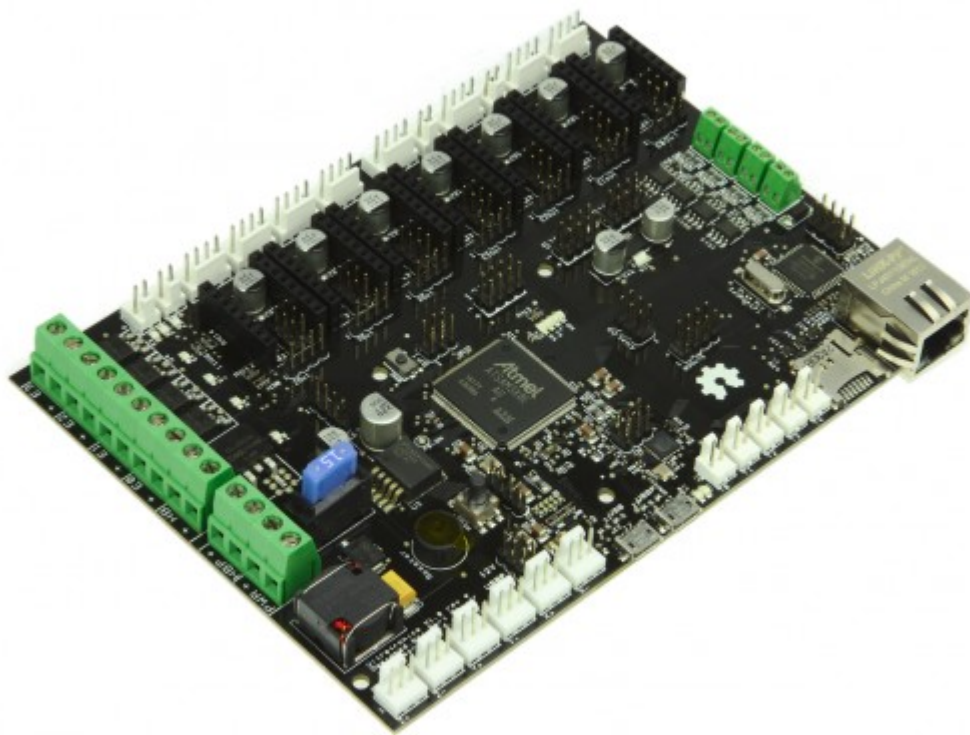


# Ultratronics v1.0 DATASHEET



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## PRODUCT OVERVIEW

Ultratronics is the latest development in 3D printer electronics. It has everything you need... and more. This board looks very similar to the popular Megatronics board, but it much more power due to the 32-bit Atmega SAM3X8E clocked at 84Mhz. This speed allows for more calculations and more features, which resulted in this 3D printer beast. Besides controlling 3D printers, this board can handle also other CNC tasks like milling, laser-cutting, etc when different firmware is applied.

The design is based on Arduino Due and combines the best features of Megatronics to a new more powerful board. The board is therefor compatible with Arduino software, but optimized for 3D printers.

The board is supplied in a Pro and a normal version. The normal version provides the same core components, but to reduce cost for more general use it has no Ethernet support and two thermo couples as where the Pro version has four.

For details on the microprocessor used, please refer to [http://www.atmel.com/Images/Atmel-11057-32-bit-Cortex-M3-Microcontroller-SAM3X-SAM3A\\_Datasheet.pdf](http://www.atmel.com/Images/Atmel-11057-32-bit-Cortex-M3-Microcontroller-SAM3X-SAM3A_Datasheet.pdf)

This document will give technical details for development purposes. End users should refer to the Ultratronics quick start guide for basic usage and safety considerations.

