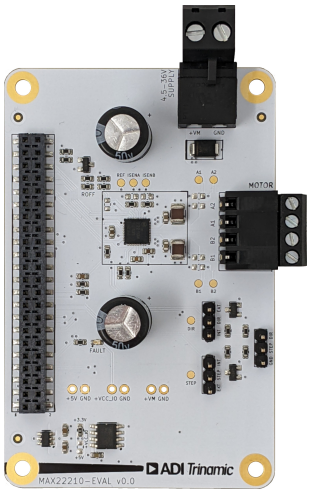
MAX22210-EVAL Evaluation Board User Guide

319-101018, Rev 1: 4/25

The MAX22210-EVAL allows evaluation of the MAX22210 in combination with the TRINAMIC evaluation board system, or as a standalone board. It uses the standard schematic and offers several options to test different modes of operation. The MAX22210 is a Step/Dir Driver for Two-Phase Bipolar Stepper Motors up to $2A_{RMS}$ (3.8A peak).

⚠ WARNING **DO NOT CONNECT/DISCONNECT MOTOR WHILE POWER IS CONNECTED.**



Features

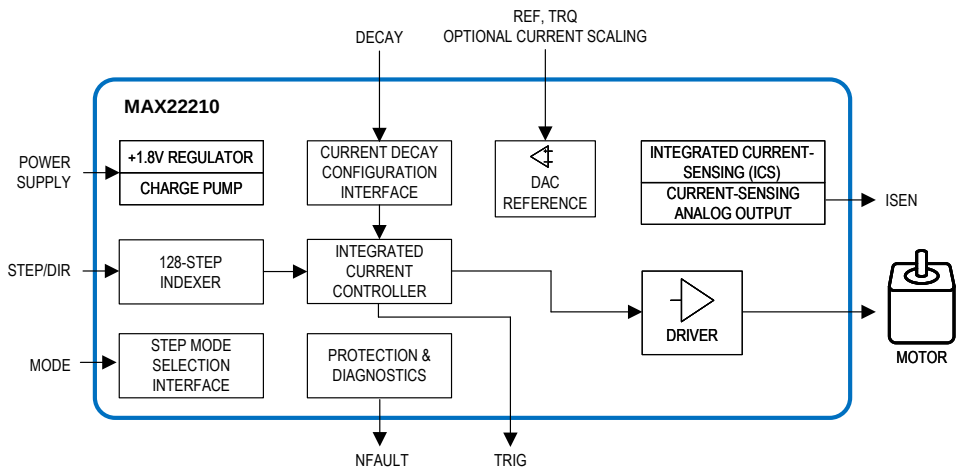
- **2-Phase** Stepper Motor up to $2A_{RMS}$ Coil Current (3.8A Peak)
- **Supply Voltage** 4.5V to 36V DC
- 1...128 Microsteps
- Step/Dir Interface
- Integrated Current Control
- Current-Sense Output (ISENA, ISENB) Current Monitor
- Protections: Overcurrent, Undervoltage, Thermal Shutdown

***Ordering Information* appears at end of data sheet.**

Applications

- Optical Systems, Lens Control
- CCTV, Security
- Liquid Handling
- Small Printing Devices
- Lab and Office Automation

Simplified Block Diagram



ANALOG DEVICES
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Contents

MAX22210-EVKIT Contents

Item	Description
MAX22210-EVAL	MAX22210 Evaluation Board
Landungsbruecke	PC Interface Board
Eselsbruecke	Bridge Connection Boards

1 Getting Started

Required Equipment

- MAX22210-EVAL (included)
- Landungsbruecke board (included)
- Eselsbruecke bridge board (included)
- A compatible motor, for example, a Qmot Stepper motor
- Power Supply
- Cables to interface the motor, encoders, and the power supply
- Latest TMCL-IDE
- Latest firmware for TMC-EvalSystem

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 voltage!
- Do not connect or disconnect the motor while powered!
- START WITH POWER SUPPLY OFF.

