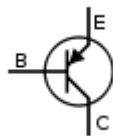
Yung-Ping Liu

電晶體

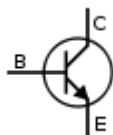
■ 電晶體 transistor

■ 雙極性電晶體 (BJT)

- PNP
- NPN



射極 (**Emitter**) 、基極 (**Base**) 和集極 (**Collector**)

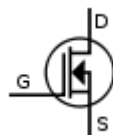


■ 場效應電晶體 (FET)

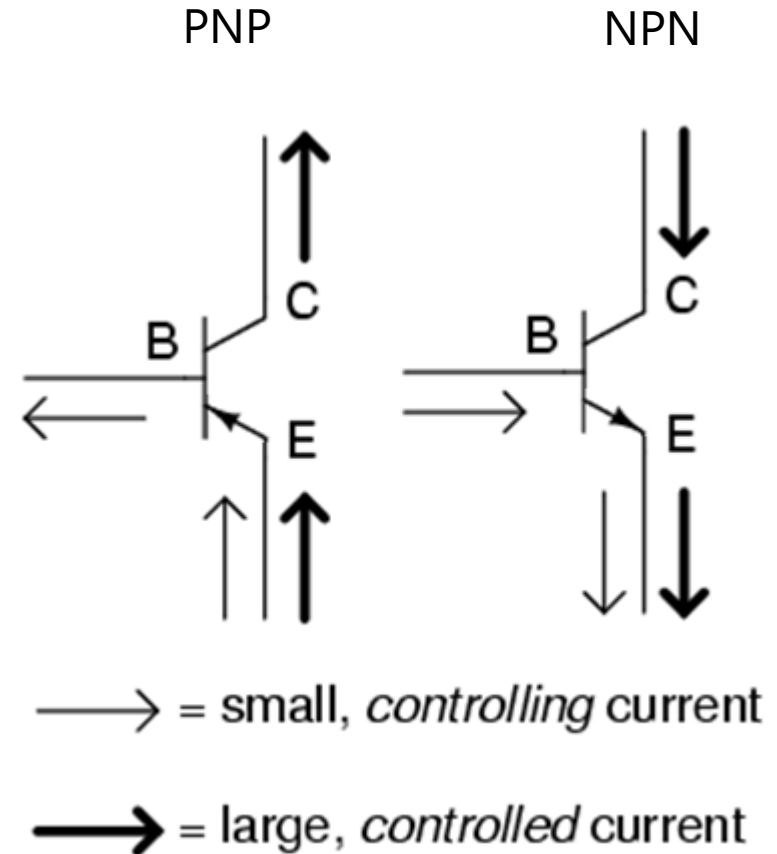
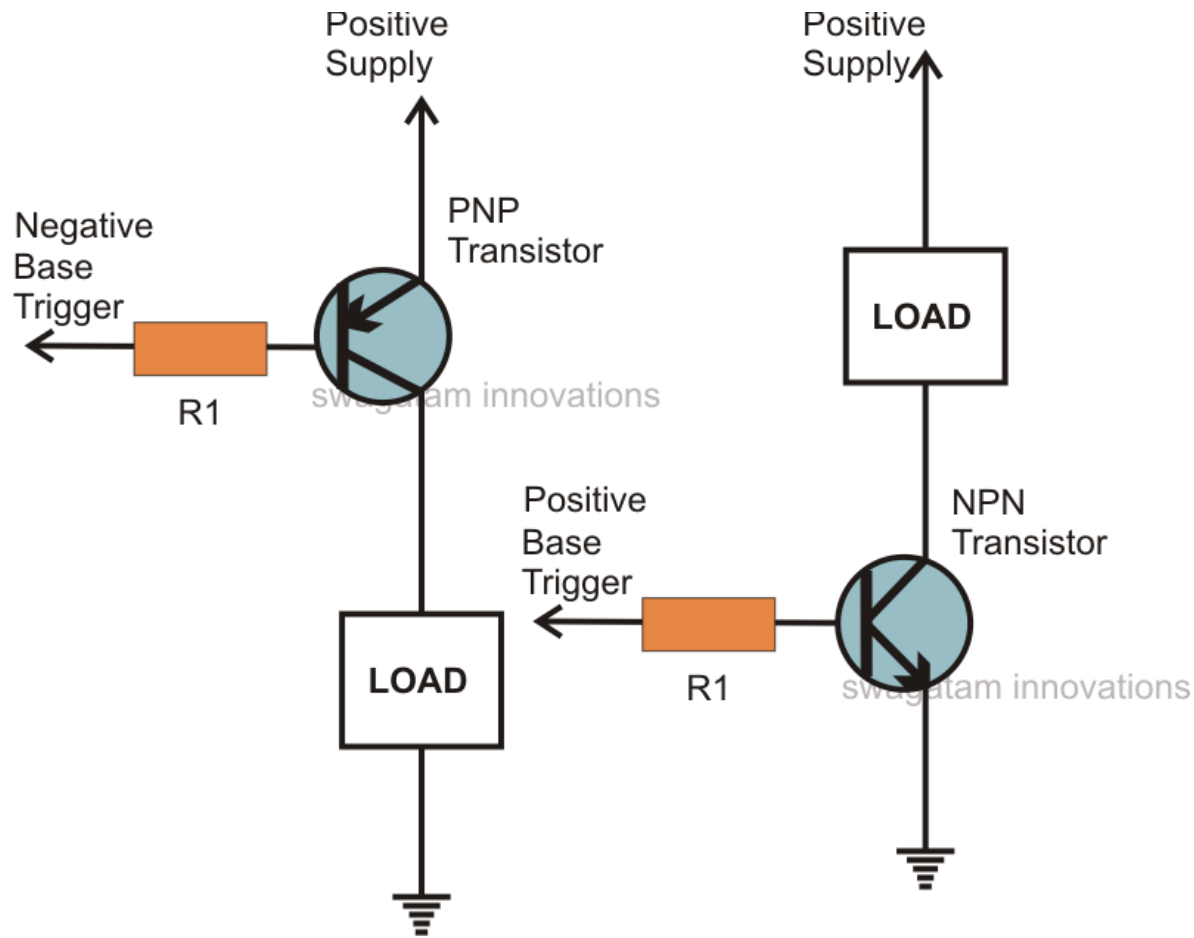
- MOSFET-P
- MOSFET-N



