CMOS INVERTER

inv my_designs:symbol ✕

In   In   Out   Out

Cell = inv

InstanceName =
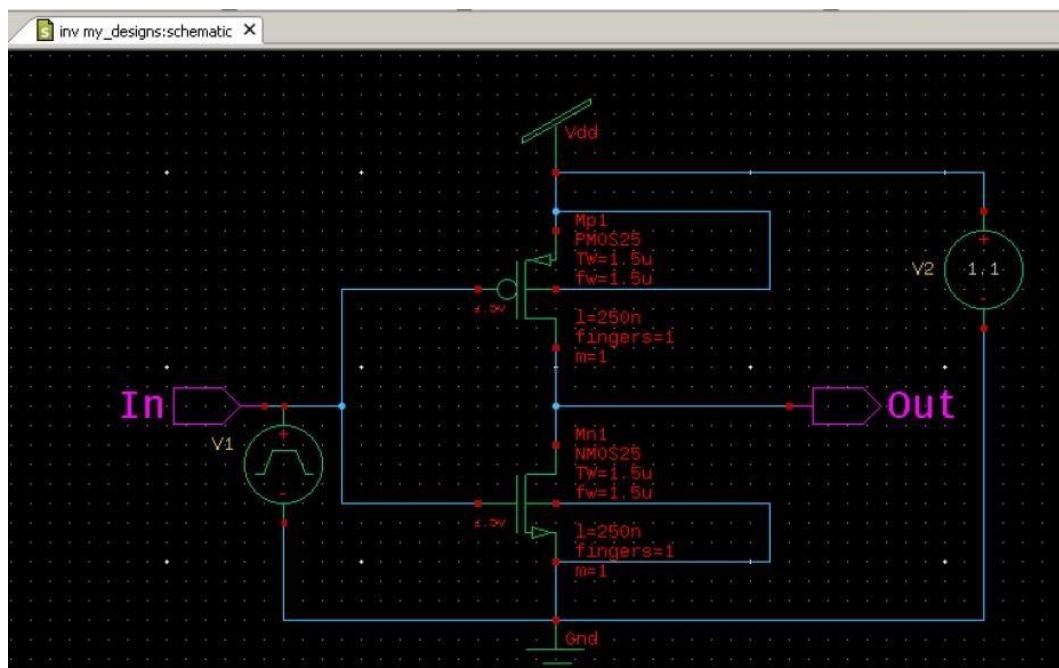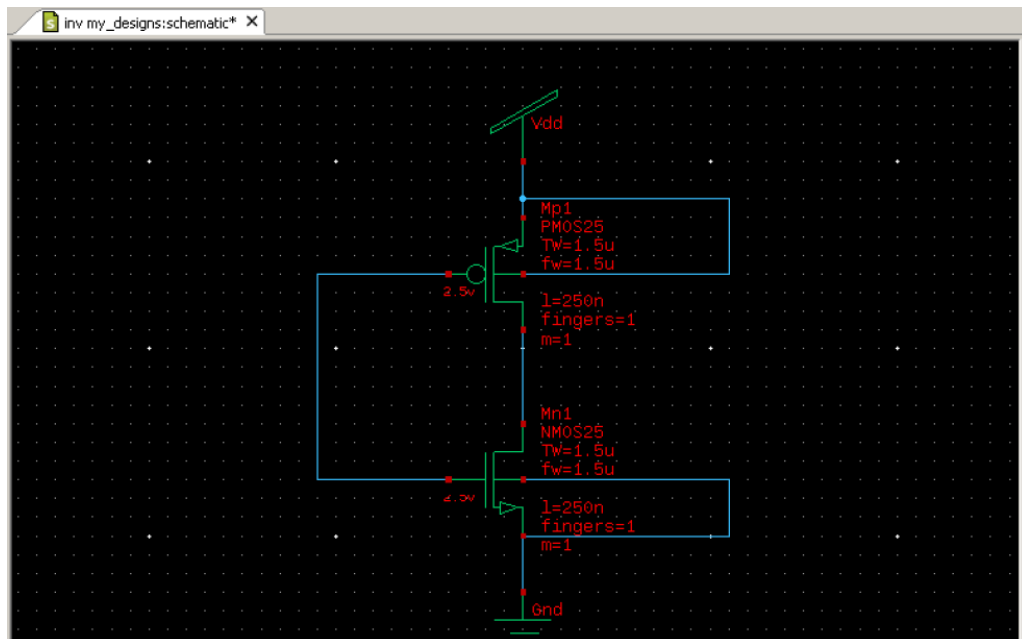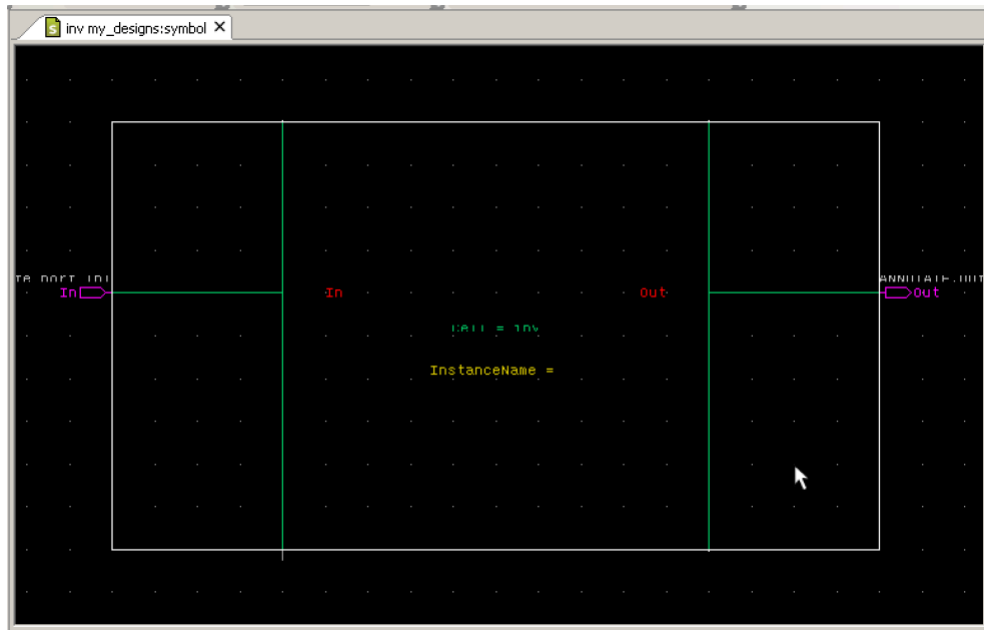

