

A10: TechCard template (with example)

The following information indicated by the numbered titles serves as description for the technology. The TechCard should not be longer than one or two pages. It should not be too scientific and be easy to understand for non-technical students. It does not provide deep insights into the technology but rather provide a back-box view. It should also give references to further information and points of contact. *The text in light grey gives an example.*

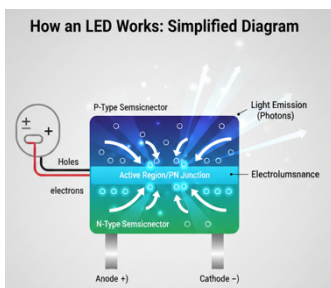
Titel: Name of Technology (LED: Light Emitting Diode)

1. What does it do?

The Light-Emitting Diode (LED) is a semiconductor device that converts electrical energy directly into light through a process called electroluminescence. It is the most energy-efficient and rapidly evolving lighting technology, used for general illumination, indicators, and displays

2. How does it work?

(if possible enriched with one or several pictures for explanation)



*An LED is essentially a **p-n junction diode**. When the device is **forward-biased** (positive voltage applied to the p-side, negative to the n-side): **Electrons** from the n-type semiconductor and **holes** from the p-type semiconductor are pushed toward the junction (the active region). The electrons and holes **recombine** (fall into a lower energy state). This process releases energy in the form of **photons** (light particles). This process is known as **electroluminescence***

3. Unique characteristics

(as bullet list)

- * **High Energy Efficiency:** Uses up to 90% less energy than incandescent bulbs, with efficacies often exceeding 150 lumens per watt.
- * **Exceptional Longevity:** Lifespans typically range from 25,000 to over 50,000 operating hours.
- * **Compact Size & Durability:** Solid-state technology, making them small, rugged, and resistant to vibration and breakage.
- * **Minimal Heat Emission:** Very little energy is wasted as heat, which increases safety and reduces cooling costs.

4. Domains of impact

(as bullet list)

- * **General Illumination:** Residential, commercial, street, and architectural lighting,
- * **Display Technology:** Backlighting for LCDs (TVs, monitors) and direct-view displays (LED screens, billboards, signage).
- * **Automotive:** Headlights, brake lights, and interior lighting due to durability and efficiency.

5. Potential societal issue the tech can address

Mitigating Climate Change and Energy Scarcity: By replacing less efficient lighting sources, LED technology lowers global electricity consumption and associated greenhouse gas emissions. This is directly connected to climate action goals.

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6. Technology readiness level

TRL 9 (Actual system proven in operational environment). The technology is fully commercialized.

7. Technology owner

(name, organisation, email, phone number)

8. Other information and references

(web page and scientific papers)

Nakamura, S. (2015). Nobel Lecture: Background story of the invention of efficient blue InGaN light emitting diodes. Reviews of Modern Physics, 87(4), 1139-1151.

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