

**IHP**  
**SG13G2**  
**SG13G2 DC CV PMOS LV**

**Rev. 1.2 (190924)**

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# 1 Documentation

## 1.1 Included Effects in Simulation Model

General	Date, Version	24.09.2019
	Processversion	SG13G2
	Simulator	ADS 2019, Spectre 18.1
	Simulation model	PSP 103.6
	Warning Boundaries	On

Statistic	Corner	x
	Process variations for Monte Carlo Simulation	e
	Mismatch	x
Transistor	DC behavior	x
	Drain diode	x
	Overlap cap.	x
	Junction cap.	x
	1/f Noise	x <sub>1</sub>
	HF / Thermal Noise	-
	Substrate resistance (RF)	x <sub>2</sub>
	Gate resistance (RF)	x <sub>2</sub>
Temperature	-40°C, 25°C, 70°C, 125°C	x

x measured and modelled

x<sub>1</sub> parameters taken from SG13

x<sub>2</sub> measurements are done from a different wafer run than DC model which leads to slight offsets

e estimated and modelled

o not included

- not applicable

## 1.2 Time range measurement

The verification of the time range measurements is done by the standard IHP verification procedure.

## 2 Setup

### 2.1 Measurement Conditions

#### 2.1.1 Measurement Conditions for Transistors

	Sweep	Start[V]	Stop[V]	No. Points	List or f(Vth)
idvg	vg	-500m	1.35	38	
	vb	0	-1.2	7	
	vd	List		3	0.05, 0.6, 1.2
	vs	0		1	
idvd	vd	0	1.35	28	
	vg	Lin f(Vth)	1.35	5	Ref. Setup: idvg Idref: 100.0n Offset: 100.0m Resolution: 1.000m
	vb	0		1	
	vs	0		1	
idvd_vbmin	vd	0	1.35	28	
	vg	Lin f(Vth)	1.35	5	Ref. Setup: idvg Idref: 100.0n Offset: 100.0m Resolution: 1.000m
	vb	-1.2		1	
	vs	0		1	
idvd_vth	vd	0	1.35	28	
	vg	List f(Vth)		3	Ref. Setup: idvg Idref: 100.0n Offset: -200.0m Resolution: 1.000m Steps: 200.0m 200.0m
	vb	0		1	
	vs	0		1	
idvd_vth_vbmin	vd	0	1.35	28	
	vg	List		3	Ref. Setup: idvg

		f(Vth)			Idref: 100.0n Offset: -200.0m Resolution: 1.000m Steps: 200.0m 200.0m
	vb	-1.2		1	
	vs	0		1	
RF idvg	vg	0	1.35	28	
	vd	List		3	0.05, 0.6, 1.2
RF idvd	vd	0	1.35	28	
	vg	0	1.35	5	
RF sdut	freq	100MEG	47.6G	31	
	vd	0	1.35	10	
	vg	0	1.35	10	

## 2.1.2 Measurement Conditions for Capacitance

	Sweep	Start[V]	Step[V]	Stop[V]	High Node	Low Node
Junction Bulk-Drain	1 VHI	5	-200m	-200m	B	D
Junction Bulk-Source	1 VHI	1	-20m	-300m	B	S
Oxide	1 VHI	-1.35	50m	1.35	B	G
Overlap	1 VHI	1.35	-50m	-1.35	G	D

## 2.2 Devices

### 2.2.1 Setup of DC Test Devices

Name	W[um]	L[um]	AD[um <sup>2</sup> ]	AS[um <sup>2</sup> ]	PD[um]	PS[um]	NRD	NRS	NF	Comment	Size Category
W10u0_L10u0_S549_5	10	10	3.4	3.4	20. 7	20. 7	0	0	1		Large

W0u15_L10u0_S555_3	150 m	10	101 m	101 m	1.3 4	1.3 4	0	0	1		Narrow
W10u0_L0u13_S548_2	10	130 m	3.4	3.4	20. 7	20. 7	0	0	1		Short
W0u15_L0u13_S554_3	150 m	130 m	101 m	101 m	1.3 4	1.3 4	0	0	1		Small
W10u0_L0u14_S548_3	10	140 m	3.4	3.4	20. 7	20. 7	0	0	1		L Scale
W10u0_L0u18_S548_5	10	180 m	3.4	3.4	20. 7	20. 7	0	0	1		L Scale
W10u0_L0u5_S549_1	10	500 m	3.4	3.4	20. 7	20. 7	0	0	1		L Scale
W10u0_L1u2_S549_2	10	1.2	3.4	3.4	20. 7	20. 7	0	0	1		L Scale
W10u0_L5u0_S549_4	10	5	3.4	3.4	20. 7	20. 7	0	0	1		L Scale
W10u0_L2u0_S549_3	10	2	3.4	3.4	20. 7	20. 7	0	0	1		L Scale
W10u0_L0u15_S548_4	10	150 m	3.4	3.4	20. 7	20. 7	0	0	1		L Scale
W0u6_L10u0_S552_1	600 m	10	204 m	204 m	1.8 8	1.8 8	0	0	1		W Scale
W0u18_L10u0_S554_1	180 m	10	103 m	103 m	1.3 4	1.3 4	0	0	1		W Scale
W0u3_L10u0_S553_2	300 m	10	102 m	102 m	1.2 8	1.2 8	0	0	1		W Scale
W05u0_L10u0_S550_3	5	10	1.7	1.7	10. 7	10. 7	0	0	1		W Scale
W02u0_L10u0_S551_1	2	10	680 m	680 m	4.6 8	4.6 8	0	0	1		W Scale
W02u0_L2u0_S550_5	2	2	680 m	680 m	4.6 8	4.6 8	0	0	1		LW Scale
W0u18_L0u14_S553_4	180 m	140	103 m	103 m	1.3 4	1.3 4	0	0	1		LW Scale
W0u18_L0u15_S553_5	180 m	150	103 m	103 m	1.3 4	1.3 4	0	0	1		LW Scale
W0u6_L0u5_S551_4	600 m	500	204 m	204 m	1.8 8	1.8 8	0	0	1		LW Scale
W0u6_L1u2_S551_5	600 m	1.2	204 m	204 m	1.8 8	1.8 8	0	0	1		LW Scale
W0u3_L0u14_S552_3	300	140	102	102	1.2	1.2	0	0	1		LW

	m	m	m	m	8	8					Scale
W0u6_L0u13_S551_2	600 m	130 m	204 m	204 m	1.8 8	1.8 8	0	0	1		LW Scale
W0u6_L0u18_S551_3	600 m	180 m	204 m	204 m	1.8 8	1.8 8	0	0	1		LW Scale
W0u3_L0u15_S552_4	300 m	150 m	102 m	102 m	1.2 8	1.2 8	0	0	1		LW Scale
W02u0_L0u13_S550_4	2	130 m	680 m	680 m	4.6 8	4.6 8	0	0	1		LW Scale
W0u15_L0u14_S554_4	150 m	140 m	101 m	101 m	1.3 4	1.3 4	0	0	1		LW Scale
W05u0_L0u13_S550_1	5	130 m	1.7	1.7	10. 7	10. 7	0	0	1		LW Scale
W0u15_L0u15_S554_5	150 m	150 m	101 m	101 m	1.3 4	1.3 4	0	0	1		LW Scale
W0u3_L0u18_S552_5	300 m	180 m	102 m	102 m	1.2 8	1.2 8	0	0	1		LW Scale
W0u3_L0u13_S552_2	300 m	130 m	102 m	102 m	1.2 8	1.2 8	0	0	1		LW Scale
W05u0_L5u0_S550_2	5	5	1.7	1.7	10. 7	10. 7	0	0	1		LW Scale
W0u15_L0u5_S555_2	150 m	500 m	101 m	101 m	1.3 4	1.3 4	0	0	1		LW Scale
W0u3_L0u5_S553_1	300 m	500 m	102 m	102 m	1.2 8	1.2 8	0	0	1		LW Scale
W0u15_L0u18_S555_1	150 m	180 m	101 m	101 m	1.3 4	1.3 4	0	0	1		LW Scale
W0u18_L0u13_S553_3	180 m	130 m	103 m	103 m	1.3 4	1.3 4	0	0	1		LW Scale
W0u15_L0u12_S554_2	150 m	120 m	101 m	101 m	1.3 4	1.3 4	0	0	1		Addition al
W10u0_L0u12_S548_1	10	120 m	3.4	3.4	20. 7	20. 7	0	0	1		Addition al
W10u0_L0u13_S382_2	10	130 m	3.4	3.4	20. 7	20. 7	0	0	1		Short
W10u0_L0u13_T356_S3 82_2	10	130 m	0	0	0	0	0	0	1		Short

## 2.2.2 Setup of CV Test Devices

Name	W[um]	L[um]	NF	AD[um <sup>2</sup> ]	AS[um <sup>2</sup> ]	PD[um]	PS[um]	Comment	Size Category
Junction Capacitance Bulk - Drain									
CJBDarea_S351B_1			1	37.5 K		850		B-High, S/D-Low	BD Area
CJBDperim_S351B_2			1	28.6 K		102K		B-High, S/D-Low	BD Perim
Junction Capacitance Bulk - Source									
CJBSarea_S351B_1			1	0		0		B-High, S/D-Low	BS Area
CJBSperim_S351B_2			1	0		0		B-High, S/D-Low	BS Perim
Oxide Capacitance									
Cox_S346K_4	160	250	1					B-High, G-Low	Oxide
Overlap Capacitance									
Cgds3_S351B_13	400	10	40	79.8	79.8	436	436	G-High, S/D-Low, B+Sub-GND	Overlap 2 GDS
Cgds2_S351B_12	6.6 K	250 m	66 0	1.26 K	1.26 K	6.87 K	6.87 K	G-High, S/D-Low, B+Sub-GND	Overlap 1 GDS
Cgds1_S351B_11	8K	130	80	1.52	1.52	8.32	8.32	G-	Overlap

		m	0	K	K	K	K	High, S/D- Low, B+Sub -GND	GDS
Cgdsb2_S351B_12	6.6 K	250 m	66 0	1.26 K	1.26 K	6.87 K	6.87 K	G- High, S/D+B -Low	Overlap 1 GDSB
Cgdsb1_S351B_11	8K	130 m	80 0	1.52 K	1.52 K	8.32 K	8.32 K	G- High, S/D+B -Low	Overlap GDSB
Cgdsb3_S351B_13	400	10	40	79.8	79.8	436	436	G- High, S/D+B -Low	Overlap 2 GDSB

### 3 Corner Devices

#### 3.1 Target Values vs. Simulated Values

##### 3.1.1 W = 10.00u, L = 130.0n, NF = 1

	Slow			Typic.			Fast		
	Target	Sim.	Error [%]	Target	Sim.	Error [%]	Target	Sim.	Error [%]
VT	-520m	- 524m	-0.73	-460m	- 460m	0.1	-410m	- 411m	-0.16
Ron*W	-	-	-	2.2	2.18	-0.76	-	-	-
Ion/W	-160	-161	-0.87	-205	-203	0.93	-260	-261	-0.48
log(Ioff/W)	-11.5	-11.6	1.18	-10.4	-10.4	1.07	-9.5	-9.51	0.21

##### 3.1.2 W = 10.00u, L = 10.00u, NF = 1

	Slow			Typic.			Fast		
	Target	Sim.	Error [%]	Target	Sim.	Error [%]	Target	Sim.	Error [%]
VT	-400m	-403m	-0.67	-350m	-352m	-0.72	-300m	-303m	-0.86
Ion/W	-2.45	-2.45	0	-2.7	-2.69	0.36	-2.95	-2.96	-0.37

##### 3.1.3 W = 150.0n, L = 130.0n, NF = 1

	Slow			Typic.			Fast		
	Target	Sim.	Error [%]	Target	Sim.	Error [%]	Target	Sim.	Error [%]
VT	-560m	-564m	-0.73	-470m	-473m	-0.65	-380m	-378m	0.64
Ion/W	-240	-240	0.1	-315	-318	-0.78	-390	-391	-0.19

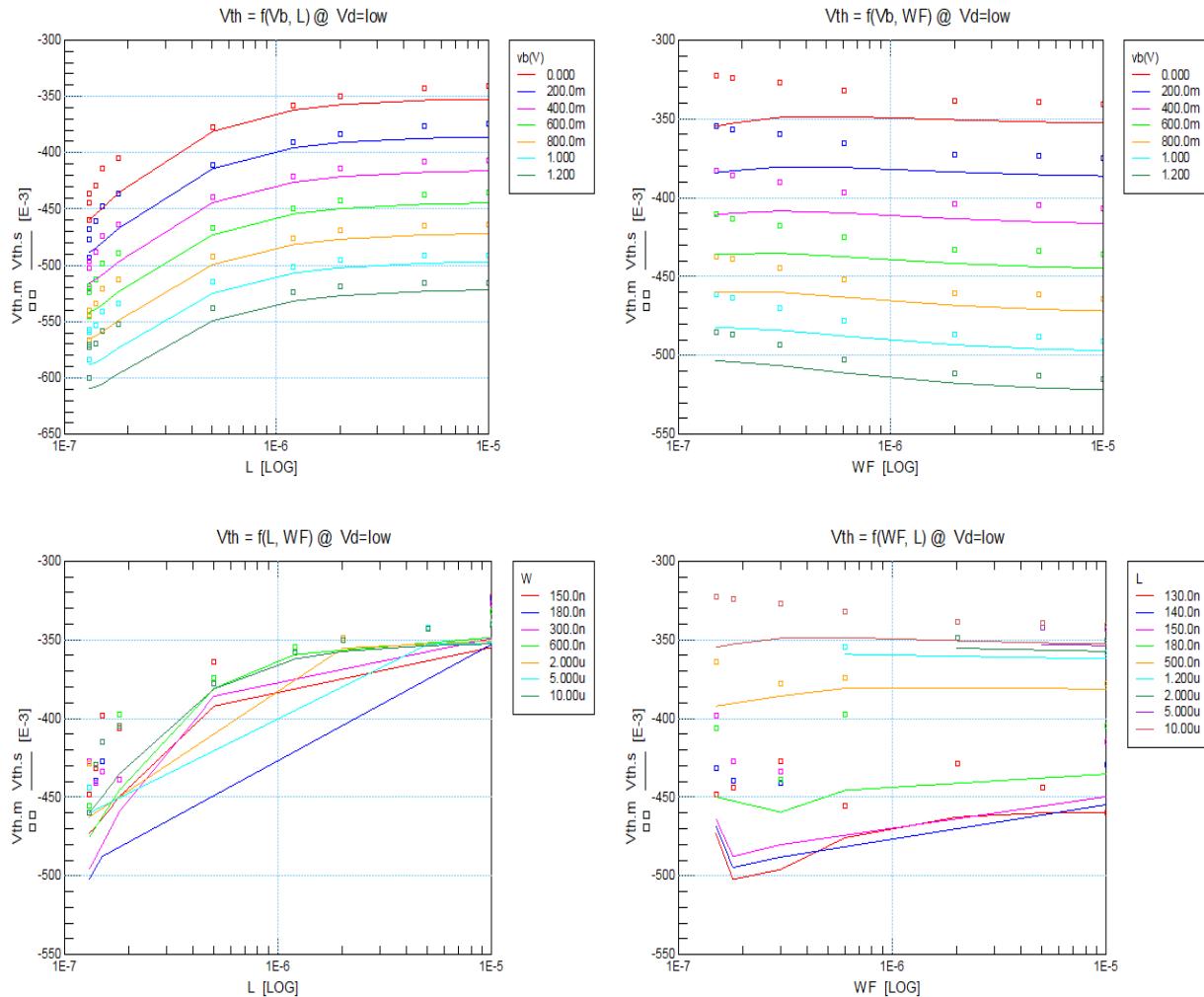
##### 3.1.4 W = 150.0n, L = 10.00u, NF = 1

	Slow			Typic.			Fast		
	Target	Sim.	Error [%]	Target	Sim.	Error [%]	Target	Sim.	Error [%]
Ion/W	-3.25	-3.23	0.54	-3.85	-3.85	0.14	-4.45	-4.48	-0.67

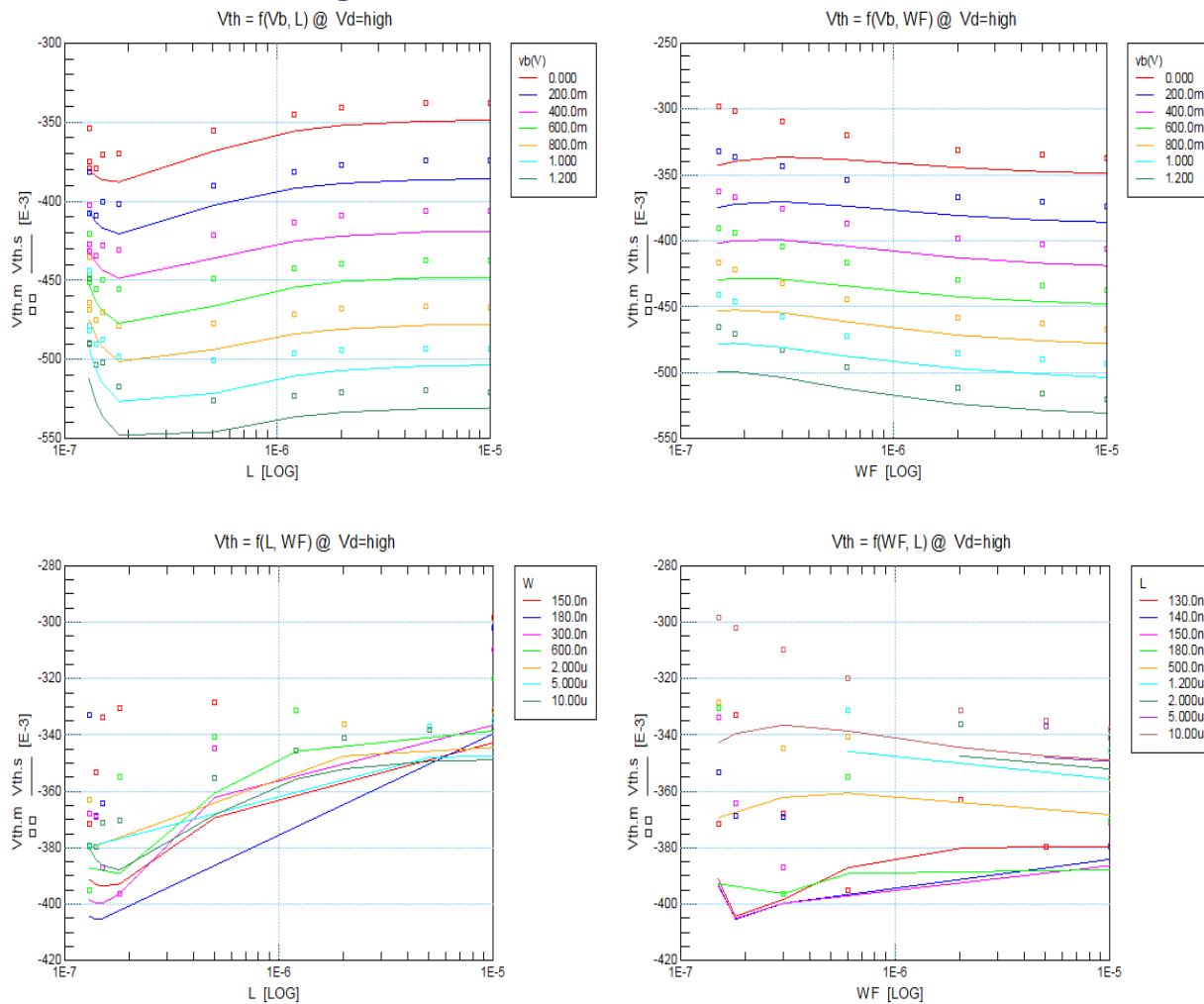
## 4 DC Transistors

### 4.1 Summarized Results

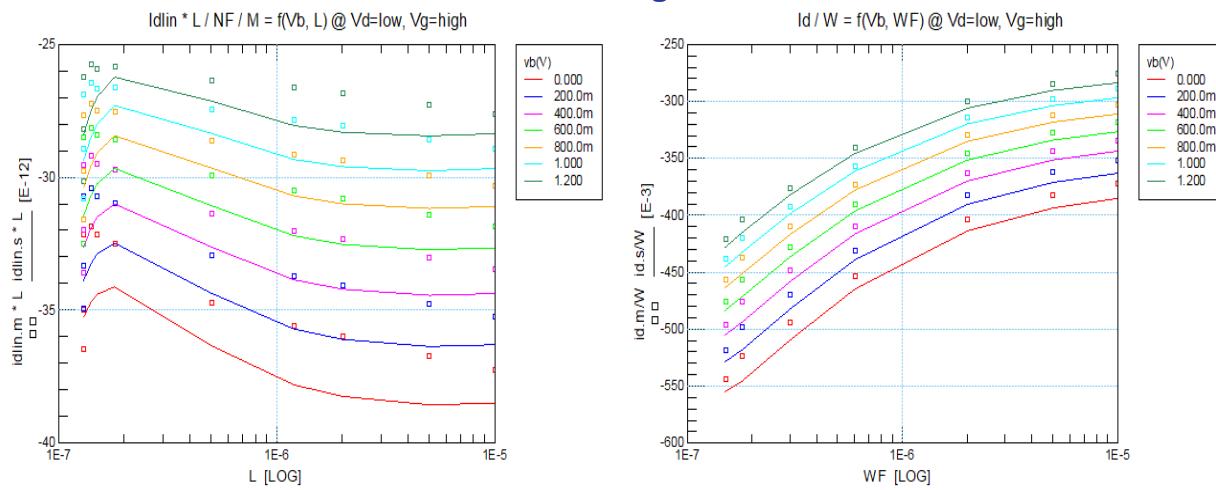
#### 4.1.1 Threshold Voltage Linear Region

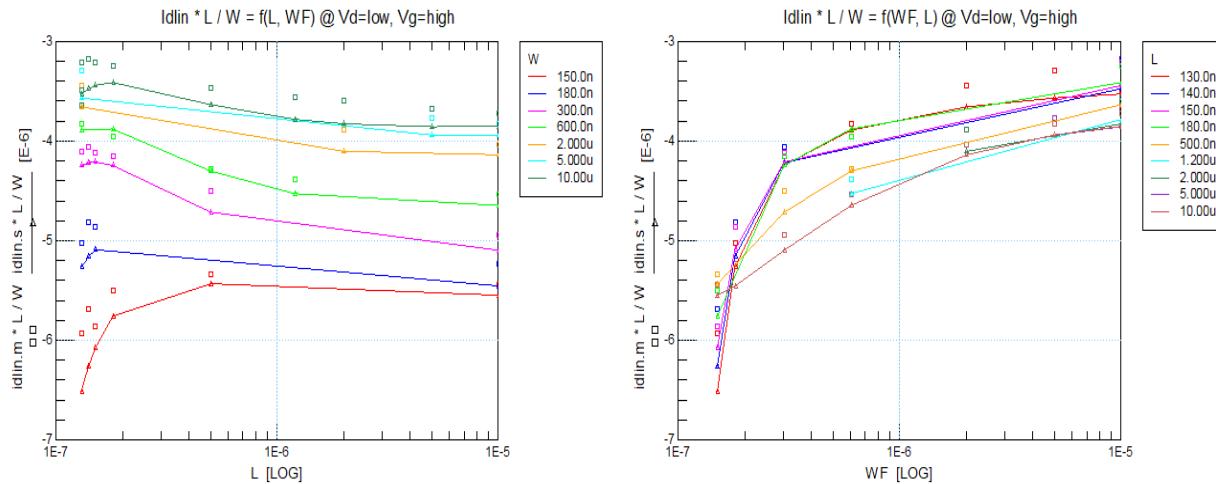


#### 4.1.2 Threshold Voltage in Saturation

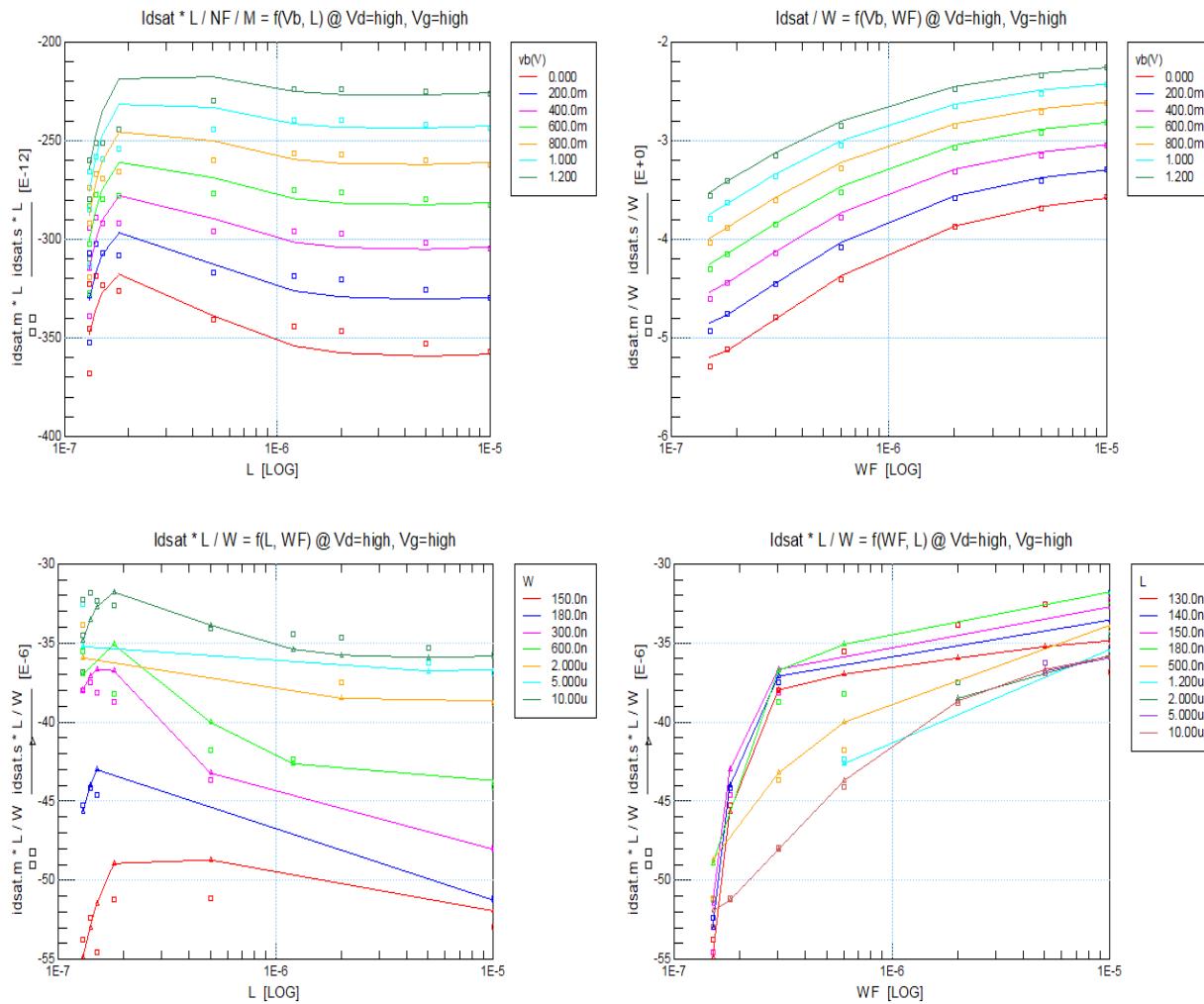


#### 4.1.3 Maximum Drain Current in Linear Region



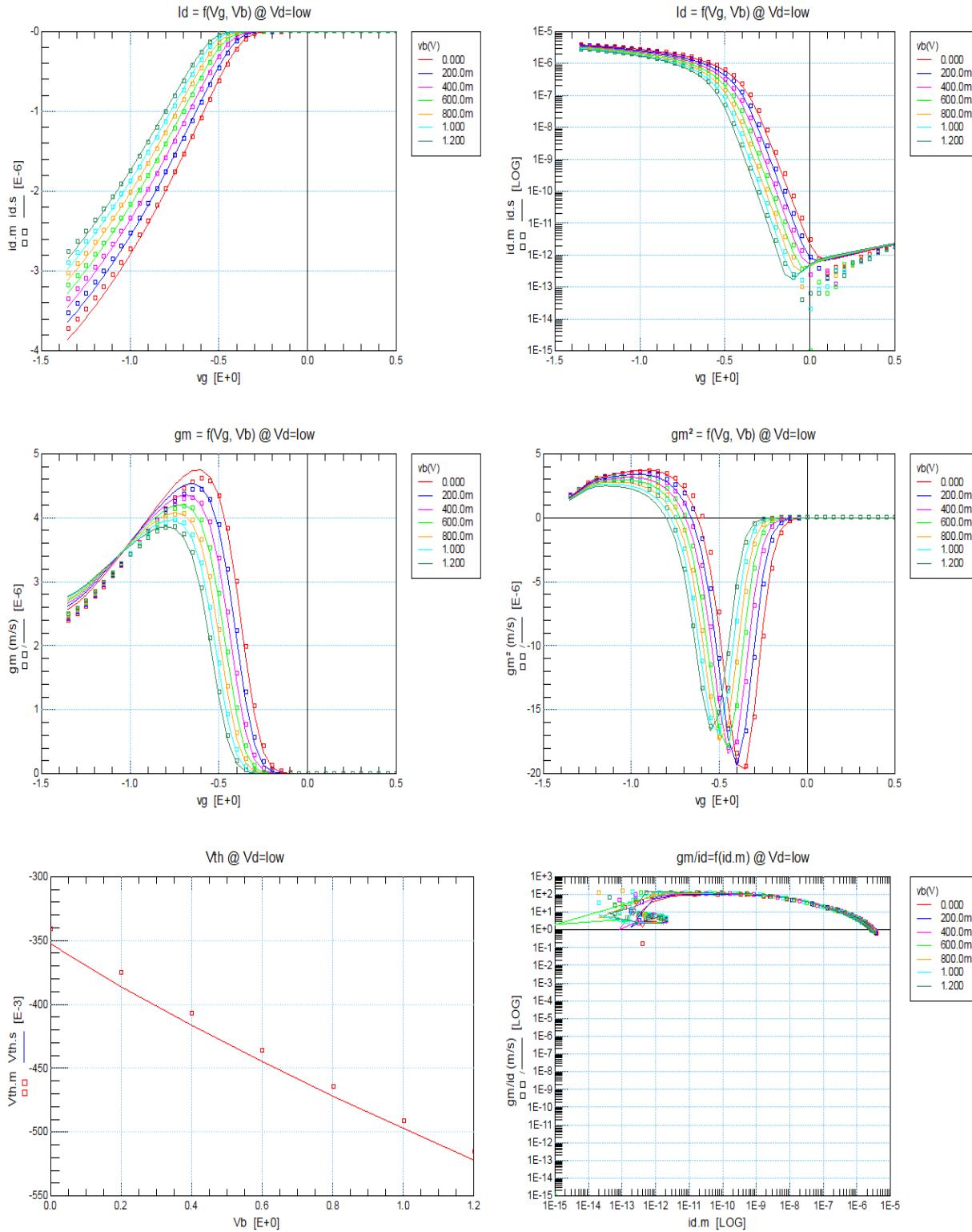


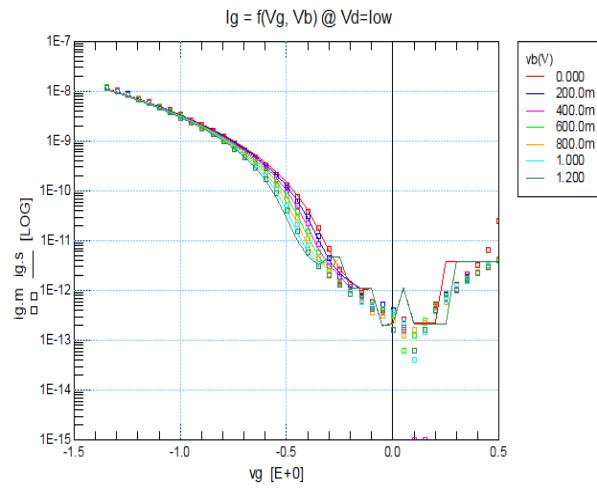
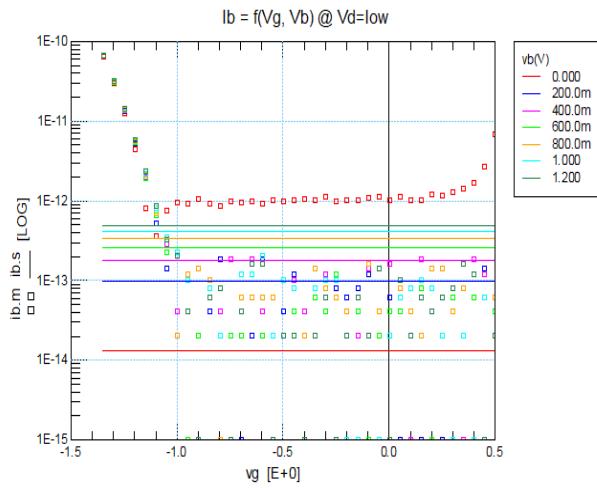
#### 4.1.4 Maximum Drain Current in Saturation Region



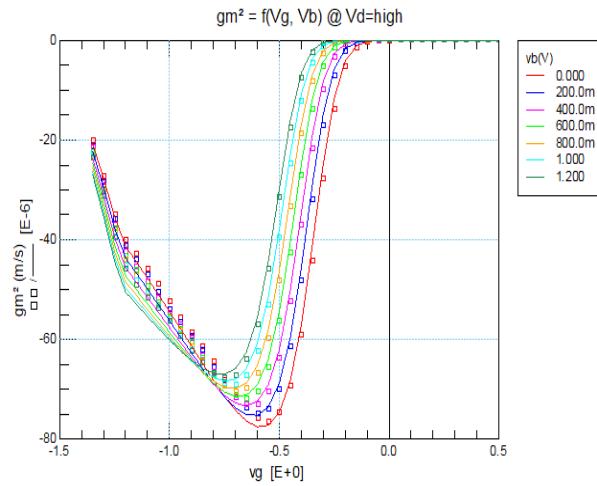
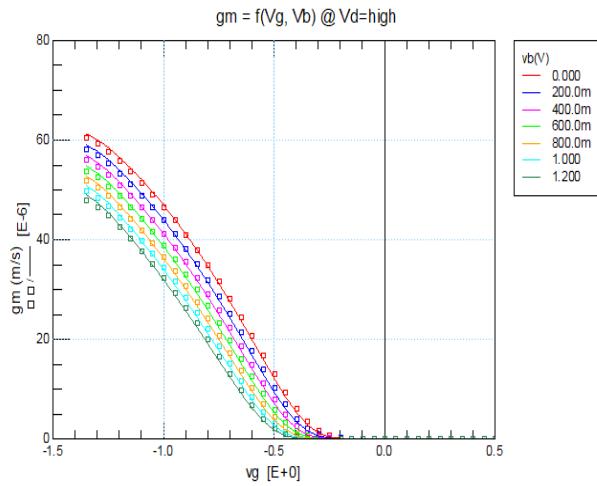
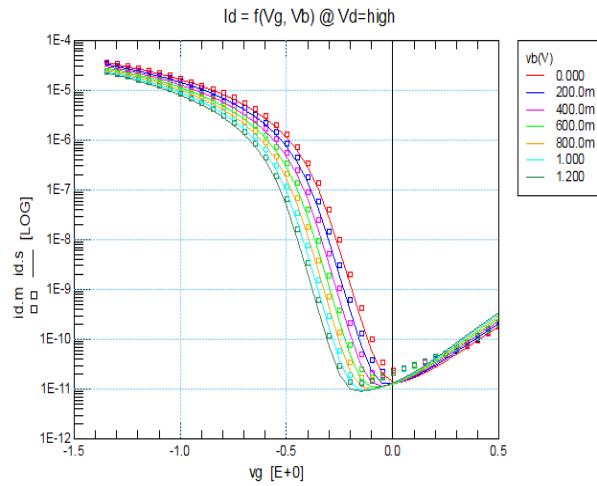
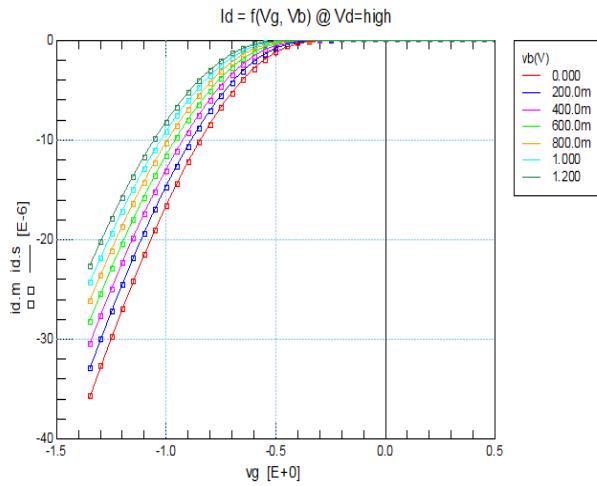
## 4.2 W10u0\_L10u0\_S549\_5

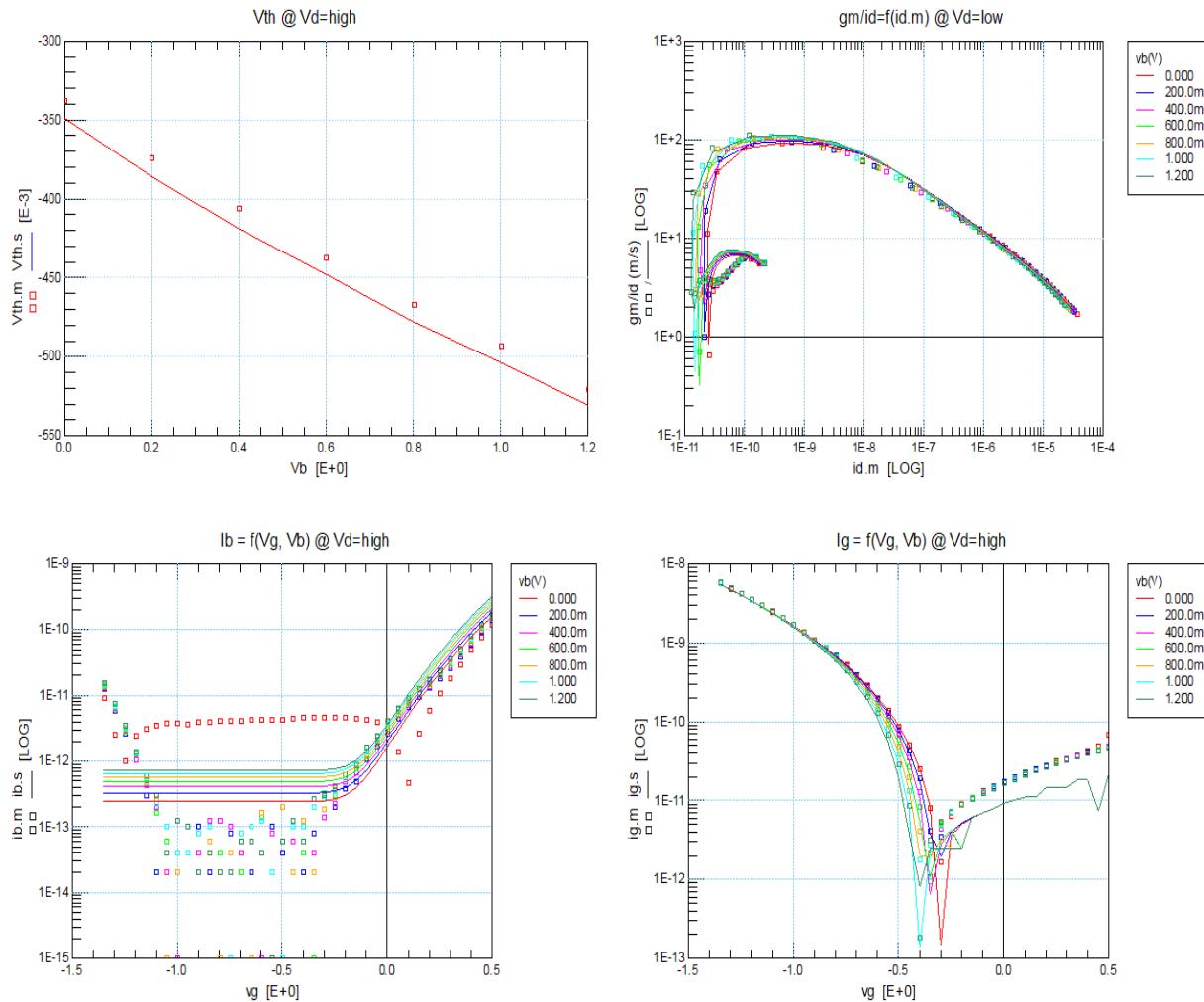
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



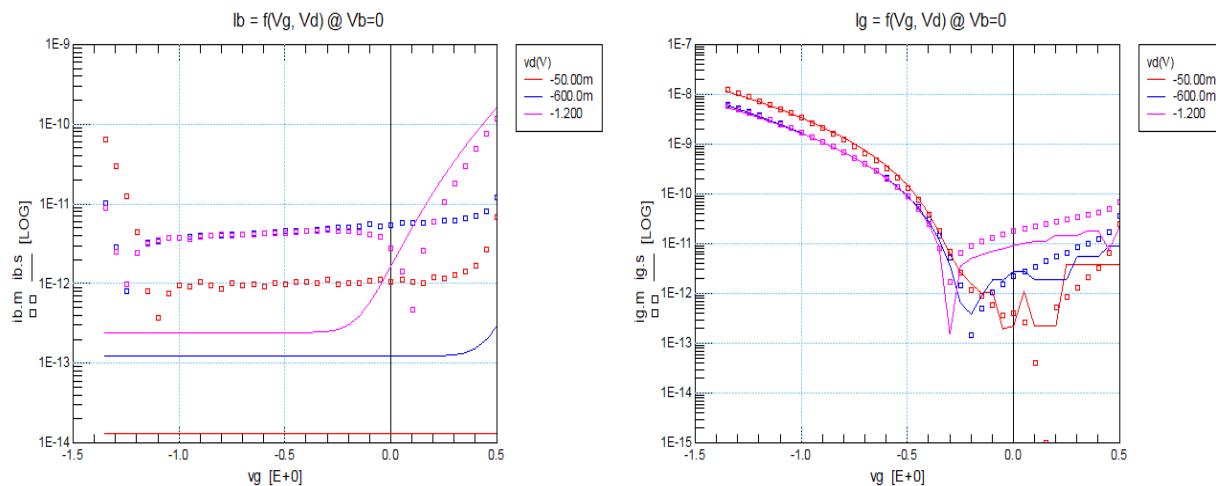


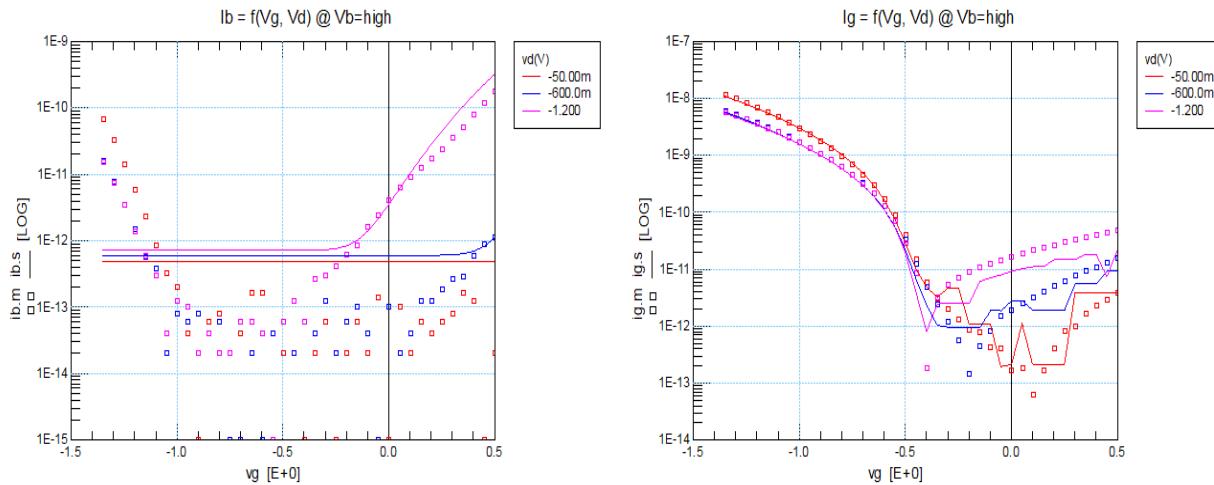
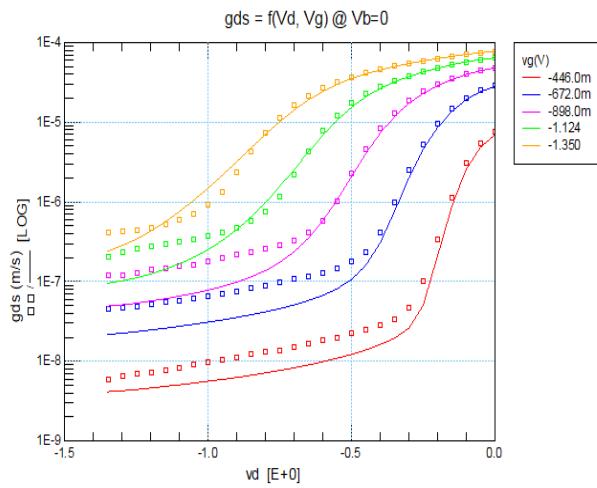
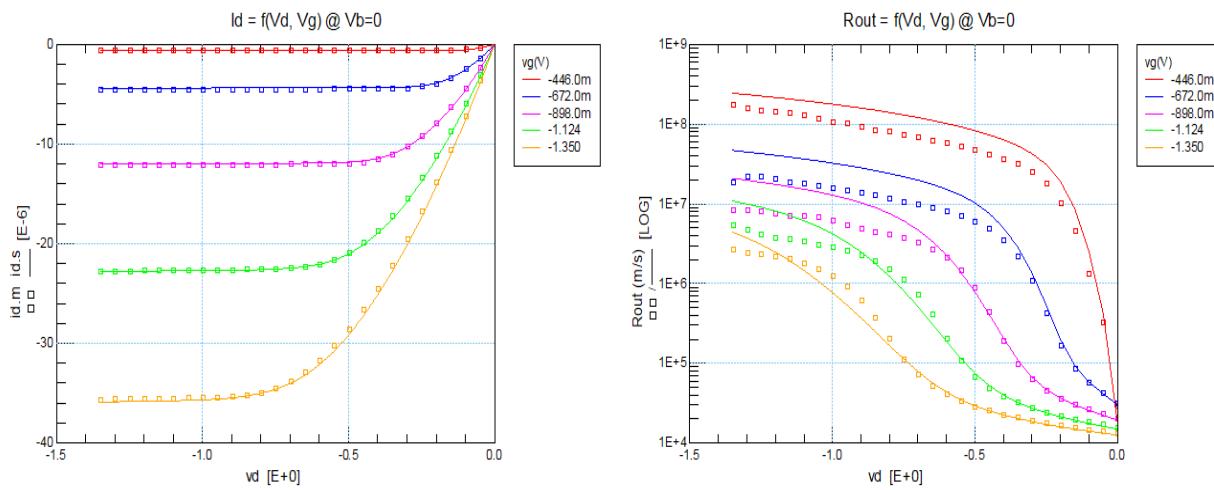
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

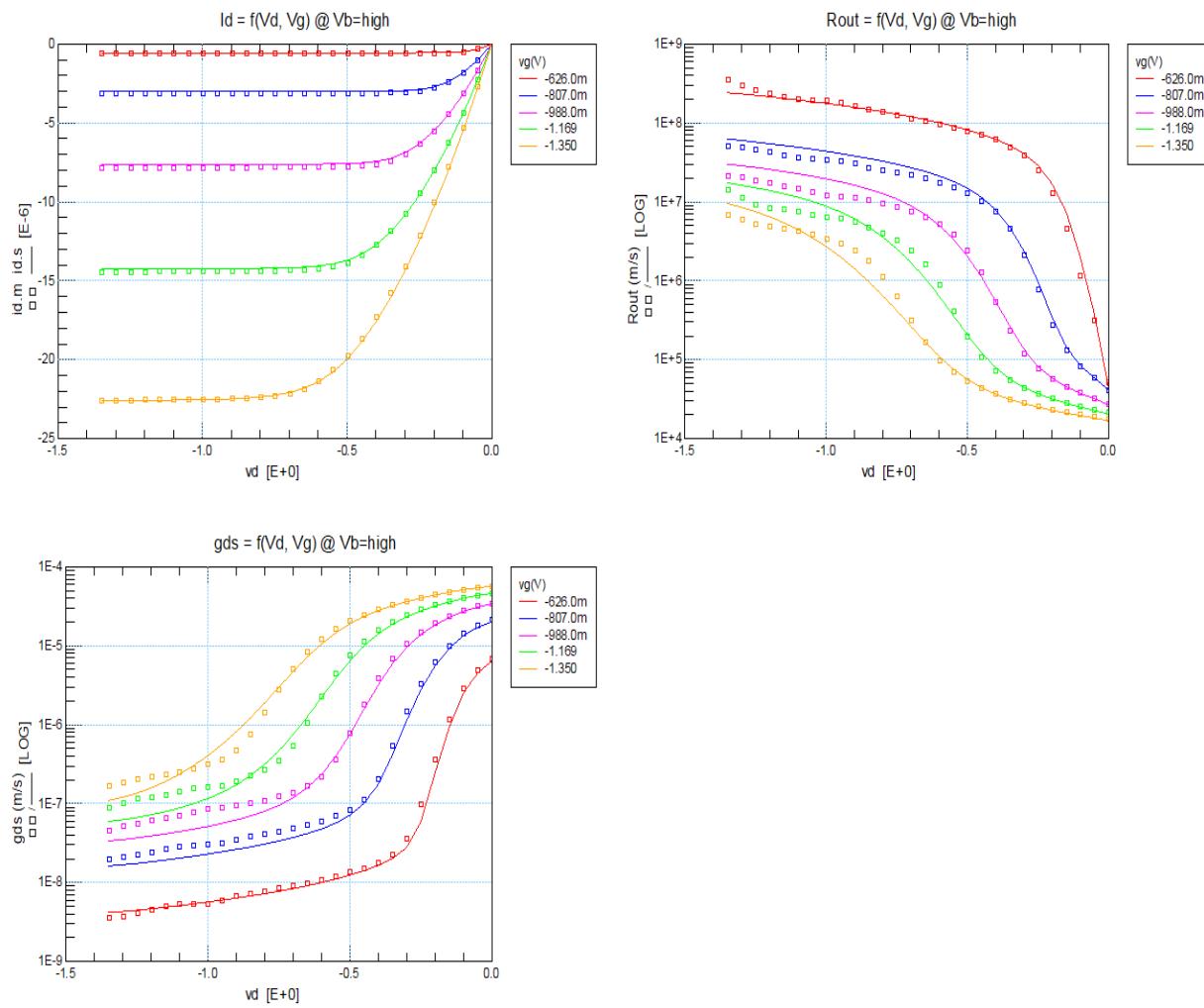
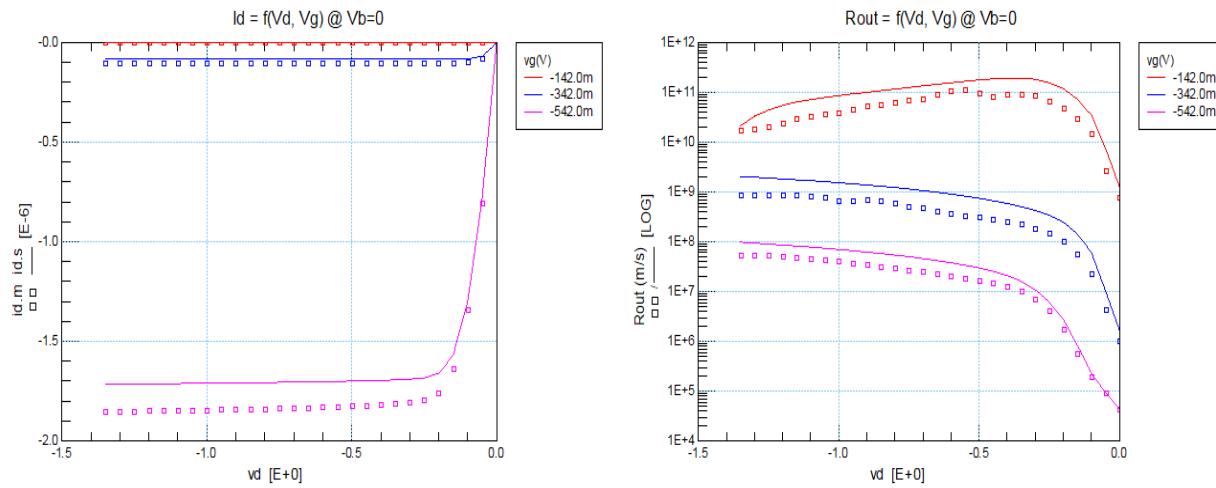


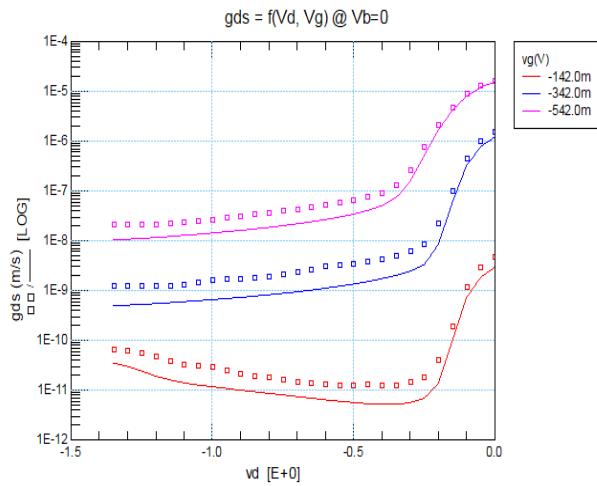


### $id_{vg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

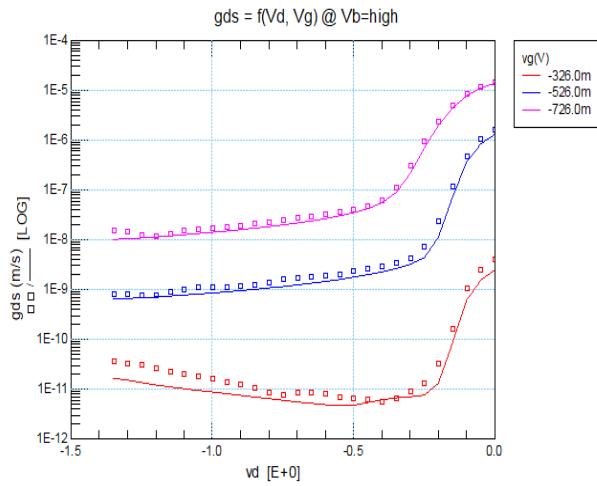
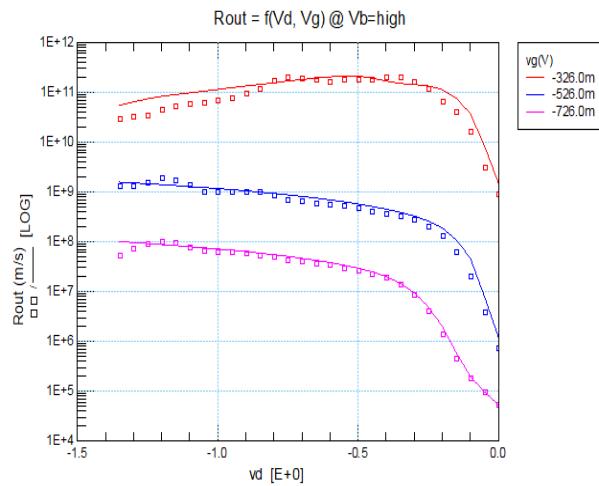
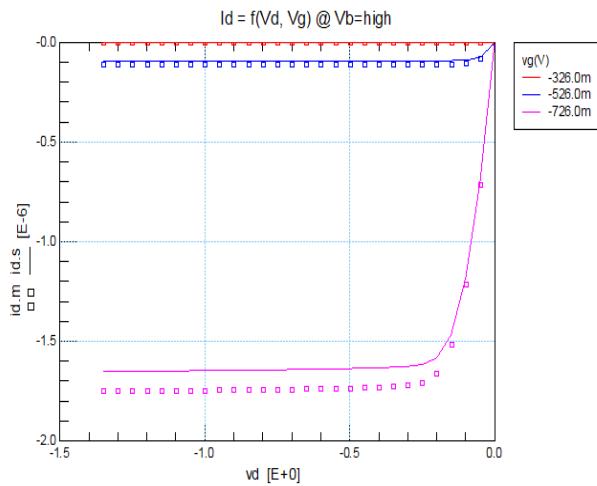


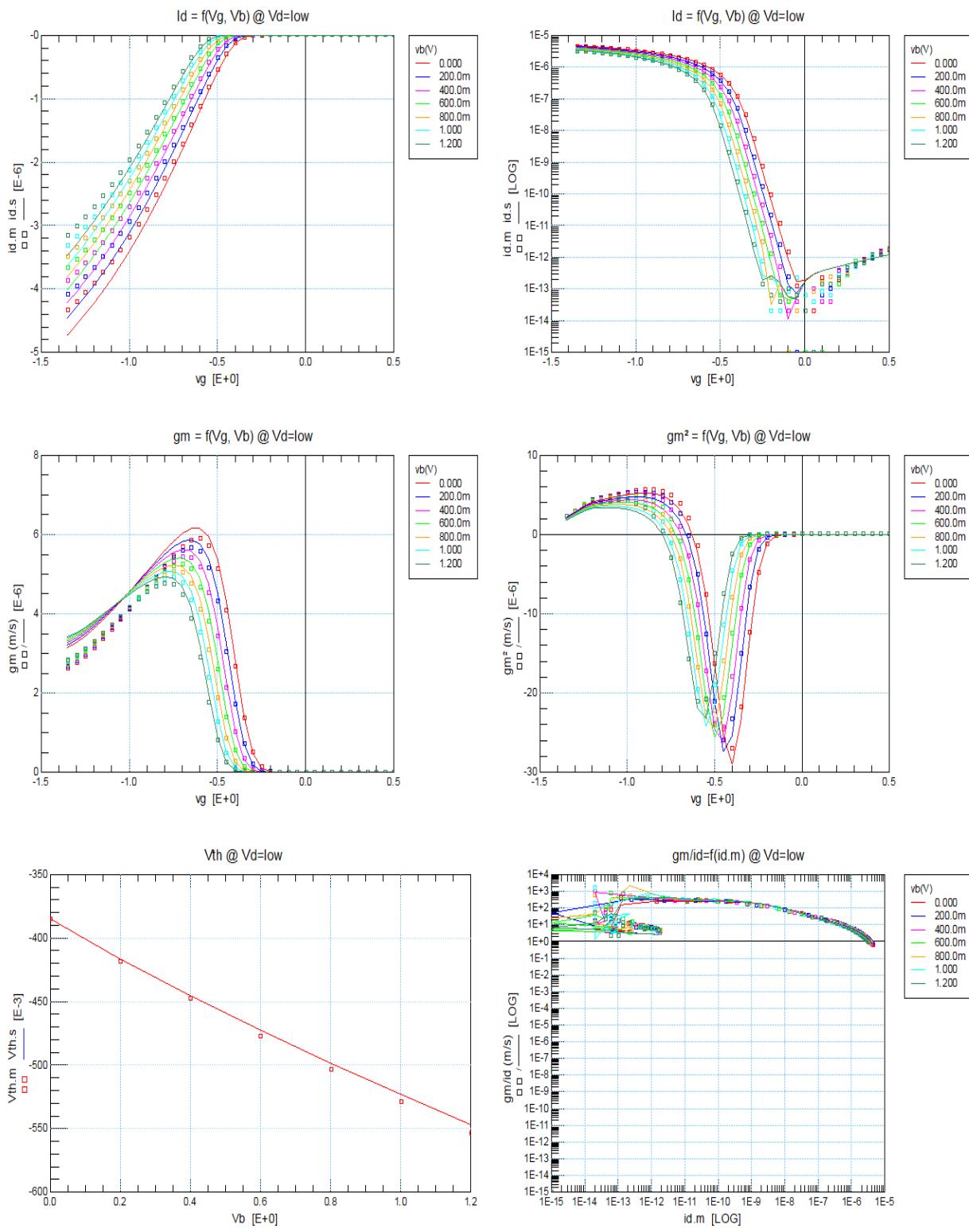
**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


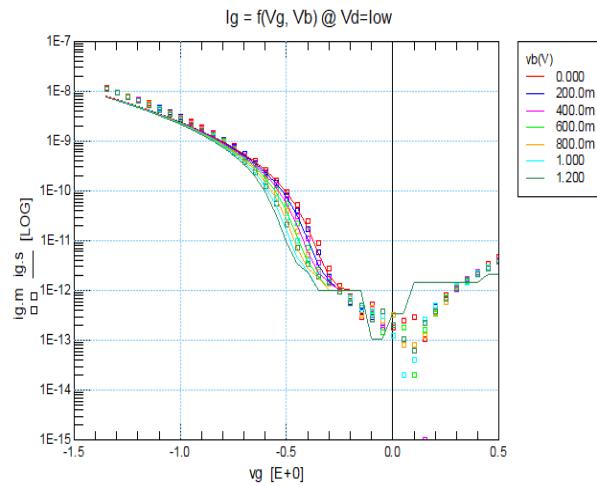
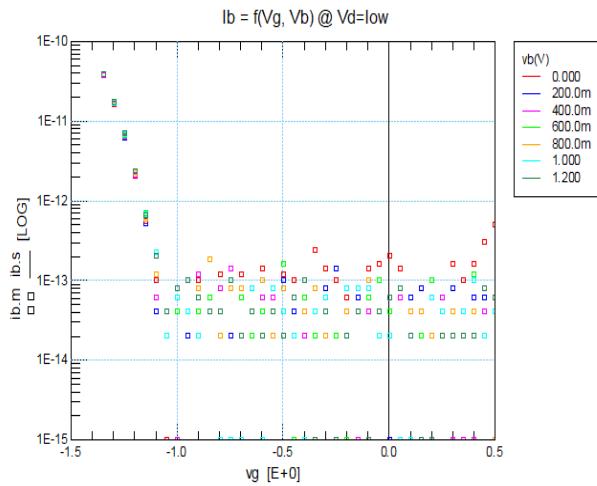
**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**



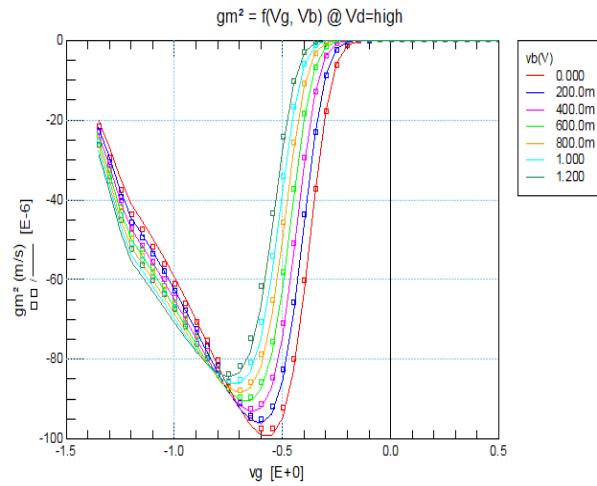
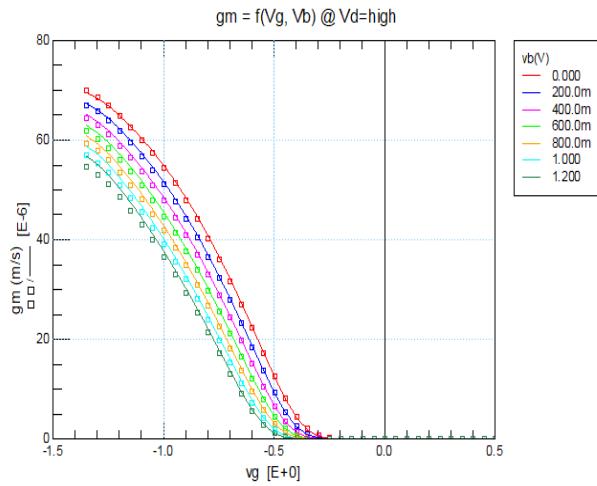
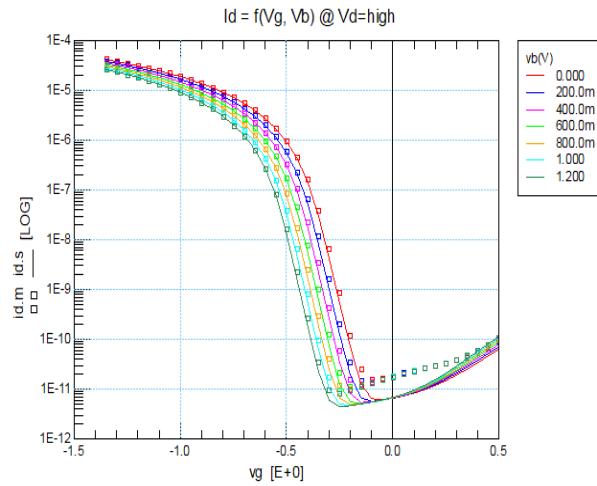
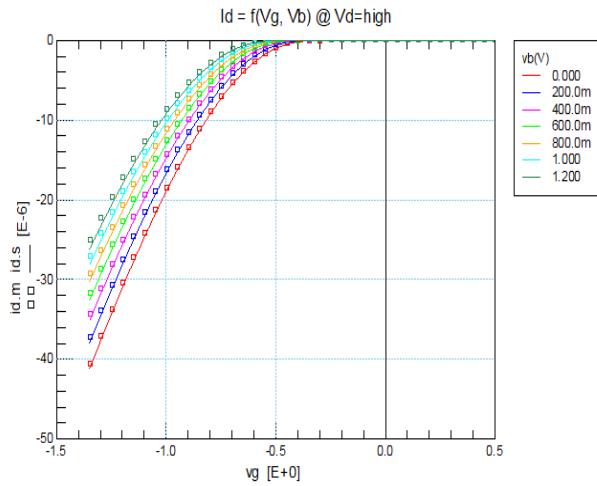
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

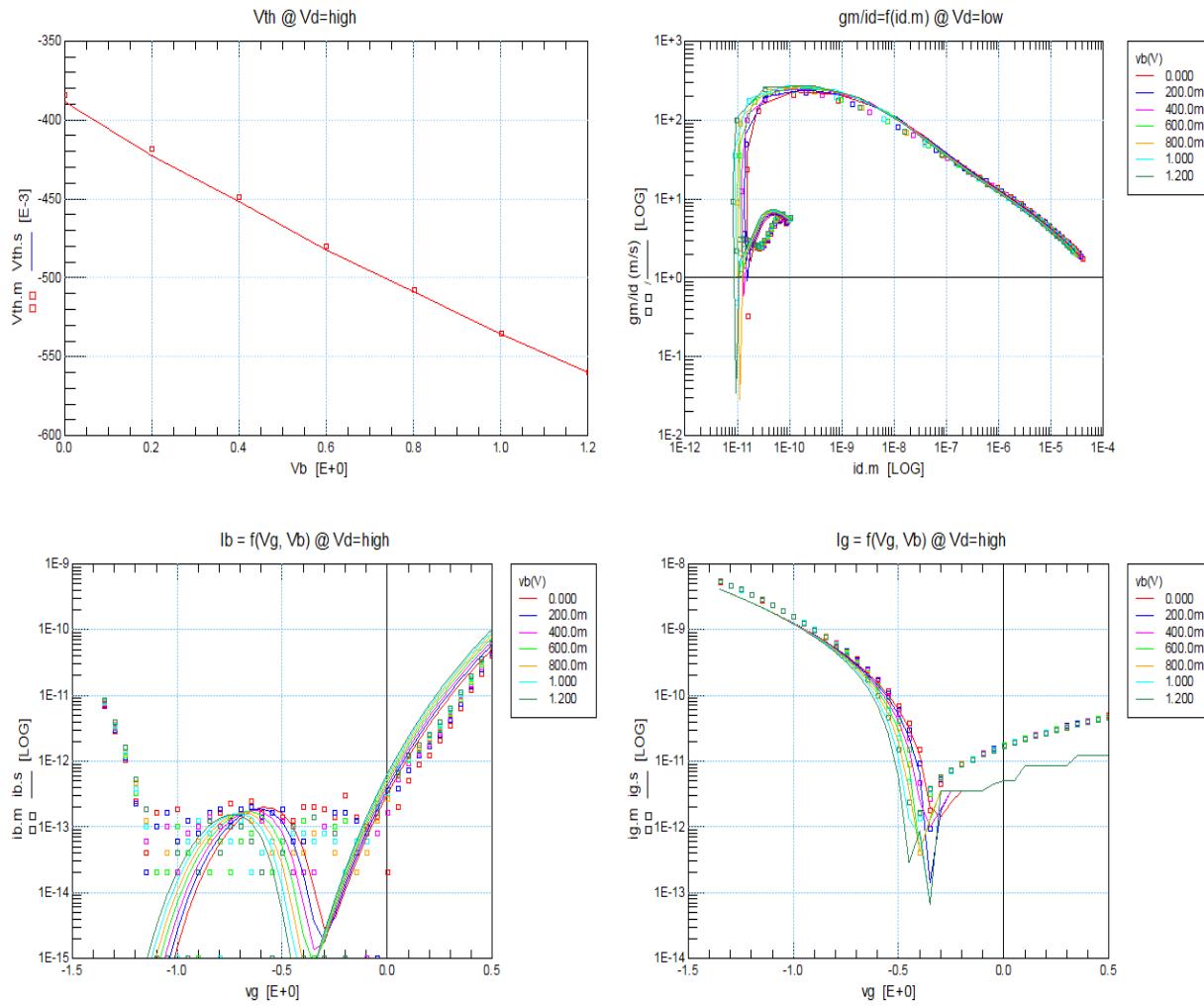


**idvg, Vd = -0.05V, T = -40°C**


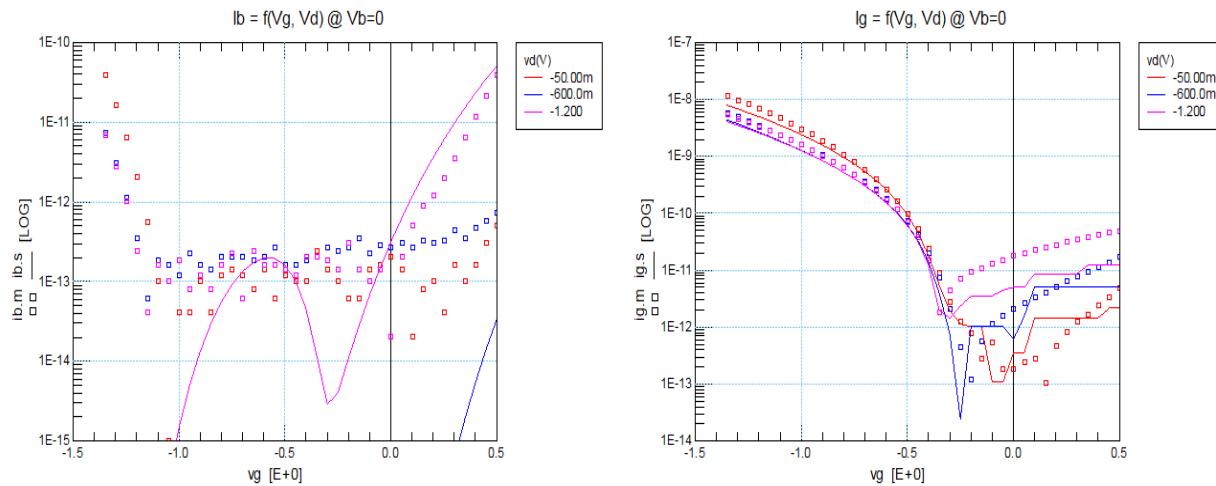


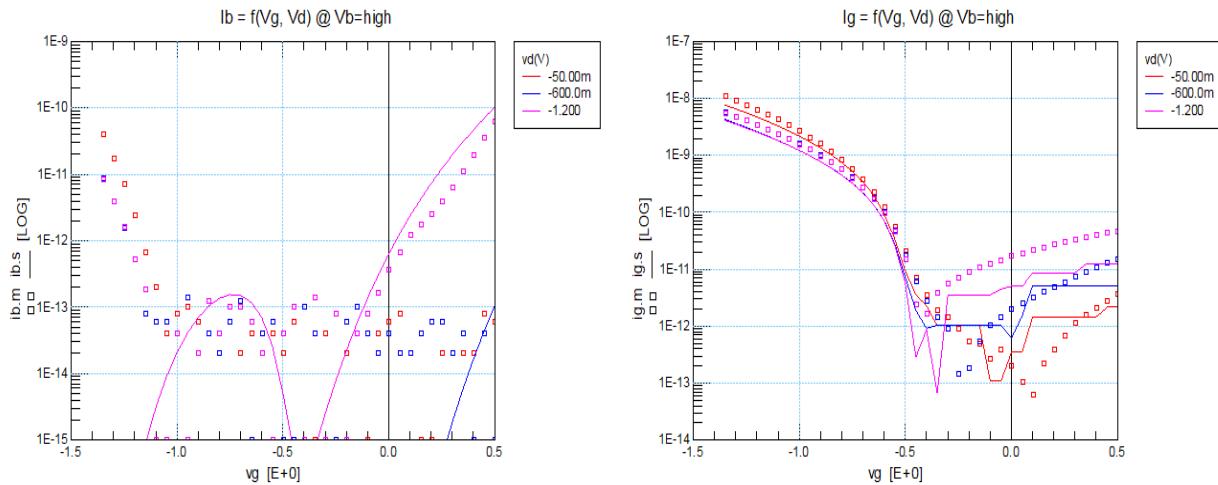
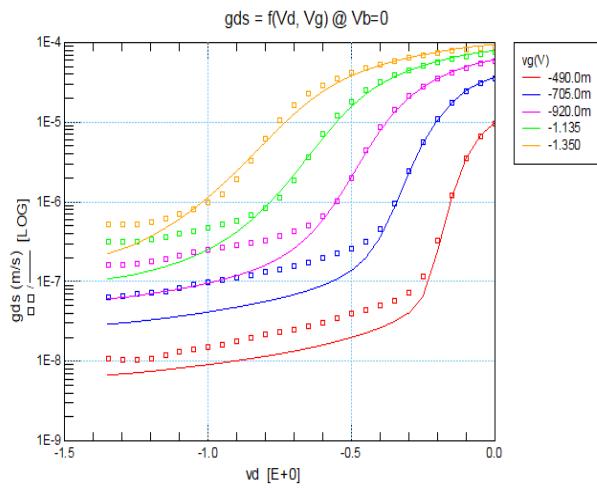
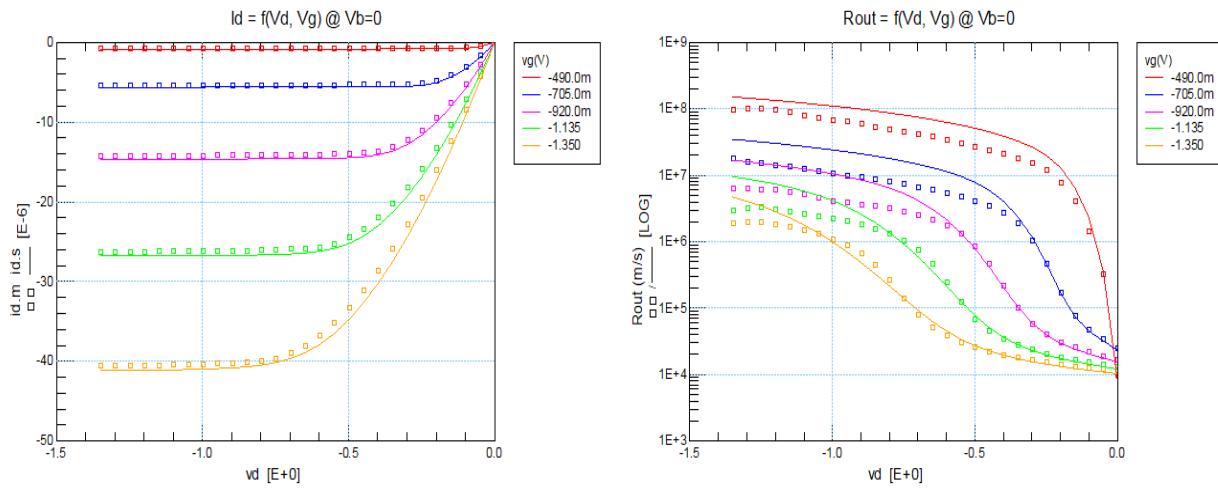
$i_{dvg}, V_d = -1.2V, T = -40^{\circ}C$

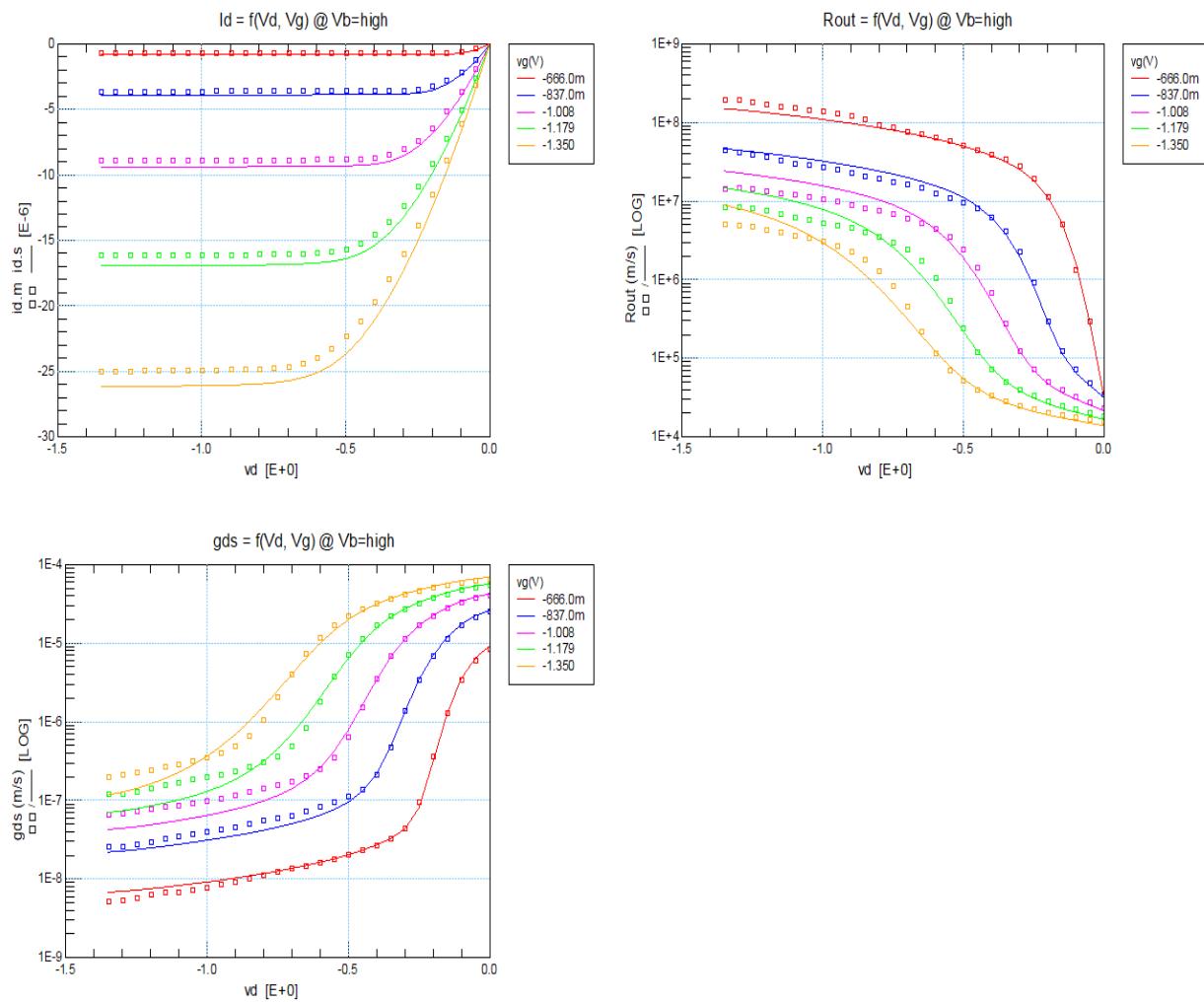
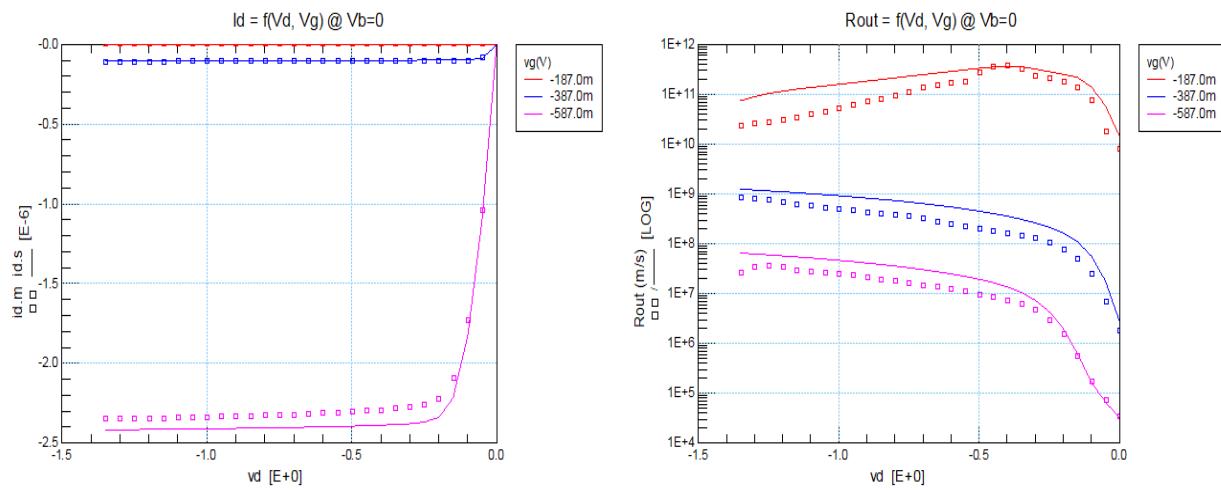


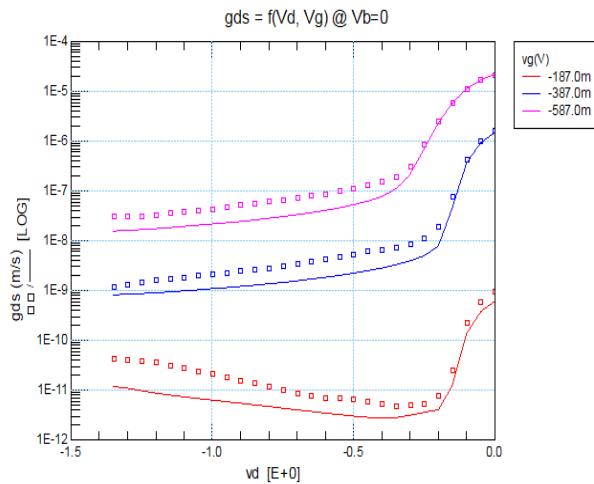


$idvg, Ib, Ig, Vb = 0V, T = -40^\circ\text{C}$

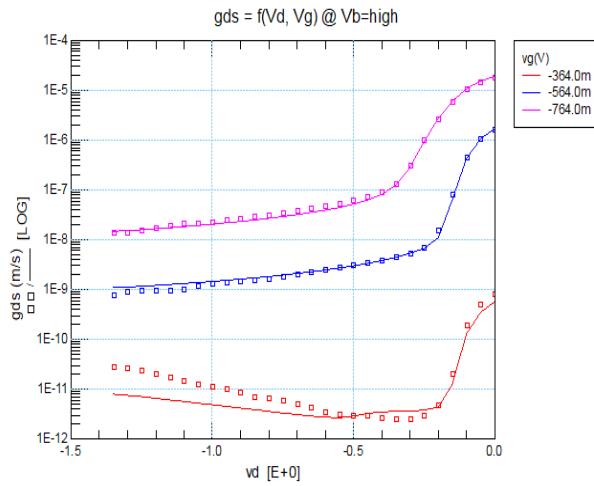
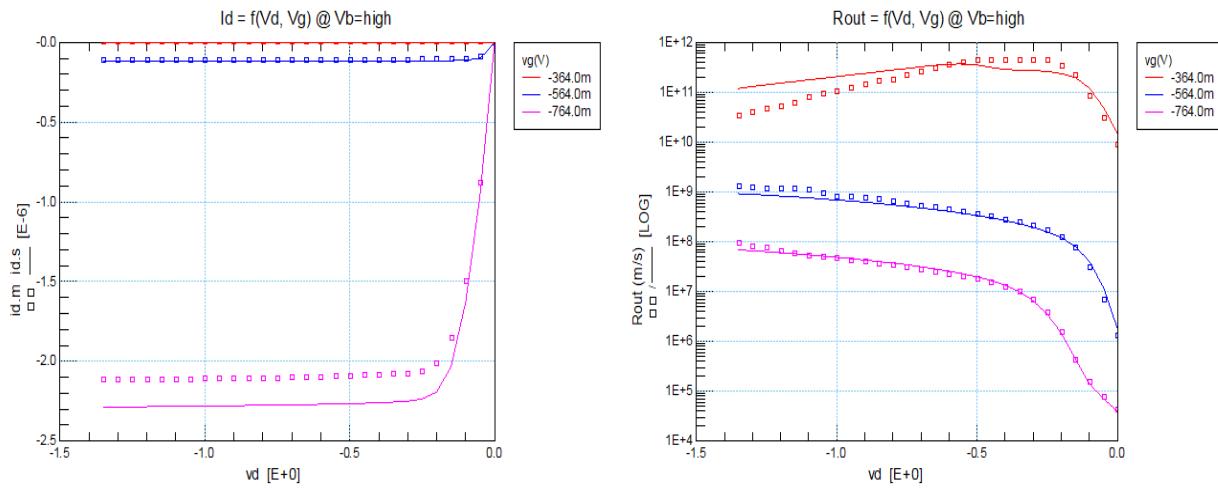


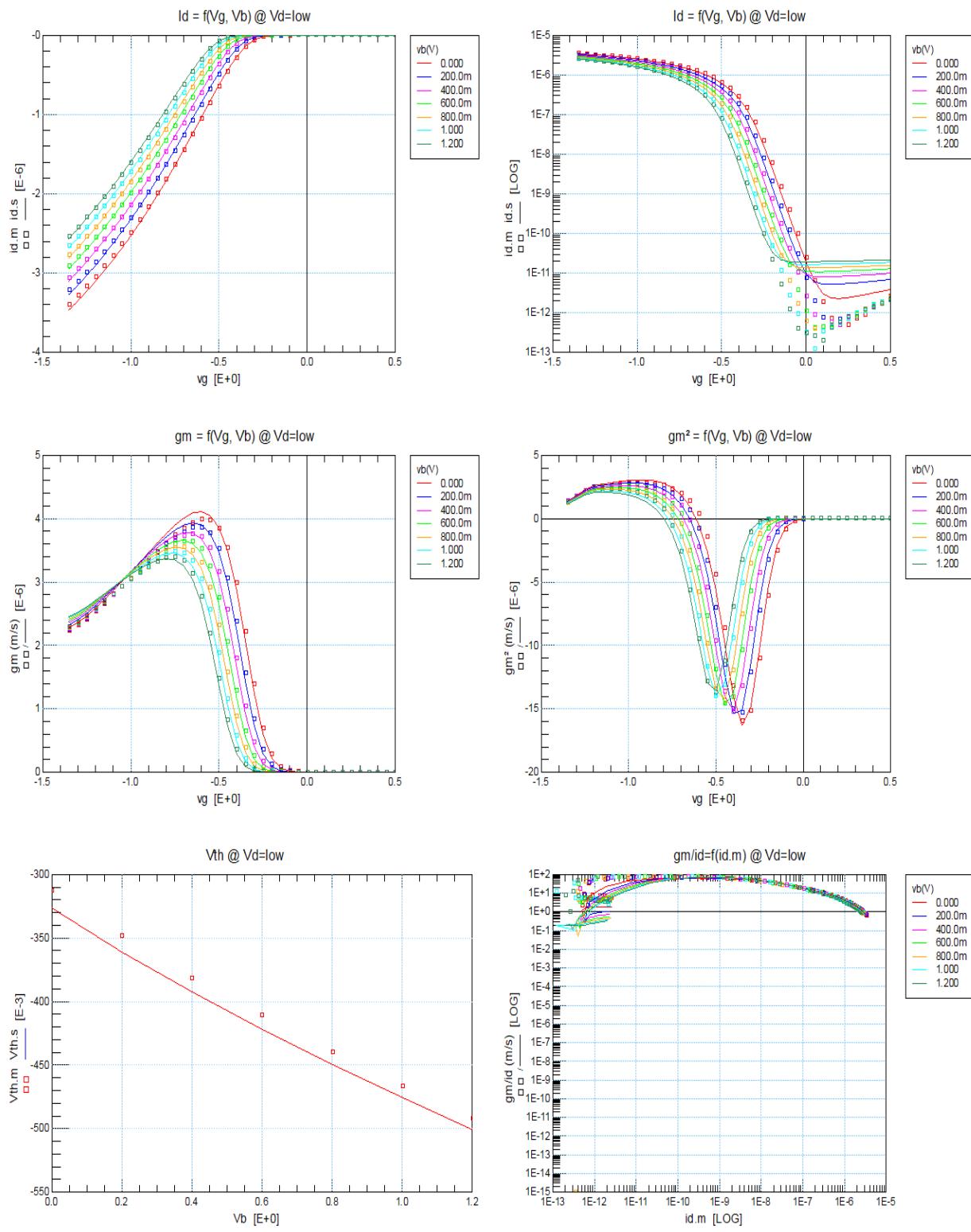
**idvg, Ib,Ig, Vb = 1.2V, T = -40°C**

**idvd, Vb = 0V, T = -40°C**


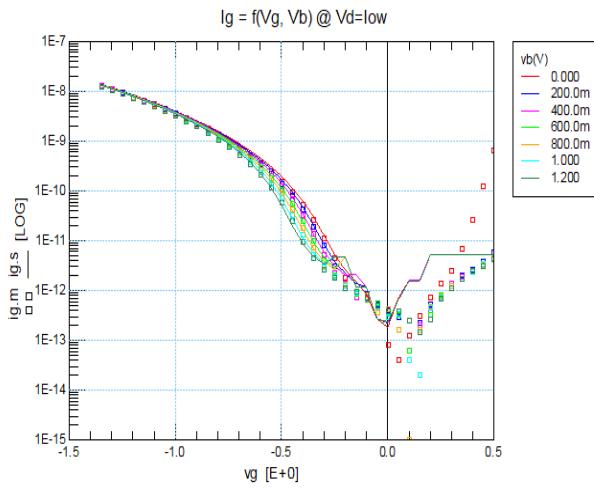
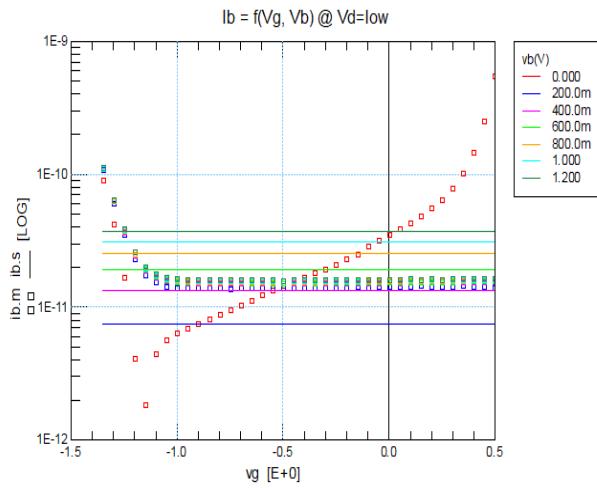
**idvd\_vbmin, Vb = 1.2V, T = -40°C****idvd\_vth, Vb = 0V, T = -40°C**



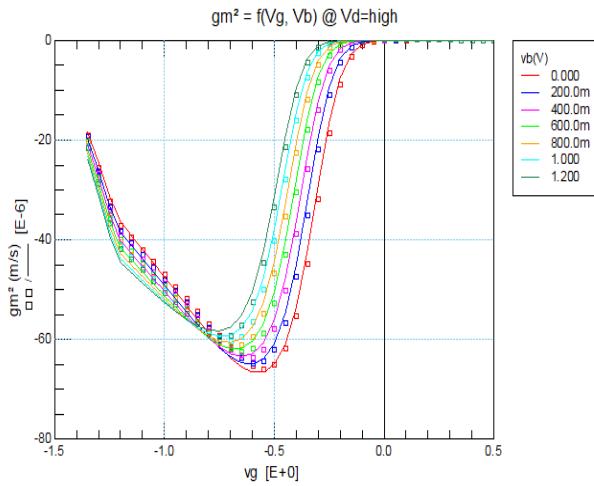
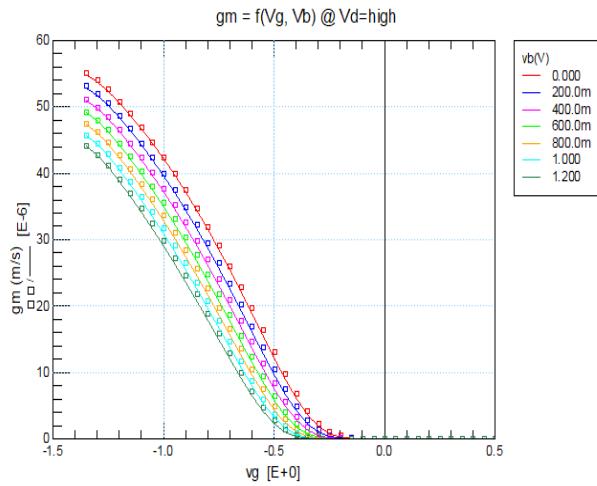
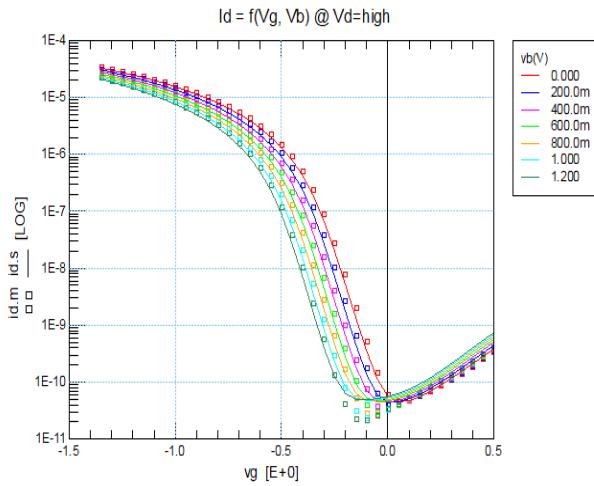
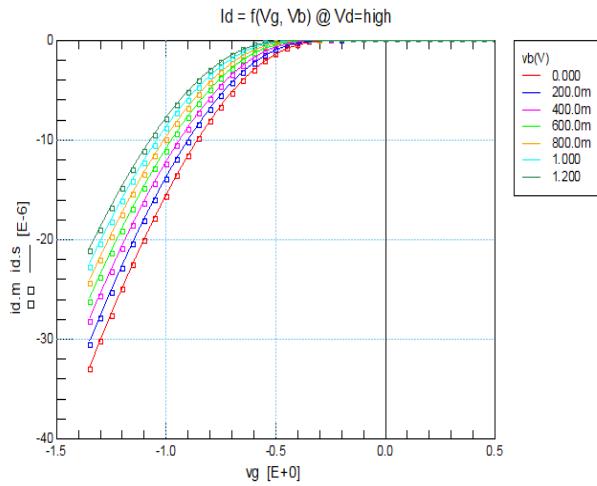
### idvd\_vth\_vbmin, Vb = 1.2V, T = -40°C

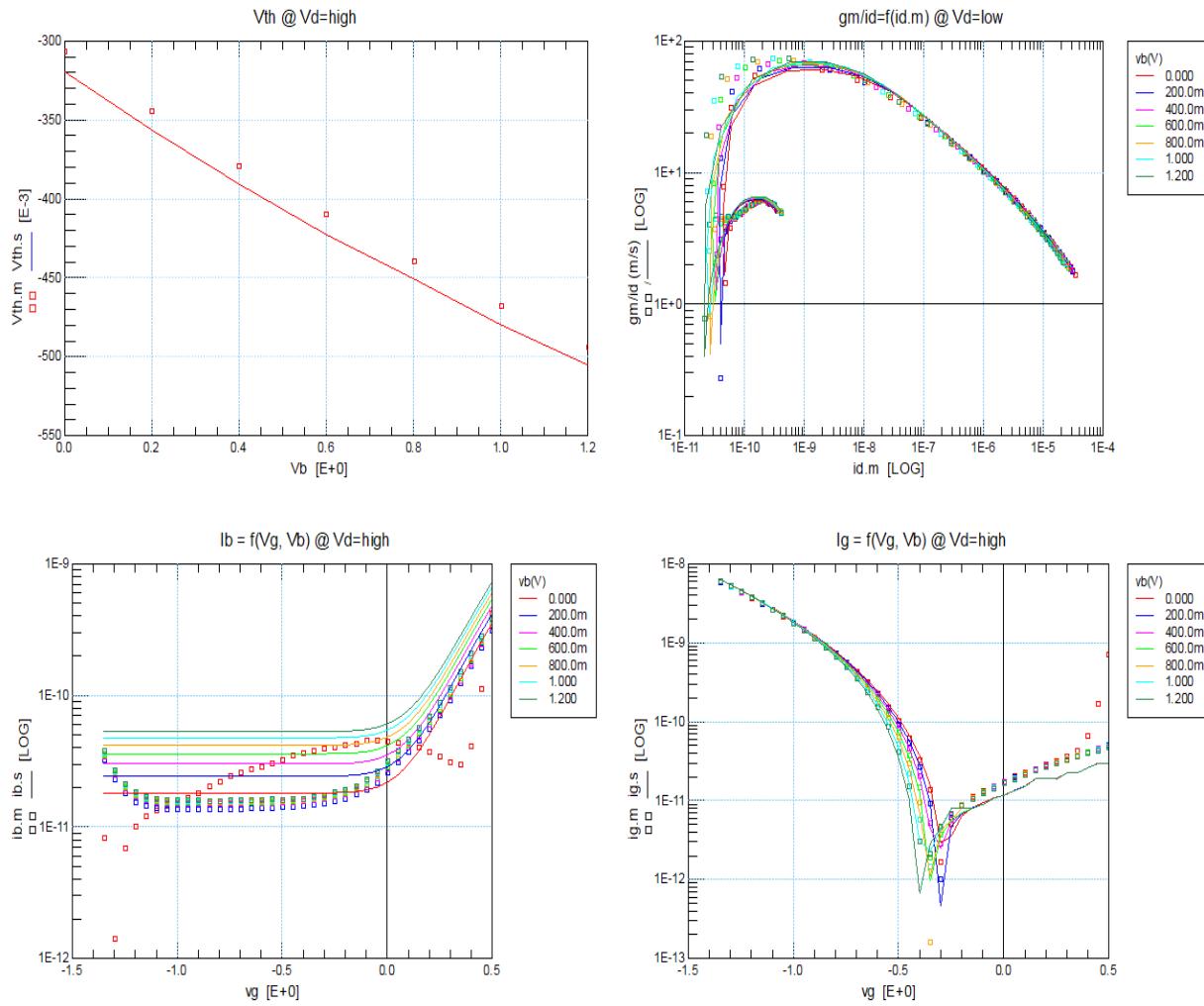


**idvg, Vd = -0.05V, T = 70°C**


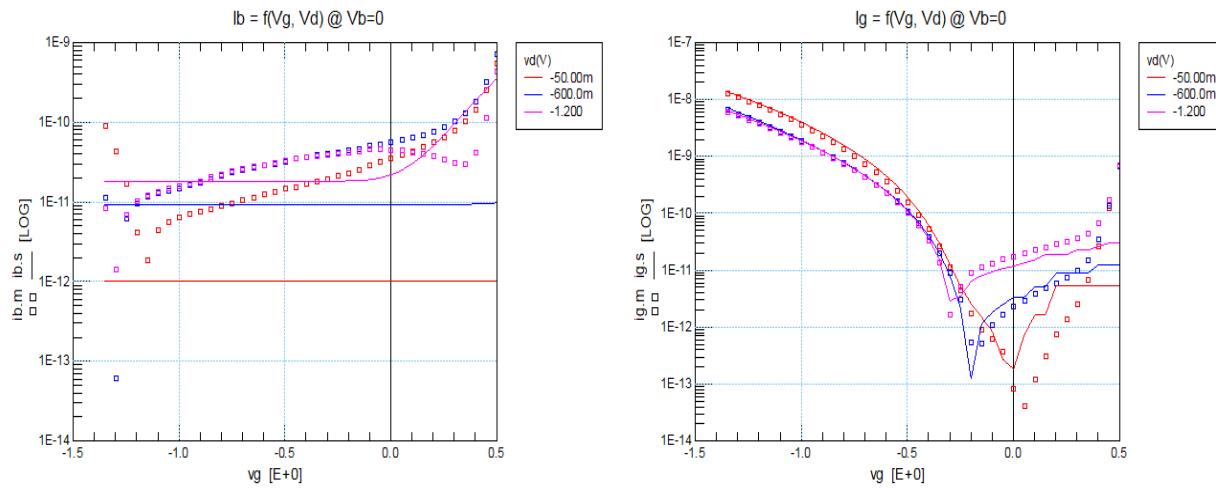


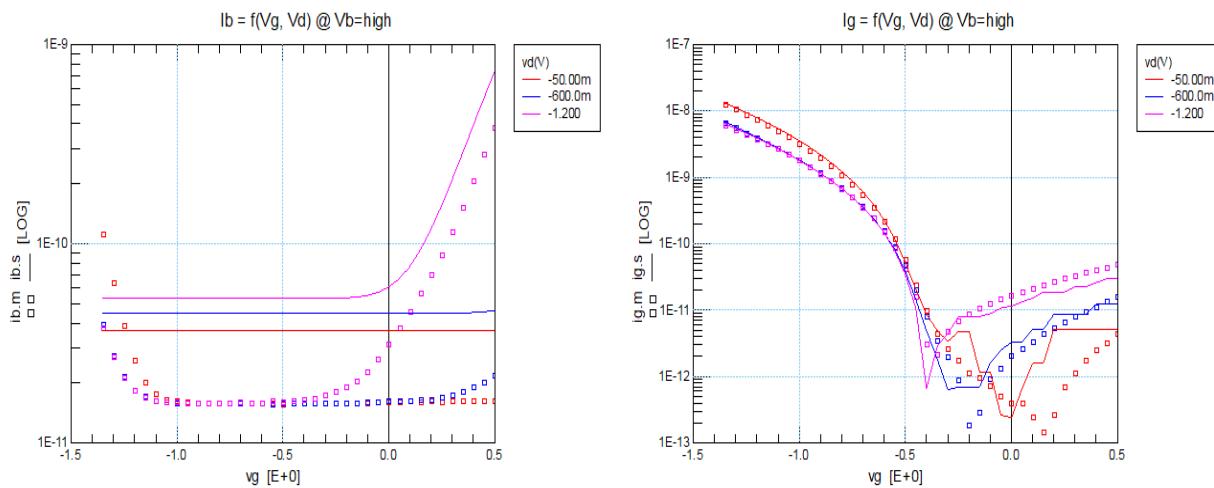
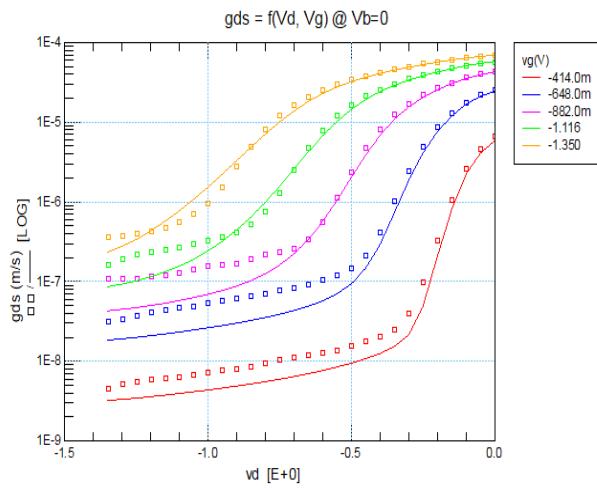
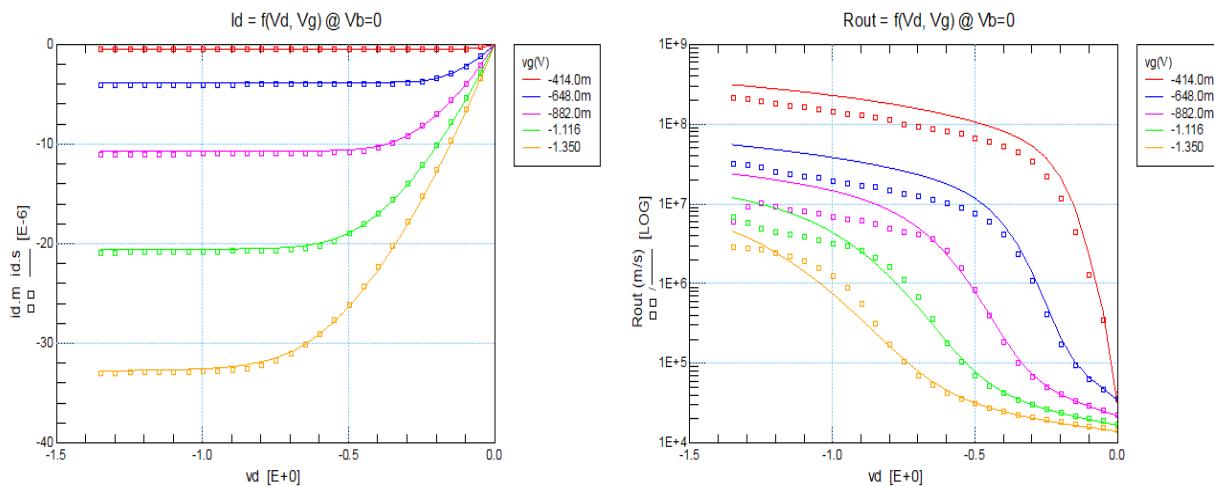
$i_{dvg}, V_d = -1.2V, T = 70^\circ\text{C}$

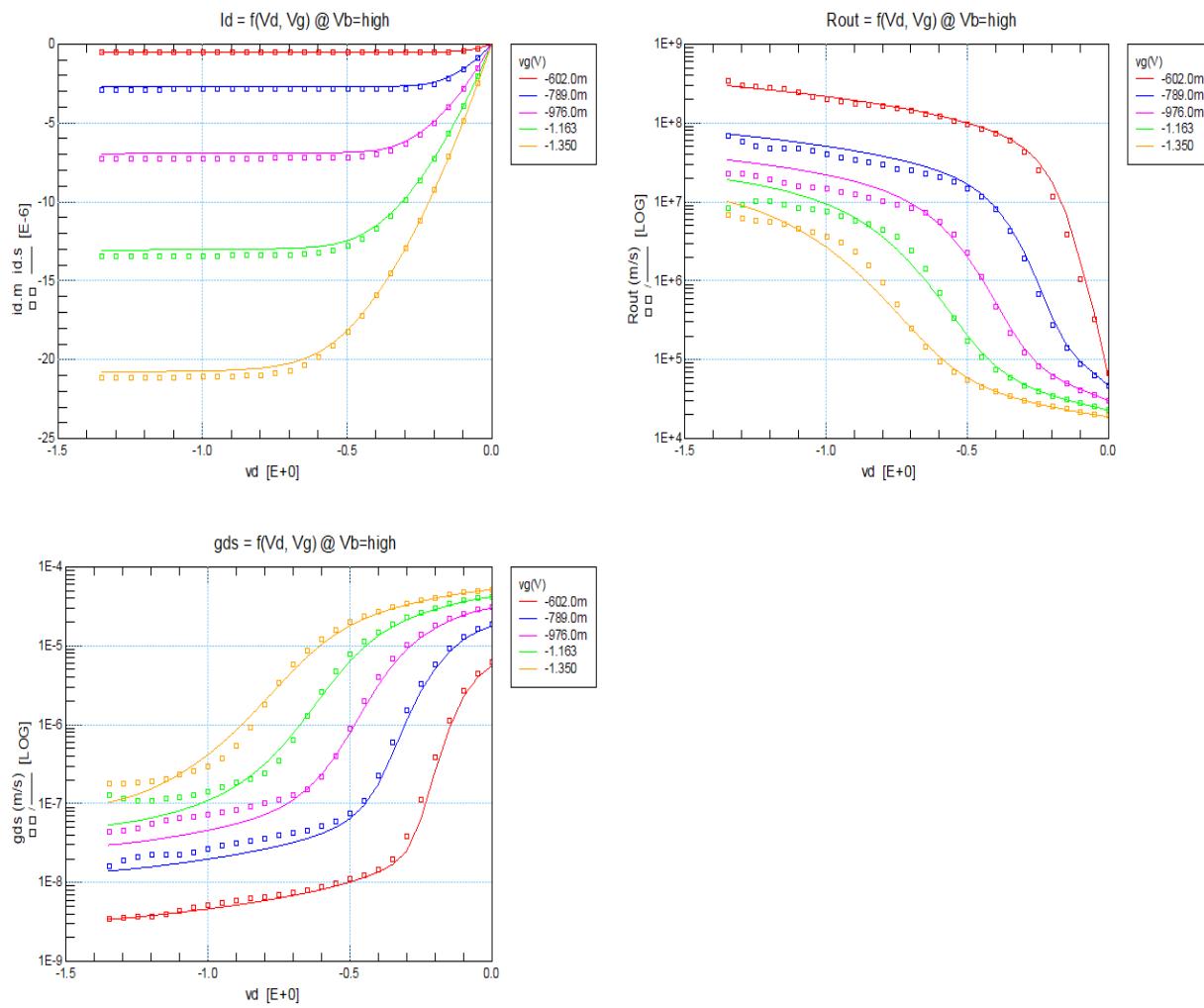
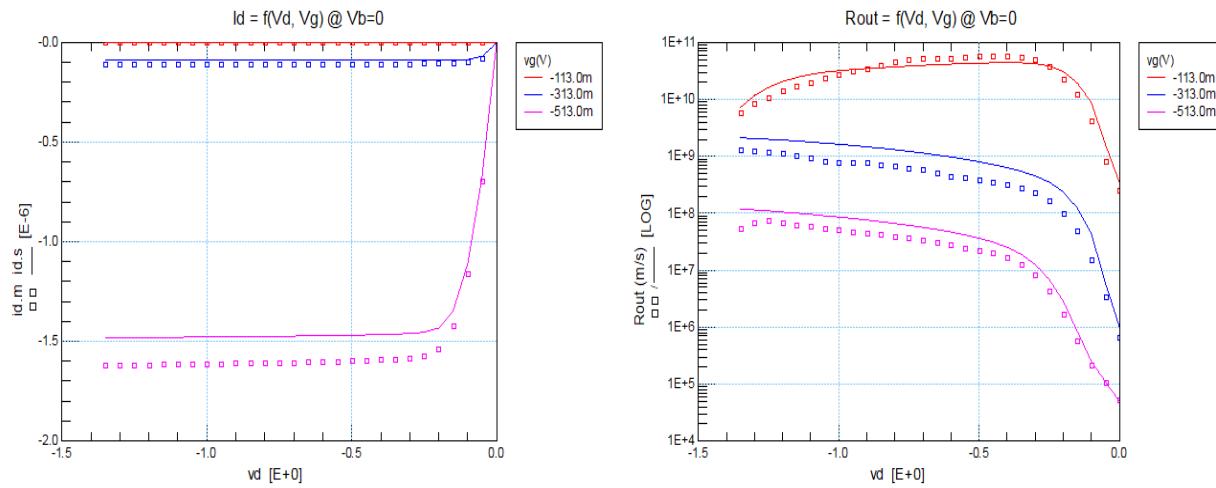


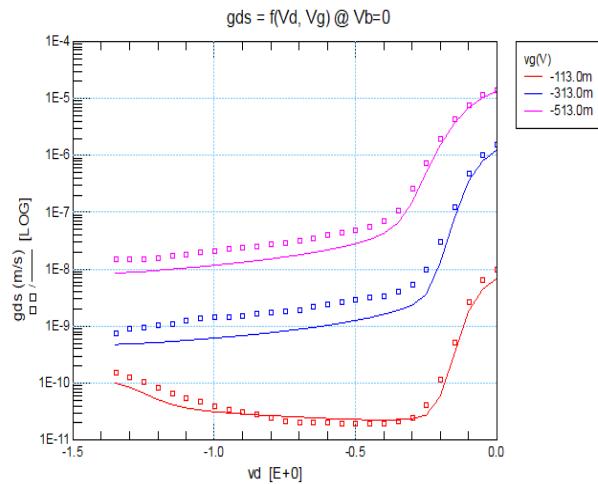


### $id_{vg}, I_b, I_g, V_b = 0V, T = 70^\circ C$

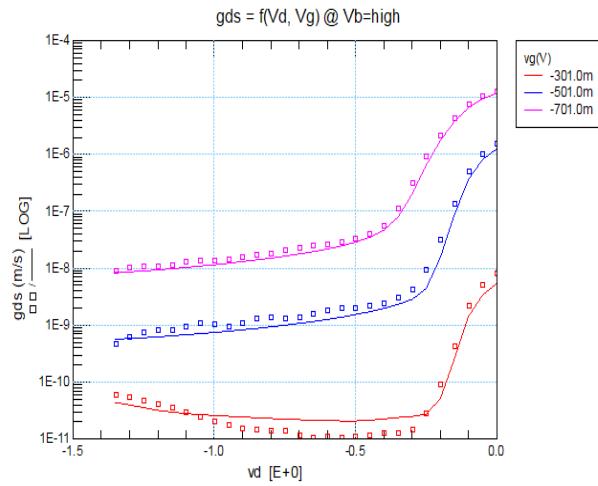
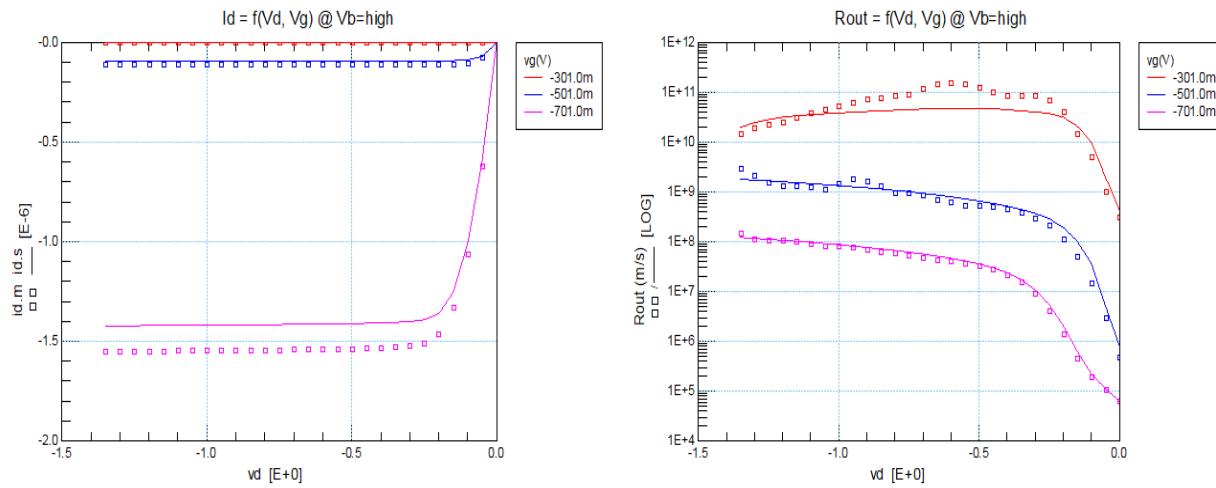


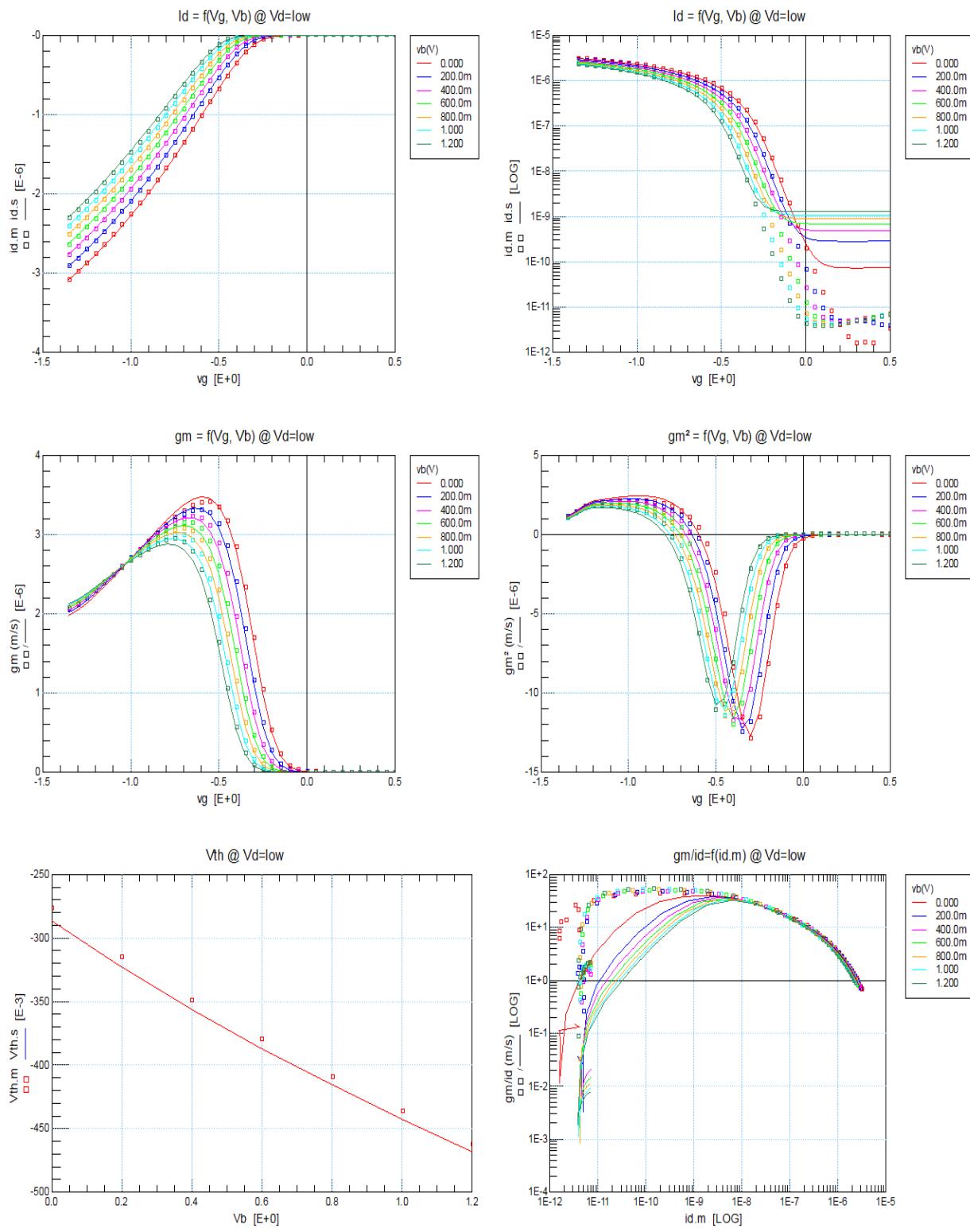
**idvg, Ib,Ig, Vb = 1.2V, T = 70°C**

**idvd, Vb = 0V, T = 70°C**


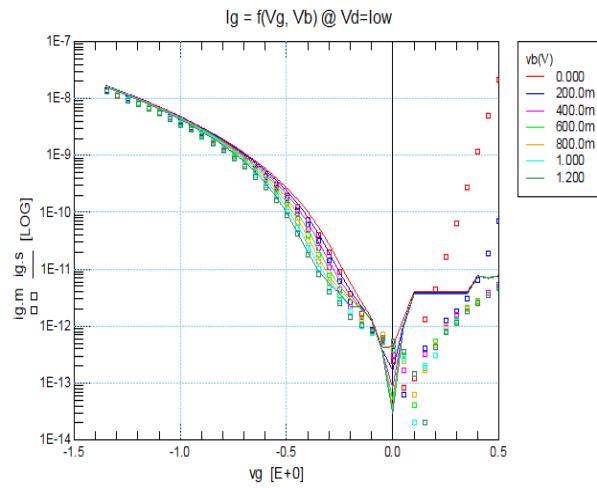
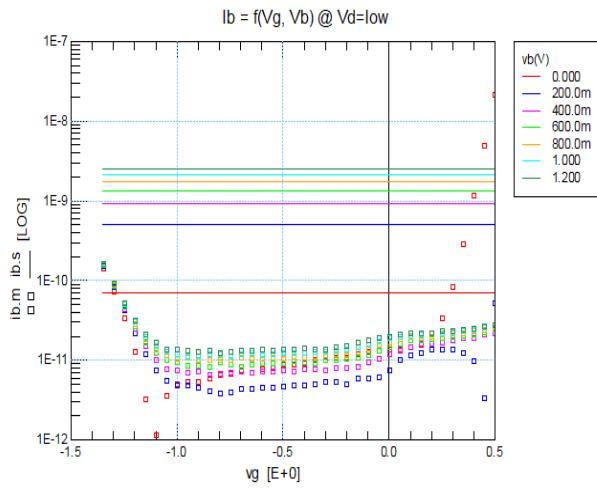
**idvd\_vbmin, Vb = 1.2V, T = 70°C****idvd\_vth, Vb = 0V, T = 70°C**



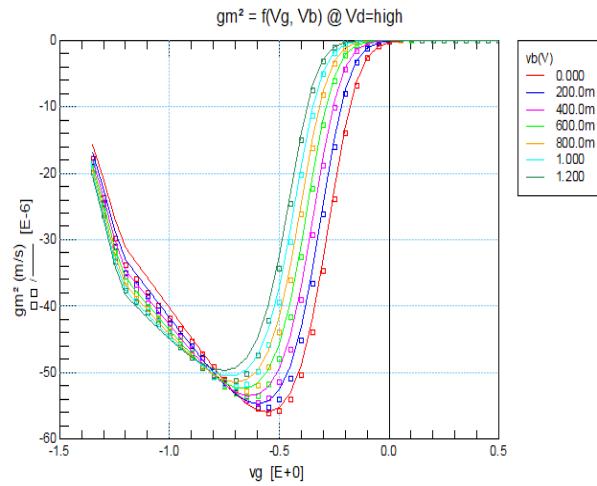
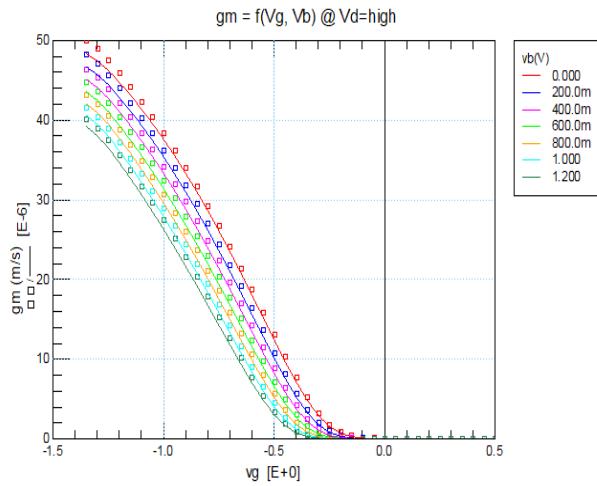
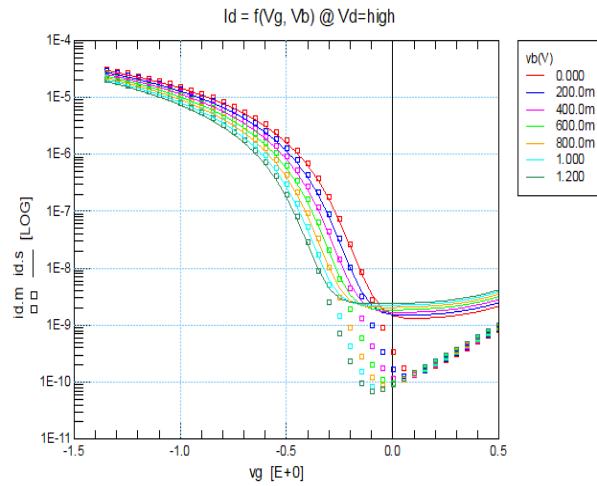
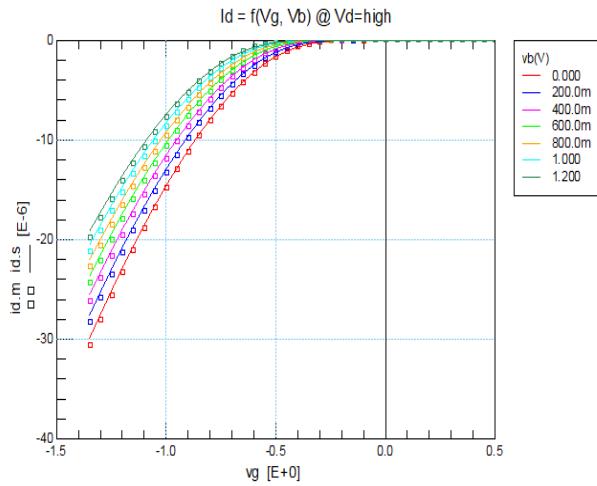
### idvd\_vth\_vbmin, Vb = 1.2V, T = 70°C

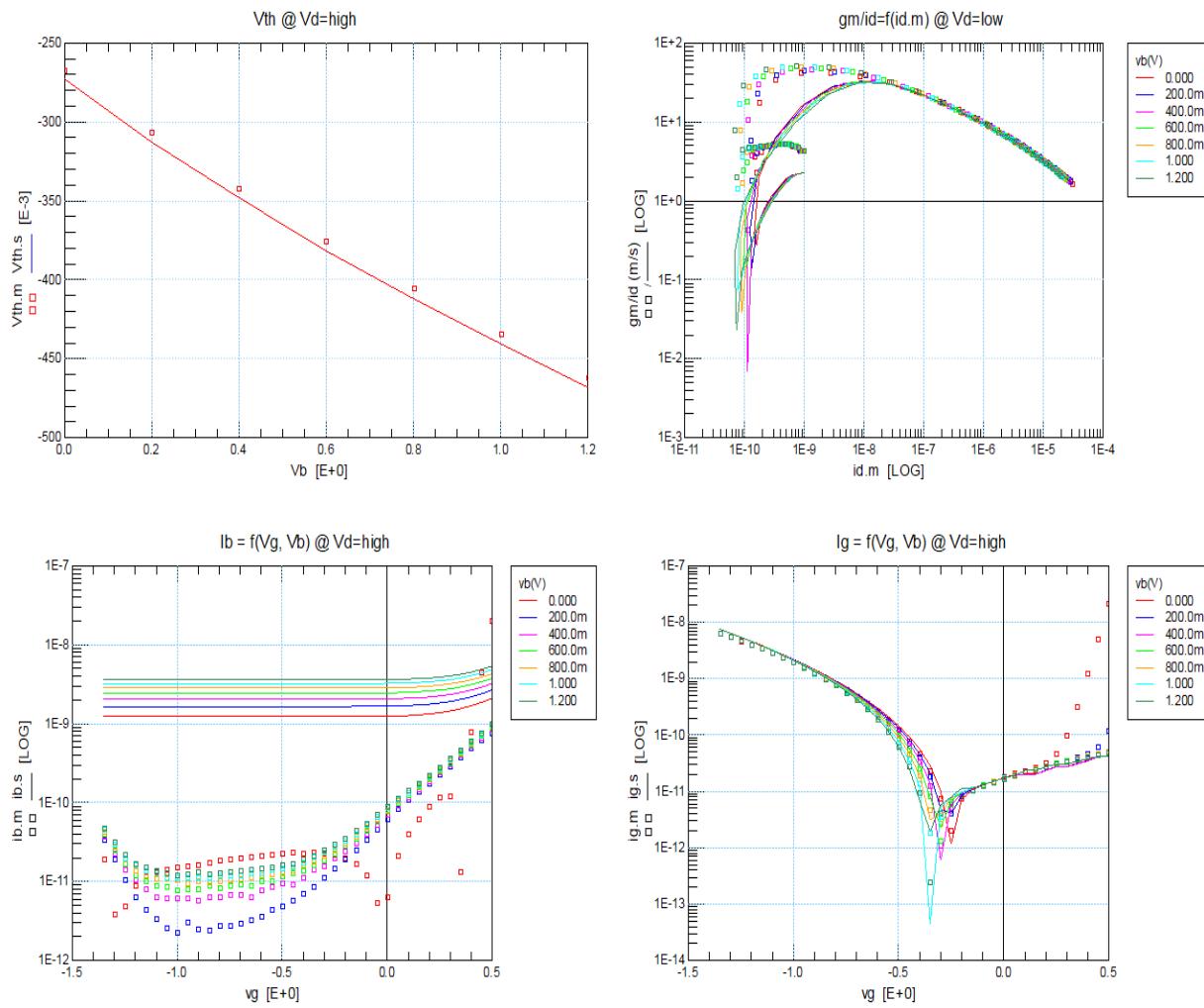


**idvg, Vd = -0.05V, T = 125°C**


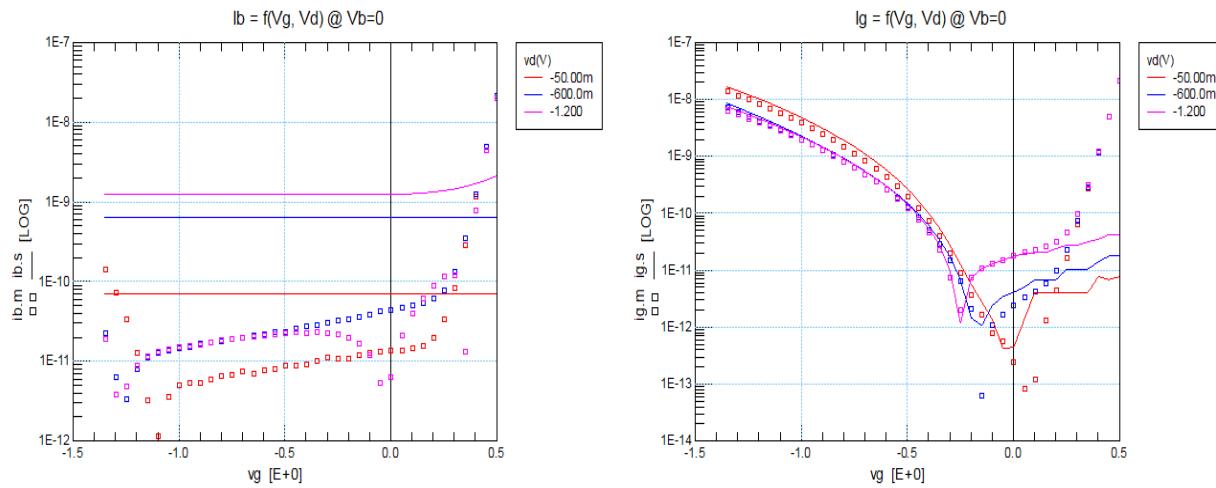


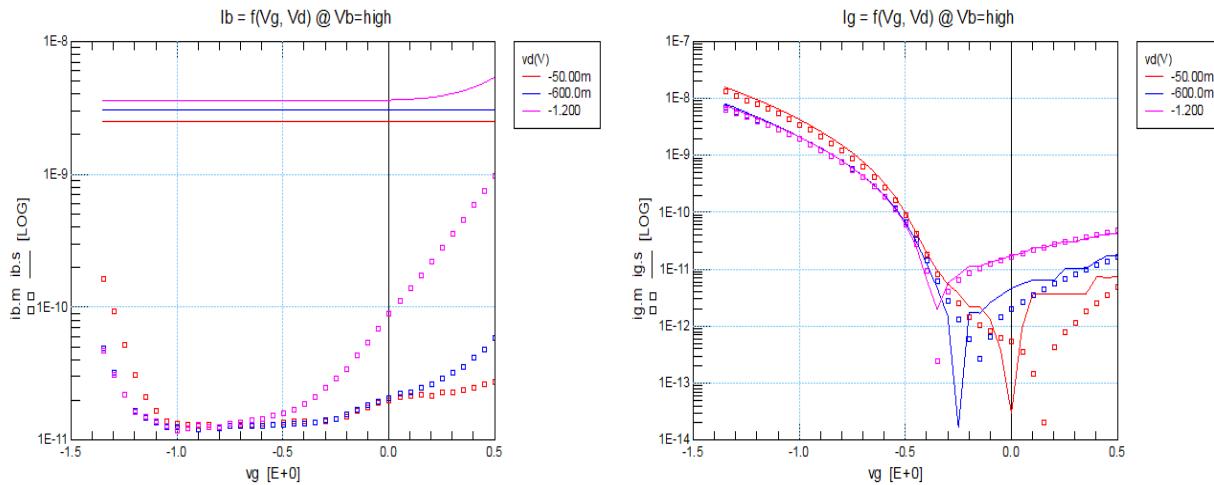
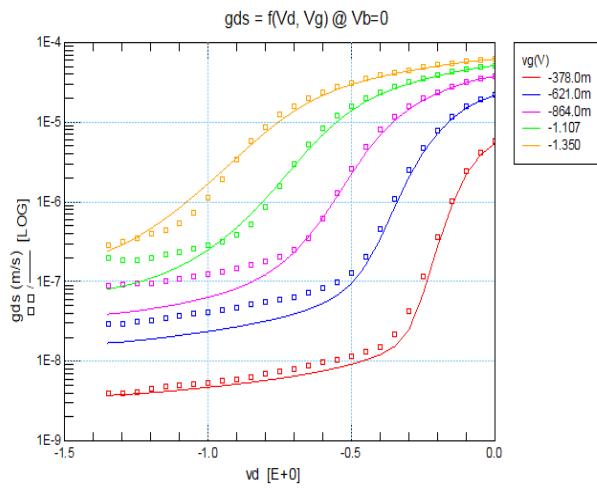
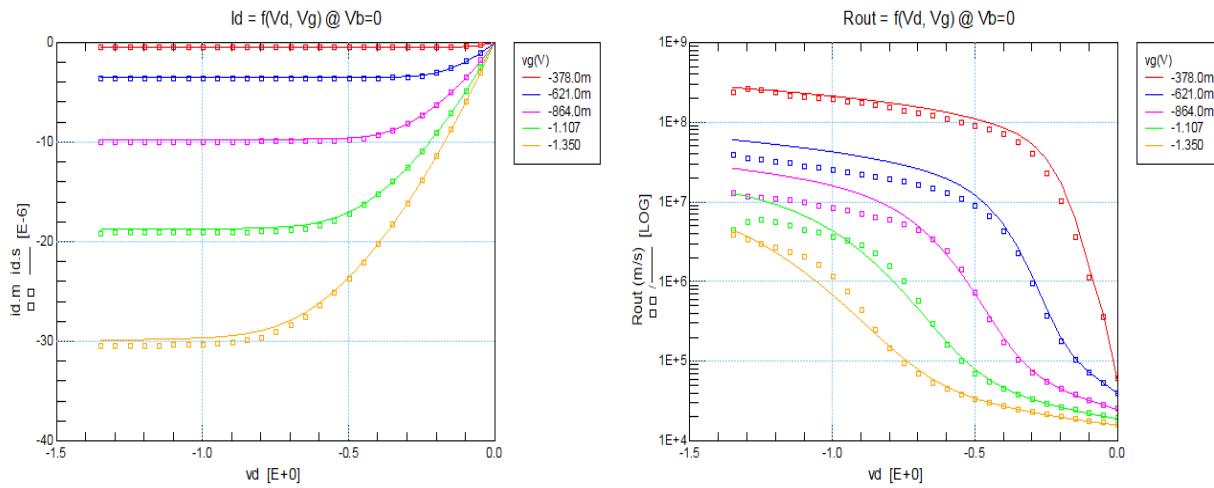
$i_d v_g, V_d = -1.2V, T = 125^\circ C$

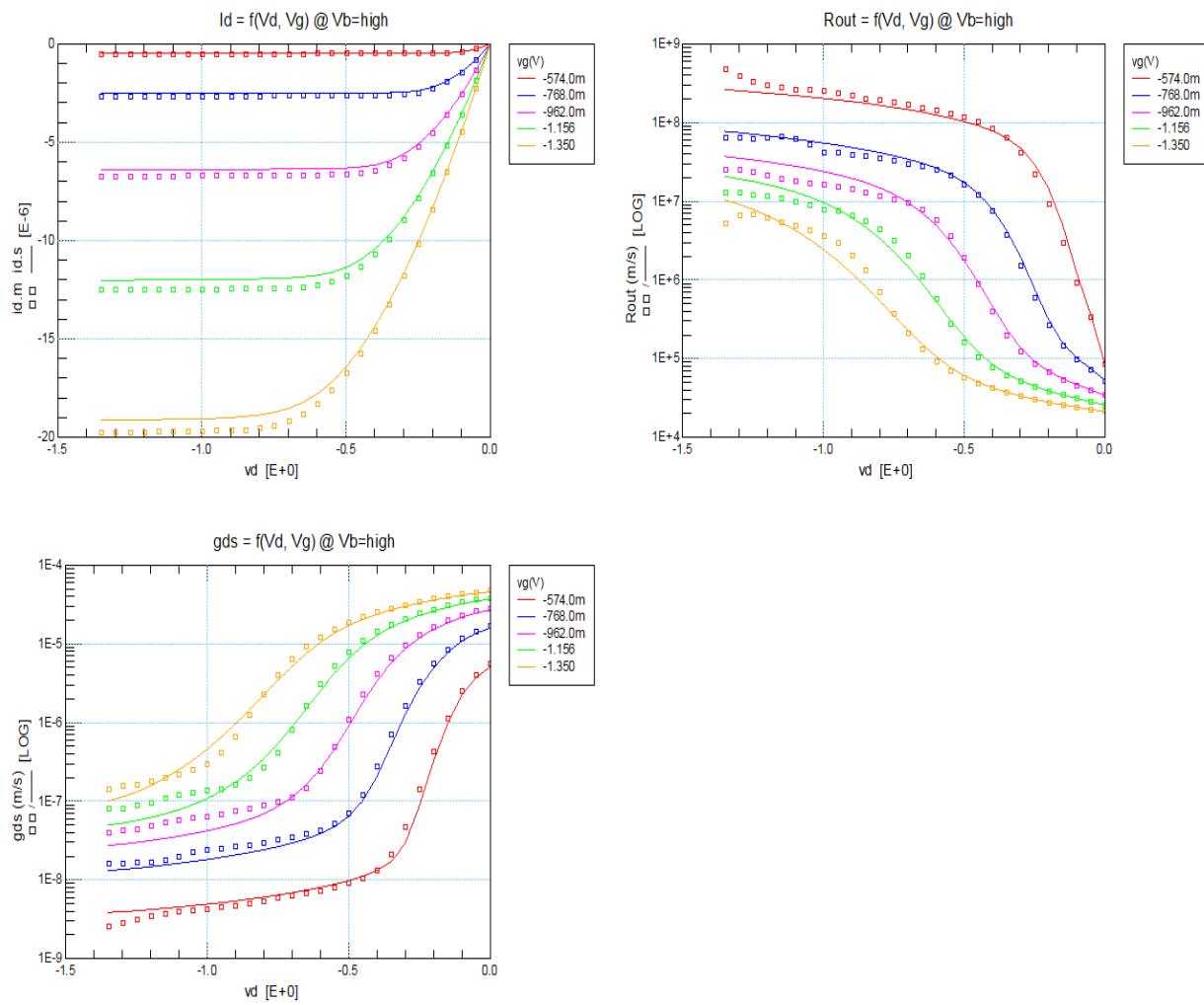
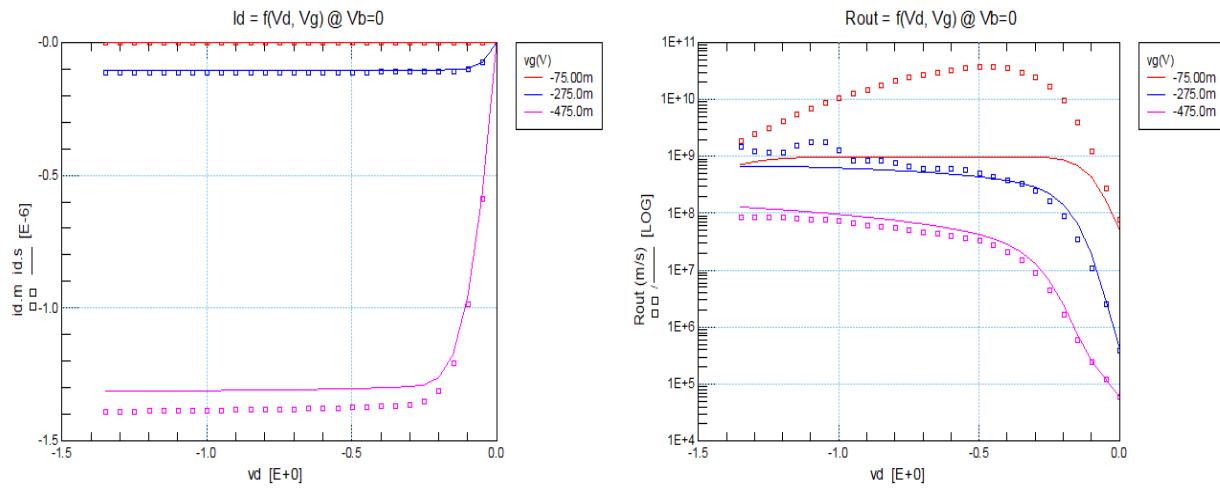


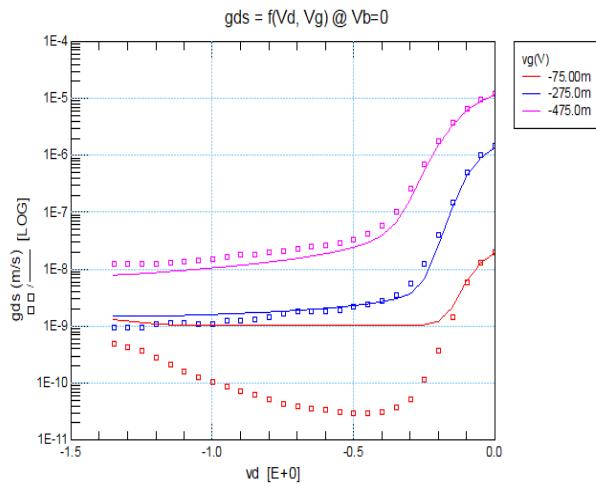


$id_{vg}, I_b, I_g, V_b = 0V, T = 125^{\circ}C$

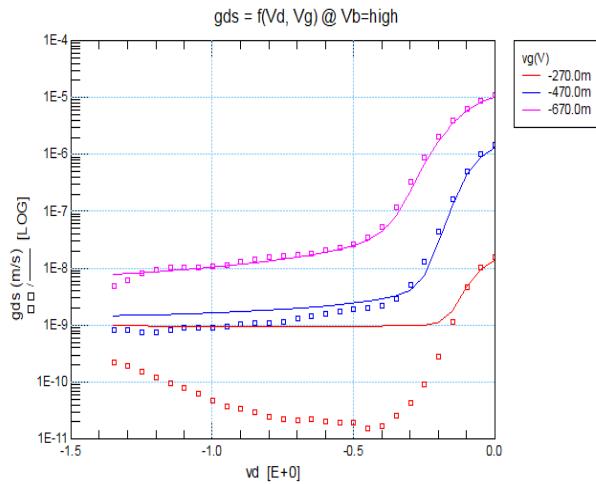
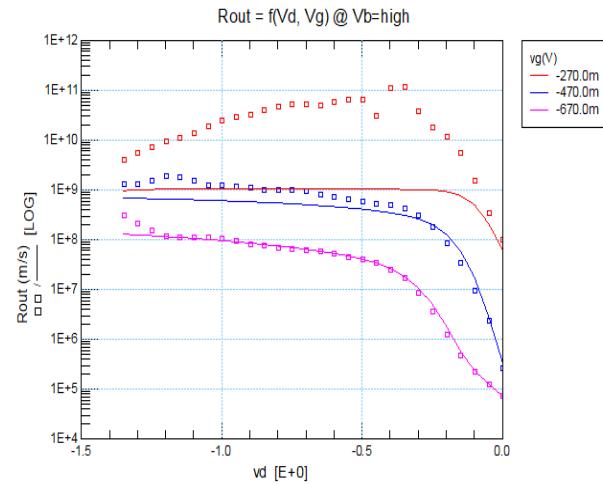
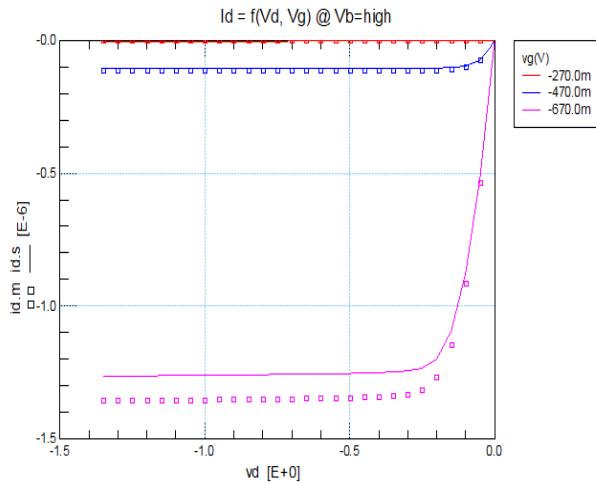


**idvg, Ib,Ig, Vb = 1.2V, T = 125°C**

**idvd, Vb = 0V, T = 125°C**


**idvd\_vbmin, Vb = 1.2V, T = 125°C****idvd\_vth, Vb = 0V, T = 125°C**

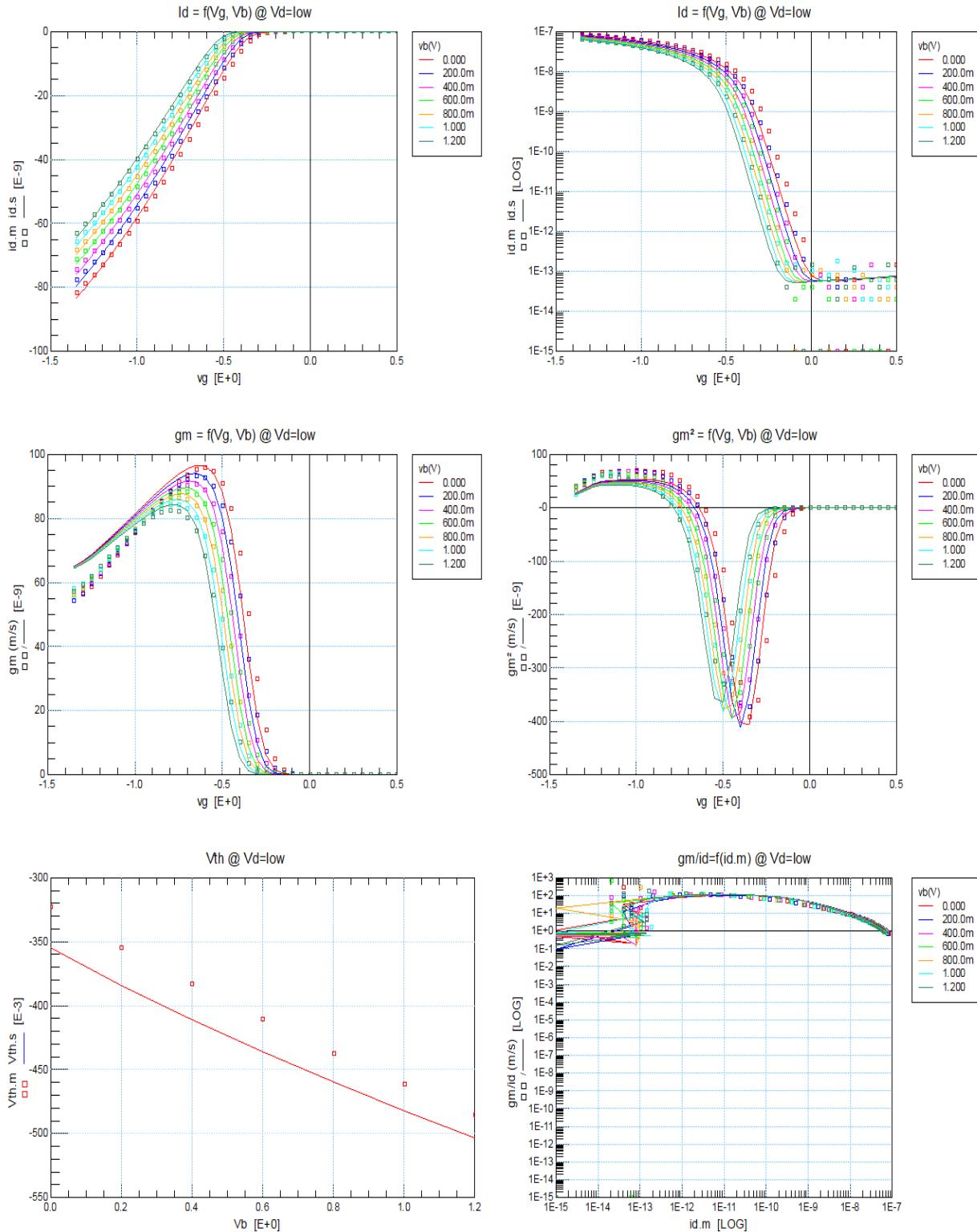


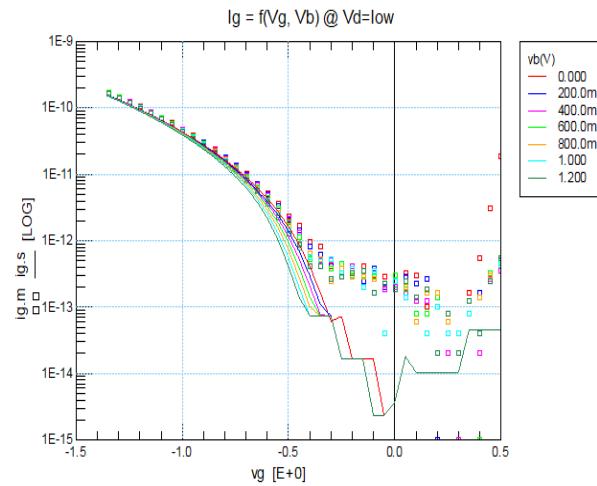
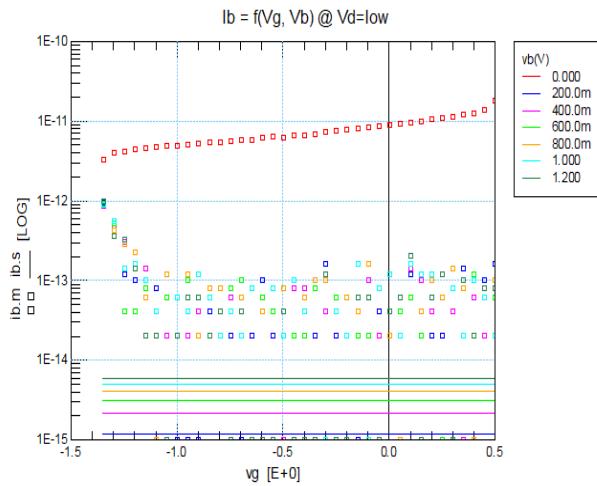
**idvd\_vth\_vbmin, Vb = 1.2V, T = 125°C**



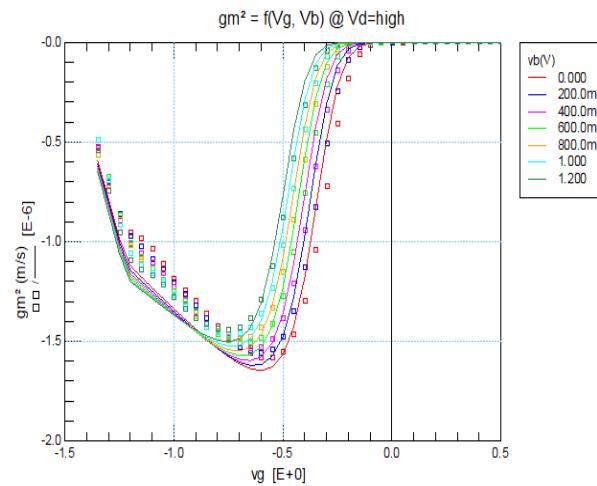
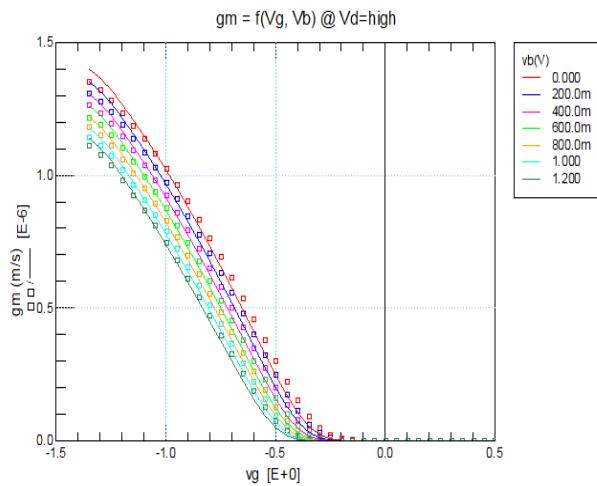
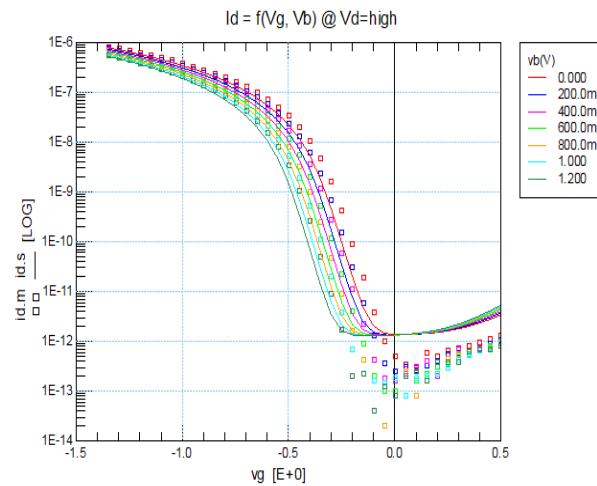
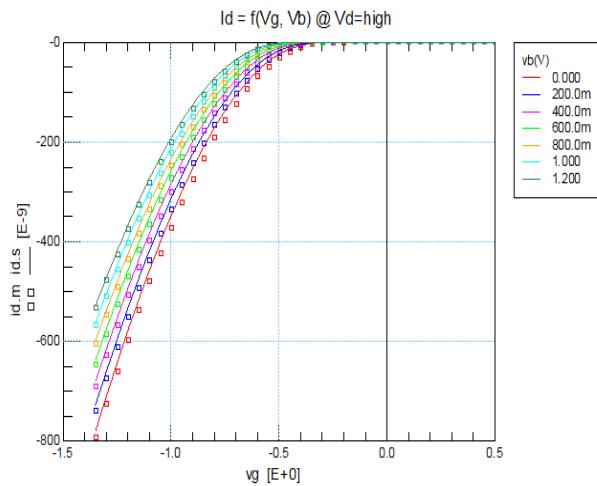
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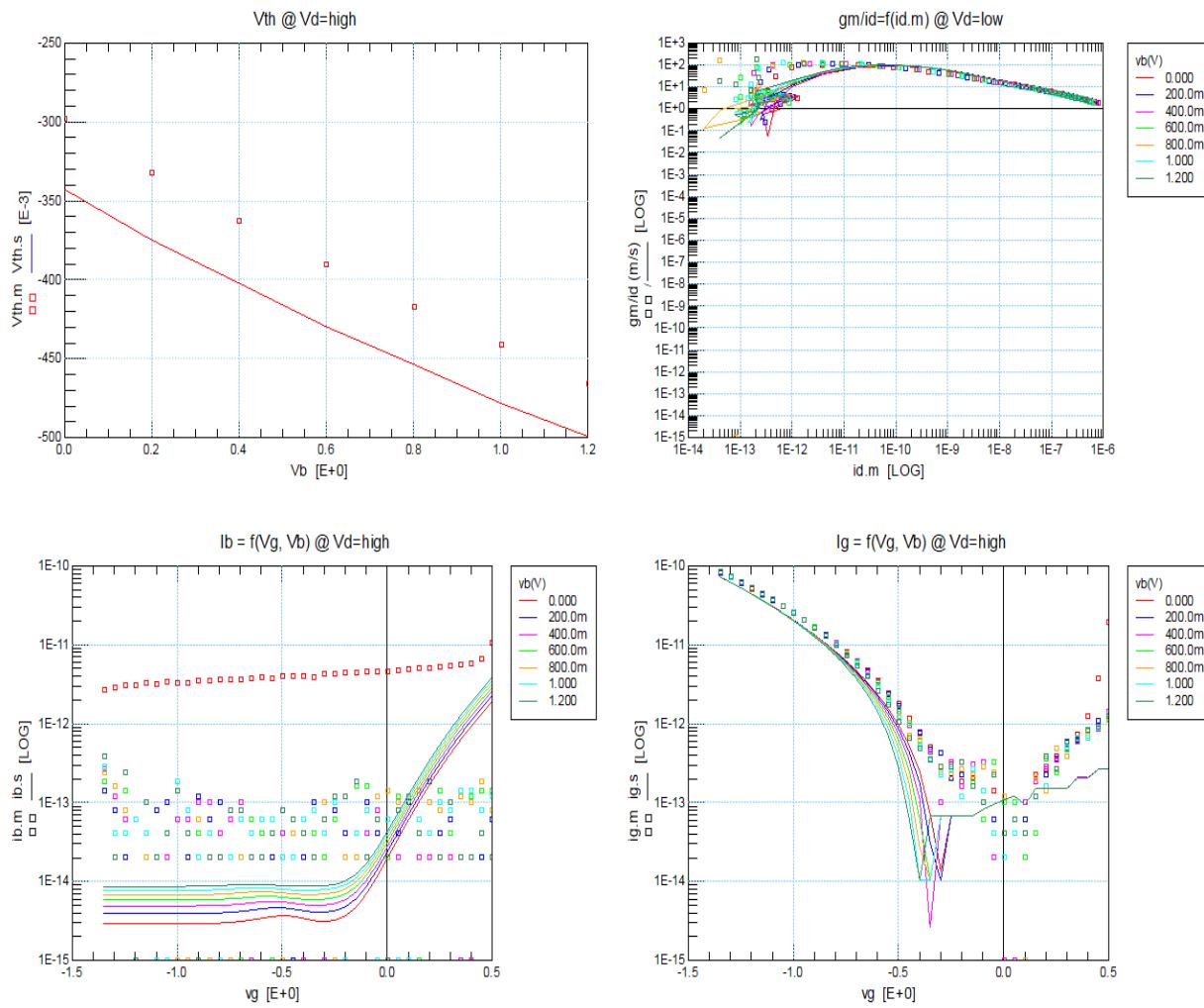
$idv_g, V_d = -0.05V, T = 27^\circ C$



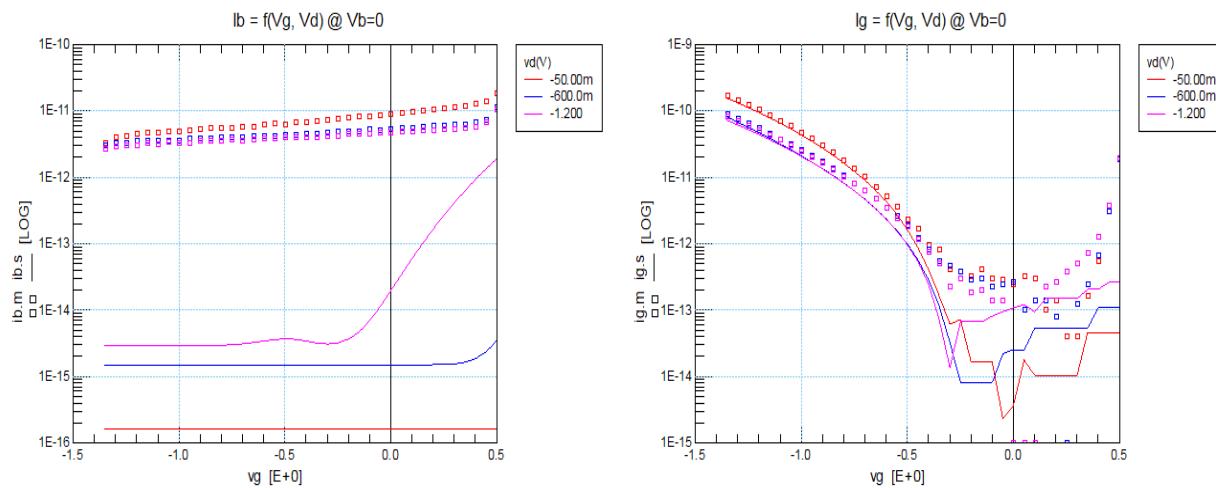


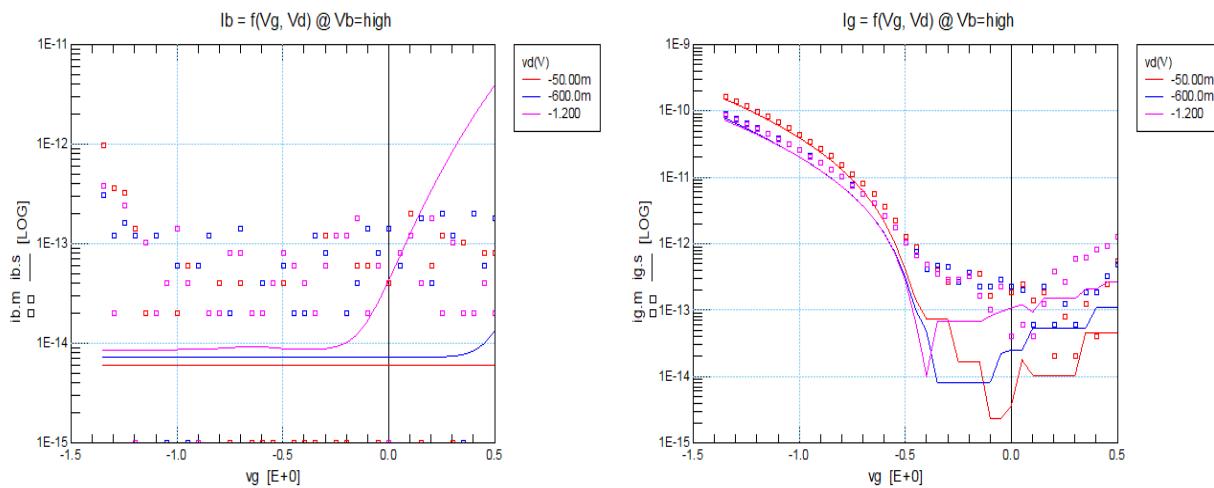
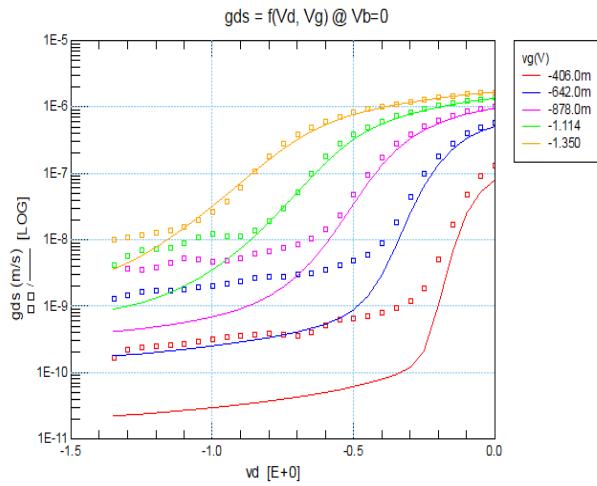
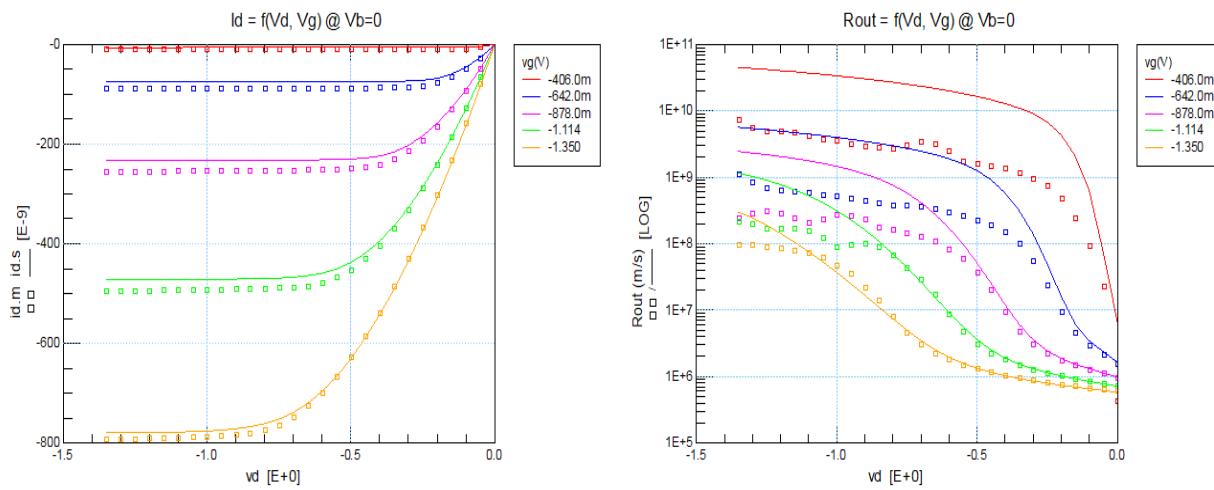
$i_d v_g, V_d = -1.2V, T = 27^\circ C$

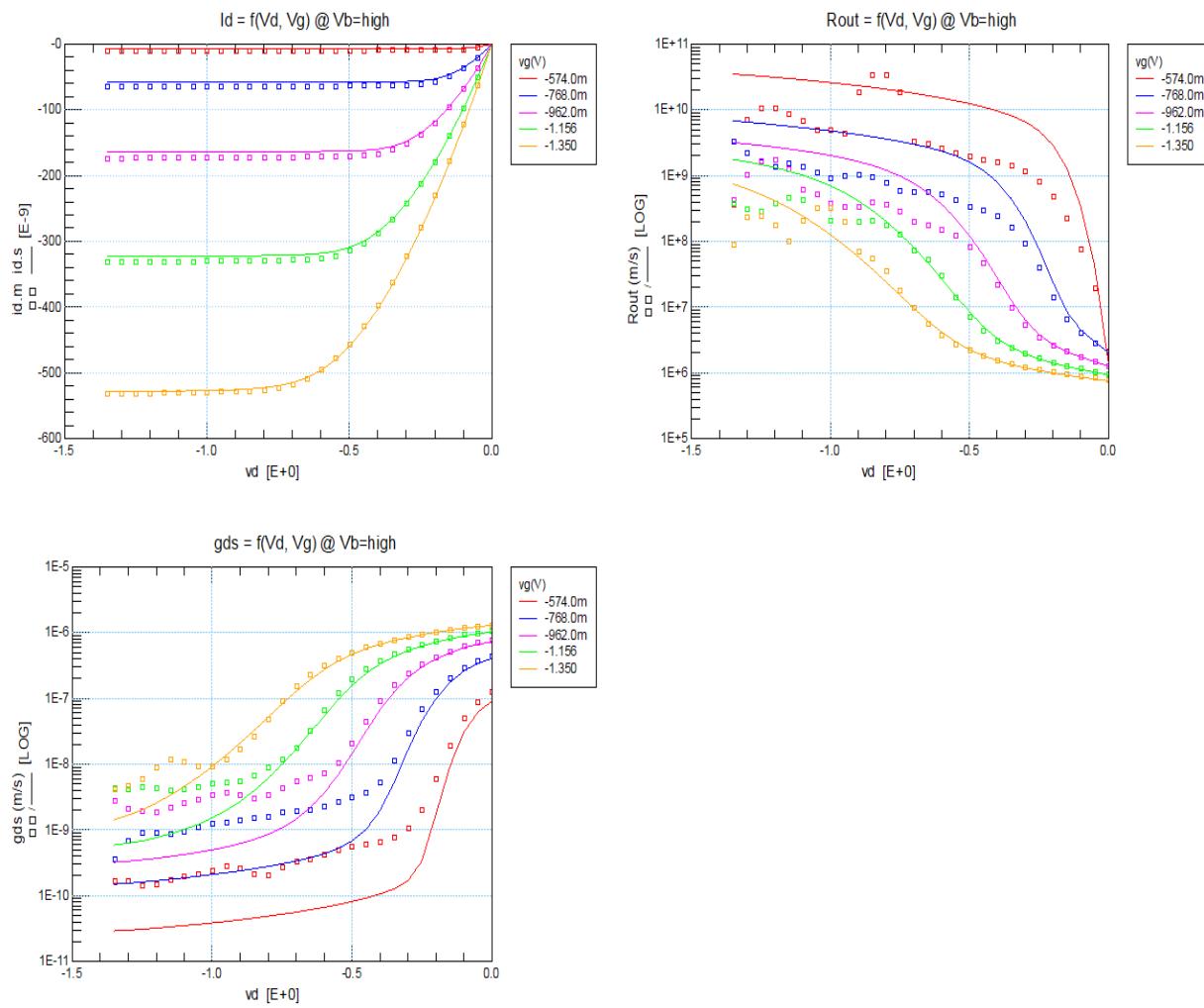
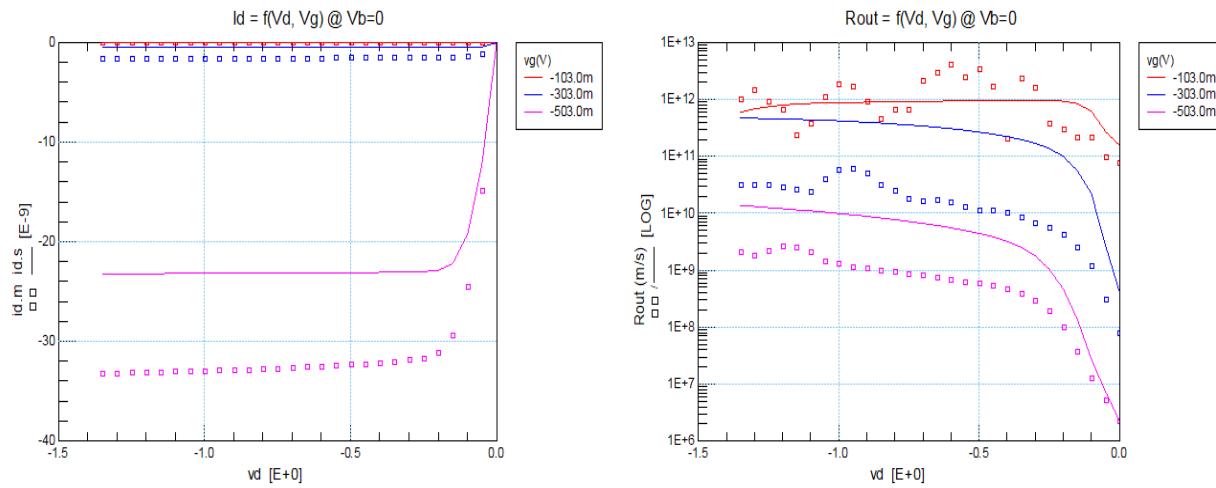


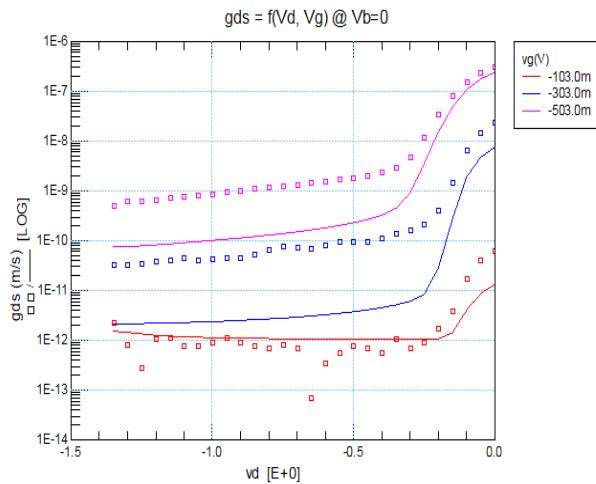


**idvg, Ib,Ig, Vb = 0V, T = 27°C**

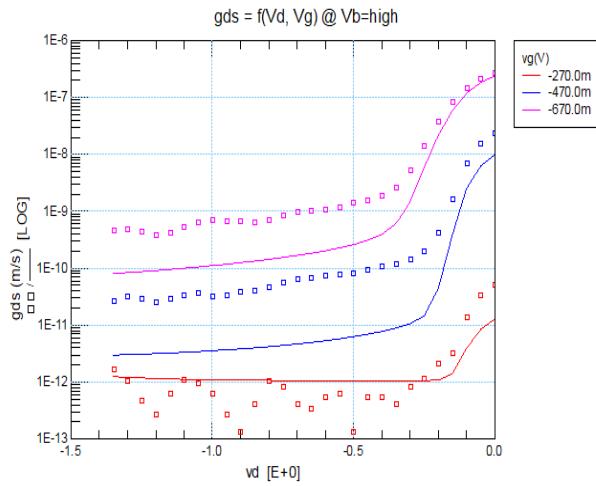
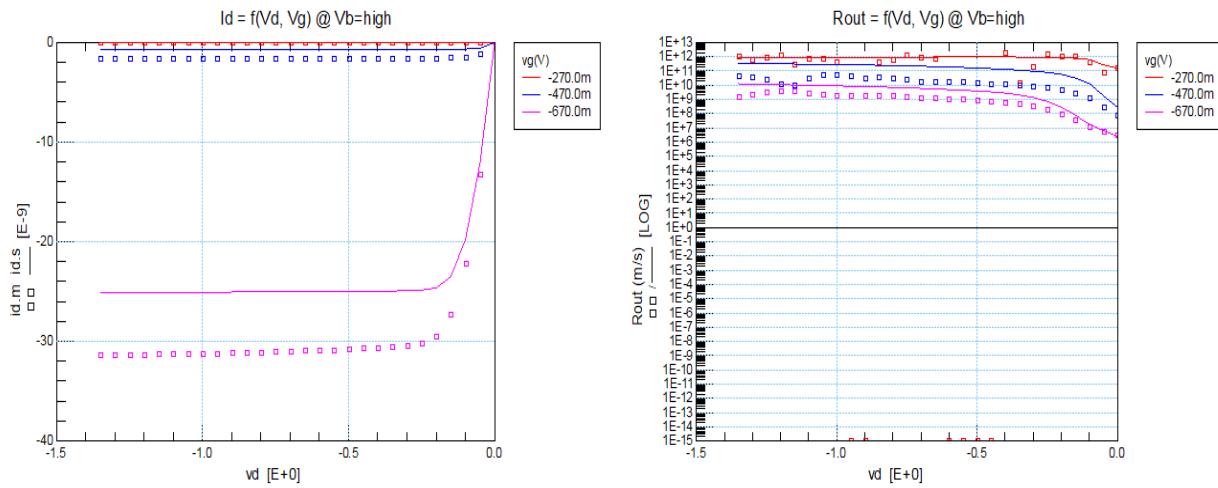


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


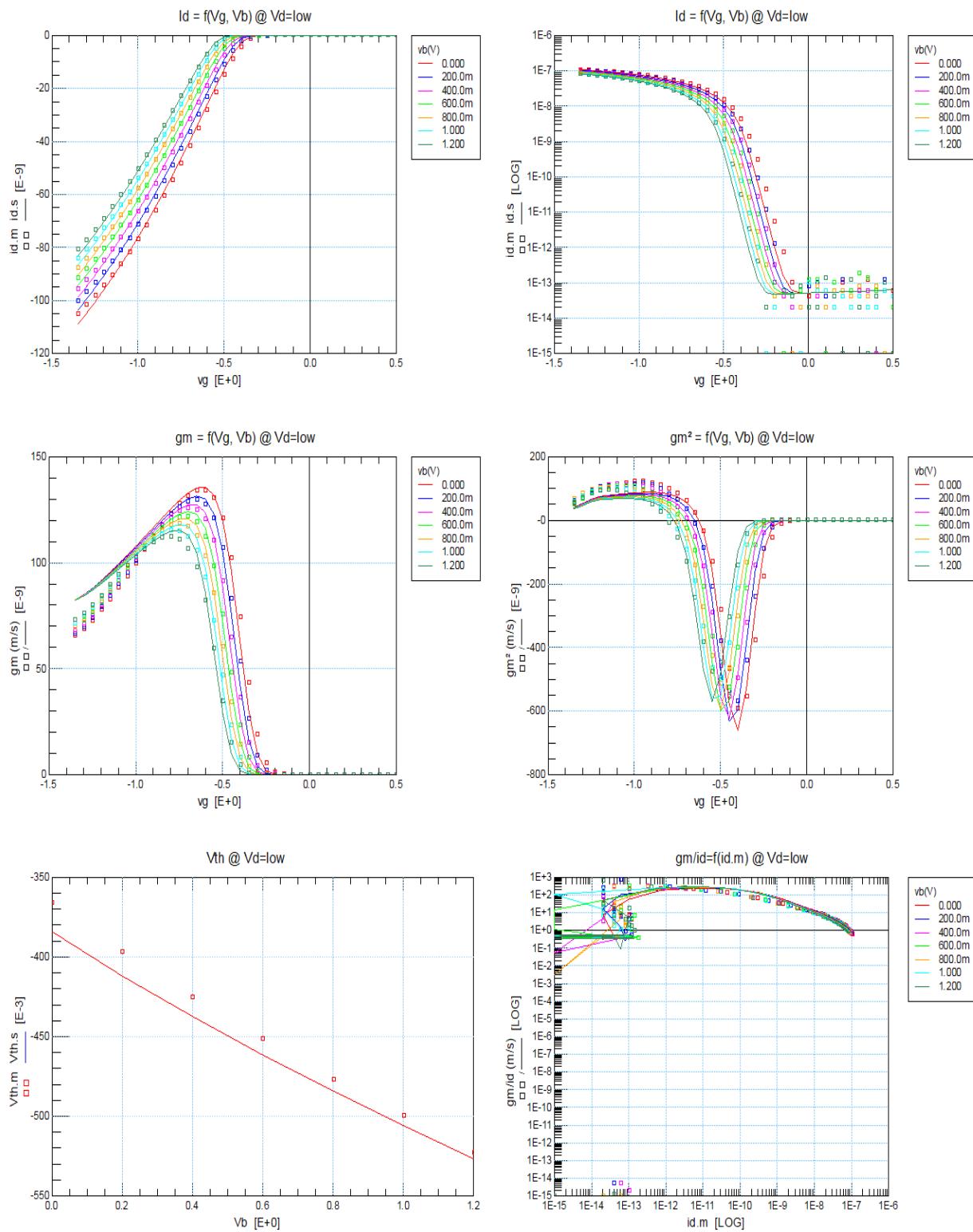
**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**


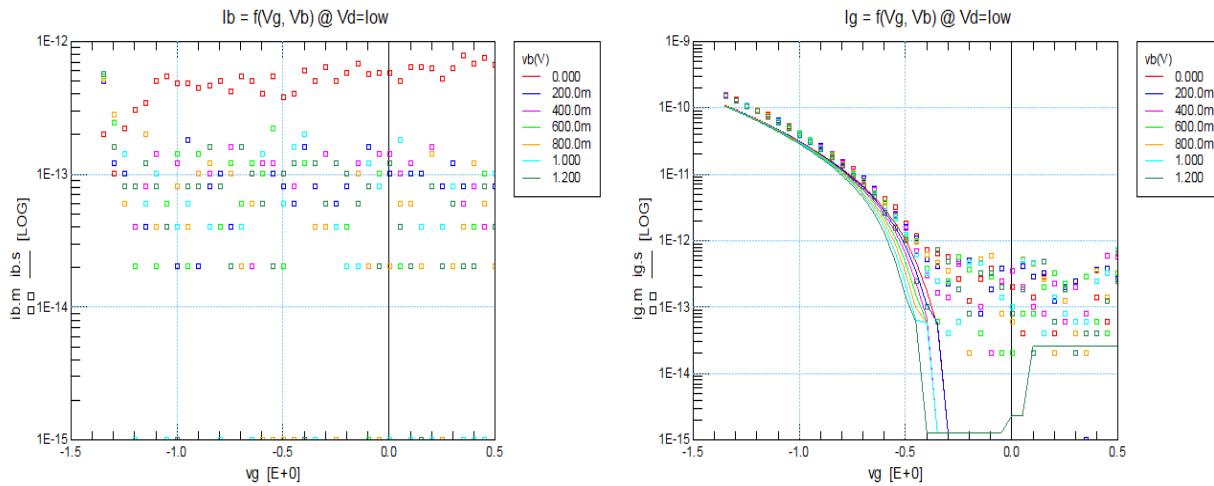


### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

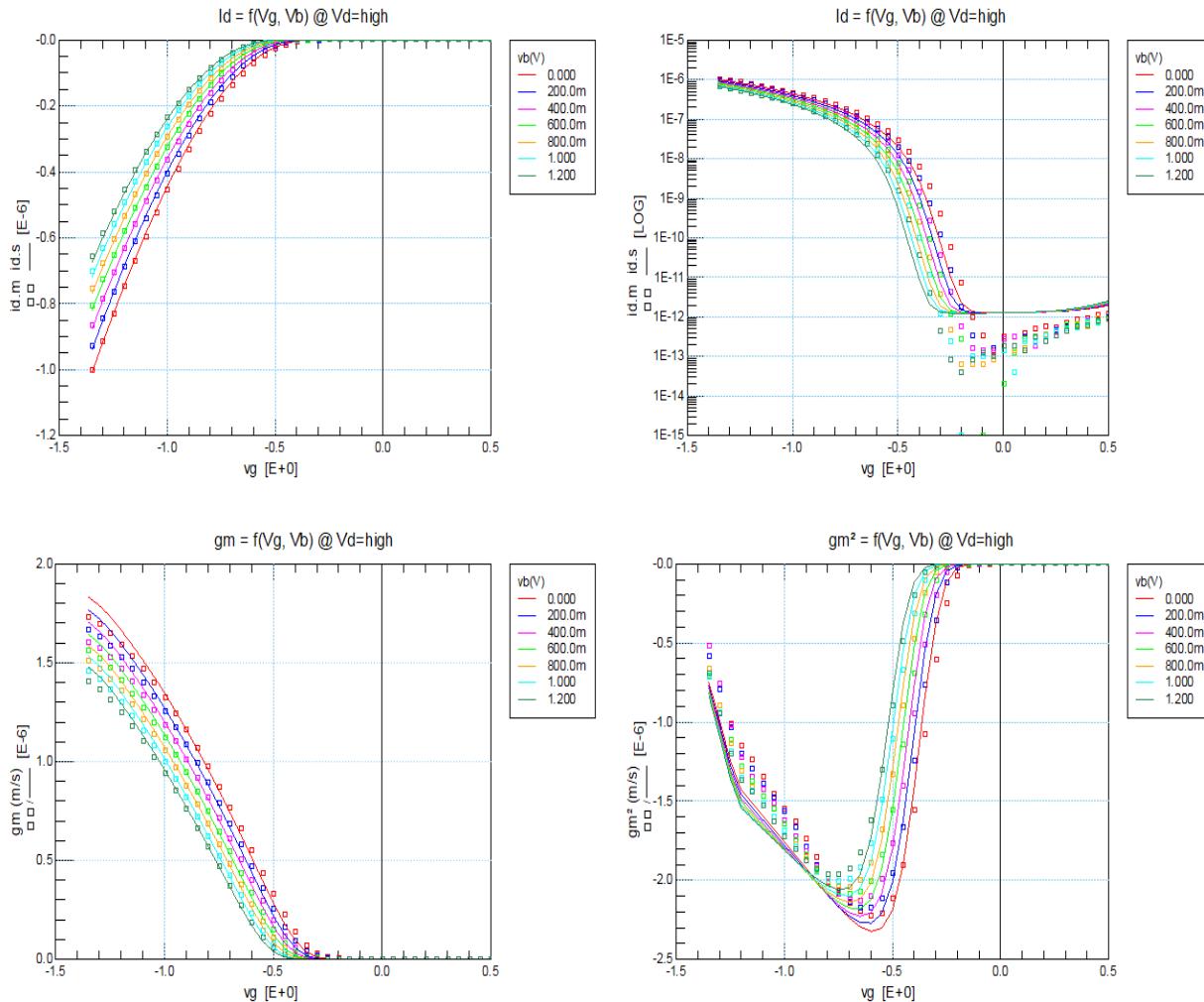


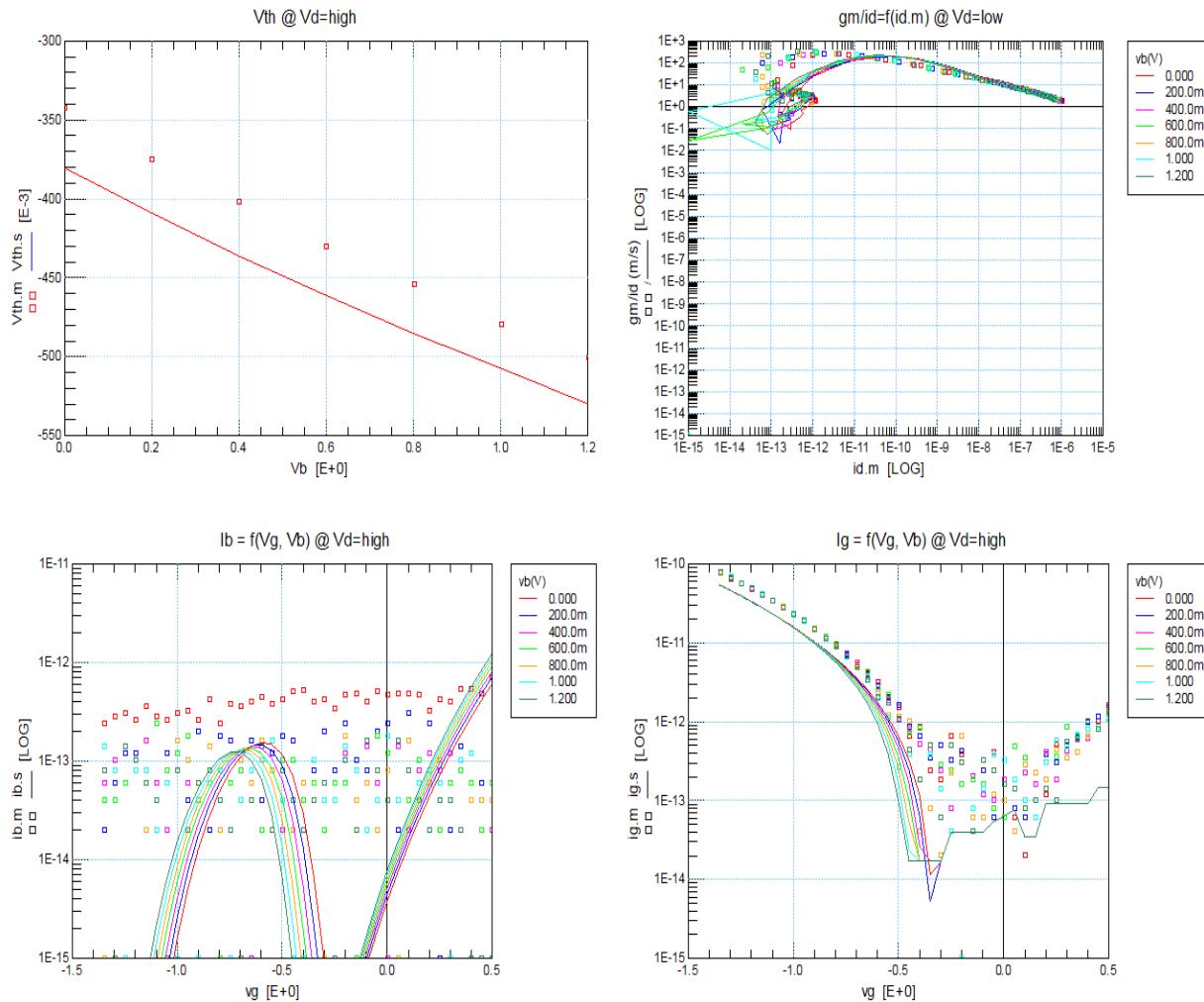
**idvg, Vd = -0.05V, T = -40°C**



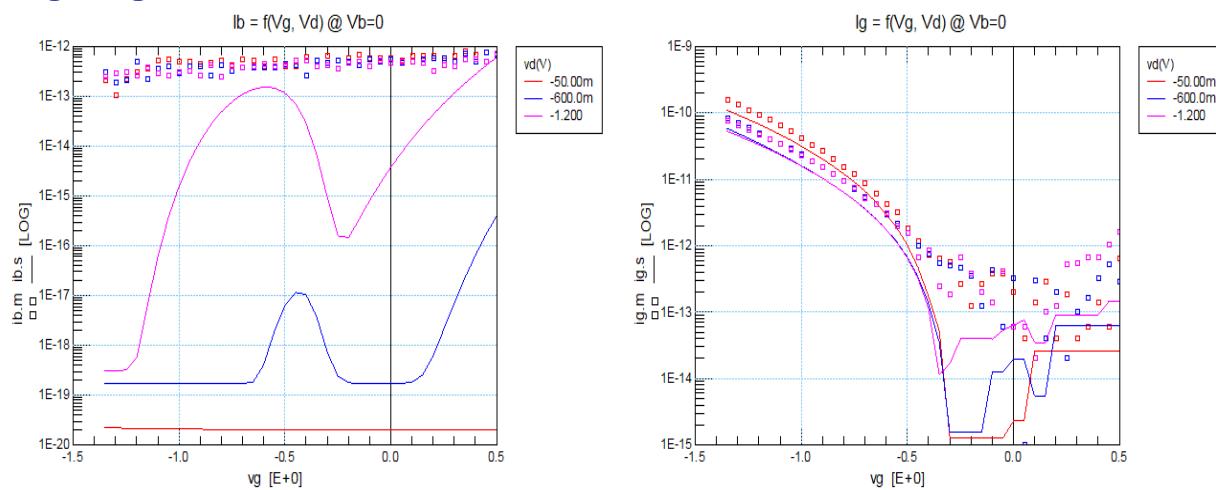


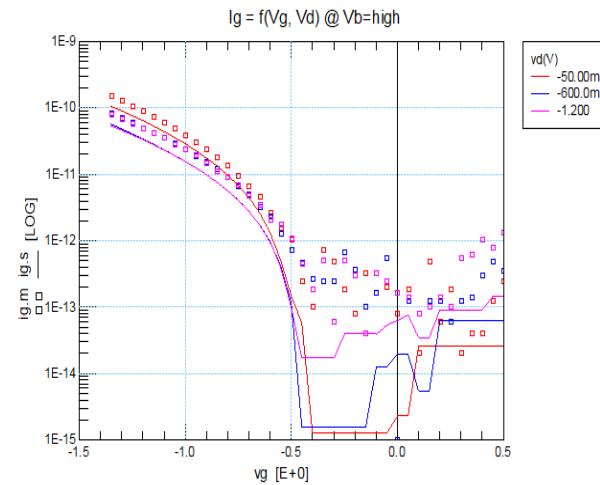
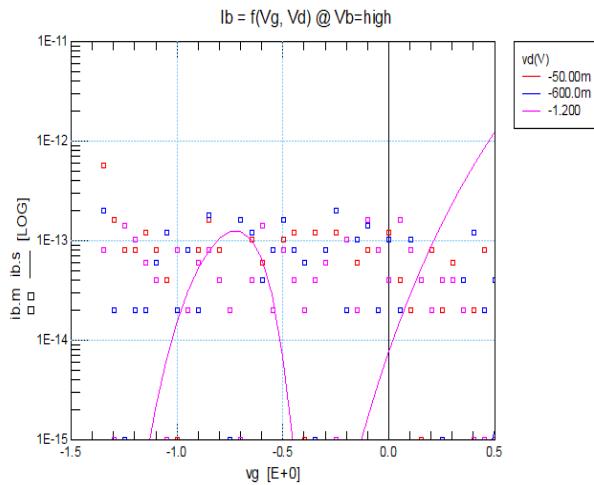
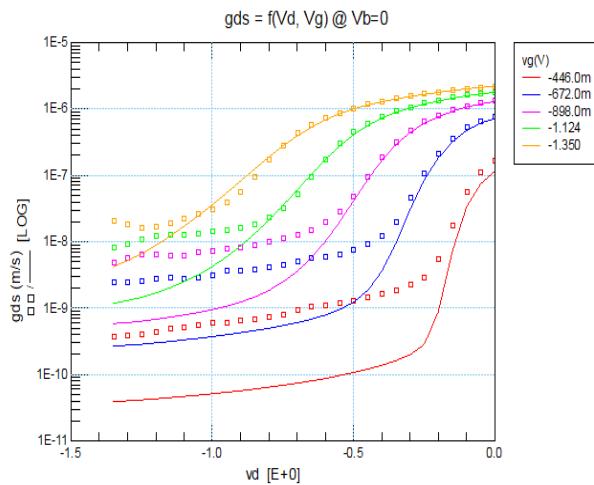
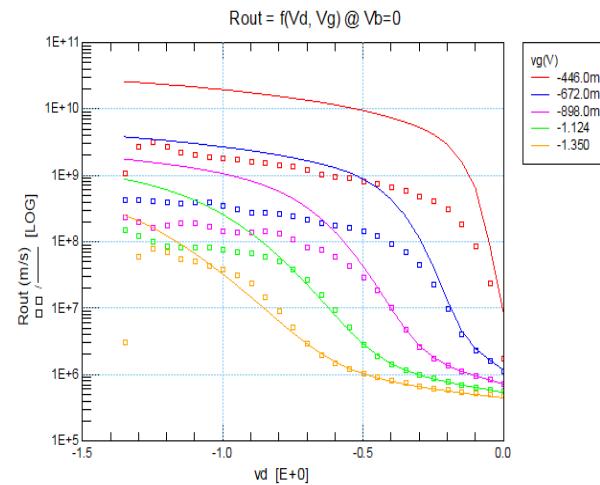
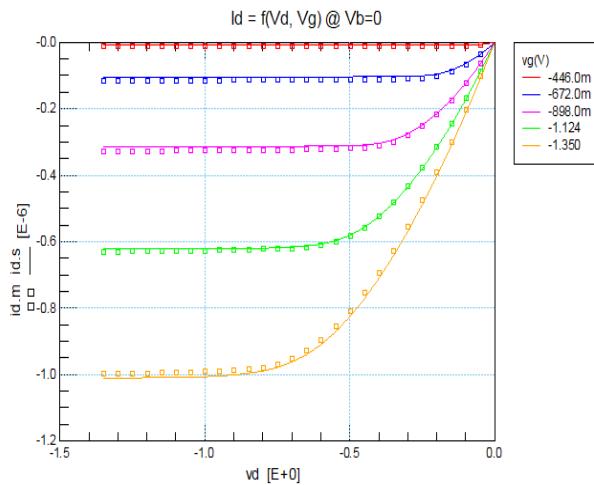
$idv_g, V_d = -1.2V, T = -40^\circ C$

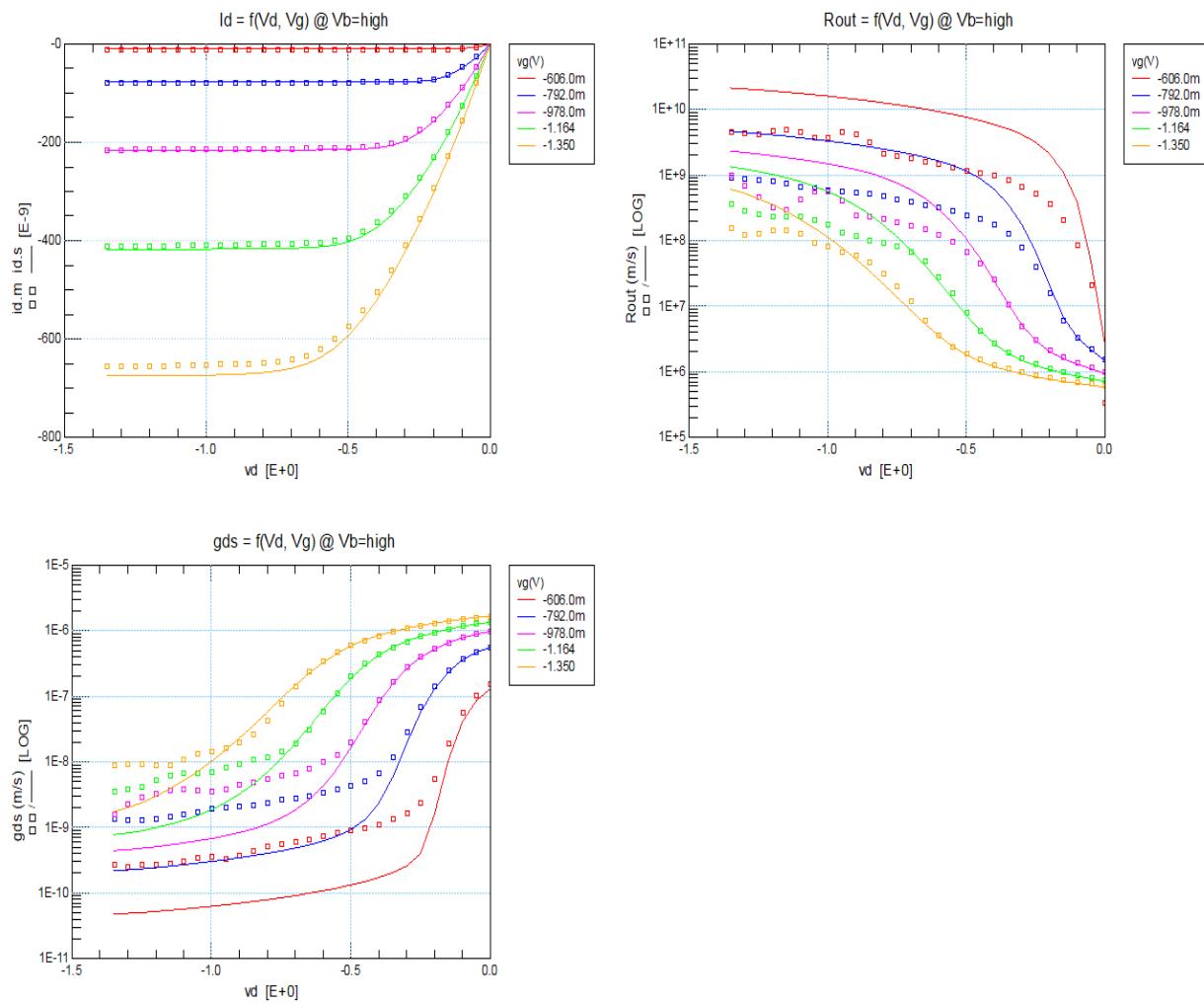
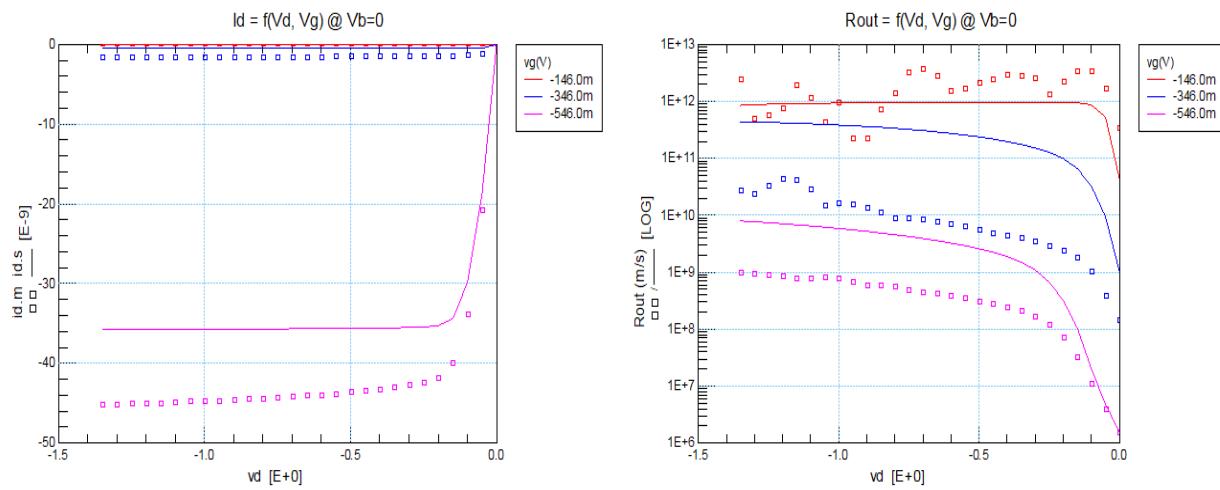


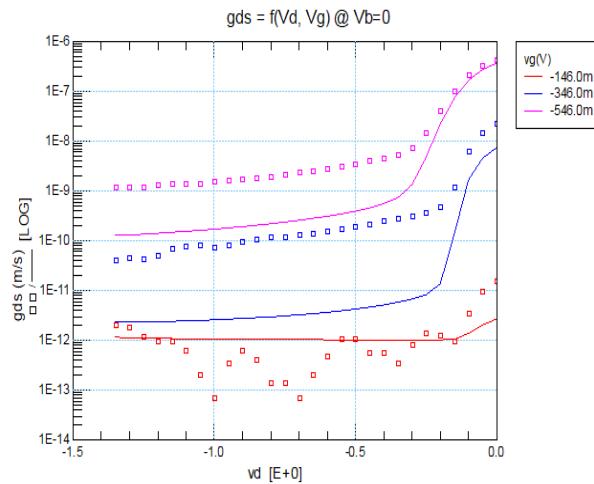


**idvg, Ib, Ig, Vb = 0V, T = -40°C**

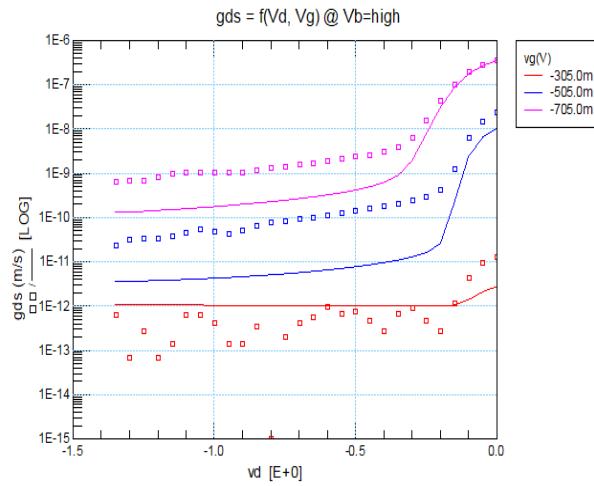
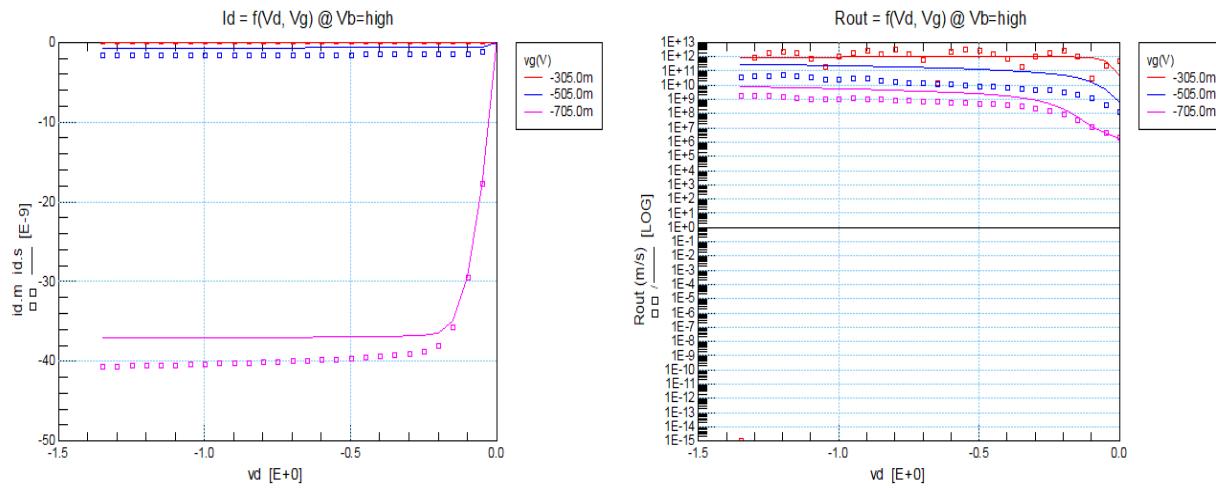


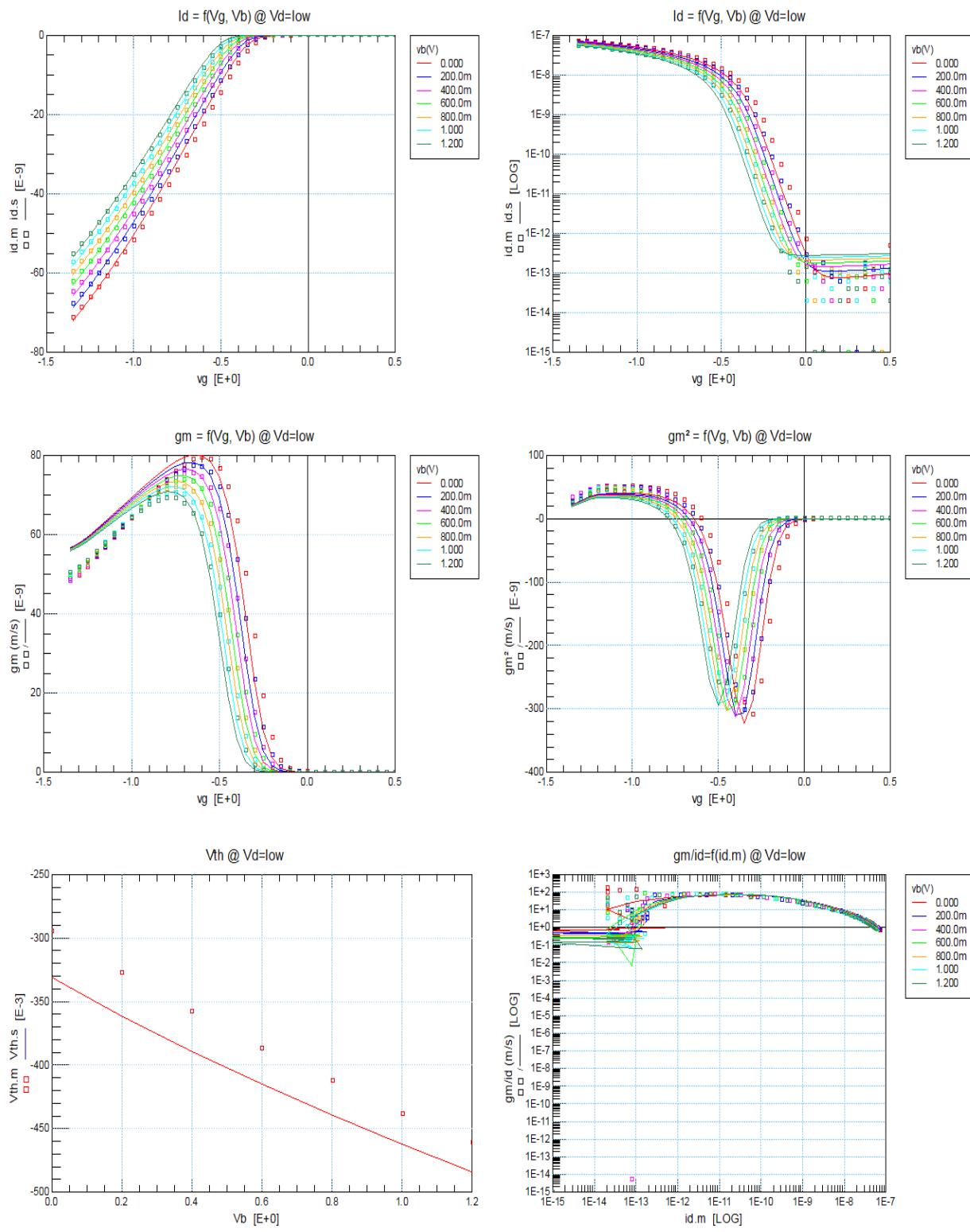
**idvg, Ib,Ig, Vb = 1.2V, T = -40°C**

**idvd, Vb = 0V, T = -40°C**


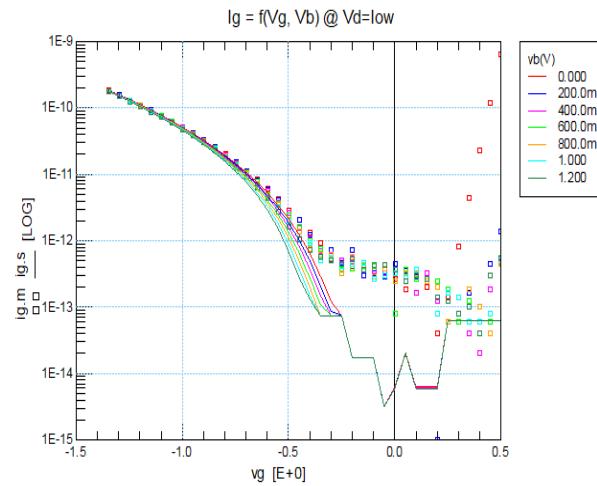
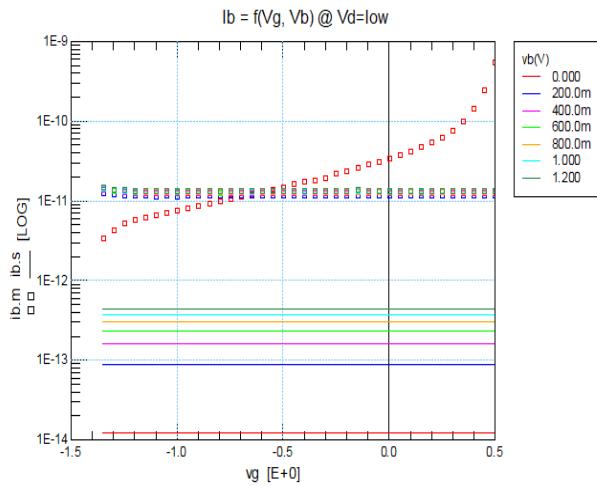
**idvd\_vbmin, Vb = 1.2V, T = -40°C****idvd\_vth, Vb = 0V, T = -40°C**



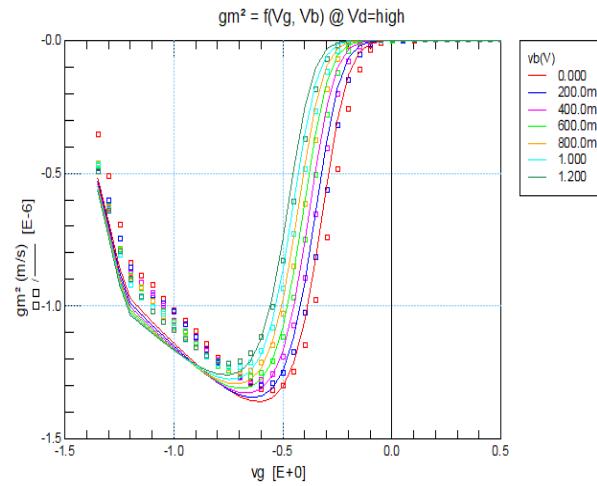
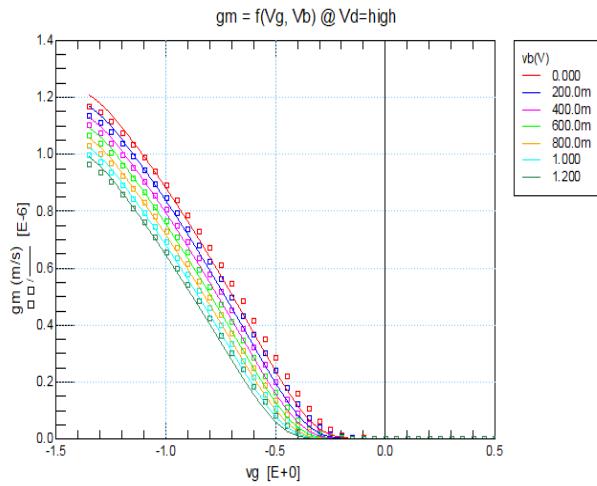
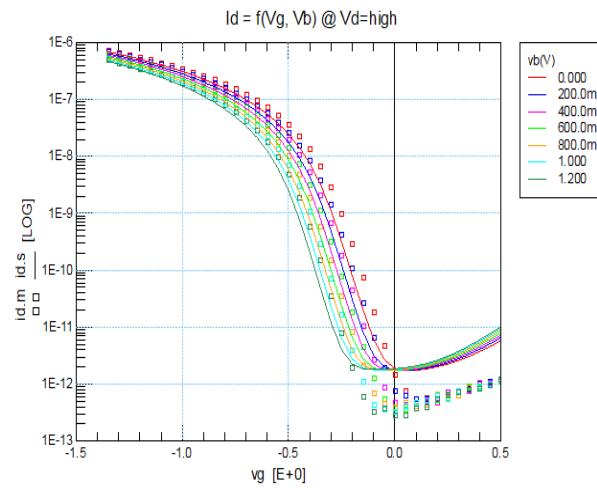
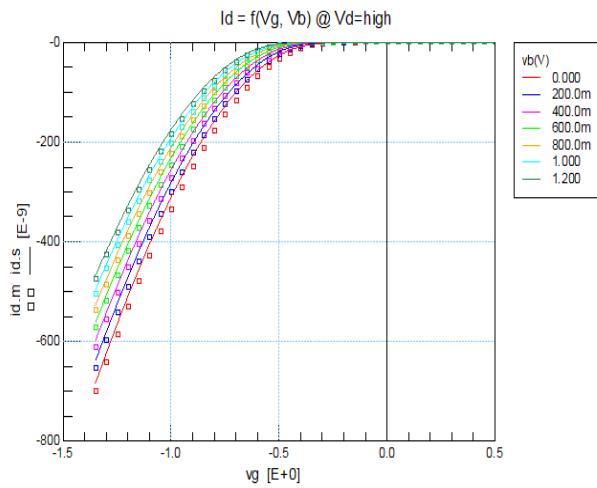
### idvd\_vth\_vbmin, Vb = 1.2V, T = -40°C

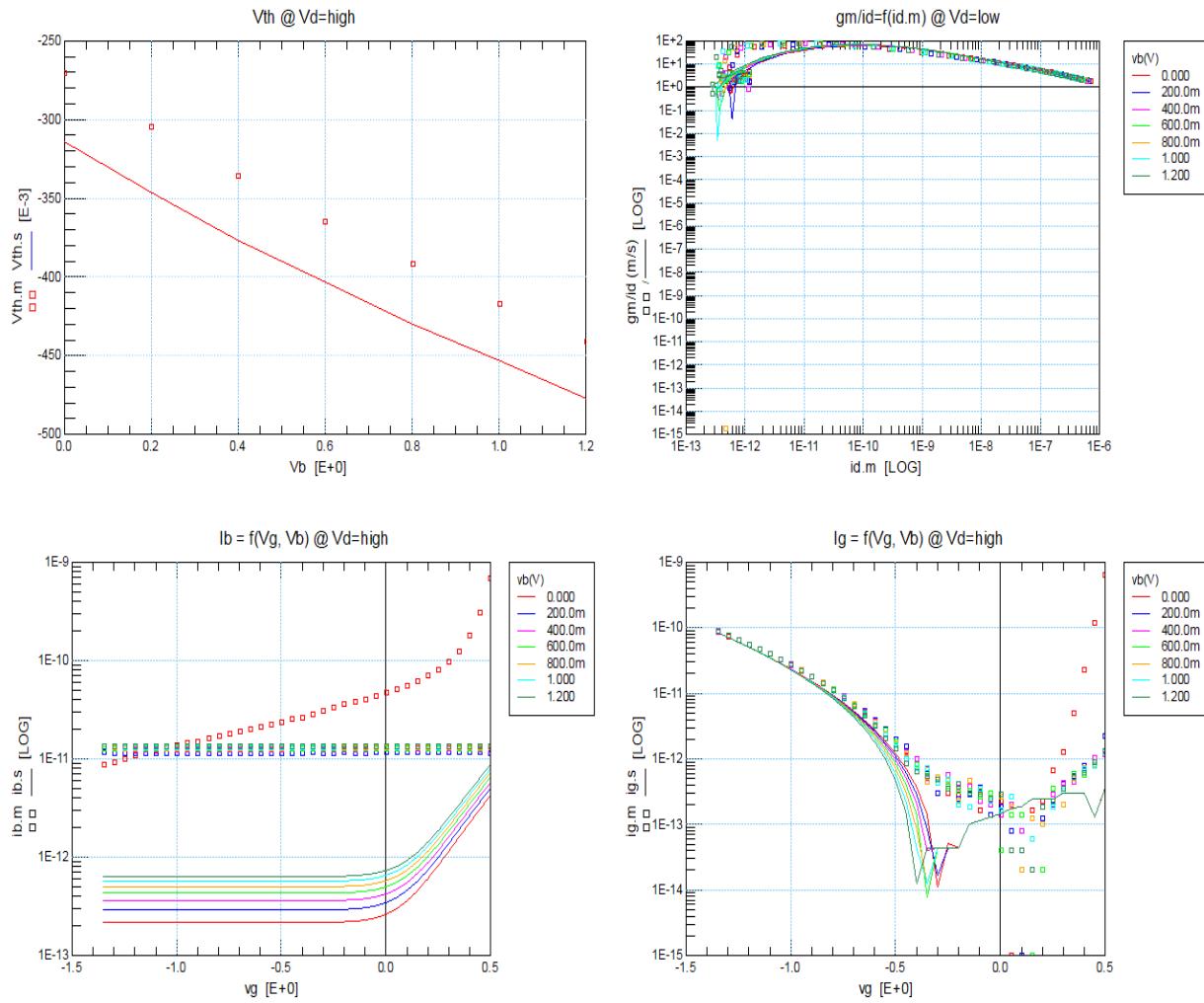


**idvg, Vd = -0.05V, T = 70°C**


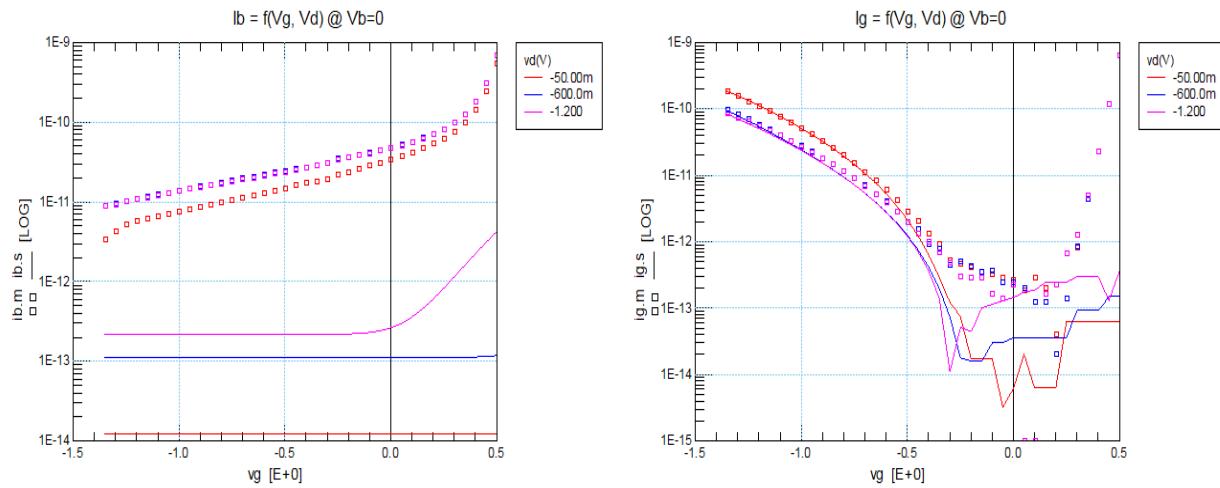


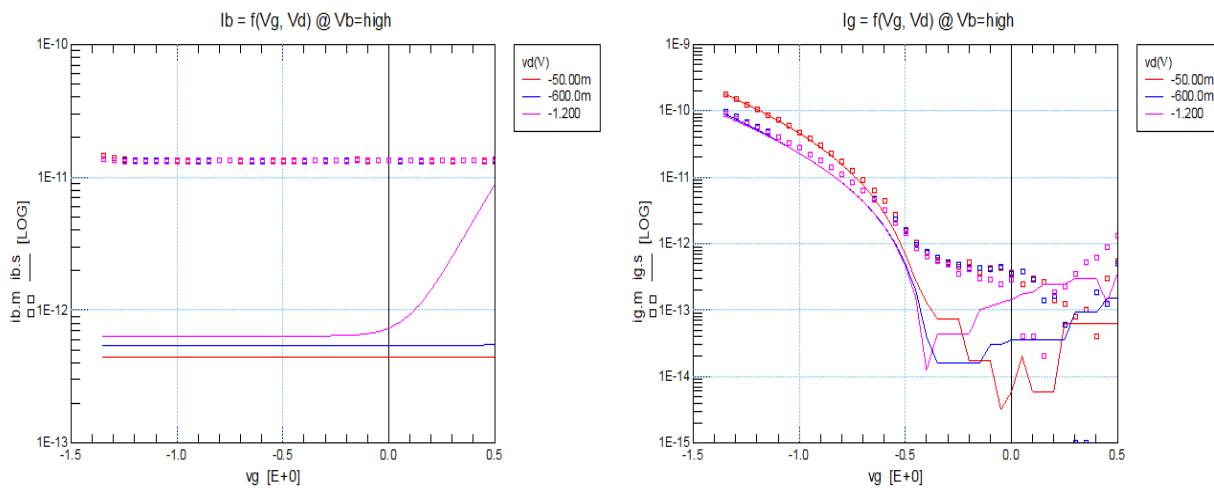
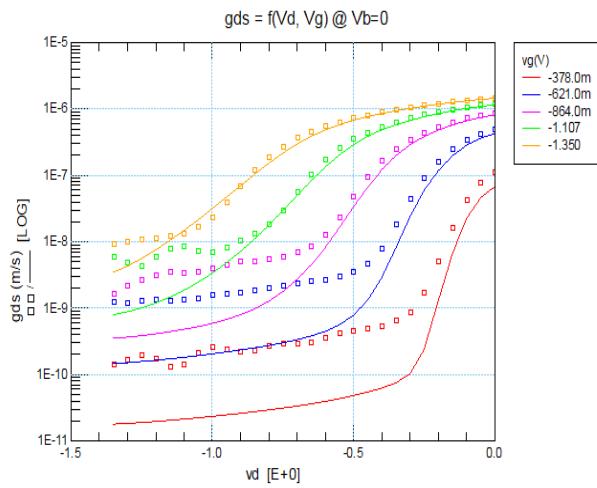
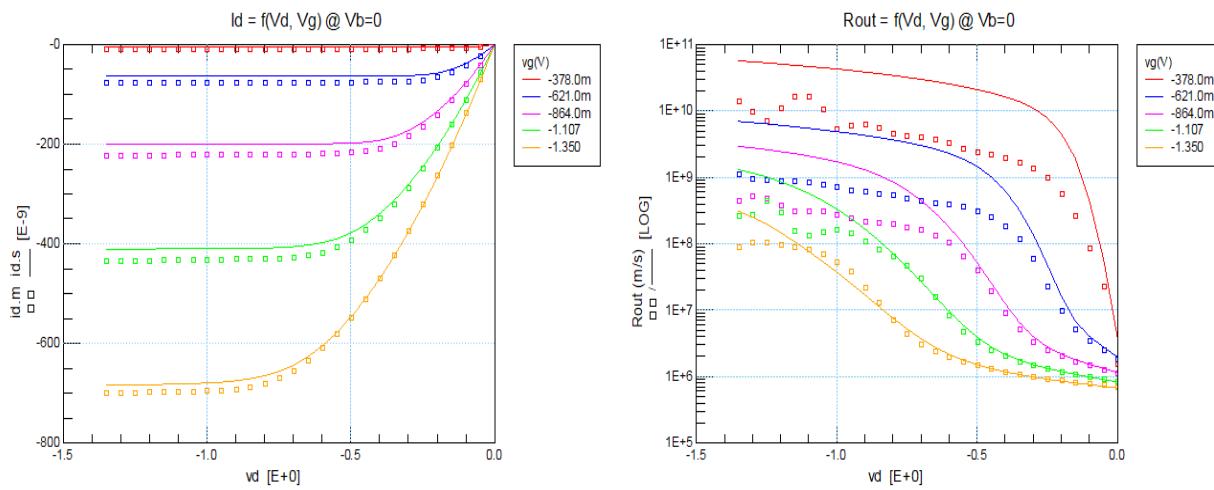
$i_{dvg}, V_d = -1.2V, T = 70^\circ C$

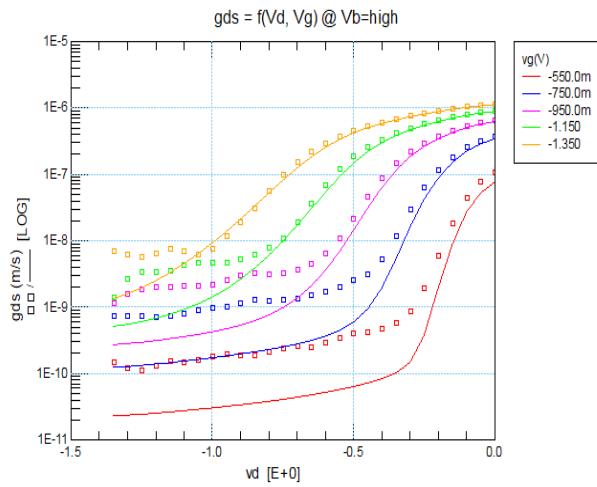
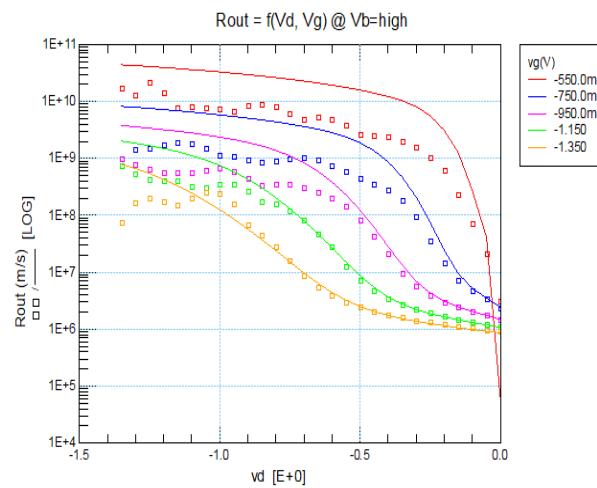
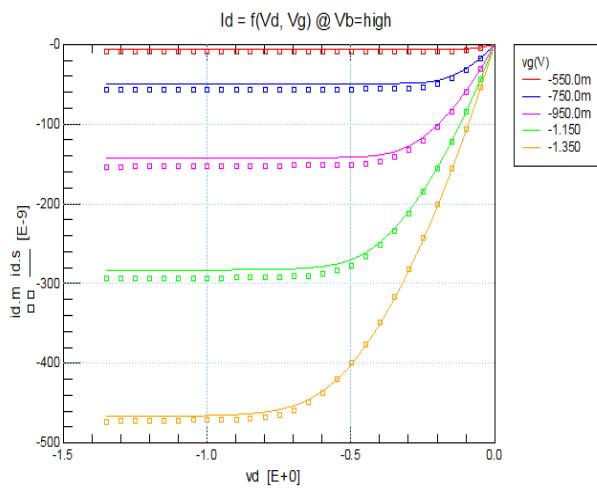
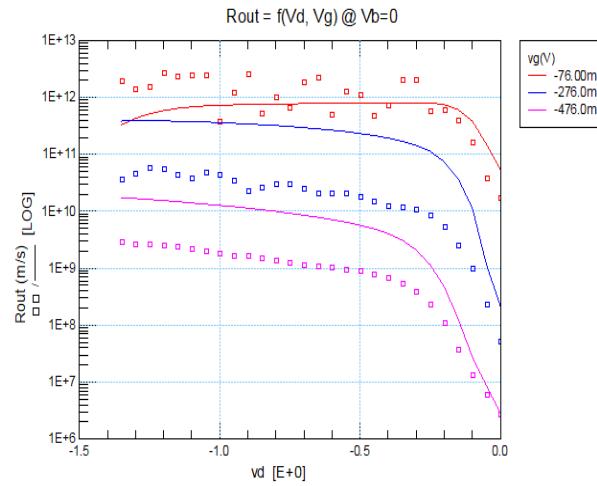
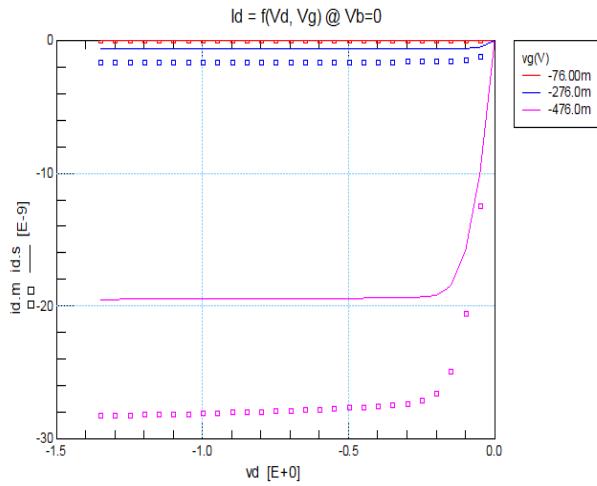


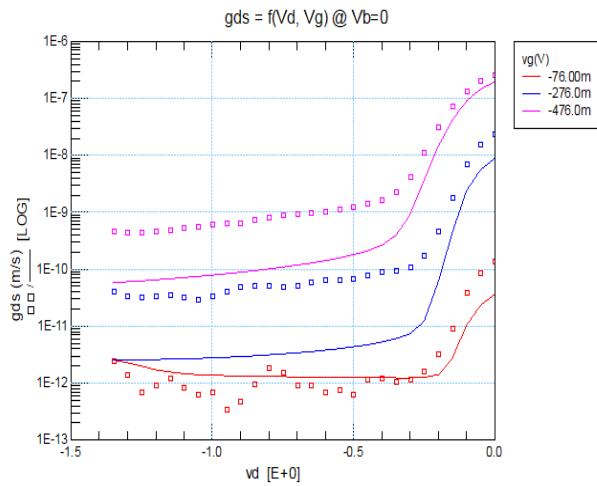


### idvg, Ib,Ig, Vb = 0V, T = 70°C

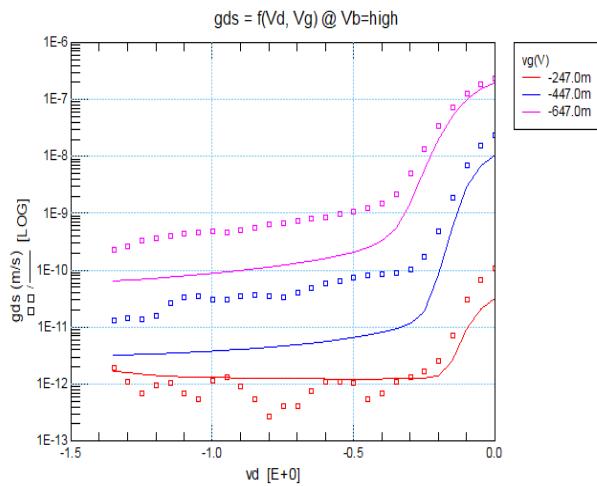
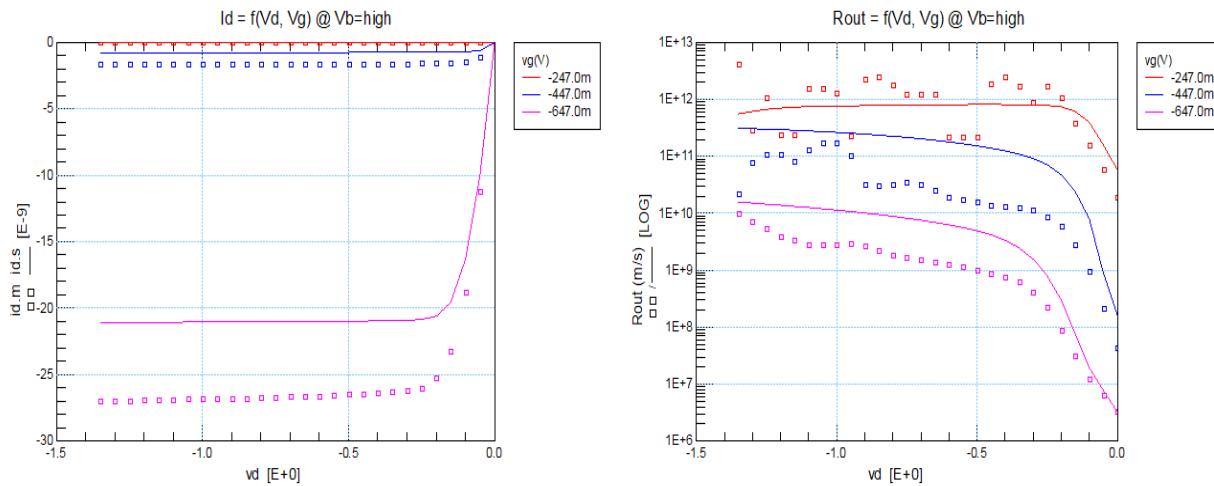


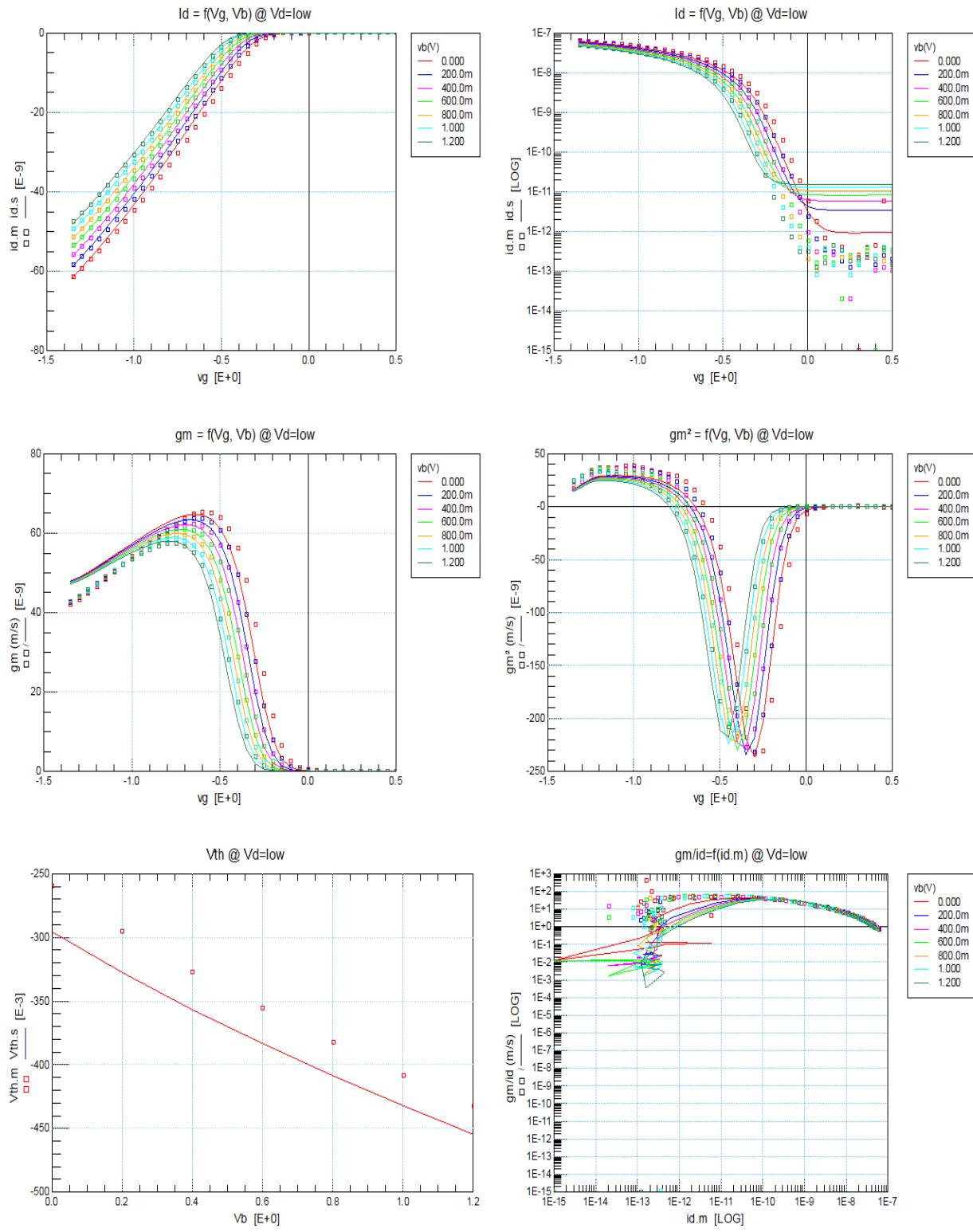
**idvg, Ib,Ig, Vb = 1.2V, T = 70°C**

**idvd, Vb = 0V, T = 70°C**


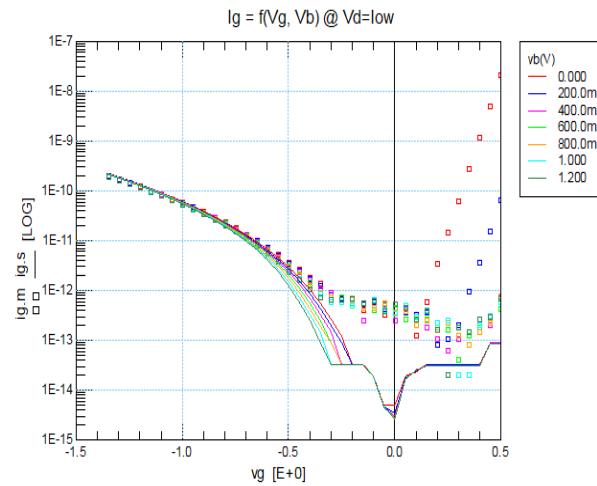
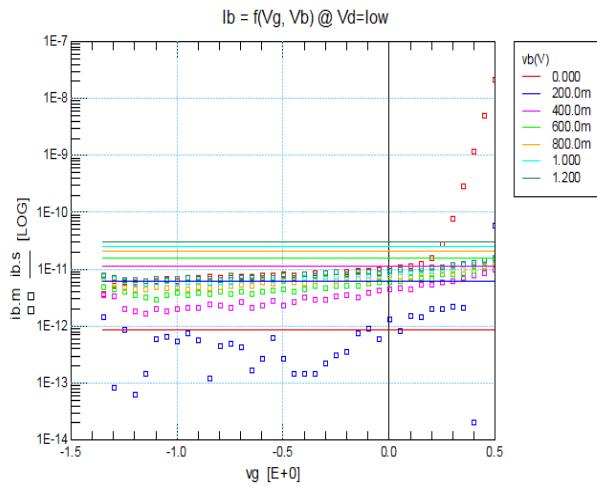
**idvd\_vbmin, Vb = 1.2V, T = 70°C****idvd\_vth, Vb = 0V, T = 70°C**



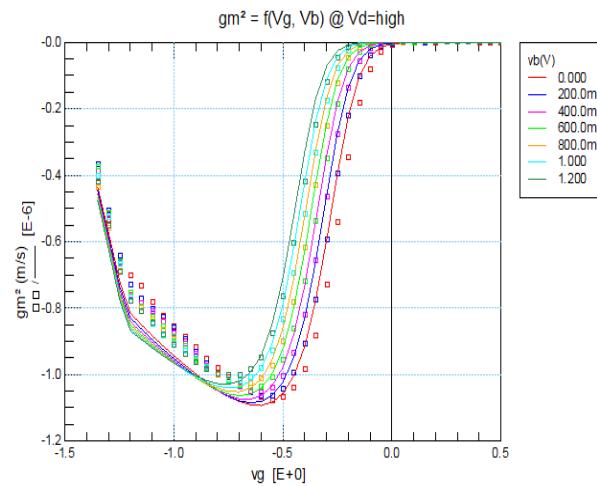
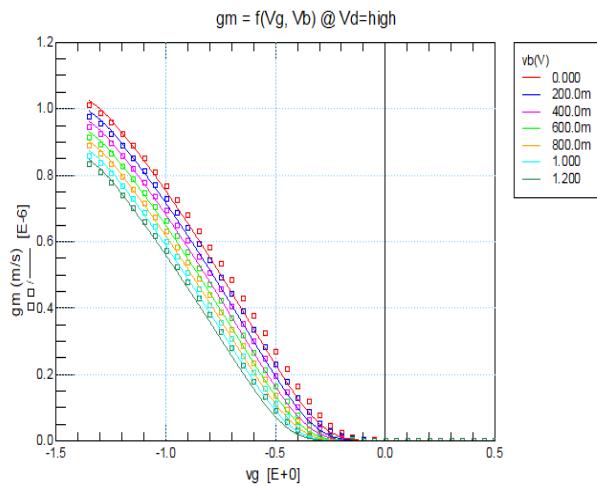
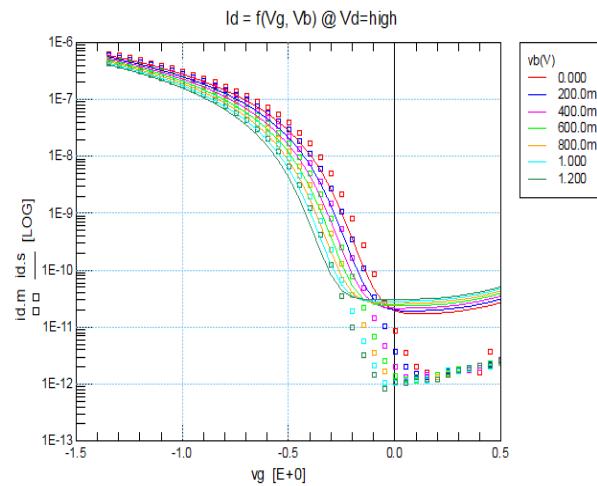
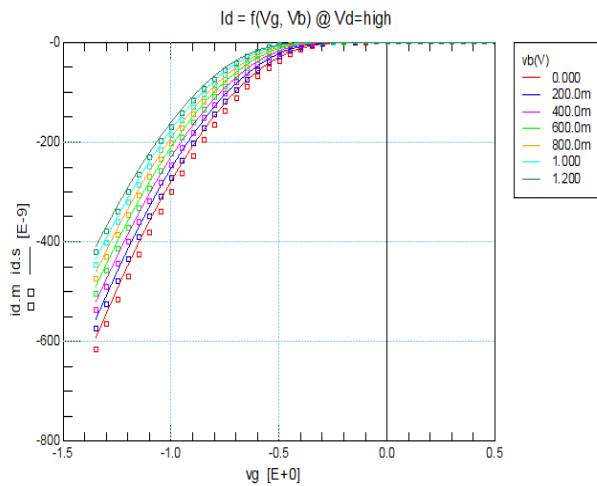
**idvd\_vth\_vbmin, Vb = 1.2V, T = 70°C**

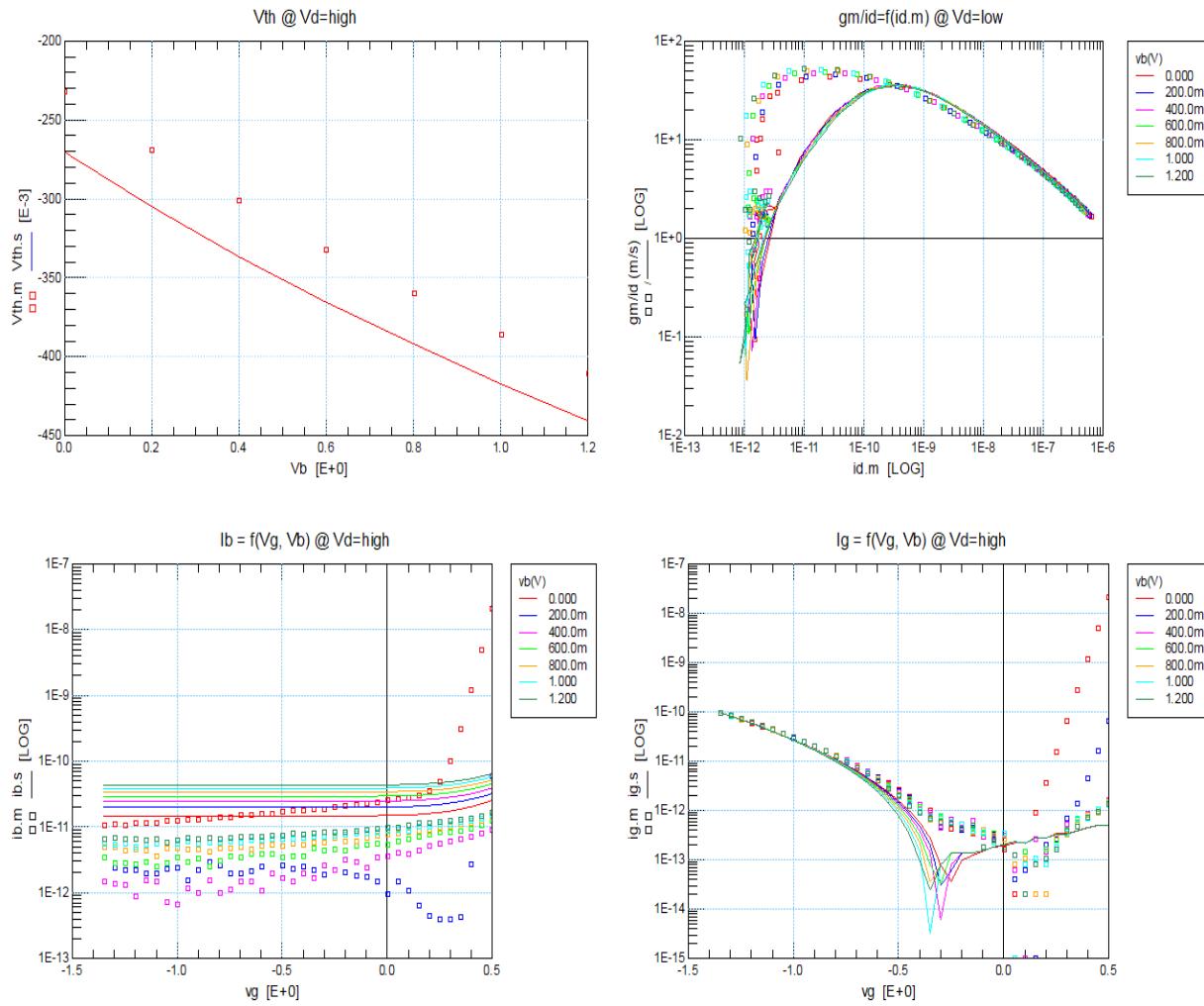


**idvg, Vd = -0.05V, T = 125°C**

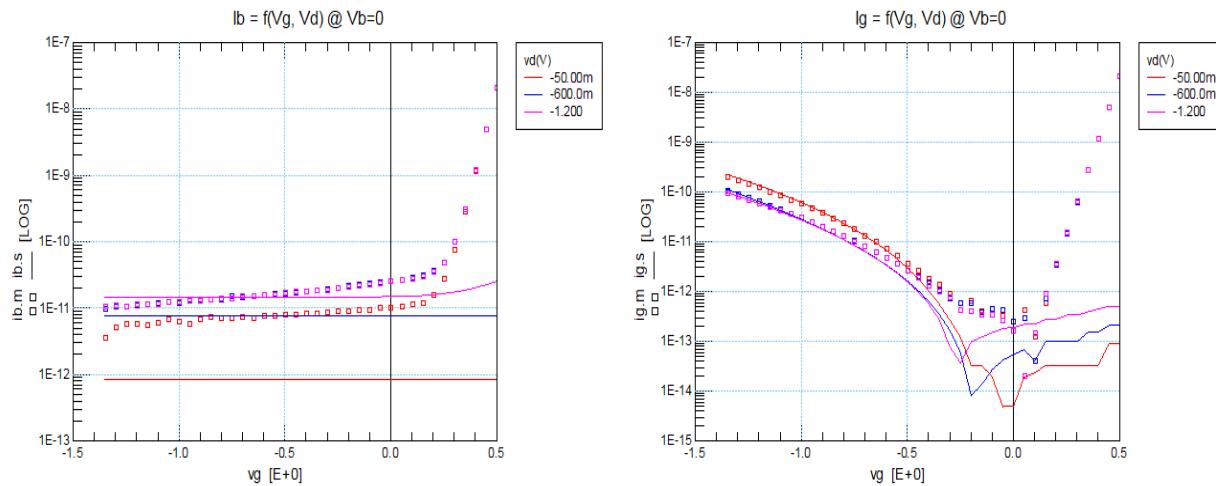


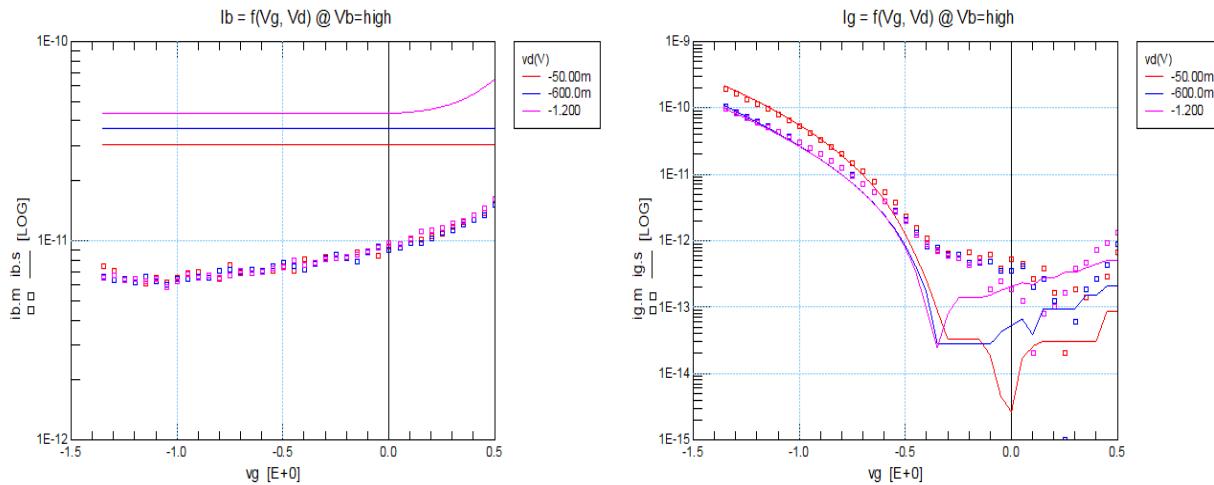
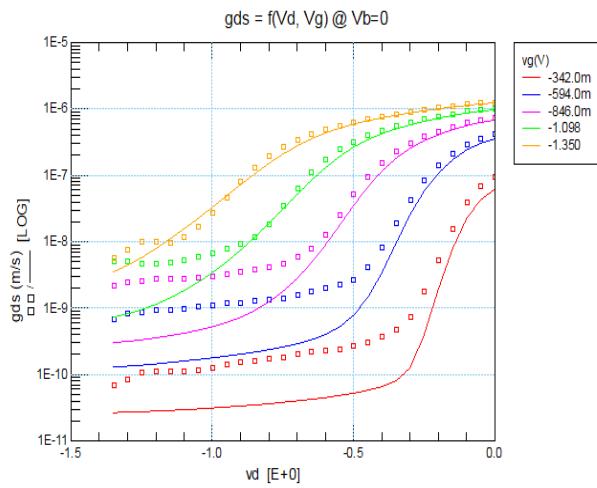
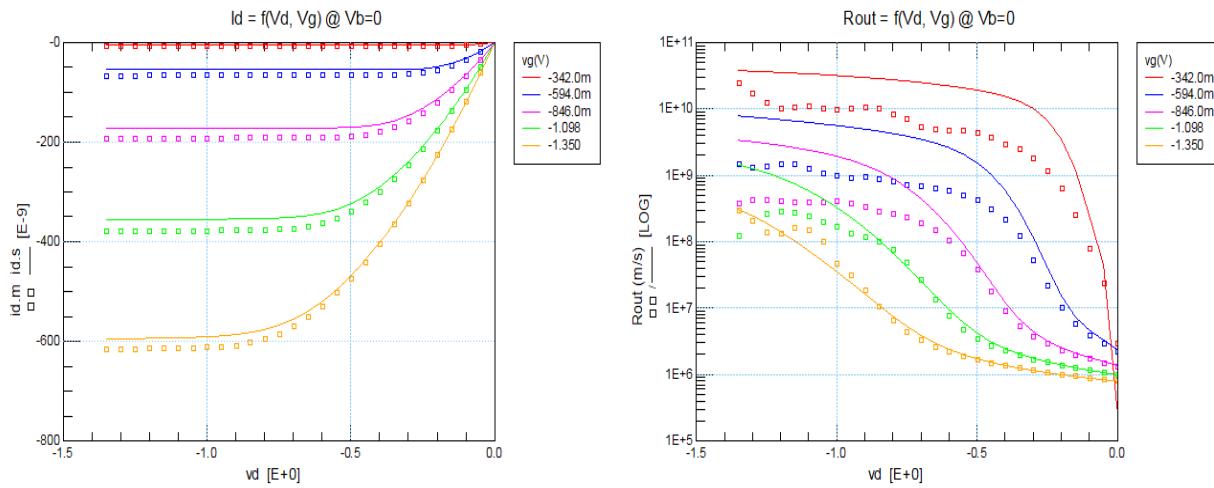
$i_{dvg}, V_d = -1.2V, T = 125^\circ C$

