

MINI-MAX/AVR-C

Single Board Computer

Technical Manual

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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 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 of RAM
- 4 Kilobytes 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 Modulation (PWM) 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 adding:

- In-circuit Programming and debugging of the micro-controller through JTAG and SPI interfaces
- Two RS232 Serial Ports and two UART Ports (TTL/CMOS level) for data communications
- Analog input terminal blocks (for 5 channels)
- 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 on the board. 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. Current consumption of the board (without peripherals) is less than 60mA.

Software examples for MINI-MAX/AVR-C are available from http://www.bipom.com/web_softwares/851677.html

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, Reference (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

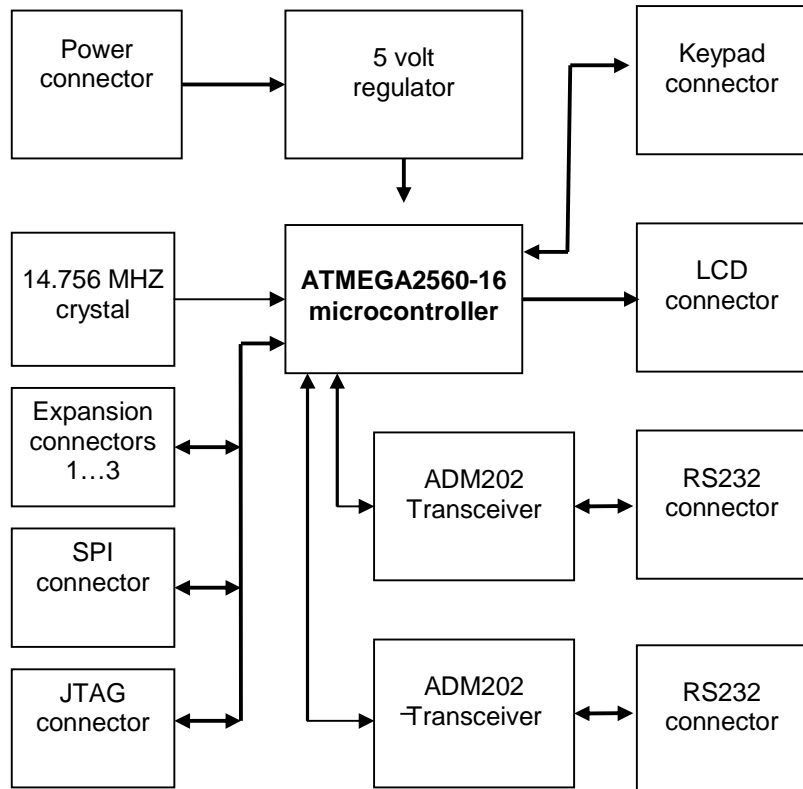


Figure 1

JTAG Port connector

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

Table 1 shows the pin assignments for the JTAG port connector:

JTAG Port Connector (X1)

Signal Name	AVR Port	Description	Pin
TCK	PF4	MINI-MAX/AVR Test clock Input	1
GND		GND	2
TDO	PF6	MINI-MAX/AVR Test Data Output	3
VDD		MINI-MAX/AVR Power Output	4
TMS	PF5	Test Mode Select Input	5
/RST		MINI-MAX/AVR Reset Input	6
VCC		MINI-MAX/AVR Power Output	7
-		Not Connected (NC)	8
TDI	PF7	MINI-MAX/AVR Test Data Input	9
GND		GND	10

Table 1

SPI Port connector

SPI port is available on a 6-pin, dual-row male connector X2. This connector can also be used for downloading programs using programmers such as [AVRISP](#) and [AVR Dragon](#).

Table 2 shows the pin assignments for the SPI port connector:

SPI Port Connector (X2)

Name	AVR Port	Description	Pin
MISO	PB3	SPI Data Input/Output	1
VCC		+5V output	2
SCK	PB1	SPI clock	3
MOSI	PB2	SPI Data Input/Output	4
/RST	RESET	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) can be connected.

LCD Connector (X3)

Signal Name	AVR Port	Pin	Pin	AVR Port	Signal Name
LD3	PL3	14	13	PL2	LD2
LD1	PL1	12	11	PL0	LD0
Not connected		10	9		Not connected
Not connected		8	7		Not connected
STROBE	PL6	6	5	PL5	READ
LD4	PL4	4	3	PG5	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	AVR Port	Description	Pin
VCC		+5V output	10
GND		Ground	9
Key 7	PH7	KEY7 In/Out	8
Key 6	PH6	KEY6 In/Out	7
Key 5	PH5	KEY5 In/Out	6
Key 4	PH4	KEY4 In/Out	5
Key 3	PK3	KEY3 In/Out	4
Key 2	PK2	KEY2 In/Out	3
Key 1	PK1	KEY1 In/Out	2
Key 0	PK0	KEY0 In/Out	1

Table 4

Asynchronous Serial Port 0

Asynchronous RS232 serial port 0 (UART0) is available on a 10-pin, dual-row male connector X5.

