SERGE Dual Universal Slope Generator (DSG) XL

The Serge Dual Universal Slope Generator DSG is one of the most versatile modules in the Serge system. The DSG mk2 by Random*Source is a licensed and authorized adaption of the original Serge design which features a number of improvements and addons (e.g. **independent VC control over RISE and FALL,** optimizations for audio performance and speed/precision, **improved tracking** and provides some **temperature compensation**).

The XL version takes that one step further:

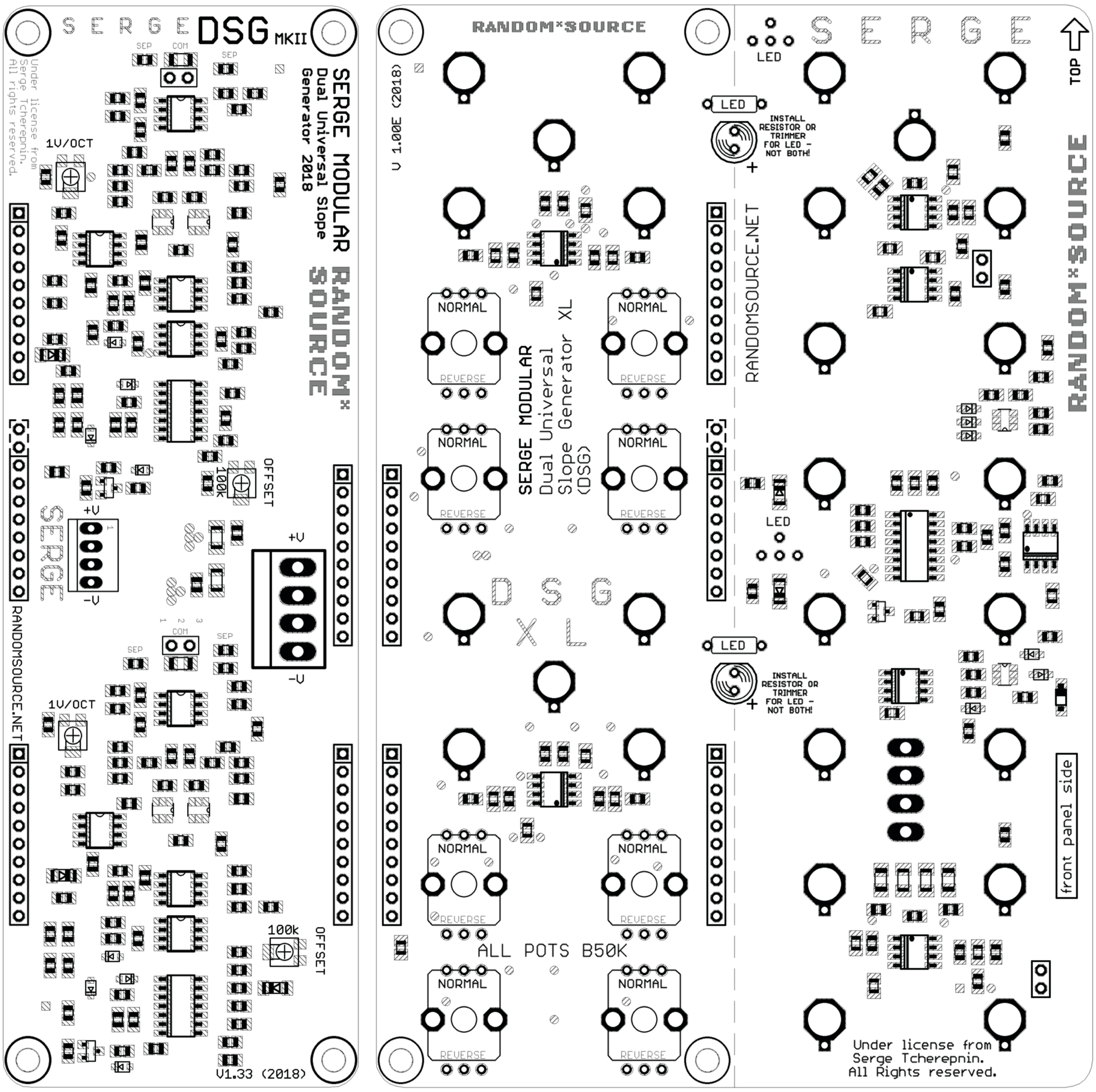
- **VC BOTH** input: in addition to the separate RISE and FALL inputs, this input provides the possibility to insert a (actively mixed) CV signal to RISE and FALL whereby the attenuverters of each side control the influence. A great way to increase (cross-)modulation.
- **SINOID** output: depending on the slope settings (RISE AND FALL), these outputs provide either a pure SINE (when RISE and FALL are equal so that the regular OUT provides a triangle wave) or soinoid shaped (with interesting overtones) if RISE and FALL are not symmetrical. Depending on the build, each output can be configured to either unipolar (usually indicated by a white jack, 0-5V) or bipolar (usually a black jack, -2.5V to +2.5V) - this setting does make a difference when used with the PEAK&TROUGH section, so a grey jack can be used to indicate that it could be either way, depending on the jumper setting.
- **NOT RISE** output: a gate output that is low during the RISE phase, high otherwise. Nice for audio (providing another pulse width) or rhythmic effects, providing a new trigger point in time.
- integrated math section: the Serge **PEAK & TROUGH**. **PEAK** output shows the result of comparing the (normal) **DSG output of the top section** with the signal sent into PEAK IN, using whatever signal is stronger (**maximum function**). If no signal is present at the PEAK IN, output is identical to

