SiMKit

Release Notes for SiMKit public version 6.4.1

Eindhoven, November 2026

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Preface

These are the release notes for simkit version 6.4.1. Changes with respect to simkit 6.3 are reported in these release notes.

The main developments of this release are:
- PSP104 was updated to version 104.1.0
- JUNCAP200 was updated to version 200.7.0
- ovcheck6 devices now work for non-consecutive branches
- the device field was added to the SOACHECK_DC_END messages
- Mextram 505 was updated to version 505.6.0
- solved a crash in combination with Spectre X versions starting from Spectre 25.1 ISR6

Overview

SiMKit is a simulator-independent compact transistor model library.

Simulator-specific connections are handled through so-called adapters that provide the correct interfacing to:
- Spectre(/APS): the Cadence circuit simulator.
- ADS: the Keysight circuit simulator.
  Simkit 6.4.1 supports ADS 2017 and higher. The SiMKit distribution is also available for ADS on Windows for ADS 2019.1 and higher.

Mica from NXP, AFS from Siemens, GoldenGate from Keysight, FineSim and CustomSim(XA) from Synopsys and several other simulators (e.g. APLAC/MWO from AWR) do provide an adapter for the SiMKit models.

For a complete description, please refer to:

https://www.nxp.com/design/design-center/development-boards-and-designs/models/simkit/compact-models:COMPACT-MODELS

New models

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Model improvements and bug-fixes

PSP104 (104.1.0)

This release includes the bug fixes in the original verilog-A code, including:
- addition of instance parameters declaration MULT_I, MULT_Q and MULT_FN
- inclusion of MULT_I factor in current assignation, on gmin current contribution and in conductance OP variables
- inclusion of MULT_Q factor in displacement current assignation and in capacitance OP variables
- inclusion of MULT_I and MULT_FN factor in noise current assignation and in noise OP variables
- inclusion of MULT_I in dissipated power OP variable
- addition of local model parameter declaration IMAXII: Maximum impact-ionization current value
- addition of global model parameter declaration IMAXIIO
- addition of local model parameter declaration GC2OVD: Gate overlap current slope factor for drain side
- addition of local model parameter declaration GC3OVD: Gate overlap current curvature factor for drain side
- addition of global model parameter declarations GC2OVDO and GC3OVDO
- addition of smoothing value macros for gate-dependent breakdown voltage and BBT current of gate-edge component of JUNCAP
- new nscr computation and new x_inf computation

PSP104.1.0 is backward compatible with PSP104.0.1 (in SiMKit 6.3)

JUNCAP200 (200.7.0)

This release includes the bug fixes in the original verilog-A code, including:
- addition of parameter declarations related to 2nd region charge model of gate-edge component at source side: FCJORGAT2, FVBIRGAT2, FPGAT2, FPHIGGAT2, VTRGAT and ANUGAT
- addition of parameter declarations related to Vg-dependent breakdown voltage model and Vg-dependent BBT current model of gate-edge component at source-side: ADVBRGAT, BDVBRGAT, ADBBTGAT and BDBBTGAT, in case of JUNCAP not stand-alone.
- addition of parameter declarations related to 2nd region charge model of gate-edge component at drain side: FCJORGAT2D, FVBIRGAT2D, FPGAT2D, FPHIGGAT2D, VTRGATD and ANUGATD, in case of JUNCAP not stand-alone.
- addition of parameter declarations related to Vg-dependent breakdown voltage model and Vg-dependent BBT current model of gate-edge component at drain side: ADVBRGATD, BDVBRGATD, ADBBTGATD and BDBBTGATD, in case of JUNCAP not stand-alone.
- addition of instance parameter declarations MULT_I and MULT_Q
- inclusion of MULT_I factor in current (OP) assignation in noise (OP) current assignation
- inclusion of MULT_Q factor in displacement current assignation and in capacitance OP variable calculations

JUNCAP200.7.0 is backward compatible with JUNCAP200.6.3 (in SiMKit 6.3)

MEXTRAM505 (505.6.0)

This release includes the following changes in the Verilog-A code, compared to Mextram 505.5:
- New non-quasi-static (NQS) option exmod = 4 for the extrinsic base-collector diffusion charges Qex and XQex. exmod upper bound extended from 3 to 4. New parameters tauxqex, taunqsqex, taunqsxqex, aqexnqs. Under exmod = 4, Qex uses the tauex-based (swqex = 1) form regardless of swqex. exmod = 0, 1, 2, 3 unchanged.
- Vb2c2star branch now gated by Ic1c2 > iclimvbcstar (new parameter, default is 1.0e-15) instead of eVb2c2star > 0.0. The new test keys off the physical collector current and is monotonic in bias, which improves convergence near onset of quasi-saturation.
- Gmax (used when swgemlim = 1) denominator gets a small floor 0.1 * Vt to keep the avalanche-limit term finite as In -> 0.
- New parameter vexlimr (default 400, range 40-400) and macro expLin_lh that linearize exp() at both very negative and very positive arguments. The reverse-bias junction exponentials (eVb2c2, eVb2e1, eVb1c4, eVbc3, eVsc1, eVsc3, eVsc4) now use the two-sided form for convergence at deep reverse bias.

