

GO ATLAS SIMFLAGS ="-V 5.18.3.R -P 32 -160"

MESH

X-MESH

X.MESH loc=0.00 spac=0.08
X.MESH loc=1.00 spac=0.04
X.MESH loc=1.30 spac=0.025
X.MESH loc=1.50 spac=0.025
X.MESH loc=1.70 spac=0.15
X.MESH loc=3.20 spac=0.15
X.MESH loc=3.50 spac=0.025
X.MESH loc=3.70 spac=0.025
X.MESH loc=4.00 spac=0.04
X.MESH loc=5.00 spac=0.08

Y-MESH

Y.MESH loc=-1.00 spac=0.94
Y.MESH loc=-0.06 spac=0.94
Y.MESH loc=-0.05 spac=0.025
Y.MESH loc=0.00 spac=0.025
Y.MESH loc=0.02 spac=0.098
Y.MESH loc=1.00 spac=0.098
Y.MESH loc=1.20 spac=0.1
Y.MESH loc=1.80 spac=0.1
Y.MESH loc=2.20 spac=0.1
Y.MESH loc=3.50 spac=2.50
Y.MESH loc=30.0 spac=5.0
Y.MESH loc=31.5 spac=0.25
Y.MESH loc=32.5 spac=0.25
Y.MESH loc=33.0 spac=20
Y.MESH loc=180.0 spac=20
Y.MESH loc=182.0 spac=1.0
Y.MESH loc=184.0 spac=1.0

DEFINING REGIONS

REGION num=1 y.max=0 material=Si3N4
REGION num=2 x.min=0.91 x.max=4.09 y.min=-0.05 y.max=0 material=oxide
REGION num=3 y.min=0 material=4H-SiC

DEFINING ELECTRODES

ELECTRODE name=source x.min=0.0 x.max=0.75 \
y.max=0 material=aluminum
ELECTRODE name=source x.min=4.25 x.max=5.00 y.max=0
material=aluminum
ELECTRODE name=gate x.min=0.90 x.max=4.10 y.max=-0.05 material=polysilicon
ELECTRODE name=drain y.min=182 y.max=184 material=aluminum

DOPING DISTRIBUTION

BULK DOPING

```

DOPING uniform n.type conc=3.3e15  REGION=3
## N+ SOURCE DOPING
DOPING uniform n.type conc=1.e20 x.min=0.44 x.max=0.99 y.min=0 y.max=0.5
DOPING uniform n.type conc=1.e20 x.min=4.01 x.max=4.56 y.min=0 y.max=0.5
## P-BASE DOPING
DOPING gauss p.type conc=4.5e17  x.min=0.0  x.max=1.3  junc=2.0  rat=0.1
DOPING gauss p.type conc=4.5e17  x.min=3.7  x.max=5.0  junc=2.0  rat=0.1
DOPING gauss p.type conc=1.0e18  x.min=0.0  x.max=1.3  junc=2.5  rat=0.2 \
start=2.0
DOPING gauss p.type conc=1.0e18  x.min=3.7  x.max=5.0  junc=2.5  rat=0.2 \
start=2.0
## N+ SUBSTRATE DOPING
DOPING uniform  n.type  conc=1.e20  y.min=32  y.max=182
SAVE outf=CIS_DMOS_Structure.str master.out
Tonyplot CIS_DMOS_Structure.str

GO ATLAS SIMFLAGS="-V 5.18.3.R -P 32 -160"
.BEGIN
VDC  1  0  0
L1  1  2  10m
DDUM  2  1  IDEAL
AMOSFET 2=drain  3=gate  0=source \
infile=CIS_DMOS_Structure.str  width=1.e6
RGND  3  0  1e20
RGATE  3  4  10
VGATE  4  0  0
.MODEL IDEAL D()
.NODESET v(1)=0 v(2)=0 v(3)=0 v(4)=0
.NUMERIC imaxdc=100
.LOG  outfile=CIS_DMOS_DC_log
.SAVE  outfile=CIS_DMOS_DC_Bias
.OPTIONS m2ln noshift print relpot
.DC  VDC  0.  10.  0.5
.DC  VDC  10.  50.  5.
.DC  VDC  50.  100.  10.
.DC  VDC  100.  2500.  50.
.END

CONTACT DEVICE=AMOSFET NAME=GATE  n.polysilicon EXT.ALPHA=10
CONTACT DEVICE=AMOSFET NAME=SOURCE EXT.ALPHA=10
CONTACT DEVICE=AMOSFET NAME=DRAIN EXT.ALPHA=10
THERMCONTACT DEVICE=AMOSFET num=4 x.min=0 x.max=5 \
y.min=0.0 y.max=184 alpha=10 ext.temp=300
INTERFACE DEVICE=AMOSFET REGION=2 charge=2.5e12 s.n=1.e4 s.p=1.e4 s.i

