SEQ v4L mk II

An updated SEQ V4L that only needs one ribbon connector to an LPC-17 or STM32F4 Core.

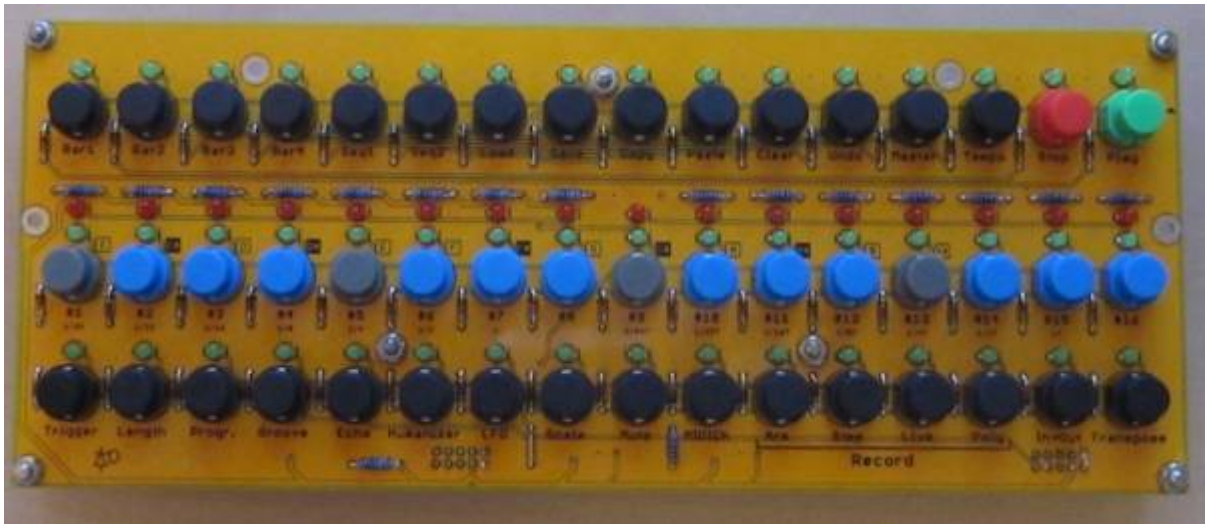
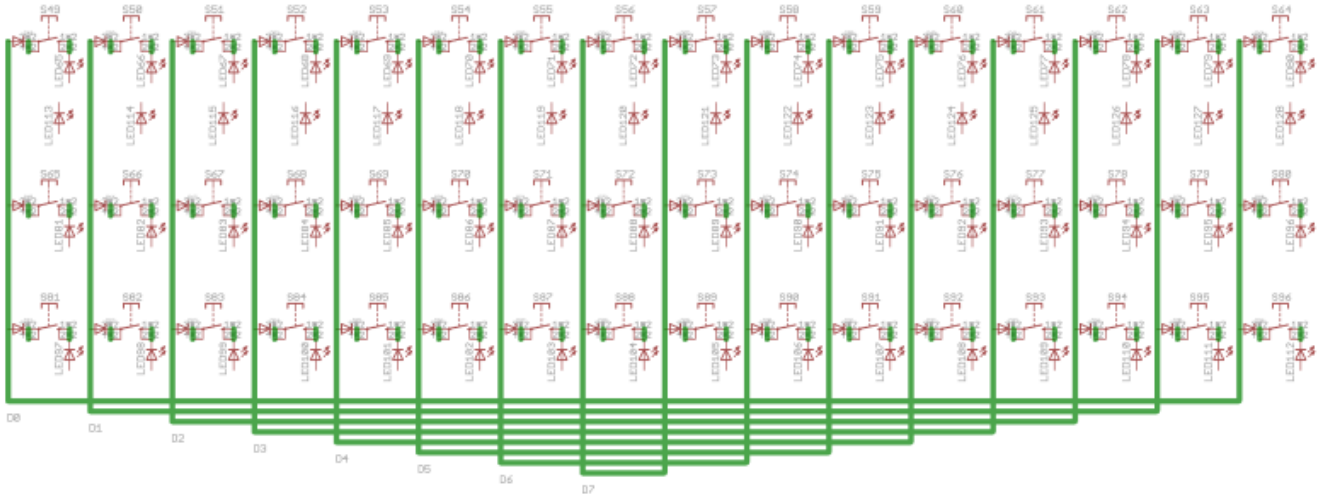


Image credit: TK.

