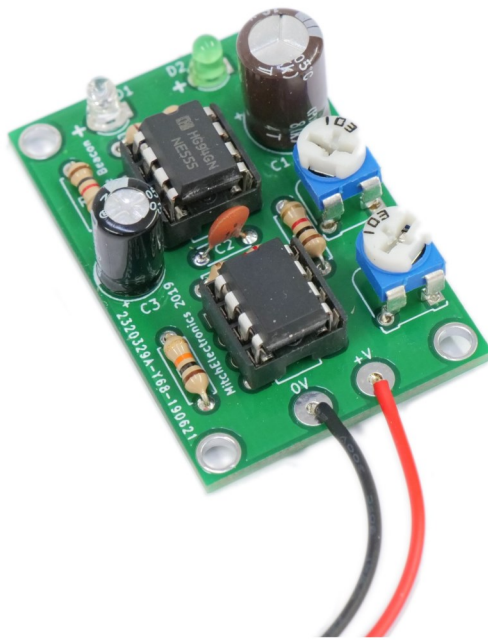


# 555 Breath Beacon Kit

MitchElectronics® 2019

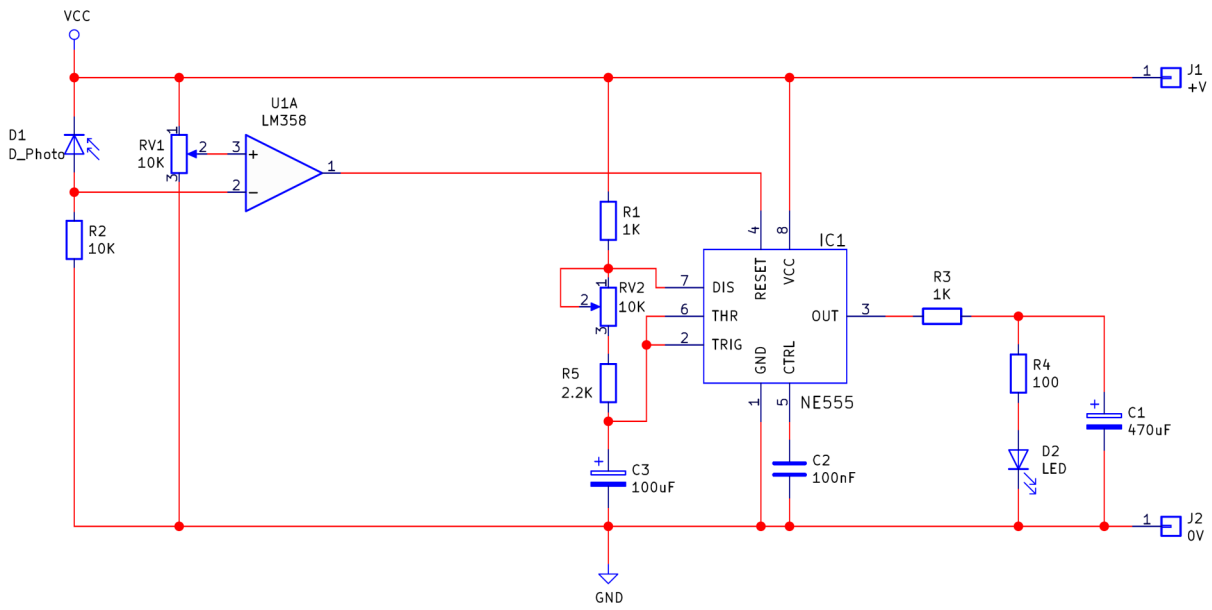


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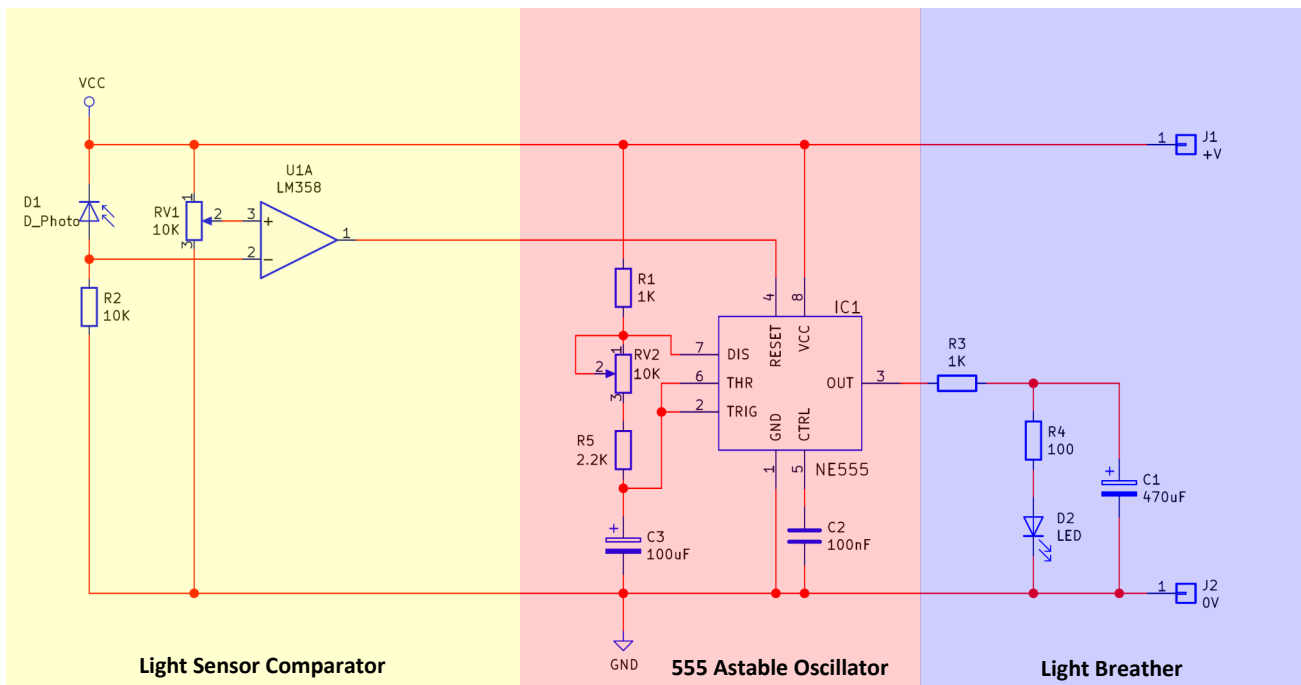
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# SCHEMATIC



## Schematic (Blocktised)



## SCHEMATIC EXPLANATION

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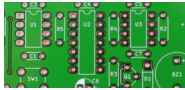
The 555 Breather Beacon Kit is a simple 555 astable that is controlled by a comparator. The comparator stage compares the voltage across R2 against the output voltage of the potentiometer RV1 and if the voltage across R2 is greater than the potentiometer voltage then the output of the comparator is 0V. If the voltage from the potentiometer is greater than the voltage across R2 then the output voltage will be 5V. The voltage across R2 is dependent on how much light falls on the photodiode D1. The more light that falls on D1 the more current it can conduct and therefore the voltage across R2 increases. Therefore, the voltage from the potentiometer RV1 determines what level of light is needed to make the output of the comparator U1A high (VCC).

The next stage of the circuit is a 555 astable oscillator. However, unlike other astable oscillators this one takes advantage of the RESET input (pin 4) to enable / disable the oscillator. This RESET input is connected to the output of the comparator U1A and since the RESET input is active high (i.e. 555 stops working if RESET is high) the 555 astable oscillator will only work when the light level falling on the D1 falls below the preset level defined by RV1. A simpler way to explain this circuit is that when the ambient light falls too low then the 555 will start to oscillate.

