# TE0841 Test Board

## Table of contents



## Overview

Example shows how to reconfigure SI5338 with MCS and monitor CLK. Additional MicroBlaze with Linux example.

Refer to http://trac.trenz-electronic.de/wiki/TE0841_Test_Board for the current online version of this manual and other available documentation.

## Key Features

- Vitis/Vivado 2021.2
- PetaLinux
- MicroBlaze
- UART
- Flash
- FMeter
- SI5338 initialisation with MCS

## Revision History

| Date | Vivado | Project Built | Authors | Description |
|---|---|---|---|---|
| 2022-05-06 | 2021.2 | TE0841-test_board-vivado_2021.2-build_14_20220506142737.zip<br>TE0841-test_board_noprebuilt-vivado_2021.2-build_14_20220506142737.zip | Waldemar Hanemann | • new spi bootloader by Henrik Brix Andersen<br>• fixed SC0841 bugs |
| 2020-05-13 | 2019.2 | TE0841-test_board-vivado_2019.2-build_11_20200513071943.zip<br>TE0841-test_board_noprebuilt-vivado_2019.2-build_11_20200513072026.zip | John Hartfiel | • new Assembly variants<br>• add Linux |
| 2018-06-21 | 2017.4 | TE0841-test_board_noprebuilt-vivado_2017.4-build_11_20180621164459.zip<br>TE0841-test_board-vivado_2017.4-build_11_20180621164432.zip | John Hartfiel | • REV02 Board parts<br>• new SI5338 configuration (default REV02)<br>• change xilisf_v5_9 for N25Q512A11G1240E support<br>• Some changes on block design |

| | | | | |
|---|---|---|---|---|
| 2018-05-15 | 2017.4 | TE0841-test_board_noprebuilt-vivado_2017.4-build_08_20180515144542.zip<br>TE0841-test_board-vivado_2017.4-build_08_20180515144523.zip | John Hartfiel | • initial release |

**Design Revision History**

# Release Notes and Know Issues

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

**Known Issues**

# Requirements

## Software

| Software | Version | Note |
|---|---|---|
| Vitis | 2021.2 | needed, Vivado is included into Vitis installation |
| PetaLinux | 2021.2 | needed |
| SI ClockBuilder Pro | --- | optional |

**Software**

## Hardware

Basic description of TE Board Part Files is available on TE Board Part Files.

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 | EMMC | Others | Notes |
|---|---|---|---|---|---|---|---|
| TE0841-01-035-1C | 01_35_1c_1gb | REV01 | 1GB | 32MB | NA | NA | NA |
| TE0841-01-035-1I | 01_35_1i_1gb | REV01 | 1GB | 32MB | NA | NA | NA |
| TE0841-01-035-2I | 01_35_2i_1gb | REV01 | 1GB | 32MB | NA | NA | NA |
| TE0841-01-040-1C | 01_40_1c_1gb | REV01 | 1GB | 32MB | NA | NA | Serial number 512479 up tp 512474 has same 64MB Flash like REV02 |
| TE0841-01-040-1I | 01_40_1i_1gb | REV01 | 1GB | 32MB | NA | NA | NA |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| TE0841-02-035-1C | 02_35_1c_2gb | REV02 | 2GB | 64MB | NA | NA | PLL programmed |
| TE0841-02-035-1I | 02_35_1i_2gb | REV02 | 2GB | 64MB | NA | NA | PLL programmed |
| TE0841-02-035-2I | 02_35_2i_2gb | REV02 | 2GB | 64MB | NA | NA | PLL programmed |
| TE0841-02-040-1C | 02_40_1c_2gb | REV02 | 2GB | 64MB | NA | NA | PLL programmed |
| TE0841-02-040-1I | 02_40_1i_2gb | REV02 | 2GB | 64MB | NA | NA | PLL programmed |
| TE0841-02-040-1IL | 02_40_1i_2gb | REV02 | 2GB | 64MB | NA | NA | PLL programmed |
| TE0841-02-31C21-A | 02_35_1c_2gb | REV02 | 2GB | 64MB | NA | NA | PLL programmed |
| TE0841-02-31I21-A | 02_35_1i_2gb | REV02 | 2GB | 64MB | NA | NA | PLL programmed |
| TE0841-02-32I21-A | 02_35_2i_2gb | REV02 | 2GB | 64MB | NA | NA | PLL programmed |
| TE0841-02-41C21-A | 02_40_1c_2gb | REV02 | 2GB | 64MB | NA | NA | PLL programmed |
| TE0841-02-41I21-A | 02_40_1i_2gb | REV02 | 2GB | 64MB | NA | NA | PLL programmed |
| TE0841-02-41I21-L | 02_40_1i_2gb | REV02 | 2GB | 64MB | NA | NA | PLL programmed |

