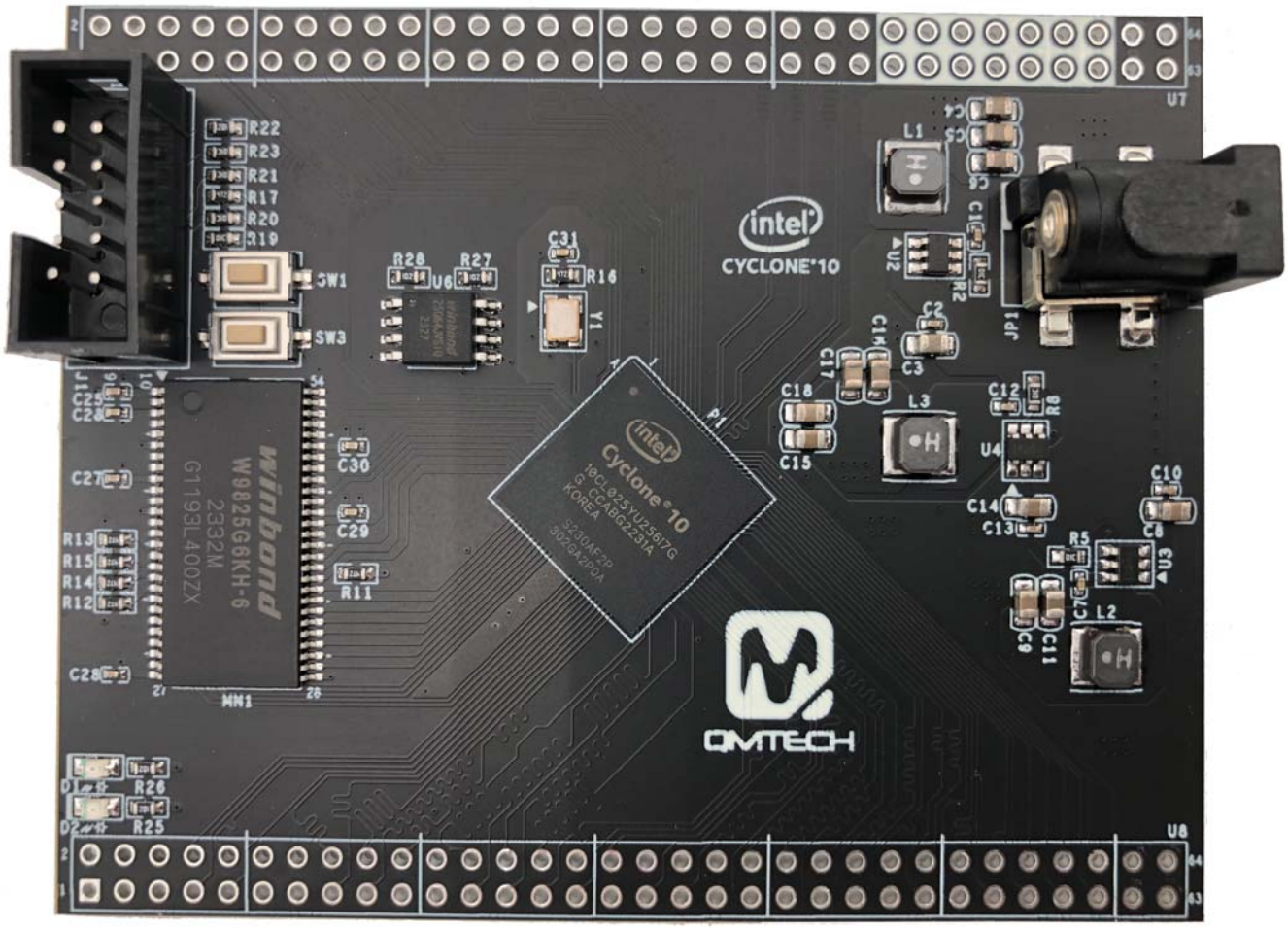
INTEL CYCLONE10 CORE BOARD

USER MANUAL



Preface

The QMTECH® Cyclone 10 Core Board uses Intel® (Altera) 10CL025 device to demonstrate the industry's lowest system cost and power, along with performance levels that make the device family ideal for differentiating your high-volume applications. All Intel® Cyclone® 10 LP FPGAs require only two core power supplies for operation, simplifying your power distribution network and saving you board costs, board space, and design time. The flexibility of the Intel® Cyclone® 10 LP FPGA enables you to design in a smaller, lower cost device, lowering your total system costs.

