Signal Laboratories

Copper Suicide™ User Manual
Scalable FPGA Development Board

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August 29, 2017

1   Abstract

Copper Suicide is a scalable FPGA development board based on the Lattice Semiconductor ECP5 FPGA. It consists of an Arm Cortex-M7 processor, 1 configuration FPGA, 8 gigabytes of DDR3 SDRAM, and 16 general purpose FPGAs in a square 2-dimensional architecture. The design is extensible by stacking additional boards on top or bottom.

2   Overview

Copper Suicide is designed to have the most flexibility between interconnections, and the highest data rate. For simplicity of design, all FPGAs have the same schematic, Figure 1 shows the FPGA interconnections. Figure 2 shows the harness wiring bundles.
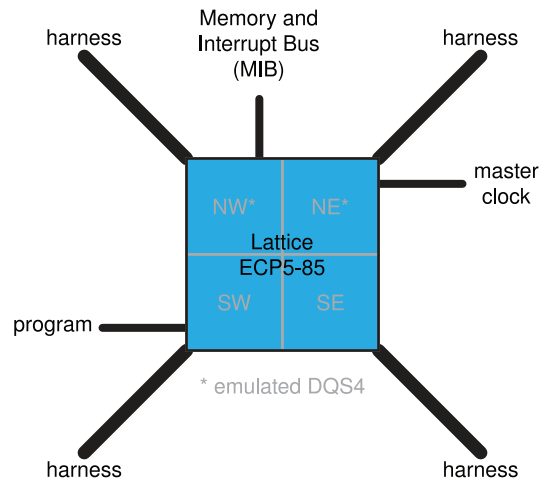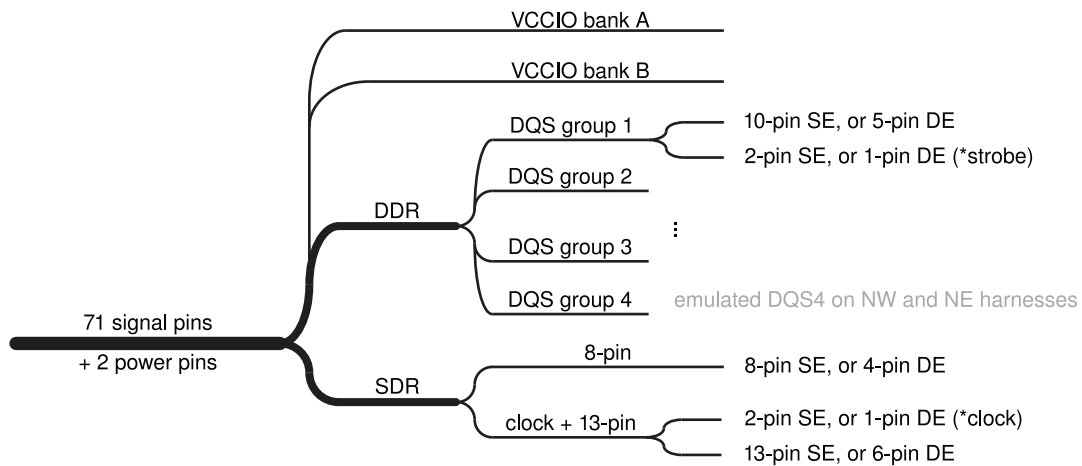

