cmos028fdsoi Technology

LVT models

DK1.2_RF_mmW

Comparison with DK1.1_RF_mmW model(s)

Please use the bookmark to navigate

General information on LVT models

- Maximum supply voltage is - 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): lvtnfet_acc, lvtpfet_acc
  - ✔ Gm_ana : Drain transconductance at Ids = iana*M*W/L, Vds = Vdd/4V, f = 100kHz.
  - ✔ Sv@1hz : Gate noise voltage spectral density at 1Hz, Vgs = Vgs_ana, Vds = Vdd/4V
  - ✔ Aid : delta_Id/Id * sqrt(W.L)
  - ✔ Gds_ana : Drain conductance at Ids = iana*M*W/L, Vds = Vdd/4, f = 100k
  - ✔ Vgs_ana : Vgs value for which drain current is iana*M*shrink_iana*W/(shrink_iana*L+dlshrink_iana+plashrink_iana*p_la) at Vds=Vdd/4V.
  - ✔ Avt : delta_Vt * sqrt(W.L)
  - ✔ Id_sv : Drain current at Vgs = Vgs_ana and Vds = Vdd/4V for which noise voltage and current spectral densities Sv, Si are extracted.
  - ✔ Cbd_off : Bulk-to-Drain capacitance at Vgs = 0V, Vds = 0V, f = 100kHz.
  - ✔ Cdg_ana : Drain-to-Gate transcapacitance at Ids = iana*M*W/L, Vds = Vdd/4V, f = 100kHz.
  - ✔ Ft_ana : Transition frequency at Ids = iana*M*W/L, Vds = Vdd/4V
  - ✔ Sv@th : Gate thermal noise voltage spectral density, Vgs = Vgs_ana, Vds = Vdd/4V
  - ✔ Abeta : delta_GmMax/GmMax * sqrt(w/L)
  - ✔ Cdd_ana : Total drain capacitance at Ids = iana*M*W/L, Vds = Vdd/4V, f = 100kHz.
  - ✔ Gdc_ana : Voltage gain at Ids = iana*M*W/L, Vds = Vdd/4V, f = 100kHz
  - ✔ Cgg_ana : Total gate capacitance at Ids = iana*M*W/L, Vds = Vdd/4V, f = 100kHz
  - ✔ Cgd_0v : Gate-to-Drain capacitance at Vgs = 0V, Vds = vds_cggV, f = 100kHz.
  - ✔ Vtgmmax : Threshold voltage at Vds = 0.05 derived from Gm max method.

lvtnfet_acc
Electrical characteristics per geometry

lvtnfet_acc @ w=20e-6, l=2.0e-6, pre_layout_local=1, nf=4, sa=8.500e-08, sb=8.500e-08, sd=1.140e-07, pcpastrx_top=1.050e-07, pcpastrx_bot=1.050e-07, devtype=PCELLwoWPE, as=4.25e-13, ad=4.25e-13, ps=1.017e-05, pd=1.017e-05, vbs=0, vdd=1, temp=25

DK1.2_RF_mmW wrt DK1.1_RF_mmW

	SSF	TT	FFF
VtGmmax [mV]	491.7 0.0mV	459.6 0.0mV	430.5 0.0mV
Vgs_ana [mV]	607.7 0.0mV	570.3 0.0mV	535.5 0.0mV
GDC_ana []	234.2 0.0%	254.3 0.0%	248.7 0.0%
GBW_QS [GHz]	13.41 0.0%	14.09 0.0%	14.11 0.0%
Ft_ana [GHz]	0.26 0.0%	0.26 0.0%	0.26 0.0%
Gm_ana [µS]	575 0.0%	594.3 0.0%	608.6 0.0%
Gds_ana [µS]	2.46 0.0%	2.34 0.0%	2.45 0.0%
Cgg_ana [fF]	346.1 0.0%	365 0.0%	368.8 0.0%
Cdg_ana [fF]	136 0.0%	143.8 0.0%	145 0.0%
Cdd_ana [fF]	6.82 0.0%	6.71 0.0%	6.86 0.0%
Avt [mV.µm]	7.05 -0.7%	7.46 -0.6%	6.85 -0.7%
Abeta [%.µm]	1.29 1.7%	1.27 1.6%	1.26 1.7%
AId [%.µm]	1.75 -0.1%	1.7 -0.0%	1.52 0.2%
Sv@1Hz [V/√Hz]	1.58e-06 0.0%	1.8e-06 0.0%	2.14e-06 0.0%
Sv@th [V/√Hz]	4.22e-09 0.0%	4.12e-09 0.0%	4.05e-09 0.0%

lvtpfet_acc
Electrical characteristics per geometry

lvtpfet_acc @ w=0.30e-6, l=0.030e-6, pre_layout_local=1, nf=1, sa=8.500e-08, sb=8.500e-08, sd=1.140e-07, pcpastrx_top=5.700e-08, pcpastrx_bot=8.000e-08, devtype=PCELLwoWPE, as=2.55e-14, ad=2.55e-14, ps=7.7e-07, pd=7.7e-07, vbs=1, vdd=1, temp=25

DK1.2_RF_mmW wrt DK1.1_RF_mmW

	SSF	TT	FFF
VtGmmax [mV]	392.7 0.0mV	374.3 0.0mV	360.4 0.0mV
Vgs_ana [mV]	630.5 0.0mV	593 0.0mV	554.9 0.0mV
GDC_ana []	4.25 0.0%	3.78 0.0%	3.22 0.0%
GBW_QS [GHz]	108.8 0.0%	111.3 0.0%	108.9 0.0%
Ft_ana [GHz]	90.18 0.0%	93.47 0.0%	94.45 0.0%
Gm_ana [µS]	126.2 0.0%	128.7 0.0%	128.6 0.0%
Gds_ana [µS]	29.69 0.0%	34.08 0.0%	39.91 0.0%
Cgg_ana [aF]	222.7 0.0%	219.2 0.0%	216.6 0.0%
Cdg_ana [aF]	152.2 0.0%	143.2 0.0%	141.3 0.0%
Cdd_ana [aF]	179.5 0.0%	180 0.0%	183.2 0.0%
Avt [mV.µm]	1.92 0.6%	1.93 0.5%	1.91 0.4%
Abeta [%.µm]	0.38 1.3%	0.49 1.4%	0.63 1.4%
AId [%.µm]	0.31 -0.2%	0.41 0.3%	0.55 0.9%
Sv@1Hz [V/√Hz]	3.41e-05 0.0%	1.15e-04 0.0%	4.11e-04 0.0%
Sv@th [V/√Hz]	1.6e-08 0.0%	1.6e-08 0.0%	1.64e-08 0.0%

lvtpfet_acc @ w=20e-6, l=2.0e-6, pre_layout_local=1, nf=4, sa=8.500e-08, sb=8.500e-08, sd=1.140e-07, pcpastrx_top=1.050e-07, pcpastrx_bot=1.050e-07, devtype=PCELLwoWPE, as=4.25e-13, ad=4.25e-13, ps=1.017e-05, pd=1.017e-05, vbs=1, vdd=1, temp=25

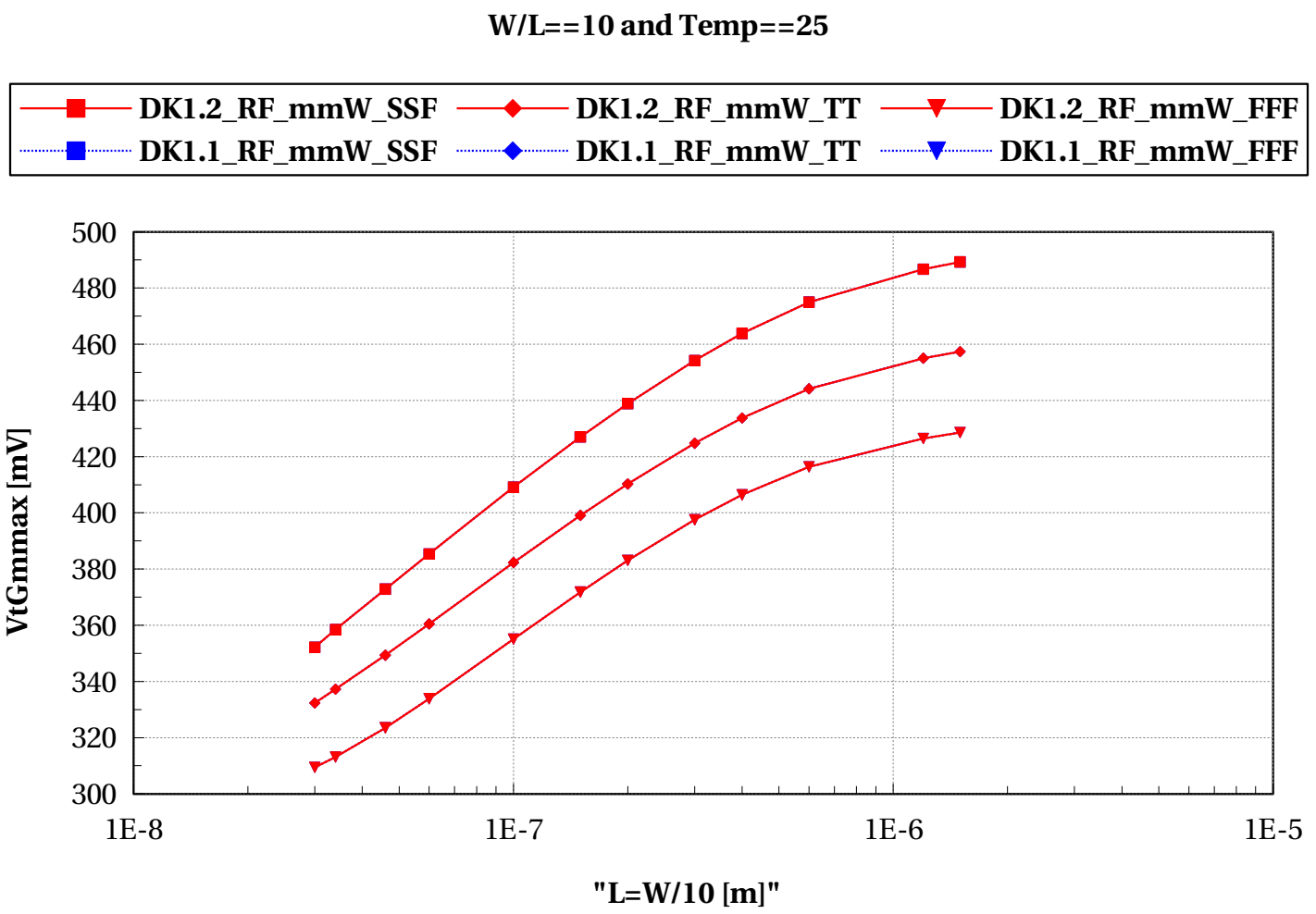
DK1.2_RF_mmW wrt DK1.1_RF_mmW

	SSF	TT	FFF
VtGmmax [mV]	503.5 0.0mV	477.8 0.0mV	455 0.0mV
Vgs_ana [mV]	644.6 0.0mV	608.8 0.0mV	575.2 0.0mV
GDC_ana []	61.12 0.0%	69.69 0.0%	75.25 0.0%
GBW_QS [GHz]	1.58 0.0%	1.81 0.0%	2.01 0.0%
Ft_ana [GHz]	8.91e-02 0.0%	9.63e-02 0.0%	0.1 0.0%
Gm_ana [µS]	203.3 0.0%	211.2 0.0%	217.6 0.0%
Gds_ana [µS]	3.33 0.0%	3.03 0.0%	2.89 0.0%
Cgg_ana [fF]	363.2 0.0%	348.9 0.0%	333.7 0.0%
Cdg_ana [fF]	149.4 0.0%	142.4 0.0%	135.3 0.0%
Cdd_ana [fF]	20.46 0.0%	18.54 0.0%	17.21 0.0%
Avt [mV.µm]	15.41 0.1%	14.79 0.0%	14.54 0.0%
Abeta [%.µm]	1.82 1.8%	1.81 1.9%	1.89 1.9%
AId [%.µm]	3.24 0.1%	2.47 0.2%	2.01 0.5%
Sv@1Hz [V/√Hz]	1.13e-06 0.0%	1.5e-06 0.0%	2.02e-06 0.0%
Sv@th [V/√Hz]	7.13e-09 0.0%	6.92e-09 0.0%	6.76e-09 0.0%

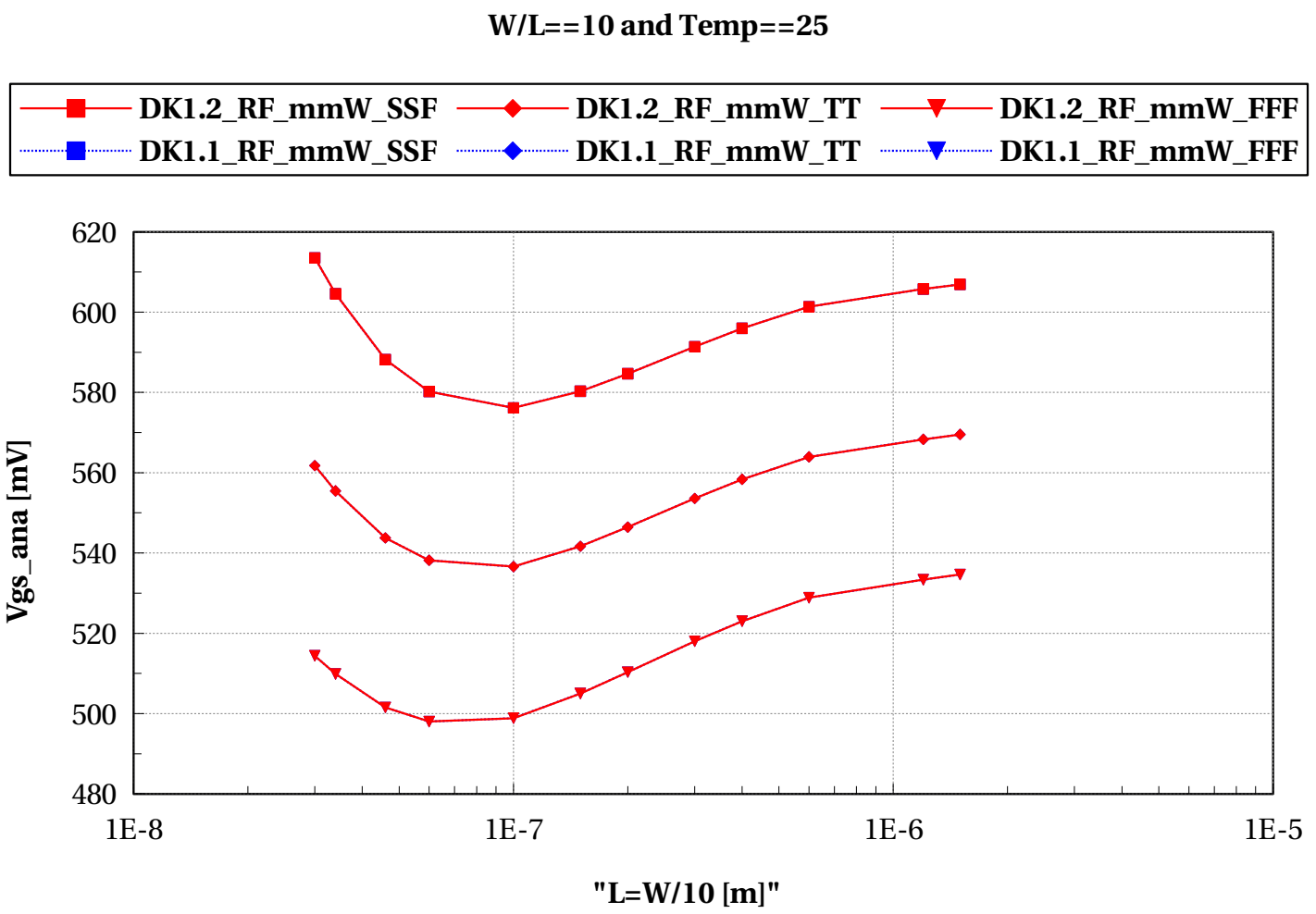
lvtnfet_acc
Electrical characteristics scaling

Scaling versus Length @ W/L=10 and W/NF<5e-6

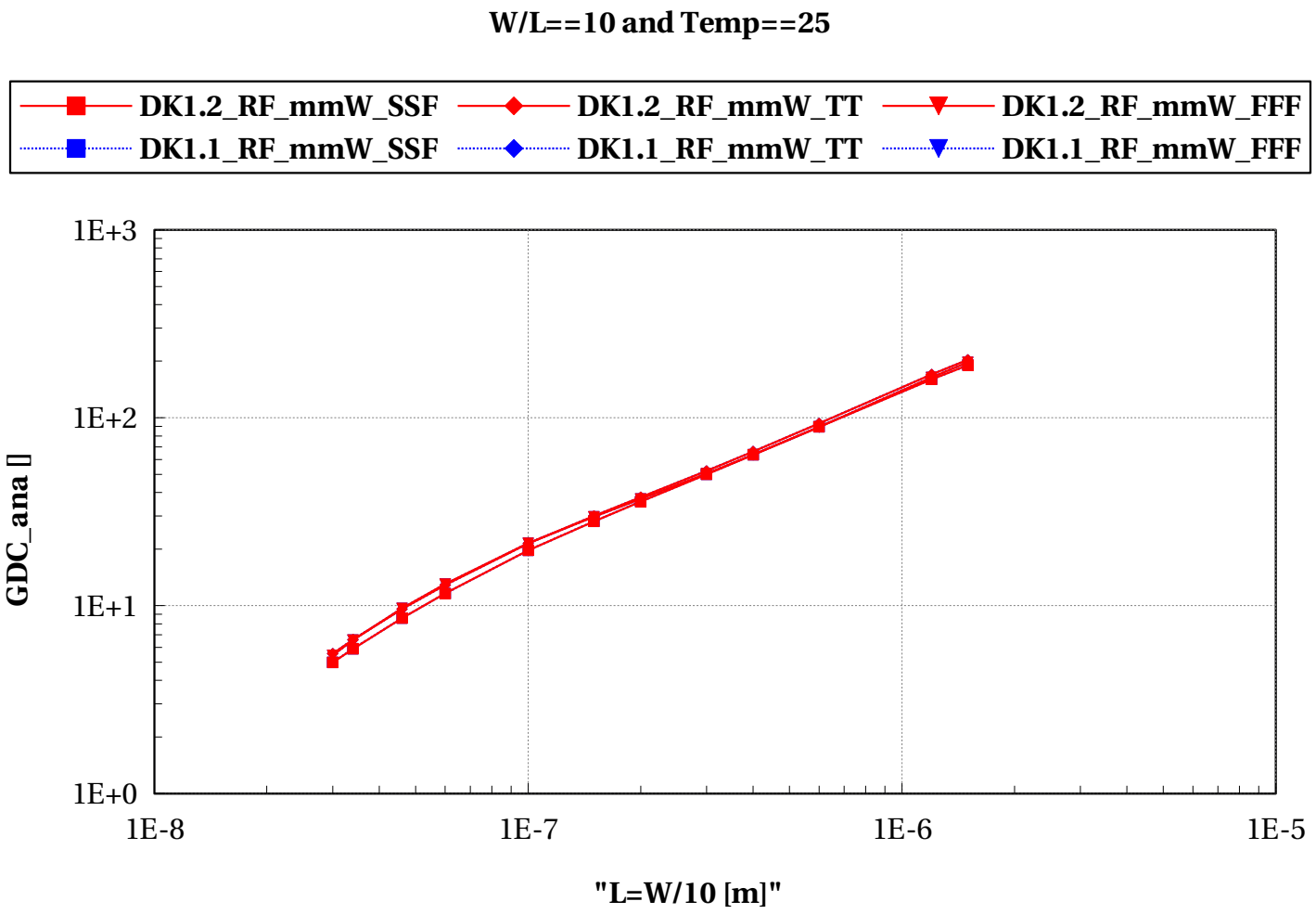
lvtnfet_acc, VtGmmax [mV] vs "L=W/10 [m]"