*used as reference

**Hardware Modules**

Design supports following carriers:

| Carrier Model | Notes |
|---|---|
| TE0701 | |
| TE0703 | |
| TE0705 | |
| TE0706 | used as reference carrier |
| TEBA0841 | |

*used as reference

**Hardware Carrier**

Additional HW Requirements:

| Additional Hardware | Notes |
|---|---|
| USB Cable for JTAG/UART | Check Carrier Board and Programmer for correct typ |
| XMOD Programmer | Carrier Board dependent, only if carrier has no own FTDI |
| heat sink | Heat sink is recommended urgently |

*used as reference

**Additional Hardware**

# Content

For general structure and usage of the reference design, see Project Delivery - AMD devices

## Design Sources

| Type | Location | Notes |
|---|---|---|
| Vivado | <project folder>\block_design<br><project folder>\constraints<br><project folder>\ip_lib<br><project folder>\board_files | Vivado Project will be generated by TE Scripts |
| Vitis | <project folder>\sw_lib | Additional Software Template for Vitis and apps_list.csv with settings automatically for Vitis app generation |
| PetaLinux | <project folder>\os\petalinux | PetaLinux template with current configuration |

**Design sources**

## Additional Sources

| Type | Location | Notes |
|---|---|---|
| SI5338 | <project folder>\misc\Si5338 | SI5338 Project with current PLL Configuration |

**Additional design sources**

## Prebuilt

| File | File-Extension | Description |
|---|---|---|
| BIT-File | *.bit | FPGA (PL Part) Configuration File |
| DebugProbes-File | *.ltx | Definition File for Vivado/Vivado Labtools Debugging Interface |
| Diverse Reports | --- | Report files in different formats |
| Hardware-Platform-Specification-Files | *.xsa | Exported Vivado Hardware Specification for Vitis and PetaLinux |
| LabTools Project-File | *.lpr | Vivado Labtools Project File |
| MCS-File | *.mcs | Flash Configuration File with Boot-Image (MicroBlaze or FPGA part only) |
| MMI-File | *.mmi | File with BRAM-Location to generate MCS or BIT-File with *.elf content (MicroBlaze only) |
| OS-Image | *.ub | Image with Linux Kernel (On Petalinux optional with Devicetree and RAM-Disk) |

| | | |
|---|---|---|
| Software-Application-File | *.elf | Software Application for Zynq or MicroBlaze Processor Systems |
| SREC-File | *.srec | Converted Software Application for MicroBlaze Processor Systems |

**Prebuilt files (only on ZIP with prebuilt content)**

## Download

Reference Design is only usable with the specified Vivado/Vitis/PetaLinux version. Do never use different Versions of Xilinx Software for the same Project.

Reference Design is available on:

- TE0841 "Test Board" Reference Design

# 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 Xilinx Design Flow.

See also:

- AMD Development Tools#XilinxSoftware-BasicUserGuides
- Vivado Projects - TE Reference Design
- Project Delivery.

