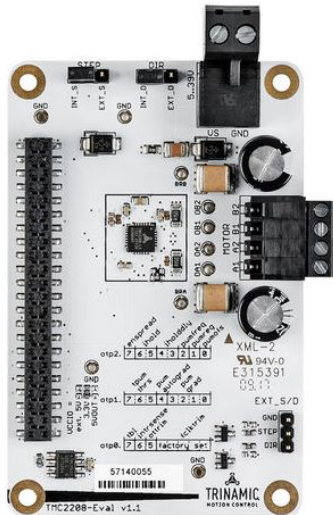# TMC2208-EVAL Evaluation Board

Document Revision V1.0 • 2019-MAY-08

The TMC2208-EVAL allows evaluation of the TMC2208 in combination with the Trinamic evaluation board system, or as stand-alone-board. It uses the standard schematic and offers several options in order to test different modes of operation.
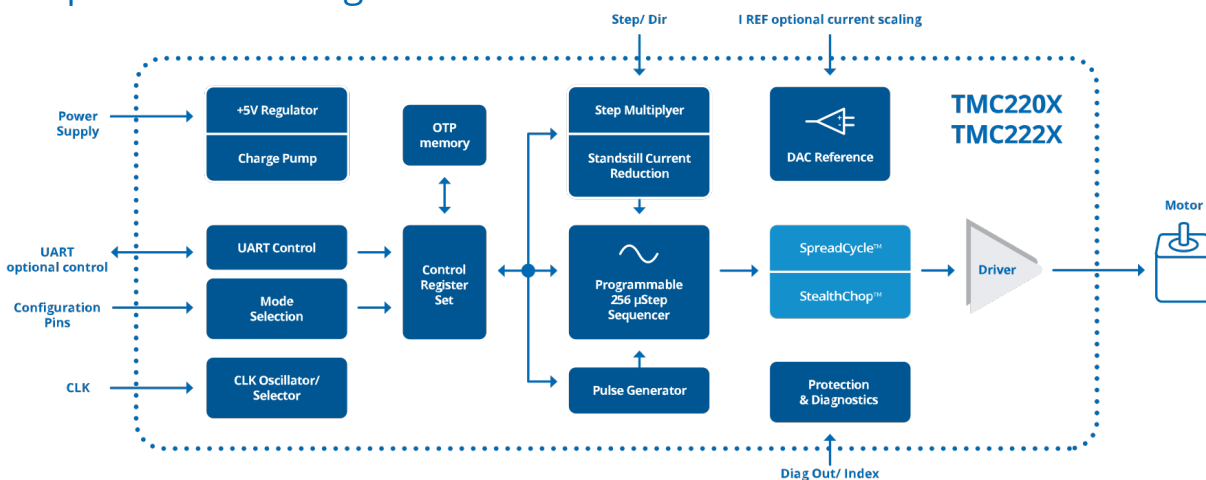
Features

- **2-phase** stepper motor up to 1.35A coil current (2A peak)
- **Supply Voltage** 4.75…36V DC
- **UART**
- 1…256 microsteps
- Step/Dir interface
- **StealthChop™** silent PWM mode
- **SpreadCycle™** smart mixed decay

Applications

- Compatible Design Upgrade
- 3D Printers
- Printers, POS

- Office and home automation
- Textile, Sewing Machines
- CCTV, Security

- ATM, Cash recycler

- HVAC

Simplified Block Diagram

Read entire documentation.

TRINAMIC
MOTION CONTROL

Contents

1   Getting Started

You need

- TMC2208-EVAL
- Landungsbruecke or Startrampe with latest firmware
- TMC2208-Bridge
- Stepper motor (e.g. QMot line)
- USB interface
- Power Supply
- Latest TMCL-IDE V3.0 and PC
- Cables for interface, motors and power