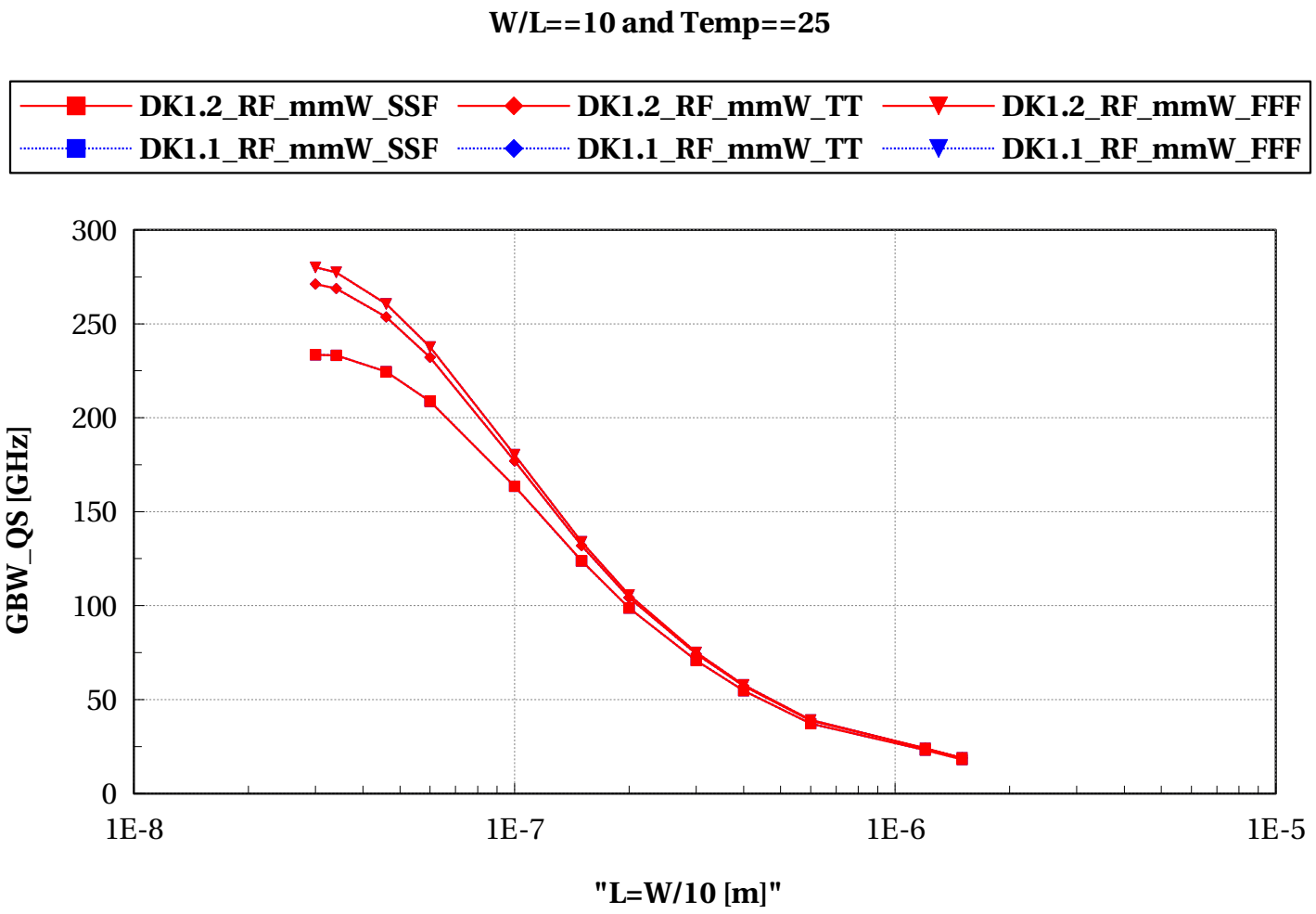
lvtnfet_acc, Vgs_ana [mV] vs "L=W/10 [m]"



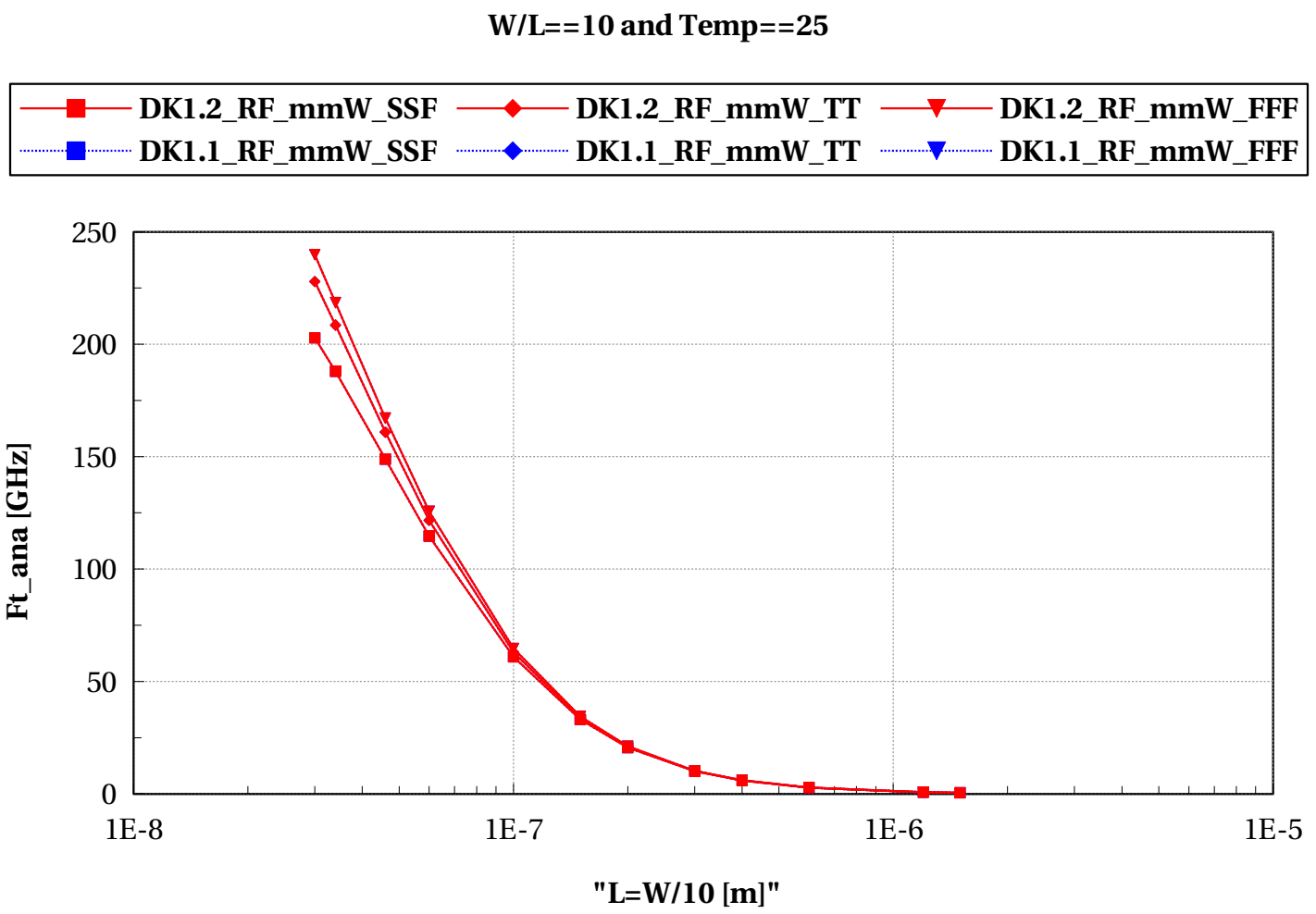
lvtnfet_acc, GDC_ana [] vs "L=W/10 [m]"



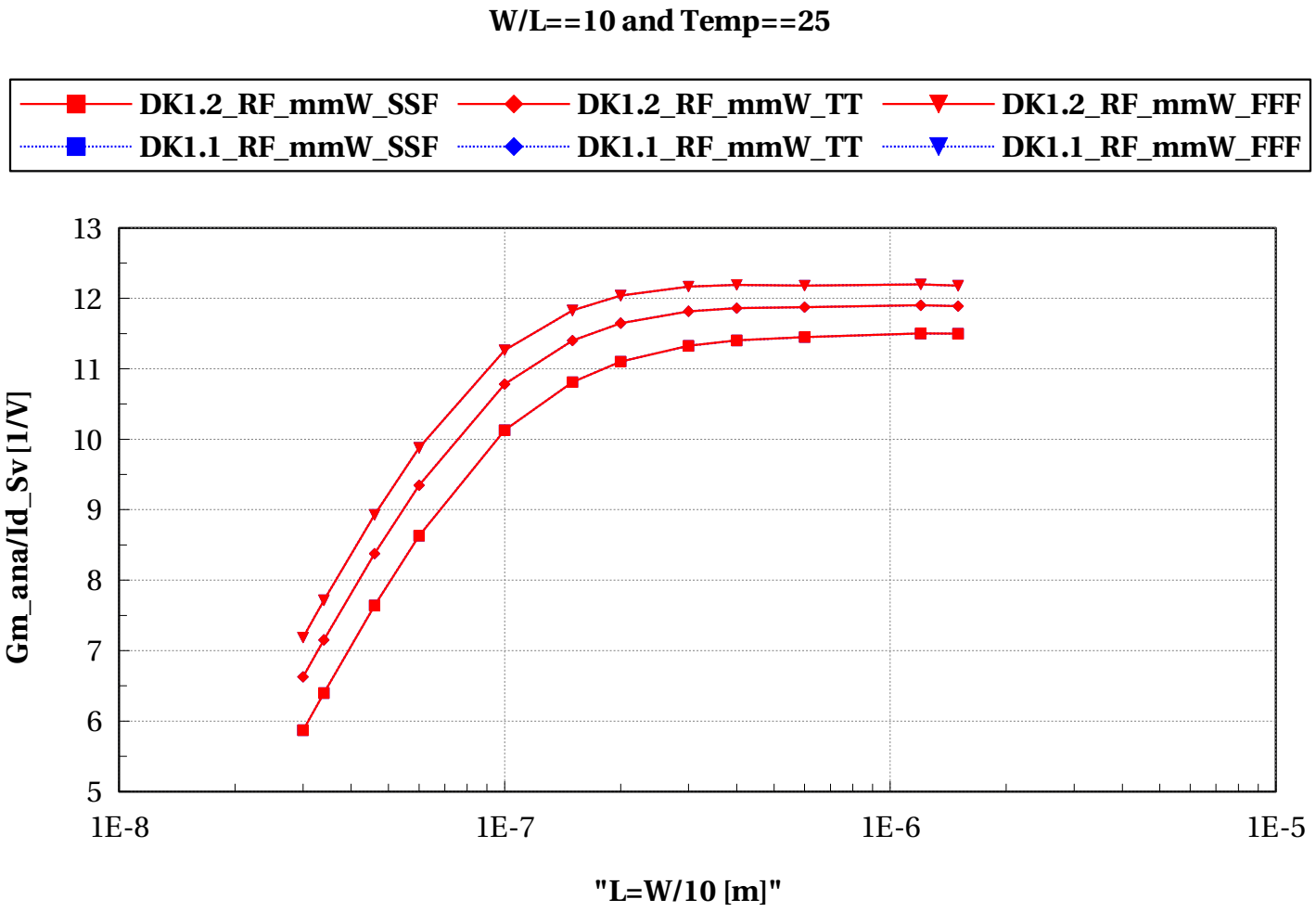
lvtnfet_acc, GBW_QS [GHz] vs "L=W/10 [m]"



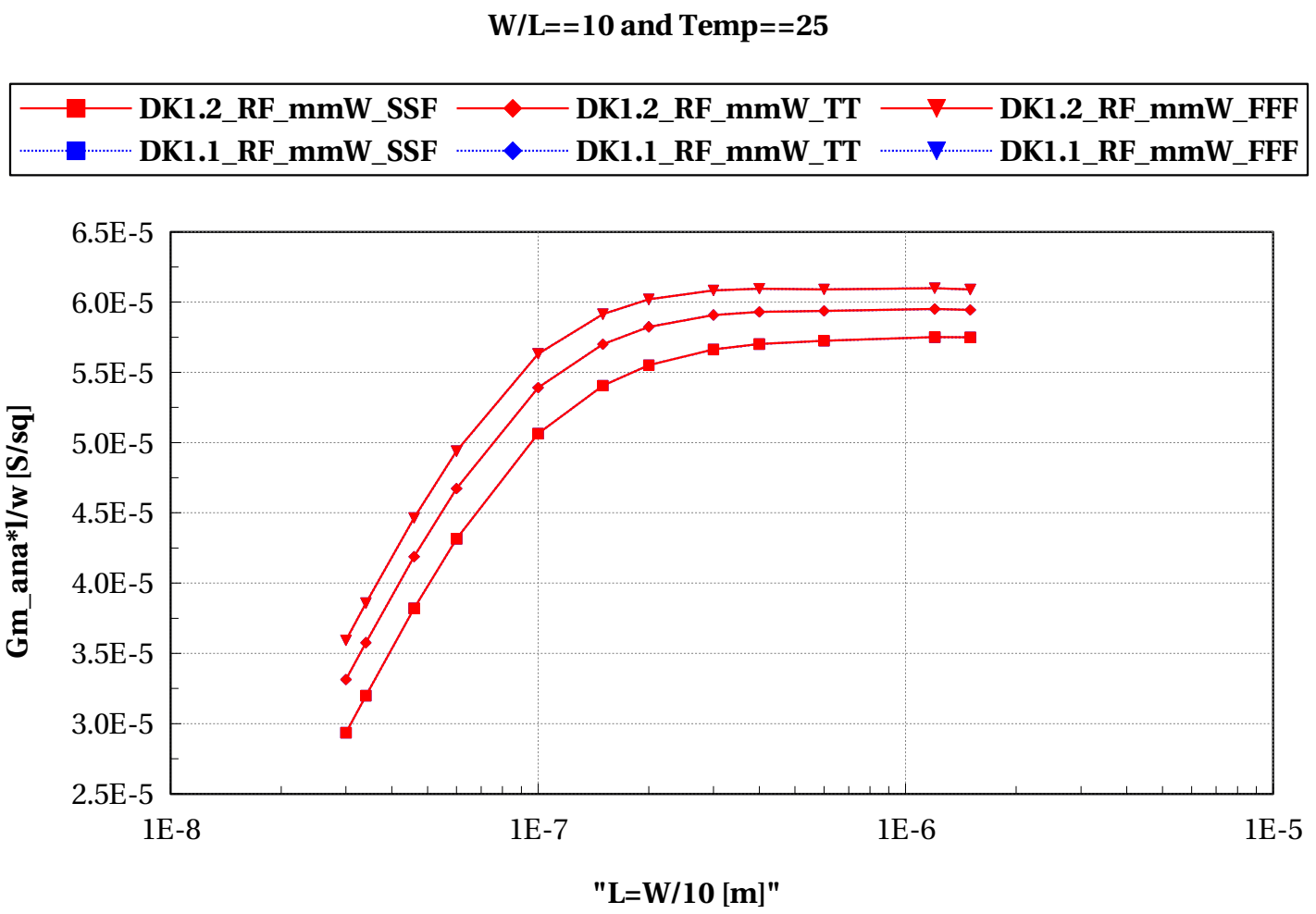
lvtnfet_acc, Ft_ana [GHz] vs "L=W/10 [m]"



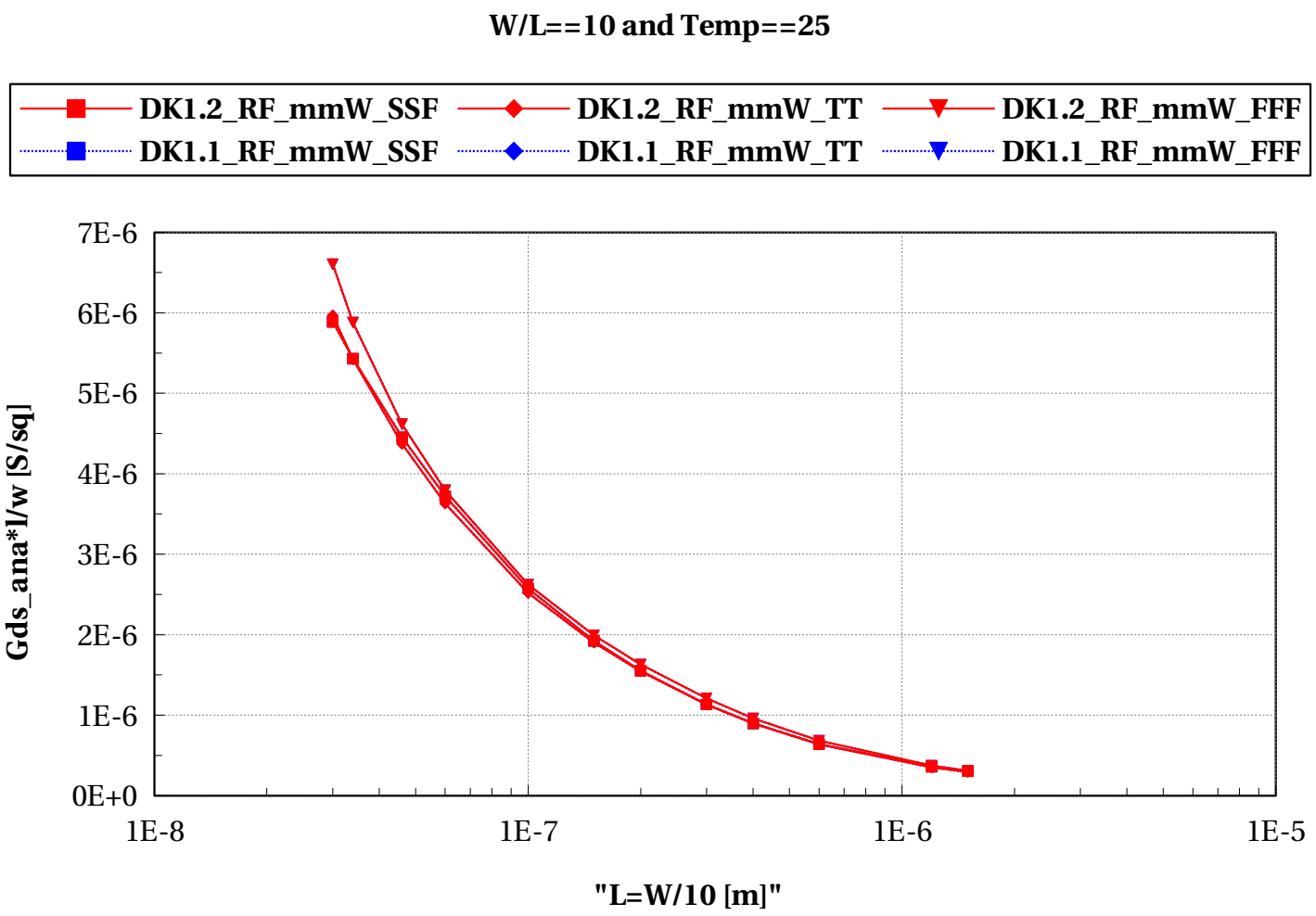
lvtnfet_acc, Gm_ana/Id_Sv [1/V] vs "L=W/10 [m]"



