

CTC-023 SPICE Modeling

SPICE Modeling Background

The primary focus of SPICE modeling at InterFET is SPICE2 parameters which can be easily used with most industry SPICE simulators. The core reference for this material is “Semiconductor Device Modeling with SPICE” second addition, by Giuseppe Massobrio and Paolo Antognetti.

The InterFET SPICE models listed in Table 1 are recommended as a starting point for your designs. They can be modified as needed. Once the model is generated you should verify the model outputs with actual measure values.

JFETs are unique devices in several areas, one of which is extremely low gate leakage. The SPICE2 Shichman Hodges model does not account for this and therefore does not accurately model gate leakage without the addition of the G_{Min} parameter. The leakage conductance SPICE value G_{Min} can be modified separately, but unfortunately that impacts all models that utilize G_{Min} in that given simulation, including other JFETs and diodes. The default value of G_{Min} in SPICE2 is 10^{-12} Siemens. Table 1 lists the InterFET SPICE models with the G_{Min} values at the top of each geometry section. If modeling is needed without G_{Min} , please note that the JFET leakage will not be accurate.

Some of the InterFET SPICE models are characterized for the high, medium, and low gain for the part within it’s specified range. This is useful for verifying the design performs over the parts high and low edge cases. As more edge case parts are characterized, InterFET will update Table 1 to cover these parts.



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Table 1: N0001SH Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 4.15f$
.MODEL 2N4117-L njf VTO=-1.19 BETA=21.9u LAMBDA=40.8m CGD=1.07p CGS=1.07p PB=49.6 IS=12.3f MFG=InterFET
.MODEL 2N4117-M njf VTO=-1.43 BETA=24.1u LAMBDA=35.1m CGD=1.07p CGS=1.07p PB=49.6 IS=12.3f MFG=InterFET
.MODEL 2N4118-L njf VTO=-2.07 BETA=21.4u LAMBDA=35.2m CGD=1.07p CGS=1.07p PB=49.6 IS=12.3f MFG=InterFET
.MODEL IFNU421 njf VTO=-2.07 BETA=21.4u LAMBDA=35.2m CGD=1.07p CGS=1.07p PB=49.6 IS=12.3f MFG=InterFET
.MODEL IFNU422 njf VTO=-2.07 BETA=21.4u LAMBDA=35.2m CGD=1.07p CGS=1.07p PB=49.6 IS=12.3f MFG=InterFET
.MODEL IFNU423 njf VTO=-2.07 BETA=21.4u LAMBDA=35.2m CGD=1.07p CGS=1.07p PB=49.6 IS=12.3f MFG=InterFET
.MODEL IFNU424 njf VTO=-2.07 BETA=21.4u LAMBDA=35.2m CGD=1.07p CGS=1.07p PB=49.6 IS=12.3f MFG=InterFET
.MODEL IFNU425 njf VTO=-2.07 BETA=21.4u LAMBDA=35.2m CGD=1.07p CGS=1.07p PB=49.6 IS=12.3f MFG=InterFET
.MODEL IFNU426 njf VTO=-2.07 BETA=21.4u LAMBDA=35.2m CGD=1.07p CGS=1.07p PB=49.6 IS=12.3f MFG=InterFET

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Table 1: N0014AL Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 5.41f$
<code>.MODEL IF140-L njf VTO=-2.99 BETA=659u LAMBDA=9.24m CGD=1.98p CGS=1.98p PB=6.67 IS=1.01f MFG=InterFET</code>

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Table 1: N0014EU Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 48.8f$
<code>.MODEL IFD89-H njf VTO=-653m BETA=1.19m LAMBDA=1.76m CGD=1.66p CGS=1.66p PB=3.16 IS=87.0f MFG=InterFET</code>

