Analog Library Reference Guide

Product Version 5.1.41
June 2004

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Contents

Preface

The information presented in this reference manual is intended for integrated circuit designers who are using Analog Library. This reference manual comprises an introductory chapter and ten chapters mapping to each of the ten categories of components in Analog Library.

Learning the Basics

Before you begin using the Analog Library, you should be familiar with the Cadence® Design Framework II environment.

The *Cadence Design Framework II User Guide* shows you how to:

- Start the Cadence software
- Get around in the Cadence software
- Get help on a command
- Use the mouse
- Use menus
- Use standard and options forms
- Start a design session

Conventions

The symbol 'x' in the Component Parameter tables indicates that the parameter is supported by the relevant simulator, while the symbol '-' indicates that the parameter is not supported. For example, in the following table the parameter, `model`, is supported by spectre, spectreS, cdsSpice, and hspiceS simulators only. This parameter is not supported by simulators, such as auCdl and auLvs as indicated by the '-' symbol.

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	-	-

Related Documents

For more information about Analog Library and other related products, you can refer to the following sources.

- The *Cadence Installation Guide* for instructions on how to install this product.
- The *SpectreRF User Guide* for additional information on Spectre specific components.
- The *Cadence SPICE Reference Manual* for additional information on Spice specific components.
- The *Component Description Format User Guide* for information on CDF parameters and the attributes of parameters of individual components and libraries of components.

1

Introduction

This book contains information about all the components in the Analog Library (analogLib). The analogLib library is a library within the Cadence Analog Design Environment. You can access the library from the following path:

<*your_install_dir*>`/tools/dfII/etc/cdslib/artist/analogLib`

Make sure you specify this path in the search path of the Set Library Search Path form.

The analogLib library contains basic components, such as resistor, capacitance, and transistor. These basic analog parts are used in building complex analog blocks, such as amplifiers.

The components in analogLib are divided into 10 categories, such as Actives, Analysis, Parasitics and so on. For each component in analogLib multiple views, such as the symbol view and simulator specific views are available. For some components, the schematic view might also be available.

Each component may be supported by different simulators, such as spectre, spectreS, or hSpice. The simulators supported in the Cadence Analog Design Environment are:

- spectre
- spectreS
- cdsSpice
- auCdl
- auLvs
- hspiceS
- hspiceD
- UltraSim

This manual lists all the basic parameters that you specify at the time of adding a component to a design. The *Add Instance* form may not show all the parameters at once. Depending on what values you specify for some parameters, more fields may appear in the Add Instance form. You can display the complete list of parameters for each component using the Edit Component CDF form.

Following are the steps to display the parameters for a component using the Add Instance form as well as the Edit Component CDF form.

For these series of steps, you will create a library and cell.

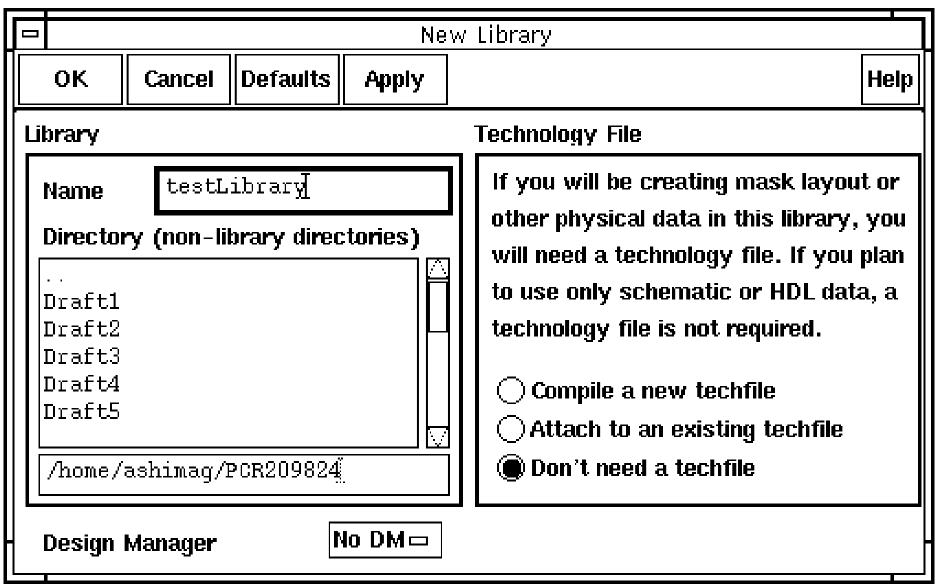
1. Type `icms&` in the xterm window.

   The CIW (Cadence Information Window) appears.

2. Select *File->Close* to close all the *What's New* windows.

3. Select *File->New->Library* from CIW.

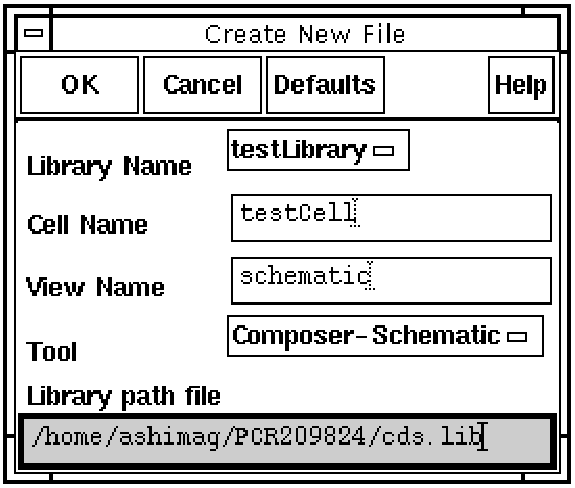
4. Type `testLibrary` in the Name field and select the *Don't need a techfile* radio button.



5. Click *OK*.

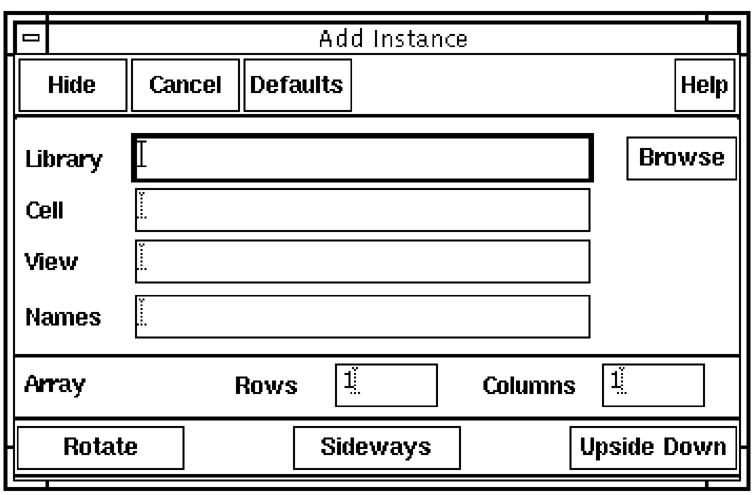
6. Select *File->New->Cellview* from CIW.

Make sure that *testLibrary* is selected in the Library Name field.



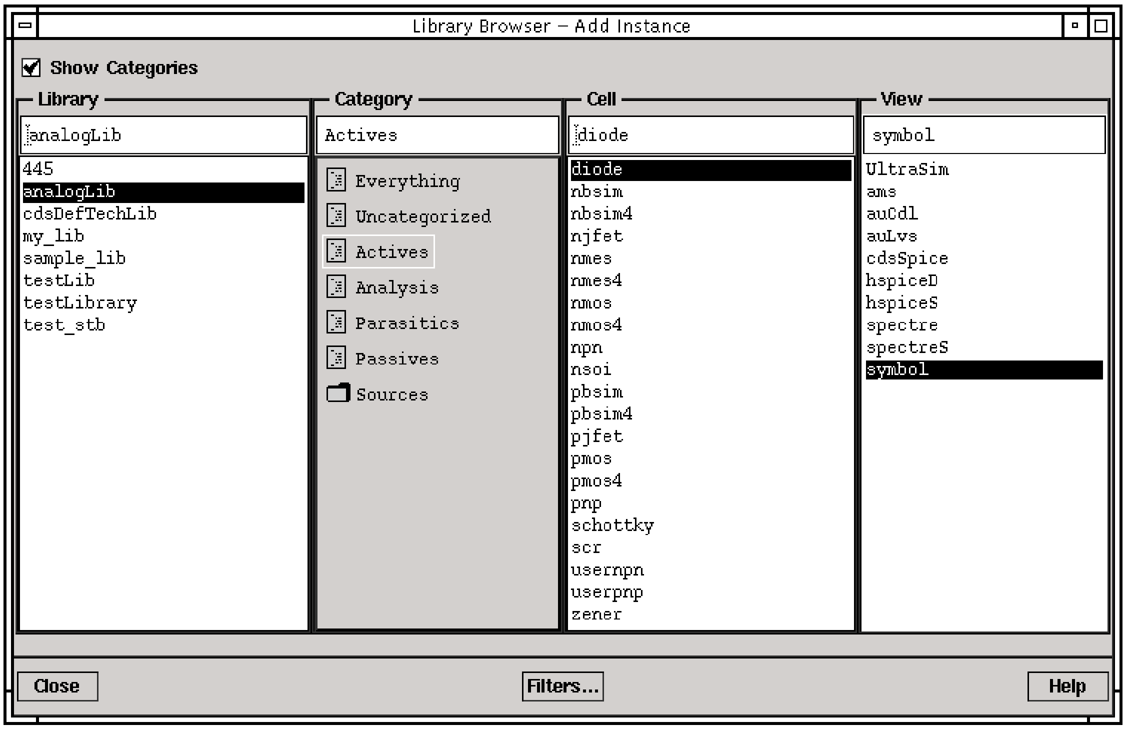
7. Type `testCell` in the Cell Name field and schematic in the View Name field.
8. Select *Composer-Schematic* from the Tool list box and click *OK*.

   The new cell is opened in Virtuoso Schematic Editor.
9. Select *Add->Instance* or click the **Instance** icon from the toolbar on the left.
10. Click *Browse* from the Add Instance form.



11. Make sure that the *Show Categories* checkbox is selected in Library Browser.
12. Select `analogLib`, `Actives`, and `diode` from the Library, Category, and Cell list boxes respectively.

The View list box displays a list of the simulators that support the selected component. The `symbol` view applies to all components.

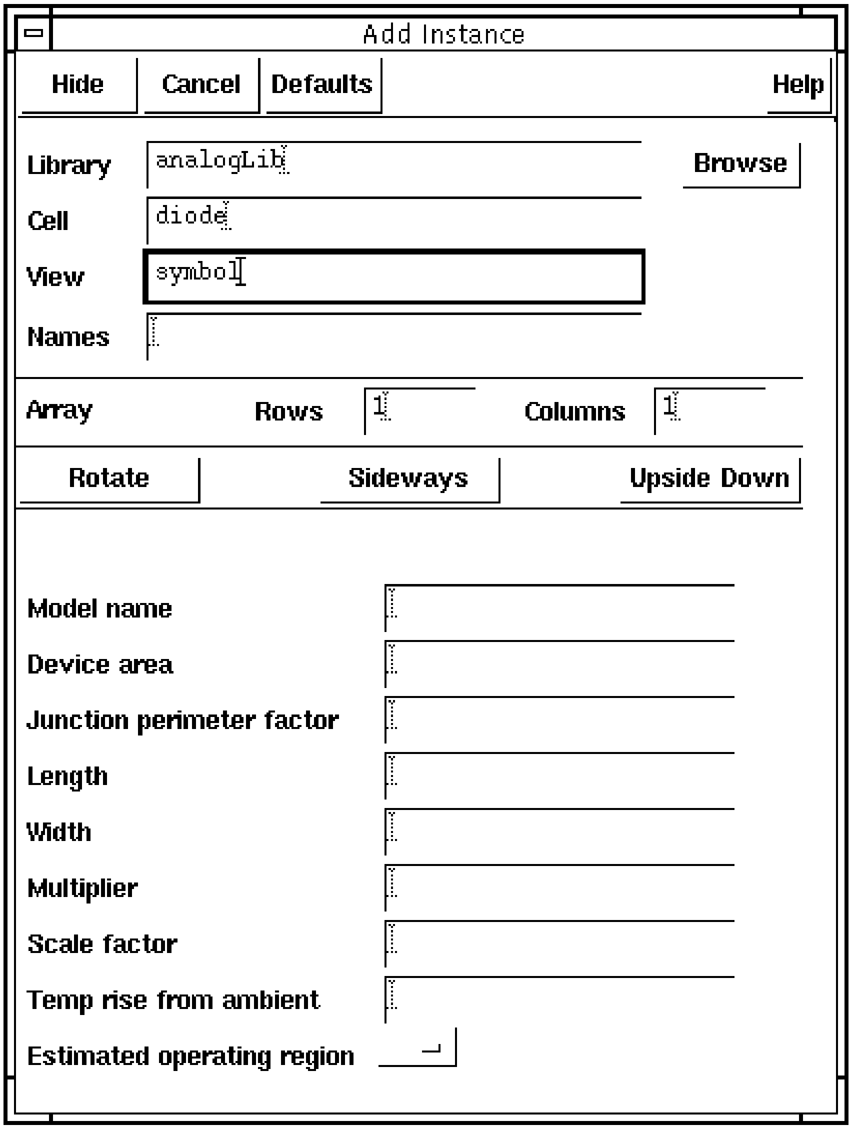


13. Select *symbol* from the View list box and click *Close*.

Notice the outline of the diode component when you move your cursor in the Virtuoso Schematic Editing window.

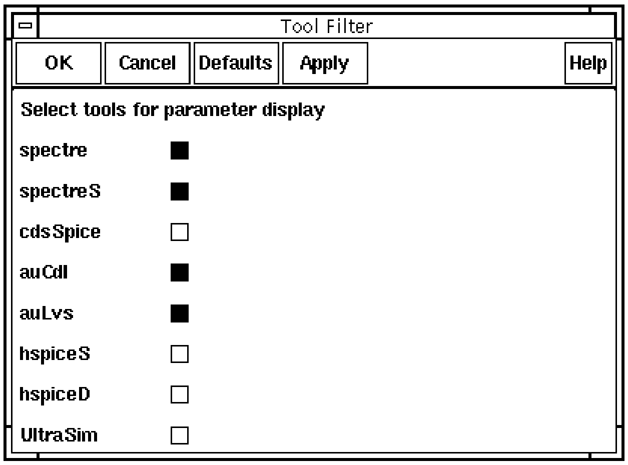
14. Click to place the component in the Virtuoso Schematic Editing window.

In the Add Instance form, notice that the library, cell, and view names appear in the Library, Cell, and View fields. The parameters for the selected component are also displayed.



These parameters are supported by the default simulators. To determine which simulators support which parameters, perform the following steps.

15. Select *Options->Tool Filter* from the Virtuoso Schematic Editing window. The Tool Filter form appears.

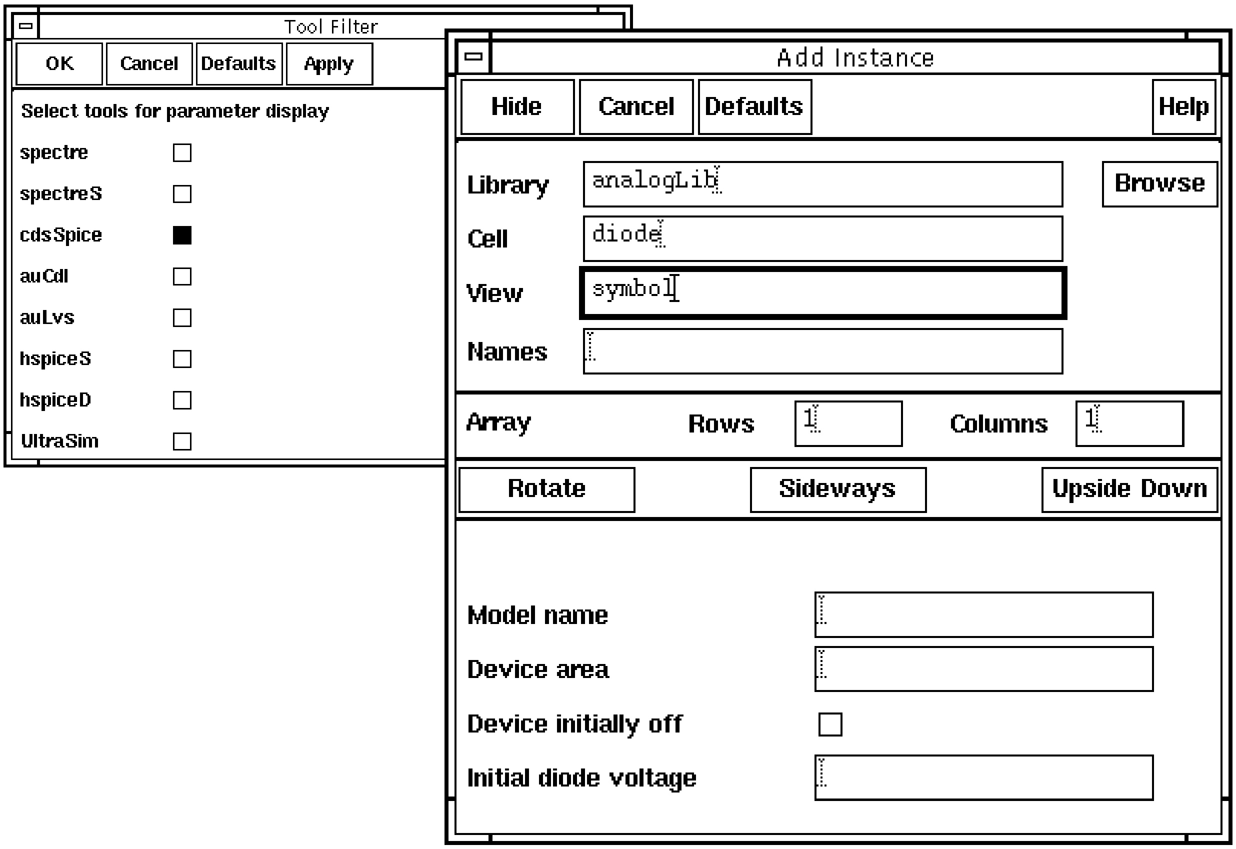


Notice that the default simulators are spectre, spectreS, auCdl, and auLvs.

16. Deselect all tools and select only `cdsSpice` from the Tool Filter form.

17. Click *Apply*.

Notice that the list of parameters in the Add Instance form changes to display only those parameters that are applicable for cdsSpice for the diode component.



In this way you can identify those parameters of an analogLib component that are supported by specific simulators.

Note: The properties of components are retrieved from their corresponding CDF parameters.

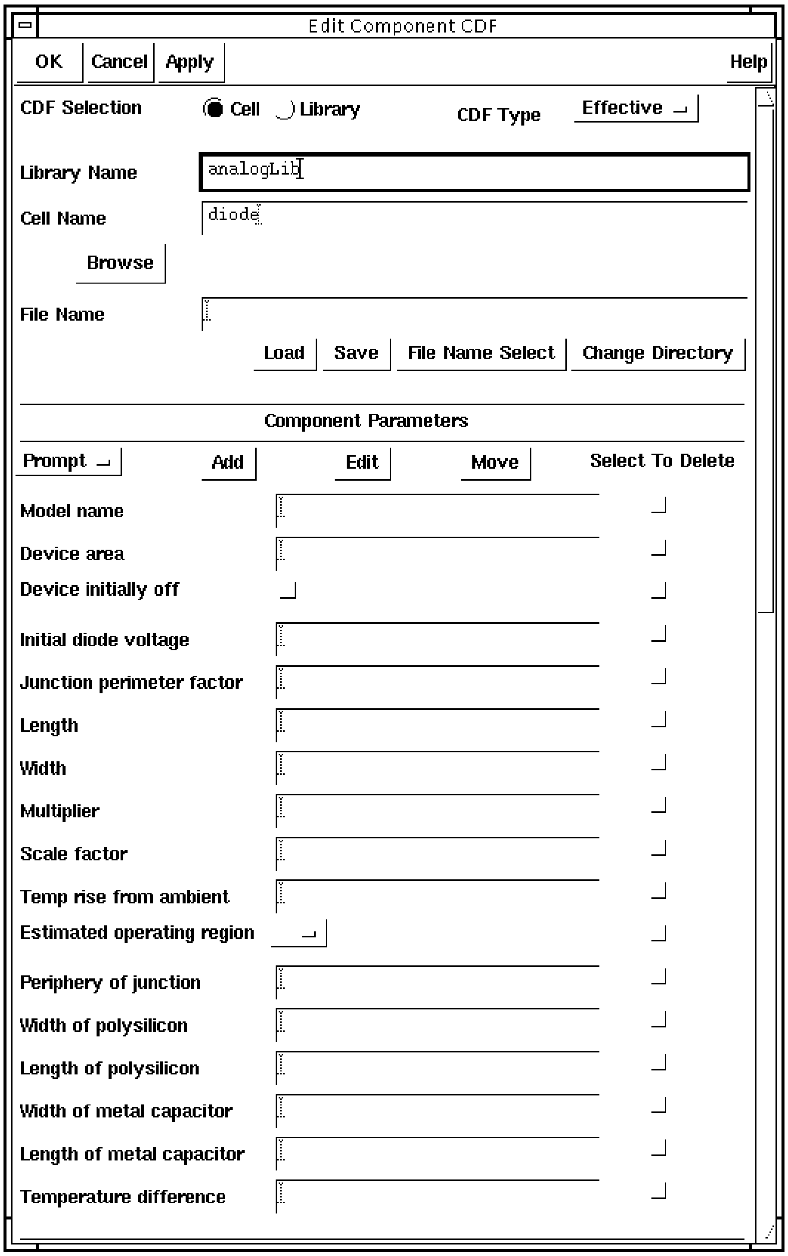
To view and edit the complete list of parameters for a component, perform the following steps.

1. Select *Tools->CDF->Edit* from CIW.

   The *Edit Component CDF* form appears.

2. Click *Browse* and select the library and cell names.

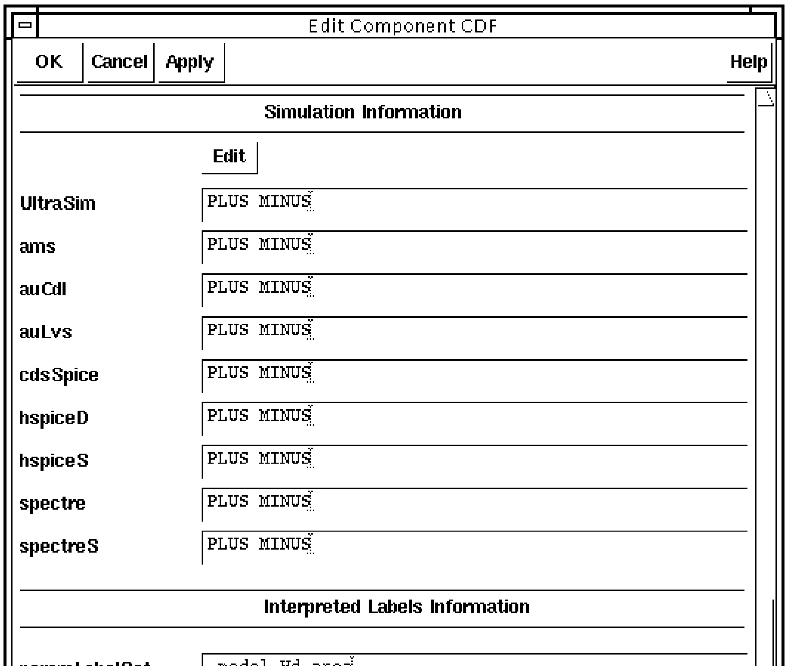
The Edit Component CDF form displays the complete list of parameters for the selected component as follows:



Note: Most of the form is cut off by the size of the window. Stretch the Edit Component CDF form to display the entire form, or scroll down to examine each section of the form.

3. Scroll down to view the Simulation Information section.

This section provides the simulation related information for the selected component.



4. Click Edit to view the list of parameters that each simulator supports.

   The simulator field appears blank for those simulators that do not support the selected component.

For more information on viewing and editing the CDF descriptions of a component, refer to the *Component Description Format User Guide*. For modifying the simulation information refer to *Chapter 4, Component Description Format User Guide*.

Caution

As far as possible, use the standard analogLib components shipped with an IC release. Do not mix or merge analogLib components, with internal simInfo or CDF parameters, from an older release with those from a newer release. For example, if you modify a local copy of the pcccs/spectre cell from the IC5032 release, create a sub-circuit, and later try to netlist the design using a newer release, such as IC5033, then the sub-circuit might not work correctly. This is because the base-level cell CDF information in the IC5032 release and the IC5033 release might not be the same.

Note about this manual

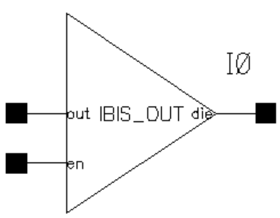
Although, multiple simulators may be supporting each component in analogLib, the descriptions, syntax, and examples used in this book are specific to Spectre. Components supported only by hspiceS or cdsSpice are listed in Appendix B and C respectively.

2

Active Components

All components listed in the **Actives** category require a defined model card. Each element maps to a specific Spectre primitive with respect to its instance parameters.

Symbol: ibis_buffer



IBIS buffer

The IBIS buffer model is based on the IBIS (I/O Buffer Information Specification) standard, version 3.2. The package and board models are not included in the buffer, they have to be added as separate subcircuits.

The ibis_buffer component is a p-cell that can have different pin combinations based on the selected buffer type. The supported buffer types are:

- input
- output
- io
- tristate
- opendrain and opensink
- ioopendrain and ioopensink
- opensource
- ioopensource

- terminator
- inputecl
- outputecl
- ioecl
- tristateecl

The following table lists the different pin combinations based on the buffer type. The presence of a pin is denoted by Y, absence of a pin is denoted by N, and optional pin is denoted by O.

Buffer Type	die/ pad pin	input	outp ut	enable	ground	pow er	ground clamp	power clamp	inverted die/pad pin
input	Y	Y	N	N	N	N	O	O	O
output	Y	N	Y	N	O	O	O	O	N
io	Y	Y	Y	Y	O	O	O	O	O
tristate	Y	N	Y	Y	O	O	O	O	N
opendrain opensink	Y	N	Y	N	O	N	O	N	N
ioopendrain ioopensink	Y	Y	Y	Y	O	N	O	N	O
opensource	Y	N	Y	N	N	O	N	O	N
ioopensource	Y	Y	Y	Y	N	O	N	O	O
terminator	Y	N	N	N	N	N	O	O	N
inputecl	Y	Y	N	N	N	N	O	O	O
outputecl	Y	N	Y	N	O	O	O	O	N
ioecl	Y	Y	Y	Y	O	O	O	O	O
tristateecl	Y	N	Y	Y	O	O	O	O	N

For each buffer type there can be four variants, internal_power, external_power, differential _input, and diff_inp_and_ext_pwr. Therefore, ibis_buffer can have 44 variants as shown in the following table.

	Buffer Type	Variant	die/pad	in	out	en	gnd	pwr	gnd_c	pwr_c	inv_die
1	input	1	Y	Y	N	N	N	N	N	N	N
2	input	2	Y	Y	N	N	N	N	Y	Y	N
3	input	3	Y	Y	N	N	N	N	N	N	Y
4	input	4	Y	Y	N	N	N	N	Y	Y	Y
5	output	1	Y	N	Y	N	N	N	N	N	N
6	output	2	Y	N	Y	N	Y	Y	Y	Y	N
7	io	1	Y	Y	Y	Y	N	N	N	N	N
8	io	2	Y	Y	Y	Y	Y	Y	Y	Y	N
9	io	3	Y	Y	Y	Y	N	N	N	N	Y
10	io	4	Y	Y	Y	Y	Y	Y	Y	Y	Y
11	tristate	1	Y	N	Y	Y	N	N	N	N	N
12	tristate	2	Y	N	Y	Y	Y	Y	Y	Y	N
13	opendrain	1	Y	N	Y	N	N	N	N	N	N
14	opendrain	2	Y	N	Y	N	Y	N	Y	N	N
15	ioopendrain	1	Y	Y	Y	Y	N	N	N	N	N
16	ioopendrain	2	Y	Y	Y	Y	Y	N	Y	N	N
17	ioopendrain	3	Y	Y	Y	Y	N	N	N	N	Y
18	ioopendrain	4	Y	Y	Y	Y	Y	N	Y	N	Y
19	opensource	1	Y	N	Y	N	N	N	N	N	N
20	opensource	2	Y	N	Y	N	N	Y	N	Y	N
21	ioopensource	1	Y	Y	Y	Y	N	N	N	N	N
22	ioopensource	2	Y	Y	Y	Y	N	Y	N	Y	N
23	ioopensource	3	Y	Y	Y	Y	N	N	N	N	Y
24	ioopensource	4	Y	Y	Y	Y	N	Y	N	Y	Y

	Buffer Type	Variant	die/pad	in	out	en	gnd	pwr	gnd_c	pwr_c	inv_die
25	terminator	1	Y	N	N	N	N	N	N	N	N
26	terminator	2	Y	N	N	N	N	N	Y	Y	N
27	inputecl	1	Y	Y	N	N	N	N	N	N	N
28	inputecl	2	Y	Y	N	N	N	N	Y	Y	N
29	inputecl	3	Y	Y	N	N	N	N	N	N	Y
30	inputecl	4	Y	Y	N	N	N	N	Y	Y	Y
31	outputecl	1	Y	N	Y	N	N	N	N	N	N
32	outputecl	2	Y	N	Y	N	Y	Y	Y	Y	N
33	ioecl	1	Y	Y	Y	Y	N	N	N	N	N
34	ioecl	2	Y	Y	Y	Y	Y	Y	Y	Y	N
35	ioecl	3	Y	Y	Y	Y	N	N	N	N	Y
36	ioecl	4	Y	Y	Y	Y	Y	Y	Y	Y	Y
37	tristateecl	1	Y	N	Y	Y	N	N	N	N	N
38	tristateecl	2	Y	N	Y	Y	Y	Y	Y	Y	N
39	opensink	1	Y	N	Y	N	N	N	N	N	N
40	opensink	2	Y	N	Y	N	Y	N	Y	N	N
41	ioopensink	1	Y	Y	Y	Y	N	N	N	N	N
42	ioopensink	2	Y	Y	Y	Y	Y	N	Y	N	N
43	ioopensink	3	Y	Y	Y	Y	N	N	N	N	Y
44	ioopensink	4	Y	Y	Y	Y	Y	N	Y	N	Y

Based on the model you have selected, you can create two types of ibis_buffer:

- with an external model card

  This is the default option. If you specify the model name the netlist is as follows:

  ```
  b1 (1 2 3) "Model name" <other instance parameters>
  ```

  For example, the netlist of an ibis_buffer with buffer type = `tristate`, buffer variant = `internal_power`, model name = `SN74_OUT_33_Typ_27degC`, polarity = `inv`, differential threshold = `1.2`V, delay time = `1ms`, delay schedule = `yes`, different element delays = `1`p, `2`p, `5`p, and `2`p, is as follows:

```
I65 (net013 net011 net012) SN74_OUT_33_Typ_27degC polarity=inv \
vdiff=1.2 delay=1m delay_schedule=[1p 2p 5p 2p]
```

- with an IBIS file

  If you specify an IBIS buffer file, then three additional parameters are displayed. In this case the netlist is as follows:

```
b1 (1 2 3) ibis_buffer file="IBIS file name" model="IBIS model name"
corner="IBIS model corner" <other instance parameters>
```

For example, the netlist with the additional parameters IBIS filename = `~/main.scs`, IBIS modelname = `IBIS_Model`, corner = `typical` is as follows:

```
I65 (net013  net011 net012) ibis_buffer file="~/main.scs" \
model="IBIS_Model" corner=typical polarity=inv vdiff=1.2 delay=1m \
delay_schedule=[1p 2p 5p 2p]
```

Command-line help

```
spectre -h ibis_buffer
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Select IBIS Buffer Type	`bufferType`	x	-	-	-	-	-	-	-
param0	`param0`	x	-	-	-	-	-	-	-
Select IBIS Buffer Variant	`bufferVariant2`	x	-	-	-	-	-	-	-
Select IBIS Buffer Variant	`bufferVariant4`	x	-	-	-	-	-	-	-
IBIS Entry Method	`ibisEntryMethod`	x	-	-	-	-	-	-	-
Model name	`model`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
IBIS file name	`ibisFile`	x	-	-	-	-	-	-	-
IBIS model name	`ibisModelName`	x	-	-	-	-	-	-	-
IBIS corner	`ibisCorner`	x	-	-	-	-	-	-	-
Polarity of the buffer	`polarity`	x	-	-	-	-	-	-	-
Differential threshold	`vdiff`	x	-	-	-	-	-	-	-
Delay Time	`delay`	x	-	-	-	-	-	-	-
Delay Schedule	`ibisDelaySchedule`	x	-	-	-	-	-	-	-
Rise on delay	`rise_on_dly`	x	-	-	-	-	-	-	-
Rise off delay	`rise_off_dly`	x	-	-	-	-	-	-	-
Fall on delay	`fall_on_dly`	x	-	-	-	-	-	-	-
Fall off delay	`fall_off_dly`	x	-	-	-	-	-	-	-

Syntax/Synopsis

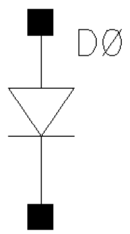
```
Name ( die [inp] [out] [en] [gnd] [pwr] [gnd_c] [pwr_c] [inv_die] ) ModelName
        <parameter=value> ...
Name ( die [inp] [out] [en] [gnd] [pwr] [gnd_c] [pwr_c] [inv_die] )
        ibis_buffer <parameter=value> ...
```

Example

