

**Table A.2** Main SPICE bipolar junction transistor model parameters.

Parameter Name	Symbol	SPICE Name	Units	Default Value
Transport Saturation Current	$I_S$	IS	A	1.0E-16
Maximum Forward Current Gain	$b_F$	BF	-	100
Forward Current-Emission Coefficient	$n_F$	NF	-	1
Forward Early Voltage	$V_{AF}$	VAF	V	¥
Maximum Reverse Current Gain	$b_R$	BR	-	1
Reverse Current-Emission Coefficient	$n_R$	NR	-	1
Reverse Early Voltage	$V_{AR}$	VAR	V	¥
Corner for Forward Beta High-Current Roll-off <sup>a</sup>	$I_{KF}$	IKF	A	¥
<i>be</i> Junction Leakage Saturation Current <sup>a</sup>		ISE	A	1.0E-13
<i>be</i> Junction Leakage Emission Coeff. (low-current condition) <sup>a</sup>		NE	-	1.5
Corner for Reverse Beta High Current Roll-off <sup>a</sup>	$I_{KR}$	IKR	A	¥
<i>bc</i> junction leakage saturation current <sup>a</sup>		ISC	A	1.0E-13
<i>bc</i> junction leakage emission coeff. (low-current condition) <sup>a</sup>		NC	-	2
Ideal Forward Transit Time	$t_F$	TF	sec	0
Ideal Reverse Transit Time	$t_R$	TR	sec	0

a. Gummel-Poon Model Parameter

**Table A.3** SPICE Parameters for parasitics (resistances, capacitances).

Parameter Name	Symbol	SPICE Name	Units	Default Value
Emitter Resistance	$r_E$	RE	$\Omega$	0
Collector Resistance	$r_C$	RC	$\Omega$	0
Zero-Bias Base Resistance	$r_B$	RB	$\Omega$	0
Minimum Base Resistance		RBM	$\Omega$	RB
Current where RB falls halfway to RBM		IRB	A	¥
Zero-Bias <i>be</i> -Junction Capacitance	$C_{be0}$	CJE	F	0
<i>be</i> -Junction Grading Coeff.	$m_{be}$	MJE	-	0.33
<i>be</i> -Junction Built-in Voltage	$\phi_{be}$	VJE	V	0.75
Zero-Bias <i>bc</i> -Junction Capacitance	$C_{bc0}$	CJC	F	0
<i>bc</i> -Junction Grading Coeff.	$m_{bc}$	MJC	-	0.33
<i>bc</i> -Junction Built-in Voltage	$\phi_{bc}$	VJC	V	0.75
Zero-Bias Collector-Substrate Cap.	$C_{cs0}$	CJS	F	0
<i>cs</i> -Junction Grading Coeff.	$m_{cs}$	MJS	-	0
<i>cs</i> -Junction Built-in Voltage	$f_{cs}$	VJS	V	0.75