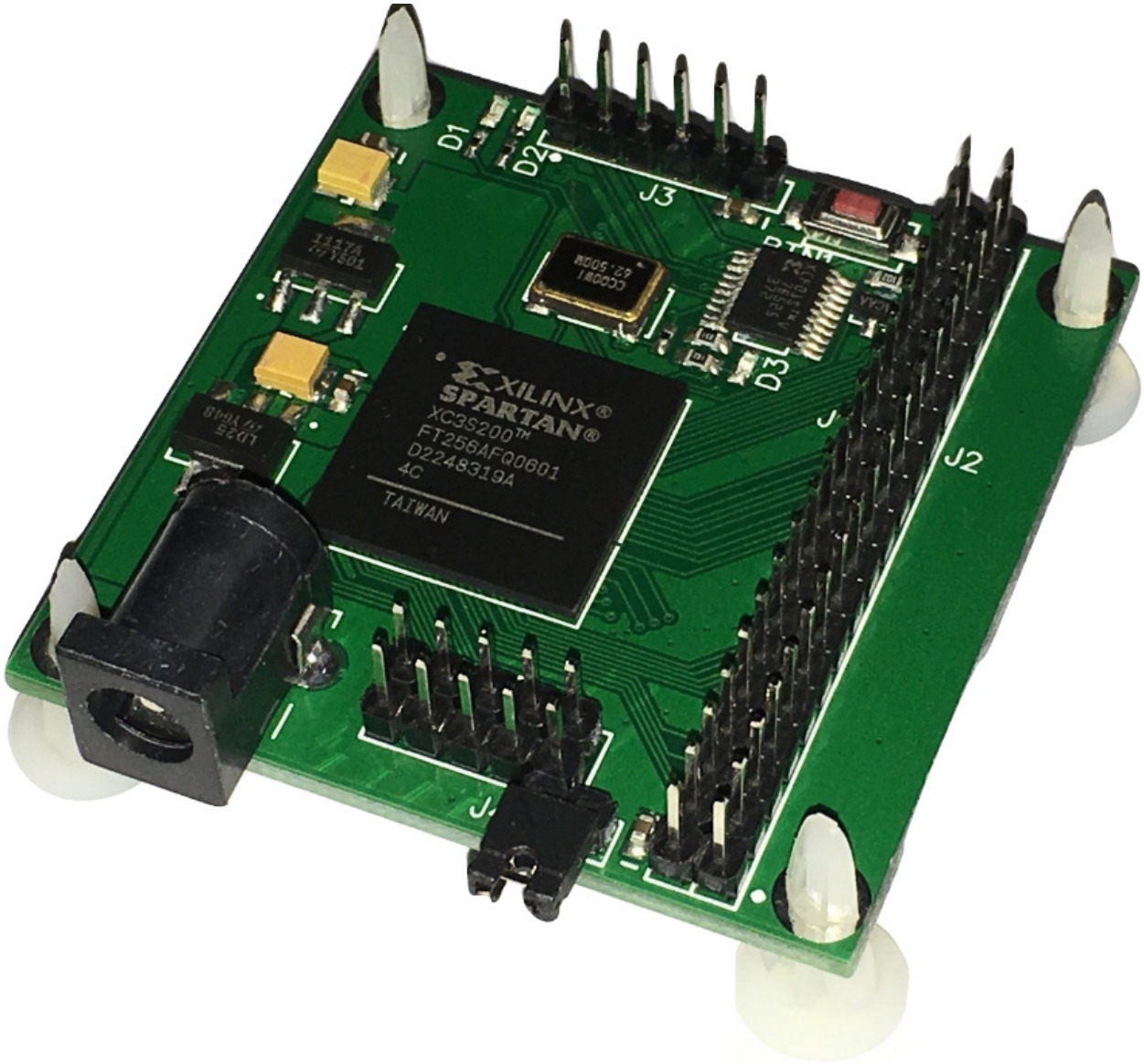
XILINX SPARTAN-3 FPGA MODULE USER's GUIDE

MODEL: XM2F3-200-1 62.5M Revision A



Introduction

Xilinx Spartan-3 XM2F3 FPGA module is designed for rapid prototyping and implementing FPGA projects. Module can be used for educational purposes. Module can work independently, or as control module in the bigger design.