OUT (in this case OUT always wins over 0 Volt).
Similarly, TROUGH is hard-wired to the OUT of the bottom section and the TROUGH output shows whichever signal is **lower** when comparing the normal output with the signal present at TROUGH IN (**minimum function**). Since the regular output runs from 0V to about 5V, feeding no signal into TROUGH IN leads to the TROUGH output being silent (no signal wins). Both sides work great with CV and audio. PEAK and TROUGH outputs can be used to generate pseudo-stereo signals as they are usually different but not unrelated when the inputs are used from the other side of the DSG.

- The top side provides a **PULSE** (red jack = gate / logic) output with a fixed duty cycle of appr. 50% (instead of the bipolar out). How does this differ from the normal Gate out? The duty cycle of the normal Gate out depends on the Rise and Fall settings and ranges from appr. 5% to 95%. The DSG achieves the best tracking when Rise is set to maximum and Fall is variable (to determine the pitch), thus producing a negative Sawtooth. At this setting, the Gate out pulse is very thin, not ideal for all audio uses. The new pulse out is a great alternative generating a nice square wave without having any negative effects on tracking. Also, as the edges of that Pulse wave are different from the ones of the Gate out, the Pulse out is great to generate complex waveforms by patching it into the various CV inputs.
- OUT2: each side has the classic (black) **bipolar output**. It is essentially the regular output, but **inverted** and centered around 0V. Please note that since it is inverted, the Rise and Fall settings also have inverted effect, i.e. Rise will control the fall of the bipolar output.
- **Tracking**: The classic DSG is an incredibly versatile module and while it can act as a great oscillator, it has not been designed as a dedicated oscillator. Traditionally its 1V/Oct tracking is rather limited compared to oscillators like the Serge PCO/NTO, covering about 1-2 octaves in the bass range. Also the DSG by design has no temperature conpensation.
  The DSG mk2 provides improved tracking, allowing it to - under ideal circumstances and using specific settings - to cover a range of up to 4 octaves (up to 440Hz). This requires the Rise to be set as fast as possible (maximum/clockwise) and calibration as well as warmup. Please note that up to 4 octaves is the best case - depending on the frequency range, temperature and other factors it will more likely be less, e.g. 2-3 octaves.
- The mk2 offers ***some*** temperature compensation, to partially compensate for the influence of temperature changes - but this is only intended to improve the susceptibility to temperature changes and by no means to completely offset them.

