# SmartSpice

Release Notes

03/19/12



SILVACO

# RELEASE NOTES

## VERSION 4.6.5

### ALTERATIONS AND ENHANCEMENTS

- Improve logical expression processing
- Improve the parameter R (repeat timepoint) processing  for V, I, and P (resistive source port) devices
- Fix password request for local host in remote mode

## VERSION 4.6.4

### ALTERATIONS AND ENHANCEMENTS

- Enable use of ground net as a port of a child instance in Verilog-A

## VERSION 4.6.3

### ALTERATIONS AND ENHANCEMENTS

- Improve .LIN analysis functionality under .MODIF and .TEMP statements
- Support child instance of VA module and hierarchical instantiation in Verilog-A

## VERSION 4.6.2

### NEW FEATURES

- New inverse FFT algorithm for S-element under .option nportalg=2

### ALTERATIONS AND ENHANCEMENTS

- Improve savebias/loadbias functionality when a netlist contains .alter statements

## VERSION 4.6.1

### ALTERATIONS AND ENHANCEMENTS

- Improve savebias/loadbias functionality when a netlist contains .alter statement
- Fix incorrect default value for option "opsolver"
- Improve Statistics output

## VERSION 4.6.0

### NEW FEATURES

- Option SPEEDPLOT speeds up simulation and reduces memory usage for DC, AC and transient analyses
- DC analysis parameter GYSTERESIS specifies DC hysteresis sweep
- Add new model parameter IMPTRUNC for S-element
- Support of .OP analysis in Rubberband

### ALTERATIONS AND ENHANCEMENTS

- Improve convolution functionality in S-element (Multi-Terminal Networks) under pseudo transient analysis and delay handler functionality. The model parameter HIGHPASSFILTERTYPE default value is changed from QUADRATIC to TUKEY.
- Improve functionality of analysis parameter SPEEDPLOT
- Improve instance vector parameters processing
- Solver BRK is removed
- Improve functionality of E-device with LAPLACE transform when option LAPLACE_ACCURATE is used
- Fix model parameter evaluation during Monte Carlo analysis

## VERSION 4.5.4

### ALTERATIONS AND ENHANCEMENTS

- Improve convolution accuracy in S-element (Multi-Terminal Networks)
- Fix .defparam functionality during parametric analysis

## VERSION 4.5.3

### NEW FEATURES

- Nodal capacitance extraction
- Implement .rttemp thermal INTEGRAL

### ALTERATIONS AND ENHANCEMENTS

- Set variable SAFEMODE to 3 to check available disk space during simulation
- Improve SWEEP functionality when device parameter depends on .PARAM statement

- Improve LSTB analysis with SWEEP
- Improve functionality of E-device under AC analysis to prevent spike on the first frequency point
- Improve .option AUTO_CALLVSAVEV functionality under AccuCell
- Add hierarchical model and nested sub-circuit search
- Generate warning when incorrect solver name is used
- Option IPLOT_ONE is extended to support .ALTER
- Improve FFT and LINEARIZE to transform selected vectors
- Improve selection of common vectors
- Improve Vectors dialog performance and fix "Display transient statistics" section in Run-time dialog
- FSDB format is supported on Windows platform

## VERSION 4.5.1

### NEW FEATURES

- Passivity check in S-element (Multi-Terminal Networks) detects the passivity violation

### ALTERATIONS AND ENHANCEMENTS

- LSTB analysis with PROBE option now generates correct files in -hspice mode; AC plot contains AC and LSTB result vectors

## VERSION 4.4.5

### NEW FEATURES

- Support multiple intervals tolerance options in transient analysis

## VERSION 4.4.4

### ALTERATIONS AND ENHANCEMENTS

- Improve instance vector parameter processing

## VERSION 4.4.3

### ALTERATIONS AND ENHANCEMENTS

- BSIM4 1.8.35 model library is used. Refer to model release notes for additional information.

- Fix an  incorrect processing of TMI model parameters which names have prefix DEV

## VERSION 4.4.2

### ALTERATIONS AND ENHANCEMENTS

- NPORTS 1.8.26 model library is used. Please refer to model release notes for additional information.

## VERSION 4.4.1

### ALTERATIONS AND ENHANCEMENTS

- NPORTS 1.8.23 and WTRA 1.8.10 model libraries are used. Refer to model release notes for additional information.

## VERSION 4.4.0

### NEW FEATURES

- The option RMNODELESS2 removes diodes, capacitors, resistors and inductors which have one connection

### ALTERATIONS AND ENHANCEMENTS

- Remove the variable and the option DHE_MODEL_SIMPLIFY
- Fix incorrect Rubberband functionality for the parameter TEMP
- Fix an invalid .tr0 file generation in -hspice mode for .probe statement
- Fix wrong device statistic on run-time dialog

## VERSION 4.3.4

### NEW FEATURES

- The command line option -CASE controls netlist case sensitivity

### ALTERATIONS AND ENHANCEMENTS

- NPORTS 1.8.20 model library is used. Refer to model release notes for additional information.
- Command CALCDIFF supports new parameters SIGMA_INTERVAL, FROM and TO

## VERSION 4.3.3

### NEW FEATURES

- Add functions SMABS(x, eps), SMSGN(x, eps), SMMIN(x, y, eps) and SMMAX(x, y, eps)

- The options MMSMOOTH and MMSMOOTHEPS make the functions ABS, SGN, MIN and MAX similar to functions SMABS, SMSGN, SMMIN and SMMAX with the smoothing coefficient eps=MMSMOOTHEPS

### ALTERATIONS AND ENHANCEMENTS

- NPORTS 1.8.18 and CAP 1.8.15 model libraries are used. Refer to model release notes for additional information
- The menu item "Source for Verilog-A debugger" functions as a toggle option
- Add timeout for Run time screen's optional sections
- Fix a wrong bin selection at the upper boundary
- Improve DCOP functionality in multi-CPU mode
- Improve handling of  initial run waveforms in Rubberband after restart
- Fix a license issue under UTMOST III. Command file mode interface is changed under VYPER; SMARTSPICE writes wait<id>.utm file second time under VYPER after second group of command ‘191set noaskquit; quit’ has been executed.

## VERSION 4.3.2

### ALTERATIONS AND ENHANCEMENTS

- Parameters V1 and V2 in PULSE for independent voltage source support run-time expression
- Fix parameter LEVEL functionality  for output statements, for example .probe i(*) level=2
- Fix incorrect reset of the parameter M when both parameters M and MULTI are specified in instance statement

## VERSION 4.3.1

### ALTERATIONS AND ENHANCEMENTS

- .BIASCHK statement can monitor current of device and report violation according to the algorithm specified by the option BIASCHKMOD
- .MODIF statement supports SWEEP syntax

## VERSION 4.3.0

### NEW FEATURES

- Rubberband saves and recovers the initial run

### ALTERATIONS AND ENHANCEMENTS

- Viewing decks enhancements:
    - Tool buttons work on selection only
    - Each included header file now is displayed strictly relative to its parent
    - Double-click to switch the current deck, now highlighted in bold
- Improve binning algorithm when parameters DL and DW are specified in instances
- Improve handling of include files containing many '.' and '..' in a path
- Correct writing of .cx file for .LSTB analysis
- Correct generation of scale in the .ac file for the .lstb analysis
- Fix reporting of temperature in the .mt0 file when using the -mp command line flag
- Fix display of plot type in the “Vectors” dialog when loading  the .cx file

## VERSION 4.1.57

### ALTERATIONS AND ENHANCEMENTS

- The version of PSF library is 2.0.1
- NPORTS 1.8.15 model library  is used. Refer to model release notes for additional information.

## VERSION 4.1.56

### ALTERATIONS AND ENHANCEMENTS

- Fix duplicated plot titles when the option POST=3 is used during Monte Carlo simulation
- RAWCONVERT saves PSF files in correct location
- LISTING EXPANDED shows circuit listing in -fast mode

## VERSION 4.1.53

### ALTERATIONS AND ENHANCEMENTS

- SPECTRE library 2.3.7 supports parameter TYPE in poly-Si (PSITFT) and amorphous-Si (ATFT) model cards:
    - poly-Si (PSITFT) type=n is translated to NTFT level 36
    - poly-Si (PSITFT) type=p is translated to PTFT level 36
    - amorphous-Si (ATFT) type=n is translated to NTFT level 35
    - amorphous-Si (ATFT) type=p is translated to PTFT level 35

## VERSION 4.1.52

### ALTERATIONS AND ENHANCEMENTS

- SPECTRE library version is 2.3.6. Step calculation algorithm for TRAN NOISE analysis is updated. The parameter 'noisetmin' value is used if and only the parameter 'noisefmax' is not specified. Otherwise the step is calculated based on the formula: step = 1/(noisefmax*10).
- Add support of TFT models:
  - poly-Si (PSITFT) is translated to PTFT/NTFT level 36
  - amorphous-Si (ATFT) is translated to PTFT/NTFT level 35
- The parameters Va, V0, Td, Theta, and Phase in SIN for independent voltage source support run-time expressions
- New keyword POI in .AC statement. It is now possible to pass 0 (zero) as numsteps value to mean <read all points>.
- Fix an issue due to uninitialized memory of frequency list in AC analysis

## VERSION 4.1.51

### ALTERATIONS AND ENHANCEMENTS

- "SmartSpice Threads Information" section is improved
- Improve behavior of .MODIF bisection optimization when both boundaries are passed or failed
- Do not stop simulation in time in AUTOSTOP mode if keywords RISE, FALL, CROSS, and OCCUR are missed in CROSS, FIND, TRIG/TARG measurements
- Correct updating of vector model parameters

## VERSION 4.1.50

### ALTERATIONS AND ENHANCEMENTS

- Enhance time step control functionality when the .option RUNMODE is set to TURBO
- Correct swept parameter in subcircuit run-time expression
- A duplication of subcircuit instance (X call) is considered as a fatal error

## VERSION 4.1.49

### NEW FEATURES

- New .option MFILEFORMAT specifies measure file format

### ALTERATIONS AND ENHANCEMENTS

- A logical expression can be used in .OPTION AUTOSTOP
- Improve consecutive run of .TRAN NOISE and .AC analyses

## VERSION 4.1.48

### ALTERATIONS AND ENHANCEMENTS

- Enhance wildcard usage in command PRINTPAR
- Fix argument number limitation for AC command
- Generate fatal error and terminate simulation when voltage loop is detected

## VERSION 4.1.47

### ALTERATIONS AND ENHANCEMENTS

- BSIM4 1.8.25 model library is used. Refer to model release notes for additional information.

