

Simple Rear Light

by Keefe Montebon

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Design of a smart rear bicycle light

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Abstract

During this assignment, we will be expected to be able to understand the different components in pics and circuits within the

1 Introduction

This section should contain the background research related to your report. All third party work used should be cited correctly and listed in the references section.

2 Equipment

This section should contain a list of the equipment used in the investigation. What parts and IC's you're using

- Proteus
- Cree CXB1520
- TP4056 Lithium Ion Charging module £6.49 (At the time of this report) [1]

3 Method

Cree:

- Advantages:

The real advantage that Cree has that makes their products superior, but affordable is the materials used. [2]

Other advantages include Low forward voltage, single wired-bond connections, Low heat generation, Extreme thinness for smaller electronics devices, Long life

span, High ESD resistance and tolerance, simple thermal management, easy to fit for tight spots and bright light generated from little power. [3]

- What it means for my circuit design:

For the final design it means I can use a relatively long lasting LED and is tested throughout the industry as a proven product, with their modules and design in plenty of products ranging from flash modules, light fixtures to industrially accepted rugged design, it seems perfect for the outdoor and long time use.

- Data sheet info: <https://cree-led.com/media/documents/ds-CXB1520.pdf>

- Additional info:

One of the major product lines for Cree, especially during the past several years, has been light products. Well known facts of using Cree LEDs is the architecture of their products such as the LR38.

They also specialise in LEDs for small electronic devices, such as LED digital camera flash, traffic signals and cellular phone backlighting. They're LEDs are also said to support dimming of 5% and are created to last for a minimum of 35,000 hours at 70 lumens.

COB:

- Advantages:

Several advantages occur when using COB LED's due to its compact package due to small chip size, High-Intensity at close distances, High uniformity even at close distances, simple design and superior thermal performance for increased life, stability and reliability. [4]

- What it means for my circuit design: For the purposes of the Rear light, it would be perfect, however, in terms of longevity it's whether the choice of having and also the reach of the light, it would most likely be best to use Cree LED rather than a COB, though it is still perfectly usable. With the architecture for the actual LED being compact, like the Cree system, it still has the same advantages,

but in this case it might be easier to choose over preference and so in this case I the Cree LED comes as my top choice.

- Data sheet info: https://download.luminus.com/datasheets/Luminus_High-Density-COB_Datasheet.pdf [5]
- Additional info:

Chip-on-Board (COB) is referred to as mounting a bare LED chip in direct contact with a substrate, like silicon carbide or sapphire, to produce LED arrays. COB LEDs have advantages over other LED technologies, such as being a surface mounted device, or a Dual In-Line package. COB LEDs allow for a highly packed density of LED array's or improved 'lumen density'.

Knog Blinder V Rear Light

Link: <https://www.probikekit.co.uk/knog-blinder-v-rear-light/13170071.html> [6] [7]



Picture: Knog Blinder V Rear Light [7]

Lighting modes:

- Steady On- High - 30lm (Lumens) – 4.5Hrs (Runtime)
- Steady On- Low - 20lm – 8Hrs
- Low Flash - 50lm – 16Hrs
- High Flash - 90lm – 14Hrs

- Fading Flash - 100lm – 15Hrs
- Pulse Flash - 30lm – 20Hrs
- Accelerating Flash - 70lm – 5Hrs
- Eco Flash - 20lm – 50+Hrs

Cateye ViZ 100 Rear Bike Light

Link: https://www.tredz.co.uk/.Cateye-ViZ-100-Rear-Bike-Light_229424.htm [8] [9]



Picture: Cateye ViZ 100 Rear Light [9]

Lighting modes:

- Constant - 15lm (Lumens) – 4.5Hrs (Runtime)
- Flashing - Low - 10lm – 8Hrs
- Group Ride - 35lm – 16Hrs
- Daytime Hyperflash - 100lm – 14Hrs
- Charging time - 3Hrs

IC TP4056

- Advantages:

Some advantages include; linear charger, small space, simple design and adjustable charging current.

