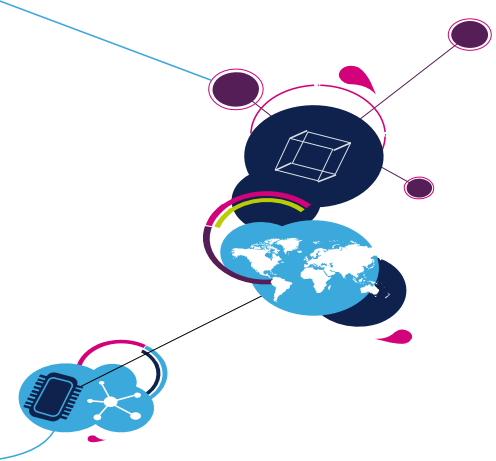
cmos028fdsoi Technology

RVT models

DK1.2_RF_mmW

Comparison with DK1.1_RF_mmW model(s)



Please use the bookmark to navigate

General information on RVT 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): nfet_acc, pfet_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*1*W/(1*L+0+0*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.

nfet_acc
Electrical characteristics per geometry

nfet_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=0, vdd=1, temp=25

DK1.2_RF_mmW wrt DK1.1_RF_mmW

	SSF	TT	FFF
VtGmmax [mV]	415.2 0.0mV	384.6 0.0mV	360.8 0.0mV
Vgs_ana [mV]	662.9 0.0mV	608.2 0.0mV	557.7 0.0mV
GDC_ana []	4.49 0.0%	4.94 0.0%	4.94 0.0%
GBW_QS [GHz]	240.7 0.0%	272.8 0.0%	284.4 0.0%
Ft_ana [GHz]	209.5 0.0%	227.6 0.0%	239.7 0.0%
Gm_ana [µS]	304.4 0.0%	333.9 0.0%	364.7 0.0%
Gds_ana [µS]	67.83 0.0%	67.6 0.0%	73.82 0.0%
Cgg_ana [aF]	231.2 0.0%	233.4 0.0%	241.5 0.0%
Cdg_ana [aF]	194.5 0.0%	177 0.0%	187.2 0.0%
Cdd_ana [aF]	188.5 0.0%	187.1 0.0%	195.3 0.0%
Avt [mV.µm]	1.18 1.4%	1.27 1.3%	1.3 1.2%
Abeta [%.µm]	0.34 -1.0%	0.35 -0.8%	0.34 -0.9%
AId [%.µm]	0.24 0.8%	0.24 1.2%	0.23 1.1%
Sv@1Hz [V/√Hz]	3.33e-05 0.0%	1.15e-04 0.0%	4.25e-04 0.0%
Sv@th [V/√Hz]	1e-08 0.0%	9.65e-09 0.0%	9.35e-09 0.0%

nfet_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]	559.6 0.0mV	518.9 0.0mV	487.3 0.0mV
Vgs_ana [mV]	673.3 0.0mV	626.7 0.0mV	590.9 0.0mV
GDC_ana []	186.5 0.0%	209.7 0.0%	216.8 0.0%
GBW_QS [GHz]	11.19 0.0%	12.12 0.0%	12.49 0.0%
Ft_ana [GHz]	0.25 0.0%	0.25 0.0%	0.24 0.0%
Gm_ana [µS]	584.3 0.0%	601.8 0.0%	618.9 0.0%
Gds_ana [µS]	3.13 0.0%	2.87 0.0%	2.85 0.0%
Cgg_ana [fF]	373.2 0.0%	389.9 0.0%	398.4 0.0%
Cdg_ana [fF]	150.4 0.0%	157 0.0%	159.8 0.0%
Cdd_ana [fF]	8.31 0.0%	7.9 0.0%	7.88 0.0%
Avt [mV.µm]	5.02 1.1%	5.23 1.1%	4.94 1.1%
Abeta [%.µm]	0.94 0.3%	0.92 0.3%	0.92 0.5%
AId [%.µm]	1.54 -0.6%	1.44 -0.6%	1.22 -0.8%
Sv@1Hz [V/√Hz]	1.46e-06 0.0%	1.69e-06 0.0%	1.98e-06 0.0%
Sv@th [V/√Hz]	4.16e-09 0.0%	4.09e-09 0.0%	4.01e-09 0.0%

pfet_acc
Electrical characteristics per geometry

pfet_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=0, vdd=1, temp=25

DK1.2_RF_mmW wrt DK1.1_RF_mmW

	SSF	TT	FFF
VtGmmax [mV]	518.8 0.0mV	498.1 0.0mV	475.4 0.0mV
Vgs_ana [mV]	779.2 0.0mV	726.3 0.0mV	677.2 0.0mV
GDC_ana []	3.45 0.0%	3.5 0.0%	3.2 0.0%
GBW_QS [GHz]	105.5 0.0%	114.5 0.0%	115.3 0.0%
Ft_ana [GHz]	81.66 0.0%	87.88 0.0%	89.72 0.0%
Gm_ana [µS]	116.2 0.0%	126.2 0.0%	131.6 0.0%
Gds_ana [µS]	33.66 0.0%	36.06 0.0%	41.13 0.0%
Cgg_ana [aF]	226.5 0.0%	228.5 0.0%	232.6 0.0%
Cdg_ana [aF]	148.1 0.0%	146 0.0%	150.8 0.0%
Cdd_ana [aF]	169.1 0.0%	170.2 0.0%	175.2 0.0%
Avt [mV.µm]	1.93 1.2%	2.01 1.1%	2.11 1.0%
Abeta [%.µm]	0.43 -2.1%	0.48 -2.4%	0.58 -2.5%
AId [%.µm]	0.46 0.4%	0.5 -0.0%	0.6 -0.6%
Sv@1Hz [V/√Hz]	4.65e-05 0.0%	1.42e-04 0.0%	4.57e-04 0.0%
Sv@th [V/√Hz]	1.64e-08 0.0%	1.57e-08 0.0%	1.57e-08 0.0%

pfet_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

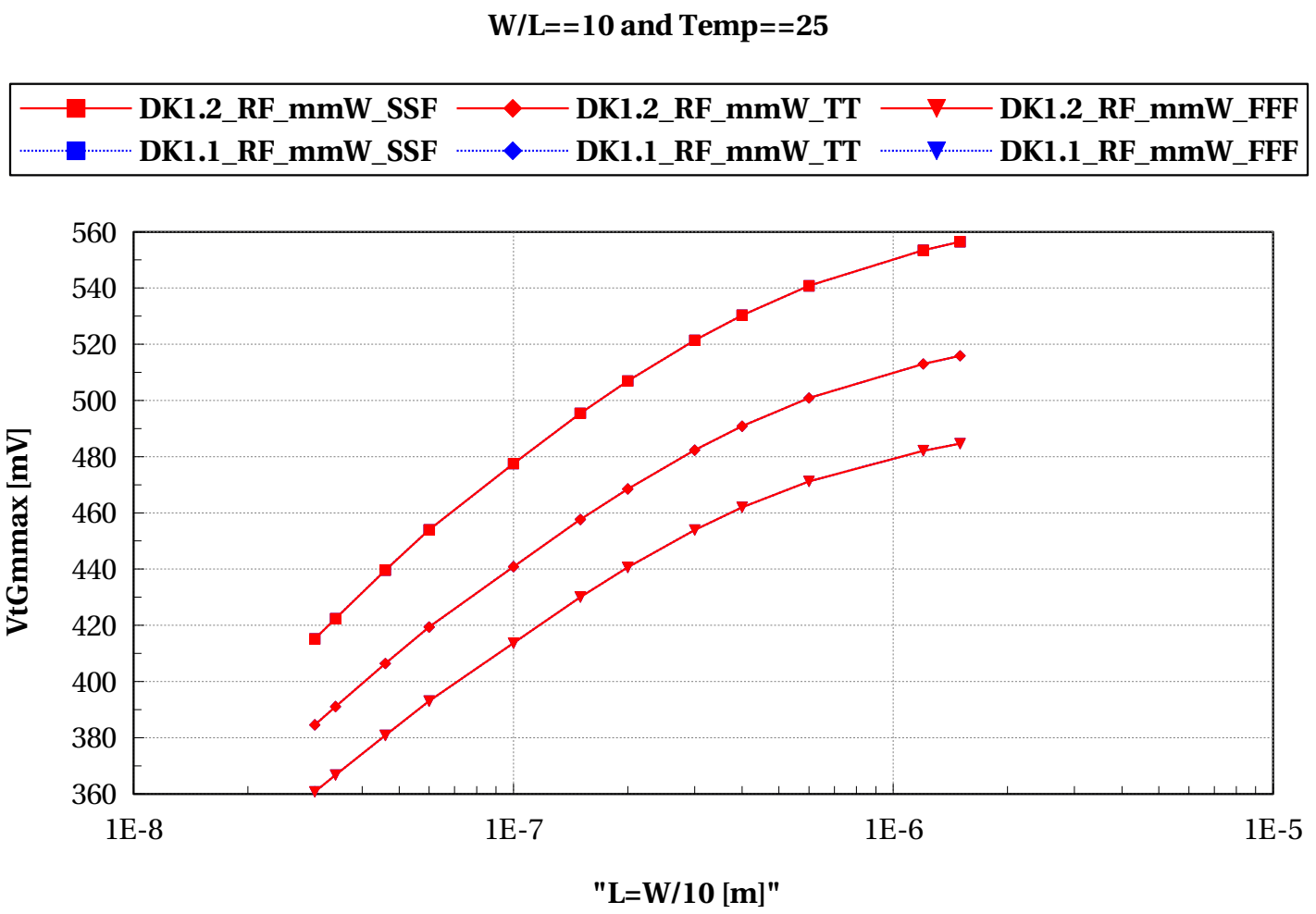
DK1.2_RF_mmW wrt DK1.1_RF_mmW

	SSF	TT	FFF
VtGmmax [mV]	627.4 0.0mV	600.9 0.0mV	577.1 0.0mV
Vgs_ana [mV]	784.4 0.0mV	754.4 0.0mV	727.8 0.0mV
GDC_ana []	96.7 0.0%	113.5 0.0%	126.3 0.0%
GBW_QS [GHz]	1.41 0.0%	1.58 0.0%	1.73 0.0%
Ft_ana [GHz]	7.79e-02 0.0%	8.02e-02 0.0%	8.06e-02 0.0%
Gm_ana [µS]	202.9 0.0%	209.4 0.0%	214.9 0.0%
Gds_ana [µS]	2.1 0.0%	1.84 0.0%	1.7 0.0%
Cgg_ana [fF]	414.3 0.0%	414.8 0.0%	415.5 0.0%
Cdg_ana [fF]	170.4 0.0%	169.4 0.0%	168.8 0.0%
Cdd_ana [fF]	22.92 0.0%	21.06 0.0%	19.77 0.0%
Avt [mV.µm]	10.86 1.2%	10.2 1.2%	9.9 1.2%
Abeta [%.µm]	1.43 1.6%	1.52 1.9%	1.63 2.1%
AId [%.µm]	3.53 0.1%	2.72 -0.3%	2.22 -0.6%
Sv@1Hz [V/√Hz]	1.62e-06 0.0%	2.1e-06 0.0%	2.73e-06 0.0%
Sv@th [V/√Hz]	7.08e-09 0.0%	6.91e-09 0.0%	6.78e-09 0.0%

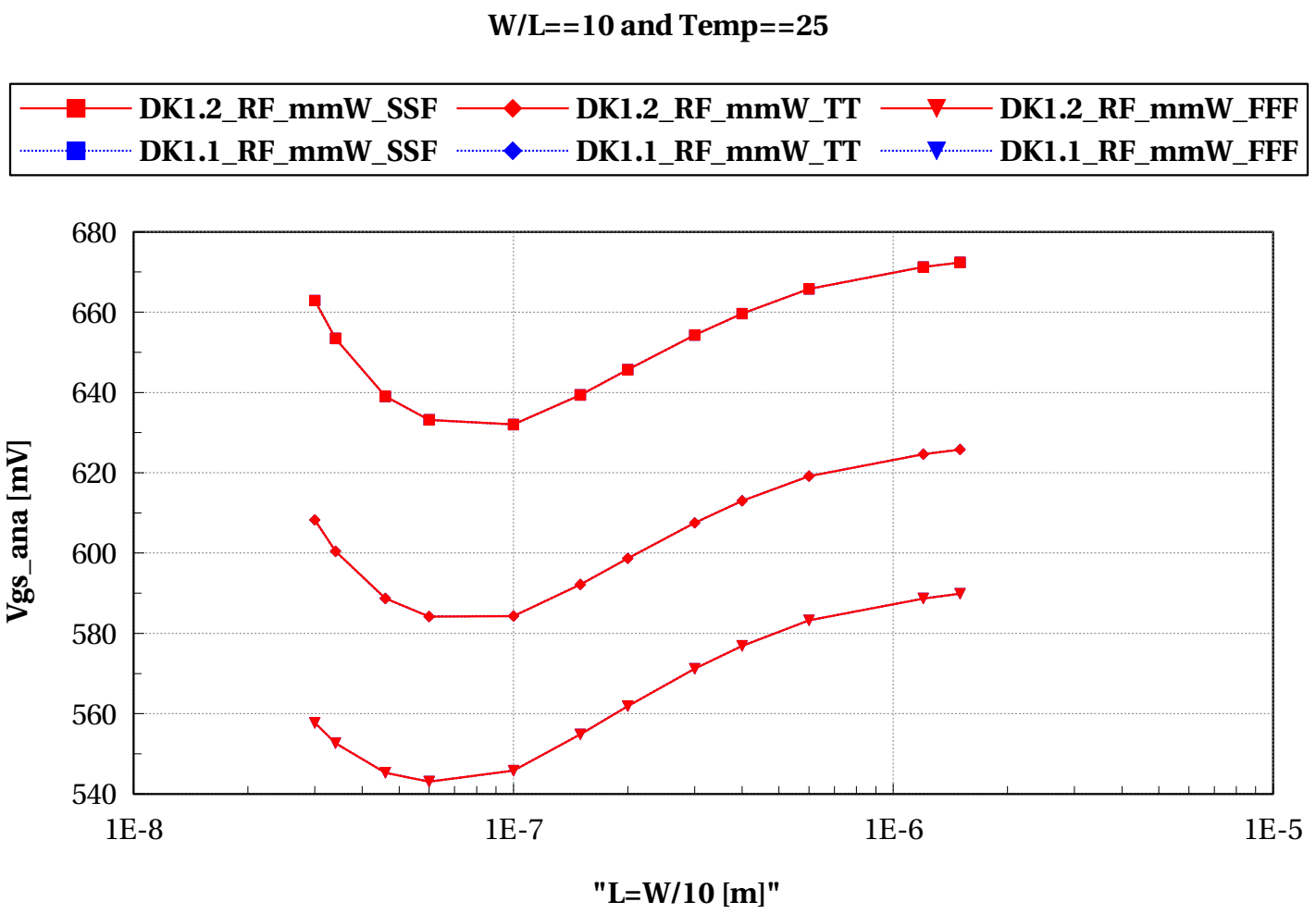
nfet_acc
Electrical characteristics scaling

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

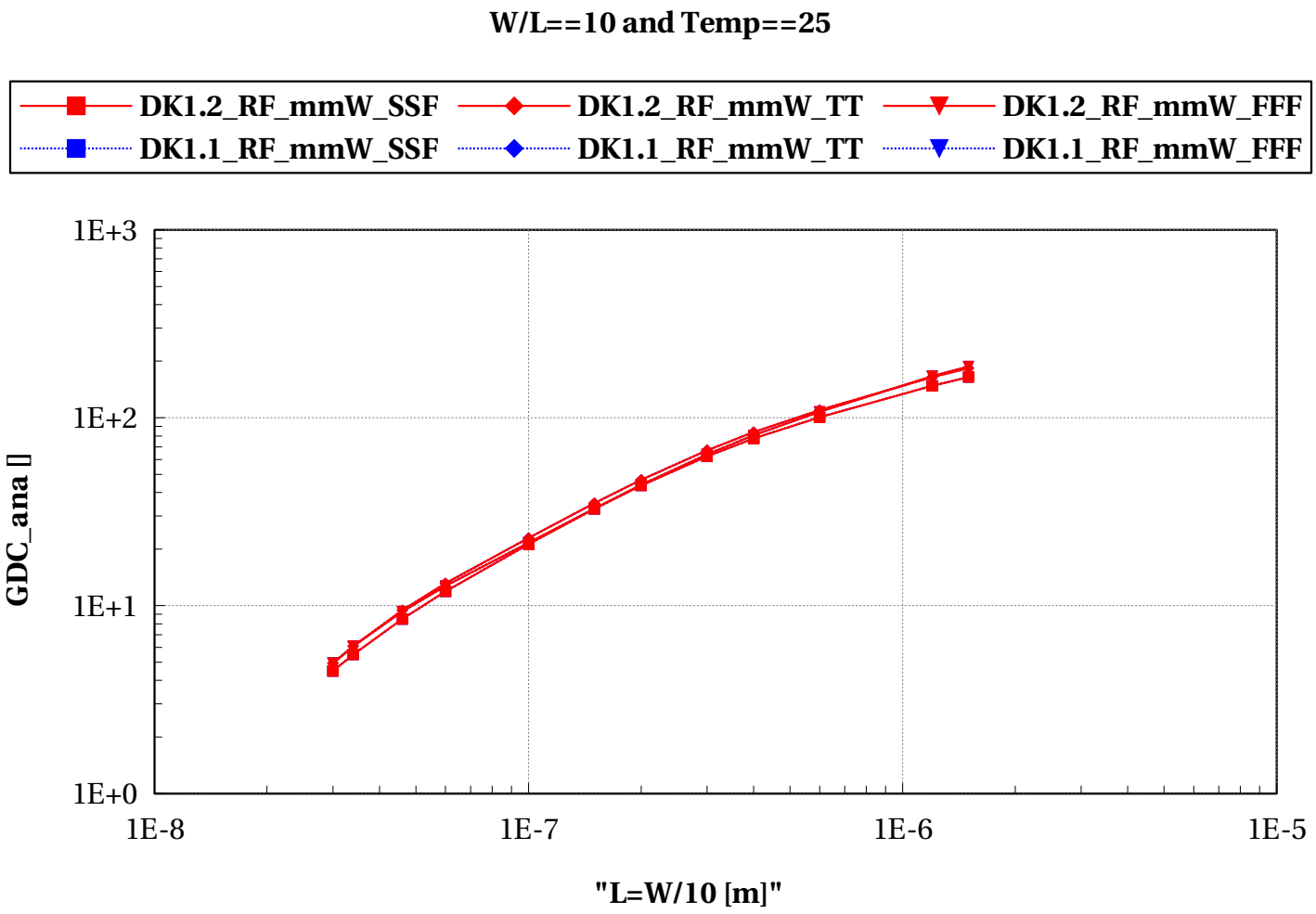
nfet_acc, VtGmmax [mV] vs "L=W/10 [m]"