File Edit View Simulation Setup Window Help

Concurrent   1

```
* SPICE export by:     S-Edit 2021.2.0
* Export time:         Fri Nov 17 23:17:22 2023
* Design path:         /home/WBPD07/SElsaR/VLSI_PD/Tanner_labs/Lab_01/CMOS_designs/lib.defs
* Library:             my_designs
* Cell:                inv
* Testbench:           Spice
* View:                schematic
* Export as:           top-level cell
* Export mode:         hierarchical
* Exclude empty:       yes
* Exclude .model:      no
* Exclude .hdl:        no
* Exclude .end:        no
* Expand paths:        yes
* Wrap lines:          no
* Exclude simulator commands:  no
* Exclude global pins:         no
* Exclude instance locations:  no
* Control property name(s):    SPICE

********* Simulation Settings - General Section *********
***** Top Level *****
MMn1 Out In Gnd Gnd NMOS25 w=1.5u l=250n m=1 ad=975f pd=4.3u as=975f ps=4.3u nrd=433.33333m nrs=433.33333m $ $x=4800 $y=3300 $w=400 $h=600
MMp1 Out In Vdd Vdd PMOS25 w=1.5u l=250n m=1 ad=975f pd=4.3u as=975f ps=4.3u nrd=433.33333m nrs=433.33333m $ $x=4800 $y=4400 $w=400 $h=600
VV2 Vdd Gnd DC 1.1 $ $x=7200 $y=4500 $w=400 $h=600
VV1 In Gnd PULSE(0 5 0 5n 5n 95n 200n) $ $x=3600 $y=3500 $w=400 $h=600

********* Simulation Settings - Analysis Section *********
.tran 10n 100n start=0n
.print tran v(Out,Gnd) v(In,Gnd)
.lib "/home/cad/eda/Tanner_2021/tanner-2021-2-rhel6-64/share/examples/Process/Generic_250nm/Models/Generic_250nm.lib" TT

********* Simulation Settings - Additional SPICE Commands *********

.end
