



MSP430-JTAG-ISO-MK2
professional MSP430 programmer/debugger

USER'S MANUAL

Revision F, February 2013
Designed by OLIMEX Ltd, 2012



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THERE IS NO WARRANTY FOR THE DESIGN MATERIALS AND THE COMPONENTS USED TO CREATE MSP430-JTAG-ISO-MK2. THEY ARE CONSIDERED SUITABLE ONLY MSP430-JTAG-ISO-MK2.

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CHAPTER 1: OVERVIEW

1. Introduction to the chapter

Thank you for choosing the MSP430-JTAG-ISO-MK2 debugger/programmer! This document provides a user's guide for the Olimex MSP430-JTAG-ISO-MK2. As an overview, this chapter gives the scope of this document and lists the board's features. The document's organization is then detailed.

The MSP430-JTAG-ISO-MK2 programmer/debugger development board enables code uploading of applications running on MSP430 microcontrollers, manufactured by Texas Instruments.

The product is our most sophisticated MSP430 programmer/debugger and has many improvements over the our previous MSP430 tools.

1.1 Features

- Supports both JTAG and SBW interfaces
- Ultra fast programming 14KB/s faster several times than TI-USB-FET (1.4KB when spy-bi-wire)
- Opto-isolation 1000VDC, target circuit can be high voltage powered (electricity meters safe debugging)
- Can burn the MSP430 JTAG security fuse in debugger and standalone mode
- LCD display for convenient navigation between different modes of operation
- 1,76 GB internal memory available for custom code (standalone mode) or mass storage
- 3-different modes of operation – Debugger, Mass storage, Stand alone
- Can be powered either by external power or the USB interface
- Extended firmware features – target voltage display, target current consumption display
- Sleek and solid black case
- Easy navigation via 4 analog buttons
- Sophisticated custom-made front panel
- MSP430.dll makes it compatible with all existing software which works with TI-USB-FET (emulates TI-USB-FET) compatible with all MSP430 programming and debugging software
- 14-pin JTAG ribbon cable included
- Dimensions: 75mm x 111mm (2.95" x 4.37")

1.2 Target market and purpose of the device

MSP430-JTAG-ISO-MK2 is suitable for programming and debugging all Texas Instruments MSP430 microcontrollers which support JTAG or SBW (Spy-Bi-Wire) interfaces. The device is recommended for all MSP430 fans. It is especially convenient for mass production due to the ease of stand-alone programming and the ability to power targets.

The ISO means that you can't burn your target device by a bad USB port (or electric failure event – over voltage) nor you can burn the USB port from a bad target board since the USB and JTAG interfaces are optically isolated. Note that it is still possible to burn the ISO-MK2 from a target device or a bad PC port.

1.3 Organization of this document

Each section in this document covers a separate topic, organized as follow:

- Chapter 1 is an overview of the debugger's usage and features
- Chapter 2 lists the additional software and hardware means you might need for proper use of the device
- Chapter 3 contains detailed description of the board peripherals and the basic controls
- Chapter 4 describes the modes of operation
- Chapter 5 is an explanation of the file format used for stand-alone programming
- Chapter 6 shows the dimensions of MSP430-JTAG-ISO-MK2
- Chapter 7 contains the revision history, the useful web links and support information

CHAPTER 2: REQUIREMENTS AND FIRST START-UP

2. Introduction to the chapter

This section helps you set up the MSP430-JTAG-ISO-MK2 debugger for the first time. Please consider first the electrostatic warning to avoid damaging the device, then discover the hardware and software required to operate the board.

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

2.1 Electrostatic warning

MSP430-JTAG-ISO-MK2 is shipped in a carton package and features a plastic case. The board must not be exposed to high very high electrostatic potentials. Avoid touching the component pins or any other metallic element without wearing a ground strap.

2.3 Hardware requirements

The board can be powered either by the USB or by +12V external source. If you use the USB note that the connector is type B – to connect to a personal computer you will probably need USB-A to USB-B cable which is not included in the package. You can purchase such a cable from us, the code is:

USB-CABLE - USB standard type A to USB standard type B cable

Powering the board from external source is very convenient for stand alone mode since you don't need to be connected to a personal computer once you have uploaded the needed files on the SD card.

2.4 Software requirements

You will need a software set of tools to be able to debug with MSP430-JTAG-ISO-MK2 in debugger mode.

We distribute a free programmer software that can be used with MSP430-JTAG-ISO-MK2.

We have tested the device with the latest “Code Composer Studio” and “IAR embedded work bench for MSP430”.

