

# MINITRONICS v2.0 DATASHEET

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**Document version** 1.0



## PRODUCT OVERVIEW

Minitronics is the slim but powerful electronics line. It's designed to be an easy to use, compact and smart solution to fit 90% of the 3D-printers. Unlike the Megatronics, which targets at the advanced range of usages, the Minitronics is plug and play, which will fit the needs of the average user better.

Minitronics has a powerful SAMD21J18 32-bit microprocessor with 256KB memory, running at 48Mhz. The board can be connected to a PC using a normal USB cable and can run stand-alone from 12V power supply. The board is compatible with Arduino and will therefor be easily programmed from the Arduino IDE.

The board comes with four DRV8825 on-board stepper drivers, which can be configured to different micro-stepping settings. To enable dual-head support an external stepper driver may be hooked up to the EXTSTEP header.

Version 2.0 of the Minitronics gives you more features, while maintaining the same small form-factor of the version 1.1. Mounting hole positions, USB connector and reset button are placed at the same positions making an upgrade easy.

The following section will contain references to documentation outside the scope of this document.

### **Microprocessor product page**

<https://www.microchip.com/wwwproducts/en/ATsamd21j18>

### **Microprocessor datasheet**

<http://ww1.microchip.com/downloads/en/DeviceDoc/SAMD21-Family-DataSheet-DS40001882D.pdf>

### **Stepper driver datasheet**

<http://www.ti.com/lit/ds/symlink/drv8825.pdf>

## DOCUMENT HISTORY

<b>Version 1.0</b>	Creation
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## TECHNICAL SPECIFICATION

<b>Microcontroller</b>	SAMD21J18
<b>Operating Voltage</b>	3.3V
<b>Input voltage</b>	12V / 24V*
<b>DC Current per I/O Pin</b>	7mA
<b>Clock Speed</b>	48Mhz
<b>Flash memory</b>	256KB

\* Board cannot accept 24V to run stand-alone. Jumper SRC12V must be removed.

## MAJOR FEATURES

	<b>SAMD21J18</b> Powerful SAMD21J18 32-bit processor with 256 KB memory, running at 48Mhz
	<b>Three analog inputs for temperature</b> Minitronics v2.0 has three headers for temperature reading.
	<b>External SD card support</b> You can now hook up an external SD card pcb, so you can print directly from SD.
	<b>Four MOSFETs</b> The board has 1 fan MOSFET, 2 regular MOSFETs and one MOSFET for the heated bed (10A) to support many needs.

