Totempole output TTL & Schotty TTL

Totempole output TTL:

If any input is low the collector base junction of Q_1 is reverse biased. At the base of transistor Q_1 has 0.9 V which is not sufficient voltage to drive the transistor Q_2 &Q_3 (i. e, 2.1 V)

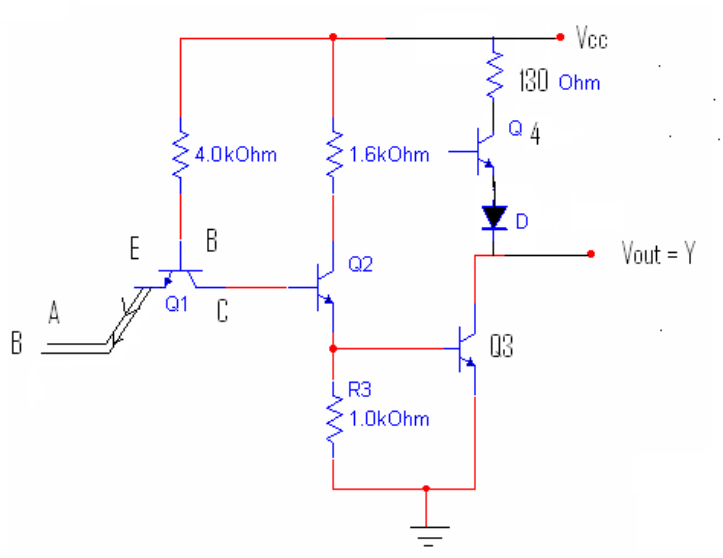

Figure 6.10

Now Q_2 & Q_3 is in cut off region. When Q_2 is in cut off, the transistor Q_4 is in saturation region, then the output Y becomes high. When all the inputs are high, collector base junction Q_1 is FB, hence the Base of Q_1 has enough voltage to drive the transistor Q2 &Q_3

When the transistor Q_2 is in saturation then the transistor Q_4 is entered into the cut off state the output y becomes low.

The need of or the reason for placing the diode in the circuit to provide diode drop in the output path. Thus ensures that Q_4 is cut off when Q_3 is in saturation.

In the case of open collector transistor, the propagation delay is around 35 n sec

During the turn on –off conditions or transients the Q_4 is entered into saturated state. Now the total resistance is 130Ω saturated resistance of transistor Q_4 + diode internal resistance which is very very low when compared to the pull up resistance in the open collector TTL.

In this way the propagation delay is reduced in totempole TTL NAND gate. Disadvantage is power dissipation is more the totempole output TTL'S cannot allow the wired logic functions. In the output totempole output TTL gates are connected together if one of the output is low and another output is high. The excursive current can produce enough heat to damage the transistors.

Schotty TTL:

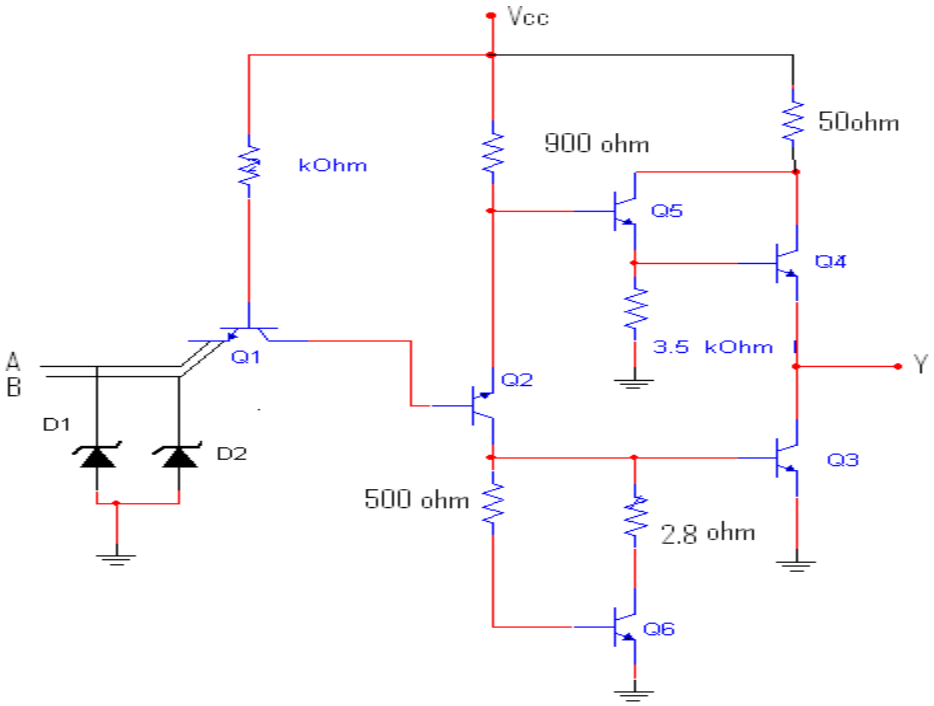

Figure 6.11

By placing the schotty diode in between each collector and base each saturated transistor. We can further reduce the propagation delay without sacrificing power. The schotty diode can present the transistor from going into saturation.

Schotty diode junction is made with one method and one semi conductor material. It differs with the normal diode. In conventional diode , the diode drop is 0.7 V Bt by using schotty diodes the diode drop is only 0. 4V.

The new combination of Q_4 & Q_5 shall give 2 V_{BE} drops, that is necessary to preventing Q_4 from conducting when output is low. The diode D_1 & D_2 and the TTL prevents the negative spikes of the voltage on the input's from damaging the transistor Q_1. The transistor Q_6 and the two emitter resistance are used to reduce the turn off current spike.