2.5 First time start-up

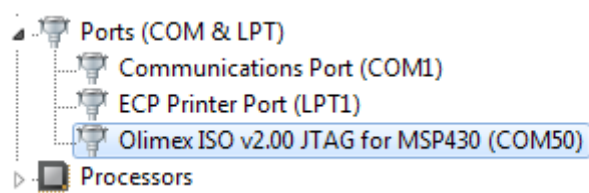
Setting up the MSP430-JTAG-ISO-MK2 for development purposes might vary between different users. However, at least a personal computer with a working USB port and a cable USB type A to

USB type B are required.

Connect the device to the computer via the cable. At first the device won't show as a new or recognized device. Depending on your choices in the menu such will be required for proper operation. In debugger mode you will need A new device should be recognized by your device manager.

You need to install the latest drivers that can be downloaded from our web site. Navigate to MSP430 section and then to the web page of MSP430-JTAG-ISO-MK2 they are located in the software section. After downloading and extracting the archive plug the debugger to the computer and enter “debugger mode” with the right arrow. You will then discover new unrecognized device in device manager. Right click over it and point the installer to “Drivers” folder from the archive. Ignore the warning and the drivers should install successfully.

After successful installation of the drivers and when in debugger mode the device should be shown in device manager as show below:



It might be a good idea at this point to change the COM port number to a free one in the 1-4 range since some software tools does not enumerate all COM ports.

You will also need to replace the MSP430.dll and/or olimex.dll in your software tools (e.g. IAR EW for MSP or Code Composer Studio) driver's folder with the one downloaded from our web-site. This is a required step to ensure that your software will work with our product. The usual location of the .dll for IAR EW for MSP is \IAR Systems\Embedded Workbench x.x\430\bin. The usual location of the .dll for IAR EW for MSP is \Texas Instruments\ccsv4\DebugServer\drivers. After replacing the dlls restart your IDE. If prompted for firmware update the next time you debug (and device in debugger mode) choose to update the firmware.

Then in the software tools select as tool TI USB or OLIMEX USB depending which dll you replaced.

It is recommended to check the device's web page for firmware updates. In time newer devices would receive support and bugs will be fixed. The procedure for firmware update requires replacing the older .dll files with the newer ones. If something extra has to be done it would be mentioned in the supporting the drivers README.txt.

CHAPTER 3: MSP430-JTAG-ISO-MK2 BOARD DESCRIPTION

3. Introduction to the chapter

Here you get acquainted with the main parts of the board and their location on the case. Some of the elements are named near their position on the case of MSP430-JTAG-ISO-MK2.

3.1 Basic device description

In the table below are show the main parts of the board and their positioning on the case.

MSP430-JTAG-ISO-MK2 description		
#	Function	
1	Display	
2	Power LED	
3	Status LED	
4	Communication LED	
5	Up/Increment button	
6	Select button	
7	Down/Decrement button	
8	Mode/Back button	
9	USB connector	
10	JTAG/SBW connector	
11	External power connector	

The functions supported are further explained in the next chapters of this document.

The LEDs functions are detailed in the table below

LED COLOR	MODE OF OPERATION	MEANING
RED	ON	INPUT POWER PRESENT
GREEN	ON	INDICATES THE DEVICE IS PROPERLY WORKING
	BLINKING	ERROR or UNDEFINED PROGRAMMER/DEBUGGER STATE
YELLOW	BLINKING	USB OR JTAG/SBW COMMUNICATION

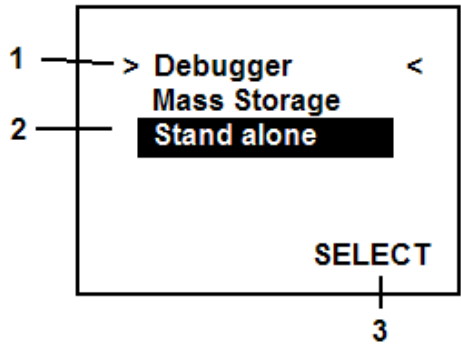
It is not recommended to power down the board when the YELLOW LED is blinking.

CHAPTER 4: MODES OF OPERATION

4. Introduction of the chapter

In this chapter we will explain the mode options of MSP430-JTAG-ISO-MK2. Furthermore, a step-by-step guide to each option will be provided. Each option will be explained.

MSP430-JTAG-ISO-MK2 has three modes of operation. Upon powering the device from external source of power (12V) or via the USB(5V) the screen should look like the image below.

