

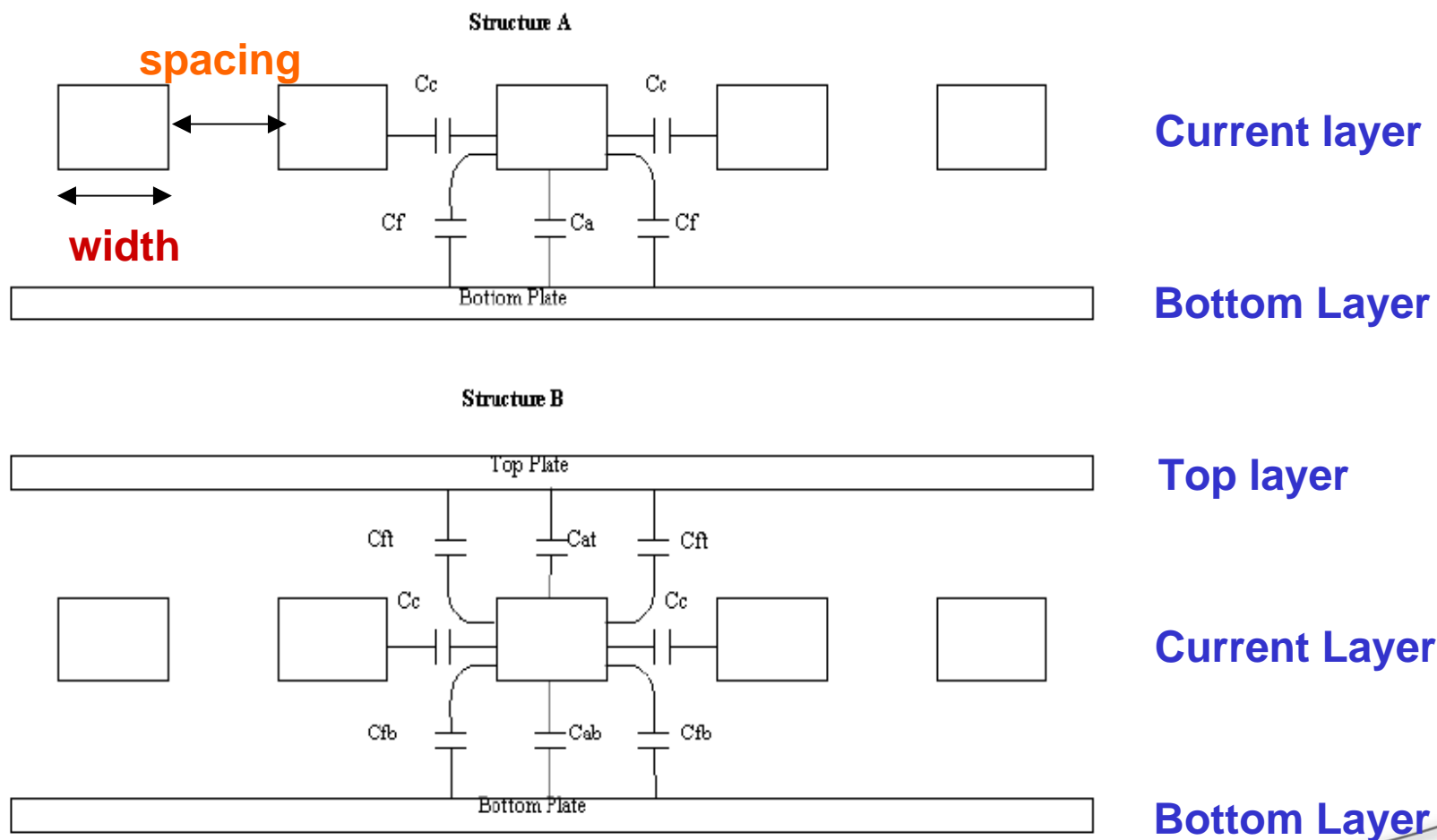


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3T Parasitic device use guide

2007/09/20

Parasitic RC Estimation Engine *Raphael* model:



Parameters Parasitic RC Estimation Engine

Parameter	Description
Model	TopLayer_CurrentLayer_BottomLayer CurrentLayer_BottomLayer CurrentLayer
Length	Length of current layer(um)
Width	Width of current layer(um)
Spacing	Space to adjacent line(um)
Temperature	Temperature(C)
Res	Line resistance(ohm)
CT	Line total capacitance(fF)
CC	Line coupling to a single adjacent line(fF)

Open Library Manager of Cadence tool

The screenshot shows the 'Library Manager' window with the following structure:

Library	Category	Cell	View
tsmcN65	Parasitic_Device	parasitic_rc_3T	[schematic
analogLib	Inductors	parasitic_rc	schematic
basic	LogicGates	parasitic_rc_3T	symbol
cdsDefTechLib	MetalRes	pcapacitor	
tsmcN65	Mosfets	presistor	
	Mosfets_mac		
	Parasitic_Device		
	RF_Devices		
	Resistors		
	Specials		
	Symbolic		

Library Name: tsmcN65

Category: Parasitic_Device

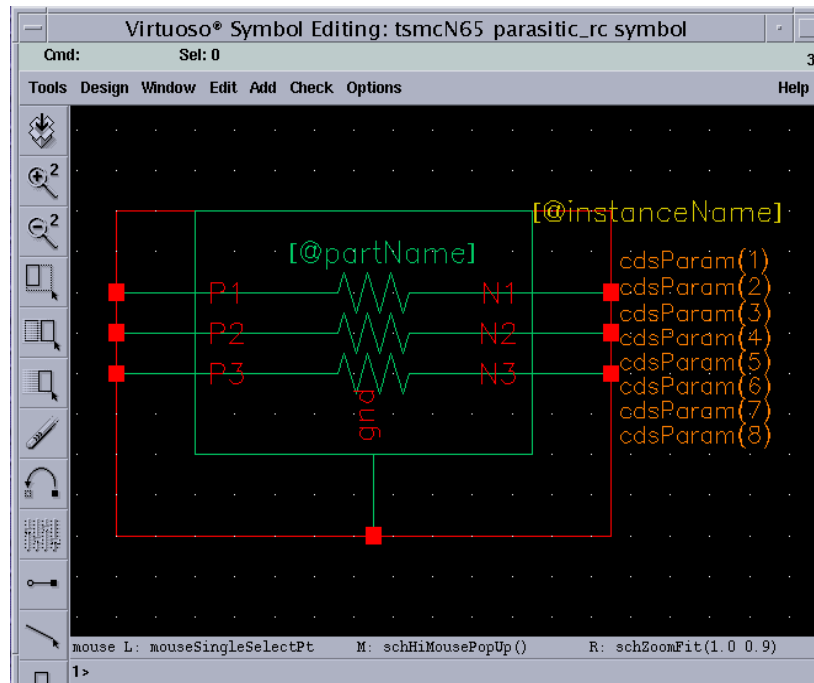
Cell Name: parasitic_rc_3T

View options: schematic, symbol

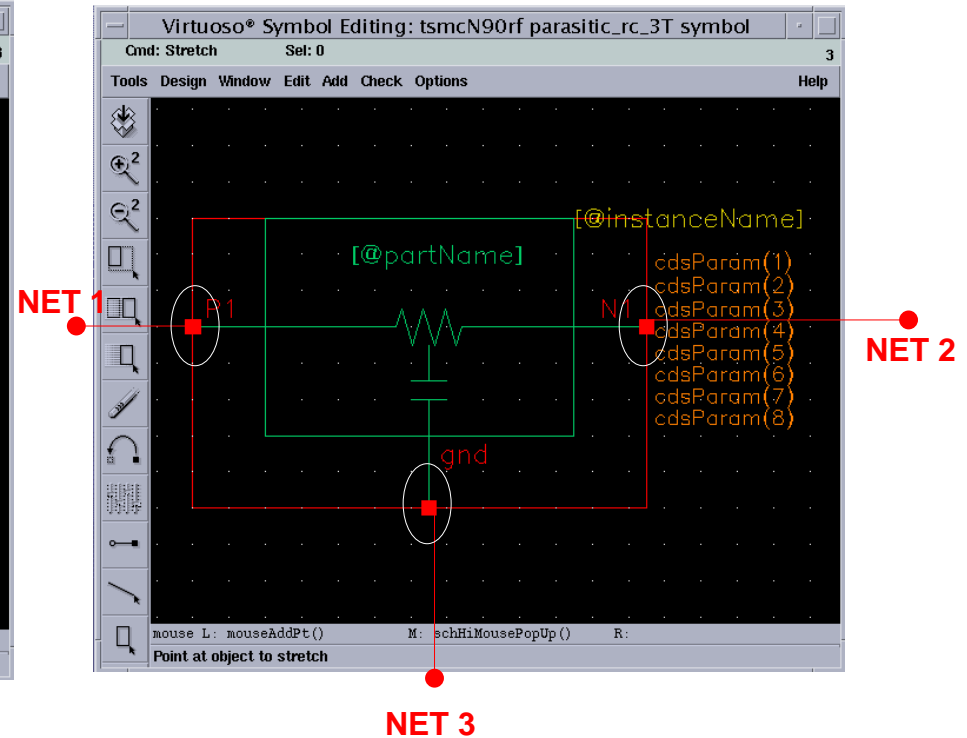
Messages: Log file is "/.automount/linux195/root/home/linux195/pdk/hylees/crn65lp_v1.2a_0919/libManager.log".

