PLOT.1D

The **PLOT.1D** statement plots a specific quantity along a line segment through the device, or plots terminal characteristics from data accumulated in a log file or read in from a previous log file.

```
PLOT.1D

 Distance Plot Quantities
   {  ( {  POTENTIA | QFN | QFP | VALENC.B | CONDUC.B | VACUUM
         | E.FIELD | ARRAY1 | ARRAY2 | ARRAY3 | TRAPS | TRAP.OCC
         | DOPING | ELECTRON | HOLES | NIE | NET.CHAR | NET.CARR
         | J.CONDUC | J.ELECTR | J.HOLE | J.DISPLA | J.TOTAL
         | RECOMBIN | N.RECOMB | P.RECOMB | II.GENER | BB.GENER
         | ( PHOTOGEN [WAVE.NUM=<n>] ) | N.MOBILI | P.MOBILI | SIGMA
         | ELE.TEMP | HOL.TEMP | ELE.VEL | HOL.VEL | J.EFIELD
         | G.GAMN | G.GAMP | G.GAMT | G.IN | G.IP | G.IT
         | IMPURITY=<c> | OTHER=<c>

 Lattice Temperature AAM Parameters
         | LAT.TEMP

 Heterojunction Device AAM Parameters
         | X.MOLE
        }

 AC Small-Signal Analysis Quantity Parameters
        [ {AC.REAL | AC.IMAG | AC.MAGN | AC.PHAS} ]

 Distance Plot Parameters
        [X.COMPON] [Y.COMPON]
        X.START=<n> Y.START=<n> X.END=<n> Y.END=<n> [HORZ.STA=<n>]
        [ {FIND.MIN | FIND.MAX} [SEMICOND] [INSULATO] [FIND.DIS=<n>] ]
      )

 Terminal Characteristics Plot Parameters
    | ( X.AXIS=<c> Y.AXIS=<c> [ORDER] [IN.FILE=<c>]
        [X.MIN=<n>] [X.MAX=<n>] [CONDITIO=<c>]
      )
   }
```

(**PLOT.1D**, continued next page)

(**PLOT.1D**, continued from previous page)

```
 Plot Controls
   [ SPLINE [NSPLINE=<n>] ]
   [LEFT=<n>] [RIGHT=<n>] [BOTTOM=<n>] [TOP=<n>] [UNCHANGE]
   [ {Y.LOGARI | S.LOGARI | INTEGRAL} ] [ABSOLUTE] [NEGATIVE]
   [CLEAR] [AXES] [LABELS] [MARKS] [TITLE=<c>] [T.SIZE=<n>]
   [X.OFFSET=<n>] [X.LENGTH=<n>] [X.SIZE=<n>] [X.LOGARI]
   [Y.OFFSET=<n>] [Y.LENGTH=<n>] [Y.SIZE=<n>]
   [CURVE] [ {SYMBOL=<n> | POINTS} ] [C.SIZE=<n>]
   [LINE.TYP=<n>] [COLOR=<n>] [DEVICE=<c>] [PAUSE]
   [PLOT.OUT=<c>] [PLOT.BIN=<c>] [PRINT] [OUT.FILE=<c>]
   [TIMESTAM [TIME.SIZ=<n>] ]

 Circuit Analysis AAM Parameters
   [STRUCTUR=<c>]
```

Parameter	Type	Definition	Default	Units
Distance Plot Quantities				
POTENTIA	logical	Specifies that midgap potential in volts is plotted versus distance along the specified line through the device.	false	
QFN	logical	Specifies that the electron quasi-Fermi potential in volts is plotted versus distance along the specified line through the device.	false	
QFP	logical	Specifies that the hole quasi-Fermi potential in volts is plotted versus distance along the specified line through the device.	false	
VALENC.B	logical	Specifies that the valence band potential in volts is plotted versus distance along the specified line through the device.	false	
CONDUC.B	logical	Specifies that the conduction band potential in volts is plotted versus distance along the specified line through the device.	false	
VACUUM	logical	Specifies that the vacuum potential in volts is plotted versus distance along the specified line through the device.	false	
E.FIELD	logical	Specifies that the magnitude of electric field in volts per centimeter is plotted versus distance along the specified line through the device.	false	
ARRAY1	logical	Specifies that the user generated array number 1 is to be plotted along the specified line. Refer to the **EXTRACT** statement for more information.	false	
ARRAY2	logical	Specifies that the user generated array number 2 is to be plotted along the specified line. Refer to the **EXTRACT** statement for more information.	false	
ARRAY3	logical	Specifies that the user generated array number 3 is to be plotted along the specified line. Refer to the **EXTRACT** statement for more information.	false	
TRAPS	logical	Specifies that the trap density in number per cubic centimeter is to be plotted along the specified line.	false	
TRAP.OCC	logical	Specifies that the filled trap density in number per cubic centimeter is to be plotted along the specified line.	false	

