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Multiplexer as selector to select different speed (Normal speed, High speed and Super high speed) to display CAR at different speed to color TV system

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Abstract

The article presents a concept of designing a Multiplexer circuit which acts as a "Selector" and that becomes capable to select different speed created at different TTL Gate configurations; Standard TTL(Normal Speed), High Speed TTL(High Speed), Schottky TTL(Super High Speed) and further connect the selected Gate speed to the CAR shape created using C-Programming at Computer Graphics and finally CAR shape display at different speed to the color TV. The Multiplexer supporting efficient and more reliable selection criteria using "Logical based selection criteria" and further the output from multiplexer is provided to CAR shape created using c-programming and finally CAR shape is display to color TV system. Basic purposes and assumptions regarding the design and development of this system as well as a description of its operation have been presented.

Keywords: *Standard TTL, High speed TTL, Schottky TTL, Multiplexer, Ring counter, MOSFET, C programming, and Color TV system etc.*

1. INTRODUCTION

In this modern era of very fast growing technology, Traditional concept of selecting and displaying selected inputs to output device within a system assumed to time consuming, one of the tedious process and comes under the categories of impracticable applications. Thus "Logical based selection criteria" using the Multiplexer concept to act as "Selector circuit" that becomes capable to select different speed TTL gates within a system is an efficient solution for; to accomplish task of selecting different speed TTL gate further connects it to CAR shape created using c-programming and finally display it at different speed to color TV System. Circuit designers are faced with challenge of developing system with increasing functionality and complexity while under demanding power and time-to-market constraints. This design concept helps to find exact solution you need. The choice of proper "Different speed TTL gates, Multiplexer (designed with standard TTL, MOSFET & Ring counter), CAR shape creation and color TV system concept depends on many factors and will affect the performance and efficiency of the circuit.

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A. METHODOLOGY OF DESIGN PROCESS

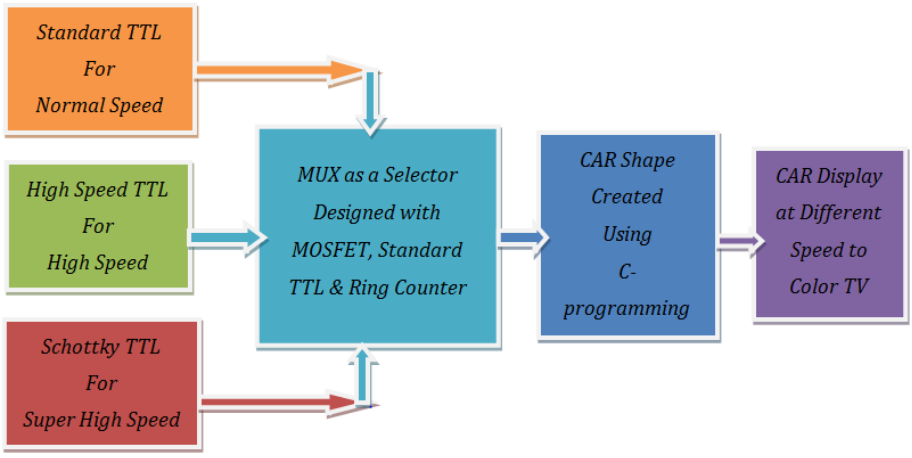

Figure 1. Methodology Adopted in Design Process

The methodology process involves the different speed TTL gates (Normal speed, high speed and super high speed) to acts as input and these inputs are interfaced with Multiplexer Circuit (designed with MOSFET switch, standard TTL, Ring counter) and further the Multiplexer circuit acts as selector for selecting particular speed TTL gate out of many speed TTL gates and further connect the selected Gate speed to the CAR shape created using C-Programming at Computer Graphics and finally CAR shape display at different speed to the color TV.

B. CONCEPT OF DEVELOPING DIFFERENT SPEED CIRCUIT AT INPUT

a) For Normal Speed (Standard TTL Circuit)

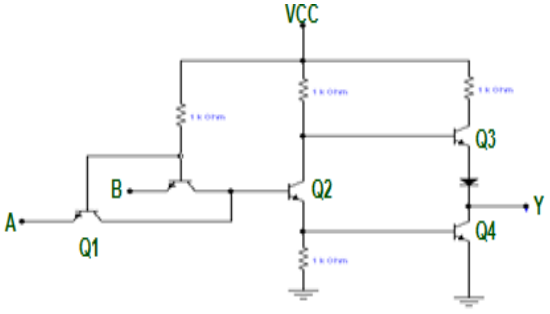

Figure 2. Standard TTL Gate

Q2 – acts as a phase splitter.
Q1 – acts as input transistor.
Q4 & D - acts as active pull-up.

