PWM Generator Kit

MitchElectronics 2018

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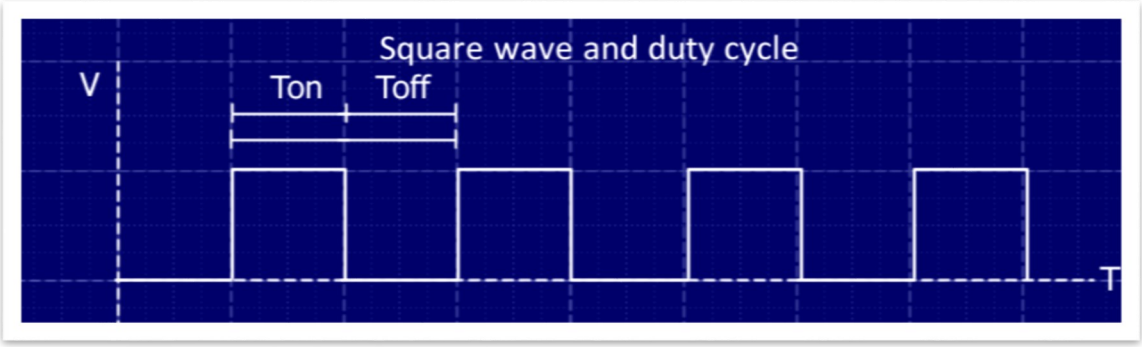
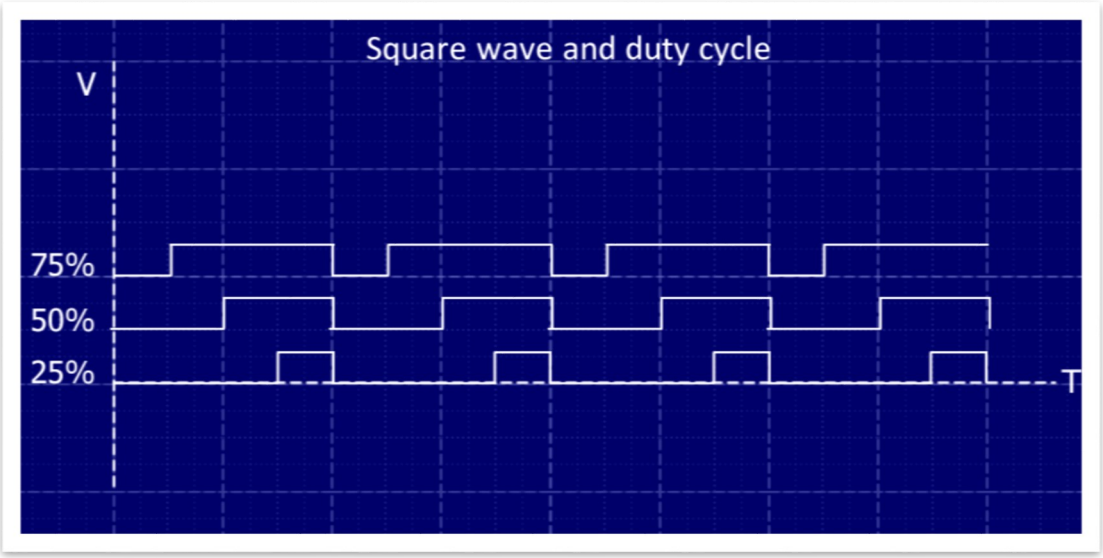
INTRODUCTION

Pulse width modulation involves taking a square wave and changing the duty cycle of the wave to convey information. But this explanation is too complex for those who do not know what PWM actually is or have never used PWM signals. So let's start with the basics, the duty cycle!

