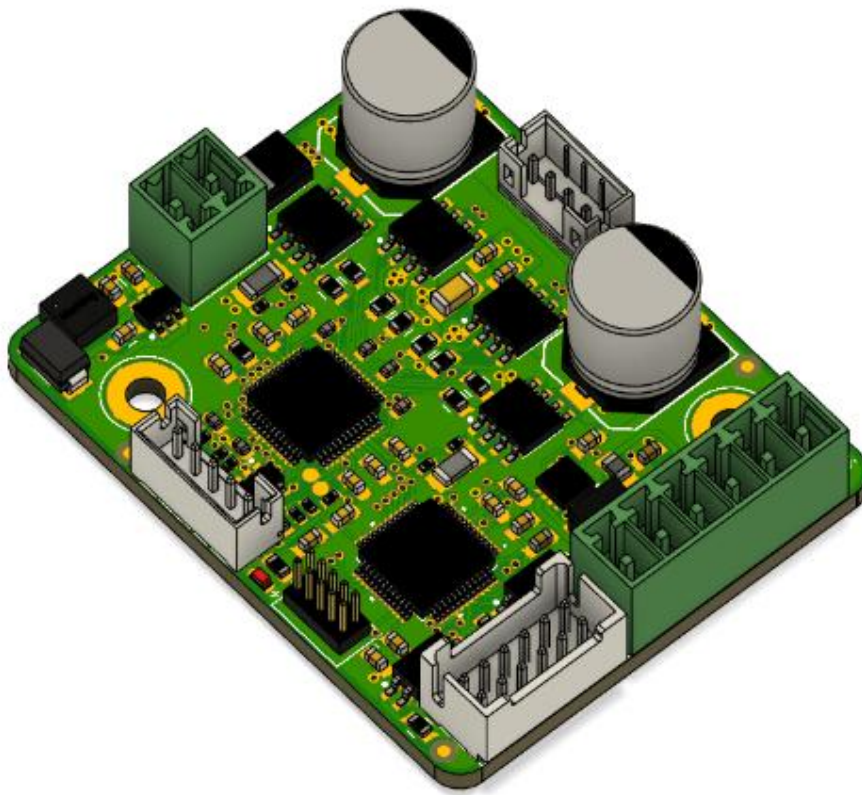


Atlas Motion by Summit Electronics

Atlas Control Step 1



Power Your Precision

The versatile Step 1 Stepper Motor Controller Board

Atlas Control by Summit Electronics

We offer you the ultimate, compact “Smart Actuator” for motion control. The compact Atlas Control Step 1 and Step 3 stepper Motor Controller Boards are based on an engine independent system. With a true Dutch design and the ADI Trinamic technology inside, you get real quality.

Looking for flawless motion control without the complexity? Whether you are building a linear actuator, dosing system or automating a precise desktop robotics project, our Atlas Control series Step 1 Stepper Motor Controller Board delivers the exact control, reliability, and smooth performance you need. Designed for professionals, engineers, and creators alike, this compact powerhouse brings you world-class Dutch design for a fair price, turning complex motion commands into effortless, whisper-quiet execution. Ideally combined with our Atlas Engines.

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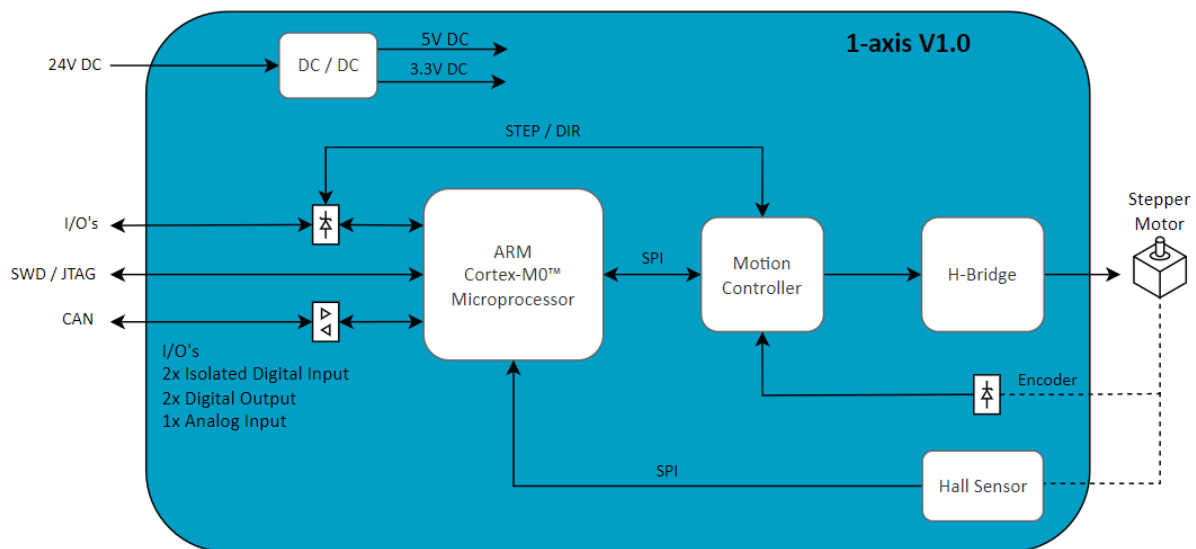
1 Functional description

