CMOS028FDSOI Technology

1V8 Extended Drain MOSFET models

DK1.2_RF_mmW

Comparison with DK1.1_RF_mmW model(s)

Recommended layout : Iso NEDMOS : l=0.167um, lext=0.222um,
PEDMOS : l=0.222um, lext=0.389um)

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General information on models

● Maximum supply voltage is 1.8 V.
● Validity domain is defined as follows:
  ✔ Drawn gate length varies from 0.167 nm to 11.111 um.
  ✔ Drawn transistor width varies from 1.111 um to 111.11 um.
  ✔ Device temperature varies from -40 °C to 125 °C.

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Output parameters definitions

● Model(s): egnexti, egpext

✔ Vt_lin : Threshold voltage defined as Vgs value for which drain current is ivt*M*0.9*W/(0.9*L+0.0+0*p_la) at Vds = 0.1V.

✔ Ron : Ratio of Vds_lin / Ilin (Vds_lin = 0.1V).

✔ Gmmax : Maximum drain transconductance at Vds = 0.1V, 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 ivt*M*0.9*W/(0.9*L+0.0+0*p_la) at Vds = 5.0V.

✔ Cgg_inv : Total gate capacitance at Vgs = 1.8V, Vds = 0V, f = 100kHz.

✔ Ioff_d : Drain current at Vgs = 0V, Vds = 5.0V.

✔ Cbg_inv : Bulk-to-Gate capacitance at Vgs = 1.8V, Vds = 0V, f = 100kHz.

✔ Cggmean : Average total gate capacitance for Vgs values between 0V and 1.8, Vds = 0V, f = 100kHz.

✔ Isat : Drain current at Vgs = 1.8V, Vds = 5.0V.

✔ 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.

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egnexti
Electrical characteristics per geometry

egnexti @ w=10e-06, l=0.167e-06, lext=0.222e-06, nfing=1, soa=0, vbs=0, vdd=1.8, temp=25.0

DK1.2_RF_mmW wrt DK1.1_RF_mmW

	SSA	TT	FFA
VtGmmax [mV]	950.8 0.0mV	806.2 0.0mV	663.7 0.0mV
Vt_lin [mV]	1006 0.0mV	848.8 0.0mV	692.9 0.0mV
Ilin [µA]	292.7 0.0%	386.4 0.0%	524.9 0.0%
Ron [Ω]	341.6 0.0%	258.8 0.0%	190.5 0.0%
Vt_sat [mV]	952.3 0.0mV	799.6 0.0mV	648.1 0.0mV
Isat [mA]	2.6 0.0%	3.94 0.0%	5.58 0.0%
DIBL [mV]	54.02 0.0mV	49.2 0.0mV	44.78 0.0mV
Gmmax [mS]	0.63 0.0%	0.82 0.0%	1.07 0.0%
Ioff_d [nA]	4.15e-02 0.0%	0.28 0.0%	1.94 0.0%
Cbd_off [fF]	11.8 0.0%	7.87 0.0%	3.94 0.0%
Csd_off []	4.18e-16 0.0%	4.18e-16 0.0%	4.18e-16 0.0%
Cgd_0v [fF]	10.25 0.0%	10.66 0.0%	11.09 0.0%
Cbg_inv []	8.69e-17 0.0%	8.54e-17 0.0%	8.78e-17 0.0%
Cgg_inv [fF]	24.78 0.0%	27.05 0.0%	29.8 0.0%
Cggmean [fF]	21.44 0.0%	23.53 0.0%	26.04 0.0%

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egpext
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egpext @ w=10e-06, l=0.222e-06, lext=0.389e-06, nfing=1, soa=0, vbs=0, vdd=1.8, temp=25.0