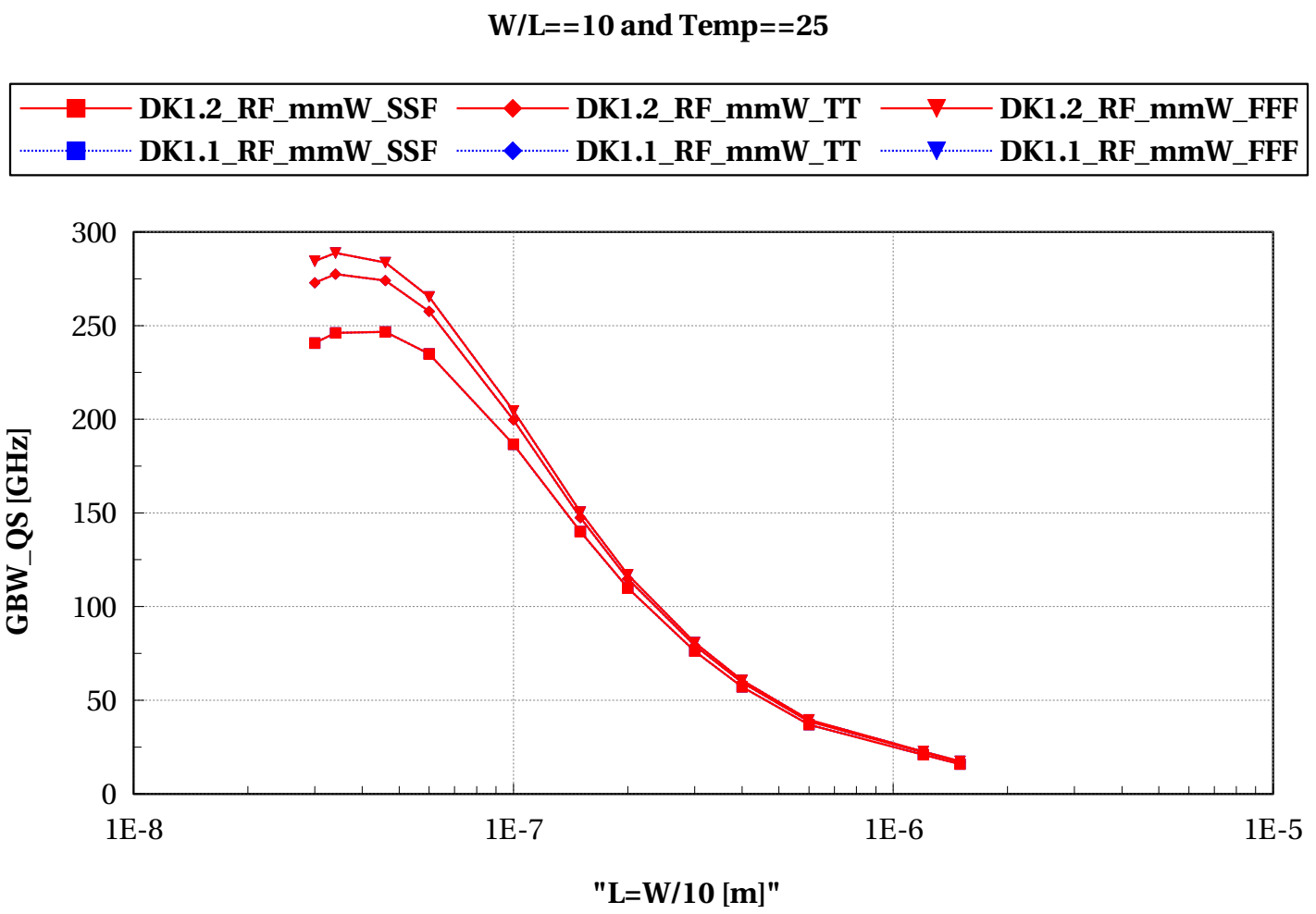
nfet_acc, Vgs_ana [mV] vs "L=W/10 [m]"



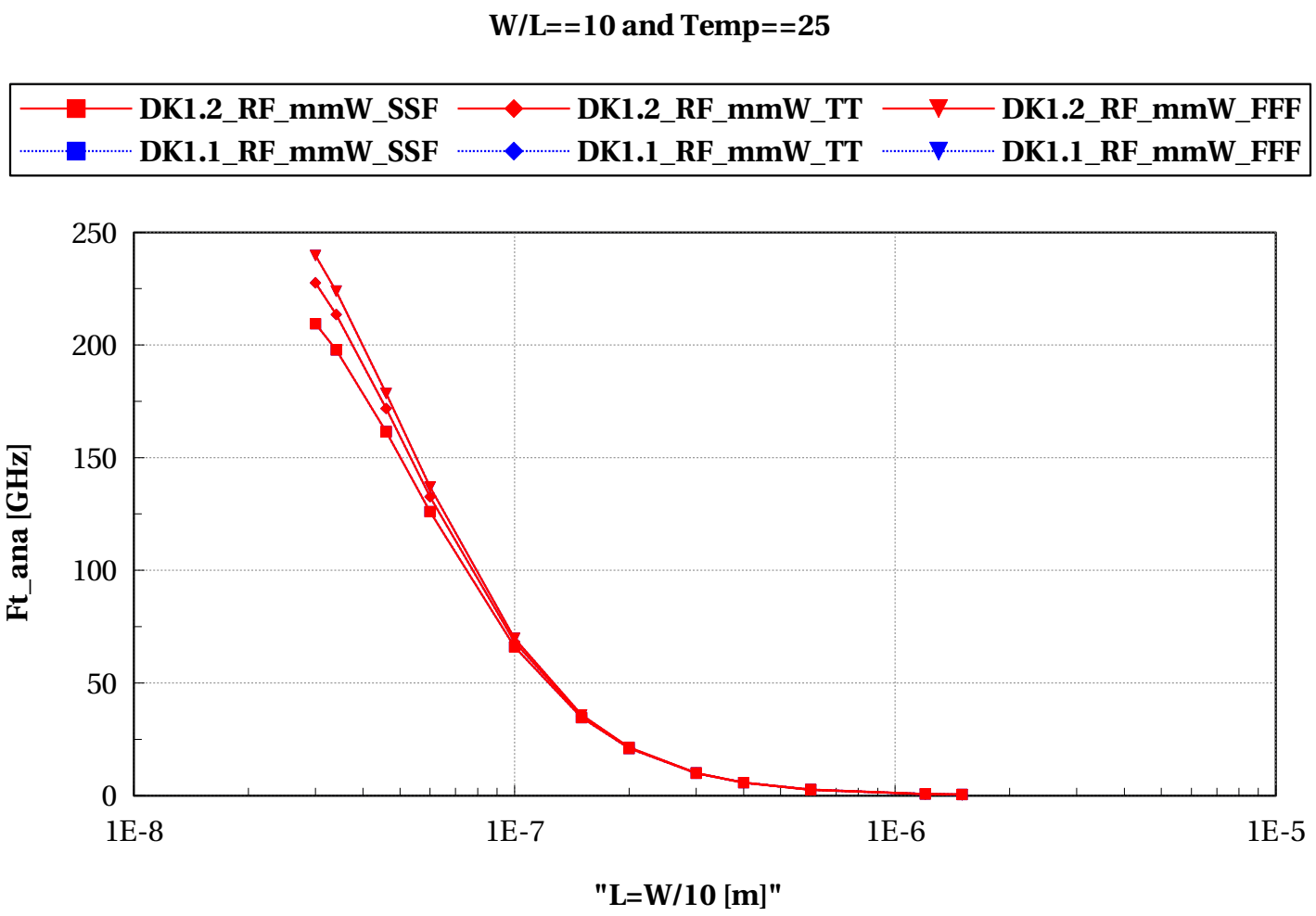
nfet_acc, GDC_ana [] vs "L=W/10 [m]"



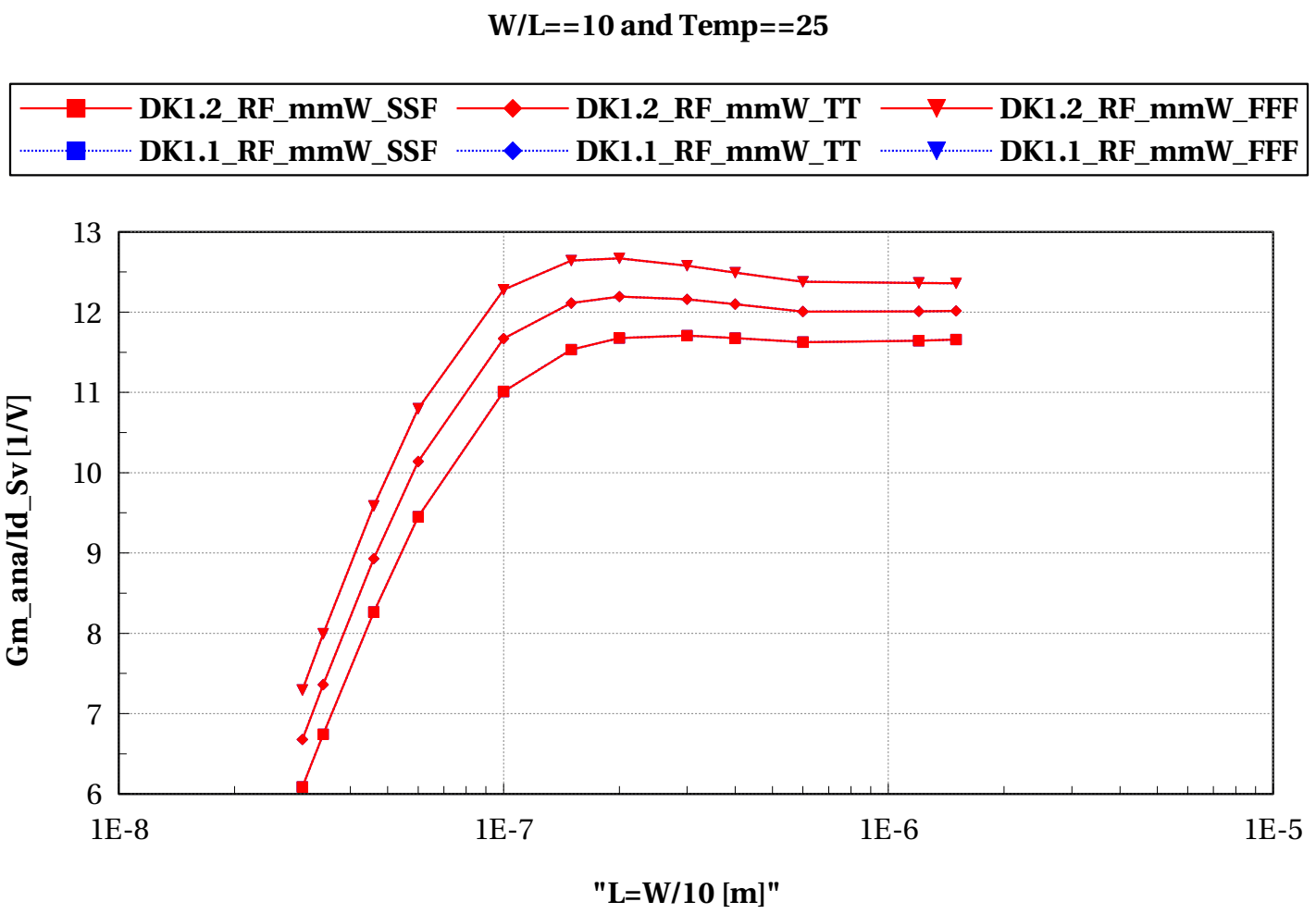
nfet_acc, GBW_QS [GHz] vs "L=W/10 [m]"



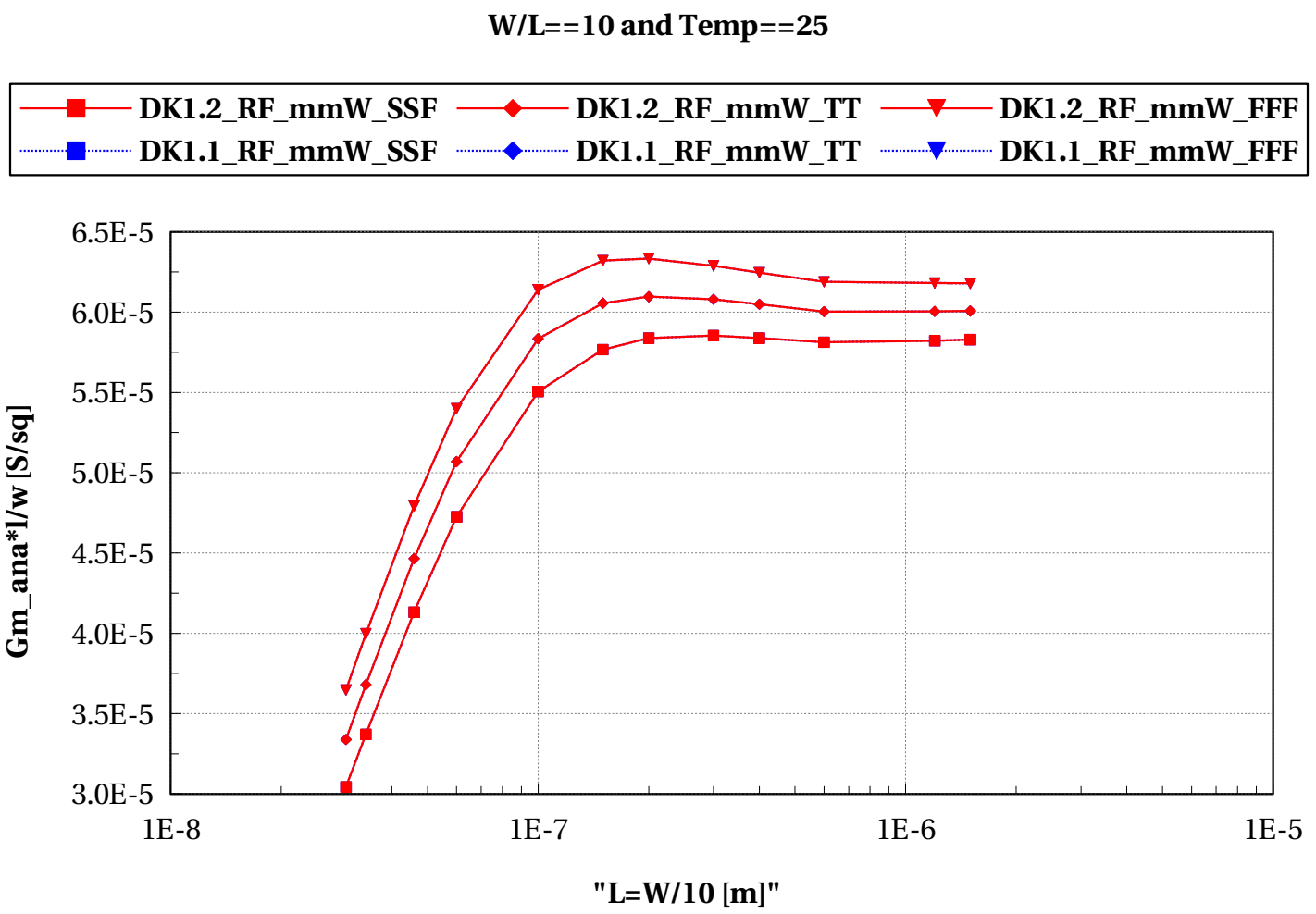
nfet_acc, Ft_ana [GHz] vs "L=W/10 [m]"



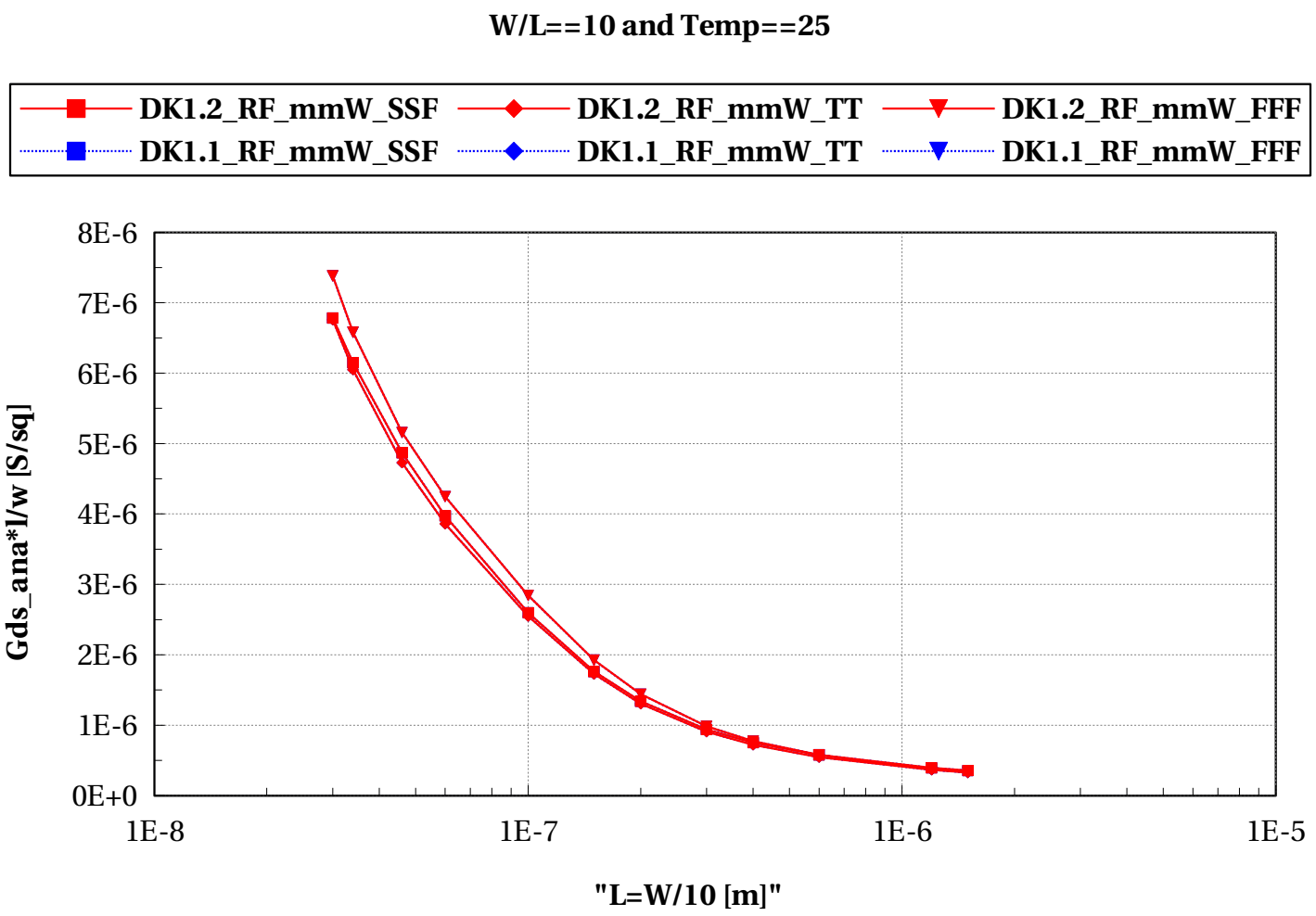
nfet_acc, Gm_ana/Id_Sv [1/V] vs "L=W/10 [m]"



