cmos028fdsoi Technology

NOSO ESD EGNFET models

DK1.2_RF_mmW

Comparison with DK1.1_RF_mmW model(s)

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General information on NOSO models

- Maximum supply voltage is 1.8 V.
- Validity domain is defined as follows:
  - ✔ Drawn gate length varies from 30nm to 10um.
  - ✔ Drawn transistor width varies from 80nm to 10um.
  - ✔ Device temperature varies from -40 °C to 125 °C.

Output parameters definitions

- Model(s): esdegnfet
  - ✔ Vt_lin : Threshold voltage defined as Vgs value for which drain current is 300e-9*M*1*W/(1*L+0+1*p_la) at Vds = 0.1V.
  - ✔ Cggmean : Average total gate capacitance for Vgs values between 0V and 1.8, Vds = 0V, f = 100kHz.
  - ✔ Ilin : Drain current at Vgs = 1.8V, Vds = 0.1V.
  - ✔ DIBL : Vt_lin - Vt_sat.
  - ✔ Cbd_off : Bulk-to-Drain capacitance at Vgs = 0V, Vds = 0V, f = 100kHz.
  - ✔ Vt_sat : Threshold voltage defined as Vgs value for which drain current is 300e-9*M*1*W/(1*L+0+1*p_la) at Vds = vds_satV.
  - ✔ Cgg_inv : Total gate capacitance at Vgs = 1.8V, Vds = 0V, f = 100kHz.
  - ✔ LogIoff : log10(Ioffsat).
  - ✔ Slp_sat : Sub-threshold slope at Vds = vds_satV, extracted from drain current vs. Vgs curve between its minimum and 300e-9*M*W/L.
  - ✔ Isat : Drain current at Vgs = 1.8V, Vds = VddV.
  - ✔ Slp_lin : Sub-threshold slope at Vds = 0.1V, extracted from drain current vs. Vgs curve between its minimum and 300e-9*M*W/L.
  - ✔ CGd_0V : Gate-to-Drain capacitance at Vgs = 0V, Vds = 0V, f = 100kHz.
  - ✔ VtGmmax : Threshold voltage at Vds = 0.1 derived from Gm max method.

esdegnfet
Electrical characteristics per geometry

esdegnfet @ w=150e-6, l=0.15e-6, nf=30, ldop=0.5e-06, lsop=0.2e-06, vbs=0, vdd=1.8, temp=25.0

DK1.2_RF_mmW wrt DK1.1_RF_mmW

	ESDWC	TT	ESDBC
Vt_lin [mV]	1052 0.0mV	946.1 0.0mV	840.6 0.0mV
Ilin [mA]	7.05 0.0%	7.96 0.0%	8.79 0.0%
Slp_lin [mV/dec]	88.22 0.0%	86.52 0.0%	85.02 0.0%
VtGmmax [mV]	1015 0.0mV	912.4 0.0mV	809.7 0.0mV
DIBL [mV]	36.7 0.0mV	35.58 0.0mV	34.56 0.0mV
Vt_sat [mV]	1016 0.0mV	910.5 0.0mV	806.1 0.0mV
Isat [mA]	28.44 0.0%	37.07 0.0%	46.81 0.0%
Slp_sat [mV/dec]	83.7 0.0%	82.88 0.0%	82.06 0.0%
LogIoff [log(A)]	-9.28 -0.0%	-9.14 -0.0%	-9 -0.0%
CGd_0V [fF]	45.86 0.0%	46.8 0.0%	47.8 0.0%
Cgg_inv [fF]	255.3 0.0%	262.4 0.0%	269.9 0.0%
Cggmean [fF]	186.4 0.0%	195.8 0.0%	206.1 0.0%
Cbd_off [fF]	281.6 0.0%	234.6 0.0%	187.7 0.0%

esdegnfet @ w=150e-6, l=0.15e-6, nf=30, ldop=0.5e-06, lsop=0.2e-06, vbs=0, vdd=1.8, temp=-40.0

DK1.2_RF_mmW wrt DK1.1_RF_mmW

	ESDWC	TT	ESDBC
Vt_lin [mV]	1108 0.0mV	1002 0.0mV	896.4 0.0mV
Ilin [mA]	7.42 0.0%	8.27 0.0%	9 0.0%
Slp_lin [mV/dec]	67.24 0.0%	66.1 0.0%	65.08 0.0%
VtGmmax [mV]	1070 0.0mV	966.7 0.0mV	863.1 0.0mV
DIBL [mV]	35.2 0.0mV	34.19 0.0mV	33.29 0.0mV
Vt_sat [mV]	1073 0.0mV	967.8 0.0mV	863.1 0.0mV
Isat [mA]	28.44 0.0%	37.04 0.0%	46.63 0.0%
Slp_sat [mV/dec]	64.9 0.0%	64.26 0.0%	63.63 0.0%
LogIoff [log(A)]	-9.26 -0.0%	-9.13 -0.0%	-8.99 -0.0%
CGd_0V [fF]	46.21 0.0%	47.17 0.0%	48.19 0.0%
Cgg_inv [fF]	257.1 0.0%	264.1 0.0%	271.6 0.0%
Cggmean [fF]	184.5 0.0%	194.1 0.0%	204.5 0.0%
Cbd_off [fF]	275.9 0.0%	229.9 0.0%	183.9 0.0%

esdegnfet @ w=150e-6, l=0.15e-6, nf=30, ldop=0.5e-06, lsop=0.2e-06, vbs=0, vdd=1.8, temp=125.0

