ArcadeMicro (Aµ) Construction Kit

Contents:

1	PCB "ArcadeMicro Rev. 2.0"		8	Resistor Array 4x 2.2 kΩ (1206)
1	Controller ATmega162 (TQFP)		2	Ceramic Capacitor 33 pF (0805)
1	RS232 Transceiver MAX232 (SOIC-16)		5	Ceramic Capacitor 100 nF (0805)
3	Shift Register 74HC164 (SOIC-14)		5	Tantalum Electrolytic Cap., 1 µF (size A)
20	MOSFET IRLML6244 (n-channel)		1	Low ESR Electrolytic Cap., 470 µF
26	Transistor BC857C/858C/860C (PNP)		1	Crystal, 14.7456 MHz (HC49 SMD)
530	LEDs (10 spares) APT2012SECK (0805)		1	SD-Card Slot (Attend 104G-TAA0-R)
2	Diode 1N4148 (Mini-MELF or 1206)		1	D-SUB 9-pin female connector
5	Resistor Array 4x 22 Ω (1206)		1	D-SUB housing for 9-pin connector
26	Resistor 68 Ω (0805)		1	3-wire cable, 1 m
1	Resistor Array 4x 1 kΩ (1206)			

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.**

CATHODE MARK
(GREEN DOTS)

LED pinout
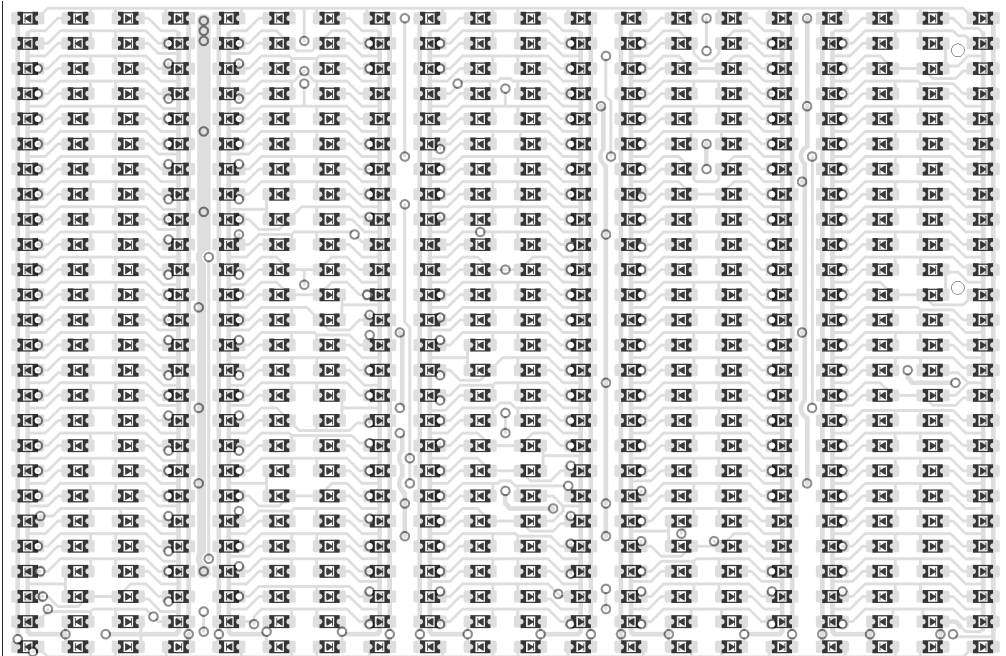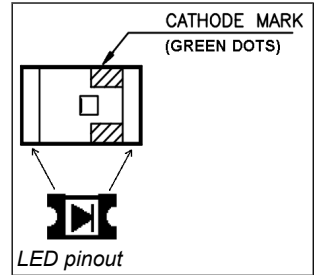
PCB top component placement

1) LEDs: The orientation is important for the LEDs, there are two green dots on one side (the same side the arrow on the bottom of the LEDs is pointing to). This side must face in the direction the arrow in the component placement image is pointing to (see LED pinout image). Please note that the orientation changes after every two rows (since the image is sideways, the rows are top-to-bottom there). 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).

2) Resistors: The orientation of the resistors doesn't matter. The markings use the last digit as an exponent, e.g. 102 = **10**·10^2 Ω = 1 kΩ. For low values, the letter R is inserted between the digits in place of the decimal point and no exponent is used, e.g. 68R0 = 68.0 Ω.