When output is low, Q3 is in saturation & Q4 cut-off, the output capacitance discharge through common emitter transistor. When output is high, Q3 cut-off & Q4 in saturation, the output capacitance is charged through series combination of emitter follower Q4 & D. The output of Q2 is provided to the base of Q3 &Q4 with voltage swing in opposite directions so that when one is ON other being OFF and vice-versa.

b) FOR HIGH SPEED (HIGH SPEED TTL)

The speed of the standard TTL gate is limited by finite storage times of transistors because they saturate. The long time constants as capacitive loads charge and discharge through relatively large valued resistors in the circuit also contribute to the transient delays.

One approach to speed up the operation of the TTL is to reduce the values of all resistances. The trade off is the corresponding increase in the power consumption. In addition to the reduction in resistance values, the other changes are

i) Input Diode: he diode acts as input 'clamps' to suppress the ringing that results from the fast voltage transients. Under transient switching conditions, signal lines appear inductive, this along with stray capacitance, causes signal to oscillate or 'ring'. he input diode clamps the –ve undershoot at approx.(-0.7v) and absorbs enough of the applied signal energy to prevent a large +ve overshoot, which might turn the gate 'ON'.

ii) The Darlington circuit:

The Darlington pair produces increased current gain, leading to the increase in the current sourcing capability.

The output impedance is low, resulting in the reduction in the time required to change the capacitive loads, allowing a higher speed of operation. Transistor T6 provides the necessary voltage drop and makes diode unnecessary.

In Darlington circuit only T6 and T2 can be driven into saturation. No matter whether T6 is in active or in saturation , TCE6 is positive. Since, VBC2 = VCE6, the collector base junction of T2 can never be forward biased. Hence T2 never saturates.

Active pull down:

The emitter resistance of T4 pulls the base of T3 down to ground when T4 cut-off. The emitter resistance of T4 is replaced by T5 & two resistors.

T3 to be turned ON, T5 appears as a resistance, turning on T3 faster. T3 to be turned-off, the turn-off base current of T3 is due to the collector current of T5 (discharging of base charges of T3 through T5 is faster). Thus, propagation delay time decreases with active pull down.

The other advantages are

- operation over wide range of temp.
- I/O characteristics exhibits the much more abrupt change between levels. The transition between logic levels is achieved with much smaller change in input voltage, 1's of course, of advantage in the matter of noise immunity.

Until T3 turns on, the active pull down provides no path for the emitter current of T4. Thus, T4 & T3 go on simultaneously and the region B-C in the VTC is absent, with active pull down.

c) SCHOTTKY TTL GATE

The "High speed TTL gate" speed is further enhanced by using using the concept of Schottky TTL gate. The details about Schottky TTL is illustrated as accordingly. Except T2, all transistors of high speed TTL are replaced by schottky transistor. A reduction in storage time results in reduction of propagation delay. This is because the time needed for a transistor to come out of saturation, delays the switching of transistor ON condition to OFF condition.

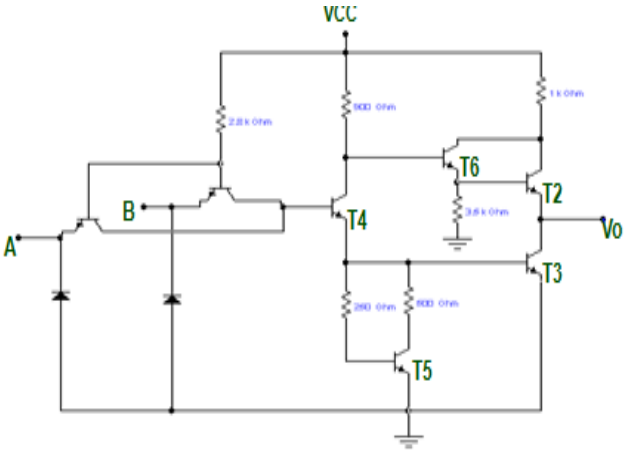

Figure 3. High Speed TTL

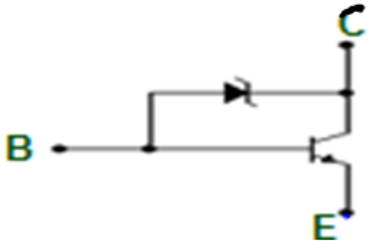

Figure 4. Schottky Diode Connected between Base and Collector of Transistor.

Saturation can be eliminated by placing Schottky diode between base & collector of each saturated transistor in the circuit. The schottky diode is formed by the junction of metal & semiconductor in contrast to conventional diode. The voltage across the conducting diode is only o.4v. The presence of schottky diode between base and collector prevents transistor entering into saturation. The resulting transistor is called schottky transistor. The transistor in TTL decreases propagation delay without sacrifice of power dissipation.

