Using IR-Light for Proximity Detecting

Student author: Stanislav D. Yanov[1]
Mentor: Plamen Angelov

Abstract – **In a few words – If you interested in a method how IR-Detectors or Proximity Detectors work , send and receive data using IR-Light. How it work, through communication between transmitter and receiver ,and what scheme to use**

Keywords – **Proximity Detector, IR-Detector, Ir-LED**

I. Task of the Article

A. Introduction

In this article I will show method from communication between simple IR-LED (Transmitter) and receiver from TSOPxxxx from Vishay Smiconductors, specified frequencies and timings of pulses to be received correctly from receiver and decoded true.

B. Ir-Emiters and Receivers

Some technical examples of the IR receivers and transmitters are shown to the fig.1 and fig.2.

Fig.1. IR-Receivers

Fig.2. IR-Emitters

Different TSOPxxxx – Frequences is shows in table.1. [1]

Student autors:
[1]Stanislav D. Yanov Student of Burgas Free University Degreed Computer Systems and Technologies studding Computer's Telecommunications and Networks.
E-mail: kukata86@gmail.com
Mentor:
Assprofessor Plamen A. Angelov, Faculty of Computer Science and Engineering, Burgras Free University, 62 San Stefano Str., Burrgas-8001, Bulgaria, E-mail: pangelov@bfu.bg

TSOP1830 30kHz	TSOP1833 33kHz
TSOP1836 36kHz	TSOP1837 37kHz
TSOP1838 38kHz	TSOP1840 40kHz
TSOP1856 56kHz	

Last two digits show the carrier frequency of the TSOP receiver.

C. Important notes for correct work of receiver or setting the transmitter.

- Carrier frequency must be close up like recommended from supplier.
- An important requirement is Gap Time on the chip, which establishes stable operation of the receiver. It is compulsory to leave the chip to cease work -Gap Time* after the sequence of pulses (information)
  Minimum 6 pulses (to start work)/ 9 pulses break (e.g. 90ms / 15ms)
  GAP-Time is needed for the chip so it can "receive" the information and to "recover" for a new on. Reducing the time sharply reduces its sensitivity.
- Practical suggestion – sensitivity is on the account of the transmitted frequency/speed

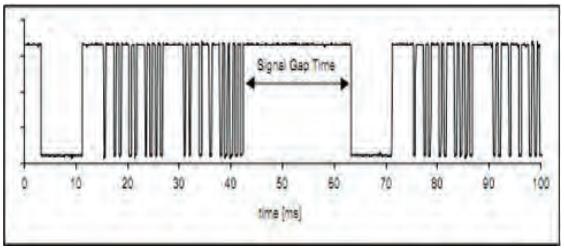

Fig.3. Gap time diagram

General Block scheme of an IR receiver is shown on fig.4.

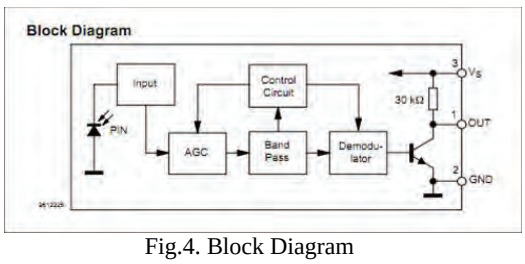

Fig.4. Block Diagram

Advantage of the using method:

- protection from interference caused by other electrical equipment (like halogen lamp);

- Internal automatic gain control (AGC) system - allows precise control the output level;
- Internal Band Pass filter reduce all output noise;
- used demodulator achieves very good separation between the carrier signal and the useful digital signal;
- Power supply 5V compatible with TTL IC'S.

D. Schematic of transmitter

Shown schematic is implemented with a timer LM555 [2], which is a necessary condition for the two desired frequencies. By serial connection of two bipolar (BJT) transistors achieve the necessary modulation of the output digital signal. But in the practical development has proved that - direct control of the powerful transistor (Q6) cause unacceptable smoothing the fronts of pulses. This cause the driver circuit (transistors Q1, Q4 and Q5) which provides precise control of the power stage. The simulation schematic is shown in fig.5.

