Wafer datasheet
Star120
(900V/120A)

Features

GaNPower innovative all-GaN-IC enables
3.8V turn-on voltage and
+/-20 V regulated gate driving. Enhanced system reliability and compatibility with conventional gate drivers.

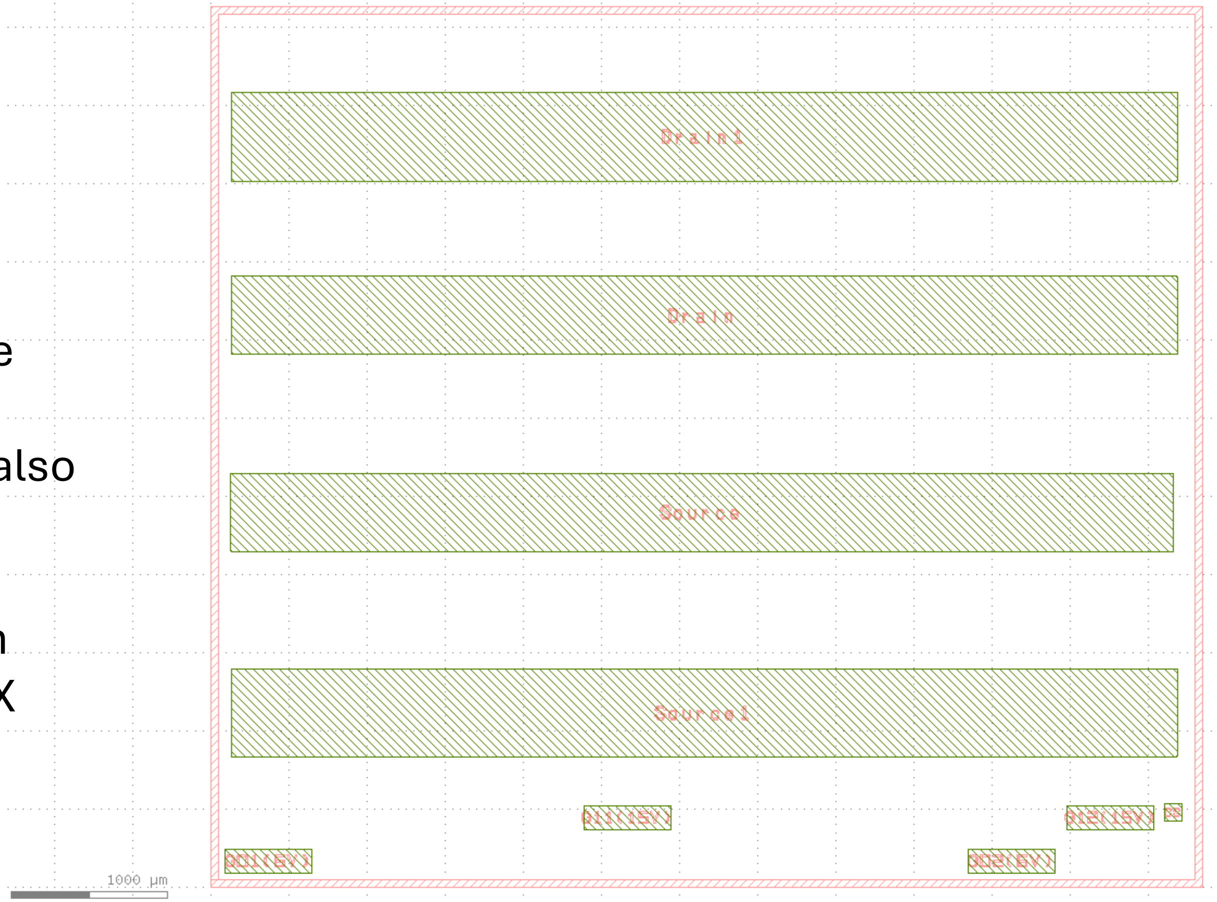
Regulated gate driving enables anti-ringing
Protection / ESD protection

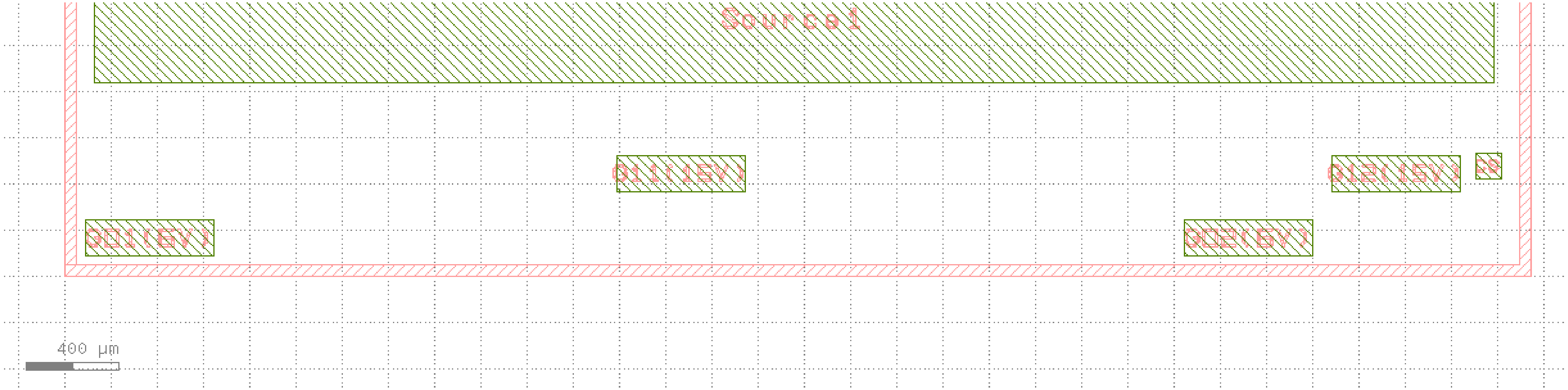
Lossless source side current sensing

Device-name	x-size	y-size
Star120	6345.90	5634.28

Note that G11(15V) and G12(15V) are internally connected.
Similarly, G01(6V) and G02(6V0 are also internally connected.

For best gate control uniformity, both G1X (for 12/15V driving) or both G0X (for 6V driving) shall be used if wire bonding configuration allows.





Main switch FET channel width: 1,426,822 um

PAD	Dx	Dy	Center_x	Center_y
G01(6V)	555.00	155.00	368.30	168.30
G11(15V)	585.00	185.00	2664.55	446.30
Source	6032.72	500.00	3144.16	2397.14
Source1	6053.72	560.00	3156.66	1116.70
Drain	6053.72	500.00	3156.66	3657.14
Drain1	6053.72	567.00	3156.66	4799.98
CS	111.00	111.00	6158.02	479.30
G02(6V)	555.00	155.00	5121.95	168.30
G12(15V)	585.00	185.00	5759.20	446.30

Basic specifications

Back metal	None
Front metal	AlCu 4um
Wafer diameter	6 inch
Wafer thickness before dicing	1000 um
Recommended die thickness after dicing	250-300um
Street width	80 um
Recommended storage	N2 environment

Wire bonding suggestion

Larger pads use 10mil or 12mil Al .

