

BMC090. Wave Pulse Animator

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I. What it Does

A. What it does to the Signal

This module is used to add harmonic content to waveforms and acts like a pulse-width modulator, except instead of outputting a pulse, it outputs a waveform with a section in the middle chopped out.

It has separate controls for the top and bottom edge of the chopped section of the waveform. These sections slightly overlap, so when set so that nothing is being chopped, a positive offset instead of a negative offset is added in the middle of the waveform

B. Controls/Inputs/Outputs

CONTROLS

1-2. Hi and Lo knobs – These set the upper and lower threshold of how much of the waveform is cut out. At counter clockwise nothing is cut and as you turn clockwise more signal is cut out.

3-4. Hi and Lo CV knobs – These attenuate the input voltage from the Hi CV and Lo CV input jacks. The attenuated voltages are mixed with the voltages set by the Hi and Lo knobs to set the thresholds.

INPUTS/OUTPUT

1. Signal In – The waveform input jack. Labeled “AIN” on the PCB. This input is DC coupled so it can be used with CV/LFO inputs as well as audio.

2-3. Hi CV and Lo CV – Input for control voltages to modulate the Hi and Lo thresholds. Labeled “HIN” and “LIN” on the PCB.

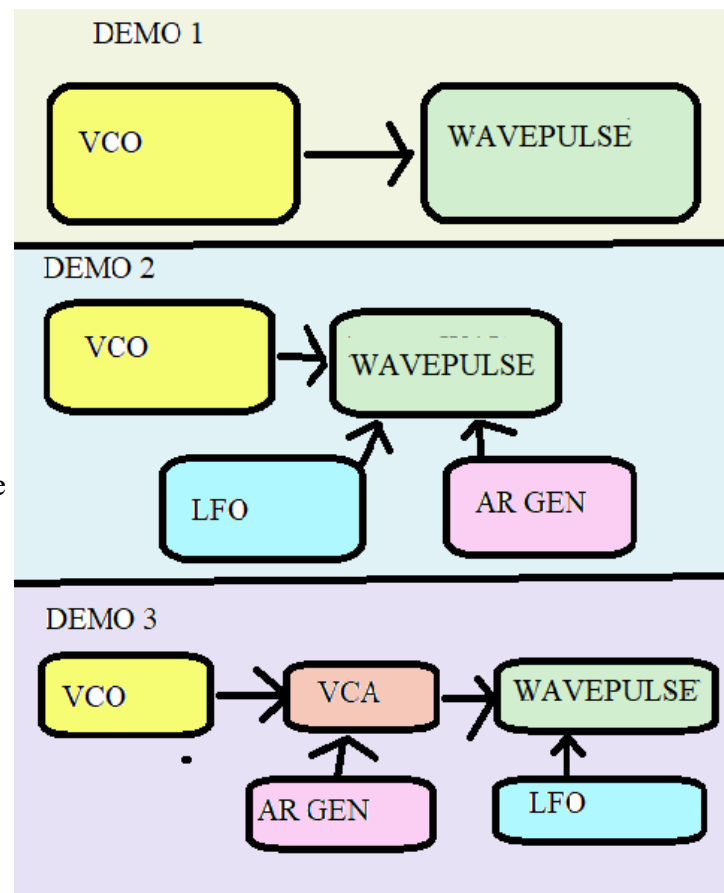
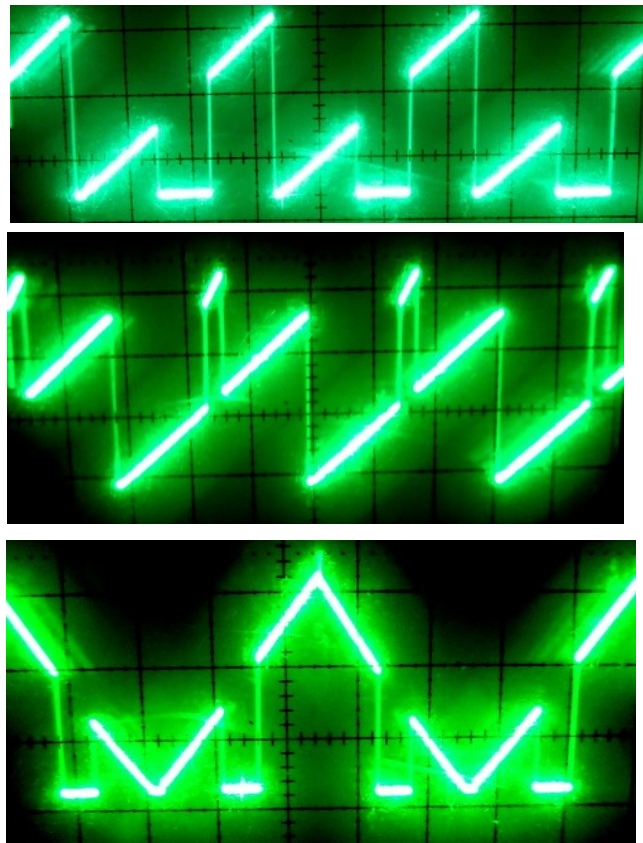
4. OUTPUT – Output of the module, marked “OUT” on the PCB.