The final stage is the breather circuit. The output of the 555 is a low oscillation square wave (whose frequency is changeable with RV2) but this alone cannot be used to make an LED breathe. A breather is a circuit where the LED gradually turns off and then gradually turns back on (as opposed to be suddenly on and then suddenly off). The breather circuit achieves this by having the output of the 555 charge a large capacitor (C1), in parallel with a resistor / LED circuit. As the voltage increases across C1 the LED gradually turns on (not fully as the current is being limited by the voltage across C1). When C1 is fully charged the LED remains fully on and when the output of the 555 turns off the voltage across C1 begins to fall. This falling voltage makes the LED slowly dim until C1 is discharged. The result is the LED gradually turning on and off and this only happens when the light level is low enough (determined by RV1).

# MATERIALS

Check that you have the following components (traffic light controller)

| Component         | Component Name | Quantity | Looks like  |
|-------------------|----------------|----------|---|
| 8 DIP Socket      | U1A, IC1       | 2        |    |
| 555 IC            | IC1            | 1        |    |
| LM358             | U1             | 1        |    |
| 100Ω Resistor     | R4             | 1        |     |
| 1KΩ Resistor      | R1, R3         | 2        |     |
| 2.2KΩ Resistor    | R5             | 1        |     |
| 10K Potentiometer | RV1, RV2       | 2        |  |
| 100nF Capacitor   | C2             | 1        |   |
| 100uF Capacitor   | C3             | 1        |   |
| 470uF Capacitor   | C1             | 1        |   |
| Photodiode        | D1             | 1        |  |
| LED               | D2             | 1        |  |
| PP3 Connector     | J1 / J2        | 1        |   |
| PCB               | -              | -        |  |

# CONSTRUCTION

## Download the electronics construction manual

To learn how to construct circuits on PCBs download the Electronics Construction Manual from MitchElectronics using the link below. This document shows you how to install all electronic components used in MitchElectronics kits. The list below shows the sections relevant to this kit so do not worry if you see component sections in the document that don't come with this kit!

