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GSA MIXED-SIGNAL/RF
SPICE MODEL CHECKLIST

Checklist Form

Version 1.4, Apr 2015

Foundry and Support Contact Information

Foundry	ams AG
Process	0.35µm SiGe-BiCMOS - S35xx – hitkit 4.10
Date	06/2012

SPICE Model Support Contact

Name	Ehrenfried Seebacher
Phone	+43 3136/500 31790
Email	tips@ams.com

Foundry Modeling Documents

Document	Document Number & Title	Section	Revision	Date
SPICE Model Library	ENG-219: S35 Process Parameters ENG-308: S35 12V HBT Module PP	4	5.0 1.0	May 2009 Oct 2006
Measured vs. Simulated Data	ENG-219: S35 Process Parameters ENG-308: S35 12V HBT Module PP	5	5.0 1.0	May 2009 Oct 2006
RF SPICE Model Library	ENG-221: S35 RF Spice Models	all	3.0	Nov 2005
Noise Model	ENG-225: S35 Noise Parameters	all	3.0	Jun 2011
Matching Models	ENG-223: S35 Matching Parameters	all	2.0	May 2006
Design Rules	ENG-218: S35 Design Rules ENG-309: S35 12V HBT Module DR	all	6.0 2.0	May 2011 Jan 2007
Process Flow/X-section	ENG-219: S35 Process Parameters ENG-308: S35 12V HBT Module PP		5.0 1.0	May 2009 Oct 2006
Device Characterization Report	ENG-219: S35 Process Parameters ENG-308: S35 12V HBT Module PP	5	5.0 1.0	May 2009 Oct 2006
PCM Structure & Test Report				
Device Parasitic Methods				

Circuit Simulators

Simulator	Vendor and Tool	Level Support	Version	Version Date
Circuit Simulator (A)	Spectre	53	MMSIM10isr17	
Circuit Simulator (B)	Eldo	53	V2010.2	
Circuit Simulator (C)	Hspice	49	V2009.09	
Circuit Simulator (D)	Smartspice	49	2.11.0	
Circuit Simulator (E)	Smash	8	4.3.5	
Circuit Simulator (F)	Agilent-ADSsim	8	2004A	

Comments

1.) Model Benchmark Simulator vs. Simulator > criteria: error < 0.5%

2.) Monte Carlo and Mismatch available for Spectre, Eldo

3.) Special RF Models for Resistors, Caps, MOS available in Spectre, Eldo, ADSsim

Model Classification, Noise, Matching, Statistical Variation, Results

Device Type	Device Name	Model Name	Model Type	Version	Model Style	Comments	Terminals	No of Bins	1/f Noise	HF Noise	RF Params	HV Params	Stat Model	Stat Method	Samples/Lots	Model Val	Corner Val	Max Error	No of Plots
MOS	nmos4	modn	Bsim3	3.2	C	1	4	1	M				SMC			R			9
	pmos4	modp	Bsim3	3.2	C	1	4	1	M				SMC			R			9
	nmosh4	modnh	Bsim3	3.2	C	2	4	1	M			S	SMC			R			2
	nmosm4	modnm	Bsim3	3.2	C	1	4	1	M				SMC			R			9
	pmosm4	modpm	Bsim3	3.2	C	1	4	1	M				SMC			R			9
	nmosmh4	modnmh	Bsim3	3.2	C	2	4	1	M			S	SMC			R			2
	nmosrf	modnrf	Bsim3	3.2	S	3	4	1	M		YSF		SMC			R			13
	pmosrf	modprf	Bsim3	3.2	S	3	4	1	M		YSF		SMC			R			13
	pldmos	modpld	Bsim3	3.2	S	3	4	1	m		YSF		SMC			R			8
BJT	vert10	vert10	GP	1	C	4	4	1	M		F		SMC			R			2
	lat2	lat2	GP	1	C	4	5	1	M		F		SMC			R			2
	npn111	npn111	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			10
	npn121	npn121	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			10
	npn132	npn132	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			10
	npn143	npn143	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			10
	npn232	npn232	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			10
	npn243	npn243	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			10
	npn254	npn254	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			10
	npn111h5	npn111h5	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			10
	npn121h5	npn121h5	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			10
	npn132h5	npn132h5	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			10
	npn143h5	npn143h5	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			10
	npn232h5	npn232h5	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			10
	npn243h5	npn243h5	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			10
	npn254h5	npn254h5	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			10
	non221h12	npn221h12	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			4
	npn232h12	npn232h12	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			4
	npn243h12	npn243h12	VBIC	1.2	C	5	4	1	M	M	F		SMC			R			4
Diode	subdiode	nd	Berkeley	1	C	6	2	1											
	welldiode	pd	Berkeley	1	C	6	2	1											
	nwd	nwd	Berkeley	1	C	6	2	1											
CAP	ngatecap	Ngatecap	CAP		C			1					SC			R			
	csink	csink	CAP		C		2	1					SC			R			1
	cpoly	cpoly	CAP		C		2	1					SC			R			1
	cstack	cstack	CAP		C		2	1					SC			R			
	cmim	cmim	CAP		C		2	1					SC			R			
	cmimrf	cmimrf	CAP		S	3	3	1			YSF		SC			R			9
	cpolyrf	cpolyrf	CAP		S	3	3	1			YSF		SC			R			9