DK1.2_RF_mmW wrt DK1.1_RF_mmW

	ESDWC	TT	ESDBC
Vt_lin [mV]	955.5 0.0mV	849.2 0.0mV	743.6 0.0mV
Ilin [mA]	6.15 0.0%	7.07 0.0%	7.94 0.0%
Slp_lin [mV/dec]	124.8 0.0%	121.9 0.0%	119.3 0.0%
VtGmmax [mV]	914.1 0.0mV	812.9 0.0mV	711.8 0.0mV
DIBL [mV]	41.51 0.0mV	40.14 0.0mV	38.88 0.0mV
Vt_sat [mV]	914 0.0mV	809 0.0mV	704.8 0.0mV
Isat [mA]	26.94 0.0%	35.06 0.0%	44.37 0.0%
Slp_sat [mV/dec]	114.7 0.0%	113.5 0.0%	112.4 0.0%
LogIoff [log(A)]	-9.28 -0.0%	-9.07 -0.0%	-8.64 -0.0%
CGd_0V [fF]	45.41 0.0%	46.32 0.0%	47.28 0.0%
Cgg_inv [fF]	253.1 0.0%	260.1 0.0%	267.6 0.0%
Cggmean [fF]	190.7 0.0%	199.9 0.0%	210 0.0%
Cbd_off [fF]	292.8 0.0%	244 0.0%	195.2 0.0%

Annex

Conditions of simulations

The simulations were done with SBenchLSF Alpha using Eldo simulator 2018.3.

- Model esdegnfet (DK1.2_RF_mmW)
  - ✔ Input Parameters
    - ✘ vds_off = vds_sat V
    - ✘ vds_cgd = 0 V
    - ✘ vds_cgg = 0 V
    - ✘ mc_sens = 0
    - ✘ vds_lin = 0.1 V
    - ✘ ivt = 300e-9 A
    - ✘ model_version = 1.1
    - ✘ ams_release = 2018.3
    - ✘ vgs_stop = vdd V
    - ✘ dlshrink_ivt = 0
    - ✘ sbenchlsf_release = Alpha
    - ✘ vds_sat = Vdd V
    - ✘ mc_nsigma = 3
    - ✘ shrink_ivt = 1

- ✘ dlshrink_tinv = 3e-9
- ✘ vgs_start = -0.5 V
- ✘ plashrink_ivt = 1
- ✘ ithslwi = 10e-9 A
- ✘ vds_cbd = 0 V
- ✘ vddmax = vdd
- ✘ mc_runs = 1000
- ✘ vstep_ivt = 0.005 V
- ✘ vgs_off = 0 V
- ✘ temp = 25 °C
- ✘ f_ext = 100k Hz
- ✘ vbs = 0 V
- ✘ vdd = 1.8 V
- ✘ shrink_tinv = 0.9

✔ Sweep Parameters

- ✘ temp = -40.0, 25.0, 125.0

✔ Extra parameters

- ✘ egnfetsb_dev = 0

● Model esdegnfet (DK1.1_RF_mmW)

✔ Input Parameters

- ✘ vds_off = vds_sat V
- ✘ vds_cgd = 0 V
- ✘ vds_cgg = 0 V
- ✘ mc_sens = 0
- ✘ vds_lin = 0.1 V

- ✘ ivt = 300e-9 A
- ✘ model_version = 1.1
- ✘ ams_release = 2018.3
- ✘ vgs_stop = vdd V
- ✘ dlshrink_ivt = 0
- ✘ sbenchlsf_release = Alpha
- ✘ vds_sat = Vdd V
- ✘ mc_nsigma = 3
- ✘ shrink_ivt = 1
- ✘ dlshrink_tinv = 3e-9
- ✘ vgs_start = -0.5 V
- ✘ plashrink_ivt = 1
- ✘ ithslwi = 10e-9 A
- ✘ vds_cbd = 0 V
- ✘ vddmax = vdd
- ✘ mc_runs = 1000
- ✘ vstep_ivt = 0.005 V
- ✘ vgs_off = 0 V
- ✘ temp = 25 °C
- ✘ f_ext = 100k Hz
- ✘ vbs = 0 V
- ✘ vdd = 1.8 V
- ✘ shrink_tinv = 0.9

✔ Sweep Parameters

- ✘ temp = -40.0, 25.0, 125.0

- ✔ Extra parameters
  - ✘ egnfetsb_dev = 0