Appendix A—FET Parameters

Symbol and Typical Values	Parameter Name	Symbol and Typical Values	Parameter Name
BV_{ds}	Breakdown voltage	g_{gs}	Gate-to-source conductance
$BV_{ds}^{(off)} = 6V$	Offstate breakdown voltage	g_{gd}	Gate-to-drain conductance
C_{fd}	Drain-side feedback/fringe capacitance	G_i	Current gain
$C_{fs} = 150$ fF/mm	Source-side fringe capacitance	g_m	Transconductance
C_{gc}	Gate-to-channel parallel-plate capacitance at $V_d = 0$	$g_{mx}^{(max)} = 950$ mS/mm	Maximum extrinsic transconductance
C_{gd}	Gate-to-drain capacitance	G_{ma}	Maximum available gain
C_{gs}	Gate-to-source capacitance	G_{ms}	Maximum stable gain
d_c	Channel thickness	G_u	Unilateral power gain
d_p	Thickness of doped layer	G_v	Intrinsic low-voltage gain
$d_{gc} = 23$ nm	Gate-to-channel distance	I_d	Drain current
ε	Dielectric constant of semiconductor	$I_d^{(knee)}$	Drain current at the onset of saturation
E_c	Channel drift field	I_g	Gate current
E_{sat}	Field where velocity saturates	$I_d^{(max)} = 700$ mA/mm	Maximum drain current
f_{mag}	Cutoff frequency for G_{ma}	I_{dss}	Saturated drain current at $V_g = 0$
$f_{max} = 350$ GHz	Cutoff frequency for G_u	$L_g = 120$ nm	Gate length
f_T	Cutoff frequency	ΔL_i	Extent of high-field penetration toward source
$f_{Tx}^{max} = 190$ GHz	Maximum current gain cutoff frequency	ΔL_x	Extent of high-field penetration toward drain
$G_a^{(12\ GHz, on\text{-}wfr)} = 16.8$ dB	Gain associated with NF_{min}	μ	Electron mobility
g_d	Intrinsic FET Output conductance	m_{eff}	Electron effective mass
g_{do}	Intrinsic dc output conductance	$NF_{min}^{(12\ GHz, on\text{-}wfr)} = 0.34$ dB	Minimum noise figure at 12 GHz
$g_{dx}^{(sat)} = 45$ mS/mm	Extrinsic output conductance in saturation	N_d	Donor concentration
		n_{so}	Full-channel sheet concentration
		Φ_b	Schottky barrier height
		P_{sat}	Saturated output power
		$P_{sat}^{(60\ GHz, 2V)} = 200$ mW/mm	Saturated output power at 60 GHz

Appendix A (Cont.)

Symbol and Typical Values	Parameter Name	Symbol and Typical Values	Parameter Name
P_{-1dB}	Output power at 1 dB gain compression	τ_{scatt}	Electron scattering time
q	Electron charge	V_c	Channel voltage
$R_c = 0.15\Omega mm$	Resistance of ohmic contacts	V_d	Drain voltage
		$V_d^{(knee)}$	Drain voltage at onset of velocity saturation
R_{ch}	Channel resistance		
R_d	Drain resistance	V_g	Gate voltage
$R_s = 0.35\Omega mm$	Source resistance	v_{sat}	Saturation velocity
$\sigma_{V_{th}}^{(wfr)} = 60$ mV	Standard deviation of V_{th} over a wafer	V_{surf}	Effective surface gating voltage
$\sigma_{V_{th}}^{(wfr\text{-}to\text{-}wfr)} = 80$ mV	Standard deviation of the average V_{th} from wafer to wafer	$V_{th} = -0.35V$	Threshold voltage
		W_g	Gate width