This release includes the following changes in the Verilog-A code, compared to

Mextram 505.4:
 - MINR and MULT handling issue of rbv_t, rbc_t and re_t are fixed.
 - New BTBT and TAT base current model is introduced.

MEXTRAM505.6.0 is backward compatible with MEXTRAM505.4.0 (in SiMKit 6.3)

SOA checks

 - ovcheck6 now allows enable/disable on non-consecutive branches for all
   simulators. This means that setting VLOW=VHIGH=0 for a certain branch will
   not affect the behavior of the consecutive branches.
 - the SOACHECK_DC_END messages for all devices with SOA now contains the
   device field, if this device was passed as instance parameter.

Spectre specific
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 - With spectre versions starting from 25.1 ISR6 there was a crash with
   Spectre X (spectre +preset=cx or mx). This was caused by an extension to
   one of the interface functions at the Spectre side (CMI-interface) that
   was not supported in the Spectre adapter of the SiMKit.
   The issue was resolved in SiMKit 6.4.1.

ADS specific
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GoldenGate specific
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 - The configuration file etc/config/goldengate.conf delivered with SiMKit now
   sets the use_multiple_simkit option to no, since the default value yes
   forces the usage of the SiMKit releases delivered inside of the GoldenGate
   package, making the use of the external SiMKit impossible.
 - This configuration file requires the definition of these two environment
   variables:
    . SIMKIT_HOME : root of the SiMKit package installation
    . XPEDION_REGISTRY_PATH=${SIMKIT_HOME}/etc/config

General
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Known limitations
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Overvoltage checking:
- Overvoltage checks do not give warnings in ADS as in Spectre.

SOA check support in PrimeSim:
- At the time of this release, the required interface to enable SOA checking
  in SiMKit was not enabled yet in PrimeSim Y-2026.03-SP1-1 and before. Hence
  SOA checking using SiMKit monitors will not work with PrimeSim.

Flexible topology in ADS and Spectre:
- A device will choose its topology based on the settings of certain
  parameters. So, e.g. a sweep of the parameter RGO (gate resistor) in
  PSP going from zero to another value, or a sweep over SWNQS in PSPNQS
  is not possible. The simulator will stop with an appropriate message
  because continuation would result in erroneous results.
- Internal node names in ADS for models with a flexible topology (from
  simkit 4.9 those are PSP, PSPNQS, MXT504, M1101 and M1102) might be
  wrong in the simulator output. The simulation results are not affected
  by this.

Instance scaling in ADS:
- Scaling of instance parameters via the option scale is not supported
  in ADS versions lower than 2019.1.

Aliasing of reference temperature for JFETIDG with ADS:

- Recognition of reference temperature names TNOM and its alias TREF is not working with ADS for ADS versions lower than 2022.

Transient noise:
- Transient noise is supported in general, but in cases where correlated noise (e.g. induced gate noise) is dominant, the results will be unreliable. This is because the separation between bias dependent and frequency dependent noise contributions is not strict, which is a requirement for the simulator interfaces.
  A workaround is to switch off induced gate noise, which can be done in mos1101 and mos1102 by setting GATENOISE=1. Refer to artf79836 for details.
  From simkit 4.6 onward, a switch option SWIGN=2 was added to psp102 and from simkit 5.5 onward, this switch is also implemented in psp103:
  . For SWIGN==0 the induced gate noise is switched off.
  . For SWIGN==1 (default) the behavior is the same as in previous simkit versions.
  . For SWIGN==2 the noise is treated in such a way that transient noise results are correct because the noise is implemented using white noise sources only (like in the Verilog-A version of PSP). Because extra internal nodes are needed, simulations will slow down.
  In practice, induced gate noise has a very minor effect and switching it off will hardly influence simulation results.

SiMKit models

The SiMKit library contains the most recent versions of the NXP transistor models. The following tables list the SiMKit models. The first table lists the 'real' SiMKit models while the second table lists the pre-SiMKit models, for which only a Spectre implementation is available.

In the following tables,
'e/g' stands for electric/geometric
't' stands for self-heating and
's' stands for substrate model

