Note 2

(1)

P-type	n-type
It is doped with trivalent impurities e.g boron	It is doped with pentavalent impurities e.g phosphorus
Conduction is mainly due to holes	Conduction is mainly due to electrons

(2)

Forward Bias: The positive terminal of the battery is connected to the P-side, and the negative to the N-side. There is high current flows carried across the sides

Reverse Bias: The positive terminal is connected to N-side, and the negative to the P-side. Current is effectively zero, except for a very tiny reverse saturation current caused by minority carriers

Paste

(3)

An ideal device is a theoretical model that performs its function perfectly without any losses or real-world limitations

(4)

Given

$$V_T = \frac{kT}{q}$$

where $K = 1.38 \times 10^{-23}\ J/K$

$q = 1.6 \times 10^{-19}\ C$

$T_K = T_C + 273 = 25 + 273 = 298K$

$$V_T = \frac{1.38 \times 10^{-23} \times 298}{1.6 \times 10^{-19}}$$

$V_T = 0.00257\ V$

$V_T = 25.67\ mV$

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Given

$$I_D = I_s\left(e^{V_D/nV_t} - 1\right)$$

$$I_D = (40 \times 10^{-9})\left(e^{0.5/(2\times 0.0256)} - 1\right)$$

$$I_D = (40 \times 10^{-9})\left(e^{9.731} - 1\right)$$

$$I_D = (40 \times 10^{-9})(16851 - 1)$$

$$I_D = 0.673\,mA$$