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Table 1: N0014LX Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 10.1f$
.MODEL IF150A-H njf VTO=-1.22 BETA=1.86m LAMBDA=10.9m CGD=2.00p CGS=2.00p PB=5.05 IS=10.1f MFG=InterFET
.MODEL IF150B-L njf VTO=-1.50 BETA=1.24m LAMBDA=44.3m CGD=2.00p CGS=2.00p PB=5.05 IS=10.1f MFG=InterFET
.MODEL IF150B-M njf VTO=-2.13 BETA=1.33m LAMBDA=7.96m CGD=2.00p CGS=2.00p PB=5.05 IS=10.1f MFG=InterFET
.MODEL IF150B-H njf VTO=-2.59 BETA=1.18m LAMBDA=7.99m CGD=2.00p CGS=2.00p PB=5.05 IS=10.1f MFG=InterFET
.MODEL IF150C-L njf VTO=-3.23 BETA=1.01m LAMBDA=14.0m CGD=2.00p CGS=2.00p PB=5.05 IS=10.1f MFG=InterFET
.MODEL IF150C-M njf VTO=-4.15 BETA=806u LAMBDA=16.9m CGD=2.00p CGS=2.00p PB=5.05 IS=10.1f MFG=InterFET

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Table 1: N0016SH Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 11.2f$
.MODEL 2N3969 njf VTO=-1.42 BETA=564u LAMBDA=6.68m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL 2N3969A njf VTO=-1.42 BETA=564u LAMBDA=6.68m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFN105 njf VTO=-4.83 BETA=192u LAMBDA=30.2m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFN17 njf VTO=-2.71 BETA=360u LAMBDA=16.6m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFN40 njf VTO=-3.53 BETA=270u LAMBDA=20.0m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFN59 njf VTO=-1.15 BETA=616u LAMBDA=3.64m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL 2N4338-L njf VTO=-596m BETA=780u LAMBDA=1.80m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL 2N4339-L njf VTO=-1.14 BETA=621u LAMBDA=3.69m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL 2N4339-M njf VTO=-1.31 BETA=577u LAMBDA=3.98m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL 2N4339-H njf VTO=-1.42 BETA=564u LAMBDA=6.68m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL 2N4340-H njf VTO=-2.71 BETA=360u LAMBDA=16.6m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL 2N4341-L njf VTO=-4.25 BETA=227u LAMBDA=20.8m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL J230 njf VTO=-1.42 BETA=564u LAMBDA=6.68m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL J231 njf VTO=-3.53 BETA=270u LAMBDA=20.0m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL J232 njf VTO=-4.83 BETA=192u LAMBDA=30.2m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL 2N3459 njf VTO=-2.58 BETA=362u LAMBDA=12.7m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL 2N3460 njf VTO=-691m BETA=787u LAMBDA=4.46m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL 2N4220 njf VTO=-1.42 BETA=564u LAMBDA=6.68m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL 2N4221 njf VTO=-3.53 BETA=270u LAMBDA=20.0m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL 2N4867 njf VTO=-1.14 BETA=621u LAMBDA=3.69m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL 2N4868 njf VTO=-2.58 BETA=362u LAMBDA=12.7m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL 2N4869 njf VTO=-4.28 BETA=237u LAMBDA=18.5m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFN3954 njf VTO=-2.72 BETA=338u LAMBDA=12.4m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFN3955 njf VTO=-2.72 BETA=338u LAMBDA=12.4m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFN3956 njf VTO=-2.72 BETA=338u LAMBDA=12.4m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFN3957 njf VTO=-2.72 BETA=338u LAMBDA=12.4m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFN3958 njf VTO=-2.72 BETA=338u LAMBDA=12.4m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL J201 njf VTO=-691m BETA=787u LAMBDA=4.46m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL J202 njf VTO=-2.58 BETA=362u LAMBDA=12.7m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL J203 njf VTO=-4.83 BETA=192u LAMBDA=30.2m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL J204 njf VTO=-2.58 BETA=362u LAMBDA=12.7m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFN5197 njf VTO=-3.53 BETA=270u LAMBDA=20.0m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFN5198 njf VTO=-3.53 BETA=270u LAMBDA=20.0m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFN5199 njf VTO=-3.53 BETA=270u LAMBDA=20.0m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFNU231 njf VTO=-2.72 BETA=338u LAMBDA=12.4m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFNU232 njf VTO=-2.72 BETA=338u LAMBDA=12.4m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFNU233 njf VTO=-2.72 BETA=338u LAMBDA=12.4m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFNU234 njf VTO=-2.72 BETA=338u LAMBDA=12.4m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFNU235 njf VTO=-2.72 BETA=338u LAMBDA=12.4m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFNU401 njf VTO=-2.58 BETA=362u LAMBDA=12.7m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET

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Table 1: N0016SH Geometry SPICE Models, Continued⁽¹⁾

