

# TEP0002 TRM

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## Overview

The Trenz Electronic TEP0002 is a Pmod compatible motor driver board and used for developing BLCD or CD motor driving software.

Wiki Resource page: <http://trenz.org/tep0002-info> for the current online version of this manual and other available documentation.

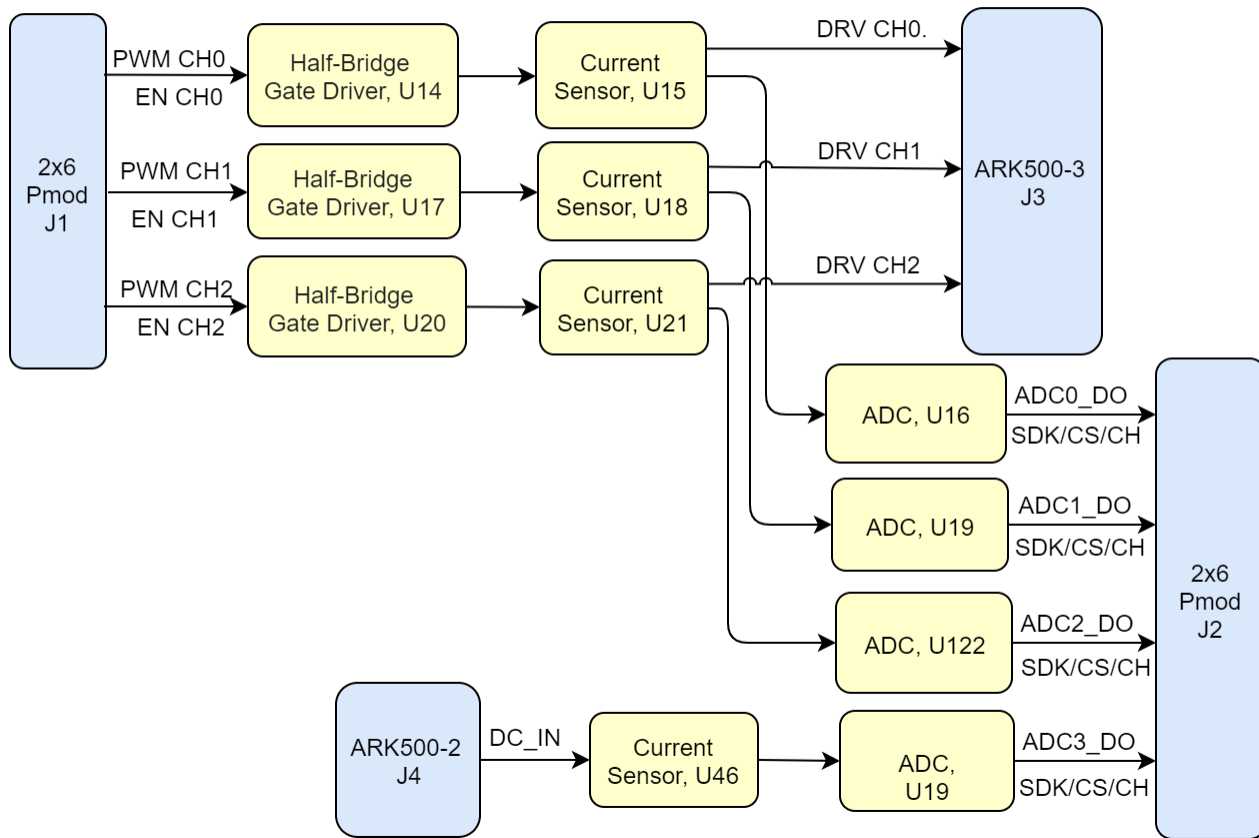
## Key Features

- **Modules/ SoC FPGA**
  - Compatible with Digilent's Pmod interfaces
- **RAM/Storage**
- **On Board**
  - 4x Current Sensor
  - 4x ADC
  - 2x Terminal Blocks
  - 2x Power Regulators
  - 3x Half-Bridge Drivers
- **Interface**
  - 2x Pmod Pin Header (2x6 Pol)
- **Power**
  - 3.3V supply voltage from Pmods

- Supply current and voltage monitoring
- **Dimension**
  - 40 mm x 40 mm

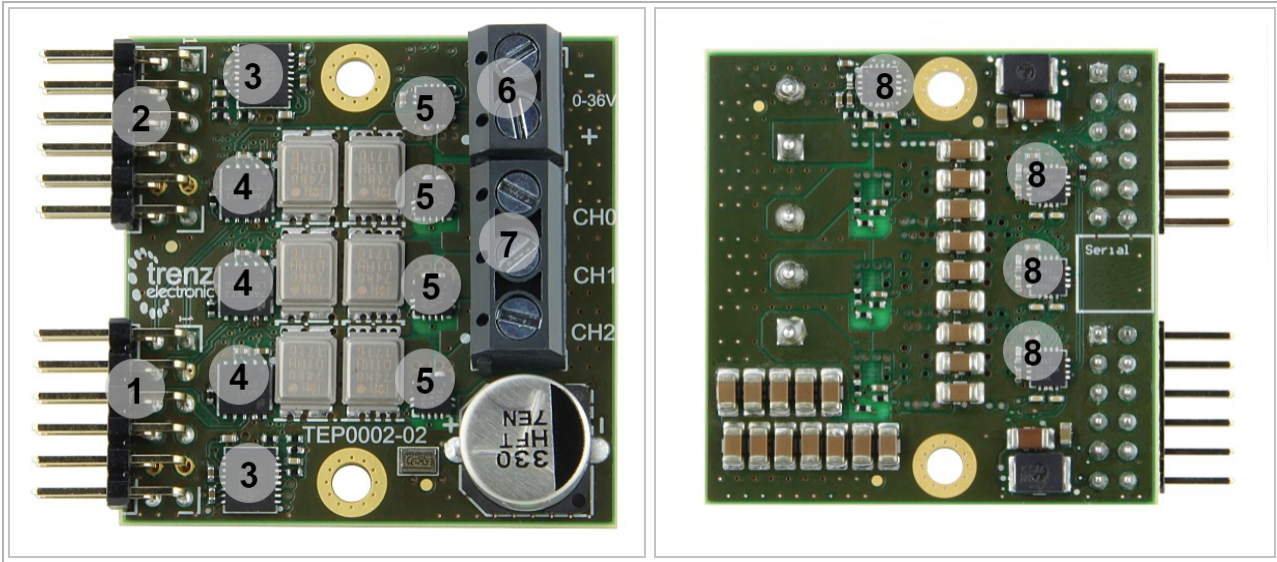
## Block Diagram

### TEP0002



TEP0002 block diagram

## Main Components



TEP0002 main components

- 1. 2x6 PMod Header, J1
- 2. 2x6 PMod Header, J2
- 3. Power Regulators, U1-U7
- 4. Half Bridge Gate Drivers, U14-U17-U20
- 5. Current Sensors, U15-U18-U21-U46
- 6. ARK500-2 connector, J2
- 7. ARK500-3 connector, J3
- 8. Analog Digital Converter, U16-U19-U22-U47

Initial Delivery State

| Storage device name | Content | Notes |
|---------------------|---------|-------|
| ---                 | ---     | ---   |

Initial delivery state of programmable devices on the module

Configuration Signals

| MODE Signal State | Boot Mode |
|-------------------|-----------|
| ---               | ---       |

Boot process.

| Signal | B2B | I/O | Note |
|--------|-----|-----|------|
| ---    | --- | --- |      |

Reset process.

Signals, Interfaces and Pins

Pmod Connectors

TEP0002 is equipped with two 2x6 Pmod Connectors, J1 and J2.

| Pin | Pmod J1 | Pmod J2      | Notes |
|-----|---------|--------------|-------|
| 1   | PWM_CH0 | ADC_CH       |       |
| 2   | PWM_CH1 | AD_SCK       |       |
| 3   | PWM_CH2 | ADC_CS       |       |
| 4   | N.C     | Sensor fault |       |
| 5   | GND     | GND          |       |
| 6   | VCC     | VCC          |       |
| 7   | EN_CH0  | ADC_DO0      |       |
| 8   | EN_CH1  | ADC_DO1      |       |
| 9   | EN_CH2  | ADC_DO2      |       |
| 10  | N.C     | ADC_DO3      |       |
| 11  | GND     | GND          |       |
| 12  | VCC     | VCC          |       |

General Pmod connectors information

Terminal blocks

The TEP0002 is equipped with two Terminal Blocks J3 and J4.

| Designator | Pin | Schematic | Notes    |
|------------|-----|-----------|----------|
| J3         | 1   | DRV_CH2   | ARK500-3 |
|            | 2   | DRV_CH1   | ARK500-3 |
|            | 3   | DRV_CH0   | ARK500-3 |
| J4         | 1   | DC_IN     | ARK500-2 |
|            | 2   | GND       | ARK500-2 |

Terminal Blocks information

On-board Peripherals

| Chip/Interface | Designator      | Notes |
|----------------|-----------------|-------|
| ADC            | U16,U19,U22,U47 |       |

On board peripherals

Analog Digital Converters

The TEP0006 is equipped with four Analog Digital Converters.

| Pin | Connected to | Notes |
|-----|--------------|-------|
|     |              |       |

|        | ADC,U16             | ADC,U19             | ADC,U22             | ADC,U47             |           |
|--------|---------------------|---------------------|---------------------|---------------------|-----------|
| AVDD   | 5AV                 | 5AV                 | 5AV                 | 5AV                 |           |
| REF    | Current Sensors,U17 | Current Sensors,U20 | Current Sensors,U22 | Current Sensors,U46 | VCC Pin   |
| AIN0+  | DRV_CH0             | DRV_CH1             | DRV_CH2             | DC_IN               |           |
| AIN0-  | GND                 | GND                 | GND                 | GND                 |           |
| AIN1+  | Current Sensors,U17 | Current Sensors,U20 | Current Sensors,U22 | Current Sensors,U46 | VIOUT Pin |
| AIN1-  | GND                 | GND                 | GND                 | GND                 |           |
| REFGND | GND                 | GND                 | GND                 | GND                 |           |
| DVDD   | 3.3V                | 3.3V                | 3.3V                | 3.3V                |           |
| SCLK   | ADC_SCK             | ADC_SCK             | ADC_SCK             | ADC_SCK             | PMod J2   |
| SDO    | ADC0_DO             | ADC1_DO             | ADC2_DO             | ADC3_DO             | PMod J2   |
| nCS    | ADC_CS              | ADC_CS              | ADC_CS              | ADC_CS              | PMod J2   |
| CH_SEL | ADC_CH              | ADC_CH              | ADC_CH              | ADC_CH              | PMod J2   |
| PDEN   | GND                 | GND                 | GND                 | GND                 |           |
| GND    | GND                 | GND                 | GND                 | GND                 |           |

ADC Information

Power and Power-On Sequence

Power Supply

Power supply with minimum current capability of xx A for system startup is recommended.

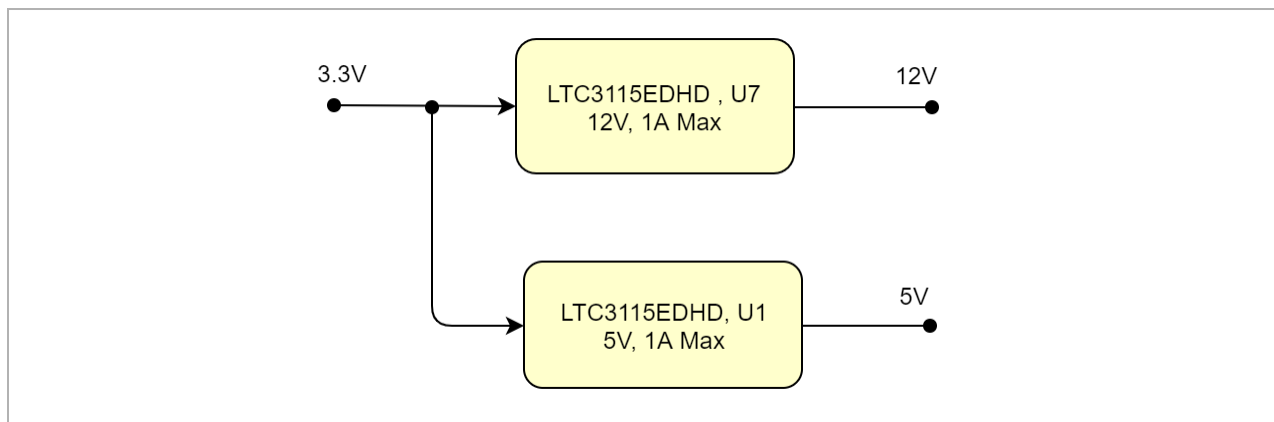
Power Consumption

| Power Input Pin | Typical Current |
|-----------------|-----------------|
| VIN             | TBD*            |

Power Consumption

\* TBD - To Be Determined

Power Distribution Dependencies



Power Distribution

## Power-On Sequence

There is no specific power on sequence, after power on the module all regulators will be enable.

## Power Rails

| Power Rail Name | Pmod J1 Pin | Pmod J2 Pin | Direction | Notes |
|-----------------|-------------|-------------|-----------|-------|
| 3.3V            | 6,12        | 6,12        | Input     |       |

Module power rails.

## Technical Specifications

### Absolute Maximum Ratings

| Symbols | Description         | Min  | Max | Unit |
|---------|---------------------|------|-----|------|
| 3.3V    | Input               | -0.3 | 6.5 | V    |
| STG_T   | Storage Temperature | -40  | 105 | °C   |

PS absolute maximum ratings

### Recommended Operating Conditions

Operating temperature range depends also on customer design and cooling solution. Please contact us for options.

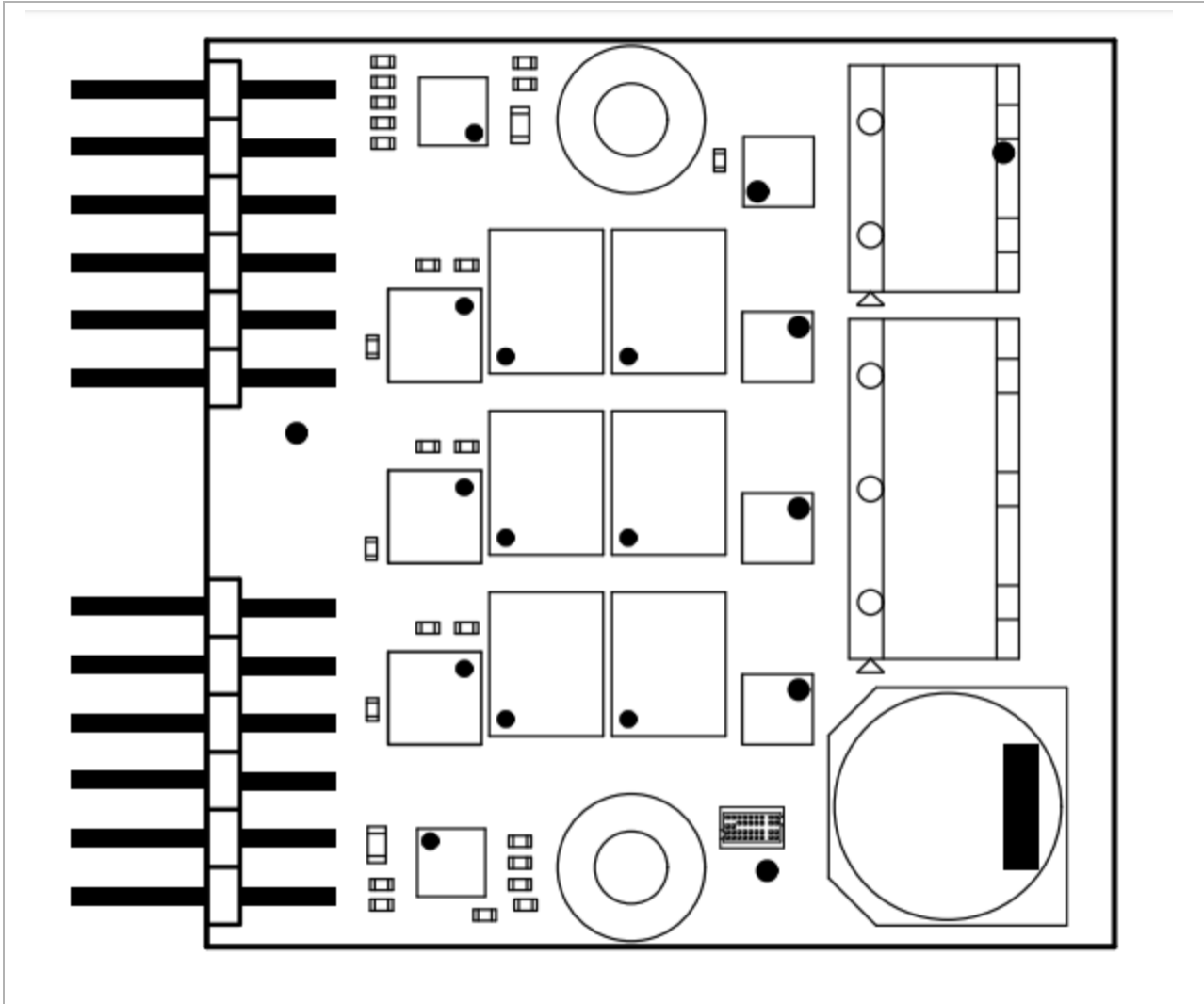
| Parameter | Min | Max | Units | Reference Document                   |
|-----------|-----|-----|-------|--------------------------------------|
| 3.3V      | 3.0 | 4.2 | V     |                                      |
| OPT_T     | -40 | 105 | °C    | See ARK500-2 and ARK500-3 Data Sheet |

Recommended operating conditions.

## Physical Dimensions

- Module size: 40 mm × 40 mm. Please download the assembly diagram for exact numbers.

PCB thickness: 1.59 mm.



Physical Dimension

## Currently Offered Variants

Trenz shop TEP0002 overview page

[English page](#)

[German page](#)

Trenz Electronic Shop Overview

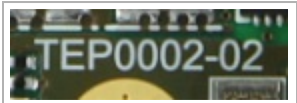
## Revision History

## Hardware Revision History

| Date       | Revision | Changes                                                                                                                                                                                                                                                                                                    | Documentation Link    |
|------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| 2019-04-23 | 03       | <ul style="list-style-type: none"><li>R18 and C46 have been removed</li><li>R22 and C57 have been removed</li><li>R26 and C67 have been removed</li><li>R17, R20, R21, R24, R25, R28 have been renamed and the resistance level have been change</li><li>U1 and U7 have been changed to LM4510SD</li></ul> | REV03                 |
| 2018-02-27 | 02       | <ul style="list-style-type: none"><li>Schematic has been updated</li></ul>                                                                                                                                                                                                                                 | <a href="#">REV02</a> |
| 2017-03-09 | 01       | <ul style="list-style-type: none"><li>Initial Release</li></ul>                                                                                                                                                                                                                                            | REV01                 |

### Hardware Revision History

Hardware revision number can be found on the PCB board together with the module model number separated by the dash.



Board hardware revision number.

## Document Change History

| Date | Revision | Contributor | Description |
|------|----------|-------------|-------------|
|------|----------|-------------|-------------|



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                    |
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| <p><b>Error rendering macro 'page-info'</b></p> <p>Ambiguous method overloading for method jdk.proxy241.\$Proxy3496#hasContentLevelPermission. Cannot resolve which method to invoke for [null, class java.lang.String, class com.atlassian.confluence.pages.Page] due to overlapping prototypes between: [interface com.atlassian.confluence.user.ConfluenceUser, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject] [interface com.atlassian.user.User, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject]</p> | <p><b>Error rendering macro 'page-info'</b></p> <p>Ambiguous method overloading for method jdk.proxy241.\$Proxy3496#hasContentLevelPermission. Cannot resolve which method to invoke for [null, class java.lang.String, class com.atlassian.confluence.pages.Page] due to overlapping prototypes between: [interface com.atlassian.confluence.user.ConfluenceUser, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject] [interface com.atlassian.user.User, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject]</p> | <p><b>Error rendering macro 'page-info'</b></p> <p>Ambiguous method overloading for method jdk.proxy241.\$Proxy3496#hasContentLevelPermission. Cannot resolve which method to invoke for [null, class java.lang.String, class com.atlassian.confluence.pages.Page] due to overlapping prototypes between: [interface com.atlassian.confluence.user.ConfluenceUser, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject] [interface com.atlassian.user.User, class java.lang.String, class com.atlassian.confluence.core.ContentEntityObject]</p> | <ul style="list-style-type: none"> <li>• Correction connector position</li> </ul>  |
| 2020-01-15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | v.54                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Pedram Babakhani                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• Technical specification update</li> </ul> |

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Document change history.

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