Some netlist

1. Here I attach some netlist code which I write for implement.
2. Note that we use model from : http://ptm.asu.edu/

CMOS Code

```
***cmos**
mpmos1 out in vdd vdd pmos w=360n l=180n
mnmos2 out in gnd gnd nmos w=180n l=180n
v1 vdd gnd dc 1.8
v2 in gnd pulse(0 1.8 0 0.1n 0.1n 1.9n 4n)
.tran 1n 10n
.model  pmos  pmos  level = 54
+version = 4.0    binunit = 1    paramchk= 1    mobmod  = 0
+capmod  = 2      igcmod  = 1    igbmod  = 1    geomod  = 1
+diomod  = 1      rdsmod  = 0    rbodymod= 1    rgatemod= 1
+permod  = 1      acnqsmod= 0    trnqsmod= 0
* parameters related to the technology node
+tnom = 27    epsrox = 3.9
+eta0 = 0.0049    nfactor = 2.1    wint = 5e-09
+cgso = 1.1e-10    cgdo = 1.1e-10    xl = -2e-08
* parameters customized by the user
+toxe = 1.85e-09    toxp = 1.1e-09    toxm = 1.85e-09    toxref = 1.85e-09
+dtox = 7.5e-10    lint = 3.75e-09
+vth0 = -0.418    k1 = 0.488    u0 = 0.00439    vsat = 70000
+rdsw = 155    ndep = 2.5e+18    xj = 1.4e-08
*secondary parameters
+ll      = 0          wl      = 0          lln     = 1          wln     = 1
+lw      = 0          ww      = 0          lwn     = 1          wwn     = 1
+lwl     = 0          wwl     = 0          xpart   = 0
+k2      = -0.01      k3      = 0
+k3b     = 0          w0      = 2.5e-006   dvt0    = 1          dvt1    = 2
+dvt2    = -0.032     dvt0w   = 0          dvt1w   = 0          dvt2w   = 0
+dsub    = 0.1        minv    = 0.05       voffl   = 0          dvtp0   = 1e-009
+dvtp1   = 0.05       lpe0    = 0          lpeb    = 0
+ngate   = 2e+020     nsd     = 2e+020     phin    = 0
+cdsc    = 0.000      cdscb   = 0          cdscd   = 0          cit     = 0
+voff    = -0.126     etab    = 0
+vfb     = 0.55       ua      = 2.0e-009   ub      = 0.5e-018
+uc      = 0          a0      = 1.0        ags     = 1e-020
+a1      = 0          a2      = 1          b0      = -1e-020    b1      = 0
+keta    = -0.047     dwg     = 0          dwb     = 0          pclm    = 0.12
+pdiblc1 = 0.001      pdiblc2 = 0.001      pdiblcb = 3.4e-008   drout   = 0.56
+pvag    = 1e-020     delta   = 0.01       pscbe1  = 8.14e+008  pscbe2  = 9.58e-007
+fprout  = 0.2        pdits   = 0.08       pditsd  = 0.23       pditsl  = 2.3e+006
+rsh     = 5          rsw     = 85         rdw     = 85
+rdswmin = 0          rdwmin  = 0          rswmin  = 0          prwg    = 3.22e-008
+prwb    = 6.8e-011   wr      = 1          alpha0  = 0.074      alpha1  = 0.005
+beta0   = 30         agidl   = 0.0002     bgidl   = 2.1e+009   cgidl   = 0.0002
```

```
+egidl   = 0.8
+aigbacc = 0.012        bigbacc = 0.0028       cigbacc = 0.002
+nigbacc = 1            aigbinv = 0.014        bigbinv = 0.004        cigbinv = 0.004
+eigbinv = 1.1          nigbinv = 3            aigc    = 0.69         bigc    = 0.0012
+cigc    = 0.0008       aigsd   = 0.0087       bigsd   = 0.0012       cigsd   = 0.0008
+nigc    = 1            poxedge = 1            pigcd   = 1            ntox    = 1
+xrcrg1  = 12           xrcrg2  = 5
+cgbo    = 2.56e-011    cgdl    = 2.653e-10
+cgsl    = 2.653e-10    ckappas = 0.03         ckappad = 0.03         acde    = 1
+moin    = 15           noff    = 0.9          voffcv  = 0.02