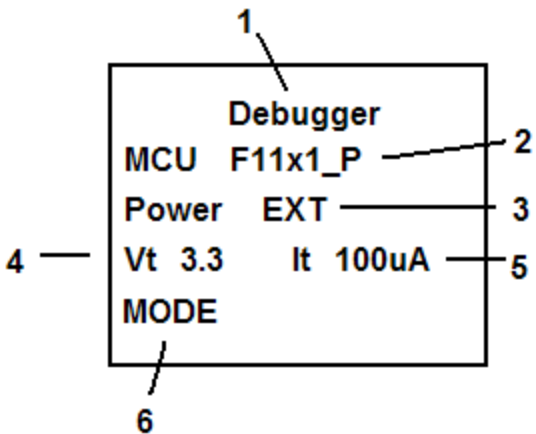
Main menu		
#	Function	
1	Current mode - current mode highlights the mode lastly used	
2	Mode select (up arrow key/increment button, down arrow key/decrement button) - mode select maker is used to navigate to desired new mode - the available modes are: Debugger, Mass Storage, Stand Alone	
3	Confirm selection (right arrow key/select button) - confirms our selected by mode-select choice	

Each of the modes selected are explained in the next sub-chapters.

Generally, the up and down yellow arrows are used for selection (navigation), the right arrow (->) is used to confirm selection or execute a selection, the left arrow is used to return one level up in the menus.

4.2 Debugger mode

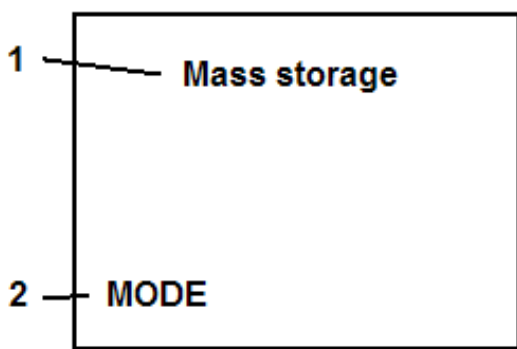
Debugger mode gives your IDE or software tools control over MSP430-JTAG-ISO-MK2 via the USB. Still the debugger gives you extra info about the microcontroller, the power and the consumption.

Menu "Debugger"		
#	Function	
1	Current mode of operation - debugger	
2	Microcontroller type	
3	Source of power: - EXT - shows the target is powered from external source (different than MSP430-JTAG-ISO-MK2) - INT - means the target is powered by the debugger/programmer	
4	Shows microcontroller power in Volts	
5	Shows current consumption - only if powering the target from the MSP430-JTAG-ISO-MK2	
6	Change the mode (button Mode/Back button)	

4.3 Mass storage mode

When connected in this mode to a computer, the computer would recognize the built-in SD card. You can then transfer OPJ files you have edited on the computer to the debugger or vice versa save to the computer files you have previously read with MSP430-JTAG-ISO-MK2.

Additionally you are able to use the SD card as general purpose card if you suddenly need to save files and lack another storage at hand.

Menu "Mass storage"		
#	Function	
1	Current mode of operation - mass storage	
2	Change mode (Mode/Back button/Left button)	

4.4 Stand alone mode

Stand alone mode is used when you need to program a number of devices with the same program or when you lack a computer near the device you need to program. However, you need to provide +12V DC to the jack in order to be able to use stand alone mode. Note that you never should apply more than 12.5V since that would damage the board or its components.

Menu "Stand alone"	
#	Function
1	Current mode of operation - stand alone mode
2	Open an existing (previously saved) project
3	Highlighted operation (Up/Increment button, Down/Decrement button)
4	Create new project
5	Change mode (Mode/Back button)
6	Select the highlighted operation (Select button)

The options in this menu let you either open the program file located on the SD card or read the memory of the currently connected MCU.

4.4.1 Opening an existing project

If you have selected the “Open” choice in the previous menu you will be presented with a list of available projects. Choosing the one you want to write to your device will lead you to a new menu.

Sub-menu “Open”		
#	Function	
1	Sub-menu “OPEN”	
2	Available projects	
3	Highlight (Up/Increment button, Down/Decrement button)	
4	Back to the upper menu (Mode/Back button)	
5	Select the highlighted project (Select button)	

4.4.1.1 Editing the open project

Edit of the opened project gives provides a way to change some basic faster.

