DESIGNING OF LIGHT EMITTING DIODE

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ABSTRACT

There is aSpontaneous emission of radiation in the visible and infrared regions of the spectrum from a forward biased p-n junction. The empty conduction band of semiconductor is populated by electrons interjected into p-n junction by the forward current through the junction, and light is developed when this electrons recombine with holes in the valance band to transmitted a photon.Light is emitted from an LED by this mechanism.

We are using wireless internet in a cafe, stealing it from the guy next door, or attempting for bandwidth at a conference, we get frustrated at the slow speeds we face when more than one device is knocked into the network. As many people and their many devices access wireless internet, clogged airwaves are going to make it. A solution to overcome this problem is "data through illumination" taking the fiber by sending data through an LED that varies in intensity faster than the human eye can follow. It is the same idea band behind infrared remote controls but far more powerful. In this paper, on the basis of the research on the existing LED control systems, according to the actual application needs. We will discuss about the various features and applications of LED such that High-power LED illumination system has high requirements on the LED driver power supply including internal quantum efficiency, external quantum efficiency and constant-currency accuracy.

I INTRODUCTION

A light-emitting diode is a semiconductor light source. LEDs are increasingly used for lighting and as indicator lamps in devices. An LED is usually small in area less than 1 mm^2. Optical components are used to configure its radiation pattern and assist in reflection. LEDs have many benefits over incandescent light sources including lower energy utilization, enlargedlifetime, improved strength, less size, faster switching, and greater endurance and reliability. LEDs are relatively expensive and require more current and heat management than conventional light sources. LEDs can operate at lower current density but the emitted photon have random phases and the device is an coherent optical source .The line width for an LED corresponds to a range of photon energy between 1and 3.5 KT. LED support many optical modes within its structure and is therefore often used as a multimode source . The device has a number of distinct advantages in optical fiber communication .LED'structures which are fabricated using the GaAsP/AlGaAs material system are well tried for operation in the shorter wavelength region. A major impetus for the strategies has been potential deployment of such single mode LED system in the telecommunication access network.

II WORKING PRINCIPLE OF LED

The process off giving of light energy applying an electrical voltage is called electroluminescence that is the emission of light from a solid with the excitation provided by an electrostatic field .in the case of a forward bias p-n junction a forward current flows due to free electrons, as we know that the electrons on N- side are in higher conduction band whereas the holes on p- side are in lower valance band. Recombination of excess electrons and holes take place when current is pass through p-n junction diode.When an electron recombine with a free hole, it falls from higher energy to lower energy level releasing a photon of wavelength corresponding to energy level difference associate with the transition .The energy difference is given up either in the form of heat or in the form of light. In case of Si and Ge junctions, a greater percentage of this energy is given in the form of heat.The emitted light depends upon the type of materials.

TABLE 1

GaAs	Infrared radiation (invisible)
GaP	Red or Green light (visible)
GaAsP	Red or Yellow light (visible)

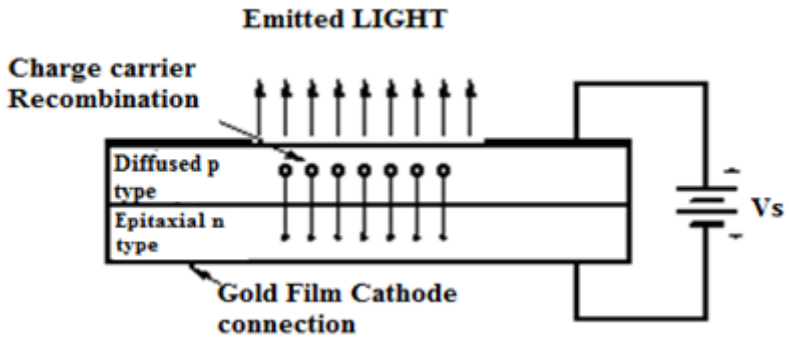


Figure.1.(a) Structure of Light Emitting Diode

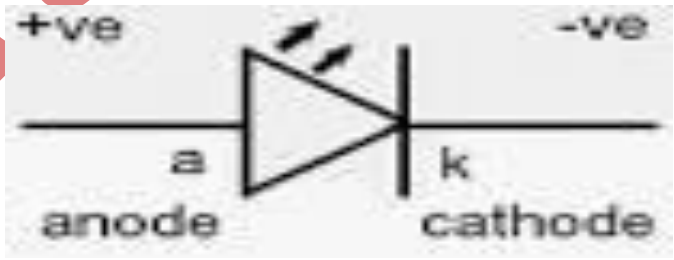


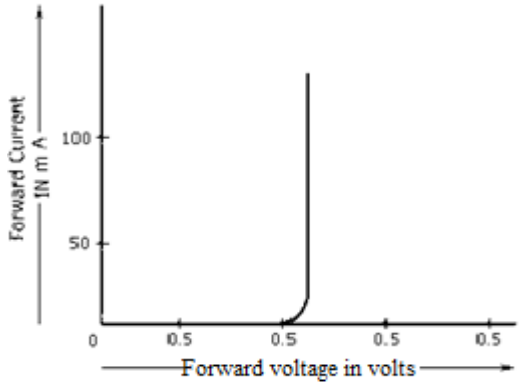
Figure 1.(b) Symbol of LED

III LED CHARACTERISTICS

We discuss few characteristics of LED.