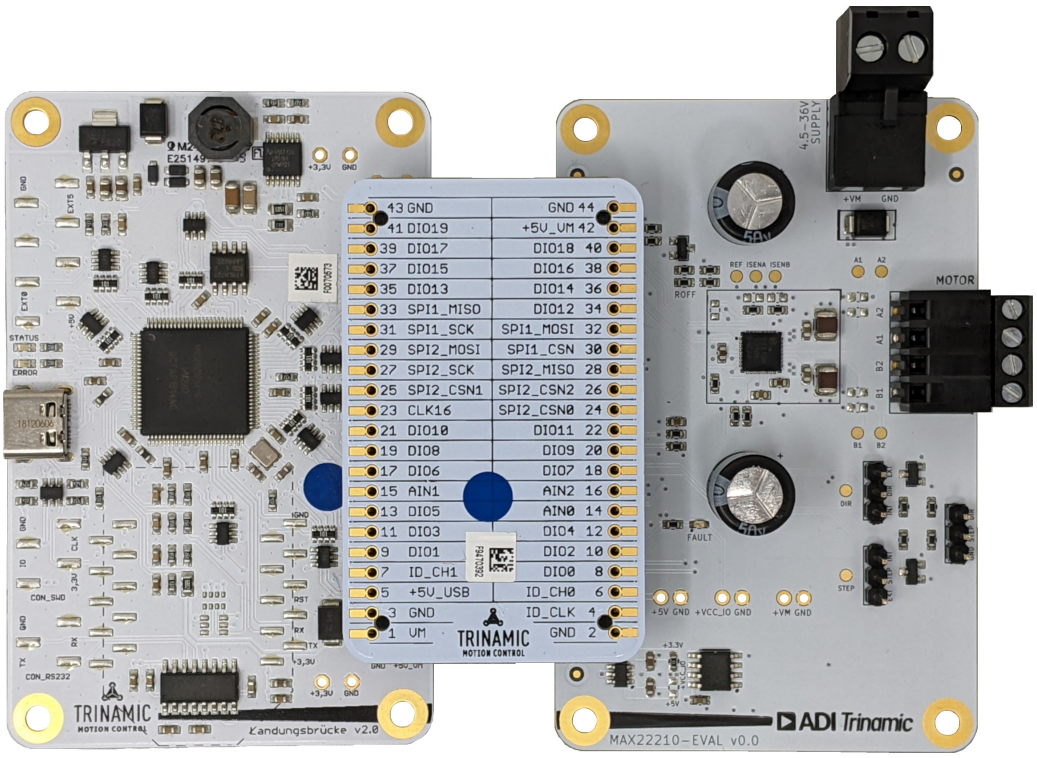

Figure 1: Getting Started

1.1 First Start-Up

1. Make sure that the latest version of the TMCL-IDE is installed. TMCL-IDE can be downloaded from www.analog.com TMCL-IDE.
2. Open TMCL-IDE and connect the Landungsbruecke with the attached MAX22210-EVAL by USB to the computer. For Windows® 8 and higher, no driver is needed. For Windows® 7, TMCL-IDE installs the driver automatically.
3. Verify that the Landungsbruecke is using the latest firmware version. The firmware version is shown in the connected device tree. The newest firmware can be downloaded from https://www.analog.com Landungsbruecke.

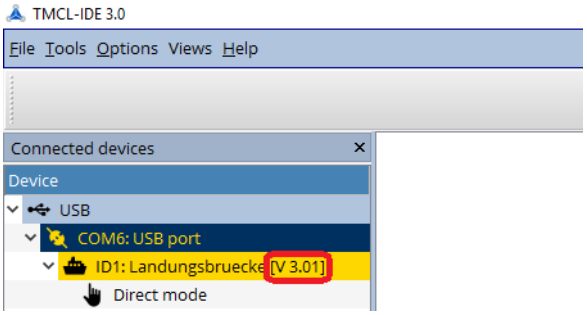

Figure 2: Firmware Version

4. TMCL-IDE needs space to display all important information and to provide a good overview. Therefore, arrange the main window as needed. Using full-screen mode is recommended. For evaluation boards, it is essential to have access to the registers. Therefore, open the register browser from the device tree on the left side. For a better view, click the top right normal icon to get a maximized register browser window.
5. TMCL-IDE includes a dialog box for diagnostic tasks. The dialog box provides an overview of the connected motion controller and driver chips. A window pops up immediately after connecting the Landungsbruecke the first time. The **Board Assignment** tab shows the actual status of the connections. The **Settings** tab allows the user to choose basic settings or reset the module to the factory default settings.

