

## TMC8100 Evaluation Board User Guide

### Features

- Synchronous Serial Bus Protocols Support
  - SSI, SPI, BiSS-C, EnDat 2.X
- Asynchronous Serial Bus Protocols Support
- Incremental A/B/Z Encoder Interface
- High-Speed 25MHz SPI System Interface
- High-Speed 16Mbps UART System Interface
- I<sup>2</sup>C Programming Interface
- Crystal Oscillator or External Clock with PLL
- Up to 128MHz Internal System Clock
- 3V to 5.5V Single Supply
- -40°C to +125°C Operating Temperature Range

### General Description

The TMC8100-EVAL is an evaluation board for the TMC8100 universal encoder bus controller. Connecting the TMC8100-EVAL to the Landungsbruecke PC interface board gives access to the graphical user interface TMCL-IDE and its fast development tools.

The TMC8100 acts as a peripheral interface block to deliver the extracted and adjusted encoder position information to the microcontroller or the motion controller over SPI or UART. This is achieved by the programmable high-performance serial communication engine for synchronous and asynchronous data.

The TMC8100-EVAL supports both absolute and incremental encoders. The encoder interfaces are supplied by the external supply of the TMC8100-EVAL. The TMC8100 is provided with a 16MHz clock source and an EEPROM for application code storage.

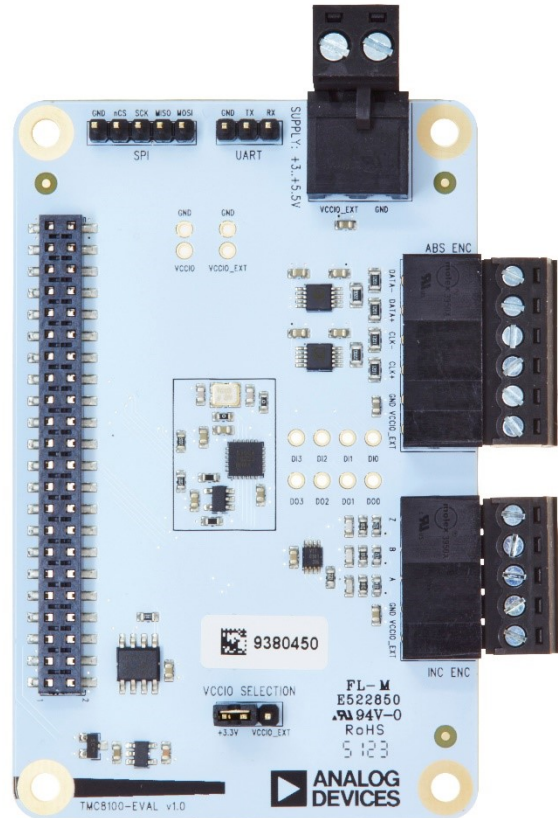


Figure 1. TMC8100-EVAL Board

### TMC8100-EVAL-KIT Contents

ITEM	DESCRIPTION
TMC8100-EVAL	Evaluation module
Landungsbruecke	PC interface board
Eselsbruecke	Bridge connection board

### Ordering Information

PART	TYPE
TMC8100-EVAL-KIT	Evaluation Kit

## Quick Start

### Required Equipment and Software

- TMC8100-EVAL-KIT
- USB-C cable
- Power supply (3V to 5.5V) and cables
- Motor with encoder (ABN/SSI/SPI/BiSS-C/EnDat 2.x/Other)
- PC with latest TMCL-IDE (Windows®)
- TMC8100 encoder interfaces example codes

The latest TMCL-IDE and the user guide can be found on the website:

[www.analog.com/en/resources/evaluation-hardware-and-software/motor-motion-control-software/tmcl-ide](http://www.analog.com/en/resources/evaluation-hardware-and-software/motor-motion-control-software/tmcl-ide).

### Setup and Operation

This TMC8100-EVAL should be used with the TMC8100 data sheet.

