ABSTRACT

In last few decades, AlGaN/GaN high electron mobility transistors have been promising devices for high frequency, high temperature and high power applications due to the material properties like large band gap, higher breakdown filed, higher saturation velocity compared with conventional semiconductor materials. Along with the above mentioned, formation of highly mobile charge layer known as two-dimensional electron gas (2DEG) is the reason for getting high current densities in these devices. As technological scaling is part of the device advancement, formation of low resistance, thermally stable Ohmic contact with smooth surface morphology is required for increasing the current density as well as decreasing the On resistance of the device.

In the literature, it was observed that contact resistance has some dependency with AlGaN layer thickness in the source and drain region. Due to trade-off relationship exists between AlGaN thickness and 2DEG density in the region limits the lower value of contact resistance. To minimize this lower value of resistance, different uneven structures are introduced in the AlGaN layer of source and drain region are investigated.

In this work, calibration of AlGaN/GaN device in the TCAD tool is done to minimize the error the between simulated characteristics and fabricated device. The process of calibration is a bit difficult as some of the models are not well calibrated. To reduce the error in the current, we have tuned the models until the desired characteristics are achieved. With this simulation deck, we try to understand the contact resistance behavior with AlGaN layer thickness in the source and drain region.