Precautions

- Do not mix up connections or short-circuit pins.
- Avoid bundling I/O wires with motor wires.
- Do not exceed the maximum rated supply supply voltage!
- Do not connect or disconnect the motor while powered!
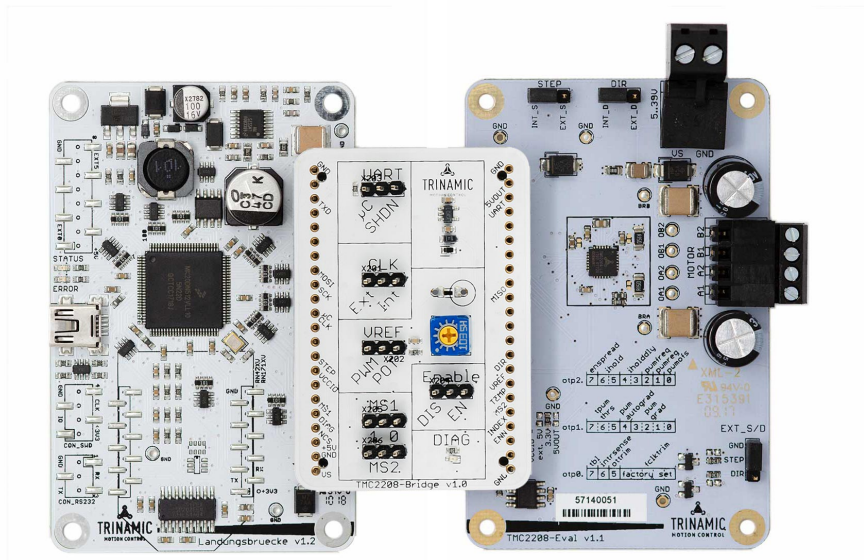- START WITH POWER SUPPLY OFF!

Figure 1: Getting started

1.1   First Start-Up

1. Make sure that the latest version of the TMCL-IDE 3.0 is installed. The TMCL-IDE can be downloaded from www.trinamic.com/support/software/tmcl-ide/.

2. Open the TMCL-IDE and connect the Landungsbruecke or Startrampe via USB to the computer. For Windows 8 and higher is no driver needed, on Windows 7 machines the TMCL-IDE is installing the driver automatically.

3. Verify that the Landungsbruecke or Startrampe is using the latest firmware version. The firmware version is shown in the connected device tree.
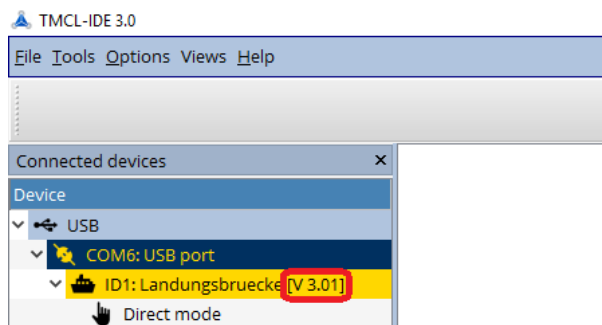

Figure 2: Firmware Version

4. The TMCL-IDE 3.0 needs room to show all important information and to provide a good overview. Therefore, arrange the main window related to your needs. We recommend using full screen. For evaluation boards it is essential to have access to the registers. Therefore open up the Register Browser (left side). For a better view click top right on the normal icon to get a maximized register browser window.

5. The TMCL-IDE includes a dialogue for diagnostic tasks. Further, the dialogue provides an overview of the connected motion controller and driver chips. Thus, a window pops up immediately after connecting the evaluation kit the first time. The window shows the actual status of the connections. The second tab of the dialogue offers the possibility to choose basic settings or to reset the module to factory 1defaults.
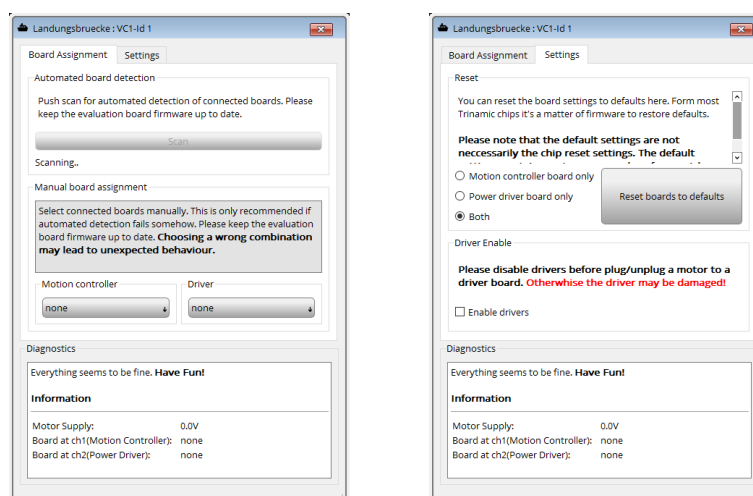

Figure 3: Landungsbruecke Dialogue

2   Hardware Information

All design files for our evaluation boards are available for free. We offer the original ECAD files (Eagle, Altium, or PADS), Gerber data, the BOM, and PDF copies. Please check schematics for Jumper settings and input/output connector description.

