

# **LOOPING VCADSR SMD VERSION**

## **Build Guide**

## **Dannysound**

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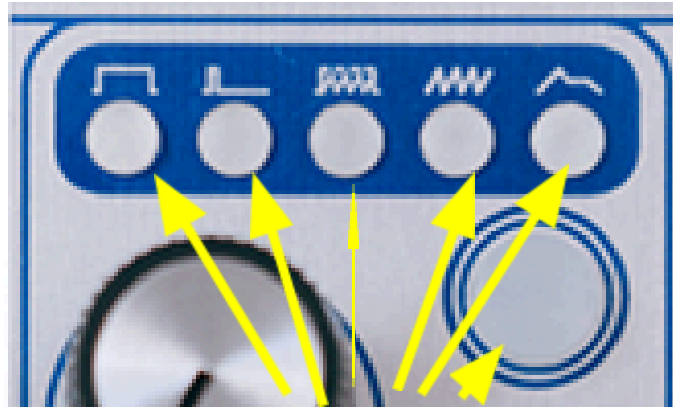
## 1 Introduction

This module is based on a design from the fabulous Electric Druid! If you're interested in designing circuits they produce some incredibly useful PIC microcontrollers for use in synths and guitar effects, plus they have some really great articles and projects. For more information please visit <https://electricdruid.net>

The new version of this module using surface mount components allows extra functions to be included whilst being slim enough to be skiff friendly.

The LOOPING VCADSR uses a Microcontroller to generate a Voltage Controllable, Loop-able Envelope. The individual parts of the Envelope (Attack, Decay, Sustain, Release, Level and Time) can all be individually controlled via CV.

It has 5 MODES of operation accessible by pressing the LED pushbutton (6):



1 2 3 4 5 6

1. Gate Envelope – Gate signal fires ADSR. The envelope goes through the attack, decay and sustain stages of the envelope as long as the gate signal is high and then goes to the release stage when the gate goes low. If the gate goes low before the AD stages have completed the envelope goes to the release stage directly.
2. Trigger Envelope – Trigger signal fires ADS. The envelope produces an attack, decay, sustain cycle that completes the AD stages whenever it receives a trigger pulse. If the sustain is set to 0 the envelope produces an AD envelope that starts at 0 and ends at 0. If sustain is not 0 the envelope will hold at the voltage set by sustain and the next trigger pulse will start the attack stage from the voltage set by sustain.
3. Gated Looping Envelope – ADSR loops whilst gate signal is high.
4. Looping Envelope – ADSR loops regardless of gate signal.
5. Logarithmic or Linear Envelope – Switches between Log or Lin envelope. Accessed by holding mode switch.

When the envelope is looping, all 5 controls affect the output.

Attack and Decay operate, as one would expect.

The Sustain control sets the minimum voltage the decay part of the envelope will decay to.

The Release sets a release time from the end of the Sustain period to the beginning of the next cycle.

When the Sustain is set to 0 you can use the Release control to add a delay between Attack and Decay cycles.

In Normal Envelope mode the Sustain CV input can be used with an LFO source to add amplitude modulation that gradually increases as the Envelope transitions from the Attack/Decay part of the envelope into the Sustain part.

The Level CV is also a useful point for amplitude modulation or can be used for Velocity Sensitivity CV.

The Time CV operates by reducing the time of the attack, decay and release stages. Higher CV results in shorter times which is useful for creating percussion type envelopes.

#### Features:

5 Modes of operation:

Gate signal ADSR

Trigger signal ADS

Gated Loop

Constant Loop

Log or Lin envelope response

CV control over:

Attack

Decay

Sustain

Release

Level

Time

Works with GATE signals from +5V to +12V

Output CV range 0V to +10V

CV input range 10V (inputs are protected and can handle any cv in the range +-12V)

Connections:

**Inputs**

ATTACK CV

DECAY CV

SUSTAIN CV

RELEASE CV

LEVEL CV

TIME CV

GATE/TRIGGER

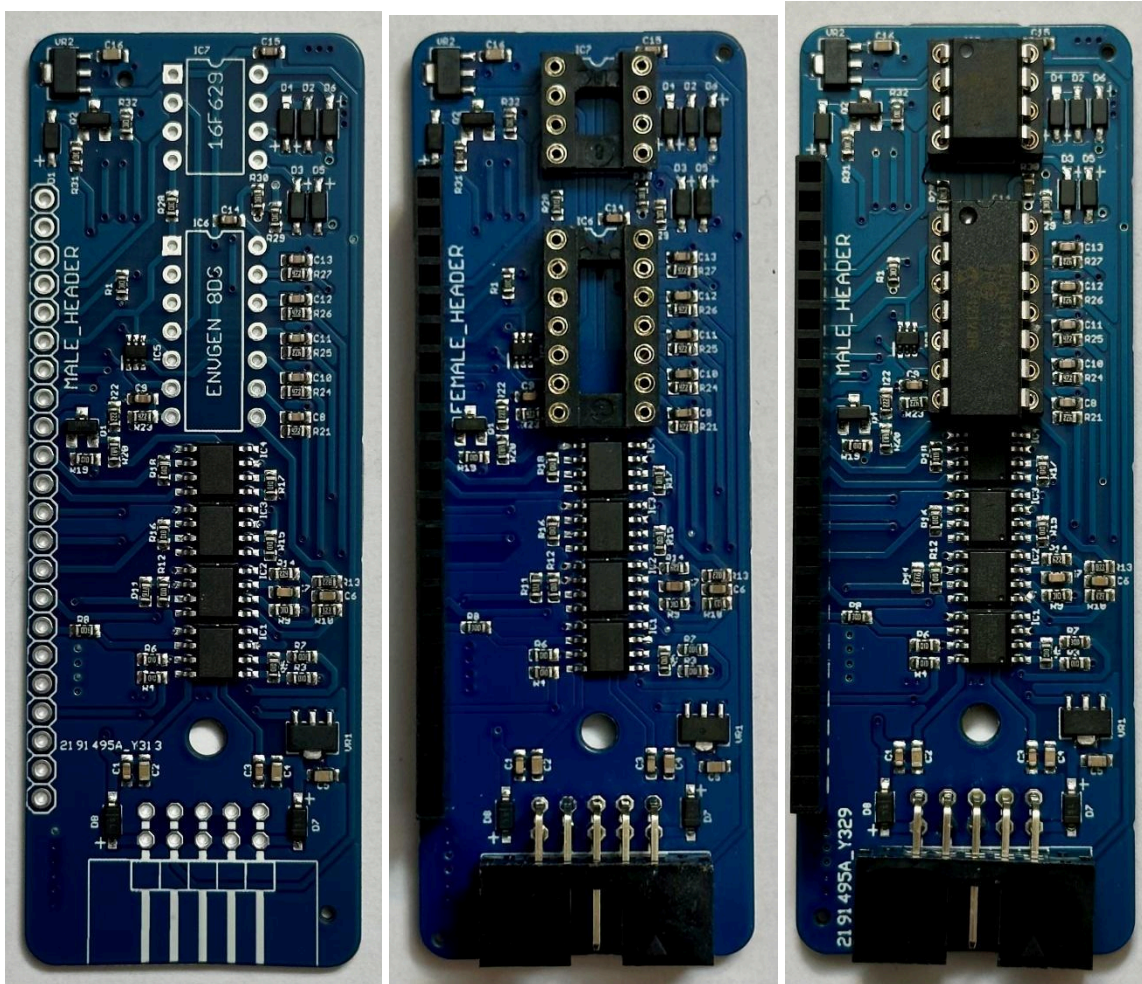
**Output**

ENVELOPE OUT

## 2 Parts List

Looping VC-ADSR Costs			
Part	Description	Amount	Value
PB Switch Illuminated	Mode switch	1	Orange
ALPHA Vertical 9mm	ATTACK, DECAY, SUSTAIN, RELEASE, LEVEL	5	B10k
Thonkiconn-PJ398SM	ATTACK CV, DECAY CV, SUSTAIN CV, RELEASE CV, LEVEL CV, TIME CV, GATE IN, ADSR OUT	8	
Knurled Nuts		8	
Rogan Small Knob	Black	5	
1X22 Pin 2.54mm MALE Header		1	
1x22 Pin 2.54mm FEMALE Header		1	
LIGHT PIPES 3MM		5	
ENVGEN8C-DS Programmed PIC		1	
Pre-programmed switch IC		1	
8 pin DIL Socket		1	
14 pin DIL Socket		1	
10-16 Pin	POWER CABLE	1	
2x5p Shrouded Right angle	Power Connector	1	
11mm Hex Standoffs		1	
M3 6mm Screws		4	
Looping VCADSR main PCB			
Looping VCADSR pots PCB			

