

## ⊛ Assignments :-

① B.1.d :- Transmission Gate (TG)

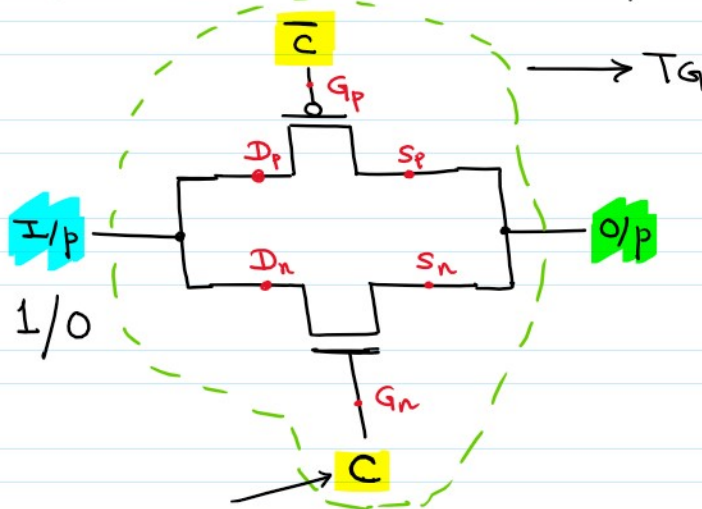
⊛ B.1.d :- Transmission Gate (TG)

⇒ Tg is one of the four CMOS - Logic sub-families

⇒ Tg is a **CMOS switch**; ie:- a semiconductor s/w built by combining 1 PMOS & 1 NMOS s/w⇒  $TG = (1 \text{ PMOS}) // (1 \text{ NMOS})$ 

⇒ Being a combination of PMOS &amp; NMOS, it gives both S1, S0 @ o/p

⇒ Construction:- → PMOS//NMOS

For  $I/p = 1$ ① If  $\left. \begin{matrix} \text{pmos} = \text{ON} \\ \text{nmos} = \text{OFF} \end{matrix} \right\} O/p = S1 \checkmark$ ② If  $\left. \begin{matrix} \text{pmos} = \text{OFF} \\ \text{nmos} = \text{ON} \end{matrix} \right\} O/p = W1 \times$ For  $I/p = 0$ ① If  $\left. \begin{matrix} \text{pmos} = \text{ON} \\ \text{nmos} = \text{OFF} \end{matrix} \right\} O/p = W0 \times$ ② If  $\left. \begin{matrix} \text{pmos} = \text{OFF} \\ \text{nmos} = \text{ON} \end{matrix} \right\} O/p = S0 \checkmark$ 

Thus, to get STRONG O/p ; irrespective of the value of I/p;  
we simultaneously s/w ON, both pmos & nmos

∴  $\text{pmos} = \text{ON}$ , for Gate = 0 $\text{nmos} = \text{ON}$ , for Gate = 1

We give opposite values of Trigger to pmos &amp; nmos

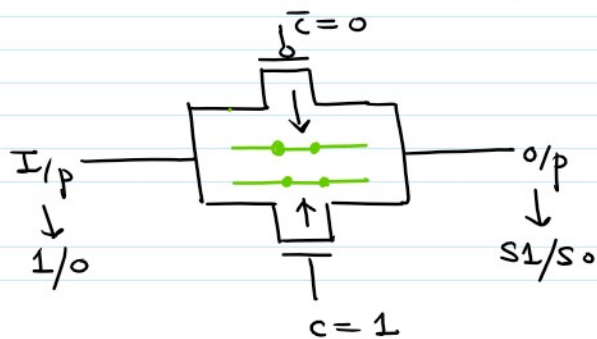
⇒ The **Control signal for TG**, denoted as "**C**" is applied to **Nmos**⇒ The **complement of "C"** ie. **C-bar** is applied to **PMOS**

⇒ Operation of TG can be summarised as follows:-

⇒ Operation of TQ can be summarised as follows:-

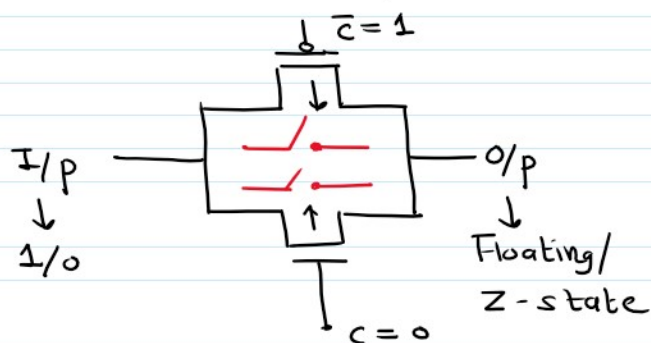
For  $c = 1$  ( $\bar{c} = 0$ )

nmos = ON, pmos = ON



For  $c = 0$  ( $\bar{c} = 1$ )