```
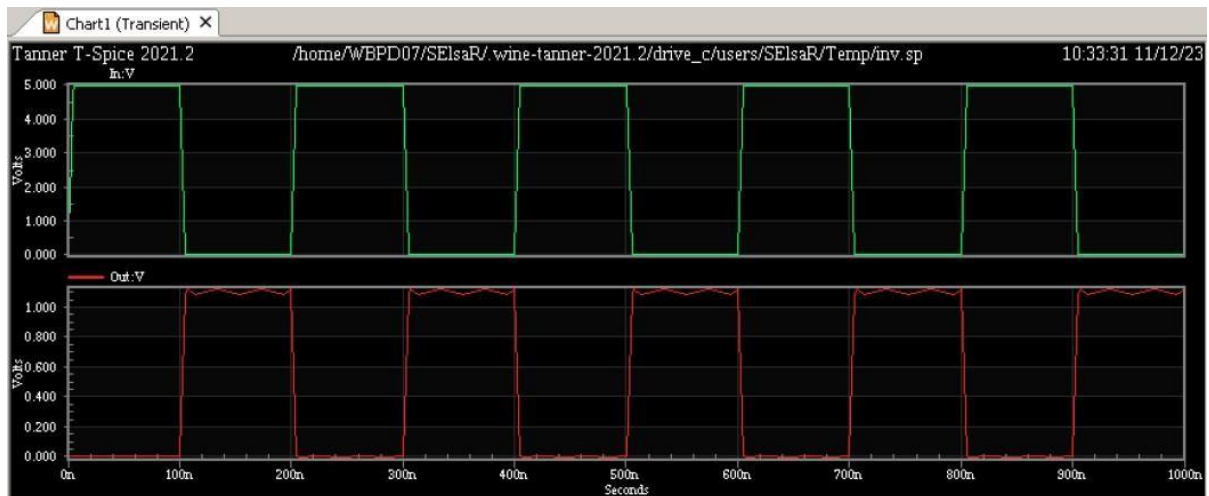
Tanner T-Spice 2021.2   /home/WBPD07/SElsaR/.wine-tanner-2021.2/drive_c/users/SElsaR/Temp/inv.sp   10:33:31 11/12/23


```
* Export mode:          hierarchical
* Exclude empty:        yes
* Exclude .model:       no
* Exclude .hdl:         no
* Exclude .end:         no
* Expand paths:         yes
* Wrap lines:           no
* Exclude simulator commands:  no
* Exclude global pins:         no
* Exclude instance locations:  no
* Control property name(s):    SPICE

********* Simulation Settings - General Section *********
***** Top Level *****
MMn1 Out In Gnd Gnd NMOS25 w=1.5u l=250n m=1 ad=975f pd=4.3u as=975f ps=4.3u nrd=433.33333m nrs=433.33333m $ $x=4800 $y=3300 $w=400 $h=600
MMp1 Out In Vdd Vdd PMOS25 w=1.5u l=250n m=1 ad=975f pd=4.3u as=975f ps=4.3u nrd=433.33333m nrs=433.33333m $ $x=4800 $y=4400 $w=400 $h=600
VV2 Vdd Gnd DC 1.1 $ $x=7200 $y=4500 $w=400 $h=600
*VV1 In Gnd PULSE(0 5 0 5n 5n 95n 200n) $ $x=3600 $y=3500 $w=400 $h=600

********* Simulation Settings - Analysis Section *********
VV1 In Gnd BIT ((101101110) pw=5n 1t=5n ht=5n on=1.1 off=0 rt=0.1n ft=0.1n delay=0)|
.tran 10n 100n start=0n
.print tran v(Out,Gnd) v(In,Gnd)
.lib "/home/cad/eda/Tanner_2021/tanner-2021-2-rhel6-64/share/examples/Process/Generic_250nm/Models/Generic_250nm.lib" TT

********* Simulation Settings - Additional SPICE Commands *********

.end
```
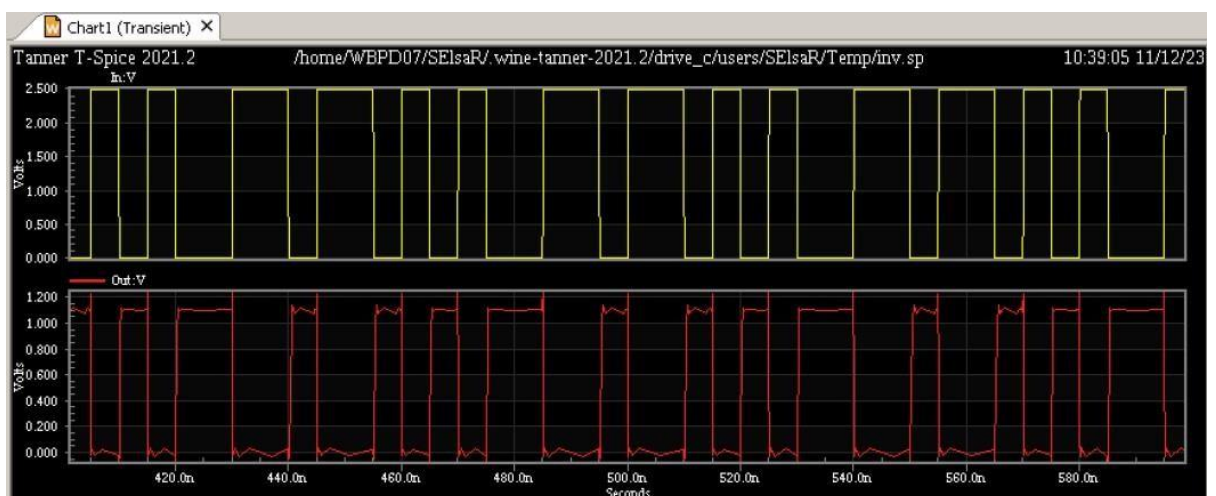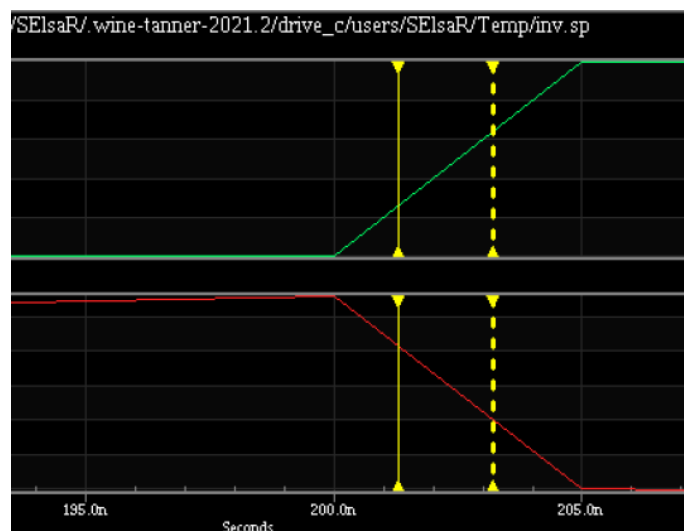