The latest versions of the documents and the example code can be found on the website:

[www.analog.com/en/resources/evaluation-hardware-and-software/evaluation-boards-kits/tmc8100evalkit](http://www.analog.com/en/resources/evaluation-hardware-and-software/evaluation-boards-kits/tmc8100evalkit)

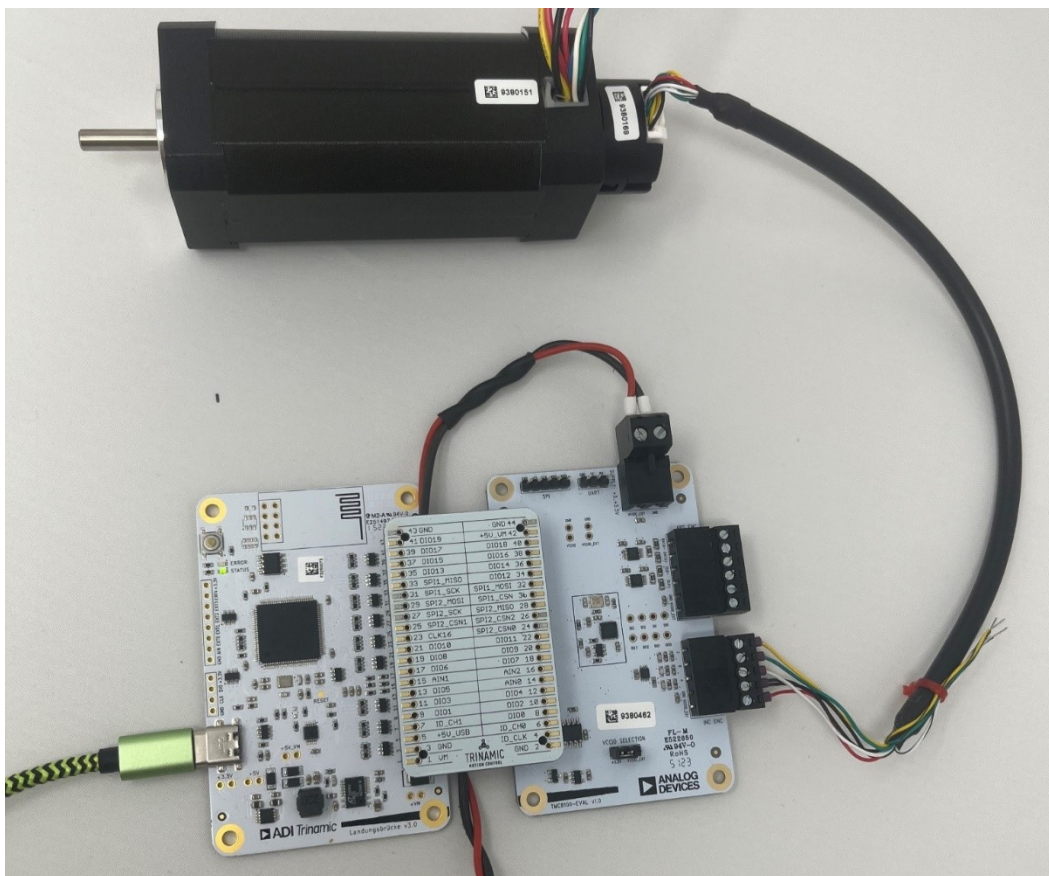


Figure 2. Example Setup: TMC8100-EVAL-KIT Connected to an ABN Encoder

To power up and set up the TMC8100-EVAL-KIT, a USB connection between the Landungsbruecke and the PC running the TMCL-IDE is needed. The software can be run without the external supply or the encoders attached.

To use the TMC8100-EVAL with an encoder, the TMC8100 must be flashed with code matching the encoder type. After connecting the encoder and providing an external supply, the TMC8100-EVAL is set for operation.

### Software Tools

On start-up, the TMCL-IDE automatically detects the board connected to the Landungsbruecke. The board name and all the board-specific tools available are displayed. The setting can also be done manually from the ID1: Landungsbruecke in the **Board Assignment** tab.

The **General Settings** is the main tool for the TMC8100-EVAL. The top section is used to program the TMC8100. The three tabs are separate subtools.