## DOCUMENT HISTORY

<b>Version 0.5</b>	Creation
<b>Version 1.0</b>	Added SERIAL header to list of connectors
<b>Version 1.1</b>	Added images Added power ratings to connectors
<b>Version 1.2</b>	Added connector schematic
<b>Version 1.3</b>	Fix hole layout Adjusted serial connector description

## PRODUCT CHANGE HISTORY

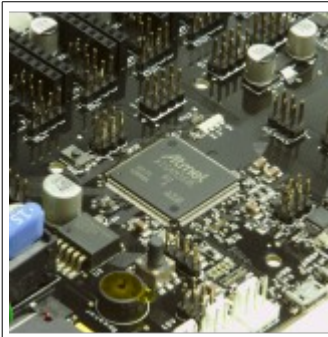
Version 1.0 revision C

- First public release

## TECHNICAL SPECIFICATION

<b>Microcontroller</b>	Atmega SAM3X8E
<b>Operating Voltage Electronics</b>	3.3V
<b>Operating Voltage High</b>	12-24V (15A heated bed, 7A electronics)
<b>DC Current per I/O Pin</b>	40mA
<b>Clock Speed</b>	84Mhz

## MAJOR FEATURES



### **Atmega SAM3X8E**

Powerful SAM3X8E 32-bit processor with 512 KB memory, running at 84Mhz



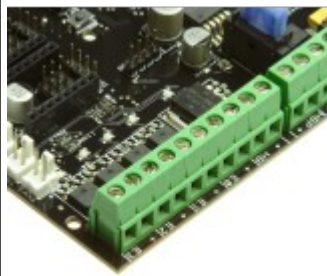
### **Thermocouple**

On board support for connecting four (Pro)/two (Normal) thermo couples two external



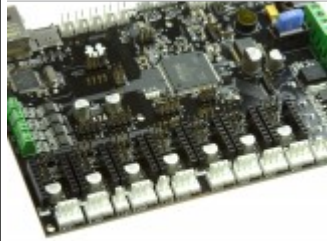
### **SD Card**

Autonomous printing from Micro SD card on board or external SD card, using the external SD card PCB module. This board support SD card detection.



### **Seven MOSFETs**

The board has 4 regular MOSFETs (25A), two 1A MOSFETs (fans) and one MOSFET for the heated bed (IRLS3034PBF) to support many needs.



### **Up to 7 stepper drivers**

Compatible with RAMPS, 7 slots for stepper drivers (not included). Modularized to make replacement easy for damaged drivers. All slots are Pololu compatible.



### **Ethernet**

The board support Ethernet connections. Firmware must provide additional modules to process the frames.