C. Demos

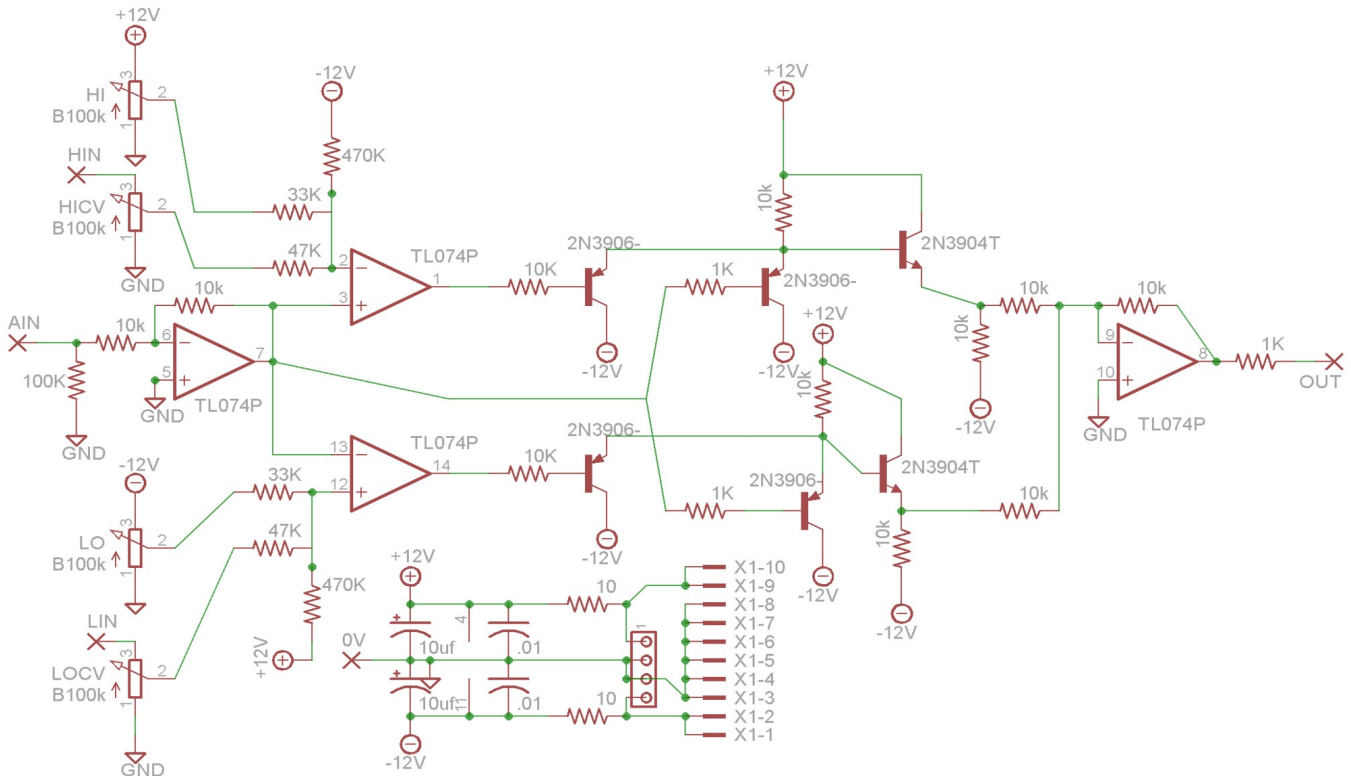
[DEMO 1](#) – Ramp, triangle and sine waves, first the unaltered waveform and then going through the pulsewave with the controls all at 12 o'clock.