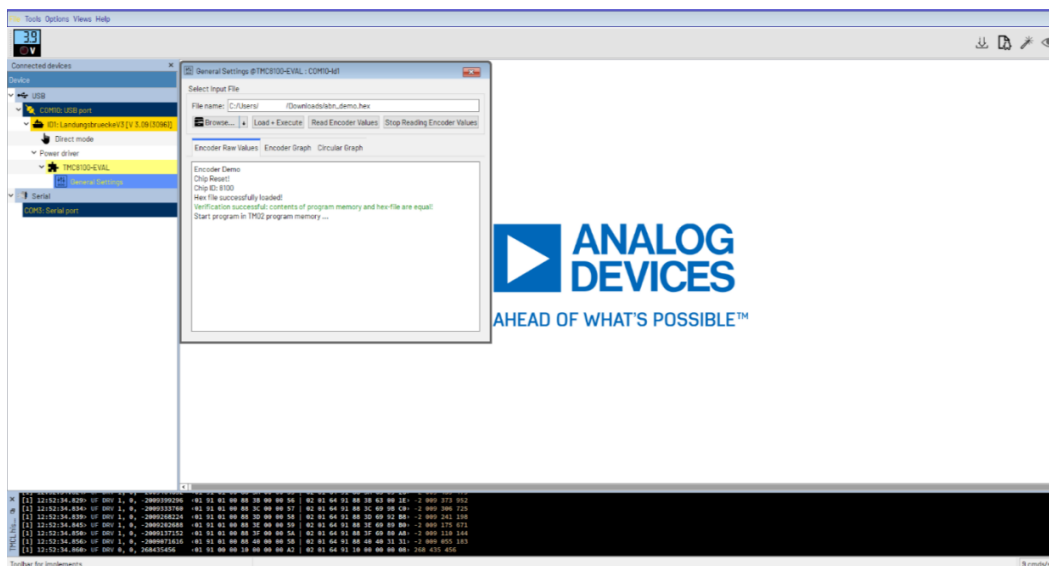


Figure 3. TMCL-IDE with TMC8100-EVAL Connection

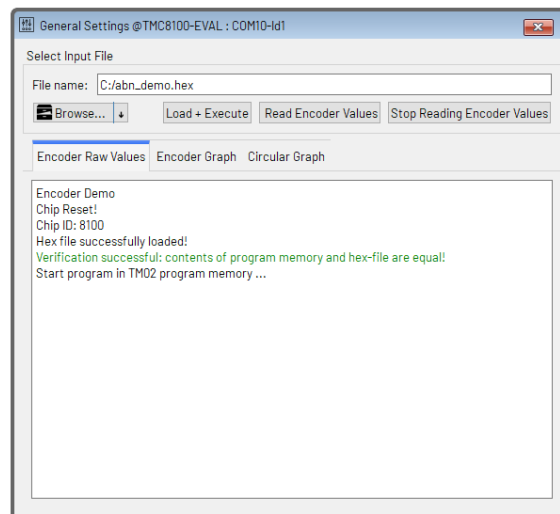


Figure 4. TMCL-IDE TMC8100-EVAL General Settings – Programming Section + Encoder Raw Values

The **Encoder Raw Values** tool has dual functions. During setup, it provides feedback on the status, example, when TMC8100 is being flashed. Once set up, the tool can display the encoder position information in raw values. This function can be turned on and off by clicking **Start Reading Encoder Data** or **Stop Reading Encoder Data**, respectively.