## VERSION 4.1.46

### NEW FEATURES

- Support distributed sweep processing for remote modes (-mpr/-mprg)

### ALTERATIONS AND ENHANCEMENTS

- Parameter NESTED can be used together with bisectional optimization to enable optimization of each nested MODIF set.
- Set option RAWPTS to 0 when option PSF is specified
- Improve simulation Run-time Statistics

## VERSION 4.1.45

### NEW FEATURES

- New pass/fail binary search algorithm is implemented for .MODIF statement

### ALTERATIONS AND ENHANCEMENTS

- Enhance functionality of variable which is defined through measure statement

## VERSION 4.1.44

### ALTERATIONS AND ENHANCEMENTS

- SmartSpice Verilog-A Interface uses version 2.0.27 of libVLGP library

## VERSION 4.1.43

### ALTERATIONS AND ENHANCEMENTS

- Enhance .MODIF statement functionality where last passed measurements are saved when the parameter SOLUTIONONLY is set to 1 and the parameter METHOD is set to 2
- Fix .option RELTOL initialization

## VERSION 4.1.42

### ALTERATIONS AND ENHANCEMENTS

- SPECTRE library version is 2.3.1
  - Add support for MOS device parameters in SAVE statement
  - A parameter DEV  from SWEEP analysis definition is translated to an actual device name
- Version of PSF library is 1.3.2
  - Fix an issue due to incorrect translation of vector names contained device parameters like '@m_m1[gds]'
  - STB analysis supports PSF ASCII/binary file formats
- SNS analysis uses the .option NUMDGT to control output precision
- CALIBRATEDEVICES generates decks using Spectre syntax for MOSFET devices in -spectre mode
- Enhance .alter statement processing when command option -P is specified
- Correct parsing of par’i(vin)’ output vector
- Support run-time expression in GAIN argument of E-device
- Enhance processing of ternary operator in expression
- Fix functionality of .del lib statement when library files are encrypted
- Fix pseudo transient analysis when a recovery is applied after "time step too small" (TSTS) error
- Fix double statistics printout when PTA failed inside DC analysis
- Fix XCALL settings in .CUTOFFTAB statement

## VERSION 4.1.41

### ALTERATIONS AND ENHANCEMENTS

- Support .dc lin analysis under the -mp command option

- Correct loading HSPICE binary format files if sweep variables are present
- Fix pass/fail binary search algorithm
- Enhance functionality of 'Sleep Mode' preferences
- Enhance pseudo transient analysis recovery algorithm during parametric analysis

## VERSION 4.1.40

### ALTERATIONS AND ENHANCEMENTS

- Sleep Mode and License Timeout options are controlled via Preferences import/export feature

## VERSION 4.1.39

### NEW FEATURES

- Hierarchical options ABSTOL, RELTOL, VNTOL, BYPASS, BYTOL, and HSIMSPEED are supported. It allows to use different option settings on different circuit hierarchy levels

### ALTERATIONS AND ENHANCEMENTS

- Remove RESET command
- Fix processing inline comments inside variability block
- Correct waveform when transient parameters from/to are specified

## VERSION 4.1.38

### ALTERATIONS AND ENHANCEMENTS

- SmartSpice Verilog-A Interface uses version 2.0.10 of libVLGP library

## VERSION 4.1.37

### ALTERATIONS AND ENHANCEMENTS

- The .option PROBELET controls  saving of .LET statement vectors into a raw file
- Remote Monte Carlo reliability and performance are improved

## VERSION 4.1.36

### ALTERATIONS AND ENHANCEMENTS

- The .CUTOFFTAB statement supports new optional filter parameters SUBCKT, XCALL, and FILTEROUT_CONDITION
- Enhance functionality of -mp command line option with .MODIF statement

- Fix an issue with the '~' as a user path expansion on UNIX for .LIB statement
- Fix simulation errors during pass/fail optimization when METHOD is set to 2 and .DATA sweep is specified
- Fix waveform length limitation and functionality of parameters FROM and TO in Rubberband

## VERSION 4.1.35

### NEW FEATURES

- Add loading of PSF files

### ALTERATIONS AND ENHANCEMENTS

- Improve performance and memory consumption under UTMOST IV

## VERSION 4.1.34

### ALTERATIONS AND ENHANCEMENTS

- Correct the use of -mp when used with the command line flag -P 1

## VERSION 4.1.32

### NEW FEATURES

- The .option and variable EQNTHRESHOLD controls solver switching from default to SPEEDS

### ALTERATIONS AND ENHANCEMENTS

- Correct UNICODE symbols representation on Windows

## VERSION 4.1.31

### ALTERATIONS AND ENHANCEMENTS

- Correct loading/writing a rawfile with UTF8 characters

## VERSION 4.1.30

### NEW FEATURES

- License timeout feature allows to release license if no user or simulation activity is detected during a specified time period, and recovered right as soon as application is awakened by user

## VERSION 4.1.29

### ALTERATIONS AND ENHANCEMENTS

- .TRAN Statement now supports optional parameters WRITE and WRITEFINAL
- Fix command flag -mp when used with .MODIF statement
- Modellib warnings/errors are processed in the same manner as simulator messages
- Fix detailed statistics table under option ACCT>1 if a solver uses multi-thread mode

## VERSION 4.1.28

### ALTERATIONS AND ENHANCEMENTS

- DC analysis supports convergence cascading
- PRINT in .MEASURE statement controls saving of measure results in raw file
- Correct processing of nodes with one connection when the .option NOWARN is set
- Correct reading/writing of HSPICE ASCII files

## VERSION 4.1.27

### NEW FEATURES

- Add support for UNICODE characters

### ALTERATIONS AND ENHANCEMENTS

- Add module information into Simulation Statistics

## VERSION 4.1.26

### ALTERATIONS AND ENHANCEMENTS

- Enhance -spectre mode:
  - .TRAN an .DC statements support new options READNS, READIC, READFORCE, and RESTART
  - Default 'm=1' parameter is removed from a subcircuit definition
  - Default number of steps of DC analysis is changed to 50
- -fast submode is ON by default. New command line flag -flat turns -fast submode OFF.
- Fix an issue when RCL-reduction is used
- Correct parsing of output statements with PAR
- Fix processing run-time expression in -fast submode

## VERSION 4.1.25

### ALTERATIONS AND ENHANCEMENTS

- Fix an issue when -RCLEVEL command line flag used in GUI mode
- Fix incremental loading for HSPICE binary files with parametric data

## VERSION 4.1.24

### ALTERATIONS AND ENHANCEMENTS

- Option rforce='val' is converted to .option icg='1/val' in -spectre mode
- Enhance PSF binary file format to add new fields 'PSF traces' and 'analysistype' so the field 'analysis description' is correct
- Fix access to measure results under AccuCell in SIPC mode

## VERSION 4.1.22

### NEW FEATURES

- SEARCHORDER allows change to default search order for .INCLUDE or .LIB statements
- Command line flag -mprfile <file name> used to pass settings to SmartSpiceServer for processing under '-mpr/-mprg' mode

### ALTERATIONS AND ENHANCEMENTS

- Improve time step control for complex circuits
- Fix maximum current calculation under option vzero=2
- PWLZ in voltage source does not accept negative voltage values
- Correct incremental rawfile loading for HSPICE 2010.12 binary format
- Fix the command WRITE with parameters FROM and TO
- Command line switch -rmc is  removed

## VERSION 4.1.20

### ALTERATIONS AND ENHANCEMENTS

- Add support for ‘<‘ and ‘>’ symbols in a node name in SPICE netlists in SPECTRE mode

## VERSION 4.1.19

### ALTERATIONS AND ENHANCEMENTS

- Add support of log files changes introduced in SPECTRE 7

- New keyword CUTOFFMODE = 1 in .CUTOFFTAB statement causes SMARTSPICE to check and report the nodes that have gate connection to MOS devices operating in cut-off by default, linear or saturation modes and MOS device parameters are satisfied by optional user specified condition.
- Fix .measure statement processing in AccuCell mode when sweep data is presented in analysis statement
- When the command ‘run’ is used and there is no loaded circuit do not perform the command
- Fix output data file generation for repeat simulations in GUI in -hspice mode

## VERSION 4.1.18

### ALTERATIONS AND ENHANCEMENTS

- Enhance -spectre mode
  - Add basic support for stability analysis. SPECTRE's 'stb' statement is converted into SPICE's '.lstb' statement
  - Add support of Monte-Carlo statement (mc statement)
  - Fix improper '\\' concatenation
  - Fix a duplicated title in netlist
- The command CALIBRATEDEVICES allows users to take I-V characteristics for all circuit devices
- Fix the statistics "Other operations" under the option ACCT=2|3
- Add new statistics "Other Matrix operations" to include some solver internal operations for matrix manipulation
- Fix .measure statement processing under AccuCell when .let statement is present in input deck

## VERSION 4.1.17

### ALTERATIONS AND ENHANCEMENTS

- Add a protection against too high values for options DCTRANOPARG and DCTRANOPSTEP for pseudo transient analysis

## VERSION 4.1.16

### ALTERATIONS AND ENHANCEMENTS

- Add support for 'process' and 'mismatch' sections for statistic block in -spectre mode

- The .option SWEEPMONTE allows running of Monte Carlo statistical analysis though nested parametric SWEEP for AC, DC, and TRAN analyses

## VERSION 4.1.15

### ALTERATIONS AND ENHANCEMENTS

- Enhance time step control algorithm for oscillators in -spectre mode
- Fix a numerical issue in calculating derivatives for run-time expressions