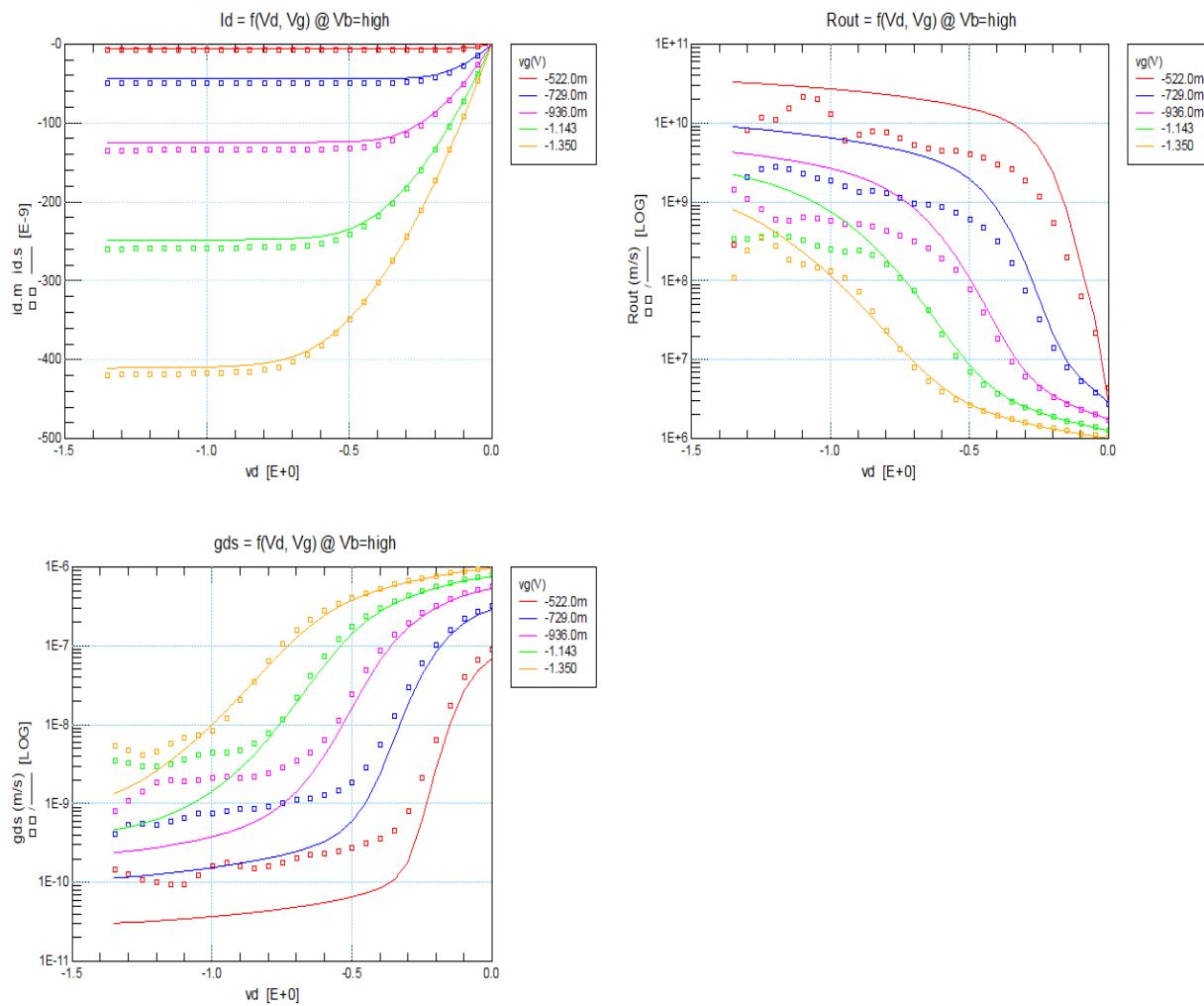
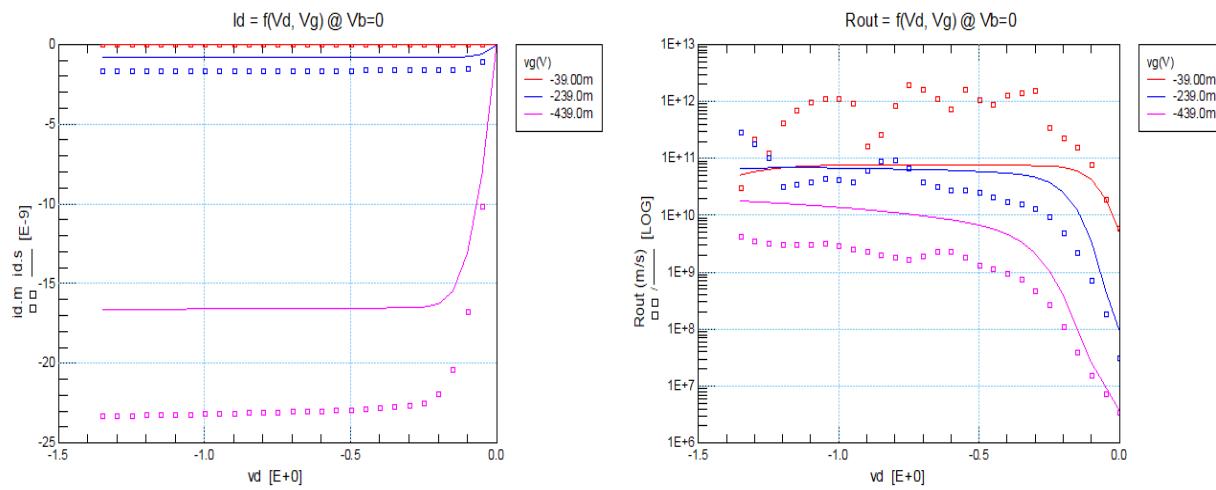


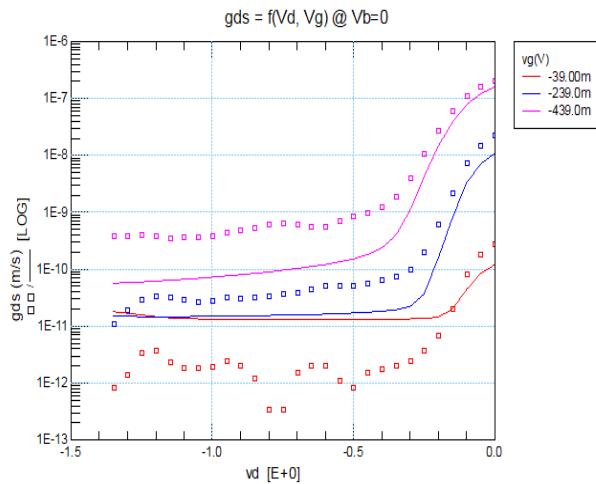


$id_{vg}, I_b, I_g, V_b = 0V, T = 125^{\circ}C$

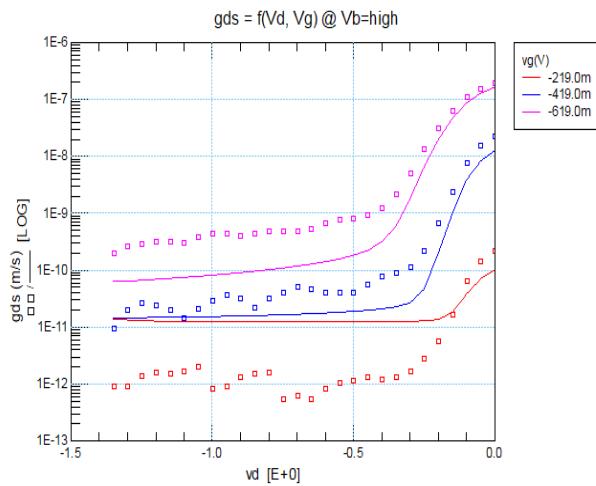
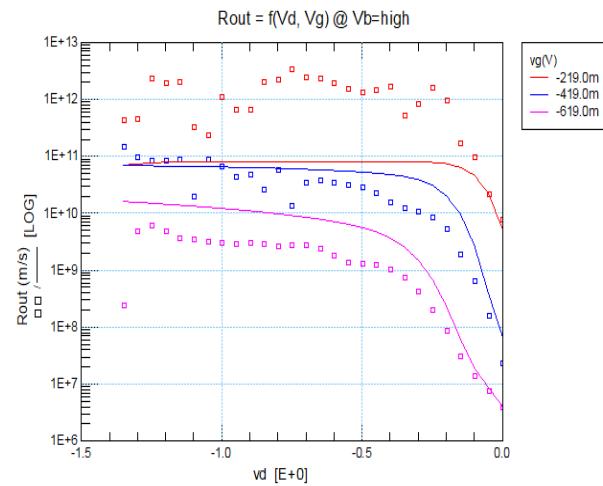
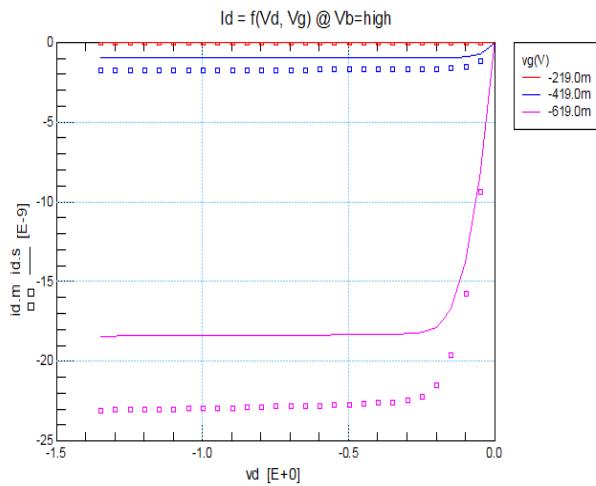


**idvg, Ib,Ig, Vb = 1.2V, T = 125°C**

**idvd, Vb = 0V, T = 125°C**


**idvd\_vbmin, Vb = 1.2V, T = 125°C****idvd\_vth, Vb = 0V, T = 125°C**

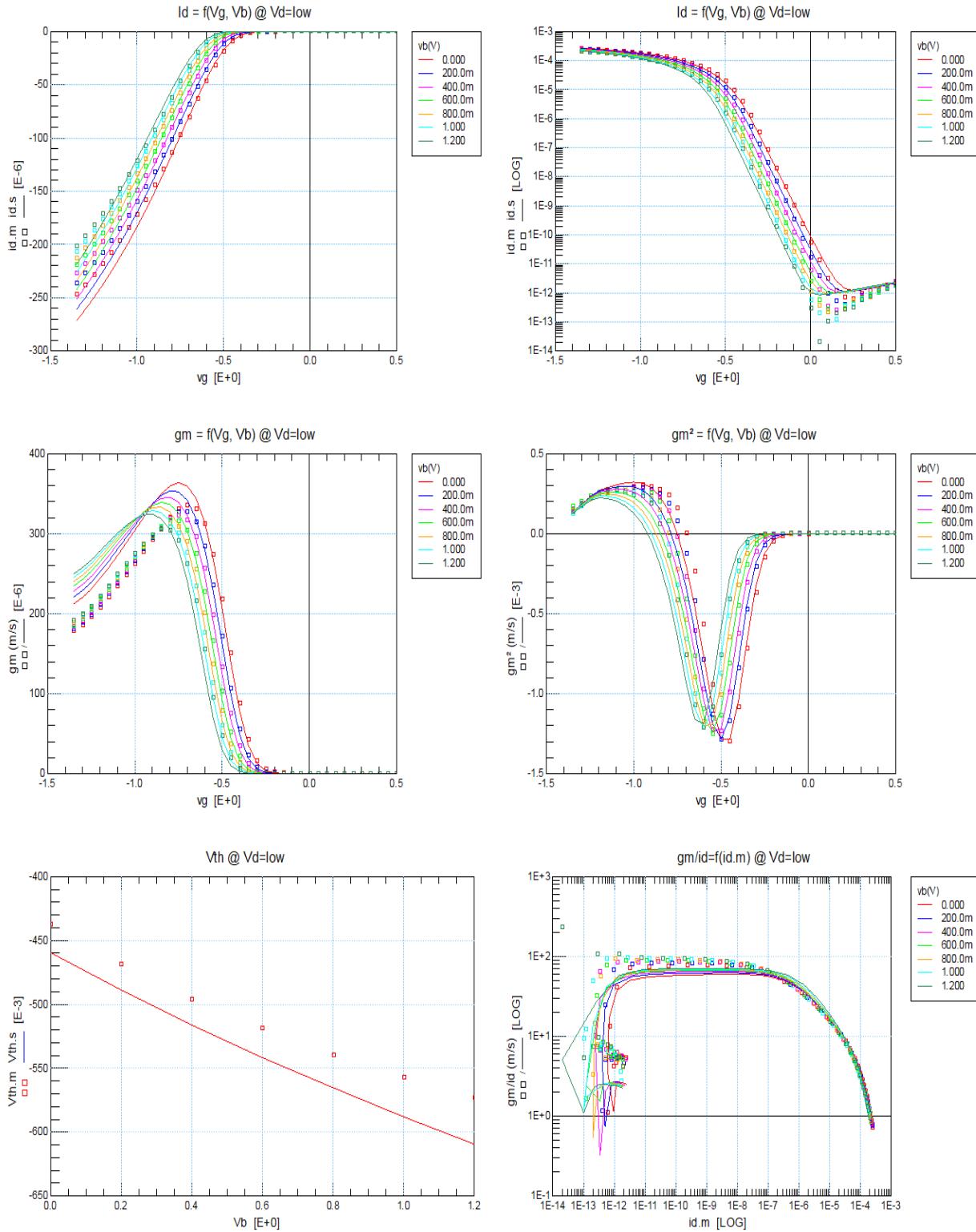


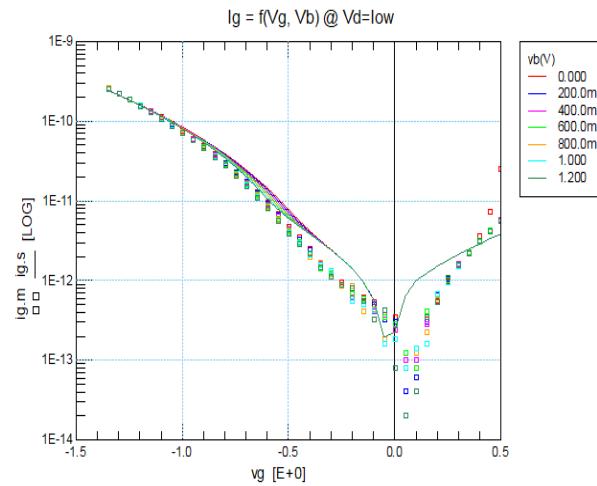
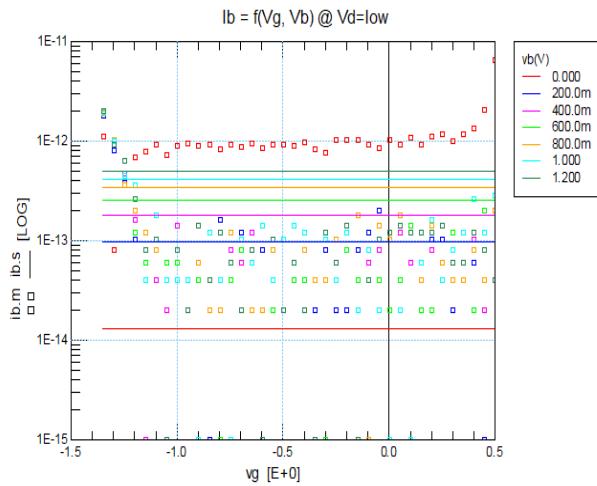
**idvd\_vth\_vbmin, Vb = 1.2V, T = 125°C**



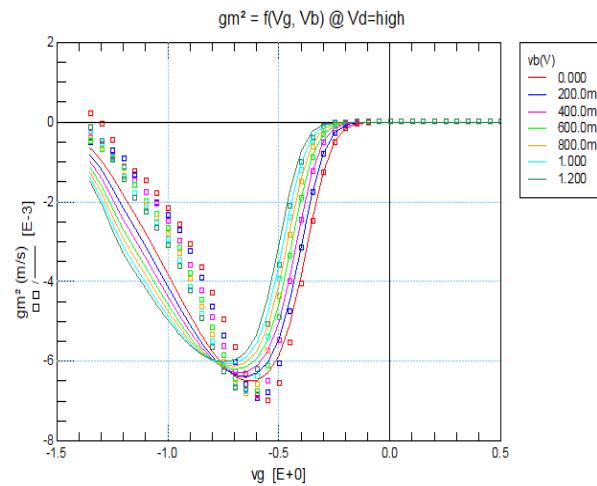
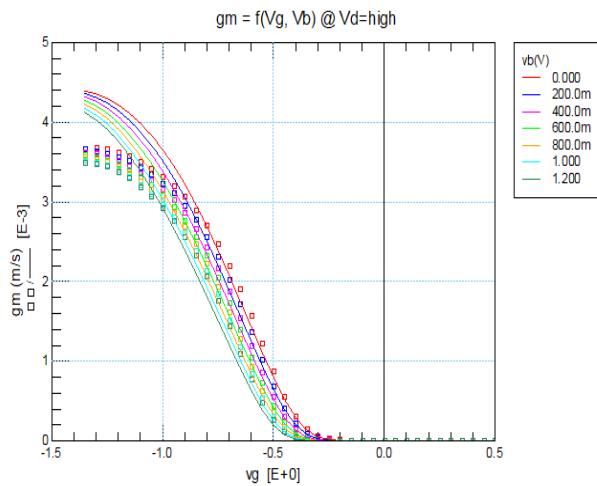
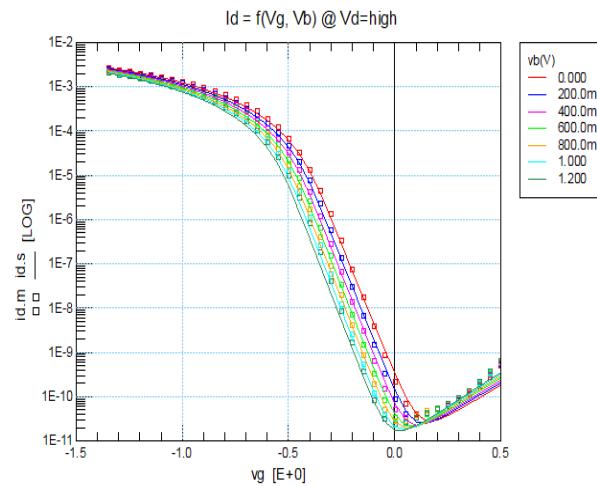
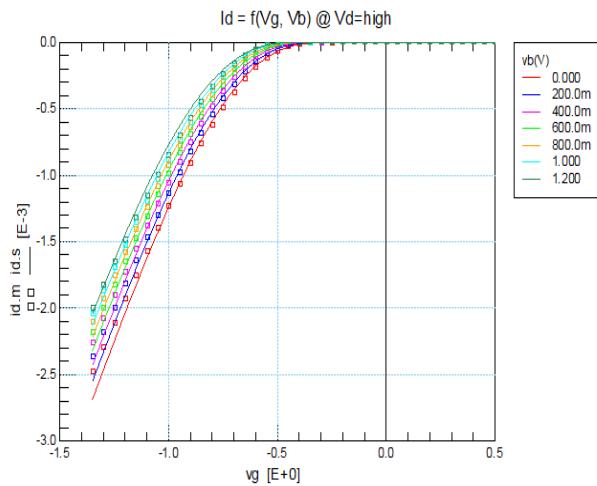
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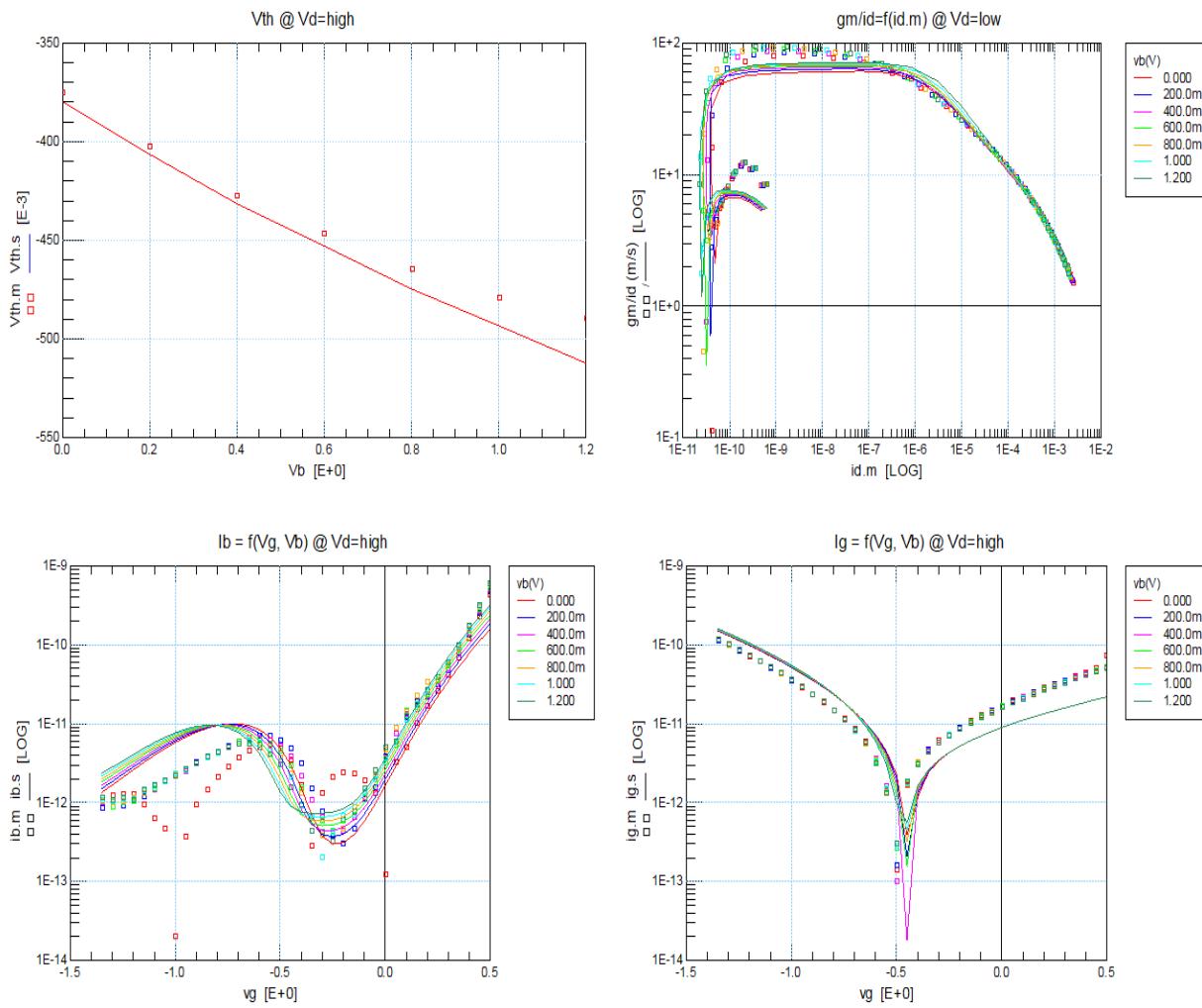
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



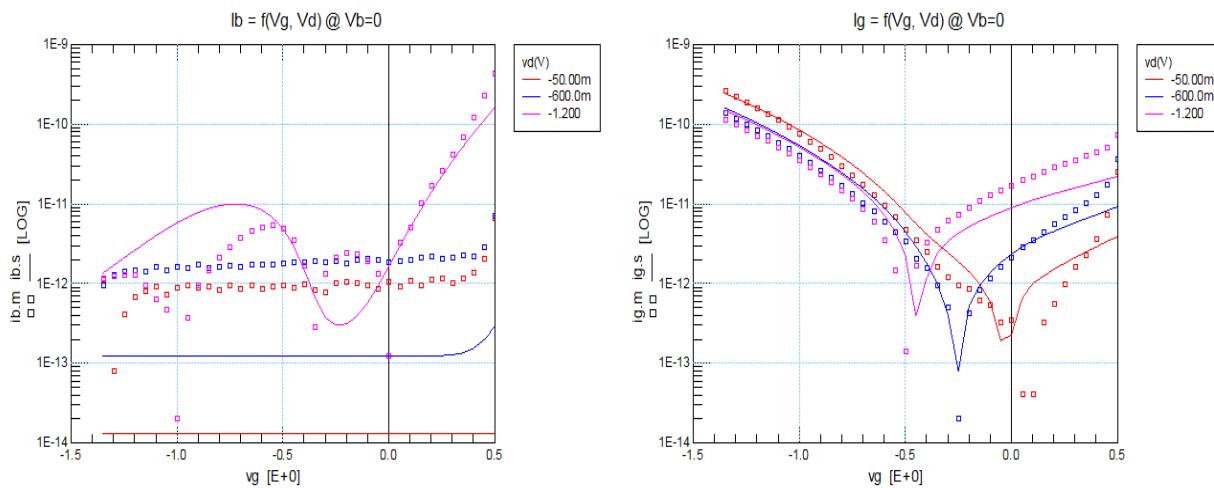


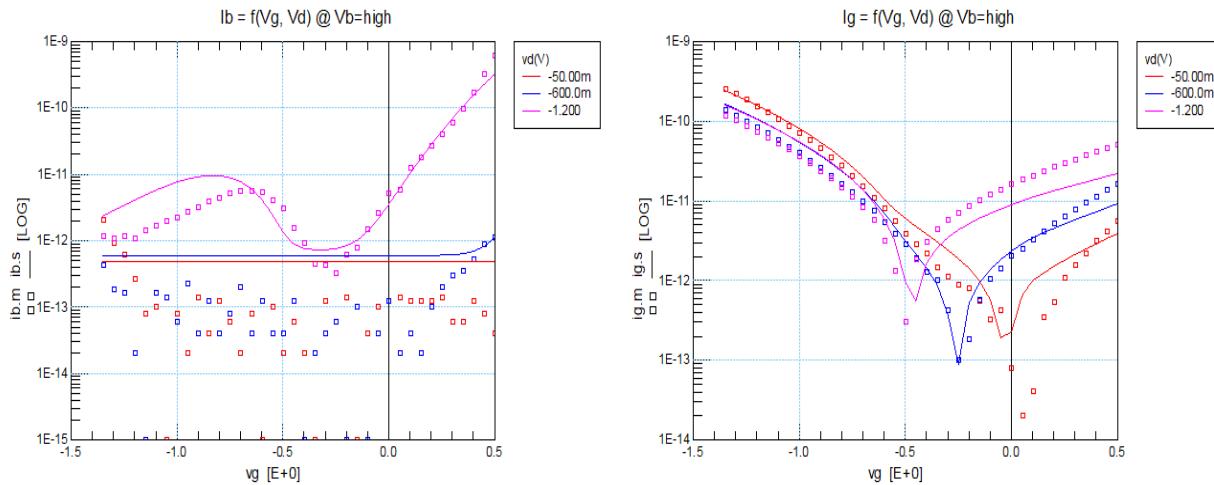
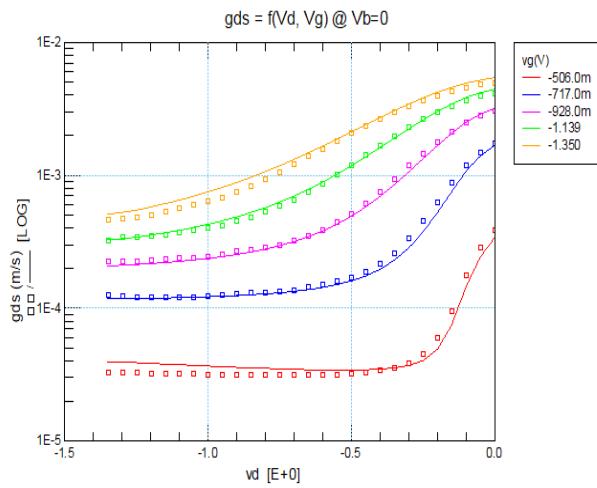
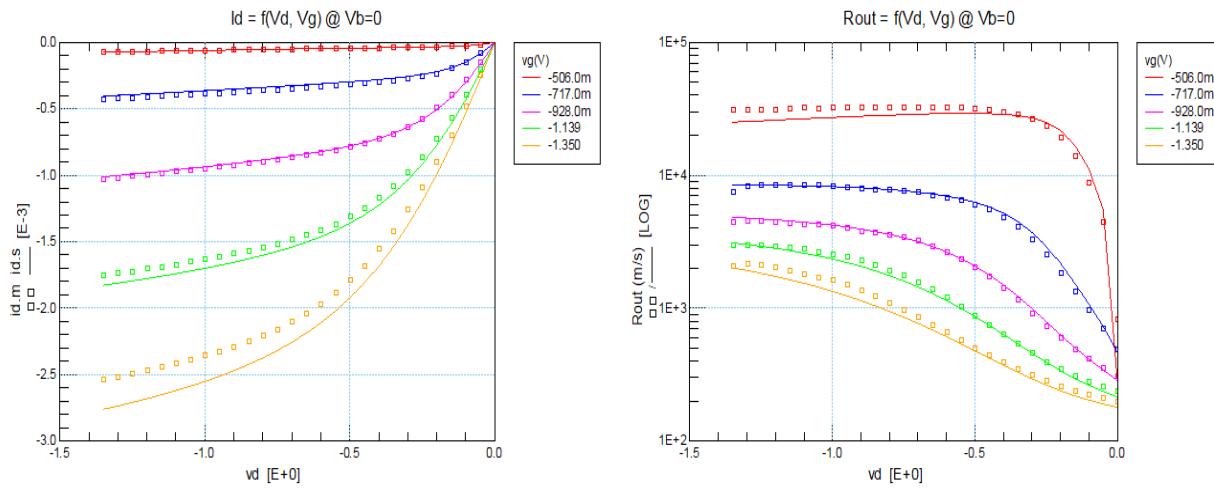
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

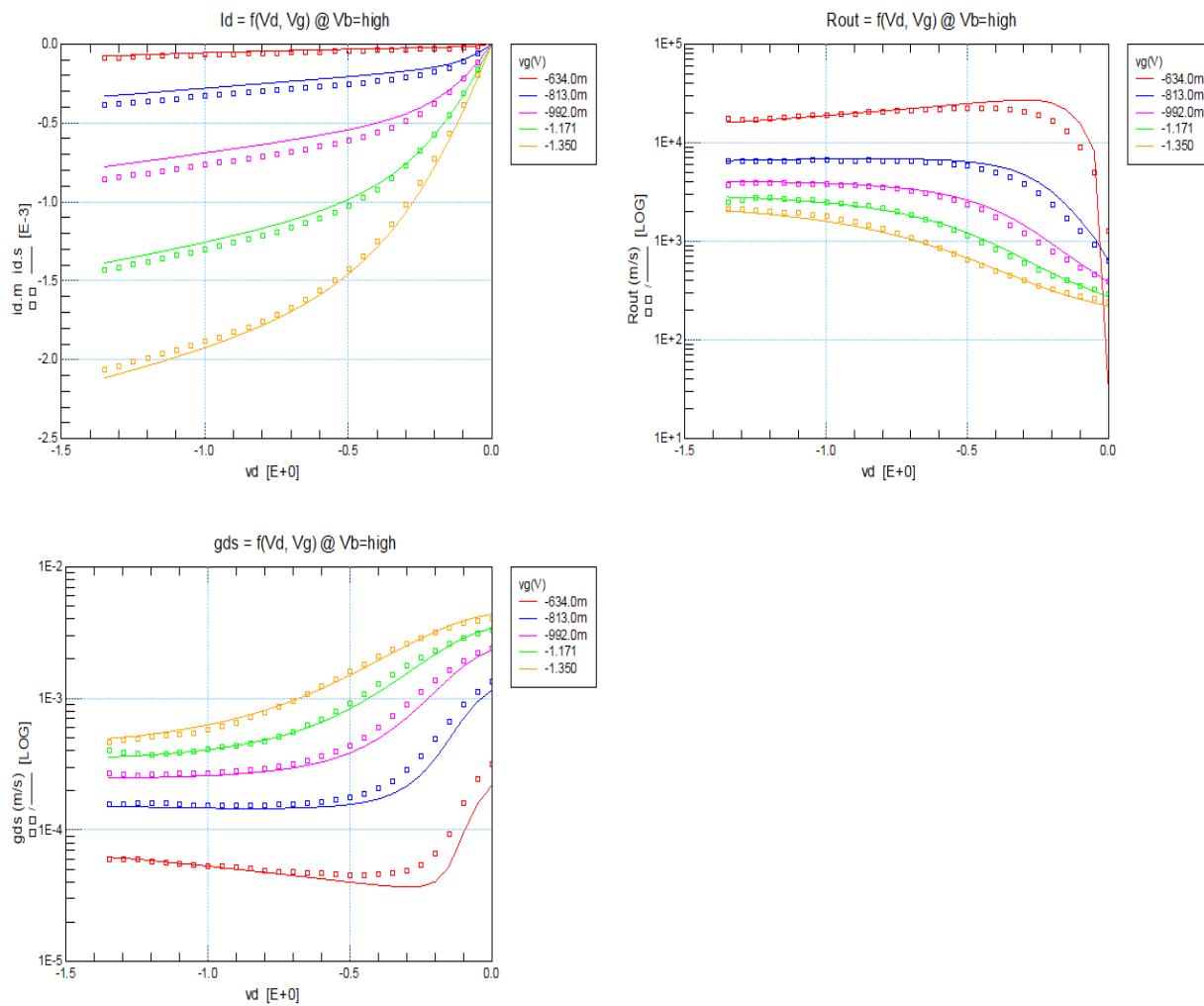
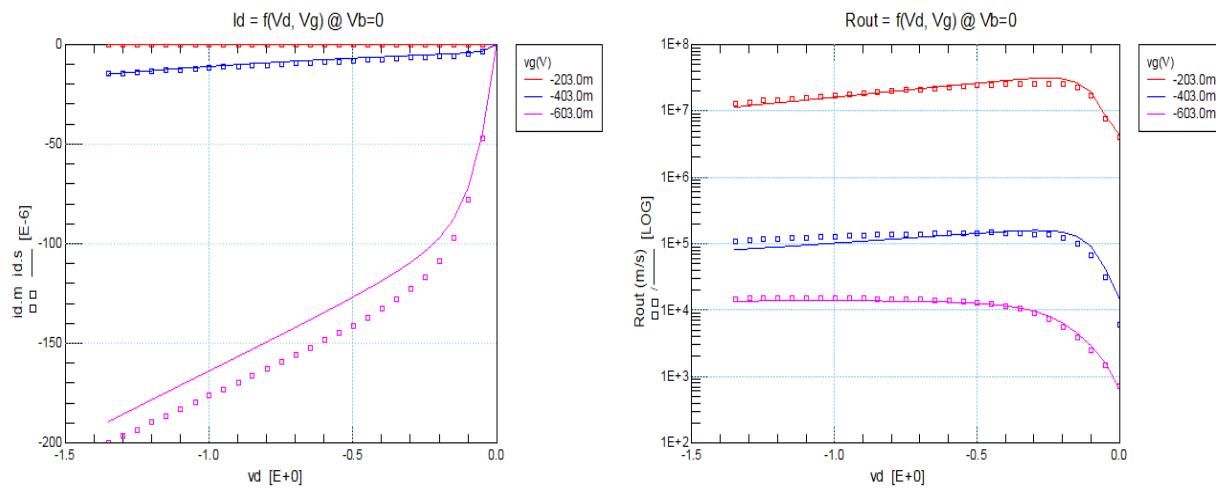


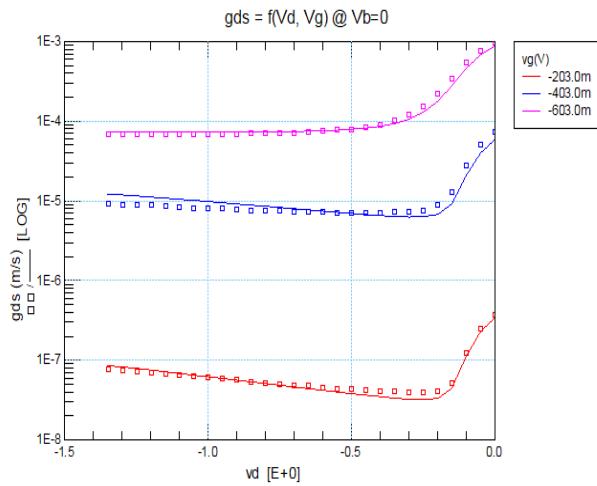


### idvg, Ib, Ig, Vb = 0V, T = 27°C

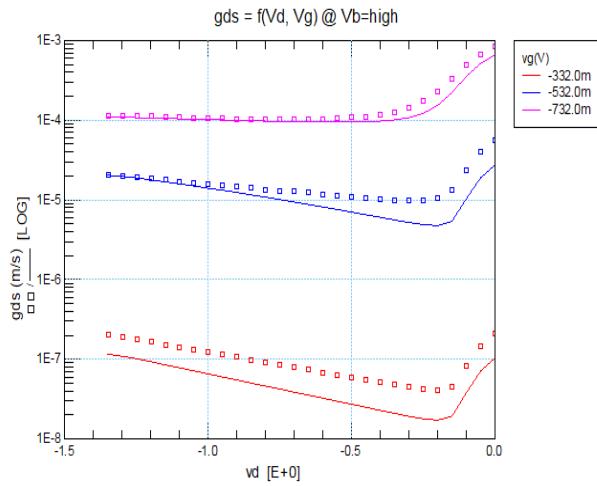
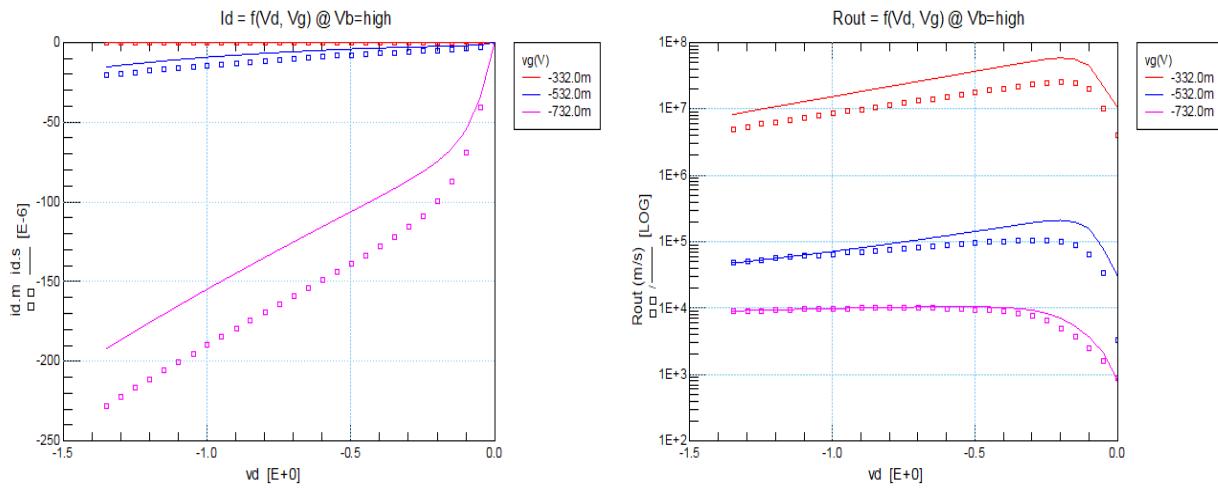


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


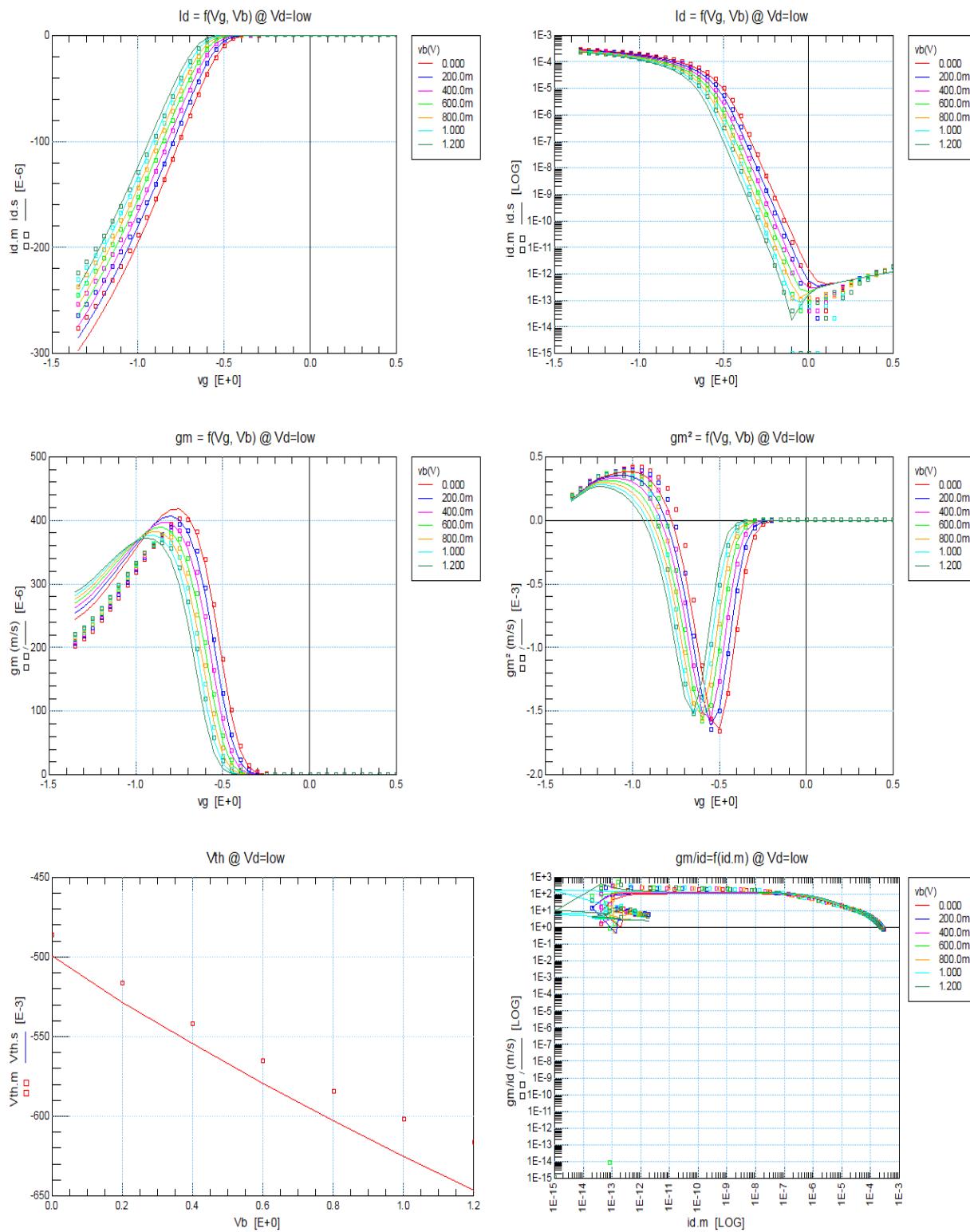
**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

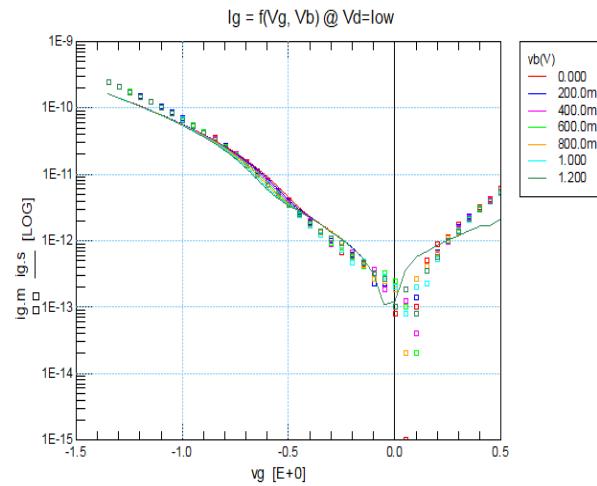
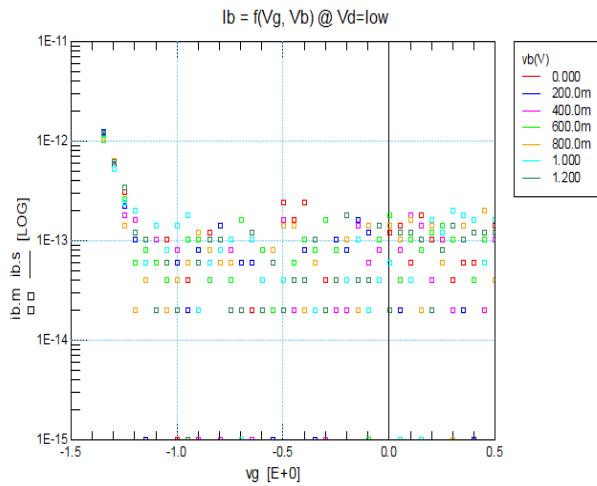


### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

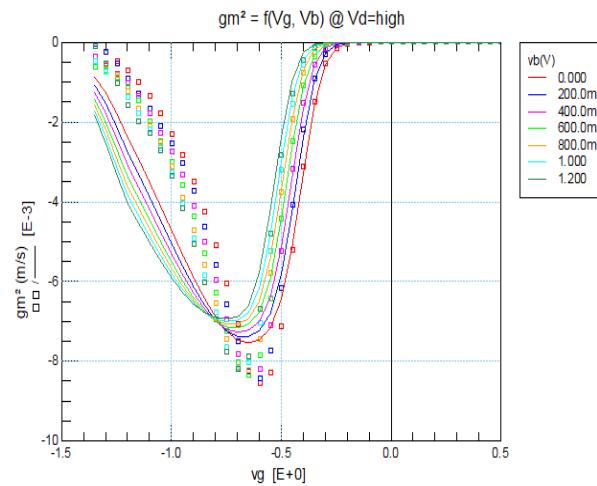
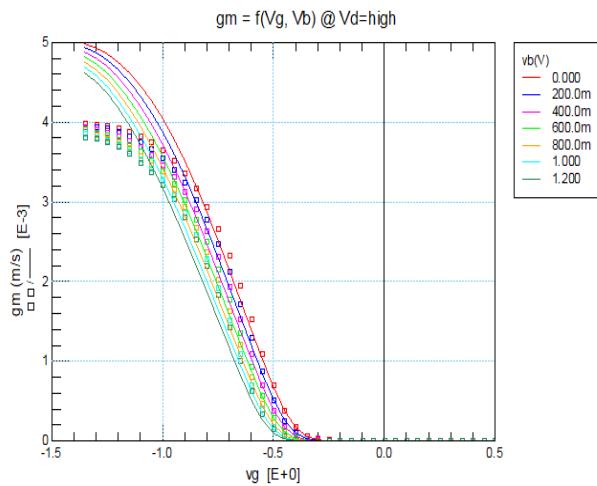
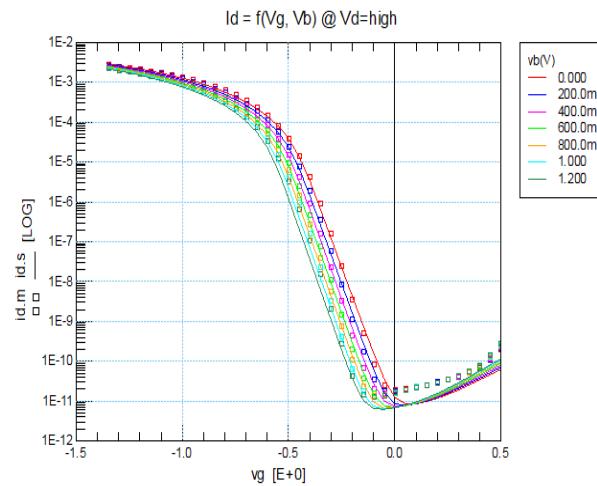
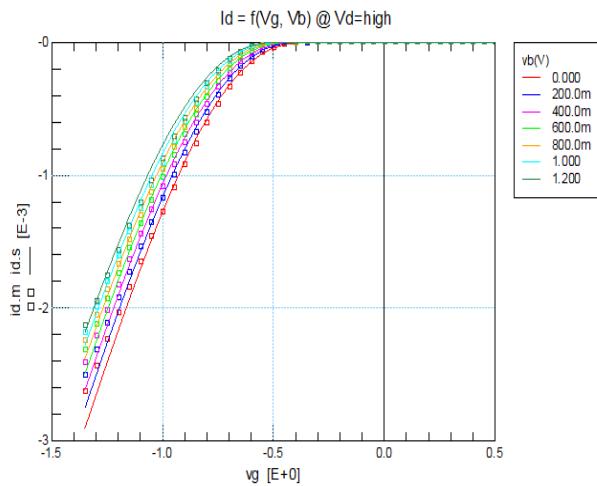


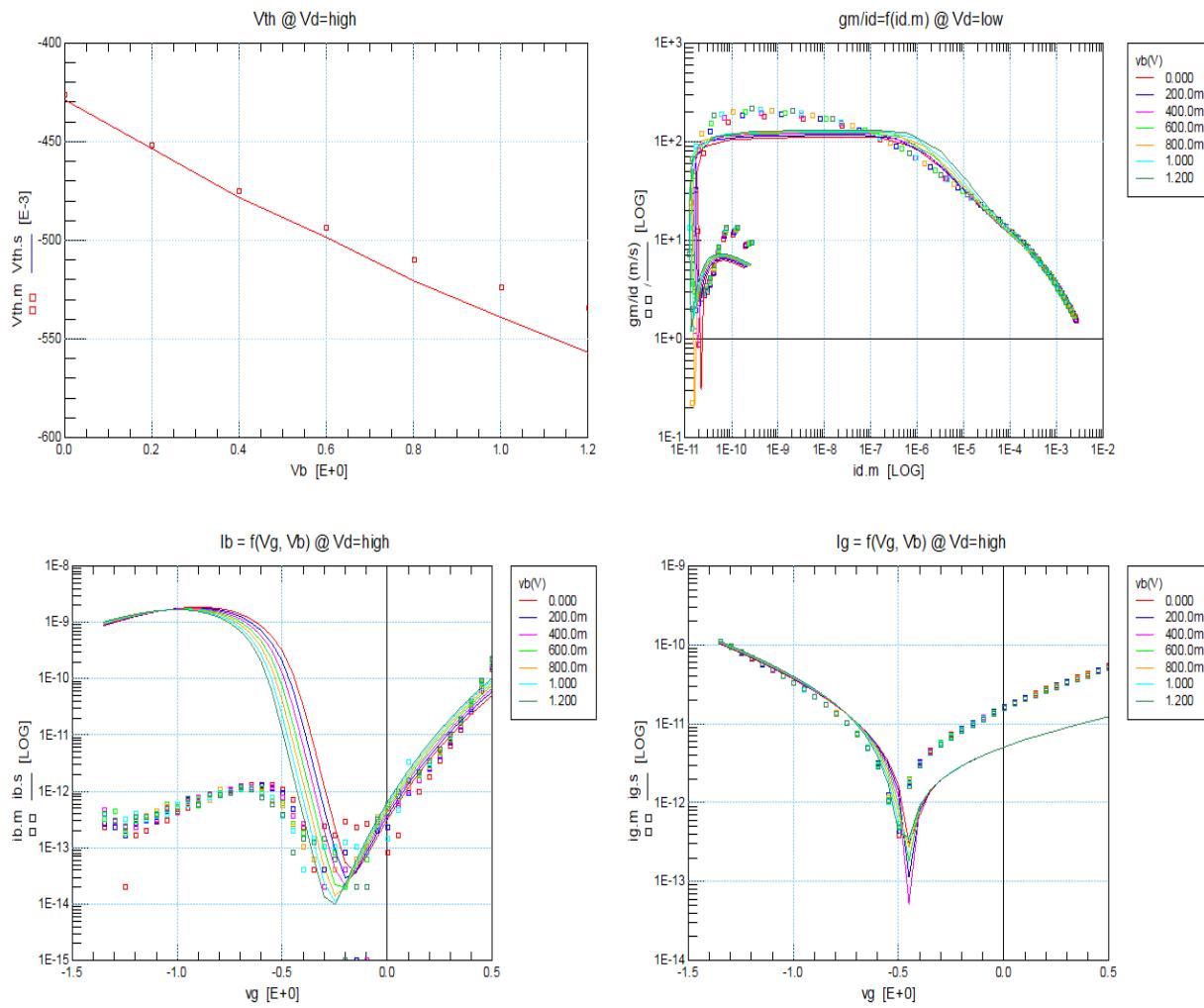
**idvg, Vd = -0.05V, T = -40°C**



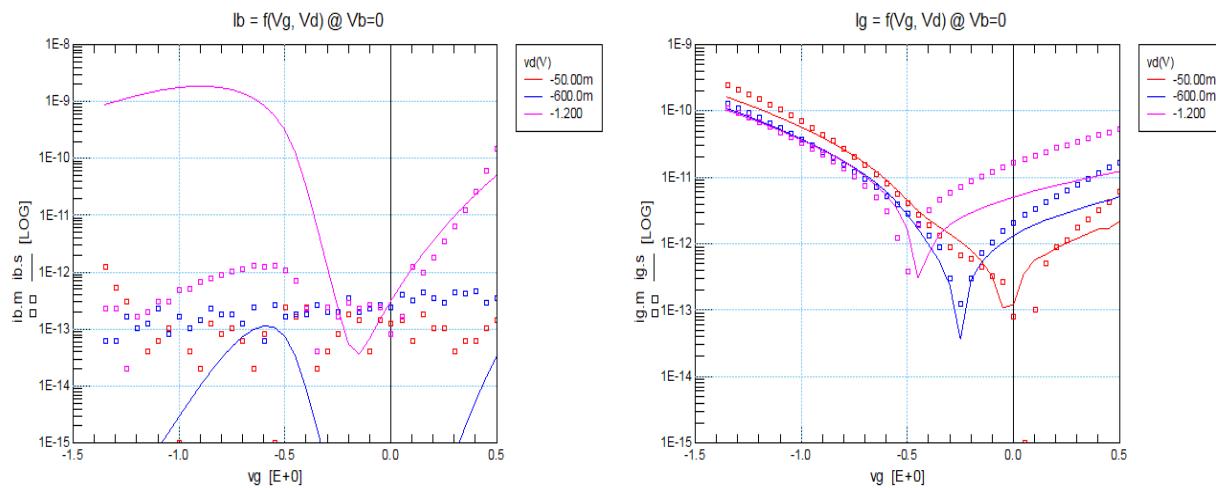


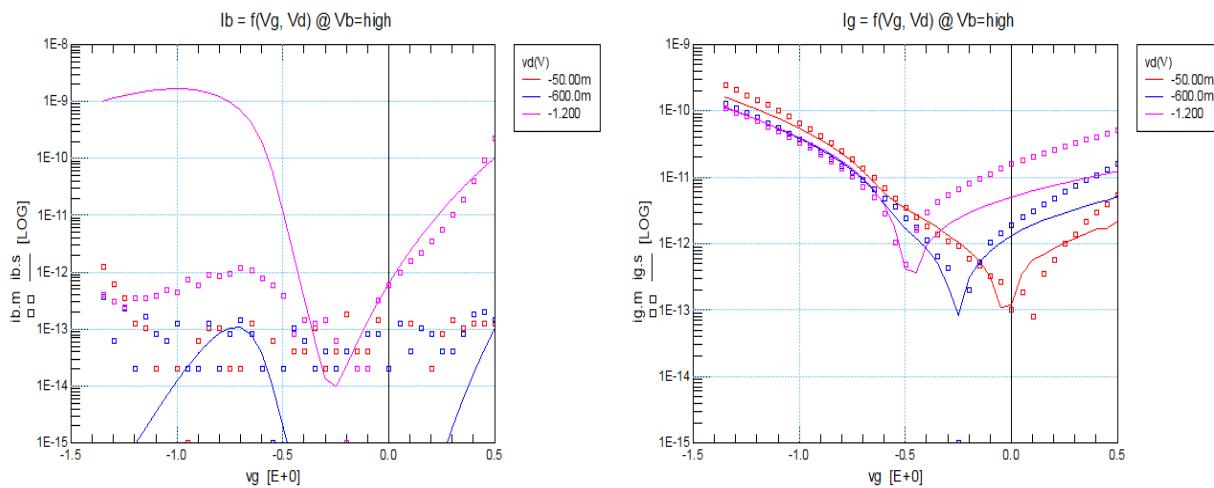
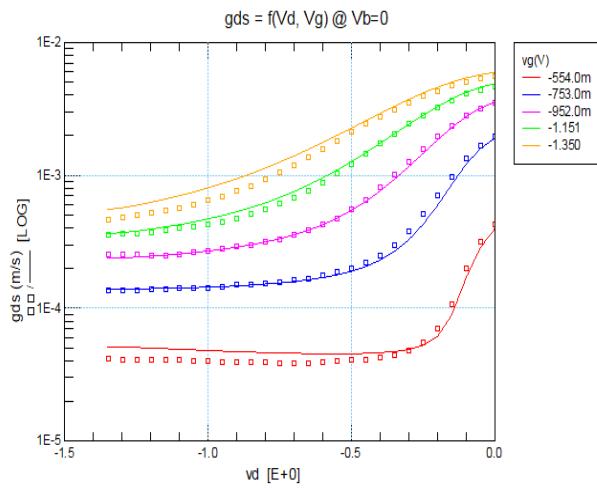
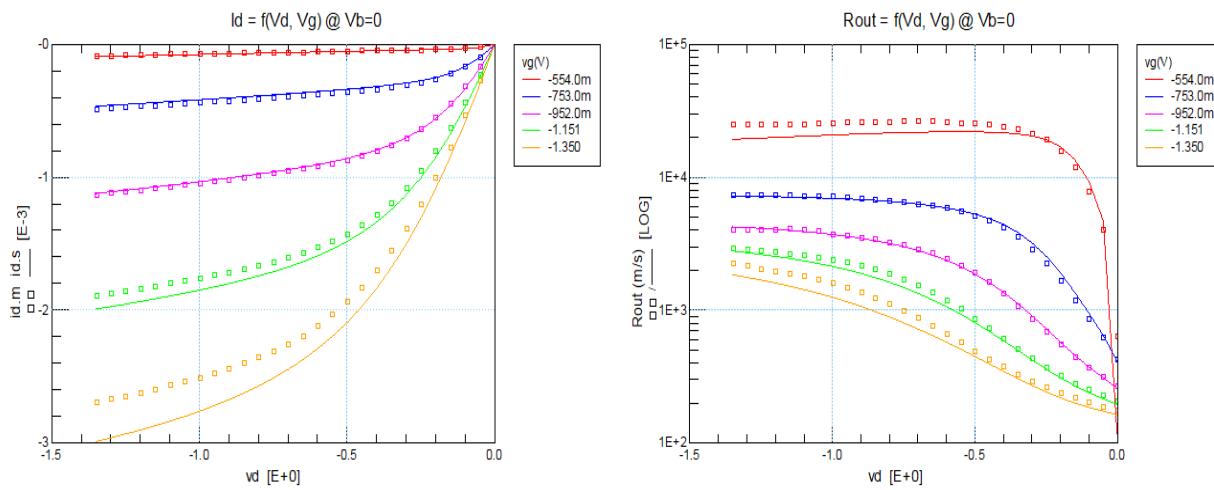
$i_{dvg}, V_d = -1.2V, T = -40^\circ C$

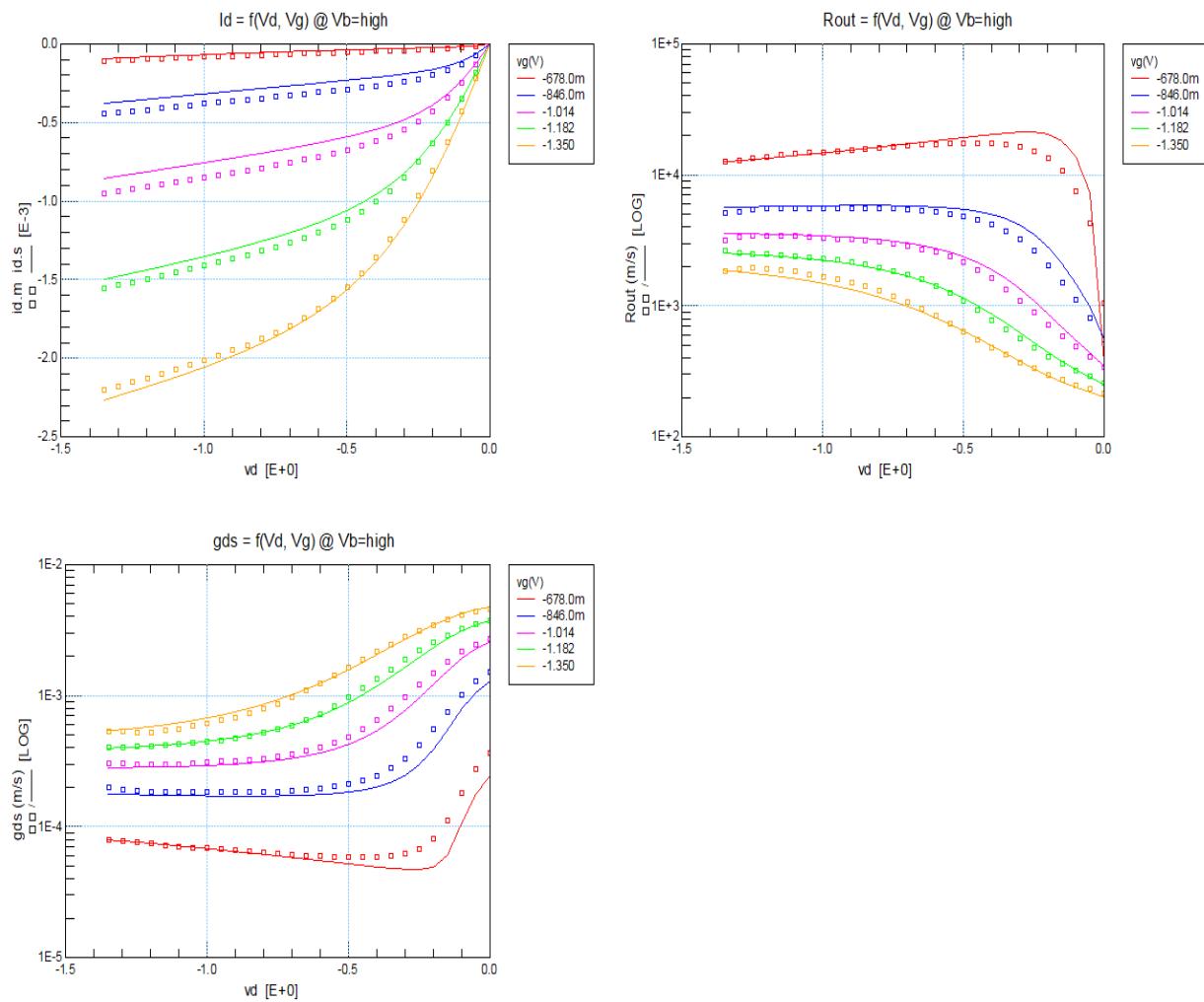
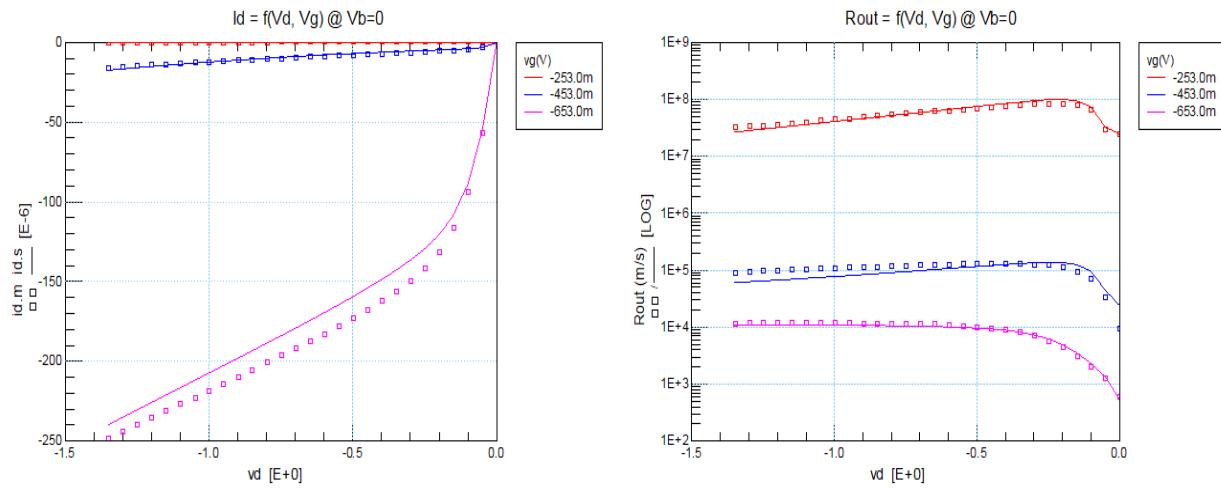


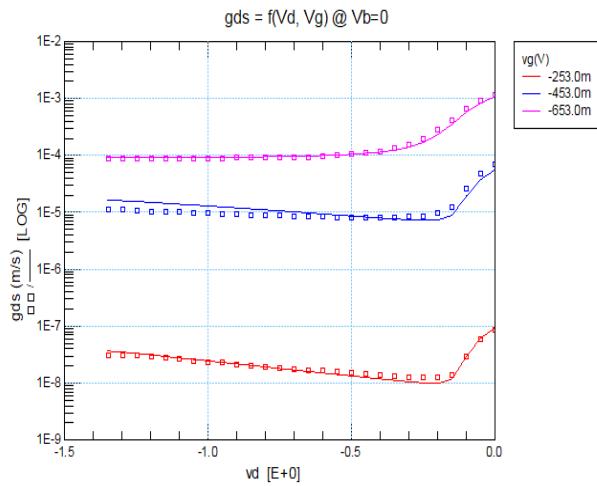


**idvg, Ib, Ig, Vb = 0V, T = -40°C**

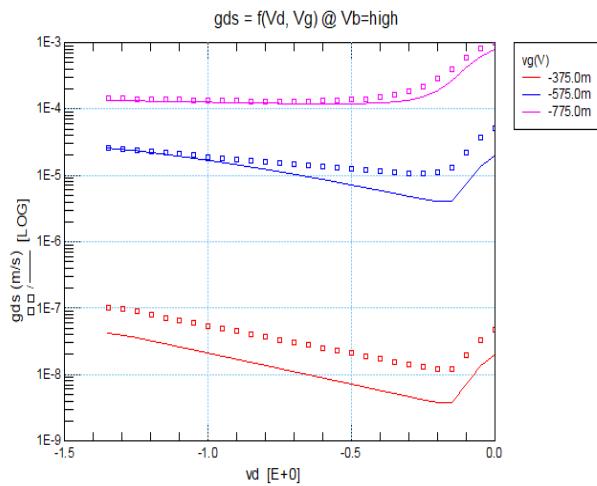
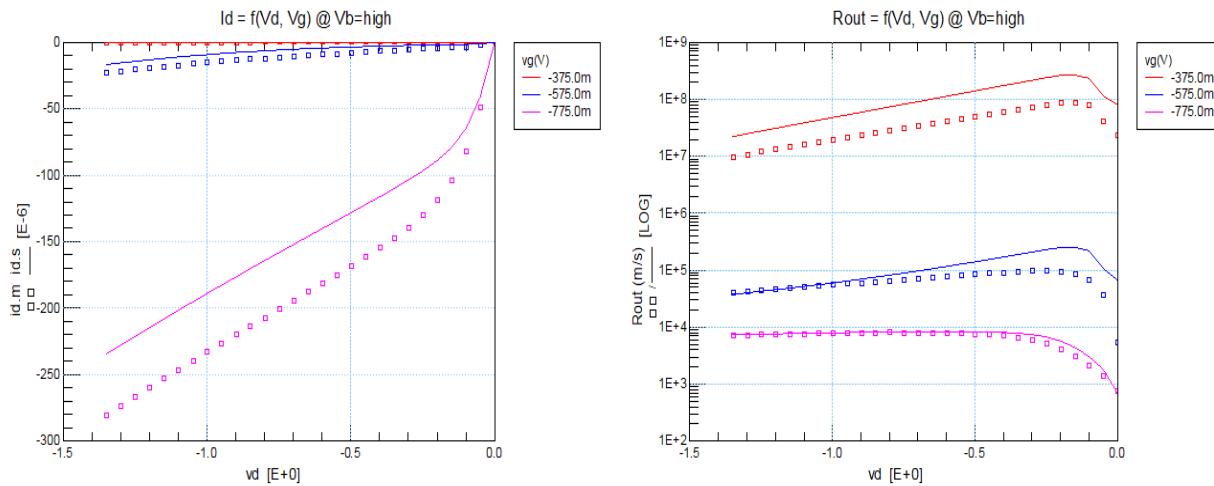


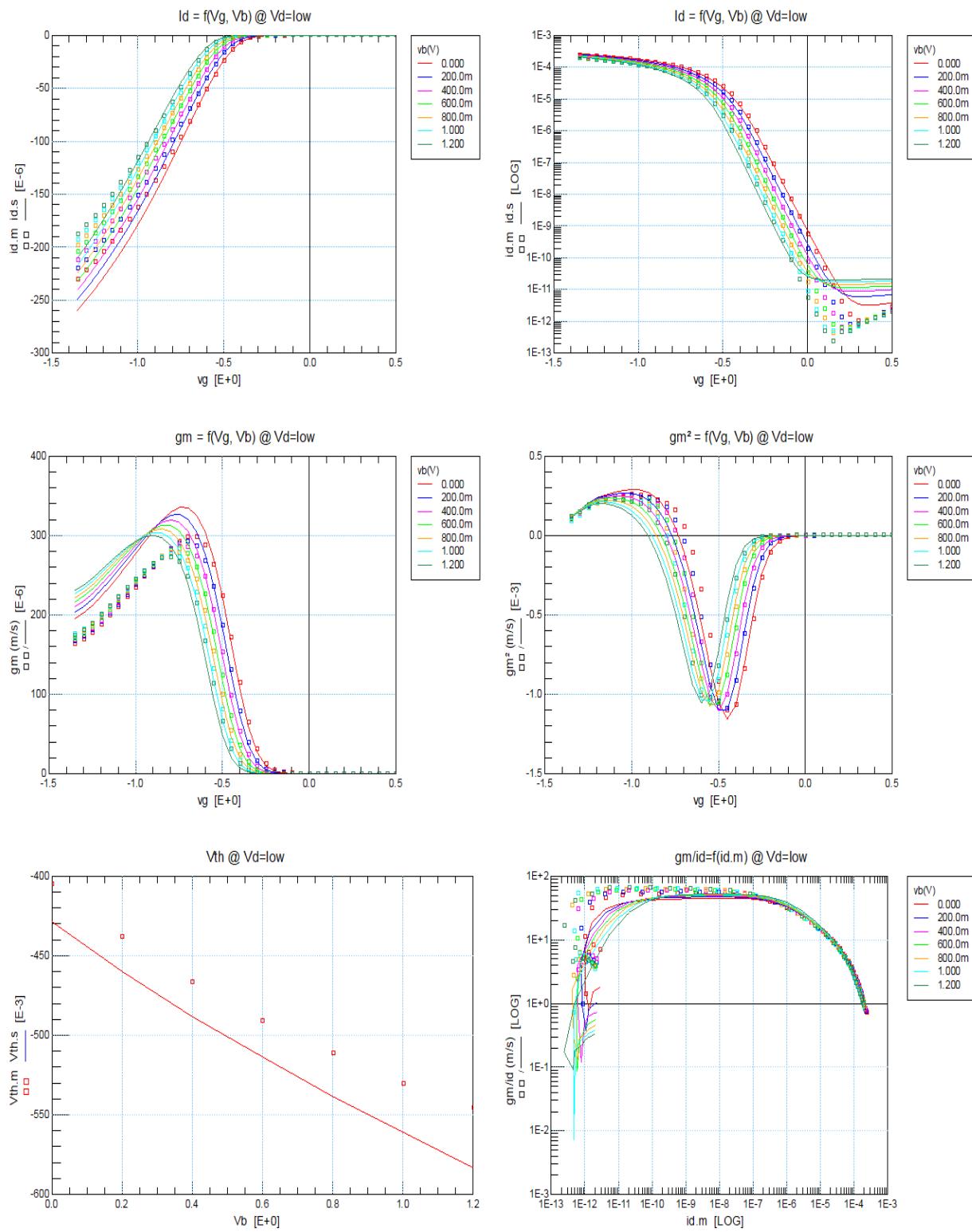
**idvg, Ib,Ig, Vb = 1.2V, T = -40°C**

**idvd, Vb = 0V, T = -40°C**


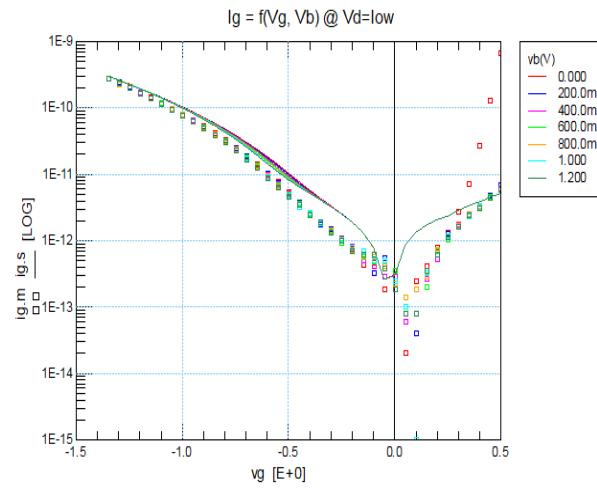
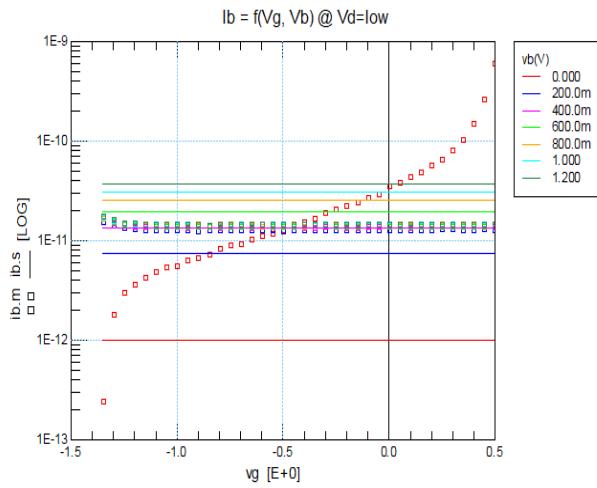
**idvd\_vbmin, Vb = 1.2V, T = -40°C****idvd\_vth, Vb = 0V, T = -40°C**



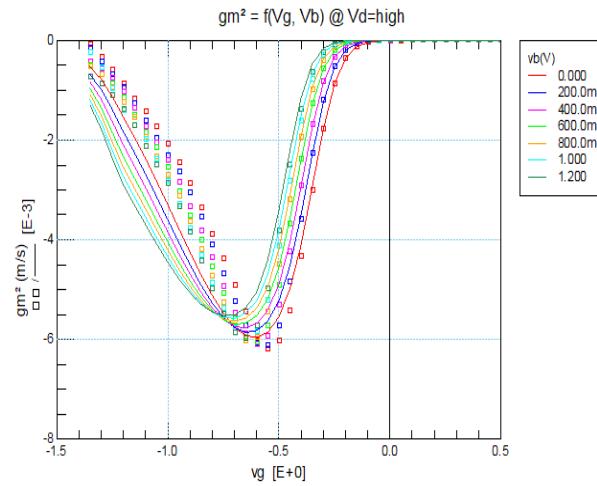
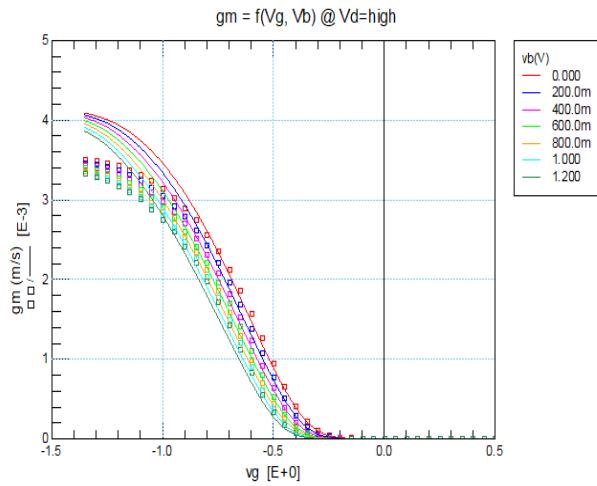
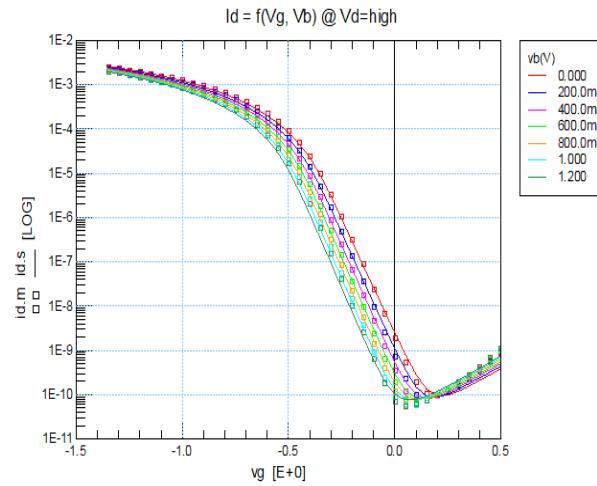
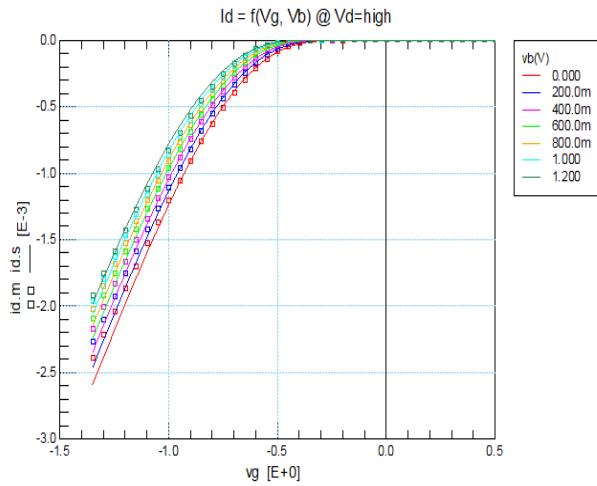
### idvd\_vth\_vbmin, Vb = 1.2V, T = -40°C

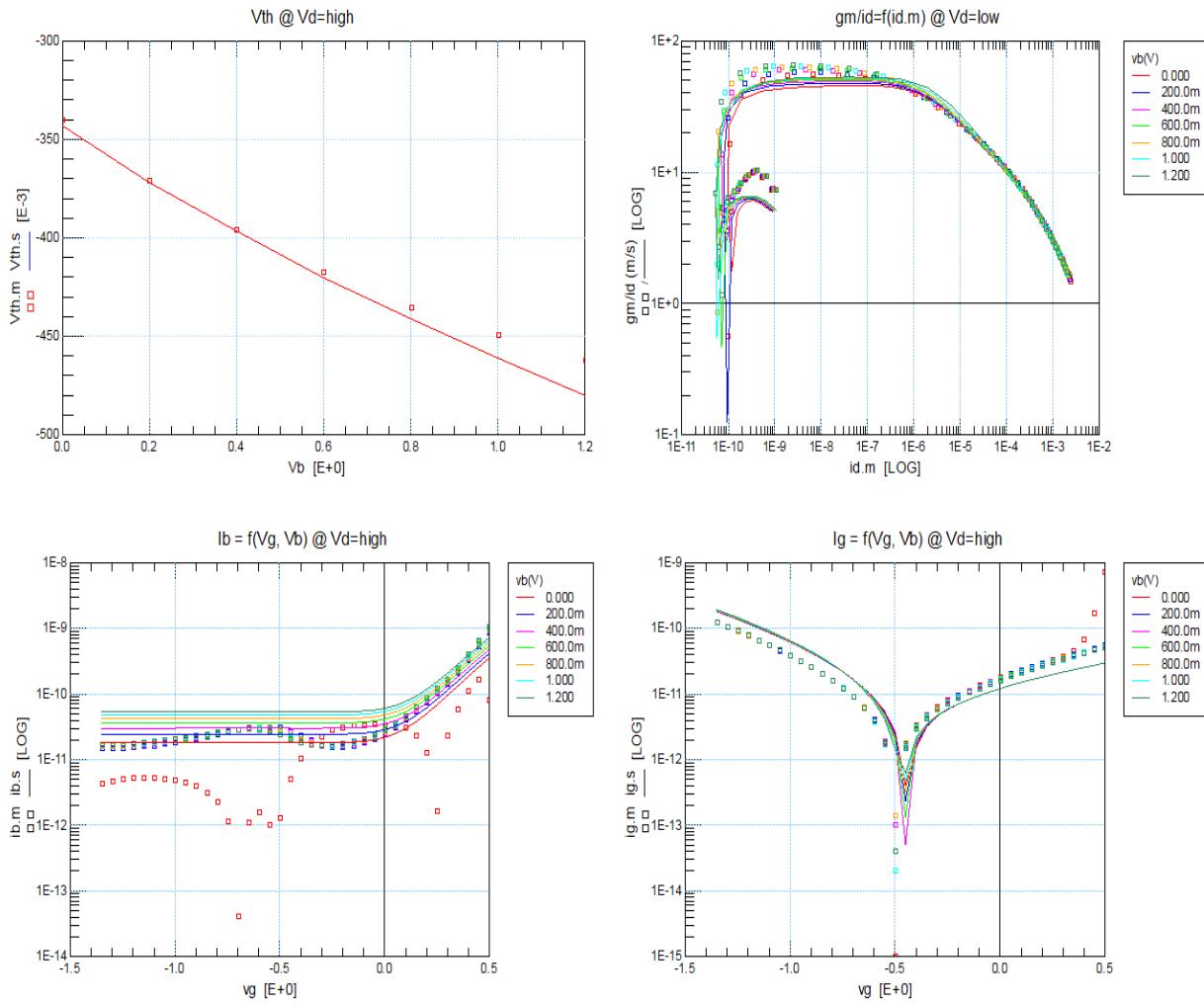


**idvg, Vd = -0.05V, T = 70°C**


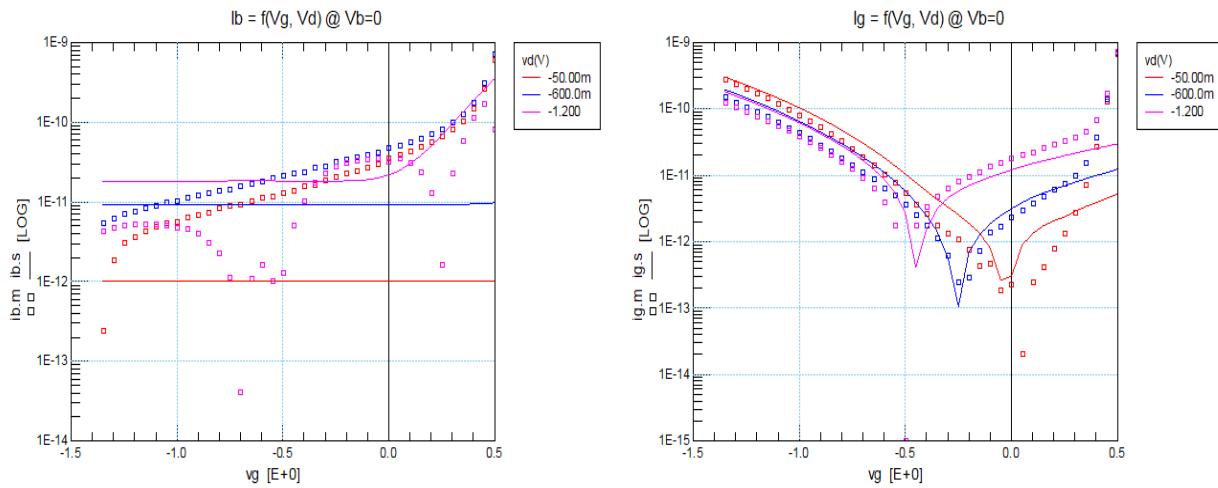


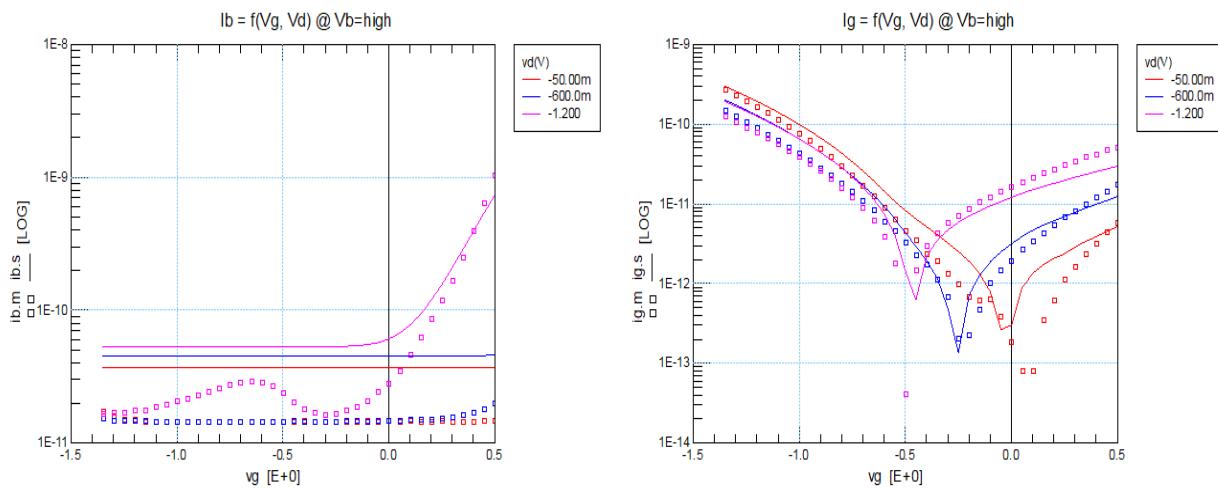
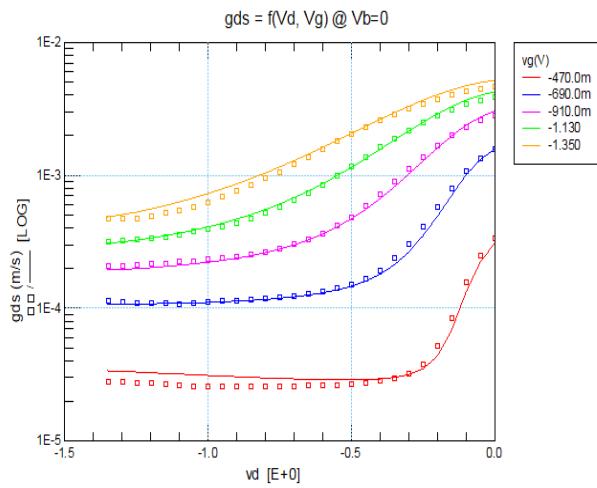
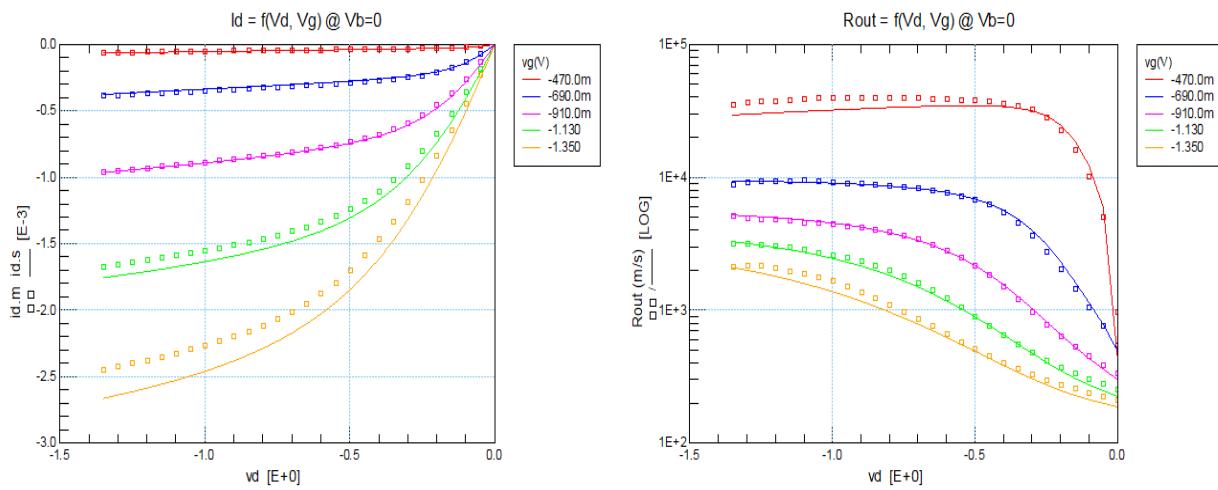
$i_{dvg}, V_d = -1.2V, T = 70^\circ C$

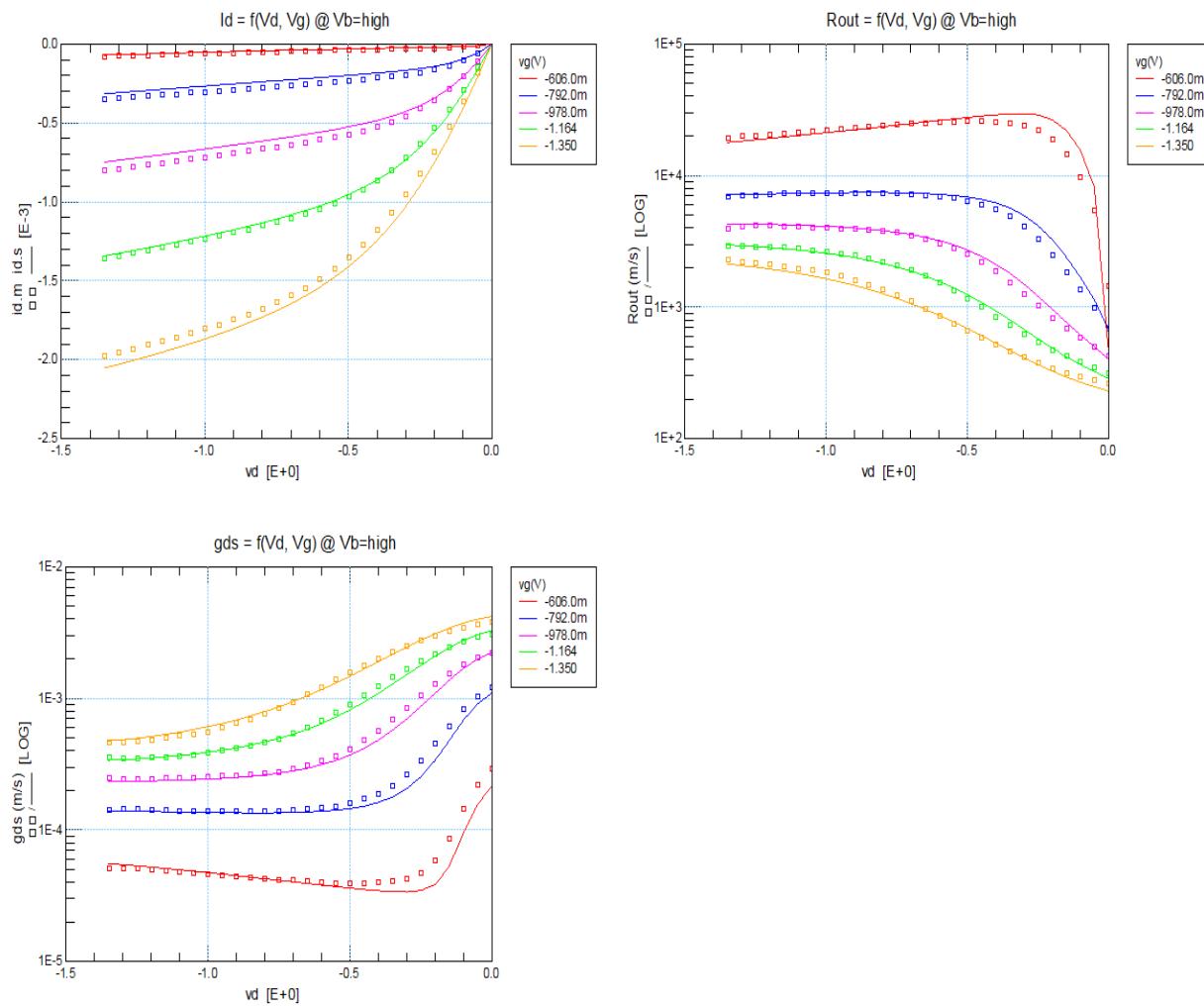
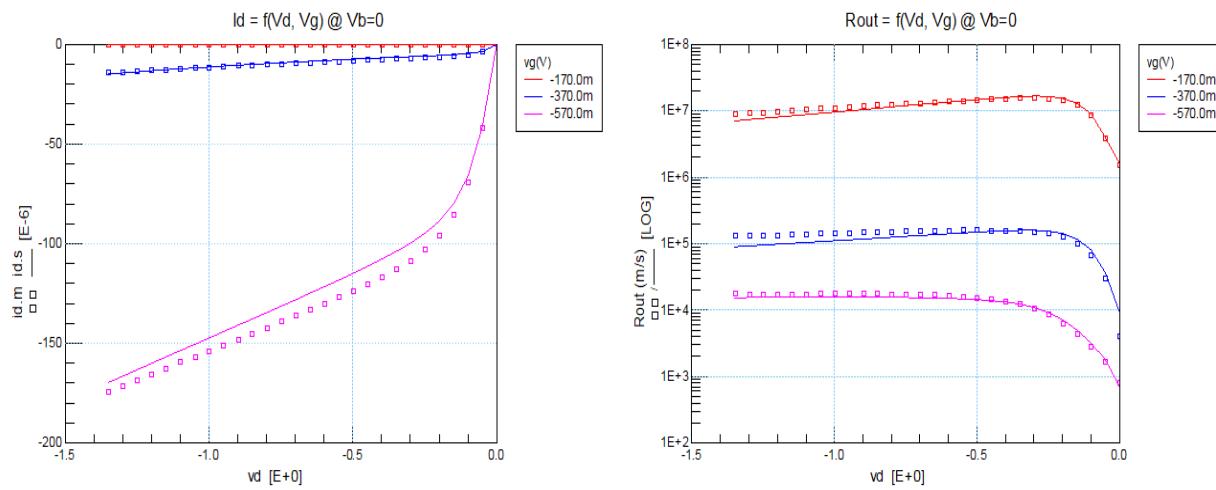


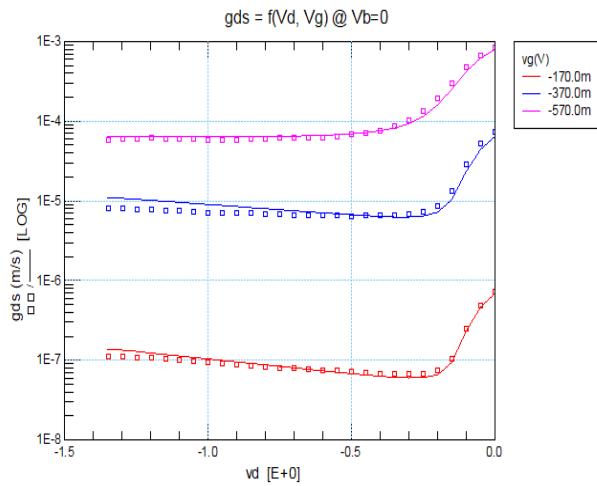


### $I_d V_g, I_b, I_g, V_b = 0V, T = 70^\circ\text{C}$

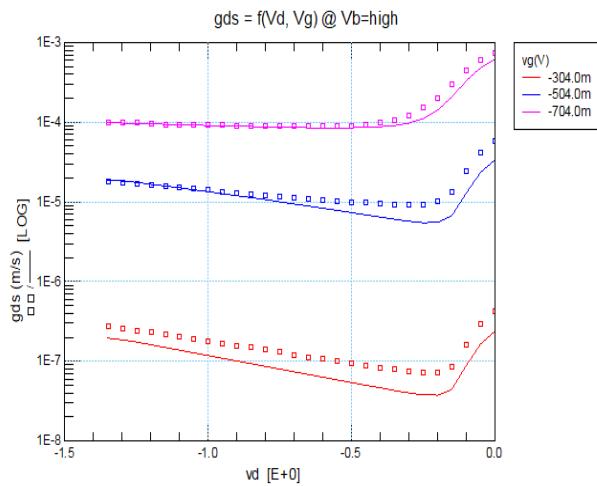
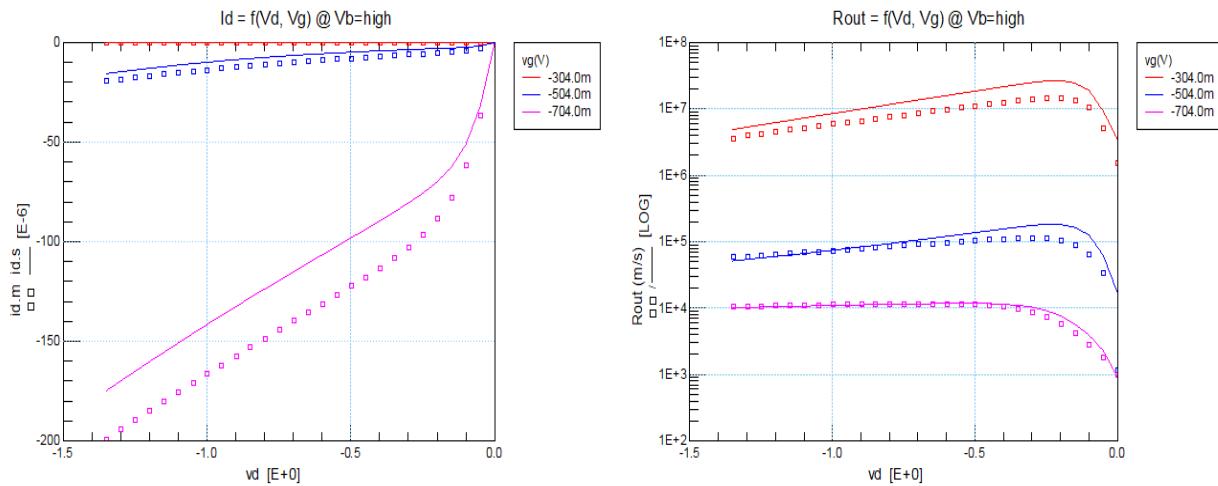


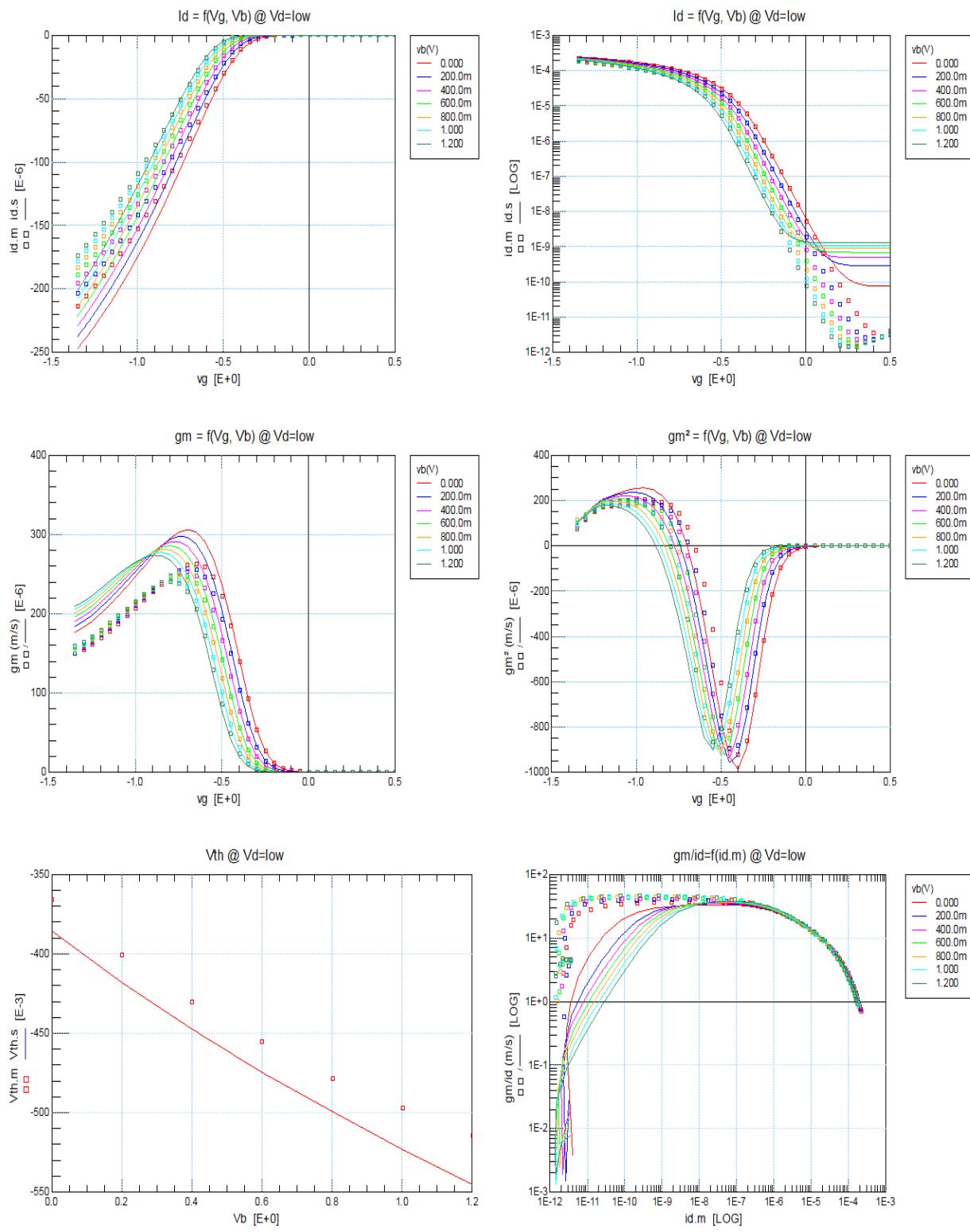
**idvg, Ib,Ig, Vb = 1.2V, T = 70°C**

**idvd, Vb = 0V, T = 70°C**


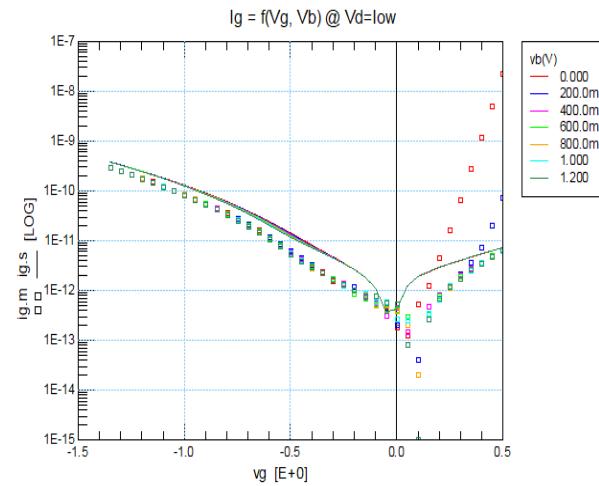
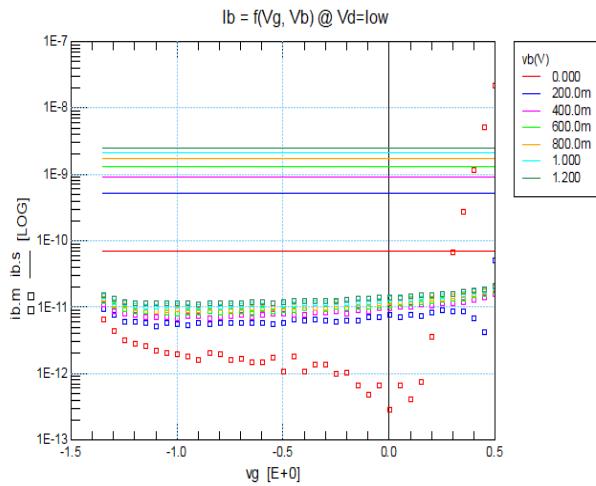
**idvd\_vbmin, Vb = 1.2V, T = 70°C****idvd\_vth, Vb = 0V, T = 70°C**



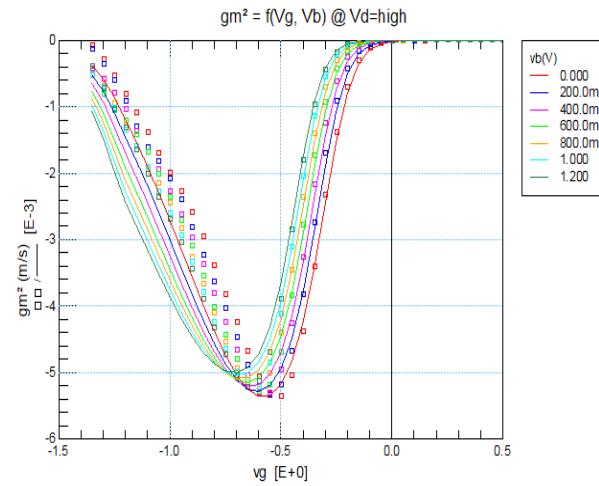
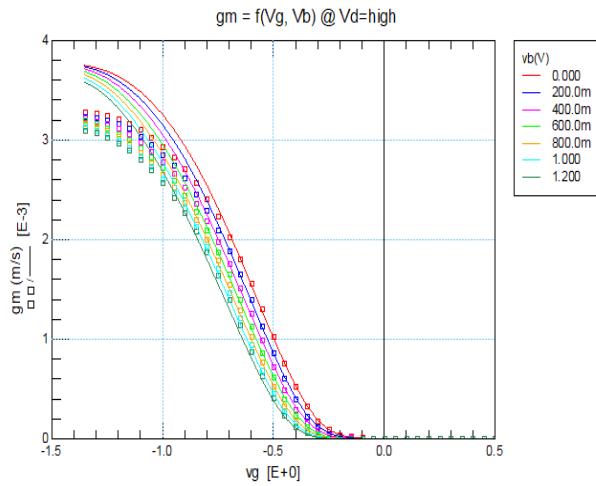
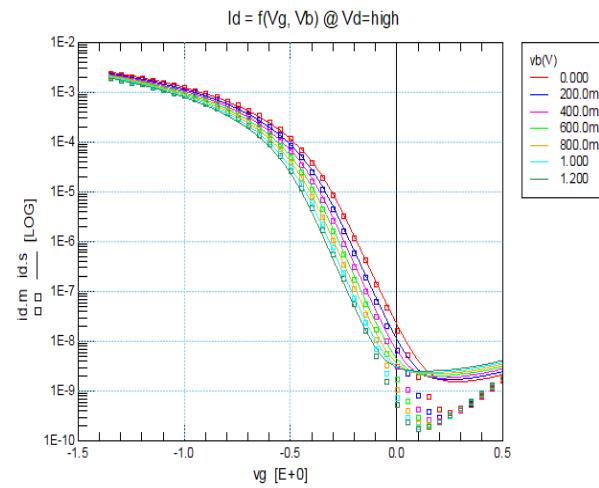
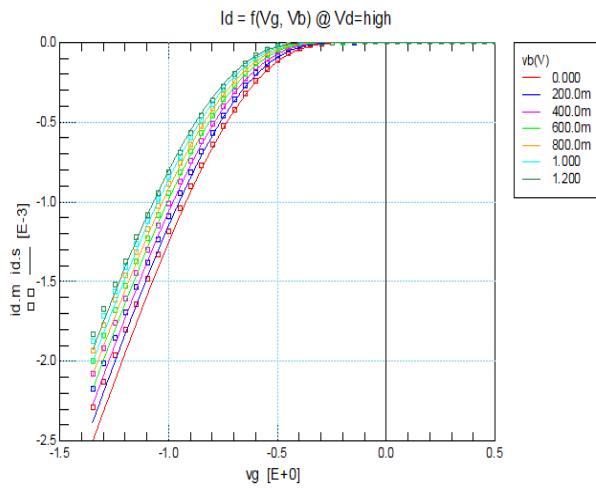
### idvd\_vth\_vbmin, Vb = 1.2V, T = 70°C

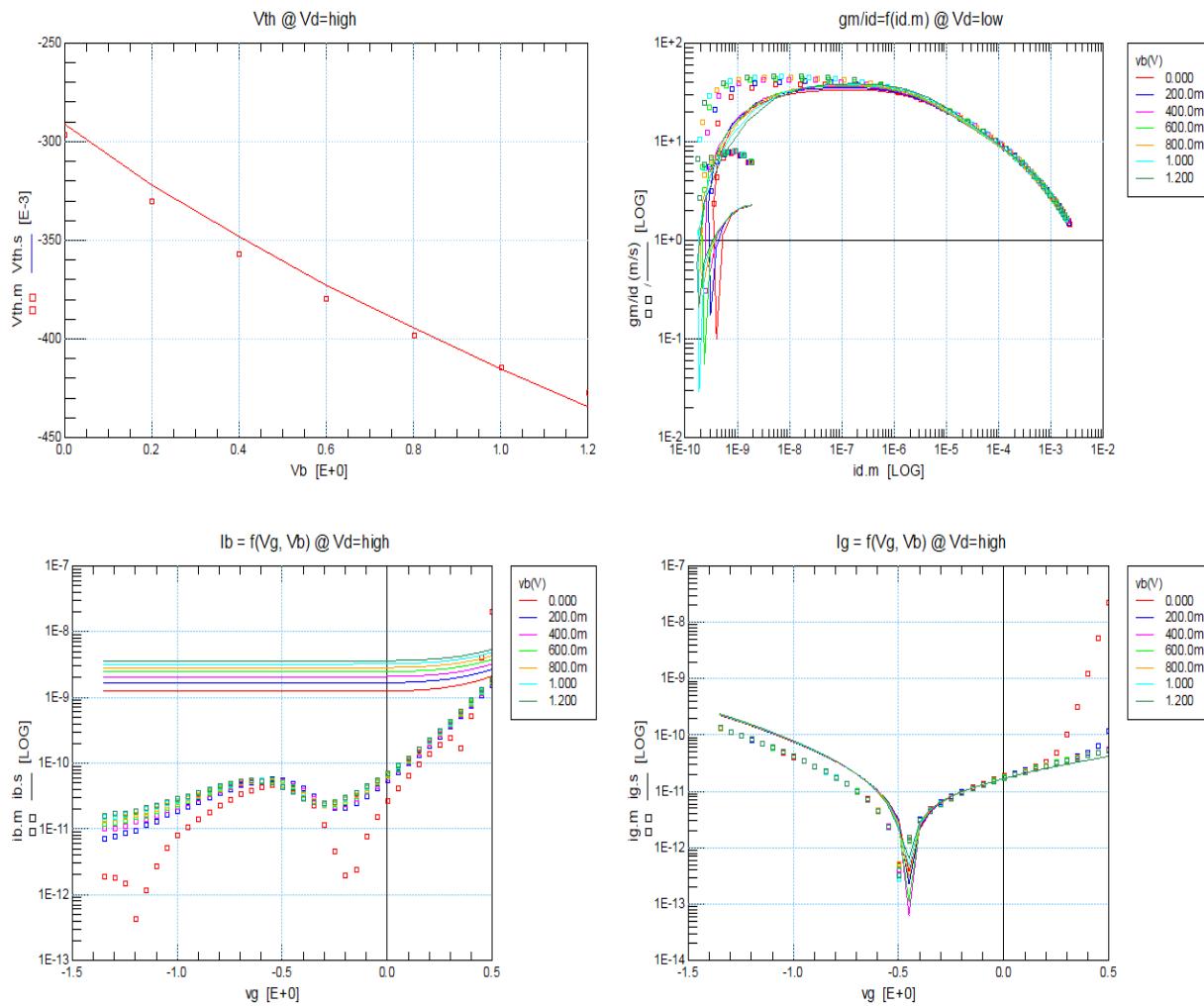


**idvg, Vd = -0.05V, T = 125°C**


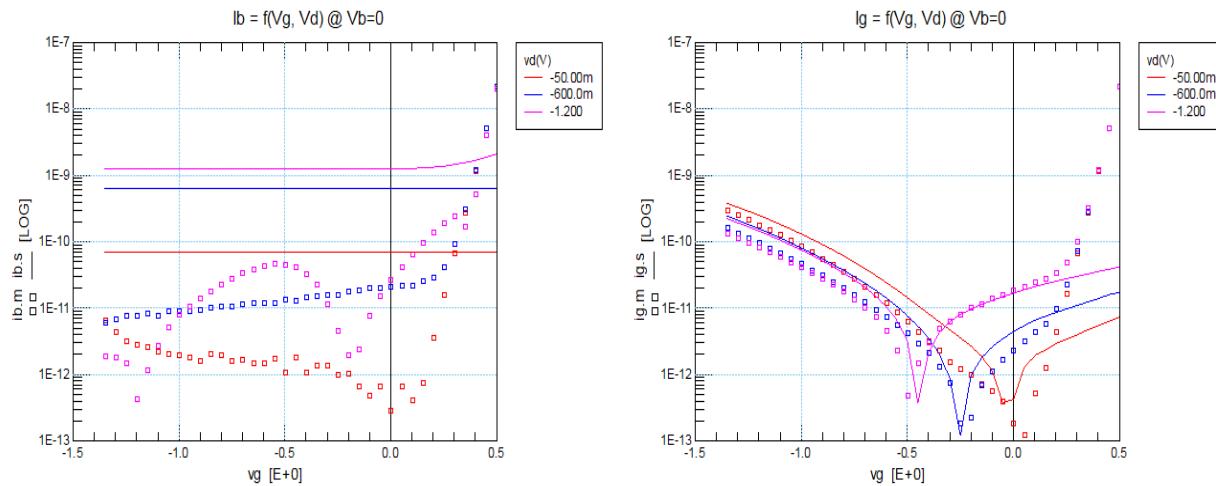


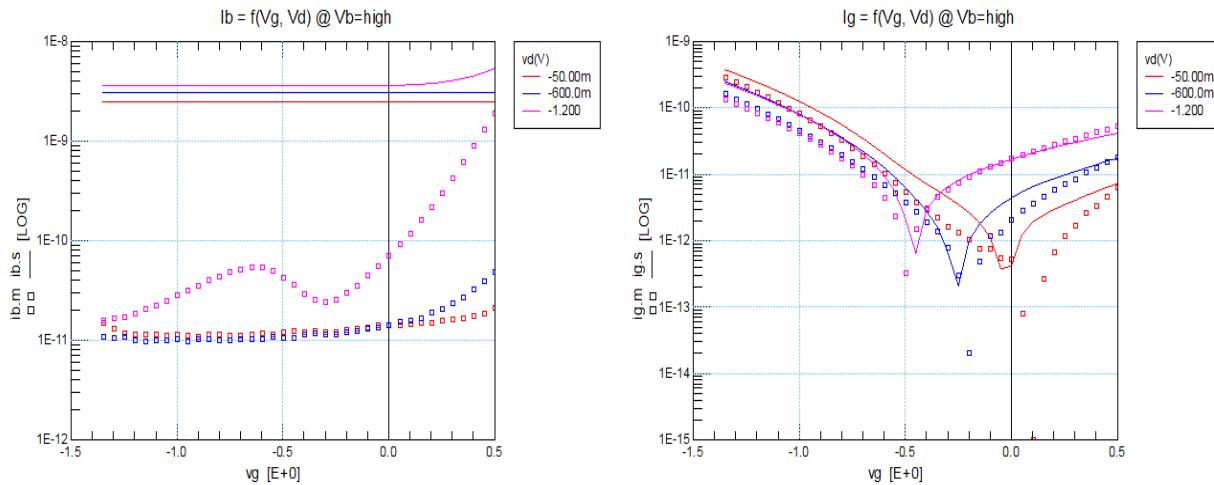
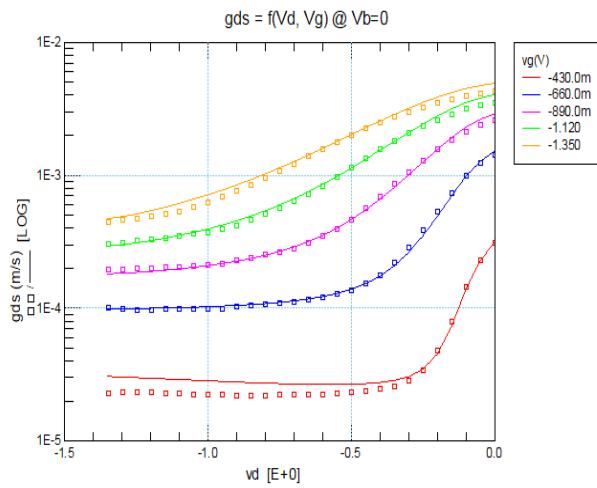
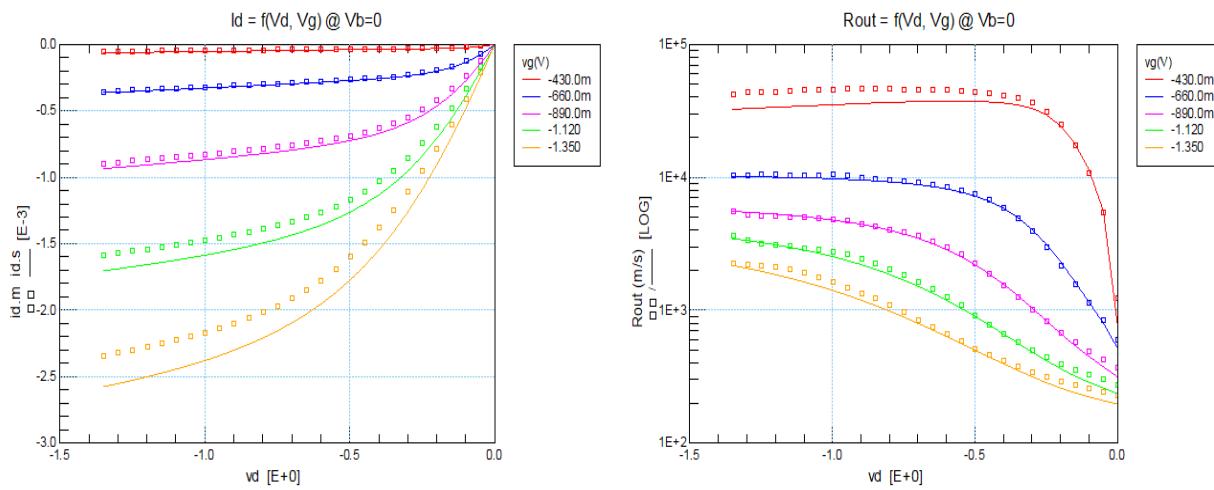
$i_d v_g, V_d = -1.2V, T = 125^\circ\text{C}$

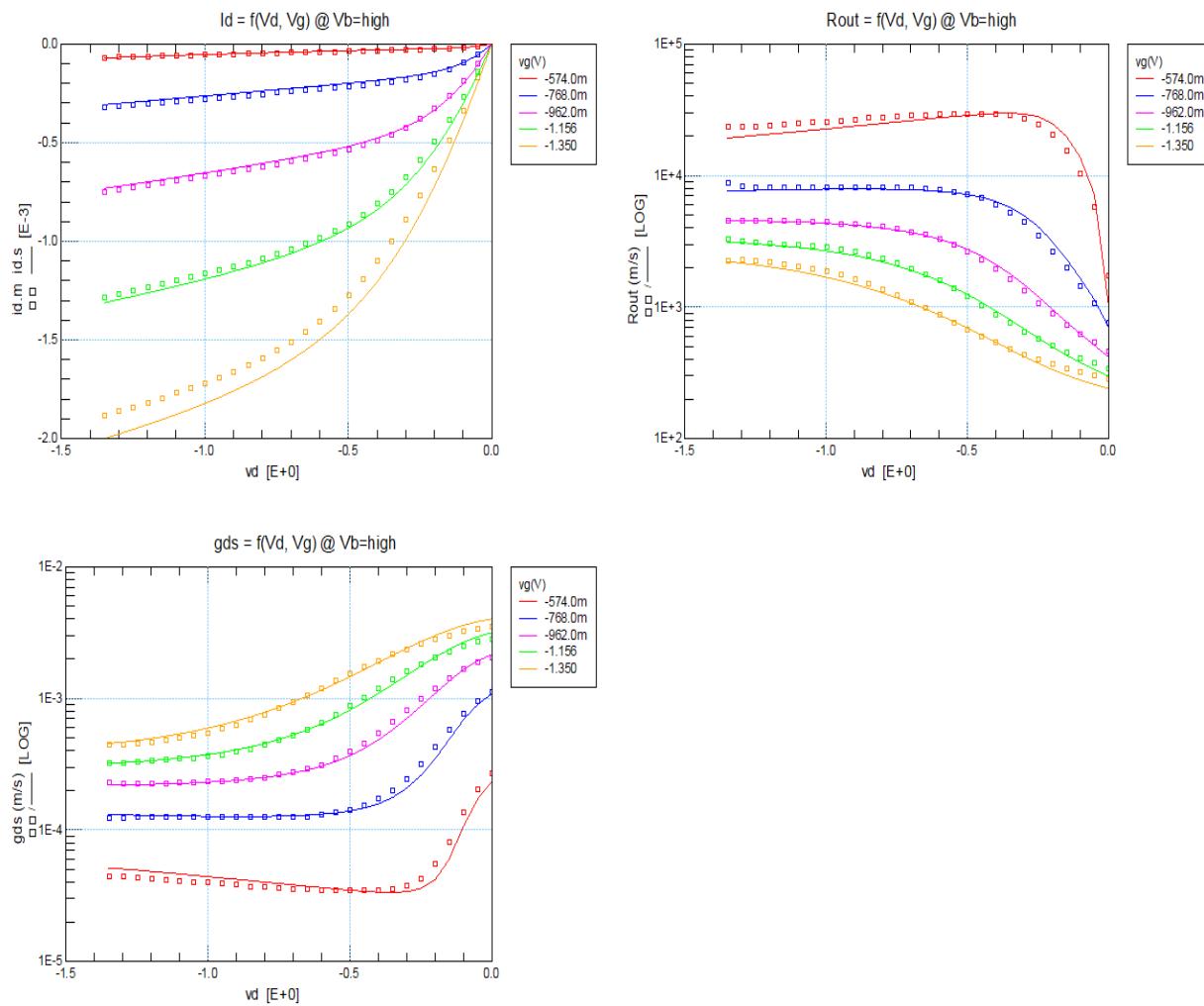
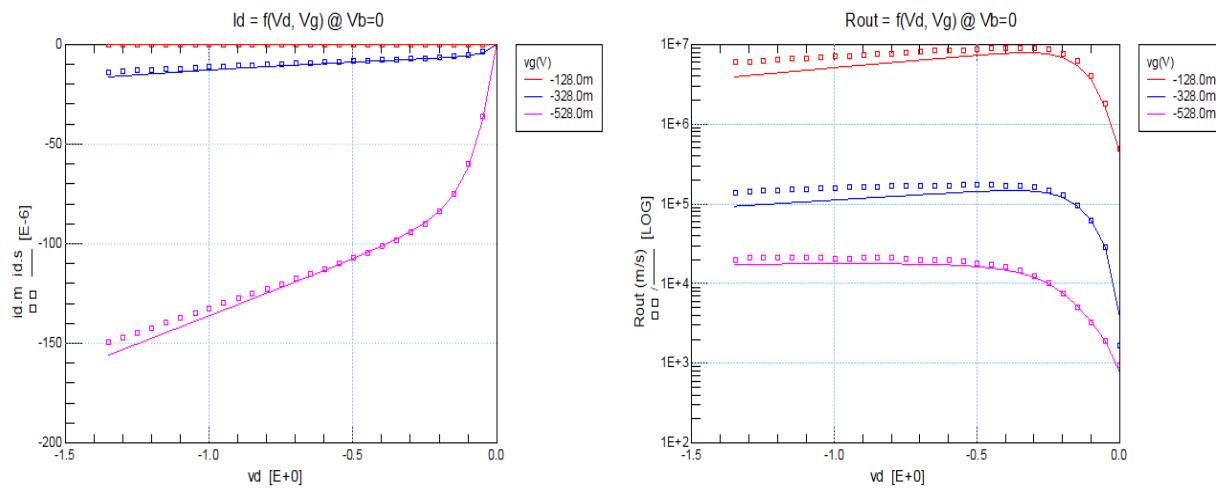


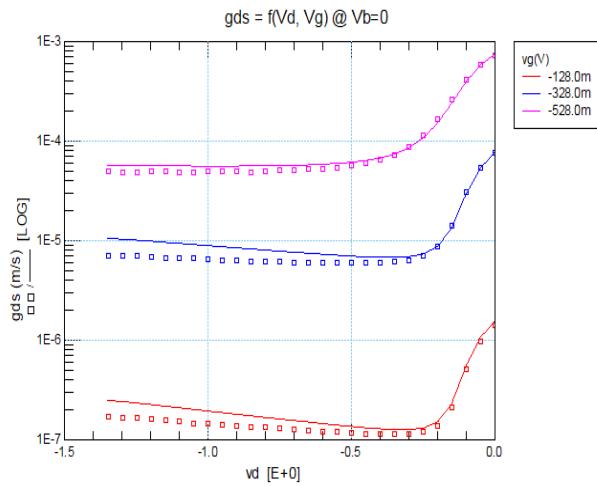


**idvg, lb,lg, Vb = 0V, T = 125°C**

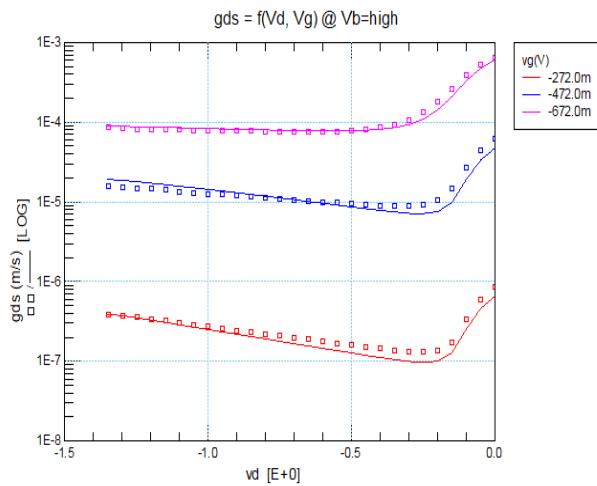
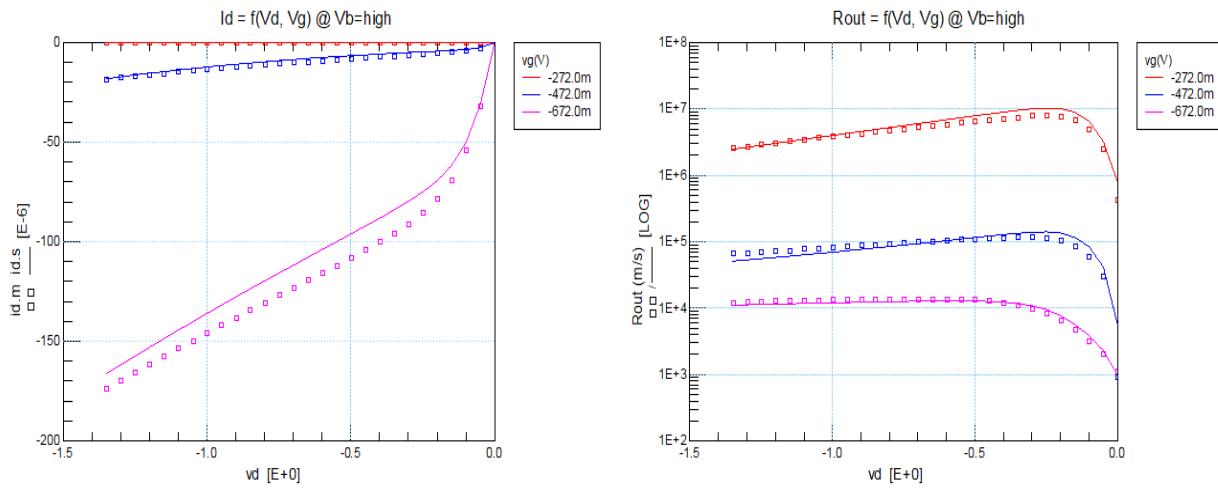


**idvg, Ib,Ig, Vb = 1.2V, T = 125°C**

**idvd, Vb = 0V, T = 125°C**


**idvd\_vbmin, Vb = 1.2V, T = 125°C****idvd\_vth, Vb = 0V, T = 125°C**

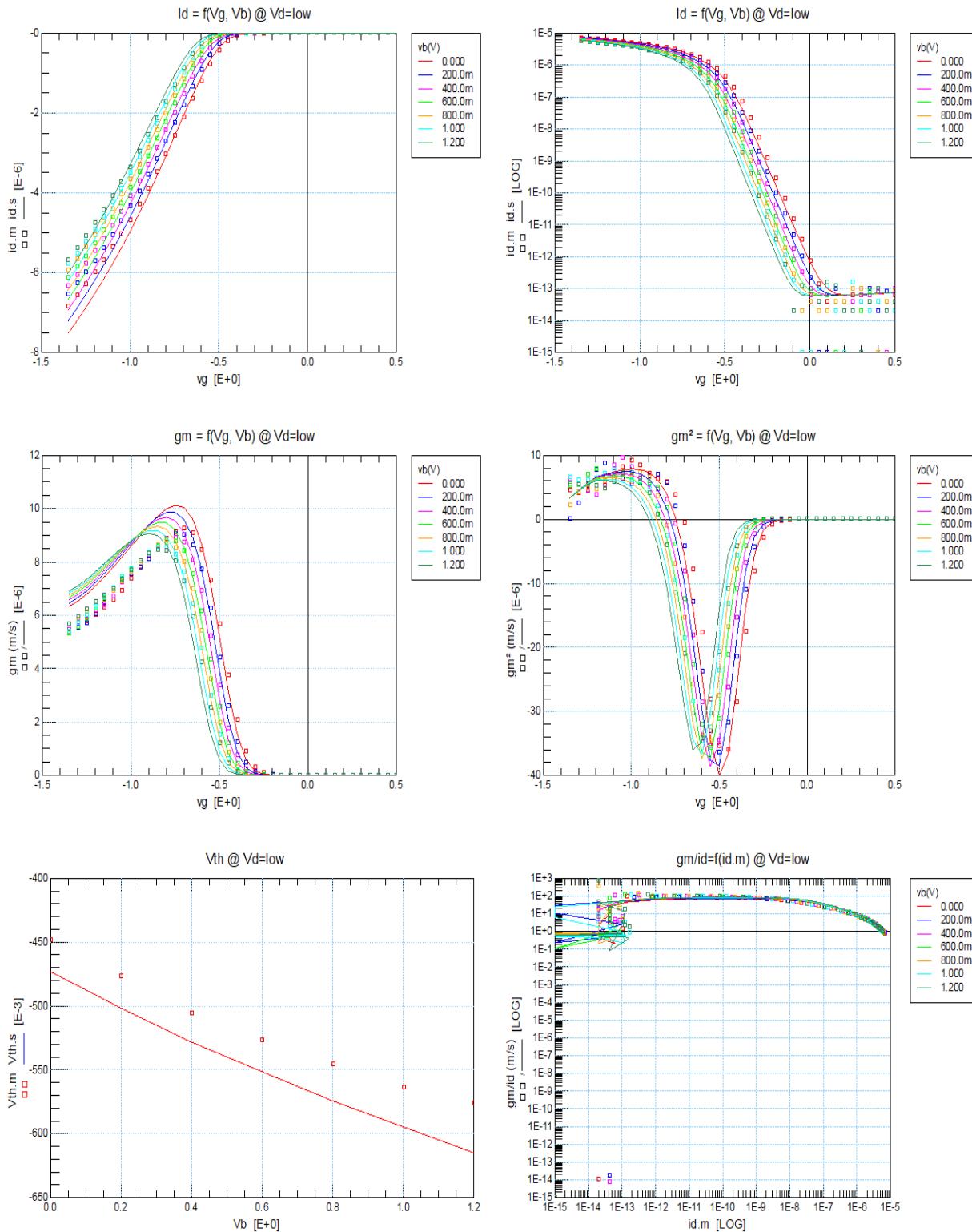


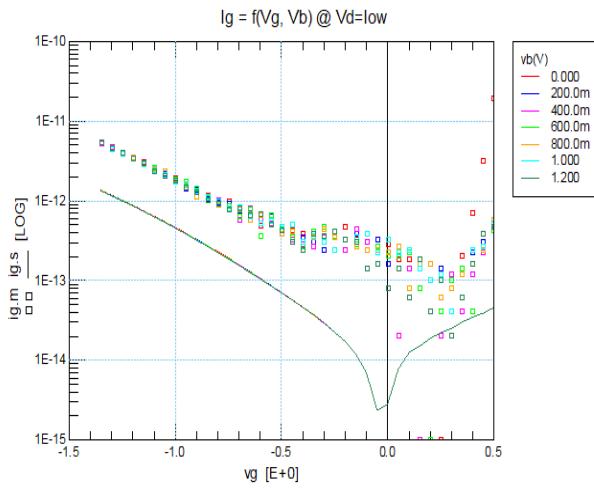
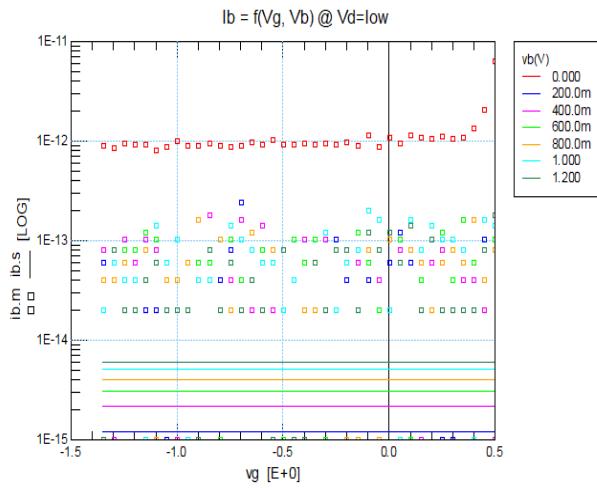
### idvd\_vth\_vbmin, Vb = 1.2V, T = 125°C



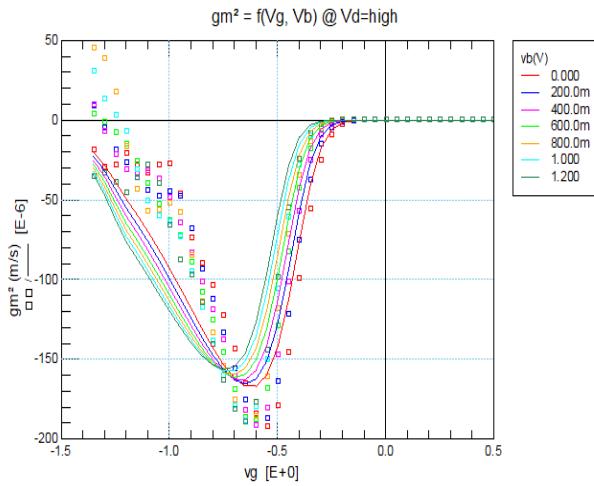
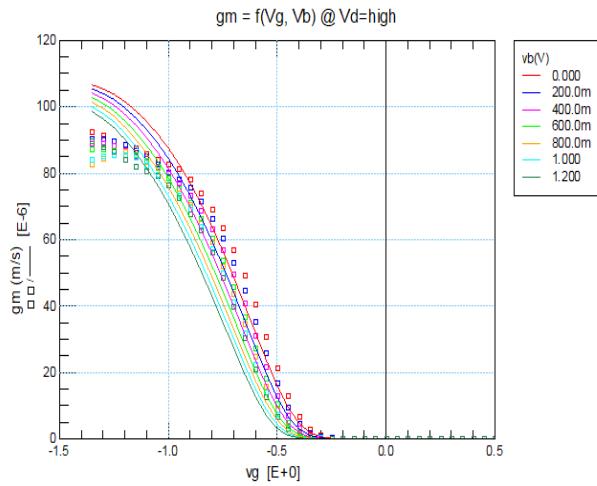
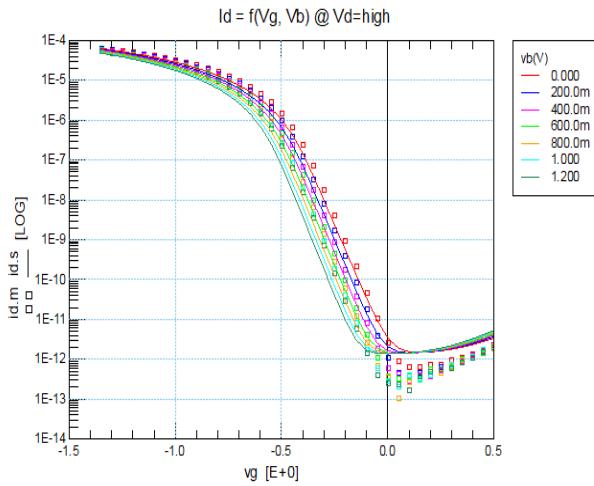
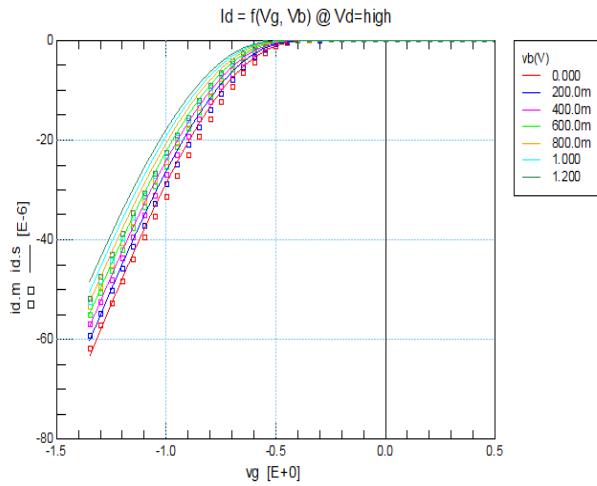
## 4.5 W0u15\_L0u13\_S554\_3

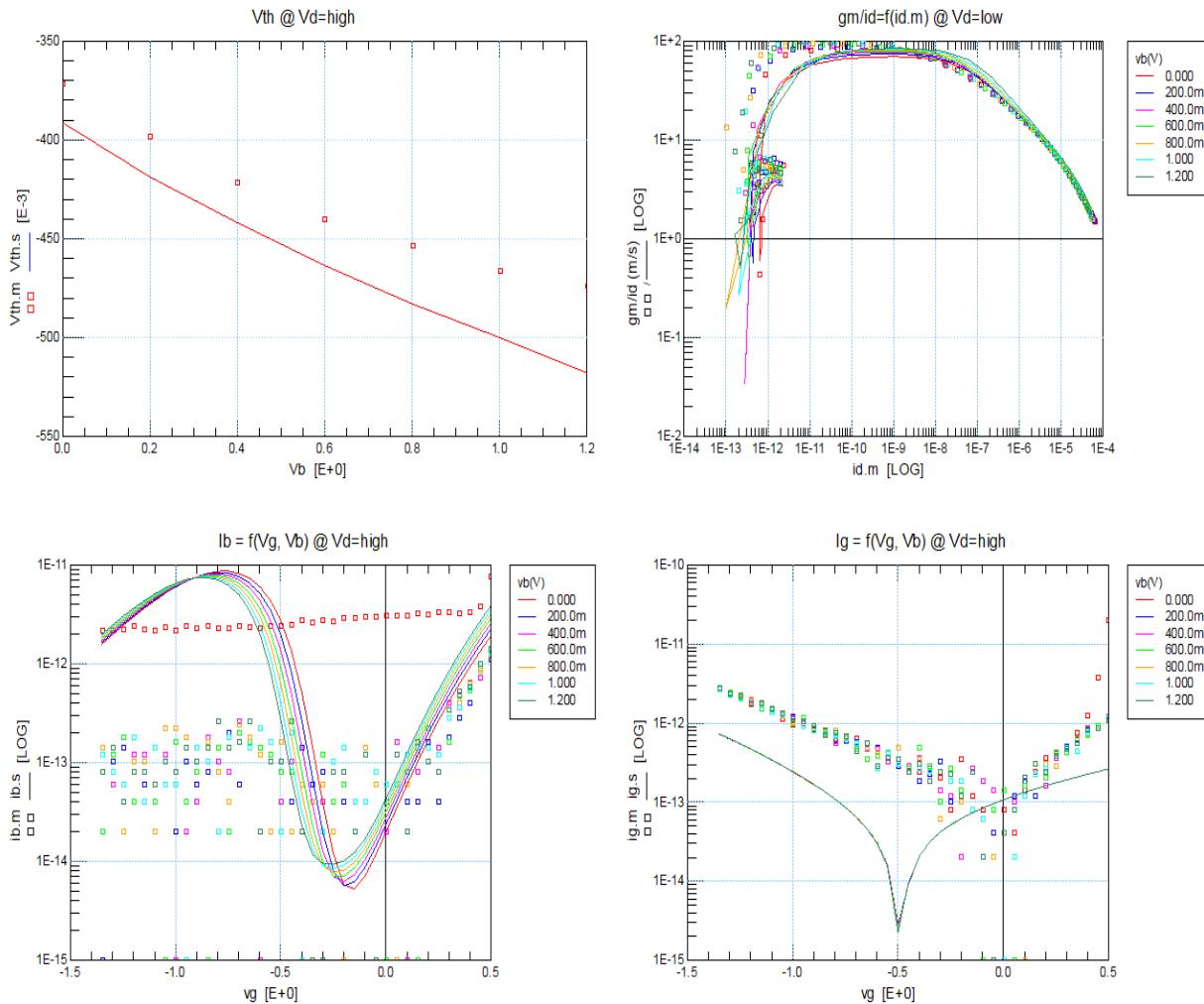
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



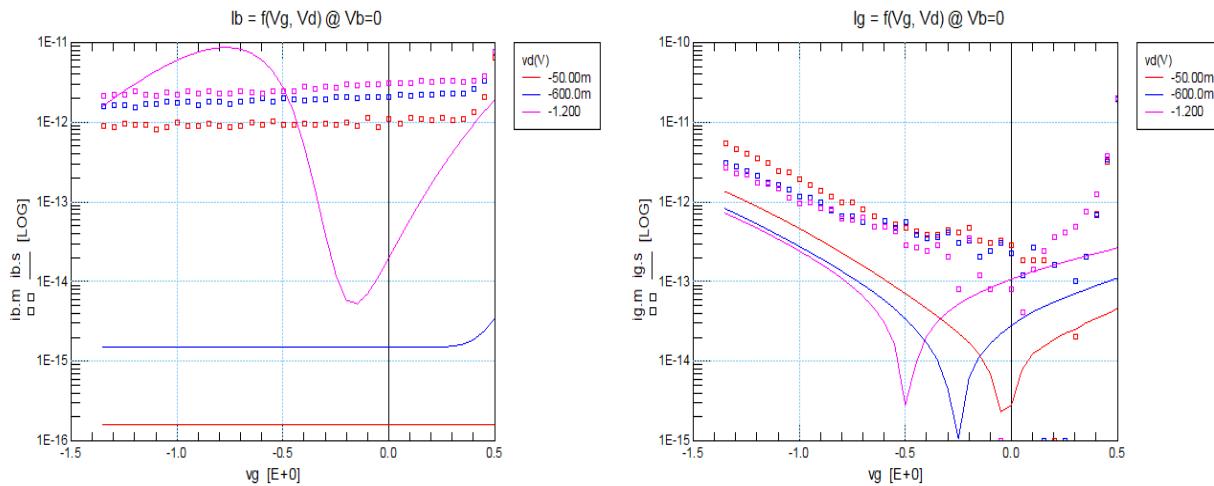


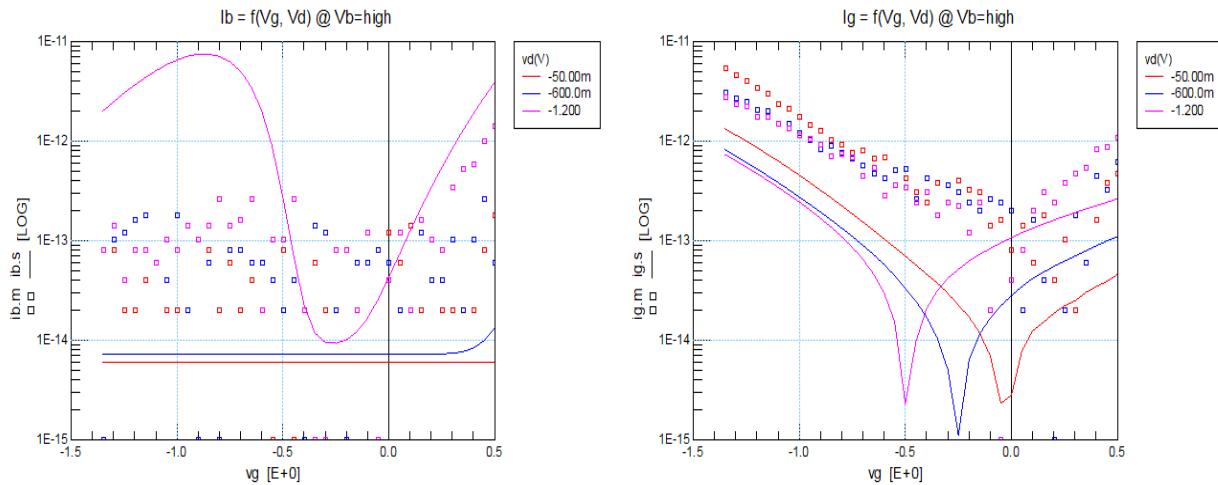
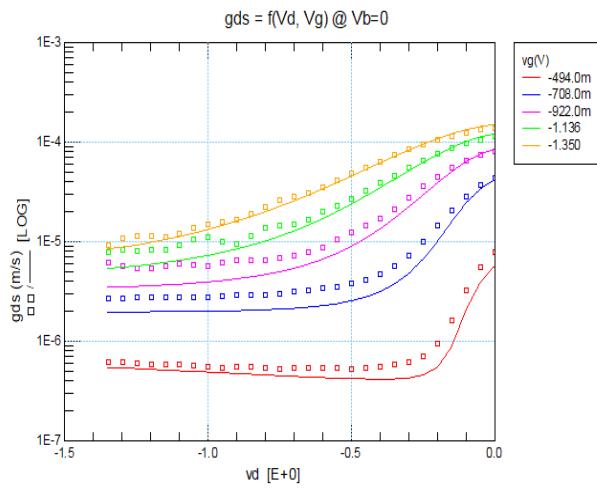
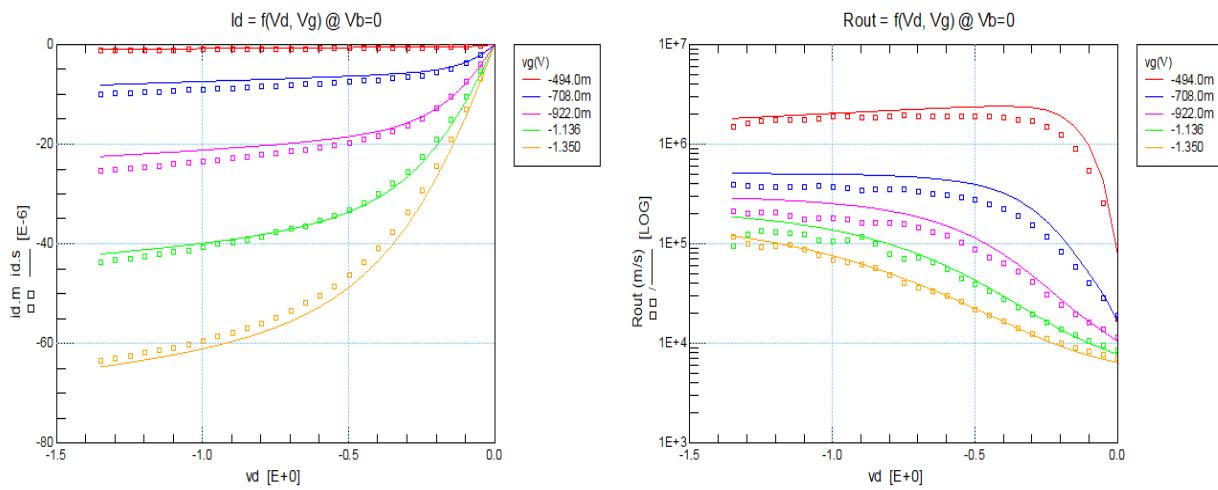
$i_d v_g, V_d = -1.2V, T = 27^\circ C$

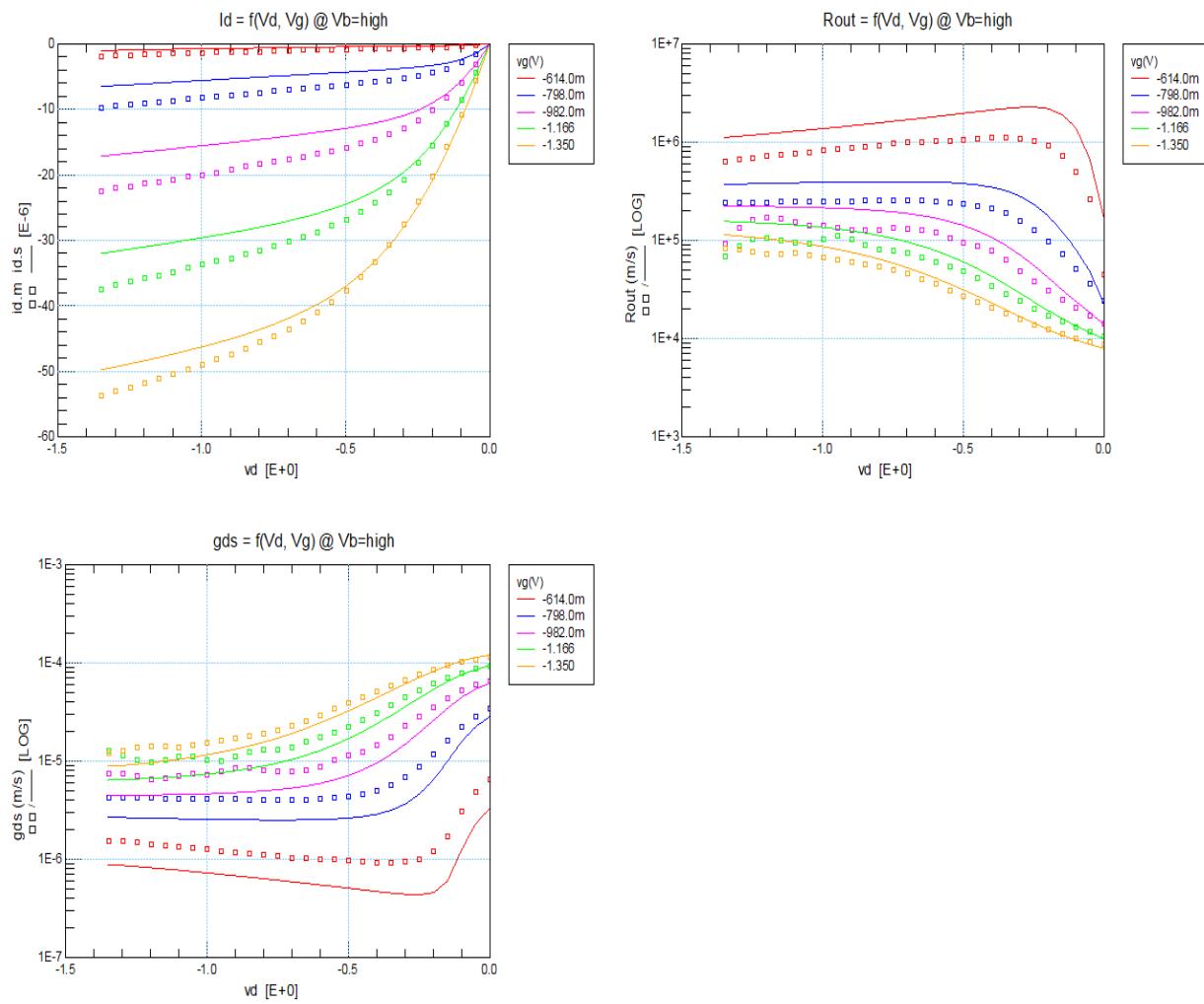
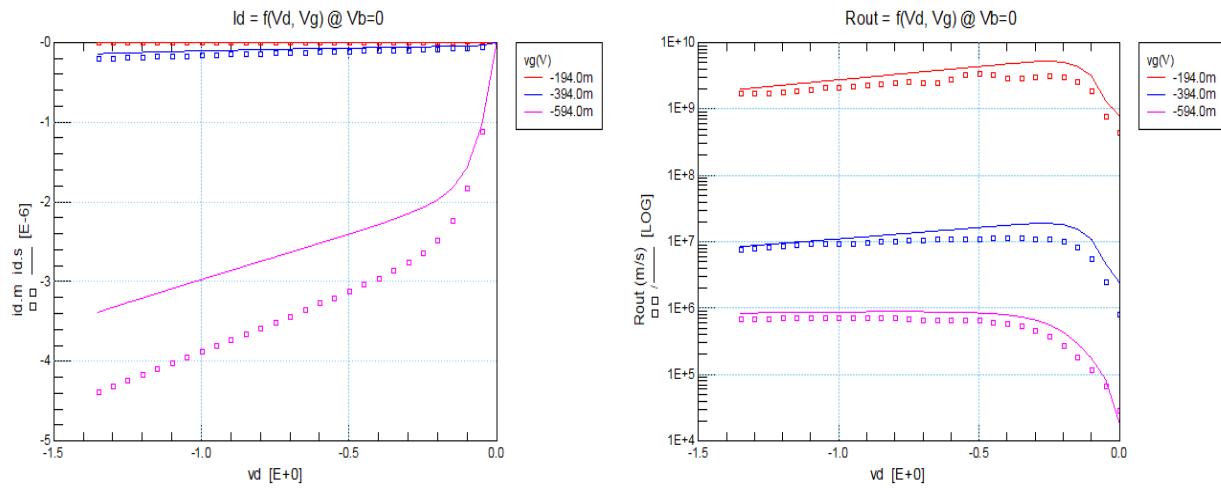


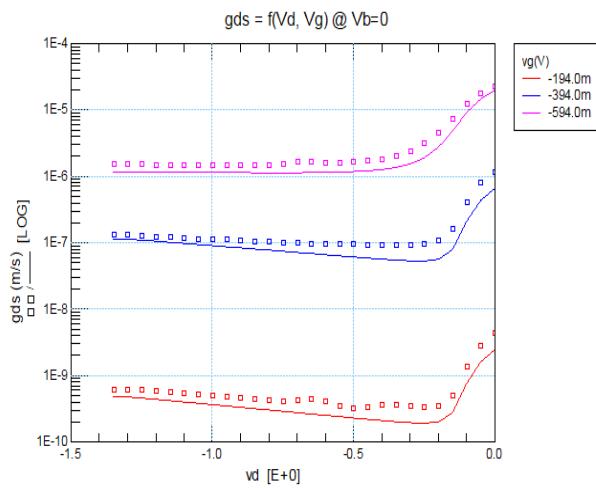


### $id_{vg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

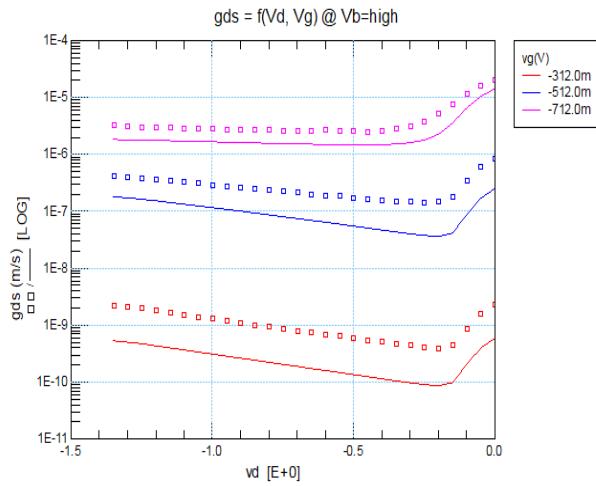
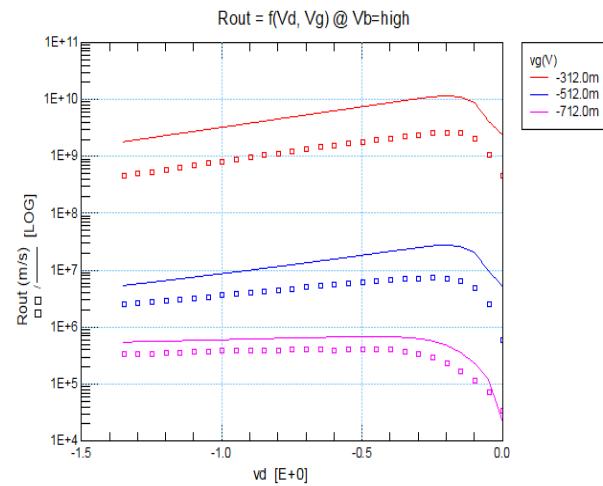
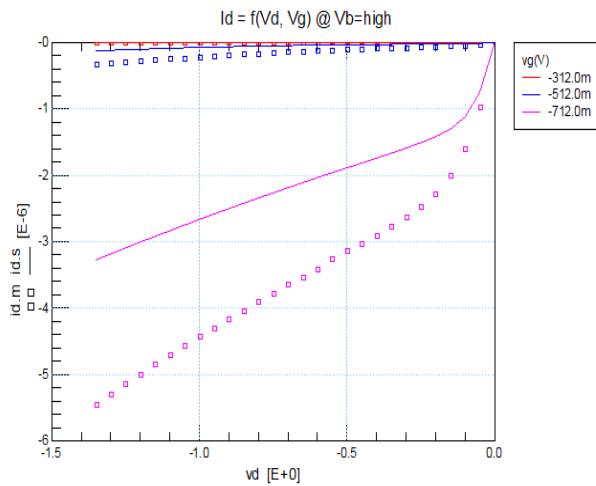


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


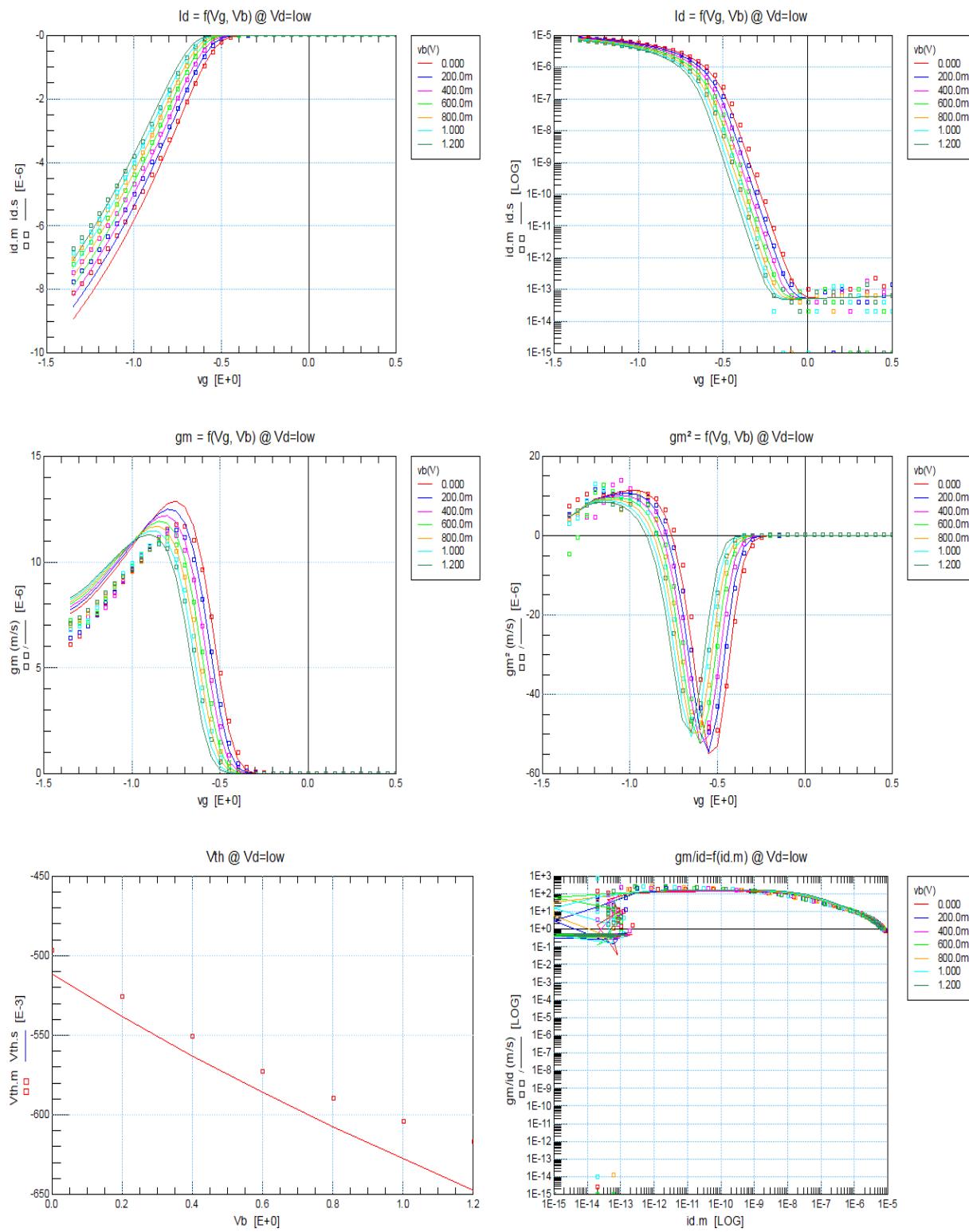
**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**


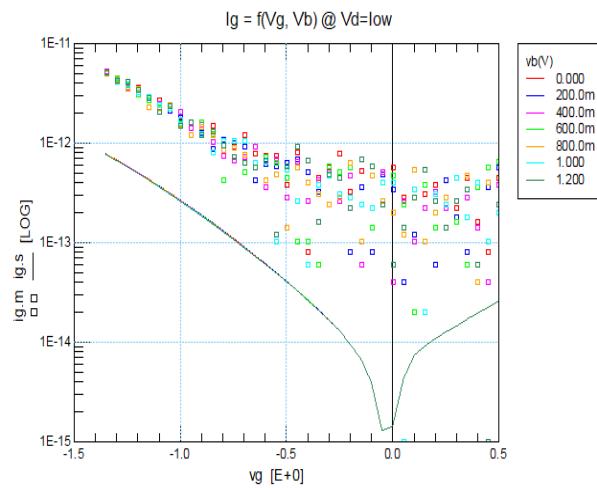
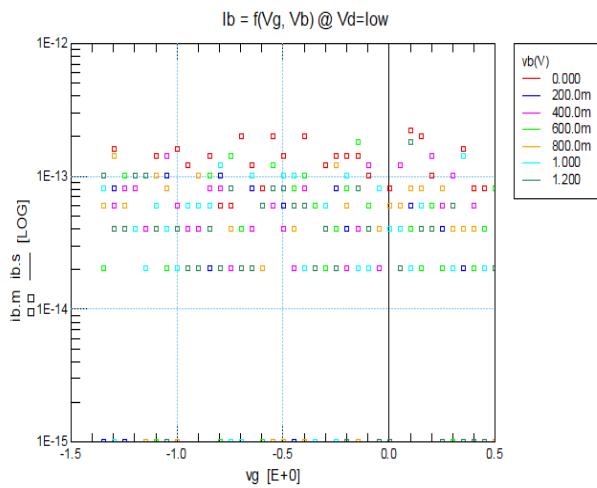


### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

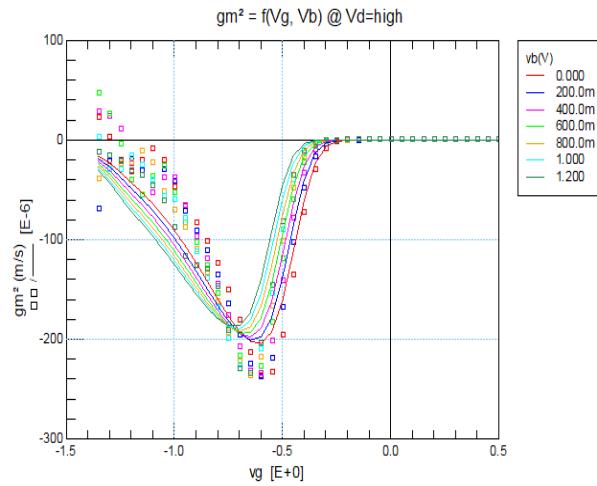
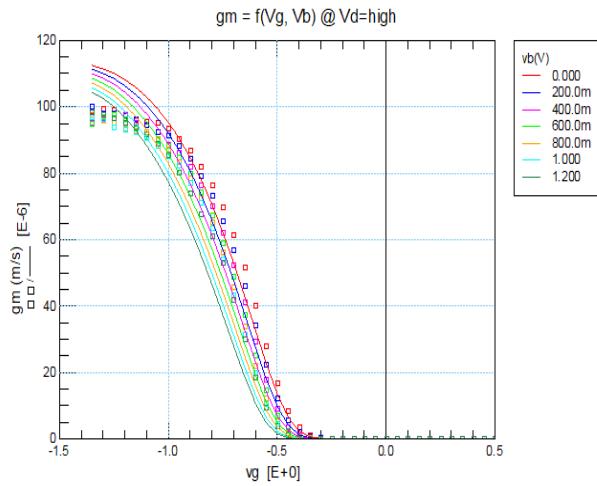
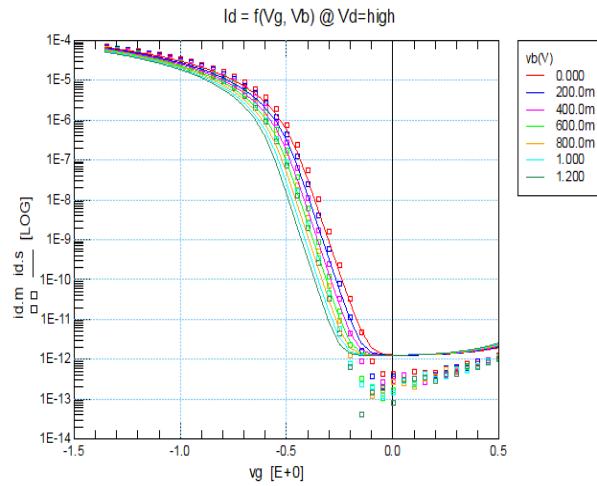
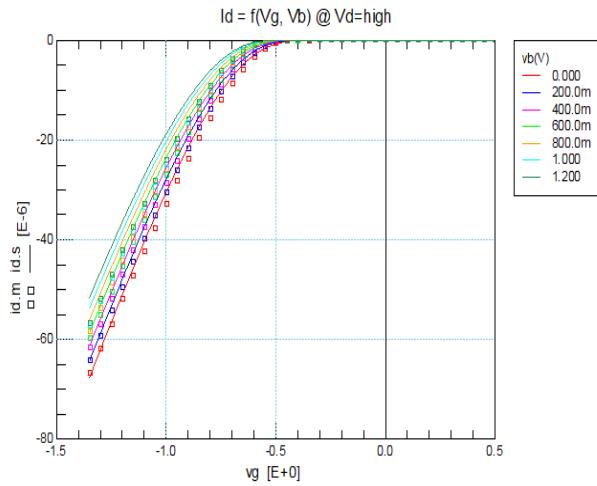


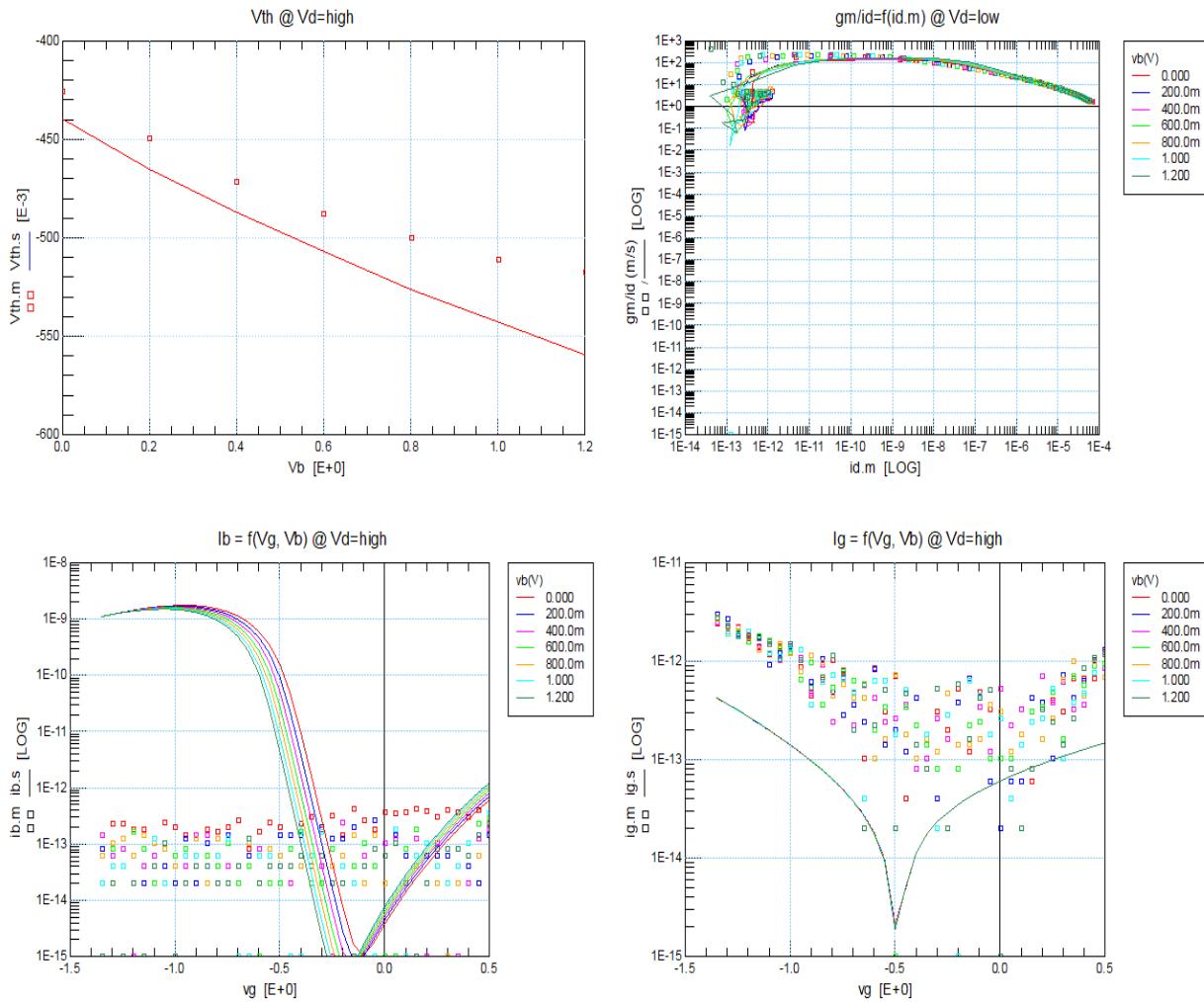
**idvg, Vd = -0.05V, T = -40°C**



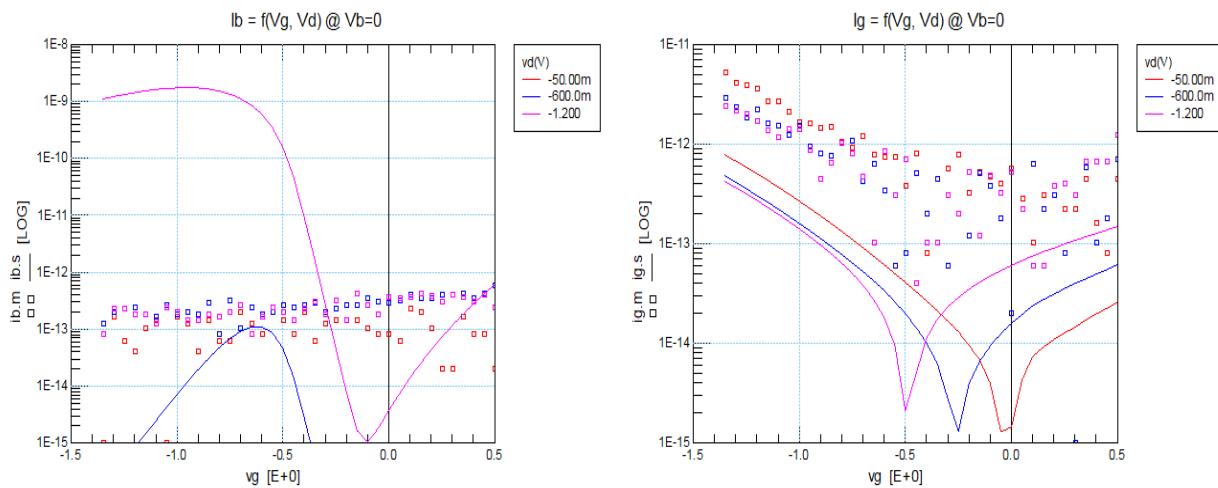


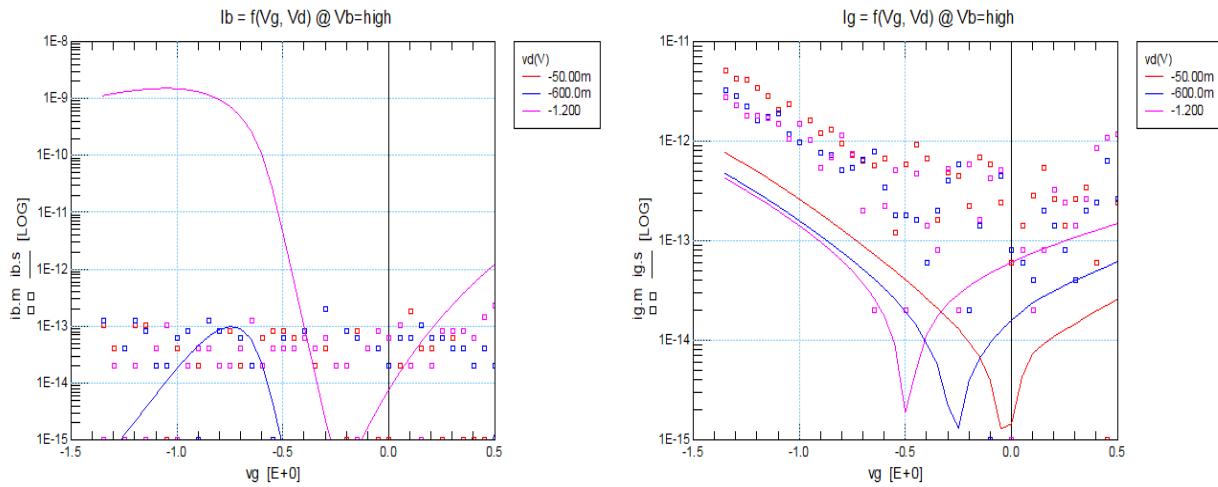
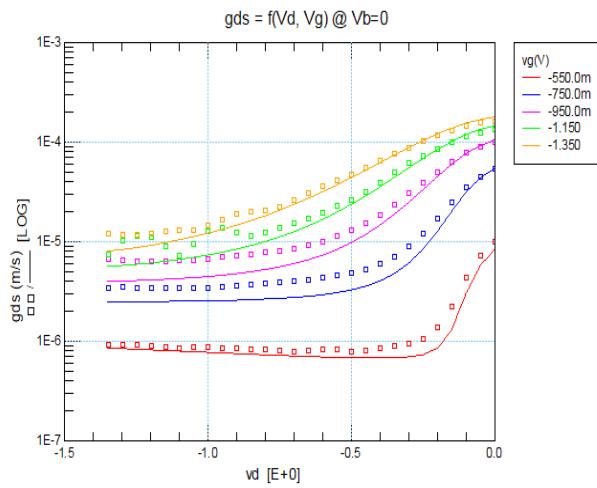
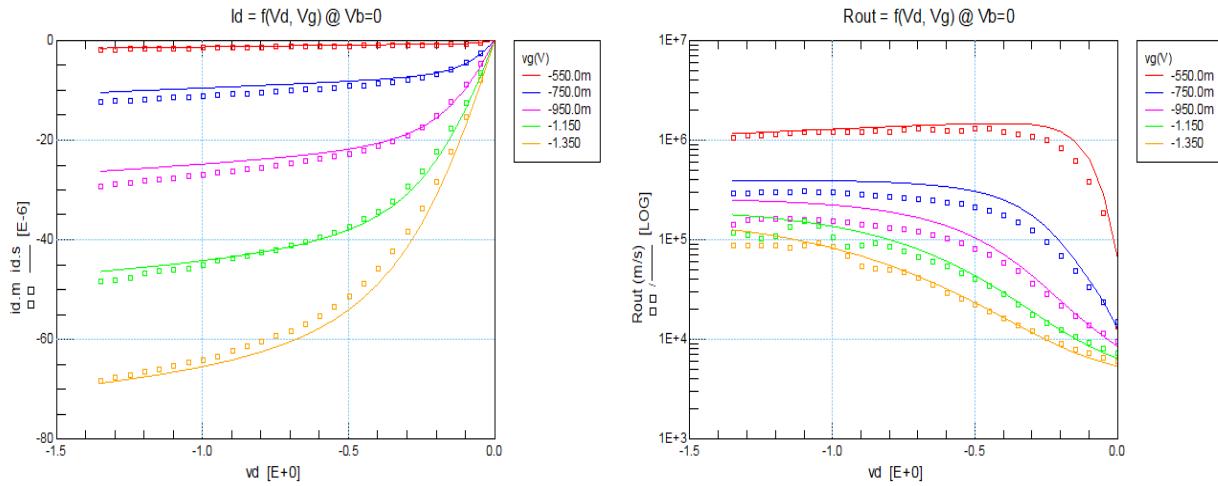
$i_d v_g, V_d = -1.2V, T = -40^\circ C$

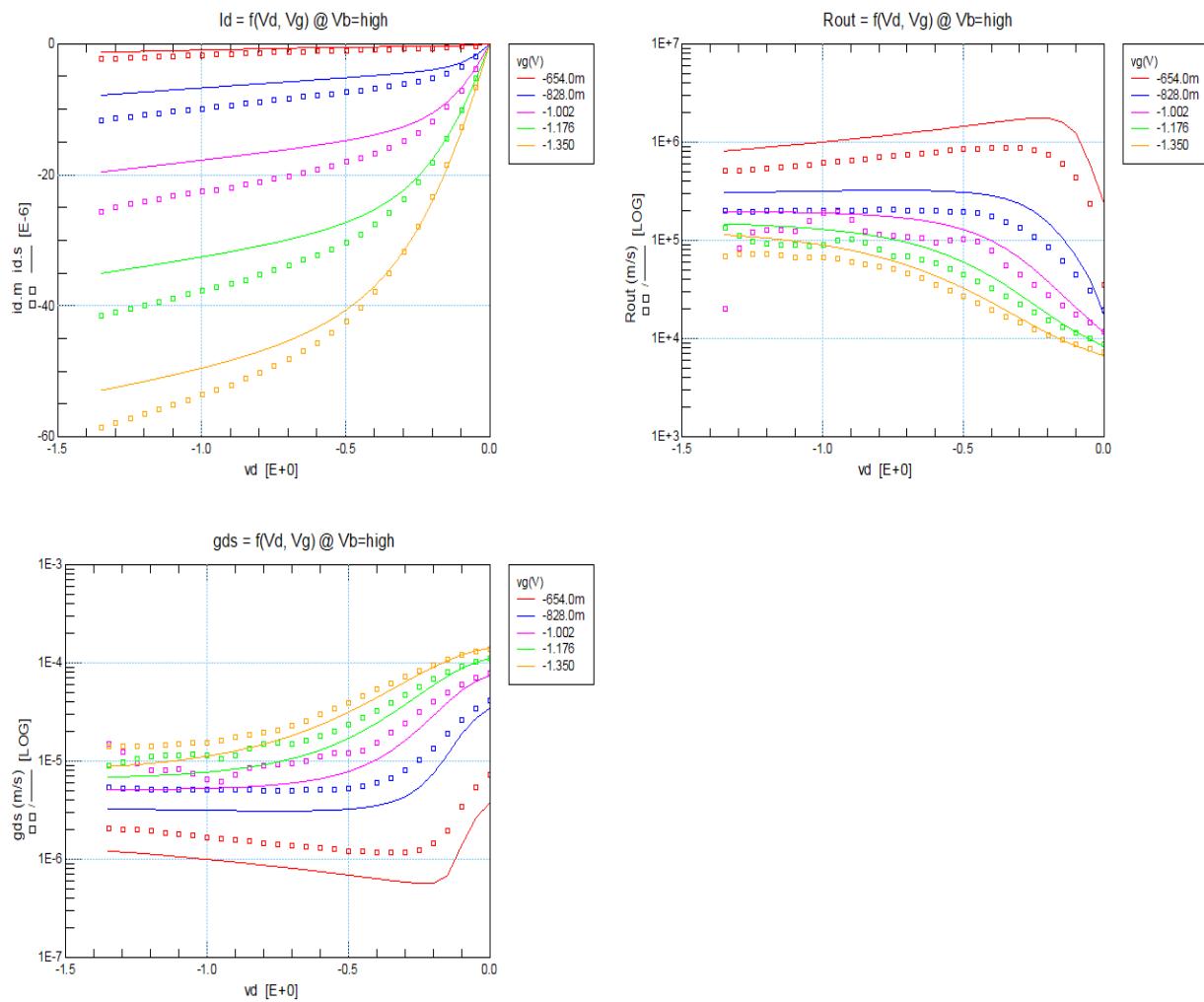
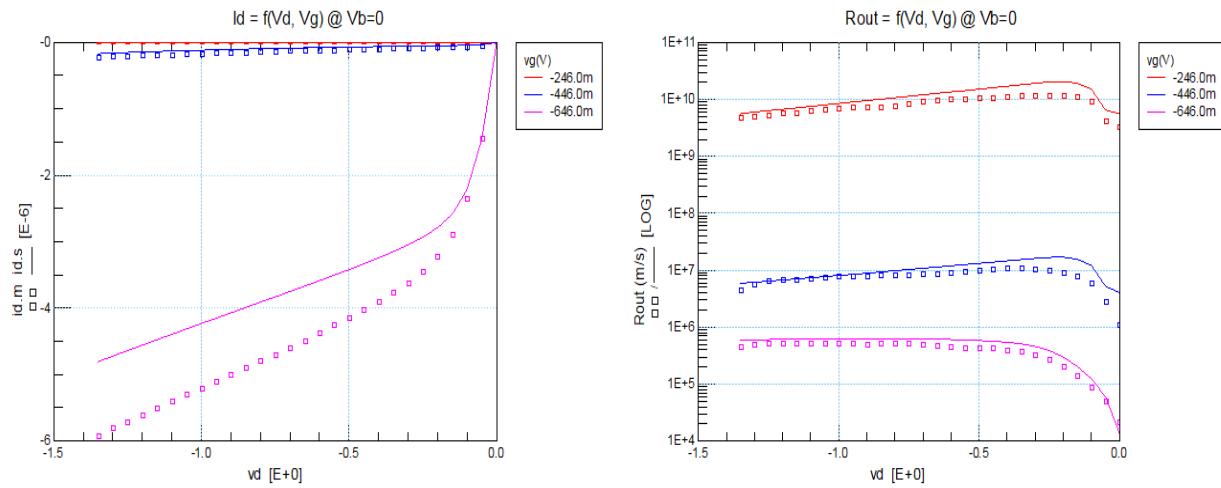


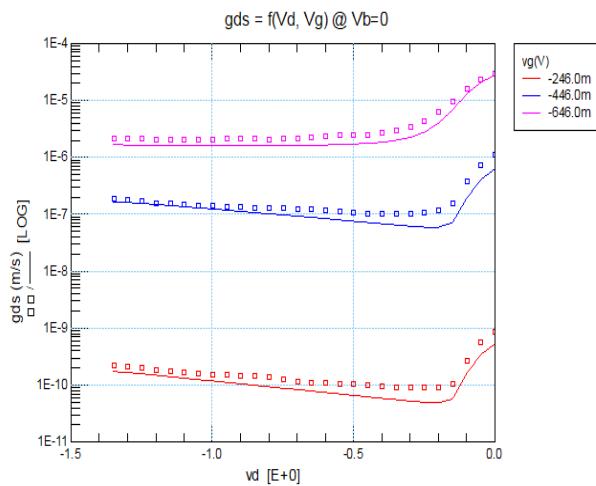


$i_d, v_g, I_b, I_g, V_b = 0V, T = -40^\circ C$

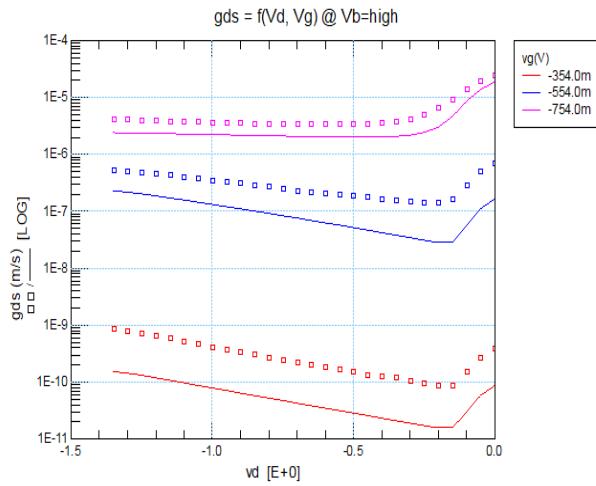
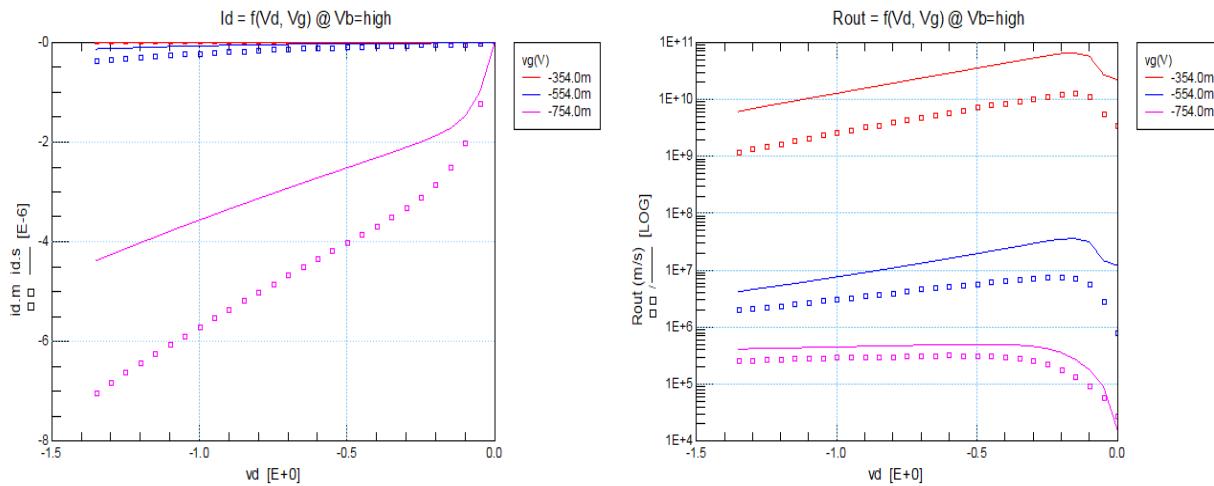


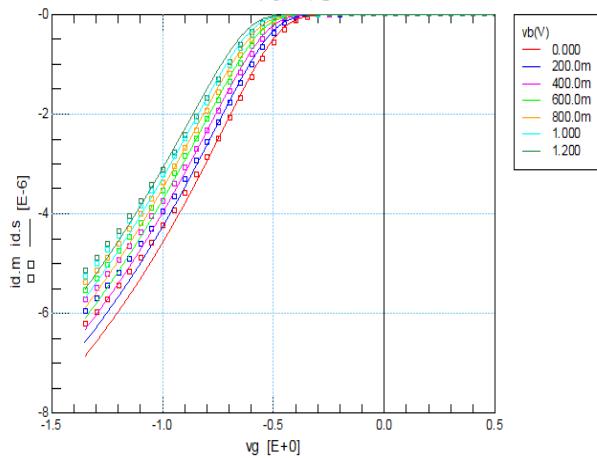
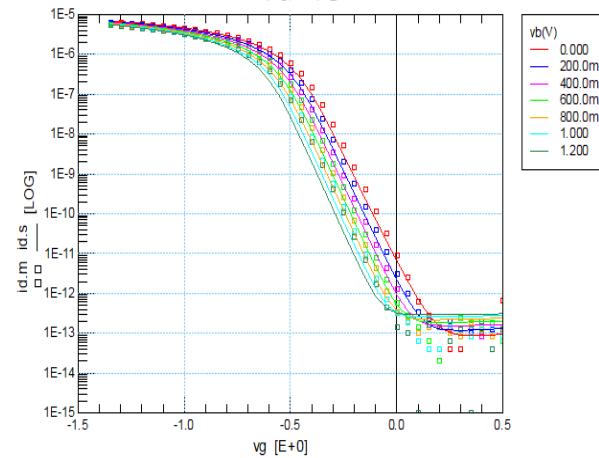
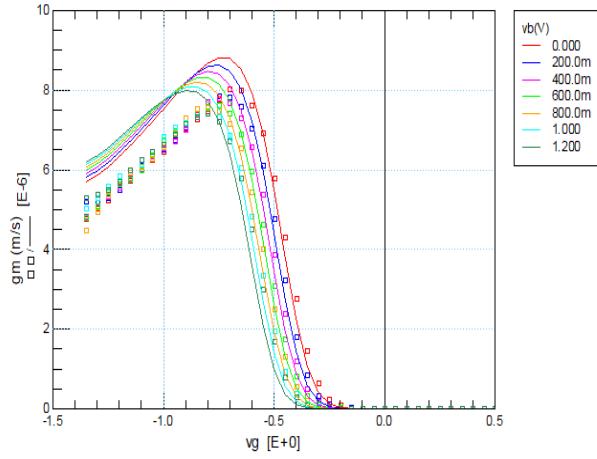
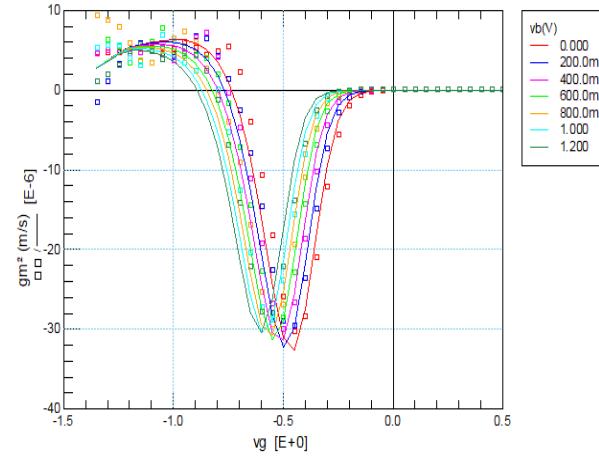
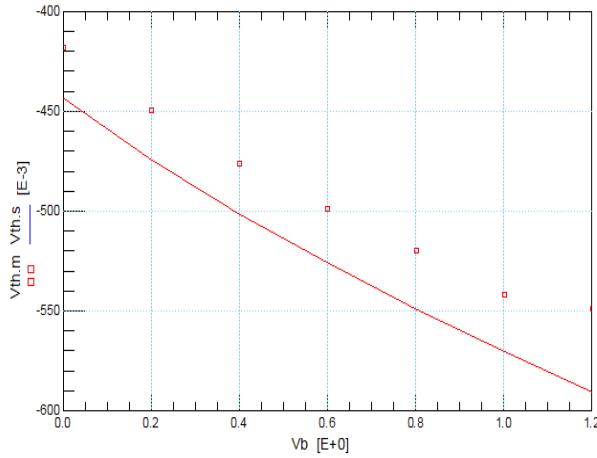
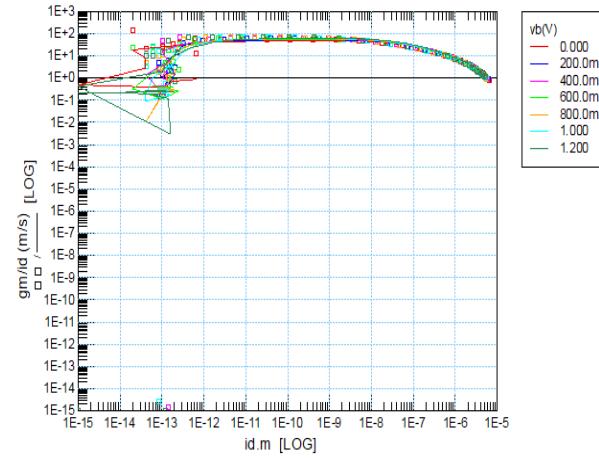
**idvg, Ib,Ig, Vb = 1.2V, T = -40°C**

**idvd, Vb = 0V, T = -40°C**


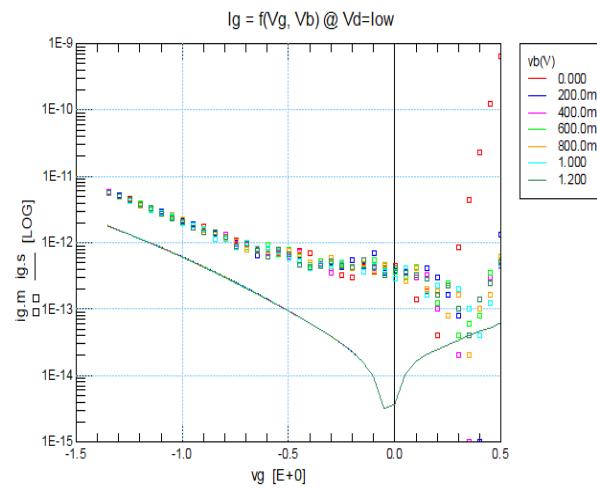
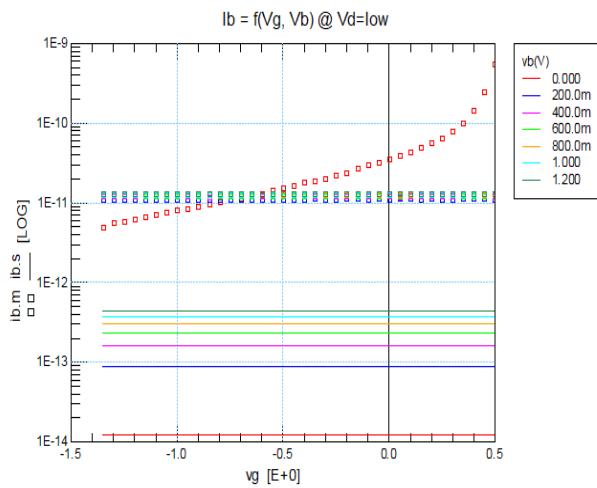
**idvd\_vbmin, Vb = 1.2V, T = -40°C****idvd\_vth, Vb = 0V, T = -40°C**



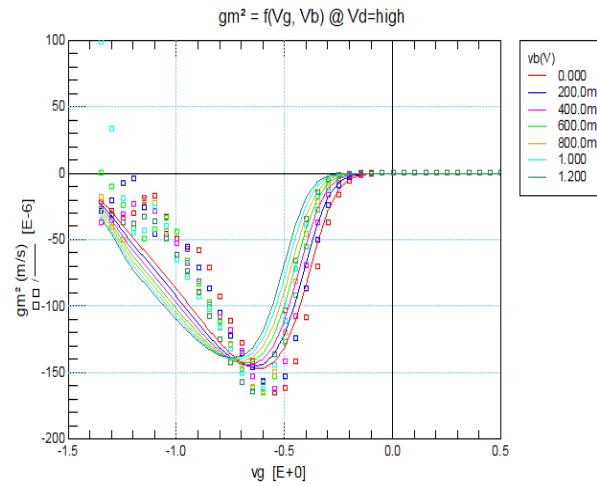
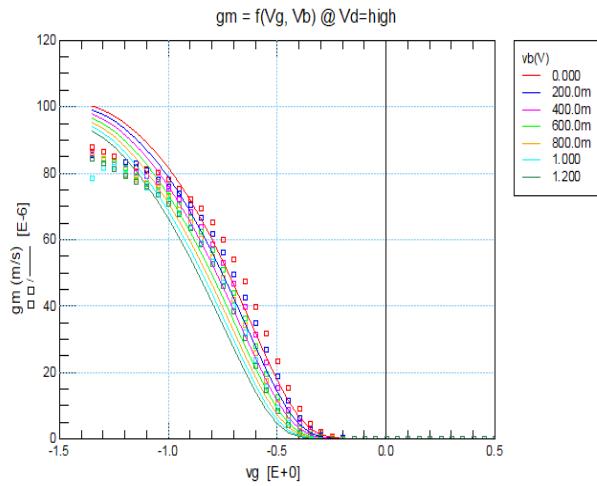
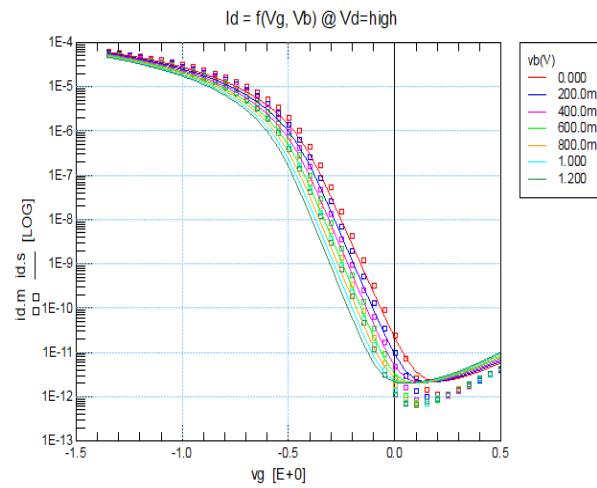
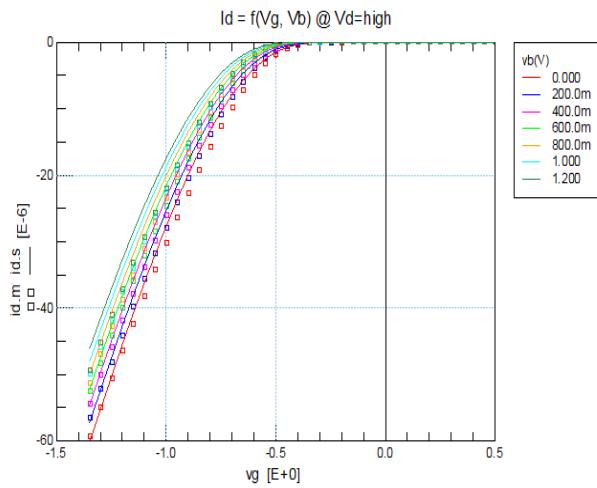
**idvd\_vth\_vbmin, Vb = 1.2V, T = -40°C**

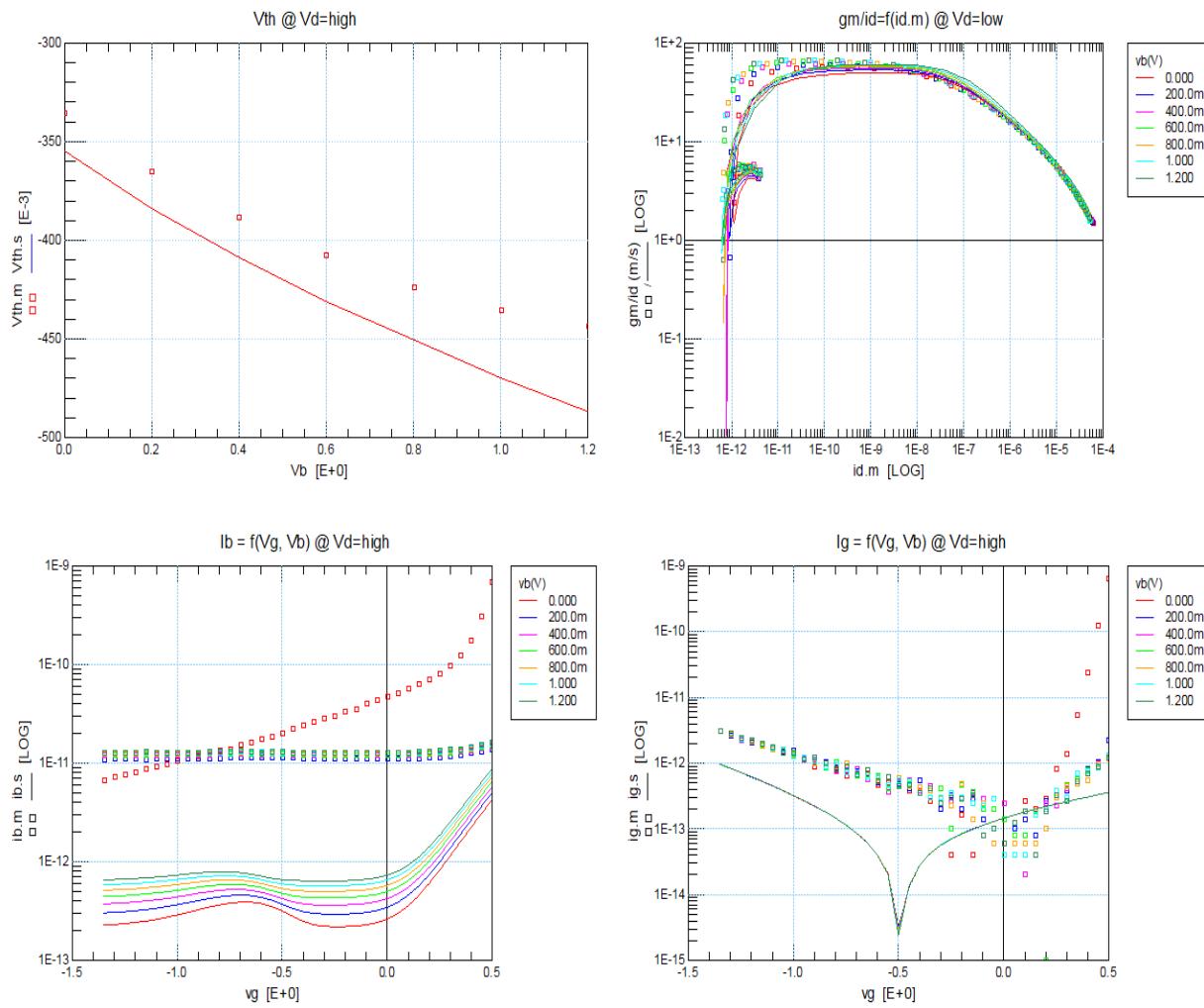


**idvg, Vd = -0.05V, T = 70°C**
 $Id = f(Vg, Vb) @ Vd=\text{low}$ 

 $Id = f(Vg, Vb) @ Vd=\text{low}$ 

 $gm = f(Vg, Vb) @ Vd=\text{low}$ 

 $gm^2 = f(Vg, Vb) @ Vd=\text{low}$ 

 $Vth @ Vd=\text{low}$ 

 $gm/id = f(id.m) @ Vd=\text{low}$ 


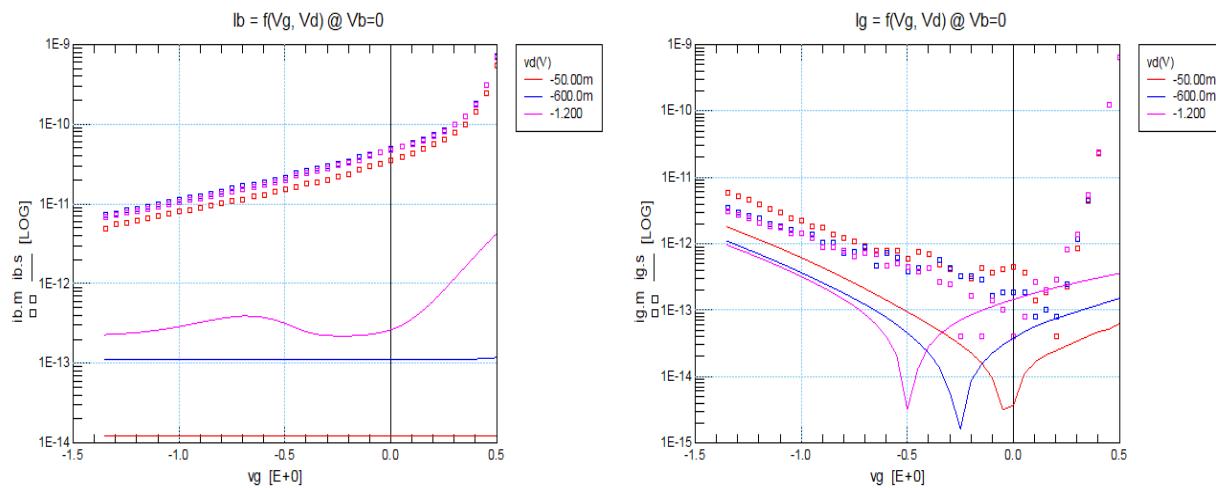


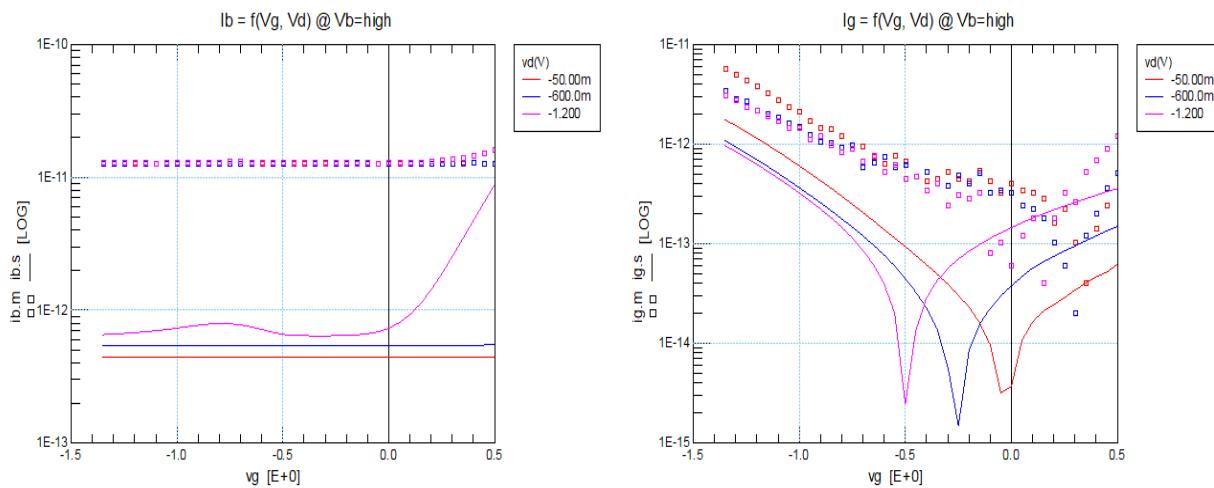
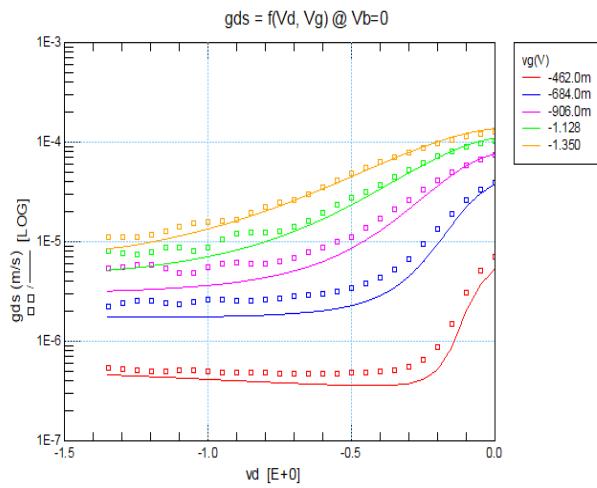
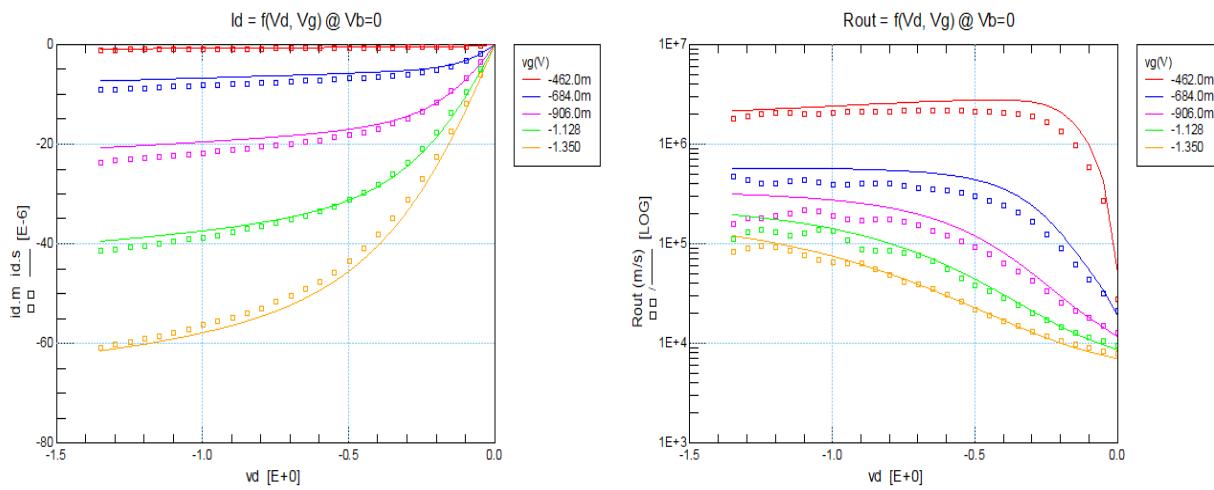
$i_{dvg}, V_d = -1.2V, T = 70^\circ C$

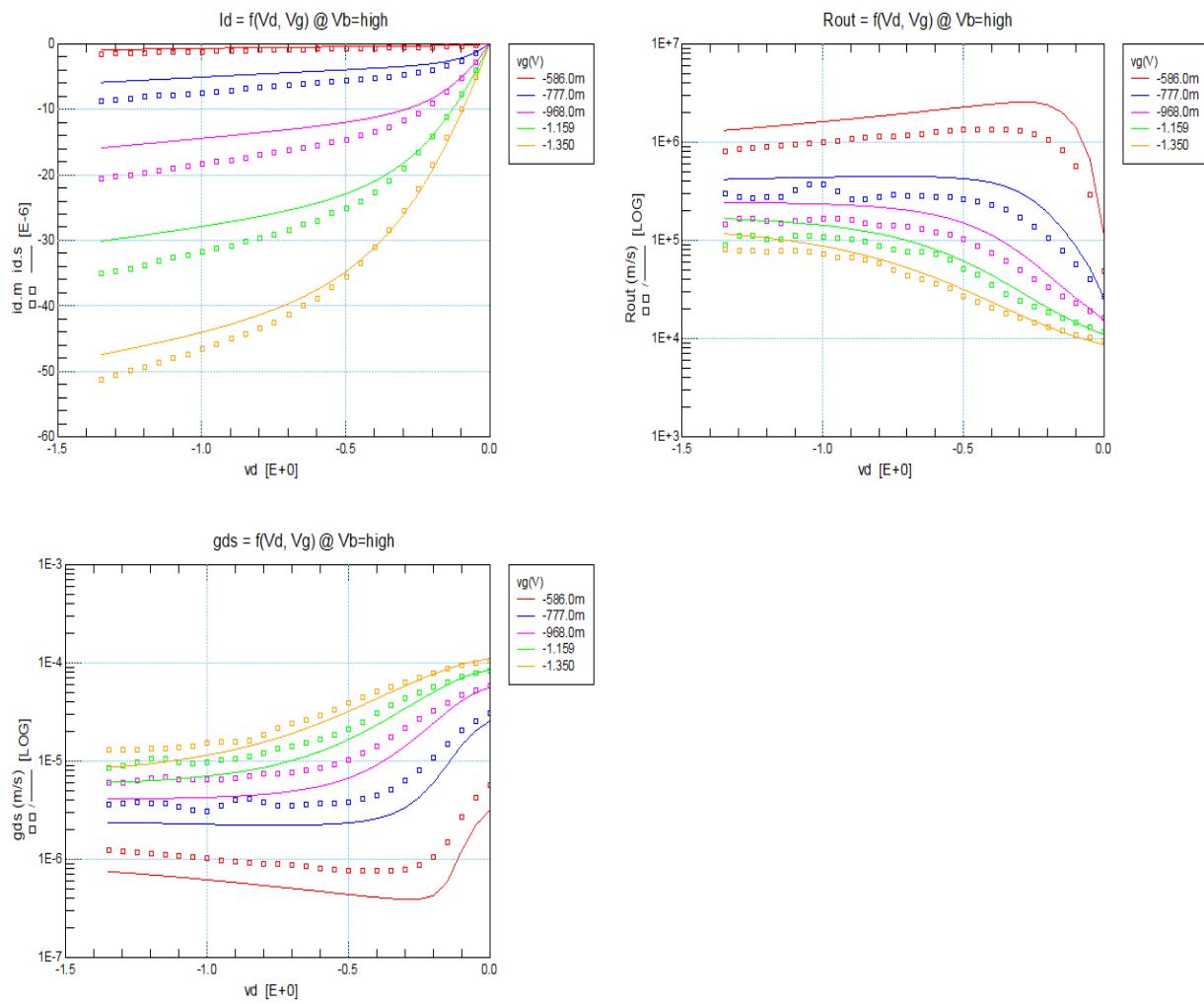
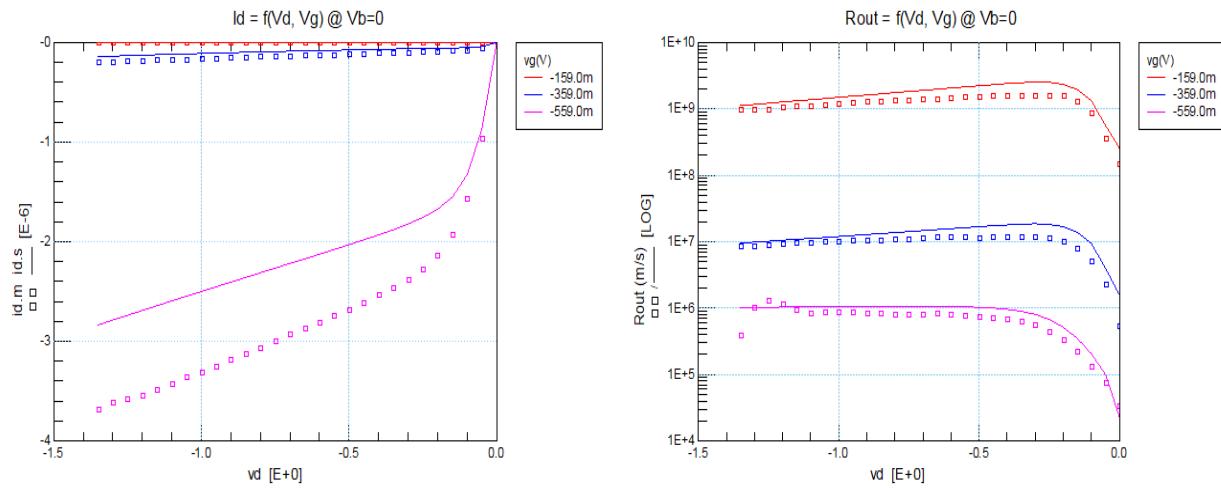


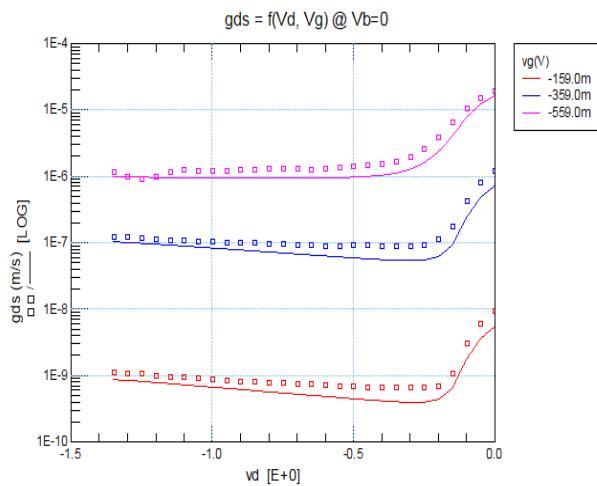


### idvg, Ib,Ig, Vb = 0V, T = 70°C

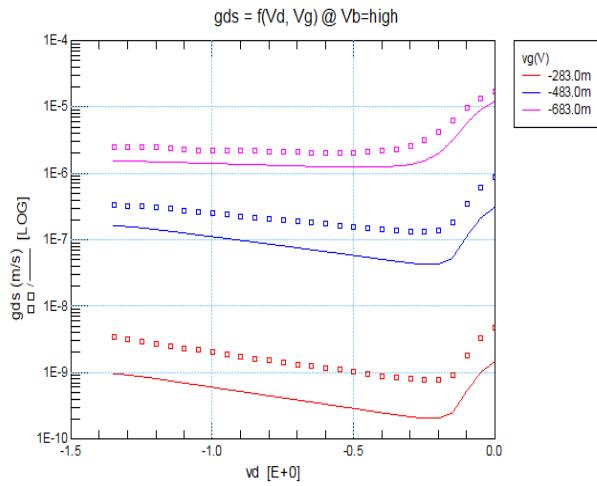
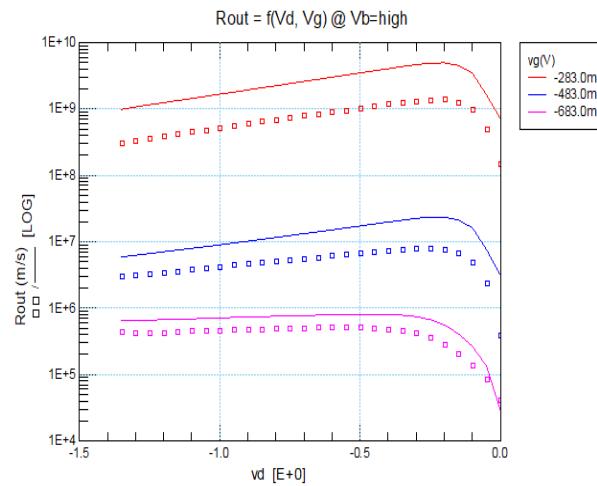
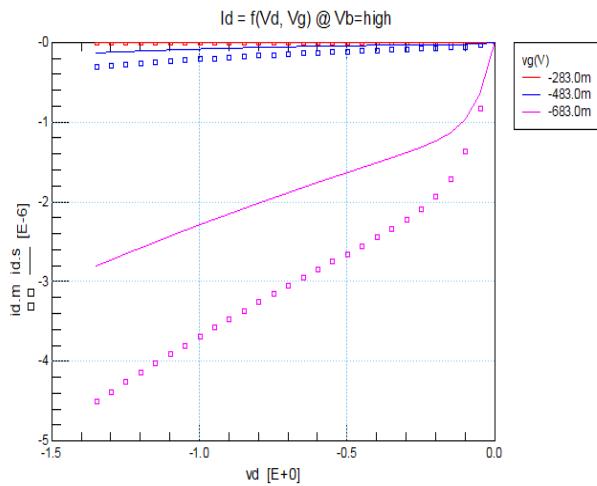


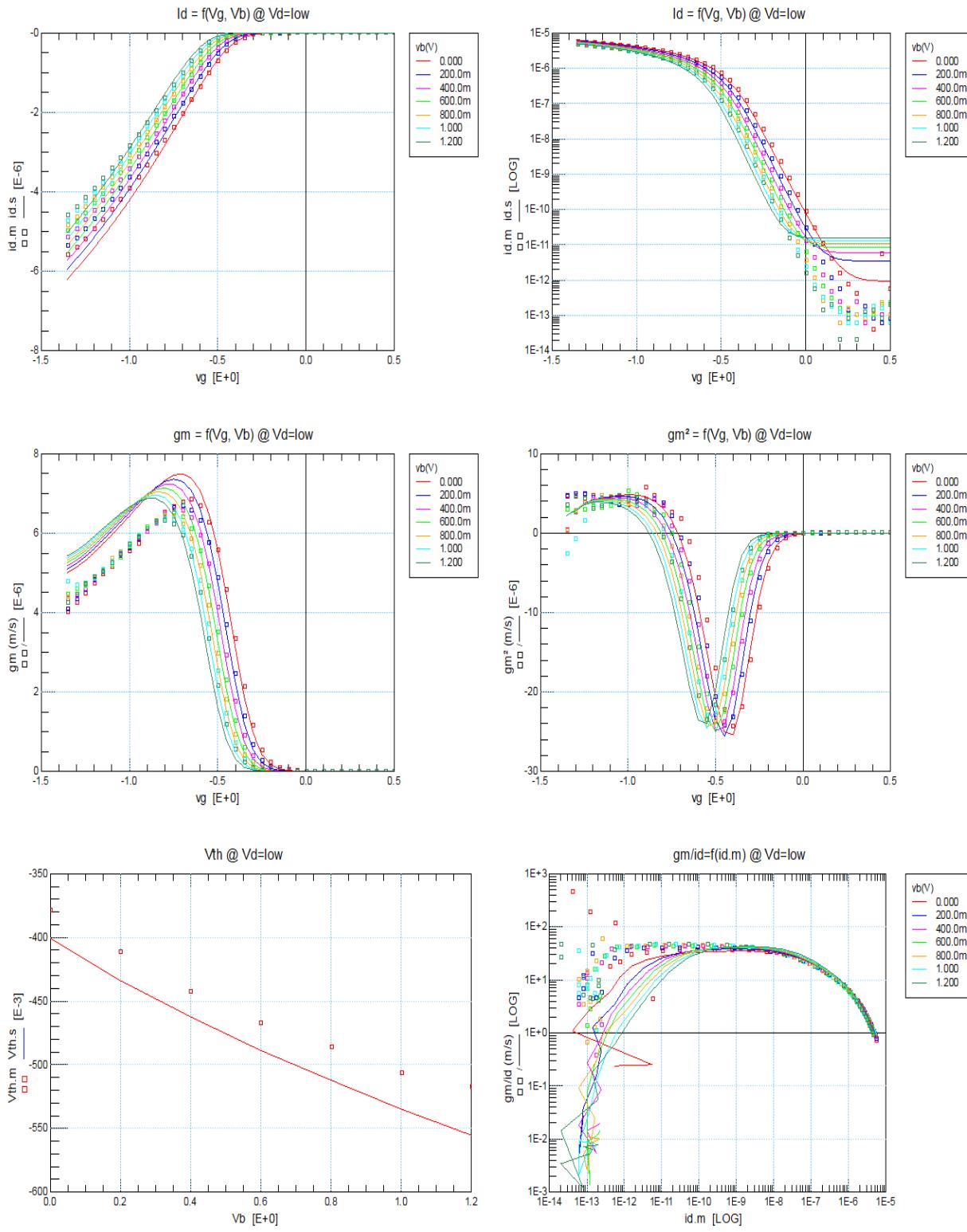
**idvg, Ib,Ig, Vb = 1.2V, T = 70°C**

**idvd, Vb = 0V, T = 70°C**


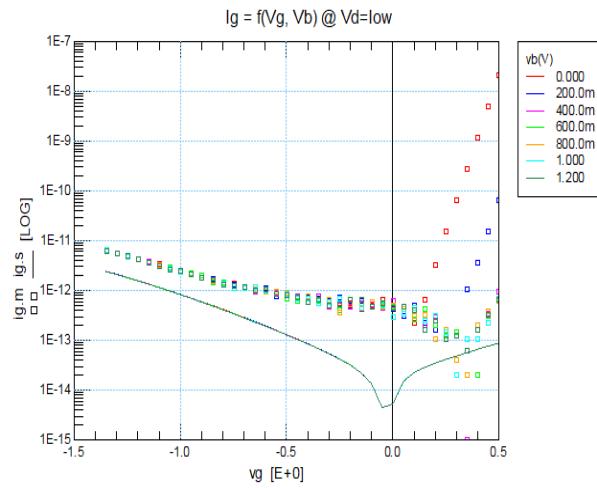
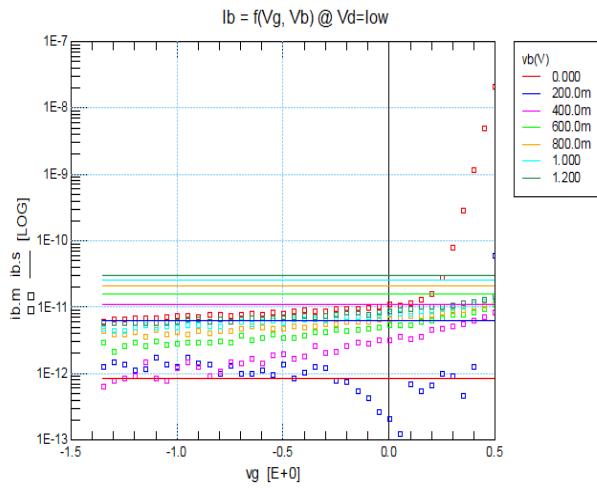
**idvd\_vbmin, Vb = 1.2V, T = 70°C****idvd\_vth, Vb = 0V, T = 70°C**



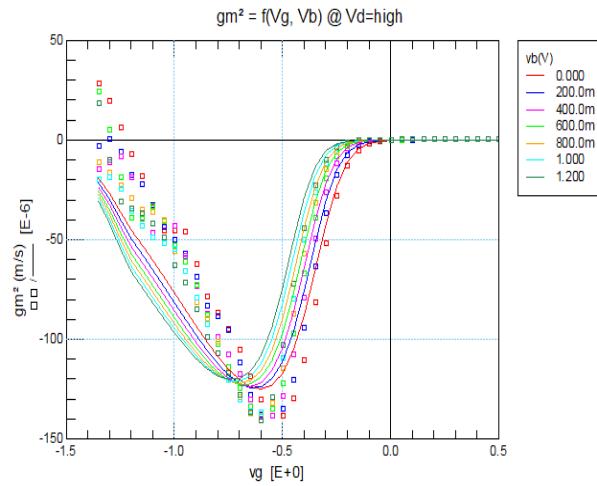
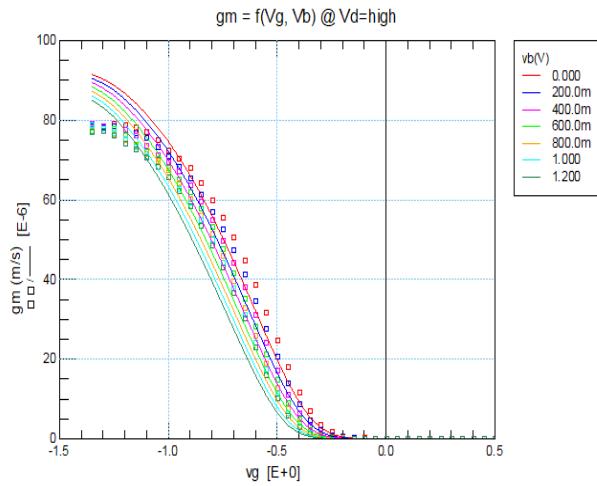
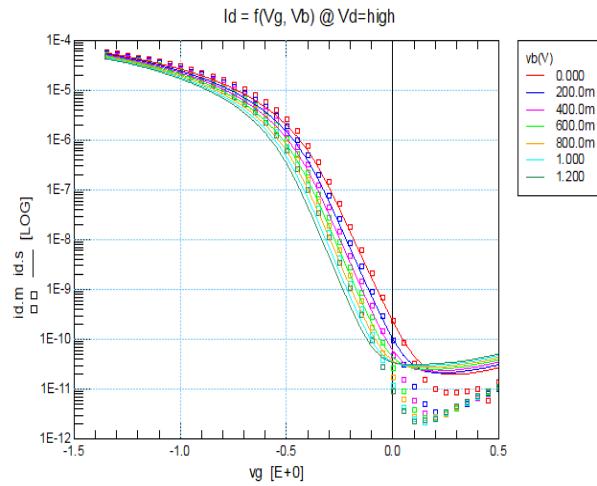
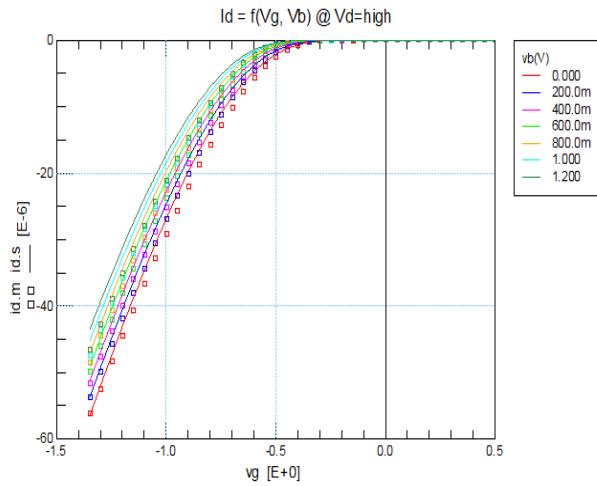
### idvd\_vth\_vbmin, Vb = 1.2V, T = 70°C

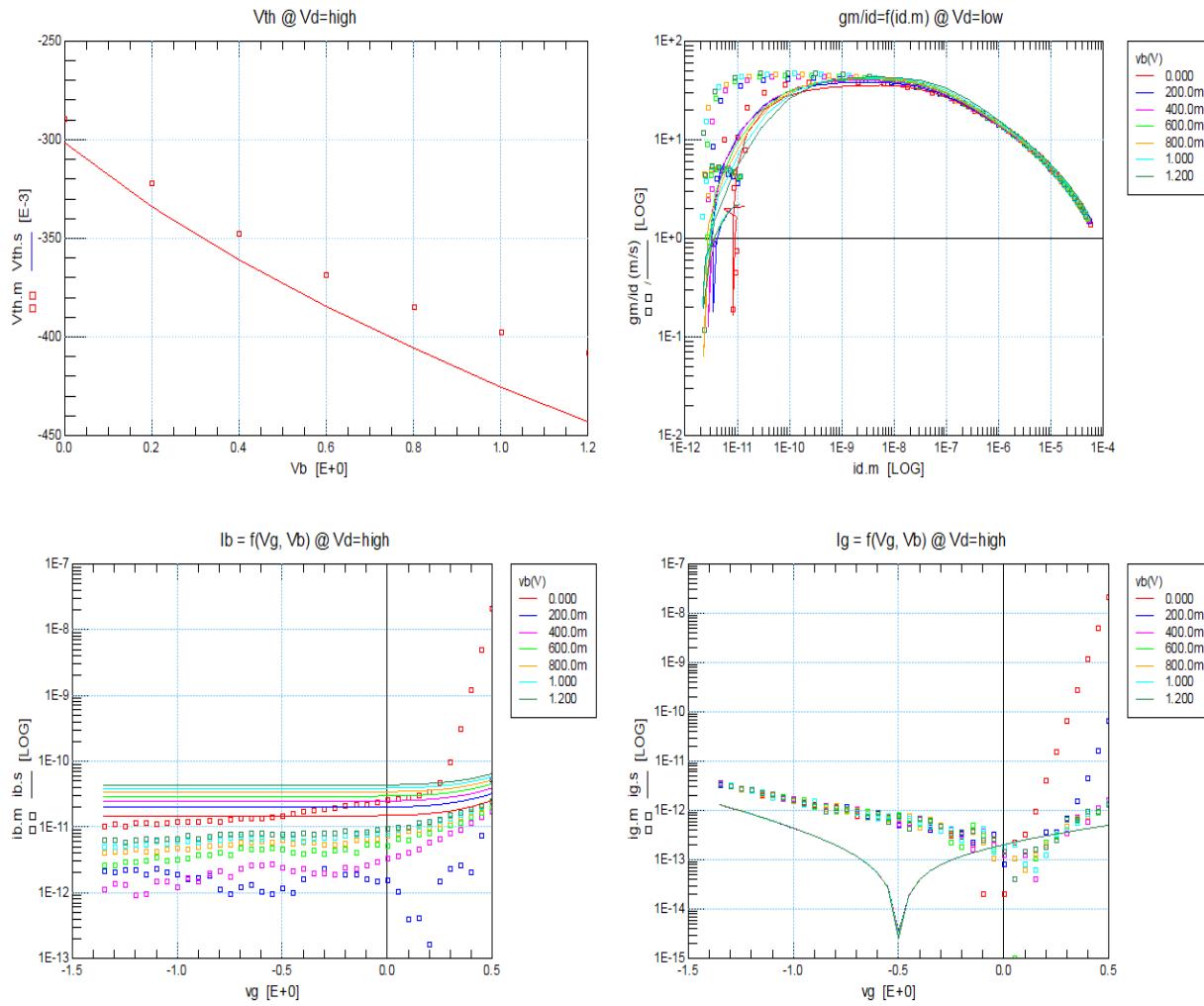


**idvg, Vd = -0.05V, T = 125°C**


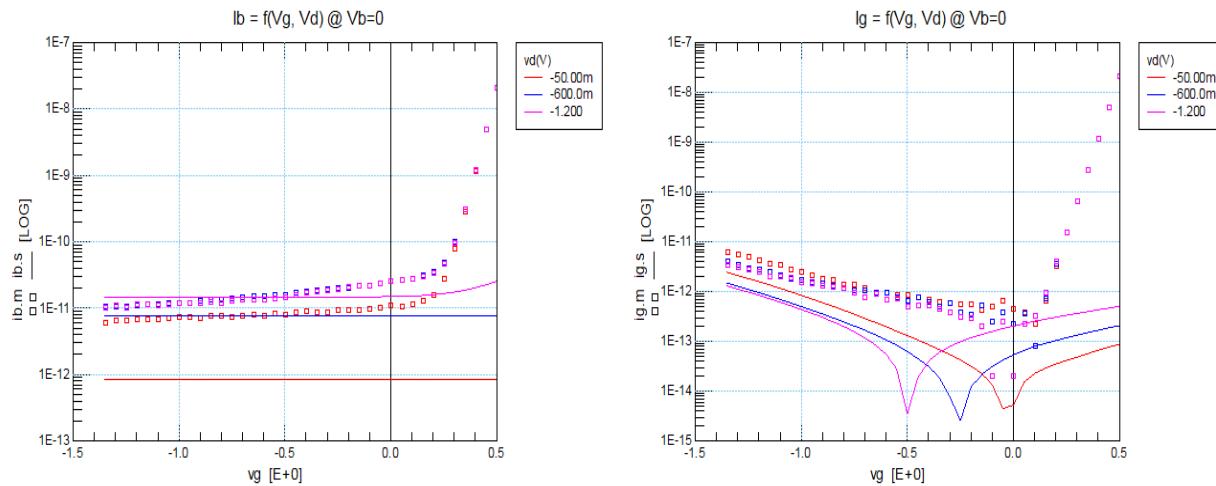


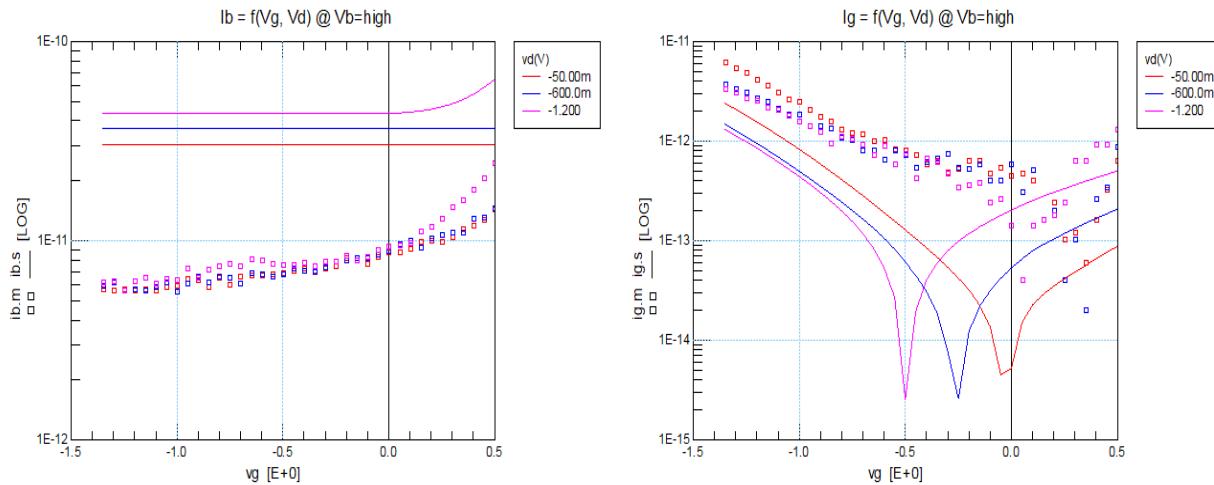
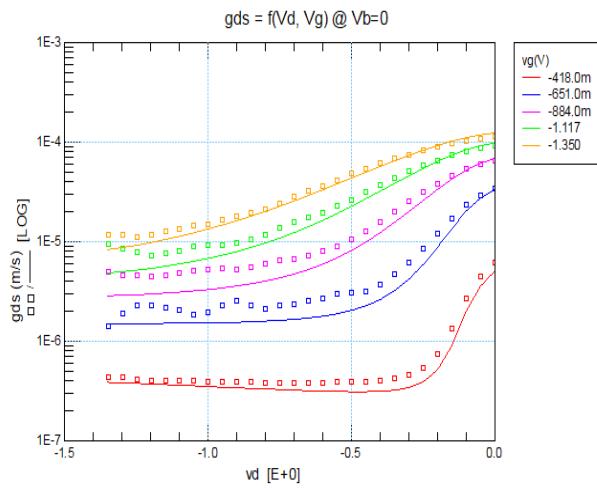
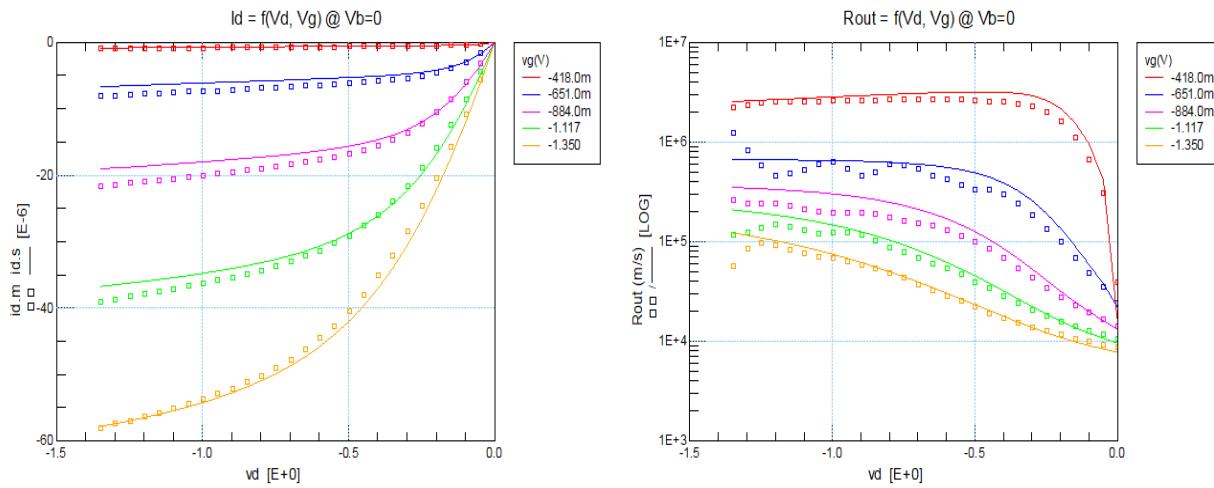
$i_{dvg}, V_d = -1.2V, T = 125^\circ\text{C}$

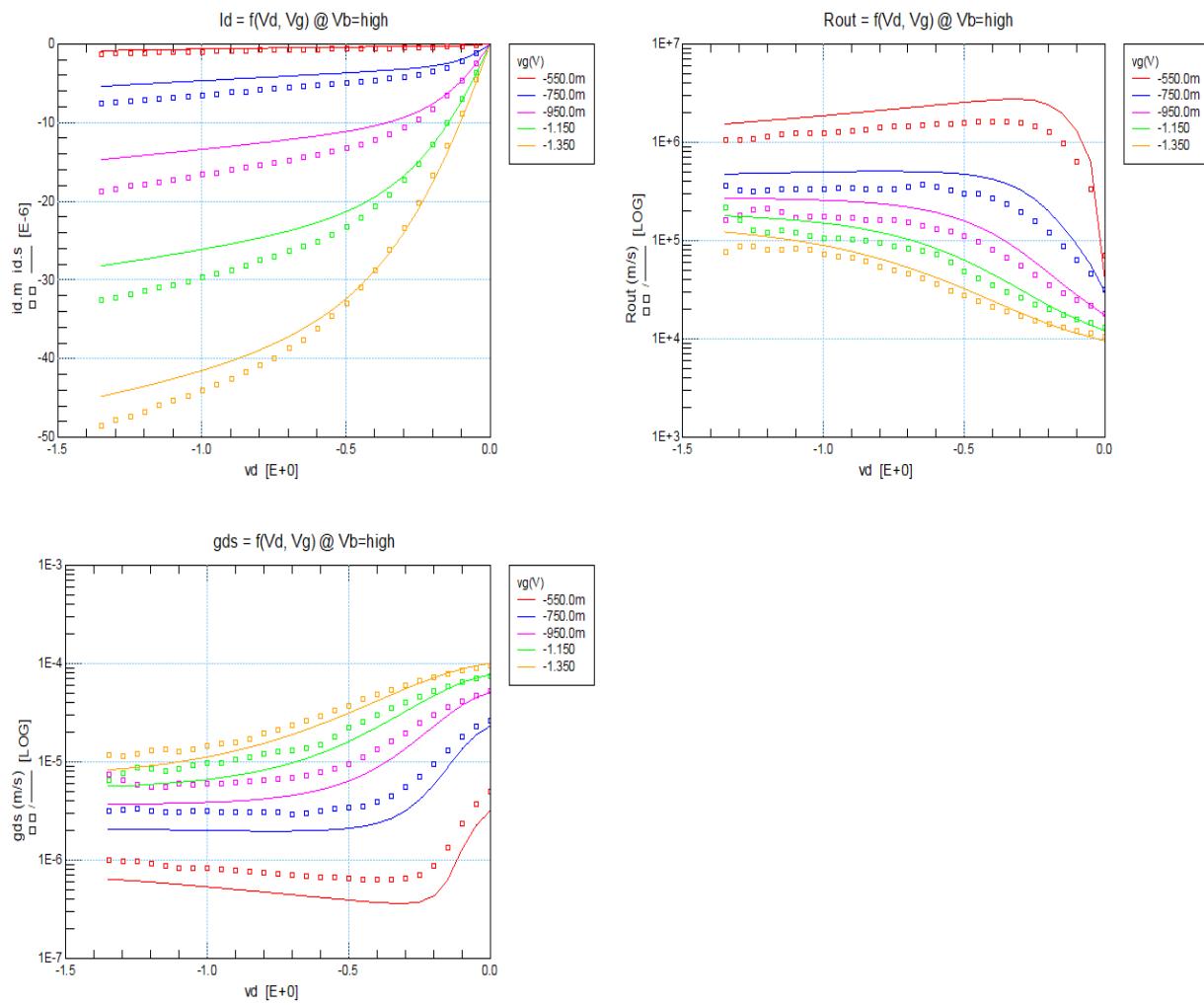
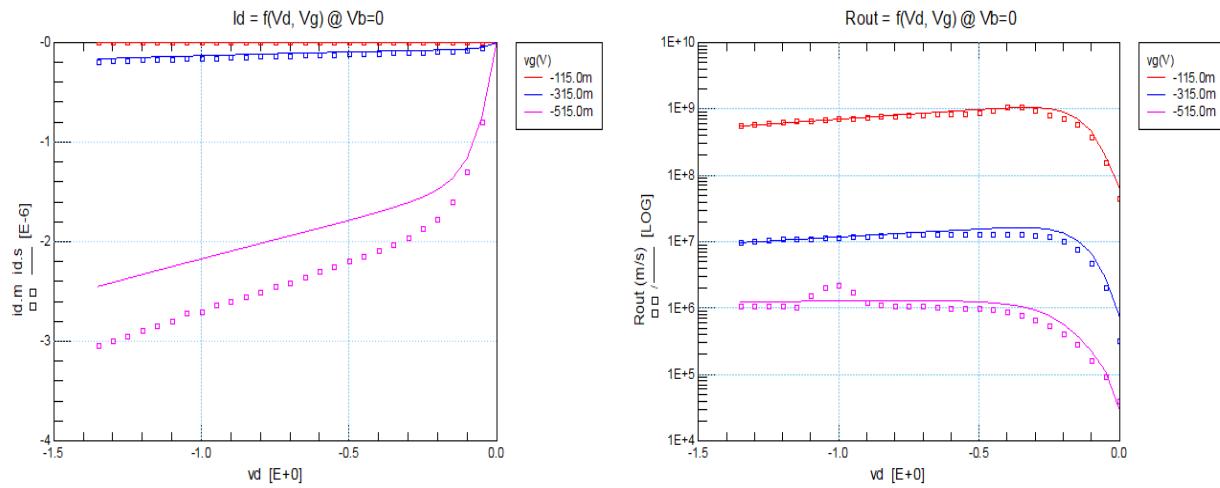


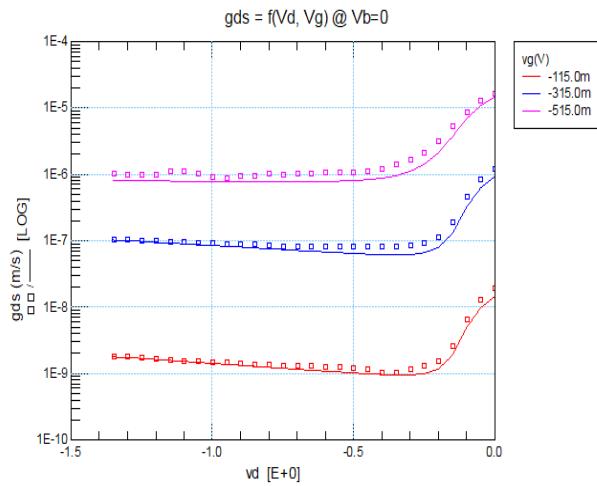


### $id_{vg}, I_b, I_g, V_b = 0V, T = 125^\circ C$

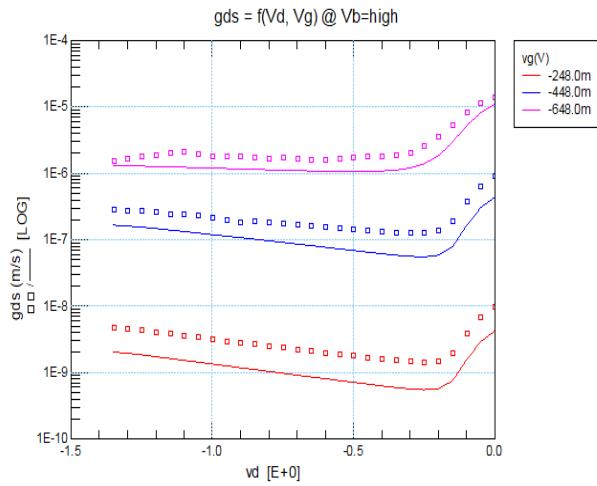
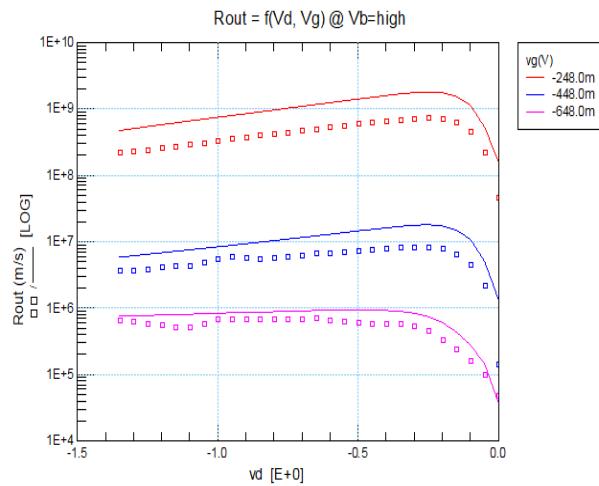
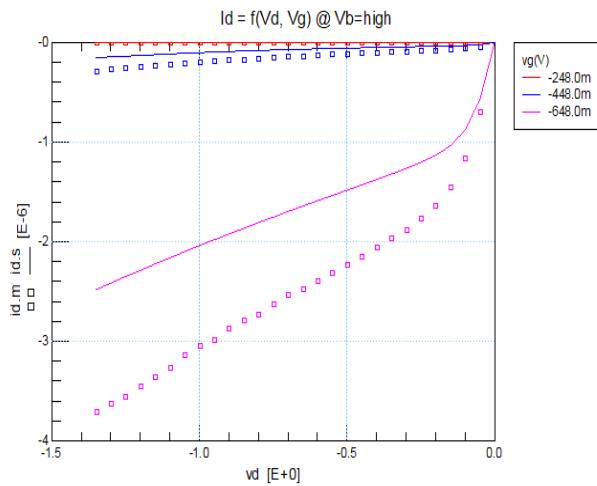