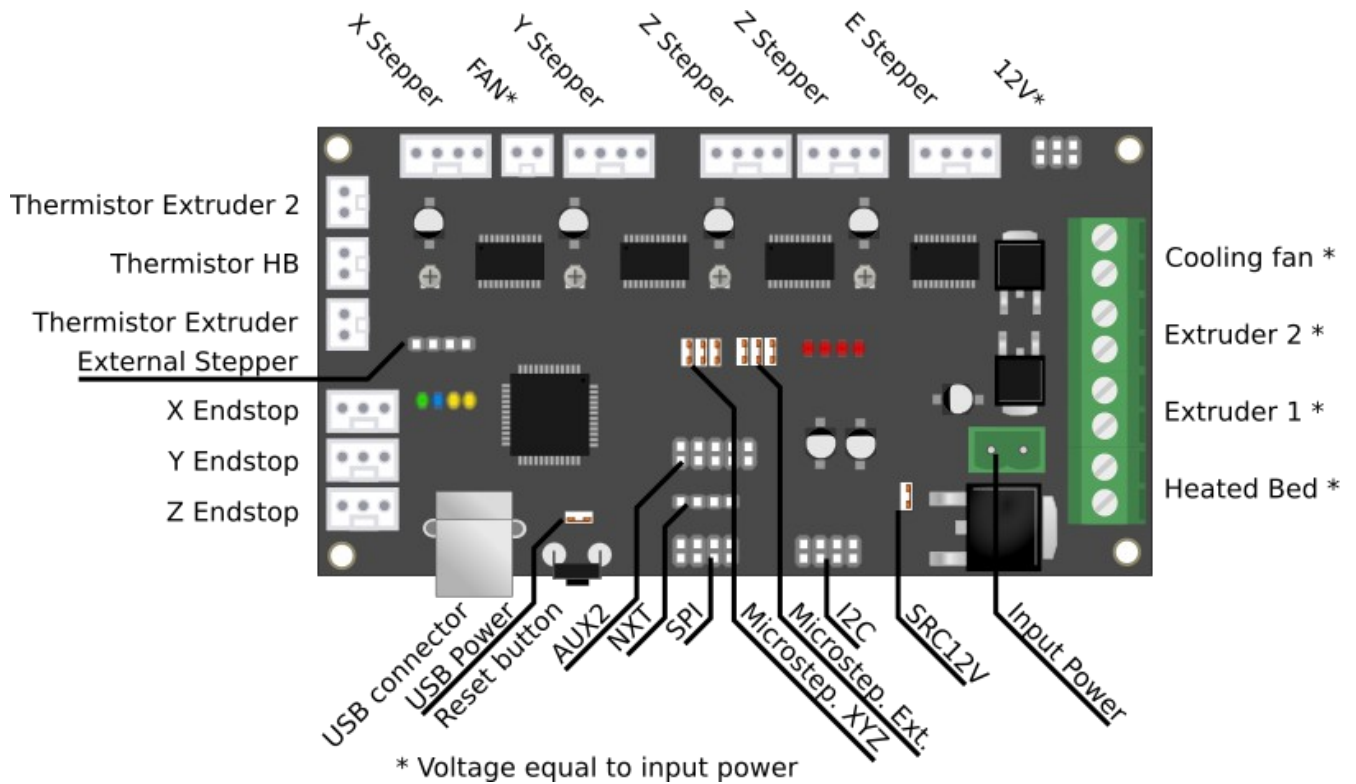
	<p><b>Up to 5 stepper drivers 1/32 step</b>  The Minitronics has four on board stepper drivers. A fifth can be connected externally, using the EXTSTEP pin header</p>
	<p><b>Small dimensions</b>  Only 93.9 x 56.8mm x 18mm form-factor, drop-in replacement for Minitronics v1.1.</p>

### *Detailed feature list*


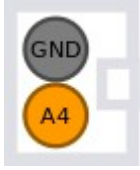
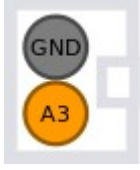
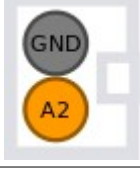





<b>Microcontroller</b>	SAMD21J18 64-pin TQFP Powerful SAMD21J18 processor with 256 KB memory, running at 48Mhz
<b>Nr. of extruders</b>	2 (using 1 external stepper motor driver)
<b>Nr. of end stops</b>	3
<b>Nr. of thermistors</b>	3
<b>Input voltage</b>	Max 12V when SRC12V is jumpered, else 12-24V
<b>Nr. of stepper drivers</b>	5 (4 on board with 1/32 step, 1 externally)

- The 3.3V and 5V logic circuit can be powered from 12V (12V MAX!), by setting a jumper
- 12V has a diode to protect against reverse polarization
- The 5V line is protected by a 500mA resettable fuse
- Two layer high quality PCB board





# CONNECTORS



Name	Description	
USB Connector	Allows a host USB device to connect to the board	
USB Power	When jumpered powers the board from USB	
Reset button	Resets the microprocessor.	
AUX2	2x5 header for peripherals	
X	X End stop	
Y	Y End Stop	