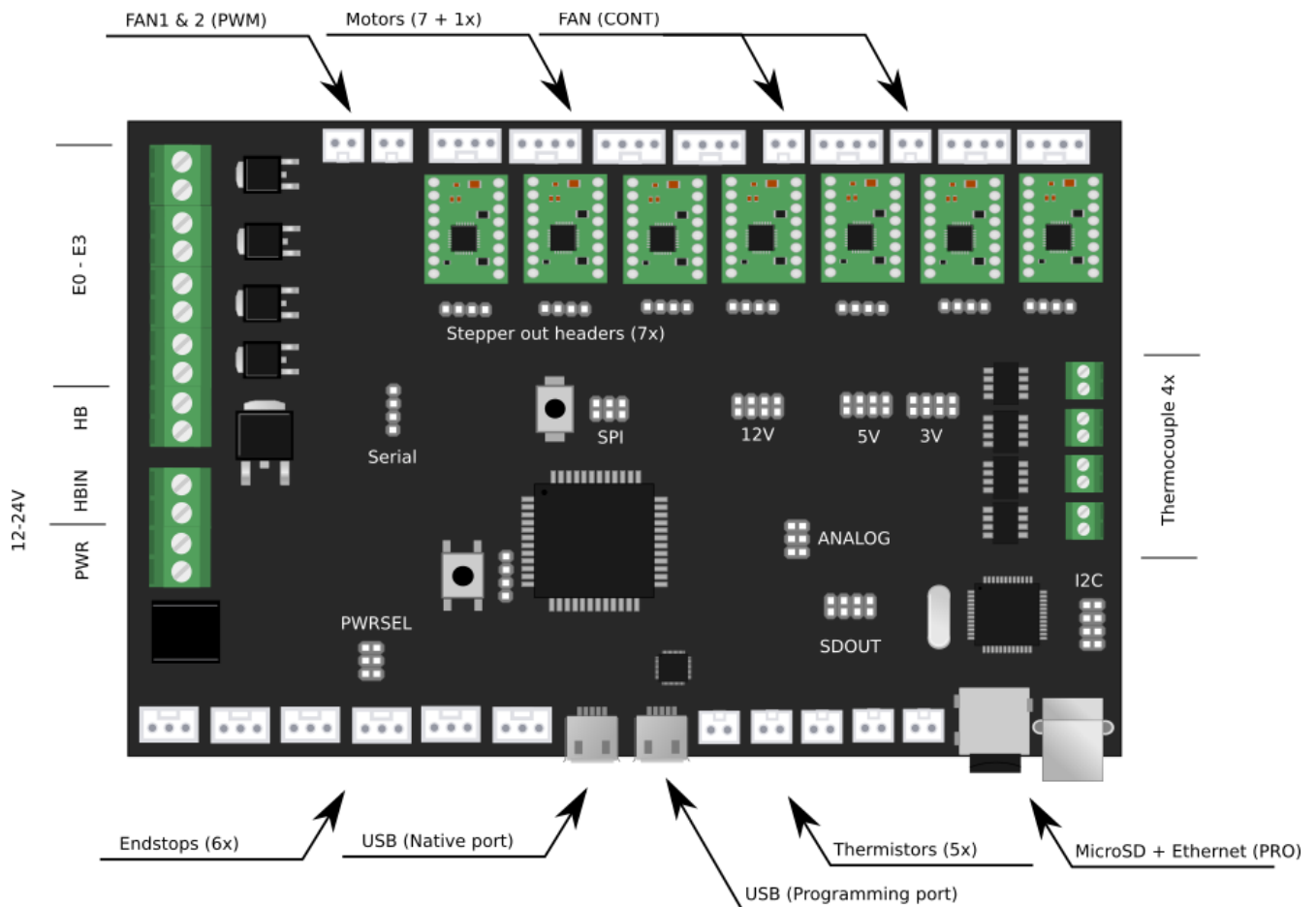
### **Support for many peripherals**

The board's functions can be extended using free available headers. See the connectors section for more information

## OTHER FEATURES

- The board's low voltage circuit can be powered from any voltage between 12 to 24V, by setting a jumper
- PWR is protected by a replaceable 15A fuse
- The 5V lines are protected by a 500mA resettable fuse
- A piezo is included to allow the printer to give feedback with sound
- Each stepper driver slot has a breakout to connect external stepper drivers to the board.
- Four layer high quality PCB board

# CONNECTORS



Name	Description
XMOT,YMOT,ZMOT (2x),E0MOT,E1MOT ,E2MOT,E3MOT	Connectors for bipolar stepper drivers
Stepper slot jumpers	Microstepping mode jumpers. See your stepper driver documentation for more information.
E0Out - Zout	Breakout headers for stepper slots 1. GND 2. DIR 3. STEP 4. ENABLE
5V	5V output (500mA max)
12V *	High voltage output, voltage is the same as the PWR input.
FAN1	Fan 1 (1A max)
FAN2	Fan 2 (1A max)



T0	Thermistor 0
T1	Thermistor 1
T2	Thermistor 2
T3	Thermistor 3
T4	Thermistor 4
TC1	Thermo couple 1
TC2	Thermo couple 2
TC3 **	Thermo couple 3
TC4 **	Thermo couple 4
Ethernet **	Ethernet connection
I2C	I2C header (2x4 header) 1. SCL 2. SCL 3. SDA 4. SDA 5. 5V 6. 5V 7. GND 8. GND
Analog	Analog I/Os 1. +3v3 2. SDA0 3. A8 4. SCL0 5. A10 6. A9
End stops X-,X+,Y-,Y+,Z-,Z+	Connectors for connecting endstops S: Signal pin -: GND +: 3V3
SDOUT	External SD card header 1. 5V 2. A2 3. MISO 4. MOSI 5. SCK 6. D53 7. GND 8. SD Detect (A6)
Powersel	Power source select. This determines how the 5V circuit is