```

```

MATERIAL DEVICE=AMOSFET material=4H-SiC REGION=3 \
  permittivity=9.76 eg300=3.26 affinity=3.7 egalp=3.3e-2 \
  egbeta=1.e+5 nc300=1.7e+19 nv300=2.5e+19 arichn=146 \
  arichp=30 augn=3.e-29 augp=3.e-29 taun0=3.33e-6 \
  taup0=6.7e-7 nsrhn=3.e+17 nsrhp=3.e+17 edb=0.050 \
  eab=0.200 tcon.polyn tc.a=0.137534 tc.b=4.9662e-4 \
  tc.c=0.000000354 hc.a=2.35 hc.b=1.75e-3 hc.c=1.e-9 hc.d=-6.6e4
MODELS DEVICE=AMOSFET REGION=3 MATERIAL=4H-SiC \
  FERMIDIRAC ANALYTIC CONWELL FLDMOB \
  SRH BGN AUGER INCOMPLETE LAT.TEMP \
  JOULE.HEAT GR.HEAT PRINT

```

MOBILITY

```

MOBILITY DEVICE=AMOSFET material=4H-SiC REGION=3 \
  vsatn=2.2e7 vsatp=2.2e7 betan=1.2 betap=2 mu1n.caug=40 \
  mu2n.caug=1136 ncritn.caug=2e17 alphan.caug=-3 betan.caug=-3 \
  gamman.caug=0.0 deltan.caug=0.76 mu1p.caug=20 \
  mu2p.caug=125 ncritp.caug=1.e19 alphap.caug=-3 betap.caug=-3 \
  gammap.caug=0.0 deltap.caug=0.5

```

Anisotropic Mobility

```

MOBILITY DEVICE=AMOSFET material=4H-SiC REGION=3 \
  n.angle=90 p.angle=90 vsatn=2.2e7 vsatp=2.2e7 betan=1.2 \
  betap=2 mu1n.caug=5 mu2n.caug=947 ncritn.caug=2e17 \
  alphan.caug=-3 betan.caug=-3 gamman.caug=0.0 \
  deltan.caug=0.76 mu1p.caug=2.5 mu2p.caug=20 ncritp.caug=1.e19 \
  alphap.caug=-3 betap.caug=-3 gammap.caug=0.0 deltap.caug=0.5

```

```

IMPACT DEVICE=AMOSFET REGION=3 ANISO E.SIDE SELB \
  SIC4H0001 an1=3.44e6 an2=3.44e6 bn1=2.58e7 bn2=2.58e7 \
  ap1=3.5e6 ap2=3.5e6 bp1=1.7e7 bp2=1.7e7 opphe=0.106
METHOD BLOCK climit=1.e-9 maxtraps=40 itlimit=50 \
  max.temp=1000 dvmax=1.e8 ix.tol=1.e-35 ir.tol=1.e-35 \
  px.tol=1.e-35 pr.tol=1.e-30 cx.tol=1.e-45 cr.tol=1.e-30

```

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TRANSIENT SIMULATION CIRCUIT

```

.BEGIN
VDC 1 0 2500
L1 1 2 10m
DDUM 2 1 IDEAL
AMOSFET 2=drain 3=gate 0=source \
  infile=CIS_DMOS_Structure.str width=1.e6
RGND 3 0 1e20
RGATE 3 4 10
VGATE 4 0 0 PULSE 0 20 5us 50ns 50ns 10us 20us

