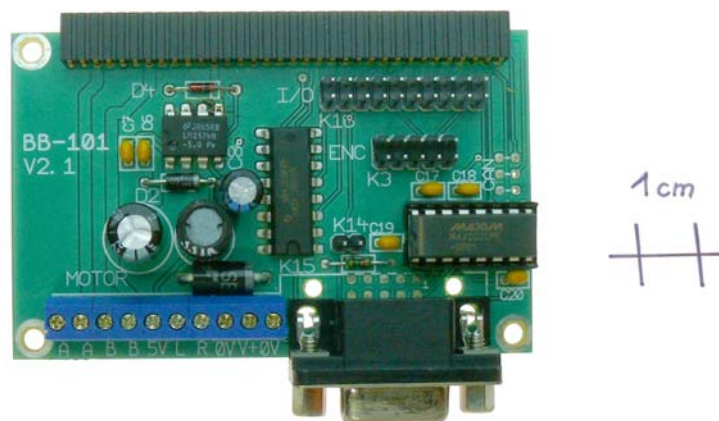


BB-101

Manual

**Base Board for the
TMCM-101 Closed Loop Stepper Motor
Driver and Controller Module**



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Contents

1	Features.....	3
2	Life Support Policy.....	4
3	Electrical and Mechanical Interfacing.....	5
3.1	Pinning.....	5
3.1.1	Motor connection	5
3.1.2	Power supply and reference switches.....	6
3.1.3	RS232, RS485 and CAN interface	6
3.1.4	I/O Header	6
3.1.5	Encoder connection	7
3.1.6	CAN-Jumper	7
3.2	Dimensions.....	7
4	Operational Ratings.....	8
4.1	Microcontroller.....	8
4.2	Stepper motor drivers	8
4.3	TMC428 Motion Controller	8
4.4	Incremental encoder interface.....	9
5	Functional Description.....	9
6	References	9
7	Revision History.....	9

Figures

Figure 1.1 : Functional Block Diagram of the BB-101	3
Figure 3.1: Pinning of BB-101.....	5
Figure 3.2 : Dimensions in mm	7

Tables

Table 3.1: Motor coil A and B.....	5
Table 3.2: Power supply and reference switches	6
Table 3.3: RS232, RS485 and CAN interface	6
Table 3.4: I/O Header	6
Table 3.5: Encoder connection	7
Table 3.7: CAN-Jumper	7
Table 4.1 : Operational Ratings (pls. refer [TMCM-101])	8

1 Features

The BB-101 is designed for the TCM-101 single axis 2-phase stepper motor controller and driver module with encoder interface. This encoder feedback makes it an optimum solution for high-reliability closed loop drives. The BB-101 gives easy access to all important signals of the TCM-101. Motor connection, power supply and limit switches are accessible via screw terminals while encoder connection and the I/Os of the TCM-101 have 2 row RM2.54 industry standard connectors. The integrated switch-mode regulator provides the required 5V supply voltage for the TCM-101. Thus only one power supply is required. The integrated level shifter enables direct connection to a PC via RS-232 (optionally RS-485, CAN).

