SERGE Dual Universal Slope Generator (DSG) mk2 for Eurorack

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. Like the first R*S verision of the DSG it offers **independent VC control over RISE and FALL**.

In addition, the Mk2 version has been optimized for audio performance and speed/precision. The left side covers a frequency range up to more than 10kHz. It also offers **improved tracking** and provides some temperature compensation.

The kit consists of a front panel in euro format as well as 2 pcbs that already contain all of the parts in surface-mount technology (SMT).

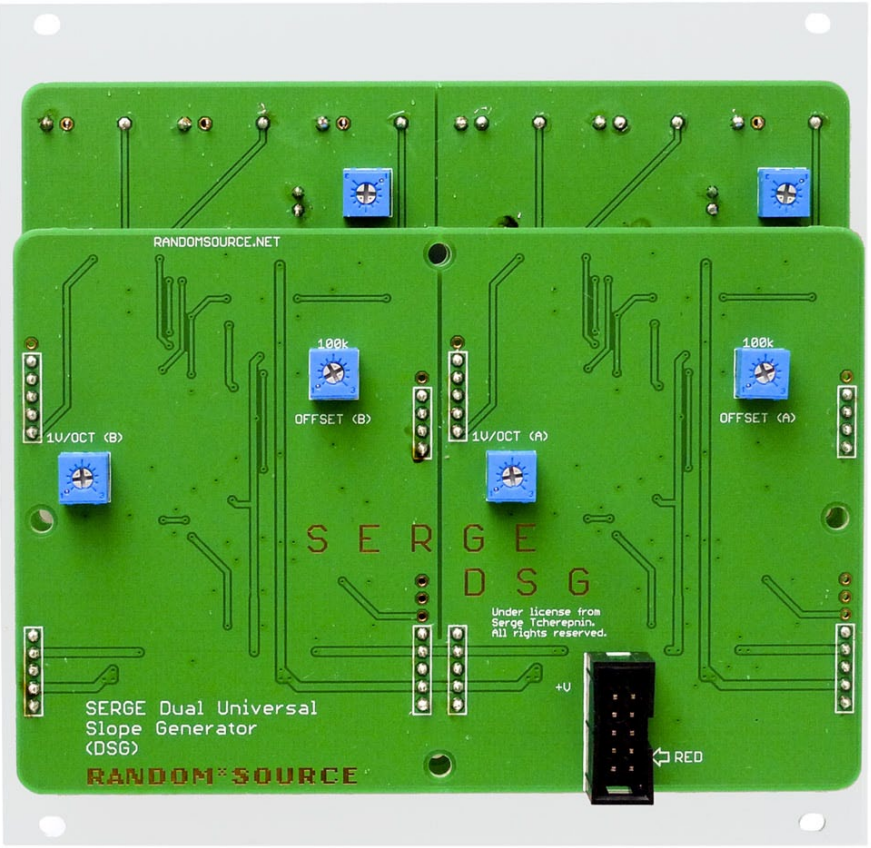
The sides 2 of the DSG differ slightly:

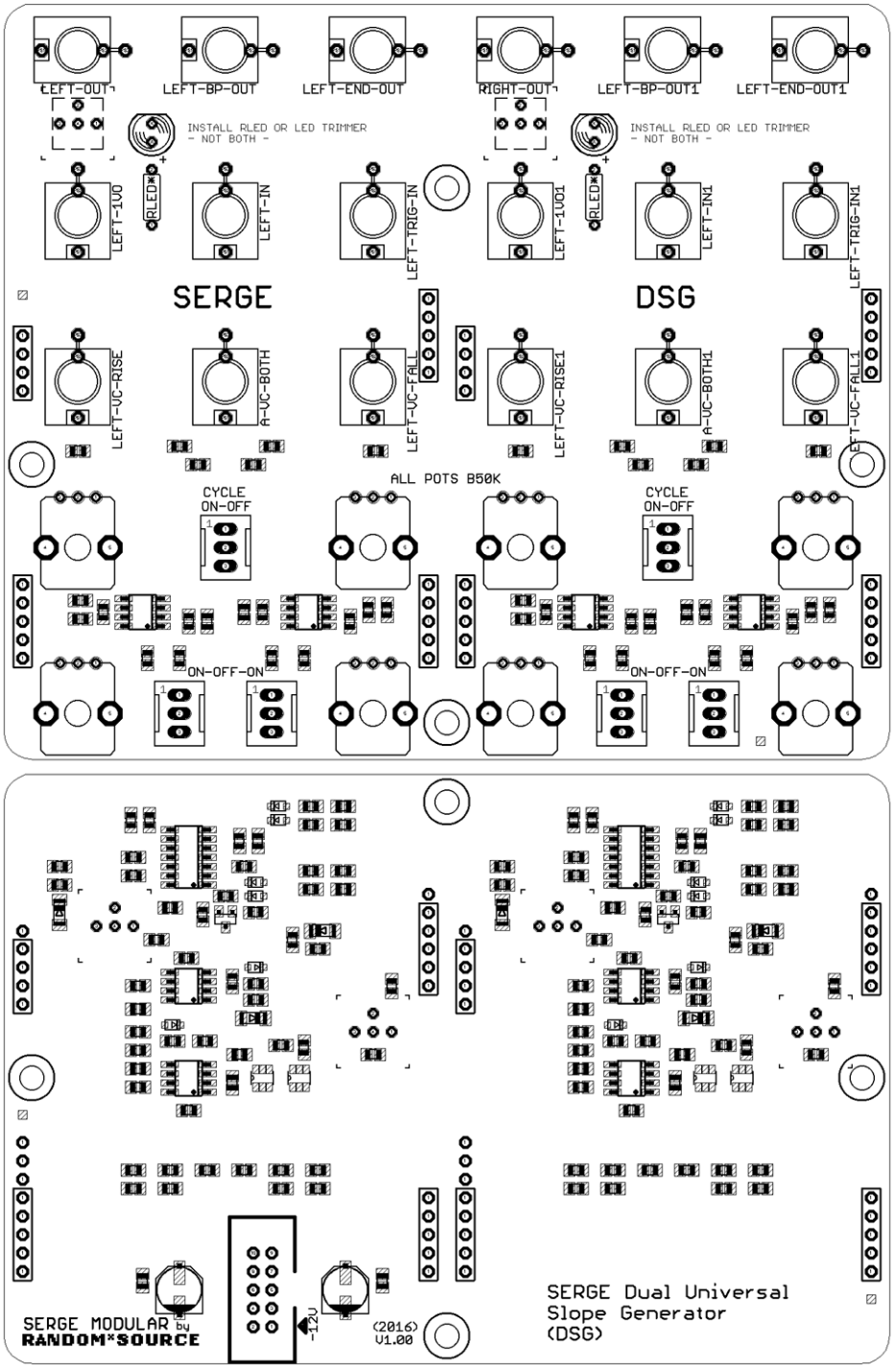
- The left side ("**contemporary**") provides a (red = gate) **Pulse output** with a fixed duty cycle of appr. 50% (instead of the bipolar out). How does this differ from the normal Gate out? The duty cycle of the normal Gate out depends on the Rise and Fall settings and ranges from appr. 5% to 95%. 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.
- The right 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*** basic 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.

Tracking and LED brightness can be adjusted with trimpots (the LED trimpots are on the panel pcb).





Technical Aspects:

- The front panel is color (screen) printed. **Do not use strong cleaning liquids, solvents, acid, ethanol, detergents etc. to clean the front panel** as that could solve/harm the paint. A damp cloth should be sufficient if you need to clean it.
- Use antistatic precaution when handling the DSG pcbs - don't touch the small SMD parts and ICs with your hands.
- **The main pcb is designed to be upside-down - all SMT parts inside the sandwich**. Make sure the direction/position of the pcbs is correct before soldering the connectors!

- Only these parts have to be soldered in: 4 trimpots on the main pcb, 2 trimpots or fixed resistors on the panel pcb to set the LED brightness (**marked in green in the picture above**), 8 rows of pin stripes to connect the main pcb to the panel pcb - **use only the pins within the marked white rectangles and ignore the ones outside** -, power header.
- LED: The trimpots (together with an on-board resistor) determine the brightness of the LED. It is **essential to use low current (max 2mA) LED**s - **otherwise the LED action could 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).