## VERSION 4.1.14

### ALTERATIONS AND ENHANCEMENTS

- Open a deck immediately after sourcing and highlight error(s) if it contains any
- Stimulus Editor supports sources with PULSE and SINE
- Correct output statements with PAR('EXPRESSION')
- Fix a .PRINT slowdown
- Fix an issue when the .option UNWRAP=1 and the function PHASE is used in netlist
- Correct the function LIMIT when run-time expression is used as an argument
- Fix DC Monte Carlo analysis when the .option FLATTENED_DCMONTE is used

## VERSION 4.1.13

### ALTERATIONS AND ENHANCEMENTS

- Enhance pattern function (PAT) and .PAT statement by supporting more than one pattern

## VERSION 4.1.12

### ALTERATIONS AND ENHANCEMENTS

- Add new impulse response and convolution calculation algorithms in NPORTS 1.8.5 model library
- The .BIASCHK statement supports new parameter DURATION under BIASCHKMODE=2. It sets a minimum violation duration to report
- Implement Stimulus Editor
- Enhance Shutdown procedure in GUI
- Do not stop after first calculated measurement when AUTOSTOP=2 is specified

- Fix generation of output, raw, and measure files when the command line options -mp or -mps are specified

## VERSION 4.1.11

### ALTERATIONS AND ENHANCEMENTS

- Enhance device and model case sensitivity control by adding new option INSENSITIVE in 'simulator lang=spectre'
- Enhance .CUOFFTAB feature to better detect pull-up/pull-down transistors in cut-off chain
- By default, when an input deck contains SIN sources, SMARTSPICE adjusts TDELTA and MAXF Laplace transform parameters to have at least 65536 points per period
- Process .FUNC statement in -spectre mode according to its case

## VERSION 4.1.8

### NEW FEATURES

- New .option VLG_TO_VSRC='value' creates a file "VLG_TO_VSRC.lib", where all VLG device terminals are connected to corresponding VSRC devices with voltage level equals 'value'. This option is useful for debuging purposes.
- The variable SPLITMEASUREPLOTS is true in -hspice mode
- Fix an issue due to incorrect measure file generation in -hspice mode

## VERSION 4.1.7

### ALTERATIONS AND ENHANCEMENTS

- By default, when an input deck contains SIN sources, SMARTSPICE adjusts TDELTA and MAXF Laplace transform parameters to have at least 8192 points per period
- Under the .option runmode=TURBO the option HSIMSPEED is defaulted to 3. This can be overridden in the netlist.

## VERSION 4.1.6

### ALTERATIONS AND ENHANCEMENTS

- The .IF-.ELSE statement can be used on any hierarchical level of circuit. Analysis, output, .param and .model statements can be included inside of IF, ELSEIF, or ELSE statement block.
- New .option GROUND_NODE_RC allows user to specify ground node name for CRC library
- Add bus notation syntax [] to access VLG device vector variables

- Retain inline comments during deck separation for parallel alter processing
- Fix parsing of capacitor with poly statement

## VERSION 4.1.5

### ALTERATIONS AND ENHANCEMENTS

- CAP 1.8.10 model has improved charge-based model for nonlinear capacitors. Device parameter CTYPE must be used to select charge computation model.
- Fix hyperbolic functions which use their values in degrees

## VERSION 4.1.4

### ALTERATIONS AND ENHANCEMENTS

- By default, when an input deck contains SIN sources, SMARTSPICE adjusts TDELTA and MAXF Laplace transform parameters to have at least 4096 points per period

## VERSION 4.1.3

### ALTERATIONS AND ENHANCEMENTS

- Backslashed symbols are preserved in node, device, model, and subcircuit names in SPECTRE library 2.1.1
- Functionality of RunTime and DC Analysis dialogs are improved. Pause feature is available in all GUI modes.
- Fix a numerical issues in Laplace transform function in ASRC device

## VERSION 4.1.2

### ALTERATIONS AND ENHANCEMENTS

- GUI enhancements:
    - Improve error/warning message functionality under -spectre mode
    - Command with '&' appended, launched from command prompt in GUI, sends its output to alternative Output window
    - 'Devices' window correctly represents hierarchy
    - Do not use TMP directory and temporary files for commands
    - Fix an issue with 'Current freq' on RT dialog during AC analysis
    - Correct an issue with '~' in file name

- Improve processing of the .option HSIMSPEED

## VERSION 4.1.1

### ALTERATIONS AND ENHANCEMENTS

- Reset the option VZERO to 0 when the option HSIMSPEED is set to 3

## VERSION 4.1.0

### NEW FEATURES

- Add an interconnect RC networks reduction feature. To enable this feature, the .option INT_RC_METHOD should be set to 1 or 2.

### ALTERATIONS AND ENHANCEMENTS

- SPECTRE library version is 2.1.0
  - Add support for initial conditions and nodeset file
  - Correct calculation the parameter MULT for MOSFET
  - Set up default file format (touchstone) for S-parameters of NPORT device
- The .CUTOFFTAB feature is enhanced by adding new parameter NSP='value' to control the number of second phase passes

## VERSION 3.19.15

### NEW FEATURES

- SOLVER_MONITOR to display solver-related information in the RunTime dialog
- RTSTATS to display 'solver_monitor' to display run-time statistics in a RunTime dialog

### ALTERATIONS AND ENHANCEMENTS

- SPECTRE library version is 2.0.1. Add SWEEP analysis
- 3D plotting feature is implemented for parametric analyses (both with TonyPlot & TonyPlot3D)
- 'Modif Screen' monitor is available from main menu
- 'Simulation Debugger' run-time section has been added for monitor under SimDbg
- Fix an issue in conditional .BIASCHK for biaschkmode=2
- The function POW is redefined from abs(x)^int(y) to x^int(y)
- Fix an issue in extrapolation algorithm of S element

## VERSION 3.19.13

### NEW FEATURES

- VSRC and ISRC devices support new LFSR function which generates a pseudo random-bit sequence

### ALTERATIONS AND ENHANCEMENTS

- The .option RAWPTS by default is set to 500 if the option POST is given
- The .option PROBE is set to 1 under TURBO mode to limit the output variables saved in rawfile. To disable this feature, .option PROBE=0 should be directly specified in the netlist.
- The .MODIF statement supports Exponential, Lognormal, and Rayleigh distribution functions
- Fix setting of the variable SUBCKT_DELIMITER

## VERSION 3.19.12

### ALTERATIONS AND ENHANCEMENTS

- The option SINGULARSUPPLYRES specifies the resistor (its value) which terminates the floating node of a voltage source on ground. Default value is 1e6.
- Correct DC convergence routine (dcgmin stepping)

## VERSION 3.19.11

### ALTERATIONS AND ENHANCEMENTS

Fix an issue with name filter for subcircuit terminal in .BIASCHK statement

## VERSION 3.19.10

### ALTERATIONS AND ENHANCEMENTS

- The backslash feature supports the following set of symbols: | : + - < > ( ) \ in output statements in -spectre mode

## VERSION 3.19.9

### ALTERATIONS AND ENHANCEMENTS

- Improve parsing of F (Current-Controlled Current Source) devices
- Add new optimization option SOLUTIONONLY in the .MODIF statement
- Correct temperature under .RTTEMP

## VERSION 3.19.8

### NEW FEATURES

- Redirect .PRINT output into separate files in -b and -sb modes when .option LIS_NEW=1 is specified

### ALTERATIONS AND ENHANCEMENTS

- SPECTRE Compatibility:
  - Auto-detect S-parameter data file format
  - Set transformer parameters n1 and n2 to 1 by default
  - Improve handling of STEP parameter in AC analysis statement
  - Add support of '\-' and '\+' combinations in output statements
- Fix an incorrect processing of nested ternary operators in expressions

## VERSION 3.19.7

### ALTERATIONS AND ENHANCEMENTS

- SPECTRE Compatibility:
  - Fix a scale factor issue for list of parameters (wave parameter in isource/vsource element)
  - Fix output statements with '\<' and '\>'
- Fix a wrong evaluation of functions FLOOR, FMOD, and ROUND in output statements

## VERSION 3.19.6

### ALTERATIONS AND ENHANCEMENTS

- Fix functionality of command line option -forcesolver for parallel .alters processing

## VERSION 3.19.5

### ALTERATIONS AND ENHANCEMENTS

- The default value of the .option PZABS is 1e-02. HSPICE compatible poles/zeroes are filtered under threshold 1e10.
- By default, TURBO sets:
  - runlvl=3 (default ON)

    - bypass=2
    - minbreak=1e-7
    - solver =speeds
- Fix an incorrect processing of characters ‘(‘ and ‘)’ in device and node names under -spectre mode
- Fix an incorrect processing of long set of parameters during parametric analyses

## VERSION 3.19.4

### ALTERATIONS AND ENHANCEMENTS

- Fix an issue with enclosed include statements in -spectre mode
- Toolbars' submenu has been added to 'View' menu
- Simulation (matrix) Debugger displays matrix cell values in different colors for each level in circuit hierarchy
- Improve .RTTEMP TERMAL performance; optimize temperature update in more suitable timepoints

## VERSION 3.19.3

### ALTERATIONS AND ENHANCEMENTS

- By default, the .option runmode=TURBO sets:
    - hsimspeed=5
    - runlvl=3 (default ON)
    - bypass=2
    - minbreak=1e-7
    - solver =speeds
- FSDB Format:
    - Time scale is changed from 1ps to 1fs
    - Save device and node current
    - Fix issue where some voltages and currents were missing
- Enhance .RTTEMP thermal: Fix an incorrect parameter processing; improve error handling; support device parameters in expression for example, i(x1.mn1)

- Fix the command RCDUMP when RLC library does not perform reduction

## VERSION 3.19.2

### ALTERATIONS AND ENHANCEMENTS

- G (Voltage-Controlled Current Source) device supports expressions for VALUE and TABLE parameters
- New method RMS (Root mean square) is implemented in .RTTEMP THERMAL statement to calculate currents/voltages presented inrun-time expression
- Rubberband displays measure result waveforms which have at least two points

## VERSION 3.19.1

### NEW FEATURES

- The .CUTOFFTAB statement checks and reports all shared (source/drain) nodes between any two MOS devices operating in cut-off mode. Statement supports OP and transient analyses.
- Add new .option RUNMODE to control simulation speed and accuracy

### ALTERATIONS AND ENHANCEMENTS

- .NET, .NOISE, and .PZ statements support Monte-Carlo statistical analysis
- Enhance SMARTSPICE performance under Gateway
- Delete Rubberband reference waveforms in SmartView under Gateway
- Fix an incorrect unsetup for output_ecl, io_ecl, and three_state_ecl IBIS model types
- Correct expression processing for E devices
- Fix an issue when .AC statement with PRINTOP outputs zeroed power and current values for resistors and voltage sources

## VERSION 3.19.0

### ALTERATIONS AND ENHANCEMENTS

- SPECTRE library version 1.13.1.R supports:
    - 'gear2only' value for 'method' option
    - 'delay' model. SPECTRE 'delay' element is replaced with SPICE VCVS DELAY element
    - Fix double conversion for distributed .ALTER

- SAFEMODE activates memory and disk space control during a simulation
- MEMORYLIMIT specifies a minimum physical or virtual memory size when a simulation will be performed. Default value is 50 (means 50 MB).
- DISKLIMIT specifies a minimum disk space when simulation will be performed. Default value is 50 (meaning 50 MB).
- .DATA statement does not update analysis parameters under AccuCell

## VERSION 3.18.12

### ALTERATIONS AND ENHANCEMENTS

- RES 1.8.10 model library is used. Refer to model release notes for additional information.

