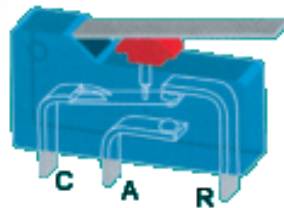
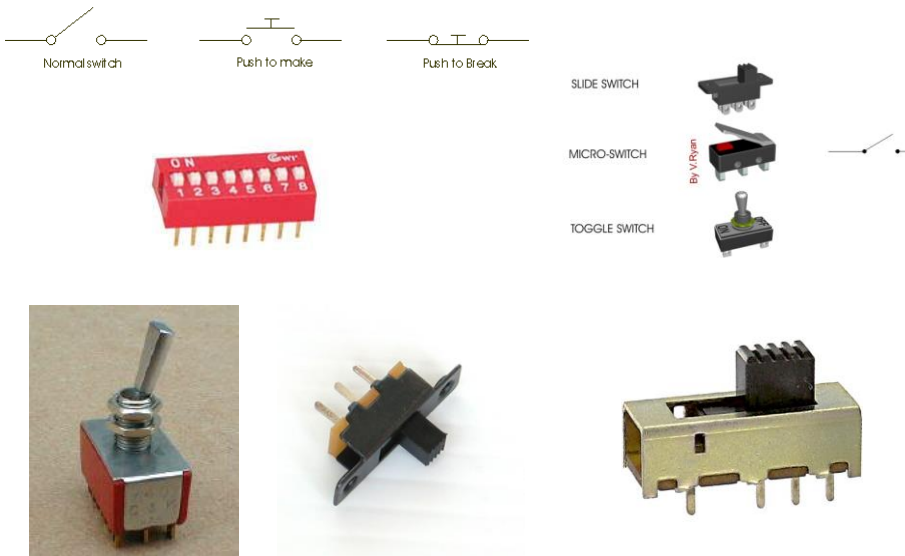


# مکاترونیک

مدرس :  
دکتر پدرام پیوندی





**Resistances**

$$R_{\text{series}} = R_1 + R_2 + \dots + R_n$$

$$R_{\text{parallel}} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_n}}$$

**Ohm's Law**

$$E = IR \quad I = \frac{E}{R} \quad R = \frac{E}{I}$$

**Joule's Law**

$$P = IE \quad P = \frac{E^2}{R} \quad P = I^2R$$

**Capacitances**

$$C_{\text{series}} = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \dots + \frac{1}{C_n}}$$

$$C_{\text{parallel}} = C_1 + C_2 + \dots + C_n$$

$$C = \frac{\epsilon A}{d}$$

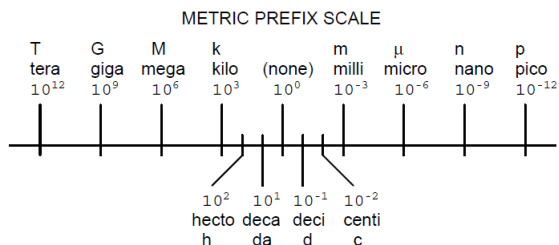
Where,

- C = Capacitance in Farads
- $\epsilon$  = Permittivity of dielectric (absolute, not relative)
- A = Area of plate overlap in square meters
- d = Distance between plates in meters

**Kirchhoff's Laws**

"The algebraic sum of all voltages in a loop must equal zero."  
Kirchhoff's Voltage Law (KVL)

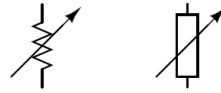
"The algebraic sum of all currents entering and exiting a node must equal zero."  
Kirchhoff's Current Law (KCL)



Fixed-value



Rheostat



Potentiometer



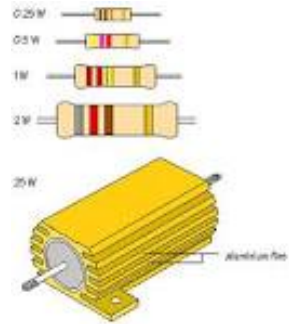
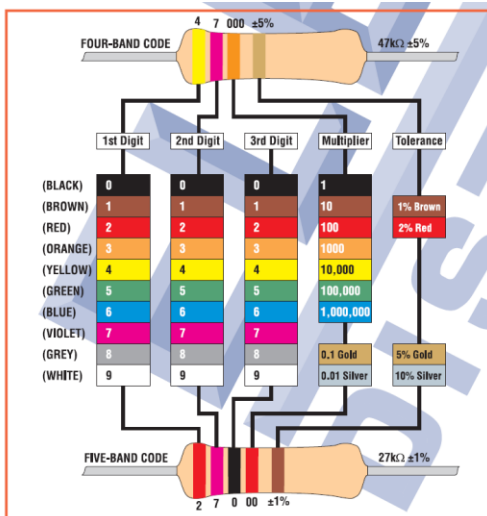
Tapped