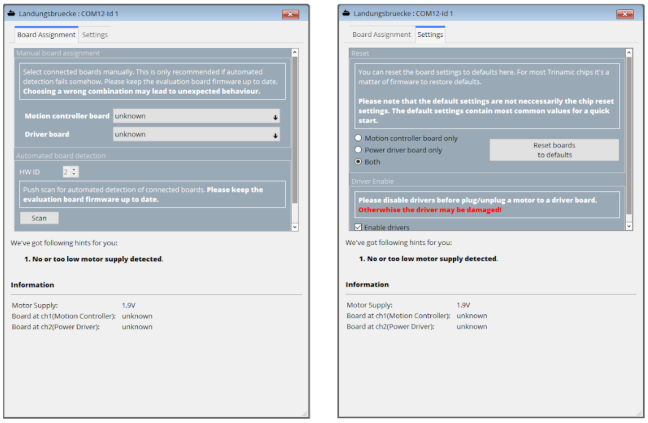

Figure 3: Landungsbruecke Dialog Box

1.2 Onboard Jumpers

1.2.1 STEP/DIR

The MAX22210-EVAL board has two jumpers (down-right) to select the Step/Direction source between Landungsbruecke connector and external pin header (down-right margin).

1.2.2 Voltage Selection

In case the MAX22210 V_{IO} should be used with +5V instead of +3.3V, there is a solder selection near the EEPROM. This selection should be changed, if an external electronic with 5V levels is connected.
Using the MAX22210-EVAL with Landungsbruecke, the V_{CC_IO} must be set to +3.3V (default).

NOTE Do not bridge both selections simultaneously. This might disturb the onboard voltage regulator. Leave at +3.3V (default) in combination with Landungsbruecke.

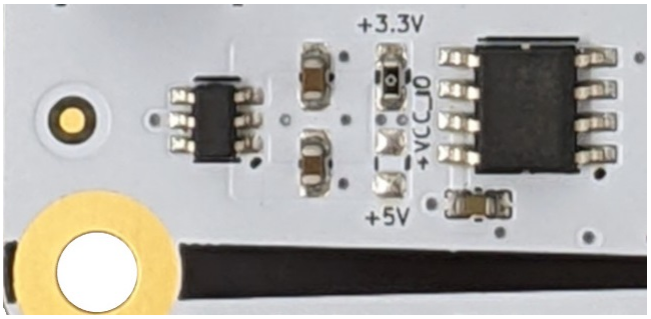

Figure 4: +V_{CC_IO} Selection near the EEPROM

1.3 Onboard Connectors

The MAX22210-EVAL has six onboard connectors. The following table contains information on the connector type and mating connectors.
The connector pinning and signal names can be derived from the board design and schematic files available on the Modular Evaluation System page of the ADI Trinamic website.

Table 1: MAX22210-EVAL Connectors

No.	Connects to...	Connector Type	Description
1	1x Power Supply	MOLEX 395221002	Connects a battery or power supply to the evaluation board. Mating connector MOLEX 395200002
2	1x Motor	MOLEX 395021004	Connects the motor to the MAX22210 output. Mating connector MOLEX 395000004
3	Landungsbruecke	46-3492-44-3-00-10-PPTR from W+P Series 3492	Main I/O and digital supply connector to connect to ADI Trinamic's Landungsbruecke controller boards through the Eselsbruecke connector or connect to an own controller board.
4	STEP/DIR	Standard 3x 2.54mm header	Used to connect external STEP/DIR.
5	STEP	Standard 3x 2.54mm header	Used to select STEP as internal or external signal through a jumper.
6	DIR	Standard 3x 2.54mm header	Used to select DIR as internal or external signal through a jumper.

1.3.1 Landungsbruecke Connector

NOTE Most signals are connected to the MAX22210 directly, without any additional protection. Consult the MAX22210 data sheet for electrical ratings.