## VERSION 3.18.11

### ALTERATIONS AND ENHANCEMENTS

- CAP 1.8.7 model library is used. Refer to model release notes for additional information.

## VERSION 3.18.10

### ALTERATIONS AND ENHANCEMENTS

- Correct parsing of coupled mutual inductor statement when coupled inductors names contained any arithmetical operators

## VERSION 3.18.9

### ALTERATIONS AND ENHANCEMENTS

- Fix setting of the variable SUBCKT_DELIMITER

## VERSION 3.18.8

### ALTERATIONS AND ENHANCEMENTS

- The option SINGULARSUPPLYRES specifies the resistor (its value) which terminates the floating node of a voltage source on ground. Default value is 1e6.

## VERSION 3.18.7

### ALTERATIONS AND ENHANCEMENTS

- Add new optimization option SOLUTIONONLY in  the .MODIF statement

- Fix an issue due to incorrect temperature update under .RTTEMP

## VERSION 3.18.6

### NEW FEATURES

- Redirect .PRINT output into separate files in -b and -sb modes when .option LIS_NEW=1 is specified

## VERSION 3.18.5

### ALTERATIONS AND ENHANCEMENTS

- ASRC 1.8.7 model library is used. Refer to model release notes for additional information.

## VERSION 3.18.4

### ALTERATIONS AND ENHANCEMENTS

- Correct processing of long set of parameters during parametric analyses

## VERSION 3.18.3

### ALTERATIONS AND ENHANCEMENTS

- Fix processing of M-factor for Verilog-A X statement

## VERSION 3.18.2

### ALTERATIONS AND ENHANCEMENTS

- RUNMODE can be set to FAST or TURBO
- Correct library loading from an invalid directory on x86 Solaris platform in Verilog-A

## VERSION 3.18.1

### ALTERATIONS AND ENHANCEMENTS

- G (Voltage-Controlled Current Source) device supports expressions for VALUE and TABLE parameters

## VERSION 3.17.28

### ALTERATIONS AND ENHANCEMENTS

- Default value of the option RUNMODE is ACCURATE

## VERSION 3.17.27

### NEW FEATURES

- Option RUNLVL controls time step relaxation mechanism
- Option RUNMODE sets group of options to control simulation speed and accuracy

### ALTERATIONS AND ENHANCEMENTS

- Default value of option RUNMODE is NOMINAL

## VERSION 3.17.26

### ALTERATIONS AND ENHANCEMENTS

- Improve .LSTB analysis under -hspice mode to create compatible file with “G”vector (loop gain) data
- Add handling of backslash character in -spectre mode
- Improve 'Take a snapshot' functionality in run-time dialog
- Improve run-time model parameter evaluation

## VERSION 3.17.25

### ALTERATIONS AND ENHANCEMENTS

- In -spectre mode JITTER measurement is used for noise measurements
- Improve CMA model parameter handling in -fast mode
- Add support for run-time expressions to evaluate model parameters
- Enhance functionality to change subcircuit instance parameters in Rubberband

## VERSION 3.17.24

### NEW FEATURES

- Option “PREVIEWSTIMULUS” enables viewing and manipulation of PWLZ source data in GUI

### ALTERATIONS AND ENHANCEMENTS

- Improve speed performance of .RTTEMP

## VERSION 3.17.23

### NEW FEATURES

- Add support of parameters NOISESEED, NOISEFMAX, NOISESCALE, NOISEFMIN, and NOISETMIN in -spectre mode
- The command CALCDIFF calculates difference between two simulation files

### ALTERATIONS AND ENHANCEMENTS

- BSIM4 1.8.4 model library is used. Refer to model release notes for additional information.

## VERSION 3.17.22

### ALTERATIONS AND ENHANCEMENTS

- Enhance .RTTEMP statement to use thermal equations

## VERSION 3.17.21

### ALTERATIONS AND ENHANCEMENTS

- Expand support for branch current syntax of two port devices R, L, C, D in -hspice mode
- AUTOSTOP enhancements:
  - Run-time execution of MIN,MAX, AMIN, AMAX and AVG
  - Run-time execution of dependent measures using MIN, MAX, AMIN.AMAX,AVG,CROSS/WHEN, DELAY/TRIG, FIND
  - Run-time expression in measures using MIN, MAX, AMIN, AMAX.AVG, CROSS/WHEN, DELAY/TRIG, FIND
- The option OPSOLVER sets DC OP solver independently from transient analysis solver
- Improve .VEC statement handling of bidirectional sources

## VERSION 3.17.20

### ALTERATIONS AND ENHANCEMENTS

- Improve performance of non-linear resistor
- G element supports lookup table with multi-input format

## VERSION 3.17.19

### ALTERATIONS AND ENHANCEMENTS

- Enhance block generation which includes a transition statement and module instantiation when definition is located in a different file in Verilog-A

## VERSION 3.17.18

### ALTERATIONS AND ENHANCEMENTS

- PSF library 1.2.5 supports Solaris x86

## VERSION 3.17.17

### ALTERATIONS AND ENHANCEMENTS

- The command RCDUMP generates original and reduced RLC listing for whole netlist
- The option DCPATHNODE defines a node within the “floating” nodes to be connected

## VERSION 3.17.16

### ALTERATIONS AND ENHANCEMENTS

- Improve -spectre mode performance of transient analysis

## VERSION 3.17.15

### ALTERATIONS AND ENHANCEMENTS

- Add option REDUCE_ALL_RLC to select R, L, and C elements for reduction
- Improve Run-time dialog functionality
- Enhance post processing for multiple combination of output commands

## VERSION 3.17.13

### ALTERATIONS AND ENHANCEMENTS

- Improve -spectre mode handling of “phy_res” device
- Solver Libraries are updated:
  - solver 1.2.31
  - solver sms 1.2.27
  - solver xms 1.2.27
- Enhance Rubberband functionality when .let statements are used under TRAN and AC
- Improve functionality under Gateway

- The option DONOTPRINTOP disables printing of OP information
- Fix -cell mode for setup/hold characterization

## VERSION 3.17.12

### ALTERATIONS AND ENHANCEMENTS

- The option CAP_MNA_FORMULA is replaced by the option EXPBYPASS to improve performance

## VERSION 3.17.11

### ALTERATIONS AND ENHANCEMENTS

- Add support of R3 model (R3_cmc, level=1003) in -spectre mode
- Fix rawfile generation for DC analysis in -hspice mode

## VERSION 3.17.10

### ALTERATIONS AND ENHANCEMENTS

- Option CAP_MNA_FORMULA is ON by default in -spectre mode
- New variables MAXVOLT and MAXAMP allow to set options MAXVOLT and MAXAMP through .CONTROL block

## VERSION 3.17.9

### ALTERATIONS AND ENHANCEMENTS

- Improve .RTTEMP statement for run-time expression
- Option AUTOSTOP supports currents in run-time expressions
- Improve statistics table

## VERSION 3.17.8

### ALTERATIONS AND ENHANCEMENTS

- New .LSTB parameter METHOD specifies MIDDLEBROOK or TIAN method in single ended mode
- The .RTTEMP supports temperature binning during transient analysis

## VERSION 3.17.7

### ALTERATIONS AND ENHANCEMENTS

- RES 1.8.2 model is used. Refer to model release notes for additional information.

## VERSION 3.17.6

### NEW FEATURES

- Option CUTOFFTAB performs search for cut-off nodes at end of operating point calculation
- Option REBINNING_VERBOSE enables printing of rebinning table
- Print threading information in regular and -hspice modes

### ALTERATIONS AND ENHANCEMENTS

- Improve Rubberband functionality under Gateway

## VERSION 3.17.5

### NEW FEATURES

- Option MACMOD manages model and subcircuit references for MOSFET and X statements

### ALTERATIONS AND ENHANCEMENTS

- Spectre switch model parameters VT1 and VT2 are changed to instance parameters
- .Biaschk with biaschkmode=2 now supports SOA functionality
- Enhance output statistics
- Fix run-time expression slowdown

## VERSION 3.17.4

### ALTERATIONS AND ENHANCEMENTS

- SmartSpice200 limited to 5 YVLG devices or X device statments
- Default value of the option NPORTALG is  changed to 1
- SMARTSPICE  forces -PS 1 command line flag to increase speed of simulation for parallel alters

## VERSION 3.17.3

### NEW FEATURES

- Add .LSTB statement (Stability Analysis)

### ALTERATIONS AND ENHANCEMENTS

- Switch default solver from SMS to XMS; Add command line flag -forcesolver to specify solver
- Number of CPU threads for solver is defined by command line flag -PS. Solver uses single thread when matrix size is less than 20,000 elements.
- String parameters are available for .PARAM, .DEFPARAM, .SUBCKT, X, and M statements
- Verilog-A compiler on Windows is MinGW gcc (shipped with package)