Tanner T-Spice 2021.2   /home/WBPD07/SElsaR/.wine-tanner-2021.2/drive_c/users/SElsaR/Temp/inv.sp   10:39:05 11/12/23

t_PHL = 0.3ns

t_PLH = 0.2ns

$$t_P = (t_{PHL} + t_{PLH})/2$$

$$t_P = (0.3+0.2)/2 = 0.25ns$$

```
T inv.sp *                                                                                    _|□|x|
   * Wrap lines:             no
   * Exclude simulator commands:  no
   * Exclude global pins:         no
   * Exclude instance locations:  no
   * Control property name(s):    SPICE

   ********* Simulation Settings - General Section *********
   MMn1 Out In Gnd Gnd NMOS25 w=1.5u l=250n m=1 ad=975f pd=4.3u as=975f ps=4.3u nrd=433.33333m nrs=433.33333m $ $x=4800 $y=3300 $w=400
   MMp1 Out In Vdd Vdd PMOS25 w=1.5u l=250n m=1 ad=975f pd=4.3u as=975f ps=4.3u nrd=433.33333m nrs=433.33333m $ $x=4800 $y=4400 $w=400
   VV2 Vdd Gnd DC 1.1 $ $x=7200 $y=4500 $w=400 $h=600
   VV1 In Gnd PULSE(0 5 0 5n 5n 95n 200n) $ $x=3600 $y=3500 $w=400 $h=600

   ********* Simulation Settings - Analysis Section *********
   .power VV1 0n 1000n|
   .tran 10n 1000n start=0n
   .print tran v(Out,Gnd) v(In,Gnd)
   .lib "/home/cad/eda/Tanner_2021/tanner-2021-2-rhel6-64/share/examples/Process/Generic_250nm/Models/Generic_250nm.lib" TT

   ********* Simulation Settings - Additional SPICE Commands *********

   .end
```

```
Input file:   inv.sp
Progress:    Simulation completed

Total nodes:   8      Active devices:   2      Independent sources:  2
Total devices:  4      Passive devices:  0      Controlled sources:   0

          Model Definitions  -       10
            Computed Models  -        2
          Independent nodes  -        5
            Boundary nodes  -        3
               Total nodes  -        8

    Opening simulation database "/home/WBPD07/SElsaR/.wine-tanner-2021.2/drive_c/users/SElsaR/Temp/inv.tsim"

Power Results

VV1 from time 0 to 1e-06
Average power consumed -> 2.243020e-06 watts
Max power 1.250016e-04 at time 5.1e-09
Min power 1.206684e-11 at time 0
```

```
T inv.sp                                                                                      _|□|x|