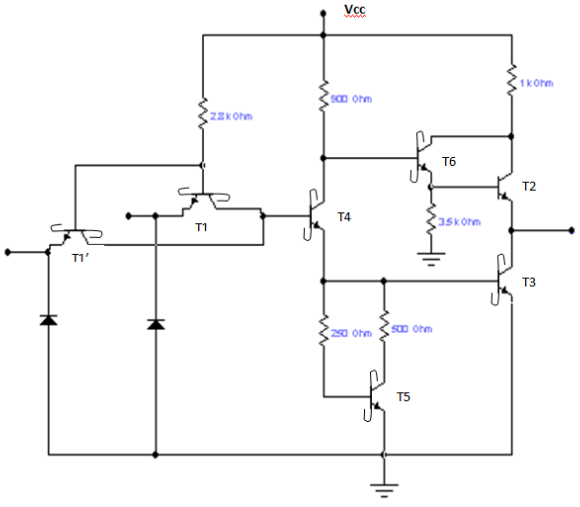

Figure 5. Schottky TTL Gate for super High speed

C. CONCEPT ABOUT DEVELOPING MULTPLEXER AS SELECTOR

Diagram shows a 3-channel multiplexer with gating drive and Ring counter, they are used to turn ON and OFF the switches T1, T2 & T3 in sequences.

The gating Amplifiers are driven by three input signals. Here two the Blanking signals are used, when both blanking signals are at low, all the switches are open and Analog signals are not transmitted to the output.

The counter is so designed that only one output of the counter is high at any time. Hence only one switch is closed at a time. Thus the output Vo represents the samples of inputs V1(t), V2(t) and V3(t) in succession.

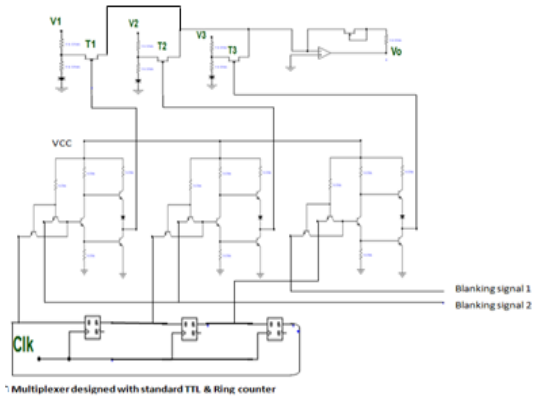

Figure 6. Video Signal

2. CONCEPT ABOUT CREATING CAR SHAPE USING C-PROGRAMMING

The Video Signal is created at Computer Graphics throuh writing a C-Program for a simple CAR shape.

The details about program part for creating a simple CAR shape is illustrated as accordingly.

ii) Program for creating simple car shape:

```
#include<stdio.h>
#include<conio.h>
#include<graphics.h>
#include<dos.h>
void main()
{
   int gd = DETECT, gm;
   initgraph(&gd, &gm, "C:\\TurboC3\\BGI");
   cleardevice();
   line( 150, 100,  242, 100);
   ellipse(242, 105, 0, 90, 10, 5);
   line(150, 100,  120, 150);
   line(252, 105,  280, 150);
   line(100, 150,  320, 150);
   line(100, 150,  100, 200);
   line(320, 150,  320, 200);
   line(100, 200,  110, 200);
   line( 320, 200,  310, 200);
   arc(130, 200, 0, 180, 20);
   arc( 290, 200, 0, 180, 20);
   line( 270, 200,  150, 200);
   circle(130, 200, 17);
   circle(290, 200, 17);
   getch();
}
```

Output:

3. CONCEPT ABOUT COLOR TV MONITOR AS DISPLAY DEVICE

A fundamental concept about television operation mechanism for color T.V. is presented and details about it is illustrated in diagram mentioned below.

