

*AVR Microcontroller Development PCB for Atmel 40-pin DIP AVR's.*



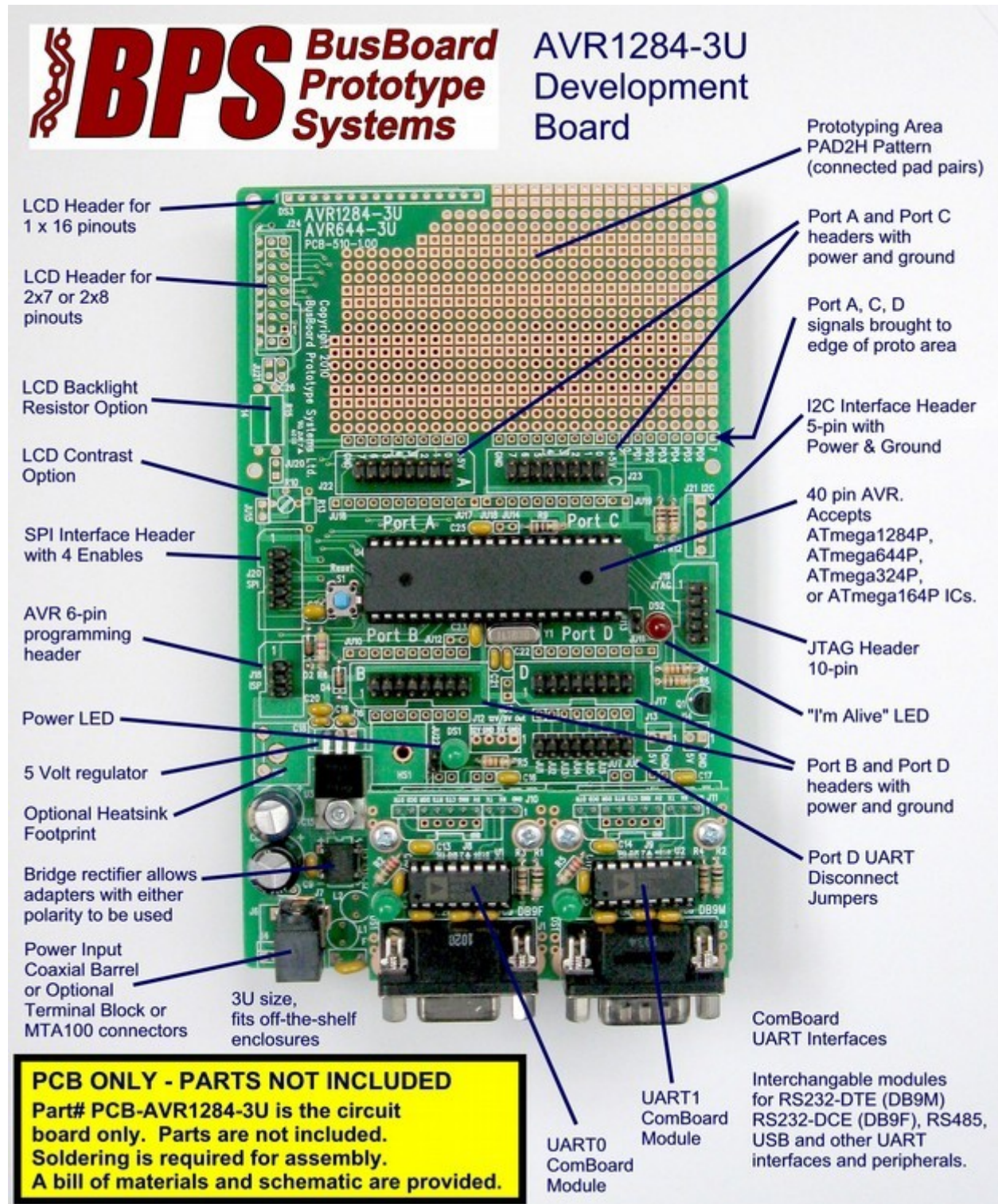
Rev 1.00 PCB shown.  
Rev 1.20 adds a ASPICE module footprint (Analog+SPI+I2C).