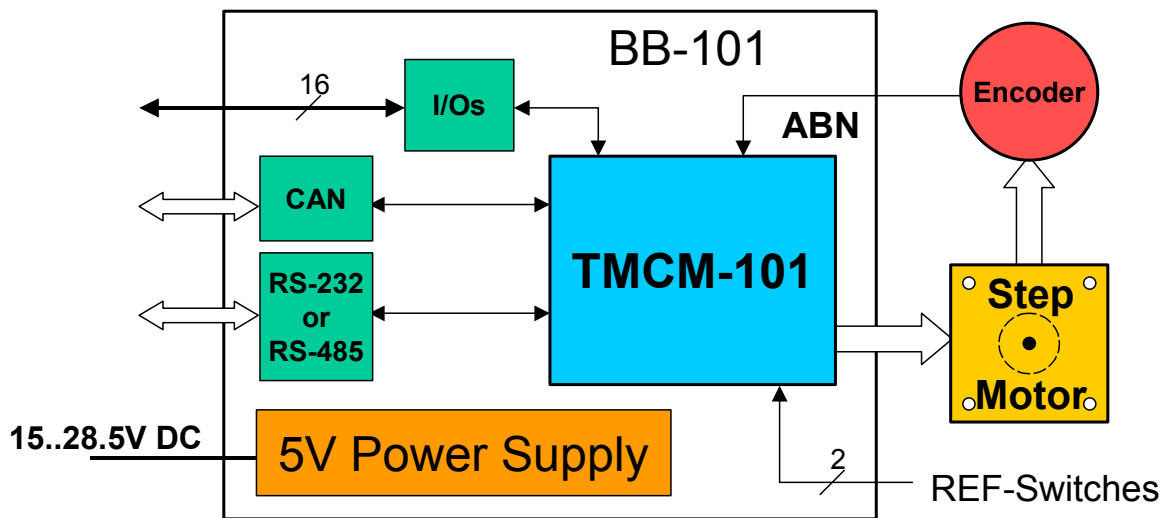


Figure 1.1 : Functional Block Diagram of the BB-101

Applications

- fast prototyping of motion control applications with high current stepper motors (e.g. lab use)
- ad-hoc evaluation of the TCM-101 module without the need of developing an own PCB
- BB-101 + TCM-101 suitable for series production

Highlights

- single voltage supply - the integrated switching regulator generates the internal 5V supply
- screw connectors for motors, power supply and reference switches for fast prototype wiring
- all 16 general purpose analog or digital I/Os of the TCM-101 supported
- screw holes for reliable mounting beyond prototyping
- compact size (80 mm x 60 mm)
- supply voltage range of 15V to 28.5V
- Up to 3A coil current RMS (4.2A peak)
- StallGuard™ for reference search
- single slot for TCM-101 controller and driver module

Order code	Description
BB-101 (-option)	Baseboard BB-101 for TCM-101
Option	
-RS232	BB-101 with RS232 / CAN interface
-RS485	BB-101 with RS485 / CAN interface

2 Life Support Policy

TRINAMIC Motion Control GmbH & Co. KG does not authorize or warrant any of its products for use in life support systems, without the specific written consent of TRINAMIC Motion Control GmbH & Co. KG.

Life support systems are equipment intended to support or sustain life, and whose failure to perform, when properly used in accordance with instructions provided, can be reasonably expected to result in personal injury or death.

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Specifications subject to change without notice.