DK1.2_RF_mmW wrt DK1.1_RF_mmW

	SSA	TT	FFA
VtGmmax [mV]	904.8 0.0mV	759.9 0.0mV	618.1 0.0mV
Vt_lin [mV]	904.2 0.0mV	747.8 0.0mV	593.3 0.0mV
Ilin [µA]	134.8 0.0%	188.8 0.0%	265.9 0.0%
Ron [Ω]	742.1 0.0%	529.7 0.0%	376.1 0.0%
Vt_sat [mV]	814.2 0.0mV	665 0.0mV	517.3 0.0mV
Isat [mA]	1.2 0.0%	1.93 0.0%	2.92 0.0%
DIBL [mV]	89.97 0.0mV	82.76 0.0mV	76.06 0.0mV
Gmmax [µS]	191.4 0.0%	247.2 0.0%	321.3 0.0%
Ioff_d [pA]	1.37 0.0%	6.68 0.0%	33.05 0.0%
Cbd_off [fF]	9.64 0.0%	7.79 0.0%	5.93 0.0%
Csd_off []	3.68e-16 0.0%	3.68e-16 0.0%	3.68e-16 0.0%
Cgd_0v [fF]	12.04 0.0%	12.95 0.0%	14.08 0.0%
Cbg_inv []	9.7e-17 0.0%	9.69e-17 0.0%	1.01e-16 0.0%
Cgg_inv [fF]	28.72 0.0%	32.42 0.0%	37.3 0.0%
Cggmean [fF]	25.08 0.0%	28.45 0.0%	32.86 0.0%

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egnexti
Electrical characteristics scaling

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scaling versus Temp (W=10um,L=0.167um)

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egnexti, VtGmmax [uAmV] vs Temp [C]

