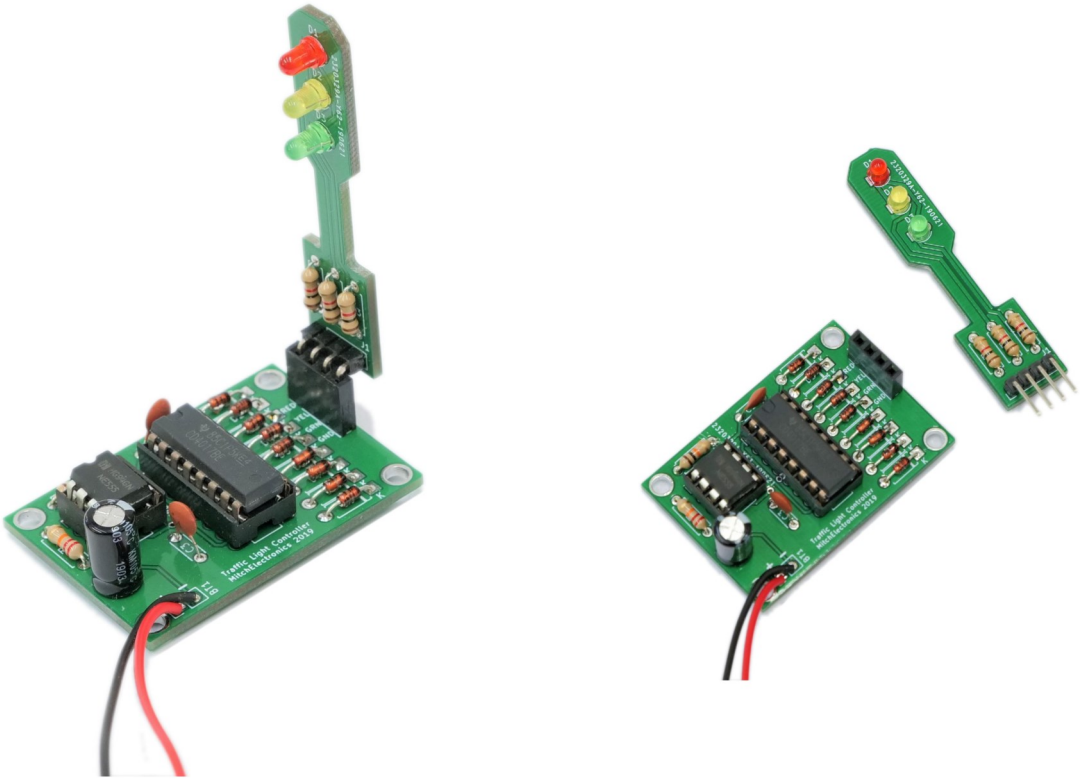
Traffic Lights

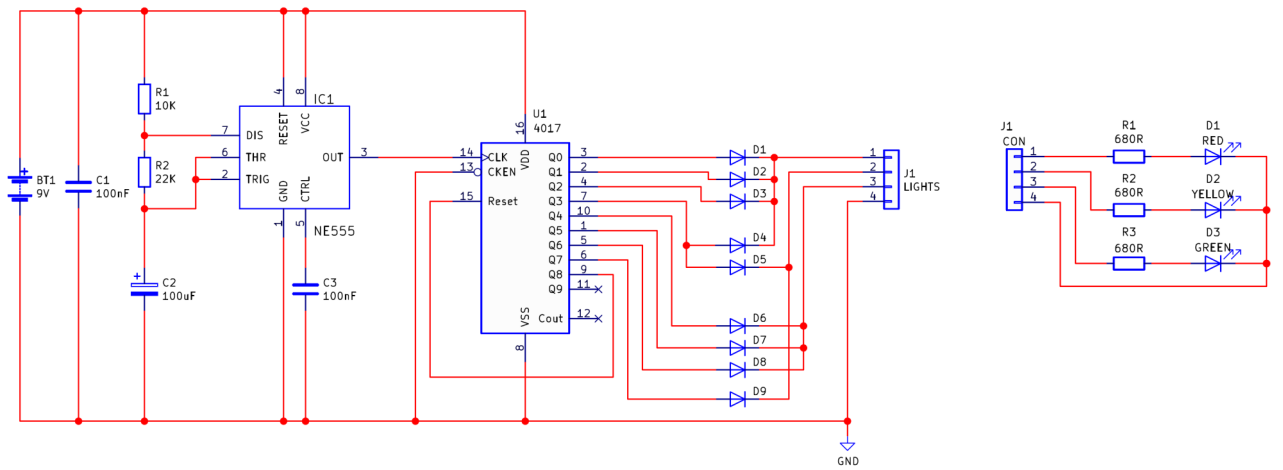
MitchElectronics® 2019



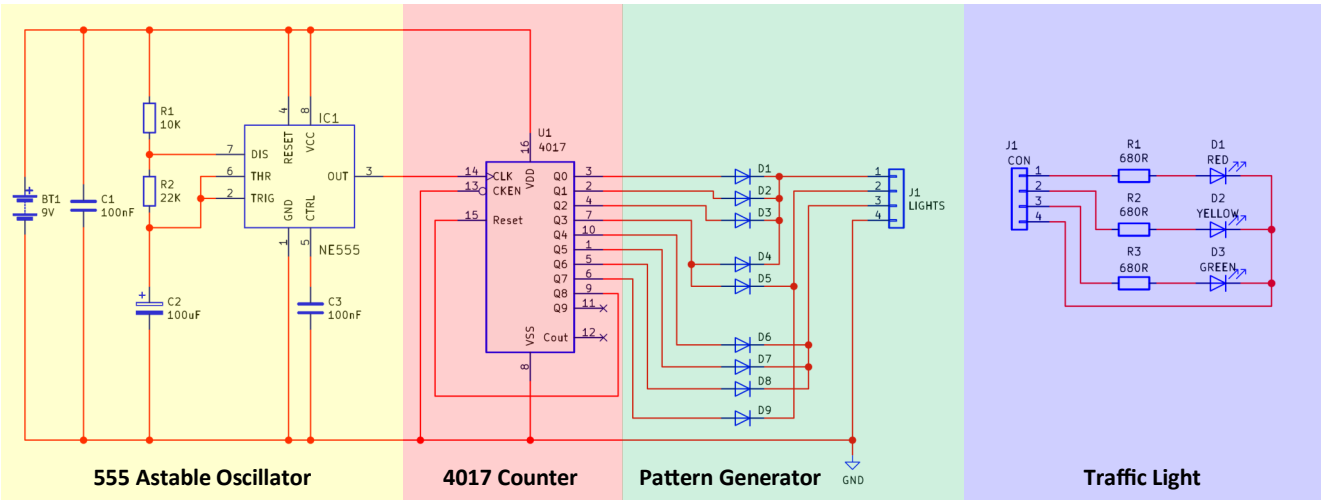
www.mitchelectronics.co.uk

CONTENTS

SCHEMATIC



Schematic (Blocktised)



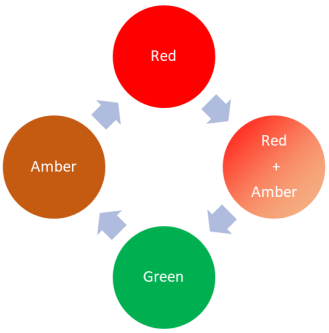
SCHEMATIC EXPLANATION

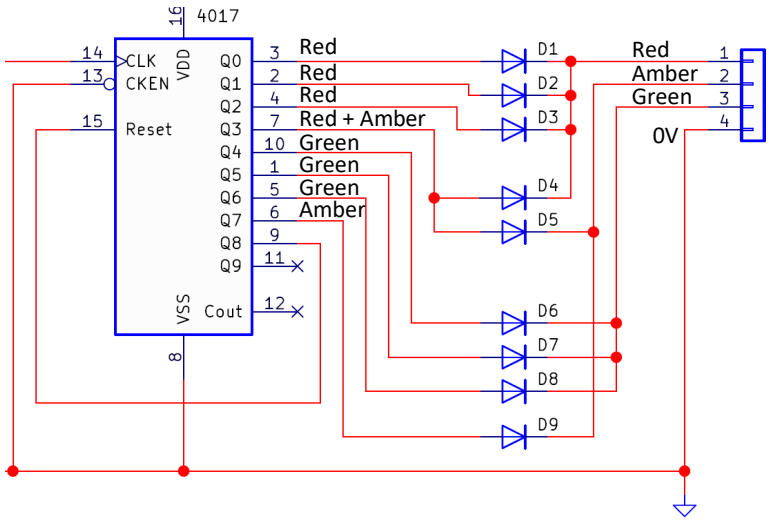
The traffic light kit reproduces the traffic light sequence of common UK traffic lights that include a red, amber, and green light. The circuit is made up of a 555 astable oscillator, a 4017 Johnson counter, a pattern generator, and the output LEDs.

The first stage in the circuit is the 555 astable oscillator and is made up of components R1, R2, C2, and C3. The resistors R1 and R2 along with capacitor C2 provide the timing for the 555 oscillator and for this circuit, the 555 astable oscillator has an output frequency of 0.27Hz.

