



Method for Fabricating High-Speed Thin-Film Transistors

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a less expensive method of fabricating high-speed thin-film transistors on flexible membranes.

Overview

Thin-film transistors often use a single-crystal layer of silicon semiconductor attached to a flexible plastic substrate to allow flexibility in the electronics. However, transistors using some types of silicon cannot operate at frequencies in the radio wave range. Other types of silicon can operate at high frequencies, but the process used to manufacture those transistors reaches temperatures too high for the flexible substrate.

The Invention

UW-Madison researchers have developed a method of fabricating high-speed thin-film transistors on flexible membranes that produce a maximum frequency of 7.8 gigahertz or more. Rather than processing the single-crystal silicon layer on a flexible substrate, it is processed on a heat-resistant bulk silicon substrate and moved to a flexible one. A hydrogen implantation layer lies between the silicon and the substrate. The silicon is split from the bulk silicon substrate at the hydrogen layer, and attached to a flexible polymer substrate using adhesive.

Applications

- LCD displays
- RFID
- Large digital signs
- Large-area microwave, analog and digital circuits
- Military antennae

Key Benefits

- Less expensive method of creating high-speed thin-film transistors
- Compatible with silicon processing infrastructure
- Starting material is bulk silicon of any orientation instead of silicon-on-insulator (SOI)
- Device feature size can be as easily downscaled, as on the silicon substrate
- Flexible thin-film transistors can be made that operate at speeds in the tens of gigahertz
- Low power consumption
- Frequency dramatically surmounts that of any other flexible membrane
- Lightweight
- Robust
- Electronics can be folded or rolled up



- Exhibits a faster, brighter display
- Capable of operating at radio frequency range, which requires an operating frequency of several gigahertz

Additional Information

For More Information About the Inventors

- [Zhenqiang Ma](#)

Tech Fields

- [Semiconductors & Integrated Circuits : Design & fabrication](#)

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846