**idvg, Ib,Ig, Vb = 1.2V, T = 125°C**

**idvd, Vb = 0V, T = 125°C**


**idvd\_vbmin, Vb = 1.2V, T = 125°C****idvd\_vth, Vb = 0V, T = 125°C**

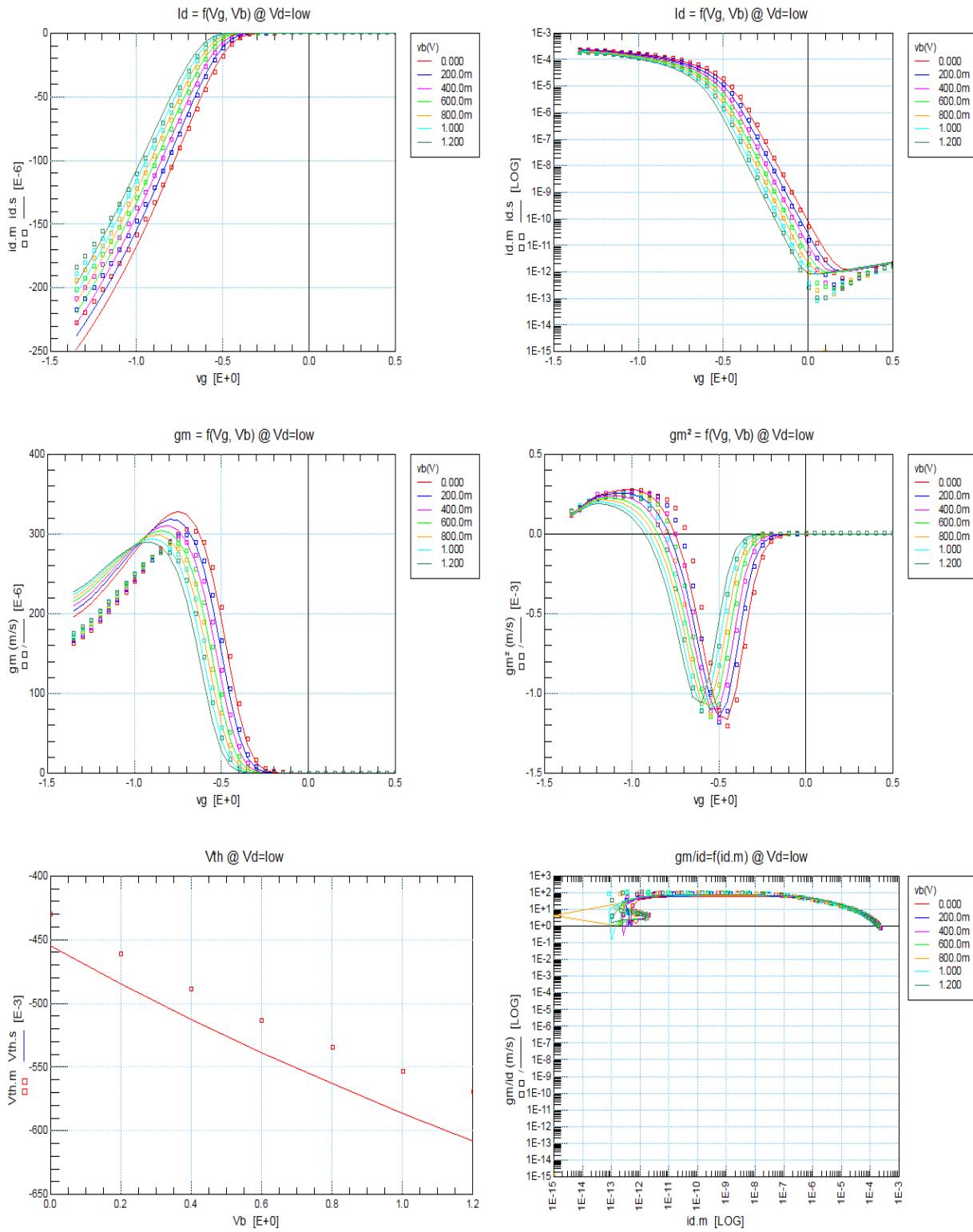


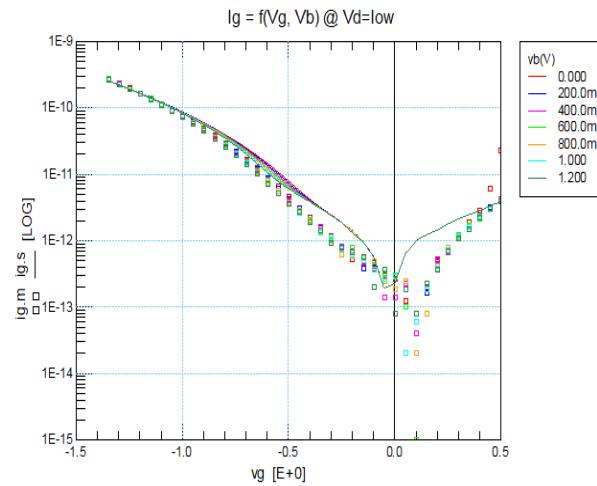
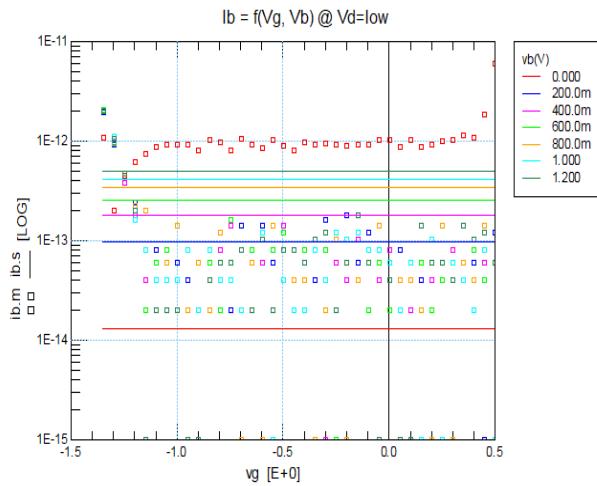
### idvd\_vth\_vbmin, Vb = 1.2V, T = 125°C



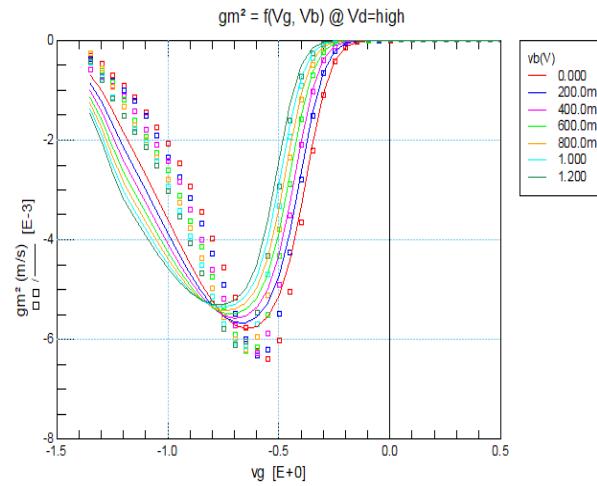
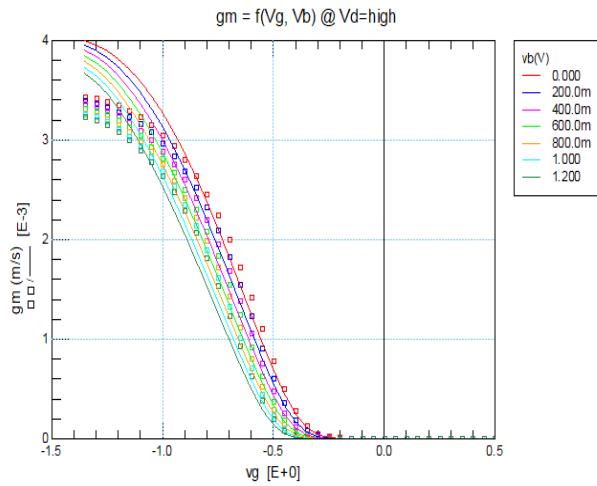
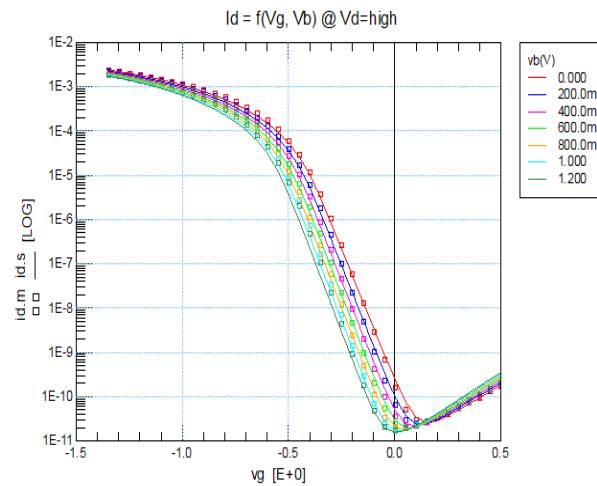
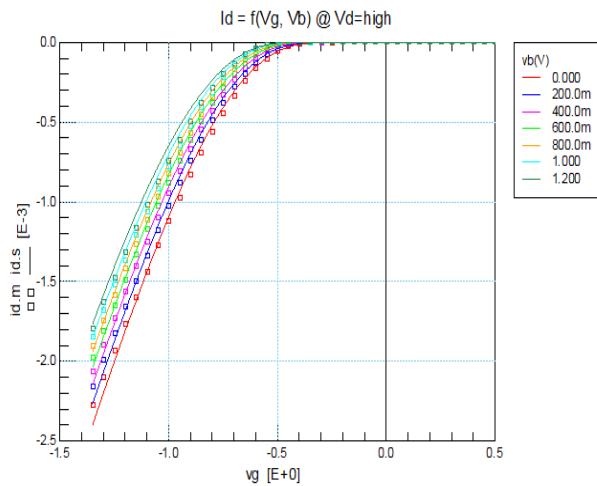
## 4.6 W10u0\_L0u14\_S548\_3

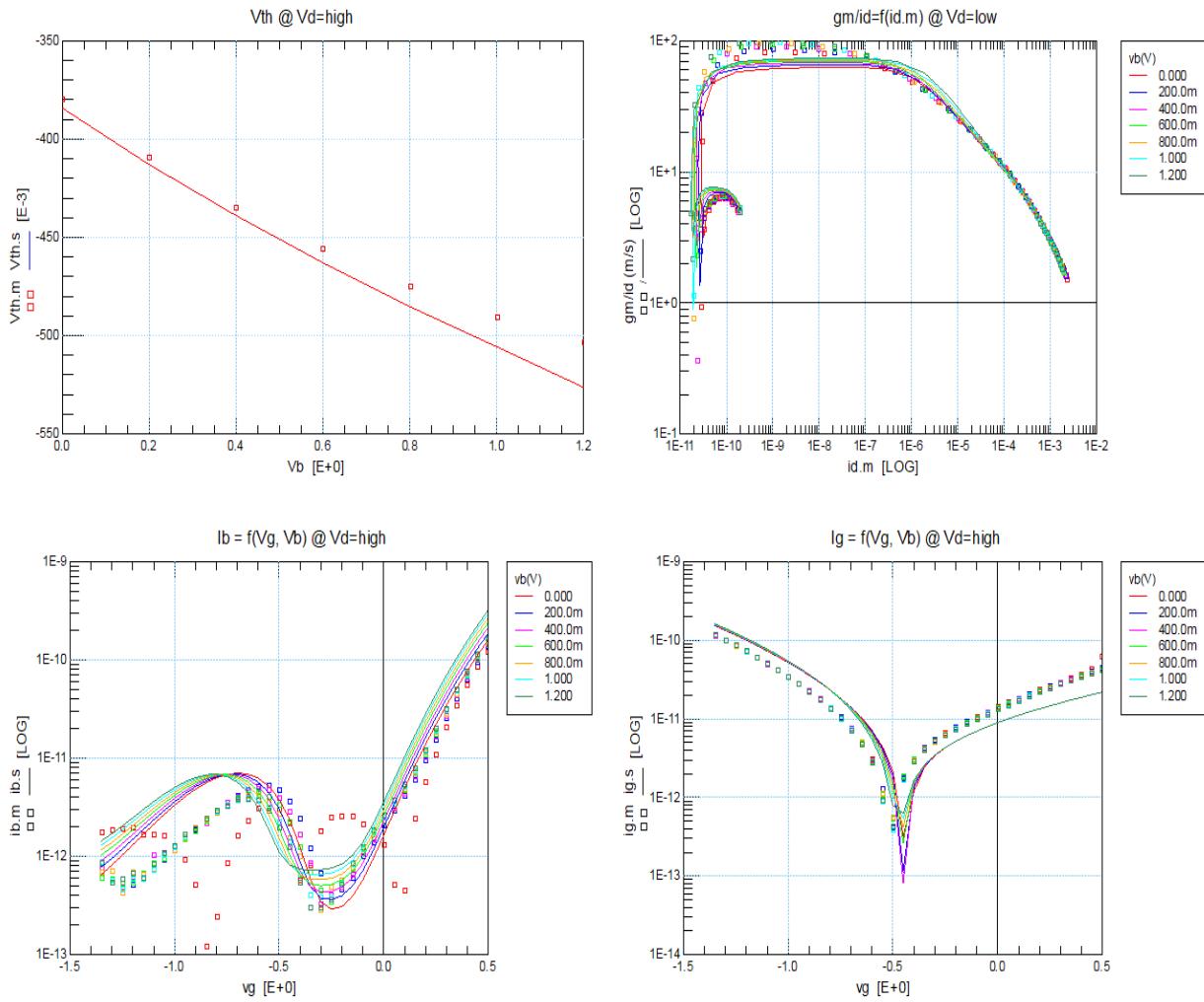
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



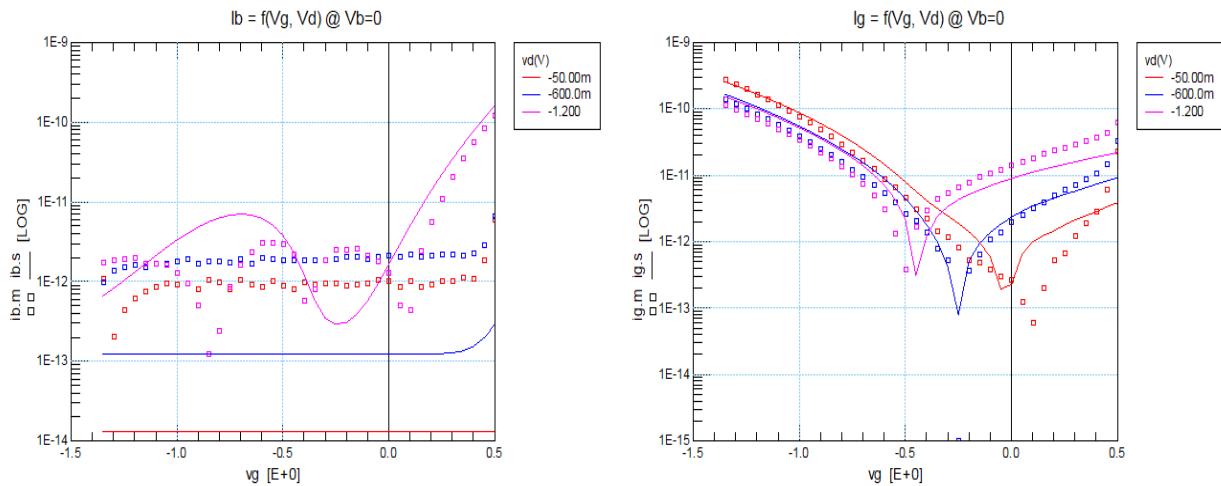


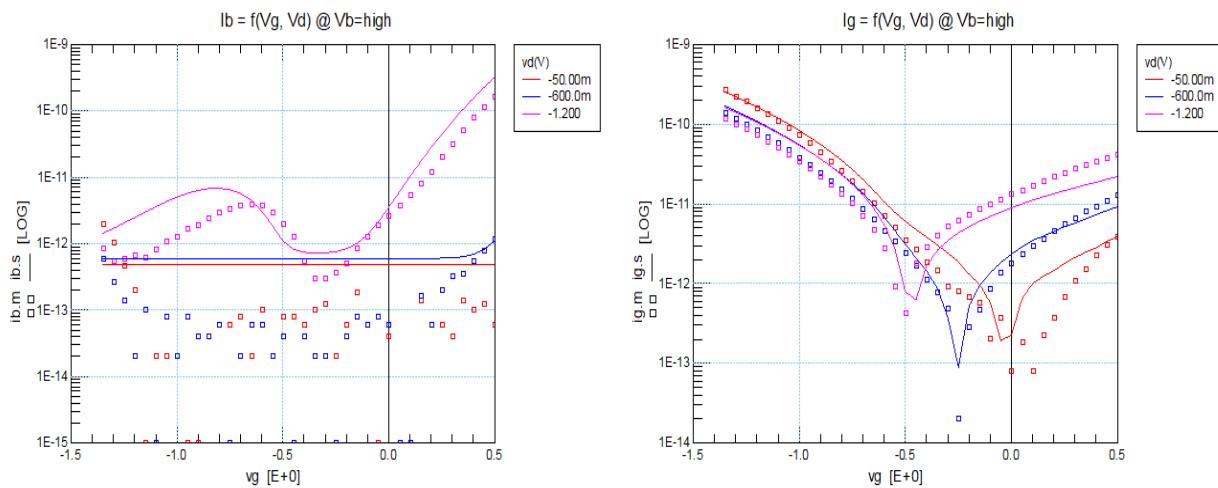
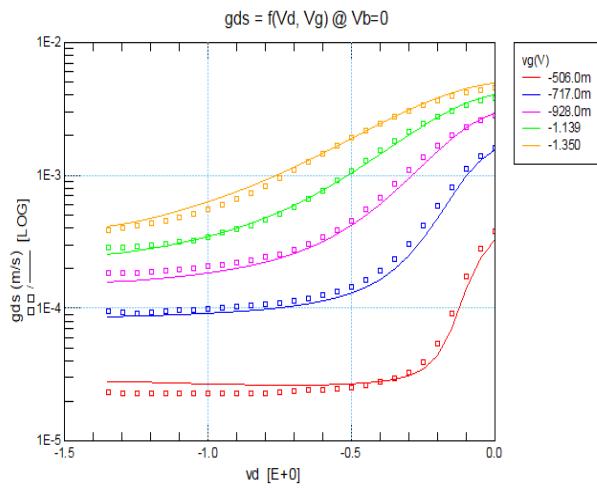
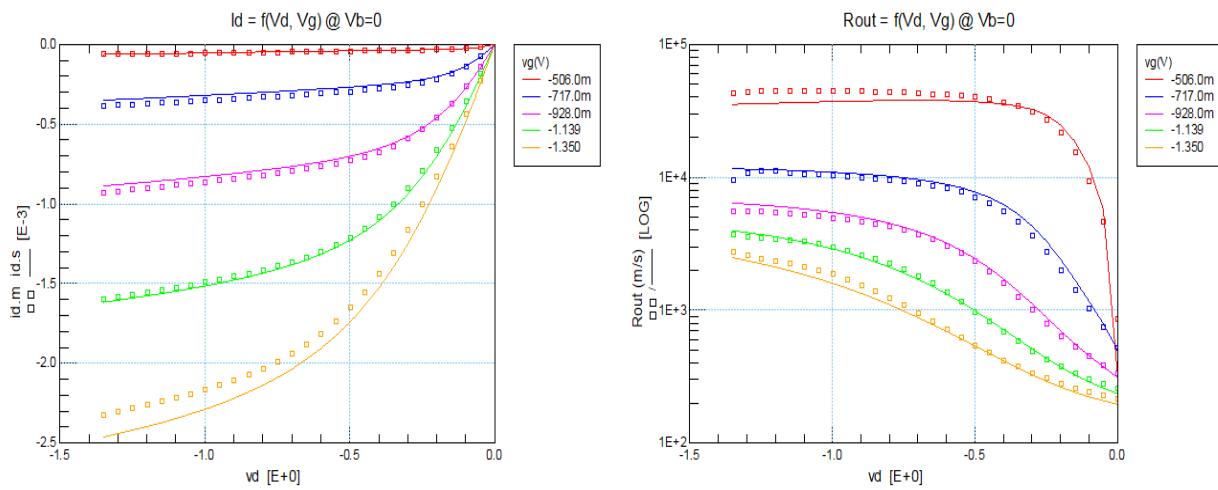
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

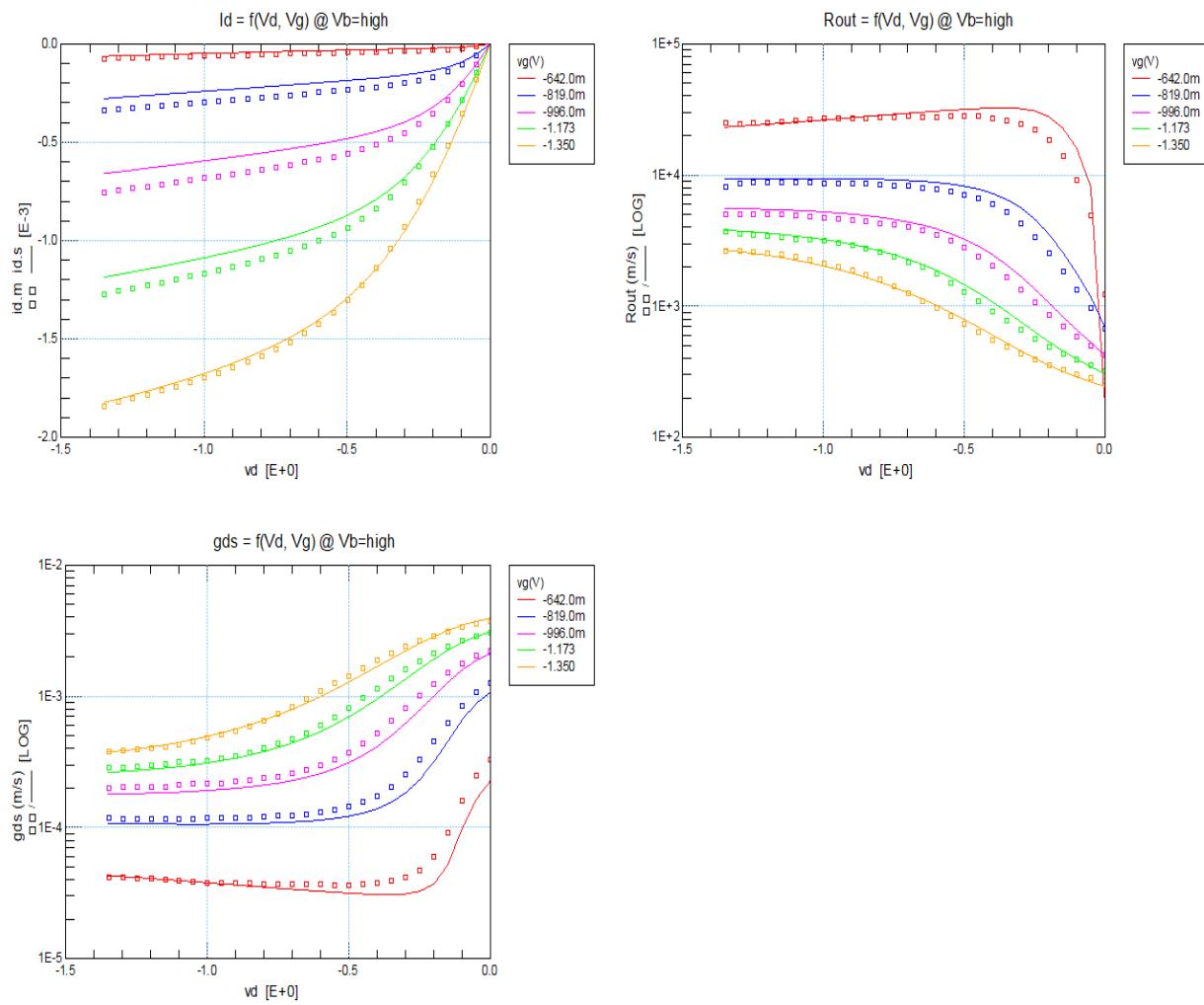
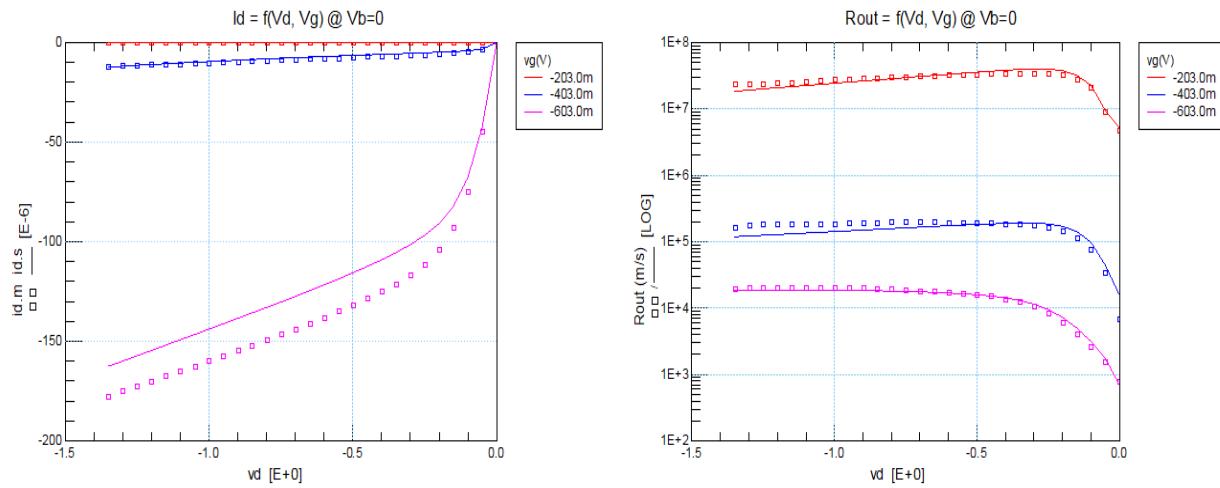


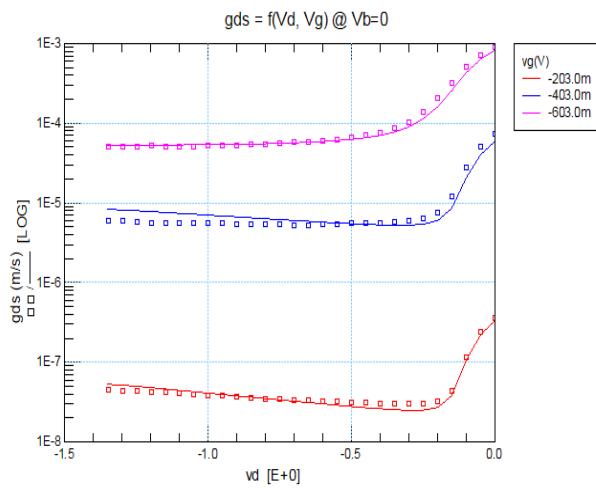


### idvg, Ib,Ig, Vb = 0V, T = 27°C

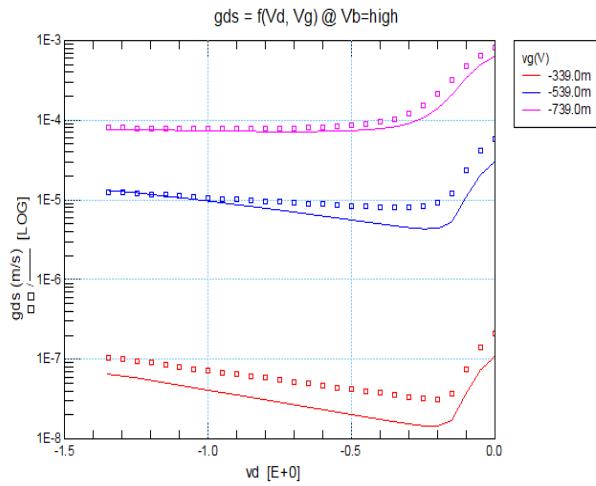
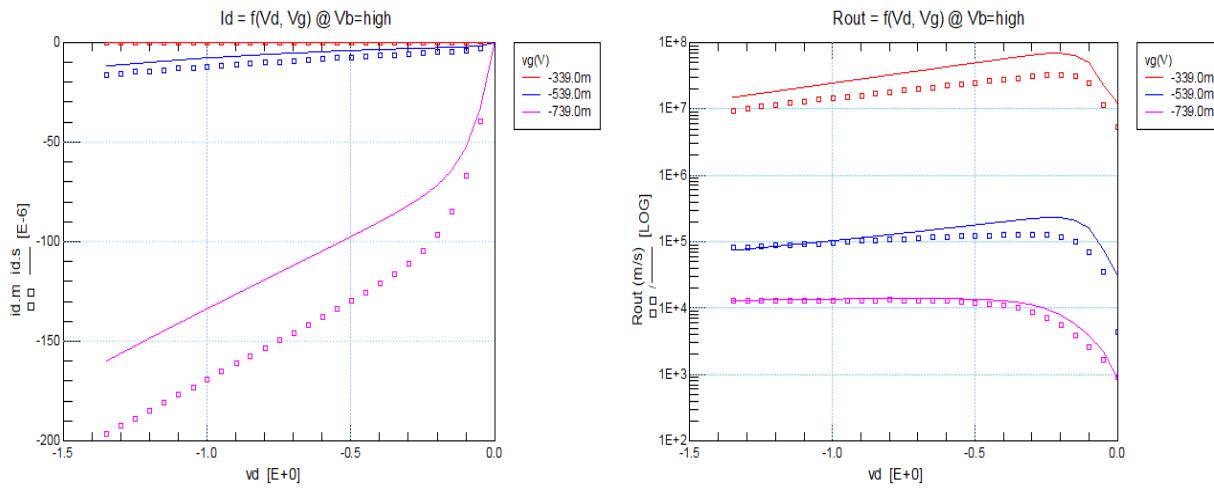


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

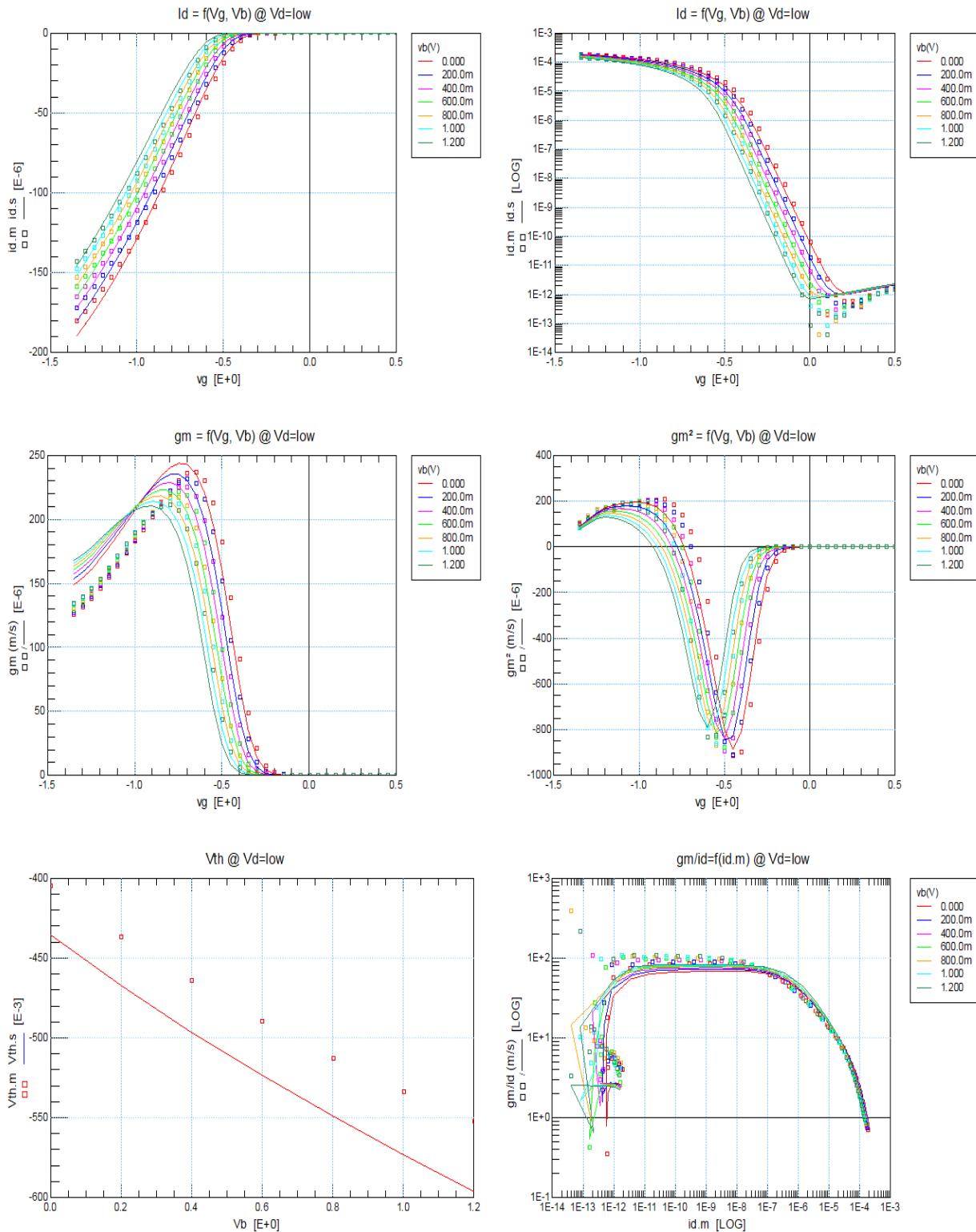


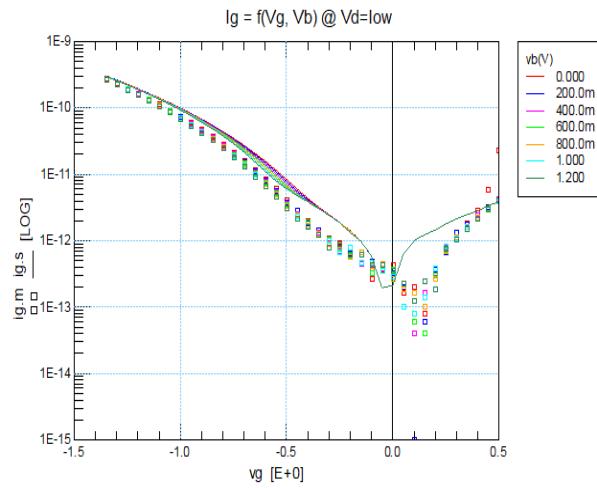
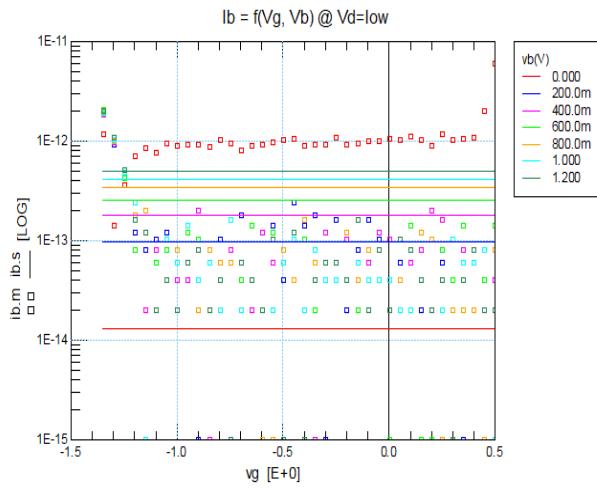
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



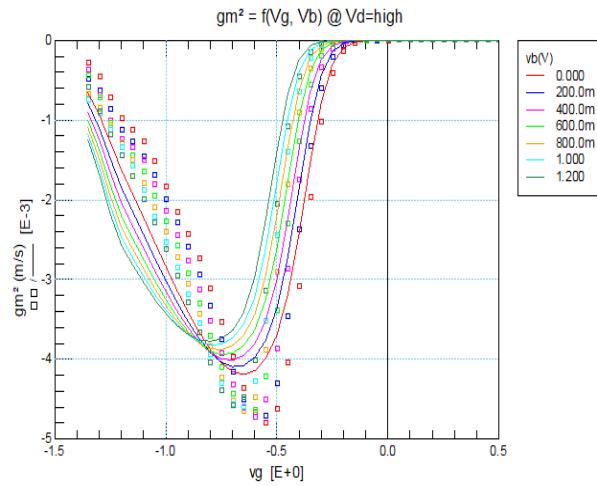
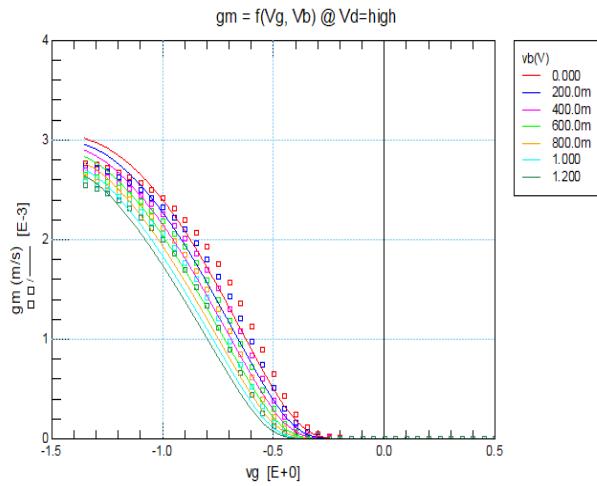
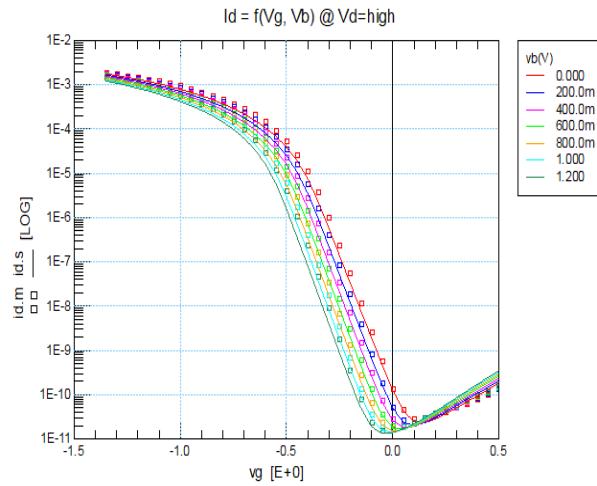
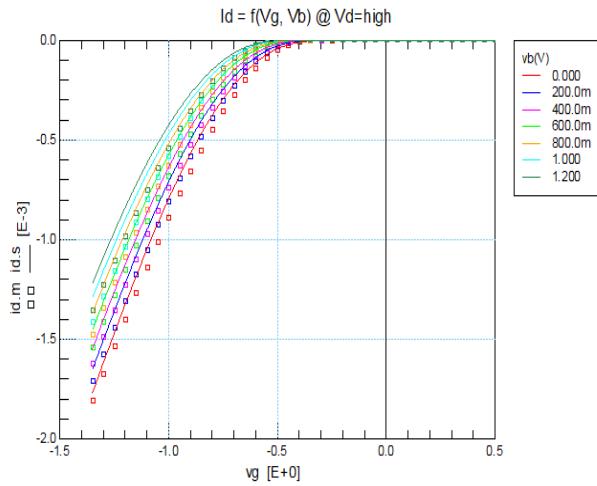
## 4.7 W10u0\_L0u18\_S548\_5

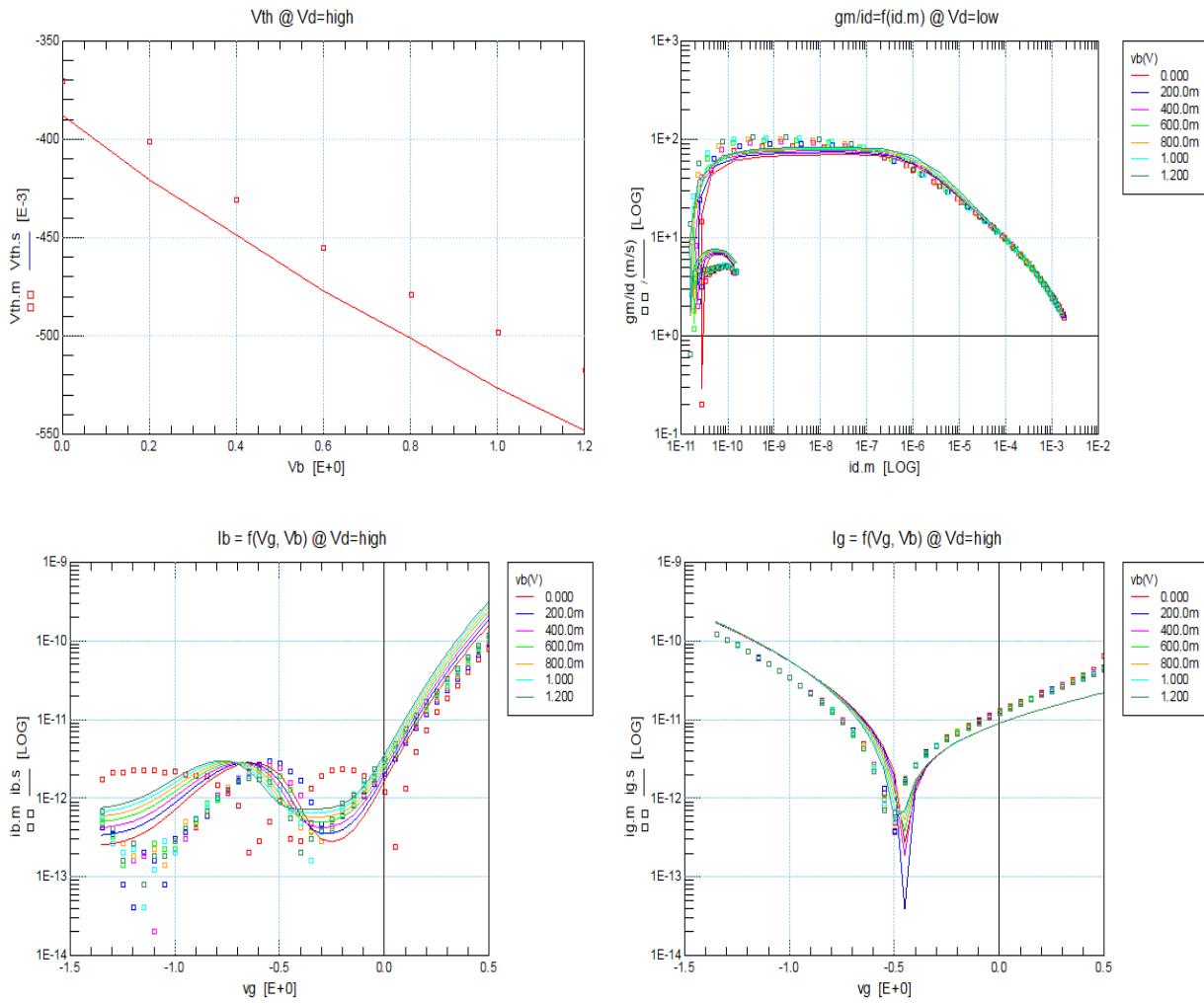
$idv_g, V_d = -0.05V, T = 27^\circ C$



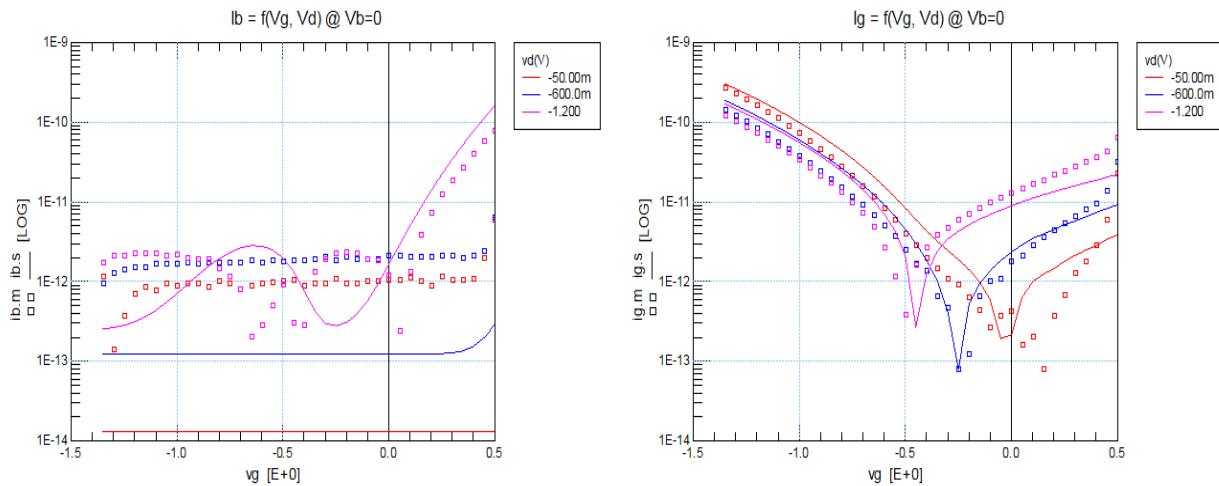


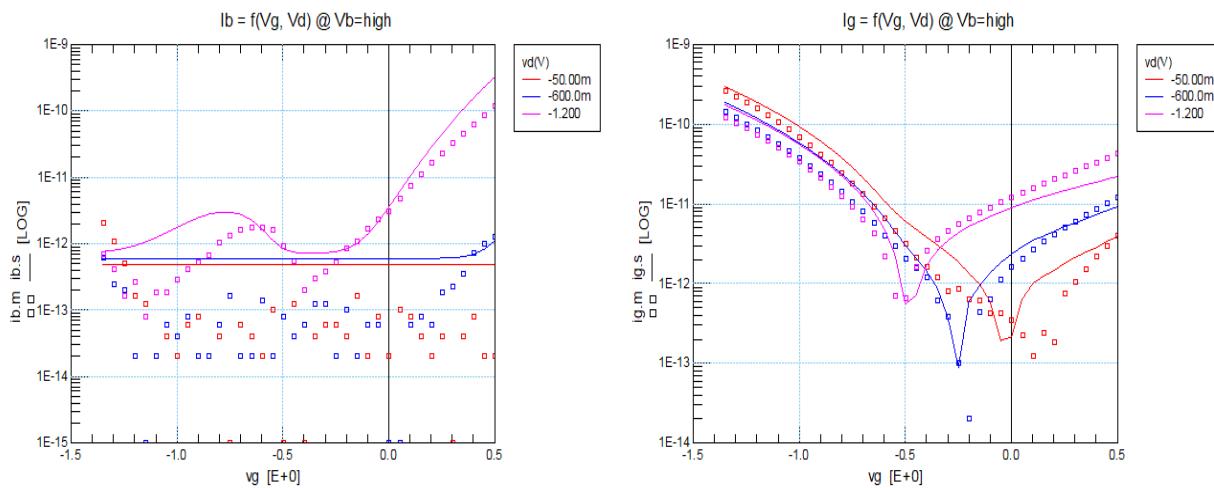
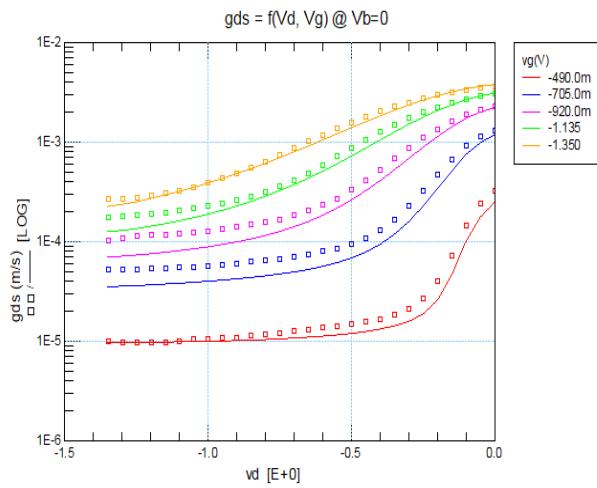
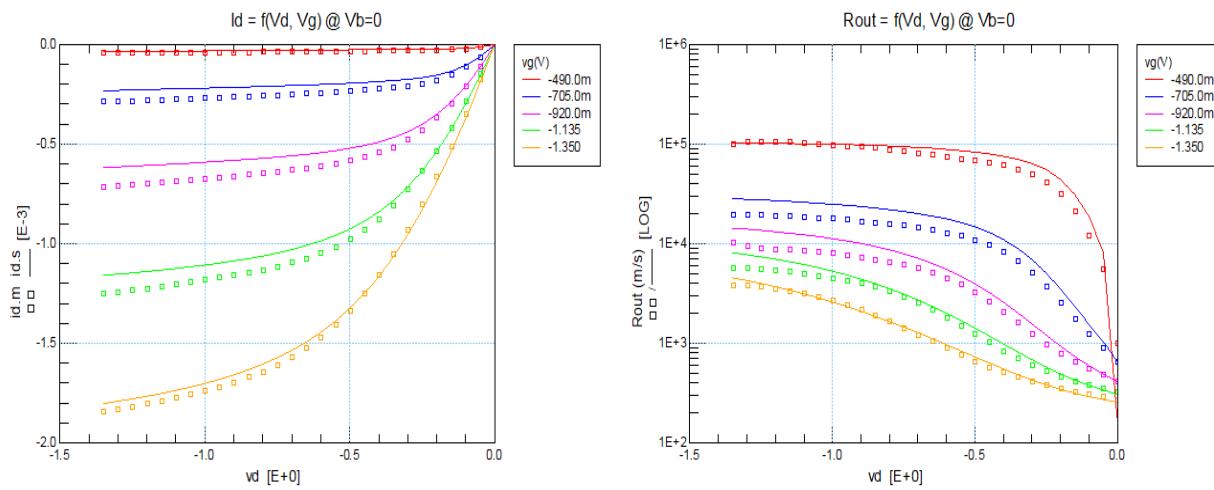
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

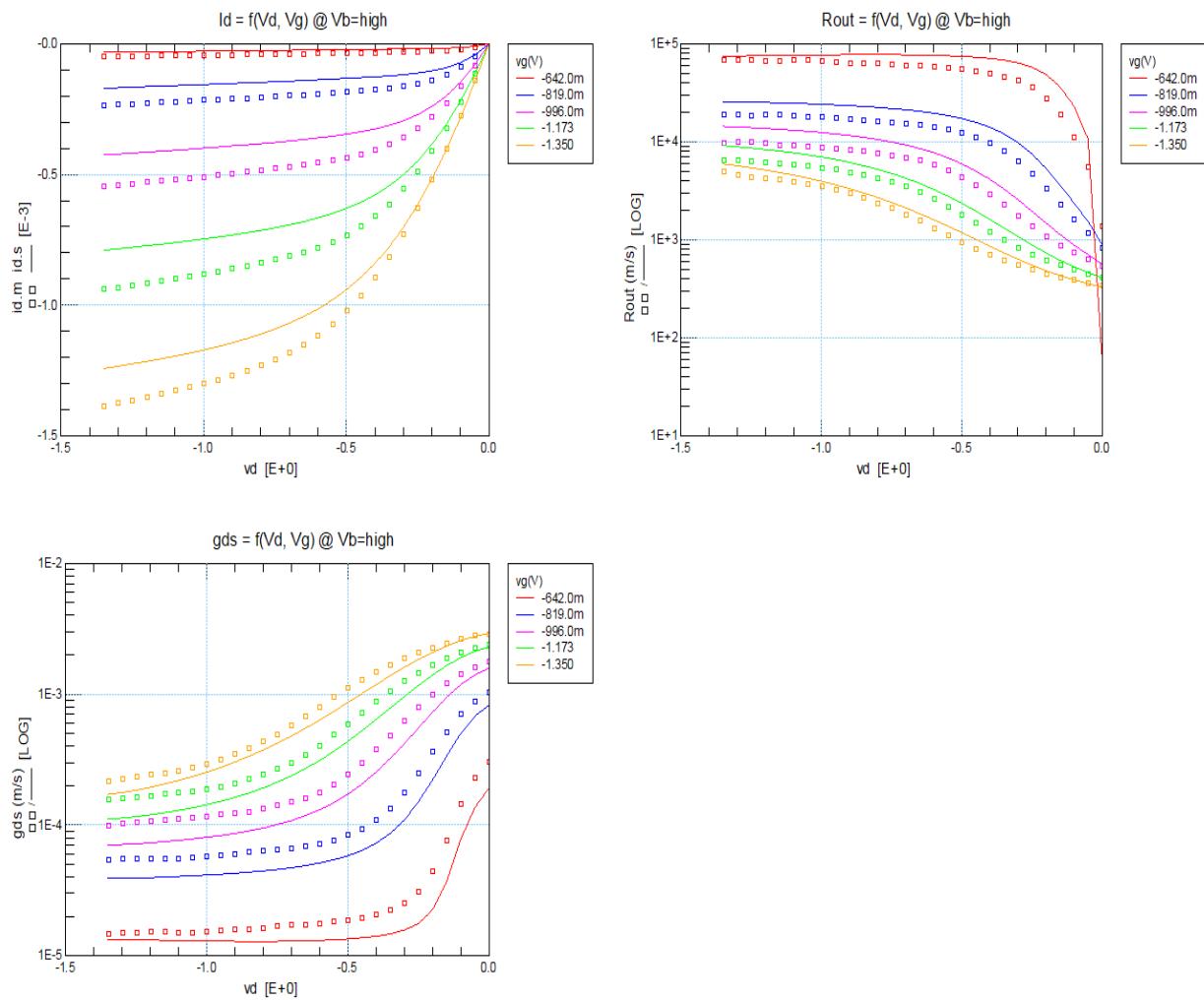
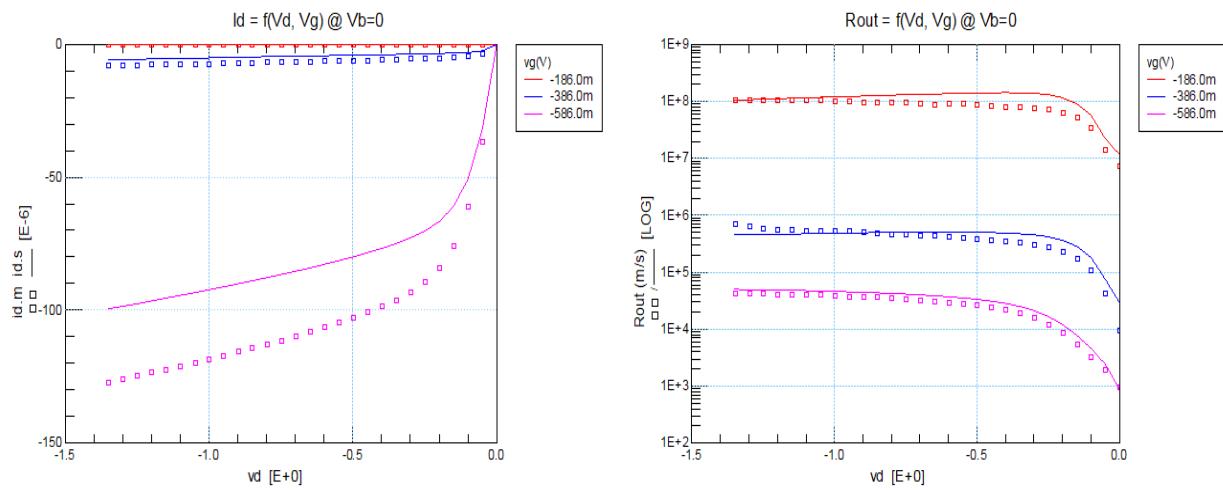


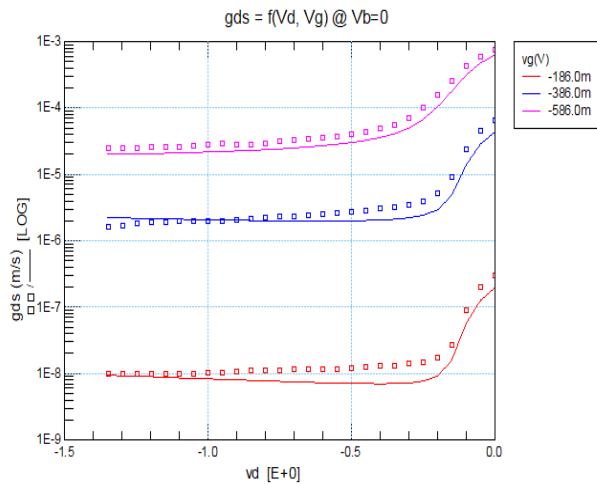


### $id_{VG}, I_b, I_g, V_b = 0V, T = 27^\circ C$

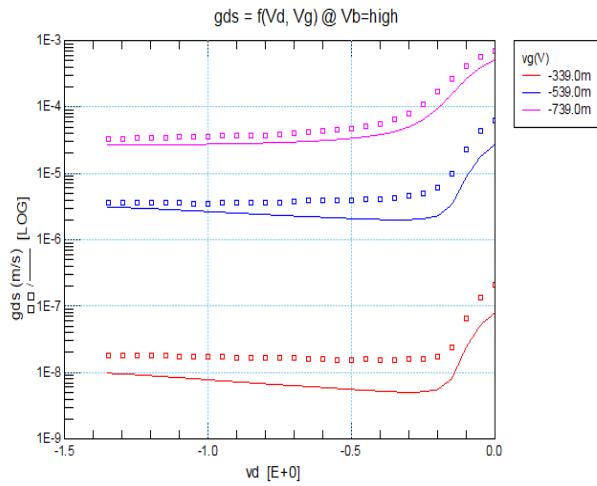
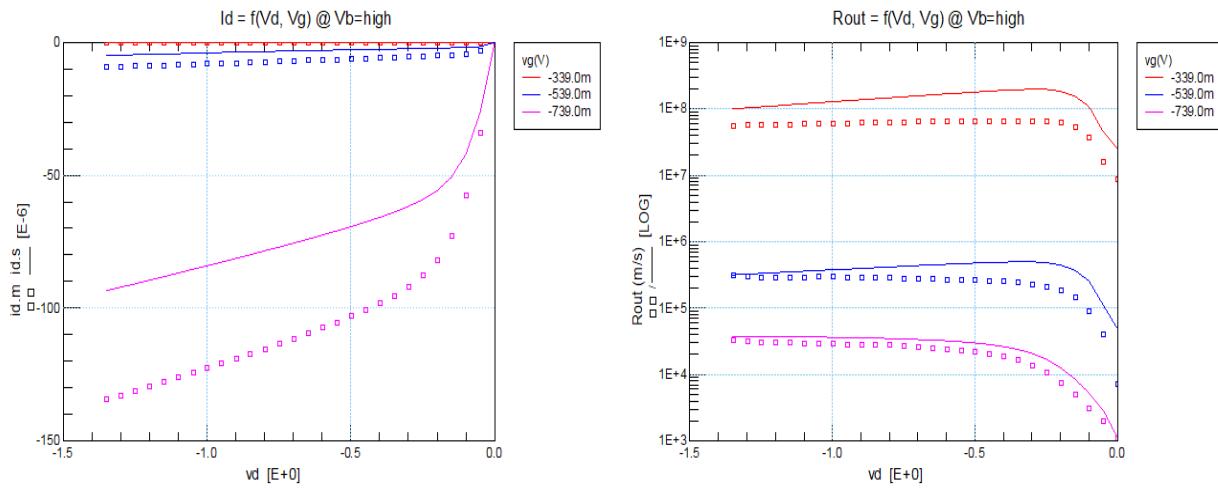


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


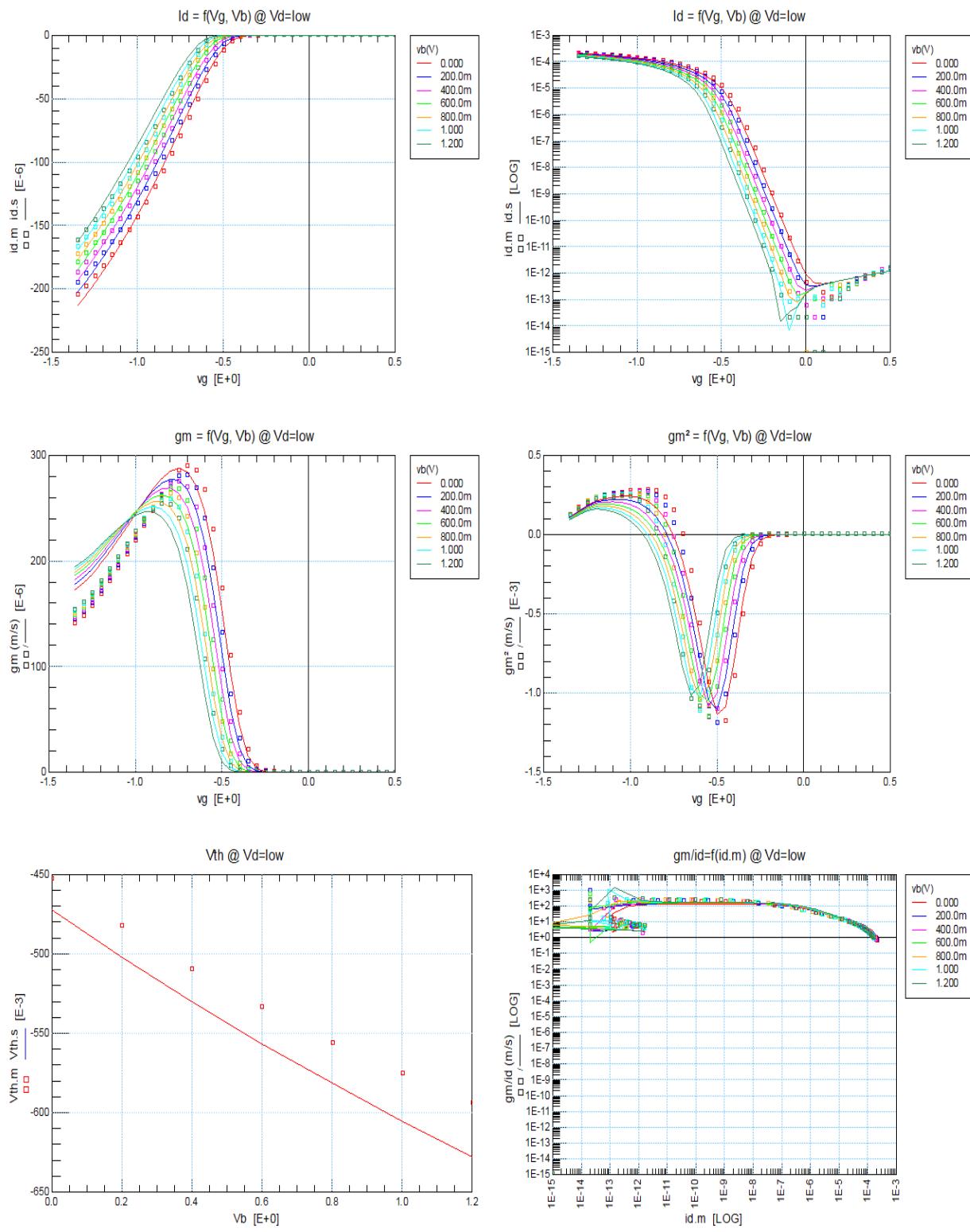
**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

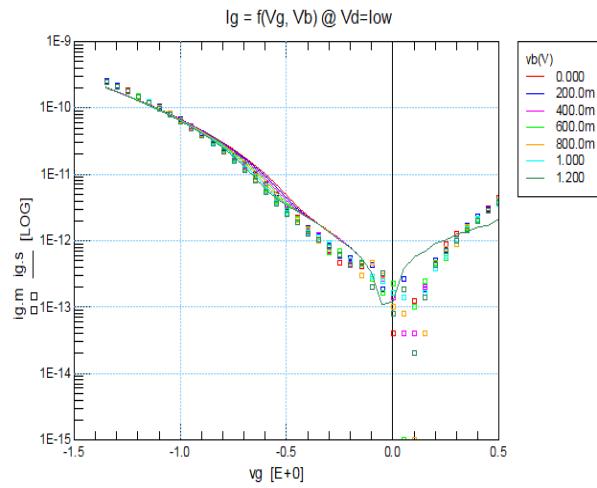
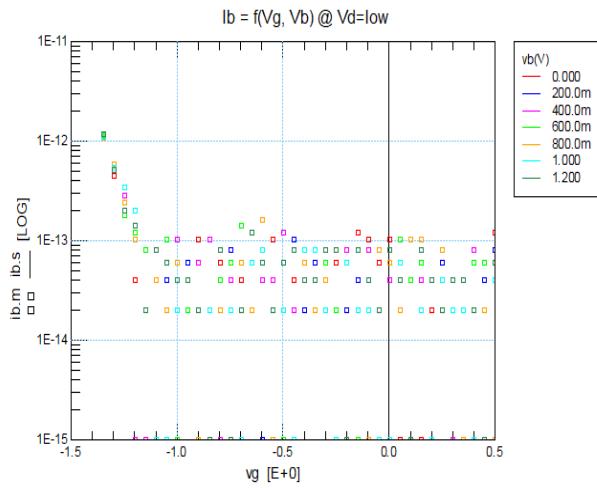


### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

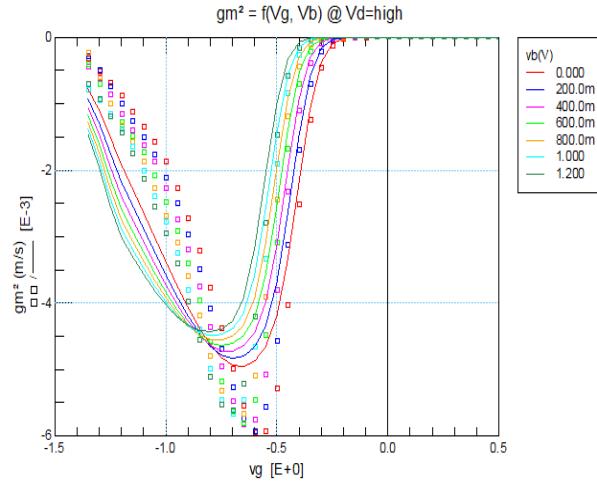
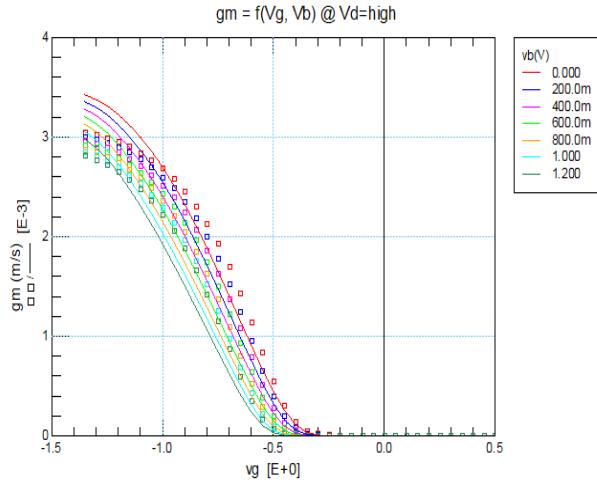
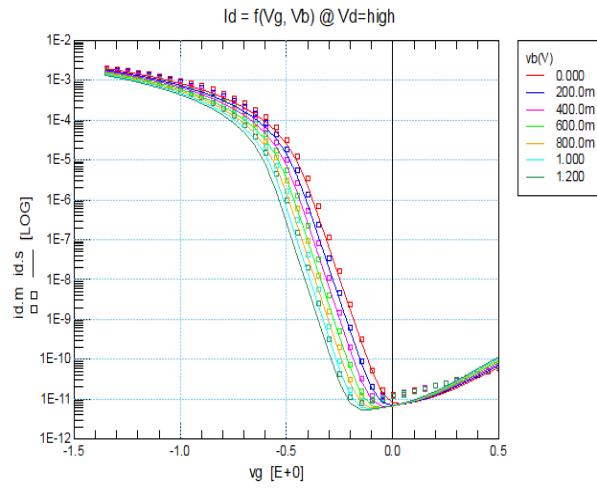
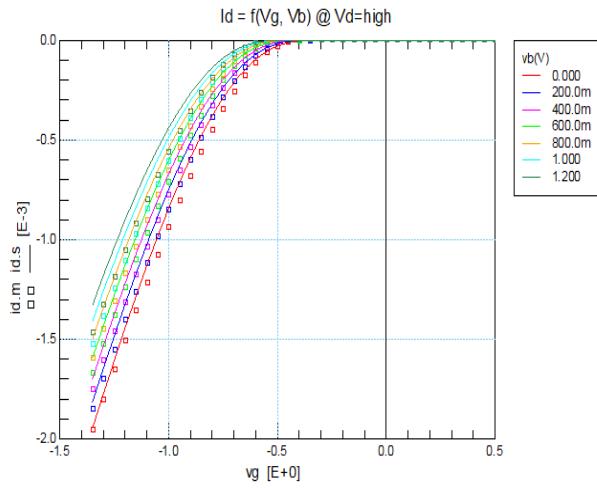


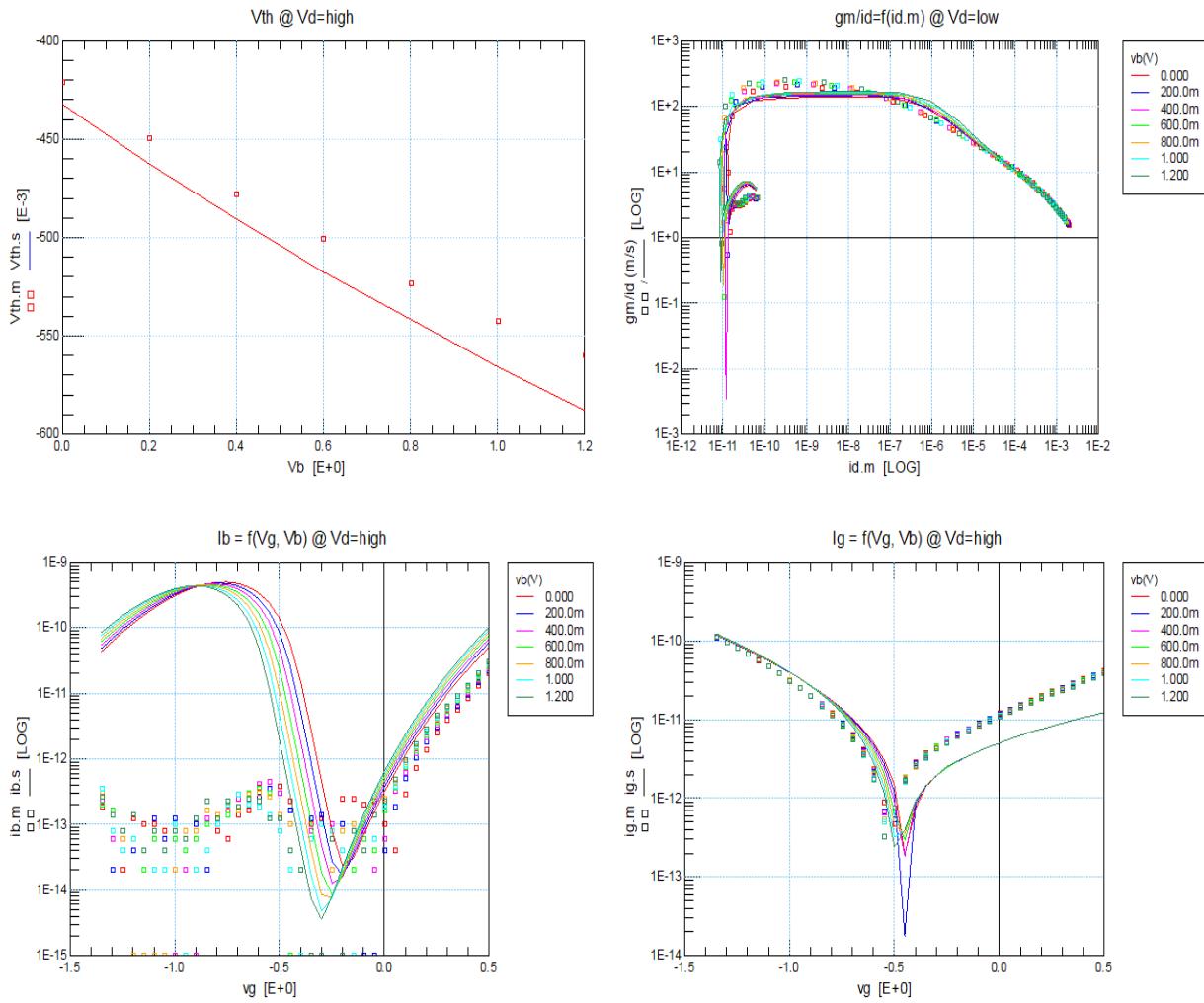
**idvg, Vd = -0.05V, T = -40°C**



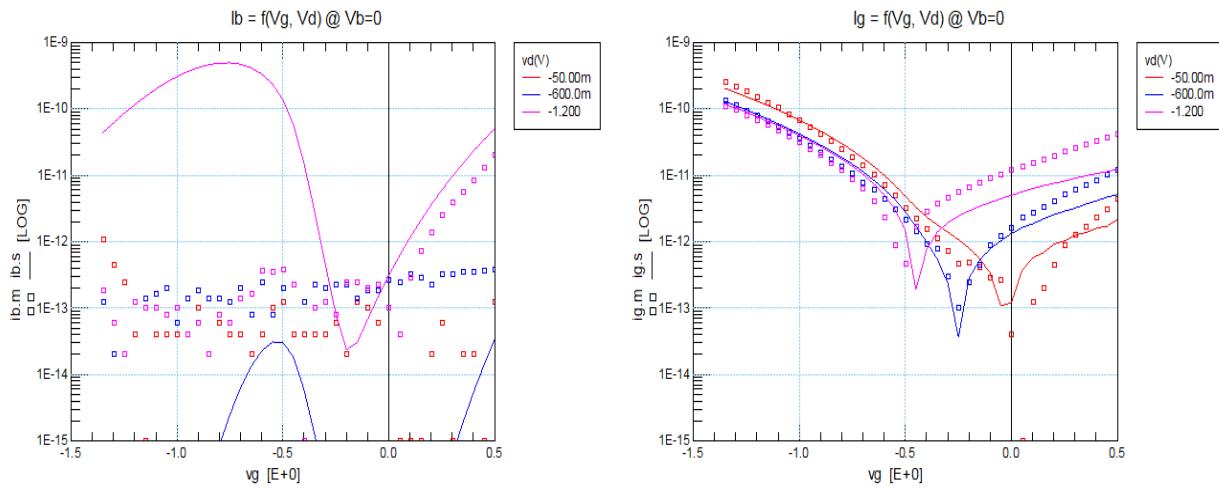


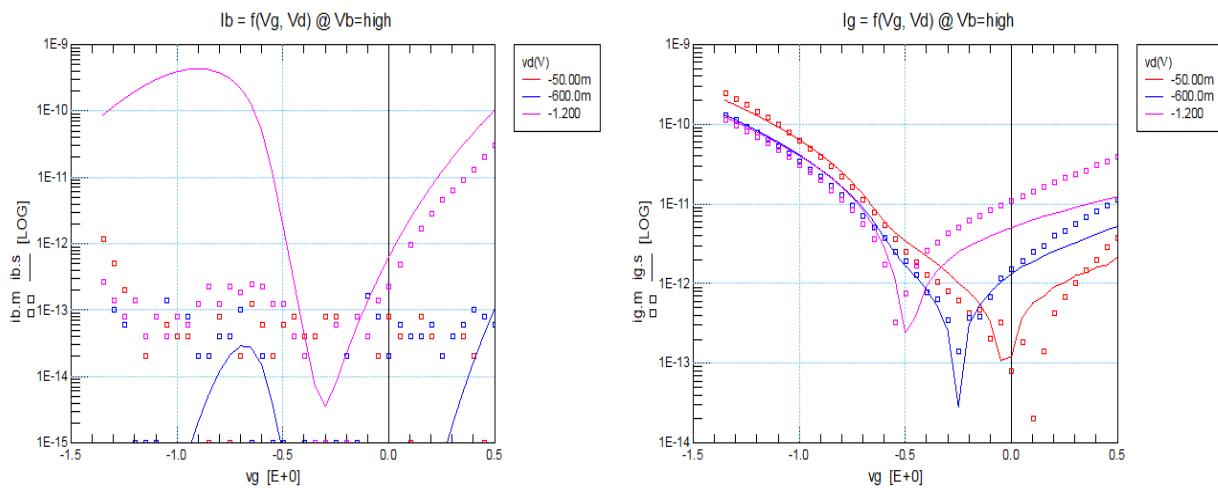
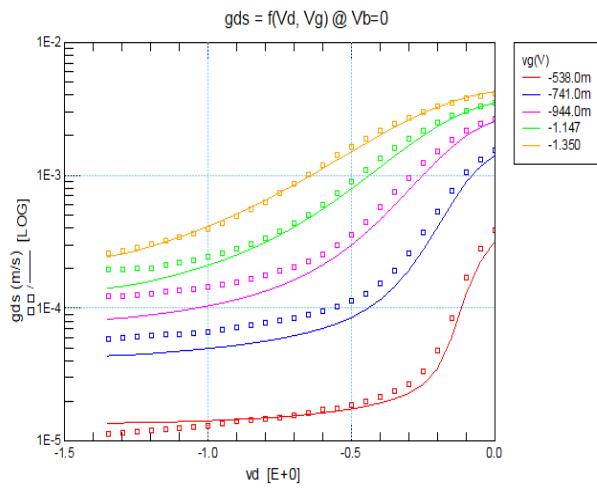
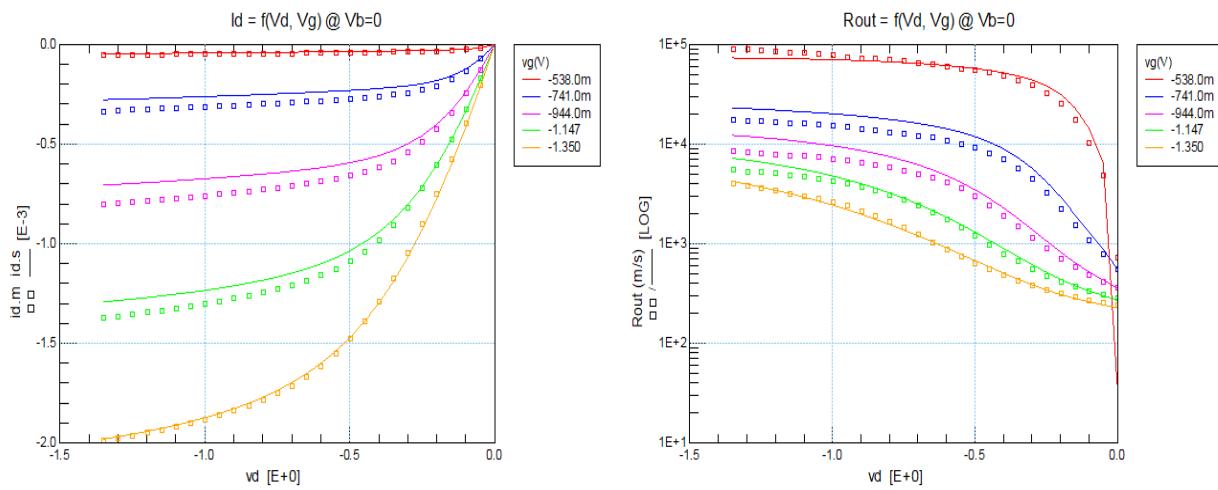
$i_{dvg}, V_d = -1.2V, T = -40^{\circ}C$

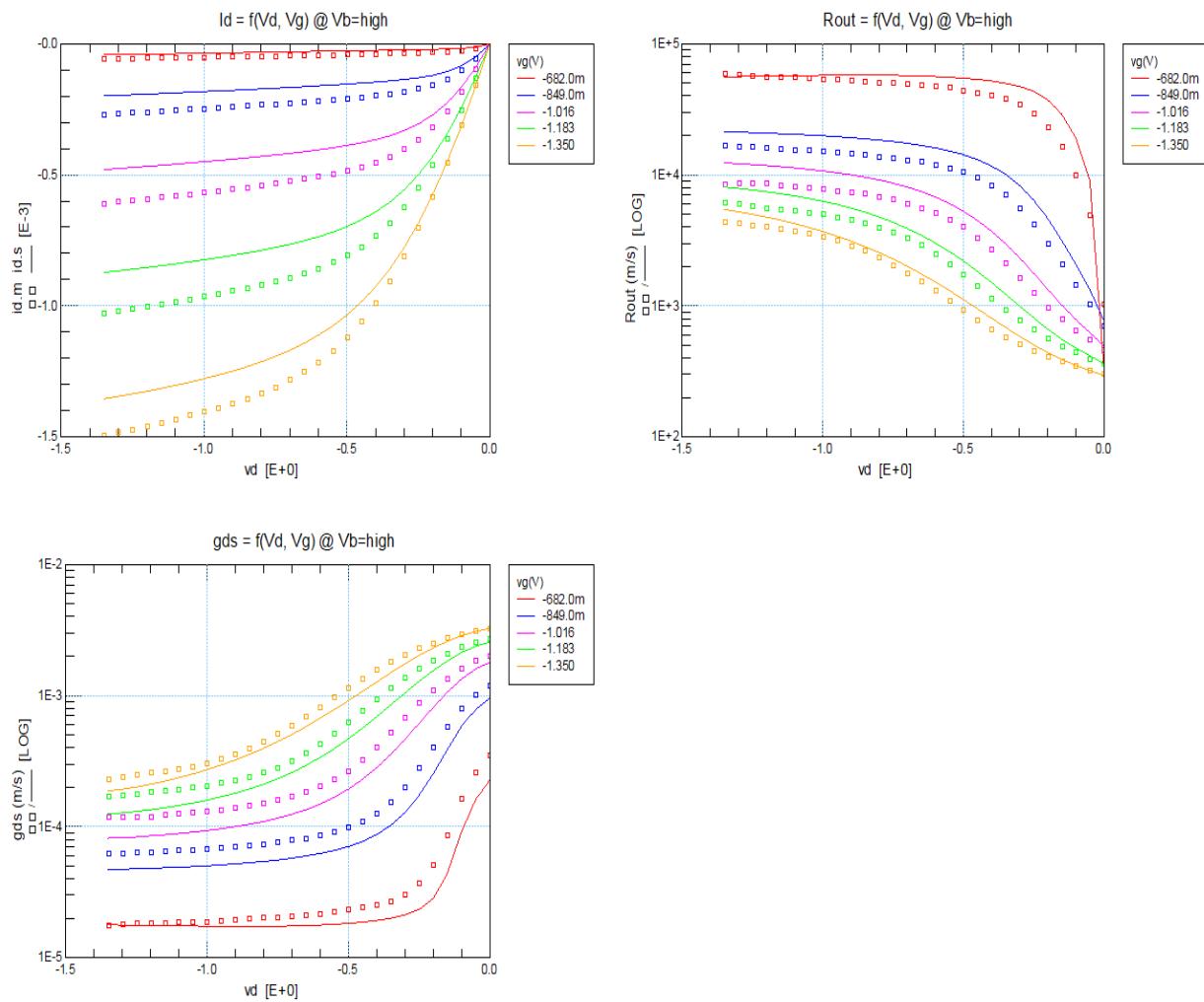
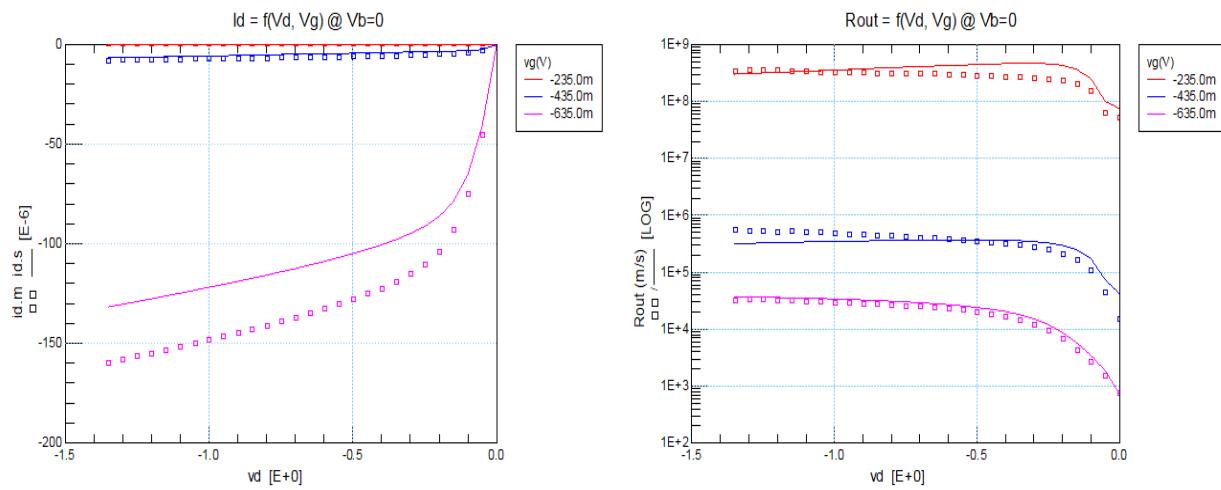


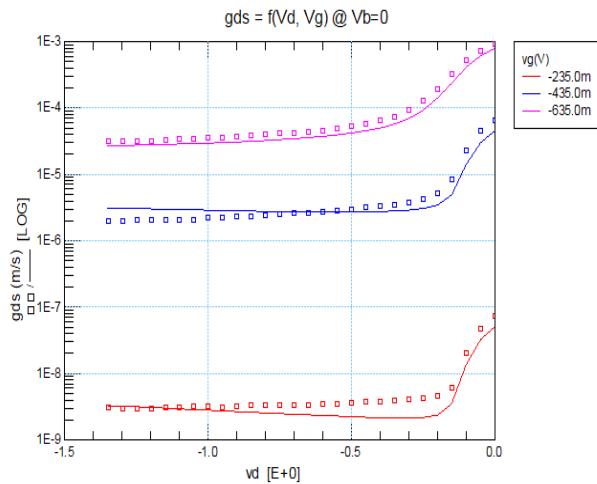


$idvg, I_b, I_g, V_b = 0V, T = -40^\circ C$

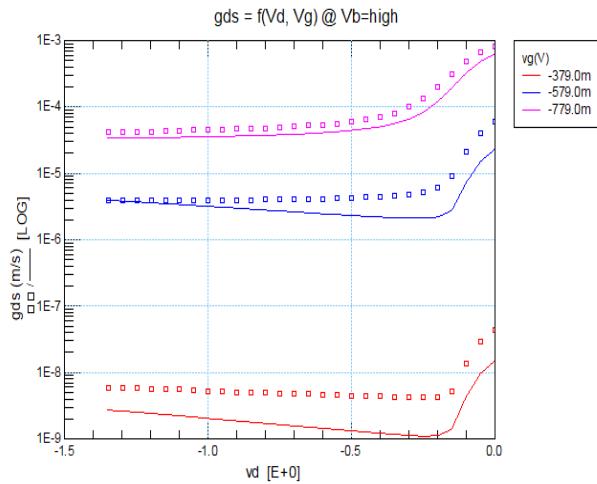
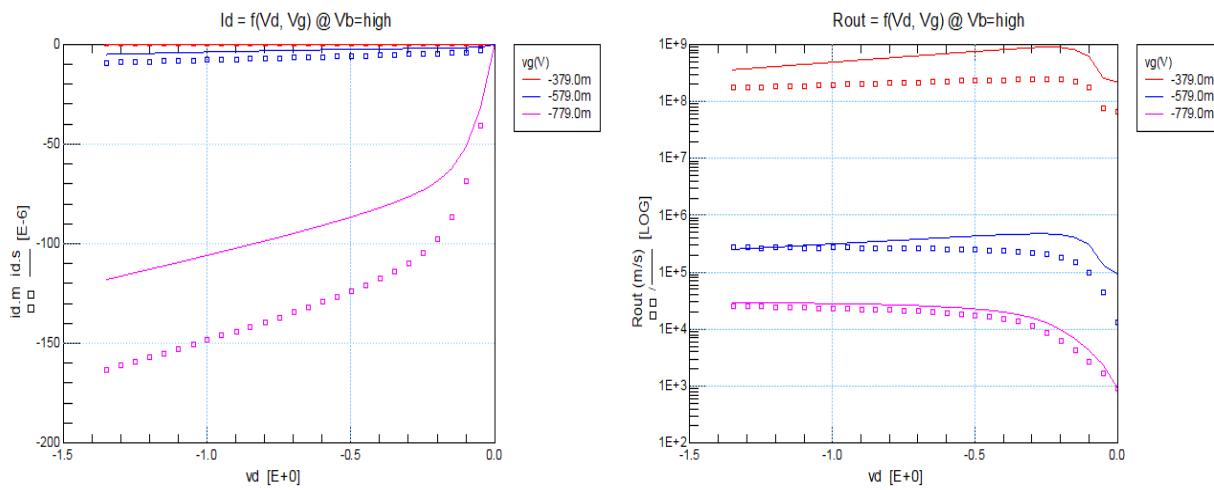


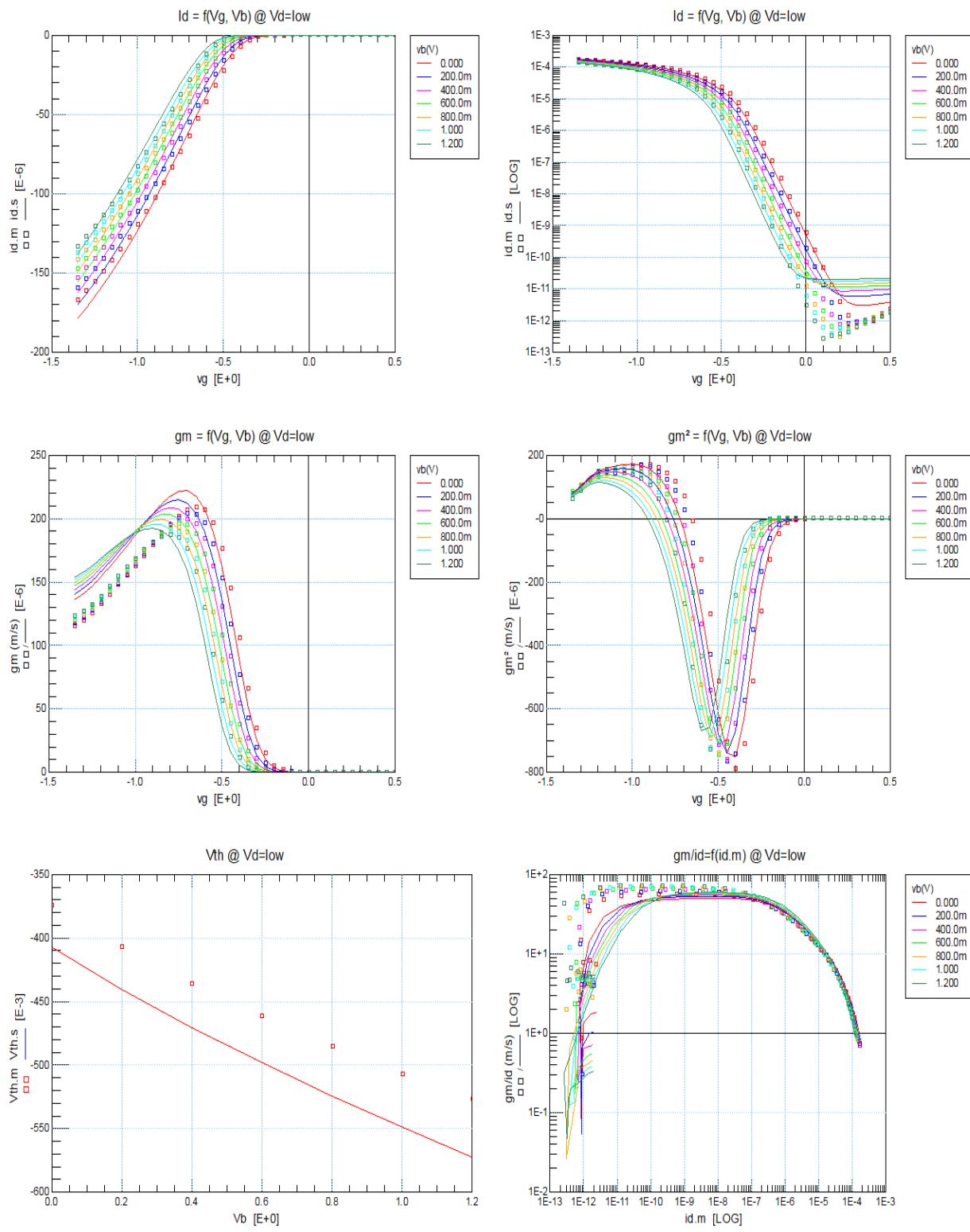
**idvg, Ib,Ig, Vb = 1.2V, T = -40°C**

**idvd, Vb = 0V, T = -40°C**


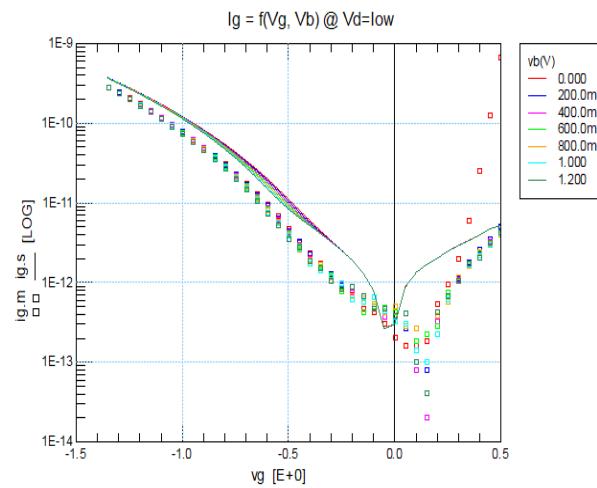
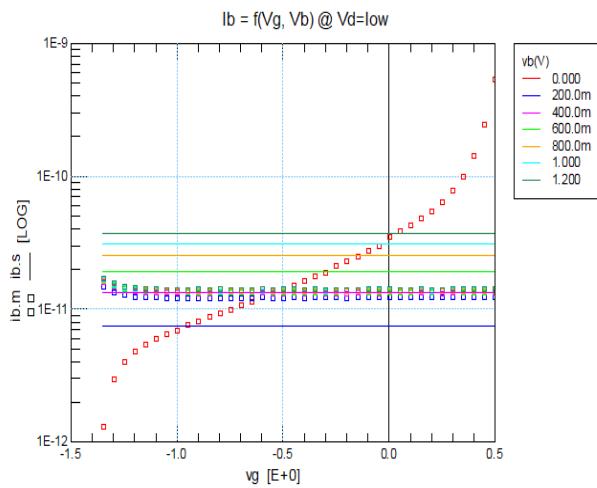
**idvd\_vbmin, Vb = 1.2V, T = -40°C****idvd\_vth, Vb = 0V, T = -40°C**



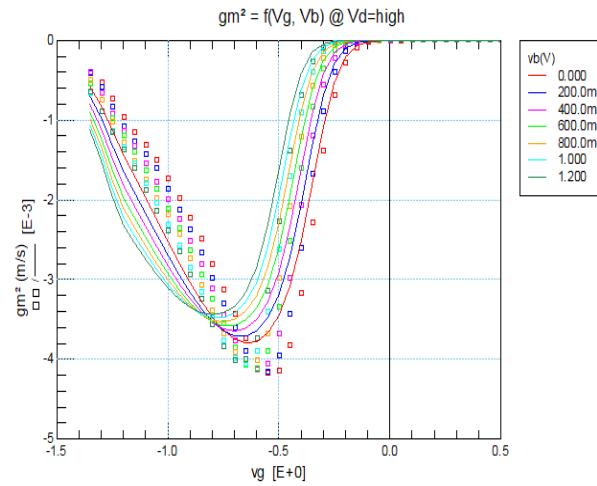
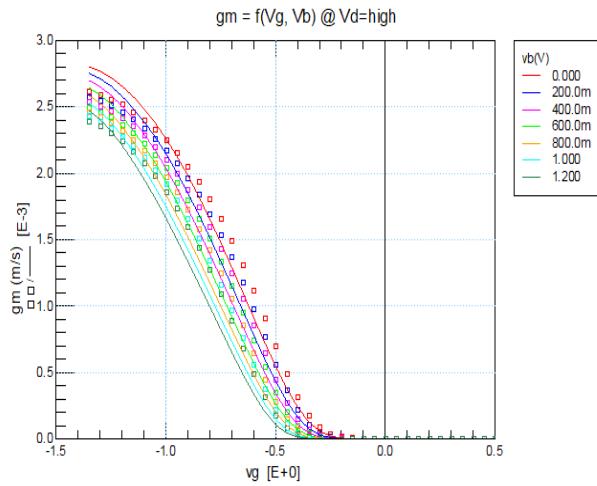
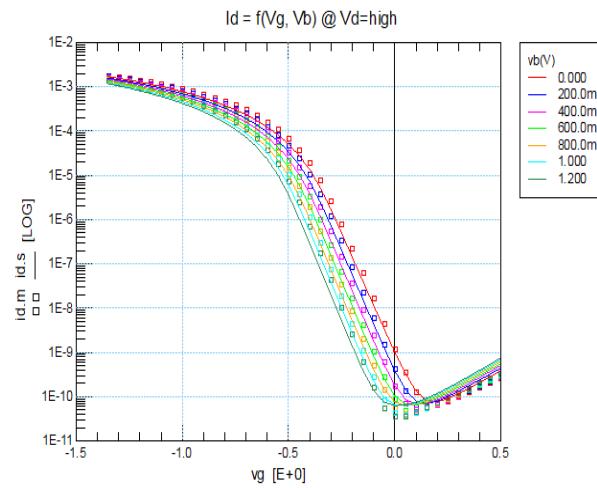
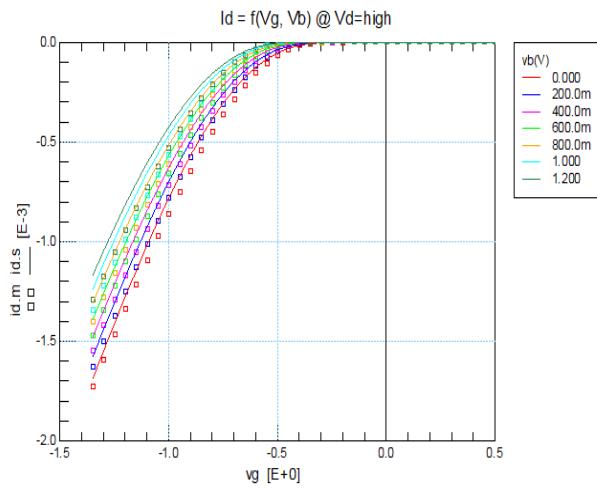
idvd\_vth\_vbmin, Vb = 1.2V, T = -40°C

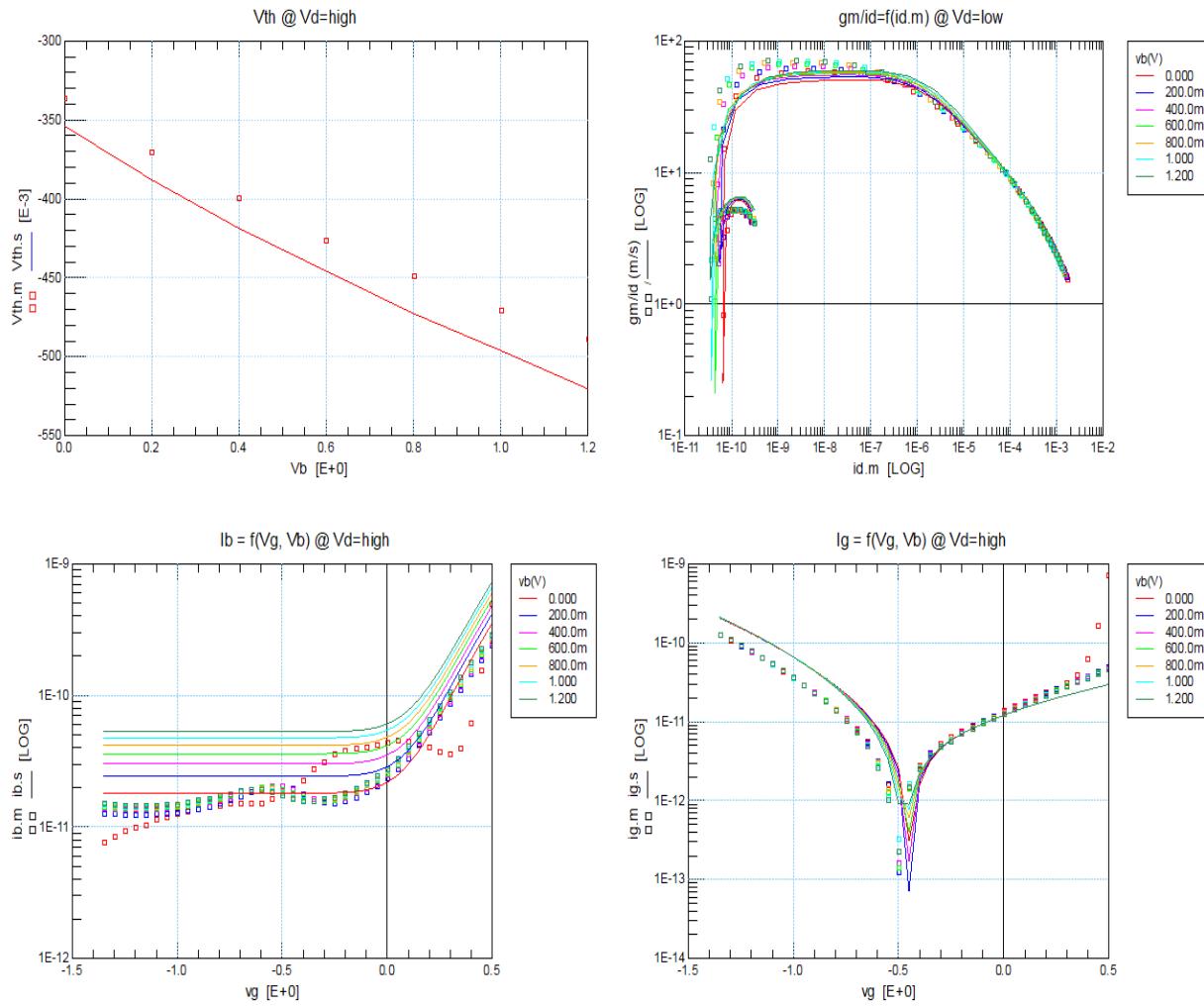


**idvg, Vd = -0.05V, T = 70°C**

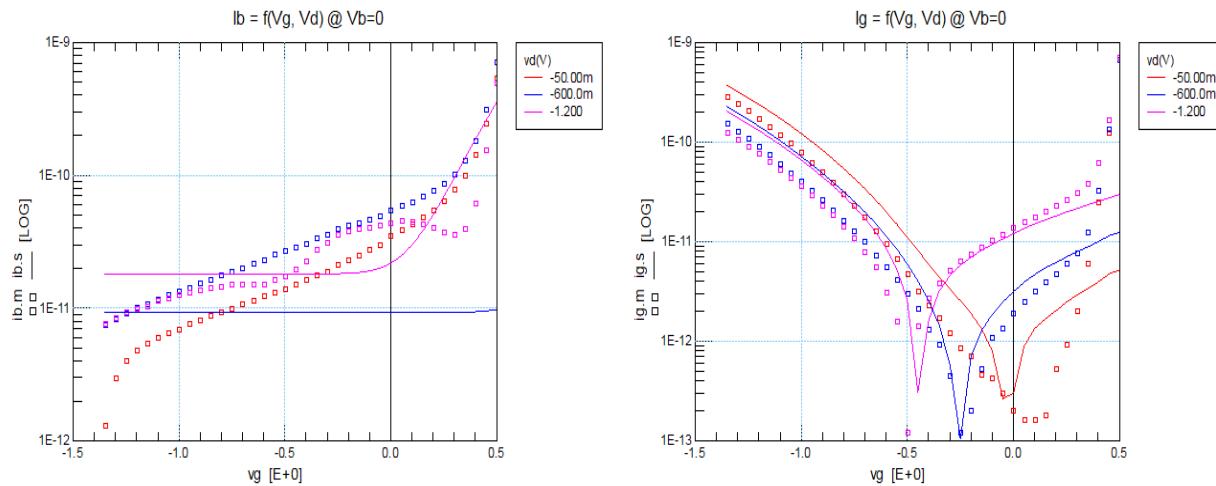


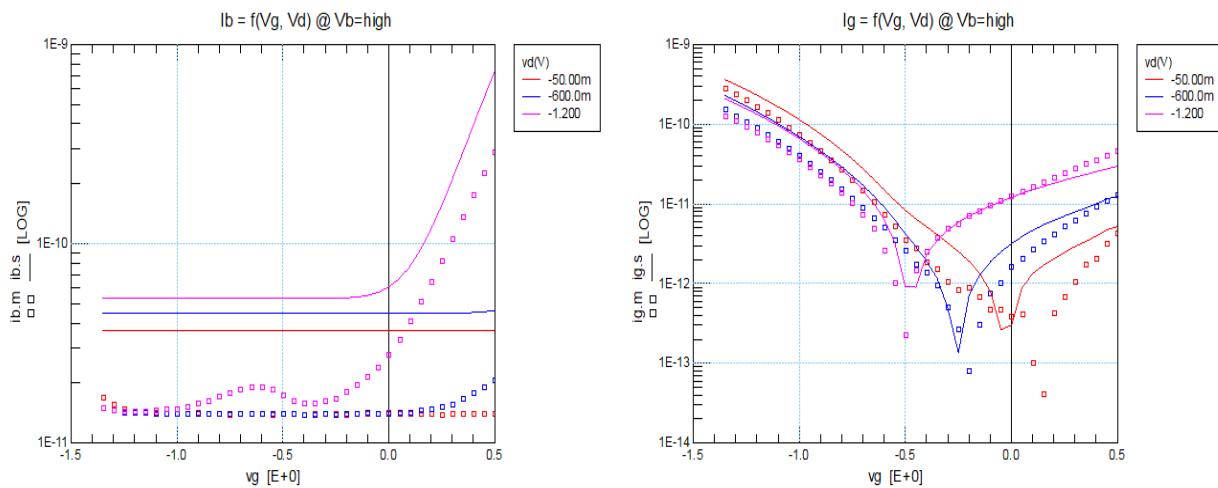
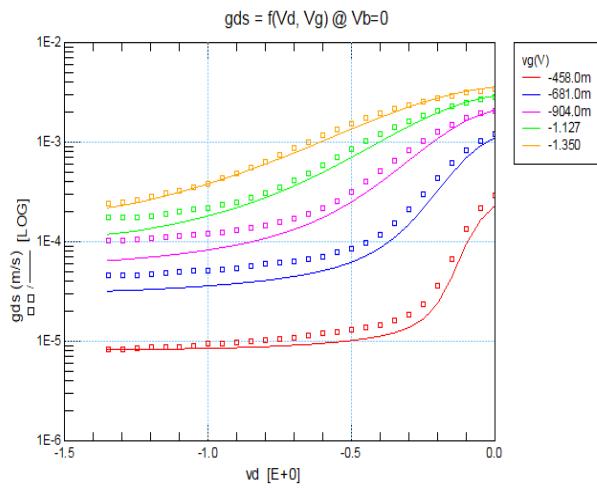
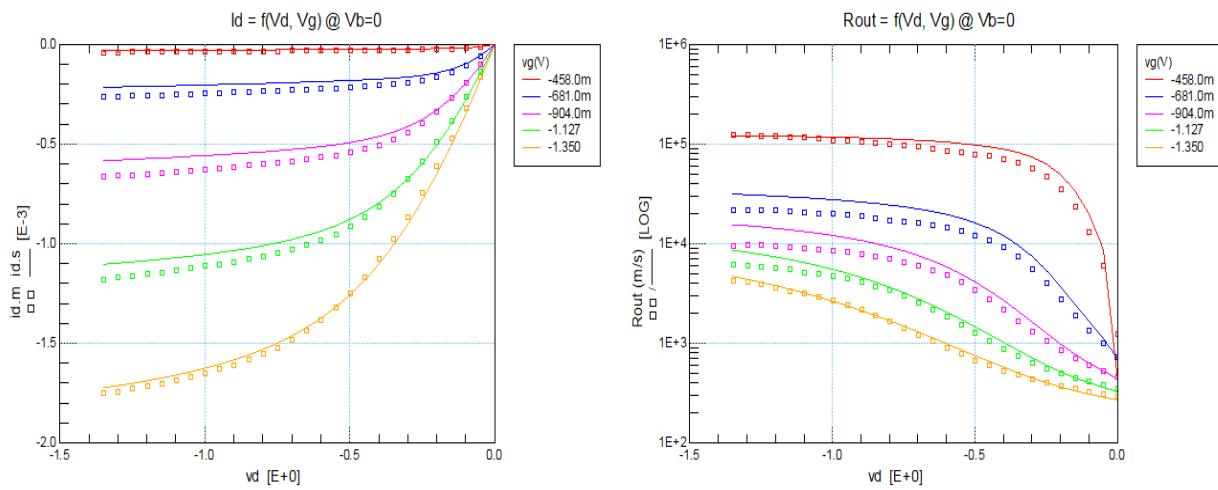
$i_{dvg}, V_d = -1.2V, T = 70^\circ C$

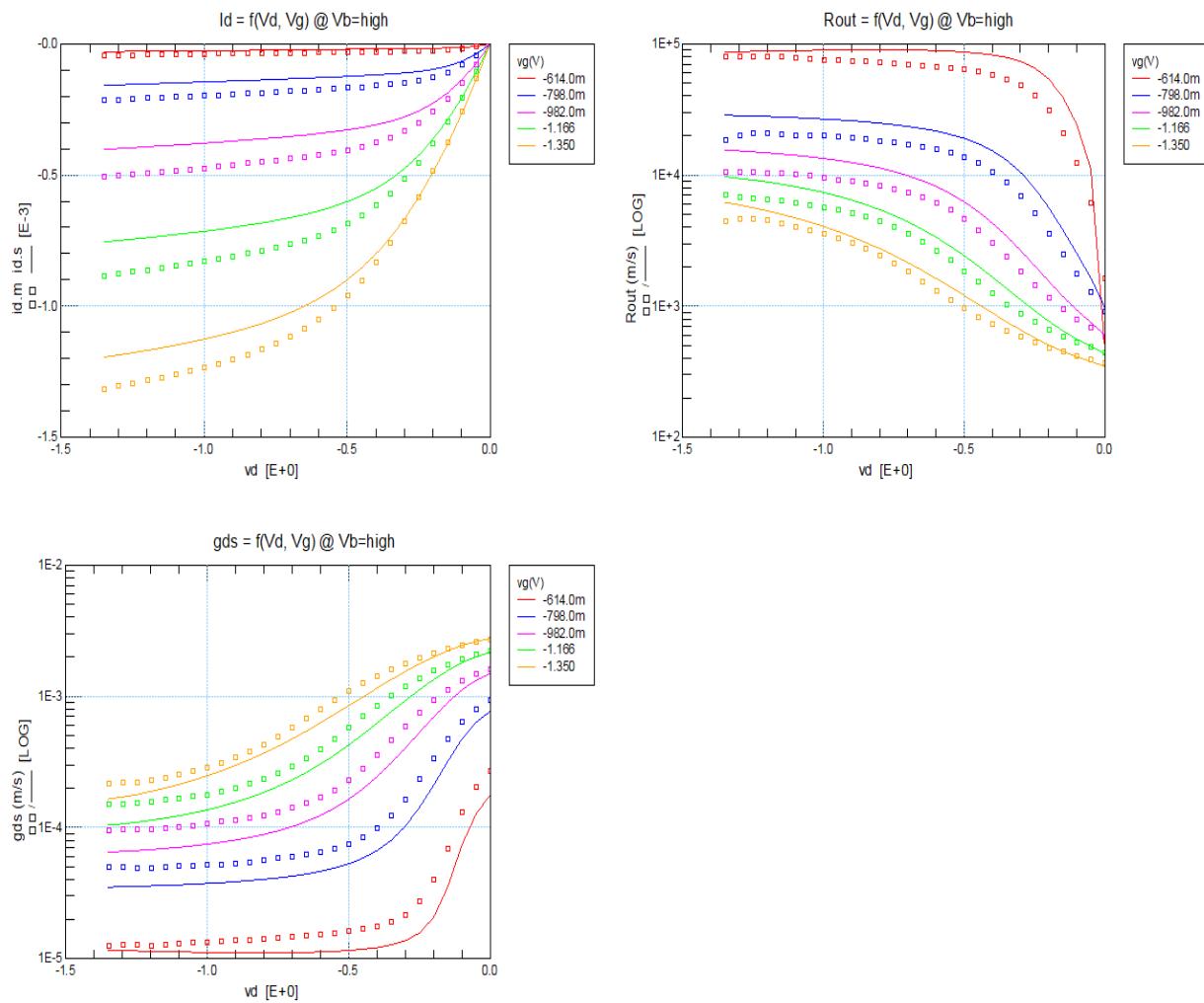
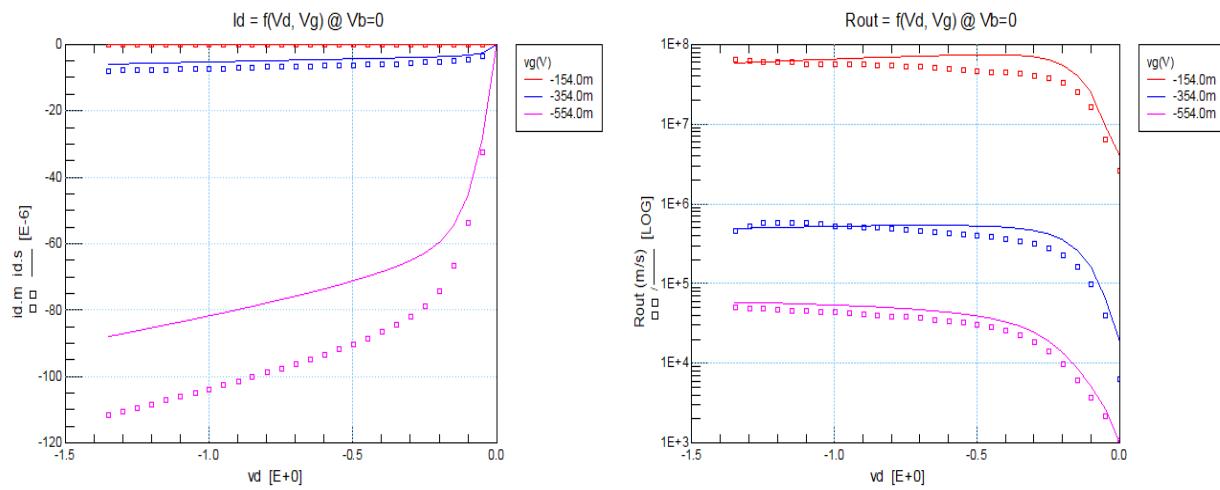


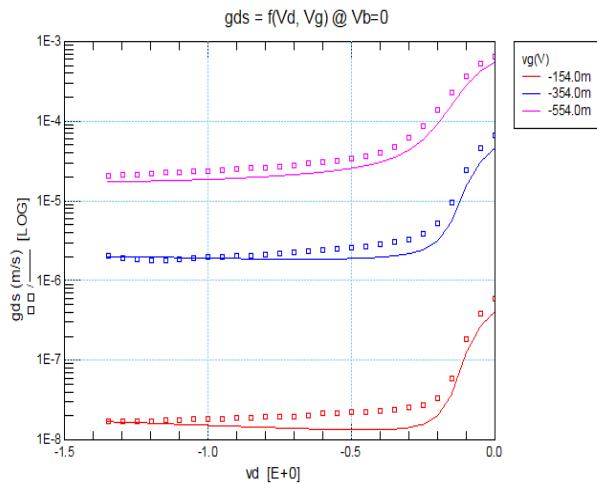


### $i_{dvg}, I_b, I_g, V_b = 0V, T = 70^\circ C$

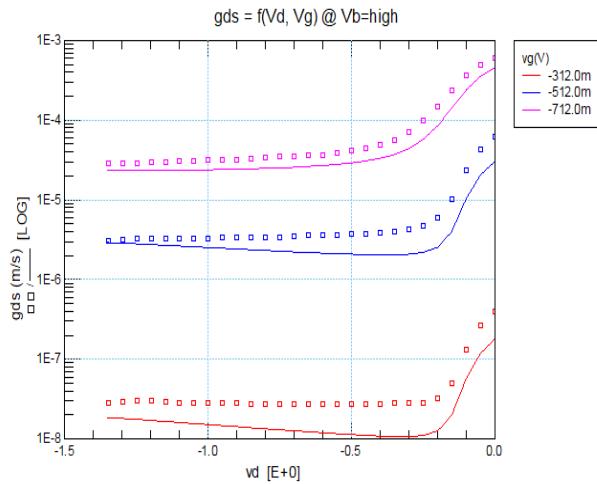
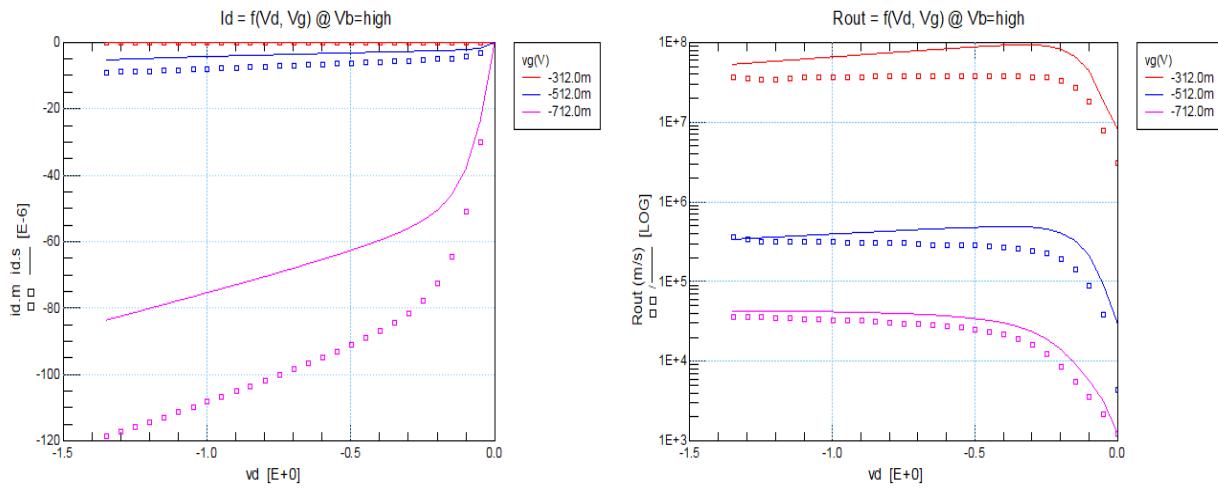


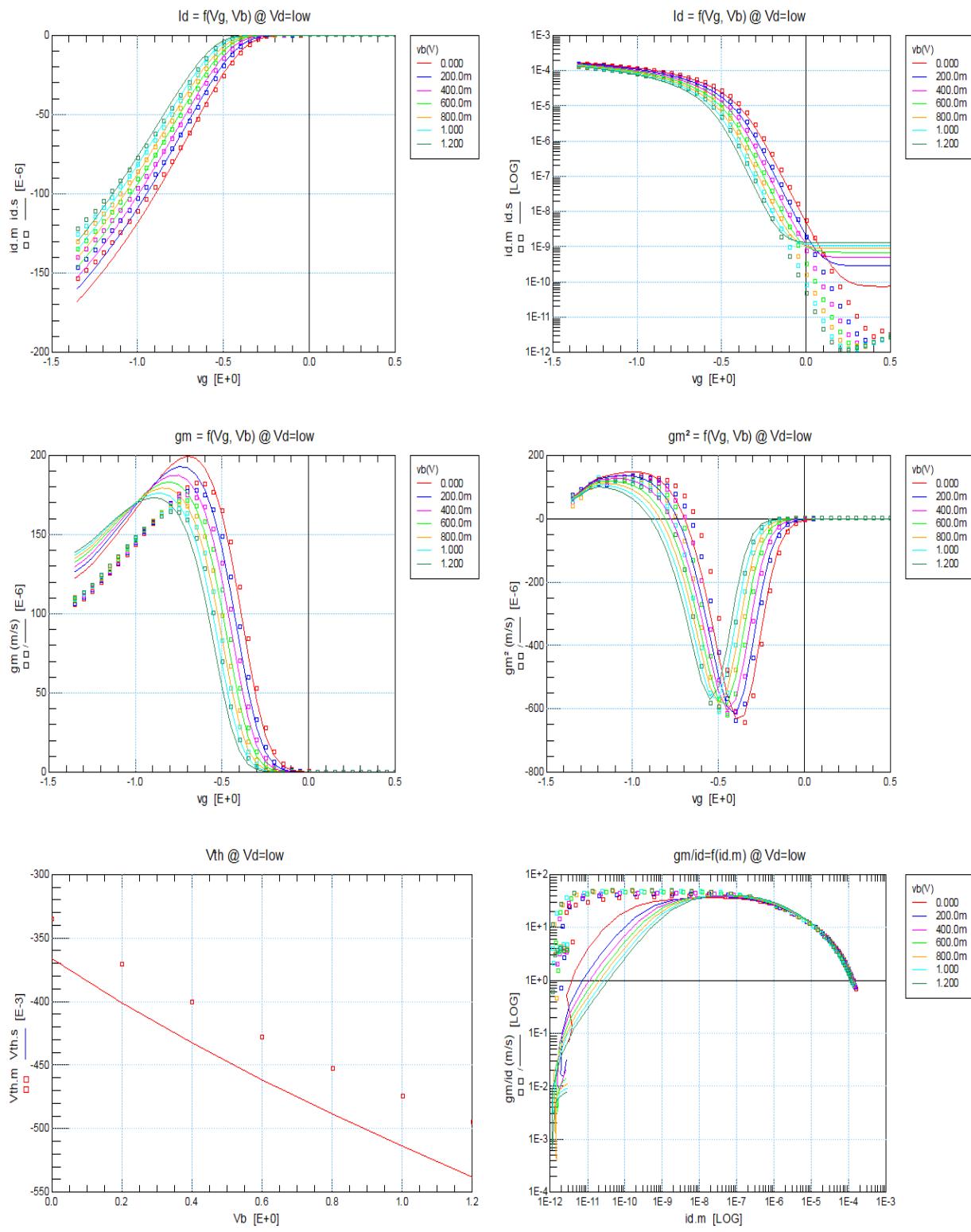
**idvg, Ib,Ig, Vb = 1.2V, T = 70°C**

**idvd, Vb = 0V, T = 70°C**


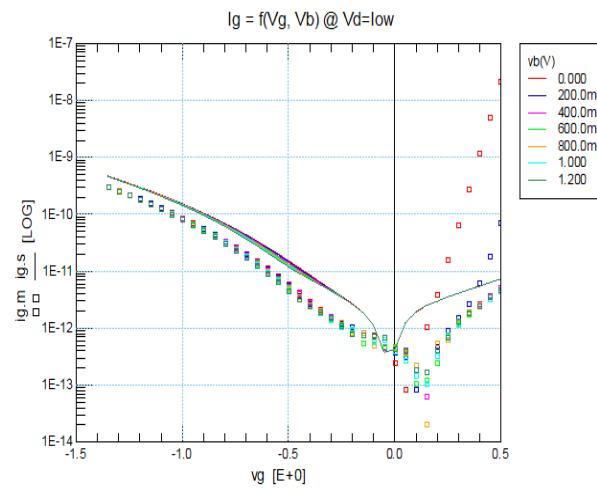
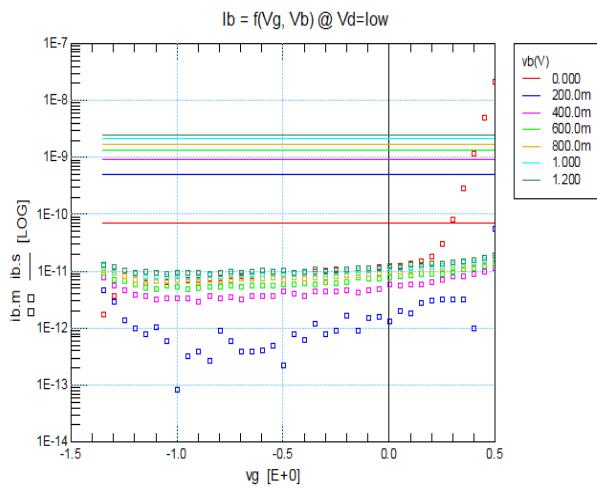
**idvd\_vbmin, Vb = 1.2V, T = 70°C****idvd\_vth, Vb = 0V, T = 70°C**



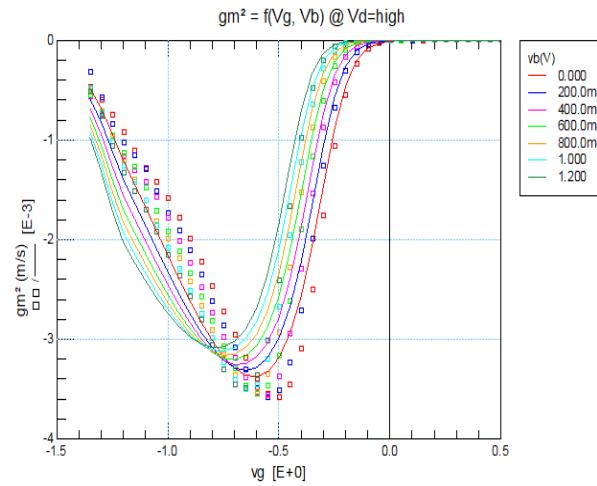
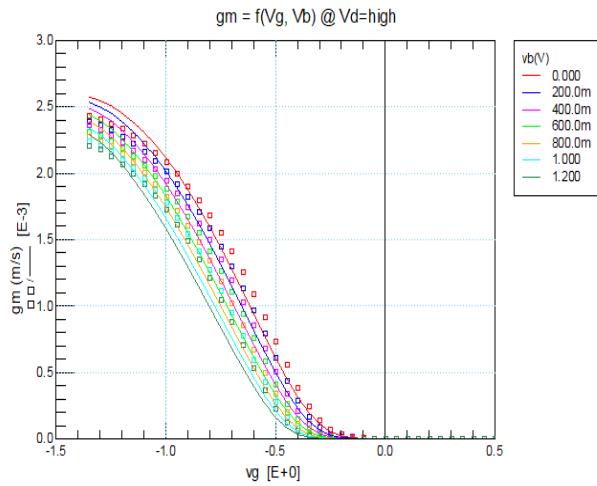
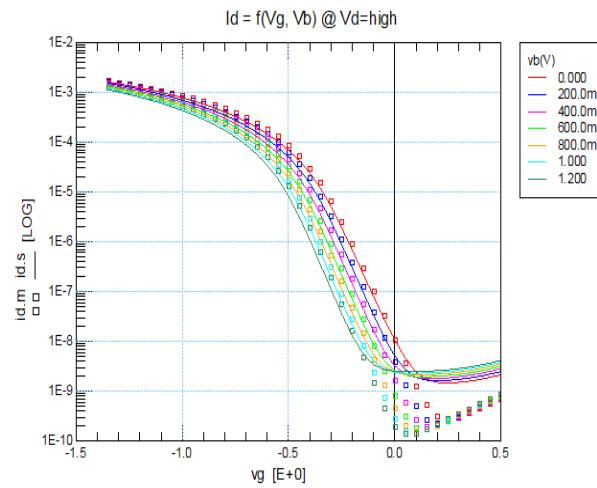
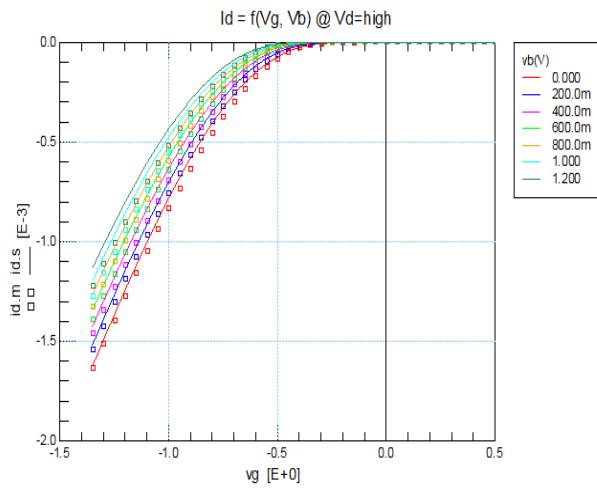
### idvd\_vth\_vbmin, Vb = 1.2V, T = 70°C

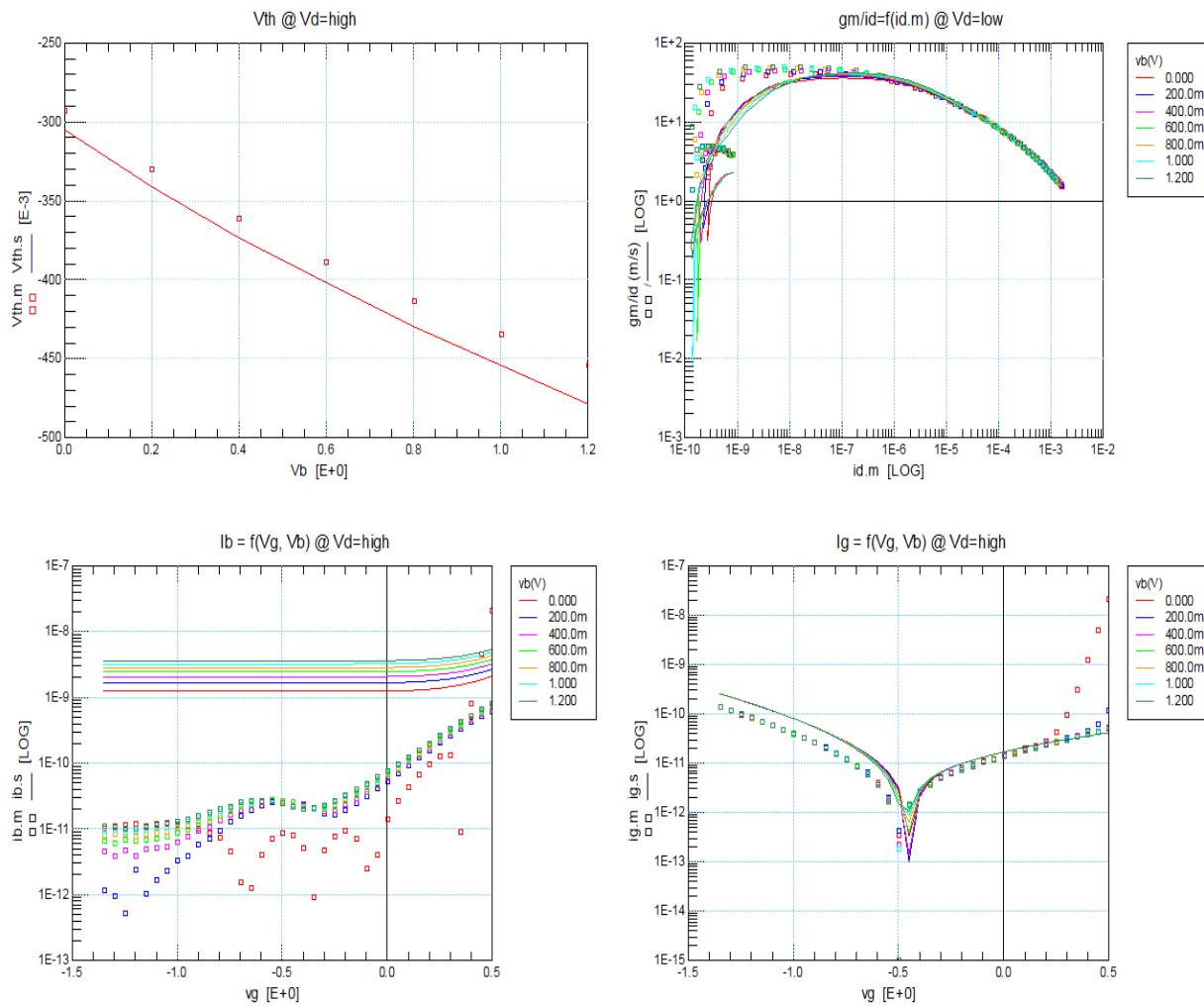


**idvg, Vd = -0.05V, T = 125°C**


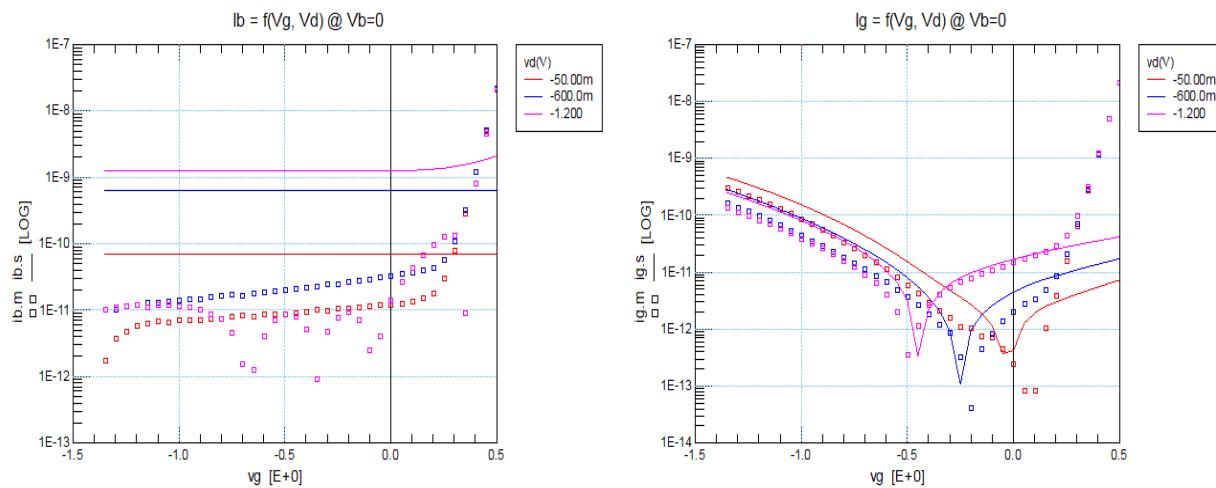


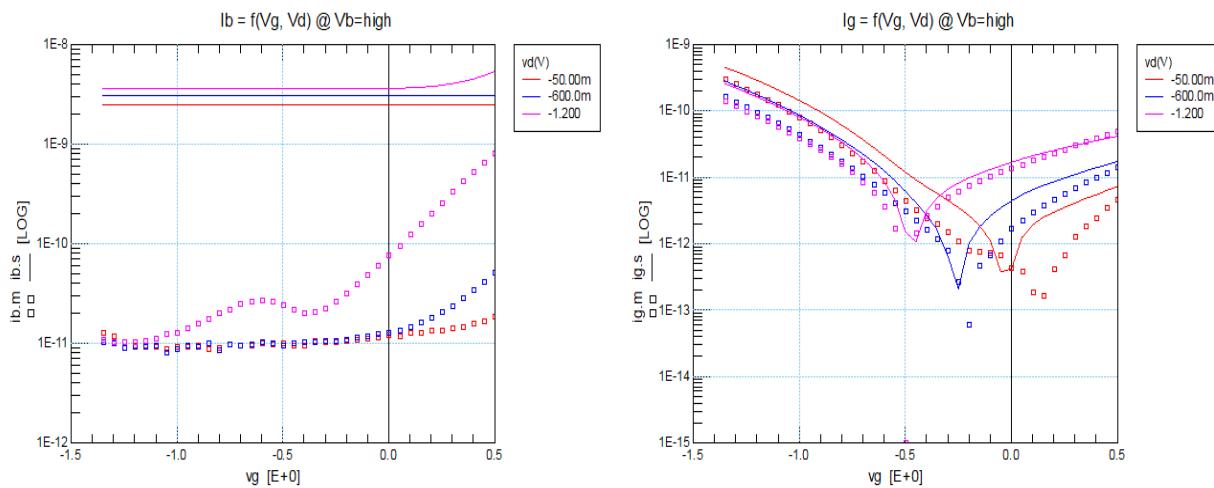
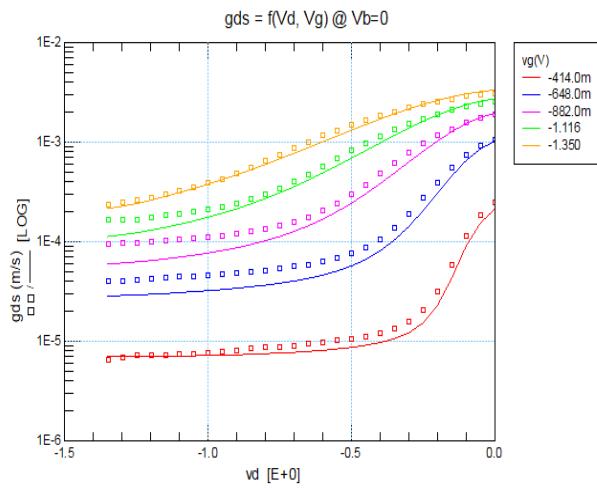
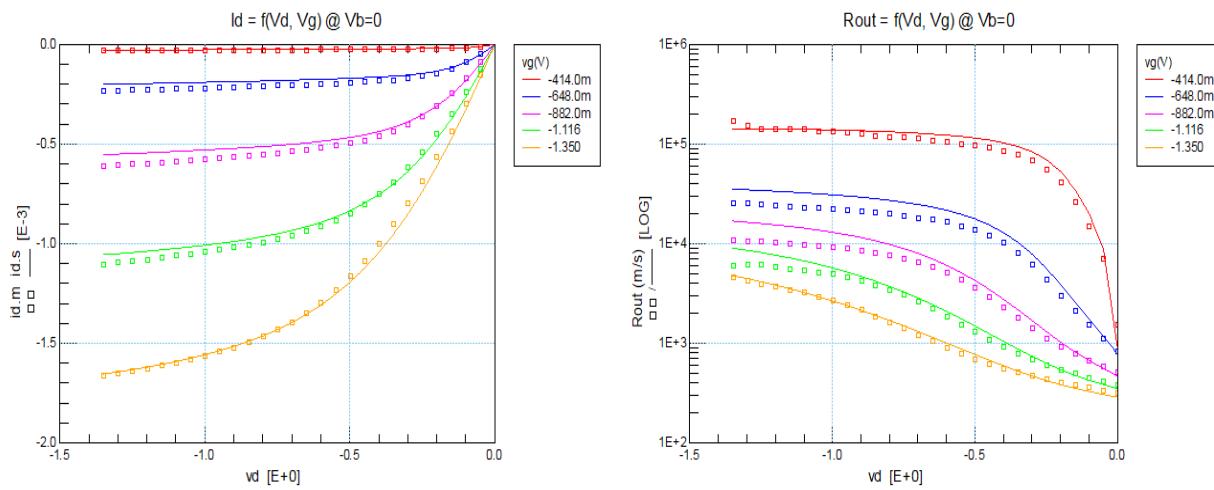
$i_d v_g, V_d = -1.2V, T = 125^\circ C$

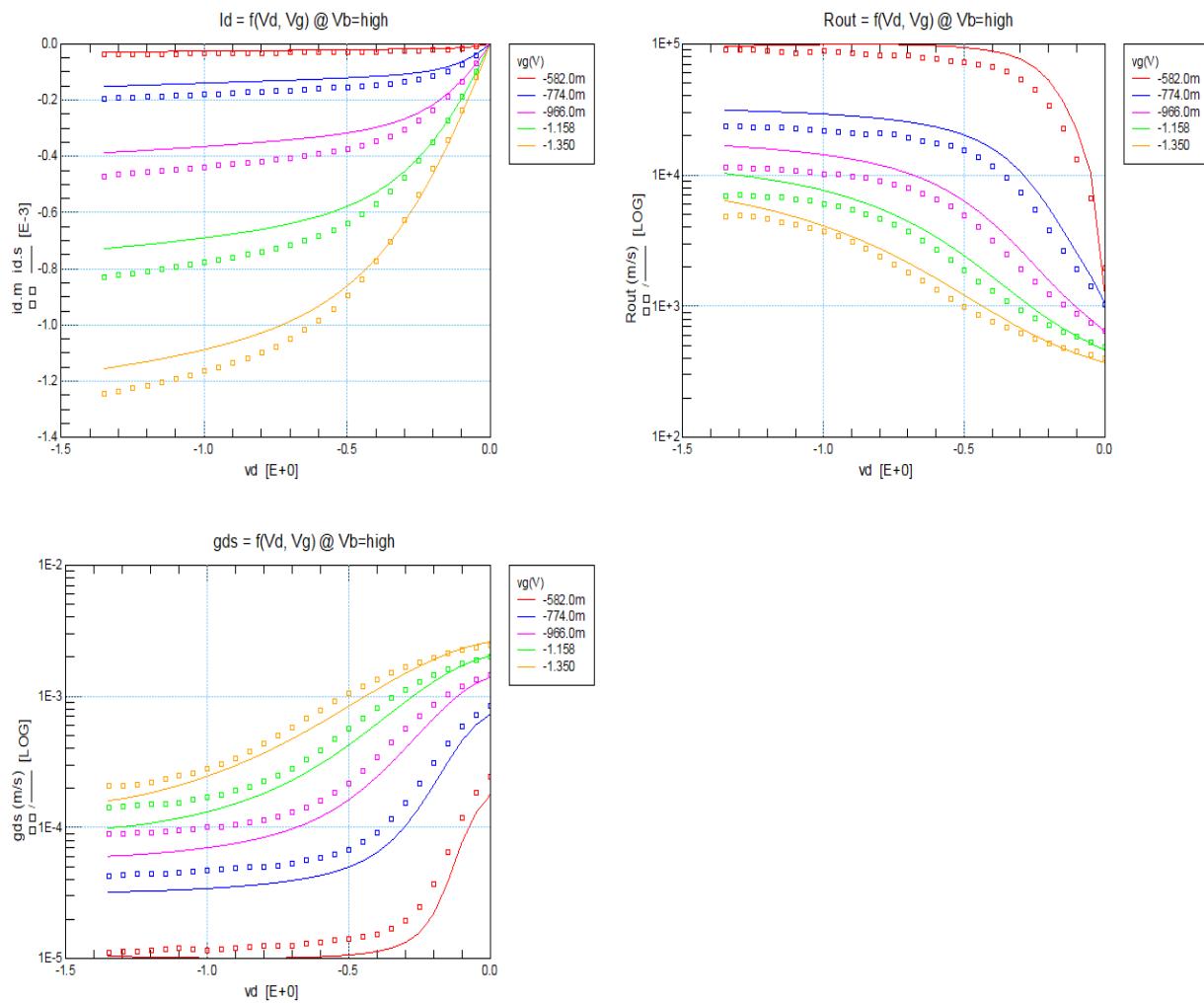
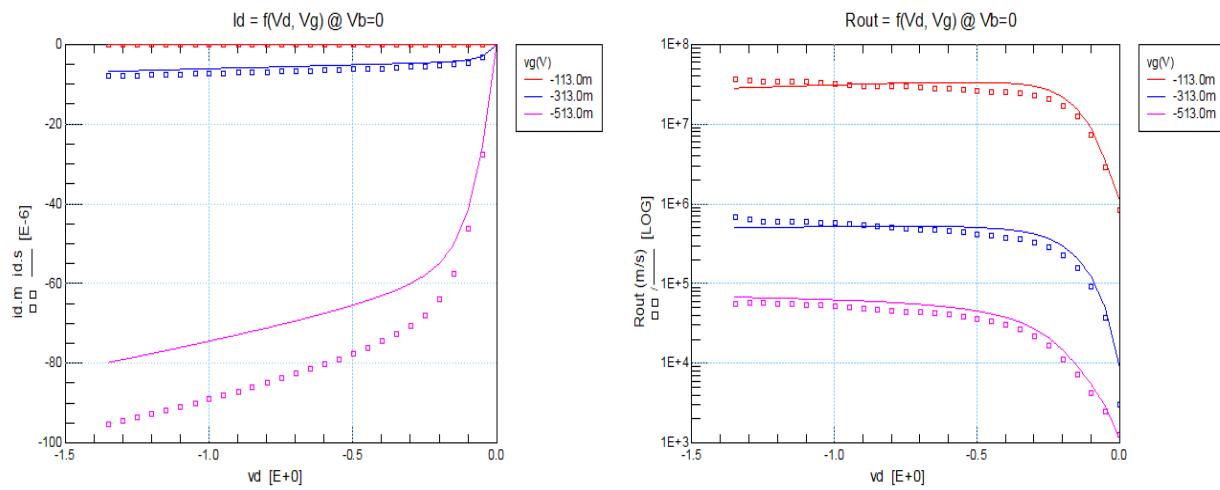


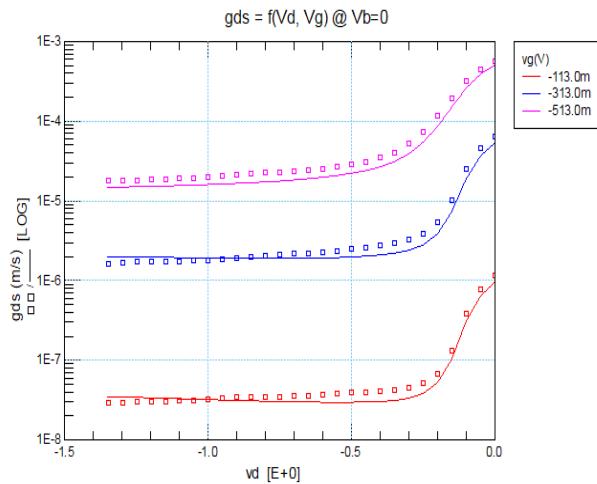


**$idvg, I_b, Ig, V_b = 0V, T = 125^\circ C$**

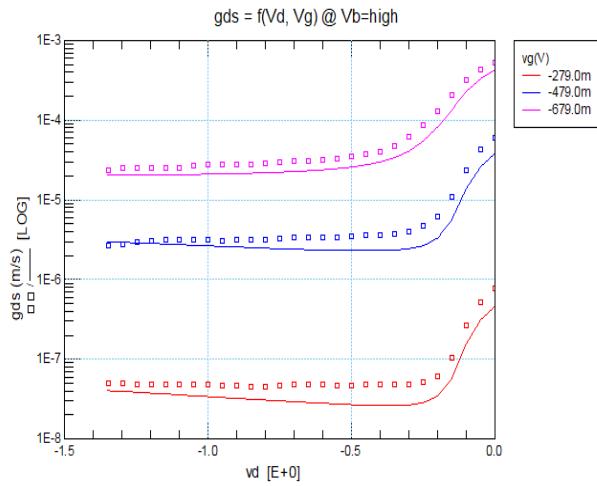
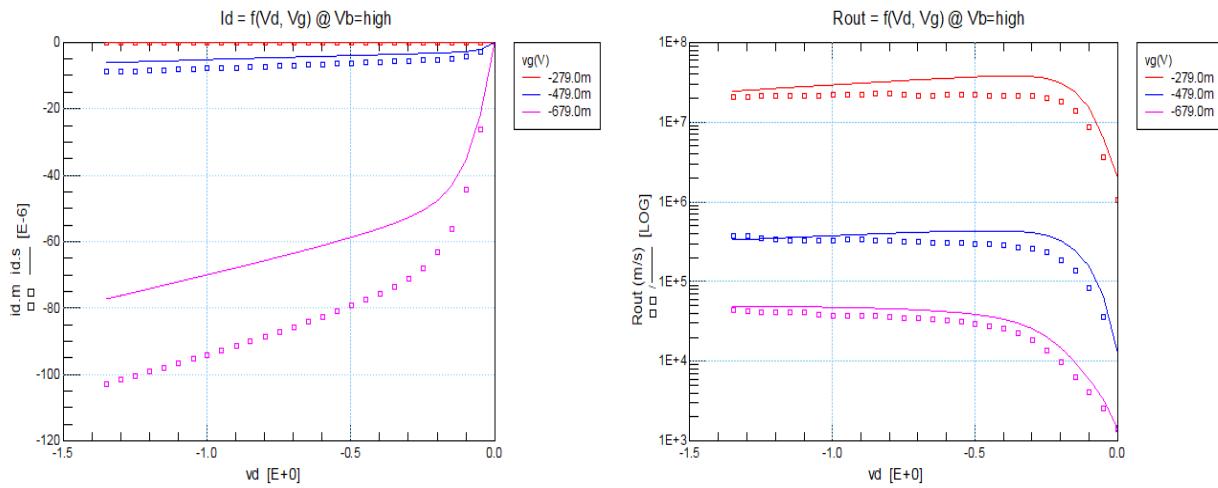


**idvg, Ib,Ig, Vb = 1.2V, T = 125°C**

**idvd, Vb = 0V, T = 125°C**


**idvd\_vbmin, Vb = 1.2V, T = 125°C****idvd\_vth, Vb = 0V, T = 125°C**

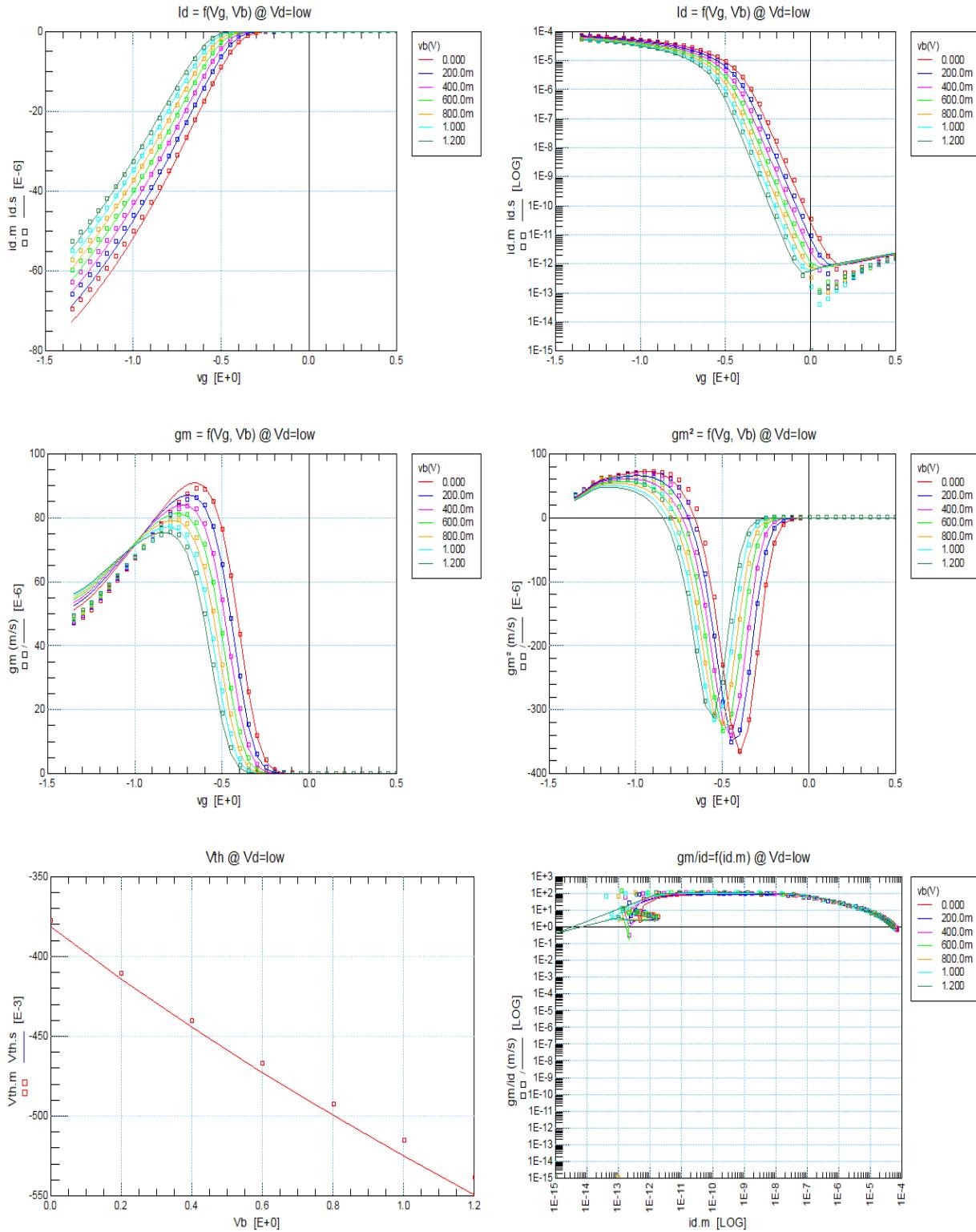


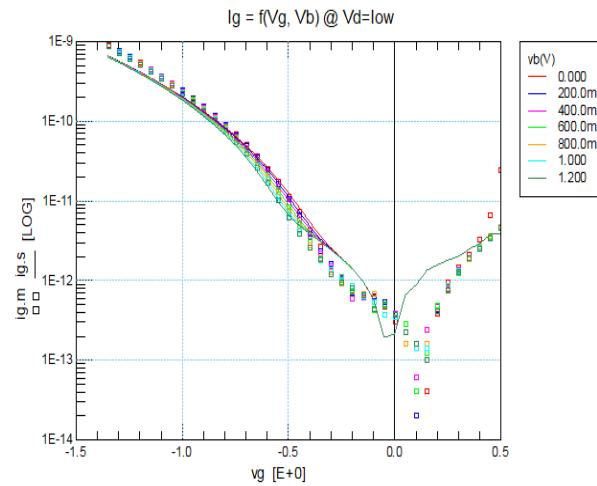
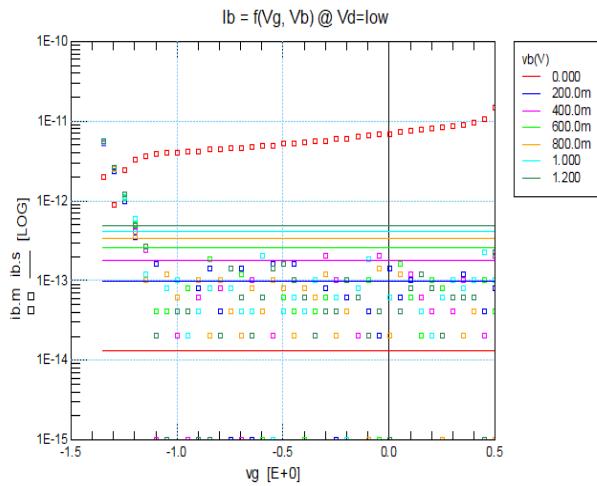
**idvd\_vth\_vbmin, Vb = 1.2V, T = 125°C**



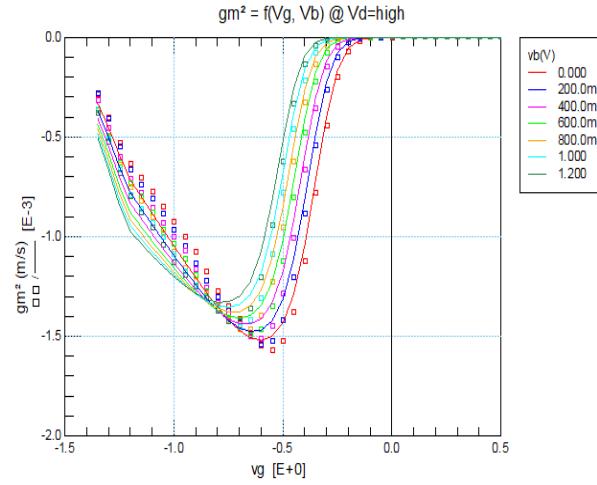
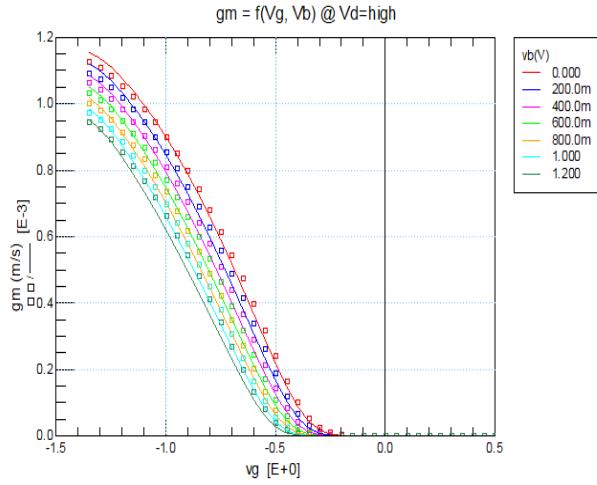
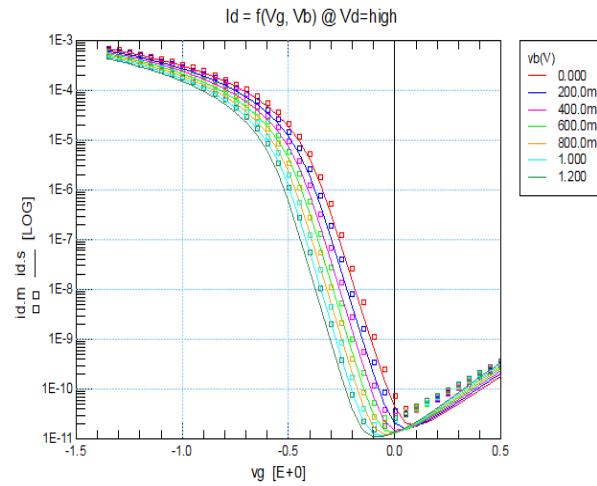
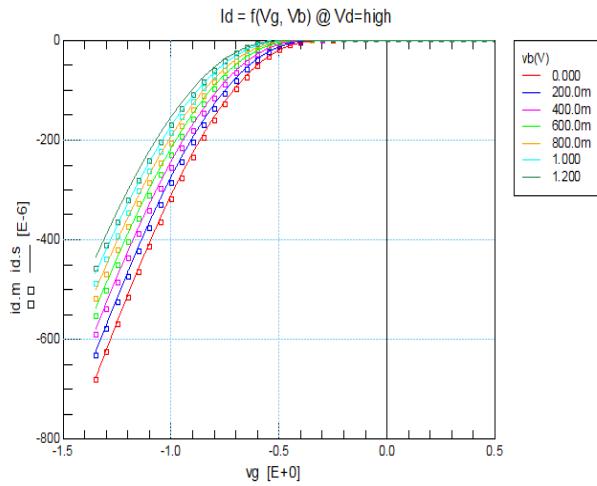
## 4.8 W10u0\_L0u5\_S549\_1

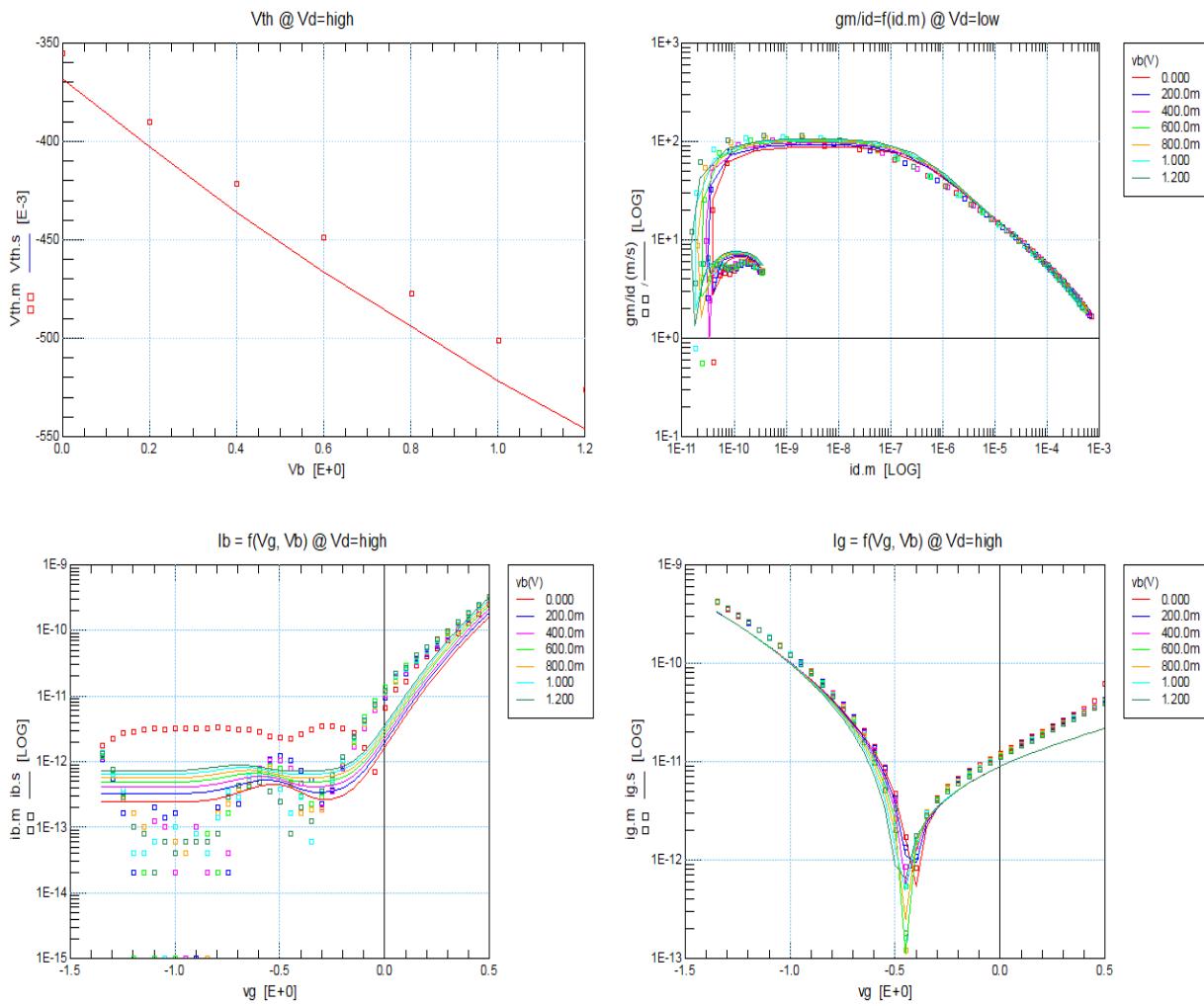
$id_{vg}$ ,  $V_d = -0.05V$ ,  $T = 27^\circ C$



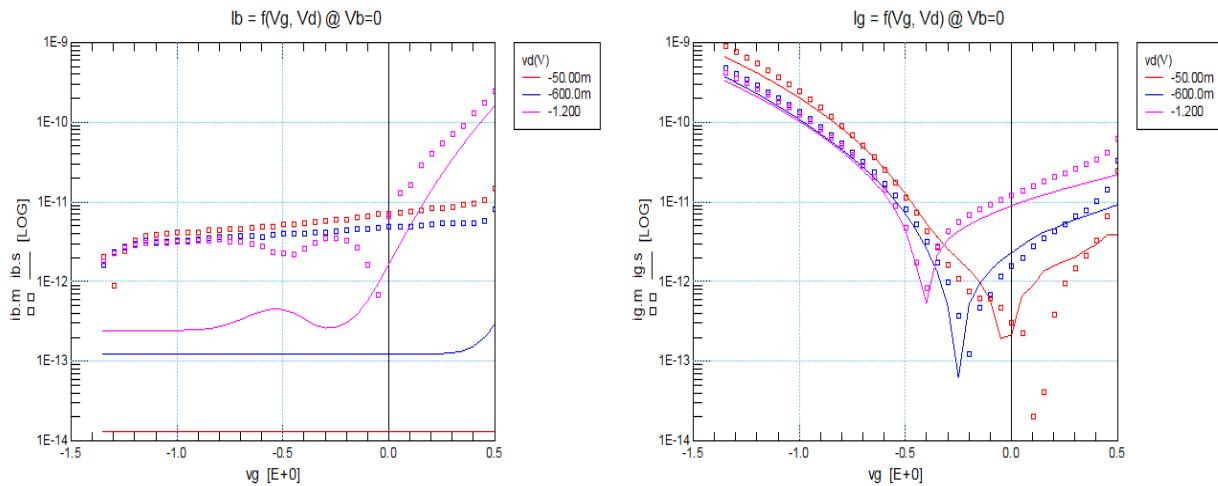


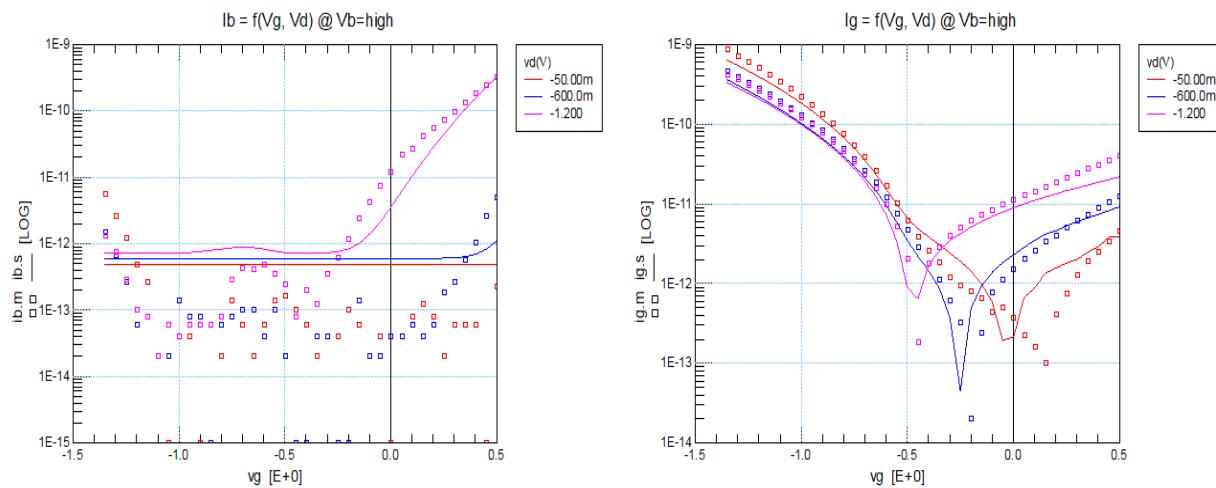
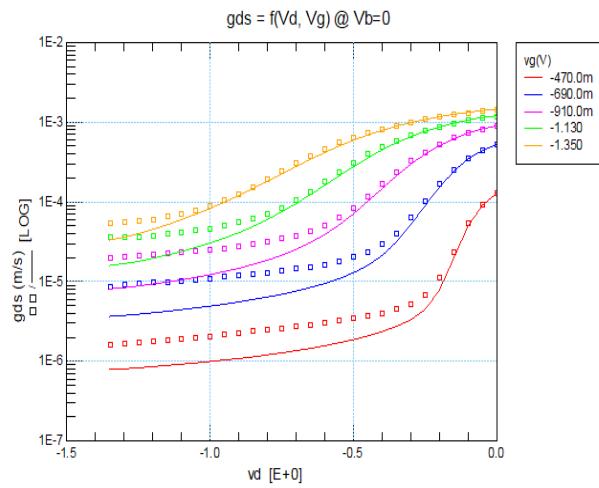
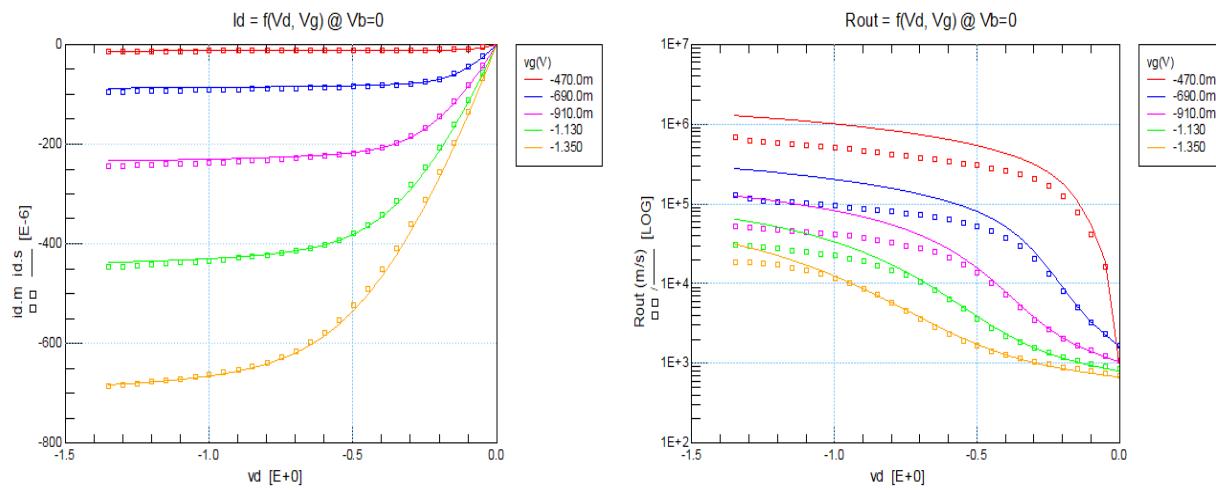
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

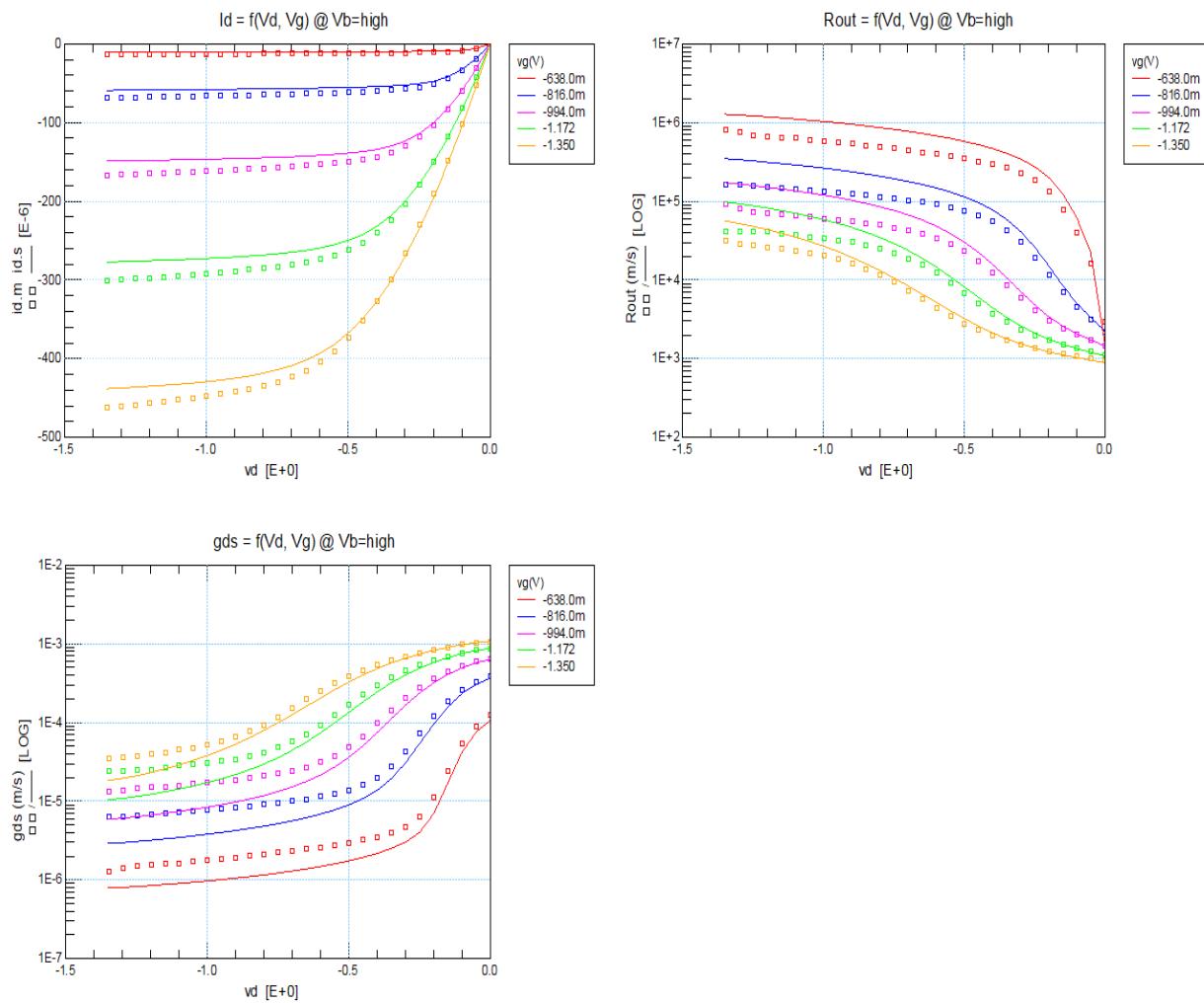
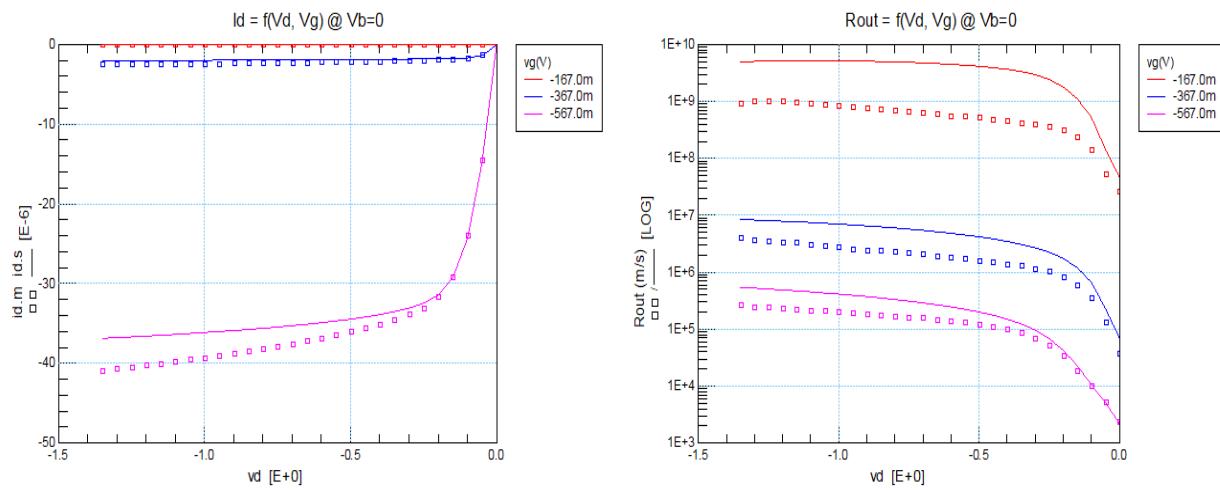


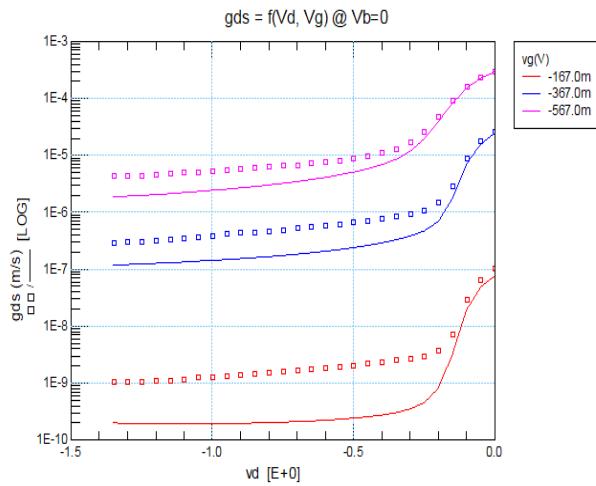


### $i_{dvg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

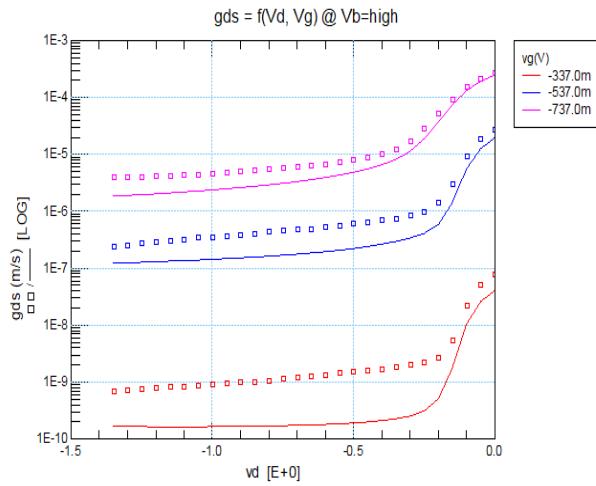
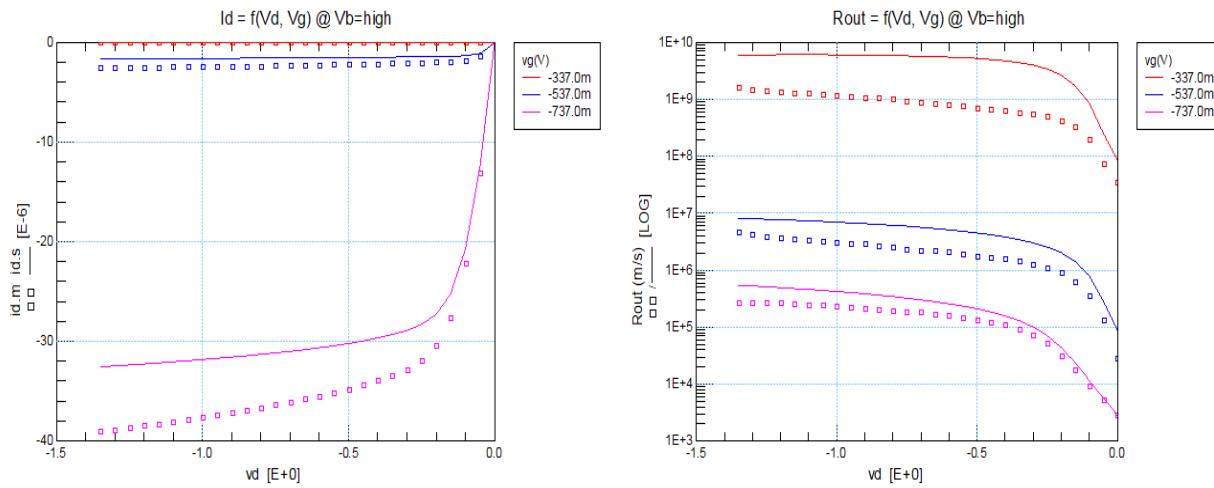


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**


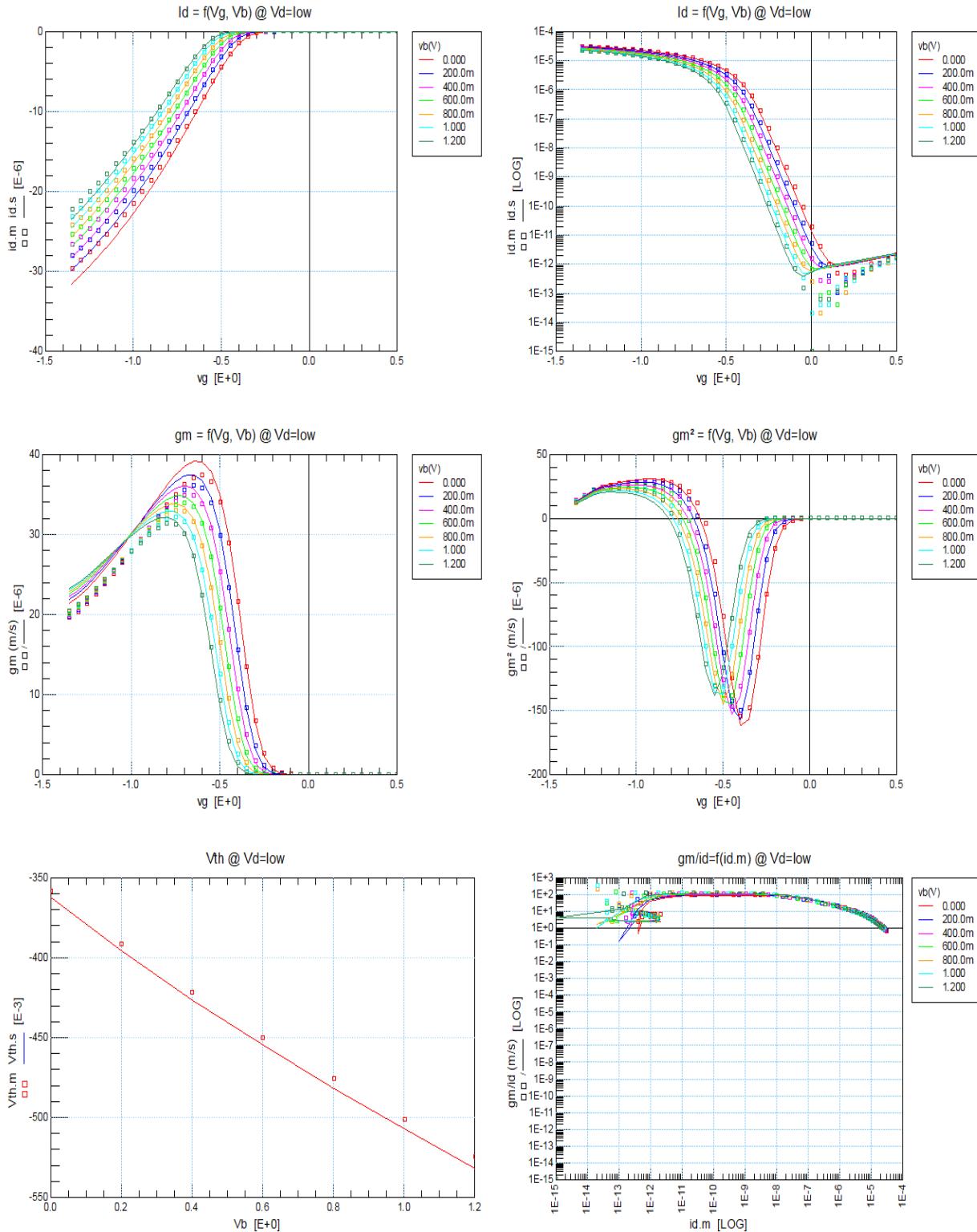


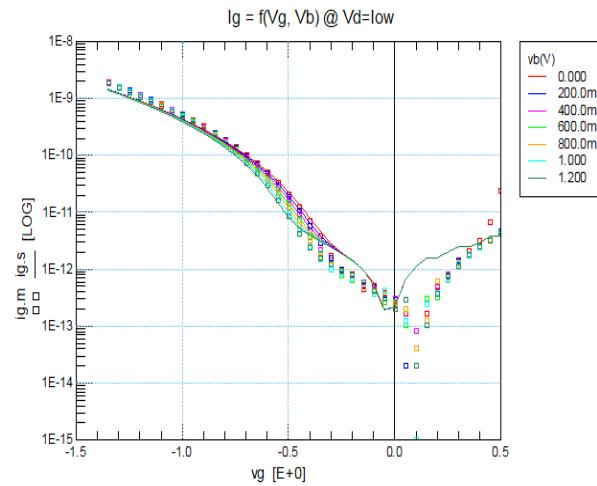
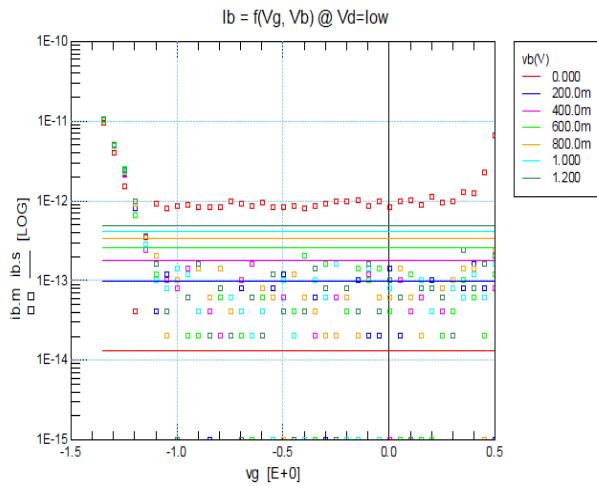
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



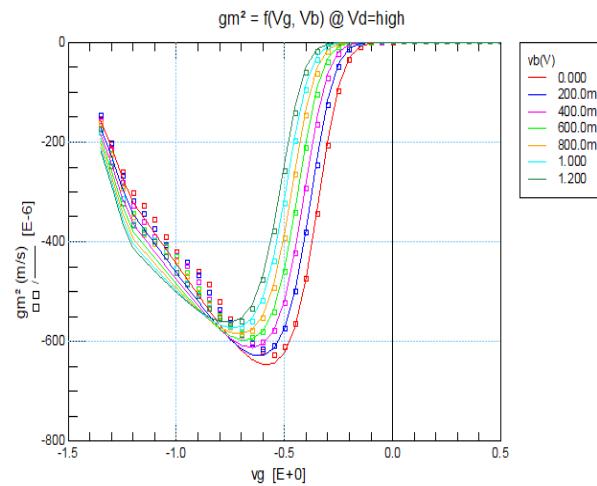
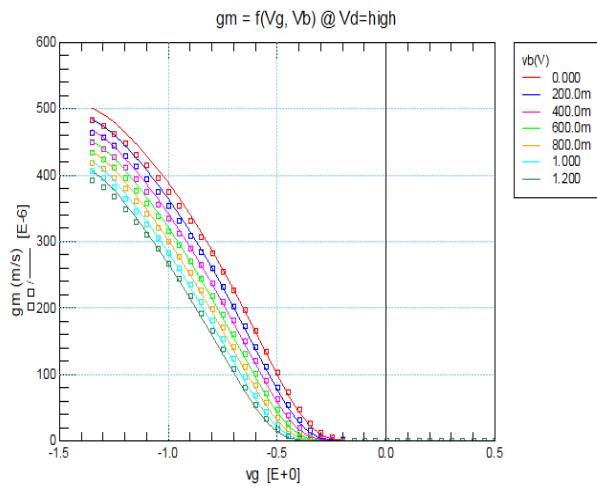
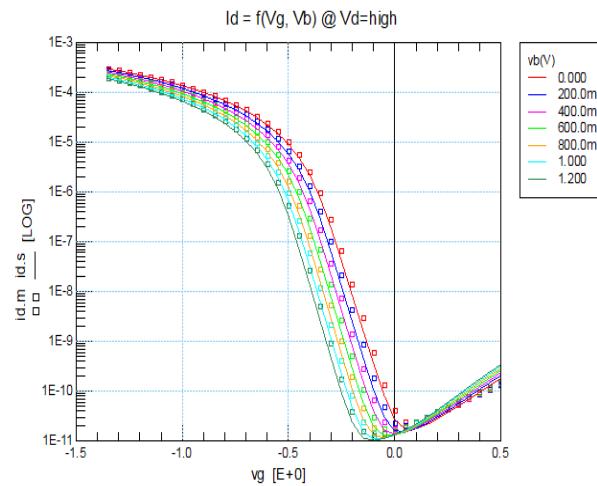
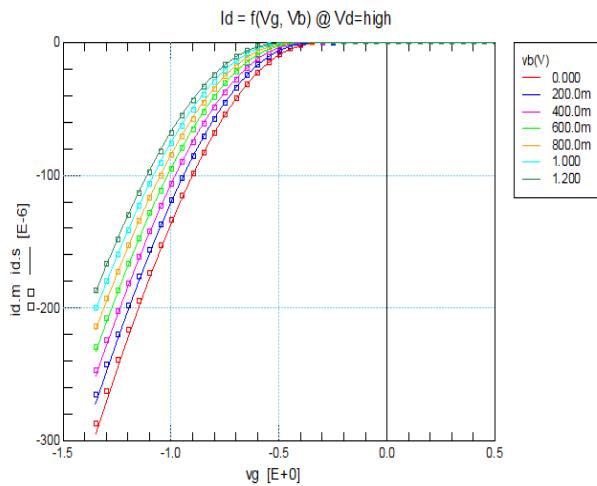
## 4.9 W10u0\_L1u2\_S549\_2

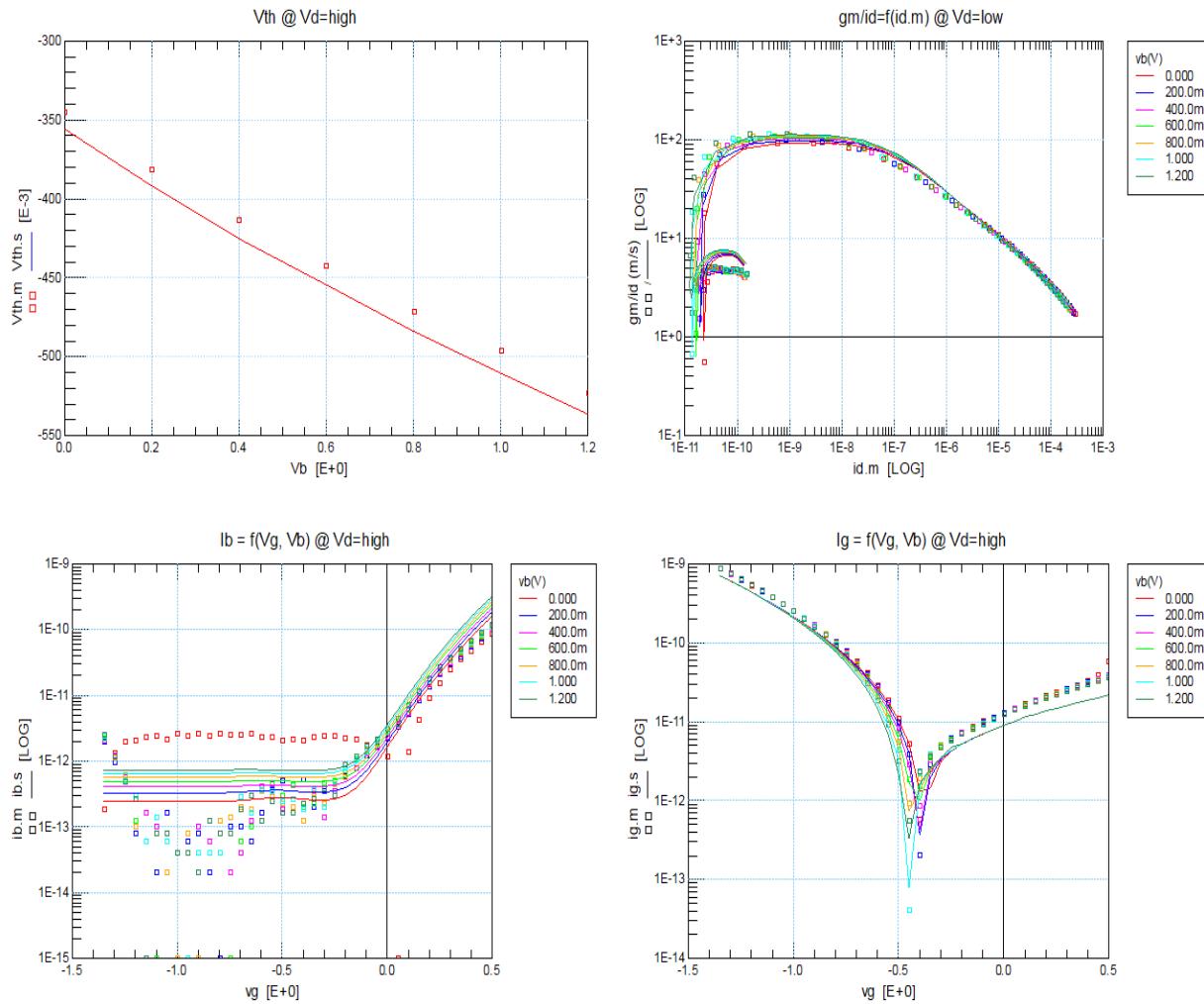
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



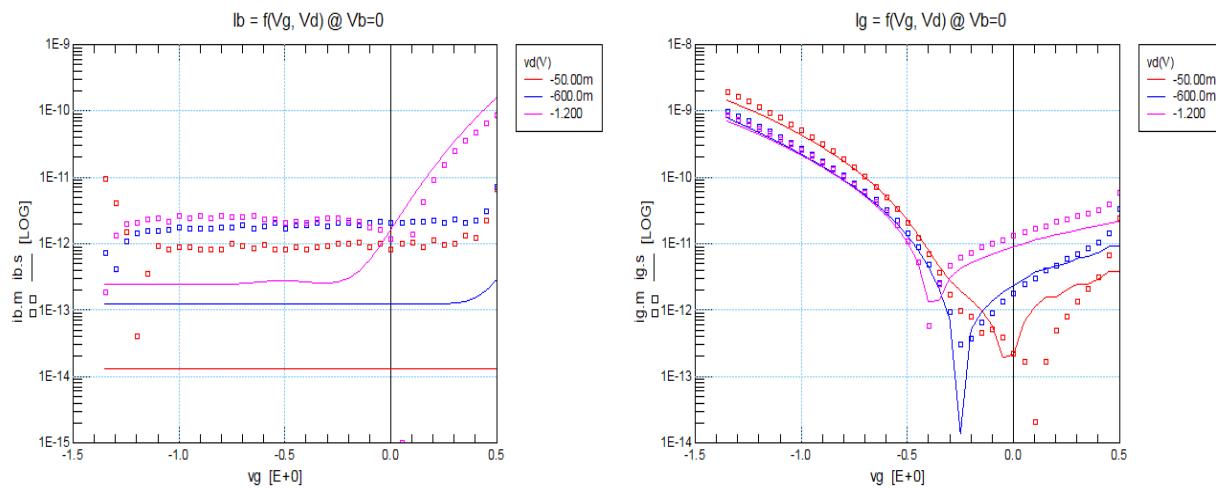


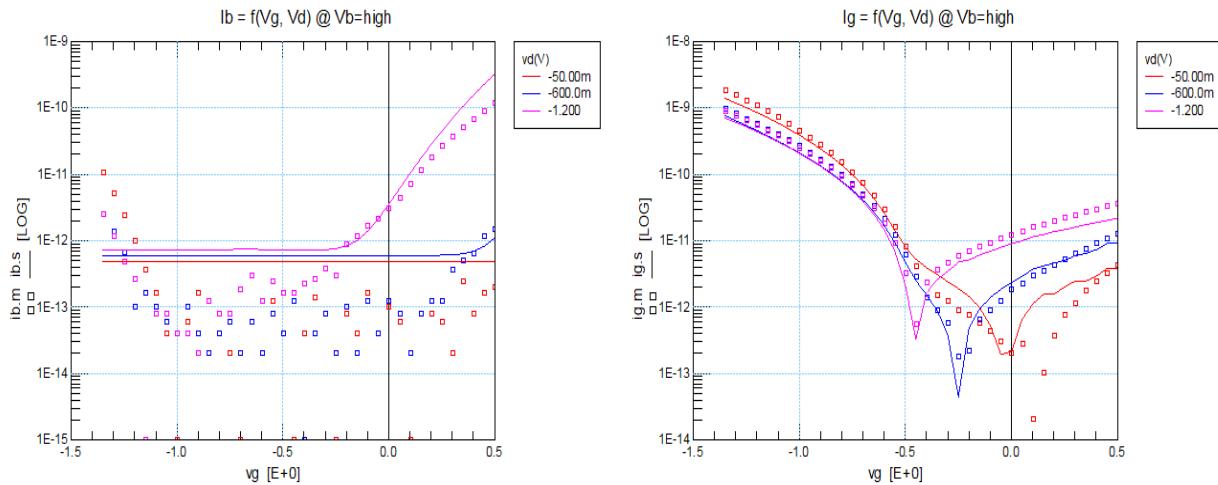
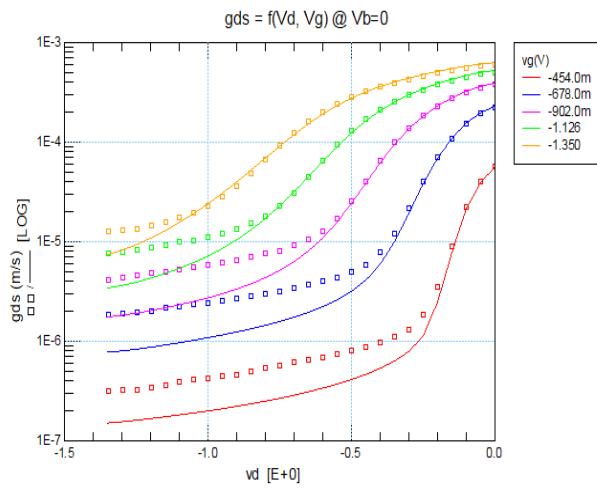
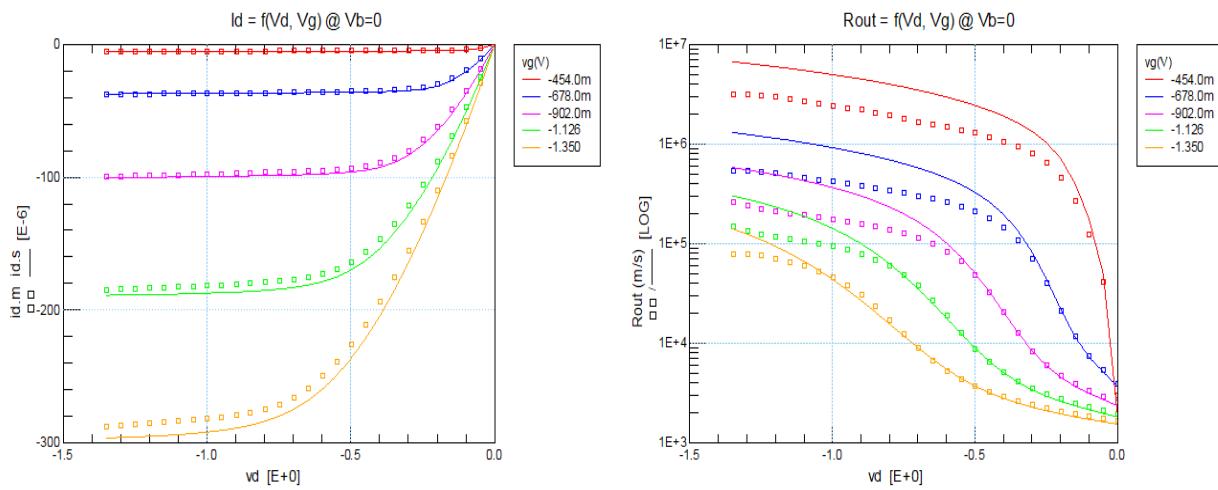
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

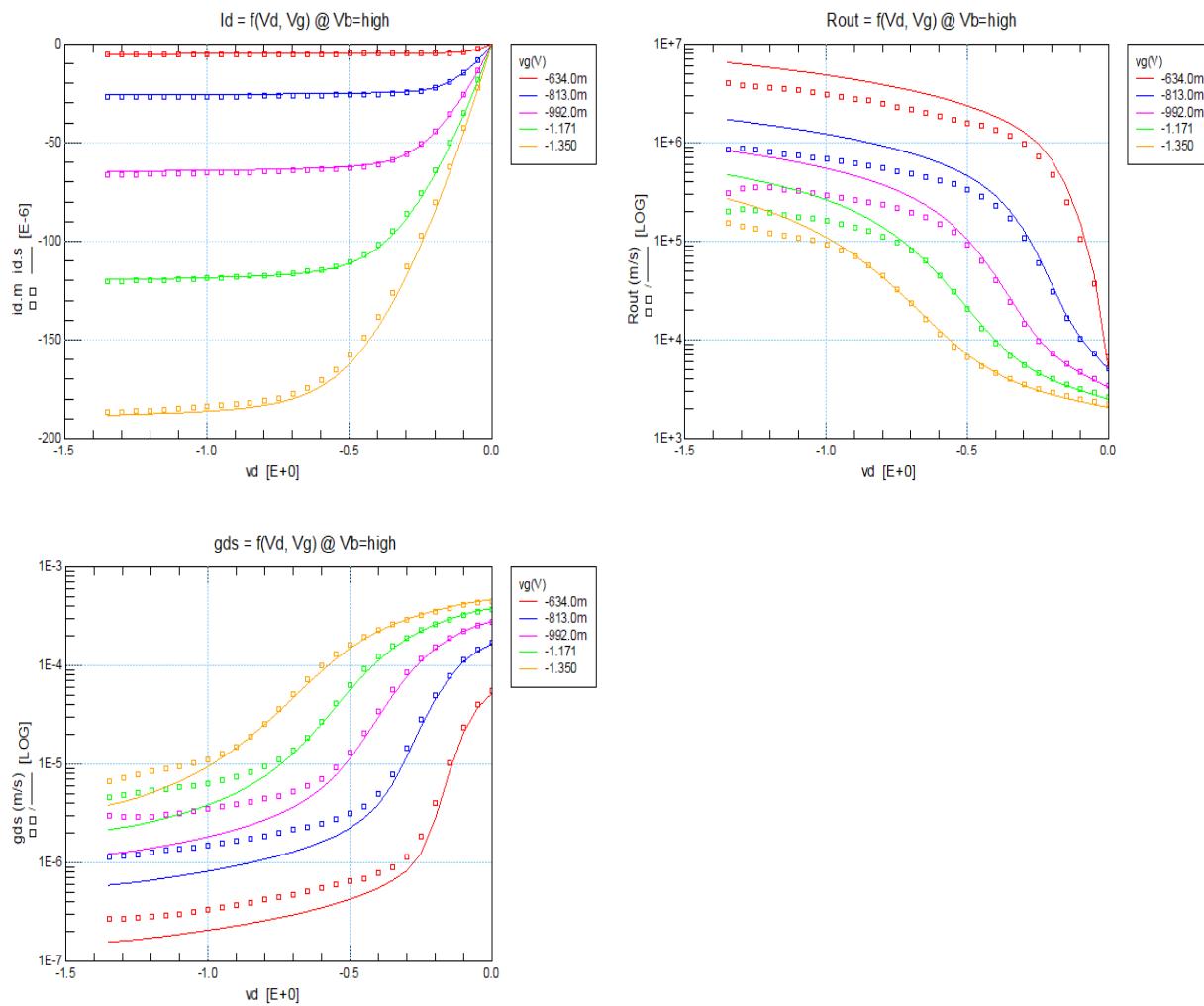
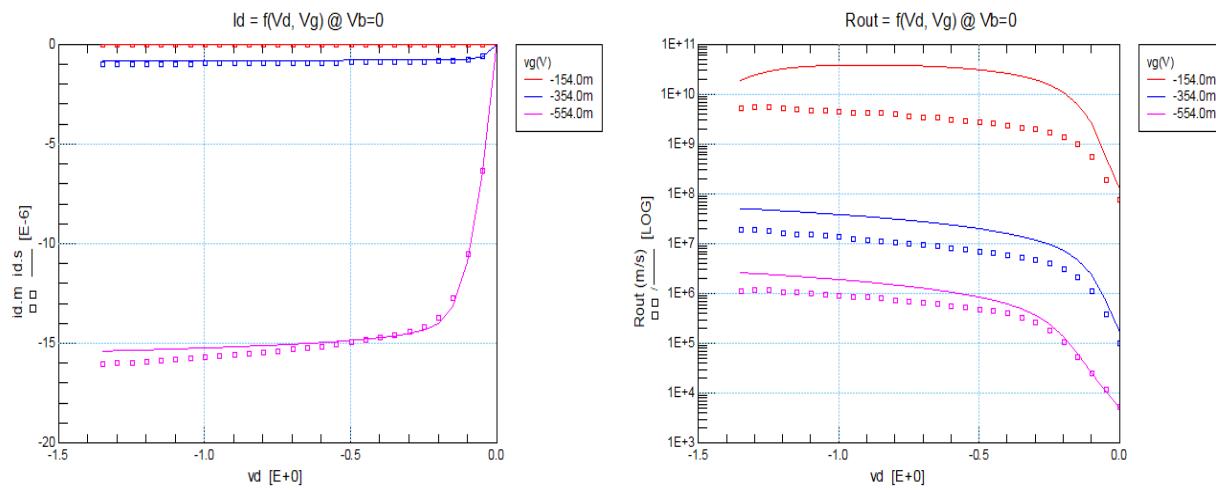


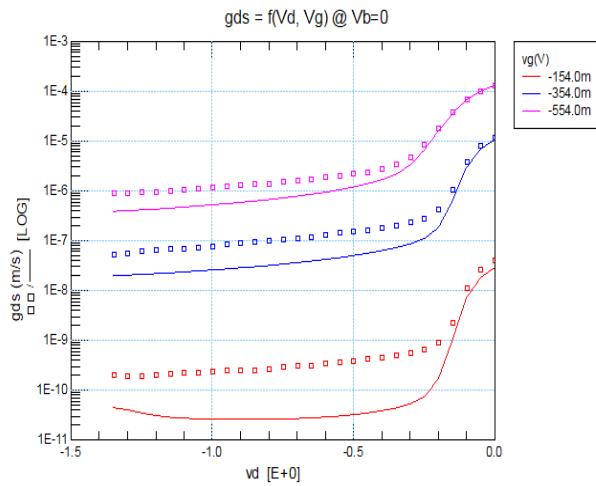


### idvg, Ib,Ig, Vb = 0V, T = 27°C

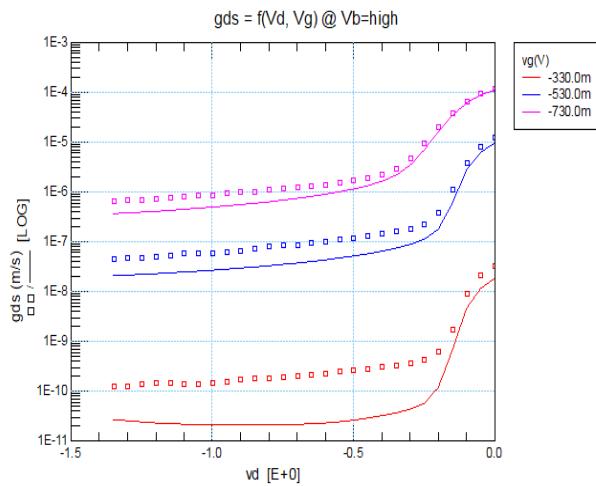
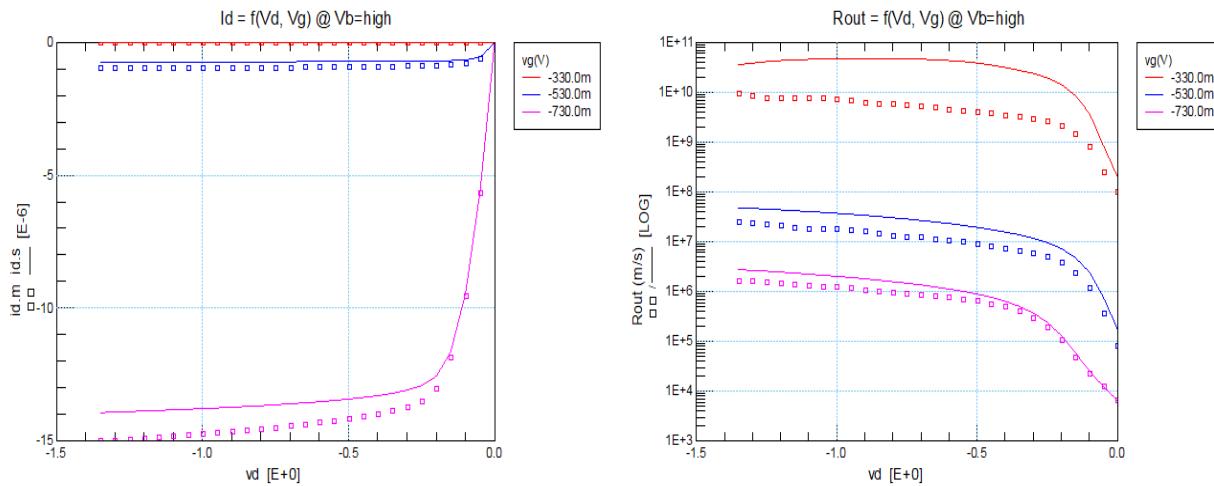


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

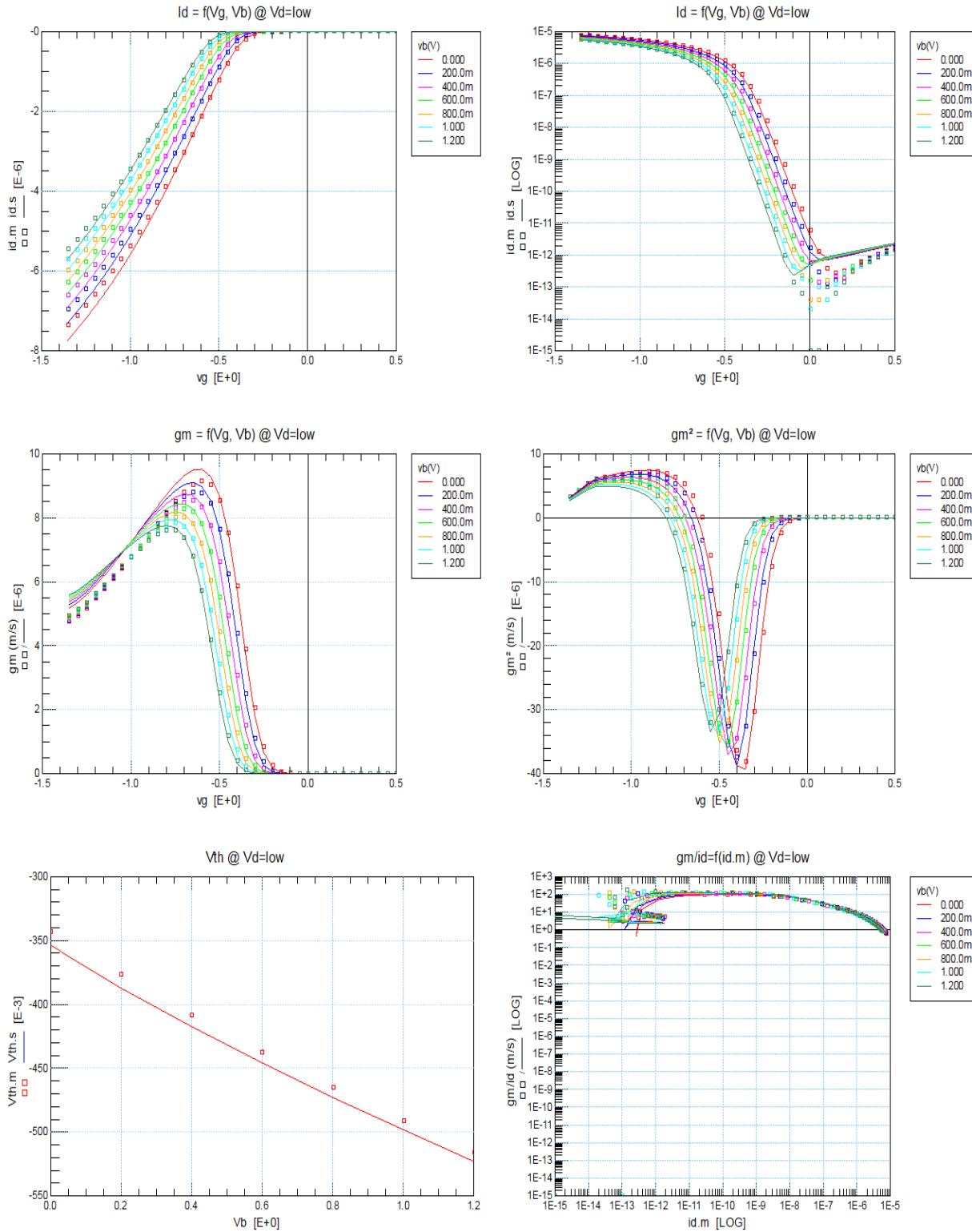


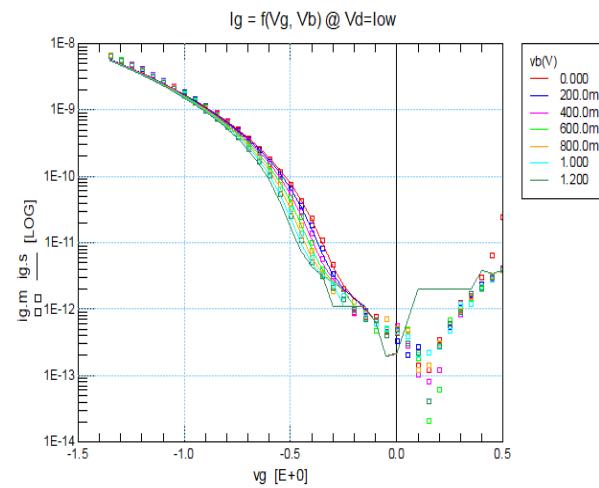
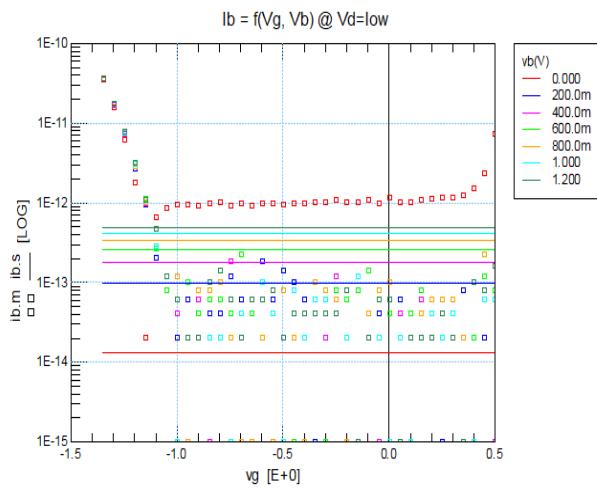
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



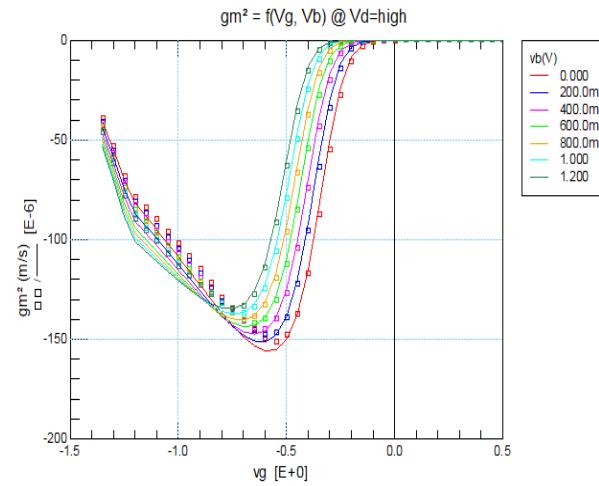
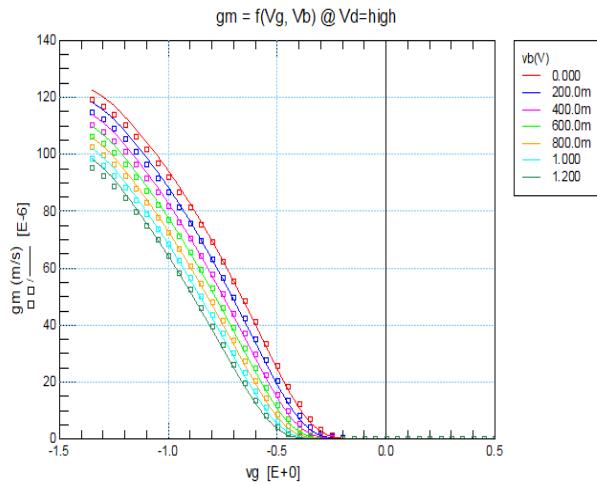
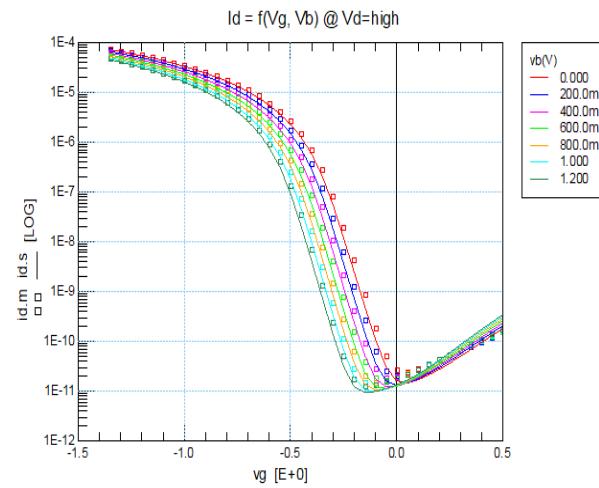
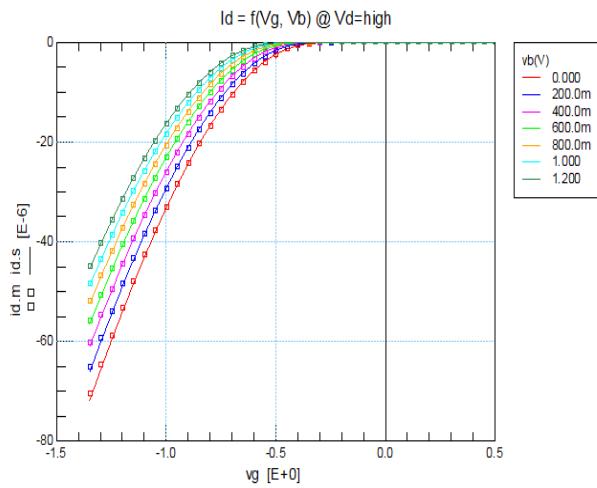
## 4.10W10u0\_L5u0\_S549\_4

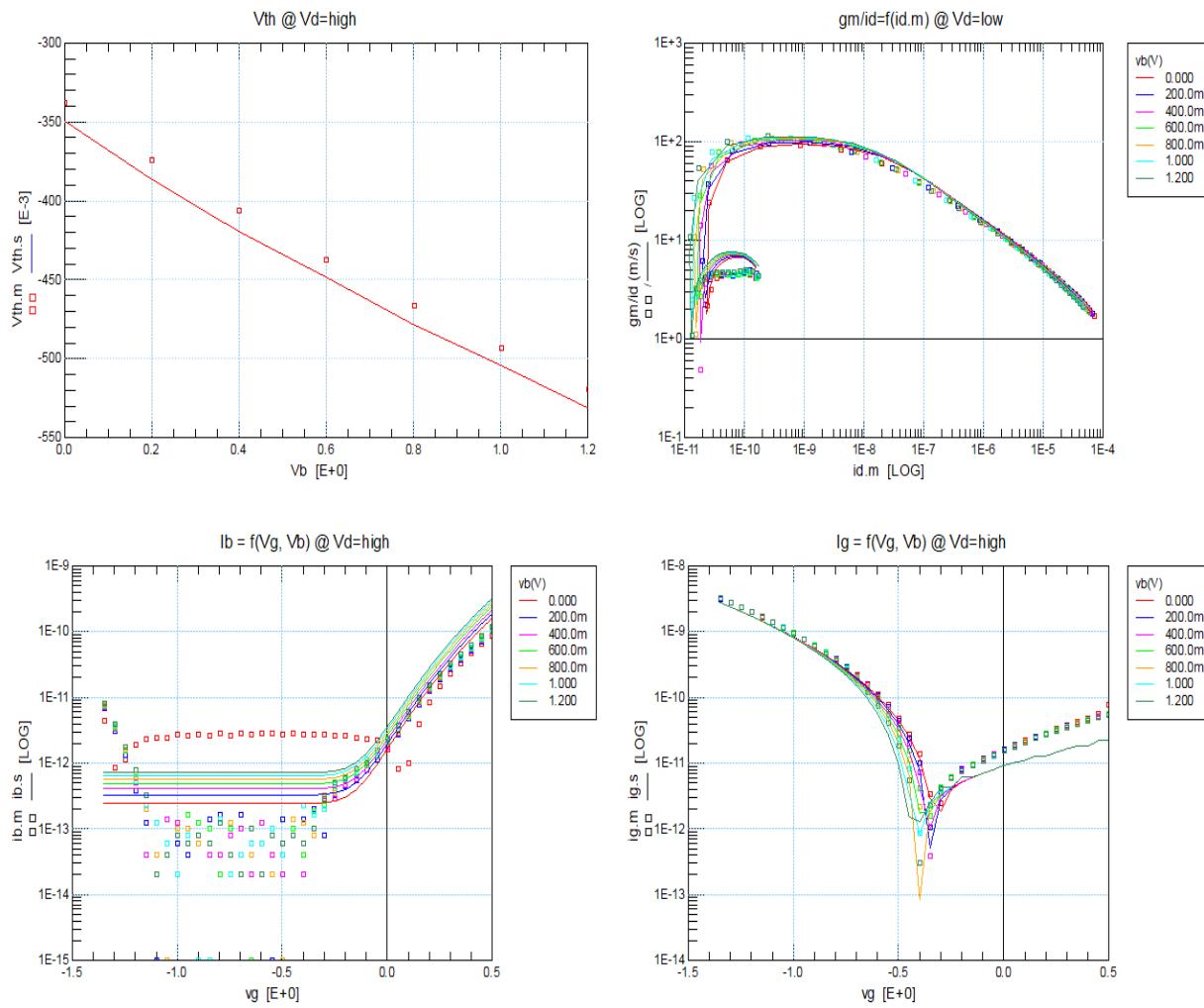
$id_{vg}$ ,  $V_d = -0.05V$ ,  $T = 27^\circ C$



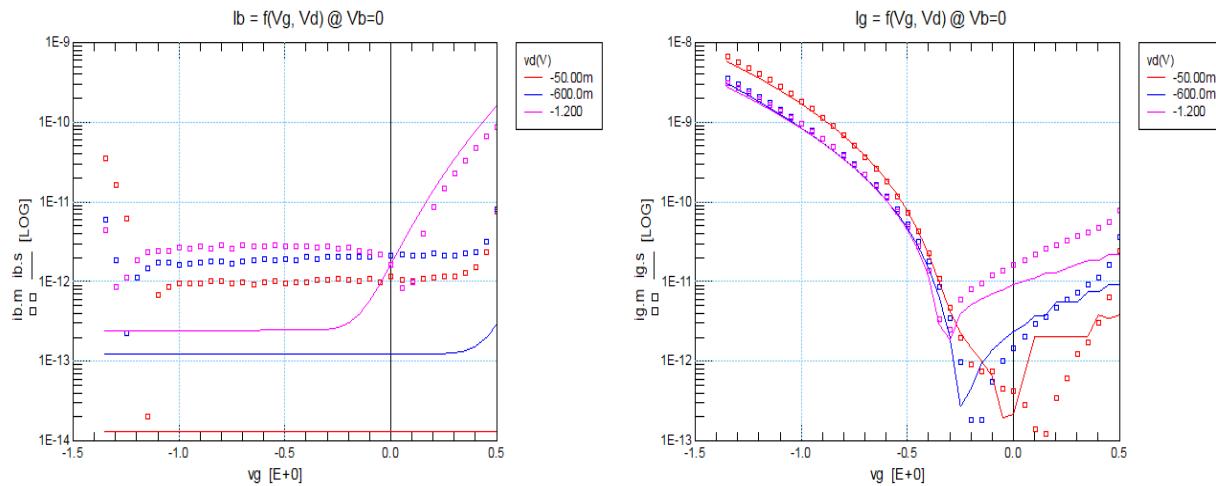


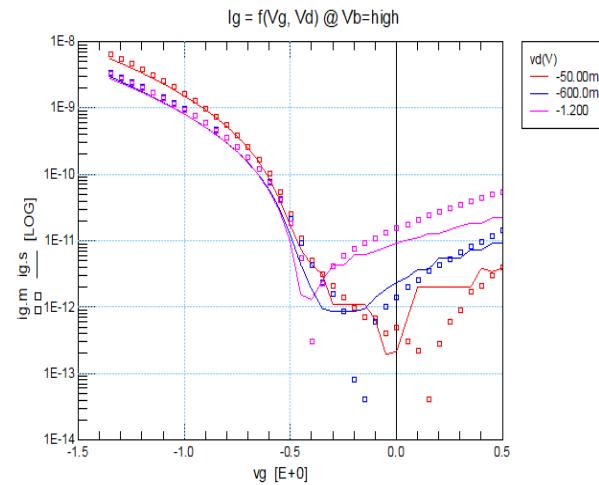
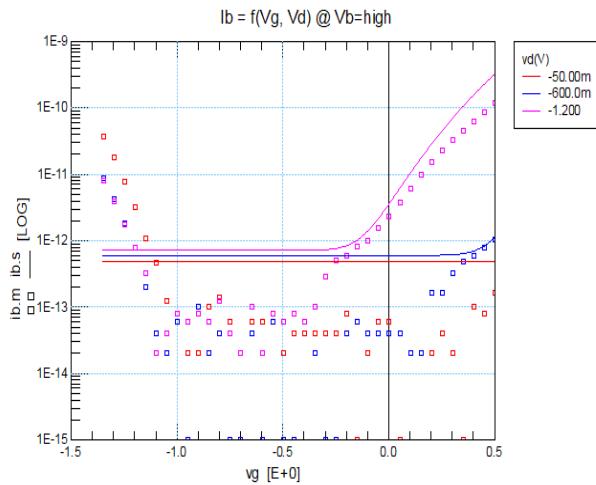
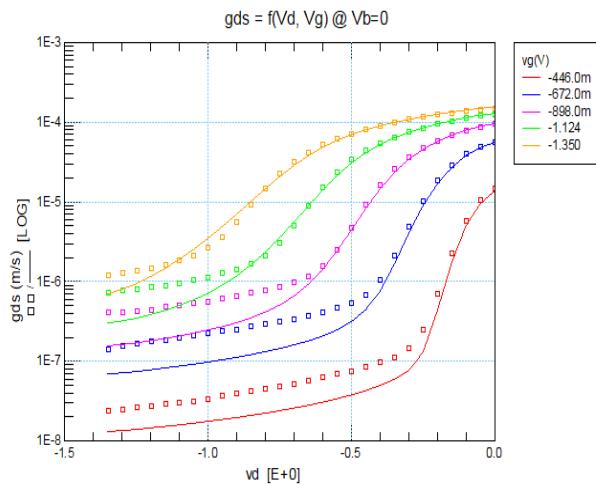
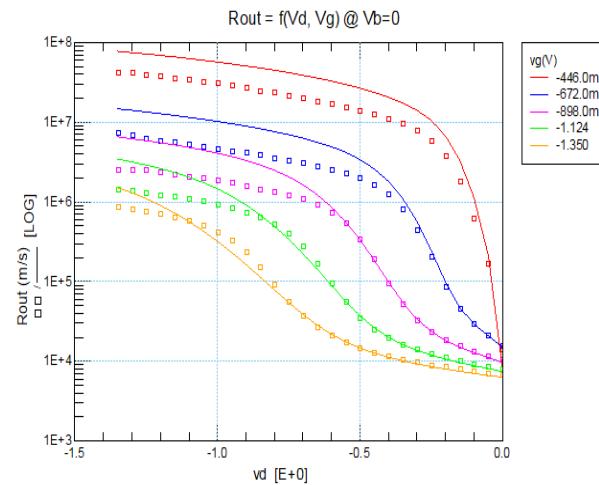
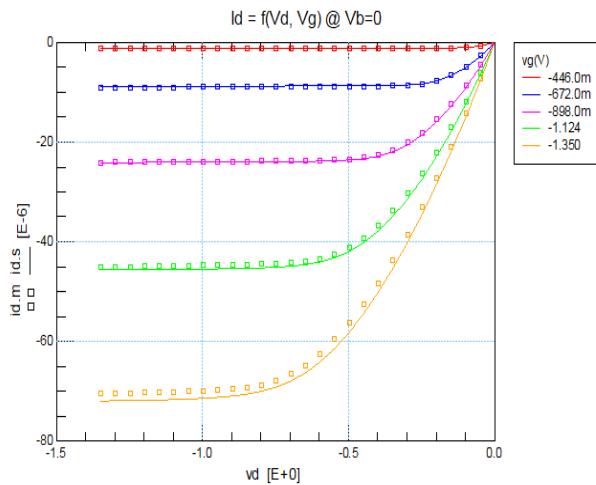
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

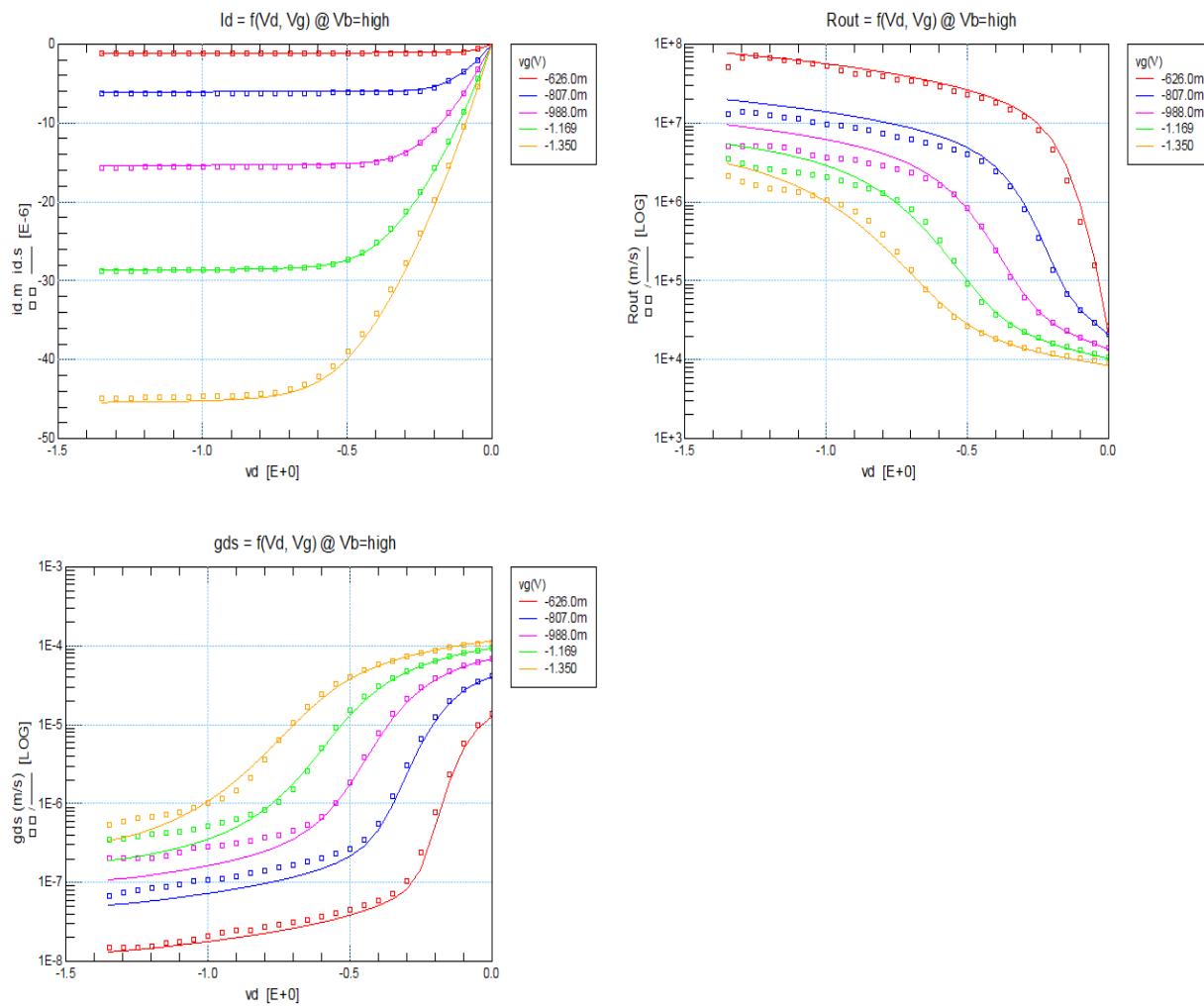
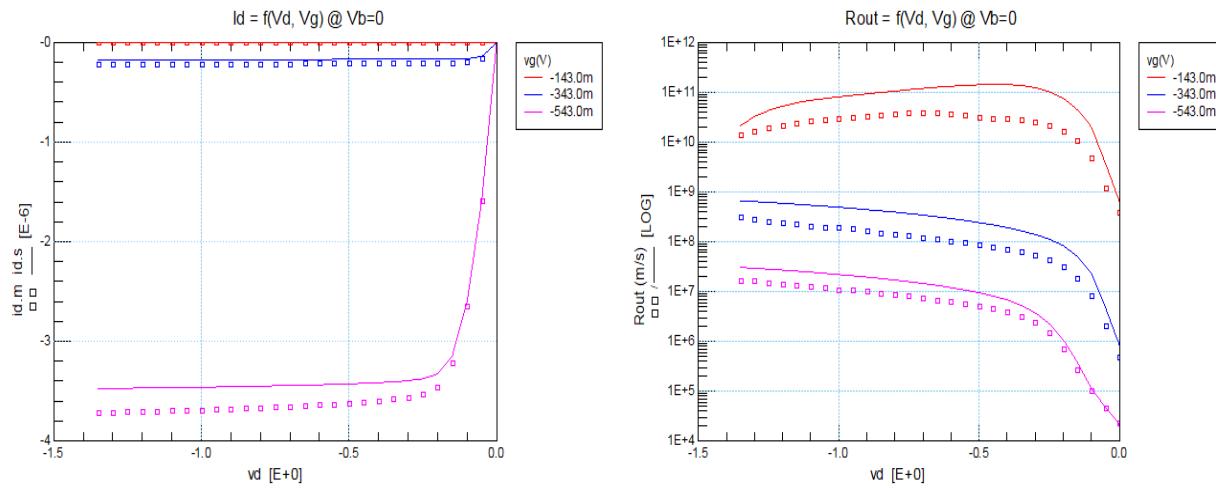


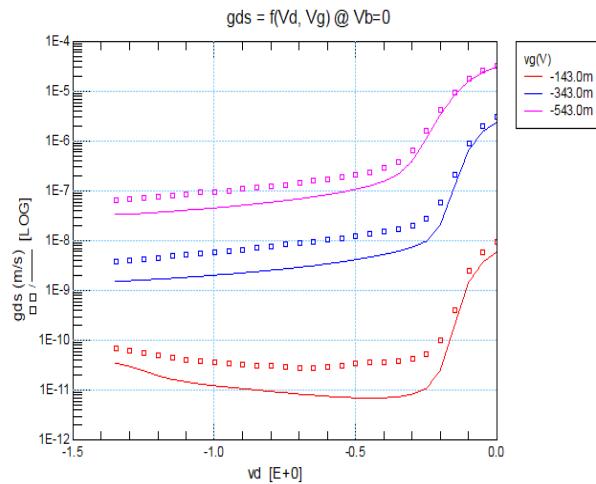


### $id_{vg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

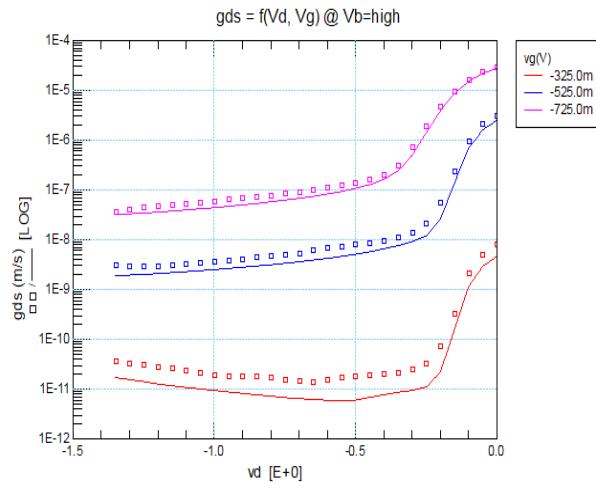
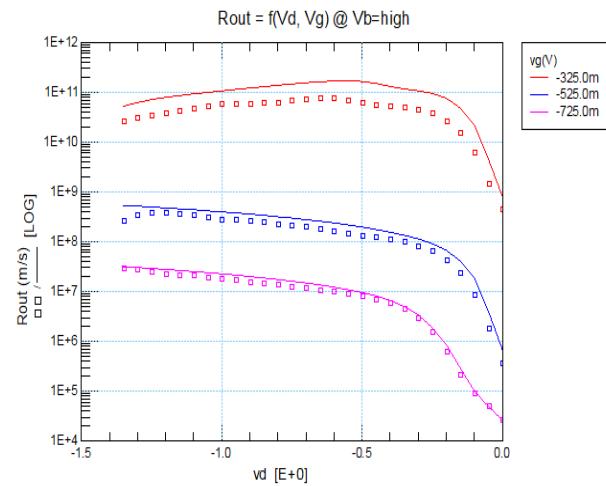
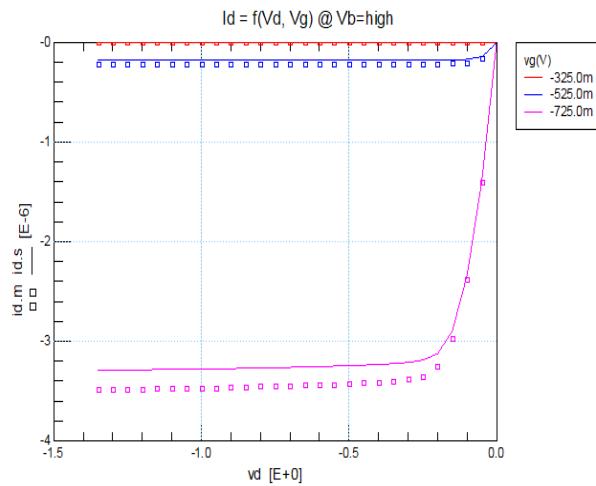


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**


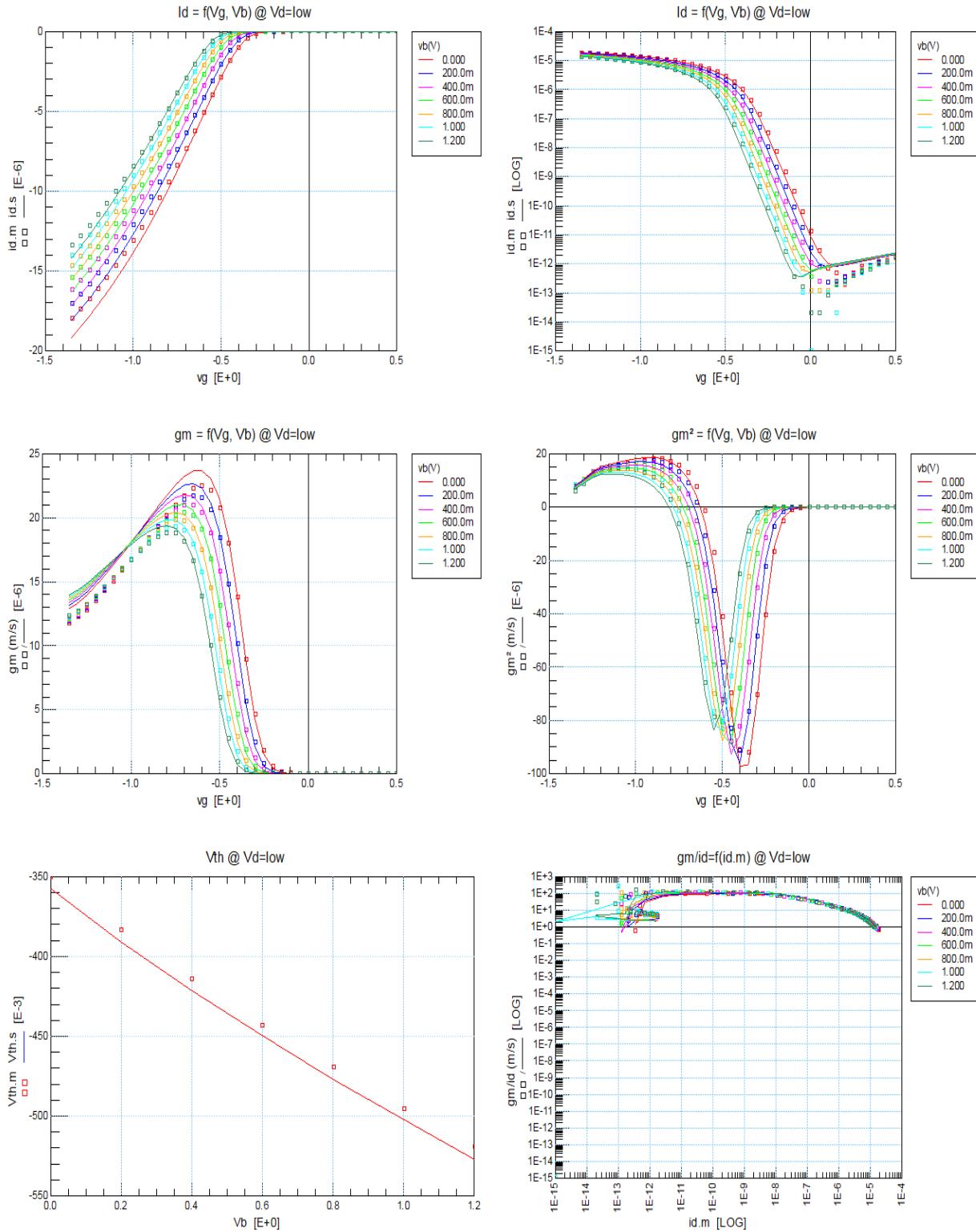


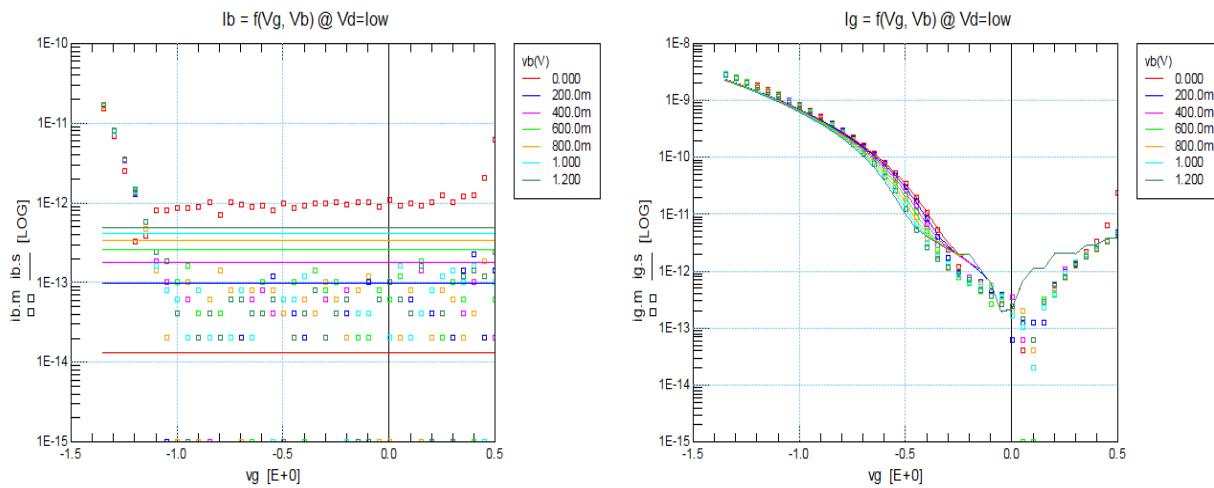
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



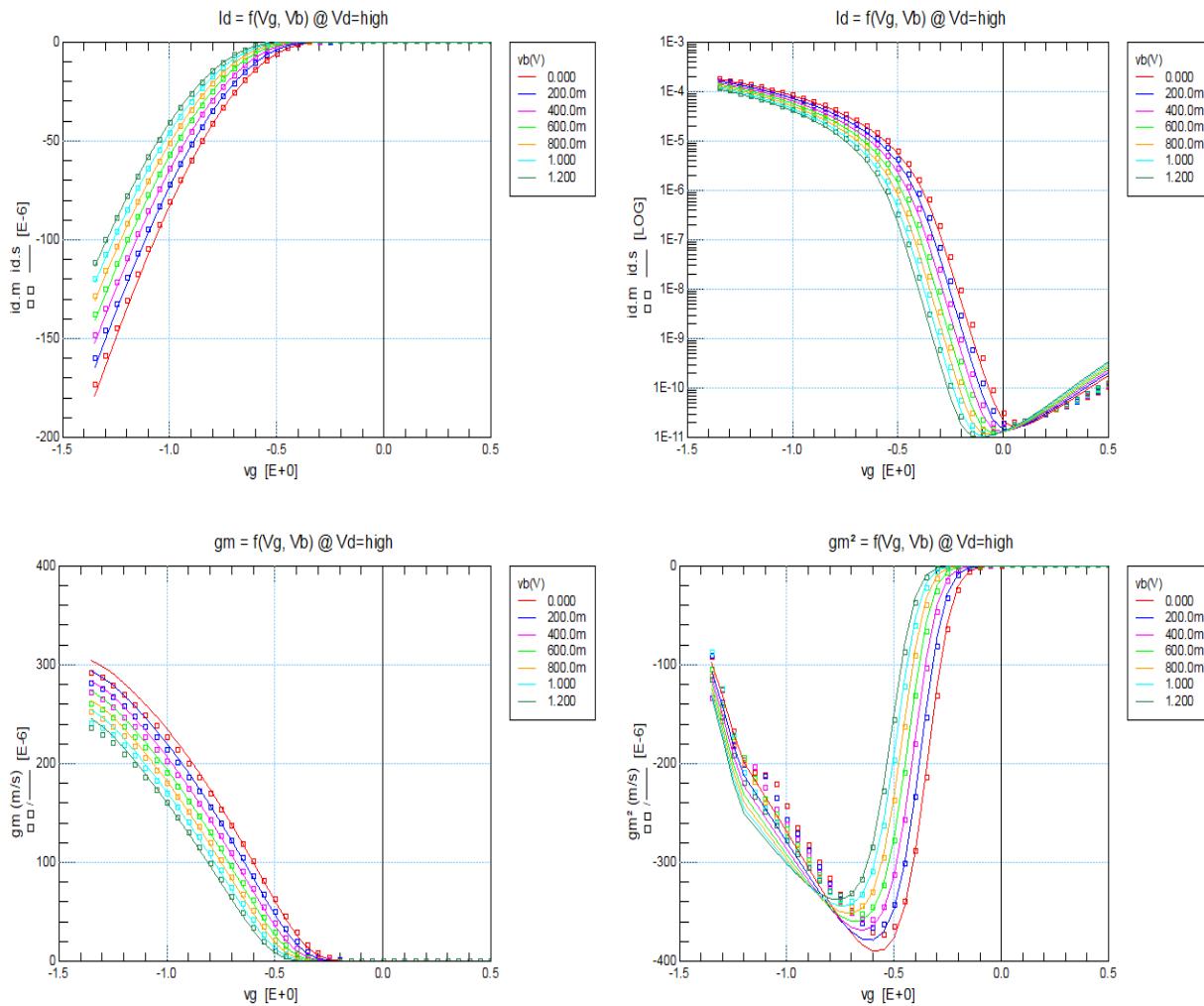
## 4.11 W10u0\_L2u0\_S549\_3

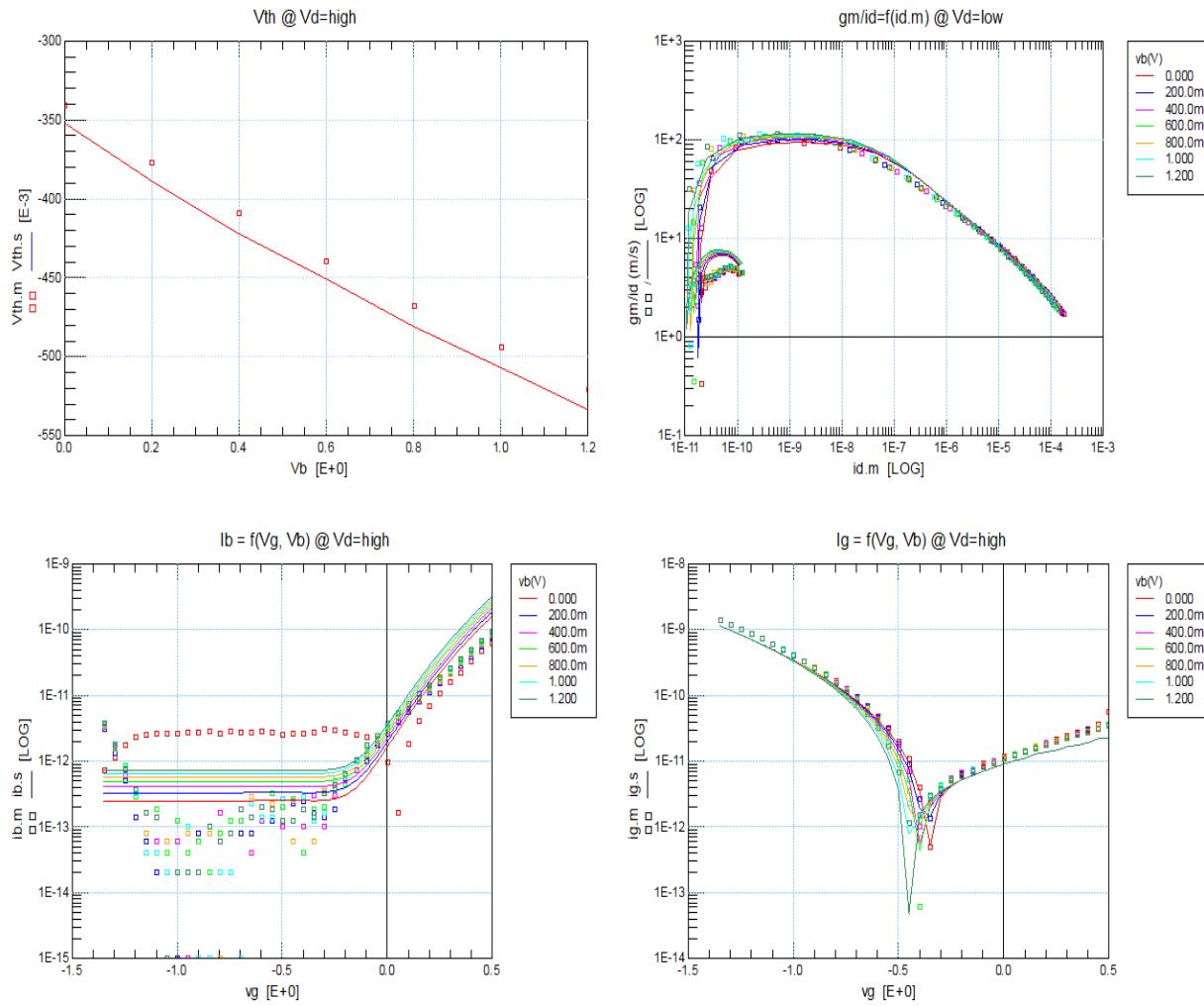
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



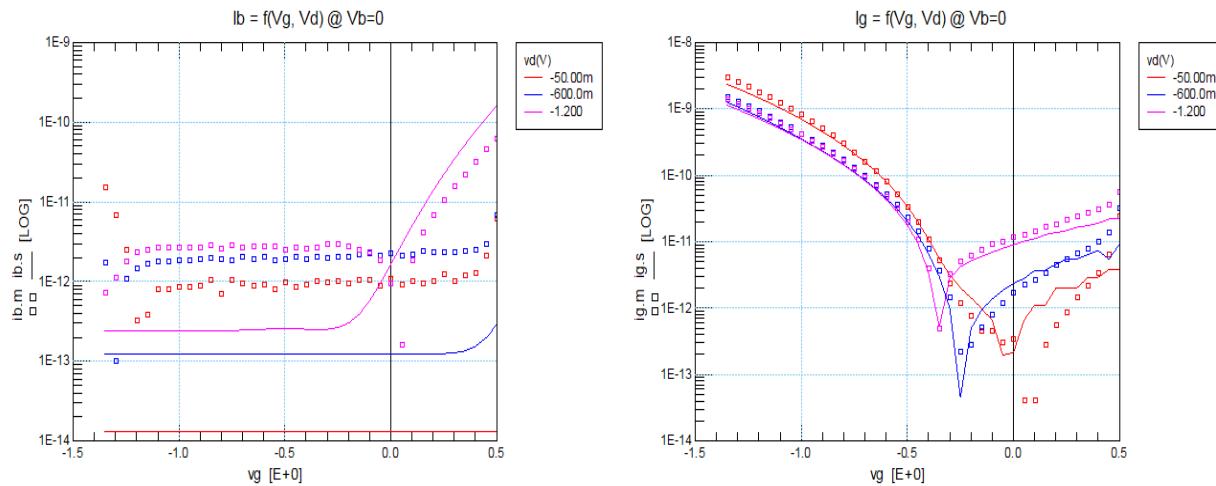


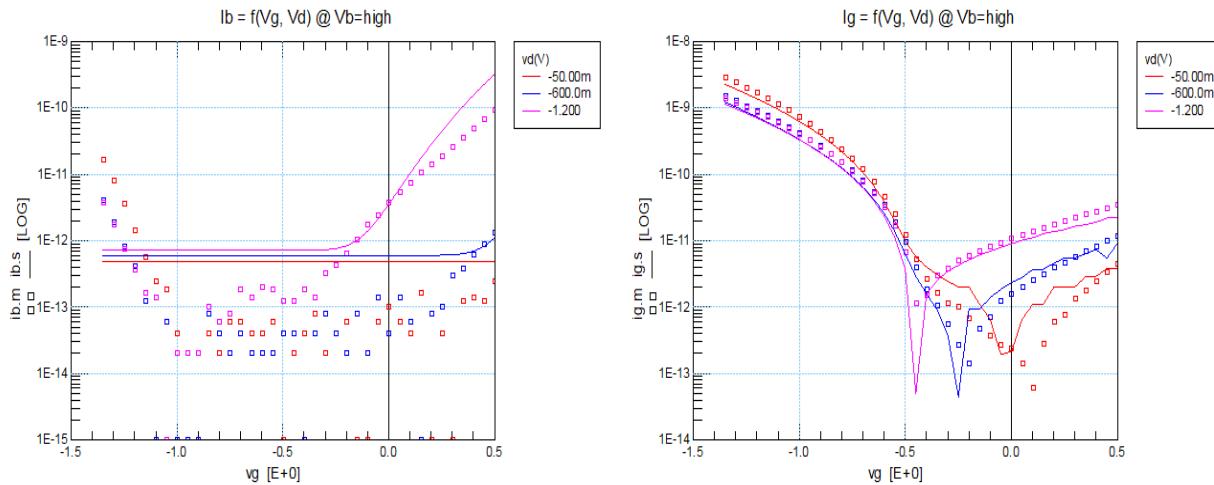
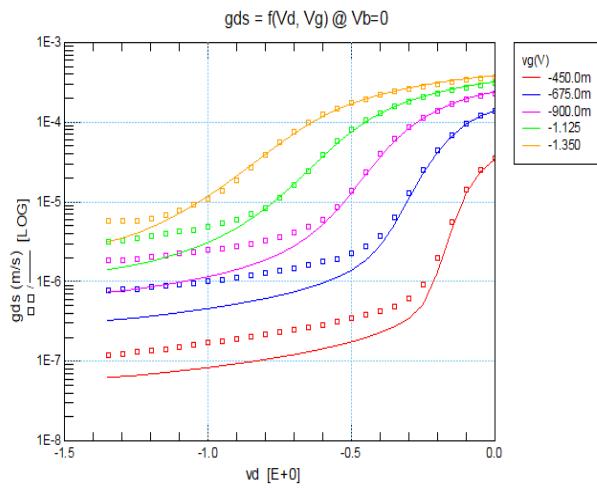
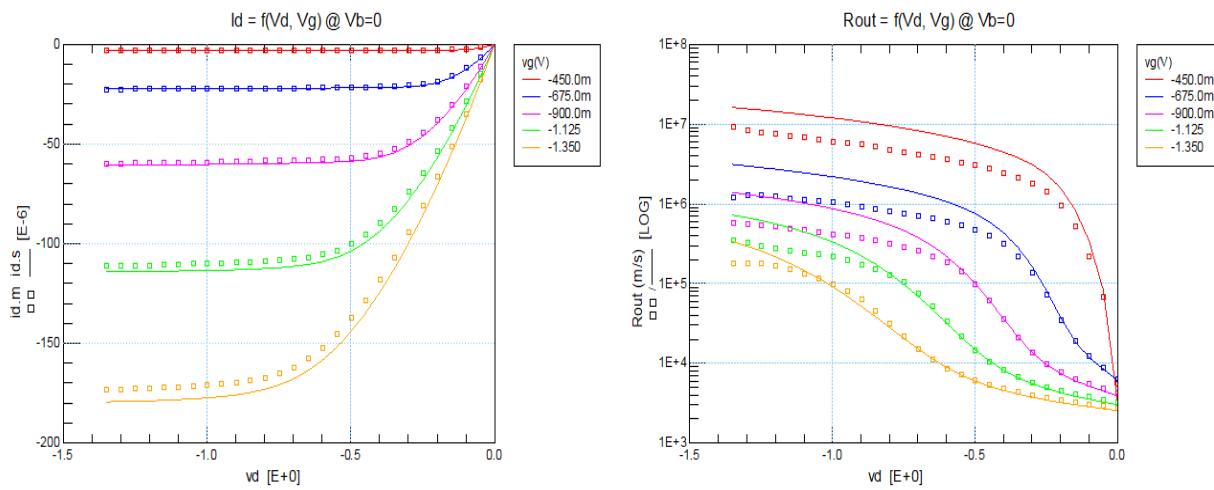
$i_{dvg}$ ,  $V_d = -1.2V$ ,  $T = 27^\circ C$