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1. Introduction

1.1 Document Scope

This demo user manual introduces the QMTECH Cyclone10 10CL025 core board and describes how to setup the core board running with application software Altera Quartus II 17.0. Users may employee the on board rich logic resource FPGA 10CL025YU256I7G and large SDRAM memory W9825G6KH-6 to implement various applications. The core board also has 90 non-multiplexed FPGA IOs for extending customized modules, such as UART module, CMOS/CCD camera module, LCD/HDMI/VGA display module etc.

1.2 Kit Overview

Below section lists the parameters of the 10CL025 core board:

- On-Board FPGA: 10CL025YU256I7G;
- On-Board FPGA external crystal frequency: 50MHz;
- 10CL025YU256I7G has rich block RAM resource;
- 10CL025YU256I7G has 25K Logic elements;
- On-Board W25Q64 SPI Flash, 8M bytes for user configuration code;
- On-Board 32MB Winbond SDRAM, W9825G6KH-6;
- On-Board power supply for FPGA by using TPS563201 wide input range DC/DC;
- 10CL025 core board has two 64p, 2.54mm pitch headers for extending user IOs**(90 IOs + 4 CLK Inputs)**. All IOs are precisely designed with length matching;
- 10CL025 core board has 2 user switches;
- 10CL025 core board has 2 user LEDs;
- 10CL025 core board has JTAG interface, by using 10p, 2.54mm pitch header;
- 10CL025 core board PCB size is: 6.7cm x 8.4cm;
- Default power source for core board is: 1A@5V DC, the DC header type: DC-050, 5.5mmx2.1mm;

1.3 Kit Top View

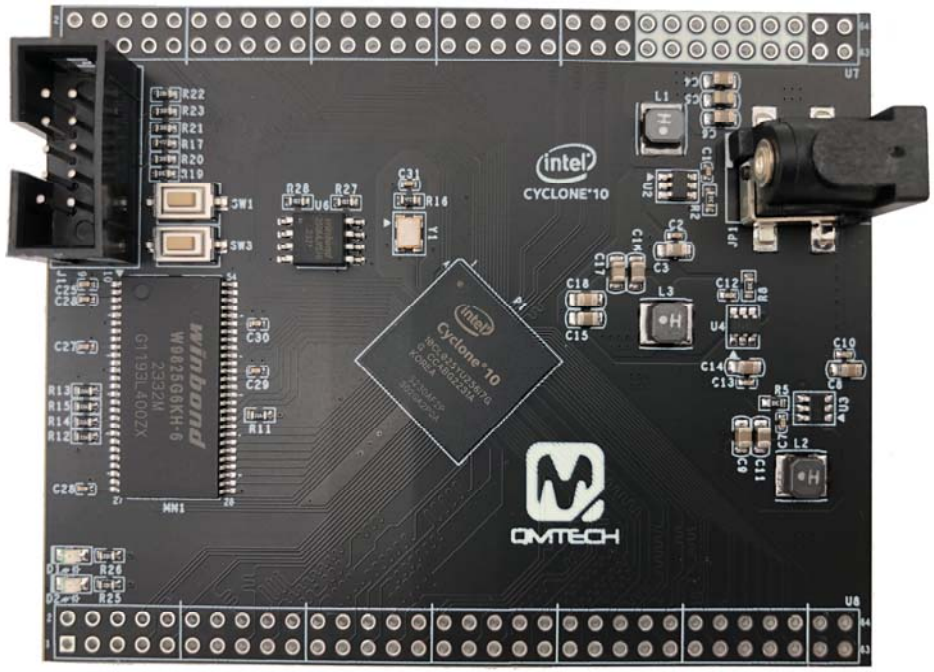

Figure 1-1. QMTECH 10CL025 Core Board Top View

2. Getting Started

Below image shows the dimension of the QMTECH Cyclone10 10CL025 core board: 67.1mm x 84.1mm. The unit in below image is millimeter(mm).