## VERSION 3.17.2

### ALTERATIONS AND ENHANCEMENTS

- SPECTRE Compatibility:
  - Add support for model psp1020
  - Add support for parameters VT and VH in relay statement
- Model library TRA 1.8.2 model library is used. Refer to model release notes for additional information.
- Enhance .BIASCHK functionality for BJT device
- Parameter redefinition is now allowed and based on last definition found in sourced files
- Fix subcircuit parameter calculation in -fast mode

## VERSION 3.17.1

### ALTERATIONS AND ENHANCEMENTS

- In -hspice mode, when the command line option -mp is used, all sweep analysis data are saved in single file and all measurement data are saved in another single file
- Process SWEEP analysis using remote alter functionality
- In SmartSpice200 maximum number of active devices is 10; maximum total number of devices is 50

- Enhance .LIN statement by adding group delay calculation for S-parameters and SELEM file format
- Fix an issue with command PRINTPAR when Verilog-A instance is present in netlist
- Support for encryption for full or partial module code in Verilog-A

## VERSION 3.16.14

### ALTERATIONS AND ENHANCEMENTS

- Correct current calculation in run-time .measure expression under .option AUTOSTOP

## VERSION 3.16.13

### ALTERATIONS AND ENHANCEMENTS

- Enhance AUTOSTOP functionality for transient analyses by supporting run-time expression in specific measurements

## VERSION 3.16.12

### ALTERATIONS AND ENHANCEMENTS

- Enhance – spectre mode:
  - Process parameter TNOM in phy_res model statement
  - Fix phy_res model when instance resistance is not specified
  - Fix phy_res instance generation for regular and inline subcircuits
- Add option DONTPRINTOP to disable printing of OP information
- Correct -cell mode for setup/hold characterization when a cell contains V-devices
- Enhance STOP/CONTINUE feature under Gateway

# BIPOLAR

## BJT

## VERSION 1.8.14

### ALTERATIONS AND ENHANCEMENTS

- Spectre compatibility mode: parasitic resistances smaller than MINR model parameter are removed and corresponding nodes collapsed

## VERSION 1.8.13

### ALTERATIONS AND ENHANCEMENTS

- Spectre compatibility mode: collapse or limit series parasitic resistances when local model parameter MINR or global option parameter MINR is used

## VERSION 1.8.12

### ALTERATIONS AND ENHANCEMENTS

- Bandwidth accounted for thermal noise

## VERSION 1.8.9

### ALTERATIONS AND ENHANCEMENTS

- Improve bypass algorithm for model evaluation, when using options bypass=1 or bypass=2

## VERSION 1.8.7

### ALTERATIONS AND ENHANCEMENTS

- TLEV=3 scaling implementation

## VERSION 1.8.6

### ALTERATIONS AND ENHANCEMENTS

- TLEV (TEMPLEV)=3 temperature scaling implementation

## VERSION 1.8.5

### ALTERATIONS AND ENHANCEMENTS

# SmartSpice Models

Release Notes

- HSPICE compatibility mode: JCAP (DCAP) option dependent default parameter value

### VERSION 1.8.4

#### ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: Modify the initial setup and clipping of IBE and IBC parameters

### VERSION 1.8.3

#### ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: Default values of TLEV and TLEVC parameters to 1 if ASPEC option parameter is used

### VERSION 1.8.1

#### ALTERATIONS AND ENHANCEMENTS

- SOA check enhancement, new model parameter VCS_MAX introduced

## PBJT

### VERSION 1.8.8

#### ALTERATIONS AND ENHANCEMENTS

- Implementation of Mextram 504.10.1 released by the model developers in January, 2012.

### VERSION 1.8.5

#### ALTERATIONS AND ENHANCEMENTS

- Parameter EXSUB controls evaluation of reverse base currents Isub and Xisub. When EXSUB=1 Vsc4 dependant component of main current of parasitic transistor is included.

### VERSION 1.8.1

#### NEW FEATURES

- Release Mextram504 version 9 (v504.9)
    - Lower clip value added for parameter TVGEB

- External voltages Vse, Vbs and Vsc added to operating point information
- Parameters for collector substrate current description (ICSS and ASUB)

ALTERATIONS AND ENHANCEMENTS

- Correct order and evaluation for noise sources

# CAPACITANCE

## CAP

VERSION 1.8.13

## ALTERATIONS AND ENHANCEMENTS

- Revert functionality to Charge-based model to version 1.8.10.R
- Remove EXPBYPASS functionality
- Revert back CAP_MNA_FORMULA functionality

## VERSION 1.8.10

## ALTERATIONS AND ENHANCEMENTS

- Charge-based model improved
- Use ctype device parameter to select charge computation model:
    - ctype=0 depends on voltage across the capacitor
    - ctype=1 depends on voltage of other circuit nodes.

## VERSION 1.8.8

## ALTERATIONS AND ENHANCEMENTS

- Spectre compatibility mode: Parameter cjsw can be used as an alias to capsw

## VERSION 1.8.6

## ALTERATIONS AND ENHANCEMENTS

- Correct EXPBYPASS feature if expression contains temperature dependent parameter while voltages do not change

## VERSION 1.8.5

- SmartSpiceRF: Improve Non-linear Capacitances over Periodic Steady-State for Small-Signal analyses

## VERSION 1.8.4

## ALTERATIONS AND ENHANCEMENTS

- New threading scheme applies to the following capacitors:

- Constant, having no run-time expression
- No voltage dependence
- No SOA check

### VERSION 1.8.2

### ALTERATIONS AND ENHANCEMENTS

- Nonlinear capacitor performance improvement
- Performance improvements in nonlinear capacitor evaluation
- CAP_MNA_FORMULA scheme has been removed

### VERSION 1.8.1

### ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: CEFF parameter takes into account device multiplier

## CONTROLLED VOLTAGE

## ASRC

### VERSION 1.8.9

### ALTERATIONS AND ENHANCEMENTS

- Parameter ’min’ behavior for VCR in G-device

## VERSION 1.8.8

### ALTERATIONS AND ENHANCEMENTS

- Improve evaluation in Laplace transform function

## VERSION 1.8.7

### ALTERATIONS AND ENHANCEMENTS

- Correct time step too small in VCCS Table

## VERSION 1.8.6

### ALTERATIONS AND ENHANCEMENTS

- SmartSpiceRF: Improve Harmonic Balance analyses

## VERSION 1.8.5

### ALTERATIONS AND ENHANCEMENTS

- Enhance syntax for VCCAP to support behavior and multi-input table model

## VERSION 1.8.4

### ALTERATIONS AND ENHANCEMENTS

- Fix derivative calculation of table with two expressions

## VERSION 1.8.3

### ALTERATIONS AND ENHANCEMENTS

- Improve table with two expressions to support derivatives on a surface

## VERSION 1.8.2

### ALTERATIONS AND ENHANCEMENTS

- Enhance the table to support multi-input

## VERSION 1.8.1

### ALTERATIONS AND ENHANCEMENTS

- Correct functionality of VCVS in the AC domain

## CCCS

### VERSION 1.8.1

### ALTERATIONS AND ENHANCEMENTS

- Correct functionality of VCVS in the AC domain

## VCVS

### VERSION 1.8.5

### NEW FEATURES

- Support runtime expression for voltage gain

### ALTERATIONS AND ENHANCEMENTS

- Revert back to 1.8.4.R for AC behaviour for min/max parameters

### VERSION 1.8.4

### ALTERATIONS AND ENHANCEMENTS

- Fix AC behaviour if min/max parameters

### VERSION 1.8.1

### ALTERATIONS AND ENHANCEMENTS

- Fix dissipated power computation so negative values are no longer reported

# DIODE

## DIODEL500

VERSION 1.8.1

NEW FEATURES

- HSPICE compatibility mode: Add level=5

## DIODELEVELS13

VERSION 1.8.21

## NEW FEATURES

- Implicit elimination of internal nodes connected to series resistances RS and RSW. Activate by option parameter hsimspeed=3.

## VERSION 1.8.20

## ALTERATIONS AND ENHANCEMENTS

- Spectre compatibility mode: Use MINR option parameter instead of RESMIN to control collapsing of the parasitic resistors

## VERSION 1.8.19

## ALTERATIONS AND ENHANCEMENTS

- Spectre compatibility mode: Collapse series resistances based on local model parameter MINR and global option parameter RESMIN. All parasitic resistors inside devices less than global option parameter RESMIN are removed.
- Bandwidth is accounted for thermal noise

## VERSION 1.8.17

## NEW FEATURES

- Parameter RESMIN controls the minimum diode series resistance

## VERSION 1.8.16

## ALTERATIONS AND ENHANCEMENTS

- Spectre compatibility mode: Correct effective area and perimeter

## VERSION 1.8.14

## NEW FEATURES

- New output variables for depletion and diffusion capacitances (CDEP, CDEPBOT, CDEPPER and CDIFF)

## VERSION 1.8.12

## ALTERATIONS AND ENHANCEMENTS

- Correct implementation of the limited currents for the sidewall breakdown current component.