```
I65 (net013 net011 net012) SN74_OUT_33_Typ_27degC polarity=inv \
vdiff=1.2 delay=1m delay_schedule=[1p 2p 5p 2p]
```

```
b1 (1 2 3) ibis_buffer file="IBIS file name" model="IBIS model name"
corner="IBIS model corner" <other instance parameters>
```

Symbol: diode



Junction Diode

The junction diode model includes nonlinear junction capacitance and reverse breakdown.

Command-line help

```
spectre -h diode
```

Component Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	x	-
Device area	`area`	x	x	x	-	-	x	x	-
Device initially off	`off`	-	-	x	-	-	x	x	-
Initial diode voltage	`Vd`	-	-	x	-	-	x	x	-
Junction perimeter factor	`perim`	x	x	-	-	-	-	-	-
Length	`l`	x	x	-	-	-	x	x	-
Width	`w`	x	x	-	-	-	x	x	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Multiplier	`m`	x	x	-	-	-	x	x	-
Scale factor	`scale`	x	x	-	-	-	-	-	-
Temp rise from ambient	`trise`	x	x	-	-	-	-	-	-
Estimated operating region	`region`	x	x	-	-	-	-	-	-
Periphery of junction	`pj`	-	-	-	-	-	x	x	-
Width of polysilicon	`wp`	x	-	-	-	-	x	x	-
Length of polysilicon	`lp`	x	-	-	-	-	x	x	-
Width of metal capcitor	`wm`	x	-	-	-	-	x	x	-
Length of metal capcitor	`lm`	x	-	-	-	-	x	x	-
Temperature difference	`dtemp`	-	-	-	-	-	x	x	-

Syntax/Synopsis

```
Name ( a c ) ModelName <parameter=value> ...
```

In the forward operation the voltage on the anode (‘a’) is more positive than the voltage on the cathode (‘c’).

Model Synopsis

```
model ModelName diode <parameter=value> ...
```

Example

```
d0 (dp dn) pdiode l=3e-4 w=2.5e-4 area=1
```

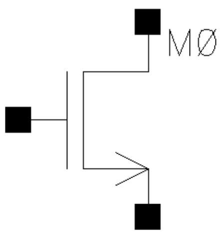
Sample model statement

```
model pdiode diode is=1.8e-5 rs=1.43 n=1.22 nz=2.31 gleak=6.2e-5
rsw=10 isw=6.1e-10 ibv=0.95e-3 tgs=2 ik=1.2e7 fc=0.5 cj=1.43e-3
pb=0.967 mj=0.337 cjsw=2.76e-9 vjsw=0.94 jmax=1e20
```

Additional Information

This device is supported within the altergroups.

Symbol: nbsim



N-type BSIM Field Effect Transistor

nbsim is an n-channel BSIM model.

Command-line help

For related information on MOS, use any of the following help commands:

```
spectre -h bsim1
```

```
spectre -h bsim2
```

```
spectre -h bsim3
```

```
spectre -h bsim3v3
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	x	-
Bulk node connection	`bn`	-	x	x	-	-	x	-	-
Multiplier	`m`	x	x	x	x	x	x	x	-
Width	`w`	x	x	x	x	x	x	x	-
Length	`l`	x	x	x	x	x	x	x	-
Drain diffusion area	`ad`	x	x	x	-	-	x	x	-
Source diffusion area	`as`	x	x	x	-	-	x	-	-
Drain diffusion periphery	`pd`	x	x	x	-	-	x	x	-
Source diffusion periphery	`ps`	x	x	x	-	-	x	x	-
Drain diffusion res squares	`nrd`	x	x	x	-	-	x	x	-
Source diffusion res squares	`nrs`	x	x	x	-	-	x	x	-
Drain diffusion length	`ld`	x	x	x	-	-	-	-	-
Source diffusion length	`ls`	x	x	x	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
NQS flag	`nqsmod`	x	-	-	-	-	-	-	-
Temp rise from ambient	`trise`	x	x	-	-	-	-	-	-
Estimated operating region	`region`	x	x	-	-	-	-	-	-
Device initially off	`off`	-	-	x	-	-	x	x	-
Drain source initial voltage	`Vds`	-	-	x	-	-	x	x	-
Gate source initial voltage	`Vgs`	-	-	x	-	-	x	x	-
Bulk source initial voltage	`Vbs`	-	-	x	-	-	x	x	-
Additional drain resistance	`rdc`	x	-	-	-	-	x	x	-
Additional source resistance	`rsc`	x	-	-	-	-	x	x	-
Dist. OD & poly(one side)	`sa`	x	-	-	-	-	-	-	-
Dist. OD & poly(other side)	`sb`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Dist. betn neighbour fingers	sd	x	-	-	-	-	-	-	-
Temperature difference	dtemp	-	-	-	-	-	x	x	-
Source/ drain selector	geo	x	-	-	-	-	x	x	-

Syntax/Synopsis

```
Name ( d g s b ) ModelName <parameter=value> ...
```

Model Synopsis

```
model ModelName bsim1 <parameter=value> ...
```

Example

Sample Instance Statement

```
m1 (1 2 0 0) nchmod l=5u w=10u as=40u ad=40u pd=28u ps=28u m=1
```

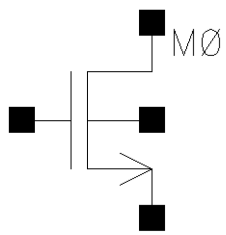
Sample Model Statement

```
model nchmod bsim1 vfb0=-0.5 lvfb=0.5 wvfb=0.3 phi0=0.8 eta0=0.056 k1=0.5 muz=454
eg=0.99 gap1=5.5e-04 trs=1e-3 trd=1e-3 xpart=0.5 rs=10 rd=10
```

Additional Information

This device is supported within the altergroups.

Symbol: nbsim4



N-type BSIM MOS transistor (4 terminals)

BSIM4 is the version-4.21 of the bsim model. BSIM4 transistors require you to use a model statement.

Command-line help

For related information on MOS, use any of the following help commands:

```
spectre -h bsim4
```

```
spectre -h bsim1
```

```
spectre -h bsim2
```

```
spectre -h bsim3
```

```
spectre -h bsim3v3
```

CDF Parameters

The CDF parameters for `nbsim4` are the same as the CDF parameters for `nbsim.`

Syntax/Synopsis

```
Name ( d g s b ) ModelName <parameter=value> ...
```

Model Synopsis

```
model ModelName bsim4 <parameter=value> ...
```

Example

```
m4 (0 2 1 1) pchmod w=2u l=0.8u as=250p ad=250p pd=168p ps=168p m=1
```

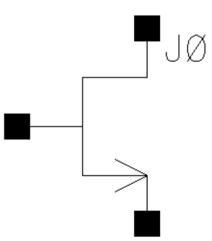
Sample Model Statement

```
model pchmod bsim4 type=p mobmod=0 capmod=2 version=4.21 toxe=3e-9
cdsc=2.58e-4 cdscb=0 cdscd=6.1e-8 cit=0 nfactor=1.1 xj=9e-8
vfb=0.76vsat=9.2e4 at=3.3e4 a0=1.1 ags=1.0e-20 a1=0 ngate=9e19
vth0=-0.42a1=0 a2=1 delta=0.014 pvag=1e-20 pclm=6.28e-4 pdits=0.2
pditsl=2.3e6pditsd=0.23 fprout=0.2 pdiblcb=3.4e-8 pdiblc1=0.81
drout=0.56pdiblc2=9.84e-6 pscbe1=8.14e8 pscbe2=9.58e-07 lint=5e-9
wint=5e-9dmcg=5e-6 dmci=5e-6 dmdg=5e-6 dmcgt=6e-7 dwj=4.5e-8
rsh=6cgso=7.43e-10 cgdo=7.43e-10 cgbo=2.56e-11 cgsl=1e-14
cgdl=1e-14ckappas=0.5 ckappad=0.5 noff=0.9 voffcv=0.02 acde=1 moin=15
xpart=0kt1l=0 kt2=2.2e-2 lpe0=5.75e-8 lpeb=2.3e-10 dvt0=2.89
dvt1=0.53dvt2=-3.2e-2 dvt0w=0 dvt1w=0 dvt2w=0 dvtp0=7.32e-7
dvtp1=0.12dsub=0.058 eta0=0.001 u0=4.19e-2 ua=8.7e-16 ub=3.06e-18
k1=0.33uc=4.6e-13 ute=-1.5 ua1=4.31e-9 ub1=7.61e-18 uc1=-5.6e-11
k2=-1.87e-2rdsw=369.4 rdw=184.7 rsw=184.7 prwg=3.22e-8 prwb=6.8e-11
wr=1rdswmin=0 rdwmin=0 rswmin=0 prt=0 b0=-1e-20 k3=80 k3b=0
w0=2.5e-6b1=0 keta=-0.047 alpha0=7.4e-2 alpha1=0.005 beta0=30
```

Additional Information

This device is supported within the altergroups.

Symbol: njfet



N-type Junction Field Effect Transistor

The JFET model is derived from the FET model of Shichman and Hodges. JFETs require you to use a model statement.

Command-line help

```
spectre -h jfet
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	-	-
Bulk node connection	`bn`	-	x	x	-	-	x	-	-
Device area	`area`	x	x	x	-	-	x	x	-
Device initially off	`off`	-	-	x	-	-	x	x	-
Drain source initial voltage	`Vds`	-	-	x	-	-	x	x	-
Gate source initial voltage	`Vgs`	-	-	x	-	-	x	x	-
Gate to bulk and src voltage	`Vgbs`	-	-	x	-	-	x	x	-
Multiplier	`m`	x	x	-	-	-	x	x	-
Estimated operating region	`region`	x	x	-	-	-		-	-
Width	`w`	-	-	-	-	-	x	x	-
Length	`l`	-	-	-	-	-	x	x	-
Temperature difference	`dtemp`	-	-	-	-	-	x	x	-

Syntax/Synopsis

```
Name ( d g s [b] ) ModelName <parameter=value> ...
```

You do not have to specify the back gate terminal when you use the four-terminal model. If left unspecified, the substrate is connected to ground.

Model Synopsis:

```
model ModelName jfet <parameter=value> ...
```

Example

```
jf1 (net1 net2 0) jmod area=1
```

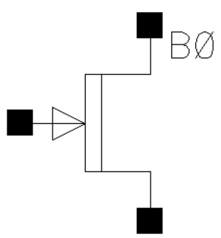
Sample Model Statement:

```
model jmod jfet beta=9e-5 lambda=0 type=n vt0=-18.7 rd=10 rs=10 cgs=1.3e-13 pb=0.65
```

Additional Information

This device is supported within the altergroups.

Symbol: nmes



N-type MES FET Transistor

The GaAs MESFET model was derived from the model by H. Statz and others at Raytheon. This model is completely symmetric and is modified slightly to make it charge conserving. GaAs MESFET instances require that you use a model statement.

Command-line help

```
spectre -h gaas
```

```
spectre -h tom2
```

```
spectre -h tom3
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	-	-
Bulk node connection	`bn`		x	x	-	-	x	-	-
Device area	`area`	x	x	x	-	-	x	x	-
Device initially off	`off`	-	-	x	-	-	x	x	-
Drain source initial voltage	`Vds`	-	-	x	-	-	x	x	-
Gate source initial voltage	`Vgs`	-	-	x	-	-	x	x	-
Bulk source initial voltage	`Vbs`	-	-	x	-	-	x	x	-
Multiplier	`m`	x	x	-	-	-	x	x	-
Estimated operating region	`region`	x	x	-	-	-	x	-	-
Width	`w`	-	-	-	-	-	x	x	-
Length	`l`	-	-	-	-	-	x	x	-
Temperature difference	`dtemp`	-	-	-	-	-	x	x	-

Syntax/Synopsis

```
Name ( d g s ) ModelName <parameter=value> ...
```

Model Synopsis:

```
model ModelName gaas <parameter=value> ...
```

Example

```
m1 (1 2 0) nmes area=1 m=2
```

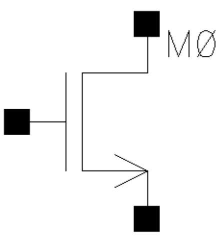
Sample Model Statement:

```
model nmes gaas type=n vto=-2 beta=0.06 lambda=0 b=0.25 rs=3.65 alpha=1.9 rd=1.98
is=1.1e-9 n=1.28 fc=0.5 cgs=0.365e-12
```

Additional Information

This device is supported within the altergroups.

Symbol: nmos



N-type Generic MOS Transistor (3 terminals)

Command-line help

For related information on MOS, use any of the following help commands:

```
spectre -h mos0
```

```
spectre -h mos1
```

```
spectre -h ekv
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	x	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Bulk node connection	`bn`	-	x	x	-	-	x	-	-
Multiplier	`m`	x	x	x	x	x	x	x	-
Width	`w`	x	x	x	x	x	x	x	-
Length	`l`	x	x	x	x	x	x	x	-
Drain diffusion area	`ad`	x	x	x	-	-	x	x	-
Source diffusion area	`as`	x	x	x	-	-	x	x	-
Drain diffusion periphery	`pd`	x	x	x	-	-	x	x	-
Source diffusion periphery	`ps`	x	x	x	-	-	x	x	-
Drain diffusion res squares	`nrd`	x	x	x	-	-	x	x	-
Source diffusion res squares	`nrs`	x	x	x	-	-	x	x	-
Drain diffusion length	`ld`	x	x	x	-	-	-	-	-
Source diffusion length	`ls`	x	x	x	-	-	-	-	-
Device initially off	`off`	-	-	x	-	-	x	x	-

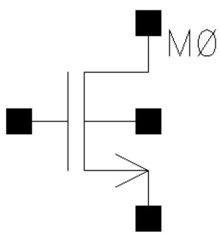
CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Drain source initial voltage	`Vds`	-	-	x	-	-	x	x	-
Gate source initial voltage	`Vgs`	-	-	x	-	-	x	x	-
Bulk source initial voltage	`Vbs`	-	-	x	-	-	x	x	-
Temp rise from ambient	`trise`	x	x	-	-	-	-	-	-
Estimated operating region	`region`	x	x	-	-	-	-	-	-
Hot-electron degradation	`degradation`	x	-	-	-	-	-	-	-
Additional drain resistance	`rdc`	x	-	-	-	-	x	x	-
Additional source resistance	`rsc`	x	-	-	-	-	x	x	-
Dist. OD & poly(one side)	`sa`	x	-	-	-	-	-	-	-
Dist. OD & poly(other side)	`sb`	x	-	-	-	-	-	-	-
Dist. betn neighbour fingers	`sd`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Temperature difference	`dtemp`	-	-	-	-	-	x	x	-
Source/ drain selector	`geo`	x	-	-	-	-	x	x	-

Example

```
M0 (net3 net1 net2) nmos
```

Symbol: nmos4



N-type Generic MOS Transistor (4 terminals)

Command-line help

For related information on MOS, use any of the following help commands:

```
spectre -h mos0
```

```
spectre -h mos1
```

```
spectre -h ekv
```

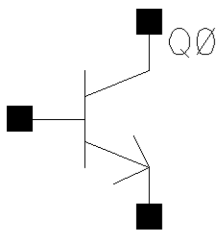
CDF Parameters

The CDF parameters for `nmos4` are the same as the CDF parameters for `nmos`.

Example

```
M0 (net1 net3 net4 net2) nmos4
```

Symbol: npn



Generic Bipolar Transistor (NPN)

npn is an ntype bjt.

Command-line help

```
spectre -h bjt

spectre -h bjt2

spectre -h bjt3

spectre -h bjt301

spectre -h vbic
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	x	-
Bulk node connection	`bn`	-	x	x	-	-	x	-	-
Device area	`area`	x	x	x	-	-	x	x	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Base-emitter voltage	`Vbe`	-	-	x	-	-	x	x	-
Collector-emitter voltage	`Vce`	-	-	x	-	-	x	x	-
Device initially off	`off`	-	-	x	-	-	x	x	-
Multiplier	`m`	x	x	-	-	-	x	x	-
Temp rise from ambient	`trise`	x	x	-	-	-	-	-	-
Estimated operating region	`region`	x	x	-	-	-	-	-	-
Temperature difference	`dtemp`	-	-	-	-	-	x	x	-
Base area	`areab`	-	-	-	-	-	x	x	-
Collector area	`areac`	-	-	-	-	-	x	x	-
Temp Rise Specifier	`triseSpec`	x	-	-	-	-	-	-	-
dtmp -Temp rise from ambient	`dtmp`	x	-	-	-	-	-	-	-
dtemp - Temp rise from ambient	`dtempn`	-	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( c b e [s] ) ModelName <parameter=value> ...
```

You do not have to specify the substrate terminal. If you do not specify it, the substrate is connected to ground.

Model Synopsis:

```
model ModelName bjt <parameter=value> ...
```

Example

```
q1 (vcc net3 minus) npn_mod region=fwd area=1 m=1
```

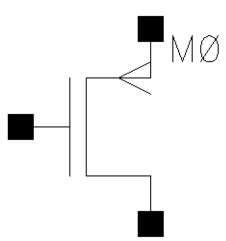
Following is a sample model statement:

```
model npn_mod bjt type=npn is=10e-13 bf=200 va=58.8 ikf=5.63e-3 rb=700 rbm=86
re=3.2 cje=0.352e-12 pe=0.76 me=0.34 tf=249e-12 cjc=0.34e-12 pc=0.55
```

Additional Information

This device is supported within the altergroups.

Symbol: pbsim



P-type BSIM MOS Transistor (3 terminals)

pbsim is a p-channel BSIM model.

Command-line help

For related information on MOS, use any of the following help commands:

```
spectre -help bsim1
```

```
spectre -help bsim2
```

```
spectre -help bsim3
```

```
spectre -help bsim3v3
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	x	-
Bulk node connection	`bn`	-	x	x	-	-	x	-	-
Multiplier	`m`	x	x	x	x	x	x	x	-
Width	`w`	x	x	x	x	x	x	x	-
Length	`l`	x	x	x	x	x	x	x	-
Drain diffusion area	`ad`	x	x	x	-	-	x	x	-
Source diffusion area	`as`	x	x	x	-	-	x	x	-
Drain diffusion periphery	`pd`	x	x	x	-	-	x	x	-
Source diffusion periphery	`ps`	x	x	x	-	-	x	x	-
Drain diffusion res squares	`nrd`	x	x	x	-	-	x	x	-
Source diffusion res squares	`nrs`	x	x	x	-	-	x	x	-
Drain diffusion length	`ld`	x	x	x	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Source diffusion length	ls	x	x	x	-	-	-	-	-
NQS flag	nqsmod	x	-	-	-	-	-	-	-
Device initially off	off	-	-	x	-	-	x	x	-
Drain source initial voltage	Vds	-	-	x	-	-	x	x	-
Gate source initial voltage	Vgs	-	-	x	-	-	x	x	-
Bulk source initial voltage	Vbs	-	-	x	-	-	x	x	-
Additional drain resistance	rdc	x	-	-	-	-	x	x	-
Additional source resistance	rsc	x	-	-	-	-	x	x	-
Temp rise from ambient	trise	x	x	-	-	-	-	-	-
Estimated operating region	region	x	x	-	-	-	-	-	-
Dist. OD & poly(one side)	sa	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Dist. OD & poly(other side)	`sb`	x	-	-	-	-	-	-	-
Dist. betn neighbour fingers	`sd`	x	-	-	-	-	-	-	-
Temperature difference	`dtemp`	-	-	-	-	-	x	x	-
Source/ drain selector	`geo`	x	-	-	-	-	x	x	-

Syntax/Synopsis

```
Name ( d g s b ) ModelName <parameter=value> ...
```

Following is the model synopsis:

```
model ModelName bsim1 <parameter=value> ...
```

Example

```
m1 (1 2 0 0) nchmod l=5u w=10u as=40u ad=40u pd=28u ps=28u m=1
```

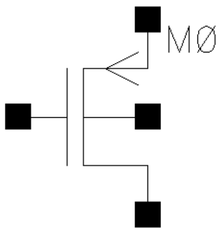
Following is the sample model statement:

```
model nchmod bsim1 vfb0=-0.5 lvfb=0.5 wvfb=0.3 phi0=0.8 eta0=0.056 k1=0.5
muz=454 eg=0.99 gap1=5.5e-04 trs=1e-3 trd=1e-3 xpart=0.5 rs=10 rd=10
```

Additional Information

This device is supported within the altergroups.

Symbol: pbsim4



P-type BSIM MOS transistor (4 terminals)

pbsim is a p-channel BSIM model.

Command-line help

For related information on MOS, use any of the following help commands:

```
spectre -help bsim1

spectre -help bsim2

spectre -help bsim3

spectre -help bsim3v3
```

CDF Parameters

The CDF parameters for `pbsim4` are the same as the CDF parameters for `pbsim`.

Syntax/Synopsis

```
Name ( d g s b ) ModelName <parameter=value> ...
```

Following is the model synopsis:

```
model ModelName bsim1 <parameter=value> ...
```

Example

```
m1 (1 2 0 0) nchmod l=5u w=10u as=40u ad=40u pd=28u ps=28u m=1
```

Following is the sample model statement:

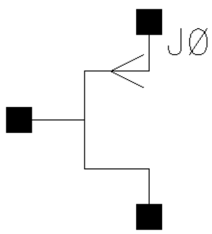
```
model nchmod bsim1 vfb0=-0.5 lvfb=0.5 wvfb=0.3 phi0=0.8 eta0=0.056 k1=0.5
```

```
muz=454 eg=0.99 gap1=5.5e-04 trs=1e-3 trd=1e-3 xpart=0.5 rs=10 rd=10
```

Additional Information

This device is supported within the altergroups.

Symbol: pjfet



P-type Junction Field Effect Transistor

The JFET model is derived from the FET model of Shichman and Hodges. JFETs require you to use a model statement.

Command-line help

```
spectre -h jfet
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	-	-
Bulk node connection	`bn`	-	x	x	-	-	x	-	-
Device area	`area`	x	x	x	-	-	x	x	-
Device initially off	`off`	-	-	x	-	-	x	x	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Drain source initial voltage	`Vds`	-	-	x	-	-	x	x	-
Gate source initial voltage	`Vgs`	-	-	x	-	-	x	x	-
Gate to bulk and src voltage	`Vgbs`	-	-	x	-	-	x	x	-
Multiplier	`m`	x	x	-	-	-	x	x	-
Width	`w`	-	-	-	-	-	x	x	-
Length	`l`	-	-	-	-	-	x	x	-
Temperature difference	`dtemp`	-	-	-	-	-	x	x	-
Estimated operating region	`region`	x	x	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( d g s [b] ) ModelName <parameter=value> ...
```

You do not have to specify the back gate terminal when you use the four-terminal model. If left unspecified, the substrate is connected to ground.

Model Synopsis:

```
model ModelName jfet <parameter=value> ...
```

Example

```
jf1 (net1 net2 0) jmod area=1
```

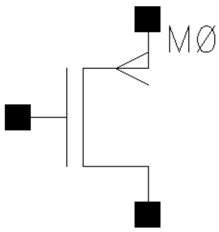
Following is a sample model statement:

```
model jmod jfet beta=9e-5 lambda=0 type=n vt0=-18.7 rd=10 rs=10 cgs=1.3e-13 pb=0.65
```

Additional Information

This device is supported within the altergroups.

Symbol: pmos



P-type Generic MOS Transistor (3 terminals)

Command-line help

For related information on MOS, use any of the following help commands:

```
spectre -h mos0
```

```
spectre -h mos1
```

```
spectre -h ekv
```

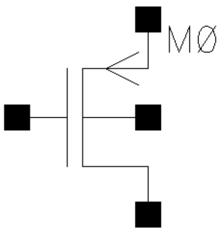
CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	-	-
Bulk node connection	`bn`	-	x	x	-	-	x	-	-
Multiplier	`m`	x	x	x	x	x	x	x	-
Width	`w`	x	x	x	x	x	x	x	-
Length	`l`	x	x	x	x	x	x	x	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Drain diffusion area	`ad`	x	x	x	-	-	x	x	-
Source diffusion area	`as`	x	x	x	-	-	x	x	-
Drain diffusion periphery	`pd`	x	x	x	-	-	x	x	-
Source diffusion periphery	`ps`	x	x	x	-	-	x	x	-
Drain diffusion res squares	`nrd`	x	x	x	-	-	x	x	-
Source diffusion res squares	`nrs`	x	x	x	-	-	x	x	-
Drain diffusion length	`ld`	x	x	x	-	-	-	-	-
Source diffusion length	`ls`	x	x	x	-	-	-	-	-
Device initially off	`off`	-	-	x	-	-	x	x	-
Drain source initial voltage	`Vds`	-	-	x	-	-	x	x	-
Gate source initial voltage	`Vgs`	-	-	x	-	-	x	x	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Bulk source initial voltage	`Vbs`	-	-	x	-	-	x	x	-
Temp rise from ambient	`trise`	x	x	-	-	-	-	-	-
Estimated operating region	`region`	x	x	-	-	-	-	-	-
Hot-electron degradation	`degradation`	x	-	-	-	-	-	-	-
Additional drain resistance	`rdc`	x	-	-	-	-	x	x	-
Additional source resistance	`rsc`	x	-	-	-	-	x	x	-
Dist. OD & poly(one side)	`sa`	x	-	-	-	-	-	-	-
Dist. OD & poly(other side)	`sb`	x	-	-	-	-	-	-	-
Dist. betn neighbour fingers	`sd`	x	-	-	-	-	-	-	-
Temperature difference	`dtemp`	-	-	-	-	-	x	x	-
Source/drain selector	`geo`	x	-	-	-	-	x	x	-

Symbol: pmos4



P-type Generic MOS Transistor (4 terminals)

Command-line help

For related information on MOS, use any of the following help commands:

`spectre -h mos0`

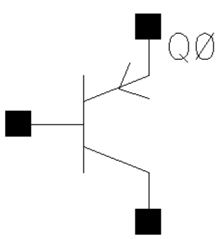
`spectre -h mos1`

`spectre -h ekv`

CDF Parameters

The CDF parameters for `pmos4` are the same as the CDF parameters for `pmos`.

Symbol: pnp



Generic Bipolar Transistor (PNP)

pnp is a p-type bjt.

Command-line help

```
spectre -h bjt

spectre -h bjt2

spectre -h bjt3

spectre -h bjt301

spectre -h vbic
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	x	-
Bulk node connection	`bn`	-	x	x	-	-	x	-	-
Device area	`area`	x	x	x	-	-	x	x	-
Multiplier	`m`	x	x	-	-	-	x	x	-
Temp rise from ambient	`trise`	x	x	-	-	-	-	-	-
Temp Rise Specifier	`triseSpec`	x	-	-	-	-	-	-	-
dtmp -Temp rise from ambient	`dtmp`	x	-	-	-	-	-	-	-
dtemp - Temp rise from ambient	`dtempn`	-	-	-	-	-	-	-	-
Estimated operating region	`region`	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Base-emitter voltage	`Vbe`	-	-	x	-	-	x	x	-
Collector-emitter voltage	`Vce`	-	-	x	-	-	x	x	-
Device initially off	`off`	-	-	x	-	-	x	x	-
Temperature difference	`dtemp`	x	-	-	-	-	x	x	-
Base area	`areab`	-	-	-	-	-	x	x	-
Collector area	`areac`	-	-	-	-	-	x	x	-

Syntax/Synopsis

```
Name ( c b e [s] ) ModelName <parameter=value> ...
```

You do not have to specify the substrate terminal. If you do not specify it, the substrate is connected to ground.

Following is the model synopsis:

```
model ModelName bjt <parameter=value> ...
```

Example

```
q1 (vcc net3 minus) npn_mod region=fwd area=1 m=1
```

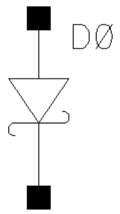
Following is a sample model statement:

```
model npn_mod bjt type=npn is=10e-13 bf=200 va=58.8 ikf=5.63e-3 rb=700
rbm=86 re=3.2 cje=0.352e-12 pe=0.76 me=0.34 tf=249e-12 cjc=0.34e-12
pc=0.55
```

Additional Information

This device is supported within the altergroups.

Symbol: schottky



Schottky Diode

A special type of diode that has a very low forward-voltage drop leading to greater system efficiency.

Command-line help

```
spectre -h diode
```

CDF Parameters

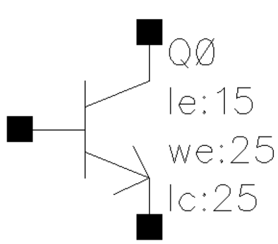
CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	-	-
Device area	`area`	x	x	x	-	-	x	x	x
Device initially off	`off`	-	-	x	-	-	x	x	x
Initial diode voltage	`Vd`	-	-	x	-	-	x	x	x
Junction perimeter factor	`perim`	x	x	-	-	-		-	-
Length	`l`	x	x	-	-	-	x	x	x
Width	`w`	x	x	-	-	-	x	x	x
Multiplier	`m`	x	x	-	-	-	x	x	x
Scale factor	`scale`	x	x	-	-	-		-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Temp rise from ambient	`trise`	x	x	-	-	-	-	-	-
Estimated operating region	`region`	x	x	-	-	-	-	-	-
Periphery of junction	`pj`	-	-	-	-	-	x	x	x
Width of polysilicon	`wp`	-	-	-	-	-	x	x	x
Length of polysilicon	`lp`	-	-	-	-	-	x	x	x
Width of metal capacitator	`wm`	-	-	-	-	-	x	x	x
Length of metal capacitator	`lm`	-	-	-	-	-	x	x	x
Temperature difference	`dtemp`	-	-	-	-	-	x	x	x

Example

```
D0 (net1 net2) schottky
```

Symbol: usernpn



User Specific NPN Bipolar Transistor (3 terminals)

Command-line help

```
spectre -h bjt
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	x	-
Bulk node connection	`bn`	-	x	x	-	-	x	-	-
Device area	`area`	x	x	x	-	-	x	x	-
Base-emitter voltage	`Vbe`	-	x	x	-	-	x	x	-
Collector-emitter voltage	`Vce`	-	x	x	-	-	x	x	-
Device initially off	`off`	-	x	x	-	-	x	x	-
Emitter length	`le`	x	x	x	-	-	x	-	-
Emitter width	`we`	x	x	x	-	-	x	-	-
Collector length	`lc`	x	x	x	-	-	x	-	-
Temp Rise Specifier	`triseSpec`	x	-	-	-	-	-	-	-
Temp rise from ambient	`trise`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
dtmp -Temp rise from ambient	`dtmp`	x	-	-	-	-	-	-	-
dtemp -Temp rise from ambient	`dtemp`	x	-	-	-	-	-	-	-
Estimated operating region	`region`	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( c b e [s] ) ModelName <parameter=value> ...
```

You do not have to specify the substrate terminal. If you do not specify it, the substrate is connected to ground.

Model Synopsis:

```
model ModelName bjt <parameter=value> ...
```

Example

Sample Instance Statement:

```
q1 (vcc net3 minus) npn_mod region=fwd area=1 m=1
```

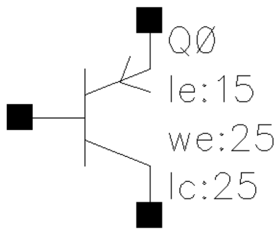
Sample Model Statement:

```
model npn_mod bjt type=npn is=10e-13 bf=200 va=58.8 ikf=5.63e-3 rb=700 rbm=86
re=3.2 cje=0.352e-12 pe=0.76 me=0.34 tf=249e-12 cjc=0.34e-12 pc=0.55
```

Additional Information

This device is supported within the altergroups.

Symbol: userpnp



User Specific PNP Bipolar Transistor (3 terminals)

Command-line help

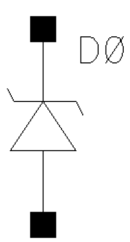
```
spectre -h bjt
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	-	-
Bulk node connection	`bn`	-	x	x	-	-	x	-	-
Device area	`area`	x	x	x	-	-	x	x	x
Base-emitter voltage	`Vbe`	-	x	x	-	-	x	x	x
Collector-emitter voltage	`Vce`	-	x	x	-	-	x	x	x
Device initially off	`off`	-	x	x	-	-	x	x	x
Emitter length	`le`	x	x	x	-	-	x	-	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Emitter width	`we`	x	x	x	-	-	x	-	x
Collector length	`lc`	x	x	x	-	-	x	-	x
Temp Rise Specifier	`triseSpec`	x	-	-	-	-	-	-	-
Temp rise from ambient	`trise`	x	-	-	-	-	-	-	-
dtmp -Temp rise from ambient	`dtmp`	x	-	-	-	-	-	-	-
dtemp - Temp rise from ambient	`dtemp`	x	-	-	-	-	-	-	-
Estimated operating region	`region`	x	-	-	-	-	-	-	-

Symbol: zener



Zener Diode

It has p-n junction in reverse bias to use the zener effect to maintain a constant voltage.