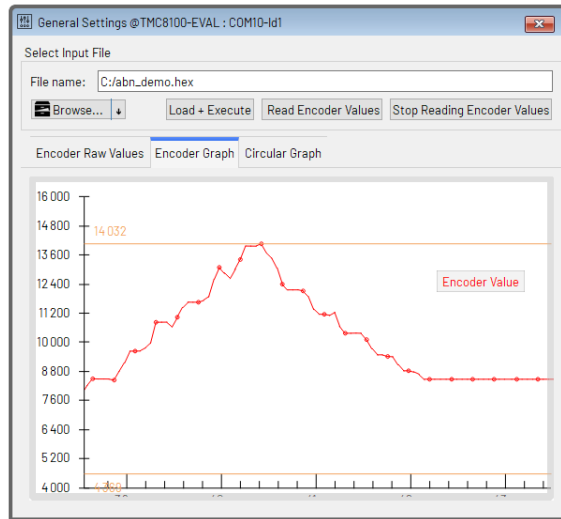


Figure 5. TMCL-IDE TMC8100-EVAL General Settings – Programming Section + Encoder Graph

The **Encoder Graph** tool displays the encoder position information on a linear graph.

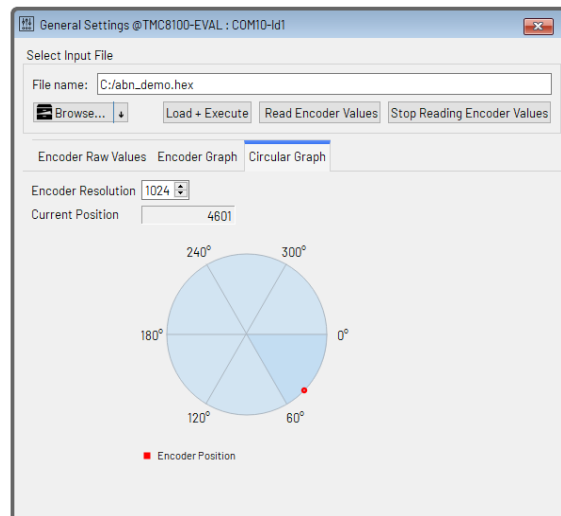


Figure 6. TMCL-IDE TMC8100-EVAL General Settings – Programming Section + Circular Graph

The **Circular Graph** tool gives a more intuitive representation of the encoder position and displays it on a circular graph (including live position). This tool requires the encoder resolution per rotation to be set.

### Detailed Description of Software

The data sheet includes a description of the TMC8100 architecture and functions. The software examples are on the product page.

### Detailed Description of Hardware

#### TMC8100-EVAL-KIT Contents

The TMC8100-EVAL contains the Landungsbruecke PC interface board, the Eselsbruecke bridge connection board, and the TMC8100-EVAL, fully assembled and tested. Prior to its first use, ensure that no damage occurred during shipment and any jumpers are properly installed. Follow best ESD practices while unpacking and handling the TMC8100-EVAL or any of its parts.

#### TMC8100-EVAL Hardware

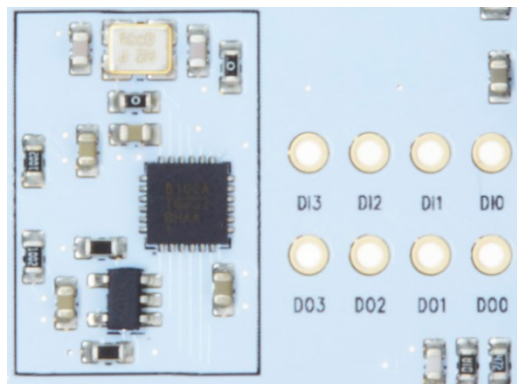


Figure 7. TMC8100 Minimal Circuit and Digital Pin Test Points

The area around the TMC8100 marked by the black box represents the minimal circuitry needed for operation, including an external oscillator and an I<sup>2</sup>C EEPROM memory. Next to it, there are labelled test points for direct access to the programmable digital I/O pins.

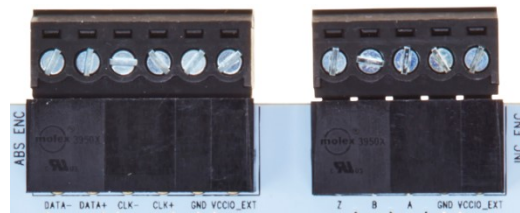


Figure 8. Encoder Connectors

The incremental encoder is connected to the connector marked as INC ENC and the absolute encoder is connected to the connector marked as ABC ENC. The pinout of the cables must match the labelling on the board.