**Part Number:** PCB-AVR1284-3U (unpopulated PCB, no parts)

## Features

- A development board for Atmel 40 pin AVR microcontrollers.
- PCB-AVR1284-3U is a bare PCB only (unpopulated, no parts provided). The BOM parts list and schematic diagram are available for download from <http://www.busboard.us/products/PCB-AVR1284-3U/>
- Can be used with Atmel 16k, 32k, 64k or 128k AVR microcontrollers (ATMEGA164PA, ATMEGA324PA, ATMEGA644PA, or ATMEGA1284P).
- Each GPIO port is brought out to a 2x8 header footprint with power and ground for easy expansion. All connectors are on a 0.1" grid to allow protoboard expansion boards.
- Two serial ports circuits are provided for use with MAX202 or MAX3232 interface ICs (16-pin DIP). ComBoard serial port expansion boards can be used also.
- All peripheral pins are brought to connectors. ISP and JTAG connector for debugging.

- LCD connector footprints provided for character LCDs including 4x20, 2x20, 2x16 and 2x40 sizes.
- All thru-hole construction allows for easy assembly. A DIP IC socket option allows easy IC replacement. Connectors are on a 0.1" grid for proto-board expansion. Prototyping area provided.
- Double-sided, FR4 glass-epoxy PCB, 1oz/ft<sup>2</sup> copper with an anti-tarnish coating. Soldermask & silkscreen provided. Lead free and RoHS compatible.



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BPS-DAT-(PCB-AVR1284-3U)-0001 Rev 2 Datasheet.doc

## **Details**

The AVR1284-3U is a development board for 40 pin AVR microcontrollers. All the interfaces are brought out to various connectors to easily hook up to accessory boards and peripheral ICs.

This is an unpopulated board and no parts are included. The BOM (bill of materials) and schematic diagram are available at <http://www.busboard.us/products/PCB-AVR1284-3U/> to construct the circuit. Soldering is required and prior experience with electronic assembly is recommended. A PCB soldermask helps prevent solder bridges on tracks and a silkscreen legend provides part locations. All thru-hole construction allows for easy assembly, maintenance, and modification.

All headers are on a 0.1" grid to allow accessory proto-boards to span multiple connectors if needed. The power input connector can be a coaxial barrel connector, a 2-pin terminal block, or a MTA-100 connector or 0.1" spacing header. LCD displays can be connected using 1x16, 2x7 or 2x8 connectors.

Atmel offers microcontrollers with many memory sizes in the same 40-pin pinout. Therefore it is possible to use the AVR1284-3U board with 64k, 32k, and 16k microcontrollers to save money.

Each port connector has +5V power, ground, and the 8 port bits. A DIL16-to-DIP16 ribbon cable can be used to carry the signals, power, and ground to a breadboard. The DIP16 connector on the ribbon cable plugs directly into the breadboard. There are 6 uncommitted lines on the headers if you want to add additional signals to the ribbon cable.

The AVR1284-3U board uses removable UART interfaces called ComBoards. It is easy to switch between different connectors and interface types. There are modules for RS323-DCE (DB9F), RS232-DTE (DB9M), and RS485 interfaces. The RS485 interface can use RJ45 jacks for CAT-5 cable or a terminal block.

The ComBoard areas also have the circuitry to build two RS232 interfaces right on the board. One uses a DB9F connector (DCE) and one uses a DB9M connector (DTE). Putting the RS232 circuitry right on the board reduces the cost and the height.

## **ComBoard Serial Modules**

ComBoard is a serial module standard that allows interchangeable serial modules to be used with microcontroller board.

On the AVR1284-3U board, the RS232 parts can be installed right on the board and ComBoard removeable modules do not need to be used.

CB1 can be populated with parts for a DB9F-female connector RS232-DCE serial port.

CB2 can be populated with parts for a DB9M-male connector RS232-DTE serial port.

Alternatively, 1x10 socket connectors can be installed in the CB1 and CB2 locations to allow removeable ComBoards to be installed. This allows the serial ports to be easily changed between CD232F, CB232M, CB485 and other serial port options.

## **Comboard 1x10 Pinout**

The 1x10 socket connector is usually used with ComBoard modules.

The CD232F and CB232M modules use the same 1x10 connector so that they can be interchanged.

Note that DTE signals names and directions are used on the 1x10 connector regardless of whether the DB9 connector is DTE or DCE.

The ComBoard 1x10 pinout is as follows:

1	GND	Ground	
2	Rx	Receive Data	Input (to MCU)
3	Tx	Transmit Data	Output (from MCU)
4	+5V (or +3.3V)	Power	Power to ComBoard
5	Ring	Ring	Input
6	CTS	Clear To Send In	Input
7	RTS	Request To Send	Output
8	DSR	Data Set Ready	Input
9	DCD	Data Carrier Detect	Input
10	DTR	DataTerminal Ready	Output

MCU = the microcontroller

The ComBoard 1x10 pinout provides all 9 pins required for full serial port handshaking plus a power pin.