源極 (**Source**) 、閘極 (**Gate**) 和洩 (漏) 極 (**Drain**)



電晶體 NPN & PNP



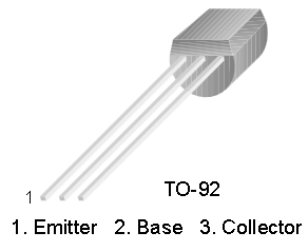
電晶體 – 9012 vs 9013



SS9012

1W Output Amplifier of Potable Radios in Class B Push-pull Operation.

- High total power dissipation. ($P_T=625\text{mW}$)
- High Collector Current. ($I_C=500\text{mA}$)
- Complementary to SS9013
- Excellent h_{FE} linearity.



PNP Epitaxial Silicon Transistor

Absolute Maximum Ratings $T_a=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{CBO}	Collector-Base Voltage	-40	V
V_{CEO}	Collector-Emitter Voltage	-20	V
V_{EBO}	Emitter-Base Voltage	-5	V
I_C	Collector Current	-500	mA
P_C	Collector Power Dissipation	625	mW
T_J	Junction Temperature	150	$^\circ\text{C}$
T_{STG}	Storage Temperature	-55 ~ 150	$^\circ\text{C}$

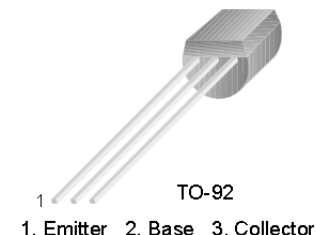
SS9012



SS9013

1W Output Amplifier of Potable Radios in Class B Push-pull Operation.

- High total power dissipation. ($P_T=625\text{mW}$)
- High Collector Current. ($I_C=500\text{mA}$)
- Complementary to SS9012
- Excellent h_{FE} linearity.



