

TMC2211 Smart Pin-Configurable Integrated Stepper Driver

General Description

The TMC2211STEPSTICK board allows an uncomplicated first evaluation of the TMC2211 and provides full control of all its features.

The TMC2211 is a smart pin-configurable, high-performance, stepper motor controller and driver IC. It features the industry's most advanced stepper motor driver based on a 256-microstep, built-in indexer and fully integrated 65V, 3.0A_{MAX} H-bridges. It also includes nondissipative integrated current sensing (ICS).

Features

- 4.5V to 65V DC Single-Supply Voltage Range
- Current Ratings per H-Bridge (25°C, typ):
 - 2A_{RMS} (2.8A sine peak) at V_S = 24V
 - 1.7A_{RMS} (2.4A sine peak) at V_S = 48V
- 2.2V to 5.5V Logic I/O Supply Voltage
- Configuration Pins and Resistors

Table 1. Content

ITEM	DESCRIPTION
TMC2211STEPSTICK	TMC2211STEPSTICK Board

Documents Needed

- TMC2211 Data Sheet

[Ordering Information](#) appears at end of user guide.

Getting Started

Required Items

- TMC2211STEPSTICK
- A compatible motor (e.g., a Qmot stepper motor)
- Power supply
- Cables to interface with the motor and power supply
- 0.64mm pin headers with 2.54mm pitch
- 1mm-to-1.5mm flathead screwdriver

Precautions

- Do not exceed the board's maximum rated supply voltage.
- Do not connect or disconnect the motor while the board is powered.
- Make sure the used board, cables, and motor are in a good state before using them.
- Ensure to use the appropriate protection while working with high voltages. In some countries, voltages higher than 50V are considered dangerous.
- Do not touch the power stage section of the board during operation as it might get hot.

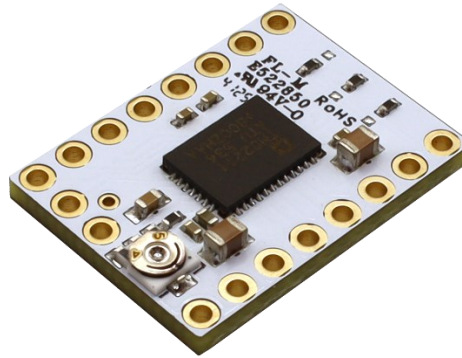


Figure 1. TMC2211STEPSTICK

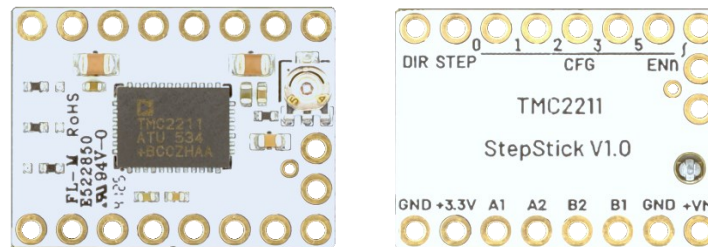


Figure 2. TMC2211STEPSTICK Top (left) and Bottom (right) Views

Connecting the Peripherals

TMC2211STEPSTICK is intended to be used as a pluggable board. It provides through holes (J201, J202) to mount 8 × pin headers with a 2.54mm pitch or to attach wires directly.

[Figure 3](#) shows a pin-header mounting example. The headers can be mounted from the other side as well, but this mounting variant would block access to the potentiometer through-hole.

Note: Voltages above 50V are considered dangerous in some countries. Keep the work area clean and do not touch the board while it is powered. Do not solder at the board while it is powered. Keep in mind that the power stage section of the board can get hot during operation.

Warning: Do not connect or disconnect the motor while the board is powered.

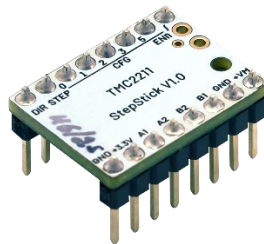


Figure 3. TMC2211STEPSTICK with Assembled Pin Headers

Board Options

The TMC2211STEPSTICK provides multiple options to configure the TMC2211. Six configuration pins on the pin headers and three 0Ω jumper resistors on six possible positions.

The following voltage levels are true for all tables:

- $V_{LOW} = GND$
- $V_{HIGH} = V_{CC_IO}$

For the full electrical characteristics table, refer to the TMC2211 data sheet.

Pin Configuration Options

Table 2. Pin Configuration for CFG0 and CFG1

CFG1	CFG0	MICROSTEP RESOLUTION
Low	Low	8 microsteps
Low	High	16 microsteps
High	Low	32 microsteps
High	High	64 microsteps

Table 3. Pin Configuration for CFG2 and CFG3

CFG3	CFG2	RUN CURRENT (A)
Low	Low	1, peak
Low	High	2, peak
High	Low	3, peak
High	High	Not used (3, peak)

Table 4. Pin Configuration for CFG5

CFG5	CHOPPER MODE
Low	SpreadCycle
High	StealthChop

Resistor Configuration

The following configuration options require a change in the placement of the 0Ω jumper resistors.

