USAGI ELECTRIC

Timer | UE555

Hollow State Circuits

Description

The UE555 is a questionably precise timing circuit capable of producing largely inaccurate timing delays or oscillations. For stable operation you should probably use a real 555. For completely epic looking operation, you should definitely use the UE555. Constructed of 14 vacuum tubes in conjunction with simple resistors and capacitors, this is one of the only 555 timers on the planet that doesn't use any silicon.

Features

- 60% of the time, it works every time
- Works in astable, monostable and bistable modes
- Output can source up to 2.5mA at 18V
- Output can absolutely fry TTL circuits

Applications

Generating a timing signal

Operating as a space heater

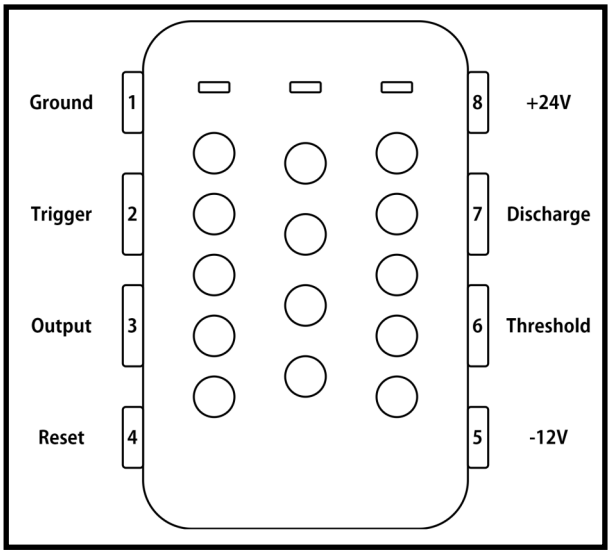
Extremely overkill Schmitt trigger

Pulse Width Modulation

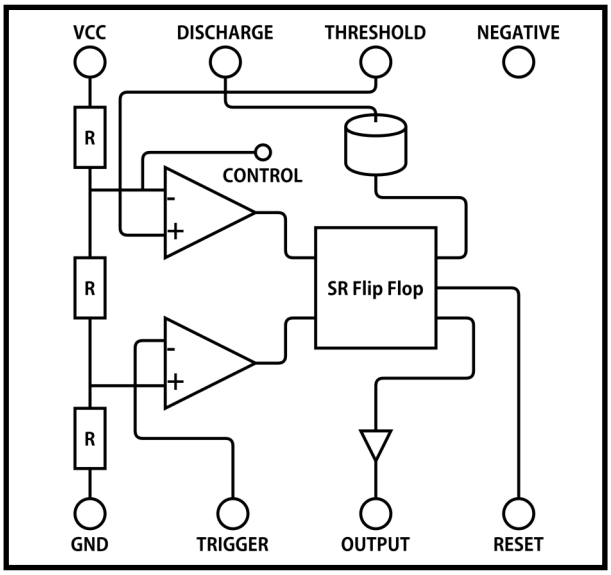
Absolute Maximum Ratings

Positive Supply Voltage	+27 V
Negative Supply Voltage	-14 V
Power Dissipation	26.45 W
Output Current	Approx. 2.5 mA
Initialization time	Approx. 11 sec.