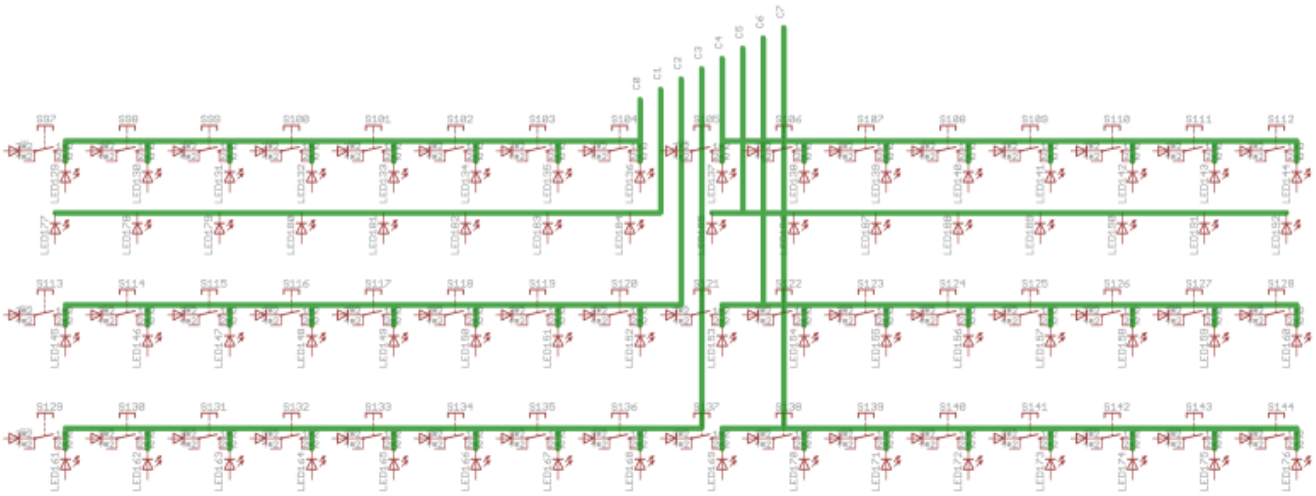
Schematic

Matrix wiring

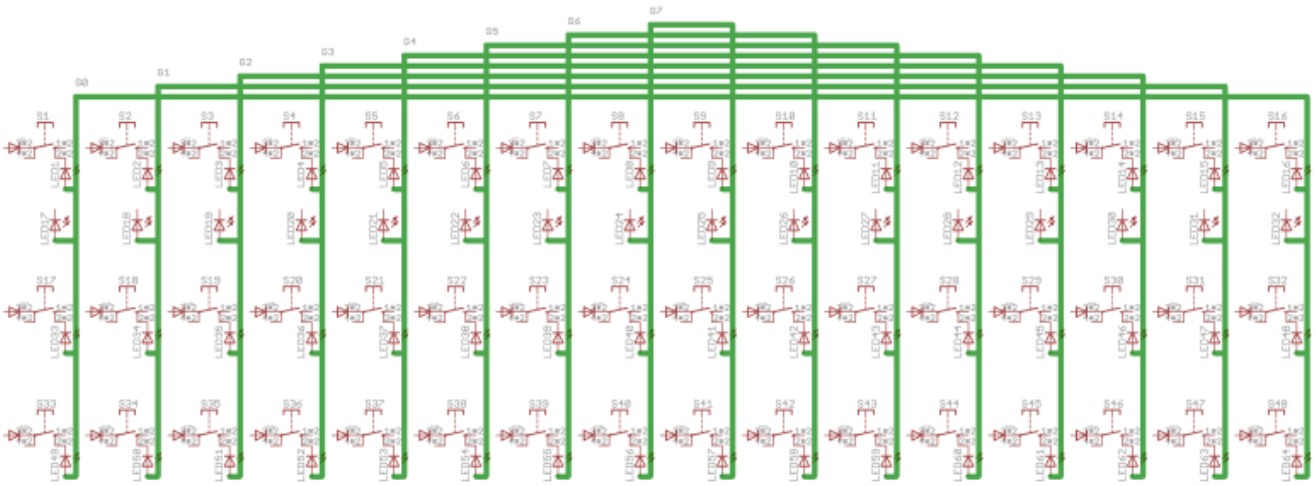
Wiring follows the same form as the original SEQ v4L. Each element is shown separately (please ignore the part designators):