- HSPICE compatibility mode: Set default value of EXPLI parameter to 0

## VERSION 1.8.11

### ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: Correct temperature scaling of the reverse tunneling saturation currents
- Spectre compatibility mode: Involve the reverse tunneling current into knee current correction
- Add pnjlim control of the Newton correction step in the presence of reverse tunneling current

## VERSION 1.8.10

### ALTERATIONS AND ENHANCEMENTS

- COMPATIBLE parameter default set to SmartSpice mode
- HSPICE compatibility mode: Clip the low saturation current values after temperature scaling

## VERSION 1.8.9

### ALTERATIONS AND ENHANCEMENTS

- COMPATIBLE parameter default set to HSPICE mode

## VERSION 1.8.8

### ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: Default values of TLEV and TLEVC parameters set to 1 if ASPEC option parameter

## VERSION 1.8.7

### ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: Adapt the breakdown voltage correction scheme

- Report negative values of breakdown current parameter IBV and reset it to its absolute value

## VERSION 1.8.6

### ALTERATIONS AND ENHANCEMENTS

- Improve Ask() routine to output Diode current for AC and SmartSpiceRF Shooting method analyses

## VERSION 1.8.5

### ALTERATIONS AND ENHANCEMENTS

- Improve Bypass code

## VERSION 1.8.4

### ALTERATIONS AND ENHANCEMENTS

- SOA check enhancement

## VERSION 1.8.3

### ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: Account for the GMIN (DCGMIN) contribution when total diode current is accessed as an output variable

## VERSION 1.8.2

### ALTERATIONS AND ENHANCEMENTS

- Spectre compatibility mode: Set the default value for the expli (imelt) model parameter to the corresponding netlist option
- HSPICE compatibility mode: Apply the area scaling of expli model parameter

## VERSION 1.8.1

### ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: MINR parameter default changed to 0
- Spectre compatibility mode: MINR parameter default maintained as 0.1

## INDEPENDANT VOLTAGE

## ISRC

VERSION 1.8.10

ALTERATIONS AND ENHANCEMENTS

- Improve processing the R (repeat timepoint) device parameter

VERSION 1.8.7

ALTERATIONS AND ENHANCEMENTS

- Correct dcValue fill

### VERSION 1.8.2

### ALTERATIONS AND ENHANCEMENTS

- New syntax supported for ISRC device

### VERSION 1.8.1

### ALTERATIONS AND ENHANCEMENTS

- Pseudo random-bit generator (PRBS) current source

## NOCS

### VERSION 1.8.4

### ALTERATIONS AND ENHANCEMENTS

- Account for Frequency bandwidth in white noise for timing jitter analysis

## PORT

### VERSION 1.8.10

### ALTERATIONS AND ENHANCEMENTS

- Improve processing the R (repeat timepoint) device parameter

### VERSION 1.8.8

### ALTERATIONS AND ENHANCEMENTS

- Input parameter NumberTonesSpecified is updated if calculated frequency is out of bandwidth for SmartSpiceRF

### VERSION 1.8.6

### ALTERATIONS AND ENHANCEMENTS

- Correct parameter NumberTonesSpecified fill

### VERSION 1.8.4

### ALTERATIONS AND ENHANCEMENTS

- Improve processing of time-domain defined sources for HB analysis
- Improve dynamically allocated vectors from given number of harmonics

### VERSION 1.8.1

### ALTERATIONS AND ENHANCEMENTS

- Enhance device to support LFSR and PWL functions

## VSRC

### VERSION 1.8.17

### ALTERATIONS AND ENHANCEMENTS

- Improve processing the R (repeat timepoint) device parameter

### VERSION 1.8.15

### ALTERATIONS AND ENHANCEMENTS

- Input parameter NumberTonesSpecified has to be updated if calculated frequency is out of bandwidth

### VERSION 1.8.13

### NEW FEATURES

- Enhance PULSE with runtime expressions (V1 and V2)

### VERSION 1.8.12

### ALTERATIONS AND ENHANCEMENTS

- Fix array bound read error during rise/fall time calculation for option "risetime"

### VERSION 1.8.11

### NEW FEATURES

- “RISETIME”/”RISETI” option support

### VERSION 1.8.10

## NEW FEATURES

- Sine with runtime expressions

## VERSION 1.8.9

## ALTERATIONS AND ENHANCEMENTS

- Improve handling of the following parameters: SIN2, ZTRISE, ZTFALL, RNORM, RHIZ, SD, and TS

## VERSION 1.8.7

## ALTERATIONS AND ENHANCEMENTS

- Correct incorrect breakpoints setup under Rubberband

## VERSION 1.8.6

## ALTERATIONS AND ENHANCEMENTS

- SmartSpice RF: Processing of time-domain defined sources for HB analyses
- SmartSpice RF: Dynamically allocate vectors upon given number of Harmonics

## VERSION 1.8.4

## ALTERATIONS AND ENHANCEMENTS

- PWL voltage source uses the DC value instead of PWL at time 0 if pseudo-transient analysis is used inside DC

## VERSION 1.8.3

## ALTERATIONS AND ENHANCEMENTS

- Correct negative values in PWLZ

## VERSION 1.8.2

## NEW FEATURES

- Pseudo random-bit generator (PRBS) voltage source has been implemented

# INDUCTANCE

## IND

### VERSION 1.8.4

### ALTERATIONS AND ENHANCEMENTS

- Correct initial current condition for transient analysis

### VERSION 1.8.3

### KNOWN ISSUES AND WORKAROUNDS

- Fix EXPBYPASS feature if expression contained temperature dependent parameters while voltages did not change

### VERSION 1.8.2

ALTERATIONS AND ENHANCEMENTS

- Improve calculation of non-linear Inductances over Periodic Steady-State for Small-Signal analyses

VERSION 1.8.1

ALTERATIONS AND ENHANCEMENTS

- Performance improvements in nonlinear inductor evaluation

## MUT

VERSION 1.8.4

KNOWN ISSUES AND WORKAROUNDS

- Correct initial current condition for transient analysis

VERSION 1.8.3

KNOWN ISSUES AND WORKAROUNDS

- Fix EXPBYPASS feature if expression contained temperature dependent parameters while voltages did not change

VERSION 1.8.2

ALTERATIONS AND ENHANCEMENTS

- Improve calculation of non-linear Inductances over Periodic Steady-State for Small-Signal analyses

VERSION 1.8.1

ALTERATIONS AND ENHANCEMENTS

- Performance improvements in nonlinear inductor evaluation

# MOSFET

## BSIM3V3

### VERSION 1.8.30

### NEW FEATURES

- Introduce new output variable Vod=Vgs-Vth

### VERSION 1.8.28

### ALTERATIONS AND ENHANCEMENTS

- LINT parameter value is taken into account for the evaluation of the parasitic resistances in the model setup phase if the selected area calculation method (ACM) is 5 (Spectre compatible ACM)

### VERSION 1.8.26

## ALTERATIONS AND ENHANCEMENTS

- Adaptation of the implicit node elimination algorithm (selected by option parameter HSIMSPEED=3) to be used also in combination with the option parameter VZERO>0.
- Eliminating fatal errors if the parameters SA or SB are less or equal zero for STIMOD=1, and if any of the parameters SA1-SA10 as well as SB1-SB10 are less or equal zero for STIMOD=2. If any of the above STIMOD parameters are less or equal zero for STIMOD>0, the value of STIMOD is reset to 0

# VERSION 1.8.25

## ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: LINT parameter replaces the parameter LD in ACM calculation of effective access resistances
- HSPICE compatibility mode: The default ACM value is used in parasitic resistance calculation if ACM > 3

# VERSION 1.8.24

## ALTERATIONS AND ENHANCEMENTS

- Spectre compatibility mode: Collapse series resistances based on local model parameter MINR and global option parameter MINR
- All parasitic resistors inside devices less than the local or the global option parameter MINR are removed. The order of checking inside devices are the follows:
    1. If resistors are smaller than the local MINR the resistor are collapsed and warning messages are issued
    2. All remaining parasitic resistors less than the global option parameter MINR are removed and warning messages are issued
    3. If a resistor is not removed and its value is smaller than 0.001, then a warning message is issued

# VERSION 1.8.23

## ALTERATIONS AND ENHANCEMENTS

- Handle round-off error for NPEAK and NGATE model parameters

# VERSION 1.8.21

## ALTERATIONS AND ENHANCEMENTS

- A hierarchical option ’hsimspeed’ allows to use a different transistor terminal RS/RD reduction techniques on different circuit hierarchy levels

## VERSION 1.8.18

## ALTERATIONS AND ENHANCEMENTS

- Correct math library functions to improve floating point calculations

## VERSION 1.8.17

## ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: Default value of IMAX model parameter is 0
- Implementing TSMC Safe Operation Area (SOA) specification v0.4

## VERSION 1.8.15

## ALTERATIONS AND ENHANCEMENTS

- Code optimization for implicit series resistance elimination in hsimspeed=3 mode.
- Default parameter CJ=0 if ASPEC option parameter is given and LEVEL=49

## VERSION 1.8.11

## ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: Default TLEV to 1, TLEVC to 1 and ACM to 1 when option ASPEC is used

## VERSION 1.8.10

## NEW FEATURES

- RSRD collapsing scheme. Activate by setting .option hsimspeed=3 in the netlist

## VERSION 1.8.9

## ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: Use MJ, MJSW and MJSWG parameters if their values are close to 1 to avoid singular depletion capacitance charges.

### VERSION 1.8.8

#### ALTERATIONS AND ENHANCEMENTS

- Default value for MINR model parameter has been changed from 1.0e-9 to 1.0e-5 for levels 49 and 53
- Spectre compatibility mode: Iinternal series resistance node collapsing scheme now uses RESMIN circuit parameter to determine if nodes are collapsed

### VERSION 1.8.7

#### ALTERATIONS AND ENHANCEMENTS

- Improve scaling in multi-threading for modelcalculations

### VERSION 1.8.6

#### ALTERATIONS AND ENHANCEMENTS

- Support hierarchical accuracy options

### VERSION 1.8.5

#### ALTERATIONS AND ENHANCEMENTS

- Enhance SOA check feature. New model parameter VBS_MAX to check maximum Vbs terminal voltage:

### VERSION 1.8.1

#### ALTERATIONS AND ENHANCEMENTS

- Improve first order extrapolation of the charge for bypass procedure.

## BSIM4

### VERSION 1.8.39

#### NEW FEATURES

- Introduce new output variable Vod=Vgs-Vth

## VERSION 1.8.37

### ALTERATIONS AND ENHANCEMENTS

- Eliminate a bug in the evaluation of the thermal noise for TNOIMOD=1

## VERSION 1.8.36

### ALTERATIONS AND ENHANCEMENTS

- The Silvaco's extension of the  transient charge -deficit  NQS model is only activated  for TRNQSMOD>1 (2 or 5), while for TRNQSMOD=1, NQS model sub-circuit is not used in AC analysis as in the original Berkeley implementation.
- The flicker noise source evaluation selected by FNOIMOD=0 is corrected for the standard MULT scaling.