3 Electrical and Mechanical Interfacing

3.1 Pinning

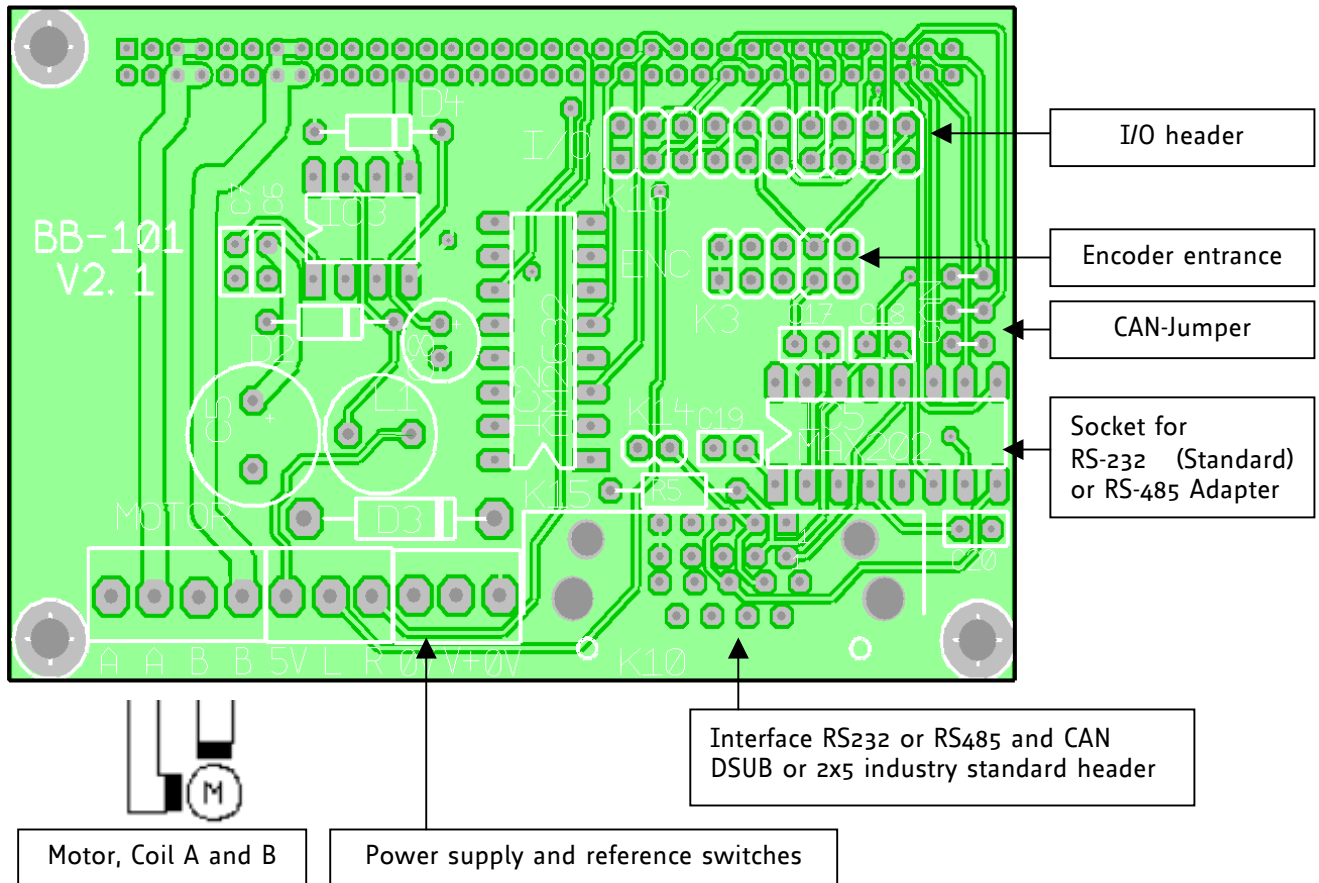


Figure 3.1: Pinning of BB-101

3.1.1 Motor connection

Pin	Number	Function
A	1	motor coil phase A (phase 4)
A	2	motor coil phase A (phase 3)
B	3	motor coil phase B (phase 2)
B	4	motor coil phase B (phase 1)

Table 3.1: Motor coil A and B

3.1.2 Power supply and reference switches

Pin	Number	Function
5V	1	+5V output, max. 100mA
L	2	Left reference switch (opener to ground)
R	3	Right reference switch (opener to ground)
oV	4	Ground
V+	5	Power supply 15-28V
oV	6	Ground

Table 3.2: Power supply and reference switches

3.1.3 RS232, RS485 and CAN interface

DSUB	2x5 header ¹	RS232 ²	RS485 ²	CAN ³
1				
2	3	TXD	RS485 +	CANL
3	5	RXD		GND
4				
5	9	GND	GND	GND
6				
7	4		RS485 -	CANH
8				
9	8	+5V (out)	+5V (out)	+5V (out)

Table 3.3: RS232, RS485 and CAN interface

Close jumper K14 for CAN and RS485 termination.

3.1.4 I/O Header

Pin	Function	Pin	Function
1	Output 0	11	Input 0
2	Output 1	12	Input 1
3	Output 2	13	Input 2
4	Output 3	14	Input 3
5	Output 4	15	Input 4
6	Output 5	16	Input 5
7	Output 6	17	Input 6
8	Output 7	18	Input 7
9	Ground	19	Ground
10	+5 V (output)	20	+5 V (output)

Table 3.4: I/O Header

Pin 1 is on lower left corner of the header in Figure 3.1.

¹ The 2x5 industry standard header is unequipped. Pin 1 is on upper right corner of the header in Figure 3.1. To equip the header in order to use ribbon cable remove the DSUB connector. For series production ask Trinamic for 2x5 header option.

