

Split Gate Technology

The background features abstract, overlapping green geometric shapes in various shades, including light lime green, medium green, and dark forest green. These shapes are primarily located on the right side of the frame, with some extending towards the center. The overall aesthetic is clean and modern, typical of a technical or scientific presentation.

What is split gate technology in Nano electronics?

- ▶ Forming quantum structures like quantum wire, dot, rings, etc, by splitting the different gates
- ▶ Two dimensional electrons are separated from the surface of the sample and confine them into a channel. If the two dimensional electrons can be quantized, we obtain a quantum wire, dot, rings, etc.

Split Gate Technology

- Using this method to form laterally confined nanostructure
- This forms an electrically controllable structure that can be adjusted by an applied voltage.

Forming Quantum Wire

- ▶ One starts with a two-dimensional electron gas, formed for instance, by a semiconductor heterostructure.
- ▶ Electrodes are deposited on top of the heterostructure.
- ▶ Left is unbiased.
- ▶ By applying the $-ve$ voltage, the electrodes deplete the electron gas below the gate.
- ▶ So the gate electrodes form a narrow electron gas channel under the split.
- ▶ Resulting the Quantum Wire.

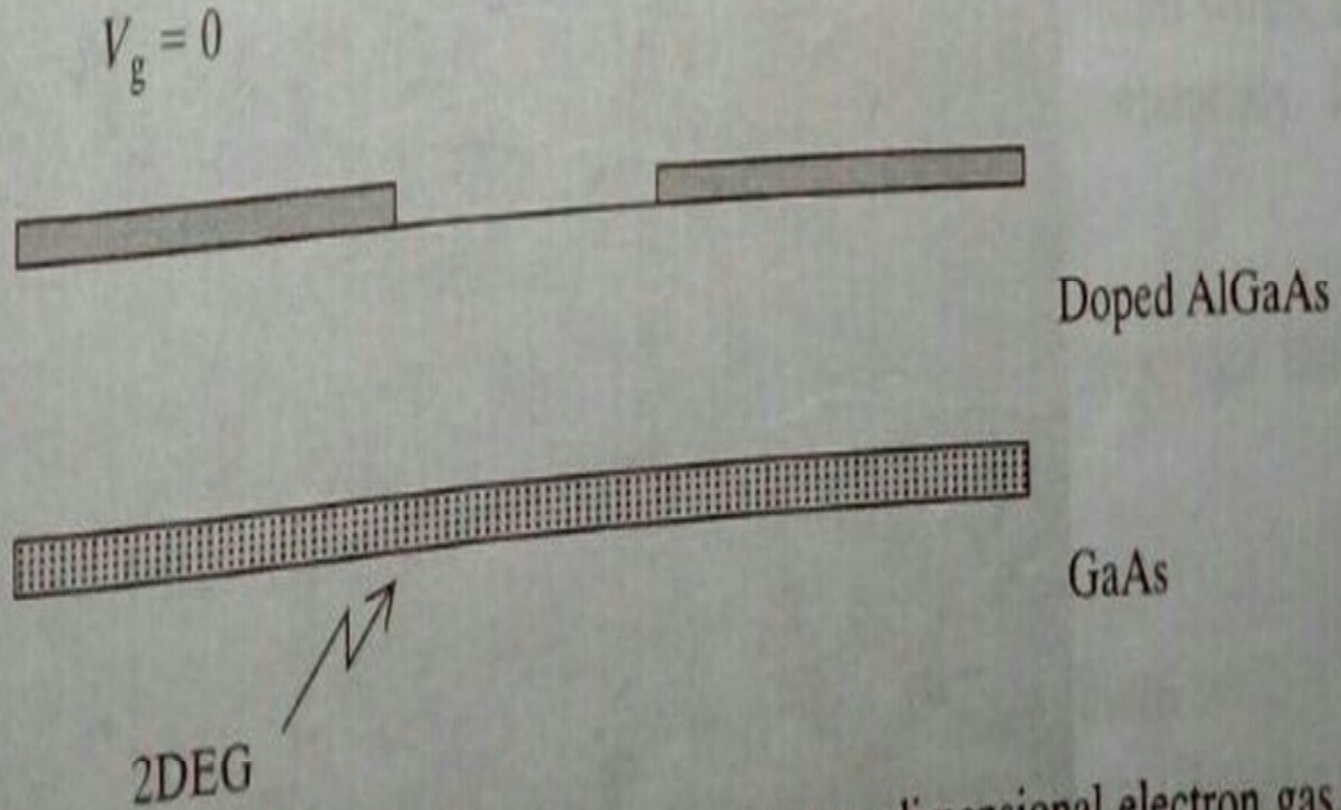
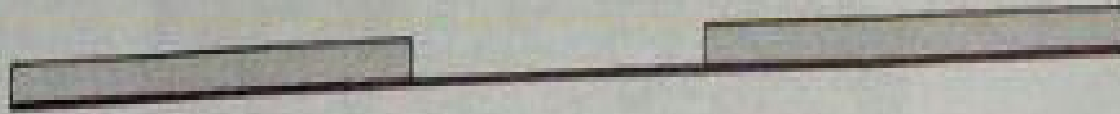


Figure 9.21 Split-gate electrodes over a two-dimensional electron gas.

$$V_g < 0$$



Doped AlGaAs



GaAs

2DEG



Quantum Dots

- ▶ It can also be fabricated in a similar manner.
- ▶ In the case of split gate quantum dot, the electrode pattern constraints the two dimensional electron gas formed by a heterojunction in the shape of a hole in the electrodes.
- ▶ Resulting a Quantum Dot.

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