

Guitar Sounds

WAH FUZZ SWITCHING SUSTAIN ATTACK/DECAY VIBRATO/TREMOLO

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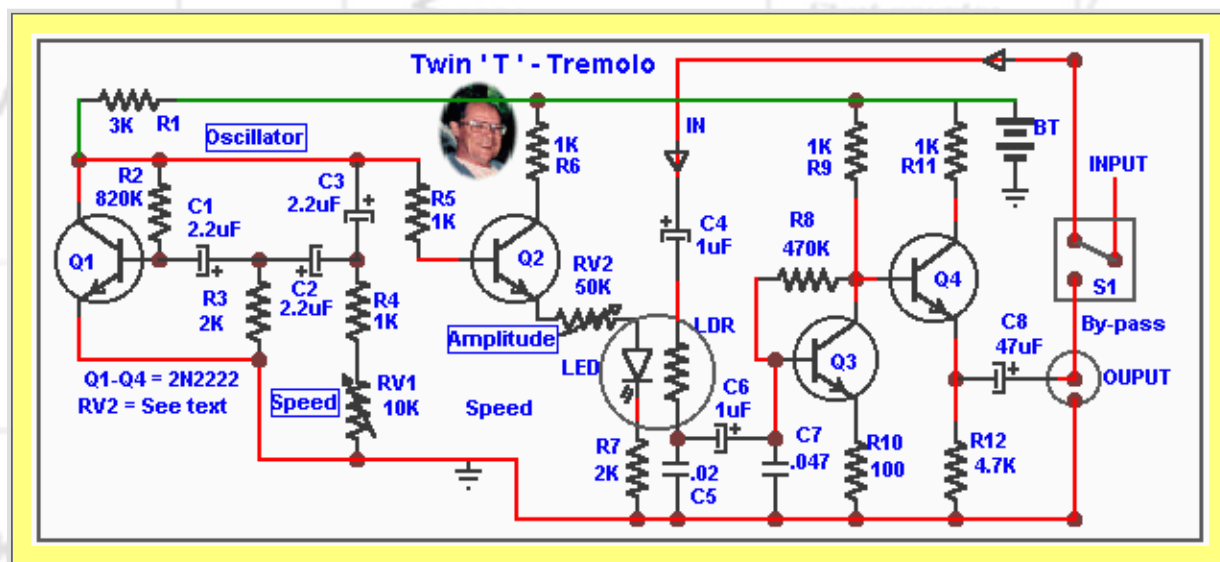
Introduction

Vibrato or Tremolo

This is the latest addition to the Guitar Effects projects . I , personally could never discern the difference but I found some definitions describing the effects. Tremolo was defined as the modulating of a note volume or amplitude while vibrato was said to be the effect produce by varying the pitch of a note like when moving the string on the fret of a guitar . Below are two tremolos , the first one using a "Twin-T" oscillator and the second one using a 555 IC timer .

Twin-T Oscillator

When a signal is processed by this circuit it adds modulations called Tremolo depending on the rate set by the oscillator . For the guitarist , many amplifiers incorporate a tremolo effect but for those that do not , this little circuit will provide the missing elements such as choice of speed from about 3 to 10 Hz and amplitude setting .



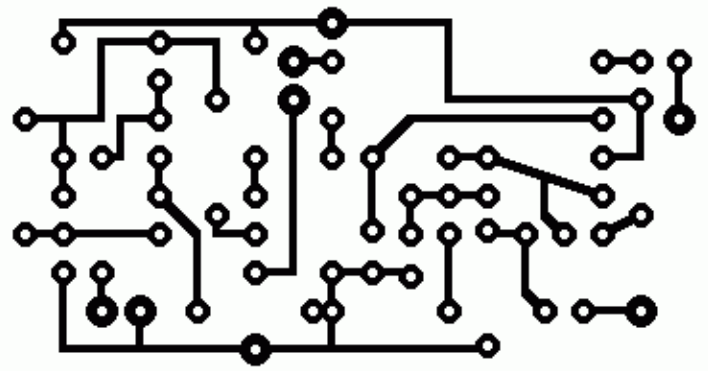
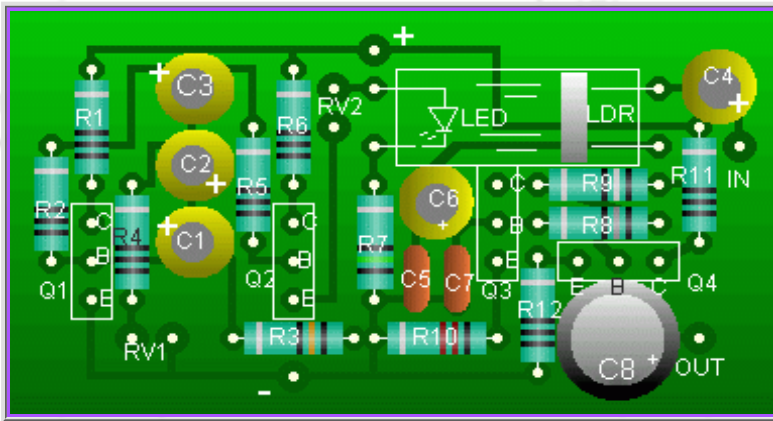
How does it work