+kt1     = -0.11        kt1l    = 0            kt2     = 0.022        ute     = -1.5
+ua1     = 4.31e-009    ub1     = 7.61e-018    uc1     = -5.6e-011    prt     = 0
+at      = 33000
+fnoimod = 1            tnoimod = 0
+jss     = 0.0001       jsws    = 1e-011       jswgs   = 1e-010       njs     = 1
+ijthsfwd= 0.01         ijthsrev= 0.001        bvs     = 10           xjbvs   = 1
+jsd     = 0.0001       jswd    = 1e-011       jswgd   = 1e-010       njd     = 1
+ijthdfwd= 0.01         ijthdrev= 0.001        bvd     = 10           xjbvd   = 1
+pbs     = 1            cjs     = 0.0005       mjs     = 0.5          pbsws   = 1
+cjsws   = 5e-010       mjsws   = 0.33         pbswgs  = 1            cjswgs  = 3e-010
+mjswgs  = 0.33         pbd     = 1            cjd     = 0.0005       mjd     = 0.5
+pbswd   = 1            cjswd   = 5e-010       mjswd   = 0.33         pbswgd  = 1
+cjswgd  = 5e-010       mjswgd  = 0.33         tpb     = 0.005        tcj     = 0.001
+tpbsw   = 0.005        tcjsw   = 0.001        tpbswg  = 0.005        tcjswg  = 0.001
+xtis    = 3            xtid    = 3
+dmcg    = 0e-006       dmci    = 0e-006       dmdg    = 0e-006       dmcgt   = 0e-007
+dwj     = 0.0e-008     xgw     = 0e-007       xgl     = 0e-008
+rshg    = 0.4          gbmin   = 1e-010       rbpb    = 5            rbpd    = 15
+rbps    = 15           rbdb    = 15           rbsb    = 15           ngcon   = 1
.model  nmos  nmos  level = 54
+version = 4.0    binunit = 1    paramchk= 1    mobmod  = 0
+capmod  = 2      igcmod  = 1    igbmod  = 1    geomod  = 1
+diomod  = 1      rdsmod  = 0    rbodymod= 1    rgatemod= 1
+permod  = 1      acnqsmod= 0    trnqsmod= 0
* parameters related to the technology node
+tnom = 27    epsrox = 3.9
+eta0 = 0.0049    nfactor = 2.1    wint = 5e-09
+cgso = 1.1e-10    cgdo = 1.1e-10    xl = -2e-08
* parameters customized by the user
+toxe = 1.75e-09    toxp = 1.1e-09    toxm = 1.75e-09    toxref = 1.75e-09
+dtox = 6.5e-10    lint = 3.75e-09
+vth0 = 0.469    k1 = 0.528    u0 = 0.04372    vsat = 147390
+rdsw = 155    ndep = 3.28e+18    xj = 1.4e-08
* secondary parameters
+ll      = 0            wl      = 0            lln     = 1            wln     = 1
+lw      = 0            ww      = 0            lwn     = 1            wwn     = 1
+lwl     = 0            wwl     = 0            xpart   = 0
+k2      = 0.01         k3      = 0
+k3b     = 0            w0      = 2.5e-006     dvt0    = 1            dvt1    = 2
+dvt2    = -0.032       dvt0w   = 0            dvt1w   = 0            dvt2w   = 0
+dsub    = 0.1          minv    = 0.05         voffl   = 0            dvtp0   = 1.0e-009
```

```
+dvtp1   = 0.1         lpe0    = 0          lpeb    = 0
+ngate   = 2e+020      nsd     = 2e+020     phin    = 0
+cdsc    = 0.000       cdscb   = 0          cdscd   = 0          cit     = 0
+voff    = -0.13       etab    = 0
+vfb     = -0.55       ua      = 6e-010     ub      = 1.2e-018
+uc      = 0           a0      = 1.0        ags     = 1e-020
+a1      = 0           a2      = 1.0        b0      = 0          b1      = 0
+keta    = 0.04        dwg     = 0          dwb     = 0          pclm    = 0.04
+pdiblc1 = 0.001       pdiblc2 = 0.001      pdiblcb = -0.005     drout   = 0.5