## VERSION 1.8.35

### ALTERATIONS AND ENHANCEMENTS

- Default value of the RGEOMOD flag parameter to 0

## VERSION 1.8.34

### ALTERATIONS AND ENHANCEMENTS

- Improve convergence control to reverse bulk-source and bulk-drain voltages if IGBMOD>0

## VERSION 1.8.33

### ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: Evaluate series parasitic resistances. If the source (drain) contact resistance is 0 and the contribution of the corresponding diffusion source (drain) resistance for RGEOMOD=1 is also 0, than the diffusion source (drain) resistance is set to 1e-3 Ohm.

## VERSION 1.8.31

### ALTERATIONS AND ENHANCEMENTS

- Adaptation of the implicit node elimination algorithm (selected by option parameter HSIMSPEED=3) to be used also in combination with the option parameter VZERO>0.

## VERSION 1.8.30

### ALTERATIONS AND ENHANCEMENTS

- Spectre compatibility mode: Collapse series resistances, based on local model parameter MINR and global option parameter MINR

## VERSION 1.8.29

### ALTERATIONS AND ENHANCEMENTS

- Bandwidth is accounted for thermal noise.

## VERSION 1.8.28

### ALTERATIONS AND ENHANCEMENTS

- Handle round-off error for the following model parameters: NDEP, NSD, LNDEP, LNSD, LNGATE, WNDEP, WNSD, WNGATE, PNDEP, PNSD, and PNGATE

## VERSION 1.8.27

### ALTERATIONS AND ENHANCEMENTS

- Issue warnings on negative Gm, Gds and Gmbs conductances

## VERSION 1.8.25

### ALTERATIONS AND ENHANCEMENTS

- Handle round-off error for NGATE model parameter

## VERSION 1.8.23

### ALTERATIONS AND ENHANCEMENTS

- Prevent negative Gds in the model evaluation

## VERSION 1.8.22

### ALTERATIONS AND ENHANCEMENTS

- Prevent negative Gmbs in the model evaluation
- Spectre compatibility mode: Control internal source and drain resistances based on the model parameter MINR

## VERSION 1.8.21

### ALTERATIONS AND ENHANCEMENTS

- Prevent negative Gm in the model evaluation
- Create warning message for negative CIT model parameter

## VERSION 1.8.20

### ALTERATIONS AND ENHANCEMENTS

- Hierarchical option ’hsimspeed’ allows a different transistor terminal RS/RD reduction technique on different circuit hierarchy levels

## VERSION 1.8.18

### NEW FEATURES

- Improve DIBL/Rout model from BSIMSOI
- Improve GIDL/GISL model from BSIMSOI
- Improve sub-threshold temperature dependence
- Improve thermal noise model (tnoiMod=2)
- limiting of diode ideality factor (NJS,NJD) and new parameter "mtrlCompatMod" to ensure consistent results of mtrlMod=0 versus mtrlMod=1

### ALTERATIONS AND ENHANCEMENTS

- Berkeley BSIM4.7 model of April 2011 now available

## VERSION 1.8.16

### ALTERATIONS AND ENHANCEMENTS

- SOA check enhancement
- Implementing TSMC Safe Operation Area (SOA) specification v0.4

## VERSION 1.8.15

### ALTERATIONS AND ENHANCEMENTS

- Code optimization for implicit series resistance elimination in hsimspeed=3 mode

## VERSION 1.8.14

### ALTERATIONS AND ENHANCEMENTS

- Set minimum value for series resistances in the implicit RsRd method

## VERSION 1.8.12

### ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: TLEV model parameter default set to 1 if ASPEC option is given
- Internal charges are now computed and correctly displayed in TRANOP mode

## VERSION 1.8.11

### ALTERATIONS AND ENHANCEMENTS

- RSRD collapsing scheme. Activate by .option hsimspeed=3 in the netlist

## VERSION 1.8.9

### ALTERATIONS AND ENHANCEMENTS

- Spectre compatibility mode: Internal series resistance node collapsing scheme has been implemented. If RS/RD values are less than RESMIN circuit parameter then corresponding internal nodes are collapsed
- limit NF in RSC/RDC scaling if nodes are collapsed

## VERSION 1.8.8

### ALTERATIONS AND ENHANCEMENTS

- New model feature that tradeoffs between accuracy and simulation efficiency.
- Setting the Hsim parameter value hsimspeed=4, the external series resistances are analytically incorporated into the effective internal drain-source resistance used with the model selector RDSMOD=0 and the internal source and drain nodes are collapsed

## VERSION 1.8.6

### ALTERATIONS AND ENHANCEMENTS

- Hierarchical accuracy options. Can specify different accuracy options for different hierarchy levels of circuit

VERSION 1.8.4

ALTERATIONS AND ENHANCEMENTS

- SOA check enhancement. New model parameter VBS_MAX

## BSIMMG104

VERSION 1.8.2

ALTERATIONS AND ENHANCEMENTS

- Expanded functionality for extrinsic source and drain contact resistance given by parameters RSC and RDC respectively. When RSC>0 or RDC>0 external contact resistances even when RDSMOD=0. When RDSMOD=1 contact resistance added to external resistance components

VERSION 1.8.1

ALTERATIONS AND ENHANCEMENTS

- Fix incorrect M scaling of external series resistance

## HISIMHV

VERSION 1.8.12

ALTERATIONS AND ENHANCEMENTS

- Additional output for alias parameters
- Requires SmartSpice 4.3.2 or later

VERSION 1.8.11

ALTERATIONS AND ENHANCEMENTS

- Release HiSIM_HV 1.2.2 (June. 29 2011)

VERSION 1.8.7

ALTERATIONS AND ENHANCEMENTS

- Correct output of internal model warnings

### VERSION 1.8.6

#### ALTERATIONS AND ENHANCEMENTS

- Implemented TSMC SOA specification v0.4

### VERSION 1.8.5

#### ALTERATIONS AND ENHANCEMENTS

- Release HiSIM_HV 1.2.1 (Nov. 2 2010)

### VERSION 1.8.4

#### ALTERATIONS AND ENHANCEMENTS

- Implement Geometry binning, all geometry scaling factors for binning set to unity

### VERSION 1.8.3

#### ALTERATIONS AND ENHANCEMENTS

- Output variable for 1/f is changed to .1overf

### VERSION 1.8.2

#### ALTERATIONS AND ENHANCEMENTS

- Enhance SOA check feature with parameter VBS_MAX for |Vbs|> Vbs_max

### VERSION 1.8.1

#### ALTERATIONS AND ENHANCEMENTS

- Add alias parameters for UTMOST III cosubnod : cosubnode, lcvdsovr : lcvdsover, wcvdsovr : wcvdsover, pcvdsovr : pcvdsover

## HISIMHVREF

### VERSION 1.8.7

#### ALTERATIONS AND ENHANCEMENTS

- Release HiSIM_HV 1.2.2 (June 29 2011)

### VERSION 1.8.3

ALTERATIONS AND ENHANCEMENTS

- Fix uninitialised model variables
- Correct output of internal model warnings

VERSION 1.8.2

ALTERATIONS AND ENHANCEMENTS

- Release HiSIM_HV 1.2.1

VERSION 1.8.1

ALTERATIONS AND ENHANCEMENTS

- Add alias parameters for UTMOST III cosubnod : cosubnode, lcvdsovr : lcvdsover, wcvdsovr : wcvdsover, pcvdsovr : pcvdsover

## HISIMREF

VERSION 1.8.6

ALTERATIONS AND ENHANCEMENTS

- Release HiSIM 2.6.0 (December 13 2011)

VERSION 1.8.2

ALTERATIONS AND ENHANCEMENTS

- Release HiSIM 2.5.1 (April 11 2011)

## HVMOS

VERSION 1.8.7

ALTERATIONS AND ENHANCEMENTS

- Correct evaluation of the flicker noise source terms for instance multiplication factor M>1

VERSION 1.8.2

ALTERATIONS AND ENHANCEMENTS

- Fix rounding issue for Ngate parameter

### VERSION 1.8.1

### ALTERATIONS AND ENHANCEMENTS

- Limiting parameters MJ, MJSW and MJSWG when close to 1 to avoid singular depletion capacitance charge evaluation

## MOSLEVELS123

### VERSION 1.8.10

### ALTERATIONS AND ENHANCEMENTS

- Spectre compatibility mode: Collapse or limit series parasitic resistances, based on local model parameter MINR and global option parameter MINR

### VERSION 1.8.9

### ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: Evaluate the default value of the surface mobility parameter U0 (if U0 not given and the transconductance parameter KP is given) from KP

### VERSION 1.8.8

### ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: Set correct default values of surface mobility (U0) and transconductance (KP) parameters

### VERSION 1.8.7

### ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: Correct usage of capacitance and charge models

### VERSION 1.8.4

### ALTERATIONS AND ENHANCEMENTS

- Use Berkeley code for vdsat derivatives

### VERSION 1.8.3

### ALTERATIONS AND ENHANCEMENTS

- Correct evaluation of the MOS level 3 drain current derivatives in saturation operation region

### VERSION 1.8.1

### ALTERATIONS AND ENHANCEMENTS

- Calculate default value (if it is not specified) for parameter KP from parameters UO and TOX(COX).
- HSPICE compatibility mode: Default value of parameter UO for PMOS devices is modified

## PSP

### VERSION 1.8.2

### ALTERATIONS AND ENHANCEMENTS

- Enhanced SOA functionality to meet TSMC specification v0.4

### VERSION 1.8.1

### ALTERATIONS AND ENHANCEMENTS

- Enhanced SOA check feature by adding parameter VBS_MAX

# NPORT

## NPORT

### VERSION 1.8.34

### ALTERATIONS AND ENHANCEMENTS

- Added writing and reading RFM-files by default

### VERSION 1.8.33

### NEW FEATURES

- New inverse FFT algorithm under .option nportalg=2

### ALTERATIONS AND ENHANCEMENTS

- Reading RFM-files has been fixed under model parameter 'rfmfile=<file>'

### VERSION 1.8.32

### ALTERATIONS AND ENHANCEMENTS

- Increased performance of S-element

## VERSION 1.8.30

### NEW FEATURES

- New default value for the HIGHPASSFILTER model parameter.
- New model parameter IMPTRUNC

## VERSION 1.8.29

### ALTERATIONS AND ENHANCEMENTS

- Improved convolution functionality under pseudo transient analysis to prevent a potential crash.
- Improved delay handler functionality.