SPICE Models, Suggested $G_{Min} = 11.2f$
.MODEL IFNU402 njf VTO=-2.58 BETA=362u LAMBDA=12.7m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFNU403 njf VTO=-2.58 BETA=362u LAMBDA=12.7m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFNU404 njf VTO=-2.58 BETA=362u LAMBDA=12.7m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFNU405 njf VTO=-2.58 BETA=362u LAMBDA=12.7m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFNU406 njf VTO=-2.58 BETA=362u LAMBDA=12.7m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFNU410 njf VTO=-2.72 BETA=338u LAMBDA=12.4m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFNU411 njf VTO=-2.72 BETA=338u LAMBDA=12.4m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET
.MODEL IFNU412 njf VTO=-2.72 BETA=338u LAMBDA=12.4m CGD=2.50p CGS=2.50p PB=11.3 IS=30.7f MFG=InterFET

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Table 1: N0026SL Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 11.8f$
.MODEL IFBF510-H njf VTO=-1.14 BETA=1.43m LAMBDA=25.8m CGD=2.50p CGS=2.50p PB=11.9 IS=23.1f MFG=InterFET
.MODEL IFBF511-L njf VTO=-1.50 BETA=1.11m LAMBDA=41.4m CGD=2.50p CGS=2.50p PB=11.9 IS=23.1f MFG=InterFET
.MODEL IFBF512-H njf VTO=-2.60 BETA=1.50m LAMBDA=8.15m CGD=2.50p CGS=2.50p PB=11.9 IS=23.1f MFG=InterFET
.MODEL IFBF513-L njf VTO=-4.11 BETA=772u LAMBDA=8.52m CGD=2.50p CGS=2.50p PB=11.9 IS=23.1f MFG=InterFET
.MODEL IFBF513-H njf VTO=-4.77 BETA=676u LAMBDA=9.19m CGD=2.50p CGS=2.50p PB=11.9 IS=23.1f MFG=InterFET
.MODEL J210 njf VTO=-2.60 BETA=1.50m LAMBDA=8.15m CGD=2.50p CGS=2.50p PB=11.9 IS=23.1f MFG=InterFET
.MODEL J211 njf VTO=-2.60 BETA=1.50m LAMBDA=8.15m CGD=2.50p CGS=2.50p PB=11.9 IS=23.1f MFG=InterFET
.MODEL J212 njf VTO=-4.93 BETA=616u LAMBDA=29.8m CGD=2.50p CGS=2.50p PB=11.9 IS=23.1f MFG=InterFET
.MODEL 2N5397 njf VTO=-4.93 BETA=616u LAMBDA=29.8m CGD=2.50p CGS=2.50p PB=11.9 IS=23.1f MFG=InterFET
.MODEL 2N5398 njf VTO=-4.93 BETA=616u LAMBDA=29.8m CGD=2.50p CGS=2.50p PB=11.9 IS=23.1f MFG=InterFET

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Table 1: N0026SS Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 10.4f$
.MODEL 2N5485-L njf VTO=-2.16 BETA=1.17m LAMBDA=12.5m CGD=2.30p CGS=2.30p PB=12.5 IS=14.9f MFG=InterFET
.MODEL 2N5485-H njf VTO=-3.77 BETA=536u LAMBDA=30.5m CGD=2.30p CGS=2.30p PB=12.5 IS=14.9f MFG=InterFET
.MODEL 2N5486-L njf VTO=-4.35 BETA=491u LAMBDA=40.6m CGD=2.30p CGS=2.30p PB=12.5 IS=14.9f MFG=InterFET
.MODEL 2N4416 njf VTO=-3.77 BETA=565u LAMBDA=29.3m CGD=2.30p CGS=2.30p PB=12.5 IS=14.9f MFG=InterFET
.MODEL 2N4302 njf VTO=-1.17 BETA=519u LAMBDA=7.72m CGD=2.30p CGS=2.30p PB=12.5 IS=14.9f MFG=InterFET
.MODEL 2N4303 njf VTO=-2.16 BETA=1.17m LAMBDA=12.5m CGD=2.30p CGS=2.30p PB=12.5 IS=14.9f MFG=InterFET
.MODEL 2N4304 njf VTO=-2.16 BETA=1.17m LAMBDA=12.5m CGD=2.30p CGS=2.30p PB=12.5 IS=14.9f MFG=InterFET
.MODEL J304 njf VTO=-3.77 BETA=565u LAMBDA=29.3m CGD=2.30p CGS=2.30p PB=12.5 IS=14.9f MFG=InterFET
.MODEL J305 njf VTO=-2.16 BETA=1.17m LAMBDA=12.5m CGD=2.30p CGS=2.30p PB=12.5 IS=14.9f MFG=InterFET