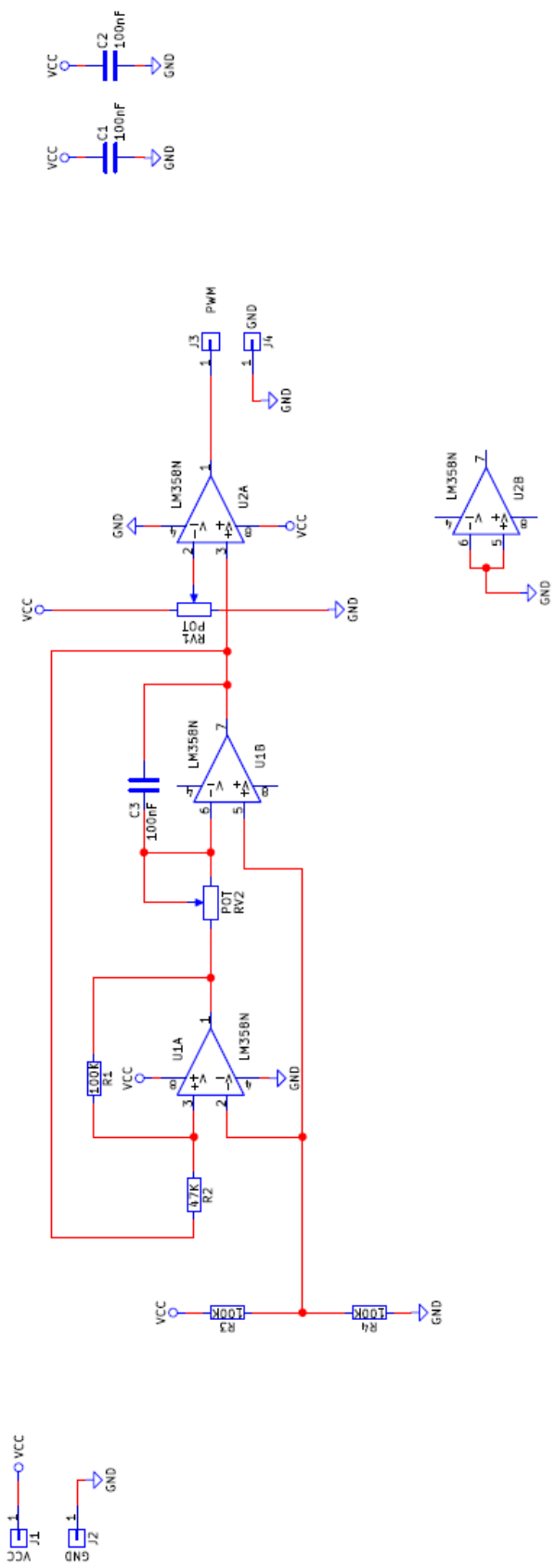
The graph below shows a square wave with a frequency of f (the actual value does not matter). Two times are shown, Ton and Toff. Ton is the time for which the wave is at its maximum and Toff is the time for which the wave is at its minimum. The time period, t, of the wave is Ton + Toff.



Now the frequency is determined by the time period so therefore the frequency is also dependent on the Ton and Toff values. But realise one thing, the frequency is determined by the sum of Toff and Ton and NOT the individual values. This means that the frequency can be kept the same BUT the values of Ton and Toff can be changed. This is the basics of PWM and now a new term comes to play, duty cycle!