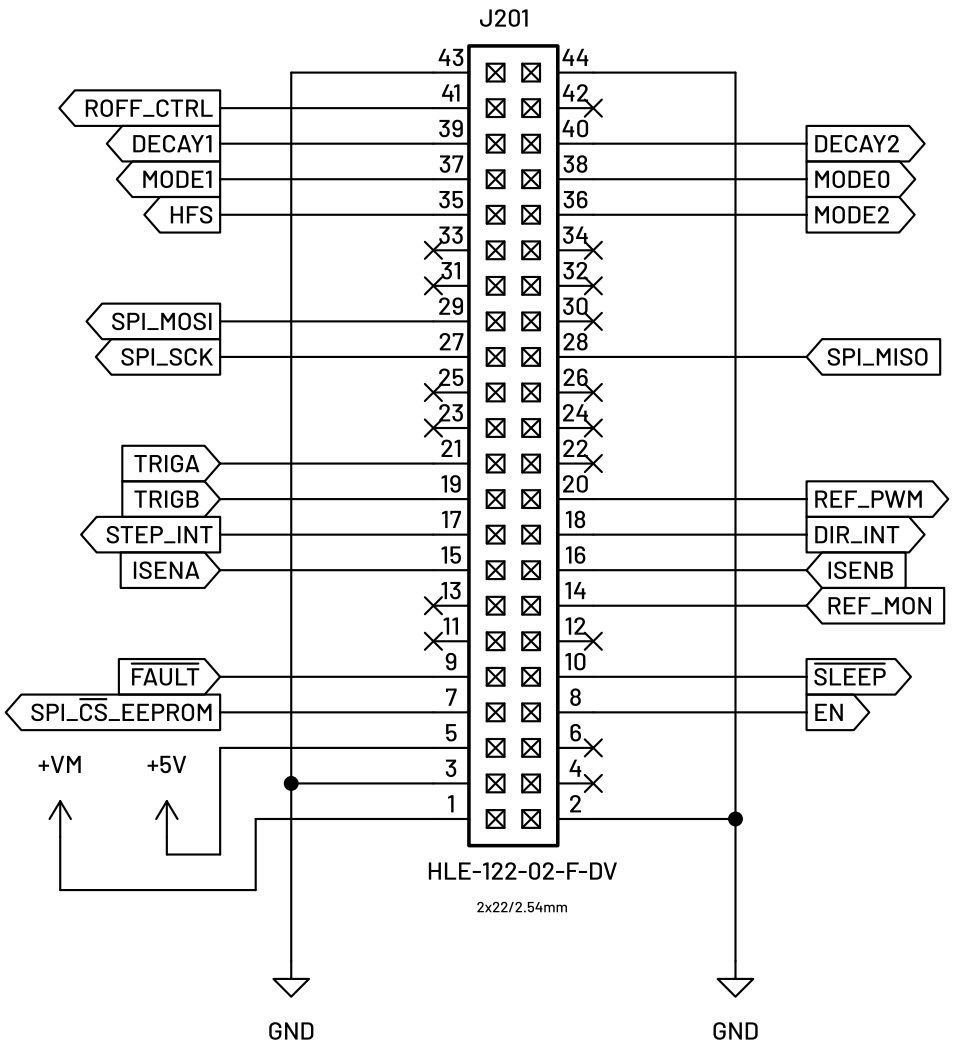

Figure 5: Pin Assignment on Landungsbruecke Connector

1.3.2 Programmable Current REF-Pin

The REF_PWM pin is used to supply an external reference to the MAX22210. The reference is set by changing the PWM duty cycle through a voltage-divider and filter as shown in Figure 6. The rail is directly connected to a monitoring pin REF_MON to check back the actual analog voltage. The MAX22210 is connected to the net at the right side (not shown).

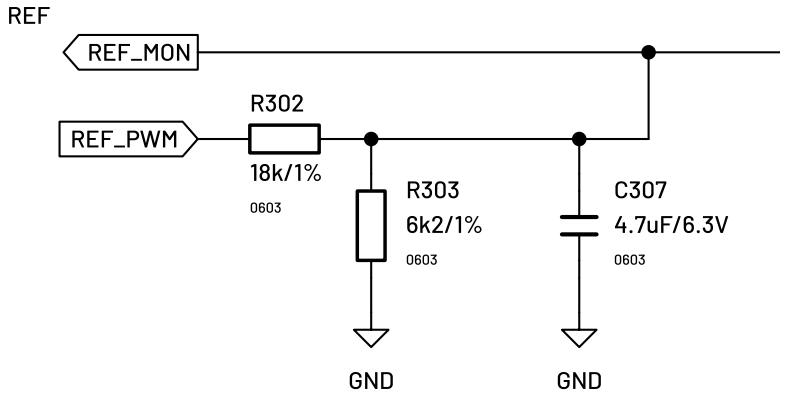

Figure 6: Pin Assignment for REF

1.3.3 Programmable Off Time ROFF-Pin

The MAX22210 needs an external reference resistor for ROFF control. This MAX22210-EVAL enables to change the value through a switchable resistance network as shown in Figure 7. ROFF of the MAX22210 is connected to the net at the right side (not shown).