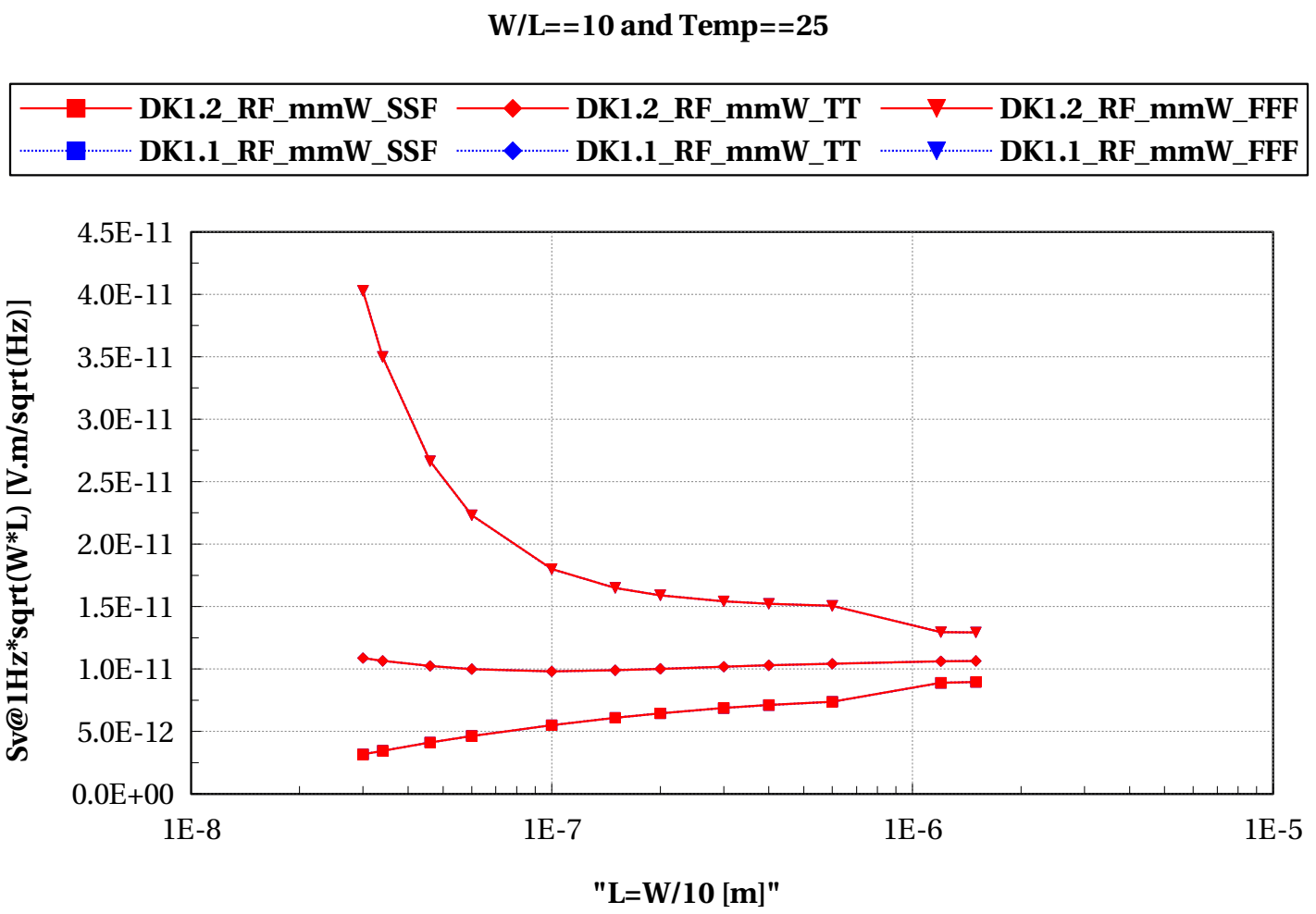
nfet_acc, Gm_ana*l/w [S/sq] vs "L=W/10 [m]"



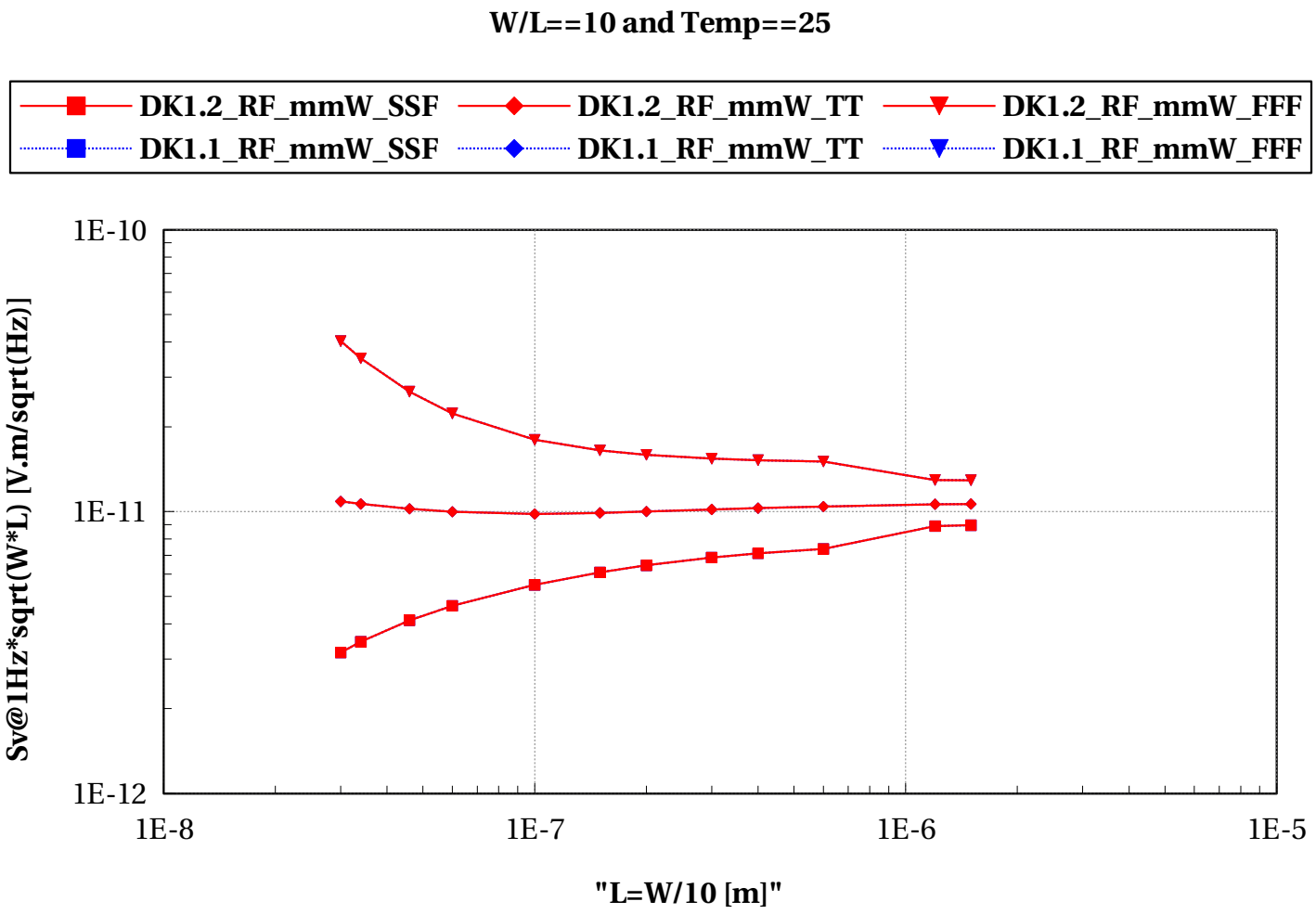
nfet_acc, Gds_ana*l/w [S/sq] vs "L=W/10 [m]"



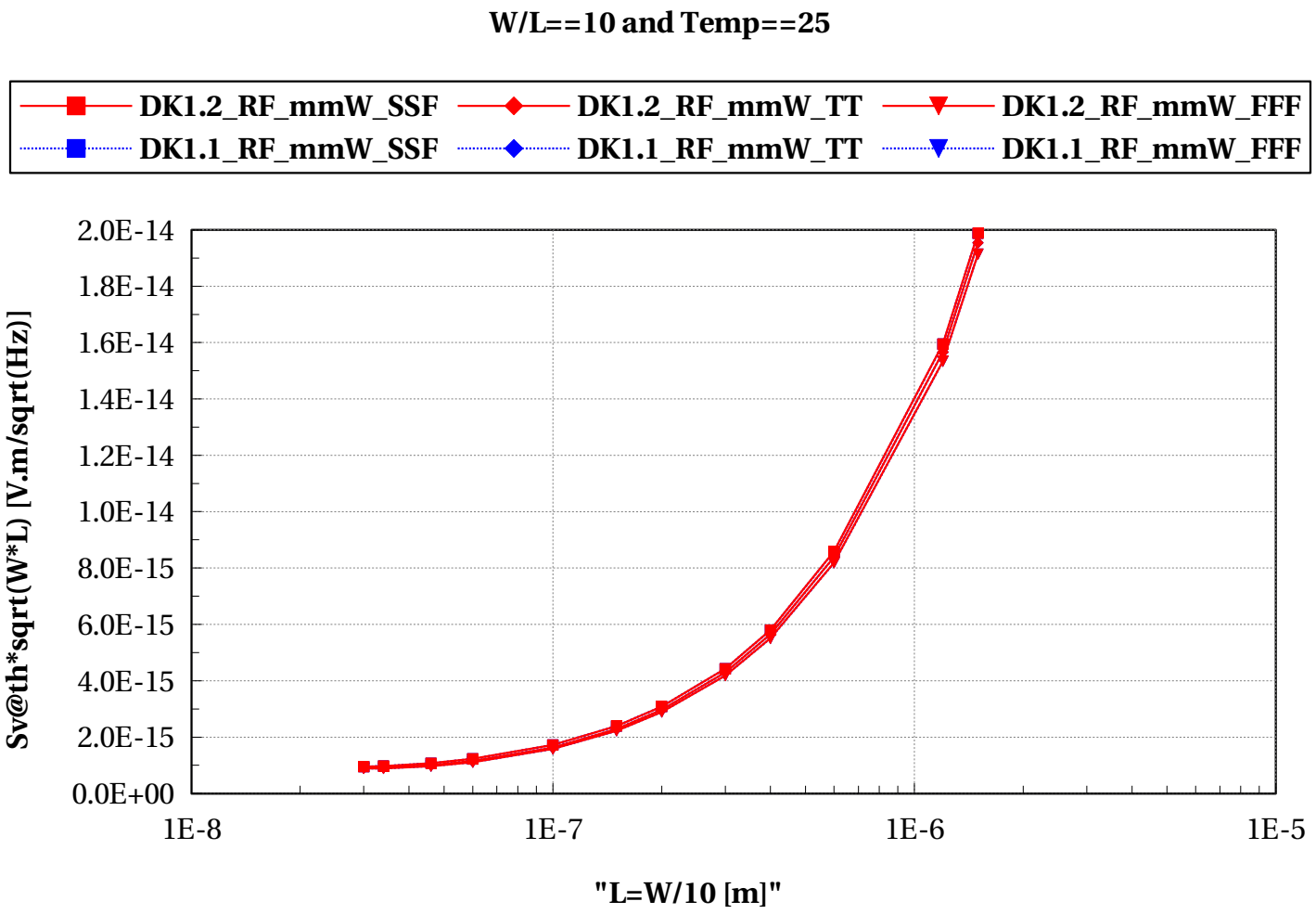
nfet_acc, Sv@1Hz*sqrt(W*L) [V.m/sqrt(Hz)] vs "L=W/10 [m]"



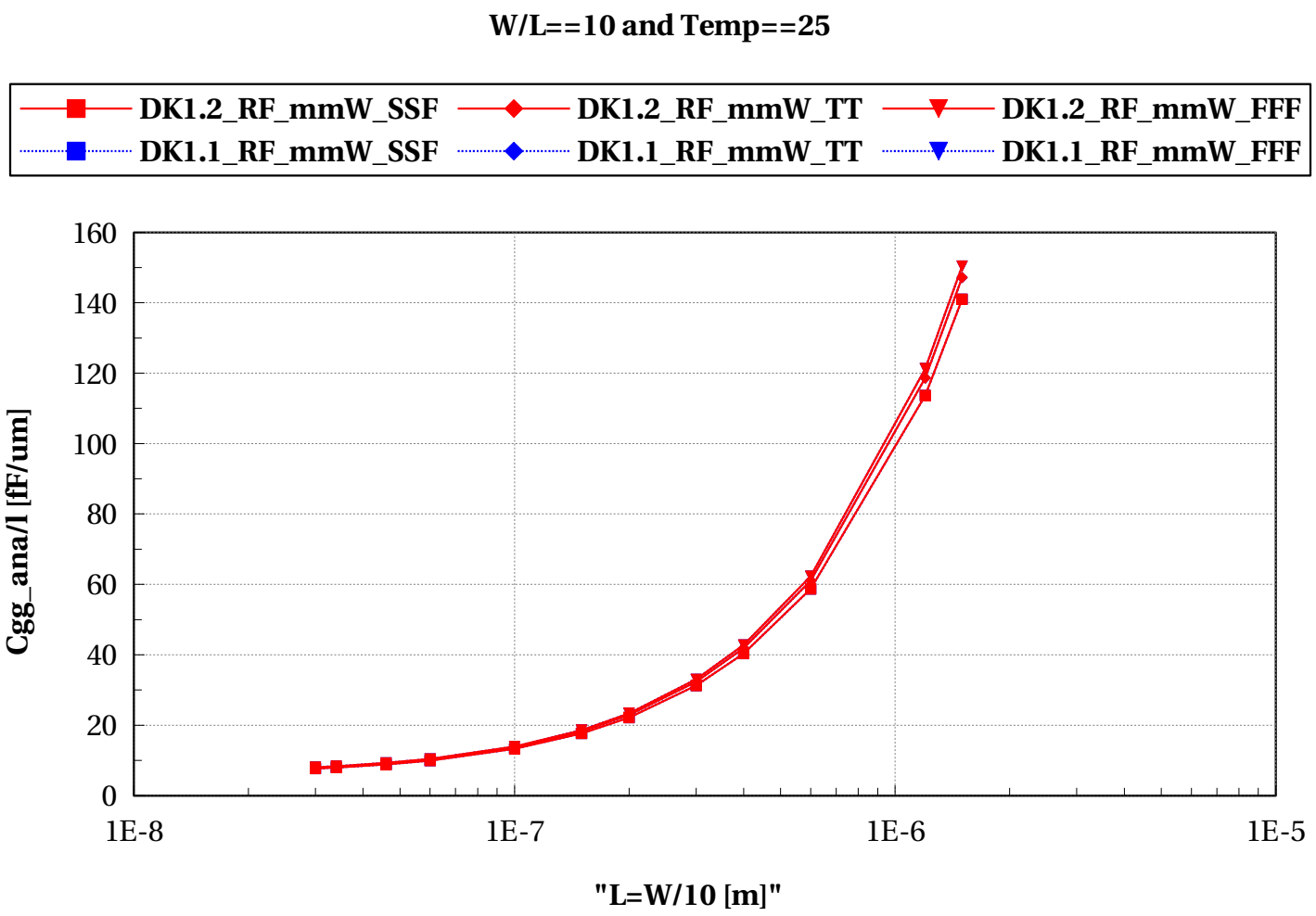
nfet_acc, Sv@1Hz*sqrt(W*L) [V.m/sqrt(Hz)] vs "L=W/10 [m]"



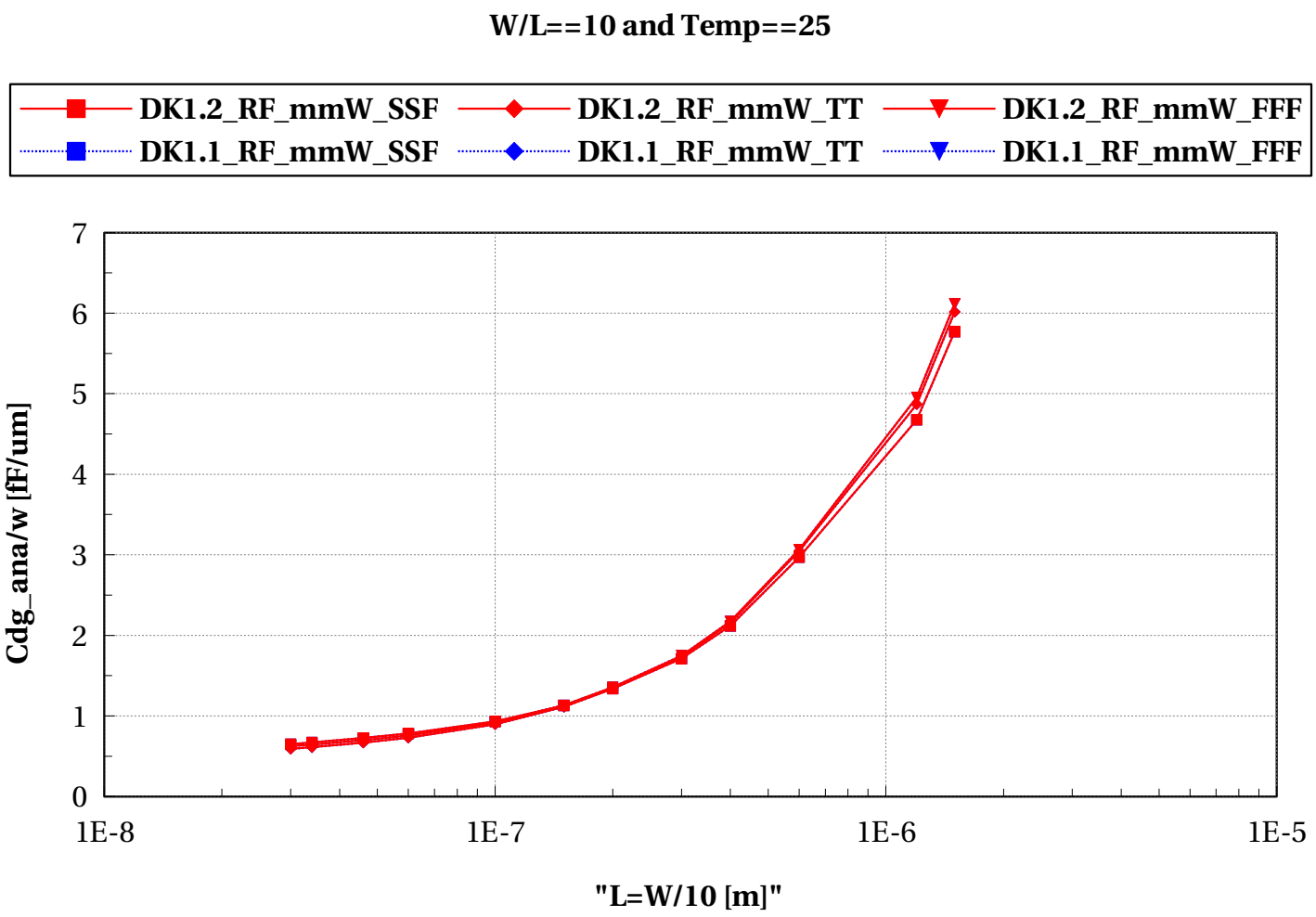
nfet_acc, Sv@th*sqrt(W*L) [V.m/sqrt(Hz)] vs "L=W/10 [m]"



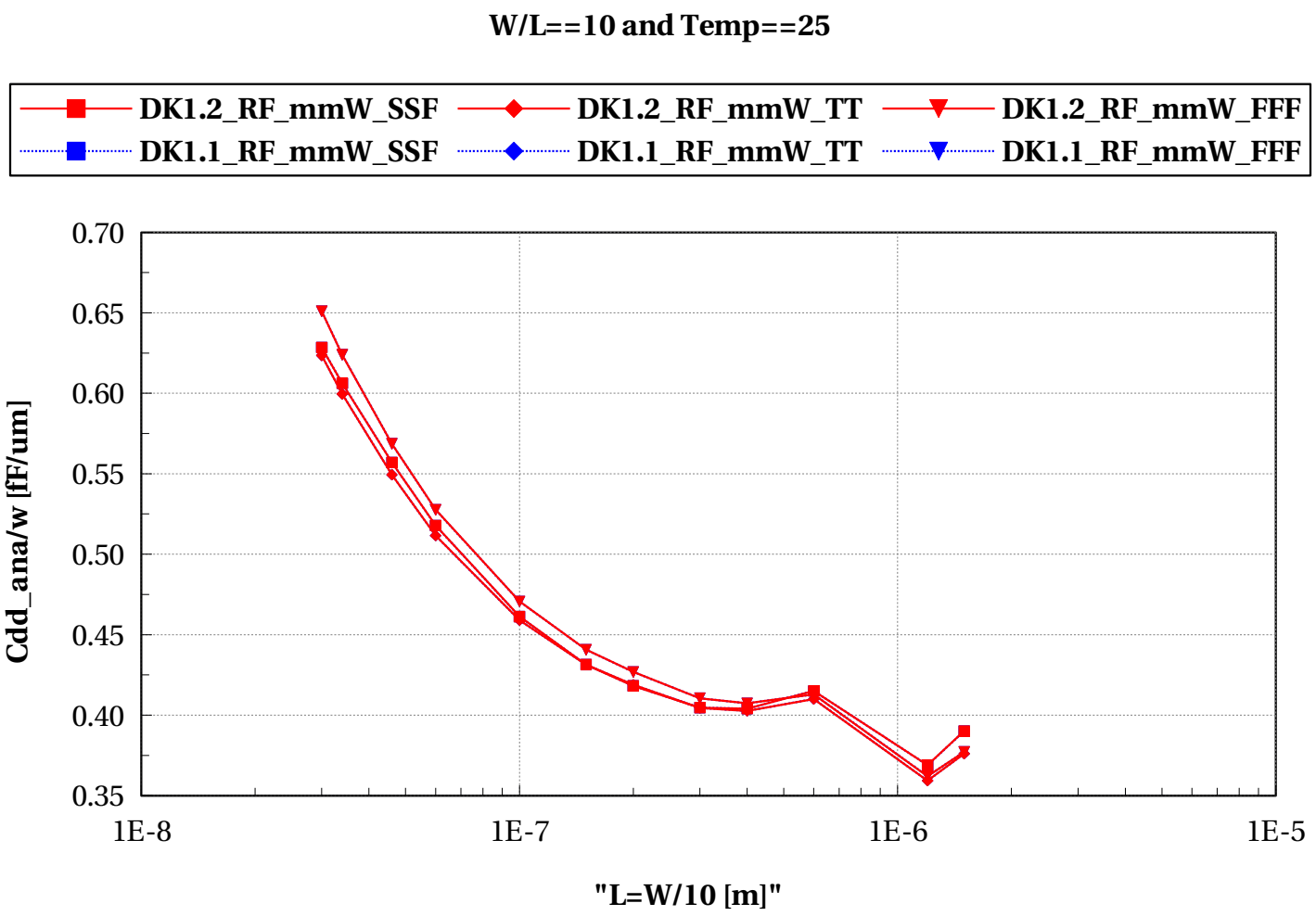
nfet_acc, Cgg_ana/l [fF/um] vs "L=W/10 [m]"