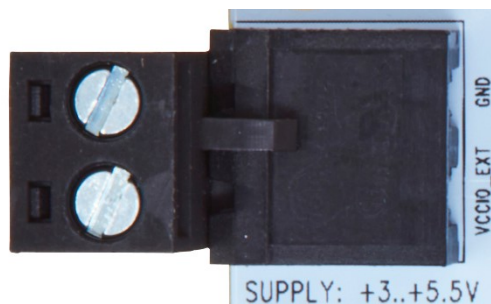


Figure 9. Supply Connector

The connector marked SUPPLY provides the supply to encoders. The polarity of the supply must match the labelling on the board, and the supply voltage must be kept within the board's specified operating range of 3V to 5.5V.

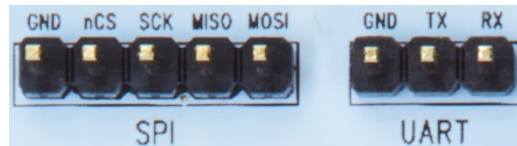


Figure 10. SPI and UART Headers

The TMC8100-EVAL provides access to the SPI and UART interfaces by headers. These allow to use the TMC8100-EVAL in standalone mode without the Landungsbruecke.



Figure 11. VCCIO SELECTION Header

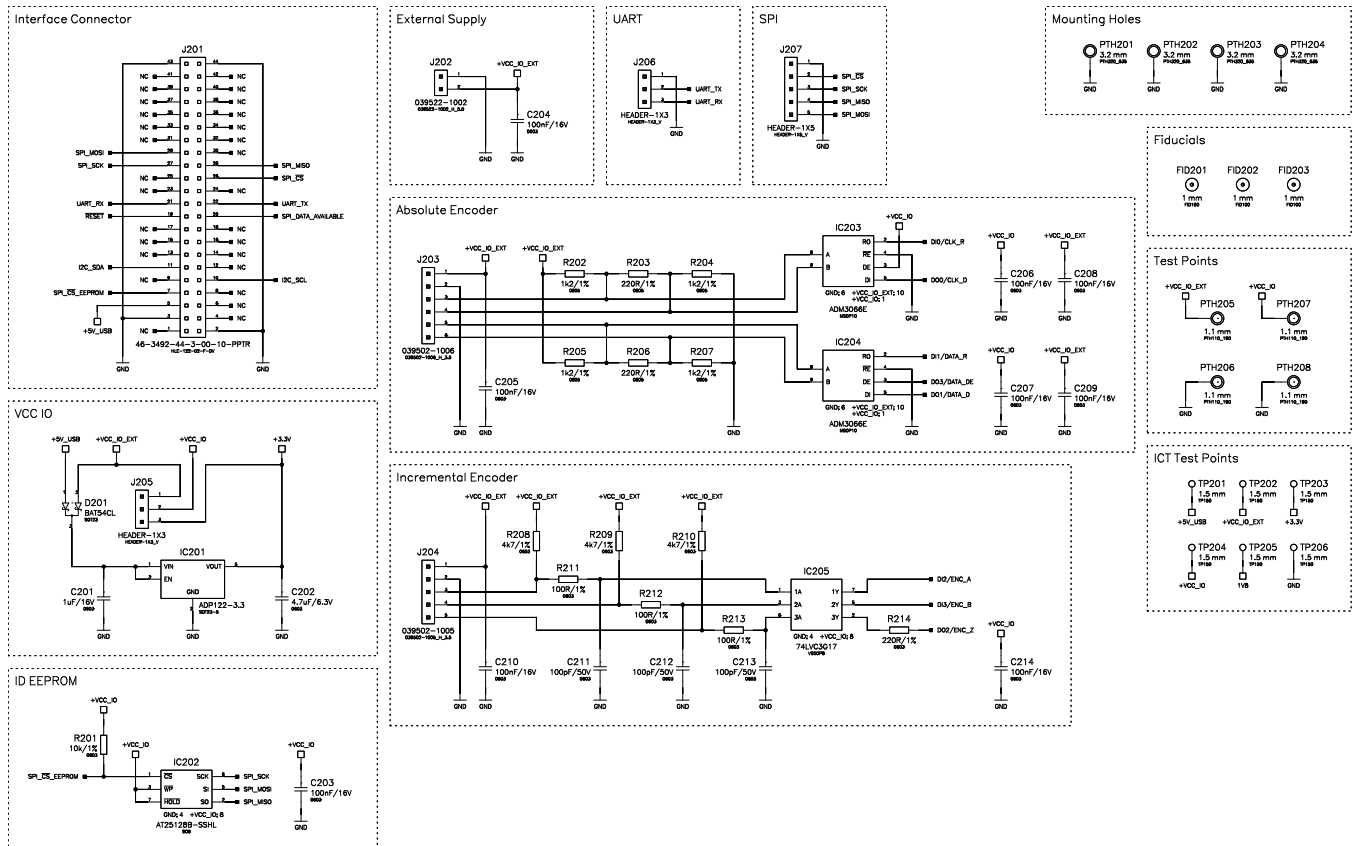
The header, labelled VCCIO SELECTION, allows to select the TMC8100 supply using a jumper. When using the TMC8100-EVAL with the Landungsbruecke, the I/O supply must be set to 3.3V. In the standalone module, the I/O supply may be set equal to the external supply.

