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AURIX™ TC3xx Motor Control Power Board

TriCore™, TC3xx Family, AURIX™ 32-bit microcontrollers

About this document

Scope and purpose

This application note provides an overview of the 3-phase motor control power board including its main features, key data, pin assignments and mechanical dimensions.

The power board has been designed to operate in various configurations and conditions, such as input voltages and control algorithms.

The hardware is compatible with AURIX™ Application Kit TC3x7 with TFT display, with AURIX™ TC3x7 in LFBGA-292 package.

Attention: *This power board is intended only for evaluation purposes and is not intended to be an end product. Please always take care of the dead-time settings of the gate driver and always have in mind that power board has no breaking chopper or similar hardware protection to absorb the energy generated during regenerative breaking of a motor. In any case, user should ensure that voltage and current are monitored properly, by software or additional hardware.*

The design of this board originates from the need of a simple and plug-and-play motor drive power board to be used for AURIX™ TC3xx evaluation purposes in motor drive applications.

Intended audience

This document is intended for all technical specialists working with the motor control power board under laboratory conditions.

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1 Introduction

The motor control power board is a part of the KIT_A2G_TC387_MOTORCTR package (eMotor Kit). In order to run a motor, the matching control board is required to interface this power board. The motor control power board is compatible with AURIX™ Application Kit TC3x7 with TFT display, with AURIX™ TC3x7 in LFBGA-292 package [1].

The motor control power board is equipped with all assembly circuits required for sensor based and sensorless based field oriented control (FOC), as well for the block commutation control. It provides low voltage DC connector, three phase output for connecting the motor, and connectors for position sensors such as encoder, resolver and Hall.

An encoder sensor based FOC application example is described in [2]. In this example, three shunts in the ground path are used for phase currents sensing. The DC-link voltage sensing, phase voltage sensing and high-side DC-link current sensing information could be used for monitoring purposes.

As a part of KIT_A2G_TC387_MOTORCTR the motor control power board is available through regular Infineon distribution partners as well as on Infineon's website.

Note: The board is neither cost nor size optimized and does not serve as a reference design.

1.1 Key features

The motor control power board characteristics are:

- All components are SMD and only placed on the top side
- Driving of a three phase PMSM / BLDC (12 V, max. 50 W)
- Sensing of motor position with resolver, encoder or Hall sensors
- Advanced gate driver (TLE9180D-31QK)
- High-side DC-link current sensing
- Low-side DC-link current sensing
- Phase current sensing with two or three shunts in ground path
- Sensing of DC-link voltage
- Sensing of phase voltages
- Configuration / Diagnostic via SPI (TLE9180D-31QK)
- Power board fits perfectly to Application Kit TC3xx with TFT display, with AURIX™ TC3x7 in LFBGA-292 package
- Low power status LED
- PCB dimensions: 100mm x 120mm
- All test points accessible from bottom side

1.2 Block diagram

The block diagram of low voltage motor control power board is shown in Figure 1. This power board includes low power DC connector, control board connectors, low power motor connectors, resolver connector, encoder connector and Hall sensor connector. The auxiliary power supply TLE42744DVD50 is used to provide 5V for an advanced gate driver TLE9180D-31QK and motor positon sensor interfaces. The LED indicates the presence of the generated 5V voltage. The phase current sensing is possible with two or three shunts in the ground path. The low-side DC-link current sensing could be used with slight changes. The TLE9180D-31QK has three

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integrated current sense amplifiers with programmable gains. The high-side DC-link current sensing is implemented by using a bidirectional, zero-drift, high-speed current-shunt monitor. The DC-link voltage and phase voltage sensing are directly measured using resistive dividers with RC filters and the mounting options for Zener diodes which can be used to protect microcontroller pins. The 3-phase Power Bridge consists of three IPG20N04S4-08A dual N-channel MOSFETs.
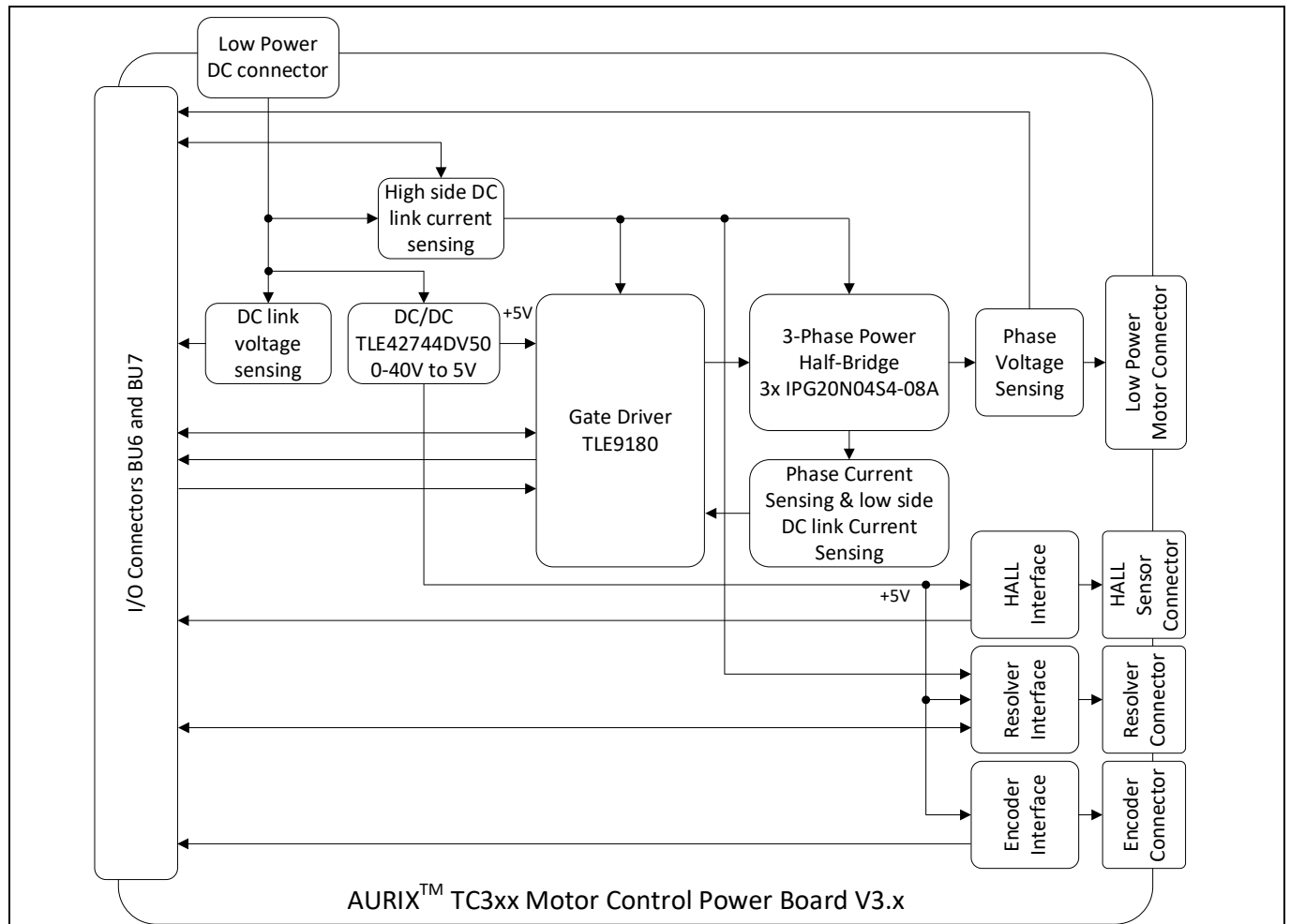

Figure 1   Block diagram of low voltage AURIX™ Motor Control Power Board in connection with AURIX™ TC3xx Application Kit with TFT display

1.3   Placement

The top and the bottom component and test points' placement are shown in Figure 2 and Figure 3, respectively.

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Revision history

Document version	Date of release	Description of changes
v1.0	2020-08-17	Initial version.

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