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Table 1: N0030SL Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 7.58f$
.MODEL TBD njf VTO=-1.18 BETA=865u LAMBDA=4.23m CGD=2.87p CGS=2.87p PB=3.59 IS=6.66f MFG=InterFET
.MODEL IFN5912-UL njf VTO=-1.71 BETA=2.51m LAMBDA=13.4m CGD=2.87p CGS=2.87p PB=3.59 IS=6.66f MFG=InterFET
.MODEL IFN5912-L njf VTO=-2.16 BETA=2.36m LAMBDA=7.79m CGD=2.87p CGS=2.87p PB=3.59 IS=6.66f MFG=InterFET
.MODEL IFN5912-UH njf VTO=-3.60 BETA=1.76m LAMBDA=13.7m CGD=2.87p CGS=2.87p PB=3.59 IS=6.66f MFG=InterFET
.MODEL IFN5911 njf VTO=-3.60 BETA=1.76m LAMBDA=13.7m CGD=2.87p CGS=2.87p PB=3.59 IS=6.66f MFG=InterFET

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Table 1: N0032SH Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 24.8f$
.MODEL 2N3819 njf VTO=-3.59 BETA=856u LAMBDA=24.1m CGD=3.58p CGS=3.58p PB=3.99 IS=95.6f MFG=InterFET
.MODEL 2N3821-L njf VTO=-1.20 BETA=461u LAMBDA=8.27m CGD=3.58p CGS=3.58p PB=3.99 IS=95.6f MFG=InterFET
.MODEL 2N3821-H njf VTO=-1.25 BETA=1.04m LAMBDA=30.8m CGD=3.58p CGS=3.58p PB=3.99 IS=95.6f MFG=InterFET
.MODEL 2N3822-L njf VTO=-2.12 BETA=541u LAMBDA=69.0m CGD=3.58p CGS=3.58p PB=3.99 IS=95.6f MFG=InterFET
.MODEL 2N3822-M njf VTO=-2.16 BETA=1.17m LAMBDA=11.5m CGD=3.58p CGS=3.58p PB=3.99 IS=95.6f MFG=InterFET
.MODEL 2N3822-H njf VTO=-3.66 BETA=538u LAMBDA=22.7m CGD=3.58p CGS=3.58p PB=3.99 IS=95.6f MFG=InterFET
.MODEL 2N3823 njf VTO=-3.59 BETA=856u LAMBDA=24.1m CGD=3.58p CGS=3.58p PB=3.99 IS=95.6f MFG=InterFET
.MODEL 2N3824 njf VTO=-937m BETA=20.0m LAMBDA=8.05m CGD=3.58p CGS=3.58p PB=3.99 IS=95.6f MFG=InterFET
.MODEL 2N3458 njf VTO=-2.16 BETA=1.17m LAMBDA=11.5m CGD=3.58p CGS=3.58p PB=3.99 IS=95.6f MFG=InterFET
.MODEL 2N4222 njf VTO=-3.59 BETA=856u LAMBDA=24.1m CGD=3.58p CGS=3.58p PB=3.99 IS=95.6f MFG=InterFET
.MODEL 2N5949 njf VTO=-3.59 BETA=856u LAMBDA=24.1m CGD=3.58p CGS=3.58p PB=3.99 IS=95.6f MFG=InterFET
.MODEL 2N5457 njf VTO=-1.25 BETA=1.04m LAMBDA=30.8m CGD=3.58p CGS=3.58p PB=3.99 IS=95.6f MFG=InterFET

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Table 1: N0042SY Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 19.9f$
.MODEL 2N6449-M njf VTO=-10.3 BETA=20.3u LAMBDA=75.9m CGD=9.00p CGS=9.00p PB=4.69 IS=1.00f MFG=InterFET
.MODEL 2N6450 njf VTO=-10.3 BETA=20.3u LAMBDA=75.9m CGD=9.00p CGS=9.00p PB=4.69 IS=1.00f MFG=InterFET