## Bill of Materials

PART	QTY	VALUE/PART NUMBER
R305, R306	2	0R
R202, R204, R205, R207	4	1k2/1%
C201	1	1uF/16V
C305	1	2.2uF/6.3V
R303, R304	2	2k7/1%
C202	1	4.7uF/6.3V
R208-R210	3	4k7/1%
C301, C302	2	9pF/50V
R201, R301, R302	3	10k/1%
X301	1	16MHz
IC302	1	24LC32AFT-I/OT
J201	1	46-3492-44-3-00-10-PPTR
IC205	1	74LVC3G17
C203-C210, C214, C303, C304, C306	12	100nF/16V
C211-C213	3	100pF/50V
R211-R213	3	100R/1%
R203, R206	2	220R/1%
R214	1	220R/1%
J204	1	395021005
J203	1	395021006
J202	1	395221002
IC203, IC204	2	ADM3066EBRMZ-R7
IC201	1	ADP122UJZ-3.3-R7
IC202	1	AT25128B-SSHL
D201	1	BAT54CL
J205-J206	2	3-Pin Header
J207	1	5-Pin Header
IC301	1	TMC8100ATG+
Mating Connector to J202	1	395200002
Mating Connector to J203	1	395000006
Mating Connector to J204	1	395000005
Jumper Connected to J205	1	Jumper

The encoder connectors and power mating connector are provided and already mounted on the TMC8100-EVAL board.