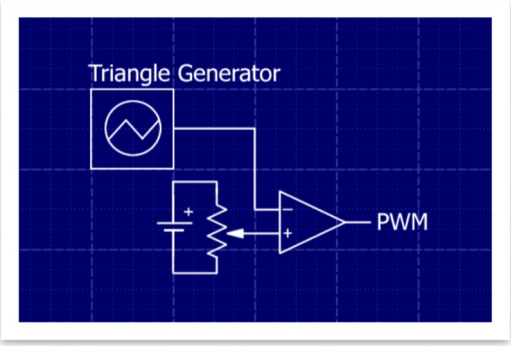


SCHEMATIC

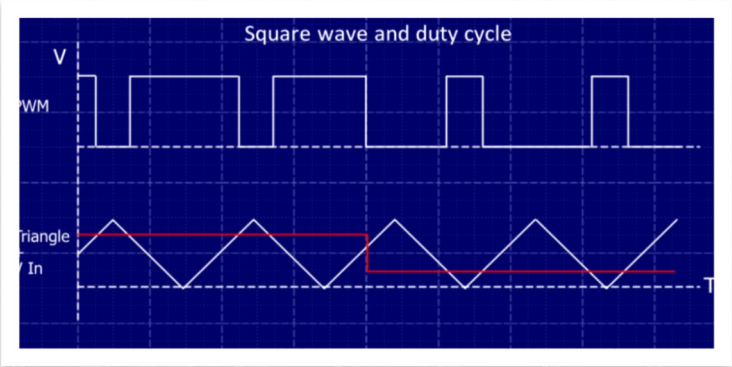

C2
100nF
VCC
GND
C1
100nF
VCC
GND
PWM
J3
GND
J4
GND
LM358N
U2A
GND
VCC
LM358N
U2B
GND
VCC
POT1
GND
LM358N
U1B
C3
100nF
POT
RV2
LM358N
U1A
100K
R1
VCC
GND
4.7K
R2
VCC
100K
R3
100K
R4
GND
VCC
J1
GND
J2

SCHEMATIC EXPLANATION

The core of the PWM Generator is a triangle wave generator which is fed into a comparator as shown in the simplified diagram below.



The potentiometer sets the PWM duty cycle by feeding a voltage into the positive pin of the comparator while the triangle oscillator provides the comparative voltage to create a square wave. This can be seen in the graph below more clearly.



The red line represents the voltage being created by the potentiometer. Half way the potentiometer is turned to output a lower voltage. The lower the voltage the potentiometer outputs will result in a smaller duty cycle. If the triangle wave is larger than the potentiometer voltage the comparator outputs a low voltage. This is because V- is larger than V+. If the triangle wave is smaller than the potentiometer voltage then the comparator will output a high voltage because V+ is larger than V-. That's it! Nothing else to it!

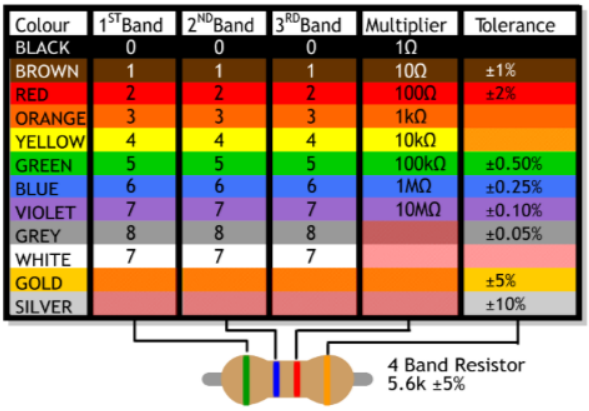
The PWM Generator not only has a potentiometer to adjust the duty cycle but also has a second potentiometer to adjust the frequency. Adjusting the frequency potentiometer changes the frequency of the triangle generator and thus changes the output frequency of the PWM signal.

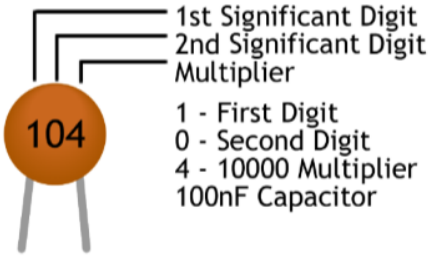
MATERIALS

Check that you have the following components

Component	Component Name	Quantity	Looks like
8 DIP Socket	U1, U2	2	
LM358	U1, U2	2	
100nF Capacitor	C1, C2, C3	3	
47kΩ Resistor	R2	1	
100kΩ Resistor	R1, R3, R4	3	
Potentiometer	POT	2	
Wire	Red and Blue	1 Each	
Wire	Black	2	
PCB	-	1	

RESISTOR AND CAPACITOR IDENTIFICATION





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

Potentiometers

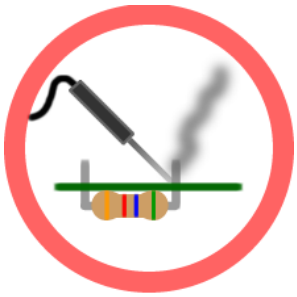
Integrated Circuits

Wires

IMPORTANT INFORMATION

RoHS Compliant Kit (Lead free)

Low Voltage Kit



Caution! Soldering Required