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Table 1: N0072SL Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 102f$
.MODEL J308 njf VTO=-2.87 BETA=3.94m LAMBDA=14.4m CGD=7.00p CGS=7.00p PB=3.37 IS=80.1f MFG=InterFET
.MODEL J309-L njf VTO=-2.09 BETA=3.49m LAMBDA=5.21m CGD=7.00p CGS=7.00p PB=3.37 IS=80.1f MFG=InterFET
.MODEL J309-M njf VTO=-2.65 BETA=2.72m LAMBDA=9.48m CGD=7.00p CGS=7.00p PB=3.37 IS=80.1f MFG=InterFET
.MODEL J309-H njf VTO=-3.11 BETA=2.32m LAMBDA=15.7m CGD=7.00p CGS=7.00p PB=3.37 IS=80.1f MFG=InterFET
.MODEL J310-L njf VTO=-2.80 BETA=3.91m LAMBDA=14.7m CGD=7.00p CGS=7.00p PB=3.37 IS=80.1f MFG=InterFET
.MODEL J310-M njf VTO=-3.23 BETA=3.52m LAMBDA=21.7m CGD=7.00p CGS=7.00p PB=3.37 IS=80.1f MFG=InterFET
.MODEL J310-H njf VTO=-3.82 BETA=2.81m LAMBDA=33.1m CGD=7.00p CGS=7.00p PB=3.37 IS=80.1f MFG=InterFET
.MODEL U308 njf VTO=-2.87 BETA=3.94m LAMBDA=14.4m CGD=7.00p CGS=7.00p PB=3.37 IS=80.1f MFG=InterFET
.MODEL U309 njf VTO=-2.65 BETA=2.72m LAMBDA=9.48m CGD=7.00p CGS=7.00p PB=3.37 IS=80.1f MFG=InterFET
.MODEL U310 njf VTO=-3.22 BETA=3.62m LAMBDA=15.2m CGD=7.00p CGS=7.00p PB=3.37 IS=80.1f MFG=InterFET
.MODEL U311 njf VTO=-3.18 BETA=3.56m LAMBDA=18.4m CGD=7.00p CGS=7.00p PB=3.37 IS=80.1f MFG=InterFET
.MODEL U430 njf VTO=-2.65 BETA=2.72m LAMBDA=9.48m CGD=7.00p CGS=7.00p PB=3.37 IS=80.1f MFG=InterFET
.MODEL U431 njf VTO=-3.22 BETA=3.62m LAMBDA=15.2m CGD=7.00p CGS=7.00p PB=3.37 IS=80.1f MFG=InterFET

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Table 1: N0072SS Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 33.5f$
.MODEL IFN5566-UL njf VTO=-1.40 BETA=3.58m LAMBDA=36.3m CGD=6.62p CGS=6.62p PB=2.87 IS=71.9f MFG=InterFET
.MODEL IFN5566-L njf VTO=-1.84 BETA=3.14m LAMBDA=20.8m CGD=6.62p CGS=6.62p PB=2.87 IS=71.9f MFG=InterFET
.MODEL IFN5566-M njf VTO=-2.44 BETA=2.46m LAMBDA=24.5m CGD=6.62p CGS=6.62p PB=2.87 IS=71.9f MFG=InterFET
.MODEL IFN5564 njf VTO=-2.44 BETA=2.46m LAMBDA=24.5m CGD=6.62p CGS=6.62p PB=2.87 IS=71.9f MFG=InterFET
.MODEL IFN5565 njf VTO=-2.44 BETA=2.46m LAMBDA=24.5m CGD=6.62p CGS=6.62p PB=2.87 IS=71.9f MFG=InterFET

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Table 1: N0132SH Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 45.8f$
<code>.MODEL IFN112 njf VTO=-1.16 BETA=2.98m LAMBDA=4.95m CGD=9.80p CGS=9.80p PB=1.83 IS=181f MFG=InterFET</code>