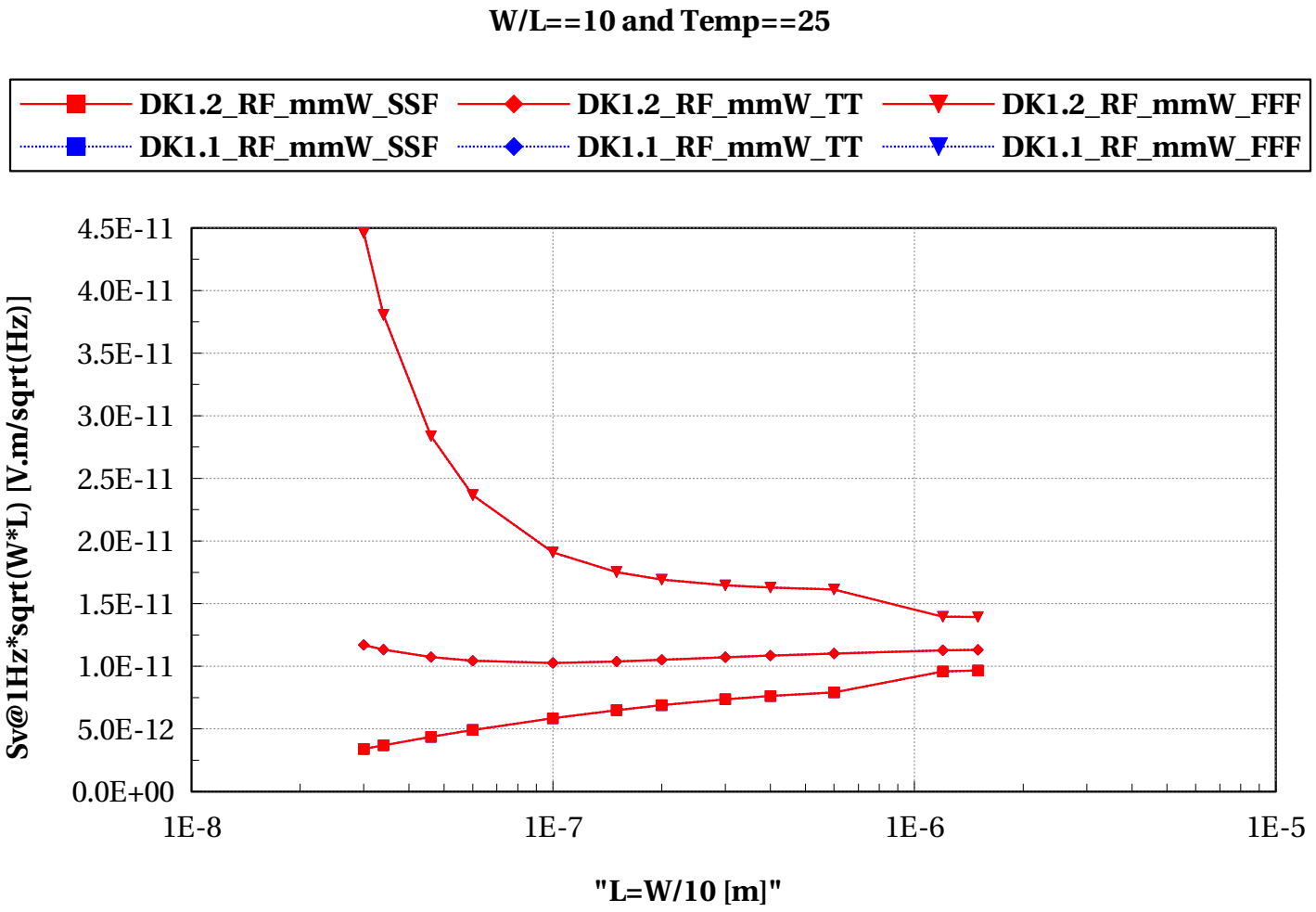
lvtnfet_acc, Gm_ana*l/w [S/sq] vs "L=W/10 [m]"



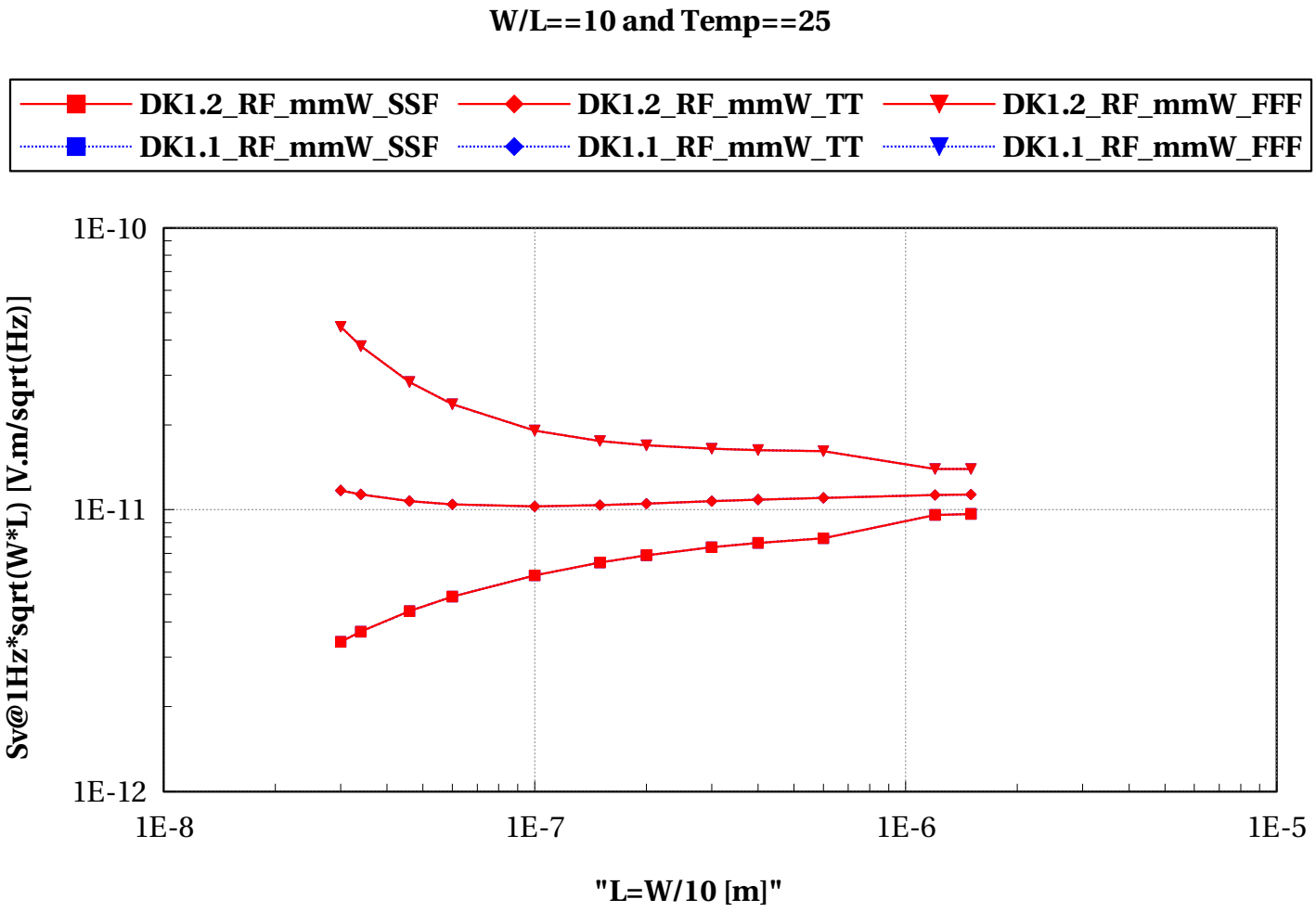
lvtnfet_acc, Gds_ana*l/w [S/sq] vs "L=W/10 [m]"



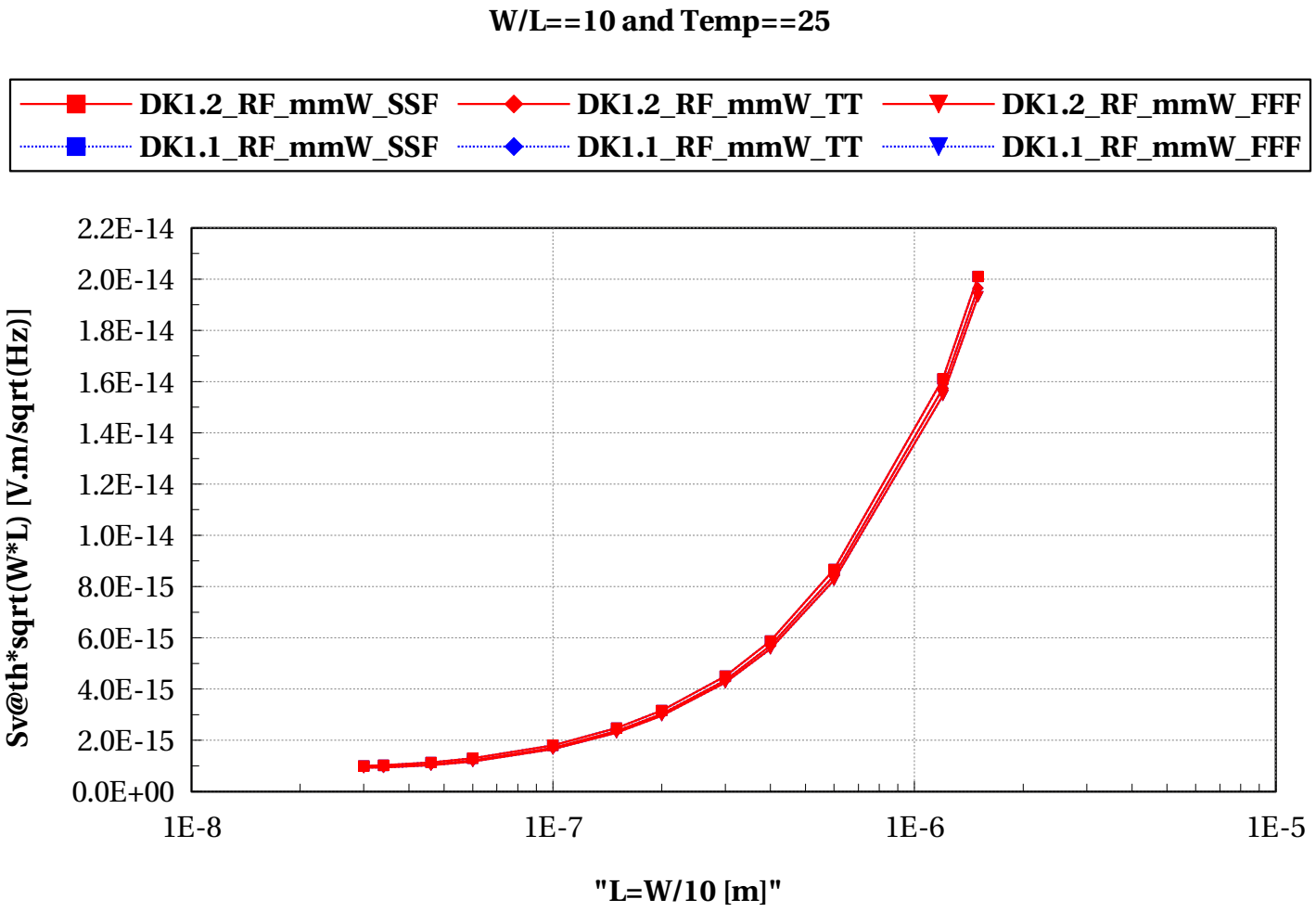
lvtnfet_acc, Sv@1Hz*sqrt(W*L) [V.m/sqrt(Hz)] vs "L=W/10 [m]"



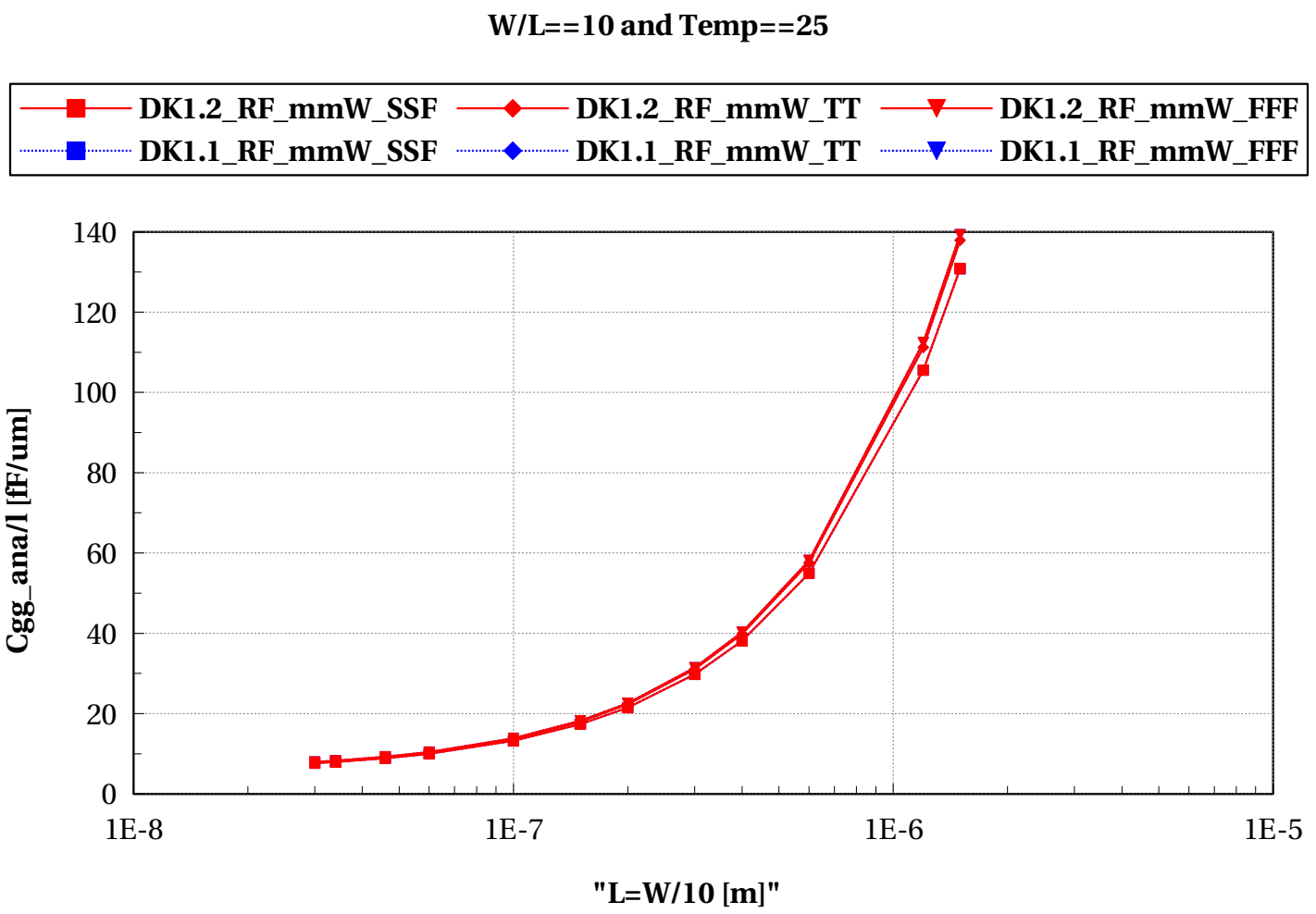
lvtnfet_acc, Sv@1Hz*sqrt(W*L) [V.m/sqrt(Hz)] vs "L=W/10 [m]"



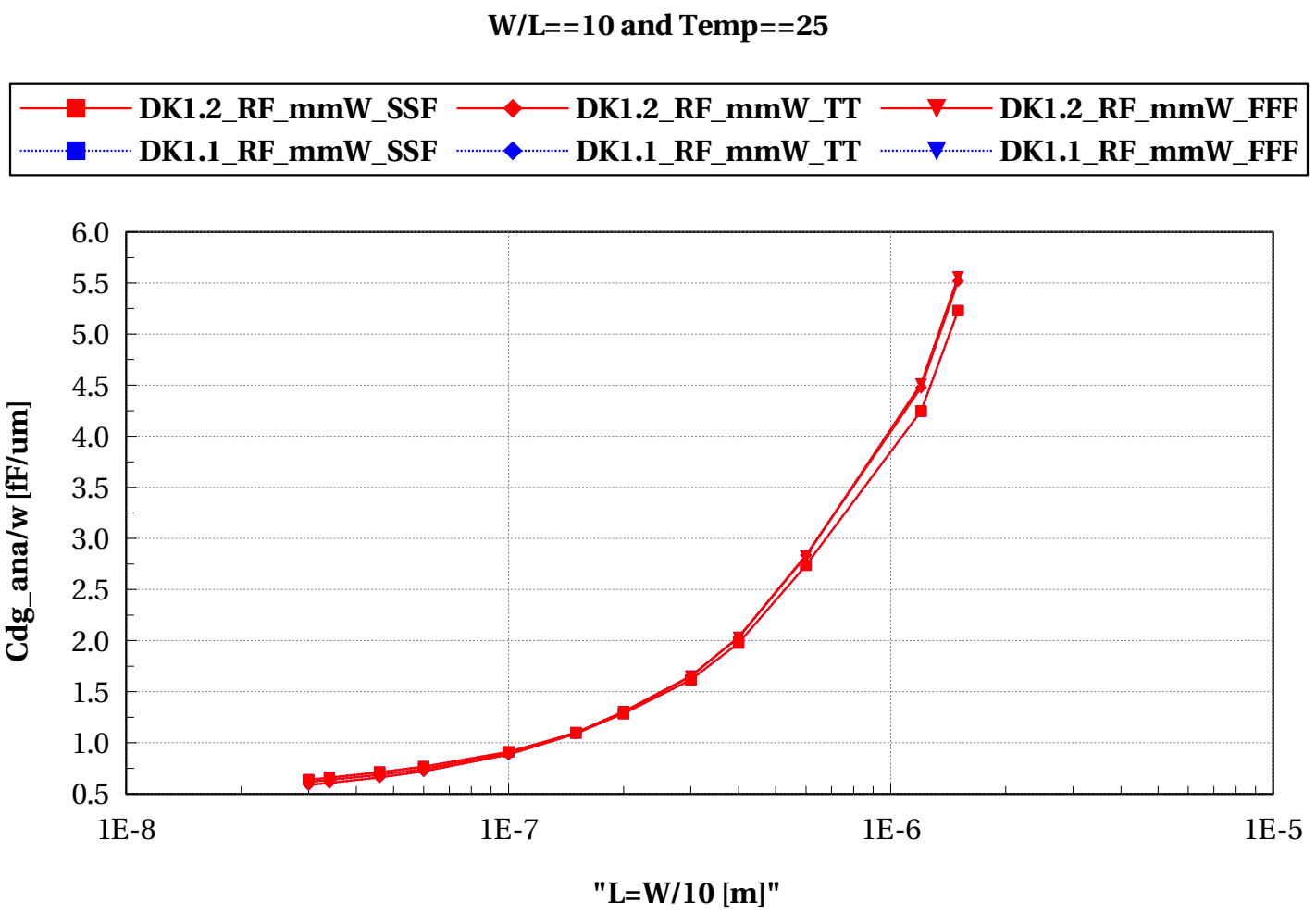
lvtnfet_acc, Sv@th*sqrt(W*L) [V.m/sqrt(Hz)] vs "L=W/10 [m]"