D0-D7 are used to scan switch input columns



C0-C7 are selection pulses on 8 “rows”



G0-G7 control LED columns

IC	Pin	Connection	Notes
IC1	11	D0	digital inputs with pullup to +5V
	12	D1	
	13	D2	
	14	D3	
	3	D4	
	4	D5	
	5	D6	
	6	D7	
IC2	15	C7	via LINK (C7), else directly connected
	1	C6	
	2	C5	
	3	C4	
	4	C3	
	5	C2	

IC	Pin	Connection	Notes
	6	C1	
	7	C0	
IC3	15	G7	via 100R resistors
	1	G6	
	2	G5	
	3	G4	
	4	G3	
	5	G2	
	6	G1	
	7	G0	

Circuit description

The circuit is merely a single colour 8*8 BLM (button LED matrix) arranged as a 16*4 with one row of switches left out. Normally a different colour LED will be used to indicate steps. A J8/9 connector carries the SRIO chain for 2* 74HC595 and 1* 74HC165 chips (with coupling capacitors). No current sink transistors are used. The remaining components are diodes on every switch to avoid false triggering, pull up resistors for the DIN inputs and current limiting resistors for LEDs.

BOM v1.1

Type	Qty	Value	Package	Parts	Notes
resistors					
	9	10k	0204/7	pull ups go on the left side of the board, plus one extra near the 74HC165	
	8	100R	0204/7	right side of the board, one at the bottom	some control over LED brightness is possible, but current is limited by 74HC595s
	1	LINK	0204/7	one wire link is required, use a clipped resistor lead	
capacitors					
	3	100n	1206	rear of board near ICs	
ICs					
	1	74HC165	SOIC16	IC1	to the right of J8/9 viewed from the rear
	2	74HC595	SOIC16	IC2, IC3	to the left of J8/9 viewed from the rear
LEDs					
	16	(red)	3mm		
	48	(green)	3mm		
diodes					
	48	1N4148		next to each switch	
switches					
	48			see note below	

Type	Qty	Value	Package	Parts	Notes
resistors					
headers					
	2		2*5 (shrouded)	J8/9, J8/9A; rear of PCB	note the input header J8/9 is located near the centre of the board between IC1 and IC2