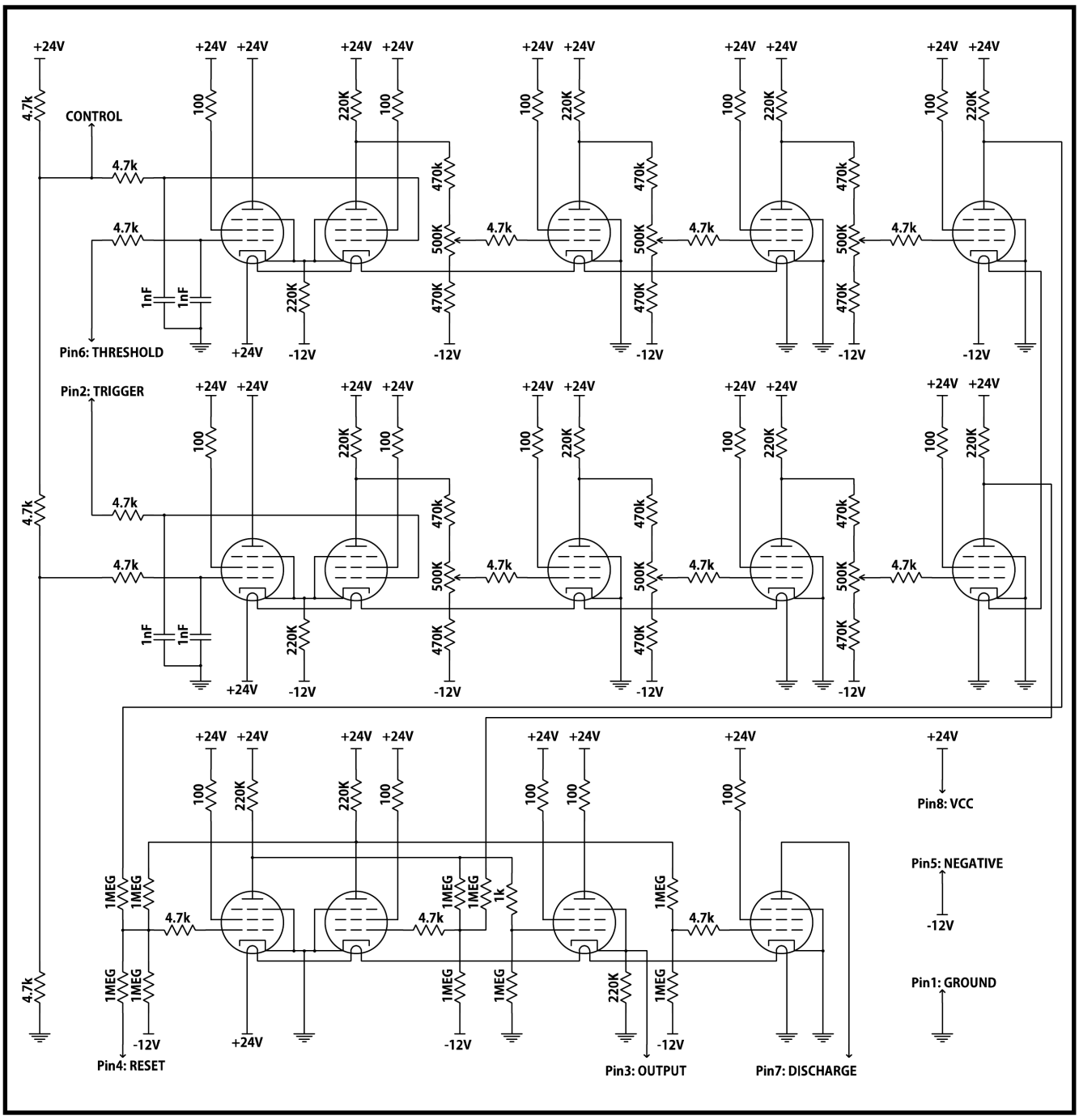
Configuration (Top View)