Smaller pads use Cu, PdCu , or Au (1.5 mil – 2 mil)

Backside must be glued to backplate using conductive glue

Backplate must be connected to the source of the GaNFET using wire bonding

Characteristics

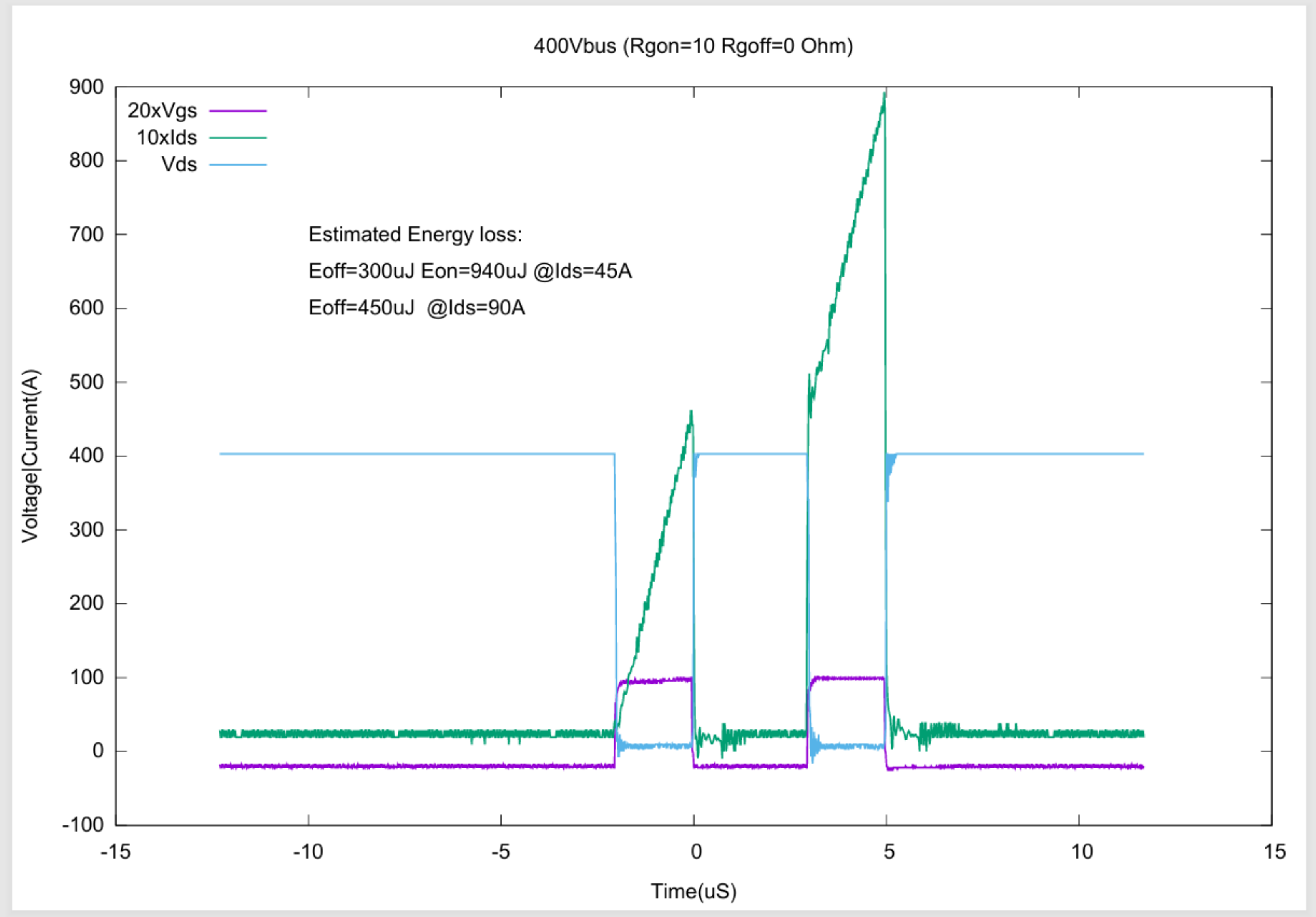
		Condition	min	typical	max	
Ids-max	Max current at 125C	Vgs=6/15 125C		120		A
Ids-max	Max current at 25C	Vgs=6/15 25C		240		A
Vds-max	D-S breakdown voltage	Vgs=0 25C < 10uA		900		V
Vg0s	Original gate voltage		-3		7	V
Vg1s	Regulated		-20		20	
Vgth (G0)	Gate threshold voltage	Vgs=Vds Ids=35mA		1.3		V
Vg1th_lin (G1)	Regulated threshold	Vds=0.01V, Ids=100 mA	2.64	3.95	5.26	V
Vg1th_sat (G1)	Regulated threshold	Vds=0.01V, Ids=100 mA		2.09	3.75	V
Rdson	On resistance	Vg0s=6/Vg1s=15 Ids=1A 25C	8.4	12	16	mOhm
Rdson (150C)	On resistance	Vg0s=6/Vg1s=15 Ids=1A 150C	18	26	34	mOhm
Vcs	Current sensing	Ids=+/-120A	-2.5		2.5	V
Qg	Gate charge	Vbus=500V Turn-off from Ids=60A Vg0s from 6 to 0 25C		29		nC

		Condition	min	typical	max	
Gm-Max	Max transconductance		360	650		mS
IDSS	Drain leakage	Vg1s=0 / Vg0s=0 Vds=800 25C		3.8	10	uA
IDSS(150C)	Drain leakage	Vg1s=0 / Vg0s=0 Vds=850 150C		19	75	μA
IDSS(150C)	Drain leakage	Vg1s=0 / Vg0s=0 Vds=900 150C		33	85	μA
IGSSF	Forward gate leakage	Vg1s=6 Vds=0 25C		670	5500	μA
-IGSSR	Reverse gate leakage	Vg1s=-6 Vds=0 25C		0.2	0.8	μA
-IGSSR(150C)	Reverse gate leakage	Vg1s=-6 Vds=0 150C		131	930	uA
Max_Isoff	Source leakage	Vg=Vs=Vb=GND, Vd=800V		0.6	7	μA
Isub	Bulk/substrate leakage	Vs=Vg=Vd=800V, B=GND		4.3		μA

Gate pulsing test at 200KHz (4 uS on /1 uS off)

VG1(-)	VG1(+)	VG0(-)	VG0(+)	VBUS
-1.3	11.6	-0.7	7.4	0
-3.4	11.6	-3.1	7.4	0
-6.3	11.6	-6.3	7.4	0
-3.4	11.6	-3.0	7.4	100V (1.5A)
-3.4	11.6	-2.9	7.4	200V (2.1A)
-3.4	11.6	-2.8	7.4	400V (4.5A)

GaNPOWER



Estimated Energy loss:

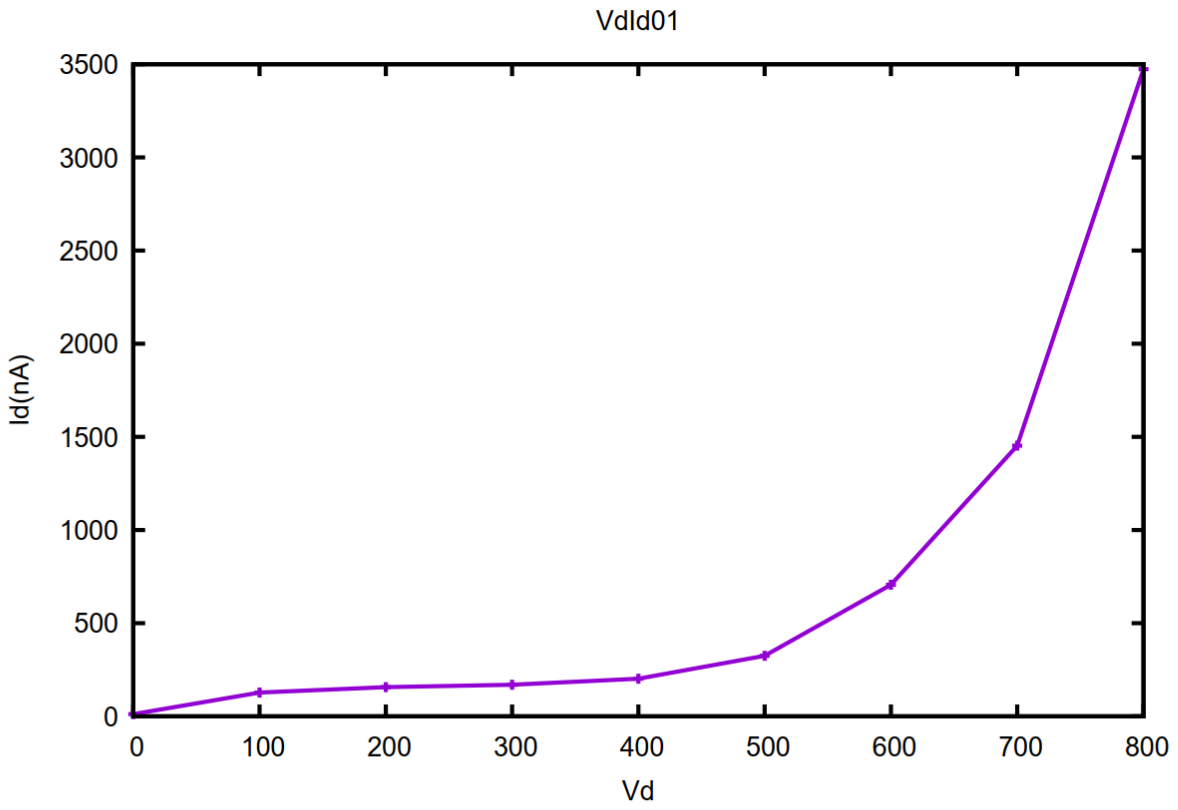
Eoff=300uJ Eon=940uJ @Ids=45A

Eoff=450uJ @Ids=90A

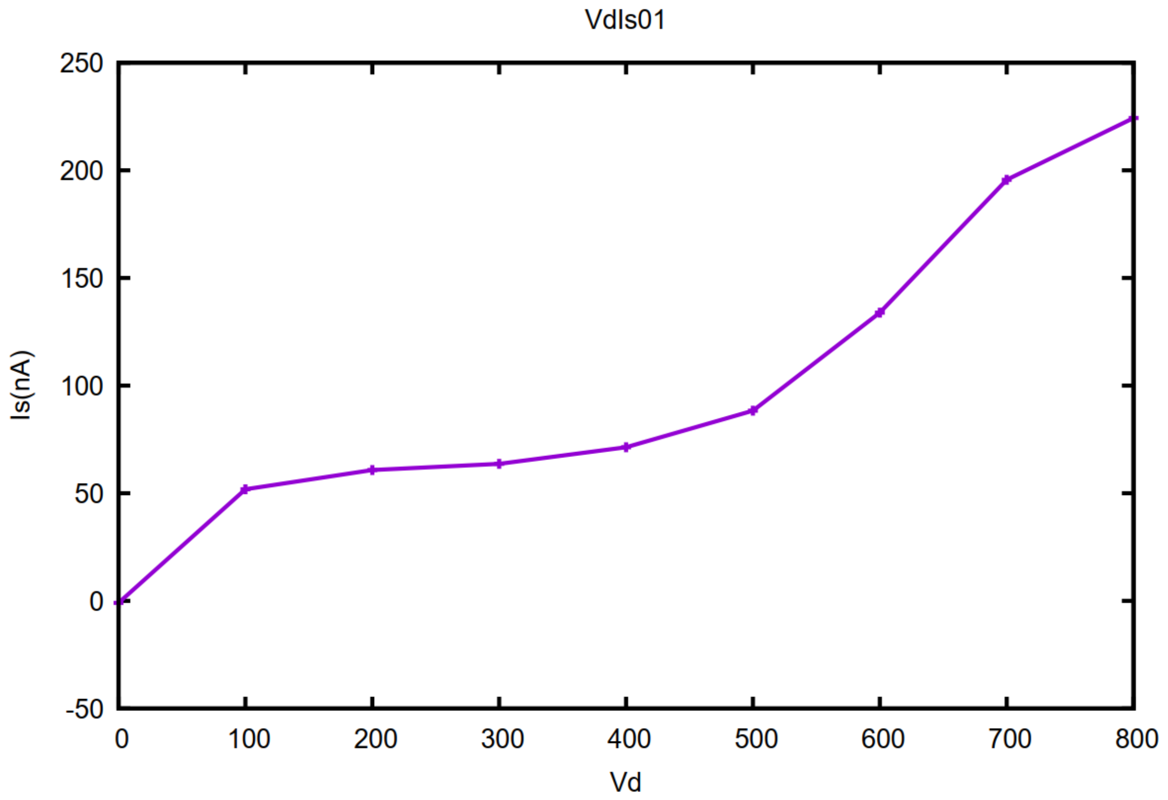
Dynamic test using TO247-4 package

For more realistic evaluation of power integral, ringing in Ids(t) data have been eliminated by peak to peak averaging.