1.1 Product overview

The Atlas Control Step 1 is a one axis small form factor Motion Controller and driver Module and 2-phase bipolar stepper motor with high torque and has sophisticated features like an ultra-low-noise chopper mode, a way to drive the motor with very high efficiency, and a programmable stall guard. The Step 1 can be controlled and configured by the onboard STM32-Cortex M0x microcontroller. On the back of the PCB, a Hall sensor is placed to allow for a closed loop system without the need for an encoder. If an encoder is preferred, this can also be used and connected to the encoder connector on the PCB. To allow for versatile use cases, the Atlas Controller Board features a CAN bus with 2 connections making the board suitable for “daisy chaining”, Further it offers 2x isolated 5 to 24V Inputs, 2x 24V outputs and 1x 5V analog input for connecting external electronics.

1.2 Product features

0.



1.3 Typical applications

- Compact Stepper Motor Driver
- Handling & Automation
- Stand-alone and multi Axis operation

2 General Specifications

2.1 Electrical Properties

Parameter:	Description
Rated Voltage:	24V DC (25V Max.)
Rated Current:	2A (2.5A Peak)
Microprocessor:	STM32 Cortex M0
Sensors:	Hall Sensor (Backside of PCB)
Interfaces:	CAN (max speed? Up-to 1Mbit/s) STEP / DIR (shared with Isolated Digital Input) Encoder input (for incremental A/B/N encoder signals) SWD input (for programming STM MCU)
I/O's:	2x Isolated Digital Input (5-24V Max. / 50 mA) 2x Digital Output (24V / 200 mA) 1x Analog Input (5V Max.)

2.2 Mechanical Properties

Parameter:	Description
Dimensions:	52.3 x 42.3 x 15 mm
Supported NEMA size:	NEMA 17

3 Electrical Specifications

3.1 Recommended Operating Conditions

Operating Condition	Description	Min.	Typ.	Max.
Operating temperature range		0°C	~	+60°C
$V_M = V_{CC}$	Power/ Motor Supply Voltage	23,8V	24V	24,2V
I_M	Motor Current			2.0A (2.5A Peak)

IMPORTANT: Do not connect or disconnect motor during operation, as this can lead to voltage spikes which might exceed voltage limits of the driver and permanently damage the MOSFET's.

IMPORTANT: Wrong polarity can damage the Atlas board.

3.2 I/O's Electrical Ratings

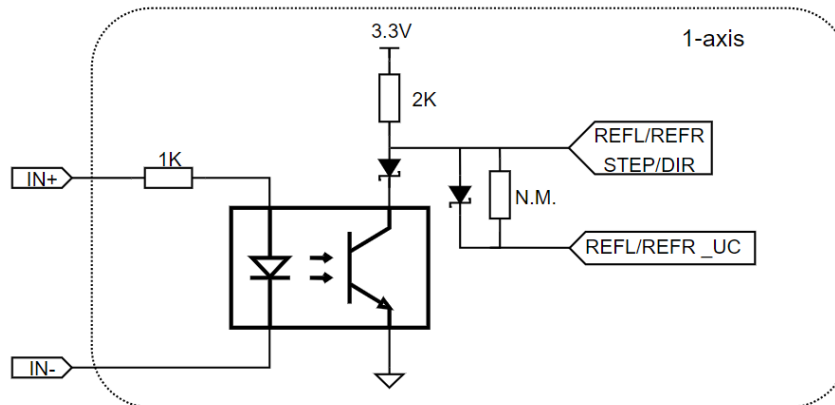
Parameter	Description	Min.	Typ.	Max.
V_{in}	Input voltage	5V		24V
I_{In}	Input current		11mA	
$I_{f,opto}$	Forward current optocoupler			50mA
V_{out}	Output voltage	0V	12V	24,1V
I_{out}	Output Current			200mA
V_{Analog}	Analog voltage	0V		5,1V
ADC Resolution	Resolution		12 bit	