Note: All configuration changes that involve soldering need to be performed while the PCB is disconnected from the power supply. Any deviations from the configurations shown in [Table 5](#) can cause permanent damage to the PCB and/or the power supply due to shorted power rails.

Table 5. Resistor Configuration for CFG6 and CFG7

CFG7	CFG6	HOLD CURRENT REDUCTION	R205	R206	R207	R208
Low	Low	No reduction (IHOLD = IRUN)	Do not place	Placed	Do not place	Placed
Low	High	Reduction to 50% (IHOLD = ½ IRUN)	Placed	Do not place	Do not place	Placed
High	Low	Reduction to 25% (IHOLD = ¼ IRUN)	Do not place	Placed	Placed	Do not place
High	High	Reduction to 12.5% (IHOLD = 1/8 IRUN)	Placed	Do not place	Placed	Do not place

Table 6. Resistor Configuration for CFG4

CFG4	DIGITAL CURRENT SCALE	R203	R204
Low	IRUN = 23 (75%)	Do not place	Placed
High	IRUN = 31 (100%)	Placed	Do not place

Current Setting

The maximum motor current is defined by the full-scale current (I_{FS}), which is set by resistors R201 and R202 at the I_{REF} pin of the TMC2211. Additionally, see [Table 6](#) for the IRUN current configuration.

The potentiometer R201 can be adjusted by using a 1mm-to-1.5mm flathead screwdriver in the through-hole.

Depower the TMC2211STEPSTICK and measure the resistance between the I_{REF} pin and GND with a multimeter.

Set the desired resistance through potentiometer R201 as follows:

- 12kΩ corresponds to 2.05A_{RMS}.
- 36kΩ corresponds to 0.68A_{RMS} (This is the typical default setting of the potentiometer.).
- 56kΩ corresponds to 0.44A_{RMS}.

More calculation examples and a formula are given by the TMC2211 data sheet.