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Table 1: N0132SL Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 51.7f$
.MODEL IF170A-L njf VTO=-464m BETA=16.6m LAMBDA=999u CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL IF170A-H njf VTO=-582m BETA=16.1m LAMBDA=1.71m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL IF170B-L njf VTO=-719m BETA=14.6m LAMBDA=3.03m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL IF170B-H njf VTO=-947m BETA=11.8m LAMBDA=1.70m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL IF170C-L njf VTO=-1.11 BETA=11.8m LAMBDA=2.03m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL IF170C-H njf VTO=-1.29 BETA=11.2m LAMBDA=2.96m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL IF170D-L njf VTO=-1.53 BETA=9.96m LAMBDA=3.50m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL IF170D-H njf VTO=-1.75 BETA=9.17m LAMBDA=3.99m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL 2N6451 njf VTO=-943m BETA=13.4m LAMBDA=1.52m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL 2N6452 njf VTO=-943m BETA=13.4m LAMBDA=1.52m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL 2N6453 njf VTO=-1.75 BETA=9.17m LAMBDA=3.99m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL 2N6454 njf VTO=-1.75 BETA=9.17m LAMBDA=3.99m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL IFN152 njf VTO=-943m BETA=13.4m LAMBDA=1.52m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL IF1320 njf VTO=-943m BETA=13.4m LAMBDA=1.52m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL IF1322 njf VTO=-1.11 BETA=11.8m LAMBDA=2.03m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL IF389A njf VTO=-552m BETA=16.3m LAMBDA=2.35m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL IF389B njf VTO=-849m BETA=12.4m LAMBDA=1.55m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL IF389C njf VTO=-1.11 BETA=11.8m LAMBDA=2.03m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET
.MODEL IF389D njf VTO=-1.53 BETA=9.96m LAMBDA=3.50m CGD=12.0p CGS=12.0p PB=1.57 IS=99.3f MFG=InterFET

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Table 1: N0132SS Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 24.6f$
.MODEL 2N3972 njf VTO=-4.92 BETA=2.42m LAMBDA=25.4m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL 2N3971 njf VTO=-4.19 BETA=3.01m LAMBDA=16.5m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL 2N3970 njf VTO=-1.06 BETA=9.32m LAMBDA=6.49m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL J113A-H njf VTO=-1.06 BETA=9.32m LAMBDA=6.49m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL J112A-L njf VTO=-2.07 BETA=5.51m LAMBDA=10.1m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL J111-L njf VTO=-4.19 BETA=2.92m LAMBDA=15.1m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL J111-H njf VTO=-4.92 BETA=2.42m LAMBDA=25.4m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL 2N4093 njf VTO=-1.06 BETA=9.32m LAMBDA=6.49m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL 2N4092 njf VTO=-2.07 BETA=5.51m LAMBDA=10.1m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL 2N4091 njf VTO=-4.92 BETA=2.42m LAMBDA=25.4m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL 2N4391 njf VTO=-4.92 BETA=2.42m LAMBDA=25.4m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL 2N4392 njf VTO=-4.19 BETA=3.01m LAMBDA=16.5m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL 2N4393 njf VTO=-1.06 BETA=9.32m LAMBDA=6.49m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL 2N4856 njf VTO=-4.92 BETA=2.42m LAMBDA=25.4m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL 2N4857 njf VTO=-4.19 BETA=3.01m LAMBDA=16.5m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL 2N4858 njf VTO=-4.19 BETA=3.01m LAMBDA=16.5m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL 2N4859 njf VTO=-4.92 BETA=2.42m LAMBDA=25.4m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL 2N4860 njf VTO=-4.19 BETA=3.01m LAMBDA=16.5m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL 2N4861 njf VTO=-4.19 BETA=3.01m LAMBDA=16.5m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET
.MODEL IFN113 njf VTO=-4.92 BETA=2.42m LAMBDA=25.4m CGD=10.9p CGS=10.9p PB=1.68 IS=22.1f MFG=InterFET

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Table 1: N0450SH Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 210f$
.MODEL IFN146-L njf VTO=-515m BETA=32.5m LAMBDA=6.76m CGD=25.0p CGS=25.0p PB=2.87 IS=386f MFG=InterFET
.MODEL IFN147 njf VTO=-553m BETA=35.6m LAMBDA=7.61m CGD=25.0p CGS=25.0p PB=2.87 IS=386f MFG=InterFET
.MODEL IFN363 njf VTO=-553m BETA=35.6m LAMBDA=7.61m CGD=25.0p CGS=25.0p PB=2.87 IS=386f MFG=InterFET