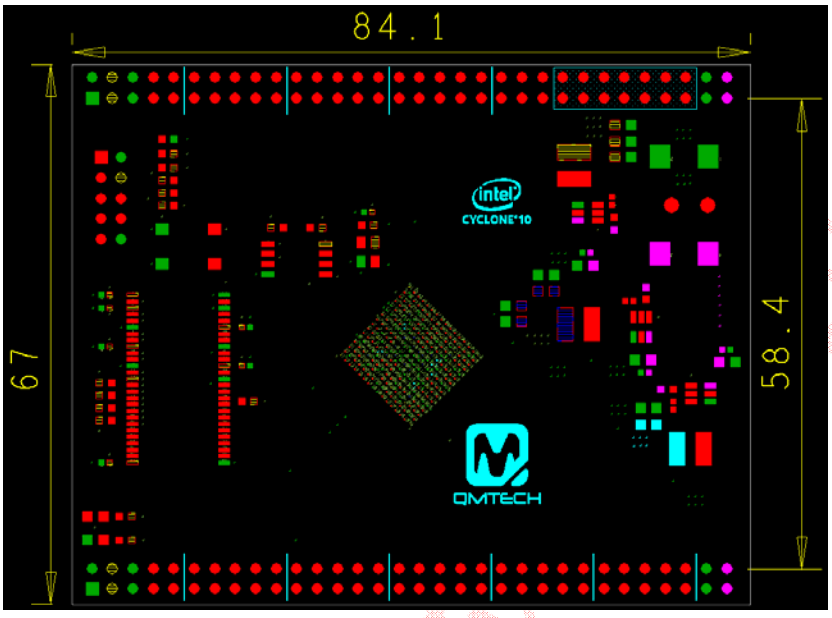

Figure 2-1. 10CL025 Core Board Dimension

To develop 10CL025 core board, users need to prepare for Altera Quartus II 17.0, Altera USB Blaster cable and 5V DC power supply. Below image shows the Altera Quartus II 17.0 development environment which could be downloaded from Intel(Altera) office website:

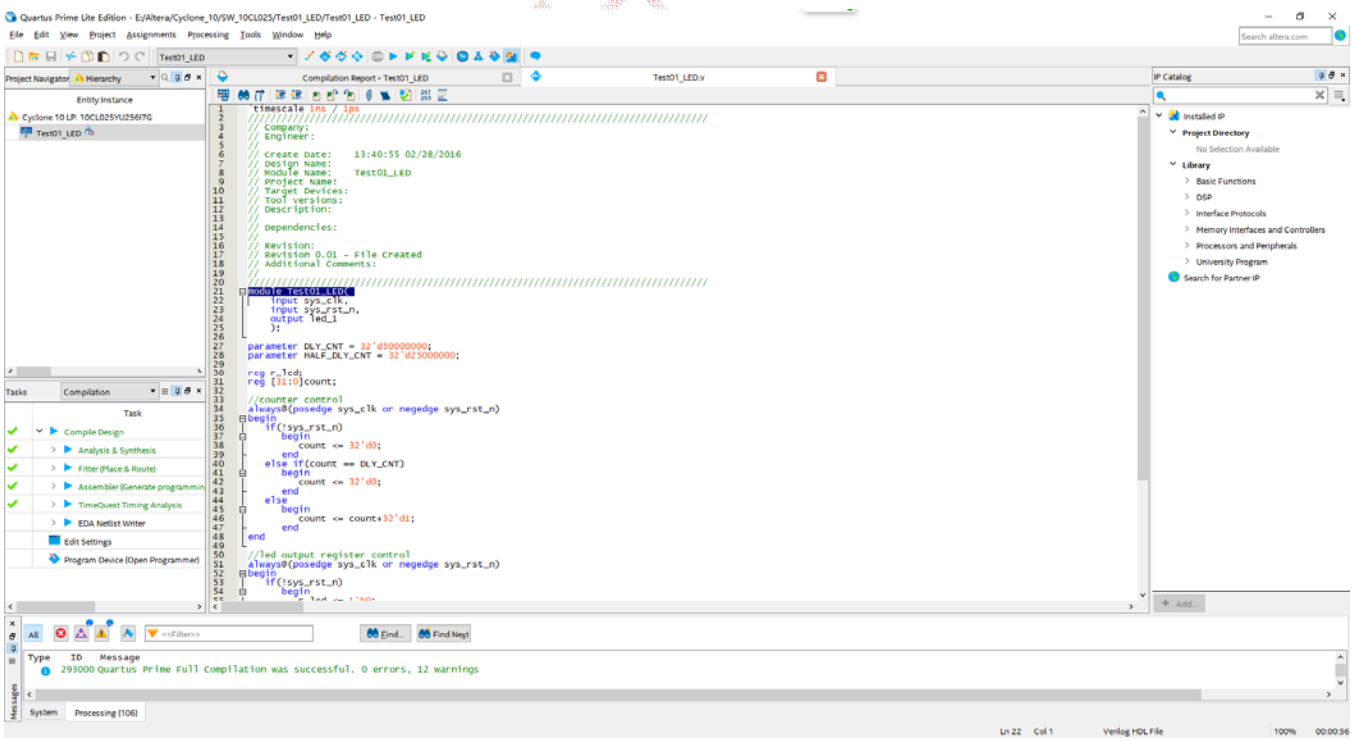

Figure 2-2. Test Example with Quartus 17.0

2.2 QMTECH 10CL025 Core Board Hardware Design

2.2.1 10CL025 Core Board Power Supply

The core board needs 5V DC input as power supply which could be directly injected from power header or the 64P header U7/U8. Users may refer to the hardware schematic for the detailed design. The on board LED D2 indicates the 3.3V supply, it will be turned on when the 5V power supply is active. In default status, all the FPGA banks IO power level is 3.3V because bank power supply is 3.3V.