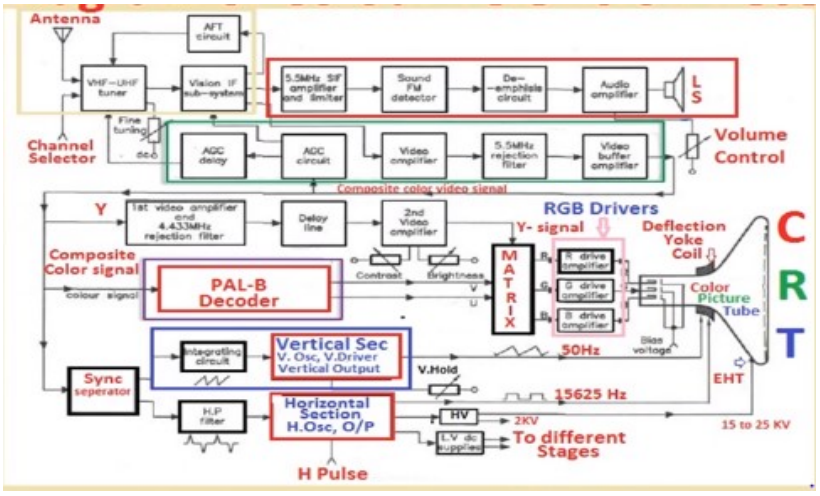

Figure 7. Color T.V. receiver block diagram

4. COMPLETE CIRCUIT DESIGN VIA INTERFACING

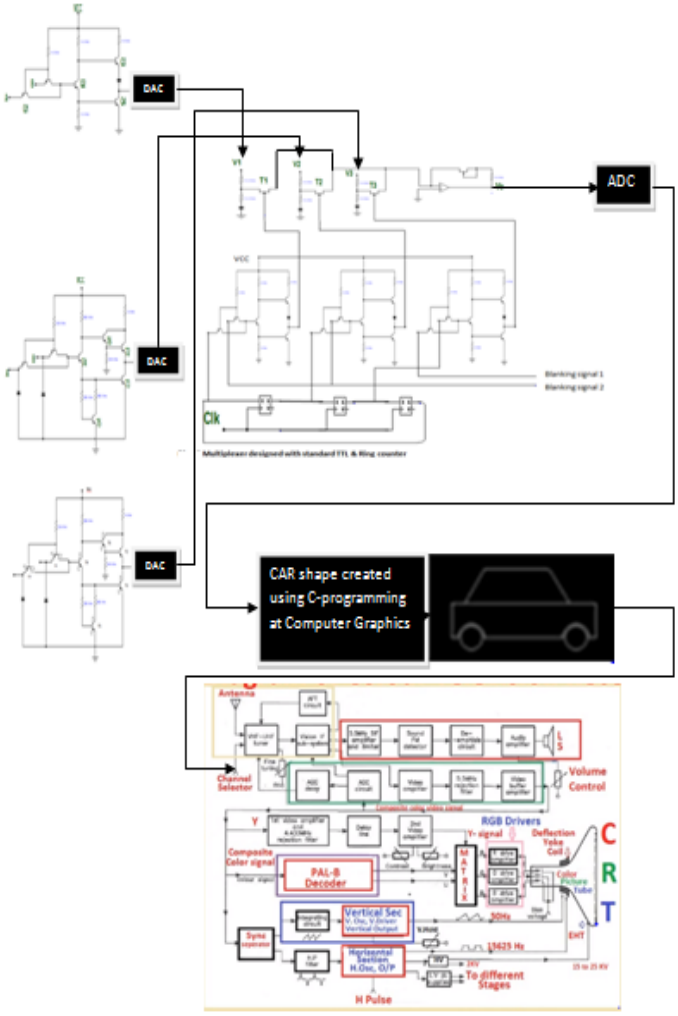

Figure 8. MULTIPLEXER AS A SELECTOR TO SELECT DIFFERENT SPEED TTL GATE AND FURTHER TO DISPLAY CAR SHAPE AT DIFFERENT SPEED TO COLOR TV SYSTEM

The complete circuit design for "MULTIPLEXER AS A SELECTOR TO SELECT DIFFERENT SPEED TTL GATE AND FURTHER DISPLAY CAR SHAPE AT DIFFERENT SPEED TO COLOR TV MONITOR" is obtained through interfacing of four circuit as i) Creating different speed TTL Gates at input ii) Multiplexer circuit (designed with MOSFET, Standard TTL circuit, and Ring counter) iii) CAR shape created using c-programming and iv) Color TV diagram.

5. CONCLUSION

The complete circuit design results into successfully converting "MULTIPLEXER AS A SELECTOR TO SELECT DIFFERENT SPEED TTL GATE AND FURTHER DISPLAY CAR SHAPE AT DIFFERENT SPEED TO COLOR TV MONITOR". The "Multiplexer circuit" is constructed with standard TTL circuit, MOSFET Gates and Ring counter which further uses "logical based selection criteria" to select particular speed TTL Gate out of multiple speed TTL Gates available at inputs and further it is fed to CAR shape created using c-programming and finally displayed at different speed to color TV sysrem. The concept to develop and design "MULTIPLEXER AS A SELECTOR TO SELECT DIFFERENT SPEED TTL GATE AND FURTHER DISPLAY CAR SHAPE AT DIFFERENT SPEED TO COLOR TV MONITOR" is one of most relevant applications, to meet Circuit designer's challenge of developing system with improving performance, smooth and reliable functioning speed to select particular speed TTL Gate and further display car shape at different speed to color TV monitor.

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