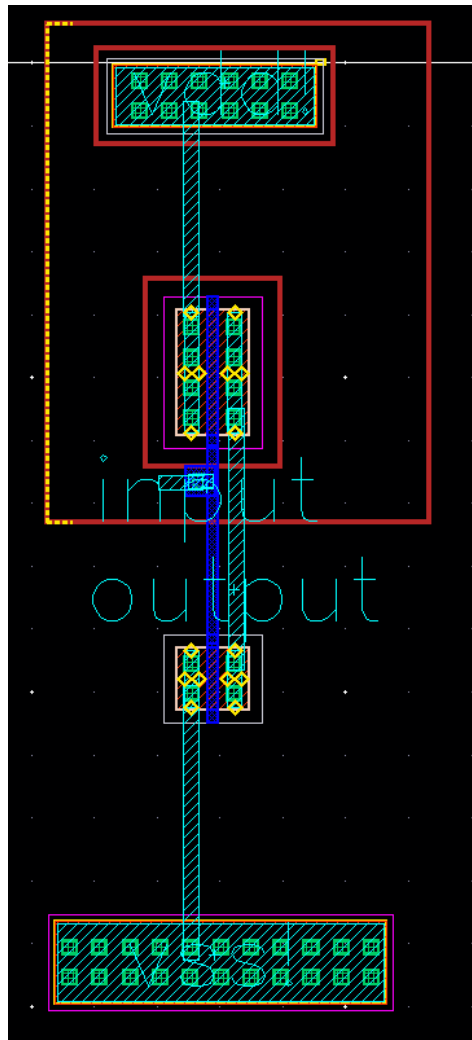


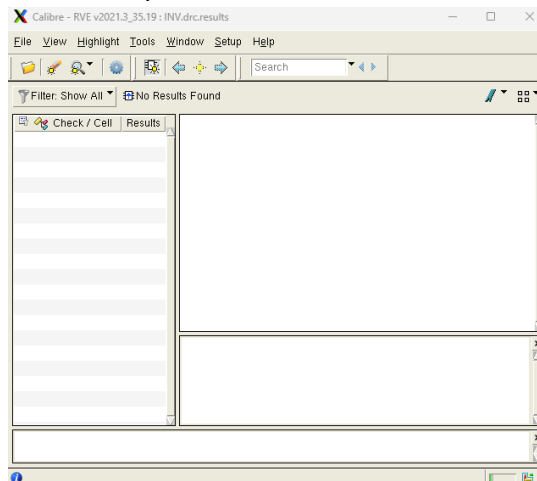
1. 成員

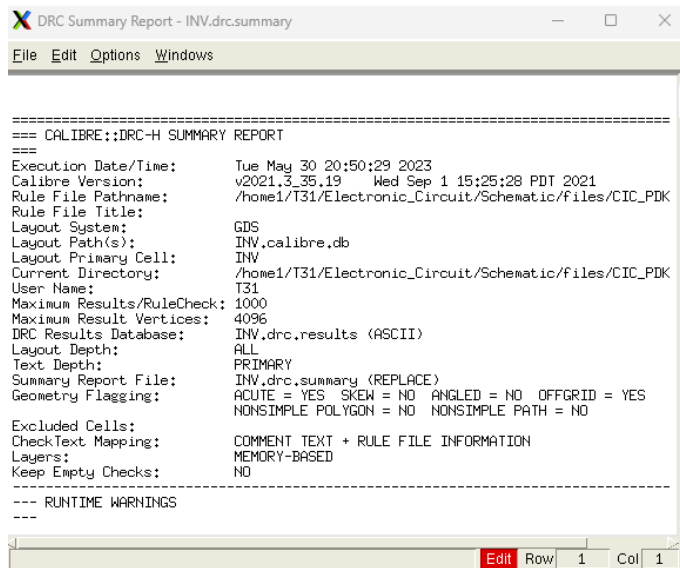
- (1) B11130038 王家宏
- (2) B11132013 莊東諺
- (3) B11132002 蘇志寬

2. Layout

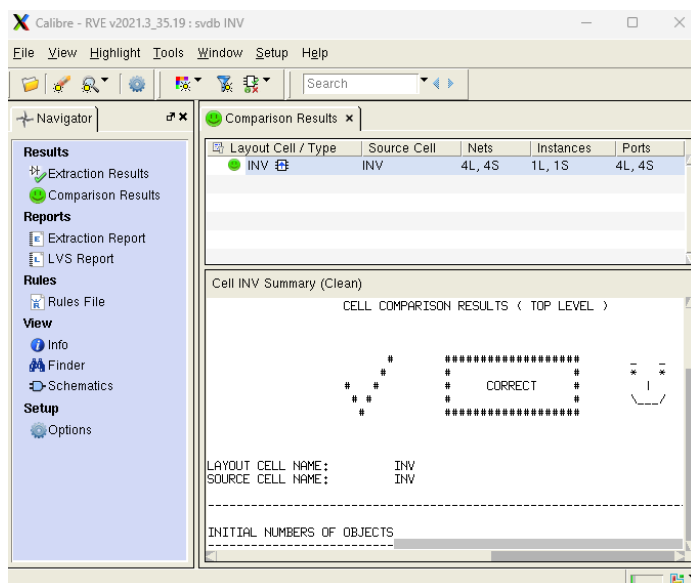
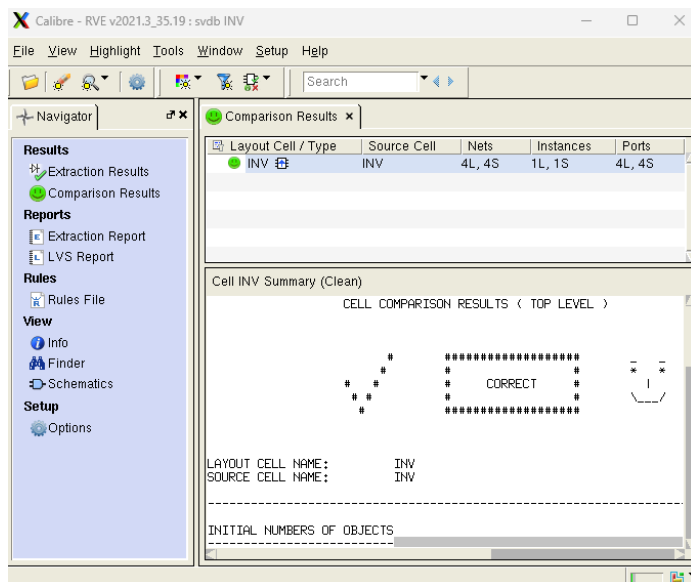