Figure 1: Copper Suicide FPGA

Figure 2: Copper Suicide Harness

The FPGA block diagram, Figure 3, shows all FPGA and ARM connections.
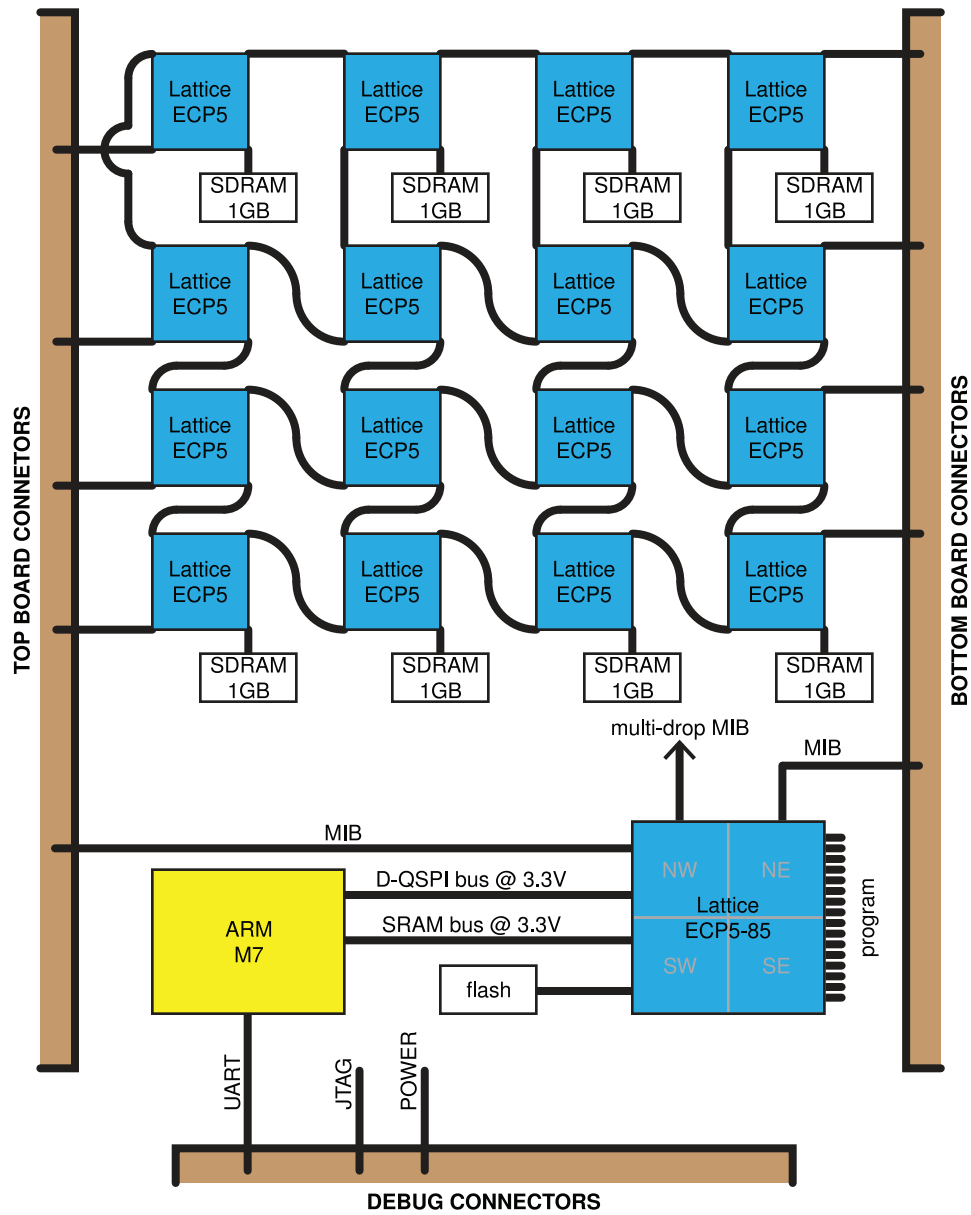
