TT-P053

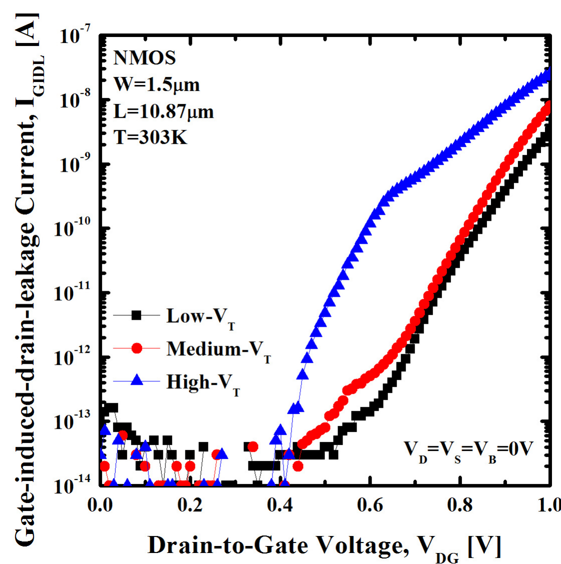
Gate-Induced-Drain-Leakage (GIDL) Current of MOSFETs with Channel Doping and Width Dependence

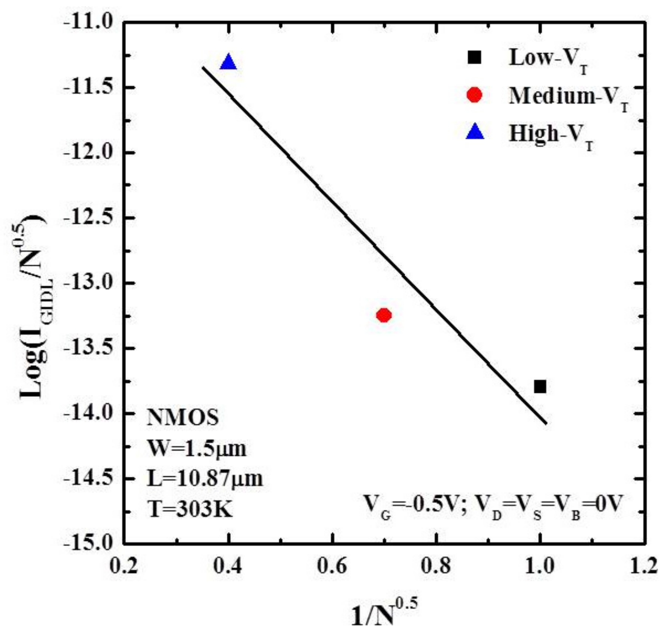
Byoungseon Choi, Pyungho Choi, Byoungdeog Choi

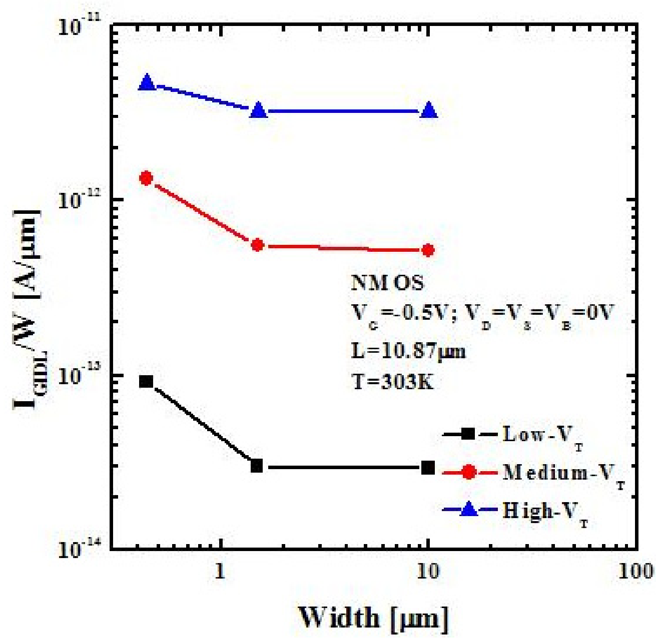
School of Information and Communication Engineering, Sungkyunkwan University

The Gate-Induced-Drain-Leakage (GIDL) current with channel doping and width dependence are characterized. The GIDL currents are found to increase in MOSFETs with higher channel doping levels and the observed GIDL current is generated by the band-to-band-tunneling (BTBT) of electron through the reverse-biased channel-to-drain p-n junction. A BTBT model is used to fit the measured GIDL currents under different channel-doping levels. Good agreement is obtained between the modeled results and experimental data. The increase of the GIDL current at narrower widths in mainly caused by the stronger gate field at the edge of the shallow trench isolation (STI). As channel width decreases, a larger portion of the GIDL current is generated at the channel-isolation edge. Therefore, the stronger gate field at the channel-isolation edge causes the total unit-width GIDL current to increases for narrow-width devices.

Keywords: Gate-induced-drain-leakage (GIDL), Band-to-band tunneling (BTBT)




-11.0
-11.5
-12.0
-12.5
-13.0
-13.5
-14.0
-14.5
-15.0
0.2
0.4
0.6
0.8
1.0
1.2
Log(I_GIDL/N^0.5)
1/N^0.5
Low-V_T
Medium-V_T
High-V_T
NMOS
W=1.5μm
L=10.87μm
T=303K
V_G=-0.5V; V_D=V_S=V_B=0V


10^-11
10^-12
10^-13
10^-14
1
10
100
I_GIDL/W [A/μm]
Width [μm]
NMOS
V_G=-0.5V; V_D=V_S=V_B=0V
L=10.87μm
T=303K
Low-V_T
Medium-V_T
High-V_T