

MINI-MAX/AVR-C

Single Board Computer

Technical Manual

Date: 5 January, 2007

Document Revision: 1.01



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MINI-MAX/AVR-C Single Board Computer Technical Manual. No part of this work may be reproduced in any manner without written permission of BiPOM Electronics.

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1. Overview

MINI-MAX/AVR-C is a general purpose, low-cost and highly-expandable micro-controller system. It is based on the ATMEL ATMEGA2560-16 single-chip Flash micro-controller. This micro-controller features

- Up to 16 MIPS Throughput at 16 MHz
- 256 Kilobytes of In-System Re-programmable Downloadable Flash Memory
- 8 Kilobytes bytes of RAM
- 4 Kilobytes bytes of EEPROM
- Two 8 bit Timer/Counters and four 16 bit Timer/Counters
- Programmable Watchdog Timer
- Four Programmable Enhanced UART Serial Interfaces
- SPI Serial Interface
- 2-wire Serial Interface (I²C)
- 12 Pulse Width channels
- 16 channel 10-bit ADC with selectable 2.56V or 1.1V Reference Voltage
- 86 general purpose I/O pins
- Real time In-System debug support through JTAG Interface

MINI-MAX/AVR-C board complements these features by providing

- In-circuit Programming and debugging of the micro-controller through either the JTAG or SPI interface
- Two RS232 Serial Ports and two UART Ports with 5V signals for data communications
- 5-channel 10-bit ADC with selectable 2.56V or 1.1V internal Reference Voltage
- Keypad connector
- LCD connector (with programmable contrast adjustment for LCD)
- Expansion bus interface to low-cost peripheral boards such as
 - Instrumentation amplifiers
 - Pressure inputs
 - Strain-gage inputs
 - 12 and 16-bit Analog-to-Digital Converters
 - Digital Input/Output cards
 - LED and LCD displays.

The Flash micro-controller can be serially programmed while in the target application circuit. Customers can program the micro-controller with the most recent firmware or custom firmware. This function of the FLASH micro-controller simplifies new program development and debugging. Downloading of a program to the micro-controller typically takes few seconds.

MINI-MAX/AVR-C should be powered from a 6 to 12 Volt (DC) external power source. A current consumption is not more than 60mA.

Software examples for MINI-MAX/AVR-C are available from <http://www.bipom.com/minimaxavr.php>

2. Specifications

MINI-MAX/AVR-C board has the following configuration:

- ATMEL ATMEGA2560-16 micro-controller with
 - 256 Kbytes on-chip Flash program/data Memory,
 - 8 Kbytes RAM
 - 4 Kbytes EEPROM
- JTAG Port for In-circuit Programming and a real time debugging
- SPI Port connector for In-circuit Programming and for data communication
- Two RS232 Serial Ports for data communications
- Two UART Ports with 5V signals for data communications
- 10-pin terminal block for 5 analog inputs, Vref output and AVcc output
- Three 20-pin Expansion connectors for a peripheral boards
- 10-pin connector for matrix and non-matrix keypads
- Dual-row 14-pin LCD connector (with software contrast adjustment for LCD)
- Single operating voltage: 6 to 12 VDC, 60 mA maximum supply consumption.
- On-board 5 Volt regulator
- Dimensions are 2.35 X 2.40 inches (5.97 X 6.10 centimeters).
- Mounting holes of 0.138 inches (3.5 millimeters) are on four corners.
- 0° - 70° C operating, -40° - +85° C storage temperature range.