Features

1) Xilinx XC3S200 FT256 FPGA
- 200,000-gates (4,320 Logic Cells)
- 12x 18x18 hardware multipliers
- 12x 18K-bits block RAMs (216K)
- 4 Digital Clock Managers
- 173 User I/O (49 routed on this board)

2) Xilinx XCF01S VO20C Flash
- 1 Mbit Platform Flash PROM
- IEEE Standard 1149.1/1532 Boundary-Scan (JTAG) support for programming
- Endurance of 20000 Program/Erase Cycles

3) Onboard IO peripherals
- 62.5MHz CMOS oscillator
- Two IO LEDs

4) Handy configuration
- JTAG header connected to JTAG chain
- Mode select jumper (JTAG or FLASH)
- Push button for manual initiation of configuration process
- Reset supervision by voltage monitor
- DONE LED

5) Onboard power supply
- 3.3V (IO, PERIPHERALS)
- 2.5V (VCCAUX, JTAG)
- 1.2V (CORE VOLTAGE)
- Input voltage range 5V – 15V.
- Power-ON LED

6) 44 independent I/O routed to the connectors
- Two 19 pin male connectors (18 IO + 1 power)
- One 10 pin connector (8 IO + 2 power)
- 2.54mm pitch for all connectors
- Small 50x50mm PCB with M3 mounting holes

Instructions

To create your own project, you must study XILINX design tools.
This software is free of charge and can be downloaded from www.xilinx.com
You should also have some knowledge in VHDL, Verilog or basic electronic schematics. Those are 3 main input methods in ISE software (One method is enough to create simple project). You can also use Xilinx Platform Studio (XPS) to fit XILINX MICROBLAZE soft-core into your FPGA module, and then, you can run your C/C++ application on FPGA. Use XILINX SDK to create your C/C++ projects. Demo project for this board is created in XILINX ISE 14.7.

1) The Spartan-3 family is a superior alternative to mask programmed ASICs. FPGAs avoid the high initial cost, the lengthy development cycles, and the inherent inflexibility of conventional ASICs. Also, FPGA programmability permits design upgrades in the field with no hardware replacement necessary, an impossibility with ASICs. This board has Xilinx XC3S200 FT256 4C FPGA IC (256 ball package, speed grade 4, commercial temperature range 0°C to +85°C).

- Spartan-3 FPGA Family Data Sheet:
  http://www.xilinx.com/support/documentation/data_sheets/ds099.pdf

2) Xilinx Platform Flash can be directly programmed via JTAG. Same as FPGA.
There are 1,048,576 configuration bits in XCF01S Flash. XC3S200 FPGA requires 1,047,616.
Demo project, for testing this board, will be stored in flash.

- Platform Flash PROM User Guide:
  http://www.xilinx.com/support/documentation/user_guides/ug161.pdf