This tremolo uses a transistor oscillator which is made of Q1, R1 to R4 , RV1, and three capacitors C1,C2,C3 . RV1 sets the oscillation rate . It produces a sine wave which is ideal for a smooth voltage signal which is applied to the base of Q2 used as a current amplifier the output of which is about 3 VAC . RV2 control the current to the LED's maximum brightness which in turn varies (modulates) the resistance of the LDR therefore the signal applied through it .

The input signal is introduced to the LDR through C4 and the output is filtered by C5 and C7 . Q3 amplifies the modulated signal and the output is taken from C8. Q4 main purpose is to provide a low impedance output .The battery should last a long time as the total current used is only 5mA . Too much amplification with Q3 will result only in amplifying the LDR noise caused by the varying resistance and this noise could be heard even when a signal is not present . .

A by-pass switch (S1) is used as shown , it can be a normally closed push button single pole double throw (SPDT) or a momentary type . The oscillator starts to operate as soon as the power is applied from a 9 volts battery . An On/Off switch can be used or the switching arrangement using the jack connections as described , see [Input Jack connections](#)

Layout and PCB shown twice the actual size



LDR Module

The construction of the [LED/LDR capsule](#) is the same as in use in the Wah circuit . Use a high brightness LED , red is OK . Choose an LDR which has a low top resistance value when in darkness , a 5 to 10 meg . resistance is about right .

Important Notes

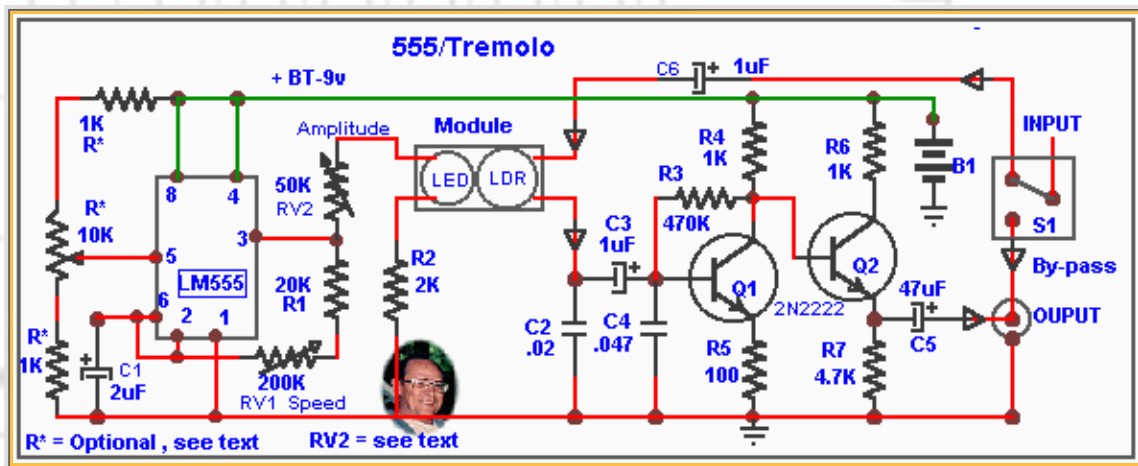
The oscillator depends on the specified components values for stability and oscillation rate within the designed range , any substituted values will affect its function . C1 , C2 and C3 should be dipped tantalum types but non-polarized capacitor are still better for this application .

RV2 value of 50K was used on my prototype but to accomodate different LEDs and LDRs response , other resistance values may be required to obtain the best result .

Tremolo with the 555 Timer

This circuit is not as smooth as the previous one . Because the 555 Timer oscillator produces a square wave it has a sharper attack tremolo effect but it allows for a wider range of frequency and with the addition of the optional circuit wich consist R* and RV* connected to pin 5 of the timer will enable varying the square wave from its normal 50% down to a sharp pulse or to its maximum pulse length .