Block Diagram



Equivalent Circuit

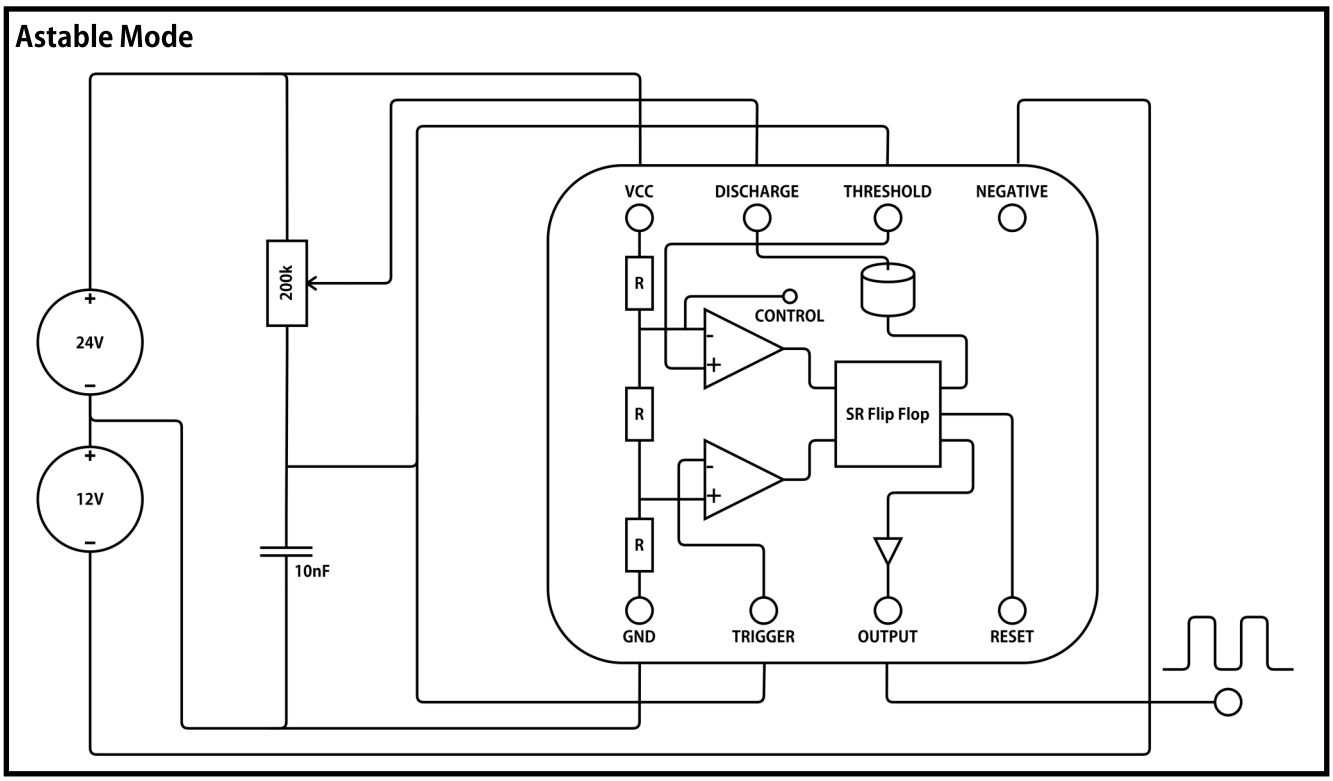


Electrical Characteristics T_A = Room Temperature, V_{CC} = +24V, V_{SS} = -12V

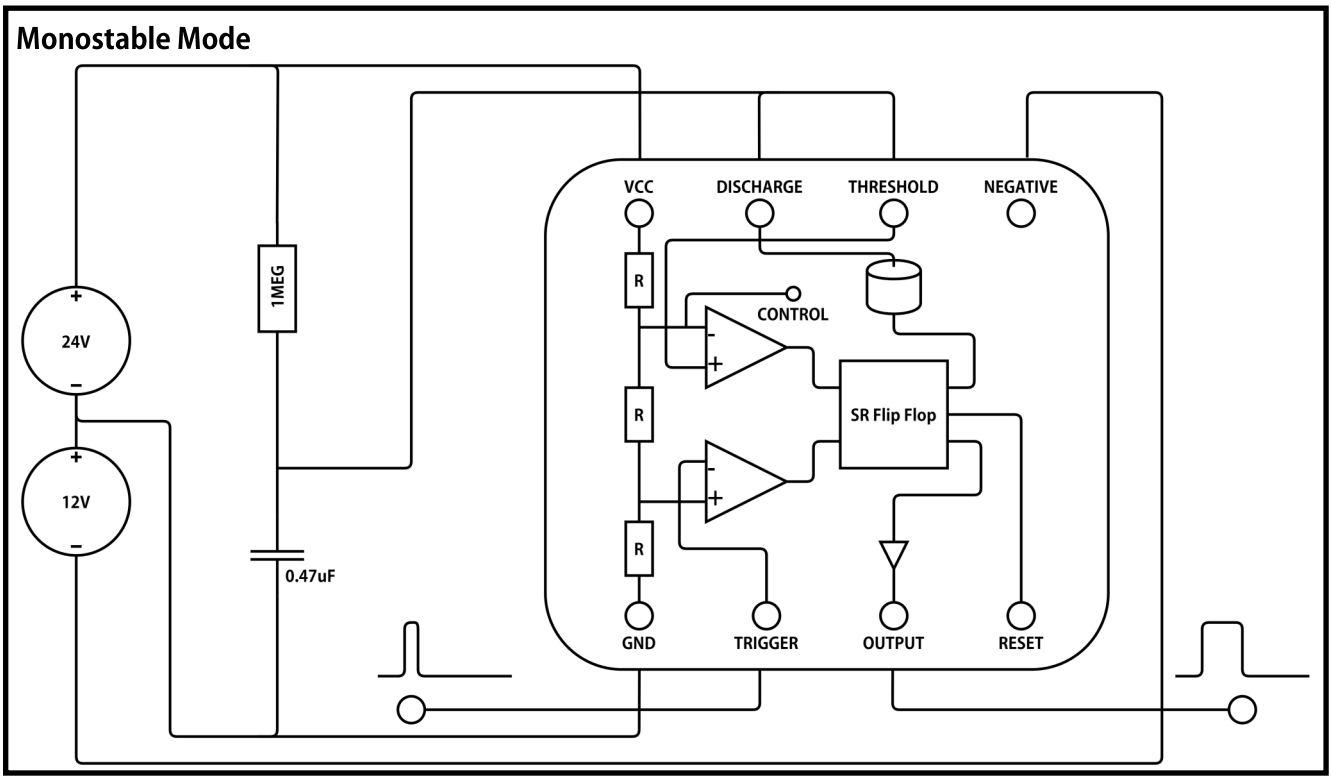
Parameter	Test Conditions	UE555			Units
		Min	Typ	Max	
Supply Voltage		22.5 -11.3	24.0 -12.0	27.5 -13.9	V
Supply Current	Vcc = 24V Vss = -12V		0.9 0.3		A
Inrush Current	Vcc = 24V Vss = -12V			5.0 2.0	A
Threshold Voltage			15.5		
Trigger Voltage			7.5		
Reset Voltage					
	Isink = 0.5mA		3.1		V
Output Voltage Drop	Isink = 1.0mA		4.8		V
	Isink = 2.5mA		8.5		V
Rise Time of Output			10		us
Fall Time of Output			20		us

