TMS320-XDS100v3
DSP and ARM emulator and adapter
USER'S MANUAL

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Designed by OLIMEX Ltd, 2013

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Table of Contents

CHAPTER 1 OVERVIEW

1. Introduction to the chapter

Thank you for choosing the TMS320-XDS100v3 emulator from Olimex! This document provides a user's guide for the Olimex TMS320-XDS100v3. As an overview, this chapter gives the scope of this document and lists the board's features. The differences between the members of the TMS320-XDS100v3 family are mentioned. The document's organization is then detailed.

The emulator is based on design provided and distributed by Texas Instruments.

1.1 Features

Among the features of the XDSv3 design are:

- TMS320-XDS100V3 hardware is designed to work with CCS 5.x software
- IEEE 1149.7 capable emulator with a USB interface.
- Can function as an 1149.7 adapter for use with existing scan controllers.
- Support for ARM Ltd's Single Wire Output (SWO).
- Software compatible with XDS100v2 (except link delay and IEEE 1149.7 modes).
- Grants free license for TI's Code Composer Studio 5.
- Supported in IAR EW for ARM (for IAR versions after 6.40).
- Physical jumper to select emulator or adapter mode.
- Operates in 1149.7 Class 4, up to 25MHz.
- LED to indicate IEEE 1149.7 Class 4 operation.
- LED to indicate operation in adapter mode.
- Supported devices: TMS320C28xx, TMS320C54xx, TMS320C55xx, TMS320C674x, TMS320C64x+, TMS320C66x, ARM9, ARM Cortex A9, ARM Cortex A8, ARM Cortex M3, ARM Cortex R4
- Works with targets in the 1.65 – 5.0V range
- Uses standard 0.1" 2x7 pin and 0.1" 2x10 pin JTAG connectors (both with TI JTAG layout)
- **All units, manufactured after 01.02.2014, also include a 2x10 pin ARM JTAG layout adapter. It makes the connection to a board that features a supported ARM core target easier.**
- Suitable for ARM 14 pin and ARM 20 pin layouts via adapter or jumper wires
- No need for external power supply, all required power is taken from USB and the target
- Dimensions 95x46 mm (3.75x1.8") + 2x15 cm (8") cables

For full list of features visit the TI's wiki address:
http://processors.wiki.ti.com/index.php/XDS100#XDS100v3_Features

1.2 Target market and purpose of the board

The main purpose of the board is programming Texas Instrument's DSP (digital signal processing) chips AND ability to program high-speed ARM targets. The board can also act as adapter to existing scan controllers.

The design of the board follows the suggestions and the schematics provided by Texas Instruments.

1.3 Organization

Each section in this document covers a separate topic, organized as follow:
  – Chapter 1 is an overview of the board usage and features
  – Chapter 2 provides a guide for quickly setting up the board
  – Chapter 3 contains the general board diagram and layout
  – Chapter 4 mentions the main software tools used with TMS320-XDS100v3
  – Chapter 5 is an explanation of the interfaces, the LEDs, the jumpers position
  – Chapter 6 contains the revision history, useful links and support information

CHAPTER 2 SETTING UP THE TMS320-XDS100v3

2. Introduction to the chapter

This section helps you set up the TMS320-XDS100v3 emulator/adapter for the first time. Please consider first the electrostatic warning to avoid damaging the board, then discover the hardware and software required to operate the board.

The procedure to power up the board is given, and a description of the default board behavior is detailed.

2.1 Electrostatic warning

TMS320-XDS100v3 is shipped in a protective anti-static package. The board must not be exposed to high electrostatic potentials. A grounding strap or similar protective device should be worn when handling the board. Avoid touching the component pins or any other metallic element.

2.3 Requirements

In order to set up the TMS320-XDS100v3 optimally, the following items are required:

- USB-A to mini-USB cable
- Set of software tools (preferably Code Composer Studio 5 – check the table - http://processors.wiki.ti.com/index.php/XDS100#XDS100_Installation_Instructions)
- a TARGET from the supported list (can be found here: http://processors.wiki.ti.com/index.php/XDS100#XDS100v3_Features)

Note that there are two ribbon cables included in the package – for the JTAG_14 and the JTAG_20 connectors.

After 01.02.2014 we also started including an adapter that makes the TI JTAG_20 connector compatible with ARM 20pin JTAG connectors. If you lack such cable you might make it yourself as described below.

2.4 Cables, layouts, connection

Initially there might be a slight confusion for the proper cable setup which is caused by the number of different connectors you might meet working with Texas Instruments ARM processors.

