ALM-012

'SID GUTS DELUXE'

- 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 took the legendary SID chip and tailored it into the eurorack modular environment. By use of a real SID chip the classic sound was taken in a new direction with the levels of direct and voltage control only a modular system can offer.

The SID GUTS DELUXE improves on the original SID GUTS 'Eurorack SID Voice' by adding new features to improve usability and further the modular control of available SID chip features. Again the charm and authenticity of the original sound is still preserved with no attempt to 'clean' or reduce noise in the SID audio output.

Both versions of 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 DELUXE, 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

As with the original SID GUTS, the DELUXE supports to following SID chip features via modular control;

- 1volt per octave control of a 'core' SID oscillator.
- 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 DELUXE also adds the following new features :

- Wider frequency control range (full 8 octaves) with fine and course offset knobs
- Improved v/oct tracking, adjustment and stability
- Voltage controlled chord mode with inversion and up to 3 voice chords.
- Voltage control of filter type selection.
- Attenuverters on both PWM and Filter voltage inputs.
- All surface mount single PCB construction - lower depth and more skiff friendly.

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: *19 HP*
- Depth: *38 mm (slightly more SID installed)*

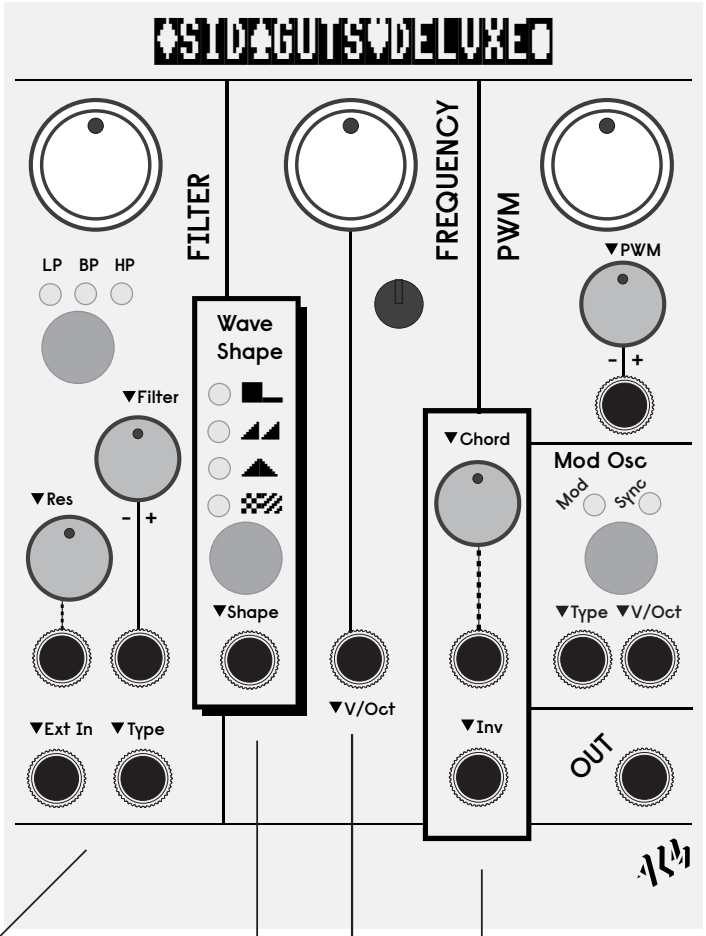
Caveats

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.
- Vintage SID chips run hot and use a lot of current. Make sure your case is well ventilated and has plenty of available headroom in the power supply.
- Vintage SID chips are fragile! Take care in handling. Failed filter sections are unfortunately quite common.
- It is strongly recommended for general use a Swin SID is used.

Core Operation

Panel Layout



Filter Cut off control.

Filter type selection.

Filter cut off attenuverter.

Filter resonance offset & attenuator.

Filter Resonance CV input. 0-5V

Filter Cutoff CV input. 0-5V

External Audio Input.

Filter type selection CV input 0-5V

Oscillator Wave shape Selection. 0-5V

Oscillator 1 Volt per Octave Frequency input and course/fine offset.

Chord mode control. Selection and inversion control / CV input 0-5V

Pulse wave shape pulse width control.

Pulse width CV attenuverter.

Pulse width CV input. 0-5V

Modulation oscillator type selection control.

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

Modulation oscillator type selection input. 0-5V

Audio Output.

Overview

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

The SID GUTS DELUXE 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.

Synthesised 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 approximately 0-8v tracking a range of 8 octaves.

The oscillator base frequency can be offset via the large course and small fine knob controls in the middle top of the panel.

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 oscillator signal can still be apparent at very low volume on some SID chips)

The oscillator one volt per octave tracking can be calibrated via the trimmer on the rear of the module. To calibrate apply 1V to v/oct input. Now tune the oscillator via front panel course and fine controls to C1. Change input voltage to 3V and now adjust trimmer on reverse until a C3 is produced. You may want to use a bigger or different voltage/octave interval. Adjust to taste.

An ALM Beasts Chalkboard makes a good stepped voltage source but you could use a sequencer, offset through quantiser, offset with a multi-meter etc..

Filter Section

The SID chip 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 filter mode can also be voltage controlled via the 'Type' input - the mode corresponding to applied voltage level (0-5v).

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 attenuverter 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 blue 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 attenuverter 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).

Chord section

The SID GUTS DELUXE able to produce up to 3 voice chords which the V/Oct input providing the root frequency of a selected to chord.

The type of Chord is selected by the 'Chord' control offset and/or a control voltage at the associated Chord input. Like with the resonance control, the Chord attenuator control behaves differently in that with no jack inserted it acts purely to set the selected chord. With a jack connected, it becomes an attenuator. There is no offset control.

Further to this Chords may be inverted by applying a voltage to the Chord 'Inv' input. Increasing the voltage increases the amount of inversion.

If the modulation oscillator is enabled it will take priority over a chord voice and can produce unexpected results. Experiment.

Please note Multiple voice chords can increase levels quite dramatically and cause distortion.

The chord selection is as follows;

1. *Fifth*
2. *Major*
3. *Minor*
4. *Suspended*
5. *Augmented*
6. *Diminished*
7. *1 Octave*
8. *2 Octave*
9. *Detuned*
10. *Detuned*

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.

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 in either position or even removed. The capacitors can also be removed (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.
- 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 strongly recommended.