MINI-MAX/AVR-BU

AVR Microcontroller
and USB Converter Board

Technical Manual

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BiPOM Electronics

WARRANTY:

1. Overview

MINI-MAX/AVR-BU is a general purpose, low-cost and highly-expandable microcontroller system with device USB support. It is based on the ATMEL AT90USB647-AU 8-bit microcontroller with integrated USB controller.

The Flash microcontroller can be programmed through USB or JTAG connectors. This simplifies new program development and debugging. Downloading of a program to the microcontroller typically takes few seconds.

Software examples for MINI-MAX/AVR-BU USB are available from www.bipom.com

2. Specifications

MINI-MAX/AVR-BU USB board has the following configuration:

- AT90USB647-AU microcontroller with the following features:

    - Program execution speed up to 8-16 MIPS at 8-16MHz
    - 64 Kilobytes of Flash
    - 2 Kilobyte of EEPROM
    - 4 Kilobyte of RAM
    - 48 Programmable I/O Lines
    - One 2-wire UART
    - One Master/Slave Serial Peripheral Interface (SPI)
    - One 2-wire Interface (TWI) with I^{2}C features
    - USB 2.0 Full-speed/Low-speed Device and On-The-Go Module
    - 832 Bytes USB DPRAM
    - Two 8-bit Timers
    - Two 16-bit Timers
    - One Programmable Watchdog Timer with Separate On-chip Oscillator
    - Four 8-bit PWM Channels
    - Six PWM Channels with Programmable Resolution from 2 to 16 Bits
    - One Output Compare Modulator
    - 8-channels, 10-bit ADC
    - JTAG (IEEE std. 1149.1 compliant) Interface

- Device mini USB Port for Full Speed (12 Mbit per Second) up stream data communication

- 8-pin connector for 2-wire UART (5V levels)

- 14-pin connector for external LCD

- 10-pin connector for external KEYPAD

- 10-pin terminal block for 5 analog inputs, +2.56 Volts reference output and 5 Volts analog supply

- 20-pin Expansion connector for peripheral boards
  (http://www.bipom.com/periph_boards.shtm)

- 10-pin JTAG Port connector for In-circuit Programming and a real time debugging In-circuit Programming and debugging of the microcontroller through the JTAG Interface using 10-pin JTAG

- MINI-MAX/AVR-BU is powered from a 5 Volt DC external power source through the USB connector.

- Current consumption is less than 20mA at 5 Volt DC.

- 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

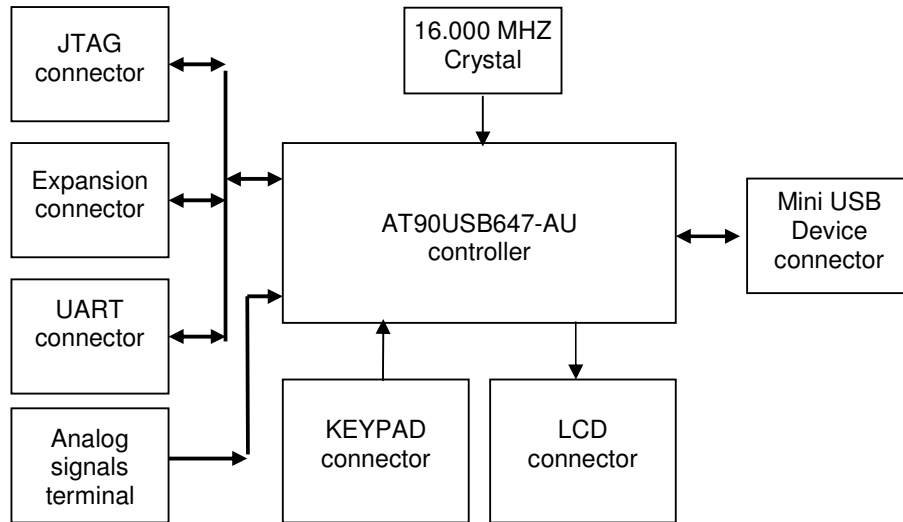Figure 1 shows the block diagram of the MINI-MAX/AVR-BU board:

Figure 1

Expansion connector

Control signals and 5 Volt power supply are available on the 20-pin connector (X8) for interfacing to peripheral boards. A peripheral board can be connected to MINI-MAX/AVR-BU board either as a piggyback daughter-board using standoffs or can be placed away from the microcontroller board using a 20-wire ribbon cable (Part #: EXPCABLE-6).