Note for switches

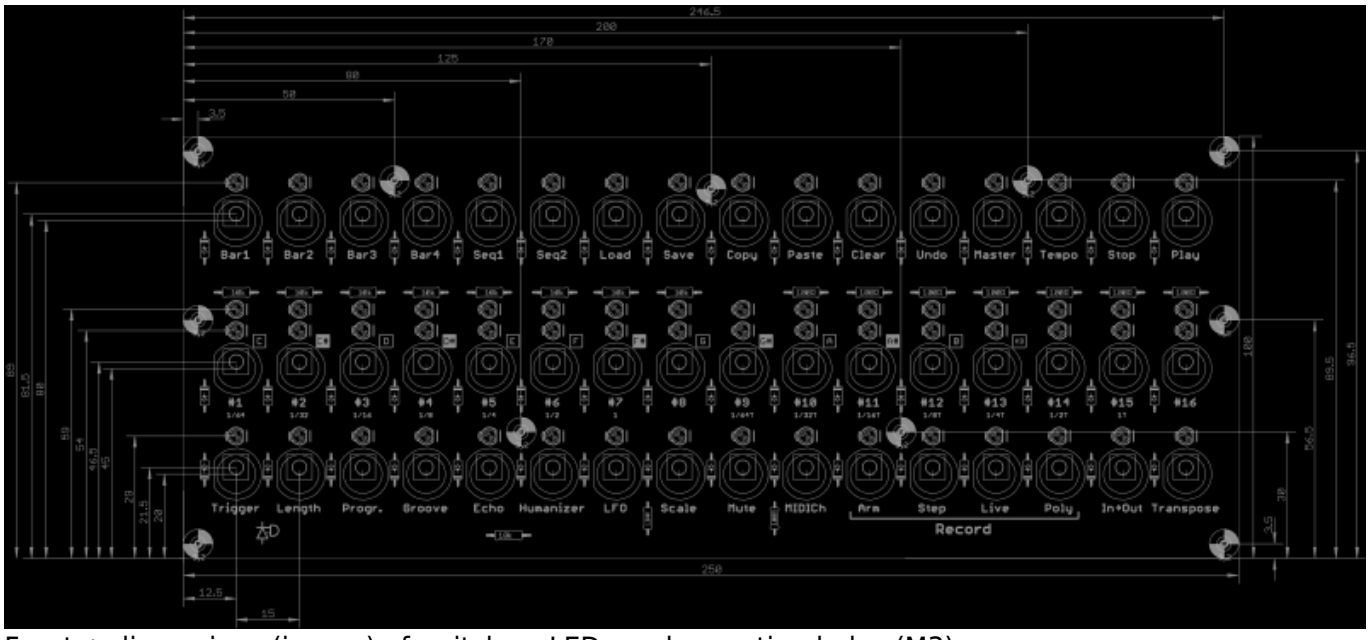
The board supports two different type of switch: el cheapo 6mm types and nicer ITT D6. The brand name is also known as C&K e.g. Mouser.

For D6 switches many different colours and even square shapes are possible. Ensure the flattened part of the circular base aligns with the silkscreen legend.