### 3 Main Board

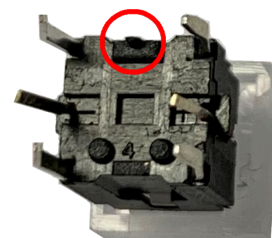


- On the same side as the pre-soldered components, first solder in the 8 pin and 14 pin DIL IC sockets. Match the curve side of the socket with the PCB silkscreen.
- Solder the 1 x 22 pin FEMALE header and the 2 x 5 pin shrouded socket as shown in the pictures. Ensure these are flush to the PCB. **Note:** the female header supplied might need to split down to size before placing. Check this link for our advised method if unsure how it should be done: <https://youtu.be/qDG3VFSMSPQ?feature=shared>
- Insert the ENVGEN IC and the 12F629 IC. **IMPORTANT** - Take note of orientation when placing all IC's, follow the above image for reference, and line up the black dot in the chip with the curved side of the socket + PCB silkscreen.

## 4 Pots Board



- Solder in the 1 x 22 pin MALE header to the BACK side of the pots PCB. The header may need to be split from a longer strip before placing it on the board. Ensure the header is soldered flush to the PCB.
- Screw the standoff into the PCB from the top of the Pots PCB as pictured
- Next place the five pots, switch and 8 jack sockets with nuts removed, **DO NOT SOLDER** yet.
- **IMPORTANT** - Pay attention to the orientation of the switch, the small alignment tab on the base of the switch should face downwards to align with the extra hole on the PCB footprint



## 5 Panel Components and Final Assembly



- Insert the 5 x 3mm light pipes. They are a tight fit and need to be pushed in firmly. It may be best to place some paper on a table then insert one light pipe, turn the panel over and place on the paper then press down to ensure the light pipe is all the way in. Repeat this for all five light pipes.
- Then place the panel on the pots pcb and once everything is fitted, put the nuts and washers on the pots to keep everything together.
- Make sure the push switch clicks in and out when pressed, then solder the pots, jack sockets and switch in place.
- Finally place the main board and pots board together and secure with the remaining standoff screw. Attach the knobs to all pots using the provided allen key



## 7 Testing

There is no calibration required for the Looping VCADSR, only testing. If you have an oscilloscope you can connect it to the output of the VCADSR. If you don't have an oscilloscope you can monitor the VCADSR Pushbutton LED as a visual indication that the module is functioning properly.

Set the control as follows:

LOOP - ON

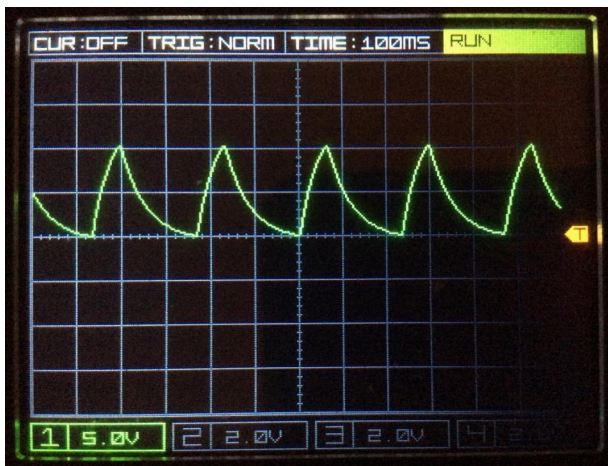
ATTACK - 50%

DECAY - 50%

SUSTAIN - 0

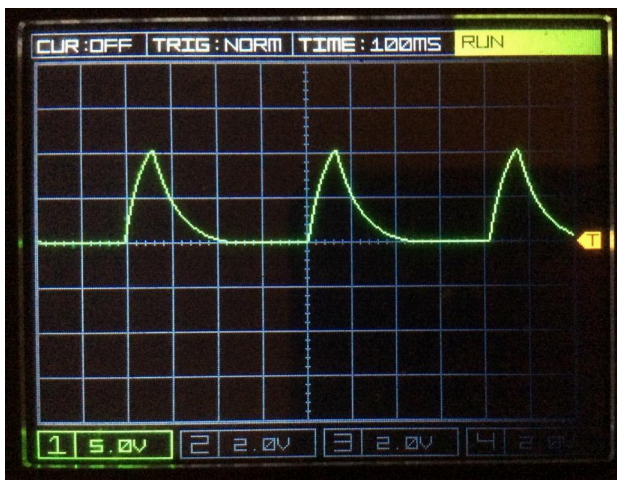
RELEASE - 0

LEVEL - 75% (75% to 100% produces a flat region between the attack and decay parts of the envelope which add some punch to the sound but is not required for testing.)

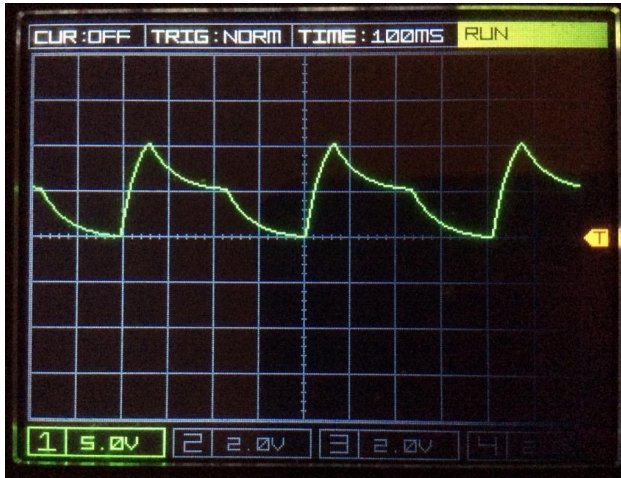


You should see the LED flashing quite fast and the wave form shown above.

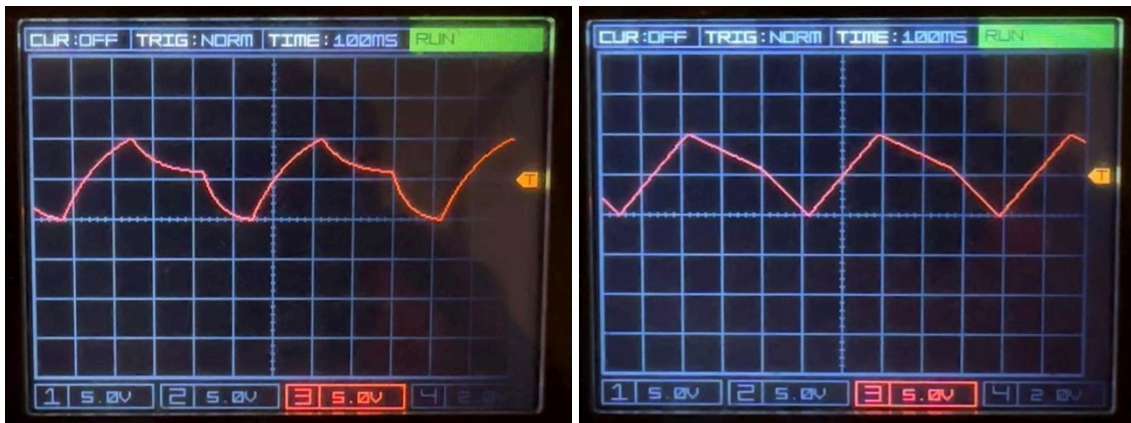
Increase the RELEASE to add a delay between the ATTACK / DECAY cycles.



You should see the LED flashing a bit slower and the waveform shown above. Increasing the SUSTAIN will add a midpoint voltage level between the decay end and the release start.