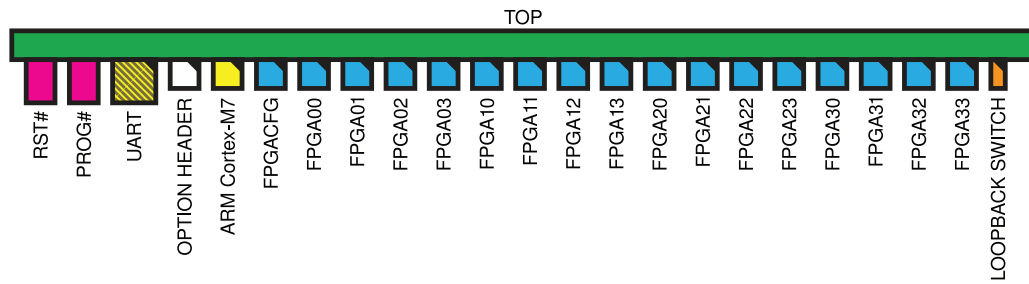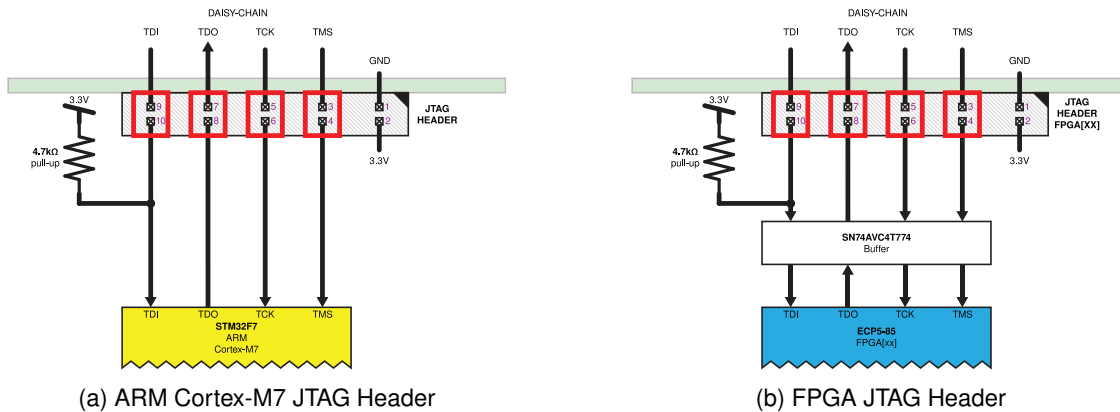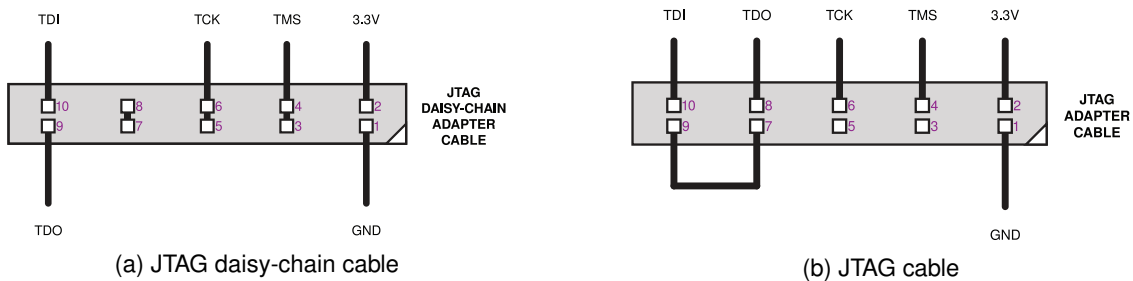Figure 3: Copper Suicide Block Diagram