Symbol view of 7T and 3T parasitic device

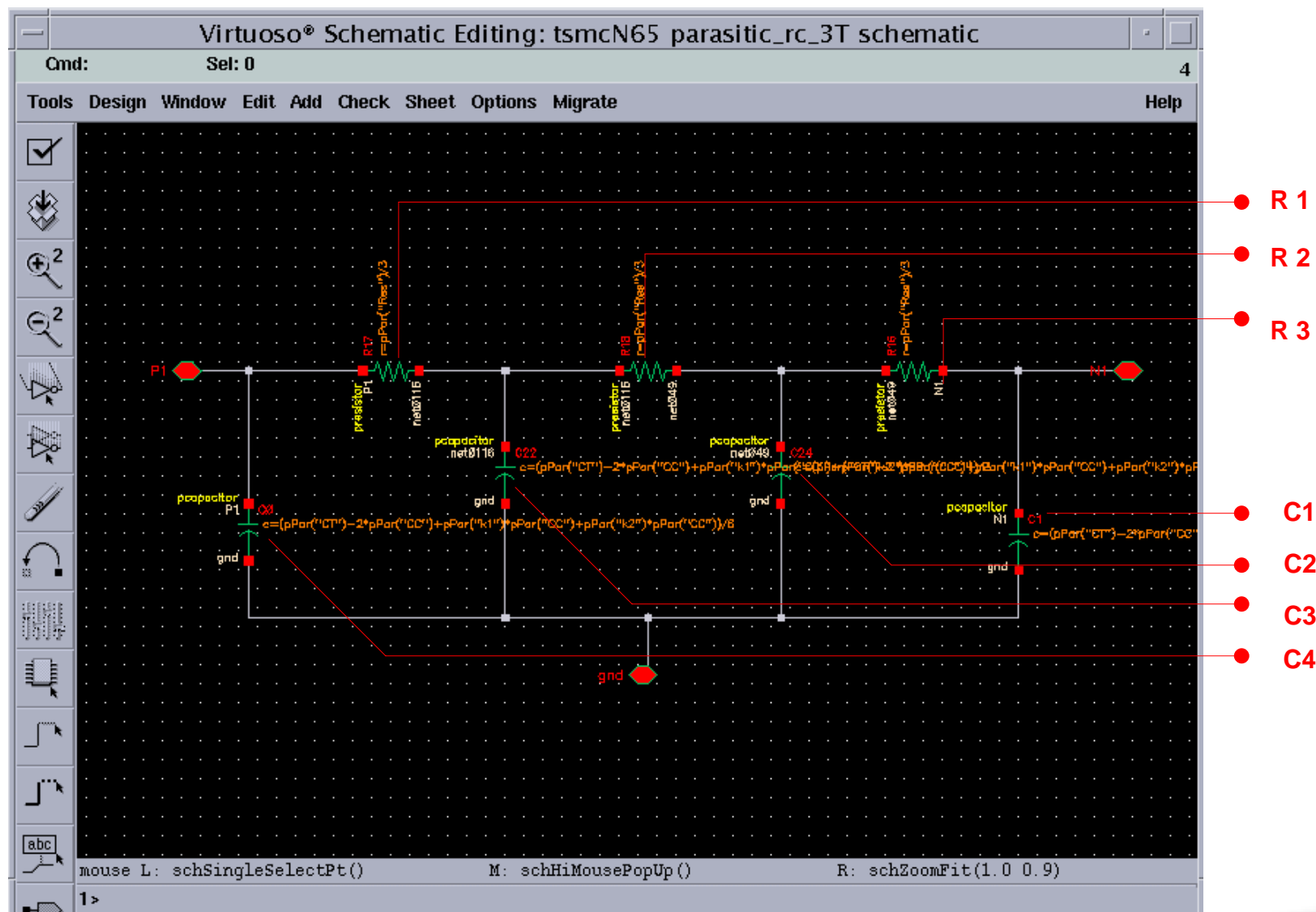
7T parasitic device



3T parasitic device



Schematic view of 3T parasitic device



Open schematic ~add instance

Raphael Table

Get the legal model and range

Chose the corner type of interconnect

Define line width

Define line length

Define line space

Define temperature

Define cross couple Factor K1

Define cross couple Factor K2

Edit Object Properties

OK Cancel Apply Defaults Previous Next

Apply To: ☐ only current ☐ instance

Show: ☐ system ☒ user ☐ CDF

Browse Reset Instance Labels Display

Property	Value
Library Name	tsmcN65
Cell Name	parasitic_rc_3T
View Name	symbol
Instance Name	I0

Add Delete Modify

User Property	Master Value	Local Value	Display
interfaceLastC..	18 11:15:33 2007		off

CDF Parameter	Value	Display
Raphael table		
corner Case	typical	off
Model	M1	off
Line Width (um)	0.15	off
Line Length (um)	1	off
Space to adjacent line (um)	0.15	off
Temperature (C)	25	off
Cross Couple Factor k1	1:NoTransEdge(DC)	off
Cross Couple Factor k2	1:NoTransEdge(DC)	off

Calculating Parasitic RC

CC (F)	9.745e-17	off
CT (F)	2.274e-16	off
Res (ohms)	0.6044	off

Instance cell From Library

Calculate parasitic RC

Calculate coupling cap. Cc

Calculate total cap. CT

Calculate total Res (ohms)

Add instance parameters of 3T device

Raphael Table

Get the legal model and range