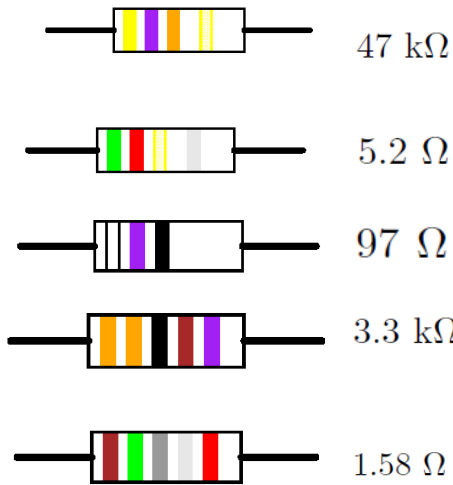
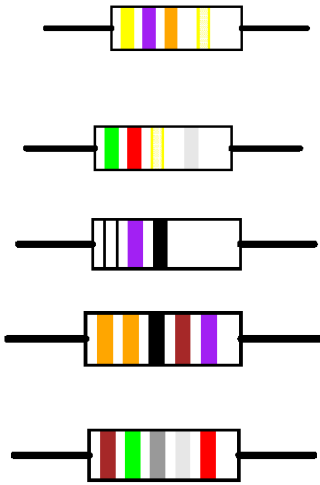


Thermistor



Photoresistor



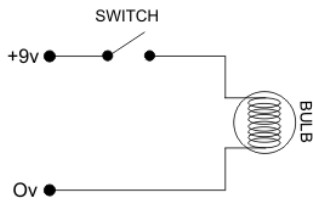




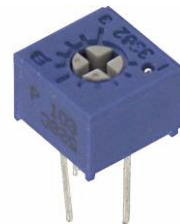
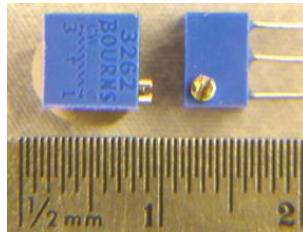
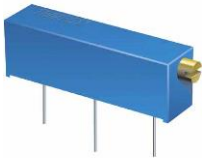
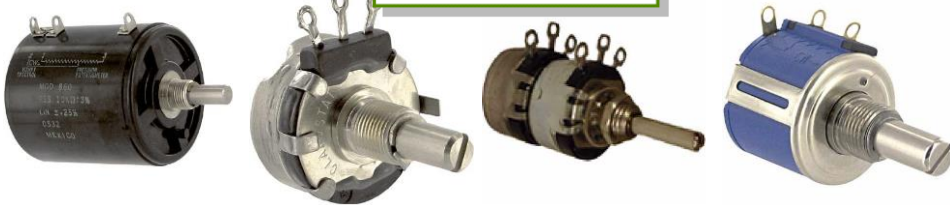
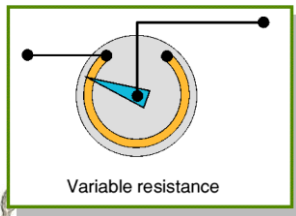
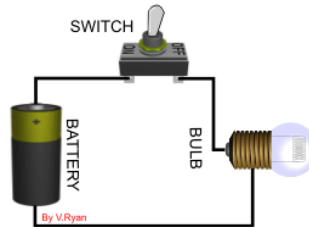
SYMBOLS

