1. 成員

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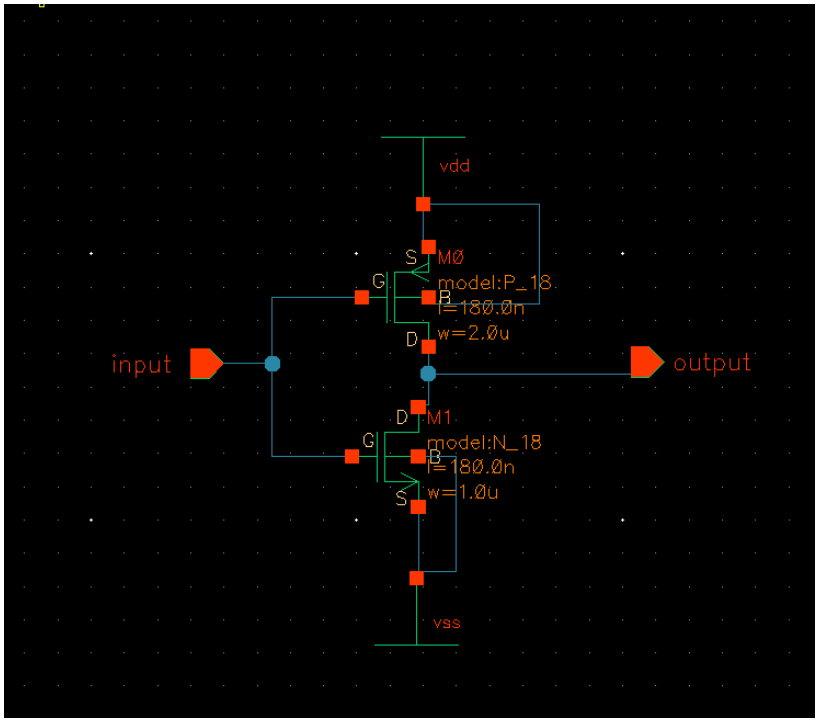
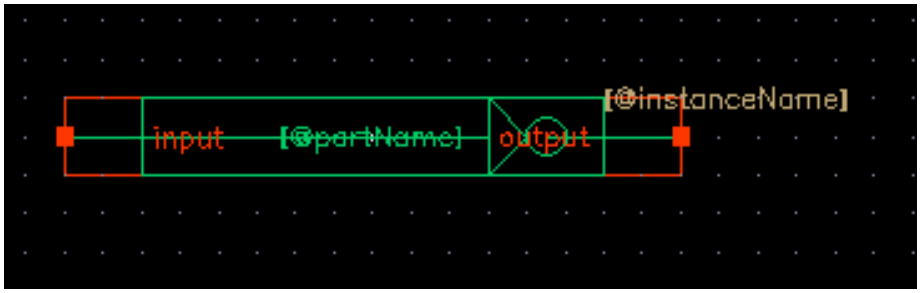
2. Schematic



3. Symbolic shape



4. SPICE file

```
********************************************************************************
* auCdl Netlist:
*
* Library Name:  inv
* Top Cell Name: INV
* View Name:     schematic
* Netlisted on:  May 22 22:24:51 2023
********************************************************************************

*.BIPOLAR
*.RESI = 2000
*.RESVAL
*.CAPVAL
*.DIOPERI
*.DIOAREA
*.EQUATION
*.SCALE METER
*.MEGA
.PARAM
.lib 'hspice.lib' tt
.GLOBAL vdd!
+        vss!

*.PIN vdd!
*+    vss!

********************************************************************************
* Library Name: inv
* Cell Name:    INV
* View Name:    schematic
********************************************************************************

.SUBCKT INV input output
*.PININFO input:I output:O
MM0 output input vdd! vdd! Pch m=1 l=180.0n w=2.0u
MM1 output input vss! vss! Nch m=1 l=180.0n w=1.0u
.ENDS

XINV input output inv

Vvdd vdd! 0 1.8v
Vvss vss! 0 0v
vin input 0 pulse(0v 1.8v 0ns 20ps 20ps 2ns 4ns)

.measure t_rise
+TRIG v(output) VAL=0.18v RISE=1
+TARG v(output) VAL=1.62v RISE=1

.measure t_fall
+TRIG v(output) VAL=1.62v FALL=1
+TARG v(output) VAL=0.18v FALL=1

.measure t_propagation_r
+TRIG v(input) VAL=0.9v FALL=1
+TARG v(output) VAL=0.9v RISE=1

.measure t_propagation_f
"inv.sp" 65L, 1304C written
```

5. slew rate and the propagation delay

```
*****************************************************************
******  option summary
******
runlvl   = 3          bypass   = 2.0000
 Opening plot unit= 15
file=inv.pa0

**info** dc convergence successful at Newton-Raphson method
******
*******************************************************************************

****** operating point information tnom=  25.000 temp=  25.000 ******
****** operating point status is voltage   simulation time is     0.
   node    =voltage      node    =voltage      node    =voltage

+0:input    =   0.      0:output  =   1.8000  0:vdd!    =   1.8000
+0:vss!     =   0.

******
*******************************************************************************

****** transient analysis tnom=  25.000 temp=  25.000 ******
t_rise=  22.6856p  targ=   2.0595n   trig=   2.0368n
t_fall=  13.0318p  targ=  30.0987p   trig=  17.0669p
t_propagation_r=  13.9747p  targ=   2.0440n   trig=   2.0300n
t_propagation_f=  12.8551p  targ=  22.8551p   trig=  10.0000p

         ***** job concluded
******
*******************************************************************************
```

6. waveform