3. Functional Blocks

Figure 1 shows the block diagram of the MINI-MAX/AVR-C board

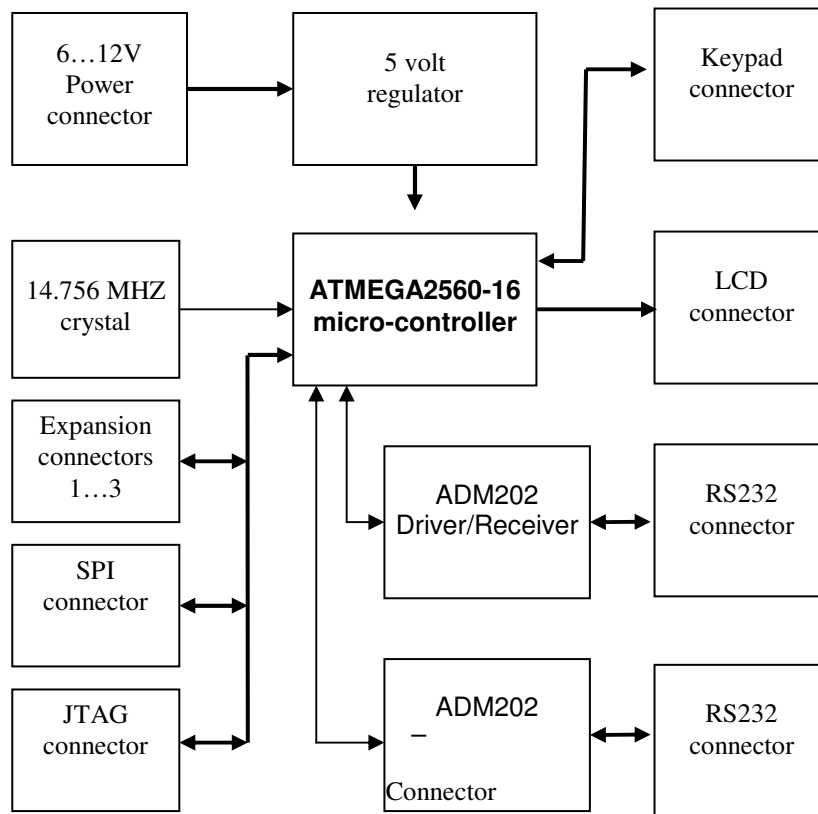


Figure 1

JTAG Port connector

JTAG port is available on a 10-pin male connector X1.

Table 1 shows the pin assignments for the JTAG port connector

JTAG Port Connector (X1)

Name	Signal	Pin
TCK	MINI-MAX/AVR Test clock Input	1
GND	GND	2
TDO	MINI-MAX/AVR Test Data Output	3
VDD	MINI-MAX/AVR Power Output	4
TMS	Test Mode Select Input	5
/RST	MINI-MAX/AVR Reset Input	6
VCC	MINI-MAX/AVR Power Output	7
-	Not Connected (NC)	8
TDI	MINI-MAX/AVR Test Data Input	9
GND	GND	10

Table 1

SPI Port connector

SPI port is available on a 6-pin male connector X2.

Table 2 shows the pin assignments for the SPI port connector

SPI Port Connector (X2)

Name	Signal	Pin
MISO	SPI Data Input/Output	1
VCC	+5V output	2
SCK	SPI clock	3
MOSI	SPI Data Input/Output	4
/RST	MINI-MAX/AVR Reset Input	5
GND	GND	6

Table 2

LCD Connector

Alphanumeric LCD displays can be connected directly to MINI-MAX/AVR-C.

For example, **LCD242**, Alphanumeric 24 Characters x 2 lines

<http://www.bipom.com/documents/peripherals/lcd242.pdf>.

LCD Connector (X3)

Signal	Pin	Pin	Signal
LD3 (PL3)	14	13	LD2 (PL2)
LD1 (PL1)	12	11	LD0 (PL0)
Not connected	10	9	Not connected
Not connected	8	7	Not connected
STROBE (PL6)	6	5	READ (PL5)
LD4 (PL4)	4	3	Vee (V-PWM)
VCC (+5V) output	2	1	GND

Table 3

Keypad Connector

8 port pins of the MINI-MAX/AVR-C are connected to the Keypad Connector (X4). Matrix keypads (3 x 5 or 4 x 4) can be connected directly to the connector. 5 Volt and Ground power lines are also available on the connector.

The keypad connector can also be used as a general-purpose 8-pin input/output port.

Table 4 shows the pin assignments for the Keypad connector.

Keypad Connector (X4)

Name	Signal	Pin
VCC	+5V output	10
GND	Ground	9
Key 7	PH7 In/Out	8
Key 6	PH6 In/Out	7
Key 5	PH5 In/Out	6
Key 4	PH4 In/Out	5
Key 3	PK3 In/Out	4
Key 2	PK2 In/Out	3
Key 1	PK1 In/Out	2
Key 0	PK0 In/Out	1

Table 4

Asynchronous Serial Port 0

Asynchronous RS232 serial port 0 is available on a 10-pin male connector X5.