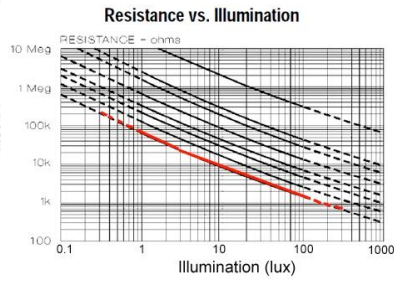
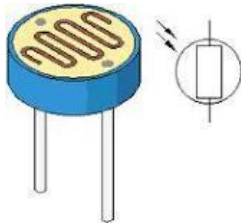
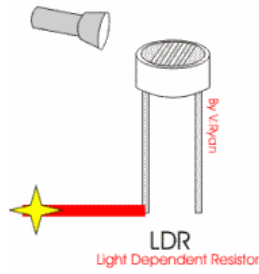
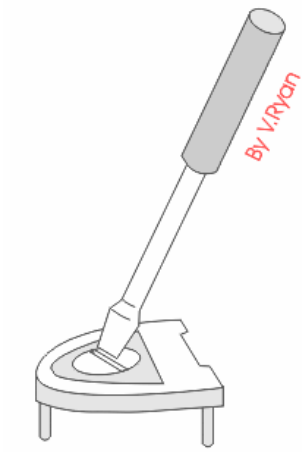
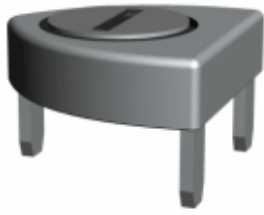


CIRCUIT DIAGRAM



PICTORIAL CIRCUIT DIAGRAM





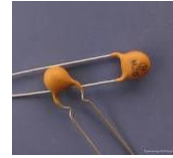
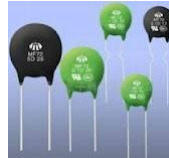
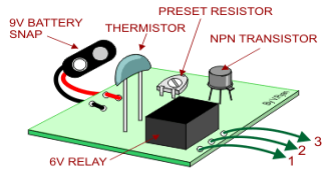
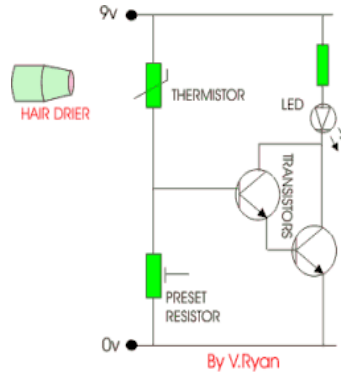
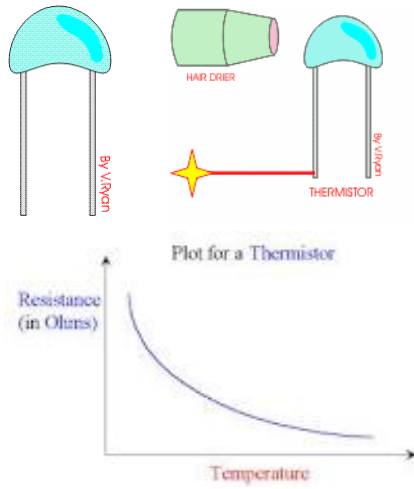
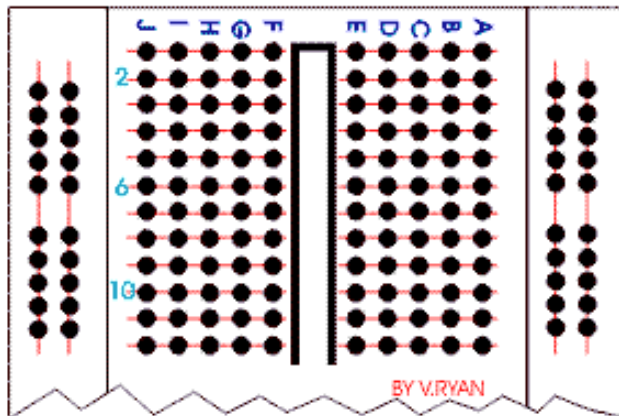
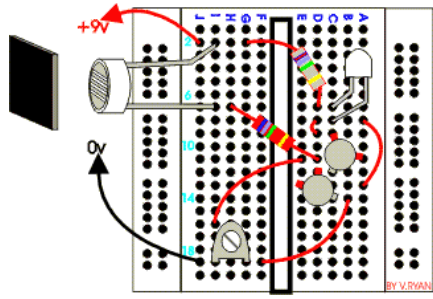
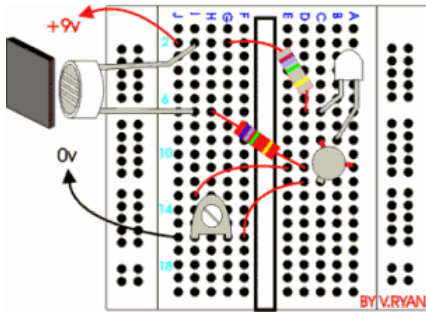


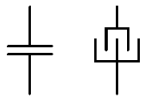
DIAGRAM 2



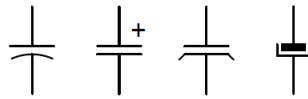
.....