Command-line help

```
spectre -h diode
```

CDF Parameters

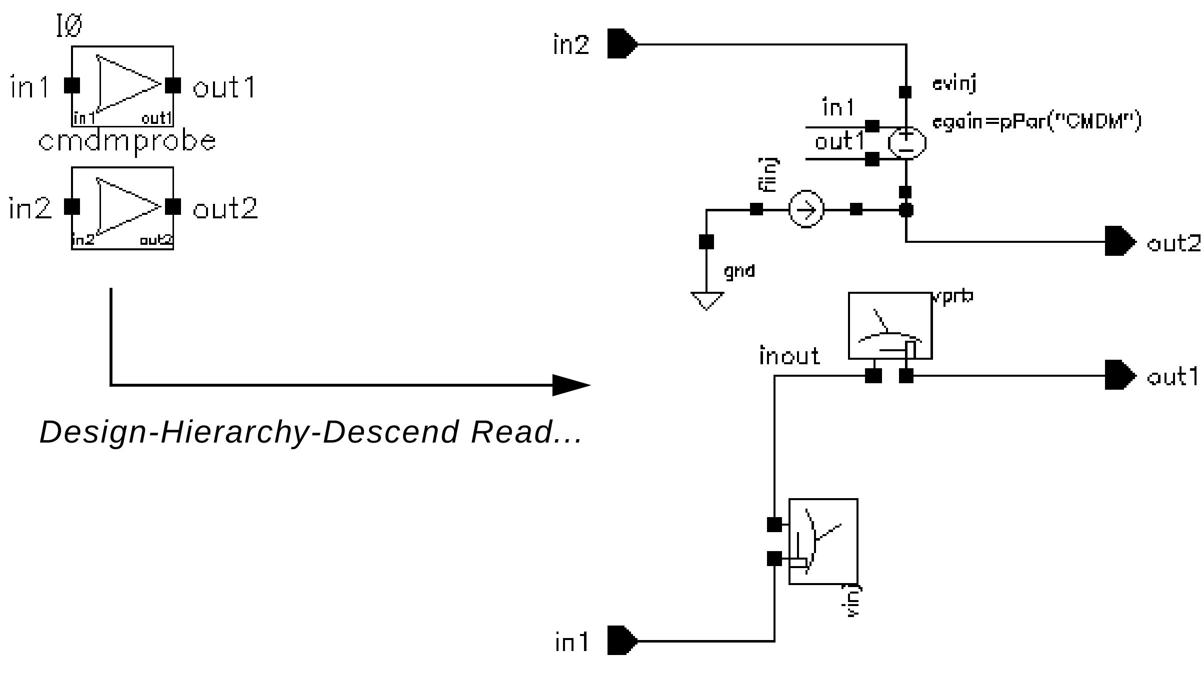
CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	x	x
Device area	`area`	x	x	x	-	-	x	x	x
Device initially off	`off`	-	-	x	-	-	x	x	x
Initial diode voltage	`Vd`	-	-	x	-	-	x	x	x
Junction perimeter factor	`perim`	x	x	-	-	-	-	-	-
Length	`l`	x	x	-	-	-	x	x	x
Width	`w`	x	x	-	-	-	x	x	x
Multiplier	`m`	x	x	-	-	-	x	x	x
Scale factor	`scale`	x	x	-	-	-	-	-	-
Temp rise from ambient	`trise`	x	x	-	-	-	-	-	-
Estimated operating region	`region`	x	x	-	-	-	-	-	-
Periphery of junction	`pj`	-	-	-	-	-	x	x	x
Width of polysilicon	`wp`	-	-	-	-	-	x	x	x
Length of polysilicon	`lp`	-	-	-	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Width of metal capacitator	`wm`	-	-	-	-	-	x	x	x
Length of metal capacitator	`lm`	-	-	-	-	-	x	x	x
Temperature difference	`dtemp`	-	-	-	-	-	x	x	x

3

Analysis Specific Components

Symbol: cmdmprobe



Common Model Differential Model Probe

This is a Spectre subcircuit component used in Spectre stability analysis for measuring differential stability. It measures the common-mode stability when CMDM is set to 1 and differential-mode stability when CMDM is set to -1.

The subcircuit consists of two iprobes and two controlled sources that can be viewed by:

➤ Selecting *Design->Hierarchy->Descend Read* or *Descend Edit* from the Virtuoso Schematic Reading window.

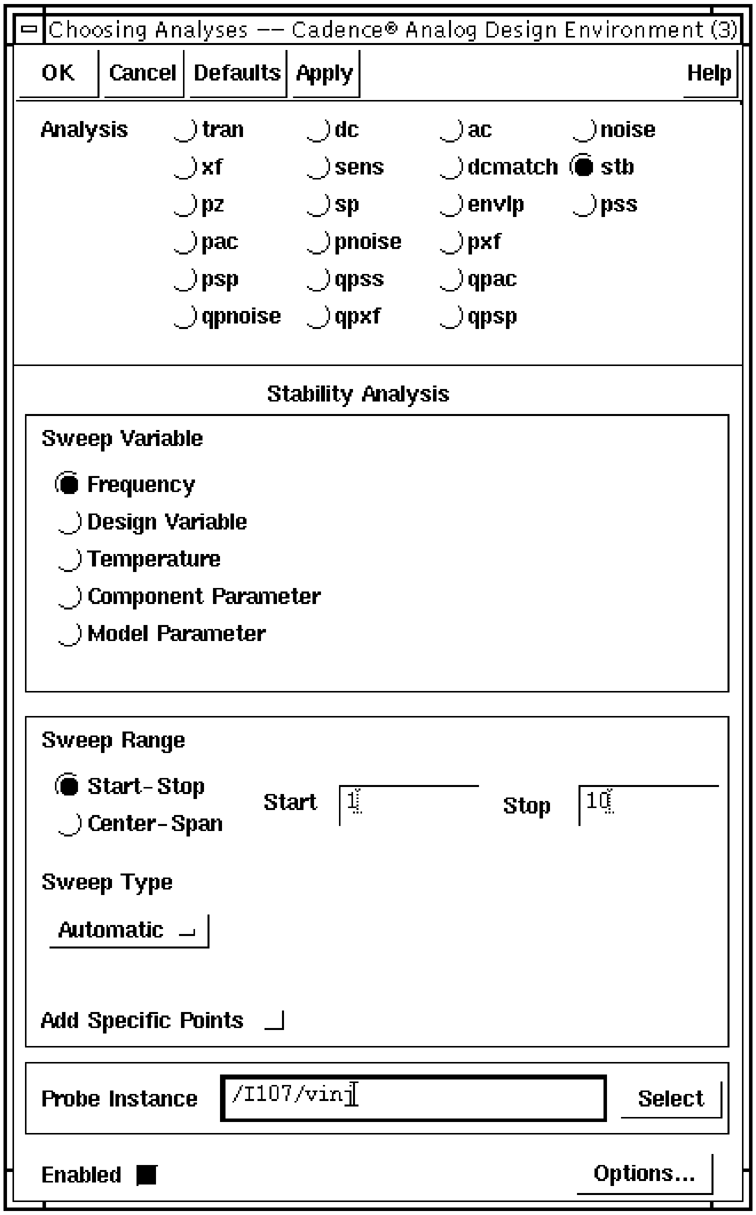
The above illustration shows the cmdmprobe subcircuit.

The subcircuit has two probes, `Vinj` and `Iinj`, designated for stability analysis. Their values are set to zero in a normal circuit simulation. To perform a stability analysis, specify the `vinj` probe in the Probe Instance field of the Choosing Analysis form. The process and the calculation is automated in Spectre's stability (stb) analysis. `Iinj` is internally placed to simplify the use model.

The steps to perform stability analysis in Spectre are as follows:

1. Add the cmdmprobe instance to the design.
2. Select the *Tools->Analog Environment* menu option.
3. Select *Analyses->Choose...* to display the Choosing Analyses form.
4. Select the *stb* radio button.
5. Specify the *Start* Sweep Range and the *Stop* Sweep Range.
6. Click *Select* and then select the cmdmprobe instance from the design.

The `<Inst_id>/vinj` automatically appears in the Probe Instance field.



7. Click *OK*.

8. Select the *Simulation->Netlist and Run* menu option to generate the netlist in Spectre Direct.

Example

For the instance I107 and Sweep Range between 1 and 10, the netlist is as follows:

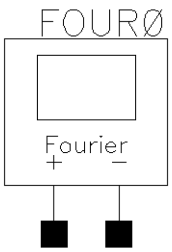
```
stb stb start=1 stop=10 probe=I107.vinj annotate=status
// Library name: analogLib
// Cell name: cmdmprobe
// View name: schematic
subckt cmdmprobe in1 in2 out1 out2
parameters CMDM=1
     evinj (in2 out2 in1 out1) vcvs gain=CMDM
     vprb (inout out1) iprobe
     vinj (inout in1) iprobe
     fiinj (0 out2) pcccs gain=CMDM probes=[ vprb vinj ] coeffs=[ 0 1 1 ]
ends cmdmprobe
// End of subcircuit definition.

// Library name: testLib
// Cell name: testCell
// View name: schematic
I107 (net048 net047 net046 net045) cmdmprobe CMDM=1
I111 (net080 net079 net078 net077) cmdmprobe CMDM=-1
```

Component Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
CMDM	CMDM	x	-	-	-	-	-	-	-

Symbol: fourier



Ratiometric Fourier Analyzer

It measures the Fourier coefficients of two different signals at a specified fundamental frequency without loading the circuit.

Command-line help

`spectre -h fourier`

Component Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	-	-	-	-	-	-
Fundamental frequency	`fund`	x	-	-	-	-	-	-	-
Minimum no. of time points	`points`	x	-	-	-	-	-	-	-
Active	`active`	x	-	-	-	-	-	-	-
Order of interpolation	`order`	x	-	-	-	-	-	-	-
Number of harmonics	`harms`	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
No. of reference Harmonics	`refharms`	x	-	-	-	-	-	-	-
Scale factor	`scale`	x	x	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( [p] [n] [pr] [nr] ) ModelName <parameter=value> ...
Name ( [p] [n] [pr] [nr] ) fourier <parameter=value> ...
```

The signal between terminals ‘p’ and ‘n’ is the test or numerator signal. The signal between terminals ‘pr’ and ‘nr’ is the reference or denominator signal. Fourier analysis is performed on terminal currents by specifying the ‘term’ or ‘refterm’ parameters. If both ‘term’ and ‘p’ or ‘n’ are specified, then the terminal current becomes the numerator and the node voltages become the denominator. By mixing voltages and currents, it is possible to compute large signal immittances.

Following is the model synopsis:

```
model ModelName fourier <parameter=value> ...
```

Example

```
four1 (1 0) fourmod harms=50
```

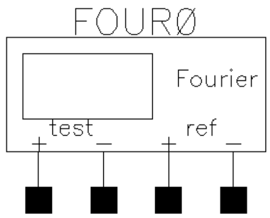
Following is the sample model statement:

```
model fourmod fourier fund=900M points=2500 order=2
```

Additional Information

This device is not supported within the altergroups.

Symbol: fourier2ch



Ratiometric Fourier Analyzer With Reference Terminals

Command-line help

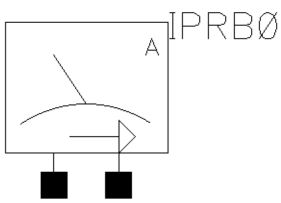
```
spectre -h fourier
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	-	-	-	-	-	-
Fundamental frequency	`fund`	x	x	-	-	-	-	-	-
Minimum no. of time points	`points`	x	x	-	-	-	-	-	-
Active	`active`	x	-	-	-	-	-	-	-
Order of interpolation	`order`	x	x	-	-	-	-	-	-
Number of harmonics	`harms`	x	x	-	-	-	-	-	-
No. of reference Harmonics	`refharms`	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Scale factor	`scale`	x	x	-	-	-	-	-	-

Symbol: iprobe



Current Probe

Current through the probe is computed and is defined as positive if it flows from the input node, through the probe, to the output node. Since the current variable gets the name of the 'iprobe' instance, you cannot create an 'iprobe' with the same name as a circuit node.

Command-line help

```
spectre -h iprobe
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	-	-	-	-	-	-
Fundamental frequency	`fund`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Minimum no. of time points	`points`	x	-	-	-	-	-	-	-
Active	`active`	x	-	-	-	-	-	-	-
Order of interpolation	`order`	x	-	-	-	-	-	-	-
Number of harmonics	`harms`	x	x	-	-	-	-	-	-
No. of reference Harmonics	`refharms`	x	-	-	-	-	-	-	-
Scale factor	`scale`	x	x	-	-	-	-	-	-
Dummy DC voltage	`vdummy`	-	-	-	-	-	-	-	x

Syntax/Synopsis

```
Name ( in out ) iprobe
```

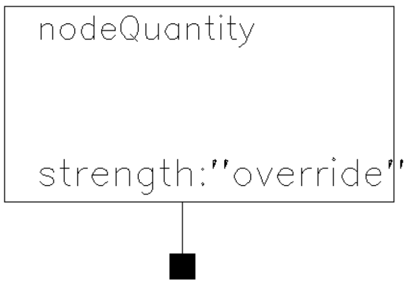
Example

```
ip (1  0) iprobe
```

Additional Information

This device is not supported within the altergroups.

Symbol: nodeQuantity



Set Node Quantities

Quantities contain information about specific types of signals, such as their units, absolute tolerances, and maximum allowed change per Newton iteration. Use the 'quantity' statement to create new quantities or to redefine properties of an existing quantity. Use this statement to set the quantities for a particular node.

For example, to indicate that the node 'net1' is used for thermal signals, you could use the following node statement.

```
i17 (net1) node value=Temp flow=Pwr
```

'Temp' and 'Pwr' are predefined quantities.

Command-line help

```
spectre -h node
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Flow	flow	x	x	-	-	-	-	-	x
Value	value	x	x	-	-	-	-	-	x
Strength	strength	x	x	-	-	-	-	-	x

Syntax/Synopsis

```
Name ( 1 [2] ... ) node <parameter=value> ...
```

Example

```
node1 (1 2 3) node value="T" flow="W" strength=override //Must define T and W with
quantity statement.
```

Additional Information

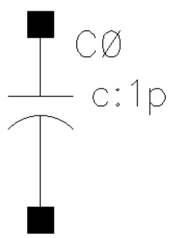
This device is not supported within the altergroups.

4

Parasitic Components

You can use the parasitic components of anlogLib to account for the effect of parasitics on analog circuits. By accounting for the effect of parasitics, you can improve the accuracy of your circuit simulations. These components are usually used during Diva extraction and are placed in an extracted view. Although these components are similar to the normal components, they appear only in extracted views.

Symbol: pcapacitor



Parasitic Capacitor

Command-line help

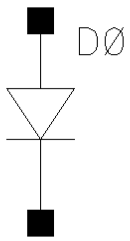
```
spectre -h capacitor
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Capacitance	c	x	-	x	x	x	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Initial condition	`ic`	x	-	x	-	-	x	x	x
Model name	`model`	x	-	-	-	-	x	-	-
Width	`w`	x	-	-	-	-	x	x	x
Length	`l`	x	-	-	-	-	x	x	x
Multiplier	`m`	x	-	-	-	-	x	x	x
Scale factor	`scale`	x	-	-	-	-	x	x	x
Temp rise from ambient	`trise`	x	-	-	-	-	-	-	-
Temperature coefficient 1	`tc1`	x	-	-	-	-	x	x	x
Temperature coefficient 2	`tc2`	x	-	-	-	-	x	x	x
Number of Polynomial Coeffs	`polyCoef`	-	-	-	-	-	x	x	x
Temperature difference	`dtemp`	-	-	-	-	-	x	x	x

Symbol: pdiode



Parasitic Diode

Command-line help

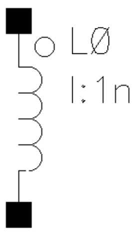
```
spectre -h diode
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	x	-	-	x	-	-
Device area	`area`	x	x	x	-	-	x	x	x
Device initially off	`off`	-	-	x	-	-	x	x	x
Initial diode voltage	`Vd`	-	-	x	-	-	x	x	x
Junction perimeter factor	`perim`	x	x	-	-	-		-	-
Length	`l`	x	x	-	-	-	x	x	x
Width	`w`	x	x	-	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Multiplier	`m`	x	x	-	-	-	x	x	x
Scale factor	`scale`	x	x	-	-	-	-	-	-
Temp rise from ambient	`trise`	x	x	-	-	-	-	-	-
Estimated operating region	`region`	x	x	-	-	-	-	-	-
Periphery of junction	`pj`	-	-	-	-	-	x	x	x
Width of polysilicon	`wp`	-	-	-	-	-	x	x	x
Length of polysilicon	`lp`	-	-	-	-	-	x	x	x
Width of metal capcitor	`wm`	-	-	-	-	-	x	x	x
Length of metal capcitor	`lm`	-	-	-	-	-	x	x	x
Temperature difference	`dtemp`	-	-	-	-	-	x	x	x

Symbol: pinductor



Parasitic Inductor

Command-line help

```
spectre -h inductor
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Inductance	`l`	x	x	x	x	x	-	x	x
Initial condition	`ic`	x	x	x	-	-	-	x	-
Model name	`model`	x	x	-	-	-	-	-	-
Resistance	`r`	x	-	-	-	-	-	x	x
Multiplier	`m`	x	x	-	-	-	-	x	x
Temp rise from ambient	`trise`	x	x	-	-	-	-	-	-
Scale factor	`scale`	-	-	-	-	-	-	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Number of Polynomial Coeffs	polyCoef	-	-	-	-	-	-	x	-
Temperature coefficient 1	tc1	-	-	-	-	-	-	x	x
Temperature coefficient 2	tc2	-	-	-	-	-	-	x	x
Temperature difference	dtemp	-	-	-	-	-	-	x	x

Syntax/Synopsis

```
Name ( 1 2 ) ModelName <parameter=value> ...
Name ( 1 2 ) inductor <parameter=value> ...
```

Following is the model synopsis:

```
model ModelName inductor <parameter=value> ...
```

Example

Following is a sample instance statement without model:

```
l33 (0 net29) inductor l=10e-9 r=1 m=1
```

Following is a sample instance statement with model:

```
l33 (0 net29) ind l=10e-9 r=1 m=1
```

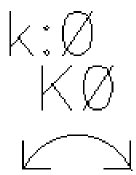
Following is the sample model statement:

```
model ind inductor l=6e-9 r=1 tc1=1e-12 tc2=1e-12 tnom=25
```

Additional Information

This device is supported within the altergroups.

Symbol: pmind



Parasitic Mutual Inductor

Command-line help

```
spectre -h mutual_inductor
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceS	UltraSim
First coupled inductor	ind1	x	x	x	-	-	x	-	-
Second coupled inductor	ind2	x	x	x	-	-	x	-	-
Coupling coefficient	k	x	x	x	-	-	x	x	x

Syntax/Synopsis

```
Name mutual_inductor <parameter=value> ...
```

Example

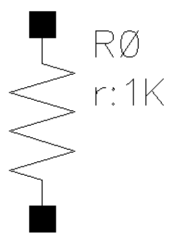
Sample instance statement with two inductors:

```
l1 (1 0) inductor
l2 (2 0) inductor
ml1 mutual_inductor coupling=1 ind1=l1 ind2=l2
```

Additional Information

This device is not supported within the altergroups.

Symbol: presistor



Parasitic Resistor

Command-line help

```
spectre -h resistor
```

CDF Parameters

CDF Parameter	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Resistance	r	x	-	x	x	x	x	x	x
Temperature coefficient 1	tc1	x	-	x	-	-	x	x	x

CDF Parameter	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Temperature coefficient 2	tc2	x	-	x	-	-	x	x	x
Model name	model	x	-	-	-	-	x	-	-
Length	l	x	-	-	-	-	x	x	x
Width	w	x	-	-	-	-	x	x	x
Resistance Form	resform	x	-	-	-	-	-	-	-
Multiplier	m	x	-	-	-	-	x	x	x
Scale factor	scale	x	-	-	-	-	x	x	x
Temp rise from ambient	trise	x	-	-	-	-	-	-	-
Generate noise?	isnoisy	x	-	-	-	-	-	-	-
Capacitance connected	hrc	-	-	-	-	-	x	x	x
Temperature difference	dtemp	-	-	-	-	-	x	x	x
AC resistance	ac	-	-	-	-	-	x	x	-
Capacitance	c	-	-	-	-	x	-	-	-

Syntax/Synopsis

```
Name ( 1 2 ) ModelName <parameter=value> ...
```

```
Name ( 1 2 ) resistor <parameter=value> ...
```

Following is the model synopsis:

```
model ModelName resistor <parameter=value> ...
```

Example

Following is a sample without model:

```
r1 (1 2) resistor r=1.2K m=2
```

Following is a sample with model:

```
r1 (1 2) resmod l=8u w=1u
```

Following is a sample model statement:

```
model resmod resistor rsh=150 l=2u w=2u etch=0.05u tc1=0.1 tnom=27 kf=1
```

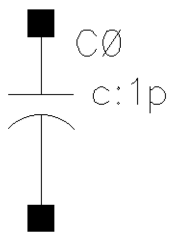
Additional Information

This device is supported within the altergroups.

5

Passive Components

Symbol: cap



Two Terminal Capacitor

You can assign the capacitance or let Spectre compute it from the physical length and width of the capacitor. In either case, the capacitance can be a function of temperature or applied voltage.

Command-line help

```
spectre -h capacitor
```

Component Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Capacitance	c	x	x	x	x	x	x	x	x
Initial condition	ic	x	x	x	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	-	-	-	x	-	-
Width	`w`	x	x	-	-	-	x	x	x
Length	`l`	x	x	-	-	-	x	x	x
Multiplier	`m`	x	x	-	-	-	x	x	x
Scale factor	`scale`	x	x	-	-	-	x	x	x
Temp rise from ambient	`trise`	x	x	-	-	-	-	-	-
Number of Polynomial Coeffs	`polyCoef`	-	-	-	-	-	x	x	x
Temperature coefficient 1	`tc1`	x	x	-	-	-	x	x	x
Temperature coefficient 2	`tc2`	x	x	-	-	-	x	x	x
Temperature difference	`dtemp`	-	-	-	-	-	x	x	x

Syntax/Synopsis

```
Name ( 1 2 ) ModelName <parameter=value> ...
Name ( 1 2 ) capacitor <parameter=value> ...
```

Model Synopsis:

```
model ModelName capacitor <parameter=value> ...
```

Example

Following is a sample without model:

```
c2 (1 0) capacitor c=2.5u tc1=1e-8
```

Following is a sample with model:

```
c2 (1 0) proc_cap c=2.5u tc1=1e-8
```

Following is a sample model statement:

```
model proc_cap capacitor c=2u tc1=1.2e-8 tnom=25
```

Additional Information

This device is supported within the altergroups.

Symbol: core

Magnetic Core with Hysteresis

This component models the magnetic hysteresis, with air gap, frequency, and temperature effects. The model is based on the AWB model for magnetic cores and windings. The user has to specify the core's material and geometric parameters to model the hysteresis.

The material parameters to specify are the 'Br', 'Bm', and 'Hc' of the core. The geometric parameters are the area, magnetic path length, and the air gap of the core.

You can specify the magnetic path length in one of the following ways:

- Give the length directly in cm.
- Or give the outer and inner diameter of the core.

Cores without terminals represent complete magnetic loops. Cores with terminals are fragments that you can use as building blocks to build models of complicated core structures.

Command-line help

```
spectre -h core
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	-	-	-	x	-	-
Device area	`area`	x	x	-	-	-	-	-	-
Physical length	`len`	x	x	-	-	-	-	-	-
Inner diam of toroidal core	`idiam`	x	x	-	-	-	-	-	-
Outer diam of toroidal core	`od`	x	x	-	-	-	-	-	-
Gap length	`gap`	x	x	-	-	-	-	-	-
Multiplier	`m`	x	x	-	-	-	-	-	-
Total Num of windings	`numOfL`	-	-	-	-	-	x	x	-
Name of winding 1	`l1 - l20`	-	-	-	-	-	x	x	-
Initial magnetization of core	`mag`	-	-	-	-	-	x	x	-

Syntax/Synopsis

```
Name ... ModelName <parameter=value> ...
```

Model Synopsis

```
model ModelName core <parameter=value> ...
```

Example

Following is a sample instance statement:

```
c1 (1 0) core_mod area=1.2 len=8.1 id=0.55 gap=0.25
```

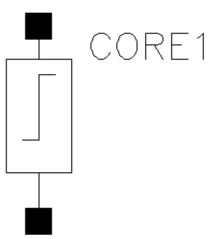
Following is a sample model statement:

```
model core_mod core len=7.7 area=0.85 br=1e3 bm=5e3 hc_t1=0.2 p1_f1=2.08
f1=10e3 p2_f2=50 f2=100K bflux=1e3 density=4.75
```

Additional Information

This device is not supported within the altergroups.

Symbol: corefragment



Magnetic Core with Hysteresis

Cores without terminals represent complete magnetic loops. Cores with terminals are fragments that you can use as building blocks to build models of complicated core structures.

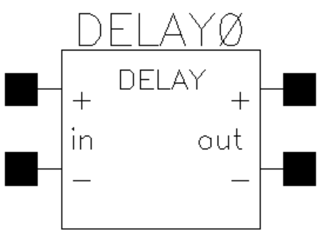
Command-line help

```
spectre -h core
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	model	x	x	-	-	-	-	-	-
Device area	area	x	x	-	-	-	-	-	-
Physical length	len	x	x	-	-	-	-	-	-
Inner diam of toroidal core	idiam	x	x	-	-	-	-	-	-
Outer diam of toroidal core	od	x	x	-	-	-	-	-	-
Gap length	gap	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	-

Symbol: delay



Delay Line

The delay line model is a four terminal device with zero output impedance and infinite input impedance. The output between nodes ‘p’ and ‘n’ is the input voltage between nodes ‘ps’ and ‘ns’ delayed by the time delay ‘td’ and scaled by ‘gain’.

Command-line help

```
spectre -h delay
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Delay time	td	x	x	-	-	-	-	-	-
Gain	gain	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( p n ps ns ) delay <parameter=value> ...
```

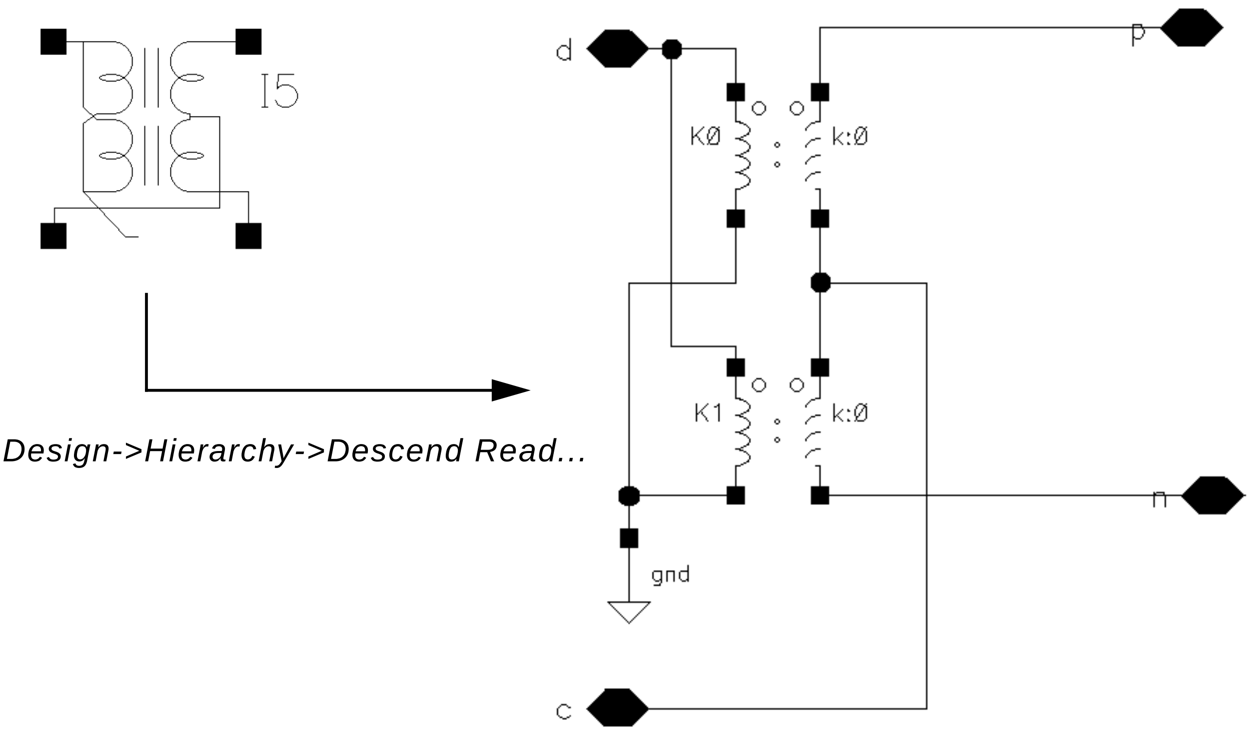
Example

```
dl1(outp outn cntrlp cntrln) delay td=10n gain=1.5
```

Additional Information

This device is not supported within the altergroups.

Symbol: ideal_balun



Balun

The balun is a bidirectional balanced-unbalanced convertor that can be used in circuits that require single or differential signal transformation. Although a passive network (including the transformer) is used to achieve balun, this implementation employs a three-port network. It requires three ports (or nodes) because the reference nodes are always at the global ground, single, blip, and bal_n.

The balun is used for converting ground-referred differential-mode (d) and common-mode (c) signals to balanced positive (p) and negative (n) signals.The balun is accurate at all frequencies including DC, because it uses ideal transformers.

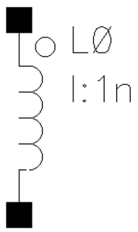
```
subckt balun (d c p n)
    T1 (d 0 p c) transformer n1=2
    T2 (d 0 c n) transformer n1=2
ends balun
```

Notice that the balun is bidirectional, you can use, as inputs or outputs, either the unbalanced signals (d for differential mode and c for common-mode) or the balanced signals (p for positive and n for negative).

Component Parameters

ideal_balun has no component parameters.

Symbol: ind



Two Terminal Inductor

The inductance of this component can be a function of temperature or branch current. If you do not specify the inductance in the instance statement, it is taken from the model.

Command-line help

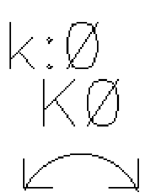
```
spectre -h inductor
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Inductance	`l`	x	x	x	x	x	x	x	x
Initial condition	`ic`	x	x	x	-	-	x	x	-
Model name	`model`	x	x	-	-	-	x	-	-
Resistance	`r`	x	-	-	-	-	x	x	x
Multiplier	`m`	x	x	-	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Temp rise from ambient	trise	x	x	-	-	-	-	-	-
Number of Polynomial Coeffs	polyCoef	-	-	-	-	-	x	x	-
Poly Coeff 1	c1 - c20	-	-	-	-	-	x	x	-
Temperature coefficient 1	tc1	-	-	-	-	-	x	x	x
Temperature coefficient 2	tc2	-	-	-	-	-	x	x	x
Scale factor	scale	-	-	-	-	-	x	x	x
Temperature difference	dtemp	-	-	-	-	-	x	x	x

Symbol: mind



Mutual Inductor

It couples two previously specified inductors. There is no limit to the number of inductors that you can couple or to the number of couplings to a particular inductor, but you must specify separate mutual inductor statements for each coupling. Using the ‘dot’ convention, place a ‘dot’ on the first terminal of each inductor.

The mutual inductor modifies the constitutive equations of two isolated inductors to:

```
v1 = L11*di1/dt + M*di2/dt
v2 = M*di1/dt + L22*di2/dt
```

where the mutual inductance, M, is computed from the coupling coefficient, k, using k = |M|/ sqrt(L11*L22).

Command-line help

```
spectre -h mutual_inductor
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceS	UltraSim
First coupled inductor	ind1	x	x	x	-	-	x	-	-
Second coupled inductor	ind2	x	x	x	-	-	x	-	-
Coupling coefficient	k	x	x	x	-	-	x	x	x

Syntax/Synopsis

```
Name mutual_inductor <parameter=value> ...
```

Example

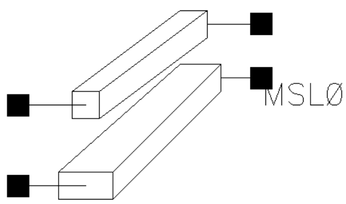
Following is a sample instance statement with two inductors:

```
l1 (1 0) inductor
l2 (2 0) inductor
ml1 mutual_inductor coupling=1 ind1=l1 ind2=l2
```

Additional Information

This device is not supported within the altergroups.

Symbol: msline



Microstrip Line

It is a microstrip line based on the equations of Hammerstad and Jensen. The model contains a thickness correction to the width and frequency dependent permittivity and characteristic impedance. The dispersion equations are those of Kirschning and Jansen.