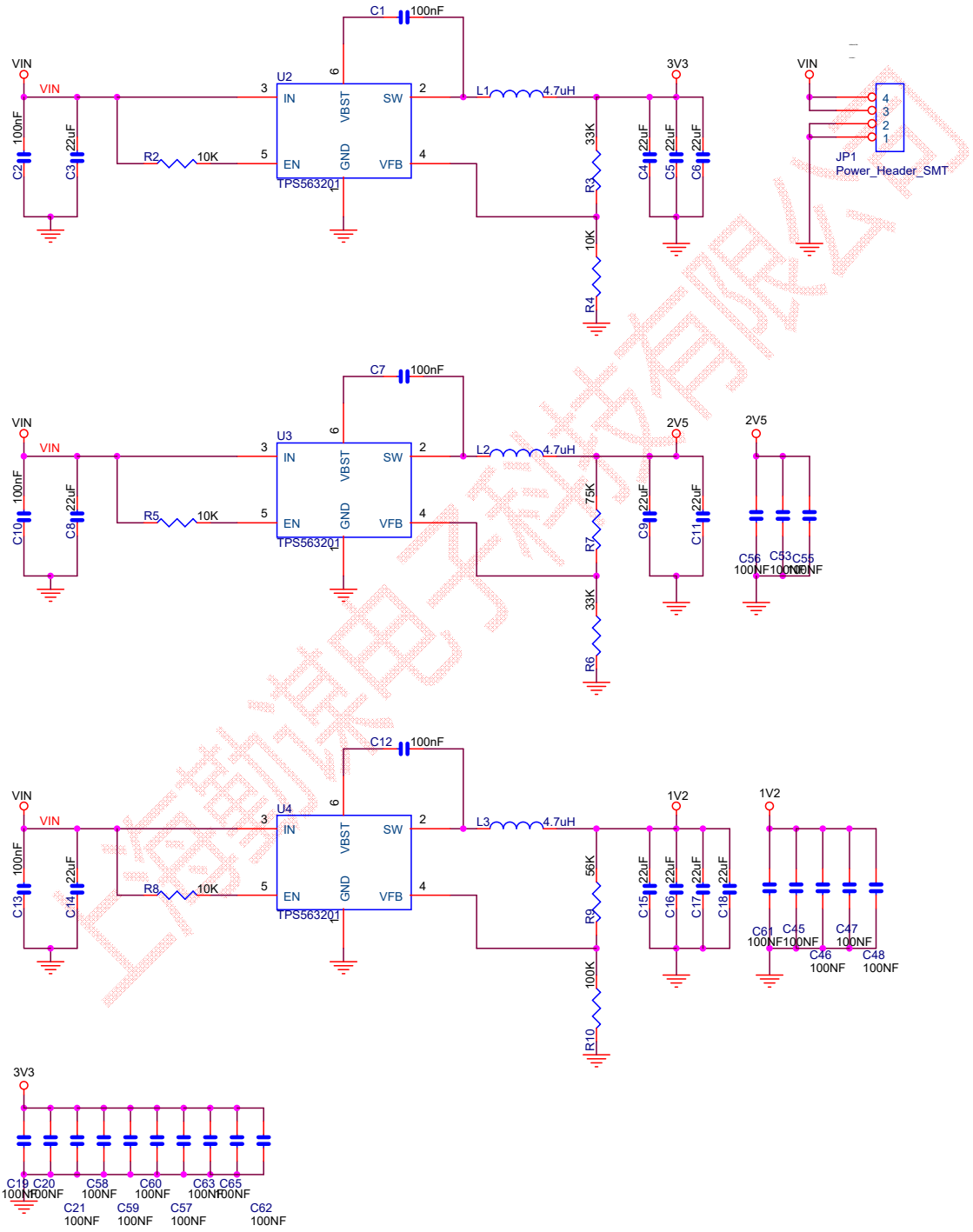

Figure 2-3. Power Supply for the FPGA

2.2.2 10CL025 Core Board SDRAM Memory

The core board has on board 16bit width data bus, 32MB memory size W9825G6KH-6 SDRAM provided by Winbond. Below image shows the detailed hardware design:

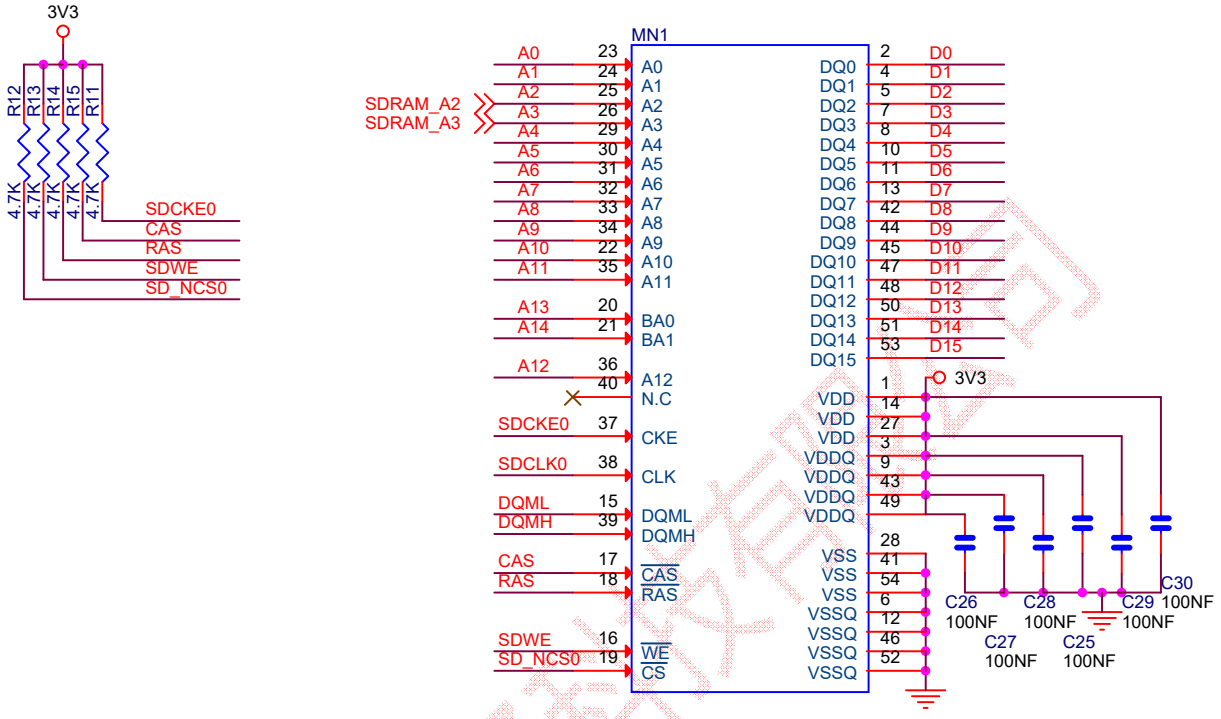

Figure 2-4. SDRAM

2.2.3 10CL025 Core Board SPI Boot

The core board boots from external SPI Flash, detailed hardware design is shown in below figure. The SPI flash is using W25Q64 manufactured by Winbond, with 64Mbit memory storage.

Note: The SPI Flash is designed with x1 mode.

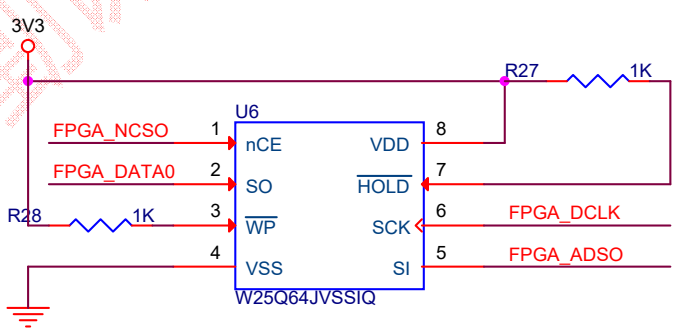

Figure 2-5. SPI Flash

Below image shows the hardware configuration of MSEL[2:0]=101: AS x 1; Fast POR, 3.3V IO:

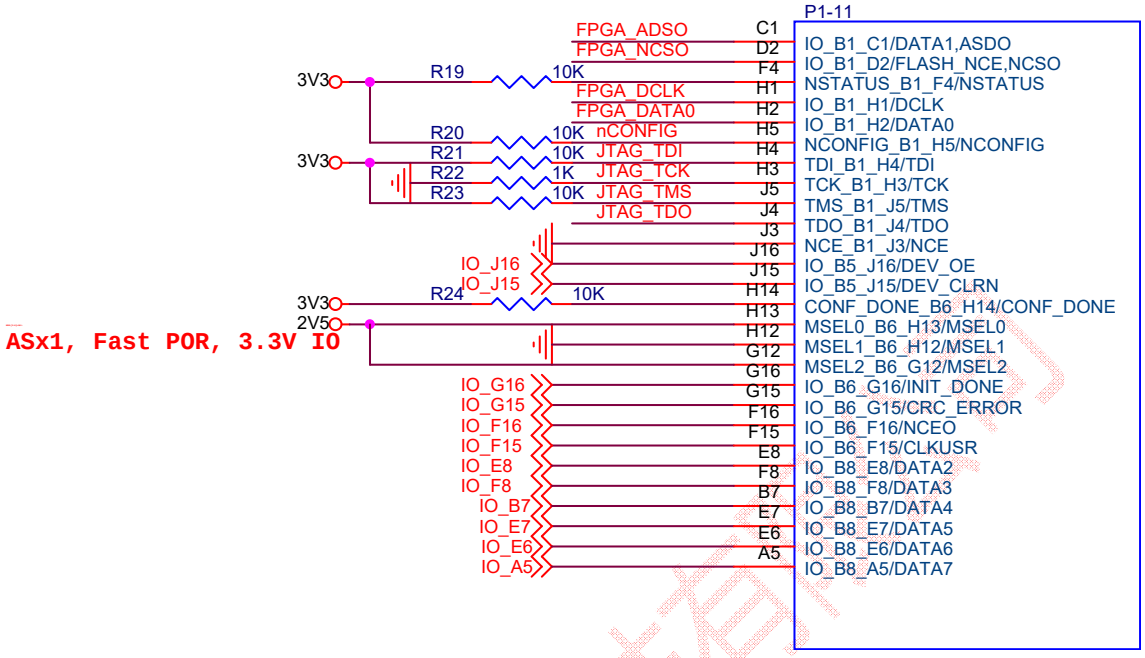

Figure 2-6. MSEL Settings

2.2.4 10CL025 Core Board System Clock

The core board has system clock frequency 50MHz which is directly provided by external crystal. The crystal is designed with high accuracy and stability with low temperature drift 10ppm/°c. Below image shows the detailed hardware design:

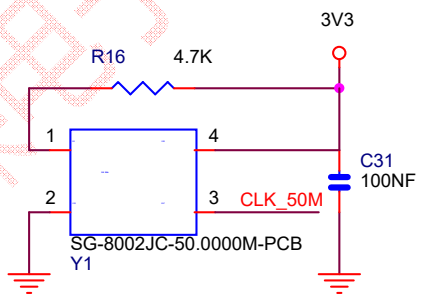

Figure 2-7. 50MHz System Clock

2.2.1 10CL025 Core Board JTAG Port

The on board JTAG port uses 10P 2.54mm pitch header which could be easily connected to Altera USB blaster cable. Below image shows the hardware design of the JTAG port:

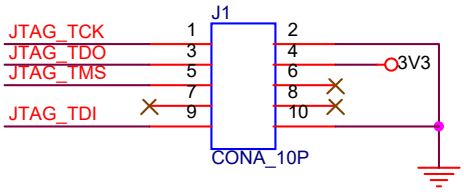

Figure 2-8. JTAG Port

2.2.2 10CL025 Core Board Extension IOs

The core board has two 64P 2.54mm pitch female headers which are used for extending user modules, such as ADC/DAC module, audio/video module, ethernet module, etc.

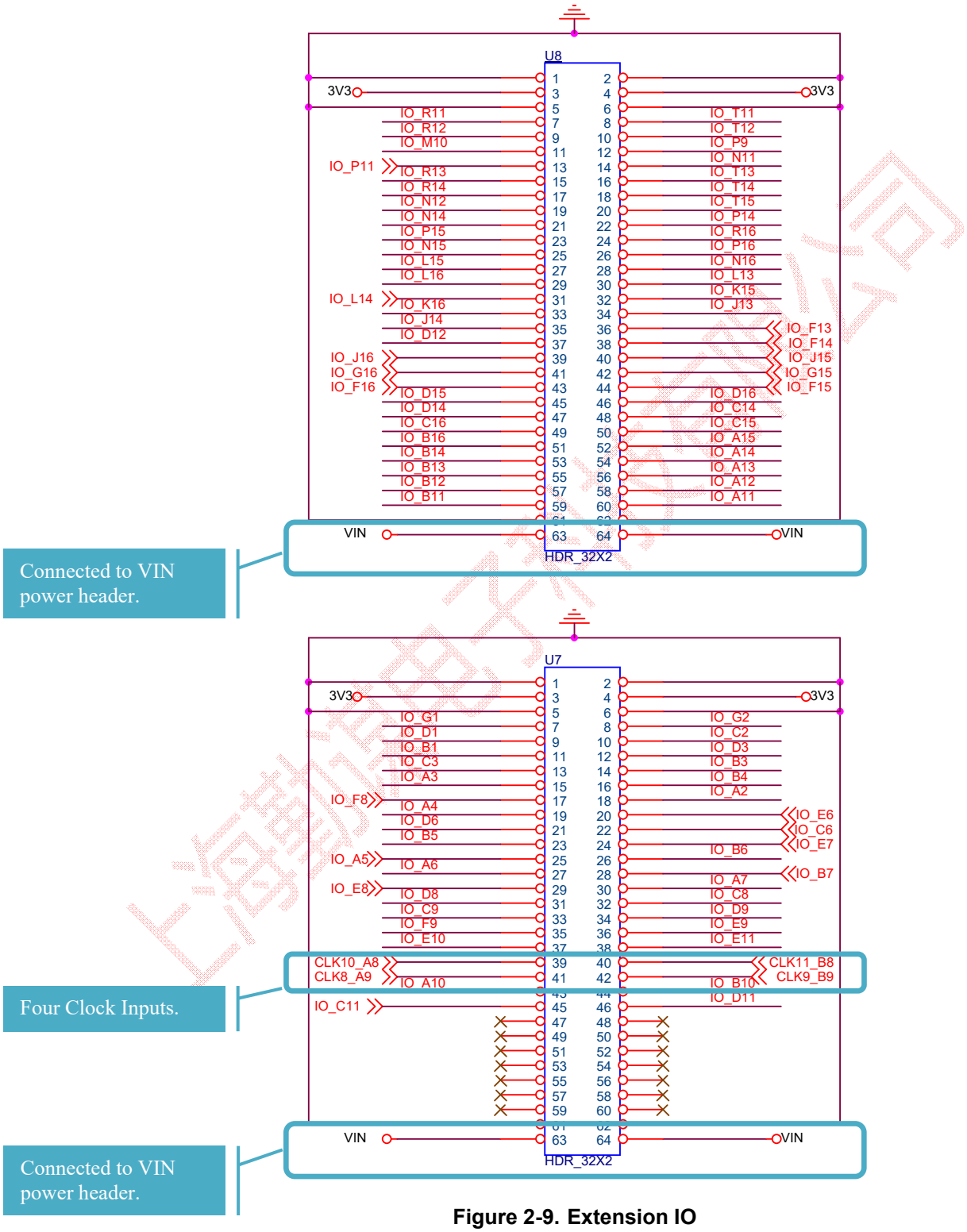