[DEMO 2](#) – Ramp into Wave Pulse with LFO and envelope modulating the Hi/Lo controls. Then triangle wave with different settings in two different registers.

[DEMO 3](#) – Triangle wave into a VCA into the Wave Pulse. An LFO slightly modulates the HI setting of the Wave pulse. I'm manipulating the decay time of VCA's envelope, and then the hi/lo settings of the Wave Pulse.



II. Schematics



Above we see the schematic for this module. On the far left we see the “AIN” wirepad. The audio enters the circuit here, and is inverted by a TL074. The inverted output is sent to two TL074s wired as comparators and to the base of a pair of 2N3906 transistors.

At the top left we see the HI and HICV pots. The HICV pot attenuates the HIN voltage, and the HI pot creates a variable voltage between 0 and +12V. These two voltages are mixed together at the inverting input of the TL074 along with a negative voltage offset provided by a 470K resistor to -12V. The mixed voltage controls the threshold of the TL074 wired as a comparator, so when the input voltage goes above this voltage the TL074’s output goes up to +12V and when the input voltage is below the output goes down to -12V.

On the bottom left we see a similar arrangement for the LO/LOCV pots. The difference is that the LO pot is connected to -12V and 470K connects to +12V. The comparator is then wired as an inverting comparator.

The output of the comparator goes to a 2N3906 transistor through a 10K resistor, the collector connects to -12V. When the comparators output goes negative, the 2N3906 will clamp the voltage at its emitter down to -12V. Its emitter is connected to the emitter of another 2N3906 with its base connected to the inverted audio input, as well as a 10K to +12V and the base of a 2N3904. These transistors are arranged the same way for both the high and low sections of the circuit.

The 2N3904’s collector connects to +12V and its emitter connects to -12V through a 10K resistor and then on to an inverting amplifier stage which mixes the high and low sections together and then outputs them through a 1K resistor.

At the bottom of the circuit we see the power arrangement. MOTM and Eurorack style connectors both have footprints on the PCB. The power rails are filtered by a 10 ohm / 10uF low pass filter, and .01uF capacitors are placed next to the power pins of the TL074 for further filtering.

NOTE FOR 15V USERS: This circuit hasn’t been tested on +/-15V systems, but should work. The only resistor values that you may want to tweak would be the 470K and 33K resistors setting the comparator threshold. You might want to increase these so that the knob doesn’t have a large section of rotation at the top that doesn’t affect the sound.

III Construction

A.PARTS LIST

SEMICONDUCTORS

Name/Value	QTY	Notes
TL074	1	14 pin DIP package. Any quad op-amp should work.
2N3904	2	
2N3906	4	

RESISTORS

Name/Value	QTY	Notes
10 ohms	2	All resistors 1/4W metal film except potentiometers
1K	3	
10K	11	
33K	2	
47K	2	
100K	1	
470K	2	
B100K PC Mounted Pot	4	16mm.

CAPACITORS

Name/Value	QTY	Notes
.01uf	2	cheap ceramic disc. Value not critical.
10uf	2	Electrolytic, 16V or higher rating.

OTHER

Name/Value	QTY	Notes
14 pin DIP socket	1	
Power connector	1	MOTM or Eurorack style
Jacks	4	

B. THE BOARD

The PCB is 74mm x 37mm. The pots are spaced 19.05mm ($\frac{3}{4}$ inch) apart, and the mounting holes are spaced 38mm apart.

Wiring for this project is simple enough that no diagram should be necessary. Connect the wirepad for each jack to the tip connector for that jack, then connect the "GND" wirepad to the sleeve of a jack.

AIN1 = Signal input jack

LIN = Lo CV input jack

HIN = Hi CV input jack

OUT = Output jack

0V = Ground connection.

Below are images of the PCB with and without traces rendered and a photo of the wiring on a completed module

