

# ArcadeMicro Colour Construction Kit

## Contents:

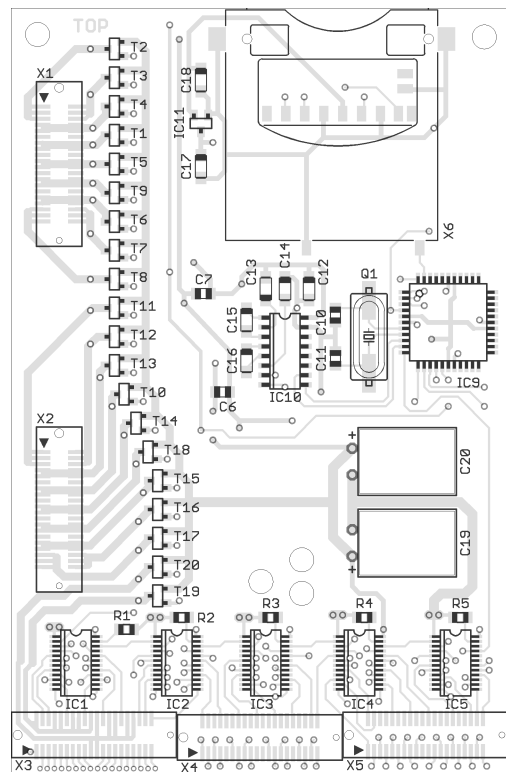
- 2 PCBs (LED Board & Controller Board)
- 1 Controller ATmega644PA (TQFP)
- 1 RS232 Driver MAX232
- 3 8-bit Shift Register 74HC164
- 5 16-bit Current Sink Shift Reg. TLC59281
- 1 3.3 V Regulator MCP1702T-3302
- 20 MOSFET IRLML6402 (p-channel)
- 530 RGB LEDs (0805, common anode)
- 20 Resistor 22  $\Omega$  (0805)
- 20 Resistor 270  $\Omega$  (0805)
- 4 Resistor 1 k $\Omega$  (0805)
- 4 Resistor 2.2 k $\Omega$  (0805)

- 5 Resistor 4.7 k $\Omega$  (0805)
- 2 Ceramic Capacitor 33 pF (0805)
- 9 Ceramic Capacitor 100 nF (0805)
- 7 Tantalum Capacitor, 1  $\mu$ F (size A)
- 2 Low-ESR Electrolytic Cap., 470  $\mu$ F
- 1 Crystal, 14.7456 MHz (SMD or THT)
- 1 SD-Card Slot
- 5 Board-to-Board Connector (Plug)
- 5 Board-to-Board Connector (Receptable)
- 1 D-SUB 9-pin female connector
- 1 D-SUB housing for 9-pin connector
- 1 3-wire cable, 1 m
- 1 Spacer 5 mm

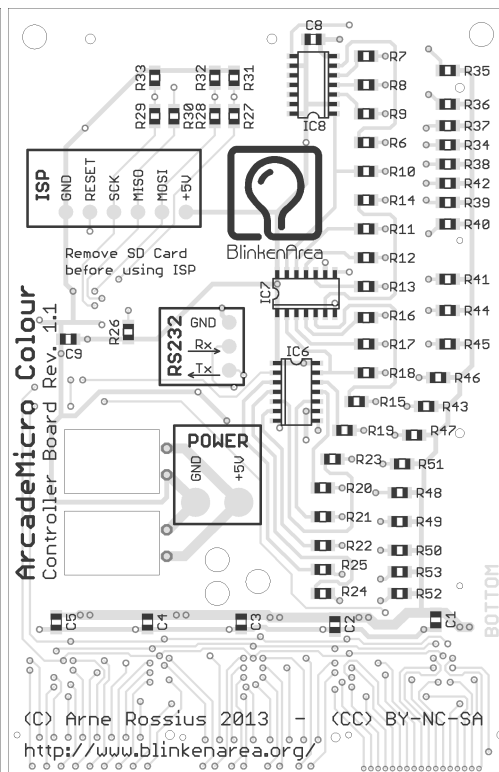
## SMD Soldering Advice

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.**

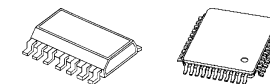


Controller Board, Top Side



Controller Board, Bottom Side

## Controller Board, Top Side

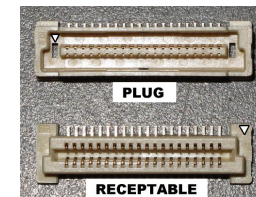


### 1) Integrated Circuits: Solder the following ICs:

IC1-IC5	TLC59281	Dent or printed bar on one short side on the IC must match the notch in the silkscreen outline.
IC10	MAX232	
IC9	ATmega644PA	Circular dent in one corner must match silkscreen.

### 2) Board-to-Board Connectors – Receptables (X1~X5):

Insert the connectors into the alignment holes on the board. The two plastic alignment pins on the connectors have different diameters, make sure to insert the bigger pin into the bigger hole. A small triangle (emphasized in the photo) marks pin 1, which is also marked with a triangle on the board.