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

Serial Port Connector (X5)

Signal Name	AVR Port	Description	Pin
-		Not Connected (NC)	1
PGM		MINI-MAX/AVR Input	2
RXD0	PE0	MINI-MAX/AVR Input	3
RTS0	PE2	MINI-MAX/AVR Output	4
TXD0	PE1	MINI-MAX/AVR Output	5
CTS0	PE3	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 (UART1) is available on a 10-pin, dual-row male connector X8.

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

Serial Port Connector (X8)

Signal Name	AVR Port	Description	Pin
-		Not Connected (NC)	1
-		NC	2
RXD1	PD2	MINI-MAX/AVR Input	3
RTS1	PD4	MINI-MAX/AVR Output	4
TXD1	PD3	MINI-MAX/AVR Output	5
CTS1	PD5	MINI-MAX/AVR Input	6
-		NC	7
-		NC	8
GND		GND	9
-		NC	10

Table 6

Expansion connectors

50 port pins and 5 Volt power supply pins are available on three 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 #: [CBL-EXP-6](#)).

Signals TXD2, RXD2 of the UART port 2 and SPI signals are available on a 20-pin connector X6. Signals TXD3, RXD3 of the UART port 3 are available on a 20-pin connector X7.

Tables 7, 8, 9 shows the pin assignments for the X6, X7, X9 connectors:

Table7: Connector X6

Signal Name	AVR Port	Pin	Pin	AVR Port	Signal Name
/RXD2	PH0	20	19	PH1	/TXD2
IO6	PH2	18	17	PB3	MISO
SCK	PB1	16	15	PB0	SS
IO22	PC7	14	13	PB2	MOSI
IO1	PB5	12	11	PB4	IO0
IO3	PB7	10	9	PB6	IO2
IO5	PD7	8	7	PD6	IO4
I2C SCL	PD0	6	5	PD1	I2C SDA
VCC (+5V)		4	3		GND
VCC (+5V)		2	1		GND

Table 8: Connector X7

Signal Name	AVR Port	Pin	Pin	AVR Port	Signal Name
/RXD3	PJ0	20	19	PJ1	/TXD3
IO20	PK6	18	17	PL7	IO21
IO8	PE5	16	15	PH3	IO9
IO10	PE6	14	13	PK4	IO11
IO12	PE7	12	11	PK5	IO13
IO14	PJ2	10	9	PJ3	IO15
IO16	PJ4	8	7	PJ5	IO17
IO18	PJ6	6	5	PJ7	IO19
VCC (+5V)		4	3		GND
VCC (+5V)		2	1		GND

Table9: Connector X9

Signal Name	AVR Port	Pin	Pin	AVR Port	Signal Name
D1	PA1	20	19	PA0	D0
D3	PA3	18	17	PA2	D2
D5	PA5	16	15	PA4	D4
D7	PA7	14	13	PA6	D6
A3	PC3	12	11	PC2	A2
A1	PC1	10	9	PC4	A4
IOR	PG1	8	7	PC0	A0
AEN	PC5	6	5	PC6	RESET
IOW	PG0	4	3	PE4	INT0
VCC (+5V)		2	1		GND

Analog Input connector

Table 10 shows the pin assignments for the analog input connector:

Analog Input Connector X10

Signal Name	AVR Port	Description	Pin
AN0	PF0	Analog input 0	1
AN1	PF1	Analog input 1	2
AGND		Analog Ground	3
AN2	PF2	Analog input 2	4
AGND		Analog Ground	5
AN3	PF3	Analog input 3	6
VREF		Output	7
AN4	PF4	Analog input 4	8
AGND		Analog Ground	9
AVCC		Output	10

Table 10

Power Supply

External power supply should be able to supply 6 to 12 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-8](#) peripheral board can be connected to a Micro-Computer board in a stacked fashion. Figure 3 shows the chain connection.