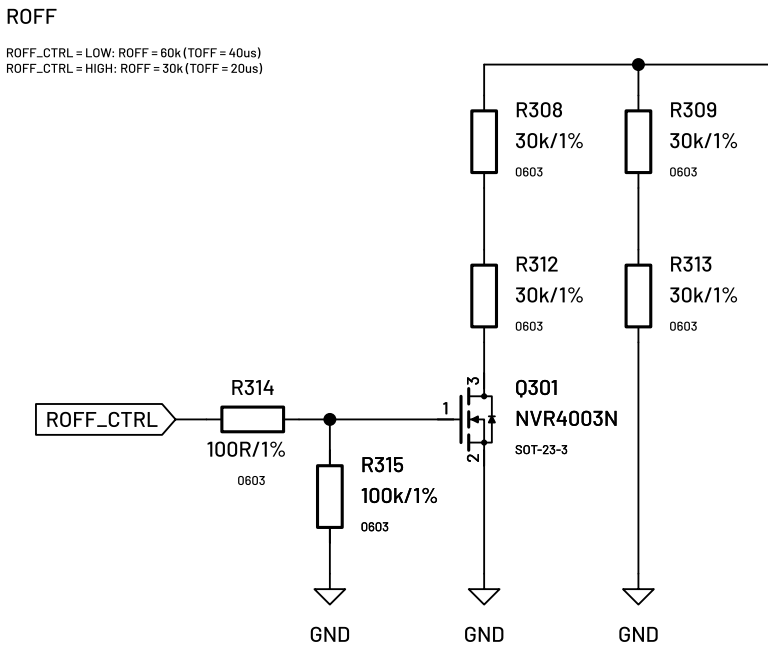

Figure 7: Pin Assignment and Logic Table for ROFF

1.3.4 TRIG Open-Drain Outputs

The TRIGA and TRIGB pins of the MAX22210-EVAL are connected to a pull-up resistor as shown in Figure 8. The TRIGA and TRIGB pins of the MAX22210-EVAL are connected to the rail exiting left.

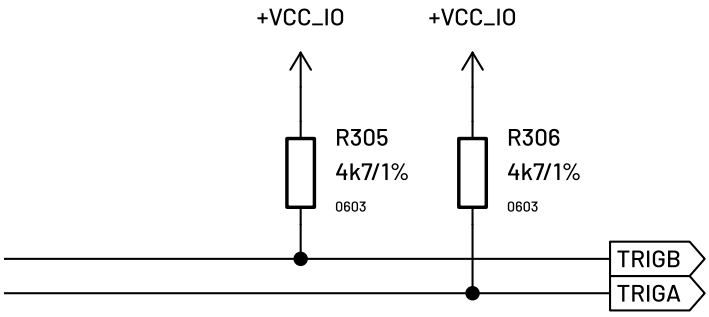

Figure 8: Open-Drain Pull-Up Resistors

1.4 Onboard Testing Pads

The MAX22210-EVAL features some test pads for general use. The A1, A2, B1, B2 are connected directly to the motor coil lines, and REF to the REF pin of the MAX22210The ISEA and ISEB pads are used for current measurement in the coils and are connected directly to the ISENA and ISENB pins of the MAX22210 on the left side (IC connection not shown). The current measurement configuration is shown in Figure 9. These pins are Current-Sense Output (CSO) - Current Monitor pins of the MAX22210 and find more information about the reading of these pins in the data sheet.