Generally, TI works with 14pin JTAG and 20pin JTAG layouts. **These layouts are different by the standards suggested by ARM. Texas Instruments JTAG layout is not the same as ARM JTAG layout.**

XDS100v3 debuggers manufactured after 01.02.2014 also include and ARM JTAG adapter.

The Olimex XDS100v3 14pin JTAG has the exact layout of TI's 14pin JTAG. Both connector have 0.1" step.

The 20pin JTAG that might be found near the 14pin JTAG of TMS320-XDS100v3. It follows the same signal layout of the original TI XDS100v3 but it uses bigger connector with pin holes with 0.1" step again (the original TI design suggests 0.05").

As already mentioned boards manufactured after 01.02.2014 also include an adapter to a 20 pin ARM JTAG for easier connection with boards like Stellaris EKS-LM3S3748 that can be debugged externally only by a tool with ARM JTAG layout.

If your target board lacks a TI layout connector and your board was manufactured before 01.02.2014 you would need to make a small adapter or use jumper wires to connect the XDS100v3 to it. Refer to the table below for the proper connections. The first 4 columns represent the TI layout of JTAG_14 and JTAG_20 connectors of TMS320-XDS100v3, the last 2 show how to connect their wires to achieve 20 pin ARM JTAG.

Pin#	JTAG_14	Pin#	JTAG_20	Pin#	ARM JTAG 20
1	TMS	1	TMS	7	TMS
2	TRSTn	2	TRSTn	3	TRSTn
3	TDI	3	TDI	5	TDI
4	TDIS**	4	TDIS**	4	GND**
5	VTRef	5	VTRef	1 & 2	3.3V (VTRef)
6	NA*	6	NA*	6	GND
7	TDO	7	TDO	13	TDO
8	GND	8	GND	8	GND
9	RTCK	9	RTCK	11	RTCK
10	GND	10	GND	10	GND
11	TCK	11	TCK	9	TCK
12	GND	12	GND	12	GND
13	EMU0	13	EMU0	-	-
14	EMU1	14	EMU1	14	GND
15		15	SRSTn	15	SRSTn
16		16	GND	16	GND
17		17	EMU2	17	NA*
18		18	EMU3	18	GND
19		19	EMU4	19	NA*
20		20	GND	20	GND

*The entries NA means the standard signal was not routed (was not used for the JTAG connection).

**The value of TDIS is controlled by the ARM_JTAG_E jumper. If you use ARM_JTAG connector keep the jumper closed. If you use TI_JTAG_14 or TI_JTAG_20 – open the ARM_JTAG_E jumper.

A useful table for the relations of the signals might be found at the following web address:
http://processors.wiki.ti.com/index.php/JTAG_Connectors#Pinout

You might want to trace the above signal connection in the schematic that is located on the next page. It show a tested and working adapter from 20-pin TI interface to a 20-pin ARM interface. There is also a relative schematic of an adapter:
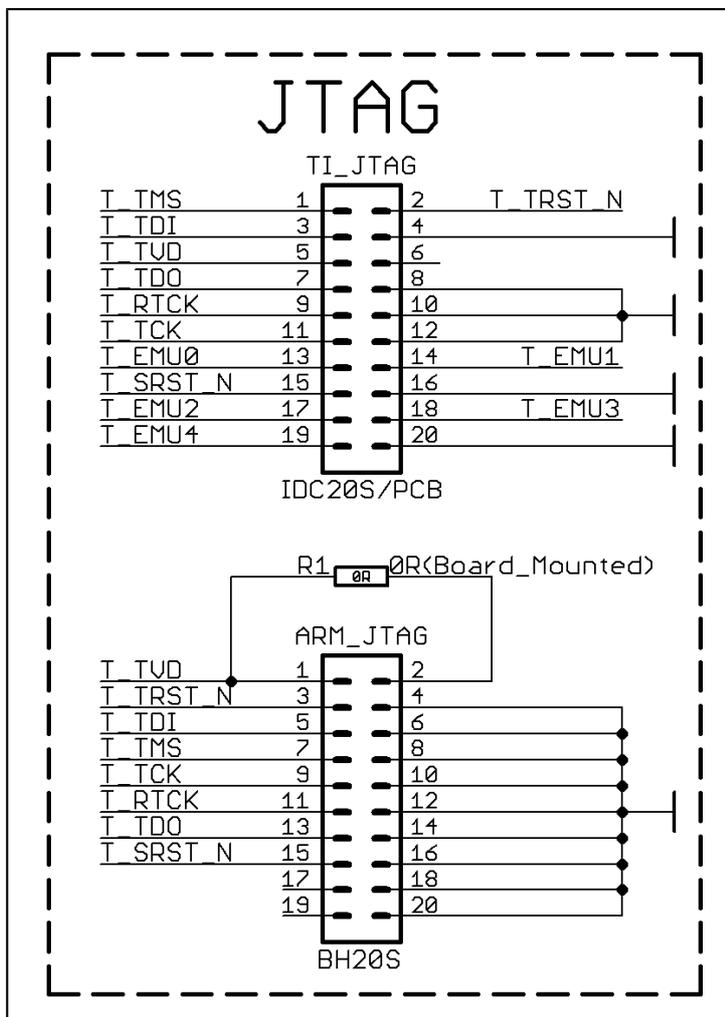
2.5 Powering the board and installation procedure for CCS 5

