

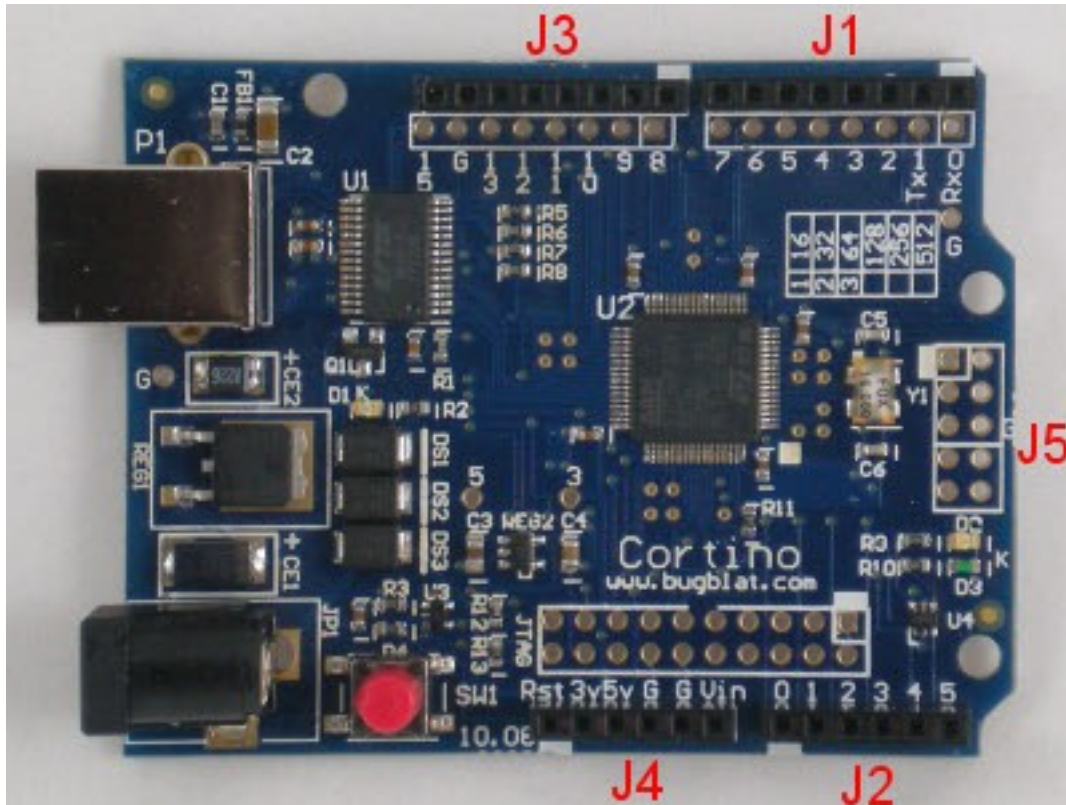
Cortino Pinout

1. Summary

This application note describes the Expansion connectors, the JTAG connector, the USB hookup, and the test pads on the Bugblat Cortino.

2. Introduction

The connectors on a Cortino can be seen in the following picture of a Cortino circuit board:



Six connectors described here. In clockwise order, starting from the left side of the top edge, they are:

- J3 – digital I/O
- J1 – digital I/O
- J5 – unassigned
- J2 – analog
- J4 – power
- JTAG – JTAG debugging interface, in just above J4 and J2

Note that each connector has pin 1 marked on the circuit board with a blob. Also, note that the pinout for two-row connectors (J5 and the JTAG connector) has pins 1 and 2 at one end, then pins 3 and 4, then pins 5 and 6, and so on.

The J3 and J1 connectors have the same spacing as the connectors on the Arduino board. These connectors are also duplicated on an exact 0.1 inch grid for easier prototyping with add-on boards.

The STM32 microprocessor on the Cortino has three 16-bit external ports (ports PA0 to PA15, PB0 to PB15, and PC0 to PC15) and one three-bit external port (ports PD0 to PD2). Port pins which are not routed to

expansion connectors and are otherwise free are routed to test pads on the circuit board, as described at the end of this document.

External port pins have main functions and alternate functions. The main function is almost always a general purpose I/O, with optional pull-ups or pull-downs. The tables which follow summarize the alternate functions. The STM32 implements a vast array of alternate functions, not easily represented in this short document - please consult the STM32 data sheets for more information.

J3 – digital I/O

On the Arduino, this connector corresponds to ATmega8 port B.