[www.mitchelectronics.co.uk/electronicsConstructionManual.pdf](http://www.mitchelectronics.co.uk/electronicsConstructionManual.pdf)

## Relevant sections in the electronics construction manual

Resistors

Capacitors

ICs

Diodes

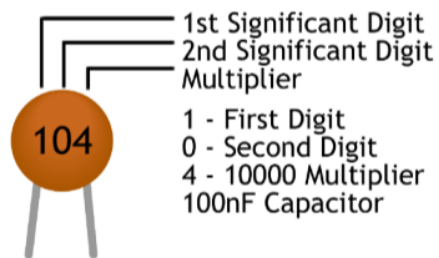
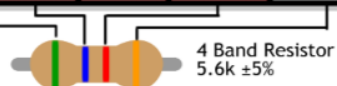
LEDs

Connectors

Wires

## RESISTOR AND CAPACITOR IDENTIFICATION

| Colour | 1 <sup>ST</sup> Band | 2 <sup>ND</sup> Band | 3 <sup>RD</sup> Band | Multiplier    | Tolerance    |
|--------|----------------------|----------------------|----------------------|---------------|--------------|
| BLACK  | 0                    | 0                    | 0                    | 1 $\Omega$    |              |
| BROWN  | 1                    | 1                    | 1                    | 10 $\Omega$   | $\pm 1\%$    |
| RED    | 2                    | 2                    | 2                    | 100 $\Omega$  | $\pm 2\%$    |
| ORANGE | 3                    | 3                    | 3                    | 1k $\Omega$   |              |
| YELLOW | 4                    | 4                    | 4                    | 10k $\Omega$  |              |
| GREEN  | 5                    | 5                    | 5                    | 100k $\Omega$ | $\pm 0.50\%$ |
| BLUE   | 6                    | 6                    | 6                    | 1M $\Omega$   | $\pm 0.25\%$ |
| VIOLET | 7                    | 7                    | 7                    | 10M $\Omega$  | $\pm 0.10\%$ |
| GREY   | 8                    | 8                    | 8                    |               | $\pm 0.05\%$ |
| WHITE  | 7                    | 7                    | 7                    |               |              |
| GOLD   |                      |                      |                      |               | $\pm 5\%$    |
| SILVER |                      |                      |                      |               | $\pm 10\%$   |



# IMPORTANT INFORMATION

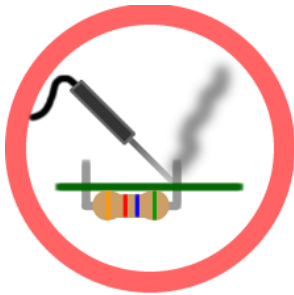
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*RoHS Compliant Kit (Lead free)*



*Low Voltage Kit*



*Caution! Soldering Required*

# TERMS AND CONDITIONS

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## **MitchElectronics Mission**

The main goal of MitchElectronics products is to provide safe electronics to makers and professionals alike while keeping the cost affordable. MitchElectronics kits are ideal for classrooms whereby students can learn about electronics using a hands-on approach which is not only highly effective at teaching students but also improves hand-eye co-ordination as well as grow interest in electronics. Since MitchElectronics kits are aimed at novices and those who are new to electronics they are designed to use low voltage power supplies such as 9V batteries which are inherently safe due to their limited voltage and current capabilities.

## **MitchElectronics Liability**

MitchElectronics kits must be inspected and tested by a competent individual before use and must be constructed by those who are competent to do so. MitchElectronics is not liable for kits and products that are constructed incorrectly or to a poor standard whereby poor standard includes (but not limited to) poor solder connections, overheated components, and damaged components. MitchElectronics is not liable for harm, injury, or damage caused by the misuse of kits and/or products if

- Incorrectly constructed
- Powered by sources other than “portable batteries” or the specified power supply
- Kits used outside their operational range (such as voltage supply, temperature etc.)
- Used as a sub-system (i.e. connected to additional circuits and modules)
- Used in a non-educational environment
- Used in a commercial environment
- Used in any dangerous or potentially hazardous environment
- Purchased from an unauthorised third party

*Portable batteries refers to low powered alkali batteries. Lithium-based batteries and those with large current capabilities (such as lead-acid batteries) are not considered portable or safe*

The use of the kits or products in the above scenarios automatically voids any warrantee or guarantee of that kit or product.

## **Kits must be**

- Inspected for damage before and after construction
- Inspected for missing parts
- Constructed correctly by a qualified individual
- Used in an appropriate manner (i.e. within operational ranges)
- Purchased from an authorised seller

Those who are not competent to construct, inspect, and test kits and products must be accompanied by a competent individual and that competent individual assumes all responsibility for harm or damages and MitchElectronics is not liable for any harm or damage.

## **Missing Parts**

MitchElectronics is only liable for missing parts for kits that have been purchased within 28 days and that have been purchased directly from [www.mitchelectronics.co.uk](http://www.mitchelectronics.co.uk). MitchElectronics is not liable for any product sold by an unauthorised third party.