Table 5 shows the pin assignments for the RS232 serial port 0 connector

Serial Port Connector (X5)

Name	Signal	Pin
-	Not Connected (NC)	1
PGM	MINI-MAX/AVR Input	2
RXD0	MINI-MAX/AVR Input	3
RTS0	MINI-MAX/AVR Output	4
TXD0	MINI-MAX/AVR Output	5
CTS0	MINI-MAX/AVR Input	6
-	NC	7
-	NC	8
GND	GND	9
-	NC	10

Table 5

Asynchronous Serial Port 1

Asynchronous RS232 serial port 1 is available on a 10-pin male connector X8.

Table 6 shows the pin assignments for the RS232 serial port 1 connector

Serial Port Connector (X8)

Name	Signal	Pin
-	Not Connected (NC)	1
-	NC	2
RXD1	MINI-MAX/AVR Input	3
RTS1	MINI-MAX/AVR Output	4
TXD1	MINI-MAX/AVR Output	5
CTS1	MINI-MAX/AVR Input	6
-	NC	7
-	NC	8
GND	GND	9
-	NC	10

Table 6

Expansion connectors

50 control pins and 5 Volt power supply pins are available on 3 20-pin connectors (X6, X7, X9) for interfacing to peripheral boards. A peripheral board can be connected to MINI-MAX/AVR-C board either as a piggyback daughter-board using standoffs or can be placed away from the micro-controller board using a 20-wire ribbon cable (Part #: EXPCABLE-6).

Signals TXD, RXD of the UART port 2 and SPI signals are available on the 20-pin connector X6. Signals TXD, RXD of the UART port 3 are available on the 20-pin connector X7. Tables 7, 8, 9 shows the pin assignments for the X6, X7, X9 connectors.

Connector X6

Signal	Pin	Pin	Signal
/RXD2	20	19	/TXD2
IO6	18	17	MISO
SCK	16	15	SS
IO22	14	13	MOSI
IO1	12	11	IO0
IO3	10	9	IO2
IO5	8	7	IO4
I2C SCL	6	5	I2C SDA
VCC (+5V)	4	3	GND
VCC (+5V)	2	1	GND

Table 7

Connector X7

Signal	Pin	Pin	Signal
/RXD3	20	19	/TXD3
IO20	18	17	IO21
IO8	16	15	IO9
IO10	14	13	IO11
IO12	12	11	IO13
IO14	10	9	IO15
IO16	8	7	IO17
IO18	6	5	IO19
VCC (+5V)	4	3	GND
VCC (+5V)	2	1	GND

Table 8

Connector X9

Signal	Pin	Pin	Signal
D1	20	19	D0
D3	18	17	D2
D5	16	15	D4
D7	14	13	D6
A3	12	11	A2
A1	10	9	A4
IOR	8	7	A0
AEN	6	5	RESET
IOW	4	3	INT0
VCC (+5V)	2	1	GND

Table 9

Analog Input connector

Table 10 shows the pin assignments for the input connector

Analog Input Connector X10

Name	Signal	Pin
AN0	Analog input 0	1
AN1	Analog input 1	2
AGND	Analog Ground	3
AN2	Analog input 2	4
AGND	Analog Ground	5
AN3	Analog input 3	6
VREF	Output	7
AN4	Analog input 4	8
AGND	Analog Ground	9
AVcc	Output	10

Table 10

Power Supply

External power supply should be able to supply 6...16 Volts DC at 100 mA current

WARNING: Correct polarity should be observed when applying external DC supply to Expansion connector.

4. Application Notes

A peripheral board can either be stacked on top of MINI-MAX/AVR-C using stand-offs or connected in a chain configuration using flat ribbon cable. Figure 2 shows how DAC-2 peripheral board can be connected to a Micro-Computer board in a stacked fashion. Figure 3 shows the chain connection.