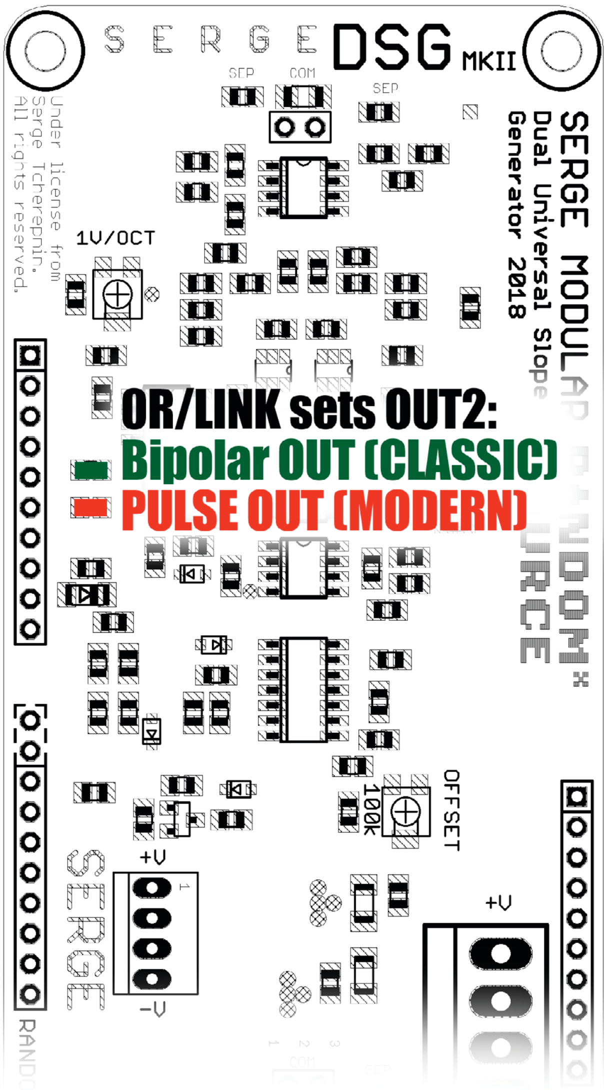
DIY - Building the DSG XL

The kit consists of a front panel in 4U format, a main pcb that already contains most of the parts in surface-mount technology (SMT) and a 4” XL component pcb (also in SMT) serving as an interface to the front panel.



Technical Aspects:

- Use antistatic precaution when handling the DSG pcbs - don't touch the small SMD parts and ICs with your hands.
- Only these parts have to be soldered in: 2 trimpots or fixed resistors on the panel pcb to set the LED brightness, 5 pin stripes to connect the main pcb to the panel pcb, MTA power connector.
  Optional: Jumpers to select if the SINOID OUT should be bipolar (-2.5V to +2.5V) or unipolar (0 to 5V).
- The regular OUT has to be trimmed to max = 5V for the SINE out to work properly (see calibration below).
- LEDs: The trimpots (together with an on-board resistor) determine the brightness of the LED. It is **essential to use low current LEDs - otherwise the LED action might affect the operation of the module** (depending on brightness and color). Use at least 100-130mcd or ultrabright LEDs (60°) plus a **trimpot of (only) 2k or 5k for (fairly) bright LEDs (**100-150mcd). If you use ultra-bright LEDs, a 5k or more trimmer might make sense, higher values for the trimpot are probably not needed (but work also).
- The DSG XL requires a DSG version 1.33 (main) pcb configured as "**CLASSIC**" version, i.e. so that OUT2 is set to deliver the BIPOLAR output signal. Check that (only) the the upper link / 0 Ohm resistor (here shown in green) has been installed:



Bill of Materials

Trimmers

2	5K (or more depending on LED)	LED - on panel pcb -	Trimpot (Bourns 3362P or Vishay T73YP202KT20 or anything that matches the footprint) to adjust the LED brightness. Pick value depending on LED (see text). Optional - use trimpot or LED resistors (not both!)

Misc

1	MTA-156		MTA-156 power connector
5	SIL header 10pol		10-pin connector, links main pcb to component pcb Please note: the 2 pins in the dotted box (next to the 8 pins) also have to be connected for the XL version!
2	Jumper (optional)	to configure the SINEOID output level on each side	closed jumper = unipolar (0V to 5V) open jumper = bipolar (-2.5V to 2.5V)
7	Banana Jacks RED	END OUT, TRIG IN, PULSE, NOT RISE	Emerson-Johnson Mouser: 530-108-0902-1 (red) or Thonk
4	Banana Jacks BLACK	IN, OUT2	Emerson-Johnson Thonk / Mouser: 530-108-0903-1 (black)
16	Banana Jacks WHITE	CV / unipolar (blue or white)	Emerson-Johnson Thonk / Mouser: 530-108-0910-1 (blue), 530-108-0901-1 (white)
2	LED 5mm	low current	pick color to suit LED lens
2	LED lens 5mm		VCC, Mouser 593-3000R (red), 593-3000A (amber) ...
8	Potentionmeter 50k or 100k	linear (B50K or B100K)	Alpha 9mm vertical pcb mount available from Thonk, Tayda

Building

This is simply a suggestion - you might find a different workflow more practical.