Z	Z End Stop																													
T1	Thermistor 1 (Extruder 1)																													
T2	Thermistor 2 (Heated bed)																													
T3	Thermistor 3 (Extruder 2)																													
FAN	Output for the board fan *																													
3V	2x1 header for 3.3V output																													
OUT12V	2x3 header for 12V output *																													
XMOT, YMOT, ZMOT, ZMOT1, EMOT	Connectors for bipolar stepper drivers (ZMOT and ZMOT1 are the same stepper driver)																													
XYZ, E0	Stepper mode selector for stepper drivers																													
	<table border="1"> <thead> <tr> <th>M0</th> <th>M1</th> <th>M2</th> <th>Resolution</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>0</td> <td>Full step</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>Half step</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>1/4 step</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>1/8 step</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>1/16 step</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>1/32 step</td> </tr> </tbody> </table>	M0	M1	M2	Resolution	0	0	0	Full step	1	0	0	Half step	0	1	0	1/4 step	1	1	0	1/8 step	0	0	1	1/16 step	1	0	1	1/32 step	
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SRC12V jumper	Power the board from 12V. <b>WARNING: MAX 12V is accepted</b>									
EXTSTEP	Breakout to hook up an external stepper driver 1. D21 / Enable 2. D20 / Step 3. D13 / Dir 4. GND									
Input Power	12V Input When SRC12V is <b>NOT</b> jumpered up to 24V is accepted									
SPI	Breakout header for SPI 1. 5V 2. D18 3. D36 / MISO 4. D37 / MOSI 5. D38 / SCK 6. D2 / CS 7. GND 8. D22									
I2C	Breakout header for I2C									

\* When powering from 24V make sure your heaters and other peripherals can handle 24V as well.

## PIN DEFINITION

This is the digital I/O assignment for Minitronics. You can use it to adjust your firmware's pinmapping to support Minitronics.

<b>I/O</b>	<b>Pad</b>	<b>Description</b>	<b>I/O</b>	<b>Pad</b>	<b>Description</b>
D0	PA11	Stepper enable	D29/A1	PB08	Stepper Y - Step
D1	PA10	Stepper X - Step	D30/A2	PB09	Thermistor T3 - Extruder 2
D2	PA14	SPI.6 - CS	D31/A3	PA04	Thermistor T2 - Heated bed
D3	PA09	Stepper X - Dir.	D32/A4	PA05	Thermistor T1 - Extruder 1
D4	PA08	Endstop - Z	D33/A5	PB02	AUX2.8
D5	PA15	N/C	D34	PA22	I2C - SDA
D6	PA20	Heater - Heated Bed	D35	PA23	I2C - SCL
D7	PA21	AUX2.1	D36	PB12	SPI.3 - MISO
D8	PA06	Endstop - X	D37	PB10	SPI.4 - MOSI
D9	PA07	Endstop - Y	D38	PB11	SPI.5 - SCK
D10	PA18	Heater - Extruder 1	D39	PB03	RX LED
D11	PA16	Heater - Extruder 2	D40	PA27	TX LED
D12	PA19	AUX2.3	D41	PA28	AUX2.5
D13	PA17	Debug LED	D42	PA24	USB N
D14	PB04	Stepper E - Step	D43	PA25	USB P
D15	PB05	Stepper E - Dir.	D44	PB22	NXT.3 - Serial 2 TX
D16	PB06	Stepper Z - Step	D45	PB23	NXT.4 - Serial 2 RX
D17	PB07	Stepper Z - Dir.	D46	PA22	I2C - SDA
D18	PA12	SPI.2	D47	PA23	I2C - SCL
D19	PB13	EXTSTEP.3	D48	PA19	AUX2.3
D20	PB14	EXTSTEP.2	D49	PA16	Heater - Extruder 2
D21	PB15	EXTSTEP.1	D50	PA18	Heater - Extruder 1
D22	PB16	SPI.7	D51	PA17	Debug LED
D23	PB17	AUX2.7	D52	PA13	N/C
D24	PB30	Cooling fan	D53	PA21	AUX2.1
D25	PB31	AUX2.2	D54	PA06	Endstop - X
D26	PB00	AUX2.4	D55	PA07	Endstop - Y
D27	PB01	AUX2.6	D56	PA03	AREF
D28/A0	PA02	Stepper Y - Dir.	D57	PA02	Alternate use of A0 (DAC output)

\* PWM available

