



# Fundumantal of Electronic I

## Second Class

Chapter01: Semiconductor Diodes

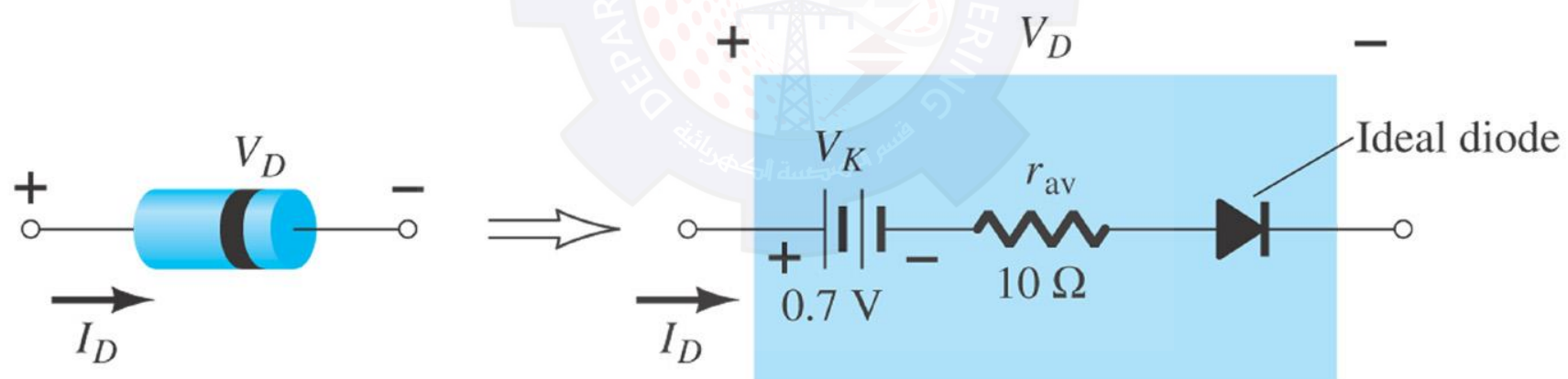
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## Diode Equivalent Circuit





# Diode Specification Sheets

Data about a diode is presented uniformly for many different diodes.

1. **Forward Voltage ( $V_F$ )** at a specified current and temperature
2. **Maximum forward current ( $I_F$ )** at a specified temperature
3. **Reverse saturation current ( $I_R$ )** at a specified voltage and temperature
4. **Reverse voltage rating, PIV or PRV or  $V(BR)$ ,** at a specified temperature
5. **Maximum power dissipation** at a specified temperature
6. **Capacitance levels**
7. **Reverse recovery time,  $t_{rr}$**  (is the time required for a diode to stop conducting once it is switched from forward bias to reverse bias)
8. **Operating temperature range**



# Diode Specification Sheets

DIFFUSED SILICON PLANAR

**A** • BV . . . 125 V (MIN) @ 100  $\mu$ A (BAY73)

**ABSOLUTE MAXIMUM RATINGS (Note 1)**

**Temperatures**

Storage Temperature Range	-65°C to +200°C
Maximum Junction Operating Temperature	+175°C
Lead Temperature	+260°C

**Power Dissipation (Note 2)**

Maximum Total Power Dissipation at 25°C Ambient	500 mW
Linear Power Derating Factor (from 25°C)	3.33 mW/°C

**Maximum Voltage and Currents**

WIV	Working Inverse Voltage	BAY73	100 V
$I_O$	Average Rectified Current		200 mA
$I_F$	Continuous Forward Current		500 mA
$i_F$	Peak Repetitive Forward Current		600 mA
$i_{F(surge)}$	Peak Forward Surge Current		1.0 A
	Pulse Width = 1 s		4.0 A
	Pulse Width = 1 $\mu$ s		4.0 A

**DO-35 OUTLINE**

**NOTES:**  
 Copper clad steel leads, tin plated  
 Gold plated leads available  
 Hermetically sealed glass package  
 Package weight is 0.14 gram