```

```

.MODEL IDEAL D()
.NUMERIC imaxtr=150 dtmax=1.e-7
.OPTIONS m2ln.tr noshift print relpot write=50

.LOAD  infile=CIS_DMOS_DC_Bias
.SAVE  master=CIS_DMOS_Transient
.LOG   outfile=CIS_DMOS.log
.SAVE  outfile=CIS_DMOS.str
.TRAN 10ns 105us
.END

CONTACT DEVICE=AMOSFET NAME=GATE  n.polysilicon EXT.ALPHA=10
CONTACT DEVICE=AMOSFET NAME=SOURCE EXT.ALPHA=10
CONTACT DEVICE=AMOSFET NAME=DRAIN EXT.ALPHA=10

THERMCONTACT DEVICE=AMOSFET num=4 x.min=0 \
  x.max=5 y.min=0.0 y.max=184 alpha=10 ext.temp=300

INTERFACE REGION=2 charge=2.5e12 s.n=1.e4 s.p=1.e4 s.i

MATERIAL material=4H-SiC REGION=3 permittivity=9.76  eg300=3.26 \
  affinity=3.7  egalp=3.3e-2  egbeta=1.e+5 nc300=1.7e+19 nv300=2.5e+19 \
  arichn=146 arichp=30 augn=3.e-29 augp=3.e-29 taun0=3.33e-6 taup0=6.7e-7 \
  nsrhn=3.e+17 nsrhp=3.e+17 edb=0.050 eab=0.200 tcon.polyn tc.a=0.137534 \
  tc.b=4.9662e-4  tc.c=0.000000354 hc.a=2.35 hc.b=1.75e-3 hc.c=1.e-9 \
  hc.d=-6.6e4

MODELS DEVICE=AMOSFET REGION=3 MATERIAL=4H-SIC \
  FERMIDIRAC ANALYTIC CONWELL FLDMOB SRH \
  BGN AUGER INCOMPLETE LAT.TEMP JOULE.HEAT GR.HEAT PRINT

MOBILITY material=4H-SIC REGION=3 vsatn=2.2e7 vsatp=2.2e7 betan=1.2 \
  betap=2 mu1n.caug=40 mu2n.caug=1136 ncritn.caug=2e17 alphan.caug=-3 \
  betan.caug=-3 gamman.caug=0.0 deltan.caug=0.76  mu1p.caug=20 \
  mu2p.caug=125 ncritp.caug=1.e19 alphap.caug=-3 betap.caug=-3 \
  gammap.caug=0.0 deltap.caug=0.5

MOBILITY material=4H-SIC REGION=3 n.angle=90 p.angle=90 vsatn=2.2e7 \
  vsatp=2.2e7 betan=1.2 betap=2 mu1n.caug=5 mu2n.caug=947 ncritn.caug=2e17 \
  alphan.caug=-3 betan.caug=-3 gamman.caug=0.0 deltan.caug=0.76 \
  mu1p.caug=2.5 mu2p.caug=20 ncritp.caug=1.e19 alphap.caug=-3 \
  betap.caug=-3 gammap.caug=0.0 deltap.caug=0.5

IMPACT DEVICE=AMOSFET REGION=3 ANISO E.SIDE SELB \
  SIC4H0001 an1=3.44e6 an2=3.44e6 bn1=2.58e7 bn2=2.58e7 \

```

```
ap1=3.5e6 ap2=3.5e6 bp1=1.7e7 bp2=1.7e7 opphe=0.106
METHOD BLOCK.TRAN climit=1.e-9 maxtraps=100 itlimit=150 \
  dvmax=1.e8 ix.tol=1.e-35 ir.tol=1.e-35 px.tol=1.e-35 \
  pr.tol=1.e-30 cx.tol=1.e-45 cr.tol=1.e-30
OUTPUT FLOWLINES

GO ATLAS SIMFLAGS="-V 5.18.3.R -P 32 -160"
tonyplot CIS_DMOS_tr.log -set CIS_DMOS_tr_log.set
QUIT
```