+pvag    = 1e-020      delta   = 0.01       pscbe1  = 8.14e+008  pscbe2  = 1e-007
+fprout  = 0.2         pdits   = 0.08       pditsd  = 0.23       pditsl  = 2.3e+006
+rsh     = 5           rsw     = 85         rdw     = 85
+rdswmin = 0           rdwmin  = 0          rswmin  = 0          prwg    = 0
+prwb    = 6.8e-011    wr      = 1          alpha0  = 0.074      alpha1  = 0.005
+beta0   = 30          agidl   = 0.0002     bgidl   = 2.1e+009   cgidl   = 0.0002
+egidl   = 0.8
+aigbacc = 0.012       bigbacc = 0.0028     cigbacc = 0.002
+nigbacc = 1           aigbinv = 0.014      bigbinv = 0.004      cigbinv = 0.004
+eigbinv = 1.1         nigbinv = 3          aigc    = 0.012      bigc    = 0.0028
+cigc    = 0.002       aigsd   = 0.012      bigsd   = 0.0028     cigsd   = 0.002
+nigc    = 1           poxedge = 1          pigcd   = 1          ntox    = 1
+xrcrg1  = 12          xrcrg2  = 5
+cgbo    = 2.56e-011   cgdl    = 2.653e-10
+cgsl    = 2.653e-10   ckappas = 0.03       ckappad = 0.03       acde    = 1
+moin    = 15          noff    = 0.9        voffcv  = 0.02
+kt1     = -0.11       kt1l    = 0          kt2     = 0.022      ute     = -1.5
+ua1     = 4.31e-009   ub1     = 7.61e-018  uc1     = -5.6e-011  prt     = 0
+at      = 33000
+fnoimod = 1           tnoimod = 0
+jss     = 0.0001      jsws    = 1e-011     jswgs   = 1e-010     njs     = 1
+ijthsfwd= 0.01        ijthsrev= 0.001      bvs     = 10         xjbvs   = 1
+jsd     = 0.0001      jswd    = 1e-011     jswgd   = 1e-010     njd     = 1
+ijthdfwd= 0.01        ijthdrev= 0.001      bvd     = 10         xjbvd   = 1
+pbs     = 1           cjs     = 0.0005     mjs     = 0.5        pbsws   = 1
+cjsws   = 5e-010      mjsws   = 0.33       pbswgs  = 1          cjswgs  = 3e-010
+mjswgs  = 0.33        pbd     = 1          cjd     = 0.0005     mjd     = 0.5
+pbswd   = 1           cjswd   = 5e-010     mjswd   = 0.33       pbswgd  = 1
+cjswgd  = 5e-010      mjswgd  = 0.33       tpb     = 0.005      tcj     = 0.001
+tpbsw   = 0.005       tcjsw   = 0.001      tpbswg  = 0.005      tcjswg  = 0.001
+xtis    = 3           xtid    = 3
+dmcg    = 0e-006      dmci    = 0e-006     dmdg    = 0e-006     dmcgt   = 0e-007
+dwj     = 0.0e-008    xgw     = 0e-007     xgl     = 0e-008
+rshg    = 0.4         gbmin   = 1e-010     rbpb    = 5          rbpd    = 15
+rbps    = 15          rbdb    = 15         rbsb    = 15         ngcon   = 1
.options POST=2
.options AUTOSTOP
.options INGOLD=2 DCON=1
.options GSHUNT=1e-12 RMIN=1e-15
.options ABSTOL=1e-5 ABSVDC=1e-4
.options RELTOL=1e-2 RELVDC=1e-2
.options NUMDGT=4 PIVOT=13
```

```
.options runlvl=6
.end
```

SRAM Code

```
*sram*
*source
vdd vdd 0 dc 2

*access control
vwl wl 0 pulse(0 4 0 100u 100u 2m 8m)

*data control
vbl bl 0 dc 1
vblb blb 0 pulse(0 1 5m 100u 100u 2m 8m)

*transistors used for latching
m1 Q QR 0 0 NMOS l=1u w=0.35u
m2 Q QR vdd vdd PMOS l=1u w=0.70u
m3 QR Q 0 0 NMOS l=1u w=0.35u
m4 QR Q vdd vdd PMOS l=1u w=0.70u

*transistors used for data access
m5 bl wl QR QR NMOS l=1u w=0.35u
m6 blb wl Q Q NMOS l=1u w=0.35u
**model
.model  PMOS PMOS  level = 54
.model  NMOS  NMOS  level = 54

.option post accurate nomod brief