	<p>powered.</p> <p>12V: Power from PWR</p> <p>USBP: Power from USB programming port</p> <p>USB: Power from USB native port</p>
ICSP	<p>2x3 breakout with SPI</p> <ol style="list-style-type: none"> <li>1. MISO</li> <li>2. +5V</li> <li>3. SCK</li> <li>4. MOSI</li> <li>5. MASTER RESET</li> <li>6. GND</li> </ol>
DEBUG	<p>Debug header</p> <ol style="list-style-type: none"> <li>1. GND</li> <li>2. JTAG_TCK</li> <li>3. JTAG_TMS</li> <li>4. MASTER RESET</li> </ol>
PS-ON	Header do enable/disable the power supply
E0 - E3	Extruder heater output (5A max)
HB	Heated bed (15A max)
HBIN	Heated bed power (12-24V) *
PWR	Power input (12-24V) * 15A max
SERIAL	<ol style="list-style-type: none"> <li>1. Serial2 RX / D17</li> <li>2. Serial2 TX / D16</li> <li>3. Serial1 RX / D19</li> <li>4. Serial1 TX / D18</li> </ol>

\* Make sure that your peripherals support the input voltage. If you supply 24V, all outputs on the board will supply 24V too.

\*\* Pro version only

## PIN DEFINITION

This is the digital I/O assignment for Ultratronics. You can use it to adjust your firmware to match Ultratronics. Also check

<https://www.arduino.cc/en/Hacking/PinMappingSAM3X> for details.