Table 1: Real SiMKit models

model	level	Spectre/AFS	ADS	e/g	t	s
juncap	1	juncap	juncap	e	no	no
juncap	200	juncap200	juncap200	e	no	no
psp	102	psp102e	psp102e	e*	no	no
psp	1020	psp1020	psp1020	g*	no	no
psp	1021	psp1021	psp1021	g*	no	no
pspnqs	102	pspnqs102e	pspnqs102e	e*	no	no
pspnqs	1020	pspnqs1020	pspnqs1020	g*	no	no
pspnqs	1021	pspnqs1021	pspnqs1021	g*	no	no
psp	103	psp103	psp103	eg	no	no
psp	103	psp103t	psp103t	eg	yes	no
pspnqs	103	pspnqs103	pspnqs103	eg	no	no
psp	104	psp104	psp104	eg	no	no
psp	104	psp104t	psp104t	eg	yes	no
pspnqs	104	pspnqs104	pspnqs104	eg	no	no
modella	500	bjt500	bjt500	e	no	no
modella	500	bjt500t	bjt500t	e	yes	no
mextram	504	bjt504	bjt504	e	no	yes
mextram	504	bjt504t	bjt504t	e	yes	yes
mextram	504	bjtd504	bjtd504	e	no	no
mextram	504	bjtd504t	bjtd504t	e	yes	no
mextram	505	bjt505	bjt505	e	no	yes
mextram	505	bjt505t	bjt505t	e	yes	yes
mextram	505	bjtd505	bjtd505	e	no	no
mextram	505	bjtd505t	bjtd505t	e	yes	no
mos	903	mos903e	mos903e	e	no	no
mos	903	mos903	mos903	g	no	no
mos	903	mos903t	mos903t	g	yes	no
mos	1101	mos1101e	mos1101e	e	no	no

mos	1101	mos1101et	mos1101et	e	yes	no
mos	11010	mos11010	mos11010	g	no	no
mos	11010	mos11010t	mos11010t	g	yes	no
mos	11011	mos11011	mos11011	g	no	no
mos	11011	mos11011t	mos11011t	g	yes	no
mos	1102	mos1102e	mos1102e	e	no	no
mos	1102	mos1102et	mos1102et	e	yes	no
mos	11020	mos11020	mos11020	g	no	no
mos	11020	mos11020t	mos11020t	g	yes	no
mos	11021	mos11021	mos11021	g	no	no
mos	11021	mos11021t	mos11021t	g	yes	no
mos	3100	mos3100	mos3100	e	no	no
mos	3100	mos3100t	mos3100t	e	yes	no
mos	40	mos40	mos4000/mos40	e	no	no
mos	40	mos40t	mos4000t/mos40t	e	yes	no
rfldmos	602	rfldmos602t	rfldmos602t	g	yes	yes**
rfldmos	602	rfldmos602dt	rfldmos602dt	g	yes	yes**
psphv	1	psphv	psphv	g	no	no
psphvt	1	psphvt	psphvt	g	yes	no
jfetidg	1	jfetidg	jfetidg	g	no	no
jfetidgt	1	jfetidgt	jfetidgt	g	yes	no
lutsoi102	102	lutsoi102	lutsoi102	g	no	no
lutsoi102t	102	lutsoi102t	lutsoi102t	g	yes	no
asmesd_3t	101	asmesd_3t	asmesd_3t	g	no	no
asmesd_4t	101	asmesd_4t	asmesd_4t	g	yes	no
asmesd_dio_2t	101	asmesd_dio_2t	asmesd_dio_2t	g	no	no
asmesd_dio_3t	101	asmesd_dio_3t	asmesd_dio_3t	g	yes	no
ovcheck	1	ovcheck	ovcheck	-	-	-
ovcheck	6	ovcheck6	ovcheck6	-	-	-

* For PSP the electrical model is referred to as the local model and the geometrical model as the global model.

** In the rfldmos model, substrate effects are modeled but the substrate is connected to the source and not available as a separate terminal.

Table 2: Other (older) models (Spectre specific)

model	level
diode	500
mos	902
mextram	503
lpnp	301
mos	705

From simkit 4.8 onwards, the mextram 3500 model is no longer supported. From simkit 4.0 onwards, mos1100, mos2002 and mos3002 are no longer supported. If these models are needed, please use older SiMKit versions and simulator versions compatible with these older SiMKit versions.

Table 3: Model version numbers

The models in simkit 6.4.1 are based on the following Verilog-A versions:

model	version
JUNCAP200	200.7.0
PSP102	102.5.0
PSP103	103.8.2
PSP104	104.1.0
Mextram504	504.13.1
Mextram505	505.6.0
RFLDMOS602	602.01.00
PSPHV	1.0.6
JFETIDG	1.0.4
LUTSOI102	102.6

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ASMESD_3T     101.1.0
ASMESD_4T     101.1.0
ASMESD_DIO_2T 101.1.0
ASMESD_DIO_3T 101.1.0
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SiMKit interface

Simkit 6.4.1 incorporate interface version 17, which is backward compatible with version 16 used in simkit 6.1–6.3, with version 15 used in simkit 5.9–6.0, with version 14 used in simkit 5.8, with version 13 used in simkit 5.7, with version 12 used in simkit 5.5–5.6, with version 11 used in simkit 5.1–5.4, with version 10 used in simkit 4.7–5.0, with version 9 used in 4.4–4.6 and with version 8 used in simkit 4.0–4.3 but not backward compatible with the interface versions used in simkit 3.8 and earlier.

The interface description document simkitInterfaceDescription.pdf is contained in the zipped model library.