Parameter	Type	Definition	Default	Units
DOPING	logical	Specifies that the net impurity concentration in number per cubic centimeter is plotted versus distance along the specified line through the device. The net impurity concentration is the donor impurity concentration minus the acceptor impurity concentration.	false	
ELECTRON	logical	Specifies that electron concentration in number per cubic centimeter is plotted versus distance along the specified line through the device.	false	
HOLES	logical	Specifies that hole concentration in number per cubic centimeter is plotted versus distance along the specified line through the device.	false	
NIE	logical	Specifies that effective intrinsic carrier concentration in number per cubic centimeter is plotted versus distance along the specified line through the device.	false	
NET.CHAR	logical	Specifies that the net charge concentration in number per cubic centimeter is plotted versus distance along the specified line through the device. The net charge concentration is the sum of the donor impurity concentration and hole concentration minus the sum of the acceptor impurity concentration and electron concentration plus the concentration of any trapped charge.	false	
NET.CARR	logical	Specifies that the net carrier concentration in number per cubic centimeter is plotted versus distance along the specified line through the device. The net carrier concentration is the hole concentration minus the electron concentration.	false	
J.CONDUC	logical	Specifies that conduction current in amps per square centimeter is plotted versus distance along the specified line through the device.	false	
J.ELECTR	logical	Specifies that electron current in amps per square centimeter is plotted versus distance along the specified line through the device.	false	
J.HOLE	logical	Specifies that hole current in amps per square centimeter is plotted versus distance along the specified line through the device.	false	
J.DISPLA	logical	Specifies that displacement current in amps per square centimeter is plotted versus distance along the specified line through the device.	false	
J.TOTAL	logical	Specifies that total current in amps per square centimeter is plotted versus distance along the specified line through the device.	false	
RECOMBIN	logical	Specifies that net recombination in number per cubic centimeter per second is plotted versus distance along the specified line through the device. For unequal electron and hole recombination, **RECOMBIN** is the same as **N.RECOMB**.	false	
N.RECOMB	logical	Specifies that net electron recombination in number per cubic centimeter per second is plotted versus distance along the specified line through the device.	false	
P.RECOMB	logical	Specifies that net hole recombination in number per cubic centimeter per second is plotted versus distance along the specified line through the device.	false	
II.GENER	logical	Specifies that the total generation rate due to impact ionization in pairs per cubic centimeter per second is plotted versus distance along the specified line through the device.	false	
BB.GENER	logical	Specifies that the total generation rate due to band-to-band tunneling in pairs per cubic centimeter per second is plotted versus distance along the specified line through the device.	false	
PHOTOGEN	logical	Specifies that total photogeneration in pairs per cubic centimeter per second is plotted versus distance along the specified line through the device.	false	