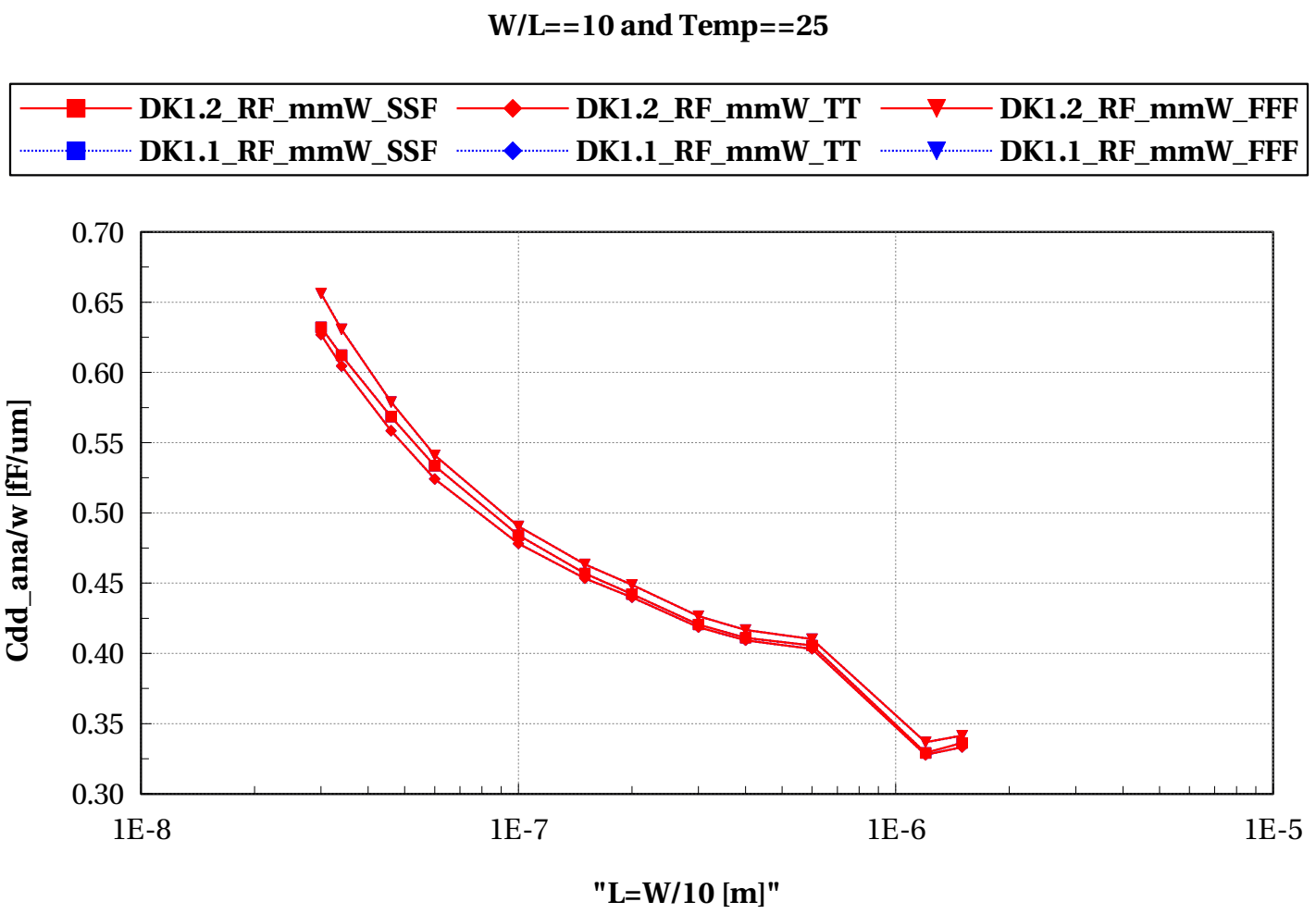
lvtnfet_acc, Cgg_ana/l [fF/um] vs "L=W/10 [m]"



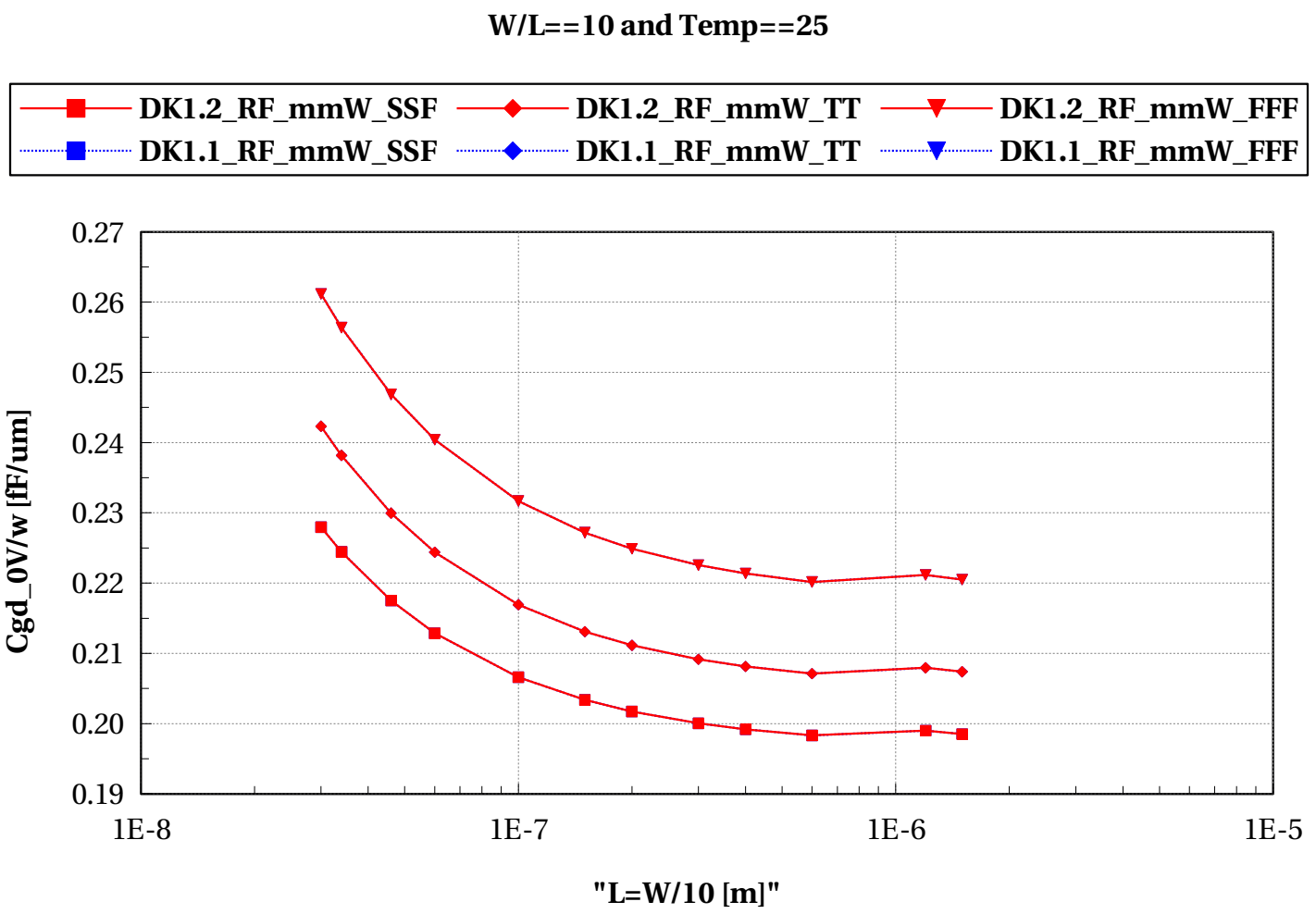
lvtnfet_acc, Cdg_ana/w [fF/um] vs "L=W/10 [m]"



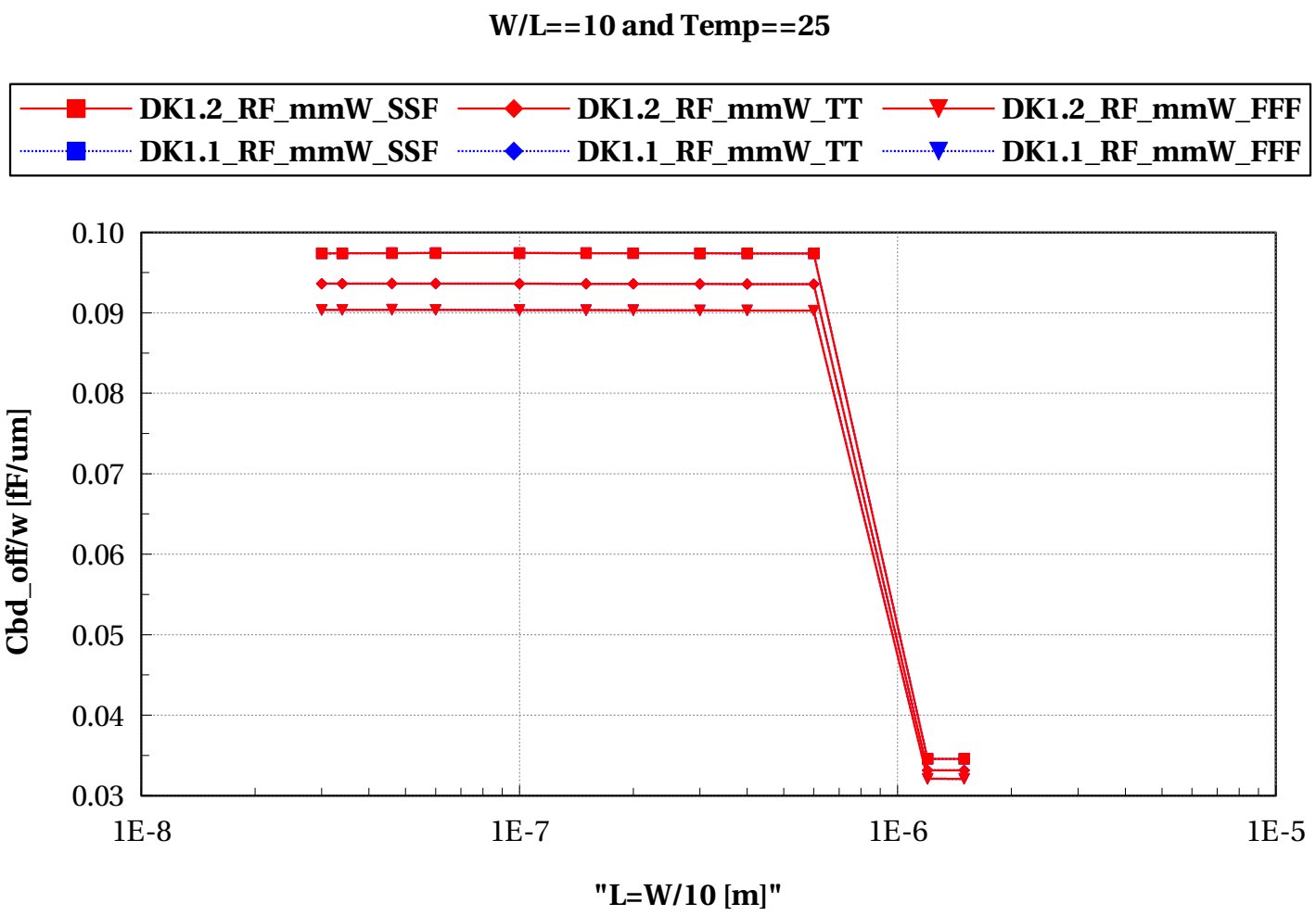
lvtnfet_acc, Cdd_ana/w [fF/um] vs "L=W/10 [m]"



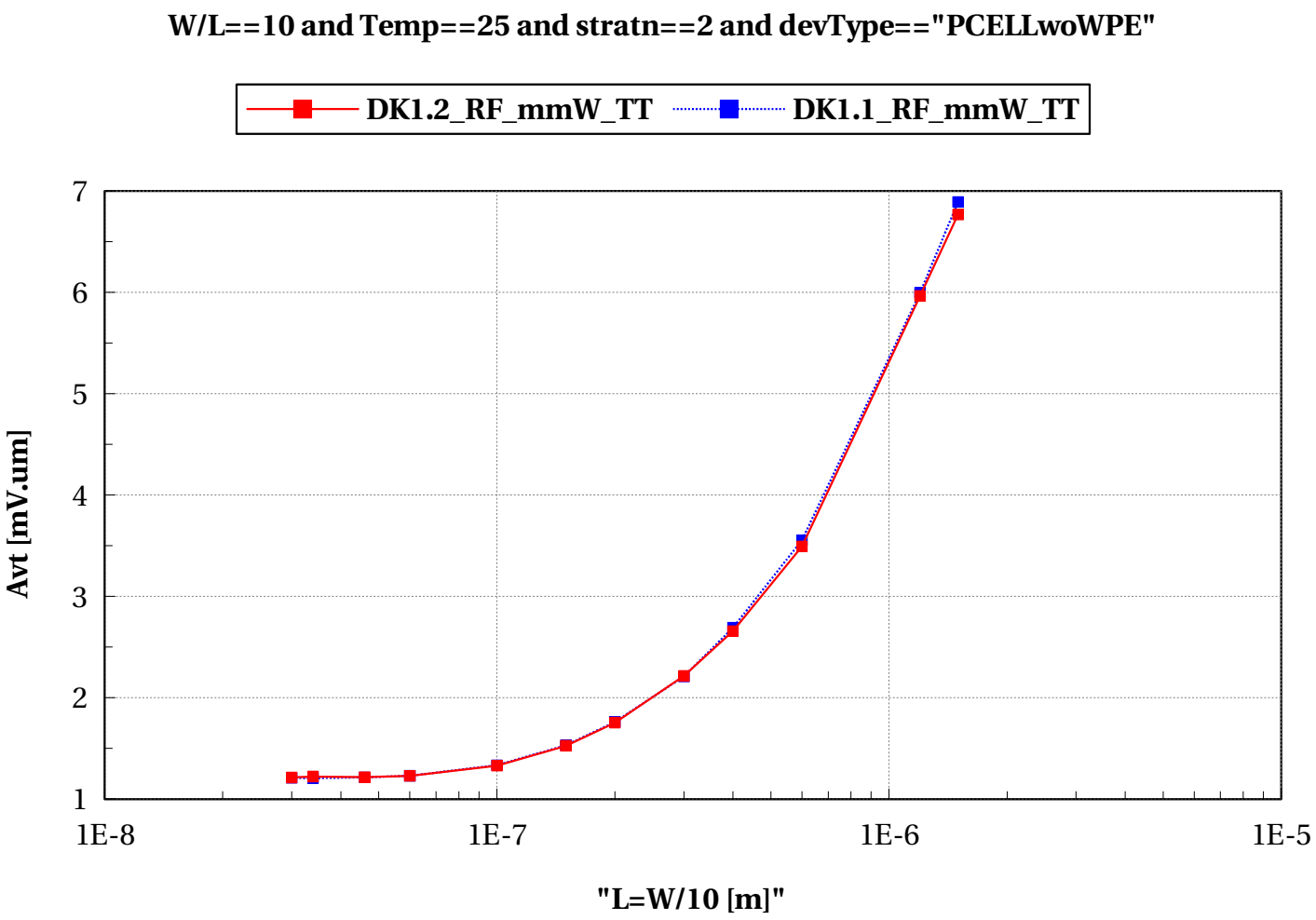
lvtnfet_acc, Cgd_0V/w [fF/um] vs "L=W/10 [m]"



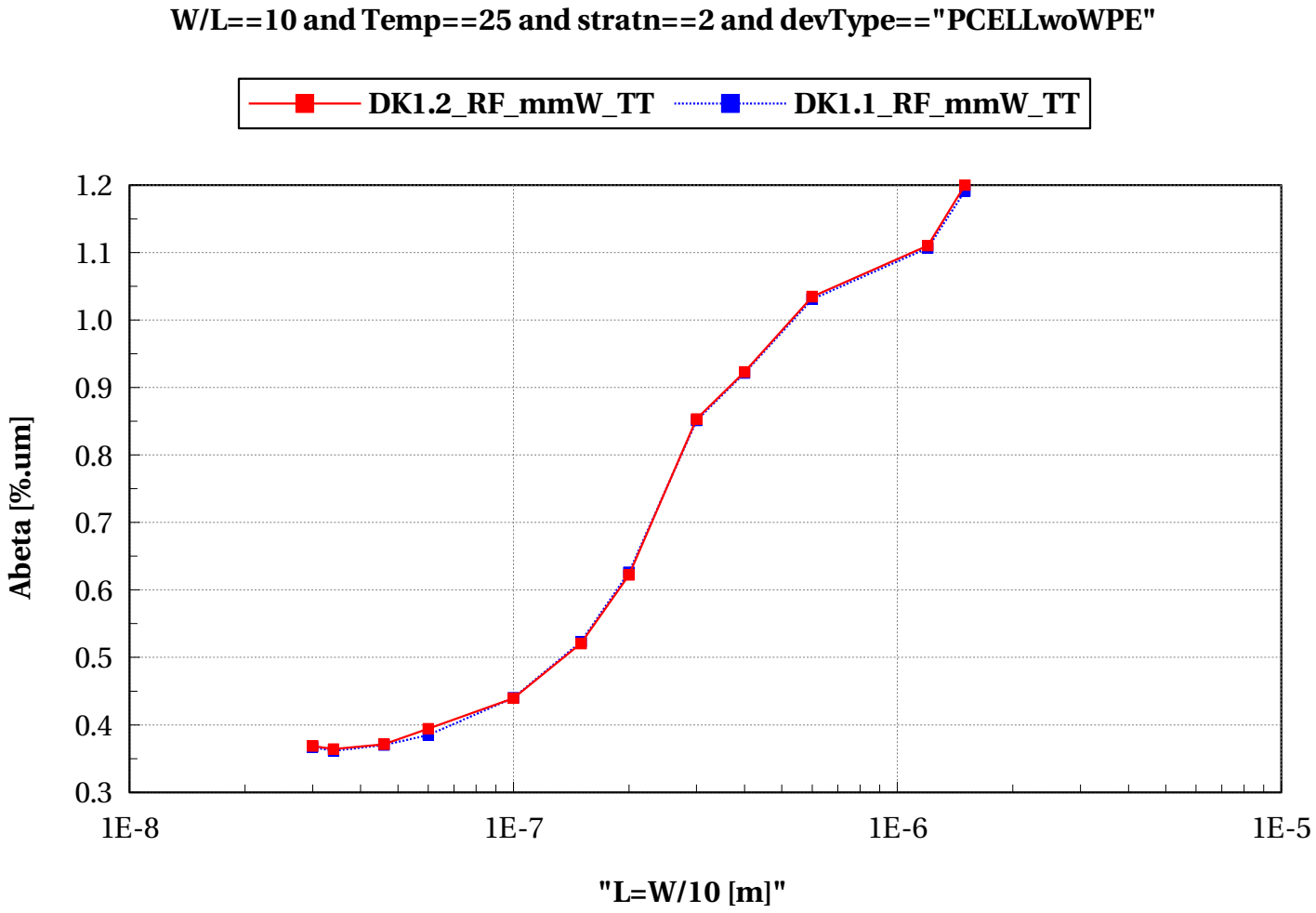
lvtnfet_acc, Cbd_off/w [fF/um] vs "L=W/10 [m]"



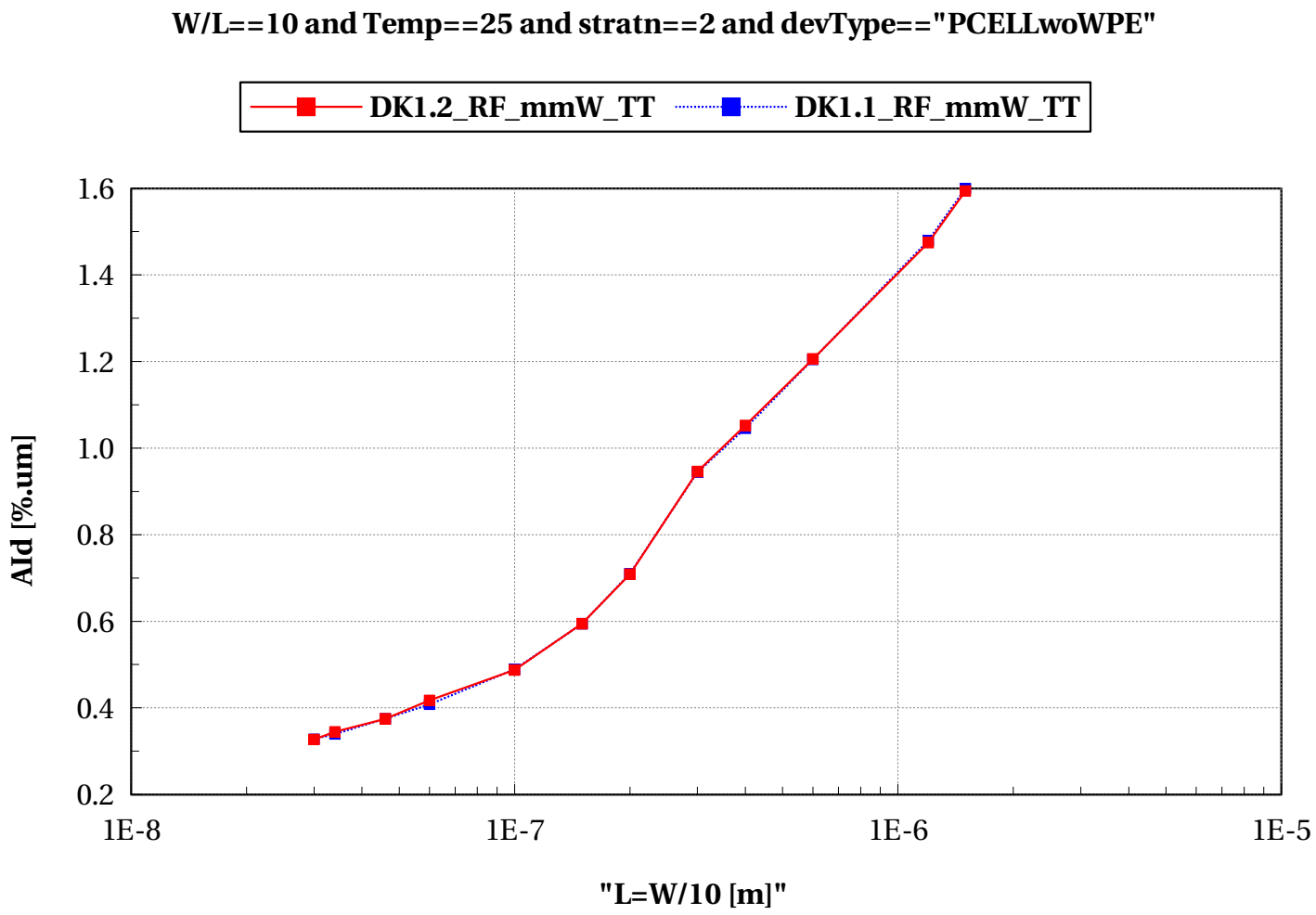
lvtnfet_acc, Avt [mV.um] vs "L=W/10 [m]"



lvtnfet_acc, Abeta [%.um] vs "L=W/10 [m]"