The second stage is a 4017 Johnson counter which is incremented every time the output of the 555 goes from low to high. Since the period of the 555 square wave output is 4 seconds (frequency of 0.27Hz), the 4017 is incremented once every 4 seconds. This long time is used to make the traffic light stay at each light stage for a reasonable amount of time (for traffic to get through). Output Q8 (ninth output as its 0 based) of the 4017 counter is connected to its reset pin so that when the counter reaches the 8th count it resets the system.

The third stage is the pattern generator which may sound complex but is in fact very simple. The pattern generator takes the current count output of the 4017 and then turns on the needed LEDs on the traffic light. Common British traffic lights have a very specific light sequence (shown below) and to make this happen on our LEDs each output is connected to a diode which feeds the output to the needed LEDs. You will also notice that multiple outputs are combined to increase the length of time a state is shown for. For example, Red and Green are used for 3 counts while the amber and red + amber states are only one count long.

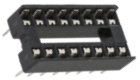
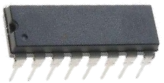
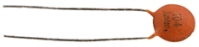
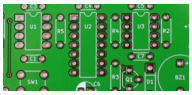




Each traffic light circuit can drive a single traffic so if more traffic lights are to be controlled by the same circuit then drivers will need to be used. Drivers can be made out of a wide range of circuits including transistors, op-amps, and dedicated LED driver ICs. This kit does not have the lights directly mounted to the controller circuit but instead on a separate PCB. This allows greater flexibility so that you can add a different light sequence, multiple lights, and other circuits.

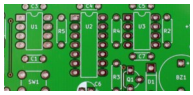
MATERIALS

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

Component	Component Name	Quantity	Looks like
8 DIP Socket	IC1	1	
16 DIP Socket	U1	1	
555 Timer	IC1	1	
4017 IC	U1	1	
10KΩ Resistor	R1	1	
22KΩ Resistor	R2	1	
100nF Capacitor	C1, C3	2	
100uF Capacitor	C2	1	
1N4148 Diode	D1, D2, D3, D4, D5, D6, D7, D8, D9	9	
4 Way Pin Socket	J1	1	
PP3 Connector	BT1	1	
PCB	-	1	

MATERIALS

Check that you have the following components (traffic light)

Component	Component Name	Quantity	Looks like
680Ω Resistor	R1, R2, R3	3	
Red LED	D1	1	
Yellow LED	D2	1	
Green LED	D3	1	
4 Way Pin Header	J1	1	
PCB	-	1	

CONSTRUCTION

Download the electronics construction manual

To learn how to construct circuits on PCBs download the Electronics Construction Manual from Mitch-Electronics 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

Relevant sections in the electronics construction manual

Resistors

Capacitors

ICs

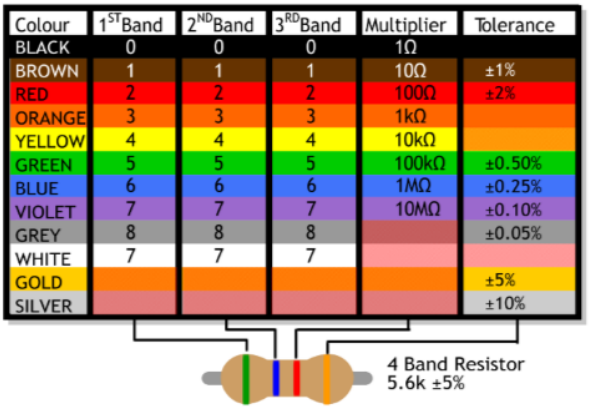
Diodes

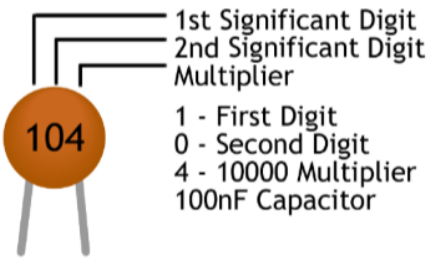
LEDs

Connectors

Wires

RESISTOR AND CAPACITOR IDENTIFICATION

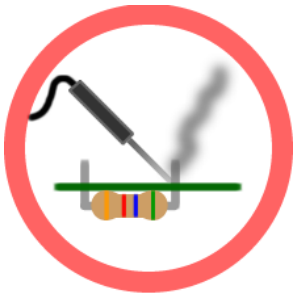




IMPORTANT INFORMATION

RoHS Compliant Kit (Lead free)

Low Voltage Kit



Caution! Soldering Required

TERMS AND CONDITIONS

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. MitchElectronics is not liable for any product sold by an unauthorised third party.