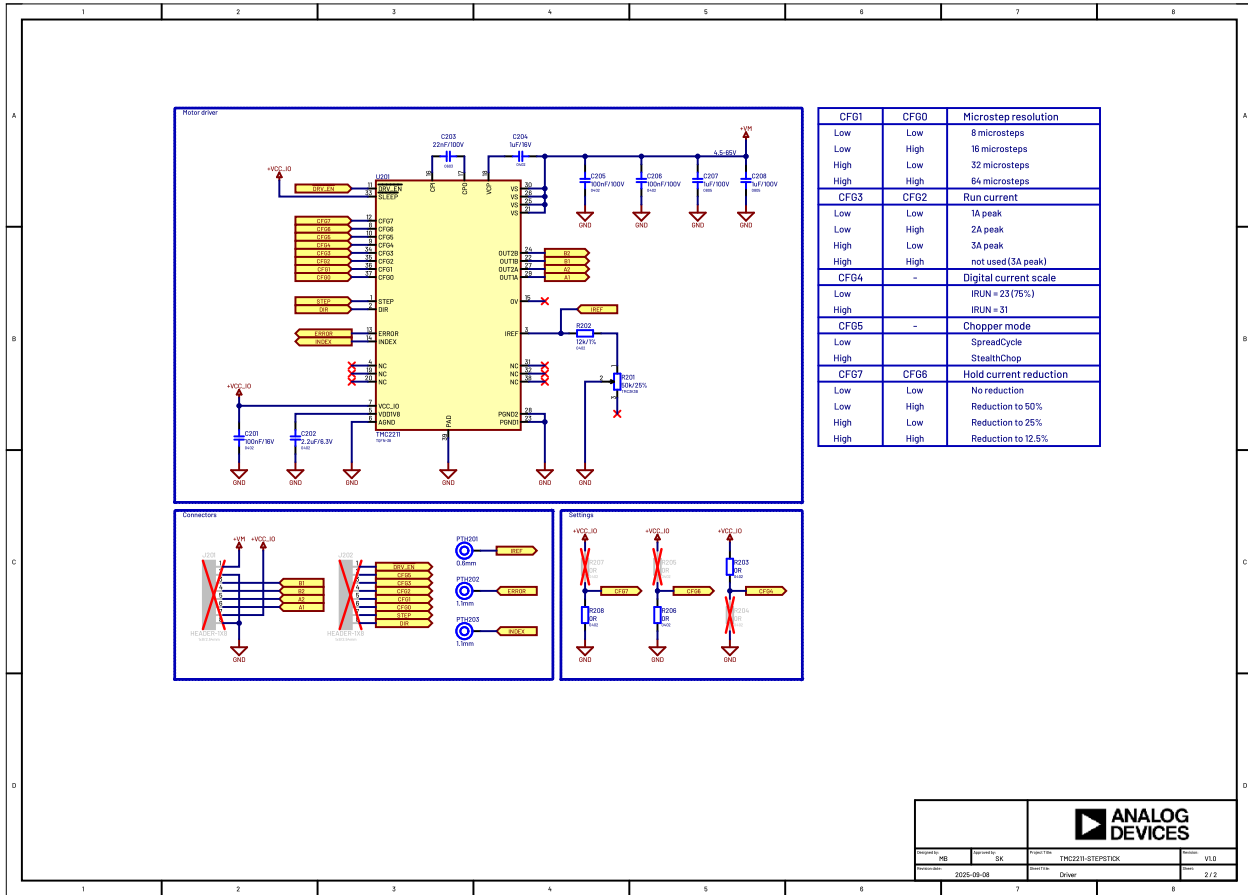
Ordering Information

PART	TYPE
TMC2211STEPSTICK	StepStick

TMC2211STEPSTICK Bill of Materials

PART	QTY	PACKAGE	MANUFACTURER	MANUFACTURER PN
C201	1	0402	Kemet	C0402C104K4RAC7867
C202	1	0402	Murata Electronics	GRM155R60J225KE01D
C203	1	0603	KEMET	C0603C223K1RACTU
C204	1	0402	Taiyo Yuden	MSASE105SB5105KFNA01
C205, C206	2	0402	Murata Electronics	GRM155R62A104KE14D
C207, C208	2	0805	KYOCERA AVX	08051C105K4T2A
R201	1	TMC3K3B	Teikoku Tshushin Kogyo Co. Ltd./NOBLE Electronics	TMC3K3B-B47K-TR
R202	1	0402	Panasonic Electronic Components	ERJ-2RKF1202X
R203, R206, R208	3	0402	Panasonic Electronic Components	ERJ-2GE0R00X
U201	1	TQFN-38	Analog Devices	TMC2211ATU+

TMC2211STEPSTICK Schematic



TMC2211STEPSTICK Mechanical Dimensions

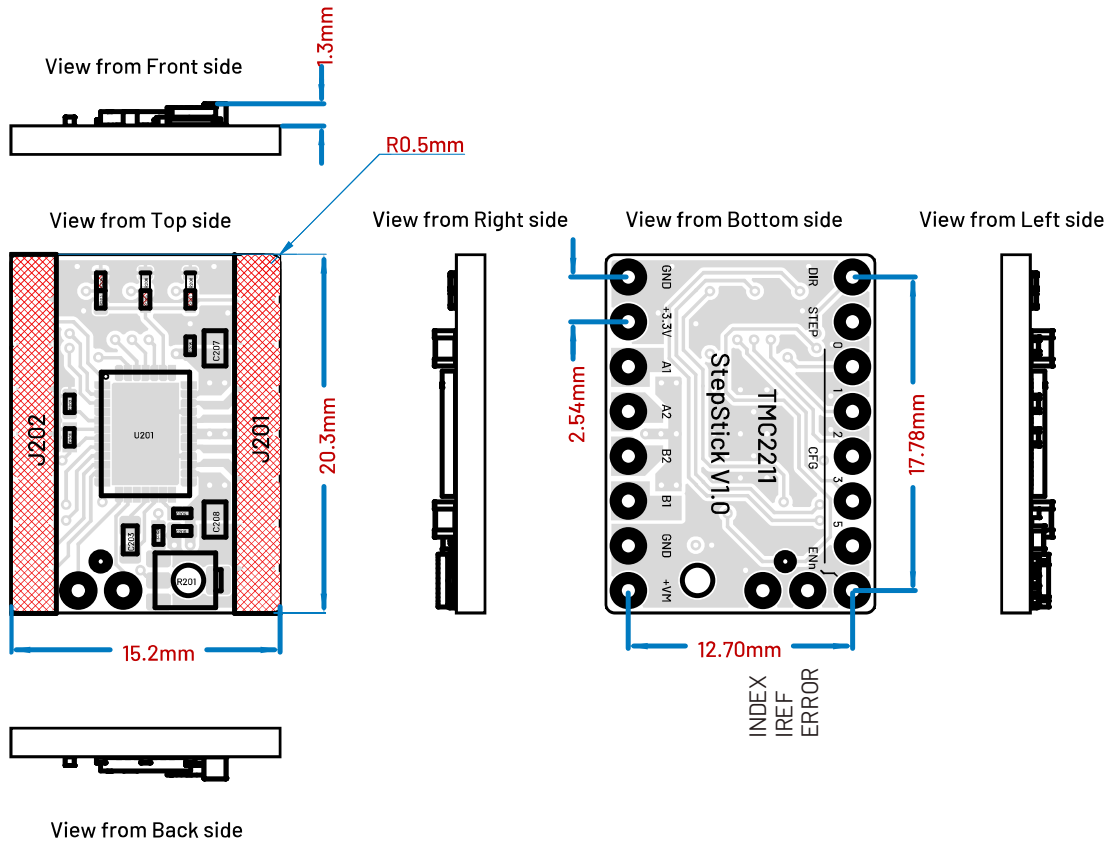


Figure 4. TMC2211STEPSTICK Component Placement—Top, Bottom, and Sides Including Dimensions

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	1/26	Initial release	—

Notes

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