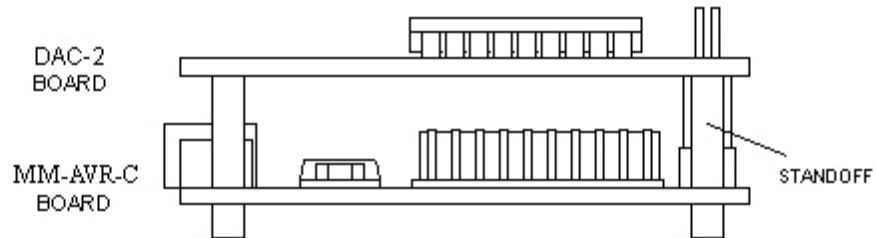


Figure 2

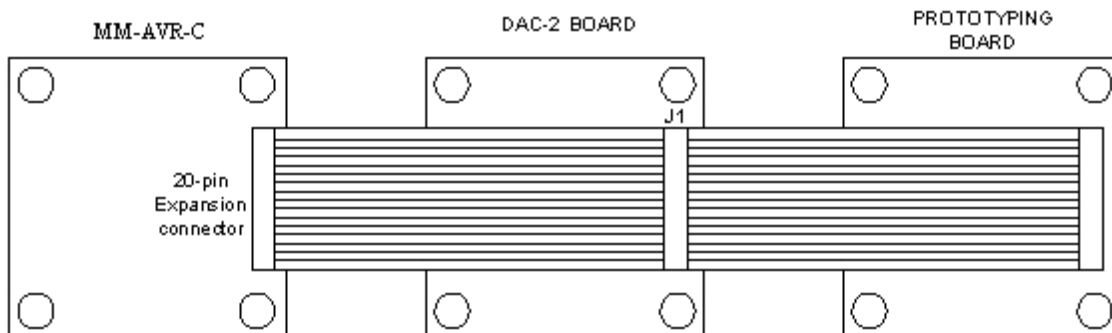


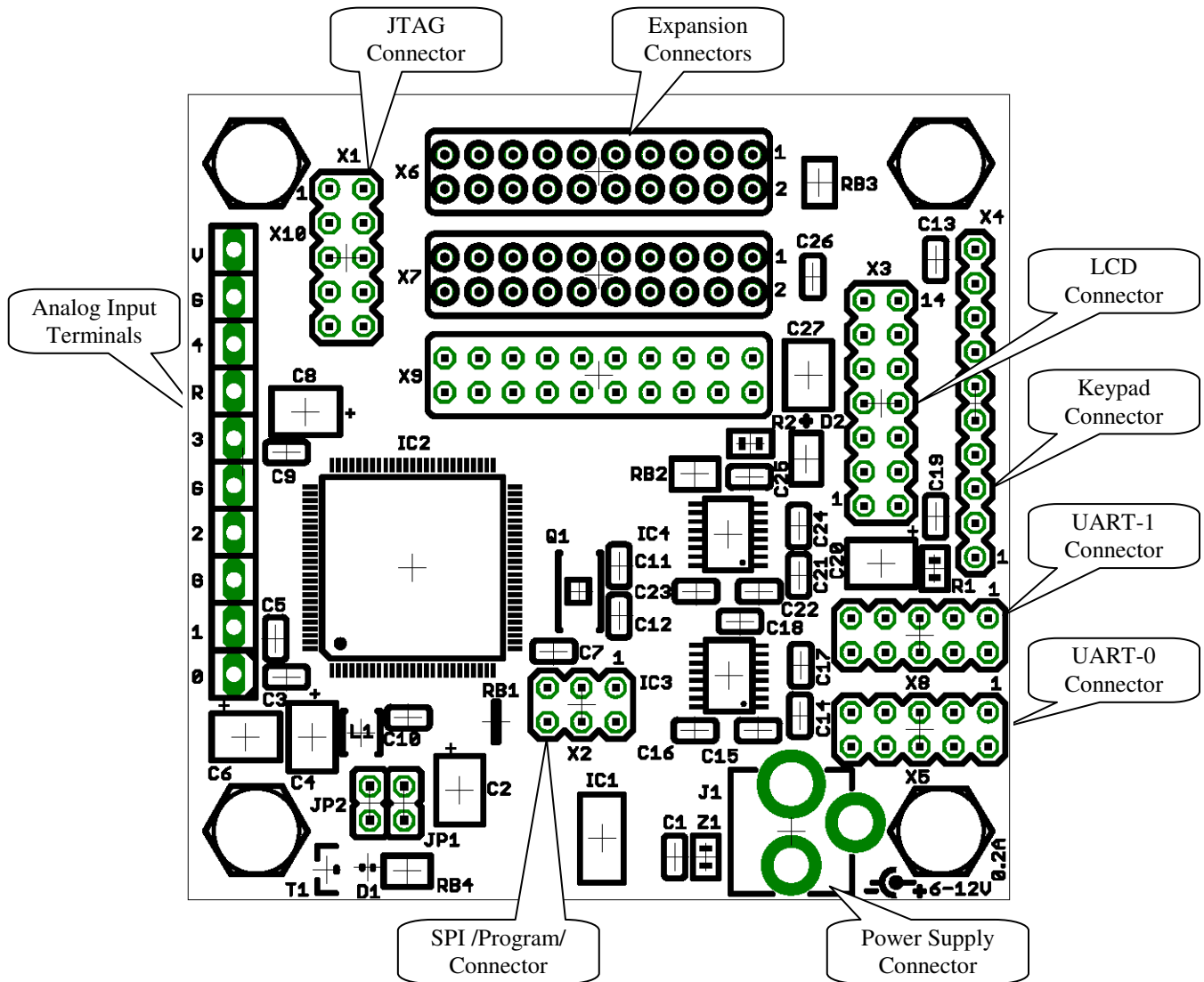
Figure 3

More details concerning BiPOM Peripheral