Pin	Connection	Mark	Remarks
1	PA8	8	UART, Timer/Counter, Clock Out (ATmega8 PB0 on Arduino)
2	PB5	9	I ² C, I ² S, SPI (ATmega8 PB1 on Arduino)
3	PB12	10	I ² C, I ² S, SPI, UART (ATmega8 PB2 on Arduino)
4	PB15	11	I ² S, SPI, Timer/Counter (ATmega8 PB3 on Arduino)
5	PB14	12	UART, SPI, Timer/Counter (ATmega8 PB4 on Arduino)
6	PB13	13	I ² S, UART, SPI, Timer/Counter (ATmega8 PB5 on Arduino)
7	Ground	G	
8	PB8	15	Timer/Counter (ATmega8 AREF on Arduino)

J1 – digital I/O

On the Arduino, this connector corresponds to ATmega8 port D.

Pin	Connection	Mark	Remarks
1	PA3	0 Rx	UART, Timer/Counter (ATmega8 PD0 on Arduino)
2	PA2	1 Tx	UART, Timer/Counter (ATmega8 PD1 on Arduino)
3	PB11	2	UART, I ² C (ATmega8 PD2 on Arduino)
4	PB10	3	UART, I ² C (ATmega8 PD3 on Arduino)
5	PB1	4	ADC, Timer/Counter (ATmega8 PD4 on Arduino)
6	PB0	5	ADC, Timer/Counter (ATmega8 PD5 on Arduino)
7	PA5	6	ADC, DAC, SPI (ATmega8 PD6 on Arduino)
8	PA4	7	ADC, DAC, SPI (ATmega8 PD6 on Arduino)

J5 – unassigned

On the Arduino, a shorter (six pin) version of this connector is the ICSP connector. One use of the spare pins could be to bring out the port C signals.

Pin	Connection	Mark	Remarks
1	none		ATmega8 PD4 on Arduino
2	none		5 volt on Arduino
3	none		ATmega8 PD5 on Arduino
4	none		ATmega8 PD3 on Arduino
5	none		reset# on Arduino
6	Ground	G	ground on Arduino
7	none		No pin on Arduino
8	none		No pin on Arduino
9	none		No pin on Arduino
10	none		No pin on Arduino

J2 – analog

On the Arduino, this connector corresponds to ATmega8 port B.

Pin	Connection	Mark	Remarks
1	PA7	0	ADC, SPI, Timer/Counter (ATmega8 PC0 on Arduino)
2	PA6	1	ADC, SPI, Timer/Counter (ATmega8 PC1 on Arduino)
3	PA1	2	ADC, UART, Timer/Counter (ATmega8 PC2 on Arduino)
4	PA0	3	ADC, UART, Timer/Counter (ATmega8 PC3 on Arduino)
5	PB7	4	I ² C, Timer/Counter, UART (ATmega8 PC4 on Arduino)
6	PB6	5	I ² C, Timer/Counter, UART (ATmega8 PC5 on Arduino)

J4 – power

As with the Arduino, this is a power connector.

Pin	Connection	Mark	Remarks
1	reset#	Rst	Logically OR'd with reset# from the USB chip to drive NRST# on the STM32. Also driven by the JTAG connector. Pulled up to 3.3V via 10KR.
2	3.3 volt	3v	Output from the 3.3 volt regulator. 150ma maximum.
3	5 volt	5v	Output from the 5 volt regulator. 350ma maximum.
4	Ground	G	
5	Ground	G	
6	Vin	Vin	Input to the 5 volt regulator.

JTAG

This is a standard ARM 20-pin JTAG test and debug connector.

Pin	Connection	Port	Remarks
1	3.3 volt		
2	3.3 volt		
3	TRST#	PB4	
4	Ground		
5	TDI	PA15	
6	Ground		
7	TMS	PA13	Also routed to the USB chip as SWDAT.
8	Ground		
9	TCK	PA14	Also routed to the USB chip as SWCLK.
10	Ground		
11	none		Pulled to ground via 10KR.
12	Ground		
13	TDO	PB3	
14	Ground		
15	reset#		Logically OR'd with reset# from the USB chip to drive NRST# on the STM32. Also driven by the push-button switch. Pulled up to 3.3V via 10KR.
16	Ground		
17	none		Pulled to ground via 10KR.
18	Ground		
19	none		Pulled to ground via 10KR.
20	Ground		

FT232R USB Interface Connections

The following signals are driven from the FT232R USB chip:

Pin	Signal	STM32	Remarks
TxD	UTxD	PA10	UART1 RxD on the STM32.
RxD	URxD	PA9	UART1 TxD on the STM32.
RTS#	URTS#	PA11	UART1 CTS# on the STM32.
CTS#	UCTS#	PA12	UART1 RTS# on the STM32.
CBUS0	Reset#	NRST#	Logically OR'd with reset# from the JTAG connector to drive NRST# on the STM32. Pulled up to 3.3V via 10KR.
CBUS1	Boot0	Boot0	Pulled to ground via 10KR.
CBUS2	SWDAT/TMS	PA13	Can be used for two-wire debugging.
CBUS3	SWCLK/TCK	PA14	Can be used for two-wire debugging.
CBUS4	Power#		Enables power from the USB port. Pulled to ground via 10KR.