Table 1 shows the pin assignments for the X1 connector:

Expansion Connector (X8)

Signal	Pin	Pin	Signal
RXD	20	19	TXD
PE1	18	17	MISO
SCK	16	15	CS
PE4	14	13	MOSI
PE5	12	11	PF5
PE6	10	9	PF6
PE7	8	7	PF7
I2C SCL	6	5	I2C SDA
Not connected	4	3	GND
VCC (+5V)	2	1	Not connected

Table 1

JTAG Port connector

JTAG port is available on a 10-pin male connector X1.
Table 2 shows the pin assignment of the JTAG port connector:

JTAG Port Connector (X1)

Pin	Name	Signal
1	PF4	Test clock Input
2,10	GND	Power ground
3	PF6	Test Data Output
4	5V	5V Power Output
5	PF5	Test Mode Select Input
6	RESET	Test Reset Input
7,8	-	Not Connected (NC)
9	PF7	Test Data Input

Table 2

LCD Module Connector

LCD connector is available on a 14-pin male connector X9.
Table 3 shows the pin assignment of the LCD connector:

LCD Connector (X9)

Pin	Name	Signal
1	GND	Power ground
2	5V	Power supply
3	VEE	Analog output
4	CTRL	CTRL
5	READ	Read execution control input
6	STRB	STRB
8	-	Not Connected (NC)
7,9…14	LD0 …LD7	Data input bus

Table 3

KEYPAD Module Connector

KEYPAD connector is available on a 10-pin male connector X2.
Table 4 shows the pin assignment of the KEYPAD connector:

KEYPAD Connector (X2)

Pin	Name	Signal
1…8	KEY0…7	Input keys
9	GND	Power ground
10	5V	Power supply

Table 4

Analog Input Connector

Table 5 shows the pin assignment of the analog input connector:

Analog Input Connector (X6)

Pin	Name	Signal
1	AN0	Analog input 0
2	AN1	Analog input 1
3,5,9	AGND	Analog Ground
4	AN2	Analog input 2
6	AN3	Analog input 3
7	AREF	+2.56V REF Output
8	AN4	Analog input 4
10	VAN	5V Output

Table 5

UART Connector

Tables 6 show the pin assignment of the UART0 connector:

UART0 Connector (X7)

Pin	Name	Signal
1,2,4,7	GND	Power ground
3	-	Not Connected
5	TXD	Data output
6	RXD	Data input
8	5V	Power supply

Table 6

USB Device connector

Standard Type Mini 'B' Right Angle Receptacle connector is used for USB Device bus.
Tables 7 show the pin assignment of the USB connector:

USB Connector (X10)

Pin	Name	Signal
1	VBUS	+5V Power input
2	D-	Data (-)
3	D+	Data (+)
4	PE3	GPIO
5	GND	Ground
6…11	SGND	Shield

Table 7.

Jumpers

Tables 8 shows the Jumper assignments:

Jumpers X3, X4, X5

Name	Signal	Open	Closed
X3	HWB	Hardware Boot Disabled	Hardware Boot Enabled
X4	AN4	Analog input 4 Disabled	Analog input 4 Enabled
X5	PF4	JTAG Disabled	JTAG Enable

Table 8

4. Application Notes

The **FLIP** software is used for a programming of MINI-MAX/AVR-BU through USB interface.
http://www.atmel.com/dyn/products/tools_card.asp?tool_id=3886

A peripheral board can either be stacked on top of MINI-MAX/AVR-BU 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 single board computer in a stacked fashion. Figure 3 shows the chain connection.
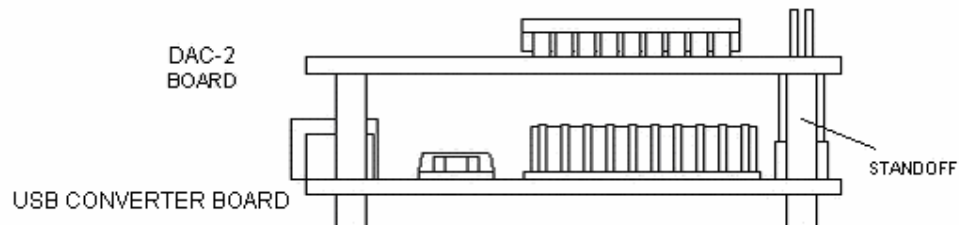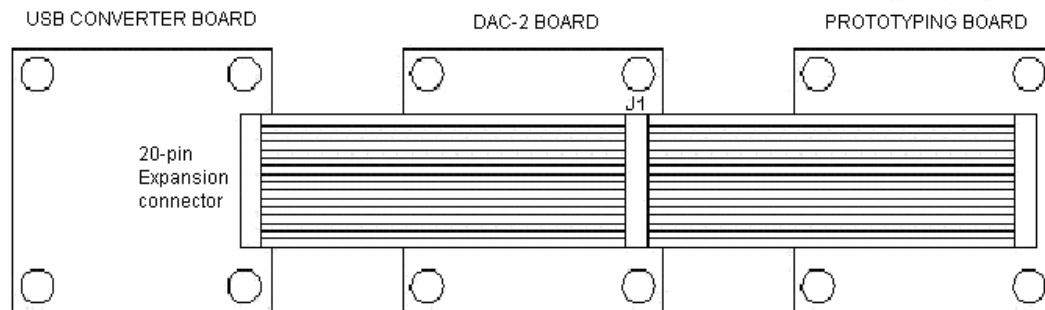

Figure 2

Figure 3

More details on BiPOM Peripheral boards are available from: http://www.bipom.com/periph_boards.php

5. Board Layout

Top view of the MINI-MAX/AVR-BU board is shown below:

6. Schematics

USB Converter Board

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