



TEI0050 Test Board

Revision v.7

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Online version of this document:

<https://wiki.trenz-electronic.de/display/PD/TEI0050+Test+Board>

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4 Overview

Refer to <http://trenz.org/tei0050-info> for the current online version of this manual and other available documentation.

4.1 Key Features

- Quartus Prime Lite 22.1std
- NIOS V/m
- UART
- QSPI flash
- SDRAM memory
- User LED
- User button

4.2 Revision History

Date	Quartus	Project Built	Authors	Description
2024-05-17	22.1 Lite	TEI0050-test_board_noprebuilt-quartus_22.1std.2-20240517115737.zip ¹ TEI0050-test_board-quartus_22.1std.2-20240517115802.zip ²	Thomas Dück	<ul style="list-style-type: none"> • update to Quartus Lite 22.1std • change to Nios V/m • TE scripts update
2023-02-13	21.1 .1 Lite	TEI0050-test_board_noprebuilt-quartus_21.1.1-20230213145533.zip TEI0050-test_board-quartus_21.1.1-20230213145613.zip	Thomas Dück	<ul style="list-style-type: none"> • fixed BSP_DIR in software project
2022-08-11	21.1 .1 Lite	TEI0050-test_board_noprebuilt-quartus_21.1.1-20220811093744.zip TEI0050-test_board-quartus_21.1.1-20220811093807.zip	Thomas Dück	<ul style="list-style-type: none"> • initial release

Table 1: Design Revision History

¹ https://shop.trenz-electronic.de/trenzdownloads/Trenz_Electronic/Modules_and_Module_Carriers/2.5x7.07/TEI0050/Reference_Design/22.1/test_board/TEI0050-test_board_noprebuilt-quartus_22.1std.2-20240517115737.zip

² https://shop.trenz-electronic.de/trenzdownloads/Trenz_Electronic/Modules_and_Module_Carriers/2.5x7.07/TEI0050/Reference_Design/22.1/test_board/TEI0050-test_board-quartus_22.1std.2-20240517115802.zip

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	22.1std	Nios V license is needed. For more information see: Intel Nios V Processors³
RiscFree IDE for Intel FPGAs	22.1std	needed

Table 3: Software

4.4.2 Hardware

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

Design supports following modules:

Module Model	Board Part Short Name	PCB Revision Support	DDR	QSPI Flash	Others	Notes
TEI0050-01-AAH11A	AH11	REV01	8M Byte	2MByte	--	--
TEI0050-01-AAH13A*	AH13	REV01	8M Byte	8MByte	--	--

Table 4: Hardware Modules

* used as reference

³ <https://www.intel.com/content/www/us/en/products/details/fpga/nios-processor/v.html>

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 usage of the reference design, see [Project Delivery - Intel devices](#)⁴

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

⁴ <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 V 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:

- [TEI0050 "Test Board" Reference Design⁵](https://shop.trenz-electronic.de/Download/?path=Trenz_Electronic/Modules_and_Module_Carriers/2.5x7.07/TEI0050/Reference_Design/22.1/test_board)

⁵ https://shop.trenz-electronic.de/Download/?path=Trenz_Electronic/Modules_and_Module_Carriers/2.5x7.07/TEI0050/Reference_Design/22.1/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.