The XDS100v3 board is powered via the mini USB.

A. Install Code Composer Studio 5.1.x before connecting XDS100 USB hardware.

B. Install the EmuPack with XDS100v3 support. It is usually downloaded via the update button

C. Connect the XDS100 hardware

    1. Make sure the Code Composer Studio 5.1.x and EmuPack with XDS100v3 support is installed FIRST before plugging in the XDS100 HW to the PC.
    2. Connect USB cable from the PC to the XDS100 hardware. Connect the JTAG to the target board (be careful to plug it in correctly: pin 1 should go to pin 1. Red strip usually indicates the side of pin 1)
    3. You will notice small popups to inform user that USB hardware is recognized and installed correctly. No input are required.

D. Setup Code Composer Studio v5.x.x

    4. Start Code Composer Studio and create a new target configuration.
    5. Select XDS100v3 as connection type
    6. Select device (target).

E. The configuration of the emulator in CCS 5 is shown below:
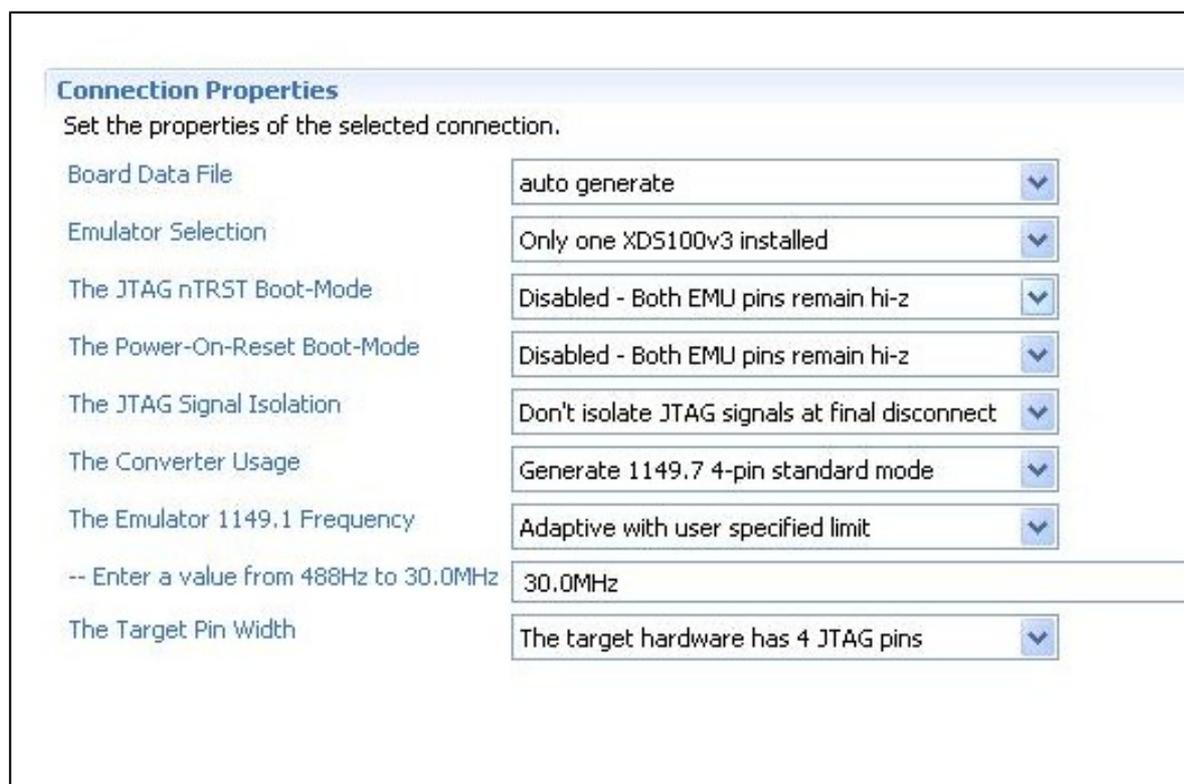
2.6 Powering the board and installation procedure for IAR EW for ARM 6

Connect the XDS100v3 to the mini USB of a computer.