Chose the corner type of interconnect

Define line width

Define line length

Define line space

Define temperature

Define cross couple Factor K1

Define cross couple Factor K2

Calculate parasitic RC

Calculate coupling cap. Co

Calculate total cap. CT

Calculate total Res (ohms)

The instance name

The instance view

The CDF parameters of this new device “parasitic_rc” contain eight parameters (five inputs and three outputs), one cyclic button(choose the corner case) and two click button (get Raphael table list and calculating Parasitic RC)

The corner case cyclic button contain five different choices. (typical, rc_best, rc_worst, c_best and c_worst)
The defaulted setting value is “typical”.

CDF parameters for Parasitic RC Estimation Engine

Click to get the legal model and their ranges

input

To select corner case

Click to get the estimation RC value

output

CDF Parameter	Value	Display
Raphael table		
Corner Case	typical <input type="checkbox"/>	off <input type="checkbox"/>
Model	M1	off <input type="checkbox"/>
Line Width (um)	0.15	off <input type="checkbox"/>
Line Length (um)	1	off <input type="checkbox"/>
Space to adjacent line (um)	0.15	off <input type="checkbox"/>
Temperature (C)	25	off <input type="checkbox"/>
Calculating Parasitic RC		
CC	0.09745	off <input type="checkbox"/>
CT	0.2274	off <input type="checkbox"/>
Res	0.6044	off <input type="checkbox"/>