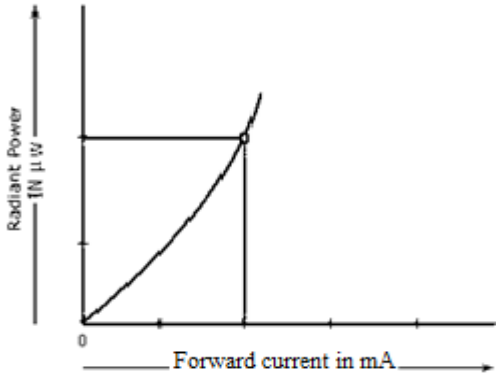
3.1 V-I characteristics

When p-n junction in forward biased with a voltage greater than 1.5V,electron –hole recombination takes place. During recombination process, the electron release energy in the form of light show in figure (a).In figure (b) the ideal light output power against current characteristics. The LED is a very linear device in comparison with the majority of injection laser and hence it tends to be more suitable for analog transmission and the non linearities of LED depend upon the appropriate configuration.



Forward bias V-I curve

FIGURE (a)



output characteristics curve

FIGURE (b)

3.2 Modulation Bandwidth

The modulation bandwidth in optical communication may be defined in either optical electrical terms. The frequency at which the output electric power is reduce by 3db with respect to the input electric power. As optical sources operate down to dc level we only consider the high frequency 3DB point, the modulation bandwidth actual the frequency range between zero and this high frequency 3DB point. If the 3DBoptical bandwidth is considered, we obtain an increased value of the modulation bandwidth.In considerations of bandwidth with in the text the electrical modulation bandwidth will be assumed unless otherwise stated.

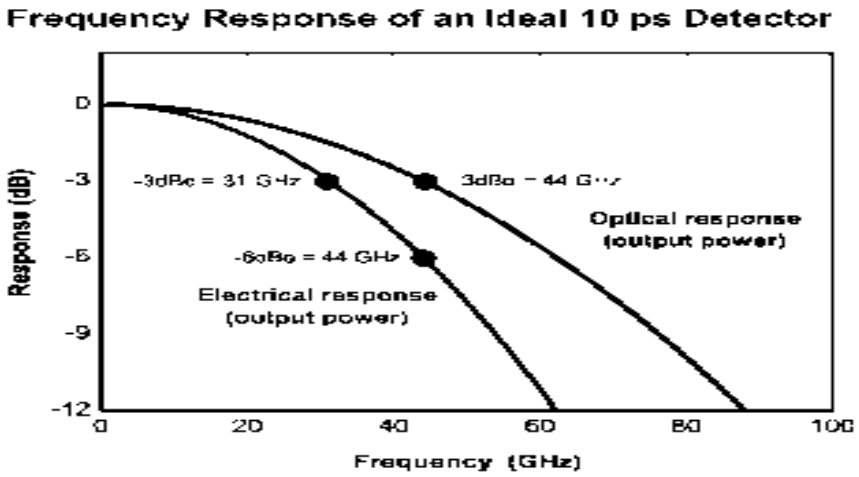


Figure. 2 Frequency Response of LED

IV APPLICATION

4.1 Freezer Case LED Lighting

Refrigerated display case lighting is a promising application for light emitting diodes as LEDs perform better in cold temperatures and do not produce radiated heat like conventional fluorescent technology. Lack of radiated heat loss the product shelf life and reduces losses of decaying goods. The cool light source saves additional energy as the refrigeration unit does not need to compensate for any heat generated by the light.

4.2 Automobile Industry

It contain the dashboard ,audio indicator, back light switch and reading light of the car interior and external brake lights, tail lights, side light and head lights. Automotive incandescent cannot resist vibration impact and it is easily damaged with short life and requires frequent replacement.

4.3 Back Light Efficient of LED

In LCD backlight LED has the characteristics of long life, high luminous efficiency interface free and high cost effective and it has been widely use in electronic watch, cell phone and credit card machines, with the increasing miniaturization of portable electronic products.

4.4 Luminous Efficiency of LED Light

LED illumination is low and it is only suitable for indoor occasions and the appliances, instruments, communication equipment, computer and toys.The immediate objective is the LED light source to replace incandescent and fluorescent lamps these alternative trend beings to develop from local applications.

4.5 Fiber Optic Communication

LEDs can be used as the light source in optical fiber communication.

V RESEARCH ON WIRELESS COMMUNICATION WITH LED

LiFi is transmission of data through illumination by taking the fiber out of fiber optics by sending data through a LED light bulb .Li-Fi is the term some have used to label the faster and cheaper wireless-communication system, which is the optical and advance version of Wi-Fi.

Li-Fi uses just the light, it can be used safely in aircrafts and hospitals that are prone to interference from radio waves and this can even work underwater .Thereby throwing open endless opportunities for military operations. Imagine only needing to drift under a street lamp to get public internet connection, or downloading a movie from the lamp on your desk .Light-emitting diode can be switched on and off faster than the human eye. But human eye can detect causing the light source to appear to be on continuously, even though it is in fact flickerig. This invisible on-off activity enables a kind of data transmission using binary codes: switching on an LED is a logical '1', switching it off is a logical '0'. Information can therefore be encoded in the light by varying the rate at which the LEDs flicker on and off to give different data. This method of using rapid pulses of light to transmit information wirelessly is technically referred to as Visible Light Communication.

IX CONCLUSION

We conclude that the advantages and application of LED has been introduced. In order to make the LEDs more efficient, good light emitting are desired. Since the efficiency of LED are strongly depends on the charge injection efficiency, efficient charge injection methods are desired to be developed. LEDs are operated in the forward bias mode so that the forward bias current injects minority carriers into the neutral regions. They are then recombined by the majority carriers to emit light. The reliability, efficiency, compatibility and features of LED lighting is driven in a large degree by the driver ICs: Driver circuits that can eliminate electrolytic will be more reliable. For replacement lamps compatibility with existing infrastructure such as voltage standards, dimming, is key to early adoption. Adding features such as monitoring and communication will be important.

REFRENCES

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