l==0.167e-06 and lext==0.222e-06

*egnexti, Ilin*1e6 [uA] vs Temp [C]*

l==0.167e-06 and lext==0.222e-06

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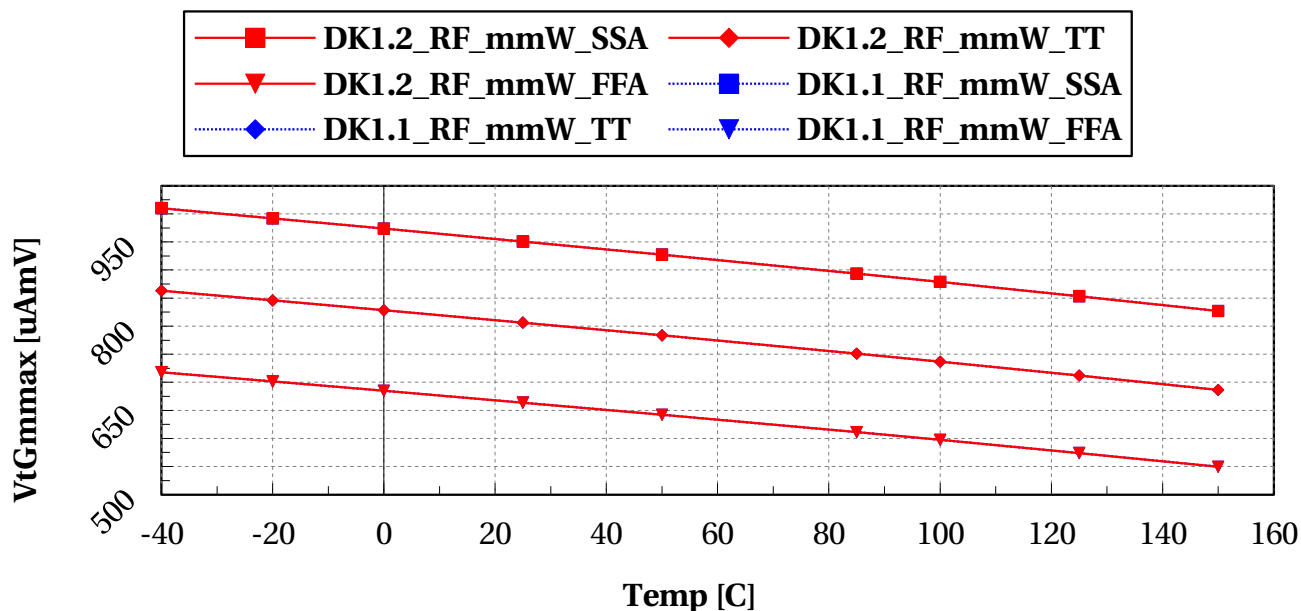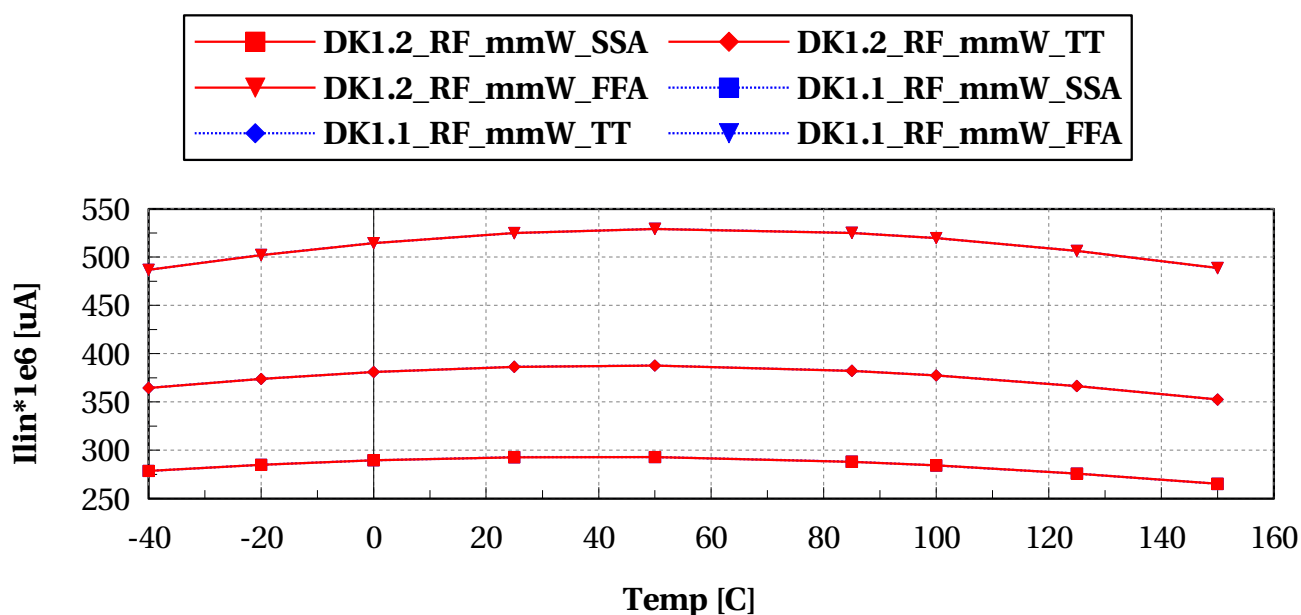
*egnexti, Isat*1e3 [mA] vs Temp [C]*
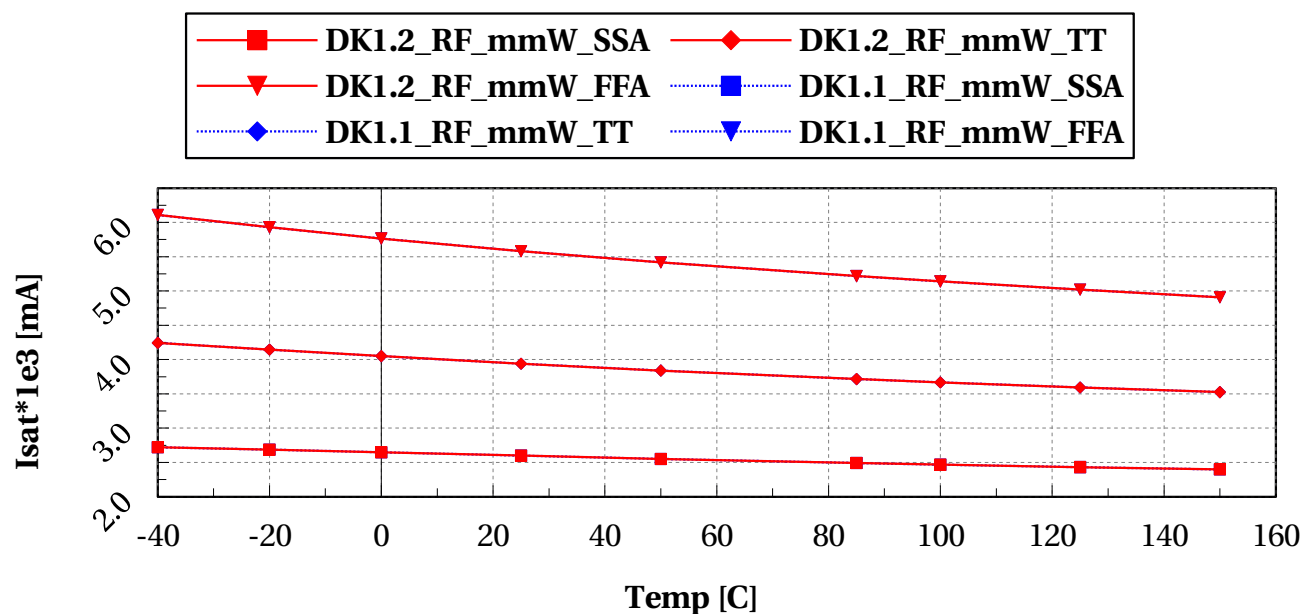
l==0.167e-06 and lext==0.222e-06