A. Install IAR EW for ARM (version 6.40 or newer) before connecting XDS100 USB hardware.

B. Install the drivers for XDS100v3 hardware – there is an executable typically located in "C:\Program Files (x86)\IAR Systems\Embedded Workbench for ARM 6\arm\drivers\ti-xds"

C. Load a demo project and right-click over the project in the "Workspace" window. Select "Options" and click the "Debugger" group then choose "TI XDS100" from the drop-down menu. Then in the tab under the "Debugger" group go to "TI XDS100" and from the emulator menu select "TI XDS100v3 USB Emulator".
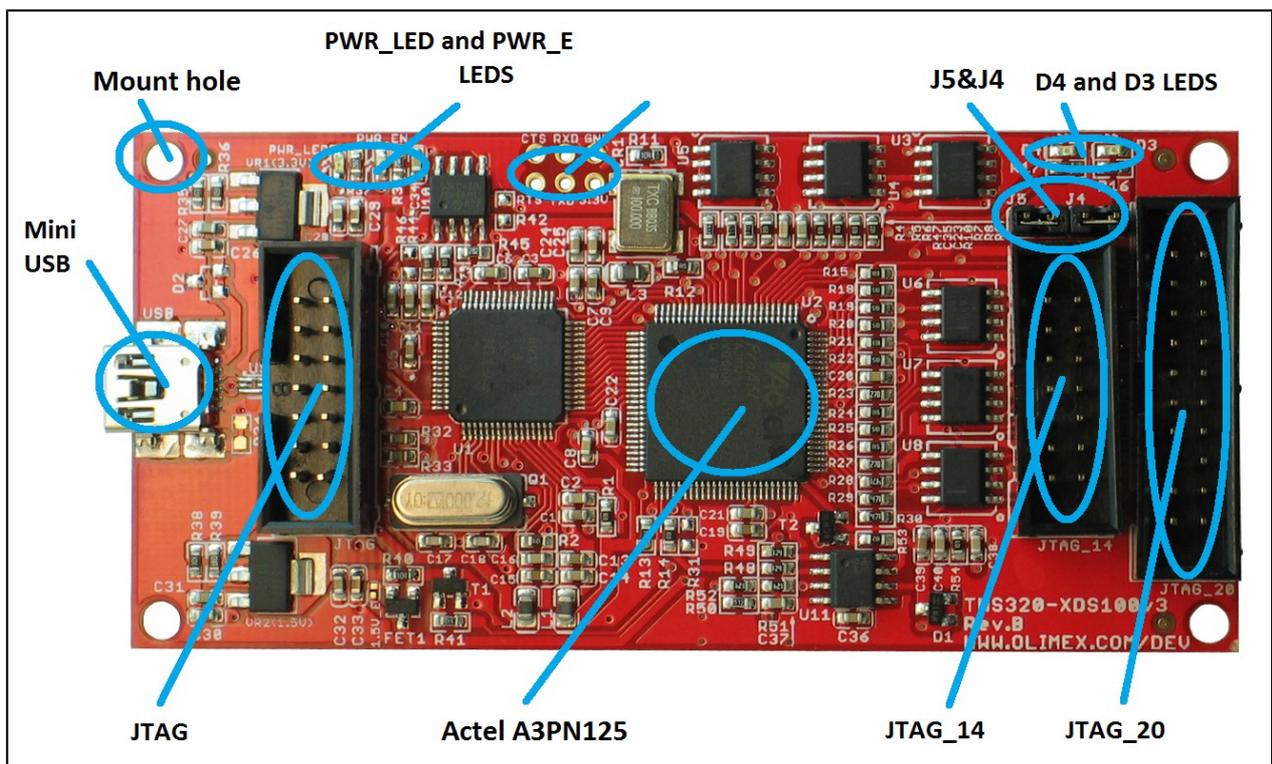
D. You are now ready to debug your project!

CHAPTER 3 TMS320-XDS100v3 DESCRIPTION

3. Introduction to the chapter

Here you get acquainted with the main parts of the board. Note the names used on the board differ from the names used to describe them. For the actual names check the TMS320-XDS100v3 board itself.

3.1 Layout (top view)

CHAPTER 4 INTERFACES AND HARDWARE

4. Introduction to the chapter

In this chapter the connectors function will be pointed, the LEDs will be explained, as well as the jumpers.

4.1 Connectors

There are five connectors on this board. 3 of them are explained below. The USB connector is type mini and the small testpads for CT-RXD-GND-RTS-RXD-3/30V is named at the silk.