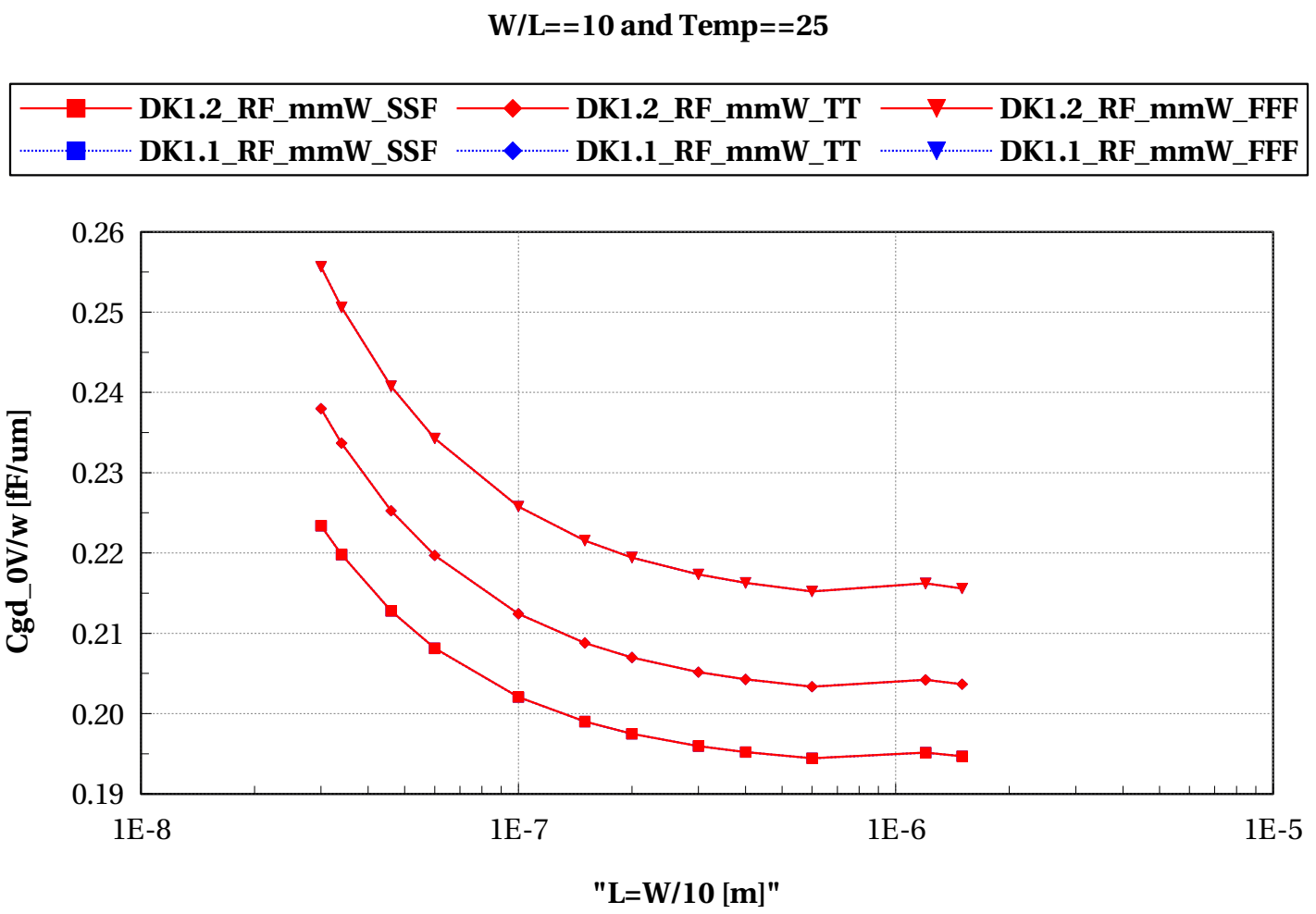
nfet_acc, Cdg_ana/w [fF/um] vs "L=W/10 [m]"



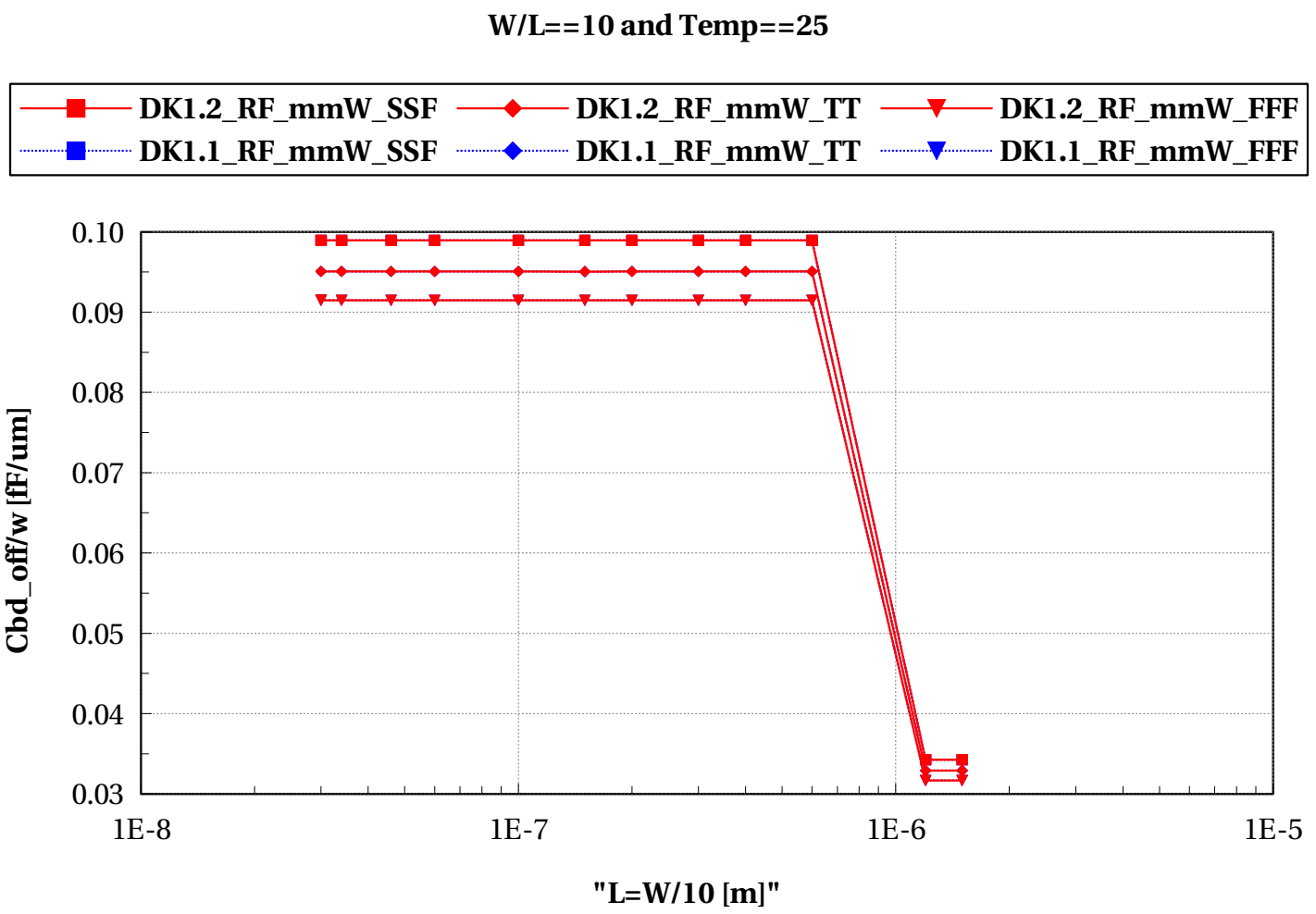
nfet_acc, Cdd_ana/w [fF/um] vs "L=W/10 [m]"



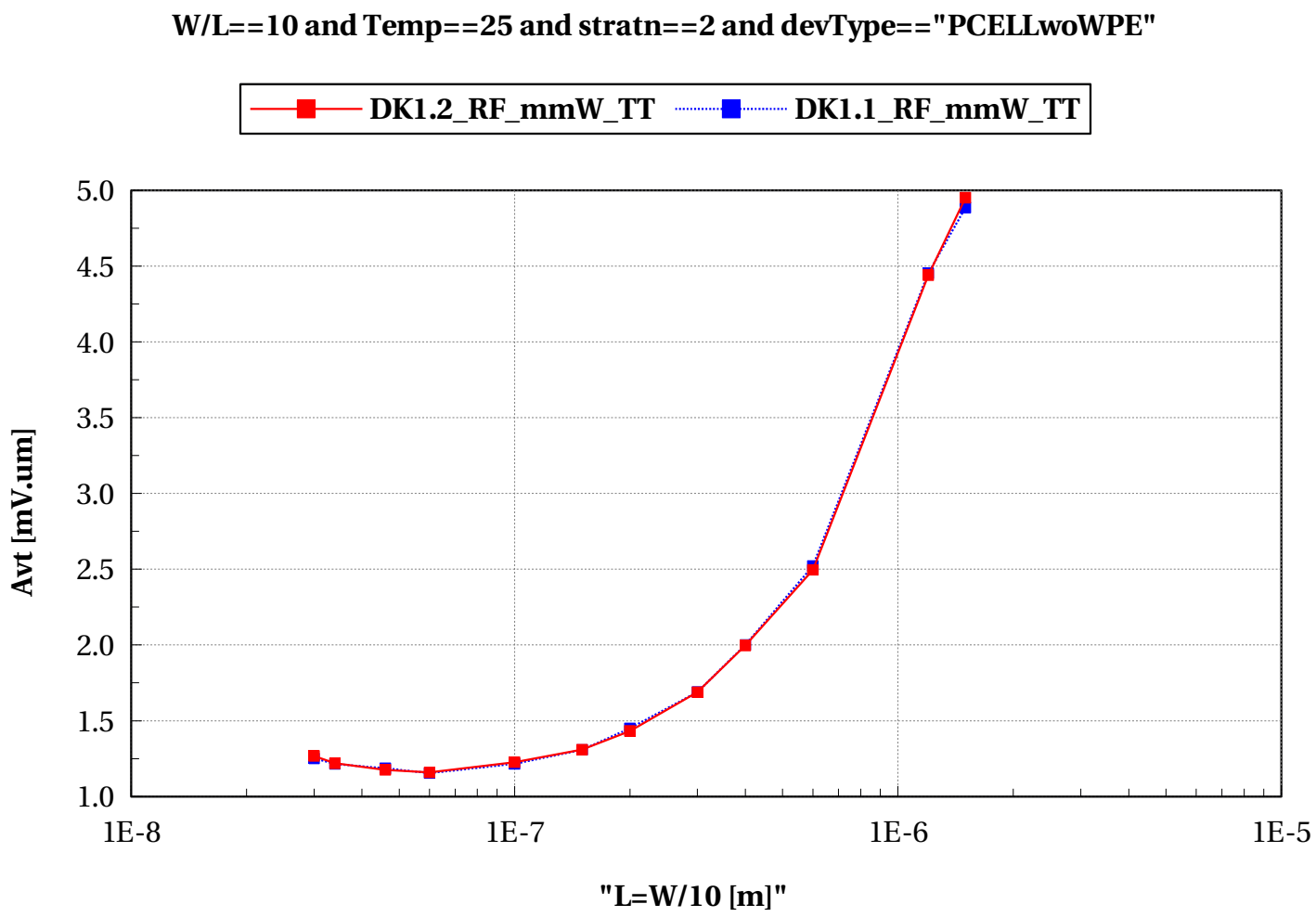
nfet_acc, Cgd_0V/w [fF/um] vs "L=W/10 [m]"



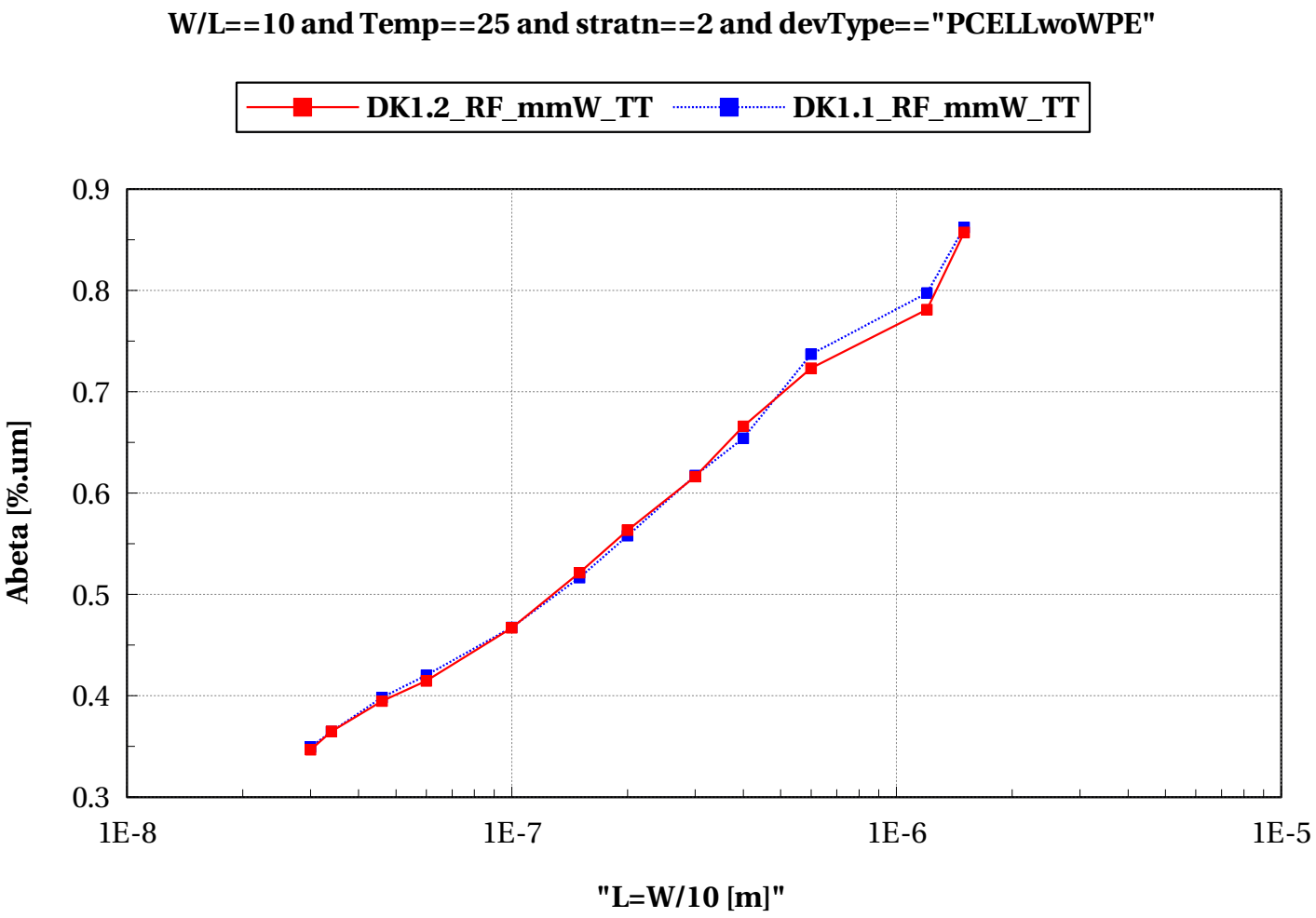
nfet_acc, Cbd_off/w [fF/um] vs "L=W/10 [m]"



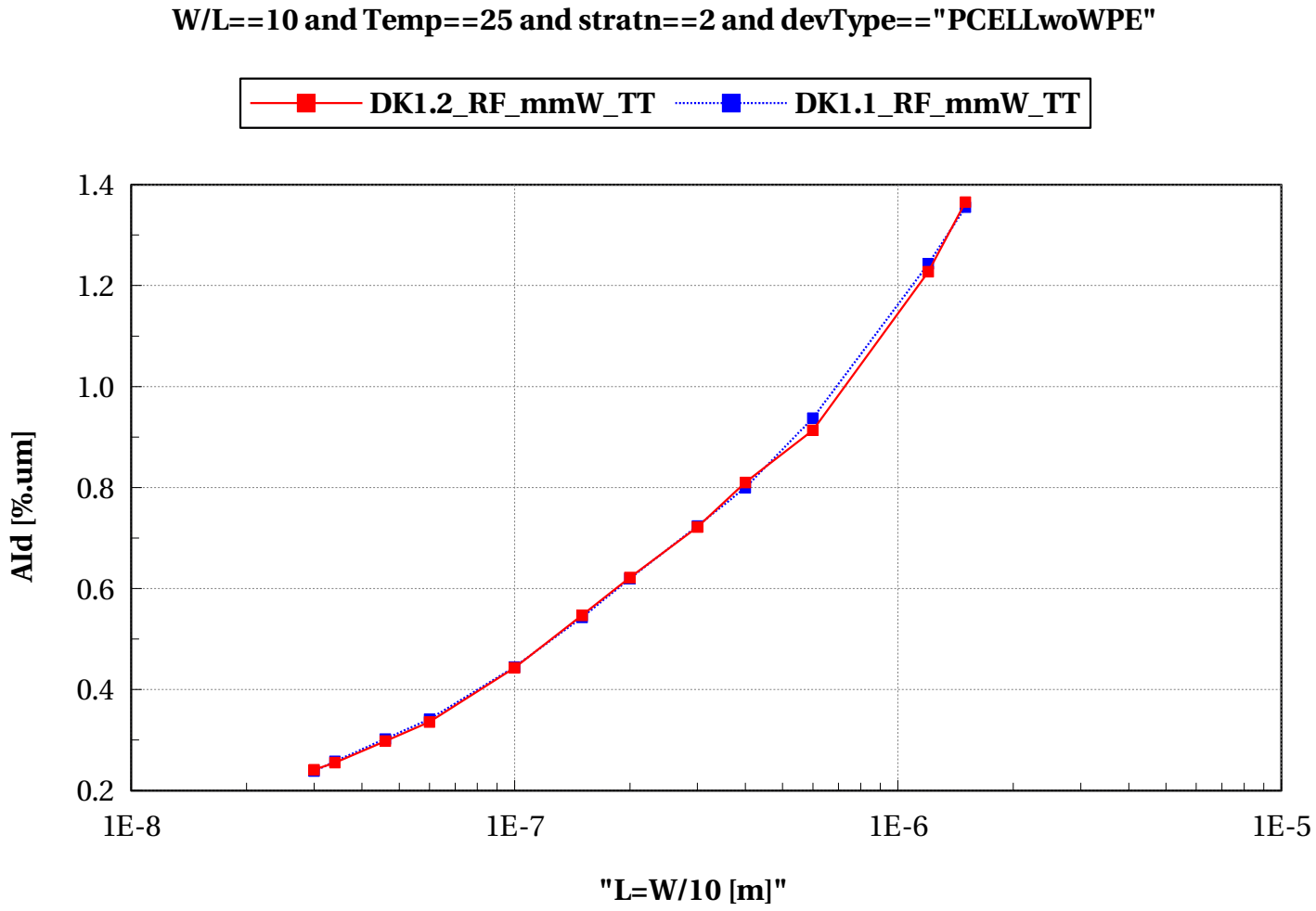
nfet_acc, Avt [mV.um] vs "L=W/10 [m]"