Command-line help

```
spectre -h msline
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Length	l	x	x	-	-	-	-	-	-
Width	w	x	x	-	-	-	-	-	-
Substrate height	h	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Conductor thickness	t	x	x	-	-	-	-	-	-
Relative permittivity	eps	x	x	-	-	-	-	-	-
Multiplier	m	x	-	-	-	-	-	-	-
Max signal frequency	fmax	x	x	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( t1 b1 t2 b2 ) msline <parameter=value> ...
```

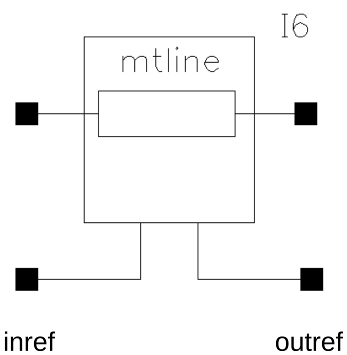
Example

```
tl1 (in 0 out 0) msline l=0.15 w=0.01 h=0.01
```

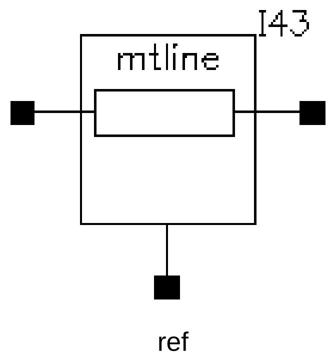
Additional Information

This device is supported within the altergroups.

Symbol: mtline



mtline without sub-circuit
(even number of pins)



mtline with sub-circuit
(odd number of pins)

Multi-Conductor Transmission Line

It is characterized by constant RLCG matrices or frequency dependent RLCG data. An mtline can have as many conductors as defined in the *Num of lines (excluding ref.)* field. However, there must be at least two conductors, with one conductor use

d as a reference, to define terminal voltages. The reference conductor can be ground. The order of the conductors is the same as the order of data in the input.

All of the conductors are assumed to have the same length. The input to `mtline` are conductor length, per-unit-length resistance (R), inductance (L), capacitance (C), and conductance (G) matrices. As these matrices are generally symmetric, either a full matrix description or a lower half matrix description can be used.

You can use mtline two different modes:

- without a sub-circuit by specifying an RLCG data file. This is the default option. In this case, mtline has an even number of terminals. For example, if Num of lines is 1, then there are two reference terminals, `inref` and `outref`.
- with a sub-circuit by using a subcircuit file generated by the LMG engine. In this case, mtline has an odd number of terminals. For example, if Num of lines is 1, then there is one reference terminal, `ref`.

The fields in the Edit Object Properties dialog box are as follows:

- Num of lines (excluding ref.)

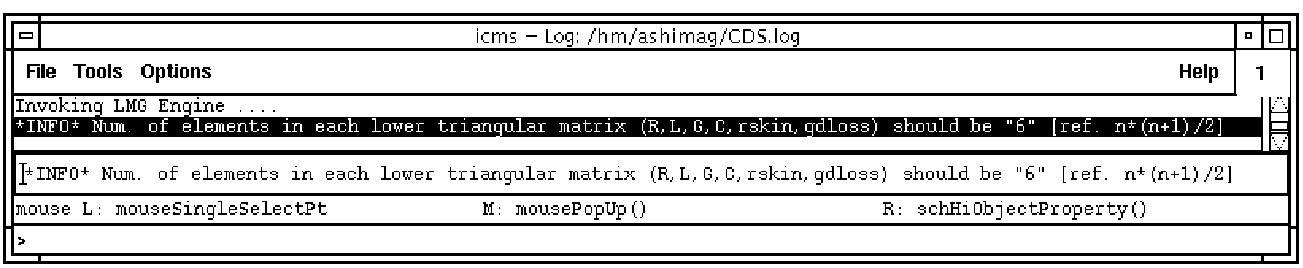
- LMG subcircuit file (with sub-circuit) or RLCG data file (without sub-circuit)
- use lmg subckt - if this option is selected then you need to specify the LMG sub-circuit file name. If this checkbox is not selected, then RLCG data file and the following RLCG specific fields are displayed:
    - ❑ Physical length
    - ❑ Enter RLCG etc. matrices
    - ❑ Frequency scale factor
    - ❑ Max signal frequency
    - ❑ Multiplicity factor

  Note: By default, this checkbox is not selected.

If you select the *Enter RLCG etc. matrices* option, then the following additional fields are displayed:

- R matrix per unit length
- L matrix per unit length
- G matrix per unit length
- C matrix per unit length
- Skin effect res matrix per unit
- Dielectric loss cond matrix per

The number of elements that you need to specify for the R/L/G is determined by the number of lines that you specify. For example, if the number of lines (n) is 3, then you need to specify (n*2) 6 elements each for R, L, and G. This information is displayed in CIW as follows.



Clicking the *Invoke 'LMG' parameter extraction tool* button invokes the Line Model Generator (LMG) tool from the hierarchy. Make sure you have defined `<install_dir>/tools/dfII/bin/lmg` in the path.

Note: It may take a few minutes for the LMG tool to be displayed.

For more information on LMG, refer to *SpectreRF Help for SpectreS, Chapter 7, Simulating Transmission Lines.*

Command-line help

```
spectre -h mtline
```

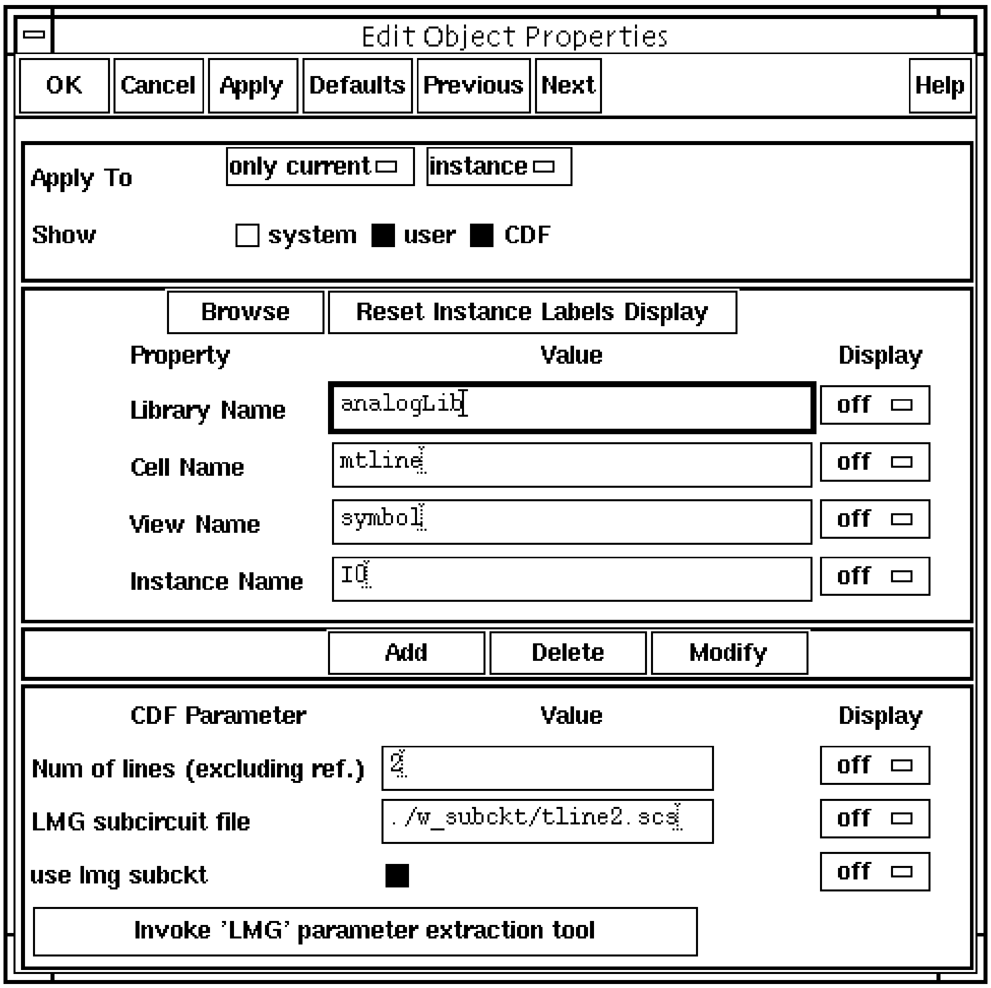
CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Num of lines (excluding ref.)	`n`	x	-	-	-	-	-	-	-
RLCG data file	`file`	x	-	-	-	-	-	-	-
LMG subcircuit file	`subcktfile`	x	-	-	-	-	-	-	-
use lmg subckt	`useImg`	x	-	-	-	-	-	-	-
Invoke 'LMG' parameter extraction tool	`firelmg`	x	-	-	-	-	-	-	-
Physical length	`len`	x	-	-	-	-	-	-	-
Enter RLCG etc. matrices	`entermatrices`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
R matrix per unit length	`r`	x	-	-	-	-	-	-	-
L matrix per unit length	`l`	x	-	-	-	-	-	-	-
G matrix per unit length	`g`	x	-	-	-	-	-	-	-
C matrix per unit length	`c`	x	-	-	-	-	-	-	-
Skin effect res matrix per unit length	`rskin`	x	-	-	-	-	-	-	-
Dielectric loss cond matrix per	`gdloss`	x	-	-	-	-	-	-	-
Frequency scale factor	`freqscale`	x	-	-	-	-	-	-	-
Max signal frequency	`fmax`	x	-	-	-	-	-	-	-
Multiplicity factor	`m`	x	-	-	-	-	-	-	-

Example

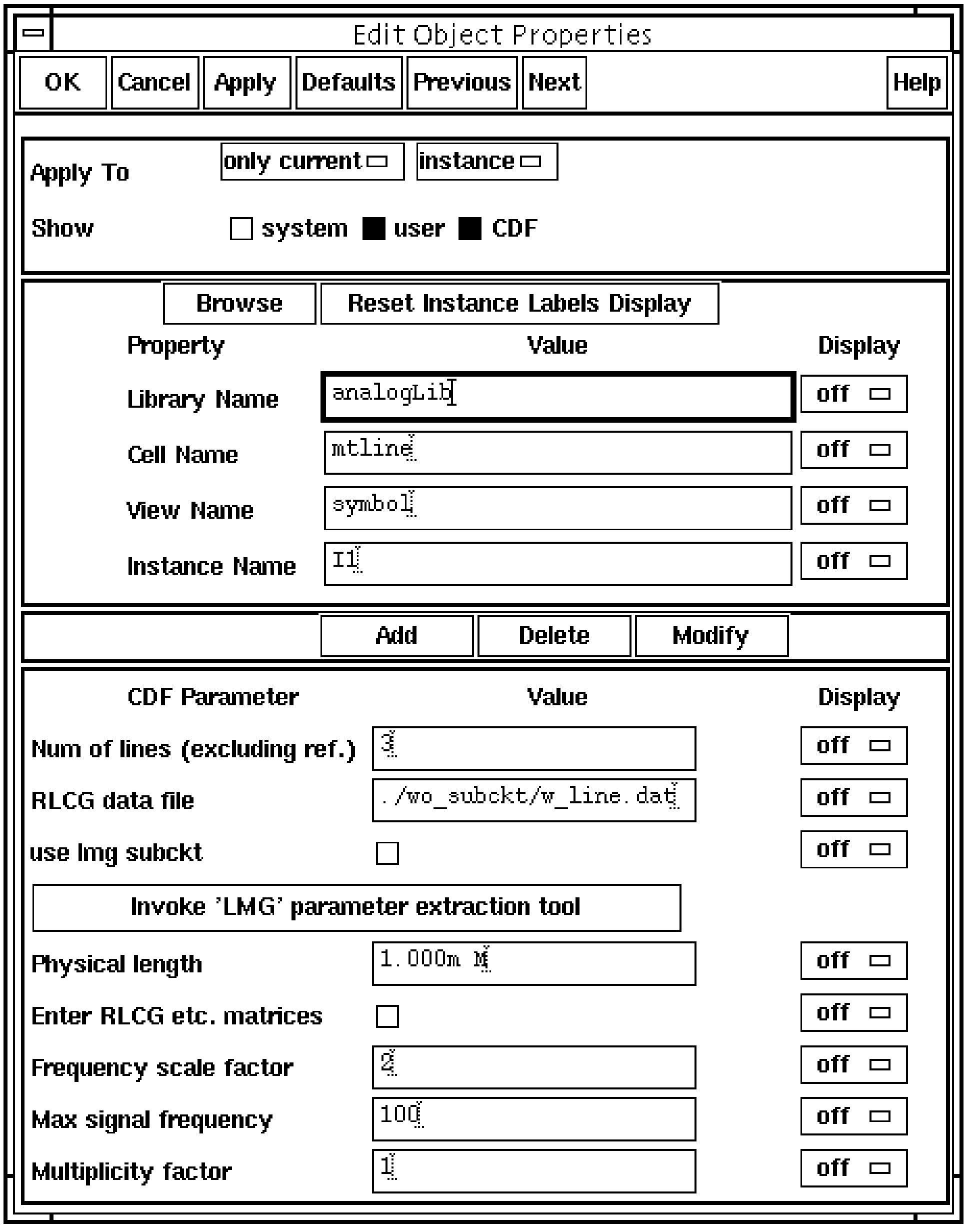
For adding a mtline with a sub-circuit, specify the following parameters:



Following is the netlist for an example of mtline with a sub-circuit:

```
I0 (net15 net16 net039 net040 net14) tline2
include "./w_subckt/tline2.scs"
```

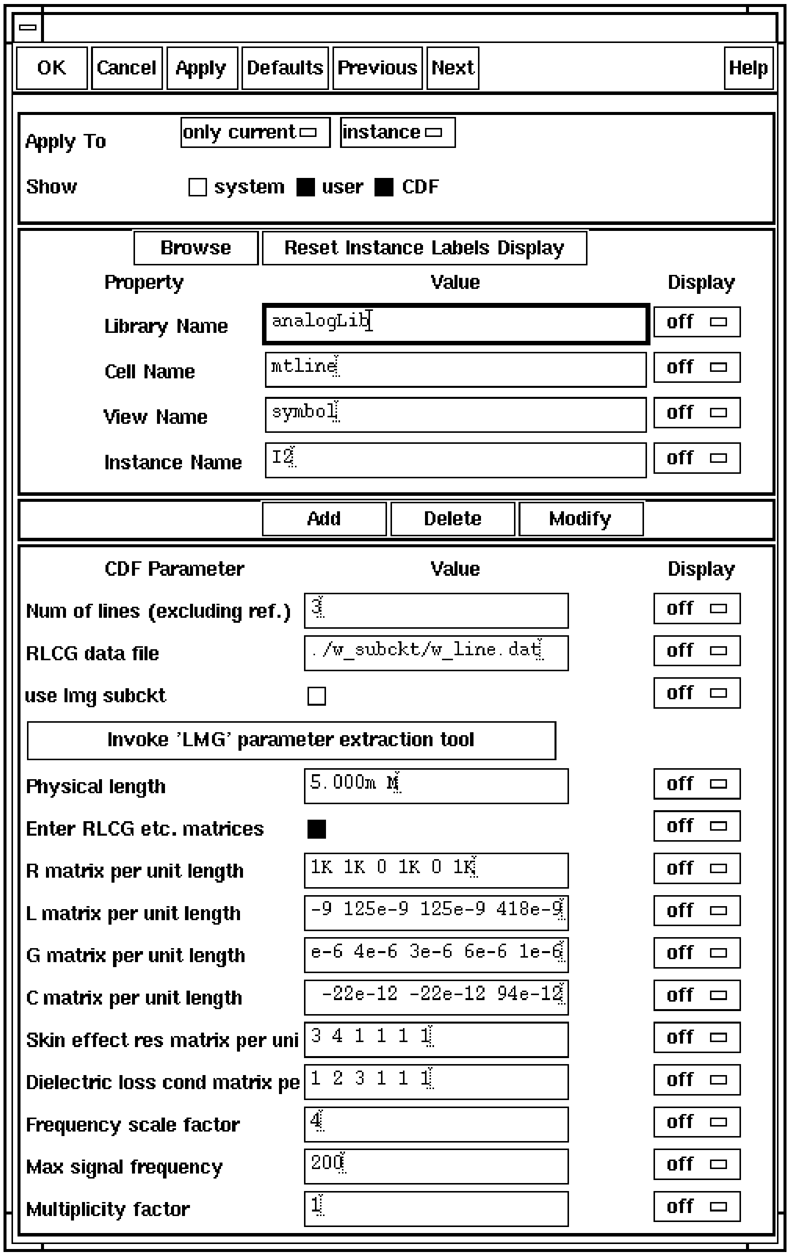
For adding a mtline without a sub-circuit and entermatrices=nil, specify the following parameters.



Following is the netlist for an example of mtline without a sub-circuit, with n=10, and entermatrices=nil:

```
I1 (net11 net12 net031 net032 net033 net034 net9 net10) mtline len=1.000m \
m=1 file="./wo_subckt/w_line.dat" freqscale=2 fmax=100
```

For adding a mtline without a sub-circuit, n=3, and entermatrices=t, specify the following parameters:



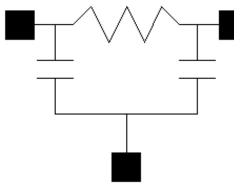
Following is the netlist for the example of mtline without a sub-circuit, n=3, and entermatrices=t.

```
I2 (net7 net8 net023 net024 net025 net026 net5 net6) mtline len=5.000m m=1 \
r=[1K 1K 0 1K 0 1K] l=[418e-9 125e-9 418e-9 125e-9 125e-9 418e-9] \
g=[23e-6 34e-6 4e-6 3e-6 6e-6 1e-6] c=[94e-12 -22e-12 94e-12 \
-22e-12 -22e-12 94e-12] rskin=[3 4 1 1 1 1] gdloss=[1 2 3 1 1 1] \
file="./w_subckt/w_line.dat" freqscale=4 fmax=200
```

Additional Information

This device is not supported within the altergroups.

Symbol: phyres



Physical Resistor

It consists of a two terminal resistor (tied between ‘t1’ and ‘t2’) and two diodes (tied between ‘t1’-‘t0’ and ‘t2’-‘t0’). The diodes are junction diodes. Under normal operation, the two diodes are reverse biased, but the parameter ‘subtype’ can reverse the direction of the diodes. If you do not specify ‘t0’, ground is assumed. The instance parameters always override model parameters. If you do not specify the instance resistance value, it is calculated from the model parameters.

Command-line help

```
spectre -h phy_res
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	x	-	-	-	-	-	-
Resistance	`r`	x	-	-	-	-	-	-	-
Capacitance	`c`	x	-	-	-	-	-	-	-
Length	`l`	x	-	-	-	-	-	-	-
Width	`w`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Temperature coefficient 1	`tc1`	x	-	-	-	-	-	-	-
Temperature coefficient 2	`tc2`	x	-	-	-	-	-	-	-
Lin temp co of lin cap	`tc1c`	x	-	-	-	-	-	-	-
Quad temp co of lin cap	`tc2c`	x	-	-	-	-	-	-	-
Temp rise from ambient	`trise`	x	-	-	-	-	-	-	-
Multiplier	`m`	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( 1 2 [0] ) ModelName <parameter=value> ...
```

Following is the model synopsis:

```
model ModelName phy_res <parameter=value> ...
```

Example

Following is the sample instance statement:

```
res1 (net9 vcc) resphy l=1e-3 w=2e-6
```

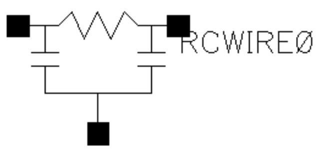
Following is the sample model statement:

```
model resphy phy_res rsh=85 tc1=1.53e-3 tc2=4.67e-7 etch=0 cj=1.33e-3
cjsw=3.15e-10 tc1c=9.26e-4
```

Additional Information

This device is supported within the altergroups.

Symbol: rcwireload



RC Wire Load

A wire model of a two terminal resistor with an optional third terminal at the instance level. If the third terminal is not specified then the two-terminal resistance model is used with the third terminal as ground.

In RC wire load model, R represents the interconnect metal or poly resistance and C represents substrate capacitance from node to ground.

You can specify the capacitance explicitly or allow it to be computed from the physical length and width of the resistor. The model parameter `cratio` can be used to allocate the parasitic capacitance of the wire element between the model's input capacitor and the output capacitor. The value of each capacitor, as a function of temperature, is represented as linear temperature coefficient of capacitor (tc1c) and quadratic temperature coefficient of capacitor (tc2c).

For details refer to spectre help.

Command-line help

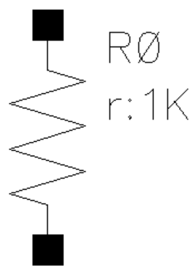
```
spectre -h resistor
```

Component Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Resistance	`r`	x	-	-	-	-	-	-	-
Length	`l`	x	-	-	-	-	-	-	-
Width	`w`	x	-	-	-	-	-	-	-
Resistance Form	`resform`	x	-	-	-	-	-	-	-
Multiplier	`m`	x	-	-	-	-	-	-	-
Scale factor	`scale`	x	-	-	-	-	-	-	-
Temp rise from ambient	`trise`	x	-	-	-	-	-	-	-
Temperature coefficient 1	`tc1`	x	-	-	-	-	-	-	-
Temperature coefficient 2	`tc2`	x	-	-	-	-	-	-	-
Generate noise?	`isnoisy`	x	-	-	-	-	-	-	-
Capacitance	`c`	x	-	-	-	-	-	-	-
Lin temp co of lin cap	`tc1c`	x	-	-	-	-	-	-	-
Quad temp co of lin cap	`tc2c`	x	-	-	-	-	-	-	-

Symbol: res



Two Terminal Resistor

You can give the resistance explicitly or allow it to be computed from the physical length and width of the resistor. In either case, the resistance can be a function of temperature or applied voltage.

If R(inst) is not given, R(inst) = R(model), if R(model) is given, then R(inst) = Rsh * (L - 2 * etchl) / (W - 2 * etch).

If the polynomial coefficients vector (‘coeffs=[c1 c2 ...]’) is specified, the resistor is nonlinear. When ‘nonlinform’ is set to ‘g’, the resistance is:

```
R(V) = dV / dI
     = R(inst) / (1 + c1 * V + c2 * V^2 + ...).
```

Command-line help

```
spectre -h resistor
```

Component Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Resistance	r	x	x	x	x	x	x	x	x
Temperature coefficient 1	tc1	x	x	x	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Temperature coefficient 2	`tc2`	x	x	x	-	-	x	x	x
Model name	`model`	x	x	-	-	-	x	-	-
Length	`l`	x	x	-	-	-	x	x	x
Width	`w`	x	x	-	-	-	x	x	x
Resistance Form	`resform`	x	x	-	-	-	-	-	-
Multiplier	`m`	x	x	-	-	-	x	x	x
Scale factor	`scale`	x	x	-	-	-	x	x	x
Temp rise from ambient	`trise`	x	x	-	-	-	-	-	-
Generate noise?	`isnoisy`	x	x	-	-	-	-	-	-
Capacitance connected	`hrc`	-	-	-	-	-	x	x	x
Temperature difference	`dtemp`	-	-	-	-	-	x	x	x
AC resistance	`ac`	-	-	-	-	-	x	x	-

Syntax/Synopsis

```
Name ( 1 2 ) ModelName <parameter=value> ...
Name ( 1 2 ) resistor <parameter=value> ...
```

Following is the model synopsis:

```
model ModelName resistor <parameter=value> ...
```

Example

Following is a sample instance statement without model:

```
r1 (1 2) resistor r=1.2K m=2
```

Following is a sample instance statement with model:

```
r1 (1 2) resmod l=8u w=1u
```

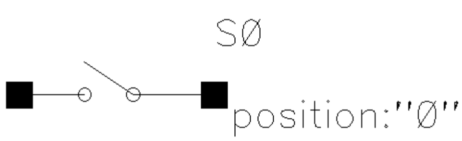
Following is a sample model statement:

```
model resmod resistor rsh=150 l=2u w=2u etch=0.05u tc1=0.1 tnom=27 kf=1
```

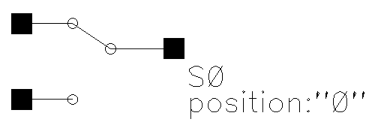
Additional Information

This device is supported within the altergroups.

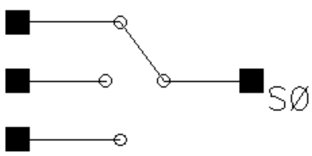
Symbol: spxtswitch



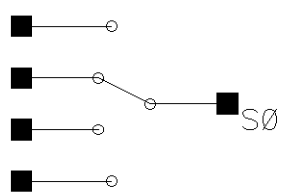
sp1tswitch



sp2tswitch



sp3tswitch



sp4tswitch

sp1tswitch - Ideal Switch With 1 Position

sp2tswitch - Ideal Switch With 2 Positions

sp3tswitch - Ideal Switch With 3 Positions sp4tswitch - Ideal Switch With 4 Positions

Ideal switch is a single-pole multiple-throw switch with infinite ‘off’ resistance and zero ‘on’ resistance. The switch is provided to allow you to reconfigure your circuit between analyses. You can only change the switch state between analyses (using the alter statement), not during an analysis.

Command-line help

```
spectre -h switch
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Switch position	position	x	x	-	-	-	-	-	-
DC position	dcPosition	x	x	-	-	-	-	-	-
AC position	acPosition	x	x	-	-	-	-	-	-
Tran position	tranPosition	x	x	-	-	-	-	-	-
IC position	icPosition	x	x	-	-	-	-	-	-
Offset voltage	offset	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( t0 t1 ... ) switch <parameter=value> ...
```

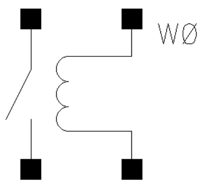
Example

```
sw1 (t1 t2 t3) switch dc_position=0 ac_position=1 tran_position=2
```

Additional Information

This device is not supported within the altergroups.

Symbol: switch



Four Terminal Relay

The four-terminal relay is a voltage controlled relay tied between terminals ‘t1’ and ‘t2’. The voltage between terminals ‘ps’ and ‘ns’ controls the relay resistance. The relay resistance varies nonlinearly between ‘ropen’ and ‘rclosed’, the open relay resistance and closed relay resistance, respectively. These resistance values correspond to control voltages of ‘vt1’ and ‘vt2’ respectively. The four parameters, ‘vt1’, ‘vt2’, ‘ropen’, and ‘rclosed’, can be instance or model parameters.

Command-line help

```
spectre -h relay
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Open/close voltage	`vsw`	-	-	x	-	-	-	-	-
Delay time	`td`	-	-	x	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Time interval for switching	ts	-	-	x	-	-	-	-	-
Open switch resistance	ro	x	x	x	-	-	-	-	-
Close switch resistance	rc	x	x	x	-	-	-	-	-
Open voltage	vt1	x	x	-	-	-	-	-	-
Closed voltage	vt2	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	-
Estimated operating region	region	x	x	-	-	-	-	-	-
Resistance	r	-	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( 1 2 ps ns ) ModelName <parameter=value> ...
Name ( 1 2 ps ns ) relay <parameter=value> ...
```

Following is the model synopsis:

```
model ModelName relay <parameter=value> ...
```

Example

Following is a sample instance statement:

```
rel1 (1 2 ps ns) my_relay ropen=1G rclosed=2
```

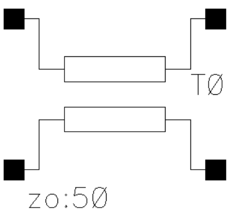
Following is a sample model statement:

```
model my_relay relay vt1=2.5 vt2=5 ropen=100M rclosed=0.1
```

Additional Information

This device is not supported within the altergroups.

Symbol: tline



Transmission Line (Lossy or Lossless)

The transmission line model includes dielectric and conductor loss effects. The conductor loss includes skin effect assuming finite or infinite conductor thickness.

Only the odd mode is modeled, so only the voltage difference across each port is important. The absolute voltage of each terminal is not significant. Also, the current into one node of a port exactly equals the current leaving the other node of the port.

Command-line help

```
spectre -h tline
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Characteristic impedance	zo	x	x	x	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Delay time	`td`	x	x	x	-	-	x	x	x
Frequency	`freq`	x	x	x	-	-	x	x	x
Normalized length	`nl`	x	x	x	-	-	x	x	x
Voltage 1	`v1`	-	-	x	-	-	x	x	x
Current 1	`i1`	-	-	x	-	-	x	x	x
Voltage 2	`v2`	-	-	x	-	-	x	x	x
Current 2	`i2`	-	-	x	-	-	x	x	x
Model name	`model`	x	x	-	-	-	-	-	-
Propogation velocity normalized	`vel`	x	x	-	-	-	-	-	x
Physical length	`len`	x	x	-	-	-	-	x	x
Multiplier	`m`	x	x	-	-	-	-	-	-
Loss resistance per unit length	`rs`	x	-	-	-	-	-	-	-
Loss conductance per unit length	`g`	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( t1 b1 t2 b2 ) ModelName <parameter=value> ...
Name ( t1 b1 t2 b2 ) tline <parameter=value> ...
```

Following is the model synopsis:

```
model ModelName tline <parameter=value> ...
```

Example

Following is a sample instance statement:

```
t1 (1 0 2 0) lmodel z0=100
```

Following is a sample model statement:

```
model lmodel tline f=10M z0=50 alphac=8501 fc=10M dcr=88
```

Additional Information

This device is supported within the altergroups.

Symbol: winding

Winding for Magnetic Core

A winding is used in conjunction with magnetic cores to model coils and transformers with hysteresis. Each winding must be associated with a single core, though a core may have any number of windings.

Command-line help

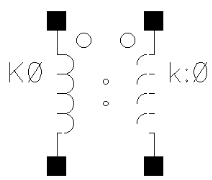
```
spectre -h winding
```

Component Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Name of core	core	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Num of turns on winding	`turn`	x	x	-	-	-	x	x	-
Res of the winding	`resis`	x	x	-	-	-	-	x	-
Multiplier	`m`	x	x	-	-	-	-	-	-
Initial condition	`ic`	x	x	-	-	-	x	x	-
Resistance	`r`	-	-	-	-	-	x	-	-

Symbol: xfmr



Linear Two Winding Ideal Transformer

Winding 1 connects terminals ‘t1’ and ‘b1’, and winding 2 connects ‘t2’ and ‘b2’. The number of turns on windings 1 and 2 are given by ‘n1’ and ‘n2’, respectively, and ‘n2’ must not be zero. The absolute number of turns of each winding is not important, only the ratio of ‘n1’ to ‘n2’. Current through winding 1 is computed.

An ideal transformer is modeled, so it acts as a transformer at DC. In particular, it implements

```
v1/v2 = n1/n2
i1/i2 = -n2/n1
```

Command-line help

```
spectre -h transformer
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Coupling coefficient	k	-	-	x	-	-	x	x	x
Primary inductor	pi	-	-	x	-	-	x	x	x
Secondary inductor	si	-	-	x	-	-	x	x	x
Number of turns on primary	n1	x	x	-	-	-	-	-	-
Num of turns on secondary	n2	x	x	-	-	-	-	-	-
Multiplier	m	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( t1 b1 t2 b2 ) transformer <parameter=value> ...
```

Example

```
tr1 (1 0 2 0) transformer n1=3 n2=3 m=2
```

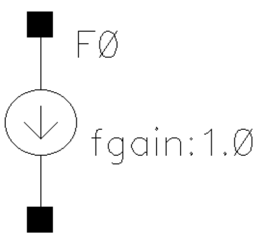
Additional Information

This device is not supported within the altergroups.

6

Sources - Dependent Components

Symbol: cccs



Linear Current Controlled Current Source

A current-controlled source detects the current with a probe device. A valid probe is a component instance in the circuit that naturally computes current. For example, probes can be voltage sources (independent or controlled), inductors, transmission lines, microstrip lines, N-ports, and transformers. If the probe device computes more than one current (such as transmission lines, microstrip lines, and N-ports), the index of the probe port through which the controlling current flows needs to be specified. Positive current exits the source node and enters the sink node of the controlled source.

