ALM-003

'SID GUTS'

- Operation Manual -

Manual Version 0.1

Introduction

The MOS Technology 6581/8580 'Sound Interface Device' chip[1], aka the 'SID', was the sound generator chip used in the Commodore 64 home computer - the greatest selling home computer of all time. The SID, by the means of 3 wavetable oscillators, a real analogue multi mode filter, an ADSR and various cross modulation options, provided the soundtrack to a generations gaming and perhaps many peoples first exposure to real sound synthesis. The SID's unique musical aesthetic has lasted well beyond the lifetime of the C64 re-imagined in standalone products such as the SID Station and with in the computer via sophisticated software emulation.

The SID GUTS now takes the legendary SID chip and tailors it into the eurorack modular environment. By use of a real SID chip the classic sound is taken in a new direction with the levels of direct and voltage control only a modular system can offer.

The SID GUTS provides a single 'SID Voice' to your modular and has been designed to achieve a balance between functionality, features, size and cost. The charm and authenticity of the original sound is preserved with no attempt to 'clean' or reduce noise in the SID audio output.

Both version on the SID chip are fully supported together with the more modern 'SwinSID' hardware emulation. The selected SID can be easy changed at the rear of the module (See appendix I).

For instructions on connecting a SID chip to the SID GUTS, please refer to Appendix I at the back of this manual.

1 For more info see http://en.wikipedia.org/wiki/MOS_Technology_SID

Features

The SID GUTS supports to following SID chip features via modular control;

- 1volt per octave control of a 'core' SID oscillator 0-5v input (with tunable offset)
- Direct and voltage control of oscillator wave shape selection (Pulse, Triangle, Square, Saw)
- Filter switchable between 4 modes - 12dB/Octave HP , LP , BP & Notch (HP+LP)
- Direct and Voltage control (with offset) of Filter cutoff and Resonance.
- 1 volt per octave control of second SID 'modulation' oscillator
- Direct and voltage control of modulation oscillator 'type'; ring modulation, sync or none.
- Direct and voltage control of pulse wave pulse width.
- External audio input[2]

The SID GUTS does not support the following SID features:

- Remaining 3rd oscillator
- ADSR

Other features include

- Support for ALL SID chips (6851/8580) & SwinSID chips.
- All settings non volatile
- Audio output and input at modular levels.
- Designed and built in England.

2 Not available with SwinSID chip

Technical Specifications

- Supply: *+/-12V*
- Current Draw: *~50-200ma (up to 200ma with 6581/8580 SID chip installed)*
- Size: *12 HP*
- Depth: *30-40 mm (with heat sinks installed)*

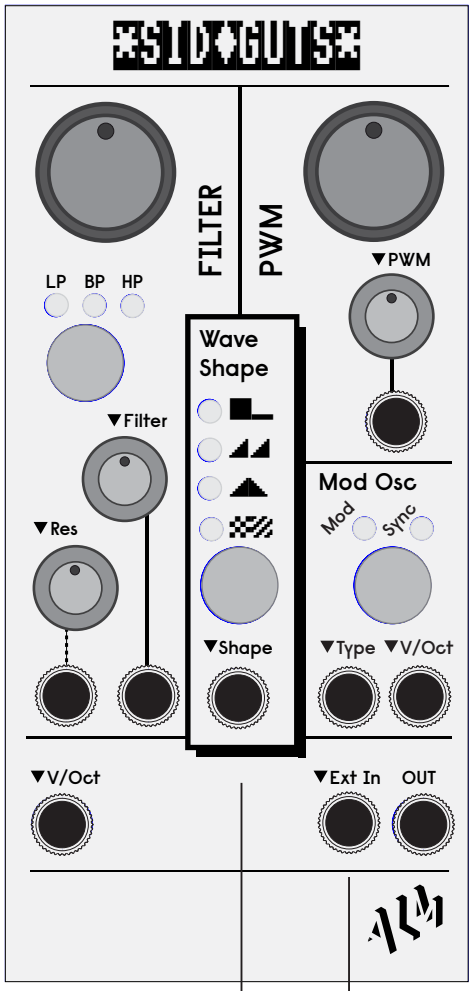
Caveats

A SID chip is vintage technology! As such there are a number of limitations;

