Blinkström Colour Construction Kit

Contents:

1	PCB "Blinkström Colour Rev. 1"
1	3-wire cable, 1m
150	RGB LEDs (PLCC4, common anode)
1	SD-Card Slot
1	D-SUB 9-pin female connector
1	D-SUB housing for 9-pin connector
1	Controller ATmega162 (TQFP)
1	RS232 Driver MAX232 (SO16, narrow)
3	Shift Register 74HC164 (SO14, narrow)
1	Crystal, 14.7456 MHz (SMD or THT)

24	MOSFET IRLML6244 or 2502 (n-channel)
18	MOSFET IRLML6402 (p-channel)
2	Diode 1N4148 (SMD)
11	Resistor Array 4x 22Ω (1206)
24	Resistor 68Ω (0805)
1	Resistor Array 4x 1kΩ (1206)
1	Resistor Array 4x 2.2kΩ (1206)
2	Capacitor 33pF (0805)
5	Capacitor 100nF (0805)
5	Tantalum Electrolytic Cap., 1µF (size A)
1	Low-ESR Electrolytic Cap., 470µF (size G)

SMD Soldering Advice

To solder the SMD components, tin only one of the pads, then grab the component with tweezers, re-heat the tinned pad and slide the component in sideways. When the component is aligned properly, remove the soldering iron, let the solder joint cool down and solder the rest of the pins. It is recommended to solder the components in the order listed below.
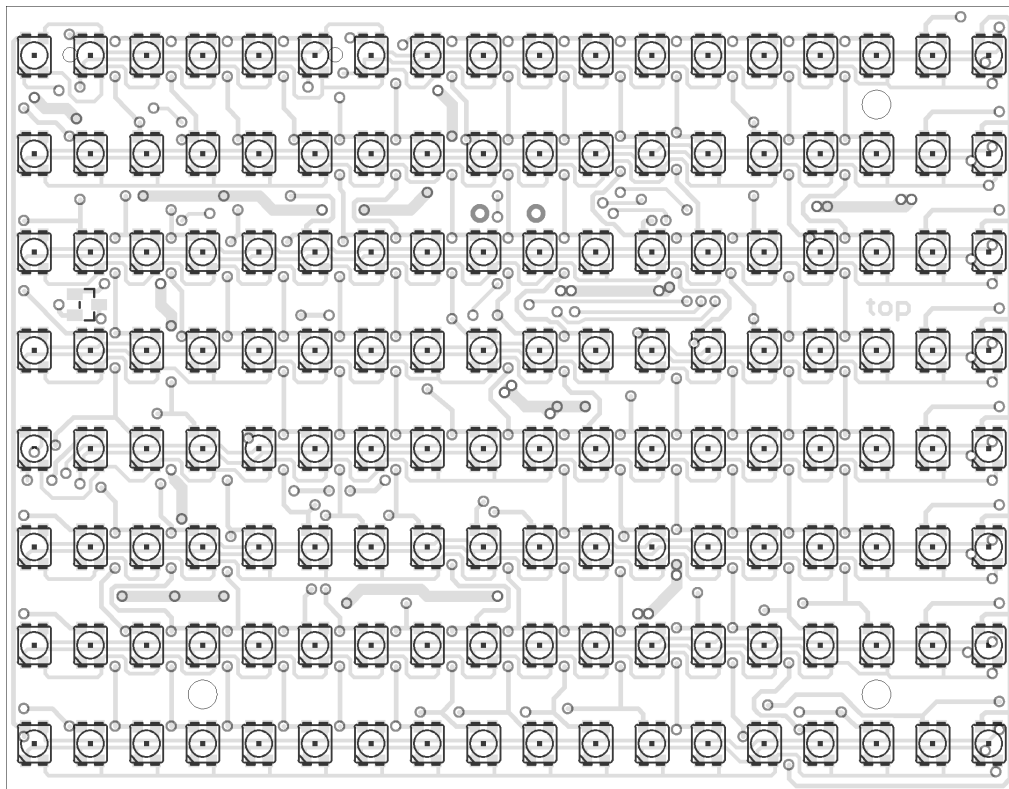
*PCB top component placement*

It is recommended to populate the board in the order given below.