NPN Epitaxial Silicon Transistor

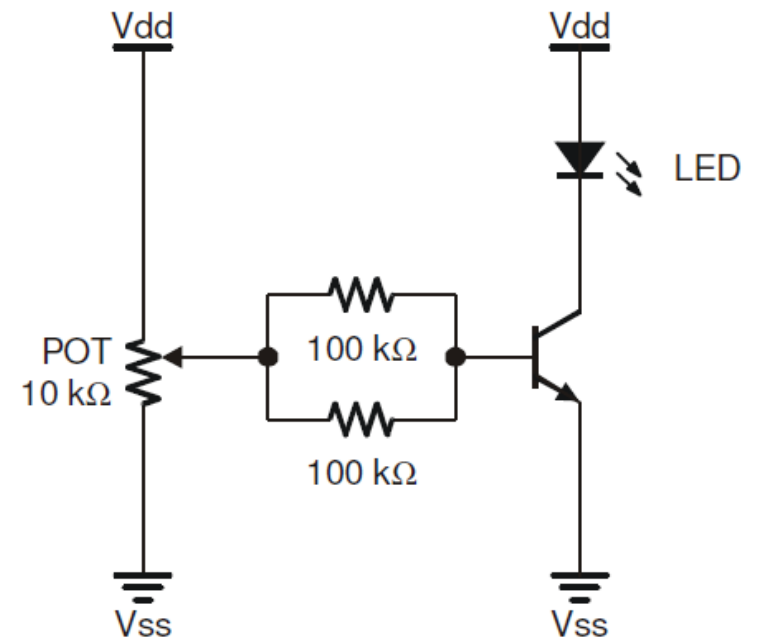
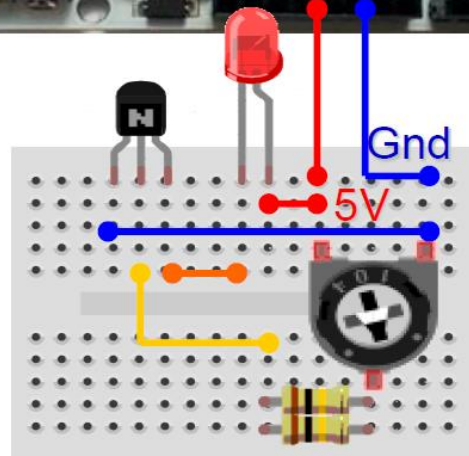
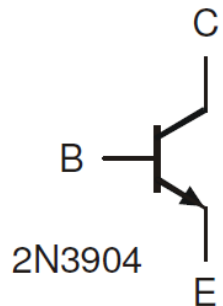
Absolute Maximum Ratings $T_a=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{CBO}	Collector-Base Voltage	40	V
V_{CEO}	Collector-Emitter Voltage	20	V
V_{EBO}	Emitter-Base Voltage	5	V
I_C	Collector Current	500	mA
P_C	Collector Power Dissipation	625	mW
T_J	Junction Temperature	150	$^\circ\text{C}$
T_{STG}	Storage Temperature	-55 ~ 150	$^\circ\text{C}$

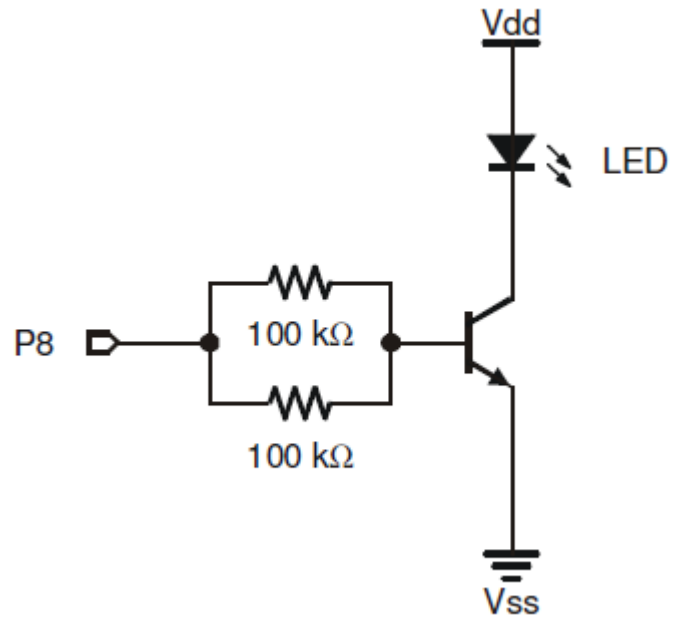
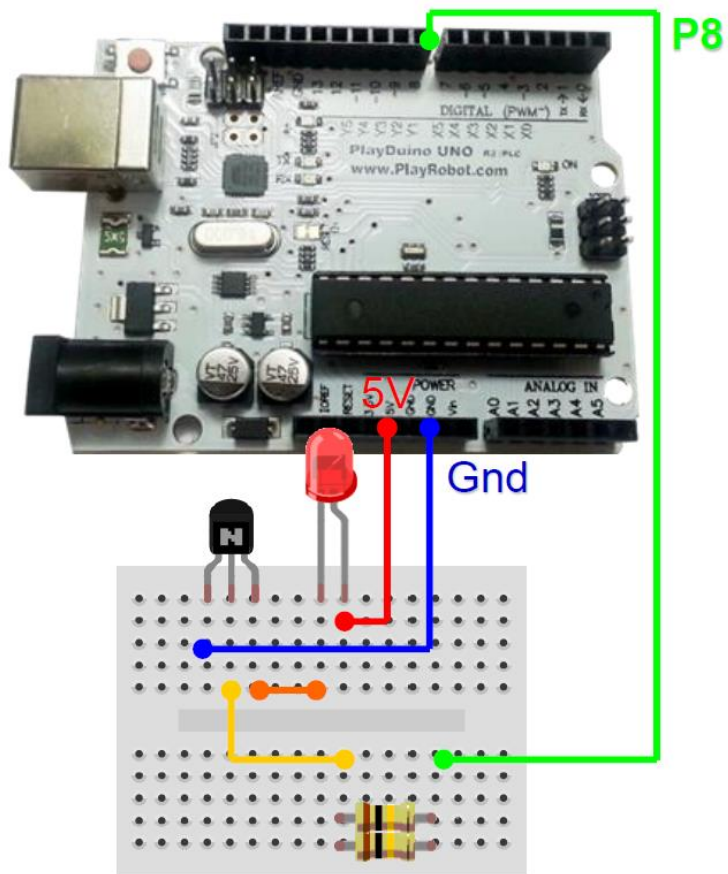
SS9013