Parasitic RC Raphael table list

Click this button to get the legal model and their ranges

CDF Parameter	Value	Display
Raphael table		
corner Case	typical	off
Model	M1	off
Line Width (um)	0.15	off
Line Length (um)	1	off
Space to adjacent line (um)	0.15	off
Temperature (C)	25	off
Calculating Parasitic RC		
CC	0.09745	off
CT	0.2274	off
Res	0.6044	off

/dsdhome/cdchangb/project/andy_solution/rcTable/Andy/tsmcN90lo/.../skill/rc_Spec

```

File
|crn90lpnmrf_lowk
pattern( M1 ) Range of width is 0.1 ~ 0.425, Range of spacing is 0.13 ~ 1.965
pattern( M1_OD ) Range of width is 0.12 ~ 0.72, Range of spacing is 0.108 ~ 2.22
pattern( M1_PO ) Range of width is 0.12 ~ 0.72, Range of spacing is 0.108 ~ 2.22
pattern( M1_PO1 ) Range of width is 0.12 ~ 0.72, Range of spacing is 0.108 ~ 2.22
pattern( M2 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M2_OD ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M2_PO ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M2_PO1 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M2_M1 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M3 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M3_OD ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M3_PO ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M3_PO1 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M3_M1 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M3_M2 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M4 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M4_OD ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M4_PO ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M4_PO1 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M4_M1 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M4_M2 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M4_M3 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M5 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M5_OD ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M5_PO ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M5_PO1 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M5_M1 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M5_M2 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M5_M3 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M5_M4 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M6 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M6_OD ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M6_PO ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M6_PO1 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M6_M1 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M6_M2 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22
pattern( M6_M3 ) Range of width is 0.14 ~ 0.84, Range of spacing is 0.126 ~ 2.22

```

Legal Model

Range of width

Range of spacing



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7T parasitic device netlist out

Start of Sub-circuit

Sub-circuit

End of Sub-circuit

```
File Help 11
* GENERATED ON JUN 7 12:49:40 2007.
* TERMINAL MAPPING: N1 = N1
*                   N2 = N2
*                   N3 = N3
*                   P1 = P1
*                   P2 = P2
*                   P3 = P3
*                   GND = GND
.SUBCKT PARASITIC_RC_1 N1 N2 N3 P1 P2 P3 GND
C42 N1 GND +5.41666667E-18
C28 P1 GND +5.41666667E-18
C35 NET0108 GND +1.08333333E-17
C25 NET048 GND +1.08333333E-17
C24 NET049 GND +1.08333333E-17
C39 NET0108 NET0116 +3.24833333E-17
C29 N2 GND +5.41666667E-18
C31 NET0116 NET089 +3.24833333E-17
C33 N2 N3 +1.62416667E-17
C40 NET0110 GND +1.08333333E-17
C26 P2 GND +5.41666667E-18
C32 NET049 NET048 +3.24833333E-17
C41 NET0110 NET049 +3.24833333E-17
C34 P3 GND +5.41666667E-18
C38 N1 N2 +1.62416667E-17
C30 P2 P3 +1.62416667E-17
C36 P1 P2 +1.62416667E-17
C37 N3 GND +5.41666667E-18
C22 NET0116 GND +1.08333333E-17
C23 NET089 GND +1.08333333E-17
R16 NET049 N2 +2.01466667E-01
R19 P3 NET089 +2.01466667E-01
R23 P1 NET0108 +2.01466667E-01
R22 NET0110 N1 +2.01466667E-01
R24 NET0108 NET0110 +2.01466667E-01
R18 NET0116 NET049 +2.01466667E-01
R20 NET048 N3 +2.01466667E-01
R17 P2 NET0116 +2.01466667E-01
R21 NET089 NET048 +2.01466667E-01
* END OF SUBCIRCUIT DEFINITION.
.ENDS PARASITIC_RC_1
```

7 nets of 7T parasitic device
N1,N2,N3
P1,P2,P3
GND



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3T parasitic device netlist out