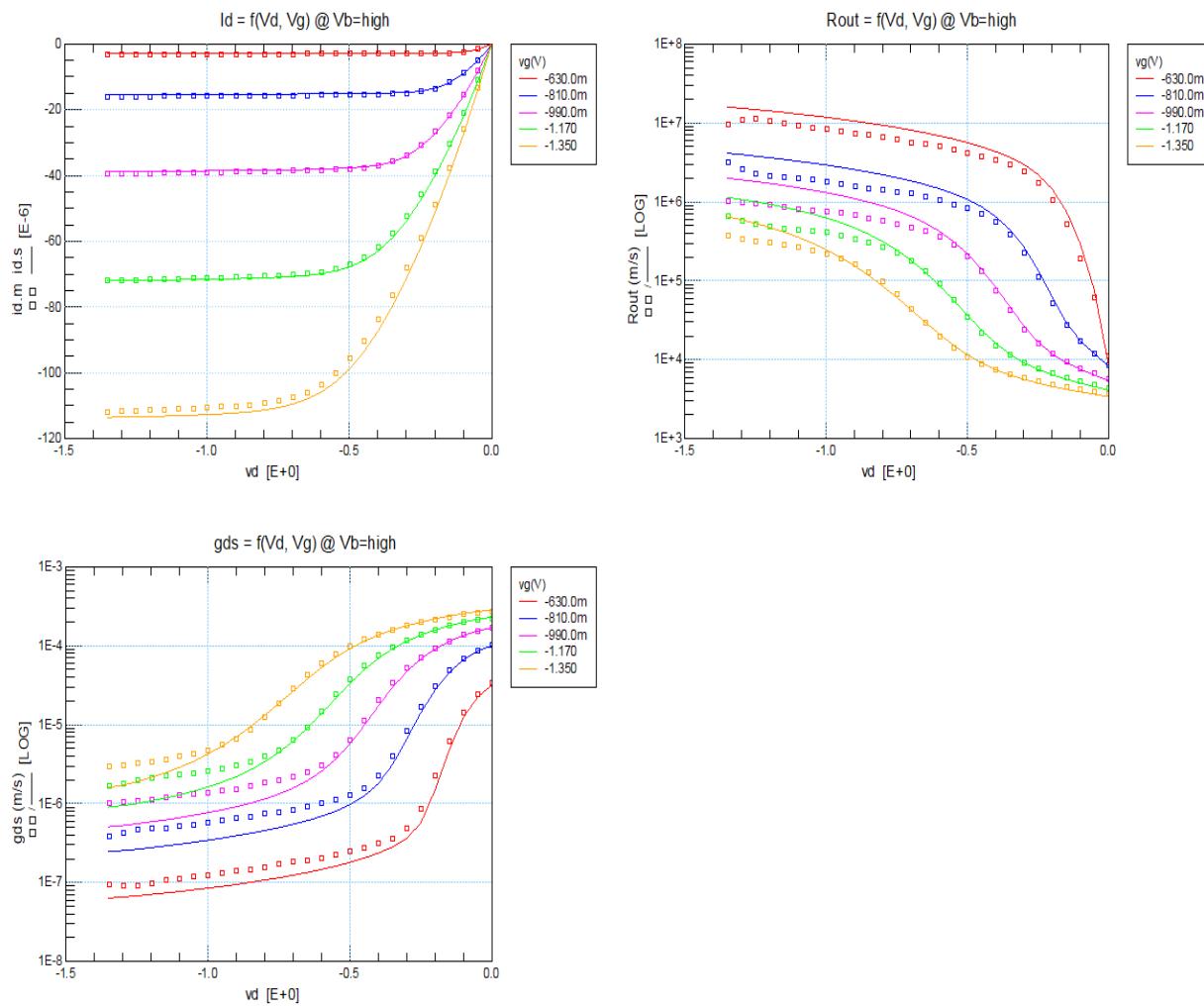
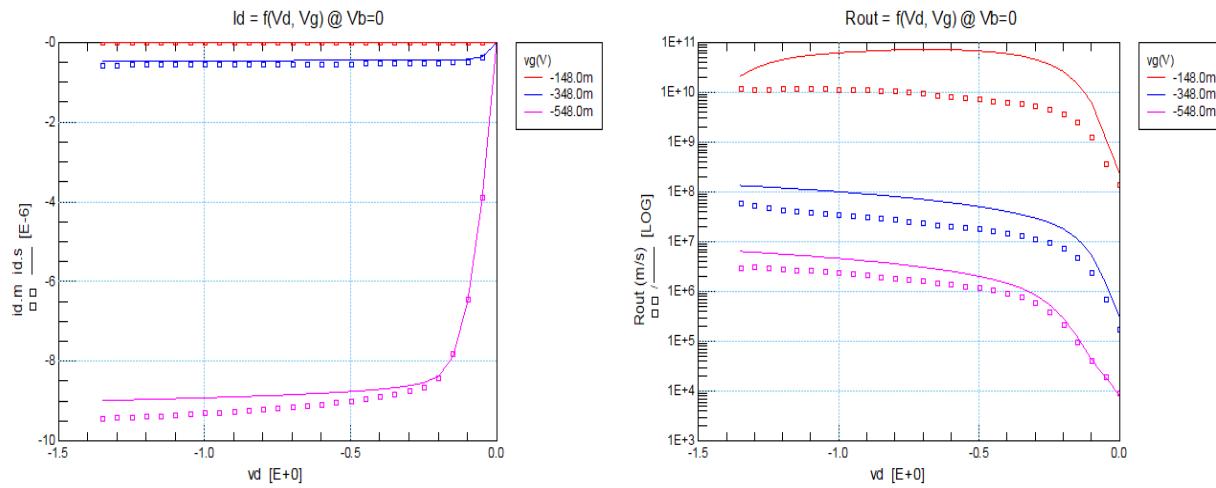


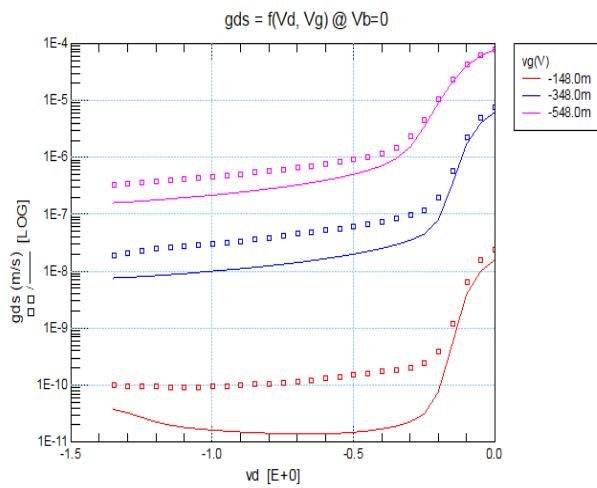


### $id_{vg}, I_b, I_g, V_b = 0V, T = 27^\circ\text{C}$

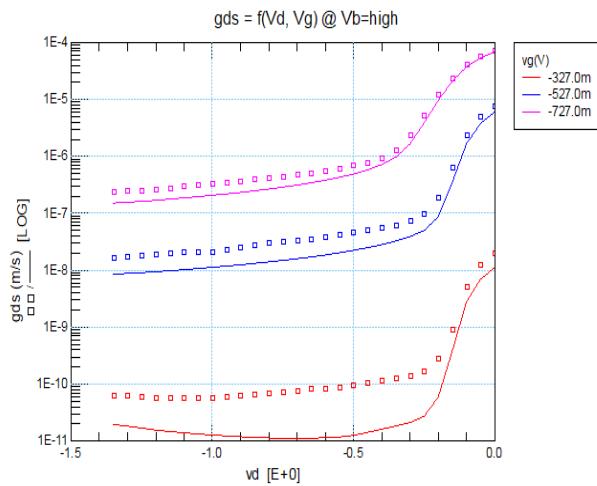
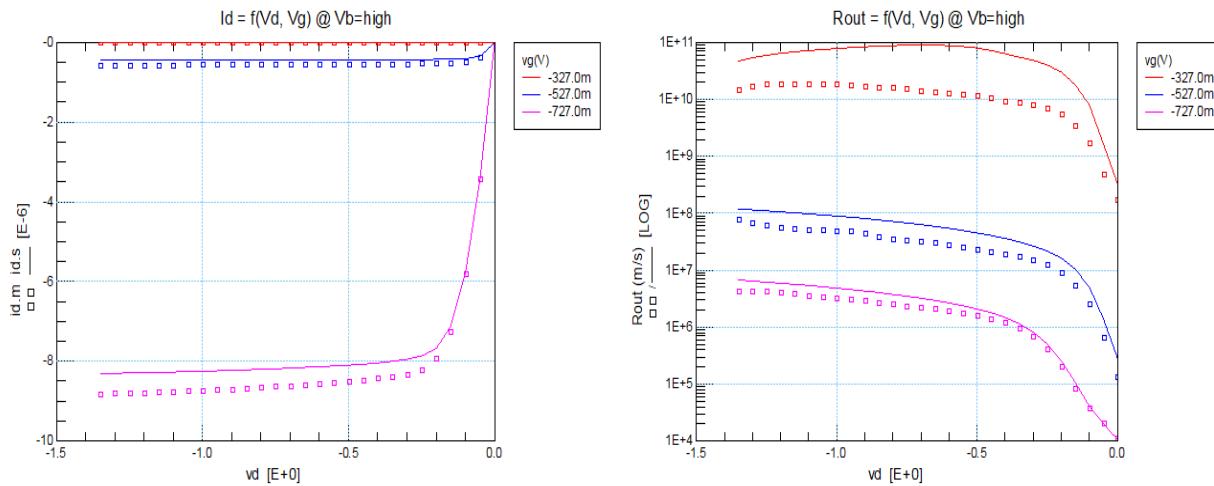


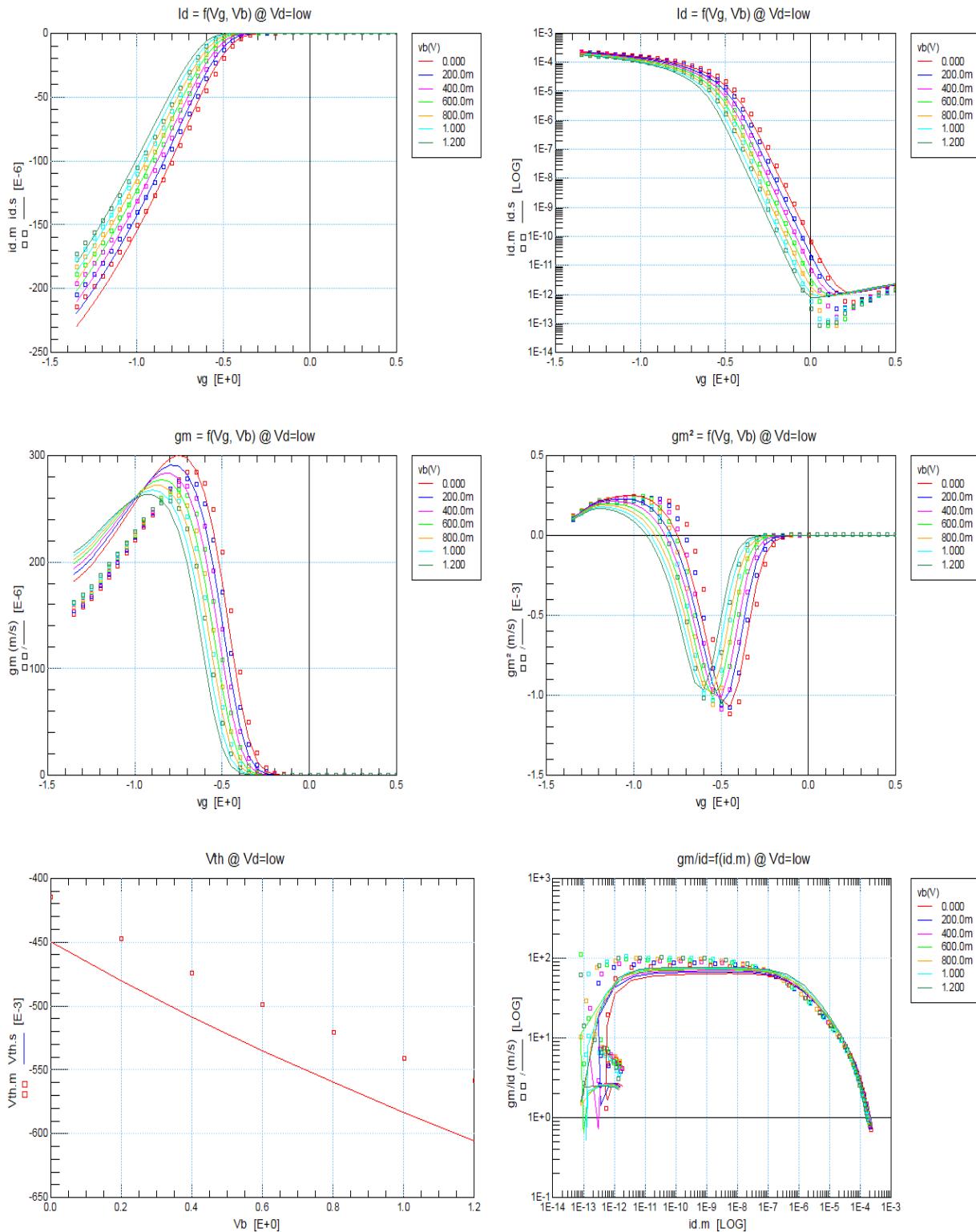
**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


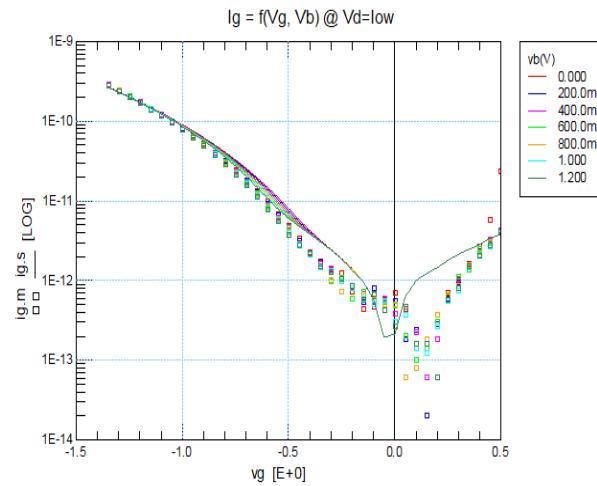
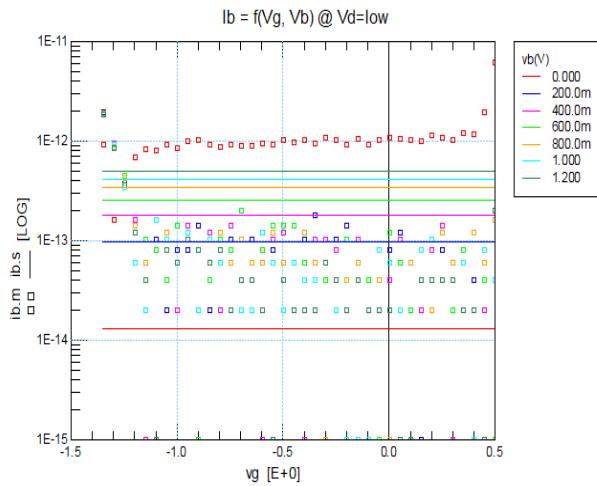
**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**




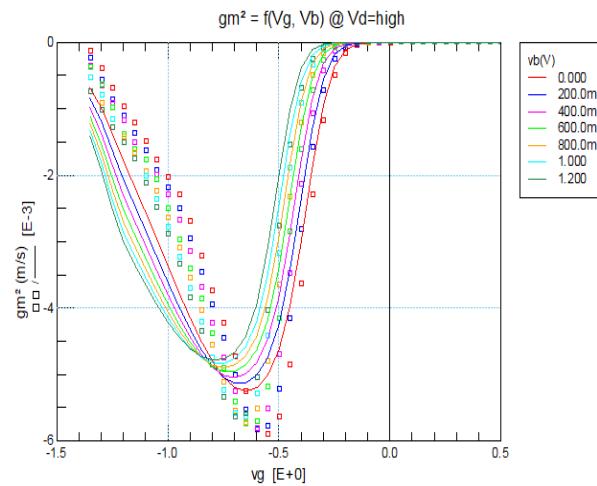
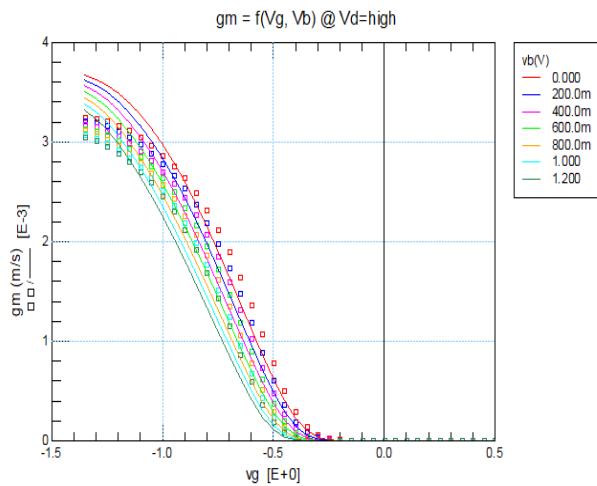
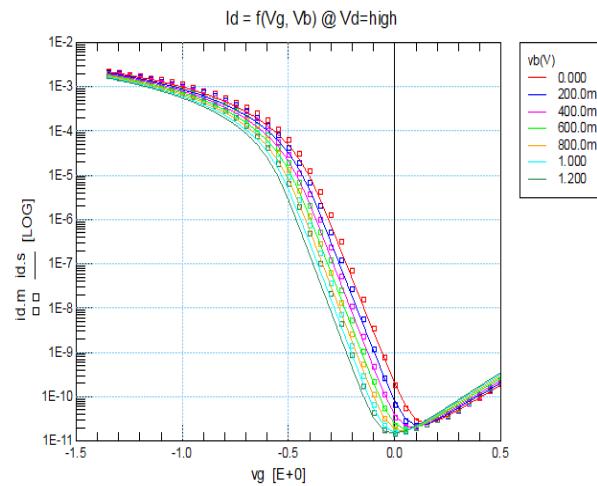
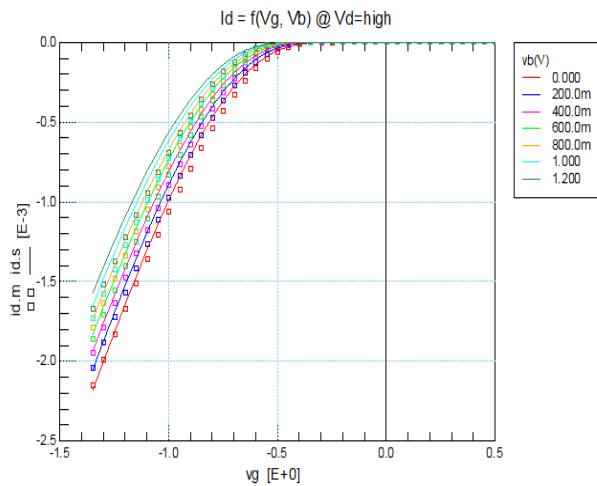
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

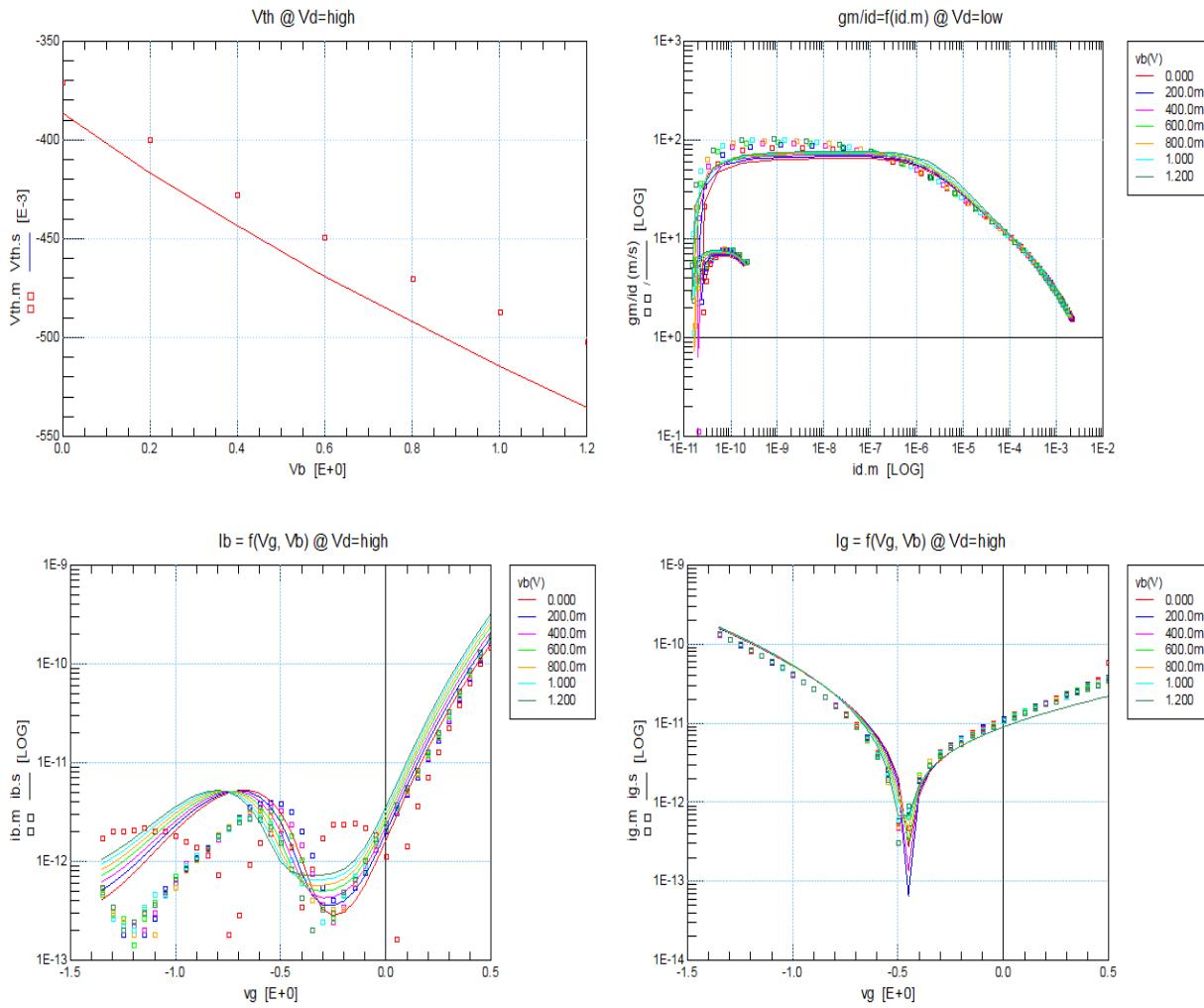


**4.12 W10u0\_L0u15\_S548\_4****idvg, Vd = -0.05V, T = 27°C**

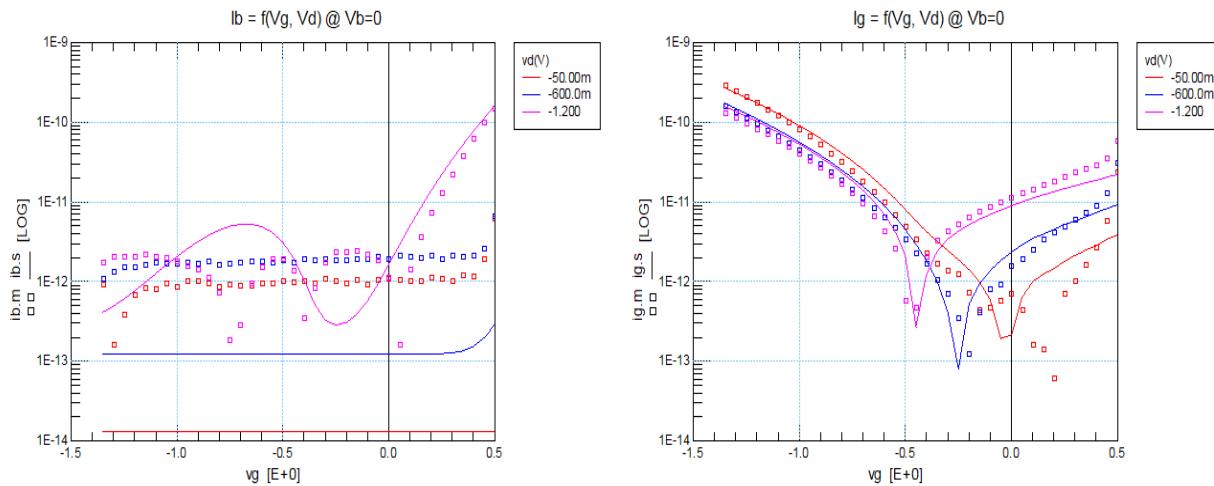


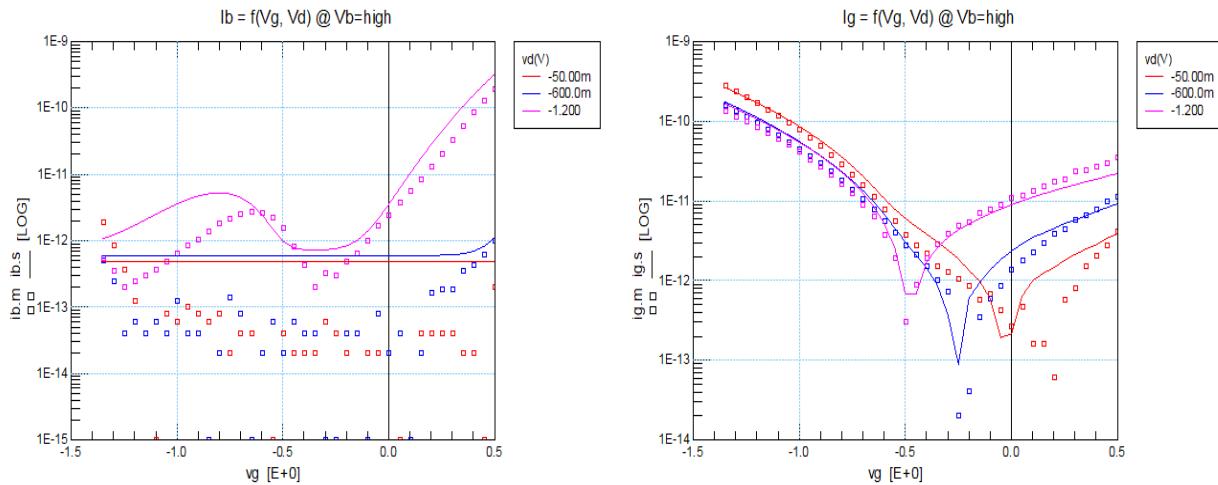
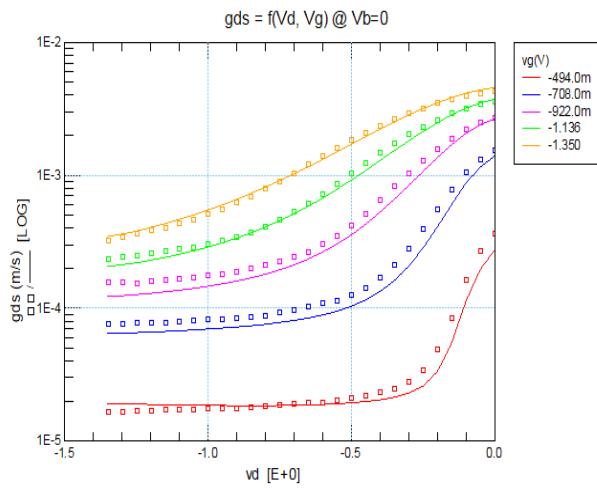
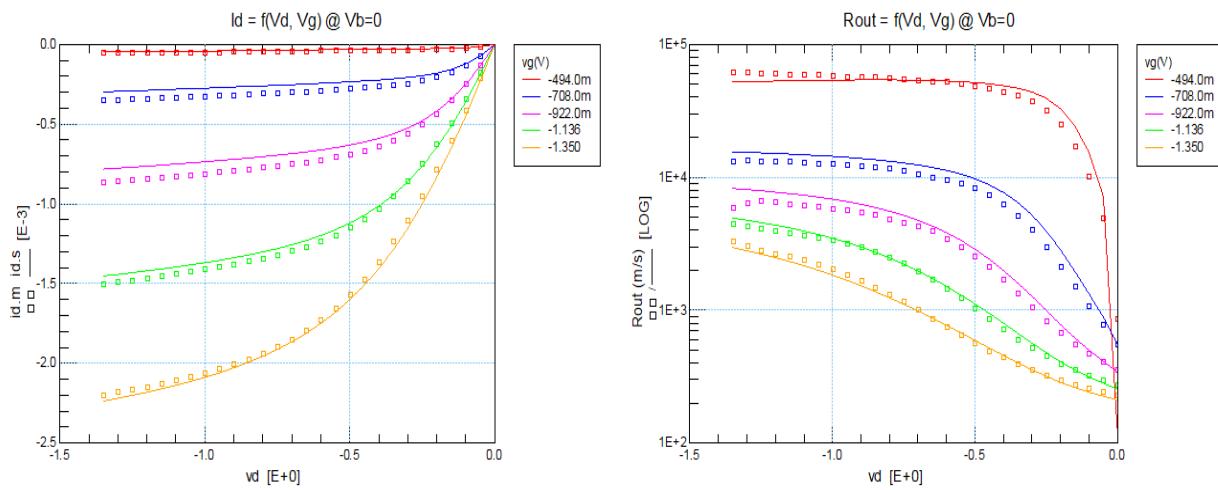
$i_d v_g, V_d = -1.2V, T = 27^\circ C$

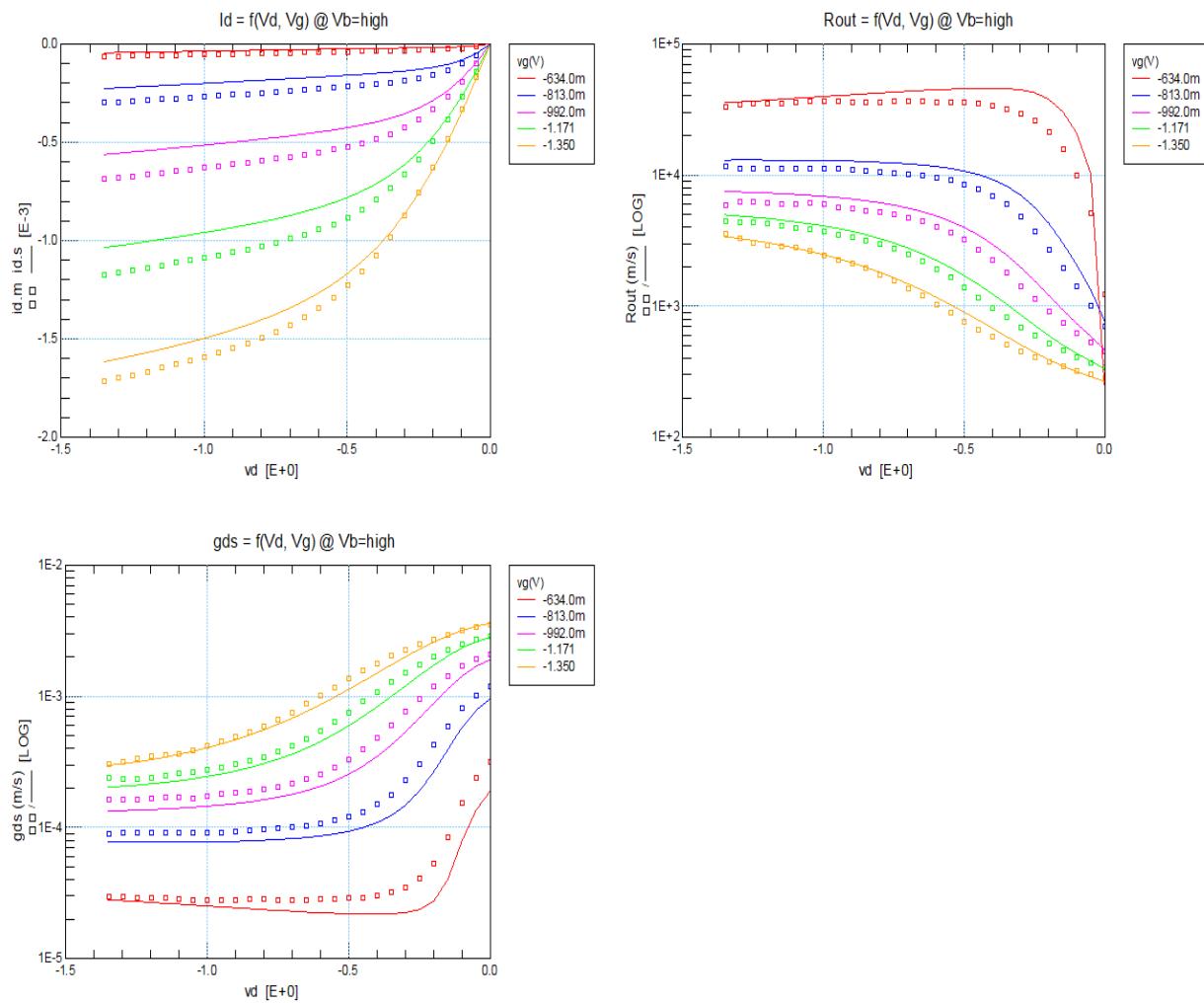
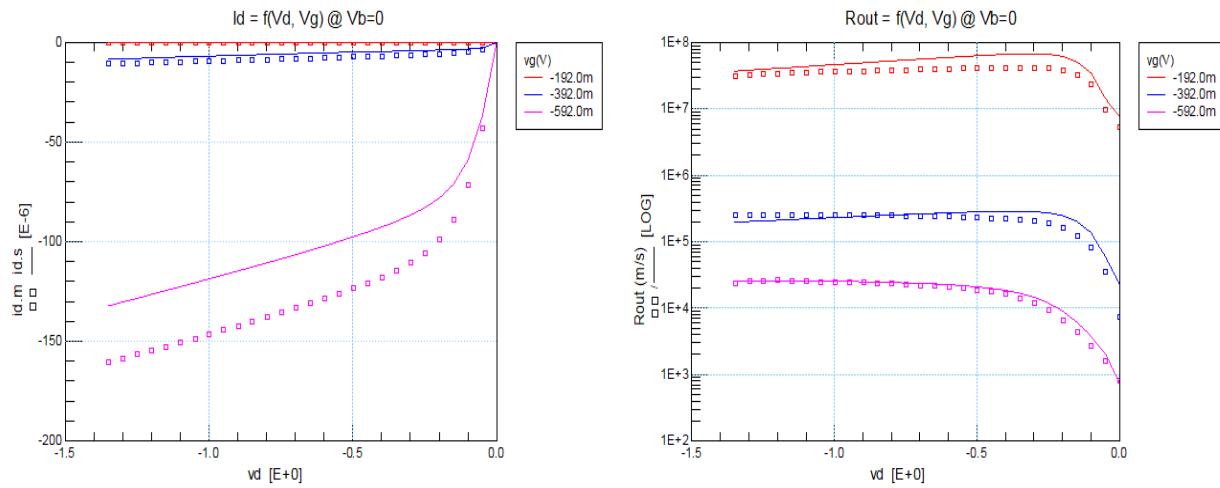


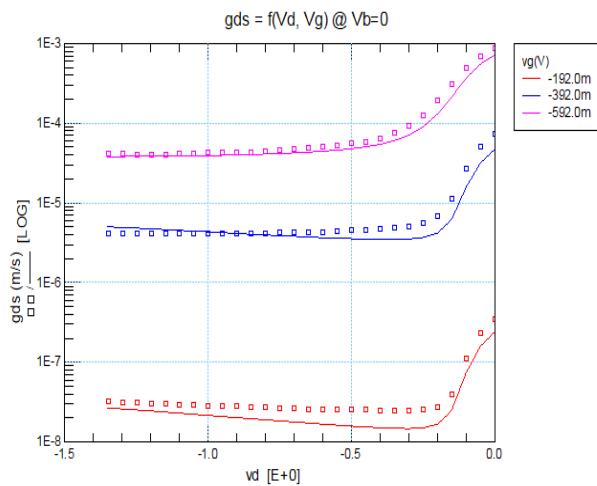


### $id_{vg}, I_b, Ig, V_b = 0V, T = 27^\circ C$

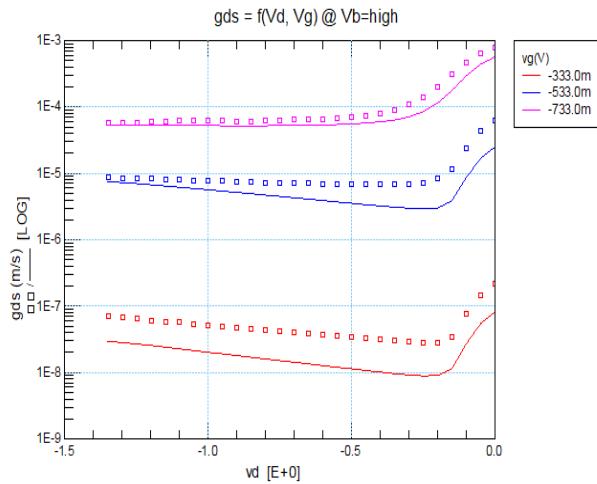
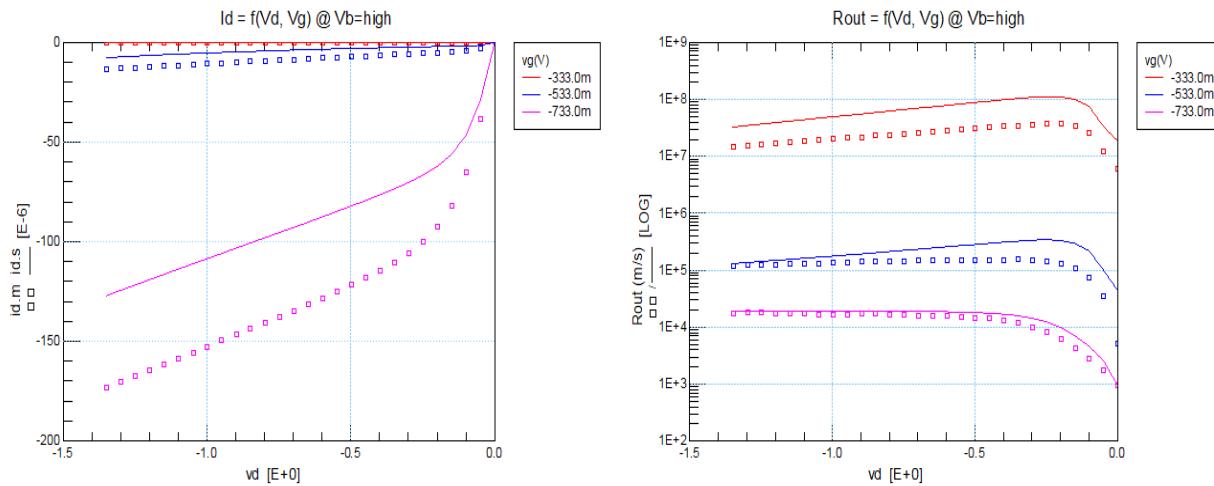


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**


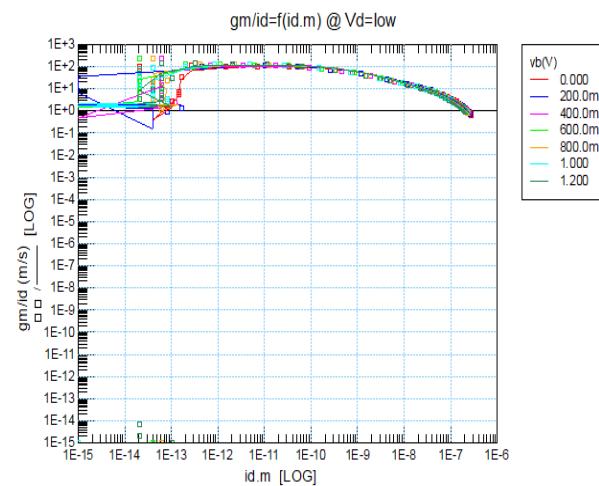
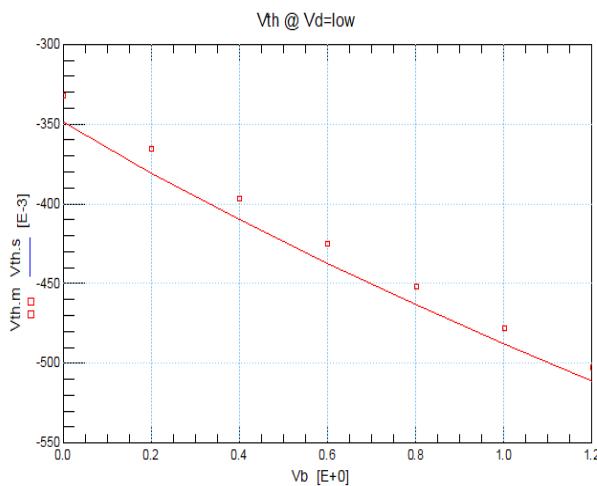
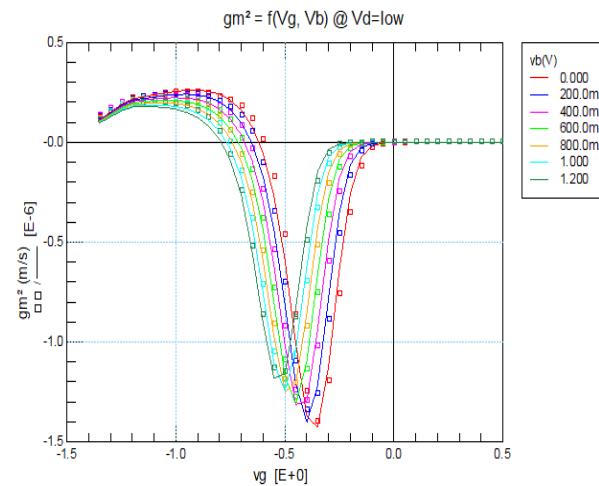
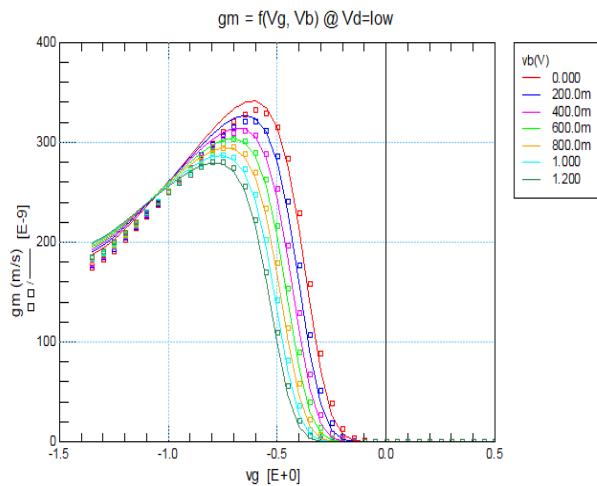
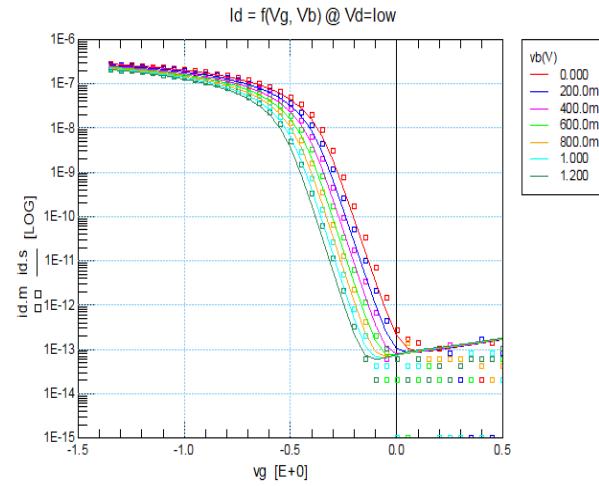
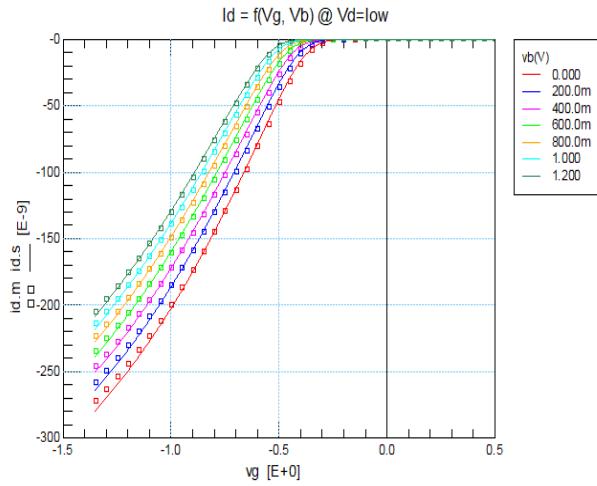


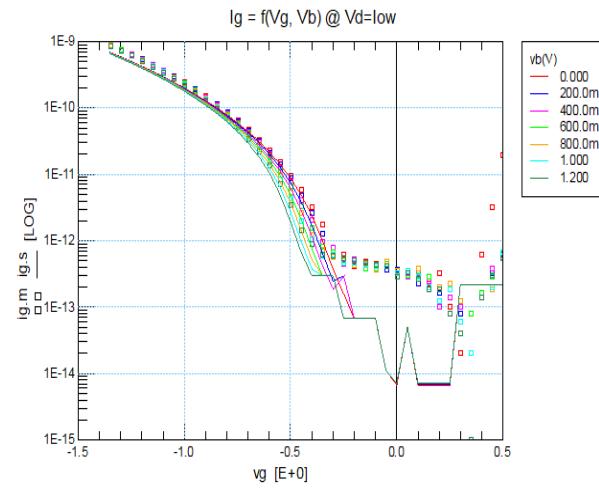
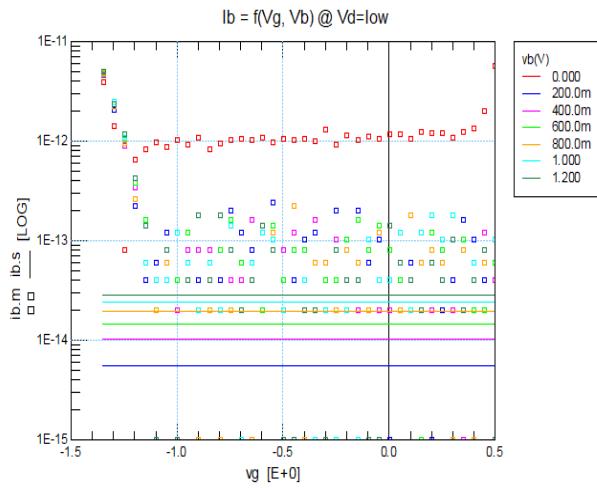
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



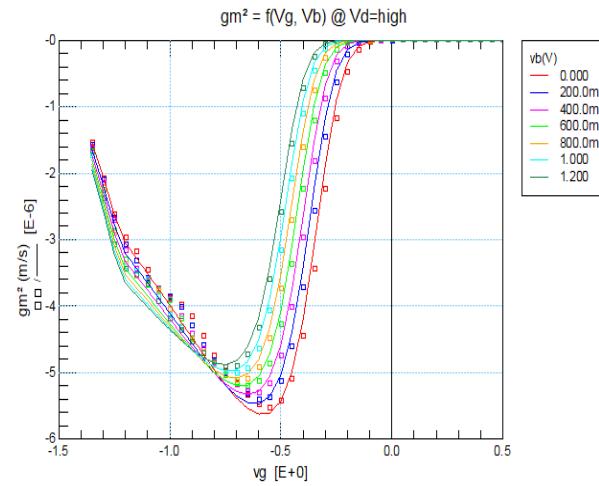
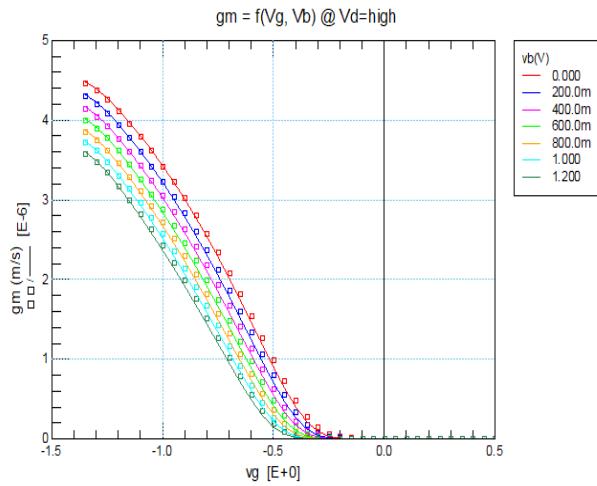
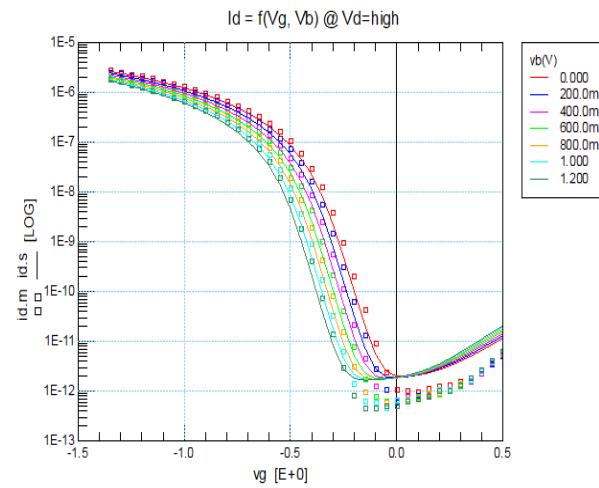
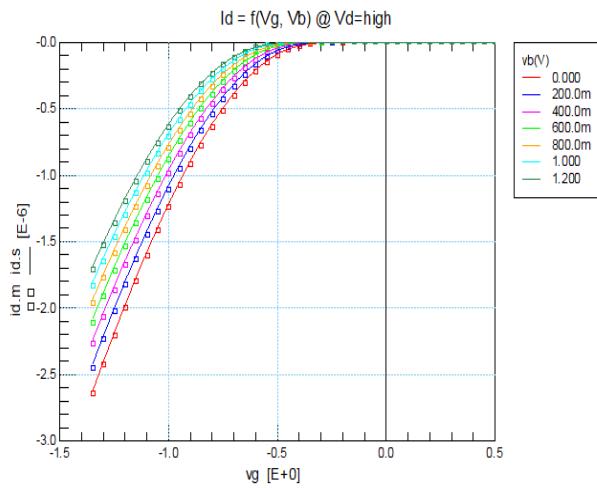
## 4.13 W0u6\_L10u0\_S552\_1

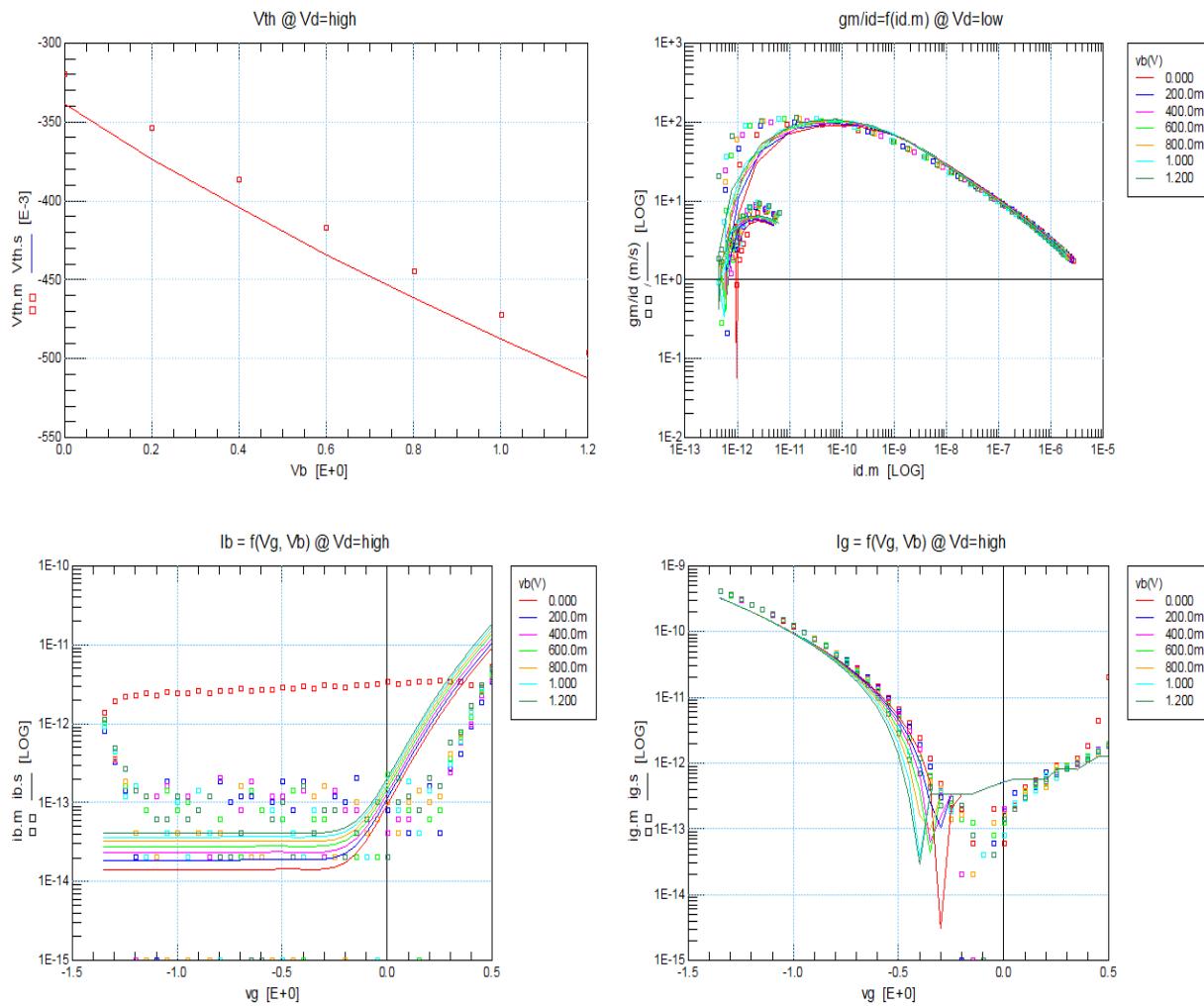
$idv_g, V_d = -0.05V, T = 27^\circ C$



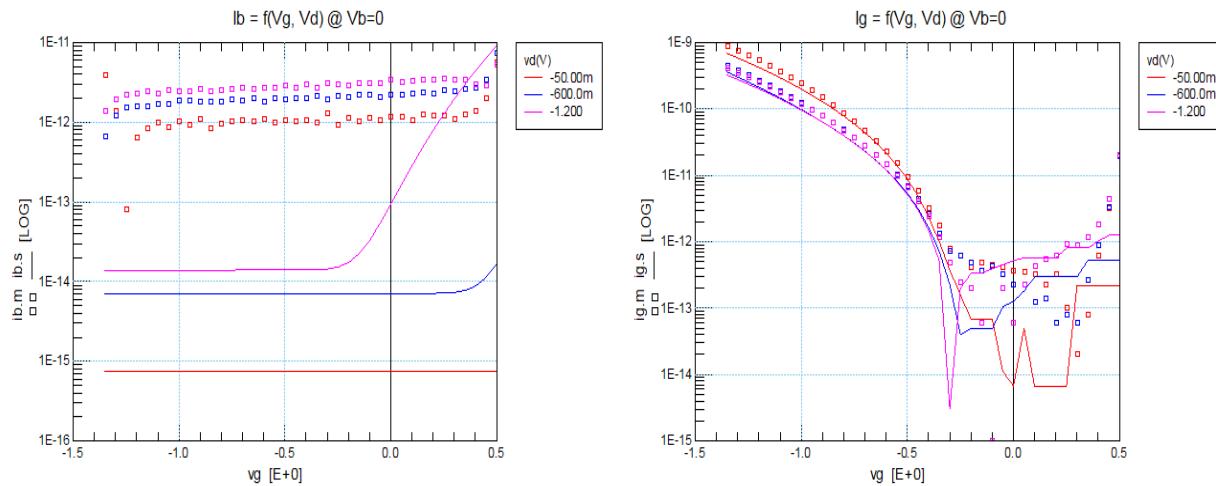


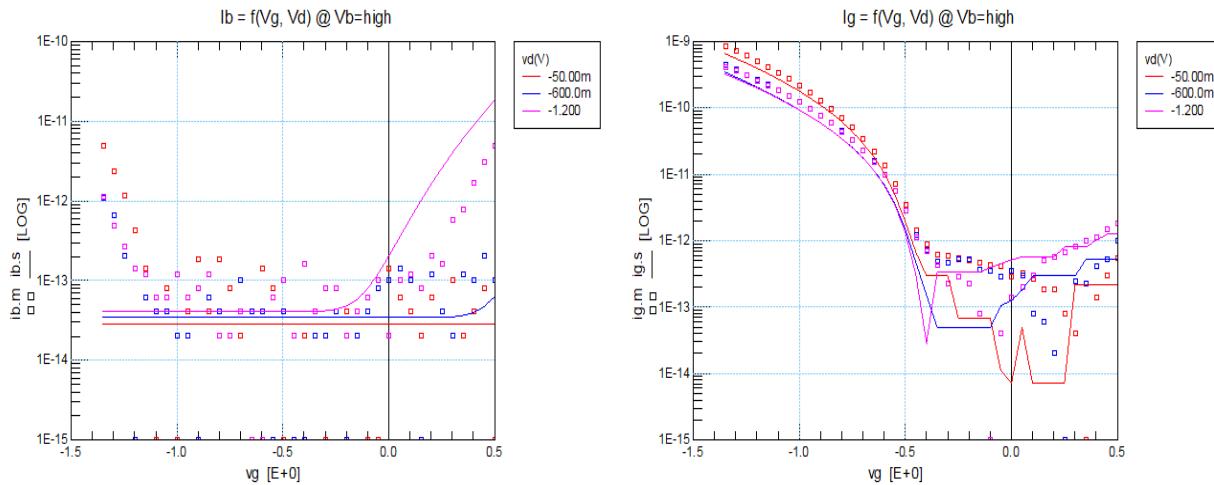
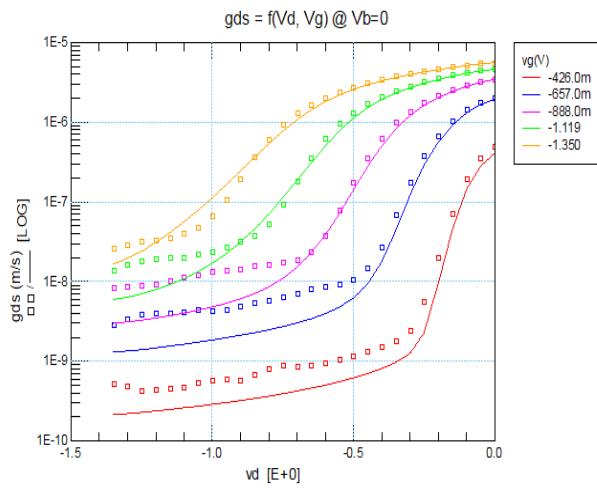
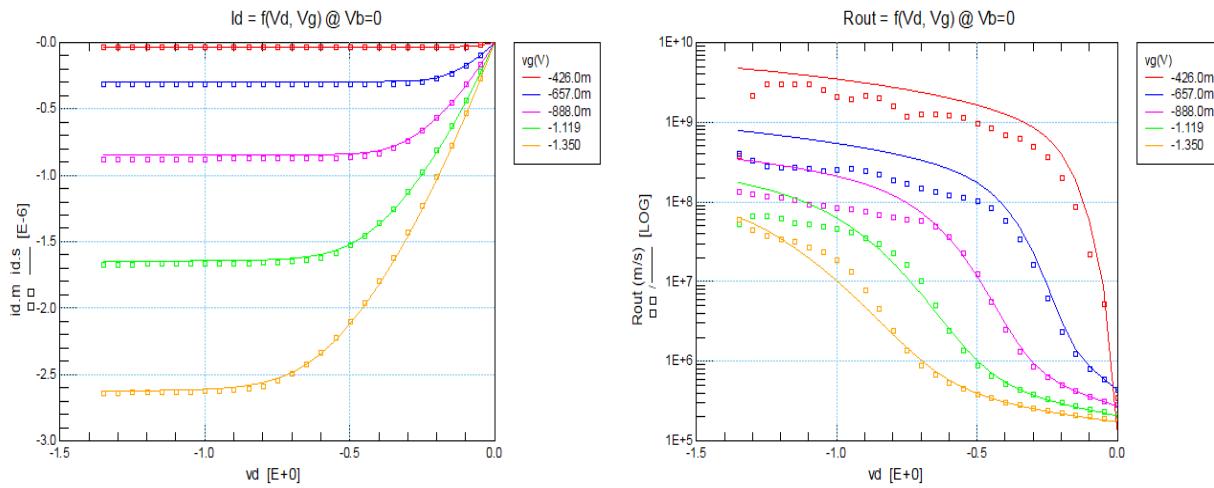
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

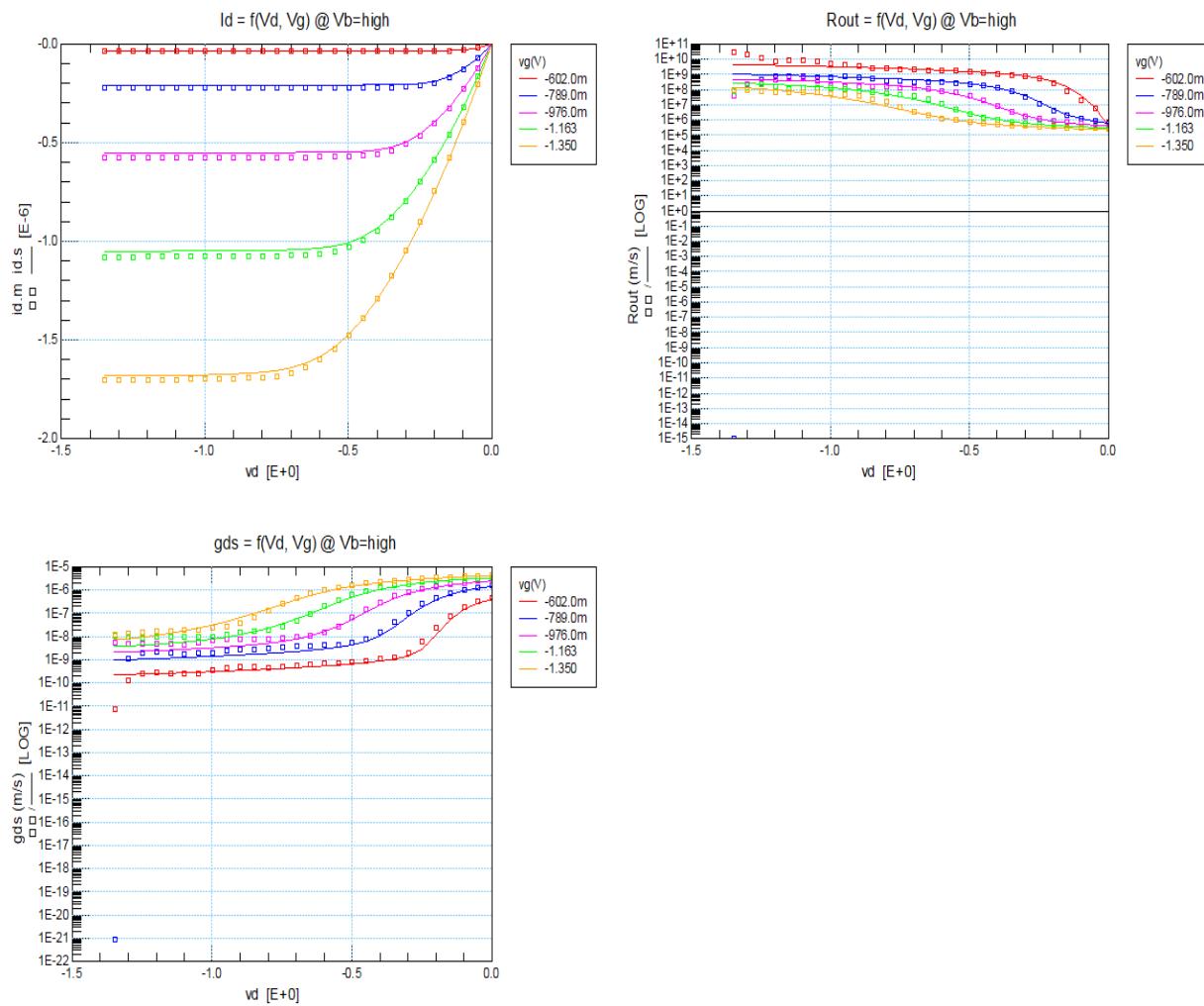
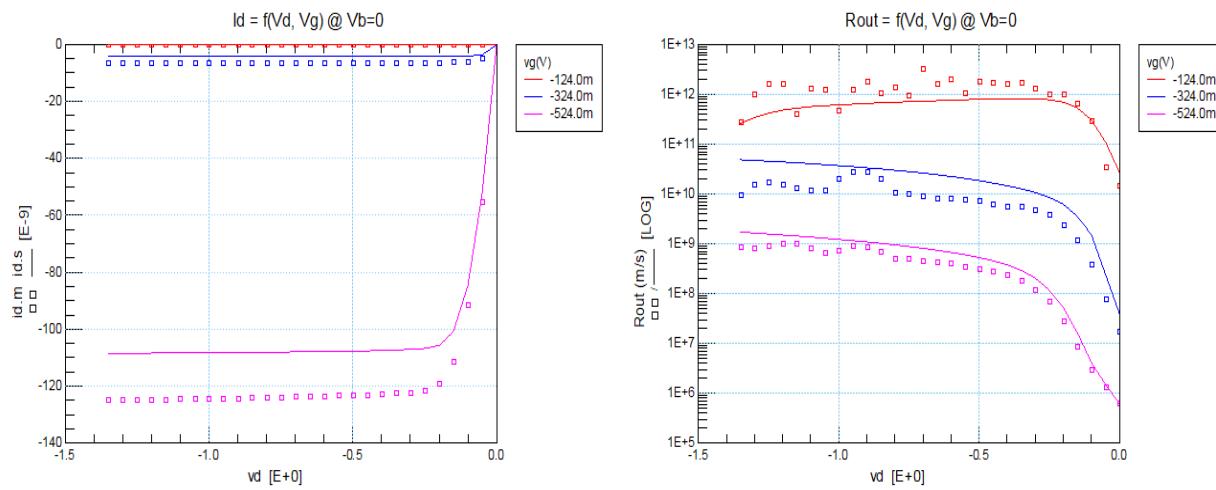


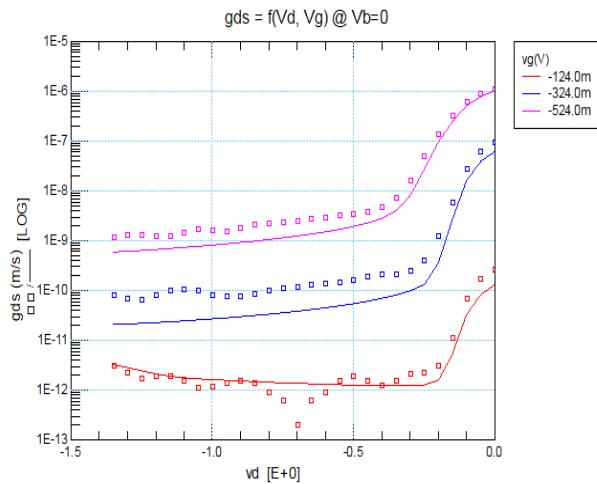


### $i_{dvg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

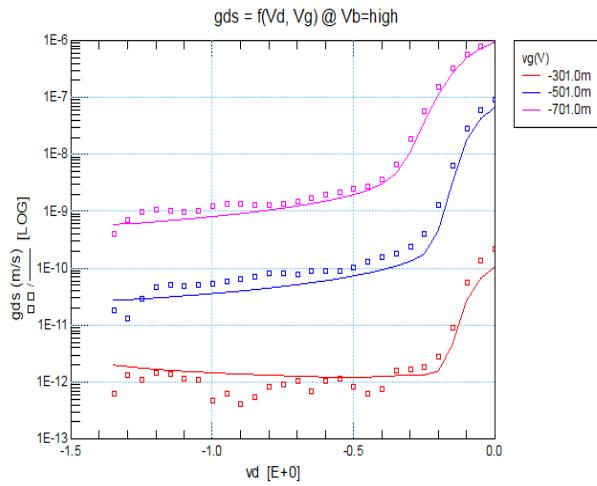
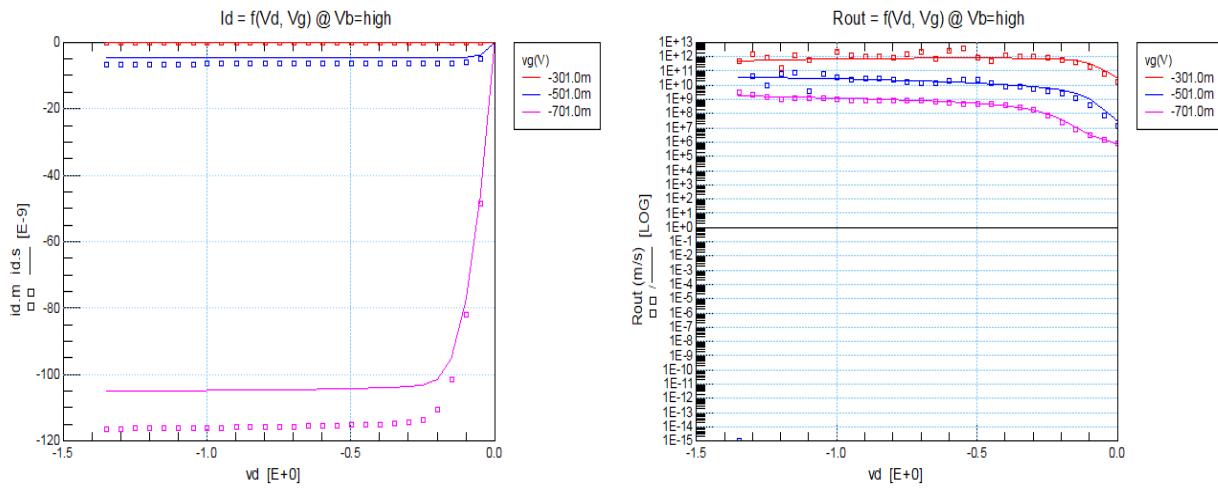


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

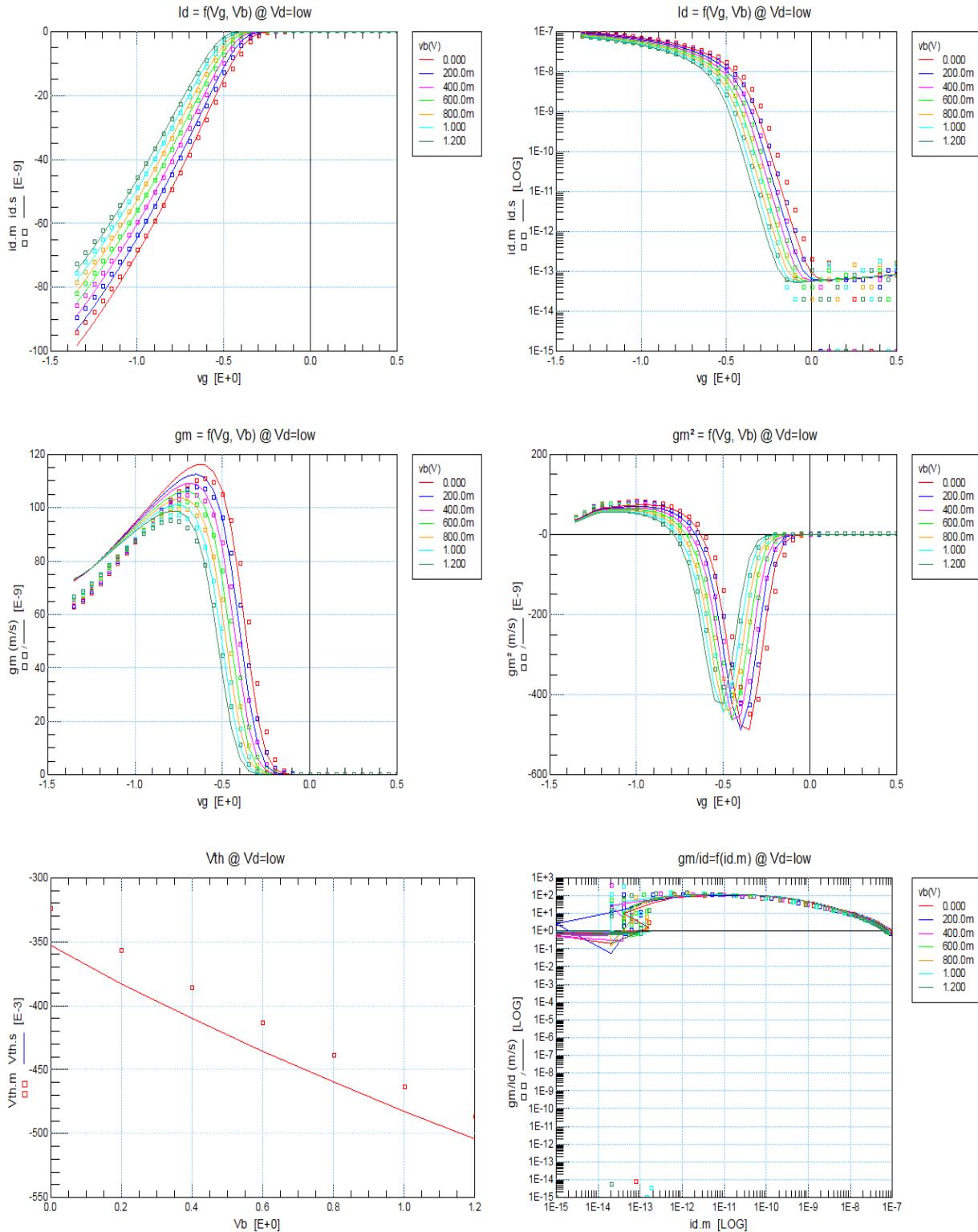


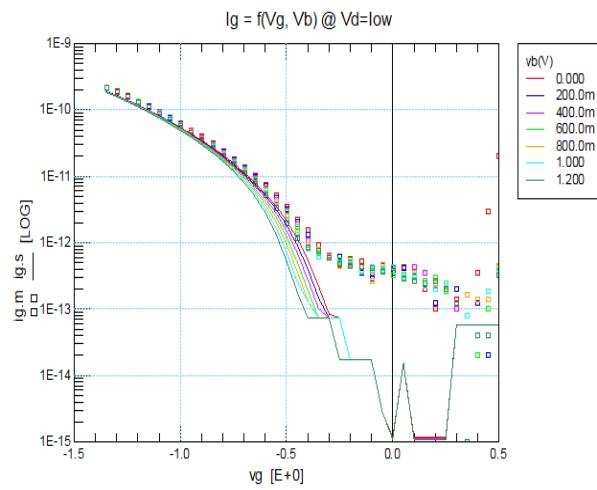
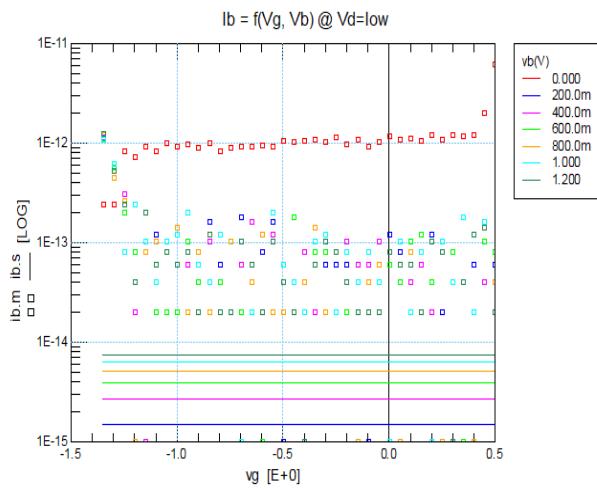
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



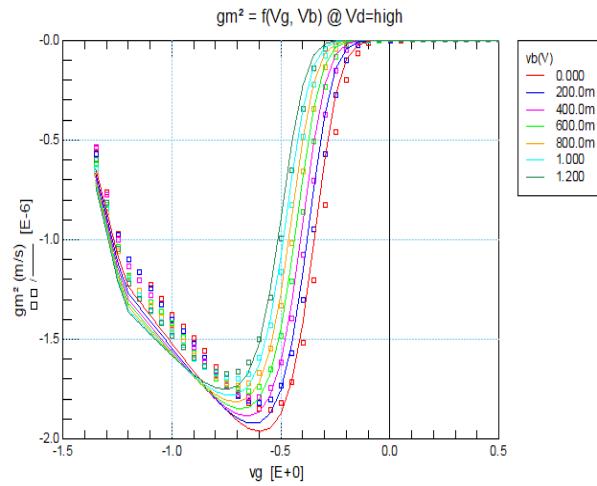
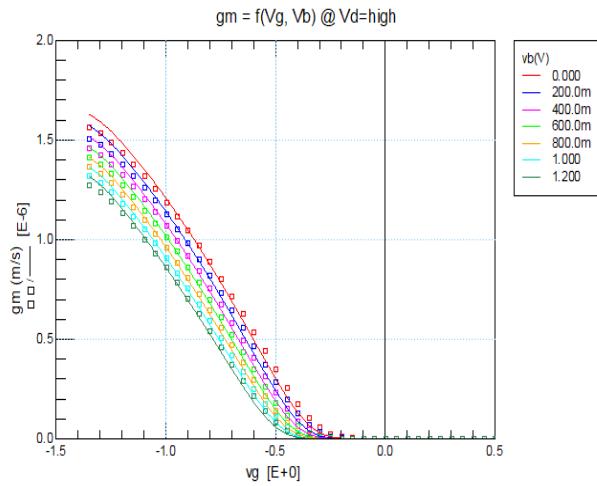
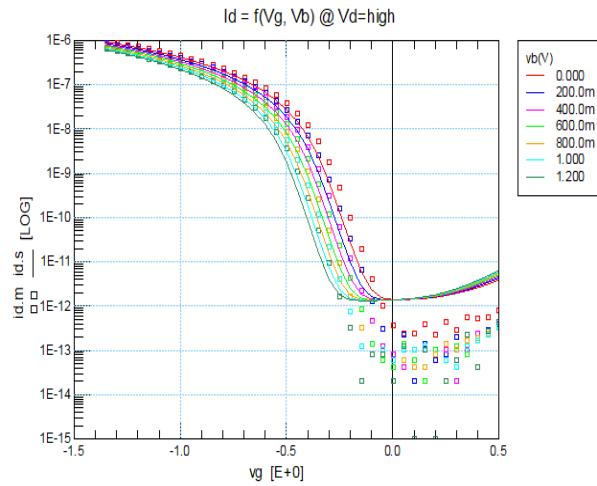
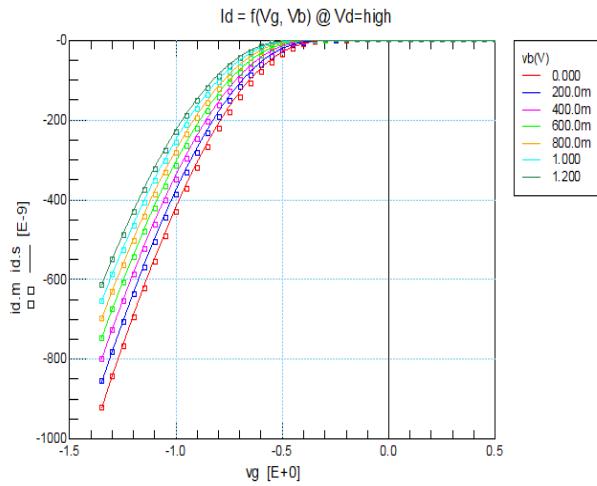
## 4.14 W0u18\_L10u0\_S554\_1

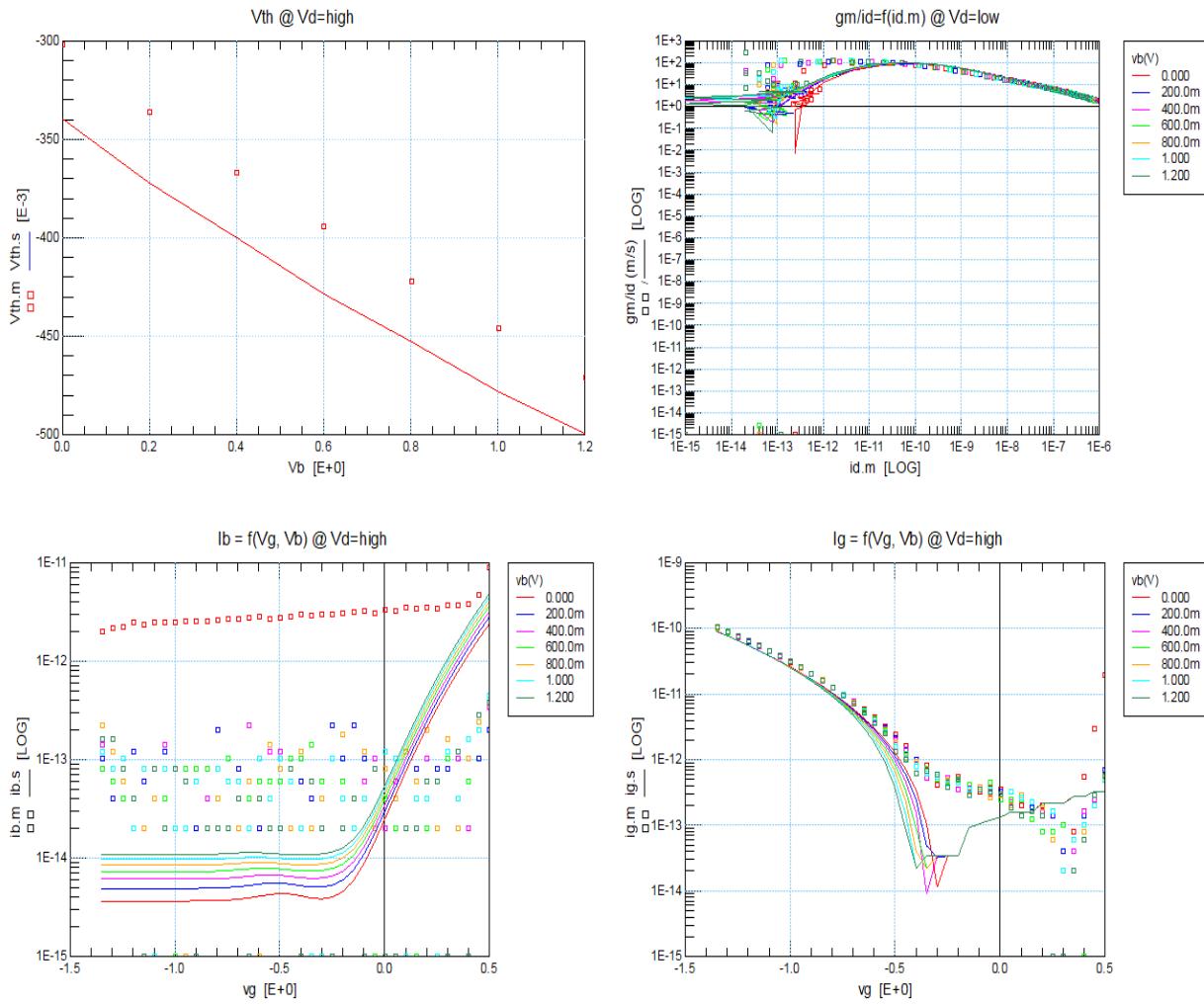
$idv_g, V_d = -0.05V, T = 27^\circ C$



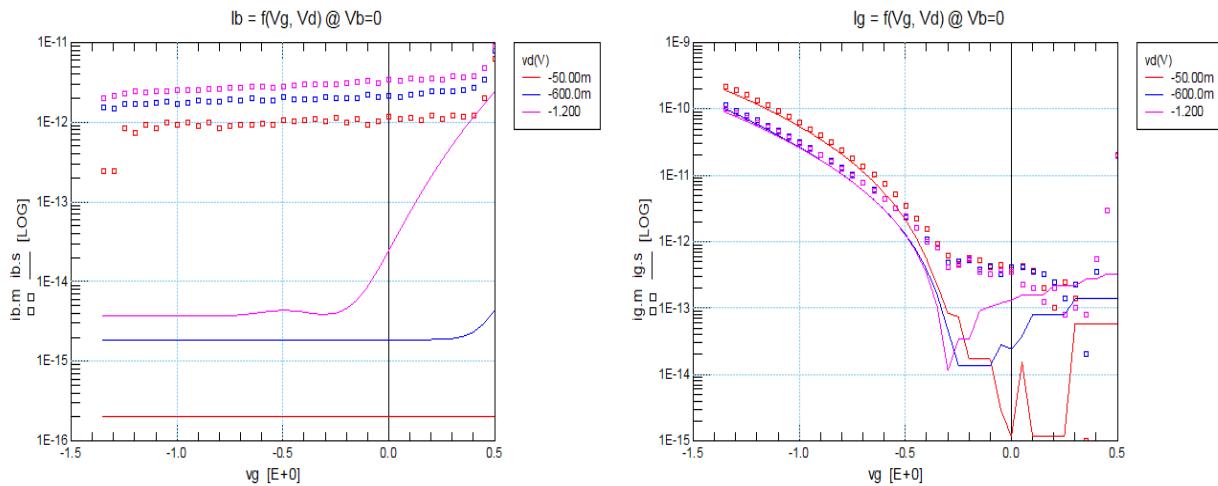


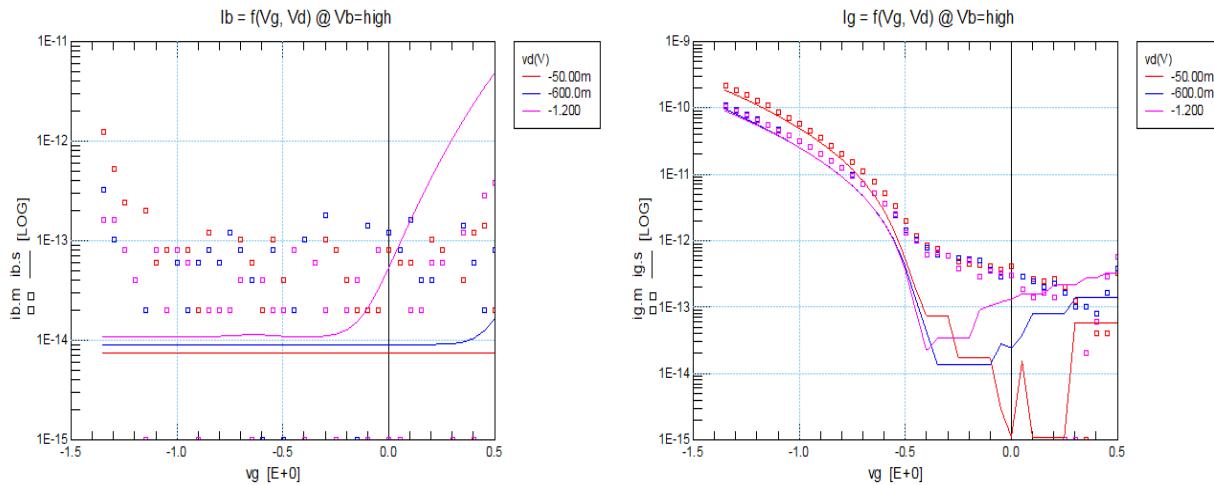
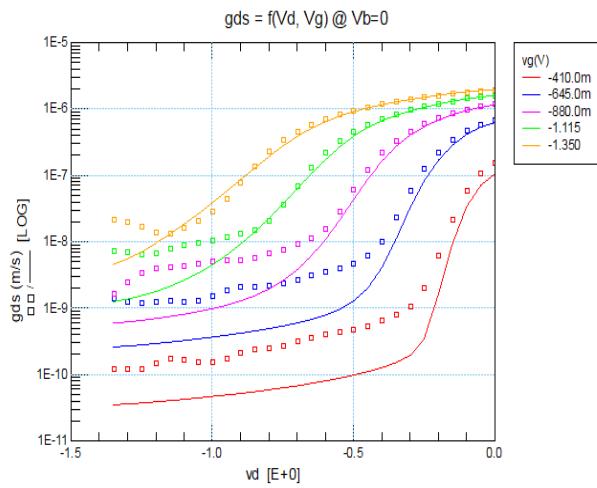
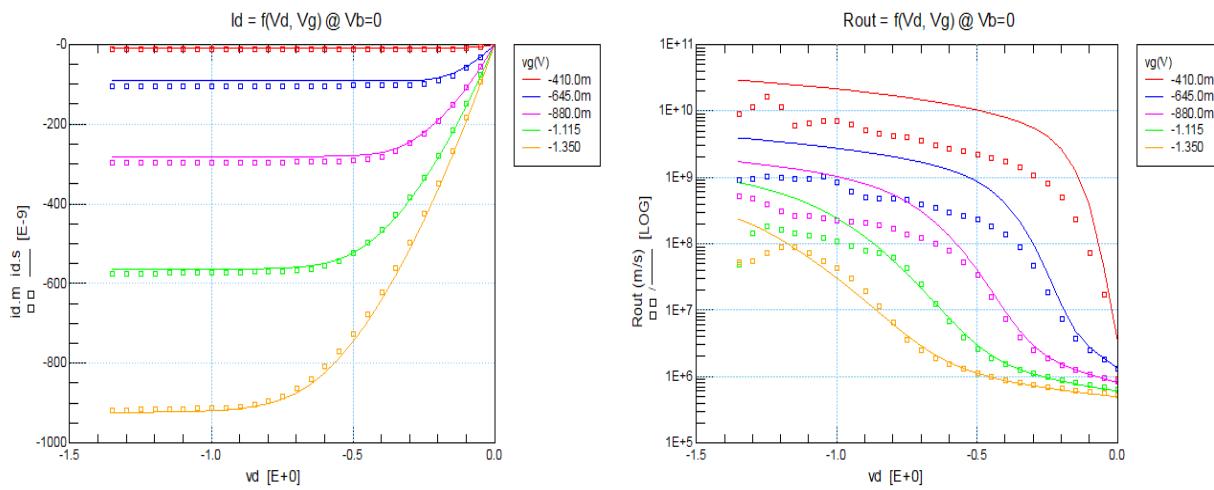
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

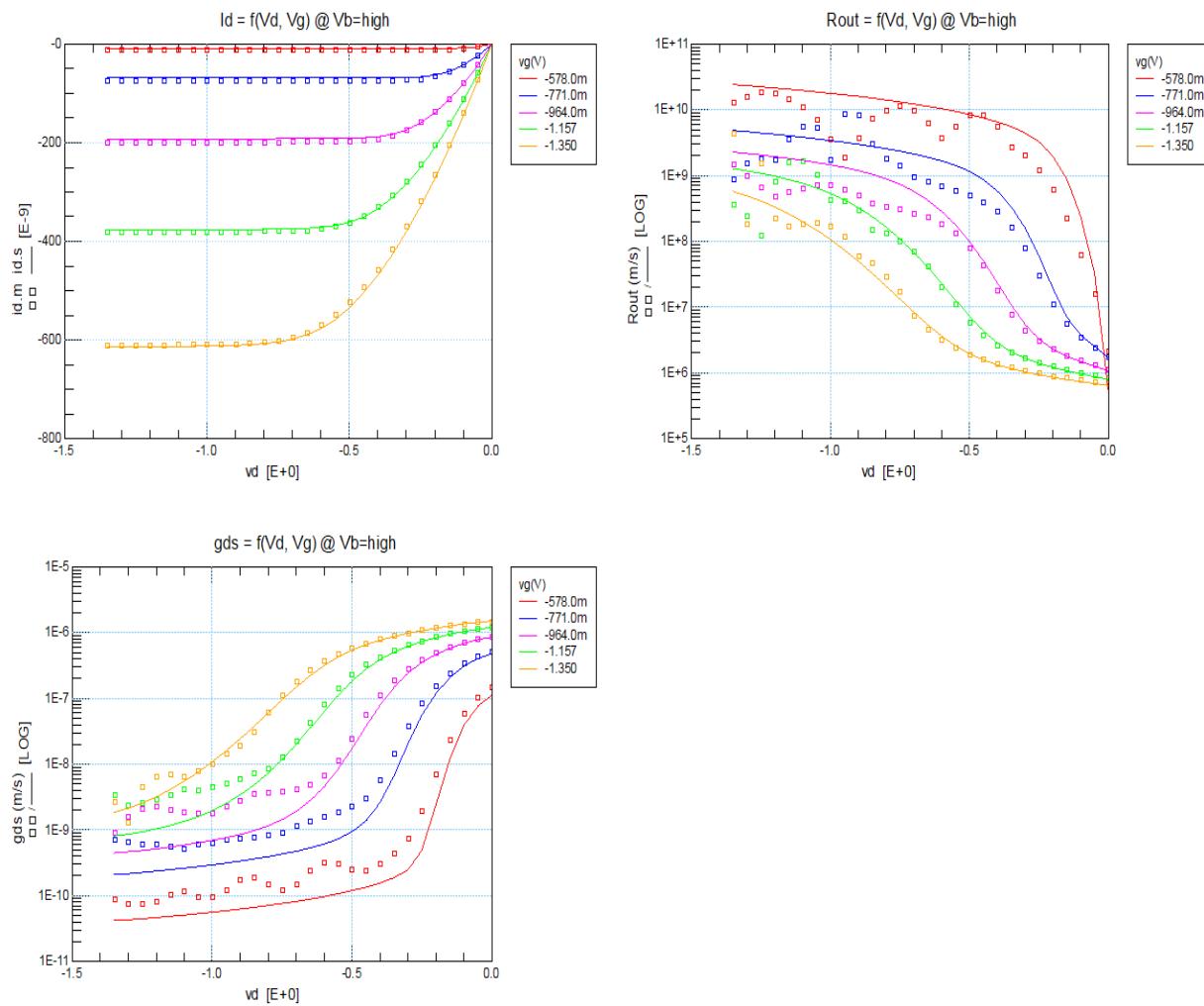
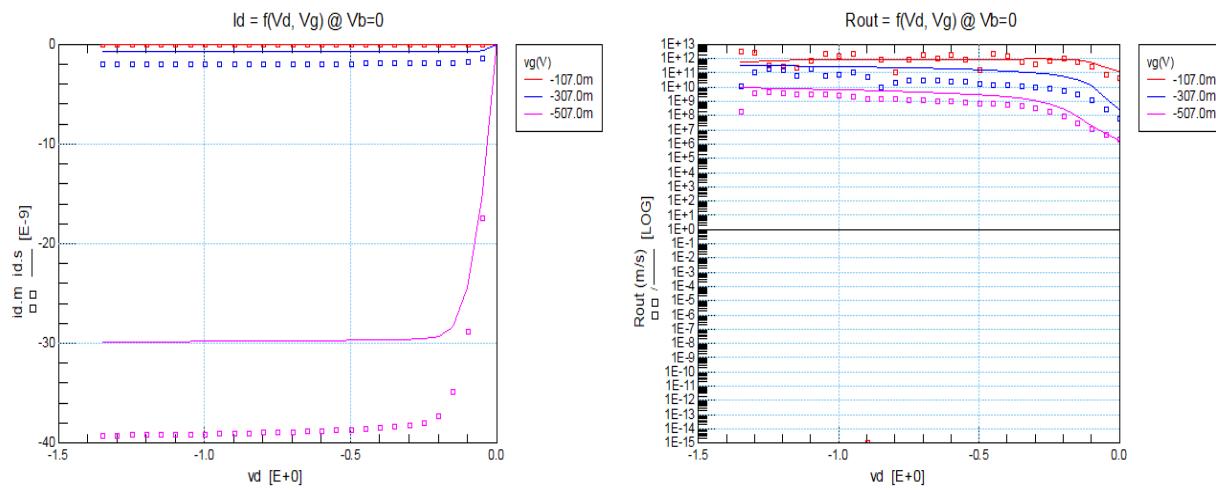


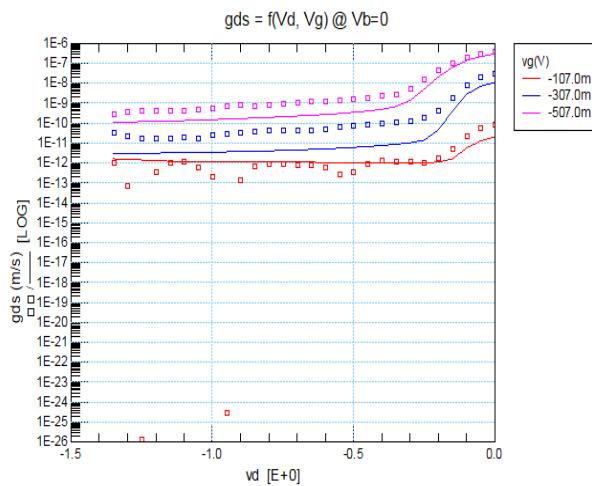


### $id_{vg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

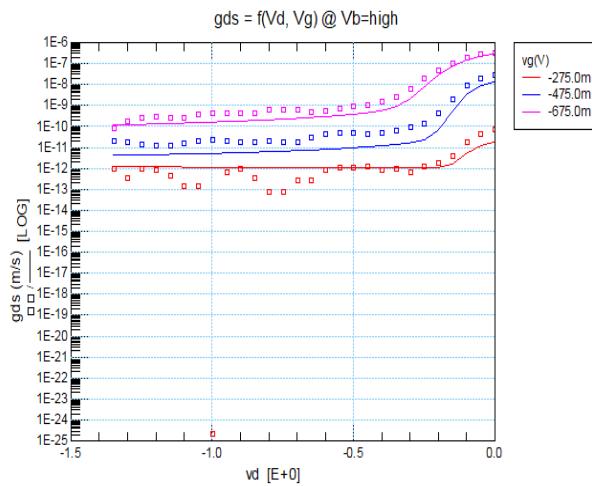
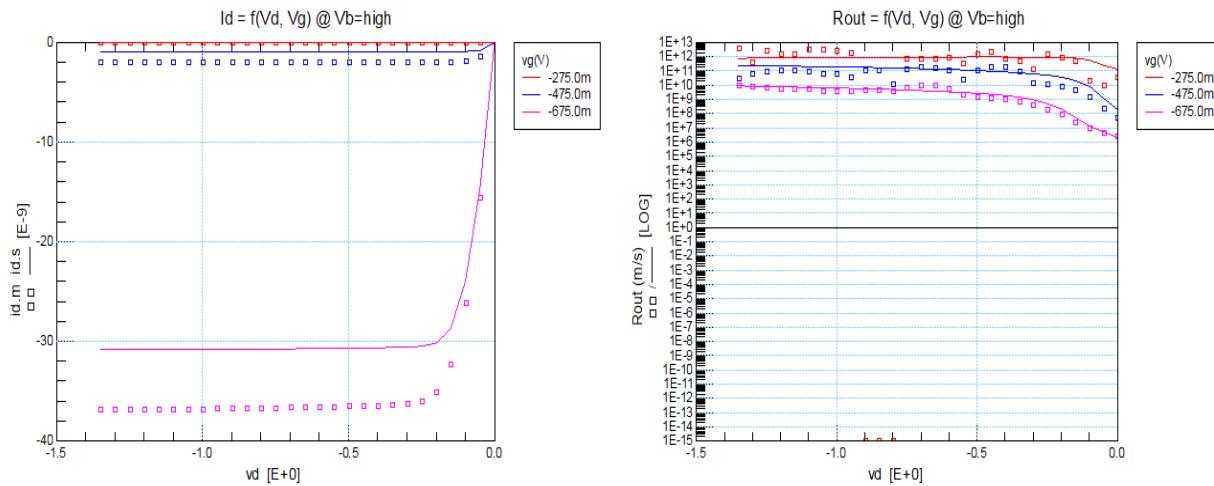


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**


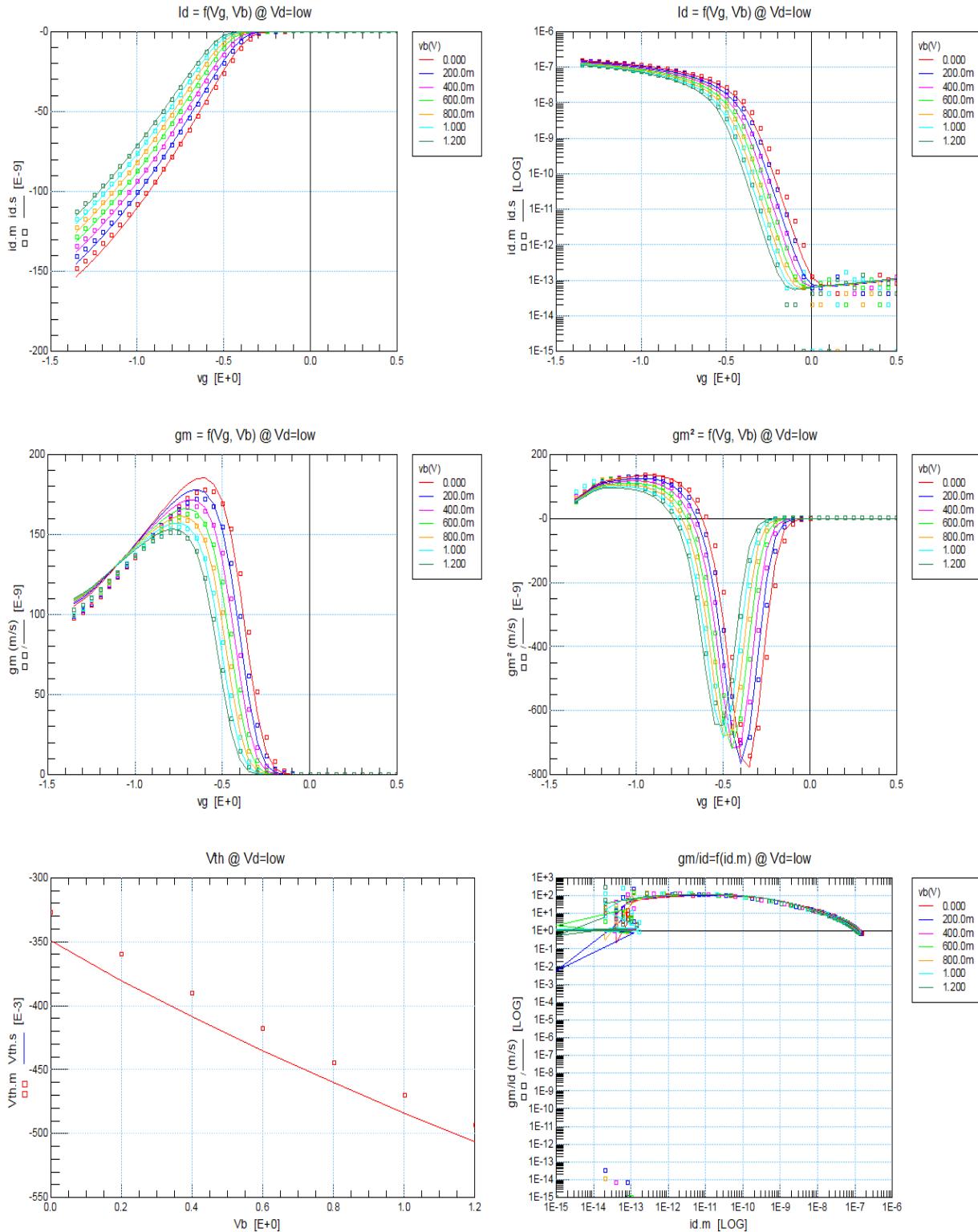


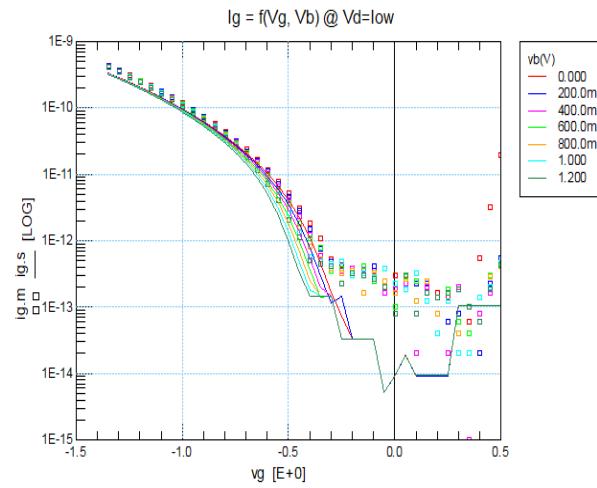
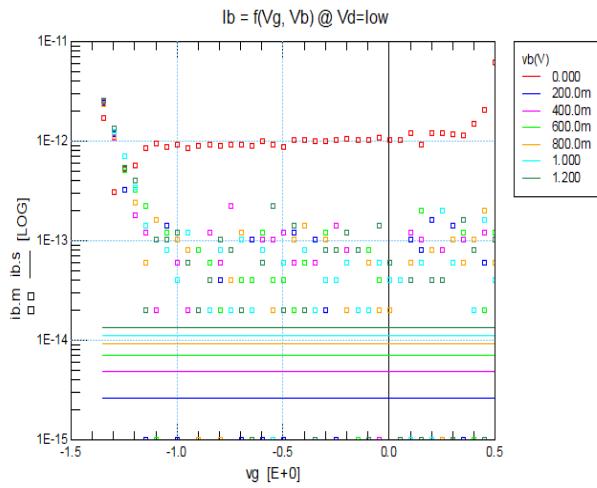
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



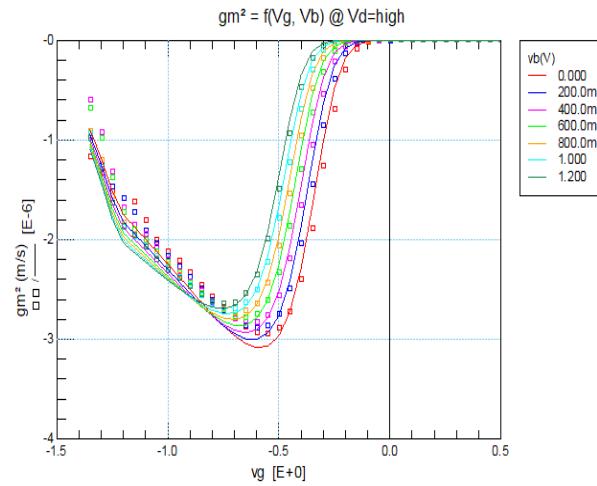
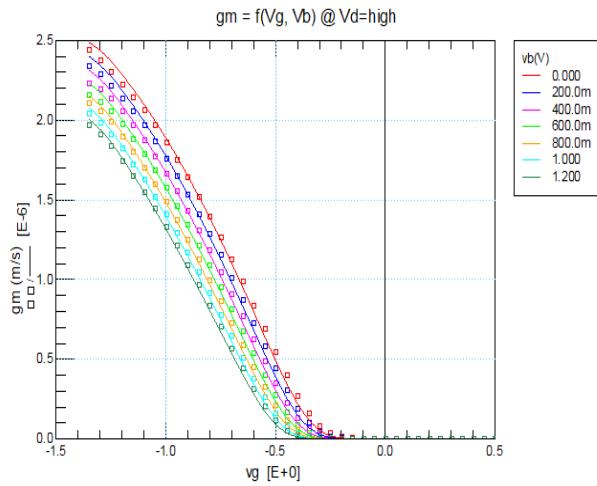
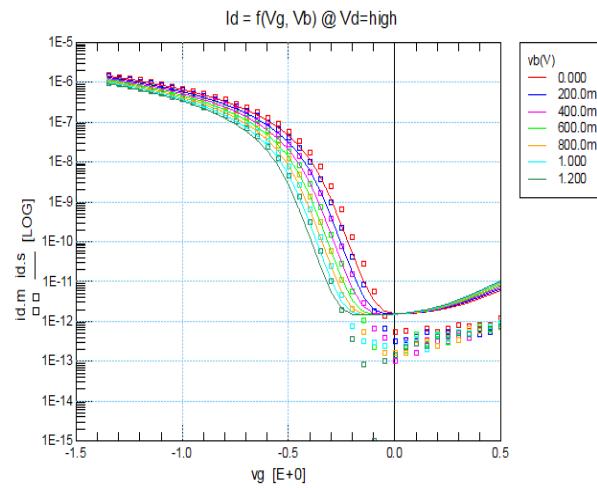
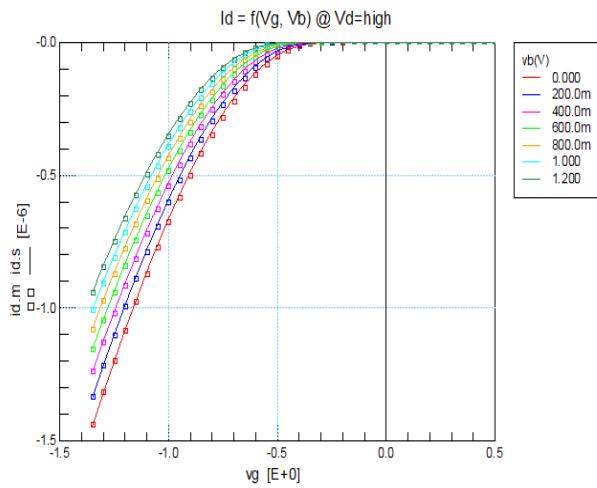
## 4.15 W0u3\_L10u0\_S553\_2

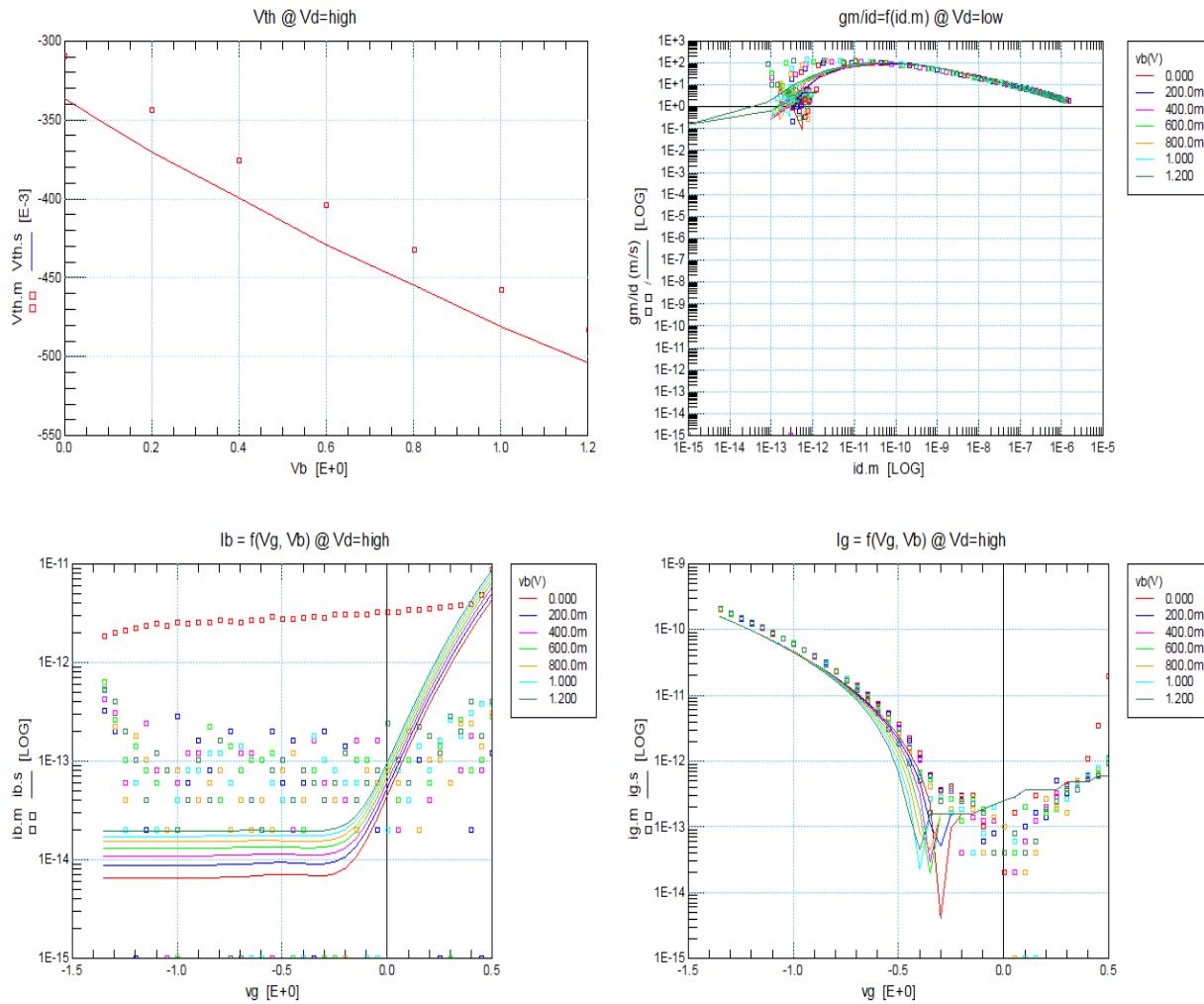
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



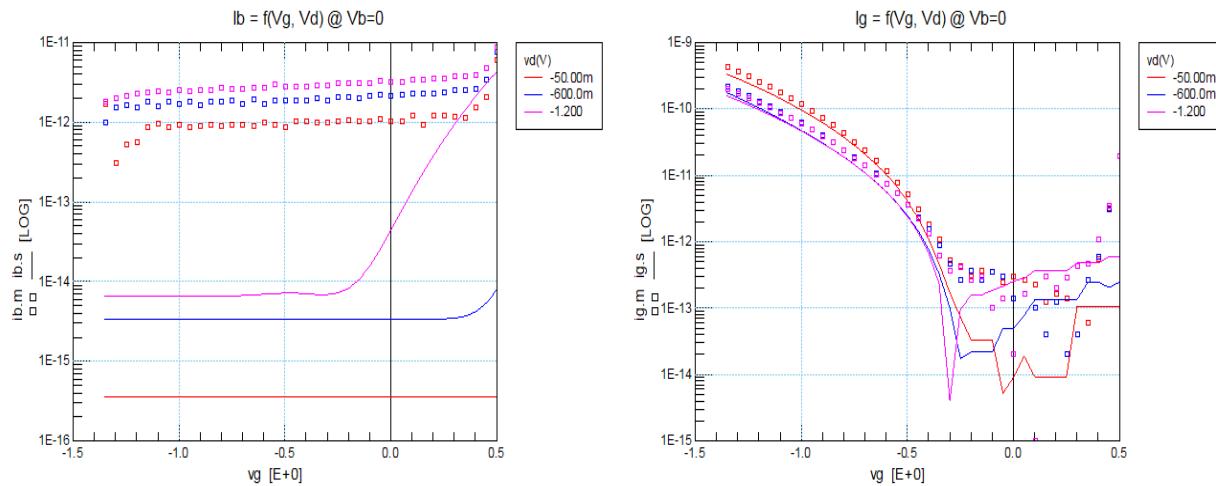


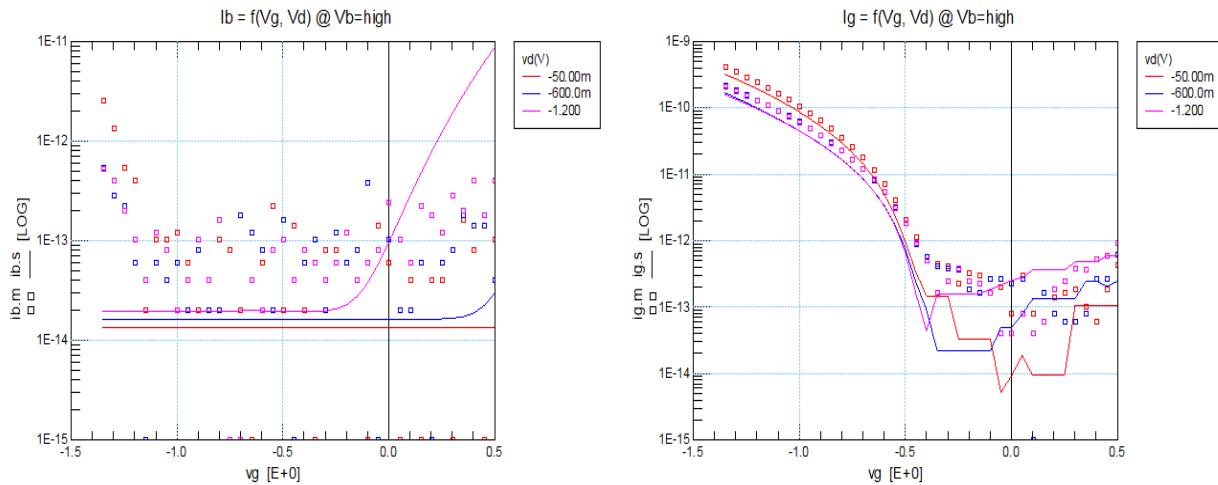
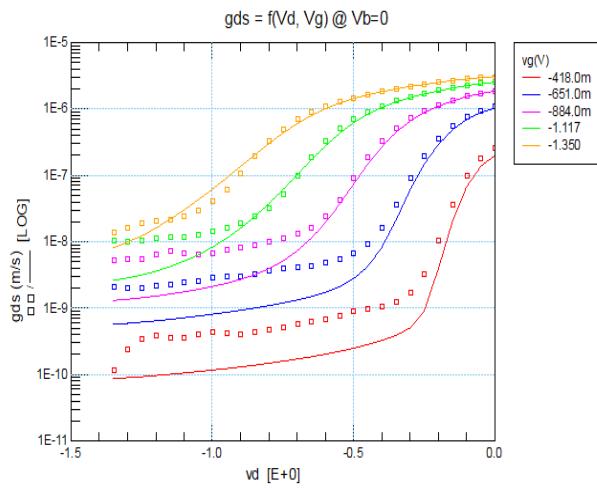
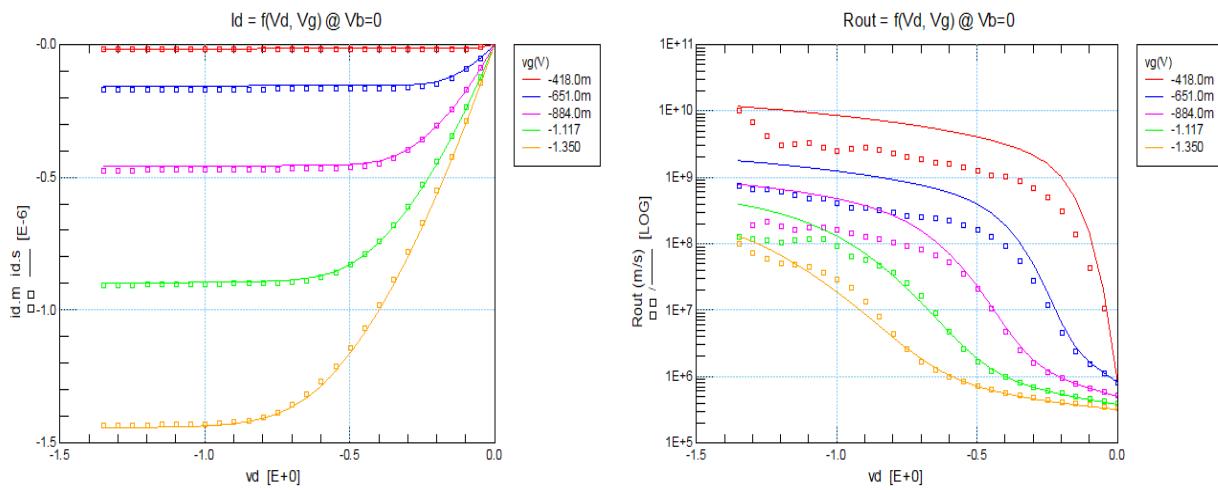
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

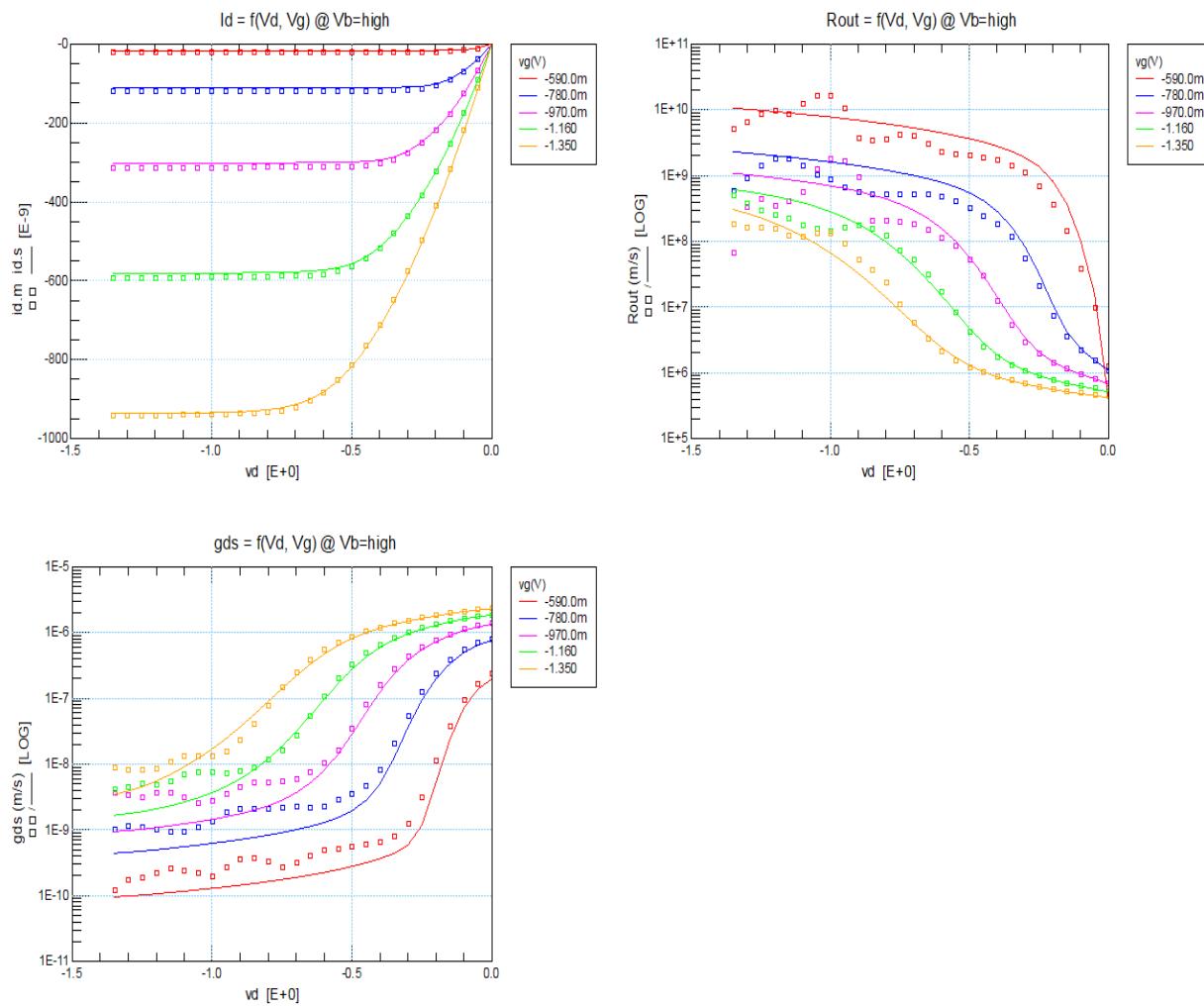
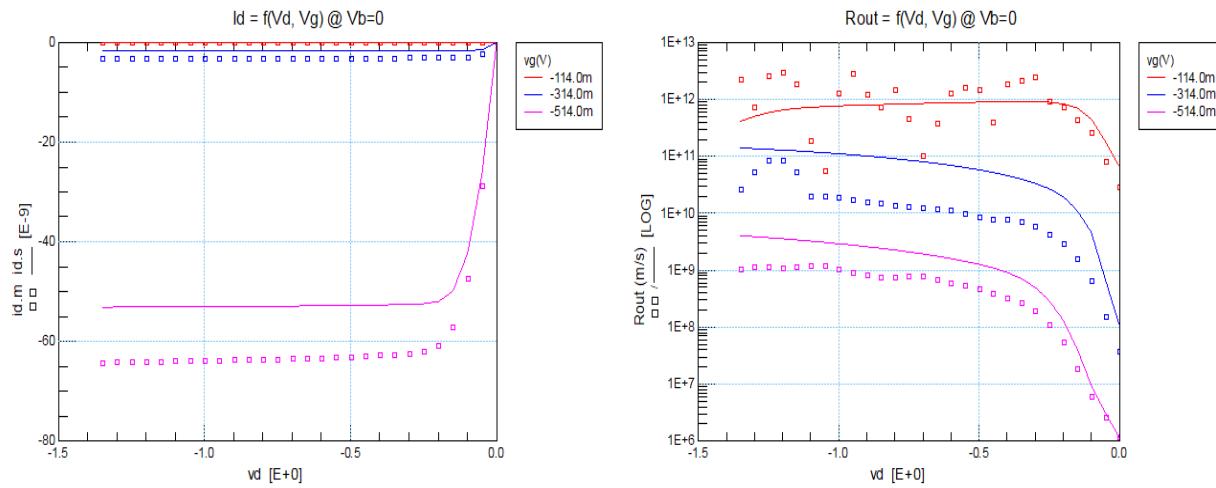


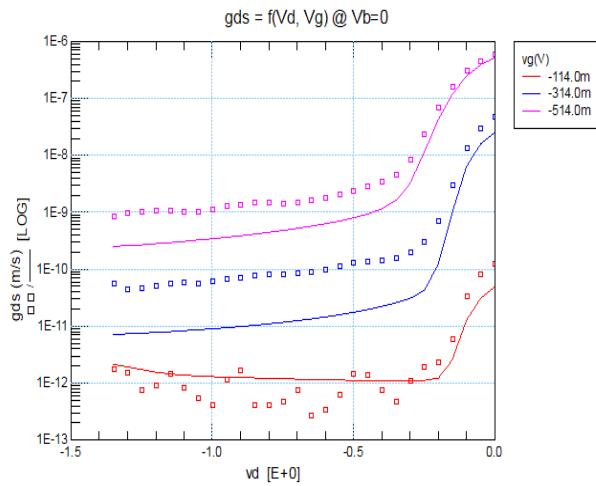


### $i_{dvg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

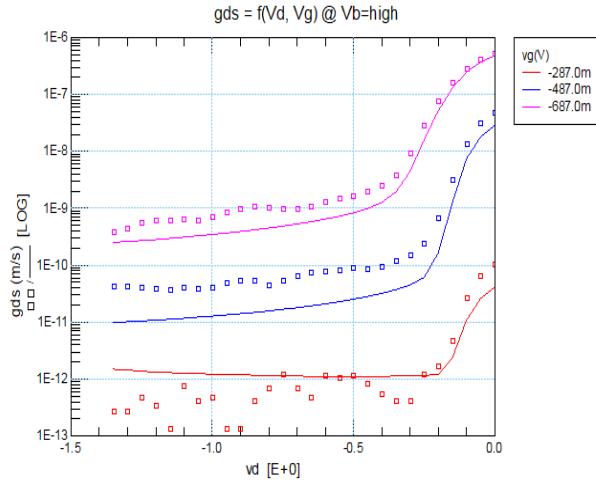
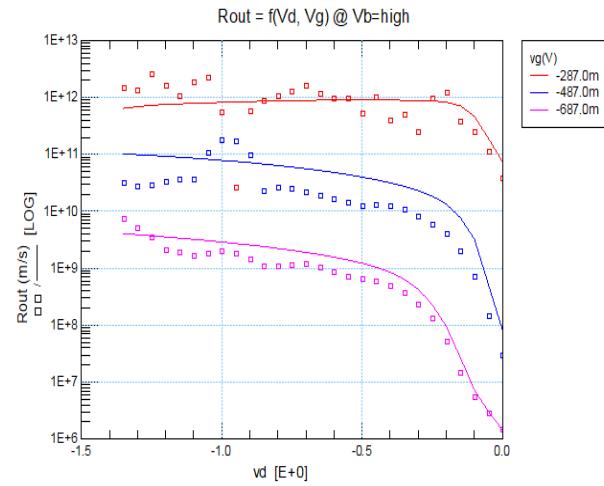
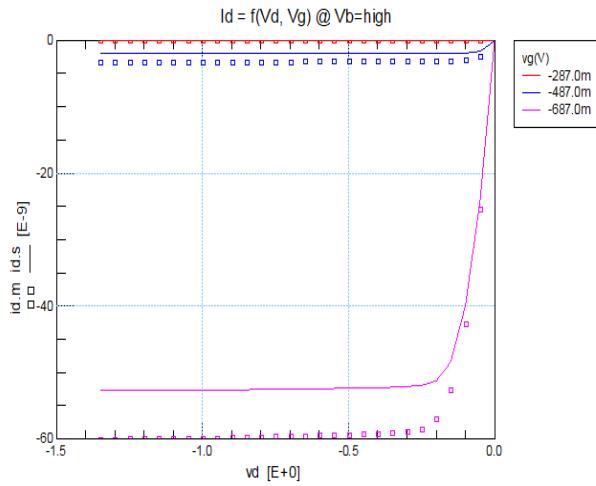


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


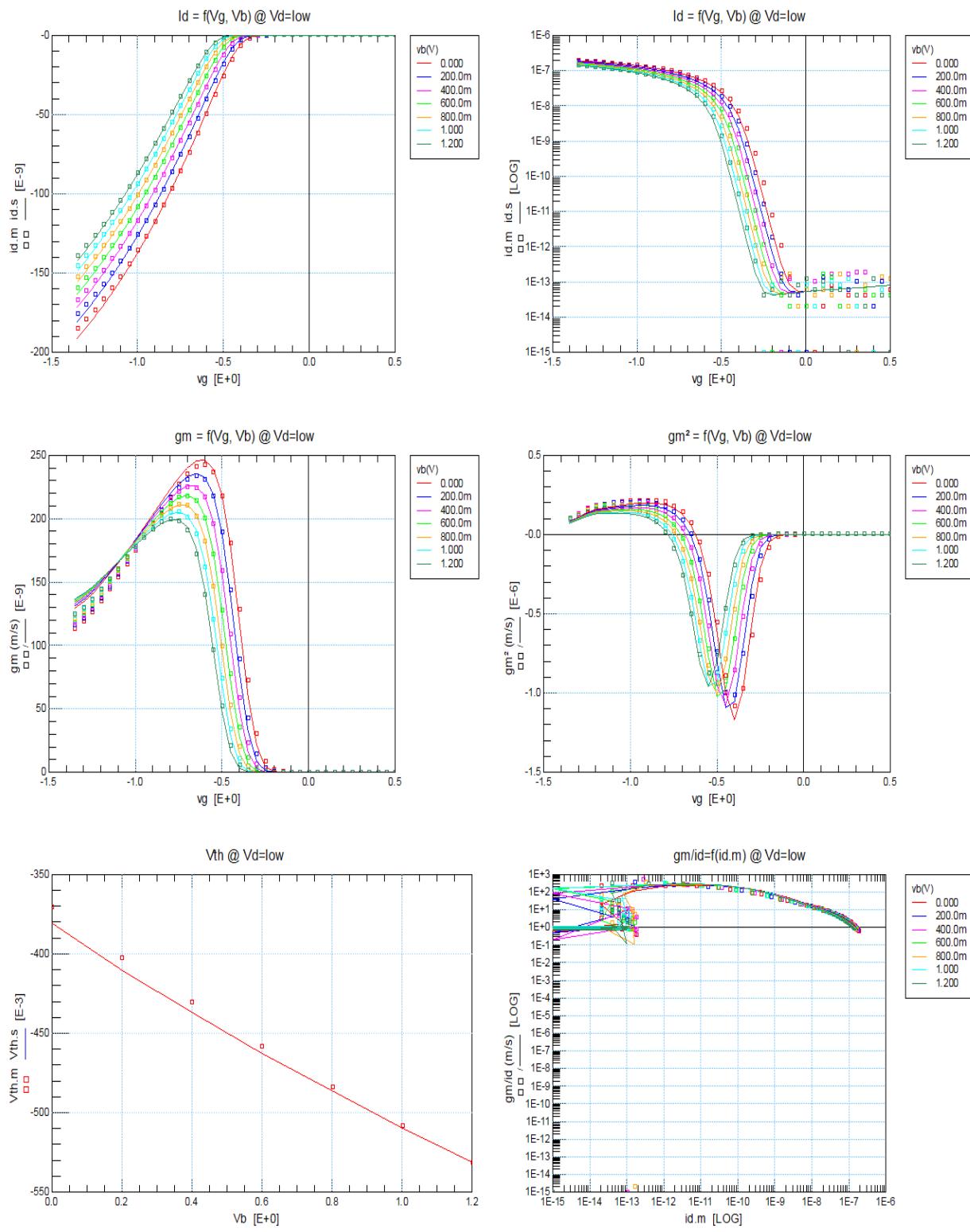
**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**


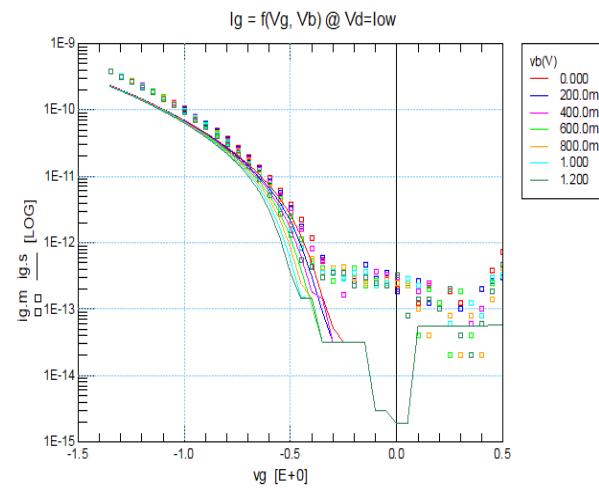
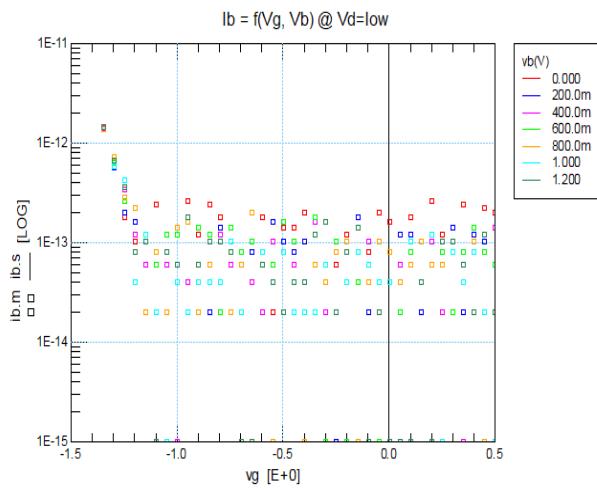


### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

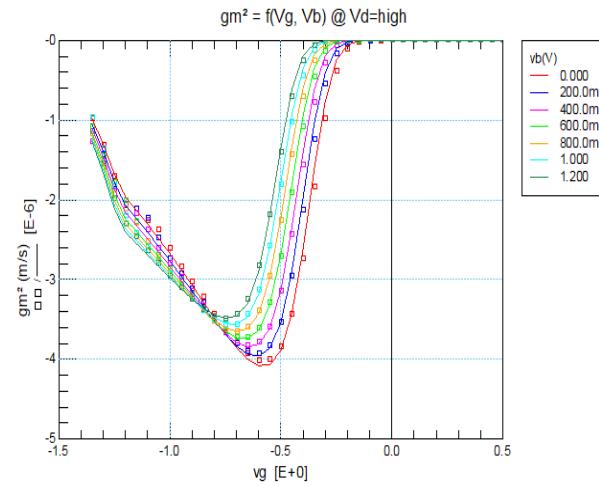
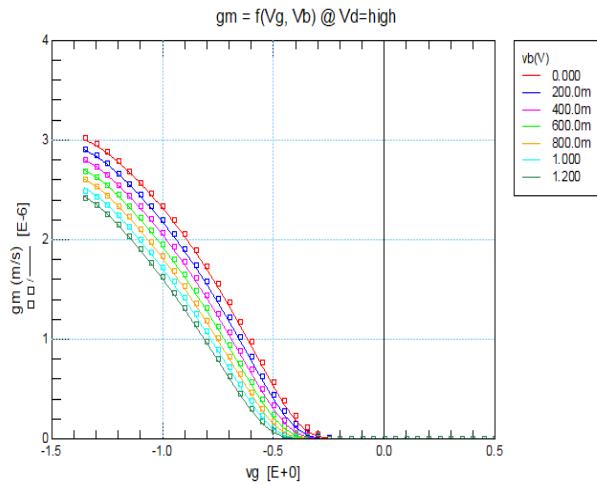
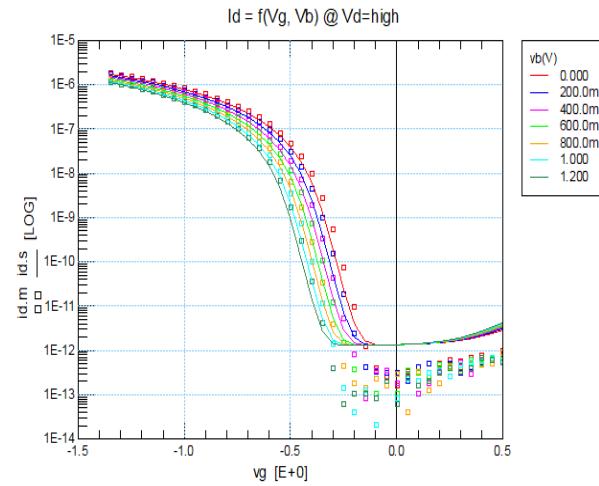
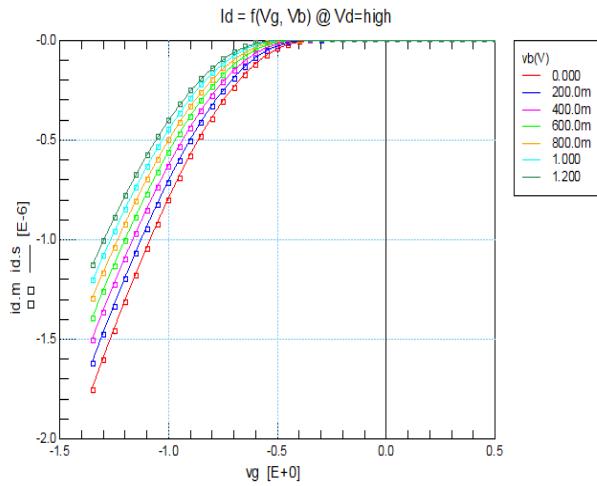


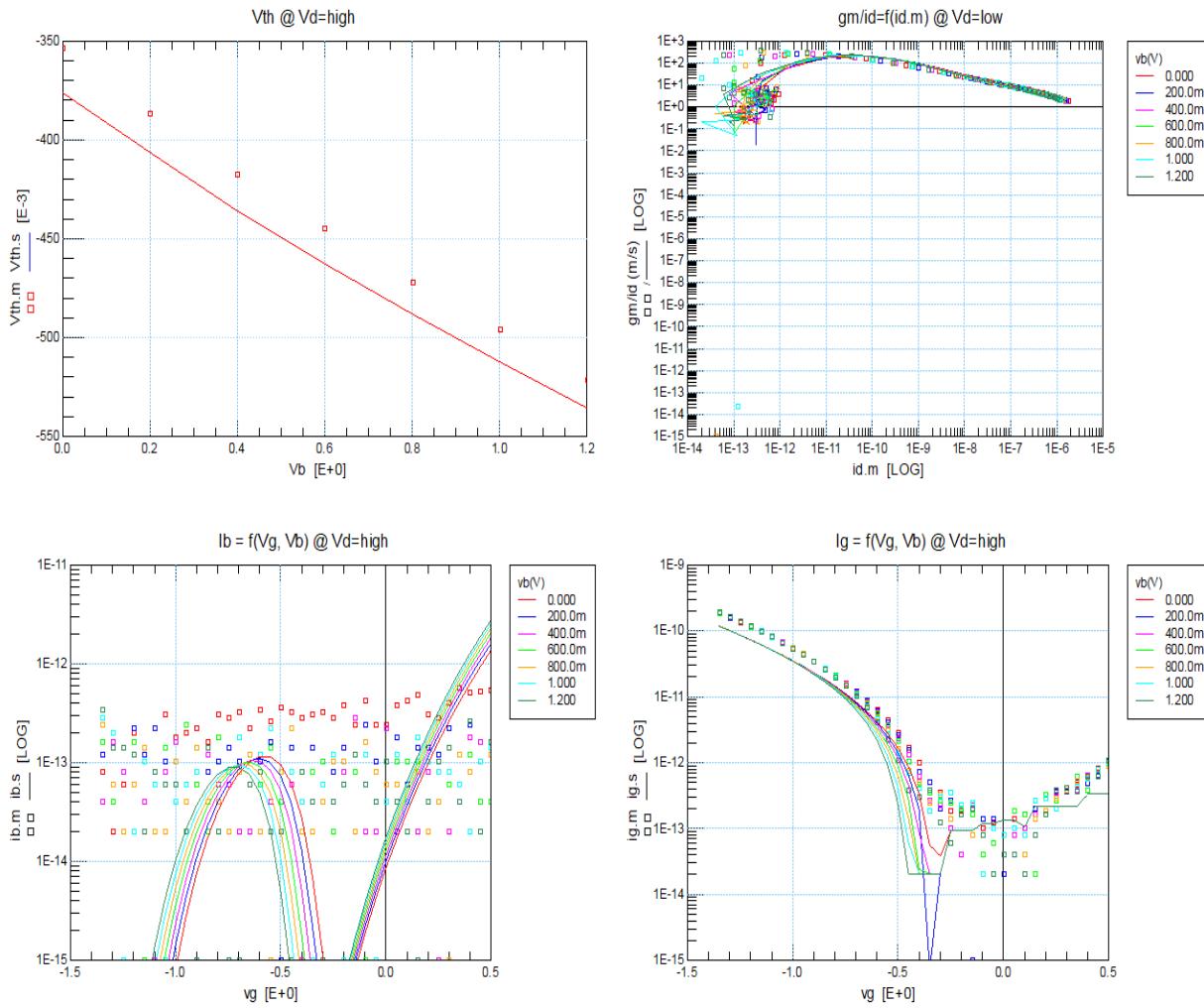
**idvg, Vd = -0.05V, T = -40°C**



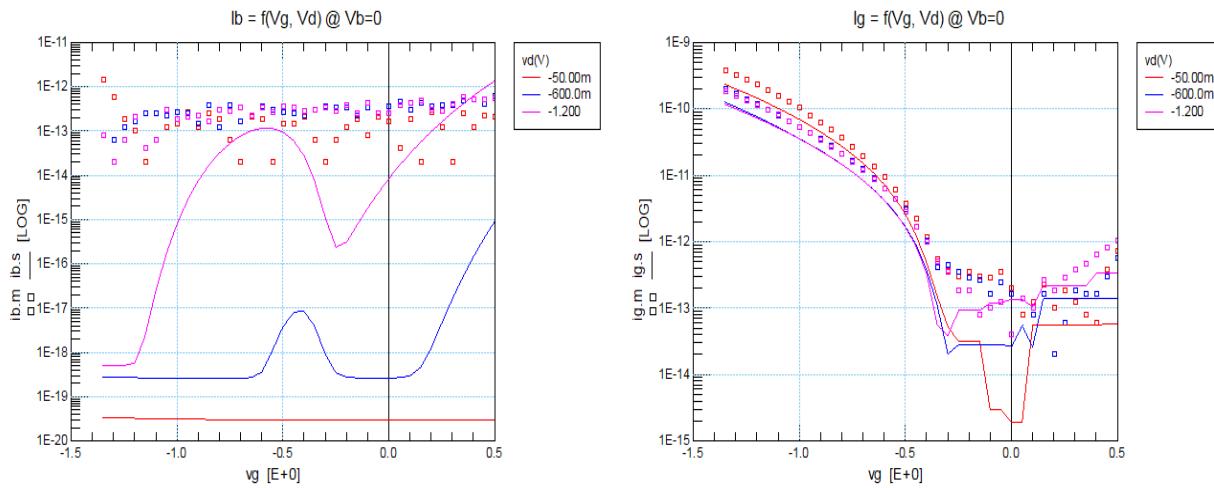


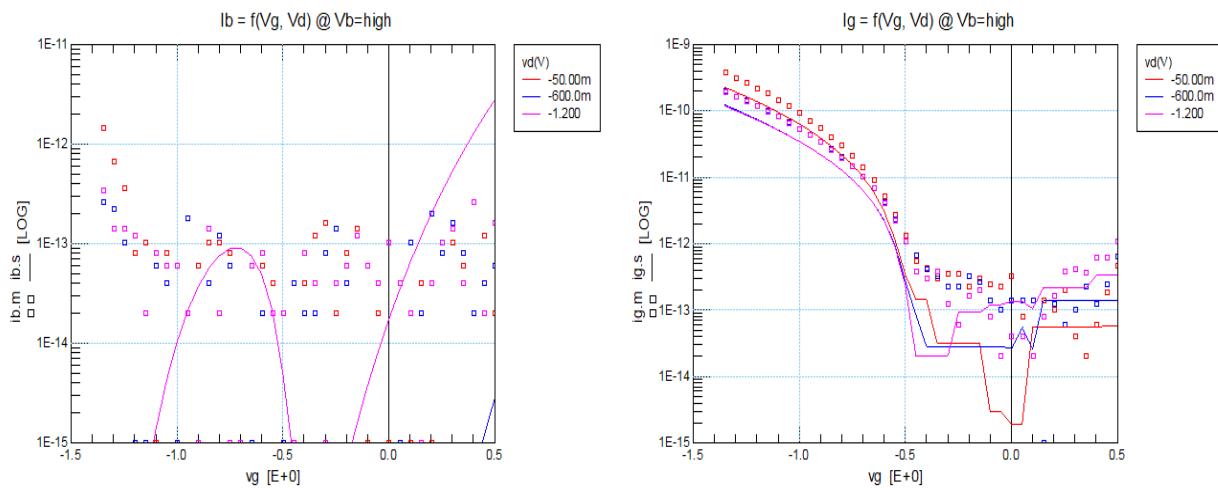
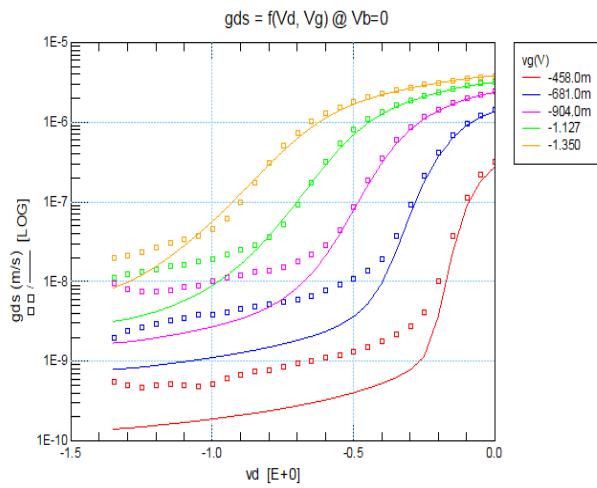
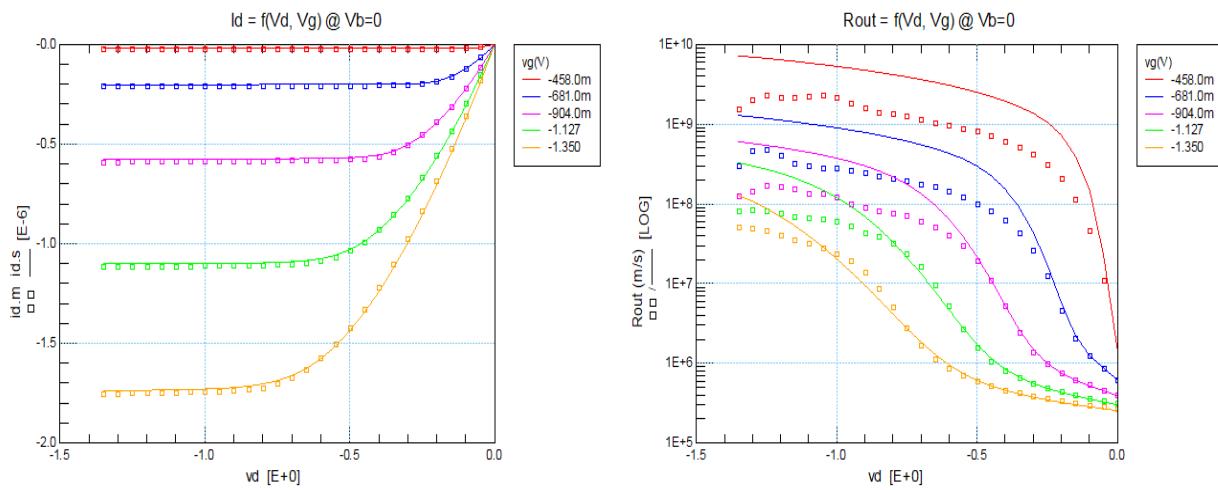
$i_{dvg}, V_d = -1.2V, T = -40^\circ C$

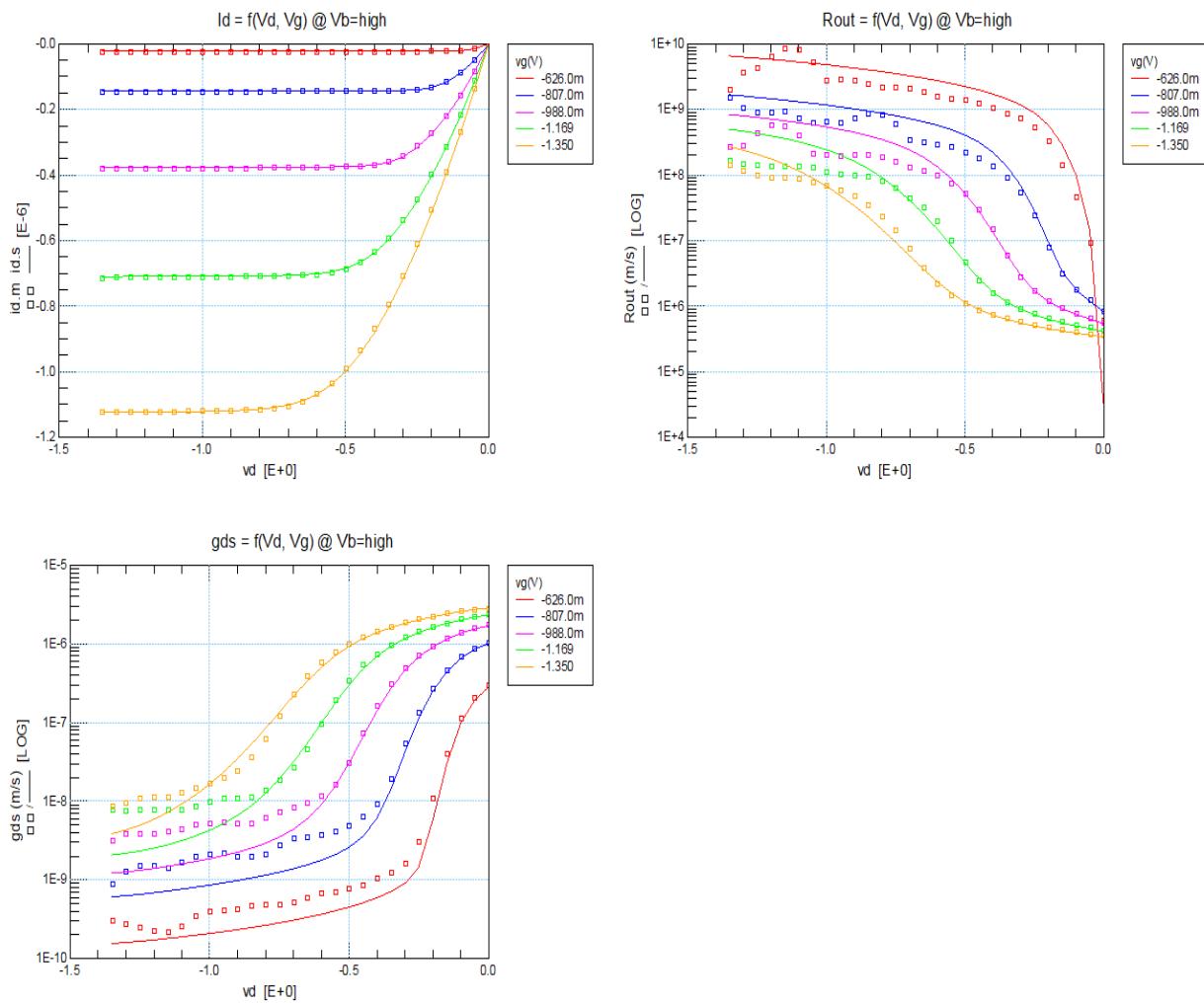
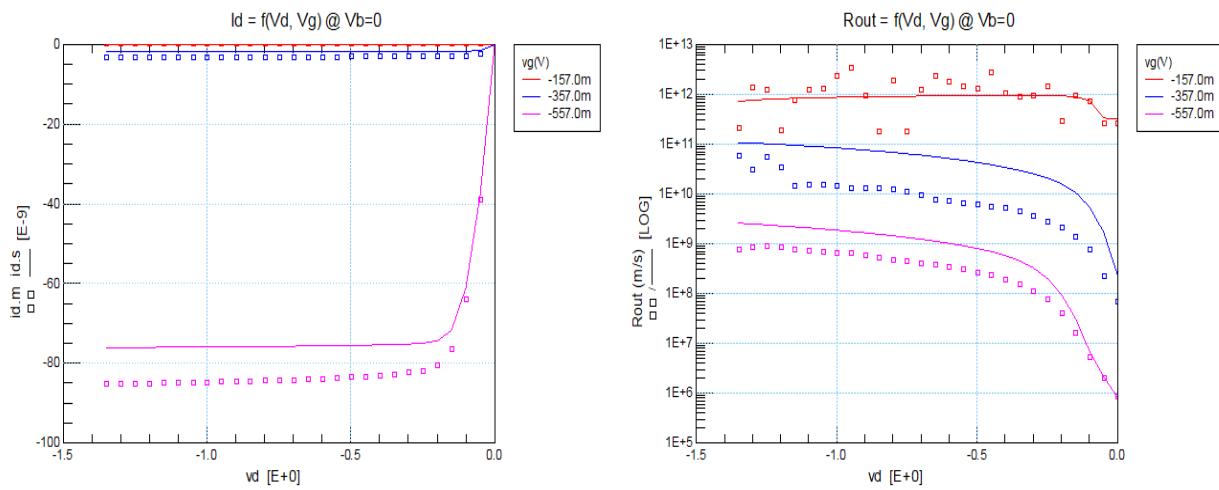


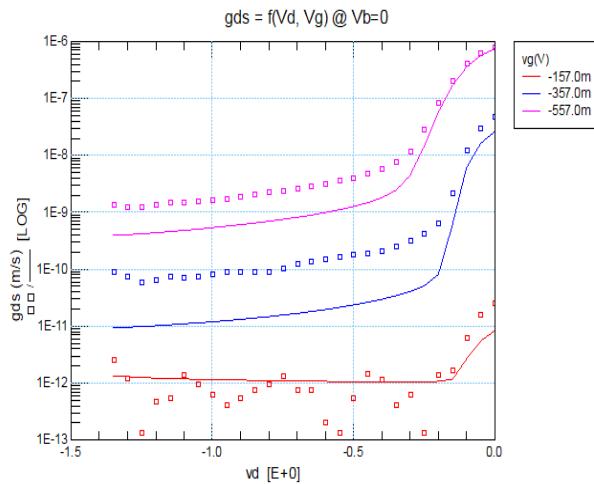


$idvg, I_b, Ig, V_b = 0V, T = -40^\circ C$

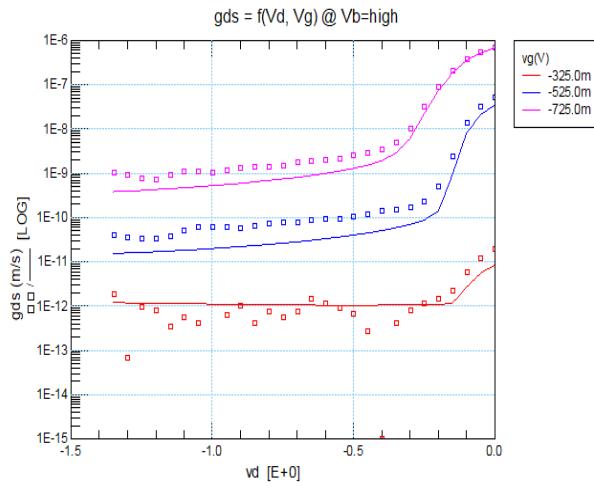
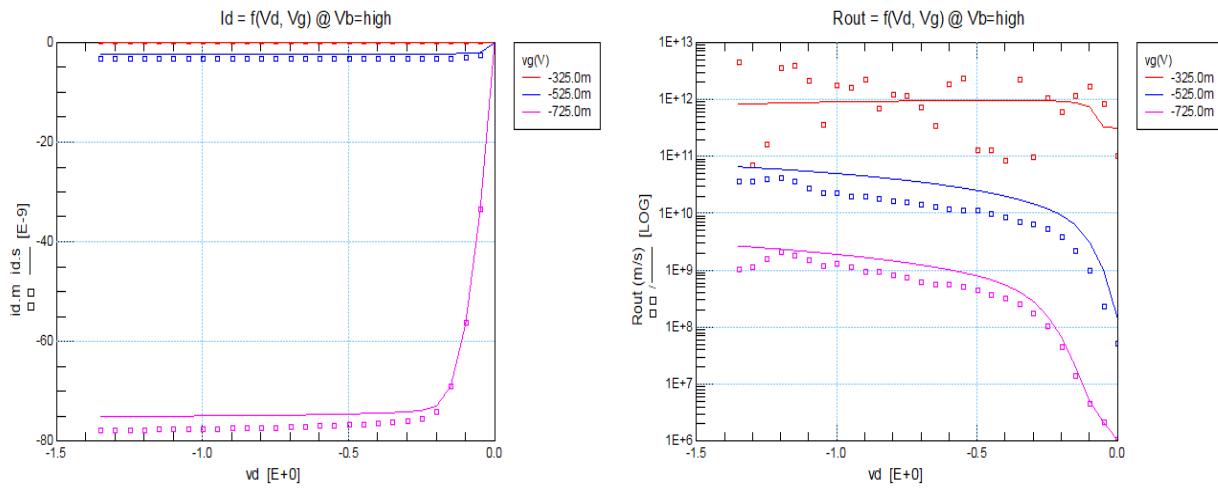


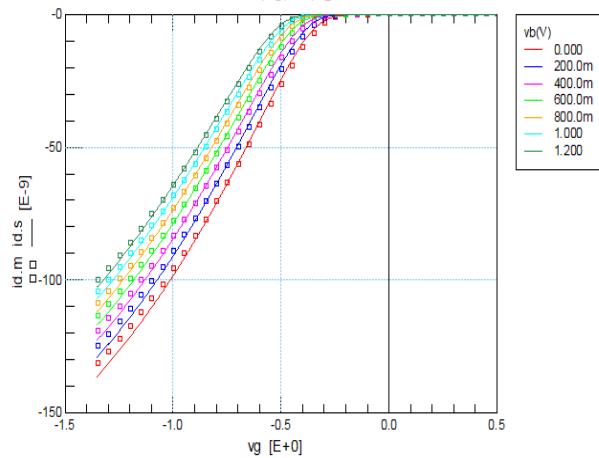
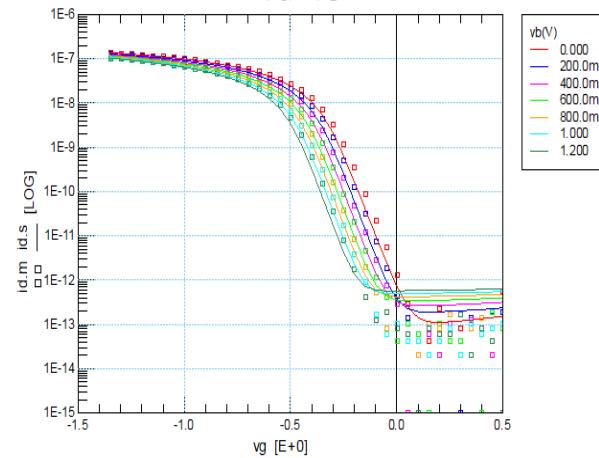
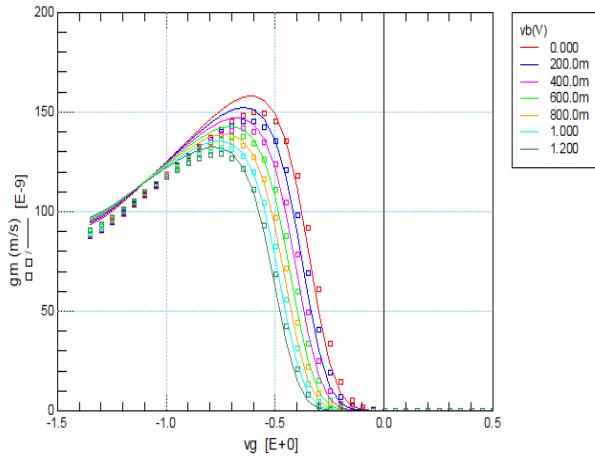
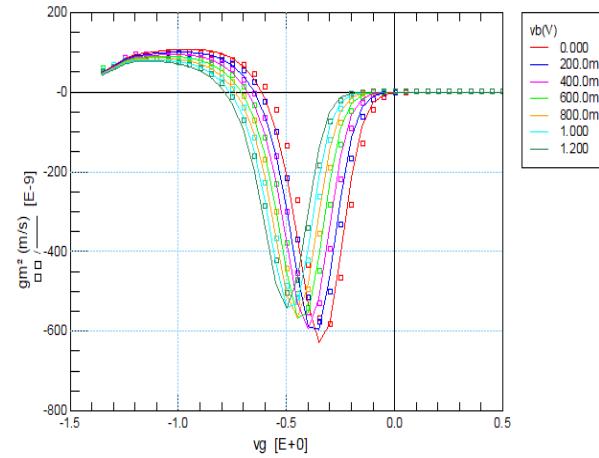
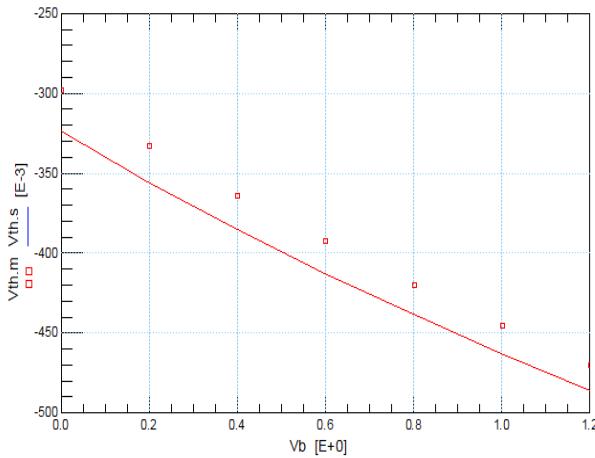
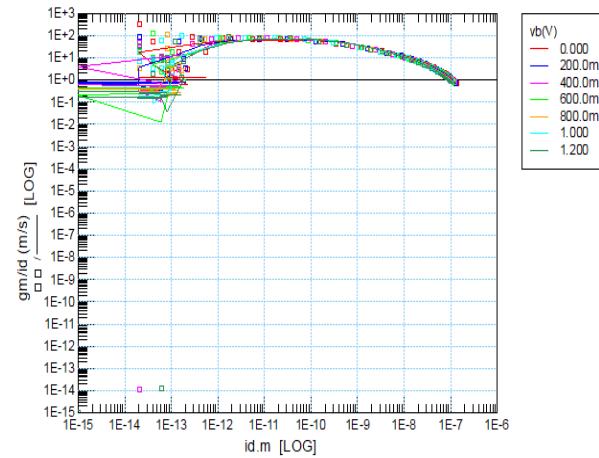
**idvg, Ib,Ig, Vb = 1.2V, T = -40°C**

**idvd, Vb = 0V, T = -40°C**


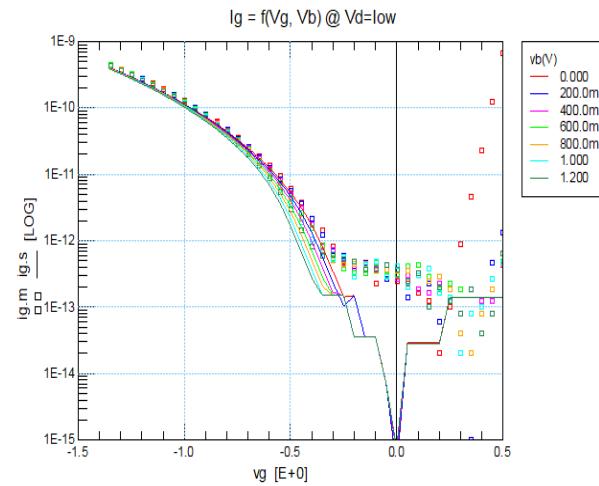
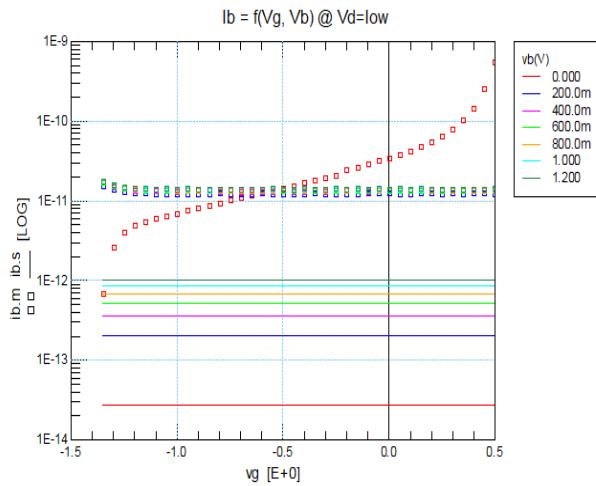
**idvd\_vbmin, Vb = 1.2V, T = -40°C**

**idvd\_vth, Vb = 0V, T = -40°C**




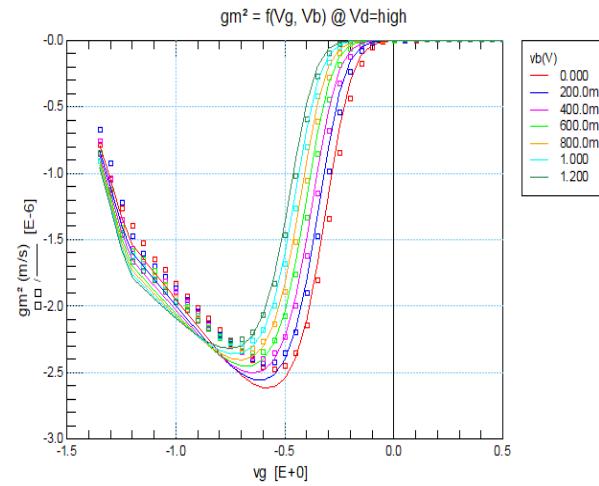
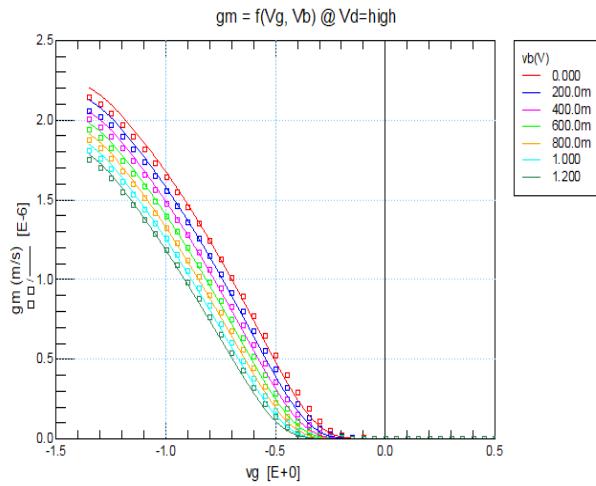
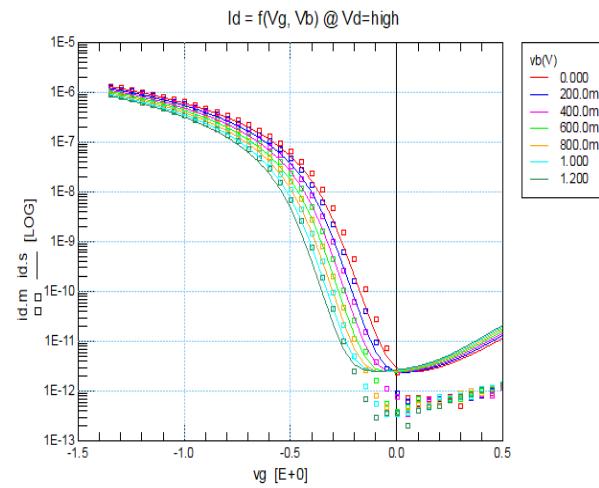
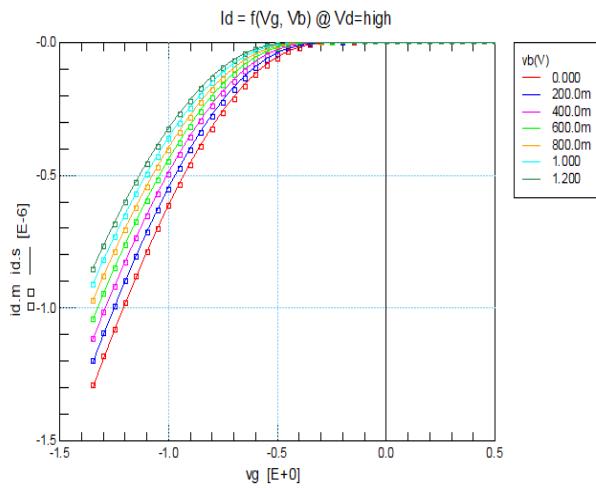
idvd\_vth\_vbmin, Vb = 1.2V, T = -40°C

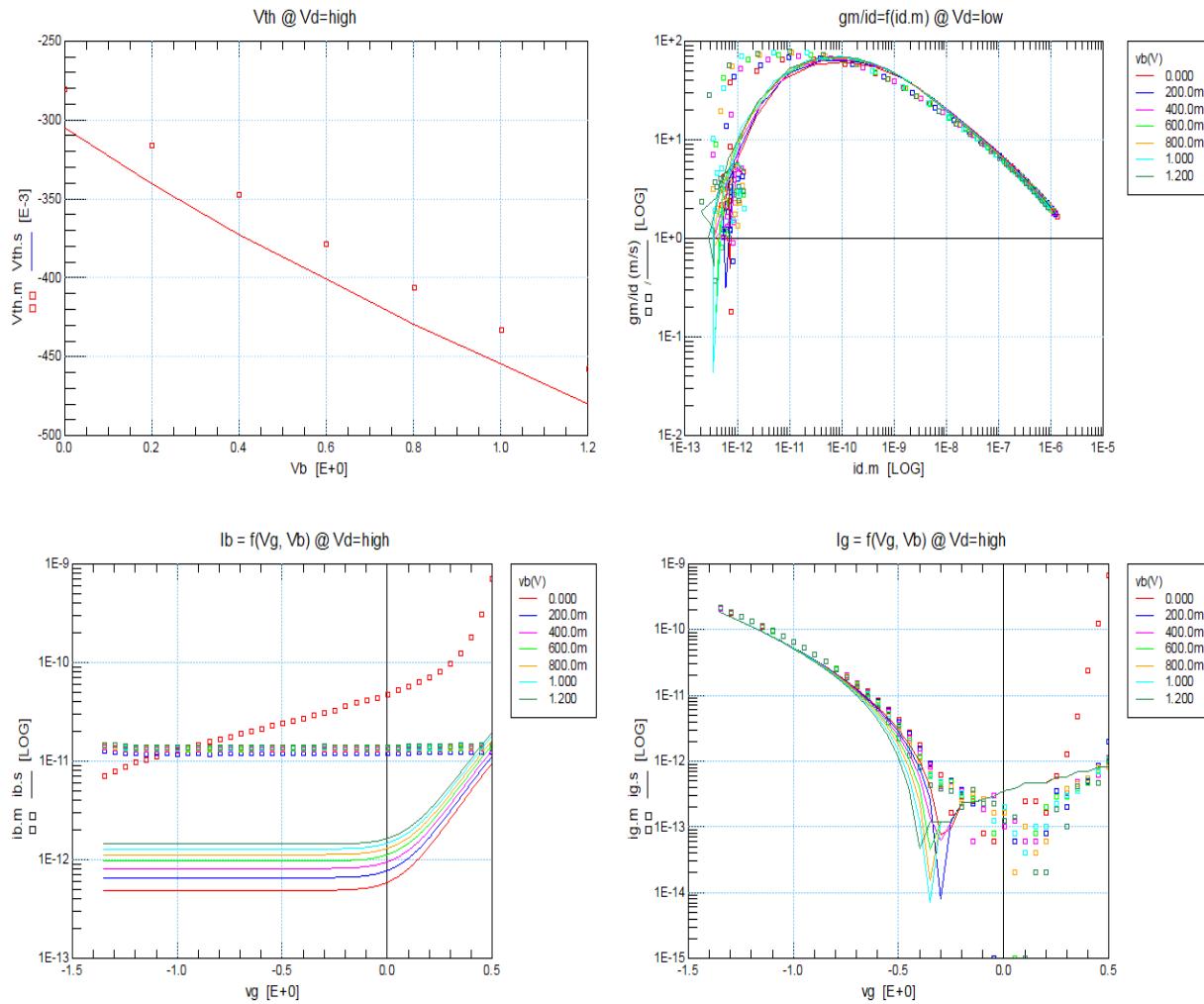


**idvg, Vd = -0.05V, T = 70°C** $Id = f(Vg, Vb) @ Vd=low$  $Id = f(Vg, Vb) @ Vd=low$  $gm = f(Vg, Vb) @ Vd=low$  $gm^2 = f(Vg, Vb) @ Vd=low$  $Vth @ Vd=low$  $gm/id = f(id.m) @ Vd=low$ 

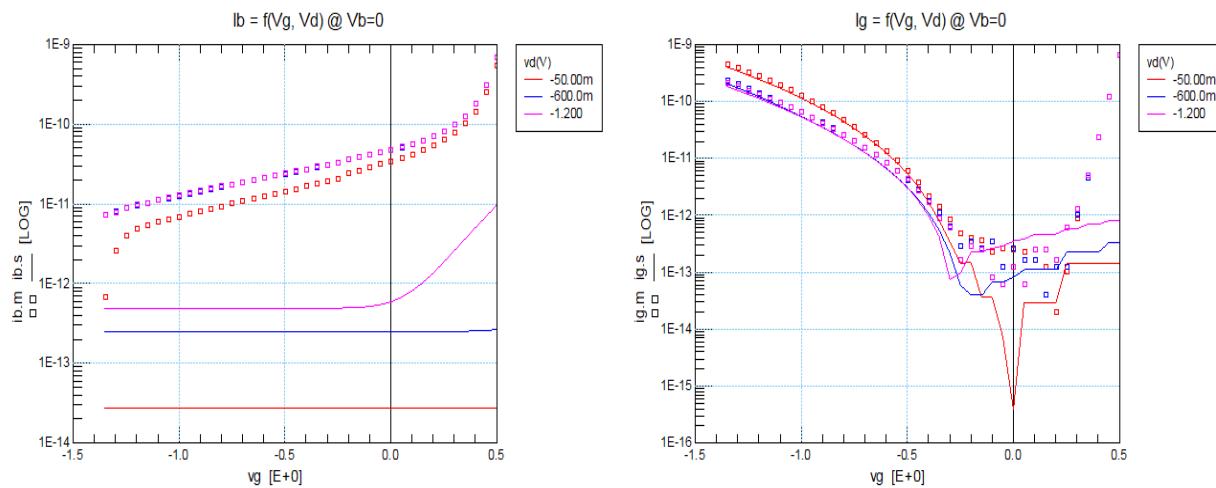


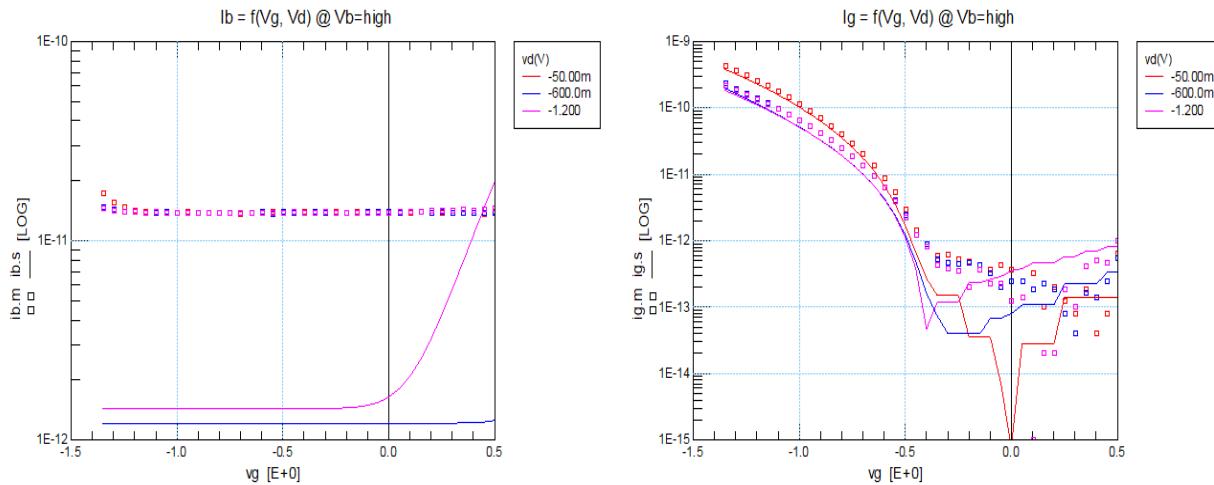
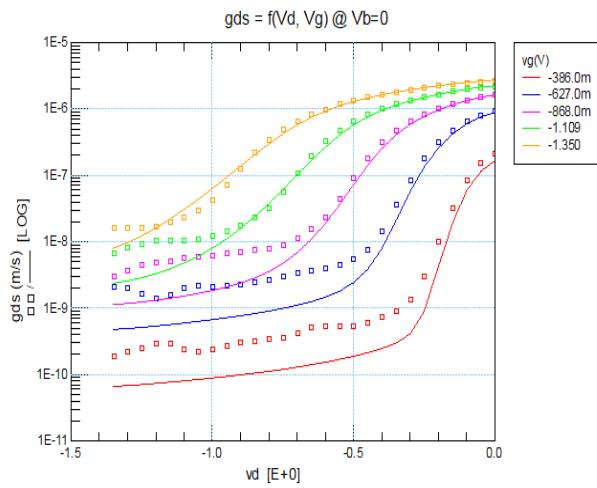
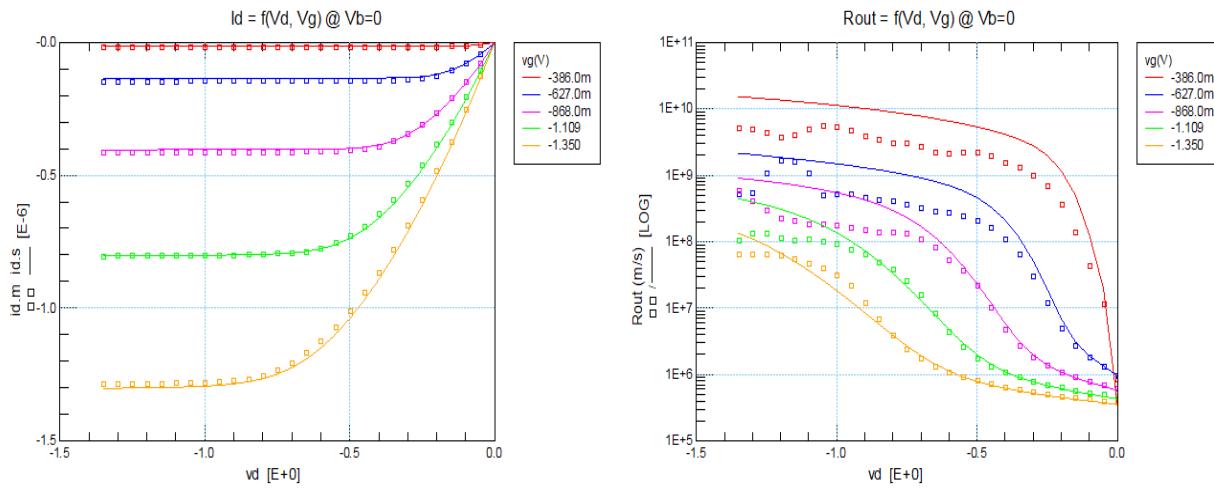
$i_{dvg}, V_d = -1.2V, T = 70^\circ C$

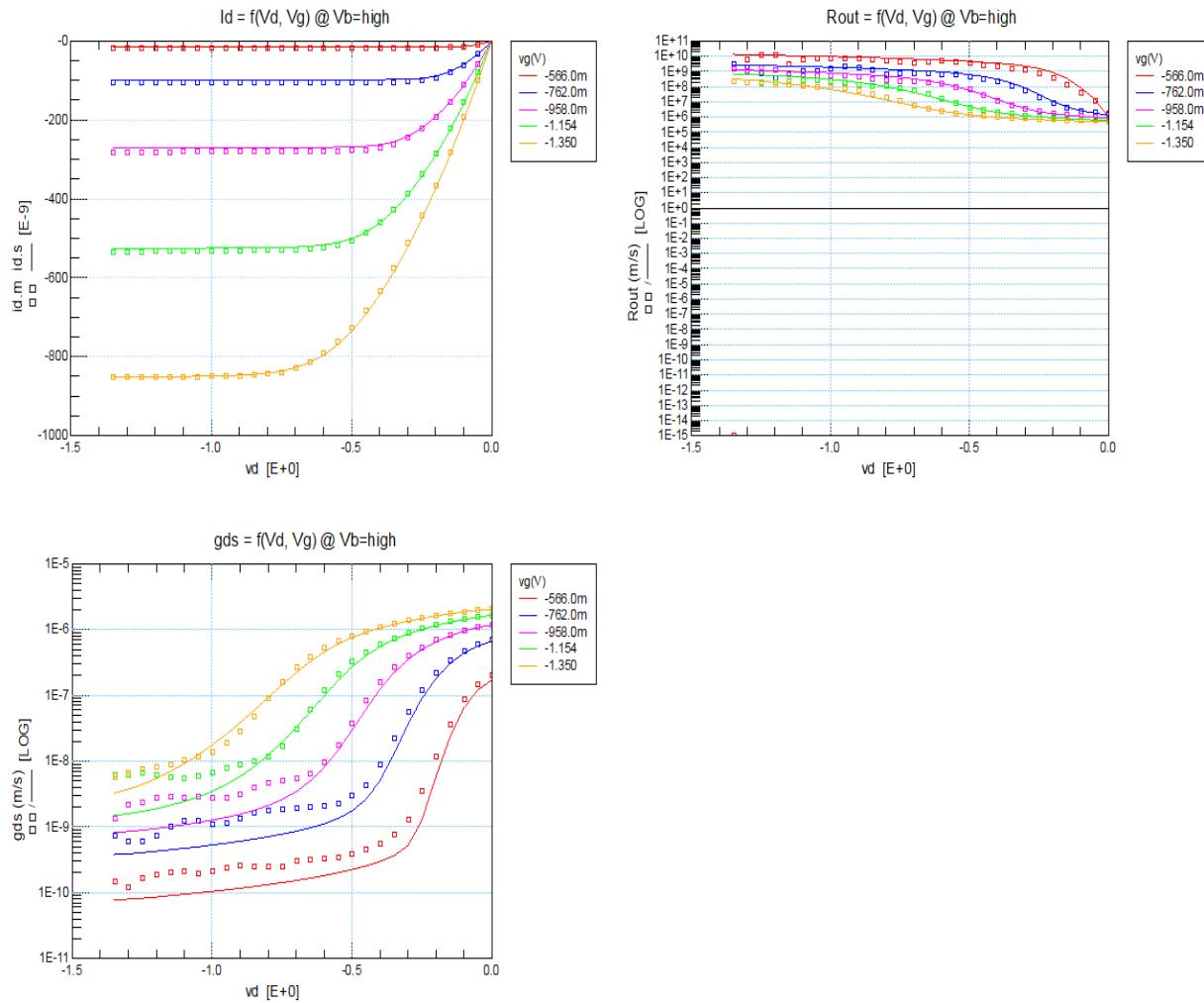
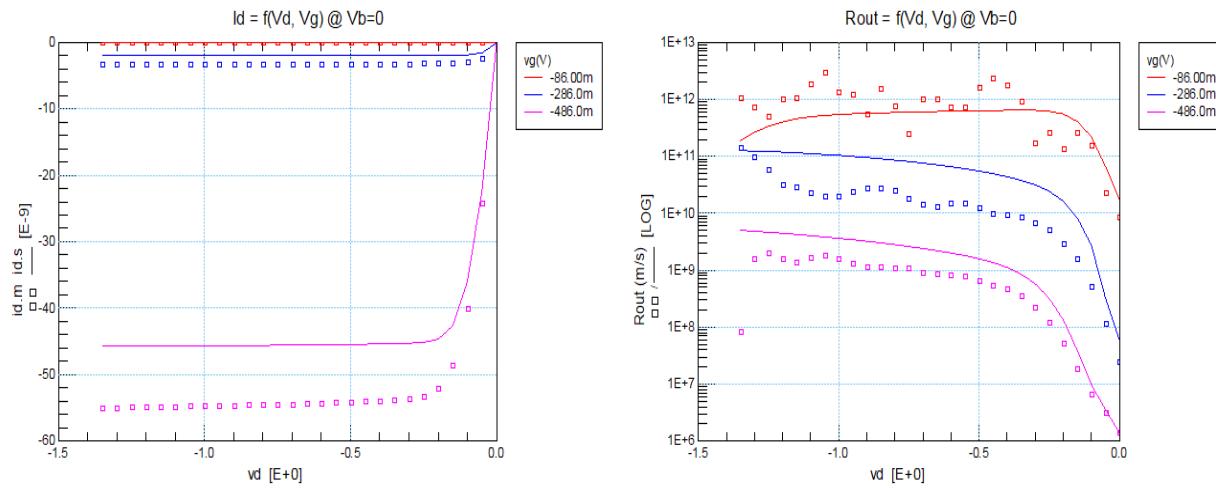


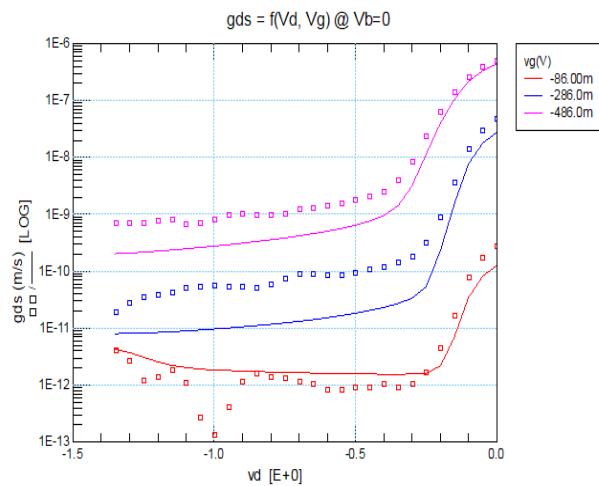


### $I_{dVg}, I_b, I_g, V_b = 0V, T = 70^\circ C$

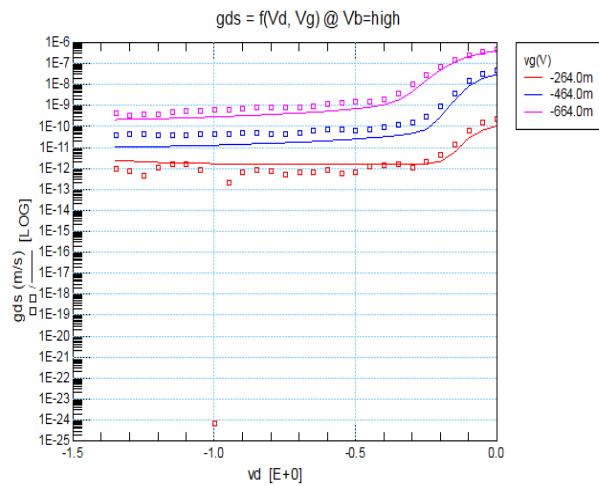
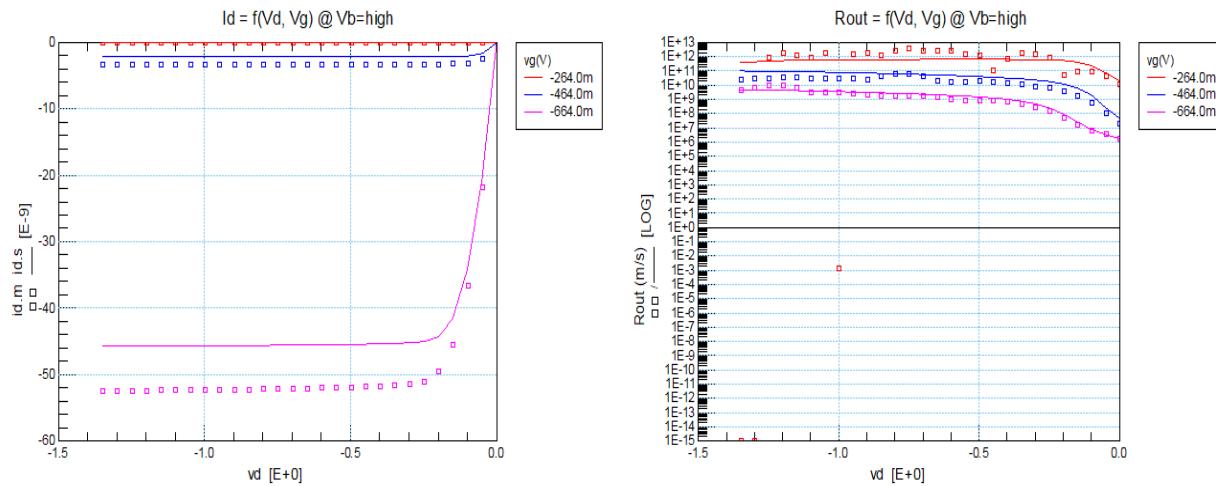


**idvg, Ib,Ig, Vb = 1.2V, T = 70°C**

**idvd, Vb = 0V, T = 70°C**


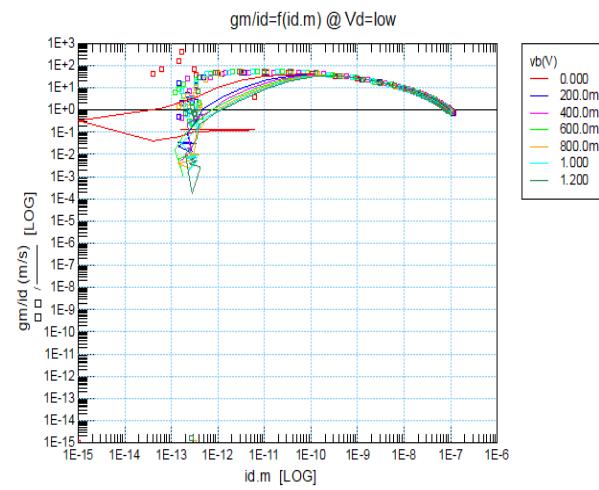
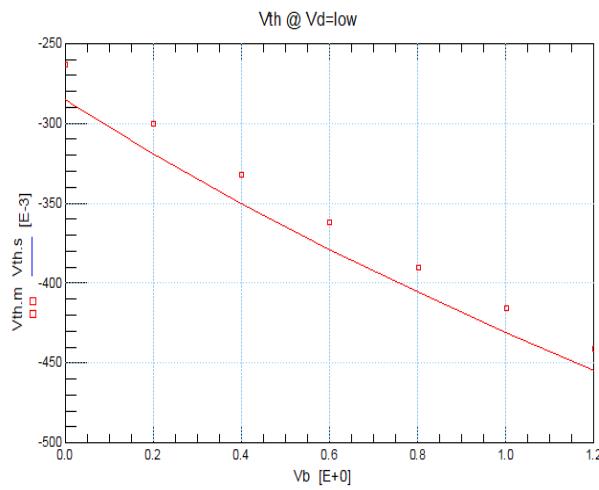
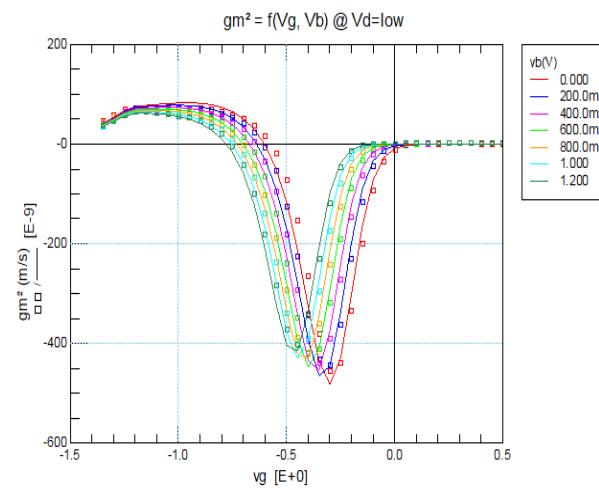
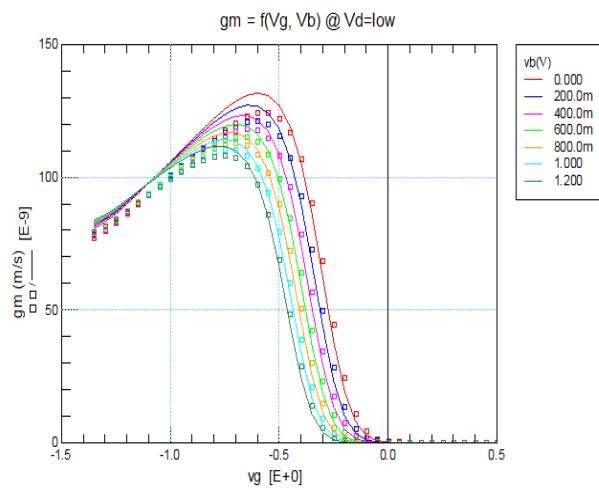
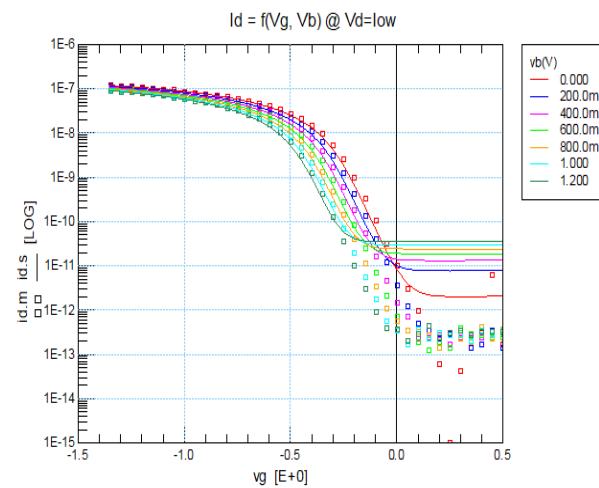
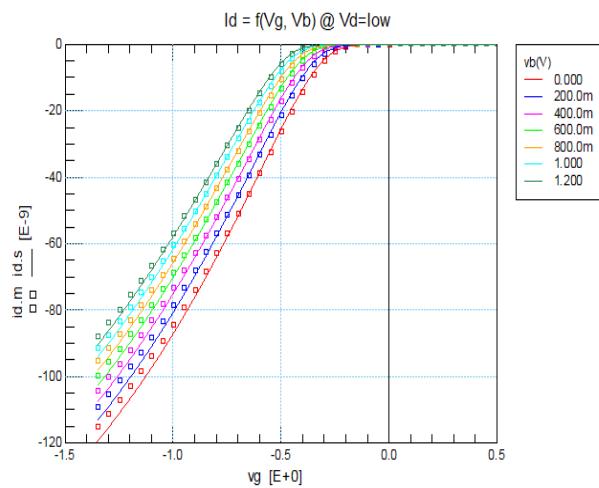
**idvd\_vbmin, Vb = 1.2V, T = 70°C****idvd\_vth, Vb = 0V, T = 70°C**

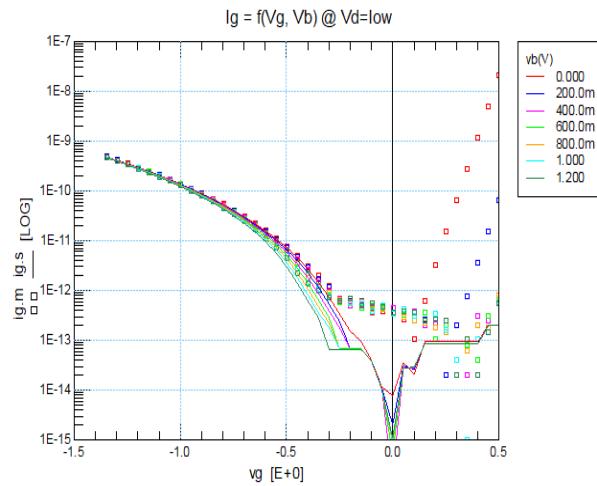
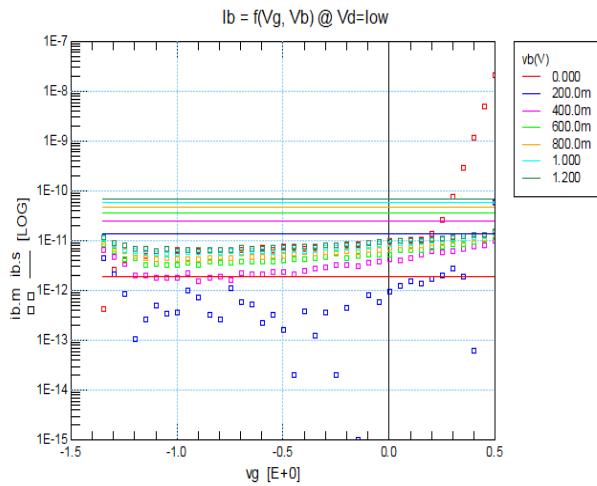


### idvd\_vth\_vbmin, Vb = 1.2V, T = 70°C

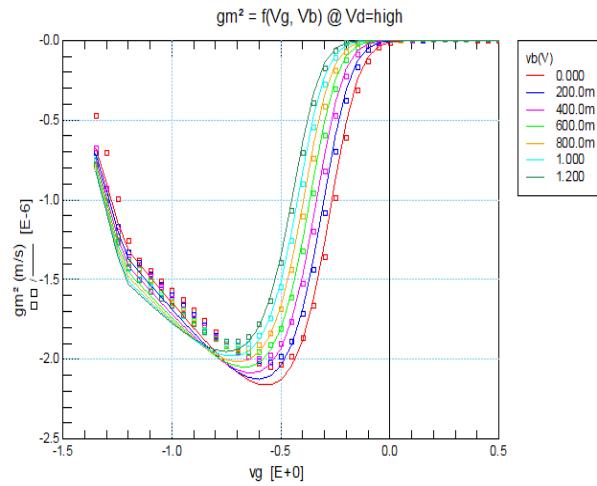
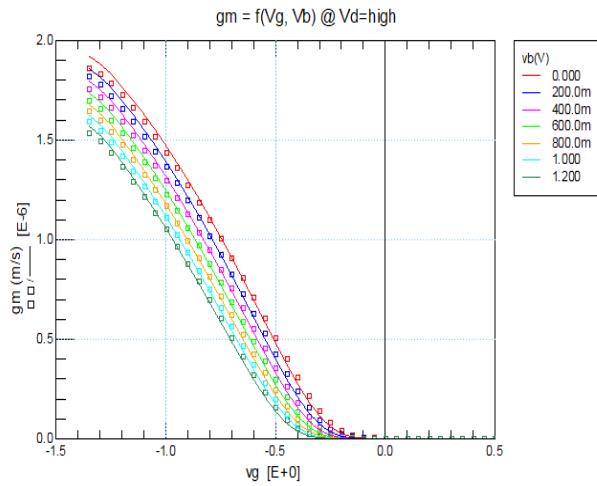
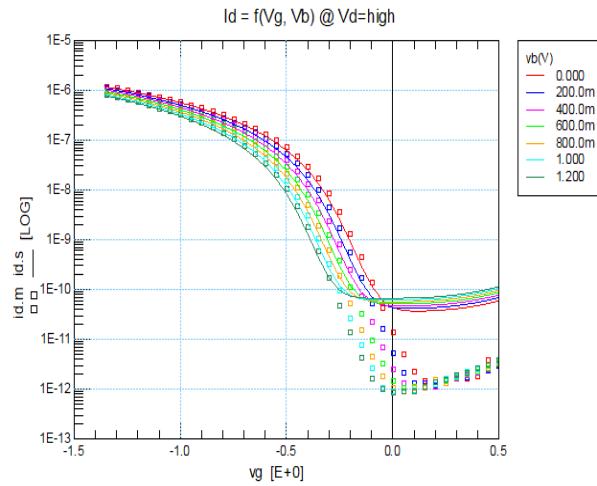
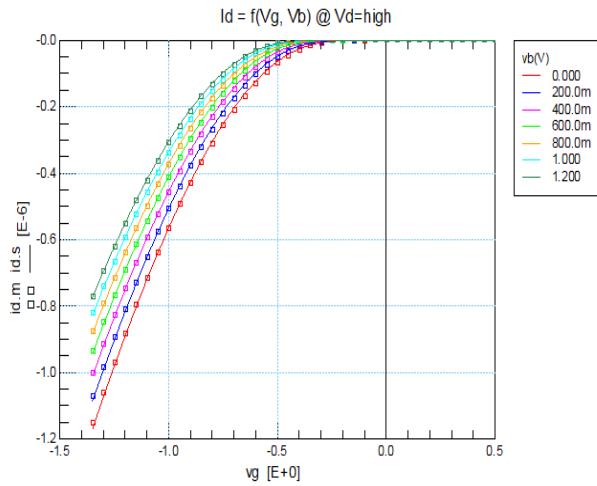


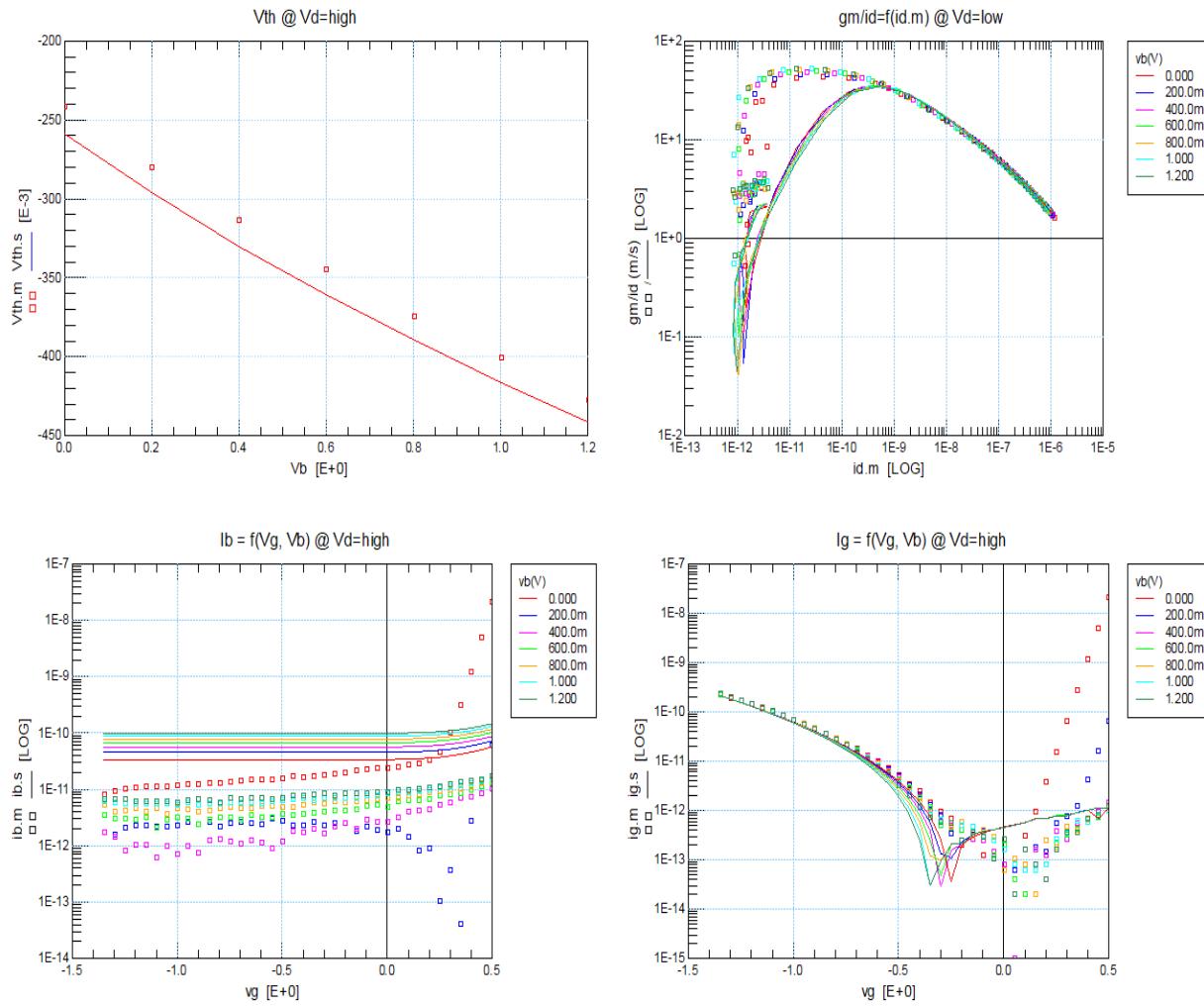
**idvg, Vd = -0.05V, T = 125°C**



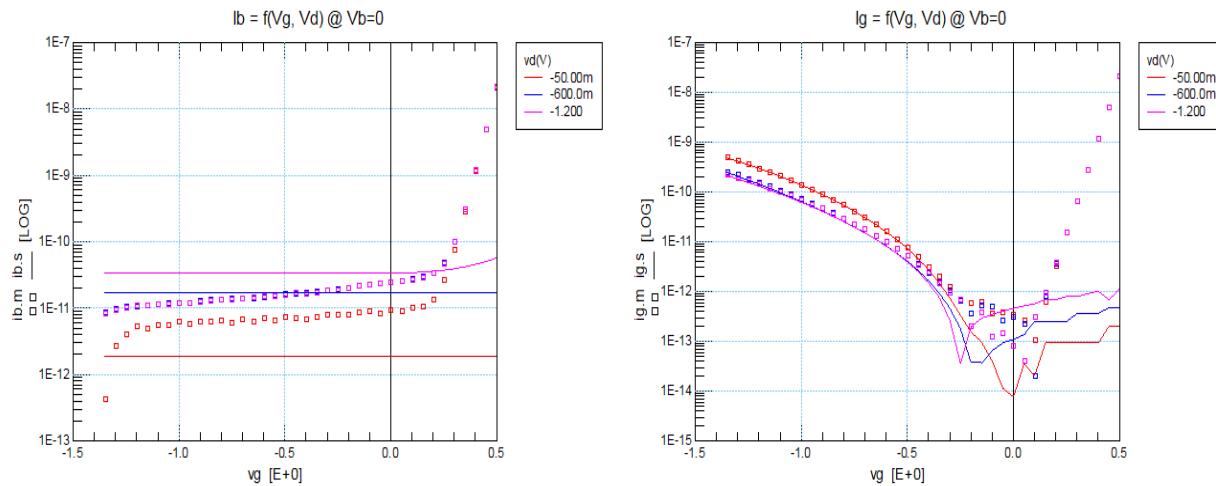


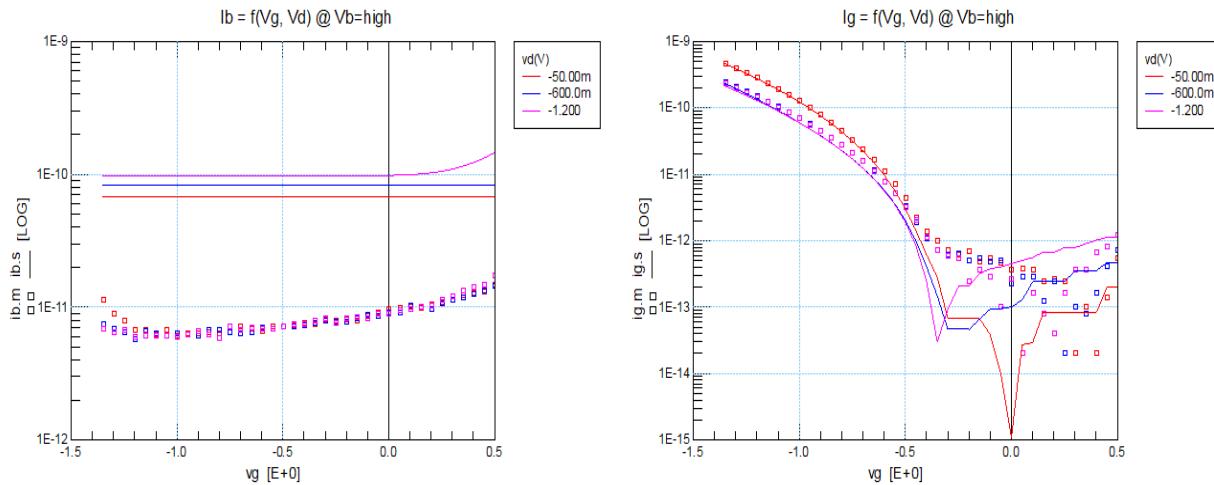
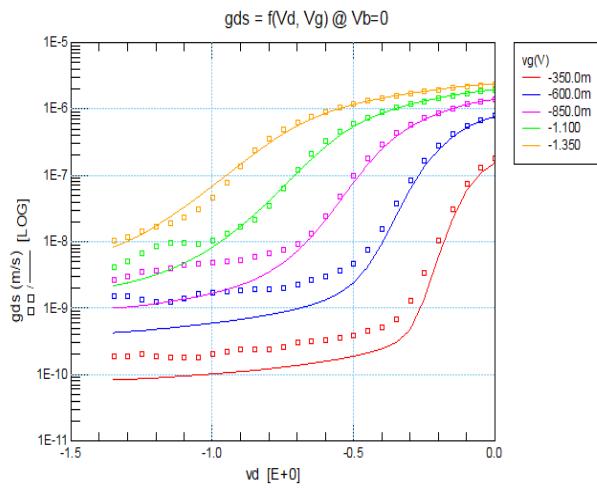
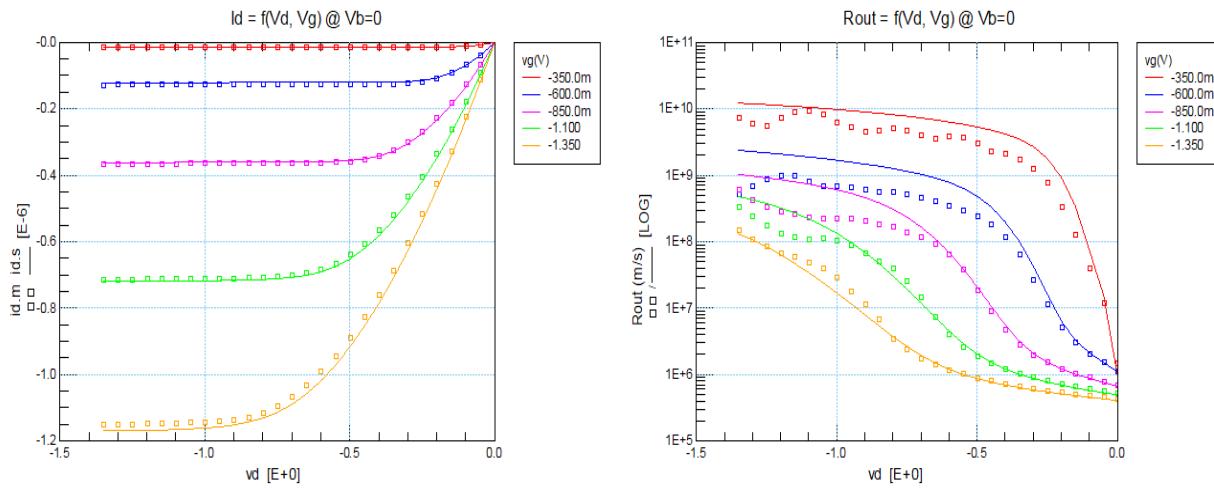
$i_{dvg}, V_d = -1.2V, T = 125^\circ\text{C}$

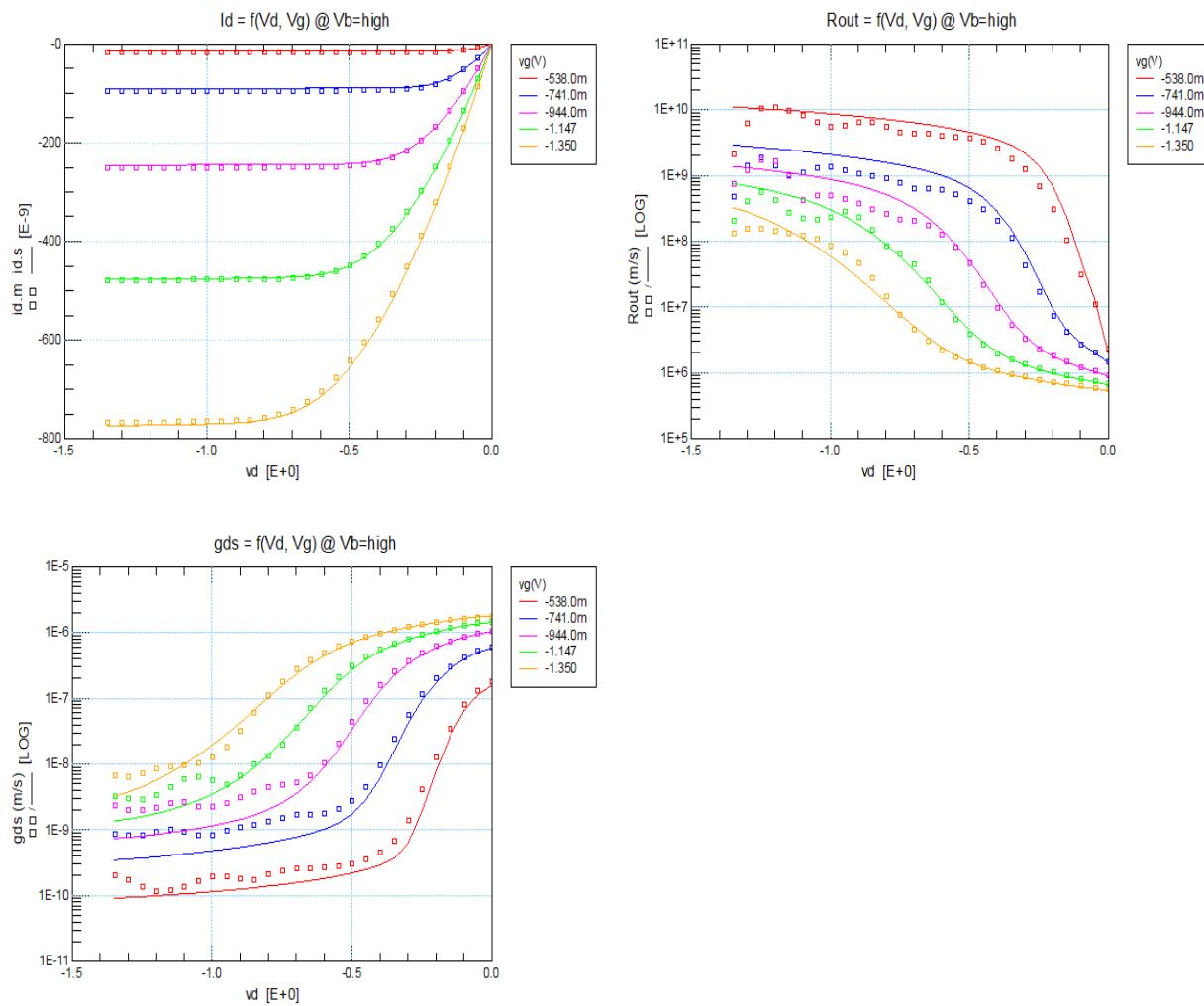
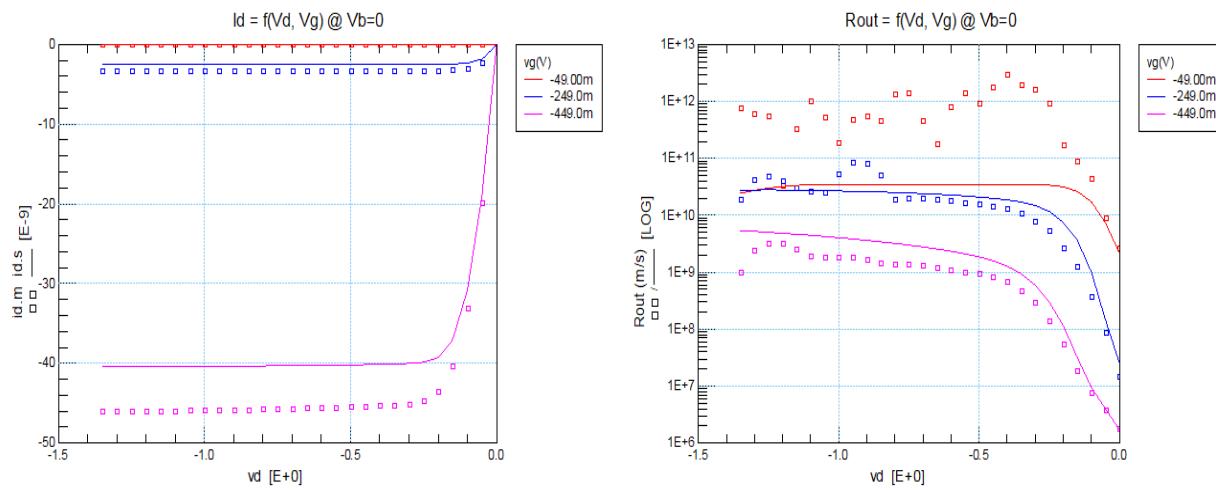


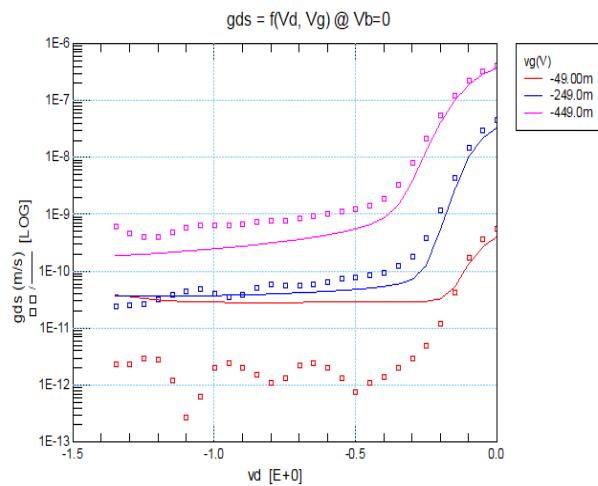


**idvg, Ib,Ig, Vb = 0V, T = 125°C**

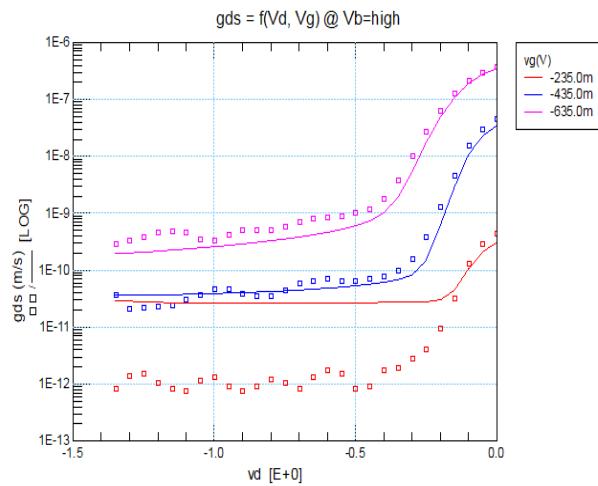
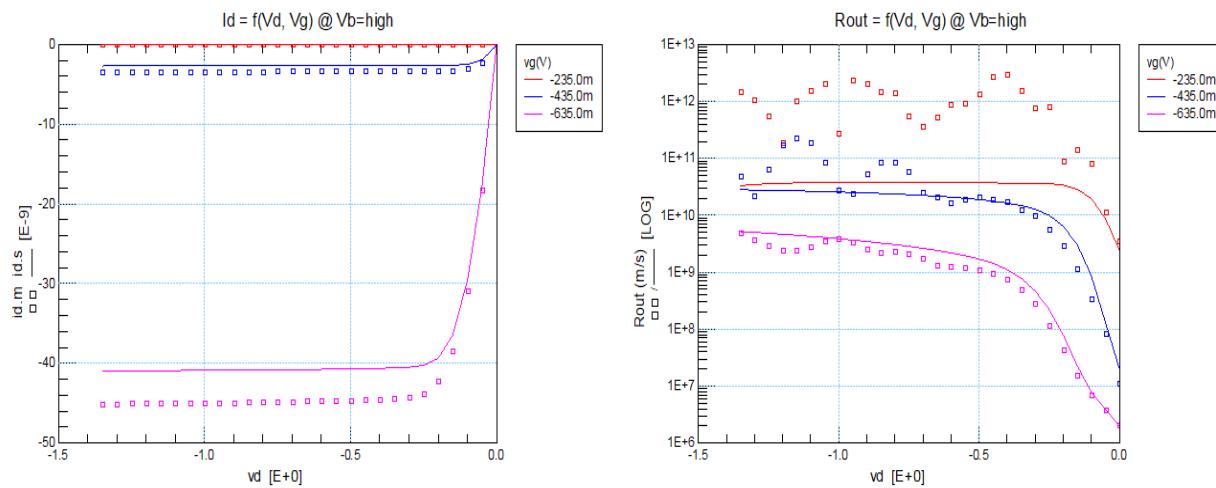


**idvg, Ib,Ig, Vb = 1.2V, T = 125°C**

**idvd, Vb = 0V, T = 125°C**


**idvd\_vbmin, Vb = 1.2V, T = 125°C**

**idvd\_vth, Vb = 0V, T = 125°C**


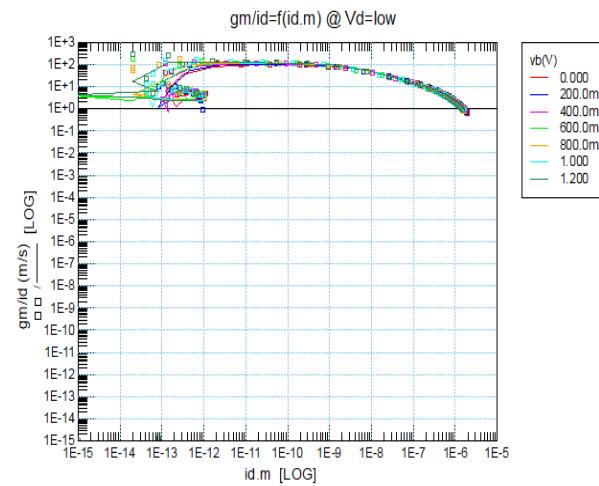
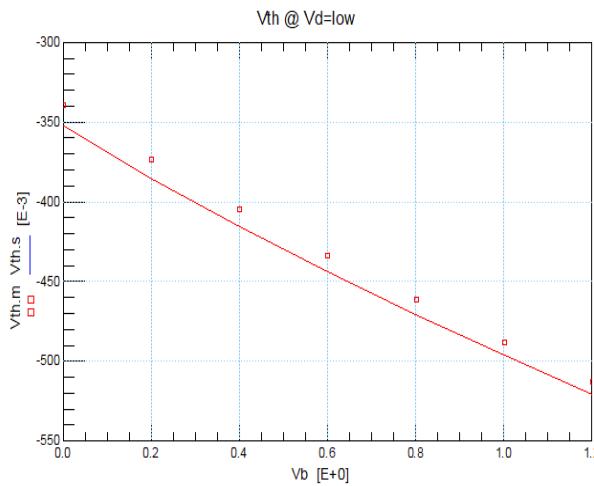
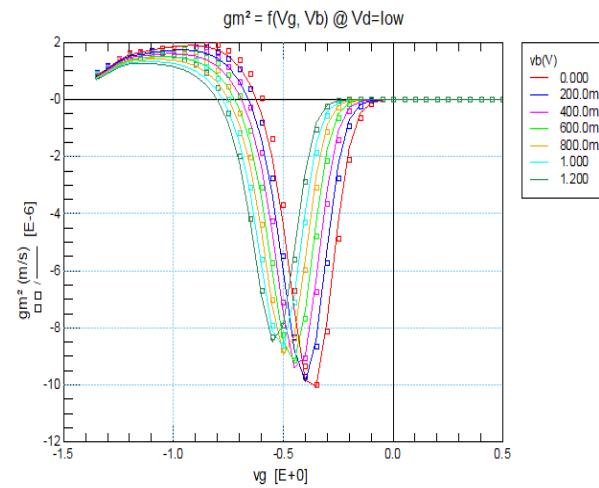
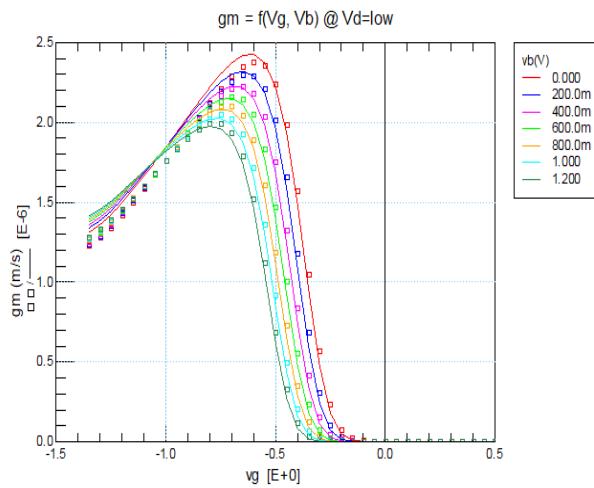
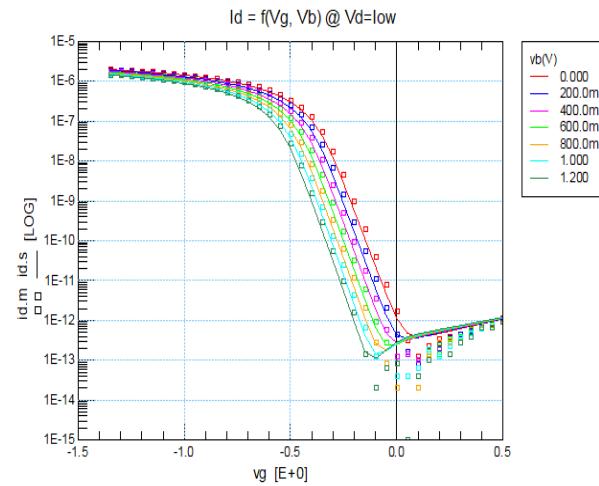
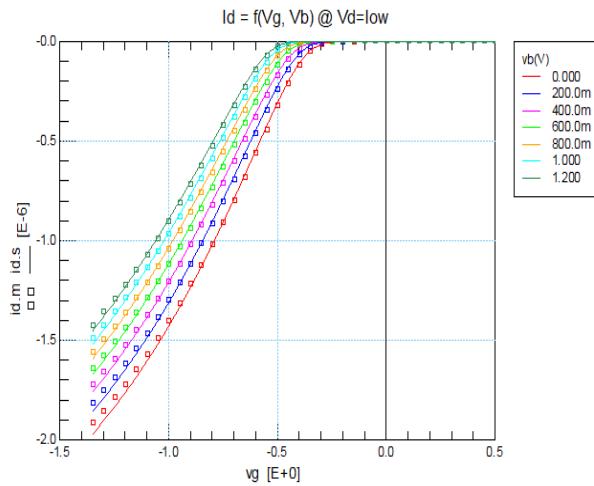


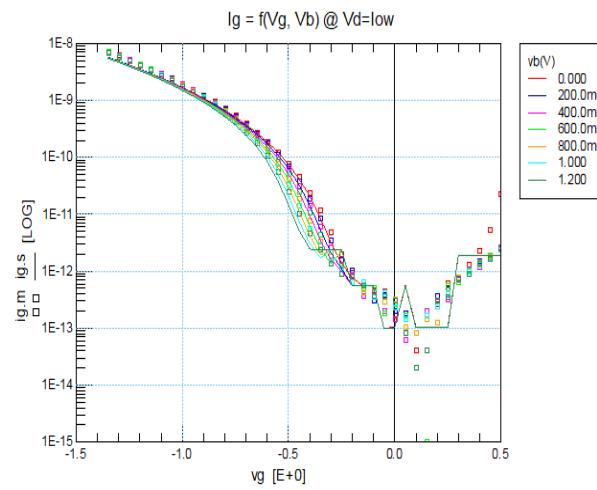
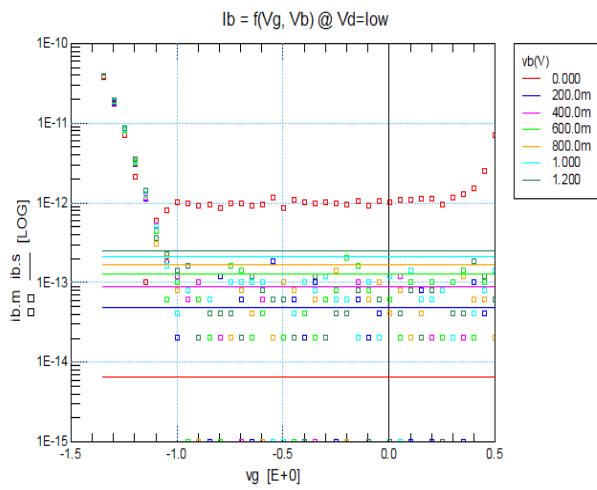
### idvd\_vth\_vbmin, Vb = 1.2V, T = 125°C



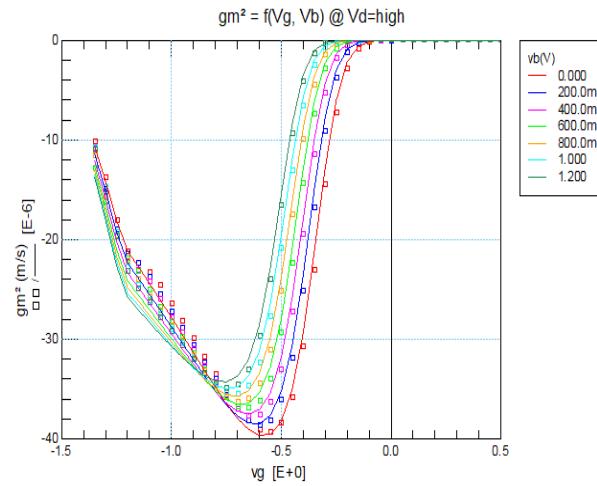
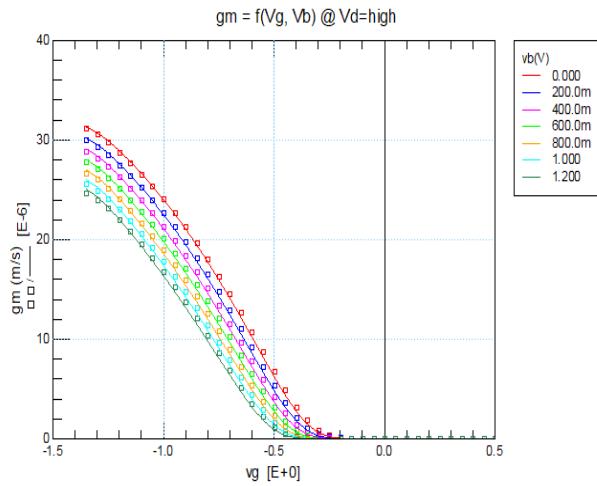
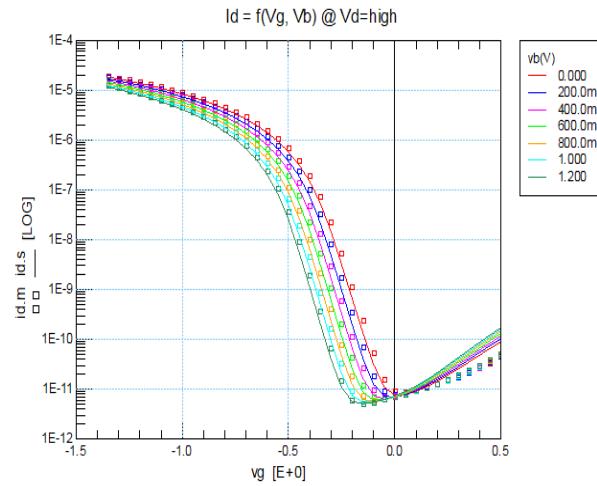
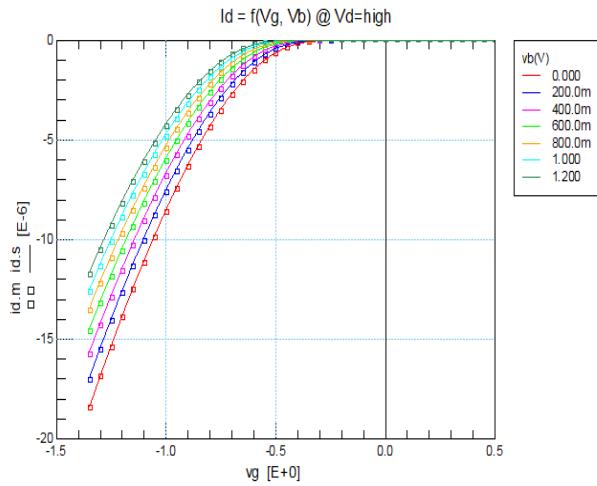
## 4.16 W05u0\_L10u0\_S550\_3

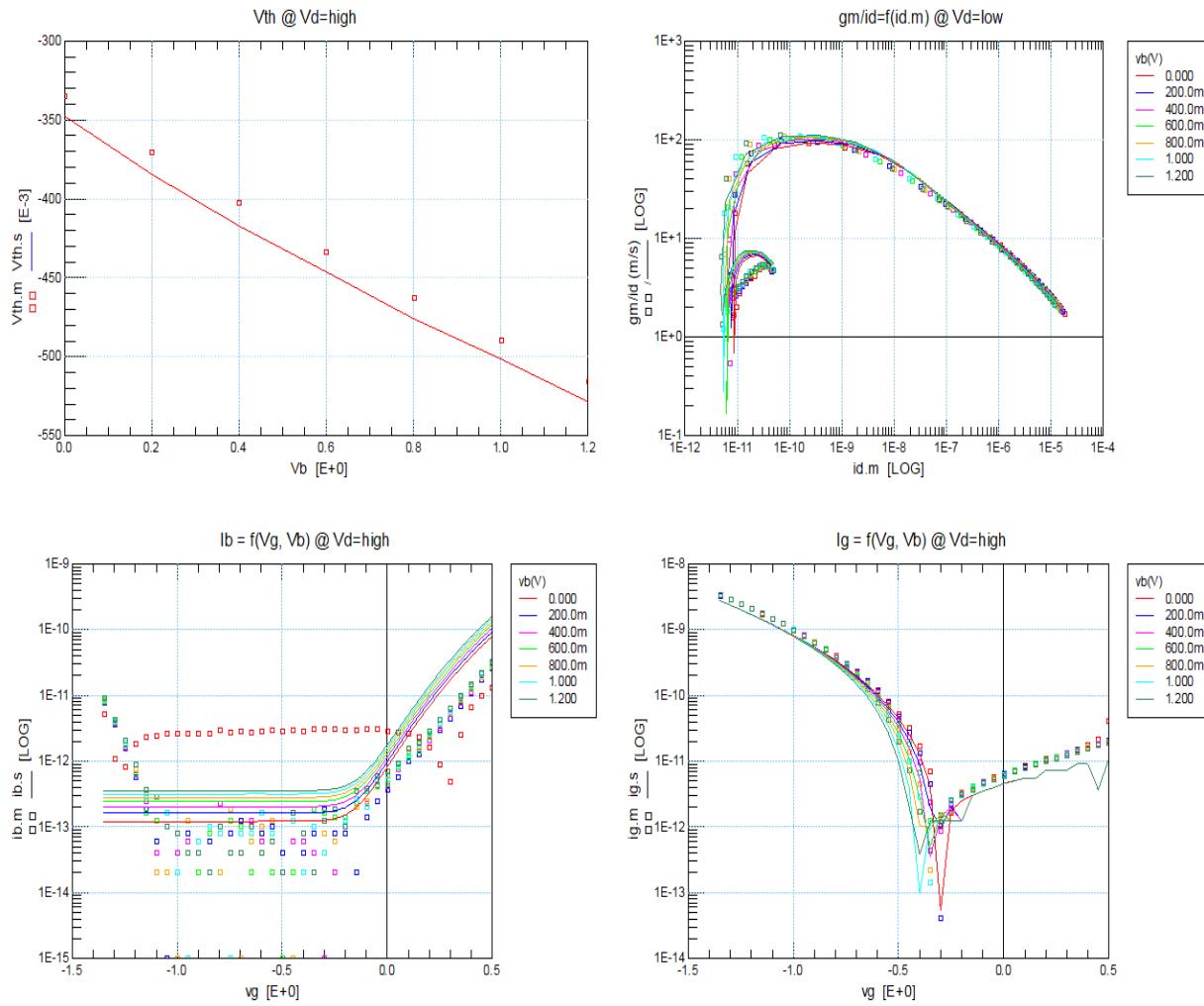
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



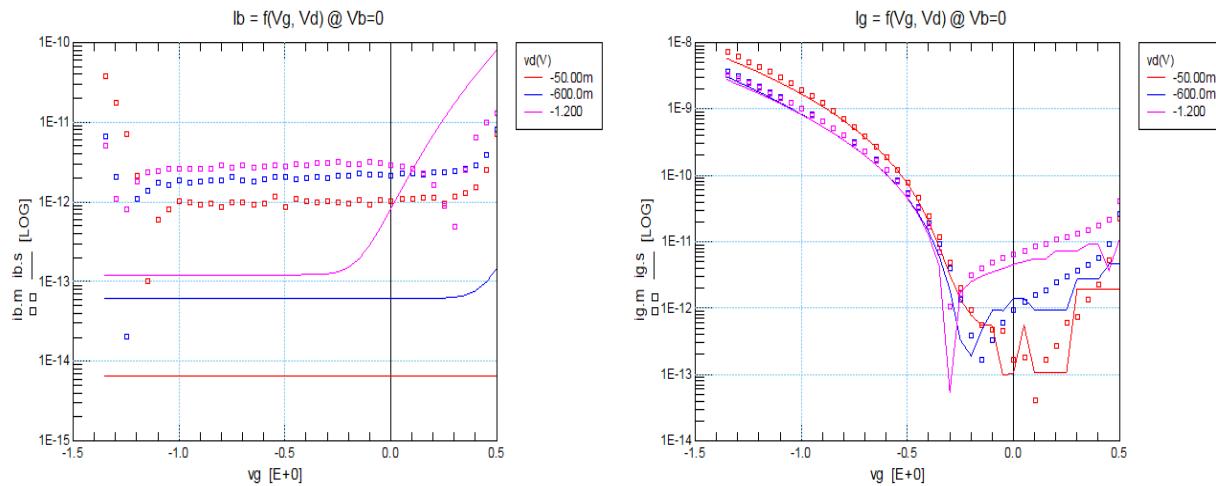


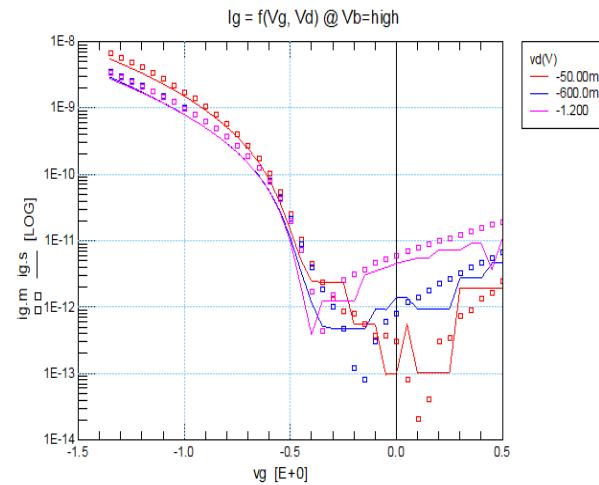
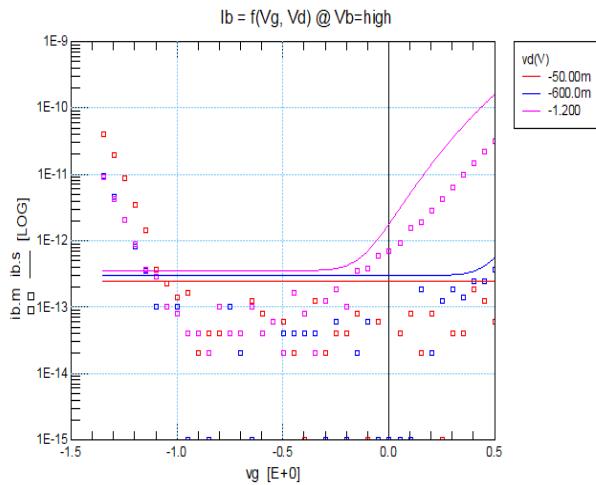
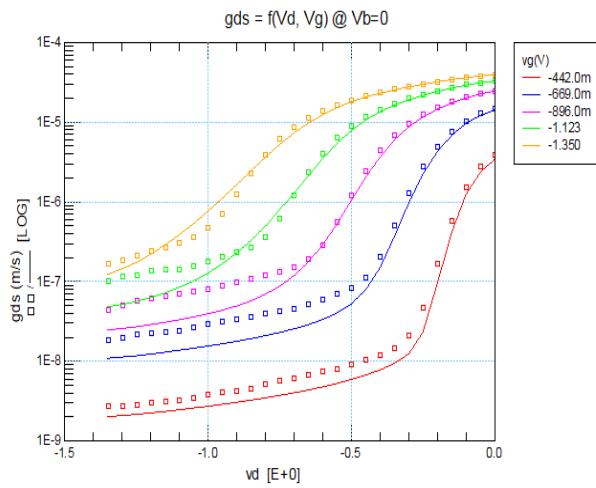
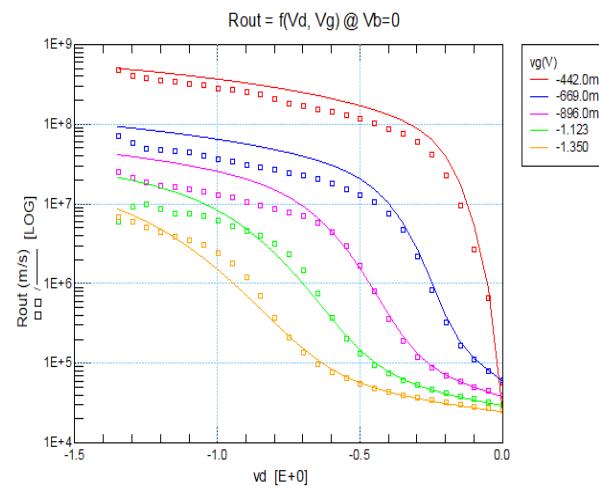
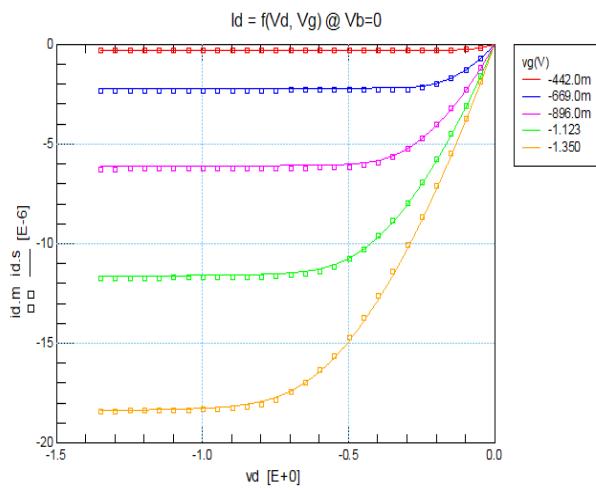
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

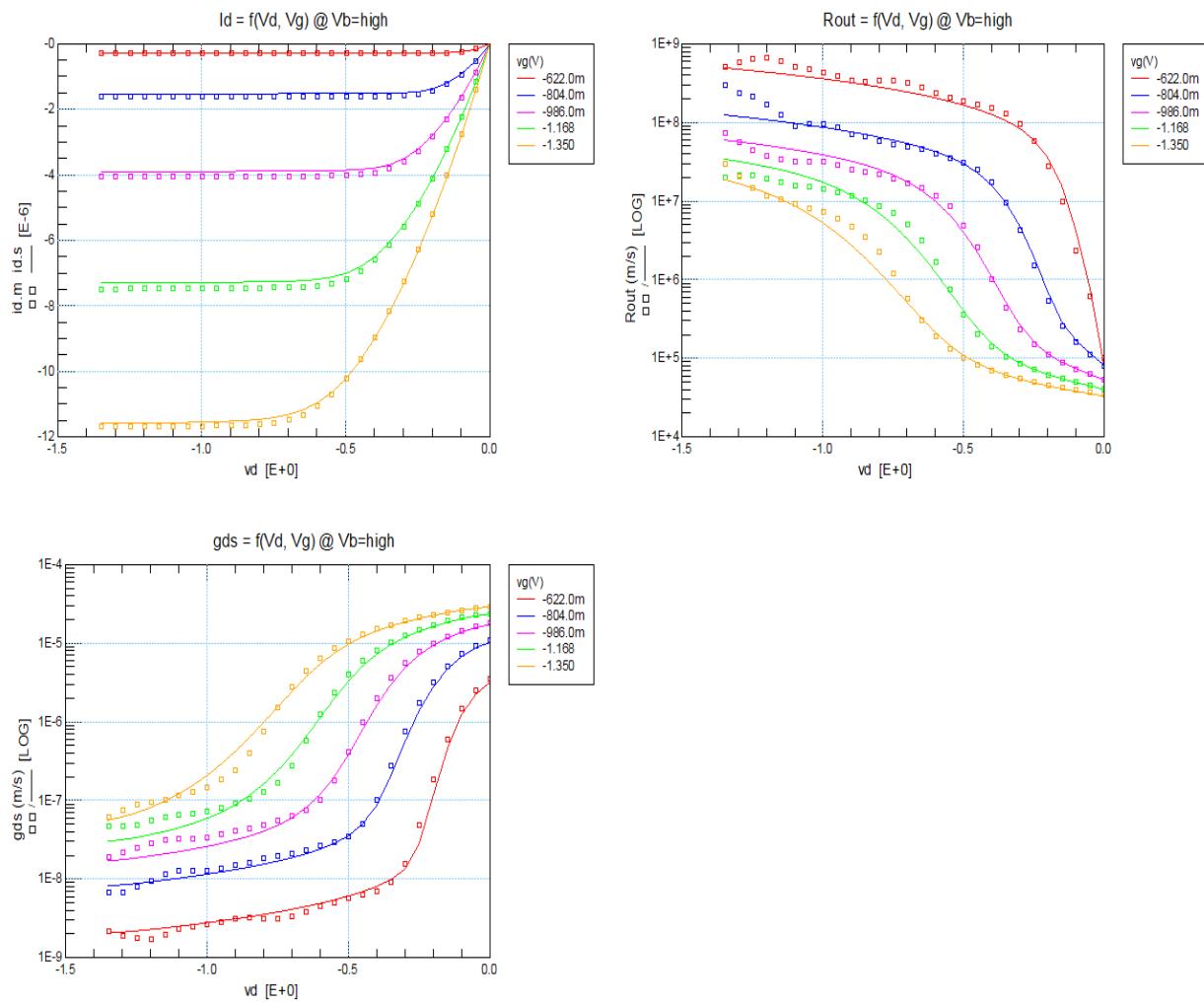
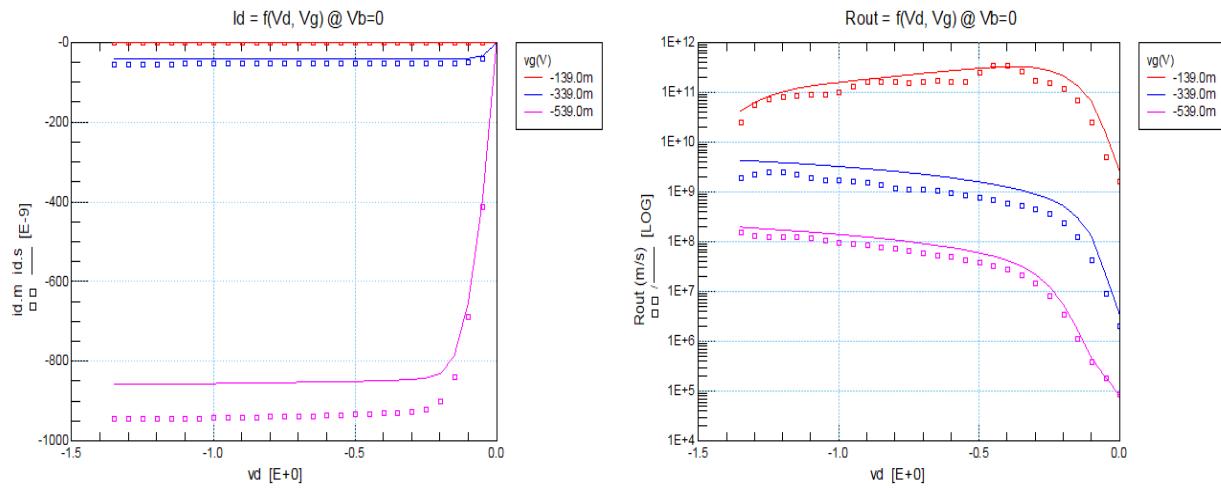