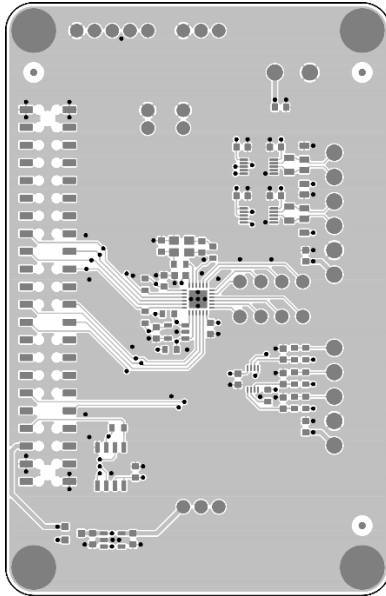
TMC8100-EVAL Schematic



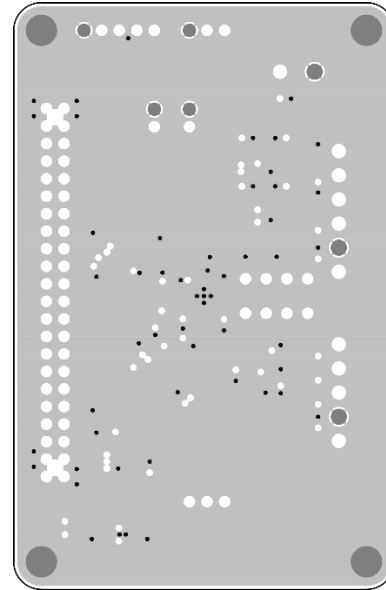




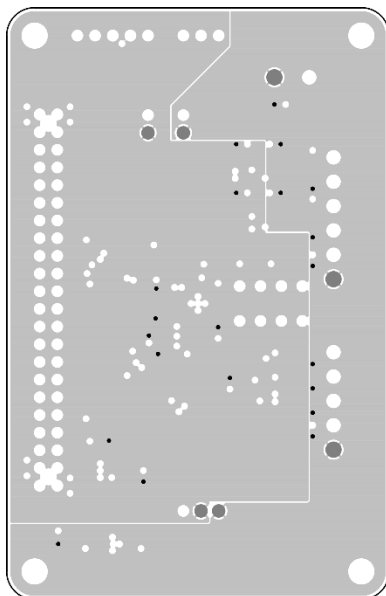
**TMC8100-EVAL PCB Layout**



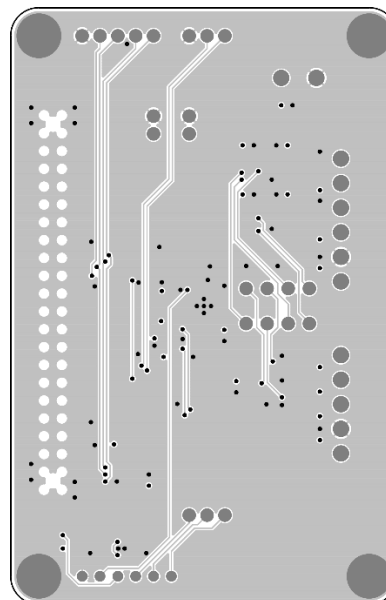
*TMC8100-EVAL PCB Layout – Top*



*TMC8100-EVAL PCB Layout – Layer 2*

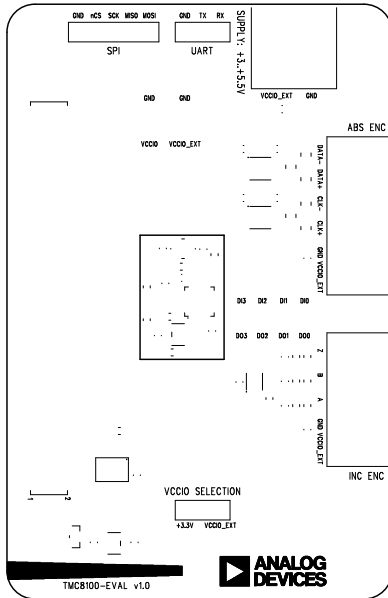


*TMC8100-EVAL PCB Layout – Layer 3*

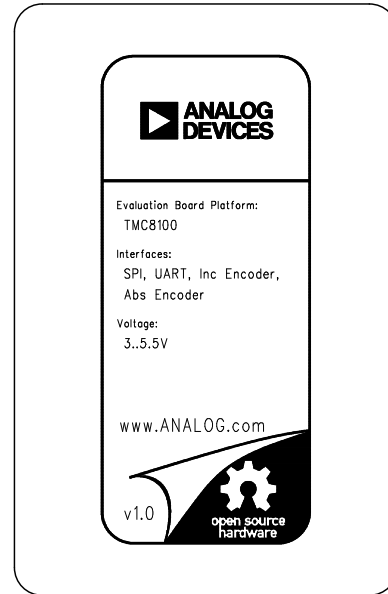


*TMC8100-EVAL PCB Layout – Bottom*

TMC8100-EVAL PCB Layout (continued)



TMC8100-EVAL – Top Silkscreen



TMC8100-EVAL – Bottom Silkscreen

**Revision History**

REVISION HISTORY	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	04/24	Initial release	—

## Notes

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