3.2.1 Digital Input

Input 1 can be configured as REFL / STEP input or general input.

Input 2 can be configured as REFR / DIR input or general input.

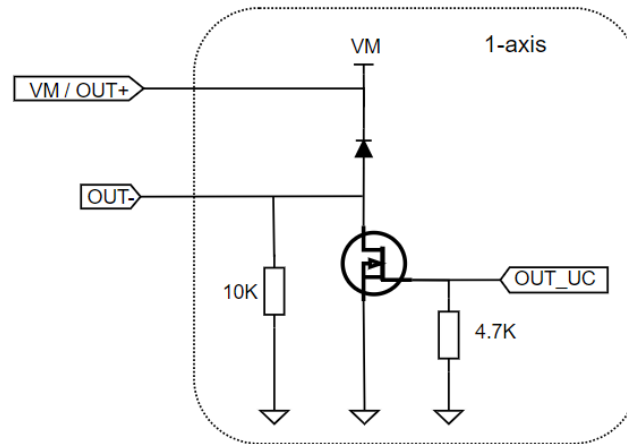
Both STEP and DIR signals can be configured to be sent from the onboard MCU, when the N.M. resistor is fitted with a 0 Ohm resistor. Alternatively the STEP / DIR signals can be provided externally through IN+/IN- without adjusting the resistors. (Note: TMC5160 should be put in SD_MODE mode if STEP/DIR is required, see Chapter 3.5 for more details on SD_MODE)



Due to limitations of the optocoupler, the maximum STEP frequency is limited to around 20KHz.

3.2.2 Digital Output

Output 1, 2 and 3 are general outputs, controlled by a MOSFET's driven by the MCU. Each output switches a 12V load connected between 12V/OUT+ and OUT-. A flyback diode is connected across the load to protect the MOSFET from voltage spikes generated by inductive loads.

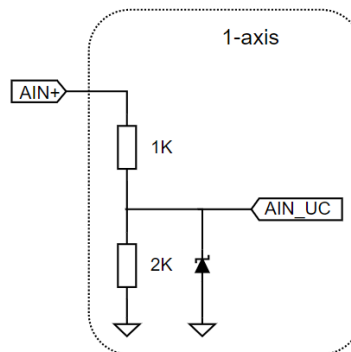


3.2.3 Analog Input

AIN is connected to a voltage divider with the following conversion rate:

$$V_{out} = \frac{2K}{1K + 2K} \cdot 5V = 3.3V$$

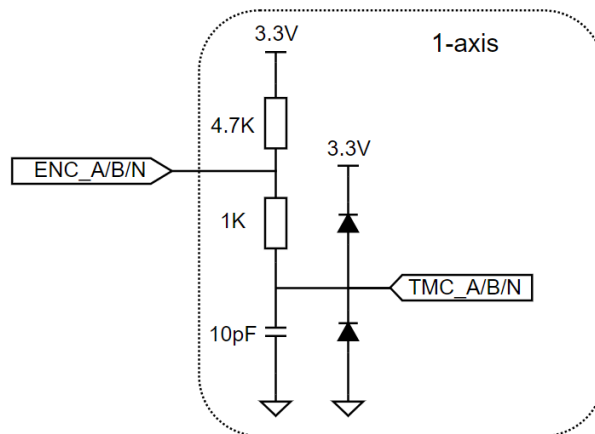
The voltage clamp is set at 3.3V to protect the MCU from overvoltage.