■ DK1.2_RF_mmW_SSA		◆ DK1.2_RF_mmW_TT	
▼ DK1.2_RF_mmW_FFA		■ DK1.1_RF_mmW_SSA	
◆ DK1.1_RF_mmW_TT		▼ DK1.1_RF_mmW_FFA	

egnexti, Ioff_d [A] vs Temp [C]

l==0.167e-06 and lext==0.222e-06

■ DK1.2_RF_mmW_SSA		◆ DK1.2_RF_mmW_TT	
▼ DK1.2_RF_mmW_FFA		■ DK1.1_RF_mmW_SSA	
◆ DK1.1_RF_mmW_TT		▼ DK1.1_RF_mmW_FFA	

egpext
Electrical characteristics scaling

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scaling versus Temp (W=10um,L=0.222um)

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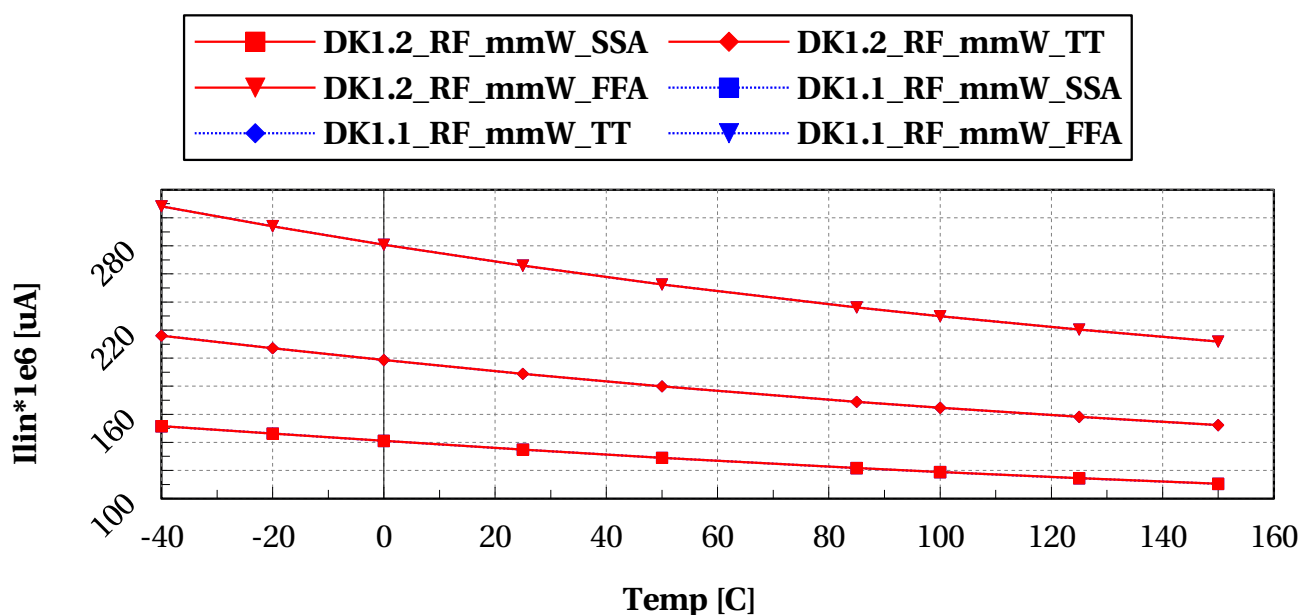
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egpext, VtGmmax [uAmV] vs Temp [C]