Figure 2-9. Extension IO

2.2.3 10CL025 Core Board User LEDs

Below image shows one user LED and 3.3V power supply indicator:

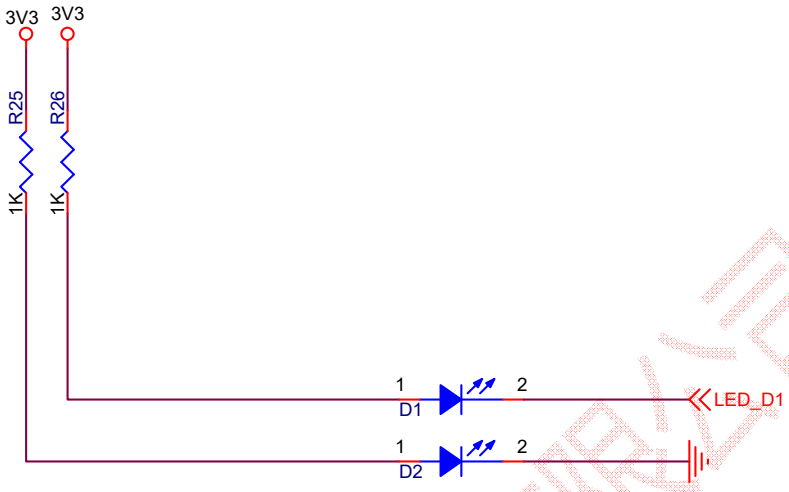

Figure 2-10. User LEDs

2.2.4 10CL025 Core Board User Keys

Below image shows the nCONFIG key and user key:

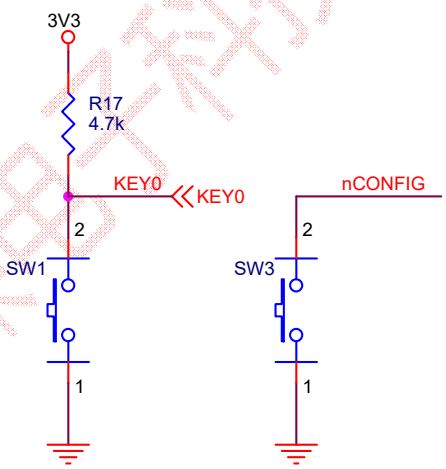

Figure 2-11. User Keys

3. Reference

[1] 10cl025-sdram-v01.pdf
[2] c10lp-51002.pdf
[3] c10lp-51003.pdf
[4] pcg-01021.pdf
[5] cyclone-10-lp-product-table.pdf
[6] an800.pdf
[7] aib-01029.pdf

4. Revision

Doc. Rev.	Date	Comments
0.1	11/08/2023	Initial Version.
1.0	11/16/2023	V1.0 Formal Release.