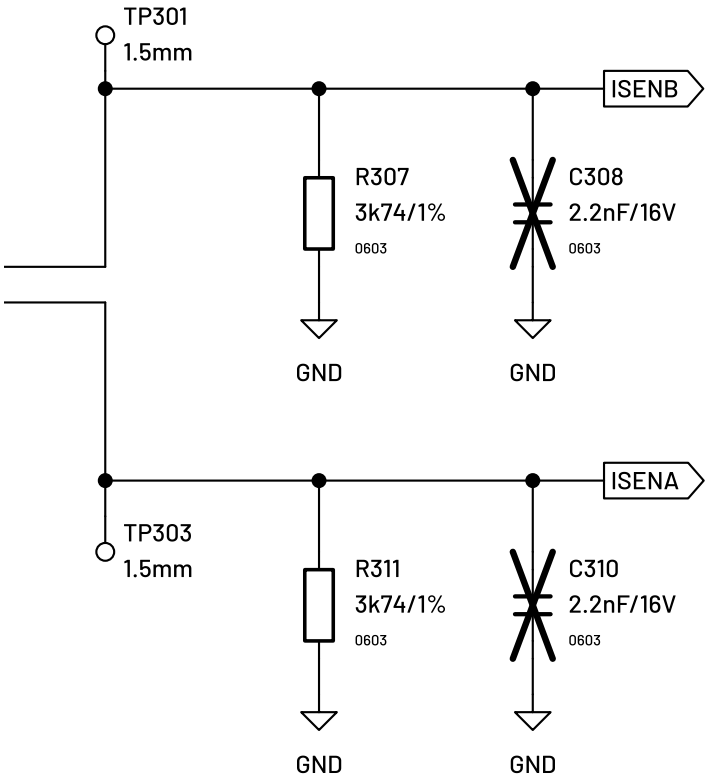

Figure 9: ISENA and ISENB Shunt Resistor Measurement Configuration

2 TMCL-IDE V4.0 Evaluation Features

This section gives tips on using TMCL-IDE V4.0. For example, how to use the velocity mode or some feature-based tools.

NOTE

To achieve optimal settings, refer to the descriptions and flowcharts in the MAX22210 data sheet. The register browser of the TMCL-IDE V4.0 provides helpful information about any currently selected parameter. Beyond that, the data sheet explains concepts and ideas which are essential for understanding how the registers are linked together, and which settings are suitable for the application. At first, to get more familiar with the evaluation board, drive the motor using velocity mode and/or positioning mode first.

2.1 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, enter the desired velocity and acceleration, and then move the motor using the arrow buttons. Stop the motor at any time by clicking the stop button. Open the velocity graph tool to get a graphical view of the actual velocity. Check the desired run and hold currents in the *Current settings* tool before.

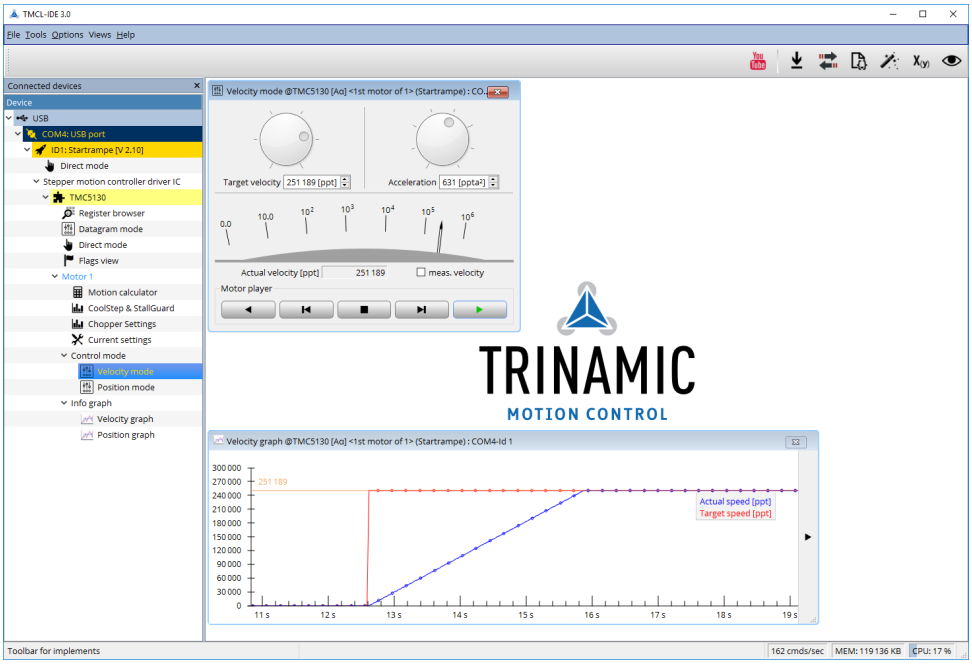

Figure 10: Driving the Motor in Velocity Mode

2.2 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, 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.
Change the desired run and hold currents in Current settings tool beforehand.