Example Circuits

Astable Mode

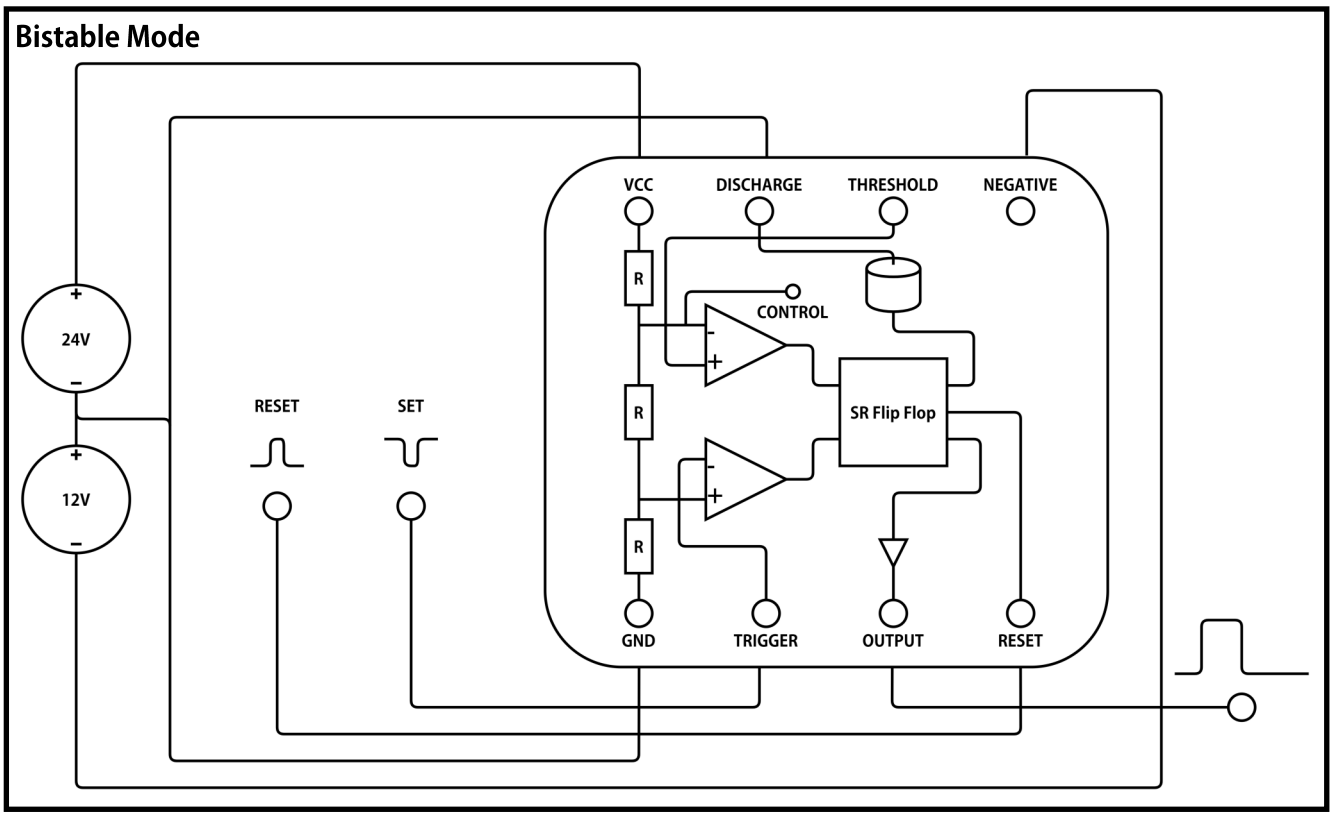


Monostable Mode

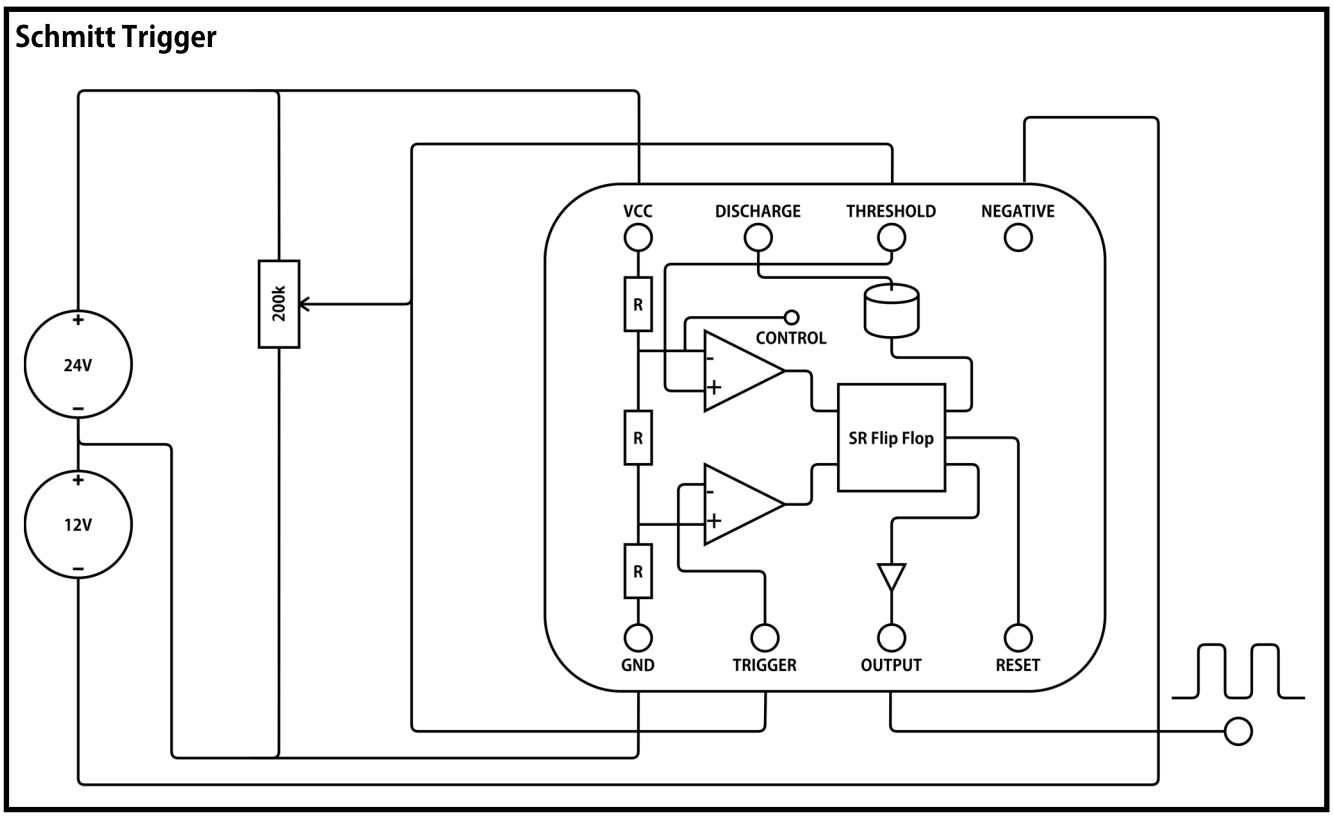


Example Circuits

Bistable Mode

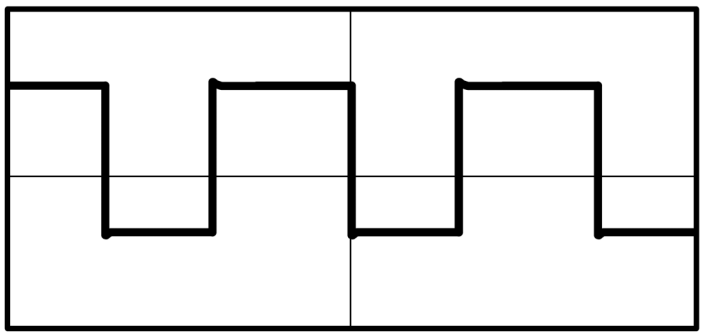


Schmitt Trigger

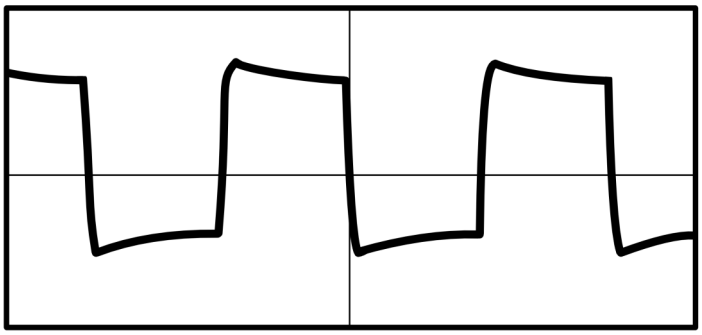


Waveforms

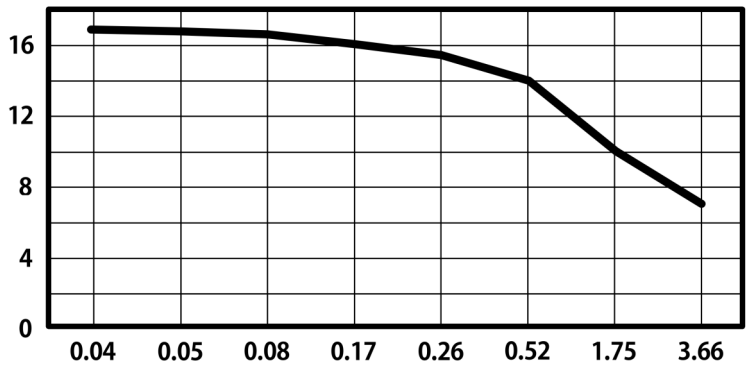
Astable Multivibrator Output at 10 Hz



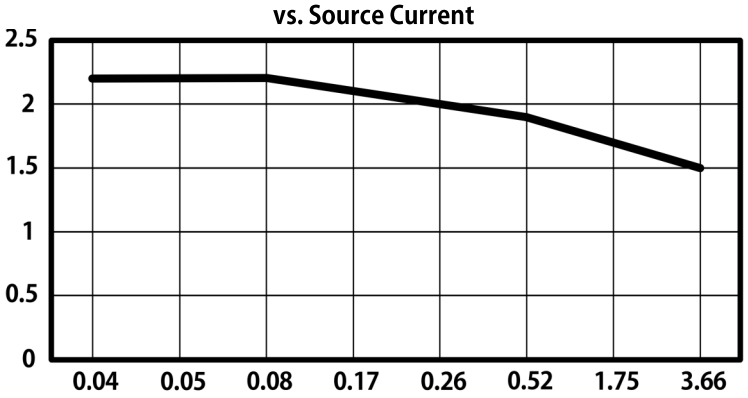
Astable Multivibrator Output at 2 kHz



High Output Voltage
vs. Source Current



Low Output Voltage
vs. Source Current



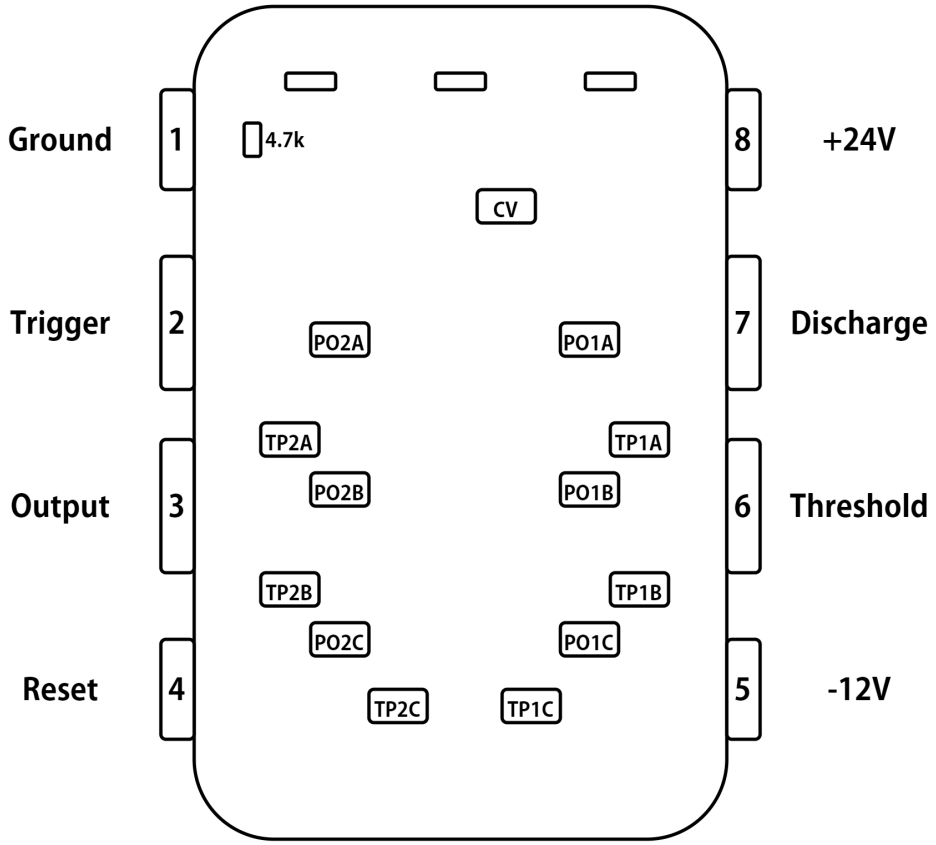
Tuning and Setup

OpAmp A

1. Using a jumper wire, connect the CV pin to ground.
2. Using a signal generator, connect a low amplitude signal (approx. 0.5V P-P) to Pin 6: Threshold
3. Connect an oscilloscope to test point TP1A
