Technische Universität Hamburg-Harburg

Arbeitsbereich Nachrichtentechnik

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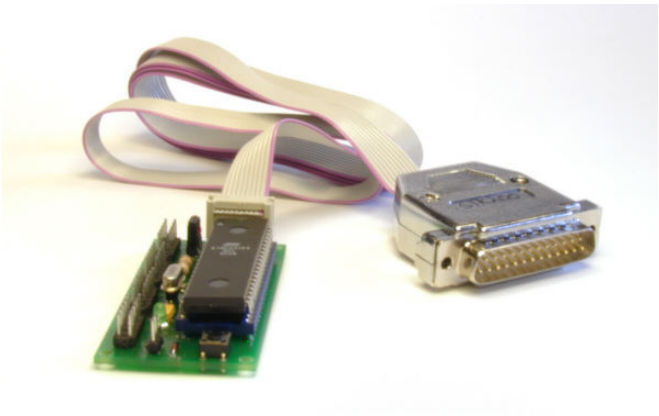
AVR Board 1.0 Application Manual



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Introduction

The **AVR Board 1.0** was developed in the Department of Telecommunications of the Technical University of Hamburg-Harburg [1] for various didactical projects. The purpose of this adapter board is to allow the necessary support for some of the AVR chips and thus to facilitate the development of simple microcontroller applications. The AVR family are 8-bit RISC microcontrollers working with up to 16MHz clock frequency, have a Harvard architecture and a hardware multiplier.

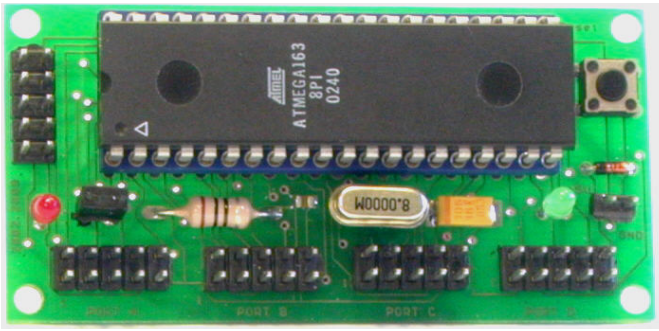


Fig.1 Picture of the AVR Microcontroller Board

The AVR Board 1.0 was tested with the ATMEGA 163 microchip from *Atmel* [3] but it supports all other pin-compatible devices (see Fig.1). It integrates all necessary components (like quartz crystal, power-on reset network and LC filter for the ADC) in order to provide the unrestricted functionality of the devices. For more details see the board schematics and microcontroller datasheet. Supported microcontrollers are:

Atmega 16(L)
Atmega 163(L)
Atmega 32(L)
Atmega 323(L)
AT90S8535 (AT90LS8535)

The outline of the AVR Board 1.0 is presented in Fig.2. The connectors PORT A, PORT B, PORT C, PORT D are connected directly to the I/Os of the microcontroller. The last two pins at every connector are power pins for supplying external hardware with power. The programming takes place over the ISP-Interface that must be connected with the ISP connector. Jumper JP1 allows the selection of the ADC reference voltage.

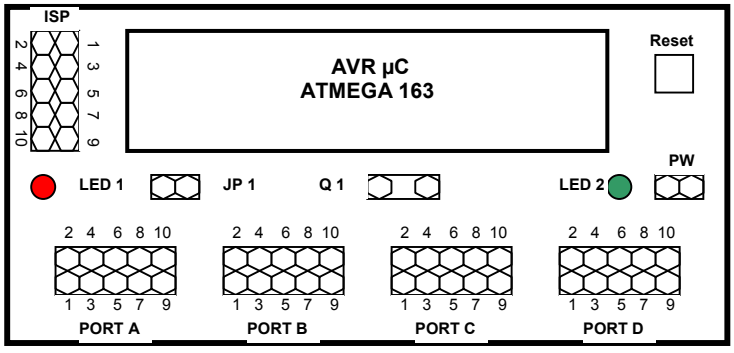


Fig.2 Outline of the AVR Board
Top View

Interface and Functionality

The pinout of the five connectors on the AVR Board is as follows:

PORT A

Pin	Function
1	PA0 (ADC0)
2	PA1 (ADC1)
3	PA2 (ADC2)
4	PA3 (ADC3)
5	PA4 (ADC4)
6	PA5 (ADC5)
7	PA6 (ADC6)
8	PA7 (ADC7)
9	VCC
10	GND

PORT B

Pin	Function
1	PB0 (TO)
2	PB1 (T1)
3	PB2 (AIN0)
4	PB3 (AIN1)
5	PB4 (SS)
6	PB5 (MOSI)
7	PB6 (MISO)
8	PB7 (SCK)
9	VCC
10	GND

PORT C

Pin	Function
1	PC0 (SCL)
2	PC1 (SDA)
3	PC2
4	PC3
5	PC4
6	PC5
7	PC6 (TOSC1)
8	PC7 (TOSC2)
9	VCC
10	GND

PORT D

Pin	Function
1	PD0 (RXD)
2	PD1 (TXD)
3	PD2 (INT0)
4	PD3 (INT1)
5	PD4 (OC1B)
6	PD5 (OC1A)
7	PD6 (ICP)
8	PD7 (OC2)
9	VCC
10	GND

ISP

Pin	Function	Pin	Function
1	MOSI	6	GND
2	VCC	7	SCK
3	LED	8	GND
4	GND	9	MISO
5	RST	10	GND

The description of the signals is presented in the following:

PA0…PA7 PB0…PB7 PC0…PC7 PD0…PD7	These pins are directly connected to the ports of the microcontroller. The pins can be configured as input or output as well. Most pins have two functionalities, for example the ADC channel inputs. For more information see the ATMEGA datasheet [4].
VCC	A +5.0V/3.3V supply voltage from the main power supply, which can be used for powering (low-power) external hardware.
GND	Ground
PW	Power supply connector. Connector must supply +5.0 V for standard devices or 3.3V for low-voltage devices (e.g. Atmega163L)
JP1	Used to choose the reference voltage for the internal A/D converter. No jumper = reference voltage pin left open; internal reference (2.56V) must be used Jumper set = reference voltage pin is connected to VCC
Q1	Socket for an external crystal of desired frequency.
LED1	Red programming LED
LED2	Green power LED
Reset	Pressing resets the microcontroller
ISP	Connector for the STK200 compatible ISP programmer. Supplies also power to the programmer.
MOSI, VCC, LED, RST, SCK, MISO	These pins are directly connected to the microcontroller corresponding uC pins. They are used for in-system programming (ISP). The LED Pin is connected to the programming LED.

Powering Options

Power must be supplied at the PW connector. Supply voltage depends on the microcontroller: +5V for standard types and 3.3V or lower for low-voltage types. A diode is built-in to protect against reversed polarity.

Additional Features and Tools

The AVR Board 1.0 will be programmed using an ISP programmer. The ISP connector pinout corresponds to the STK200 programmer (see table above). A suitable programmer for the printer port (LPT) was developed and is presented Fig.3. The programmer is compatible with most common software tools used for developing AVR applications: "AVR Studio" from Atmel [3], "Codevision AVR" compiler from HP Info Tech [5] and the "Ponyprog" freeware programmer [6].