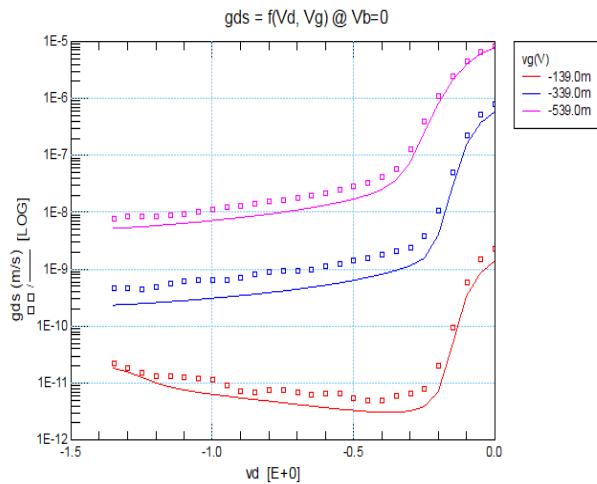


### idvg, Ib,Ig, Vb = 0V, T = 27°C

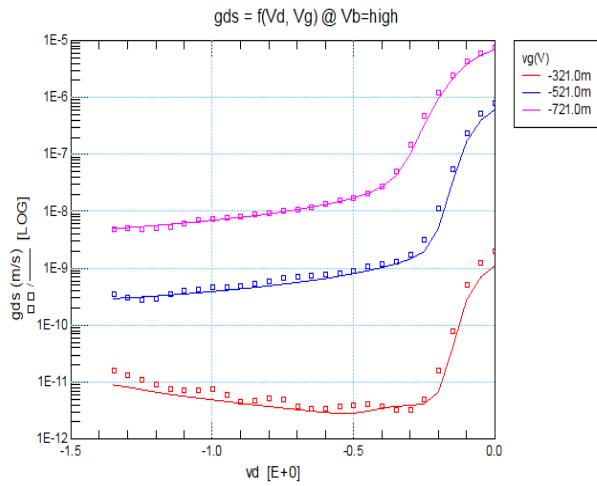
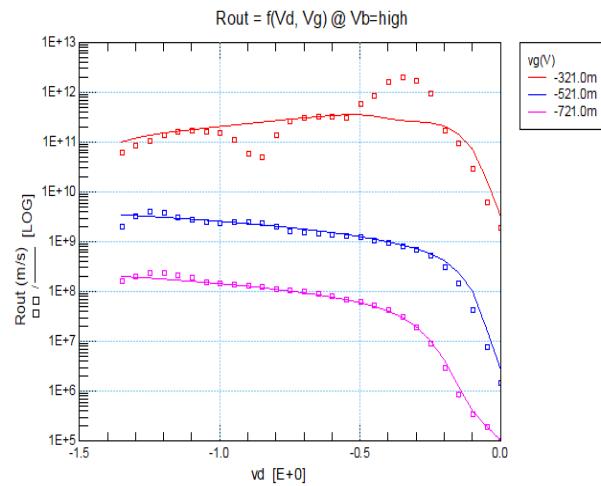
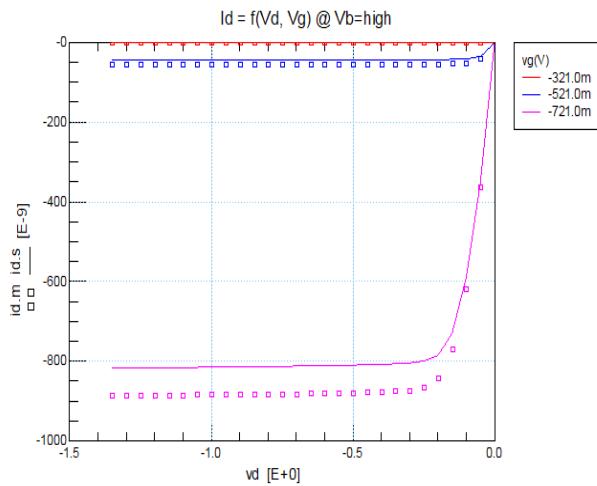


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

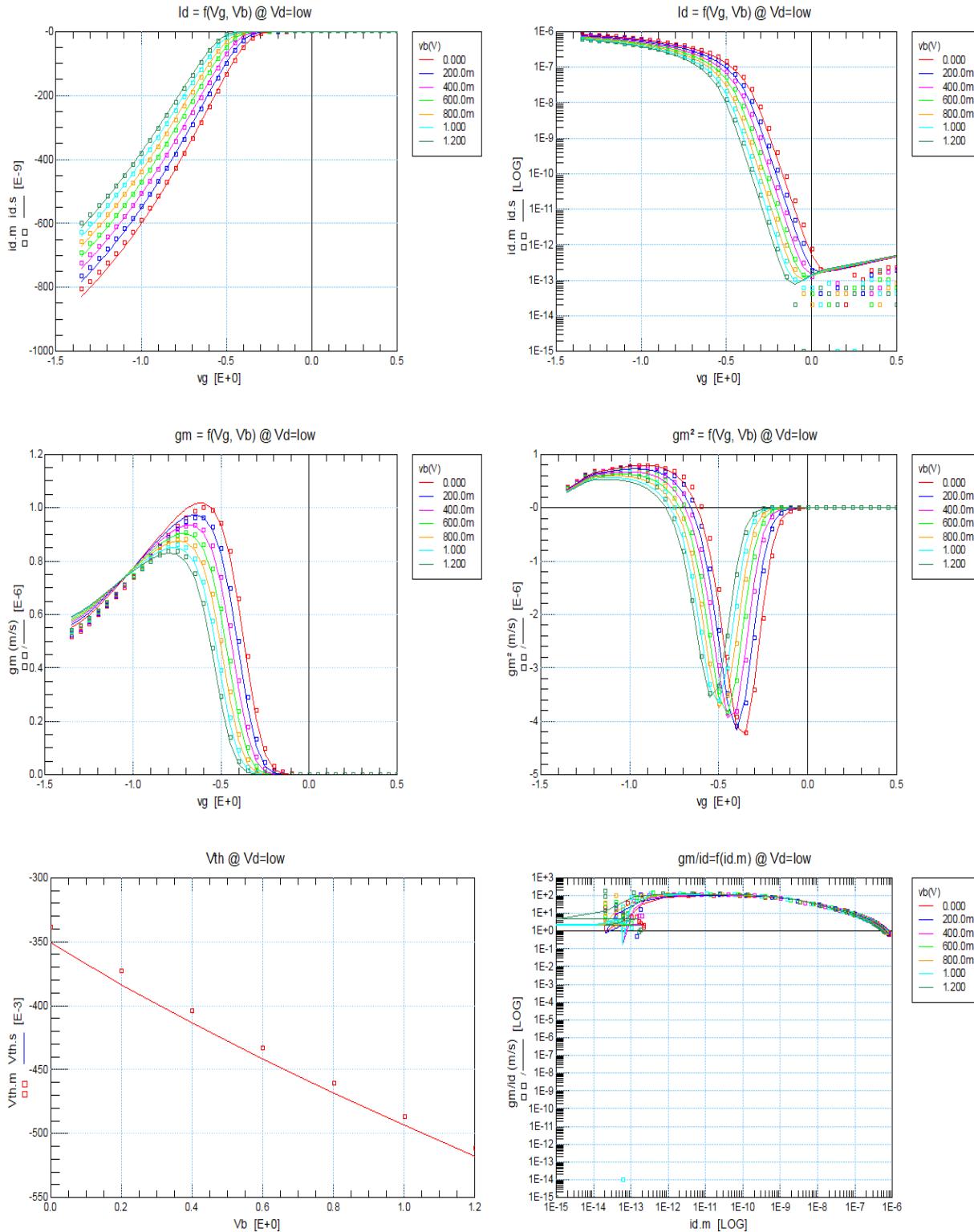


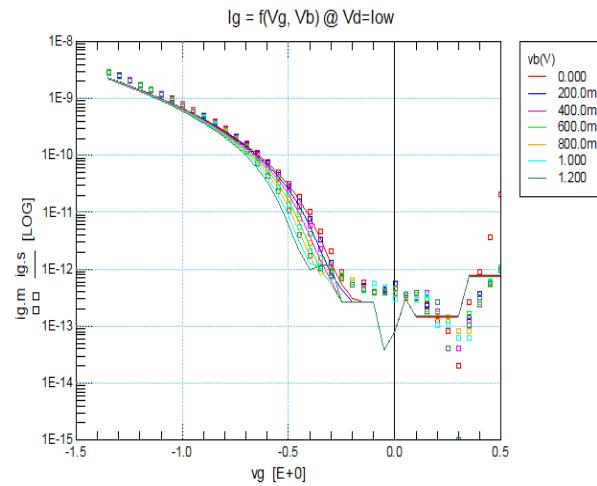
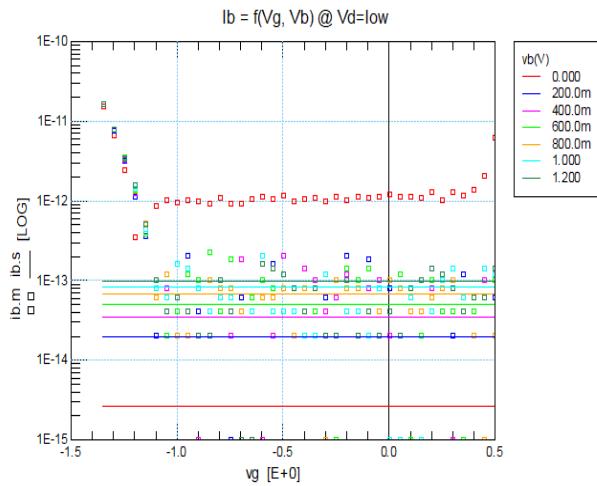
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



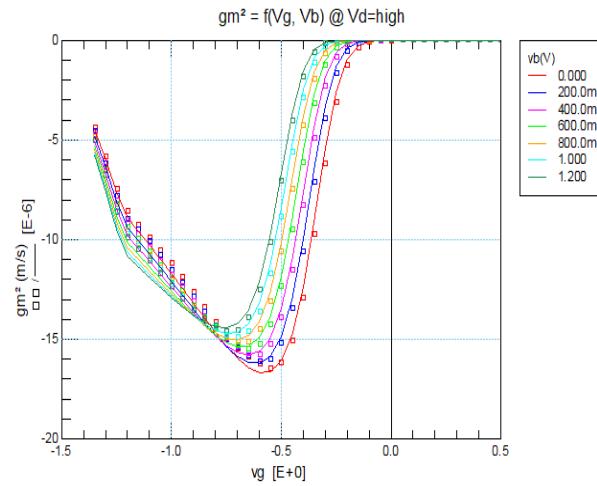
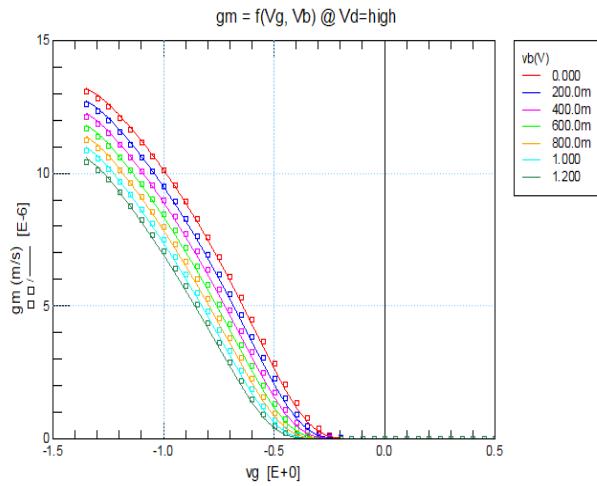
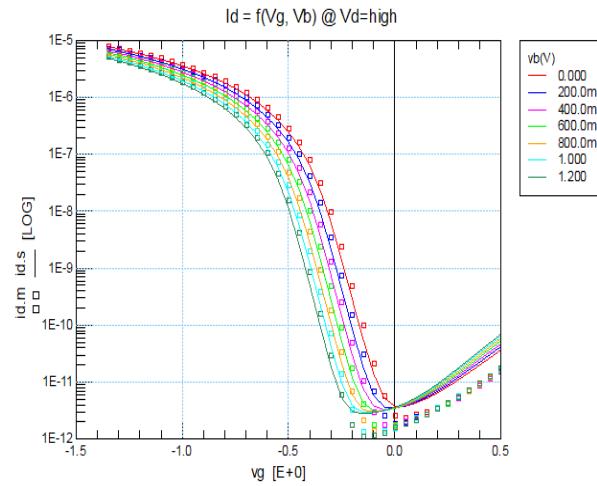
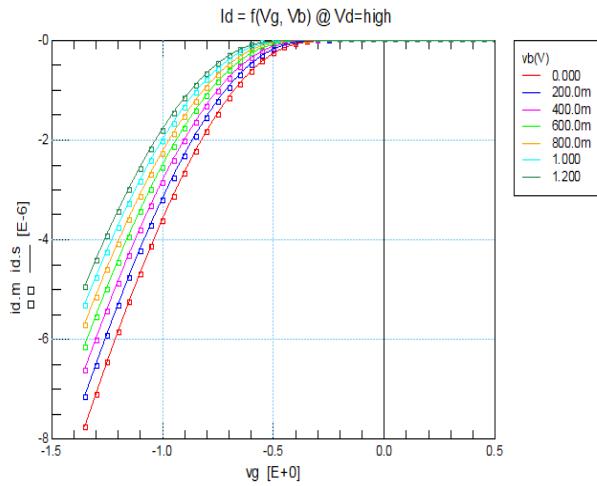
## 4.17W02u0\_L10u0\_S551\_1

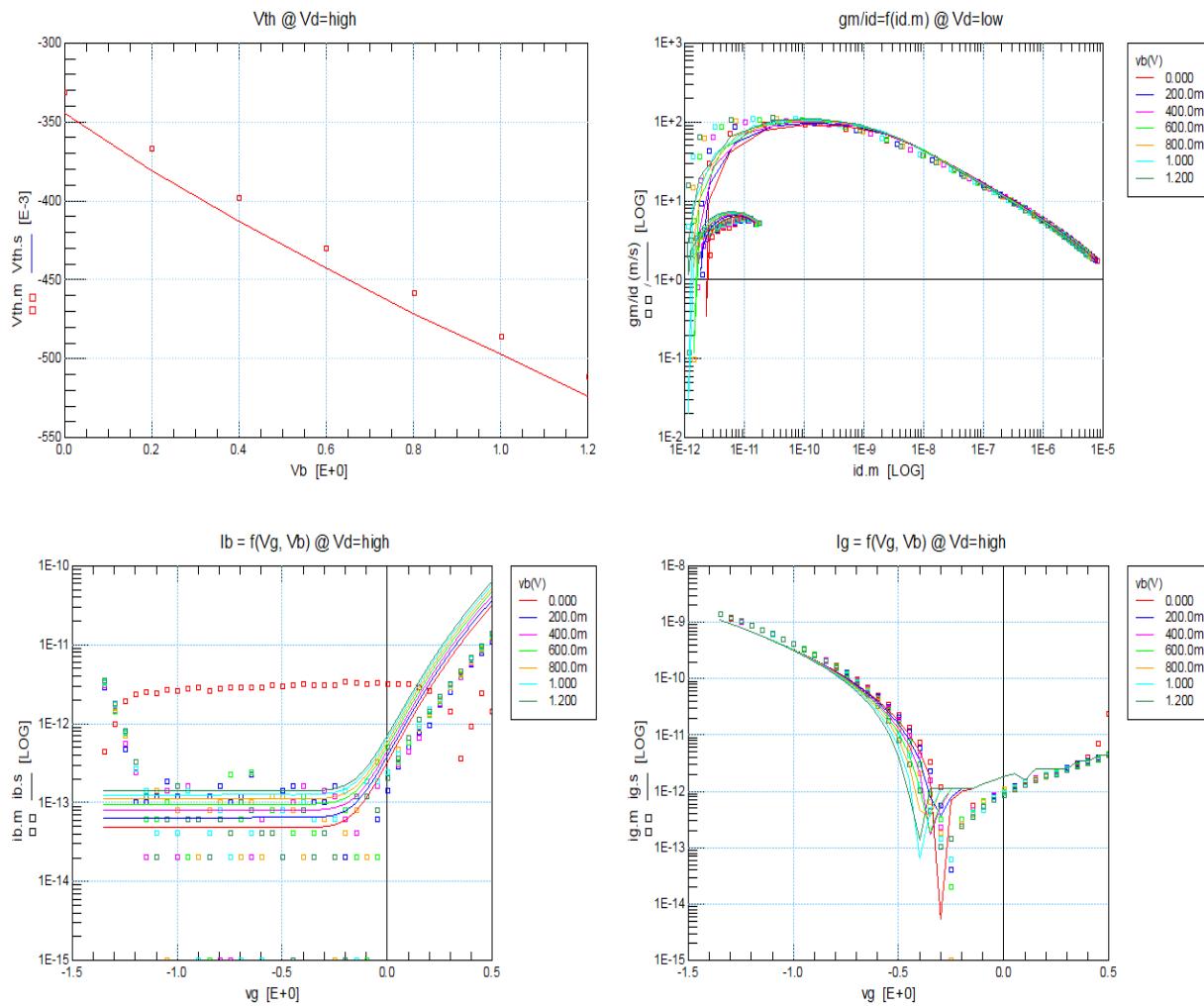
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



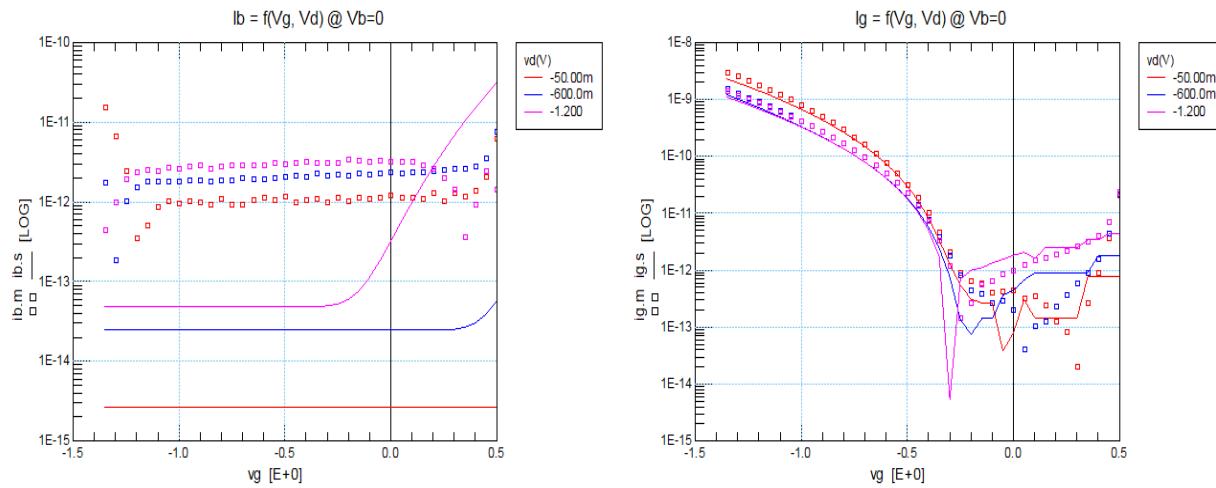


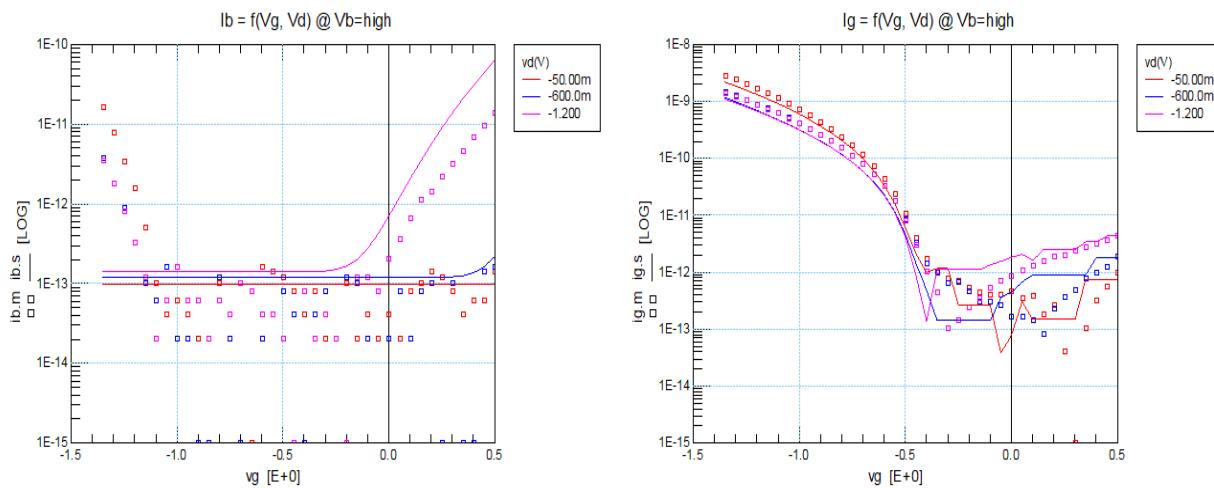
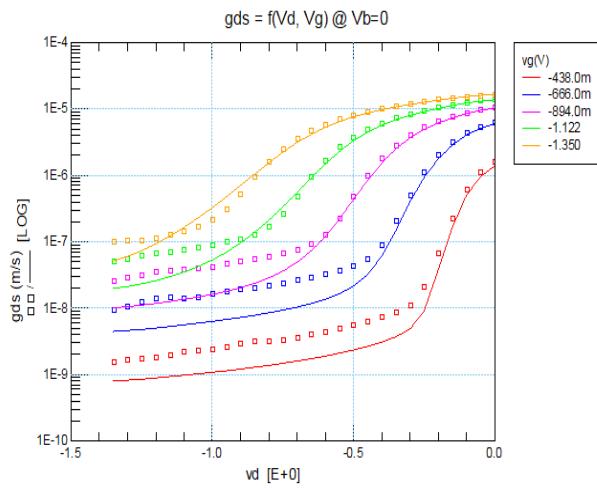
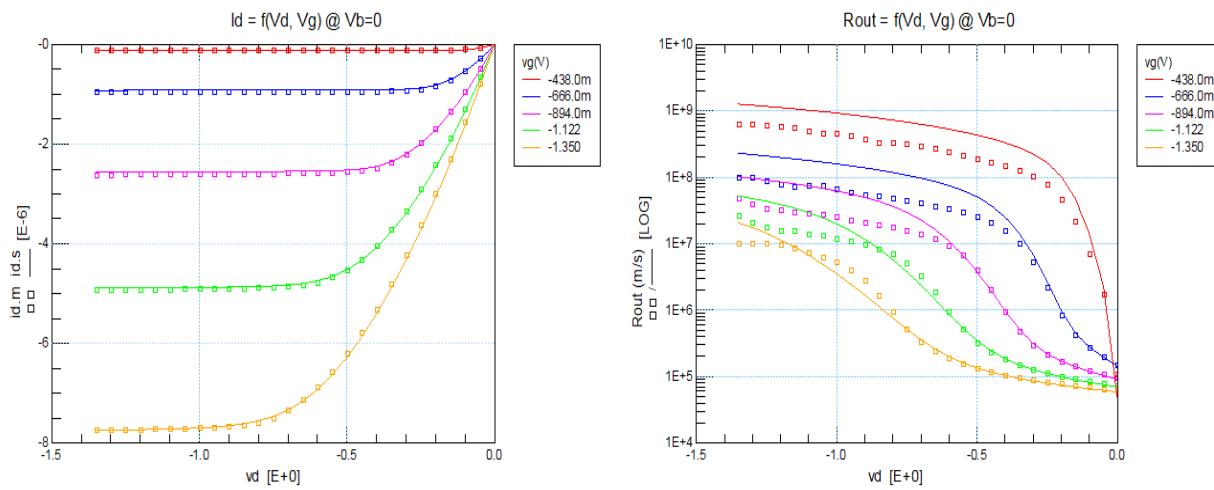
$i_d v_g, V_d = -1.2V, T = 27^\circ C$

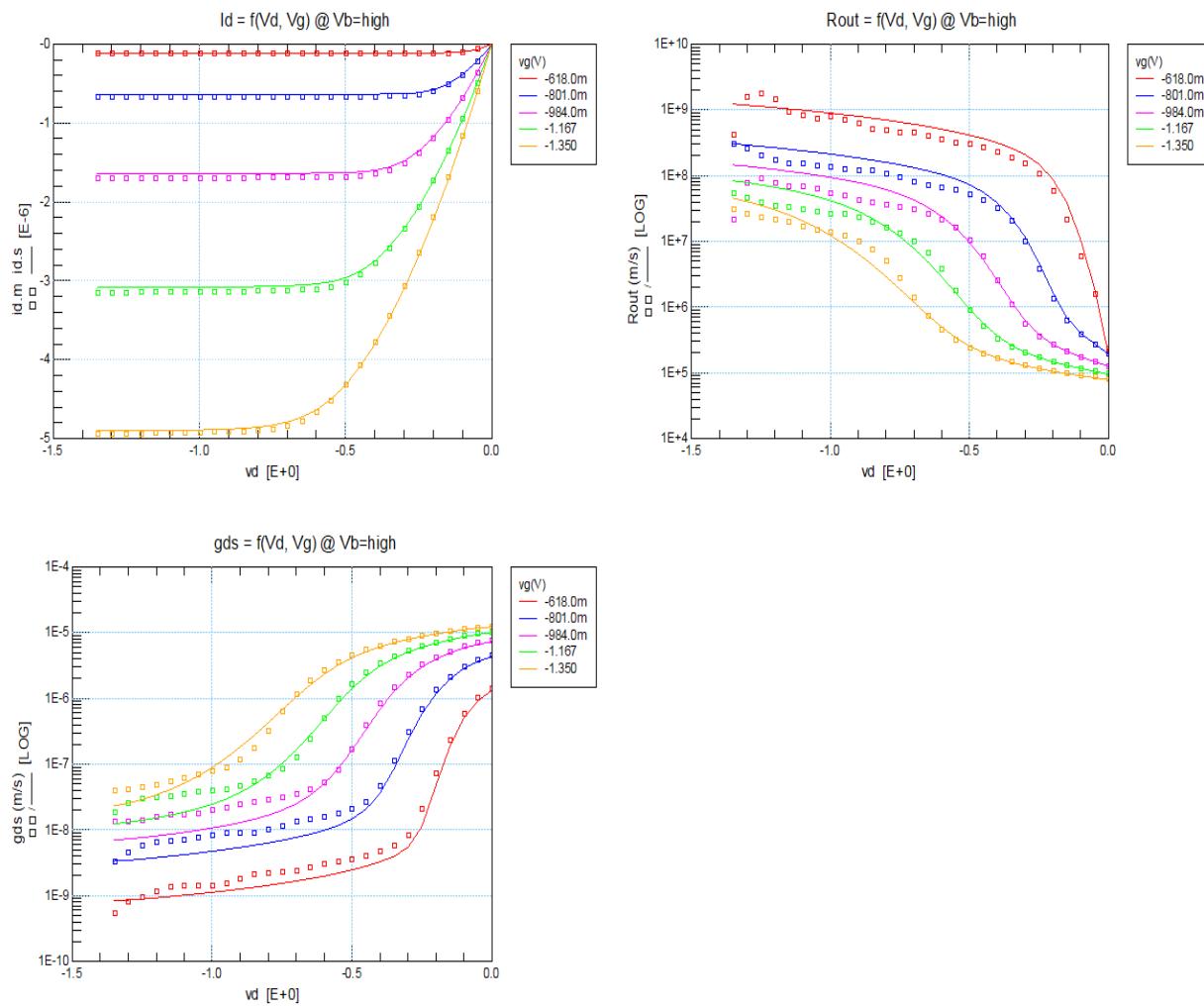
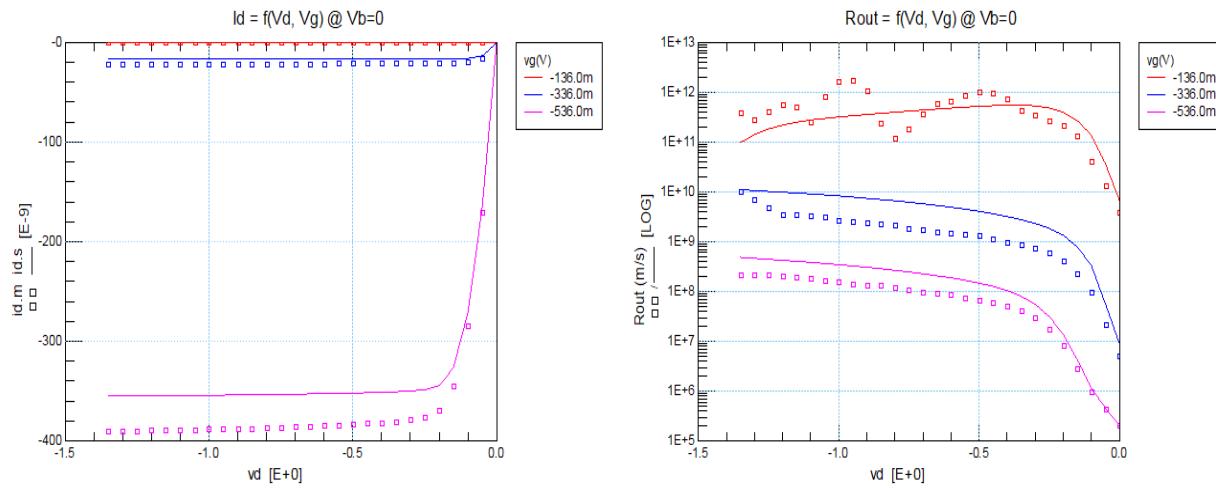


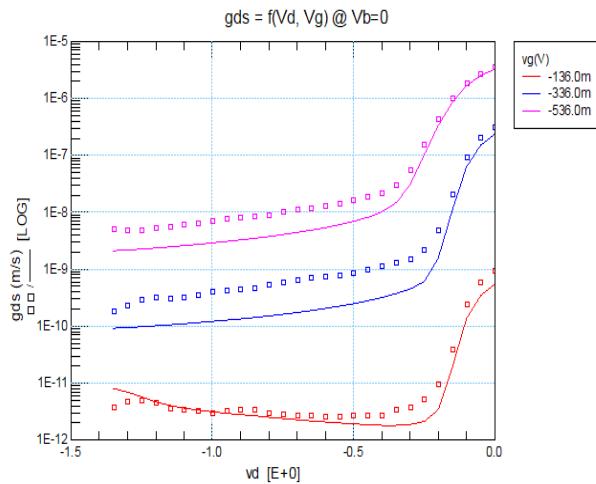


### $id_{vg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

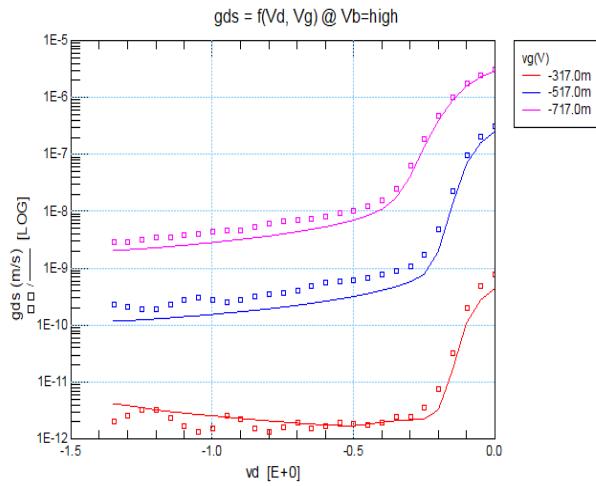
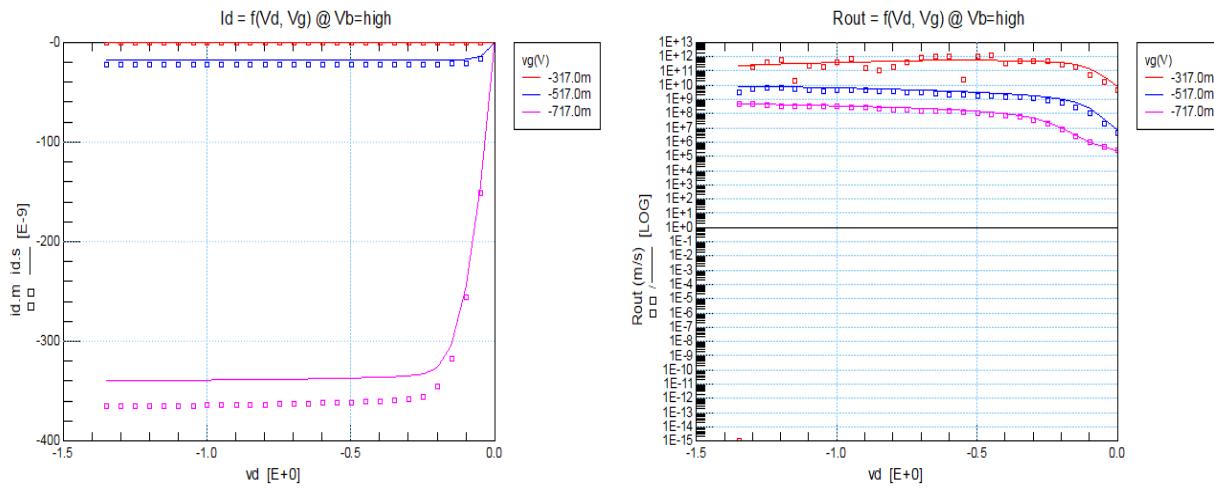


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

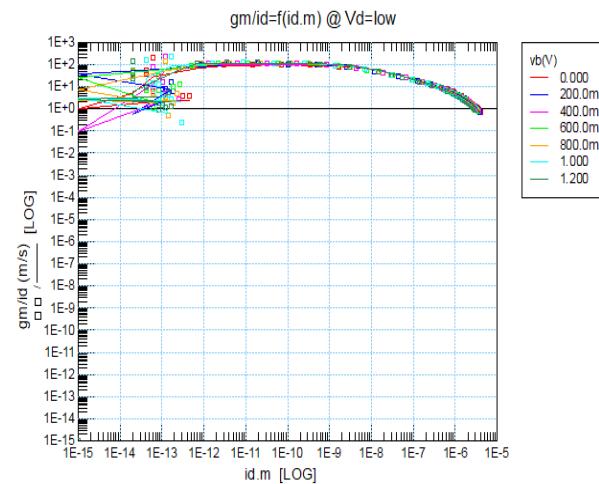
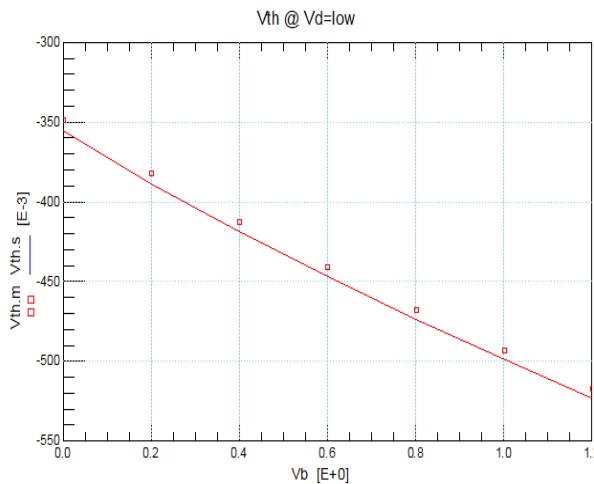
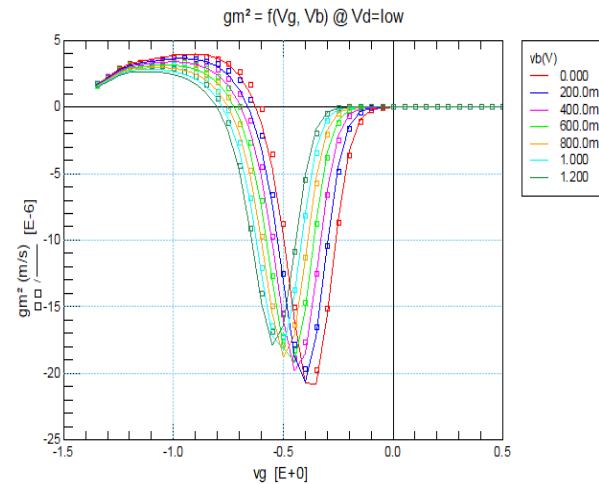
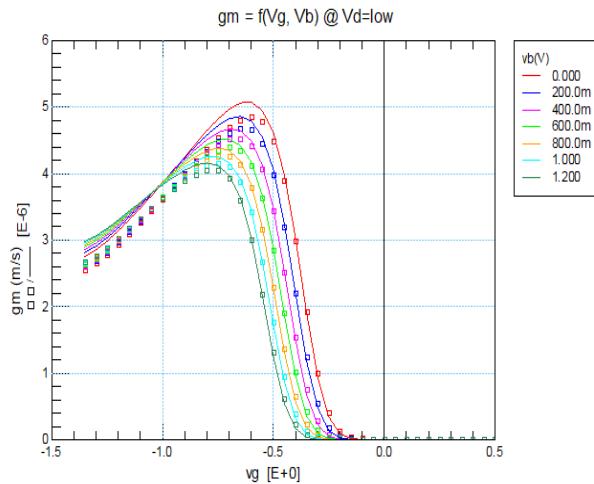
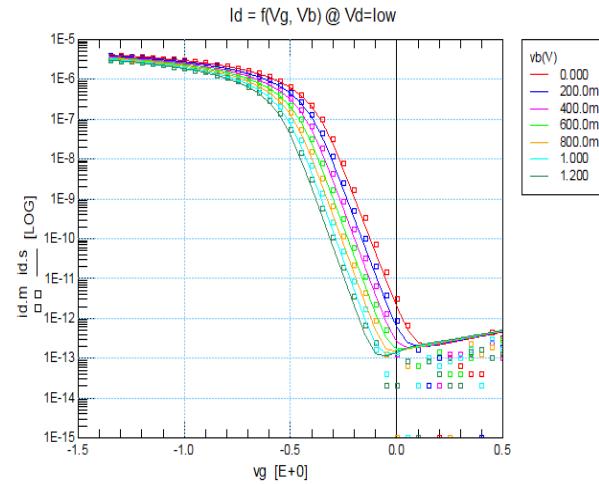
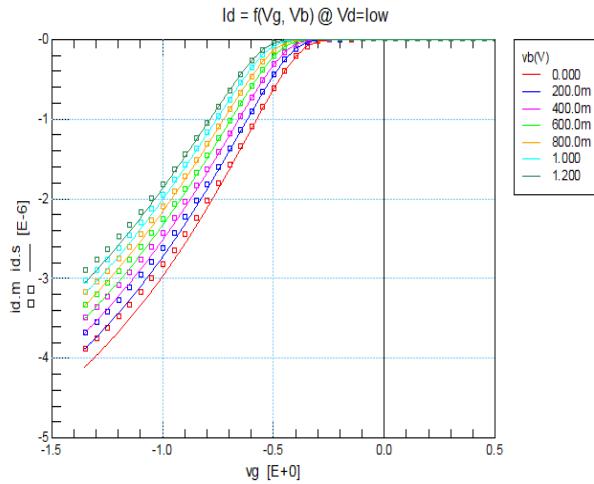


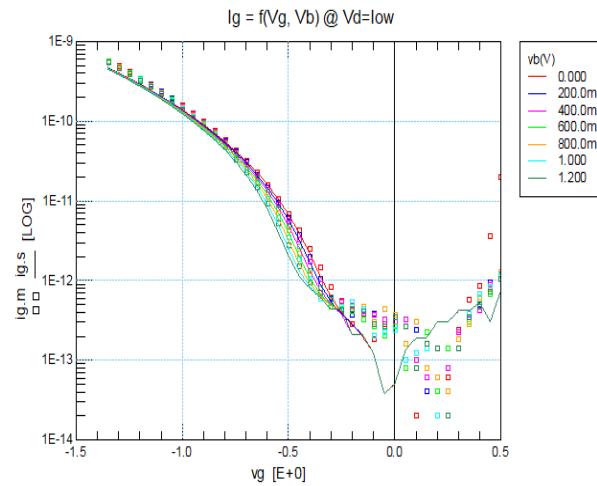
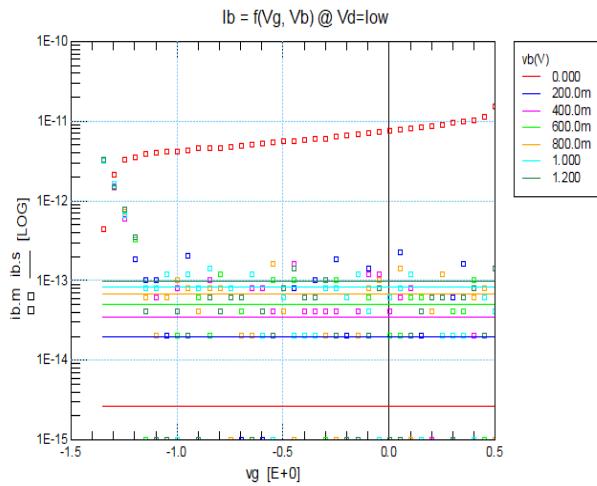
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



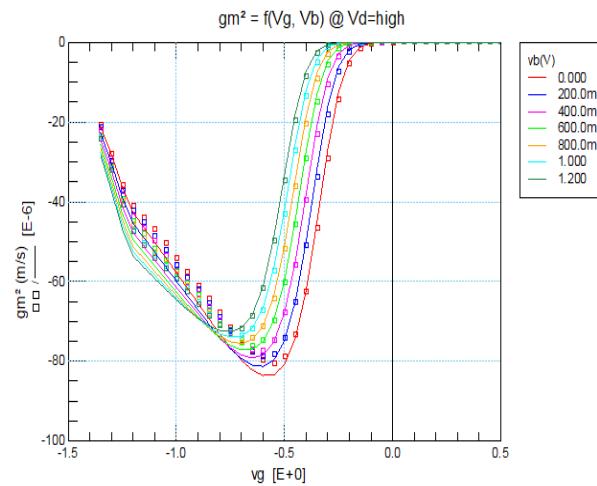
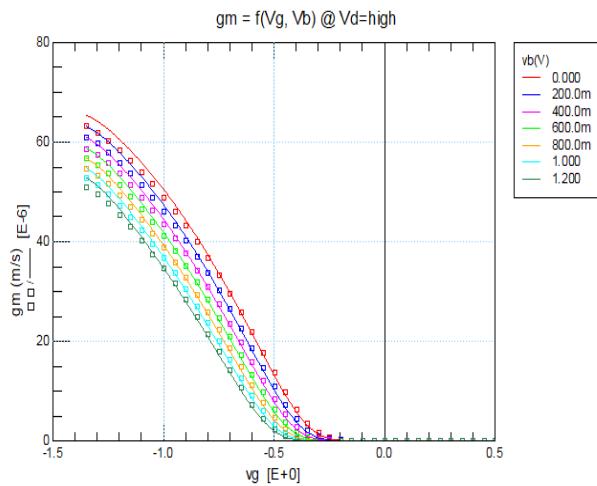
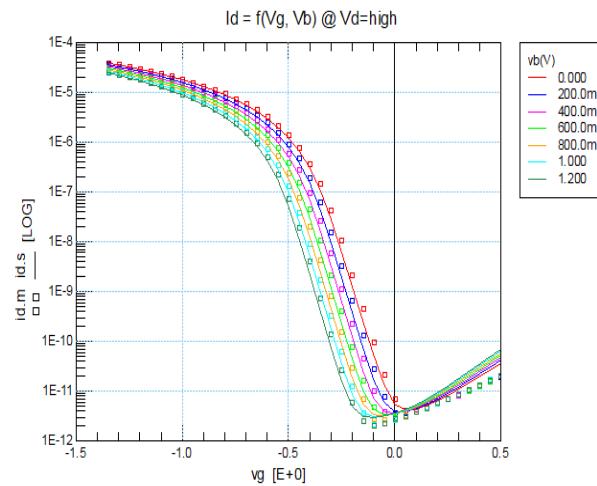
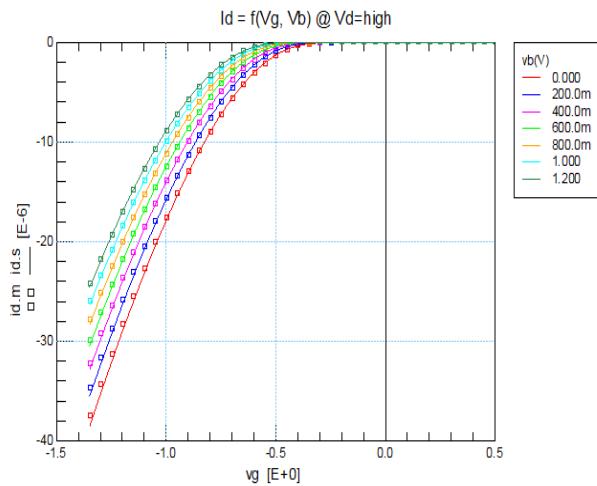
## 4.18 W02u0\_L2u0\_S550\_5

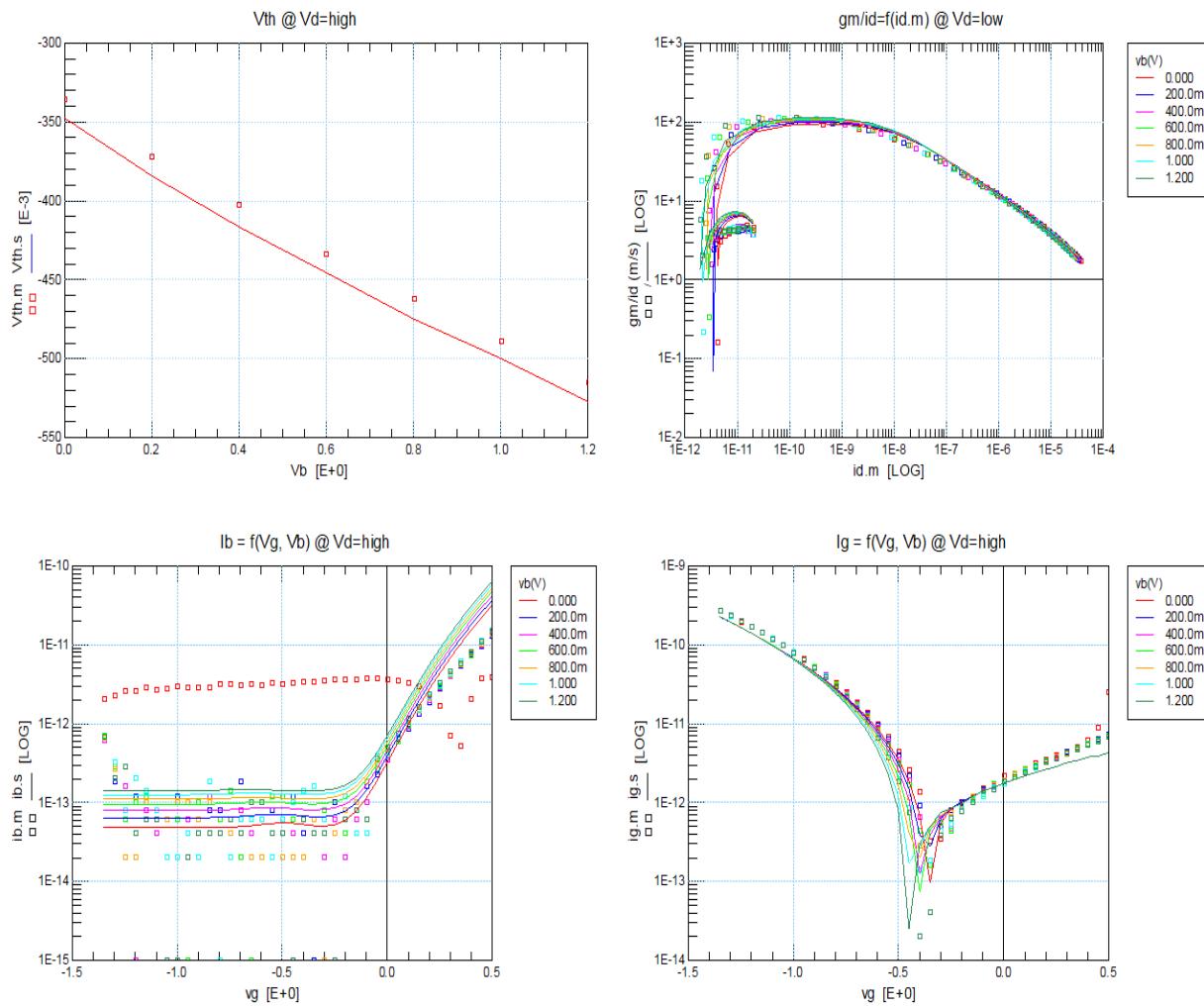
$id_{vg}$ ,  $V_d = -0.05V$ ,  $T = 27^\circ C$



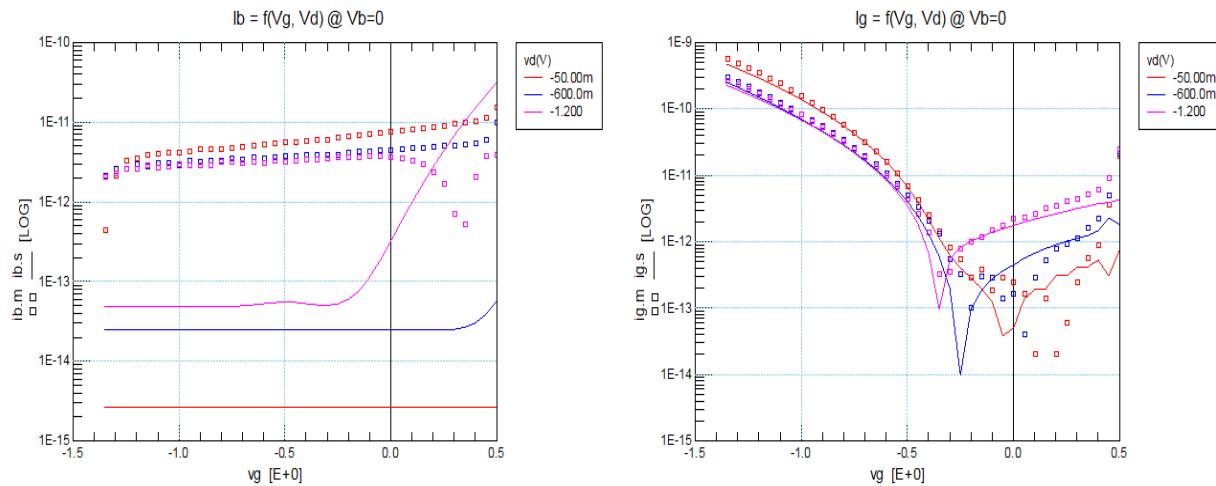


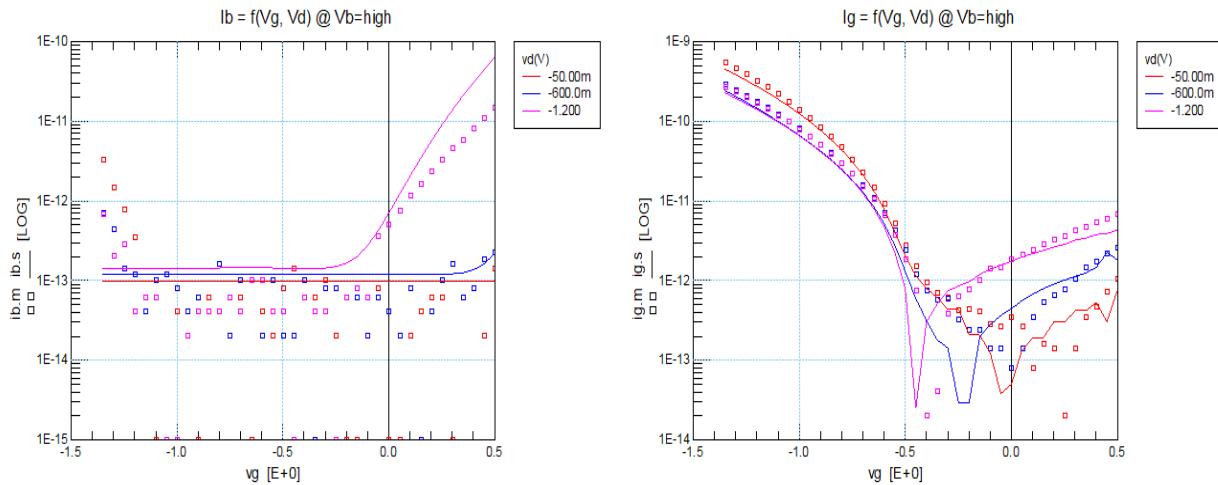
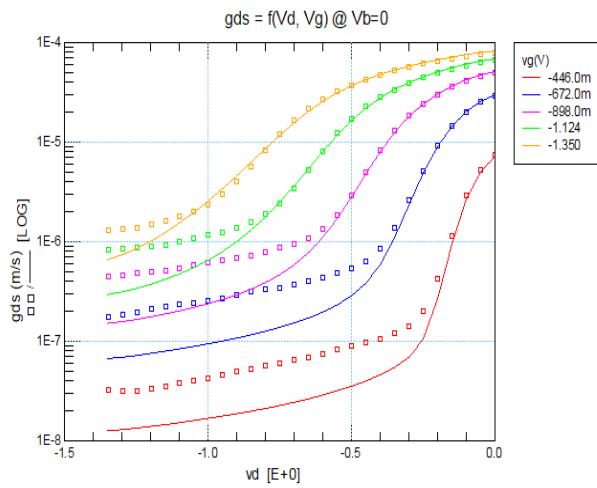
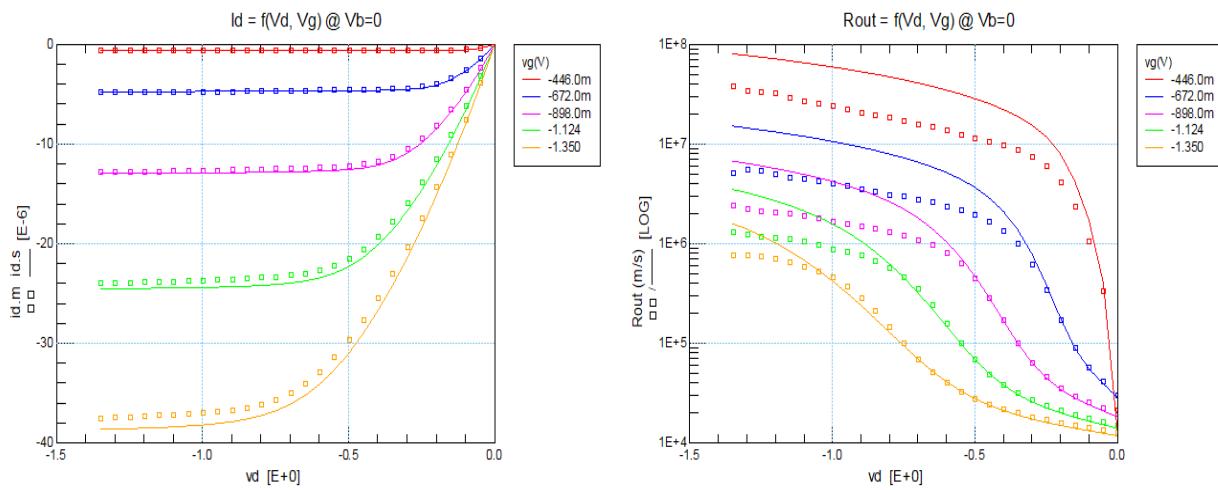
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

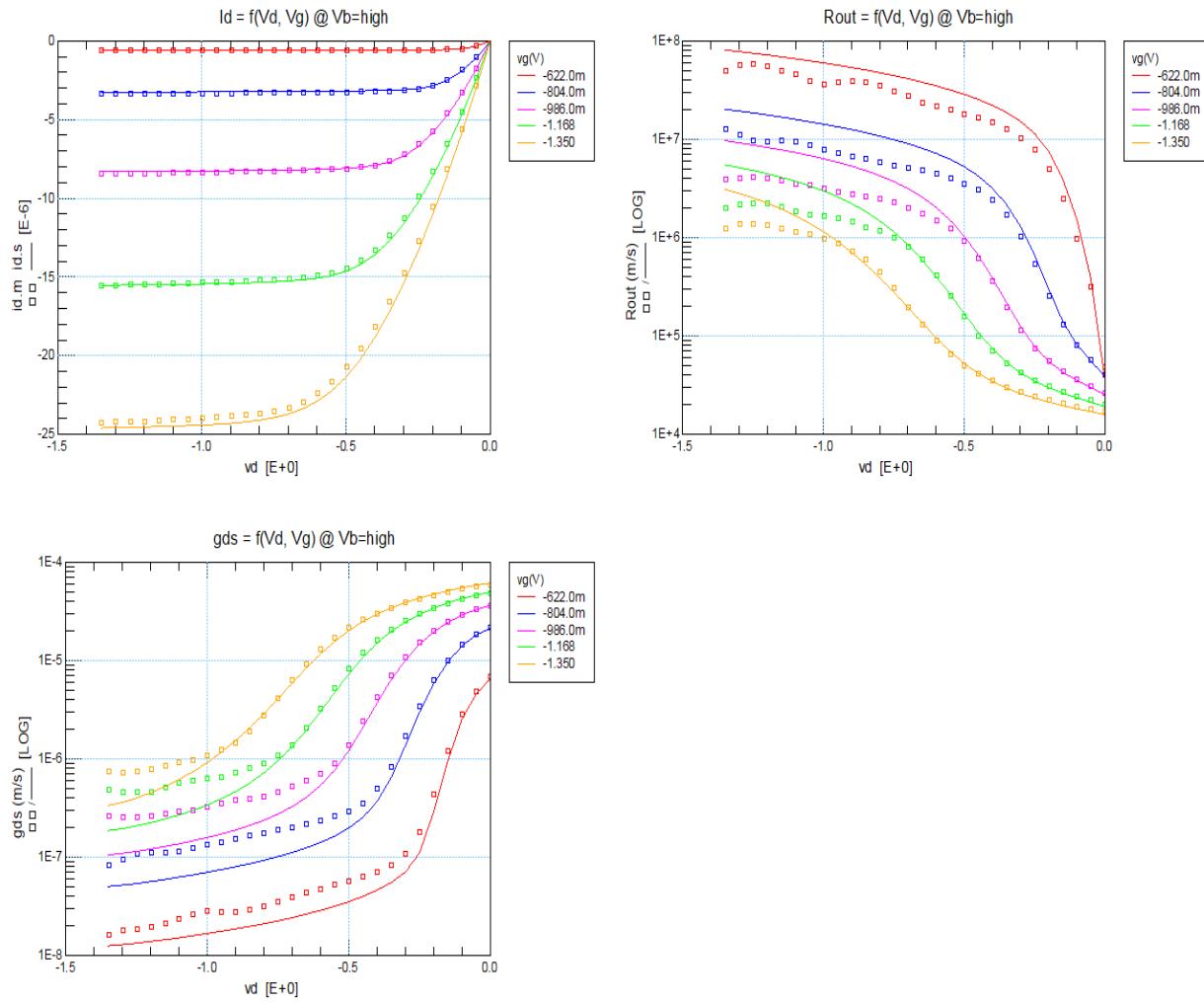
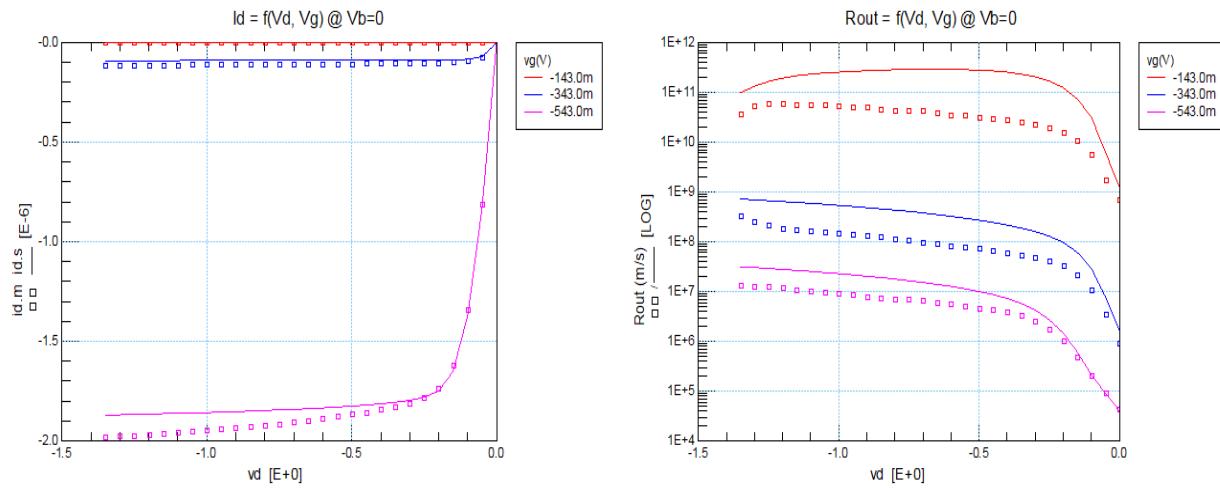


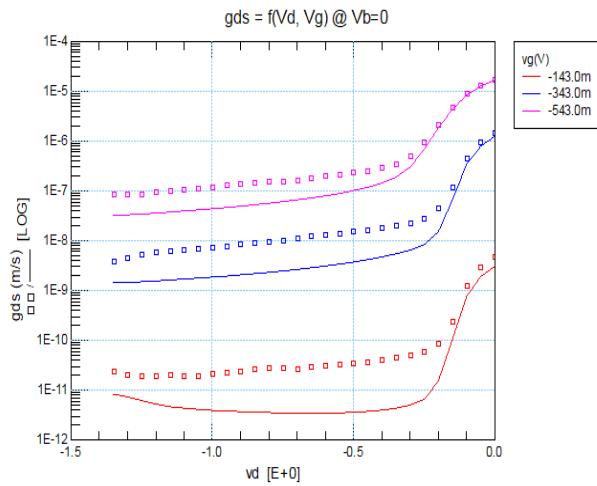


### $i_{dvg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

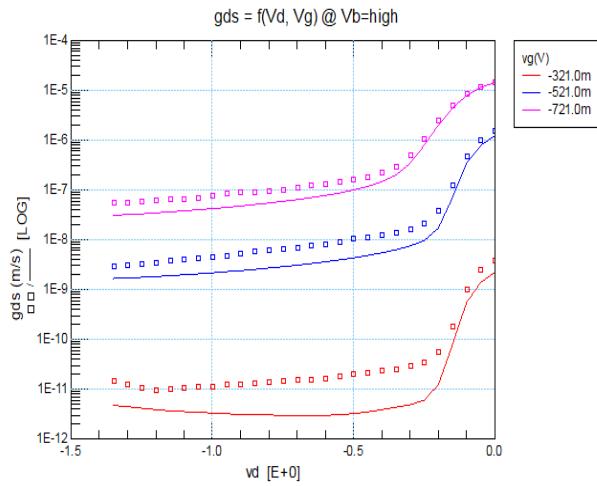
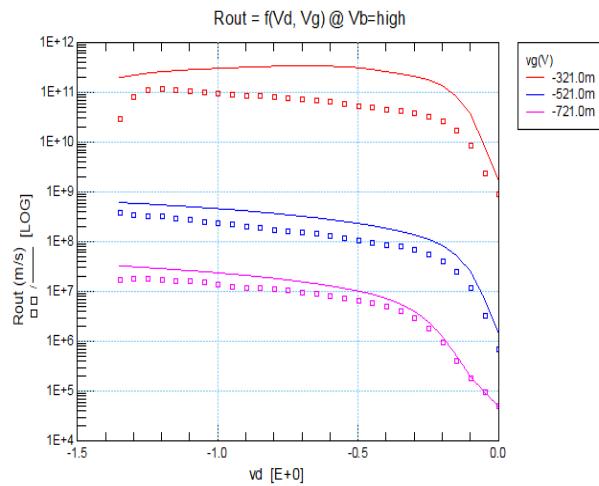
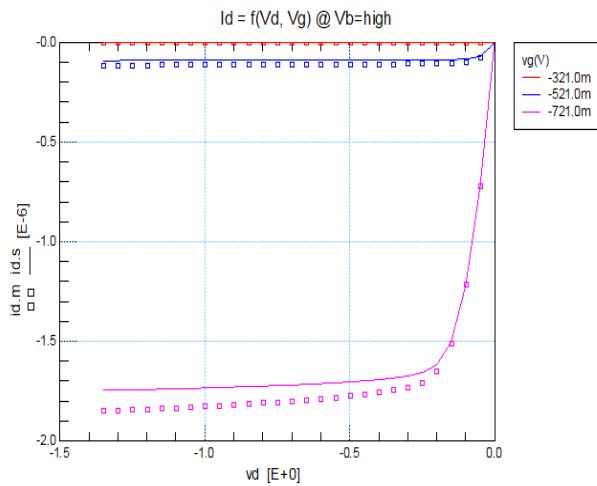


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**


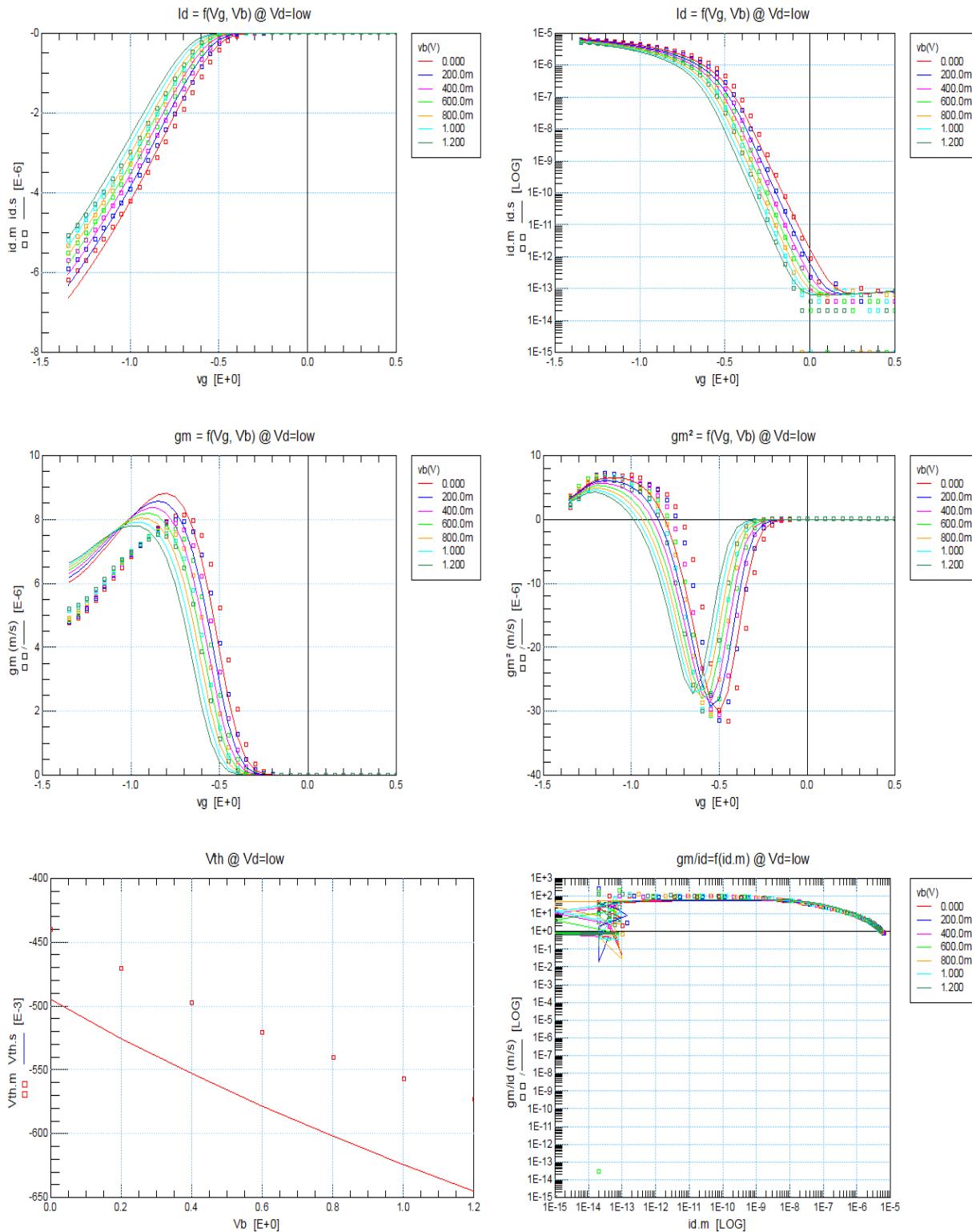


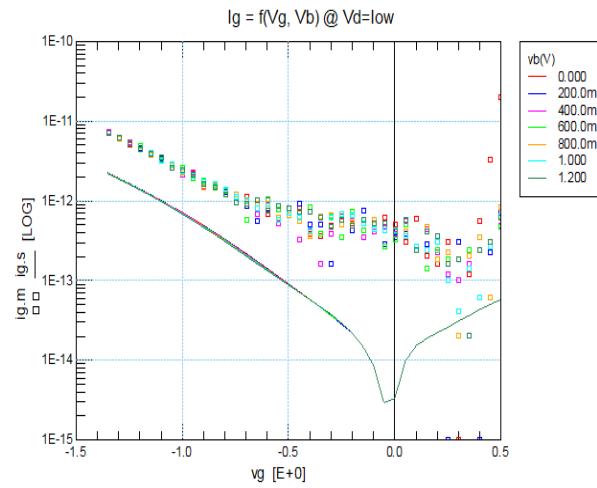
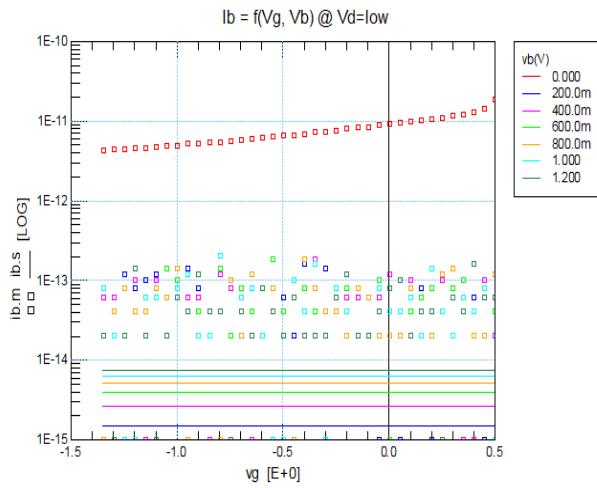
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



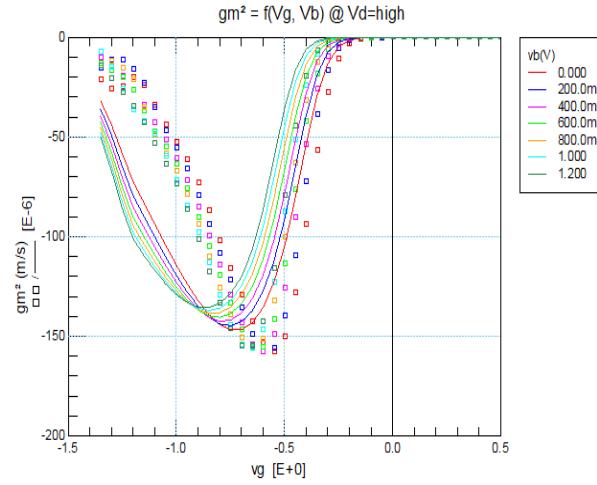
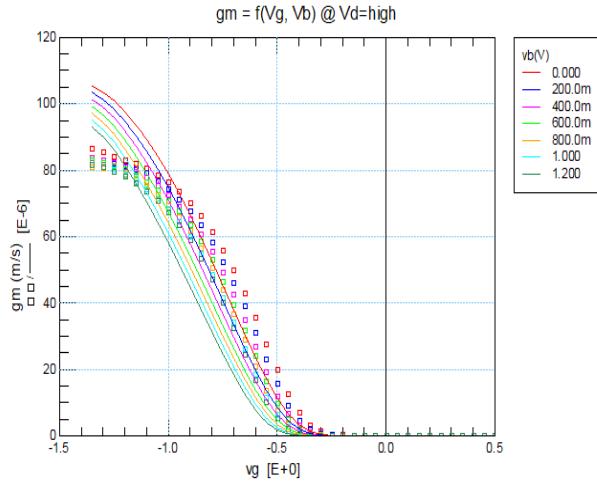
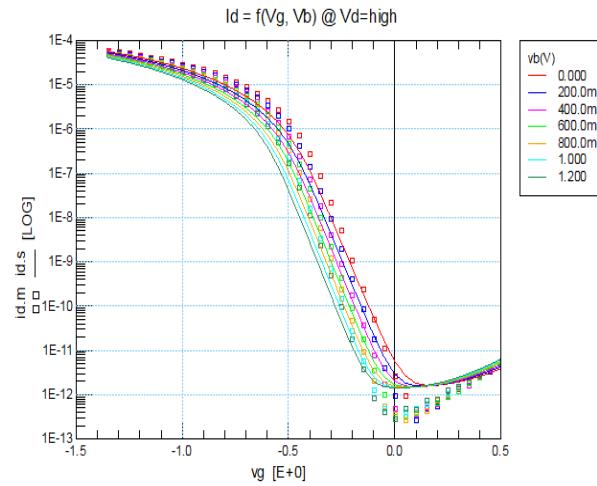
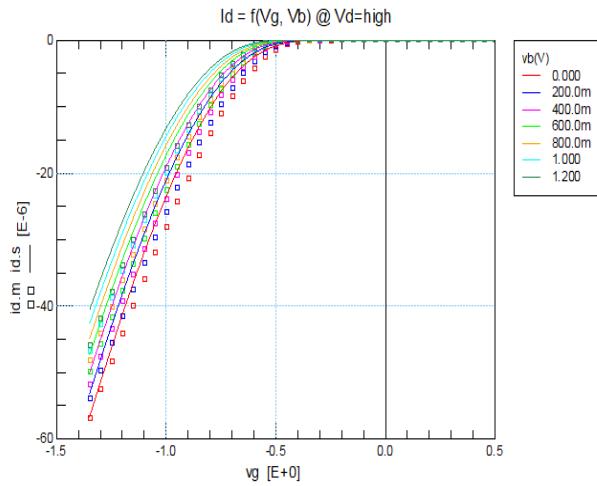
## 4.19 W0u18\_L0u14\_S553\_4

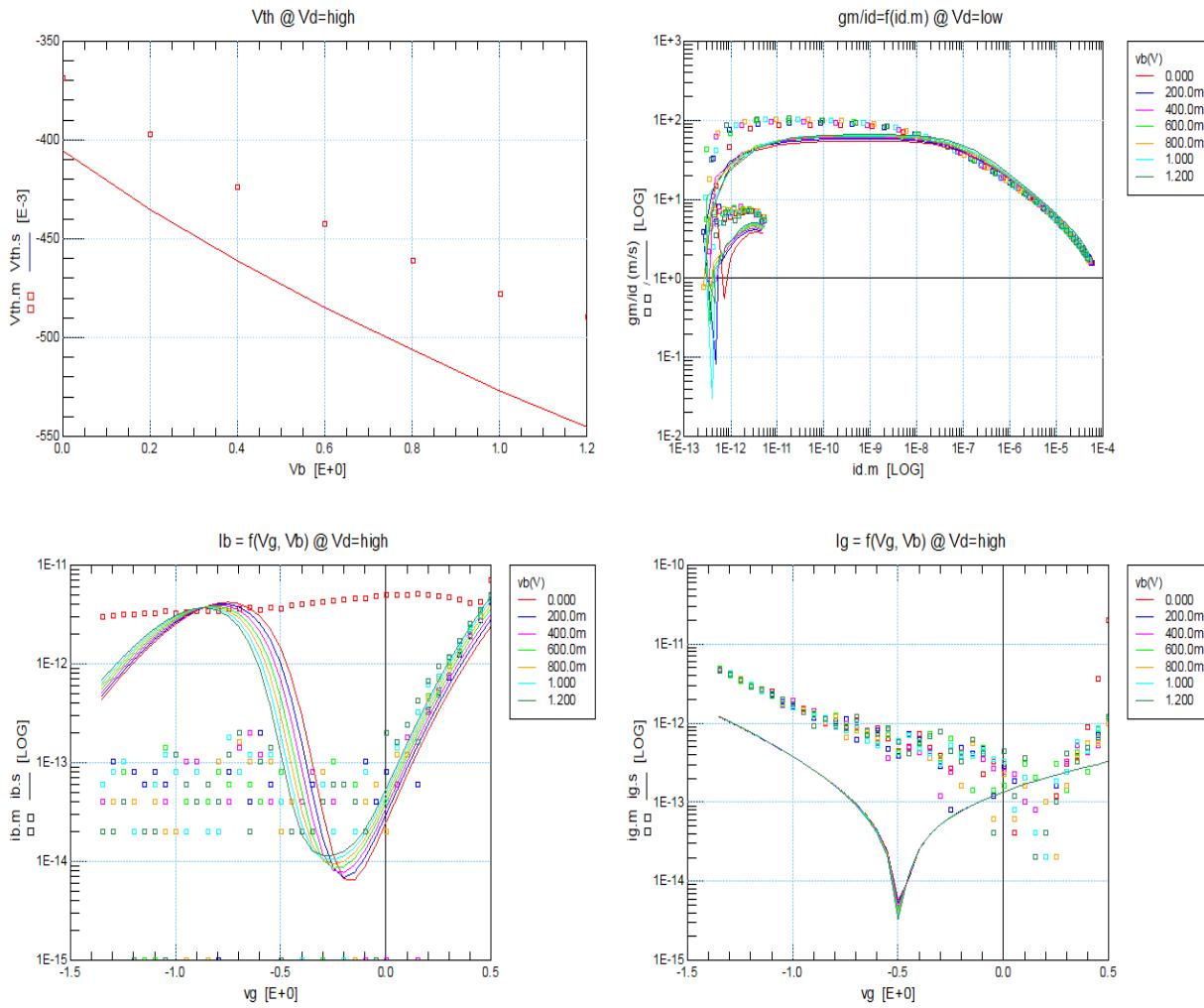
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



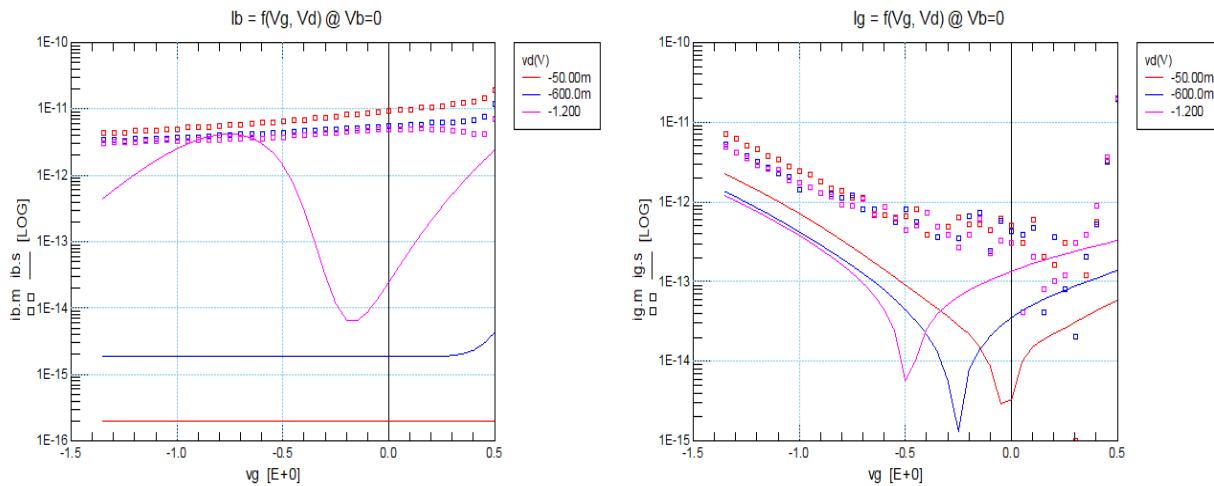


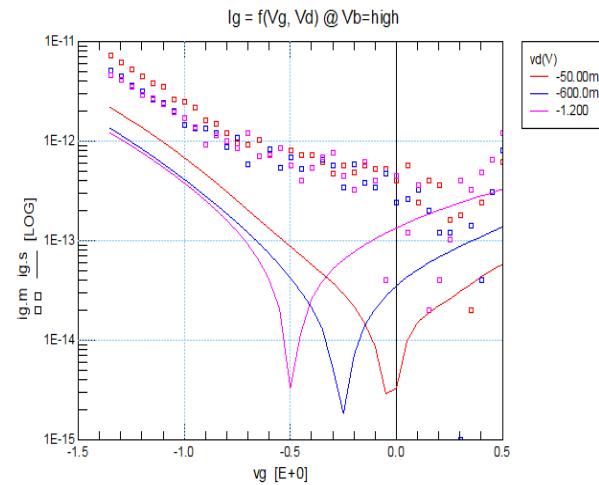
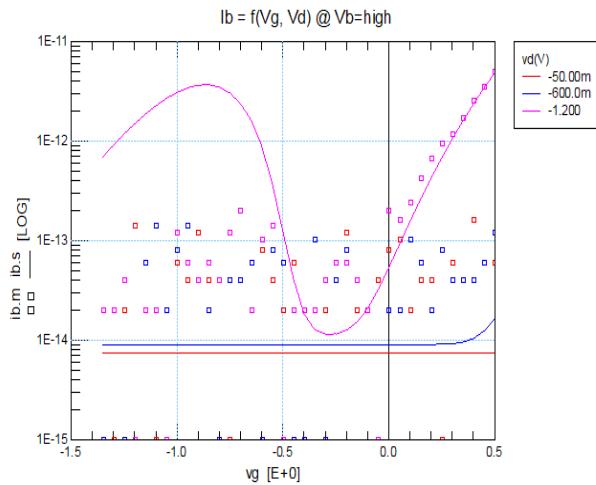
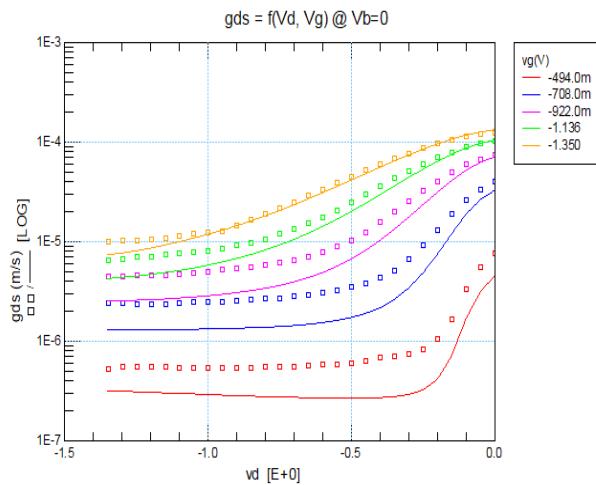
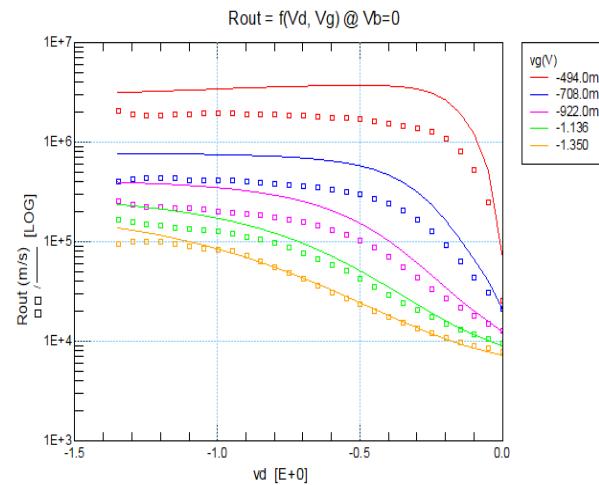
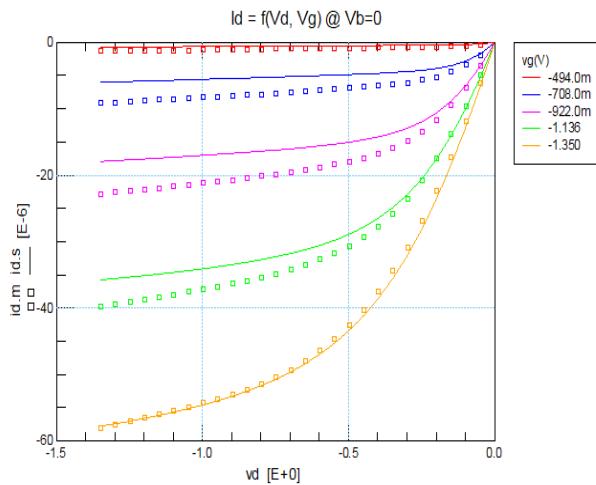
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

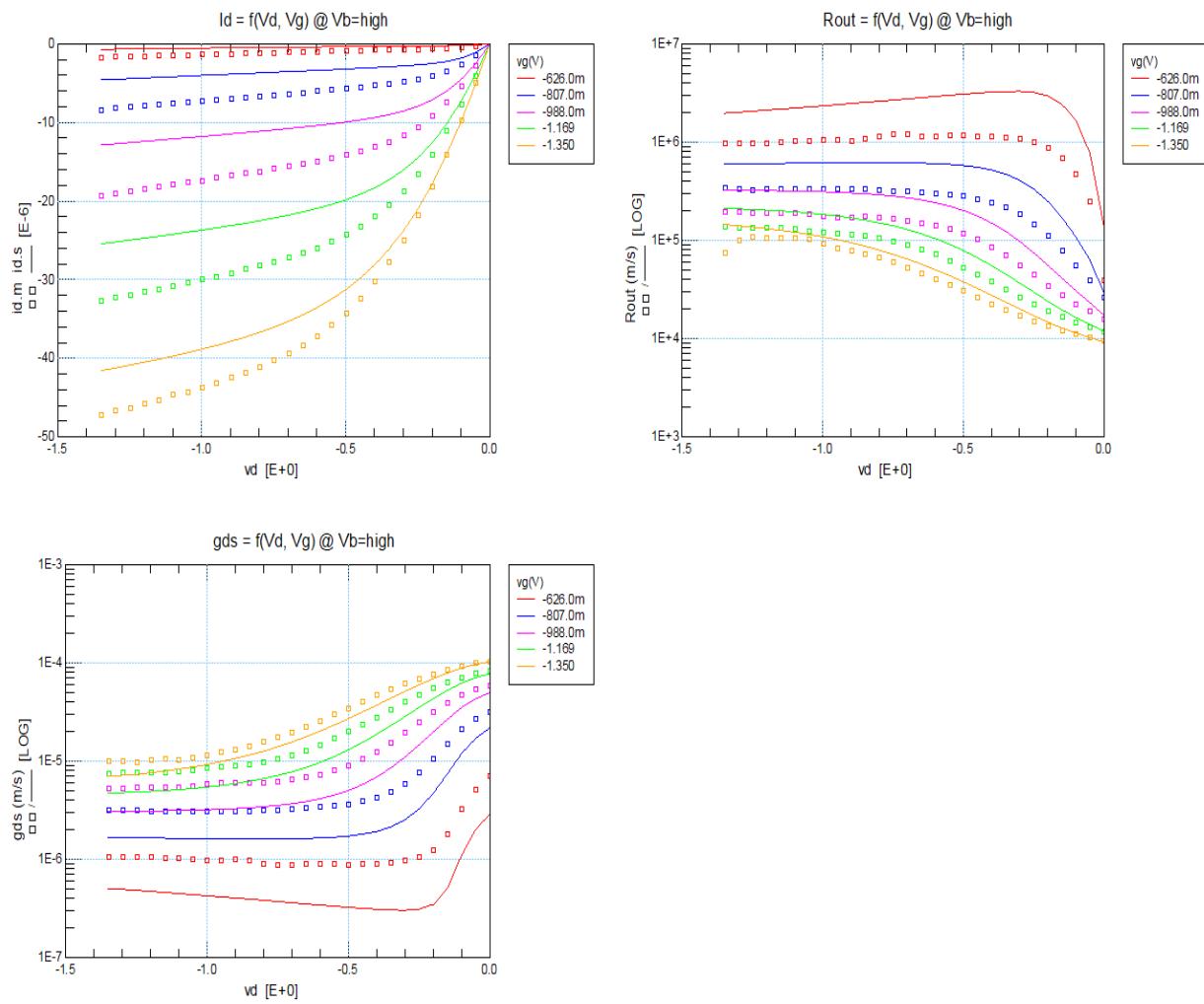
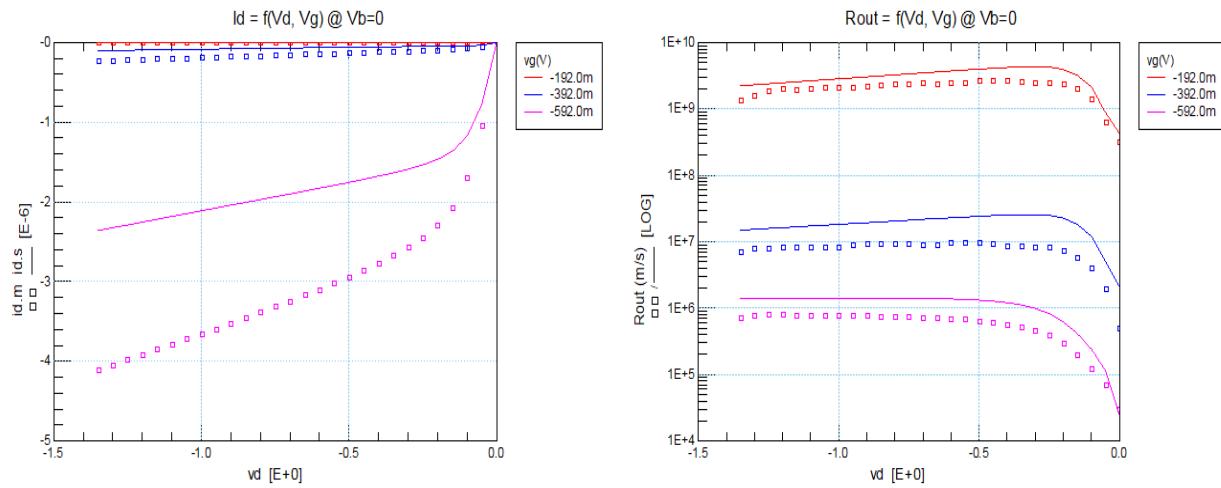


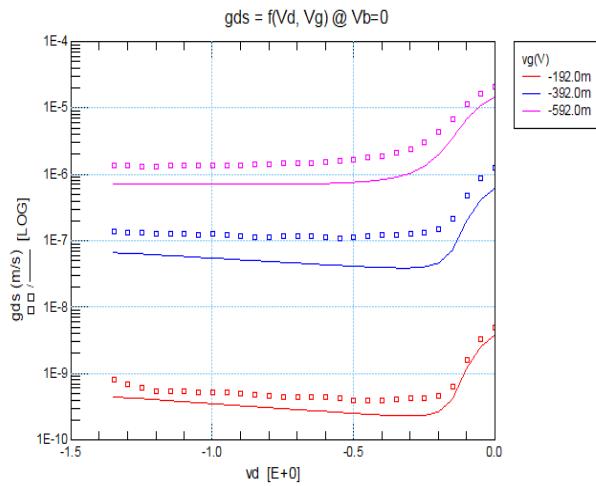


### $i_{dvg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

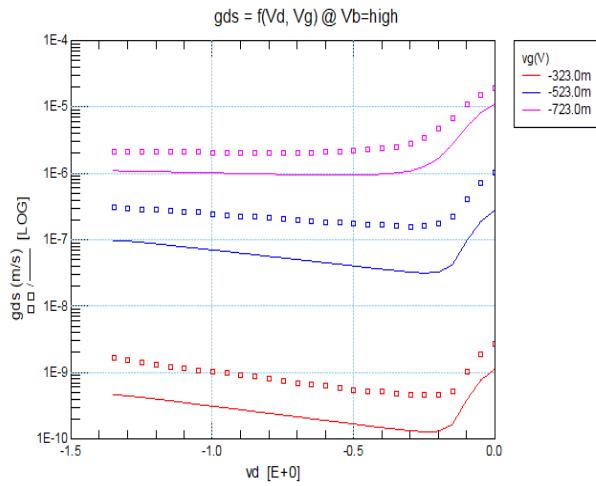
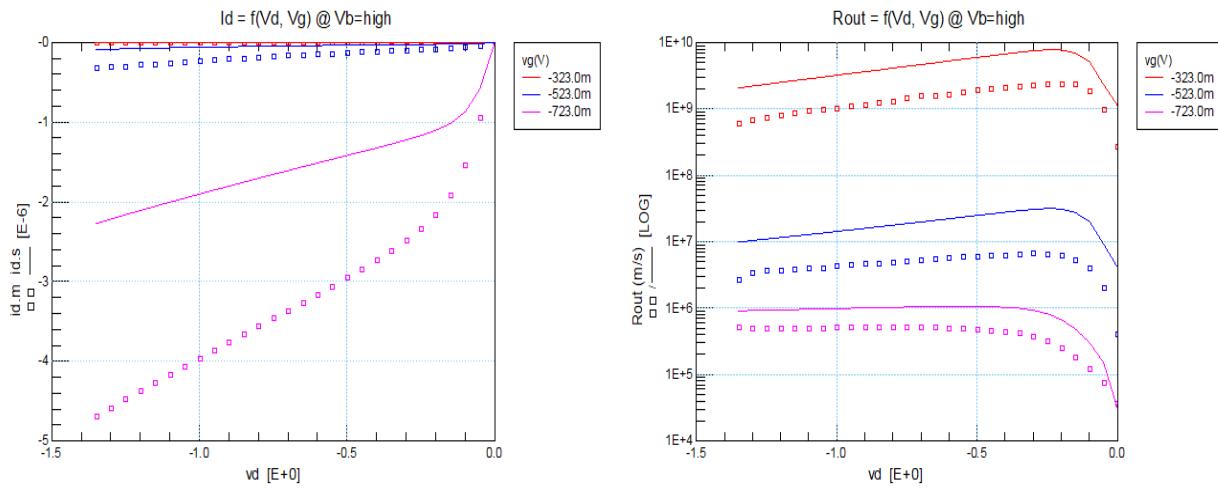


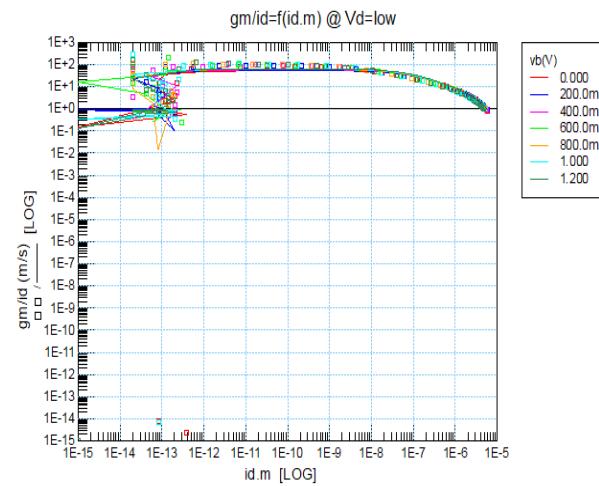
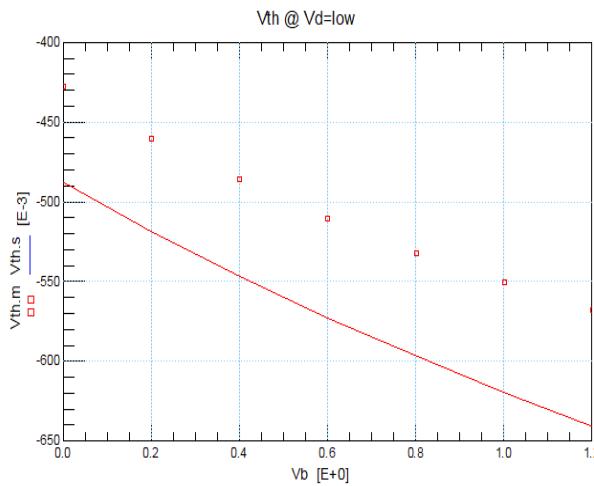
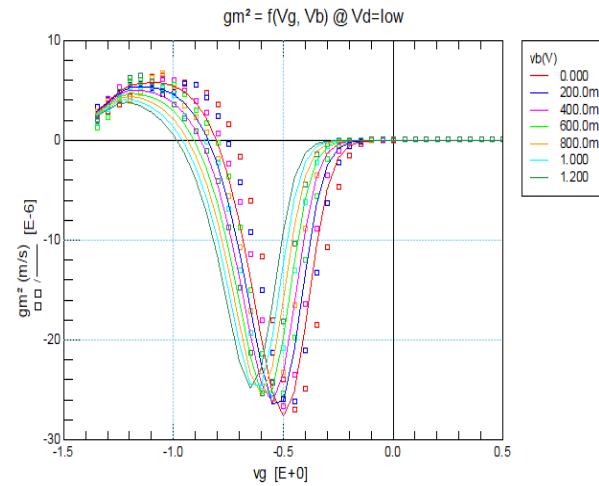
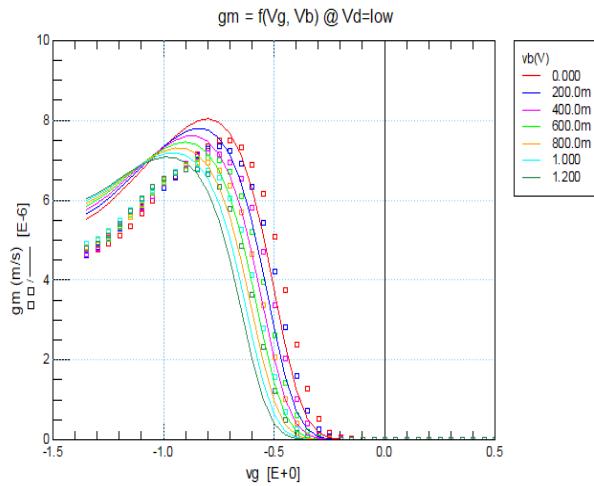
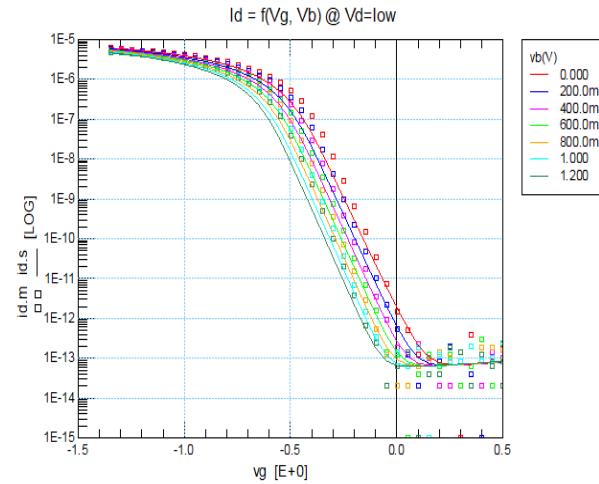
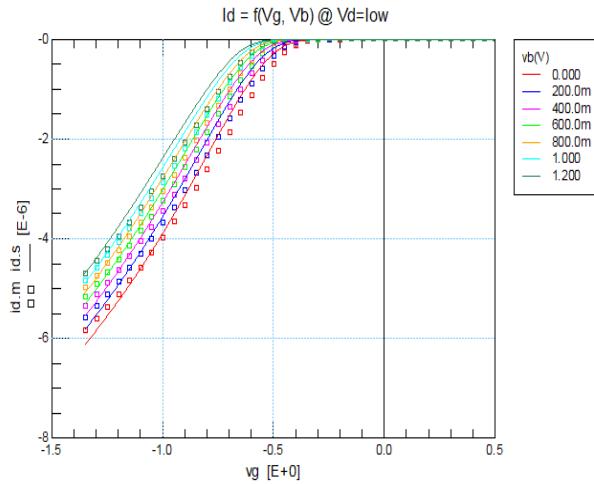
**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


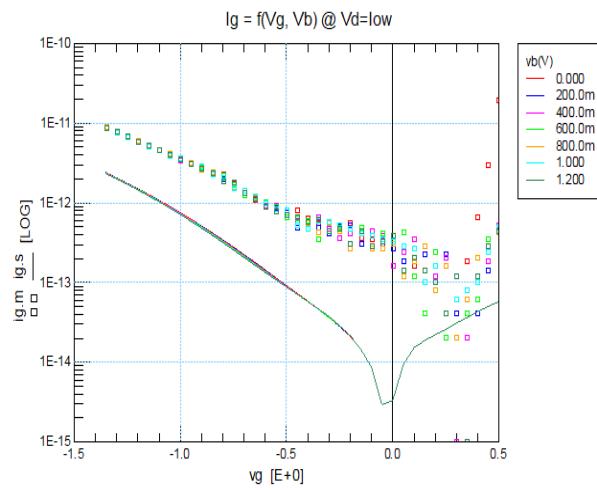
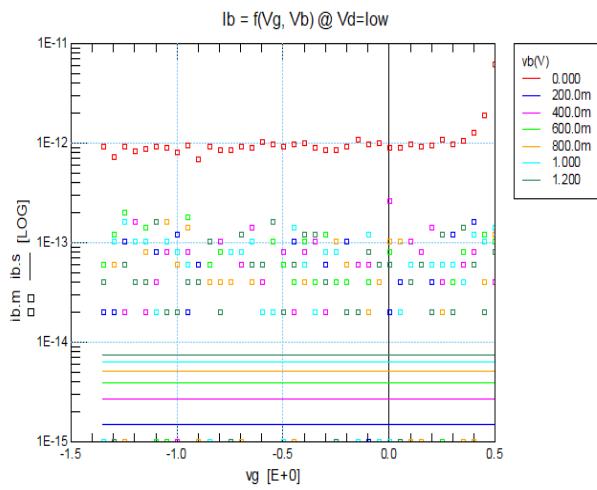
**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**



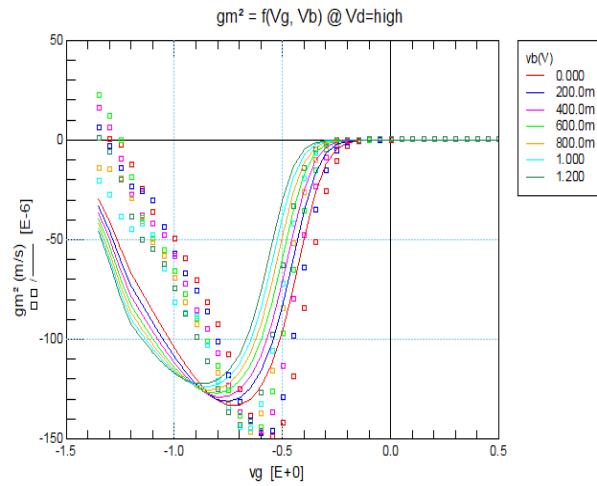
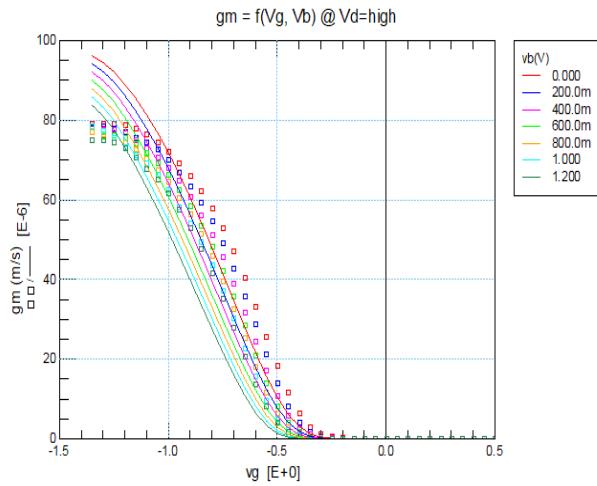
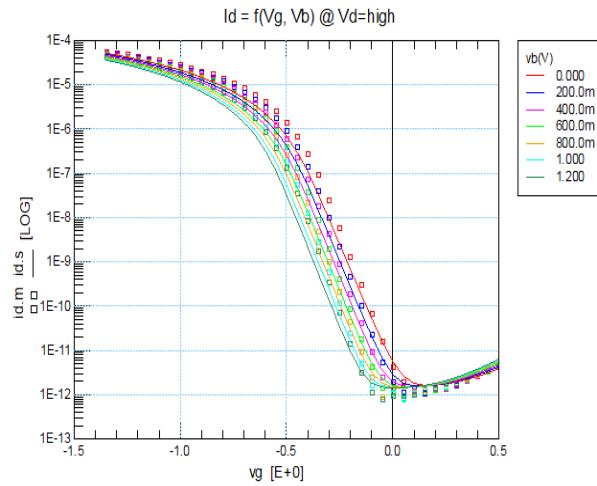
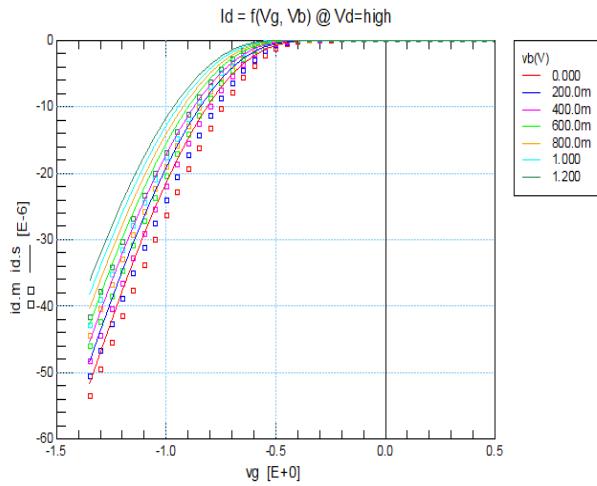
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

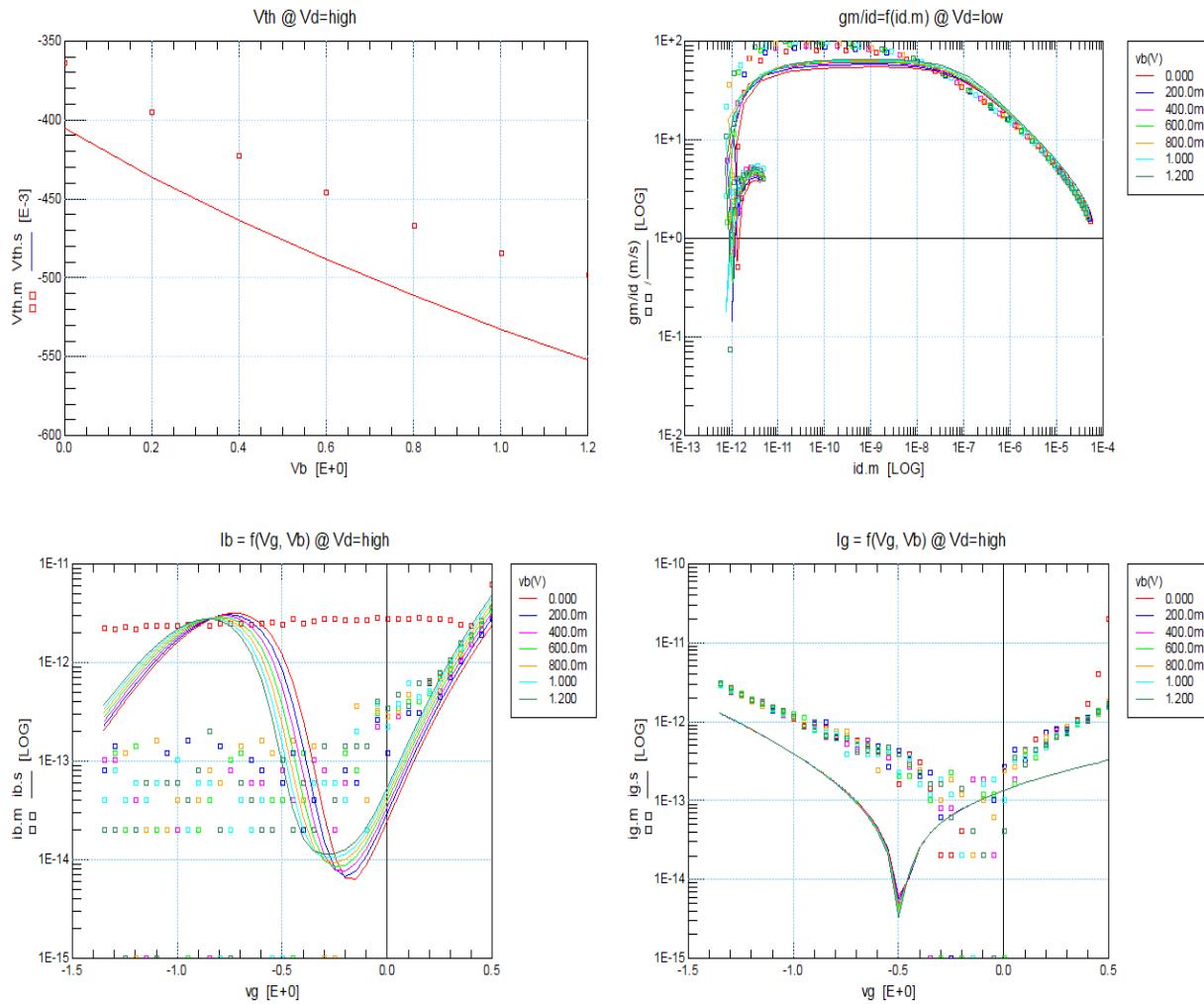


**4.20 W0u18\_L0u15\_S553\_5****idvg, Vd = -0.05V, T = 27°C**

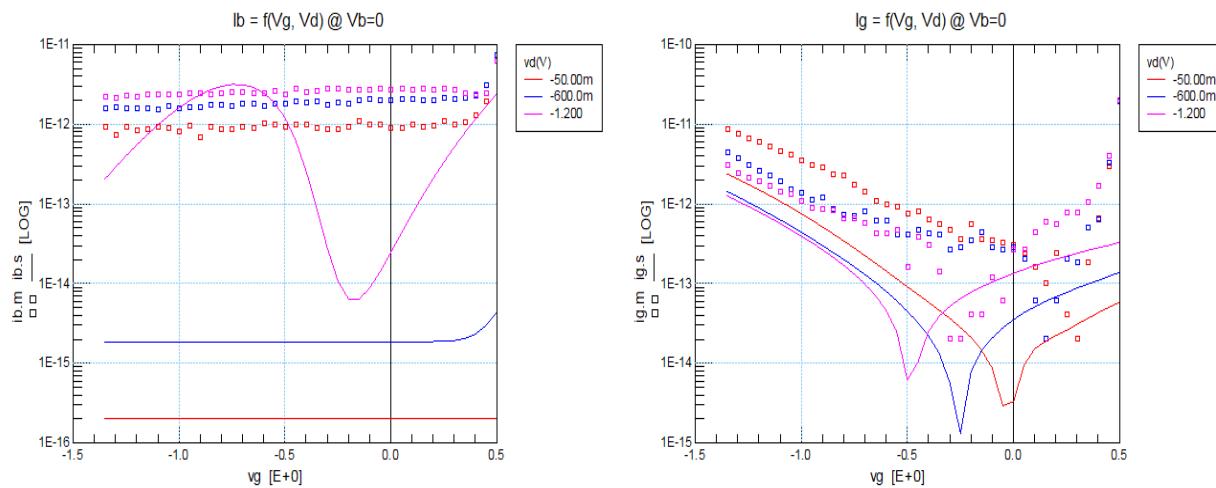


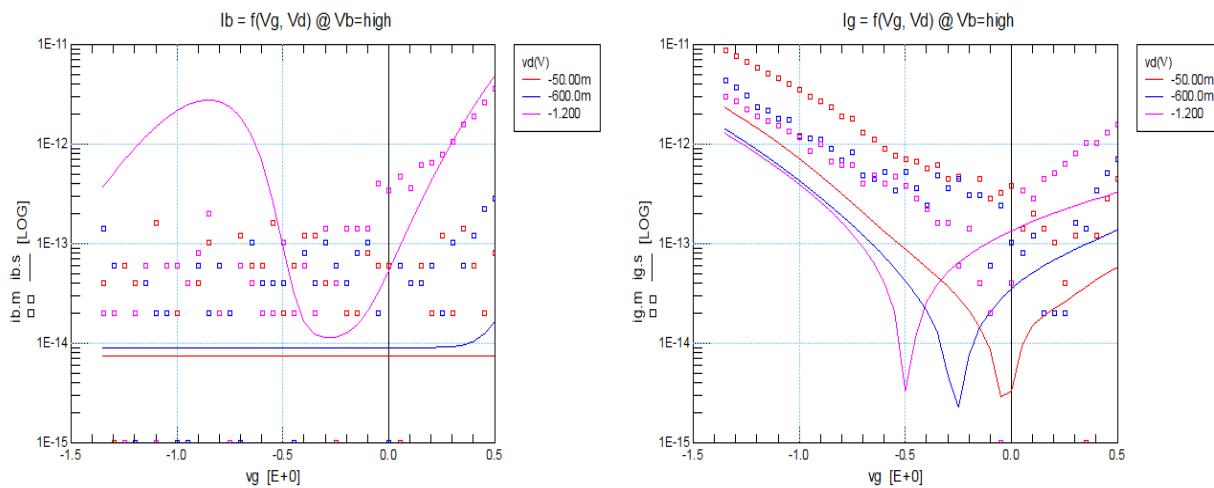
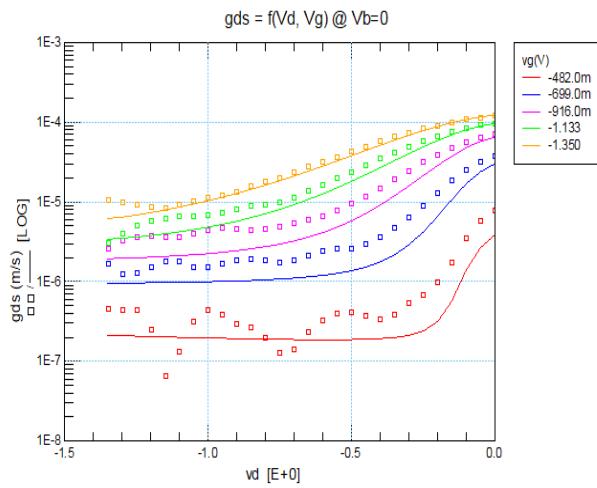
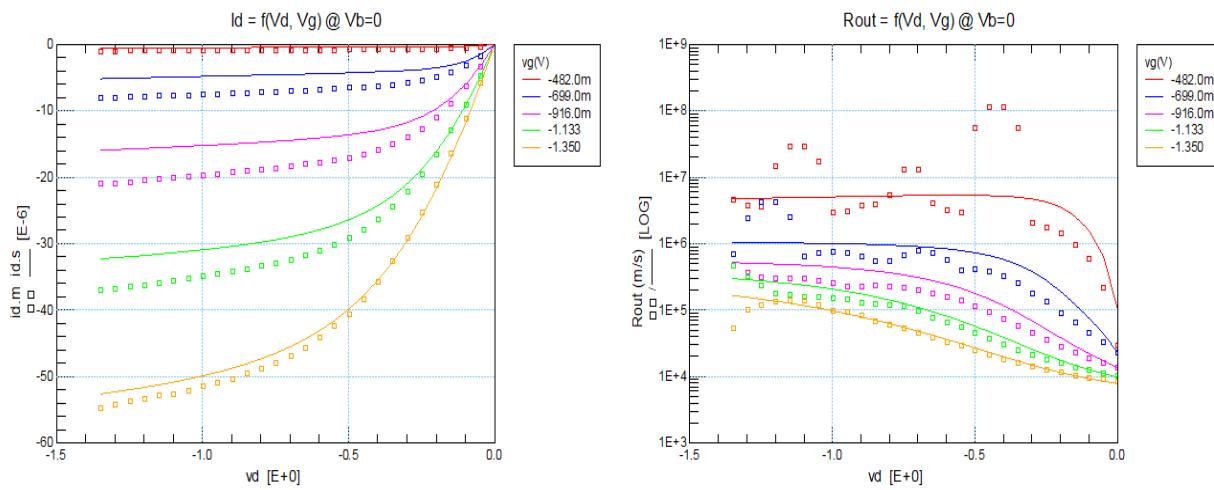
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

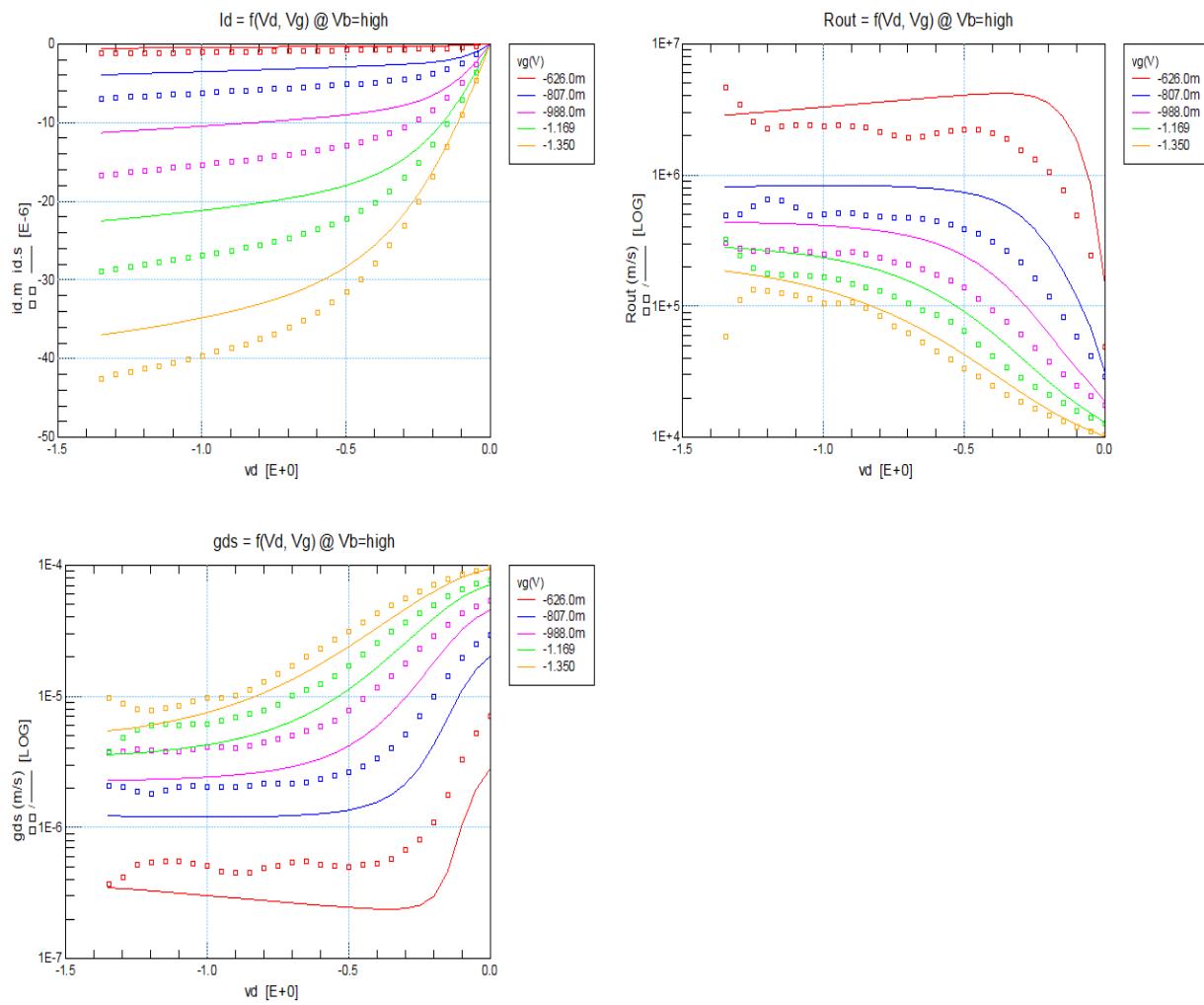
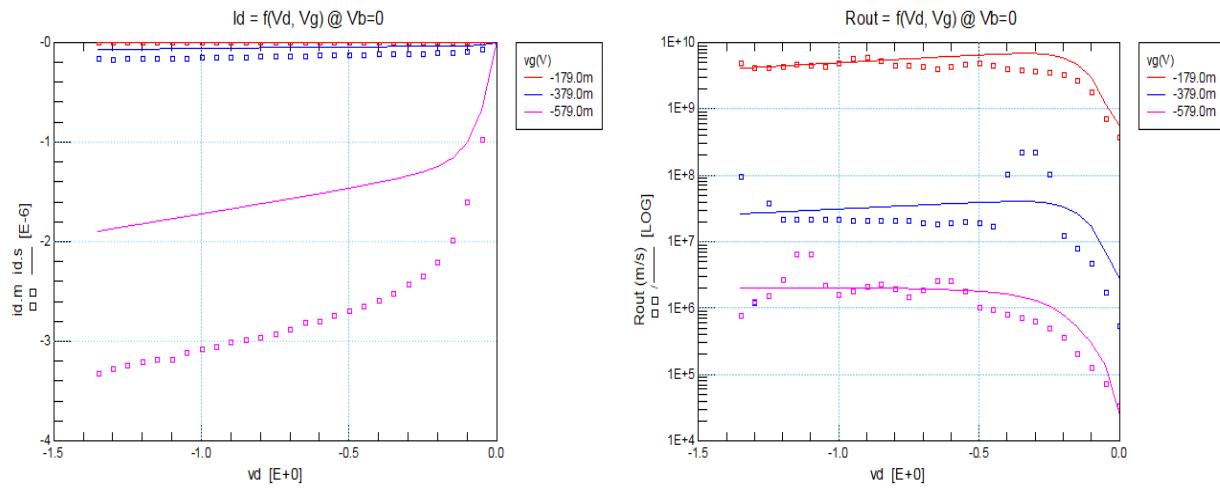


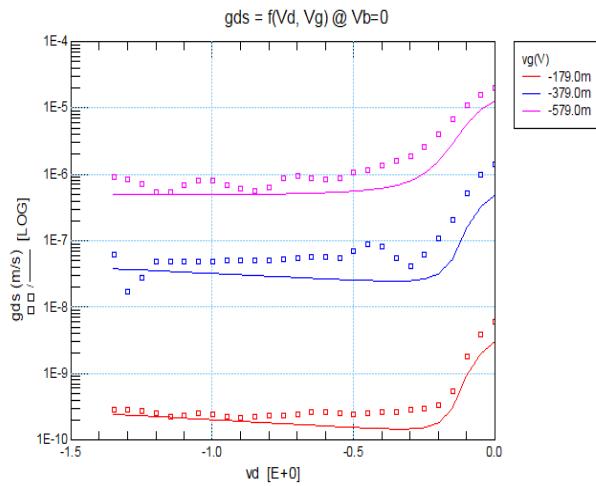


### $id_{vg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

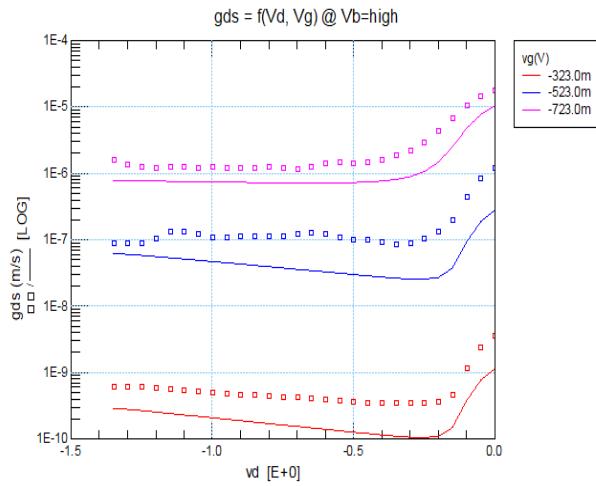
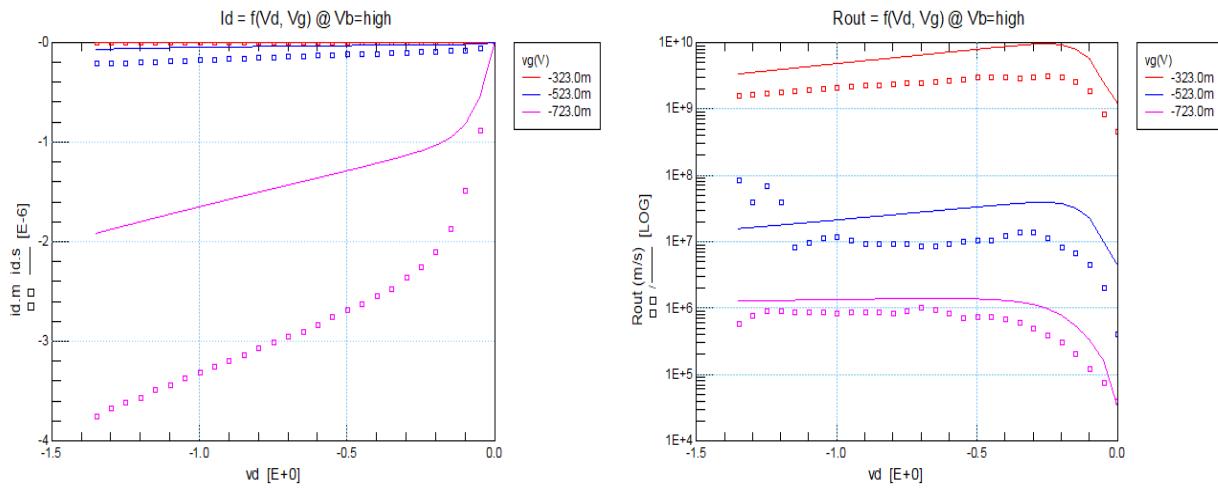


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

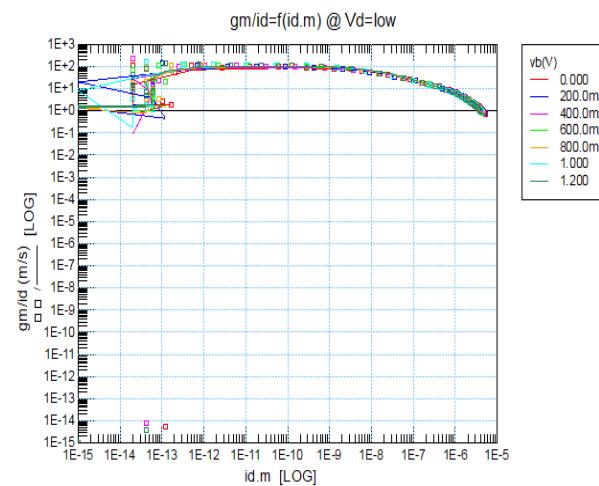
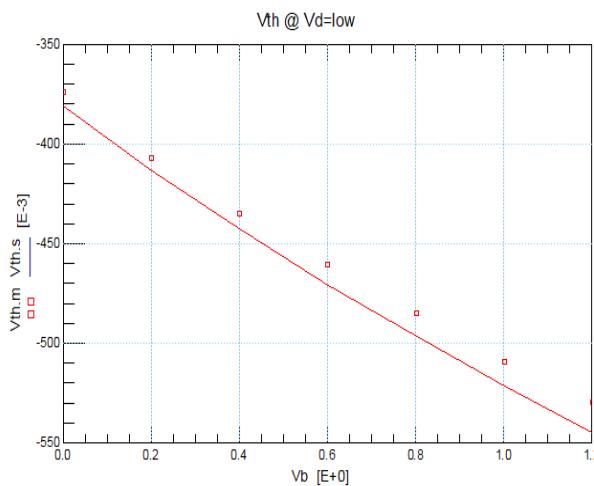
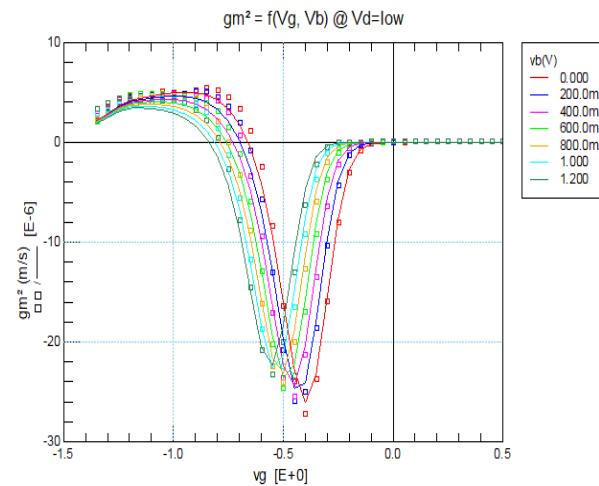
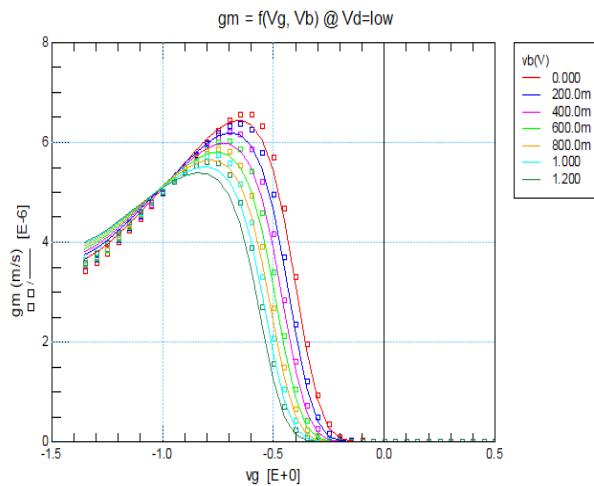
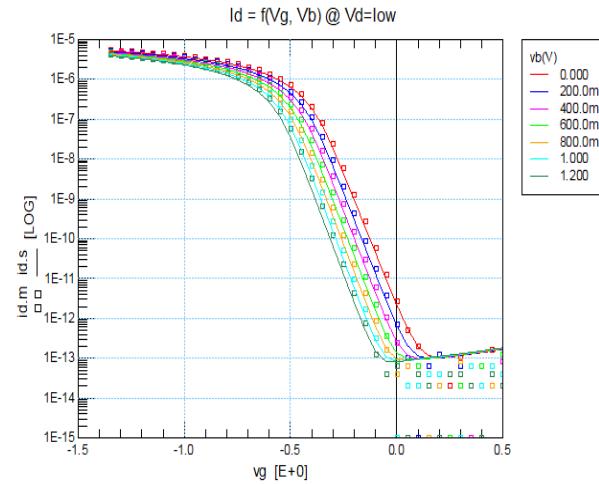
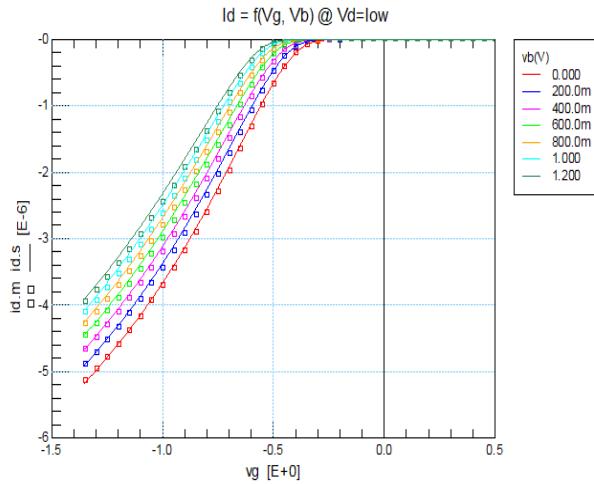


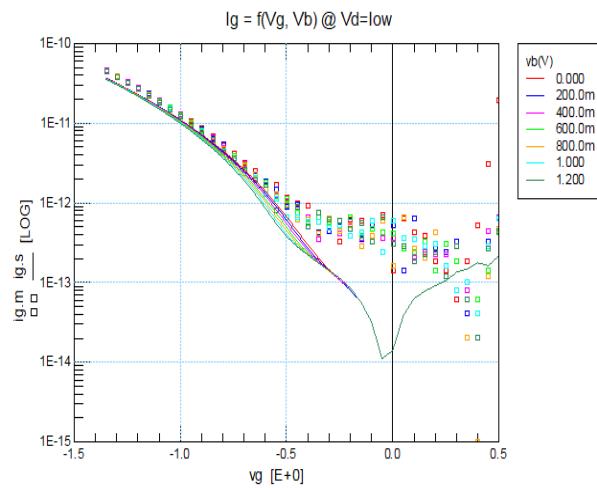
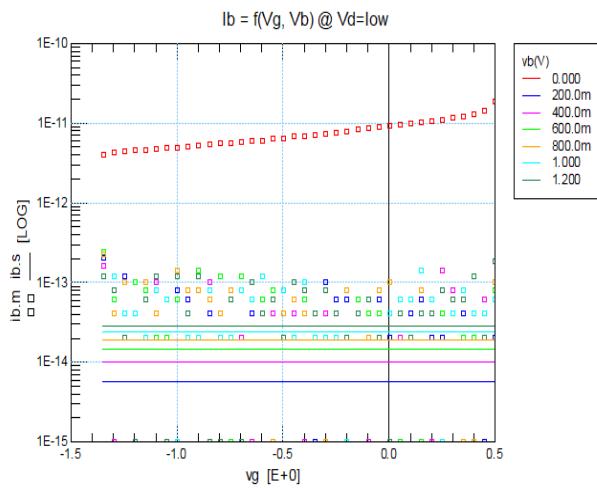
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



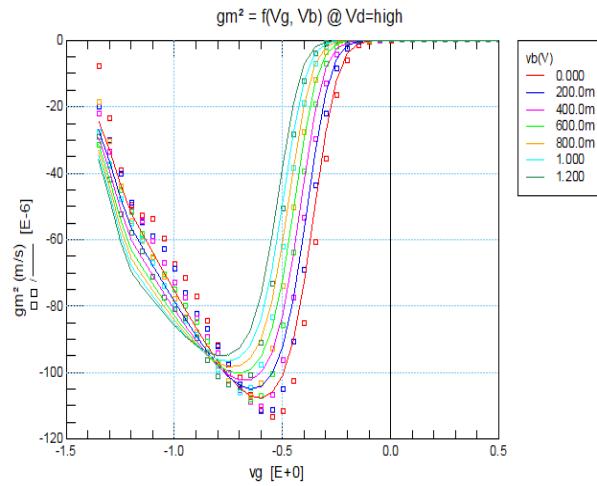
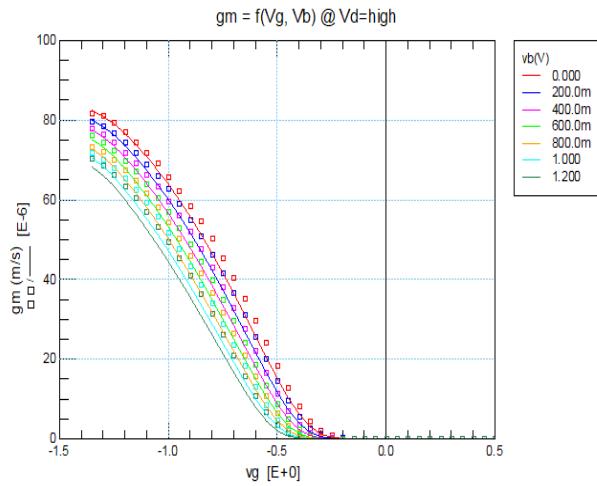
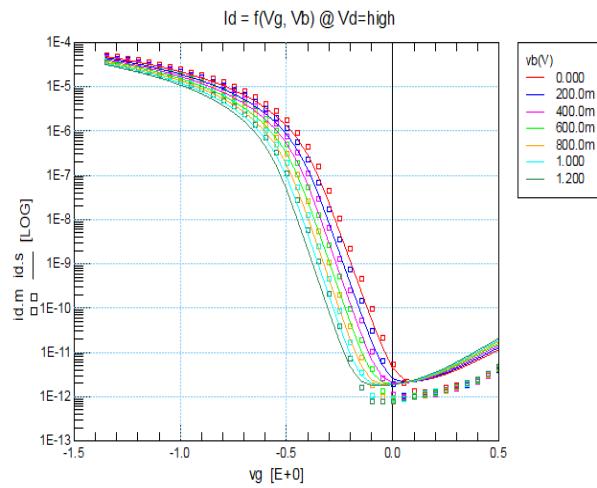
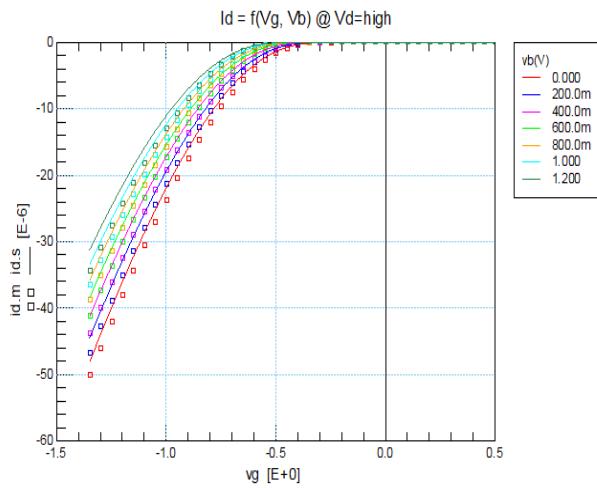
## 4.21 W0u6\_L0u5\_S551\_4

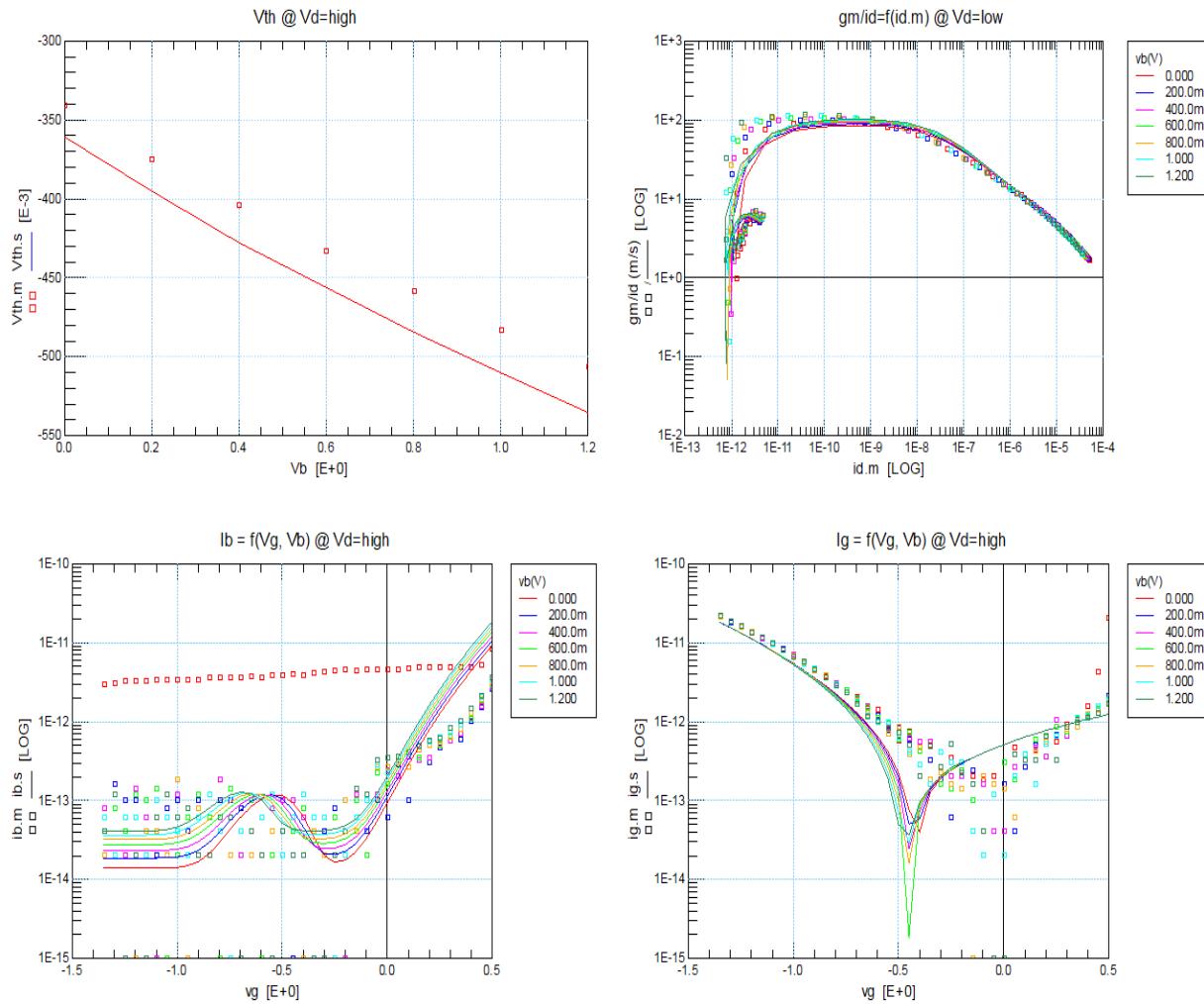
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



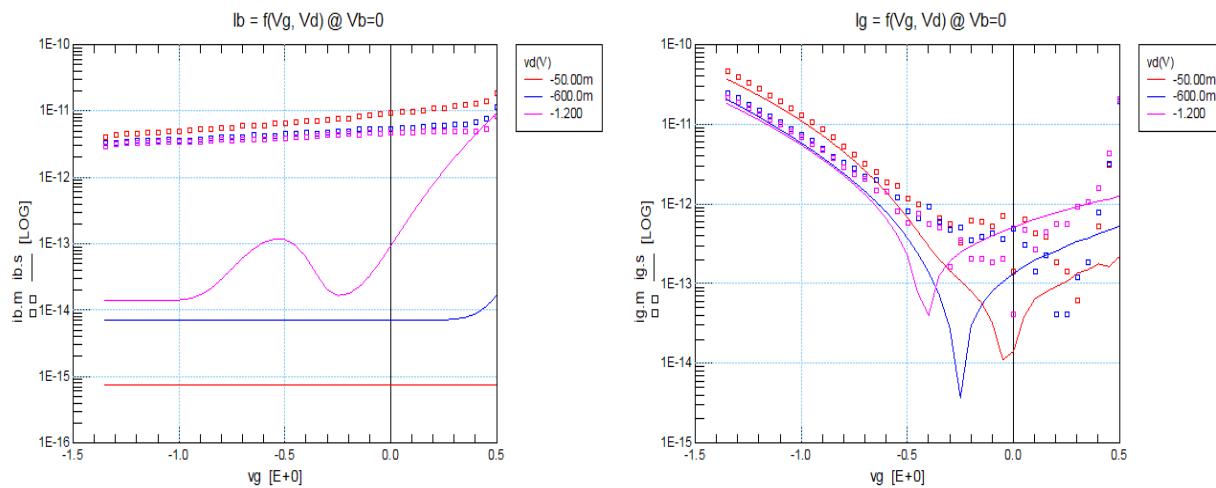


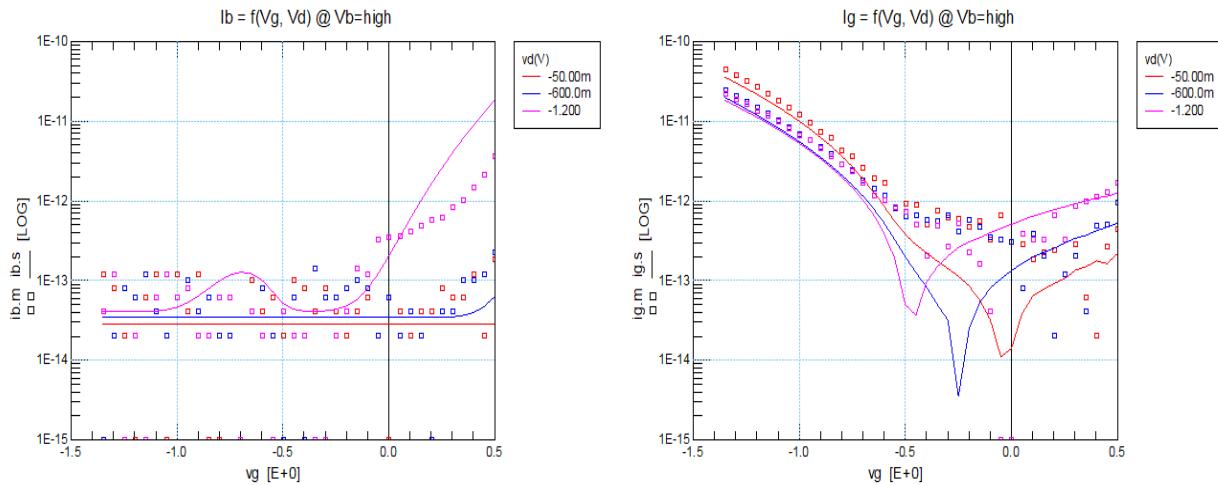
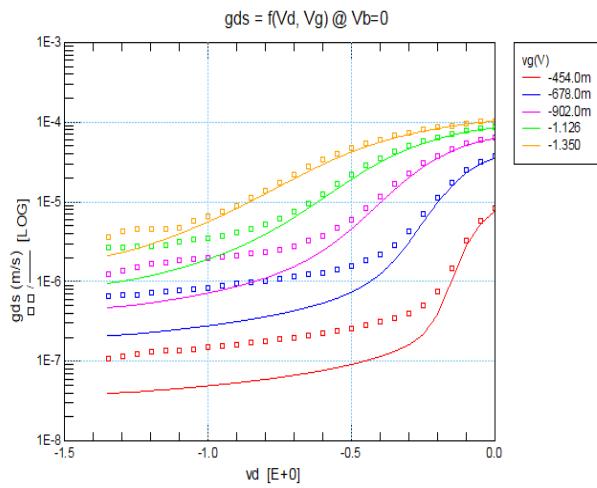
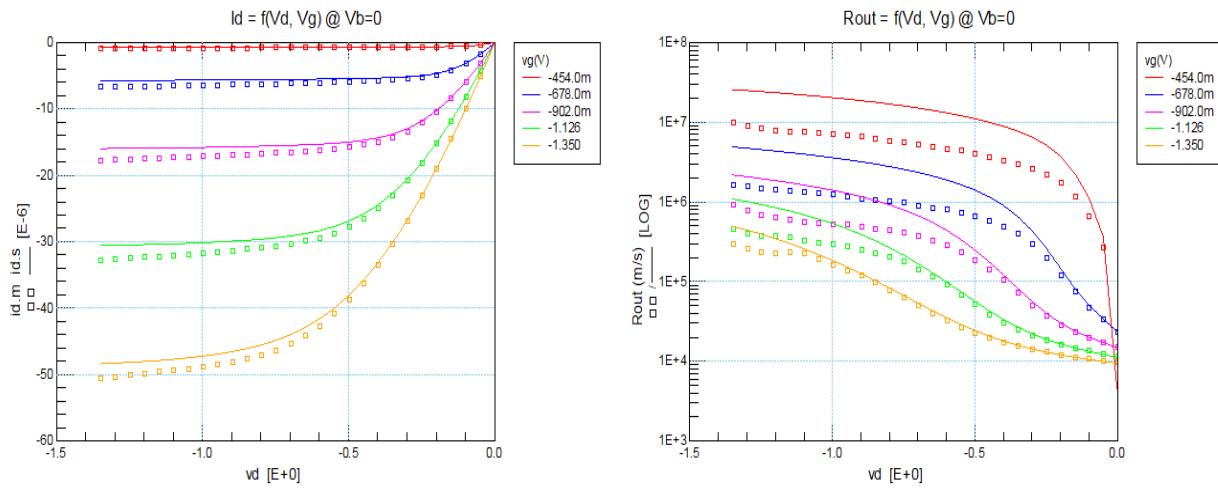
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

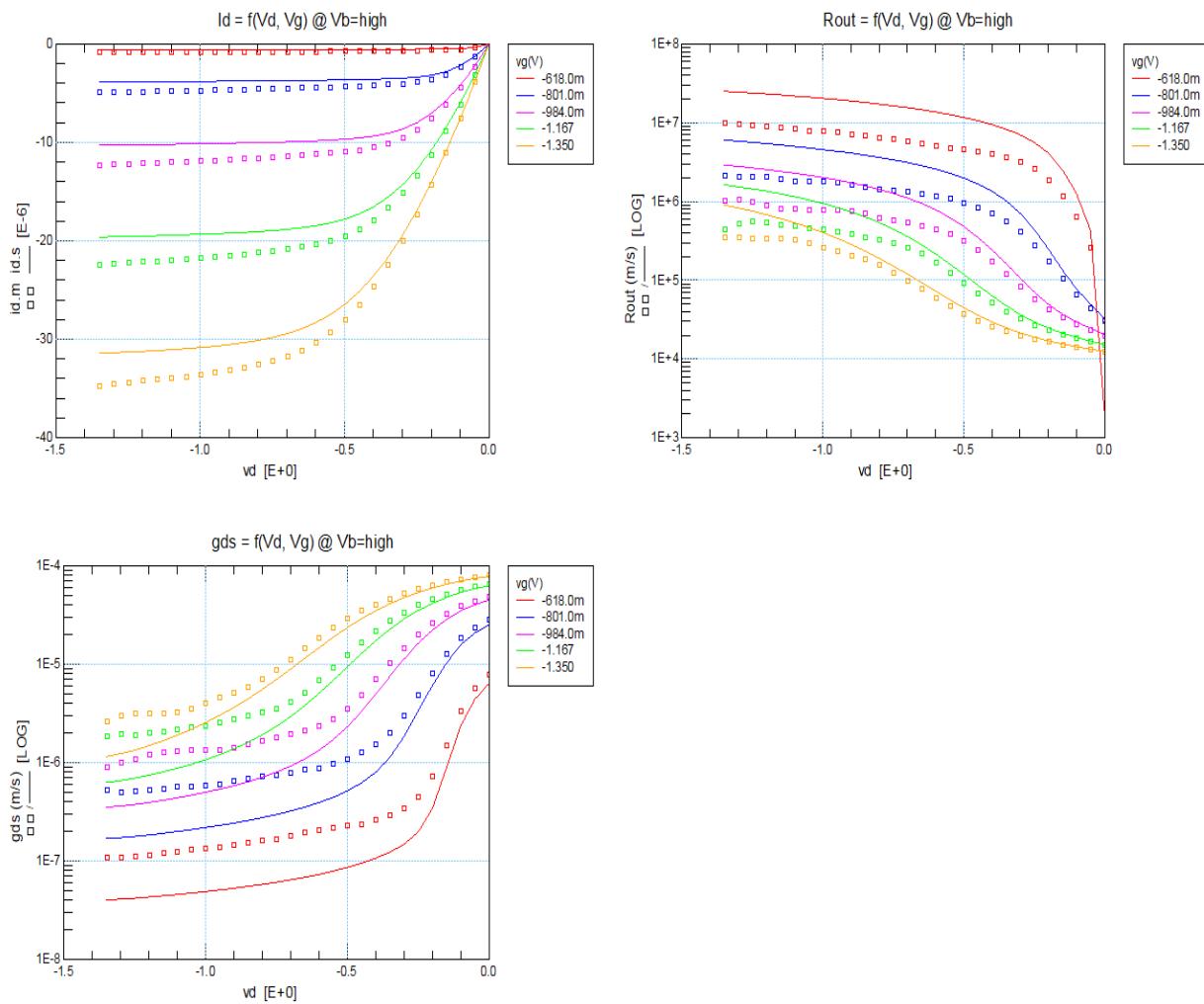
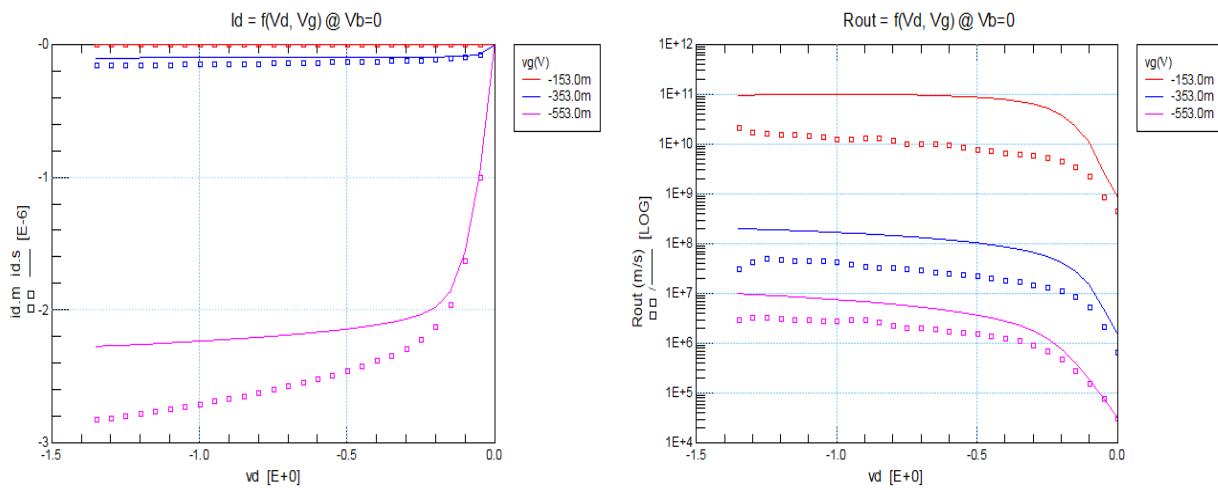


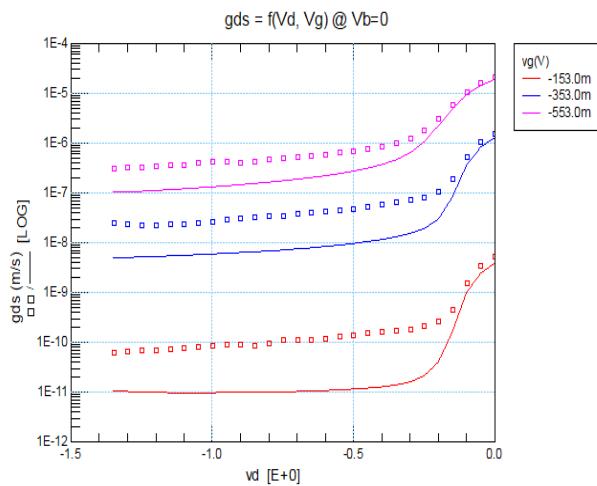


### idvg, Ib,Ig, Vb = 0V, T = 27°C

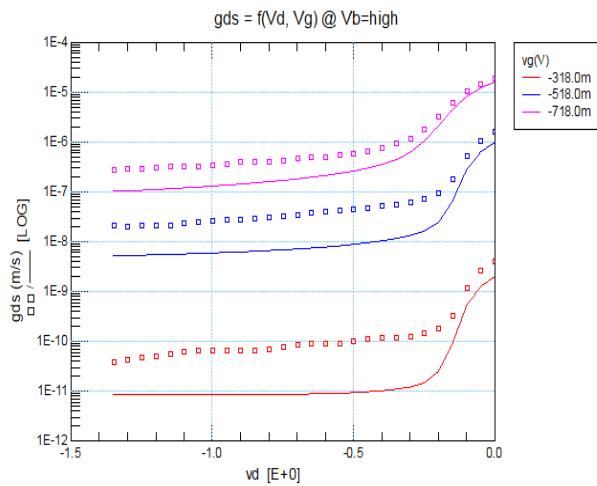
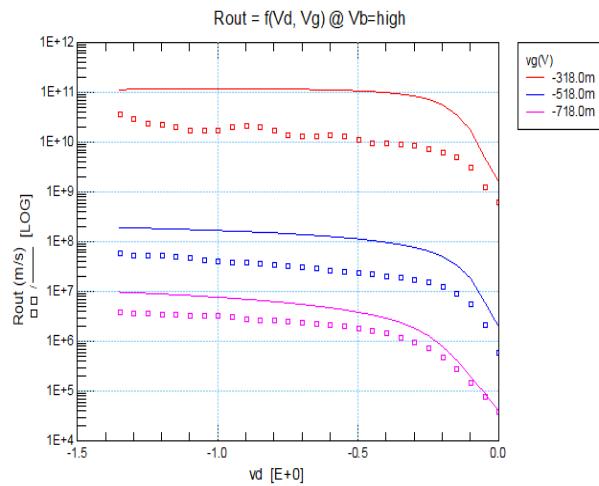
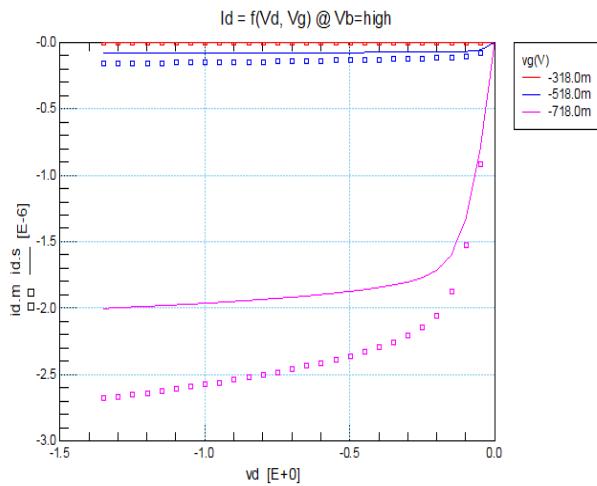


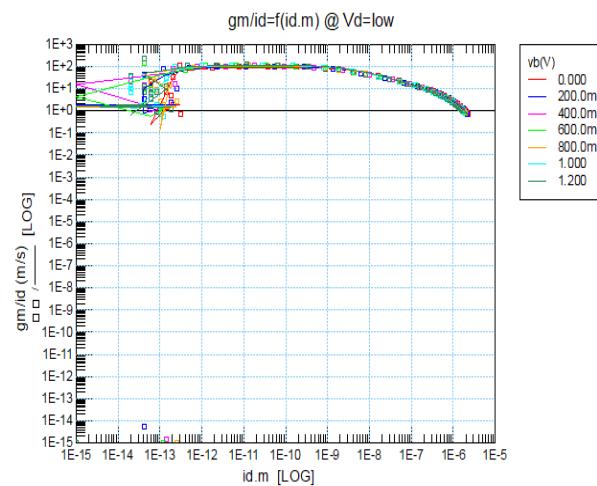
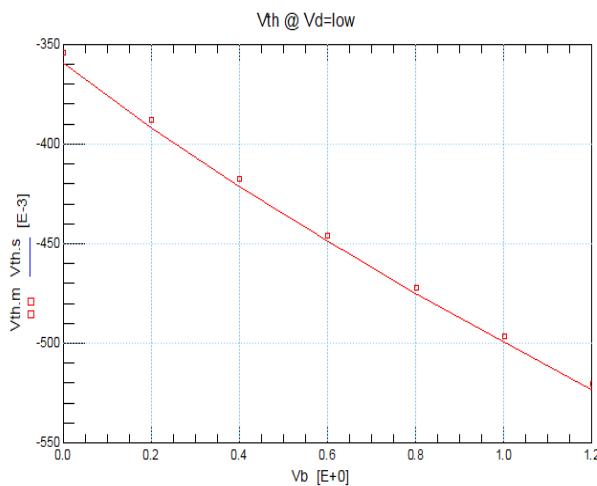
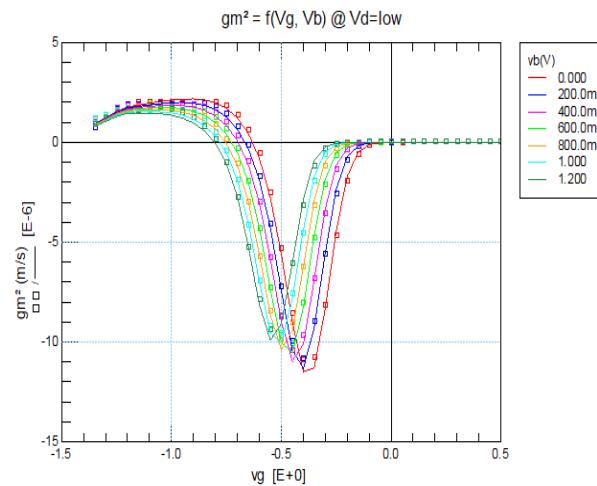
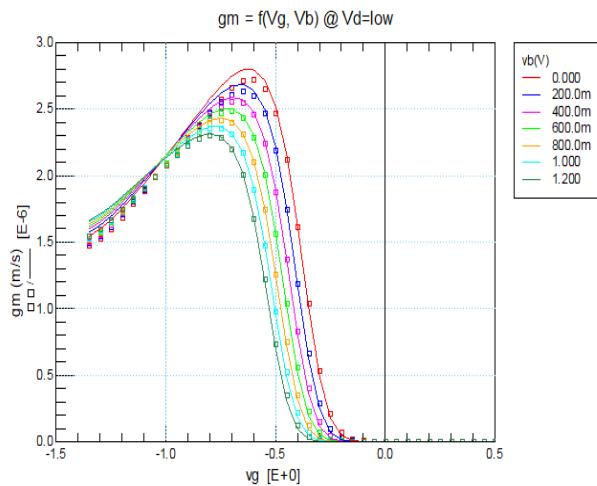
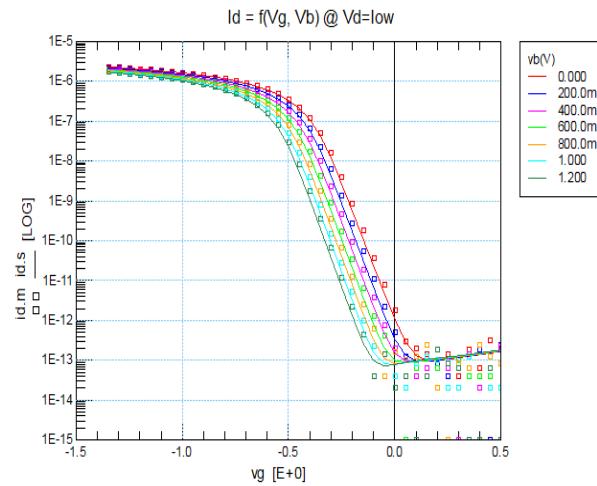
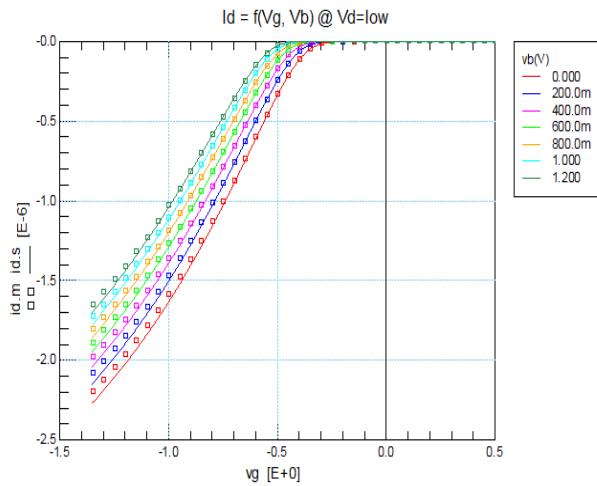
**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


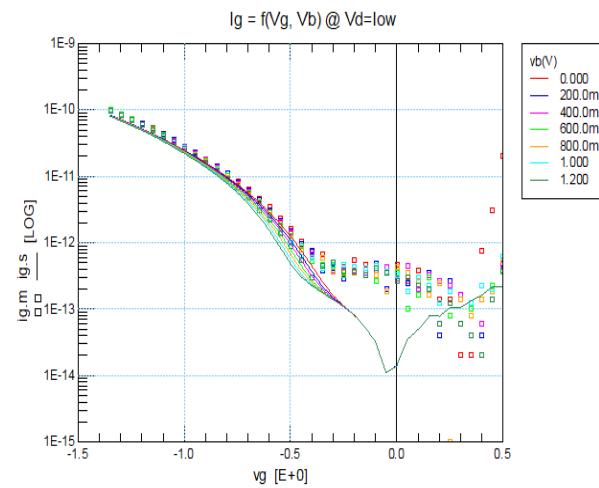
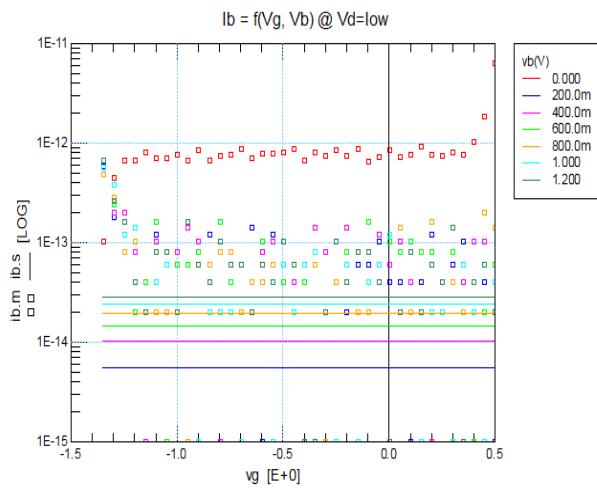
**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**




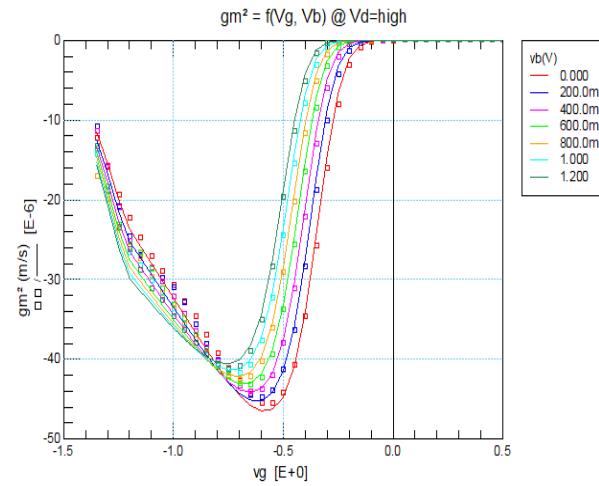
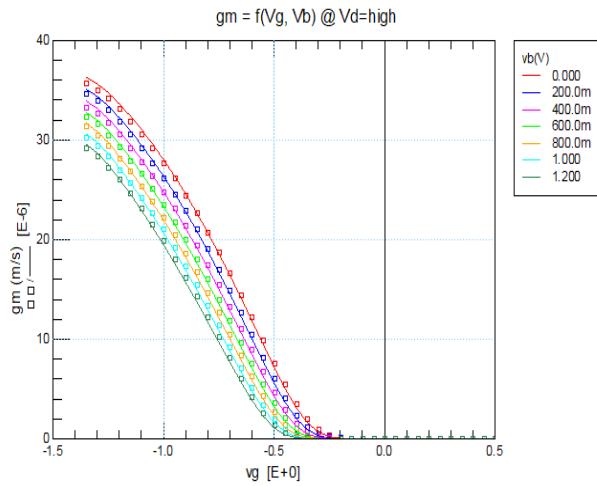
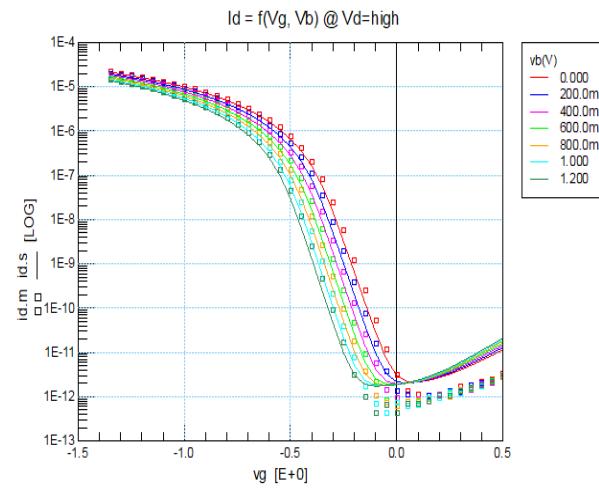
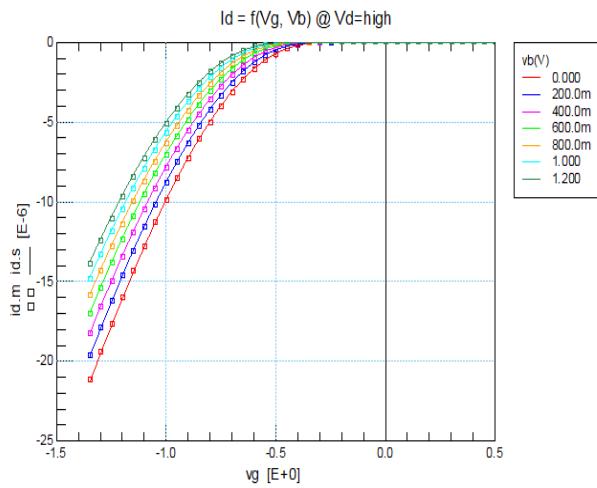
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

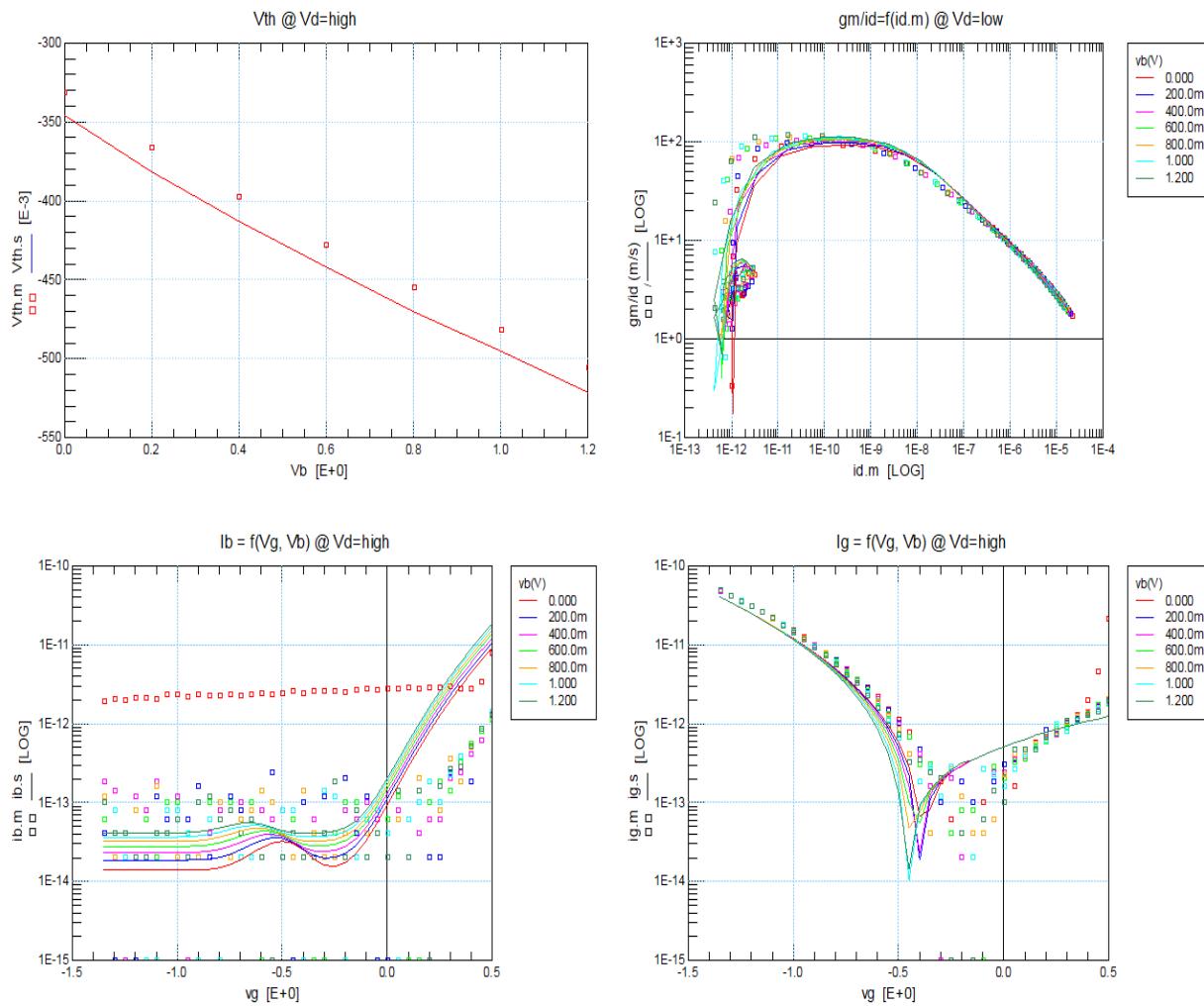


**4.22 W0u6\_L1u2\_S551\_5****idvg, Vd = -0.05V, T = 27°C**

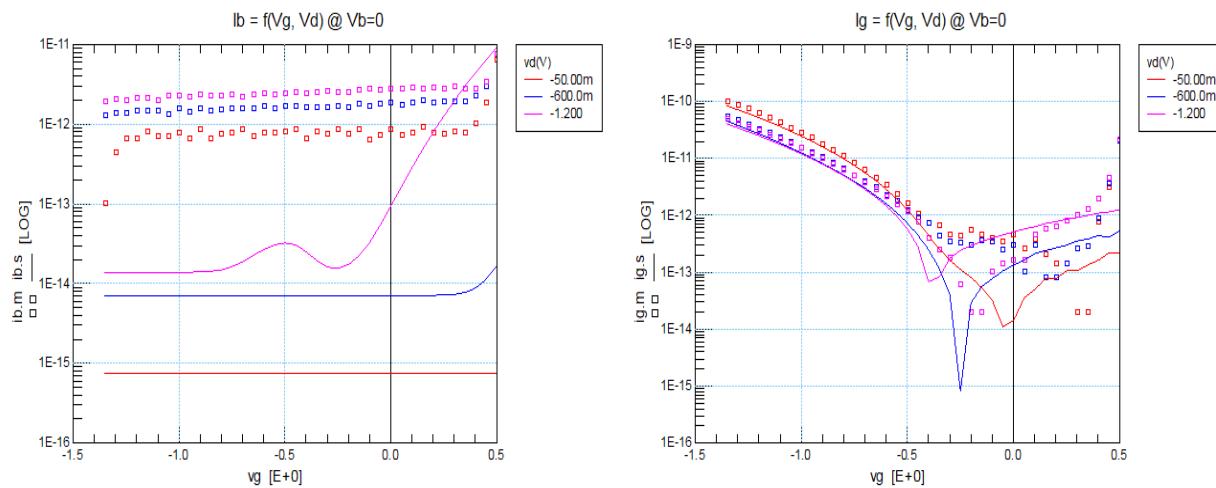


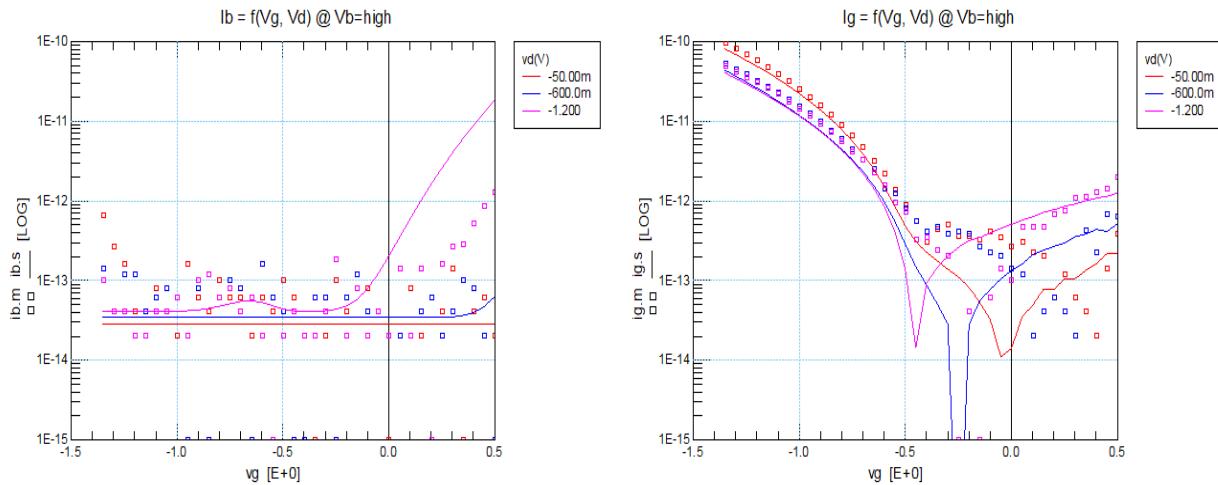
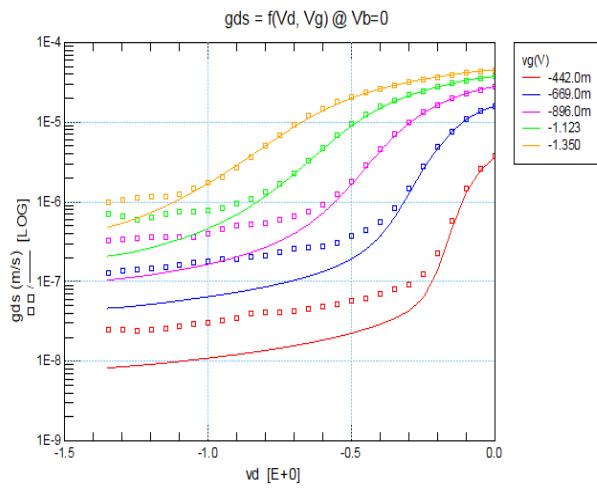
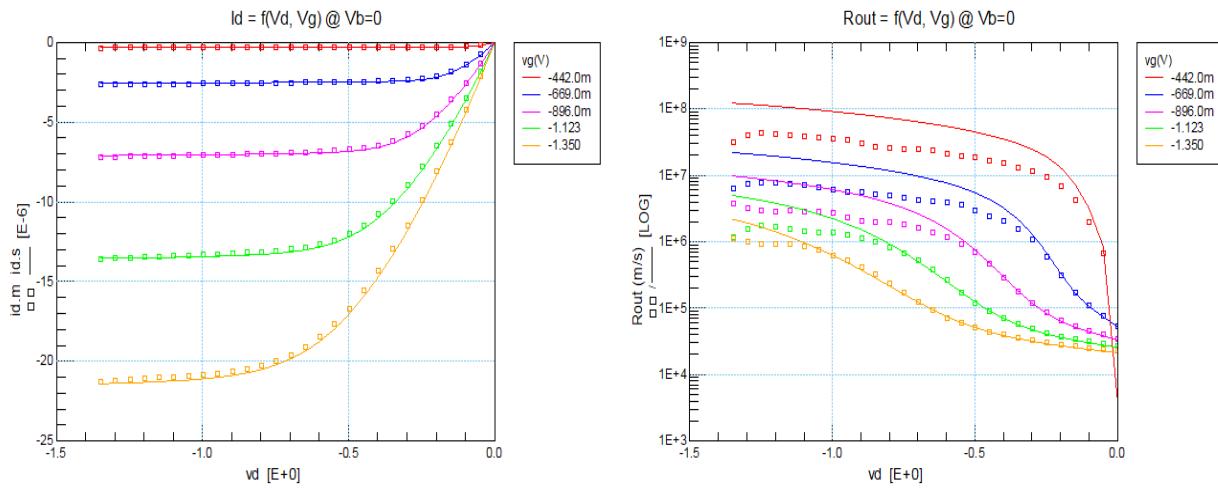
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

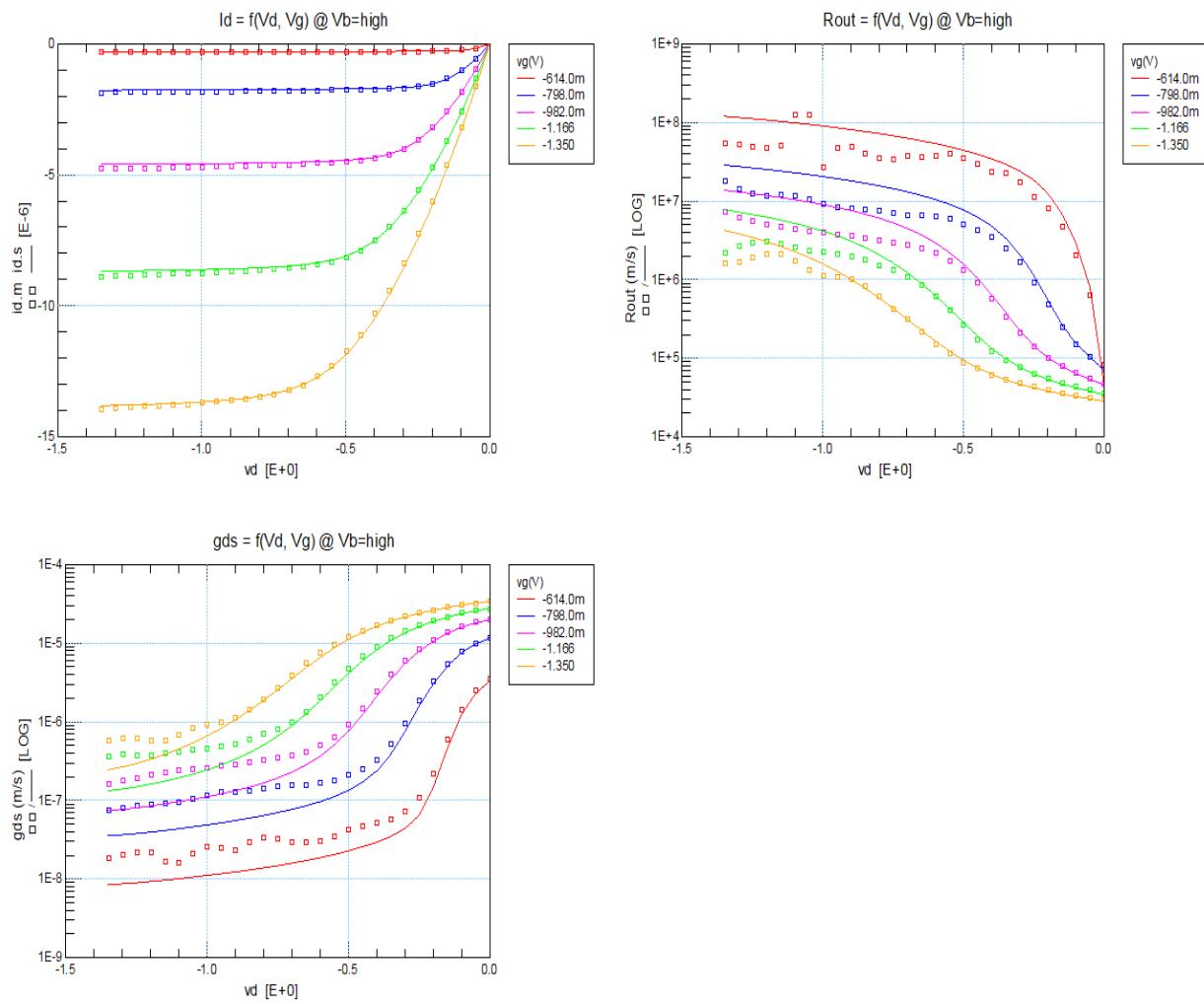
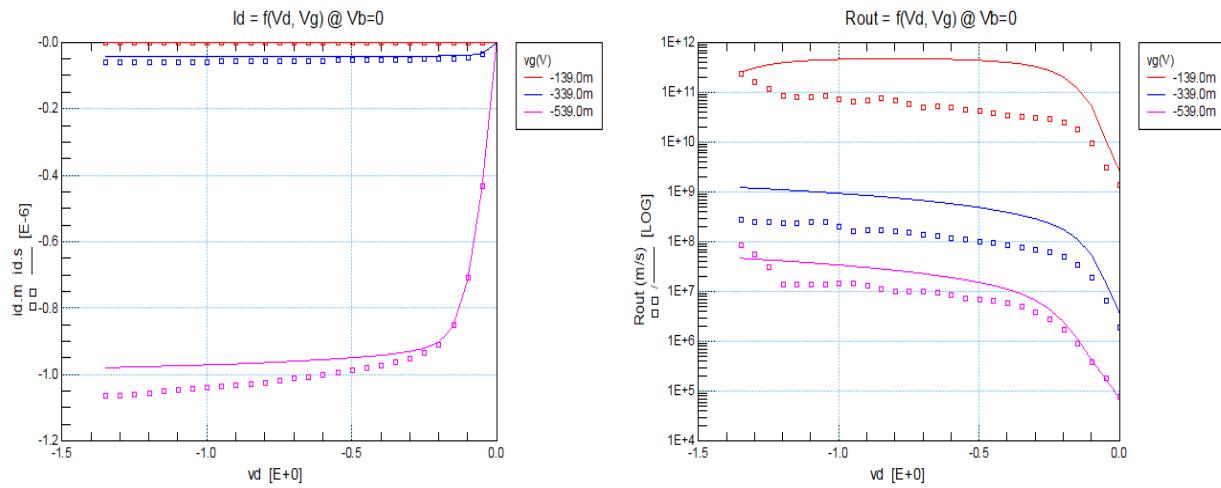


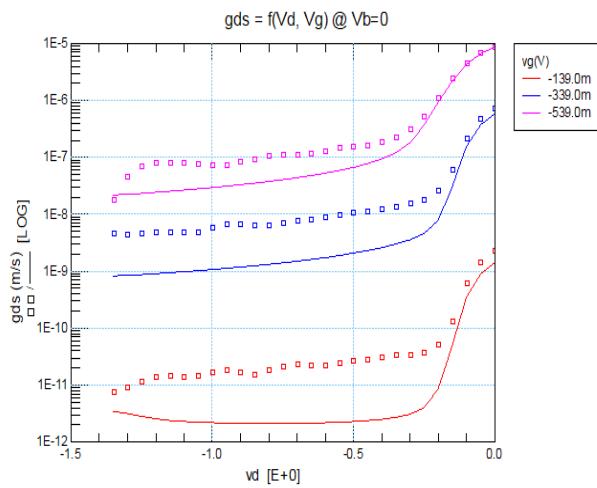


### idvg, Ib,Ig, Vb = 0V, T = 27°C

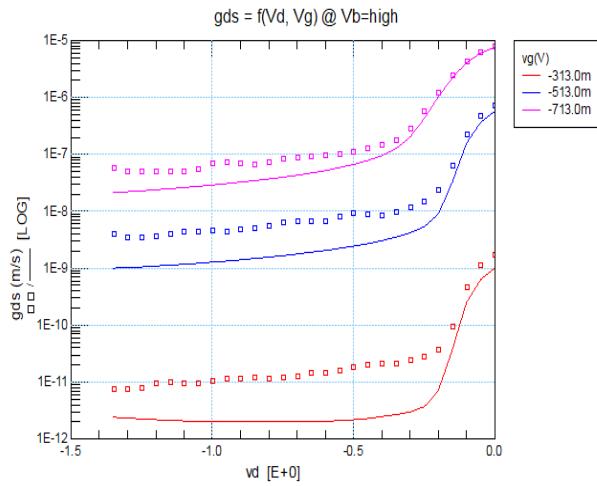
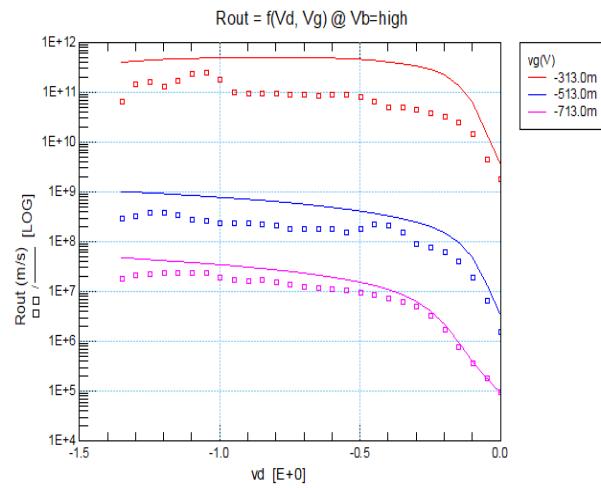
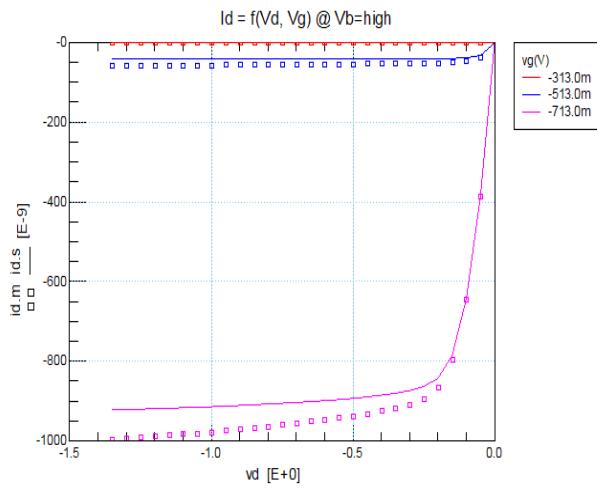


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**


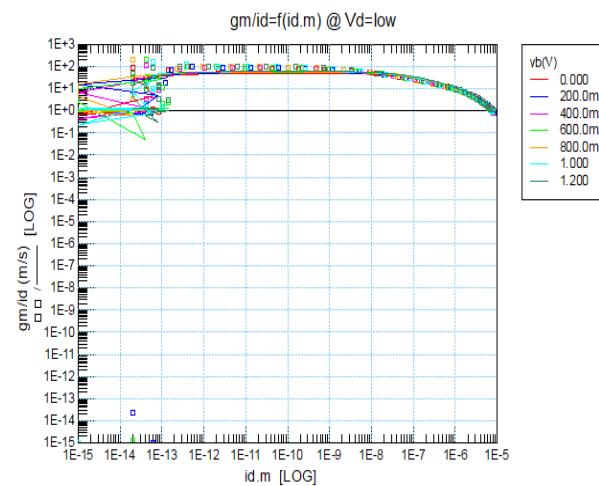
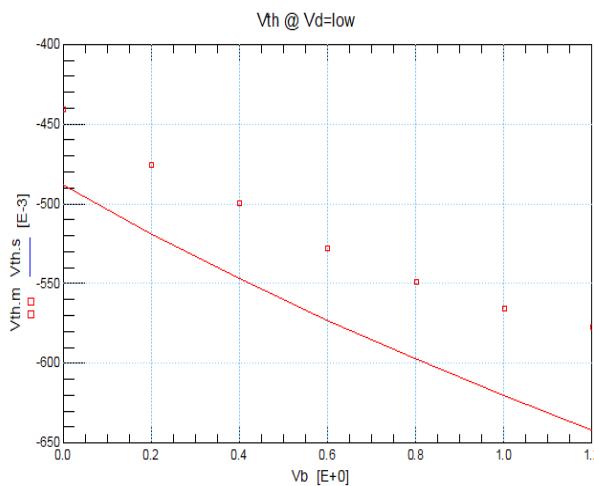
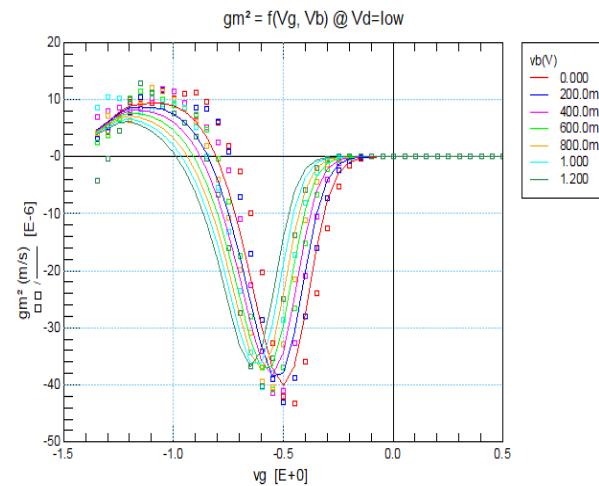
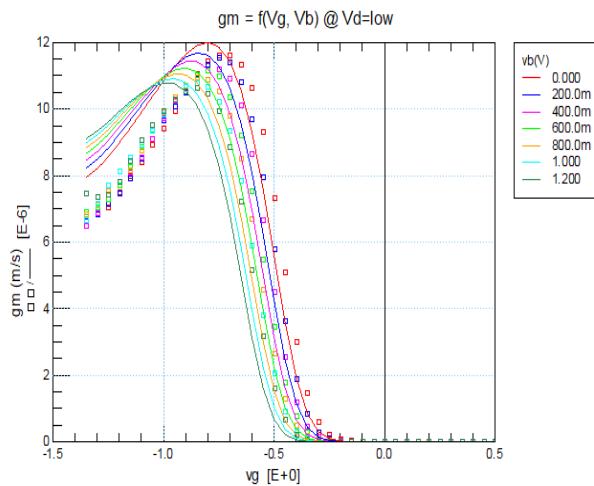
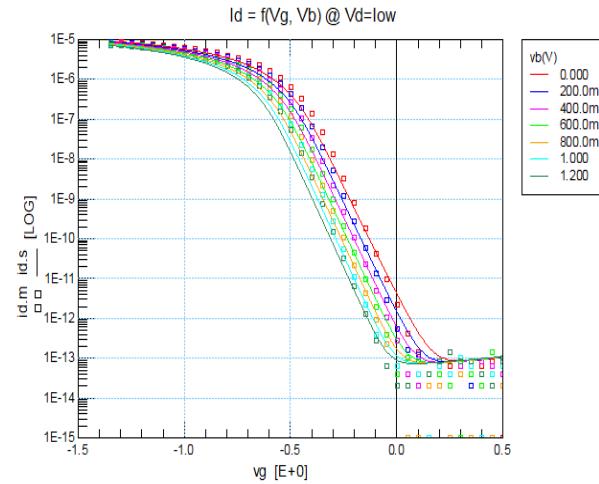
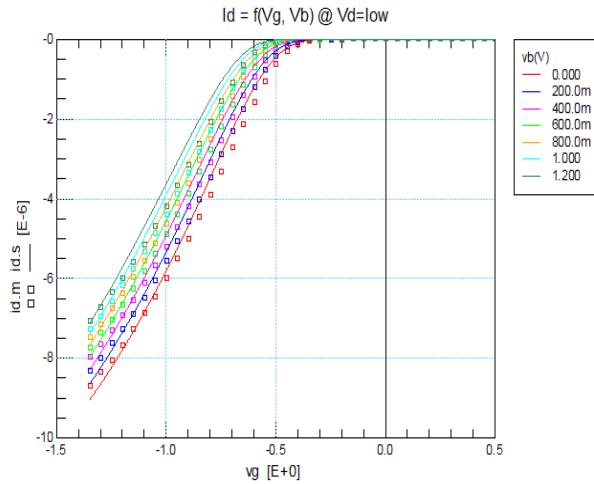


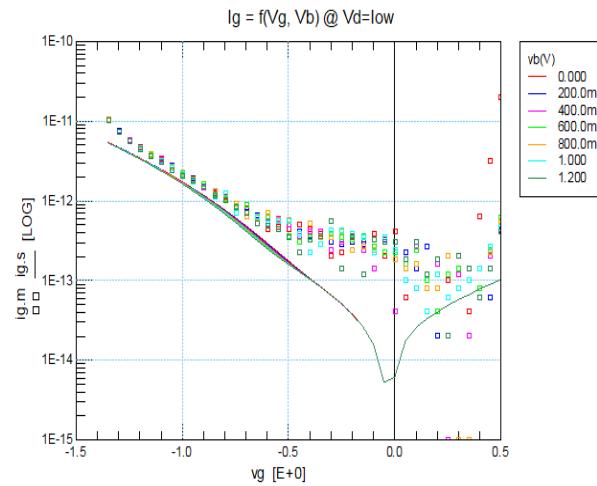
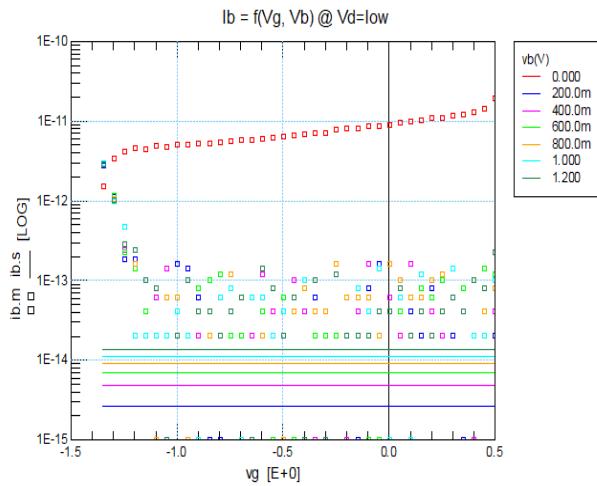
**idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C**



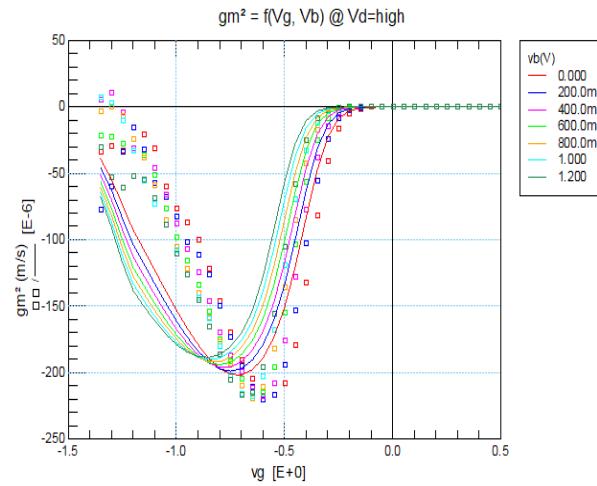
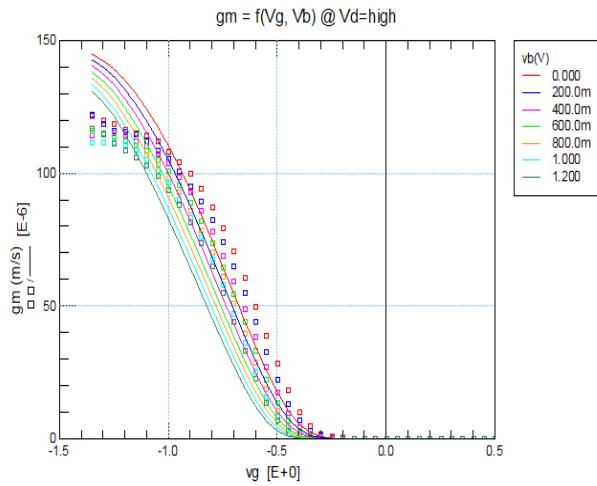
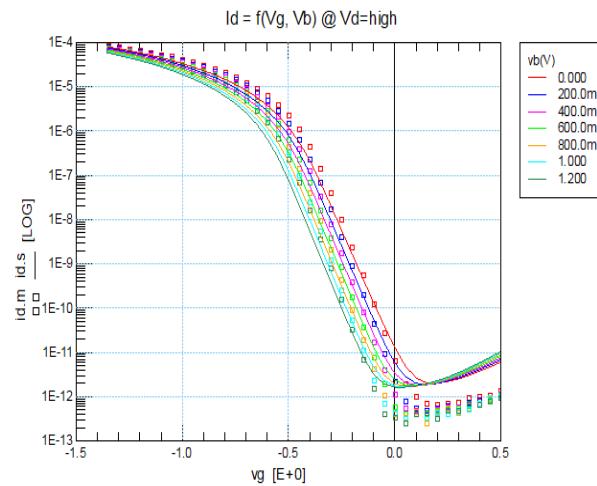
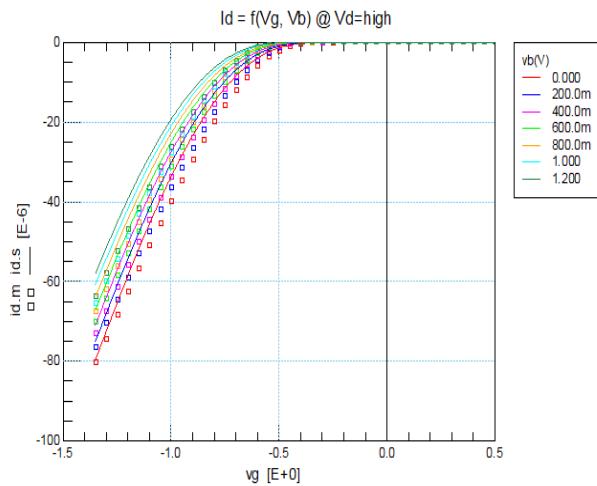
## 4.23 W0u3\_L0u14\_S552\_3

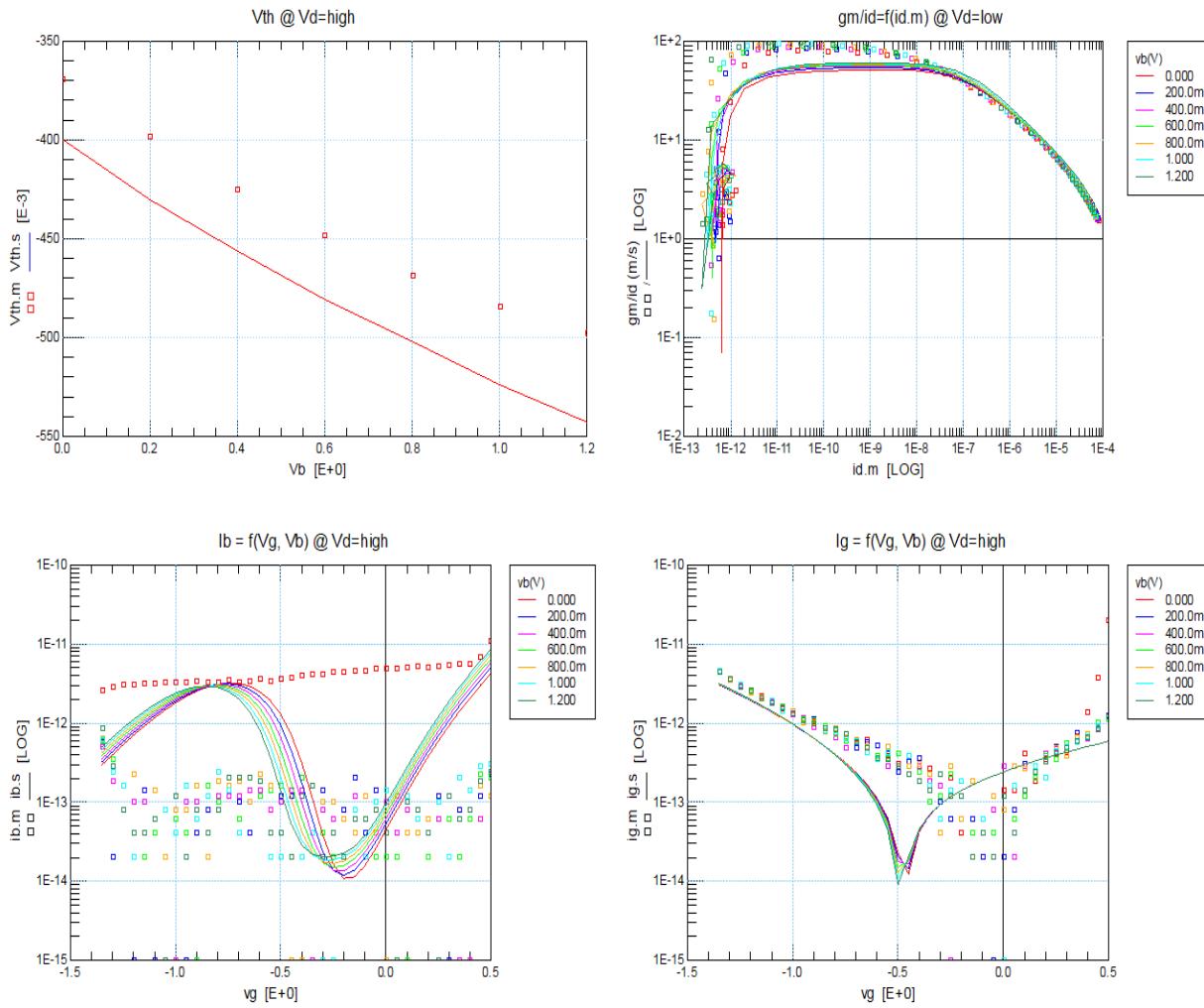
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



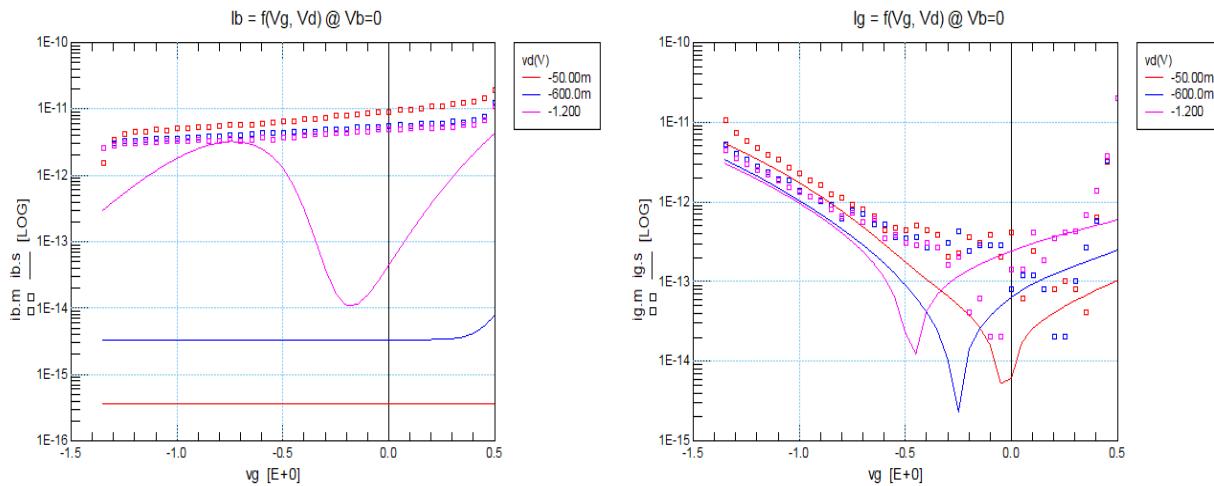


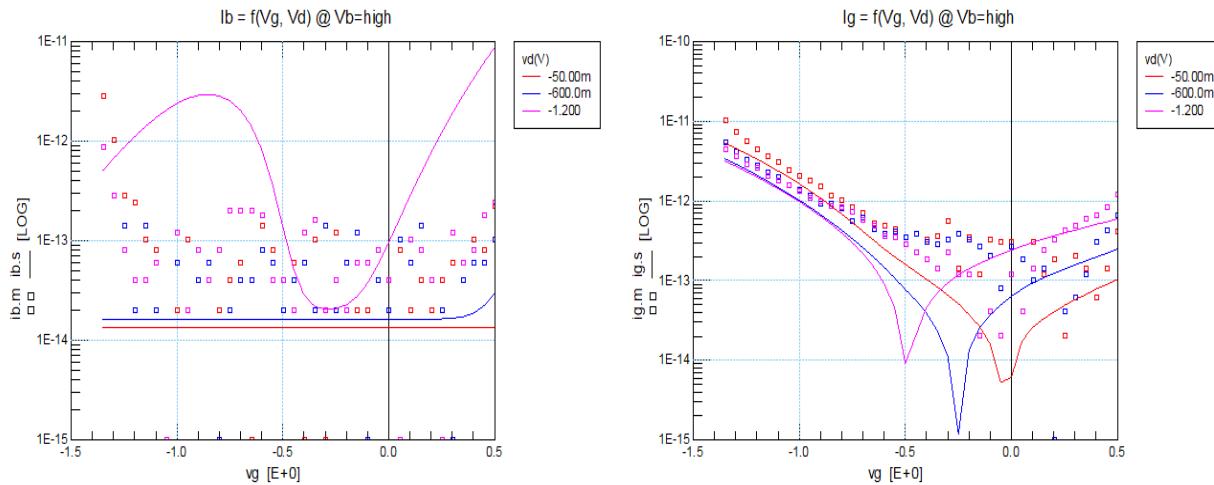
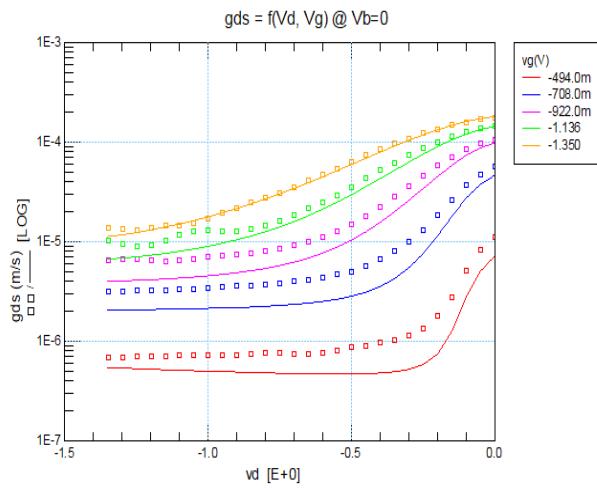
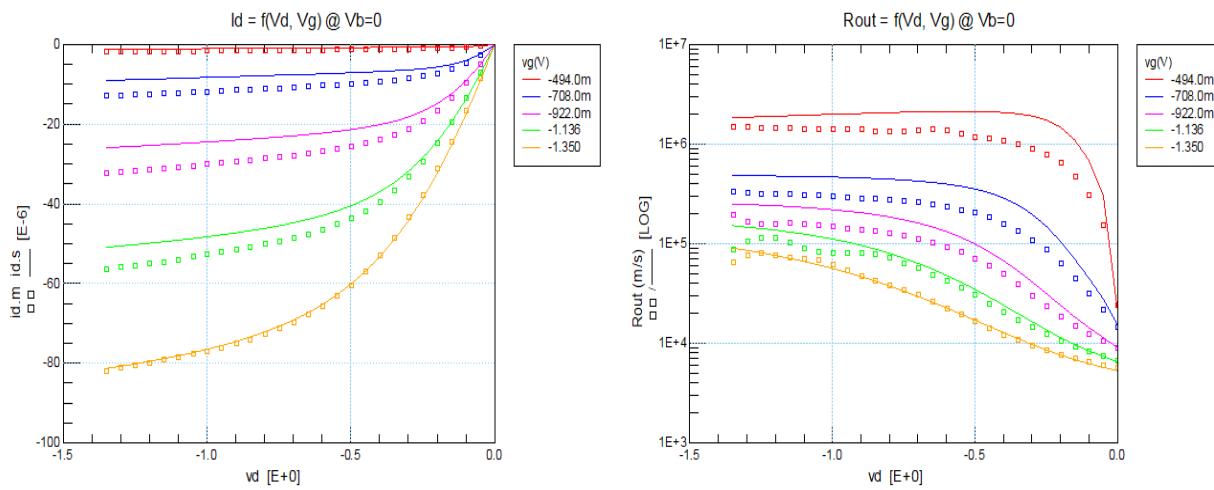
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

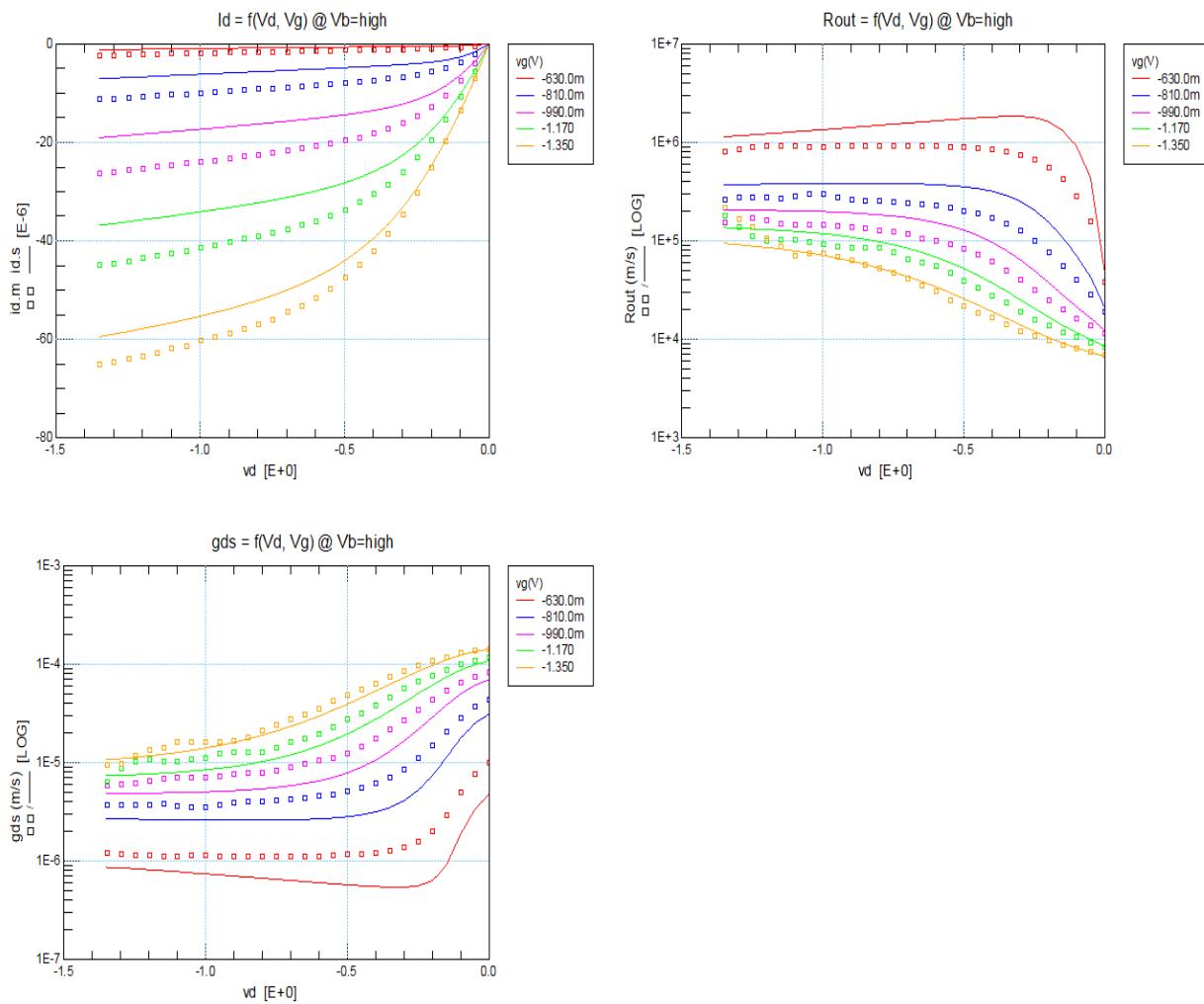
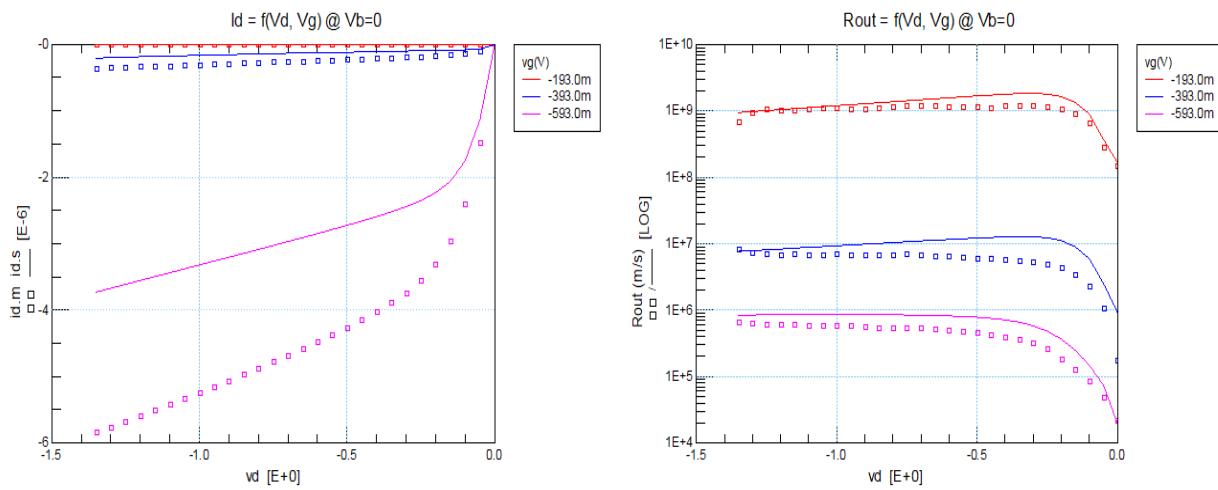


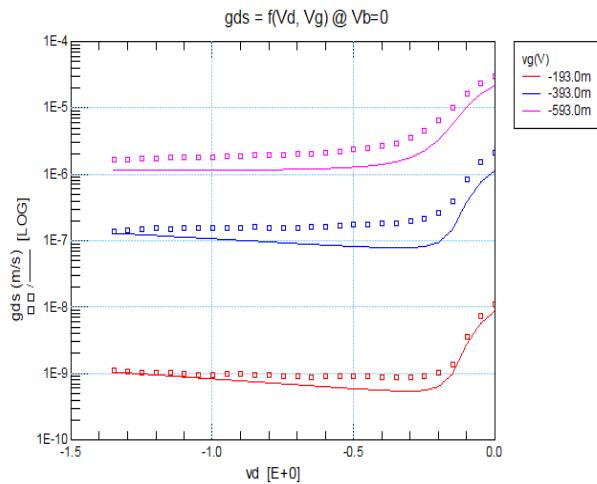


$id_{VG}$ ,  $I_b$ ,  $I_g$ ,  $V_b = 0V$ ,  $T = 27^\circ C$

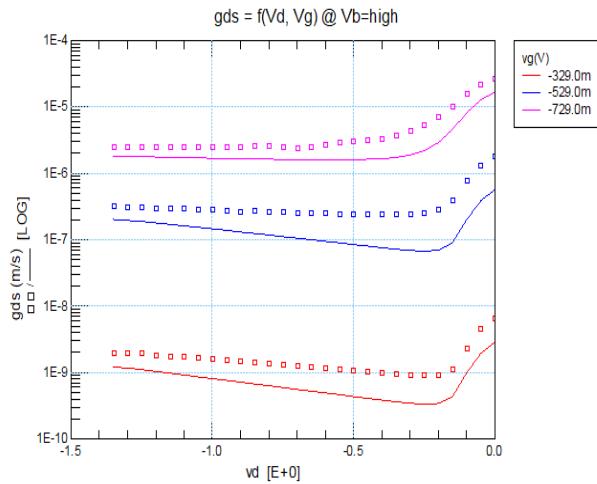
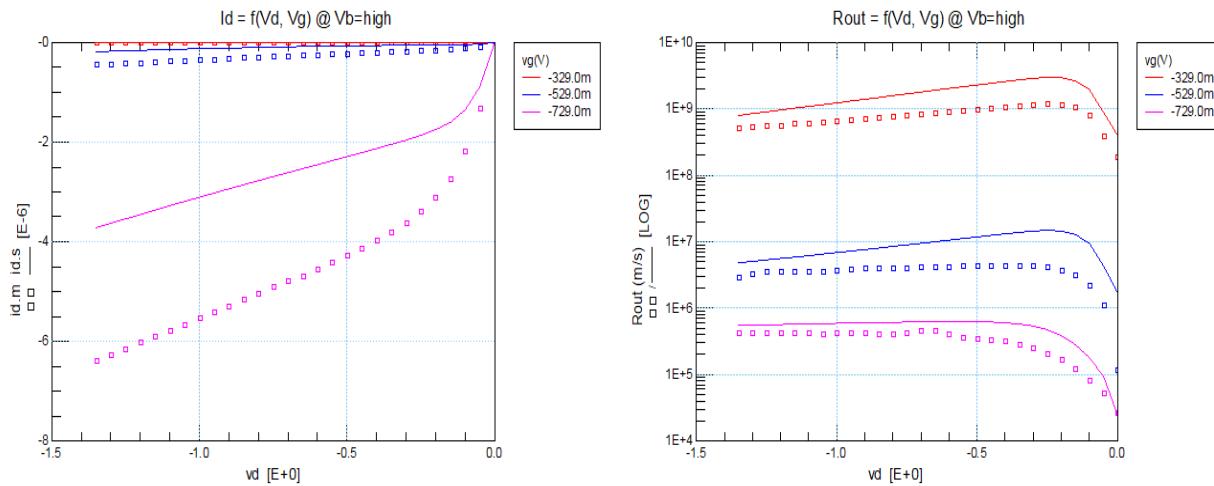


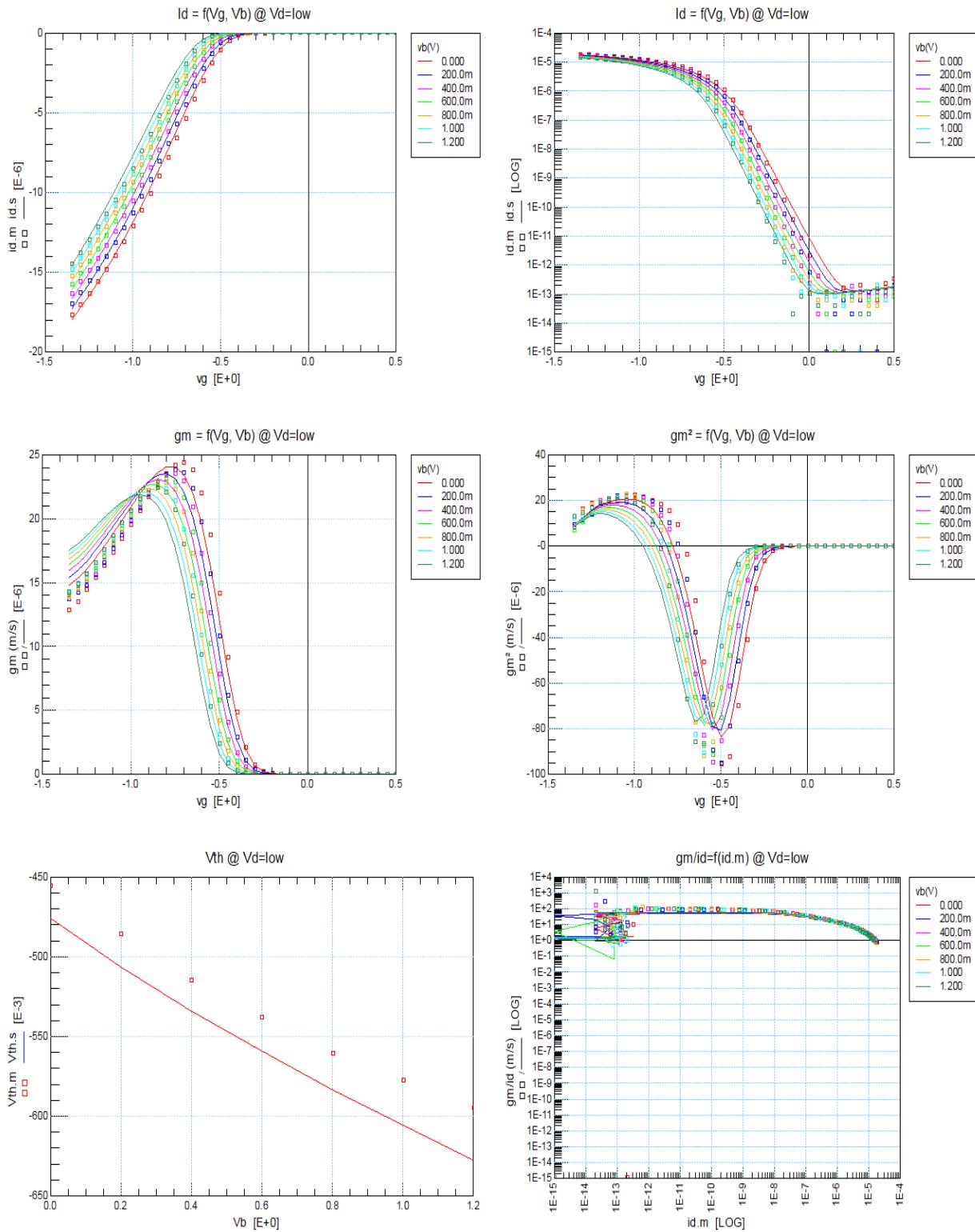
**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


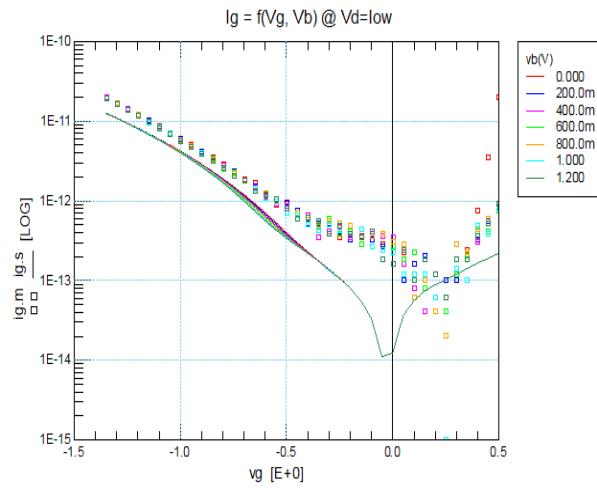
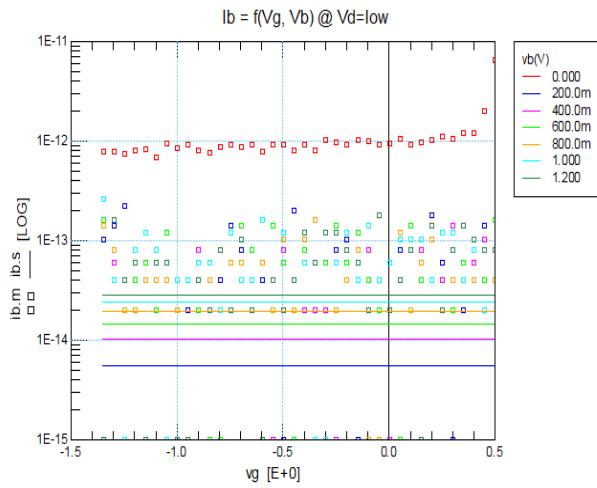
**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**



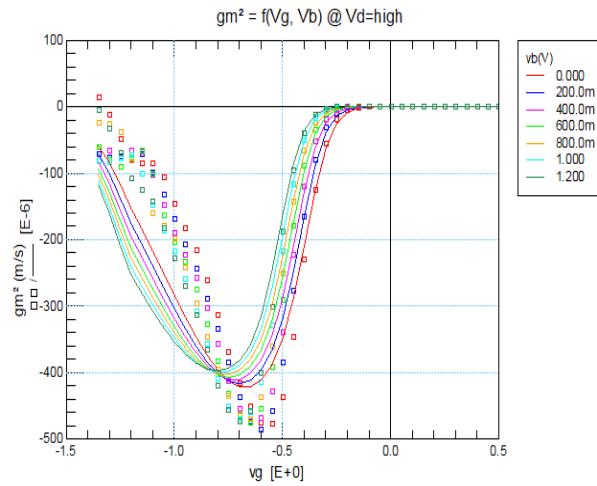
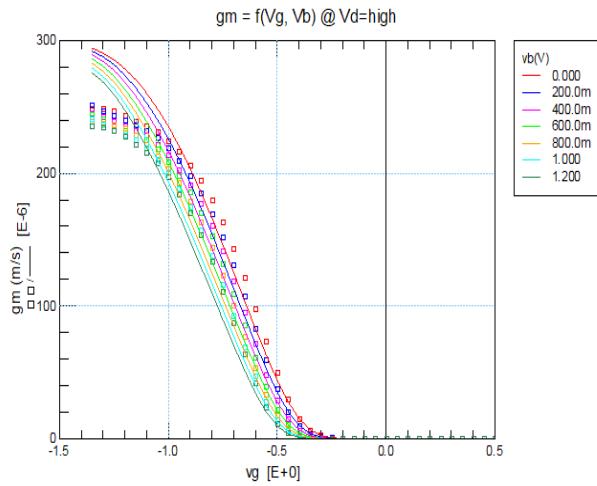
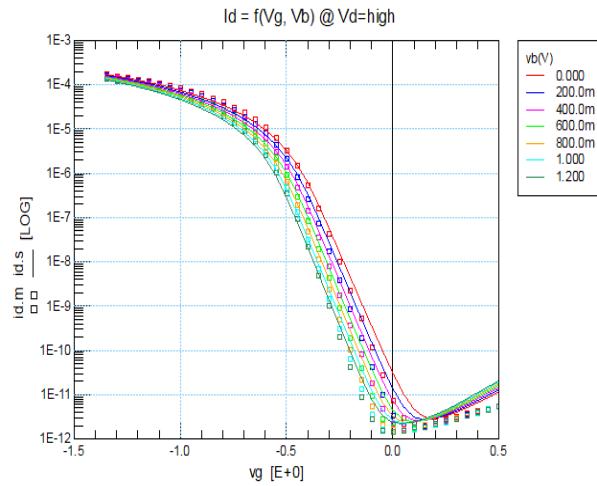
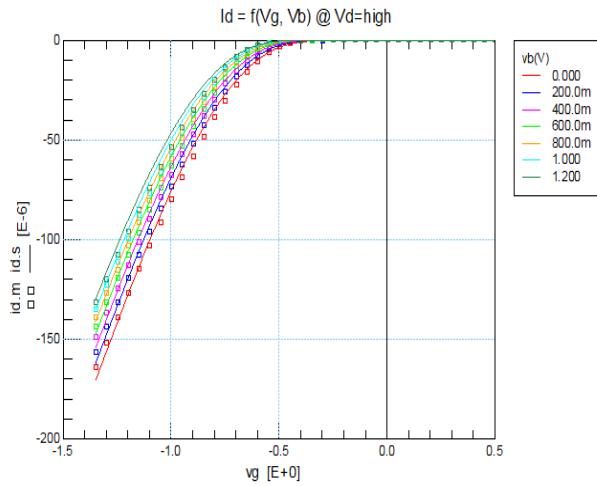
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

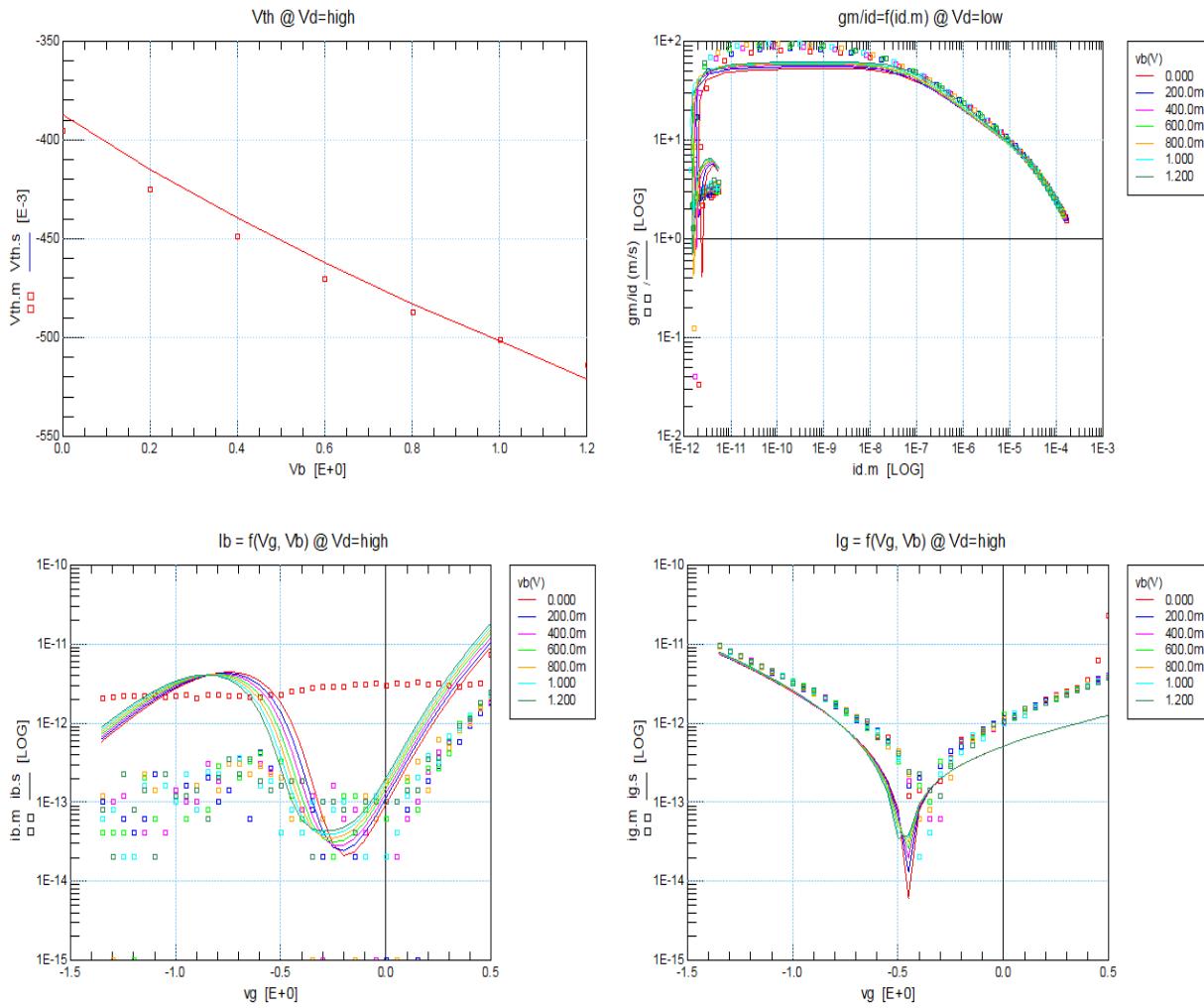


**4.24 W0u6\_L0u13\_S551\_2****idvg, Vd = -0.05V, T = 27°C**

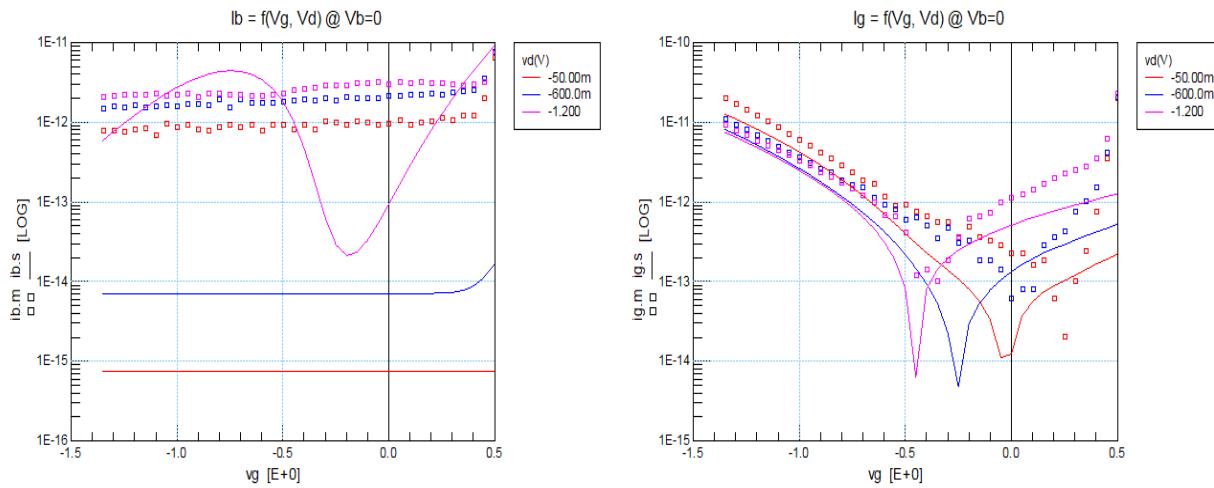


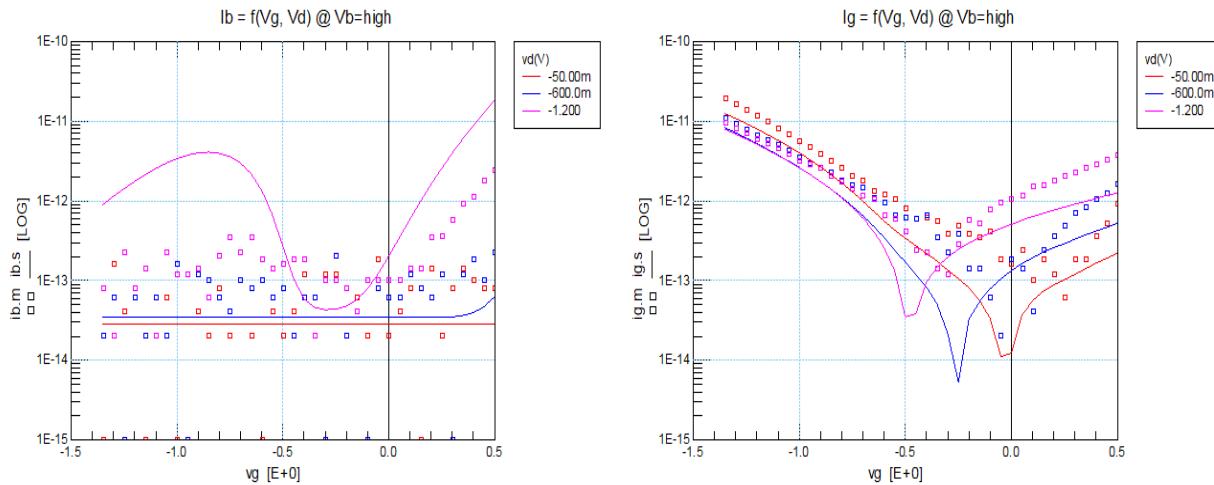
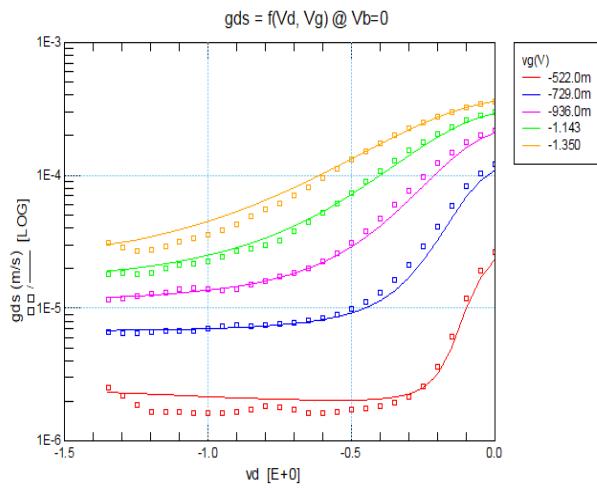
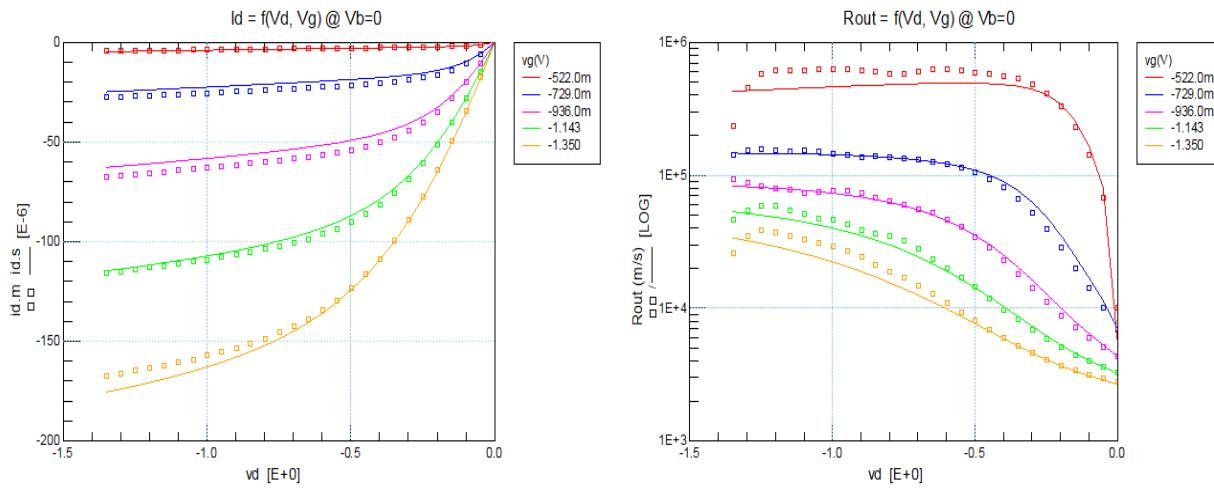
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

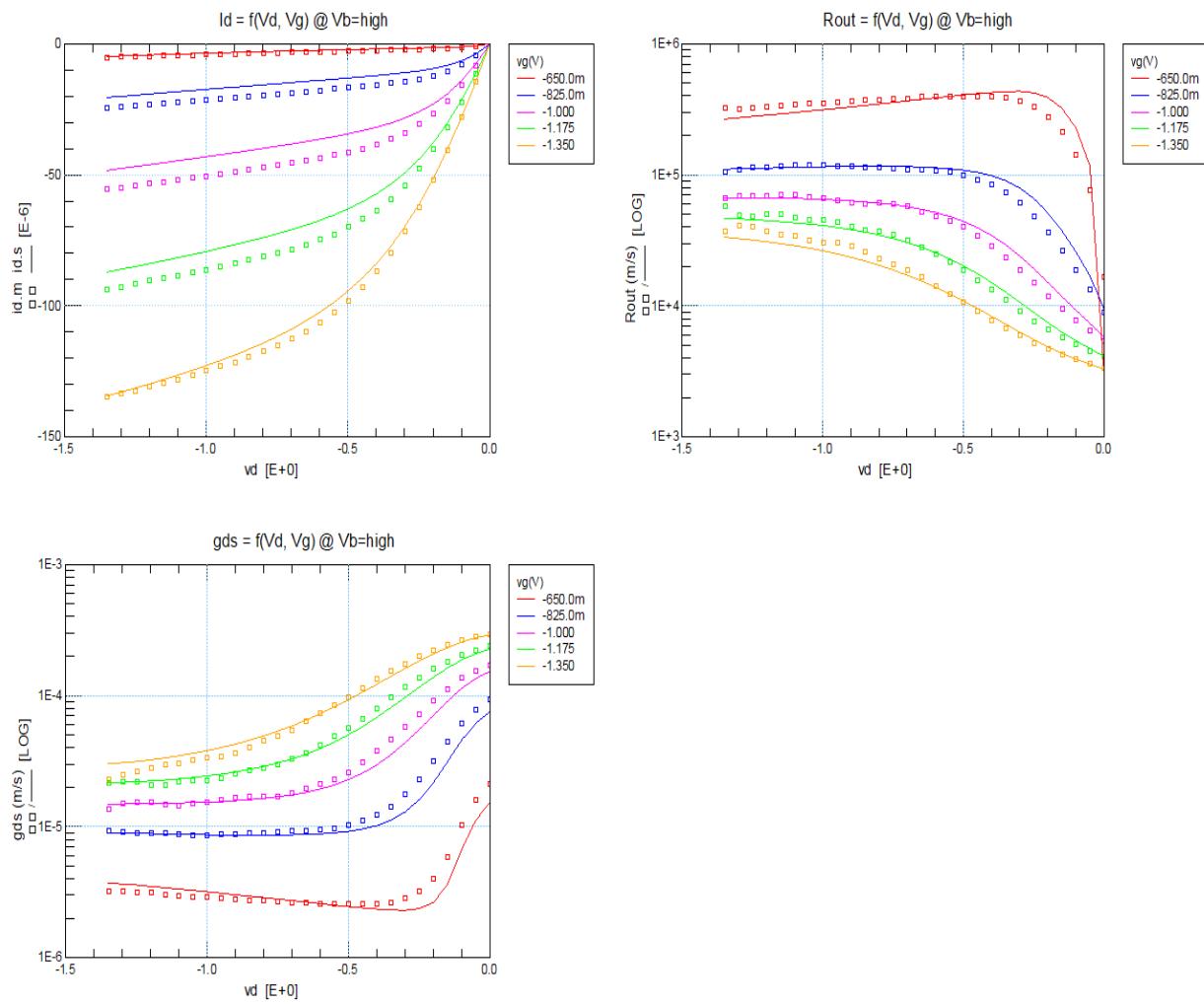
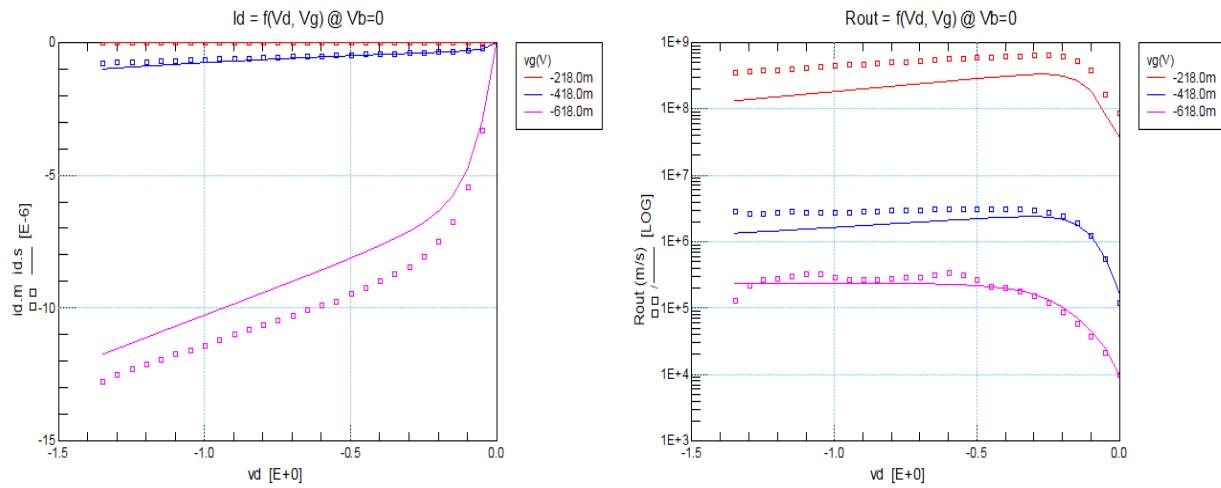


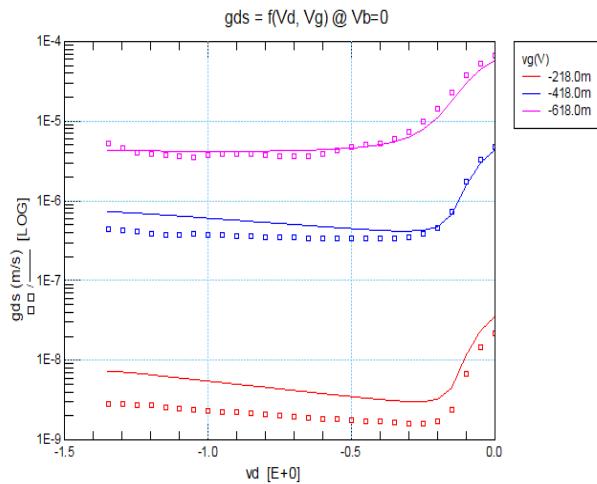


### $i_{dvg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

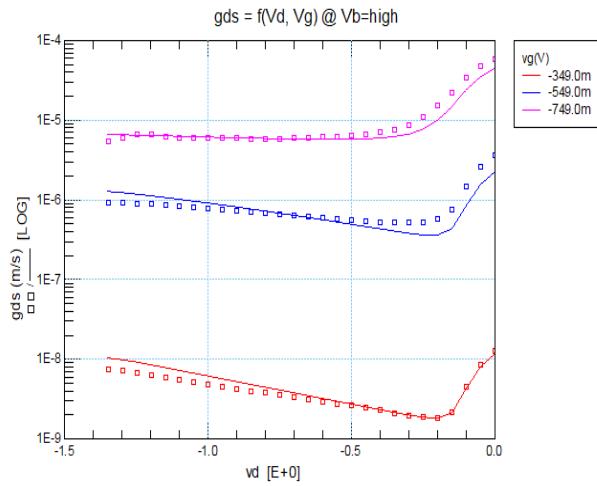
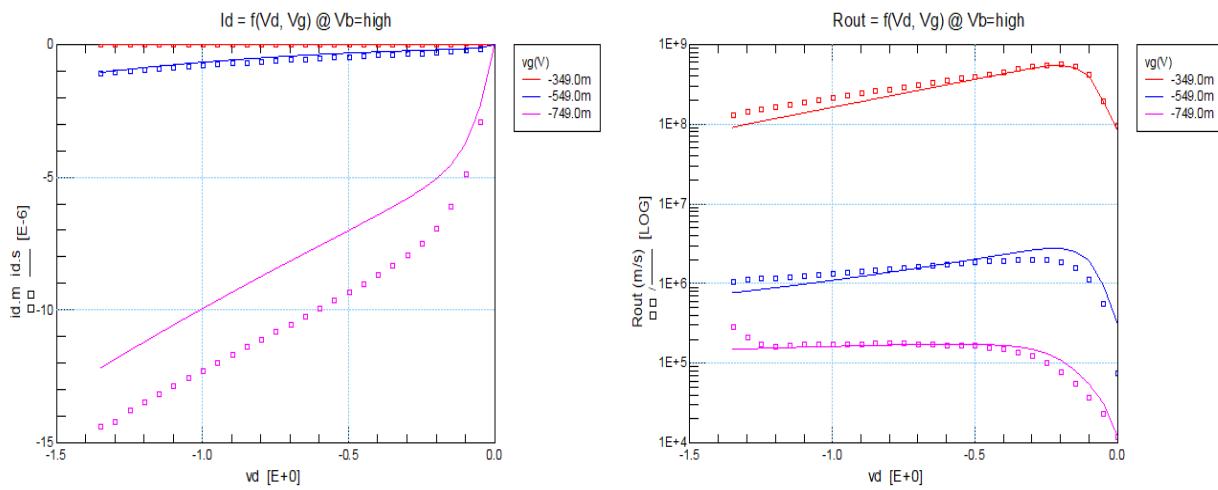


