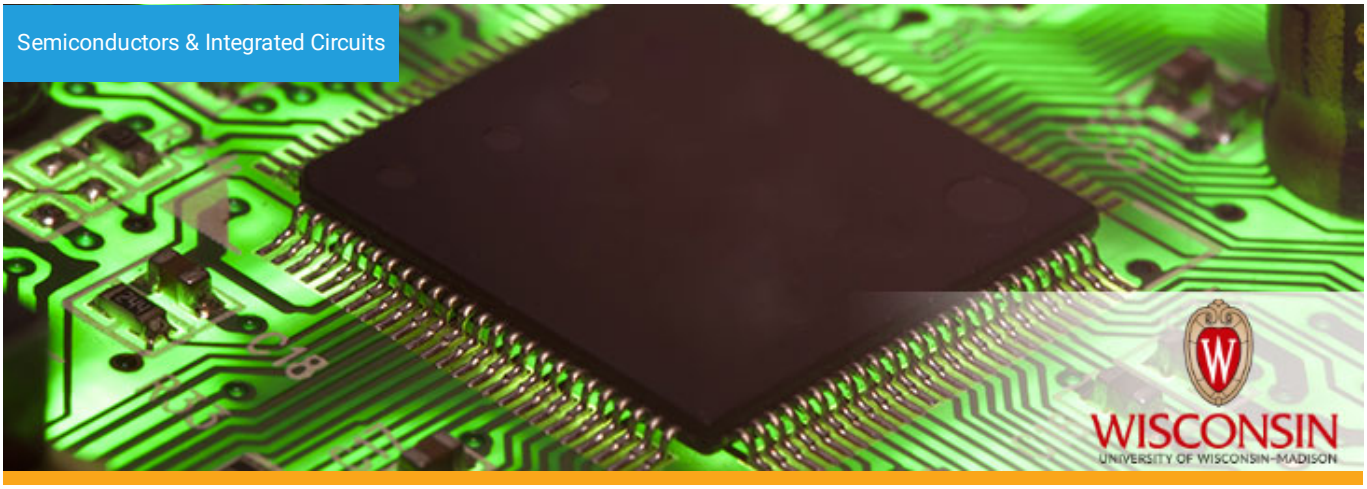
Semiconductors & Integrated Circuits



Flexible Thin-Film Transistors for Mass Production

View U.S. Patent No. 9,704,999 in PDF format.

WARF: P150093US01

Inventors: Zhenqiang Ma, Jung-Hun Seo

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing high performance radiofrequency transistors for use in flexible electronic devices.

Overview

Flexible electronics such as pliant displays, wearable electronics and new biomedical devices have gained popularity in recent years. Such devices are mounted on a supple plastic support layer and offer many design advantages over stiff components.

Currently, manufacturing radiofrequency thin-film transistors (TFTs) for use in these devices is challenging and costly. One of the difficulties is finding a scalable fabrication process. Conventional nanoscale patterning techniques such as e-beam lithography are impractical in this regard.

The Invention

UW–Madison researchers have developed a new approach for fabricating high performance radiofrequency TFTs. Their method enables mass production and takes advantage of recent improvements in nanoimprinting lithography (NIL) technology.

The new TFTs include a trench cut into the semiconductor layer that separates the source and drain regions. The trench provides the TFTs with a unique current flow path that helps prevent several issues (e.g., short channel effect) that typically arise at this scale. The fabrication process is so fine that the length of the channel region is on the order of submicrons.

Applications

- Radiofrequency thin-film transistors for a wide range of flexible electronic applications
- LCD displays
- RFID
- Large digital signs
- Large-area microwave, analog and digital circuits
- Military antennae

Key Benefits

- Combines submicron-scale dimensions with high performance
- Can be fabricated using high throughput manufacturing methods (i.e., roll-to-roll processing)
- May cut costs
- Enables the fabrication of large area TFT arrays
- Leverages nanoimprint lithography and thin film transfer techniques
- Potentially dramatic power savings (~ 35x)

Stage of Development

The researchers are making devices with III/V semiconductors such as gallium arsenide and gallium nitride.

Additional Information

For More Information About the Inventors

- Zhenqiang Ma

Publications

- View a news story about this technology.

Tech Fields

- Semiconductors & Integrated Circuits : Design & fabrication

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