Fig.3 STK200 compatible programmer for the printer port

References

[1] *TUHH, Department of Telecommunications* Website, http://www.et2.tu-harburg.de

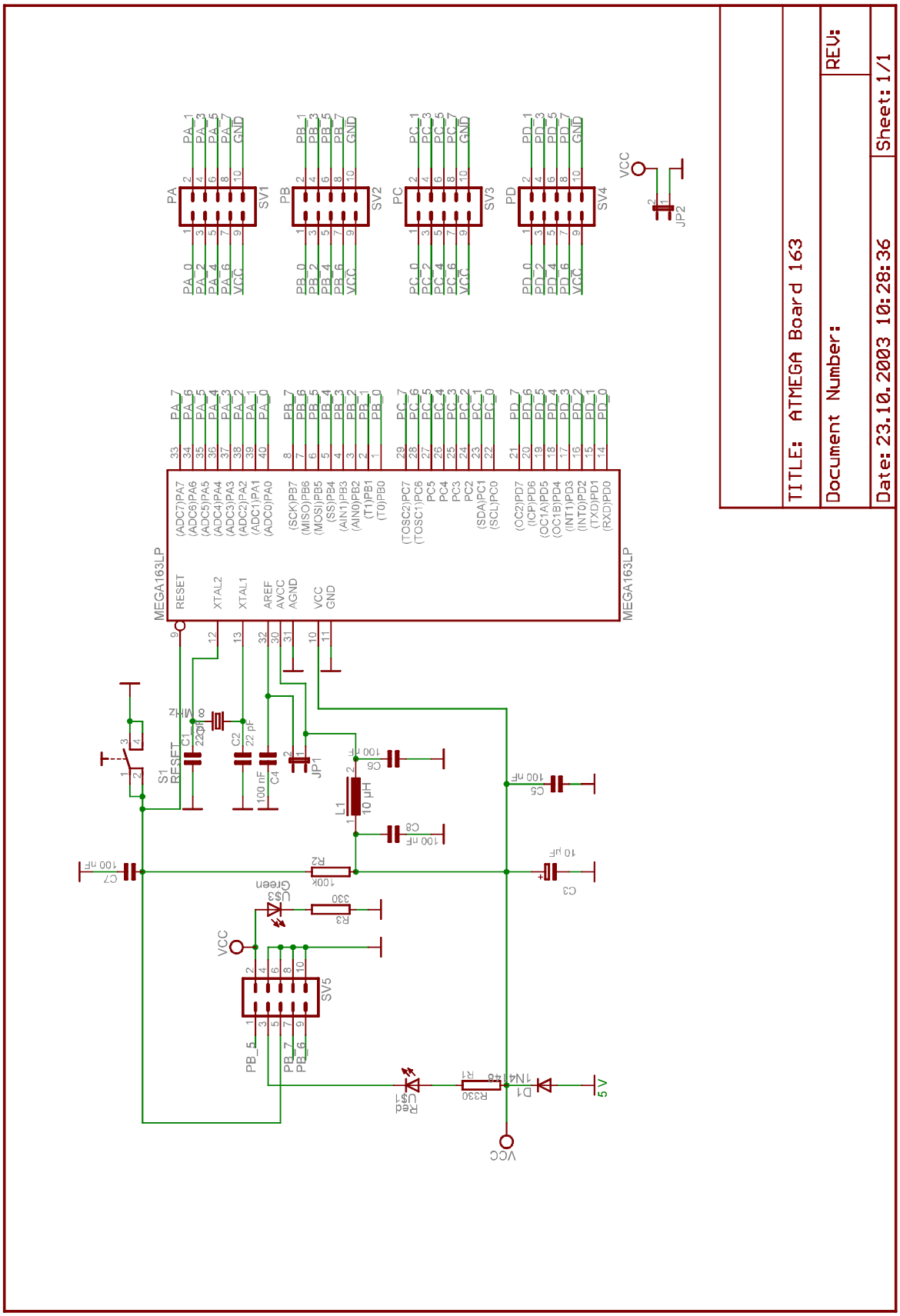
[2] Hobbythek Website, http://www.et2.tu-harburg.de/lehre/Arbeitsgruppen/