Parameter	Type	Definition	Default	Units
N.MOBILI	logical	Specifies that the electron mobility in cm^2/V-s is plotted versus distance along the specified line through the device.	false	
P.MOBILI	logical	Specifies that the hole mobility cm^2/V-s is plotted versus distance along the specified line through the device.	false	
SIGMA	logical	Specifies that the conductivity in $(Ohm\text{-}cm)^{-1}$ is plotted versus distance along the specified line through the device.	false	
ELE.TEMP	logical	Specifies that the electron temperature in Kelvins is plotted versus distance along the specified line through the device.	false	
HOL.TEMP	logical	Specifies that the hole temperature in Kelvins is plotted versus distance along the specified line through the device.	false	
ELE.VEL	logical	Specifies that the electron mean velocity in cm/s is plotted versus distance along the specified line through the device.	false	
HOL.VEL	logical	Specifies that the hole mean velocity in cm/s is plotted versus distance along the specified line through the device.	false	
J.EFIELD	logical	Specifies that the component of the electric field in V/cm in the direction of the total current density is plotted versus distance along the specified line through the device.	false	
G.GAMN	logical	Specifies that the probability per unit length that an electron is injected into the oxide is plotted versus distance along the specified line through the device.	false	
G.GAMP	logical	Specifies that the probability per unit length that a hole is injected into the oxide is plotted versus distance along the specified line through the device.	false	
G.GAMT	logical	Specifies that the probability per unit length that an electron or hole (the sum of the electron and hole probabilities) is injected into the oxide is plotted versus distance along the specified line through the device.	false	
G.IN	logical	Specifies that hot electron injection current initiated from each point in amps/micron is plotted versus distance along the specified line through the device.	false	
G.IP	logical	Specifies that hot hole injection current initiated from each point in amps/micron is plotted versus distance along the specified line through the device.	false	
G.IT	logical	Specifies that total hot carrier injection current initiated from each point in amps/micron is plotted versus distance along the specified line through the device.	false	
IMPURITY	char	The name of an impurity to plot in number per cubic centimeter as a function of distance along the specified line through the device.	none	
OTHER	char	The name of an **OTHER** quantity to plot as a function of distance along the specified line through the device.	none	
Lattice Temperature AAM Parameters				
LAT.TEMP	logical	Specifies that the lattice temperature in Kelvins is plotted versus distance along the specified line through the device. This parameter is only used with the Lattice Temperature AAM.	false	

Parameter	Type	Definition	Default	Units
Heterojunction Device AAM Parameters				
X.MOLE	logical	Specifies that the mole fraction for the material is plotted versus distance along the specified line through the device. This parameter is only used with the Heterojunction Device AAM.	false	
AC Small-Signal Analysis Quantity Parameters				
AC.REAL	logical	Specifies that the real part of the quantity obtained from AC analysis is plotted.	false	
AC.IMAG	logical	Specifies that the imaginary part of the quantity obtained from AC analysis is plotted	false	
AC.MAGN	logical	Specifies that the magnitude of the quantity obtained from AC analysis is plotted.	false	
AC.PHAS	logical	Specifies that the phase of the quantity obtained from AC analysis is plotted. Phase is defined as $\text{atan}(\text{imag}(X)/\text{real}(X))$, where X represents the quantity to be plotted.	false	
Distance Plot Parameters				
X.COMPON	logical	Specifies that the x component of a vector quantity is plotted as opposed to the default magnitude.	false	
Y.COMPON	logical	Specifies that the y component of a vector quantity is plotted as opposed to the default magnitude.	false	
X.START	number	The x location of the initial point of the line segment along which the specified quantity is plotted. synonyms: A.X	none	microns
Y.START	number	The y location of the initial point of the line segment along which the specified quantity is plotted. **synonym: A.Y**	none	microns
X.END	number	The x location of the final point of the line segment along which the specified quantity is plotted. **synonym: B.X**	none	microns
Y.END	number	The y location of the final point of the line segment along which the specified quantity is plotted. **synonym: B.Y**	none	microns
HORZ.STA	number	The value along the horizontal plot axis associated with the starting point of the line. This value establishes the reference for horizontal distance along the line.	0.0	microns
FIND.MIN	logical	Specifies that the minimum value of the specified quantity is plotted versus distance along the specified line through the device. For each point along the specified line, the program finds the minimum value by searching along a line that passes through the point and is perpendicular to the specified line.	false	
FIND.MAX	logical	Specifies that the maximum value of the specified quantity is plotted versus distance along the specified line through the device. For each point along the specified line, the program finds the maximum value by searching along a line that passes through the point and is perpendicular to the specified line.	false	
SEMICOND	logical	Specifies that when **FIND.MIN** or **FIND.MAX** is used, the search area should include semiconductor materials.	true	

