

PWM Generator Kit

MitchElectronics 2018



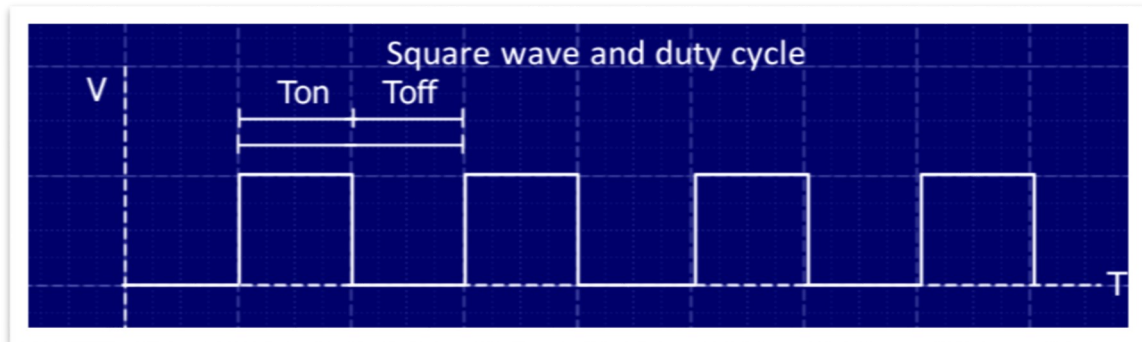
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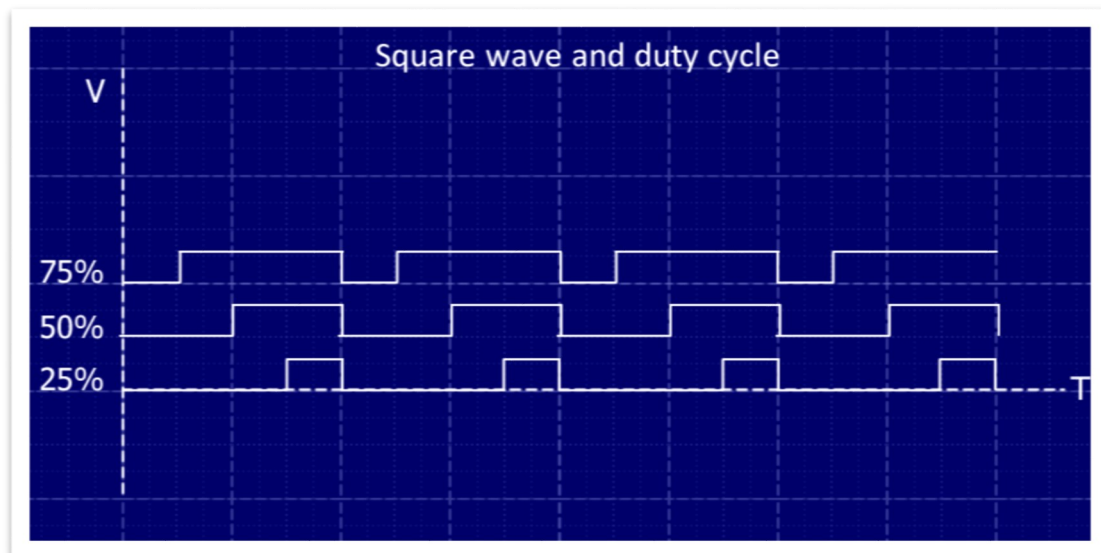
INTRODUCTION

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!