This option combined with the speed and amplitude setting produces a multitude of effects like staccado , slow or sharp tremolo and more . Try it also with reverb for unusual results .

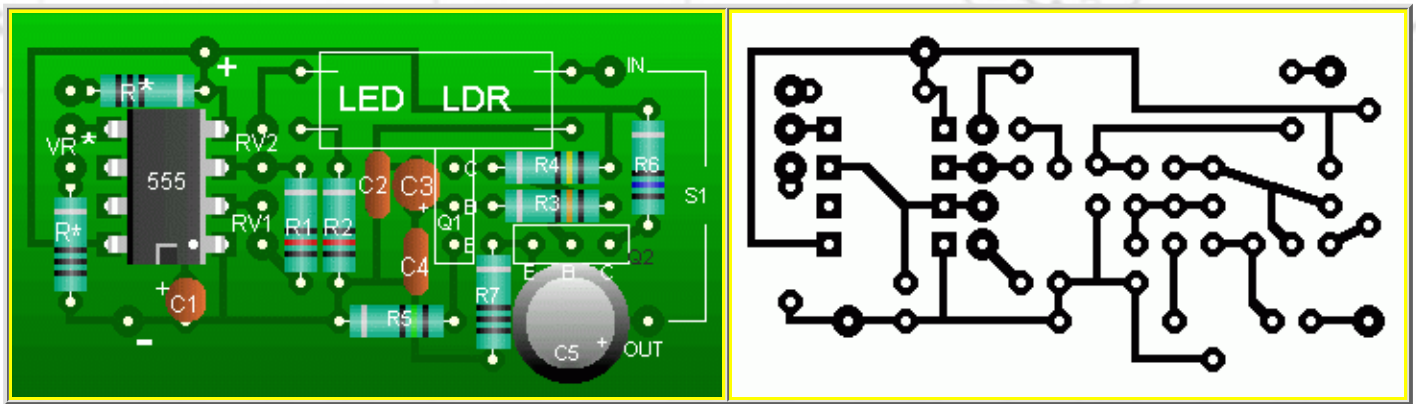


Construction

The oscillator set-up allows for a frequency of 1Hz to about 22Hz , changing the value of C1 will give other ranges , multiple ranges can be had by simply switching different values .

The same comments about using the amplitude setting RV2 applies for this circuit and the remaining part of the amplifier circuit is the same as the with the Twin-'T' Tremolo .