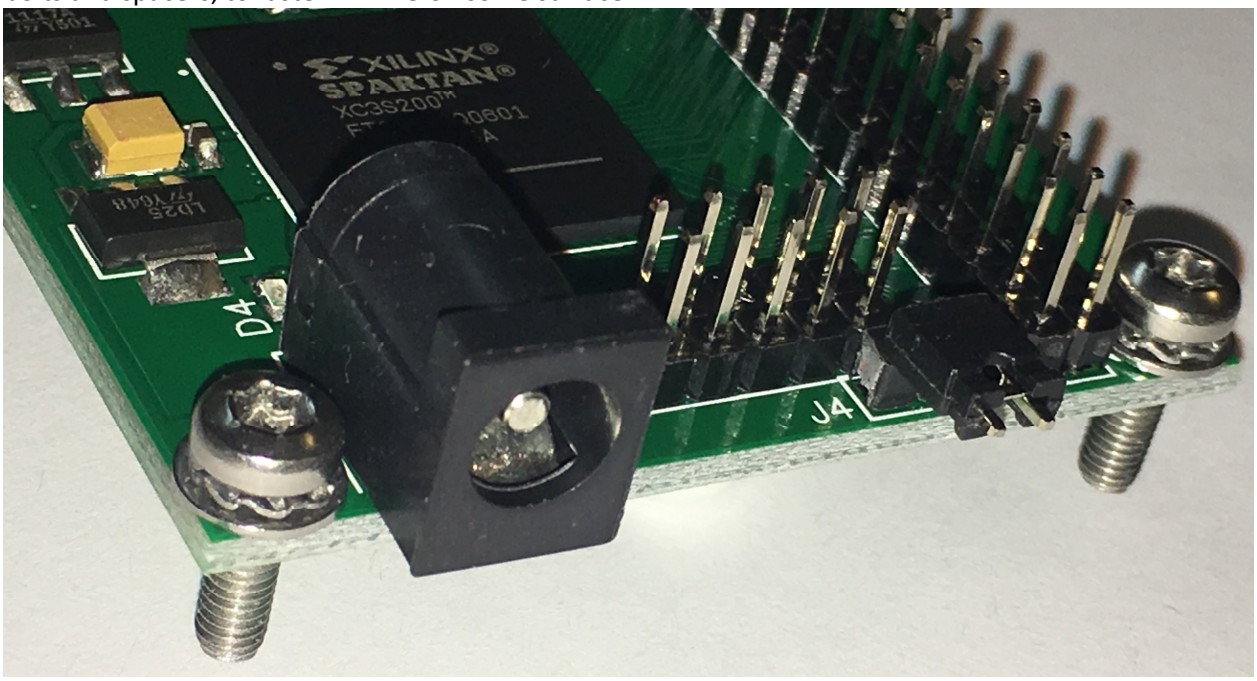
3) Board has few simple peripherals onboard. 2 yellow LEDs, pins A5 and A12. 62.5MHz CMOS Crystal oscillator, connected to GCLK6 input, pin A8. You can use DCM, to convert oscillator frequency, to value between 18Mhz -280Mhz.

- Using Digital Clock Managers (DCMs) in Spartan-3 FPGAs:
  http://www.xilinx.com/support/documentation/application_notes/xapp462.pdf

4) J3 is JTAG connector. There are two devices on JTAG chain: FPGA and Flash.
J4 is FPGA mode select jumper. When jumper is connected, all tree FPGA mode pins are tied to GND. This is Master Serial mode (load from flash). When Jumper is removed, M0 and M2 pins are tied to VCCAUX by internal FPGA resistors, this is JTAG mode (waiting configuration from JTAG, not loading from the flash).
BTN1 is push button, what is connected to PROG_B pin for manual initiation of configuration process at any time. To configure or reconfigure FPGA from FLASH, insert J4 jumper and press BTN1 button. To clear FPGA configuration and put it in JTAG mode, remove J4 jumper and press BTN1 button. You can configure your FPGA via cable, without experiencing errors, when module is in JTAG mode.
There is MAX809 reset supervisor IC, connected to PROG_B pin. The function of the MAX809 is to monitor the 3.3V VCC supply voltage, and assert PROG_B signal low whenever this voltage declines below the 3.08V reset threshold. The reset signal remains asserted for 240ms after VCC rises above the threshold. This ensures that during power on, flash will be ready before FPGA, for proper bitstream loading. D3 is DONE LED. It turns on after FPGA has finished configuration process.

5) There are three voltage regulators on the board. They are making all needed voltages for the module. There is only need to connect main DC power to the J6 input. Module will work with input voltages from 5V to 15V. It is recommended to use low voltage, like 5V, because voltage regulators will spread much heat, if high input voltage is applied.
D4 is a POWER-ON LED, when it is on, it means that there is input DC voltage with correct polarity connected.

6) There are total 44 I/O pins, what are routed to the connectors, and can be used in your design. Please refer to the board schematics, to get information about connections. All I/O are independent and not crossing with any module peripherals. First pins of J2 and J5 are connected to GND. First pin of J1 and second pin of J5 are connected to 3.3V. Please note that all FPGA banks are powered from 3.3V, it means that you must use I/O standard "LVCMOS33" or "LVTTL" in your design. Please note that HSWAP_EN pin is connected to VCCAUX, this means that when FPGA is not configured, all IO pull-up resistors are disabled.
Board size is quite small – 50mm x 50mm. It can be mounted inside of some other device. Every corner of the PCB has metalized 3.1MM mounting hole, connected to GND. You can use M3 bolts and spacers, to fasten XM2F3 on some surface.