Parameter	Type	Definition	Default	Units
INSULATO	logical	Specifies that when **FIND.MIN** or **FIND.MAX** is used, the search area should include insulator materials.	false	
FIND.DIS	number	The maximum distance to either side of the specified line over which the search takes place when **FIND.MIN** or **FIND.MAX** is specified.	The search line spans the device.	microns

Terminal Characteristics Plot Parameters

X.AXIS char — The quantity used for the horizontal axis when plotting data stored in a log file. If a log file is available or read using the **IN.FILE** parameter, the choices include the following: — none

I-V Terminal Characteristics

VA(<name>)	applied bias for electrode *<name>*
V(<name>)	contact bias for electrode *<name>*
I(<name>)	total terminal current for electrode *<name>*
IE(<name>)	electron terminal current for electrode *<name>*
IH(<name>)	hole terminal current for electrode *<name>*
ID(<name>)	displacement terminal current for electrode *<name>*
QE(<name>)	total charge on electrode *<name>*
HE(<name>)	hot carrier injection current into electrode *<name>*
TIME	simulation time (transient simulations)
II	impact ionization current (integrated I.I. gener. rate)
<name>	a quantity defined with the **EXTRACT** statement

AC Analysis Quantities Note: Quotes are required.

"C(<ni>,<nj>)"	AC capacitance component for elect. *<ni>,<nj>*
"G(<ni>,<nj>)"	AC conductance component for elect. *<ni>,<nj>*
"Y(<ni>,<nj>)"	AC admittance component for elect. *<ni>,<nj>*
"SR(<ni>,<nj>)"	Real component of S-param. for elect. *<ni>,<nj>*
"SI(<ni>,<nj>)"	Imag. component of S-param. for elect. *<ni>,<nj>*
FREQ	AC frequency

Programmable Device AAM Quantities

FE(<name>)	FN tunneling current into electrode *<name>*

Circuit Analysis AAM Quantities

VC(<name>)	voltage at circuit node *<name>*
IC(<name>)	current in voltage source *<name>*
V(<dn>.<tn>)	voltage at electrode *<tn>* of device *<dn>*
I(<dn>.<tn>)	*total* current at electrode *<tn>* of device *<dn>*
IE(<dn>.<tn>)	*electron* current at electrode *<tn>* of device *<dn>*
IH(<dn>.<tn>)	*hole* current at electrode *<tn>* of device *<dn>*
ID(<dn>.<tn>)	*displacement* current at electrode *<tn>* of device *<dn>*

Parameter	Type	Definition	Default	Units
		Circuit Analysis AAM AC Quantities Note: Quotes are required.		
		"VCR(<name>)" AC real voltage component for node *<name>*		
		"VCI(<name>)" AC imaginary voltage comp. for node *<name>*		
		"ICR(<name>)" AC real current component for source *<name>*		
		"ICI(<name>)" AC imaginary current comp. for source *<name>*		
		Optical Device AAM Quantities		
		WA Wavelength (microns)		
		IT Intensity (W/cm^2)		
		LF Frequency of light modulation (Hz)		
		IP Internal photo current (Amps/micron)		
		EP External photo current (Amps/micron)		
		TR Transmittance at the illumination surface		
		RF Reflectance at the illumination surface		
		CE(name) External collection efficiency at electrode *<name>*		
		CI(name) Internal collection efficiency at electrode *<name>*		
		IS(name) Light modulation small signal current at elec *<name>*		
Y.AXIS	char	The quantity used for the vertical axis when plotting data stored in a log file. The choices are the same as given previously for the **X.AXIS** parameter.	none	
ORDER	logical	Specifies that the data points in log files are sorted by abscissa value before plotting. If **^ORDER** is specified, the data points in the log file are plotted as they occur.	true	
IN.FILE	char	The identifier for a log file containing either I-V data or AC data to be used when plotting terminal characteristics. If **IN.FILE** is not specified, data accumulated in the most recent log file during the present run is used. **synonym: INFILE**	none	
X.MIN	number	The minimum abscissa value plotted. Data points in the log file with smaller abscissa values are ignored.	The minimum value available.	abscissa dependent
X.MAX	number	The maximum abscissa value plotted. Data points in the log file with higher abscissa values are ignored.	The maximum value available.	abscissa dependent
CONDITIO	char	Specifies a numeric expression that must evaluate to "TRUE" before data will be plotted.	none	
Plot Controls				
SPLINE	logical	Specifies that spline smoothing is performed on the data.	false	
NSPLINE	number	The number of interpolated points to use when spline smoothing is specified. The maximum allowed is 1000.	100	none
LEFT	number	The value associated with the left end of the horizontal axis.	The minimum value available.	abscissa dependent