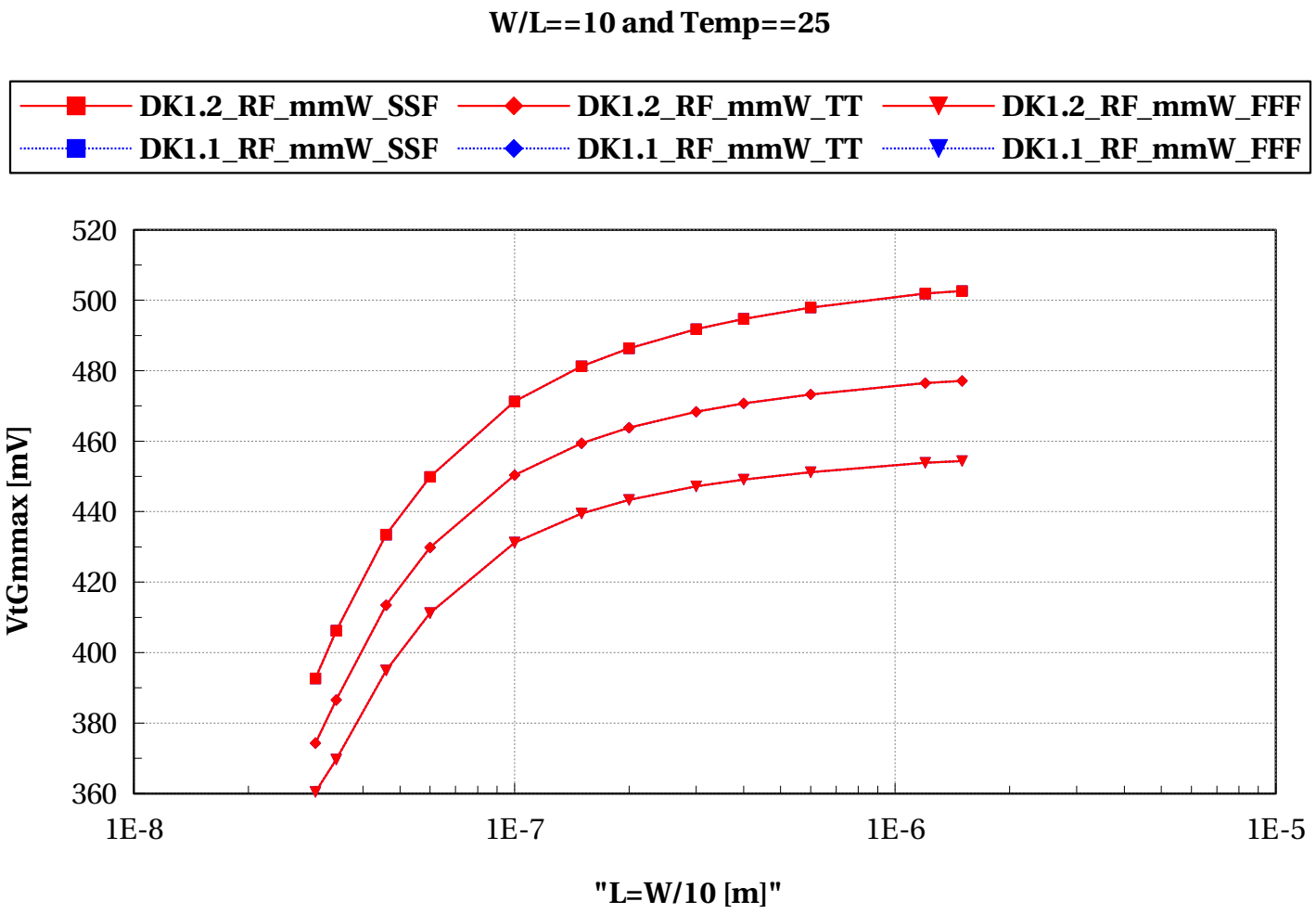
lvtnfet_acc, AId [%.um] vs "L=W/10 [m]"



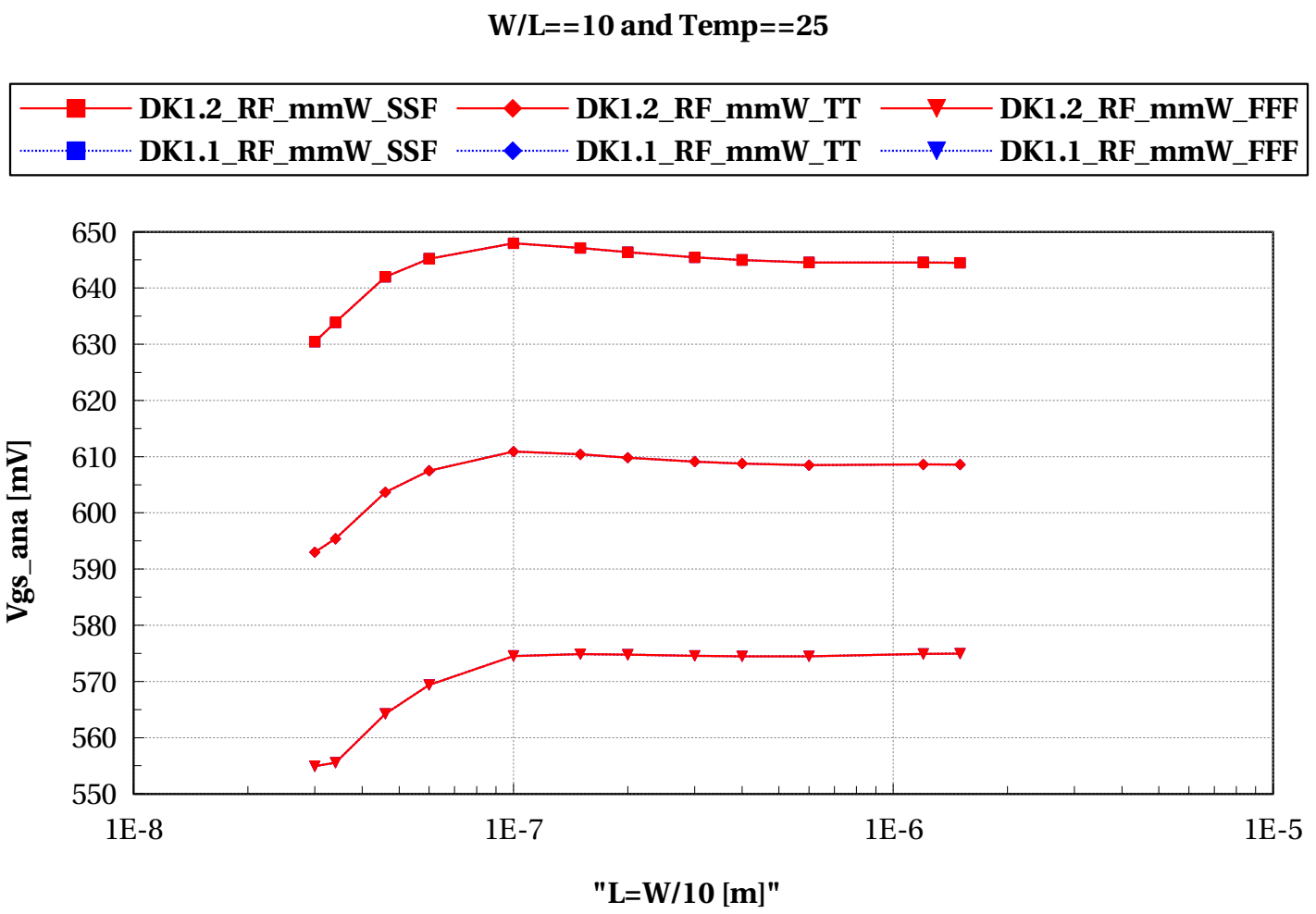
lvtpfet_acc
Electrical characteristics scaling

Scaling versus Length @ W/L=10 and W/NF<5e-6

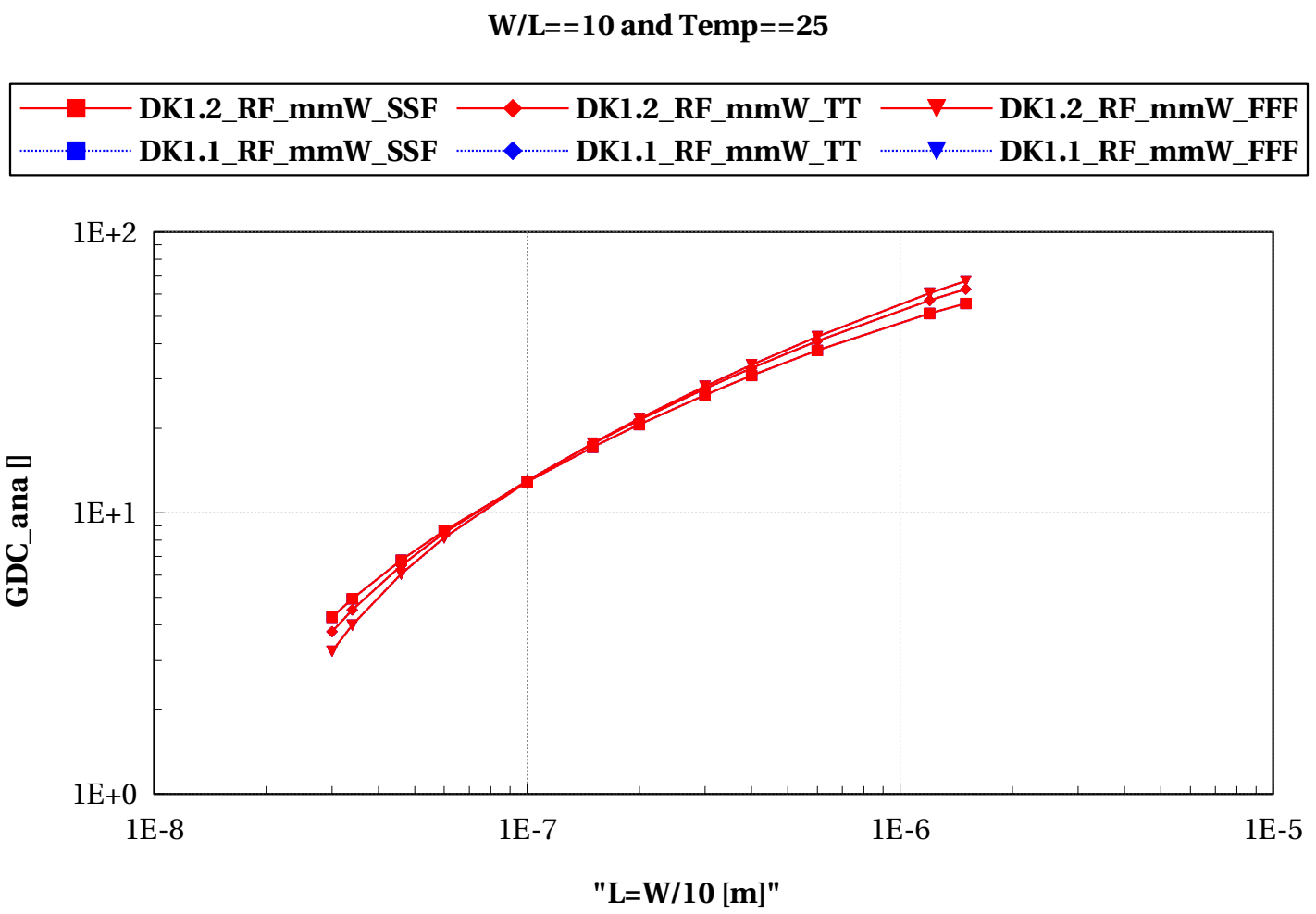
lvtpfet_acc, VtGmmax [mV] vs "L=W/10 [m]"



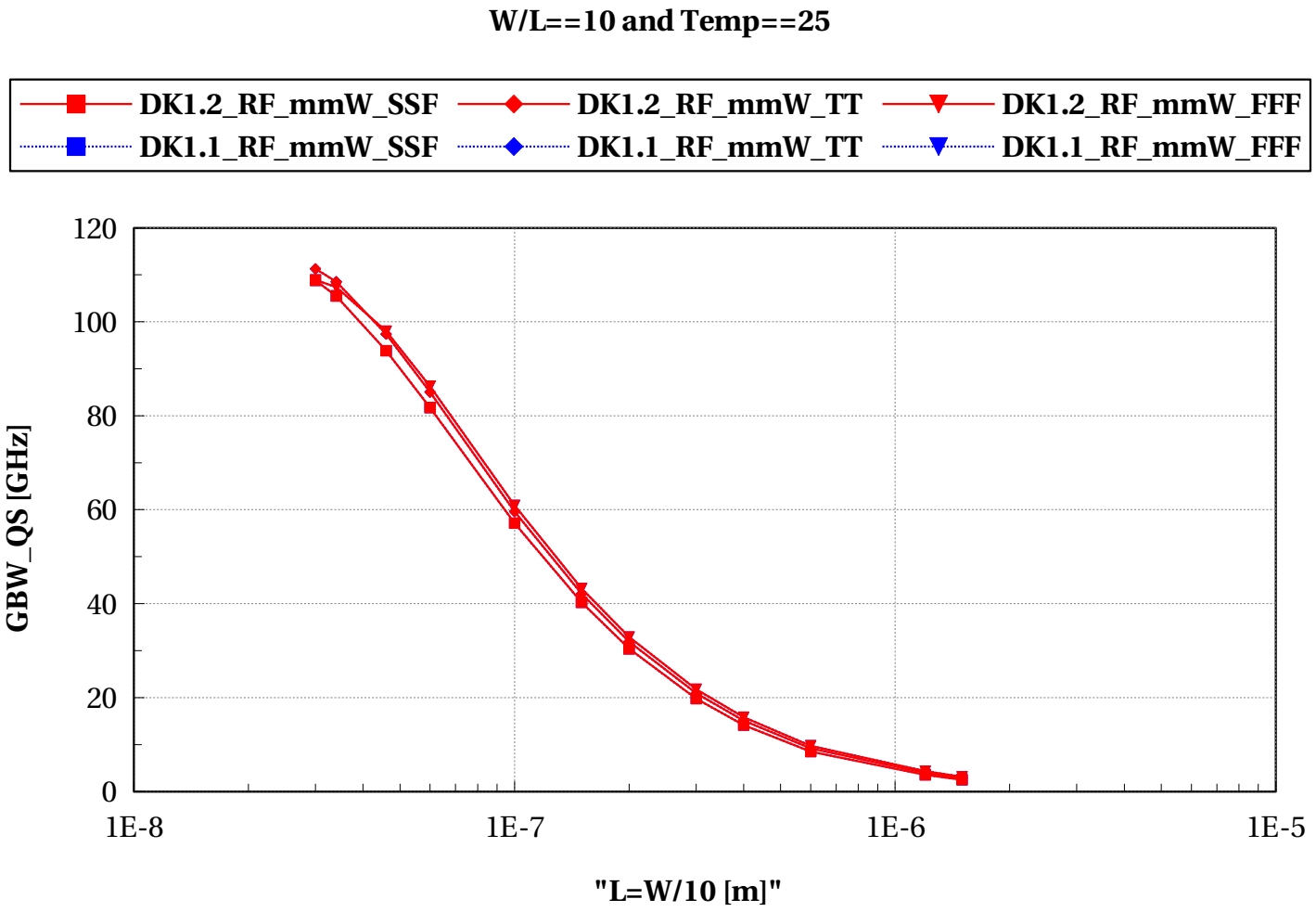
lvtpfet_acc, Vgs_ana [mV] vs "L=W/10 [m]"



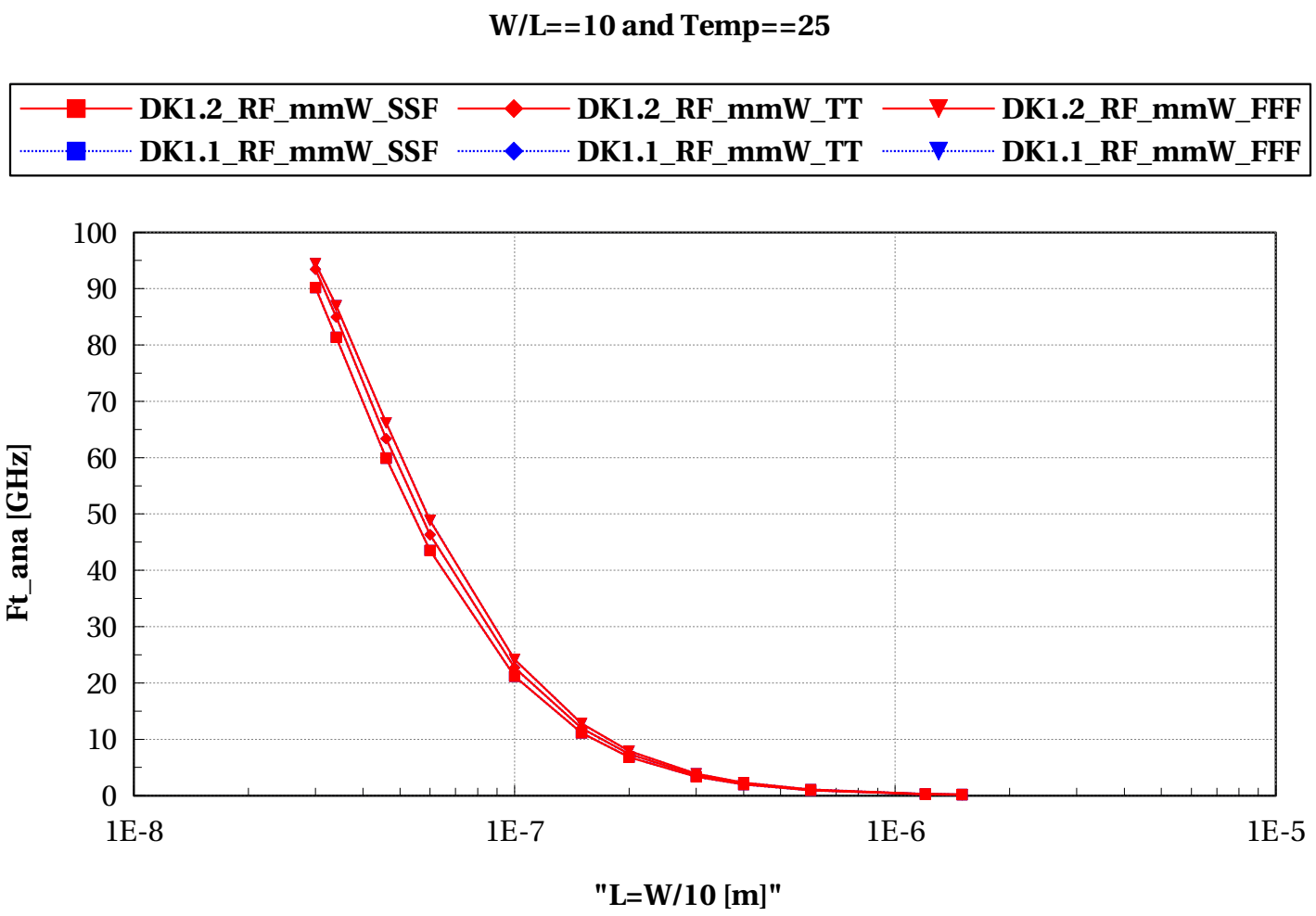
lvtpfet_acc, GDC_ana [] vs "L=W/10 [m]"