1) LEDs: The orientation is important for the LEDs, observe the position of the chamfered corner. The orientation is the same for all LEDs. If you don't want to solder all LEDs at first, you should at least complete the first row and the first column (which is enough to see if the circuit is working) and add a single LED in the remaining corner (to make the board lie flat when populating the other side).

The remaining parts will be populated on the bottom side of the board. The SOT23 footprint on the top side remains unpopulated.

2) Integrated Circuits: The controller (IC4) has a dent in one corner to indicate the correct orientation. Usually that corner is also chamfered. The other ICs have either a notch, dent or bar on one end or a chamfered long edge. The chamfered edge is indicated on the silkscreen with a line. If you can't find the notch or chamfered edge, you can also find the correct orientation using the text on the ICs: if you hold the IC so the text is the right way up, the notch is on the left side. ICs 1, 2 and 3 are 74HC164 (shift register) and IC5 is MAX232 (RS232 driver).
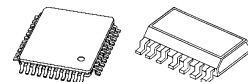
3) Resistors: The orientation of the resistors doesn't matter.

Name	R1 ~ R11	R12 ~ R35	R36	R37	R38
Value	4x 22 Ω	68 Ω	4.7 kΩ	4x 1.0 kΩ	4x 2.2 kΩ
Marking	220	680 *or* 68R0	472 *or* 4701	102	222

4) Transistors:

| Name	T1 ~ T18	T19 ~ T42
Type	IRLML6402	IRLML6244 *or* IRLML2502
Marking	E....	S.... *or* G....

5) Diodes (D1, D2): The black ring on the diodes corresponds to the thick line on the silkscreen.

6) Capacitors: Only the electrolytic capacitors (1 µF and 470 µF) have a specific orientation. The 1 µF ones have a bar printed near one of the pins indicating the positive side which has to match the bar in the image on the next page. The 470 µF one has two chamfered corners on the positive side which must match the silkscreen outline; there is also a black bar printed on top of the capacitor on the negative side.

Name	C6, C7	C1, C2, C4, C5, C10	C8, C9, C11, C12, C13	C3
Value	33 pF	100 nF	1 µF	470 µF
Marking	*None*	*none*	A6E *or* 105	470
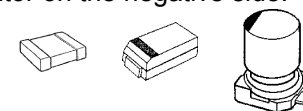
7) Quartz Crystal (Q1): The orientation of the quartz crystal doesn't matter. If your kit has a through-hole quartz crystal, make sure to leave about a millimetre of space between the crystal and the board to avoid short-circuits.

8) SD Card Slot (X1): Remove the SD card dummy from the slot and make sure the two plastic pins are properly latched in the holes before soldering. Make sure the solder joints inside the slot are flat enough for an SD card to fit over them.

9) RS232 Connection: Solder the three wires of the cable to the RS232 solder pads on the PCB. Connect the other side to the female D-SUB connector, then mount the housing on the connector. The pin numbers are indicated on the D-SUB connector.

Solder pad	Tx	Rx	GND
D-SUB connector pin	2 (RxD)	3 (TxD)	5 (GND)