- A real SID chip is noisy.
- Filter performance varies between chips.
- Resonance has very little effect and sometimes even unexpected.
- SID chip updates are limited to approx. 50Hz thus very fast (i.e audio rate) modulations will not work as expected.
- On rare occasions certain SID chips appear to 'lock up' and lose audio output. If this occurs, reset the oscillator by disabling and re-enabling (see Oscillator Control section).
- SID chips run hot and use a lot of current.
- SID chips are fragile! Take care in handling.

Core Operation

Panel Layout



Filter Cut off control.

Filter type selection.

Filter cut off attenuator.

Filter resonance offset & attenuator.

Filter Resonance CV input. 0-5V

Filter Cutoff CV input. 0-8V

Oscillator 1 Volt per Octave Frequency input. 0-5V

Pulse wave shape pulse width control.

Pulse width CV attenuator.

Pulse width CV input. 0-8V

Modulation oscillator type selection control.

Modulation oscillator 1 volt per octave input. 0-5V

Modulation oscillator type selection input. 0-5V

Audio Output.

Oscillator Wave shape Selection. 0-5V

External Audio Input.

Overview

The SID GUTS panel provides both direct user and interfaced voltage control of the various SID chip audio parameters.

The SID GUT's can be best thought of as a core wave table based oscillator with a built in multi mode filter and a second cross modulation oscillator. This provides classic SID type sounds but with modular levels of control.

Synthesized audio is output through the 'output' jack. The external input allows external audio to be passed through the filter. Note this feature is not available with a SwinSID chip.

Oscillator control

The frequency of the core oscillator is controlled by the 1 volt per octave input the the lower left hand corner of the panel. It responds to 0-5v giving a range of 5 octaves.

The oscillator base frequency can be offset (i.e tuned) giving a further total range of 8 octaves. This is achieved by pressing and holding both the Filter and Mod Osc buttons at the same time and then releasing. All Filter and Mod Osc LEDs will light indicating tuning mode is active. By then repeatedly pressing and holding either the Filter or Mod Osc buttons, the oscillator can be tuned. Hold both buttons again to exit tuning mode.

The core oscillator can also be turned off by holding the Waveform and Mod Osc buttons simultaneously. All wave shape LEDs will turn off indicating that the oscillator is de-activated. The oscillator can be turned back on by pressing just the wave shape button. This feature can be useful when using an external audio signal (though the signal can still be apparent at very low volume on some SID chips)

Filter Section

The SID provides a multimode filter which acts on both its internal oscillator and any external audio signal.

The filter mode can be switched cycled between low pass, band pass, high pass and notch (low pass & high pass combined) by pressing the blue filter button. The associated LED's will light indicating the mode.

The cut off point of the filter is controlled by the large filter control knob. The cut off point is further offset by the control voltage input and associated uni polar attenuator knob. A voltage applied here will further change the cut off in respect to the filter knob position.

The resonance attenuator control behaves differently in that with no jack inserted it acts purely to set the filter resonance. With a jack connected, it becomes an attenuator. There is no offset control. Generally the actual resonance effect provided by the SID is very subtle. Some SID chips exhibit the issue where low (or high) resonance settings will actually cut audio out.

Wave shape Section

The SID provides 4 different waveform types; pulse, sawtooth, triangle and noise. The wave shape can be selected by either pressing the associated button to cycle through types or by applying a 0-5v to the wave shape control input.

PWM Section

With the pulse waveform selected, the pulse width of the waveform can be controlled by adjusting the PWM knob. The pulse width can be further controlled via the control voltage input and associated uni polar attenuator knob. A voltage applied here will further change the pulse width in respect to the PWM knob position.

