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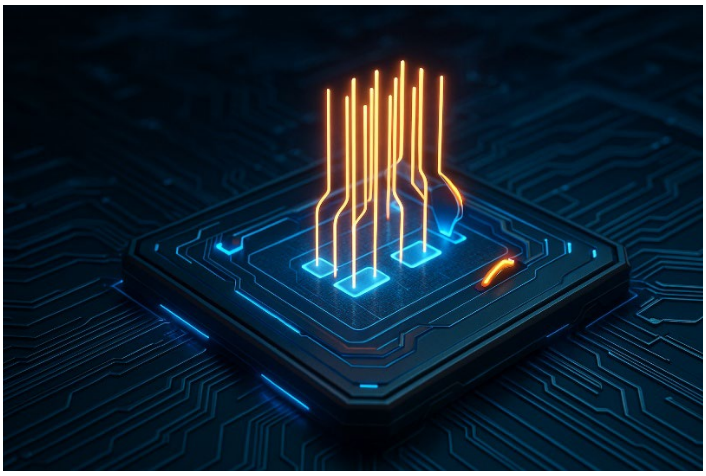
Solar Thermophotovoltaic Device



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Description

Current memristor technologies, including those based on amorphous silicon oxide or 2D semiconductors, show promise for next-generation memory and neuromorphic systems. However, they often suffer from limited CMOS compatibility, hindering integration into standard semiconductor processes and complex fabrication steps or reliance on filament formation and doping for switching mechanisms.
The technology introduces a CMOS-compatible memristor device featuring:

- Two Schottky diodes arranged in a back-to-back configuration.
- A silicon nanowire connecting the electrodes, coated with a superficial oxide layer formed by natural oxidation or oxygen plasma treatment.
- The oxide layer induces stable, repeatable memristive switching without filament formation, enabling a non-volatile memory effect.
- The design allows precise control of Schottky barrier height through an intermediate oxide layer, enabling tunable switching and low-power operation.
- Fully CMOS-compatible fabrication process, scalable for high-density memory arrays and biosensor networks.

Advantages

- CMOS Compatibility: Seamless integration into existing semiconductor manufacturing lines.
- Robust Memristive Behavior: Stable and reproducible switching enabled by surface oxidation.
- Low-Power Operation: Tunable Schottky barrier for efficient energy use.
- Scalability: Suitable for large-scale memory arrays and biosensor networks.
- Enhanced Biosensing: Activated nanowire surface for efficient biomolecule capture.
- No Filament Formation Required: Simplifies design and improves reliability.

Applications

- Non-Volatile Memory: High-density storage as an alternative to flash memory.
- Neuromorphic Computing: Synapse-like behavior for AI hardware.
- Biosensing: Detection of DNA, proteins, and therapeutic compounds.
- Drug Monitoring: Exploiting memristive effects for real-time analysis.
- Low-Power Electronics: Energy-efficient switching for portable devices