2N3904

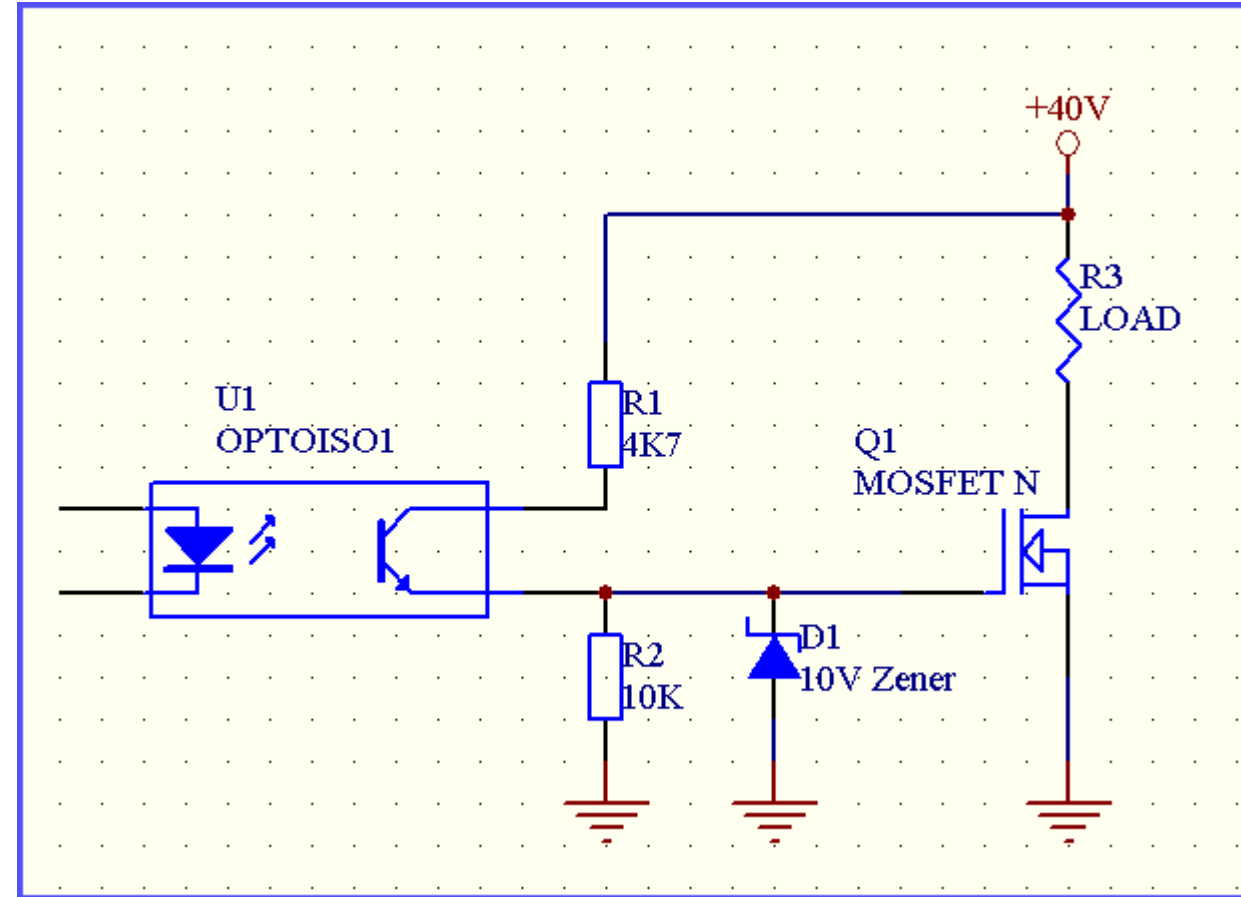