² RS232 and RS485 are ordering options (female DSUB connector onboard, use untwisted cable)

³ In order to use the CAN interface close the CAN-Jumpers or connect the pins by hardwire and remove the RS232 or RS485 chip from its socket. To use the other interfaces open the CAN-Jumpers.

4 Operational Ratings

The operational ratings show the intended / the characteristic range for the values and should be used as design values. In no case shall the maximum values be exceeded.

Symbol	Parameter	Min	Typ	Max	Unit
VS	Power supply voltage for operation	15		28	V
T _{ENV}	Environment temperature at rated current (no cooling)	-40		+45	°C
	Environment temperature at 80% of rated current or 50% duty cycle (no forced cooling required)	-40		+70	°C

Table 4.1 : Operational Ratings (pls. refer [TMCM-101])

The power supply has to be disconnected when plugging in a TMCM-101 module into the BB-101. Do not connect or disconnect the motor while the unit is powered. Connecting or disconnecting the motor while the unit is powered might damage it.

4.1 Microcontroller

On this module, the Atmel AT90CAN128 is used to run the TMCL operating system and to control the TMC428. The CPU has 128Kbyte flash memory, 4 Kbyte RAM and 4Kbyte EEPROM. The microcontroller runs the TMCL (Trinamic Motion Control Language) operating system which makes it possible to execute TMCL commands that are sent to the module from the host via the interface. The microcontroller interprets the TMCL commands and controls the TMC428 which executes the motion commands.

The flash ROM of the microcontroller holds the TMCL operating system and the EEPROM memory of the microcontroller is used to permanently store configuration data.

The TMCL operating system can be updated via the serial interface (RS232 or RS422). Please use the latest version of the TMCL IDE to do this.

4.2 Stepper motor drivers

The stepper motor driver used on the TMCM-101 module is the TMC249 chip together with SI7501 MOSFETs and an extension for up to 64 microsteps. This driver circuit is very easy to use. It can control the currents for the two phases of the stepper motors. 64x microstepping and a maximum coil current of 3A RMS is possible.

The power dissipation of the TMC249 chip and the MOSFETs is very low so that the temperature of the MOSFETs normally does not exceed 125°C. Depending on the ambient temperature a cooling fan may be needed. The coils will be switched off automatically when the temperature or the current exceeds the limits and are automatically switched on again when the values are within the limits again.

4.3 TMC428 Motion Controller

The TMC428 is a high-performance stepper motor control IC and can control up to three 2-phase-stepper-motors. Motion parameters like speed or acceleration are sent to the TMC428 via SPI by the microcontroller. Calculation of ramps and speed profiles are done internally by hardware based on the target motion parameters.

4.4 Incremental encoder interface

The encoder interface of the TMCM-101 module allows to connect two channel incremental encoders with an optional null channel. The signal of the encoder must have TTL (+5V) level.

5 Functional Description

The BB-101 is for stand alone operation of the TMCM-101:

The TMCM-101 is a single axis 2-phase stepper motor controller and driver module. The build in encoder feedback makes it an optimum solution for high reliability drives. It is equipped with a CAN interface and a serial interface that can be used as an RS232, RS422 or RS485 interface by adding an appropriate line driver/level shifter. The module also has two stop switch inputs (stop left and stop right), eight general purpose digital outputs and seven general purpose inputs where each one can be used either as a digital input or as an analogue input.

An interface for incremental encoders (with A, B and N channel) allows exact position control and closed loop operation. Furthermore, using the Trinamic StallGuard feature overload or obstruction of the motor can be detected.

The TMCM-101 can be programmed using the Trinamic Motion Control Language (TMCL) which allows to control the module by a host or to run stand alone, executing a TMCL program that is stored in the 16kByte EEPROM on the module (the EEPROM can store up to 2047 TMCL commands).

All inputs and outputs of the module are provided on an 68 pin connector with 2mm pitch. The size of the board is very compact (80 x 70mm).

6 References

[TMCM-101] TMCM-101 Driver Manual, www.trinamic.com

7 Revision History

Version	Date	Author	Comments
1.00	November 7, 2007	HC	initial version