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Fabrication of 1200V 100A class 4H-SiC Trench Gate MOSFET according to Trench Shape
(트렌치 형상에 따른 1200V 100A급 4H-SiC Trench Gate MOSFET 제작)

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Abstract:

The need to develop efficient power semiconductor devices is required to increase energy use explosion and reduce CO2 emissions to future environments. The development of silicon carbide (SiC) power devices with better material properties than silicon (Si) is urgent, especially when carbon emissions are reduced and the efficient use of new and renewable energy is desperately needed, especially when the efficient use of electricity is desperately needed. The trench gate MOSFET used a 6-inch 4H-SiC substrate, and a 1200V, 100A class trench gate power MOSFET device was fabricated by forming a high-density trench to obtain high current. In order to fabricate a trench gate MOSFET device for high voltage high current, the etching slope for the trench etched shape was optimized through simulation. Trench slope is the angle of the trench slope to prevent shield p-doping on the trench sidewall. The trench slope increases the breakdown voltage of the device and decreases the on-resistance depending on the thickness of the buffer oxide.

In this study, the trench slope was more than 87° and the buffer oxide of trench sidewall was doped to 500Å. According to these optimum conditions, the trench etch slope was etched by 88° to fabricate the trench gate MOSFET, and the characteristics of the device were evaluated. As a result, the breakdown voltage (BV) was 1360V, the drain current (Id) was 100A, and the gate-source (Igs) leakage current of the device was excellent at 1.3nA. The on-resistance (Rds) of the trench gate MOSFET was measured to be 29 mΩ. The switching characteristics were 7.5mJ at Eon and 5.3mJ at Eoff.

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Keywords

SiC, Trench, Power MOSFET

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