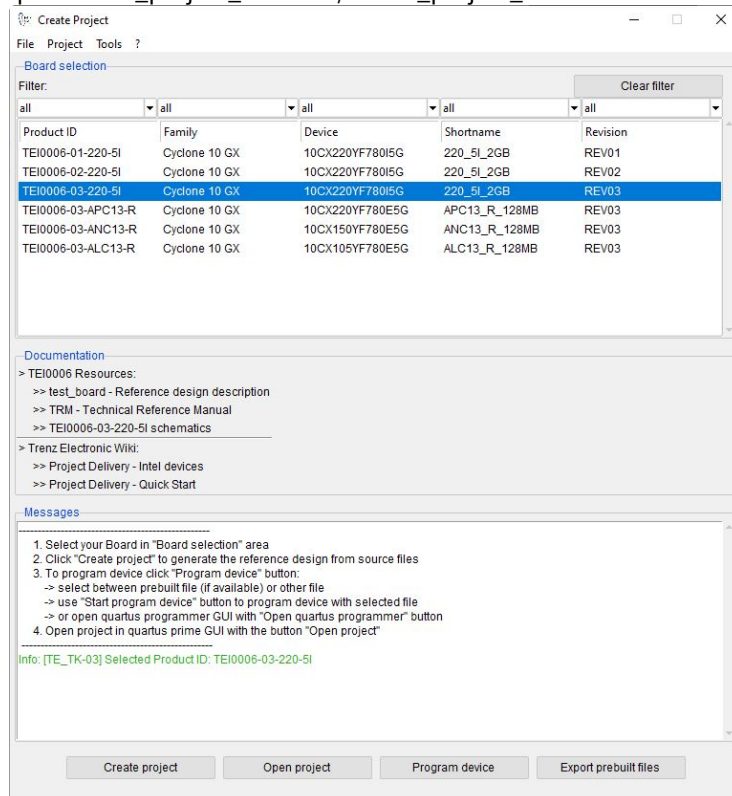
See also:

- [Project Delivery - Intel devices](#)⁶

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](#)⁷

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*"

⁶ <https://wiki.trenz-electronic.de/display/PD/Project+Delivery+-+Intel+devices>


⁷ <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 Get prebuilt files

 Reference Design is also available with prebuilt files. It's recommended to use TE prebuilt files for first launch.

1. Run `create_project_win.cmd/create_project_linux.sh`
2. Select Module in 'Board selection'
3. Click on 'Export prebuilt files' button
 - a. Folder `<project folder>/_binaries_<Article Name>` with subfolder `programming_files` will be generated and opened

6.1.2 QSPI

1. Connect JTAG and power on carrier with module
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

6.1.3 JTAG


Not used on this example.

6.2 Usage

1. Prepare HW like described on section [Programming](#) (see page 10)
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 `ls -l dev/serial/by-id` (UART is *USB1)

- b. Speed: 115200
2. Press reset button S1
3. Press user button S2 to toggle between different LED sequences
4. Console output depends on used Software project, see [Software Design - SDK#Application](#) (see page 13)

7 System Design - Quartus

7.1 Block Design

The block designs may differ depending on the assembly variant.