The Trenz Electronic FPGA Reference Designs are TCL-script based project. Command files for execution will be generated with "_create_win_setup.cmd" on Windows OS and "_create_linux_setup.sh" on Linux OS.

TE Scripts are only needed to generate the vivado project, all other additional steps are optional and can also executed by Xilinx Vivado/Vitis GUI. For currently Scripts limitations on Win and Linux OS see: Project Delivery Currently limitations of functionality

> ⚠ **Caution!** Win OS has a 260 character limit for path lengths which can affect the Vivado tools. To avoid this issue, use Virtual Drive or the shortest possible names and directory locations for the reference design (for example "x:\<project folder>")

1. Run _create_win_setup.cmd/_create_linux_setup.sh and follow instructions on shell:

**_create_win_setup.cmd/_create_linux_setup.sh**

```
------------------------Set design paths---------------------------
-- Run Design with: _create_win_setup
-- Use Design Path: <absolute project path>
-------------------------------------------------------------------
------------------------TE Reference
Design--------------------------
-------------------------------------------------------------------
-- (0)  Module selection guide, project creation...prebuilt export...
-- (1)  Create minimum setup of CMD-Files and exit Batch
-- (2)  Create maximum setup of CMD-Files and exit Batch
-- (3)  (internal only) Dev
-- (4)  (internal only) Prod
-- (c)  Go to CMD-File Generation (Manual setup)
-- (d)  Go to Documentation (Web Documentation)
-- (g)  Install Board Files from Xilinx Board Store (beta)
-- (a)  Start design with unsupported Vivado Version (beta)
-- (x)  Exit Batch (nothing is done!)
----
Select (ex.:'0' for module selection guide):
```

2. Press 0 and enter to start "Module Selection Guide"
3. Create project and follow instructions of the product selection guide, settings file will be configured automatically during this process.
    - optional for manual changes: Select correct device and Xilinx install path on "design_basic_settings.cmd" and create Vivado project with "vivado_create_project_guimode.cmd"

    > Note: Select correct one, see also Vivado Board Part Flow

4. Create hardware description file (.xsa file) for PetaLinux project and export to prebuilt folder

**run on Vivado TCL (Script generates design and export files into "<project folder>\prebuilt\hardware\<short name>")**

```
TE::hw_build_design -export_prebuilt
```

> Using Vivado GUI is the same, except file export to prebuilt folder.

5. Create and configure your PetaLinux project with exported .xsa-file, see PetaLinux KICKstart
    - use TE Template from "<project folder>\os\petalinux"
    - use exported .xsa file from "<project folder>\prebuilt\hardware\<short name>" . **Note:** HW Export from Vivado GUI creates another path as default workspace.
    - The build images are located in the "<plnx-proj-root>/images/linux" directory

    > **Important Note**: Select correct Flash partition offset on petalinux-config: Subsystem Auto HW Settings  Flash Settings,  FPGA+Boot+bootenv=0xB00000 (increase automatically generate Boot partition), see TE0841 Test Board#Config

6. Configure the **boot.scr** file as needed, see Distro Boot with Boot.scr
7. Copy PetaLinux build image files(uboot.elf and image.ub) to prebuilt folder
    - copy **u-boot.elf** and **image.ub** "<plnx-proj-root>/images/linux" to prebuilt folder

    > "<project folder>\prebuilt\os\petalinux\<ddr size>" or "<project folder>\prebuilt\os\petalinux\<short name>"

8. Generate Programming Files with Vitis(Scripts generate applications and bootable files, which are defined in "sw_lib\apps_list.csv" and open Vitis)

    **run on Vivado TCL (Script generates applications and bootable files, which are defined in "test_board\sw_lib\apps_list.csv")**

    ```
    TE::sw_run_vitis -all
    TE::sw_run_vitis (optional; Start Vitis from Vivado GUI or start
    with TE Scripts on Vivado TCL)
    ```

    > TCL scripts generate also platform project, this must be done manually in case GUI is used. See Vitis