Parameter	Type	Definition	Default	Units
RIGHT	number	The value associated with the right end of the horizontal axis.	The maximum value available.	abscissa dependent
BOTTOM	number	The value associated with the bottom end of the vertical axis. **synonym: MIN.VALU**	The minimum value available.	ordinate dependent
TOP	number	The value associated with the top end of the vertical axis. **synonym: MAX.VALU**	The maximum value available.	ordinate dependent
UNCHANGE	logical	Specifies that the data is added to the previous plot. **UNCHANGE** has the effect of disabling **CLEAR** and **AXES**, and forces the previous axis bounds to be used for scaling. **UNCHANGE** can be used to plot more than one curve on the same plot.	false	
Y.LOGARI	logical	Specifies that a logarithmic vertical axis is used. **synonym: LOGARITH**	false	
S.LOGARI	logical	Specifies that a signed logarithmic vertical axis is used. To avoid overflow, the actual quantity plotted is given by sign(y) * log(1 + |y|).	false	
INTEGRAL	logical	Specifies that the integral of the ordinate is plotted.	false	
ABSOLUTE	logical	Specifies that the absolute value of the ordinate is plotted.	false	
NEGATIVE	logical	Specifies that the negative of the ordinate is plotted.	false	
CLEAR	logical	Specifies that the graphics display area is cleared before beginning the plot.	true	
AXES	logical	Specifies that the horizontal and vertical axes, axis labels, distance marks, and title are plotted.	true	
LABELS	logical	Specifies that axis labels are to be plotted.	true	
MARKS	logical	Specifies that distance marks are to be plotted along the plot axes.	true	
TITLE	char	The character string to be used as the title of the plot.	The character string in the most recent **TITLE** statement.	
T.SIZE	number	The height of the characters in the character string used as the plot title.	0.4	cm
X.OFFSET	number	The distance by which the left end of the horizontal axis is offset from the left edge of the graphics display area.	2.0	cm
X.LENGTH	number	The length of the horizontal axis.	screen width-**X.OFFSET**-1.25	cm
X.SIZE	number	The height of the characters used to label the horizontal axis.	0.25	cm
X.LOGARI	logical	Specifies that the horizontal axis is logarithmic.	false	
Y.OFFSET	number	The distance by which the bottom end of the vertical axis is offset from the bottom edge of the graphics display area.	2.0	cm
Y.LENGTH	number	The length of the vertical axis.	screen height-**Y.OFFSET**-1.25	cm

Parameter	Type	Definition	Default	Units
Y.SIZE	number	The height of the characters used to label the vertical axis at the left edge of the plot.	0.25	cm
CURVE	logical	Specifies that solid or dashed line curves are to be plotted connecting the data points in the plot.	true	
SYMBOL	number	The type of centered symbol plotted at the data points in the plot. The value of this parameter may lie in the range 1 to 15. If this parameter is not specified, the plot will not contain centered symbols. Values of this parameter are associated with the following symbol: 1 Square 2 Circle 3 Triangle 4 Plus 5 Upper case X 6 Diamond 7 Up-arrow 8 Roofed upper case X 9 Upper case Z 10 Upper case Y 11 Curved square 12 Asterisk 13 Hourglass 14 Bar 15 Star	none	none
POINTS	logical	Specifies that centered squares are plotted at the data points in the plot. This parameter has the same effect as specifying **SYMBOL**=1.	false	
C.SIZE	number	The size of the centered symbol used for the plot.	0.25	cm
LINE.TYP	number	The type of line used for the plot. A line type value of 1 generates a solid line plot. Line type values greater than 1 generate dashed line plots, with the dash size increasing with the value of line type.	1	none
COLOR	number	The index of the color used for the plot. The color associated with each color index is dependent upon the color graphics device that is used. This parameter has no effect if a color graphics device is not used.	1	none
DEVICE	char	The name of the graphics output device. Valid names are defined by the file *mdpdev* (see Chapter 1, "Plot Device Definition File—mdpdev" on page 1-14 and Appendix B). If the value of this parameter is "DEFAULT", the first entry in *mdpdev* preceded by "*" is chosen.	The last value specified or "DEFAULT"	
PAUSE	logical	Specifies that program execution pauses after the completion of all graphical output associated with this statement. The user must enter a space followed by a carriage return to continue execution.	false	
PLOT.OUT	char	The identifier for the file in which the character sequences controlling the graphics device are saved. This file may be output to the graphics device to reproduce the graphical output. This output is only available for the direct device drivers such as those used when the **DEVICE** parameter is **HP2648**, **HP2623**, **HP7550**, **TEK4010**, **TEK4100**, **REGIS**, or **POSTSCRIPT**.	*<base>.dplt* if the **DF** entry is "T" in the file *mdpdev*	