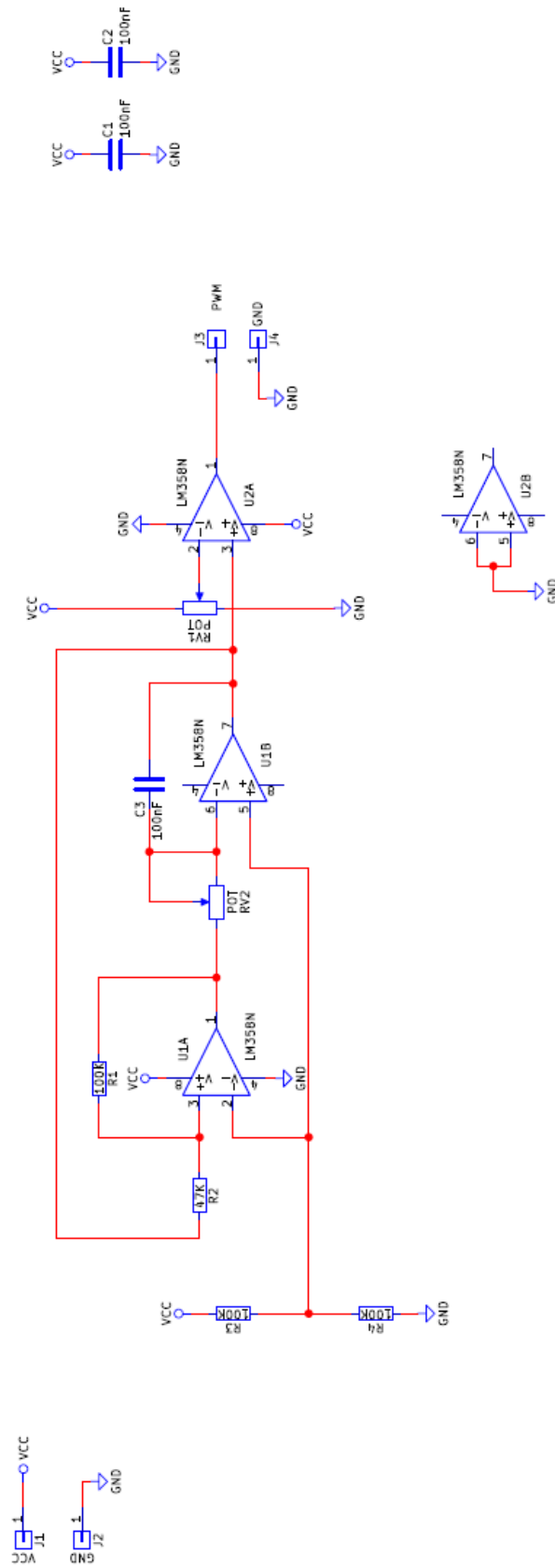
The graph below shows a square wave with a frequency of f (the actual value does not matter). Two times are shown, T_{on} and T_{off} . T_{on} is the time for which the wave is at its maximum and T_{off} is the time for which the wave is at its minimum. The time period, t , of the wave is $T_{on} + T_{off}$.



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

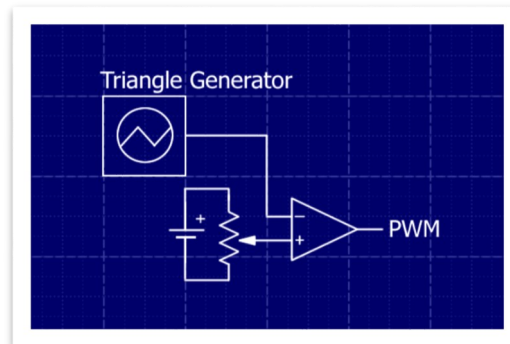


SCHEMATIC

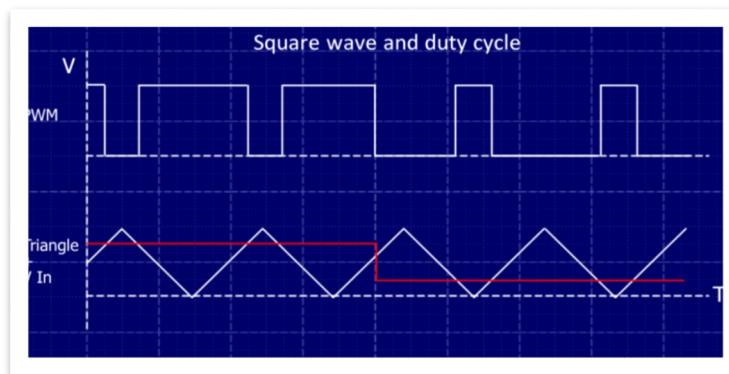


SCHEMATIC EXPLANATION

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.

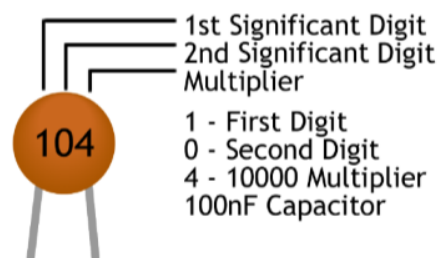
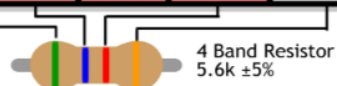
MATERIALS

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

Colour	1 ST Band	2 ND Band	3 RD Band	Multiplier	Tolerance
BLACK	0	0	0	1Ω	
BROWN	1	1	1	10Ω	±1%
RED	2	2	2	100Ω	±2%
ORANGE	3	3	3	1kΩ	
YELLOW	4	4	4	10kΩ	
GREEN	5	5	5	100kΩ	±0.50%
BLUE	6	6	6	1MΩ	±0.25%
VIOLET	7	7	7	10MΩ	±0.10%
GREY	8	8	8		±0.05%
WHITE	9	9	9		
GOLD					±5%
SILVER					±10%



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

Relevant sections in the electronics construction manual

Resistors

Capacitors

Potentiometers

Integrated Circuits

Wires

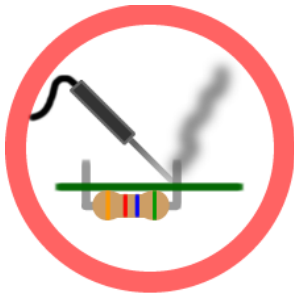
IMPORTANT INFORMATION



RoHS Compliant Kit (Lead free)



Low Voltage Kit



Caution! Soldering Required