Powering up the board for the first time

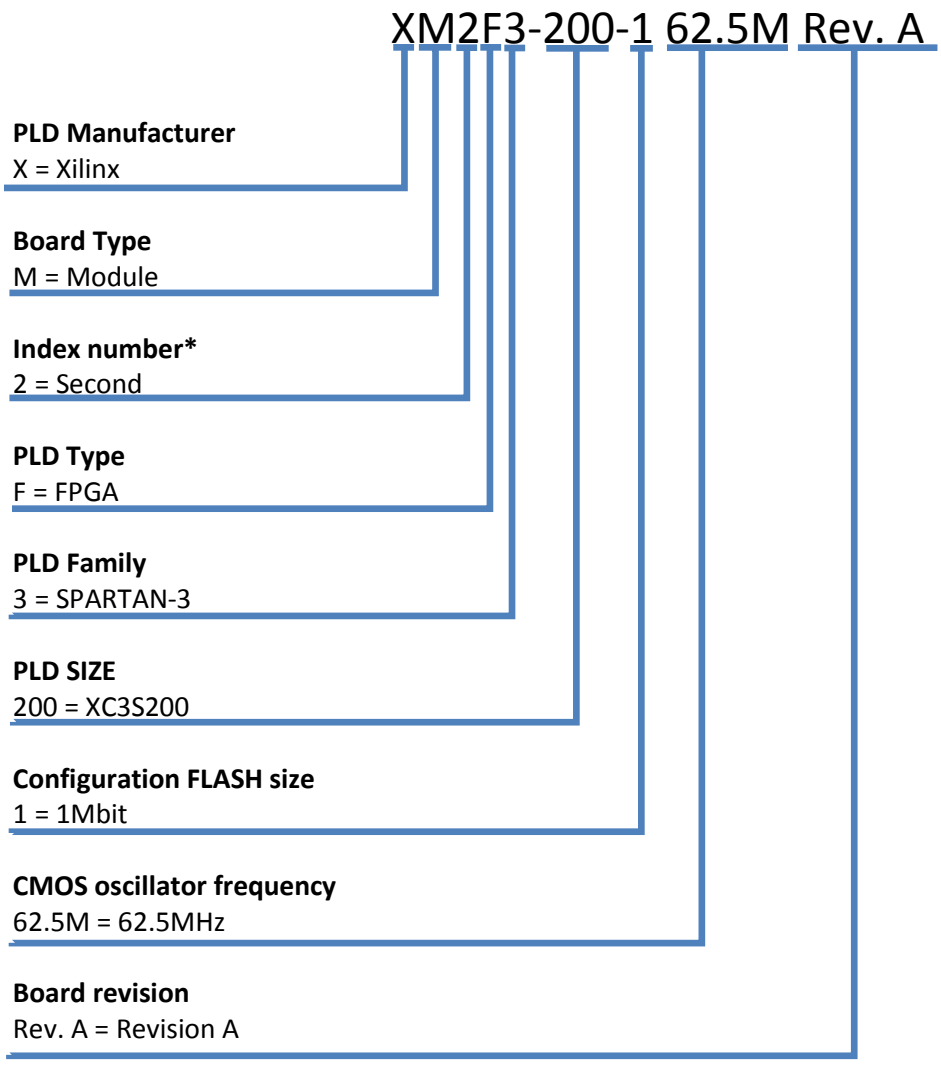
1) Connect 5V to J6, with correct polarity.

2) Demo design will be automatically loaded into FPGA from the Flash, if jumper J4 is not removed.

3) LEDs D1-D2 will start blinking.

4) Use fly wire, to connect IO pins one by one to VCC 3.3V. LEDs will blink faster, every time when one of IO pins is connected to VCC 3.3V. If there is missing contact, or short circuit between IO, LED blinking will not change. Be careful, and don't make short circuit between VCC and GND.

Model name chart



*Index number is used to distinguish from similar existing model