**3) Capacitors:** Solder the following capacitors. Orientation only matters for the 1  $\mu$ F capacitors, the printed bar on one side of the capacitor must match the silkscreen image on the left (the PCB itself doesn't have a polarity marker on it). The 33 pF and 100 nF capacitors look the same and have no marking, you can only tell them apart by the quantity included in the kit (33 pF: two, 100 nF: nine).

Name	C6, C7	C10, C11	C12~C18
Value	100 nF	33 pF	1 $\mu$ F
Marking	none	none	105 or A6E



**4) Resistors (R1~R5):** These five 4.7 k $\Omega$  resistors are marked “472” (meaning  $47 \cdot 10^2 \Omega$ ) or “4701” ( $470 \cdot 10^1 \Omega$ ). Orientation doesn't matter.



**5) Transistors (T1~T20):** All transistors are the same type (marked “E....”).



**6) Quartz Crystal (Q1):** Orientation doesn't matter.

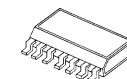
**7) SD Card Slot (X6):** Insert the SD card slot into the alignment holes before soldering. Start with the large outer pins, then remove the SD card dummy before soldering the inner pins.

**8) Spacer:** Glue it to the right of the SD card slot, about 1 cm below the top edge of the board. I recommend using superglue (cyanoacrylate).



## Controller Board, Bottom Side

**9) Integrated Circuits (IC6~IC8):** Solder the remaining three ICs (74HC164). The little dent or printed bar on the IC must face toward the notch in the silkscreen outline on the board.



**10) Capacitors (C1~C5, C8, C9):** These are the remaining 100 nF capacitors from step 3. Orientation doesn't matter.



**11) Resistors:** Solder the following resistors. Orientation doesn't matter.

Name	R6~R25	R26, R31~R33	R27~R30	R34~R53
Value	22 $\Omega$	2.2 k $\Omega$	1 k $\Omega$	270 $\Omega$
Marking	220 or 22R0	222 or 2201	102 or 1001	271 or 2700

(For an explanation of the markings, see step 4. "22R0" is a marking used for low resistance values, meaning 22.0  $\Omega$  without an exponent).



**12) Electrolytic Capacitors (C19, C20):** The electrolytic capacitors are mounted inside the cutouts in the board. Bend the leads so the capacitors will fit inside the cutouts. Observe the polarity: on the capacitors, the negative side is marked with a thick printed line along that side, sometimes with minus signs in it. On the board, the positive side is marked with a plus sign next to the pad. Note that the orientations of both capacitors are different. The capacitors should be inserted from the top side of the board so they won't protrude as much on the bottom side.



**13) Serial Port:** Solder the 3-wire cable to the three "RS232" pads on the board. Solder the D-Sub connector to the other side of the cable. The pin numbers are marked on the D-Sub connector. After you have made sure that everything works, you can mount the D-Sub housing on the connector.

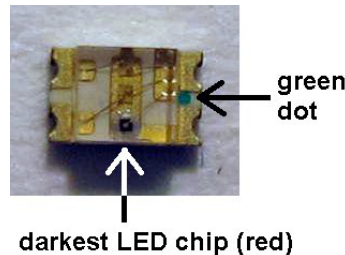
Pad Name	Tx	Rx	GND
D-Sub Pin	2 (RxD)	3 (TxD)	5 (GND)



**14) Power Supply:** Connect a regulated 5 V power supply capable of supplying at least 0.9 A (possibly more with an SD card inserted) 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. *Always* measure the polarity of USB cables, many (but not all) use red for ground and black for positive!

### LED Board

**15) LEDs:** The orientation is important for the LEDs, they have a green dot between the pads on one side. This green dot must face toward the top edge of the board for all LEDs (the edge with X3~X5 along it on the bottom side is the bottom edge). If you find it hard to see the green dot, you can use the position of the dark red LED chip inside the LED package (see photo to the right) instead.



**16) Board-to-Board Connectors – Plugs (X1~X5)**  
See step 2.

## 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 an "SD card error" message after updating the firmware, check if the programmer is still connected.

## Using the ArcadeMicro Colour

After powering on, the ArcadeMicro Colour should display the BlinkenArea and Ap logos. You can now send an MCUF stream via RS232 (115200 Baud) or insert an SD card. The MCUF streaming format is described at <http://wiki.blinkenarea.org/index.php/MicroControllerUnitFrameEnglish>

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 ArcadeMicro Colour, an error message will scroll across the LEDs.

Files on the SD card must be stored in a directory with the name `ARCADE.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, or use 'fatsort' from <http://fatsort.sourceforge.net/>). If there is no `ARCADE.RGB` directory, an error message will be displayed. The supported file formats are:

File extension	Format
BIN	modified BlinkströmAdvanced file (binary, 8 grayscales per 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 at <http://wiki.blinkenarea.org/index.php/FileFormats>

**Questions? Problems? Comments?** Please contact me:

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## Project Webpage

Hardware: <http://wiki.blinkenarea.org/index.php/ArcadeMicroColourEnglish>

Software: <http://wiki.blinkenarea.org/index.php/BlinkenPlusEnglish>