   * Exclude global pins:         no
   * Exclude instance locations:  no
   * Control property name(s):    SPICE

   ********* Simulation Settings - General Section *********
   ***** Top Level *****
   MMn1 Out In Gnd Gnd NMOS25 w=1.5u l=250n m=1 ad=975f pd=4.3u as=975f ps=4.3u nrd=433.33333m nrs=433.33333m $ $x=4800 $y=3300 $w=400
   MMp1 Out In Vdd Vdd PMOS25 w=1.5u l=250n m=1 ad=975f pd=4.3u as=975f ps=4.3u nrd=433.33333m nrs=433.33333m $ $x=4800 $y=4400 $w=400
   VV2 Vdd Gnd DC 1.1 $ $x=7200 $y=4500 $w=400 $h=600
   *VV1 In Gnd PULSE(0 5 0 5n 5n 95n 200n) $ $x=3600 $y=3500 $w=400 $h=600
   VV1 In Gnd

   ********* Simulation Settings - Analysis Section *********
   .step list temp 0 25 250 450

   .dc lin source VV1 0 1.1 0.01
   .print dc v(In,Gnd) v(Out,Gnd)
   .lib "/home/cad/eda/Tanner_2021/tanner-2021-2-rhel6-64/share/examples/Process/Generic_250nm/Models/Generic_250nm.lib" TT
   ********* Simulation Settings - Additional SPICE Commands *********

   .end
```
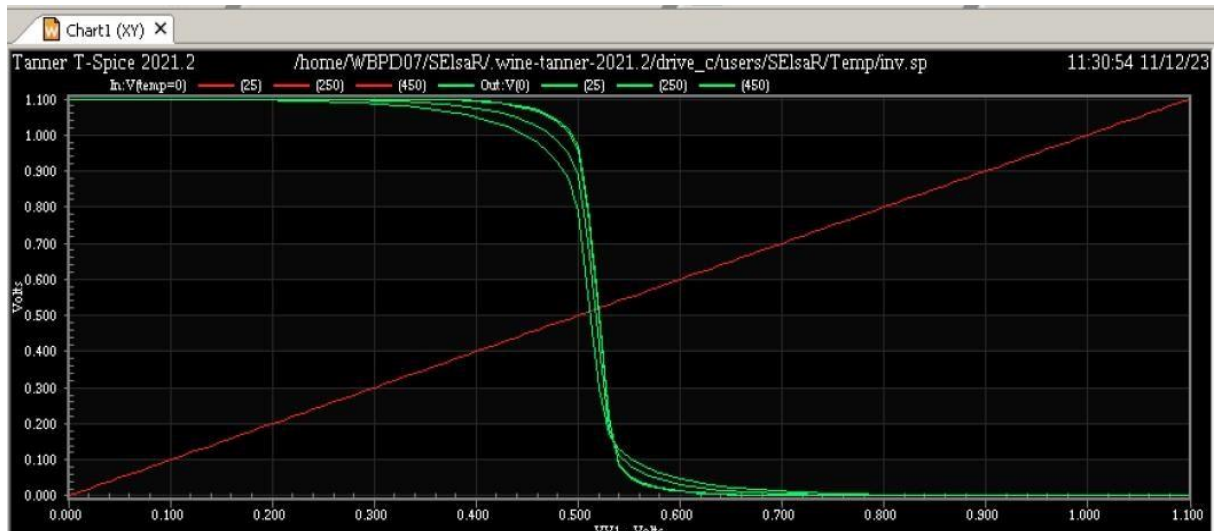
Tanner T-Spice 2021.2   /home/WBPD07/SElsaR/.wine-tanner-2021.2/drive_c/users/SElsaR/Temp/inv.sp   11:30:54 11/12/23

```
* Wrap lines:              no
* Exclude simulator commands:  no
* Exclude global pins:        no
* Exclude instance locations:  no
* Control property name(s):    SPICE

********* Simulation Settings - General Section *********
MMn1 Out In Gnd Gnd NMOS25 w=1.5u l=250n m=1 ad=975f pd=4.3u as=975f ps=4.3u nrd=433.33333m nrs=433.33333m $ $x=4800 $y=3300 $w=400
MMp1 Out In Vdd Vdd PMOS25 w=1.5u l=250n m=1 ad=975f pd=4.3u as=975f ps=4.3u nrd=433.33333m nrs=433.33333m $ $x=4800 $y=4400 $w=400
VV2 Vdd Gnd DC 1.1 $ $x=7200 $y=4500 $w=400 $h=600
VV1 In Gnd

********* Simulation Settings - Analysis Section *********
.dc lin source VV1 0 1.1 0.1
.print dc v(Out,Gnd) v(In,Gnd)
.lib "/home/cad/eda/Tanner_2021/tanner-2021-2-rhel6-64/share/examples/Process/Generic_250nm/Models/Generic_250nm.lib" TT

********* Simulation Settings - Additional SPICE Commands *********

.end
```
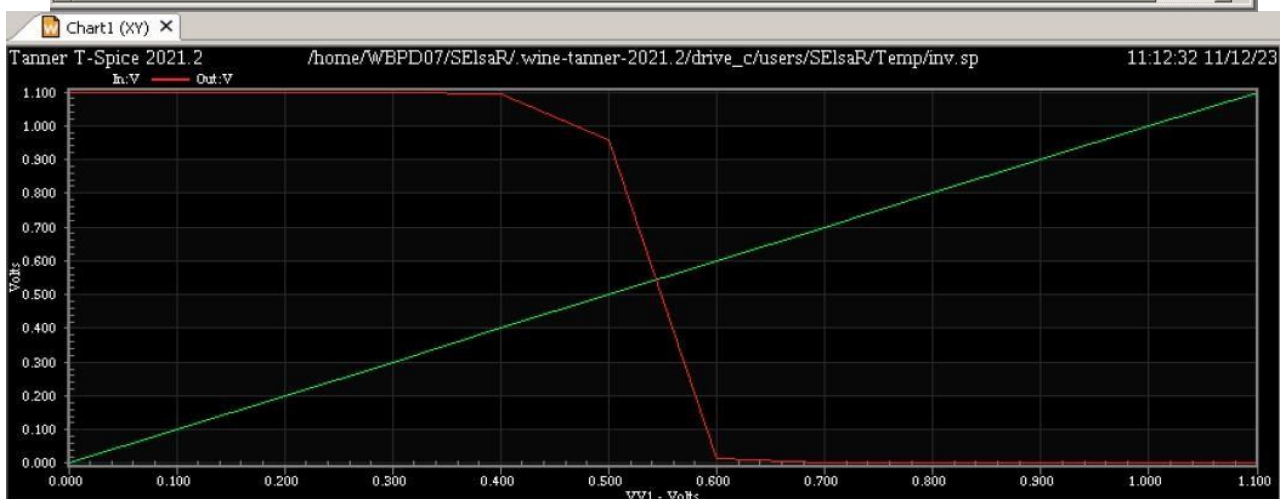