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



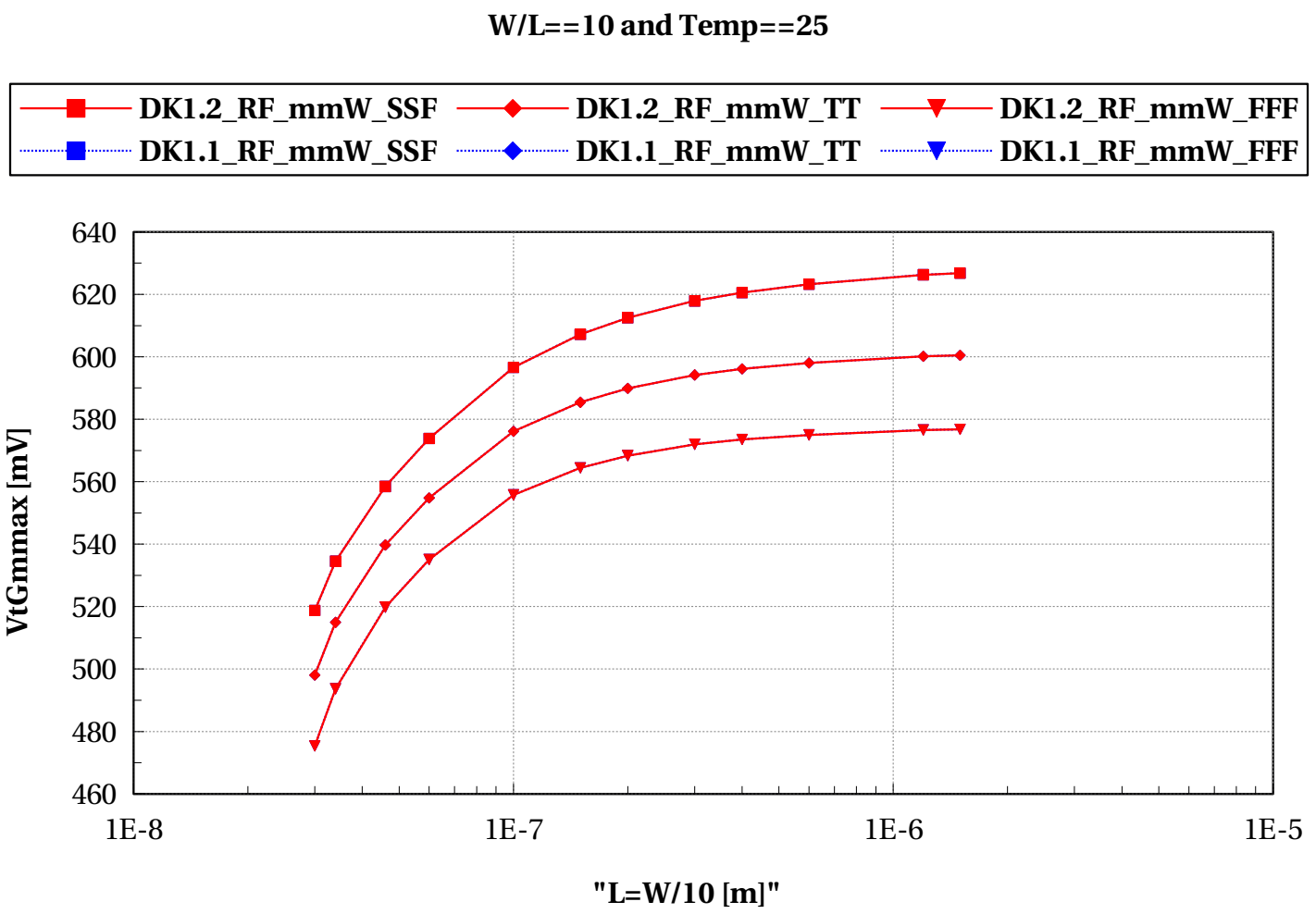
nfet_acc, AId [%.um] vs "L=W/10 [m]"



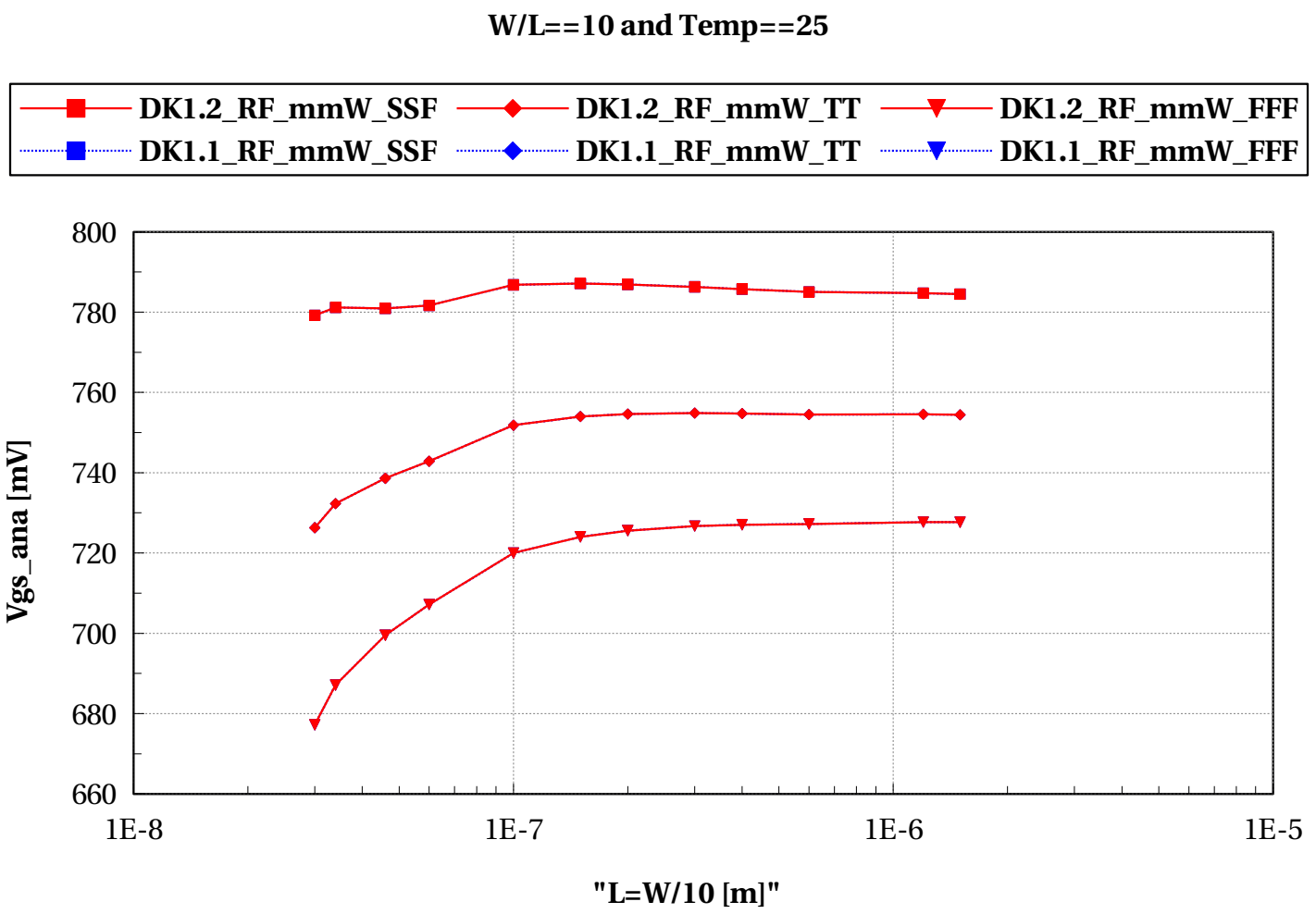
pfet_acc
Electrical characteristics scaling

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

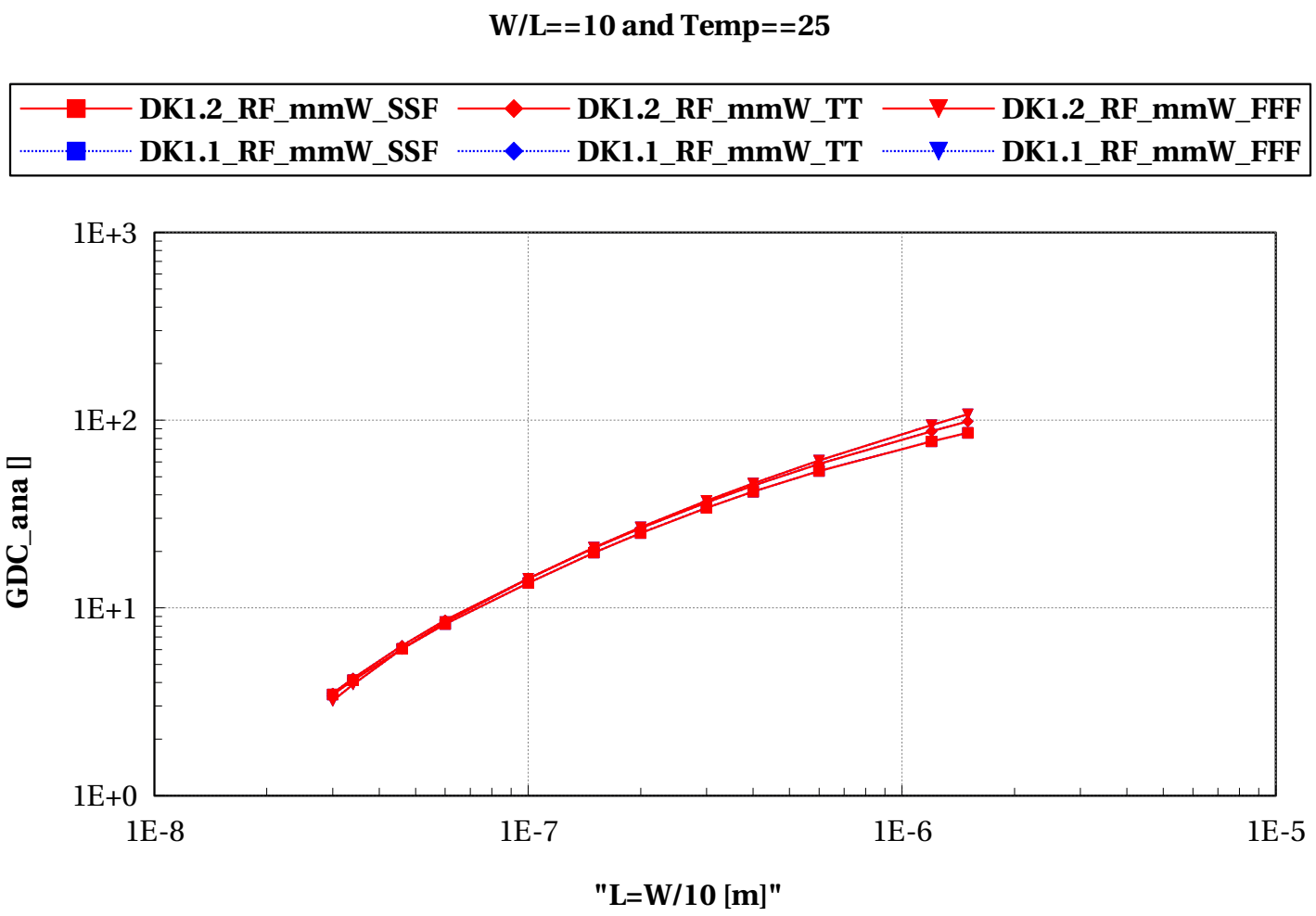
pfet_acc, VtGmmax [mV] vs "L=W/10 [m]"



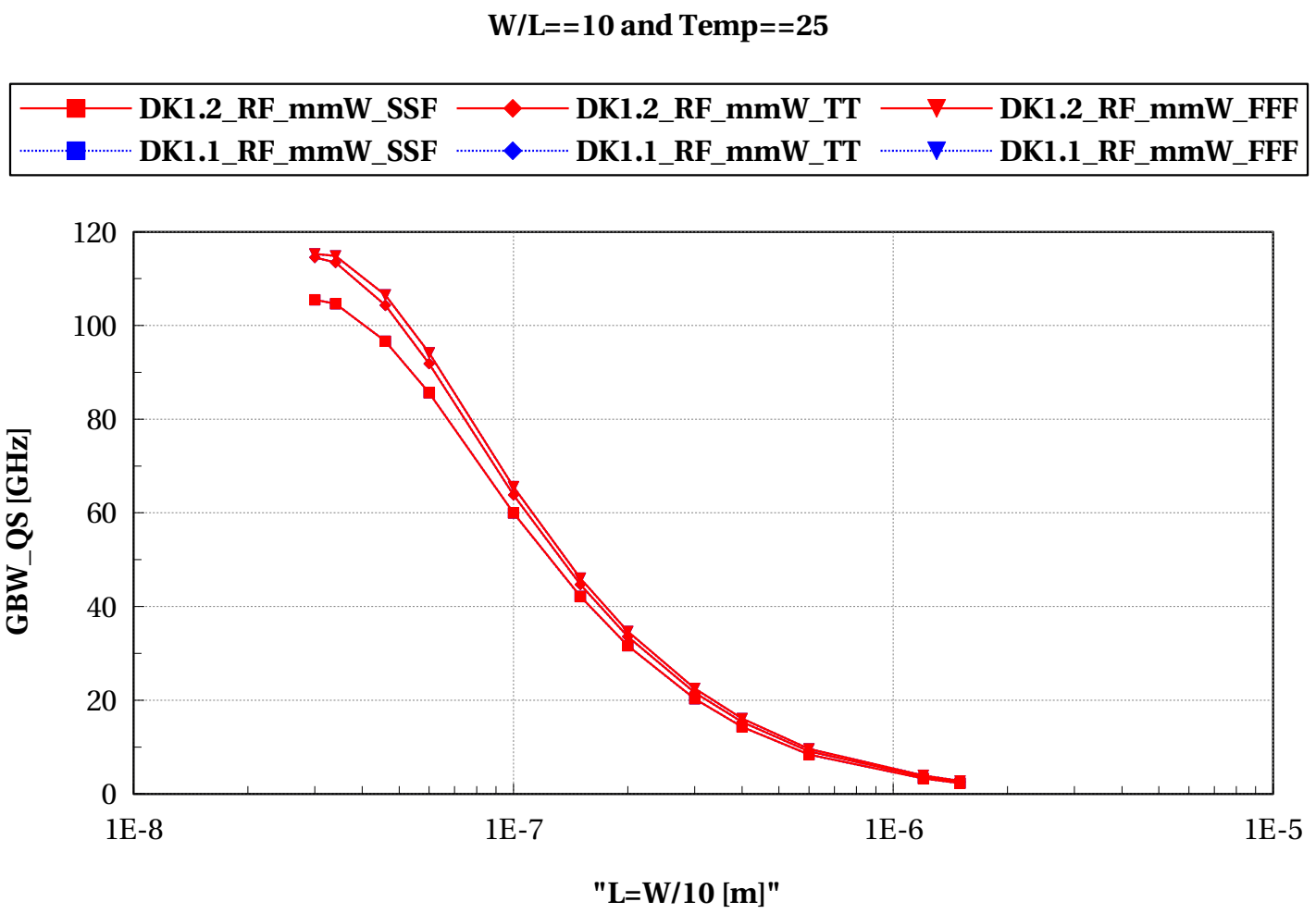
pfet_acc, Vgs_ana [mV] vs "L=W/10 [m]"



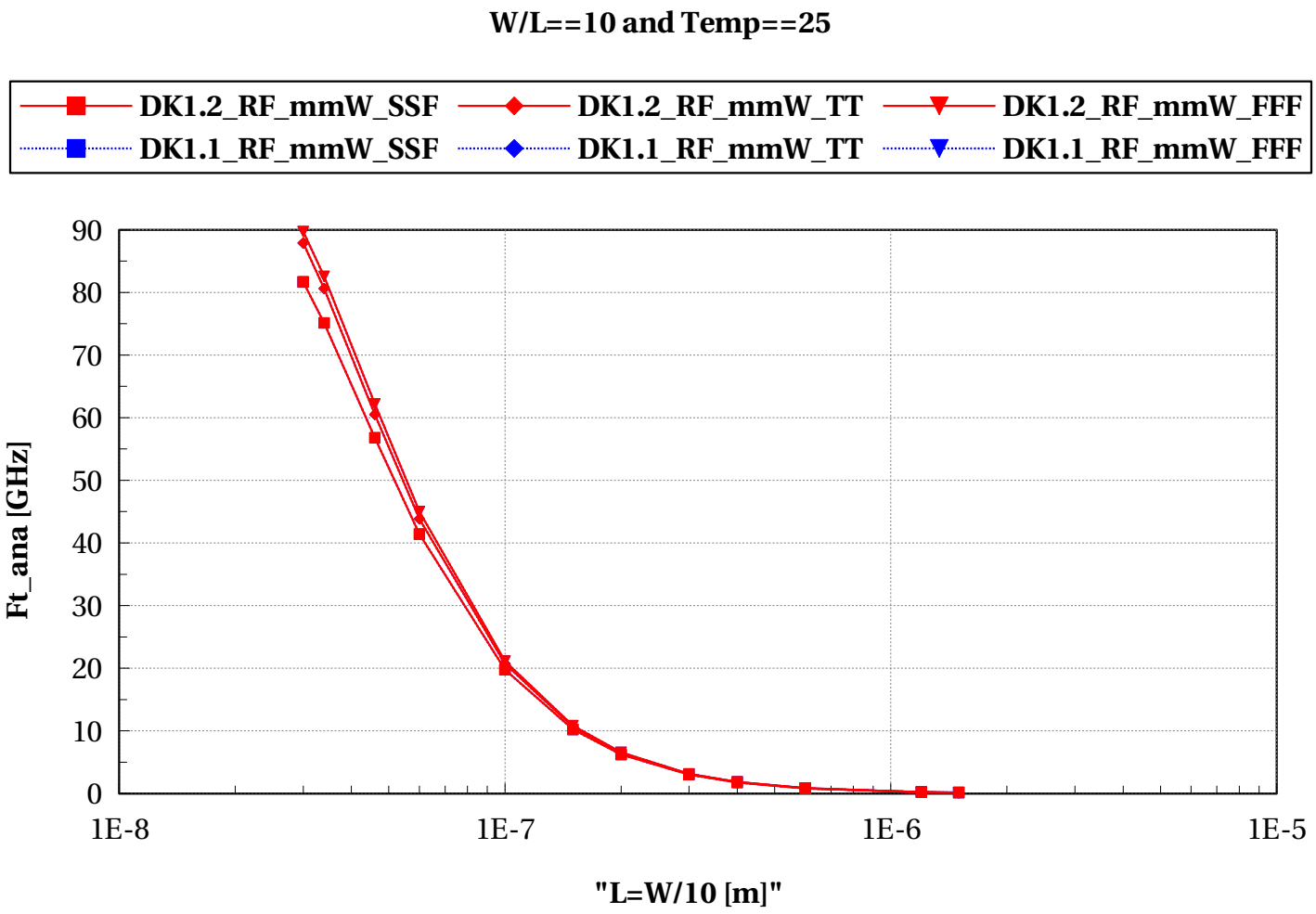
pfet_acc, GDC_ana [] vs "L=W/10 [m]"