l==0.222e-06 and lext==0.389e-06
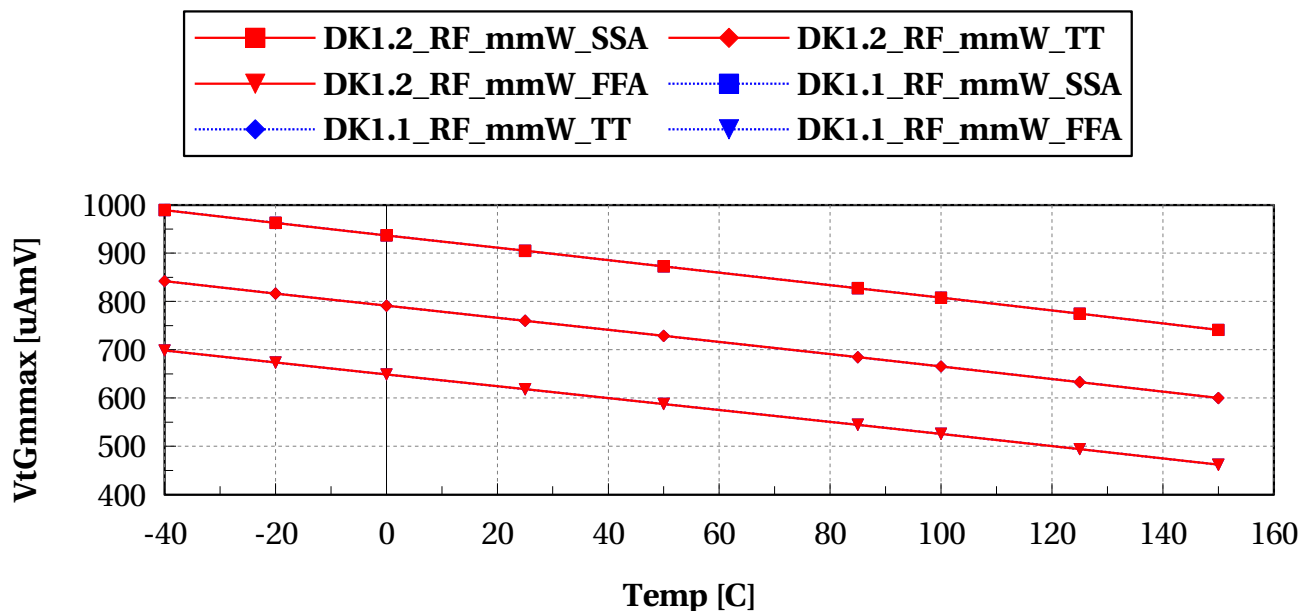
*egpext, Ilin*1e6 [uA] vs Temp [C]*

l==0.222e-06 and lext==0.389e-06

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egpext, Isat*1e3 [mA] vs Temp [C]

l==0.222e-06 and lext==0.389e-06

egpext, Ioff_d [A] vs Temp [C]