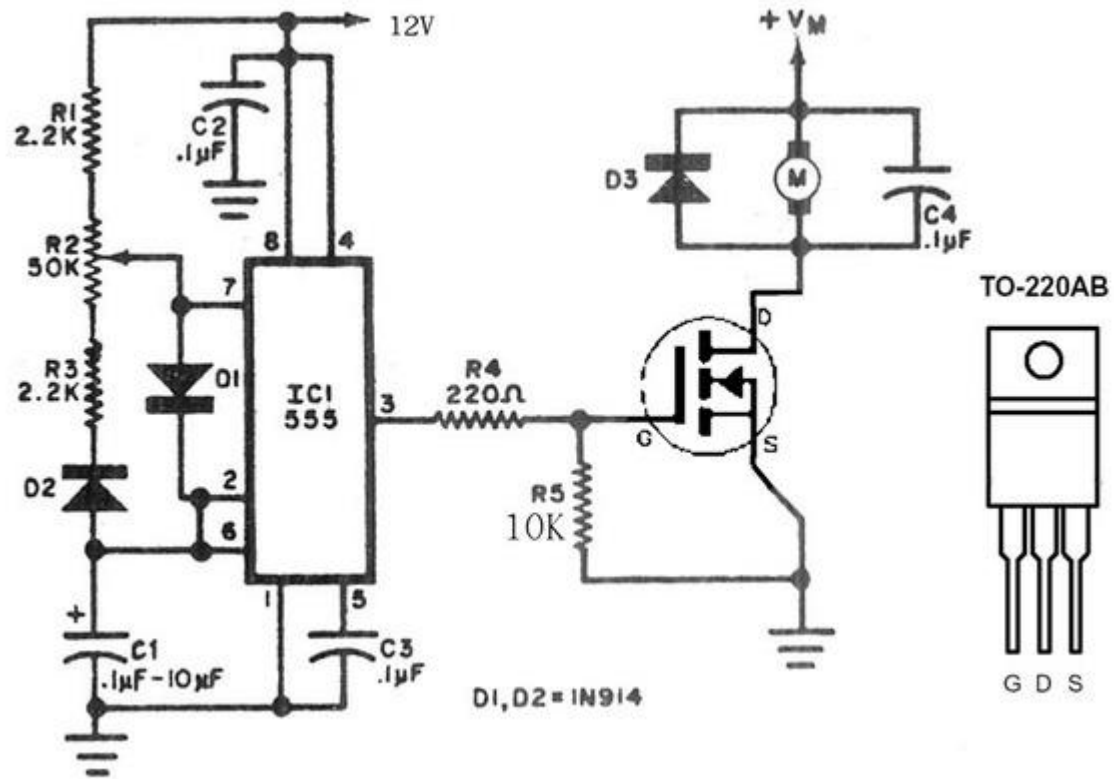
LED 的明亮反映出電流大小，越亮代表電流越大；越暗電流越小。



