SPICE Parameters for Select JFETs

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Introduction

SPICE is the de facto standard for simulating circuit performance. Abundant libraries are available, but many of them were derived from data sheets. Data sheets seldom define the product—at best they offer minimum performance guarantees. Furthermore, the programs used to develop these faulty library models often employ default parameters that rightfully need to be extracted.

The following table of SPICE parameters has been extracted from measurements—none have been derived from data sheets. Additionally, the parameters for each geometry have been verified by modeling, both as a sine-wave and pulse amplifier, with excellent precision.

The following table of parameters will input directly into the PSPICE[1] circuit file. To users familiar with PSPICE, where CDS or ALPHA is offered, the MODEL statement is the GASFET; otherwise it is the JFET.

Be aware that SPICE parameters for any semiconductor (JFETs included) are valid only for that manufacturer. Because of the vagaries in design, the product of one manufacturer seldom matches that of another. This is especially true for the critically-important parameters, RS and RD.

The following represents typical models of Siliconix FETs. However, we make no warranty, implied, expressed or otherwise, for their accuracy. These models are offered only as a guide for use in circuit analysis.

SPICE Parameters

Part Number			VTO	BETA	LAMBDA	RS	RD[a]	CGS	CGD	CDS[a]	ALPHA
Metal Can	TO-226A	TO-236									
2N4391	J111	SST111	–5	4.9 M	35 M	13	13	14 P	9.5 P	1.1 P	1.5
2N4416	J304	SST4416	–3	1.7 M	4.7 M	55	–	2.48 P	1.72 P	–	0.8
2N4339	J202	SST202	–0.88	0.85 M	5 M	50	–	3.7 P	3.5 P	–	
$^1/_2$ U421	–	–	–1.15	3.33 M	15 M	314	–	0.71 P	0.64 P	–	
U310	J310	SST310	–1.22	10.8 M	10 M	10	–	5.37 P	3.5 P	–	
–	J211	–	–3.15	2.25 M	4.3 M	23	–	3 P	3 P	–	0.8
2N5116	J176	SST176	–1.78[b]	4.7 M	5 M	20	35	14 P	13 P	1.1 P	1.5

Notes:
a. These parameters are only important when modeling the JFET as a switch.
b. SPICE identifies depletion-mode FETs (all JFETs, regardless of polarity) by a negative VTO.

When ALPHA and CDS are offered, the PSPice model used is the GASFET, not the JFET model.

For the parameter I_S, refer to the Gate Operating Current for the particular geometry, which may be found among the typical characteristic curves in the Data Book.

[1] PSPice is the registered trade mark of MicroSim Corporation.