Start of Sub-circuit

Sub-circuit

End of Sub-circuit

```
/dsdhome/hylees/simulation/test2/hspiceS/schematic/n
File Help 8

XIO NET3 NET1 NET2 LSUB1

* FILE NAME: TSMCN65 PARASITIC RC 3T SCHEMATIC.S.
* SUBCIRCUIT FOR CELL: PARASITIC_RC_3T.
* GENERATED FOR: HSPICES.
* GENERATED ON SEP 20 12:02:46 2007.

* TERMINAL MAPPING: N1 = N1
*                      P1 = P1
*                      GND = GND
*
.SUBCKT LSUB1 N1 P1 GND
R16 NET049 N1 +2.01466667E-01
R18 NET0116 NET049 +2.01466667E-01
R17 P1 NET0116 +2.01466667E-01
C0 P1 GND +3.79000000E-17
C1 N1 GND +3.79000000E-17
C24 NET049 GND +7.58000000E-17
C22 NET0116 GND +7.58000000E-17

* END OF SUBCIRCUIT DEFINITION.
.ENDS LSUB1

* INCLUDE FILES

.lib "/.automount/linux195/root/home/linux195/pdk/hylees/crn65lp_v1.2a_091
.lib "/.automount/linux195/root/home/linux195/pdk/hylees/crn65lp_v1.2a_091
.lib "/.automount/linux195/root/home/linux195/pdk/hylees/crn65lp_v1.2a_091
.lib "/.automount/linux195/root/home/linux195/pdk/hylees/crn65lp_v1.2a_091
.lib "/.automount/linux195/root/home/linux195/pdk/hylees/crn65lp_v1.2a_091
.lib "/.automount/linux195/root/home/linux195/pdk/hylees/crn65lp_v1.2a_091
.lib "/.automount/linux195/root/home/linux195/pdk/hylees/crn65lp_v1.2a_091
```

3 nets of 3T parasitic device
N1
P1
GND



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Compare the netlist of 7T and 3T device

7T parasitic device

3T parasitic device

```
/dsdhome/hylees/simulation/test2/hspiceS/schematic,
File Help 9
* # FILE NAME: /DSDHOME/HYLEES/SIMULATION/TEST2/HSPICES/SCHEMATIC/NETLI:
* TEST2.C.RAW
* NETLIST OUTPUT FOR HSPICES.
* GENERATED ON SEP 20 12:07:33 2007

* FILE NAME: TSMCN65_TEST2_SCHEMATIC.S.
* SUBCIRCUIT FOR CELL: TEST2.
* GENERATED FOR: HSPICES.
* GENERATED ON SEP 20 12:07:33 2007.

XI1 NET06 NET05 NET04 NET03 NET02 NET01 NET07 PARASITIC_RC_1
XI0 NET3 NET1 NET2 LSUB1

* FILE NAME: TSMCN65_PARASITIC_RC_SCHEMATIC.S.
* SUBCIRCUIT FOR CELL: PARASITIC_RC.
* GENERATED FOR: HSPICES.
* GENERATED ON SEP 20 12:07:33 2007.

* TERMINAL MAPPING: N1 = N1
*                   N2 = N2
*                   N3 = N3
*                   P1 = P1
*                   P2 = P2
*                   P3 = P3
*                   GND = GND
.SUBCKT PARASITIC_RC_1 N1 N2 N3 P1 P2 P3 GND
R16 NET049 N2 +3.16543210E-01
R19 P3 NET089 +3.16543210E-01
R23 P1 NET0108 +3.16543210E-01
R22 NET0110 N1 +3.16543210E-01
R24 NET0108 NET0110 +3.16543210E-01
R18 NET0116 NET049 +3.16543210E-01
R20 NET048 N3 +3.16543210E-01
R17 P2 NET0116 +3.16543210E-01
R21 NET089 NET048 +3.16543210E-01
C42 N1 GND +4.57777778E-18
C28 P1 GND +4.57777778E-18
C35 NET0108 GND +9.15555556E-18
C25 NET048 GND +9.15555556E-18
C24 NET049 GND +9.15555556E-18
C39 NET0108 NET0116 +2.50518519E-17
```