9. (optional) Update spi_bootloader.elf and/or scu_te084.elf

    a. Copy "\prebuilt\software\<short name>\spi_bootloader.elf" into "\firmware\microblaze_0\"
    b. Copy "\\workspace\sdk\scu\Release\scu.elf" into "\firmware\microblaze_mcs_0\"
    c. Regenerate Vivado Project or Update Bitfile only with "spi_bootloader.elf" and "scu_te0841.elf"

# Launch

## Programming

> Check Module and Carrier TRMs for proper HW configuration before you try any design.
>
> Reference Design is also available with prebuilt files. It's recommended to use TE prebuilt files for first launch.

Xilinx documentation for programming and debugging: Vivado/Vitis/SDSoC-Xilinx Software Programming and Debugging

### Get prebuilt boot binaries

1. Run _create_win_setup.cmd/_create_linux_setup.sh and follow instructions on shell
2. Press 0 and enter to start "Module Selection Guide"
    a. Select assembly version
    b. Validate selection
    c. Select create and open delivery binary folder

    > Note: Folder "<project folder>_binaries_<Article Name>" with subfolder "boot_<app name>" for different applications will be generated

## QSPI-Boot mode

Option for **u-boot.mcs** on QSPI Flash.
(u-boot.mcs contains all files necessary to boot up linux)

1. Connect the **USB cable**(JTAG) and **power supply** on carrier with module
2. Open Vivado Project with "vivado_open_existing_project_guimode.cmd" or if not created, create with "vivado_create_project_guimode.cmd"
   Enter the following TCL-Command into the TCL-Console inside Vivado to program the QSPI Flash.

   | **run on Vivado TCL (Script programs BOOT.bin on QSPI flash)** |
   | --- |
   | `TE::pr_program_flash -swapp u-boot` |

   ⚠ To program with Vitis/Vivado GUI, use special FSBL (fsbl_flash) on setup

3. Reboot (if not done automatically)

## SD-Boot mode

Not used on this Example.

## JTAG

Not used on this example.

# Usage

1. Prepare HW like described on section Programming
2. Connect UART USB (most cases same as JTAG)
3. Select QSPI as Boot Mode

   ⓘ Note: See TRM of the Carrier, which is used.

   ✓ Starting with Petalinux version 2020.1, the industry standard "Distro-Boot" boot flow for U-Boot was introduced, which significantly expands the possibilities of the boot process and has the primary goal of making booting much more standardised and predictable.
   The boot options described above describe the common boot processes for this hardware; other boot options are possible.
   For more information see Distro Boot with Boot.scr

4. Power On PCB

   1. FPGA Loads Bitfile from Flash

   2. MCS Firmware configure SI5338 and starts Microblaze

   3. SREC Bootloader from Bitfile Firmware loads U-Boot into DDR

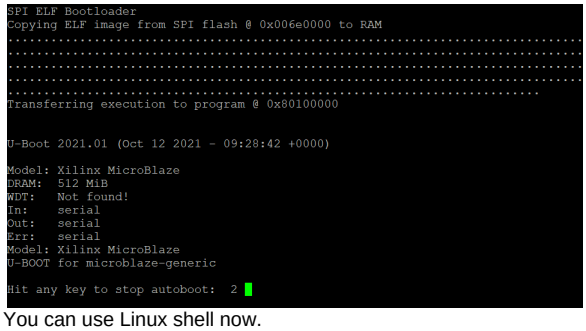
   4. U-boot loads Linux from QSPI Flash into DDR