**ELECTRICAL CHARACTERISTICS (25°C Ambient Temperature unless otherwise noted)**

SYMBOL	CHARACTERISTIC	BAY73		UNITS	TEST CONDITIONS
		MIN	MAX		
<b>E</b> $V_F$	Forward Voltage	0.85	1.00	V	$I_F = 200$ mA
		0.81	0.94	V	$I_F = 100$ mA
		0.78	0.88	V	$I_F = 50$ mA
		0.69	0.80	V	$I_F = 10$ mA
		0.67	0.75	V	$I_F = 5.0$ mA
		0.60	0.68	V	$I_F = 1.0$ mA
<b>F</b> $I_R$	Reverse Current		500	nA	$V_R = 20$ V, $T_A = 125^\circ$ C
			1.0	$\mu$ A	$V_R = 100$ V, $T_A = 125^\circ$ C
			0.2	nA	$V_R = 20$ V, $T_A = 25^\circ$ C
			0.5	nA	$V_R = 100$ V, $T_A = 25^\circ$ C
<b>G</b> BV	Breakdown Voltage	125		V	$I_R = 100$ $\mu$ A
<b>G</b> C	Capacitance		8.0	pF	$V_R = 0$ , $f = 1.0$ MHz
<b>H</b> $t_{rr}$	Reverse Recovery Time		3.0	$\mu$ s	$I_F = 10$ mA, $V_R = 35$ V $R_L = 1.0$ to 100 k $\Omega$ $C_L = 10$ pF, JAN 256

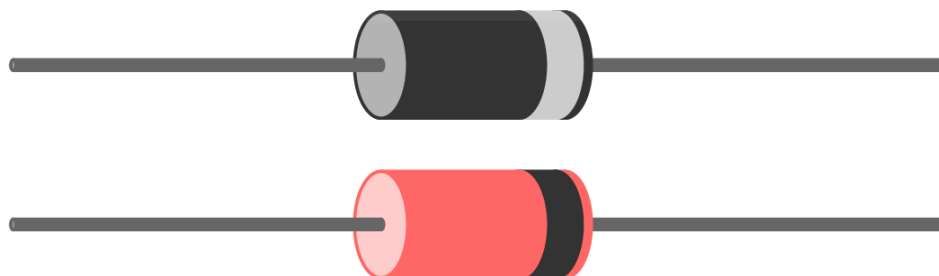
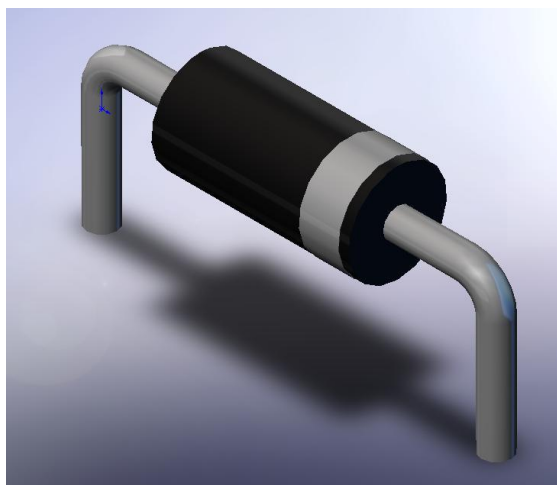
**NOTES:**  
 1 These ratings are limiting values above which the serviceability of the diode may be impaired.  
 2 These are steady state limits. The factory should be consulted on applications involving pulses or low duty-cycle operation.



