CheckMate Vibrotrem

Synchronized Vibrato and Tremolo

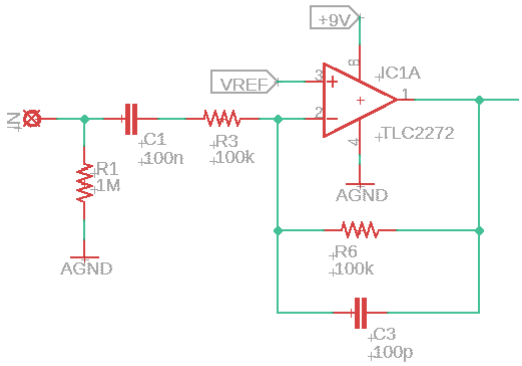
Overview

I've had a hankering to try a tempo-synchronized tremolo and vibrato for some time. Together, the two effects can create some fun textures, and having the LFO's synchronized allows for some mild rotary-esque sounds, though this is not a rotary emulator. I wanted to make one that was easily DIY-able, but the vibrato can be a bit of a challenge. I decided to use the ES56033 and modulate its delay time due to its short minimum delay time of about 14 ms (half the PT2399). It's a little weird, but it sounds pretty cool.

How it Works

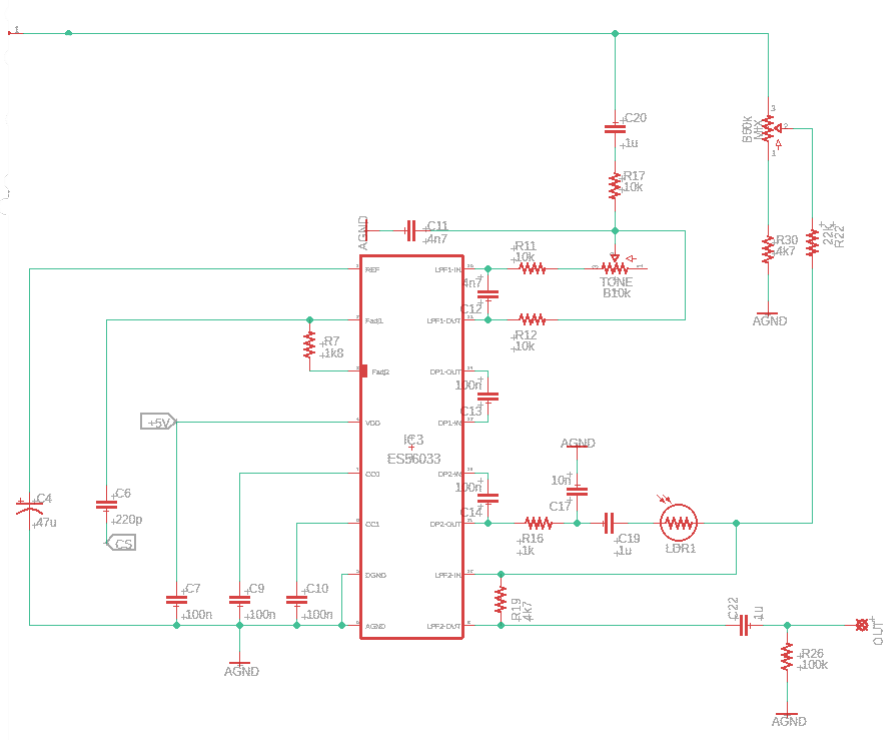
At the heart of it, this circuit is a combination of my Wobble Box circuit and Forrest Whiteside's Shoot the Moon tremolo. It uses the ES56033 delay stage from the Wobble Box and the LFO and general operational concept from the Shoot the Moon. However, to keep parts count down, the tremolo is implemented using one of the two onboard opamps in the ES56033.

The input buffer is pretty standard stuff for a circuit like this. It's a simple inverting opamp stage so that we can split the signal between the dry input to the output summing amplifier and the delay stage.