10) Power Supply: Connect a regulated 5 V power supply capable of supplying at least 0.8 A to the two power pads (+5V and GND). Use wires thick enough for the current, or the LEDs might become dimmer if a lot of them are turned on at the same time due to the voltage drop. Also make sure to get the polarity right, your kit might be destroyed if connected backwards. Use a multimeter to check the power supply's polarity if you're not sure. A possible power source is a USB 3.0 port, which can supply up to 0.9 A.
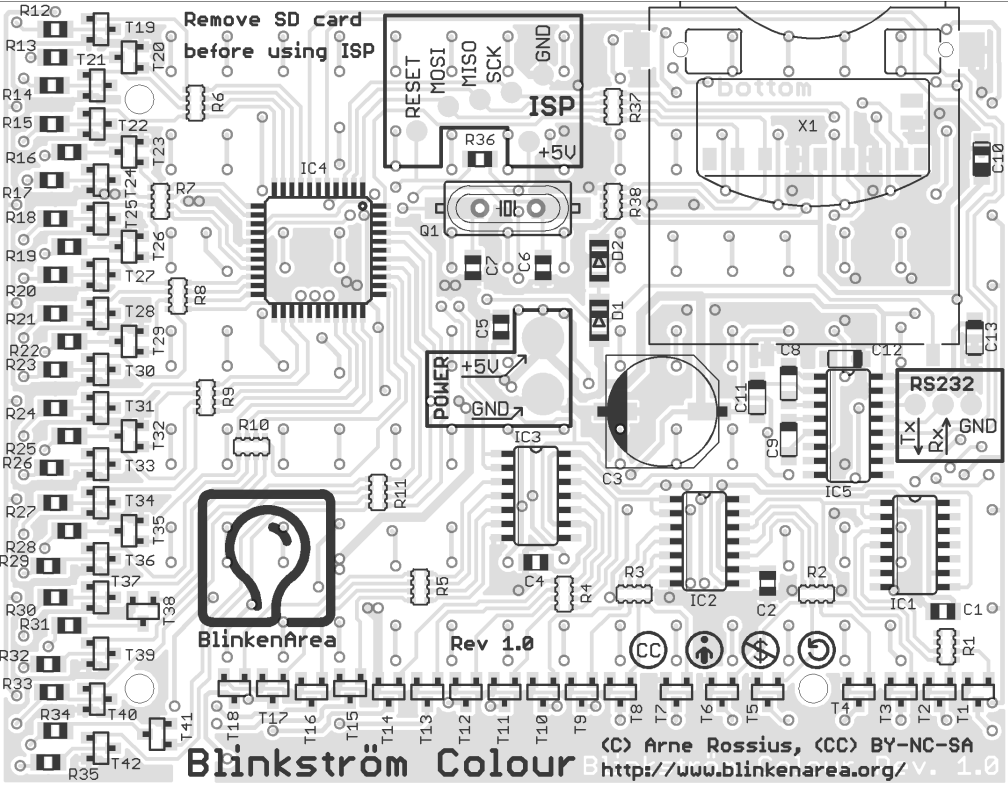
PCB bottom component placement

Programming the Controller
The kit comes with a pre-programmed controller. If you want to update the firmware or use your own, you can use the solder pads in the "ISP" section to connect an AVR ISP programmer. The most recent firmware is available for download from the project page in the BlinkenArea wiki (see below for URL). While programming, the SD card must be removed from the slot. A connected AVR programmer can also cause trouble when accessing the SD card, so if you get SD card error messages after updating the firmware, check if the programmer is still connected.

Using the Blinkström Colour
After powering on, the Blinkström Colour should display the BSC logo followed by a coloured "Chaosknoten". You can now send an MCUF stream via RS232 (115200 Baud) or insert an SD card.

MMC, SD and SDHC cards are supported with a FAT16 or FAT32 filesystem. Very small MMC and SD cards (up to 32 MB) use FAT12 and must be reformatted to FAT16 before they can be used with this kit. If there are several partitions on the card, the first primary partition with a FAT16 or FAT32 partition ID (0x04, 0x06, 0x0B, 0x0C) will be used. Some SD cards come with no partition at all, in which case a partition must be created and formatted. If your SD card isn't compatible with the Blinkström Colour, an error message will scroll across the LEDs.

Files on the SD card must be stored in a directory with the name `BP18X8.RGB`. The files in that directory will be played in the order listed in the FAT (usually the order in which they were copied onto the SD card). If there is no BP18X8.RGB directory, an error message will be displayed. The supported file formats are:

File extension	Format
BIN	modified BlinkströmAdvanced file (binary, 8 grayscales for each colour)
BLM	BlinkenLights Movie (simple ASCII format, no grayscale support, i.e. each colour can be either on or off)
BML	Blinkenlights Markup Language (XML-based, 2 to 256 grayscales per colour, but only 8 grayscales per colour displayed)
BBM	Blinken Binary Movie (binary format with up to 256 grayscales per colour, but only 8 grayscales per colour displayed)

More information about the file formats is available in the BlinkenArea Wiki.

Questions? Problems? Comments?
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Project Webpage
http://wiki.blinkenarea.org/index.php/BlinkstroemColour
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