TRISTATE INVERTER, PASS TRANSISTOR AND TGS

1.15 Pass transistors:

We have n and p pass transistors.

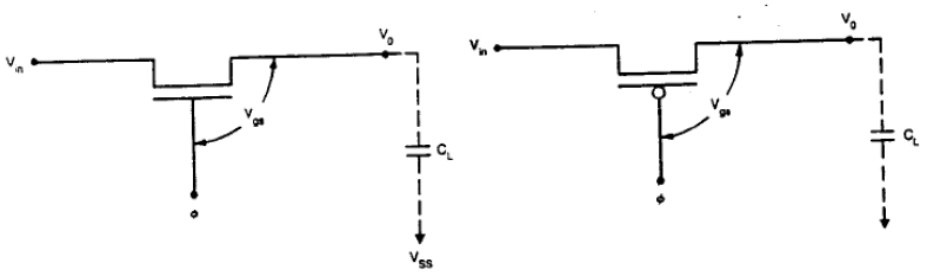

Figure 34: n and p pass transistors.

The disadvantage with the pass transistors is that, they will not be able to transfer the logic levels properly. The following table gives that explanation in detail.

Transmission characteristics of *n*-channel and *p*-channel pass transistors

DEVICE	TRANSMISSION OF '1'	TRANSMISSION OF '0'
n	poor	good
p	good	poor

If Vdd (5 volts) is to be transferred using nMOS the output will be (Vdd-Vtn). **POOR 1 or Weak Logic 1**

If Gnd(0 volts) is to be transferred using nMOS the output will be Gnd. **GOOD 0 or Strong Logic 0**

If Vdd (5 volts) is to be transferred using pMOS the output will be Vdd. **GOOD 1 or Strong Logic 1**

If Gnd(0 volts) is to be transferred using pMOS the output will be Vtp. **POOR 0 or Weak Logic 0.**

1.16 Transmission gates (TGs):

It's a parallel combination of pmos and nmos transistor with the gates connected to a complementary input. The disadvantages weak 0 and weak 1 can be overcome by using a TG instead of pass transistors.

Working of transmission gate can be explained better with the following equation. **When _="0" n and p device off, Vin=0 or 1, Vo="Z" When _="1" n and p device on, Vin=0 or 1, Vo=0 or 1 , where „Z" is high impedance.** One more important advantage of TGs is that the reduction in

the resistance because two transistors will come in parallel and it is shown in the graph. The graph shows the resistance of n and p pass transistors, and resistance of TG which is lesser than the other two.

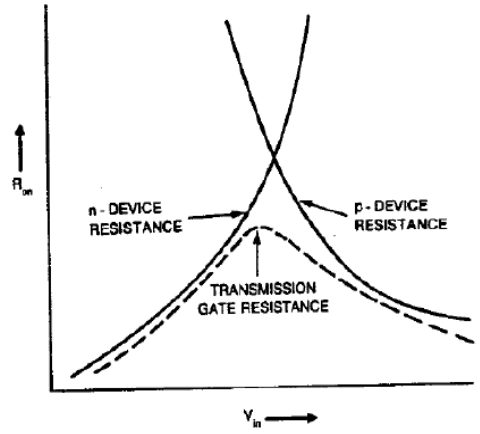

Figure 35: Graph of resistance vs. input for pass transistors and TG.

By cascading a transmission gate with an inverter the tristate inverter circuit can be obtained. The working can be explained with the help of the circuit.

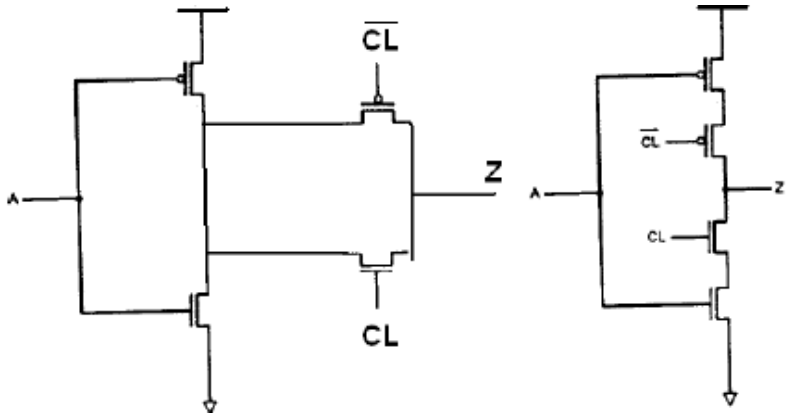

Figure 36: Tristate Inverter

The two circuits are the same only difference is the way they are written. When CL is zero the output of the inverter is in tristate condition. When CL is high the output is Z is the inversion of the input A

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