l==0.222e-06 and lext==0.389e-06

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Annex

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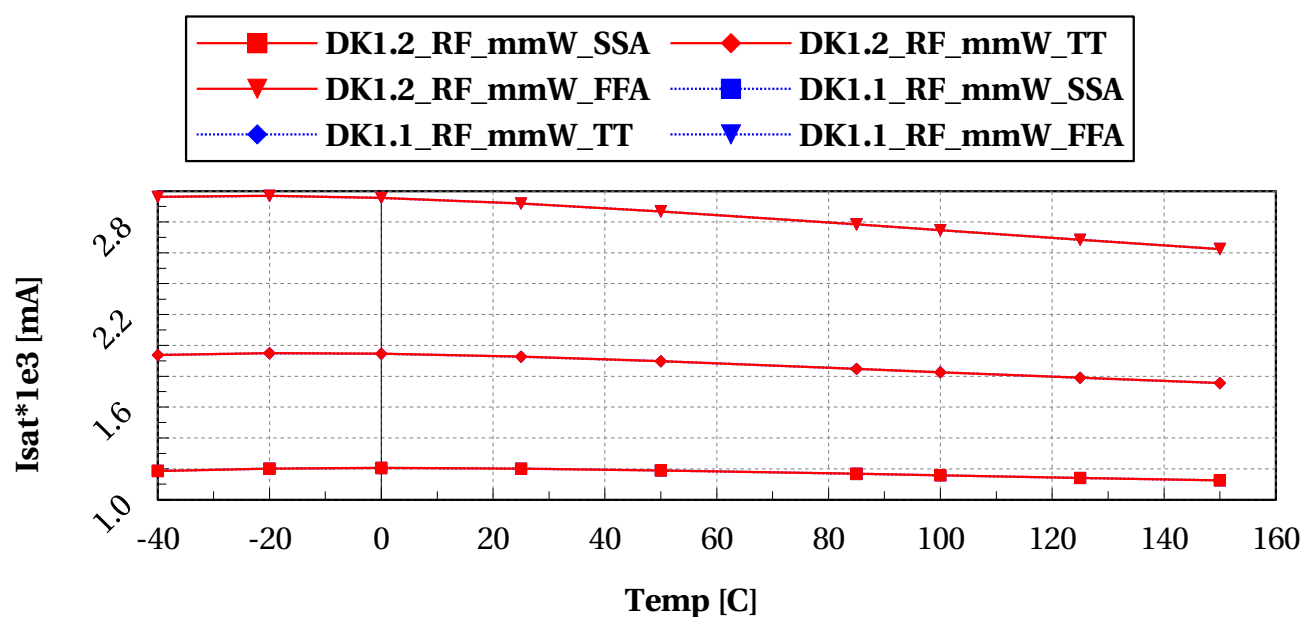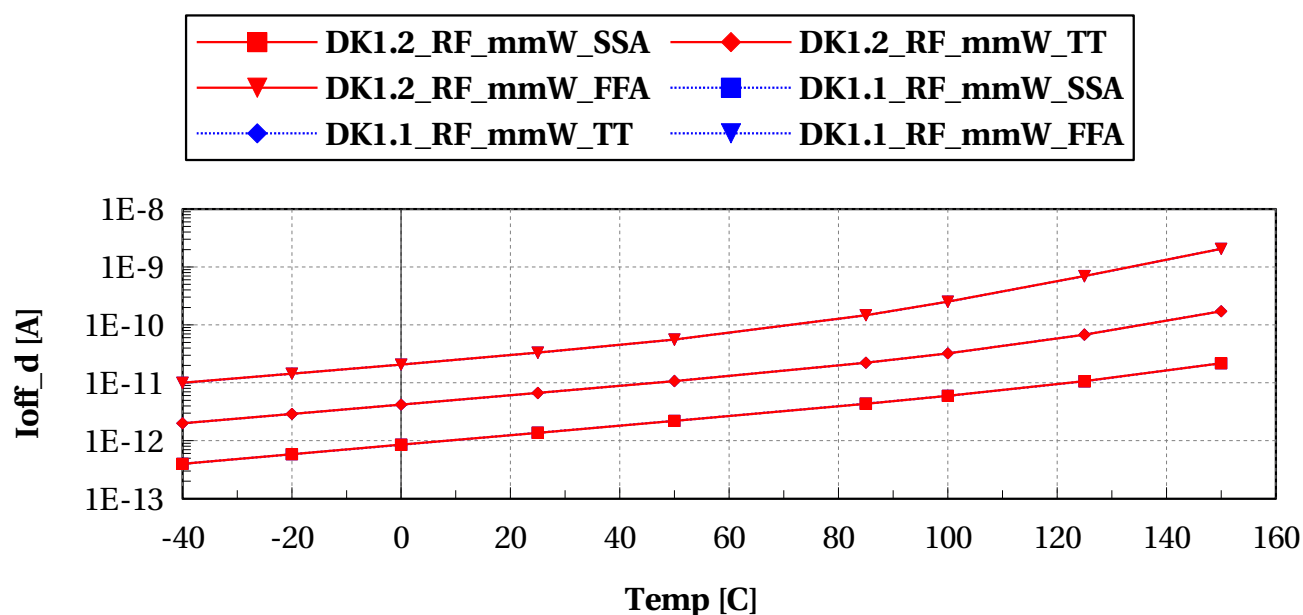
Conditions of simulations