Command-line help

```
spectre -h cccs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Name of voltage source	vref	x	x	x	-	-	x	x	x
Current gain	fgain	x	x	x	-	-	-	-	x
Initial condition	ic	-	-	x	-	-	-	-	x
Port	port	x	-	-	-	-	-	-	-
Type of transfer char	trfType	x	-	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	x
Type of Source	typesrc	x	-	-	-	-	-	-	-
Maximum Output Current	maxm	x	-	-	-	-	-	-	-
Minimum Output Current	minm	x	-	-	-	-	-	-	-
Absolute Output Current	absol	x	-	-	-	-	-	-	-
Smoothing Factor	smoothing	x	-	-	-	-	-	-	-
Type	csType	-	-	-	-	-	x	x	x
Current gain	hfgain	-	-	-	-	-	x	x	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Maximum output current	maxi	-	-	-	-	-	x	x	x
Minimum output current	mini	-	-	-	-	-	x	x	x
Scale factor	scale	-	-	-	-	-	x	x	x
Multiplier	hm	-	-	-	-	-	x	x	
Temperature coefficient 1	tc1	-	-	-	-	-	x	x	x
Temperature coefficient 2	tc2	-	-	-	-	-	x	x	x
Absolute value	habs	-	-	-	-	-	x	x	-
Initial condition	hic	-	-	-	-	-	x	x	-
Delta	delta	x	-	-	-	-	x	x	x
Number of controlling pairs	xypairs	-	-	-	-	-	x	x	x
Delay Time	htd	-	-	-	-	-	x	x	-
Absolute value	abs	x	-	-	-	-	-	-	x
Delay Time	td	-	-	-	-	-	-	-	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Controlling Volt 1	x1 - x20	-	-	-	-	-	x	x	x

Syntax/Synopsis

```
Name ( sink src ) cccs <parameter=value> ...
```

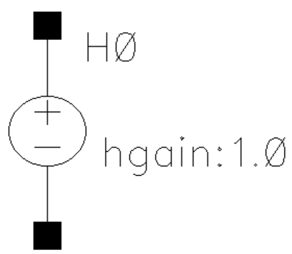
Example

```
vcs (pos gnd) cccs gain=2.5 probe=v1 m=1 //Note that v1 is an instance of a voltage source
```

Additional Information

This device is supported within the altergroups.

Symbol: ccvs



Linear Current Controlled Voltage Source

A current-controlled source senses the current with a probe device. A valid probe is a component instance in the circuit that naturally computes current. For example, probes can be voltage sources (independent or controlled), inductors, transmission lines, microstrip lines, N-ports, and transformers.

If the probe device computes more than one current (such as transmission lines, microstrip lines, and N-ports), the index of the probe port through which the controlling current flows needs to be specified. Current through the controlled voltage source is calculated and is defined to be positive if it flows from the positive terminal, through the source, to the negative terminal.

Command-line help

```
spectre -h ccvs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Name of voltage source	vref	x	x	x	-	-	x	x	x
Transresistance	hgain	x	x	x	-	-	-	-	x
Initial condition	ic	-	-	x	-	-	-	-	x
Port	port	x	-	-	-	-	-	-	-
Type of transfer char	trfType	x	-	-	-	-	-	-	-
Multiplier	m	x	-	-	-	-	-	-	-
Type of Source	typesrc	x	-	-	-	-	-	-	-
Minimum Output Voltage	minm	x	-	-	-	-	-	-	-
Maximum Output Voltage	maxm	x	-	-	-	-	-	-	-
Absolute Output Voltage	absol	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Smoothing Factor	`smoothing`	x	-	-	-	-	-	-	-
Type	`csType`	-	-	-	-	-	x	x	x
Transresistance	`hhgain`	-	-	-	-	-	-	x	-
Maximum output voltage	`maxv`	-	-	-	-	-	x	x	x
Minimum output voltage	`minv`	-	-	-	-	-	x	x	x
Scale factor	`scale`	-	-	-	-	-	x	x	x
Temperature coefficient 1	`tc1`	x	-	-	-	-	x	x	x
Temperature coefficient 2	`tc2`	x	-	-	-	-	x	x	x
Absolute value	`habs`	-	-	-	-	-	x	x	-
Initial condition	`hic`	-	-	-	-	-	x	x	-
Delta	`delta`	x	-	-	-	-	x	x	x
Number of controlling pairs	`xypairs`	-	-	-	-	-	x	x	x
Delay Time	`htd`	-	-	-	-	-	x	x	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Absolute value	abs	x	-	-	-	-	-	-	x
Delay Time	td	-	-	-	-	-	-	-	x
Controlling Volt 1	x1 - x20	-	-	-	-	-	x	x	x

Syntax/Synopsis

```
Name ( p n ) ccvs <parameter=value> ...
```

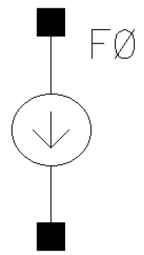
Example

```
vvs (pos gnd) ccvs rm=1 probe=v1 m=1   //Note that v1 is an instance of a voltage
source
```

Additional Information

This device is supported within the altergroups.

Symbol: pcccs



Polynomial Current Controlled Current Source

A vector of coefficients specifies the polynomial function that defines the relationship between the output current and the controlling currents. You must specify at least one coefficient.

For a polynomial in M variables a1, a2, ... am, the polynomial function F(a0,a1,...,am) is given by:

```
F = c0 + c1 * a1 + c2 * a2 + ...
+ c(m+1) * a1^2 + c(m+2) * a1 * a2 +...
+ c(2m+1) * a2^2 + c(2m+2) * a2 * a3 +...
```

where the ‘c’s are coefficients of the polynomial terms.

Command-line help

```
spectre -h pcccs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Max Coefficient Number	polyCoef	x	x	-	-	-	-	-	-
Poly Coeff 0	c0	x	x	-	-	-	-	-	-
Poly Coeff 1	c1	x	x	-	-	-	-	-	-
Poly Coeff 2	c2	x	x	-	-	-	-	-	-
Poly Coeff 3	c3	x	x	-	-	-	-	-	-
Poly Coeff 4	c4	x	x	-	-	-	-	-	-
Number of Probes	probeCnt	x	x	-	-	-	-	-	-
Probe 1	p1	x	x	-	-	-	-	-	-
Port 1	port1	x	x	-	-	-	-	-	-
Probe 2	p2	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Port 2	port2	x	x	-	-	-	-	-	-
Probe 3	p3	x	x	-	-	-	-	-	-
Port 3	port3	x	x	-	-	-	-	-	-
Probe 4	p4	x	x	-	-	-	-	-	-
Port 4	port4	x	x	-	-	-	-	-	-
Gain	gain	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	-
Maximum Output Current	maxm	x	-	-	-	-	x	-	-
Minimum Output Current	minm	x	-	-	-	-	x	-	-
Absolute Output Current	absol	x	-	-	-	-	-	-	-
Smoothing Factor	smoothing	x	-	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	-	-	-	-	x	-	-
Temperature coefficient 2	tc2	x	-	-	-	-	x	-	-

Syntax/Synopsis

```
Name ( sink src ) pcccs <parameter=value> ...
```

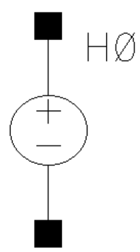
Example

```
vpc (net1 0) pcccs probes=[vb vc ve vlp vpn] coeffs=[0 8.8e6 -8.8e6 9e6 8e6 -9e6]
```

Additional Information

This device is not supported within the altergroups.

Symbol: pccvs



Polynomial Current Controlled Voltage Source

The polynomial function defining the relationship between the output voltage and the controlling currents is specified by a vector of coefficients. At least one coefficient must always be specified. Current through the voltage source is calculated and is defined as positive if it flows from the positive terminal, through the source, to the negative terminal.

For a polynomial in M variables a1, a2, ... am, the polynomial function F(a0,a1,...,am) is given by:

```
F = c0 + c1 * a1 + c2 * a2 + ...
+ c(m+1) * a1^2 + c(m+2) * a1 * a2 +...
+ c(2m+1) * a2^2 + c(2m+2) * a2 * a3 +...
```

where the ‘c’s are coefficients of the polynomial terms.

Command-line help

```
spectre -h pccvs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Max Coefficient Number	polyCoef	x	x	-	-	-	-	-	-
Poly Coeff 0	c0	x	x	-	-	-	-	-	-
Poly Coeff 1	c1	x	x	-	-	-	-	-	-
Poly Coeff 2	c2	x	x	-	-	-	-	-	-
Poly Coeff 3	c3	x	x	-	-	-	-	-	-
Poly Coeff 4	c4	x	x	-	-	-	-	-	-
Number of Probes	probeCnt	x	x	-	-	-	-	-	-
Probe 1	p1	x	x	-	-	-	-	-	-
Port 1	port1	x	x	-	-	-	-	-	-
Probe 2	p2	x	x	-	-	-	-	-	-
Port 2	port2	x	x	-	-	-	-	-	-
Probe 3	p3	x	x	-	-	-	-	-	-
Port 3	port3	x	x	-	-	-	-	-	-
Probe 4	p4	x	x	-	-	-	-	-	-
Port 4	port4	x	x	-	-	-	-	-	-
Gain	gain	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	-
Maximum Output Voltage	maxm	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Minimum Output Voltage	minm	x	-	-	-	-	-	-	-
Absolute Output Voltage	absol	x	-	-	-	-	-	-	-
Smoothing Factor	smoothing	x	-	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	-	-	-	-	-	-	-
Temperature coefficient 2	tc2	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( p n ) pccvs <parameter=value> ...
```

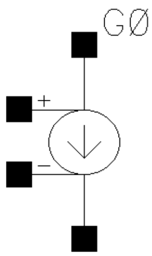
Example

```
ixy (net1 0) pccvs coeffs=[0 1 0 1] probes=[vin1 vin2] gain=2
```

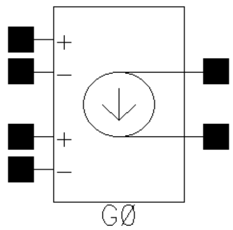
Additional Information

This device is not supported within the altergroups.

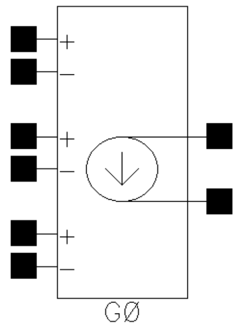
Symbol: pvccs, pvccs2, pvccs3



pvccs



pvccs2



pvccs3

Polynomial Voltage Controlled Current Source

A polynomial voltage controlled current source in which the symbol varies with the number of controlling voltages. A vector of coefficients specifies the polynomial function that defines the relationship between the output current and the controlling voltages. You must specify at least one coefficient.

For a polynomial in M variables a1, a2, ... am, the polynomial function F(a0,a1,...,am) is given by:

```
F = c0 + c1 * a1 + c2 * a2 + ...
+ c(m+1) * a1^2 + c(m+2) * a1 * a2 +...
+ c(2m+1) * a2^2 + c(2m+2) * a2 * a3 +...
```

where the ‘c’s are coefficients of the polynomial terms.

Command-line help

```
spectre -h pvccs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Max Coefficient Number	polyCoef	x	-	-	-	-	-	x	-
Poly Coeff 0	c0 - c10	x	-	-	-	-	-	x	-
Initial condition	ic	-	-	-	-	-	-	x	-
Scale factor	scale	-	-	-	-	-	-	x	-
Absolute value	abs	x	-	-	-	-	-	x	-
Gain	gain	x	-	-	-	-	-	-	-
Multiplier	m	x	-	-	-	-	-	x	-
Maximum Output Current	maxm	x	-	-	-	-	-	x	-
Minimum Output Current	minm	x	-	-	-	-	-	x	-
Absolute Output Current	absol	x	-	-	-	-	-	-	-
Smoothing Factor	smoothing	x	-	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	-	-	-	-	-	x	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Temperature coefficient 2	tc2	x	-	-	-	-	x	x	-

Syntax/Synopsis

```
Name ( sink src ps1 ns1 ... ) pvccs <parameter=value> ...
```

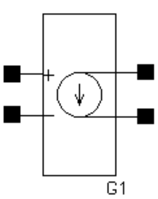
Example

```
v2 (net1 0 net2 0) pvccs coeffs=[0 -2e-3 - 10e-3] gain=2 m=1
```

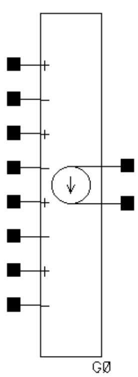
Additional Information

This device is not supported within the altergroups.

Symbol: pvccsp



pvccsp



pvccsp with 4 controlling voltages

Parameterized Cell Based Polynomial Nonlinear Voltage Controlled Current Source

pvccsp is a PCELL-based polynomial voltage controlled current source in which the symbol varies with the number of controlling voltages. pvccsp is similar to pvccs except that it has one additional parameter (nc) that specifies the number of controlling voltage sources.

Note: The maximum number of controlling voltages is 20. Therefore, if you specify a number greater than 20, the value of this parameter will default to 20.

Command-line help

```
spectre -h pvccs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Num of controlling voltage(s)	`nc`	x	-	-	-	-	-	-	-
Max Coefficient Number	`polyCoef`	x	-	-	-	-	-	-	-
Poly Coeff 0	`c0`	x	-	-	-	-	-	-	-
Poly Coeff 1	`c1`	x	-	-	-	-	-	-	-
Poly Coeff 2	`c2`	x	-	-	-	-	-	-	-
Poly Coeff 3	`c3`	x	-	-	-	-	-	-	-
Poly Coeff 4	`c4`	x	-	-	-	-	-	-	-
Gain	`gain`	x	-	-	-	-	-	-	-
Multiplier	`m`	x	-	-	-	-	-	-	-
Maximum Output Current	`maxm`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Minimum Output Current	`minm`	x	-	-	-	-	-	-	-
Absolute Output Current	`absol`	x	-	-	-	-	-	-	-
Smoothing Factor	`smoothing`	x	-	-	-	-	-	-	-
Temperature coefficient 1	`tc1`	x	-	-	-	-	-	-	-
Temperature coefficient 2	`tc2`	x	-	-	-	-	-	-	-

Example

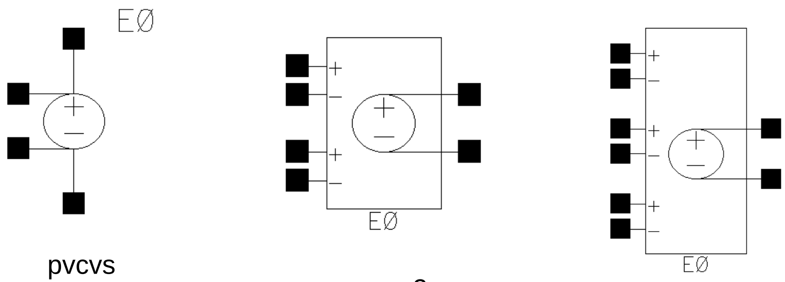
Following is the netlist when the pvccs coefficient is specified as an instance parameter and not specified in a file:

```
G0 (net21 net23 net22 net24 ) pvccs gain=1.0  m=1 coeffs=[ 1 1 1 1 ]  min=1.0
max=3.1 abs=off tc1=0 tc2=0
```

Following is the netlist when the pvccs coefficient is specified in a file:

```
G0 (net21 net23 net22 net24 ) pvccs gain=1.0  m=1 file=”abc.coeff”  min=1.0
max=3.1 abs=off tc1=0 tc2=0
```

Symbol: pvcvs, pvcvs2, pvcvs3



pvcvs pvcvs2 pvcvs3

Polynomial Voltage Controlled Voltage Source

It is a polynomial voltage controlled voltage source in which the symbol varies with the number of controlling voltages. A vector of coefficients specifies the polynomial function that defines the relationship between the output voltage and the controlling voltages. You must specify at least one coefficient. Current through the voltage source is calculated and is defined to be positive if it flows from the positive terminal, through the source, to the negative terminal.

For a polynomial in M variables a1, a2, ... am, the polynomial function F(a0,a1,...,am) is given by:

```
F = c0 + c1 * a1 + c2 * a2 + ...
+ c(m+1) * a1^2 + c(m+2) * a1 * a2 +...
+ c(2m+1) * a2^2 + c(2m+2) * a2 * a3 +...
```

where the ‘c’s are coefficients of the polynomial terms.

Command-line help

```
spectre -h pvcvs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Max Coefficient Number	polyCoef	x	x	-	-	-	-	-	-
Poly Coeff 0	c0 - c20	x	x	-	-	-	-	-	-
Initial condition	ic	-	-	-	-	-	-	x	-
Scale factor	scale	-	-	-	-	-	-	x	-
Absolute value	abs	x	-	-	-	-	-	x	-
Gain	gain	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	-
Minimum Output Voltage	minm	x	-	-	-	-	-	x	-
Maximum Output Voltage	maxm	x	-	-	-	-	-	x	-
Absolute Output Voltage	absol	x	-	-	-	-	-	-	-
Smoothing Factor	smoothing	x	-	-	-	-	-	-	-
Temperature coefficient 1	tc1	-	-	-	-	-	-	x	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Temperature coefficient 2	tc2	x	-	-	-	-	-	x	-

Syntax/Synopsis

```
Name ( p n ps1 ns1 ... ) pvcvs <parameter=value> ...
```

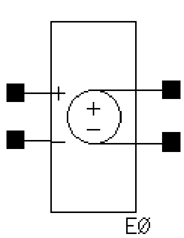
Example

```
v1 (p 0 c1 0) pvcvs coeffs=[0 0 0 0.1 1 1] gain=1
```

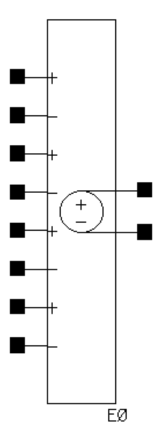
Additional Information

This device is not supported within the altergroups.

Symbol: pvcvsp



pvcvsp



pvcvsp with 4 controlling voltages

Parameterized Cell Based Polynomial Nonlinear Voltage Controlled Voltage Source

pvcvsp is a PCELL-based polynomial voltage controlled voltage source in which the symbol varies with the number of controlling voltages. This component is similar to pvcvs except that it has one additional parameter (nc) that specifies the number of the controlling voltage sources.

Note: The maximum number of controlling voltages is 20. Therefore, if you specify a number greater than 20, the value of this parameter will default to 20.

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Num of controlling voltage(s)	`nc`	x	-	-	-	-	-	-	-
Max Coefficient Number	`polyCoef`	x	-	-	-	-	-	-	-
Poly Coeff 0	`c0`	x	-	-	-	-	-	-	-
Poly Coeff 1	`c1`	x	-	-	-	-	-	-	-
Poly Coeff 2	`c2`	x	-	-	-	-	-	-	-
Poly Coeff 3	`c3`	x	-	-	-	-	-	-	-
Poly Coeff 4	`c4`	x	-	-	-	-	-	-	-
Gain	`gain`	x	-	-	-	-	-	-	-
Multiplier	`m`	x	-	-	-	-	-	-	-
Minimum Output Voltage	`min`	x	-	-	-	-	-	-	-
Maximum Output Voltage	`max`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Absolute Output Voltage	`abs`	x	-	-	-	-	-	-	-
Smoothing Factor	`delta`	x	-	-	-	-	-	-	-
Temperature coefficient 1	`tc1`	x	-	-	-	-	-	-	-
Temperature coefficient 2	`tc2`	x	-	-	-	-	-	-	-

Example

Following is the netlist when the pvcvs coefficient is passed as an instance parameter and not specified in a file:

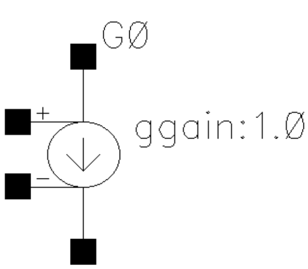
```
E0 (net21 net23 net22 net24 ) pvcvs gain=1.0  m=1 coeffs=[ 1 1 1 1 ]  min=1.0
max=3.1 abs=off tc1=0 tc2=0
```

Following is the netlist when the PVCVS coefficient is specified in a file:

```
E0 (net21 net23 net22 net24 ) pvcvs gain=1.0  m=1 file=”abc.coeff”  min=1.0
max=3.1 abs=off tc1=0 tc2=0
```

Note: The parameters, `polyCoef` and `coefSpec`, are not netlisted.

Symbol: vccs



Linear Voltage Controlled Current Source

Positive current exits the source node and enters the sink node.

Command-line help

```
spectre -h vccs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Transconductance	ggain	x	x	x	-	-	-	-	x
Initial condition	ic	-	-	x	-	-	-	-	x
Multiplier	m	x	-	-	-	-	-	-	x
Type	csType	-	-	-	-	-	x	x	x
Transconductance	hggain	-	-	-	-	-	x	x	-
Maximum output current	maxi	-	-	-	-	-	x	x	x
Minimum output current	mini	-	-	-	-	-	x	x	x
Scale factor	scale	-	-	-	-	-	x	x	x
Multiplier	hm	-	-	-	-	-	x	x	-
Temperature coefficient 1	tc1	-	-	-	-	-	x	x	x
Temperature coefficient 2	tc2	-	-	-	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Absolute value	habs	-	-	-	-	-	x	x	-
Initial condition	hic	-	-	-	-	-	x	x	-
Pwl type	pwlType	-	-	-	-	-	x	x	x
Delta	delta	x	-	-	-	-	x	x	x
Number of controlling pairs	xypairs	-	-	-	-	-	x	x	x
Delay Time	htd	-	-	-	-	-	x	x	-
Absolute value	abs	x	-	-	-	-	-	-	x
Delay Time	td	-	-	-	-	-	-	-	x

Syntax/Synopsis

```
Name ( sink src ps ns ) vccs <parameter=value> ...
```

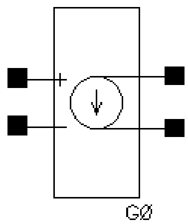
Example

```
v1 (1 0 2 3) gm=-1 m=2
```

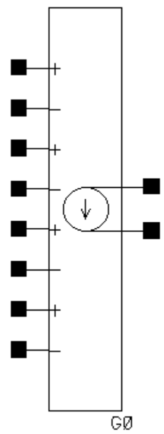
Additional Information

This device is supported within the altergroups.

Symbol: vccsp



vccsp



vccsp with 4
controlling voltages

Parameterized Cell Based Voltage Controlled Current Source

vccsp is a PCELL-based voltage controlled current source in which the symbol varies with the number of controlling voltages. vccsp is similar to vccs except that it has one additional parameter (nc) that specifies the number of controlling voltage sources.

Note: The maximum number of controlling voltages is 20. Therefore, if you specify a number greater than 20, the value of this parameter will default to 20.

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Num of controlling voltage(s)	`nc`	x	-	-	-	-	-	-	-
Transconductance	`ggain`	x	-	-	-	-	-	-	-
Multiplier	`m`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Type of Source	`typesrc`	x	-	-	-	-	-	-	-
Minimum Output Voltage	`min`	x	-	-	-	-	-	-	-
Maximum Output Voltage	`max`	x	-	-	-	-	-	-	-
Absolute Output Voltage	`abs`	x	-	-	-	-	-	-	-
Smoothing Factor	`delta`	x	-	-	-	-	-	-	-
Temperature coefficient 1	`tc1`	x	-	-	-	-	-	-	-
Temperature coefficient 2	`tc2`	x	-	-	-	-	-	-	-

Example

Following is the netlist for the linear transfer characteristic:

```
G0  (net011 net012 net09 net010) vcvs type=vcvs  m=1  gain =1.0 min=1 max=4
abs=off tc1= 0 tc2=0
```

Following is the netlist for the PWL transfer characteristic when the voltage or voltage pair is not specified in a file:

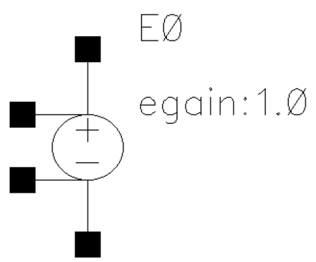
```
G0  (net011 net012 net09 net010) vcvs type=vcvs  m=1 pwl=[1 1 2 4] scale=1
delta=0 tc1=0 tc2=0
```

Following is the netlist for the PWL transfer characteristic when the voltage or voltage pair is specified in a file:

```
G0  (net011 net012 net09 net010) vcvs type=vcvs  m=1 file=”abc” scale=1 delta=0
tc1=0 tc2=0
```

Note: The parameters, `trfType` and `iVectSpec` are not netlisted.

Symbol: vcvs



Linear Voltage Controlled Voltage Source

Current through the voltage source is calculated and is defined to be positive if it flows from the positive terminal, through the source, to the negative terminal.

Command-line help

```
spectre -h vcvs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Voltage gain	egain	x	x	x	-	-	-	-	x
Initial condition	ic	-	-	x	-	-	-	-	x
Multiplier	m	x	-	-	-	-	-	-	-
Type	csType	-	-	-	-	-	x	x	x
Voltage gain	hegain	-	-	-	-	-	x	x	-
Maximum output voltage	maxv	-	-	-	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Minimum output voltage	minv	-	-	-	-	-	x	x	x
Scale factor	scale	-	-	-	-	-	x	x	x
Temperature coefficient 1	tc1	-	-	-	-	-	x	x	x
Temperature coefficient 2	tc2	-	-	-	-	-	x	x	x
Absolute value	habs	-	-	-	-	-	x	x	-
Initial condition	hic	-	-	-	-	-	x	x	-
Delta	delta	x	-	-	-	-	x	x	x
Number of controlling pairs	xypairs	-	-	-	-	-	x	x	x
Delay Time	htd	-	-	-	-	-	x	x	-
Absolute value	abs	x	-	-	-	-	-	-	x
Delay Time	td	-	-	-	-	-	-	-	x

Syntax/Synopsis

```
Name ( p n ps ns ) vcvs <parameter=value> ...
```

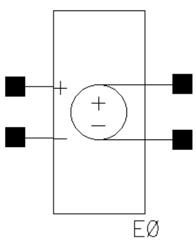
Example

```
e1 (out1 0 pos neg) vcvs gain=10
```

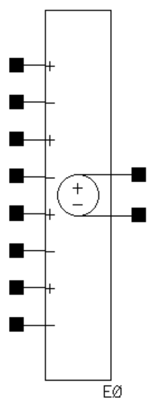
Additional Information

This device is supported within the altergroups.

Symbol: vcvsp



vcvsp



vcvsp with 4
controlling voltages

Parameterized Cell Based Voltage Controlled Voltage Source

vcvsp is a PCELL-based voltage controlled voltage source in which the symbol varies with the number of controlling voltages.

Note: The maximum number of controlling voltages is 20. Therefore, if you specify a number greater than 20, the value of this parameter will default to 20.

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Num of controlling voltage(s)	`nc`	x	-	-	-	-	-	-	-
Type of transfer char	`trfType`	x	-	-	-	-	-	-	-
Voltage gain	`egain`	x	-	-	-	-	-	-	-
Multiplier	`m`	x	-	-	-	-	-	-	-
Type of source	`type`	x	-	-	-	-	-	-	-
Minimum Output Voltage	`min`	x	-	-	-	-	-	-	-
Maximum Output Voltage	`max`	x	-	-	-	-	-	-	-
Absolute Output Voltage	`abs`	x	-	-	-	-	-	-	-
Smoothing Factor	`delta`	x	-	-	-	-	-	-	-
Temperature coefficient 1	`tc1`	x	-	-	-	-	-	-	-
Temperature coefficient 2	`tc2`	x	-	-	-	-	-	-	-

Example

Following is the netlist for linear transfer characteristic:

```
G0  (net011 net012 net09 net010) vcvs type=vcvs  m=1  gain =1.0 min=1 max=4
abs=off tc1= 0 tc2=0
```

Following is the netlist for PWL transfer characteristic when the voltage or voltage pair is not specified in a file but passed as an instance parameter:

```
G0  (net011 net012 net09 net010) vcvs type=vcvs  m=1 pwl=[1 1 2 4]   scale=1
delta=0 tc1=0 tc2=0
```

Following is the netlist for PWL transfer characteristic when the voltage or voltage pair is not specified in a file:

```
G0  (net011 net012 net09 net010) vcvs type=vcvs  m=1 file=”abc”   scale=1
delta=0 tc1=0 tc2=0
```

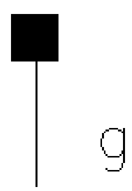
Note: The parameters, `trfType` and `iVectSpec`, are not netlisted.

7

Sources - Global Components

This chapter contains a list of all those components of the Analog Library that netlist as a global net.

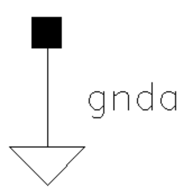
Symbol: gnd



Component Parameters

gnd has no component parameters.

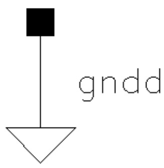
Symbol: gnda



Component Parameters

gnda has no component parameters.

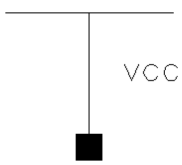
Symbol: gndd



Component Parameters

gndd has no component parameters.

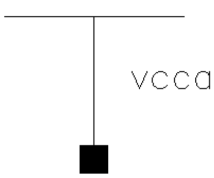
Symbol: vcc



Component Parameters

vcc has no component parameters.

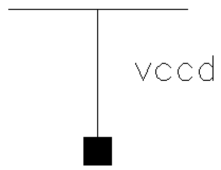
Symbol: vcca



Component Parameters

vcca has no component parameters.

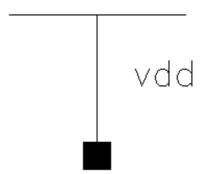
Symbol: vccd



Component Parameters

vccd has no component parameters.

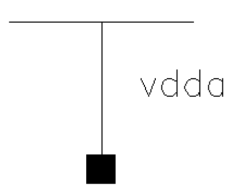
Symbol: vdd



Component Parameters

vdd has no component parameters.

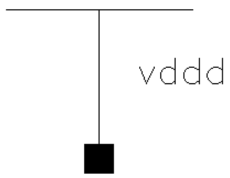
Symbol: vdda



Component Parameters

vdda has no component parameters.

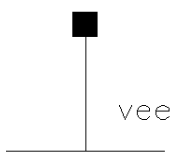
Symbol: vddd



Component Parameters

vddd has no component parameters.

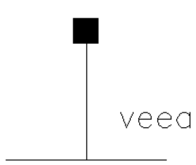
Symbol: vee



Component Parameters

vee has no component parameters.

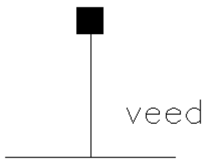
Symbol: veea



Component Parameters

veea has no component parameters.

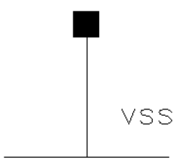
Symbol: veed



Component Parameters

veed has no component parameters.

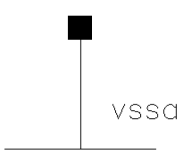
Symbol: vss



Component Parameters

vss has no component parameters.

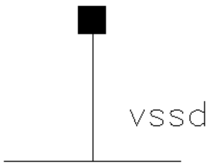
Symbol: vssa



Component Parameters

vssa has no component parameters.

Symbol: vssd



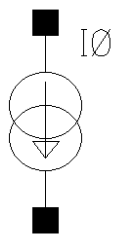
Component Parameters

vssd has no component parameters.

8

Sources - Independent Components

Symbol: idc



Independent DC Current Source

idc is a constant isource.

Command-line help

```
spectre -h isource
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC magnitude	acm	x	x	x	-	-	x	x	x
AC phase	acp	x	x	x	-	-	x	x	x
DC current	idc	x	x	x	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	x	x	x
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-
Source type	srcType	x	-	-	-	-	-	-	-
AC Phase	acPhase	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( sink src ) isource <parameter=value> ...
```

Positive current exits the source node and enters the sink node.

Example

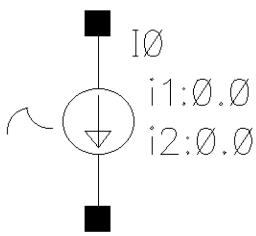
```
i1 (in 0) isource dc=0 type=pulse delay=10n val0=0 val1=500u period=500n

rise=1n fall=1n width=250n
```

Additional Information

This device is supported within the altergroups.

Symbol: iexp



Independent Exponential Current Source

Command-line help

```
spectre -h isource
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC magnitude	acm	x	x	x	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC phase	acp	x	x	x	-	-	x	x	x
DC current	idc	x	x	x	-	-	-	x	x
Current 1	i1	x	x	x	-	-	x	x	x
Current 2	i2	x	x	x	-	-	x	x	x
Delay time 1	td1	x	x	x	-	-	x	x	x
Damping factor 1	tau1	x	x	x	-	-	x	x	x
Delay time 2	td2	x	x	x	-	-	x	x	x
Damping factor 2	tau2	x	x	x	-	-	-	x	x
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	x	x	x
Delay time	td	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
DC source	dc	-	-	-	-	-	x	x	x
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Delay Time	delay	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( sink src ) isource <parameter=value> ...
```

Positive current exits the source node and enters the sink node.

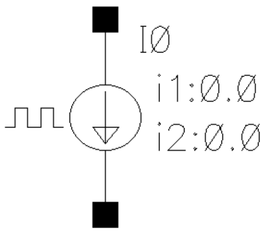
Example

```
i1 (in 0) isource dc=0 type=pulse delay=10n val0=0 val1=500u period=500n
rise=1n fall=1n width=250n
```

Additional Information

This device is supported within the altergroups.

Symbol: ipulse



Independent Pulse Current Source

ipulse is a square wave varying isource.

Command-line help

```
spectre -h isource
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC magnitude	acm	x	x	x	-	-	x	x	x
AC phase	acp	x	x	x	-	-	x	x	x
DC current	idc	x	x	x	-	-	-		
Current 1	i1	x	x	x	-	-	x	x	x
Current 2	i2	x	x	x	-	-	x	x	x
Delay time	td	x	x	x	-	-	x	x	x
Rise time	tr	x	x	x	-	-	x	x	x
Fall time	tf	x	x	x	-	-	x	x	x
Pulse width	pw	x		x	-	-	x	x	x
Period	per	x	x	x	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Frequency name for 1/period	fundname	x	-	-	-	-	-	-	-
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	x	x	x
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
DC source	dc	-	-	-	-	-	x	x	x
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Source type	srcType	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Delay Time	delay	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( sink src ) isource <parameter=value> ...
```

Positive current exits the source node and enters the sink node.