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

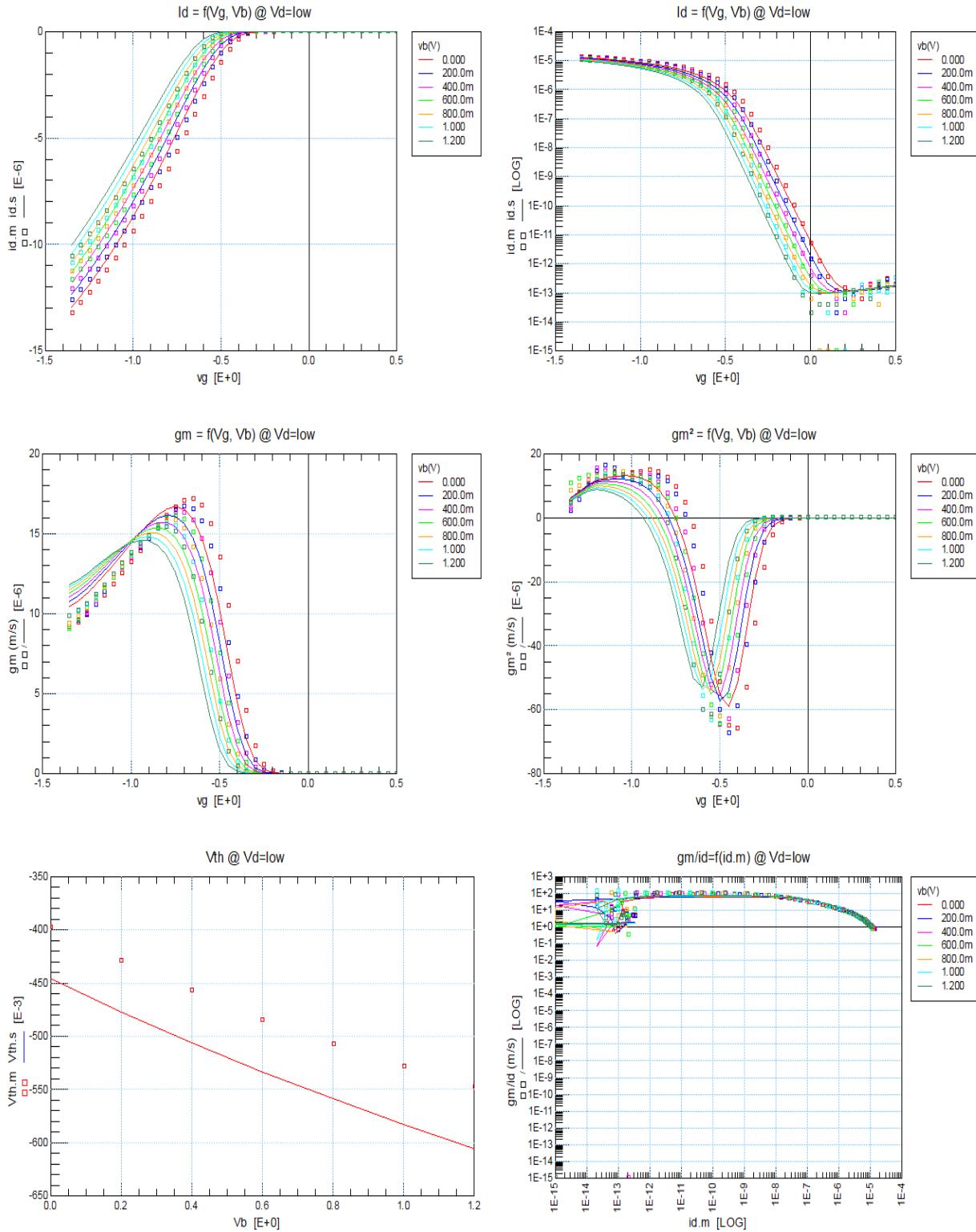


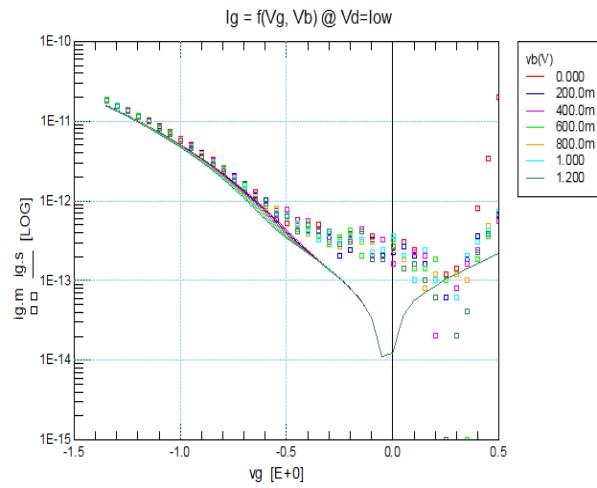
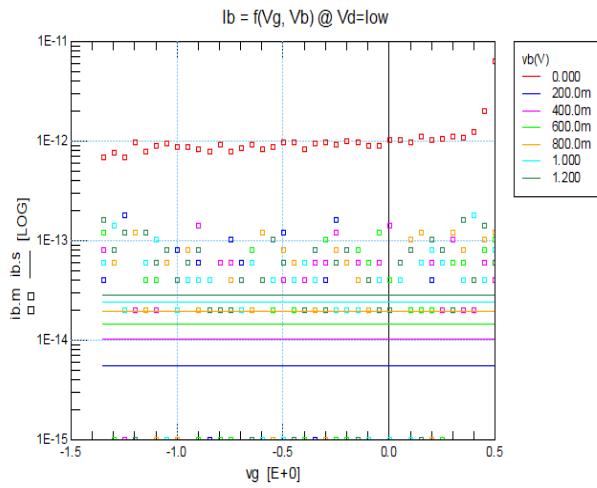
idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



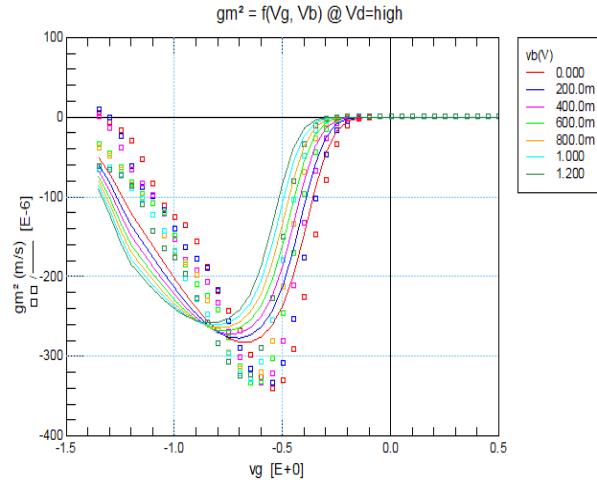
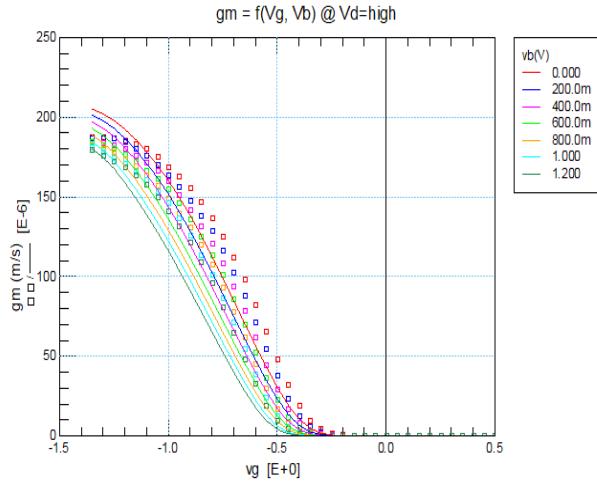
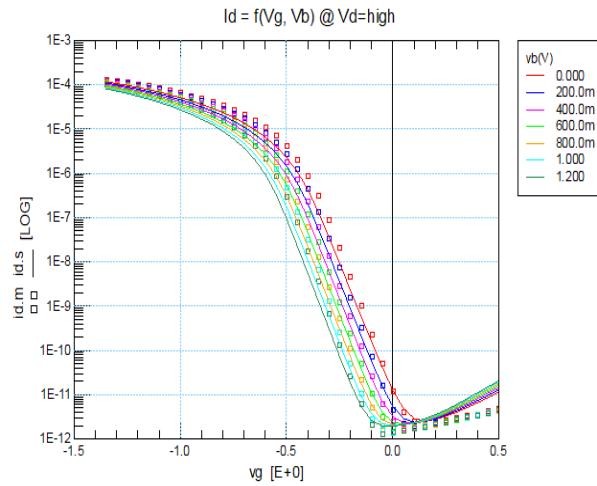
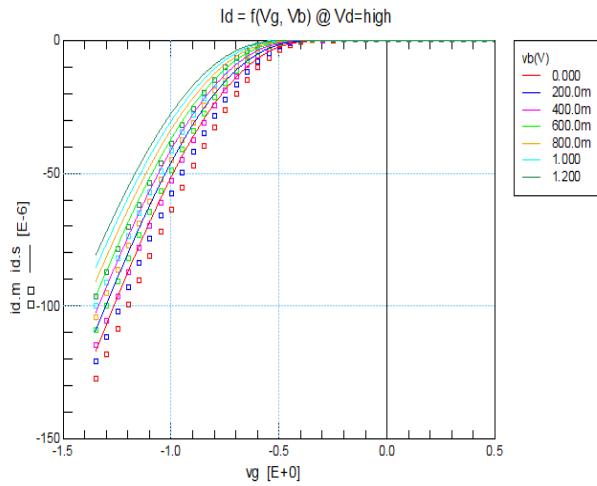
## 4.25 W0u6\_L0u18\_S551\_3

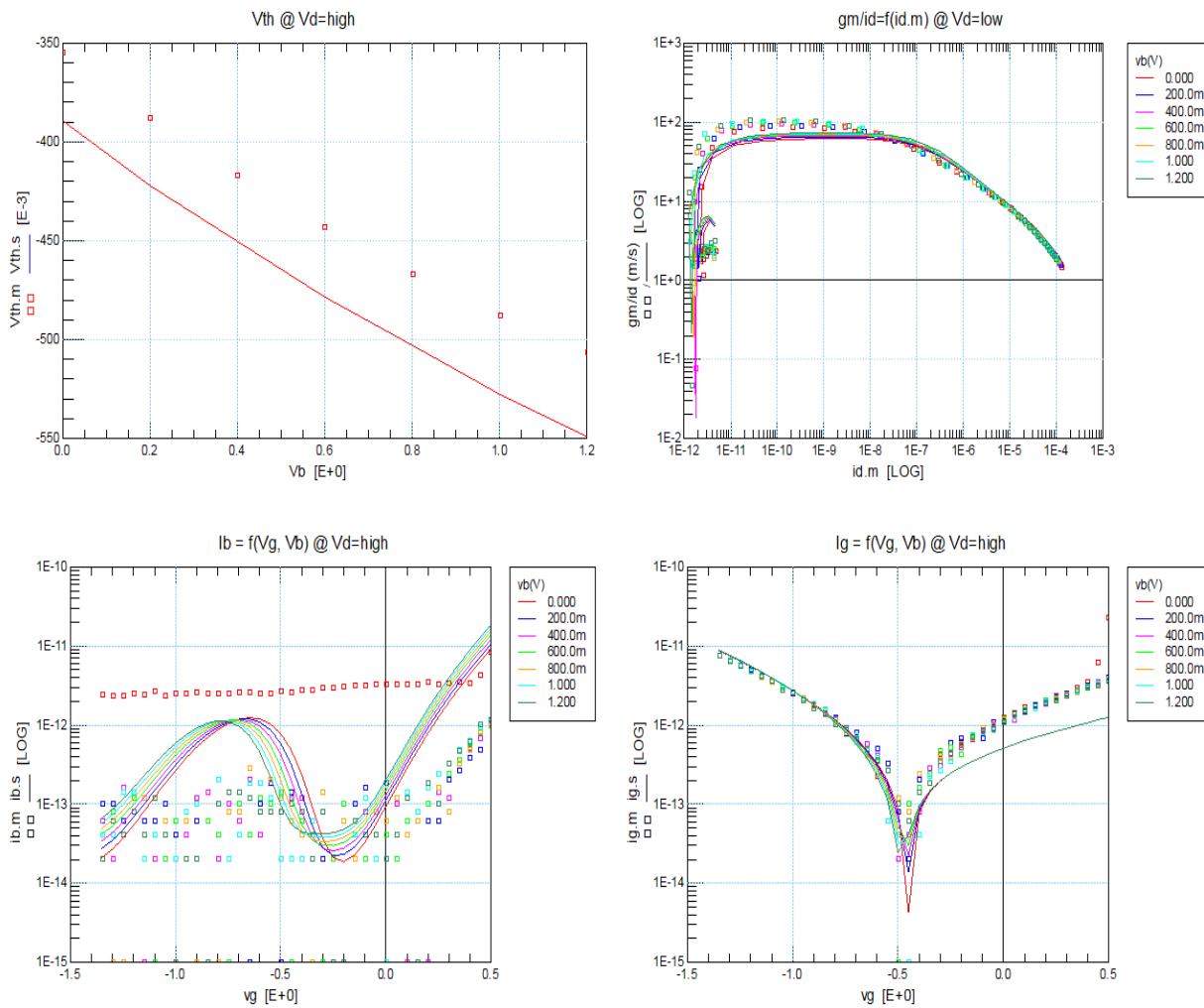
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



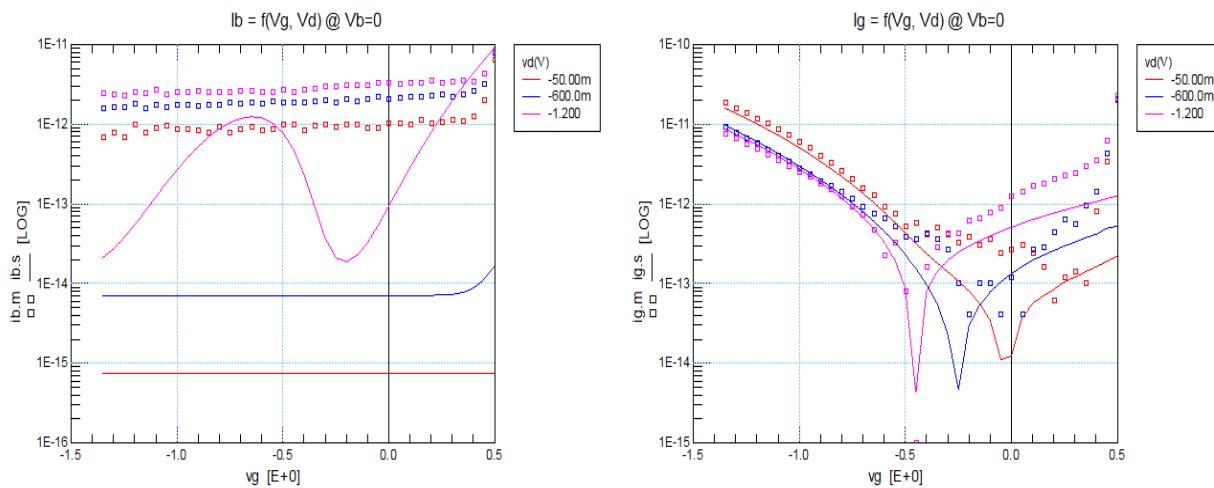


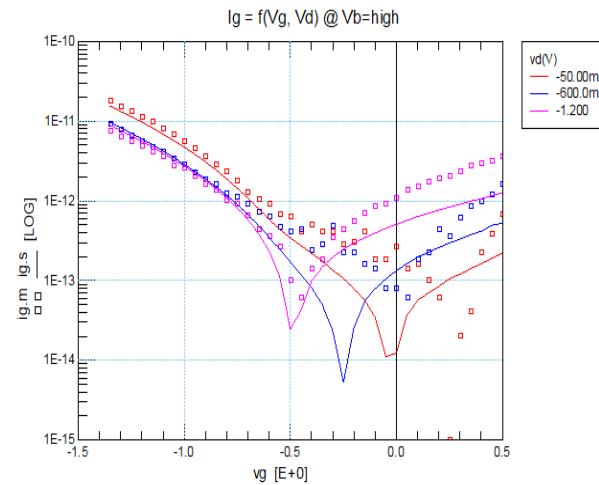
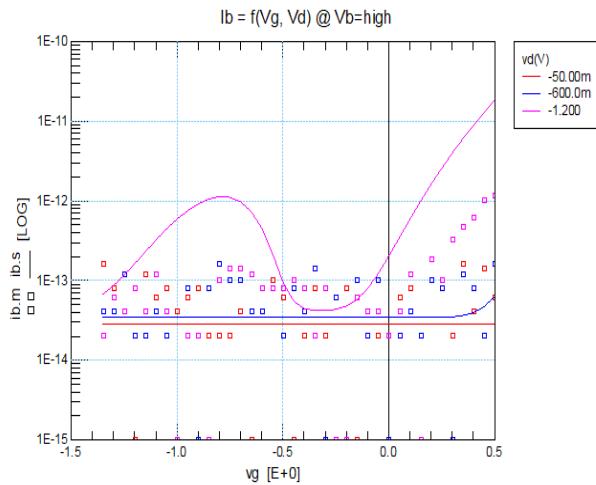
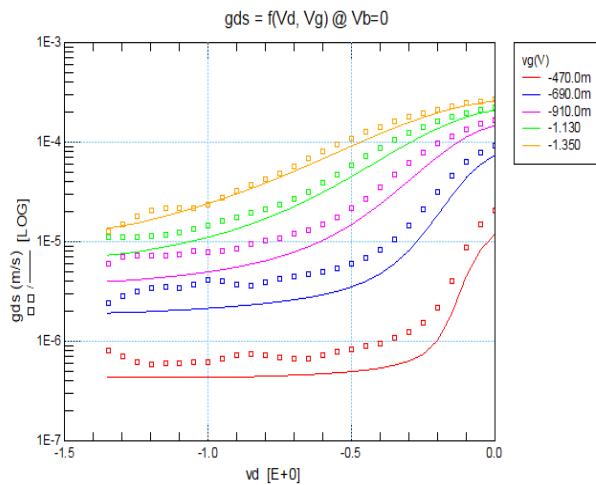
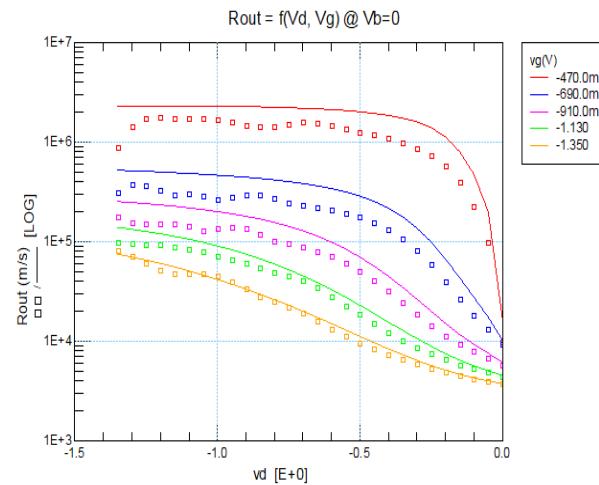
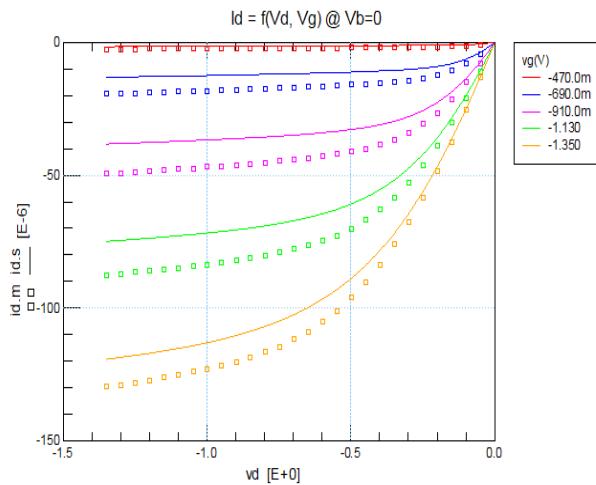
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

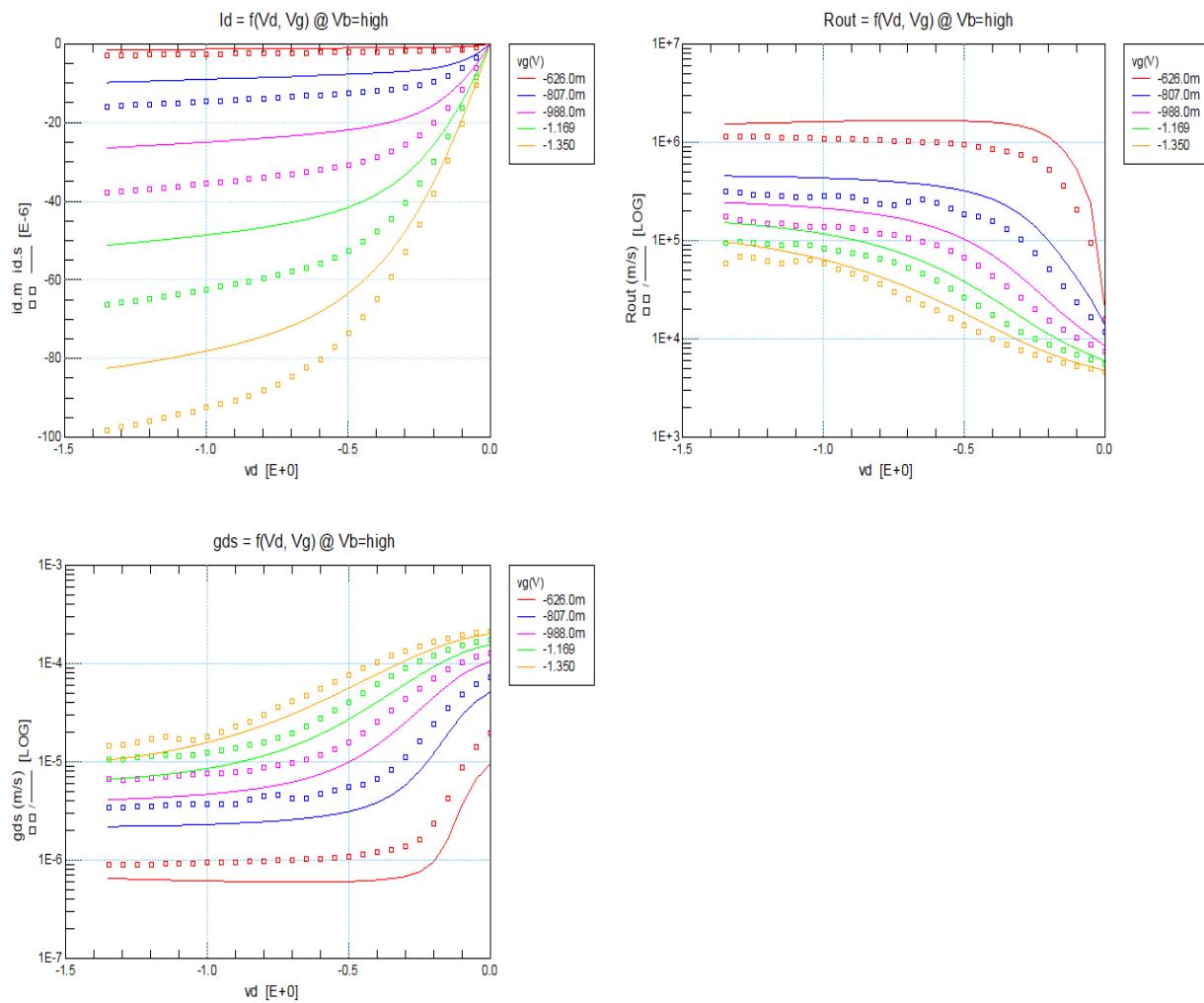
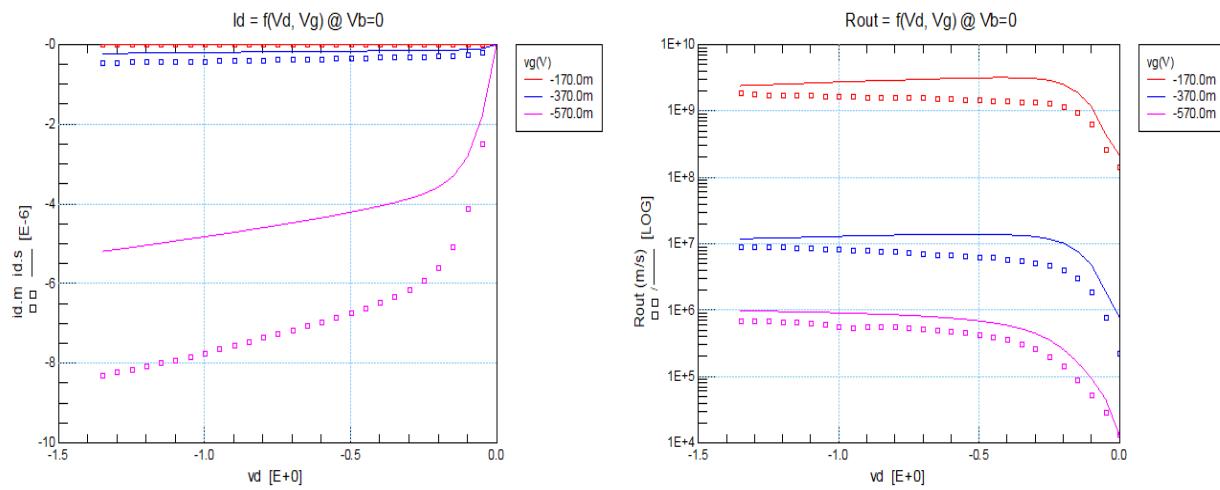


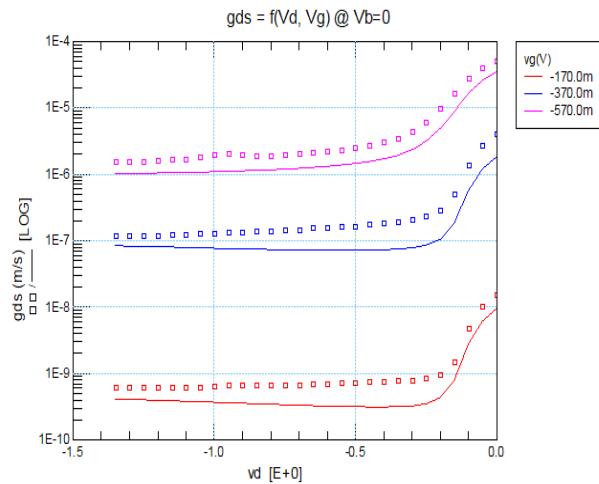


### $i_{dVg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

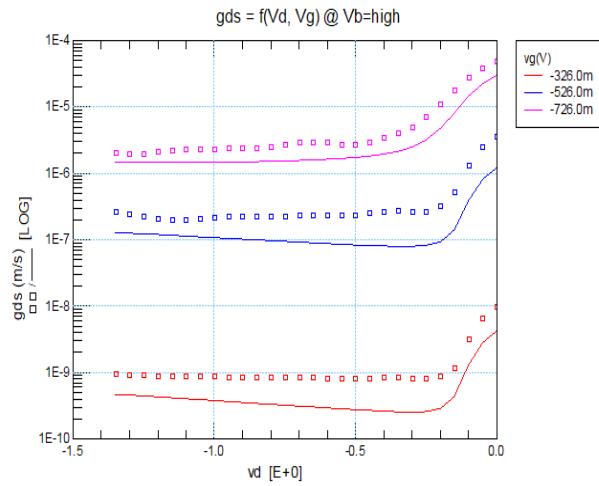
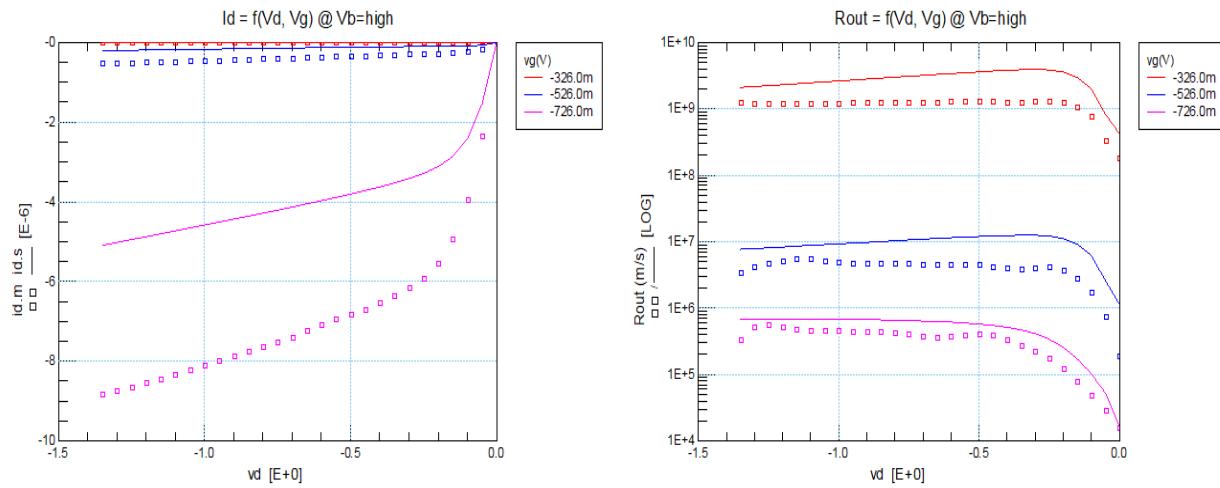


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**


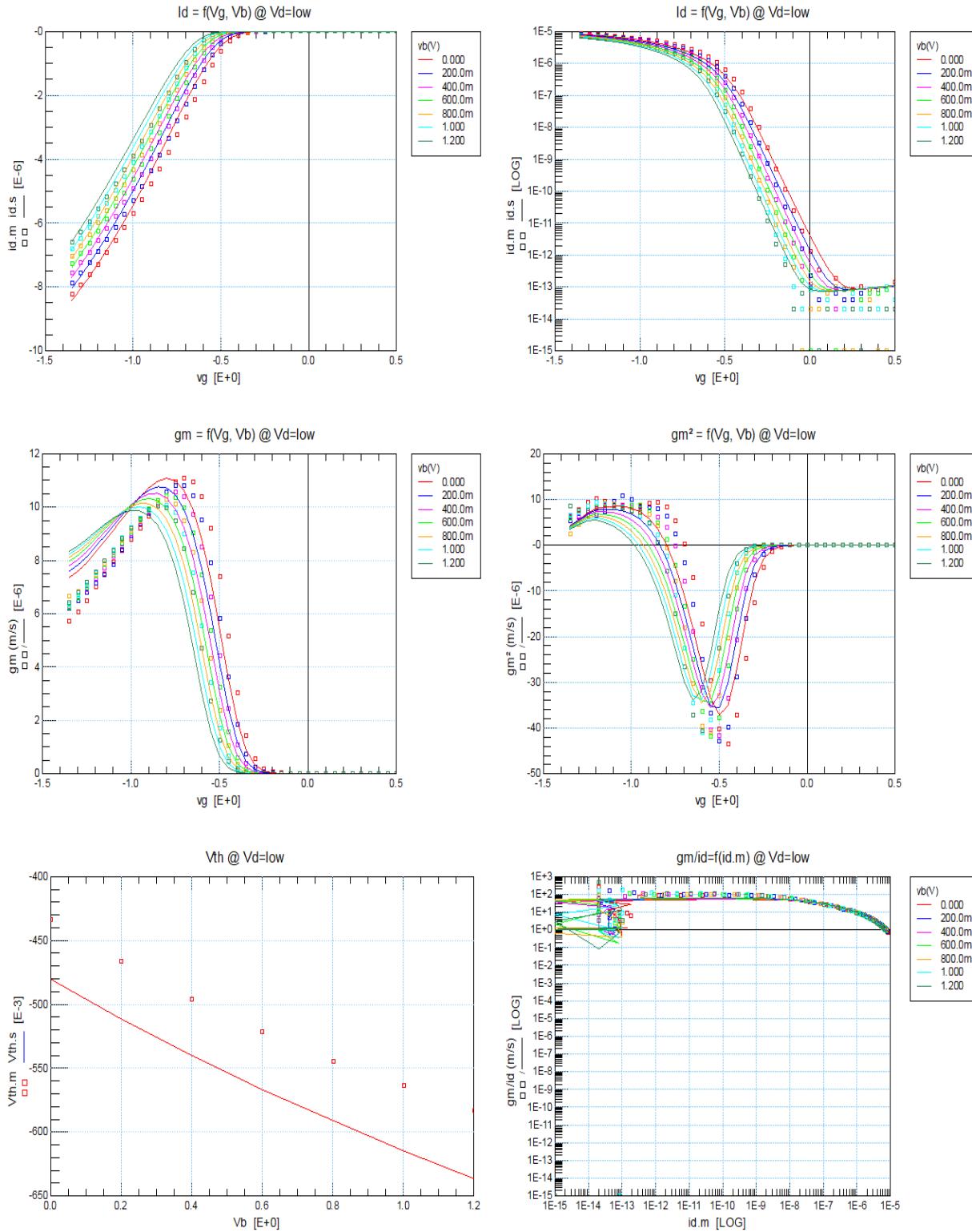


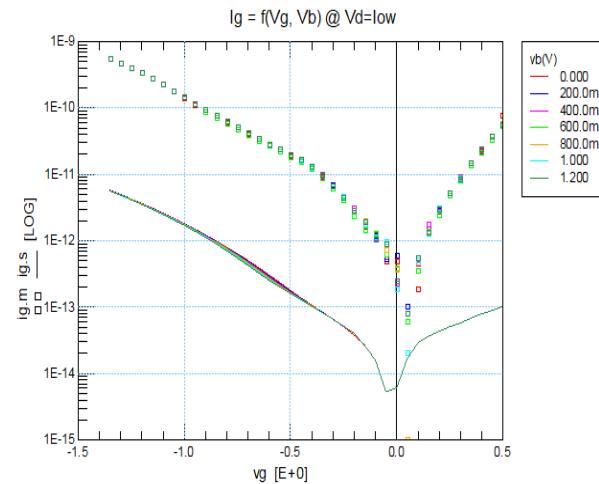
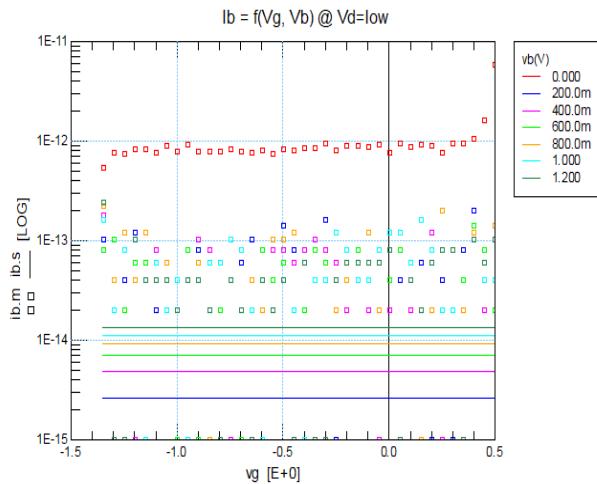
**idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C**



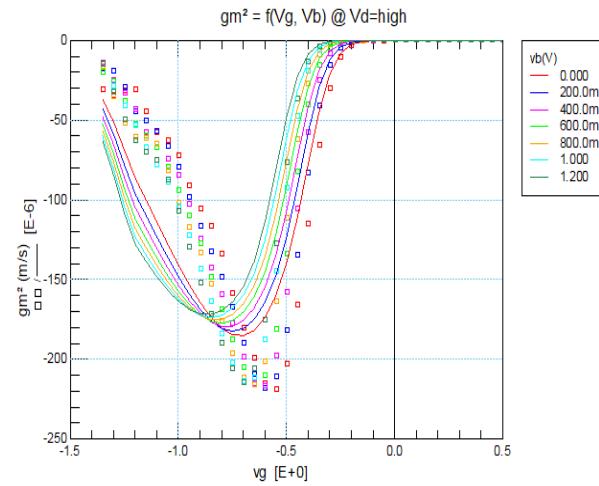
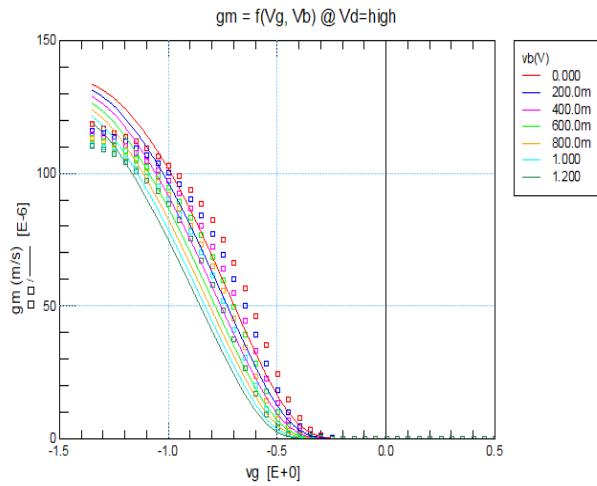
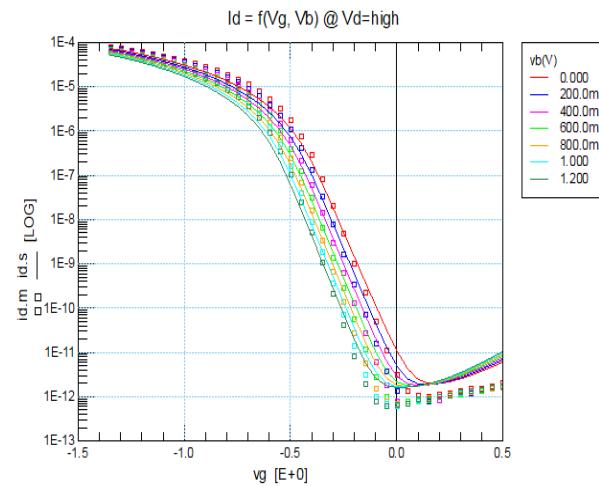
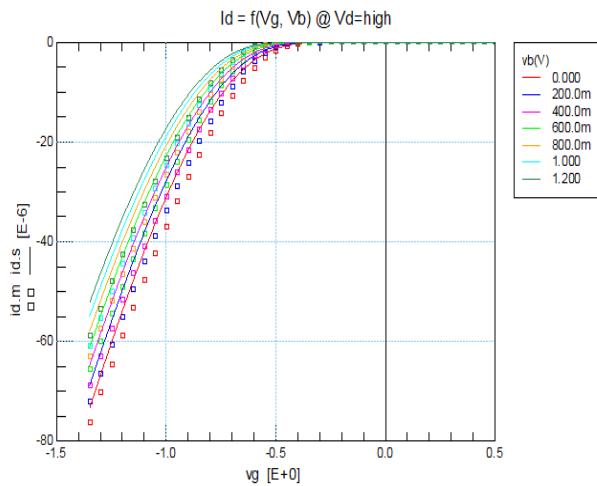
## 4.26 W0u3\_L0u15\_S552\_4

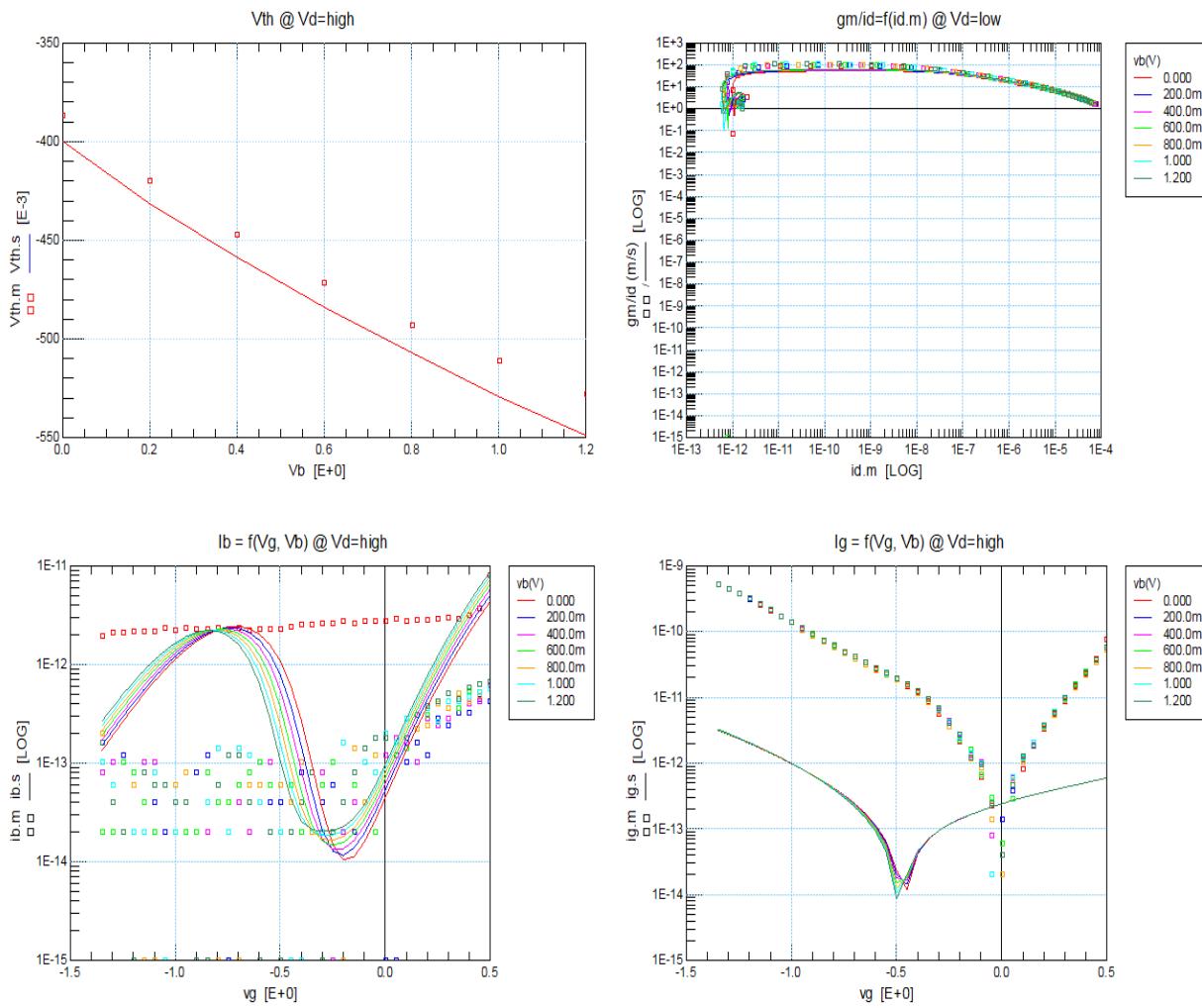
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



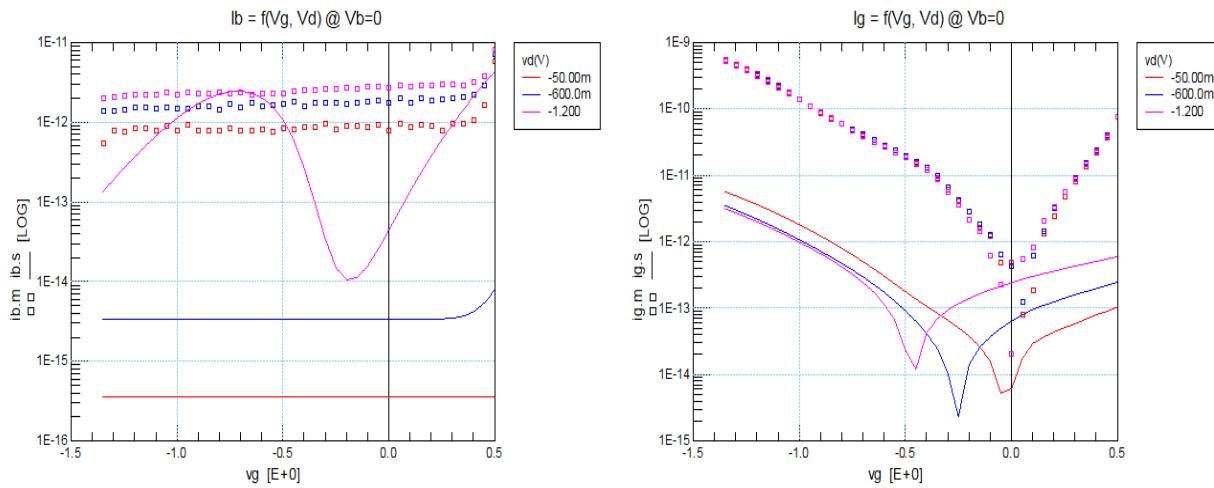


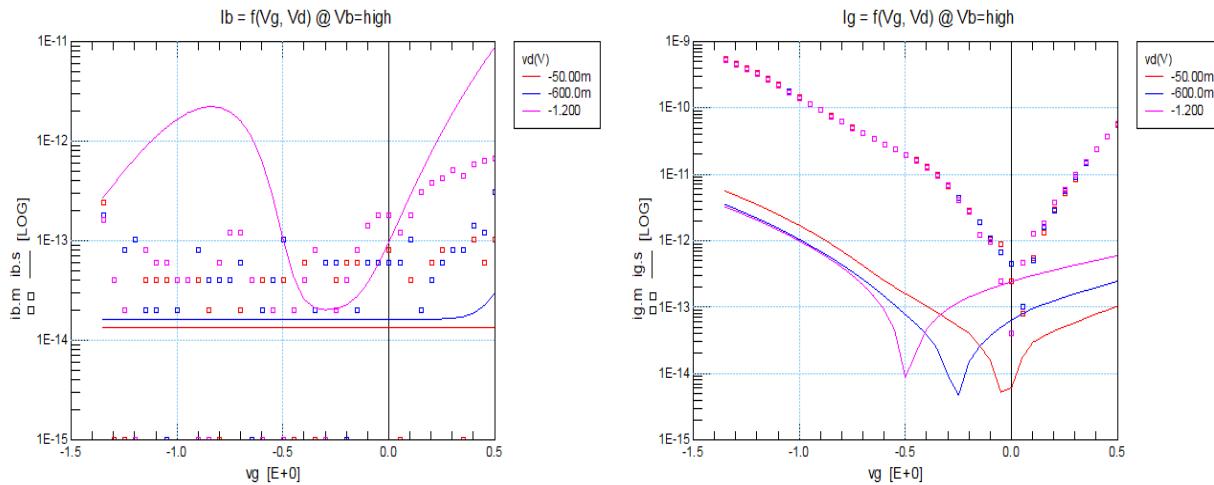
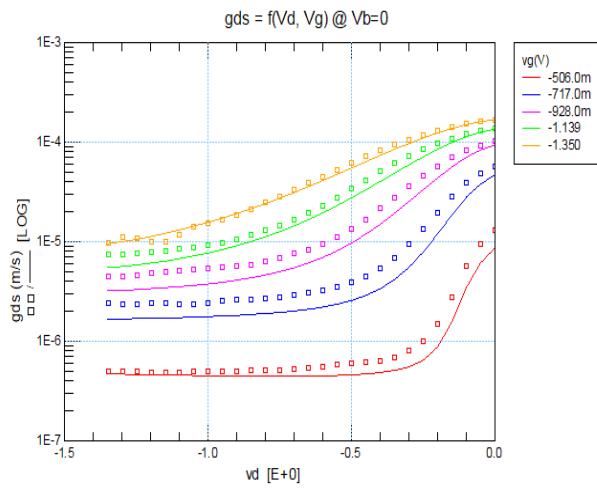
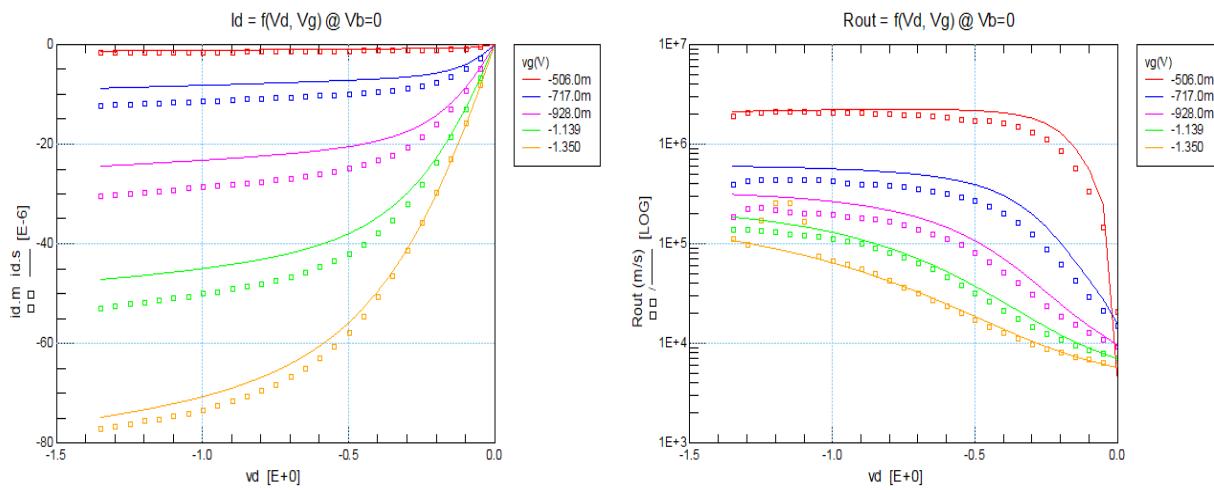
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

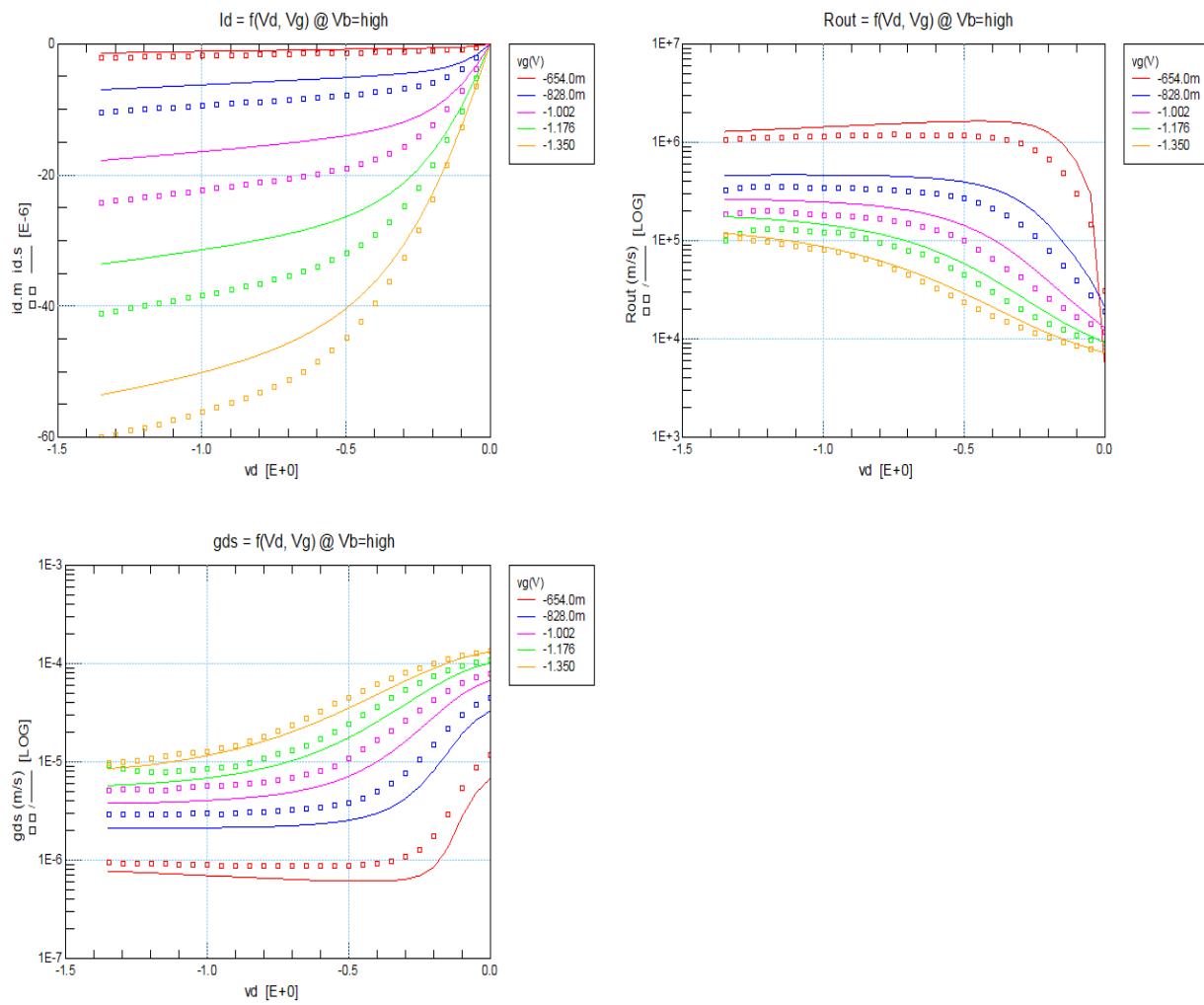
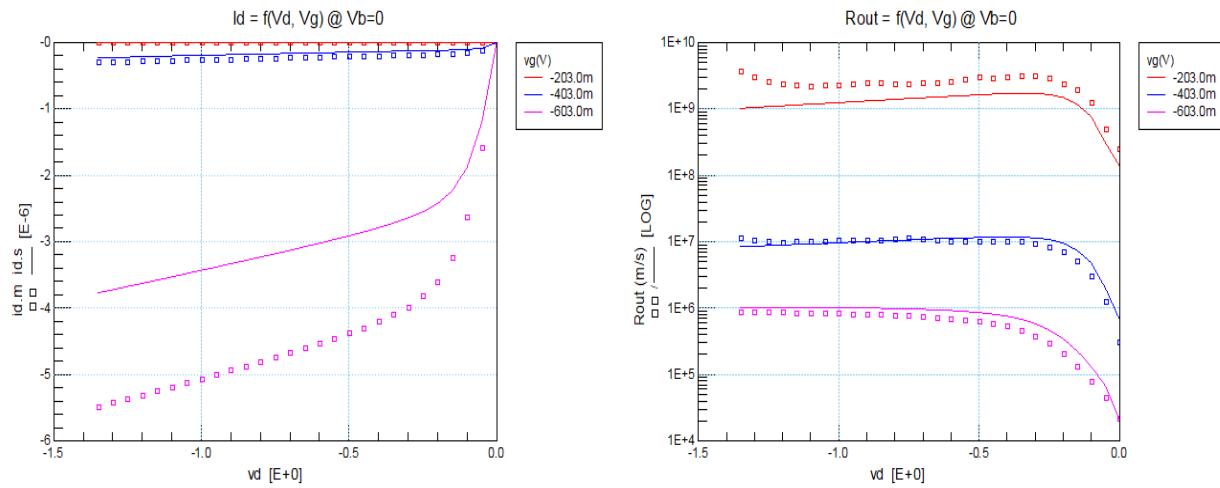


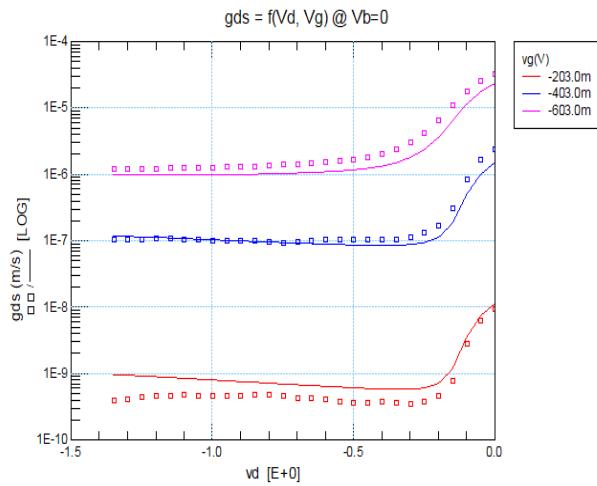


**idvg, Ib, Ig, Vb = 0V, T = 27°C**

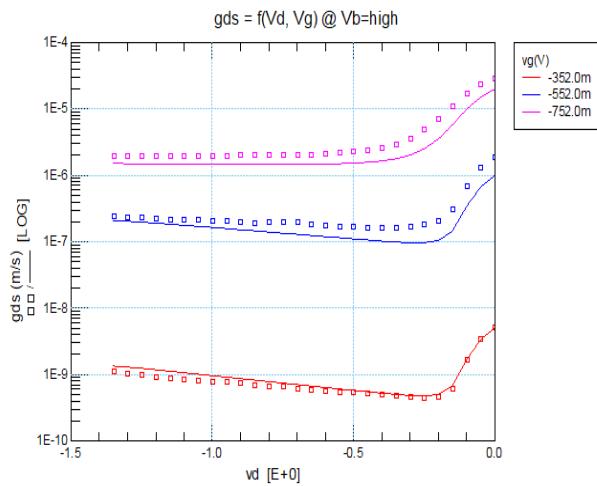
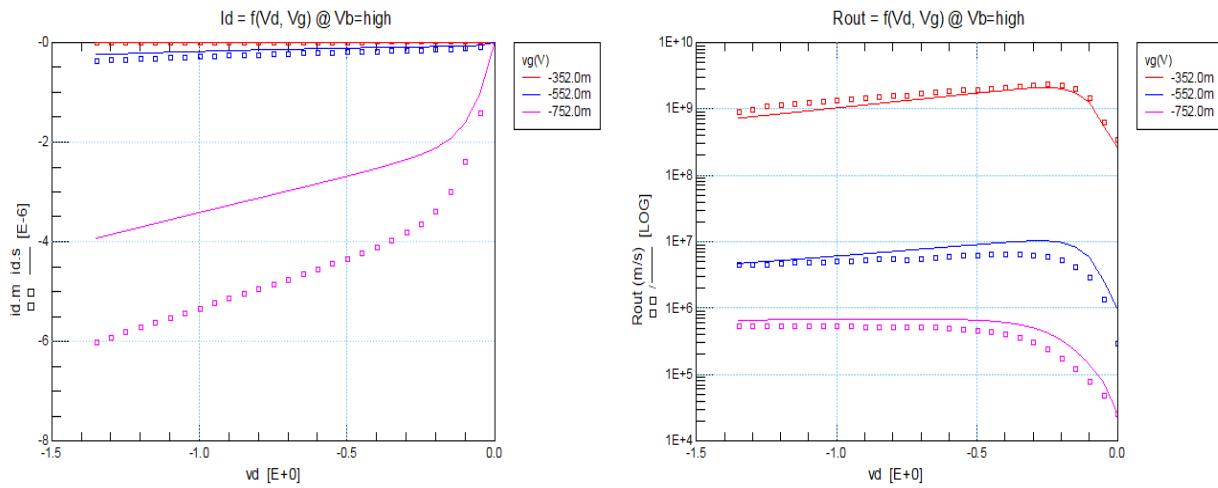


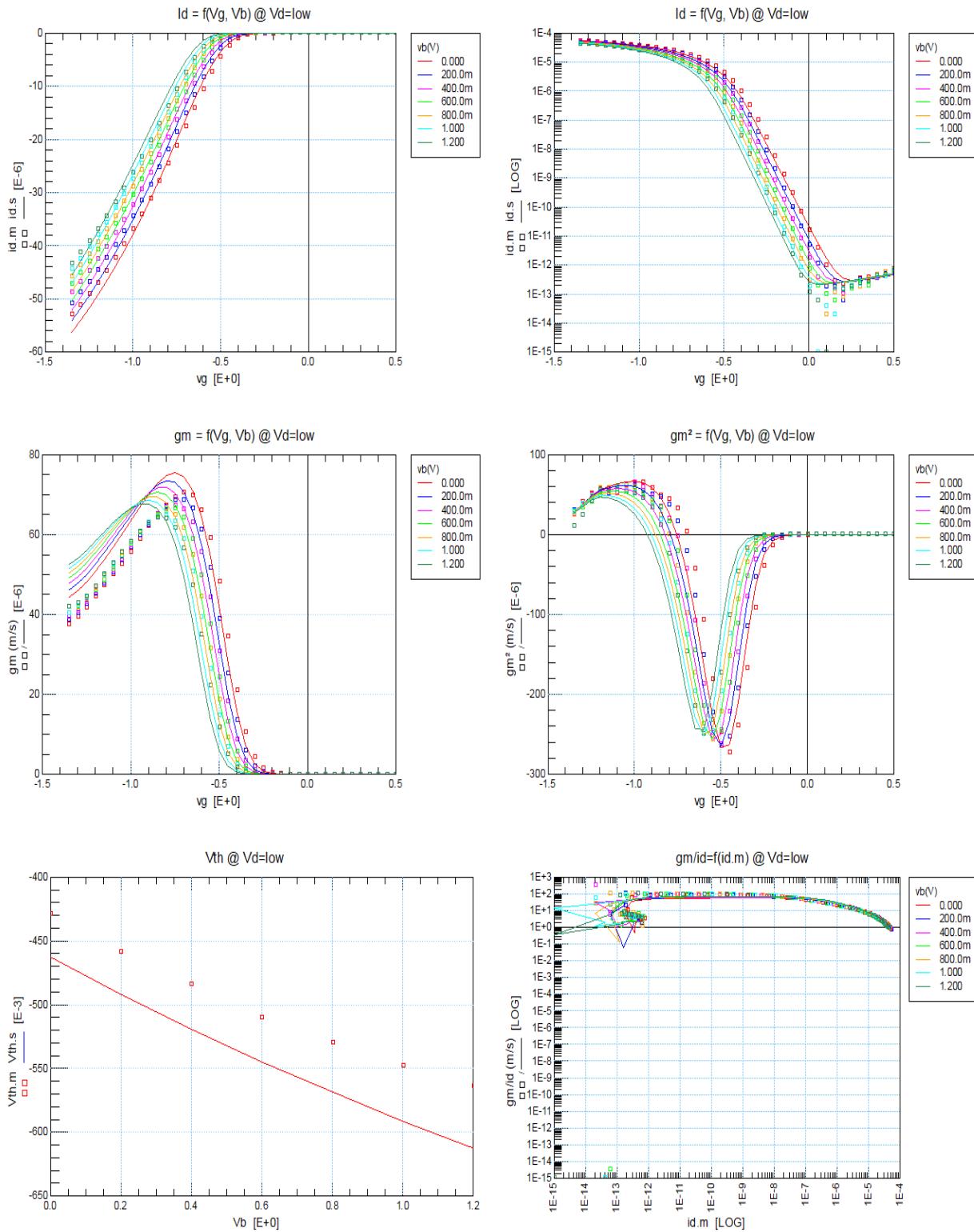
**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


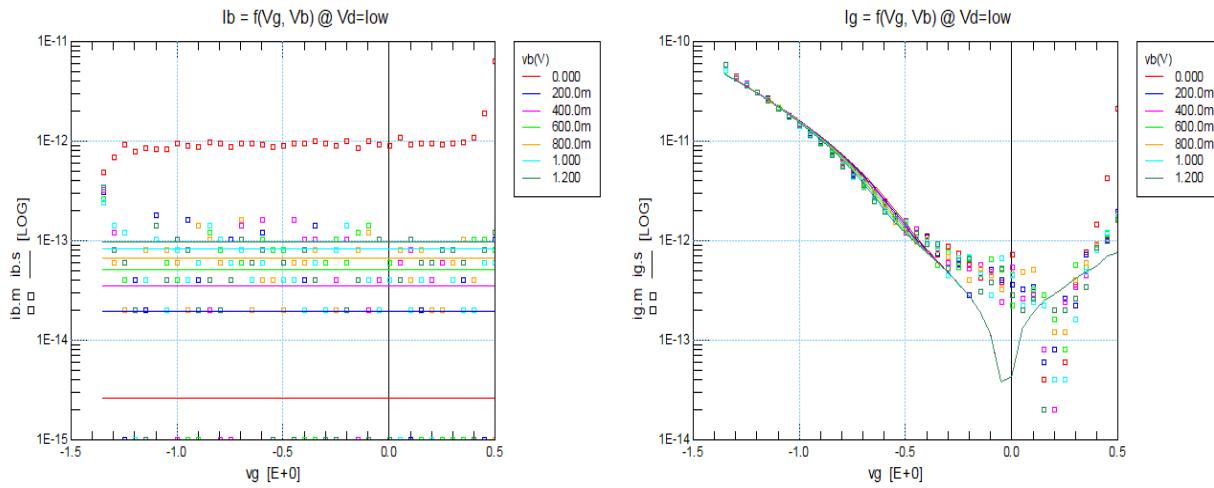
**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**



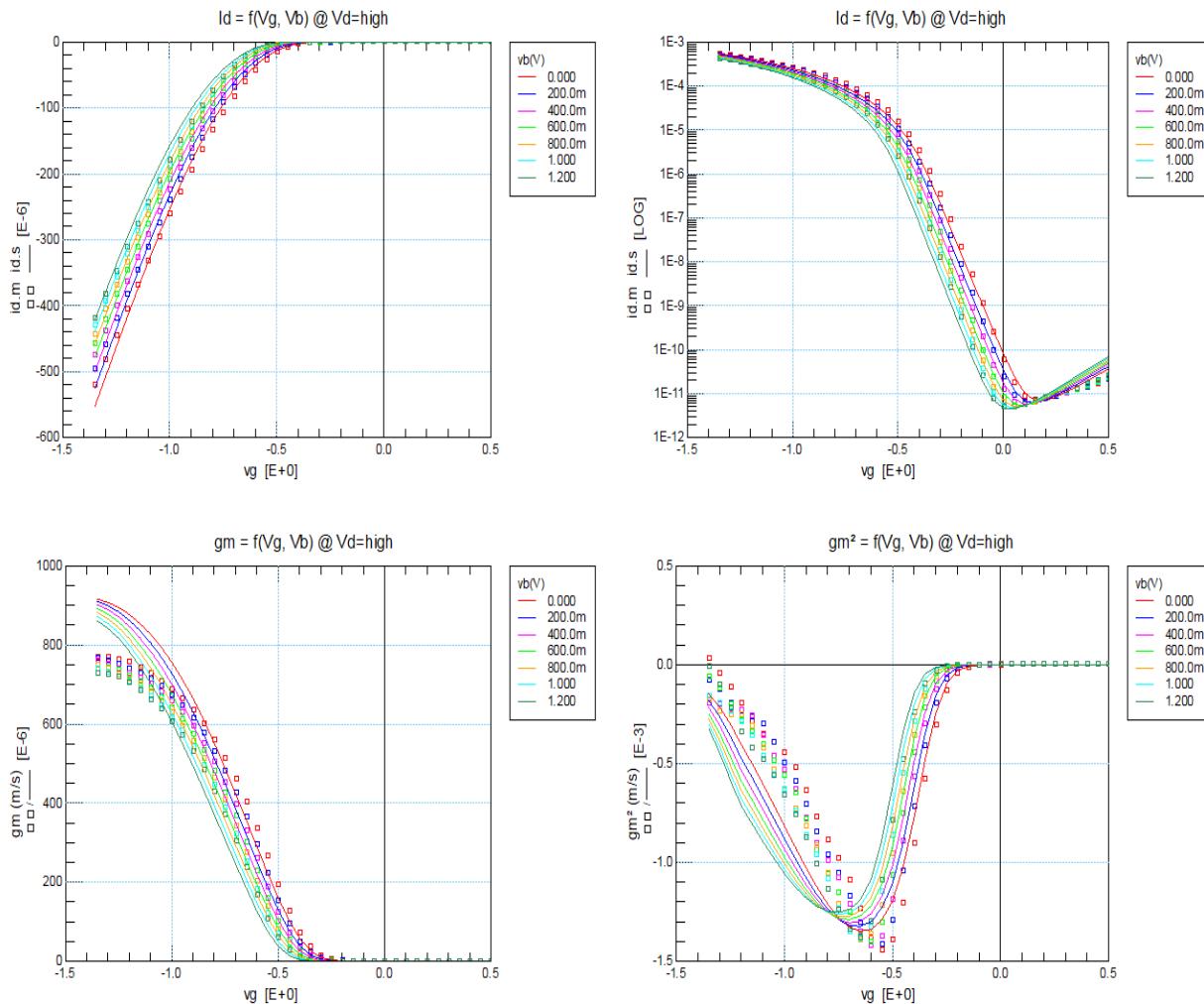
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

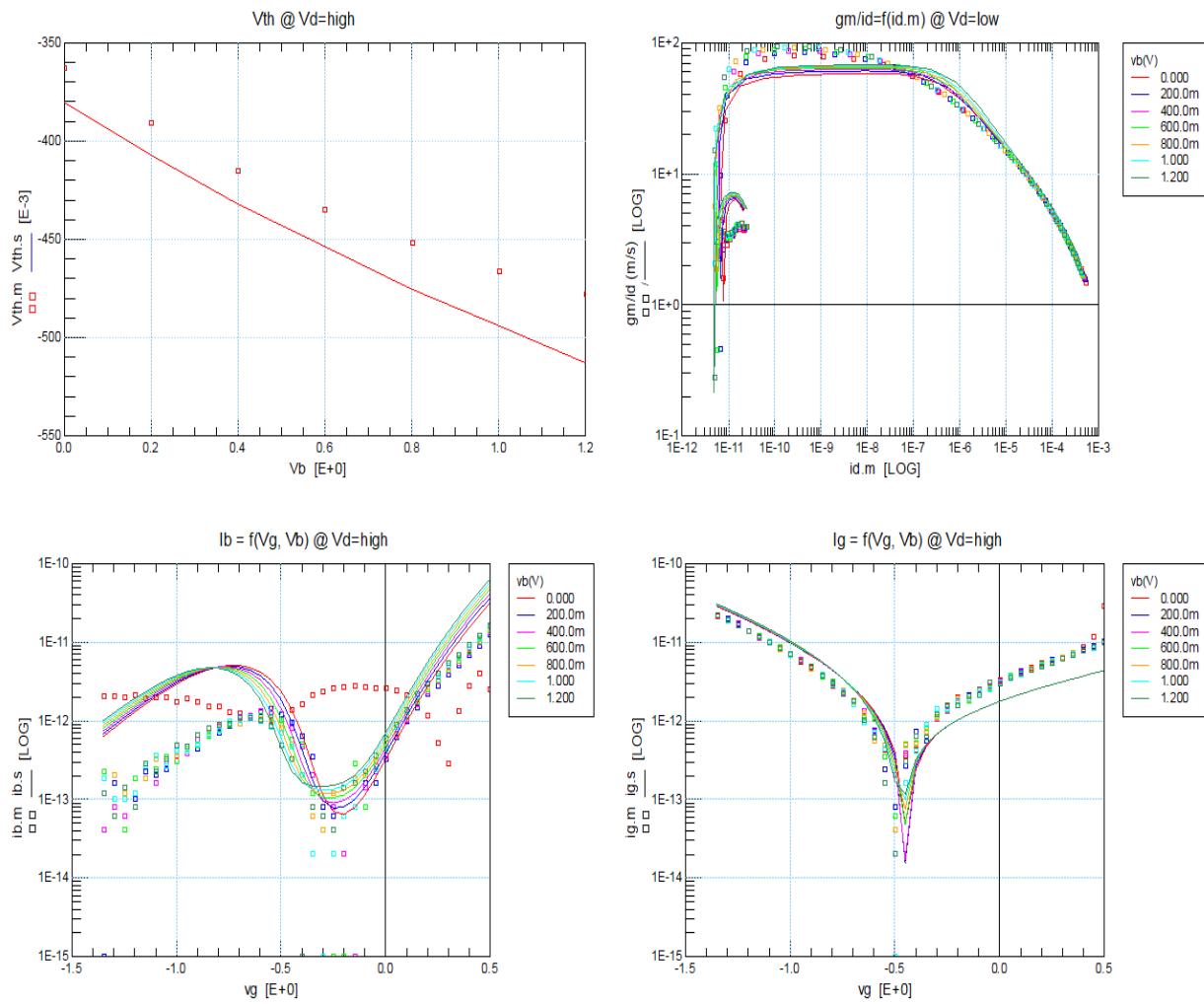


**4.27W02u0\_L0u13\_S550\_4****idvg, Vd = -0.05V, T = 27°C**

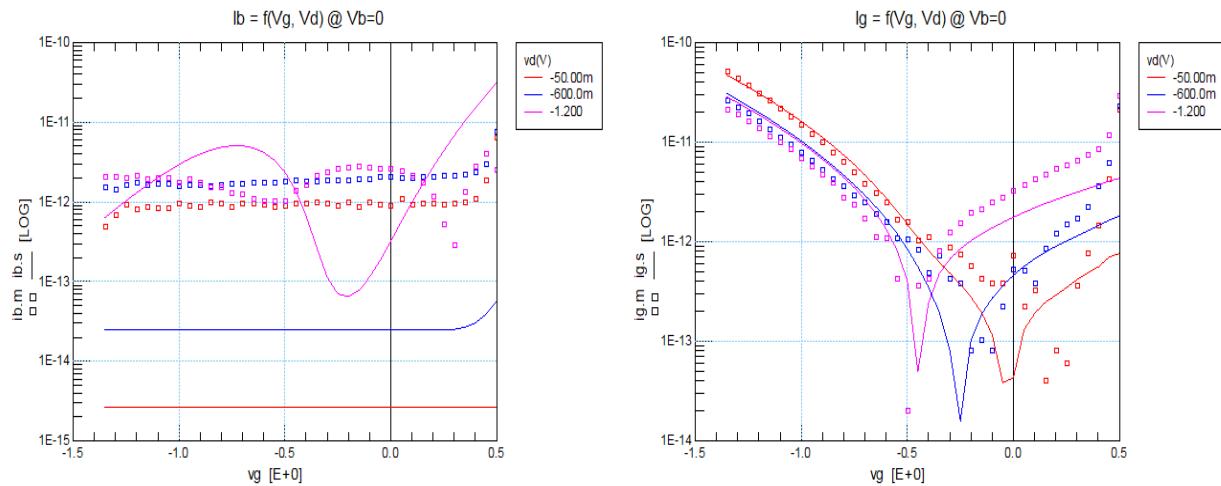


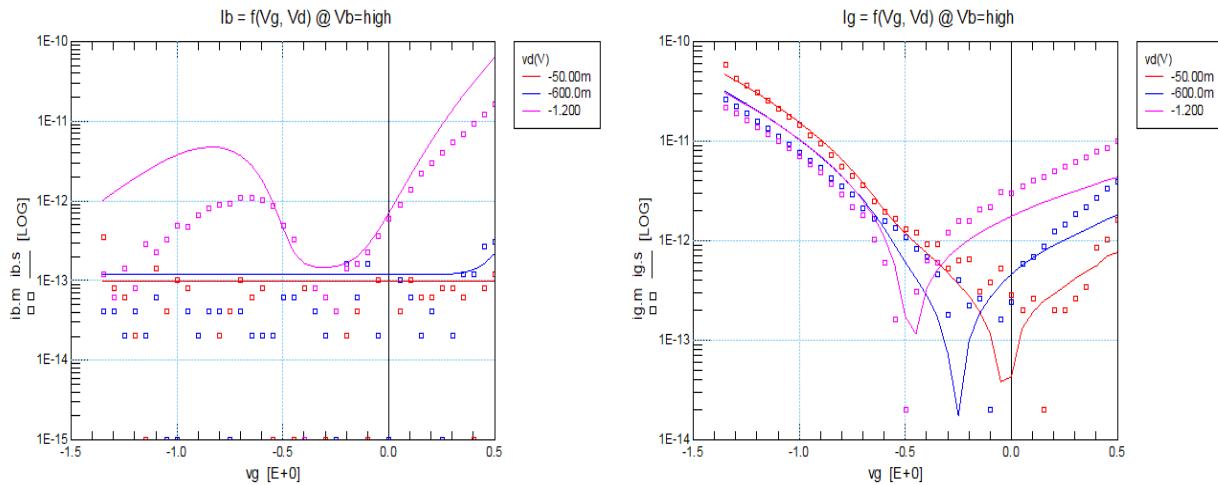
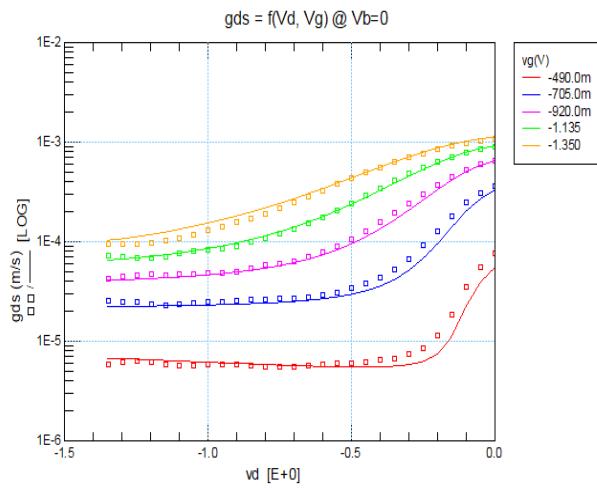
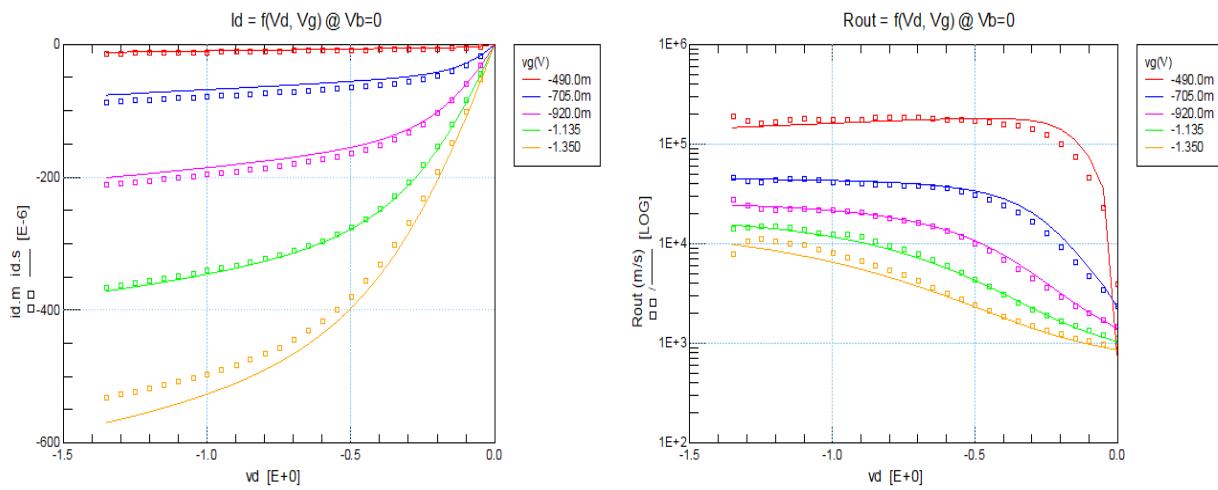
$idvg, Vd = -1.2V, T = 27^\circ C$

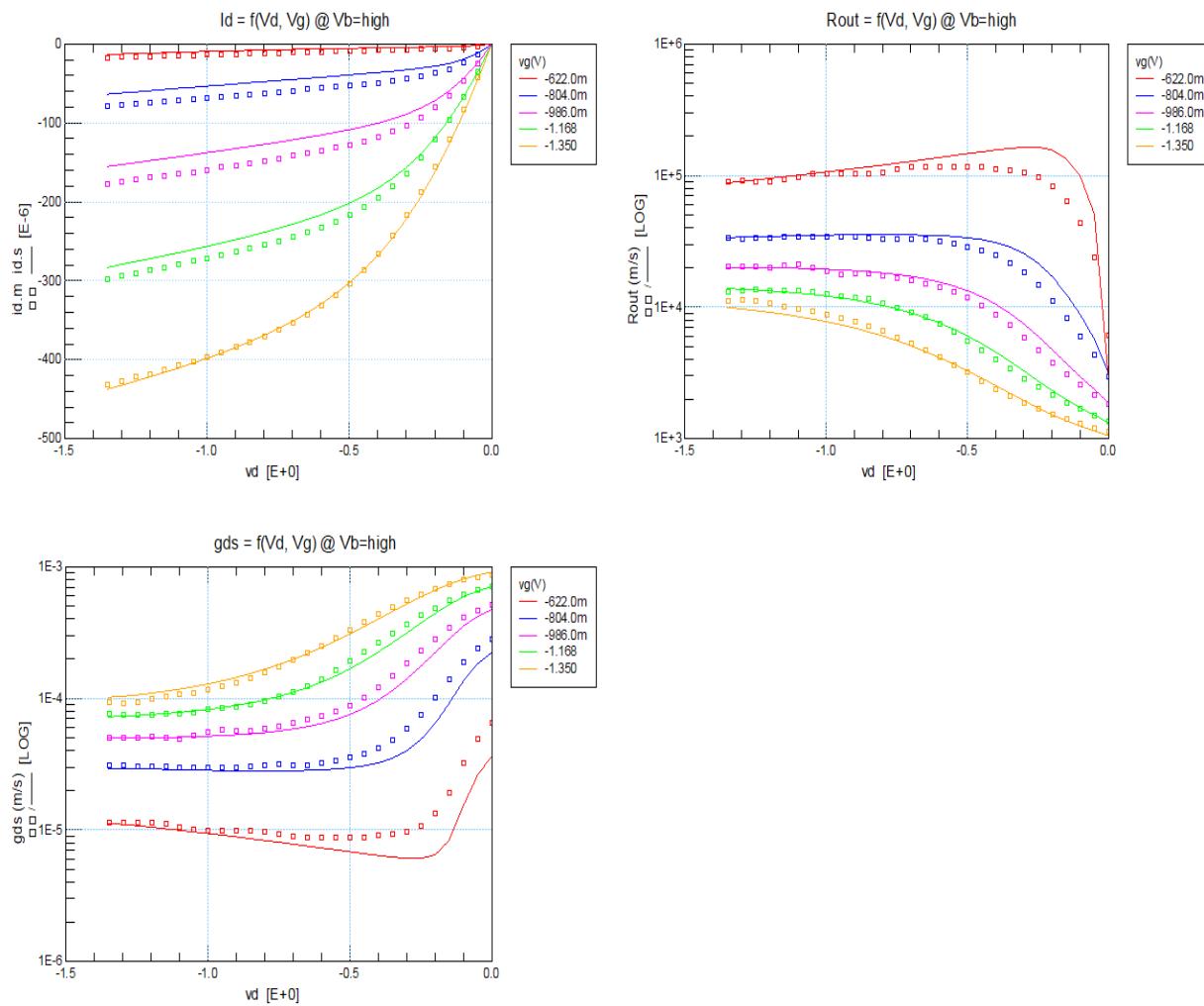
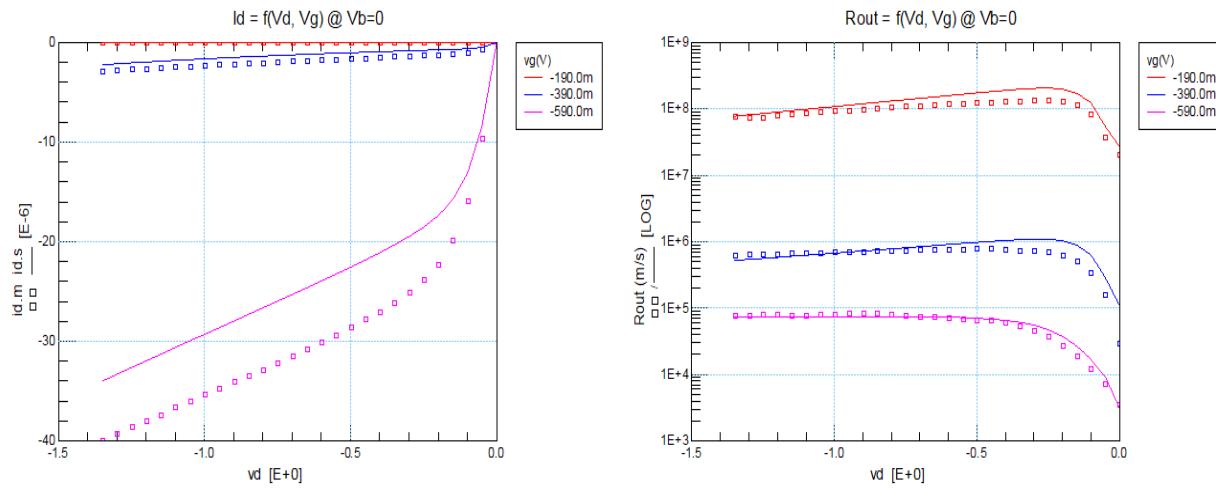


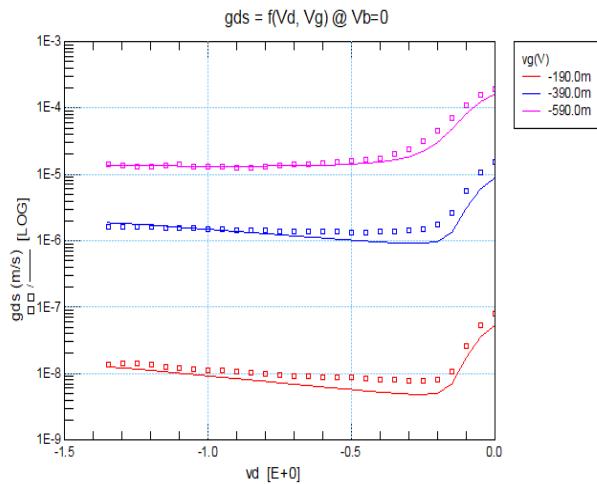


### $idvg, Ib, Ig, Vb = 0V, T = 27^\circ C$

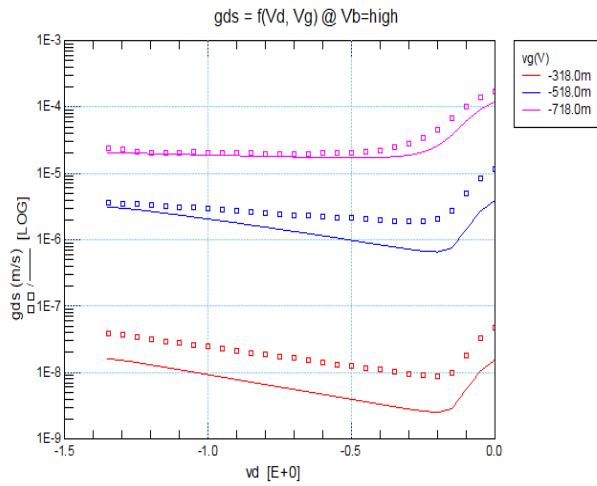
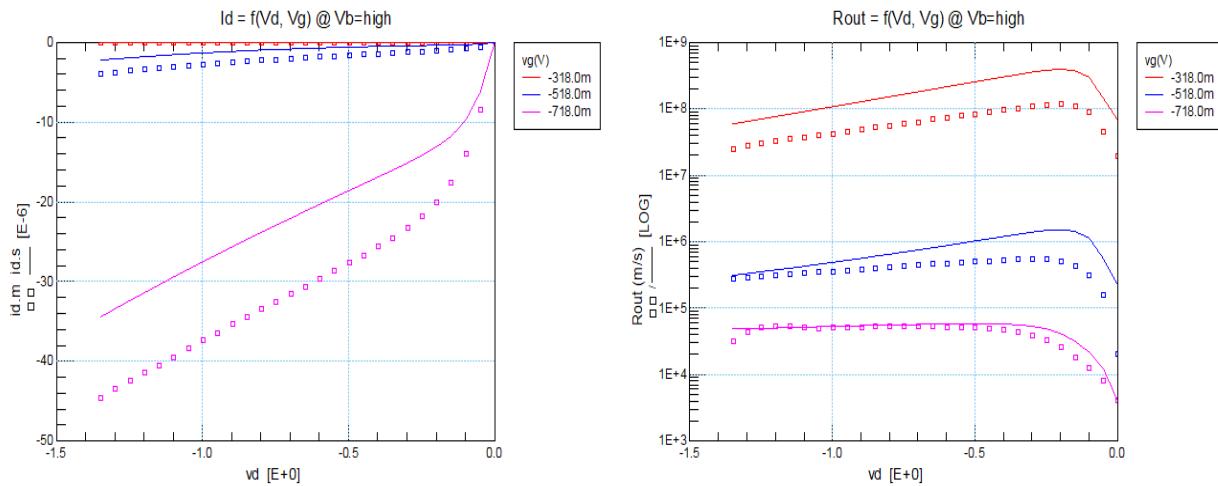


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

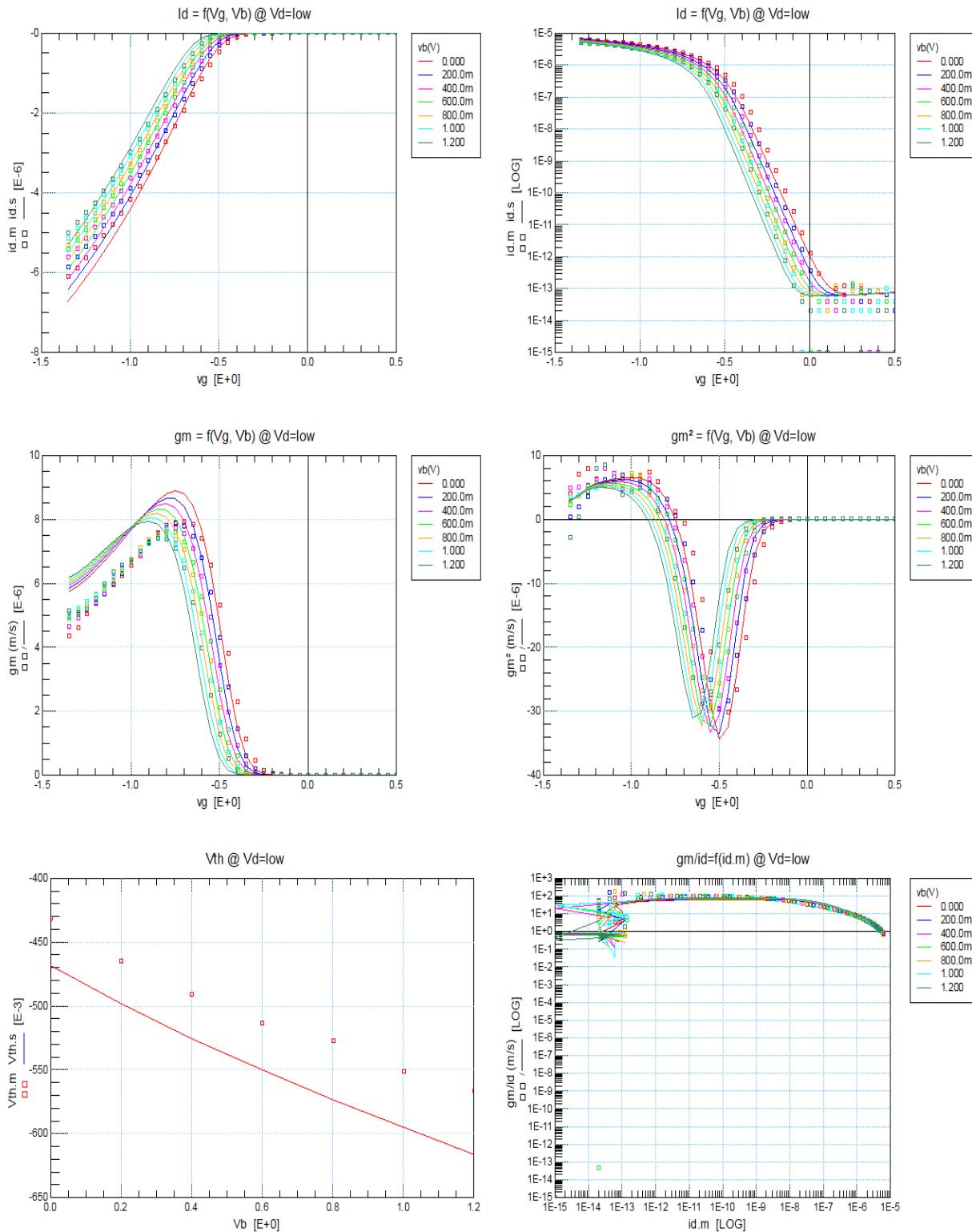


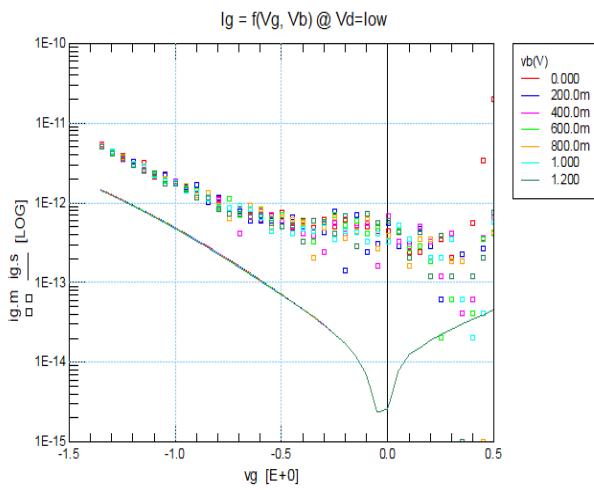
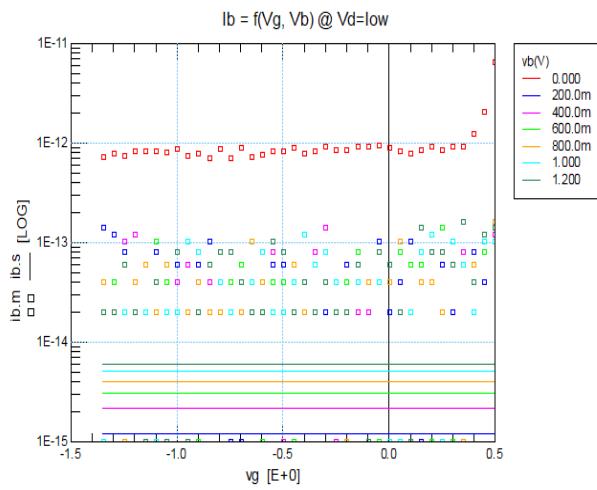
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



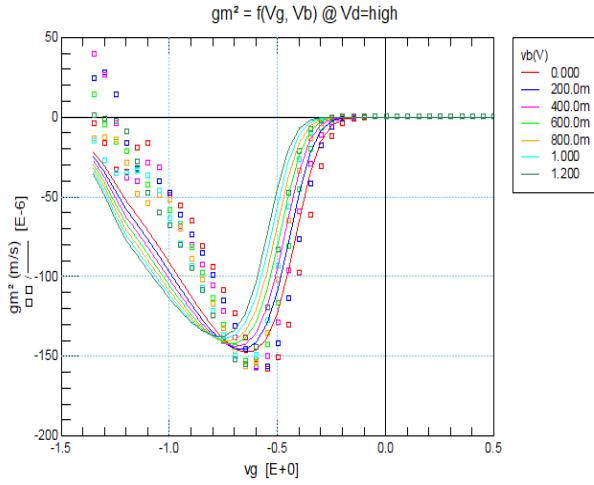
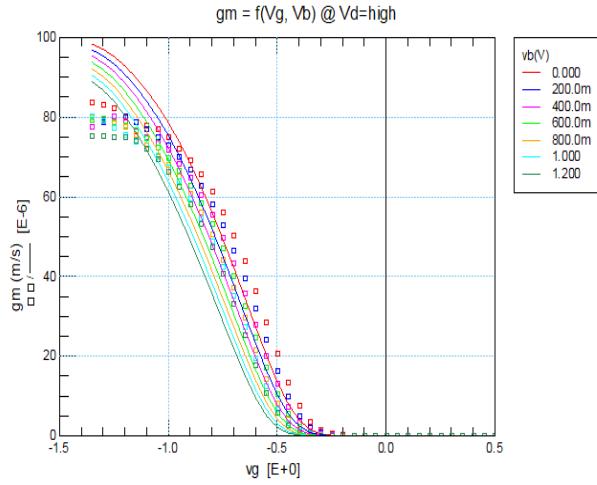
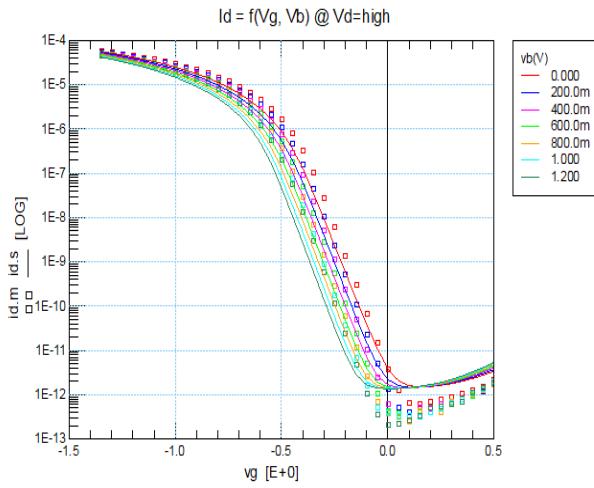
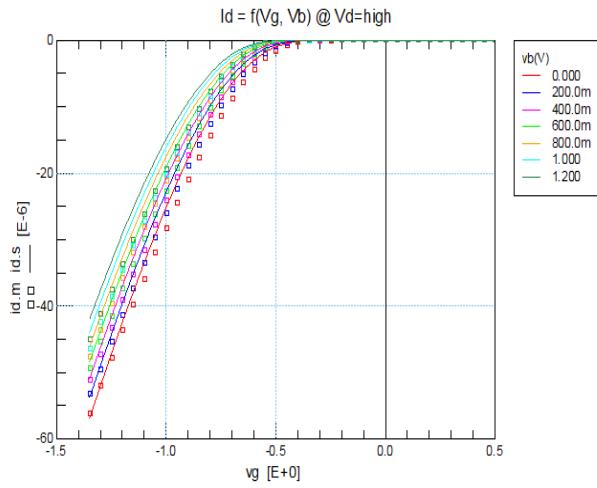
## 4.28 W0u15\_L0u14\_S554\_4

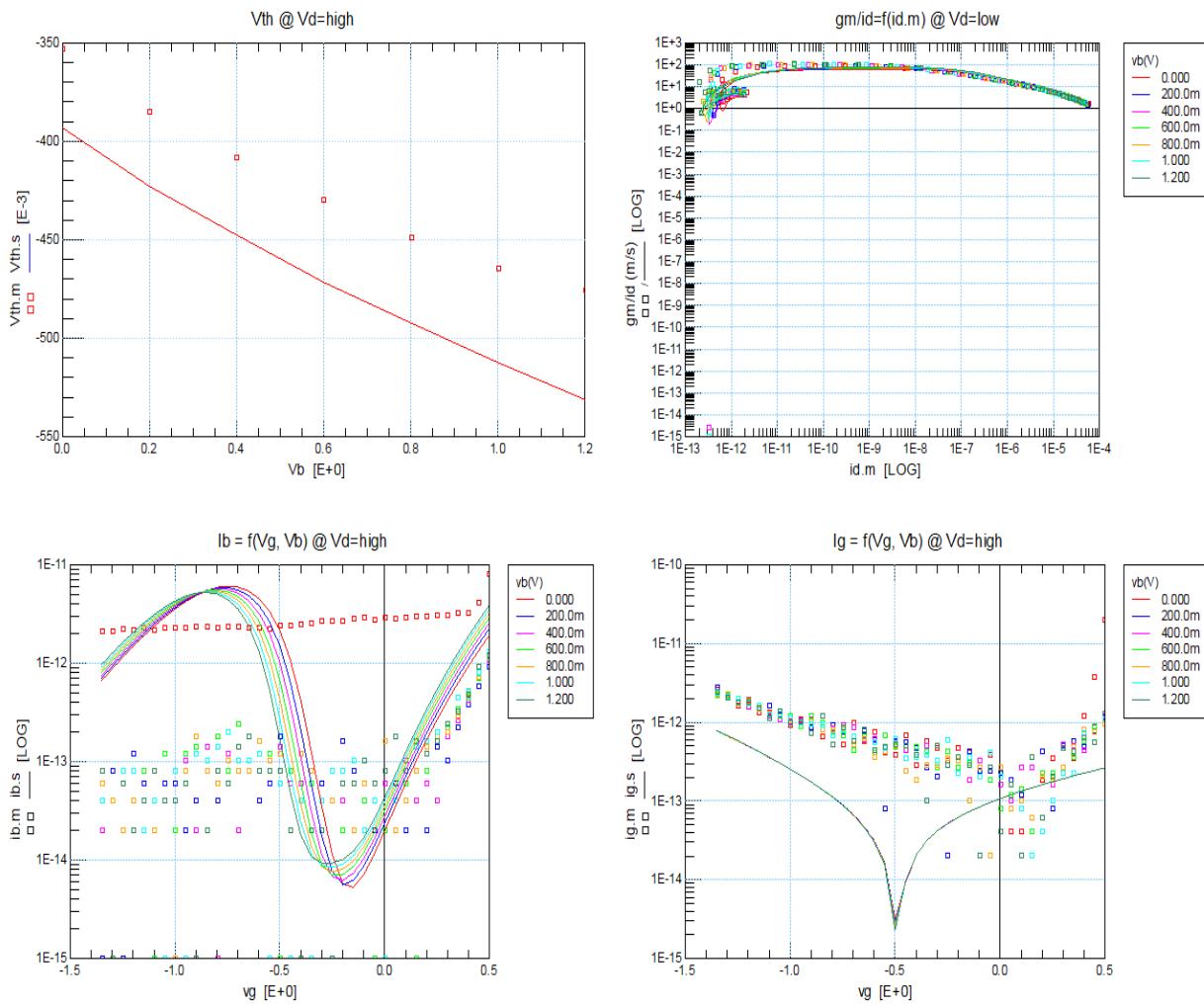
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



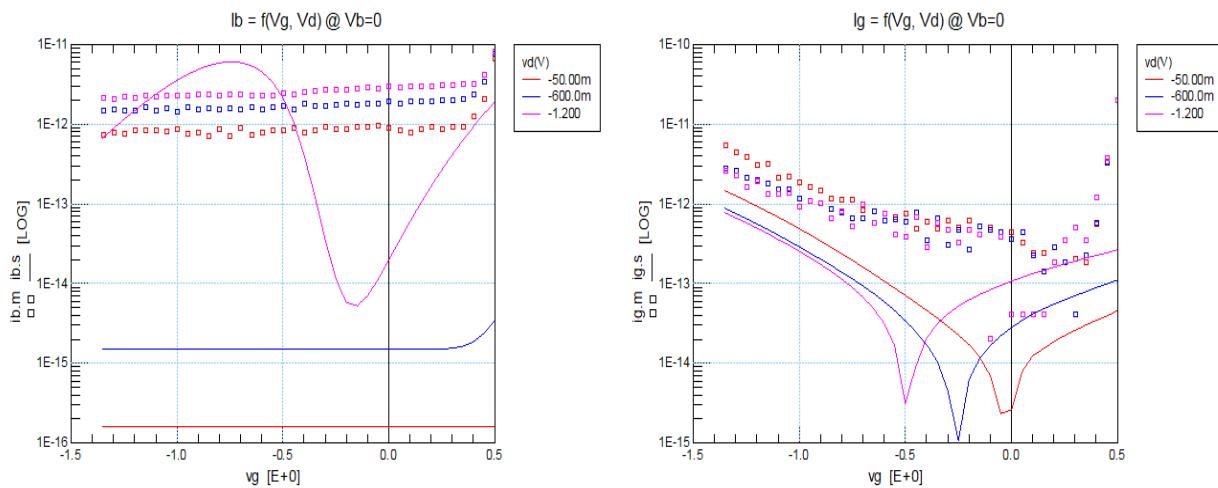


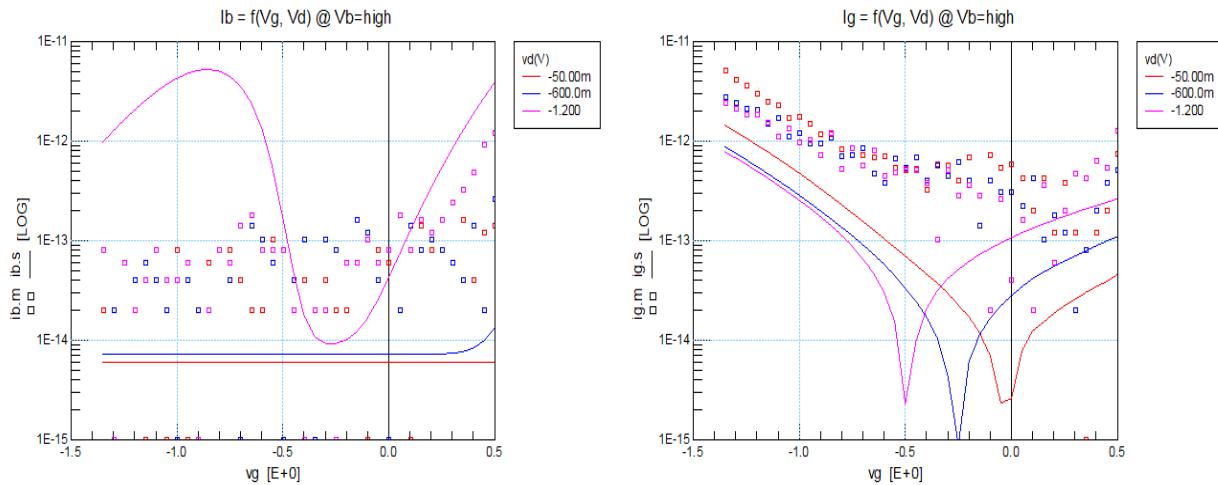
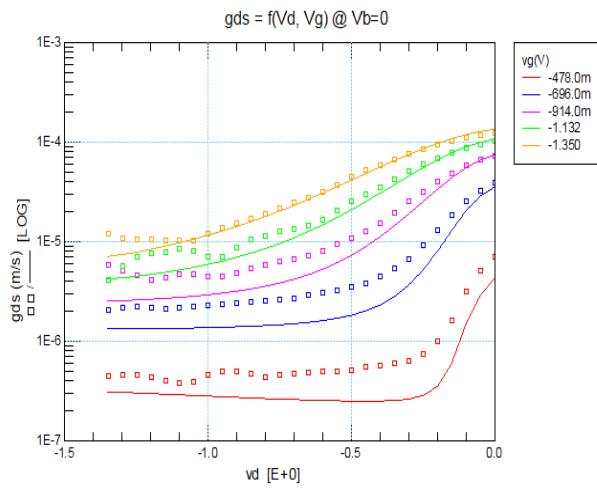
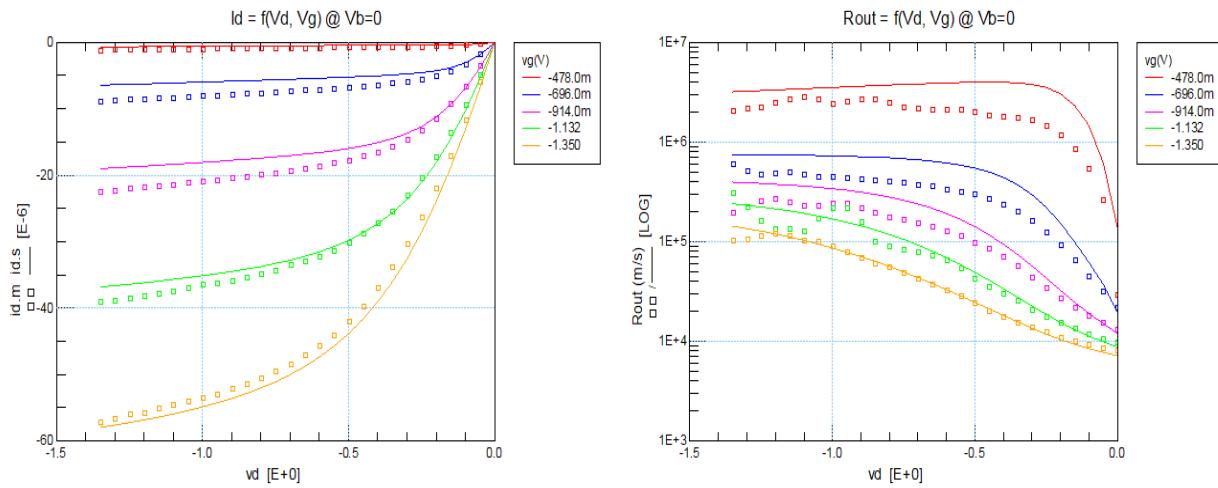
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

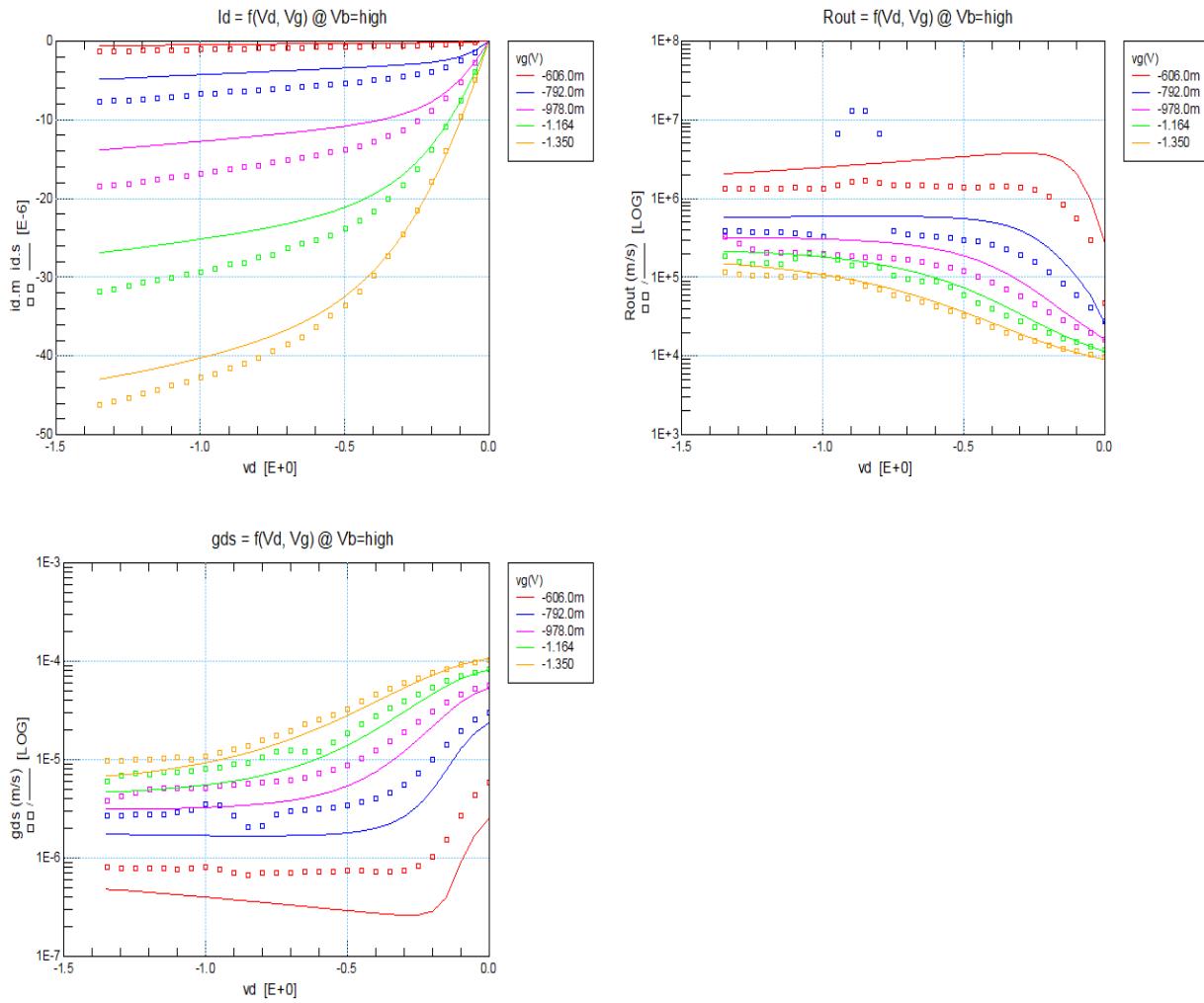
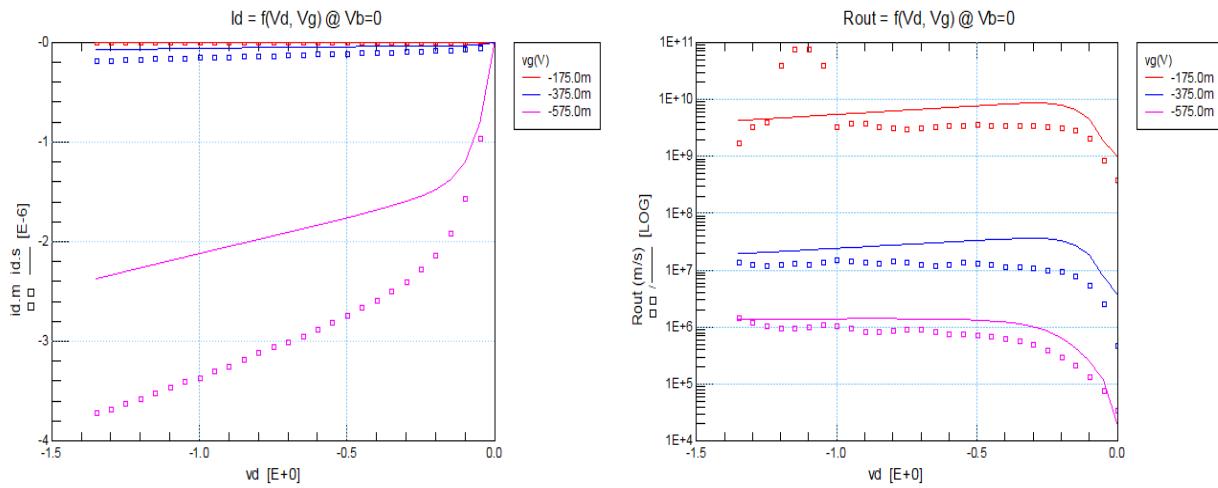


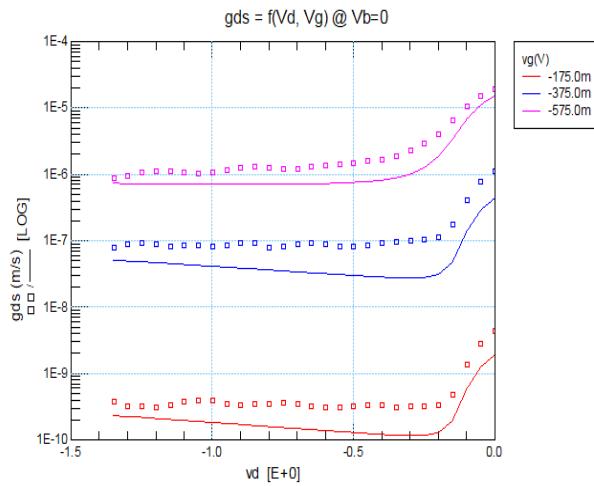


**idvg, Ib,Ig, Vb = 0V, T = 27°C**

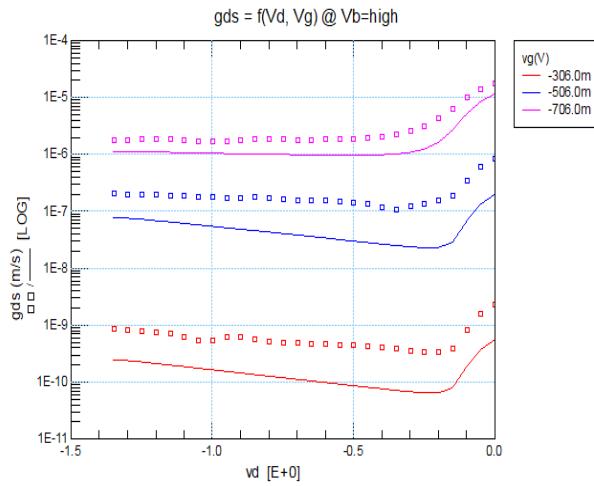
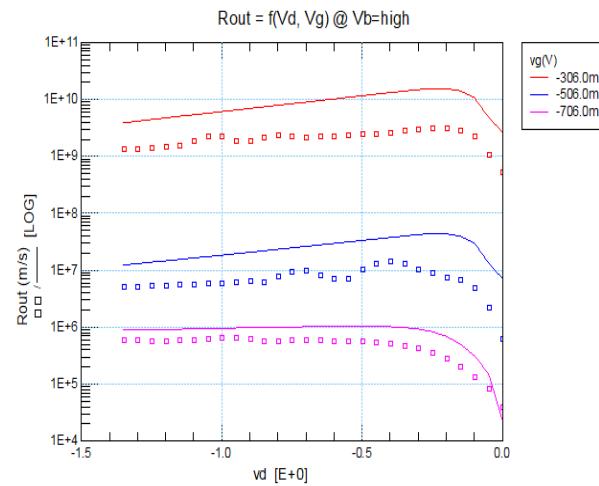
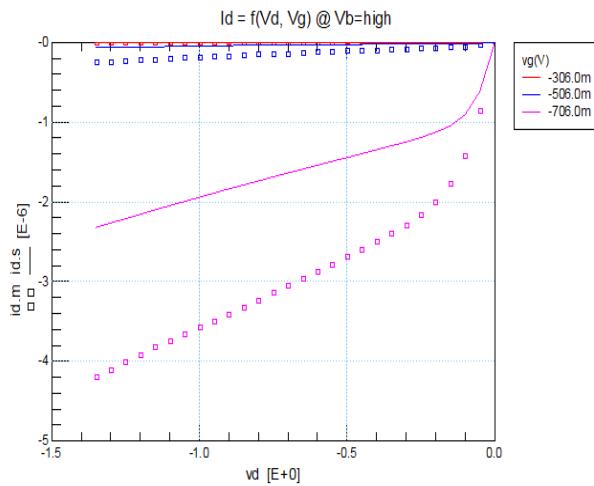


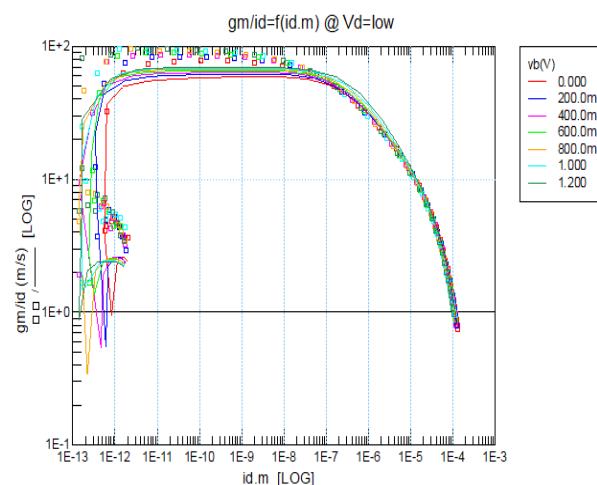
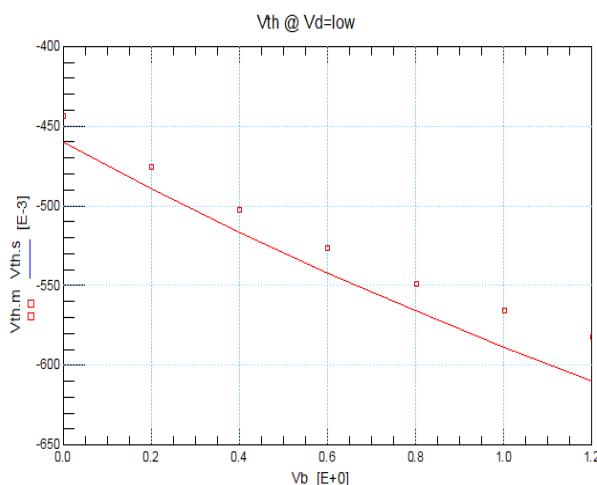
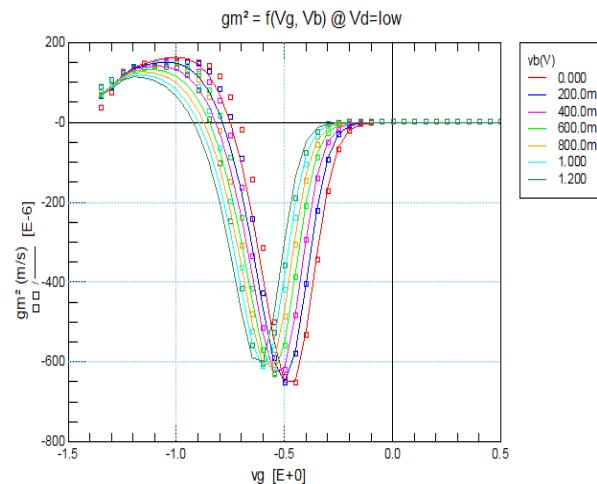
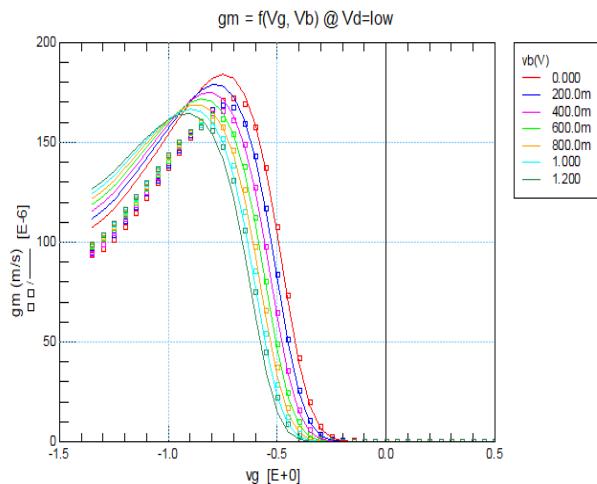
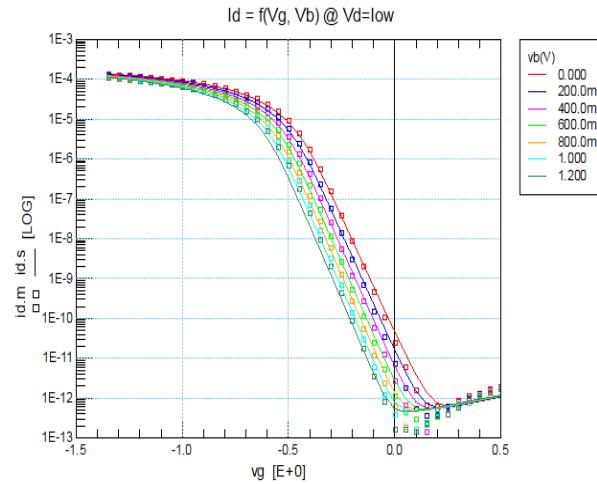
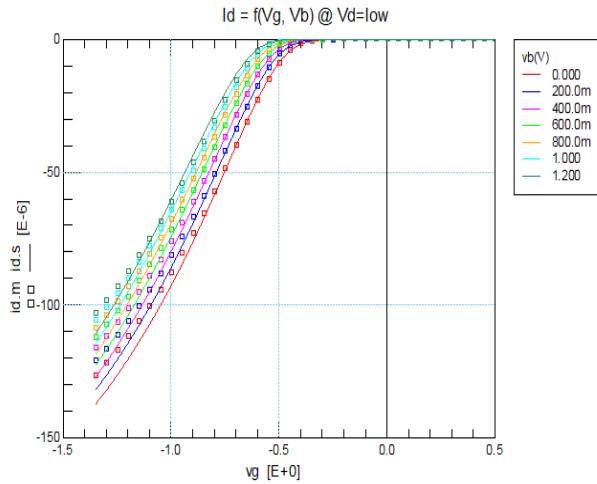
**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


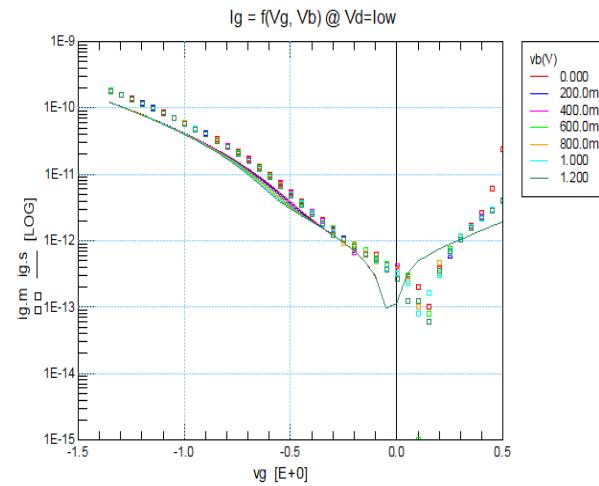
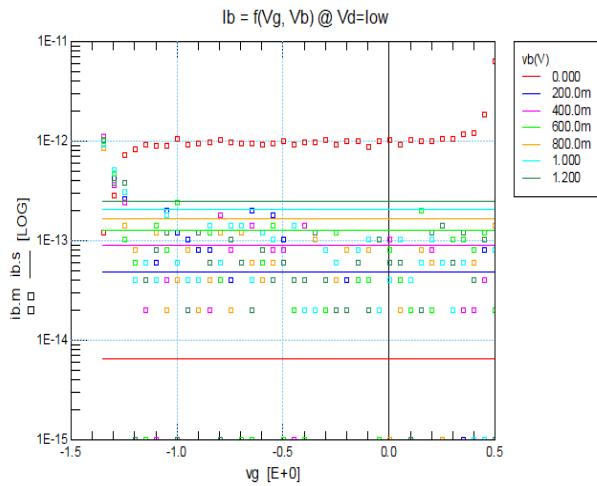
**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**



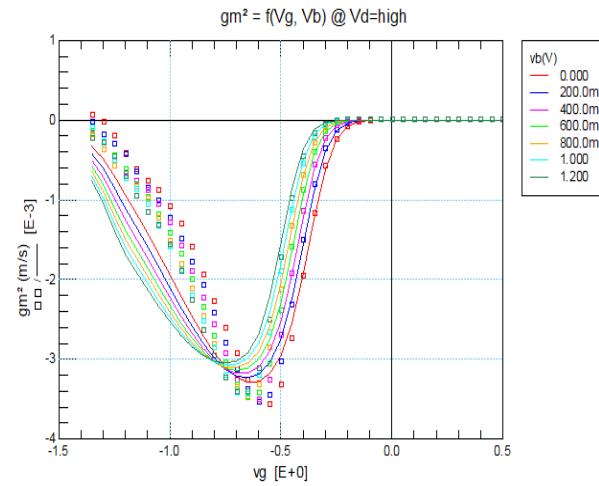
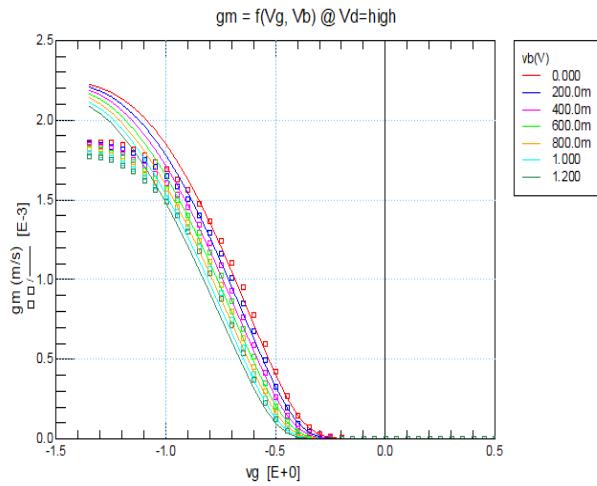
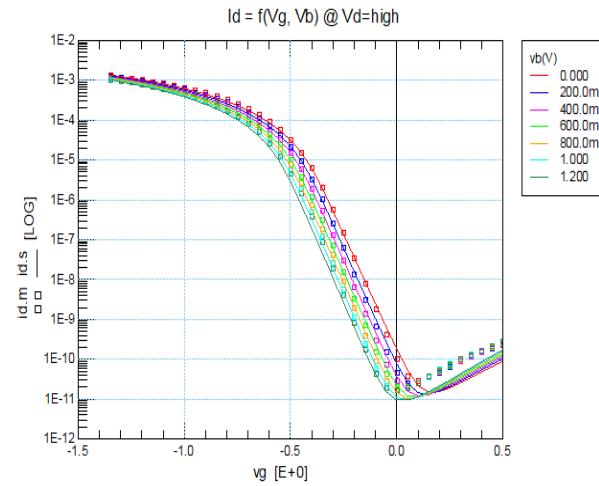
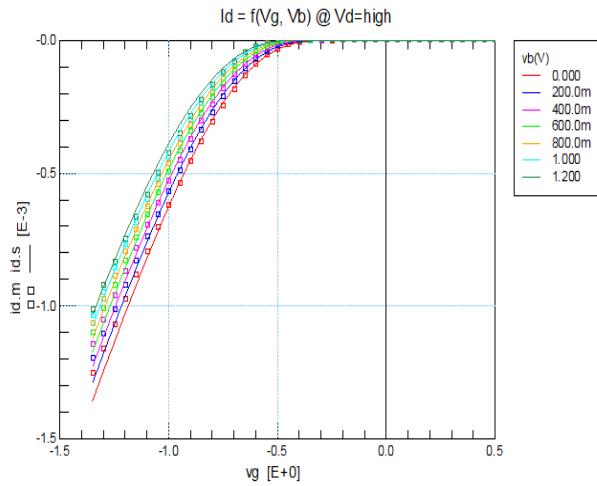
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

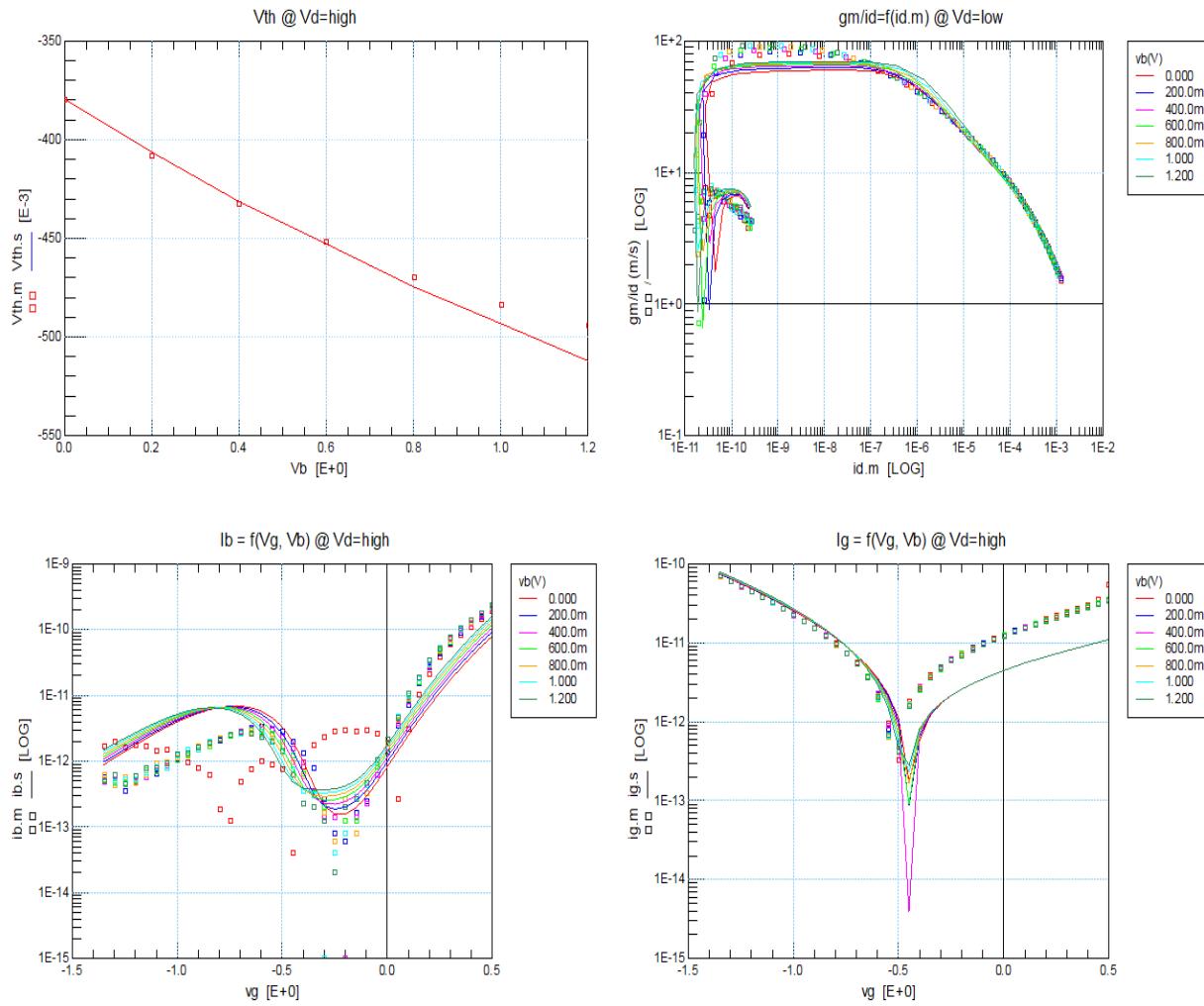


**4.29 W05u0\_L0u13\_S550\_1****idvg, Vd = -0.05V, T = 27°C**

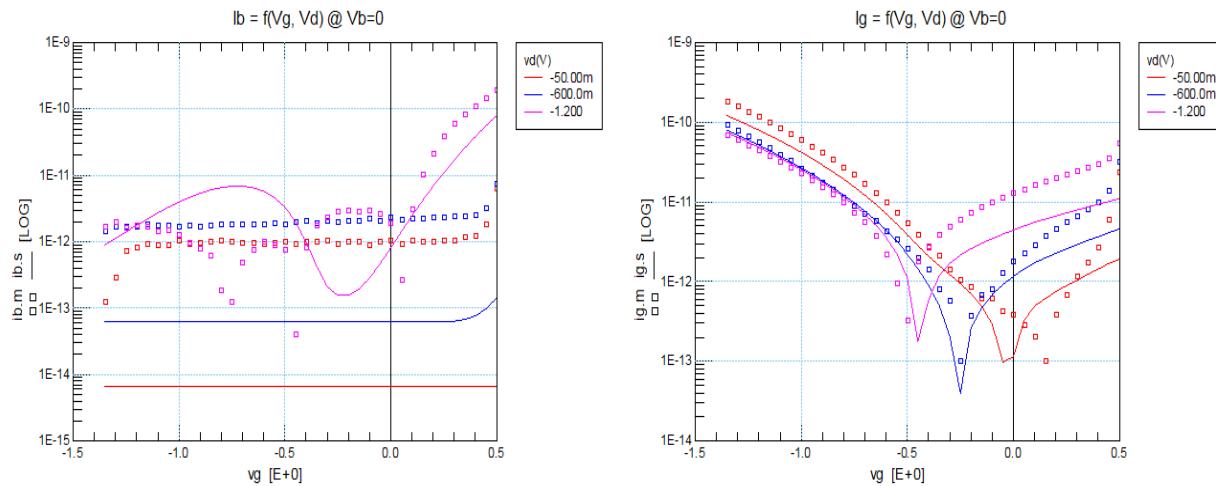


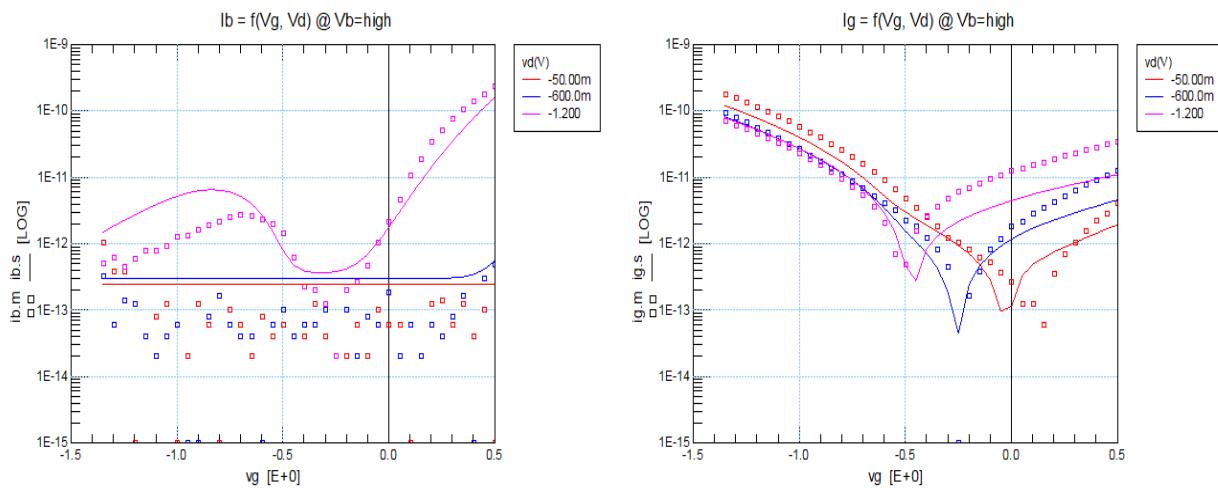
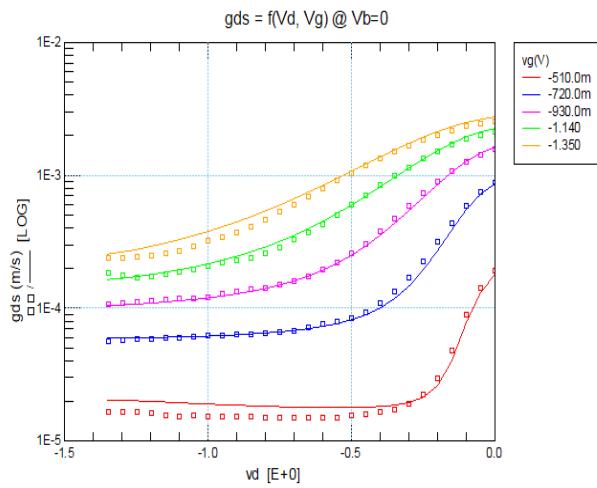
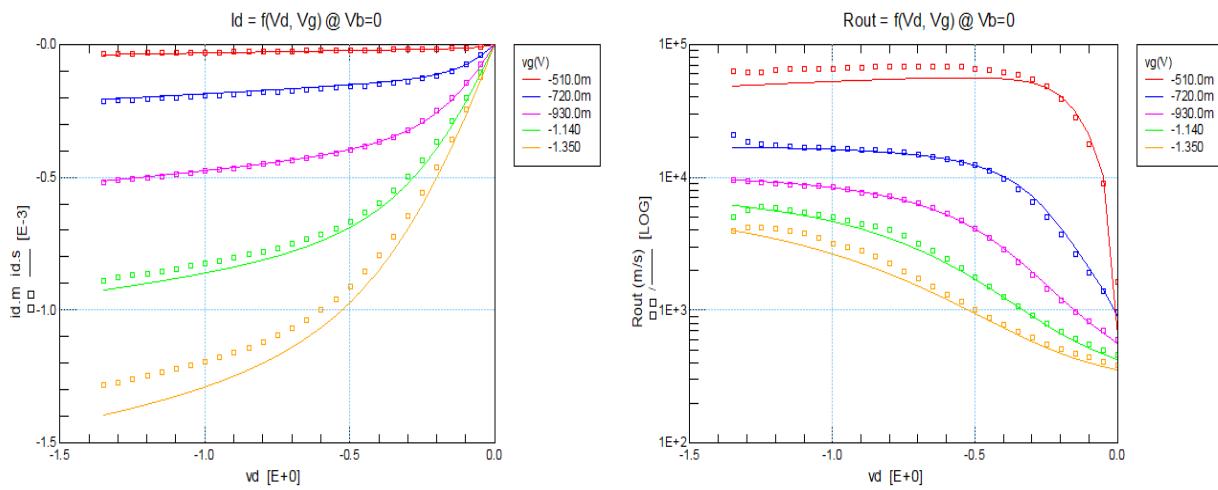
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

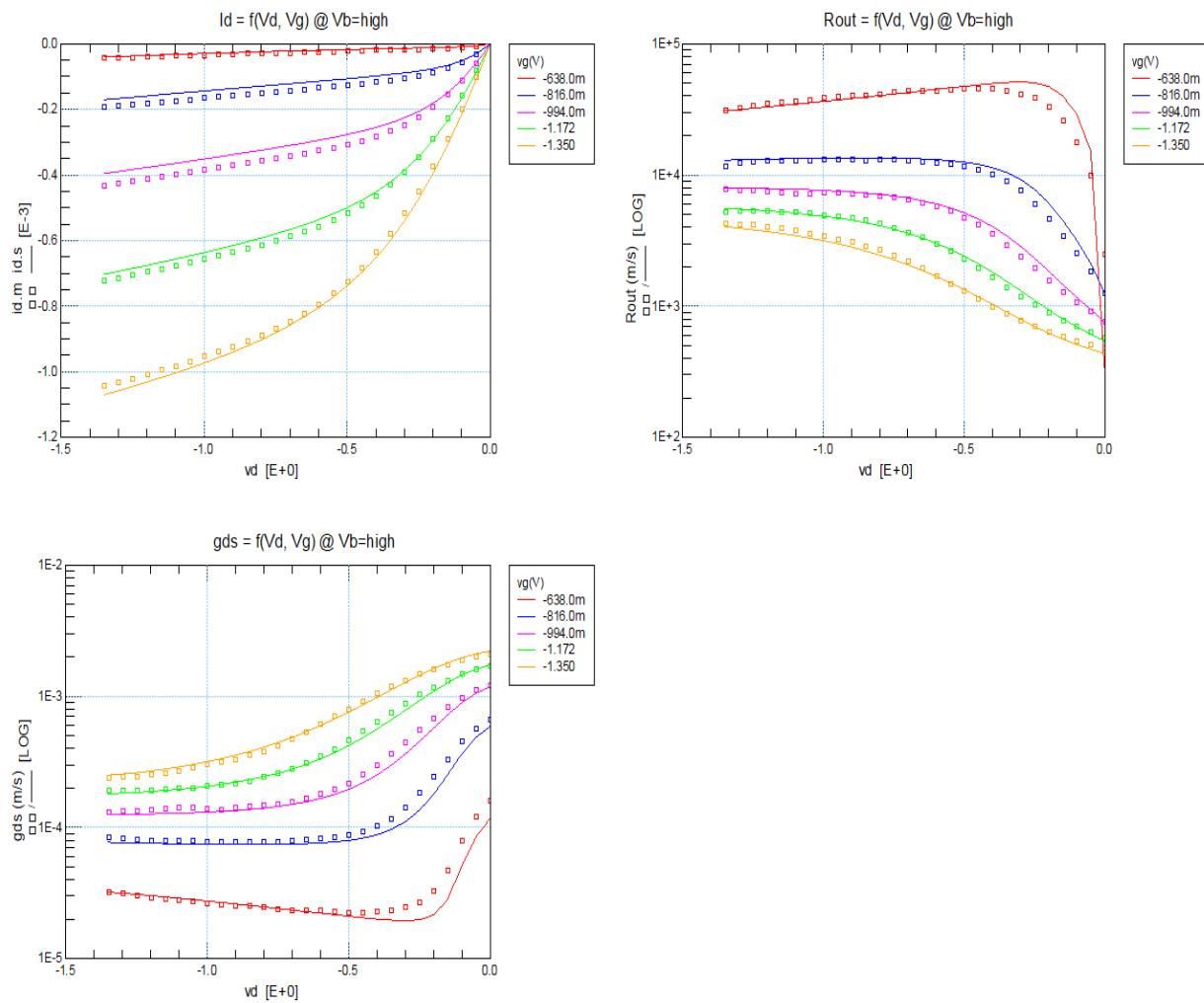
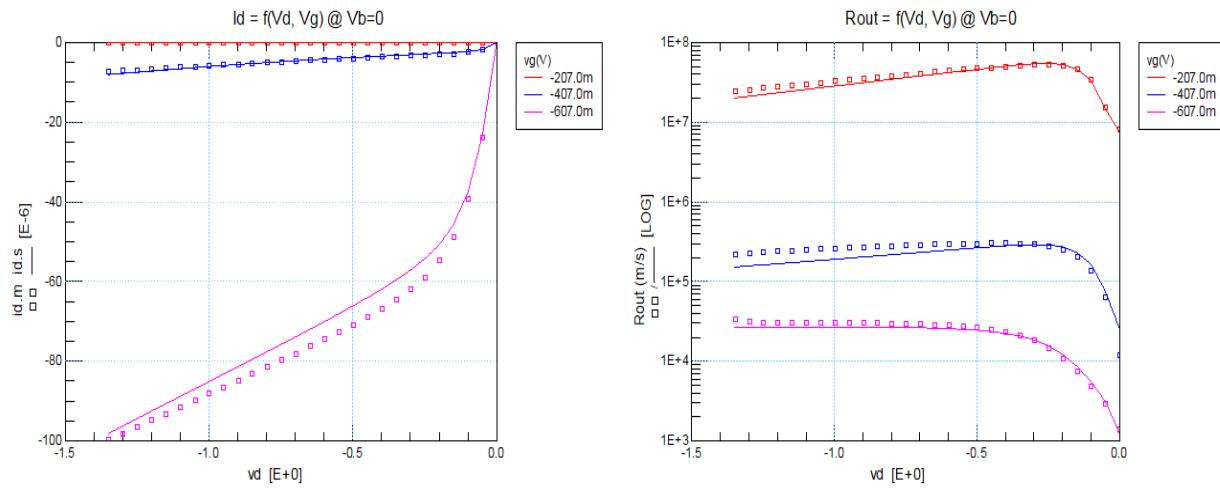


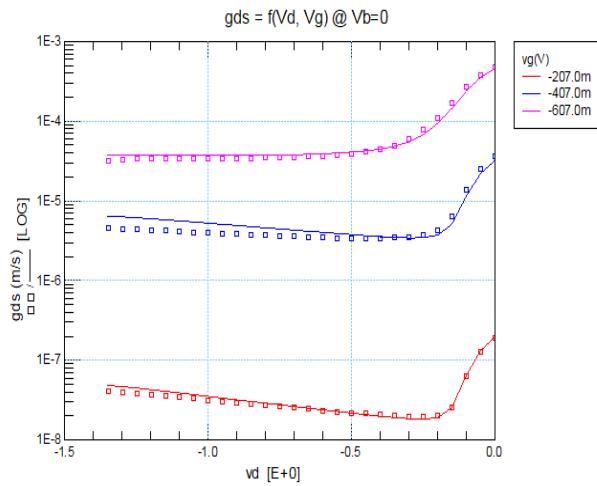


### idvg, lb, lg, Vb = 0V, T = 27°C

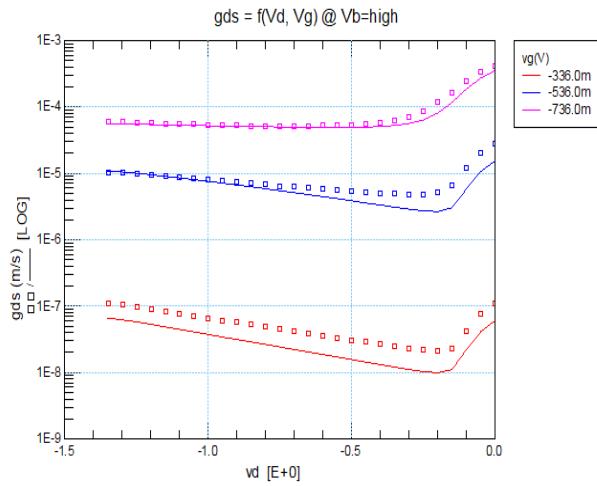
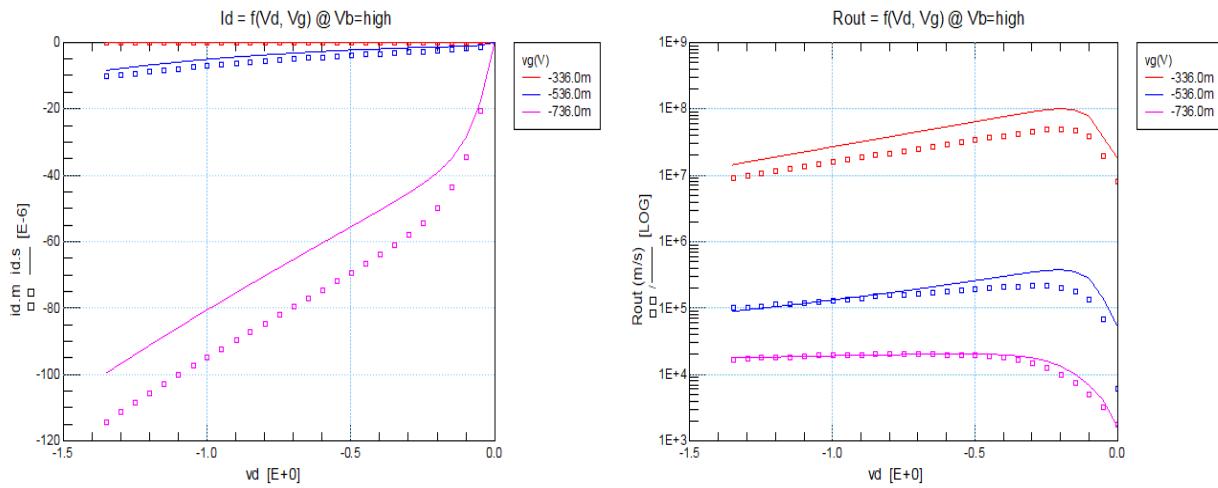


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

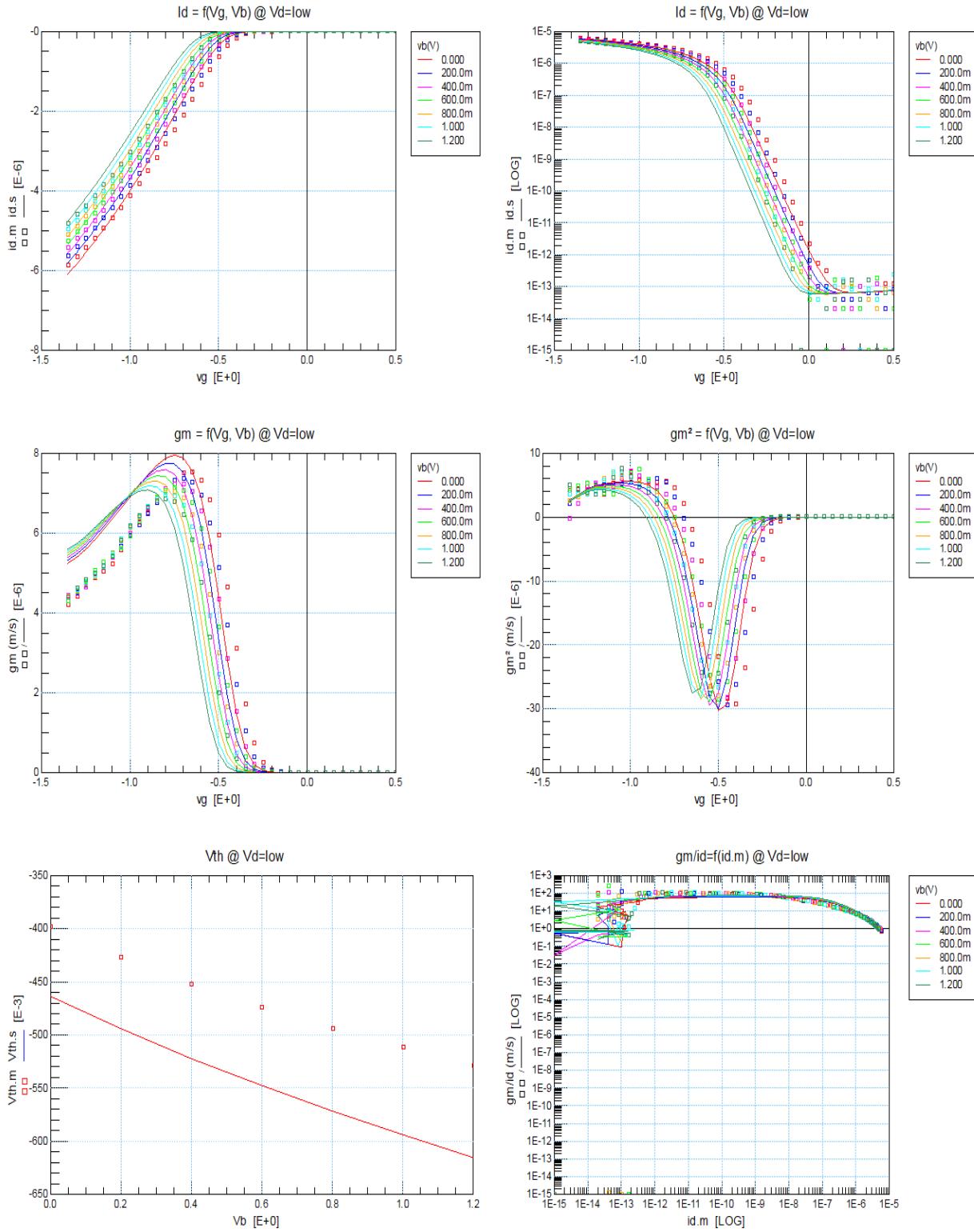


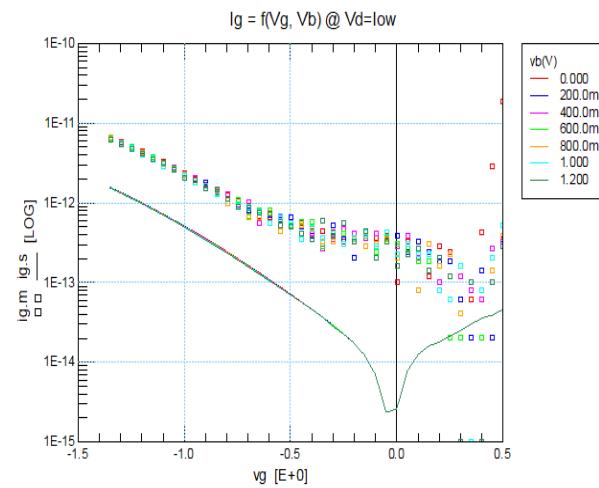
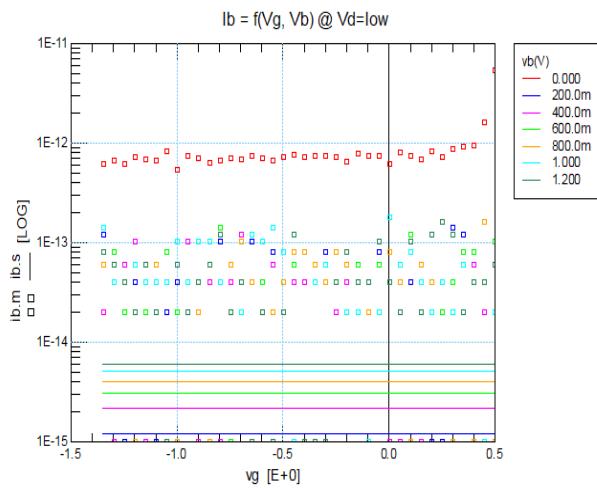
idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



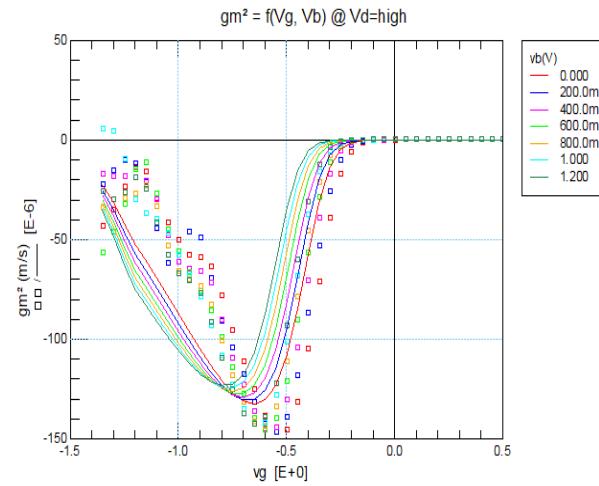
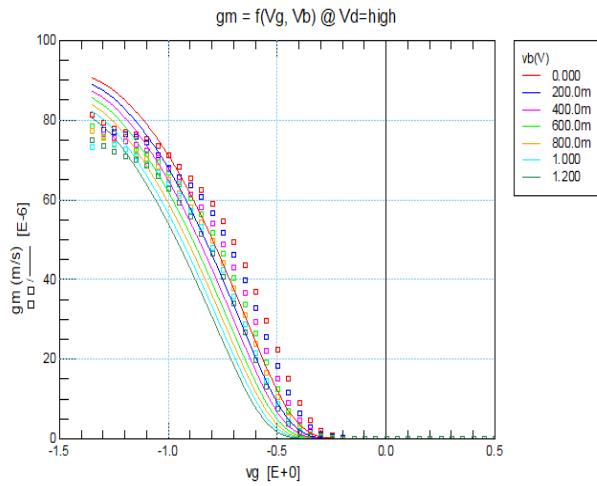
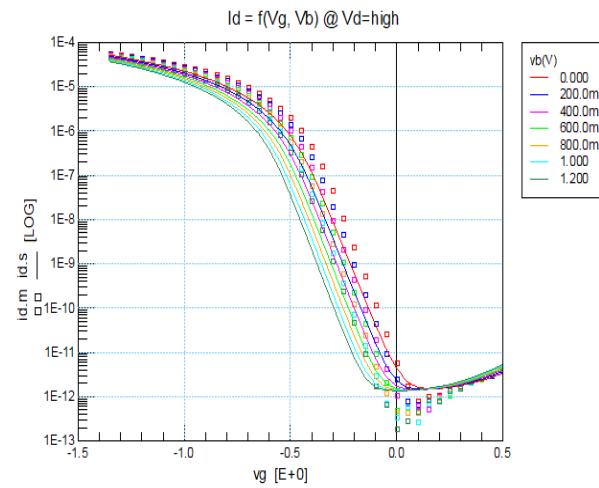
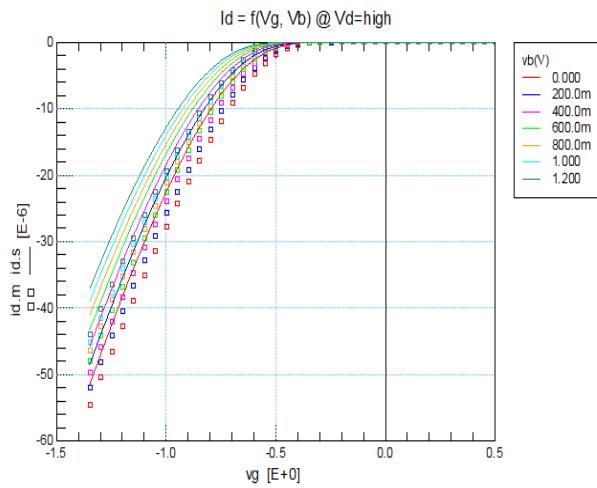
## 4.30 W0u15\_L0u15\_S554\_5

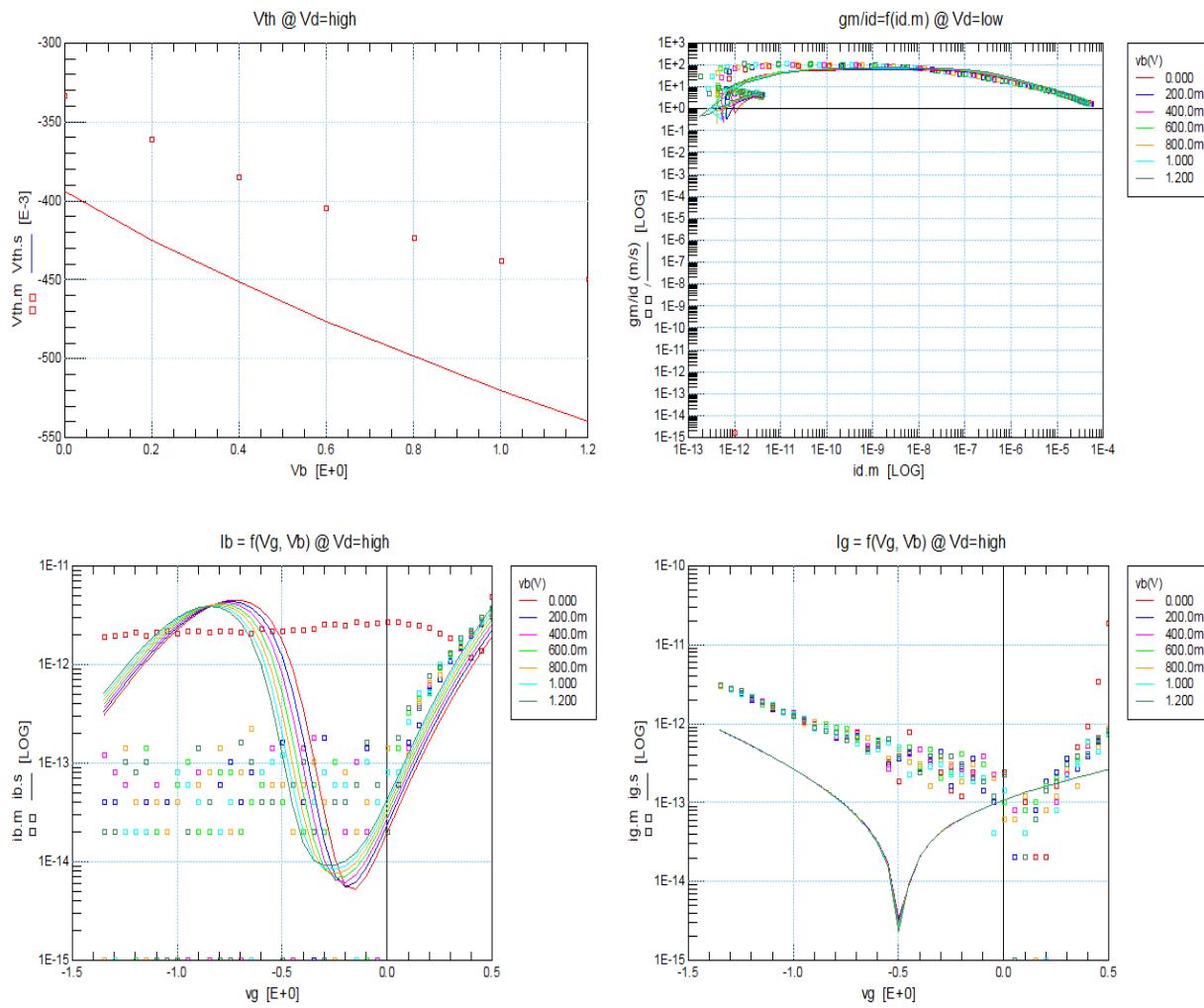
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



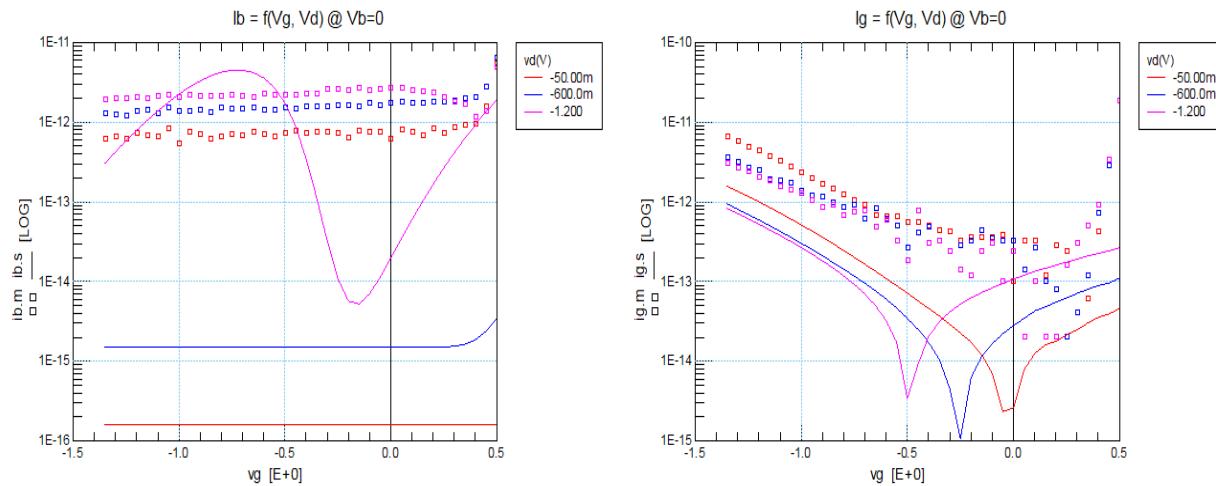


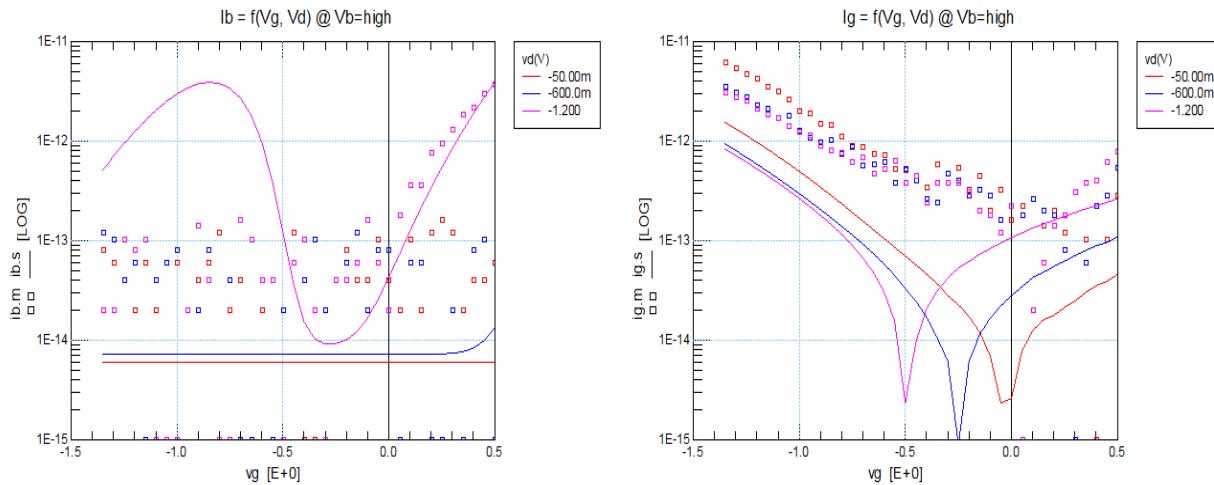
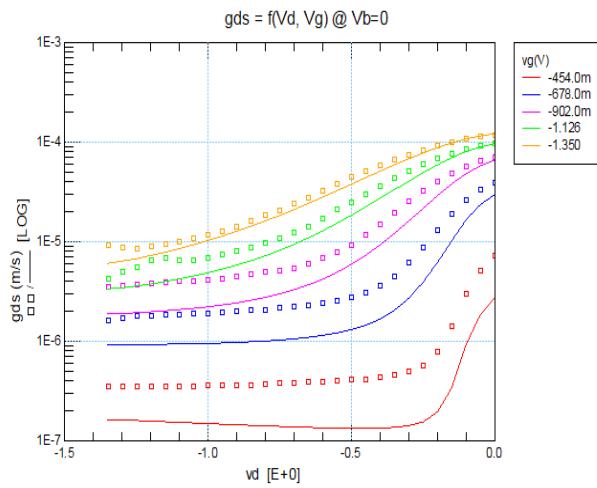
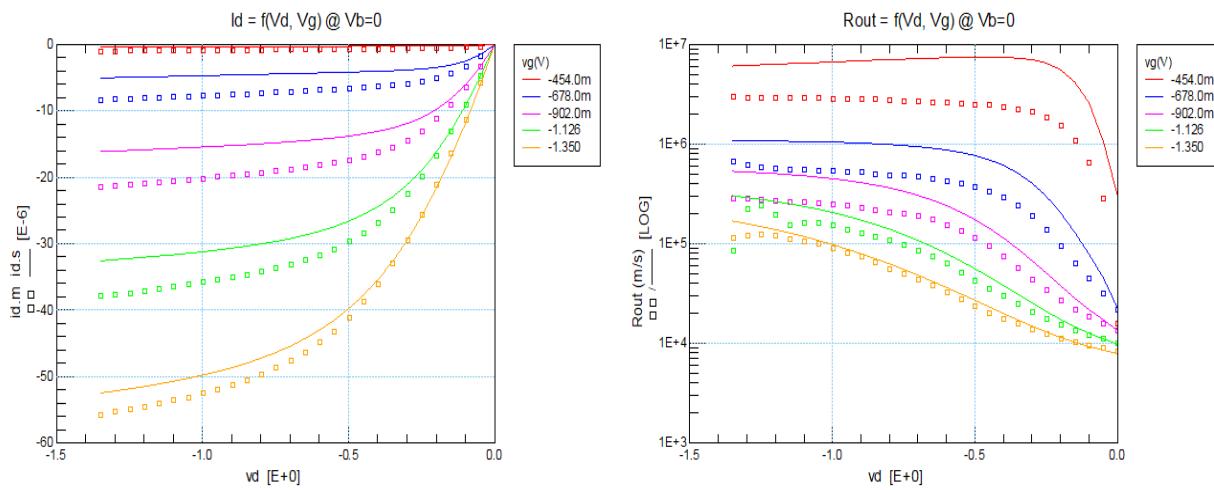
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

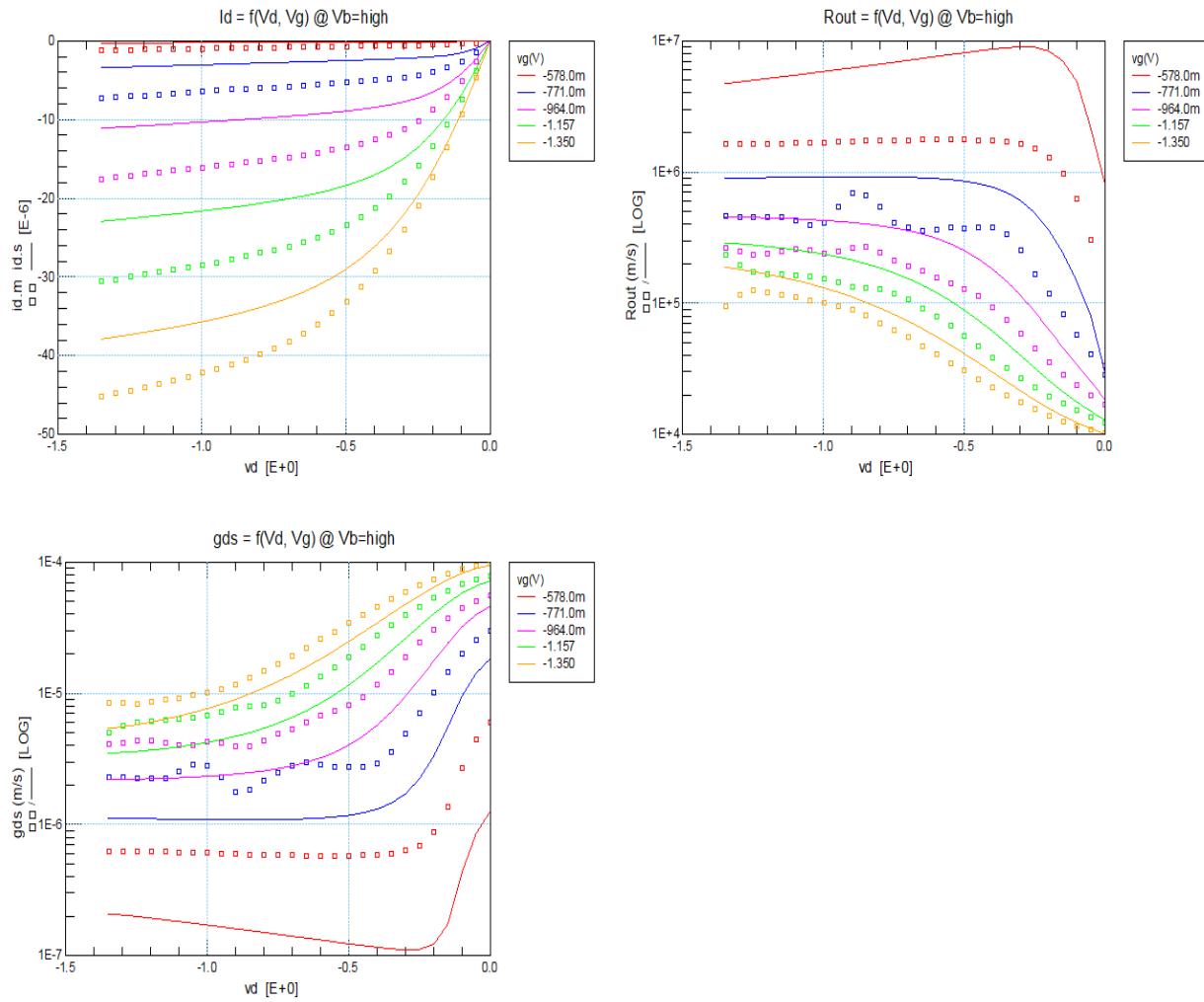
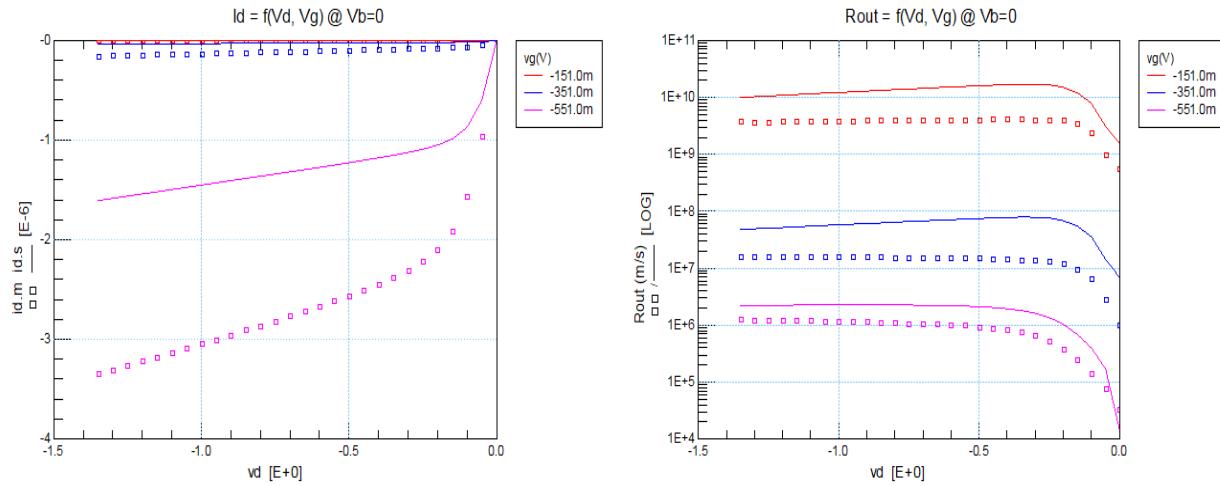


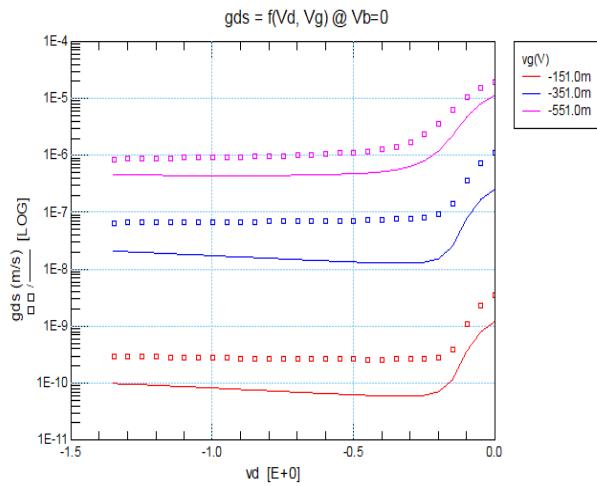


### $i_d v_g, I_b, l_g, V_b = 0V, T = 27^\circ C$

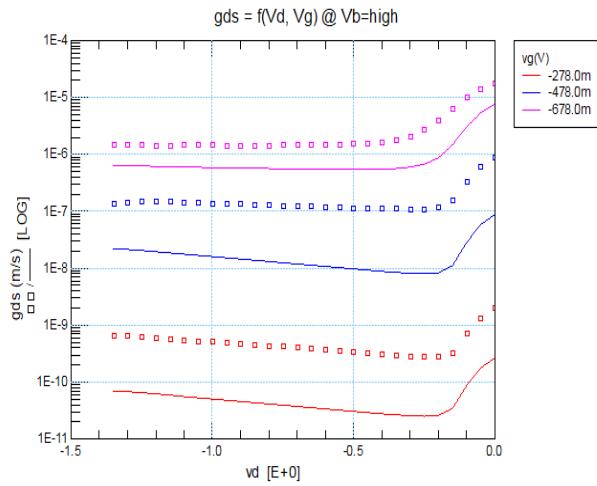
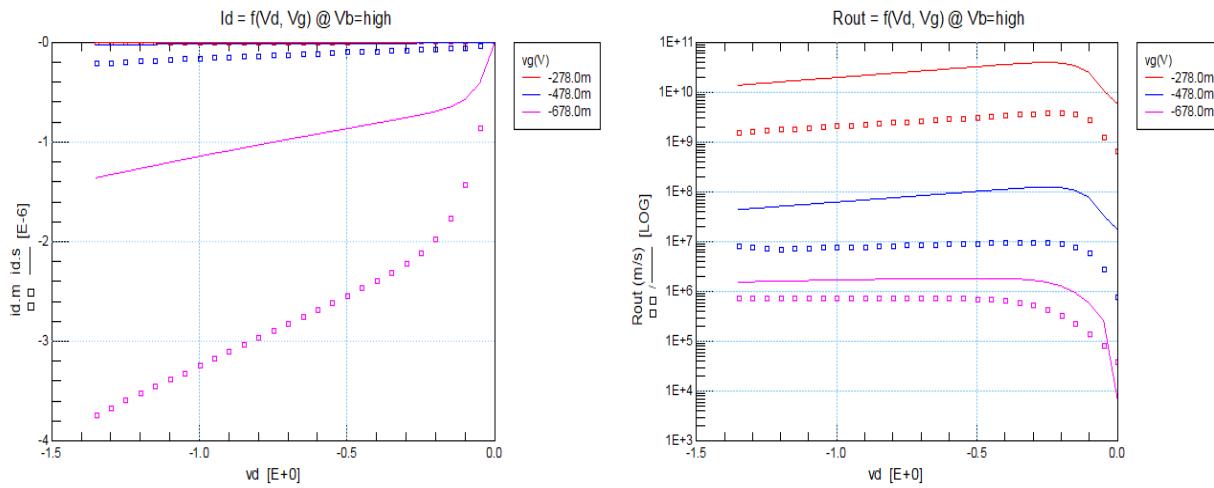


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

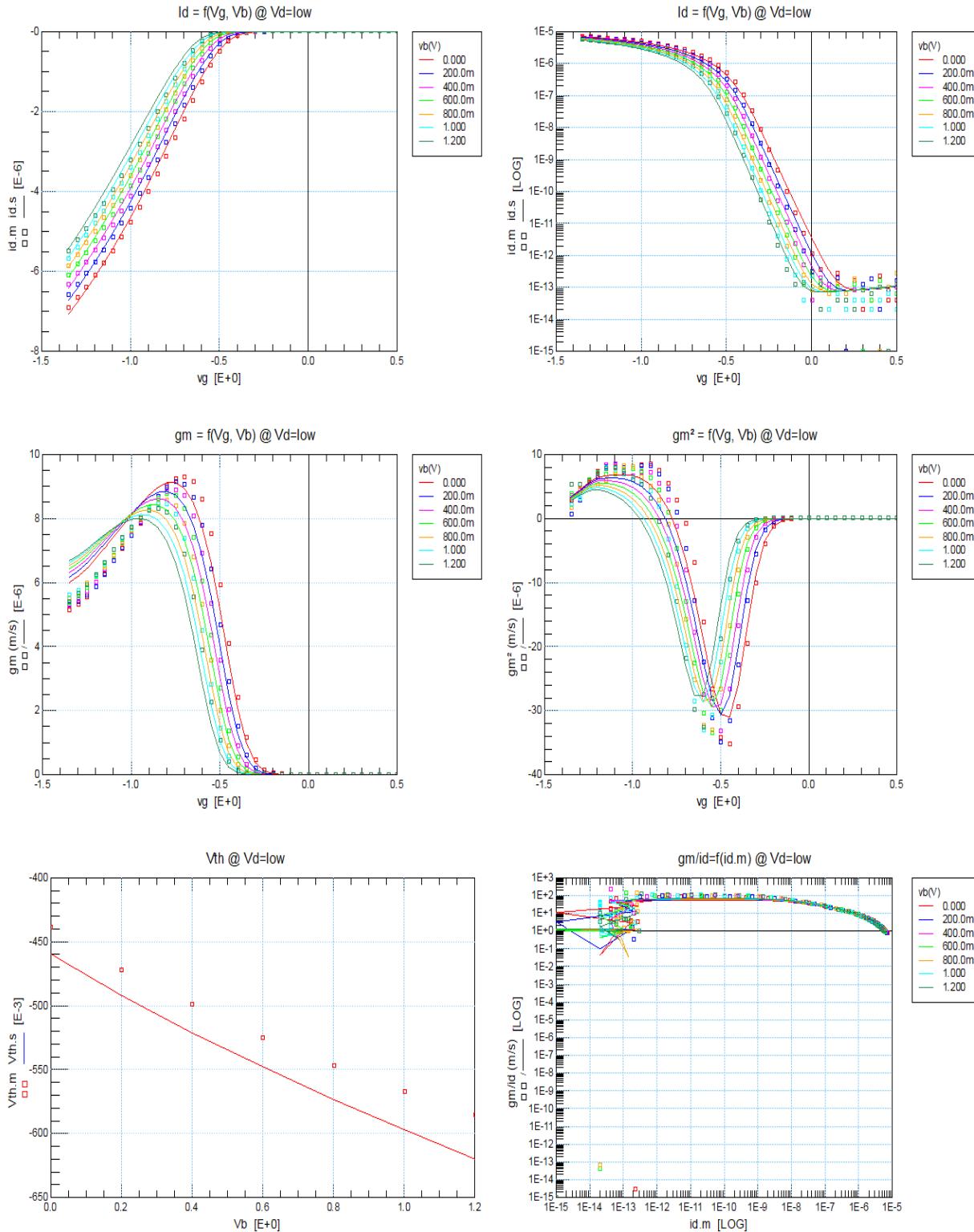


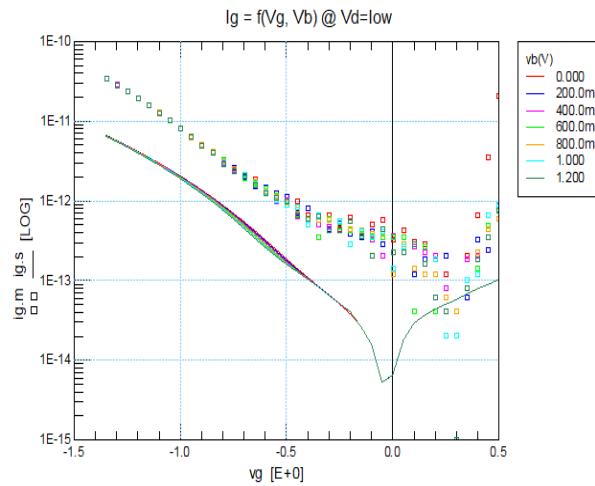
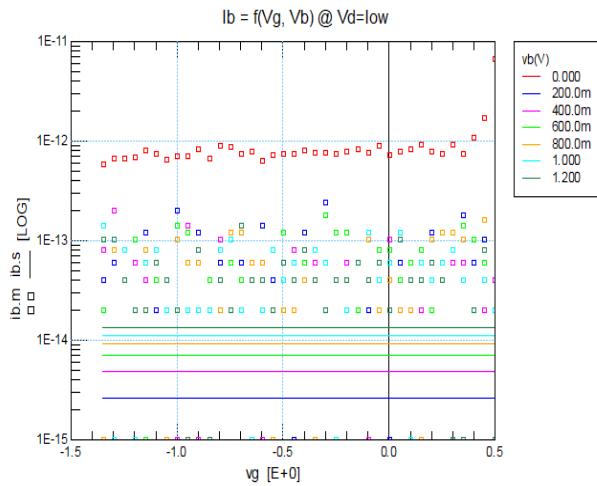
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



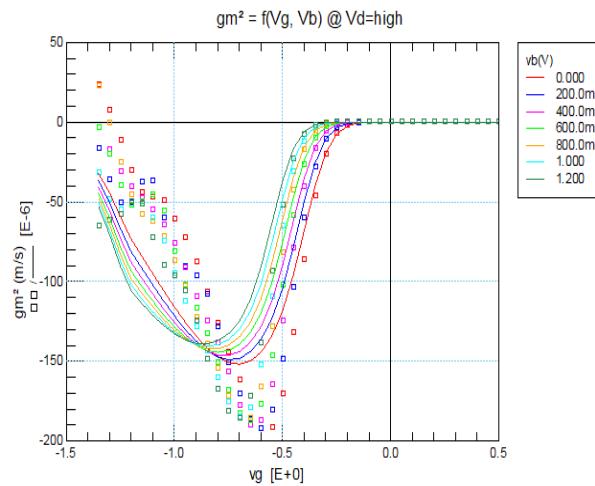
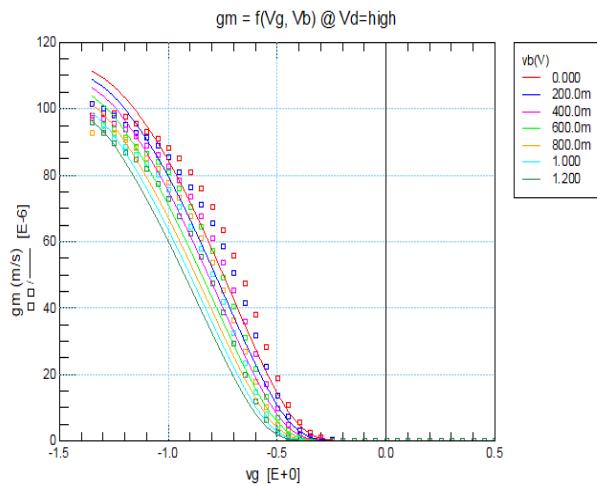
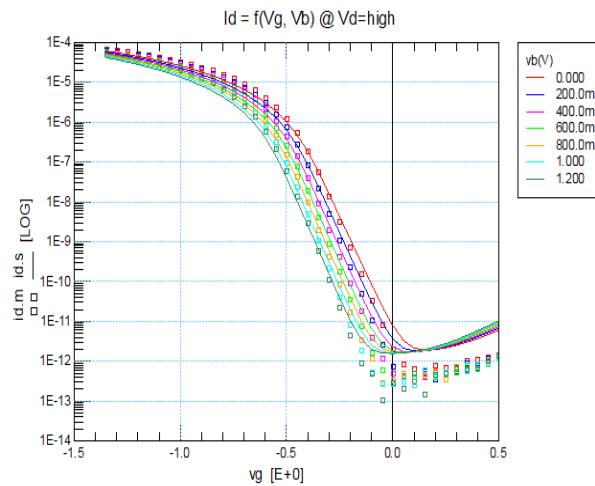
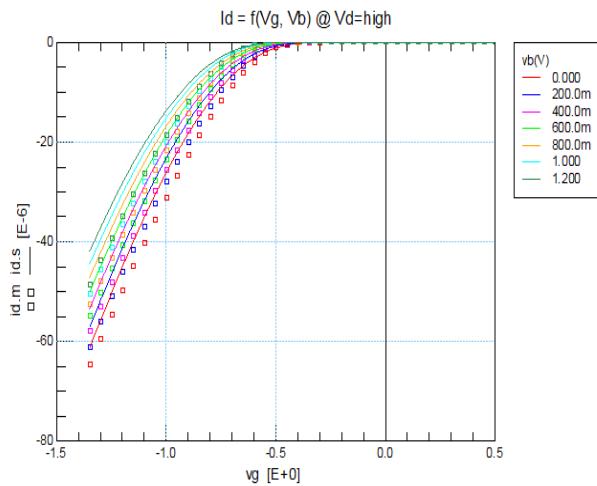
## 4.31 W0u3\_L0u18\_S552\_5

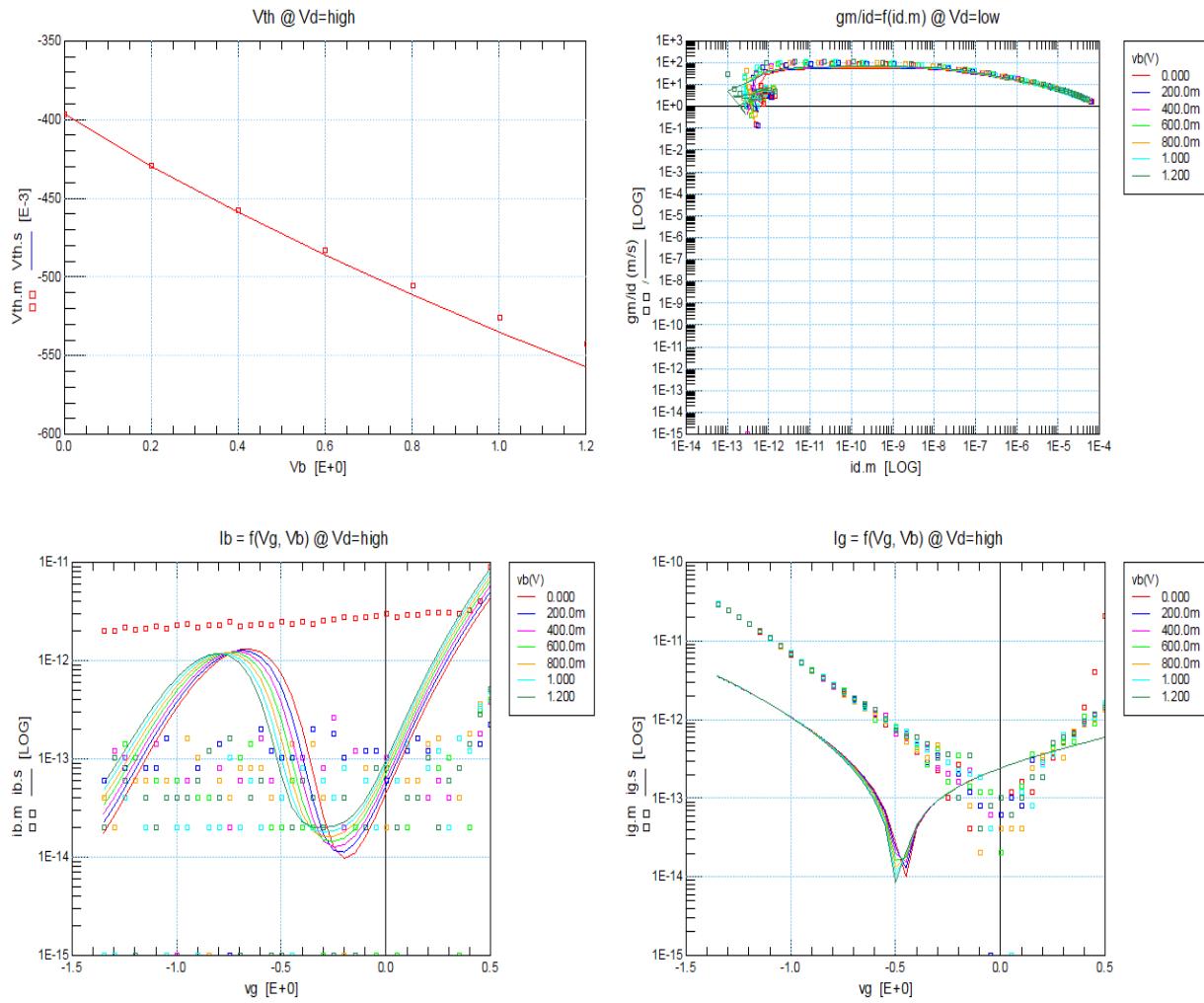
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



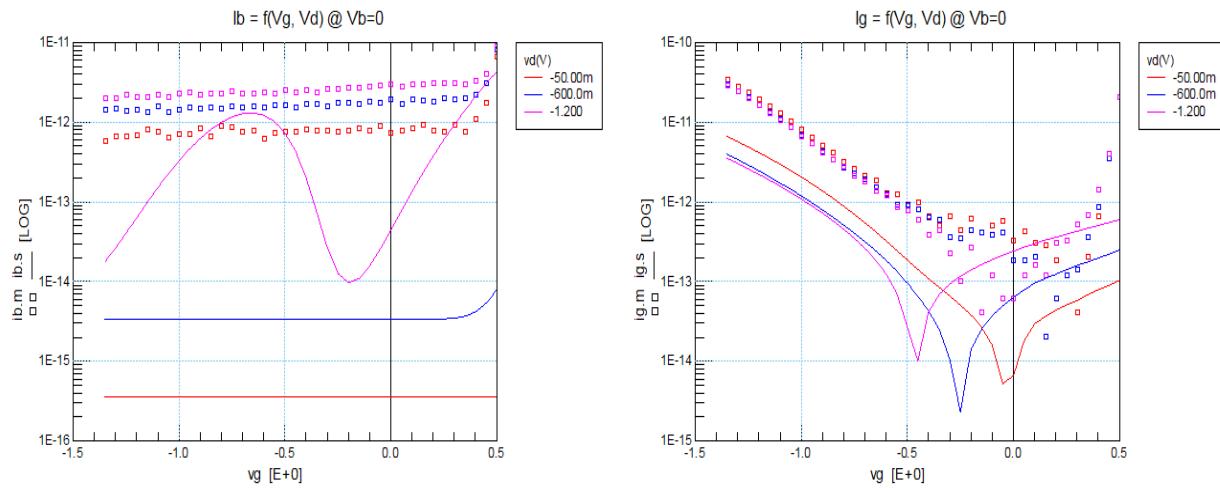


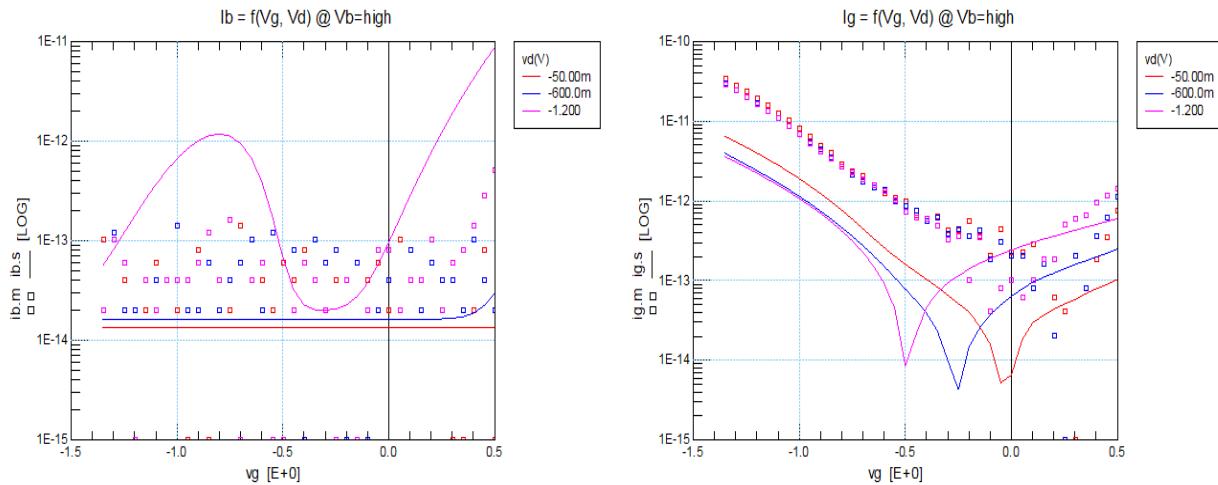
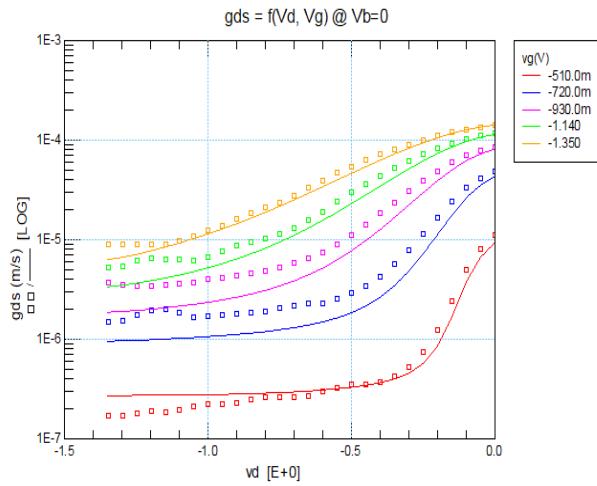
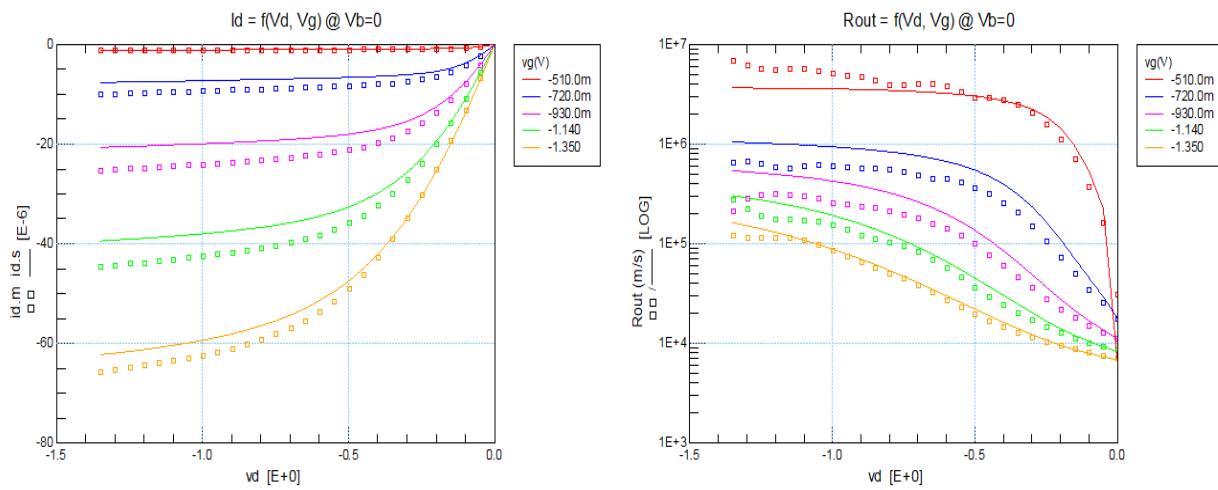
$i_d v_g, V_d = -1.2V, T = 27^\circ C$

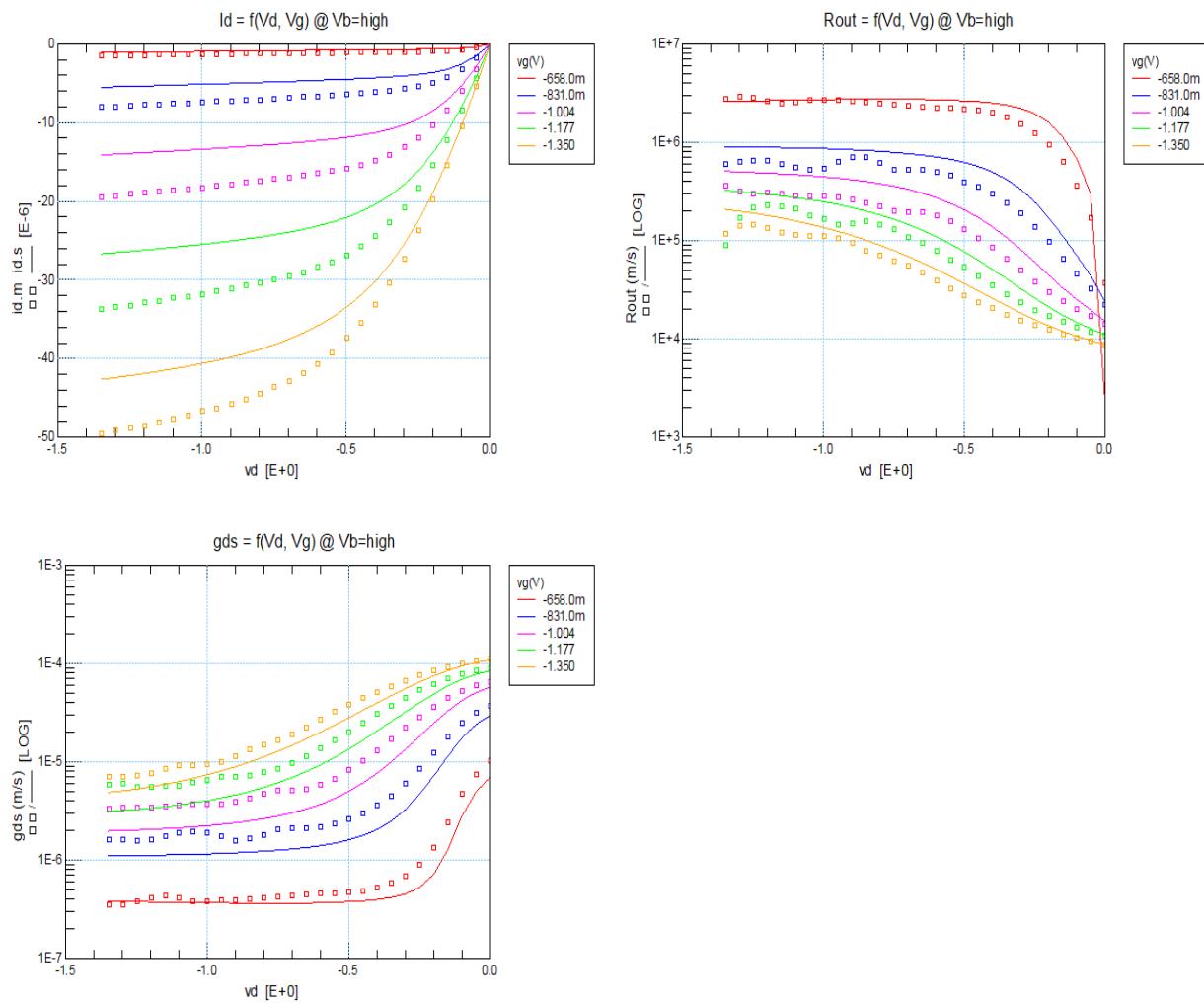
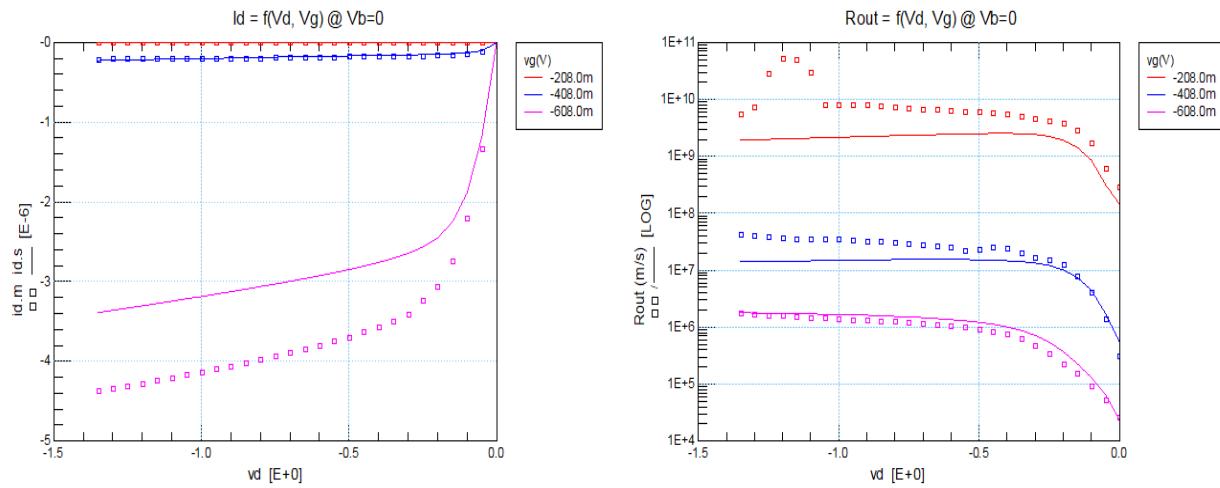


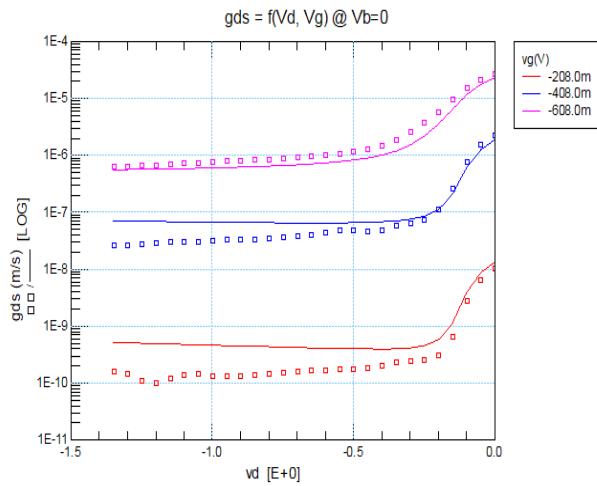


**idvg, Ib,lg, Vb = 0V, T = 27°C**

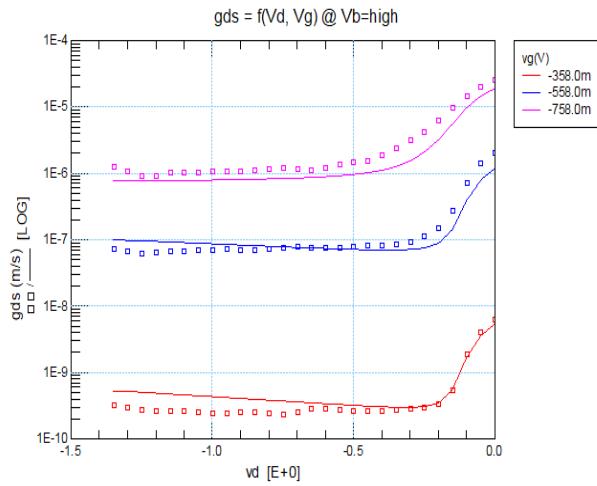
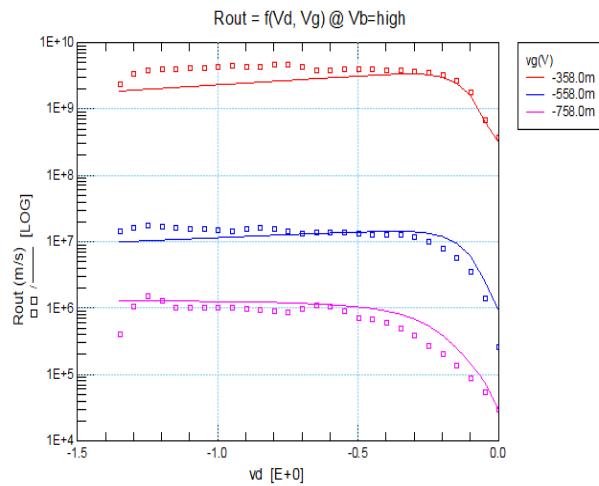
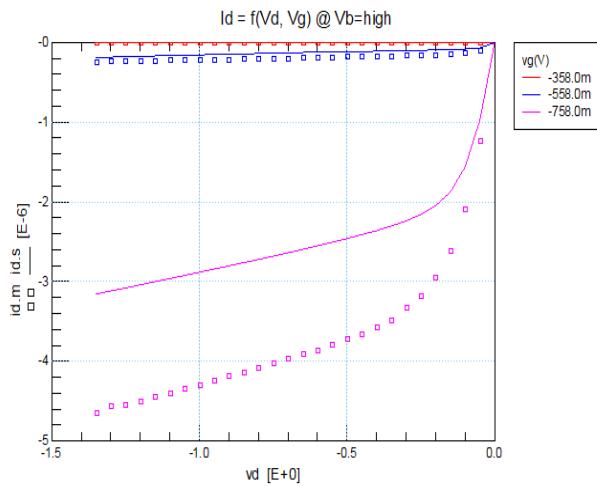


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**


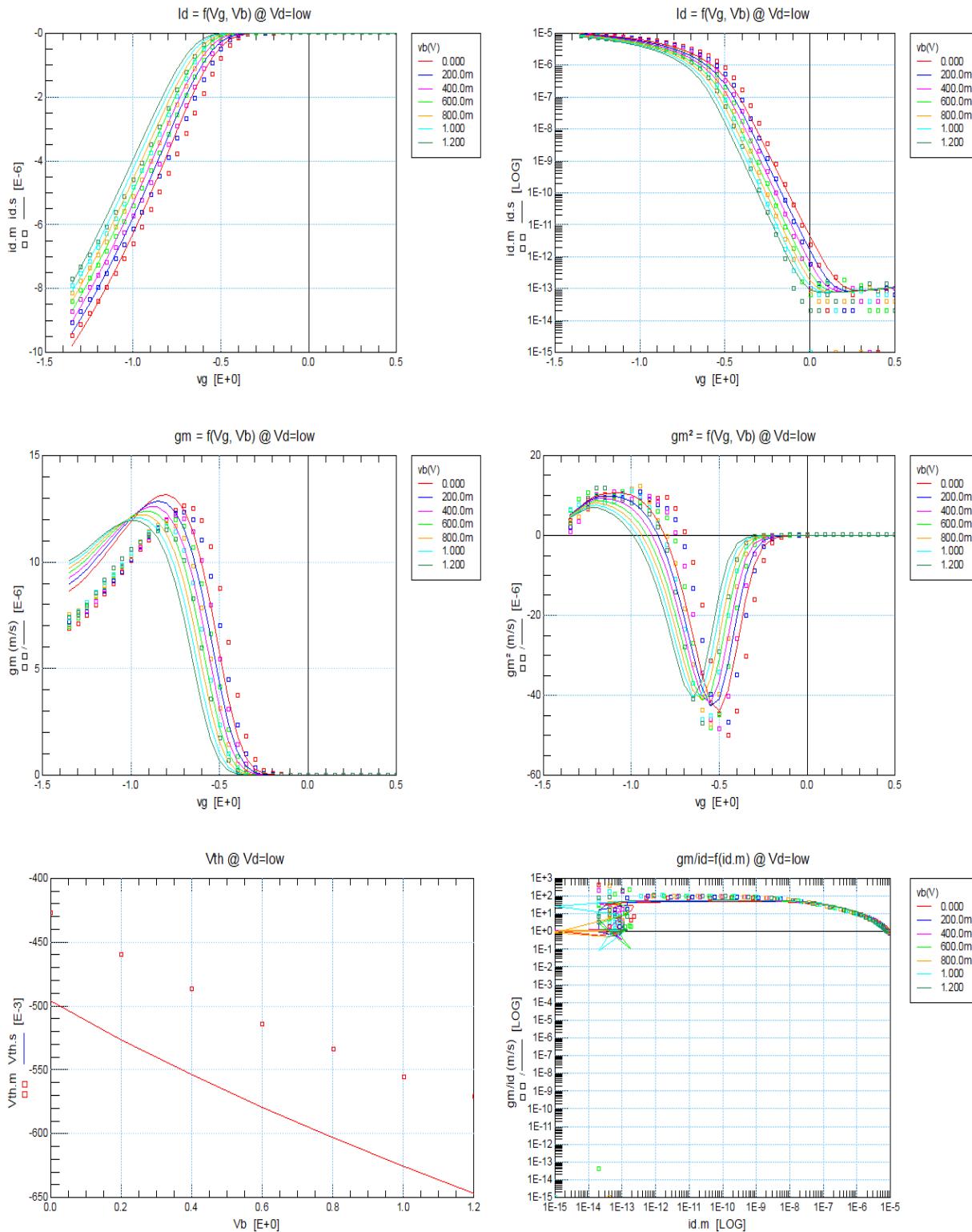


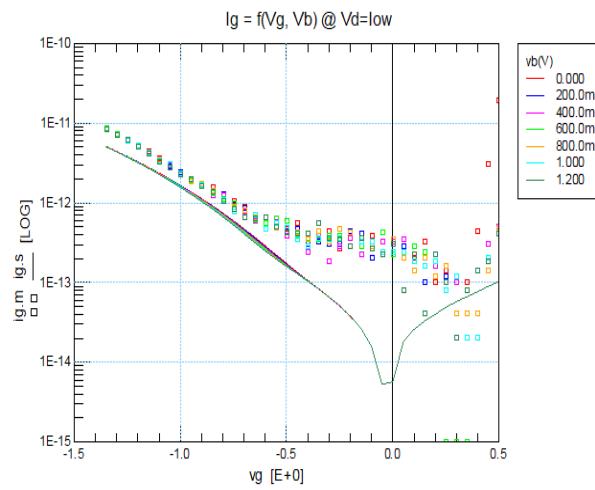
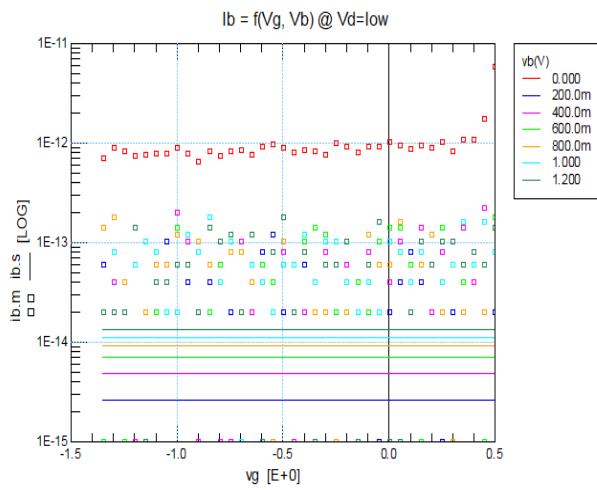
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



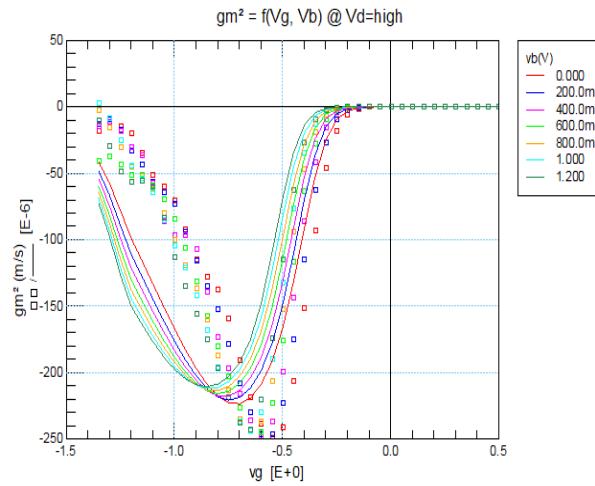
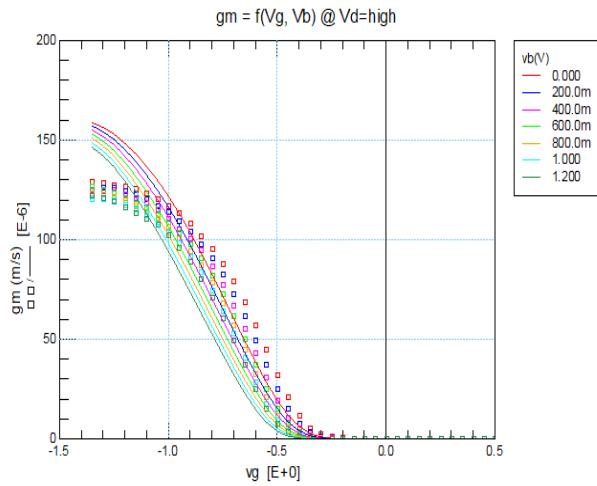
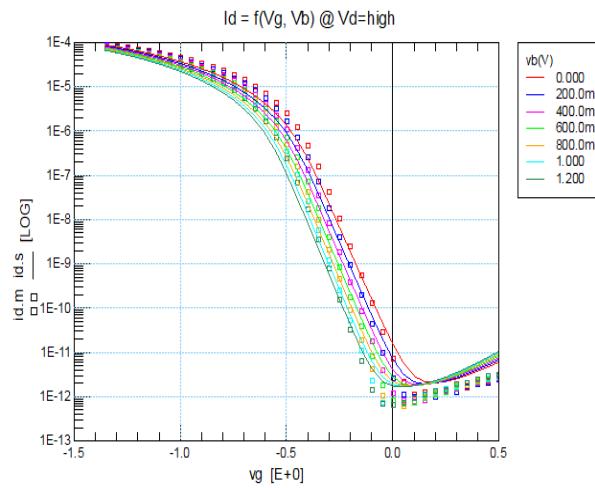
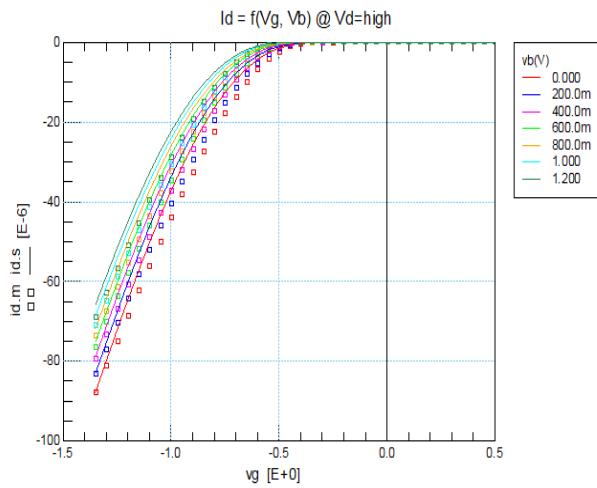
## 4.32 W0u3\_L0u13\_S552\_2

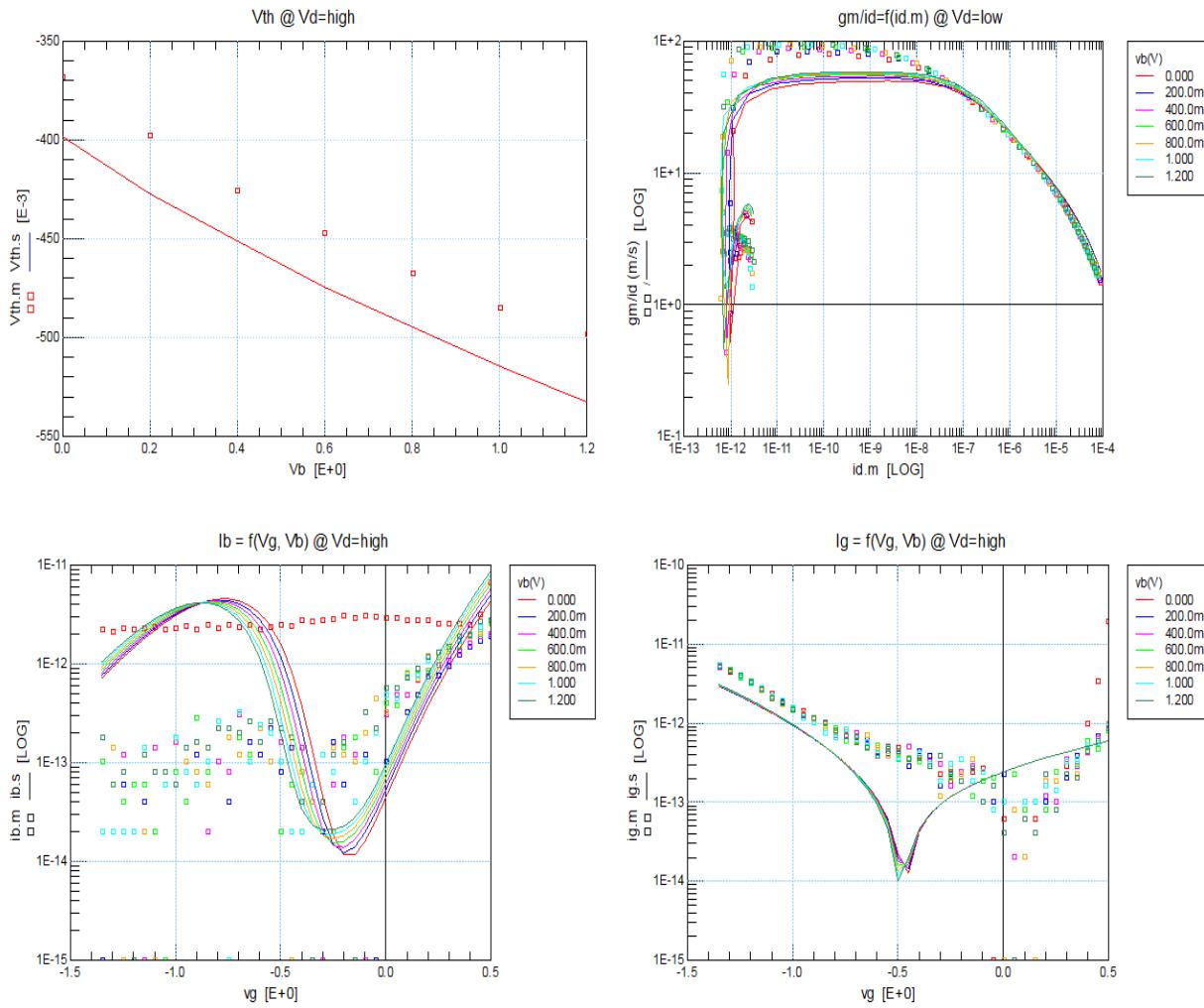
idvg, Vd = -0.05V, T = 27°C



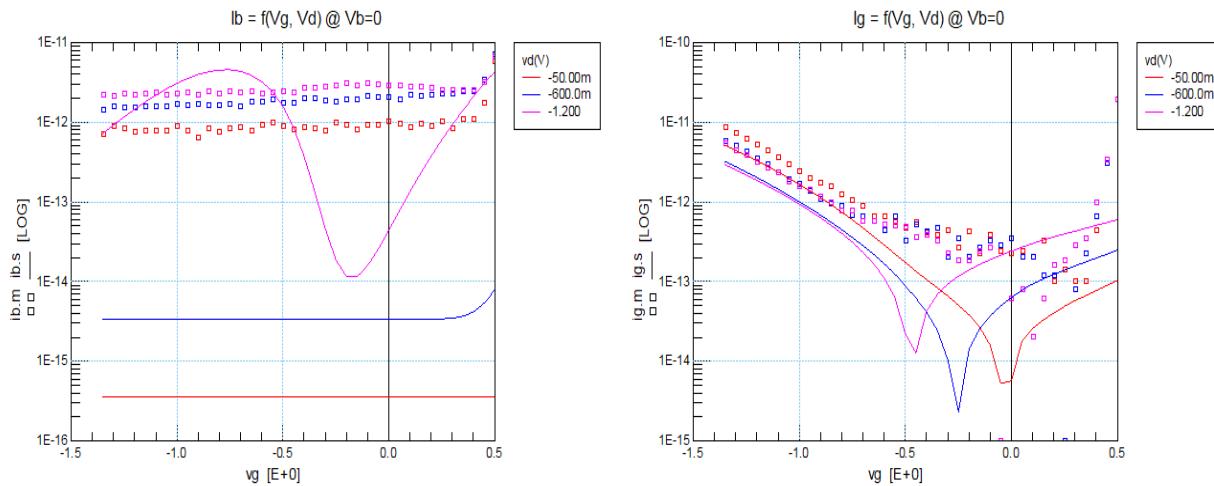


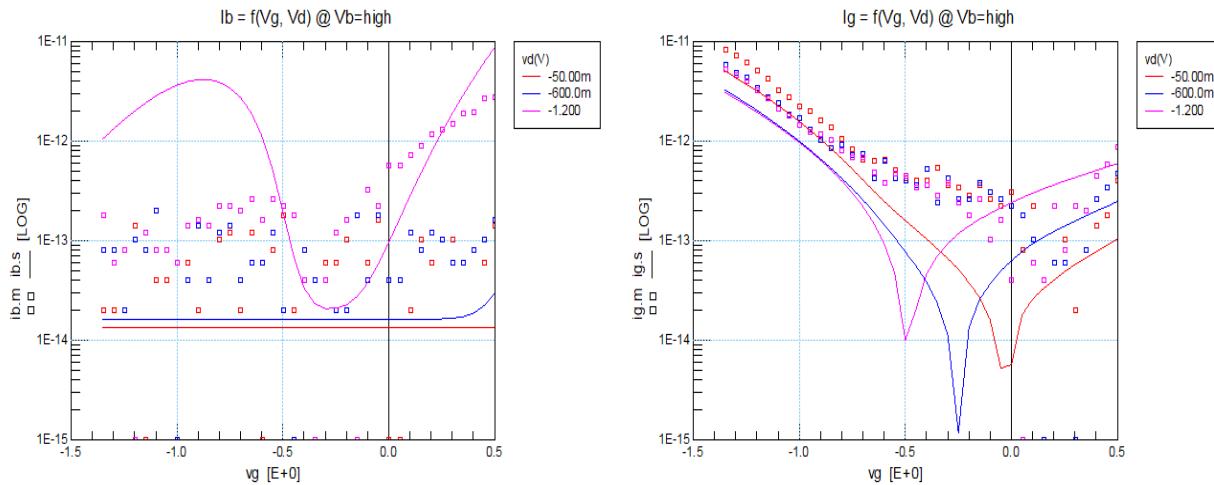
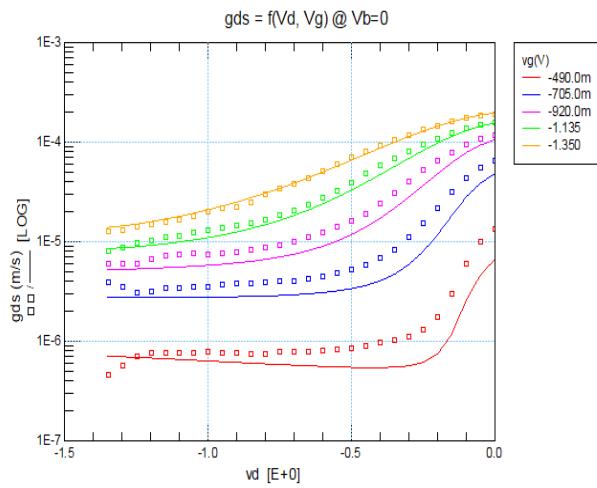
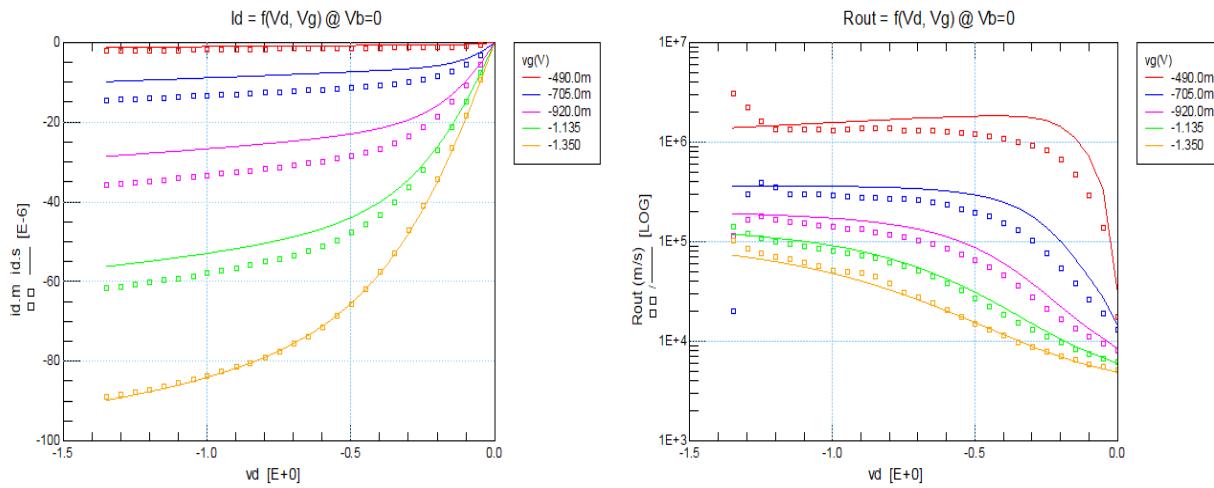
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

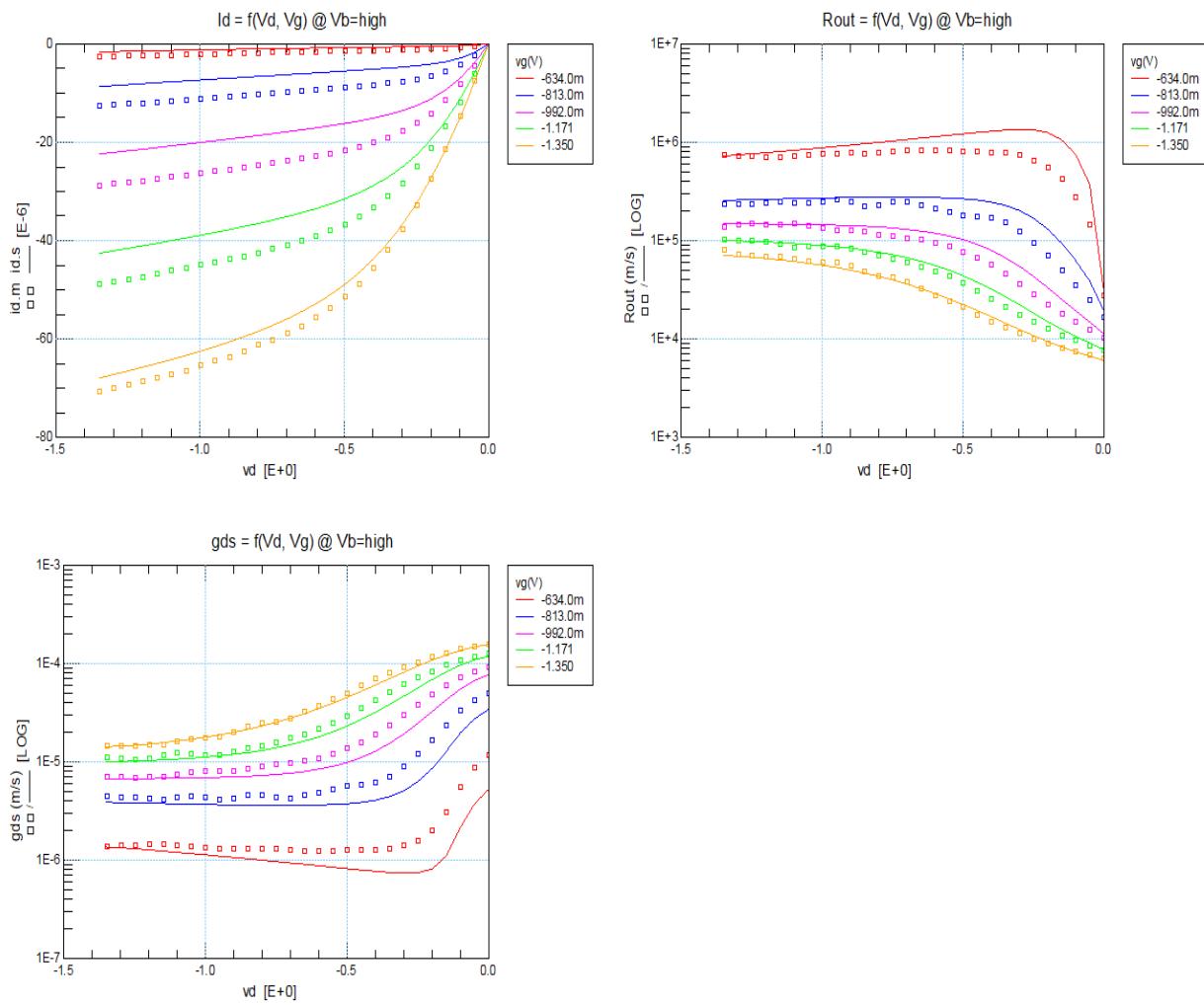
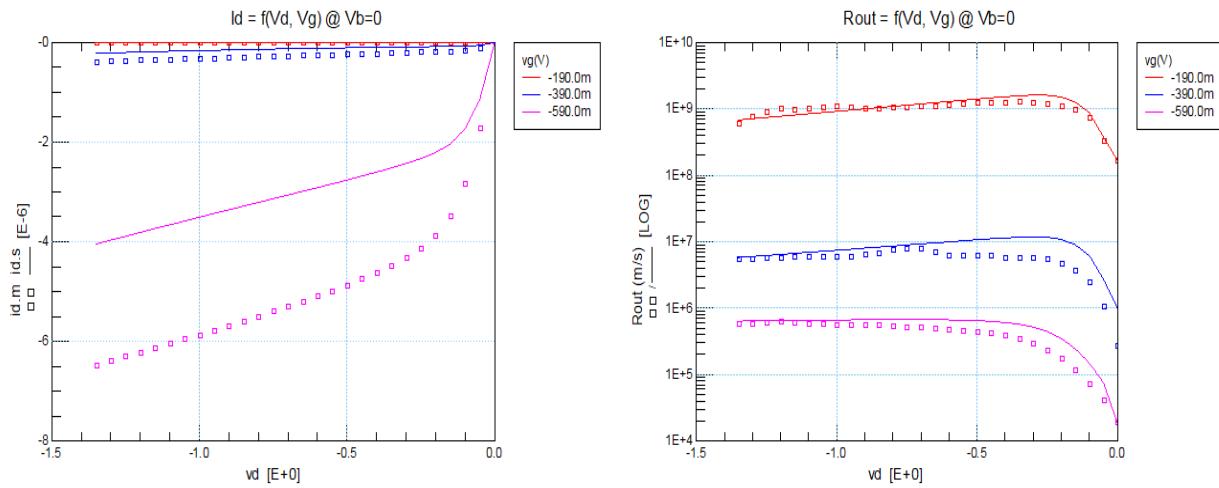


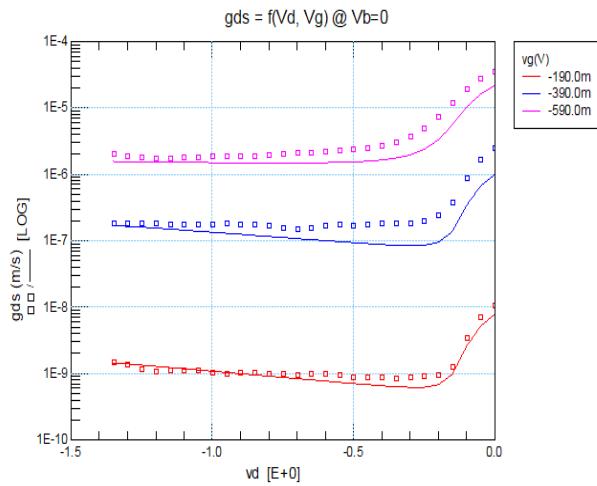


$id_{vg}, I_b, I_g, V_b = 0V, T = 27^\circ\text{C}$

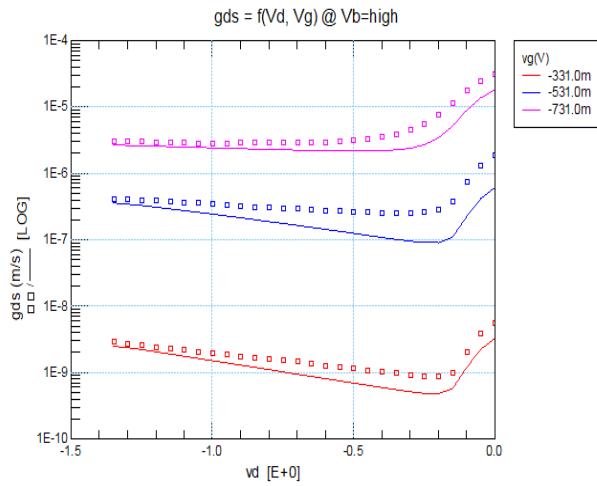
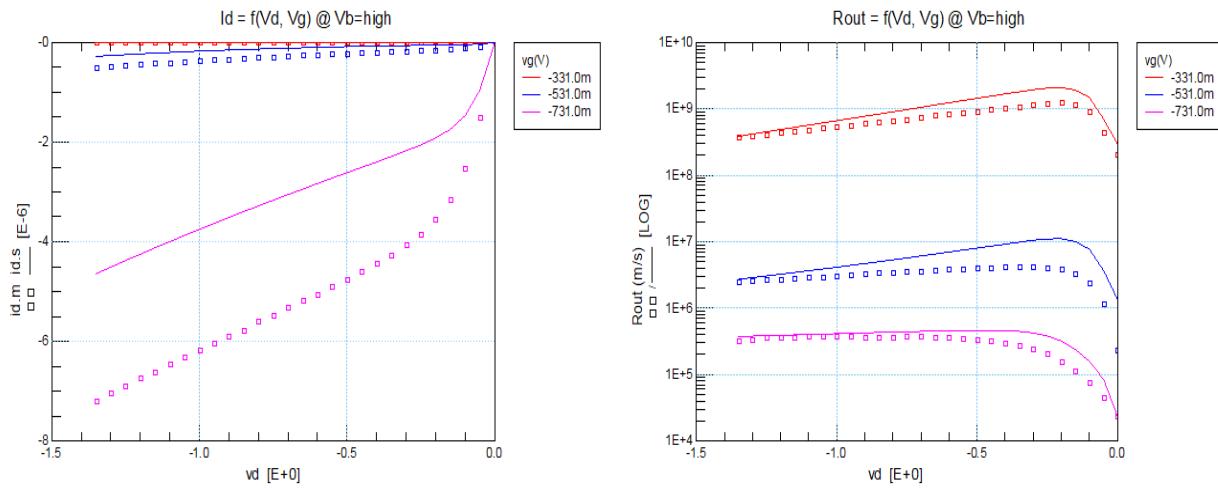


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


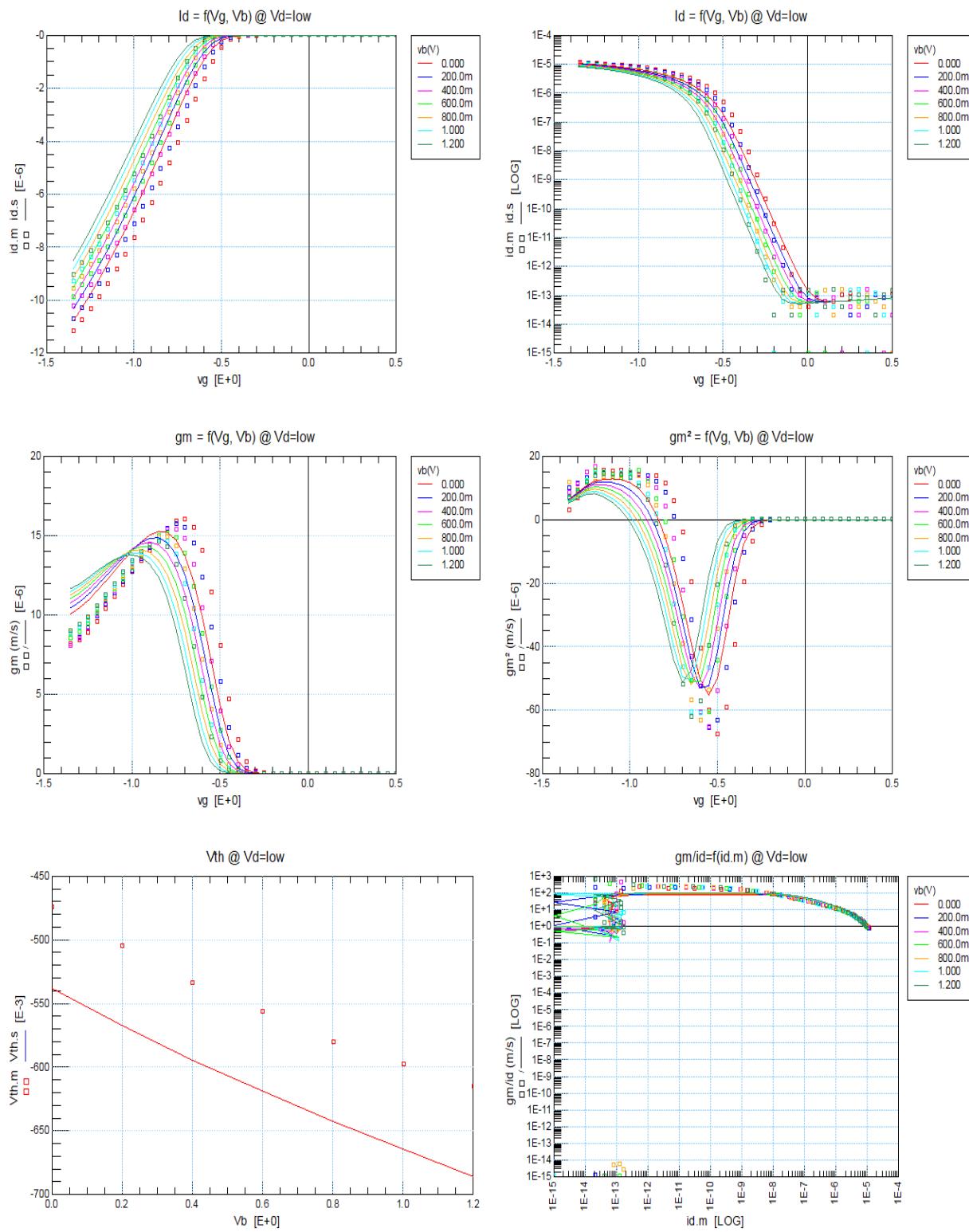
**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

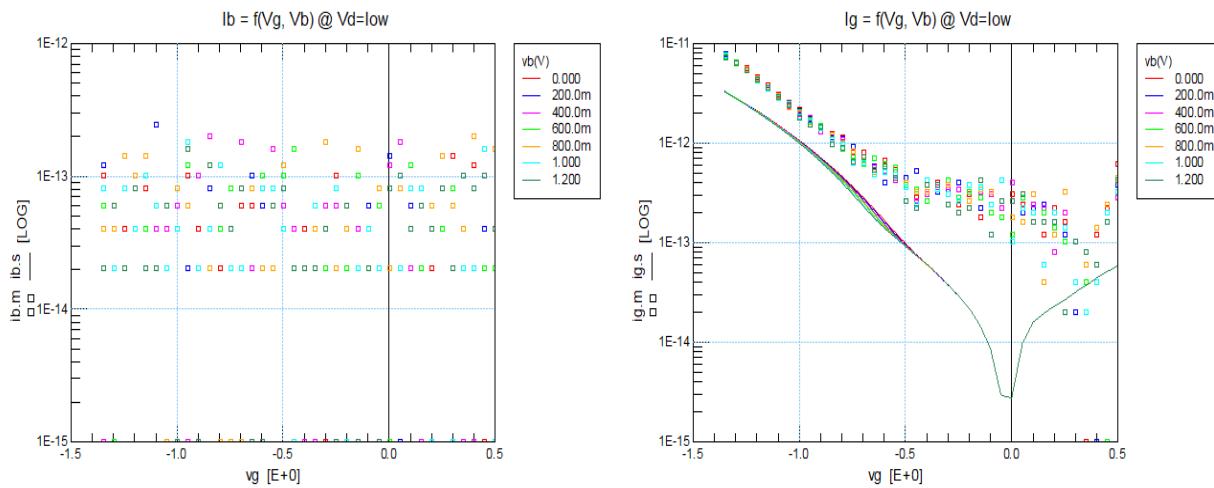


idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

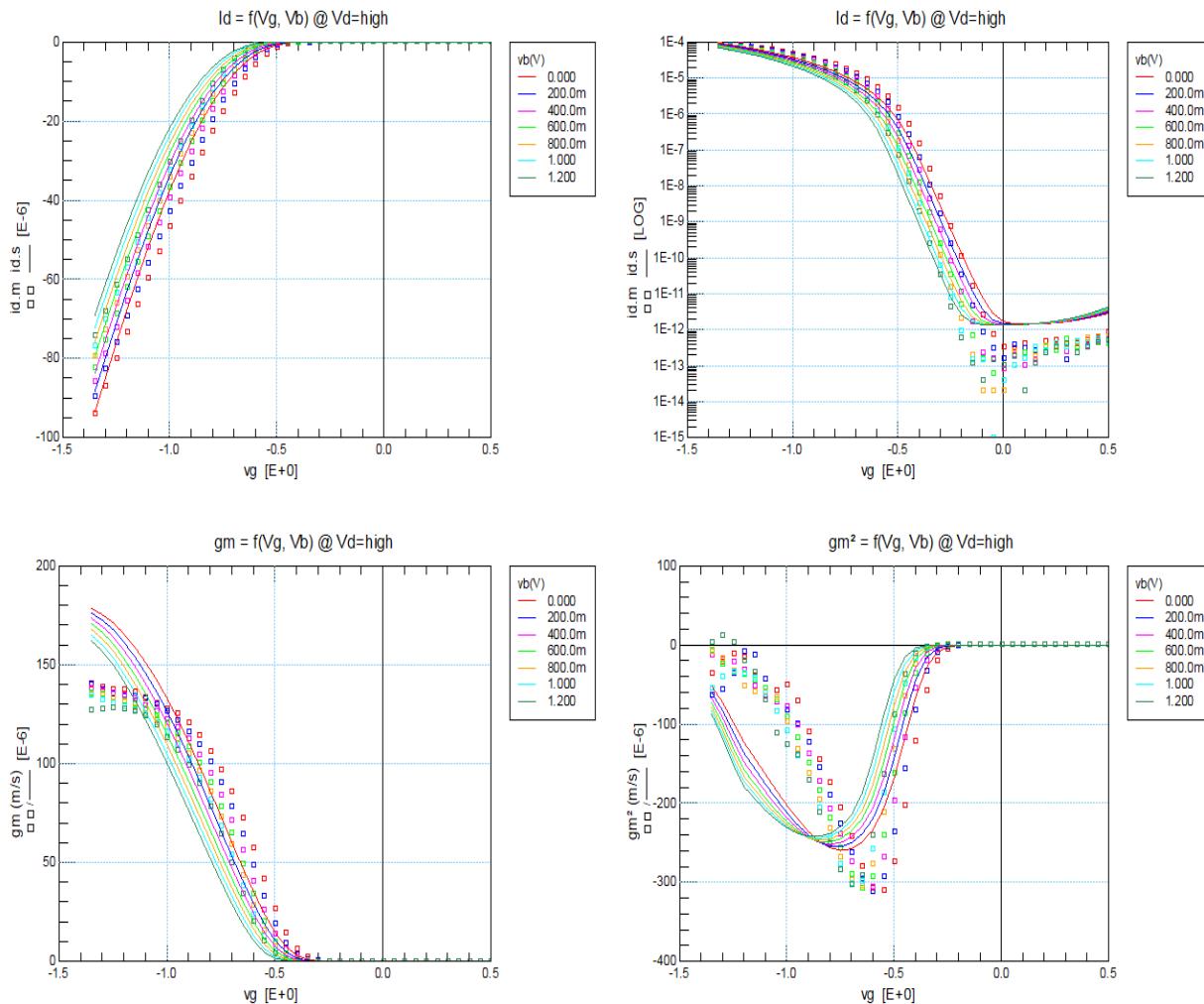


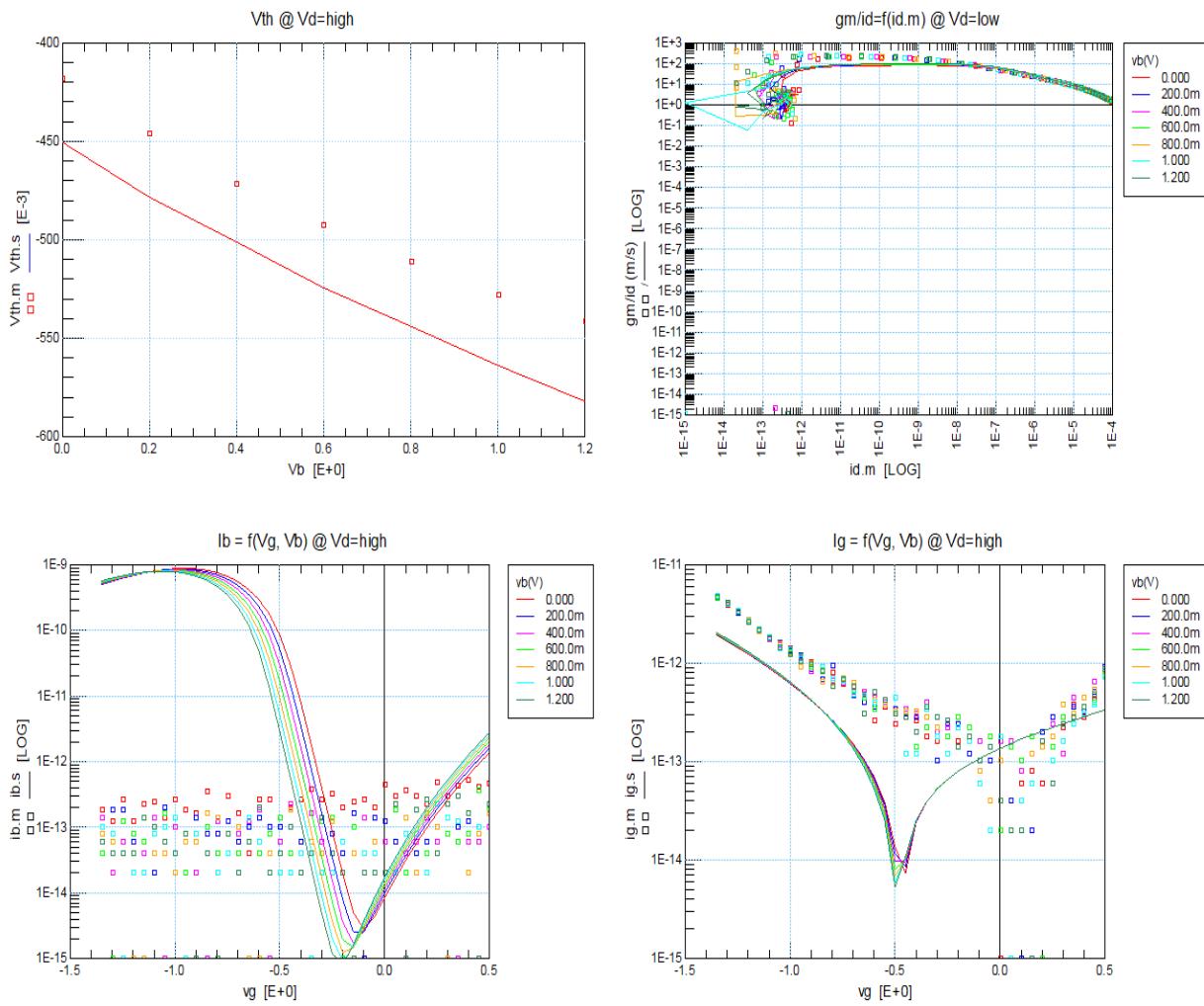
**idvg, Vd = -0.05V, T = -40°C**



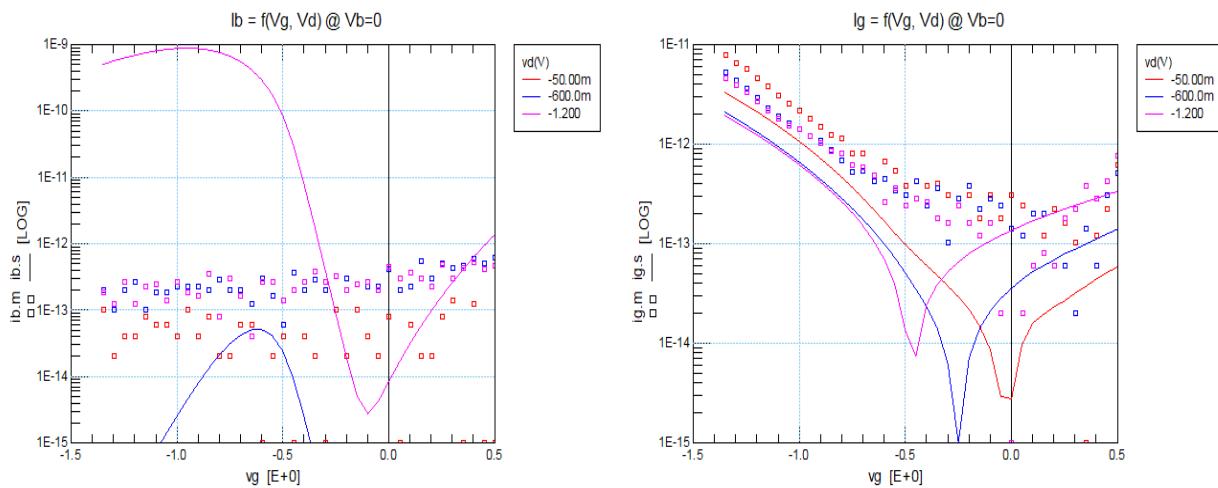


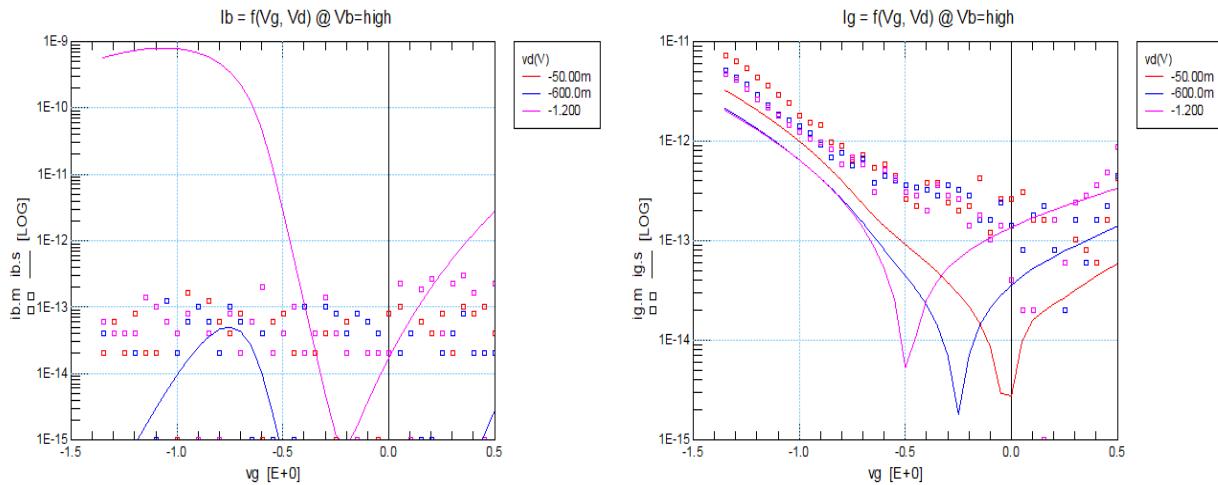
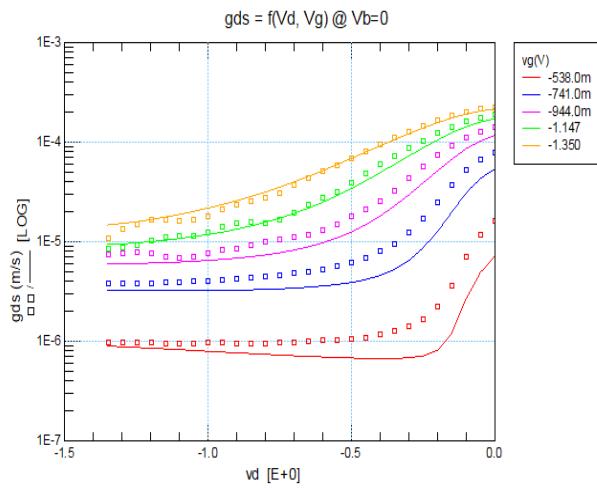
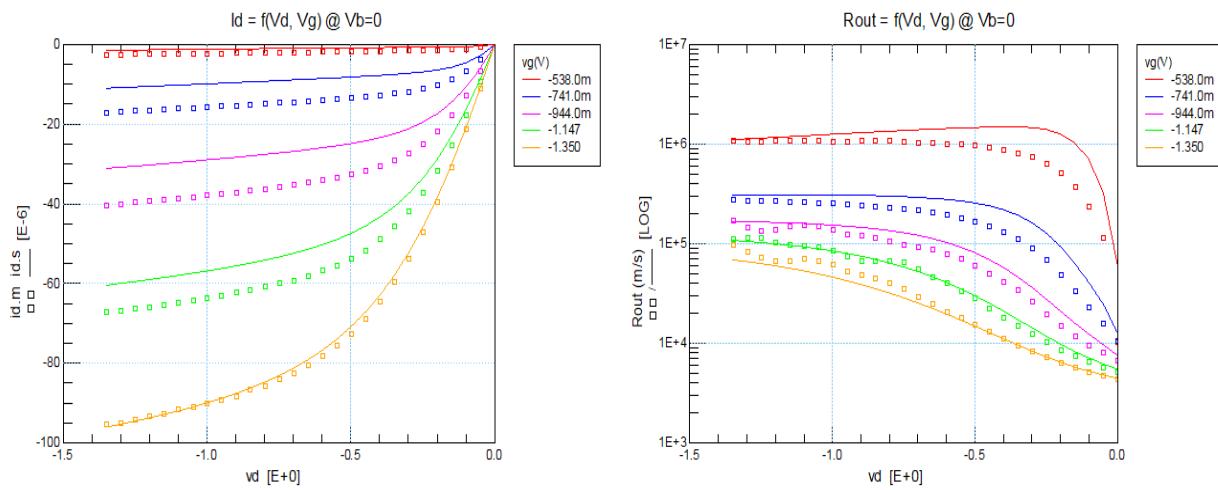
$id_{vg}, Vd = -1.2V, T = -40^\circ C$