.option post_version=9007
.option runlvl = 5
.op

.end
```

(2)

```
* INVERTER
*-----------------------------------
* Include model/library file
*-----------------------------------

*-------------------------------------------------------------------------------------------------------
*NMOS config fil
*-------------------------------------------------------------------------------------------------------
.model  nmos  nmos  level = 54
*-------------------------------------------------------------------------------------------------------
*PMOS config file
*-------------------------------------------------------------------------------------------------------
.model  pmos  pmos  level = 54
*-------------------------------------------
* Parameters
```

```
* Several parameters are declared
* These parameters are used later in this file
*---------------------------------------------
.param wn=300n
.param wp=700n
.param l=240n
.param vref=1.25
*---------------------------------------
* NETLIST
* The width and length of the tr's are not
* numbers but the parameters
*---------------------------------------
C0 OUT 0 20E-15 M=1.0
MP1 OUT IN VDD! VDD! pmos L='l' W='wp'
+AD=+3.00000000E-13 AS=+3.00000000E-13 PD=+2.30000000E-06 PS=+2.30000000E06
+M=1
MN1 OUT IN 0 0 nmos L='l' W='wn'
+AD=+3.00000000E-13 AS=+3.00000000E-13 PD=+2.30000000E-06 PS=+2.30000000E06
+M=1

*-----------------------------------
* OPTIONS
*-----------------------------------
.OPTIONS POST
.PRINT TRAN V(IN) V(OUT)
.TRAN 1.00000E-09 3.00000E-08 START= 0.
.TEMP 25.0000
*-----------------------------------
* INPUT
*-----------------------------------
.global vdd!
vvdd! vdd! 0 DC=2.5
vIN IN 0 pulse 0.0 2.5 1n 1n 1n 5n 10n
*-----------------------------------
* MEASURE
*-----------------------------------
.measure tplh trig v(in) val=vref fall=1
+ targ v(out) val=vref rise=1
.measure a_power avg power from=0ns to=30ns
*---------------------------------------------
* ALTER
* HSPICE runs several times according to
* the number of .alter statement.
* In this example, HSPICE runs 5 times
* (1 for the initial value & 4 for the .alter's)
* The measurement results for each simulation
* will be stored in .mt0, .mt1, files.
*---------------------------------------------
.alter
.param wn=300n wp=700n
.alter
```

```
.param wn=300n wp=800n
.alter
.param wn=600n wp=900n
.alter
.param wn=600n wp=1200n
.end
```

Youtube Code

```
*SRAM*
*initial conditions stored for read operation
.ic v(Q)=1
.ic v(QR)=0
*data control
.ic v(bl)=1
.ic v(blb)=1
mpgl 4 1 5 5 nmos w=45n l=45n
mpgr 6 1 3 6 nmos w=45n l=45n
mpdl 4 3 0 0 nmos w=45n l=45n
mpdr 3 4 0 0 nmos w=45n l=45n
mpul 2 3 4 2 pmos w=90n l=45n
mpur 2 4 3 2 pmos w=90n l=45n
V4 1 0 1 *this is for VDD*
v1 1 0 1 *this is word line "WL*
V2 5 0 pulse (0 1 0 0.01n 0.01n 10n 20n) *this is Bit line*
v3 6 0 pulse (0 1 10n 0.01n 0.01n 10n 28n) *this is for BitBar "BLB"*
.tran 0.1n 20n start = 0
.model  nmos  nmos  level = 54
.model  pmos  pmos  level = 54
.options POST=2
.options AUTOSTOP
.options INGOLD=2 DCON=1
.options GSHUNT=1e-12 RMIN=1e-15
.options ABSTOL=1e-5 ABSVDC=1e-4
.options RELTOL=1e-2 RELVDC=1e-2
.options NUMDGT=4 PIVOT=13
.options runlvl=6

.end
```