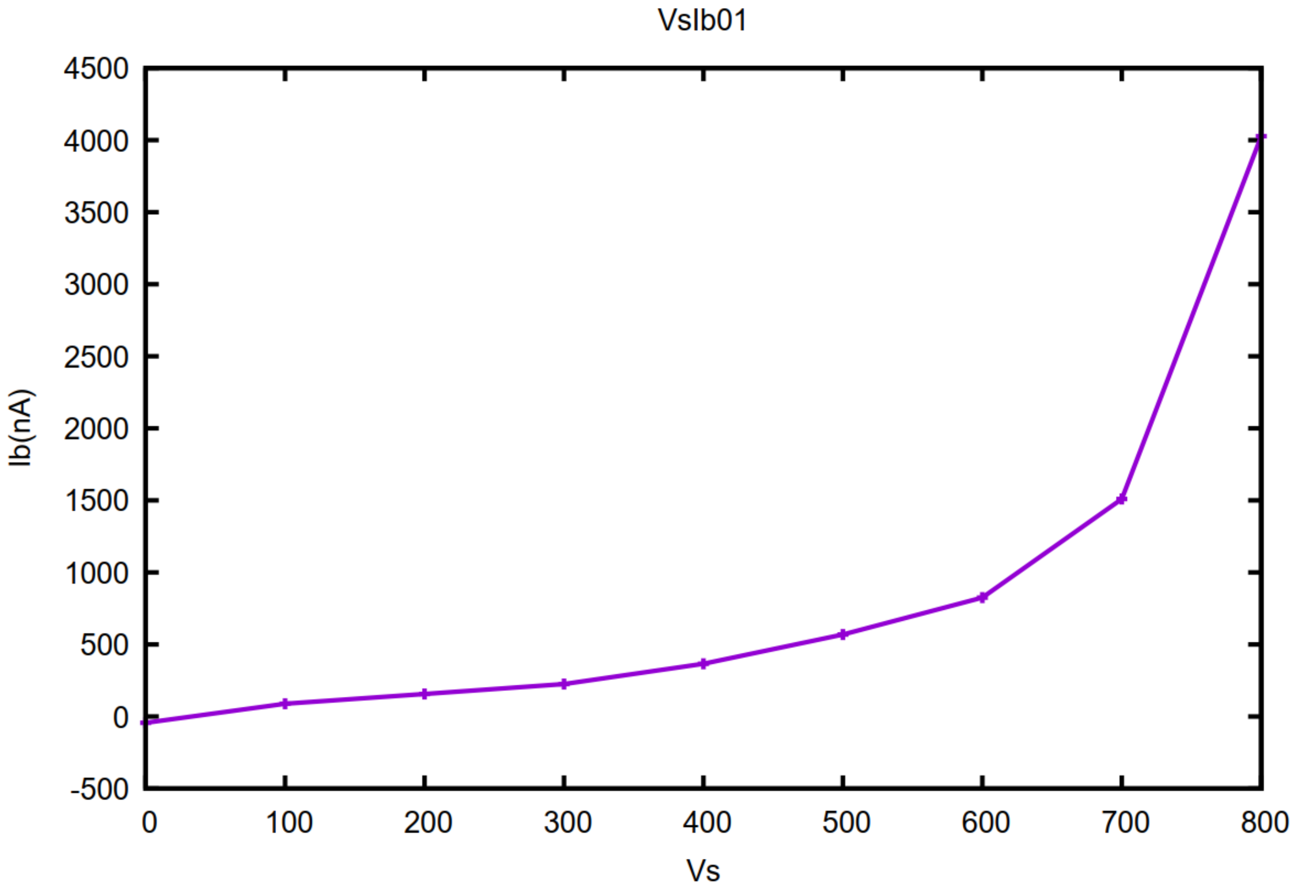
@RT



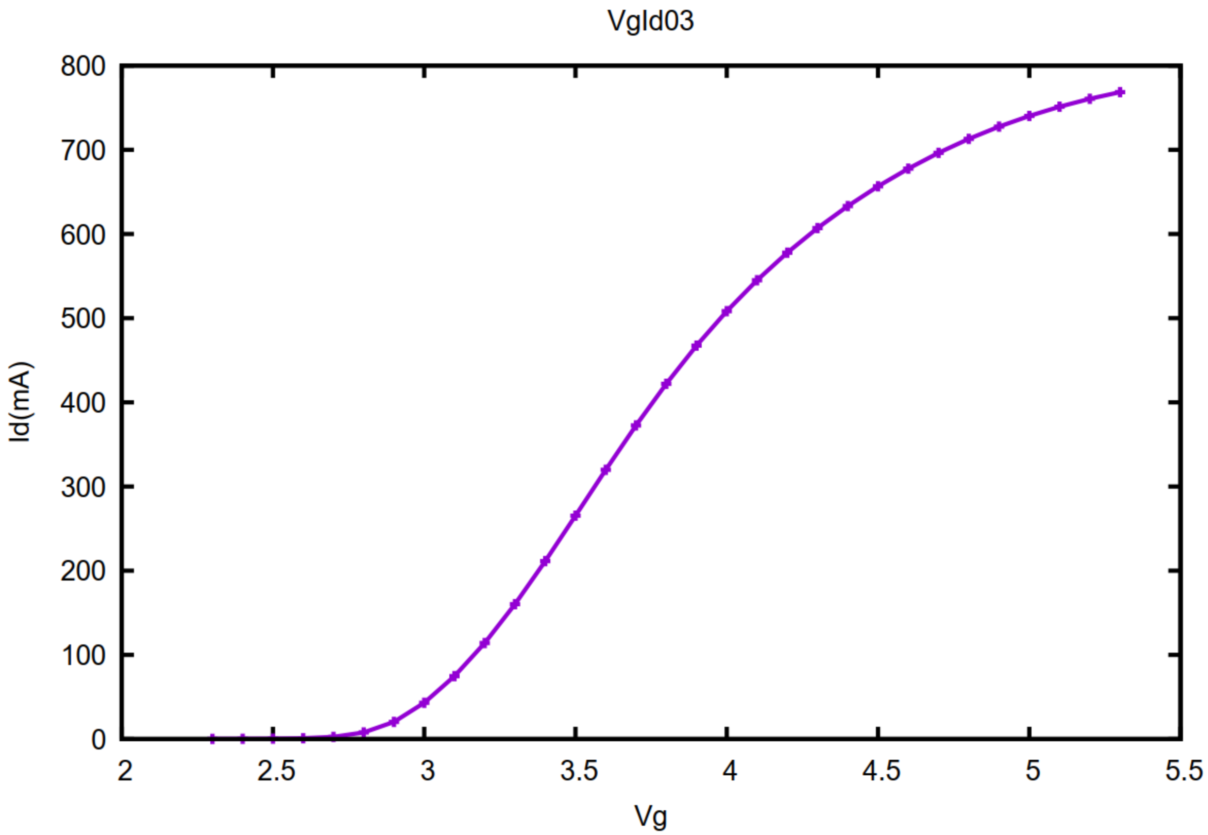
Drain leakage Idss versus Vds @Vg=Vs=Vb=GND