Note that both JTAG layouts follows the TI specification (which is different than ARM JTAG). Please refer to the table that can be found at the following web address:
http://processors.wiki.ti.com/index.php/JTAG_Connectors#Pinout

4.1.1 JTAG

The JTAG connector (note the one WITHOUT any prefix or suffix to the name) is used during production to upload the firmware of TMS320-XDS100-V3. It has a 14-pin TI JTAG layout.

You can **not** program targets using this connector! It is used to program the emulator itself!

It can be used to restore the firmware of the the unit. The firmware is located inside the FPGA integrated circuit.

4.1.2 JTAG_14

Used for 14-pin JTAG connection. The JTAG_14 follows the JTAG layout of Texas Instruments. This interface might be used to communicate with Olimex TMS320-P28016 and Olimex TMX320-P28027. The interface might be used with any target that follows the 14-pin TI JTAG layout.

4.1.3 JTAG_20

Used for 20-pin JTAG connection. The JTAG_20 follows the JTAG layout of Texas Instruments. Note that the step is different from the original JTAG connector. The original connector has a 0.05" step connector, while the one used by Olimex has 0.1".

You can lead the signals from this connector to an ARM JTAG layout connector with a small adapter board or jumper wires.

4.2 LEDs

There are four LEDs on TMS320-XDS100v3. Two for indicating power input and power output and two for the current board-mode.

4.2.1 Power LEDs

The PWR_LED shows whether the board is powered. The PWR_EN shows whether the board can power the target.

4.2.2 D3 and D4

The D3 and D4 LEDs show the state of, respectively, J4 and J5 jumpers.

4.3 Jumpers

There are two PTH jumpers on TNS320-XDS100v3. They are responsible for the emulation – adapter configuration. When J4 and J5 are open – the chosen mode is emulator mode. When J4 an J5 are closed the chosen mode is adapter.

For general use of the XDS100v3 as emulator and debugger, please, keep jumpers J4 and J5 open.

CHAPTER 5 REVISION HISTORY AND SUPPORT

5. Introduction to the chapter

In this chapter you will find the current and the previous version of the document you are reading. Also the web-page for your device is listed. Be sure to check it after a purchase for the latest available updates and examples.

5.1 Document revision

Revision	Changes	Modified page#
A, 10.09.12	Initial creation	All
B, 25.09.12	Fixed several problems with links. Fixed the line numbers and the formatting of the index. Some other minor changes.	3, 6, 7, 9, 12
C, 03.01.12	Added emulator options screenshot, fixed several spelling errors	7
D, 21.11.13	Added information about the layout of the JTAG interfaces	5
E, 29.01.14	Added information about the added ARM JTAG adapter	4, 6, 8

5.2 Useful web links and purchase codes

The web page you can visit for more info on your device is
https://www.olimex.com/Products/DSP/Emulators/TMS320-XDS100-V3/.

ORDER CODES:

TMS320-XDS100v3 – completely assembled and tested JTAG emulator

How to order?

You can order to us directly via our internet shop or from any of our distributors.

Check https://www.olimex.com/ **for more info.**

5.3 Product support

For product support, hardware information and error reports mail to: support@olimex.com. Note that we are primarily a hardware company and our software support is limited.

Please consider reading the paragraph below about the warranty of Olimex products.

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Warranty and returns:

Our boards have lifetime warranty against manufacturing defects and
components.

During development work it is not unlikely that you can burn your programmer
or development board. This is normal, we also do development work and we have
damaged A LOT of programmers and boards during our daily job so we know how it
works. If our board/programmer has worked fine then stopped, please check if
you didn't apply over voltage by mistake, or shorted something in your target
board where the programmer was connected etc. Sometimes boards might get
damaged by ESD shock voltage or if you spill coffee on them during your work
when they are powered.

Please note that warranty do not cover problems caused by improper use,
shorts, over-voltages, ESD shock etc.

If the board has warranty label it should be not broken. Broken labels void
the warranty, same applies for boards modified by the customer, for instance
soldering additional components or removing components - such boards will be
not be a subject of our warranty.

If you are positive that the problem is due to manufacturing defect or
component you can return the board back to us for inspection.

When we receive the board we will check and if the problem is caused due to
our fault and we will repair/replace the faulty hardware free of charge,
otherwise we can quote price of the repair.

Note that all shipping costs back and forth have to be covered by the
customer. Before you ship anything back you need to ask for RMA. When you ship
back please attach to it your shipping address, phone, e-mail, RMA# and brief
description of the problem. All boards should be sent back in antistatic
package and well packed to prevent damages during the transport.
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