[3] *Atmel* Website, http://www.atmel.com/

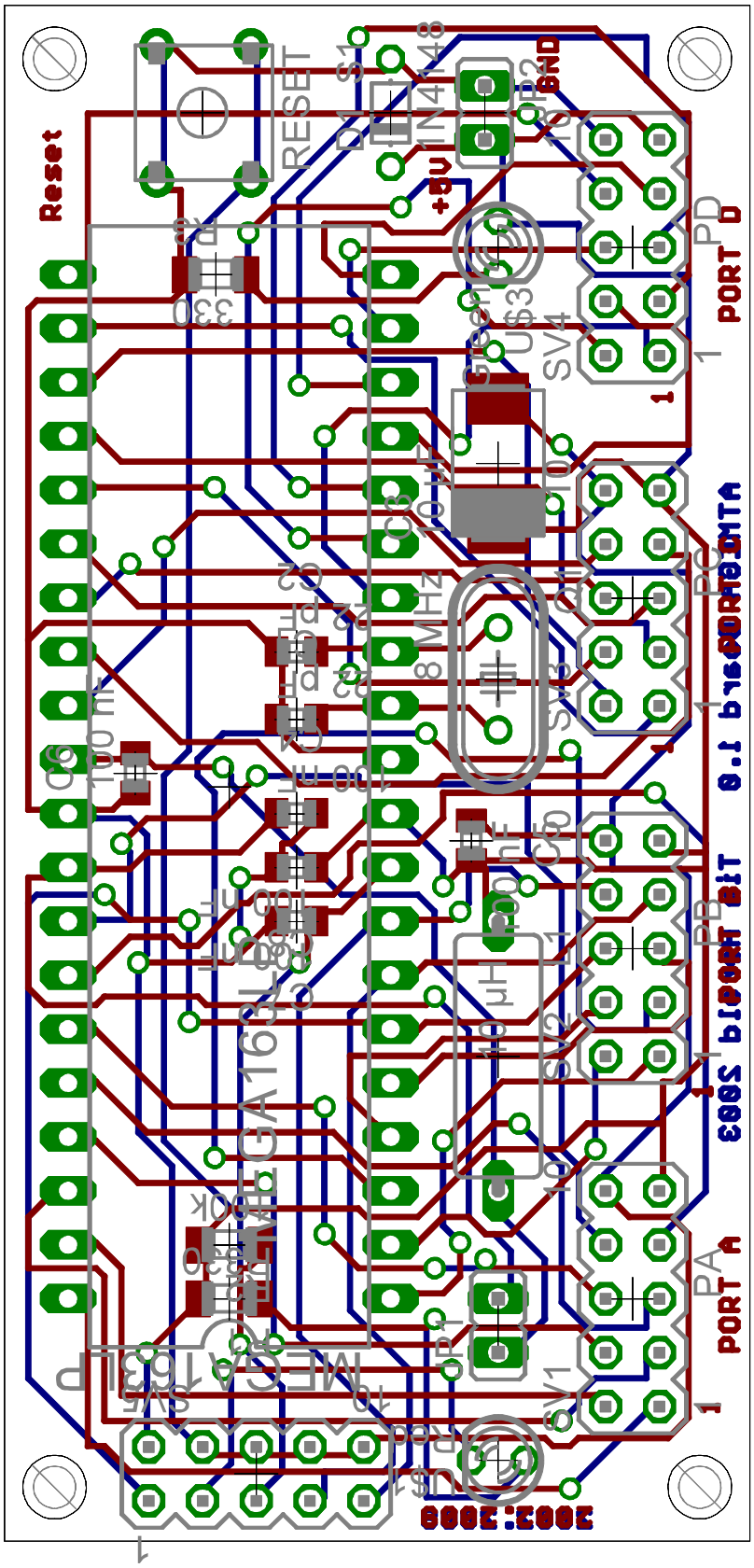
[4] *CodeVision AVR,* http://www.hpinfotech.ro/

[5] *Ponyprog* Programmer Homepage, http://www.lancos.com/prog.html

AVR Board 1.0 Schematic



AVR Board 1.0 PCB



AVR STK200 Programmer Schematic