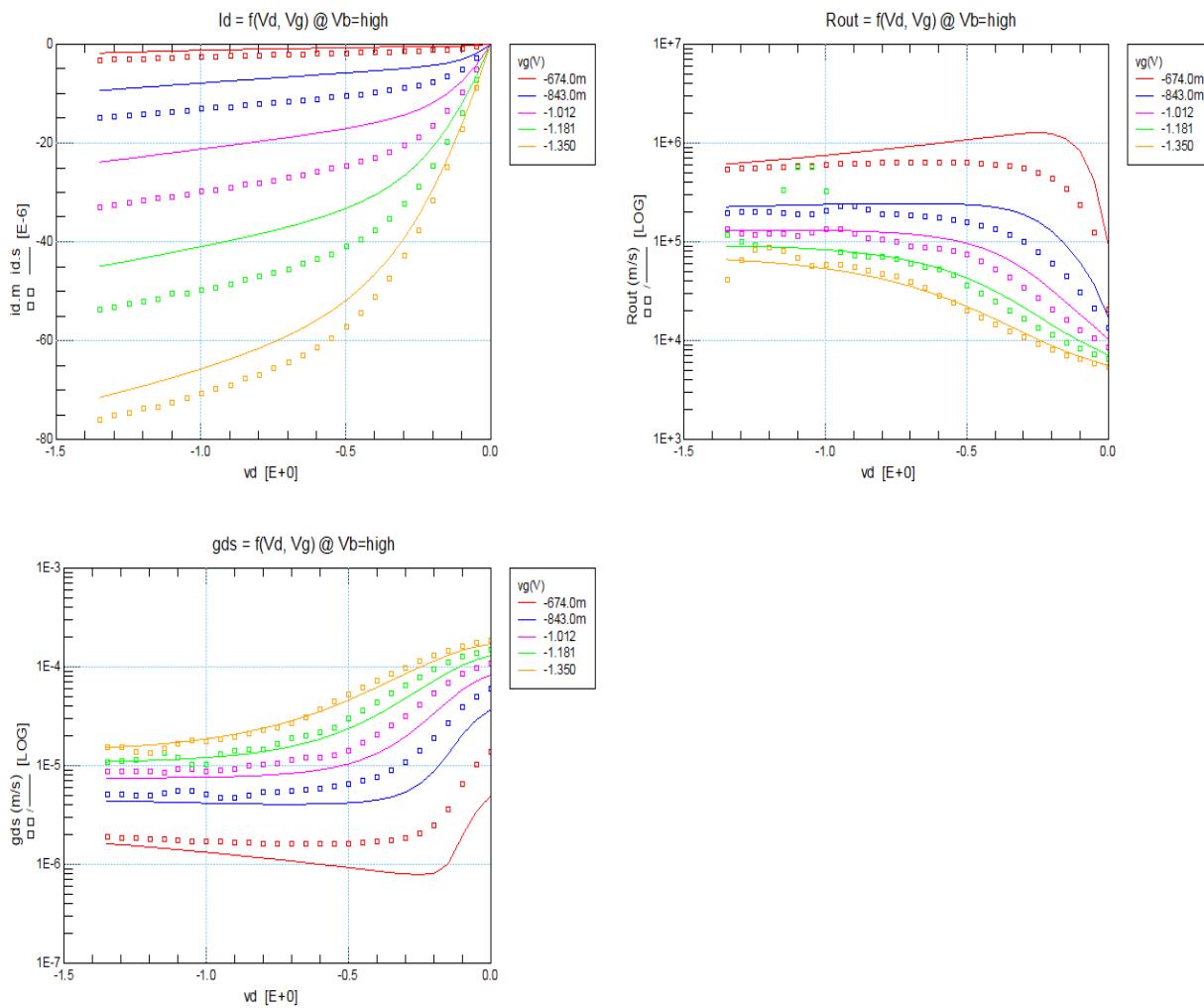
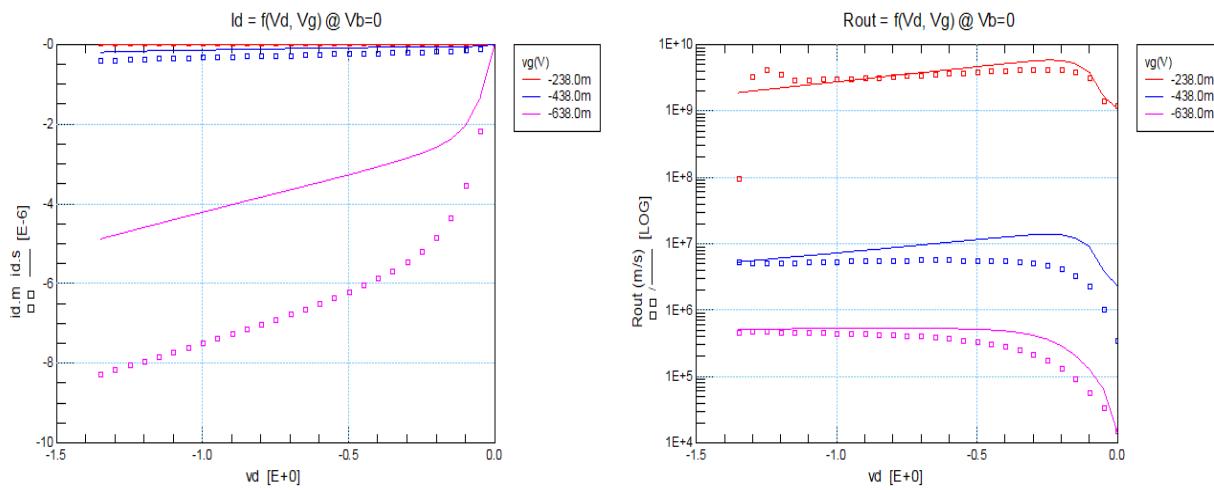


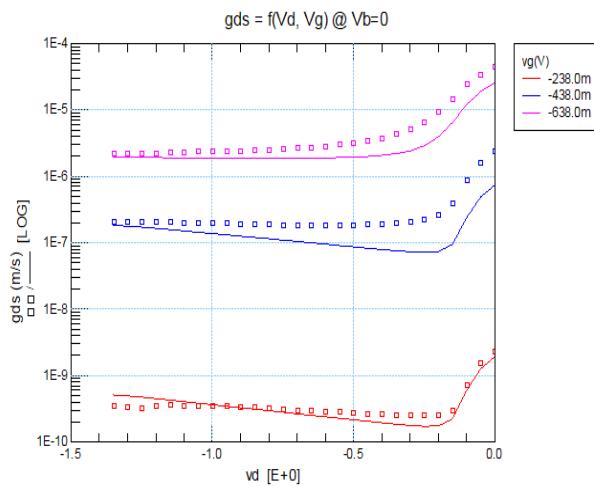


**idvg, Ib,Ig, Vb = 0V, T = -40°C**

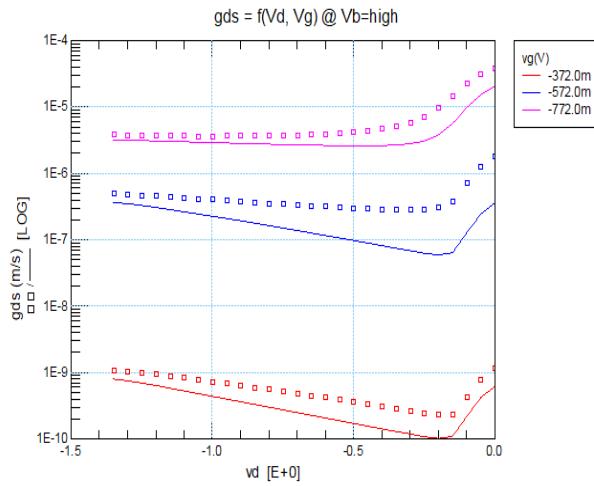
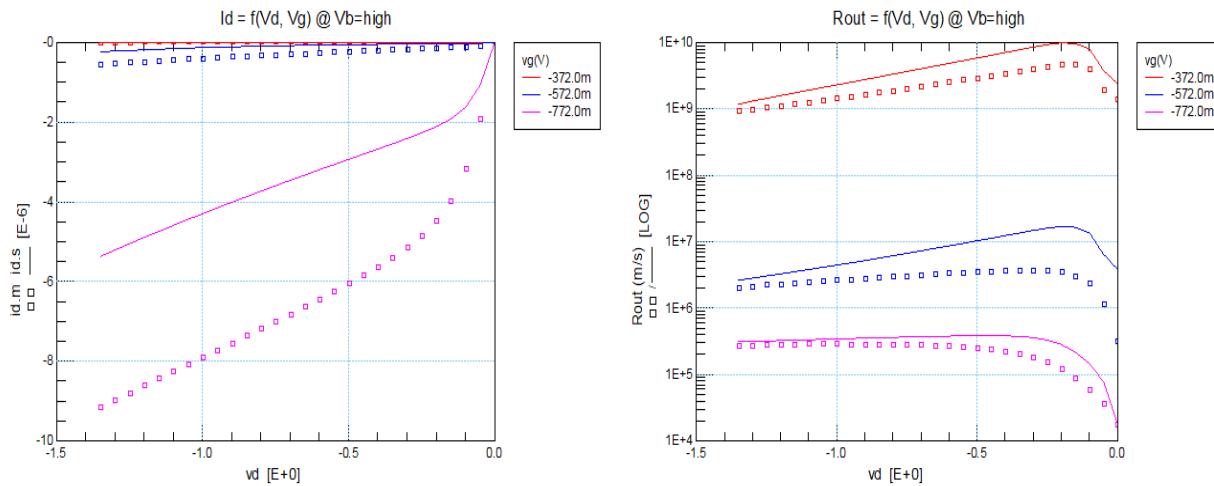


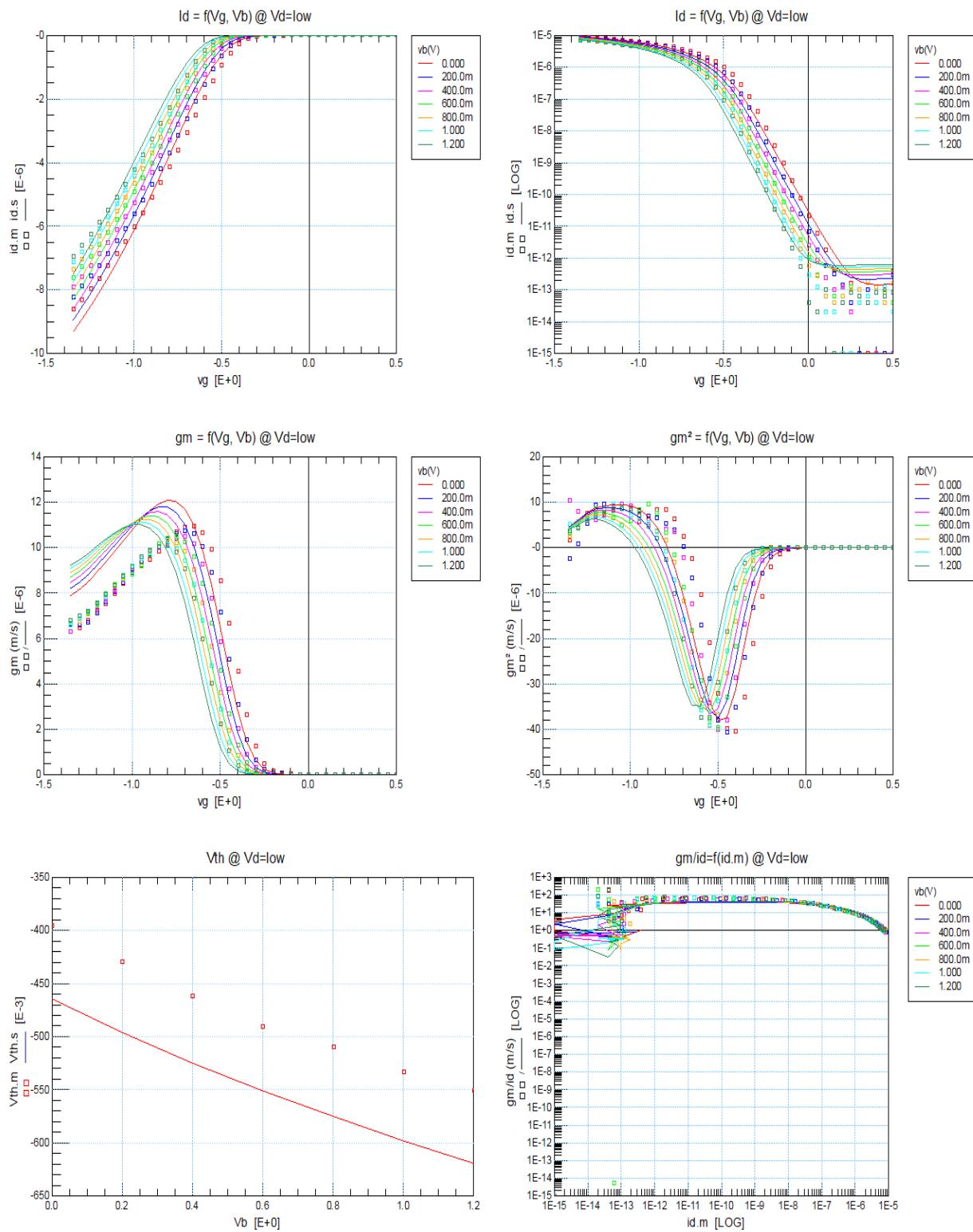
**idvg, Ib,Ig, Vb = 1.2V, T = -40°C**

**idvd, Vb = 0V, T = -40°C**


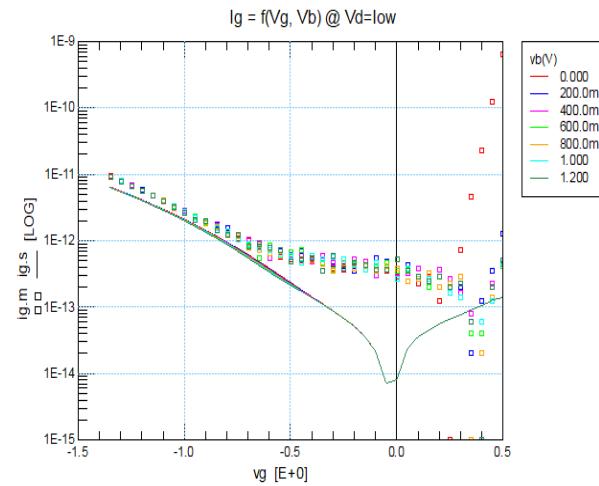
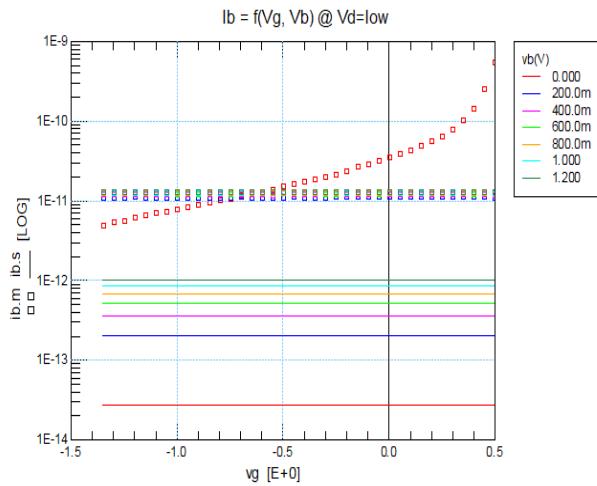
**idvd\_vbmin, Vb = 1.2V, T = -40°C**

**idvd\_vth, Vb = 0V, T = -40°C**




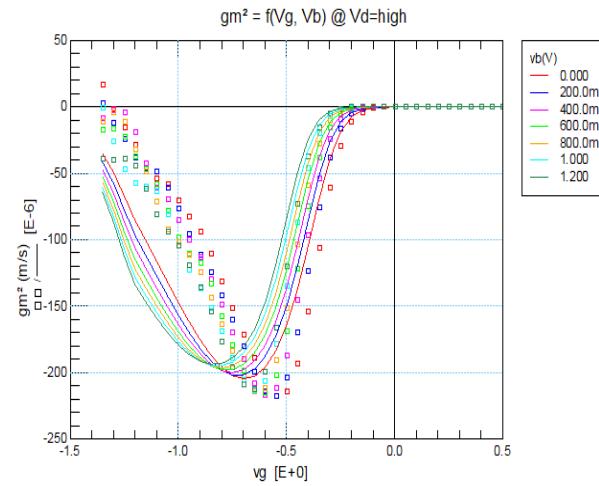
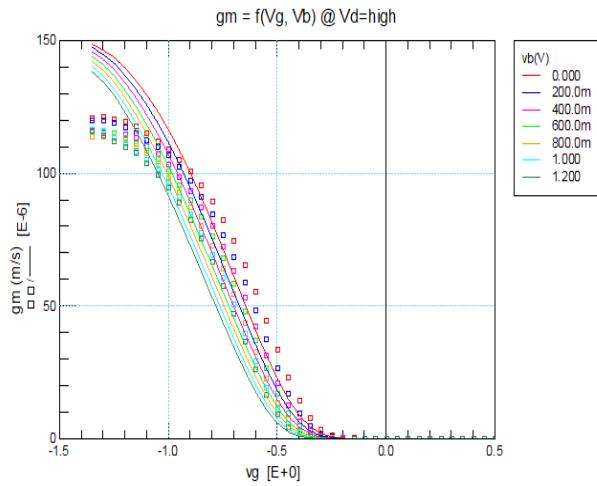
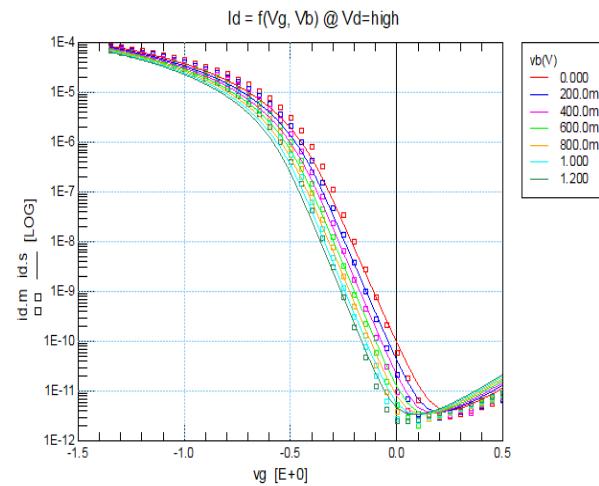
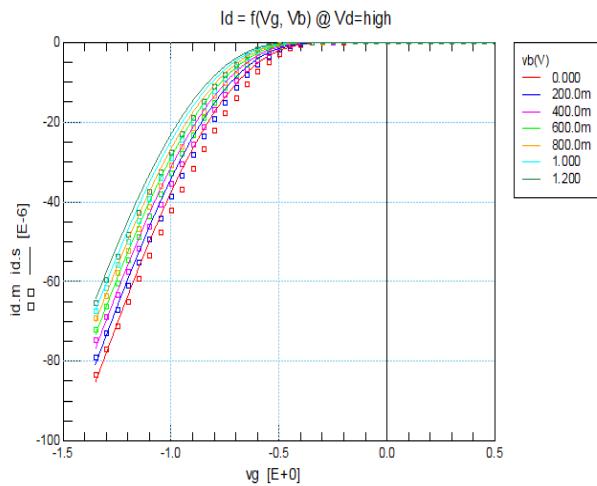
### idvd\_vth\_vbmin, Vb = 1.2V, T = -40°C

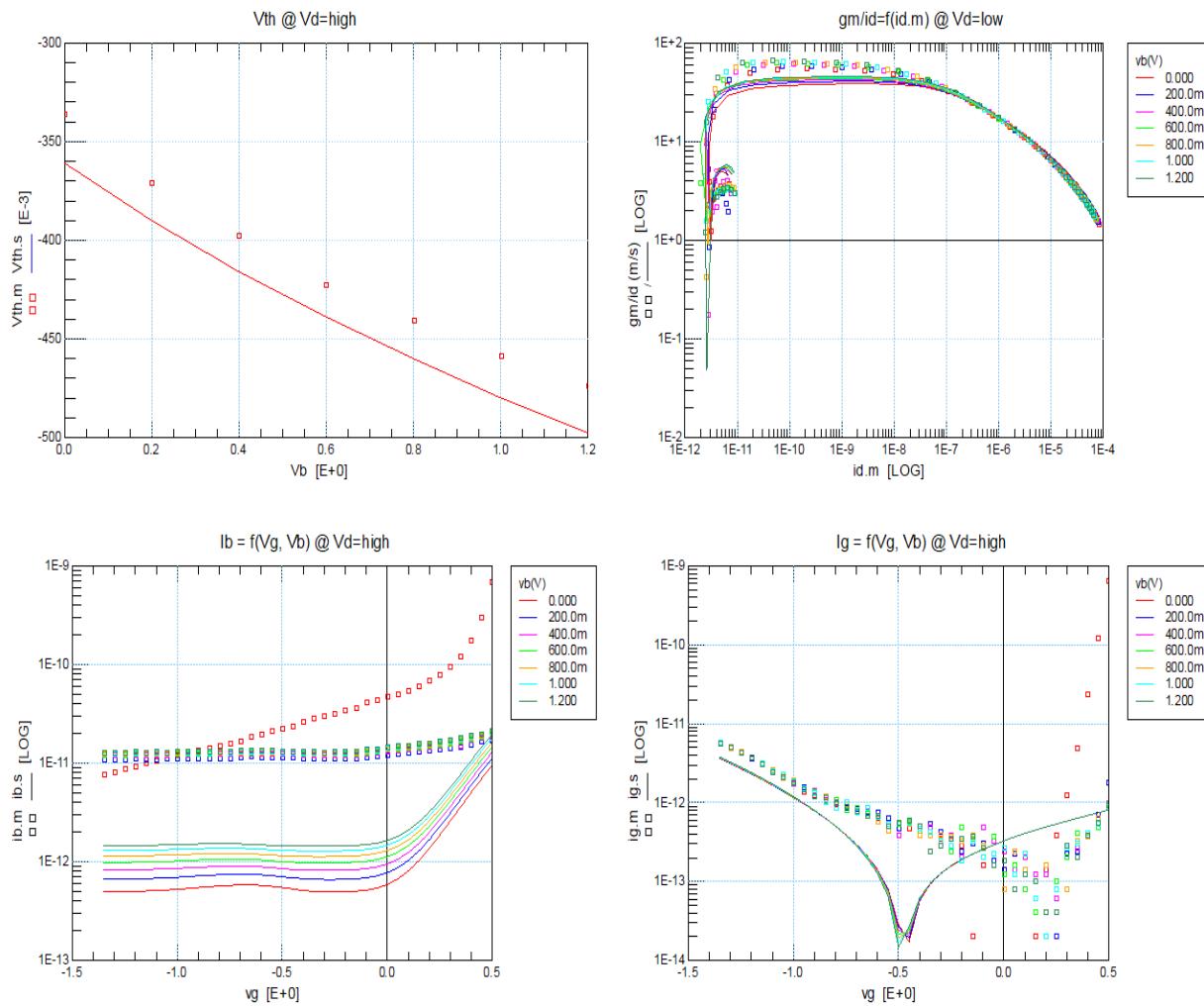


**idvg, Vd = -0.05V, T = 70°C**


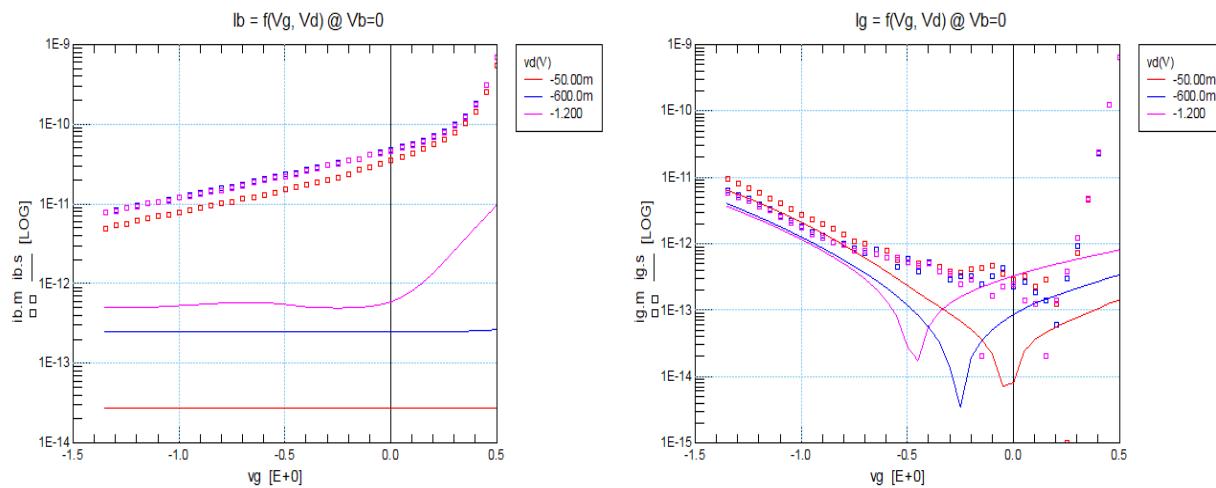


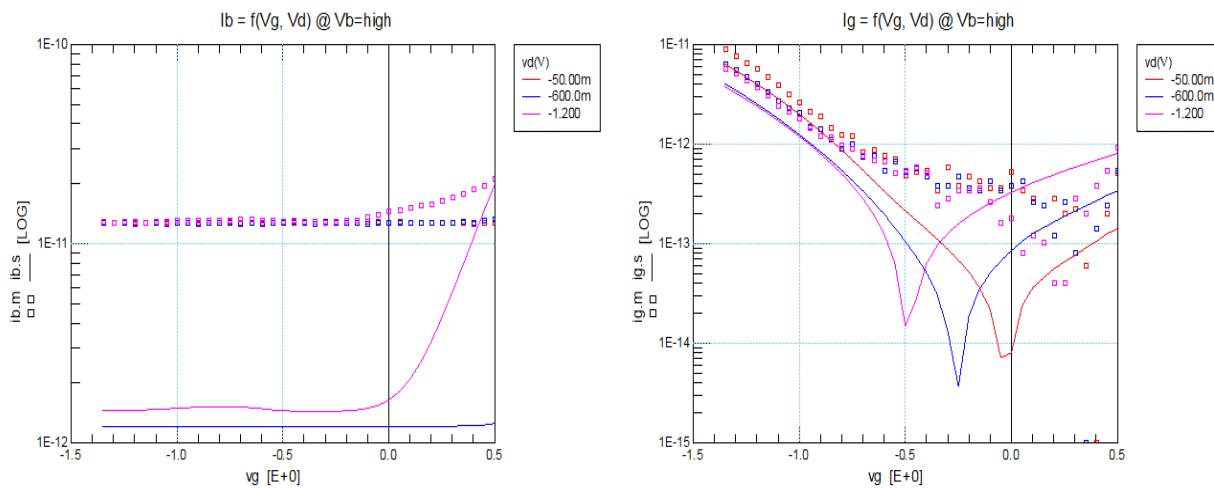
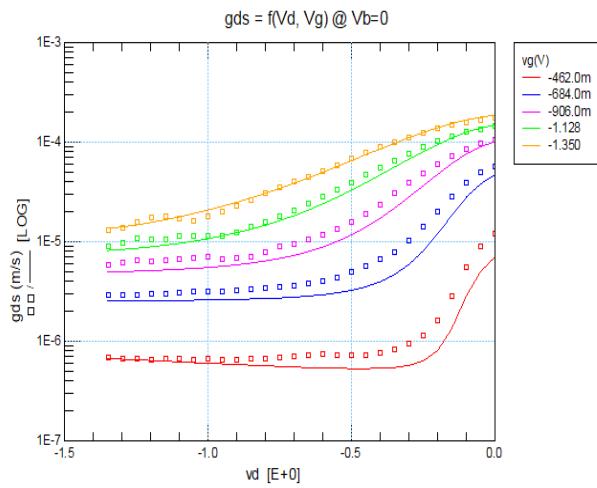
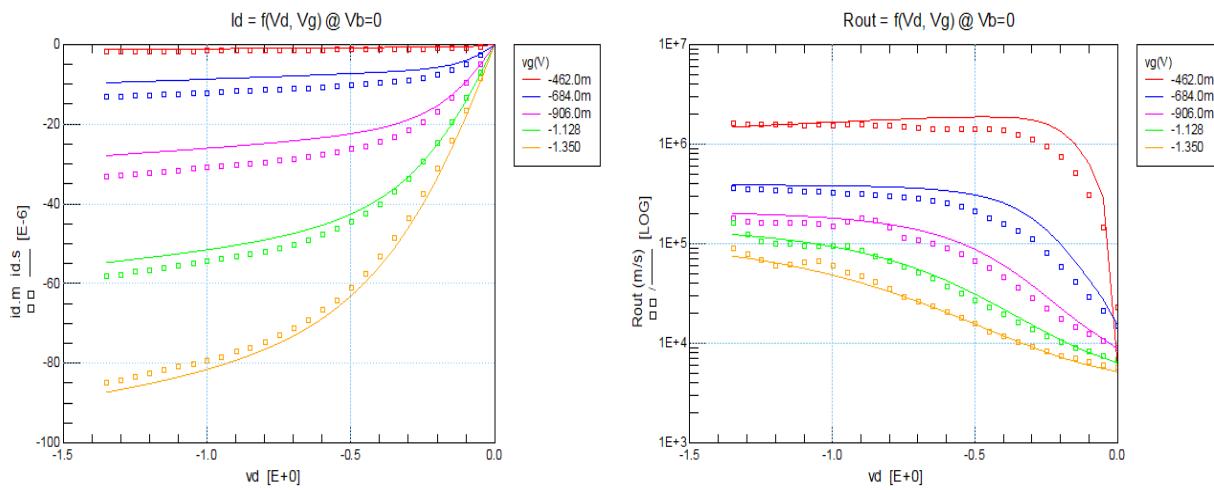
$i_{dvg}, V_d = -1.2V, T = 70^\circ C$

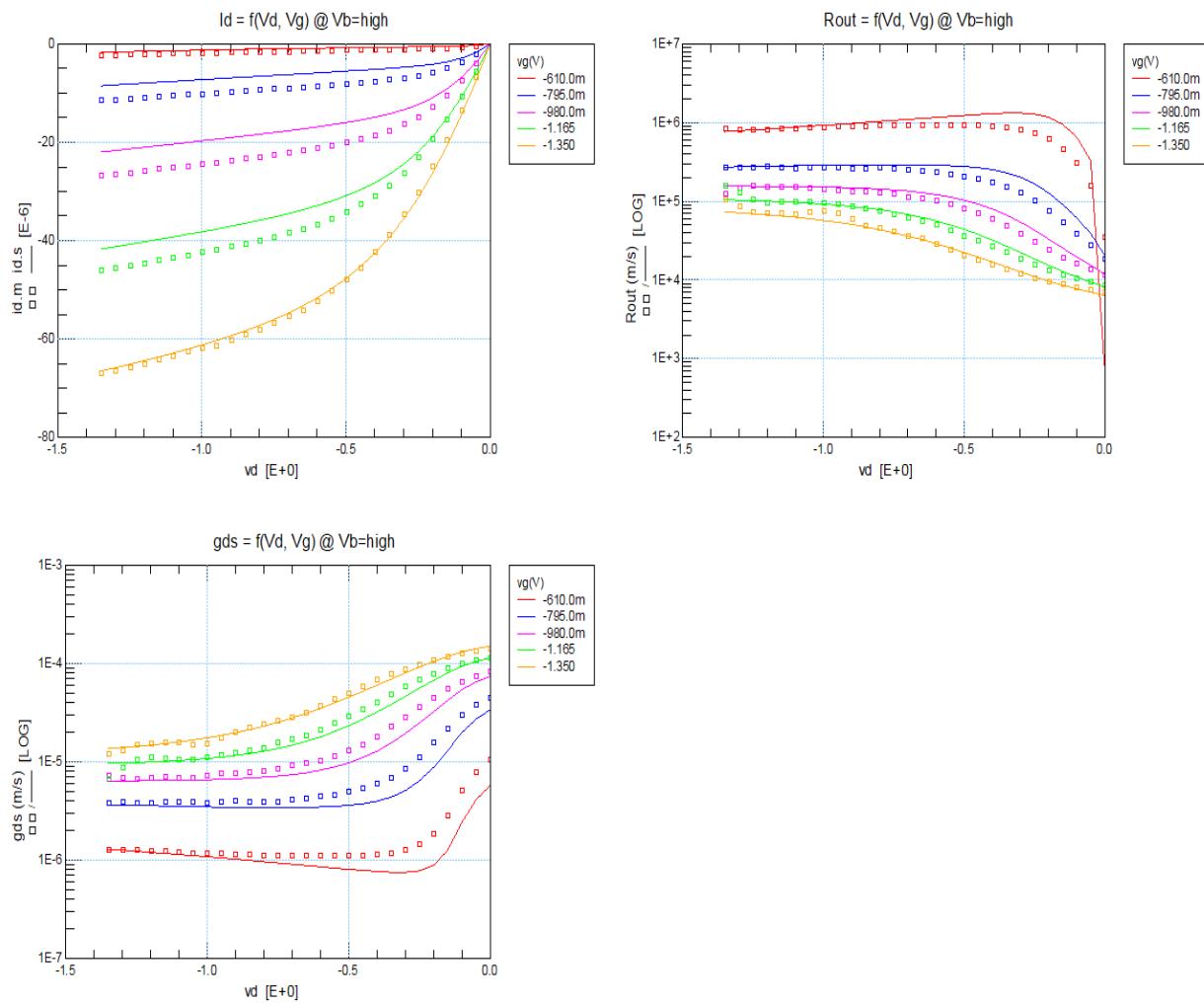
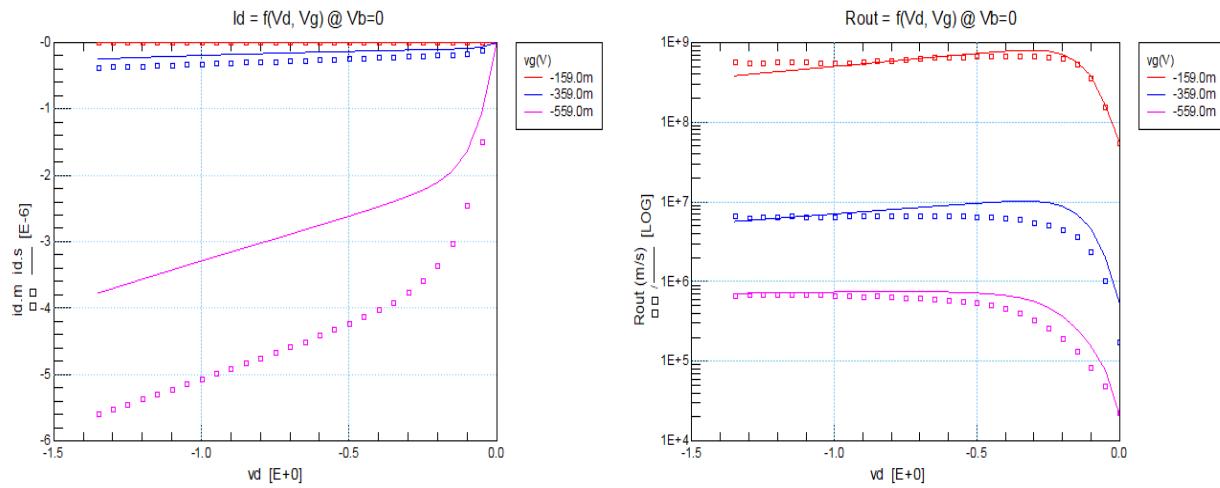


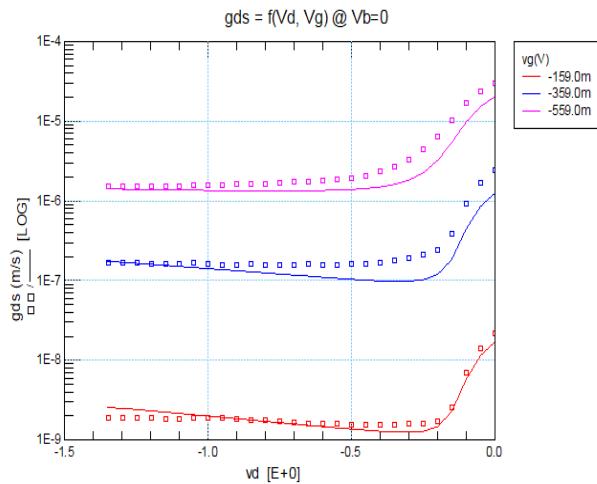


### idvg, Ib,Ig, Vb = 0V, T = 70°C

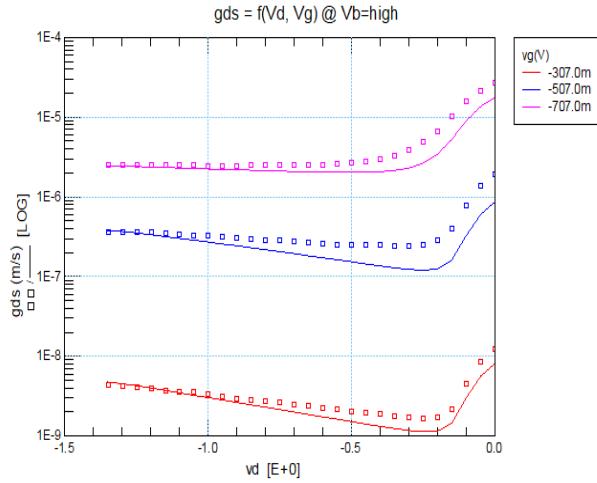
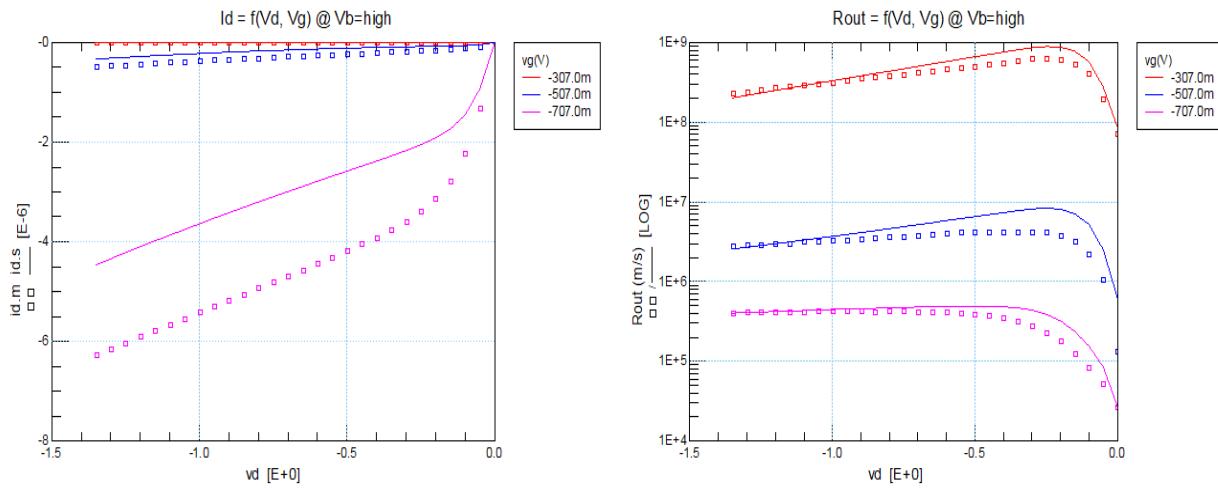


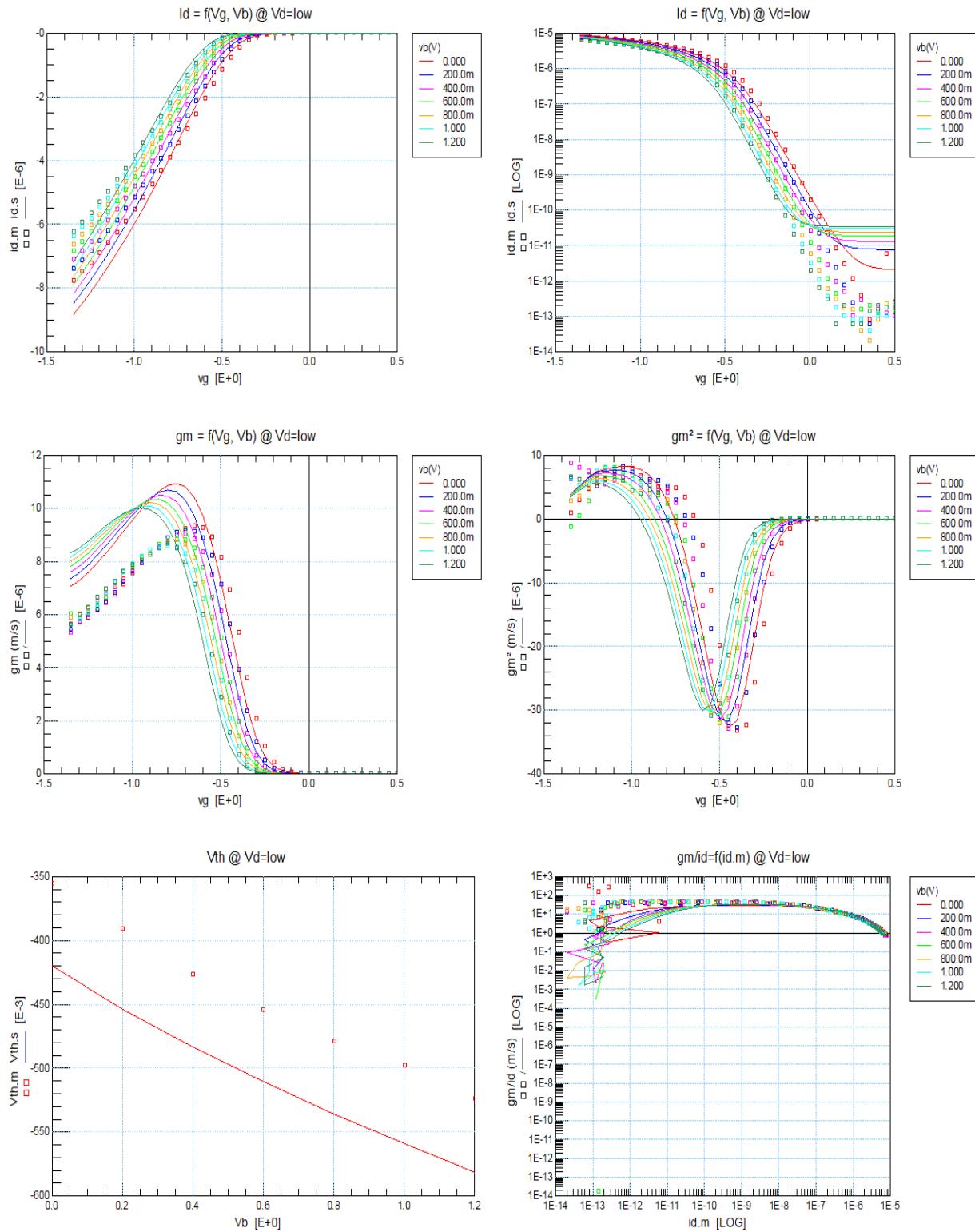
**idvg, Ib,Ig, Vb = 1.2V, T = 70°C**

**idvd, Vb = 0V, T = 70°C**


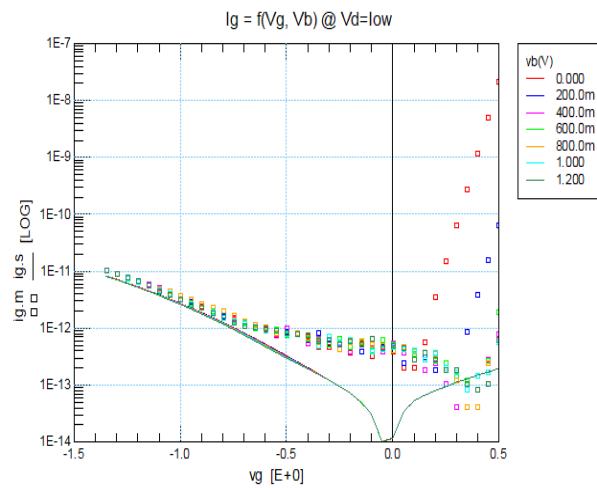
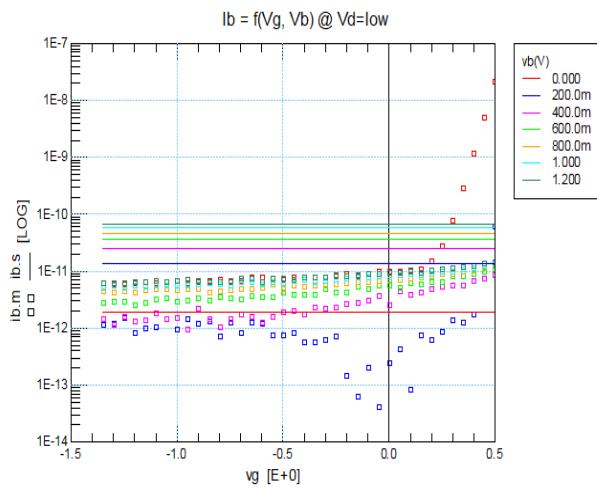
**idvd\_vbmin, Vb = 1.2V, T = 70°C****idvd\_vth, Vb = 0V, T = 70°C**



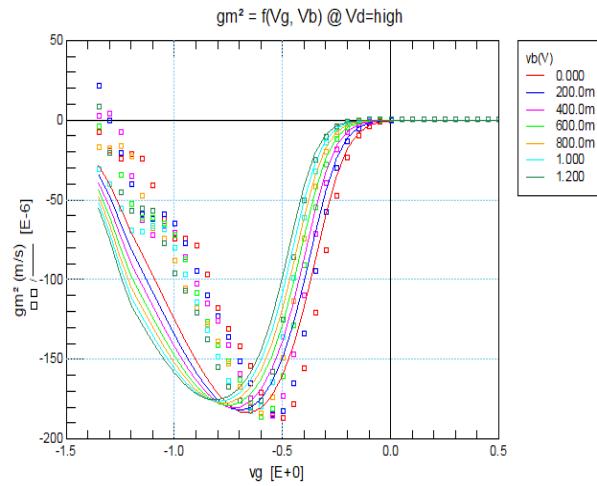
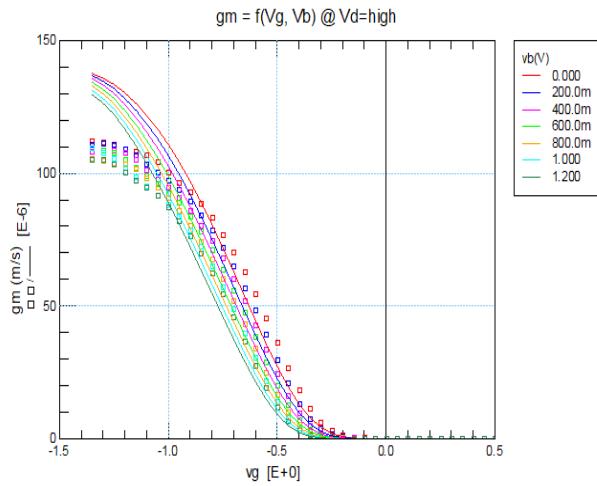
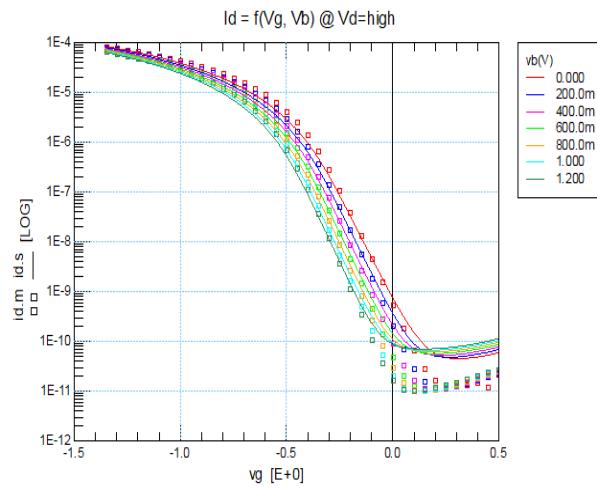
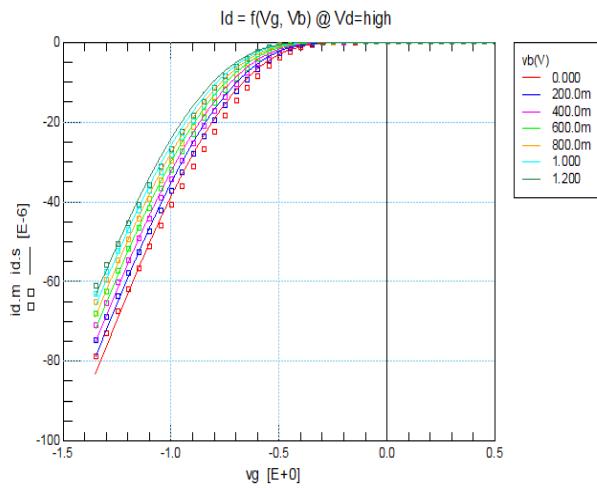
### idvd\_vth\_vbmin, Vb = 1.2V, T = 70°C

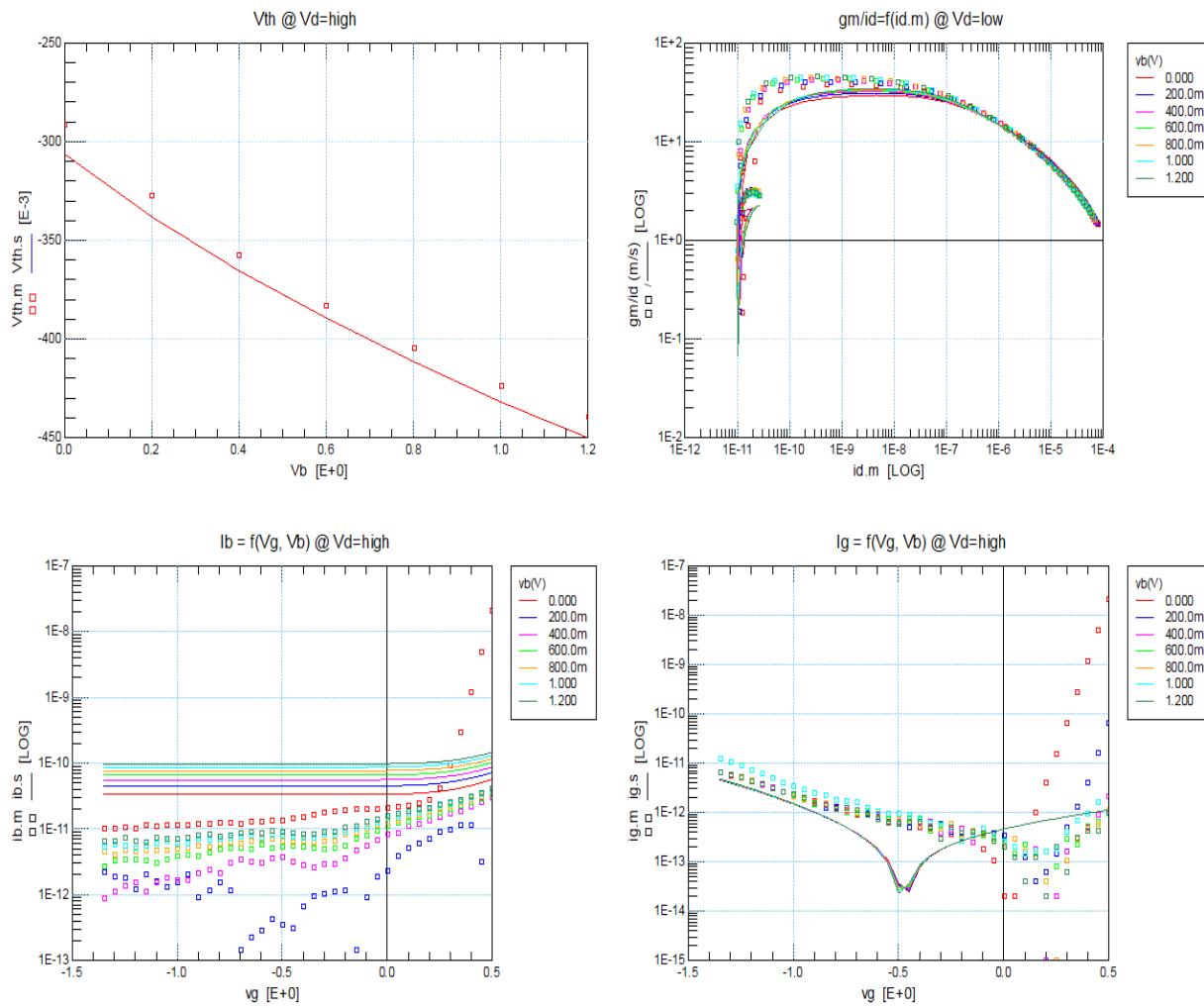


**idvg, Vd = -0.05V, T = 125°C**


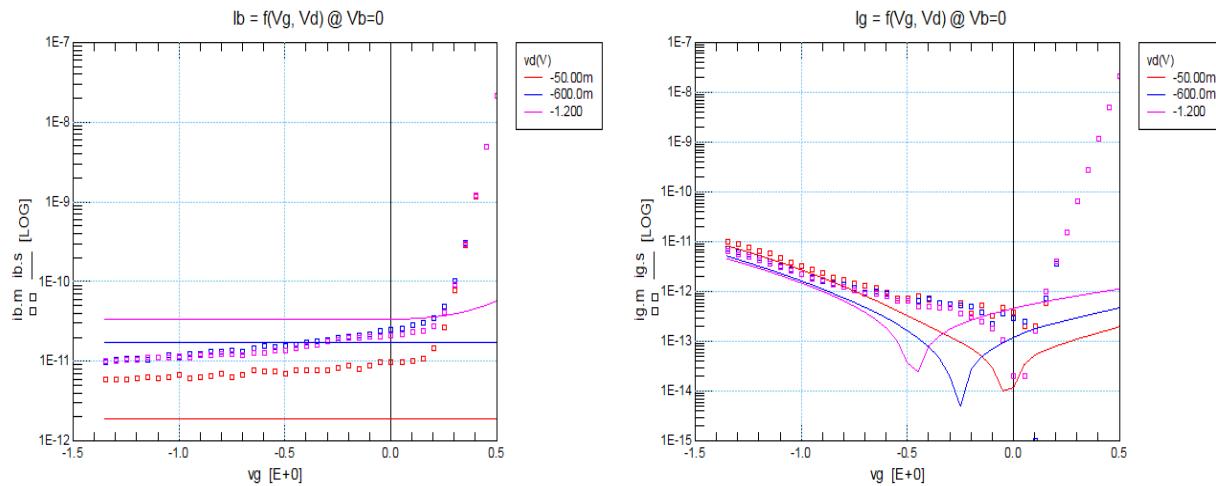


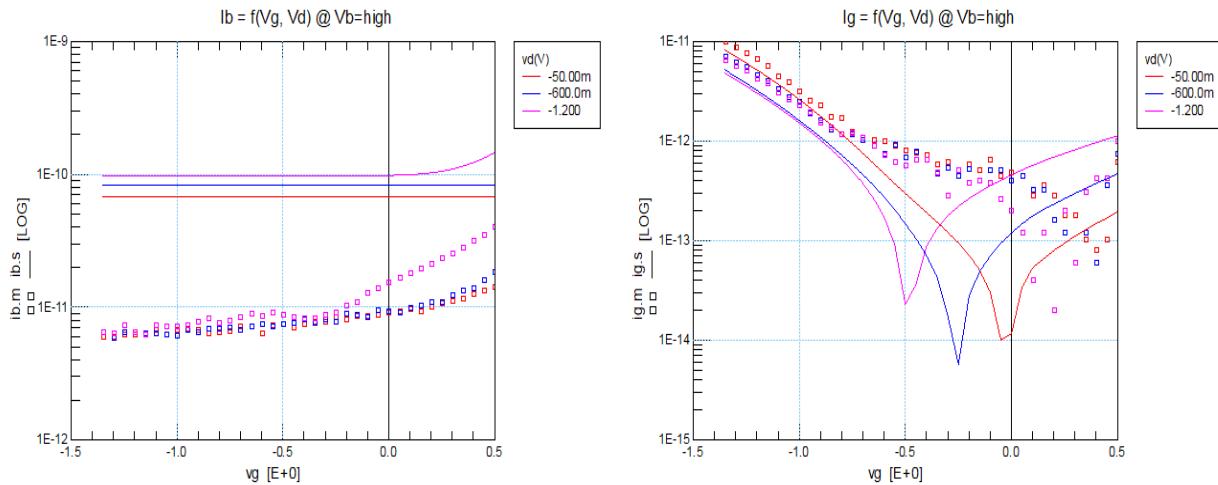
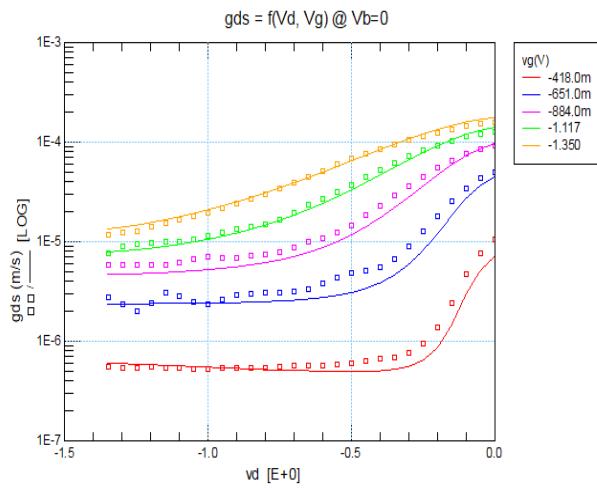
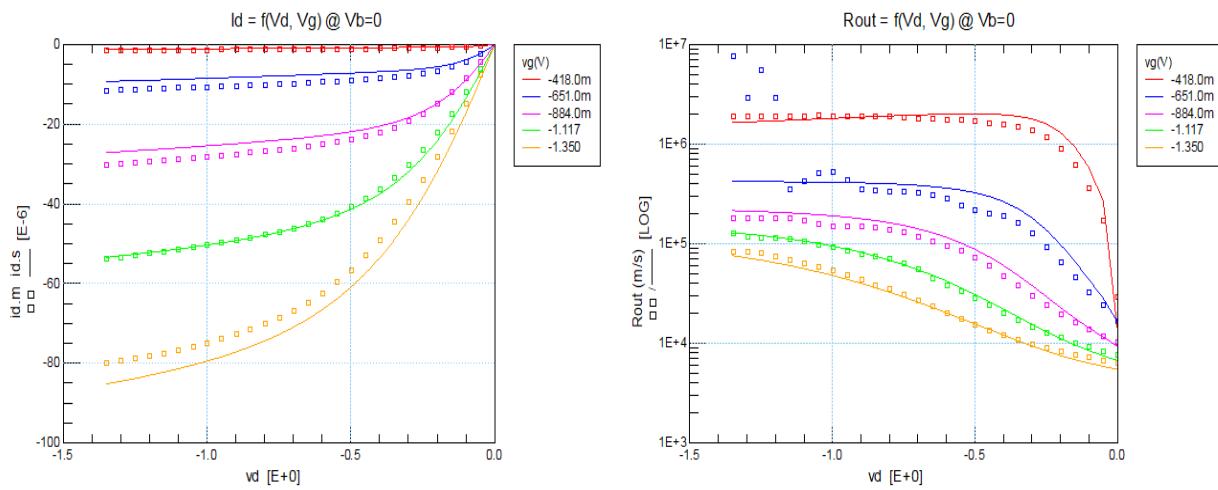
$i_{dvg}, V_d = -1.2V, T = 125^\circ C$

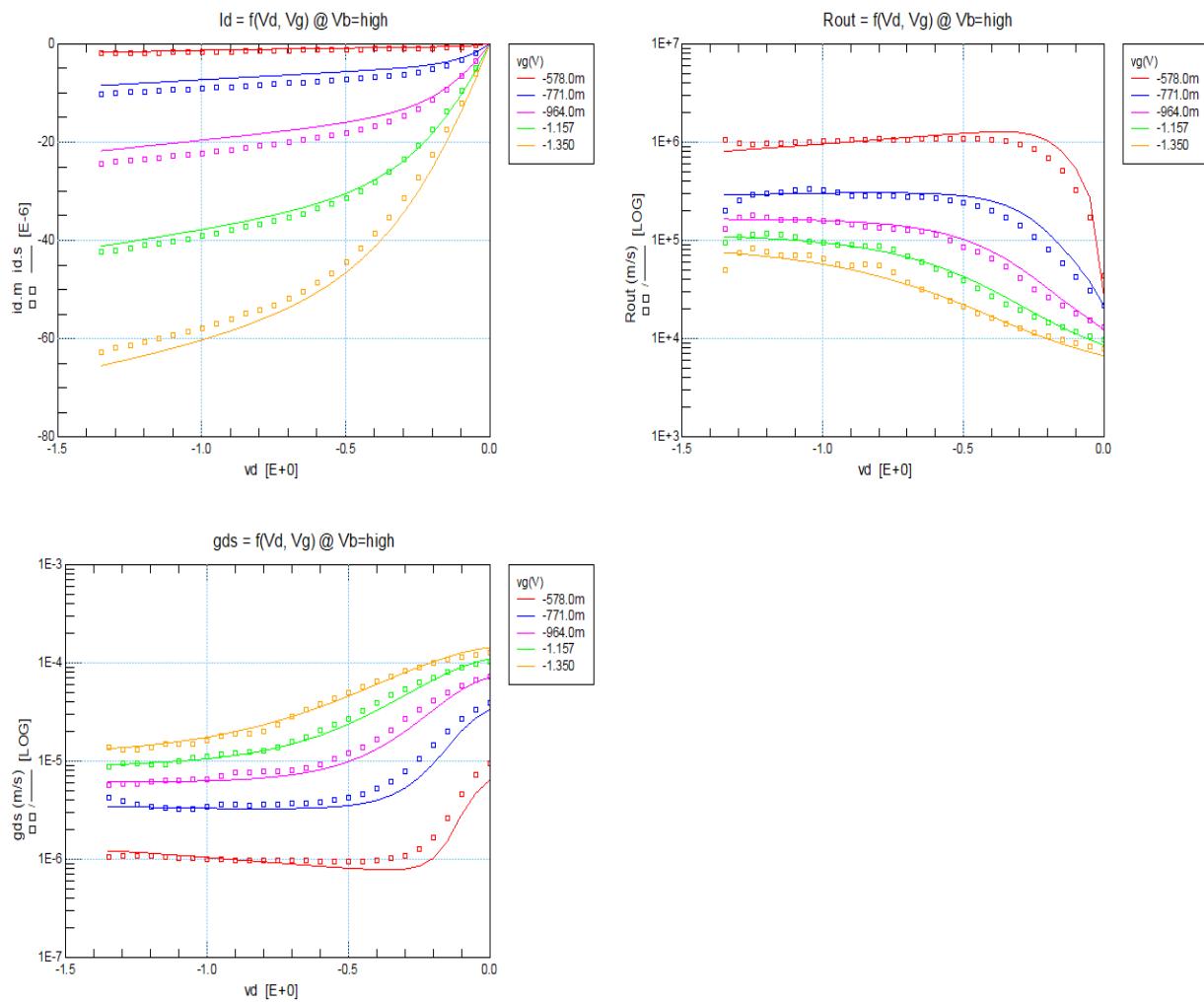
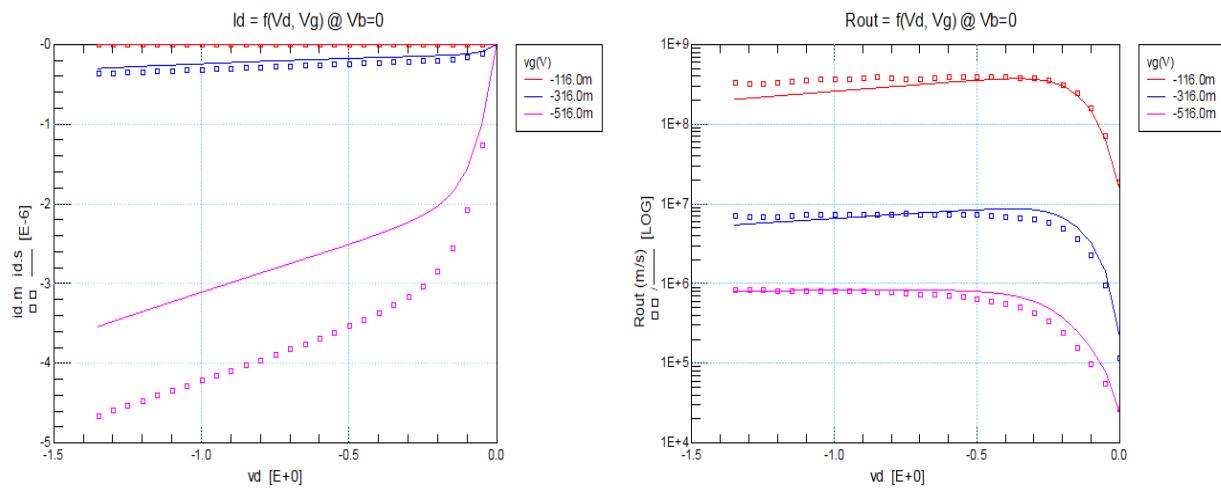


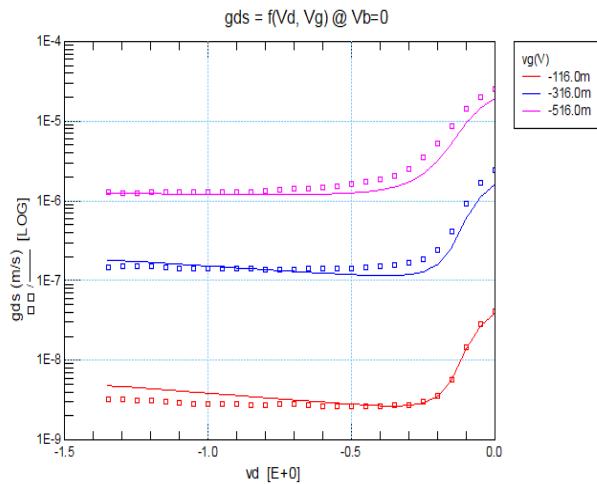


$id_{vg}$ ,  $Id$ ,  $Ig$ ,  $V_b = 0V$ ,  $T = 125^\circ\text{C}$

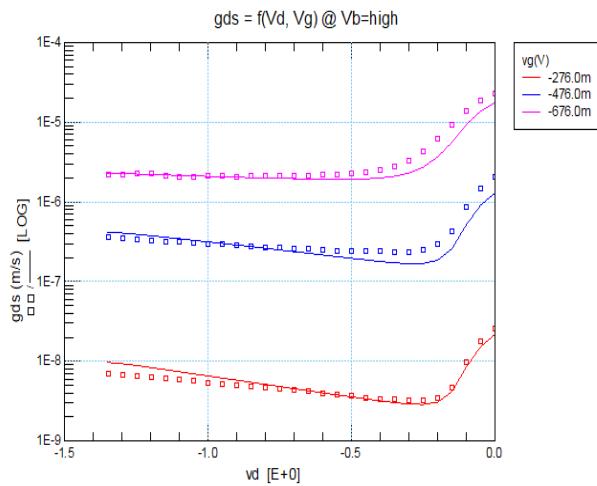
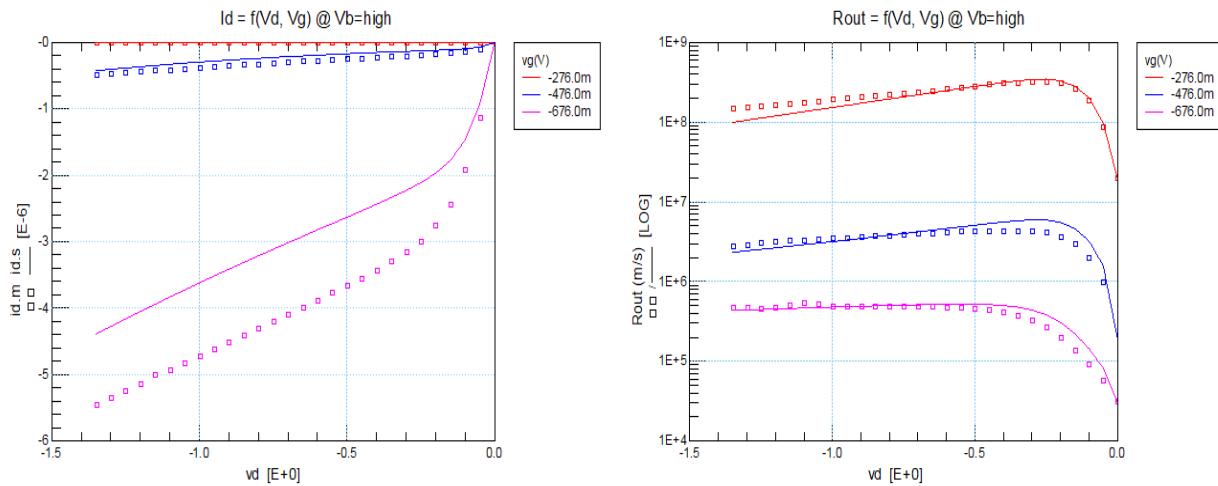


**idvg, Ib,Ig, Vb = 1.2V, T = 125°C**

**idvd, Vb = 0V, T = 125°C**


**idvd\_vbmin, Vb = 1.2V, T = 125°C****idvd\_vth, Vb = 0V, T = 125°C**

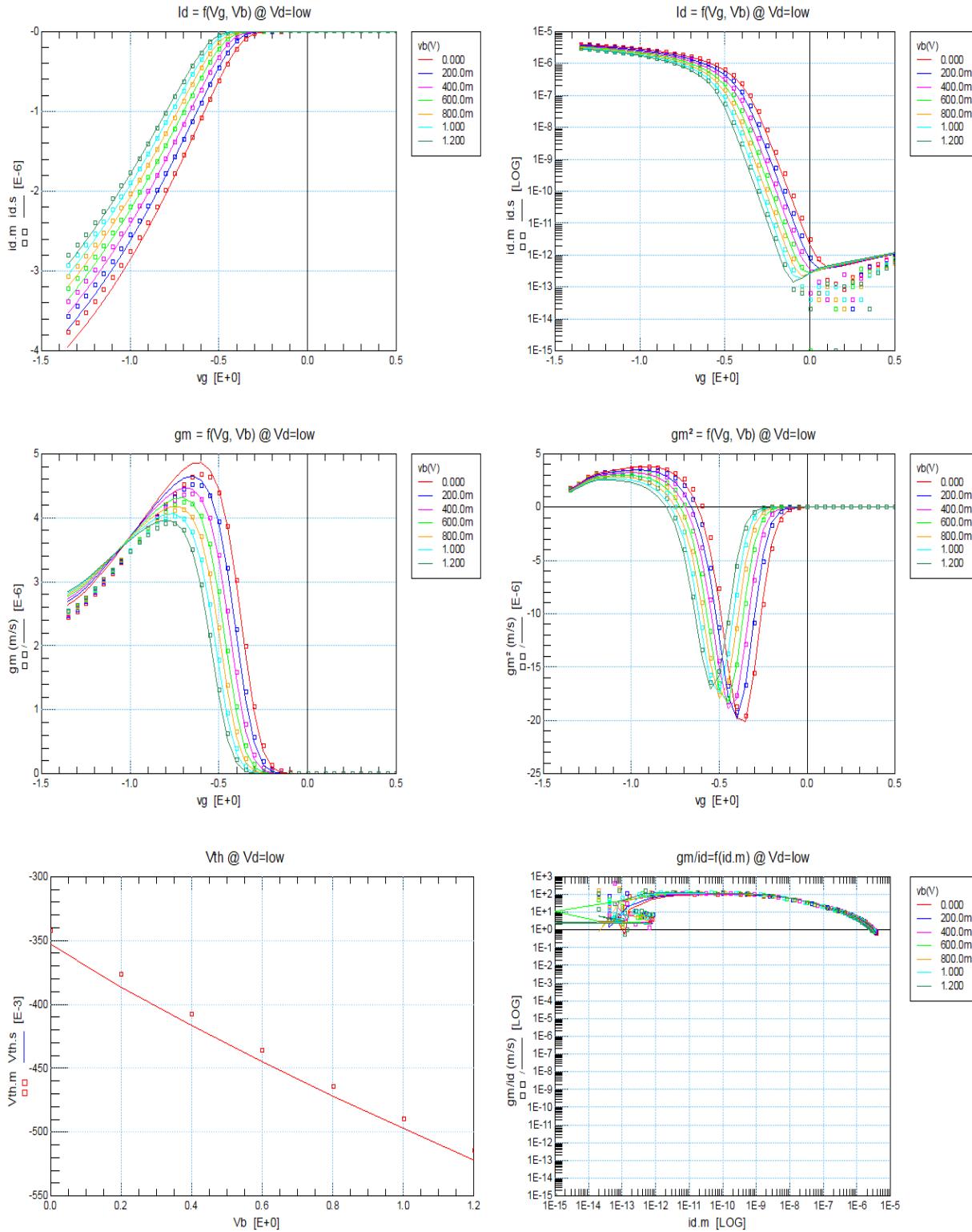


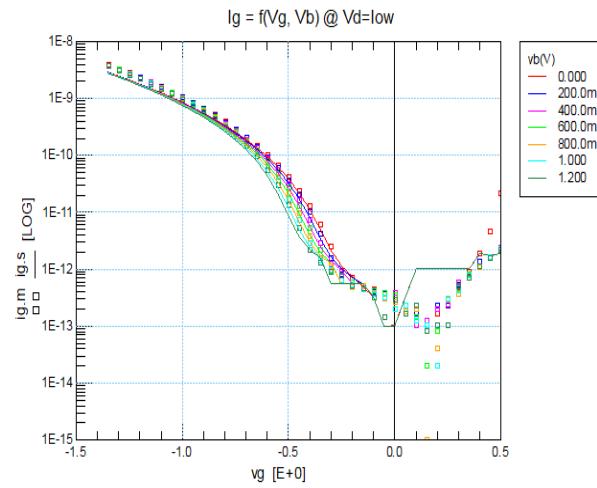
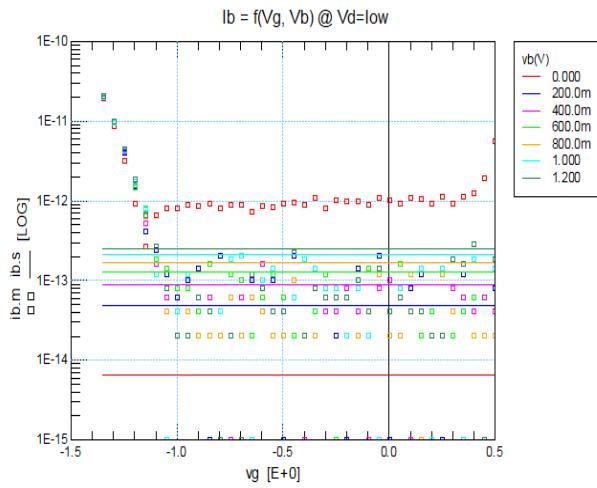
**idvd\_vth\_vbmin, Vb = 1.2V, T = 125°C**



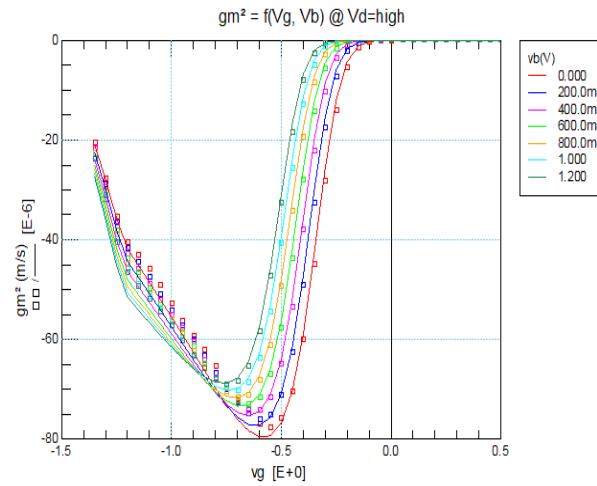
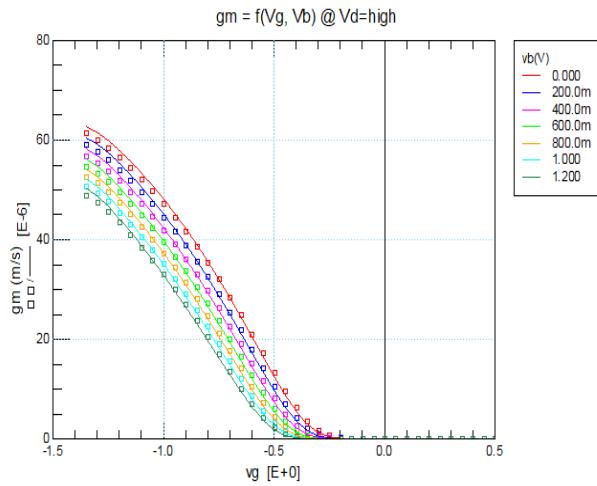
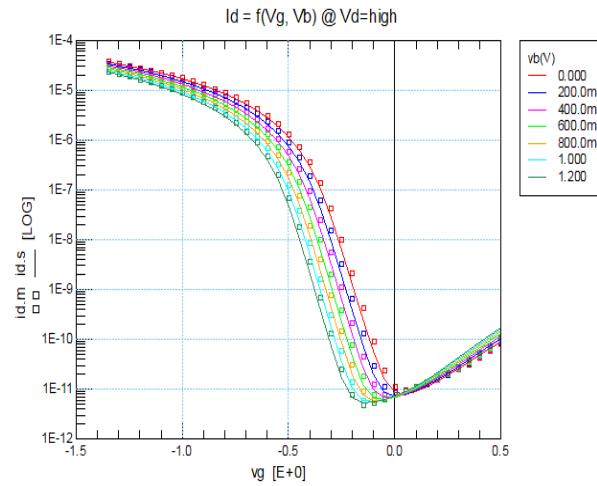
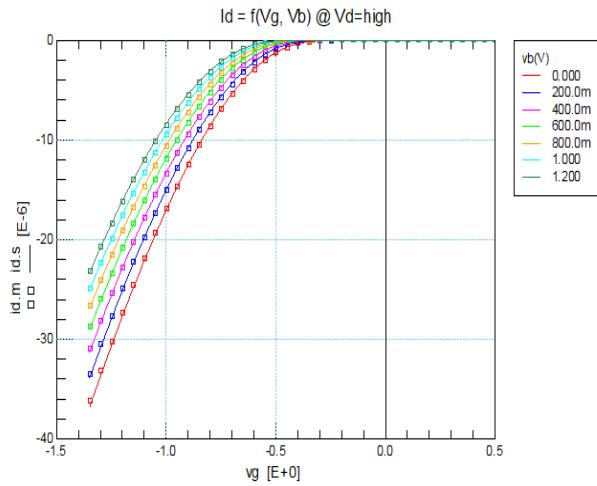
## 4.33 W05u0\_L5u0\_S550\_2

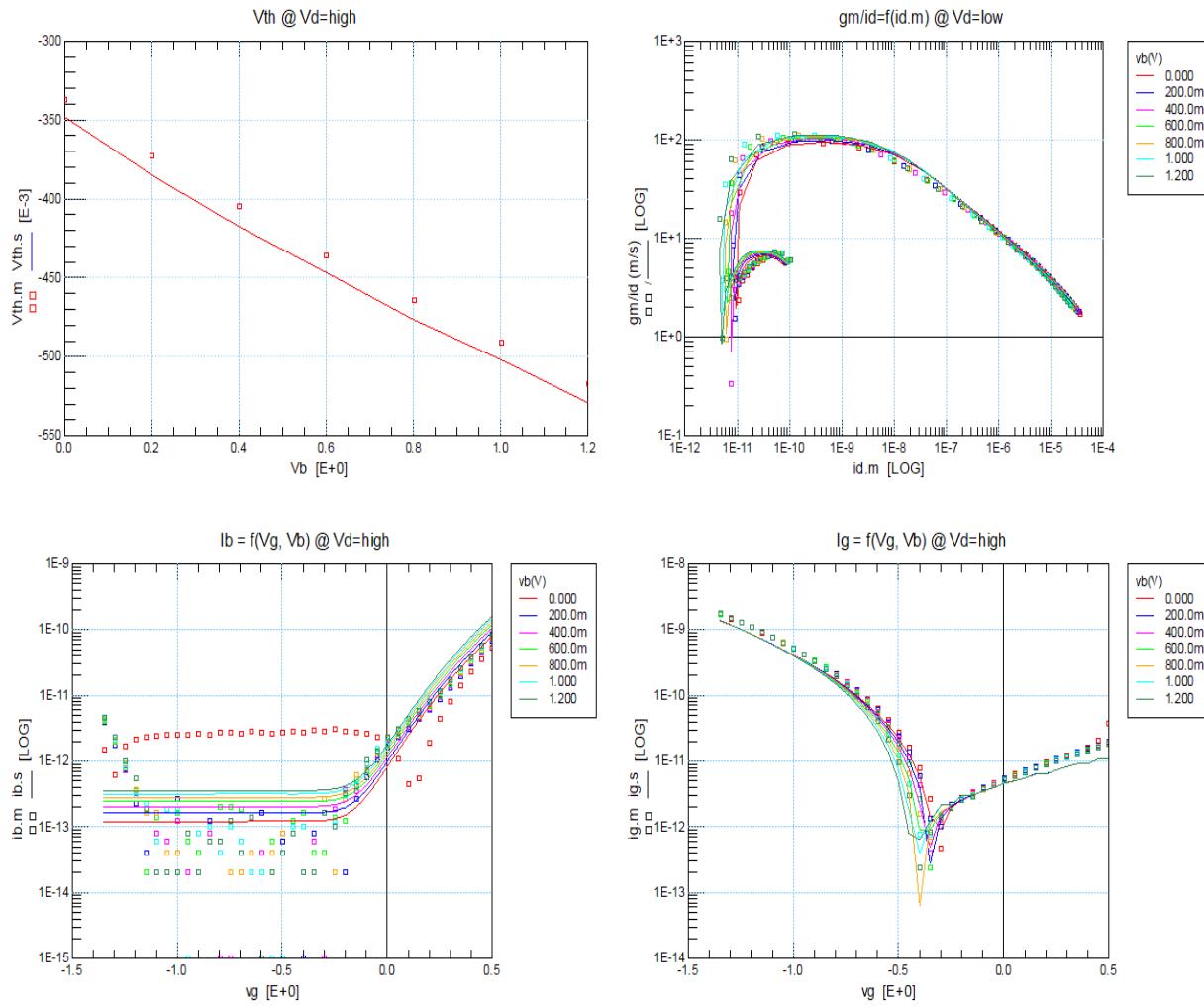
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



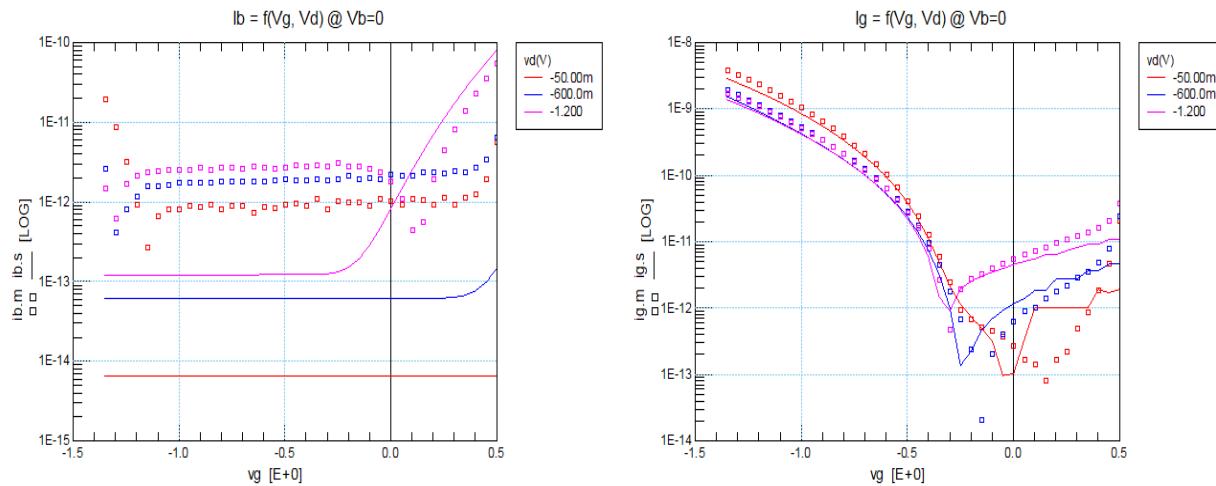


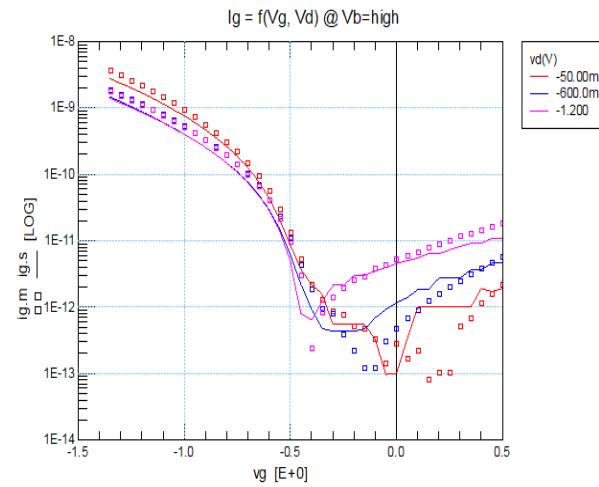
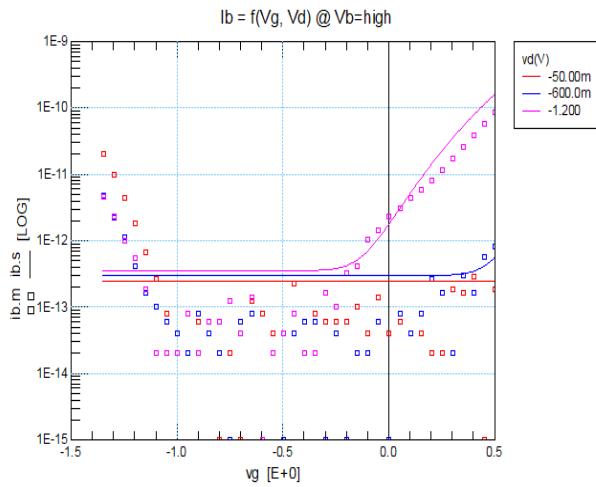
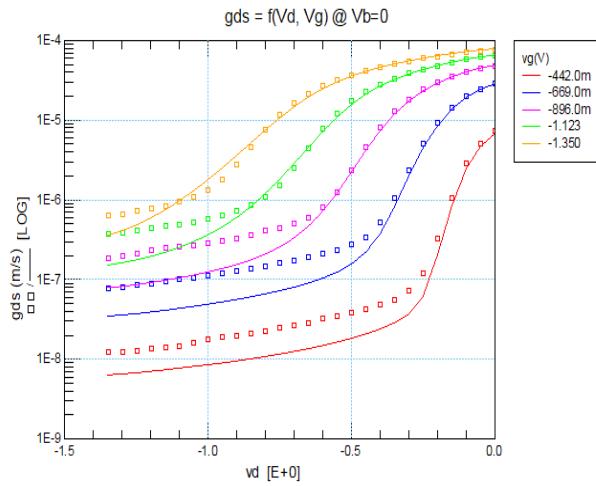
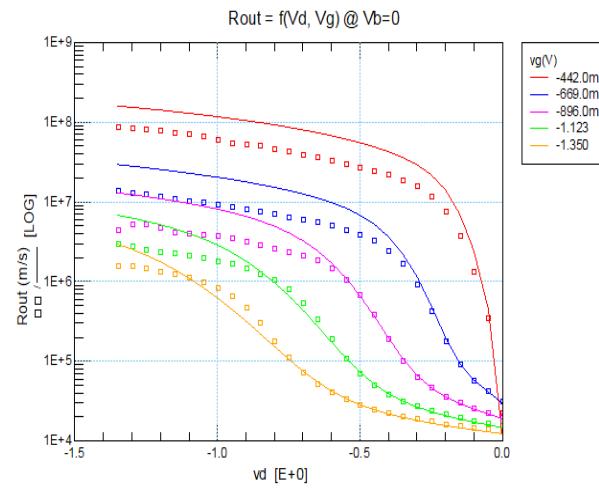
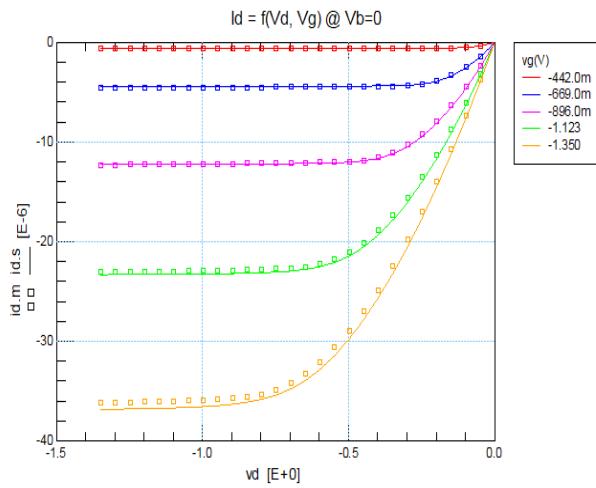
$i_d v_g, V_d = -1.2V, T = 27^\circ C$

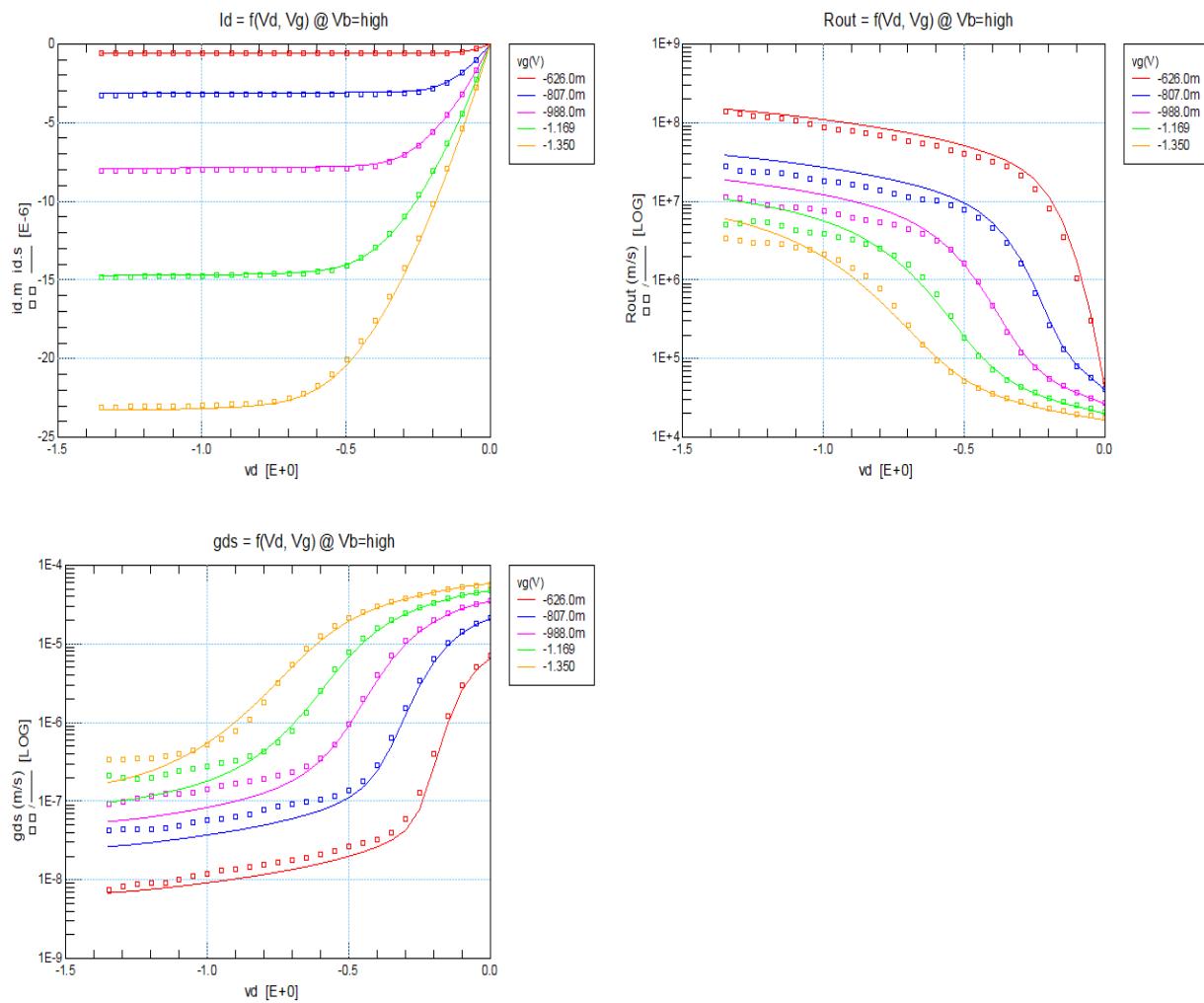
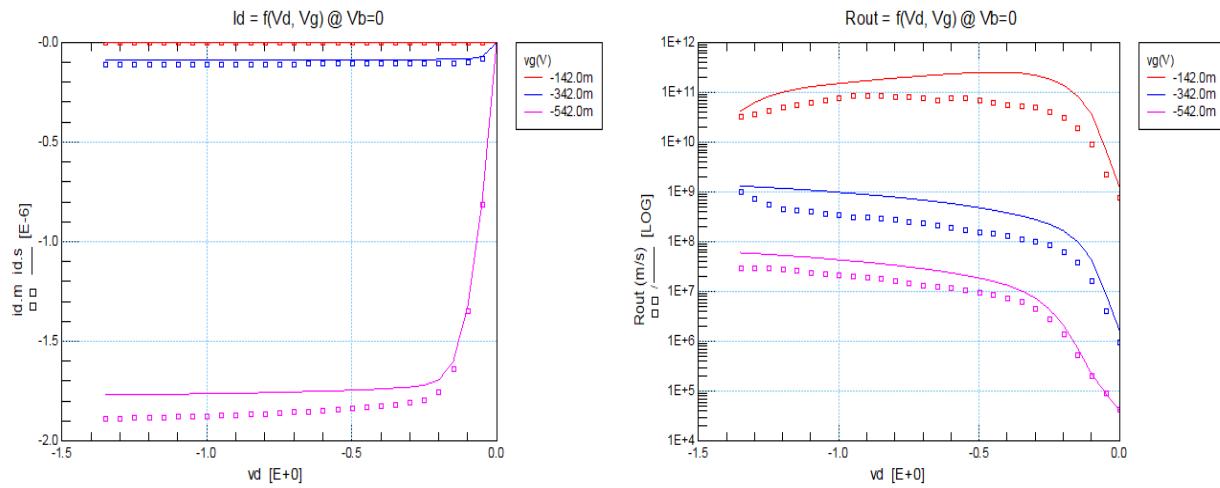


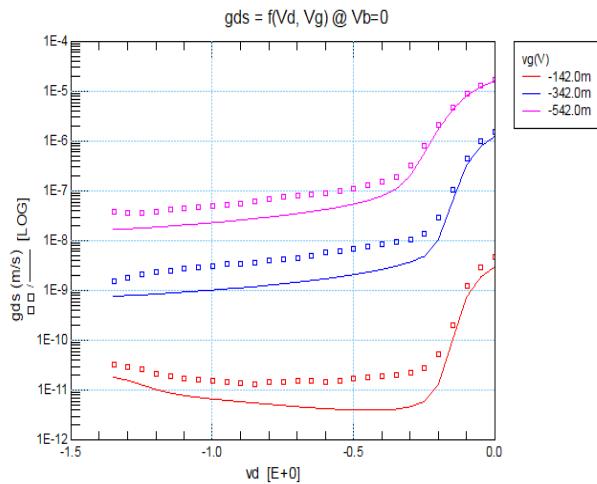


### $i_{dvg}, i_b, i_g, V_b = 0V, T = 27^\circ C$

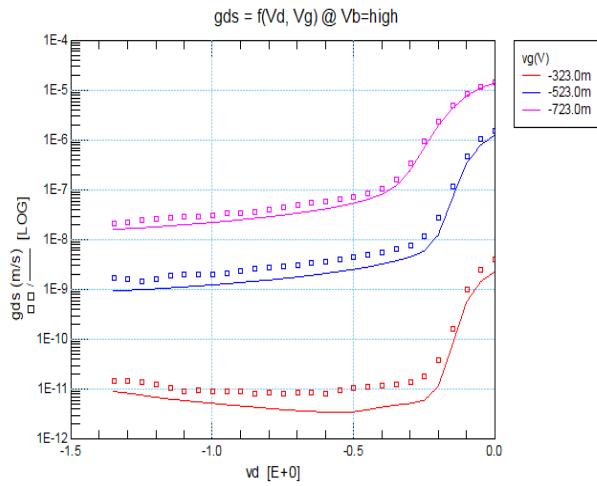
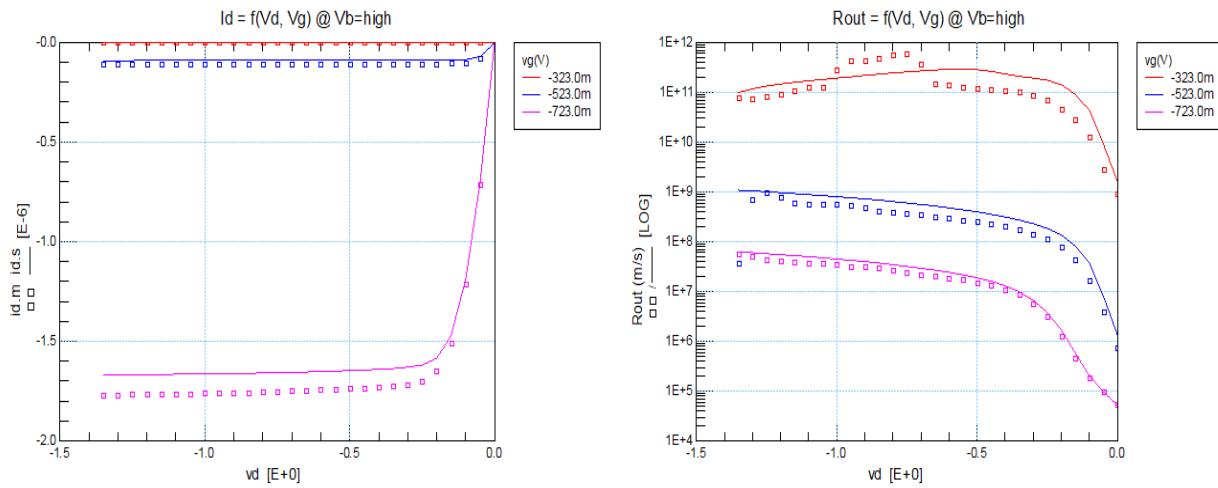


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**


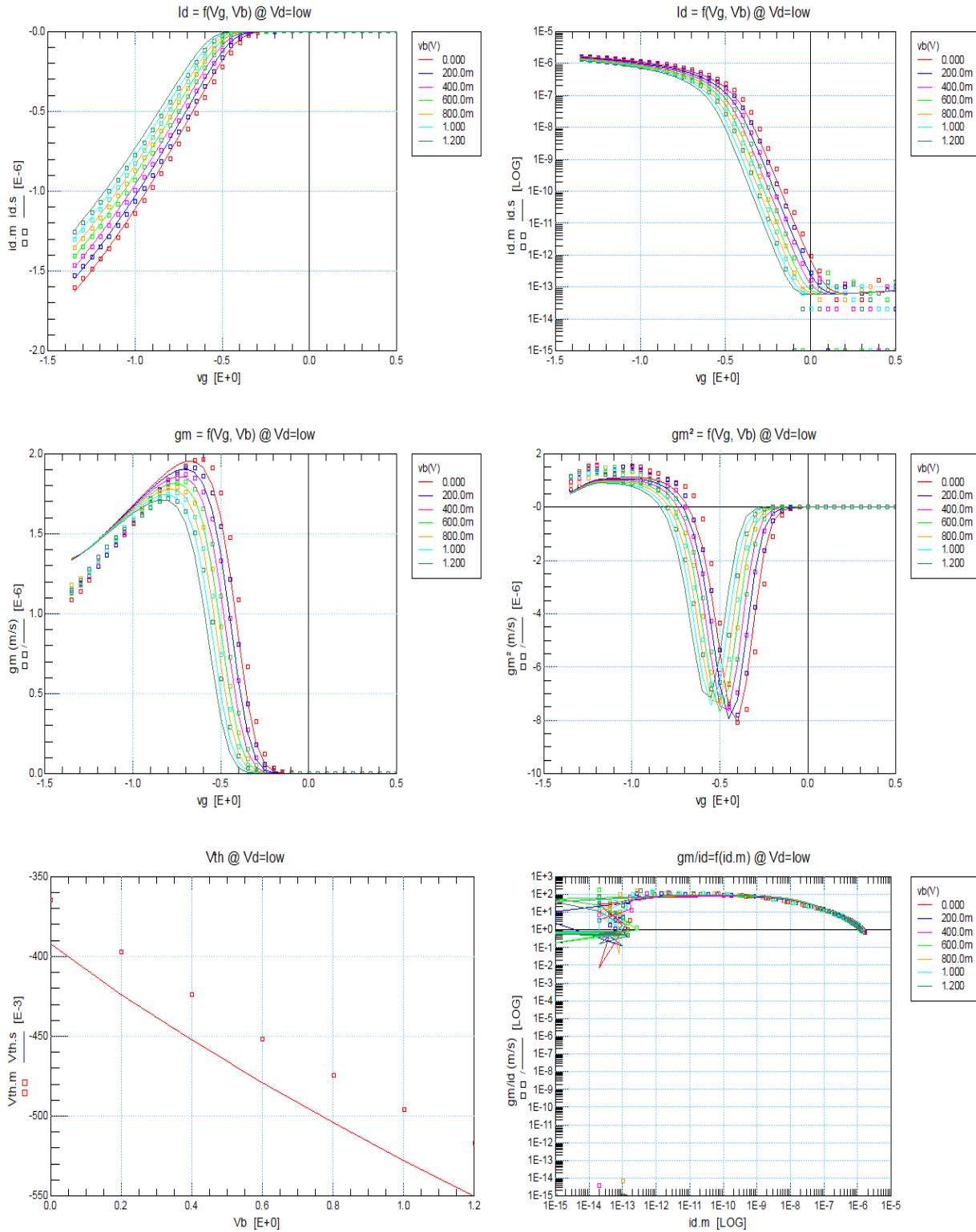


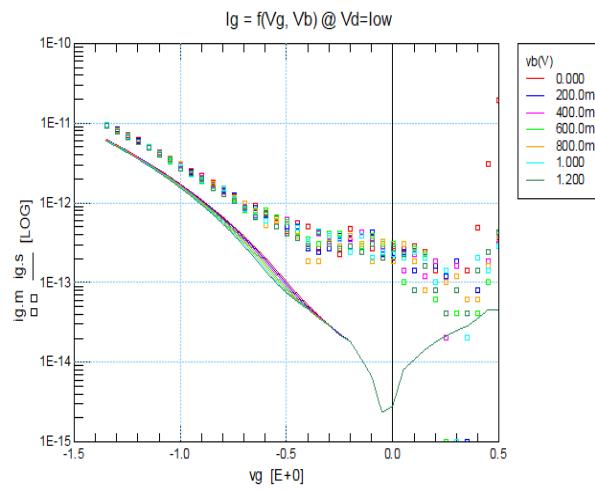
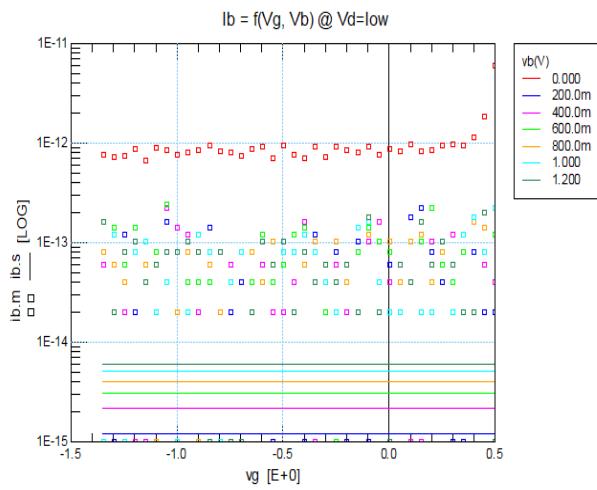
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



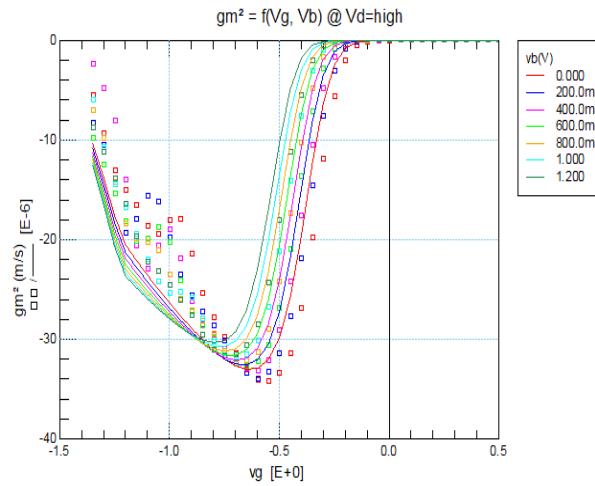
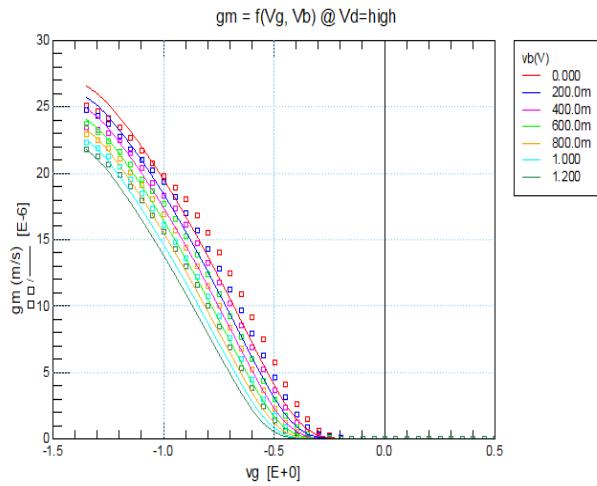
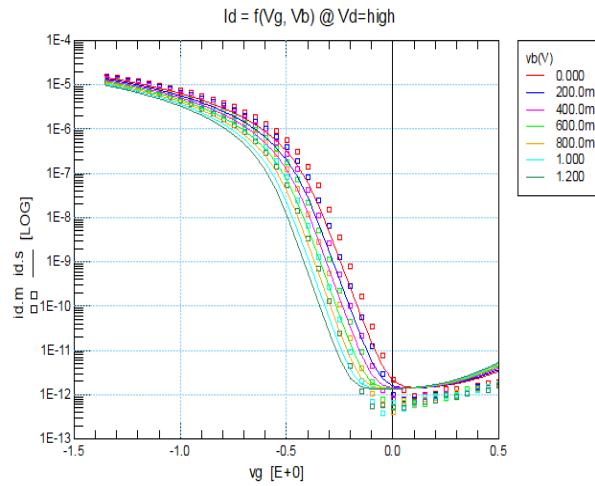
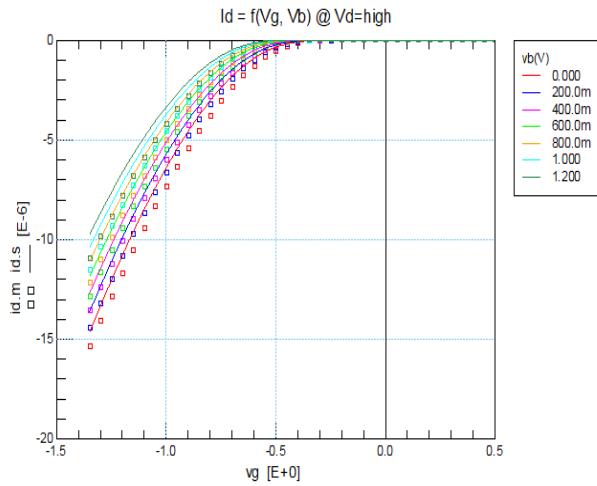
## 4.34 W0u15\_L0u5\_S555\_2

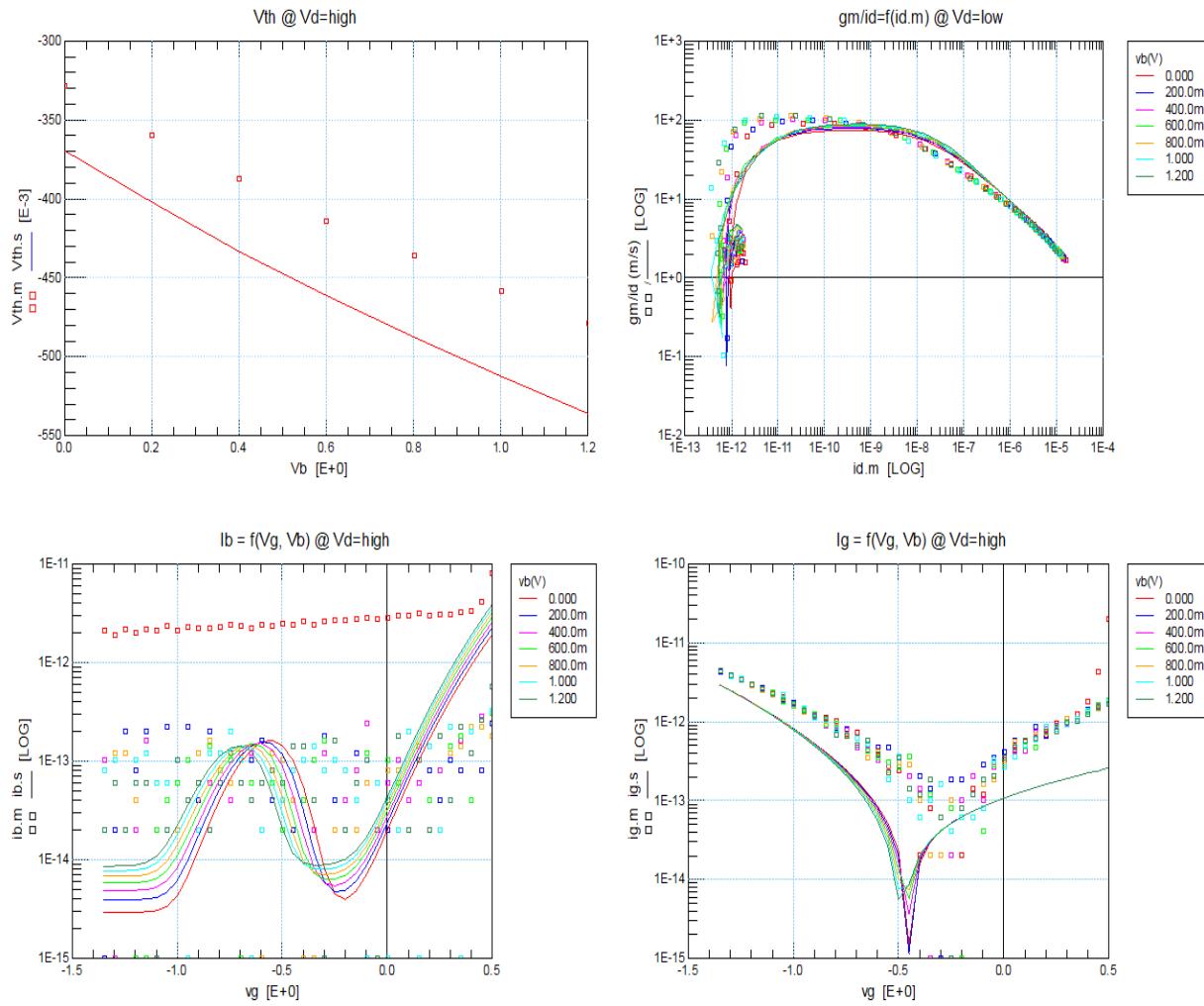
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



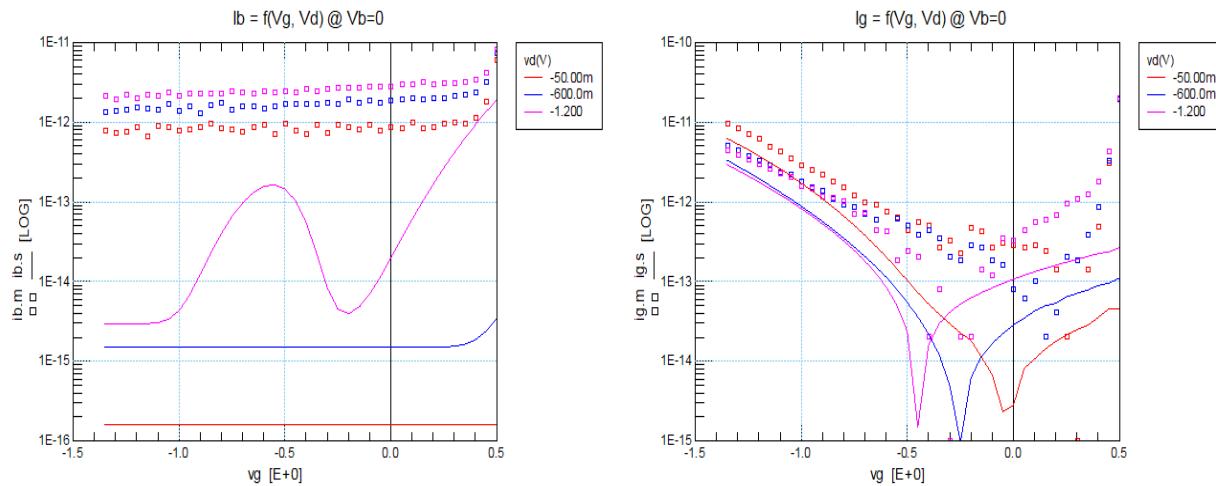


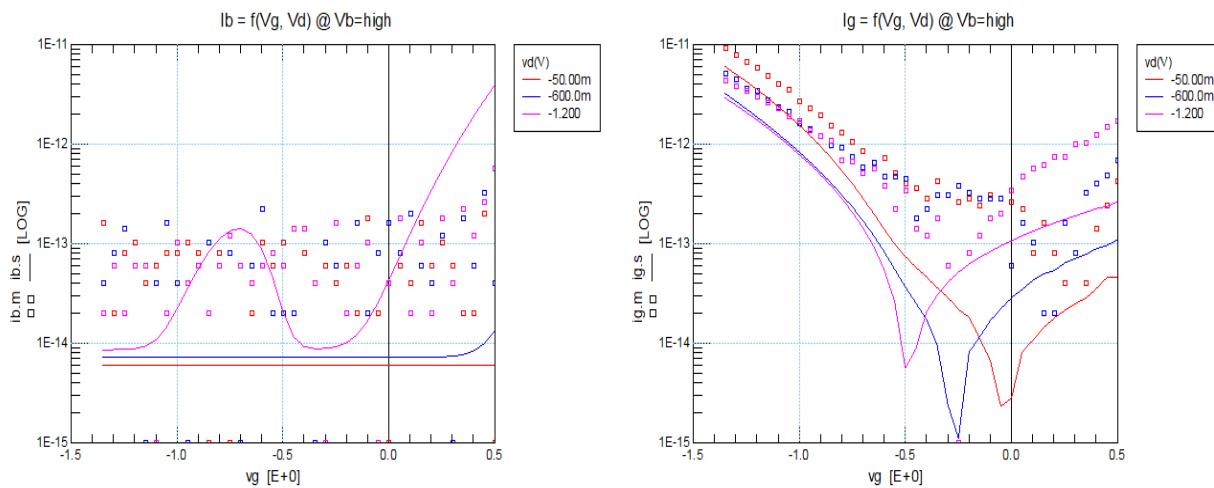
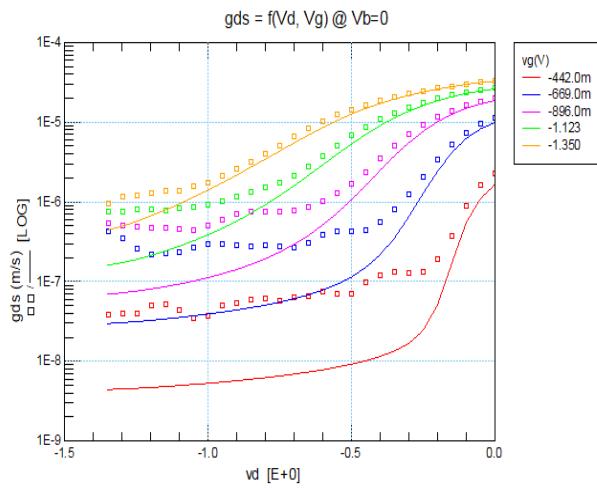
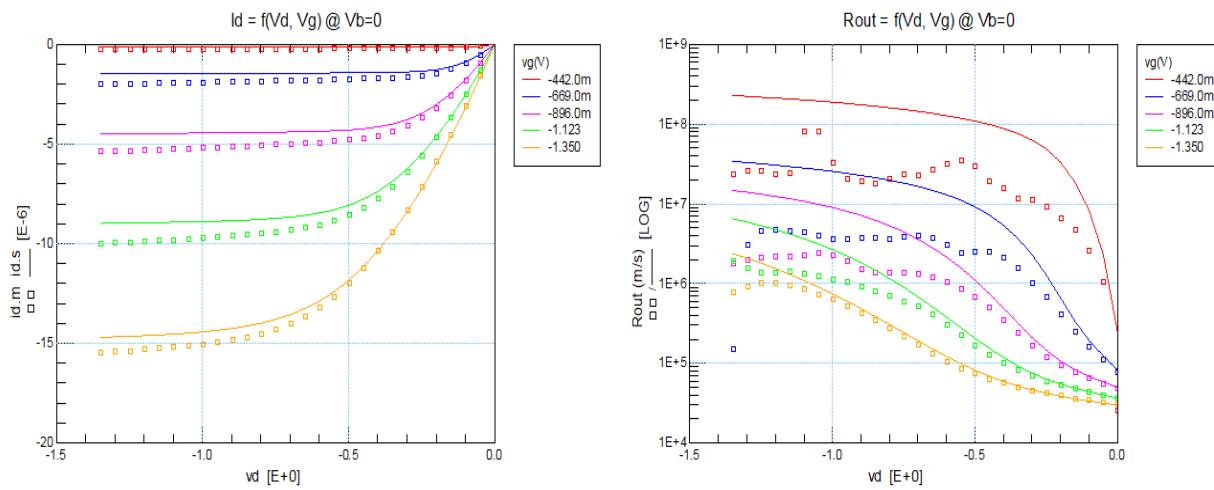
$i_d v_g, V_d = -1.2V, T = 27^\circ C$

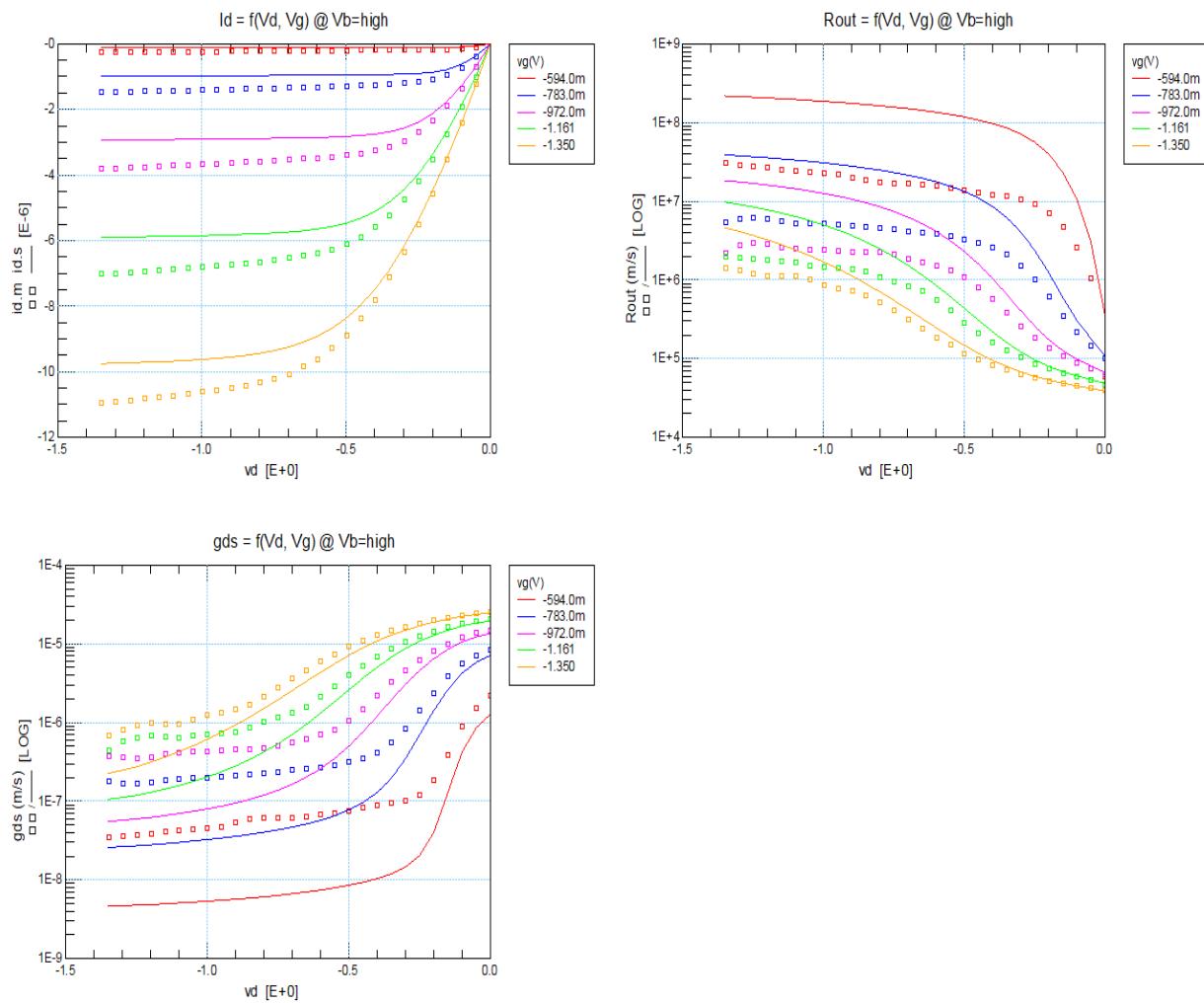
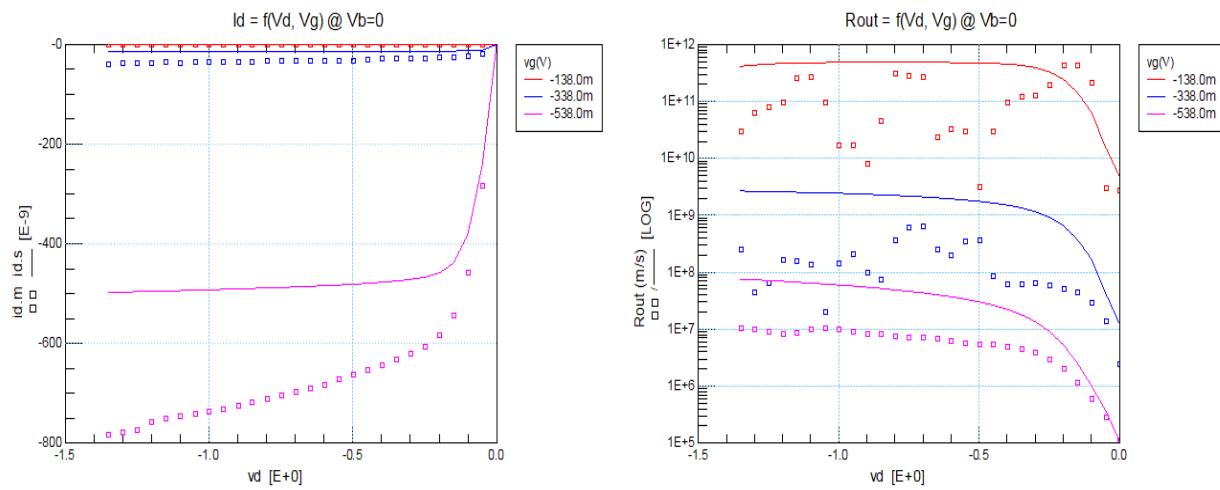


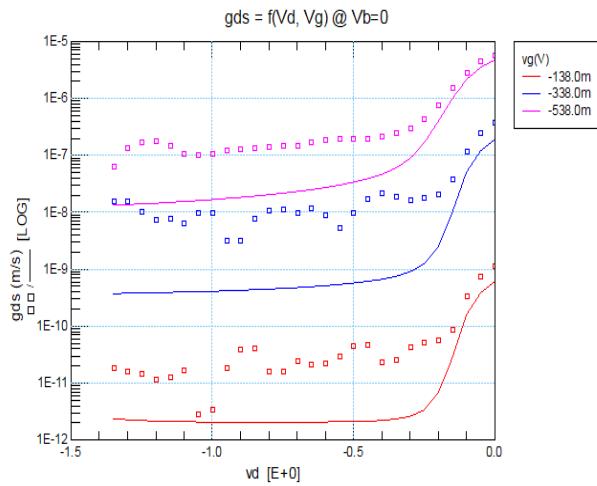


$id_{VG}$ ,  $I_b$ ,  $I_g$ ,  $V_b = 0V$ ,  $T = 27^\circ C$

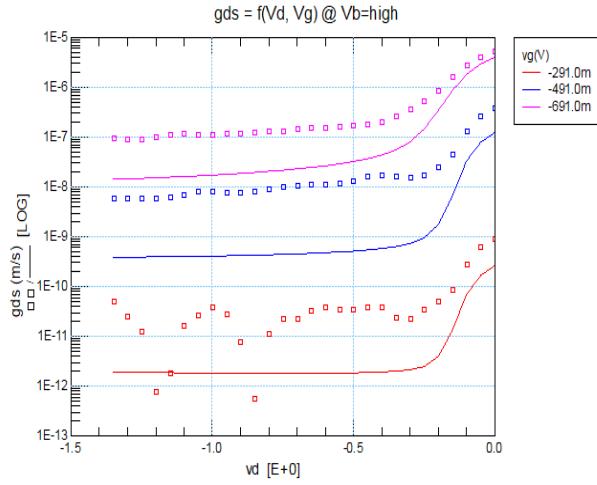
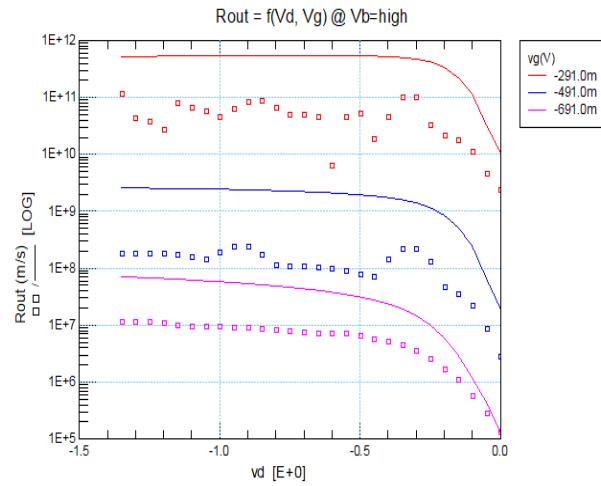
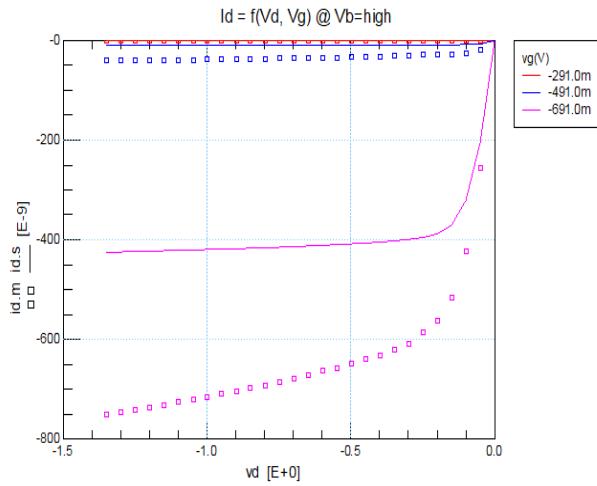


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**


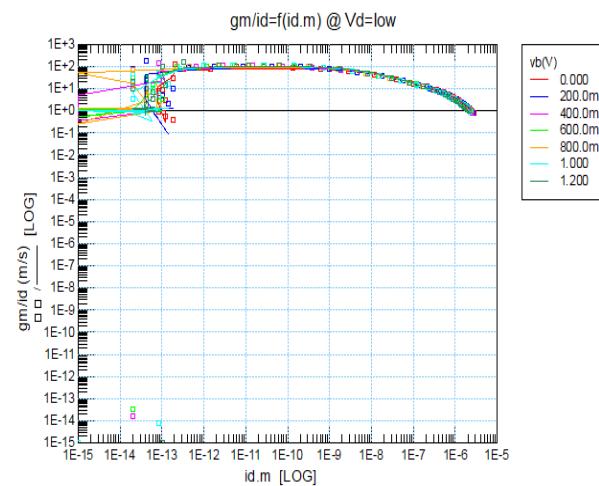
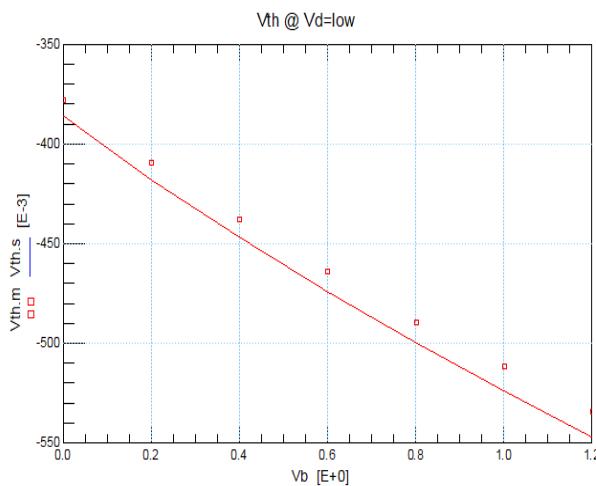
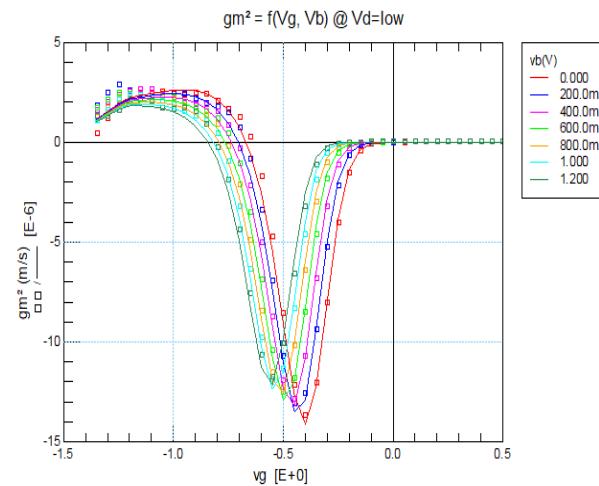
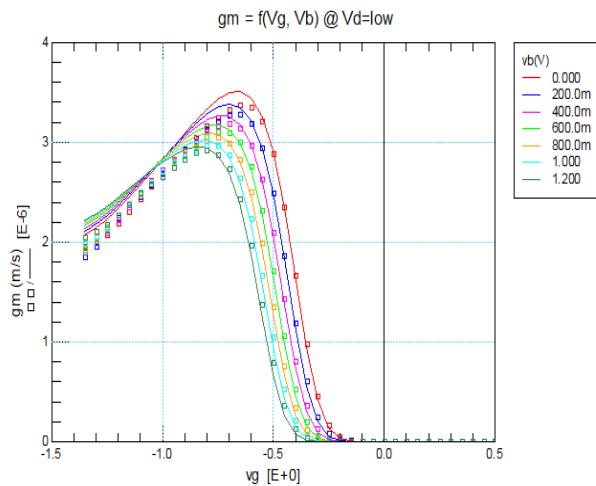
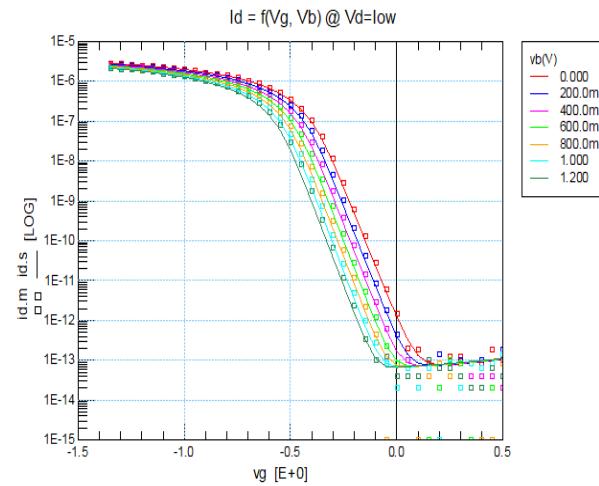
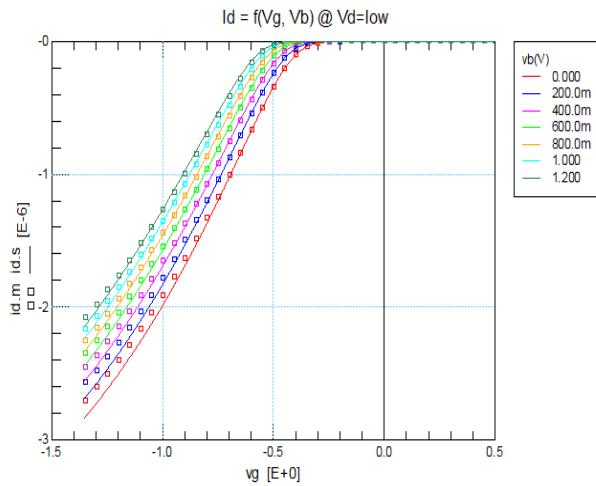


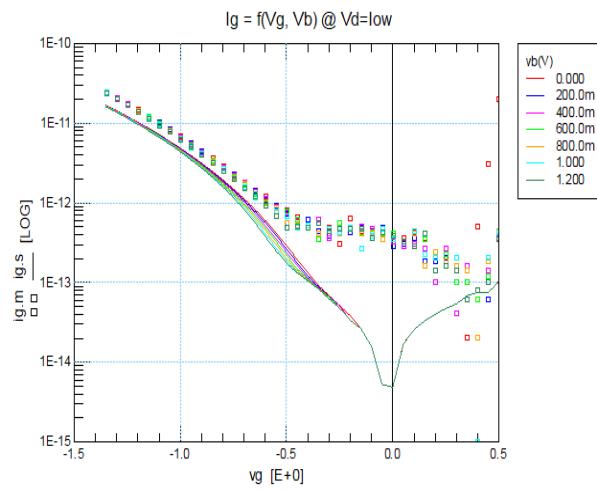
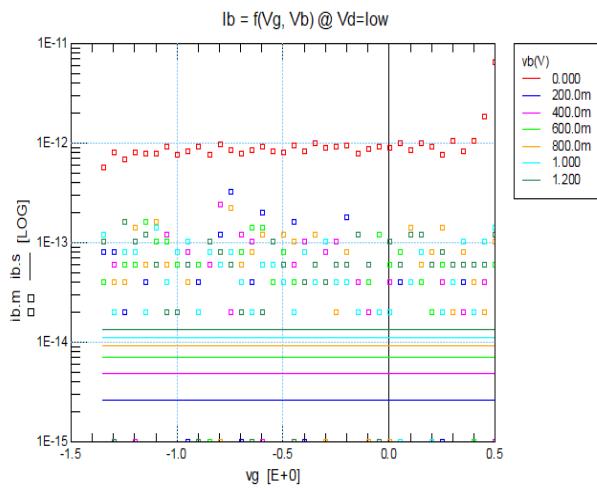
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



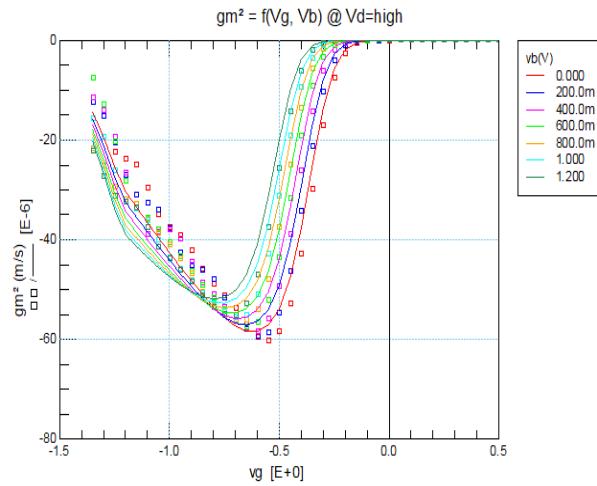
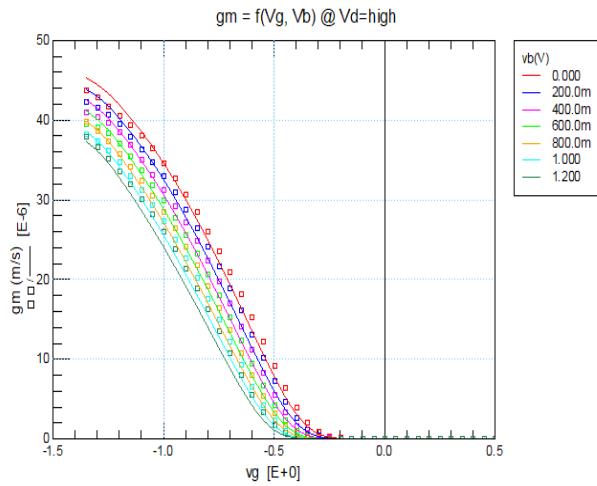
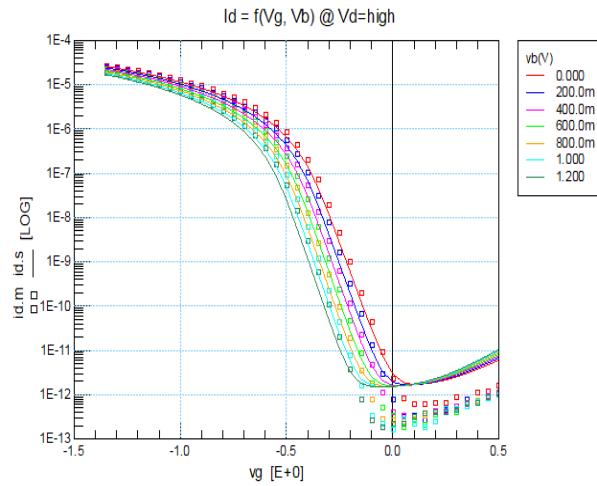
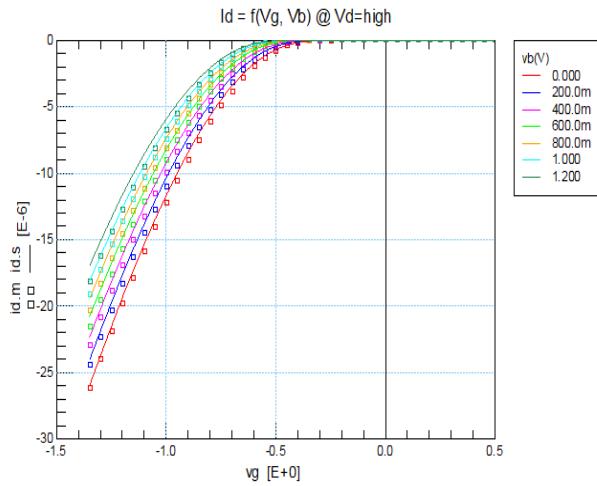
## 4.35 W0u3\_L0u5\_S553\_1

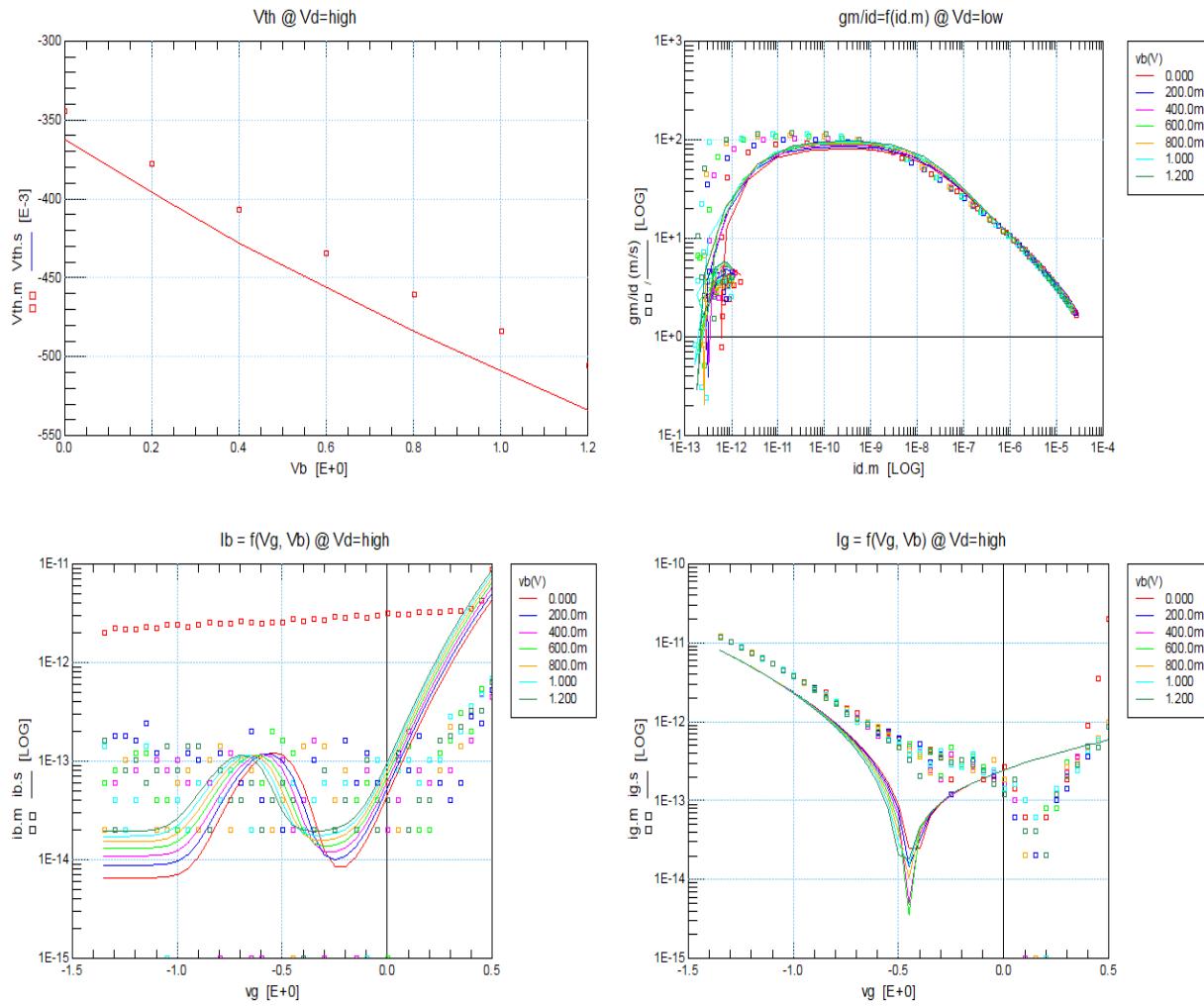
idvg, Vd = -0.05V, T = 27°C



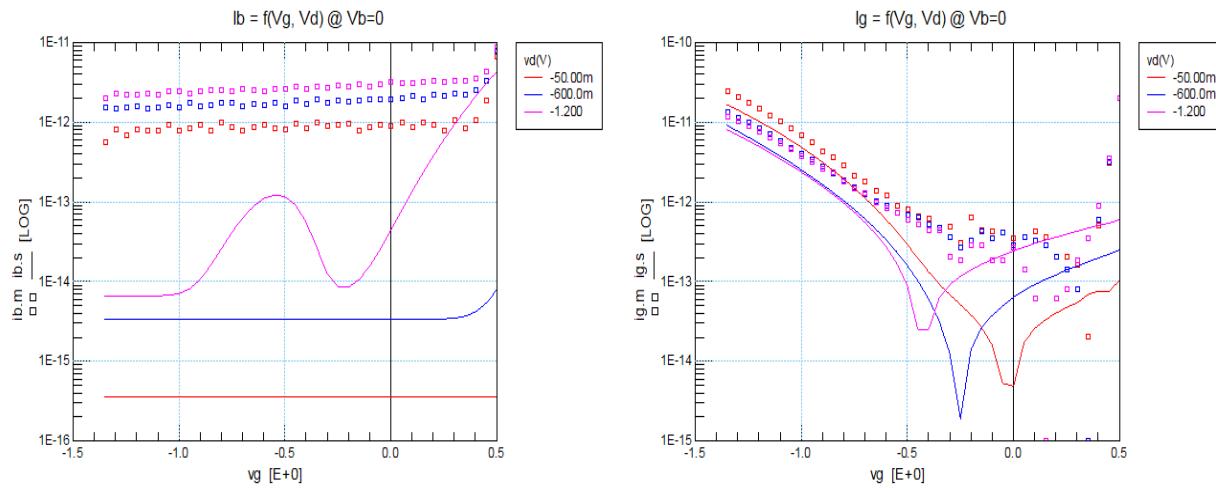


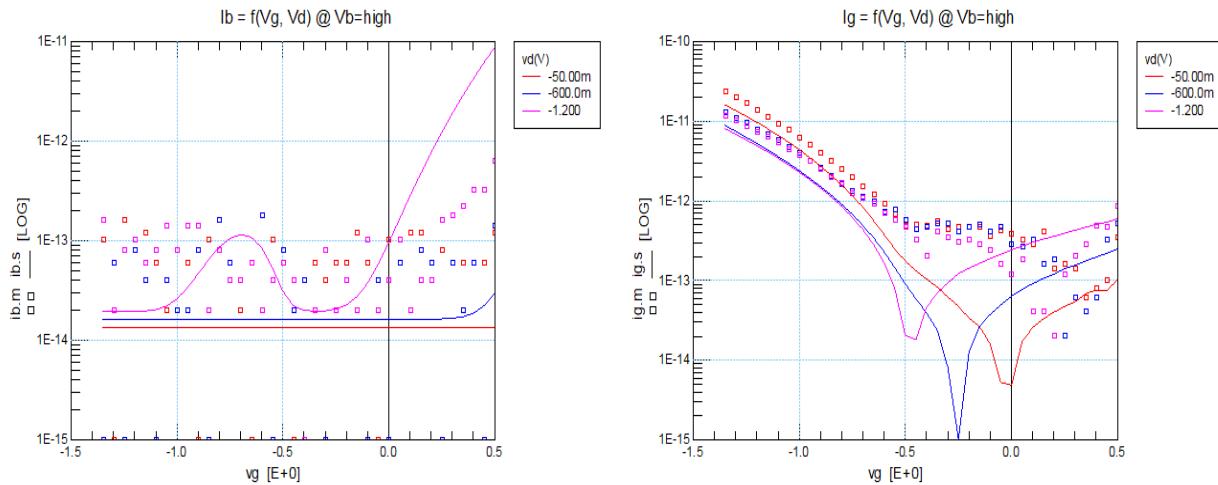
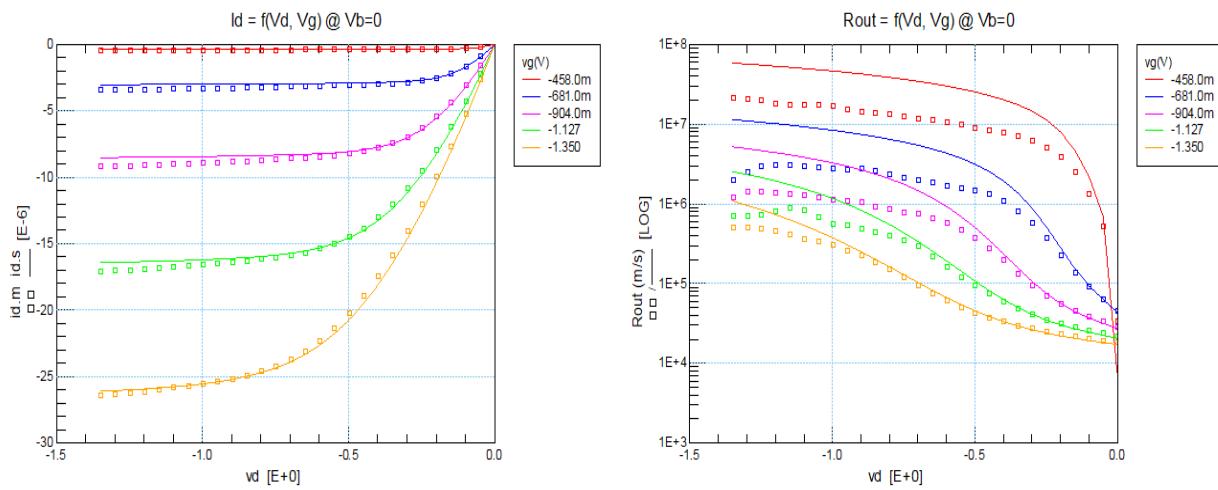
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

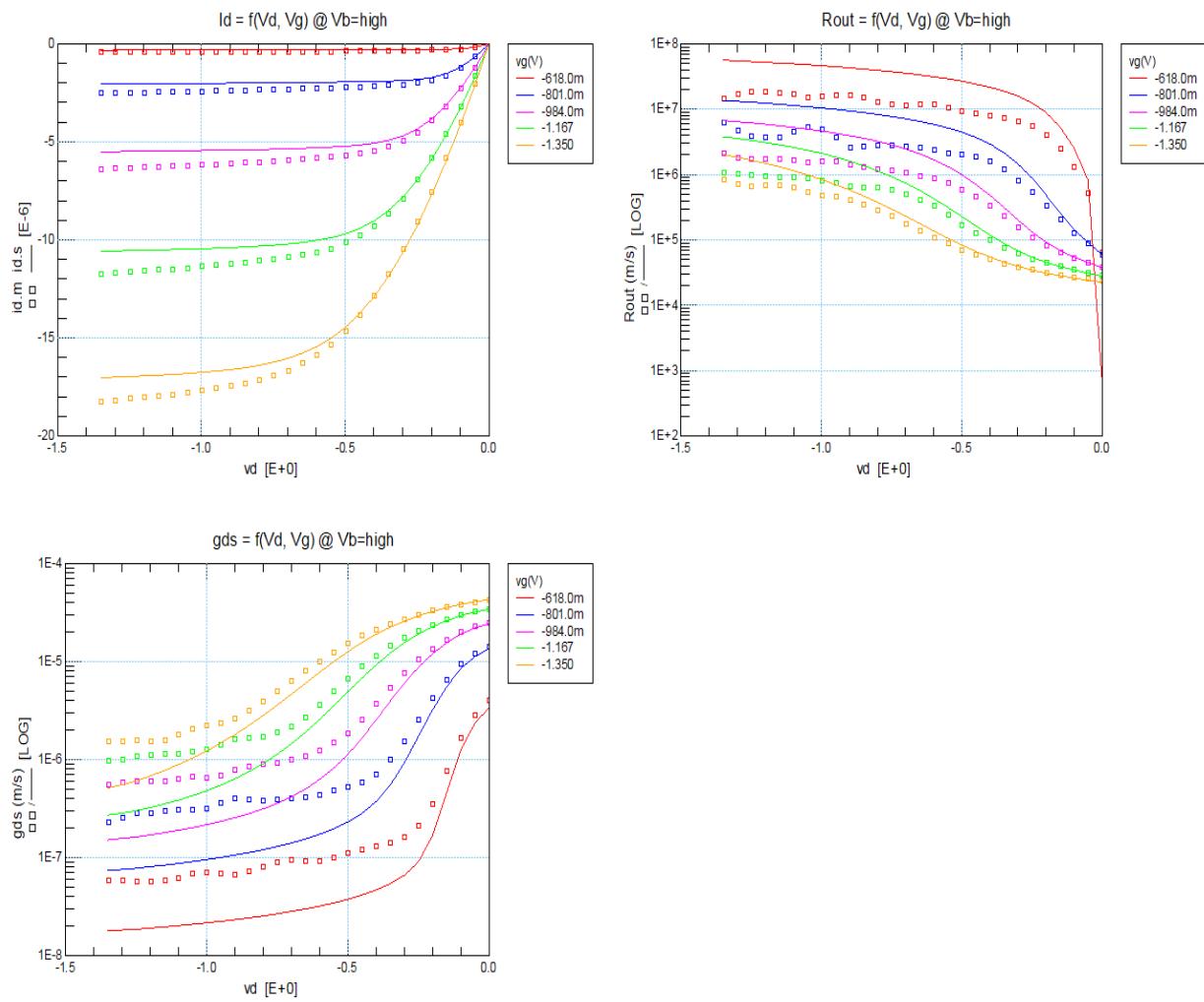
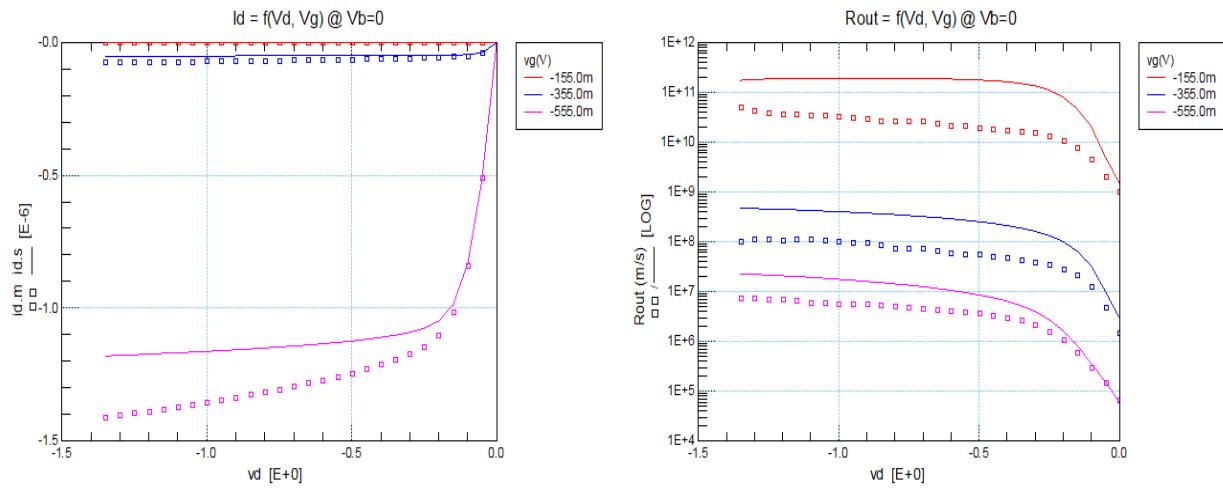


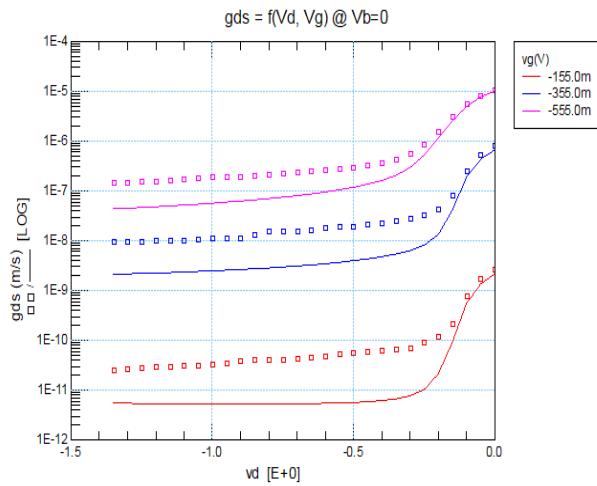


### $i_d v g, I_b, I_g, V_b = 0V, T = 27^\circ C$

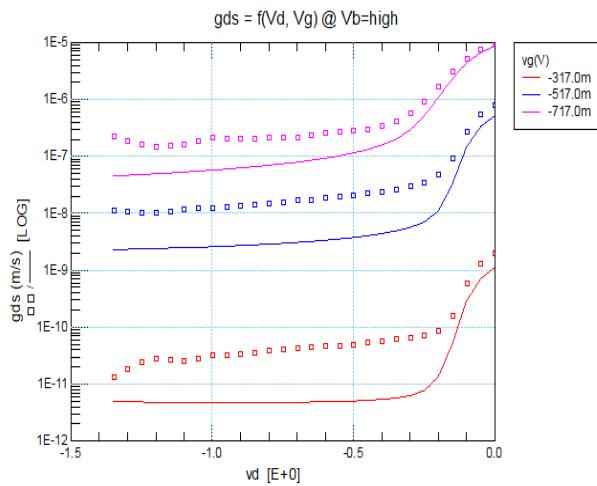
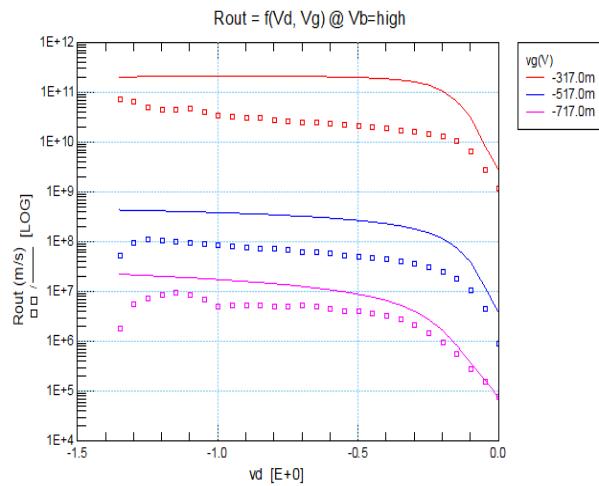
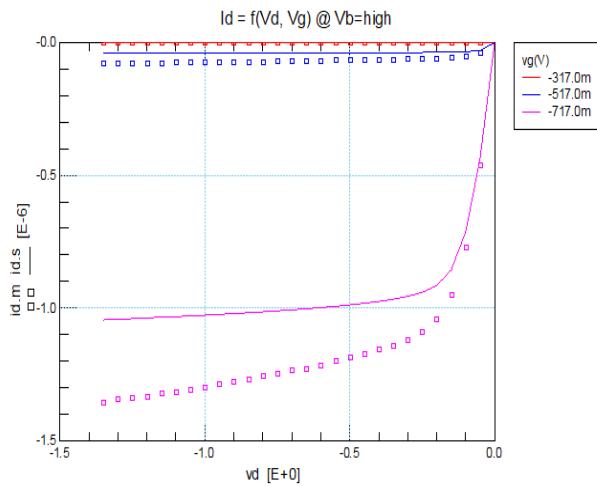


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

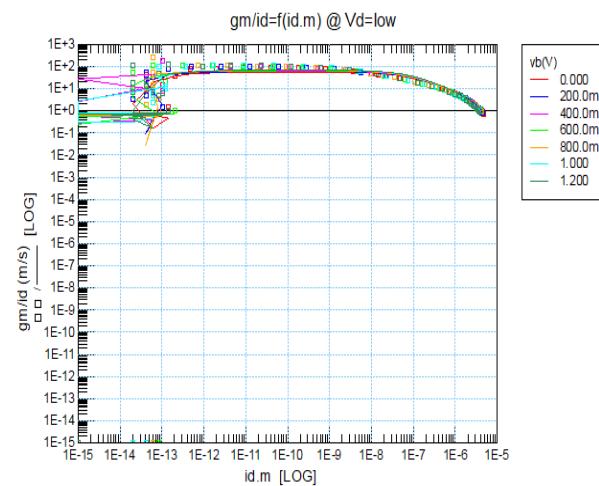
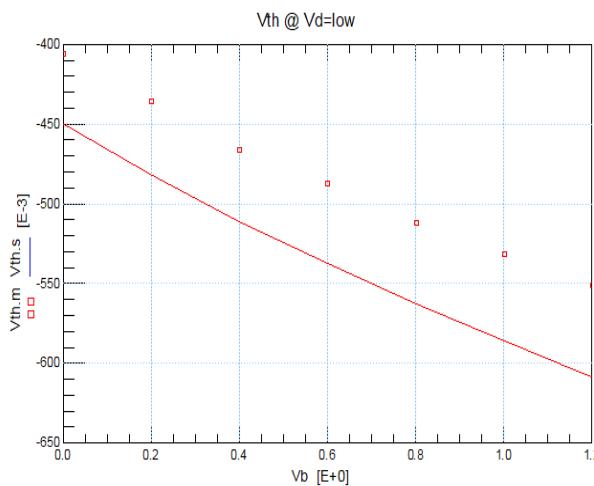
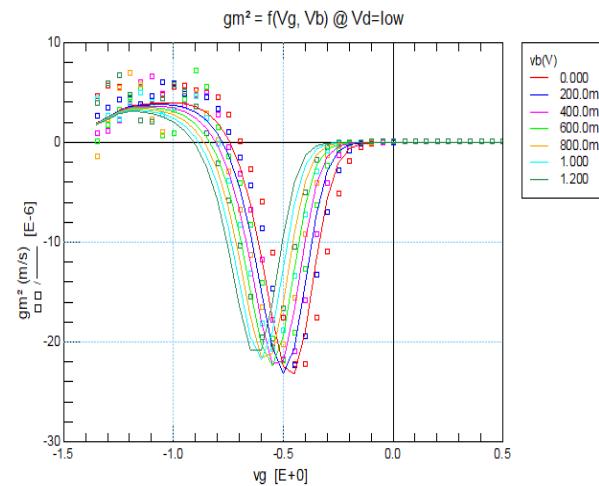
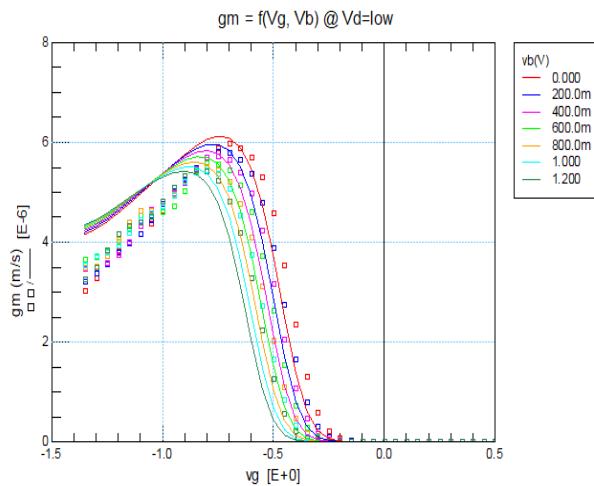
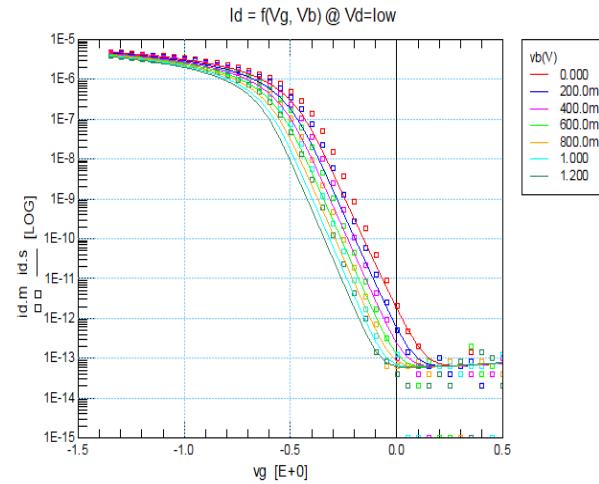
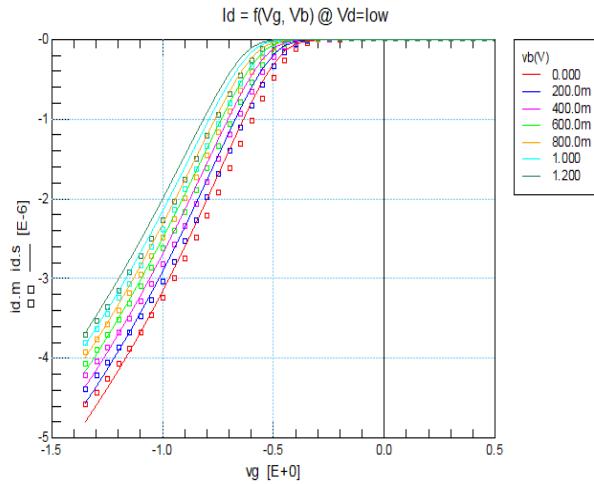


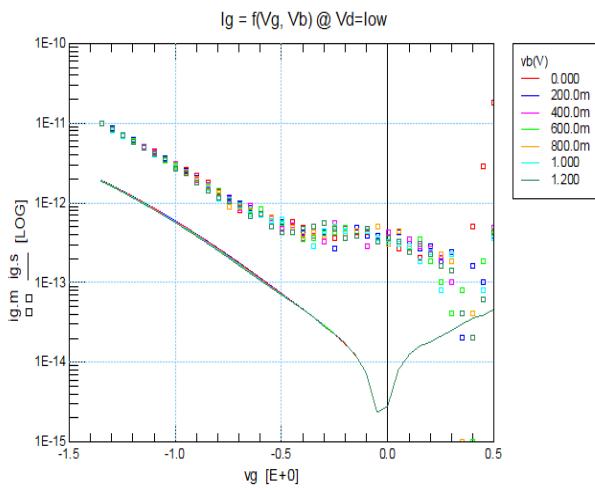
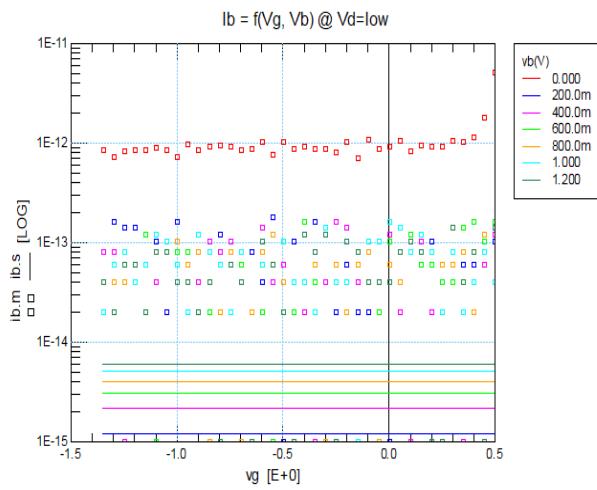
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C



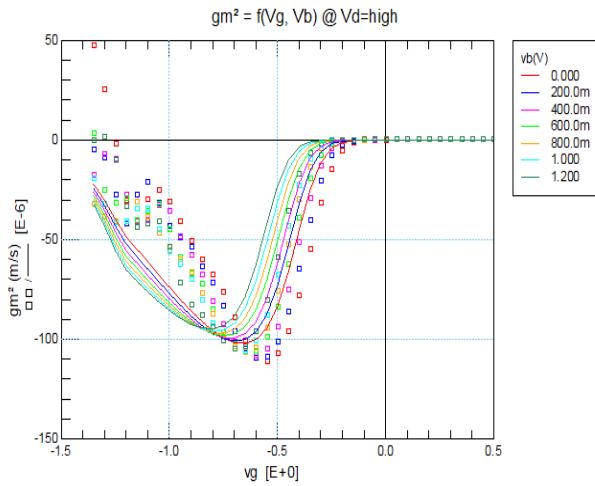
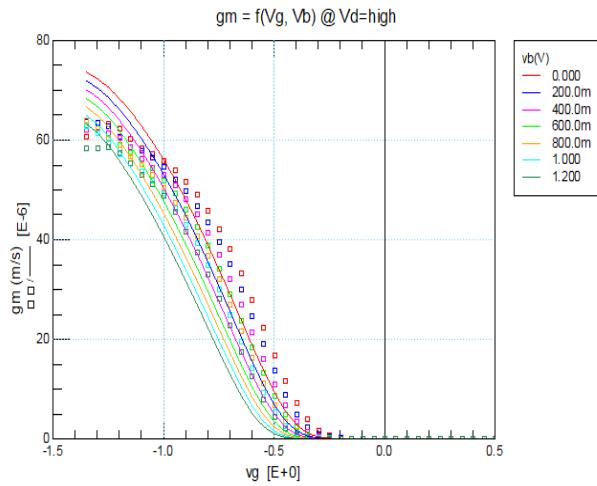
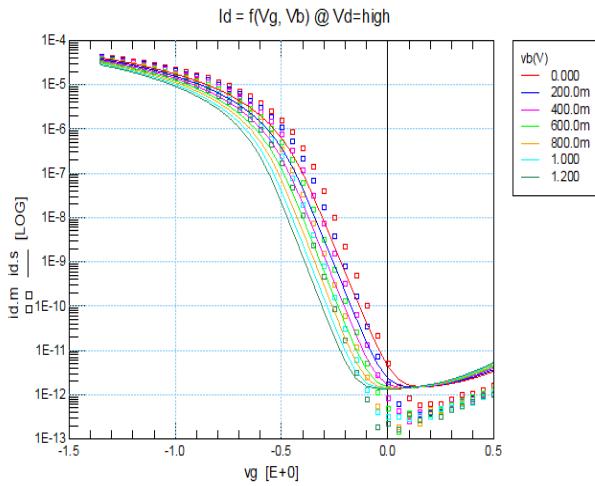
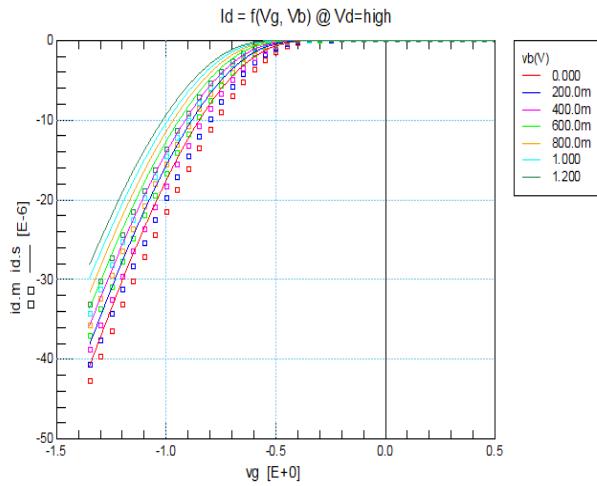
## 4.36 W0u15\_L0u18\_S555\_1

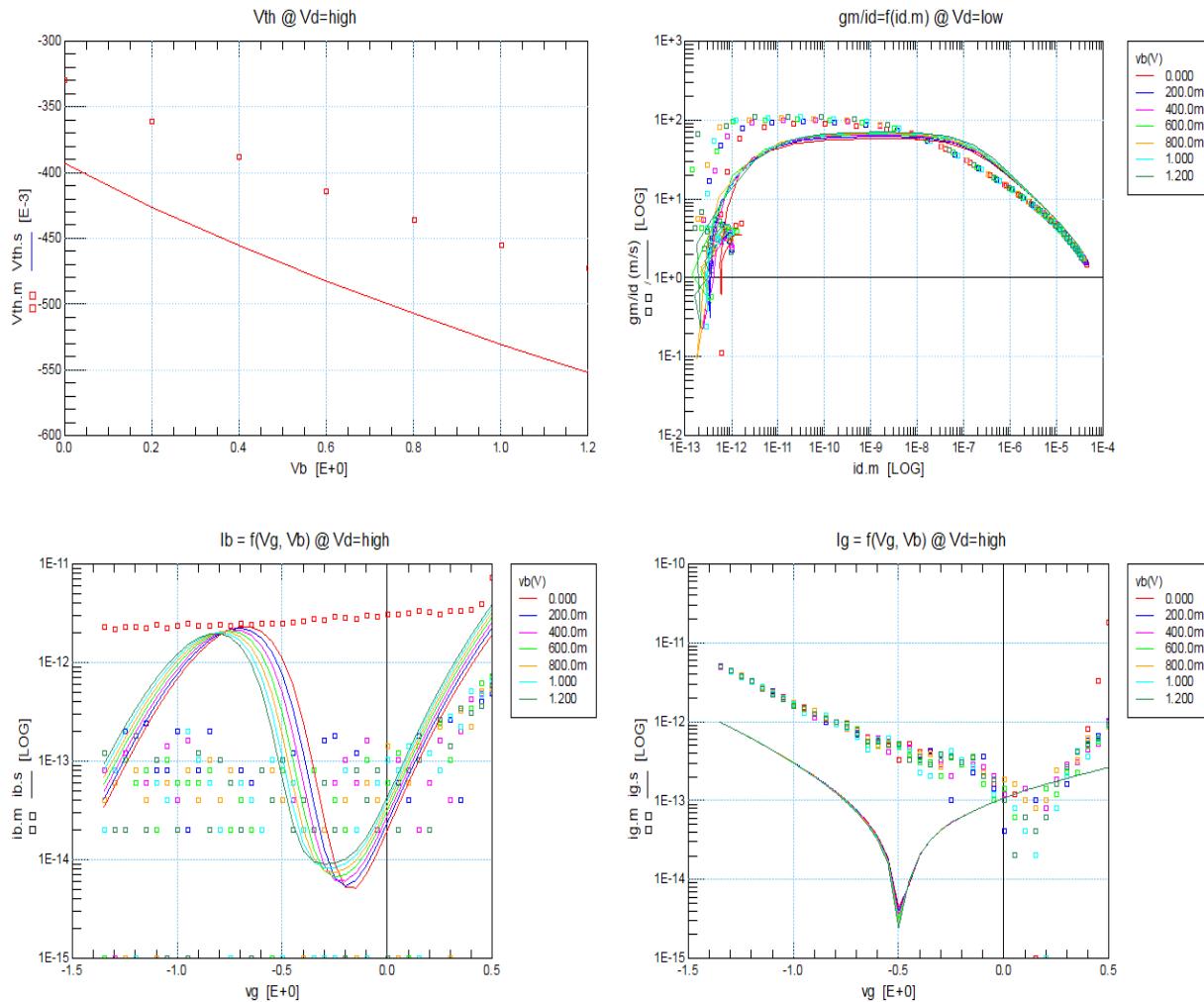
idvg, Vd = -0.05V, T = 27°C



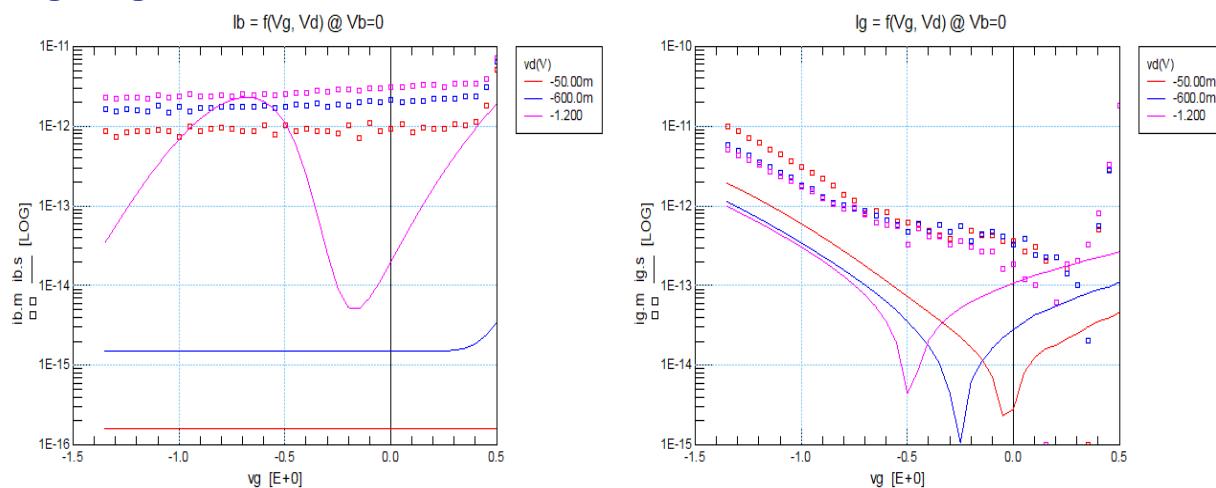


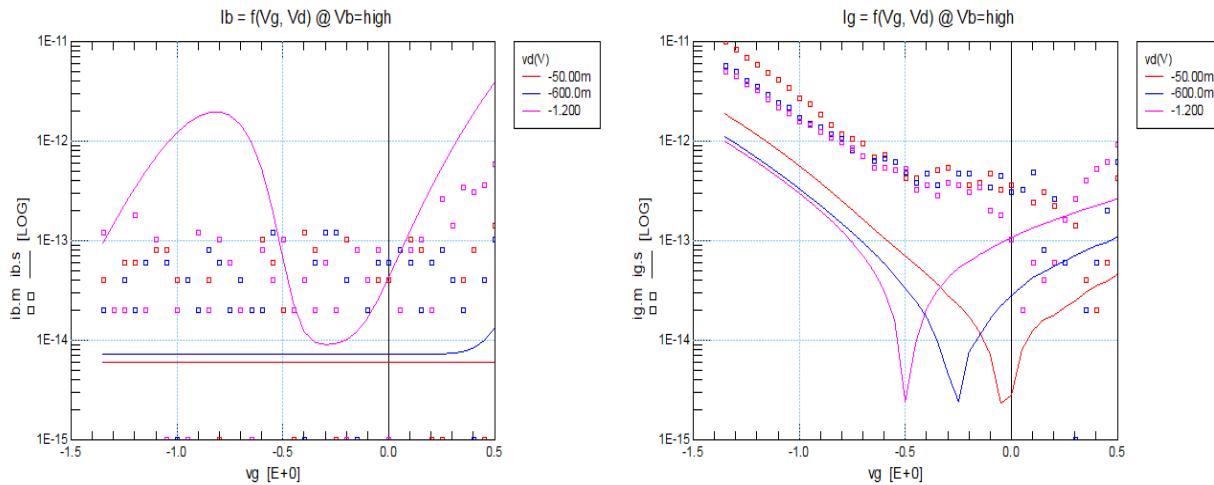
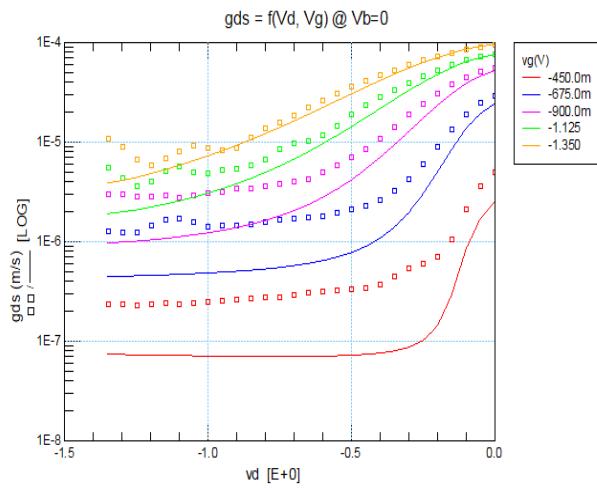
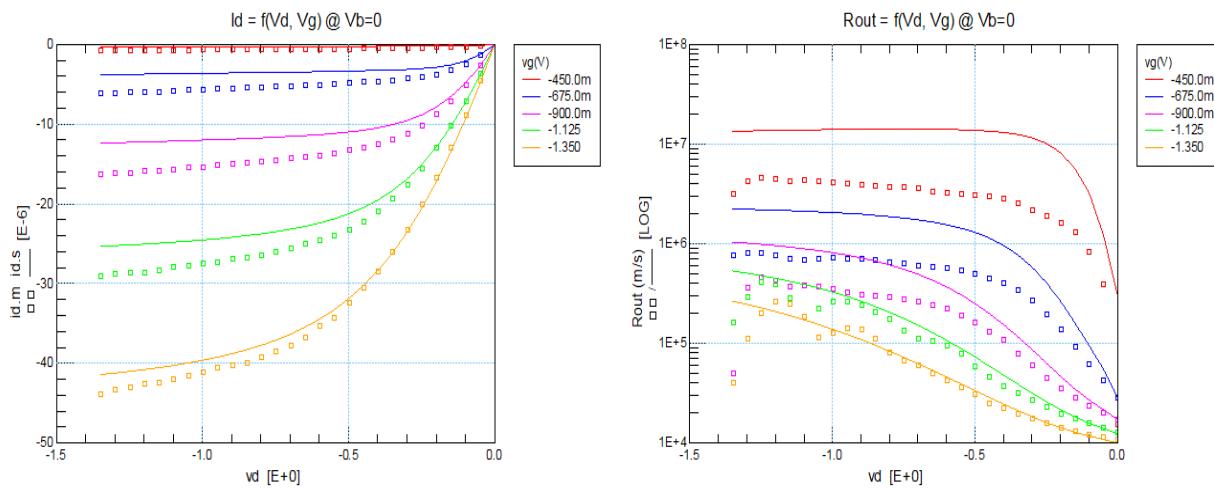
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

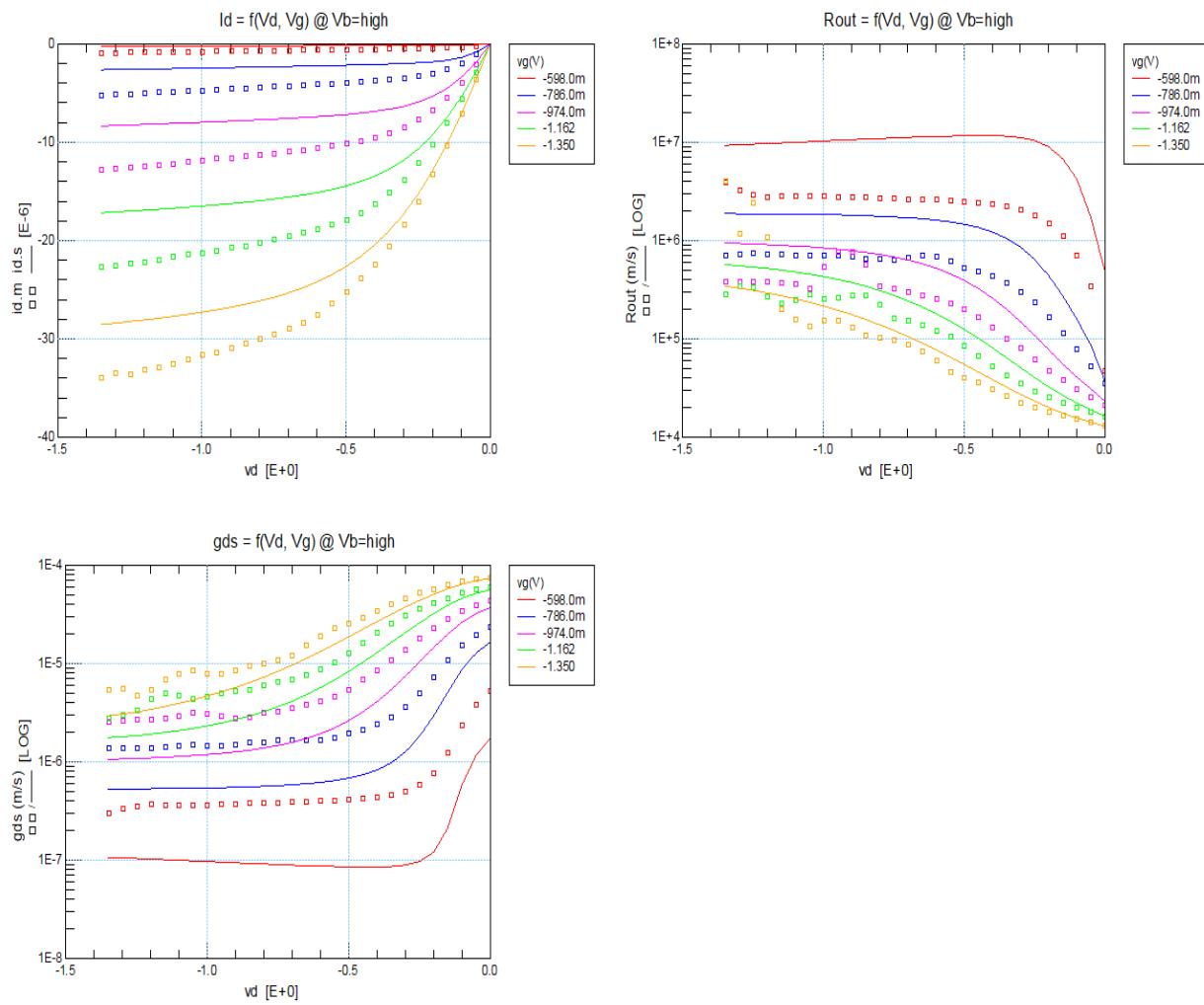
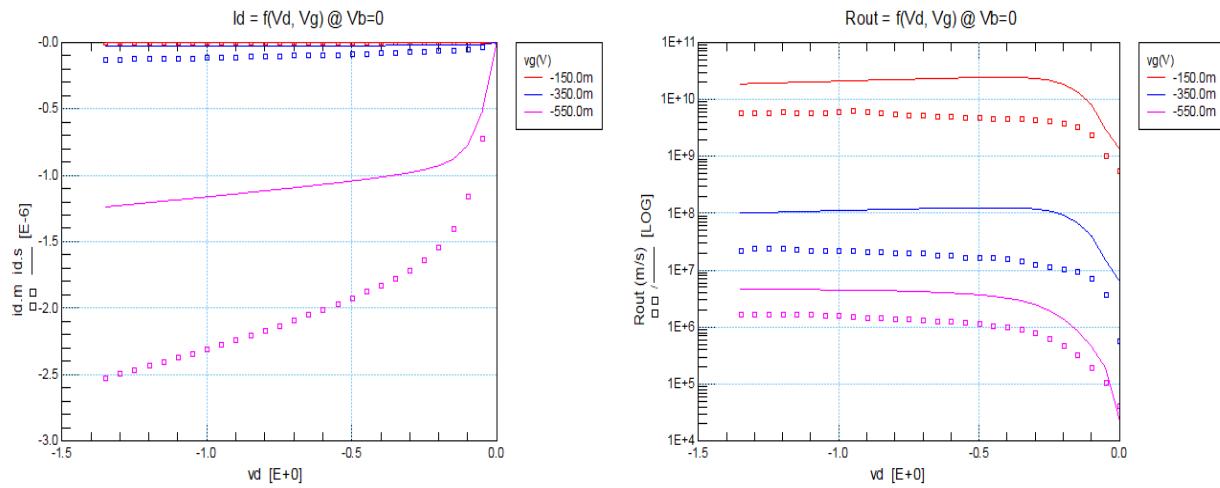


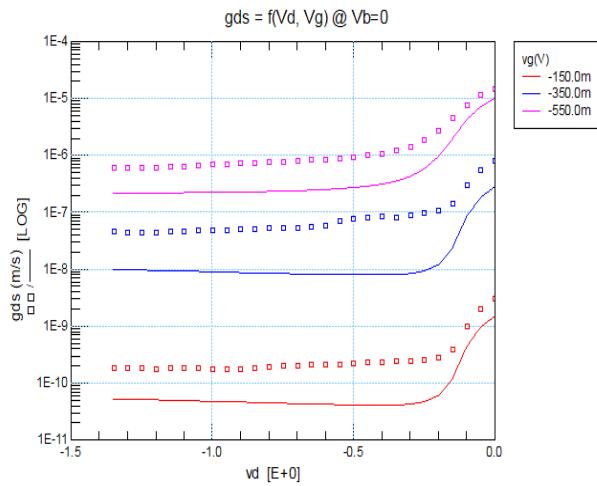


### idvg, Ib,Ig, Vb = 0V, T = 27°C

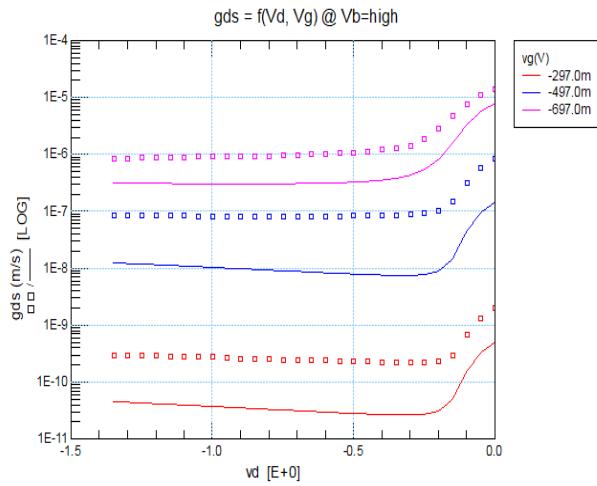
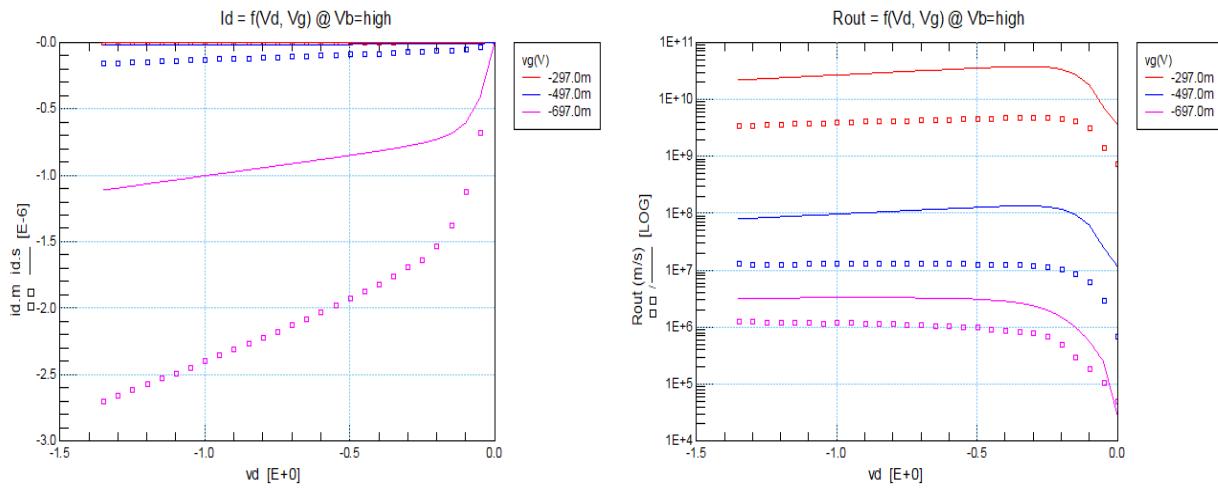


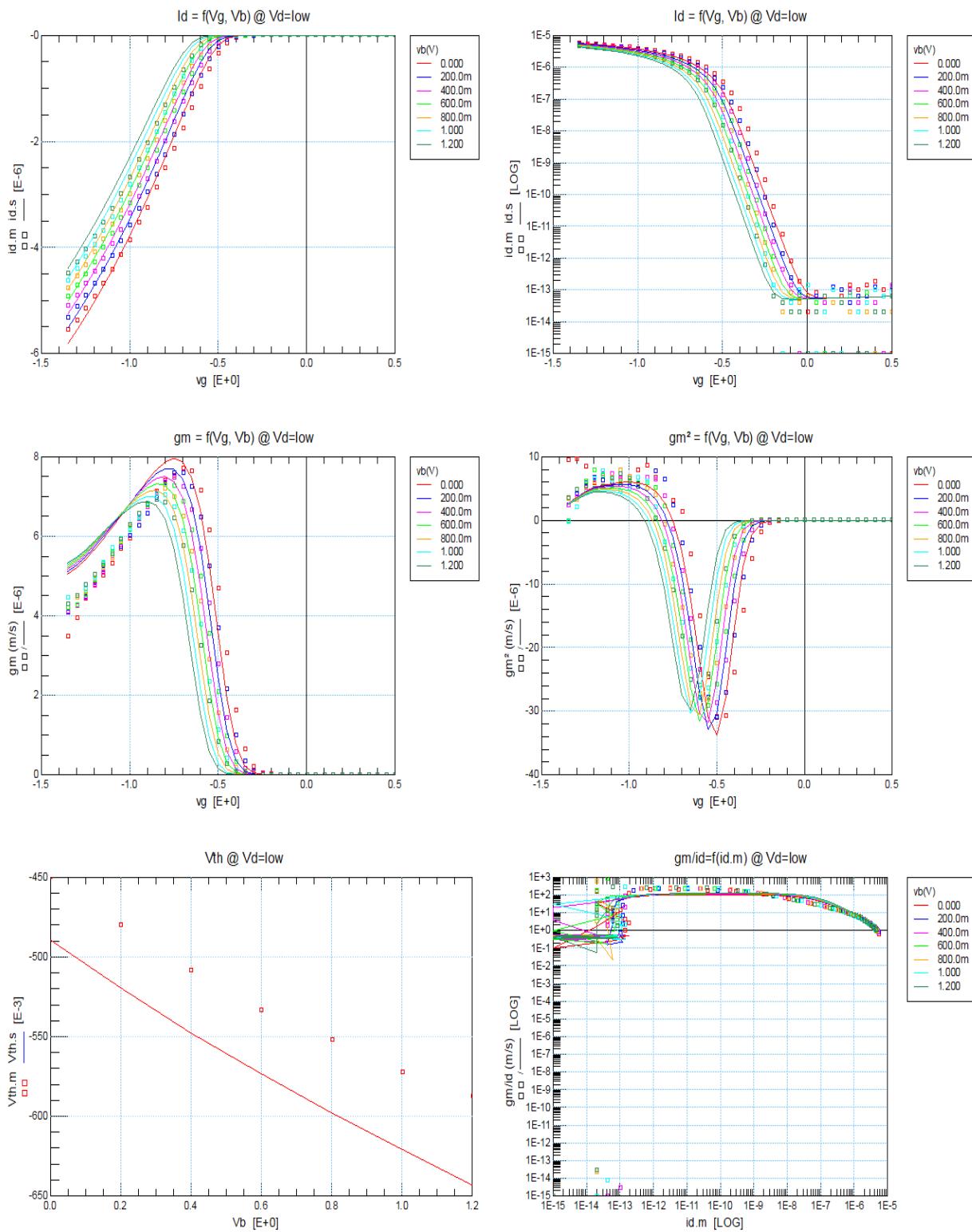
**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


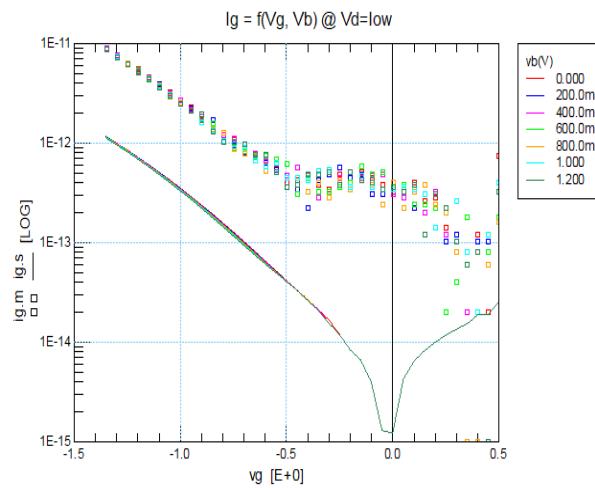
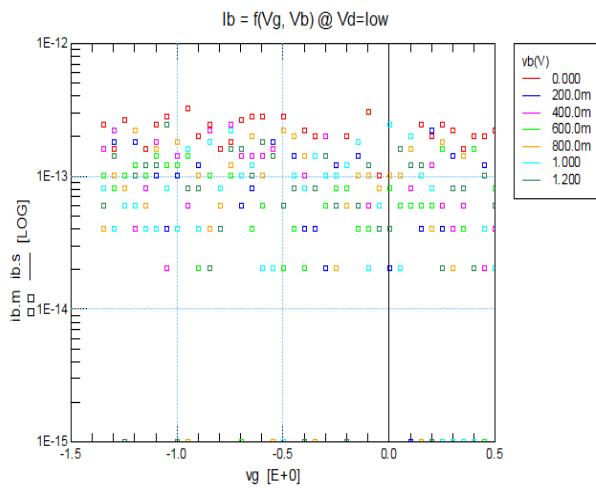
**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**



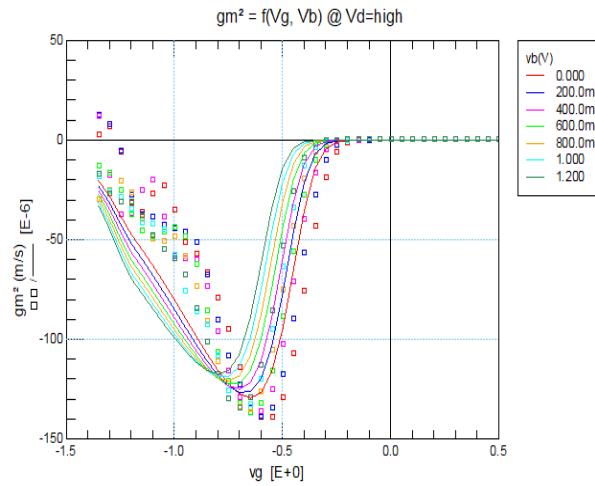
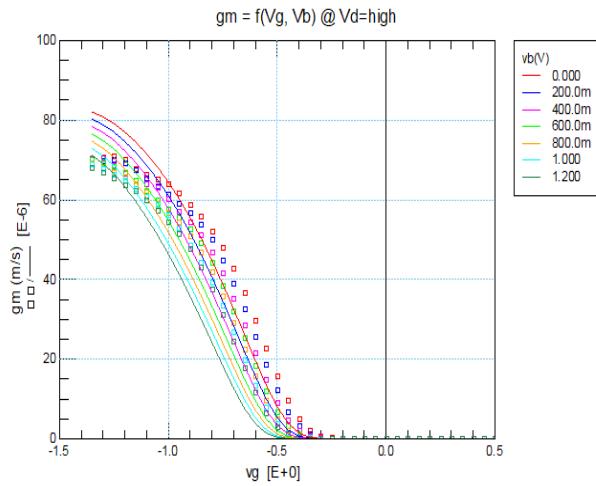
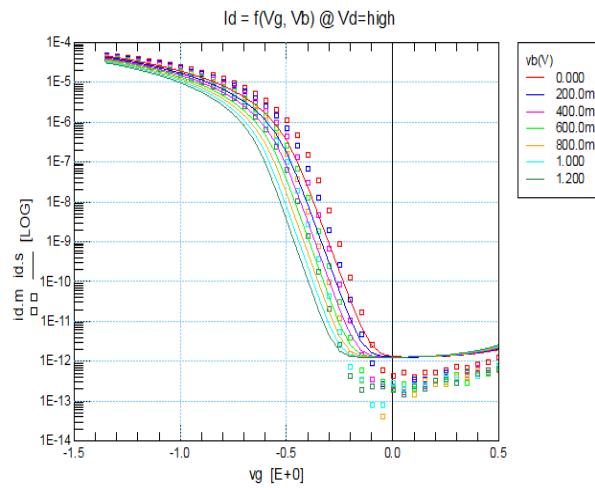
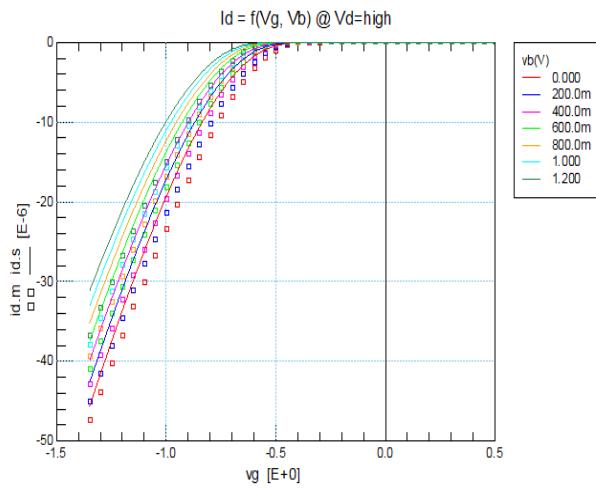
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

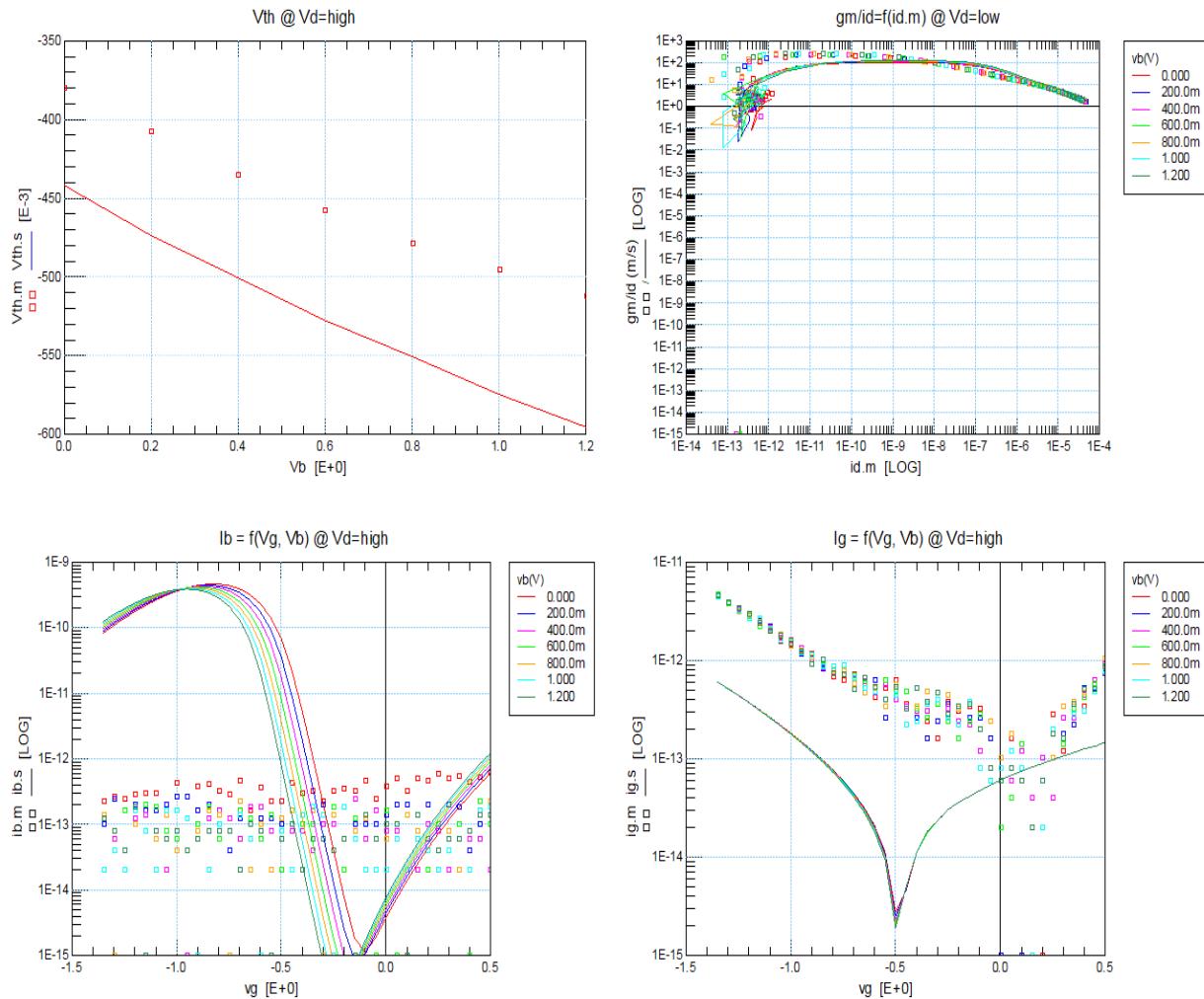


**idvg, Vd = -0.05V, T = -40°C**


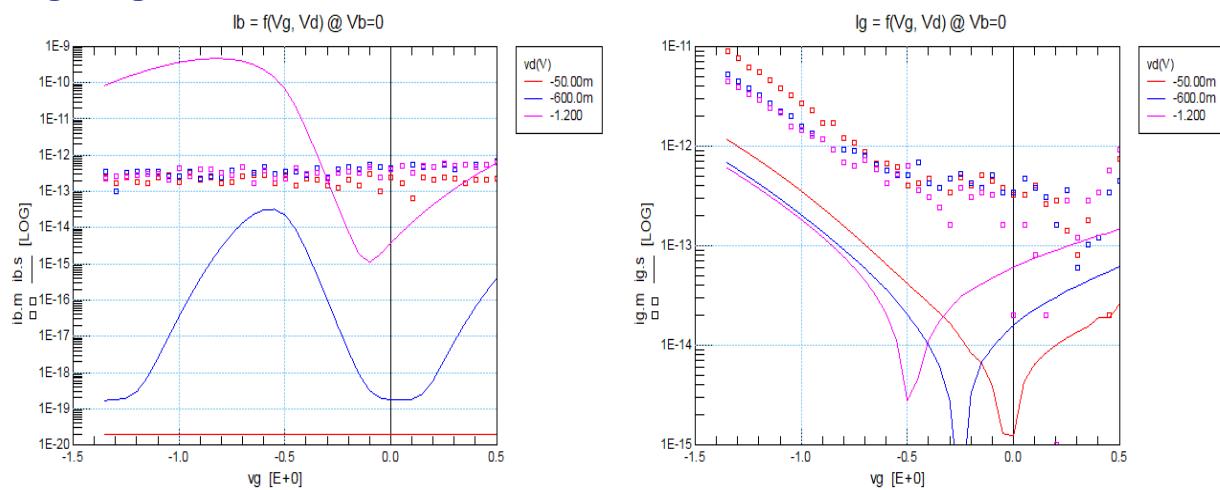


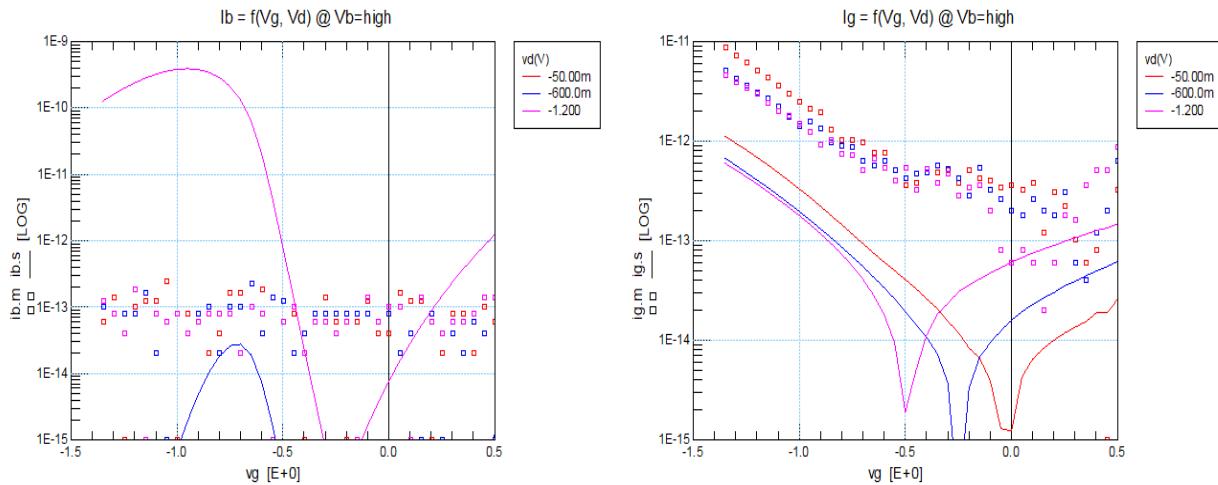
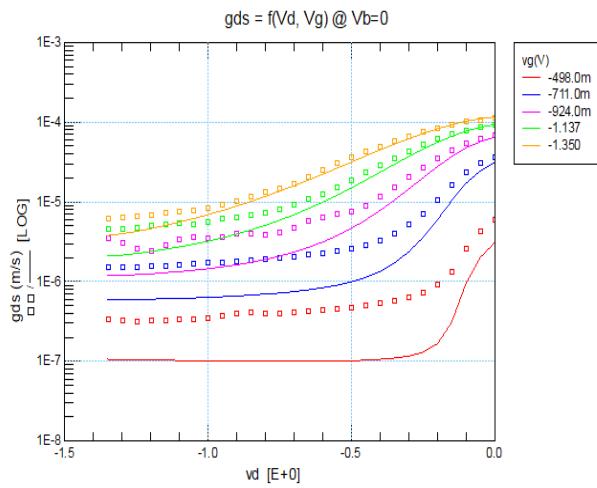
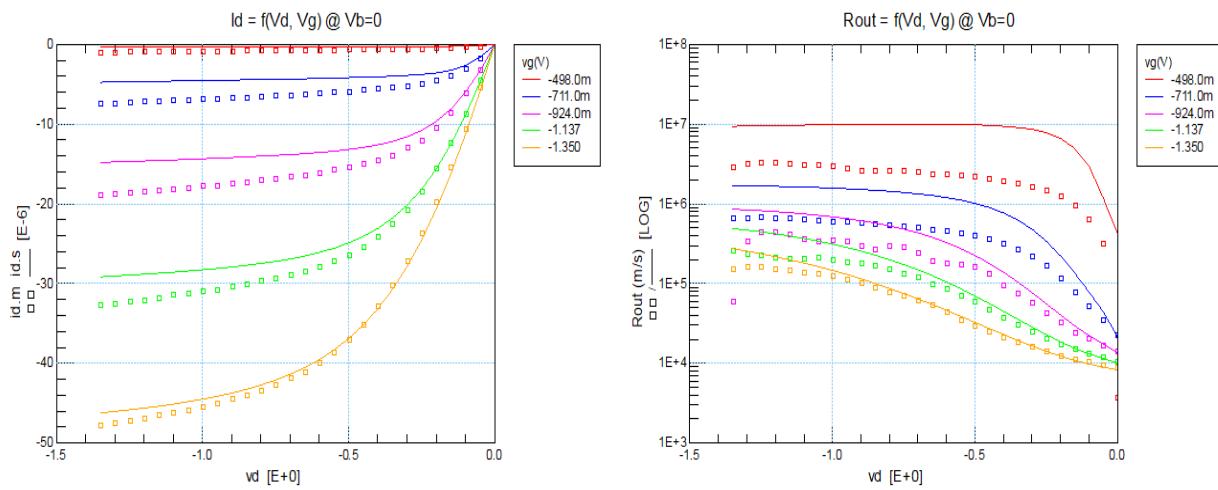
$i_{dvg}, V_d = -1.2V, T = -40^\circ C$

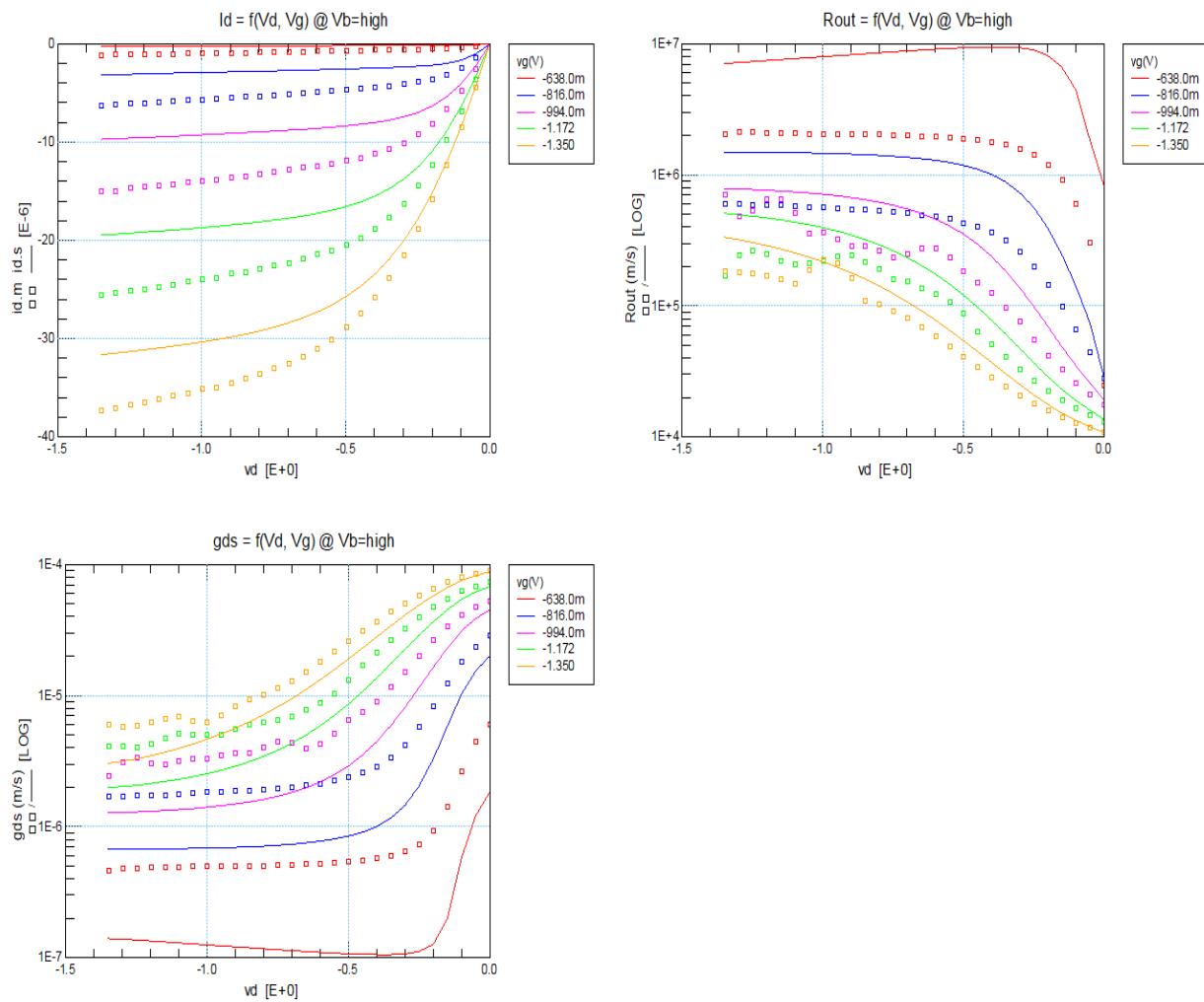
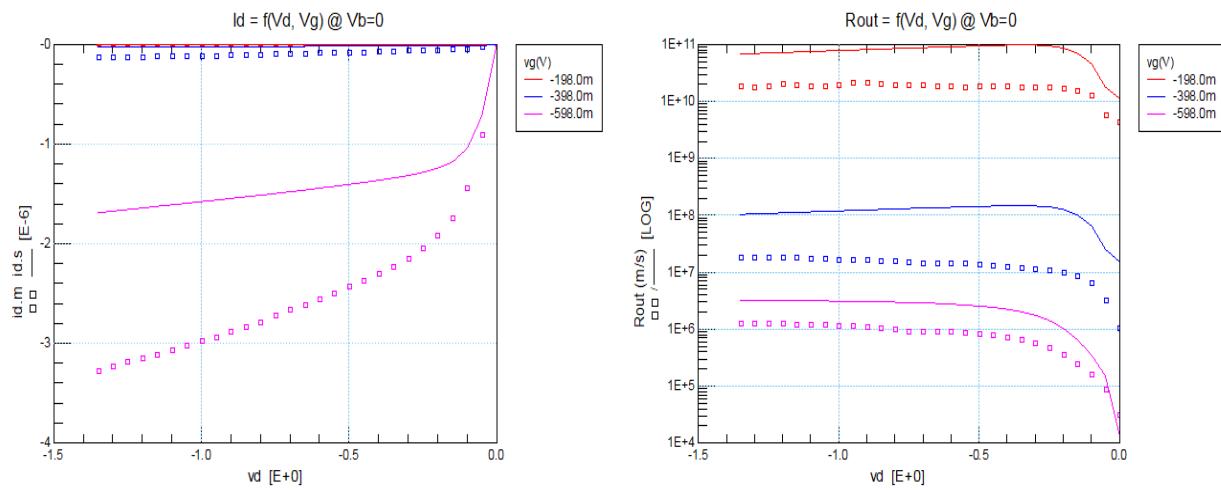


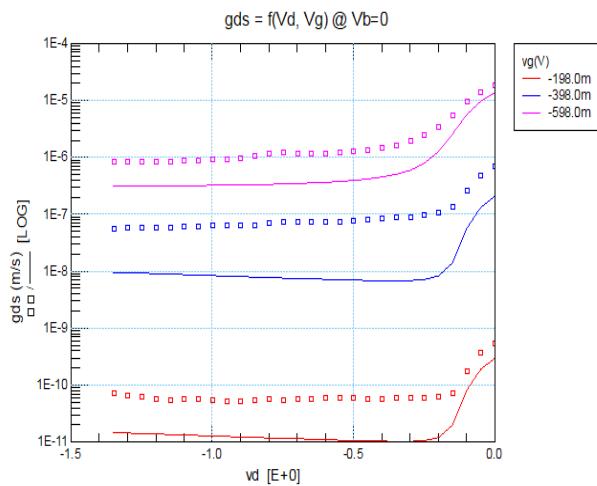


**idvg, Ib, Ig, Vb = 0V, T = -40°C**

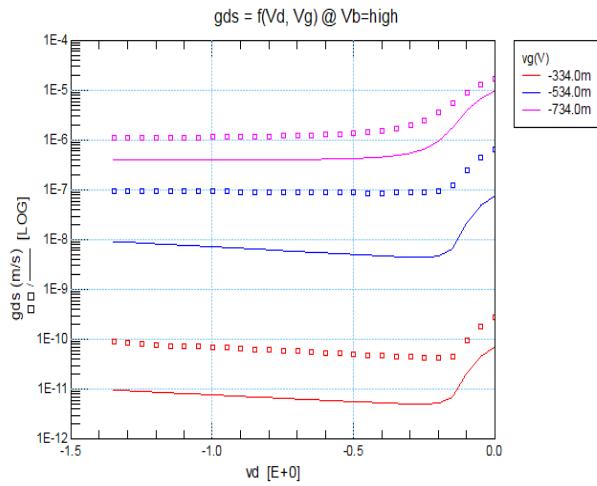
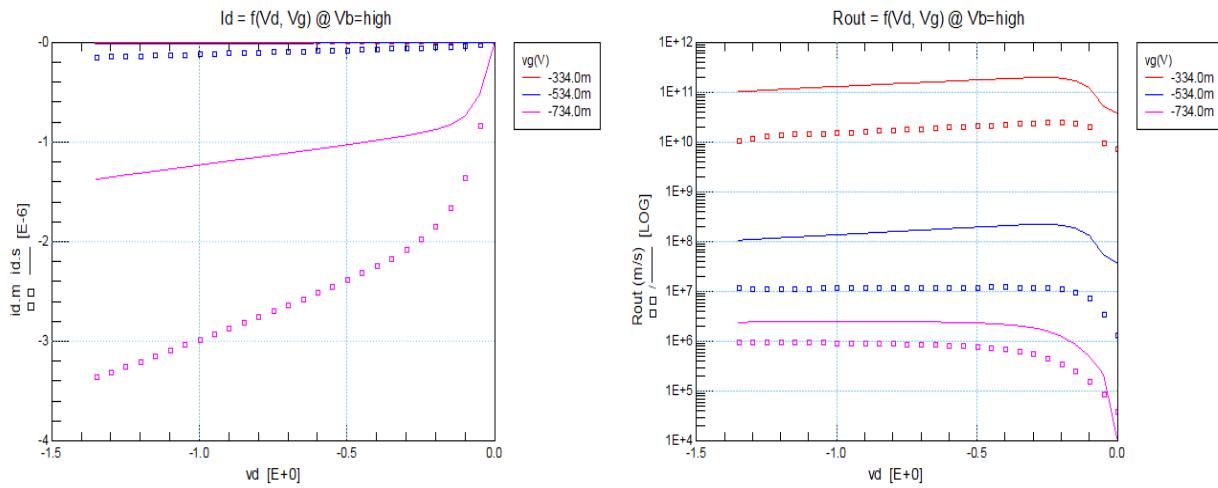


**idvg, Ib,Ig, Vb = 1.2V, T = -40°C**

**idvd, Vb = 0V, T = -40°C**


**idvd\_vbmin, Vb = 1.2V, T = -40°C**

**idvd\_vth, Vb = 0V, T = -40°C**


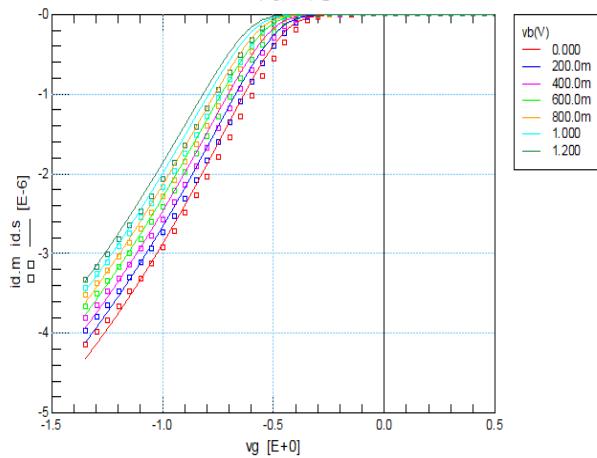


### idvd\_vth\_vbmin, Vb = 1.2V, T = -40°C

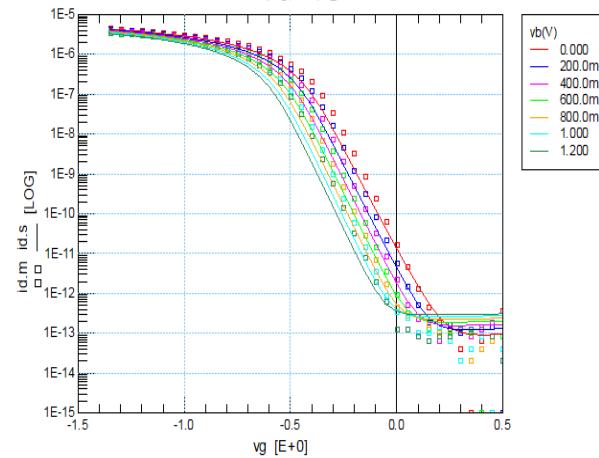


$id_{vg}$ ,  $V_d = -0.05V$ ,  $T = 70^\circ C$

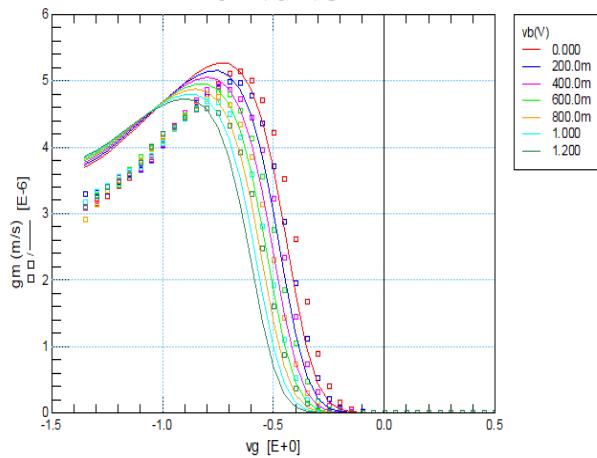
$Id = f(V_g, V_b) @ V_d=low$



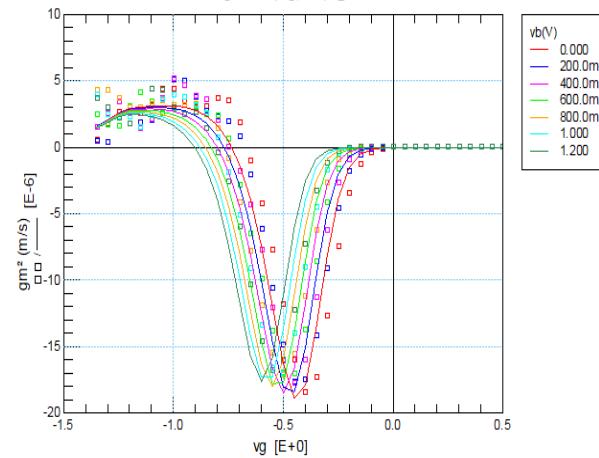
$Id = f(V_g, V_b) @ V_d=low$



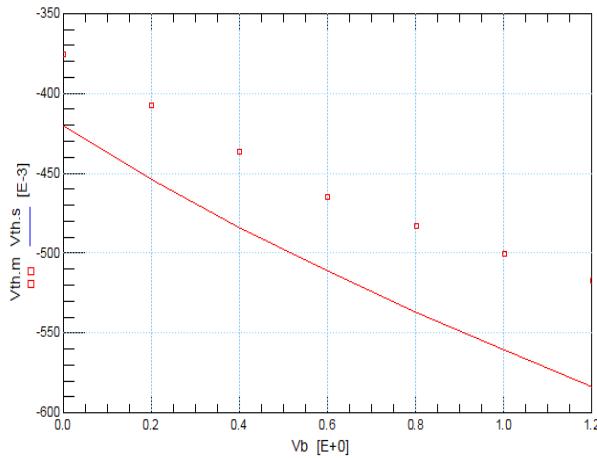
$gm = f(V_g, V_b) @ V_d=low$



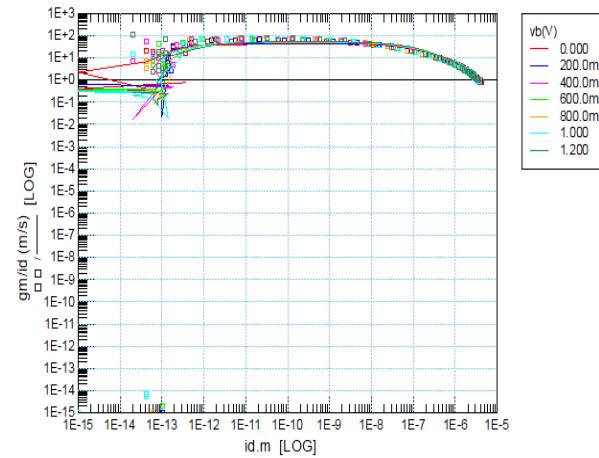
$gm^2 = f(V_g, V_b) @ V_d=low$

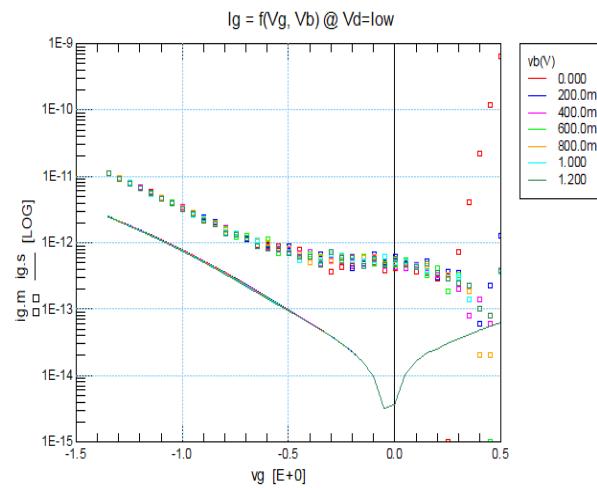
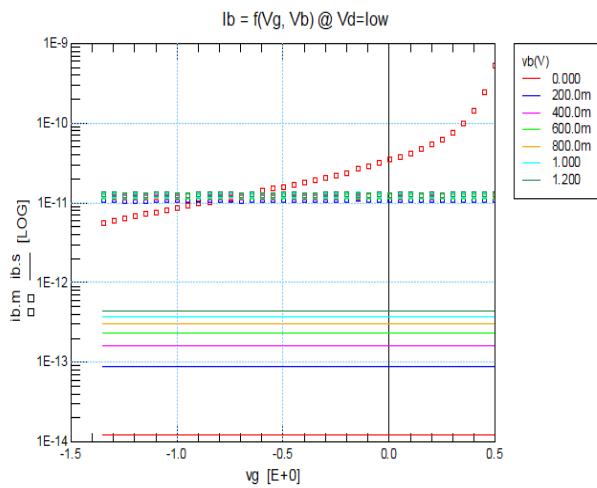


$V_{th} @ V_d=low$

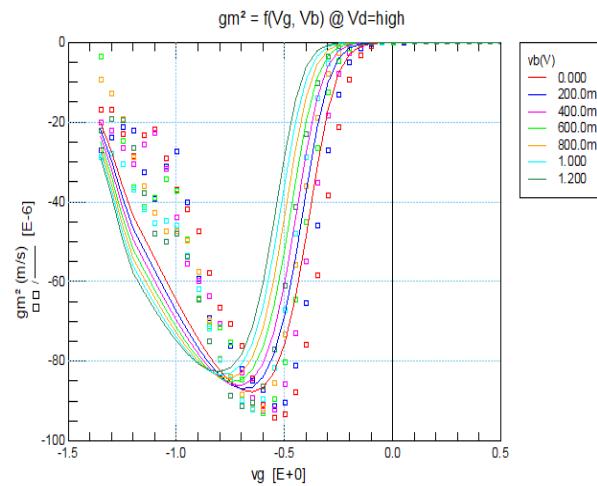
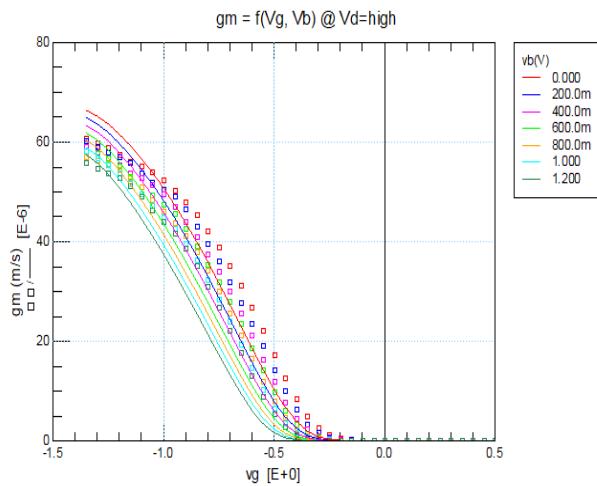
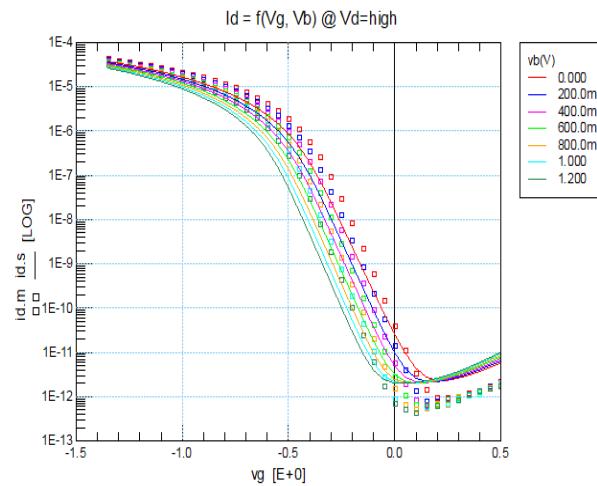
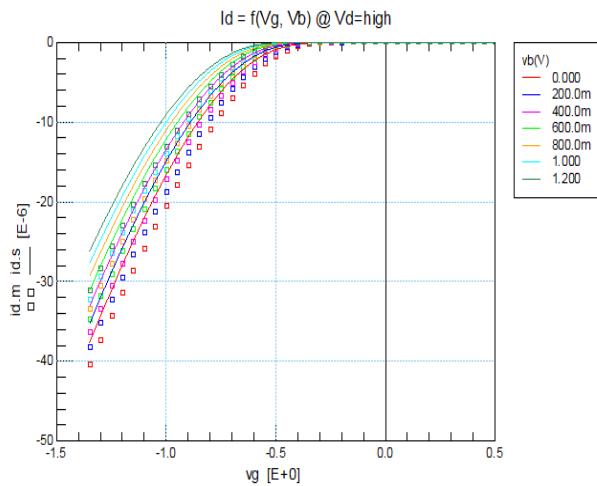


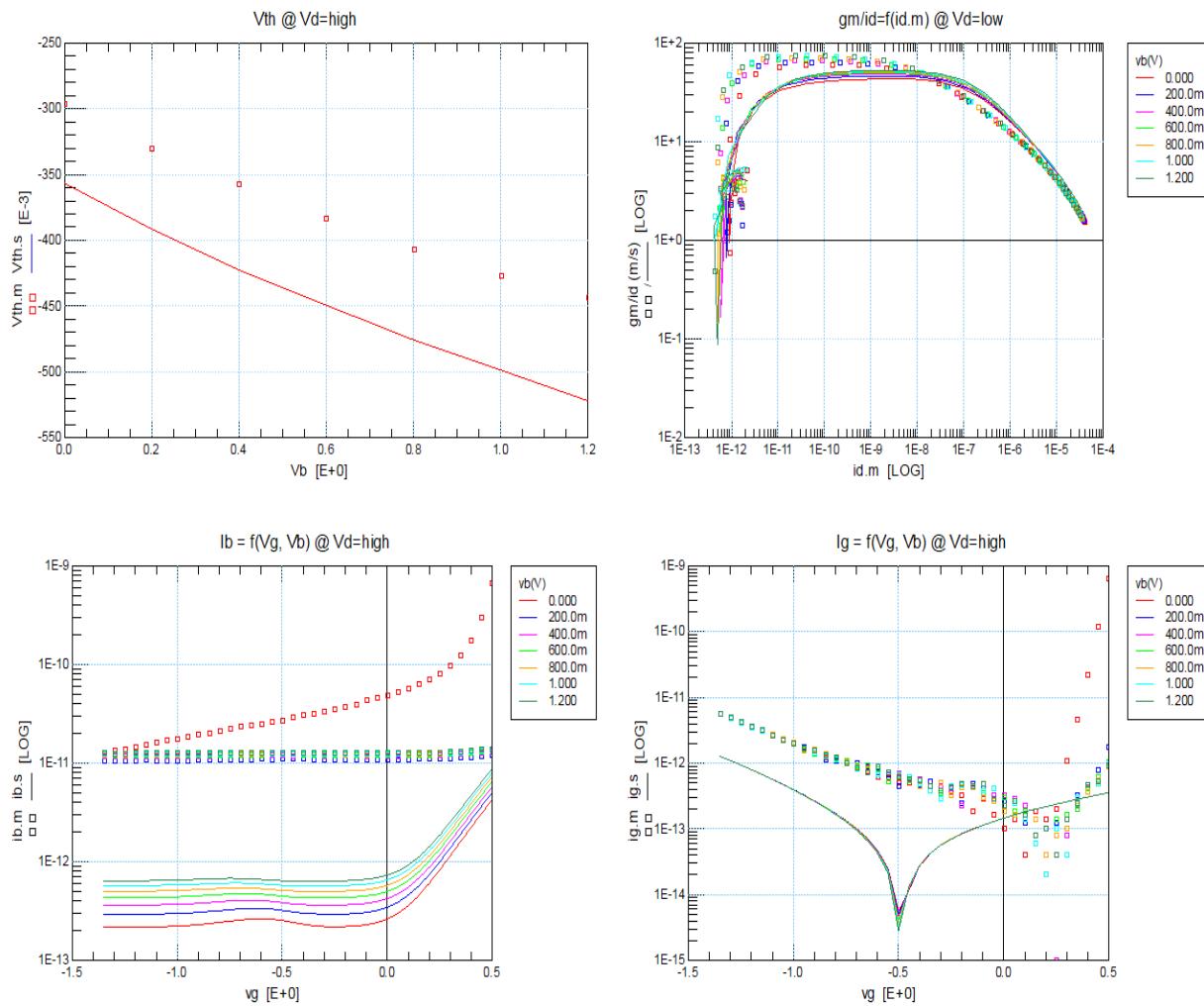
$gm/id = f(id_m) @ V_d=low$



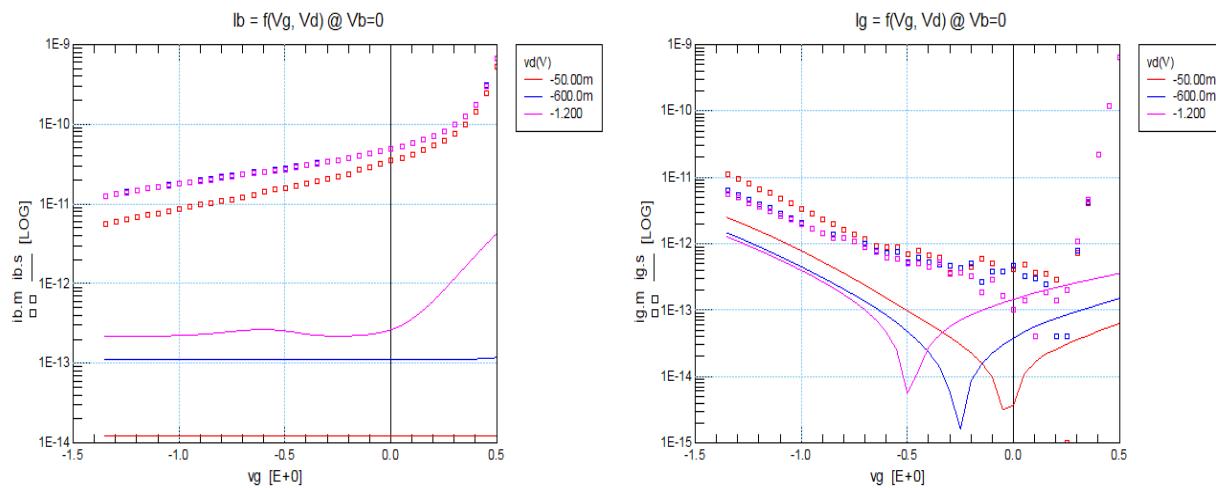


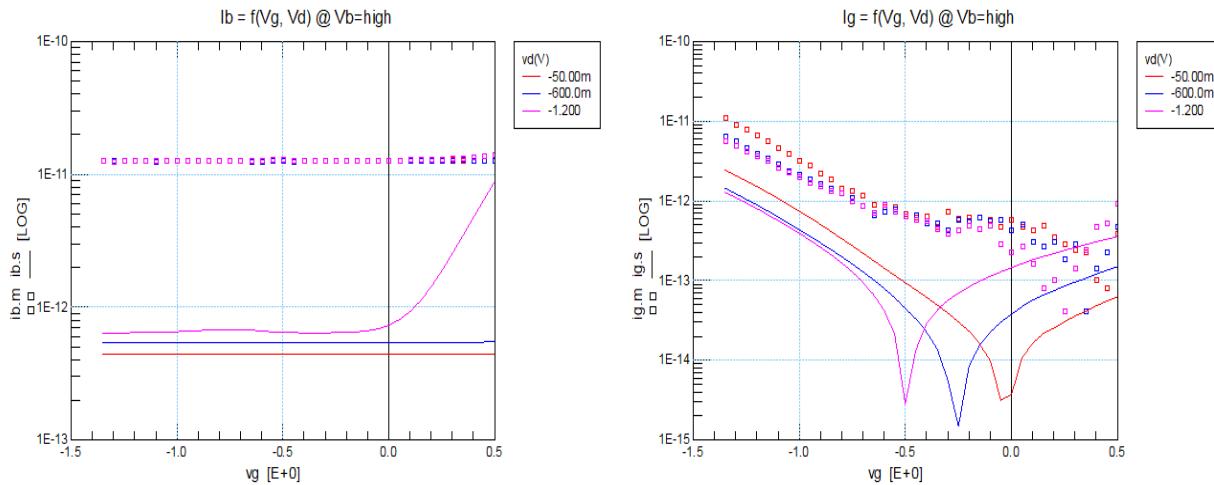
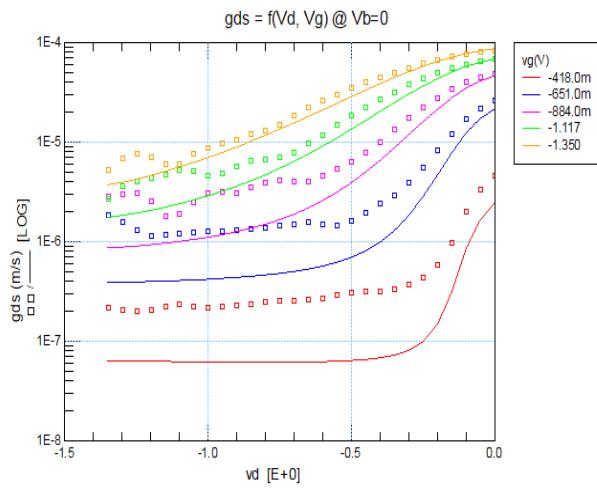
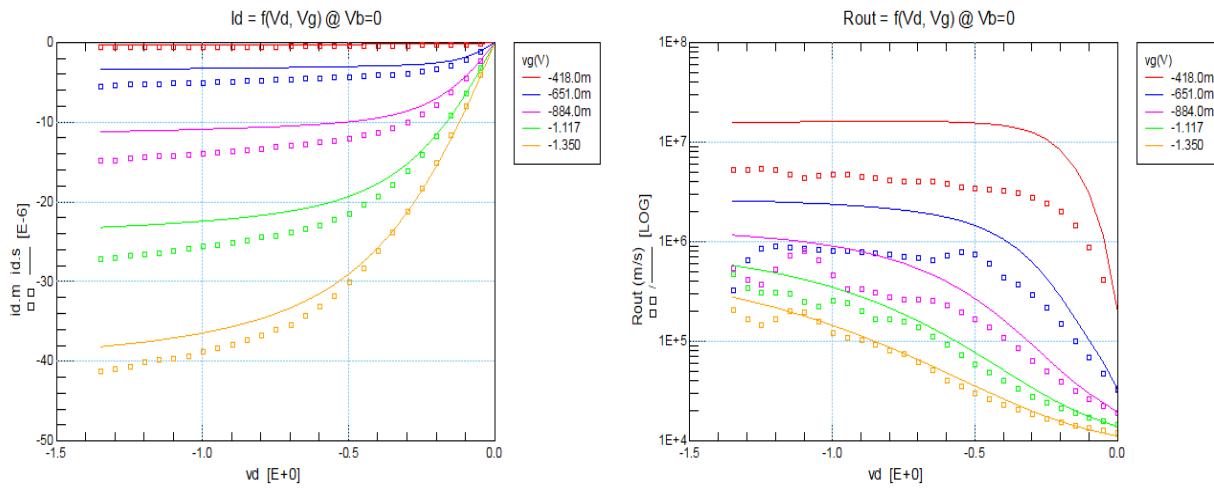
$i_{dvg}, V_d = -1.2V, T = 70^\circ C$

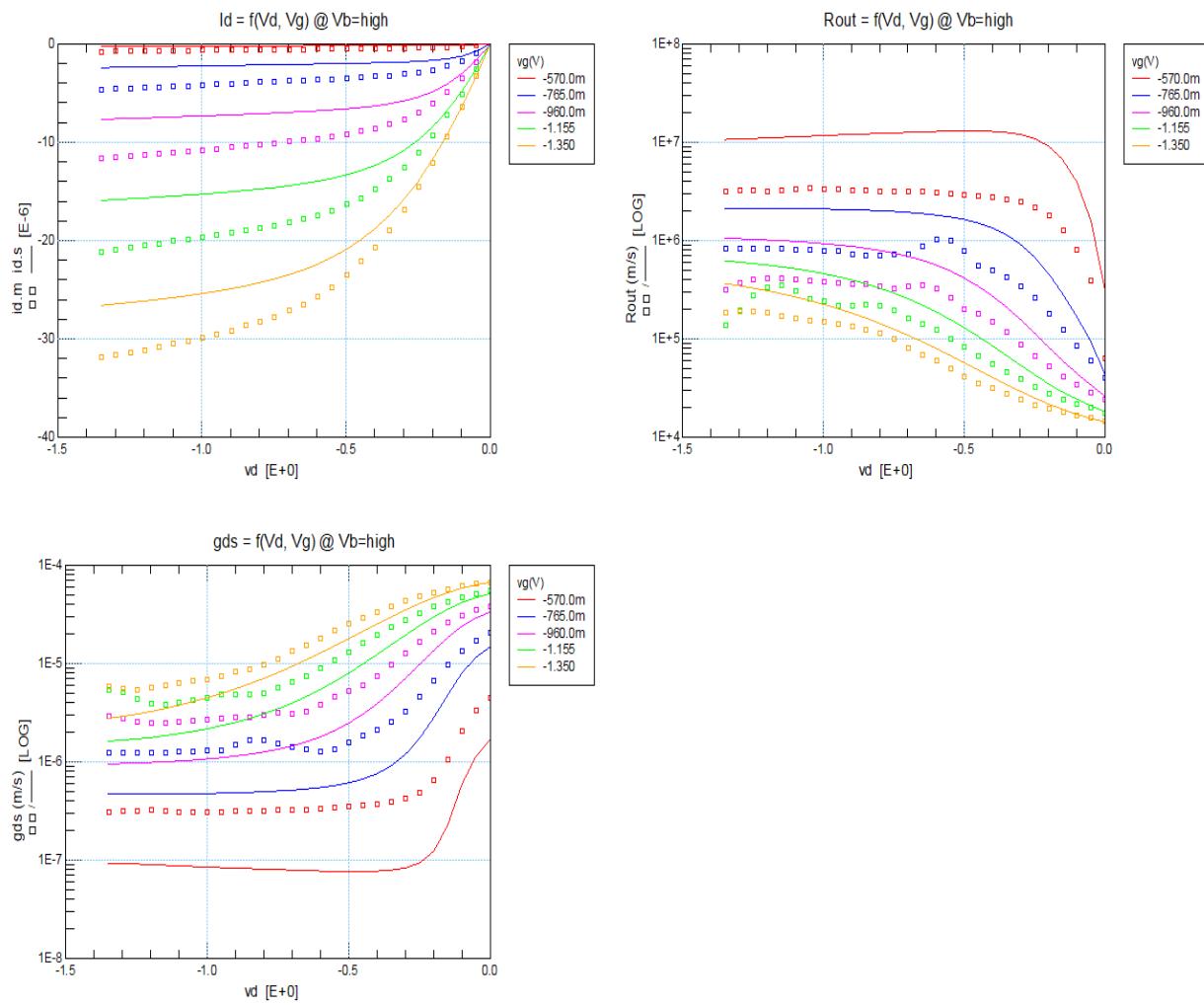
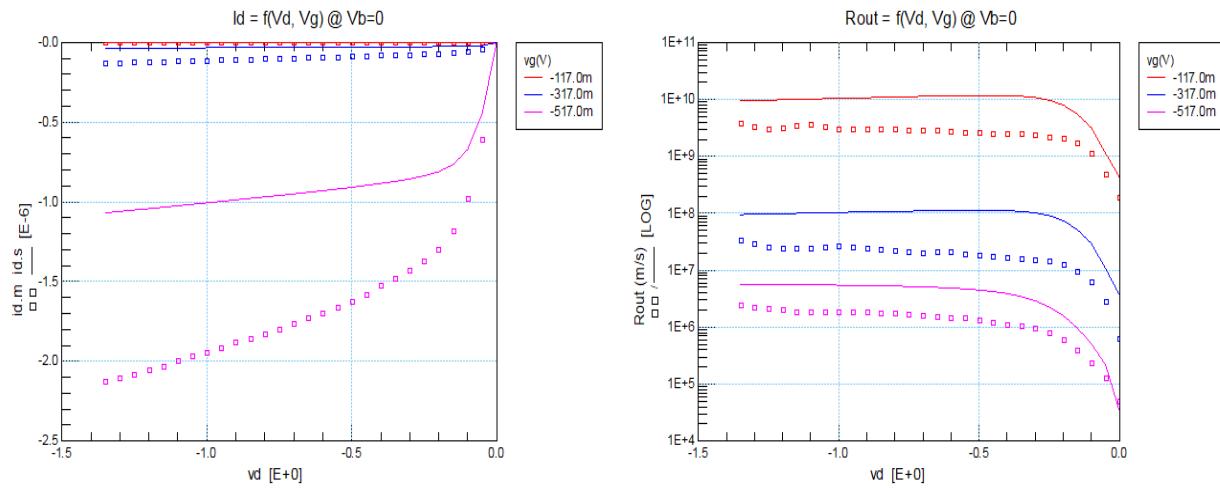