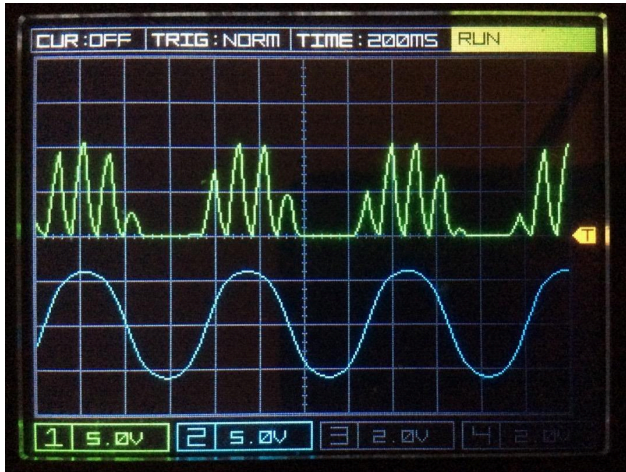


You should see the LED flashing in keeping with the waveform shown above.

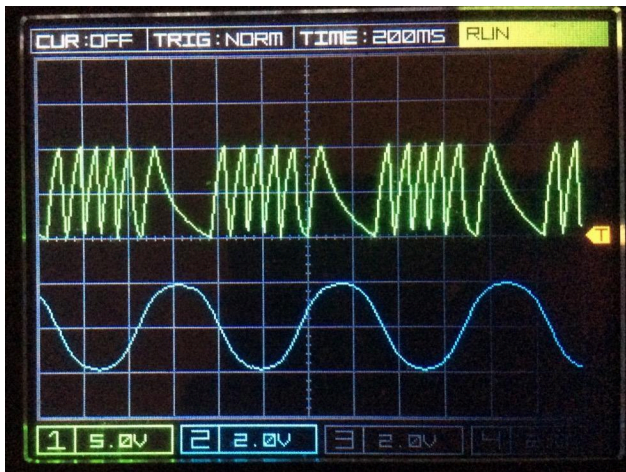


Press and hold the LED pushbutton to activate linear response and observe the difference as shown above.

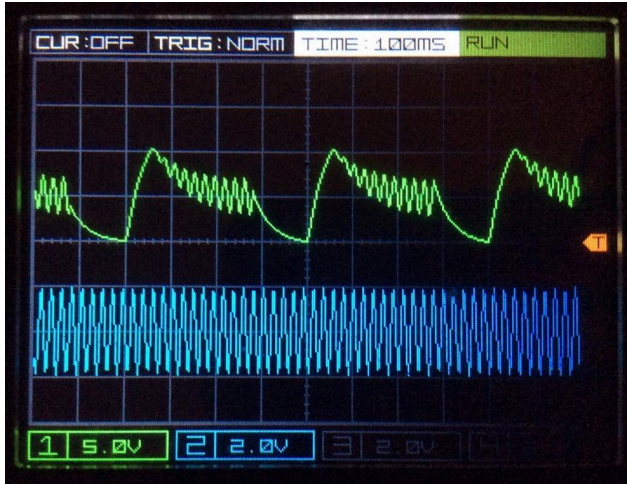
To test the CV inputs you can connect an LFO (preferably through an attenuator) to the CV inputs and observe the output.



The oscilloscope plots above show the ADSR output in green being amplitude modulated by the LFO in blue. The LEVEL control is set to 50% and the LFO is providing  $\pm 5V$  into the LEVEL CV.



The plots above show the LFO modulating the DECAY CV. The LFO has been attenuated to  $\pm 2V$ .



These plots show the SUSTAIN CV being modulated by a much faster LFO (in blue). The SUSTAIN control is set to 50% and the LFO is providing  $\pm 2V$  into the SUSTAIN CV.

You can now test the GATE input by setting to GATED LOOP or OFF and apply a gate signal to the GATE input.

Test the trigger input by setting to TRIGGER mode and setting a long attack and Decay time with Sustain set to 0 and applying a trigger to the GATE input.

NOTE:

To use the module with Velocity Sensitivity (0V to 10V) set the LEVEL control to 0 and connect the Velocity CV to the LEVEL CV input.

Velocity CV or an LFO can also be used to test the TIME CV input, higher CV levels result in shorter envelope times.