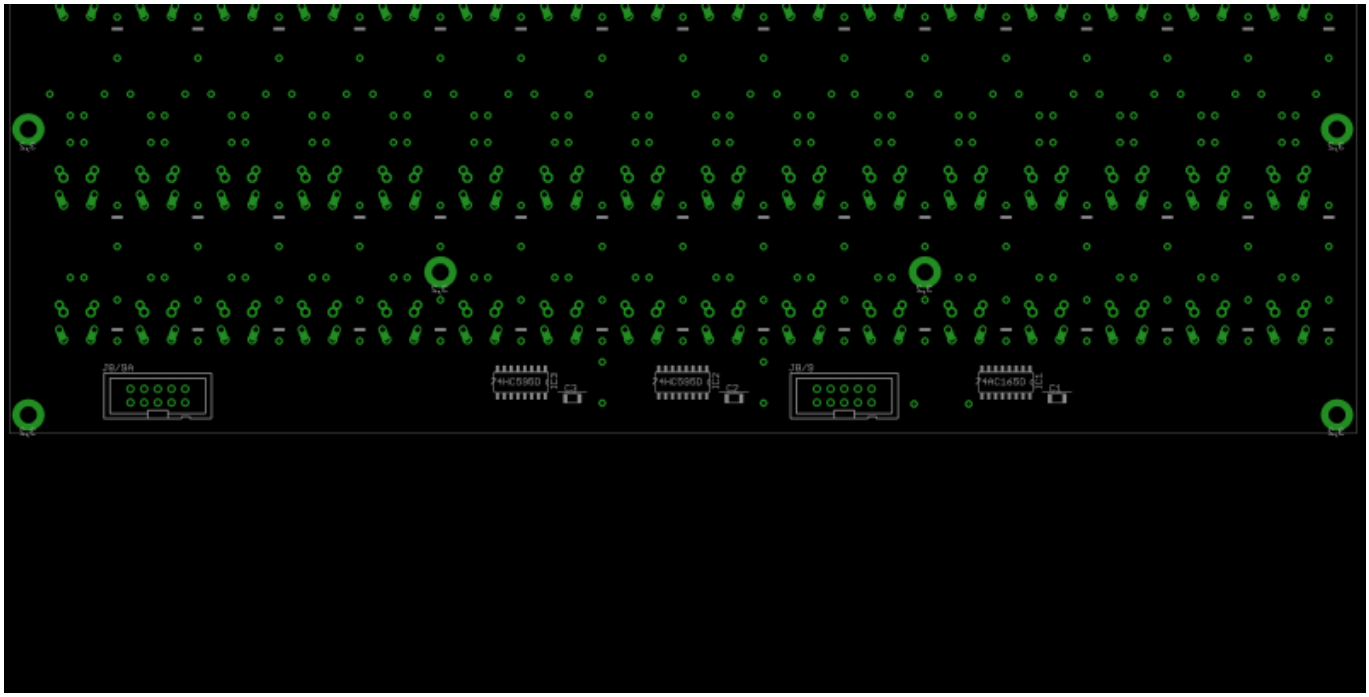
Versions

v1.1: first release. Errata: the bottom silkscreen names/values are missing. Please refer to the PCB image. In words, the two 74HC595 chips are next to each other, while the 74HC165 chip is on the right side of J8/9 when viewed from the rear.

PCBs



Front + dimensions (in mm) of switches, LEDs and mounting holes (M3)



Rear placement of ICs (ignore the “AC” package, the correct CMOS family is 74**HC**165)

Assembly

Putting the board together is simple. As usual, start with the flattest components and work your way up.

SMT Components

- 3* 1206 capacitors
- 1* 74HC165
- 2* 74HC595

If you haven't soldered SMT before it's best to start here so you have a flat PCB to work with. A good strategy is to tin one of the (corner) pads with solder, then place the part with tweezers before forming a joint. Before continuing with others, ensure the part is correctly aligned by reflowing the single pad as needed. If it takes many tries, be sure not to overheat ICs. After a while the flux will be less effective at wetting the joint and so extra through a flux pen or similar is nice to have on hand.

It's good practice to visually and electrically check for short circuits between pads and remove excess solder with braid when required.

Resistors (+link), Diodes and Switches

- 9* 10k, left side (refer to PCB image)
- 8* 100R, right side (refer to PCB image)
- there's a set of dummy pads if you want the line of resistors to look symmetrical, it's just for show :)
- 1* LINK
- 48* 1N4148 diodes. Note carefully the alignment of the cathode band. The top two rows point

"north", while the bottom two point "south." If you get any of these wrong, the switches will not work.
- 64* LEDs, cathode marked by the flat part on the silkscreen. As noted, usually you will have 16 red and 48 green or other colour options. If you intend to build an opaque case, you may wish to install them "proud" i.e. only soldered once they're pushed up into the panel. For transparent cases, it's fine to mount them "flush" to the PCB.
- 48* switches. See part notes above. You can use different colours to help identify the different functions.

Headers

- J8/9 should be mounted on the rear of the board.
- J8/9A is optional for extending the SRIO chain (e.g. TPD, BLM etc.)

Interconnection to Core

J8/9 connects to J8/9 of a Core module (LPC17 or STM32F4).

License

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