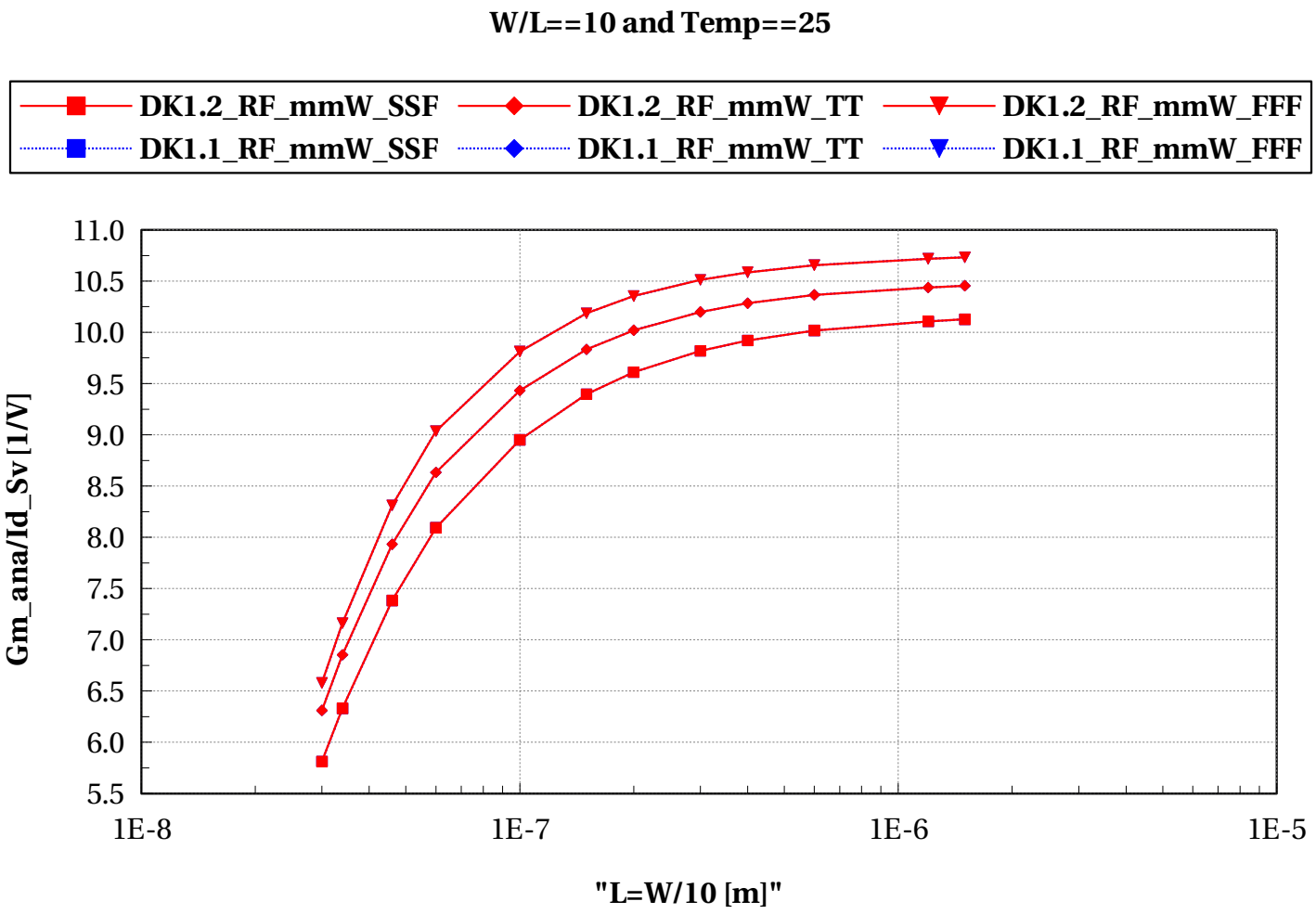
pfet_acc, GBW_QS [GHz] vs "L=W/10 [m]"



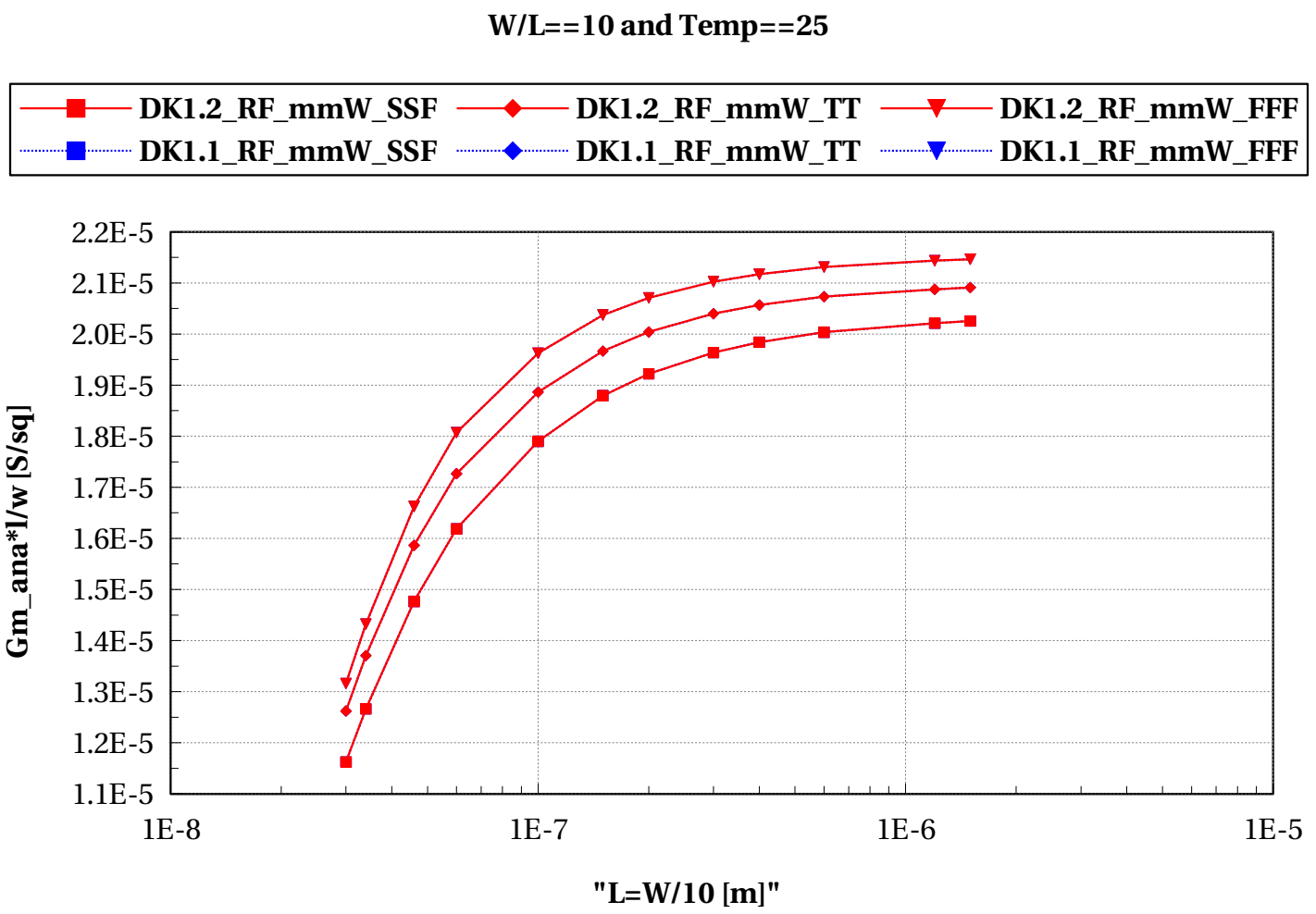
pfet_acc, Ft_ana [GHz] vs "L=W/10 [m]"



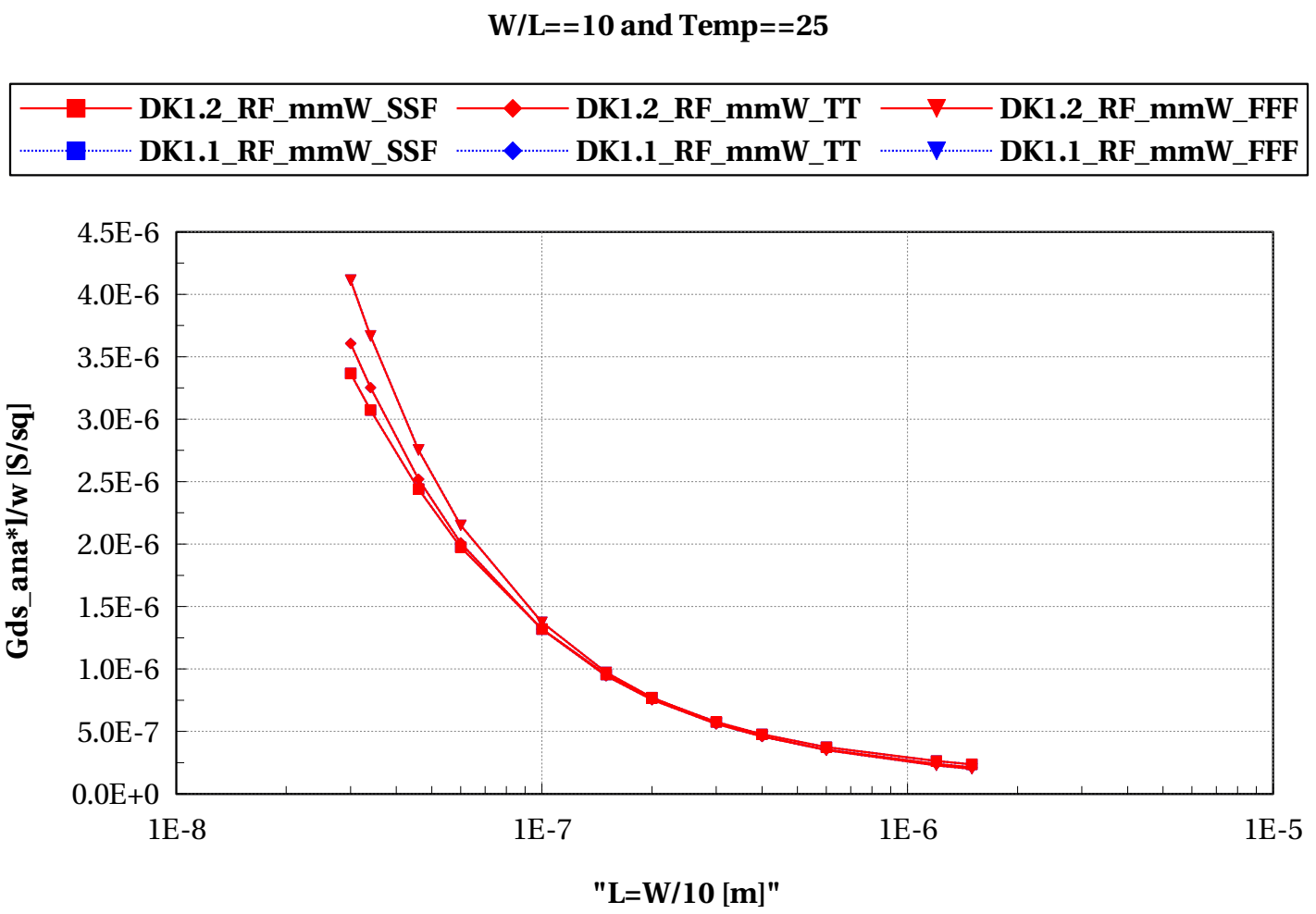
pfet_acc, Gm_ana/Id_Sv [1/V] vs "L=W/10 [m]"



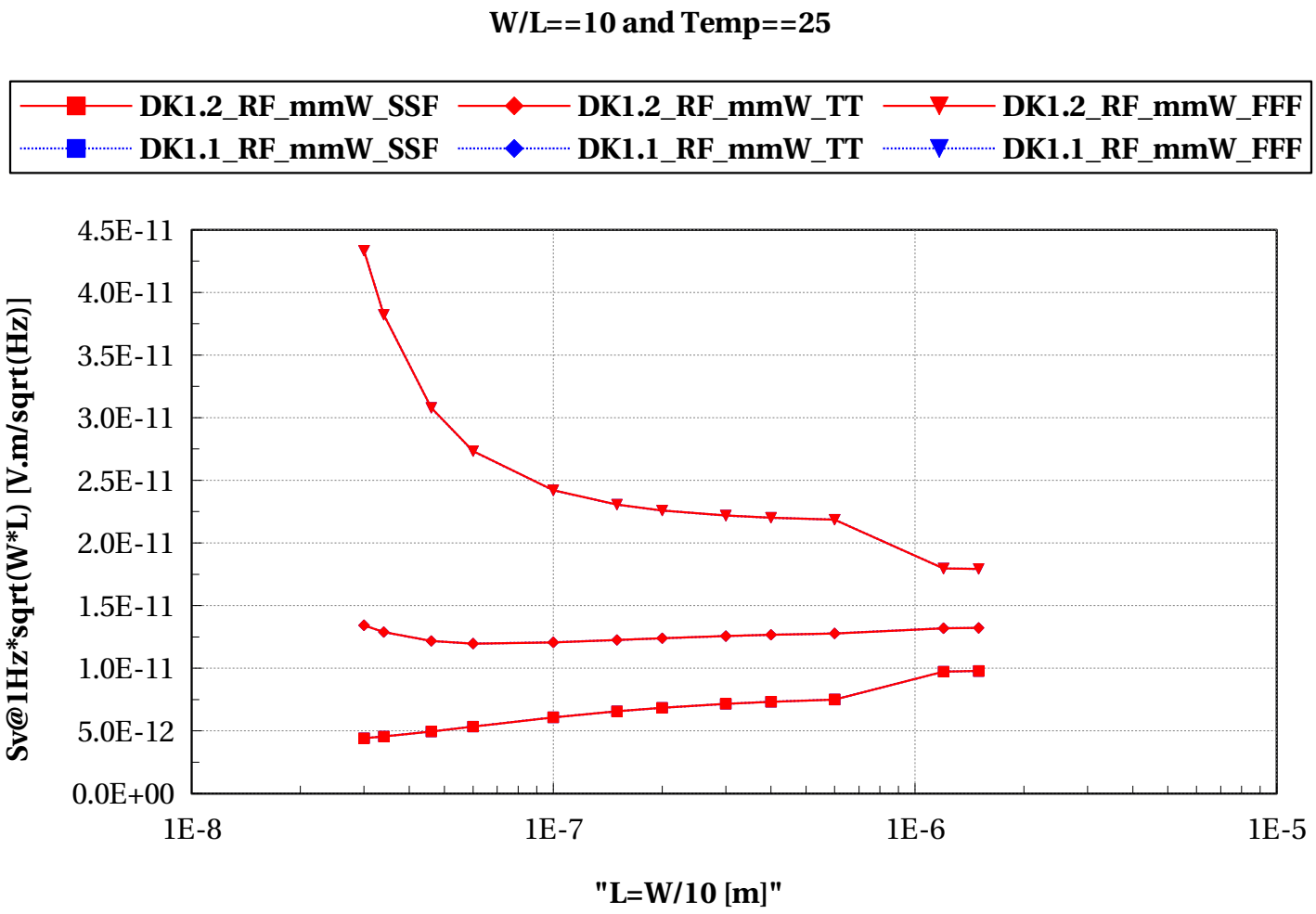
pfet_acc, Gm_ana*l/w [S/sq] vs "L=W/10 [m]"



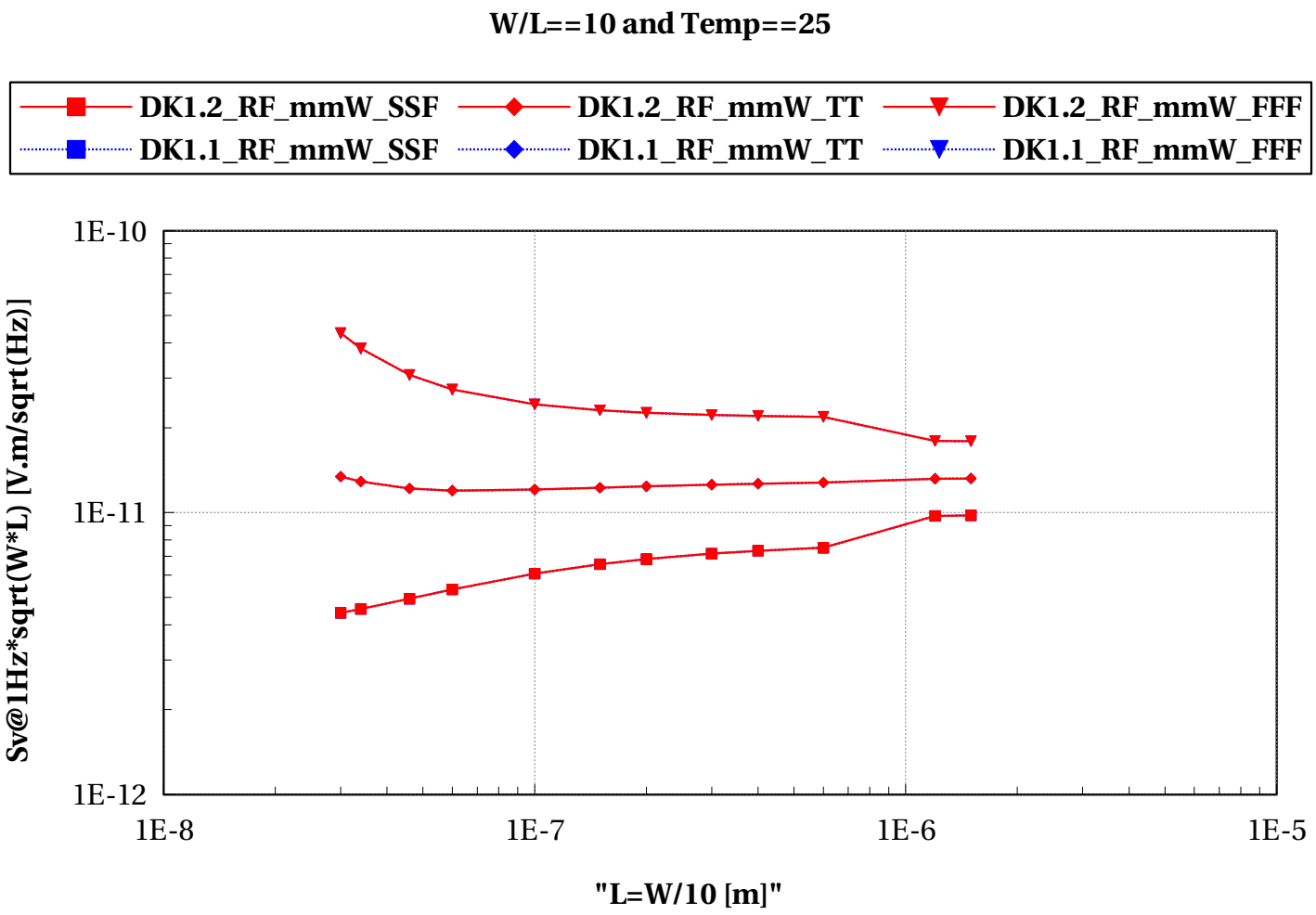
pfet_acc, Gds_ana*l/w [S/sq] vs "L=W/10 [m]"