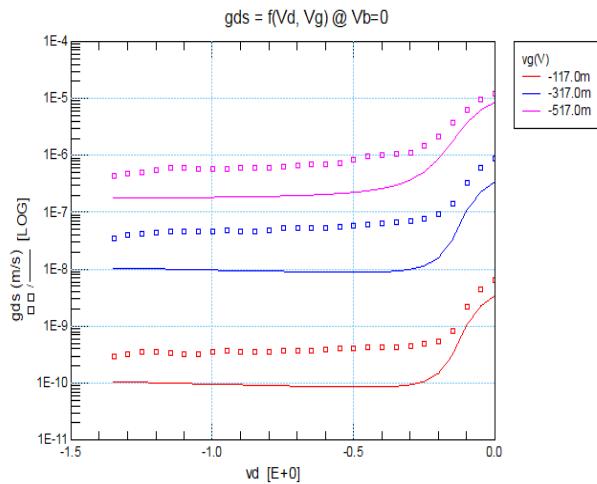


### $idvg, Ib, Ig, Vb = 0V, T = 70^\circ C$

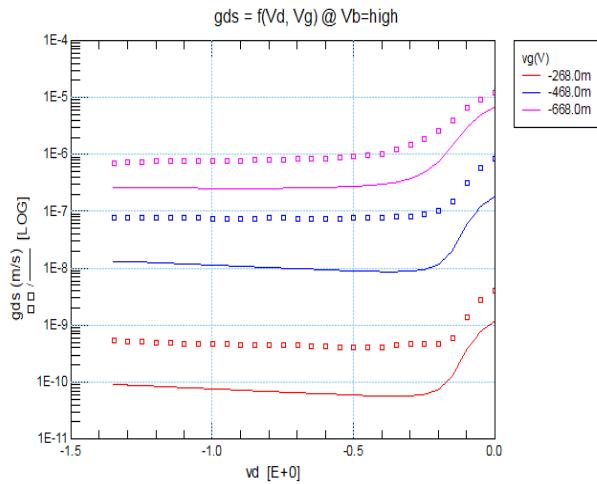
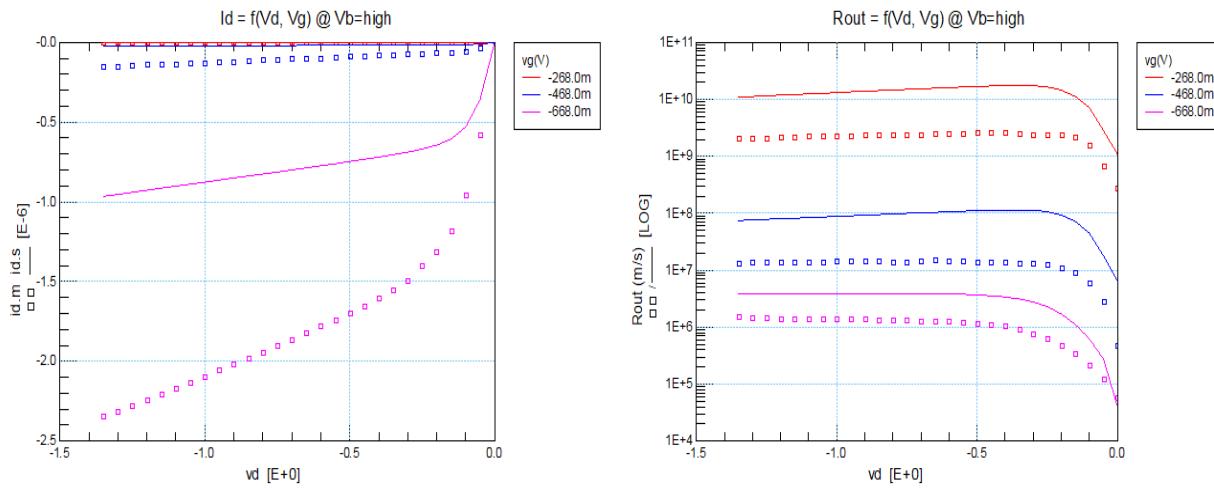


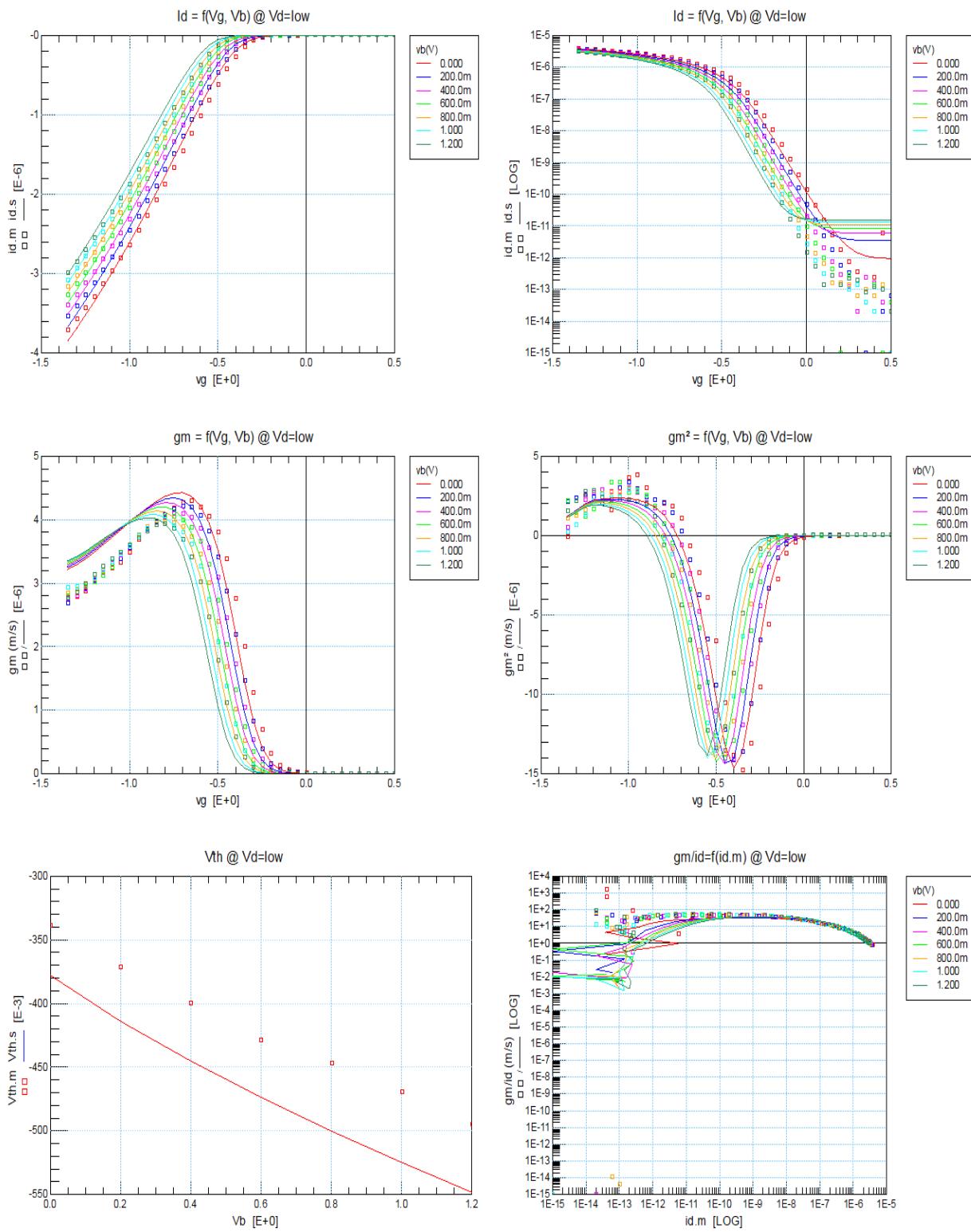
**idvg, Ib,Ig, Vb = 1.2V, T = 70°C**

**idvd, Vb = 0V, T = 70°C**


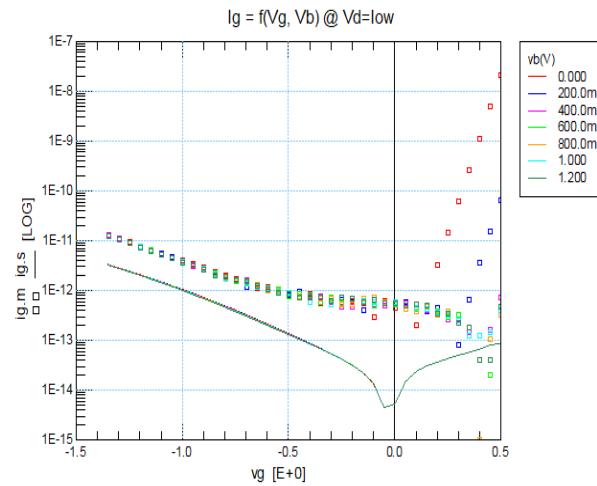
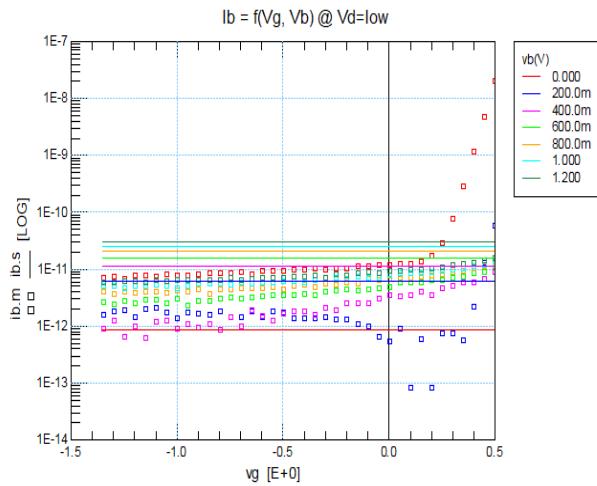
**idvd\_vbmin, Vb = 1.2V, T = 70°C****idvd\_vth, Vb = 0V, T = 70°C**



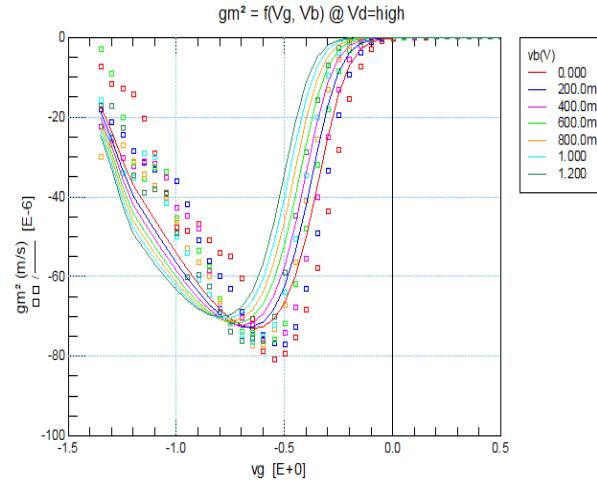
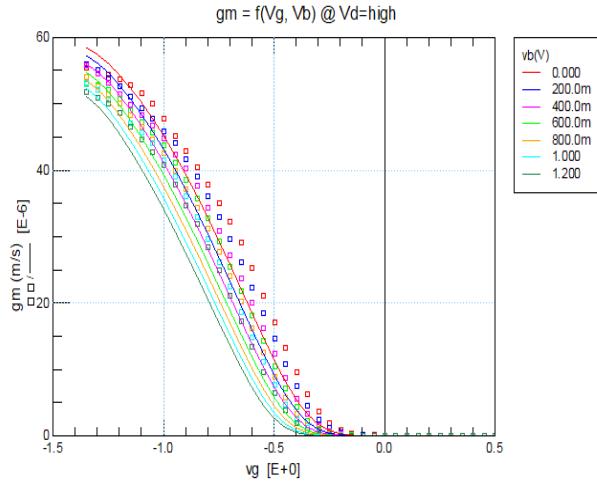
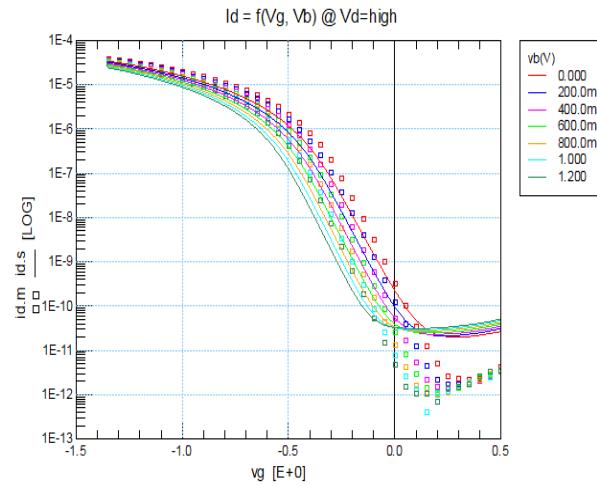
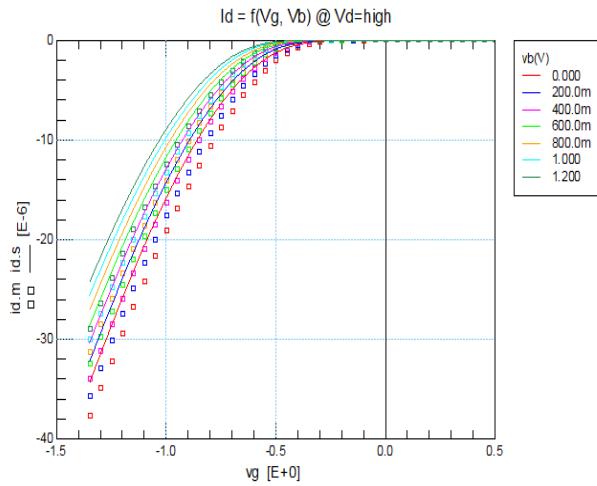
### idvd\_vth\_vbmin, Vb = 1.2V, T = 70°C

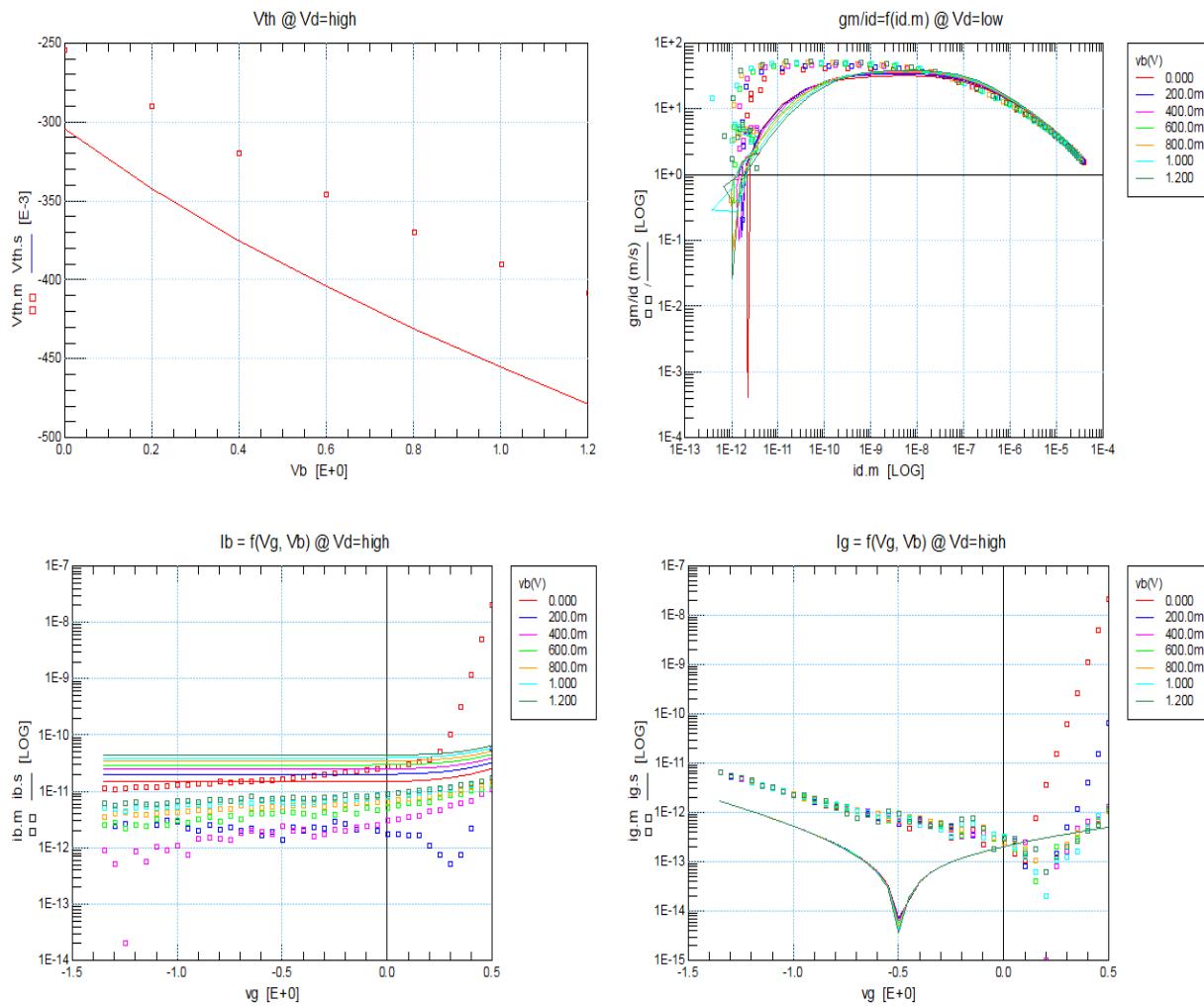


**idvg, Vd = -0.05V, T = 125°C**


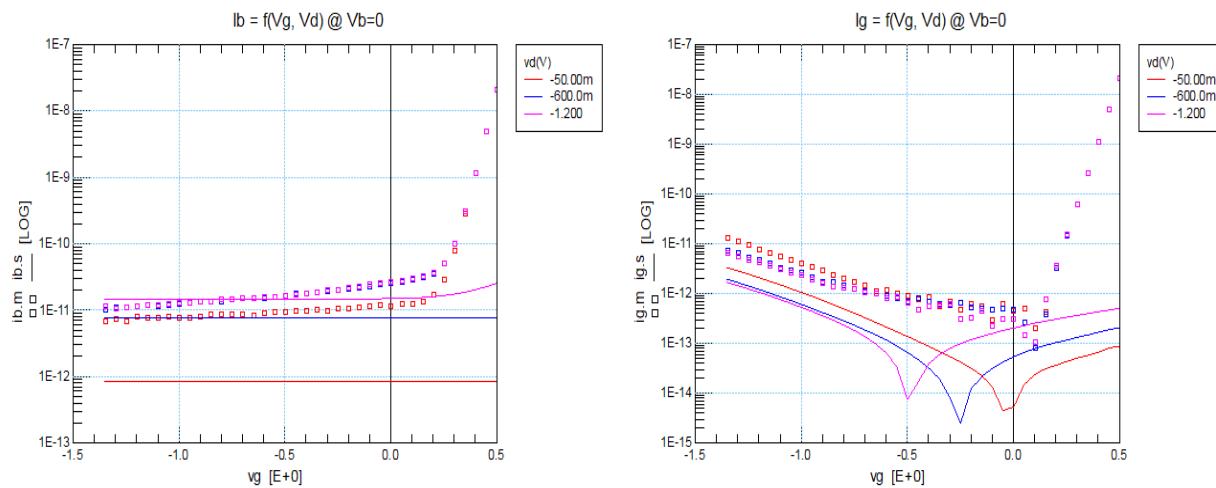


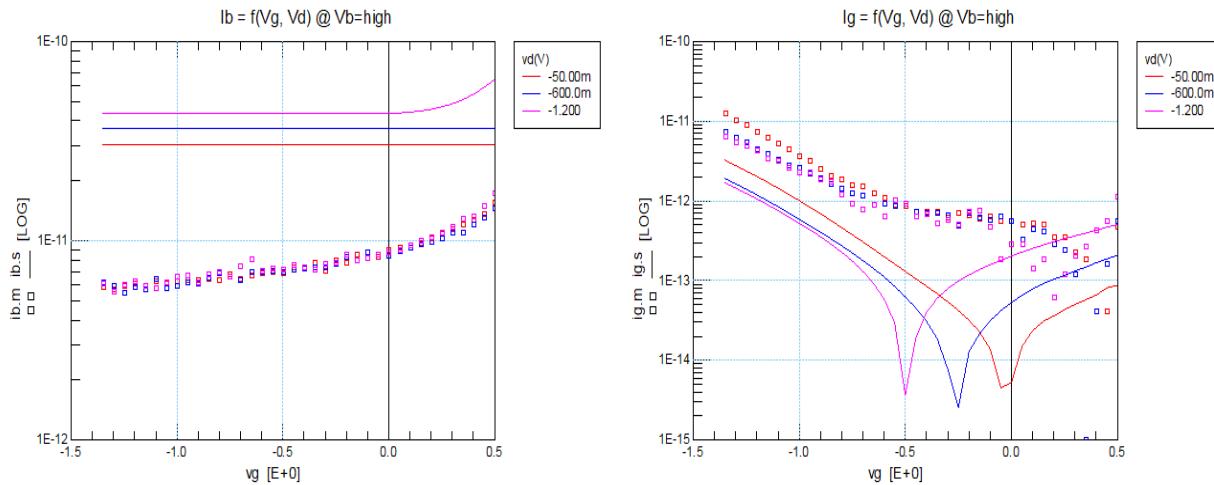
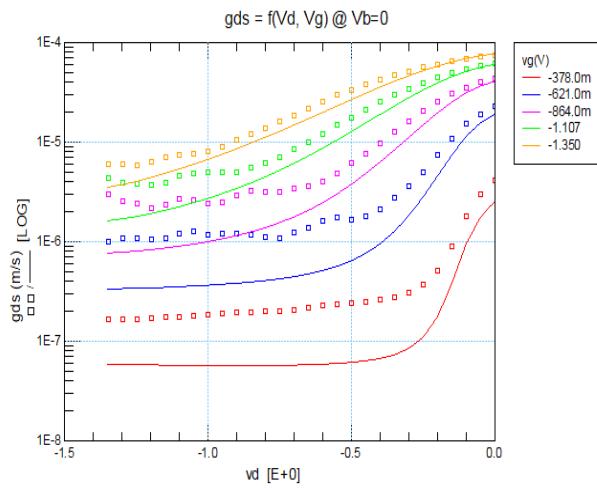
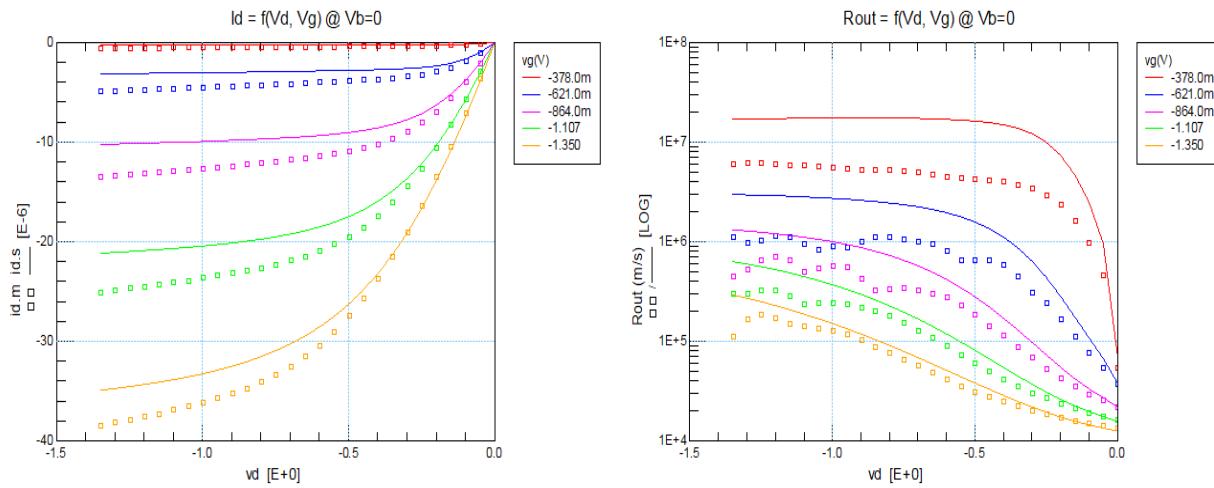
$i_{dvg}, V_d = -1.2V, T = 125^\circ C$

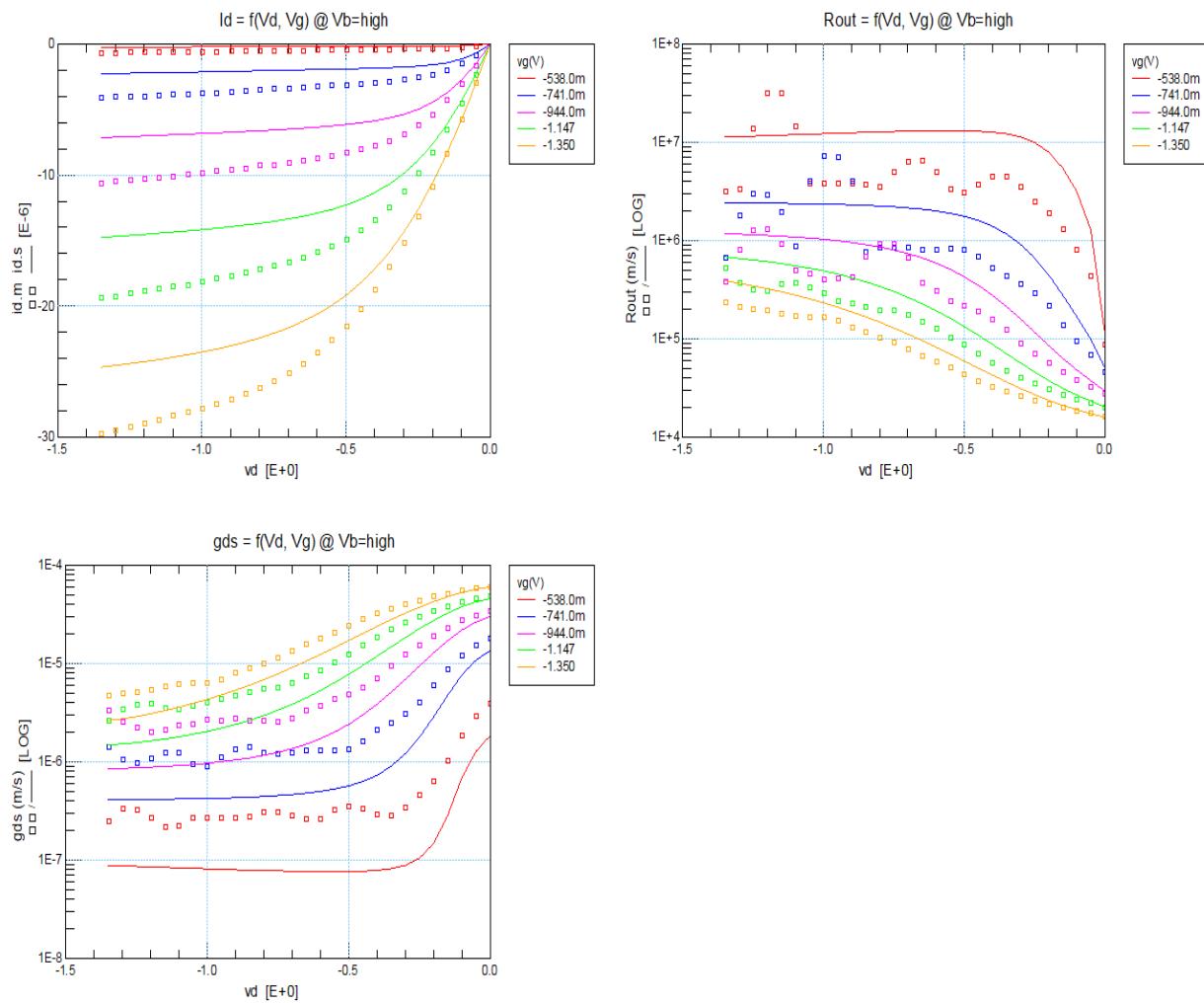
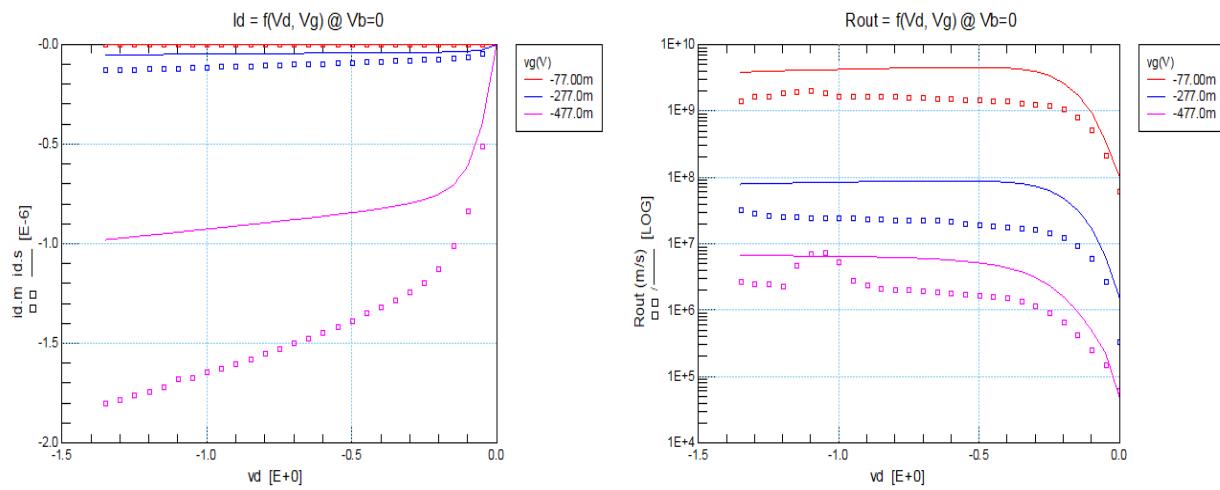


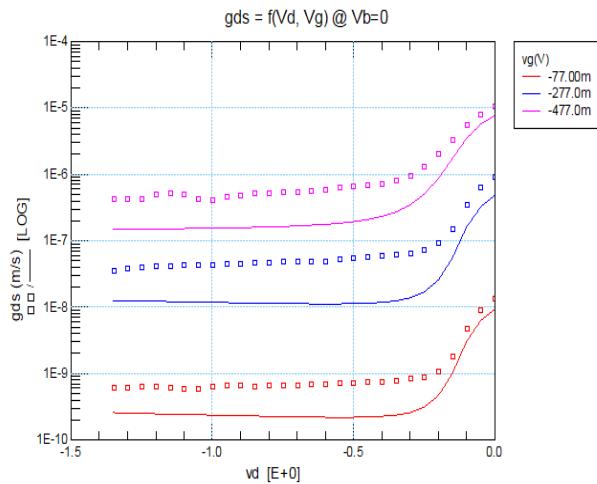


### $id_{vg}, I_b, I_g, V_b = 0V, T = 125^\circ C$

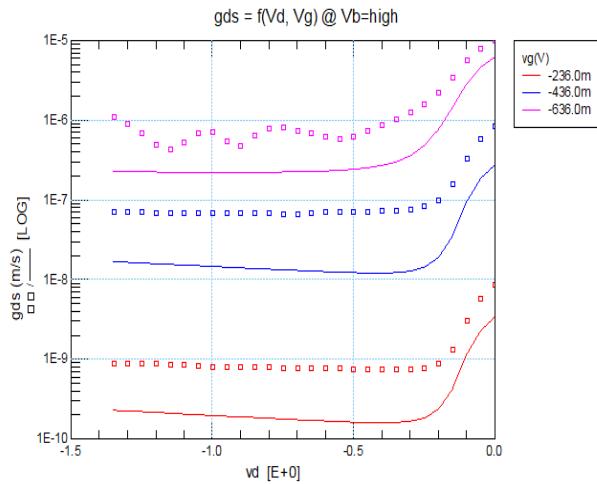
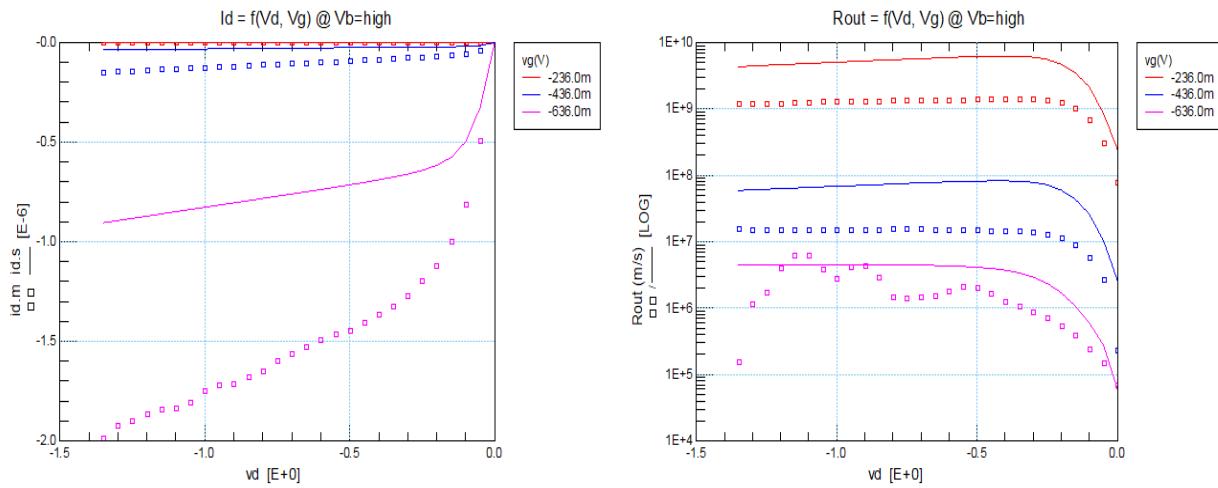


**idvg, Ib,Ig, Vb = 1.2V, T = 125°C**

**idvd, Vb = 0V, T = 125°C**


**idvd\_vbmin, Vb = 1.2V, T = 125°C****idvd\_vth, Vb = 0V, T = 125°C**

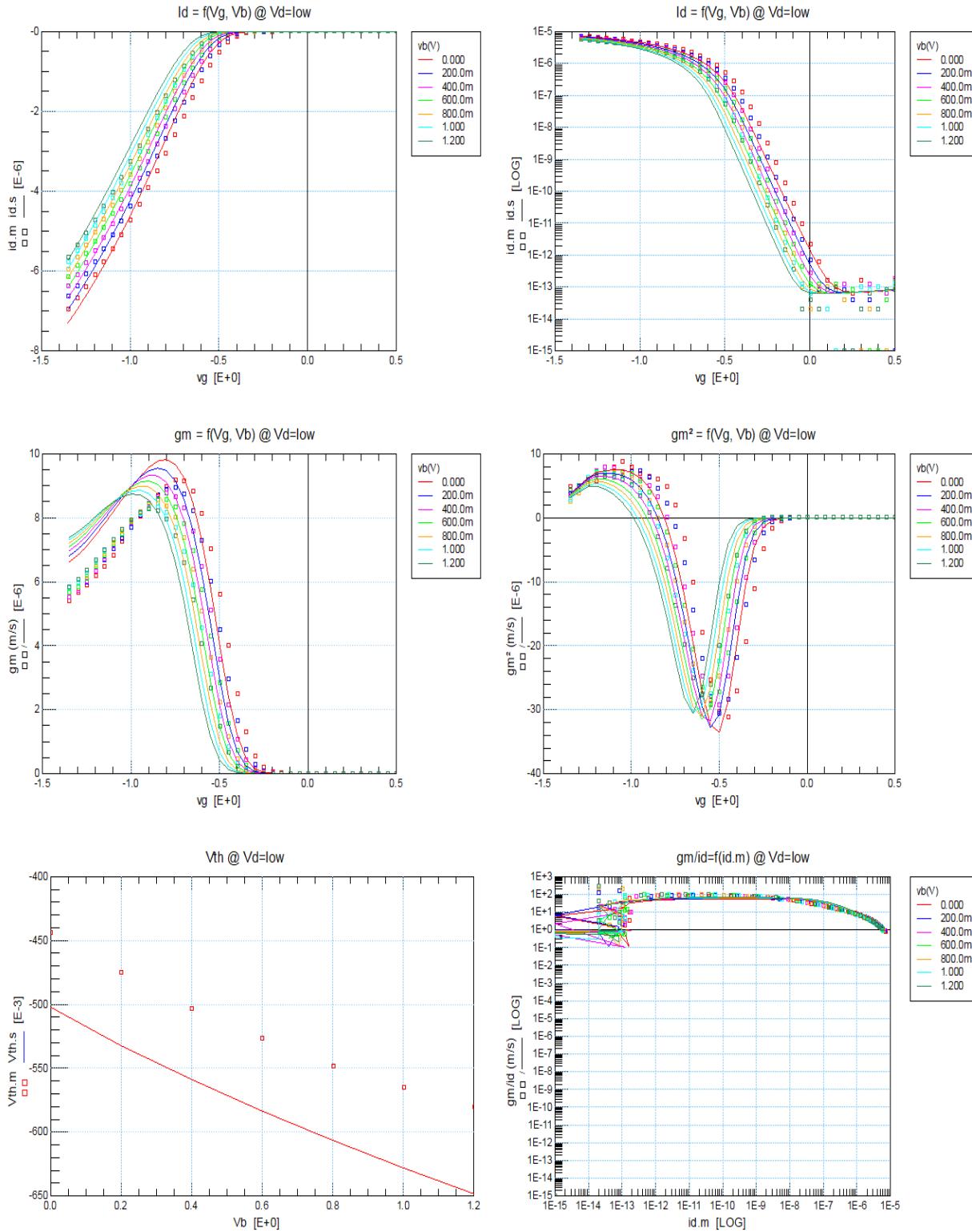


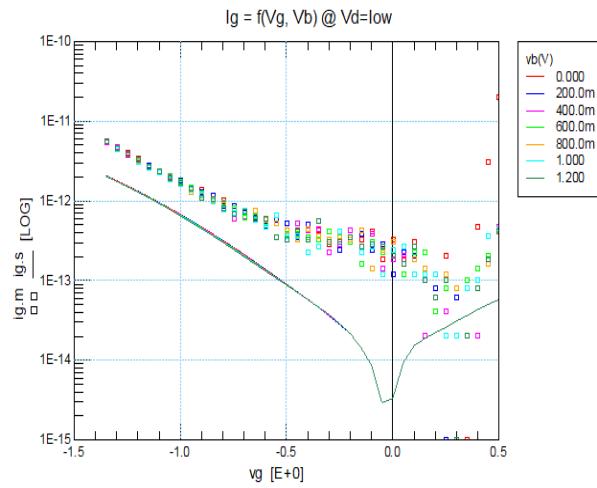
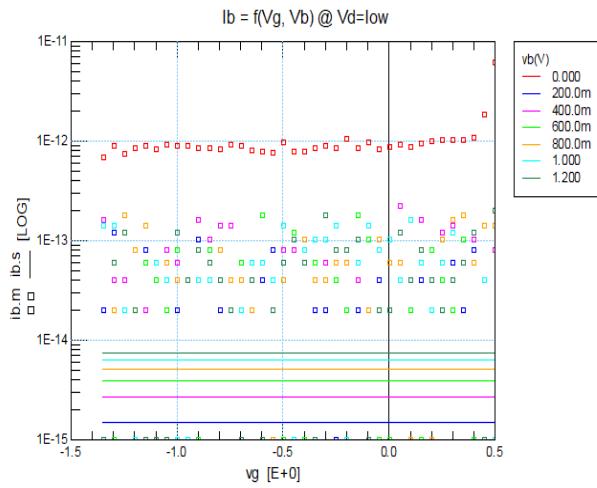
idvd\_vth\_vbmin, Vb = 1.2V, T = 125°C



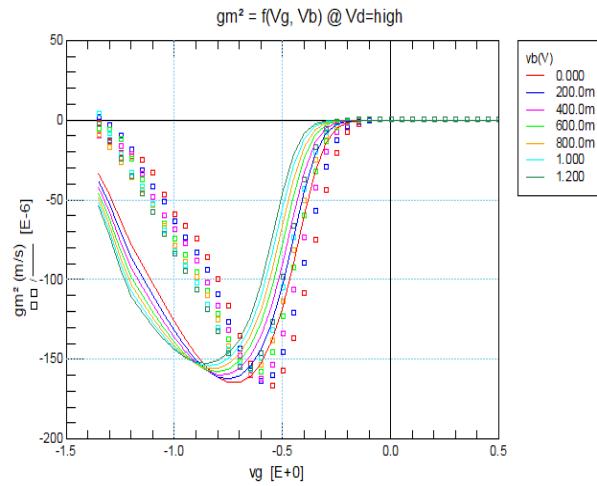
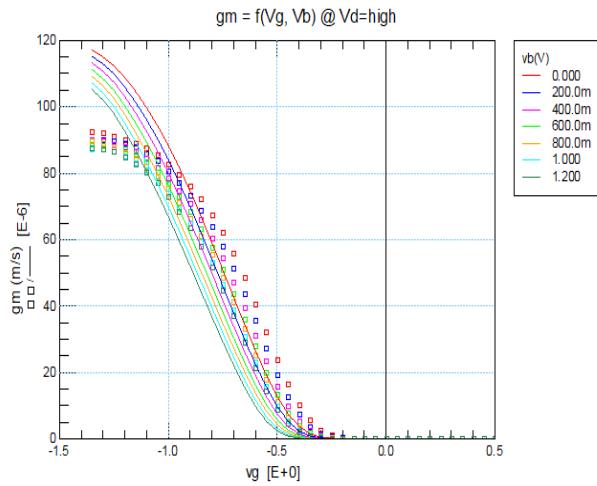
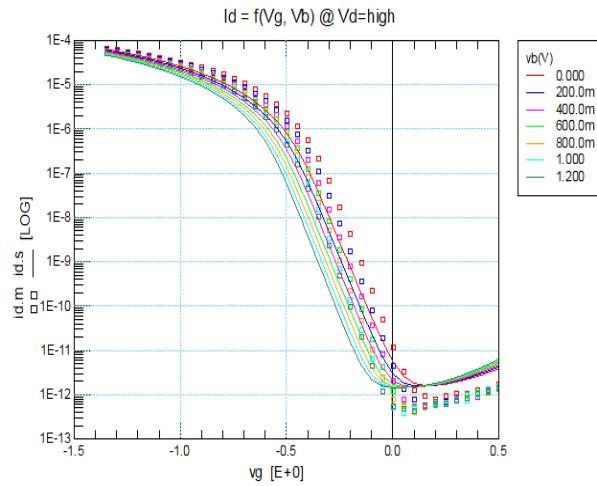
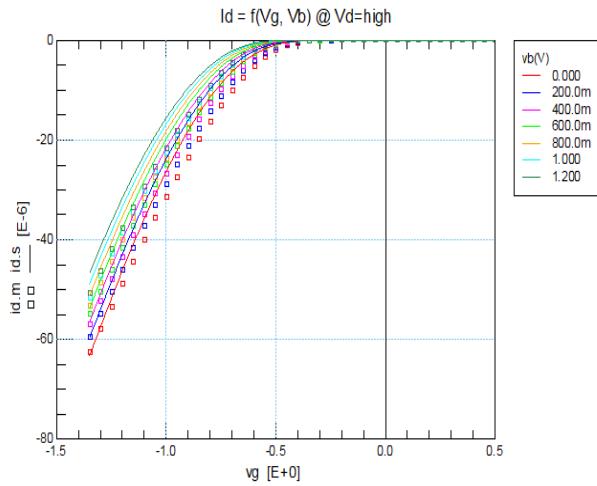
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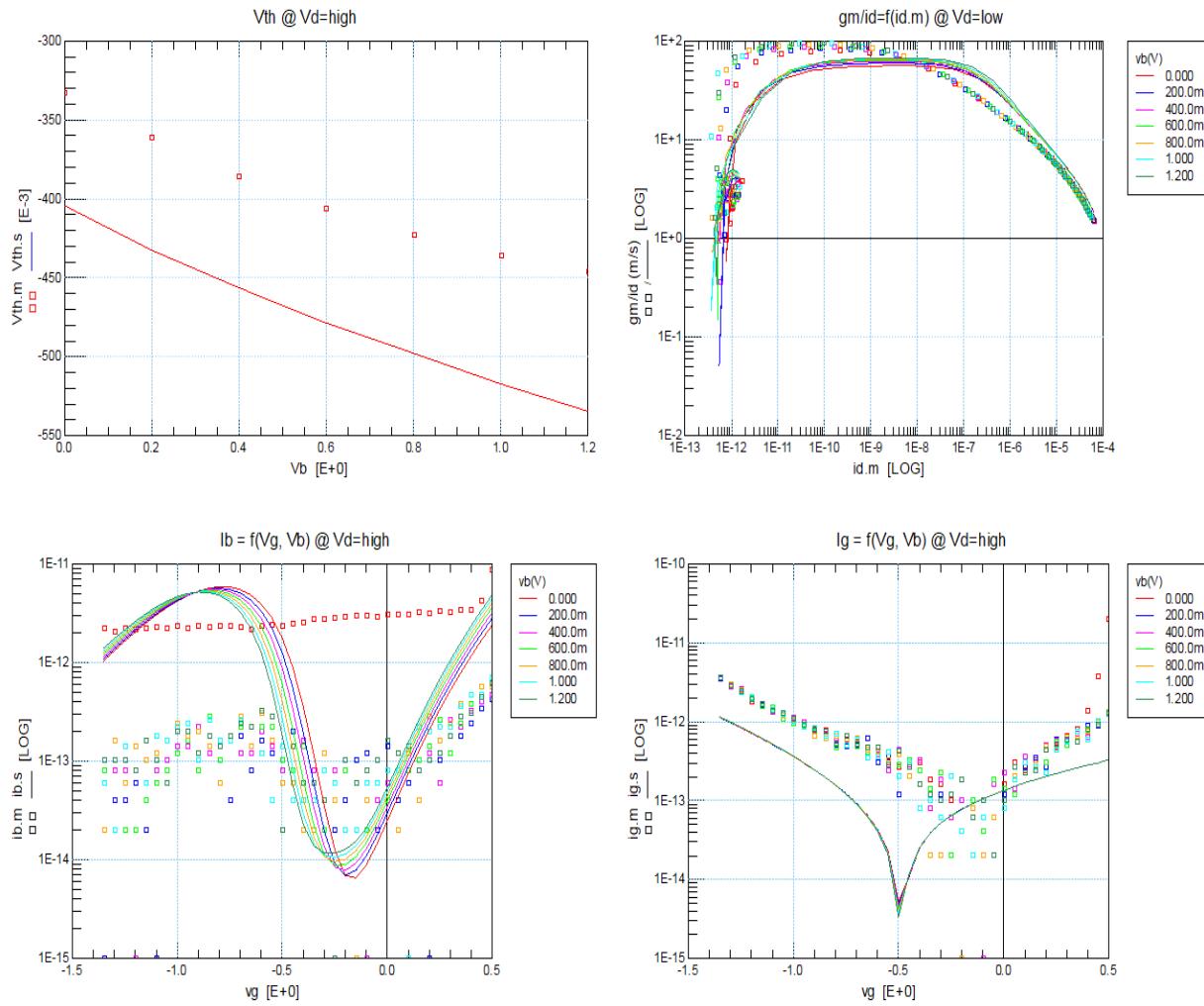
$idvg$ ,  $Vd = -0.05V$ ,  $T = 27^\circ C$



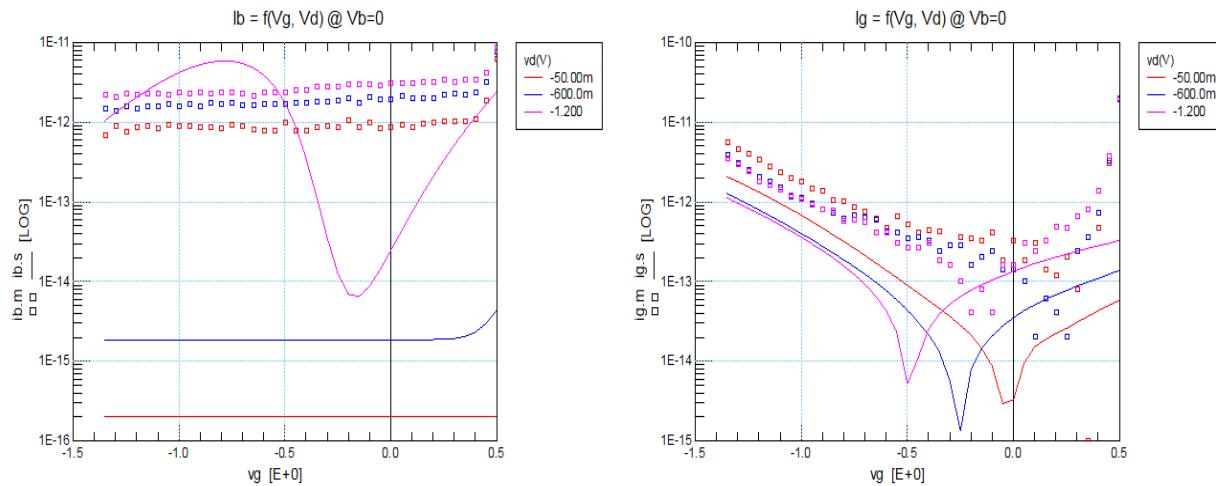


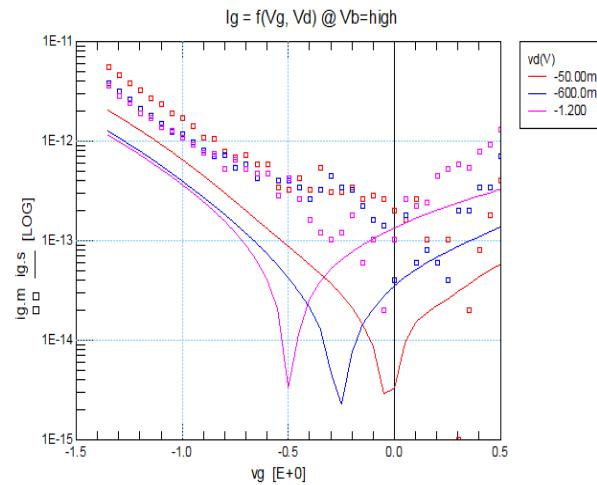
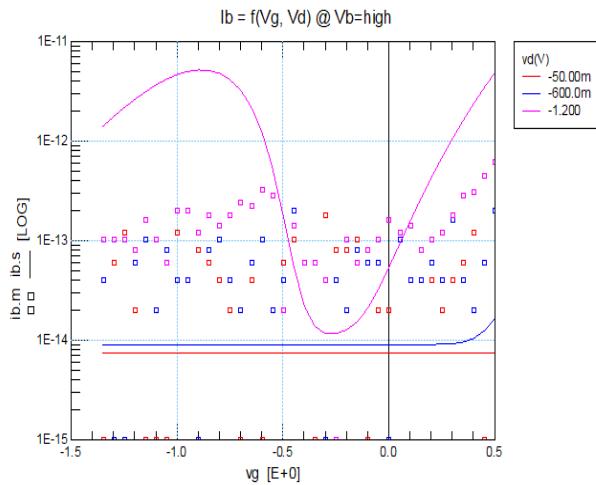
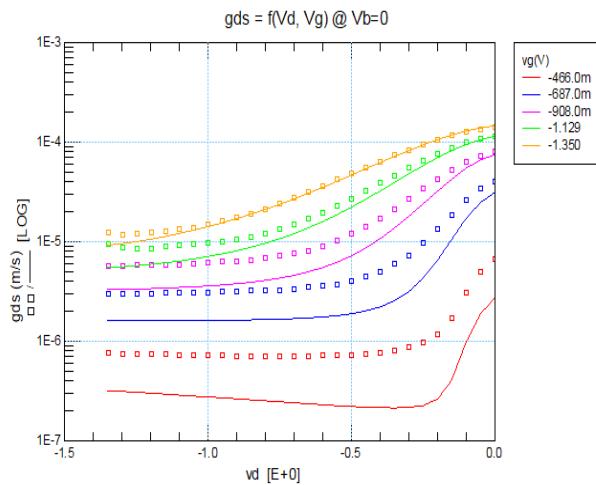
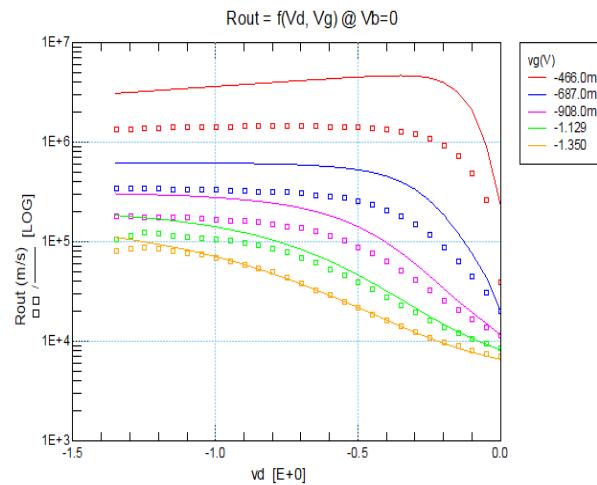
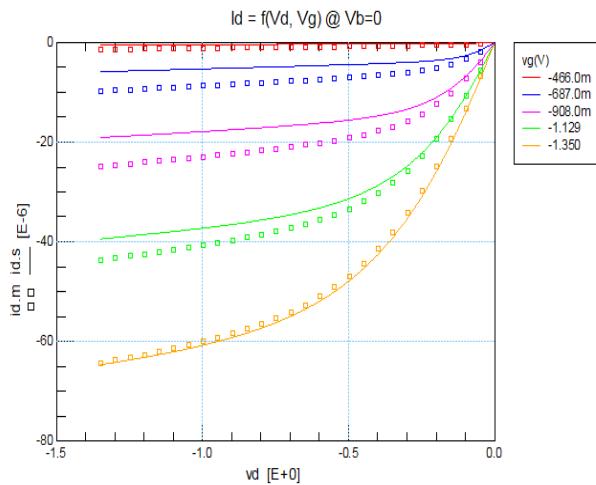
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

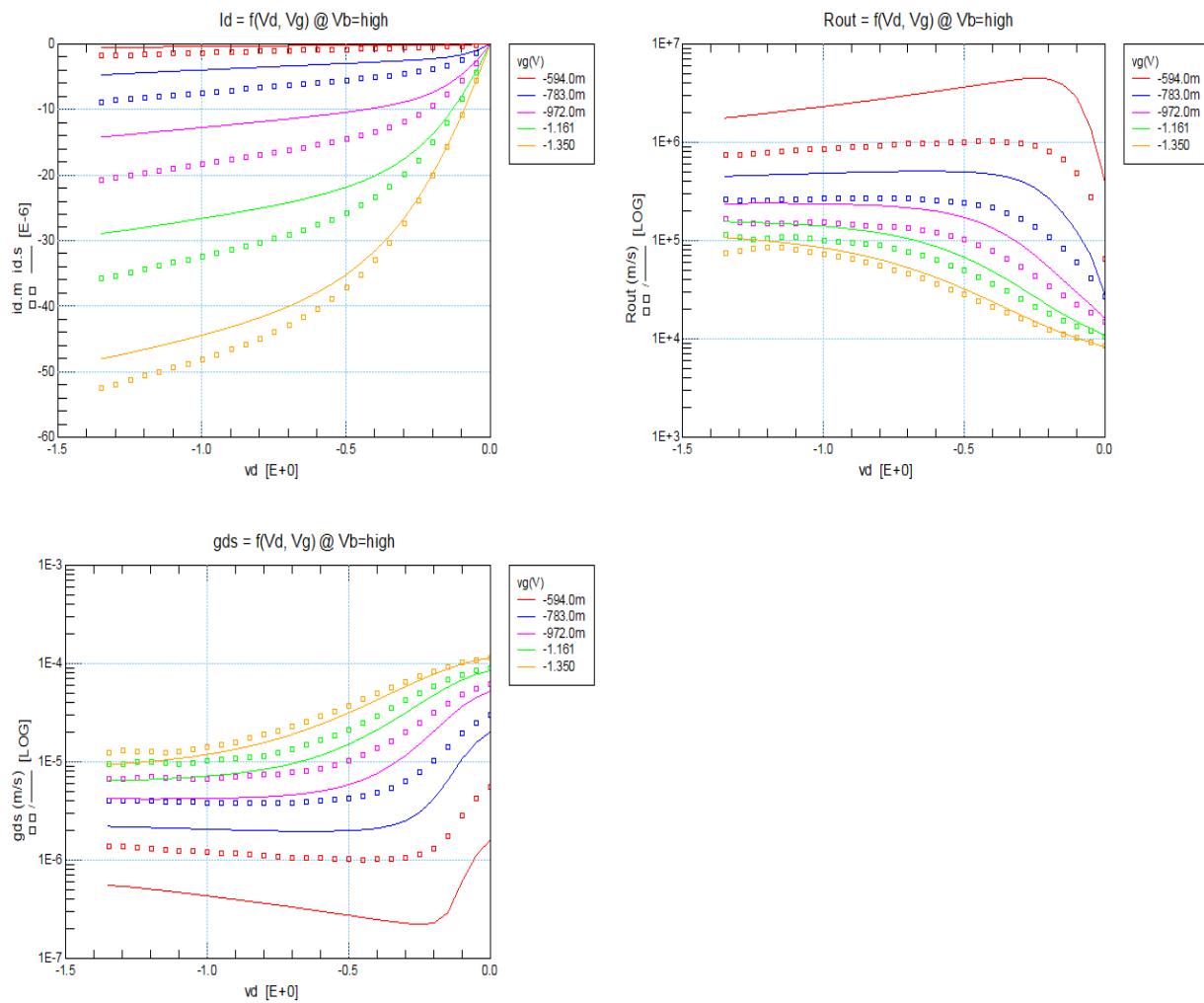
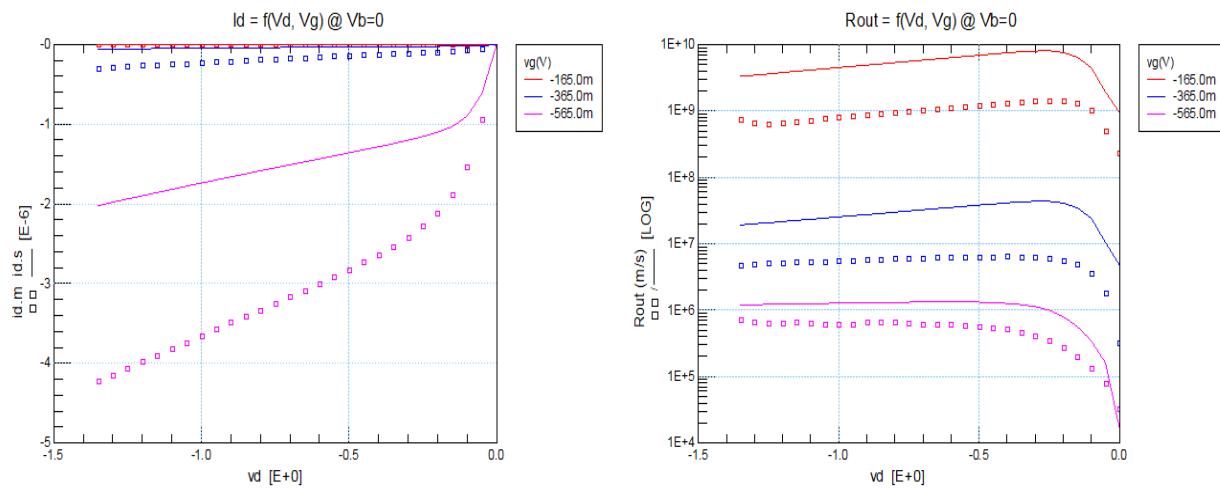


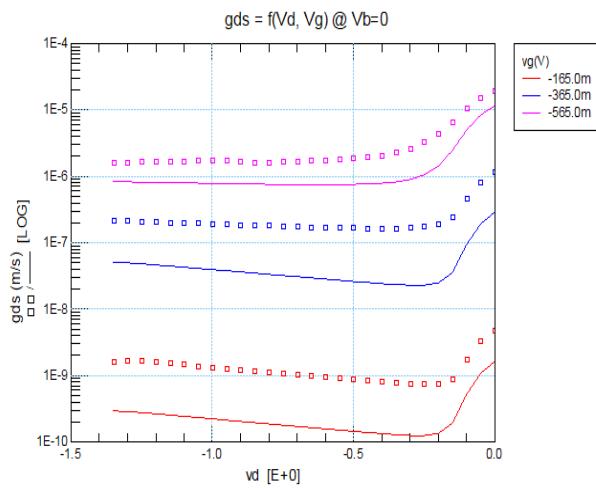


### $i_{dvg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

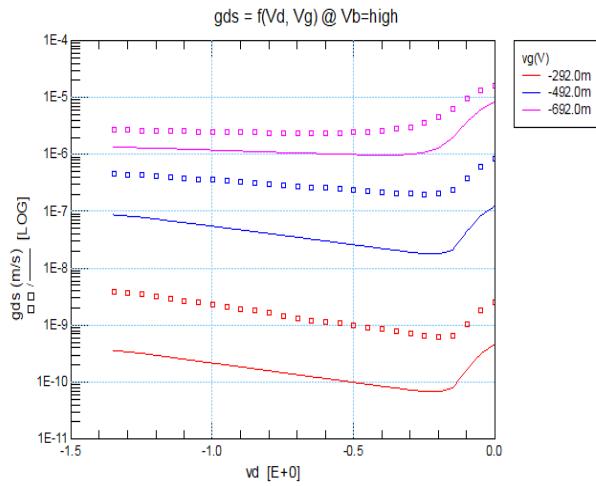
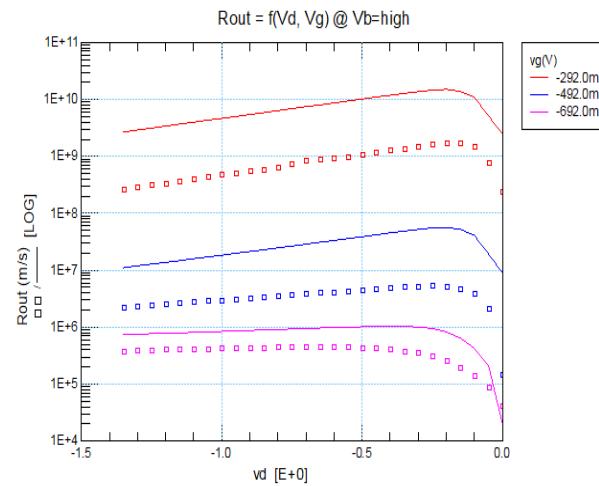
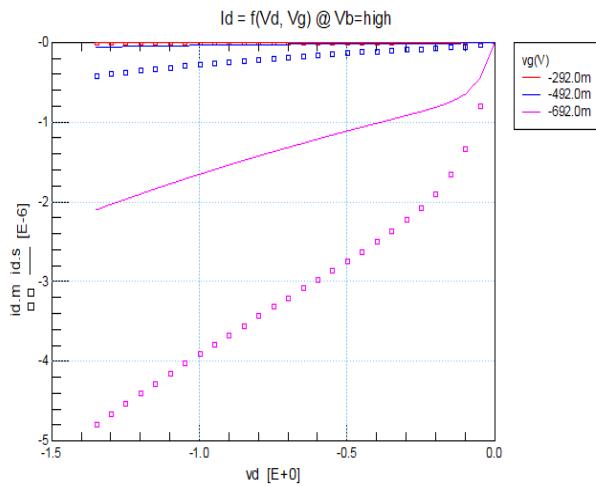


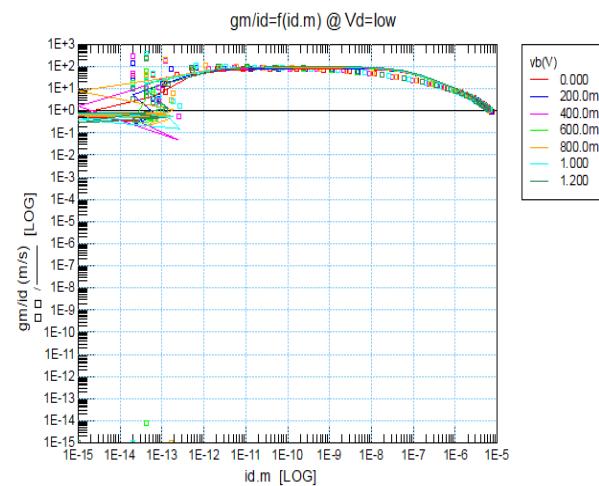
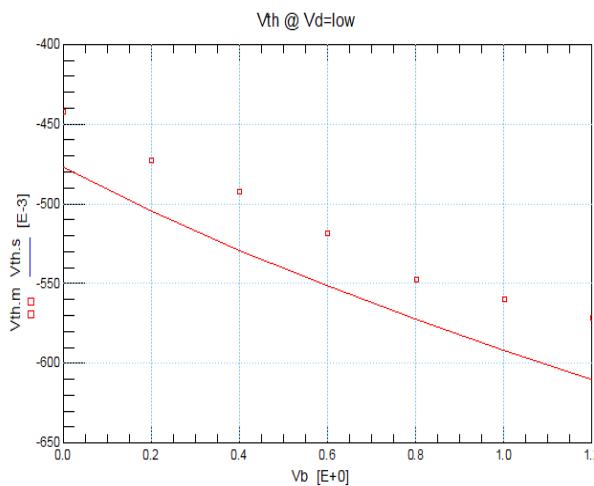
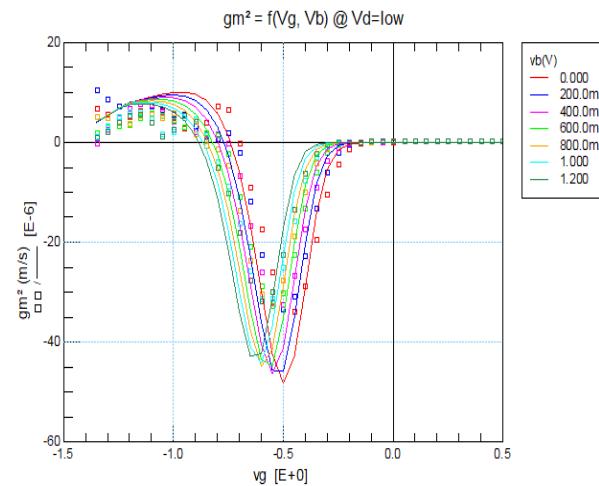
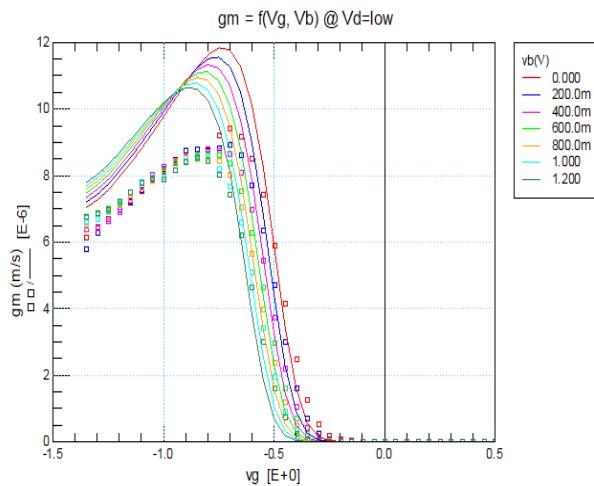
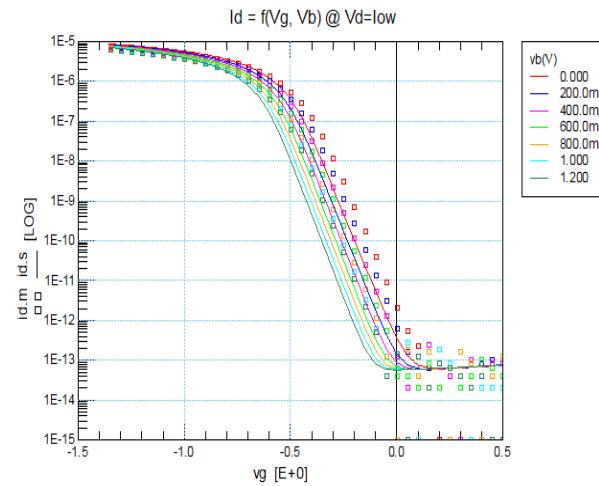
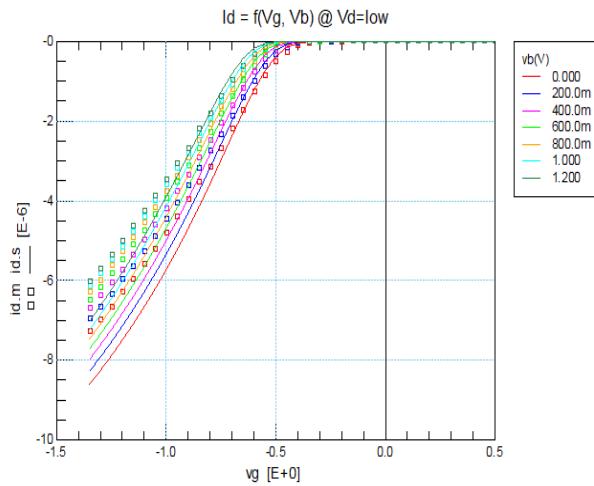
**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


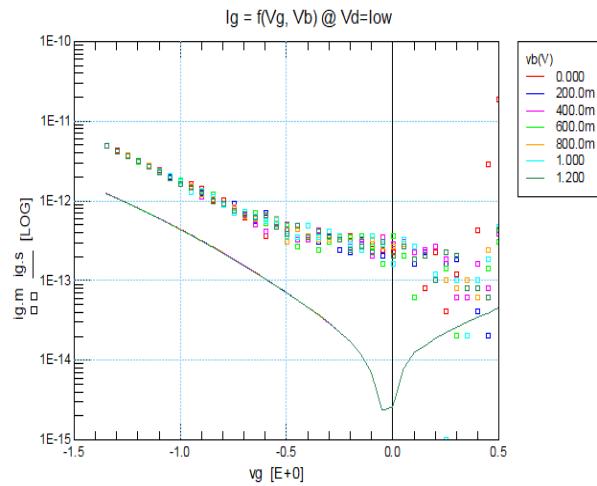
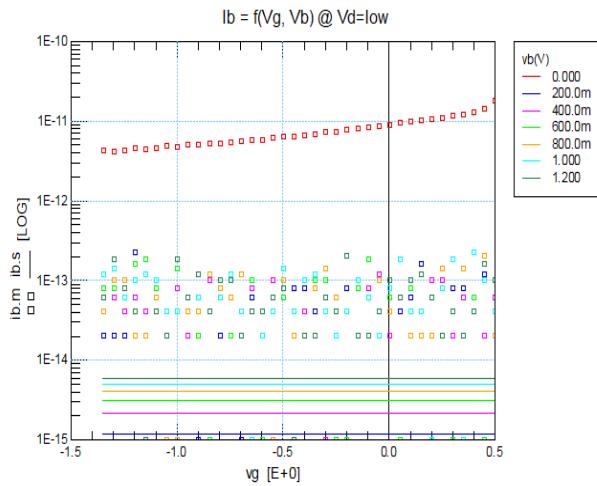
**idvd\_vbmin, Vb = 1.2V, T = 27°C**

**idvd\_vth, Vb = 0V, T = 27°C**




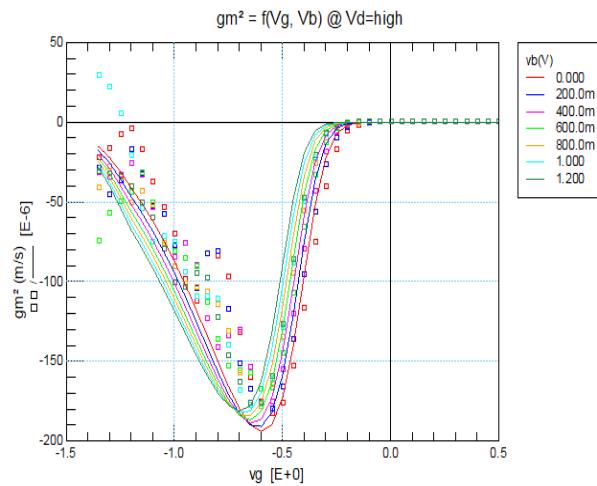
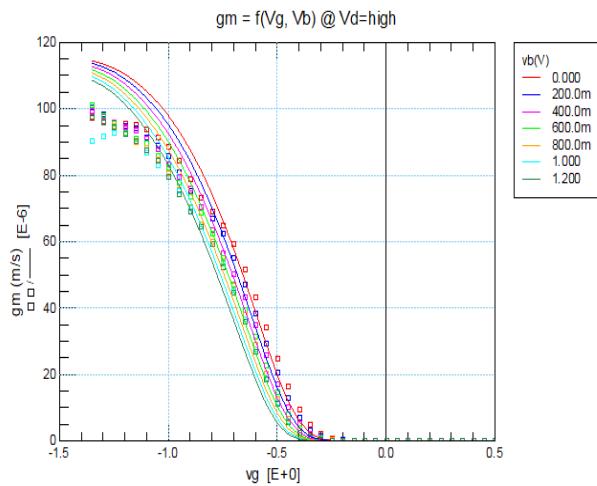
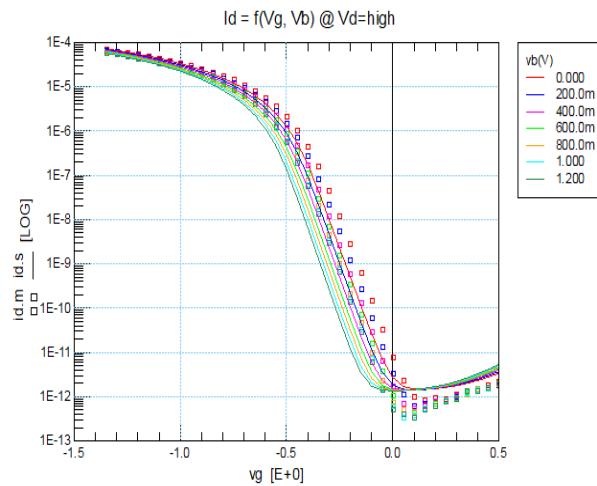
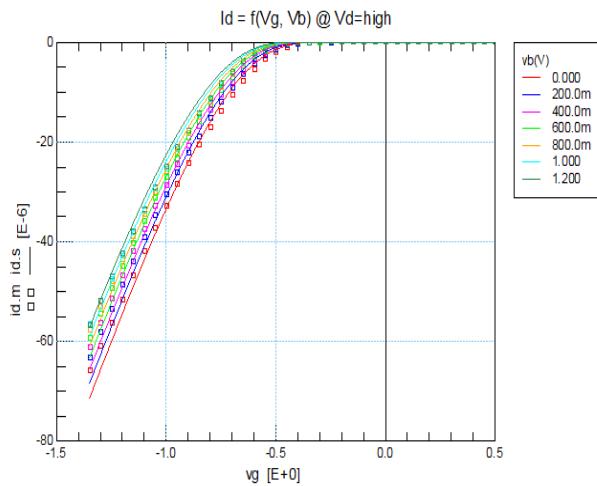
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

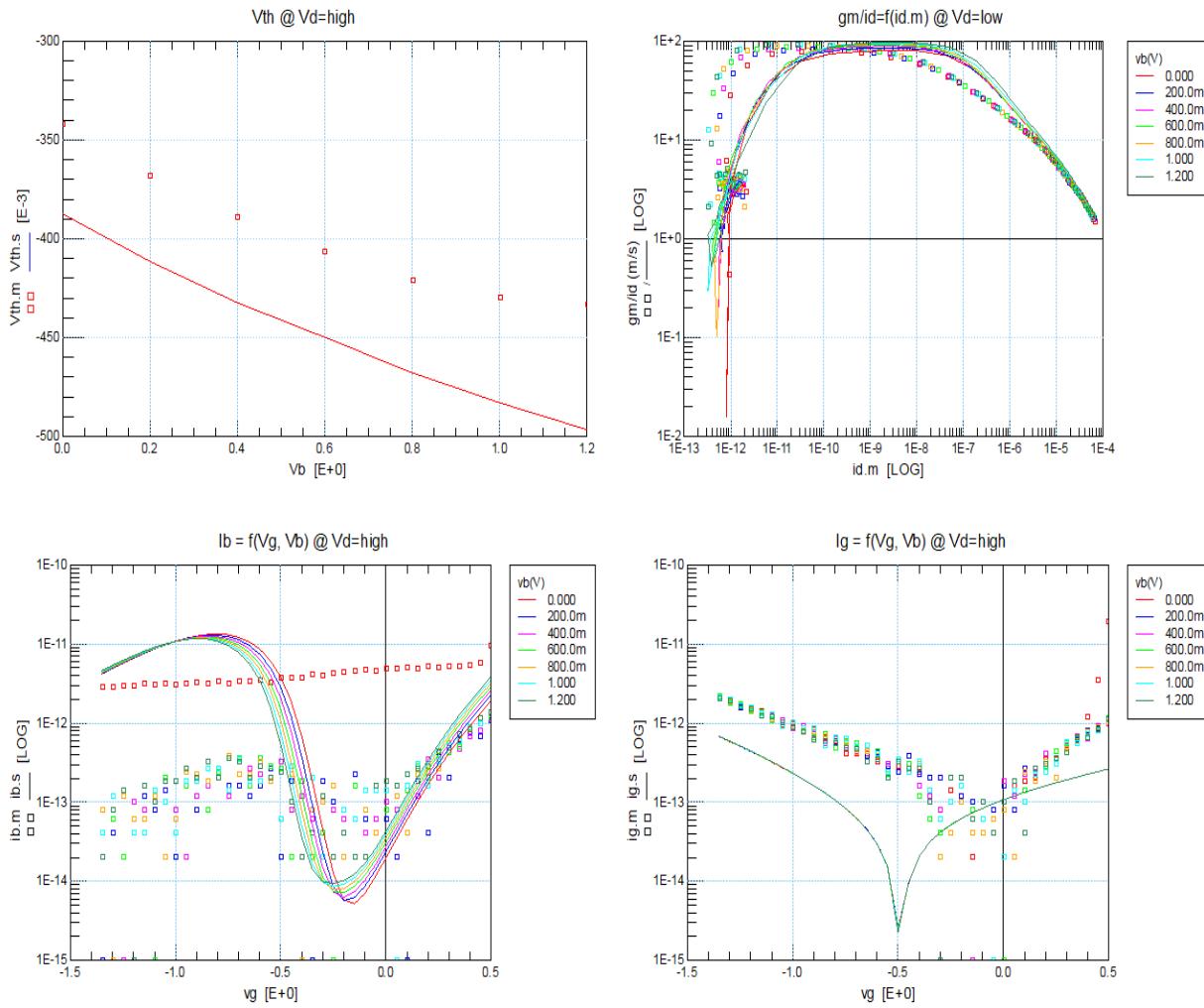


**4.38 W0u15\_L0u12\_S554\_2****idvg, Vd = -0.05V, T = 27°C**

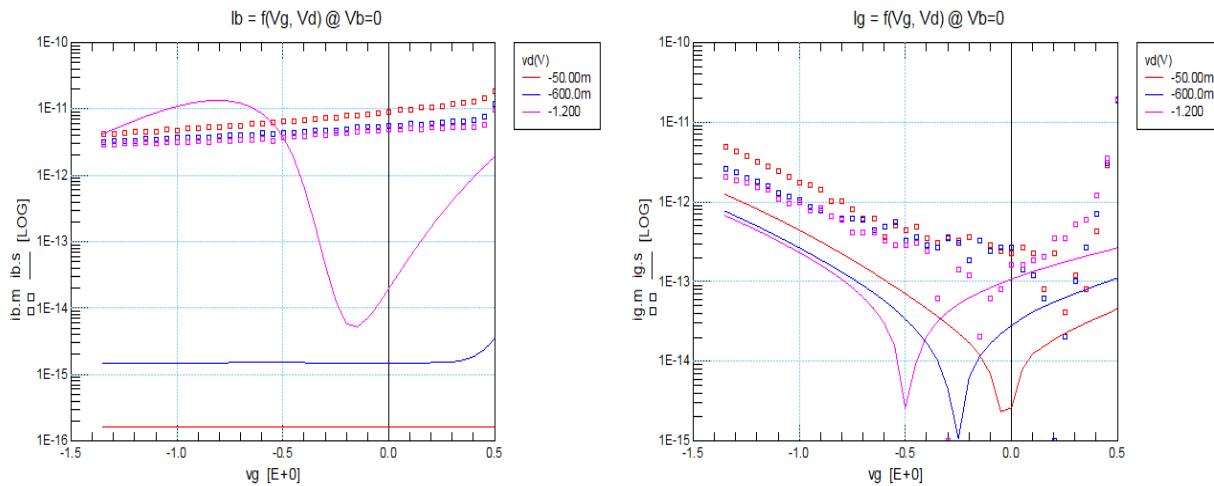


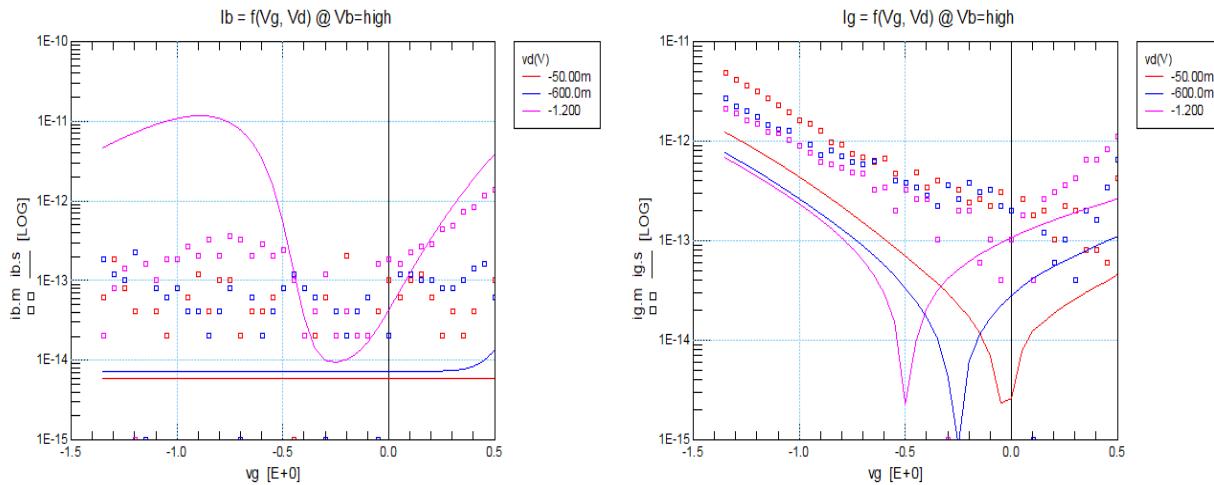
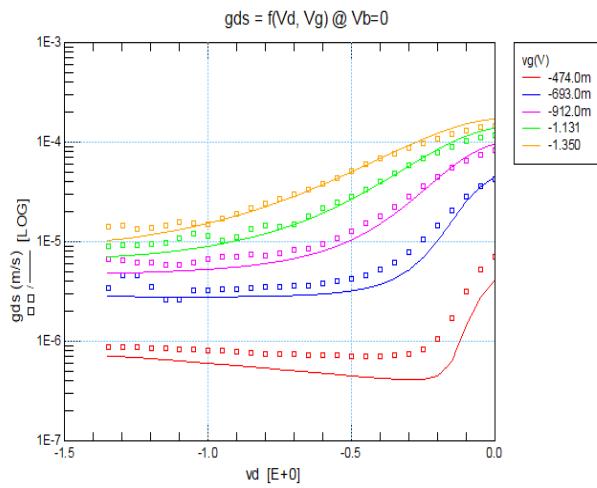
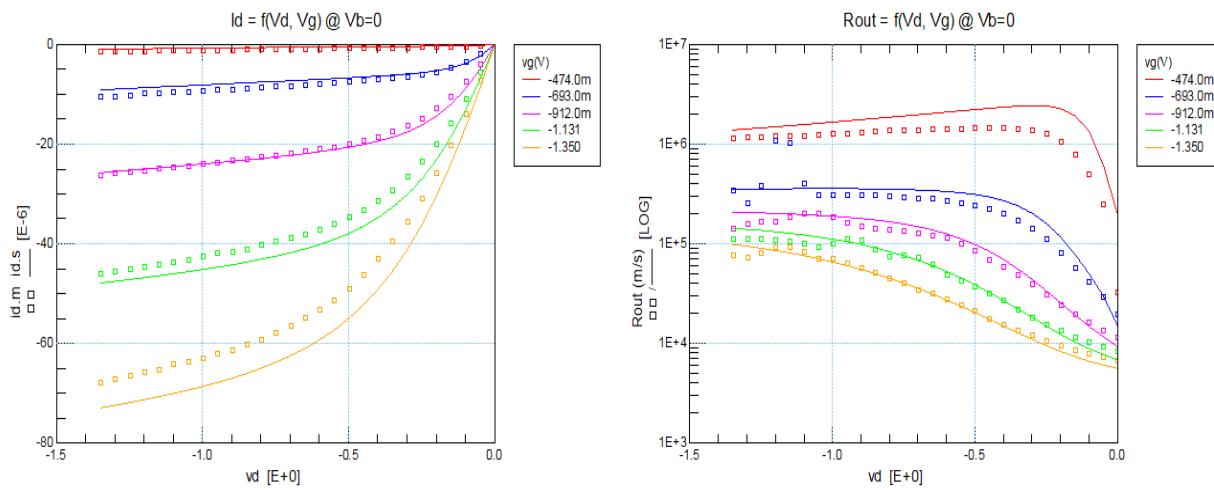
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

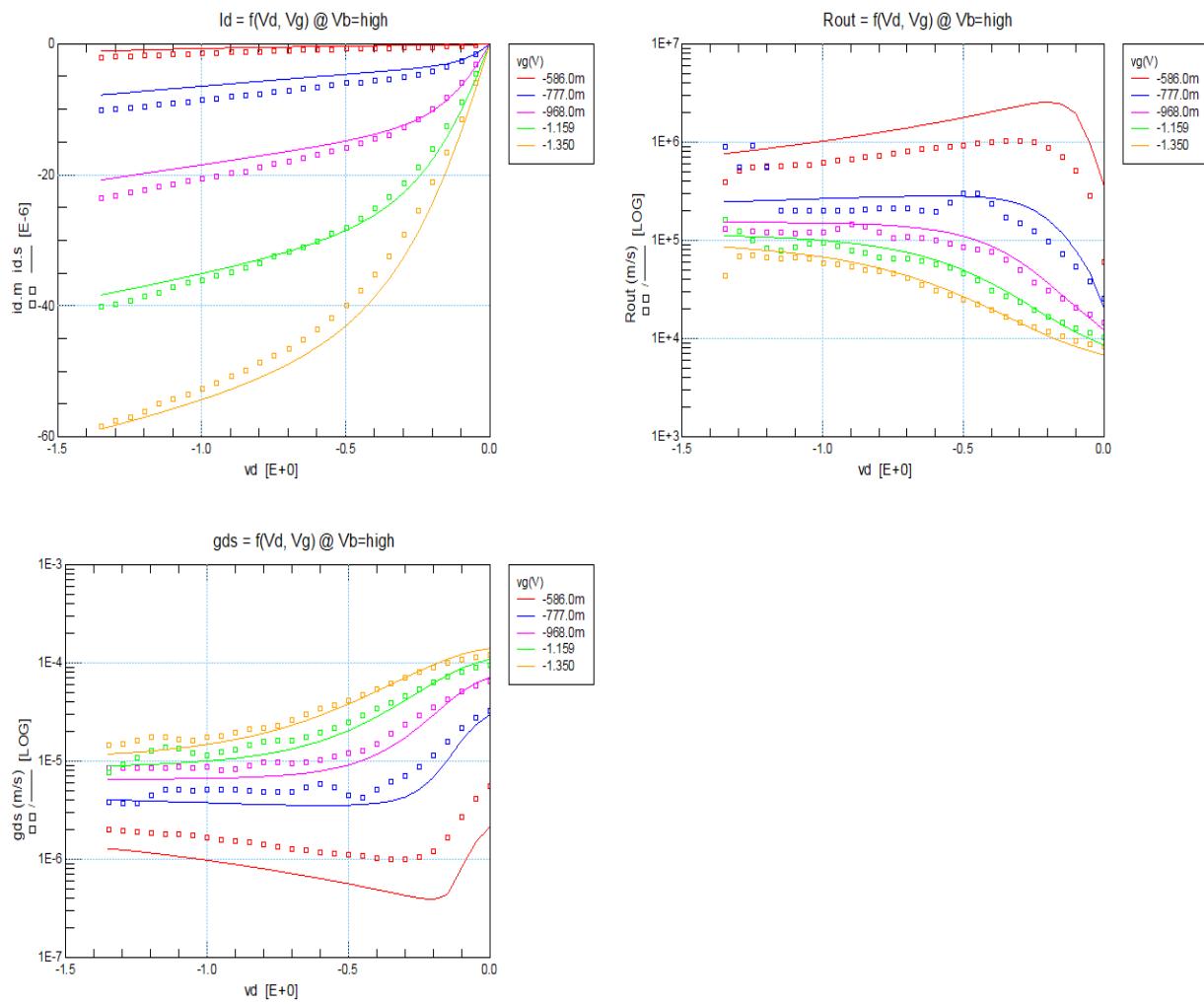
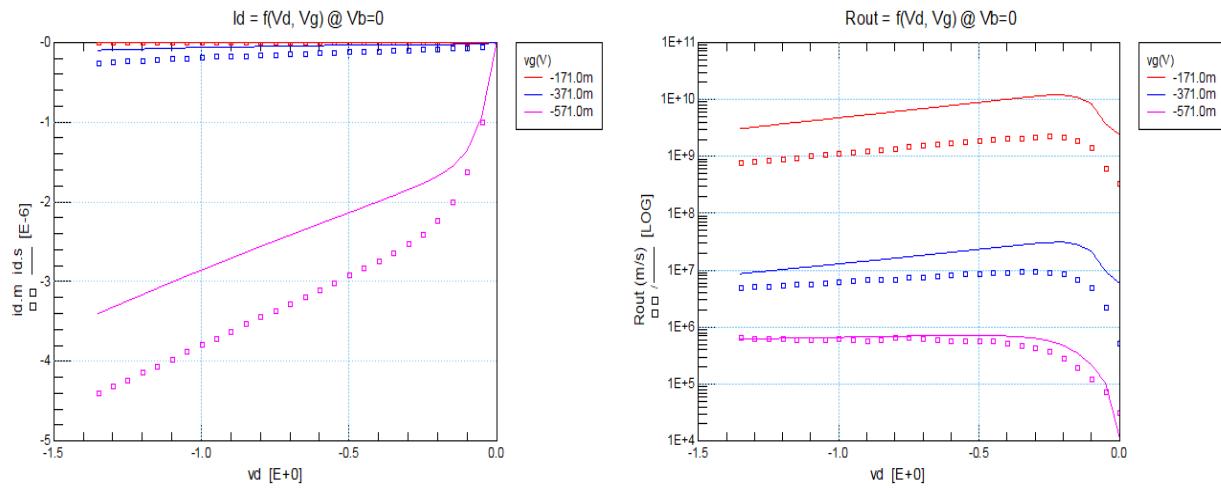


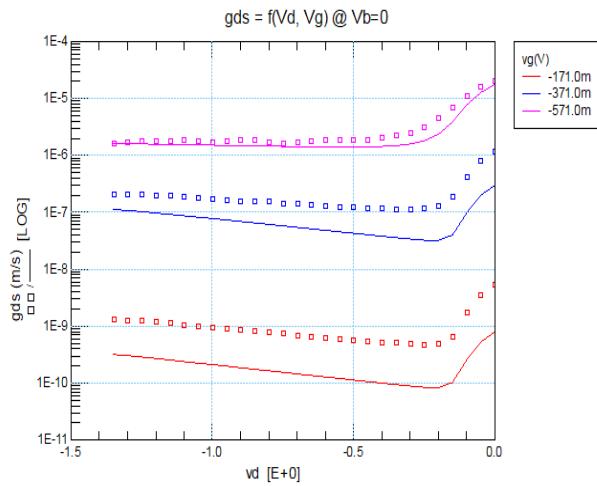


### idvg, Ib,Ig, Vb = 0V, T = 27°C

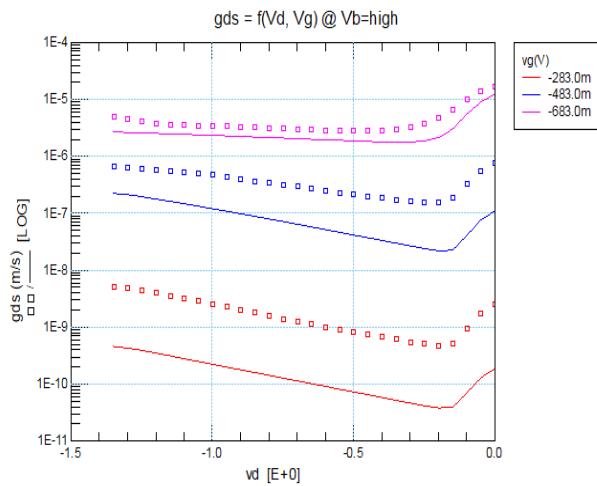
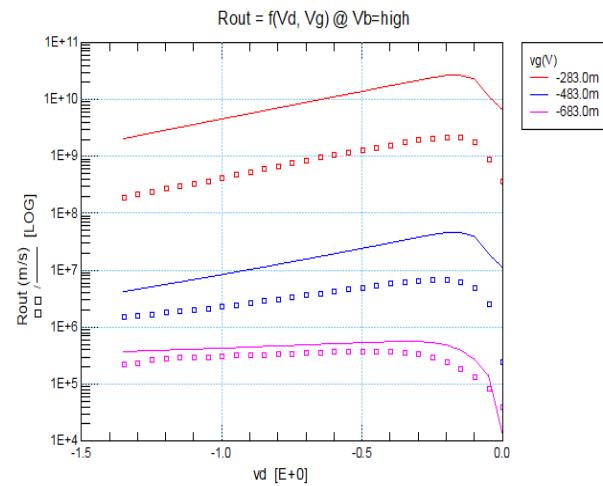
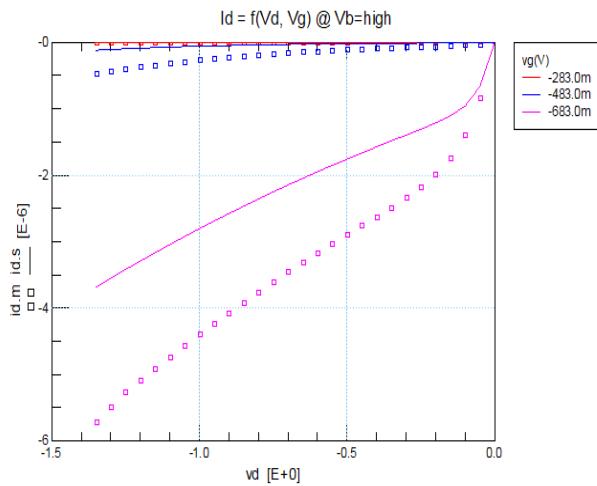


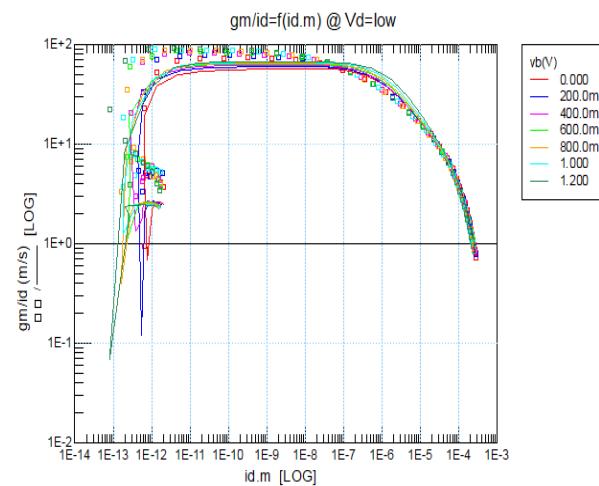
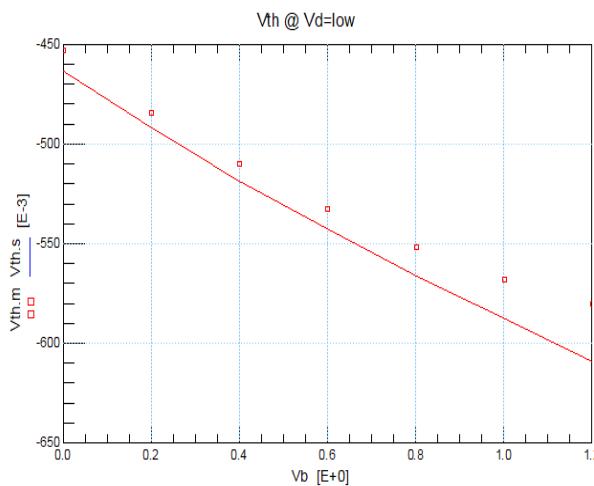
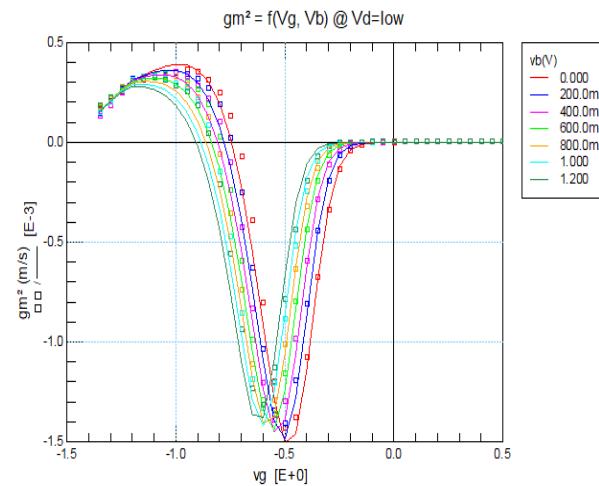
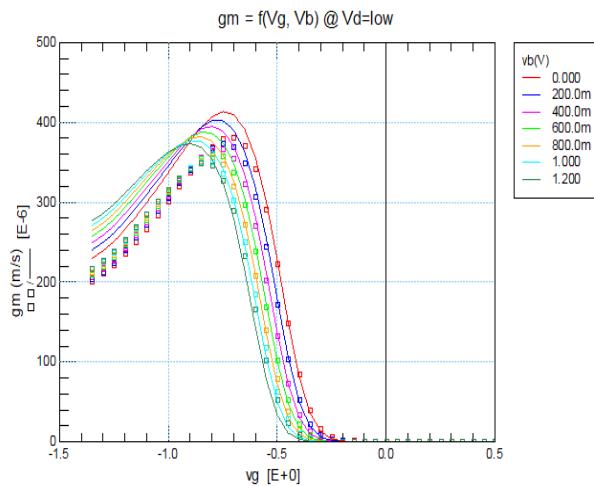
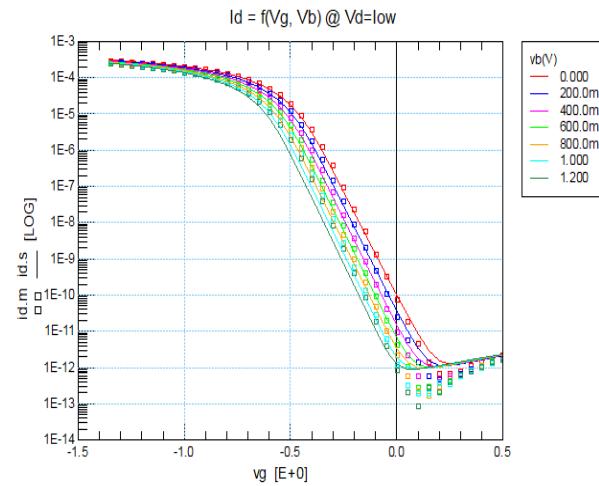
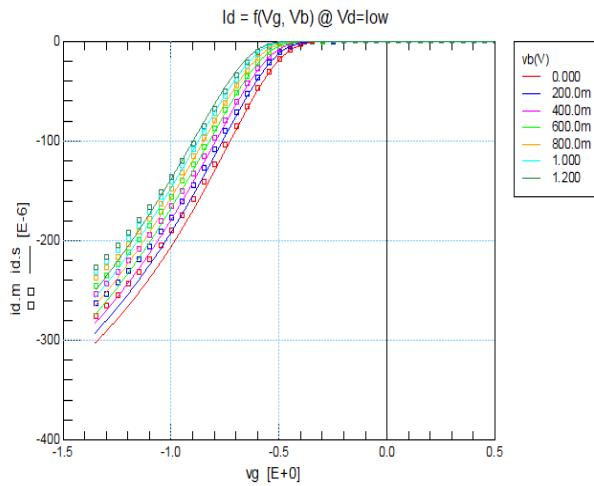
**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


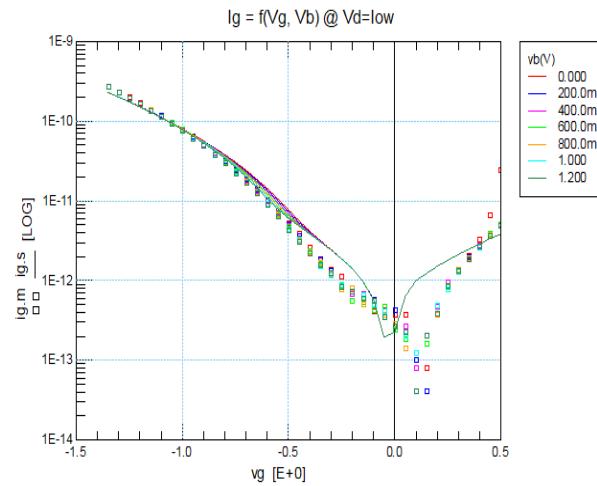
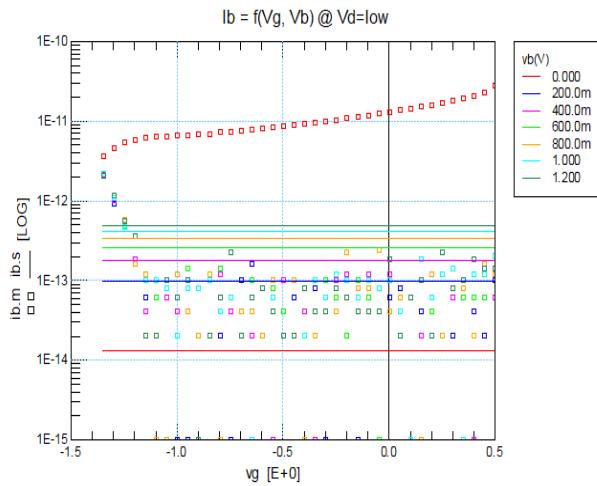
**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**



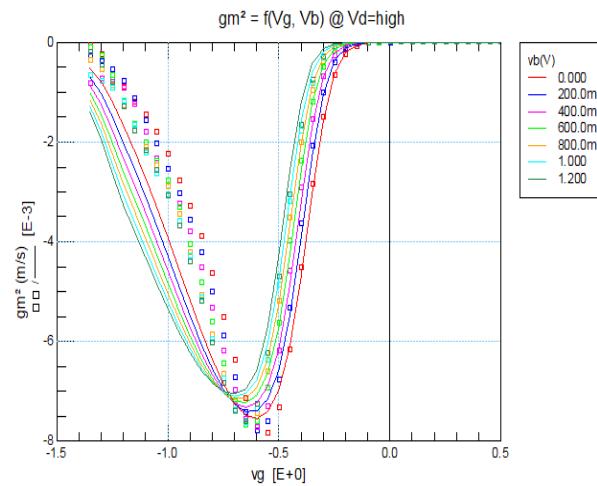
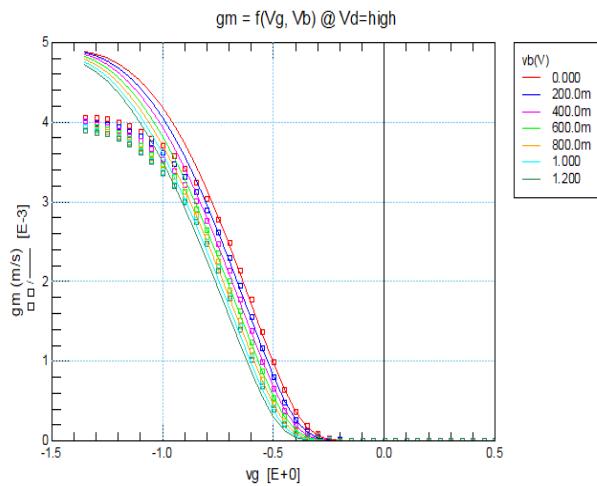
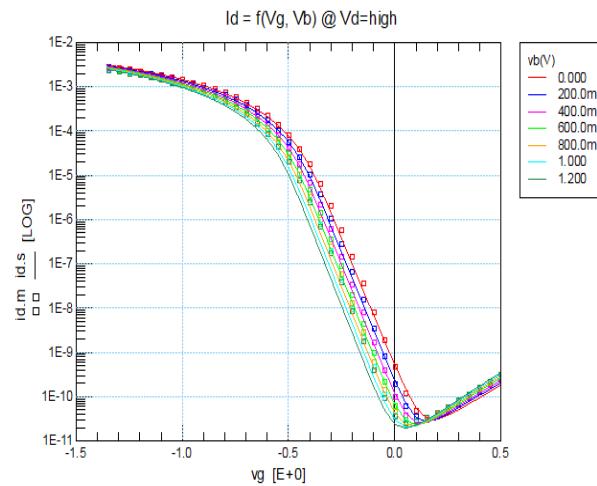
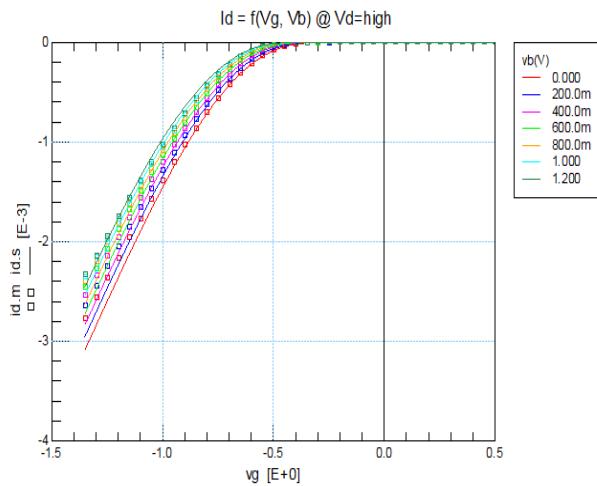
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

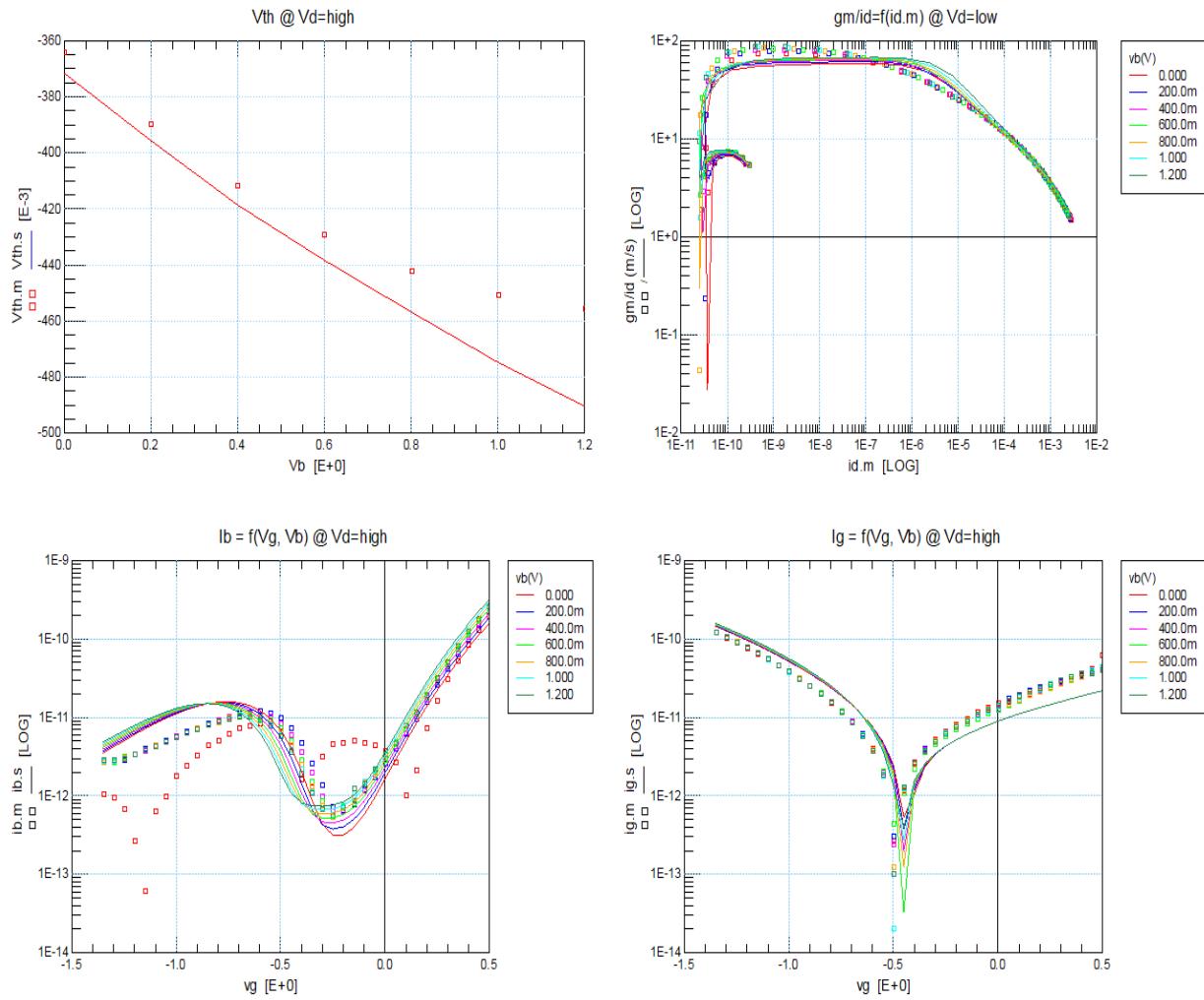


**4.39 W10u0\_L0u12\_S548\_1****idvg, Vd = -0.05V, T = 27°C**

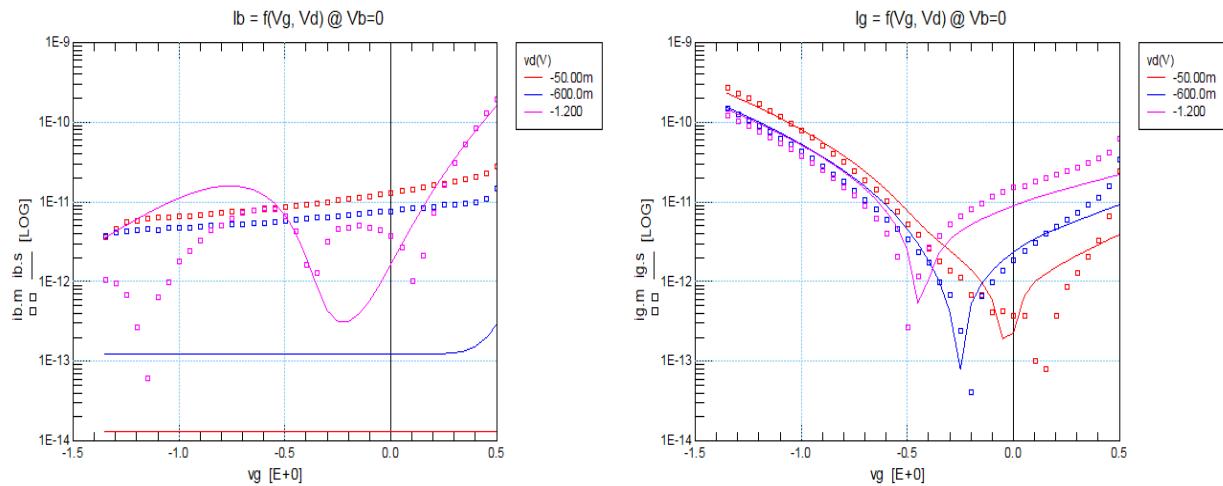


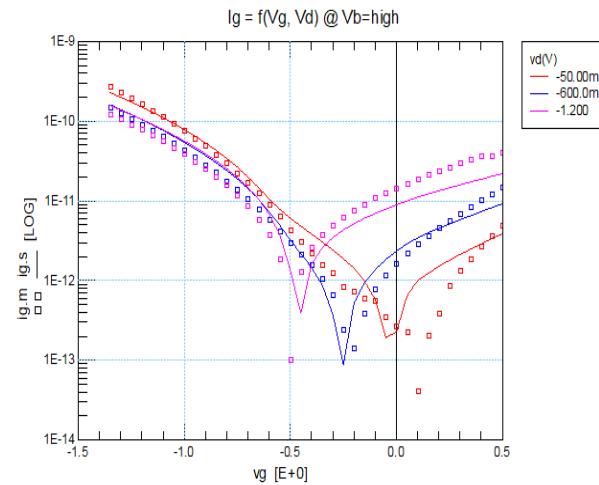
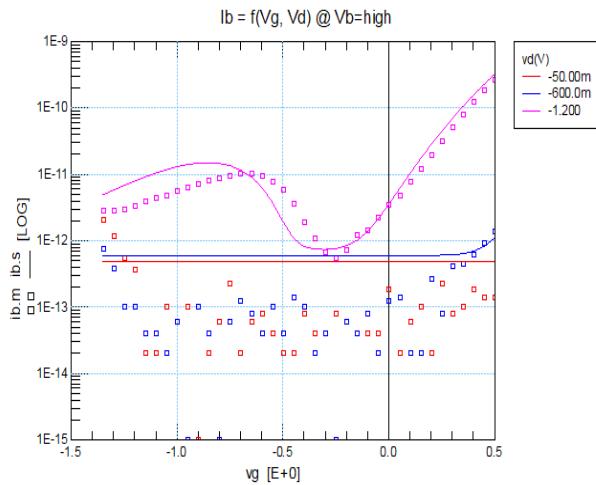
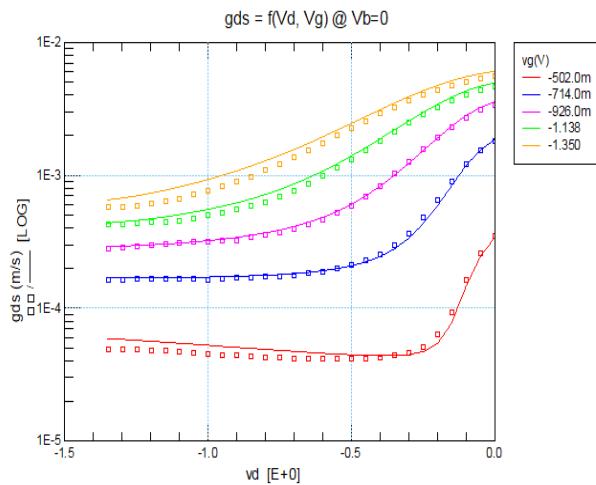
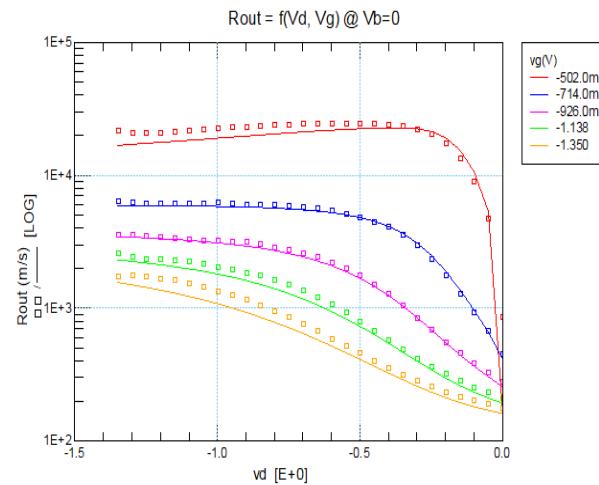
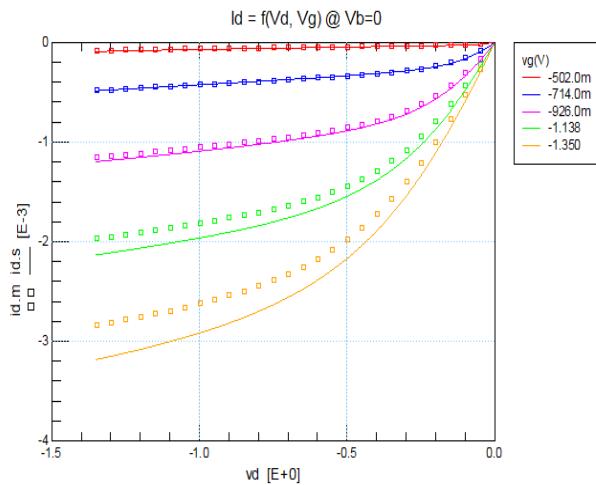
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

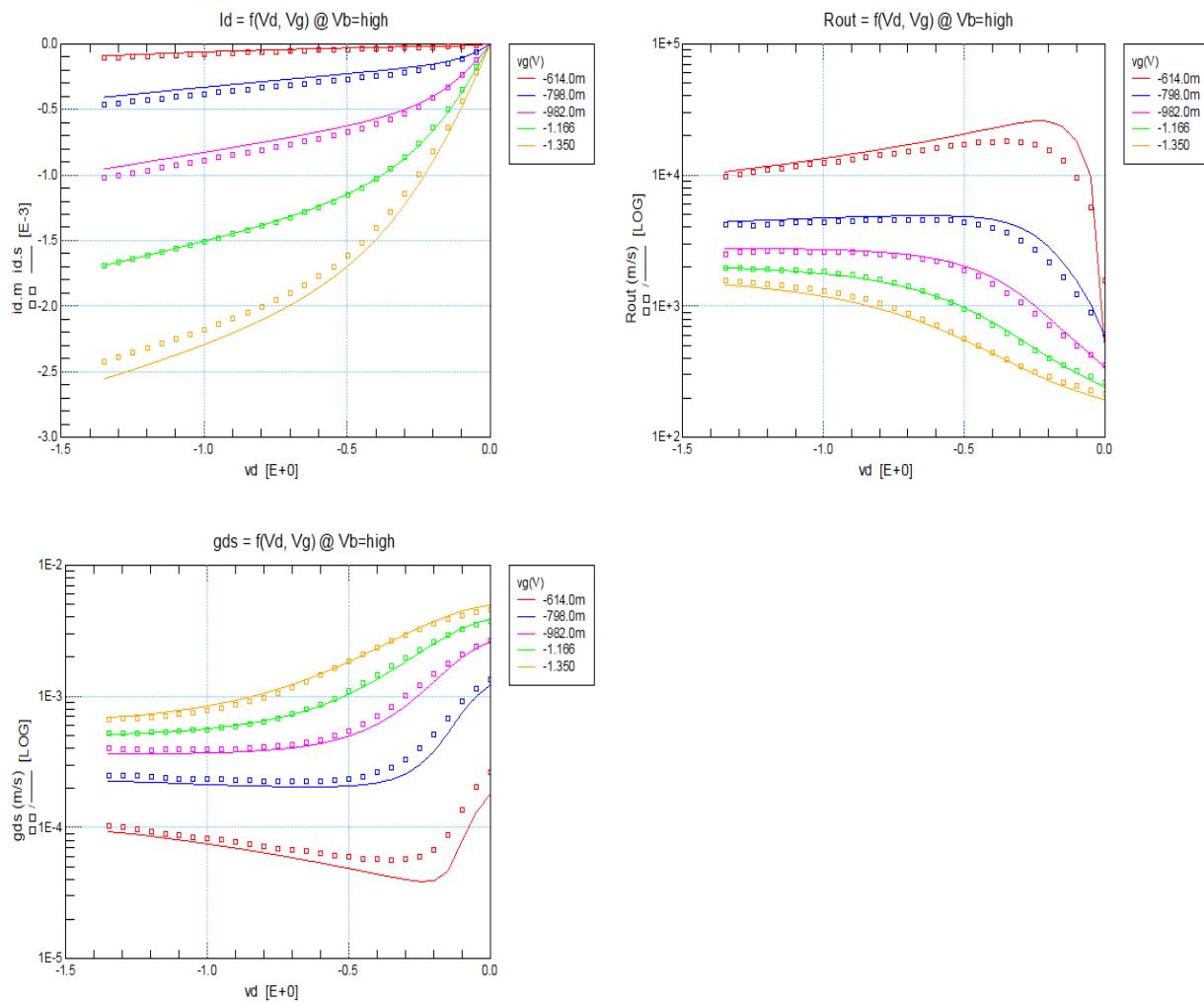
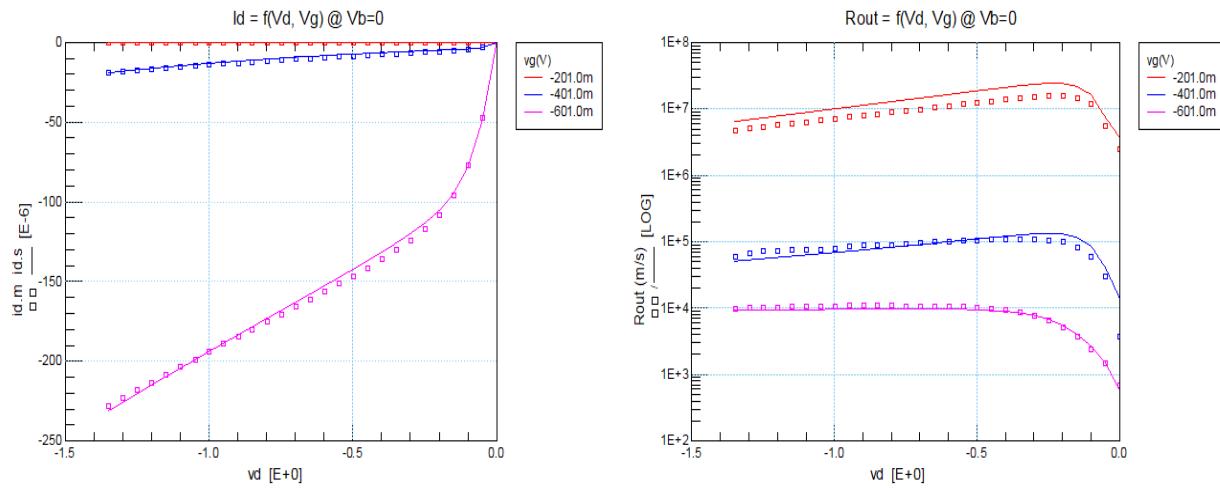


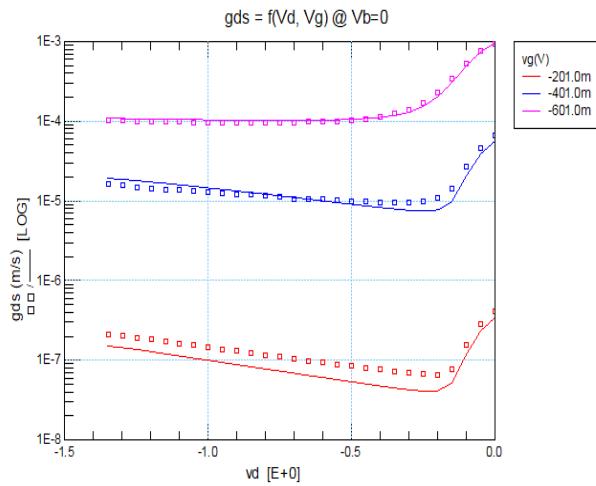


### idvg, lb, lg, Vb = 0V, T = 27°C

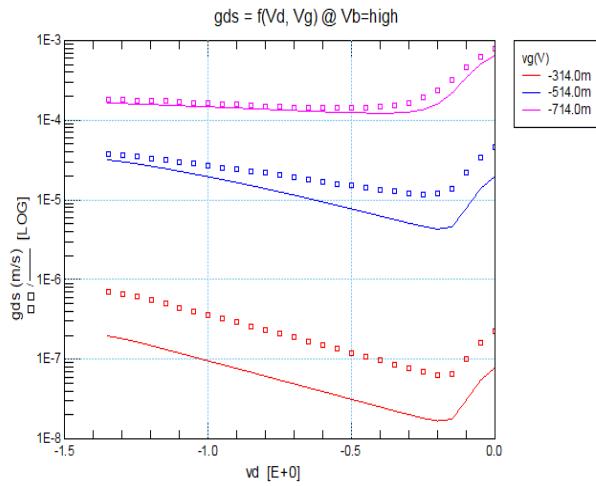
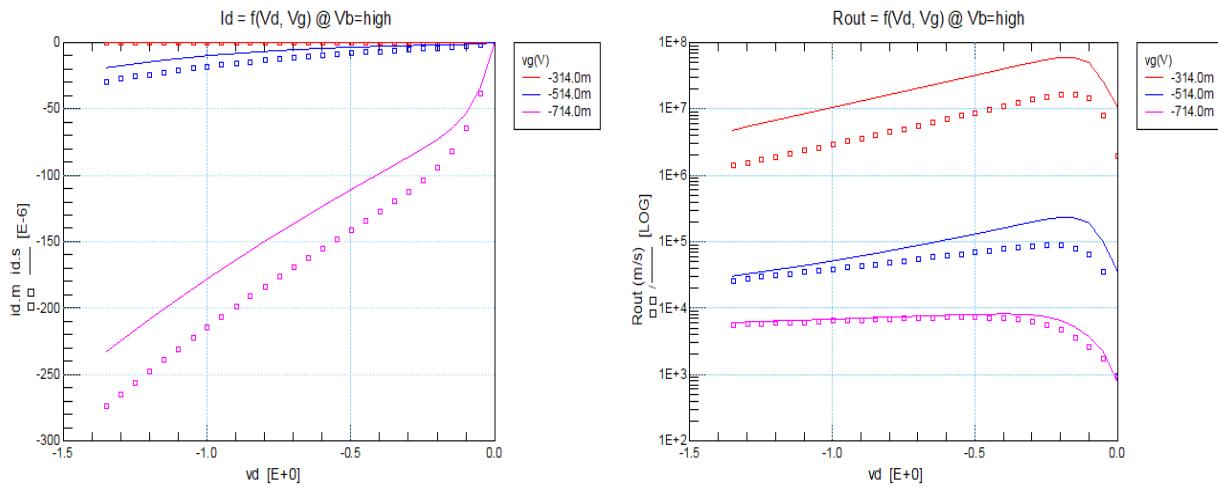


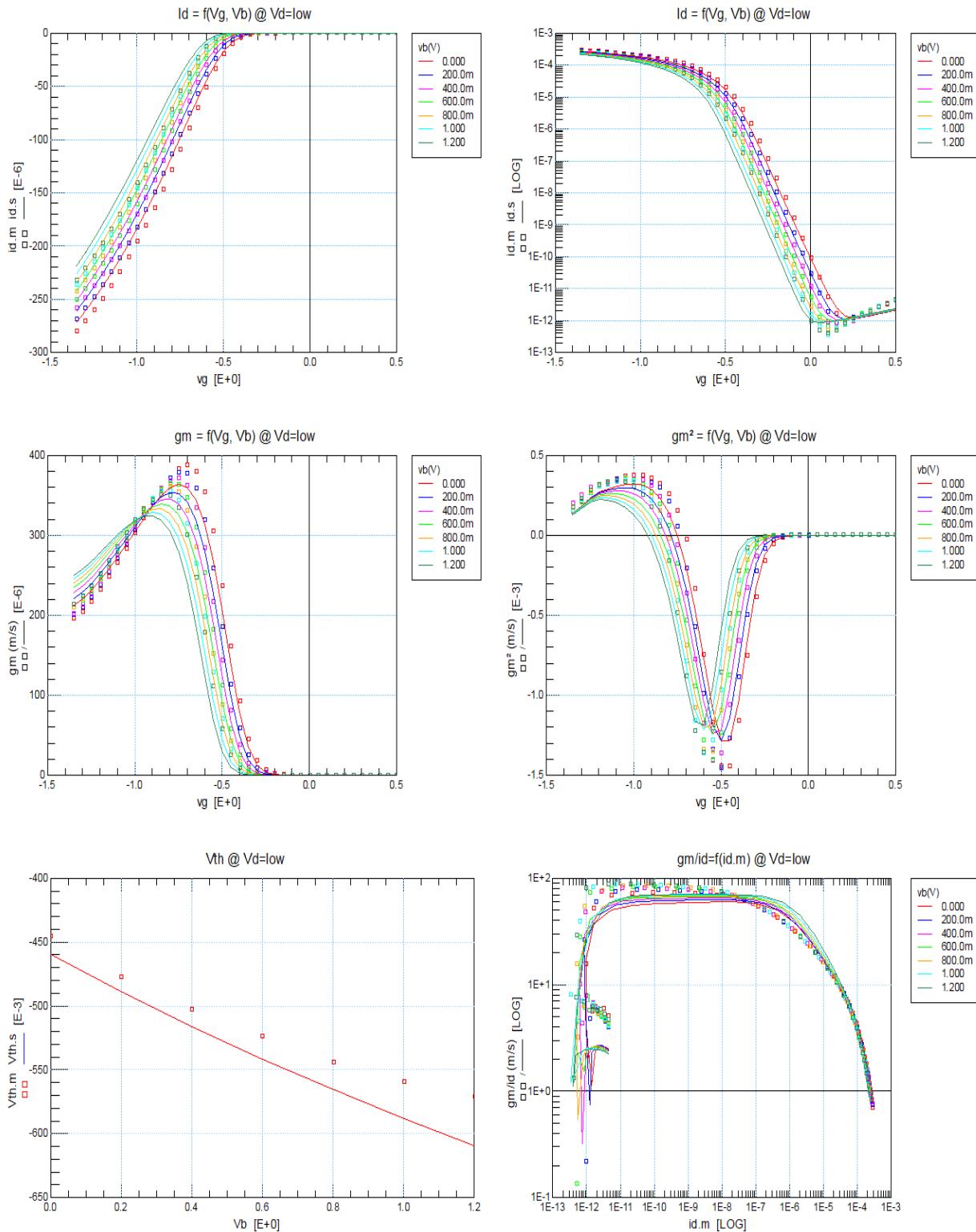
**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


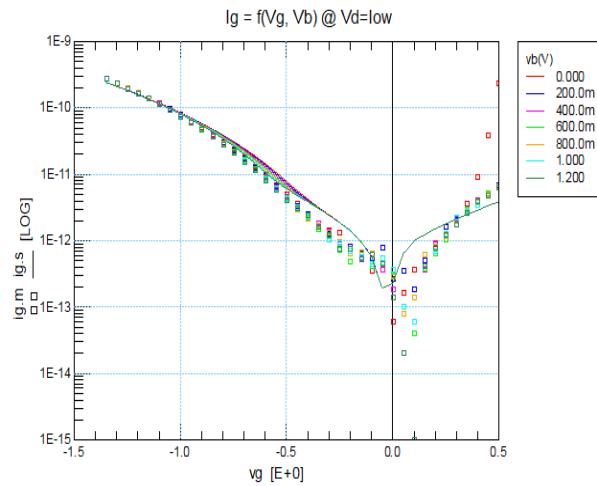
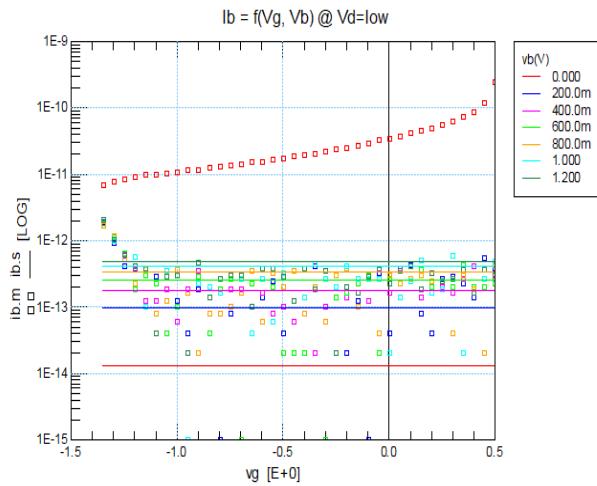
**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**



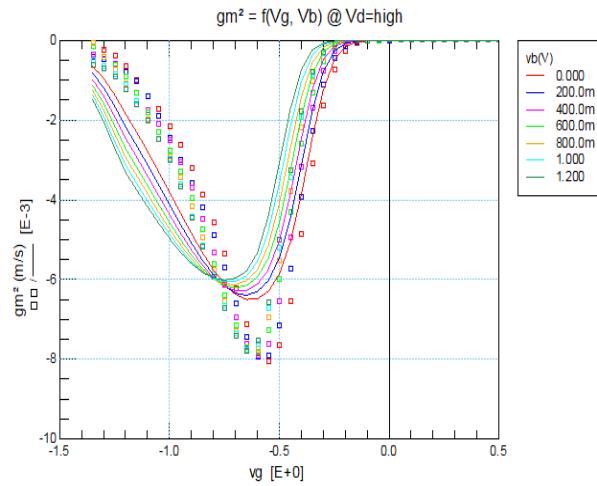
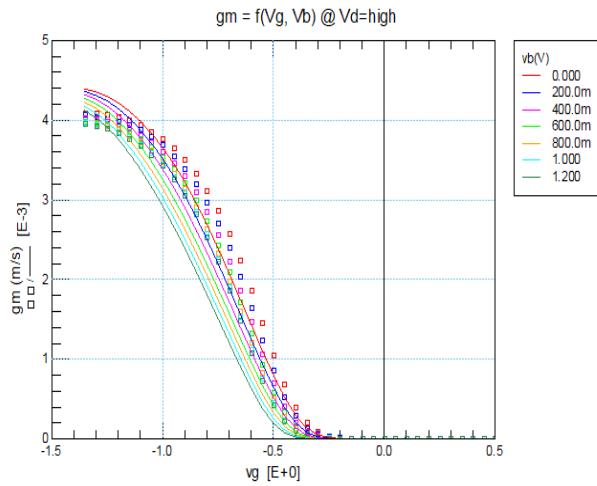
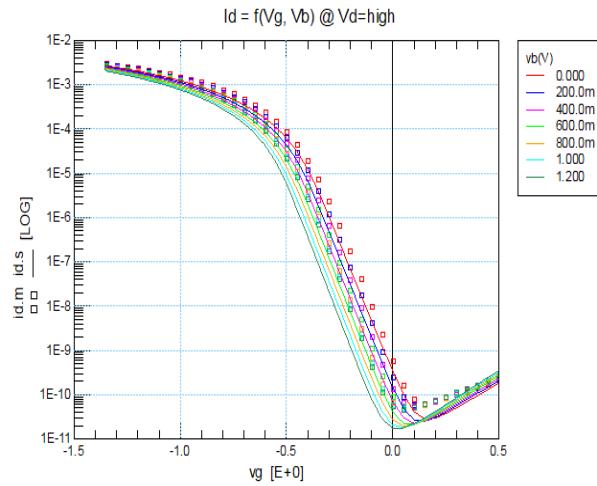
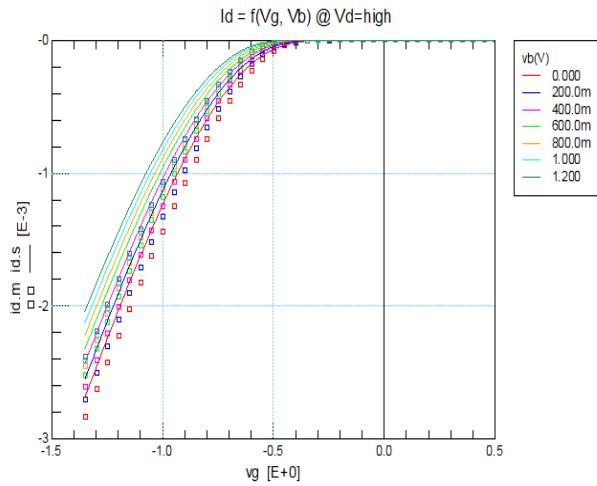
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

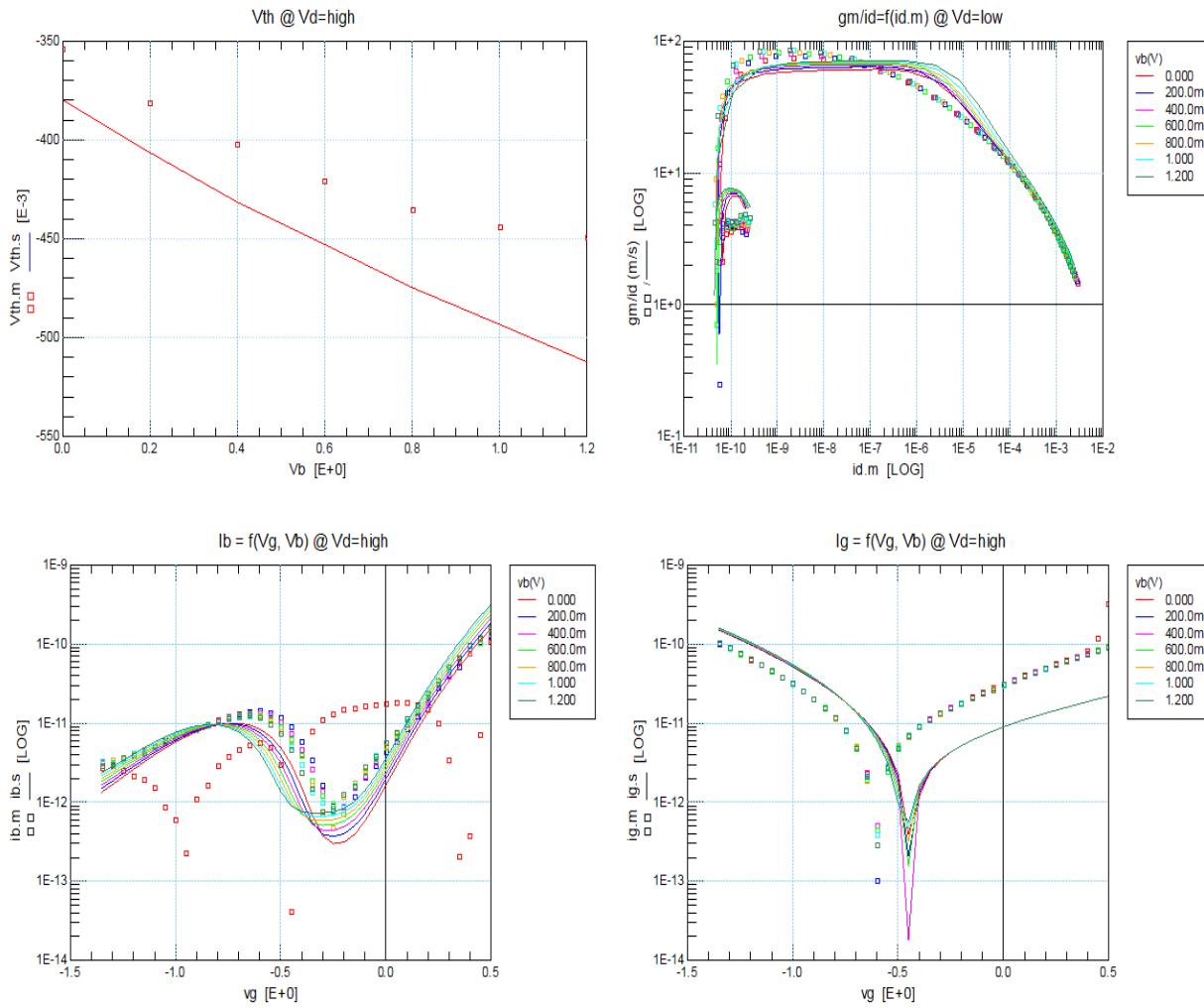


**4.40W10u0\_L0u13\_S382\_2****idvg, Vd = -0.05V, T = 27°C**

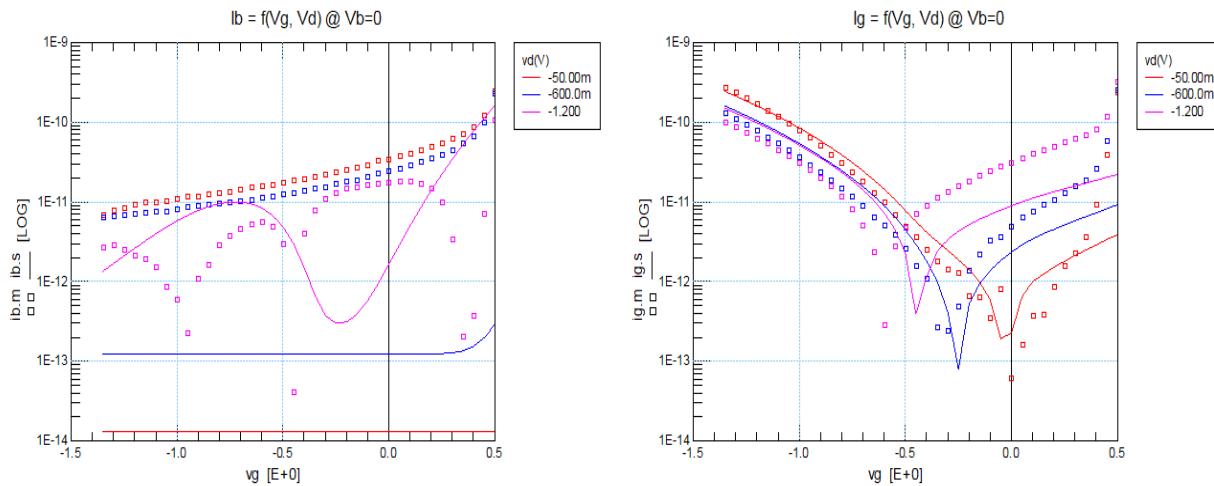


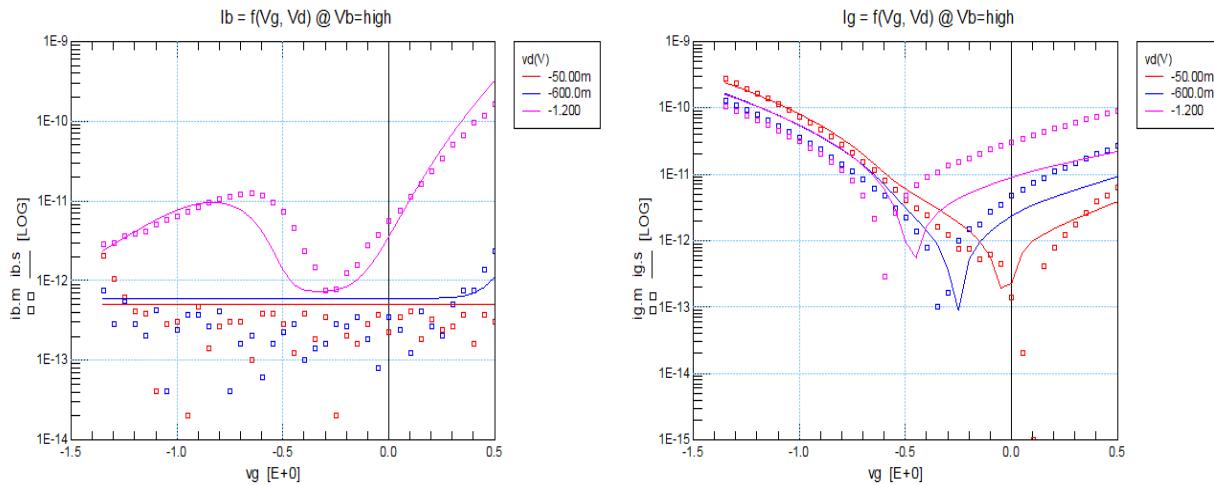
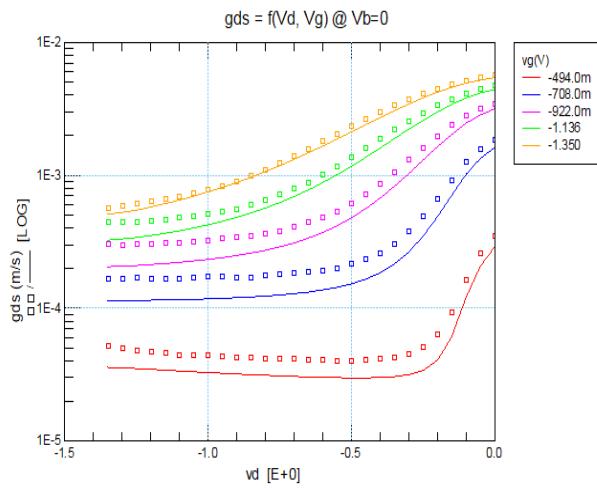
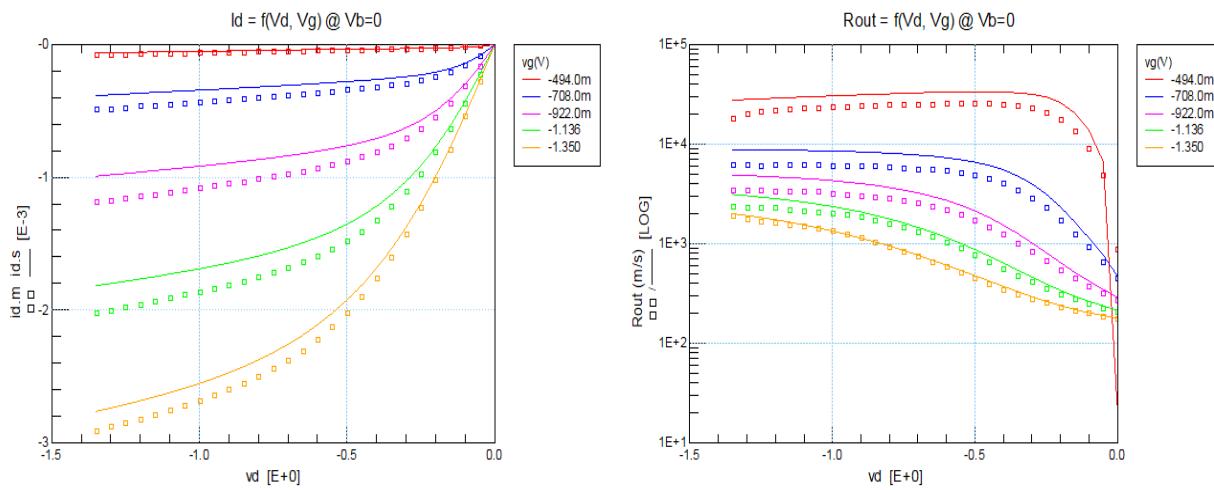
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

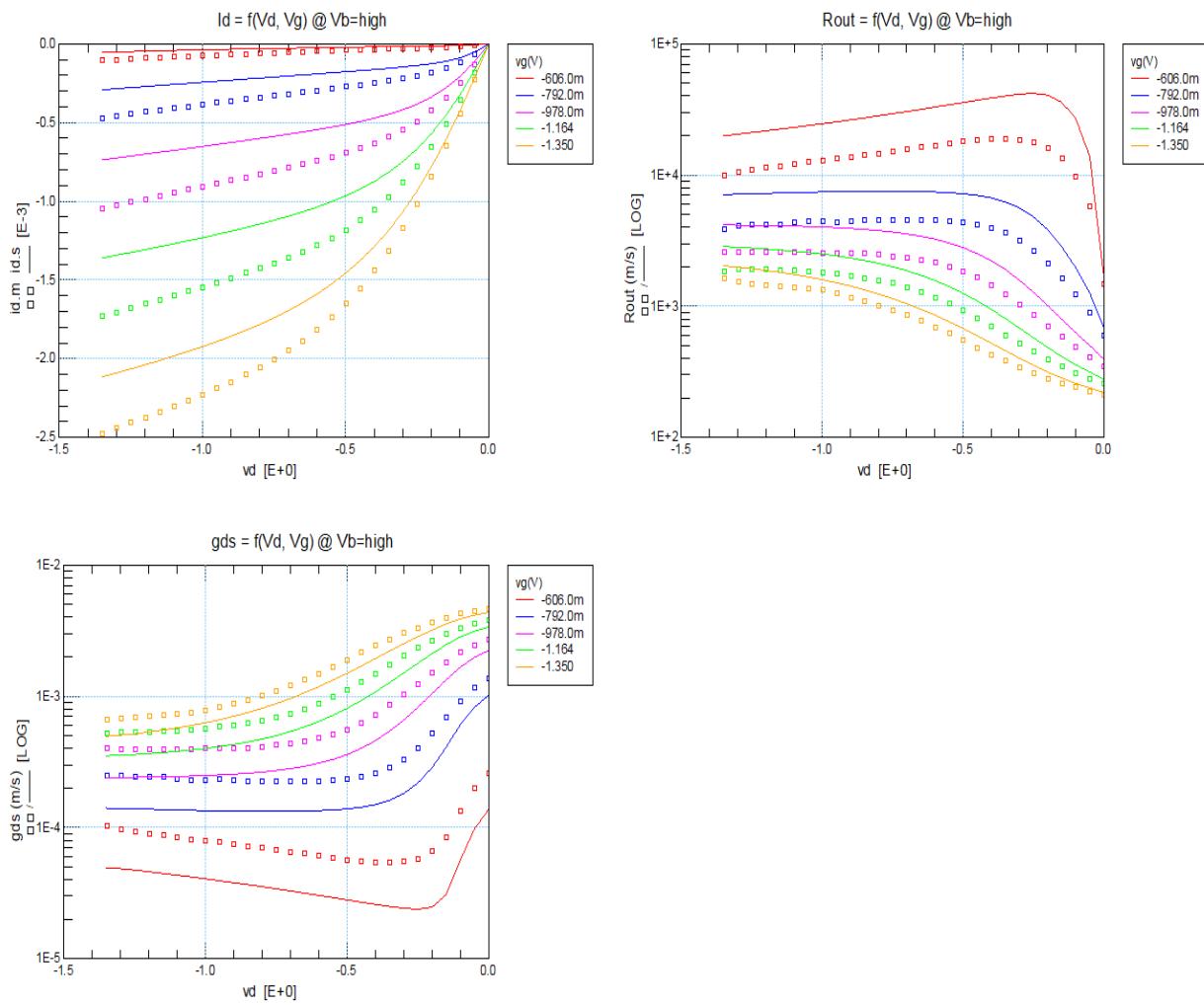
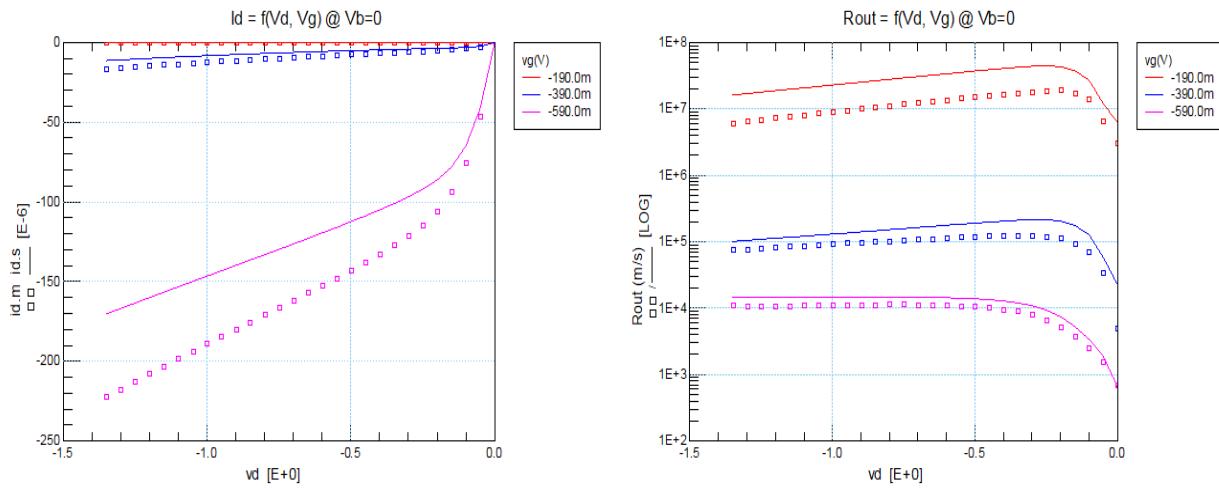


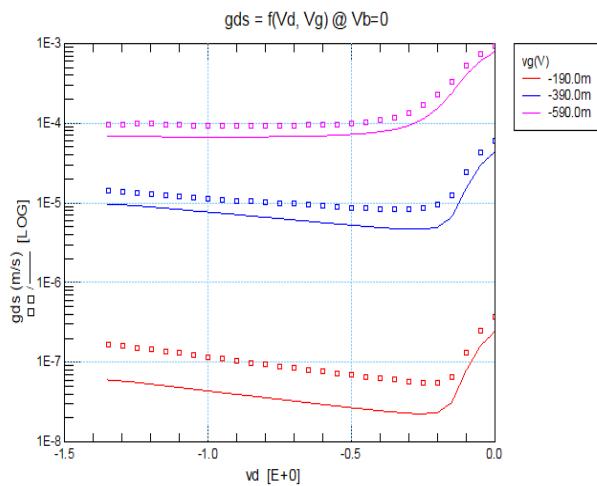


### $i_{dvg}, I_b, I_g, V_b = 0V, T = 27^\circ C$

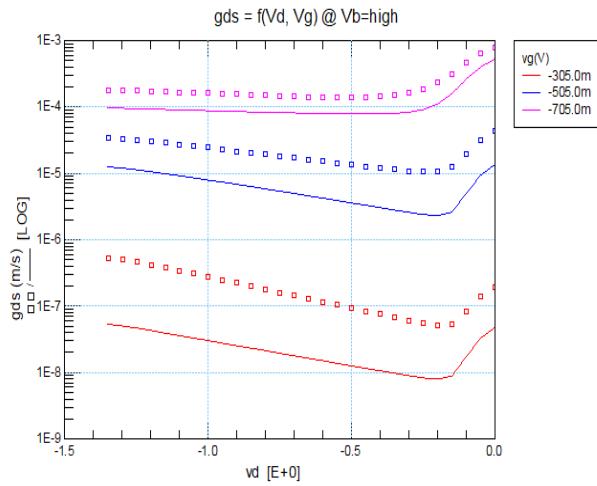
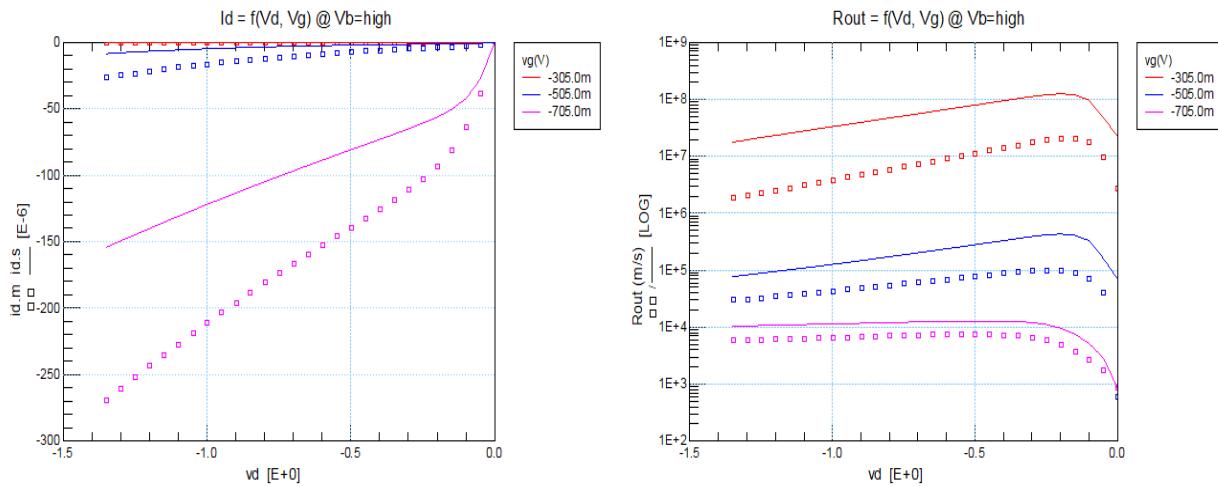


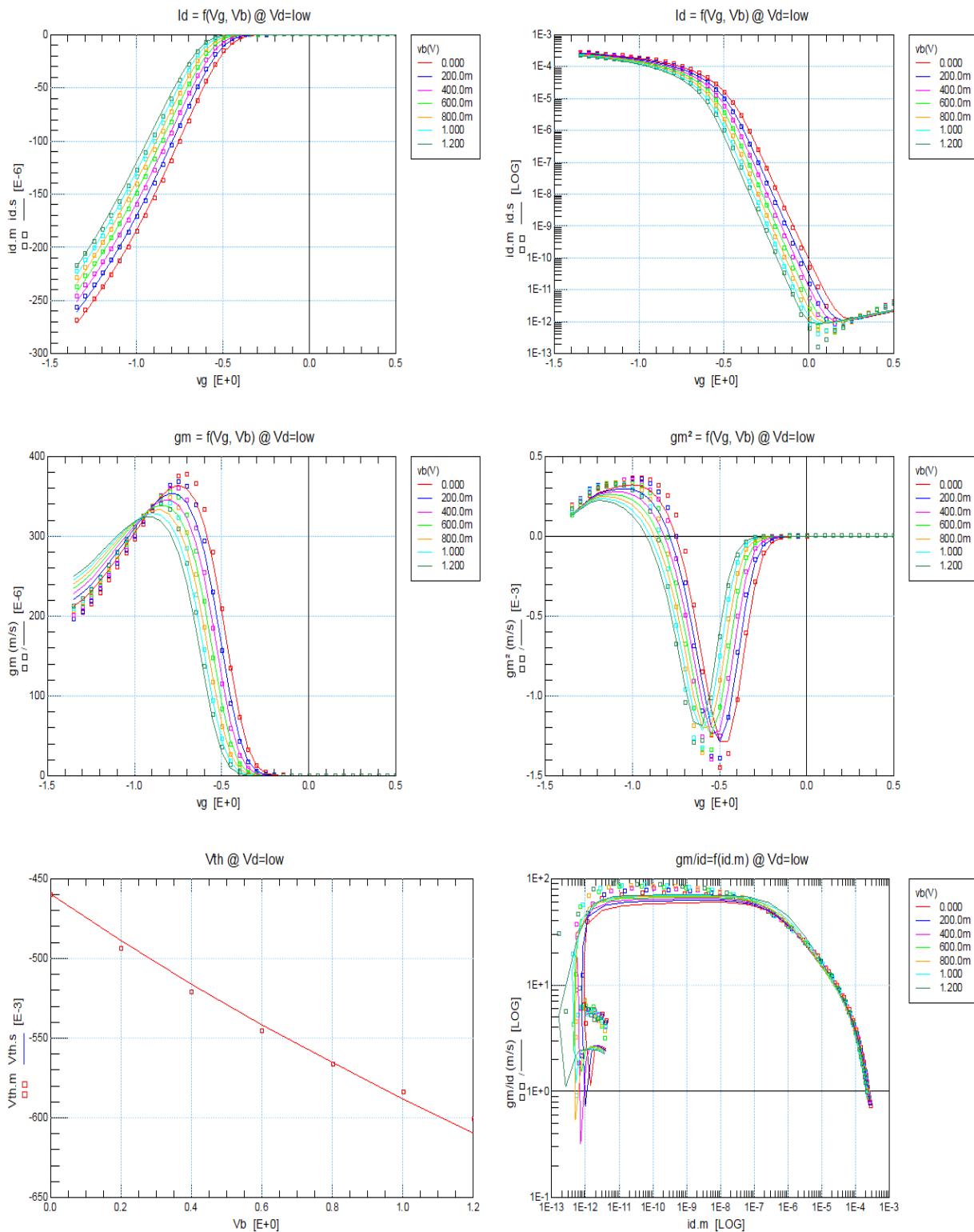
**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


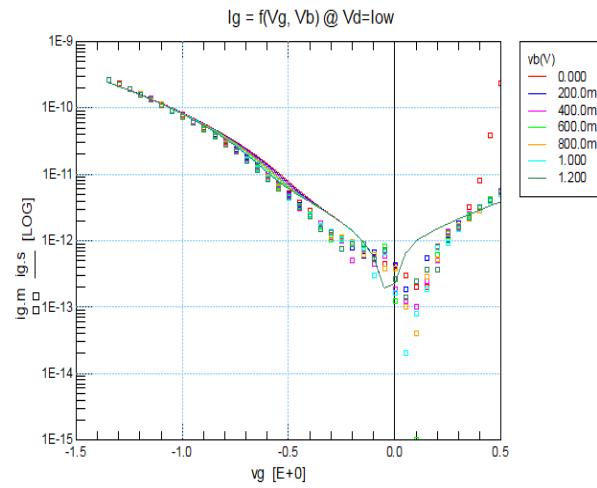
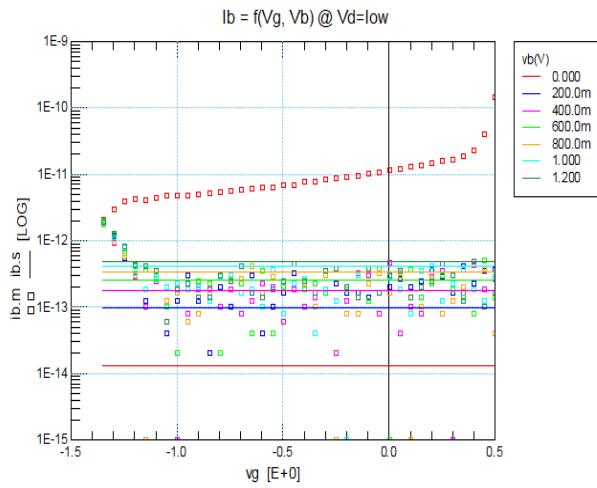
**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**



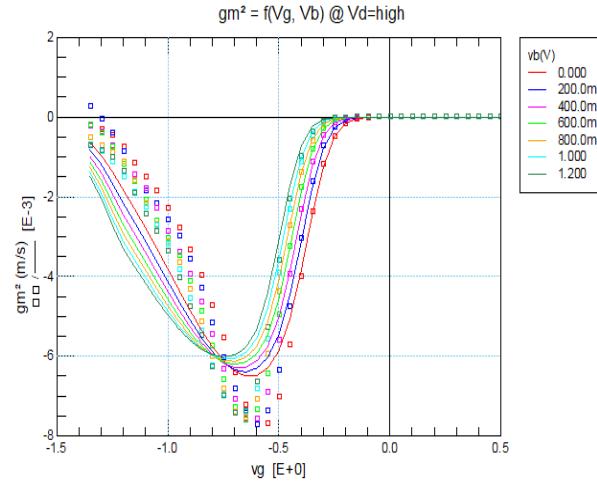
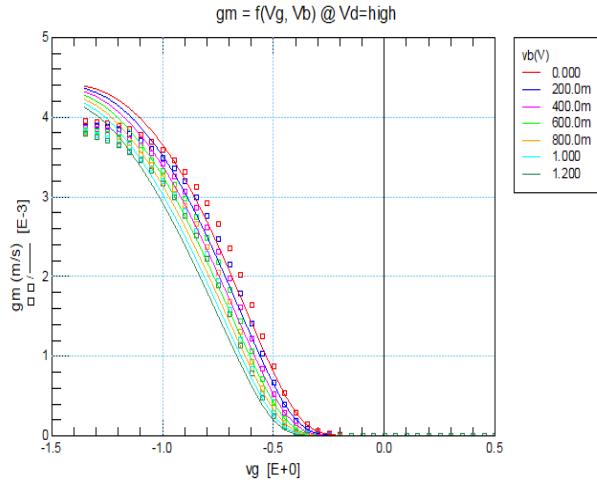
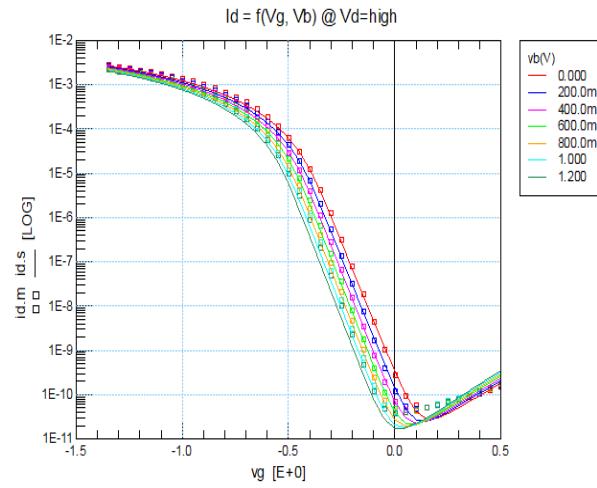
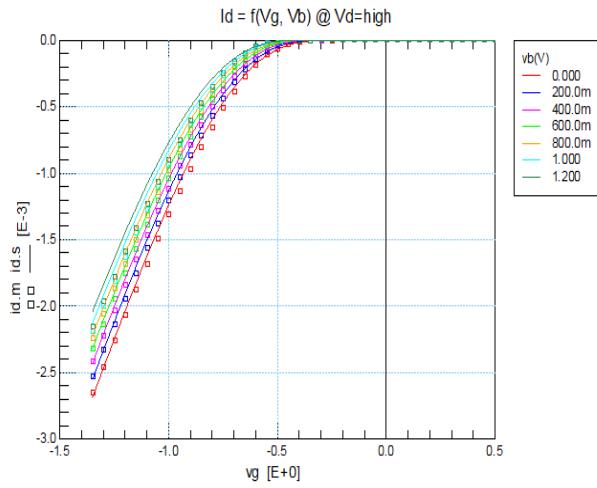
### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

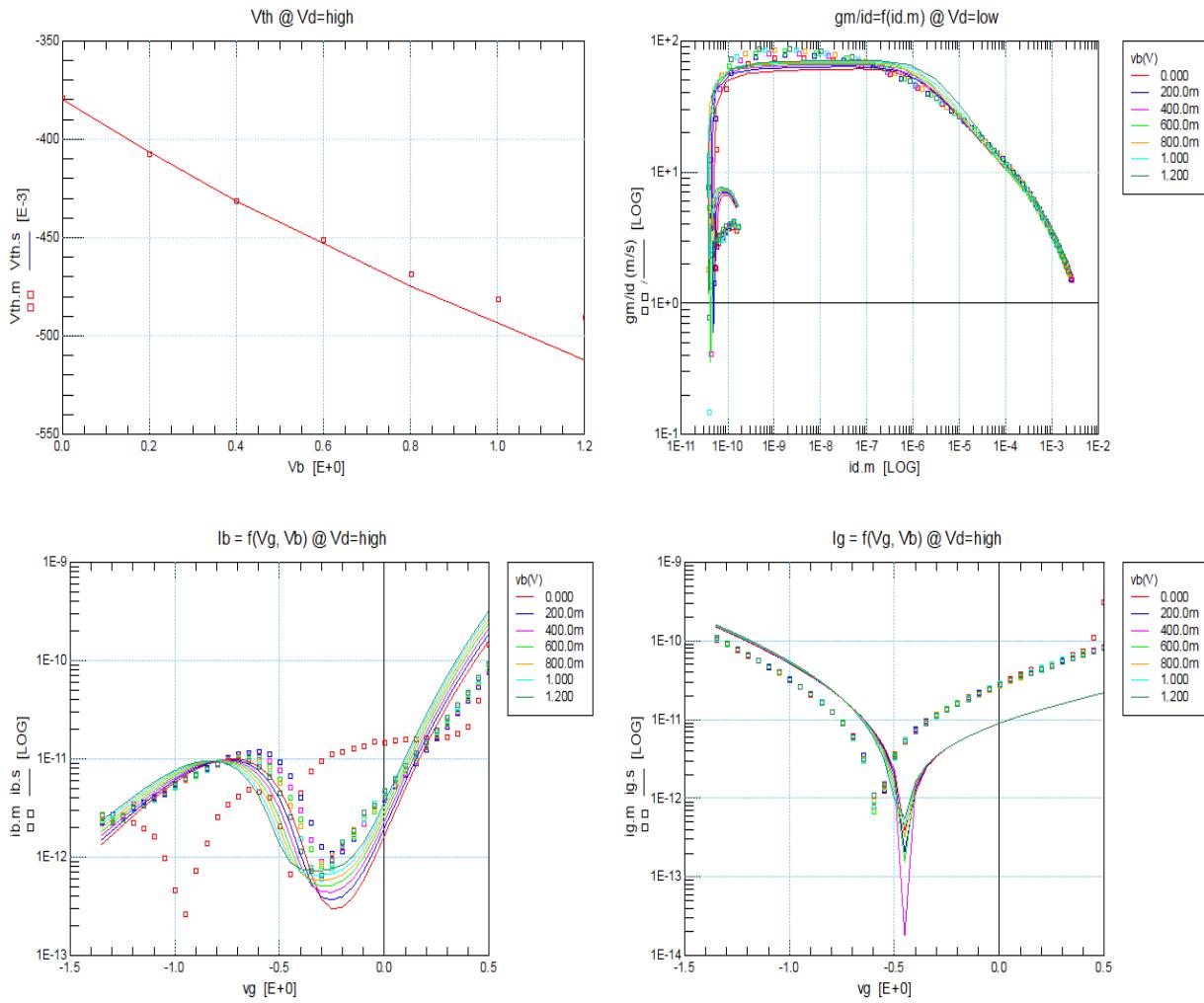


**4.41 W10u0\_L0u13\_T356\_S382\_2****idvg, Vd = -0.05V, T = 27°C**

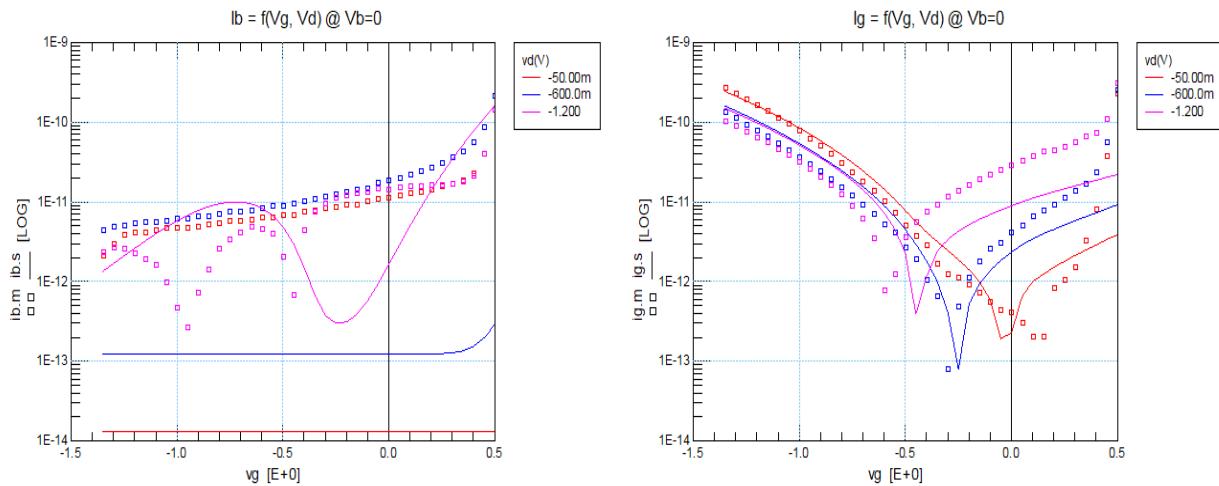


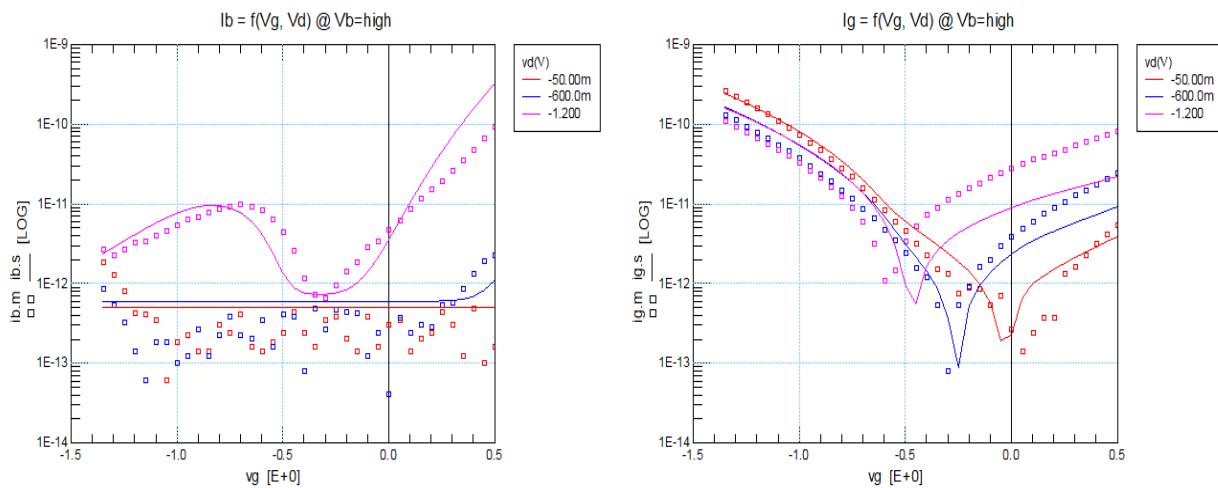
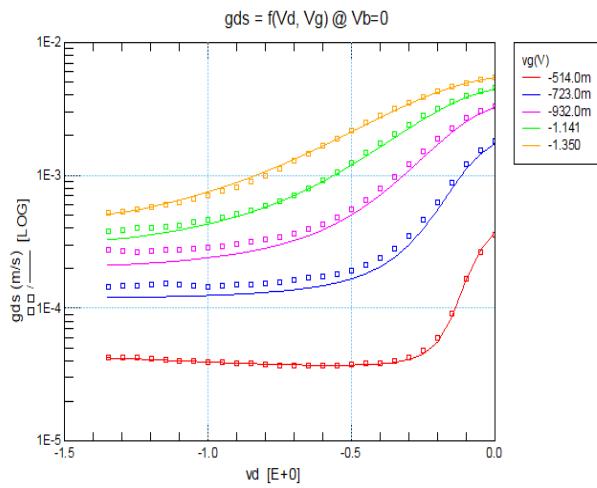
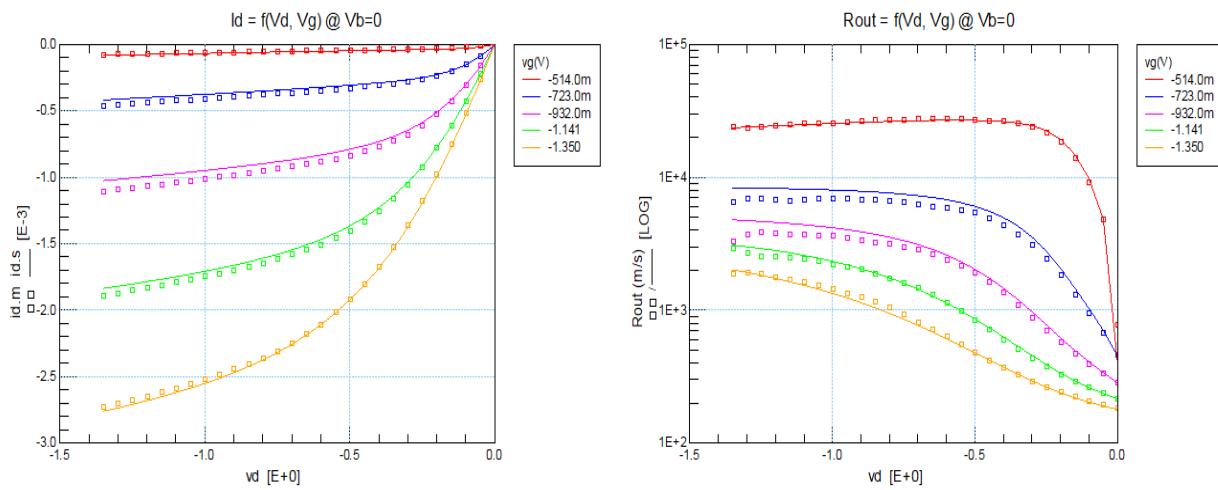
$i_{dvg}, V_d = -1.2V, T = 27^\circ C$

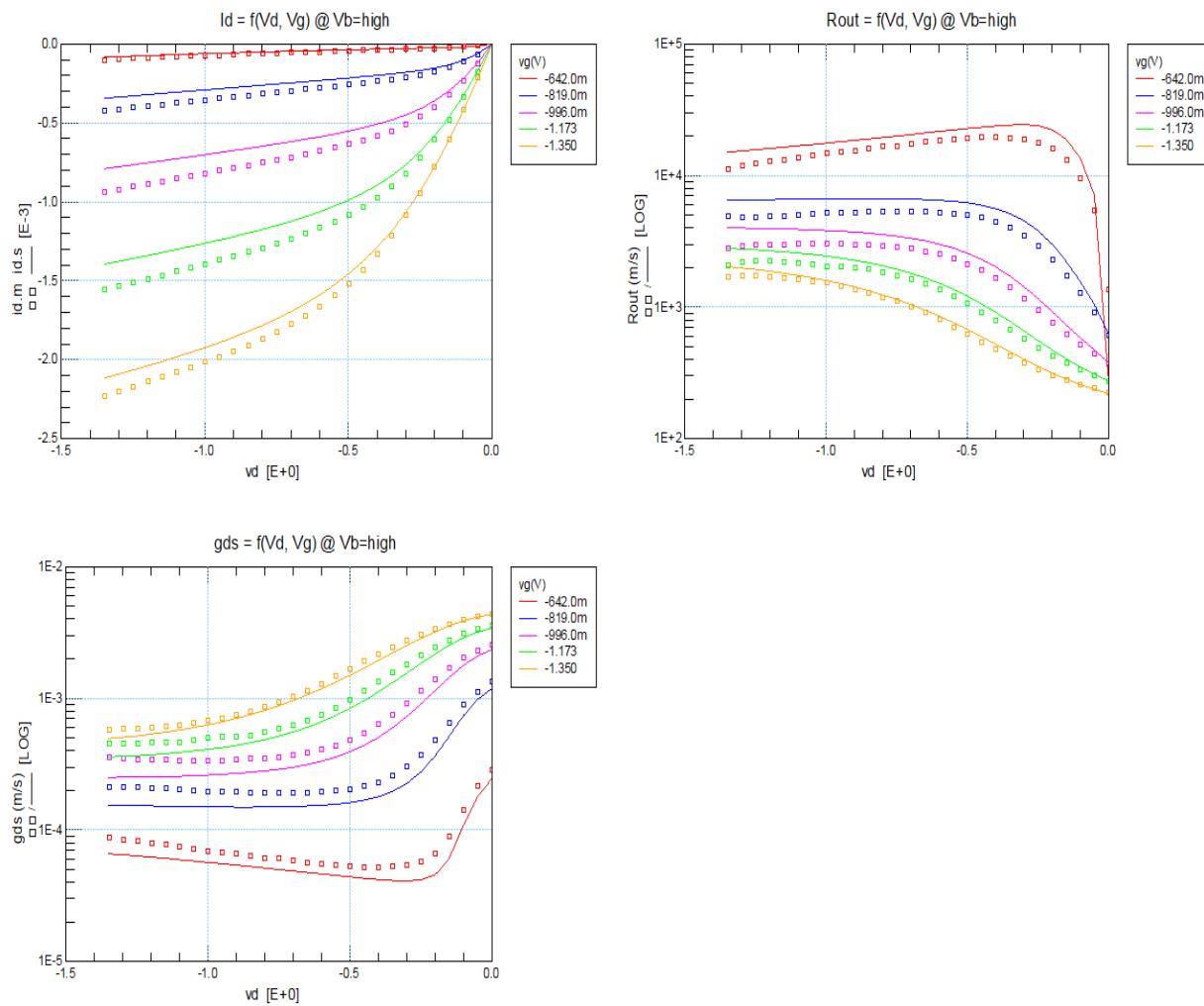
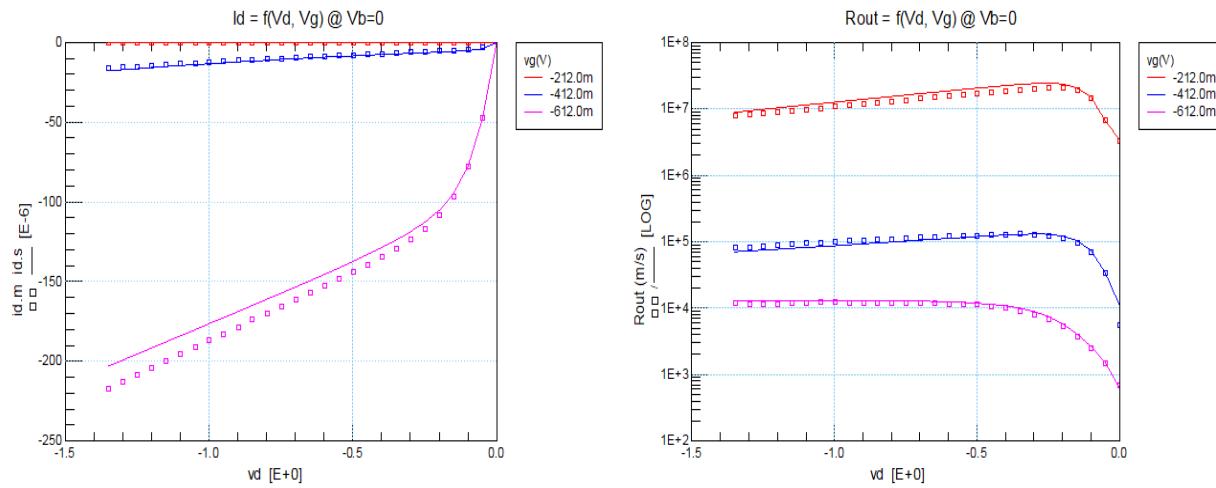


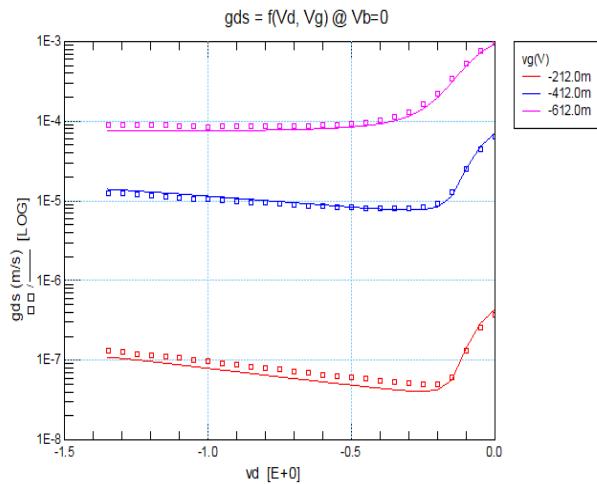


**idvg, Ib,Ig, Vb = 0V, T = 27°C**

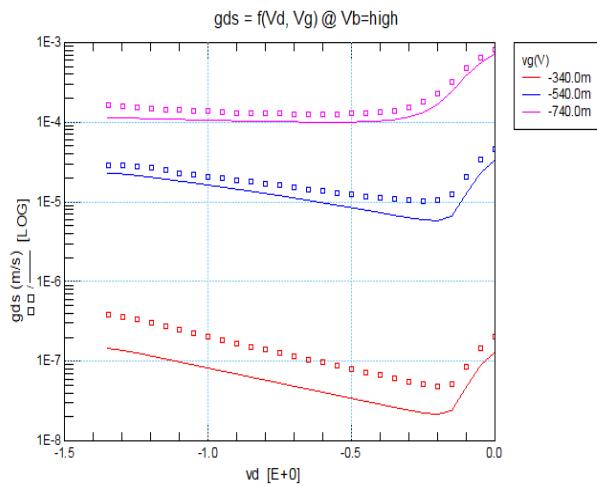
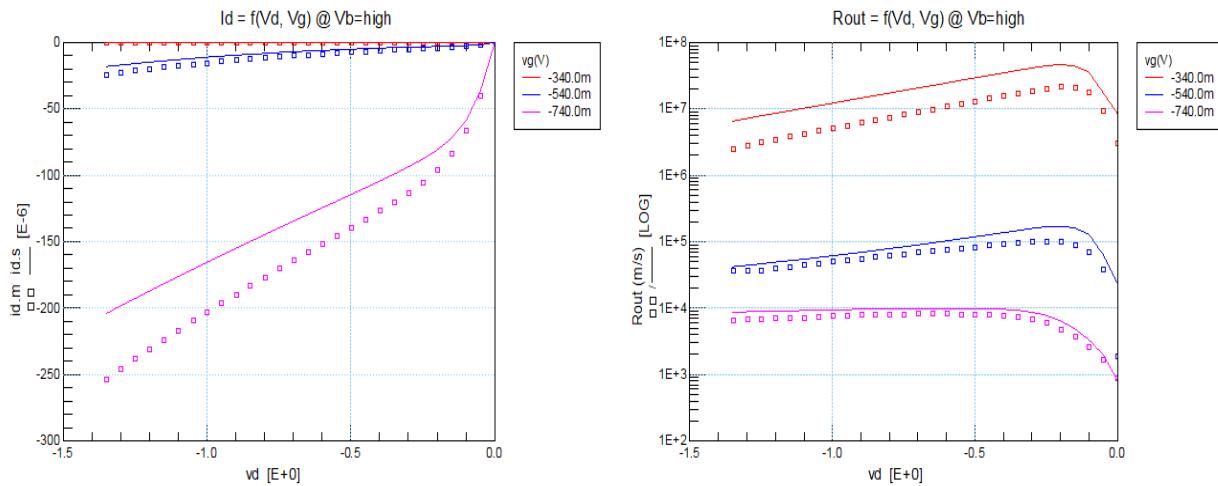


**idvg, Ib,Ig, Vb = 1.2V, T = 27°C**

**idvd, Vb = 0V, T = 27°C**


**idvd\_vbmin, Vb = 1.2V, T = 27°C****idvd\_vth, Vb = 0V, T = 27°C**

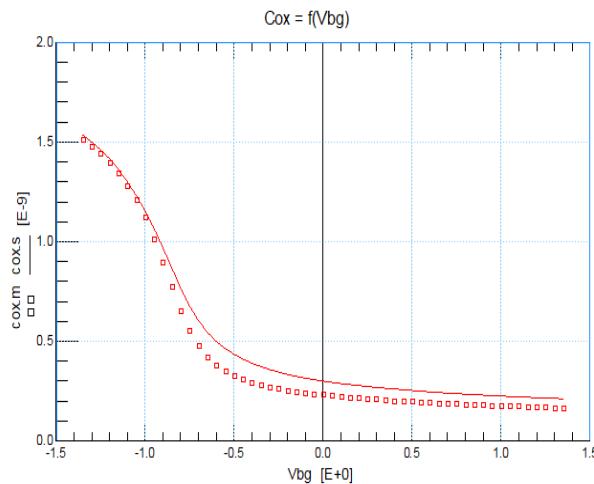


### idvd\_vth\_vbmin, Vb = 1.2V, T = 27°C

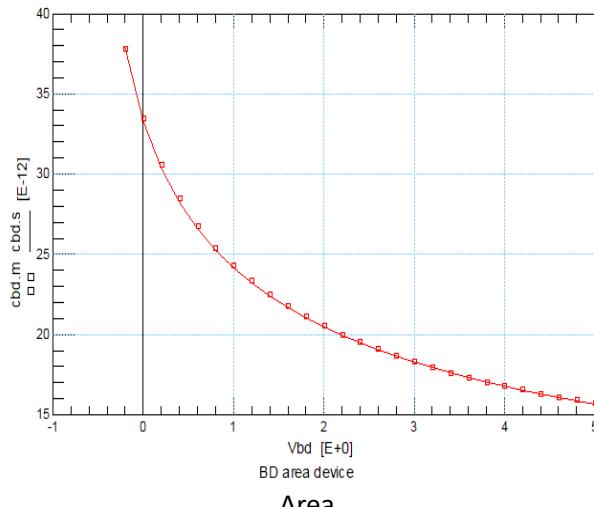


## 5 Capacitances

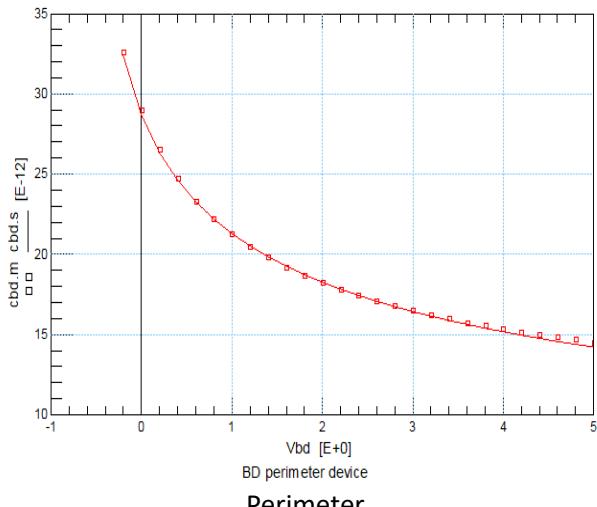
### 5.1 Gate Oxide Capacitance



### 5.2 Junction Capacitance Bulk - Drain

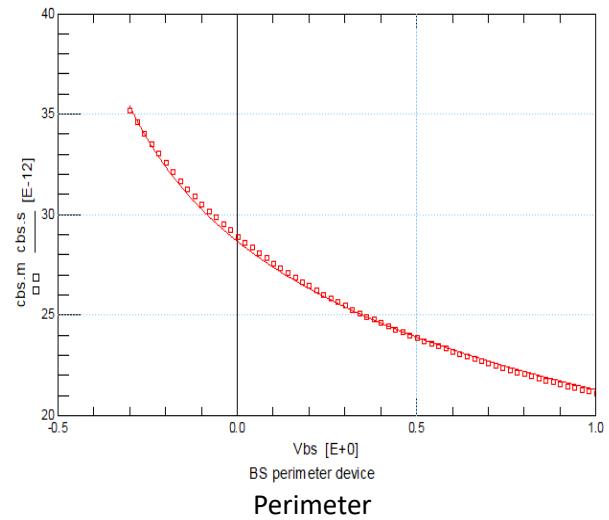
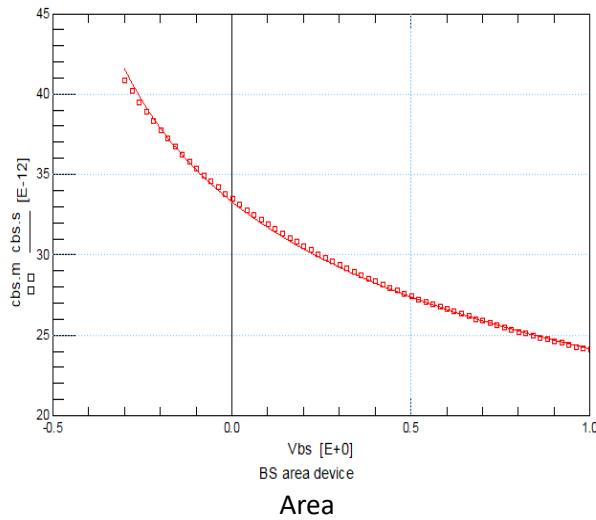


Area

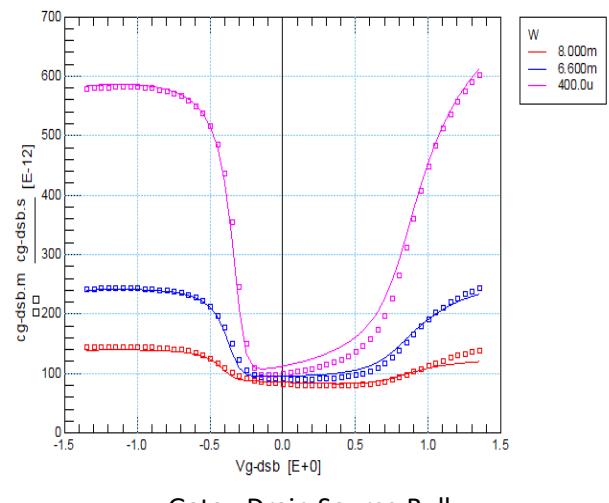
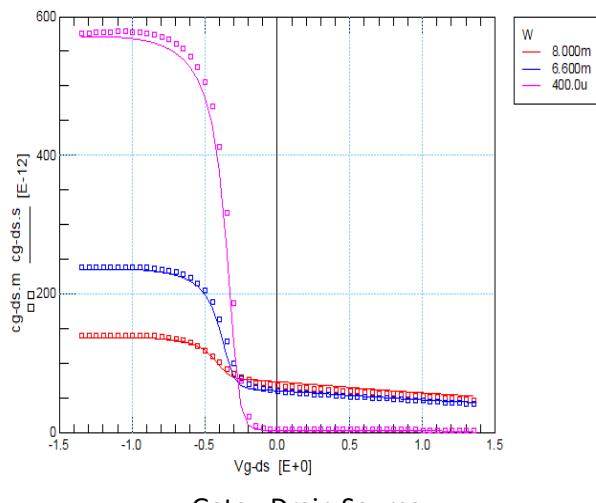


Perimeter

### 5.3 Junction Capacitance Bulk - Source

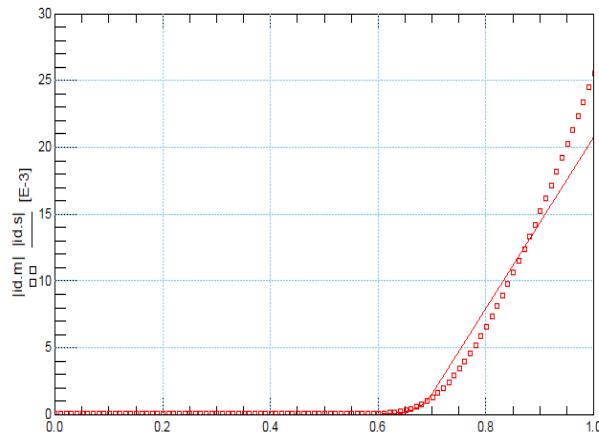


### 5.4 Overlap Capacitance

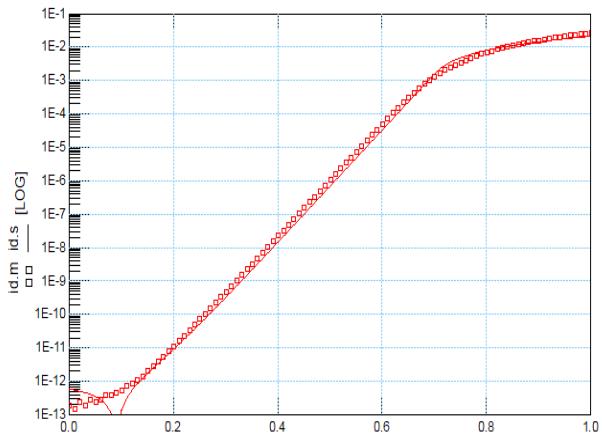


## 6 Diodes

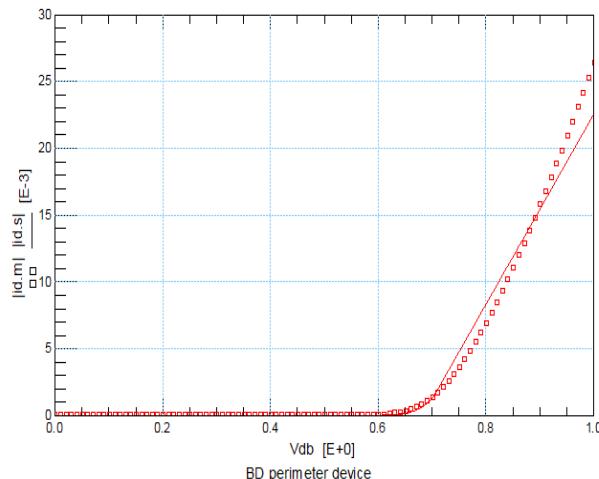
### 6.1 Diode Bulk - Drain



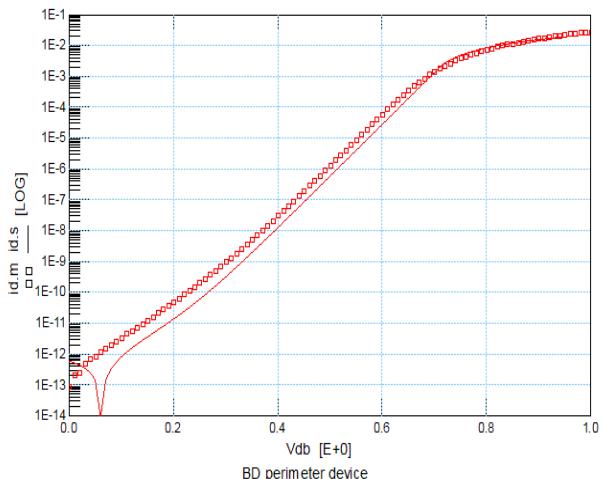
Area



Area

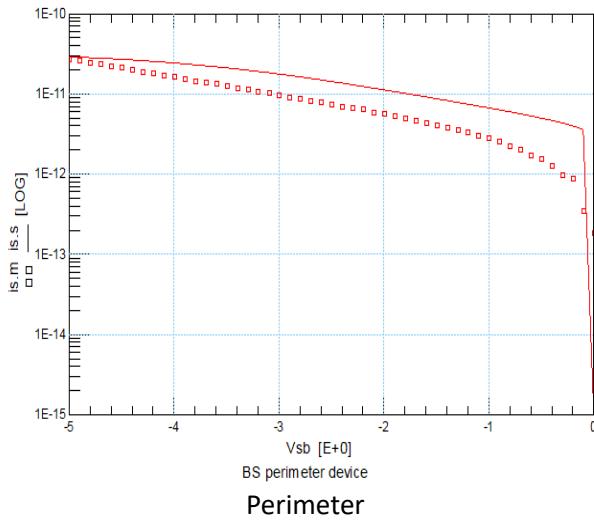
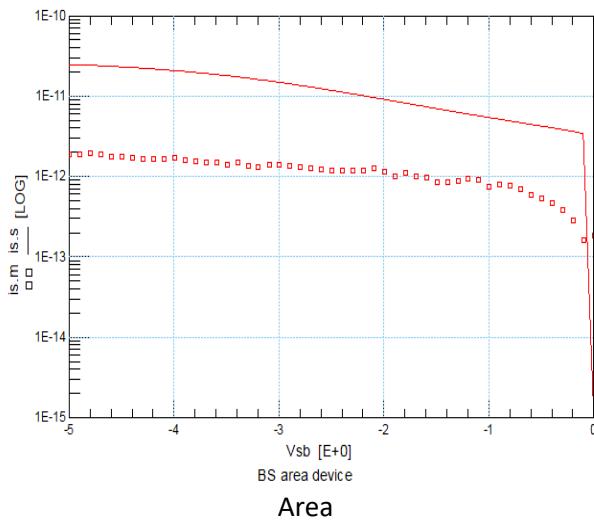
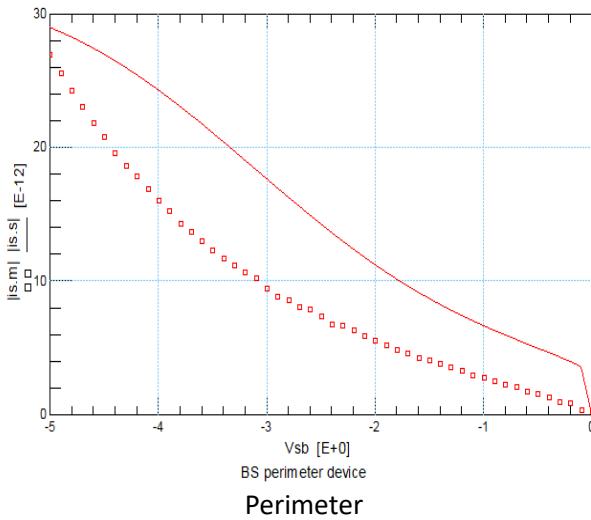
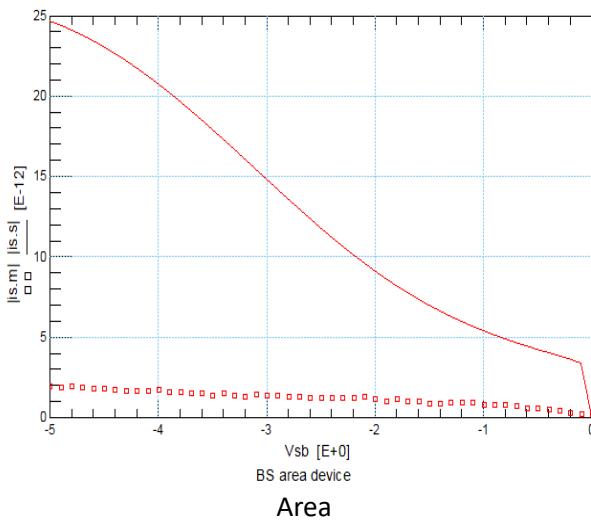


Perimeter



Perimeter

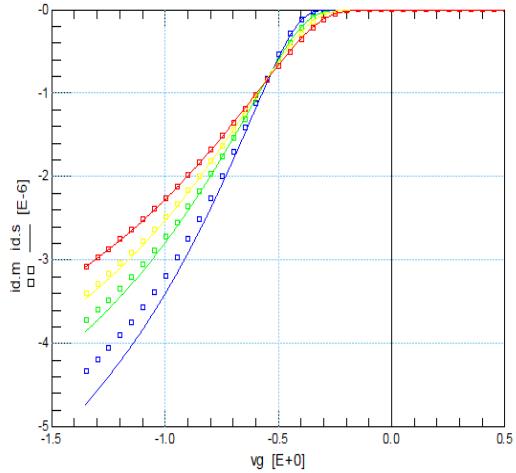
## 6.2 Diode Bulk - Source



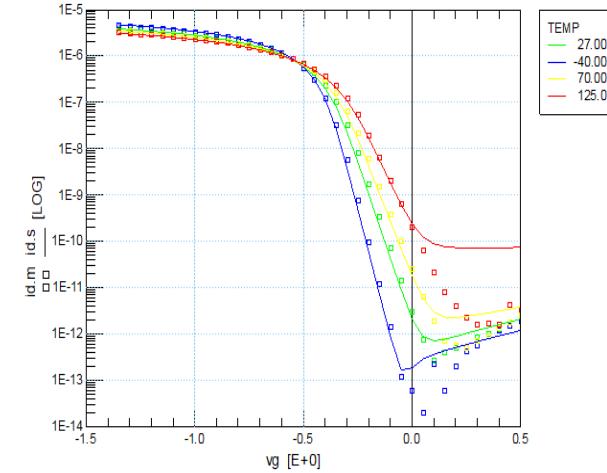
## 7 Temperature Measurement

### 7.1 Transistors

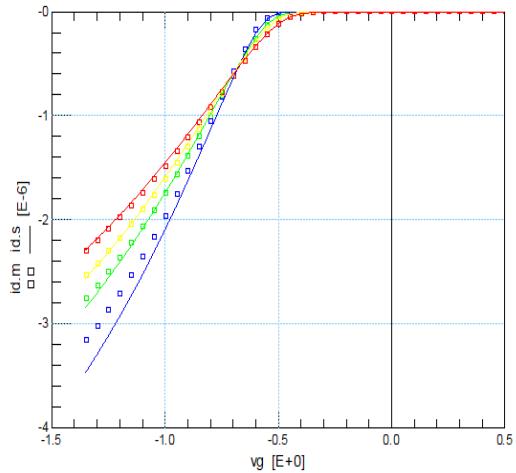
#### 7.1.1 W10u0\_L10u0\_S549\_5



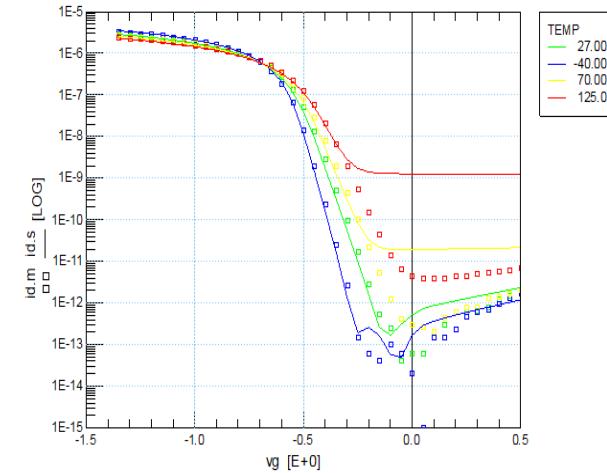
$Id = f(Vg, T)$  @ low  $Vds$ ,  $Vbs = 0$



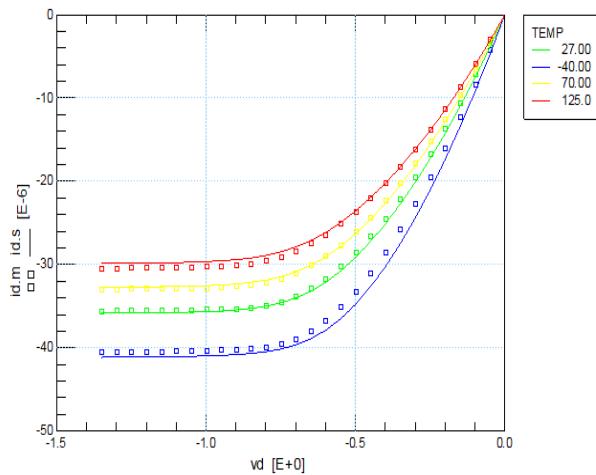
$\log(Id) = f(Vg, T)$  @ low  $Vds$ ,  $Vbs = 0$



$Id = f(Vg, T)$  @ low  $Vds$ ,  $Vbs = \text{max}$

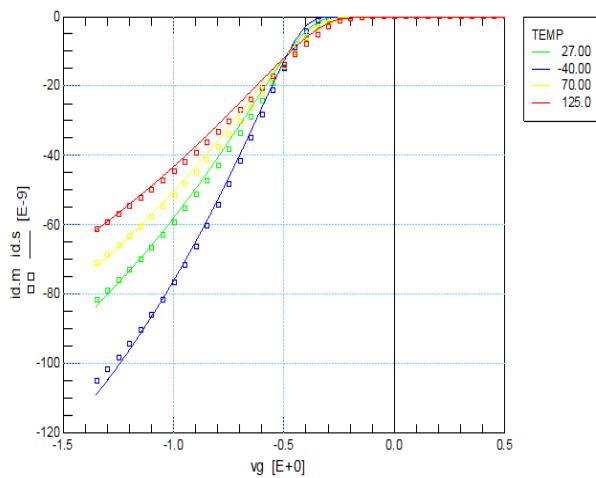


$\log(Id) = f(Vg, T)$  @ low  $Vds$ ,  $Vbs = \text{max}$

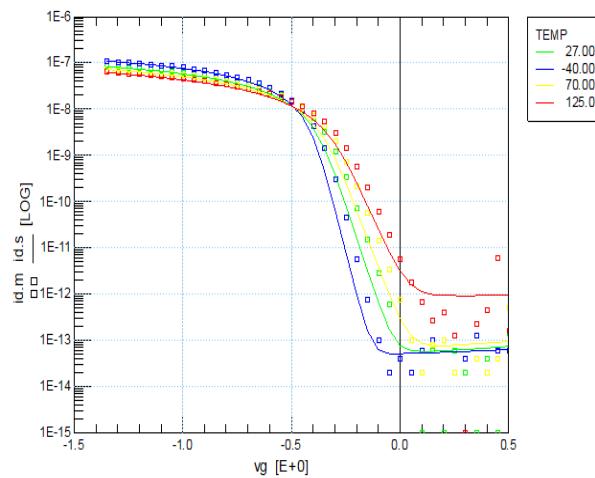


$$Id = f(Vd, Vg, T) @ Vbs = 0$$

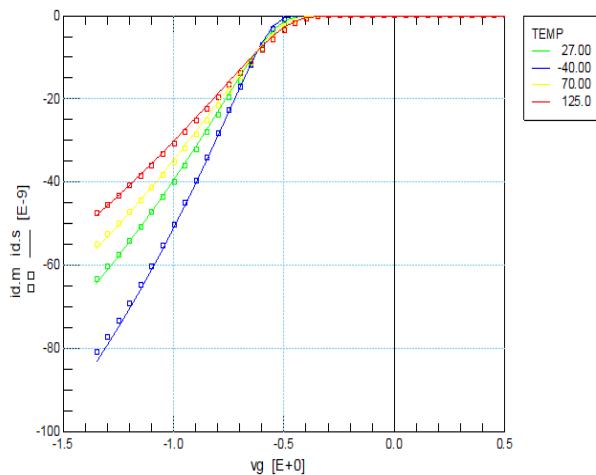
### 7.1.2 W0u15\_L10u0\_S555\_3



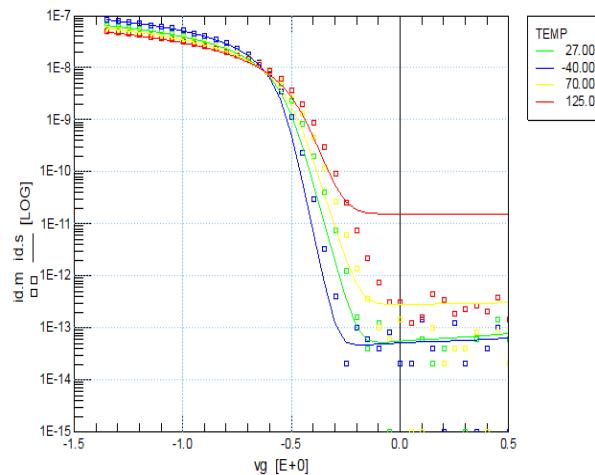
$$Id = f(vg, T) @ \text{low } Vds, Vbs = 0$$



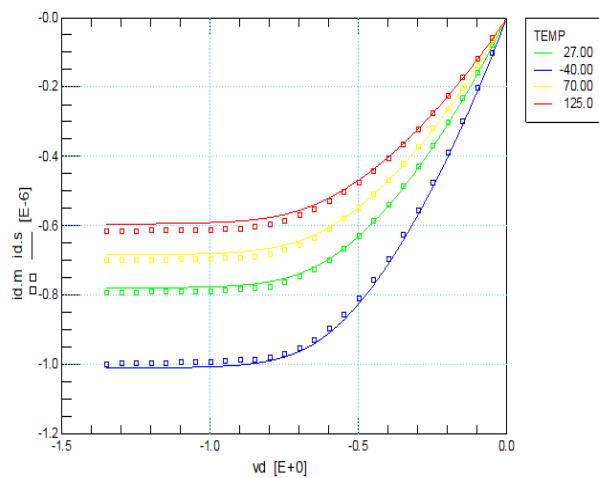
$$\log(Id) = f(vg, T) @ \text{low } Vds, Vbs = 0$$



$$Id = f(vg, T) @ \text{low } Vds, Vbs = \text{max}$$

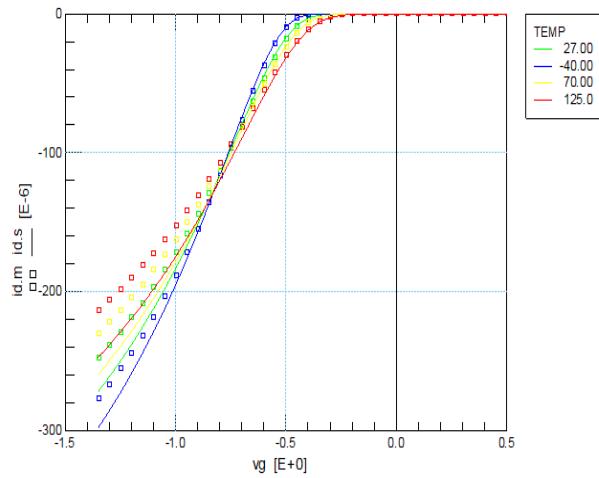


$$\log(Id) = f(vg, T) @ \text{low } Vds, Vbs = \text{max}$$

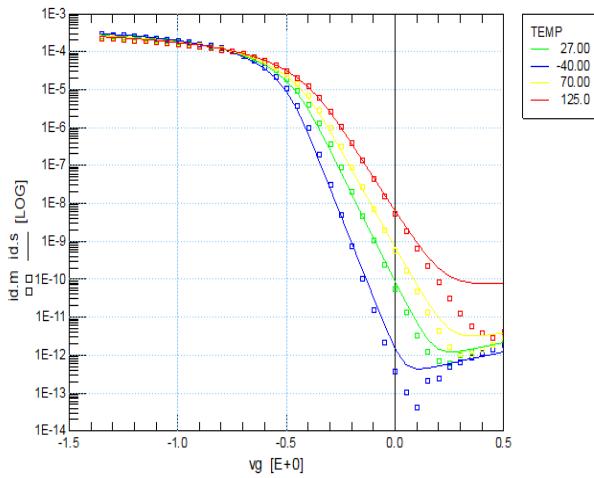


$$Id = f(Vd, Vg, T) @ Vbs = 0$$

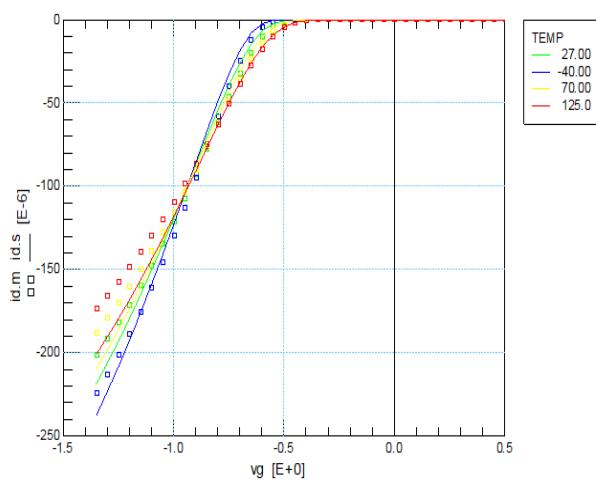
### 7.1.3 W10u0\_L0u13\_S548\_2



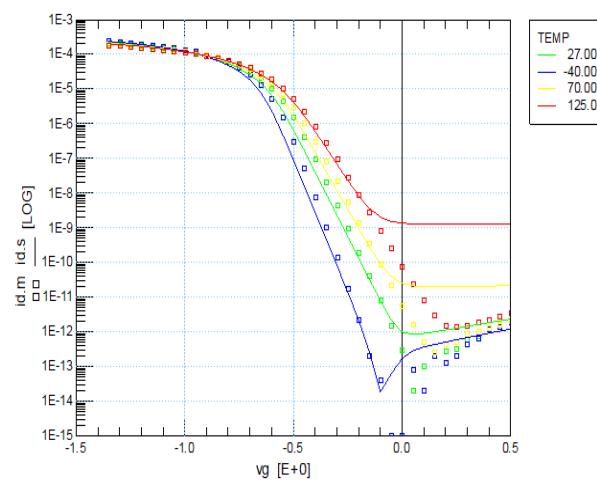
$$Id = f(Vg, T) @ \text{low } Vds, Vbs = 0$$



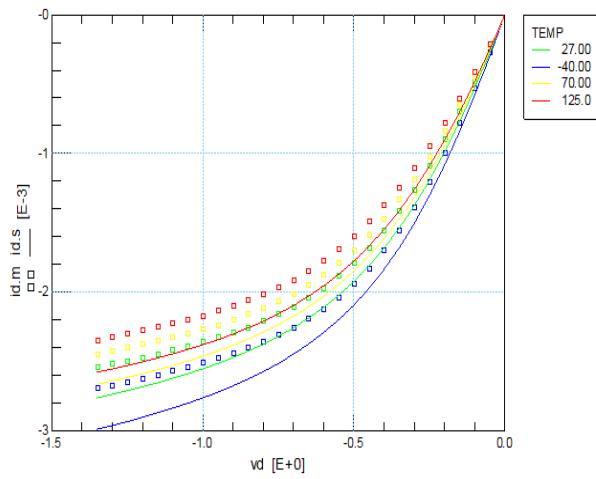
$$\log(Id) = f(Vg, T) @ \text{low } Vds, Vbs = 0$$



$Id = f(Vg, T) @ \text{low } Vds, Vbs = \text{max}$

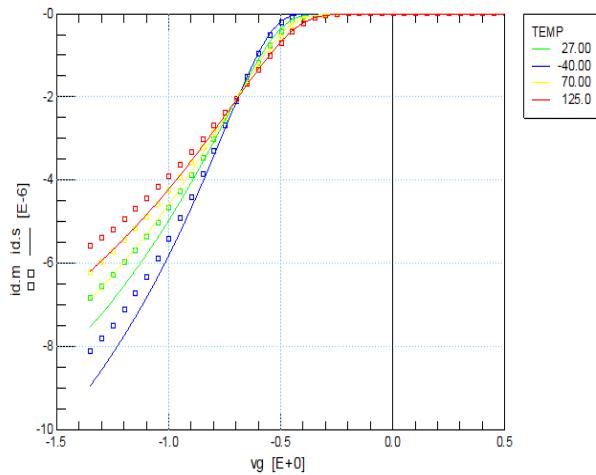


$\log(Id) = f(Vg, T) @ \text{low } Vds, Vbs = \text{max}$

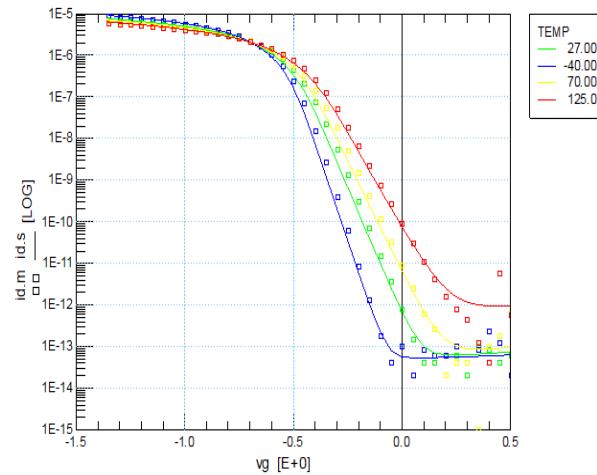


$Id = f(Vd, Vg, T) @ Vbs = 0$

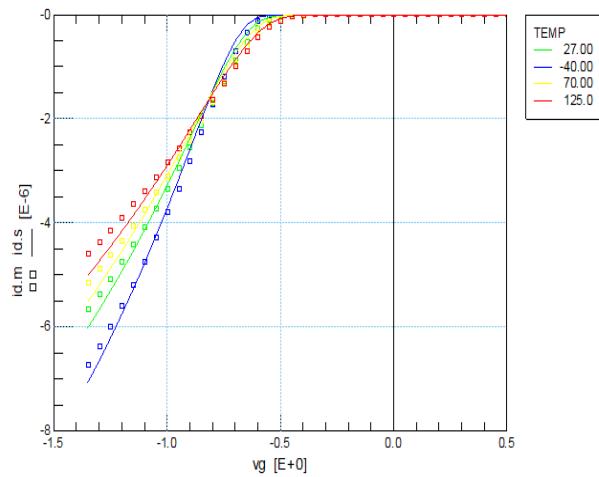
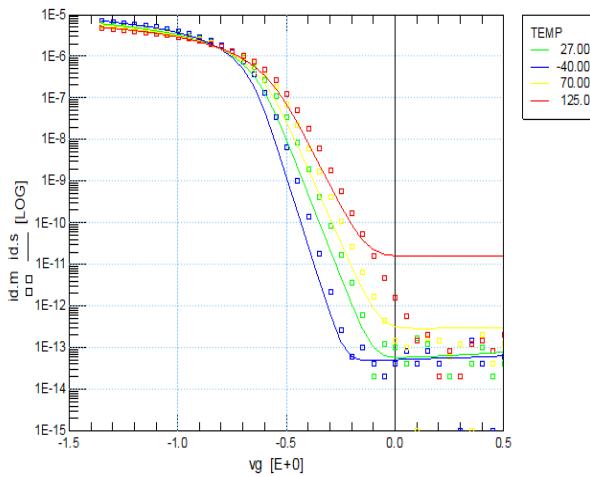
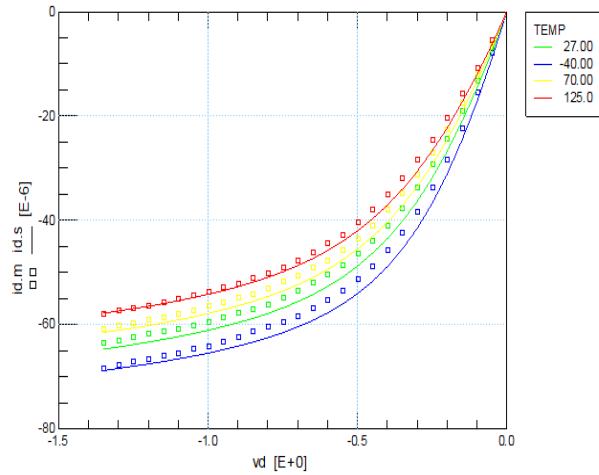
#### 7.1.4 W0u15\_L0u13\_S554\_3



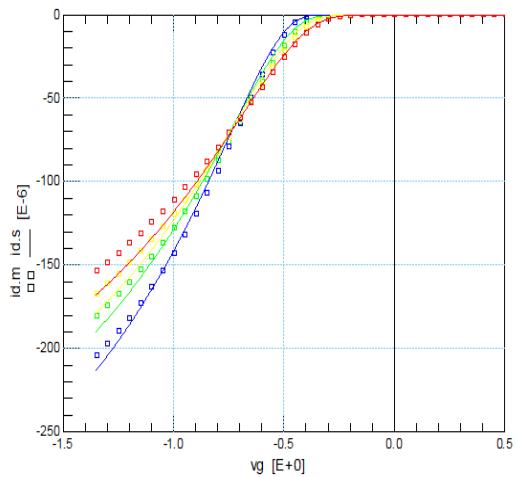
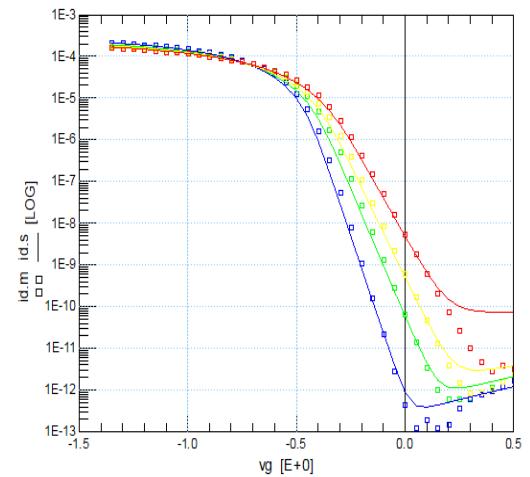
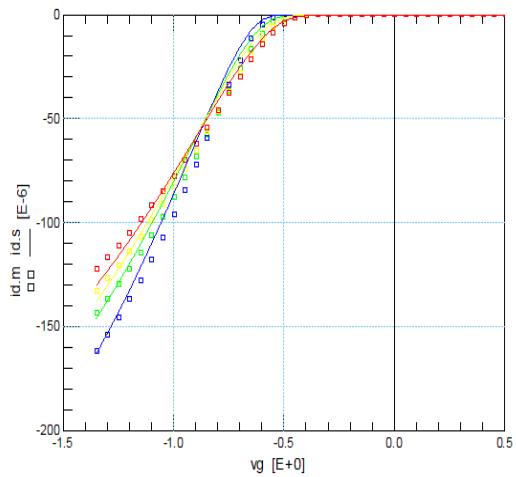
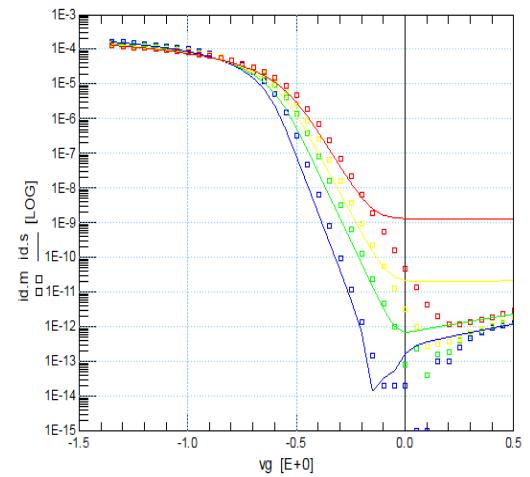
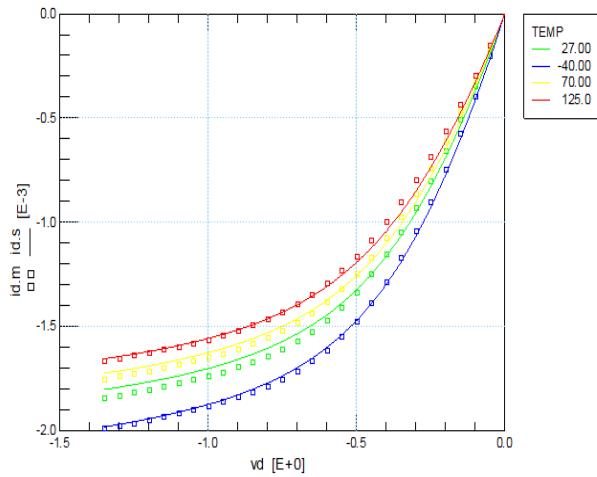
$Id = f(Vg, T) @ \text{low } Vds, Vbs = 0$



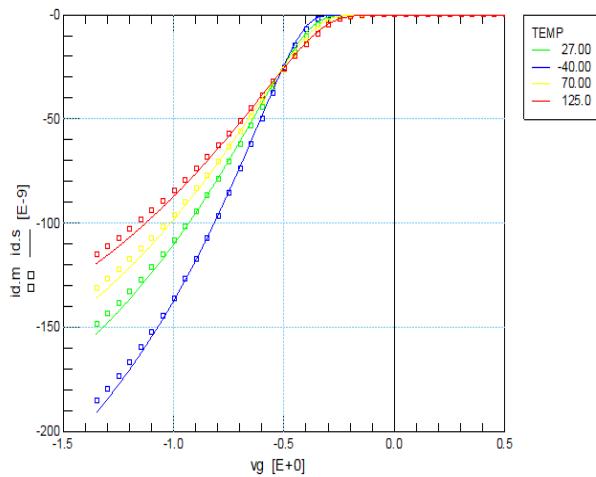
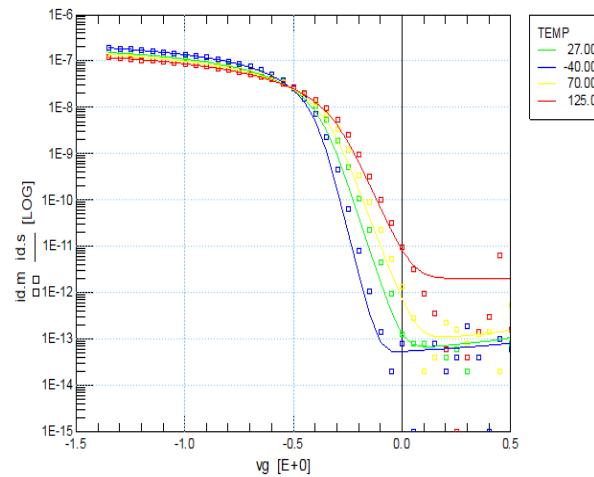
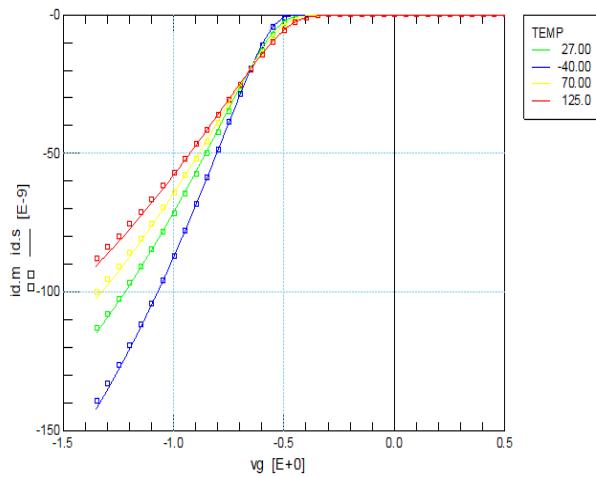
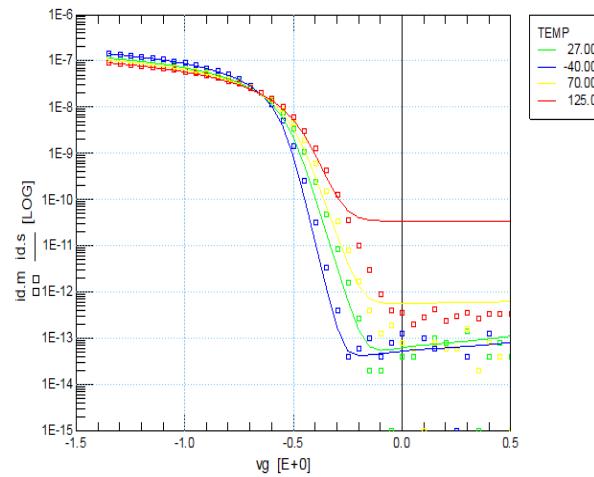
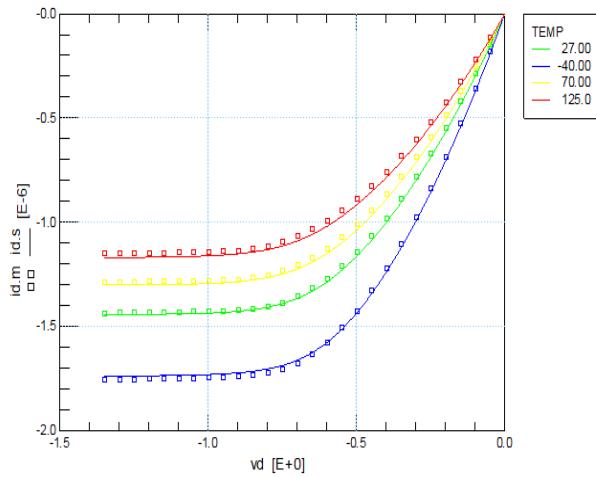
$\log(Id) = f(Vg, T) @ \text{low } Vds, Vbs = 0$

 $Id = f(v_g, T) @ \text{low } V_{ds}, V_{bs} = \text{max}$  $\log(Id) = f(v_g, T) @ \text{low } V_{ds}, V_{bs} = \text{max}$  $Id = f(V_d, V_g, T) @ V_{bs} = 0$

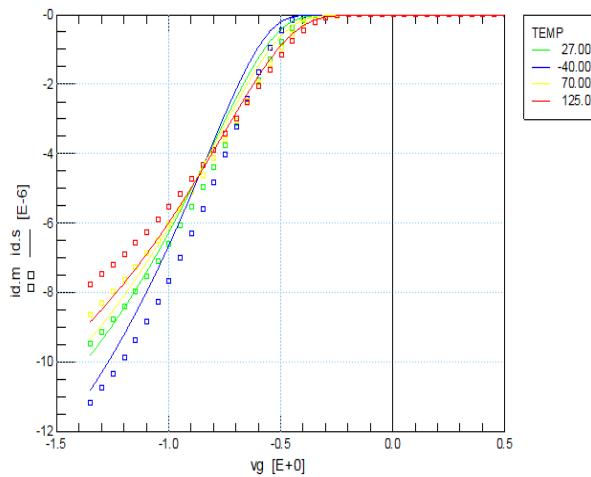
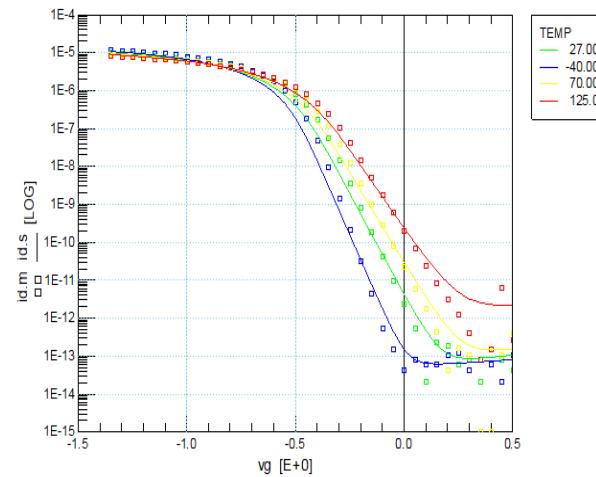
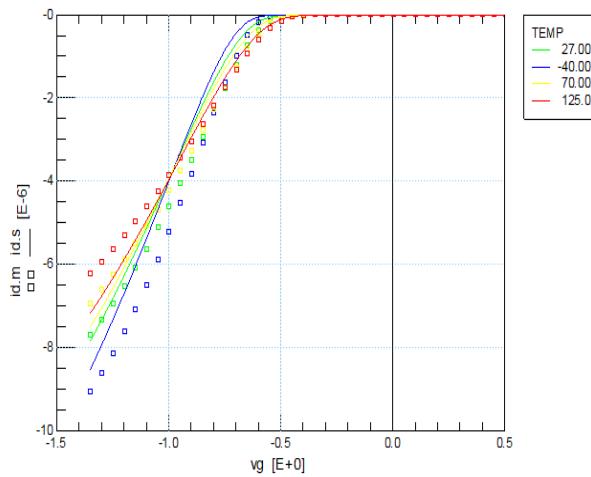
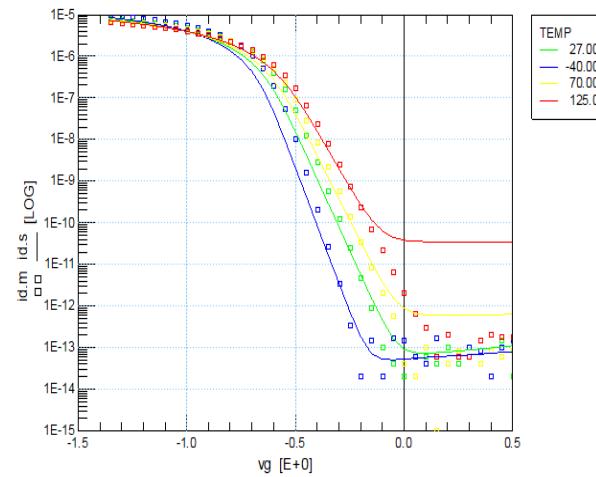
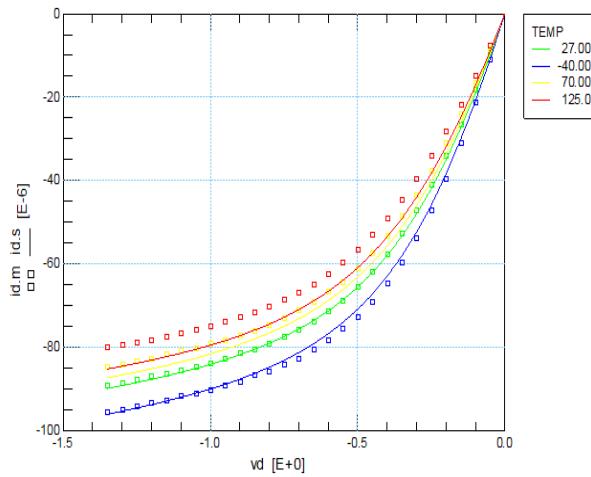
### 7.1.5 W10u0\_L0u18\_S548\_5

 $Id = f(vg, T) @ \text{low } V_{ds}, V_{bs} = 0$  $\log(Id) = f(vg, T) @ \text{low } V_{ds}, V_{bs} = 0$  $Id = f(vg, T) @ \text{low } V_{ds}, V_{bs} = \text{max}$  $\log(Id) = f(vg, T) @ \text{low } V_{ds}, V_{bs} = \text{max}$  $Id = f(Vd, Vg, T) @ V_{bs} = 0$

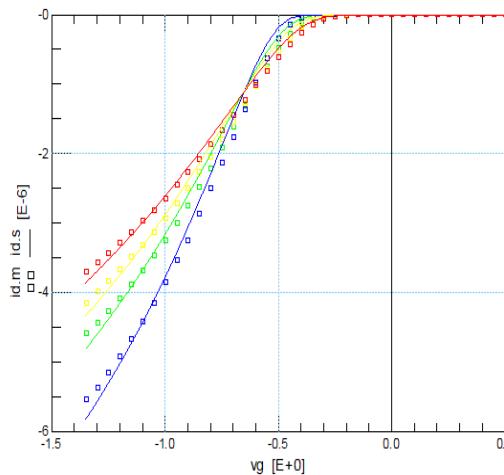
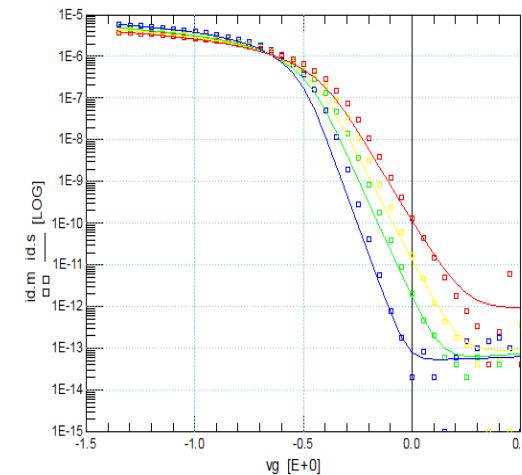
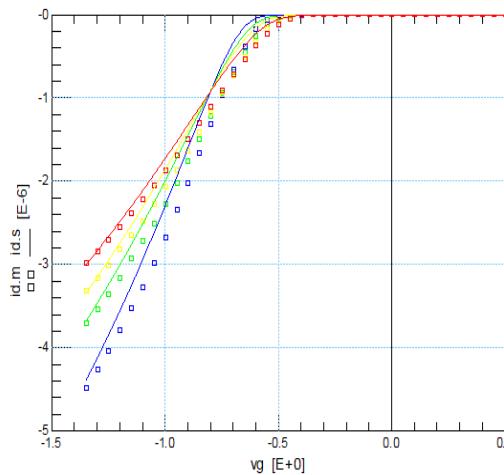
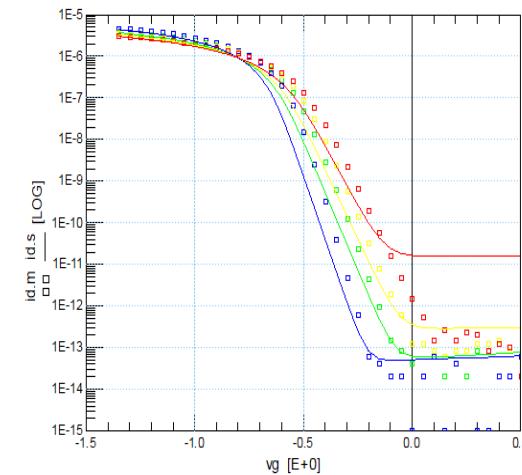
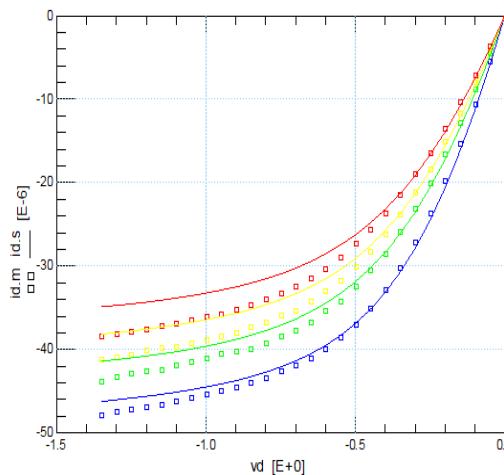
## 7.1.6 W0u3\_L10u0\_S553\_2

 $Id = f(vg, T) @ \text{low } V_{ds}, V_{bs} = 0$  $\log(Id) = f(vg, T) @ \text{low } V_{ds}, V_{bs} = 0$  $Id = f(vg, T) @ \text{low } V_{ds}, V_{bs} = \text{max}$  $\log(Id) = f(vg, T) @ \text{low } V_{ds}, V_{bs} = \text{max}$  $Id = f(Vd, Vg, T) @ V_{bs} = 0$

## 7.1.7 W0u3\_L0u13\_S552\_2

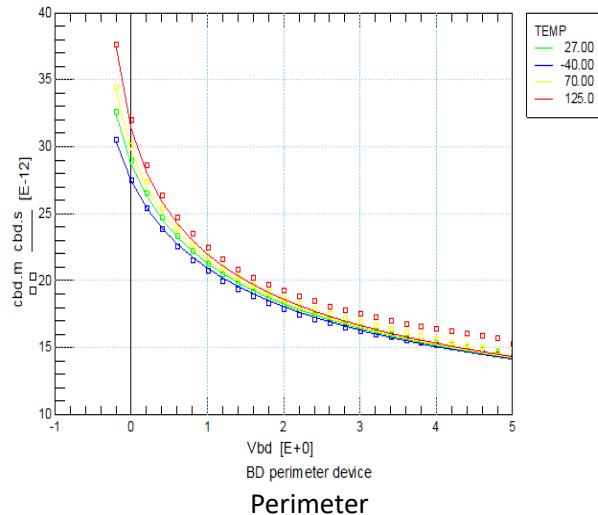
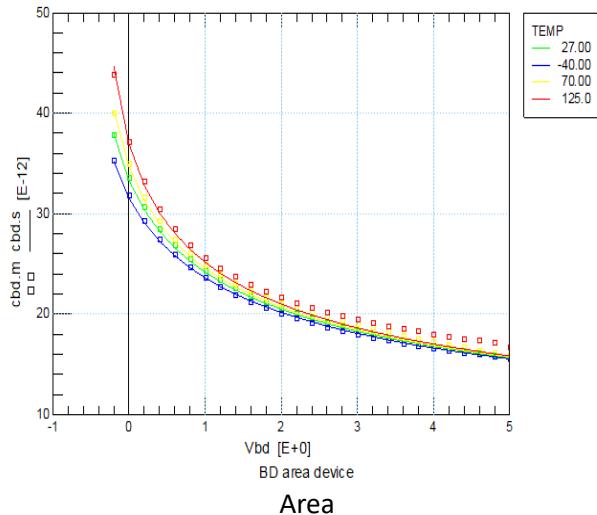
 $Id = f(vg, T) @ \text{low } V_{ds}, V_{bs} = 0$  $\log(Id) = f(vg, T) @ \text{low } V_{ds}, V_{bs} = 0$  $Id = f(vg, T) @ \text{low } V_{ds}, V_{bs} = \text{max}$  $\log(Id) = f(vg, T) @ \text{low } V_{ds}, V_{bs} = \text{max}$  $Id = f(Vd, Vg, T) @ V_{bs} = 0$

### 7.1.8 W0u15\_L0u18\_S555\_1

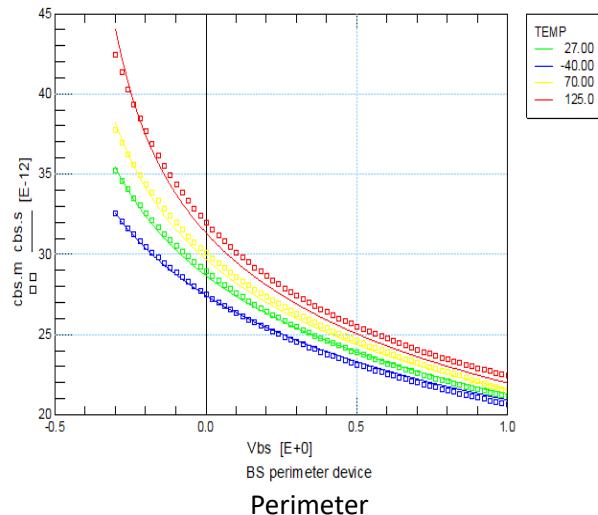
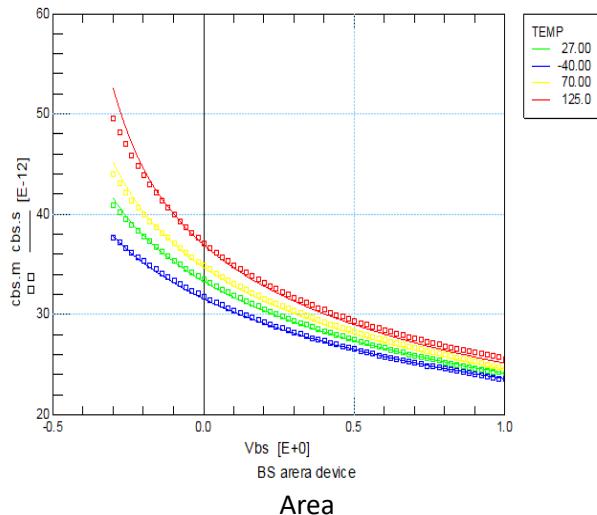
 $Id = f(Vg, T) @ \text{low } Vds, Vbs = 0$  $\log(Id) = f(Vg, T) @ \text{low } Vds, Vbs = 0$  $Id = f(Vg, T) @ \text{low } Vds, Vbs = \text{max}$  $\log(Id) = f(Vg, T) @ \text{low } Vds, Vbs = \text{max}$  $Id = f(Vd, Vg, T) @ Vbs = 0$

## 7.2 Junction Capacitance

### 7.2.1 Bulk - Drain

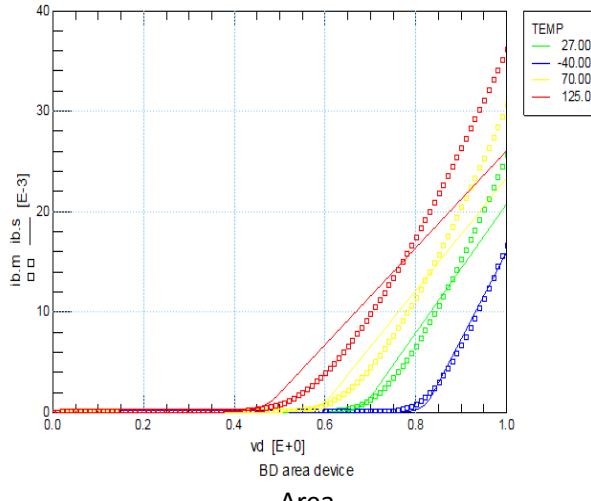


### 7.2.2 Bulk - Source

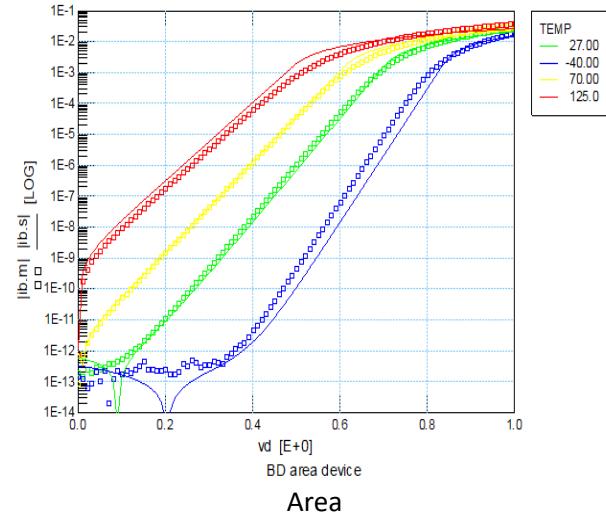


## 7.3 Parasitic Diodes

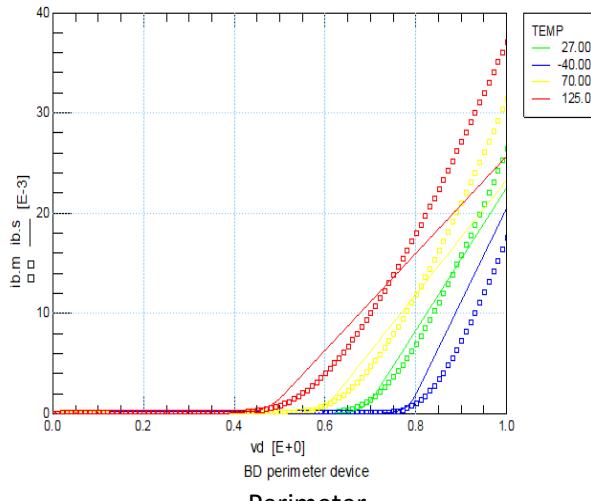
### 7.3.1 Bulk - Drain



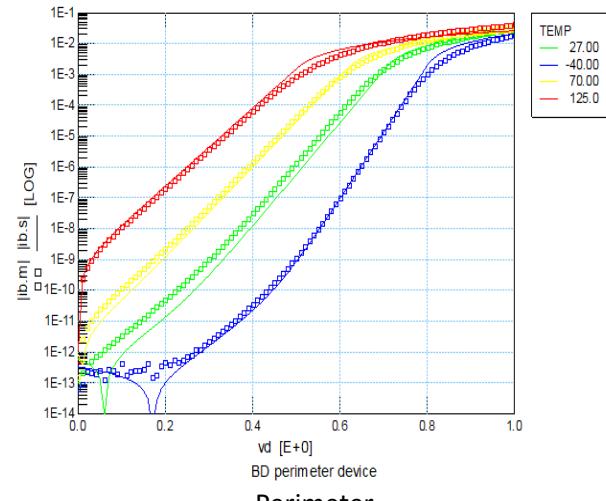
Area



Area

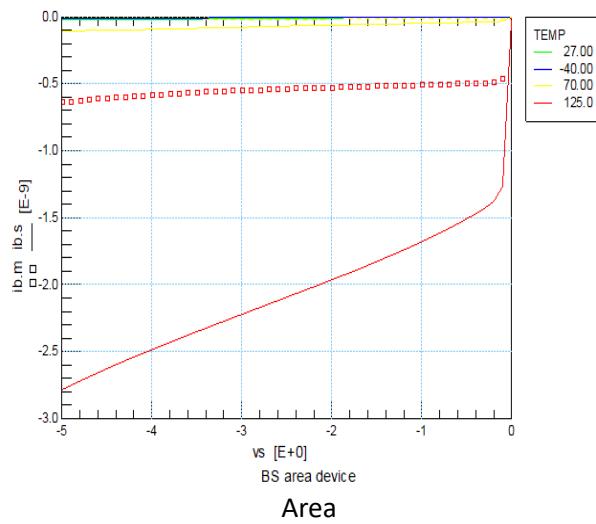


Perimeter

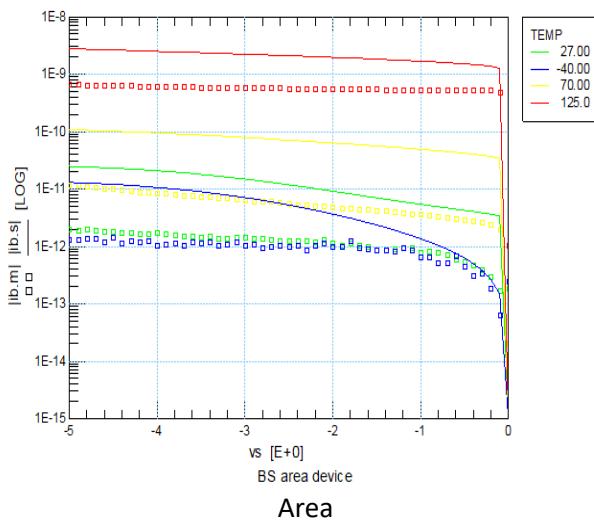


Perimeter

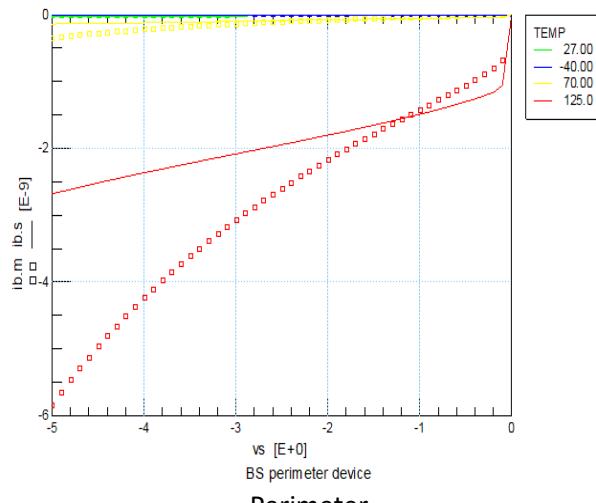
### 7.3.2 Bulk - Source



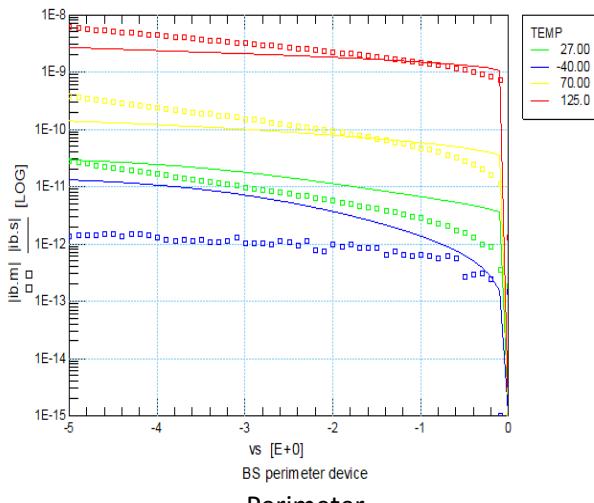
Area



Area



Perimeter



Perimeter

## 8 Flicker Noise

Flicker noise model parameters are taken from the SG13 simulation models.

### 8.1 Measurement Conditions

Not defined as no flicker noise measurements are yet done on SG13G2 devices.

### 8.2 Devices

Not defined as no flicker noise measurements are yet done on SG13G2 devices.

## 9 Change History

Revision	Device	Changes
190606	All	Initial version
190730	All	Adjust temperature and RF behavior
190924	Summarized Results	Legend added