Silavon™

Optimised 650 NM Silicon avalanche LED

"Lighting Silicon's Potential."

Technology

The invention relates to an optimised silicon avalanche light emitting diode (LED) that emits light at a wavelength of approximately 650 nm (red light). The device is based on a silicon PN junction structure designed with strategically doped regions and engineered impurity concentrations to enhance photon generation efficiency. It achieves optical emission through carrier recombination between high-energy electrons and low-energy holes within a precisely defined interaction zone.

Market need

Conventional LEDs rely on compound semiconductors such as GaAs or InP, which are costly and incompatible with silicon CMOS processes. As the industry moves toward silicon photonics and on-chip optical communication, there is a strong need for efficient light sources fabricated directly on silicon. This technology addresses that gap, enabling high-speed, low-cost, and compact optical-electronic integration - a critical capability for next-generation computing, communications, and sensing markets.

Features

- Emits red light (650 nm) directly from a silicon PN junction, eliminating the need for costly compound semiconductors like GaAs or InP.
- Incorporates a reverse-biased junction that accelerates electrons and a forward-biased junction that injects low-energy holes, creating a controlled recombination zone for efficient light generation.
- A narrow conduction path confines carrier flow, increasing carrier density and light intensity while minimising heat buildup.
- Can be manufactured using standard silicon integrated circuit (IC) processes, allowing seamless integration into electronic chips.
- Operates efficiently at low excitation voltages, reducing risk of thermal damage and improving reliability.

Benefits

- Low-Cost Production
- Facilitates optical interconnects between transistors and chips, reducing latency and energy loss in high-speed processors.
- Enhanced System Performance
- Uses abundant, non-toxic silicon instead of rare or hazardous materials, supporting sustainable manufacturing.
- Reduces administrative workload for supervisors and faculty coordinators.

Industry
ICT

Potential application
- Silicon photonics and on-chip optical communication: integration of light sources directly onto silicon chips for high-speed data transfer.
- Optical interconnects in computing: enabling compact, low-cost, and energy-efficient intra- and inter-chip optical links.
- Sensing and imaging systems: red-light emission for medical diagnostics, environmental sensing, and lab-on-chip devices.
- Consumer electronics: use in displays, optical indicators, and augmented/virtual reality devices.
- LiDAR and optical range finding: red-light sources for compact, low-power distance sensing applications.

Creator
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Stage of development
Prototype

Intellectual property
Patent Protection

Desired relationship
Co-development, Investors