如果你想要將你的電晶體加上一個開關，那麼你可以用下圖線路。



IRF530 -- MOSFET (N Type)

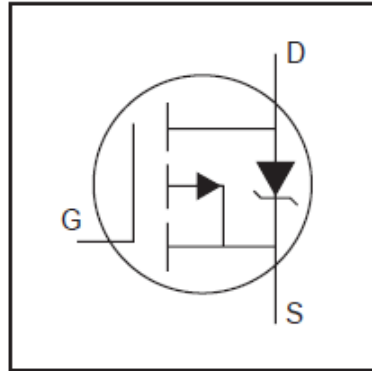


IRF5210 –MOSFET (P Type)

PD - 91434A

IRF5210

HEXFET® Power MOSFET



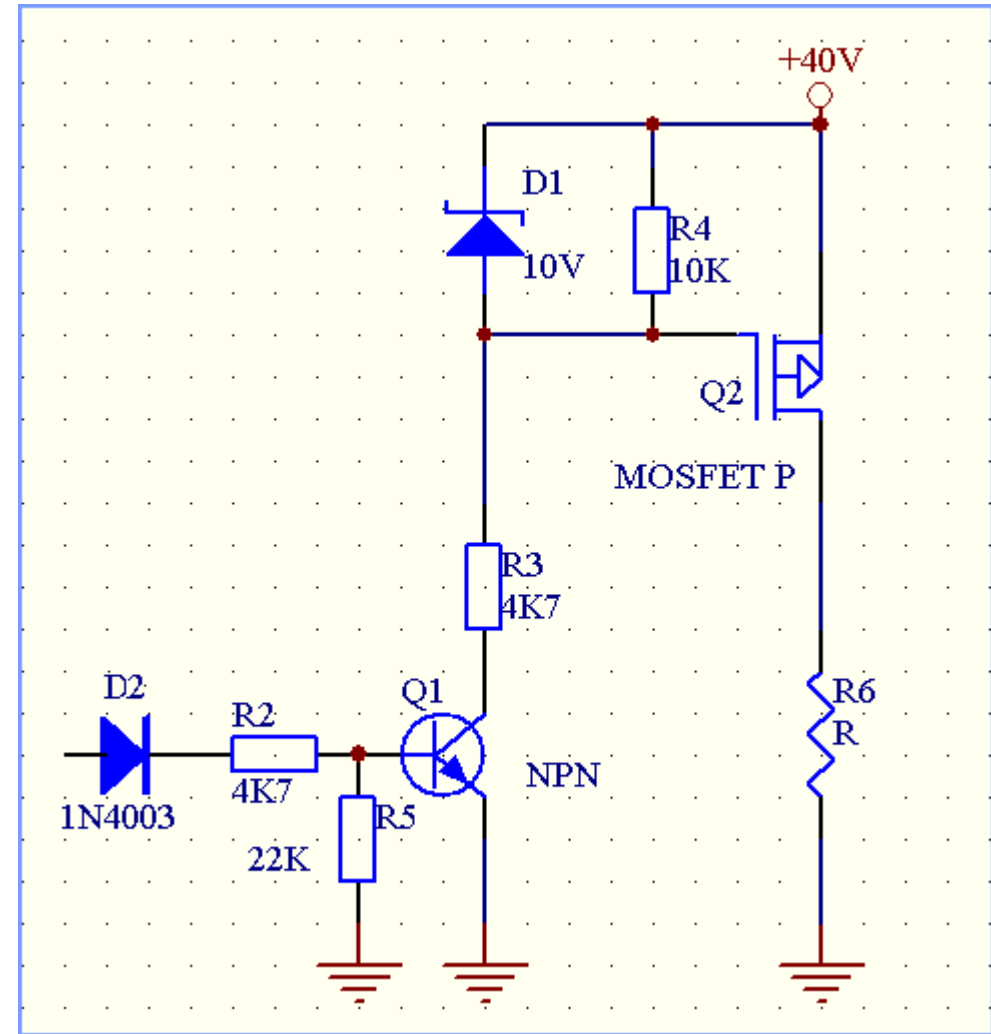
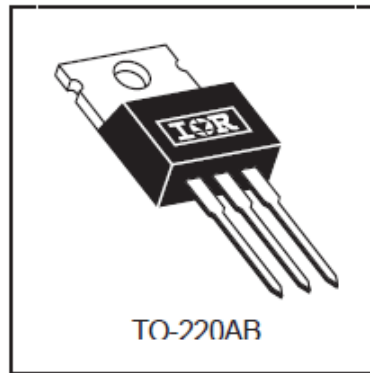
$$V_{DSS} = -100V$$

$$R_{DS(on)} = 0.06\Omega$$

$$I_D = -40A$$

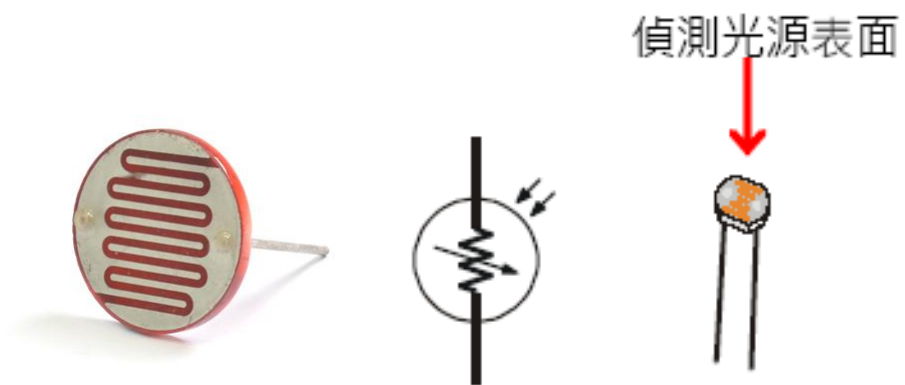
Rectifier
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光敏電阻 Photoresistor