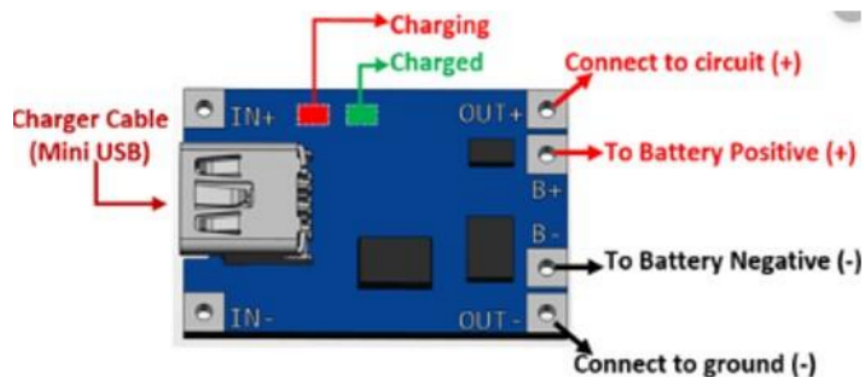
- What it means for my circuit design:

This gives the design added capability to charge the light module, with relative ease. Though, it has be implemented carefully because, in reports, it does say a reverse polarity can cause it to heat instead of charge, which could cause potential harm to the user. [10]

- Data sheet info: <http://www.tp4056.com/d/tp4056.pdf> [11]

- Additional information:

Other features that the system includes are a Lithium Ion battery that can discharge and charge, which supports a constant current. It also features an overvoltage protection design and a soft start in to limit inrush current. However, lacks a reverse polarity protection. This again could cause the system to create heat instead of charge the system in total. The module also provides [12]



TP4056 Pinout Diagram [11] [12]



TP4056 Connection Diagram [12]

Motorists and flashing lights

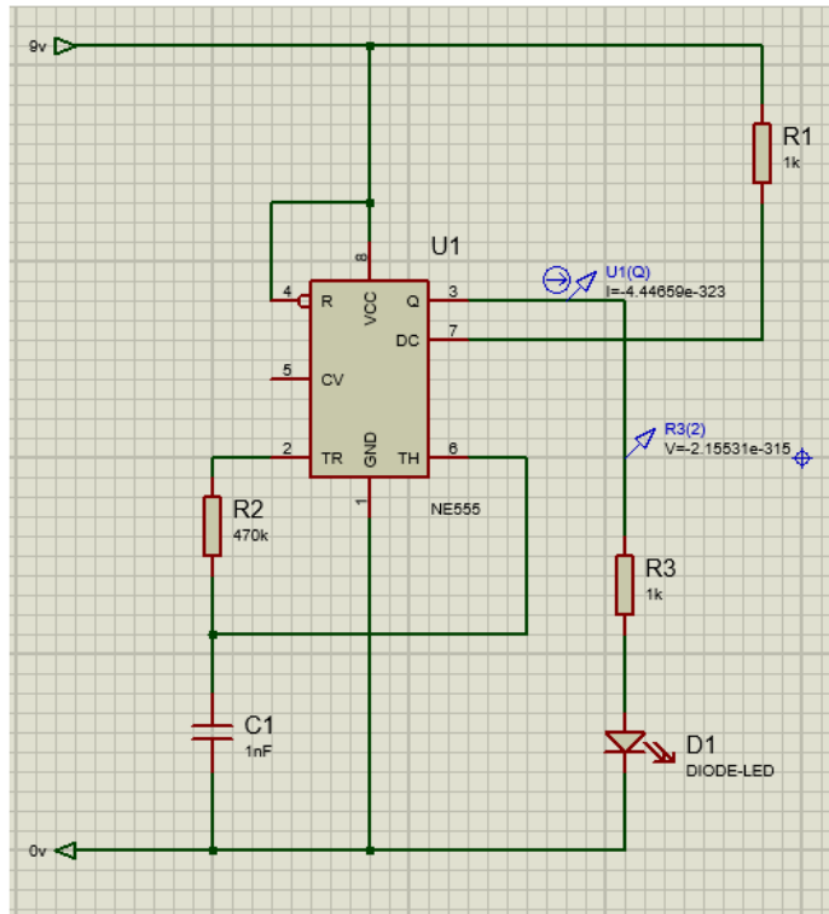
In the article found, it's said that beacons or 'flashers' are frequently used requested by communities. [13] These communities refer to the Arizona Department of Transportation (ADOT) and are believed to reduce vehicle speed by letting the driver know there is a possible obstruction or warning ahead.

Most of these flashers are placed on intersections or in conjunction with a warning sign in advance of an area requiring greater than normal care.

