

# Motion Control Integrated Circuit

# TMC 222



## Microstepping Stepper Motor Controller / Driver with I<sup>2</sup>C Interface

The TMC222 is a system-on-chip, which integrates an I<sup>2</sup>C interface, a positioning controller and a 800mA, 2-phase stepper motor driver in a single chip. The driver uses features a resolution of up to 16 micro steps and integrates a high performance current regulation. The positioning controller integrates trapezoid curve target positioning and automatic search for reference point. The building blocks support a 4096 full step positioning range. The complete parameter setting can be

stored in OTP by the user or by an system integrator. After initialization the TMC222 performs all time critical tasks autonomously based on target positions and velocity parameters.



Together with an inexpensive microcontroller the TMC222 forms a complete motion control system.

Communication between the TMC222 and the host takes place via a two wire serial interface with transfer rates of up to 350 kbps.

## Application and Benefits

The TMC222 is the first SoC to combine positioning intelligence and drive electronics with a I<sup>2</sup>C serial interface. A single I<sup>2</sup>C Master can address up to 32 TMC222 controlled axes, enabling a decentralized architecture with all its benefits. The all in one design enables the stepper control IC to act as a true gateway to the stepper motors, turning it into an economical and easy-to-use peripheral device. The proprietary current control algorithm ensures very smooth and quiet motor rotation, which is par-

ticularly desired in office environments. The TMC222 is ideal for a wide range of distributed single axis positioning applications. The circuit can be placed directly at the motor within encapsulated systems with a bus length of up to a few meters, or centralized on the same PCB as a master CPU. Software coding is kept to a minimum, assuring fast design success and development cost reduction. The TMC222 targets especially IT peripherals, industrial automation, medical devices, consumer appliances and white goods.

## Features:

### Motor Driver

- Controls one stepper motor with four bit micro stepping
- Programmable coil current up to 800 mA
- Supply voltage range operating range 8V ... 29V
- Fixed frequency PWM current control with automatic selection of fast and slow decay mode
- Full step frequencies up to 1 kHz
- High temperature, open circuit, short, over-current and under-voltage diagnostics

### Motion Controller

- Internal 16-bit wide position counter
- Configurable speed and acceleration settings
- Build-in ramp generator for autonomous positioning and speed control
- On-the-fly alteration of target position
- Reference switch input available for read out

### I<sup>2</sup>C Interface

- Transfer rates up to 350 kbps
- Diagnostics and status information as well as motion parameters accessible
- Field-programmable node addresses (32)

### TMC222 Evaluation Board

The TMC222 evaluation board makes it possible to evaluate the features of the TMC222 stepper motor controller and driver chip. The TMC222 evaluation board allows connecting the TMC222 chip to a power supply, a motor and a LIN master. The board is mainly intended for direct attachment to the Trinamic USB-2-X interface converter which allows easy interfacing of the evaluation board to a PC running under Windows 98/2000/XP via the USB interface.



The evaluation board has particularly small dimensions. At just 74 mm x 60 mm, it can easily be connected with different types of stepping motors. The integrated screw terminals make installation easy; the PCB can be adapted to every type of motor.

There is also an evaluation software running under Windows which allows easy evaluation of all the features provided by the TMC222 chip. The evaluation software needs the Trinamic USB-2-X interface converter to work.

The TMC222 Evaluation Kit comes with a TMC222 Eval Board, USB-2-X adapter, programming and evaluation software for Windows OS (9x, XP, NT4.0, 2000), documentation, an USB cable and a stepper motor.

### Applications

- Optical and fine mechanical devices
- Office automation
- Chip card reader
- Plotters
- Valves in building automation
- IT peripherals
- Industrial automation
- Medical devices
- Consumer appliances
- White goods.

### TMC222 Evaluation Software



### Ordering Information

ORDER CODE	DESCRIPTION
TMC222-SI	TMC222 SO-20
TMC222-Eval Board	TMC222 Evaluation Board
TMC222-Eval Kit	TMC222 Evaluation Kit with USB2X-interface