Parameter	Type	Definition	Default	Units
PLOT.BIN	char	The identifier for the file in which the binary information describing the graphical output is saved.	*<base>.bplt* if the **BF** entry is "T" in the file *mdp-dev*	
PRINT	logical	Specifies that the data points which are plotted are also printed to the standard output file.	false	
OUT.FILE	char	The identifier for a formatted file to store the values of the plotted data points. **synonym: OUTFILE**	none	
TIMESTAM	logical	Specifies that the date and time are to be plotted in the lower right corner of the plot. This option is not available on all computer systems.	false	
TIME.SIZ	number	The height of the characters used to plot the date and time.	0.25	cm
Circuit Analysis AAM Parameters				
STRUCTUR	char	Specifies the device to plot. This parameter is only used with the Circuit Analysis AAM.	first element	
Optical Device AAM Parameters				
WAVE.NUM	number	The identifying index for a wavelength to use for plotting **PHOTOGEN**. The specified index must correspond to one of the wavelengths actually considered during the photogeneration ray tracing analysis. This parameter is only used with the Optical Device AAM.	Contribution due to all wavelengths are included	none

Description

The **PLOT.1D** statement plots the following:

- A specific quantity along a line segments through the device (distance plots)

or

- Terminal characteristics from data accumulated in a log file or read in from a previous log file, I-V, AC, or user-defined (arbitrary) data

See Also...

To further illustrate the **PLOT.1D** statement, refer to:

- Input file *mdex1* in N-Channel MOSFET Examples, Chapter 4, "Impurity Distribution Plots" on page 4-9
- Input file *mdex1g* in N-Channel MOSFET Examples, Chapter 4, "Simulation of Gate Characteristics" on page 4-11
- Input file *mdex1d* in N-Channel MOSFET Examples, Chapter 4, "Simulation of Drain Characteristics" on page 4-12
- Most other examples that have graphical output

Distance Plots

Plots of quantities along a specified line segment through the device require that a device structure be previously defined. This may be accomplished with a structure definition initiated by a **MESH** statement or by using the **IN.FILE** parameter on the **MESH** statement to input a structure file generated previously.

Plots of all quantities except impurity concentration (**DOPING**), require that a solution be present. This may be accomplished with a solution initiated by a **SOLVE** statement or by using a **LOAD** statement to input a data file generated previously by a **SOLVE** statement.

A distance plot requires specifying the endpoints of the line segment through the device along which the specified quantity is plotted. As an example, the following statement plots the potential horizontally through a device:

```
PLOT.1D   POTENTIAL  X.START=0  X.END=3  Y.START=0  Y.END=0
```

Minimum or Maximum Quantity and Location

The parameters **FIND.MIN** and **FIND.MAX** can be used to find and plot the minimum or maximum of the specified quantity as a function of distance along the specified line segment through the device.

For each point along the line segment, the program searches for the minimum or maximum value along a line that passes through the point and is perpendicular to the line segment.

The actual locations of the minimum or maximum can be found by specifying the **PRINT** parameter and examining the standard output listing. The search area can be configured to the following:

- Confined to semiconductor materials only (the default)
- Confined to insulator materials only
- Include all materials by using the parameters **SEMICOND** and **INSULATO**
- Confined to occur within a specified distance of the line segment by using the parameter **FIND.DIS**

Internal Plots of AC Quantities

Distance plots of quantities obtained from the results of an AC small-signal analysis can be obtained by specifying one of the parameters **AC.REAL**, **AC.IMAG**, **AC.MAGN**, or **AC.PHAS** in addition to the desired quantity (**POTENTIA**, **ELECTRON**, **HOLE**, **ELE.TEMP**, **HOL.TEMP**, **LAT.TEMP**, **J.CONDUC**, **J.ELECT**, **J.HOLE**, **J.DISPLA**, or **J.TOTAL**). For the current vectors, the quantity may be further qualified by specifying **X.COMPON** or **Y.COMPON**.

Plots of Log File Data

Plots of data contained in log files include:

- I-V and transient data

- Results of AC analysis
- Optical quantities
- User-defined or arbitrary quantities.

The **IN.FILE** parameter is used to specify the name of a log file containing the data of interest. If **IN.FILE** is not specified, the program attempts to use data from the most recently opened log file.

Log files are opened, named, and initiated using the **LOG** statement or, if no **LOG** statement is specified, a default log file with the name <*base*>.*ivl* is created.

Axis Quantities

A plot of log file data requires specifying the quantity to plot along each axis. As an example, the following statements plot the drain current of a MOSFET as a function of the drain voltage and the drain current as a function of the gate voltage:

```
PLOT.1D   IN.FILE=IV.DAT  Y.AXIS=I(DRAIN)  X.AXIS=V(DRAIN)
PLOT.1D   IN.FILE=MOS.IVL Y.AXIS=I(DRAIN)  X.AXIS=V(GATE)
```

In the above examples, the I-V data was read from log files named *IV.DAT* and *MOS.IVL*.

Circuit Analysis AAM

With the Circuit Analysis AAM, node voltages and the currents flowing in voltage sources are also available as plot options for the x- or y-axis.

- Circuit node voltages are selected using *VC(*<*name*>*)*, where <*name*> is the name of the node of interest.
- Currents in voltage sources or inductors can be selected using *IC(*<*name*>*)*, where <*name*> is the name of the voltage source of interest.
- To plot the voltage or current at the terminal of a numerical device, use *V(*<d*name*>.<*tname*>*)* or *I(*<d*name*>.<*tname*>*)*, where *P*<*dname*> is the name of the Medici device and <*tname*> is the electrode name.

The following examples plot the voltage at circuit node 1, the current in source *VDD*, and the current at the drain terminal of device *P4* respectively.

```
PLOT.1D   X.AXIS=TIME  Y.AXIS=VC(1)
PLOT.1D   X.AXIS=TIME  Y.AXIS=IC(VDD)
PLOT.1D   X.AXIS=TIME  Y.AXIS=I(P4.drain)
```

Other Information

This section contains additional information important to using **PLOT.1D**. It includes the following:

- Disabling the clear operation
- Plotting more than one curve
- Integrating the abscissa

- Labeling
- Electric field lines

Specify **^CLEAR** to disable the clear operation, and leave the previous plot intact. This allows two or more independent plots to be displayed simultaneously by overriding clearing the display device when a plot is initialized.

The **UNCHANGE** parameter can be used to plot more than one curve on the same plot. **UNCHANGE** has the same effect as specifying **^CLEAR** and **^AXES**, and additionally forces the previous axis bounds to be used for scaling.

INTEGRAL can be used to integrate the specified function over the abscissa coordinate. If **INTEGRAL** is specified, the parameters **X.LOGARI**, **Y.LOGARI**, and **S.LOGARI** should not be specified. If **INTEGRAL** is specified, and either of the parameters **ABSOLUTE** or **NEGATIVE** are also specified, then the absolute value or negative, respectively, of the specified function is taken before the integration is performed.

The **PLOT.1D** statement may be followed by any number of **LABEL** statements to facilitate placing labels in the graphical output.

E.LINE statements for plotting quantities along electric field lines may also follow **PLOT.1D** statements.