## Linux

1. Open Serial Console (e.g. putty)
    - Speed: 9600
    - select COM Port

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

2. Boot process takes a while, please wait...

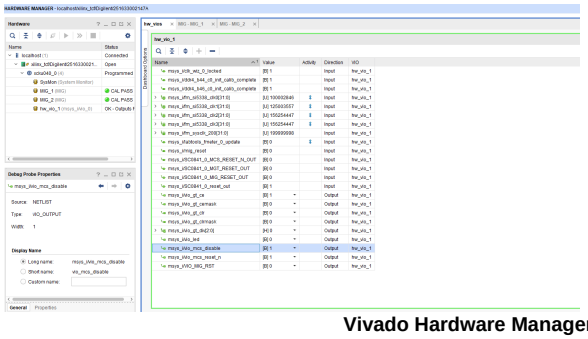



3. You can use Linux shell now.

## Vivado HW Manager

Open Vivado HW-Manager and add VIO signal to dashboard (*.ltx located on prebuilt folder)

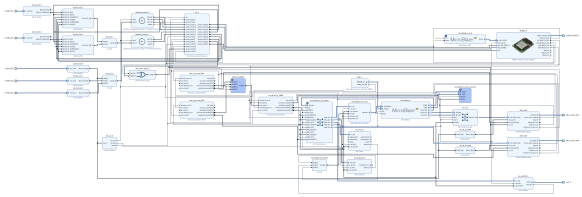
- Control:
    - SI will be configured with MCS firmware, default all off on PCB REV01, PCB REV02 SI5338 will be preconfigured.
    - LED control via VIO
    - MGT CLK Freq can be changed over BUFG_GT control signals divider
    - MCS Reset possible via VIO
    - MIG Reset is possible over VIO
    - MCS can be disabled over VIO (For PCB REV01 MCS is enabled, fpr PCB REV02 MCS is disabled by default VIO)
- Monitoring:
    - Set radix from VIO signals (fm_si...) to unsigned integer.
      Note: Frequency Counter is inaccurate and displayed unit is Hz



**Vivado Hardware Manager**

# System Design - Vivado

# Block Design



**Block Design PCB**

Note: REV01 has SI5338 programming default enabled and REV02 default disabled. SI5338 of REV02 is preprogrammed

# Constraints

## Basic module constraints

**_i_bitgen_common.xdc**

```
set_property BITSTREAM.GENERAL.COMPRESS TRUE [current_design]
set_property BITSTREAM.CONFIG.CONFIGRATE 69 [current_design]
set_property CFGBVS GND [current_design]
set_property CONFIG_VOLTAGE 1.8 [current_design]
set_property CONFIG_MODE SPIx4 [current_design]
set_property BITSTREAM.CONFIG.SPI_32BIT_ADDR YES [current_design]
set_property BITSTREAM.CONFIG.SPI_BUSWIDTH 4 [current_design]
set_property BITSTREAM.CONFIG.M1PIN PULLNONE [current_design]
set_property BITSTREAM.CONFIG.M2PIN PULLNONE [current_design]
set_property BITSTREAM.CONFIG.M0PIN PULLNONE [current_design]

set_property BITSTREAM.CONFIG.USR_ACCESS TIMESTAMP [current_design]
```

## Design specific constraints

**_i_io.xdc**

```
set_property PACKAGE_PIN AD28 [get_ports sc0841_interface_ddr4_par_44]
set_property PACKAGE_PIN C28 [get_ports sc0841_interface_ddr4_par_46]
set_property PACKAGE_PIN AD20 [get_ports sc0841_interface_en_ddr4pwr]
set_property PACKAGE_PIN AH23 [get_ports sc0841_interface_en_gtpwr]
set_property PACKAGE_PIN AF24 [get_ports sc0841_interface_en_osc]
set_property PACKAGE_PIN AB20 [get_ports sc0841_interface_pll_scl_io]
set_property PACKAGE_PIN P28 [get_ports sc0841_interface_xio_io]
set_property PACKAGE_PIN AE20 [get_ports sc0841_interface_pg_ddr]
set_property PACKAGE_PIN AH22 [get_ports sc0841_interface_pg_gt]
set_property PACKAGE_PIN AB19 [get_ports sc0841_interface_pll_sda_io]

set_property IOSTANDARD SSTL12_DCI [get_ports sc0841_interface_ddr4_par_44]
set_property IOSTANDARD SSTL12_DCI [get_ports sc0841_interface_ddr4_par_46]
set_property IOSTANDARD LVCMOS33 [get_ports sc0841_interface_en_ddr4pwr]
set_property IOSTANDARD LVCMOS33 [get_ports sc0841_interface_en_gtpwr]
set_property IOSTANDARD LVCMOS33 [get_ports sc0841_interface_en_osc]
set_property IOSTANDARD LVCMOS33 [get_ports sc0841_interface_pll_scl_io]
set_property IOSTANDARD LVCMOS18 [get_ports sc0841_interface_xio_io]
set_property IOSTANDARD LVCMOS33 [get_ports sc0841_interface_pg_ddr]
set_property IOSTANDARD LVCMOS33 [get_ports sc0841_interface_pg_gt]
set_property IOSTANDARD LVCMOS33 [get_ports sc0841_interface_pll_sda_io]
```