Bill of Materials

Trimmers

2	100k	Offset	Trimpot (Bourns 3362P, Vishay T73YP104KT20 or anything that matches the footprint) to adjust the uni-polar output and the symmetry of the bi-polar output.
2	5k	1V/Oct	Trimpot (Bourns 3362P, Vishay T73YP502KT20 or anything that matches the footprint) to adjust the tracking of the 1V/Oct input. Single turn is sufficient.
2	2K or more	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

2	Switches SPDT ON - OFF (ON - ON)	Cycle	Sub-Miniature Switch, e.g. Mountain Switch (Mouser: 108-0042-EVX)
4	Switches SPDT ON - OFF - ON (or ON - OFF)	Expo 3-positions recommended!	Sub-Miniature Switch, e.g. Mountain Switch 3 positions: Mouser: 108-0044-EVX 2 positions: Mouser: 108-0042-EVX
1	Euro Power header		MTA-100 power connector, Reichelt: WSL 10G
2	SIL header 4pol		pin connectors/headers, linking main pcb to compo-nent pcb - using precision strips allows to break off pieces as needed
6	SIL header 5pol		
18	Thonkiconn Jacks		3.5mm Jack Sockets (PJ301M-12) from Thonk
2	LED 5mm	low current (max) 2mA	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

Power Connector

The module is designed to be powered using a standard Eurorack 10-pin DIP header (pinout +12V / GND / GND / GND / -12V with the **red stripe on the cable indicating the -12V side**). Depending on the headers used on the pcb, the markings indicating -12V may be blocked, so **be careful about the direction! Reversing the power is likely to severely damage your module.**

Building

1. Use a side-cutter to separate main pcb and component pcb.

2. Main pcb and component pcb are to be connected through precision DIP socket and pins. It is recommended to use the pins on the main pcb (facing down, soldered from above) and the pin sockets on the component 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**). **Use only the pins within the white boxes** (i.e. ignore the onese outside). Check that the direction of the pcbs is correct - **SMT parts on the main pcb have to be inside** the sandwich - and that the sockets (female headers) are all on the same side (panel pcb). 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 will not be too easy, just go mm by mm - they stick together nicely (giving a good connection).

4. Solder the LED trimmers or resistors onto the panel pcb - if you use trimmers, make sure they sit on the right side!

5. Solder the trimmers and power header onto the main pcb. **Pay attention that these parts are at the back of the main pcb (not where the SMT parts sit!)**.

6. Mount the Thonkiconn jacks, the pots and the switch onto the component pcb. Stick the LEDs through, too (long leg means +). You probably have to remove the top nut from each switch (that one is needed to fasten the switch onto the front panel. For best results, you may want to check that the other nut is all the way down and possibly remove spacers or similar from the switch threads.

7. Pots should sit on the side facing the front panel (as marked on the board). Don‘t solder them in yet. Attach any screws / spacers if desired to the component pcb (this gets more difficult once the panel pcb is connected to the front panel).

8. Mount the LED lenses onto the front panel (and add retention rings if you use them).

9. Carefully mount the panel pcb (with the pots, leds etc. inserted) onto the front panel. 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 jacks, pots and switches to the the front panel to make sure of that. Make sure you push the LEDs (all the way) into the LED lenses - they should kind of snap in.

10. Once everything is nicely in place, solder the pots, jacks und switch onto the panel pcb (while the front panel is attached).

11. Connect a power cord supplying +12V, GND, GND, -12V to the power-header on the main board and double check the direction of the power header before you turn power on. You should be ready to go now :-)

Calibration

Use the CYCLE switch on each side of the module to turn the cycle on - the DSG now acts as an LFO / VCO. 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.

OFFSET (=output amplitude)

Starting from a middle position, adjust the **OFFSET trimmer** so that the OUTput is in the range of 0V to 5V. The module might 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.

1V/OCT TRACKING

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).

LED Brightness

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).

Power Consumption

Power consumption: appr. 95mA @ +12V and appr. 80mA @ -12V

Module width: 26HP, depth: < 35 mm

(Version 10 July 2016)