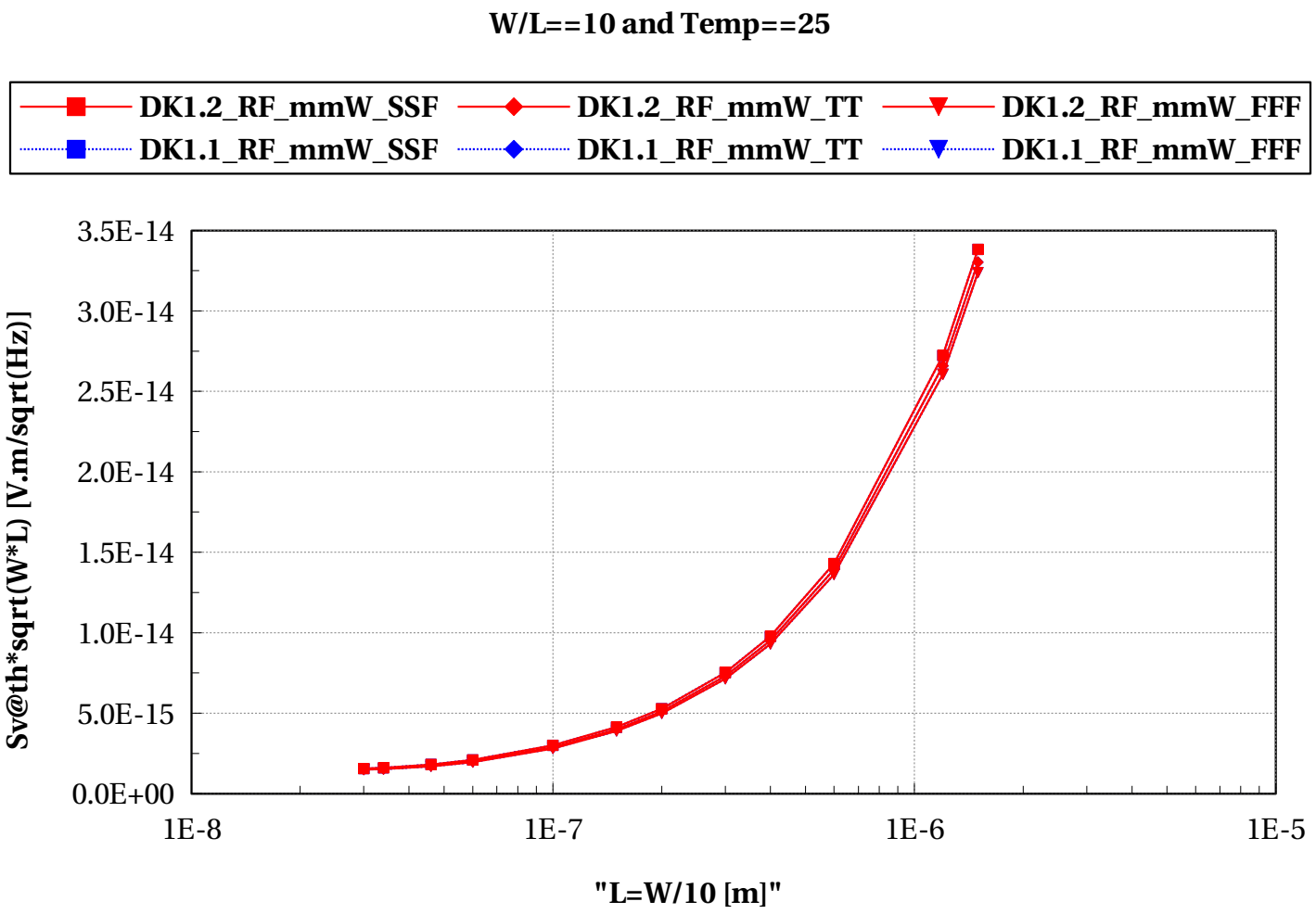
pfet_acc, Sv@1Hz*sqrt(W*L) [V.m/sqrt(Hz)] vs "L=W/10 [m]"



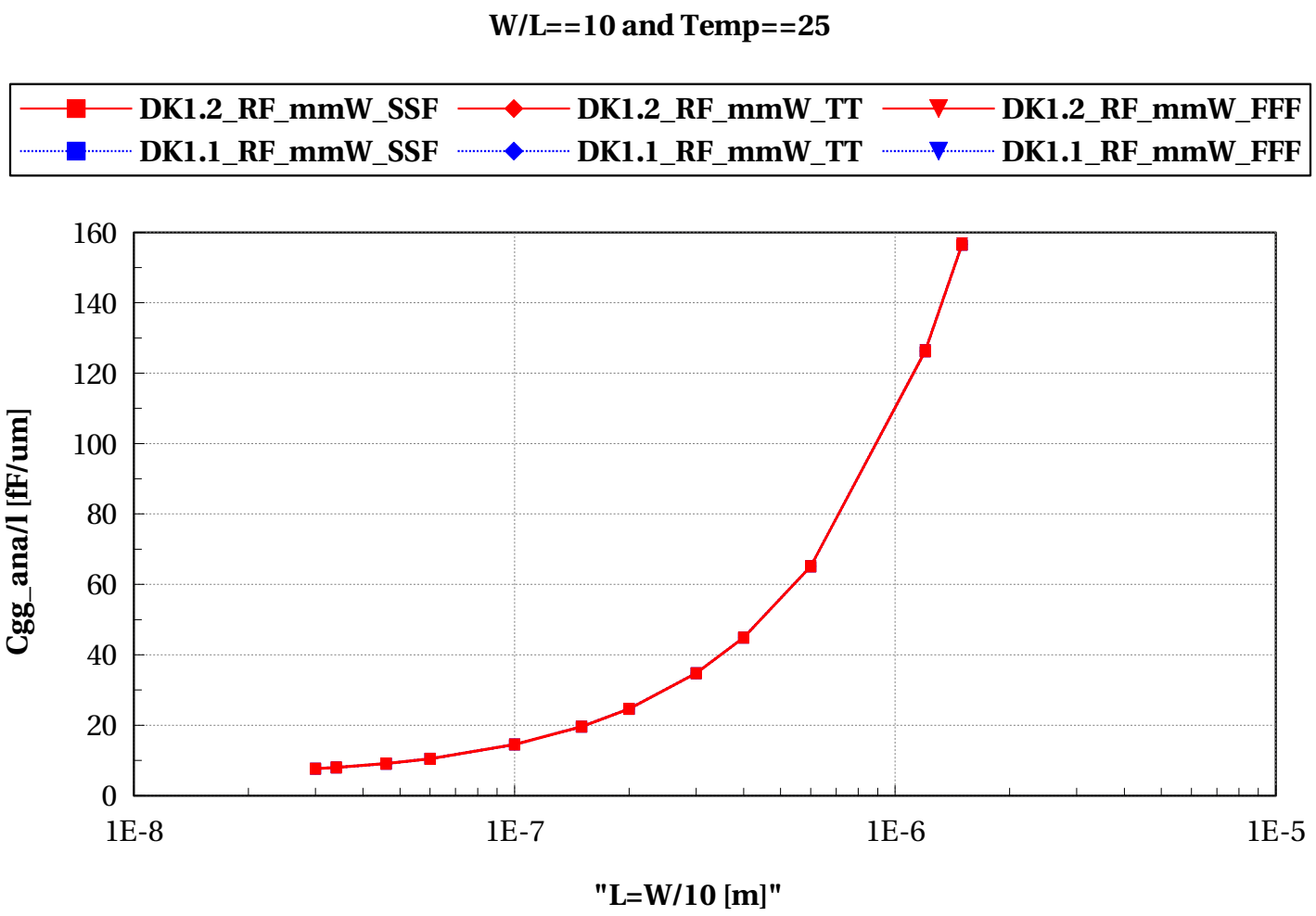
pfet_acc, Sv@1Hz*sqrt(W*L) [V.m/sqrt(Hz)] vs "L=W/10 [m]"



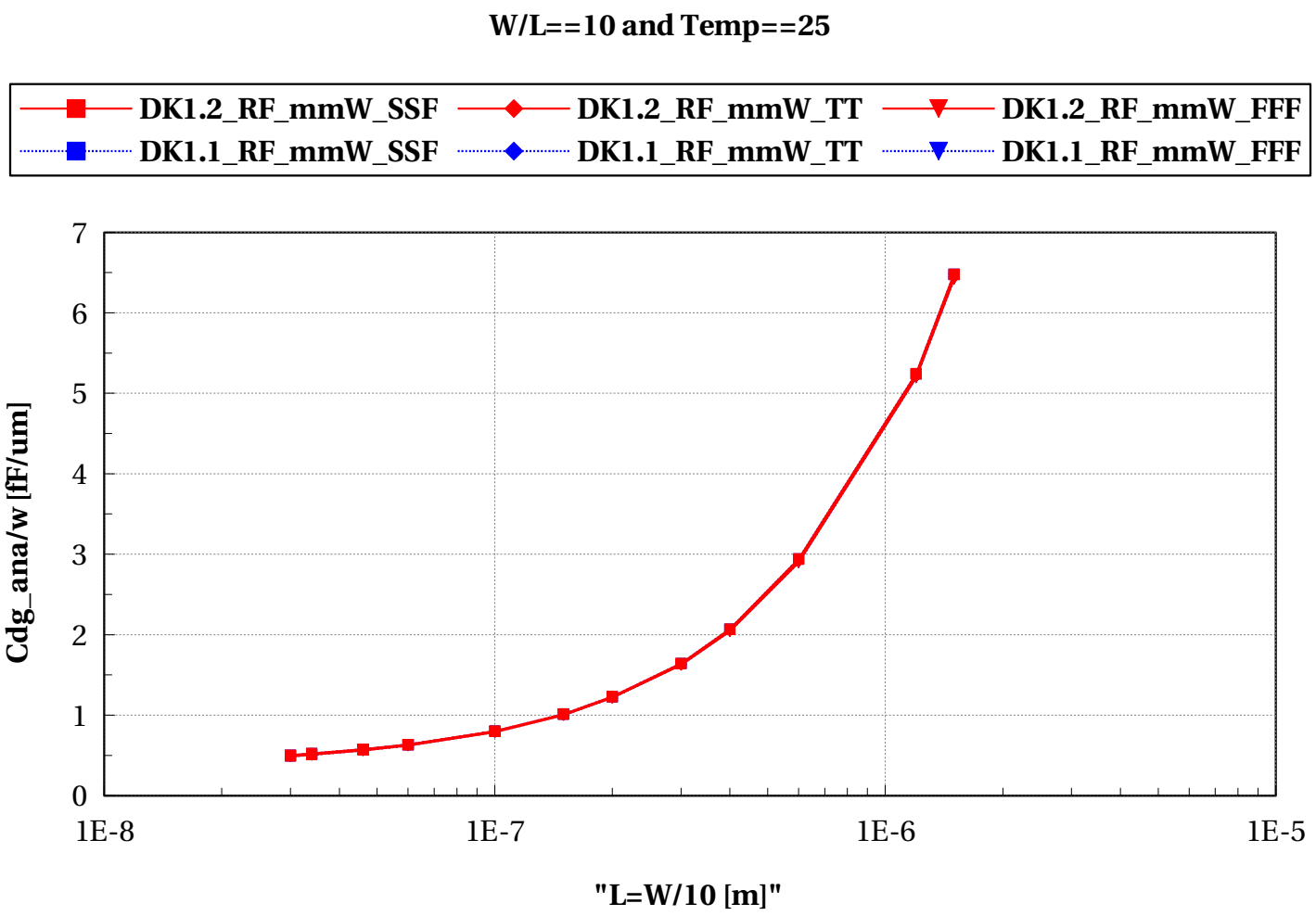
pfet_acc, Sv@th*sqrt(W*L) [V.m/sqrt(Hz)] vs "L=W/10 [m]"



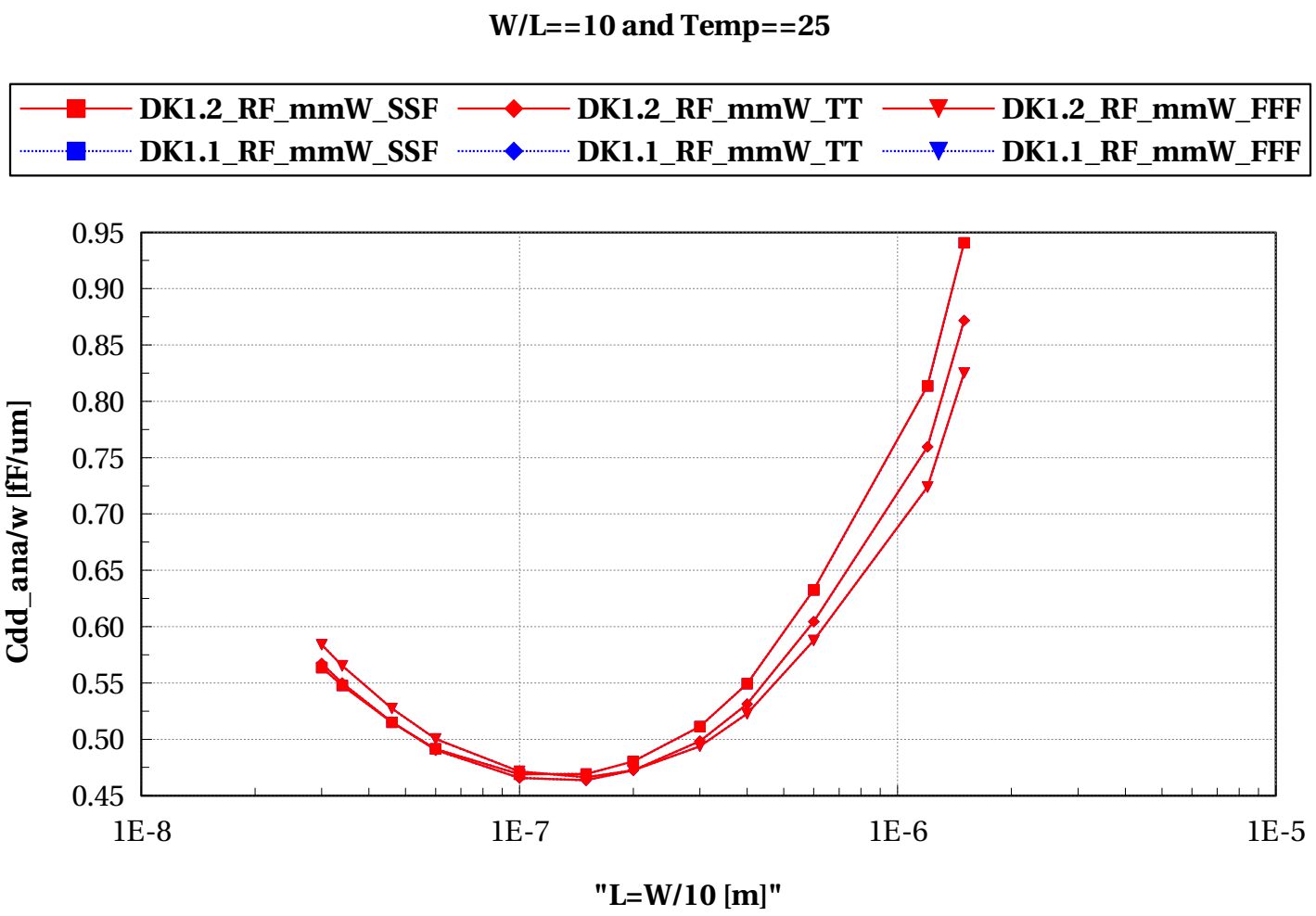
pfet_acc, Cgg_ana/l [fF/um] vs "L=W/10 [m]"



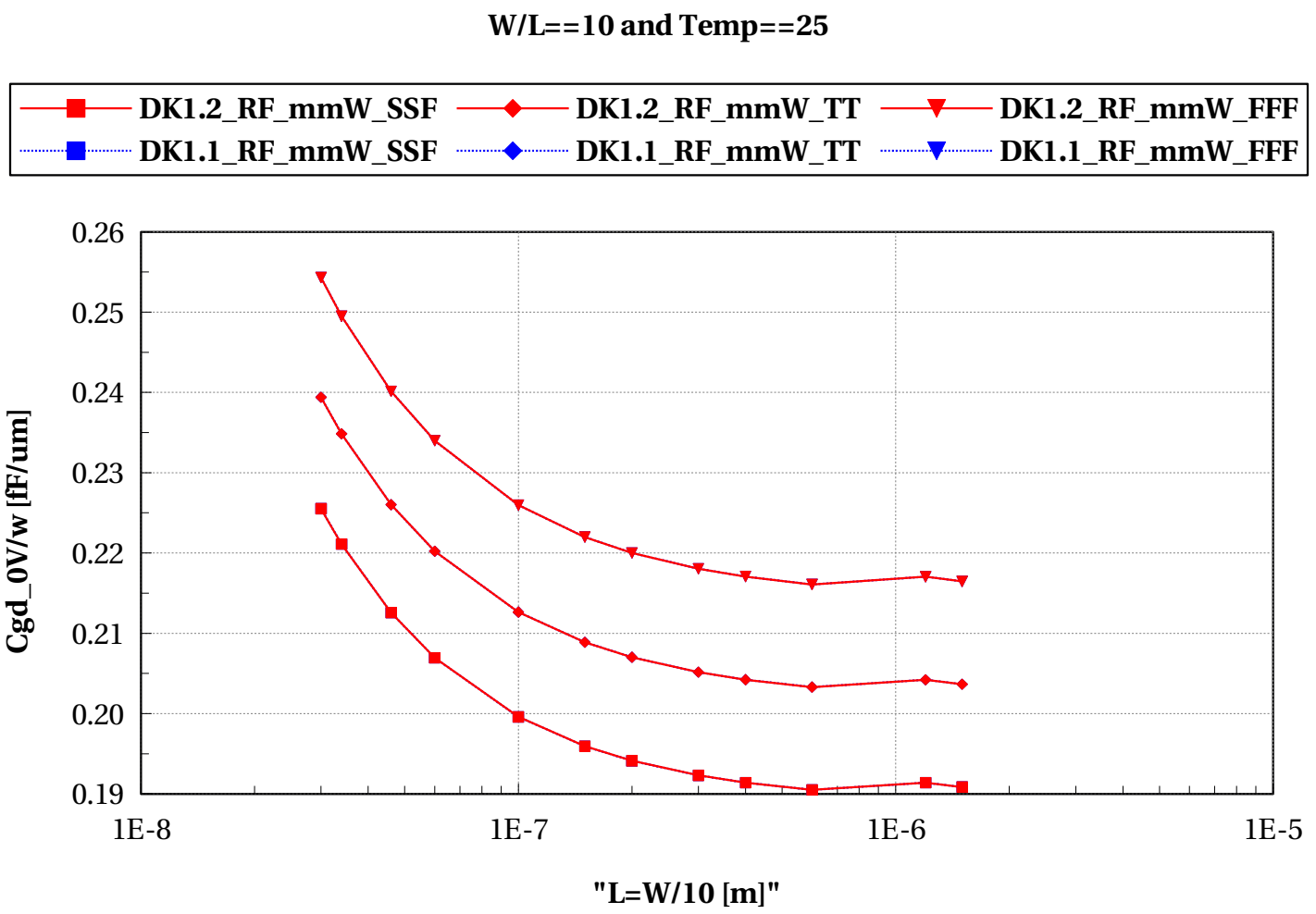
pfet_acc, Cdg_ana/w [fF/um] vs "L=W/10 [m]"