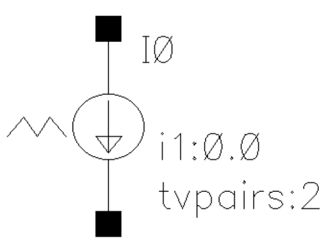
Example

```
i1 (in 0) isource dc=0 type=pulse delay=10n val0=0 val1=500u period=500n
rise=1n fall=1n width=250n
```

Additional Information

This device is supported within the altergroups.

Symbol: ipwl



Independent Piece-Wise Linear Current Source

Command-line help

```
spectre -h isource
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Number of pairs of points	`tvpairs`	x	x	x	-	-	x	x	x
AC magnitude	`acm`	x	x	x	-	-	x	x	x
AC phase	`acp`	x	x	x	-	-	x	x	x
DC current	`idc`	x	x	x	-	-	-		
Time 1	`t1 - t50`	x	x	x	-	-	x	x	x
Current 1	`i1 - i50`	x	x	x	-	-	x	x	x
Frequency name for 1/period	`fundname`	x	-	-	-	-	-	-	-
Noise file name	`noisefile`	x	x	-	-	-	-	-	-
Number of noise/freq pairs	`FNpairs`	x	x	-	-	-	-	-	-
XF magnitude	`xfm`	x	x	-	-	-	-	-	-
PAC magnitude	`pacm`	x	x	-	-	-	-	-	-
PAC phase	`pacp`	x	x	-	-	-	-	-	-
Multiplier	`m`	x	x	-	-	-	x	x	x
Delay time	`td`	x	x	-	-	-	x	x	x
Offset current	`io`	x	x	-	-	-	-	-	-
Scale factor	`scale`	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Time scale factor	stretch	x	x	-	-	-	-	-	-
Period of the PWL	pwlperiod	x	x	-	-	-	-	-	-
Transition width	twidth	x	x	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
DC source	dc	-	-	-	-	-	x	x	x
Repeated function	rpt	-	-	-	-	-	x	x	x
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Source type	srcType	x	-	-	-	-	-	-	-
Delay Time	delay	x	-	-	-	-	-	-	-
Transition width	twidth	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( sink src ) isource <parameter=value> ...
```

Positive current exits the source node and enters the sink node.

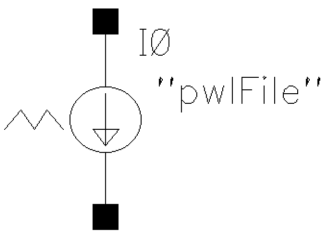
Example

```
i1 (in 0) isource dc=0 type=pulse delay=10n val0=0 val1=500u period=500n
rise=1n fall=1n width=250n
```

Additional Information

This device is supported within the altergroups.

Symbol: ipwlf



Independent Piece-Wise Linear Current Source Based on a File

Command-line help

```
spectre -h isource
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC magnitude	acm	x	x	x	-	-	x	x	-
AC phase	acp	x	x	x	-	-	x	x	-
DC current	idc	x	x	x	-	-	x	x	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
PWL file name	fileName	x	x	x	-	-	x	x	-
Frequency name for 1/period	fundname	x	-	-	-	-	-	-	-
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	-
Delay time	td	x	x	-	-	-	-	-	-
Offset current	io	x	x	-	-	-	-	-	-
Scale factor	scale	x	x	-	-	-	-	-	-
Time scale factor	stretch	x	x	-	-	-	-	-	-
Period of the PWL	pwlperiod	x	x	-	-	-	-	-	-
Transition width	twidth	x	x	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Source type	srcType	x	-	-	-	-	-	-	-
Delay Time	delay	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( sink src ) isource <parameter=value> ...
```

Positive current exits the source node and enters the sink node.

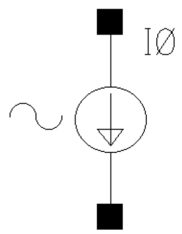
Example

```
i1 (in 0) isource dc=0 type=pulse delay=10n val0=0 val1=500u period=500n
rise=1n fall=1n width=250n
```

Additional Information

This device is supported within the altergroups.

Symbol: isin



Independent Sinusoidal Current Source

isin is a sin wave isource.

Command-line help

```
spectre -h isource
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC magnitude	acm	x	x	x	-	-	x	x	x
AC phase	acp	x	x	x	-	-	x	x	x
DC current	idc	x	x	x	-	-	-		
Offset current	io	x	x	x	-	-	x	x	x
Amplitude	ia	x	x	x	-	-	x	x	x
Frequency	freq	x	x	x	-	-	x	x	x
Delay time	td	x	x	x	-	-	x	x	x
Damping factor	theta	x	x	x	-	-	x	x	x
First frequency name	fundname	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Second frequency name	fundname2	x	-	-	-	-	-	-	-
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	x	x	x
Initial phase for Sinusoid	sinephase	x	x	-	-	-	-	-	-
Amplitude 2	ia2	x	x	-	-	-	-	-	-
Initial phase for Sinusoid 2	sinephase2	x	x	-	-	-	-	-	-
Frequency 2	freq2	x	x	-	-	-	-	-	-
FM modulation index	fmmodindex	x	x	-	-	-	-	-	-
FM modulation frequency	fmmodfreq	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AM modulation index	ammodindex	x	x	-	-	-	-	-	-
AM modulation frequency	ammodfreq	x	x	-	-	-	-	-	-
AM modulation phase	ammodphase	x	x	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
Noise temperature	noisetemp	x	x	-	-	-	-	-	-
DC source	dc	-	-	-	-	-	x	x	x
Phase delay	phi	-	-	-	-	-	x	x	x
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Delay Time	delay	x	-	-	-	-	-	-	-
Sine DC level	sinedc	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( sink src ) isource <parameter=value> ...
```

Positive current exits the source node and enters the sink node.

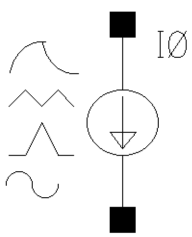
Example

```
i1 (in 0) isource dc=0 type=pulse delay=10n val0=0 val1=500u period=500n
rise=1n fall=1n width=250n
```

Additional Information

This device is supported within the altergroups.

Symbol: isource



Independent Current Source

The value of the DC current as a function of the temperature is given by:

```
I(T) = I(tnom) * [1 + tc1 * (T - tnom) + tc2 * (T - tnom)^2].
```

Command-line help

```
spectre -h isourcevt
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
DC current	idc	x	-	-	-	-	-	-	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Source type	srcType	x	-	-	-	-	-	-	-
Frequency name 1	fundname	x	-	-	-	-	-	-	-
Frequency 1	freq	x	-	-	-	-	-	-	x
Amplitude 1 (Ipk)	ia	x	-	-	-	-	-	-	x
Phase for Sinusoid 1	sinephase	x	-	-	-	-	-	-	-
Sine DC level	sinedc	x	-	-	-	-	-	-	-
File name	fileName	x	-	-	-	-	-	-	-
Number of PWL/Time pair	tvpairs	x	-	-	-	-	-	-	-
Time 1	t1 - t50	x	-	-	-	-	-	-	-
Current 1	i1 - i50	x	-	-	-	-	-	-	-
Delay time	td	x	-	-	-	-	-	-	x
Rise time start	td1	x	-	-	-	-	-	-	-
Rise time constant	tau1	x	-	-	-	-	-	-	-
Fall time start	td2	x	-	-	-	-	-	-	-
Fall time constant	tau2	x	-	-	-	-	-	-	-
DC offset	offset	x	x	-	-	-	-	-	-
Amplitude scale factor	scale	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Time scale factor	stretch	x	x	-	-	-	-	-	-
Breakpoints	allbrkpts	x	-	-	-	-	-	-	-
Period	pwlperiod	x	-	-	-	-	-	-	-
Period start time	pwlperiodstart	x	-	-	-	-	-	-	-
Transition width	twidth	x	-	-	-	-	-	-	-
Period of waveform	per	x	-	-	-	-	-	-	-
Display second sinusoid	numofsines	x	-	-	-	-	-	-	-
FM modulation index 1	fmmodindex	x	x	-	-	-	-	-	-
FM modulation freq 1	fmmodfreq	x	x	-	-	-	-	-	-
AM modulation index 1	ammodindex	x	x	-	-	-	-	-	-
AM modulation freq 1	ammodfreq	x	x	-	-	-	-	-	-
AM modulation phase 1	ammodphase	x	x	-	-	-	-	-	-
Damping factor 1	theta	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Display small signal params	smallSig	x	-	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-
AC magnitude	acm	x	x	-	-	-	-	-	-
AC phase	acp	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
Display noise parameters	noiseParam	x	-	-	-	-	-	-	-
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Display modulation params	modulation	x	-	-	-	-	-	-	-
Display temperature params	tempParam	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Linear temp. coefficient	tc1	x	-	-	-	-	-	-	-
Quadratic temp. coeff.	tc2	x	-	-	-	-	-	-	-
Multiplier	m	x	-	-	-	-	-	-	x
DC source	dc	-	-	-	-	-	-	-	x
Phase delay	phi	-	-	-	-	-	-	-	x

Syntax/Synopsis

```
Name ( sink src ) isource <parameter=value> ...
```

Positive current exits the source node and enters the sink node.

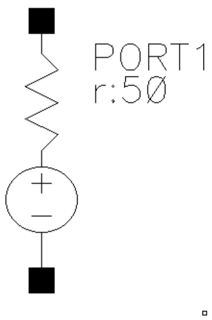
Example

```
i1 (in 0) isource dc=0 type=pulse delay=10n val0=0 val1=500u period=500n
rise=1n fall=1n width=250n
```

Additional Information

This device is supported within the altergroups.

Symbol: pdc



Independent DC Resistive Source

When Source type=dc, the dc and temperature effect parameters are active and set the DC level for all analyses. The DC voltage sets the DC level of the source for DC analysis. The value must be a real number. If you do not specify the DC value, it is assumed to be the time =0 value of the waveform.

The DC voltage parameter specifies the DC voltage across the port when it is terminated in its reference resistance. In other words, the DC voltage of the internal voltage source is double the user specified DC value, dc. The same is true for the values for the transient, AC, and PAC signals of the port.

For more information on this component refer to Appendix H, of SpectreRF User Guide.

Command-line help

```
spectre -h port
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Freq 1 to Freq 10	`F1 - F10`	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	`N1 - N10`	x	x	-	-	-	-	-	-
Resistance	`r`	x	x	-	-	-	-	-	-
Port number	`num`	x	x	-	-	-	-	-	-
DC voltage	`vdc`	x	x	-	-	-	-	-	-
Multiplier	`m`	x	x	-	-	-	-	-	-
Temperature coefficient 1	`tc1`	x	x	-	-	-	-	-	-
Temperature coefficient 2	`tc2`	x	x	-	-	-	-	-	-
Nominal temperature	`tnom`	x	x	-	-	-	-	-	-
AC magnitude	`acm`	x	x	-	-	-	-	-	-
AC phase	`acp`	x	x	-	-	-	-	-	-
XF magnitude	`xfm`	x	x	-	-	-	-	-	-
PAC magnitude	`pacm`	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
PAC phase	pacp	x	x	-	-	-	-	-	-
Source type	srcType	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( p n ) port <parameter=value> ...
```

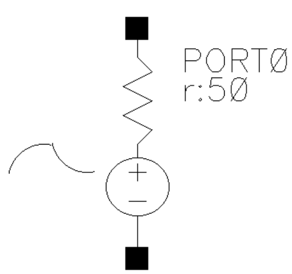
Example

```
p20 (2 0) port num=2 r=50 type=pulse period=1e-9 rise=1e-10 fall=1e-10 val1=1
width=0.5n mag=1
```

Additional Information

This device is not supported within the altergroups.

Symbol:pexp



Independent Exponential Resistive Source

For more information on this component refer to Appendix H, of SpectreRF User Guide.

Command-line help

```
spectre -h port
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Resistance	r	x	x	-	-	-	-	-	-
Port number	num	x	x	-	-	-	-	-	-
DC voltage	vdc	x	x	-	-	-	-	-	-
Delay time	td	x	x	-	-	-	-	-	-
Delay time 1	td1	x	x	-	-	-	-	-	-
Damping factor 1	tau1	x	x	-	-	-	-	-	-
Delay time 2	td2	x	x	-	-	-	-	-	-
Damping factor 2	tau2	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
AC magnitude	acm	x	x	-	-	-	-	-	-
AC phase	acp	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-
Source type	srcType	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( p n ) port <parameter=value> ...
```

Example

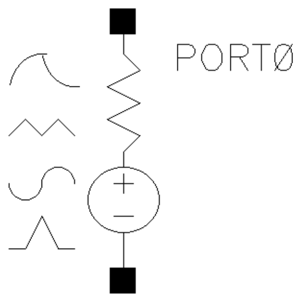
```
p20 (2 0) port num=2 r=50 type=pulse period=1e-9 rise=1e-10 fall=1e-10 val1=1
```

width=0.5n mag=1

Additional Information

This device is not supported within the altergroups.

Symbol: port



Independent Resistive Source

For more information on this component refer to Appendix H, of SpectreRF User Guide.

Command-line help

```
spectre -h port
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Resistance	`r`	x	-	-	-	-	-	-	-
Port number	`num`	x	-	-	-	-	-	-	-
DC voltage	`vdc`	x	-	-	-	-	-	-	-
Source type	`srcType`	x	-	-	-	-	-	-	-
Frequency name 1	`fundname`	x	-	-	-	-	-	-	-
Frequency 1	`freq`	x	-	-	-	-	-	-	-
Amplitude 1 (Vpk)	`va`	x	-	-	-	-	-	-	-
Amplitude 1 (dBm)	`vaDBm`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Phase for Sinusoid 1	`sinephase`	x	-	-	-	-	-	-	-
Sine DC level	`sinedc`	x	-	-	-	-	-	-	-
Number of PWL/Time pair	`tvpairs`	x	x	-	-	-	-	-	-
Time 1	`t1 - t50`	x	x	-	-	-	-	-	-
Voltage 1	`v1 - v50`	x	x	-	-	-	-	-	-
FM modulation index	`fmmodindex`	x	x	-	-	-	-	-	-
FM modulation frequency	`fmmodfreq`	x	x	-	-	-	-	-	-
AM modulation index	`ammodindex`	x	x	-	-	-	-	-	-
AM modulation frequency	`ammodfreq`	x	x	-	-	-	-	-	-
AM modulation phase	`ammodphase`	x	x	-	-	-	-	-	-
Delay time	`td`	x	-	-	-	-	-	-	-
Amplitude scale factor	`scale`	x	-	-	-	-	-	-	-
Power of PWL waveform	`pwldbm`	x	-	-	-	-	-	-	-

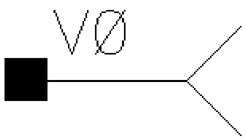
CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Display second sinusoid	`numofsines`	x	-	-	-	-	-	-	-
Display modulation params	`modulation`	x	-	-	-	-	-	-	-
Display small signal params	`smallSig`	x	-	-	-	-	-	-	-
Display temperature params	`tempParam`	x	-	-	-	-	-	-	-
Display noise parameters	`noiseParam`	x	-	-	-	-	-	-	-
Multiplier	`m`	x	-	-	-	-	-	-	-
Number of noise/freq pairs	`FNpairs`	x	x	-	-	-	-	-	-
Freq 1 to Freq 10	`F1 - F10`	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	`N1 - N10`	x	x	-	-	-	-	-	-

Additional Information

Power of PWL waveform (`pwldbm`) is an alternative to *Amplitude scale factor* (`scale`). Use `pwldbm` to specify the rms power for the waveform and spectre automatically calculates the correct scale factor.

If `pwldbm` is specified, it overwrites the `scale` parameter.

Symbol: powerSupply

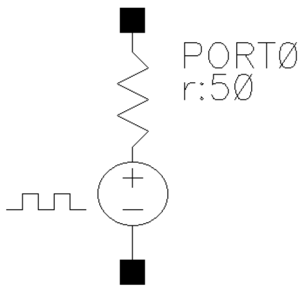


CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Resistance	r	x	-	-	-	-	-	-	-
Port number	num	x	-	-	-	-	-	-	-
DC voltage	vdc	x	-	-	-	-	-	-	-
Source type	srcType	x	-	-	-	-	-	-	-
Frequency name 1	fundname	x	-	-	-	-	-	-	-
Frequency 1	freq	x	-	-	-	-	-	-	-
Amplitude 1 (Vpk)	va	x	-	-	-	-	-	-	-
Amplitude 1 (dBm)	vaDBm	x	-	-	-	-	-	-	-
Phase for Sinusoid 1	sinephase	x	-	-	-	-	-	-	-
Sine DC level	sinedc	x	-	-	-	-	-	-	-
Delay time	td	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Display second sinusoid	numofsines	x	-	-	-	-	-	-	-
Display modulation params	modulation	x	-	-	-	-	-	-	-
Display small signal params	smallSig	x	-	-	-	-	-	-	-
Display temperature params	tempParam	x	-	-	-	-	-	-	-
Display noise parameters	noiseParam	x	-	-	-	-	-	-	-
Multiplier	m	x	-	-	-	-	-	-	-

Symbol: ppulse



Independent Resistive Pulse Source

For more information on this component refer to Appendix H, of SpectreRF User Guide.

Command-line help

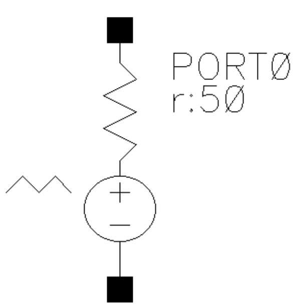
```
spectre -h port
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Frequency name for 1/period	fundname	x	-	-	-	-	-	-	-
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Delay Time	delay	x	-	-	-	-	-	-	-
Resistance	r	x	x	-	-	-	-	-	-
Port number	num	x	x	-	-	-	-	-	-
DC voltage	vdc	x	x	-	-	-	-	-	-
Delay time	td	x	x	-	-	-	-	-	-
Voltage 1	v1	x	x	-	-	-	-	-	-
Voltage 2	v2	x	x	-	-	-	-	-	-
Period	per	x	x	-	-	-	-	-	-
Rise time	tr	x	x	-	-	-	-	-	-
Fall time	tf	x	x	-	-	-	-	-	-
Pulse width	pw	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Multiplier	m	x	x	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
AC magnitude	acm	x	x	-	-	-	-	-	-
AC phase	acp	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-

Symbol: ppwl



Independent Piece-Wise Linear Resistive Source

For more information on this component refer to Appendix H, of SpectreRF User Guide.

Command-line help

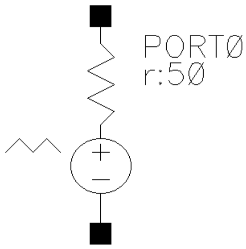
```
spectre -h port
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Frequency name for 1/ period	fundname	x	-	-	-	-	-	-	-
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Number of pairs of points	tvpairs	x	x	-	-	-	-	-	-
Time 1	t1 - t50	x	-	-	-	-	-	-	-
Voltage 1	v1 - v50	x	-	-	-	-	-	-	-
Resistance	r	x	x	-	-	-	-	-	-
Port number	num	x	x	-	-	-	-	-	-
DC voltage	vdc	x	x	-	-	-	-	-	-
Delay time	td	x	x	-	-	-	-	-	-
Offset Voltage	vo	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Scale factor	scale	x	x	-	-	-	-	-	-
Time scale factor	stretch	x	x	-	-	-	-	-	-
All are breakpoints	allbrkpts	x	x	-	-	-	-	-	-
Period of the PWL	pwlperiod	x	x	-	-	-	-	-	-
Transition width	twidth	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
AC magnitude	acm	x	x	-	-	-	-	-	-
AC phase	acp	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-
Source type	srcType	x	-	-	-	-	-	-	-

Symbol: ppwlf



Independent Piece-Wise Linear Resistive Source Based on File

For more information on this component refer to Appendix H, of SpectreRF User Guide.

Command-line help

```
spectre -h port
```

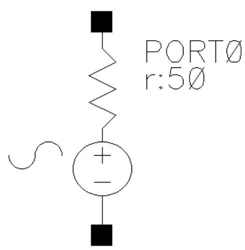
CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Frequency name for 1/period	fundname	x	-	-	-	-	-	-	-
Noise file name	noisefile	x	x	-	-	-	-	-	-
PWL file name	fileName	x	-	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Resistance	r	x	x	-	-	-	-	-	-
Port number	num	x	x	-	-	-	-	-	-
DC voltage	vdc	x	x	-	-	-	-	-	-
Delay time	td	x	x	-	-	-	-	-	-
Offset voltage	vo	x	x	-	-	-	-	-	-
Scale factor	scale	x	x	-	-	-	-	-	-
Time scale factor	stretch	x	x	-	-	-	-	-	-
All are breakpoints	allbrkpts	x	x	-	-	-	-	-	-
Period of the PWL	pwlperiod	x	x	-	-	-	-	-	-
Transition width	twidth	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
AC magnitude	acm	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC phase	`acp`	x	x	-	-	-	-	-	-
XF magnitude	`xfm`	x	x	-	-	-	-	-	-
PAC magnitude	`pacm`	x	x	-	-	-	-	-	-
PAC phase	`pacp`	x	x	-	-	-	-	-	-
Source type	`srcType`	x	-	-	-	-	-	-	-

Symbol: psin



Independent Sinusoidal Resistive Source

The psin component is used in all RF circuits for SpectreRF and Spectre S-parameter simulations. When you netlist psin in the analog design environment using the SpectreS simulator, you can see that psin is the port component in Spectre simulation. A port is a resistive source that is tied between positive and negative terminals. It is equivalent to a voltage source in series with a resistor, and the reference resistance of the port is the value of the resistor.

For more information on this component refer to Appendix C, of SpectreRF User Guide.

Command-line help

```
spectre -h port
```

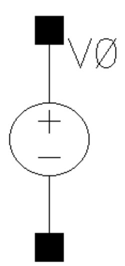
CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Frequency name	fundname	x	-	-	-	-	-	-	-
Second frequency name	fundname2	x	-	-	-	-	-	-	-
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Resistance	r	x	x	-	-	-	-	-	-
Port number	num	x	x	-	-	-	-	-	-
DC voltage	vdc	x	x	-	-	-	-	-	-
Source type	srcType	x	x	-	-	-	-	-	-
Delay time	td	x	x	-	-	-	-	-	-
Sine DC level	sinedc	x	x	-	-	-	-	-	-
Amplitude	va	x	x	-	-	-	-	-	-
Amplitude (dBm)	vaDBm	x	x	-	-	-	-	-	-
Initial phase for Sinusoid	sinephase	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Frequency	freq	x	x	-	-	-	-	-	-
Amplitude 2	va2	x	x	-	-	-	-	-	-
Amplitude 2 (dBm)	vaDBm2	x	x	-	-	-	-	-	-
Initial phase for Sinusoid 2	sinephase2	x	x	-	-	-	-	-	-
Frequency 2	freq2	x	x	-	-	-	-	-	-
FM modulation index	fmmodindex	x	x	-	-	-	-	-	-
FM modulation frequency	fmmodfreq	x	x	-	-	-	-	-	-
AM modulation index	ammodindex	x	x	-	-	-	-	-	-
AM modulation frequency	ammodfreq	x	x	-	-	-	-	-	-
AM modulation phase	ammodphase	x	x	-	-	-	-	-	-
Damping factor	theta	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
Noise temperature	noisetemp	x	x	-	-	-	-	-	-
AC magnitude	acm	x	x	-	-	-	-	-	-
AC phase	acp	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC magnitude (dBm)	pacmDBm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-

Symbol: vdc



Independent Voltage Source

vdc is a constant vsource.

Command-line help

```
spectre -h vsource
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC magnitude	acm	x	x	x	-	-	x	x	x
AC phase	acp	x	x	x	-	-	x	x	x
DC voltage	vdc	x	x	x	-	-	x	x	x
Noise file name	noiseFile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
Source type	srcType	x	-	-	-	-	-	-	-
AC Phase	acPhase	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( p n ) vsource <parameter=value> ...
```

Example

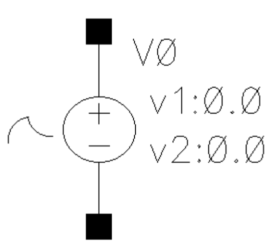
```
vpulse1 (1 0) vsource type=pulse val0=0 val1=5 period=100n rise=10n fall=10n
width=40n

vpwl1 (1 0) vsource type=pwl wave=[1n 0 1.1n 2 1.5n 0.5 2n 3 5n 5] pwlperiod=5n
```

Additional Information

This device is supported within the altergroups.

Symbol: vexp



Independent Exponential Voltage Source

vexp is an exponential vsource.

Command-line help

```
spectre -h vsource
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC magnitude	acm	x	x	x	-	-	x	x	x
AC phase	acp	x	x	x	-	-	x	x	x
DC voltage	vdc	x	x	x	-	-	-	-	-
Voltage 1	v1	x	x	x	-	-	x	x	x
Voltage 2	v2	x	x	x	-	-	x	x	x
Delay time 1	td1	x	x	x	-	-	x	x	x
Damping factor 1	tau1	x	x	x	-	-	x	x	x
Delay time 2	td2	x	x	x	-	-	x	x	x
Damping factor 2	tau2	x	x	x	-	-	x	x	x
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-
Delay time	td	x	x	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
DC source	dc	-	-	-	-	-	x	x	x
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Delay Time	delay	x	-	-	-	-	-	-	-
Source type	srcType	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( p n ) vsource <parameter=value> ...
```

Example

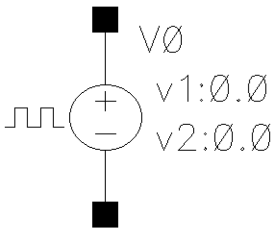
```
vpulse1 (1 0) vsource type=pulse val0=0 val1=5 period=100n rise=10n fall=10n
width=40n
```

```
vpwl1 (1 0) vsource type=pwl wave=[1n 0 1.1n 2 1.5n 0.5 2n 3 5n 5] pwlperiod=5n
```

Additional Information

This device is supported within the altergroups.

Symbol: vpulse



Independent Pulse Voltage Source

vpulse is a square wave varying vsource.

Command-line help

```
spectre -h vsource
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC magnitude	acm	x	x	x	-	-	x	x	x
AC phase	acp	x	x	x	-	-	x	x	x
DC voltage	vdc	x	x	x	-	-	-	-	-
Voltage 1	v1	x	x	x	-	-	x	x	x
Voltage 2	v2	x	x	x	-	-	x	x	x
Delay time	td	x	x	x	-	-	x	x	x
Rise time	tr	x	x	x	-	-	x	x	x
Fall time	tf	x	x	x	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Pulse width	pw	x	x	x	-	-	x	x	x
Period	per	x	x	x	-	-	x	x	x
Frequency name for 1/period	fundname	x	-	-	-	-	-	-	-
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
DC source	dc	-	-	-	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Source type	srcType	x	-	-	-	-	-	-	-
Delay Time	delay	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( p n ) vsource <parameter=value> ...
```

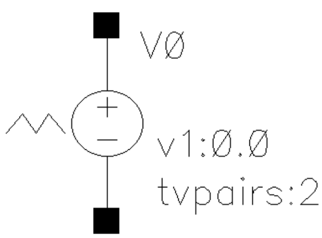
Example

```
vpulse1 (1 0) vsource type=pulse val0=0 val1=5 period=100n rise=10n fall=10n
width=40n
vpwl1 (1 0) vsource type=pwl wave=[1n 0 1.1n 2 1.5n 0.5 2n 3 5n 5] pwlperiod=5n
```

Additional Information

This device is supported within the altergroups.

Symbol: vpwl



Independent Piece-Wise Linear Voltage Source

vpwl is a piece-wise linear vsource.

Command-line help

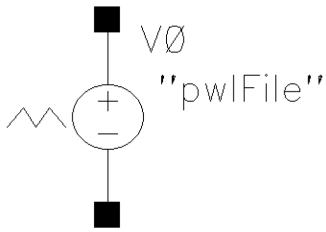
```
spectre -h vsource
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Number of pairs of points	tvpairs	x	x	x	-	-	x	x	x
AC magnitude	acm	x	x	x	-	-	x	x	x
AC phase	acp	x	x	x	-	-	x	x	x
DC voltage	vdc	x	x	x	-	-	-	-	-
Time 1	t1 - t50	x	x	x	-	-	x	x	x
Voltage 1	v1 - v50	x	x	x	-	-	x	x	x
Frequency name for 1/period	fundname	x	-	-	-	-	-	-	-
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-
Delay time	td	x	x	-	-	-	x	x	x
Offset voltage	vo	x	x	-	-	-	-	-	-
Scale factor	scale	x	x	-	-	-	-	-	-
Time scale factor	stretch	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Period of the PWL	pwlperiod	x	x	-	-	-	-	-	-
Transition width	twidth	x	x	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
DC source	dc	-	-	-	-	-	x	x	x
Repeated function	rpt	-	-	-	-	-	x	x	x
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Delay Time	delay	x	-	-	-	-	-	-	-
Source type	srcType	x	-	-	-	-	-	-	-

Symbol: vpwlf



Independent Piece-Wise Linear Voltage Source Based on File

Command-line help

```
spectre -h vsource
```

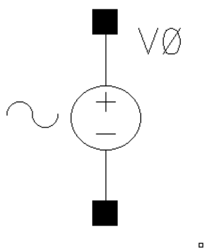
CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC magnitude	acm	x	x	x	-	-	x	x	-
AC phase	acp	x	x	x	-	-	x	x	-
DC voltage	vdc	x	x	x	-	-	x	x	-
PWL file name	fileName	x	x	x	-	-	x	x	-
Frequency name for 1/period	fundname	x	-	-	-	-	-	-	-
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
XF magnitude	`xfm`	x	x	-	-	-	-	-	-
PAC magnitude	`pacm`	x	x	-	-	-	-	-	-
PAC phase	`pacp`	x	x	-	-	-	-	-	-
Delay time	`td`	x	x	-	-	-	-	-	-
Offset voltage	`vo`	x	x	-	-	-	-	-	-
Scale factor	`scale`	x	x	-	-	-	-	-	-
Time scale factor	`stretch`	x	x	-	-	-	-	-	-
Period of the PWL	`pwlperiod`	x	x	-	-	-	-	-	-
Transition width	`twidth`	x	x	-	-	-	-	-	-
Temperature coefficient 1	`tc1`	x	x	-	-	-	-	-	-
Temperature coefficient 2	`tc2`	x	x	-	-	-	-	-	-
Nominal temperature	`tnom`	x	x	-	-	-	-	-	-
Freq 1 to Freq 10	`F1 - F10`	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	`N1 - N10`	x	x	-	-	-	-	-	-
Delay Time	`delay`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Source type	`srcType`	x	-	-	-	-	-	-	-

Symbol: vsin



Independent Sinusoidal Voltage Source

vsin is a sin wave vsource.

Command-line help

```
spectre -h vsource
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC magnitude	`acm`	x	x	x	-	-	x	x	x
AC phase	`acp`	x	x	x	-	-	x	x	x
DC voltage	`vdc`	x	x	x	-	-	-	-	-
Offset voltage	`vo`	x	x	x	-	-	x	x	x
Amplitude	`va`	x	x	x	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Frequency	freq	x	x	x	-	-	x	x	x
Delay time	td	x	x	x	-	-	x	x	x
Damping factor	theta	x	x	x	-	-	x	x	x
First frequency name	fundname	x	-	-	-	-	-	-	-
Second frequency name	fundname2	x	-	-	-	-	-	-	-
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-
Initial phase for Sinusoid	sinephase	x	x	-	-	-	-	-	-
Amplitude 2	va2	x	x	-	-	-	-	-	-
Initial phase for Sinusoid 2	sinephase2	x	x	-	-	-	-	-	-
Frequency 2	freq2	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
FM modulation index	fmmodindex	x	x	-	-	-	-	-	-
FM modulation frequency	fmmodfreq	x	x	-	-	-	-	-	-
AM modulation index	ammodindex	x	x	-	-	-	-	-	-
AM modulation frequency	ammodfreq	x	x	-	-	-	-	-	-
AM modulation phase	ammodphase	x	x	-	-	-	-	-	-
Temperature coefficient 1	tc1	x	x	-	-	-	-	-	-
Temperature coefficient 2	tc2	x	x	-	-	-	-	-	-
Nominal temperature	tnom	x	x	-	-	-	-	-	-
Noise temperature	noisetemp	x	x	-	-	-	-	-	-
DC source	dc	-	-	-	-	-	x	x	x
Phase delay	phi	-	-	-	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Delay Time	delay	x	-	-	-	-	-	-	-
Source type	srcType	x	-	-	-	-	-	-	-
Sine DC level	sinedc	x	x	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( p n ) vsource <parameter=value> ...
```

Example

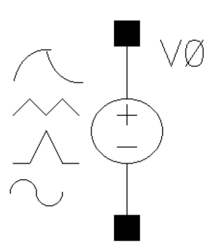
```
vpulse1 (1 0) vsource type=pulse val0=0 val1=5 period=100n rise=10n fall=10n
width=40n
```

```
vpwl1 (1 0) vsource type=pwl wave=[1n 0 1.1n 2 1.5n 0.5 2n 3 5n 5] pwlperiod=5n
```

Additional Information

This device is supported within the altergroups.

Symbol: vsource



Independent Voltage Source

Current through the source is computed and is defined to be positive if it flows from the positive node, through the source, to the negative node.

The value of the DC voltage as a function of the temperature is given by:

```
V(T) = V(tnom) * [1 + tc1 * (T - tnom) + tc2 * (T - tnom)^2].
```

Command-line help

```
spectre -h vsource
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
DC voltage	vdc	x	-	-	-	-	-	-	-
Source type	srcType	x	-	-	-	-	-	-	-
Frequency name 1	fundname	x	-	-	-	-	-	-	-
Frequency 1	freq	x	-	-	-	-	-	-	x
Amplitude 1 (Vpk)	va	x	-	-	-	-	-	-	x
Phase for Sinusoid 1	sinephase	x	-	-	-	-	-	-	-
Sine DC level	sinedc	x	-	-	-	-	-	-	-
File name	fileName	x	-	-	-	-	-	-	-
Number of PWL/Time pair	tvpairs	x	-	-	-	-	-	-	-
Time 1	t1 - t50	x	-	-	-	-	-	-	-
Voltage 1	v1 - v50	x	-	-	-	-	-	-	-
Delay time	td	x	-	-	-	-	-	-	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Rise time start	td1	x	-	-	-	-	-	-	-
Rise time constant	tau1	x	-	-	-	-	-	-	-
Fall time start	td2	x	-	-	-	-	-	-	-
Fall time constant	tau2	x	-	-	-	-	-	-	-
DC offset	offset	x	x	-	-	-	-	-	-
Amplitude scale factor	scale	x	x	-	-	-	-	-	-
Time scale factor	stretch	x	x	-	-	-	-	-	-
Breakpoints	allbrkpts	x	-	-	-	-	-	-	-
Period of waveform	per	x	-	-	-	-	-	-	-
FM modulation index 1	fmmodindex	x	x	-	-	-	-	-	-
FM modulation frequency 1	fmmodfreq	x	x	-	-	-	-	-	-
AM modulation index 1	ammodindex	x	x	-	-	-	-	-	-
AM modulation frequency 1	ammodfreq	x	x	-	-	-	-	-	-
AM modulation phase 1	ammodphase	x	x	-	-	-	-	-	-

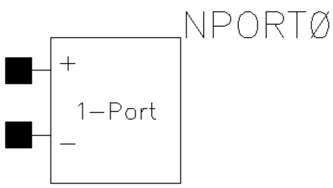
CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Display second sinusoid	numofsines	x	-	-	-	-	-	-	-
Damping factor 1	theta	x	-	-	-	-	-	-	-
Display small signal params	smallSig	x	-	-	-	-	-	-	-
PAC magnitude	pacm	x	x	-	-	-	-	-	-
PAC phase	pacp	x	x	-	-	-	-	-	-
AC magnitude	acm	x	x	-	-	-	-	-	-
AC phase	acp	x	x	-	-	-	-	-	-
XF magnitude	xfm	x	x	-	-	-	-	-	-
Display noise parameters	noiseParam	x	-	-	-	-	-	-	-
Noise file name	noisefile	x	x	-	-	-	-	-	-
Number of noise/freq pairs	FNpairs	x	x	-	-	-	-	-	-
Freq 1 to Freq 10	F1 - F10	x	x	-	-	-	-	-	-
Noise 1 to Noise 10	N1 - N10	x	x	-	-	-	-	-	-
Display modulation params	modulation	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Display temperature params	tempParam	x	-	-	-	-	-	-	-
Linear temp. coefficient	tc1	x	-	-	-	-	-	-	-
Quadratic temp. coeff.	tc2	x	-	-	-	-	-	-	-
DC source	dc	-	-	-	-	-	-	-	x
Offset voltage	vo	-	-	-	-	-	-	-	x
Phase delay	phi	-	-	-	-	-	-	-	x
Repeated function	rpt	-	-	-	-	-	-	-	x
Period	pwlperiod	x	-	-	-	-	-	-	-
Period start time	pwlperiodstart	x	-	-	-	-	-	-	-
Transition width	twidth	x	-	-	-	-	-	-	-
Multiplier	m	x	-	-	-	-	-	-	-
Delay Time	delay	x	-	-	-	-	-	-	-

9

Sources - Ports

Symbol: n1port



Linear N Port

A linear N-port with one port based on the S-parameter data file. The S-parameter data file specifies the characteristics of the N-port.