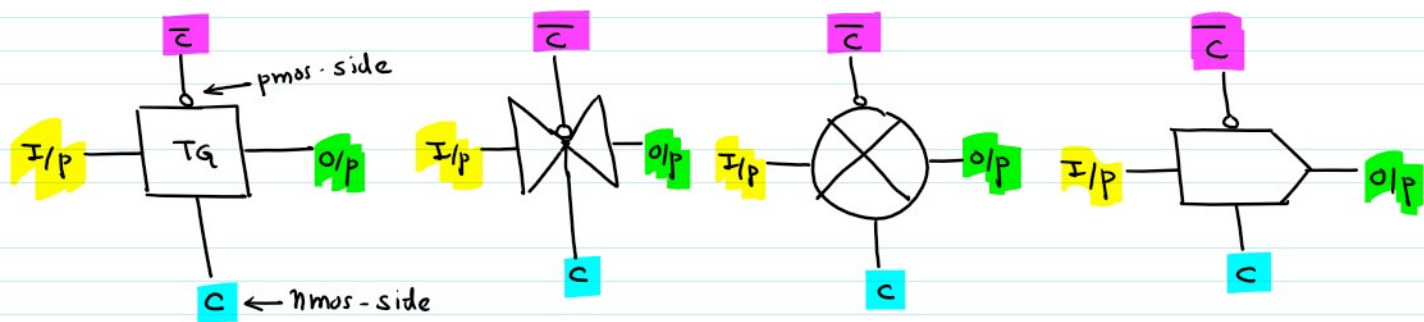
nmos = OFF, pmos = OFF



⇒ Thus; TQ closes for  $c = 1$  (Nmos side)

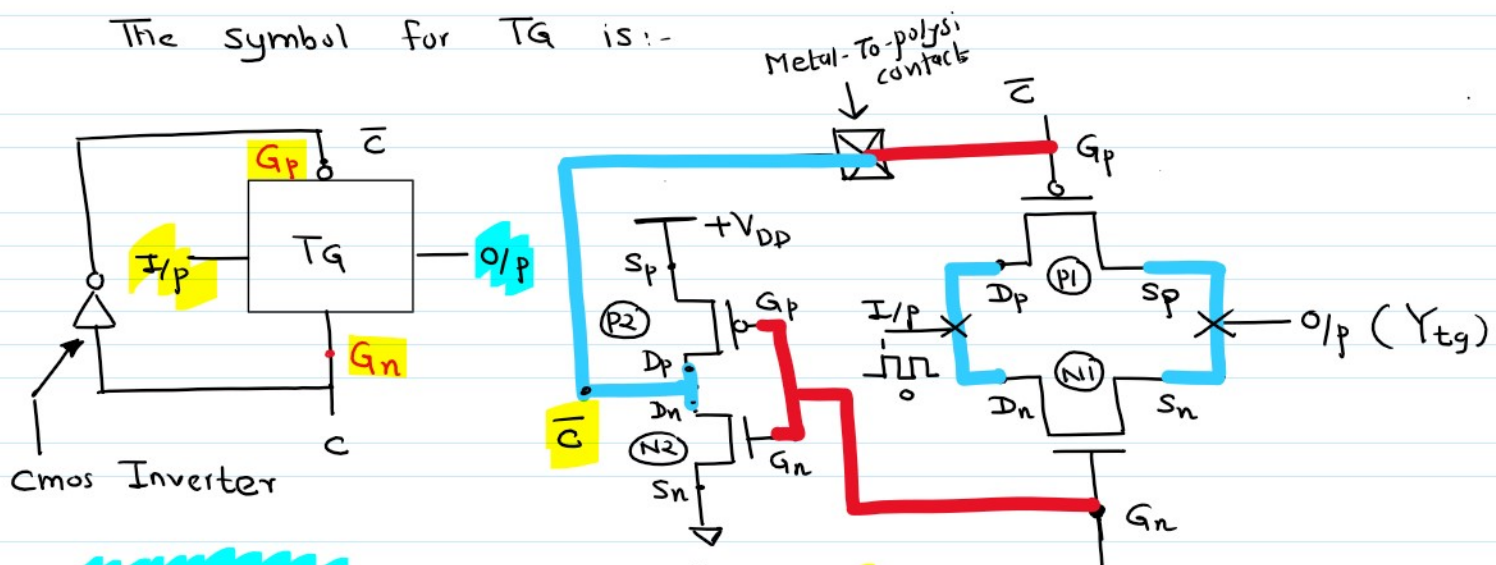
TQ opens for  $c = 0$  (Nmos side)

⇒ Symbols:- TQ has multiple Representations as follows:-

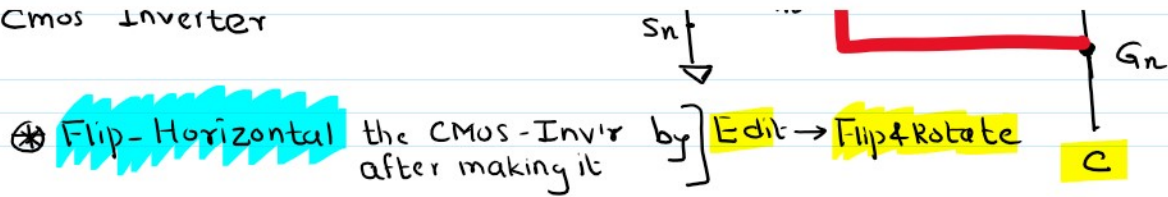


⇒ MOSFET-level Schematic of TQ:-

The symbol for TQ is:-



Cmos Inverter



⇒ To check functionality of TG:-

- ① Apply 2.5 GHz Clock @ I/p
- ② For clock = 1 ; we should get o/p =  $+V_{DD} = 1.2V$  (s1)
- ③ For clock = 0 ; we should get o/p =  $-V_{SS} = 0V$  (s0)

⊗ Refer to the YouTube channel video for Demo of TG-Layout