The files can be downloaded from the evaluation boards' website directly at out homepage: TRINAMIC Eval Kit homepage.

Note   If files are missing on the website or something is wrong please send us a note.

2.1   Bridge Board Jumpers

The TMC2208 Bridge board provides multiple jumpers. The UART Jumper selects between 3 different options for the PDN_UART pin.

Option	Function
μC	UART communication enabled
SHDN	PDN_UART = GND (stand still power down enabled)
Open	PDN_UART = open (stand still power down disabled)

Table 1: Jumper UART

The CLK jumper selects the CLK input source.

Option	Function
Ext	CLK comes from Microcontroller. Allows to try with different frequencies
Int	CLK input at GND; uses internal clock source default
open	CLK input at GND; uses internal clock source default (internal pull down, not recommended)

Table 2: Jumper CLK

The VREF jumper selects between different source for the motor current setting pin VREF.

Option	Function
PWM	VREF input of driver can be controlled by Microcontroller PWM. Set motor base current via the duty cycle
POT	VREF input is controlled via the Poti. Scale motor current using poti.
open	Internal reference used

Table 3: Jumper VREF

The jumpers MS1 and MS2 select the microstep resolution in standalone mode.

MS1	MS2	Function
0	0	8 microsteps
1	0	2 microsteps
0	1	4 microsteps
1	1	16 microsteps

Table 4: Jumpers MS1 and MS2

The Jumper ENABLE disables or enables the driver.

Option	Function
EN	Driver is enabled
DIS	Driver is disabled. In this mode, it is allowed to remove / attach a motor.
open	undefined

Table 5: Jumper ENABLE

2.2   Onboard Jumpers and OTP

The TMC2208-Eval board has two jumpers to select between Step/Direction source between MCU and external pin header (lower right corner). The silk screen also displays the three OTP bytes in the IC. The user can mark programmed bits manually to remember which bits have been set in the IC.

3 Evaluation Features in the TMCL-IDE

This chapter gives some hints and tips on using the functionality of the TMCL-IDE, e.g. how to use the velocity mode or using the wizards.

Note

In order to achieve good settings please refer to descriptions and flowcharts in the TMC2208-LA datasheet. The register browser of the TMCL-IDE provides helpful information about any currently selected parameter. Beyond that, the datasheet explains concepts and ideas which are essential for understanding how the registers are linked together and which setting will fit for which kind of application. For getting more familiar with the evaluation kit in the beginning of your examinations, drive the motor using velocity mode and/or positioning mode first. Beyond this, the direct mode function can be used. This way, TMCL commands can be sent to the evaluation board system.

3.1 Velocity Mode

To move the motor in velocity mode, open the velocity mode tool by clicking the appropriate entry in the tool tree. In the velocity mode tool you can enter the desired velocity and acceleration and then move the motor using the arrow buttons. The motor can be stopped at any time by clicking the stop button. Open the velocity graph tool to get a graphical view of the actual velocity.