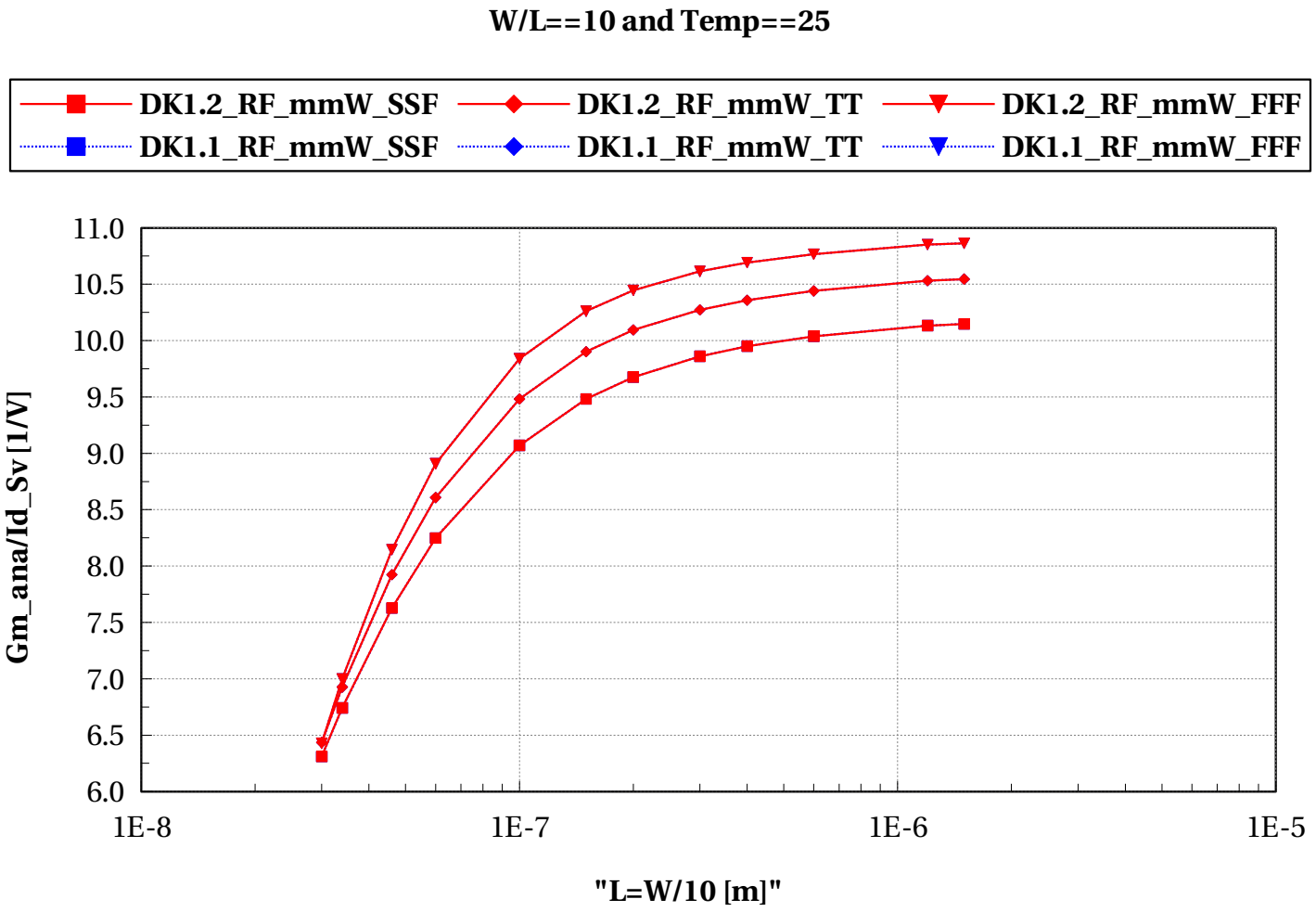
lvtpfet_acc, GBW_QS [GHz] vs "L=W/10 [m]"



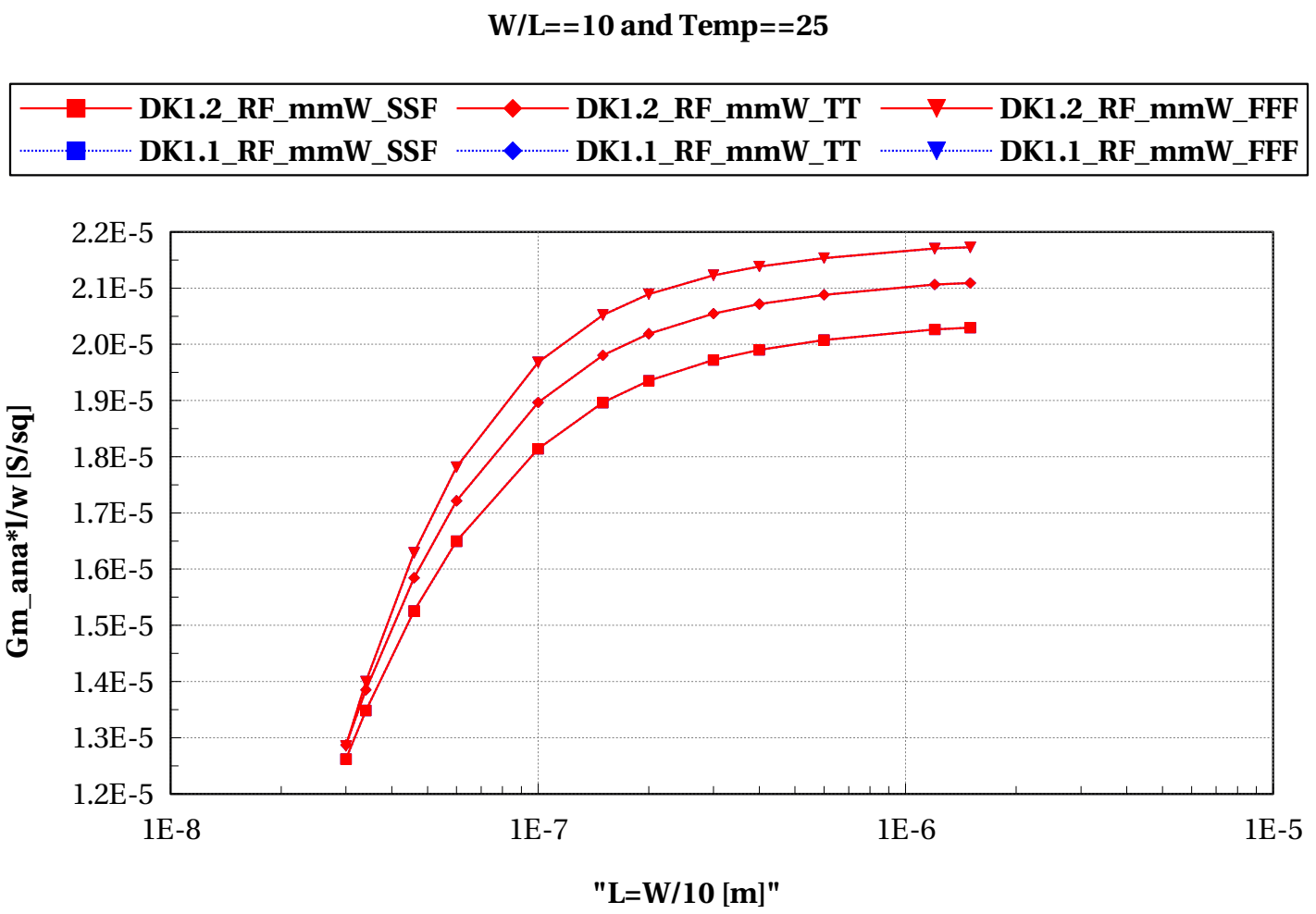
lvtpfet_acc, Ft_ana [GHz] vs "L=W/10 [m]"



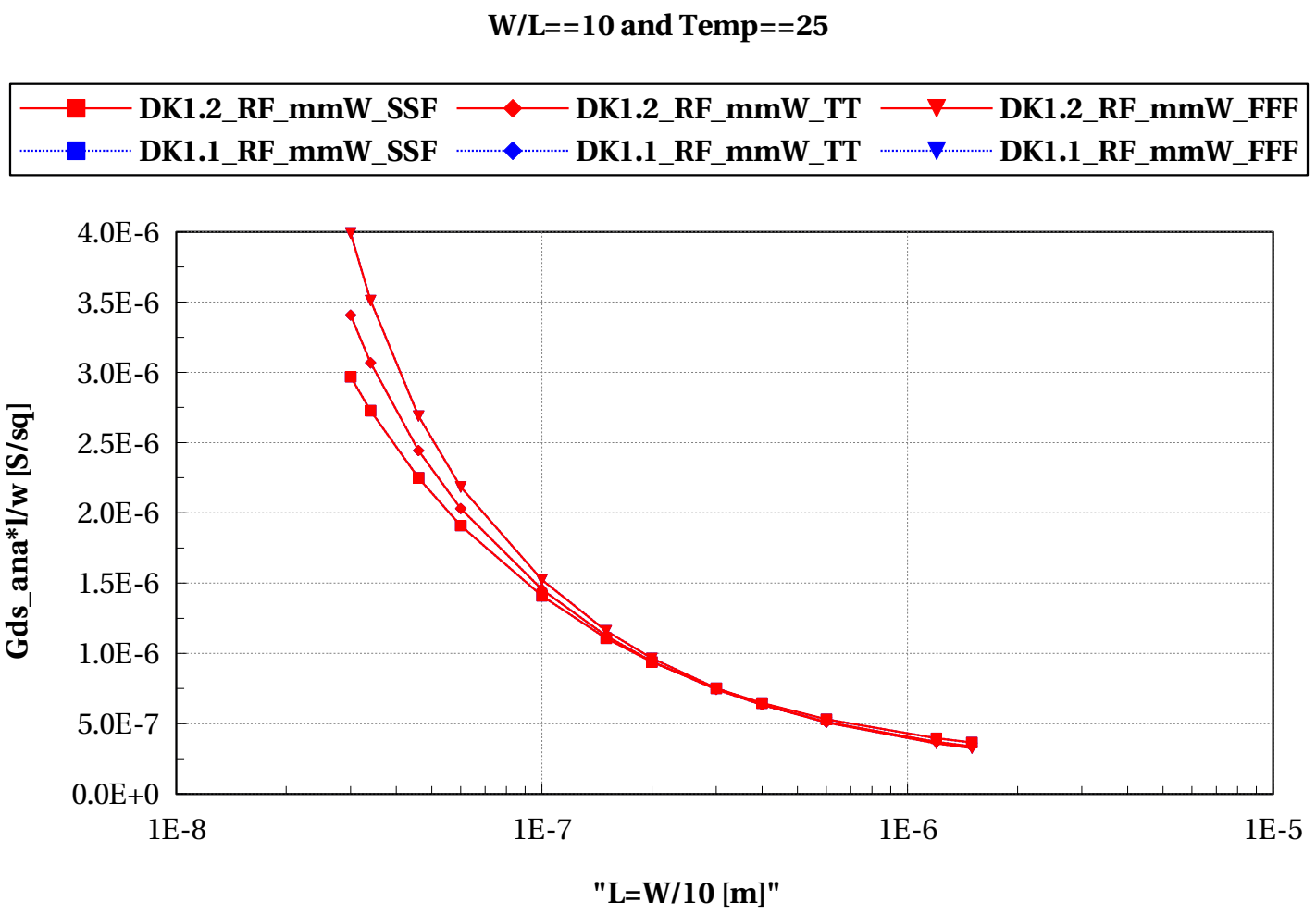
lvtpfet_acc, Gm_ana/Id_Sv [1/V] vs "L=W/10 [m]"



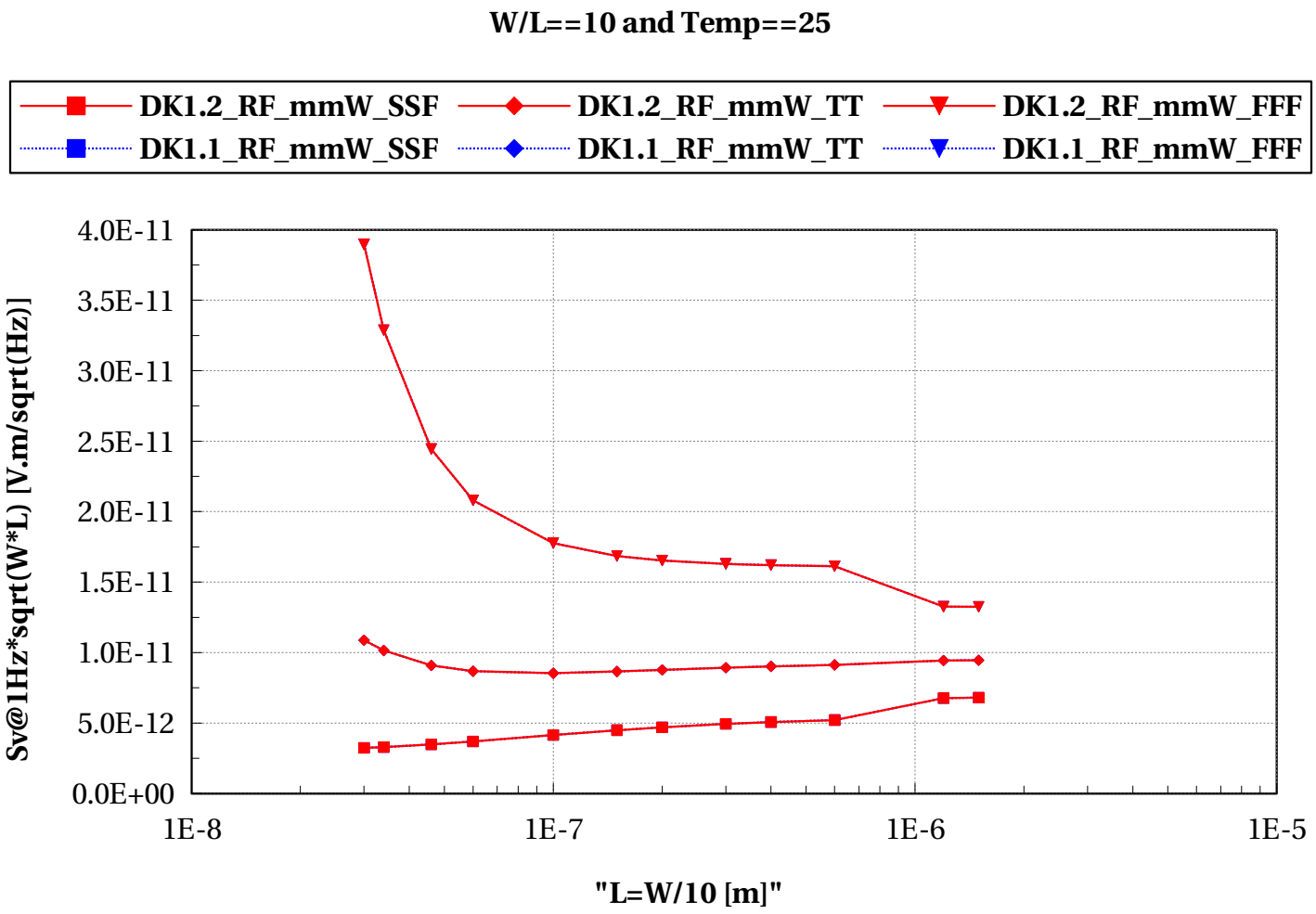
lvtpfet_acc, Gm_ana*l/w [S/sq] vs "L=W/10 [m]"



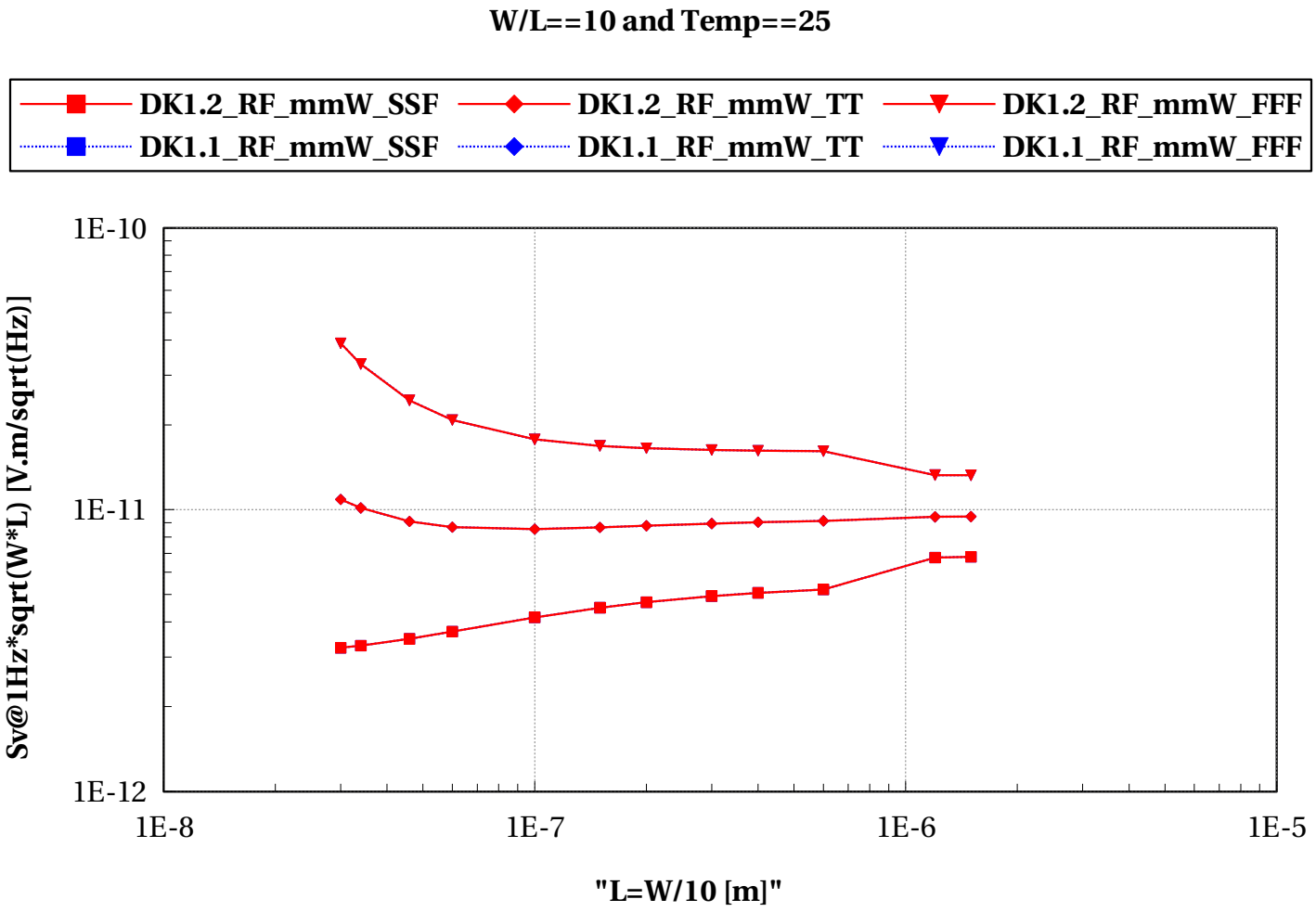
lvtpfet_acc, Gds_ana*l/w [S/sq] vs "L=W/10 [m]"