**_i_ddr4.xdc**

```
set_property CLOCK_DEDICATED_ROUTE BACKBONE [get_pins -hier -filter {NAME
=~ */u_ddr4_infrastructure/gen_mmcme*.u_mmcme_adv_inst/CLKIN1}]
set_property BITSTREAM.CONFIG.UNUSEDPIN PULLUP [current_design]

create_clock -period 4.950 -name ddr4_0_clk [get_pins */ddr4_b44/*
/u_ddr4_infrastructure/gen_mmcme*.u_mmcme_adv_inst/CLKIN1]
create_clock -period 4.950 -name ddr4_1_clk [get_pins */ddr4_b46/*
/u_ddr4_infrastructure/gen_mmcme*.u_mmcme_adv_inst/CLKIN1]
```

**_i_qspi.xdc**

```
# You must provide all the delay numbers
# CCLK delay is 0.1, 6.7 ns min/max for ultra-scale devices; refer Data
sheet
# Consider the max delay for worst case analysis
# Max delay constraints are used to instruct the tool to place IP near to
STARTUPE3 primitive.
# If needed adjust the delays appropriately
#set_max_delay -datapath_only -from [get_clocks clk_out2_msys_clk_wiz_0_0]
-to [get_pins -hier *STARTUP*_inst/DO[*] {*STARTUP*_inst/DTS[*]}] 1.000


create_generated_clock -name clk_sck -source [get_pins -hierarchical
*axi_quad_spi_0/ext_spi_clk] -edges {3 5 7} -edge_shift {6.700 6.700
6.700} [get_pins -hierarchical *USRCCLKO]
set_multicycle_path -setup -from clk_sck -to [get_clocks -of_objects
[get_pins -hierarchical */ext_spi_clk]] 2
set_multicycle_path -hold -end -from clk_sck -to [get_clocks -of_objects
[get_pins -hierarchical */ext_spi_clk]] 1
set_multicycle_path -setup -start -from [get_clocks -of_objects [get_pins -
hierarchical */ext_spi_clk]] -to clk_sck 2
set_multicycle_path -hold -from [get_clocks -of_objects [get_pins -
hierarchical */ext_spi_clk]] -to clk_sck 1
set_max_delay -datapath_only -from [get_pins -hier {*STARTUP*_inst/DI[*]}]
1.000
set_max_delay -datapath_only -from [get_clocks clk_out2_msys_clk_wiz_0_0] -
to [get_pins -hier *STARTUP*_inst/USRCCLKO] 1.000
set_max_delay -datapath_only -from [get_clocks clk_out2_msys_clk_wiz_0_0] -
to [get_pins -hier {*STARTUP*_inst/DO[*]}] 1.000
set_max_delay -datapath_only -from [get_clocks clk_out2_msys_clk_wiz_0_0] -
to [get_pins -hier {*STARTUP*_inst/DTS[*]}] 1.000
```