Port Pins on Test Pads

There are test pads on all 16 port C pads, on PB9, and on PD2. The picture below shows the location of the pads.

Above U2

top row - PC4
row 2 - PC5

Right of U2

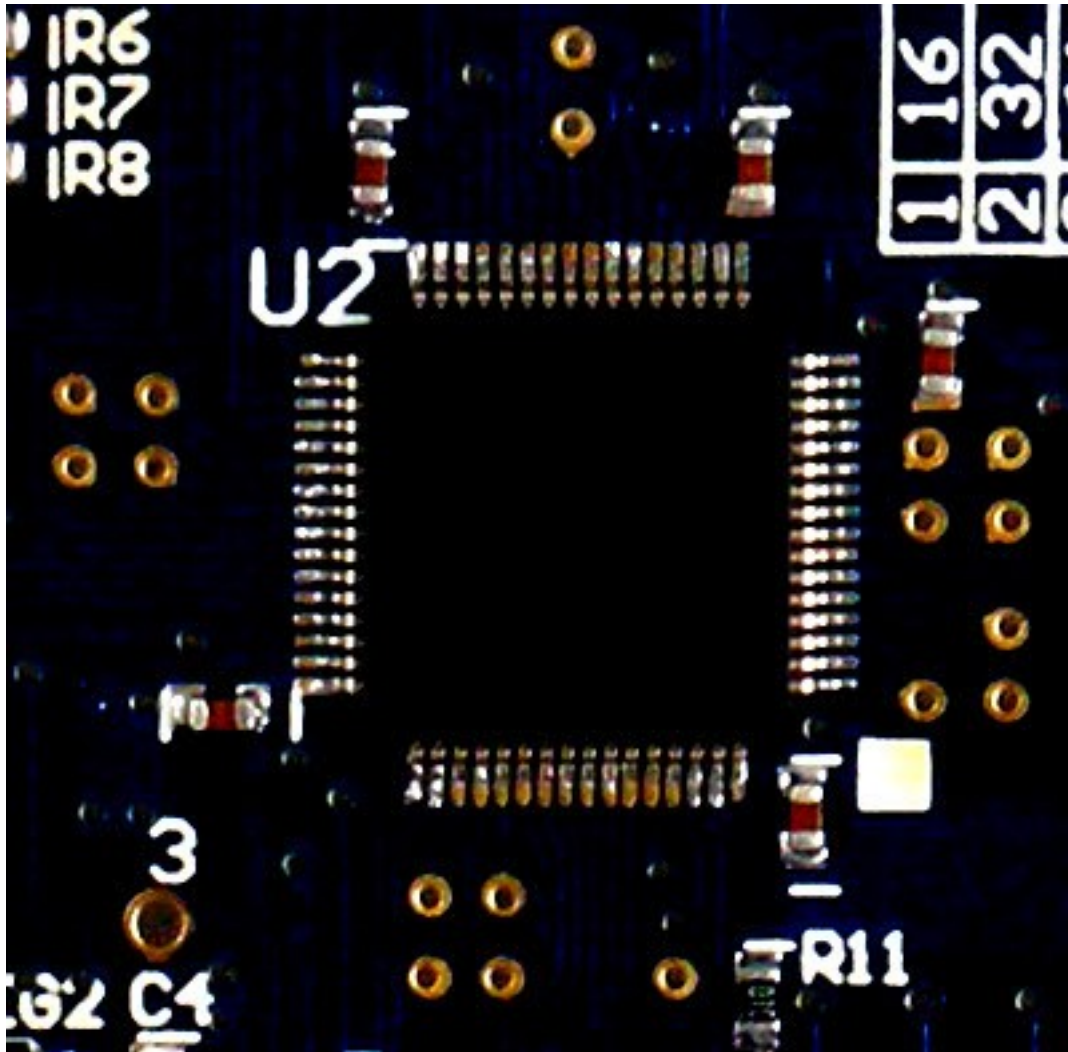
top row - PC3 PC2
row 2 - PC1 PC0
row 3 - PC15
row 4 - PC13 PC14

Below U2

top row - PC10 PC12
row 2 - PC11 PD2 PB9

Left of U2

top row - PC7 PC6
row 2 - PC9 PC8



Revision History

10 November 2008: Initial version.

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