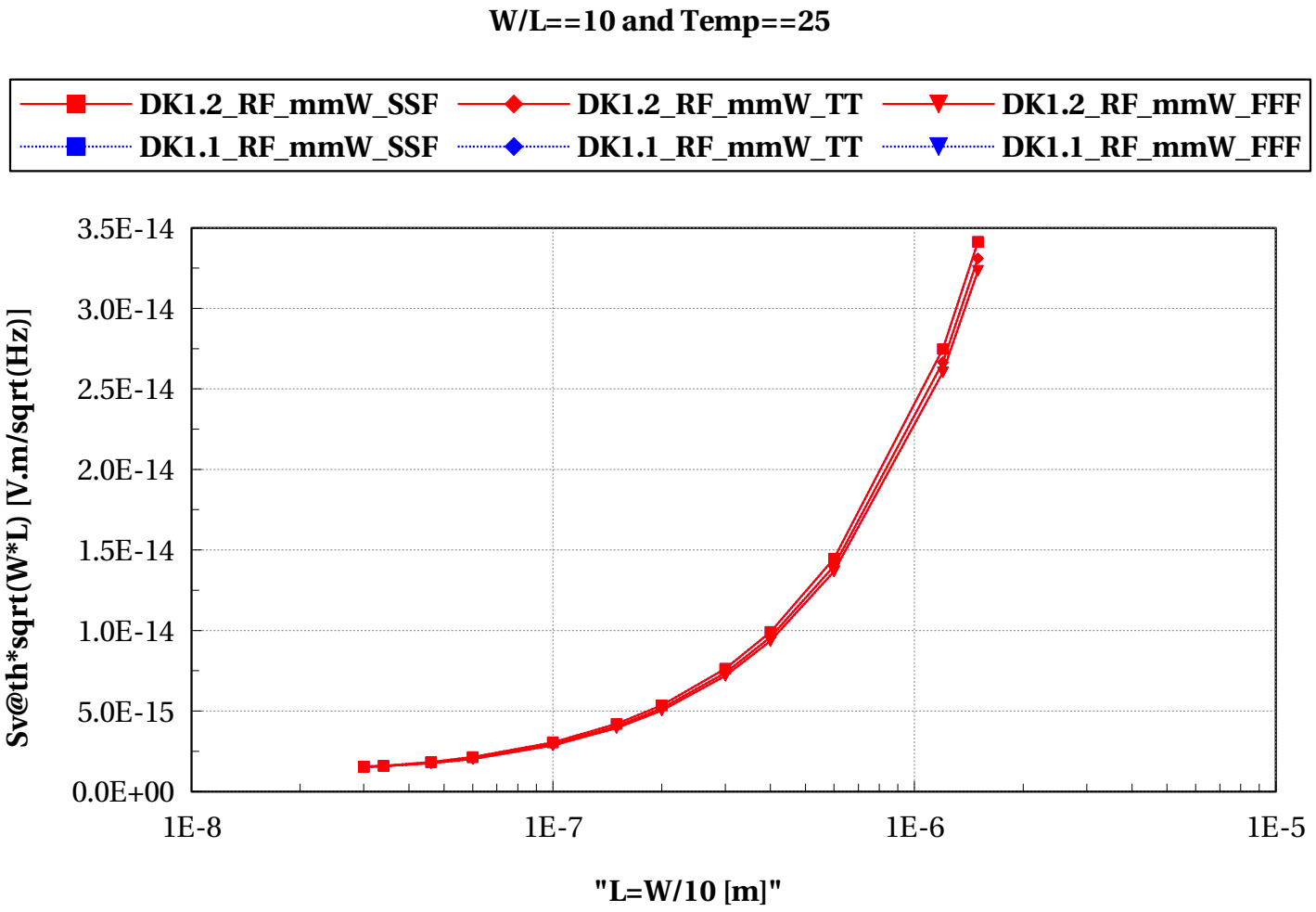
lvtpfet_acc, Sv@1Hz*sqrt(W*L) [V.m/sqrt(Hz)] vs "L=W/10 [m]"



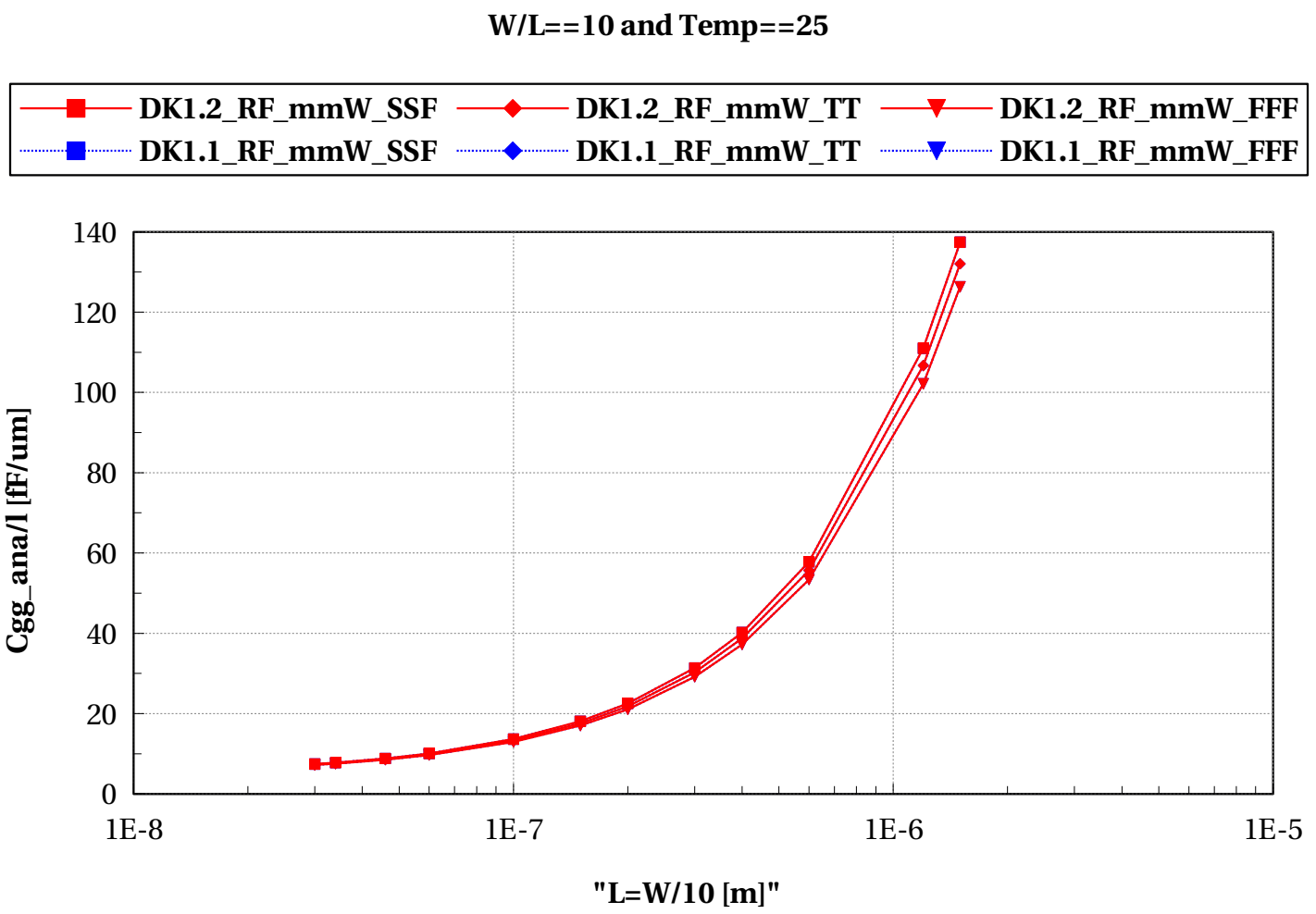
lvtpfet_acc, Sv@1Hz*sqrt(W*L) [V.m/sqrt(Hz)] vs "L=W/10 [m]"



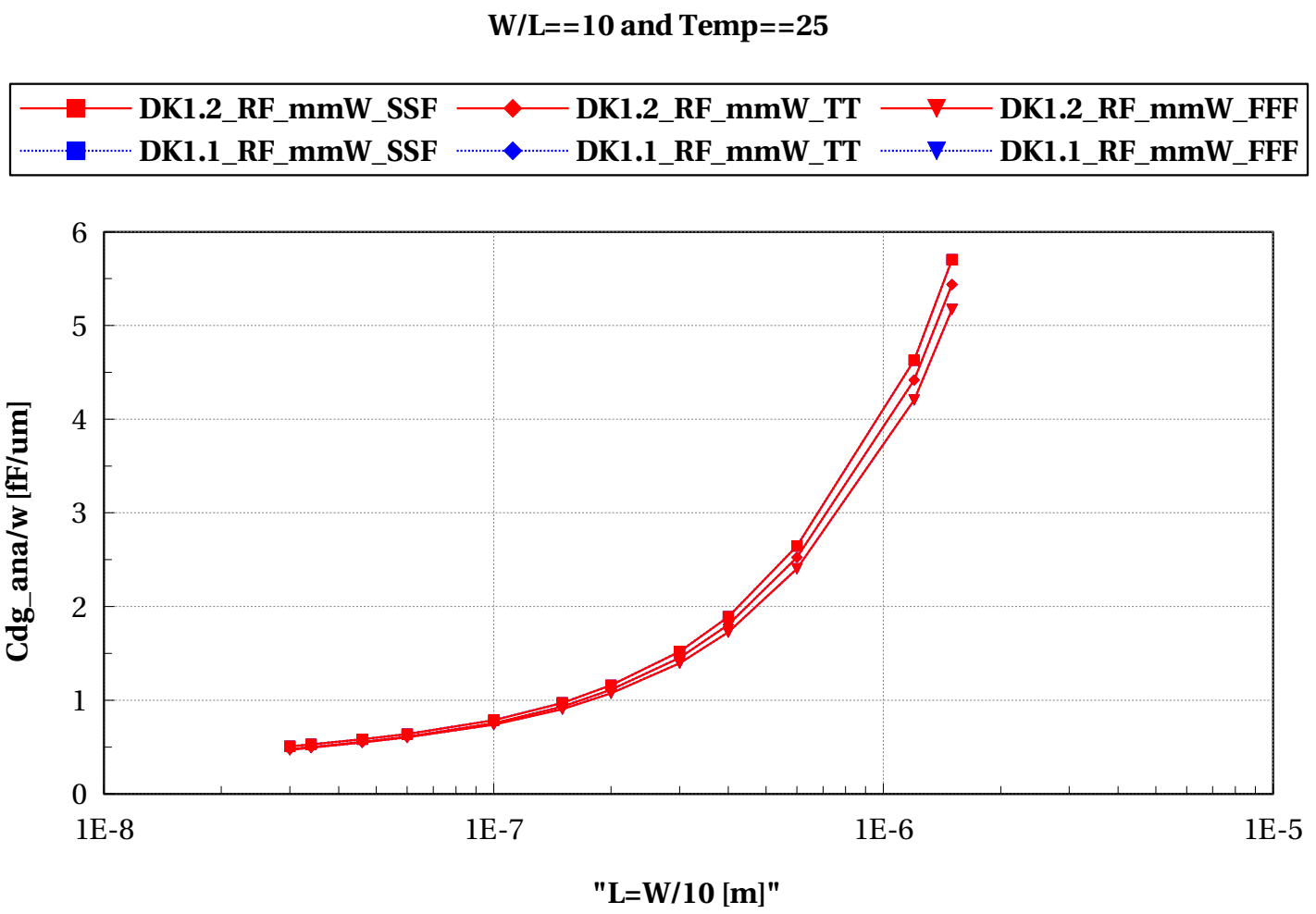
lvtpfet_acc, Sv@th*sqrt(W*L) [V.m/sqrt(Hz)] vs "L=W/10 [m]"



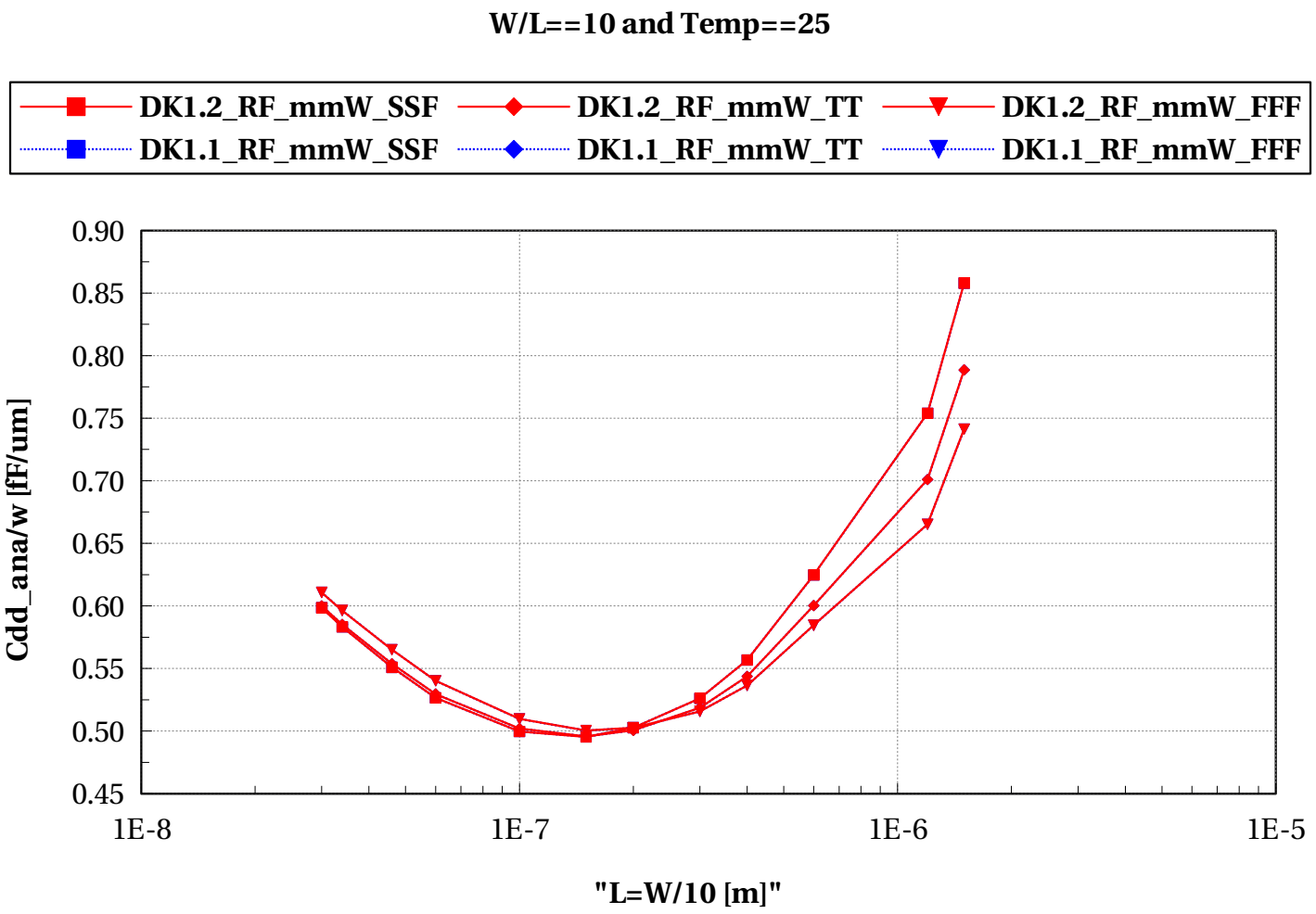
lvtpfet_acc, Cgg_ana/l [fF/um] vs "L=W/10 [m]"



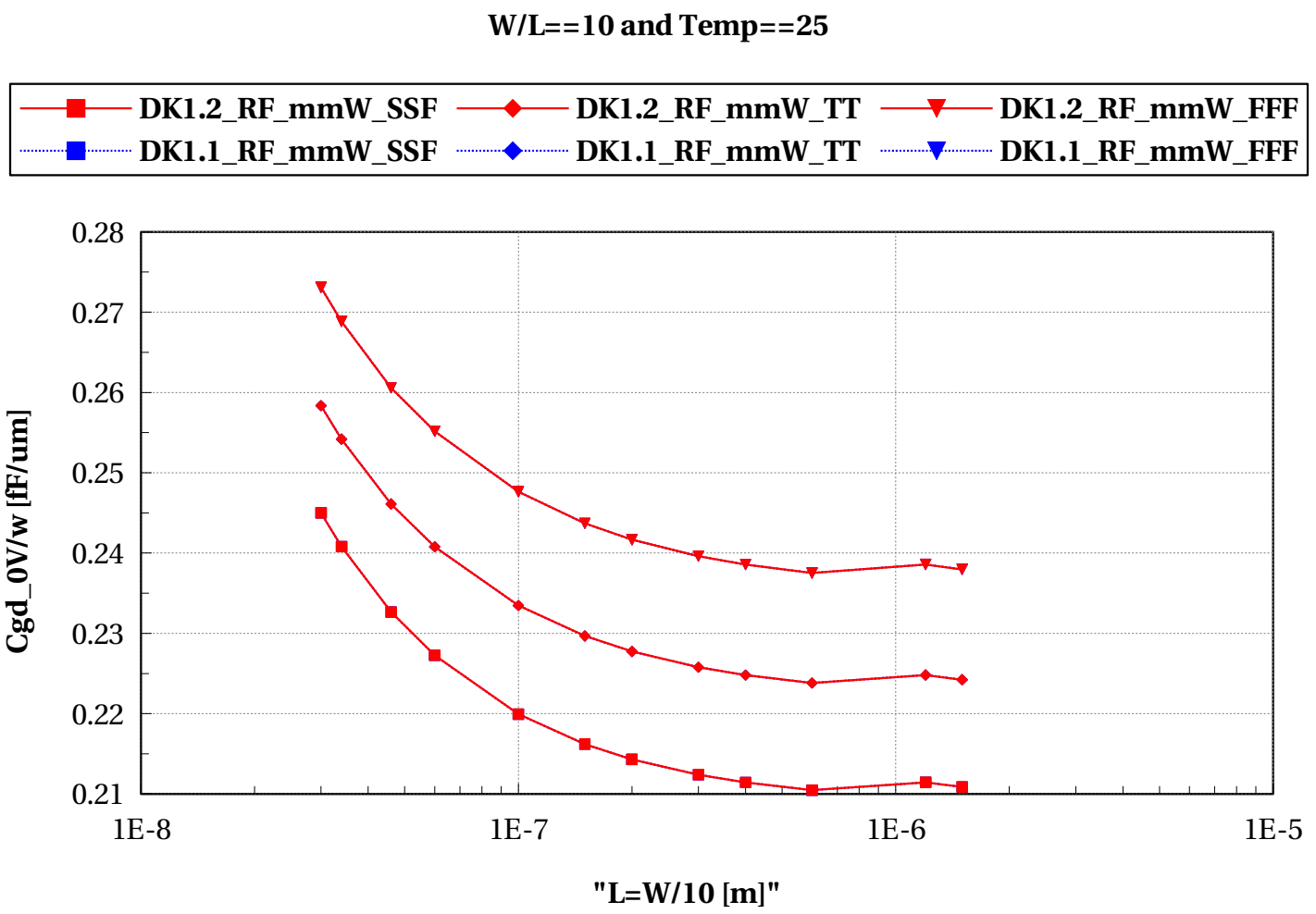
lvtpfet_acc, Cdg_ana/w [fF/um] vs "L=W/10 [m]"