**_i_fm.xdc**

```
current_instance msys_i/ddr4_b46/inst
set_property LOC MMCME3_ADV_X0Y2 [get_cells -hier -filter {NAME =~ *
/u_ddr4_infrastructure/gen_mmcme*.u_mmcme_adv_inst}]
current_instance -quiet
current_instance msys_i/ddr4_b44/inst
set_property LOC MMCME3_ADV_X0Y0 [get_cells -hier -filter {NAME =~ *
/u_ddr4_infrastructure/gen_mmcme*.u_mmcme_adv_inst}]

current_instance -quiet
set_false_path -from [get_clocks -of_objects [get_pins msys_i/clk_wiz_0
/inst/mmcme3_adv_inst/CLKOUT0]] -to [get_clocks si5338_clk0_clk_p]
set_false_path -from [get_clocks -of_objects [get_pins msys_i/clk_wiz_0
/inst/mmcme3_adv_inst/CLKOUT0]] -to [get_clocks si5338_clk3_clk_p]
set_false_path -from [get_clocks -of_objects [get_pins msys_i/clk_wiz_0
/inst/mmcme3_adv_inst/CLKOUT0]] -to [get_clocks -of_objects [get_pins
{msys_i/util_ds_buf_6/U0/USE_BUFG_GT.GEN_BUFG_GT[0].BUFG_GT_U/O}]]
set_false_path -from [get_clocks si5338_clk3_clk_p] -to [get_clocks -
of_objects [get_pins msys_i/clk_wiz_0/inst/mmcme3_adv_inst/CLKOUT0]]
set_false_path -from [get_clocks -of_objects [get_pins msys_i/ddr4_b44/inst
/u_ddr4_infrastructure/gen_mmcme3.u_mmcme_adv_inst/CLKOUT0]] -to
[get_clocks -of_objects [get_pins msys_i/clk_wiz_0/inst/mmcme3_adv_inst
/CLKOUT0]]
set_false_path -from [get_clocks -of_objects [get_pins msys_i/ddr4_b46/inst
/u_ddr4_infrastructure/gen_mmcme3.u_mmcme_adv_inst/CLKOUT0]] -to
[get_clocks -of_objects [get_pins msys_i/clk_wiz_0/inst/mmcme3_adv_inst
/CLKOUT0]]
set_false_path -from [get_clocks -of_objects [get_pins msys_i/clk_wiz_0
/inst/mmcme3_adv_inst/CLKOUT0]] -to [get_clocks -of_objects [get_pins
{msys_i/util_ds_buf_5/U0/USE_BUFG_GT.GEN_BUFG_GT[0].BUFG_GT_U/O}]]
set_false_path -from [get_clocks -of_objects [get_pins msys_i/ddr4_b44/inst
/u_ddr4_infrastructure/gen_mmcme3.u_mmcme_adv_inst/CLKOUT0]] -to
[get_clocks -of_objects [get_pins msys_i/clk_wiz_0/inst/mmcme3_adv_inst
/CLKOUT0]]
set_false_path -from [get_clocks -of_objects [get_pins msys_i/ddr4_b46/inst
/u_ddr4_infrastructure/gen_mmcme3.u_mmcme_adv_inst/CLKOUT0]] -to
[get_clocks -of_objects [get_pins msys_i/clk_wiz_0/inst/mmcme3_adv_inst
/CLKOUT0]]
```

# Software Design - Vitis

For Vitis project creation, follow instructions from:

Vitis

## Application

Template location: "<project folder>\sw_lib\sw_apps\"

### scu

MCS Firmware to configure SI5338 and Reset System.

## spi_bootloader

TE modified SPI Bootloader from Henrik Brix Andersen.

Bootloader to load app or second bootloader from flash into DDR.

Here it loads the u-boot.elf from QSPI-Flash to RAM. Hence u-boot.srec becomes redundant.