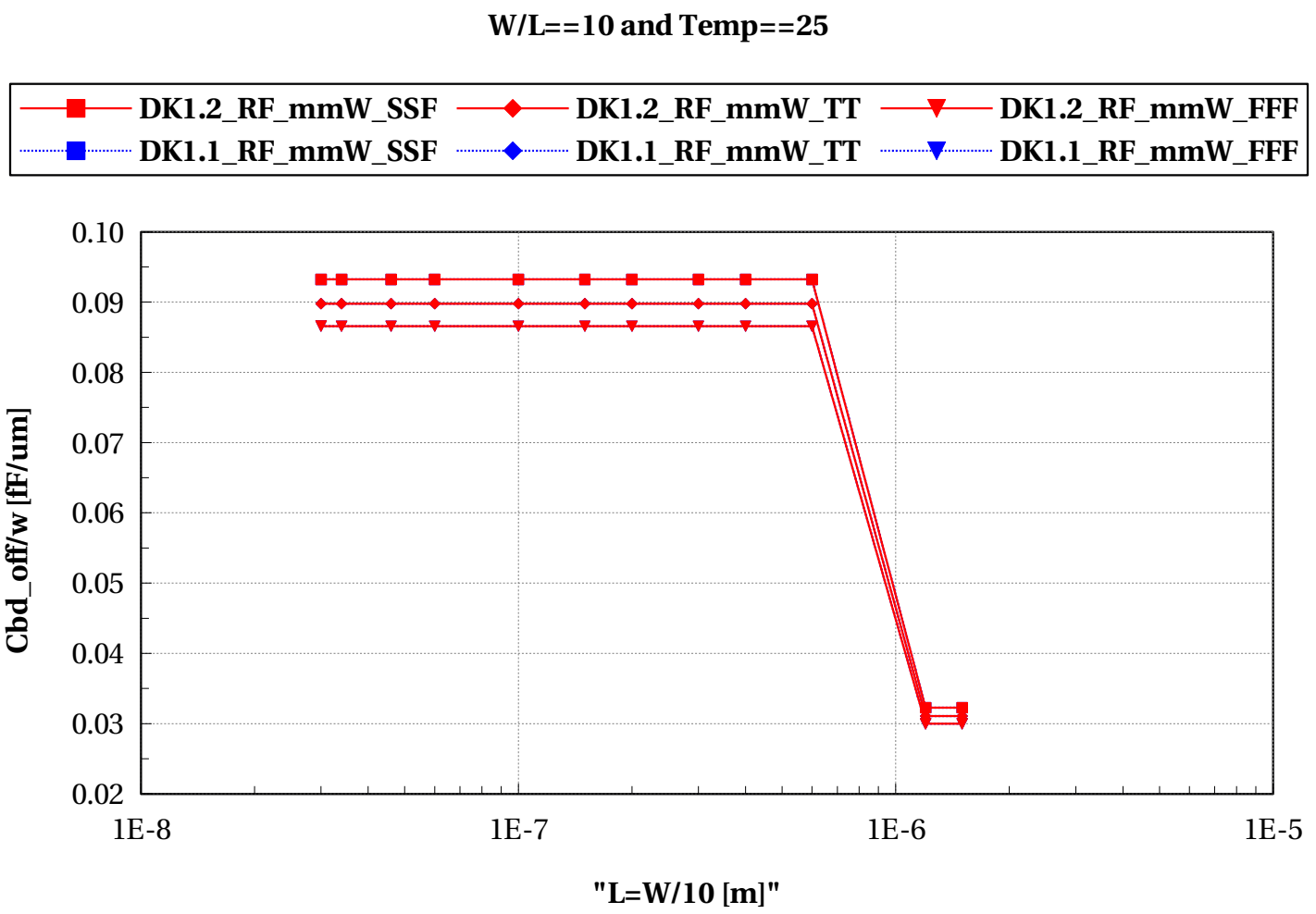
pfet_acc, Cdd_ana/w [fF/um] vs "L=W/10 [m]"



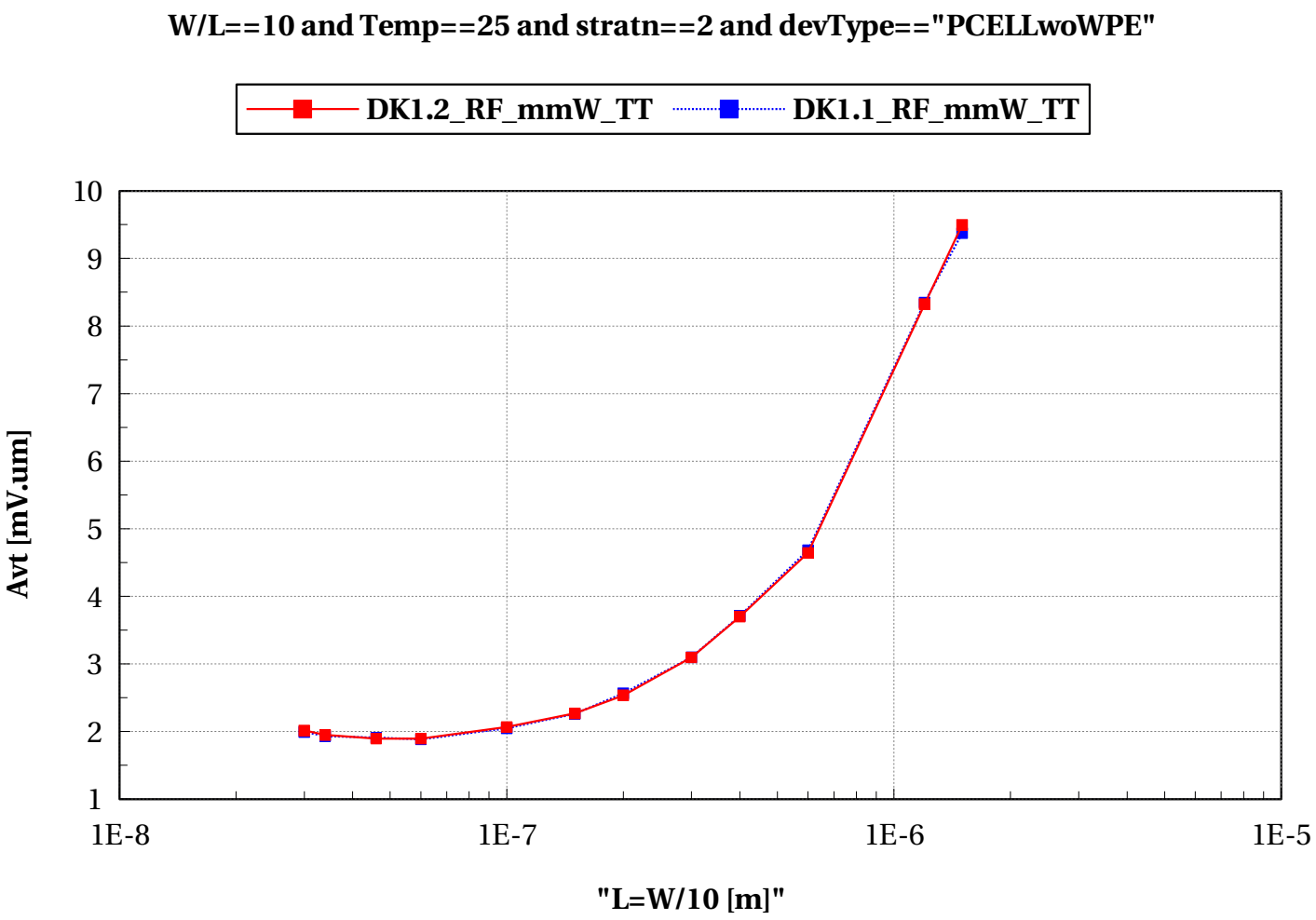
pfet_acc, Cgd_0V/w [fF/um] vs "L=W/10 [m]"



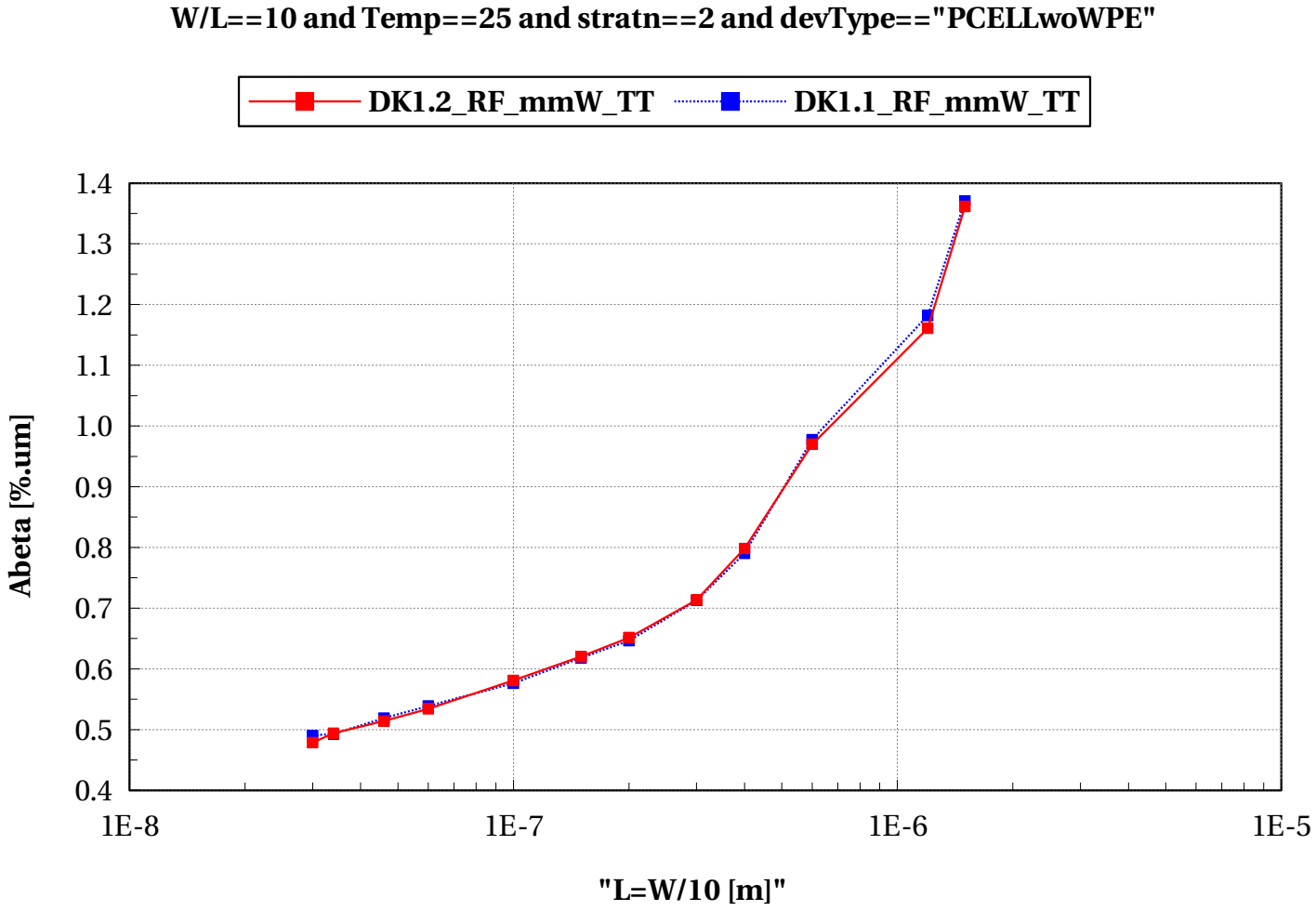
pfet_acc, Cbd_off/w [fF/um] vs "L=W/10 [m]"



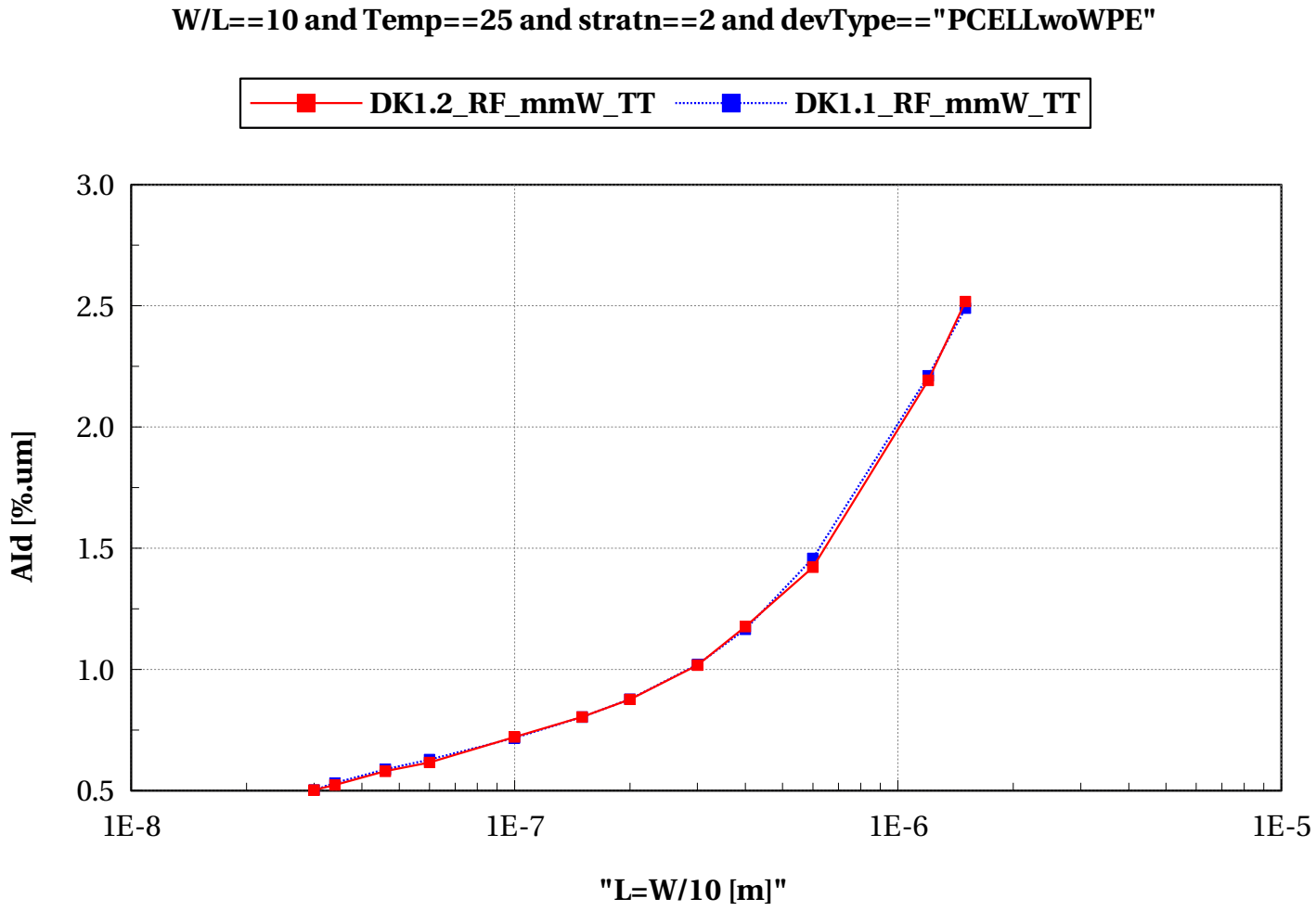
pfet_acc, Avt [mV.um] vs "L=W/10 [m]"



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



pfet_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 nfet_acc (DK1.2_RF_mmW)
  - ✔ Input Parameters
    - ✘ vds_off = vds_sat V
    - ✘ iana = 5e-6 A
    - ✘ shrink_iana = 1
    - ✘ mc_sens = 0
    - ✘ vds_lin = 0.05 V
    - ✘ ivt = 300e-9 A
    - ✘ model_version = 1.2.d
    - ✘ vds_cgd = 0 V
    - ✘ vds_mm = 0.05 V
    - ✘ ams_release = 2018.3
    - ✘ plashrink_iana = 0
    - ✘ vgs_stop = vdd V
    - ✘ dlshrink_ivt = 0
    - ✘ sbenchlsf_release = Alpha

- ✘ vds_sat = Vdd V
- ✘ mc_nsigma = 3
- ✘ shrink_ivt = 1
- ✘ vstep_iana = 0.01 V
- ✘ vgs_start = 0 V
- ✘ plashrink_ivt = 1
- ✘ dlshrink_iana = 0
- ✘ ithslwi = 10e-9 A
- ✘ vds_ana = Vdd/4 V
- ✘ vds_cbd = 0 V
- ✘ vddmax = vdd
- ✘ mc_runs = 5000
- ✘ vstep_ivt = 0.005 V
- ✘ vgs_off = 0 V
- ✘ temp = 25 °C
- ✘ f_ext = 100k Hz
- ✘ vbs = 0 V
- ✘ vdd = 1 V

✔ Sweep Parameters

✔ Extra parameters

- ✘ rvt_dev = 1

● Model pfet_acc (DK1.2_RF_mmW)

✔ Input Parameters

- ✘ vds_off = vds_sat V
- ✘ iana = 2e-6 A

- ✘ shrink_iana = 1
- ✘ mc_sens = 0
- ✘ vds_lin = 0.05 V
- ✘ ivt = 70e-9 A
- ✘ model_version = 1.2.d
- ✘ vds_cgd = 0 V
- ✘ vds_mm = 0.05 V
- ✘ ams_release = 2018.3
- ✘ plashrink_iana = 0
- ✘ vgs_stop = vdd V
- ✘ dlshrink_ivt = 0
- ✘ sbenchlsf_release = Alpha
- ✘ vds_sat = Vdd V
- ✘ mc_nsigma = 3
- ✘ shrink_ivt = 1
- ✘ vstep_iana = 0.01 V
- ✘ vgs_start = 0 V
- ✘ plashrink_ivt = 1
- ✘ dlshrink_iana = 0
- ✘ ithslwi = 10e-9 A
- ✘ vds_ana = Vdd/4 V
- ✘ vds_cbd = 0 V
- ✘ vddmax = vdd
- ✘ mc_runs = 5000
- ✘ vstep_ivt = 0.005 V

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

✔ Sweep Parameters

✔ Extra parameters

- ✘ rvt_dev = 1

● Model nfet_acc (DK1.1_RF_mmW)

✔ Input Parameters

- ✘ vds_off = vds_sat V
- ✘ iana = 5e-6 A
- ✘ shrink_iana = 1
- ✘ mc_sens = 0
- ✘ vds_lin = 0.05 V
- ✘ ivt = 300e-9 A
- ✘ model_version = 1.2.c
- ✘ vds_cgd = 0 V
- ✘ vds_mm = 0.05 V
- ✘ ams_release = 2018.3
- ✘ plashrink_iana = 0
- ✘ vgs_stop = vdd V
- ✘ dlshrink_ivt = 0
- ✘ sbenchlsf_release = Alpha
- ✘ vds_sat = Vdd V

- ✘ mc_nsigma = 3
- ✘ shrink_ivt = 1
- ✘ vstep_iana = 0.01 V
- ✘ vgs_start = 0 V
- ✘ plashrink_ivt = 1
- ✘ dlshrink_iana = 0
- ✘ ithslwi = 10e-9 A
- ✘ vds_ana = Vdd/4 V
- ✘ vds_cbd = 0 V
- ✘ vddmax = vdd
- ✘ mc_runs = 5000
- ✘ vstep_ivt = 0.005 V
- ✘ vgs_off = 0 V
- ✘ temp = 25 °C
- ✘ f_ext = 100k Hz
- ✘ vbs = 0 V
- ✘ vdd = 1 V

✔ Sweep Parameters

✔ Extra parameters

- ✘ rvt_dev = 1

● Model pfet_acc (DK1.1_RF_mmW)

✔ Input Parameters

- ✘ vds_off = vds_sat V
- ✘ iana = 2e-6 A
- ✘ shrink_iana = 1

- ✘ mc_sens = 0
- ✘ vds_lin = 0.05 V
- ✘ ivt = 70e-9 A
- ✘ model_version = 1.2.c
- ✘ vds_cgd = 0 V
- ✘ vds_mm = 0.05 V
- ✘ ams_release = 2018.3
- ✘ plashrink_iana = 0
- ✘ vgs_stop = vdd V
- ✘ dlshrink_ivt = 0
- ✘ sbenchlsf_release = Alpha
- ✘ vds_sat = Vdd V
- ✘ mc_nsigma = 3
- ✘ shrink_ivt = 1
- ✘ vstep_iana = 0.01 V
- ✘ vgs_start = 0 V
- ✘ plashrink_ivt = 1
- ✘ dlshrink_iana = 0
- ✘ ithslwi = 10e-9 A
- ✘ vds_ana = Vdd/4 V
- ✘ vds_cbd = 0 V
- ✘ vddmax = vdd
- ✘ mc_runs = 5000
- ✘ vstep_ivt = 0.005 V
- ✘ vgs_off = 0 V

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

✔ Sweep Parameters

✔ Extra parameters

- ✘ rvt_dev = 1