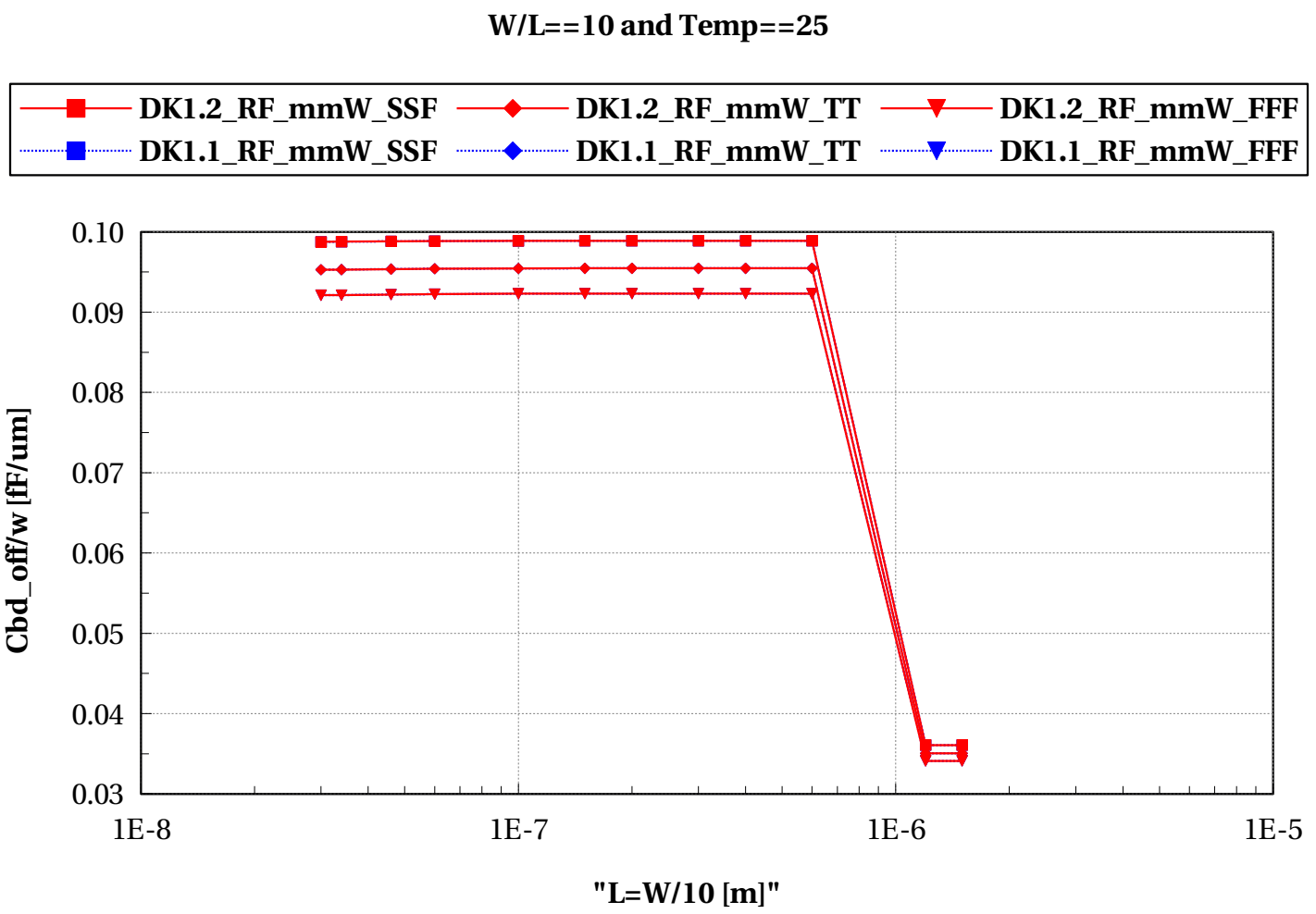
lvtpfet_acc, Cdd_ana/w [fF/um] vs "L=W/10 [m]"



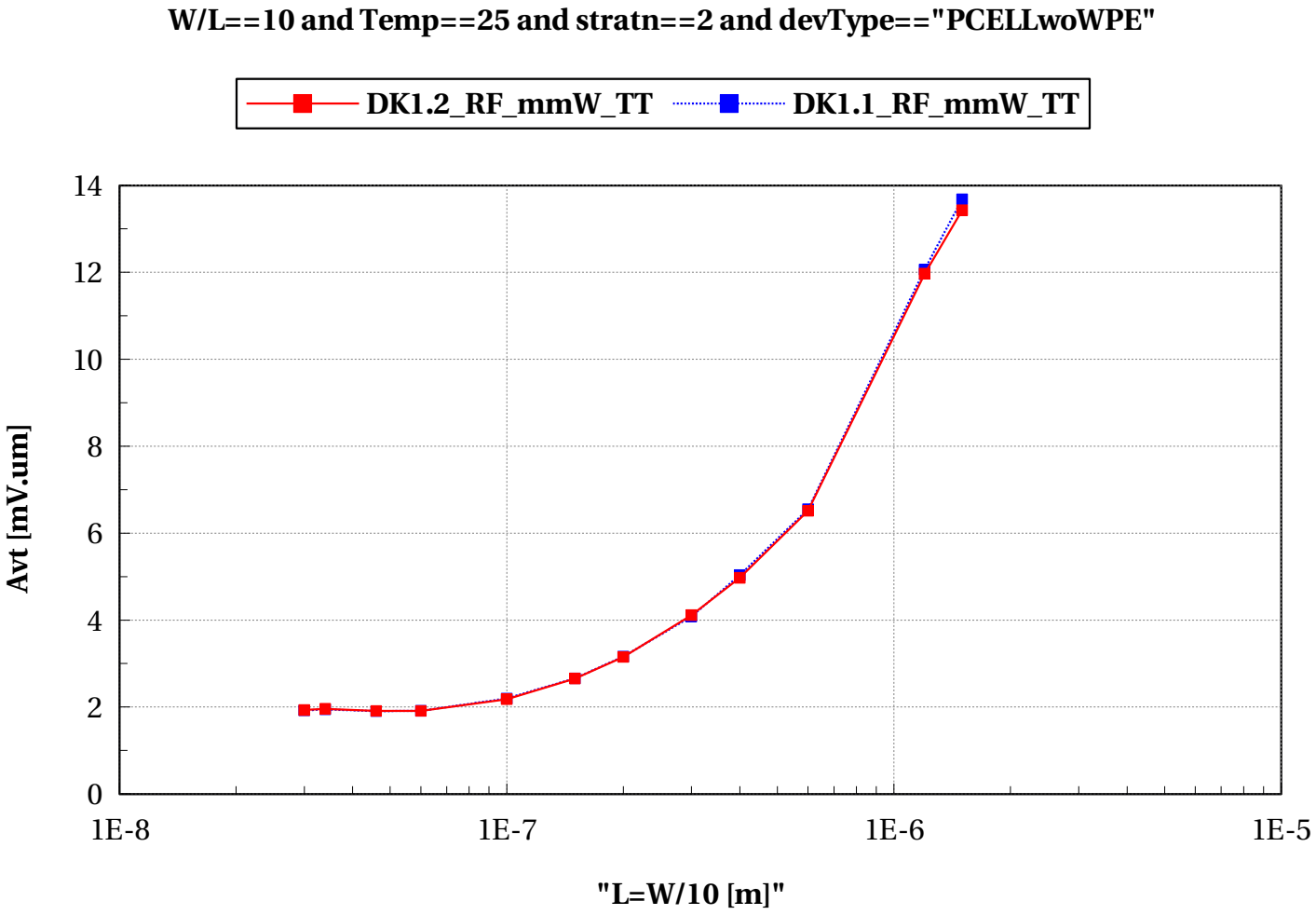
lvtpfet_acc, Cgd_0V/w [fF/um] vs "L=W/10 [m]"



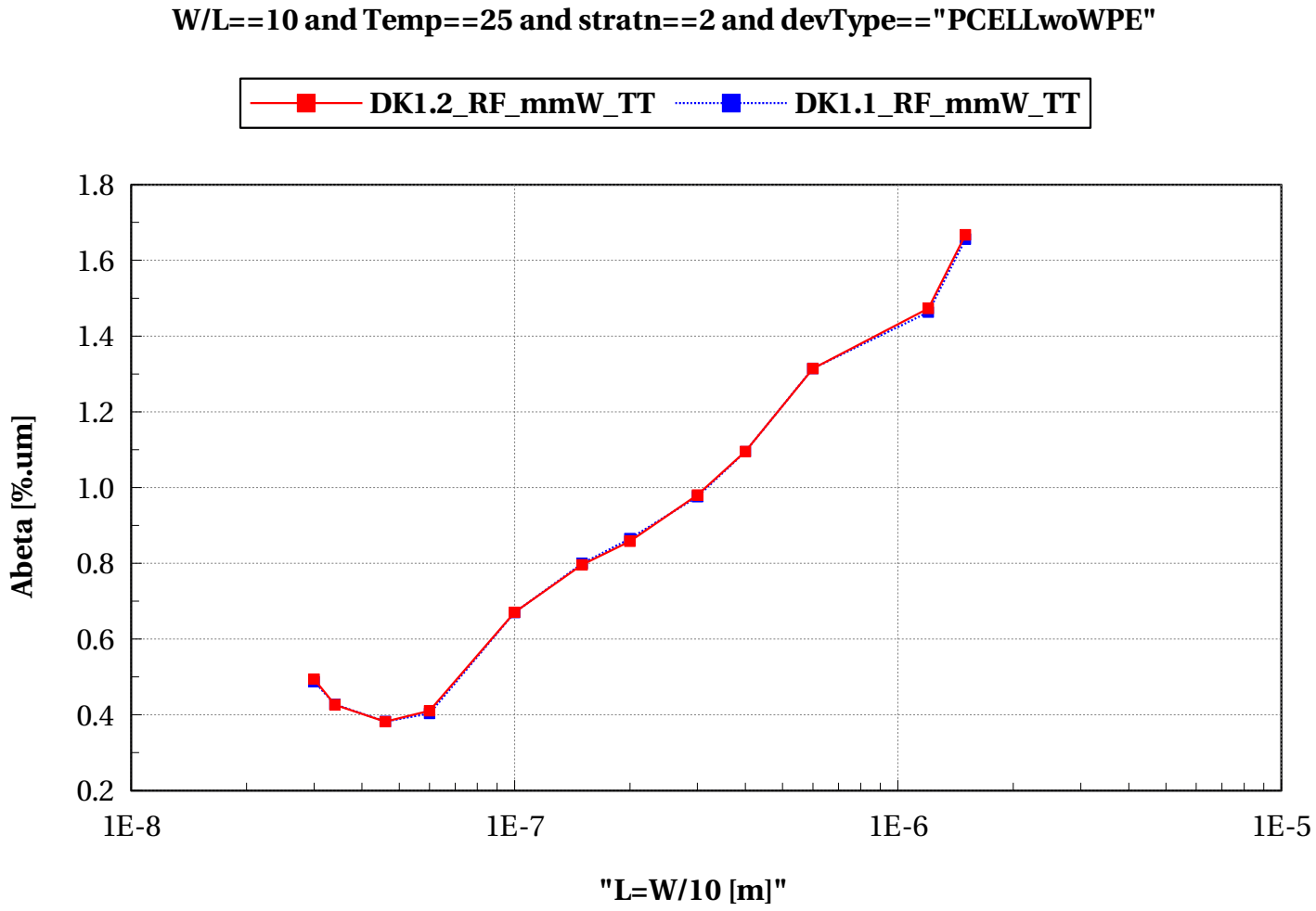
lvtpfet_acc, Cbd_off/w [fF/um] vs "L=W/10 [m]"



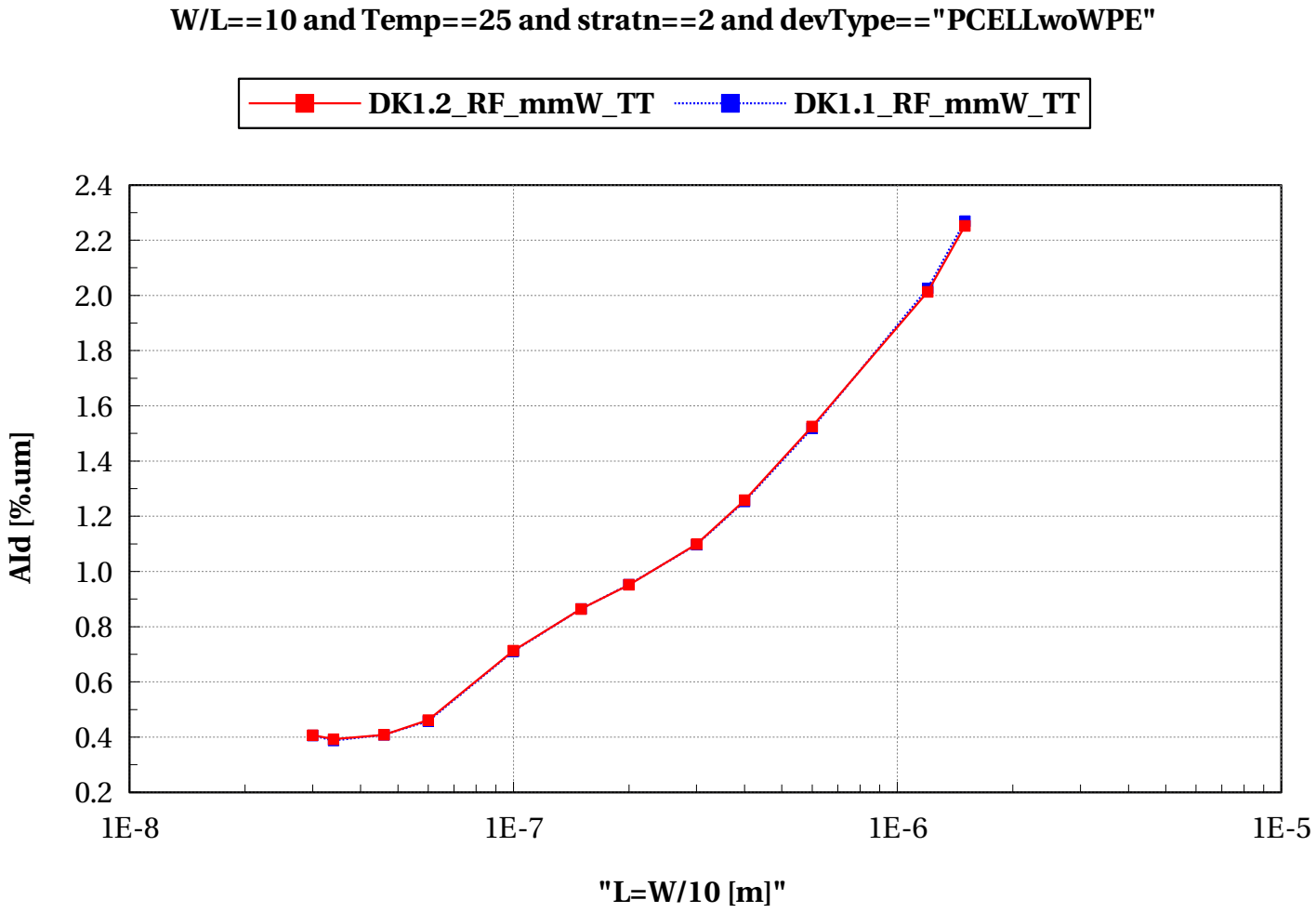
lvtpfet_acc, Avt [mV.um] vs "L=W/10 [m]"



lvtpfet_acc, Abeta [%.um] vs "L=W/10 [m]"



lvtpfet_acc, AId [%.um] vs "L=W/10 [m]"



Annex

Conditions of simulations

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

- Model lvtnfet_acc (DK1.2_RF_mmW)
  - ✔ Input Parameters
    - ✘ vds_off = vds_sat V
    - ✘ vds_cgd = 0 V
    - ✘ mc_sens = 0
    - ✘ vds_lin = 0.05 V
    - ✘ ivt = 300e-9 A
    - ✘ model_version = 1.3.e
    - ✘ vstep_ivt = 0.005 V
    - ✘ iana = 5e-6 A
    - ✘ vds_mm = 0.05 V
    - ✘ ams_release = 2018.3
    - ✘ vgs_stop = vdd V
    - ✘ dlshrink_ivt = 0
    - ✘ sbenchlsf_release = Alpha
    - ✘ vds_sat = Vdd V

- ✘ mc_nsigma = 3
- ✘ vgs_start = 0 V
- ✘ plashrink_ivt = 1
- ✘ ithslwi = 10e-9 A
- ✘ vds_ana = Vdd/4 V
- ✘ vds_cbd = 0 V
- ✘ vddmax = vdd
- ✘ mc_runs = 5000
- ✘ shrink_ivt = 1
- ✘ vgs_off = 0 V
- ✘ temp = 25 °C
- ✘ f_ext = 100k Hz
- ✘ vbs = 0 V
- ✘ vdd = 1 V

✔ Sweep Parameters

✔ Extra parameters

- ✘ lvt_dev = 1

● Model lvtpfet_acc (DK1.2_RF_mmW)

✔ Input Parameters

- ✘ vds_off = vds_sat V
- ✘ vds_cgd = 0 V
- ✘ mc_sens = 0
- ✘ vds_lin = 0.05 V
- ✘ ivt = 70e-9 A
- ✘ model_version = 1.3.e

- ✘ vstep_ivt = 0.005 V
- ✘ iana = 2e-6 A
- ✘ vds_mm = 0.05 V
- ✘ ams_release = 2018.3
- ✘ vgs_stop = vdd V
- ✘ dlshrink_ivt = 0
- ✘ sbenchlsf_release = Alpha
- ✘ vds_sat = Vdd V
- ✘ mc_nsigma = 3
- ✘ vgs_start = 0 V
- ✘ plashrink_ivt = 1
- ✘ ithslwi = 10e-9 A
- ✘ vds_ana = Vdd/4 V
- ✘ vds_cbd = 0 V
- ✘ vddmax = vdd
- ✘ mc_runs = 5000
- ✘ shrink_ivt = 1
- ✘ vgs_off = 0 V
- ✘ temp = 25 °C
- ✘ f_ext = 100k Hz
- ✘ vbs = 1 V
- ✘ vdd = 1 V

✔ Sweep Parameters

✔ Extra parameters

- ✘ lvt_dev = 1

- Model lvtnfet_acc (DK1.1_RF_mmW)
  - ✔ Input Parameters
    - ✘ vds_off = vds_sat V
    - ✘ vds_cgd = 0 V
    - ✘ mc_sens = 0
    - ✘ vds_lin = 0.05 V
    - ✘ ivt = 300e-9 A
    - ✘ model_version = 1.3.d
    - ✘ vstep_ivt = 0.005 V
    - ✘ iana = 5e-6 A
    - ✘ vds_mm = 0.05 V
    - ✘ ams_release = 2018.3
    - ✘ vgs_stop = vdd V
    - ✘ dlshrink_ivt = 0
    - ✘ sbenchlsf_release = Alpha
    - ✘ vds_sat = Vdd V
    - ✘ mc_nsigma = 3
    - ✘ vgs_start = 0 V
    - ✘ plashrink_ivt = 1
    - ✘ ithslwi = 10e-9 A
    - ✘ vds_ana = Vdd/4 V
    - ✘ vds_cbd = 0 V
    - ✘ vddmax = vdd
    - ✘ mc_runs = 5000
    - ✘ shrink_ivt = 1

- ✘ vgs_off = 0 V
- ✘ temp = 25 °C
- ✘ f_ext = 100k Hz
- ✘ vbs = 0 V
- ✘ vdd = 1 V

✔ Sweep Parameters

✔ Extra parameters

- ✘ lvt_dev = 1

● Model lvtpfet_acc (DK1.1_RF_mmW)

✔ Input Parameters

- ✘ vds_off = vds_sat V
- ✘ vds_cgd = 0 V
- ✘ mc_sens = 0
- ✘ vds_lin = 0.05 V
- ✘ ivt = 70e-9 A
- ✘ model_version = 1.3.d
- ✘ vstep_ivt = 0.005 V
- ✘ iana = 2e-6 A
- ✘ vds_mm = 0.05 V
- ✘ ams_release = 2018.3
- ✘ vgs_stop = vdd V
- ✘ dlshrink_ivt = 0
- ✘ sbenchlsf_release = Alpha
- ✘ vds_sat = Vdd V
- ✘ mc_nsigma = 3

- ✘ vgs_start = 0 V
- ✘ plashrink_ivt = 1
- ✘ ithslwi = 10e-9 A
- ✘ vds_ana = Vdd/4 V
- ✘ vds_cbd = 0 V
- ✘ vddmax = vdd
- ✘ mc_runs = 5000
- ✘ shrink_ivt = 1
- ✘ vgs_off = 0 V
- ✘ temp = 25 °C
- ✘ f_ext = 100k Hz
- ✘ vbs = 1 V
- ✘ vdd = 1 V

✔ Sweep Parameters

✔ Extra parameters

- ✘ lvt_dev = 1