Electric Druid One-Shot Event Generator

Introduction

This new chip is a One-Shot Event Generator. It creates interesting unipolar modulation waveforms made from a one-shot "ping". You can alter the shape and speed of the ping, and also add decaying echos to it, with separate Delay and Repeats controls.

This lets you easily generate interesting and unusual one-off modulation waveforms. It make things that sounds like a ball bouncing on the floor, or a single hit with echoes, or a stick being dragged across a washboard. You'll get a variety of "Sproing!", "BOINGBOINGboingboing!", and "BLIPBlipblipblipblipblip!" sounds, as well as "KRRaackrackrackrackrackrack!", "Brrrrrrrrrrt!" and similar. Since it's only an modulation source, ultimately what it sounds like is up to you to decide as you choose what to control with it, but it produces a different selection of waveforms from either a typical LFO or a typical envelope, and we hope you find that inspiring.

Finally, a note of thanks. This chip was developed as the result of an email exchange with Mark Hammer. The original idea was his, and his initial concept was pretty close to what we finished up with, although practicalities lead to the final chip producing only unipolar waveforms (we also discussed a bipolar version, and had ideas for both types.). I think his idea is a great addition to the world of modulation, and I'm grateful to him for sharing it and letting me implement it.

Features

Simple Triggering with SPST or input pulses of any level

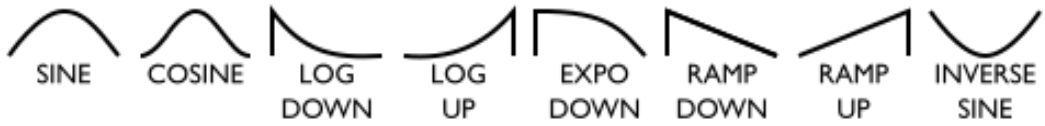
The TRIGGER input allows you to use a pulse signal or a simple SPST switch to trigger the event. The input expects a short-to-ground, so a positive-going pulse should be buffered with a transistor.

Ping rate from 2.5 seconds to 50 msecs

The pings can be as slow as 2.5 seconds or fast as 50 milliseconds. Given that you can have multiple "echoes" of the ping in a single event, this can make very complex sounds, and sounds that can go on for over two and half minutes!

Eight output waveforms for a variety of sounds

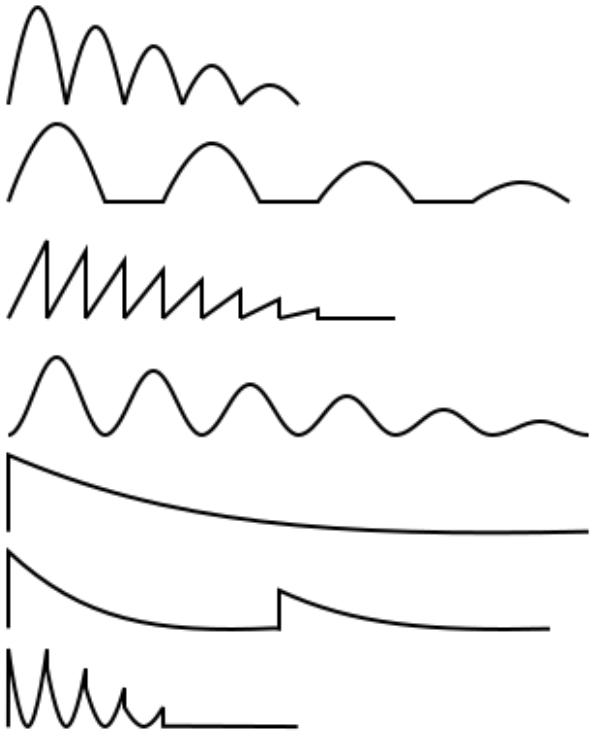
The chip can produce eight different ping waveforms, shown below. These are selected by the voltage on Pin 6 (WAVEFORM CV).



Each wave has a different character when played slowly as opposed to fast. At audio rates, each has its own sound.

Pings with "Echoes"

The single ping can be augmented with echoes to make the entire event. The delay time for the echoes can be set between 0 and 2.2 seconds, and the number of repeats can be set between 1 and 36. The echoes will die away linearly towards zero.