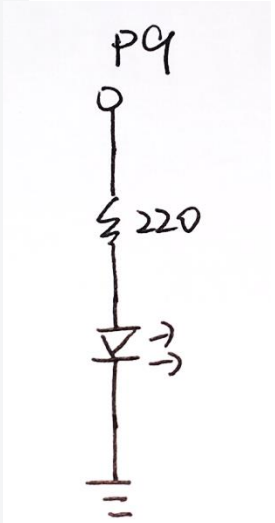
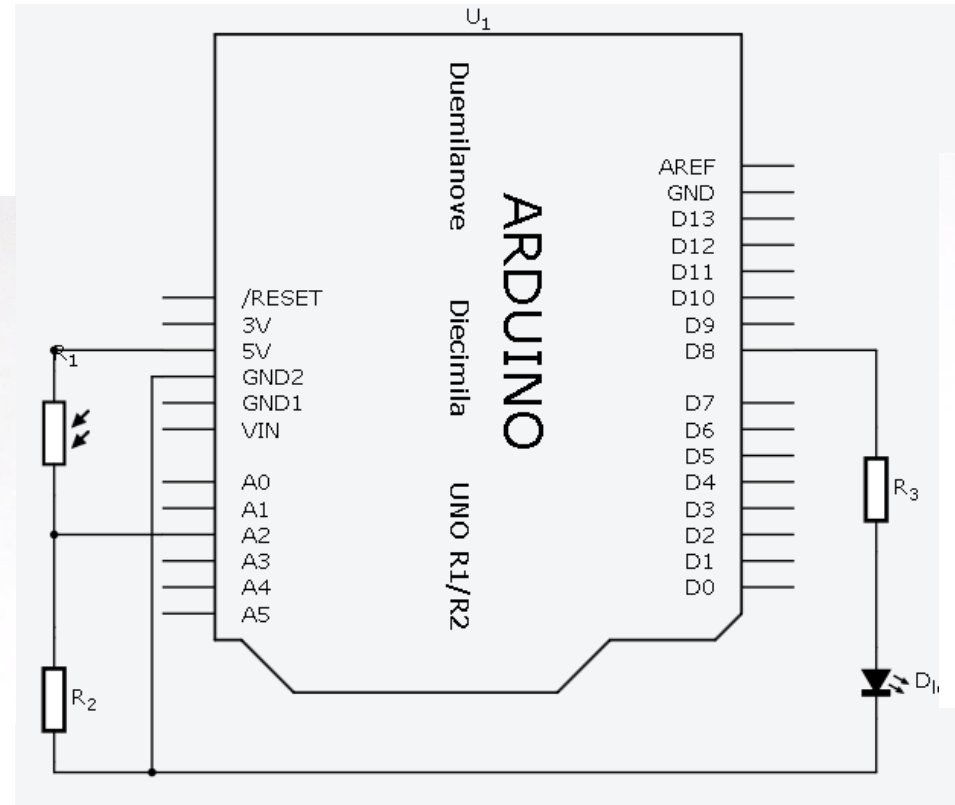
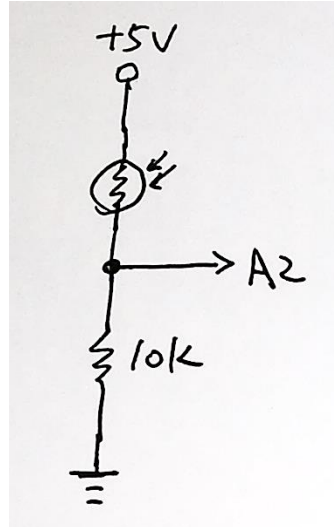
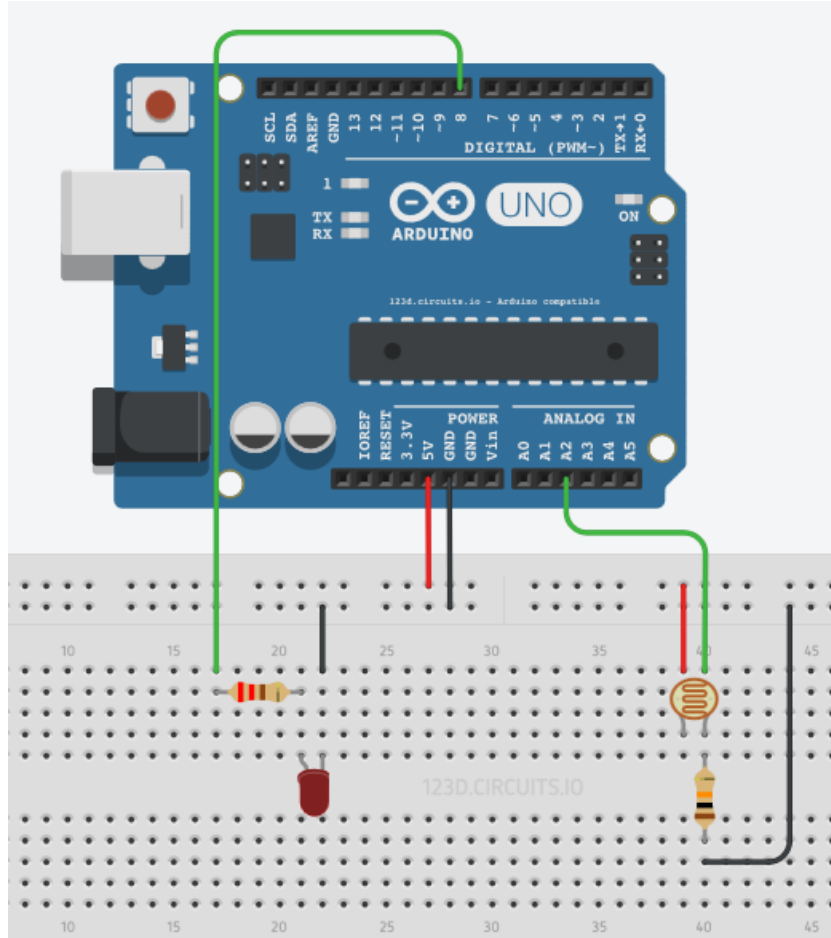
- 光敏電阻，簡稱光電阻，又名光導管。它的電阻和光線的強弱有直接的關係，隨著入射光強度越強則電阻值下降。