In the websites [13] findings summary, the serve function only when used in proper place, such intersections, junctions or warnings to other drivers that may not see certain roads. In this case, it would be best to assume that different flash types for drivers serve the same purposes as flashers for junctions, however, with bicycle lights, serve as an active warning to drivers. However, it does not directly correlate to bicycle flashes and there is seldom pieces of info that highlight such facts.

It still stands that having the function itself is useful and shows a level awareness for the incoming, or oncoming obstruction or even the cyclist himself.

control for motors. In this case, when voltage is applied the DIAC increases in breakdown voltage, which would then conduct and can only conduct in that state. Similarly, if voltage is decreased below avalanche breakdown voltage it will then stop conducting, or turn off.



Design 2: 555 timers with LED

U1: is the main IC in this case and is by itself just a 555 timer, which is what creates the flashing for the Diode (D1) in this circuit.

R2, C1: are configured in an RC circuit, which is in this case follows a simple filter in the First Order. Again, used as 'smoothing' for the signal itself, or in this case a smooth change in D1

4 References

- "amazon.co.uk," [Online]. Available: <https://www.amazon.co.uk/TP4056-Lithium-Charging-Protection-Function/dp/B07BSVS842>. [Accessed 29 01 2022].
- 1] "LEDLight.org," 2022. [Online]. Available: <http://www.ledlights.org/FAQ/What-is-Cree-LED.html>. [Accessed 28 01 2022].
- 2] "cree-led.com," 2016-2021. [Online]. Available: <https://cree-led.com/media/documents/ds-CXB1520.pdf>. [Accessed 28 01 2022].
- 3] "siliconlightworks.com/resoures/what-are-cob-leds." 2022. [Online]. Available: <https://siliconlightworks.com/resoures/what-are-cob-leds>. [Accessed 28 01 2022].
- 4] "download.luminus.com," 2017. [Online]. Available: https://download.luminus.com/datasheets/Luminus_High-Density-COB_Datasheet.pdf. [Accessed 28 01 2022].
- 5] "probikekit.co.uk," 2022. [Online]. Available:

6] <https://www.probikekit.co.uk/knog-blinder-v-rear-light/13170071.html>. [Accessed 29 01 2022].

“www.cyclestore.co.uk,” 2021. [Online]. Available:

7] https://www.cyclestore.co.uk/knog_blinder_v_100_lumen_rear_light_2021-ID_82862?msclkid=b7c3cb73300c1b7a0cf8aa8e8bc5a969&utm_source=bing&utm_medium=cpc&utm_campaign=*Bing%20-%20%20Shopping%20-%20%20All&utm_term=4582833202124219&utm_content=UK%20All. [Accessed 29 01 2022].

“tredz.co.uk,” 2022. [Online]. Available: <https://www.tredz.co.uk/>. Cateye-ViZ-

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9] 100-Rear-Bike-Light_229424.htm. [Accessed 29 01 2022].

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NanJing Top Power ASIC Corp. , NanJing Top Power ASIC Corp., [Online].

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“microcontrollerslab.com,” 2013-2022. [Online]. Available:

12 <https://microcontrollerslab.com/tp4056-linear-lithium-ion-battery-charging-module/>.

] [Accessed 29 01 2022].

5 Appendices

Any applicable stuff that you feel would break the flow of the narrative in the report, but should be included for reference purposes.

Simple Rear Light

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

30/100

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GRADING FORM: GJ_2019

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ENGAGEMENT WITH LITERATURE

 Some research done, however needed to be more extensive. The formatting of the reference list at the end of the document is all over the place - need to get this sorted out!

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KNOWLEDGE AND UNDERSTANDING

 The report presented, while having some redeeming features, doesn't follow the brief, which is to design a system around a PIC microcontroller! (not a 555 timer!!)

20

COGNITIVE AND INTELLECTUAL

 The report presented, while having some redeeming features, doesn't follow the brief, which is to design a system around a PIC microcontroller! (not a 555 timer!!) Therefore much of a conversation on complex system operation is missing

20

PRACTICAL APPLICATION



See above. No microcontroller. No software design. Shouldn't really rely on using pre-built modules either - not if you want to get marks for YOUR circuit design

10

TRANSFERABLE SKILLS



Report is reasonable, but could have been formatted more professionally. Also far too brief as is.

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