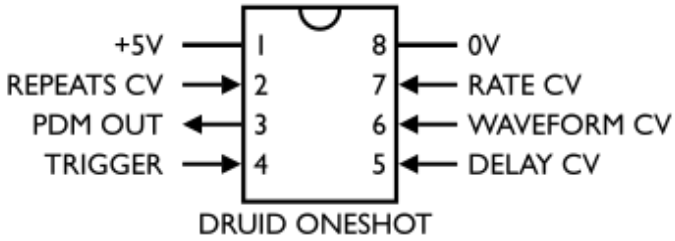
16-bit waves and 12-bit LFO output resolution

The ONESHOT chip uses 16-bit wave data with interpolation to give the smoothest possible result. Similarly, intermediate calculations are done at 16-bit accuracy. The final PDM output is 12-bit.

31.25KHz sample output rate, with 2MHz PDM output

The sample rate is 31.25KHz, a big increase on the 19.5KHz of the previous generation Electric Druid chips. The output is produced using Pulse Density Modulation at a rate of 2MHz. This reduces noise compared with the PWM output on earlier Druid chips and allows very simple filters to produce a smooth analogue output.

Pinout Diagram



Pin	Function	Details	Notes
1	+5V	Power supply	
2	REPEATS CV	0-5V analogue input	Controls the number of times the ping repeats between 1 and 36. For lower numbers, it is easy to set a specific number. Higher up this becomes difficult, and the sound is simply "many repeats".
3	PDM OUTPUT	0-5V digital output	PDM output at 2MHz, 31.25KHz sample rate
4	TRIGGER	0-5V digital input	Triggers the one-shot event. Note that this input expects to be shorted to ground. See application notes for details.
5	DELAY CV	0-5V analogue input	Controls the delay between individual pings from 0 to 2.2 seconds.
6	WAVEFORM CV	0-5V analogue input	Selects waveform 0 to 7
7	RATE CV	0-5V analogue input	Controls the speed of each individual ping from 2.5 seconds to 50 milliseconds.
8	0V	Power supply	

Application Notes

Unused pins

The chip is simple to use. However, the CV pins cannot be left floating, so if a particular function is not required, the pin should be connected to some definite voltage level.