Layout and PCB shown twice the actual size



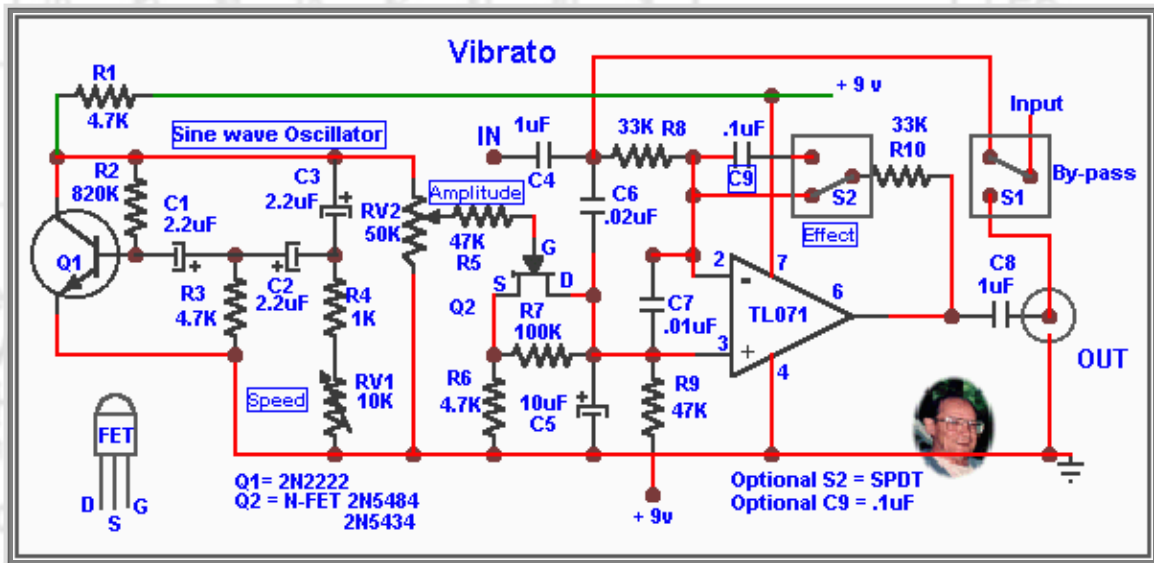
Using the Tremolo

I found the best way to use the tremolo is to first set the guitar volume control to 3/4 of maximum output , turn on the amplifier and raise volume control until a slight breathing sound is heard then just back down until the output is clear of any noise . Try some notes , adjust the tremolo to maximum then readjust the guitar volume control higher or lower as required .

Vibrato

Below is the circuit for theVibrato which is the result of pitch modulation and to accomplish this I chose a N-FET transistor as a variable resistor to modulate the bias of the op-amp at pin 3 . C6 and C7 are used as phase shifter thus modulating the pitch at the signal source .

The oscillator used is the Twin-T oscillator wich is similar to the tremolo with slight change in values to R1 and R3 the result is a slightly faster oscillating range and slight gain in voltage output and doing away with the buffer stage . The sine wave is taken from the Q1 collector and its amplituded is controlled by RV2 to modulated the gate (G) of the FET's resistance . This modulated resistance is applied between the negative bus (source)and the op-amp at pin 3 (drain) . Normally the op-amp needs a voltage half the power supply at pin 3 to operate in the AC configuration and you will notice that R9 is used as the voltage divider resistance connected to positive bus providing a fixed positive bias to the op-amp while the FET modulates the negative side of the bias .



The components value used to calibrate the FET , RV2,R5,R6,R7 and R9 are critical and should not be changed . I used both the 2N5484 and the 2N5434 with good results and low noise , some other FETs I've tried produced excessive noise that could be easily detected by the amplifier . The TL071 , a FET input op-amp has been chosen for its low noise output but other op-amps can be used .

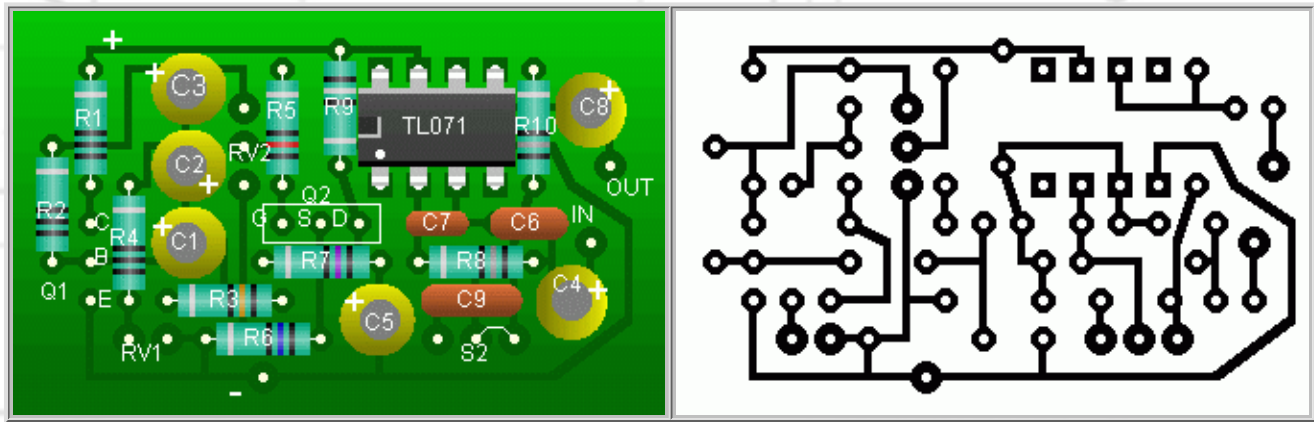
Use good shielding pratice , S1 is shown as simple by-pass switch , more info can be found about that on the switching page .

Effect Option

S2 , a SPDT miniature swtich and C9 (.1uF) have been added to produce a very pleasant effect when switched in series with R10 which is the gain feed back resistor . When switched in and depending of the setting of RV1 and RV2 will give a

tremulous to something like an echo modulation , I found it to be a very pleasant sound . The effect is optional and if not used S2 and C9 can be omitted and a jumper installed where shown on the layout at S2 connection points .

Layout and PCB shown twice the actual size



Let me have your comments on the performance results of these little circuits .

Laurier Gendron

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