An N-port can have as many ports as there are in the N-port described in the S-parameter data file. Each pair of terminals in the ‘nport’ instance statement represents one port. Because there is no limit to the number of ports, there is no limit to the number of terminals. However, the terminals must be given in pairs and there must be at least one pair. The order of the pairs is the same as the order of the ports in the data file. Any missing ports should be skipped.

Command-line help

```
spectre -h nport
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Number of Ports	P	x	-	-	-	-	-	-	-
S-parameter data file	dataFile	x	-	-	-	-	-	-	-
Multiplier	m	x	-	-	-	-	-	-	-
Scale factor	scale	x	-	-	-	-	-	-	-
Interpolation method	interp	x	-	-	-	-	-	-	-
Relative Error	relerr	x	-	-	-	-	-	-	-
Absolute Error	abserr	x	-	-	-	-	-	-	-
ROM Data File	romdatfile	x	-	-	-	-	-	-	-
Rational Order	ratorder	x	-	-	-	-	-	-	-
Max frequency of interest	fmax	x	-	-	-	-	-	-	-
Frequency sampling interval	fdelta	x	-	-	-	-	-	-	-
Max order impulse response	maxn	x	-	-	-	-	-	-	-
Impulse response trunc threshold	imptrunc	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Thermal Noise	thermalnoise	x	-	-	-	-	-	-	-
Use smooth data windowing	usewindow	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( t1 b1 [t2] [b2] ... ) ModelName <parameter=value> ...
Name ( t1 b1 [t2] [b2] ... ) nport <parameter=value> ...
```

Terminals must be given in pairs.

Model Synopsis:

```
model ModelName nport <parameter=value> ...
```

Example

```
x1 (a1 0 b1 0 b3 0) ndata file="sparam2.data"
```

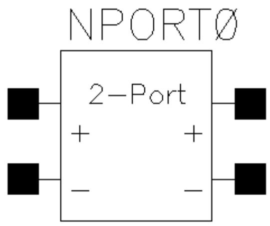
Following is a sample model statement:

```
model ndata nport file="sparam.data" scale=1
```

Additional Information

This device is not supported within the altergroups.

Symbol: n2port



A linear N-port with two ports based on the S-parameter data file.

Command-line help

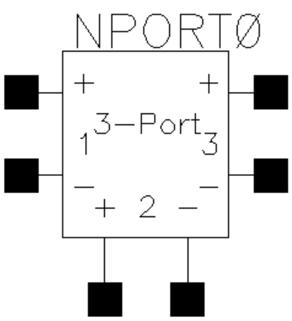
```
spectre -h nport
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
S-parameter Data File	`dataFile`	x	x	-	-	-	-	-	-
Multiplier	`m`	x	x	-	-	-	-	-	-
Scale Factor	`scale`	x	x	-	-	-	-	-	-
Interpolation Method	`interp`	x	-	-	-	-	-	-	-
Relative Error	`relerr`	x	-	-	-	-	-	-	-
Absolute Error	`abserr`	x	-	-	-	-	-	-	-
ROM Data File	`romdatfile`	x	-	-	-	-	-	-	-
Rational Order	`ratorder`	x	-	-	-	-	-	-	-
Max frequency of interest	`fmax`	x	-	-	-	-	-	-	-
Frequency sampling interval	`fdelta`	x	-	-	-	-	-	-	-
Max order impulse response	`maxn`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Impulse response trunc threshold	`imptrunc`	x	-	-	-	-	-	-	-
Thermal Noise	`thermalnoise`	x	-	-	-	-	-	-	-
Use Smooth Data Windowing	`usewindow`	x	-	-	-	-	-	-	-

Symbol: n3port



A linear N-port with three ports based on the S-parameter data file.

Command-line help

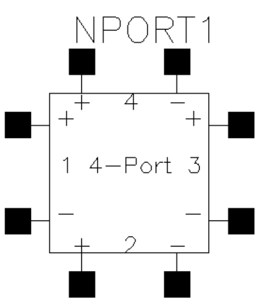
```
spectre -h nport
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
S-parameter data file	`dataFile`	x	x	-	-	-	-	-	-
Multiplier	`m`	x	x	-	-	-	-	-	-
Scale factor	`scale`	x	x	-	-	-	-	-	-
Interpolation Method	`interp`	x	-	-	-	-	-	-	-
Relative Error	`relerr`	x	-	-	-	-	-	-	-
Absolute Error	`abserr`	x	-	-	-	-	-	-	-
ROM Data File	`romdatfile`	x	-	-	-	-	-	-	-
Rational Order	`ratorder`	x	-	-	-	-	-	-	-
Max frequency of interest	`fmax`	x	-	-	-	-	-	-	-
Frequency sampling interval	`fdelta`	x	-	-	-	-	-	-	-
Max order impulse response	`maxn`	x	-	-	-	-	-	-	-
Impulse response trunc threshold	`imptrunc`	x	-	-	-	-	-	-	-
Thermal Noise	`thermalnoise`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Use Smooth Data Windowing	`usewindow`	x	-	-	-	-	-	-	-

Symbol: n4port



A linear N-port with four ports based on the S-parameter data file.

Command-line help

```
spectre -h nport
```

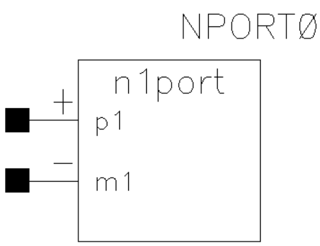
CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
S-parameter data file	`dataFile`	x	x	-	-	-	-	-	-
Multiplier	`m`	x	x	-	-	-	-	-	-
Scale factor	`scale`	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Interpolation method	`interp`	x	-	-	-	-	-	-	-
Relative Error	`relerr`	x	-	-	-	-	-	-	-
Absolute Error	`abserr`	x	-	-	-	-	-	-	-
ROM Data File	`romdatfile`	x	-	-	-	-	-	-	-
Rational Order	`ratorder`	x	-	-	-	-	-	-	-
Max frequency of interest	`fmax`	x	-	-	-	-	-	-	-
Frequency sampling interval	`fdelta`	x	-	-	-	-	-	-	-
Max order impulse response	`maxn`	x	-	-	-	-	-	-	-
Impulse response trunc threshold	`imptrunc`	x	-	-	-	-	-	-	-
Thermal Noise	`thermalnoise`	x	-	-	-	-	-	-	-
Use Smooth Data Windowing	`usewindow`	x	-	-	-	-	-	-	-
S-parameter data format	`datafmt`	x	-	-	-	-	-	-	-
Thermal noise model	`noisemodel`	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
No. of Harmonics for PSS	`pssharms`	x	-	-	-	-	-	-	-

Symbol: nport



Linear N Port

An N-port takes its characteristics from an S-parameter data file. An N-port can have as many ports as there are in the N-port described in the S-parameter data file. Each pair of terminals in the ‘nport’ instance statement represents one port. Because there is no limit to the number of ports, there is no limit to the number of terminals. However, the terminals must be given in pairs and there must be at least one pair. The order of the pairs is the same as the order of the ports in the data file. Any missing ports should be skipped.

Command-line help

```
spectre -h nport
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Number of Ports	p	x	-	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
S-parameter Data File	`dataFile`	x	-	-	-	-	-	-	-
ROM Data File	`romdatfile`	x	-	-	-	-	-	-	-
Multiplier	`m`	x	-	-	-	-	-	-	-
Scale Factor	`scale`	x	-	-	-	-	-	-	-
Interpolation Method	`interp`	x	-	-	-	-	-	-	-
Relative Error	`relerr`	x	-	-	-	-	-	-	-
Absolute Error	`abserr`	x	-	-	-	-	-	-	-
Rational Order	`ratorder`	x	-	-	-	-	-	-	-
Thermal Noise	`thermalnoise`	x	-	-	-	-	-	-	-
Use Smooth Data Windowing	`usewindow`	x	-	-	-	-	-	-	-
No. of Harmonics for PSS	`pssharms`	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
model ndata nport file="sparam.data" scale=1
```

Example

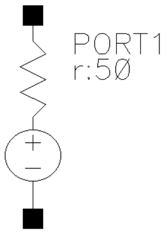
```
x1 (a1 0 b1 0 b3 0) ndata file="sparam2.data"
```

Additional Information

This device is not supported within the altergroups.

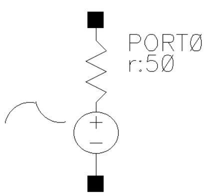
Symbol: pdc

[



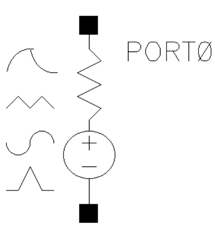
This component is the same as pdc described in the Chapter 8, “Symbol: pdc”

Symbol: pexp



This component is the same as pexp described in the Chapter 8, “Symbol:pexp”

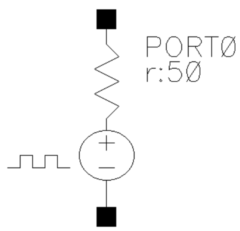
Symbol: port



Independent Resistive Pulse Source

This component is the same as port described in the Chapter 8, “Symbol: port”

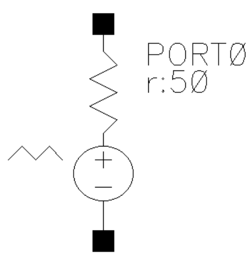
Symbol: ppulse



Independent Resistive Pulse Source

This component is the same as ppulse described in the Chapter 8, “Symbol: ppulse”

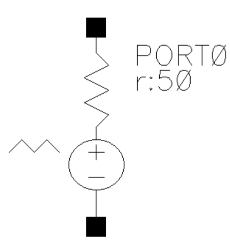
Symbol: ppwl



Independent Piece-Wise Linear Resistive Source

This component is the same as ppwl described in the Chapter 8, “Symbol: ppwl”

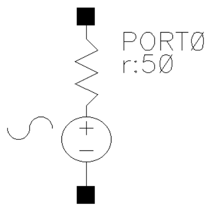
Symbol: ppwlf



Independent Piece-Wise Linear Resistive Source Based on File

This component is the same as ppwlf described in the Chapter 8, “Symbol: ppwlf”

Symbol: psin



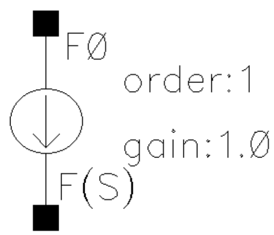
Independent Sinusoidal Resistive Source

This component is the same as psin described in the Chapter 8, “Symbol: psin”

10

Sources - Z_S_Domain Components

Symbol: scccs



S-Domain Linear Current Controlled Current Source

The device output is defined through a transfer function given as a ratio of two polynomials in the complex variable s. Polynomials can be specified in terms of either coefficients or roots. The roots of the numerator are the zeros of the transfer function and the roots of the denominator are the poles.

Command-line help

```
spectre -h scccs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Specification type	spec	x	x	-	-	-	-	-	-
Order of transfer function	order	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Probe Device Name	probe	x	x	-	-	-	-	-	-
Coef. of num. const. term	a0	x	x	-	-	-	-	-	-
Coef. of num. 1st term	a1	x	x	-	-	-	-	-	-
Coef. of den. const. term	b0	x	x	-	-	-	-	-	-
Coef. of den. 1st term	b1	x	x	-	-	-	-	-	-
Port	port	x	-	-	-	-	-	-	-
Gain	gain	x	x	-	-	-	-	-	-
Multiplier	m	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( sink src ) scccs <parameter=value> ...
```

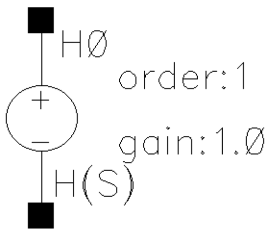
Example

```
l1 (2 1) inductor l=15
sc1 (1 0) scccs probe=l1 zeros=[0 6 0 -6 2 -8 2 8] poles=[-1 0 0 64 0 -64 -2 8 -2 -8]
```

Additional Information

This device is not supported within the altergroups.

Symbol: sccvs



S-Domain Linear Current Controlled Voltage Source

The device output is defined through a transfer function given as a ratio of two polynomials in the complex variable s. Polynomials can be specified in terms of either coefficients or roots. The roots of the numerator are the zeros of the transfer function and the roots of the denominator are the poles.

Command-line help

```
spectre -h sccvs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Specification type	`spec`	x	x	-	-	-	-	-	-
Order of transfer function	`order`	x	x	-	-	-	-	-	-
Probe Device Name	`probe`	x	x	-	-	-	-	-	-
Coef. of num. const. term	`a0`	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Coef. of num. 1st term	a1	x	x	-	-	-	-	-	-
Coef. of den. const. term	b0	x	x	-	-	-	-	-	-
Coef. of den. 1st term	b1	x	x	-	-	-	-	-	-
Port	port	x	-	-	-	-	-	-	-
Gain	gain	x	x	-	-	-	-	-	-
Multiplier	m	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( p n ) sccvs <parameter=value> ...
```

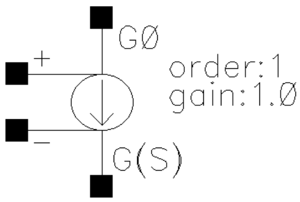
Example

```
myv (1 0) vsource type=sine freq=10K
scc1 (2 0) sccvs probe=myv gain=0.5 numer=[2] denom=[5]
```

Additional Information

This device is not supported within the altergroups.

Symbol: svccs



S-Domain Linear Voltage Controlled Current Source

The device output is defined through a transfer function given as a ratio of two polynomials in the complex variable s. Polynomials can be specified in terms of either coefficients or roots. The roots of the numerator are the zeros of the transfer function and the roots of the denominator are the poles.

Command-line help

```
spectre -h svccs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Specification type	spec	x	x	-	-	-	-	-	-
Order of transfer function	order	x	x	-	-	-	-	-	-
Coef. of num. const. term	a0	x	x	-	-	-	-	-	-
Coef. of num. 1st term	a1	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Coef. of den. const. term	b0	x	x	-	-	-	-	-	-
Coef. of den. 1st term	b1	x	x	-	-	-	-	-	-
Gain	gain	x	x	-	-	-	-	-	-
Multiplier	m	-	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( sink src ps ns ) svccs <parameter=value> ...
```

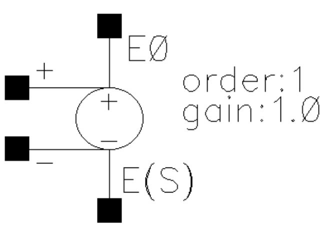
Example

```
s2 (1 0 control 0) svccs gain=0.4 numer=[2 3] denom=[4 5 1]
```

Additional Information

This device is not supported within the altergroups.

Symbol: svcvs



S-Domain Linear Voltage Controlled Volatge Source

The device output is defined through a transfer function given as a ratio of two polynomials in the complex variable s. Polynomials can be specified in terms of either coefficients or roots.

The roots of the numerator are the zeros of the transfer function and the roots of the denominator are the poles.

Command-line help

```
spectre -h svcvs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Specification type	spec	x	x	-	-	-	-	-	-
Order of transfer function	order	x	x	-	-	-	-	-	-
Coef. of num. const. term	a0	x	x	-	-	-	-	-	-
Coef. of num. 1st term	a1	x	x	-	-	-	-	-	-
Coef. of den. const. term	b0	x	x	-	-	-	-	-	-
Coef. of den. 1st term	b1	x	x	-	-	-	-	-	-
Gain	gain	x	x	-	-	-	-	-	-
Multiplier	m	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( p n ps ns ) svcvs <parameter=value> ...
```

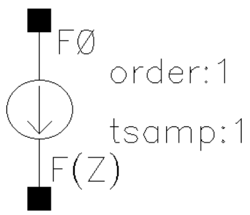
Example

```
e1 (1 0 control 0) svccs gain=5 poles=[-1 0 1 0] zero=[0 0 1 0]
```

Additional Information

This device is not supported within the altergroups.

Symbol: zcccs



Z-Domain Linear Current Controlled Current Source

The output is defined with a transfer function given as the ratio of two polynomials in the complex variable z. Each polynomial can be specified using either its coefficients or its roots. The roots of the numerator are the zeros of the transfer function and the roots of the denominator are the poles.

Command-line help

```
spectre -h zcccs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Specification type	spec	x	x	-	-	-	-	-	-
Order of transfer function	order	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Probe Device Name	`probe`	x	x	-	-	-	-	-	-
Coef. of num. const. term	`a0`	x	x	-	-	-	-	-	-
Coef. of num. 1st term	`a1`	x	x	-	-	-	-	-	-
Coef. of den. const. term	`b0`	x	x	-	-	-	-	-	-
Coef. of den. 1st term	`b1`	x	x	-	-	-	-	-	-
Port	`port`	x	-	-	-	-	-	-	-
Sampling period	`tsamp`	x	x	-	-	-	-	-	-
Delay time	`td`	x	x	-	-	-	-	-	-
Transaction time	`tt`	x	x	-	-	-	-	-	-
Gain	`gain`	x	x	-	-	-	-	-	-
Polynomial argument	`polyarg`	x	x	-	-	-	-	-	-
S to Z Transformation	`sxz`	x	x	-	-	-	-	-	-
Multiplier	`m`	x	x	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( sink src ) zcccs <parameter=value> ...
```

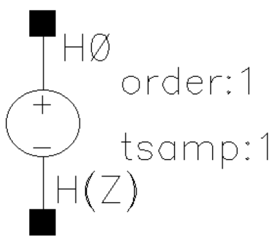
Example

```
va (1 0) vsource type=sine freq=10K
z2 (2 0) zcccs probe=va gain=1 ts=4.9e-5 tt=1e-5 polyarg=inservez
numer=[1 -1] denom=[1 0]
```

Additional Information

This device is not supported within the altergroups.

Symbol: zccvs



Z-Domain Linear Current Controlled Voltage Source

The output is defined with a transfer function given as the ratio of two polynomials in the complex variable z. Each polynomial can be specified using either its coefficients or its roots. The roots of the numerator are the zeros of the transfer function and the roots of the denominator are the poles.

Command-line help

```
spectre -h zccvs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Specification type	spec	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Order of transfer function	`order`	x	x	-	-	-	-	-	-
Probe Device Name	`probe`	x	x	-	-	-	-	-	-
Coef. of num. const. term	`a0`	x	x	-	-	-	-	-	-
Coef. of num. 1st term	`a1`	x	x	-	-	-	-	-	-
Coef. of den. const. term	`b0`	x	x	-	-	-	-	-	-
Coef. of den. 1st term	`b1`	x	x	-	-	-	-	-	-
Port	`port`	x	-	-	-	-	-	-	-
Sampling period	`tsamp`	x	x	-	-	-	-	-	-
Delay time	`td`	x	x	-	-	-	-	-	-
Transaction time	`tt`	x	x	-	-	-	-	-	-
Gain	`gain`	x	x	-	-	-	-	-	-
Polynomial argument	`polyarg`	x	x	-	-	-	-	-	-
S to Z Transformation	`sxz`	x	x	-	-	-	-	-	-
Multiplier	`m`	x	x	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( p n ) zccvs <parameter=value> ...
```

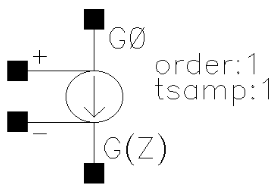
Example

```
va (1 0) vsource type=sine freq=10K
z2 2 0 zccvs probe=va gain=-2 ts=5e-5 tt=1.1e-5 numer=[1 -1]
```

Additional Information

This device is not supported within the altergroups.

Symbol: zvccs



Z-Domain Linear Voltage Controlled Current Source

The output is defined with a transfer function given as the ratio of two polynomials in the complex variable z. Each polynomial can be specified using either its coefficients or its roots. The roots of the numerator are the zeros of the transfer function and the roots of the denominator are the poles.

Command-line help

```
spectre -h zvccs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Polynomial argument	`polyarg`	x	x	-	-	-	-	-	-
S to Z Transformation	`sxz`	x	x	-	-	-	-	-	-
Specification type	`spec`	x	x	-	-	-	-	-	-
Order of transfer function	`order`	x	x	-	-	-	-	-	-
Coef. of num. const. term	`a0`	x	x	-	-	-	-	-	-
Coef. of num. 1st term	`a1`	x	x	-	-	-	-	-	-
Coef. of den. const. term	`b0`	x	x	-	-	-	-	-	-
Coef. of den. 1st term	`b1`	x	x	-	-	-	-	-	-
Sampling period	`tsamp`	x	x	-	-	-	-	-	-
Delay time	`td`	x	x	-	-	-	-	-	-
Transaction time	`tt`	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Gain	gain	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( sink src ps ns ) zvccs <parameter=value> ...
```

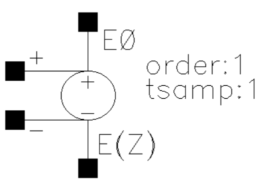
Example

```
va (1 0) vsource type=sine freq=10K
z1 (2 0 1 0) zvccs gain=2 ts=4.5e-5 tt=1e-5 zeros=[-1 0] poles=[0 0]
```

Additional Information

This device is not supported within the altergroups.

Symbol: zvcvs



Z-Domain Voltage Controlled Voltage Source

The output is defined with a transfer function given as the ratio of two polynomials in the complex variable z. Each polynomial can be specified using either its coefficients or its roots. The roots of the numerator are the zeros of the transfer function and the roots of the denominator are the poles.

To use the ‘s’ to ‘z’ transformation, set the optional ‘sxz’ parameter to one of the transformation methods - forward differences, backward differences, or bilinear. When the ‘sxz’ parameter is specified, the transfer function specification is assumed to be given in the complex variable s and it will be transformed to the complex variable z using the indicated method.

Command-line help

```
spectre -h zvcvs
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Polynomial argument	polyarg	x	x	-	-	-	-	-	-
S to Z Transformation	sxz	x	x	-	-	-	-	-	-
Specification type	spec	x	x	-	-	-	-	-	-
Order of transfer function	order	x	x	-	-	-	-	-	-
Coef. of num. const. term	a0	x	x	-	-	-	-	-	-
Coef. of num. 1st term	a1	x	x	-	-	-	-	-	-
Coef. of den. const. term	b0	x	x	-	-	-	-	-	-
Coef. of den. 1st term	b1	x	x	-	-	-	-	-	-
Sampling period	tsamp	x	x	-	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Delay time	td	x	x	-	-	-	-	-	-
Transaction time	tt	x	x	-	-	-	-	-	-
Gain	gain	x	x	-	-	-	-	-	-
Multiplier	m	x	x	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( p n ps ns ) zvcvs <parameter=value> ...
```

Example

```
va (1 0) vsource type=sine freq=10K
z3 (3 0 1 0) zvcvs gain=-1 ts=4e-5 tt=1e-5 numer=[-1 -1]
```

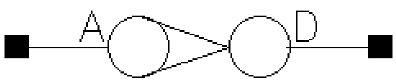
Additional Information

This device is not supported within the altergroups.

11

Uncategorized Components

Symbol: MOS_a2d



Interface Element for MOS - Metal Oxide Semiconductor Analog to Digital Convertor

A general Interface Element (IE) for mixed signal. To match your design, you will need to change the Base CDF. The default is for 5V logic. Do not manually place this component in your schematic as the IE placement is done automatically by the mixed signal netlister.

Node	Name
Input	A
Output	D

Command-line help

```
spectre -h a2d
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Macro Name	`macro`	-	-	x	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Level 0 threshold	a2d_v0	x	-	x	-	-	-	-	-
Level 1 threshold	a2d_v1	x	-	x	-	-	-	-	-
Time to x state	a2d_tx	x	-	x	-	-	-	-	-

Syntax/Synopsis

```
Name ( p n ) a2d <parameter=value>
```

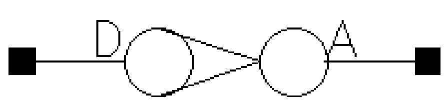
Example

```
I0 a2d timex=1m v1=1.5 vh=3.5
```

Additional Information

This device is not supported within the altergroups.

Symbol: MOS_d2a



Interface Element for MOS - Metal Oxide Semiconductor Digital to Analog Convertor

A general Interface Element (IE) for mixed signal. To match your design, you will need to change the Base CDF. The default is for 5V logic. Do not manually place this component in your schematic as the IE placement is done automatically by the mixed signal netlister.

Node	Name
Input	D

Node	Name
Output	A

Command-line help

```
spectre -h d2a
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Macro name	macro	-	-	x	-	-	-	-	-
Level 0 voltage	d2a_vl	x	-	x	-	-	-	-	-
Level 1 voltage	d2a_vh	x	-	x	-	-	-	-	-
Rise time	d2a_tr	x	-	x	-	-	-	-	-
Fall time	d2a_tf	x	-	x	-	-	-	-	-
Level X voltage	d2a_vx	x	-	-	-	-	-	-	-
Level Z voltage	d2a_vz	x	-	-	-	-	-	-	-

Syntax/Synopsis

```
Name ( p n ) d2a <parameter=value> ...
```

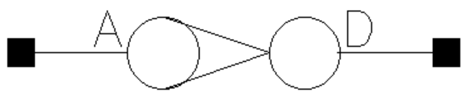
Example

```
I1 d2a fall=2n rise=3n val1=5 val0=0 valx=1.25
```

Additional Information

This device is not supported within the altergroups.

Symbol: TTL_a2d



Interface Element for TTL - Transistor to Transistor Logic Analog to Digital Convertor

An Interface Element (IE) for TTL that is used as an analog-to-digital interface for mixed-signal simulations. The analog-to-logic converter transfers analog waveforms to a logic simulator.