4. Adjust potentiometer PO1A to achieve largest, most uniform waveform on oscilloscope.
5. Move oscilloscope to TP1B and adjust potentiometer PO1B in the same manner.
6. Move oscilloscope to TP1C and adjust potentiometer PO1C in the same manner.
7. Remove oscilloscope and jumper wire.

OpAmp B

1. Using a jumper wire, connect the 4.7k resistor shown in the illustration below to ground.
2. Using a signal generator, connect a low amplitude signal (approx. 0.5V P-P) to Pin 2: Trigger
3. Connect an oscilloscope to test point TP2A
4. Adjust potentiometer PO2A to achieve largest, most uniform waveform on oscilloscope.
5. Move oscilloscope to TP2B and adjust potentiometer PO2B in the same manner.
6. Move oscilloscope to TP2C and adjust potentiometer PO2C in the same manner.
7. Remove oscilloscope and jumper wire.



Disclaimers

- Make no mistake, this is easily the world's worst 555 timer. If you are planning on using this for critical timing operations or anything other than a simple "that's neat" object, kudos to you! But also, probably not a great idea. Still, kudos!
- All of the measurements, values, and characteristics were taken using a UE555 populated with 6AU6 sharp cutoff pentodes (otherwise known as the greatest tube of all time). However, the UE555 timer can work with other tubes, as long as they are pin compatible with the 6AU6 and are all of the same type. For example, the 6CB6, 6136, 6DT6, 8136, 6BZ6 and 6BA6 should all work to varying degrees of success.
- Do keep in mind that all testing was done in-house, and it is entirely possible that the tubes you are using will not work, even if they are 6AU6s. This is because electrical engineering is essentially magic, and your success is entirely dependent on how many electrical components you have sacrificed to the engineering gods. I have sacrificed thousands of components ranging from capacitors to tubes to ICs, so it's entirely possible that the UE555 works for me simply because the gods are happy.
- This thing uses an extreme amount of power and supplies practically no output current. If more current is needed and you wish to stick with the vacuum tube theme, toss a couple cathode follower buffers in parallel on a breadboard and pipe the output through that. If less power draw is desired, uhhh, use a normal 555?
- If you've read this far, give yourself a high five from me!
- Here's a line drawing of a bunny!