3.3 Encoder Electrical Ratings

Parameter	Description	Min.	Typ.	Max.
V_{enc}	Encoder Voltage output		5V	
$A_{High\ Level}$	Input for incremental encoder	2.3V	3.3V	3.6V
$B_{High\ Level}$	Input for incremental encoder	2.3V	3.3V	3.6V
$N_{High\ Level}$	Input for incremental encoder	2.3V	3.3V	3.6V

The Atlas Control Step 3 Controller Board offers 3 separate encoder inputs. An external incremental A/B/Z encoder can be connected to the encoder connector to create a closed loop system.



3.4 Motor Current

The TMC5160 driver operates current controlled. The driver current may be programmed in the software for motor coil currents up to 2A, the CS value is limited to 20 in the library due to CS 20 being the max ~2A value for the PM42SH18-20-38-M. please note this table is different for every stepper used! Start your test with a low CS setting and scale up slowly. Do not cross the 2A motor coil current.

Motor Current setting [CS]	DC input current [mA]	AC Motor coil current [mA]
0	50	75
1	55	175
2	60	270
3	75	365
4	85	460
5	100	555
6	115	650
7	135	745
8	160	840
9	185	935
10	210	1030
11	240	1125
12	275	1220
13	310	1315
14	350	1410
15	390	1505
16	430	1600
17	480	1695
18	525	1790
19	575	1885
20	630	1980

3.5 TMC5160 mode

The Atlas Control Step 1 Controller Board is by default set up to be in SPI_MODE, meaning it's controlled by the MCU using the SPI interface. This mode is recommended to get the most out of the functionality and special features offered by the TMC5160 chip. If STEP / DIR control is required, the TMC5160 should be put in SD_MODE.

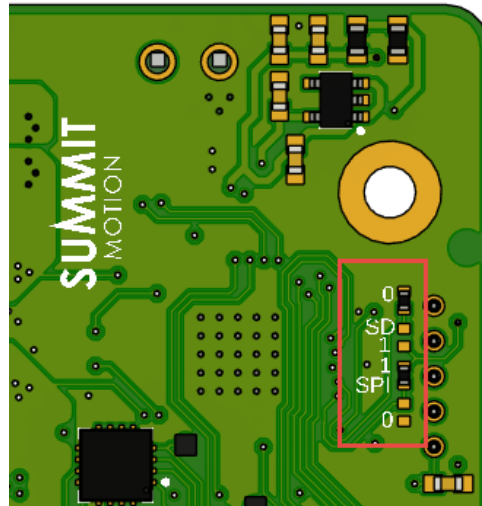
This can be achieved by adjusting onboard resistors, as marked on the board.

SPI_MODE	SD_MODE	Resistors
SPI = 1, SD = 0	SPI = 0, SD = 1	R316, R317, R318, R319