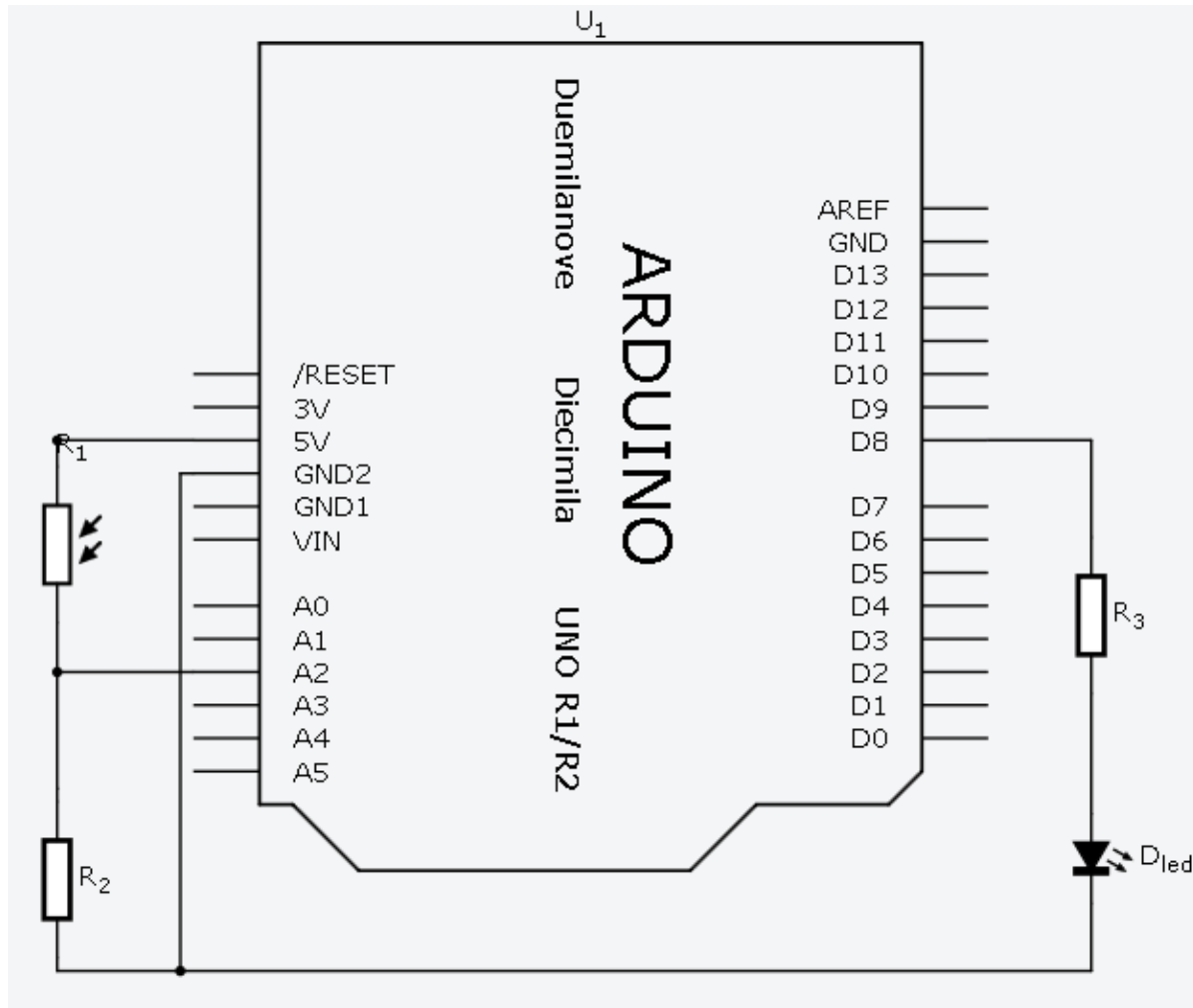
光敏電阻元件圖與實體圖

它被廣泛的應用在低成本的光感元件，比如說攝影用的測光計、火災及煙霧警報器、防盜警報器、工業上控制電路中或者是燈具的自動開關上。

光敏電阻測試



光敏電阻測試



```
int sensorPin = 2;
int led = 9;
int value = 0;

void setup() {
  Serial.begin(9600);
  pinMode(LED,OUTPUT);
}

void loop(){
  value = analogRead(sensorPin);
  Serial.print("Read:");
  Serial.print(value, DEC);
  //把AD值200-800 Scale to 0-255
  value = map(value, 200, 800, 0, 255);
  Serial.print(" Write:");
  Serial.println(value, DEC);
  delay(1000);
}
```

實驗-光強度偵測

- 練習：光控控制開關，當光線變暗時將燈(LED)開啟
- Homework1：照度計
 - 利用LCD顯示環境光線的強度