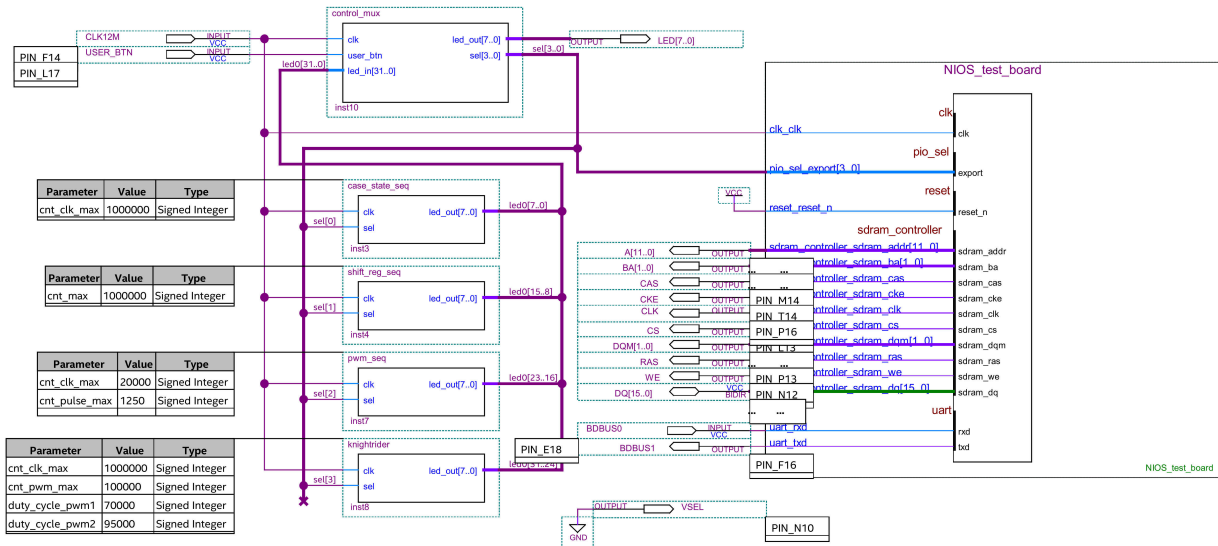


Figure 1: Block Design - Project

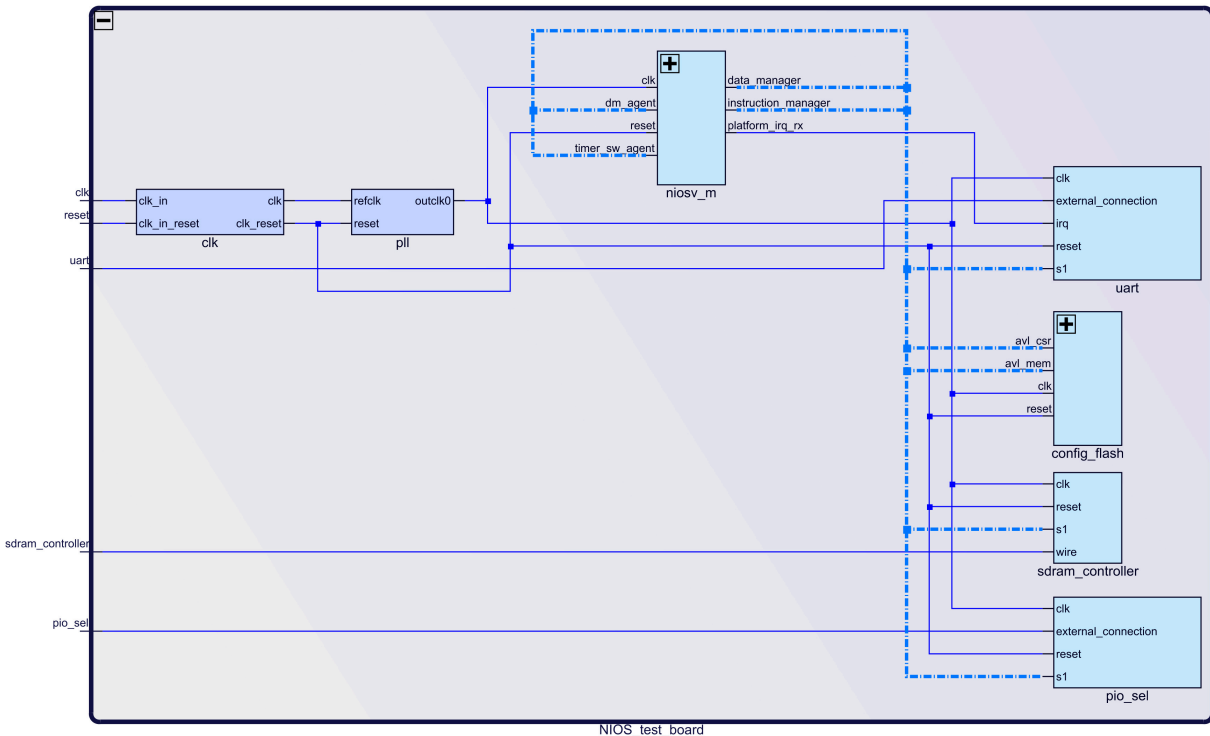


Figure 2: Block Design - Platform Designer

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 hello_tei0050

'hello_tei0050' is a Hello World example as endless loop instead of one console output.

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
 2024-05-17	v.7 (see page 5)	Thomas Dück⁸	<ul style="list-style-type: none"> • update to Quartus Prime Lite 22.1 • document style update
2023-02-14	v.6	Thomas Dück	<ul style="list-style-type: none"> • fixed BSP_DIR in software project
2022-08-11	v.5	Thomas Dück	<ul style="list-style-type: none"> • initial release
--	all	Thomas Dück⁹	--

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>

9.4 Document Warranty

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⁸ <https://wiki.trenz-electronic.de/display/~t.dueck>

⁹ <https://wiki.trenz-electronic.de/display/~t.dueck>

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RoHS

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WEEE

¹⁰ <http://guidance.echa.europa.eu/>


¹¹ <https://echa.europa.eu/candidate-list-table>

¹² <http://www.echa.europa.eu/>

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