Tanner T-Spice 2021.2   /home/WBPD07/SElsaR/.wine-tanner-2021.2/drive_c/users/SElsaR/Temp/inv.sp   11:12:32 11/12/23

```
* Exclude simulator commands:    no
* Exclude global pins:           no
* Exclude instance locations:    no
* Control property name(s):      SPICE

********* Simulation Settings - General Section *********
********* Simulation Settings - General Section *********
MMn1 Out In Gnd Gnd NMOS25 w=1.5u l=250n m=1 ad=975f pd=4.3u as=975f ps=4.3u nrd=433.33333m nrs=433.33333m $ $x=4800 $y=3300 $w=400
MMp1 Out In Vdd Vdd PMOS25 w=1.5u l=250n m=1 ad=975f pd=4.3u as=975f ps=4.3u nrd=433.33333m nrs=433.33333m $ $x=4800 $y=4400 $w=400
VV2 Vdd Gnd DC 1.1 $ $x=7200 $y=4500 $w=400 $h=600
VV1 In Gnd PULSE(0 5 0 5n 5n 95n 200n) $ $x=3600 $y=3500 $w=400 $h=600

********* Simulation Settings - Analysis Section *********
.tf Out VV1
.tran 10n 1000n start=0n
.print tran v(Out,Gnd) v(In,Gnd)
.lib "/home/cad/eda/Tanner_2021/tanner-2021-2-rhel6-64/share/examples/Process/Generic_250nm/Models/Generic_250nm.lib" TT

********* Simulation Settings - Additional SPICE Commands *********

.end
```