Command-line help

```
spectre -h a2d
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Macro Name	macro	x	-	x	-	-	-	-	-
Level 0 threshold	a2d_v0	x	-	x	-	-	-	-	-
Level 1 threshold	a2d_v1	x	-	x	-	-	-	-	-
Time to x state	a2d_tx	x	-	x	-	-	-	-	-

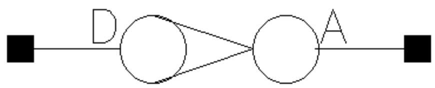
Syntax/Synopsis

Example

```
I3 interfaceElement timex=1m v1=1.5 vh=3.5
```

Additional Information

Symbol: TTL_d2a



Interface Element for TTL - Transistor to Transistor Digital to Logic Analog Convertor

An Interface Element (IE) for TTL that is used as a digital-to-analog interface for mixed-signal simulations.

Command-line help

```
spectre -h d2a
```

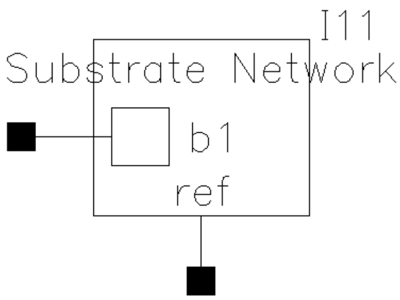
CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Macro Name	macro	x	-	x	-	-	-	-	-
Level 0 voltage	d2a_vl	x	-	x	-	-	-	-	-
Level 1 voltage	d2a_vh	x	-	x	-	-	-	-	-
Rise time	d2a_tr	x	-	x	-	-	-	-	-
Fall time	d2a_tf	x	-	x	-	-	-	-	-
Level X voltage	d2a_vx	x	-	-	-	-	-	-	-
Level Z voltage	d2a_vz	x	-	-	-	-	-	-	-

Example

```
I3 interfaceElement fall=2n rise=3n val1=5 val0=0
```

Symbol: scasubckt



Substrate Coupling Analysis (SCA) Subcircuit

This component is a schematic pcell component supported in the SCA flow.

The parameter ’Name of model’ is netlisted as a model for the according instance and a file ‘Subckt file’ is included in the netlist. Depending on the ‘Number of ports’ a subckt with multiple ports is netlisted and a symbol with the same number of terminals is displayed.

Command-line help

```
spectre -h scasubckt
```

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Name of the model	modelName	x	x	-	-	-	-	-	-
Subckt file	modelFile	x	x	-	-	-	-	-	-
Number of ports	padNum	x	x	-	-	-	-	-	-

A

List of All CDF Parameters

CDF Parameter Label	CDF Parameter	Description	Default
# of lumps in element	`lumps`		
Absolute Error	`abserr`	Maximum absolute allowed tolerance for rational interpolation errors. Deviations of the nport model from supplied s-parameter data of absolute magnitude less than abserr are generally ignored. This parameter needs to be defined when using the rational interpolation method.	-
Absolute Output Current	`absol`		
Absolute Value	`abs`		
Absolute value	`habs`		
AC magnitude	`acm`		
AC phase	`acp`		
AC Phase	`acPhase`		
AC position	`acPosition`	Position to which switch is set at the start of AC analysis.	0
AC resistance	`ac`		-
Active	`active`	Whether Fourier analysis should be performed or skipped. Possible values are no or yes.	-

CDF Parameter Label	CDF Parameter	Description	Default
Additional drain resistance	`rdc`		
Additional source resistance	`rsc`		
All are breakpoints *Breakpoints*	`allbrkpts`	-	
AM modulation frequency	`ammodfreq`	-	
AM modulation index	`ammodindex`	-	
AM modulation phase	`ammodphase`	-	
Amplitude	`ia`		
Amplitude 1 (dBm)	`vaDBm`		
Amplitude 1 (Vpk)	`va`		
Amplitude 2	`ia2`		
Amplitude 2	`va2`		
Amplitude 2 (dBm)	`vaDBm2`		
Anode gate voltage	`Vag`		
Base area	`areab`		
Base-emitter voltage	`Vbe`		
Body contact area	`ab`		
Body diffusion resistor square	`nrb`		
Body-source initial voltage	`Vbys`		
Bulk node connection	`bn`		
Bulk source initial voltage	`Vbs`		
Capacitance	`c`	Capacitance	1p F
Capacitance connected	`hrc`		-

CDF Parameter Label	CDF Parameter	Description	Default
Carrier frequency	`fc`		
Cathode gate voltage	`Vcg`		
Characteristic impedance	`zo`	Characteristic impedance of lossless line.	
Close switch resistance	`rc`	Resistance of a fully closed relay.	
Closed voltage	`vt2`	Relay resistance is ‘rclosed’ at this voltage.	
CMDM	`CMDM`		1
Coef. of den. 1st term	`b1`		
Coef. of den. const. term	`b0`		
Coef. of num. 1st term	`a1`		
Coef. of num. const. term	`a0`		
Collector area	`areac`		
Collector length	`lc`		
Collector-emitter voltage	`Vce`		
Conductor thickness	`t`		
Controlling Volt 1	`x1`		
Controlling Volt 2	`x2`		
Corresp Element 1	`y1`		
Corresp Element 2	`y2`		
Coupling coefficient	`k`	Coupling coefficient	0
Current 1 - Current 50	`i1 - i50`		
Current 2	`i2`		
Current eqn	`cur`		-
Current gain	`fgain`		

CDF Parameter Label	CDF Parameter	Description	Default
Current gain	`hfgain`		
Damping factor	`theta`		
Damping factor 1 *Rise time constant*	`tau1`	Rise time constant for exponential wave.	
Damping factor 2 *Fall time constant*	`tau2`	Fall time constant for exponential wave.	
DC current	`idc`		
DC position	`dcPosition`	Position to which switch is set at the start of DC analysis.	0
DC source	`dc`		
DC voltage	`vdc`		
Delay Schedule	`ibisDelaySchedule`		No
Delay Time	`delay`		
Delay time	`td`	Time delay	
Delay Time	`htd`	Time delay	
Delay time 1 *Rise time start*	`td1`	Rise start time for exponential wave	
Delay time 2 *Fall time start*	`td2`	Fall start time for exponential wave.	
Delta	`delta`		
Device area	`area`	Transistor area factor.	
Device initially off	`off`		-
Dielectric loss cond matrix per	`gdloss`		
Differential threshold	`vdiff`		
Display modulation params	`modulation`		

CDF Parameter Label	CDF Parameter	Description	Default
Display noise parameters	`noiseParam`		
Display second sinusoid	`numofsines`		
Display small signal params	`smallSig`		
Display temperature params	`tempParam`		
Dist. betn & poly(one side)	`sa`		
Dist. betn OD & poly(otherside)	`sb`		
Dist. betn neighbour fingers	`sd`		
Drain diffusion area	`ad`		
Drain diffusion length	`ld`		
Drain diffusion periphery	`pd`		
Drain diffusion res squares	`nrd`		
Drain source initial voltage	`Vds`		
Dummy DC voltage	`vdummy`		`0`
Emitter length	`le`		
Emitter width	`we`		
Enter RLCG etc. matrices	`entermatrices`		
Estimated operating region	`region`	Estimated operating region. Possible values are off, on or breakdown.	-
Fall on delay	`fall_on_dly`		
Fall off delay	`fall_off_dly`		

CDF Parameter Label	CDF Parameter	Description	Default
Fall time	`d2a_tf`		2n s
Fall time	`fall`	Time for transition to fall from Level 1 voltage to Level 0 voltage.	2n s
Fall time	`tf`	Time for transition to fall from Level 1 voltage to Level 0 voltage.	2n s
First coupled inductor	`ind1`	Inductor to be coupled	
Flow	`flow`	Flow quantity	
FM modulation frequency	`fmmodfreq`		
FM modulation index	`fmmodindex`		
Freq 1 to Freq 10	`F1 - F10`		
Frequency	`freq`	Reference frequency (used in conjunction to the normalized length to specify electrical length of line).	
Frequency 1	`freq`		
Frequency 2	`freq2`		
Frequency name 1	`fundname`		
Frequency name for 1/ period	`fundname`		
Frequency sampling interval	`fdelta`		
Frequency scale factor	`freqscale`		
Front gate-source voltage	`Vgfs`		
Fundamental frequency	`fund`		-
Gain	`gain`	Gain Parameter.	1.0
Gap length	`gap`	Gap length	

CDF Parameter Label	CDF Parameter	Description	Default
Gate source initial voltage	`Vgs`		
Gate to bulk and src voltage	`Vgbs`		
Generate noise?	`isnoisy`	Should resistor generate noise. Possible values are no or yes.	-
Hot-electron degradation	`degradation`		
IBIS Entry Method	`ibisEntryMethod`		
IBIS file name	`ibisFile`		
IBIS model name	`ibisModelNameo`		
IBIS corner	`ibisCorner`		typical
IC position	`icPosition`	Position to which switch is set at the start of IC analysis (precedes transient analysis).	0
Impulse response trunc threshold	`imptrunc`		
Inductance	`l`		1n
Initial condition	`ic`		-
Initial condition	`hic`		
Initial diode voltage	`Vd`		-
Initial magnetization of core	`mag`		
Initial phase for Sinusoid	`sinephase`		
Initial phase for Sinusoid 2	`sinephase2`		
Inner diam of toroidal core	`idiam`	Inner diameter of toroidal core	

CDF Parameter Label	CDF Parameter	Description	Default
Internal junction voltage	`Vbcc`		
Interpolation Method	`interp`	Method to interpolate s-parameter data. Possible values are spline, rational or linear.	-
Invoke ‘LMG’ parameter extraction tool	`firelmg`		
Junction perimeter factor	`perim`		-
Length	`l`	Length of the resistor	-
Length of metal capacitor	`lm`	Length of metal capacitor	-
Length of polysilicon	`lp`	Length of plysilicon capacitor	-
Level 0 threshold	`a2d_v0`		1.5 V
Level 0 voltage	`d2a_vl`	Final value for logical 0.	0 V
Level 1 threshold	`a2d_v1`		3.5 V
Level 1 voltage	`d2a_vh`		5 V
Level X voltage	`d2a_vx`		
Level Z voltage	`d2a_vz`		
Lin temp co of lin cap	`tc1c`	Linear temperature coefficient of capacitor.	
LMG subcircuit file	`subcktfile`		
Loss conductance per unit length	`g`	Dielectric (shunt) conductance per unit length	
Loss resistance per unit length	`rs`		
Macro name	`macro`		
Max	`max`		-

CDF Parameter Label	CDF Parameter	Description	Default
Max Coefficient Number	`polyCoef`		
Max order impulse response	`maxn`		
Max signal frequency	`fmax`	Maximum signal frequency	
Maximum output current	`maxi`		
Maximum output current	`maxm`		
Maximum output resistance	`maxr`		
Maximum output voltage	`maxv`		
Min	`min`		-
Minimum no. of time points	`points`		-
Minimum output current	`mini`		
Minimum output current	`minm`		
Minimum output resistance	`minr`		
Minimum output voltage	`minv`		
Model name	`model`		-
Model type	`mtype`		
Modulation frequency	`fm`		
Modulation index	`mdi`		
Multiplier	`m`	Multiplicity factor	-
Multiplier	`hm`		

CDF Parameter Label	CDF Parameter	Description	Default
Name of core	`core`	Name of core around which winding is wrapped.	-
Name of the model	`modelName`		
Name of voltage source	`vref`		
Name of winding 1	`l1`		
No. of reference Harmonics	`refharms`	Number of harmonics for reference (denominator) channel, if an array is not given. The harmonics start from ‘reffirstharm’ and go up to ‘reffirstharm’ + ‘harms’ - 1.	-
No. of Harmonics for PSS	`pssharms`		
Noise 1 to Noise 10	`N1 - N10`		
Noise file name	`noisefile`	Name of file containing excess spot noise data in the form of frequency-noise pairs.	
Noise temperature	`noisetemp`		
Nominal temperature	`tnom`	Parameter measurement temperature. Default set by options.	
Normalized length	`nl`	Normalized electrical length in wavelengths at ‘f’ of a lossless line.	
NQS flag	`nqsmod`		
Num of controlling voltage(s)	`nc`		
Num of lines (excluding ref.)	`n`		1
Num of turns on secondary	`n2`	Number of turns on winding 2.	

CDF Parameter Label	CDF Parameter	Description	Default
Num of turns on winding	`turn`	Number of turns on winding.	-
Number of controlling pairs	`xypairs`		
Number of harmonics	`harms`	Number of harmonics for test (numerator) channel, if an array is not given. The harmonics start from ‘firstharm’ and go up to ‘firstharm’ + ‘harms’ - 1.	-
Number of noise/freq pairs	`FNpairs`		
Number of PWL/Time pairs	`tvpairs`		
Number of pairs of points	`tvpairs`		
Number of Polynomial Coeffs *Max Coefficient Number*	`polyCoef`		0
Number of ports	`padNum`		1
Number of Ports	`p`		1
Number of Probes	`probeCnt`		
Number of turns on primary	`n1`	Number of turns on winding 1.	
Offset constant	`oc`		
Offset current	`io`		
Offset voltage *DC offset*	`offset`	Offset voltage in series with common terminal	-
Offset voltage	`vo`	Offset voltage in series with common terminal	-

CDF Parameter Label	CDF Parameter	Description	Default
Open switch resistance	`ro`	Resistance of a fully open relay.	
Open voltage	`vt1`	Relay resistance is ‘ropen’ at this voltage	
Open/close voltage	`vsw`		
Order of interpolation	`order`	Order of interpolation	-
Outer diam of toroidal core	`od`	Outer diameter of toroidal core	
PAC magnitude	`pacm`	Periodic AC analysis magnitude	
PAC magnitude (dBm)	`pacmDBm`		
PAC phase	`pacp`	Periodic AC analysis phase	
param0	`param0`		
Period *Period of waveform*	`per`		
Period of the PWL *Period*	`pwlperiod`	Period of the periodic PWL waveform	
Period start time	`pwlperiodstart`	Period start time of the periodic PWL waveform	
Periphery of junction	`pj`		-
Phase delay	`phi`		
Phase for Sinusoid 1	`sinephase`		
Physical length	`len`	Effective length of magnetic path Physical length (used with ‘vel’ to specify electrical length of line).	
Polarity of the buffer	`polarity`	Possible values: inv, noninv, or blank	inv

CDF Parameter Label	CDF Parameter	Description	Default
Poly Coeff 0	`c0`	Polynomial coefficients. At least one must be given.	
Poly Coeff 1	`c1`	Polynomial coefficients. At least one must be given.	
Poly Coeff 2	`c2`		
Poly Coeff 3	`c3`		
Poly Coeff 4	`c4`		
Polynomial argument	`polyarg`		
Port	`port`		
Port 1	`port1`		
Port 2	`port2`		
Port 3	`port3`		
Port 4	`port4`		
Port number	`num`		
Power of PWL waveform	`pwldbm`	Power of PWL waveform in dBm.	
Primary inductor	`pi`		
Probe 1	`p1`	Devices through which the controlling currents flow.	
Probe 2	`p2`	Index of the probe ports through which the controlling currents flow.	
Probe 3	`p3`		
Probe 4	`p4`		
Probe Device Name	`probe`		
Propogation velocity normalized	`vel`	Propagation velocity of the line given as a multiple of ‘c’, the speed of light in free space. (vel <= 1).	
Pulse width	`pw`		

CDF Parameter Label	CDF Parameter	Description	Default
PWL file name	`fileName`		
Pwl type	`pwlType`		
Quad temp co of lin cap	`tc2c`	Quadratic temperature coefficient of capacitor.	
Rational Order	`ratorder`	Order of rational function to use in fitting the s-parameter data. If this argument is given, relerr and abserr are ignored in selecting the order of the rational function interpolation. If ratorder is not specified then the program will attempt to select an order of rational interpolation that satisfies the criteria implied by abserr and relerr. This parameter needs to be defined when using the rational interpolation method.	-
Relative Error	`relerr`	Maximum relative allowed tolerance for rational interpolation errors. Deviations of the nport model from supplied s-parameter data of relative magnitude less than relerr are generally ignored. This parameter needs to be defined when using the rational interpolation method.	-
Relative permittivity	`eps`	Substrate permittivity relative to a vacuum.	
Repeated function	`rpt`		
Res of the winding	`resis`	Resistance of the winding.	-
Resistance	`r`	Resistance	1K Ohms

CDF Parameter Label	CDF Parameter	Description	Default
Resistance Form	`resform`	Default is 'yes' if 'r < thresh'. Possible values are no or yes.	-
Rise on delay	`rise_on_dly`		
Rise off delay	`rise_off_dly`		
Rise time	`d2a_tr`		3n s
Rise time	`rise`	Time for transition to rise from Level 0 voltage to Level 1 voltage.	3n s
Rise time	`tr`	Time for transition to rise from Level 0 voltage to Level 1 voltage.	3n s
RLCG data file	`file`		
ROM Data File	`romdatfile`	File used for storing time-domain reduced order model (ROM). This parameter needs to be defined when using the rational interpolation method.	-
S to Z Transformation	`sxz`		
S-parameter Data File	`dataFile`	S-parameter data file name.	-
S-parameter data format	`datafmt`		
Sampling period	`tsamp`		
Scale factor *Amplitude scale factor*	`scale`	Scale factor	-
Second coupled inductor	`ind2`	Inductor to be coupled	
Second frequency name	`fundname2`		
Secondary inductor	`si`		
Signal amplitude	`sa`		

CDF Parameter Label	CDF Parameter	Description	Default
Signal frequency	`fs`		
Select IBIS Buffer Type	`bufferType`		
Select IBIS Buffer Variant	`bufferVariant2`		
Select IBIS Buffer Variant	`bufferVariant4`		
Sine DC level	`sinedc`		
Skin effect res matrix per unit length	`rskin`		
Smoothing Factor	`smoothing`		
Source diffusion area	`as`		
Source diffusion length	`ls`		
Source diffusion periphery	`ps`		
Source diffusion res squares	`nrs`		
Source type	`srcType`		
Source/drain selector	`geo`		
Specification type	`spec`		
Strength	`strength`	Quantity strength. Possible values are indifferent, suggest, insist, or override.	override
Subckt file	`modelFile`		
Substrate height	`h`		
Switch position	`position`	Switch position (0, 1, 2, ...).	0
Temp Rise Specifier	`triseSpec`		
dtmp -Temp rise from ambient	`dtmp`		

CDF Parameter Label	CDF Parameter	Description	Default
dtemp -Temp rise from ambient	`dtempn`		
Temp rise from ambient	`trise`	Temperature rise from ambient	-
Temperature coefficient 1 *Linear temp. coefficient*	`tc1`	Linear temperature coefficient First order temperature coefficient.	-
Temperature coefficient 2 *Quadratic temp. coeff.*	`tc2`	Quadratic temperature coefficient Second order temperature coefficient.	-
Temperature difference	`dtemp`		-
Thermal Noise	`thermalnoise`	Thermal noise. Possible values are no or yes.	yes
Thermal noise model	`noisemodel`		
Time 1	`t1`		
Time 2	`t2`		
Time interval for switching	`ts`		
Time scale factor	`stretch`		
Time to x state	`a2d_tx`		1m s
Total Num of windings	`numOfL`		
Tran position	`tranPosition`	Position to which switch is set at the start of transient analysis.	0
Transaction time	`tt`		
Transconductance	`ggain`		
Transconductance	`hggain`		
Transition width	`twidth`		

CDF Parameter Label	CDF Parameter	Description	Default
Transresistance	`hgain`		
Transresistance	`hhgain`		
Type	`csType`		
Type of source	`typesrc`		
Type of transfer char	`trfType`		
Use Img subckt	`useImg`		
Use Smooth Data Windowing	`usewindow`	Use of smooth data windowing function. The use of window improves time-domain amplitude resolution. Setting this to no improves high-frequency resolution. Possible values are no or yes. This parameter needs to be defined when using the spline interpolation method.	-
Value	`value`	Value quantity	
Volt/res conversion factor	`transfactor`		
Voltage 1	`v1`		
Voltage 2	`v2`		
Voltage eqn	`vol`		-
Voltage gain	`egain`		
Voltage gain	`hegain`		
Width	`w`	Width	-
Width of metal capcitor	`wm`	Width of metal capacitor	-
Width of polysilicon	`wp`	Width of polysilicon capacitor	-
XF magnitude	`xfm`		

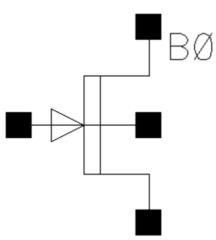
B

hspiceS Components

This section lists all the Analog Library components that are specific to hspiceS. For more information regarding these components, refer to your hspiceS manual.

Active Components

Symbol: nmes4



N-type MES FET Transistor with 4 Terminals

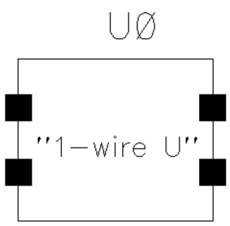
CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Device area	area	-	-	x	-	-	x	x	-
Device initially off	off	-	-	x	-	-	x	x	-

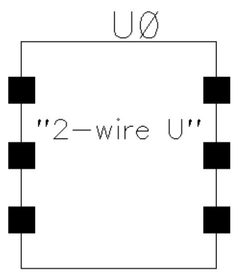
CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Drain source initial voltage	Vds	-	-	x	-	-	x	x	-
Gate source initial voltage	Vgs	-	-	x	-	-	x	x	-
Bulk source initial voltage	Vbs	-	-	x	-	-	x	x	-
Width	w	-	-	x	-	-	x	x	-
Length	l	-	-	x	-	-	x	x	-
Model name	model	-	-	-	-	-	x	-	-
Bulk node connection	bn	-	-	-	-	-	x	-	-
Multiplier	m	-	-	-	-	-	x	x	-
Temperature difference	dtemp	-	-	-	-	-	x	x	-

Passive Components

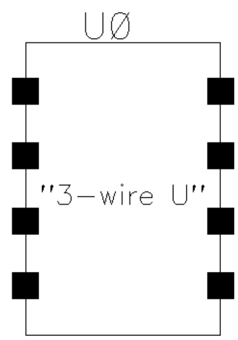
Symbol: uxwire



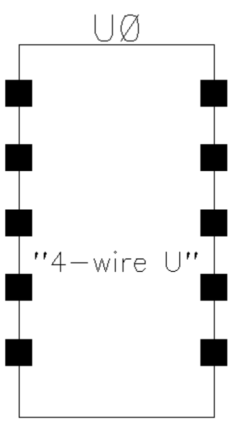
u1wire



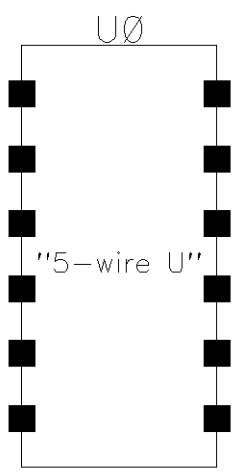
u2wire



u3wire



u4wire



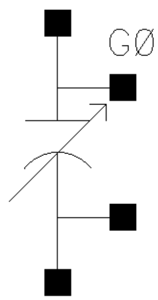
u5wire

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	-	-	-	-	-	x	-	-
Length	`l`	-	-	-	-	-	x	x	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
# of lumps in element	lumps	-	-	-	-	-	x	x	-

Symbol: vccap

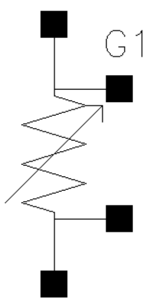


CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Scale factor	scale	-	-	-	-	-	x	x	x
Multiplier	hm	-	-	-	-	-	x	x	-
Temperature coefficient 1	tc1	-	-	-	-	-	x	x	x
Temperature coefficient 2	tc2	-	-	-	-	-	x	x	x
Initial condition	hic	-	-	-	-	-	x	x	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Delta	delta	-	-	-	-	-	x	x	x
Type	csType	-	-	-	-	-	x	x	x
Number of controlling pairs	xypairs	-	-	-	-	-	x	-	x
Controlling Volt 1	x1 - x20	-	-	-	-	-	x	x	x
Corresp Element 1	y1 -y20	-	-	-	-	-	x	-	-

Symbol: vcres



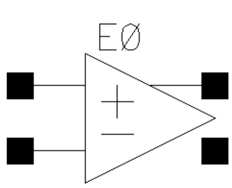
CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Type	csType	-	-	-	-	-	x	x	x
Volt/res conversion factor	transfactor	-	-	-	-	-	x	x	x

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Maximum output resistance	maxr	-	-	-	-	-	x	x	-
Minimum output resistance	minr	-	-	-	-	-	x	x	-
Scale factor	scale	-	-	-	-	-	x	x	x
Multiplier	hm	-	-	-	-	-	x	x	-
Temperature coefficient 1	tc1	-	-	-	-	-	x	x	x
Temperature coefficient 2	tc2	-	-	-	-	-	x	x	x
Initial condition	hic	-	-	-	-	-	x	x	-

Sources - Dependent Components

Symbol: iopamp

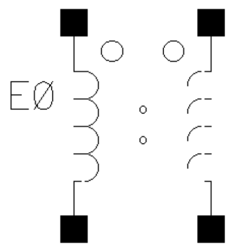


CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Name of voltage source	vref	-	-	x	-	-	x	-	-
Transresistance	hgain	-	-	x	-	-	-	-	-
Initial condition	ic	-	-	x	-	-	-	-	-
Port	port	-	-	-	-	-	-	-	-
Multiplier	m	-	-	-	-	-	-	-	-
Type	csType	-	-	-	-	-	x	-	-
Transresistance	hhgain	-	-	-	-	-	x	-	-
Maximum output voltage	maxv	-	-	-	-	-	x	-	-
Minimum output voltage	minv	-	-	-	-	-	x	-	-
Scale factor	scale	-	-	-	-	-	x	-	-
Temperature coefficient 1	tc1	-	-	-	-	-	x	-	-
Temperature coefficient 2	tc2	-	-	-	-	-	x	-	-
Absolute value	habs	-	-	-	-	-	x	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Initial condition	hic	-	-	-	-	-	x	-	-

Symbol: ixfmr

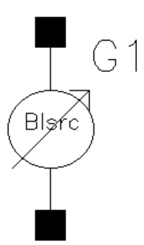


CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Coupling coefficient	k	-	-	-	-	-	x	x	-

Sources - Independent Components

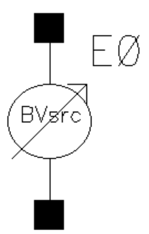
Symbol: bcs



CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Current eqn	`cur`	-	-	-	-	-	x	x	-
Min	`min`	-	-	-	-	-	x	x	-
Max	`max`	-	-	-	-	-	x	x	-
Scale factor	`scale`	-	-	-	-	-	x	x	-

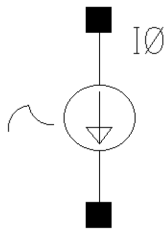
Symbol: bvs



CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Voltage eqn	`vol`	-	-	-	-	-	x	x	-
Min	`min`	-	-	-	-	-	x	x	-
Max	`max`	-	-	-	-	-	x	x	-

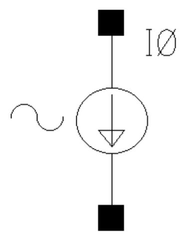
Symbol: iam



CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Signal amplitude	sa	-	-	-	-	-	x	x	-
Carrier frequency	fc	-	-	-	-	-	x	x	-
Modulation frequency	fm	-	-	-	-	-	x	x	-
Offset constant	oc	-	-	-	-	-	x	x	-
Delay time	td	-	-	-	-	-	x	x	-
DC source	dc	-	-	-	-	-	x	x	-
Multiplier	m	-	-	-	-	-	x	x	-
AC magnitude	acm	-	-	-	-	-	x	x	-
AC phase	acp	-	-	-	-	-	x	x	-

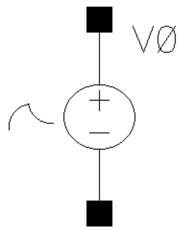
Symbol: isffm



CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC magnitude	acm	-	-	x	-	-	x	x	-
AC phase	acp	-	-	x	-	-	x	x	-
DC current	idc	-	-	x	-	-	-	-	-
Offset current	io	-	-	x	-	-	x	x	-
Amplitude	ia	-	-	x	-	-	x	x	-
Frequency	freq	-	-	x	-	-	x	x	-
Modulation index	mdi	-	-	x	-	-	x	x	-
Signal frequency	fs	-	-	x	-	-	x	x	-
DC source	dc	-	-	-	-	-	x	x	-
Multiplier	m	-	-	-	-	-	x	x	-

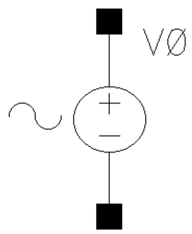
Symbol: vam



CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Signal amplitude	sa	-	-	-	-	-	x	x	-
Carrier frequency	fc	-	-	-	-	-	x	x	-
Modulation frequency	fm	-	-	-	-	-	x	x	-
Offset constant	oc	-	-	-	-	-	x	x	-
Delay time	td	-	-	-	-	-	x	x	-
DC source	dc	-	-	-	-	-	x	x	-
AC magnitude	acm	-	-	-	-	-	x	x	-
AC phase	acp	-	-	-	-	-	x	x	-

Symbol: vsffm



CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC magnitude	acm	-	-	x	-	-	x	x	-
AC phase	acp	-	-	x	-	-	x	x	-
DC voltage	vdc	-	-	x	-	-	-	-	-
Offset voltage	vo	-	-	x	-	-	x	x	-
Amplitude	va	-	-	x	-	-	x	x	-
Frequency	freq	-	-	x	-	-	x	x	-
Modulation index	mdi	-	-	x	-	-	x	x	-
Signal frequency	fs	-	-	x	-	-	x	x	-
DC source	dc	-	-	-	-	-	x	x	-

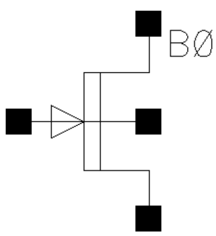
C

cdsSpice Components

This section lists all the Analog Library components that are specific to cdsSpice. For more information regarding these components, refer to your cdsSpice manual.

Active Components

Symbol: nmes4



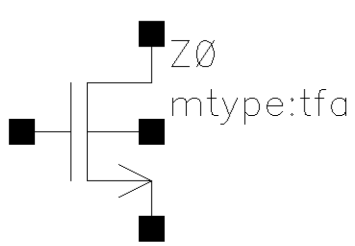
N-type MES FET Transistor with 4 Terminals

CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Device area	area	-	-	x	-	-	x	x	-
Device initially off	off	-	-	x	-	-	x	x	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Drain source initial voltage	Vds	-	-	x	-	-	x	x	-
Gate source initial voltage	Vgs	-	-	x	-	-	x	x	-
Bulk source initial voltage	Vbs	-	-	x	-	-	x	x	-
Width	w	-	-	x	-	-	x	x	-
Length	l	-	-	x	-	-	x	x	-
Model name	model	-	-	-	-	-	x	-	-
Bulk node connection	bn	-	-	-	-	-	x	-	-
Multiplier	m	-	-	-	-	-	x	x	-
Temperature difference	dtemp	-	-	-	-	-	x	x	-

Symbol: nsoi

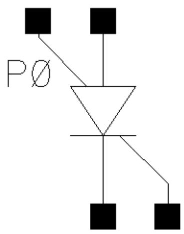


CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	model	-	-	x	-	-	-	-	-
Bulk node connection	bn	-	-	x	-	-	-	-	-
Model type	mtype	-	-	x	-	-	-	-	-
Multiplier	m	-	-	x	x	x	-	-	-
Width	w	-	-	x	x	x	-	-	-
Length	l	-	-	x	x	x	-	-	-
Drain diffusion area	ad	-	-	x	-	-	-	-	-
Source diffusion area	as	-	-	x	-	-	-	-	-
Drain diffusion res squares	nrd	-	-	x	-	-	-	-	-
Source diffusion res squares	nrs	-	-	x	-	-	-	-	-
Body diffusion resistor square	nrb	-	-	x	-	-	-	-	-
Device initially off	off	-	-	x	-	-	-	-	-
Drain source initial voltage	Vds	-	-	x	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Front gate-source voltage	Vgfs	-	-	x	-	-	-	-	-
Gate to bulk and src voltage	Vgbs	-	-	x	-	-	-	-	-
Body-source initial voltage	Vbys	-	-	x	-	-	-	-	-

Symbol: scr



Silicon Controlled Rectifier

scr is a conventional rectifier controlled by a gate signal. Although the main circuit is a rectifier, the application of a forward voltage is not enough for conduction. Therefore, a gate signal controls the rectifier conduction.

CDF Parameters

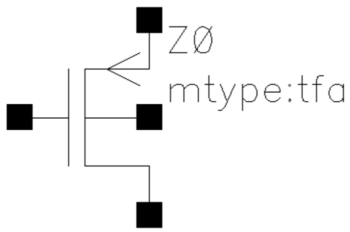
CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	-	-	x	-	-	-	-	-
Bulk node connection	`bn`	-	-	x	-	-	-	-	-
Device area	`area`	-	-	x	-	-	-	-	-
Device initially off	`off`	-	-	x	-	-	-	-	-
Anode gate voltage	`Vag`	-	-	x	-	-	-	-	-
Cathode gate voltage	`Vcg`	-	-	x	-	-	-	-	-
Internal junction voltage	`Vbcc`	-	-	x	-	-	-	-	-

Example

```
P231   32   5   21   8   7   PSCR
PN01   25   14   18   2   PMOD   IC=-.8 .8 -15
```

Parasitic Components

Symbol: psoi



Independent Resistive Source

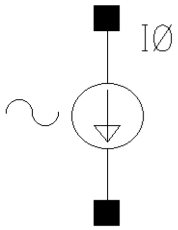
CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Model name	`model`	-	-	x	-	-	-	-	-
Bulk node connection	`bn`	-	-	x	-	-	-	-	-
Model type	`mtype`	-	-	x	-	-	-	-	-
Multiplier	`m`	-	-	x	x	x	-	-	-
Width	`w`	-	-	x	x	x	-	-	-
Length	`l`	-	-	x	x	x	-	-	-
Drain diffusion area	`ad`	-	-	x	-	-	-	-	-
Source diffusion area	`as`	-	-	x	-	-	-	-	-

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
Body contact area	ab	-	-	x	-	-	-	-	-
Drain diffusion res squares	nrd	-	-	x	-	-	-	-	-
Source diffusion res squares	nrs	-	-	x	-	-	-	-	-
Body diffusion resistor square	nrb	-	-	x	-	-	-	-	-
Device initially off	off	-	-	x	-	-	-	-	-
Drain source initial voltage	Vds	-	-	x	-	-	-		
Front gate-source voltage	Vgfs	-	-	x	-	-	-		
Gate to bulk and src voltage	Vgbs	-	-	x	-	-	-		
Body-source initial voltage	Vbys	-	-	x	-	-	-		

Sources - Independent Components

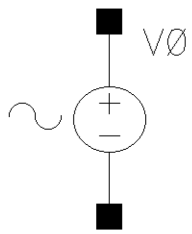
Symbol: isffm



CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC magnitude	acm	-	-	x	-	-	x	x	-
AC phase	acp	-	-	x	-	-	x	x	-
DC current	idc	-	-	x	-	-	-	-	-
Offset current	io	-	-	x	-	-	x	x	-
Amplitude	ia	-	-	x	-	-	x	x	-
Frequency	freq	-	-	x	-	-	x	x	-
Modulation index	mdi	-	-	x	-	-	x	x	-
Signal frequency	fs	-	-	x	-	-	x	x	-
DC source	dc	-	-	-	-	-	x	x	-
Multiplier	m	-	-	-	-	-	x	x	-

Symbol: vsffm



CDF Parameters

CDF Parameter Label	CDF Parameter	spectre	spectreS	cdsSpice	auCdl	auLvs	hspiceS	hspiceD	UltraSim
AC magnitude	`acm`	-	-	x	-	-	x	x	-
AC phase	`acp`	-	-	x	-	-	x	x	-
DC voltage	`vdc`	-	-	x	-	-	-	-	-
Offset voltage	`vo`	-	-	x	-	-	x	x	-
Amplitude	`va`	-	-	x	-	-	x	x	-
Frequency	`freq`	-	-	x	-	-	x	x	-
Modulation index	`mdi`	-	-	x	-	-	x	x	-
Signal frequency	`fs`	-	-	x	-	-	x	x	-
DC source	`dc`	-	-	-	-	-	x	x	-

Index

Z