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

- Model egnexti (DK1.2_RF_mmW)
  - ✔ Input Parameters
    - ✘ vds_off = 5.0 V
    - ✘ vds_cgd = 0 V
    - ✘ vds_cgg = 0 V
    - ✘ mc_sens = 0
    - ✘ vds_lin = 0.1 V
    - ✘ ivt = 300e-9 A
    - ✘ model_version = 0.1
    - ✘ ams_release = 2018.3
    - ✘ vgs_stop = vdd V
    - ✘ dlshrink_ivt = 0.0
    - ✘ sbenchlsf_release = Alpha
    - ✘ vds_sat = 5.0 V
    - ✘ mc_nsigma = 3
    - ✘ shrink_ivt = 0.9
    - ✘ dlshrink_tinv = 0
    - ✘ vgs_start = 0 V
    - ✘ plashrink_ivt = 0
    - ✘ ithslwi = 10e-9 A
    - ✘ vds_cbd = 0 V
    - ✘ vddmax = vdd
    - ✘ voffset = 0.2 V
    - ✘ mc_runs = 1000
    - ✘ vstep_ivt = 0.01 V
    - ✘ vsub1 = 0
    - ✘ vgs_off = 0 V
    - ✘ temp = 25 °C
    - ✘ vsub2 = 0
    - ✘ f_ext = 100k Hz

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- ✗ vbs = 0 V
- ✗ vdd = 1.8 V
- ✗ shrink_tinv = 1
- ✗ vds_gmgd = 0.6 V
- ✔ Sweep Parameters
  - ✗ temp = -40.0, -20.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0
- ✔ Extra parameters
  - ✗ egext_dev = 0
  - ✗ cf_global = 1
- ● Model egpext (DK1.2_RF_mmW)
  - ✔ Input Parameters
    - ✗ vds_off = 5.0 V
    - ✗ vds_cgd = 0 V
    - ✗ vds_cgg = 0 V
    - ✗ mc_sens = 0
    - ✗ vds_lin = 0.1 V
    - ✗ ivt = 70e-9 A
    - ✗ model_version = 0.1
    - ✗ ams_release = 2018.3
    - ✗ vgs_stop = vdd V
    - ✗ dlshrink_ivt = 0.0
    - ✗ sbenchlsf_release = Alpha
    - ✗ vds_sat = 5.0 V
    - ✗ mc_nsigma = 3
    - ✗ shrink_ivt = 0.9
    - ✗ dlshrink_tinv = 0
    - ✗ vgs_start = 0 V
    - ✗ plashrink_ivt = 0
    - ✗ ithslwi = 10e-9 A
    - ✗ vds_cbd = 0 V
    - ✗ vddmax = vdd
    - ✗ voffset = 0.2 V
    - ✗ mc_runs = 1000
    - ✗ vstep_ivt = 0.01 V
    - ✗ vsub1 = 0
    - ✗ vgs_off = 0 V
    - ✗ temp = 25 °C
    - ✗ f_ext = 100k Hz

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- ● Model egnexti (DK1.1_RF_mmW)
  - ✔ Input Parameters
    - ✘ vds_off = 5.0 V
    - ✘ vds_cgd = 0 V
    - ✘ vds_cgg = 0 V
    - ✘ mc_sens = 0
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    - ✘ plashrink_ivt = 0
    - ✘ ithslwi = 10e-9 A
    - ✘ vds_cbd = 0 V
    - ✘ vddmax = vdd
    - ✘ voffset = 0.2 V
    - ✘ mc_runs = 1000
    - ✘ vstep_ivt = 0.01 V
    - ✘ vsub1 = 0
    - ✘ vgs_off = 0 V
    - ✘ temp = 25 °C
    - ✘ vsub2 = 0

- ✘ f_ext = 100k Hz
- ✘ vbs = 0 V
- ✘ vdd = 1.8 V
- ✘ shrink_tinv = 1
- ✘ vds_gmgd = 0.6 V
- ✔ Sweep Parameters
  - ✘ temp = -40.0, -20.0, 0.0, 25.0, 50.0, 85.0, 100.0, 125.0, 150.0
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    - ✘ shrink_ivt = 0.9
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    - ✘ ithslwi = 10e-9 A
    - ✘ vds_cbd = 0 V
    - ✘ vddmax = vdd
    - ✘ voffset = 0.2 V
    - ✘ mc_runs = 1000
    - ✘ vstep_ivt = 0.01 V
    - ✘ vsub1 = 0
    - ✘ vgs_off = 0 V
    - ✘ temp = 25 °C

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