Modulation Oscillator section

This section provides access to a second onboard SID oscillator which can be used to modulate the main oscillator in interesting ways. The frequency of the modulation oscillator is controlled by the 1 volt per octave input (0-5V range). Modulation type is controlled by both the voltage control input (0-5V) and via cycling through type with the push button. The modulation types are None, Sync and Ring Modulation.

With *Sync*, The main oscillator is synced to the modulation oscillator frequency.

With *Ring modulation*, The main oscillator is ring modulated to the modulation oscillator. Ring modulation forces the triangle waveform to be selected (two triangle waves are ring modulated together).

Limited Warranty

From the date of manufacture this device is guaranteed for a period of 2 years against any manufacturing or material defects. Any such defects will be repaired or replaced at the discretion of ALM. This does not apply to;

- Physical damage arising for mistreating (i,e dropping, submerging etc).
- Damage caused by incorrect power connections.
- Overexposure to heat or direct sunlight.
- Damage caused by inappropriate mis-use.
- Use of incorrect or non official firmware

No responsibility is implied or accepted for harm to person or apparatus caused through operation of this product.

By using this product you agree to these terms.

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Support

For the latest news, additional info, downloads and firmware updates please visit the ALM website at http://busycircuits.com and follow @busycircuits on twitter.

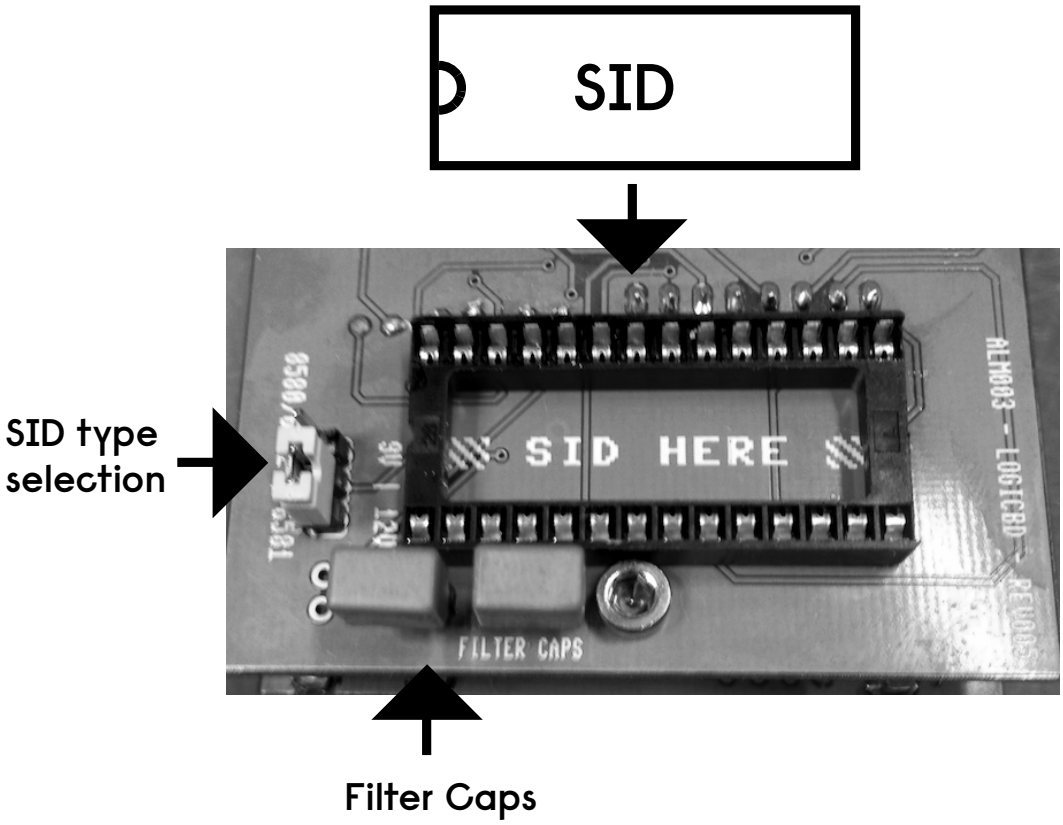
Please send any questions or comments to info@busycircuits.com

APPENDIX I: Technical Info

Connection of SID chip

The SID GUTS uses a real 'SID' chip connected to the DIL IC socket on the rear of the SID module. Together with the IC socket, there is a jumper for setting the type of SID chip used and also two sockets for 5mm filter capacitors.