Headers...

Figure 4: Copper Suicide Debug Headers

JTAG Connector, 50mil pitch, male, unshrouded (Sullins part number GRPB052VWVN):

(a) ARM Cortex-M7 JTAG Header

(b) FPGA JTAG Header

JTAG Adapter Cables, 50mil pitch, female (Amphenol/FCI part number 20021311-00010T4LF) :

(a) JTAG daisy-chain cable

(b) JTAG cable

2.1 JTAG

The JTAG daisy-chain starts at the top of the board and connects the MCU and all 17 FPGAs, figure 7. Each device may be removed from the daisy chain with jumpers on the side of the board. If there is a need to connect to a single device the same jumpers may be used as a direct JTAG connection.

   The daisy-chain may be extended to additional boards through the top and bottom connectors. For example another Copper Suicide board may be connected for a total of 36 devices in the chain. If there is no other board connected to the bottom of Copper Suicide then a jumper must be placed on P1 to connect the daisy-chain TDO to the top of the board (JTAG loopback).

   Each Copper Suicide board has a TCK and TMS buffer to reduce capacitance. The TDO is a pass through
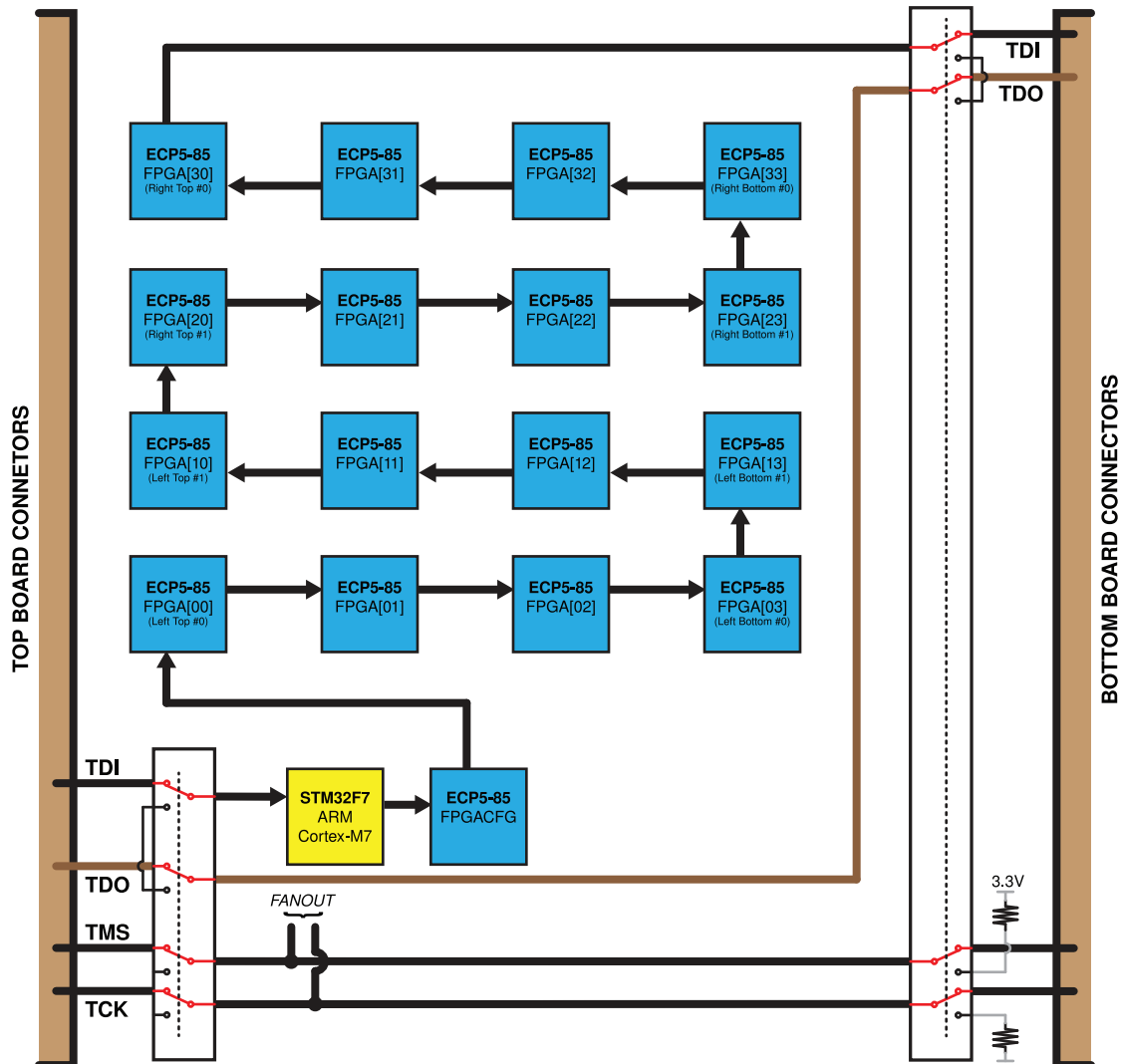

Figure 7: Copper Suicide Block Diagram

3   Pinouts

4   Troubleshooting

JTAG is giving readback errors : check that the TMS net is pulled up and TCK net is pulled down. Even if you are using the JTAG adapter in "direct connect" mode (as opposed to "daisy chain" mode) the board needs to be in loopback mode (J6 needs to be jumpered, pin 1 to pin 2, and pin 3 to pin 4).

MCU is not programming : make sure to unlock the MCU using the instructions in §**??**.