3. DRC reports





4. LVS reports



5. SPICE file

```
* File: INV.pex.sp
* Created: Sun May 28 22:36:24 2023
* Program "Calibre xRC"
* Version "v2021.3_35.19"
*
.include "INV.pex.sp.pex"
.subckt INV VSS! INPUT VDD! OUTPUT
.lib 'hspice.lib' tt
*
* OUTPUT      OUTPUT
* INPUT INPUT
* VDD!  VDD!
* VSS!  VSS!
MM1 N_OUTPUT_MM1_d N_INPUT_MM1_g N_VSS!_MM1_s N_VSS!_MM1_b Nch L=1.8e-07
+ W=1e-06 AD=4.9e-13 AS=4.9e-13 PD=1.98e-06 PS=1.98e-06
MM0 N_OUTPUT_MM0_d N_INPUT_MM0_g N_VDD!_MM0_s N_VDD!_MM0_b Pch L=1.8e-07
+ W=2e-06 AD=9.8e-13 AS=9.8e-13 PD=2.98e-06 PS=2.98e-06
*
.include "INV.pex.sp.INV.pxi"
*
.ends
*
XINV VSS! INPUT VDD! OUTPUT INV

Vvdd vdd! 0 1.8
Vvss vss! 0 0
vin input 0 pulse(0 1.8 0n 20p 20p 2n 4n)

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

.option post
.tran 1p 20n
.END
```

6. slew rate and the propagation delay

```

***** option summary
*****
runlvl = 3          bypass = 2.0000
Opening plot unit= 15
file=INV.pex.pa0

**info** dc convergence successful at Newton-Raphson method
*****
* file: inv.pex.sp

***** 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.      1:n_input_ = 0.      1:n_input_ = 0.
+1:n_output= 1.8000  1:n_output= 1.8000  1:n_vdd!_m= 1.8000
+1:n_vdd!_m= 1.8000  1:n_vss!_m= 3.9794p 1:n_vss!_m= 171.0946p
+2:2          = 316.0365f 2:4      = 328.7357f 2:7      = 327.5267f
+2:9          = 321.2196f 2:10     = 947.1221f 2:14     = 17.3619p
+2:16         = 211.7611f 2:20     = 8.5408f  2:22     = 24.3460f
+2:24         = 35.5021f 2:26     = 37.6406f 2:29     = 314.3043f
+2:31         = 16.3102p 2:32     = 15.3978p 2:33     = 16.6001p
+2:37         = 570.6644f 2:40     = 716.6496f 2:42     = 1.4782p
+2:44         = 2.3245p  2:49     = 2.0709p  2:51     = 723.7868f
+2:53         = 465.5667f 2:57     = 137.2535p 3:2      = 1.8000
+3:4          = 1.8000  3:6      = 1.8000  3:7      = 1.8000
+3:8          = 1.8000  3:10     = 1.8000  3:13     = 1.8000
+3:14         = 1.8000  3:16     = 1.8000  3:20     = 1.8000
+3:22         = 1.8000  3:24     = 1.8000  3:29     = 1.8000
+3:33         = 1.8000  3:36     = 1.8000  3:40     = 1.8000
+3:42         = 1.8000  4:5      = 0.      4:17     = 0.
+4:18         = 0.      4:19     = 0.      5:4      = 1.8000
+5:6          = 1.8000  5:7      = 1.8000  5:9      = 1.8000
+5:12         = 1.8000  5:18     = 1.8000  5:19     = 1.8000
+5:20         = 1.8000  5:21     = 1.8000  5:24     = 1.8000
+5:29         = 1.8000

*****
* file: inv.pex.sp

***** transient analysis tnom= 25.000 temp= 25.000 *****
t_rise= 23.6103p targ= 2.0610n trig= 2.0374n
t_fall= 13.2862p targ= 31.8009p trig= 18.5147p
t_propagation_r= 14.9121p targ= 2.0449n trig= 2.0300n
t_propagation_f= 13.9033p targ= 23.9033p trig= 10.0000p

      ***** job concluded
*****
* file: inv.pex.sp

***** job statistics summary tnom= 25.000 temp= 25.000 *****

***** Machine Information *****
CPU:
model name      : Intel(R) Xeon(R) Silver 4110 CPU @ 2.10GHz
cpu MHz         : 2100.000
CPU(s)          : 32

```

7. waveform