Note

In order to get a more accurate graphical velocity view, close the register browser window when using the velocity graph.
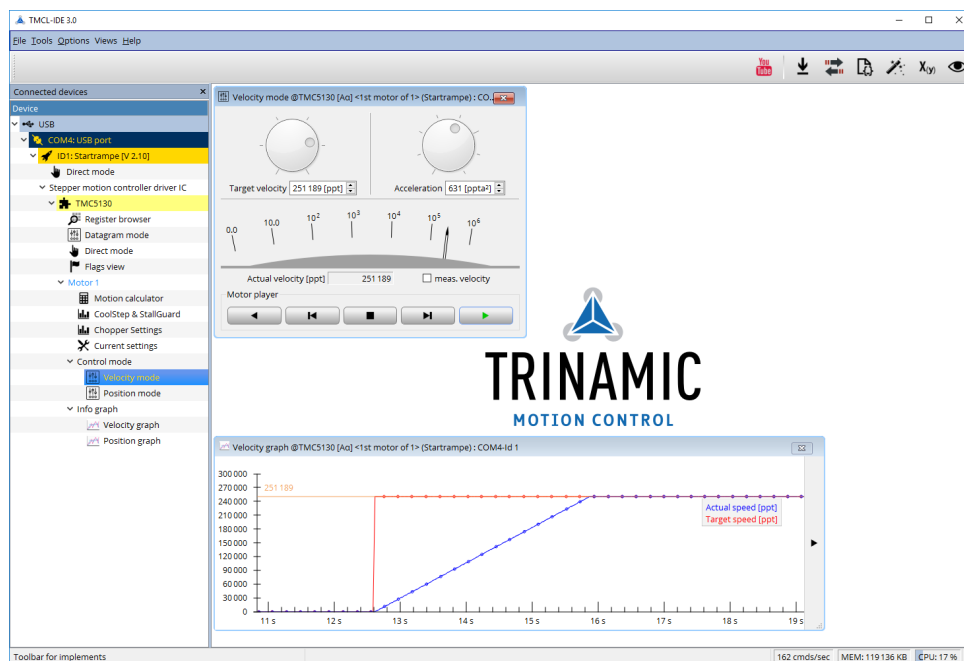

Figure 4: Driving the motor in velocity mode (TMCL-IDE provides similar view for TMC2208-EVAL)

3.2   Position Mode

To move the motor in position mode, open the position mode tool by clicking the appropriate entry in the tool tree. In the position mode tool you can enter a target position and then start positioning by clicking the Absolute or Relative Move button. The speed and acceleration used for positioning can also be adjusted here.
Open the position graph tool to get a graphical view of the actual position.

Note   In order to get a more accurate graphical position view, close the register browser window when using the position graph.
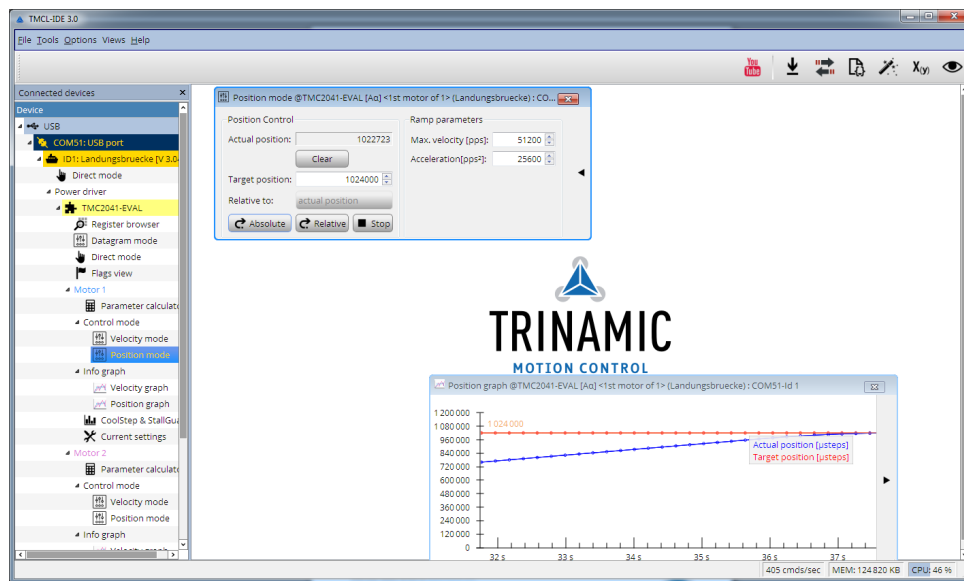

Figure 5: Driving the motor in position mode (TMCL-IDE provides similar view for TMC2208-EVAL)

4   Revision History

4.1   Document Revision

Version	Date	Author	Description
0.9	2017-OCT-19	MN	Initial release.
1.0	2019-MAY-08	OM	Bridge board jumper description added.

Table 6: Document Revision