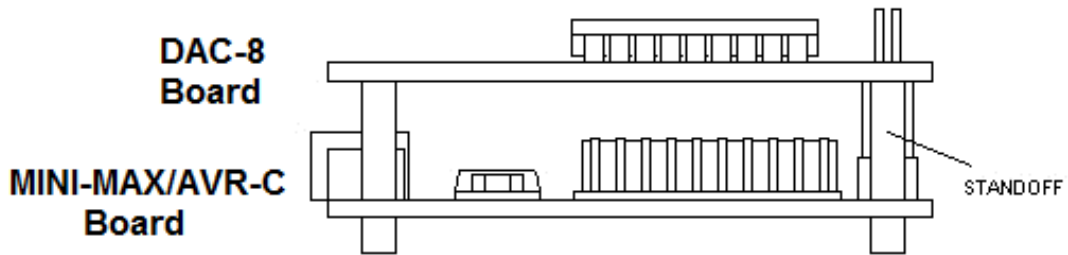


Figure 2

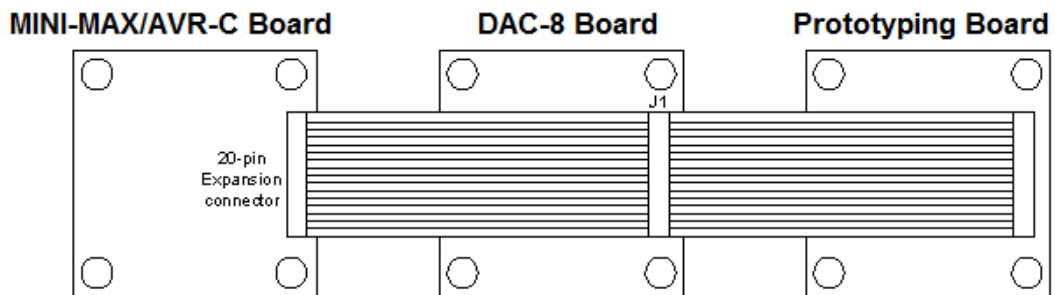
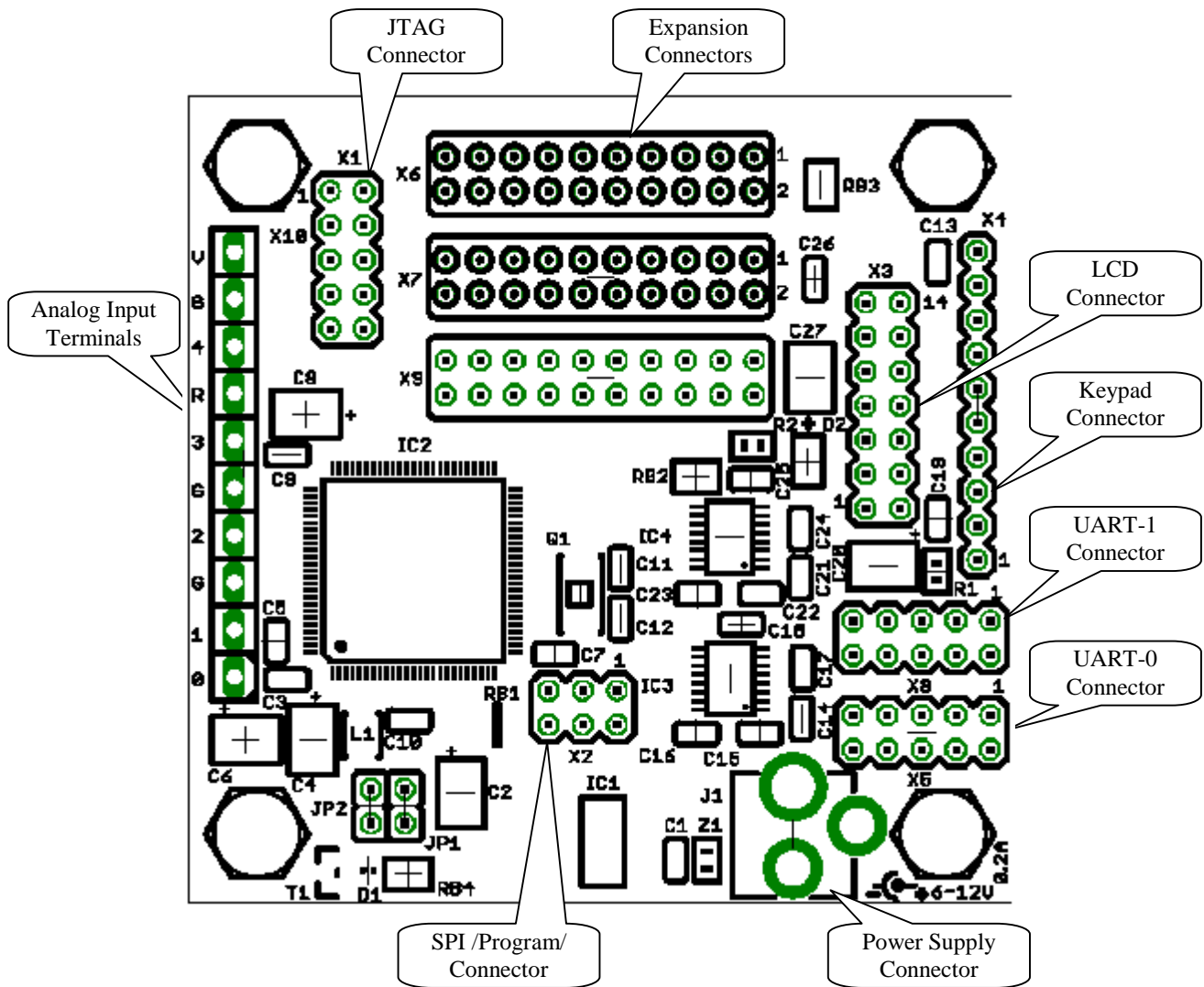