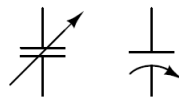
Non-polarized



Polarized (top positive)

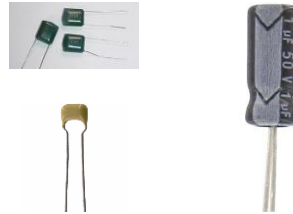
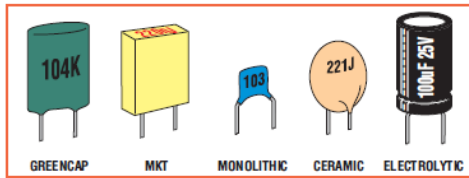


Variable





Capacitor Tolerance Marking Codes					
F	G	J	K	M	Z
±1%	±2%	±5%	±10%	±20%	-20%, +80%
Examples: 104K = 0.1µF ± 10%; 4n7J = 4.7nF ± 5%					

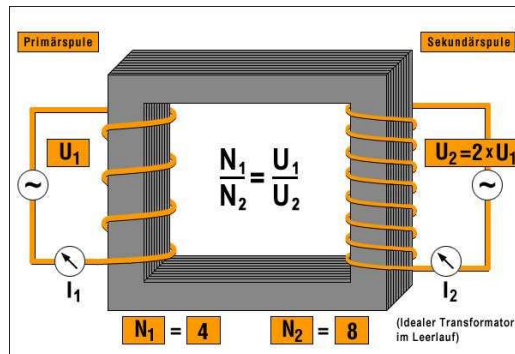


### Material Codes for Plastic Film Capacitors

Capacitors which use a plastic film dielectric are identified using the following codes:

- MKT Metallised Polyester (PETP)
- KS Polystyrene film/foil
- MKC Metallised Polycarbonate
- KP Polypropylene film/foil
- KT Polyester film/foil
- MKP Metallised polypropylene

Hence a capacitor marked '104' has a value of 10 with 4 zeroes after it, or 100,000pF (which is the same as 100nF, or 0.1µF). Similarly '681' means 68 with a single zero, or 680pF, while '472' means 47 with two zeroes, or 4700pF (which is the same as 4.7nF).



By V.Ryan

CATHODE

ANODE

SYMBOL

R - 1

2K Ohms

12 v

D-1 Sw-1

Not Conducting...Reversed Bias Diode in circuit backwards.