Some modules only use some of the pins, such as Tx and Rx for 2-wire serial, or Tx, Rx, RTS and CTS for 4-wire serial with flow control.

### Comboard 2x5 Pinout

The ComBoard 2x5 header is an alternative pinout that allows the serial port to be used with 10-pin ribbon cables. This is useful to interface to another board or to locate the serial driver away from the main board.

The ComBoard 2x5 pinout is as follows:

9	GND	Ground	
3	Rx	Receive Data	Input (to MCU)
5	Tx	Transmit Data	Output (from MCU)
10	+5V (or +3.3V)	Power	Power to ComBoard
8	Ring	Ring	Input
6	CTS	Clear To Send In	Input
4	RTS	Request To Send	Output
2	DSR	Data Set Ready	Input
1	DCD	Data Carrier Detect	Input
7	DTR	DataTerminal Ready	Output

MCU = the microcontroller

Note: The ComBoard pinout is different from the UEXT standard, which also uses 10-pin ribbon cables. ComBoard can have all 9 serial signals plus power. UEXT serial signals only have Tx, Rx and power.

The ComBoard 2x5 pin order is designed so that the serial signals are on the correct DB9 pins when a 2x5 to DB9 ribbon cable is used.

### Comboard 4-Pin Pinout

If only Tx and Rx are required, a 4-pin connector can be used with Comboard provided Tx, Rx, Power and Ground. A MTA-100 type connector is typically used, but the 0.1" pin spacing allows other connector types to be fitted as well.

The ComBoard 1x4 pinout is as follows:

1	GND	Ground	
2	Rx	Receive Data	Input (to MCU)
3	Tx	Transmit Data	Output (from MCU)
4	+5V (or +3.3V)	Power	Power to ComBoard

MCU = the microcontroller

### GPIO Headers

Each GPIO power has 8 GPIO data pins, power on pin 16 and ground on pin 9.

Pins 10 to 15 are connected only to test points so other signals may be routed to them as needed.

A 2x8 socket to DIP16 ribbon cable can be used to carry the port signals and power to a solderless breadboard for experimenting.

The GPIO 2x8 pinout is as follows:

Signal Function	Pin	Pin	Signal Function
Port bit 0	1	2	+5V
Port bit 1	3	4	Uncommitted Pin
Port bit 2	5	6	Uncommitted Pin
Port bit 3	7	8	Uncommitted Pin
Port bit 4	9	10	Uncommitted Pin
Port bit 5	11	12	Uncommitted Pin
Port bit 6	13	14	Uncommitted Pin
Port bit 7	15	16	Ground

The +5V and ground tracks have in-line jumpers (JUxx) that allow the power to be disconnected so the pin can be used differently. There is a track underneath each jumper connecting the power pin so that the jumper does not need to be installed for normal use. Cut the track to disconnect the pin or to install the jumper connector.

Each pin has a test point for monitoring. It also provides a good connection point to make it easy to add alternate connections.

## **LCD Options**

LCD connector footprints are provided to allow for various LCD types.

OLED and VFD displays often use the same footprints and some are drop-in replacements for LCDs.