## VERSION 1.8.28

### ALTERATIONS AND ENHANCEMENTS

- Improved convolution accuracy

## VERSION 1.8.27

### ALTERATIONS AND ENHANCEMENTS

- S element support:

  2 new model/instance parameters - DELAYHANDLE=0|1|on|off and DELAYFREQ=val

## VERSION 1.8.26

### ALTERATIONS AND ENHANCEMENTS

- Default value for the HIFGPASSFILTERTYPE model parameter is changed from QUADRATIC to TUKEY.

## VERSION 1.8.25

### NEW FEATURES

- New model parameter HIFGPASSFILTERTYPE has been added to specify the high pass filter type.

## VERSION 1.8.23

## ALTERATIONS AND ENHANCEMENTS

- Default value for the model parameter LOSSY is 1.
- Default value for the model paramter SCALECONV is 1.
- Add HIFGPASSFILTER model parameter. It specifies the percentage of the spectrum which will be filtered by high pass filter.

# VERSION 1.8.22

## ALTERATIONS AND ENHANCEMENTS

- Passivity check (in S-element)

# VERSION 1.8.21

## NEW FEATURES

- New model parameter CURR has been added. When CURR=1 new currents contributions formula will be used during convolution. Default is 1.

# VERSION 1.8.20

## NEW FEATURES

- New model parameter SCALECONV has been added. Activate scaling currents in convolution

# VERSION 1.8.19

## NEW FEATURES

- Model parameter LOSSY=1 removes positive resistor

# VERSION 1.8.18

## NEW FEATURES

- Model parameter LOSSY blocked for RF analyses

# VERSION 1.8.17

## ALTERATIONS AND ENHANCEMENTS

- Fix incorrect behaviour with pseudo-transient analysis

## VERSION 1.8.16

### ALTERATIONS AND ENHANCEMENTS

- New model parameter ZC has beed added to specify resistor values for lossy algorithm.

  Syntax:

  .model smodel s tstonefile=touchstone.s4p lossy=1 zc=10

- Spline interpolation is used to calculate Y-parameters for 0 point frequency if it is not specified in the touchstone file and the transient analysis is performed.

## VERSION 1.8.13

### ALTERATIONS AND ENHANCEMENTS

- New implementation of S-element.

## VERSION 1.8.7

### ALTERATIONS AND ENHANCEMENTS

- Fix DCOP calculation for AC analysis in case if the first frequency point is non zero.

## VERSION 1.8.5

### ALTERATIONS AND ENHANCEMENTS

- New impulse response and convolution calculation algorithms has been implemented under .option NPORTALG=0
- Fix DCOP calculation in case if the first frequency point is not zero
- Fix linear interpolation when two angles both are close to the 180 degrees
- Do not force the linear interpolation in the transient analysis

## VERSION 1.8.3

### ALTERATIONS AND ENHANCEMENTS

- Incorrect synthesis of S-element equivalent scheme

## VERSION 1.8.1

ALTERATIONS AND ENHANCEMENTS

- Correct formation of a Foster"s network

# RESISTANCE

## RES

VERSION 1.8.16

ALTERATIONS AND ENHANCEMENTS

- Bandwidth is accounted for thermal noise.

VERSION 1.8.15

ALTERATIONS AND ENHANCEMENTS

- Spectre compatibility mode: Add Tran Noise Produce (Timing Jitter)

VERSION 1.8.9

ALTERATIONS AND ENHANCEMENTS

- Fix EXPBYPASS feature if expression contains temperature dependent parameters while voltages are constant

VERSION 1.8.8

ALTERATIONS AND ENHANCEMENTS

- Improve evaluation of non-linear Resistances over Periodic Steady-State for Small-Signal analyses

VERSION 1.8.7

## ALTERATIONS AND ENHANCEMENTS

- Correct Timing Jitter Analysis

## VERSION 1.8.2

## ALTERATIONS AND ENHANCEMENTS

- Spectre compatibility mode: Add instance parameters KF, AF, EF (FEXP), LDEXP, WDEXP

## VERSION 1.8.1

## ALTERATIONS AND ENHANCEMENTS

- HSPICE compatibility mode: REFF parameter now takes into account device multiplier

# SOI

## BSIM3SOIV3

### VERSION 1.8.4

### ALTERATIONS AND ENHANCEMENTS

- Warning for too small effective drain and source perimeters (Pdeff<Weff or Pseff<Weff) only if corresponding instance parameters PS and PD given. Small Pdeff or Pseff values are clipped independantly of parameters PS or PD given.

## BSIMSOI4

### VERSION 1.8.9

### ALTERATIONS AND ENHANCEMENTS

- Implementation of the instance parameter adjustments by the option parameter SCALE.
- Correct implementation of the multiple device (M-scaling) feature.

### VERSION 1.8.8

### ALTERATIONS AND ENHANCEMENTS

- Eliminate fatal error message for negative PDITSD model parameter.

### VERSION 1.8.6

## ALTERATIONS AND ENHANCEMENTS

- Fix issue in loading of charge thermal derivatives

## VERSION 1.8.2

## NEW FEATURES

- BSIMSOI4.4 now available

## VERSION 1.8.1

## NEW FEATURES

- BSIMSOI4.1 now available

# SWITCHES

## SW

VERSION 1.8.2

ALTERATIONS AND ENHANCEMENTS

- Correct calculation of interval control voltages. Boundaries included in conditions to determine if relay is open or closed. Boundaries are not used when determining transistion phase.calculation of a 4 terminal relay (spectre style).

VERSION 1.8.1

ALTERATIONS AND ENHANCEMENTS

- When the switch element is used as a four terminal relay (Spectre style) the resistance of the element depends on control voltage. Resistance was not calculated when control voltage was equal to the parameters VT1 and VT2

# TFT

## RPIASI

VERSION 1.8.5

ALTERATIONS AND ENHANCEMENTS

- Improve bypass method for latent devices when option BYPASS has value 1 or 2
- Improve implicit elimination of internal nodes connected to source/drain ports by parasitic resistance. Activated by option parameter hsimspeed=3.

## RPIPSI

VERSION 1.8.9

ALTERATIONS AND ENHANCEMENTS

- Correct instance multi-scaling if model flag INTSDNOD is 0
- Implement Hspice compatible GMIN control

VERSION 1.8.5

ALTERATIONS AND ENHANCEMENTS

- Improve bypass method for latent devices if option BYPASS has value 1 or 2

- Improve implicit elimination of internal nodes connected to source/drain ports by parasitic resistance. Activated by option parameter hsimspeed=3.

# TRANSMISSION LINE

## TRA

VERSION 1.8.1

ALTERATIONS AND ENHANCEMENTS

- When parameters NL, F and TD are given in a device statement NL and F now take precedence over TD. Effective time delay is computed as NL/F

## WTRA

VERSION 1.8.7

ALTERATIONS AND ENHANCEMENTS

- Improve SCALE parameter value dependant on a given G value

## VERSION 2.0.53

### ALTERATIONS AND ENHANCEMENTS

- Support to use ground net as a port of a child instance

## VERSION 2.0.52

### ALTERATIONS AND ENHANCEMENTS

- Accept size one vector (e.g. input [0:0] in; )
- Correctly process encrypted Verilog-A source file

## VERSION 2.0.50

### ALTERATIONS AND ENHANCEMENTS

- Accept negative dimension range (MSB < LSB)
- real number can be used as array range indices

## VERSION 2.0.46

### NEW FEATURES

- Support SPICE primitives
- save/restore functionality

## VERSION 2.0.44

# Verilog-A

Release Notes

### NEW FEATURES

- Derived nature

### ALTERATIONS AND ENHANCEMENTS

- Becomes the only VerilogA compiler in SmartSpice

## VERSION 2.0.43

### NEW FEATURES

- absdelay() function
- paramset
- localparam
- Support more parameters of $simparam(): gdev, imax, scale, simulatorSubversion, simulatorVersion
- Support SmartSpice option 'vzero'

## VERSION 2.0.42

### ALTERATIONS AND ENHANCEMENTS

- Build library without the fast math library on Linux

## VERSION 2.0.41

### NEW FEATURES

- Probabilistic distribution system functions ( $random and $rdist_*)
- Support encrypted Verilog-A source file
- Noise table
- last_crossing() function
- Z-transform filters
- Support ground net

### ALTERATIONS AND ENHANCEMENTS

- Resolve incorrect result when input port current is used as output contribution
- analysis('ic') should return 1 in transient op analysis

- Return zero(0) rather than give error if the argument of analysis() function is unknown
- Make ac_stim() function returns zero(0) in non-ac analysis
- Handle limiting when nested user-defined function is used
- Convert real to integer with rounding other than truncating
- Check the number of arguments of $table_model()
- VADebugger no longer invoke multiple windows when running in multi-threaded mode

## VERSION 2.0.40

### NEW FEATURES

- Multiple-module debug support in VADebugger
- VADebugger supports setting of conditional break point with 'New Breakpoint' function

### ALTERATIONS AND ENHANCEMENTS

- Allow modification as well as removal of conditions of conditional expression for an existing breakpoint

## VERSION 2.0.39

### NEW FEATURES

- Access internal variables declared with attribute
- ALIASPARAM
- $limit() function
- cross() and above() functions

### ALTERATIONS AND ENHANCEMENTS

- Create a separate process for Verilog-A parser to get additional memory space on 32-bits platforms

## VERSION 2.0.38

### ALTERATIONS AND ENHANCEMENTS

- User's dll can not be compiled properly because an internal function is not generated correctly

## VERSION 2.0.37

### NEW FEATURES

- First release of VADebugger
- $table_model() function
- genvar/generate statement
- Add option '-no_recompile_for_collapsed_nodes' to skip optimization in setup session
- Add option '-no_opt' to skip all optimizations

## VERSION 2.0.36

### ALTERATIONS AND ENHANCEMENTS

- Improve math protection mechanism for better convergence

## VERSION 2.0.35

### ALTERATIONS AND ENHANCEMENTS

- Add option '-no_op'  to avoid creating the operating point calculation routine
- Add option '-c_opt_options=-O2' which sets optimization flag to -O2 instead of -O3 (which is the default) for user's dll compilation