anode

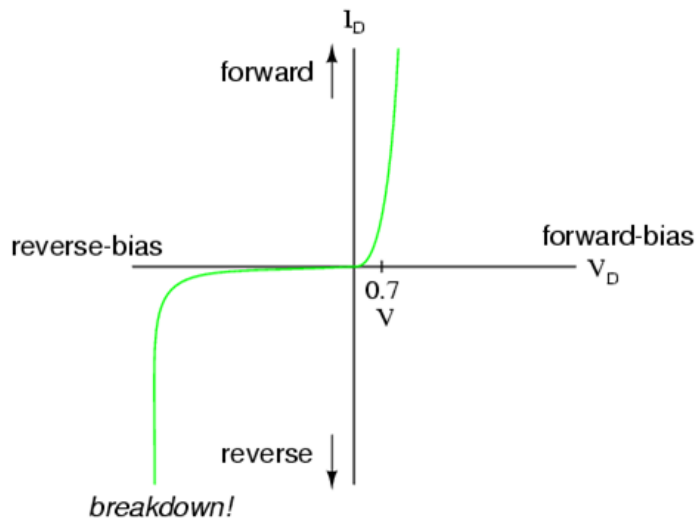
R - 1

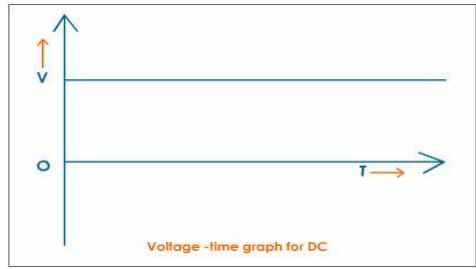
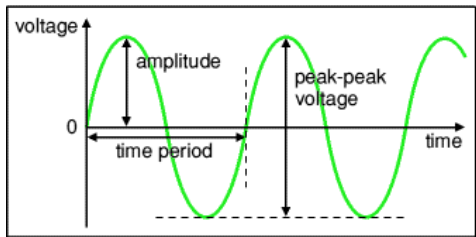
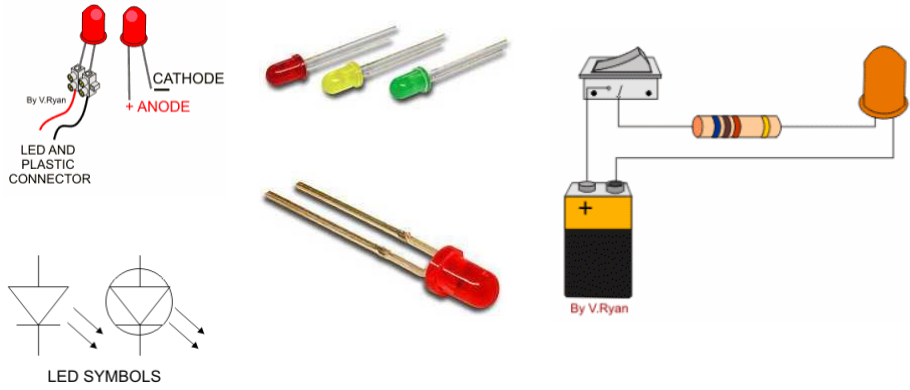
2K Ohms

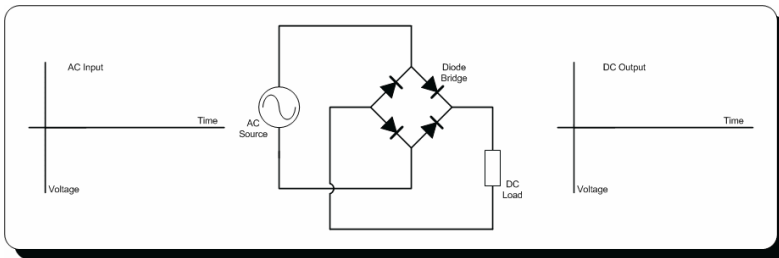
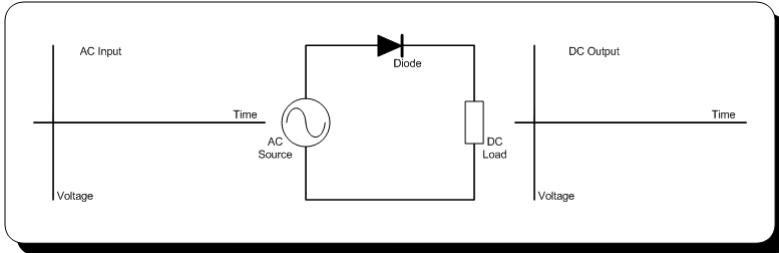
12 v

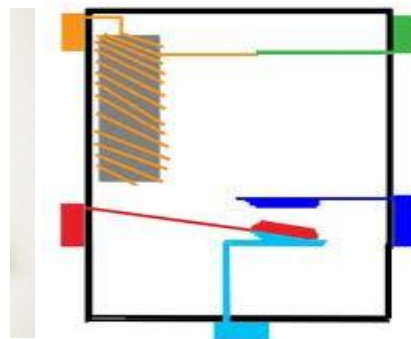
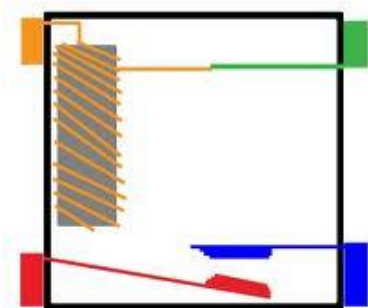
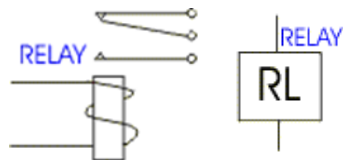
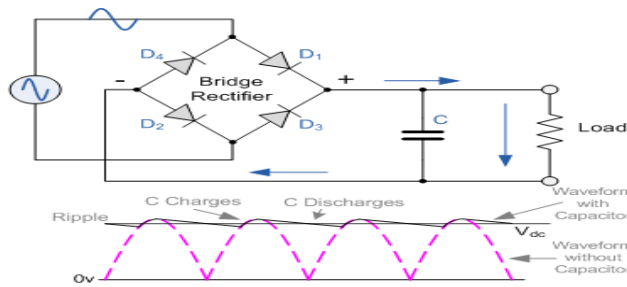
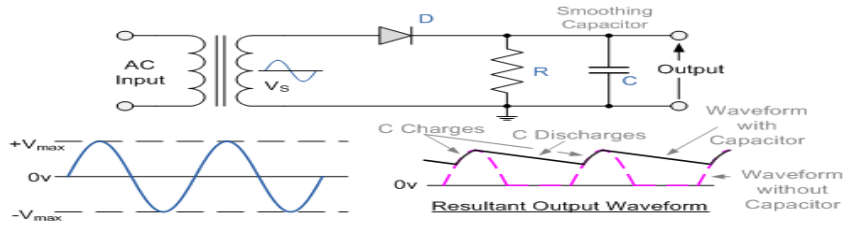
D-1 Sw-1