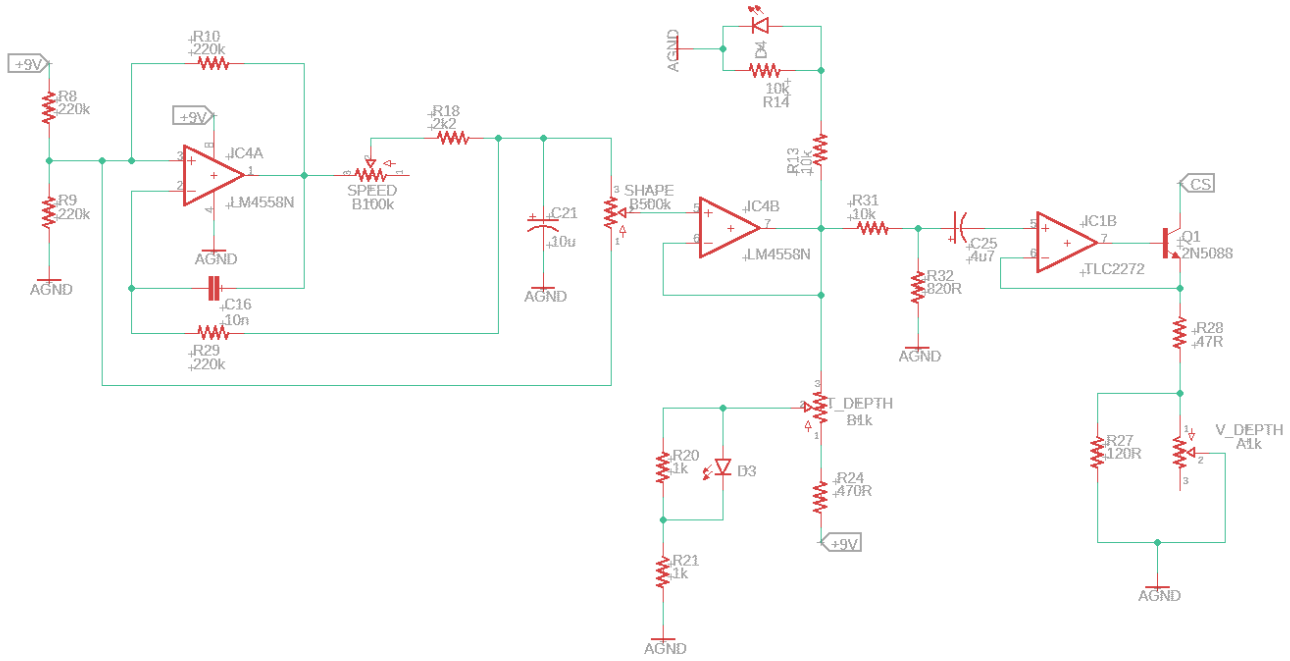
CheckMate Input Buffer

The delay stage is really a combination delay and tremolo stage. The signal comes in to a multifeedback lowpass filter as usual, but the delay time is modulated by way of a current sink (discussed later), as is necessary for the ES56033 due to the internal compensation circuitry. The output of the ES56033 is amplitude modulated (tremolo) by way of an LDR on the input pin of the opamp, much like how the Shoot the Moon does its tremolo. However, the ES56033 opamp is also used as the summing amplifier with the dry signal. You will notice that instead of a traditional mix control that varies the wet signal between 0 and roughly unity with the dry signal, the dry signal is controlled between 0 and unity. This allows for a full vibrato-and-tremolo only output for really intense effects with dry at 0 and more chorus-y, rotary effects when there is some dry signal mixed in. Additionally, this was done to save the space of a dual opamp chip with having a separate output buffer.



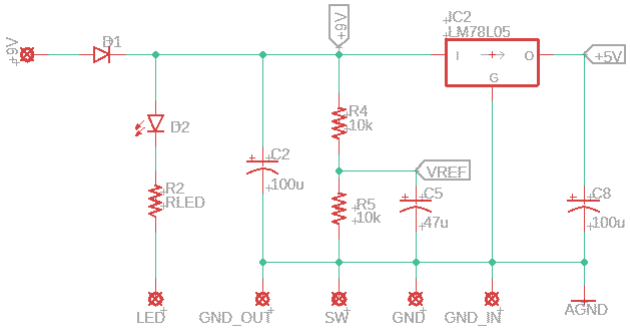
CheckMate Delay/Tremolo/Output Stage

The LFO is taken from the Shoot the Moon. I really liked that it has shape control in addition to the standard speed and depth controls. Additionally, the way the output for the tremolo is configured made it compatible with the necessary current sink that is used for modulating the delay time of the ES56033. The ES56033 delay time cannot simply be modulated by putting a voltage directly on one of the Fadj pins because I believe it has internal compensation circuitry, so a current sink is needed to control how much current is pulled through the internal VCO circuit.



CheckMate LFO

Finally, we have the power section. This is pretty standard for a pedal like this, with +9V, VREF, and +5V. If you've seen any number of my designs, this shouldn't be a surprise to you.



CheckMate Power Section

BOM

The BOM below is the list of parts I used for mine along with quantities. All parts are through hole with resistors being 1/4W. I got everything from Tayda.

Part	Qty.	Notes
47R Resistor	1	
120R Resistor	1	
470R Resistor	1	
820R Resistor	1	
1k Resistor	3	
1k8 Resistor	1	
2k2 Resistor	1	
4k7 Resistor	2	
10k Resistor	8	
22k Resistor	1	
100k Resistor	3	
220k Resistor	4	
1M Resistor	1	
Current Limiting Resistor	2	
100pF Capacitor	1	
220pF Capacitor	1	
4.7nF Capacitor	2	
10nF Capacitor	2	
100nF Capacitor	6	
1uF Ceramic/Film Capacitor	3	
4.7uF Electrolytic Capactitor	1	
10uF Electrolytic Capacitor	1	
47uF Electrolytic Capacitor	2	
100uF Electrolytic Capacitor	2	
A1k Potentiometer	1	16mm PCB Mount
B1k Potentiometer	1	16mm PCB Mount
B10k Potentiometer	1	16mm PCB Mount
B50k Potentiometer	1	16mm PCB Mount
B100k Potentiometer	1	16mm PCB Mount

B500k Potentiometer	1	16mm PCB Mount
1N5817	1	
KE10720 LDR	1	
LED	3	Bypass, Rate, LDR
78L05	1	
TLC2272	1	
LM4558	1	Any 4558 should work
ES56033E	1	
Enclosure	1	
1/4” input jack	2	
DC power jack	1	
3PDT footswitch	1	

Schematic

The schematic for this project is provided below as well as a separate image in the project documentation folder.

CheckMate Full Schematic

Build Notes

Here are some things I noted from building the CheckMate that might be helpful to you. Please read this section to make sure you don't go through excessive frustration.

Enclosure Size/Drilling

The CheckMate fits nicely into a 125B. The board is a little too wide to fit a 1590B.

Jacks

Whatever jacks you use for in/out and power in 125B are fair game; no restrictions here.

Opamps

While the TLC2272 is specified for one of the dual opamps, a TL072 can be pressed into service. Because it is not a rail-to-rail type opamp, the range of vibrato will be different and the voltage divider formed by R31/R32 will need to be adjusted. See the values used for the Wobble Box for a good starting place.

In Closing

The CheckMate is a fun project that can get some roughly rotary sounds with very few parts, but it's not really going to fool anyone outside of a mix. Still, it scratches an itch I've had for a while, so I hope you like it.