

Curtice Cubic Nonlinear Model Results Differ From ADS

Problem

The AWR Curtice nonlinear model does not match the Curtice Cubic model in ADS

Solution

The AWR Curtice model is very similar to the ADS Curtice Cubic model, but they are not identical. Below are some of the common differences:

1. $RDSO = 0$ in ADS means $RDSO = \text{infinity}$ If $RDSO = 0$ or is very large ($>1e6$), then the ADS Curtice Cubic model will match the AWR Curtice model. The ADS Curtice Cubic model implements an extra term $[(V_{ds}-V_{DSDC})/RDSO]$ in the $I(v)$ equation that is not present in the AWR Curtice model.
2. In the ADS Curtice Cubic, C_{gs} and C_{gd} can be linear or nonlinear capacitance depending on the value of G_{scap} and G_{dcap} . The default mode for G_{scap} and G_{dcap} are linear. This corresponds to $G_{scap} = 1$, and $G_{dcap}=1$. If G_{scap} and G_{dcap} are missing, then they are using the default value. In the AWR Curtice model, $CGSO$ and $CGDO$ are used for the nonlinear capacitances and CGS and CGD are used for the linear capacitances. If you set $CGSO$ to a non-zero value, then $CGS = 0$. Similarly, if you set CGS to a non-zero value, then $CGSO = 0$. CGS and $CGSO$ should not both have a value. The same is true for CGD and $CGDO$.
3. There is no $A5$ parameter in the AWR Curtice model. As an approximation, set $\text{Tau} = A5 \cdot V_{dsdc}$.
4. $AWR\ VBO = ADS\ Vbr$, $AWR\ BETA = ADS\ BETA2$, $AWR\ LAMBDA$ does not exist in ADS, leave $LAMBDA = 0$.

The above fix is based on on the attached referenced paper by Dr. Steve Maas and we have added a switch that enables/disables this **FIXUP** parameter.

By default this **FIXUP** is enabled. The user may elect to disable **FIXUP**, however, convergence issues may appear due to some inadequate polynomial values ($A0$, $A1$, etc). A benefit of disabling **FIXUP** is that simulation results will now have better correlation with those of ADS model, assuming the model converges. To enable/ disable the $A1$ parameter, double click on the Curtice Cubic Element to bring up its properties, click on Show Secondary in the bottom right hand corner of the dialog and scroll down to the bottom of the resulting list. The **FIXUP** switch is the last parameter in the list.

Element Options: CURTICE3 - Curtice Cubic Nonlinear FET Model Properties (Showing 47 of 47)

Parameters User Attributes Symbol Layout Model Options

2nd Yield

Name	Value	Unit	Tune	Optimize	Constrain	Lower	Upper	Step Size	Hide	Hide Label	Description
RS	0.001	Ohm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Source resistance
RIN	0.001	Ohm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Intrinsic resistance
CGSO	0	pF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Gate-source capacitance at 0V
CGDO	0	pF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Gate-drain capacitance at 0V
FC	0.5		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Gate-capacitance linearization parameter
CDS	0	pF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Drain-source capacitance
CGS	0	pF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Fixed gate-source capacitance
CGD	0	pF	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Fixed gate-drain capacitance
TNOM	26.85	DegC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Temperature
LAMBDA	0		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	DC drain-source resistance parameter
RGD	0.001	Ohm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Gate-drain resistance
RDSO	1000000	Ohm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Constant drain-source resistance
LG	0	nH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Gate inductance
LS	0	nH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Source inductance
LD	0	nH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Drain inductance
P	2		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Noise par: P
Tg	16.85	DegC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Noise par: gate noise temp
KF	0		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Flicker noise coefficient
AF	1		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Flicker noise exponent
FFE	1		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Flicker noise freq. exponent
NFLAG	AWR1		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	Noise model
AFAC	1		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	Gate-width scale factor (for COMPAT=AWR)
NETNG	1		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	Number of gate fingers scale factor
FIXUP	enable		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input checked="" type="checkbox"/>	<input type="checkbox"/>	disable/enable standard fixup
COMPAT	AWR		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	Compatibility selector
TYPE	N-channel		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	Device type

Device ID

☒ Enable ☐ Freeze ☐ Hide Name ☐ Bold Name Part Number:

OK Cancel Help Element Help Vendor Help

Downloads

[Fixup in Curtice Model](#)