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Table 1: N0450SL Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 94.3f$
.MODEL IF4500-L njf VTO=-392m BETA=48.4m LAMBDA=1.09m CGD=38.0p CGS=38.0p PB=2.04 IS=102f MFG=InterFET
.MODEL IF4500-M njf VTO=-448m BETA=71.4m LAMBDA=2.66m CGD=38.0p CGS=38.0p PB=2.04 IS=102f MFG=InterFET
.MODEL IF4500-H njf VTO=-817m BETA=41.8m LAMBDA=1.47m CGD=38.0p CGS=38.0p PB=2.04 IS=102f MFG=InterFET
.MODEL IF4500-UH njf VTO=-862m BETA=52.3m LAMBDA=4.39m CGD=38.0p CGS=38.0p PB=2.04 IS=102f MFG=InterFET
.MODEL J110 njf VTO=-1.32 BETA=40.7m LAMBDA=5.42m CGD=38.0p CGS=38.0p PB=2.04 IS=102f MFG=InterFET
.MODEL J109 njf VTO=-2.50 BETA=26.0m LAMBDA=5.62m CGD=38.0p CGS=38.0p PB=2.04 IS=102f MFG=InterFET
.MODEL J108-L njf VTO=-4.47 BETA=8.43m LAMBDA=44.1m CGD=38.0p CGS=38.0p PB=2.04 IS=102f MFG=InterFET
.MODEL J108-H njf VTO=-4.20 BETA=14.4m LAMBDA=25.7m CGD=38.0p CGS=38.0p PB=2.04 IS=102f MFG=InterFET
.MODEL 2N6550 njf VTO=-1.76 BETA=34.8m LAMBDA=9.87m CGD=38.0p CGS=38.0p PB=2.04 IS=102f MFG=InterFET
.MODEL IFN860 njf VTO=-1.06 BETA=46.2m LAMBDA=3.73m CGD=38.0p CGS=38.0p PB=2.04 IS=102f MFG=InterFET

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Table 1: N0903SL Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 3.17p$
.MODEL IF9030 njf VTO=-613m BETA=137m LAMBDA=11.9m CGD=70.0p CGS=70.0p PB=2.90 IS=1.52p MFG=InterFET
.MODEL IFN5434 njf VTO=-613m BETA=137m LAMBDA=11.9m CGD=70.0p CGS=70.0p PB=2.90 IS=1.52p MFG=InterFET
.MODEL IF9034 njf VTO=-613m BETA=137m LAMBDA=11.9m CGD=70.0p CGS=70.0p PB=2.90 IS=1.52p MFG=InterFET
.MODEL IF9035 njf VTO=-613m BETA=137m LAMBDA=11.9m CGD=70.0p CGS=70.0p PB=2.90 IS=1.52p MFG=InterFET

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Table 1: N106ASF Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 24.6f$
.MODEL IFN201A njf VTO=-501m BETA=1.21m LAMBDA=4.43m CGD=2.80p CGS=2.80p PB=2.90 IS=49.2f MFG=InterFET

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Table 1: N107ASF Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 62.9f$
.MODEL IFN160A-L njf VTO=-500m BETA=2.46m LAMBDA=5.38m CGD=4.00p CGS=4.00p PB=1.73 IS=1.00f MFG=InterFET
.MODEL IFN160A-H njf VTO=-639m BETA=2.22m LAMBDA=6.84m CGD=4.00p CGS=4.00p PB=1.73 IS=1.00f MFG=InterFET
.MODEL IFN160B-H njf VTO=-1.13 BETA=1.55m LAMBDA=14.0m CGD=4.00p CGS=4.00p PB=1.73 IS=1.00f MFG=InterFET

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Table 1: N3600SL Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 1.32p$
.MODEL IF3601-M njf VTO=-526m BETA=479m LAMBDA=3.20m CGD=216p CGS=216p PB=3.77 IS=2.44p MFG=InterFET
.MODEL IF3601-H njf VTO=-1.15 BETA=186m LAMBDA=39.3m CGD=216p CGS=216p PB=3.77 IS=2.44p MFG=InterFET
.MODEL IF3602 njf VTO=-526m BETA=479m LAMBDA=3.20m CGD=216p CGS=216p PB=3.77 IS=2.44p MFG=InterFET