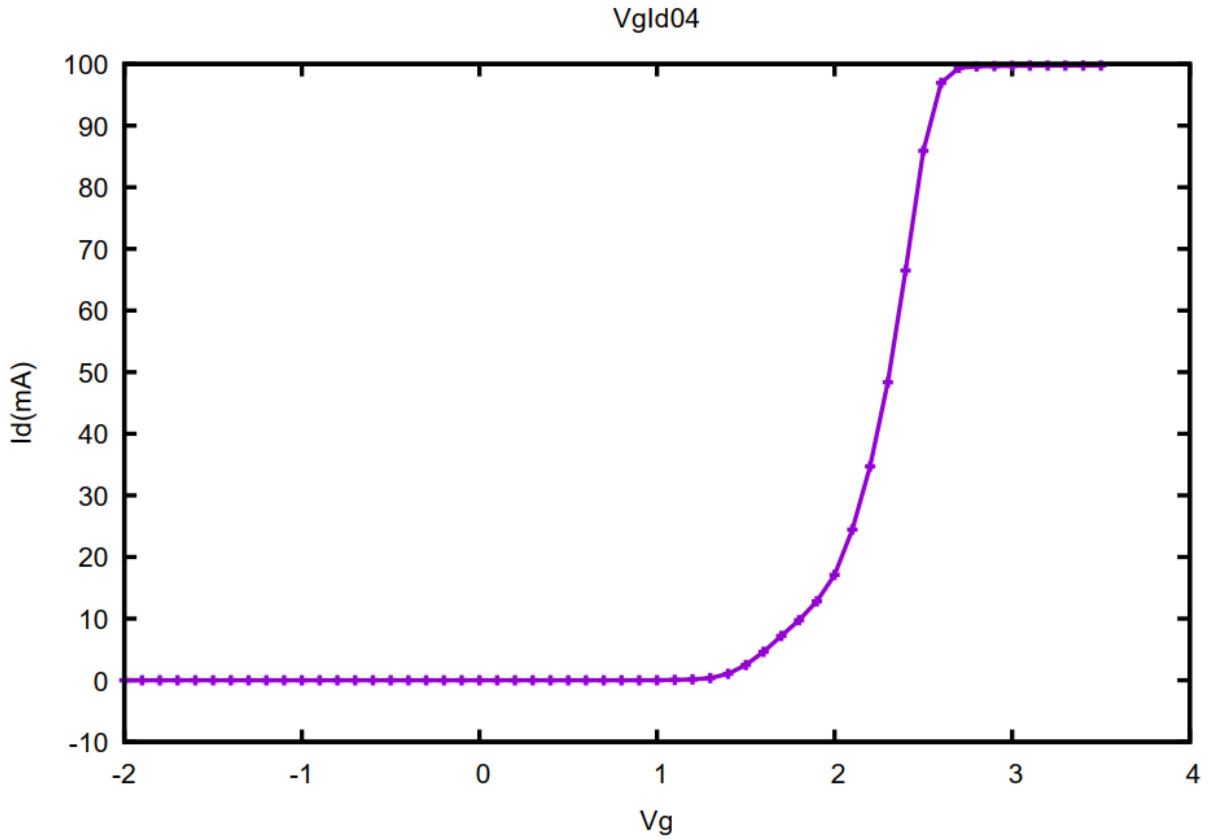
Source leakage Is versus Vds @Vg=Vs=Vb=GND



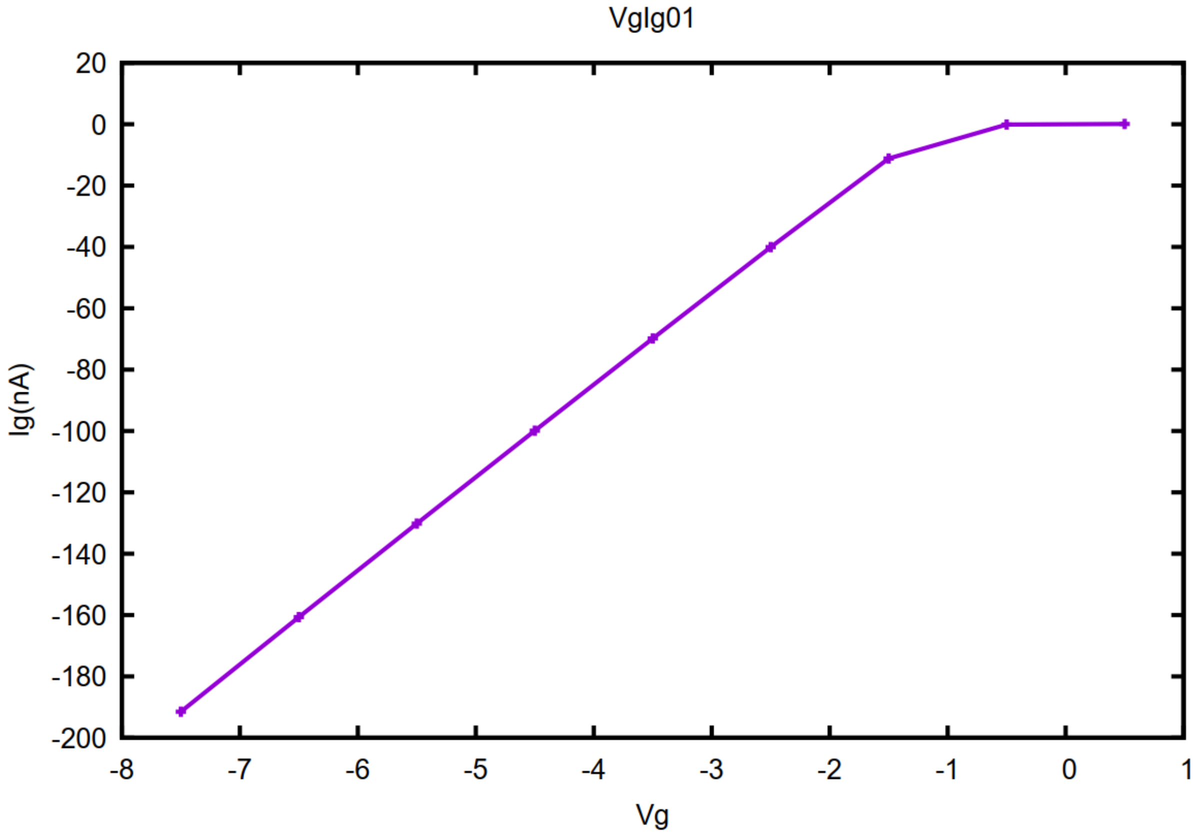
Bulk (Subtrate) leakage Ib versus Vs
@Vg=Vs=Vd, B=GND