Descriptions:

- Modified Files: bootloader.c
- Changes:
    - Change the SPI defines in the header
    - Add some reiteration in the frist spi read call

## hello_te0841

Hello TE0841 is a Xilinx Hello World example as endless loop instead of one console output.

## u-boot

U-Boot.elf is generated with PetaLinux. SDK/HSI is used to generate u-boot.srec. Vivado to generate *.mcs

# Software Design - PetaLinux

For PetaLinux installation and project creation, follow instructions from:

- PetaLinux KICKstart

## Config

Start with **petalinux-config** or **petalinux-config --get-hw-description**

Changes:

- SUBSYSTEM_FLASH_AXI_QUAD_SPI_0_BANKLESS_PART0_SIZE = **0x6E0000** (fpga)
- SUBSYSTEM_FLASH_AXI_QUAD_SPI_0_BANKLESS_PART1_SIZE = **0x400000** (boot)
- SUBSYSTEM_FLASH_AXI_QUAD_SPI_0_BANKLESS_PART2_SIZE = **0x20000** (bootenv)
- SUBSYSTEM_FLASH_AXI_QUAD_SPI_0_BANKLESS_PART3_SIZE = **0xB00000** (kernel)

    - (with this kernel flash address is 0xB00000 (fpga+boot+bootenv) and Kernel size 0xB00000)

## U-Boot

Start with **petalinux-config -c u-boot**

Changes:

- No changes.

Content of **platform-top.h** located in <plnx-proj-root>\project-spec\meta-user\recipes-bsp\u-boot\files:

```
#include <configs/microblaze-generic.h>
#include <configs/platform-auto.h>

#define CONFIG_SYS_BOOTM_LEN 0xF000000
```

## Device Tree

Content of **system-user.dtsi** located in <petalinux project directory>\project-spec\meta-user\recipes-bsp\device-tree\files:

```
/include/ "system-conf.dtsi"
/ {
};
```

## Kernel

Start with **petalinux-config -c kernel**

Changes:

- No changes.

## Rootfs

Start with **petalinux-config -c rootfs**

Changes:

- # CONFIG_dropbear is not set
- # CONFIG_dropbear-dev is not set
- # CONFIG_dropbear-dbg is not set
- # CONFIG_packagegroup-core-ssh-dropbear is not set
- # CONFIG_packagegroup-core-ssh-dropbear-dev is not set
- # CONFIG_packagegroup-core-ssh-dropbear-dbg is not set
- # CONFIG_imagefeature-ssh-server-dropbear is not set

## Applications

No additional application.

# Additional Software

## SI5338

File location "<project folder>\misc\Si5338\Si5338-*.slabtimeproj"

General documentation how you work with this project will be available on Si5338

# App. A: Change History and Legal Notices

## Document Change History

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

| Date | Document Revision | Authors | Description |
|---|---|---|---|
| **Error rendering macro 'page-info'**<br>Ambiguous method overloading for method jdk.proxy241.$Proxy3496#hasContentLevelPermission. Cannot resolve which method to invoke for [null, class java. | **Error rendering macro 'page-info'**<br>Ambiguous method overloading for method jdk.proxy241.$Proxy3496#hasContentLevelPermission. Cannot resolve which method to invoke for [null, class java. | **Error rendering macro 'page-info'**<br>Ambiguous method overloading for method jdk.proxy241.$Proxy3496#hasContentLevelPermission. Cannot resolve which method to invoke for [null, class java. | • new document style<br>• 21.2 release |

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| 2020-05-13 | v.8 | John Hartfiel | • 19.2 release |
| 2018-08-07 | v.7 | John Hartfiel | • some notes |
| 2018-06-21 | v.5 | John Hartfiel | • Design update<br>• new assembly variants (PCB REV02 |
| 2018-06-21 | v.3 | John Hartfiel | • Release 2017.4 |
| 2018-04-16 | v.1 | John Hartfiel | • Initial release |
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**Document change history.**

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