

Planar LED :

Structure of Planar LED

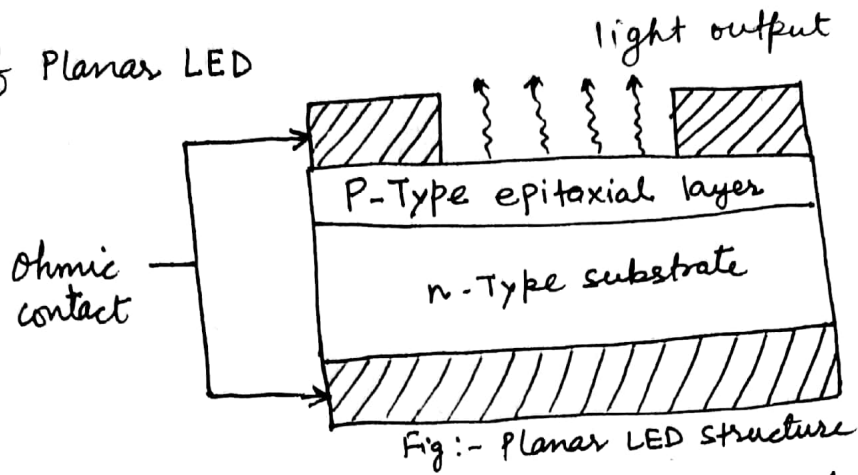


Fig:- Planar LED structure

It is the simplest LED structure fabricated either by liquid or Vapour phase epitaxial process over a Ga-As substrate. This involves a p-type diffusion into n-type substrate. Planar LED is the simplest form of surface LED-type structures. The internal reflection takes place in the structure, so low radiation is produced. That means limited amount of light is emitted out from such LED.

Radiated Power by Planar LED :

Internal generated Power P_{int} -

$$P_{int} = \eta_{int} \left(\frac{h c i}{q \lambda} \right)$$

Where, h = Planck constant

c = light velocity

i = forward current

λ = operating wavelength

η_{int} = Internal quantum efficiency

q = charge of electron

$$\text{Also, } \eta_{int} = \frac{\tau_r}{\tau} \quad ; \quad \tau = \text{Total rise time}$$

τ_r = Radiated rise time

τ_{nr} = Non-radiated rise time

$$\tau = \frac{\tau_r \tau_{nr}}{\tau_r + \tau_{nr}}$$

Radiated Power P_{opt}

$$P_{opt} = \eta_{ext} P_{int}$$

where, η_{ext} = external quantum efficiency = $\frac{1}{n(n+1)^2}$

Here, n = Refractive Index of material

Advantages:

1. It is the simplest form of LED to fabricate
2. It is cost effective and relatively cheap
3. Electrical drive circuit is relatively simple to design and easy to implement

Disadvantages:

1. It has poor internal and external quantum efficiency
2. output coupling efficiency is poor
3. Power efficiency is much less as compared to other LED structure of different geometries.