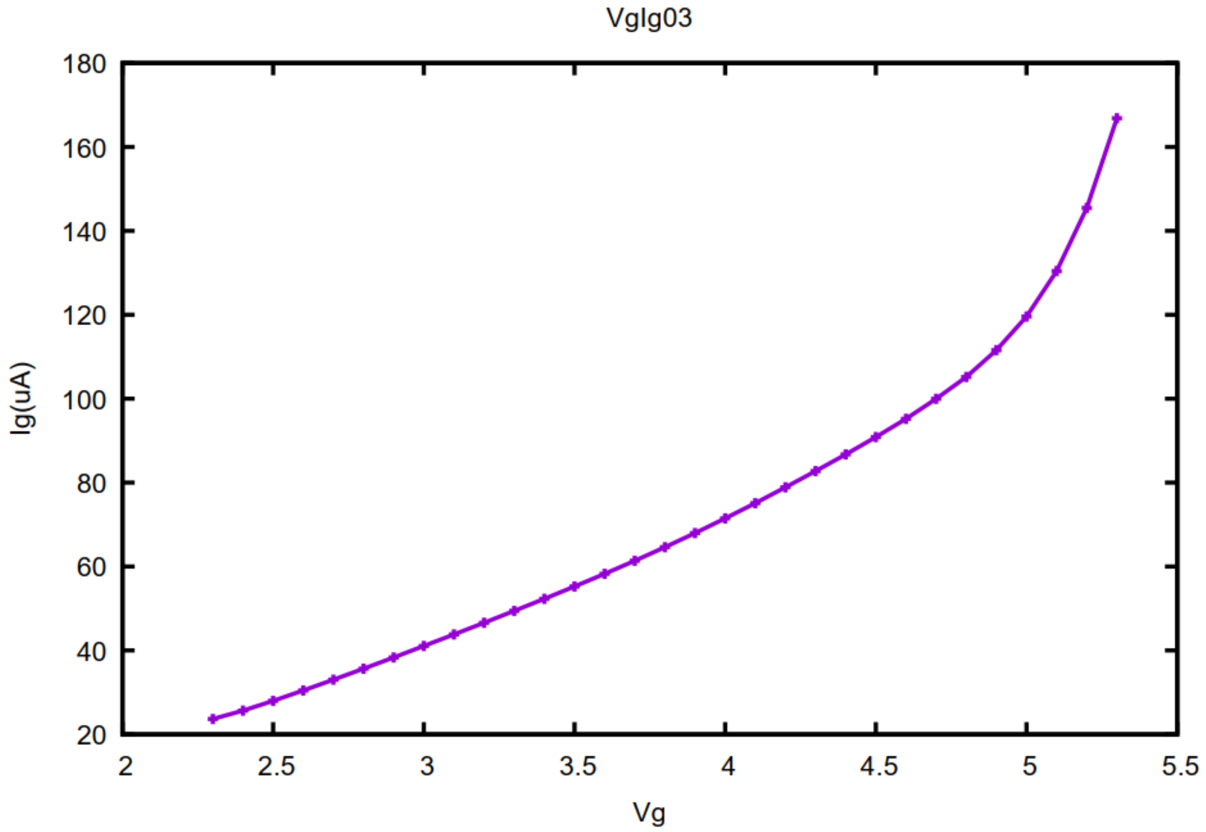


Id-Vg transfer curve
@Vds=0.01V, Vs=Vb=GND



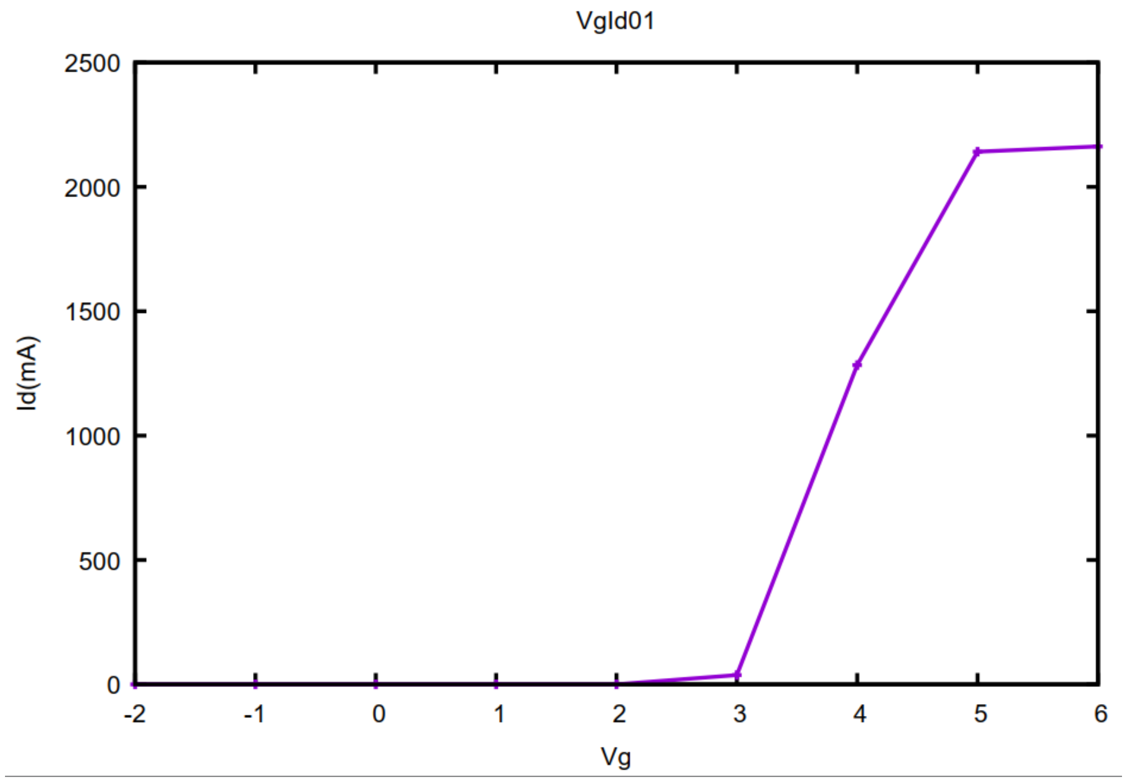
Id vs Vg transfer curve
@Vds=100V, Vs=Vb=GND