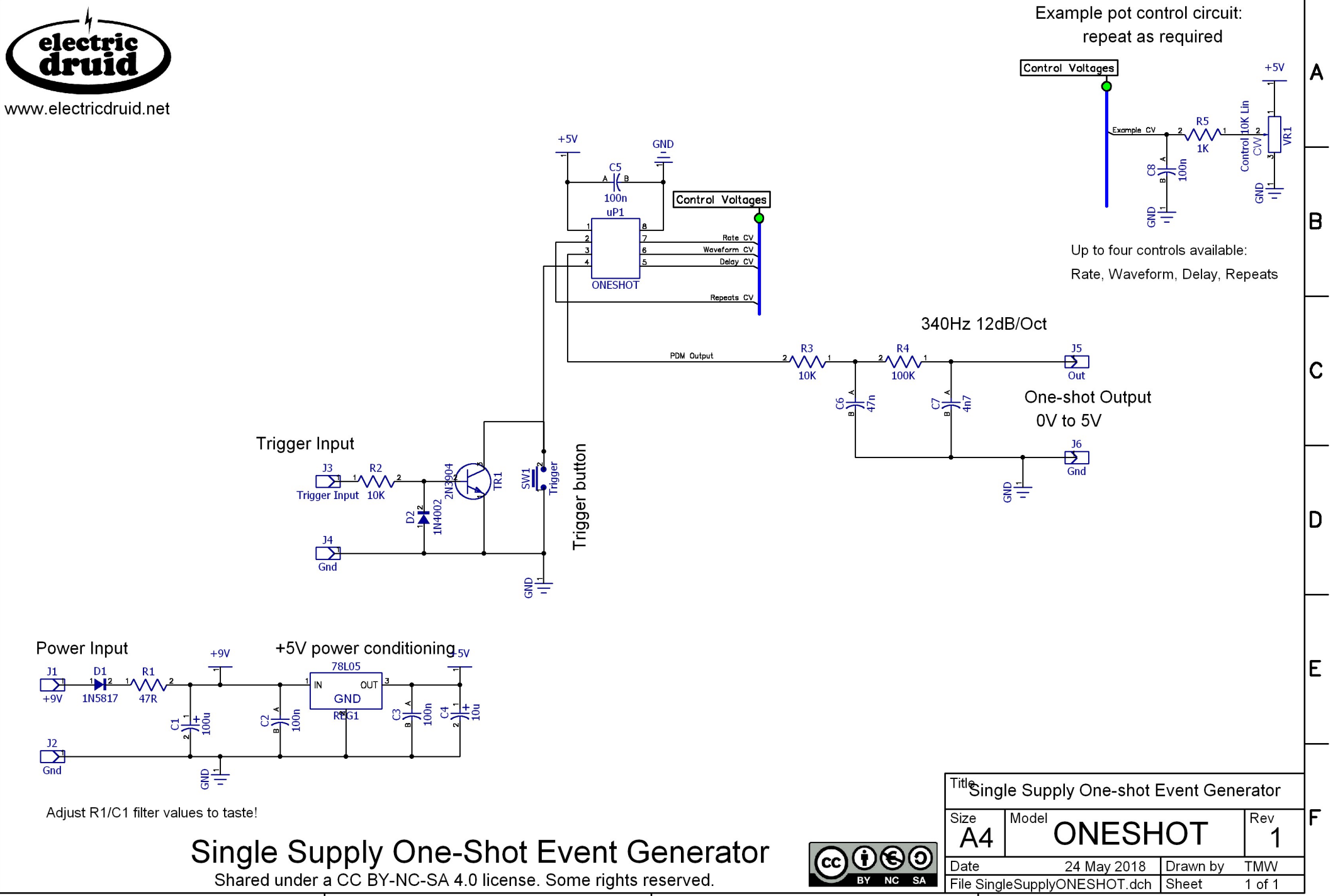
Function	Pin	If not required	Connect
Repeats CV	2	Fix at required voltage for given number of repeats, or tie to ground for no repeats.	Example: 10K trimmer between 0V and +5V, or 10K to Gnd
Delay CV	5	Could be left at minimum level	10K to Gnd.
Waveform CV	6	Fix at required voltage for given waveform	Example: 10K trimmer between 0V and +5V
Rate CV	7	Fix at required voltage for given speed	Example: 10K trimmer between 0V and +5V

Example circuit: Single supply One-Shot Event Generator for effects/stompbox use

The example circuit on the next page shows a generator that can be added to 9V effects/stompbox circuits. It can replace or add to a simple LFO in many designs (chorus, flangers, phasers, and tremolos, for example) and will provide other options and sounds.

The output filtering is a super-simple passive filter which provides a 0-5V output with minimum components. This 0-5V envelope signal can be used directly or added to other signals if required.

The circuit can be triggered by the simple Trigger button, or by an external pulse input. The transistor circuit shown provides protection against negative voltages and signals up to 20V or so.


www.electricdruid.net
Example pot control circuit:
repeat as required
Control Voltages
+5V
Example CV
R5
1K
Control 10K Lin
CW
VR1
C8
100n
GND
Up to four controls available:
Rate, Waveform, Delay, Repeats
+5V
GND
C5
100n
uP1
Control Voltages
Rate CV
Waveform CV
Delay CV
Repeats CV
ONESHOT
340Hz 12dB/Oct
PDM Output
R3
10K
R4
100K
J5
Out
C6
47n
C7
4n7
One-shot Output
0V to 5V
J6
Gnd
Trigger Input
J3
Trigger Input
R2
10K
2N3904
TR1
SW1
Trigger
Trigger button
D2
1N4002
J4
Gnd
Power Input
+5V power conditioning
J1
+9V
D1
1N5817
R1
47R
78L05
IN
OUT
GND
REG1
C1
100u
C2
100n
C3
100n
C4
10u
J2
Gnd
Adjust R1/C1 filter values to taste!
Single Supply One-Shot Event Generator
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Title
Single Supply One-shot Event Generator
Size
A4
Model
ONESHOT
Rev
1
Date
24 May 2018
Drawn by
TMW
File SingleSupplyONESHOT.dch
Sheet
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