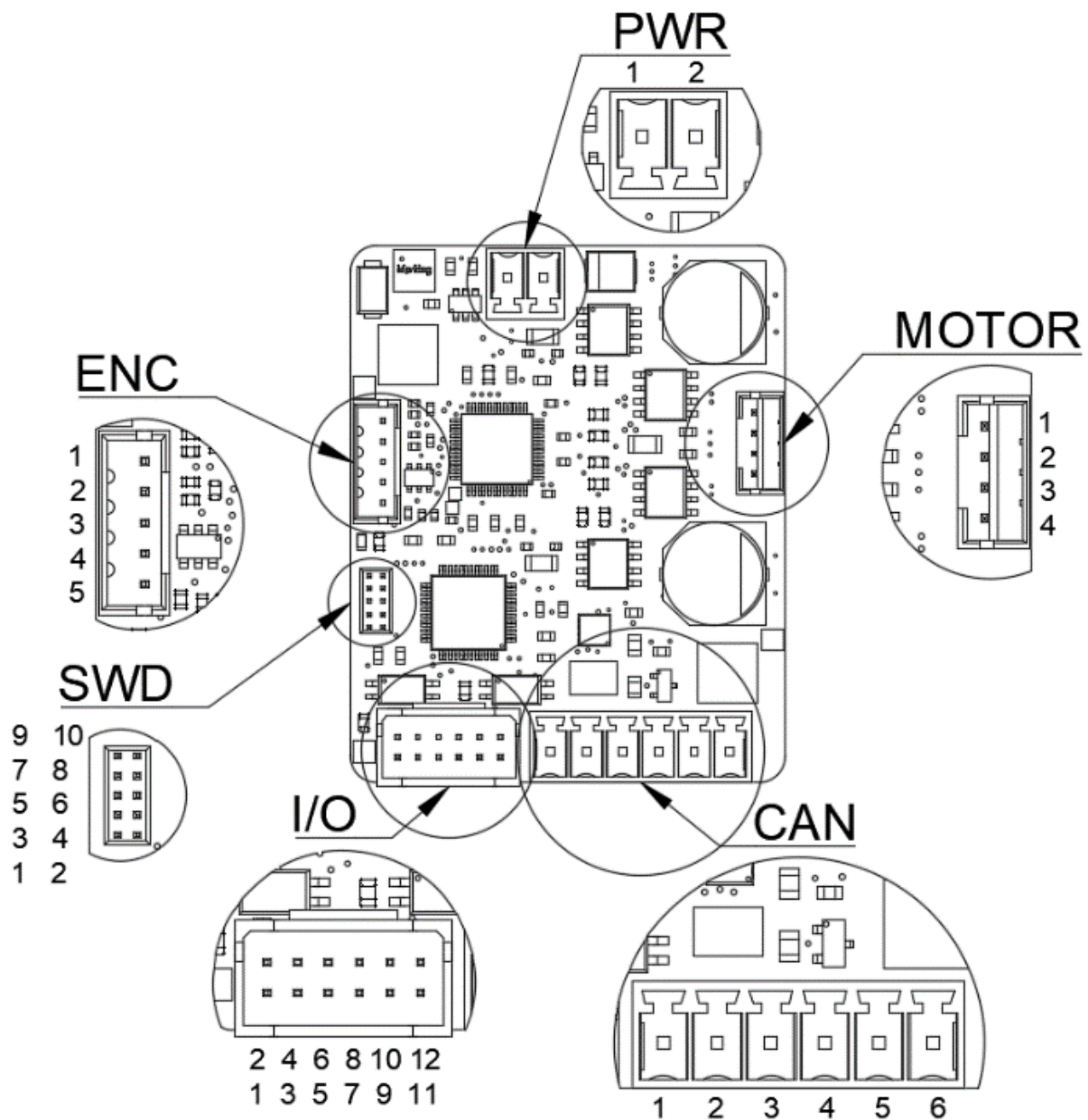
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4 Mechanical specifications