# Diode Symbol and Packaging



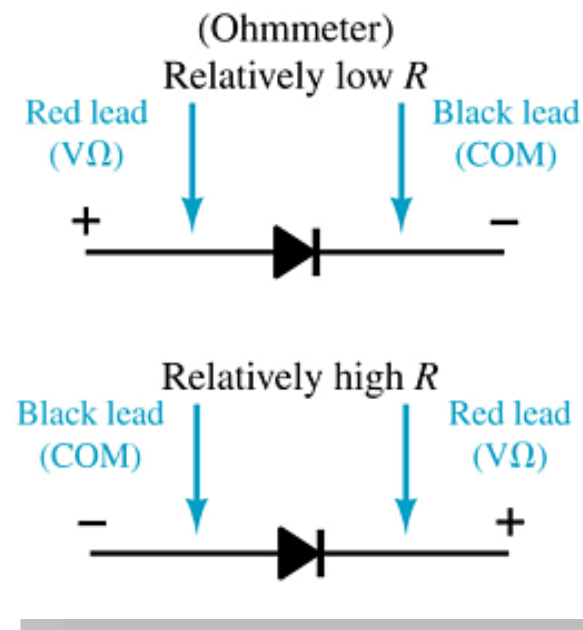
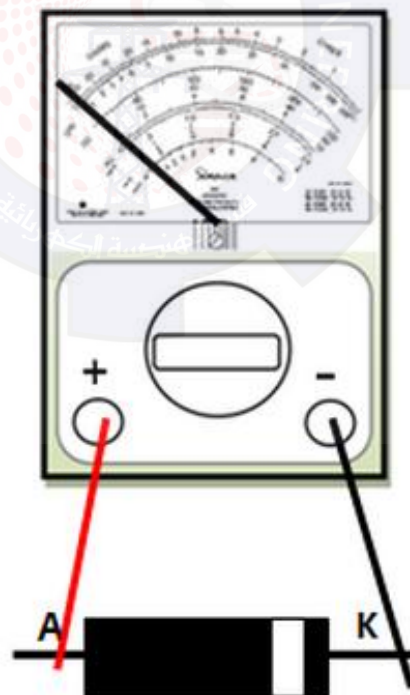
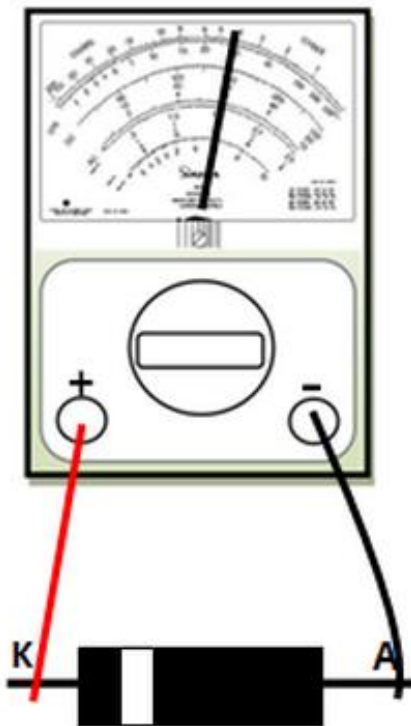
The anode is abbreviated A  
The cathode is abbreviated K





## Diode Testing - Ohmmeter

An ohmmeter set on a low Ohms scale can be used to test a diode. The diode should be tested out of circuit.





# Other Types of Diodes

**Zener diode**

**Light-emitting diode**

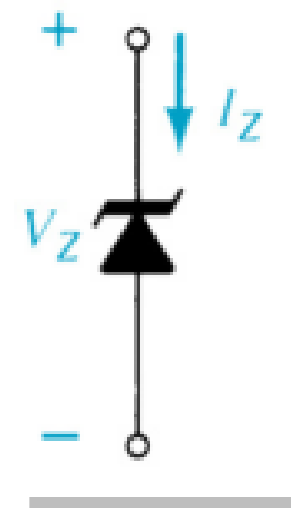
**Diode arrays**





## Zener Diode

- A **Zener diode** is a type of diode that permits current not only in the forward direction like a normal diode, but also in the reverse direction if the voltage is larger than the breakdown voltage known as "Zener voltage" ( $V_Z$ ).
- Common Zener voltages are between 1.8 V and 200 V.
- Zener diode is used as regulator (circuits will be shown in chapter 2).





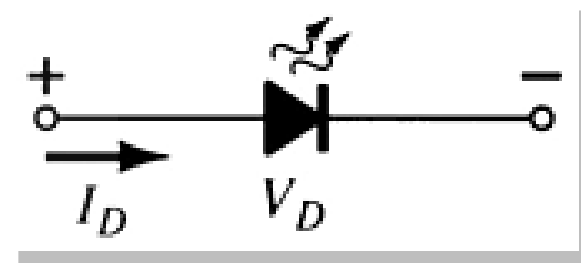


## Light-Emitting Diode (LED)

- An LED emits photons when it is forward biased.
- These can be in the infrared or visible spectrum.
- The forward bias voltage is usually in the range of 2 V to 5 V.

### *Light-Emitting Diodes*

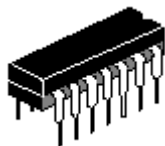
Color	Construction	Typical Forward Voltage (V)
Amber	AlInGaP	2.1
Blue	GaN	5.0
Green	GaP	2.2
Orange	GaAsP	2.0
Red	GaAsP	1.8
White	GaN	4.1
Yellow	AlInGaP	2.1





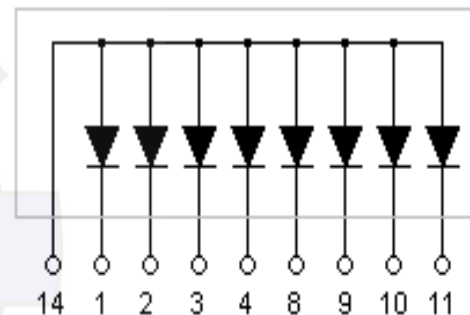
# Diode Arrays

Multiple diodes can be packaged together in an integrated circuit (IC).



A variety of combinations exist.

Common Anode



Common Cathode