Name	R1~R5	R6~R12, R40	R13~R38	R39
Value	4x 22 Ω	4x 2.2 kΩ	68 Ω	4x 1 kΩ
Marking	220	222	680 *or* 68R0	102
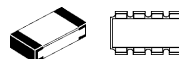
3) Transistors:

Name	T1~T20	T21~T46
Type	IRLML6244	BC857C, BC858C *or* BC860C
Marking	S....	3G, 3L *or* 4G

4) Integrated Circuits: The controller (IC1) has a dent in one corner to indicate the correct orientation. The other ICs have either a notch (or dent) on one end or a chamfered long edge. The chamfered edge is indicated on the silkscreen with a line. If you hold the IC so the text on it is the right way up, the notch is on the left side.

Name	IC1	IC2	IC3, IC4, IC5
Type	ATmega162	MAX232	74HC164
Function	Microcontroller	RS232 transceiver	Shift register
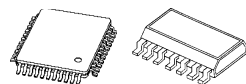
5) Diodes (D1, D2): The thick line on the silkscreen corresponds to the black ring or white bar on the diodes.

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 face toward the little '+' sign on the silkscreen. 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. 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: five).

Name	C1	C2~C6	C7~C11	C12, C13
Value	470 µF	1 µF	100 nF	33 pF
Marking	470	A6E *or* 105	*none*	*none*

7) Quartz Crystal (Q1): The orientation of the quartz crystal doesn't matter.

8) SD Card Slot (X1): Insert slot into the alignment holes before soldering. Start with the large outer pins, then remove the SD card dummy before soldering the inner pins. Make sure the solder joints inside the slot are flat enough for the SD card to fit over them.
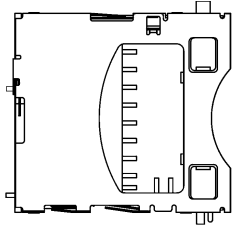
9) RS232 Connection: Solder the 3-wire cable to the three "RS232" pads on the board. Solder the D-Sub connector to the other side of the cable. The pin numbers are marked on the D-Sub connector. After you have made sure that everything works, you can mount the D-Sub housing on the connector.

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 1 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.
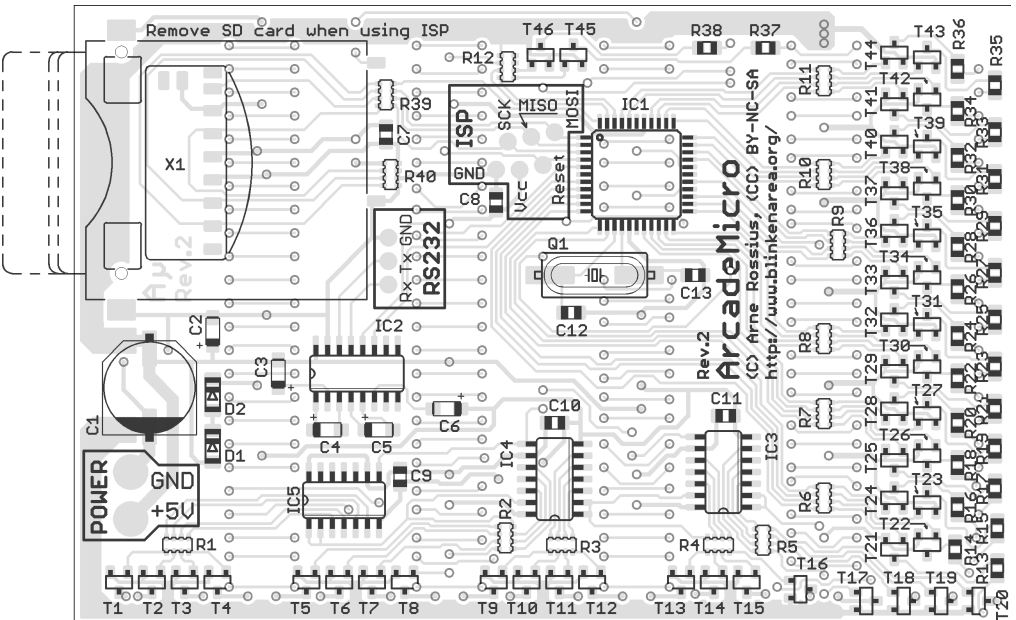
PCB bottom component placement

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). The SD card must be removed from the slot before programming. 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

After powering on, the ArcadeMicro should display the Aμ logo followed by a "Chaosknoten". 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. 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, an error message will scroll across the LEDs.

Files on the SD card must be stored in a directory with the name ARCADE. 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 directory, an error message will be displayed.

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

More information about the file formats is available at
http://wiki.blinkenarea.org/index.php/FileFormats

Questions? Problems? Comments? Ideas?   Please contact me:
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Project Webpage
Hardware: http://wiki.blinkenarea.org/index.php/ArcadeMicroEnglish
Software: http://wiki.blinkenarea.org/index.php/BlinkenPlusEnglish