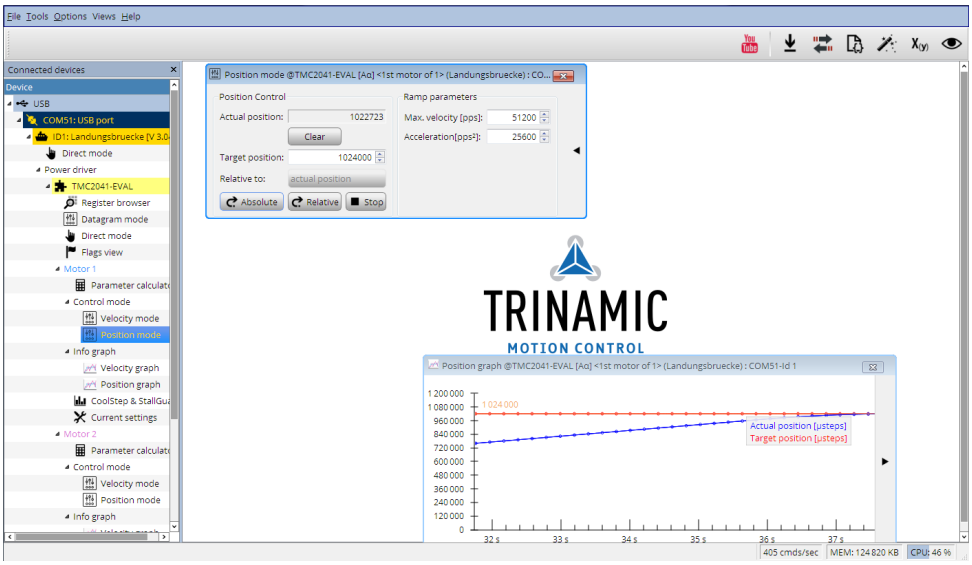

Figure 11: Driving the Motor in Position Mode

2.3 Chip Click

To configure the control pins for the MAX22210-EVAL, open the Chip Click tool by clicking the appropriate entry in the tool tree. By hovering the mouse over a pin in the graphical view, a description of the pin's possible configurations is shown. To change the pin state, click the small boxes next to the pin name. There are three states that tie to GND, V_{CC_IO} and OPEN (three-stated). Landungsbruecke then controls the pin directly through the Eselsbruecke interface. Signals captured by Landungsbruecke are read only and their status is displayed within the small boxes.

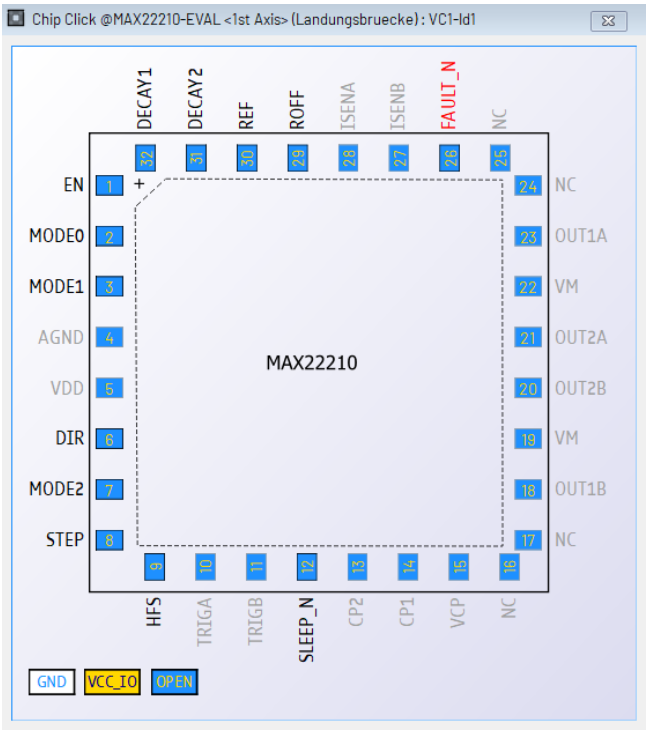

Figure 12: MAX22210 Graphical Pin Control Within the Chip Click Tool

Ordering Information

Part	Type
MAX22210EVKIT#	Evaluation Kit

Revision History

Document Revision

Version	Date	Description	Pages Changed
0	8/23	Initial release	-
1	4/25	Full document change	All

Notes