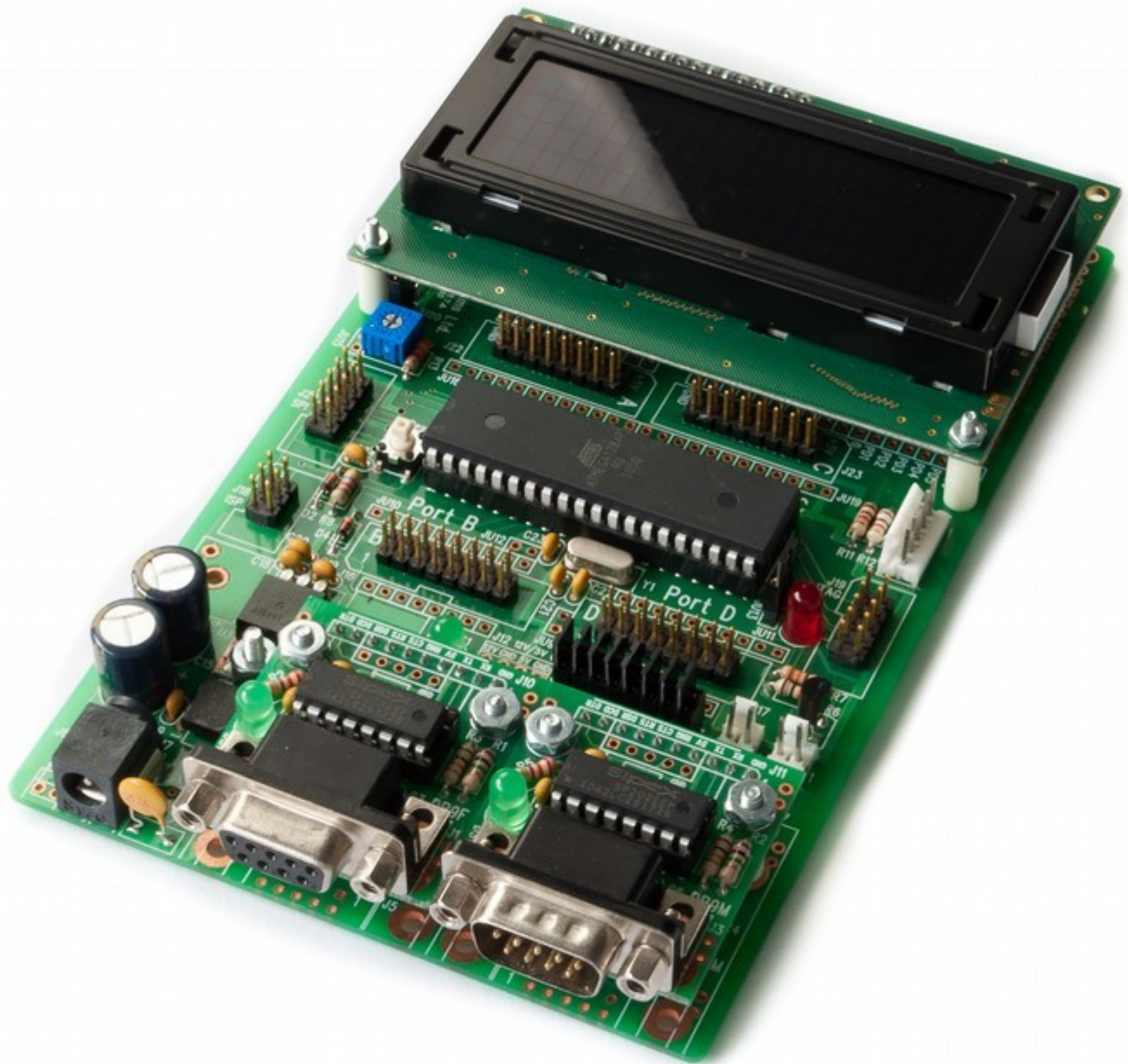
Display Footprint Options:

Connector DS3 (1x14 pin)	4x20 Character LCD
J24 (2x7 pin)	2 x16 or 2x20 Character LCD
J24 with J25 (2x7 pin)	2 x16 or 2x20 Character LCD Cable reversed for connecting to the back of the display.
J24 with test points (2x8 pin)	2 x16 or 2x20 Character LCD with backlight power on same 16 pin connector. Test points next to the connectors allow for LCDs with extra pins for backlighting on 2x8 headers.
J24 with J25 and test points (2x8 pin)	2 x16 or 2x20 Character LCD, cable reversed for connecting to the back, with backlight power on same 16 pin connector.



This AVR-3U board has a Newhaven 4x20 character display added (Newhaven part# NHD-0420DZW-AY5 for Yellow).

Other features shown include a RS485 ComBoard module and a switching regulator instead of the 7805 for better battery efficiency.



The AVR1284-3U board with 4x20 LCD  
Note the blue contrast adjust pot.



## **Power and Heatsink Options**

The 7805 regulator tab can be bolted or soldered to the PCB for heatsinking. The PCB accepts a vertical heatsink for the TO-220 package to allow more current to be drawn without overheating the 7805 regulator.

Footprints are provided for three DC input connector options: 1) a barrel connector, 2) a 2 position removable terminal block, or 3) a 2-pin MTA-100 0.1” connector.

The power input has a bridge rectifier to allow DC adapters with either polarity (center + or center-) to be used with barrel connector power input.

Note: If the AVR board is being used with other modules with separate power supplies, the common ground should be connected to the board ground, not the barrel connector ground to avoid the diode voltage drop across the rectifier.

In some cases it may be desirable to insert wire jumpers instead of the bridge rectifier. This makes it easier to share a common ground with other boards if they have the same DC power supply.

A 1N4001 diode can a wire can be used instead of the bridge rectifier to avoid the diode drop in the ground connection, but still provide reverse-polarity protection. If this is done, the diode is installed between pin 3 and pin 1 of D1. The wire is installed between pin 2 and pin 4. i.e. The diode and the wire cross. The diode band (cathode) goes to pin 1 which has the plus sign.