Model Style:	S	Subcircuit Model
	C	Compact Model
1/f Noise, HF Noise:	M	Measured
RF Parameters:	Y	Y-Parameters Included
	S	S-Parameters Included
	F	FT or Transition Frequency Numbers Included
HV Parameters:	S	Safe Operating Area
Stat Model:	S	Statistical Parameters Available
	C	Process Corner Models Available
	M	Matching Parameters Available
Model Val:	R	Results of Model Validation Available

Device Type	Device Name	Model Name	Model Type	Version	Model Style	Comments	Terminals	No of Bins	1/f Noise	HF Noise	RF Params	HV Params	Stat Model	Stat Method	Samples/Lots	Model Val	Corner Val	Max Error	No of Plots
RES	rdiffp	rdiffp	RES		C		2	1					SC			R			
	rdiffp3	rdiffp3	JFET		C		3	1					SC			R			
	rdiffn	rdiffn	RES		C		2	1					SC			R			
	rdiffn3	rdiffn3	JFET		C		3	1					SC			R			
	rnwell	rnwell	JFET		C		3	1					SC			R			
	rpolyb	rpolyb	RES		C		2	1					SC			R			
	rpolybrf	rpolybrf	RES		S	3	3	1			YSF		SC			R			6
	rpoly1	rpoly1	RES		C	7	2	1					SC			R			
	rpoly2	rpoly2	RES		C	7	2	1					SC			R			
	rpoly2rf	rpoly2rf	RES		S	3	3	1			YSF		SC			R			6
	rpolyh	rpolyh	RES		C	7	2	1					SC			R			
	rpolyhrf	rpolyhrf	RES		S	3	3	1			YSF		SC			R			6
IND	StxxxAyyyB		IND		S		3	1			YSF		C			R			9
	DIxx																		
VAR	cvar	cvar	BSIM	3.2	S		3	1			YSF		SMC			R			9
	jvar	jvar	VBIC	1.2	C		3	1			YSF		SMC			R			9

Model Style:	S	Subcircuit Model
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1/f Noise, HF Noise:	M	Measured
RF Parameters:	Y	Y-Parameters Included
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	F	FT or Transition Frequency Numbers Included
HV Parameters:	S	Safe Operating Area
Stat Model:	S	Statistical Parameters Available
	C	Process Corner Models Available
	M	Matching Parameters Available
Model Val:	R	Results of Model Validation Available

Comments

1. Scalable MOS models with physical parameter set
2. High Voltage MOS Transistors with fixed layout; Usage for specific cells only
3. Fully modelled RF behavior valid to given fmax
4. Fixed layout for bipolar models
5. NPN transistor area scales with length
6. Model usage only in backward direction
7. Simple resistor model without RF behavior includes voltage, temp.- dependency and width-dependency W=f(T)

Active Device Specific Parameters

Device Type	Device Name	Model Name	Geom	Min Width	Max Width	Min Length	Max Length	Max Finger	Min Temp	Max Temp	Max Freq
MOS	nmos4	modn	10	0.4		0.35			-40	125	*)
	pmos4	modp	10	0.4		0.35			-40	125	*)
	nmosm4	modnm	10	0.4		0.5			-40	125	
	pmsom4	modmp	10	0.4		0.5			-40	125	
	nmosh	modnh	10	0.4		3.0	3.0		-40	125	
	nmosmh	modnmh	10	0.4		3.0	3.0		-40	125	
	nmosrf	modnrf	3	5	200	0.35	0.35		-40	125	
	pmosrf	modprf	3	5	150	0.35	0.35		-40	125	
	pldmos	modpld	10	20	120	0.35	0.35	24	-40	125	
BJT	vert10	vert10		10	10	10	10				
	lat2	lat2		2	2	2	2				
	npn111	npn111		0.4	0.4	0.8	24	1	-40	125	45
	npn121	npn121		0.4	0.4	0.8	24	1	-40	125	45
	npn132	npn132		0.4	0.4	0.8	24	1	-40	125	45
	npn143	npn143		0.4	0.4	0.8	24	1	-40	125	45
	npn232	npn232		0.4	0.4	0.8	24	1	-40	125	45
	npn243	npn243		0.4	0.4	0.8	24	1	-40	125	45
	npn254	npn254		0.4	0.4	0.8	24	1	-40	125	45
	npn111h5	npn111h5		0.4	0.4	0.8	24	1	-40	125	45
	npn121h5	npn121h5		0.4	0.4	0.8	24	1	-40	125	45
	npn132h5	npn132		0.4	0.4	0.8	24	1	-40	125	45
	npn143h5	npn143h5		0.4	0.4	0.8	24	1	-40	125	45
	npn232h5	npn232		0.4	0.4	0.8	24	1	-40	125	45
	npn243h5	npn243h5		0.4	0.4	0.8	24	1	-40	125	45
	npn254h5	npn254h5		0.4	0.4	0.8	24	1	-40	125	45
	npn221h12	npn221h12		0.4	0.4	0.8	24	1	-40	125	45
	npn232h12	npn232h12		0.4	0.4	0.8	24	1	-40	125	45
	npn243h12	npn243h12		0.4	0.4	0.8	24	1	-40	125	45

*) Max. frequency is strongly dependent on the transistor length:
for L=0.35um fmax=1GHz.

Passive Device Specific Parameters

Device Type	Device Name	Model Name	Geom	Min Width	Max Width	Min Length	Max Length	Min Temp	Max Temp	Max Freq
Diode	subdiode	nd	1					-40	125	
	welldiode	pd	1					-40	125	
	nwd	nwd	1					-40	125	
VAR	cvar	cvar		6	1000	0.65	0.65	-40	125	>6
	jvar	jvar		50	1000	1.4	1.4	-40	125	>6
IND	StxxxAyyyB*							-40	125	>6
	DIxx									
CAP	ngatecap	ngatecap		0.4		0.35		-40	125	
	csink	csink		0.35		0.35		-40	125	
	cpoly	cpoly		0.8		0.8		-40	125	
	cstack	cstack		5.2		5.2		-40	125	
	cmim	cmim		4.0	30	4.0	30	-40	125	
	cpolyrf	cpolyrf	1	10.6	33.9	10.6	33.9	-40	125	>6
	cmimrf	cmimrf	1	10	30	7.7	26	-40	125	>6
RES	rdiffp	rdiffp		0.3		L/W>5		-40	125	
	rdiffp3	rdiffp3		0.3		L/W>5		-40	125	
	rdiffn	rdiffn		0.3		L/W>5		-40	125	
	rdiffn3	rdiffn3		0.3		L/W>5		-40	125	
	rnwell	rnwell	3	3.0		L/W>5		-40	125	
	rpolyb	rpolyb		0.7		L/W>5		-40	125	
	rpoly1	rpoly1		0.65		L/W>5		-40	125	
	rpoly2	rpoly2		0.65		L/W>5		-40	125	
	rpolyh	rpolyh		0.8		L/W>5		-40	125	
	rpolybrf	rpolybrf	3	1	3		60	-40	125	>6
	rpolyhrf	rpolyhrf	3	1	3		30	-40	125	>6
	rpoly2rf	rpoly2rf	3	1	3		90	-40	125	>6

*Inductor name syntax: S..spiral, T..type(P=square,Y=square symm), xxx port1 drive ind *10 in nH,
A..layout, yyy..outer diameter, B..process