Figure 3

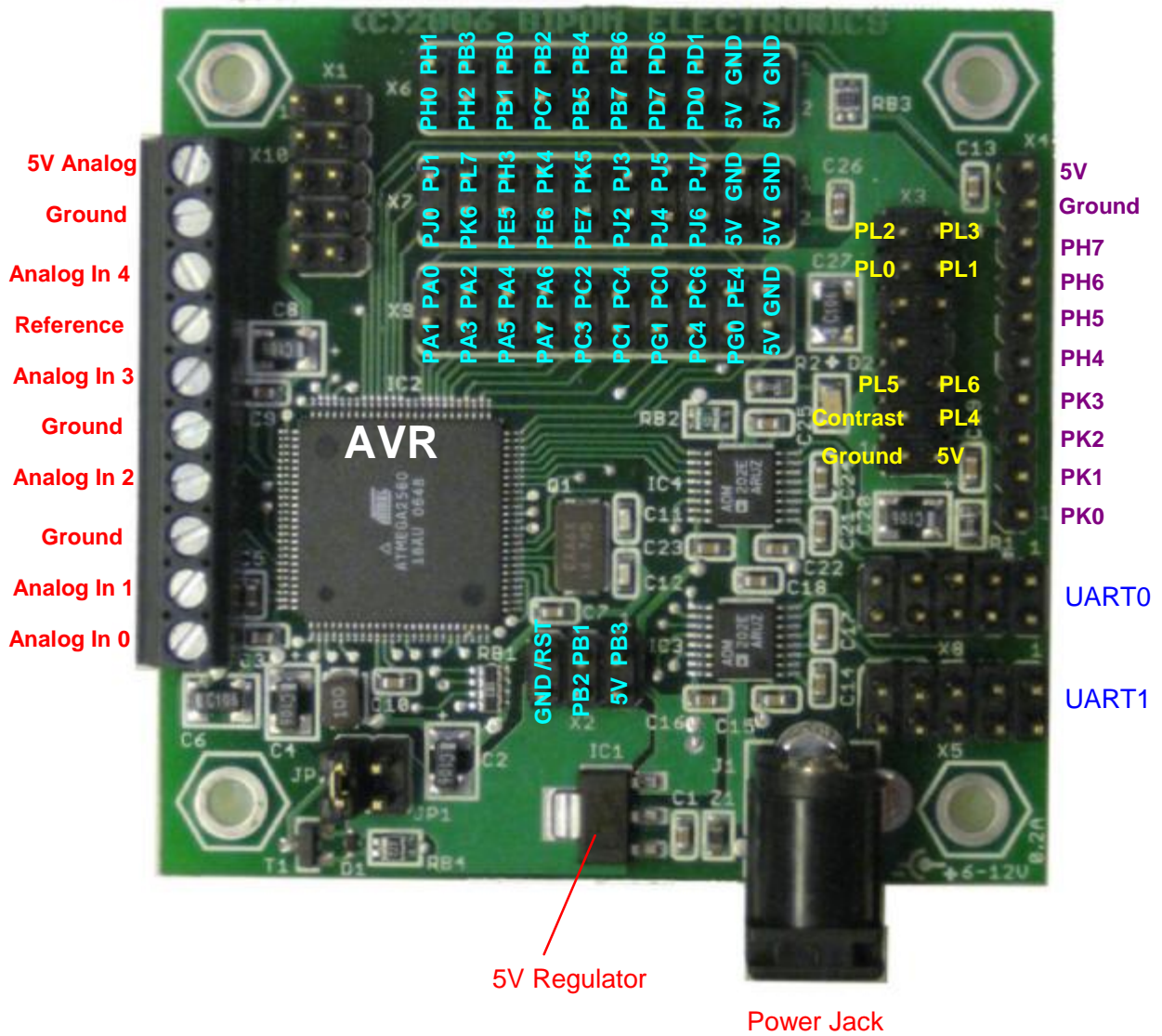
For a complete list of BiPOM Peripheral boards, please visit:
http://www.bipom.com/periph_cat/us/44/0.html

5. Board Layout

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



Port Pin Assignments using ATMEL port naming convention:



Port Pin Assignments using Arduino port naming convention:

