



TEI0003 Test Board

Revision v.9

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Online version of this document:

<https://wiki.trenz-electronic.de/pages/viewpage.action?pageId=195203089>

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4 Overview

NIOS II Design with SDRAM controller, 3-axis Accelerometer and different LED sequences.

Refer to <http://trenz.org/cyc1000-info> for the current online version of this manual and other available documentation.

4.1 Key Features

- Quartus Prime Lite 21.1
- NIOS II
- SPI
- UART
- EPCQ16(A) flash memory
- SDRAM memory
- 3-axis Accelerometer
- User LEDs
- User buttons

4.2 Revision History

Date	Quartus	Project Built	Authors	Description
2022-04-21	21.1 Lite	TEI0003-test_board_noprebuilt-quartus_21.1.0-20220421150041.zip TEI0003-test_board-quartus_21.1.0-20220421150114.zip	Thomas Dück	<ul style="list-style-type: none">• update to Quartus Prime Lite 21.1
2021-07-09	20.1 Lite	TEI0003-test_board_noprebuilt-quartus_20.1.1-20210709110930.zip TEI0003-test_board-quartus_20.1.1-20210709110847.zip	Thomas Dück	<ul style="list-style-type: none">• update to Quartus Prime Lite 20.1• TE scripts update

Date	Quartus	Project Built	Authors	Description
2020-10-19	19.1 Lite	TEI0003-test_board_noprebuilt-quartus_19.1.0-20201019101802.zip TEI0003-test_board-quartus_19.1.0-20201019101738.zip	Thomas Dück	<ul style="list-style-type: none"> script update bugfixes
2020-05-13	19.1 Lite	TEI0003-test_board_noprebuilt-quartus_19.1.0-20200513080815.zip TEI0003-test_board-quartus_19.1.0-20200513081030.zip	Thomas Dück	<ul style="list-style-type: none"> 19.1 update
2019-11-11	18.1	TEI0003-test_board_noprebuilt-quartus_18.1-20191111104152.zip TEI0003-test_board-quartus_18.1-20191111104339.zip	Thomas Dück	<ul style="list-style-type: none"> add bash files for Linux OS
2019-10-29	18.1	TEI0003-test_board_noprebuilt-quartus_18.1-20191029121432.zip TEI0003-test_board-quartus_18.1-20191029121225.zip	Thomas Dück	<ul style="list-style-type: none"> create project with TE scripts new board variants
2019-04-02	18.1	TEI0003-02-test_board-quartus_18.1-20190402.zip	Thomas Dück	<ul style="list-style-type: none"> initial release

Table 1: Design Revision History

4.3 Release Notes and Know Issues

Issues	Description	Workaround	To be fixed version
No known issues	---	---	---

Table 2: Known Issues

4.4 Requirements

4.4.1 Software

Software	Version	Note
Quartus Prime Lite	21.1	needed
NIOS II SBT for Eclipse	---	optional

Table 3: Software

4.4.2 Hardware

Complete List is available on <project folder>/board_files/*_devices.csv

Design supports following modules:

Module Model	PCB Revision Support	Board Part Short Name	DDR	EPCQ Flash	Others	Notes
TEI0003-02*	REV01, REV02	25_C8_8MB	8MByte	2MByte	NA	NA
TEI0003-02 A	REV2	25_C8_8MB	8MByte	2MByte	NA	NA

Table 4: Hardware Modules

*used as reference

Design supports following carriers:

Carrier Model	Notes

Table 5: Hardware Carrier

* used as reference

Additional HW Requirements:

Additional Hardware	Notes
USB cable for JTAG/UART	Check Carrier Board and Programmer for correct type

Table 6: Additional Hardware

* used as reference

4.5 Content

For general structure and of the reference design, see [Project Delivery - Intel devices](#)¹

4.5.1 Design Sources

Type	Location	Notes
Quartus	<project folder>/source_files/ quartus	Quartus project will be generated by TE Scripts
Software	<project folder>/source_files/ software	Additional software will be generated by TE Scripts

Table 7: Design sources

4.5.2 Prebuilt

File	File-Extension	Description
SOPC Information File	*.sopcinfo	File with description of the *.qsys file to create software for the target hardware

¹ <https://wiki.trenz-electronic.de/display/PD/Project+Delivery+-+Intel+devices>

File	File-Extension	Description
SRAM Object File	*.sof	Ram configuration file
JTAG indirect configuration file	*.jic	Flash configuration file
Diverse Reports	---	Report files in different formats
Software Application File	*.elf	Software application for NIOS II processor system

Table 8: Prebuilt files (only on ZIP with prebuilt content)

4.5.3 Download

Reference Design is only usable with the specified Quartus version. Do never use different versions of Quartus software for the same project.

Reference Design is available on:

- [TEI0003 "Test Board" Reference Design²](#)

² https://shop.trenz-electronic.de/Download/?path=Trenz_Electronic/Modules_and_Module_Carriers/2.5x6.15/TEI0003/Reference_Design/21.1/test_board

5 Design Flow

! Reference Design is available with and without prebuilt files. It's recommended to use TE prebuilt files for first launch.

Trenz Electronic provides a tcl based built environment based on Quartus Design Flow.

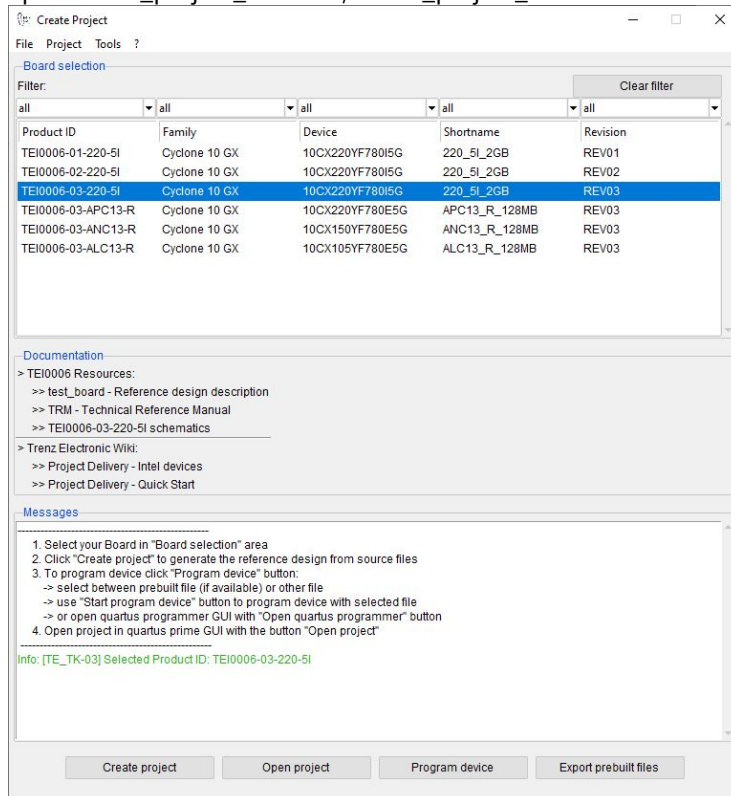
See also:

- [Project Delivery - Intel devices](#)³

The Trenz Electronic FPGA Reference Designs are TCL-script based projects. To create a project, open a project or program a device execute "create_project_win.cmd" on Windows OS and "create_project_linux.sh" on Linux OS.

TE Scripts are only needed to generate the quartus project, all other additional steps are optional and can also be executed by Intel Quartus/SDK GUI. For currently Scripts limitations on Win OS and Linux OS see: [Project Delivery - Intel devices](#) → [Currently limitations of functionality](#)⁴

1. Open create_project_win.cmd/create_project_linux.sh:




2. Select Board in "Board selection"
3. Click on "Create project" button to create project
 - a. (optional for manual changes) Select correct quartus installation path in "<project folder>/settings/design_basic_settings.tcl"

³ <https://wiki.trenz-electronic.de/display/PD/Project+Delivery+-+Intel+devices>

⁴ <https://wiki.trenz-electronic.de/display/PD/Project+Delivery+-+Intel+devices#ProjectDelivery-Inteldevices-Currentlylimitationsoffunctionality>

6 Launch

6.1 Programming

 Check Module and Carrier TRMs for proper HW configuration before you try any design.

6.1.1 EPCQ16(A) Flash

1. Connect the Module to USB-Port
2. Open create_project_win.cmd/create_project_linux.sh
3. Select correct board in "Board selection"
4. Click on "Program device" button
 - a. if prebuilt files are available: select "Program prebuilt file"
 - b. using own generated programming file: select "Program other file" and click on "Browse ..." to open own generated programming file
 - c. (optional) click on "Open programmer GUI" to program device with Quartus programmer GUI
5. Click on "Start program device" button

6.1.2 JTAG


Not used on this example.

6.2 Usage

1. Prepare Hardware like described on section [Programming](#)(see page 12)
2. Connect UART USB (most cases same as JTAG)

6.2.1 UART

1. Open Serial Console (e.g. PuTTY)
 - a. select COM Port

 Win OS: see device manager
Linux OS: see dmesg | grep tty (UART is *USB1)

- b. Speed: 115200
2. Press reset button
 3. Console output depends on used Software project, see [Software Design - SDK#Application](#)(see page 15)

7 System Design - Quartus

7.1 Block Design

The block designs may differ depending on the assembly variant.

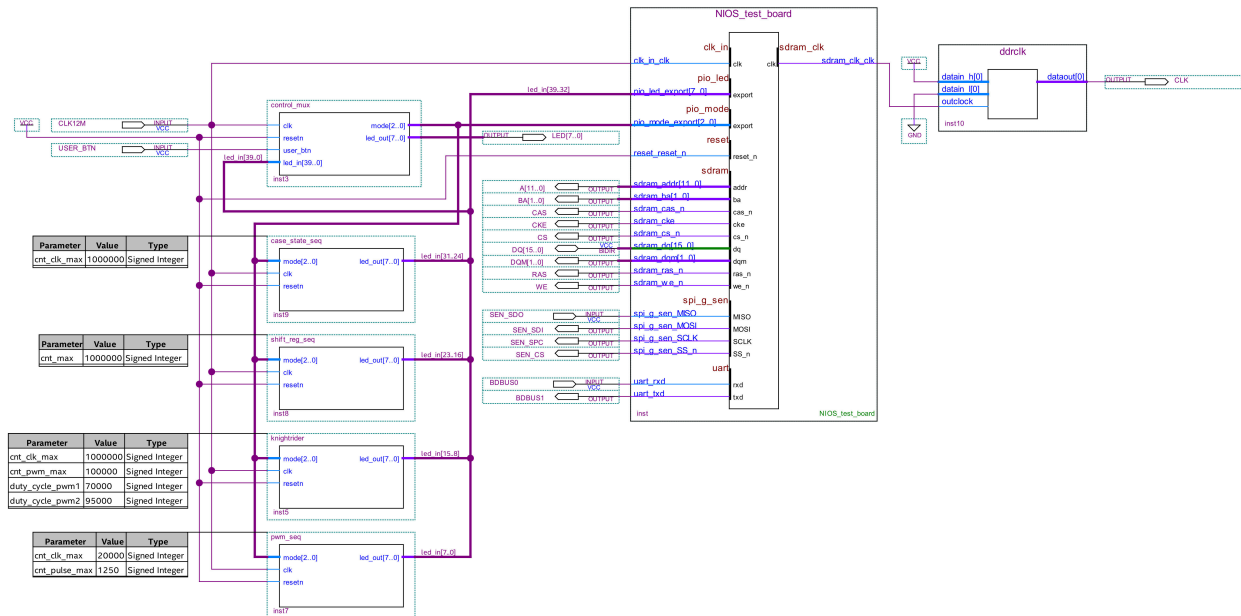


Figure 1: Block Design - Project

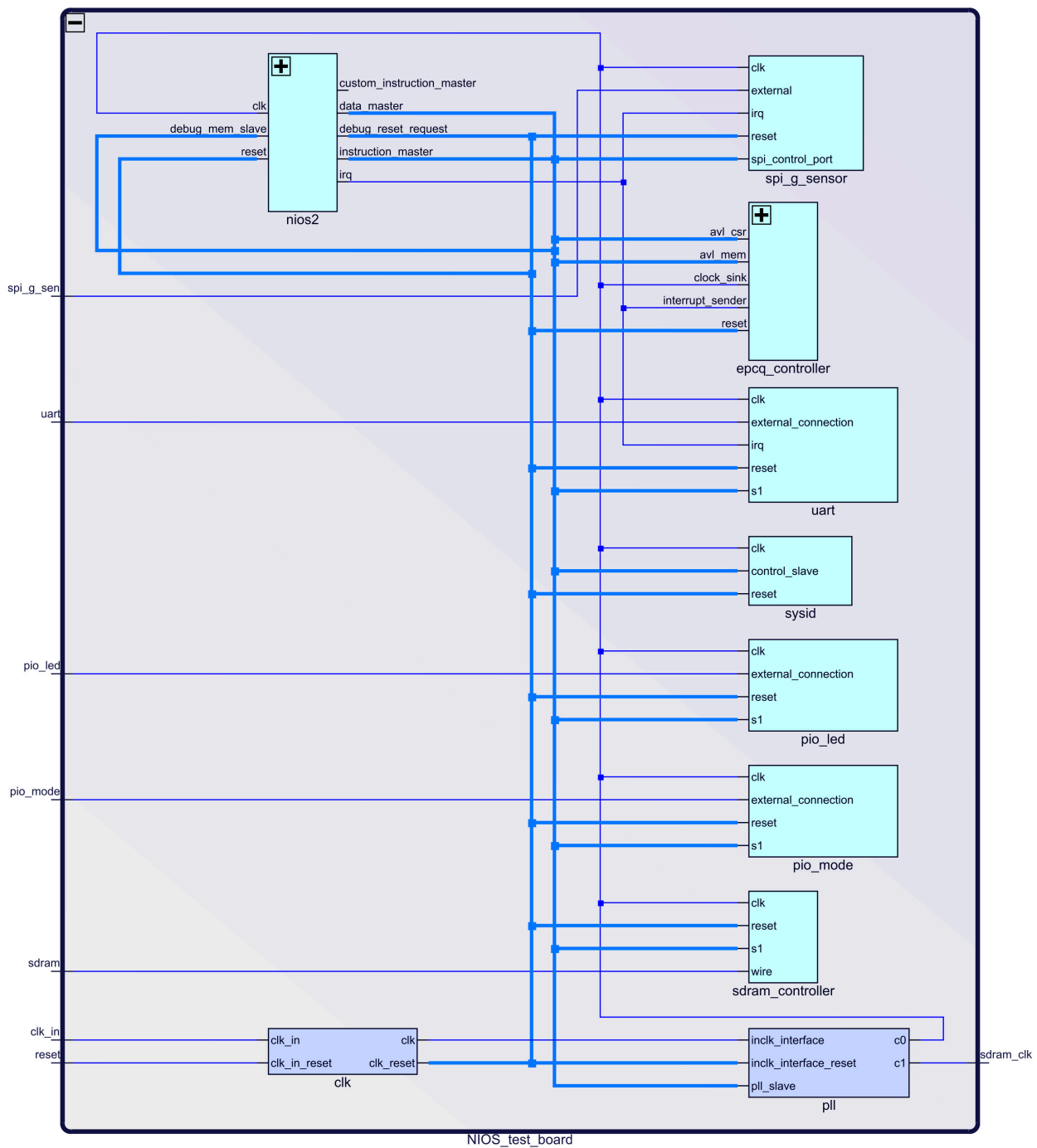


Figure 2: Block Design - Platform Designer

8 Software Design - SDK

8.1 Application

Used software project depends on board assembly variant. Template location: *<project folder>/source_files/software/*

8.1.1 test_board

Software example to test TEI0003 module.

- You can toggle between following modes by pressing the user button
 - a. Spirit level
 - b. Case statement sequence
 - c. Shift register sequence
 - d. Knightrider sequence
 - e. Pulse-width modulation sequence

9 Appx. A: Change History and Legal Notices

9.1 Document Change History

To get content of older revision got to "Change History" of this page and select older document revision number.


Date	Document Revision	Authors	Description
 2022-04-22	v.9 ⁵	Thomas Dück ⁶	<ul style="list-style-type: none"> • update to Quartus Prime Lite 21.1
2021-07-09	v.8	Thomas Dück	<ul style="list-style-type: none"> • update to Quartus Prime Lite 20.1 • document style update • script update
2020-10-09	v.7	Thomas Dück	<ul style="list-style-type: none"> • script update • bugfixes
2020-05-13	v.6	Thomas Dück	<ul style="list-style-type: none"> • 19.1 release
2019-11-11	v.5	Thomas Dück	<ul style="list-style-type: none"> • add bash files for Linux OS
2019-10-29	v.3	Thomas Dück	<ul style="list-style-type: none"> • change design to TE scripts • new board variants
2019-04-03	v.2	Thomas Dück	<ul style="list-style-type: none"> • Initial release 18.1
--	all	Thomas Dück ⁷	--

Table 9: Document change history.

9.2 Legal Notices

9.3 Data Privacy

Please also note our data protection declaration at <https://www.trenz-electronic.de/en/Data-protection-Privacy>

⁵ <https://wiki.trenz-electronic.de/pages/viewpage.action?pageId=195203089>

⁶ <https://wiki.trenz-electronic.de/display/~t.dueck>

⁷ <https://wiki.trenz-electronic.de/display/~t.dueck>

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⁸ <http://guidance.echa.europa.eu/>

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Trenz Electronic is registered under WEEE-Reg.-Nr. DE97922676.

 2019-06-07

⁹ <https://echa.europa.eu/candidate-list-table>

¹⁰ <http://www.echa.europa.eu/>