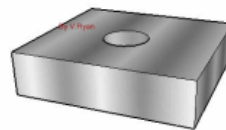
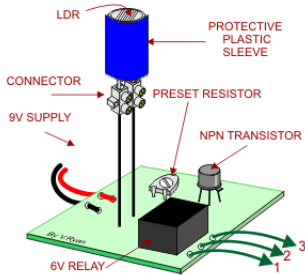
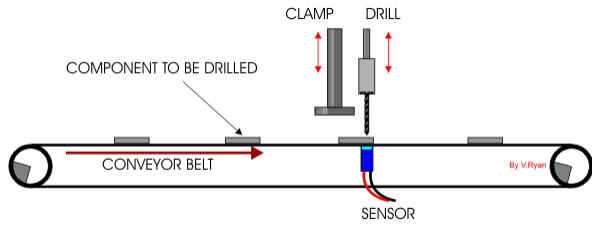
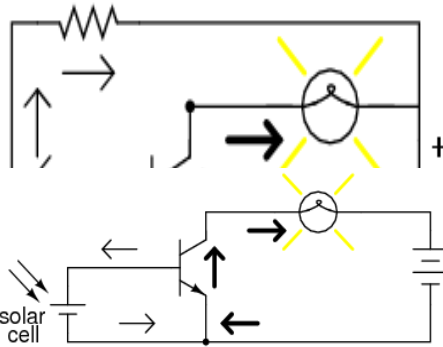
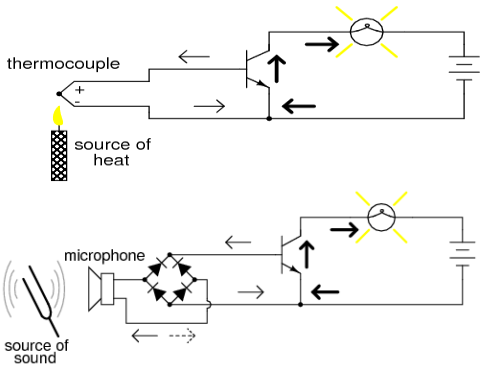
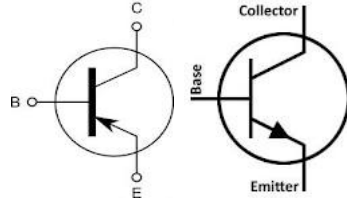
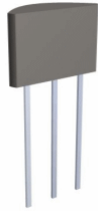
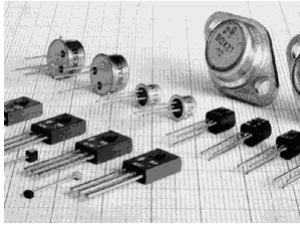
Conducting...Forward Bias

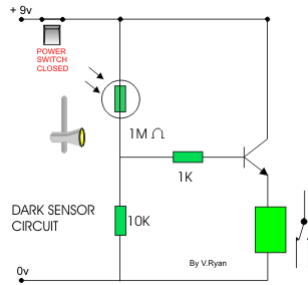
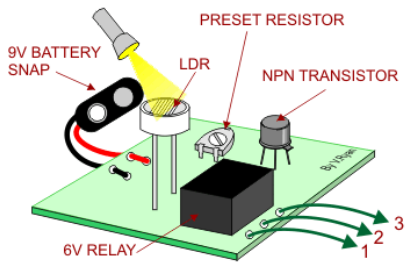












PICTURE	SYMBOL	COMPONENT	DETAILS
		RELAY	
		RESISTOR	
		LIGHT DEPENDENT RESISTOR (LDR)	
		TRANSISTOR	
		SWITCH	