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Table 1: P0032SF Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 84.8f$
.MODEL 2N5020-L pjf VTO=-1.21 BETA=334u LAMBDA=10.8m CGD=5.32p CGS=5.32p PB=722m IS=147f MFG=InterFET
.MODEL 2N5020A pjf VTO=-1.21 BETA=334u LAMBDA=10.8m CGD=5.32p CGS=5.32p PB=722m IS=147f MFG=InterFET
.MODEL 2N5020B pjf VTO=-1.21 BETA=334u LAMBDA=10.8m CGD=5.32p CGS=5.32p PB=722m IS=147f MFG=InterFET
.MODEL 2N5021 pjf VTO=-2.16 BETA=517u LAMBDA=12.6m CGD=5.32p CGS=5.32p PB=722m IS=147f MFG=InterFET
.MODEL 2N5460-H pjf VTO=-2.16 BETA=517u LAMBDA=12.6m CGD=5.32p CGS=5.32p PB=722m IS=147f MFG=InterFET
.MODEL 2N5461-H pjf VTO=-3.60 BETA=444u LAMBDA=12.0m CGD=5.32p CGS=5.32p PB=722m IS=147f MFG=InterFET
.MODEL 2N5463 pjf VTO=-2.16 BETA=517u LAMBDA=12.6m CGD=5.32p CGS=5.32p PB=722m IS=147f MFG=InterFET
.MODEL 2N5464 pjf VTO=-2.16 BETA=517u LAMBDA=12.6m CGD=5.32p CGS=5.32p PB=722m IS=147f MFG=InterFET
.MODEL 2N5465 pjf VTO=-3.60 BETA=444u LAMBDA=12.0m CGD=5.32p CGS=5.32p PB=722m IS=147f MFG=InterFET
.MODEL 2N2608 pjf VTO=-2.16 BETA=517u LAMBDA=12.6m CGD=5.32p CGS=5.32p PB=722m IS=147f MFG=InterFET
.MODEL 2N2609 pjf VTO=-2.16 BETA=517u LAMBDA=12.6m CGD=5.32p CGS=5.32p PB=722m IS=147f MFG=InterFET
.MODEL 2N3330 pjf VTO=-2.16 BETA=517u LAMBDA=12.6m CGD=5.32p CGS=5.32p PB=722m IS=147f MFG=InterFET
.MODEL 2N3331 pjf VTO=-3.60 BETA=444u LAMBDA=12.0m CGD=5.32p CGS=5.32p PB=722m IS=147f MFG=InterFET

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Table 1: P0099SF Geometry SPICE Models⁽¹⁾

SPICE Models, Suggested $G_{Min} = 113f$
.MODEL J177 pjf VTO=-1.22 BETA=2.32m LAMBDA=8.31m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL 2N5115-L pjf VTO=-2.16 BETA=3.16m LAMBDA=8.60m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL 2N5114-L pjf VTO=-3.53 BETA=2.19m LAMBDA=38.5m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL J174 pjf VTO=-3.53 BETA=2.19m LAMBDA=38.5m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL J175 pjf VTO=-2.16 BETA=3.16m LAMBDA=8.60m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL J176 pjf VTO=-1.22 BETA=2.32m LAMBDA=8.31m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL J177 pjf VTO=-1.22 BETA=2.32m LAMBDA=8.31m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL J270 pjf VTO=-1.22 BETA=2.32m LAMBDA=8.31m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL J271 pjf VTO=-2.16 BETA=3.16m LAMBDA=8.60m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL U304 pjf VTO=-3.53 BETA=2.19m LAMBDA=38.5m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL U305 pjf VTO=-2.16 BETA=3.16m LAMBDA=8.60m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL U306 pjf VTO=-2.16 BETA=3.16m LAMBDA=8.60m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL IFP44 pjf VTO=-1.22 BETA=2.32m LAMBDA=8.31m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL IFN3993 pjf VTO=-2.16 BETA=3.16m LAMBDA=8.60m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL IFN3994 pjf VTO=-1.22 BETA=2.32m LAMBDA=8.31m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET
.MODEL 2N5019 pjf VTO=-2.16 BETA=3.16m LAMBDA=8.60m CGD=12.2p CGS=12.2p PB=557m IS=1.00f MFG=InterFET

1. SPICE models presented as a reference only. It is the Buyers responsibility for designing, validating and testing the end application under all field use cases and extreme use conditions.



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