

PHOTODIODES

LAUREN HERNANDEZ

October 19, 2021



OVERVIEW

- What is a photodiode?
- History
- Various uses
- How does it work?
- How do you operate it?
- Conclusion

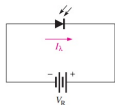


WHAT IS A PHOTODIODE

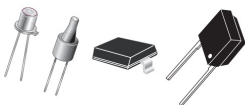
- semiconductor
- light \rightarrow electricity
- detect light intensity



Introduction to Photodiode



(a) Reverse-bias operation
using standard symbol



(b) Typical Photodiodes

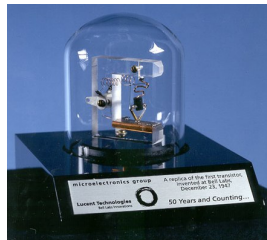


Photodiode symbol

www.TheEngineeringKnowledge.com

BRIEF HISTORY

- Dr. John N. Shive
- Bell Labs, 1948
- Nobel for transistor

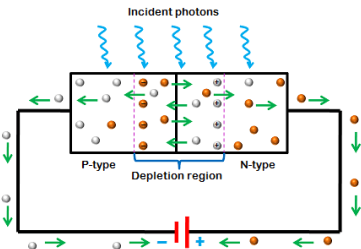
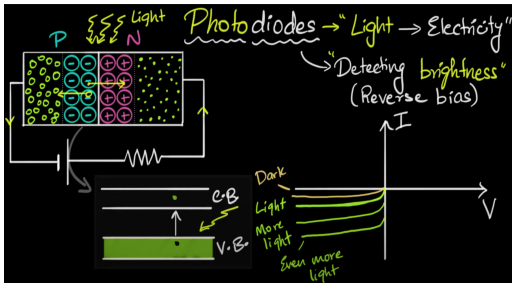
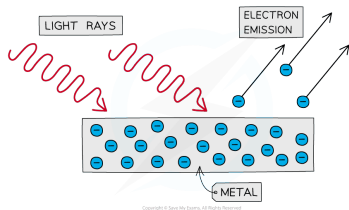


VARIOUS USES

Automatic Street Light



HOW DOES IT WORK?

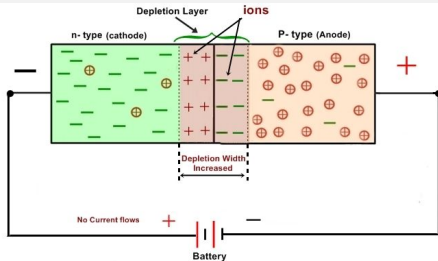


PN Junction photodiode



HOW DOES IT WORK?

- PN
- PIN
- Avalanche
- Schottky

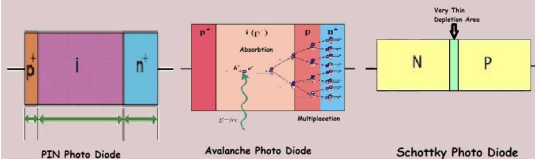


Reverse Bias

circuitspedia.com

THECODEPROGRAM.COM

Explanation of Photodiodes



HOW DOES IT WORK?

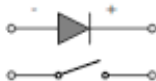
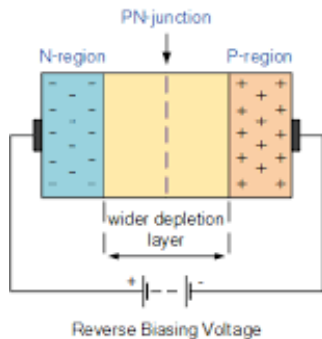
PERFORMANCE PARAMETERS

- Responsivity = $\frac{\text{generated photocurrent}}{\text{light intensity}}$
- Quantum efficiency = $\frac{\text{electron hole pairs}}{\text{incident photons}}$
- Response time



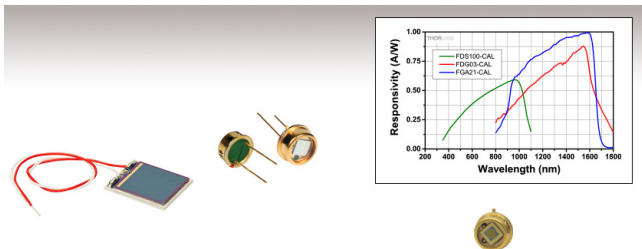
HOW DO YOU OPERATE IT?

- Light
- Circuit
- Photoconductive mode
- Photovoltaic mode



CONCLUDING THOUGHTS

- Turn photons into current
- Invented alongside transistors
- Wide variety of uses
- Can be adjusted for efficiency
- Can produce voltage or current



REFERENCES

- Photodiode operation, types and applications. ElectricalMag. (2020, August 22). Retrieved October 19, 2021, from <https://electricalmag.com/photodiode/>.
- TUFAN, B. H. (2020, May 10). Explanation of photodiodes. Thecodeprogram. Retrieved October 19, 2021, from <https://thecodeprogram.com/explanation-of-photodiodes>.
- P-n junction. The P-N Junction. (n.d.). Retrieved October 19, 2021, from <http://hyperphysics.phy-astr.gsu.edu/hbase/Solids/pnjun.html>.
- Department of Chemistry — UCI Department of Chemistry. (n.d.). Retrieved October 19, 2021, from <https://www.chem.uci.edu/unicorn/243/handouts/photodiode.pdf>.
- YouTube. (2020, December 11). Photodiodes - (Working & Why it's reverse biased) — semiconductors — physics — khan academy. YouTube. Retrieved October 19, 2021, from <https://www.youtube.com/watch?v=KgKcbW77txY>.