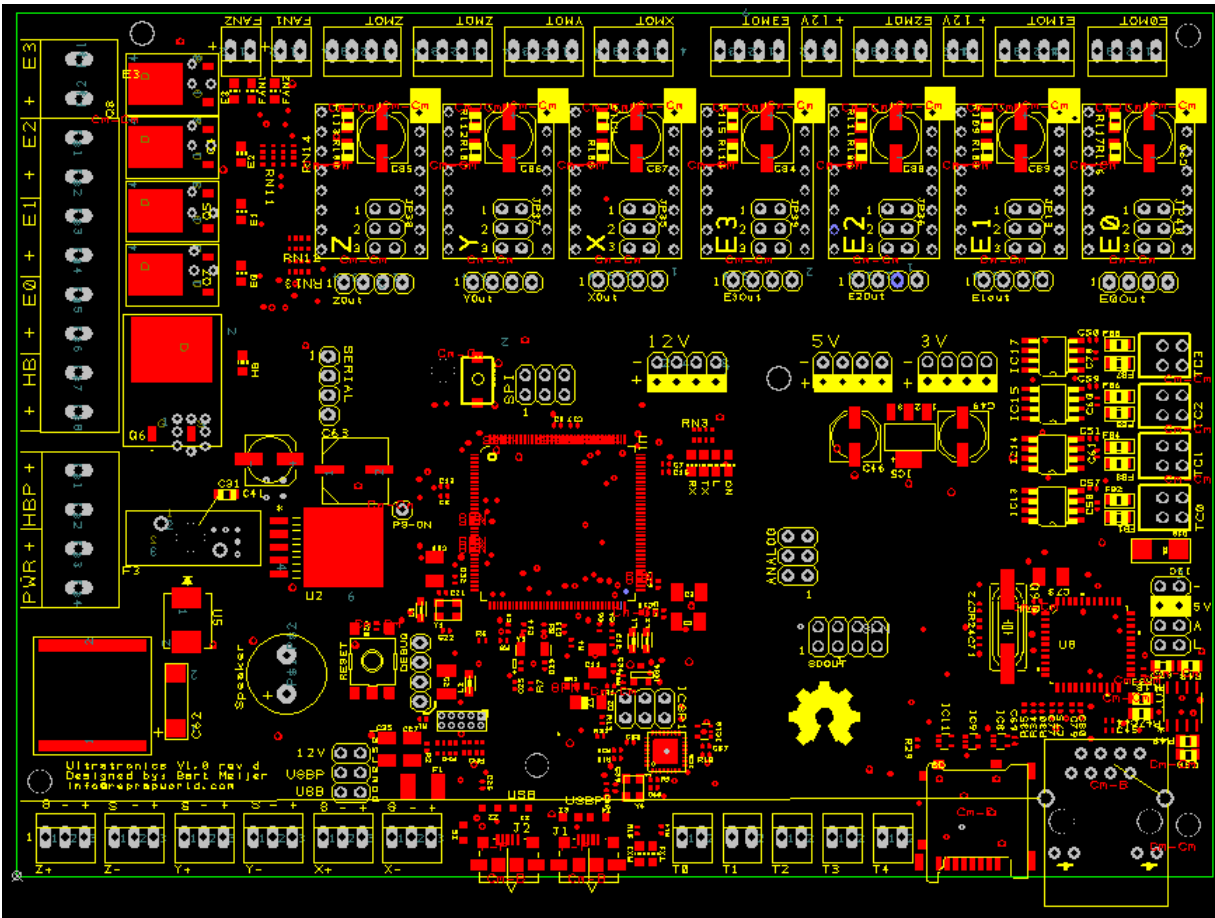
Pin	Definition	Pin	Definition
D0	RX0	D38	E3 axis direction
D1	TX0	D39	E3 axis step
D2	Heated bed *	D40	E3 axis enable
D3	Extruder 0 *	D41	E2 axis direction
D4	N/C *	D42	E2 axis step
D5	FAN 2 *	D43	E2 axis enable
D6	FAN 1 *	D44	E1 axis step
D7	Extruder 2 *	D45	E1 axis enable
D8	Extruder 1 *	D46	E0 axis direction
D9	Extruder 3 *	D47	E0 axis step
D10	N/C *	D48	E0 axis enable
D11	Y-Max *	D49	Interrupt ethernet
D12	Y-Min *	D50	CS TC3
D13	Debug LED	D51	CS TC2
D14	N/C	D52	CS TC1
D15	N/C	D53	N/C
D16	TXD2 / Serial-4	A0/D54	T0
D17	RXD2 / Serial-3	A1/D55	T1
D18	TXD1 / Serial-2	A2/D56	T2
D19	RXD1 / Serial-1	A3/D57	T3
D20	SDA / Analog-2	A4/D58	T4
D21	SCL / Analog-4	A5/D59	CS SD
D22	Y axis step	A6/D60	SD Detect
D23	Y axis direction	A7/D61	CS Ethernet
D24	Z axis enable	A8/D62	Analog-3 / SDOOut-2
D25	Z axis step	A9/D63	Analog-6
D26	Z axis direction	A10/D64	Analog-5

D27	Speaker	A11/D65	CS TC0
D28	Z-Max	D66	N/C
D29	Z-Min	D67	N/C
D30	X-Max	D68	N/C
D31	X-Min	D69	N/C
D32	PS-ON	D70	SDA
D33	Y axis enable	D71	SCL
D34	X axis direction	D72	LED RX
D35	X axis step	D73	LED TX
D36	E1 axis direction	D74	MISO
D37	X axis enable	D75	MOSI
		D76	SCK
		D77	N/C
		D78	N/C

\* This pin provides PWM

# BOARD DIMENSIONS

Width: 155mm  
Depth: 112.025mm



List of M3 holes (measured from the bottom left):

- 3, 12.2
- 16.25, 109.250
- 55.3, 65.5
- 67.5, 14.3
- 98.9, 64.5
- 152.0, 6.6
- 152.0, 109.0