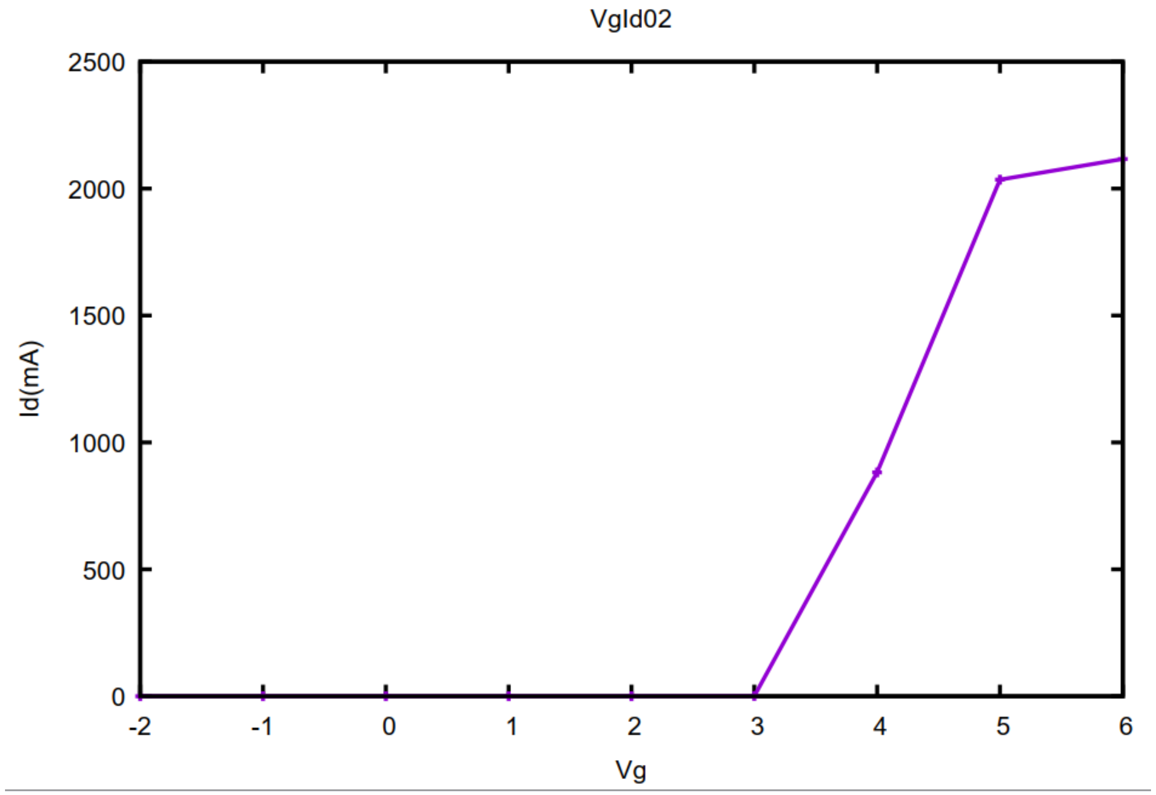


Gate leakage
@Vds=0.1V, Vs=Vb=GND

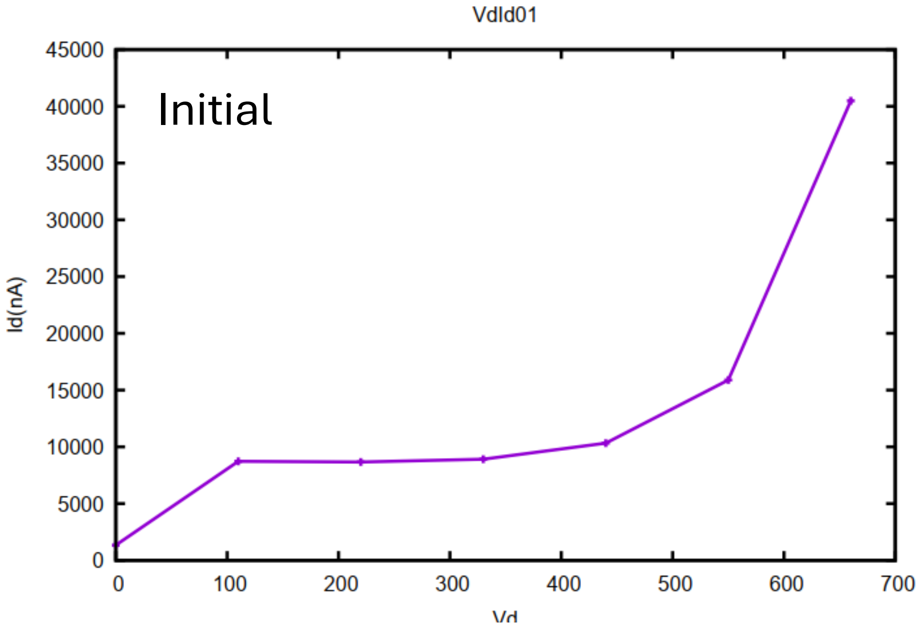
@HT 150 ^{O}C

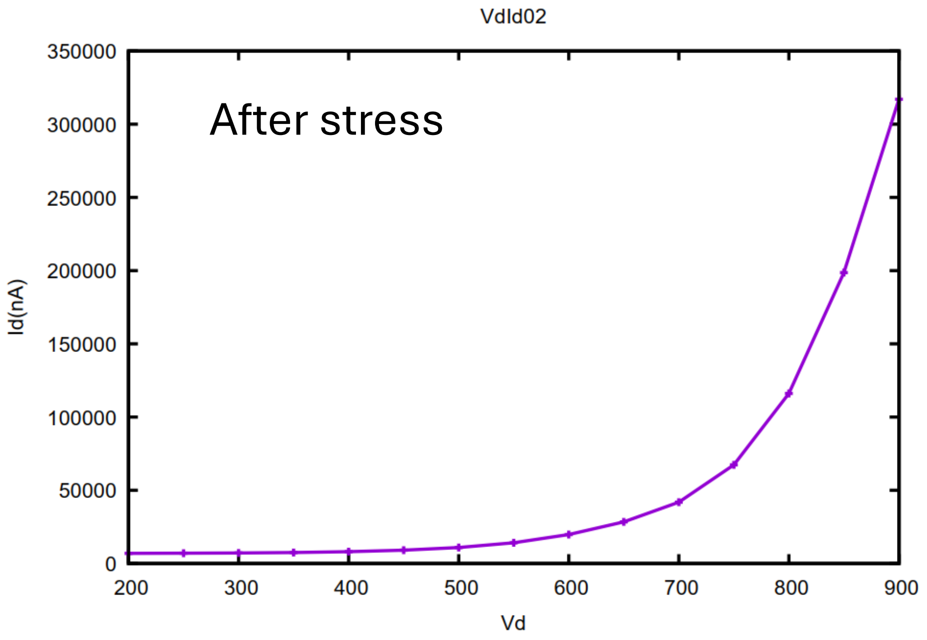


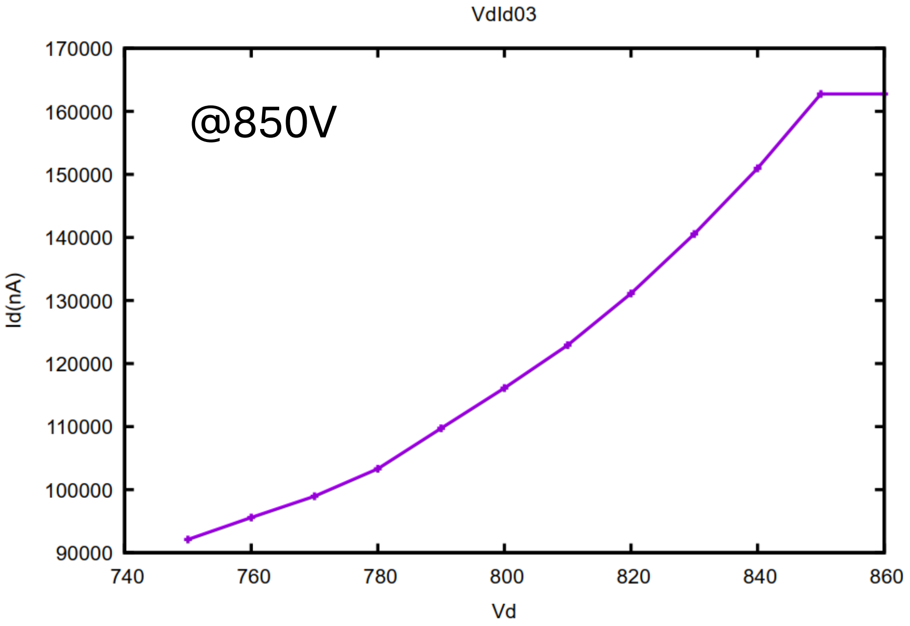
Id-Vg transfer curve, initial @Vds=0.1V

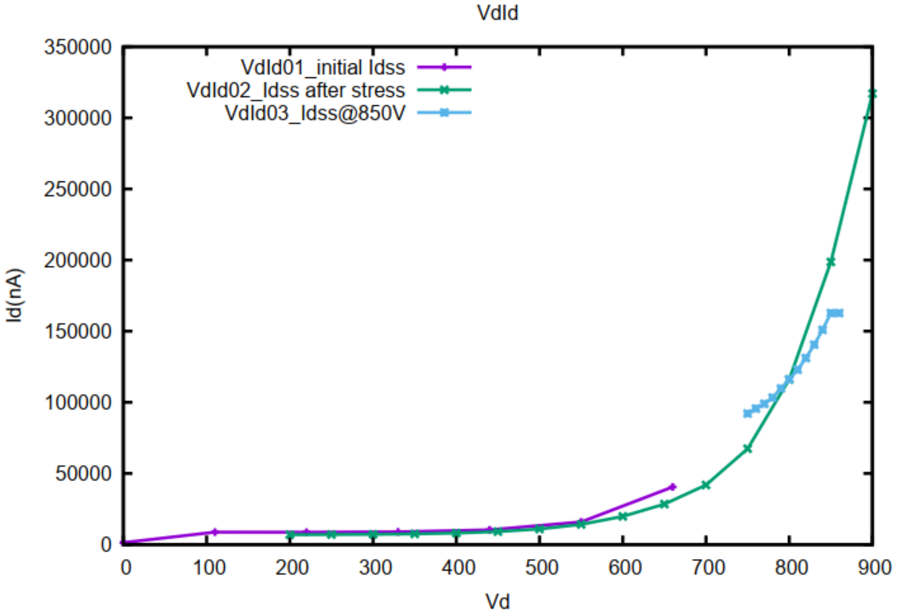


Id-Vg transfer curve, after stress @Vds=0.1V

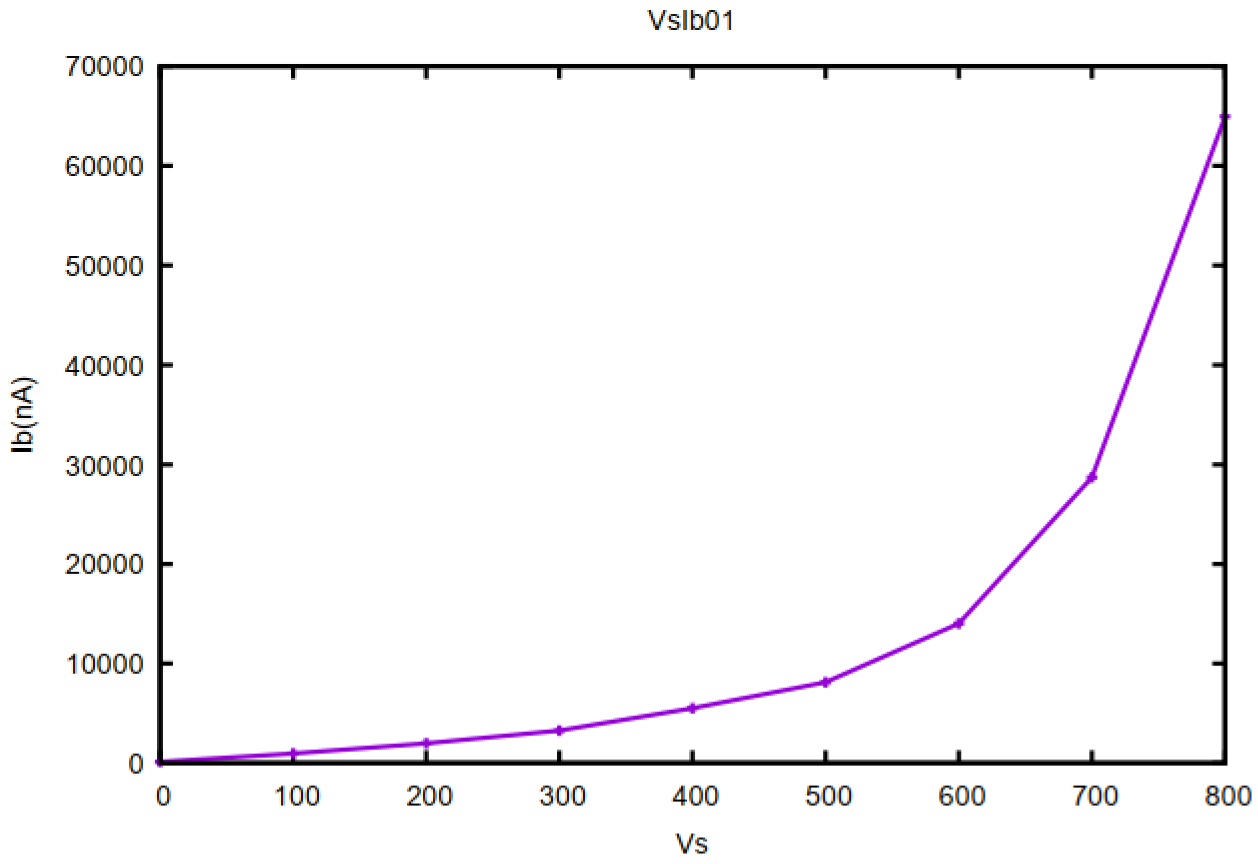








Drain leakage Idss versus Vd @Vg=Vs=Vb=GND



Bulk/substrate leakage Ib versus Vs @Vg=Vs=Vd, B=GND

Application note on G1 (15V) driving

Negative Gate Turn-off

As with most EMODE GaNFET, it is best to use negative turn off gate driving to achieve fast turn off. In such a case, G0 can be left not connected (NC). Negative gate voltage of -1 to -3 are recommended.

Zero Gate Turn-off

When using G1 for driving (either 0-12V or 0-15V),it is best to wire bond a bare die of low voltage diode (max rating 20V, max current 0.5A) between G0 and G1 such that the forward direction of the diode points from G0 to G1. Caution: at light loading (less than 0.5A), turn-off may be slow.

Recommended Rgoff=0 Rgon=0 to 5 Ohm. Recommended driver: 1EDBX275F , or other driver with stronger current capability. It is also possible to drive multiple devices/dies at parallel. When parallelizing more than three Star120, paralleled multiple-driver is recommended.

Application note on G0 (6V) driving

G0 can be used as a standard EMODE p-GaN gate. Recommended Rgoff=0 Rgon=5-10 Ohm

Choice of G1 or G0:

For better system reliability, G1 is recommended.