

SiMKit

Release Notes for SiMKit version 5.1_pub

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Preface

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These are the release notes for simkit version 5.1_pub. Changes with respect to simkit 5.0_pub are reported in these release notes.

The main developments of this release are:

- Mextram 505: the performance is improved by 7%
- For Spectre:
 - * solved a non-convergence with psp103
 - * some corrections of the gmin handling
 - * Spectre + APS: correction of duration value in OVCHECK_END messages

Overview

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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 and APS: the Cadence circuit simulators.
- ADS: the Keysight circuit simulator.
Simkit 5.1_pub supports ADS 2012, 2014, 2015, 2016, 2017. The SiMKit distribution is also available for ADS on Windows for the same versions.

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

For a complete description, please refer to:

<http://www.nxp.com/models/simkit.html>

Model improvements and bug-fixes

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Mextram 505

Mextram 505 performance was improved by 7%, keeping the results identical.

Noise sources

All thermal noise sources in SiMKit device models (marked with type SK_NT_THERMAL) are now bias and frequency independent. This was not always the case in previous SiMKit releases.

Spectre specific
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Gmin handling

The handling of gmin branches in Spectre simulations has been corrected. This might give some changes in DC convergence, especially for designs that contain mextram504.
The gmin value is now scaled with mult.

Non-convergence psp103

For negative temperatures a negative argument of a logarithm in psp103 caused non-convergence in DC in some cases. This has been solved.

Improvement in SOA warnings

When using Spectre +aps the duration value in OVCHECK_END messages could be incorrect. This has been solved by using a new Cadence interface functionality that corrects this issue. This functionality is available in cadence_mmsim versions 13 and higher. For these cadence_mmsim versions the issue is solved.

ADS specific
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This version of SiMKit was compiled with gcc 6.3.0 and works fine with all ADS versions from 2012 to 2017.

In previous SiMKit versions we used gcc 4.7.2, and ADS 2017 requires at least gcc 5.3.0.

Known limitations
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Overvoltage checking:

- Overvoltage checks do not give warnings in ADS as in Spectre. The full functionality is only available in Spectre, APS and in Mentor AFS per 2015_Q1_update1.

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 (in simkit 5.1_pub 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.

Transient noise:

- Transient noise simulations with MOST devices are currently not supported. The noise results are unreliable. A workaround is to switch off induced gate noise, which can be done in mos 1101 and 1102 by setting GATENOISE=1.

In simkit 4.8.1_pub a switch SWIGN was added to PSP103:

- . For SWIGN=1 (default) the behavior is the same as in previous simkit versions.
- . For SWIGN=0 the induced gate noise is switched off.

SiMKit models

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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/APS/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
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
rflmos	602	rflmos602t	rflmos602t	g	yes	yes**
rflmos	602	rflmos602dt	rflmos602dt	g	yes	yes**
jfetidg	1	jfetidg	jfetidg	g	no	no
jfetidgt	1	jfetidgt	jfetidgt	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 rflmos 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	Spectre

diode	500	dio500
mos	902	mos902
mextram	503	bjt503
lpnp	301	bjt301
mos	705	mos705

From simkit 4.8_pub onwards, the mextram 3500 model is no longer supported.

From simkit 4.0_pub 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.

SiMKit interface

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Simkit 5.1_pub incorporates interface version 11 which is backward compatible with version 10 used in simkit 4.7_pub-5.0_pub and with version 9 used in 4.4_pub-4.6_pub and with version 8 used in simkit 4.0_pub-4.3_pub but not backward compatible with the interface versions used in simkit 3.8_pub and earlier.

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