



Structures and Processes of Three dimensional Super Junction

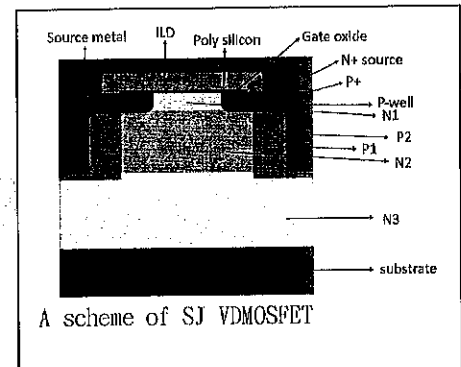
(Below is limited to 1-page only; be careful not to disclose vital technology content. Please delete these words when the document is finished)

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Experience:

<https://ntuhpdcweb.wixsite.com/hpdc>



Market Demand:

To enhance the transmission efficiency in power systems, power devices have to be performed stably under both high reverse bias and high temperature conditions. The demand of power devices is increasing with the advanced technology development. Therefore, increasing the breakdown voltage and reducing the specific on-resistance are the major targets of the power devices design.

Our Technology:

To summary our technology:

1. The concentration of P-pillar is varied vertically and horizontally.
2. The fabrication of half-pillar SJ is more achievable compared with the full-pillar SJ.
3. The lateral concentration gradient of P-pillar makes the lower specific on-resistance.
4. The photo mask cost of fabrication remains the same.

Strength:

1. Higher breakdown voltage
2. Wide process tolerance
3. High product yield
4. Lower specific on-resistance
5. High transmission efficiency

Competing Products:

The conventional super junction structure, which utilizes the P-pillar to deplete the drift region vertically and horizontally, makes the depletion region spread out well to achieve higher breakdown voltage. In this patent, the device replaces full-pillar with half-pillar, so that the process cost can be reduced and the time cost will also be reduced. The concentration of P-pillar is varied vertically and horizontally, so that the lateral concentration gradient of P-pillar can reduce specific on-resistance effectively.

Intellectual Properties:

In this patent, the concentration of P-pillar is graded horizontally to make the specific on-resistance smaller. The lateral concentration gradient of P-pillar makes the lower specific on-resistance than United States Patent · US 6,693,338 B2.

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