Input file: inv.sp
Progress: Simulation completed

| Total nodes: 8 | Active devices: 2 | Independent sources: 2 |
| Total devices: 4 | Passive devices: 0 | Controlled sources: 0 |

```
            Computed Models -        2
        Independent nodes -        5
          Boundary nodes -        3
              Total nodes -        8

    Opening simulation database "/home/WBPD07/SElsaR/.wine-tanner-2021.2/drive_c/users/SElsaR/Temp/inv.tsim"

SMALL-SIGNAL TRANSFER FUNCTION: temperature=25.0


Out / VV1 =   -8.0053e+05

Input resistance at VV1 =          -inf
Output resistance at Out =    4.5963e+03


Parsing                  0.24 seconds
Setup                    0.04 seconds
Transfer function        0.07 seconds
DC Analysis              0.02 seconds
Overhead                 0.30 seconds
----------------------------------------
Total                    0.69 seconds

Simulation completed
```

```
******** Simulation Settings - General Section ********
******** Simulation Settings - General Section ********
MMn1 Out In Gnd Gnd NMOS25 w=1.5u l=250n m=1 ad=975f pd=4.3u as=975f ps=4.3u nrd=433.33333m nrs=433.33333m $ $x=4800 $y=3300 $w=400
MMp1 Out In Vdd Vdd PMOS25 w=1.5u l=250n m=1 ad=975f pd=4.3u as=975f ps=4.3u nrd=433.33333m nrs=433.33333m $ $x=4800 $y=4400 $w=400
VV2 Vdd Gnd DC 1.1 $ $x=7200 $y=4500 $w=400 $h=600
*VV1 In Gnd PULSE(0 5 0 5n 5n 95n 200n) $ $x=3600 $y=3500 $w=400 $h=600
VV1 In Gnd

******** Simulation Settings - Analysis Section ********
.param wn=1.5u
.step lin param wn 0.5u 4.5u 1.0u
.dc lin source VV1 0 1.1 0.01
.print dc v(Out,Gnd) v(In,Gnd)
.lib "/home/cad/eda/Tanner_2021/tanner-2021-2-rhel6-64/share/examples/Process/Generic_250nm/Models/Generic_250nm.lib" TT

******** Simulation Settings - Additional SPICE Commands ********

.end
```