4.1 Pin Assignment



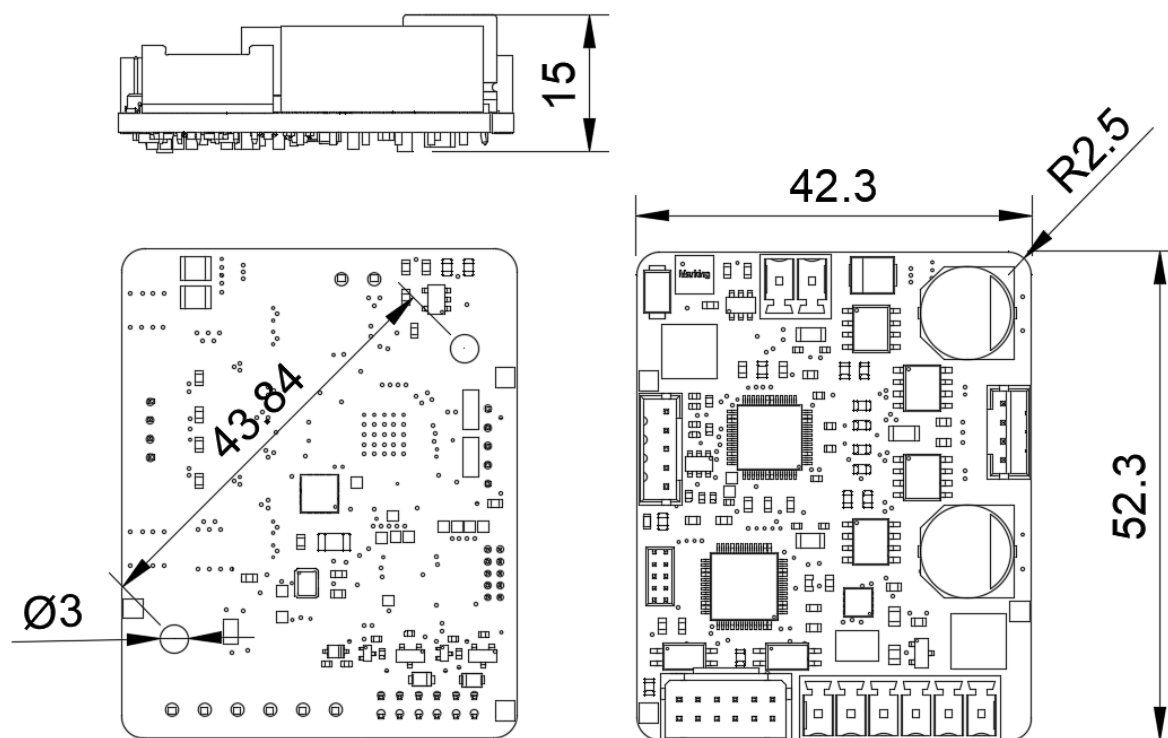
Connector Name	#	Function	Notes
PWR	1	GND	
	2	VM	24V / 2A
ENC	1	GND	
	2	ENCC	Encoder signals to TMC5160 encoder input
	3	ENCB	
	4	ENCA	
	5	5V	5V / 500 mA
SWD	1	SWDIO	STM Microprocessor program / Debug
	2	3.3V	
	3	SWDCLK	
	4	GND	
	5	N.C.	
	6	GND	
	7	N.C.	
	8	N.C.	
	9	NRST	
	10	GND	
I/O	1	IN_1+	Digital input / REFL / STEP input, Optocoupler input R = 1KOhm 5/12/24V, 200mA compatible
	2	IN_1-	
	3	OUT_1+	Digital Output, OUT_1+ is equal to VM, 50mA
	4	OUT_1-	
	5	IN_2+	Digital input / REFR / DIR input, Optocoupler input R = 1KOhm, 5/12/24V, 200mA compatible
	6	IN_2-	
	7	OUT_2+	Digital Output, OUT_2+ is equal to VM, 50mA
	8	OUT_2-	
	9	AIN+	Analog Input (5V max)
	10	GND	
	11	GND	
	12	GND	
CAN	1	CANH	1 Channel CAN bus, 2 access points for daisy chaining
	2	GND	
	3	CANL	
	4	CANH	
	5	GND	
	6	CANL	
MOTOR	1	BMB2	Stepper motor connection
	2	BMB1	
	3	BMA2	
	4	BMA1	

4.2 Connectors

Connector Name	Connector on SSM1ST2420HC	Mating Connector
PWR	STB1000VH-3.5-2	STB2000V-3.5-2
ENC	SWTB-C2001VD-05	SWTB-H2001-5
I/O	SWTB- C2012VD-2x6	SWTB-H2012-2x6
CAN	STB1000VH-3.5-6	STB2000V-3.5-6
MOTOR	SWTB-C2001VD-04	SWTB-H2001-4

4.3 Module Dimensions

Unit: mm



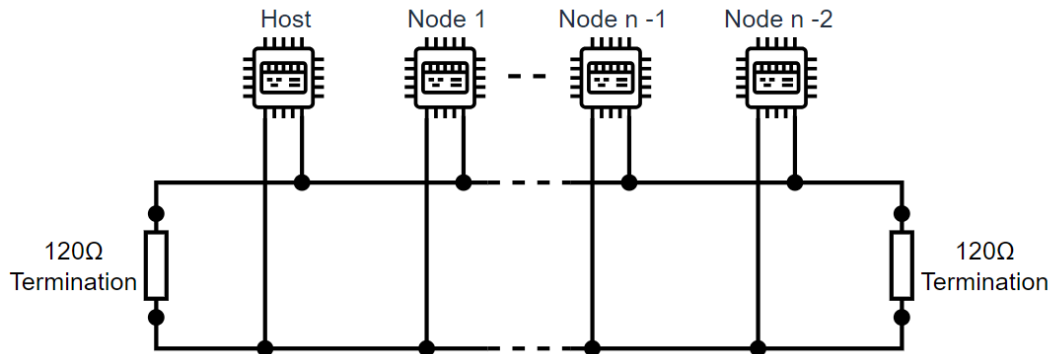
5 Communication

5.1 CAN bus

Bus structure:

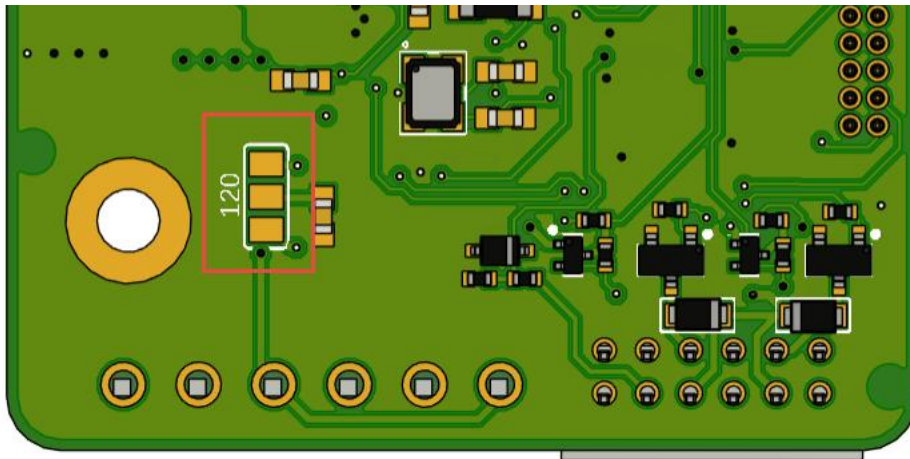
The CAN network topology should follow a linear bus structure, where all nodes are connected along a single communication line. The physical wiring between the bus and each node, as well

as between nodes, should be kept as short as possible to minimize signal reflections and maintain signal integrity. Long stubs and branches can cause distortion, resulting in communication errors.



Bus termination:

CAN bus termination resistors are located on the front of the 3-axis PCB. Four pins are provided and can be connected using 2.54 mm jumper bridges, as shown in the image below. The bus is terminated using a 120 Ω resistor, which is a standard value to match the characteristic impedance of typical CAN cables. The termination jumpers are not connected by default and should be manually installed when termination is required, usually at both physical ends of the CAN bus.



Number of Nodes:

The Atlas Control Step 1 Controller Board module uses the TJA1042TK/3/1 CAN transceiver, which presents a high differential input impedance of approximately 19 k Ω . This means that each node places minimal DC load on the bus, so the theoretical maximum number of nodes is not limited by the transceiver input resistance.

However, practical limits on the number of nodes stem from the total bus electrical characteristics:

- **Unit Load:** Each transceiver adds a unit load to the bus, and the CAN standard typically supports up to 30 unit loads per segment. Using transceivers with lower unit loads can increase this number.
- **Bus Capacitance and Length:** The overall bus length and cable capacitance affect signal propagation and timing. Longer cables increase delay and reduce the maximum achievable bitrate.
- **Stub Length:** The length of the wiring stub between each node and the main bus line should be kept as short as possible (preferably less than 30 cm) to avoid reflections and signal degradation.
- **Bit Rate:** Higher bit rates require shorter bus lengths to maintain signal integrity. For example, a 1 Mbps CAN network is typically limited to around 40 meters of bus length, whereas lower bit rates allow longer cables.

To ensure reliable communication, it is recommended to:

- Use 120 Ω termination resistors at each end of the CAN bus.
- Keep stub lengths as short as possible.
- Limit the number of nodes per bus segment to approximately 30 when using standard unit-load transceivers.
- For networks requiring more nodes or longer cable lengths, consider using CAN repeaters or segmented buses.

6 Software

The Atlas Control Step 1 Controller Board can be programmed using STMCubeIDE, using the SWD interface available on the board.

The Software Development Kit (SDK) contains libraries, header files, and example code to interface with Summit Stepper driver modules.

The SDK can be downloaded from the official Summit GitHub repository.

Link: <https://github.com/Summit-Electronics>

More details regarding software setup, building and flashing can be found in the document: Summit_Stepper_Driver_Module_SDK_User_Guide.pdf

Technical support

For all product questions please contact us via info@summit-electronics.com

Ordering information

Order your modules via www.summit-electronics.com or info@summit-electronics.com.
Please contact us for more information. Customization of the product is available on request.

Document Information	
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Active, (Mass production)

This document applies to the following products:

Name	Type number	version	Product Status
SSM1ST2420HC	SSM1ST2420HC	1.0	Active, (Mass production)