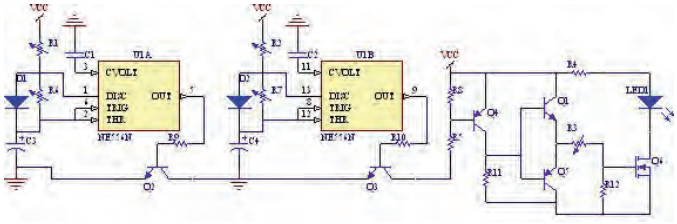

Fig.5. The simulation schematic

E. Alternative methods of miming

It can be used simple NAND in astable multivibrator mode only with two passive components one resistor and one capacitor. Examples of technical solutions such schemes are shown in fig.6.

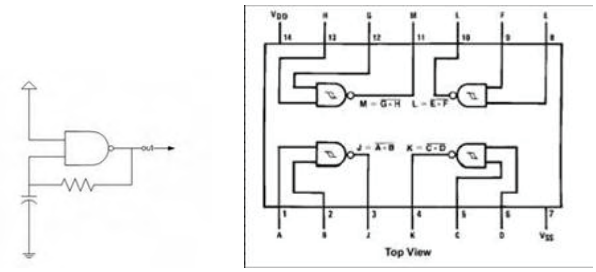

Fig.6. Example connection of the NAND inverter

F. Simulation on Proteus 7

The results of the simulation program are shown in fig.7 and fig.8.

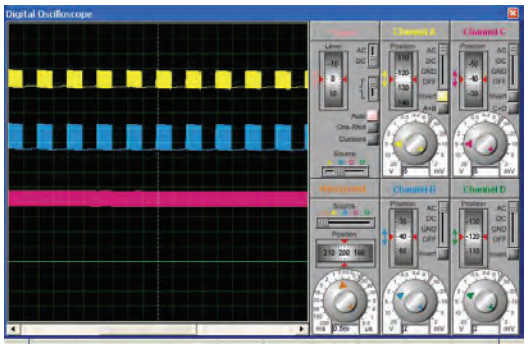

Fig.7. Result of the program simulation in observing the packet of information

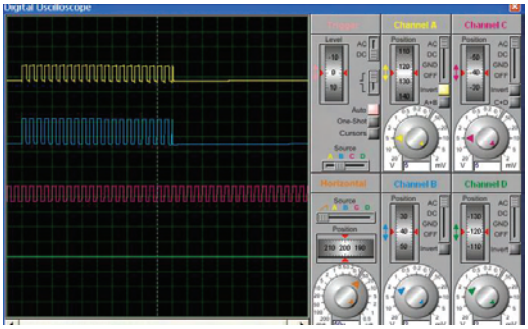

Fig.8. Result of the program simulation in observing the content of the digital package

G. Picture of working board

Some pictures from the practical implementation are shown in fig.9.

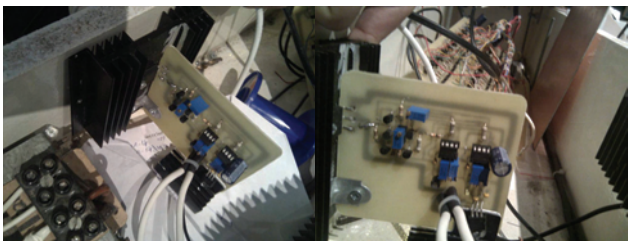

Fig.9. Pictures from the practical implementation

II. CONCLUSIONS

- Manage the power stage must be done using the driver circuit;
- The specificity of the used driver is reducing the level of control signal.

REFERENCES

[1] Photo Modules for PCM Remote Control Systems, Document Number 82047, Rev. 13, 13-Sep-00.
[2] LM555 Timer, 2006 National Semiconductor Corporation DS00785.