boards are available from the link below:

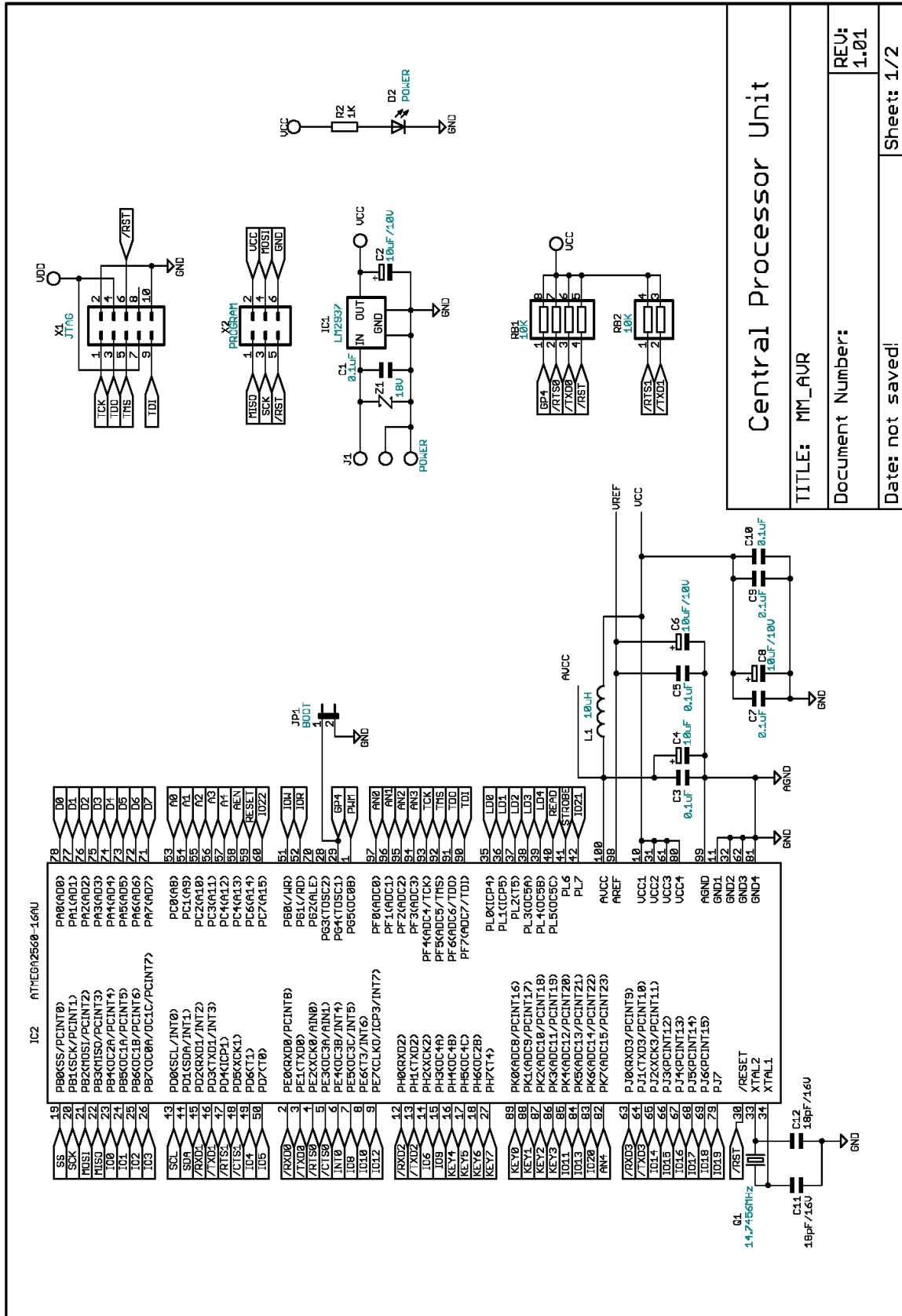
http://www.bipom.com/periph_boards.php

5. Board Layout

Layout of MINI-MAX/AVR-C board is shown below:



6. Schematics



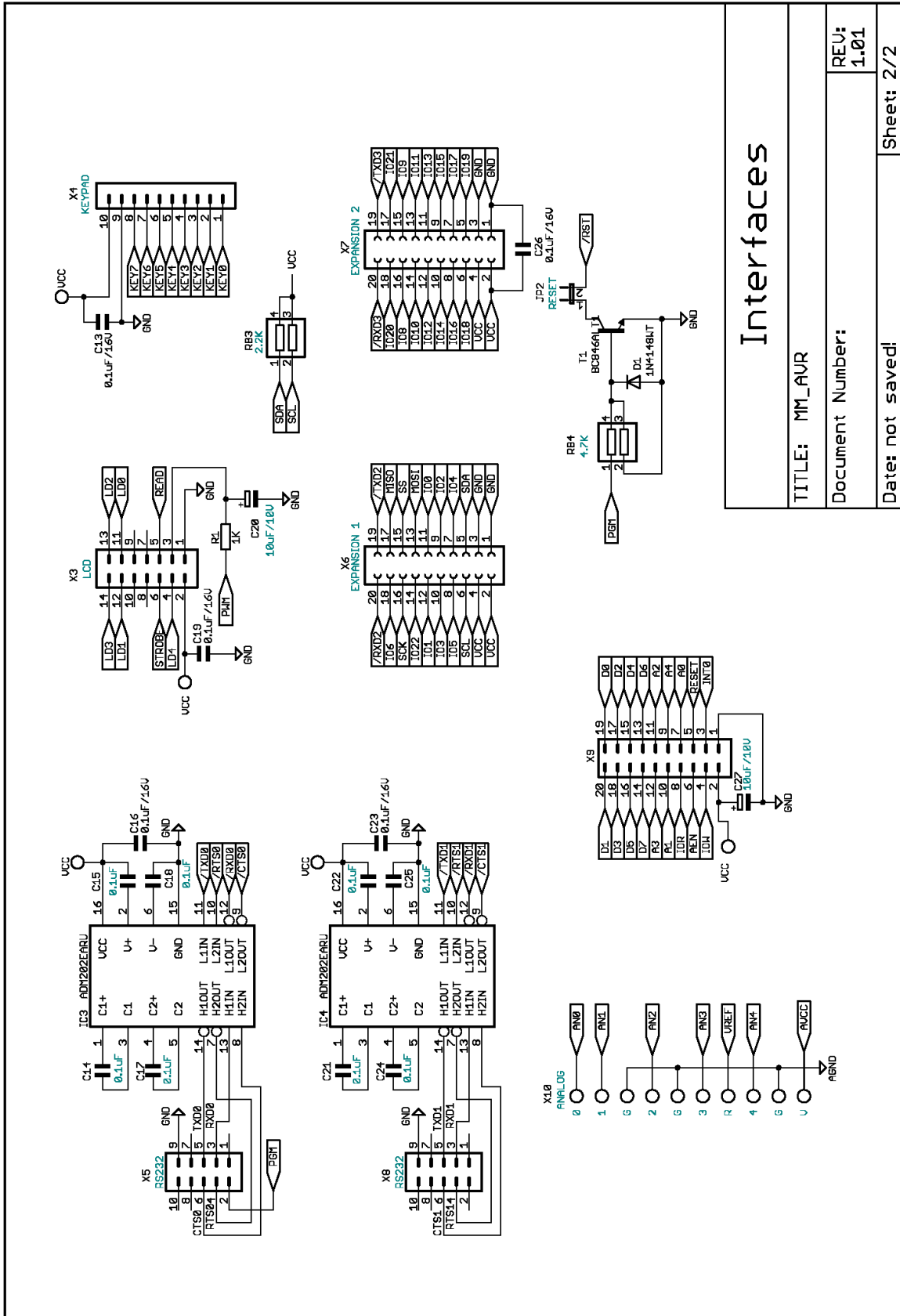
Central Processor Unit

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