1. Mount the Banana jacks and the LED lenses onto the front panel. If you use retention rings for the LED lenses, attach the rings to the lenses.

2. Main pcb and XL (panel) pcb are to be connected through precision DIP socket and pins. It is recommen-ded to use the pins on the main pcb (facing down, soldered from above) and the pin sockets on the panel pcb (standing up, soldered from the front panel side). Break or cut off the pieces you need and stick them together so that main pcb and component pcb form a nice sandwich (don‘t solder yet). Check that you didn‘t leave out any pins / holes and that the sockets are all on the same side (panel pcb). Also make sure the pcbs have the right orientation (so that the pots will sit outside!). Solder all the pins in while keeping the sandwich together - this avoids any misalignments.

3. Carefully separate the sandwich - if you used precision sockets, this may not to too easy - they stick together nicely (giving a good connection).

4. Solder the LED trimpots (or resistors) onto the panel pcb. Install the pins for the jumpers (optional).

5. Mount the pots onto the component pcb. Pots should sit on the printed side - this side faces the front panel. Don‘t solder them in yet. Stick the LEDs into the panel pcb - the long leg must be at the + side.

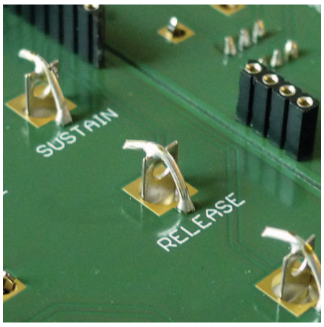
6. Optional: Attach 10mm spacers to the panel pcb - when using precision pin connectors, spacers are not really necessary as the connectors firmly hold the main pcb anyway, but if you choose to add them, this is a good time.

7. Install the banana jacks to the front panel.

8. Carefully mount the XL (panel) pcb (with the pots and LED inserted) onto the front panel. First slide / push the LED into the LED lens - all the way, this may take a bit of force. You may then have to wiggle each pot a bit to get the pots through. Make sure the threads of the pots go through completely and the pots sit right at the front panel. Screw the pots to the panel.

9. Once everything is nicely in place, especially the LED sitting inside (and not on top) of the LED lens, solder the LED and the pots onto the component pcb (while the front panel is attached).

10. Solder the banana jacks in. You can either solder them directly to the surrounding vias (ring round) or - which makes removing easier should you ever need to do that - by inserting a stiff (bare) wire into the little hole (via) and solder that wire to the top of the banana jack:



11. Solder the 4 trimpots and the power connector onto the main board.

12. Mount the main pcb onto the component pcb and fasten it using screws / spacers if desired.

13. Connect a power cord supplying +12V, GND, GND, -12V to the MTA-header on the main board (make sure you didn‘t mix the direction up!) and you should be ready to go :-)

Calibration

Patch GATE OUT into TRIG IN on each side of the module. This should put the module in CYCLE mode (acting like an oscillator). From the original kit instructions:

Turn the RISE and FALL knobs to center position or above. Patch the OUT(put) into an audio mixer or Output Module to monitor the output. There should be a triangle wave present which can be changed to a sawtooth wave of lower frequency by turning down either the RISE or FALL knob. The frequency and timbre will depend upon the settings and the shape as set by the relationship between the Rise and Fall times.

Starting from a middle position, adjust the **OFFSET trimmer** so that the OUTput is in the range of 0V to (exactly) 5V. The module may stop cycling towards either end of the trimmer - if this happens, move the trimmer a bit back towards the center, unplug the patch cord between GATE OUT and TRIG IN and plug it in again - that should bring the cycle back.

Adjust **LED brightness** according to taste - make sure you don't turn the brightness up too much (i.e. trimmer setting shoud be at least 1k unless you use white or blue LEDs).

Using the trimpots on the main pcb the **1V/Oct tracking** can be adjusted. However, be aware that by design the tracking of this module will not reach the range covered by dedicated oscillators. To adjust the tracking, set the wave to an inverted Sawtooth (negative ramp, Rise is as steep as possible) and calibrate for the lower range (up to 440Hz).

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