Rear of Module:



The SID GUTS supports 3 different types of SID chip; The original 6581 chip, the later 8580 and a modern hardware emulation chip - the 'SwinSID'. The SID chip should be clearly identified. Beware of fake SID chips or patly working SID chips with broken filters.

- For a ***6581*** chip, the jumper should be set accordingly for 12V. The capacitors should be 470PF (supplied).
- For a ***8580*** chip, the jumper should set accordingly for 9V, the capacitors should be 22NF.
- For a **SwinSID**[3], the jumper can be removed, as can the capacitors - they have no effect on the filter.

You may want to experiment with different capacitors value pairs and the effect on the filters response. Other common values include 2.2NF, 6.8NF, 1NF etc..

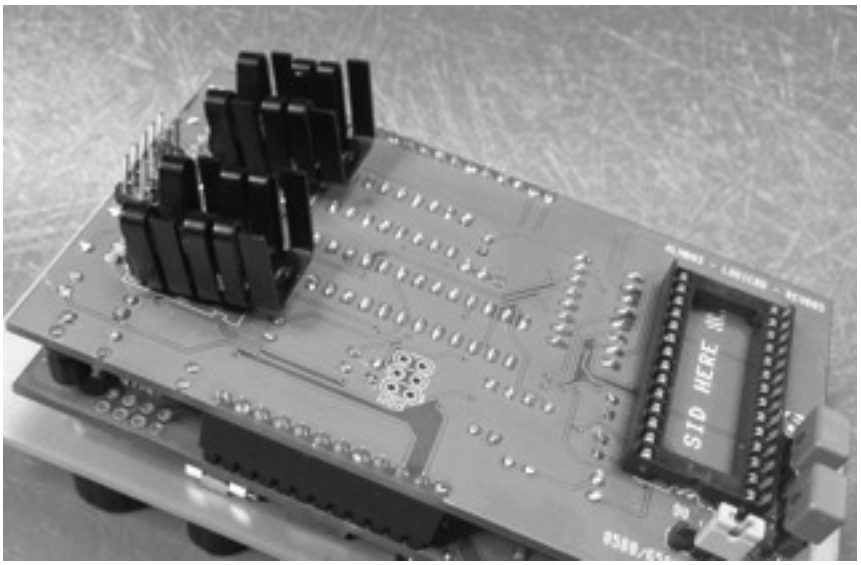
Take care when inserting and removing the SID chip in the DIL socket. Use of antistatic protection is recommended.

3 http://www.swinkels.tvtom.pl/swinsid/

IMPORTANT INFO. READ!

Vintage SID chips are a very old technology and known to run hot and pull a lot of current. If you decide to use a vintage SID chip (instead of a modern 'SwinSID' chip) with the SID GUTS;

- Make sure your power supply has adequate power available (*~200 milliamps*).
- Make sure your case has plenty of space around the module to allow air flow and/or good ventilation.
- The supplied heat sinks should be attached to the two regulators on the rear of the module. The regulators should be bent up slightly and the heat sinks securely attached by sliding them on. They will remain slightly raised via the small 'leg' at the top of the regulator (closest to SID chip):



- A vertical case is recommended (heat flows up!).

ALM Busy Circuits accepts no responsibility for damage done when using vintage SID chips. Do so at your own risk. TAKE CARE.

The use of the alternative more modern SwinSID is recommended.