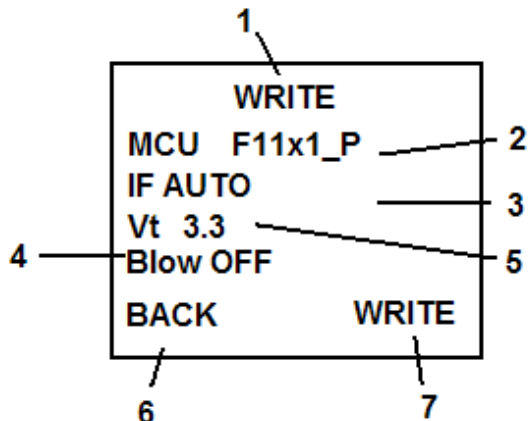
Sub-menu “Edit”		
#	Function	
1	Sub-menu “EDIT”	
2	Highlighted operation (Up/Increment button, Down/Decrement button)	
3	Choosing the default programmer interface <ul style="list-style-type: none"> - JTAG - SBW - AUTO – automatically chooses JTAG or SBW interface is available 	
4	Shows the current voltage of the microcontroller	

5	Blows the READ fuse of the target (ON/OFF)	
6	Back to the “Open” sub-menu (Mode/Back button)	
7	Store the changes in the project (Select button)	

4.4.1.2 Writing in an existing project

Writing to the target board. If you program the same type of board with the same program you would probably stay just in this menu just pressing the right arrow button, switching the board and then again pressing the right arrow.

After selecting the “Write” option (7) you will be given again the most important options before finally writing the device.

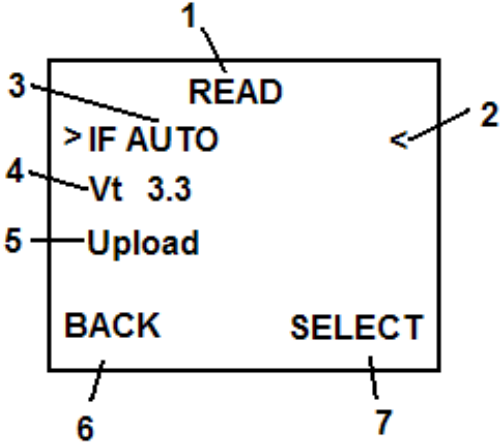
Sub-menu “Write”		 <p>The screenshot shows a menu titled 'WRITE' with the following options: 'MCU F11x1_P', 'IF AUTO', 'Vt 3.3', 'Blow OFF', 'BACK', and 'WRITE'. Numbered callouts point to: 1. The 'WRITE' title, 2. 'MCU F11x1_P', 3. 'IF AUTO', 4. 'Blow OFF', 5. 'Vt 3.3', 6. 'BACK', and 7. 'WRITE'.</p>
#	Function	
1	Sub-menu “WRITE”	
2	Microcontroller type	
3	Interface used	
4	READ protection fuse	
5	Voltage of the microcontroller	
6	Back to “EDIT” sub-menu (Mode/Back button)	
7	Store (Select button)	

Note that if the writing fails for some reason you will be given a screen notifying you for the failed write attempt. You will have to press the left arrow key to discard the message (opposed to the key required to the write – right arrow).

4.4.4 Reading from a microcontroller “READ”

The “READ” option in “Stand alone” mode gives a chance to get the program of a standard MSP430 MCU which hasn't its read fuse blown.

You will not be able to read MSP430 chips with burnt code protection fuses.

Sub-menu “Read”		
#	Function	
1	Sub-menu “READ”	
2	Highlighted operation (Up/Increment button, Down/Decrement button)	
3	Programming interface	
4	Voltage of the microcontroller	
5	Reading the program from the microcontroller and creating a project file named the type of the microcontroller and consecutive number	
6	Back to the main menu (Mode/Back button)	
7	Select the highlighted operation (Select button)	

CHAPTER 5: OPJ FILE FORMAT

The default form of the OPJ file. It can be opened with a text editor for faster edit. It is useful to edit the OPJ file when you need to change only options in the programming mechanism, not the logic of the program. Some of the options can be modified only in the OPJ file.

Note that the OPJ file name is limited to 8 characters which are also case sensitive.

For the OPJ file below I have read the contents of a board with MSP430F2274. It is preferable that binary file (in .txt or .hex format) that contains the source code is located in the same directory as the OPJ file.

<?xml version="1.0" encoding="UTF-8"?>	- xml header
<ISO_V2>	- ISO V2 section
<!--Device ID-->	- ID of the controller
<!--Device interface – JTAG,SBW,AUTO-->	- Interface type
<!--Device voltage 2700-3600 mV-->	- Controller voltage
<!--Device main base address-->	
<!--Device info base address-->	
<Target Id="57" IF="AUTO" Vt="3000" MainBase="0x8000" InfoBase="0x1000"/>	- ON/OFF operation
<!--Presave calibration data - 0/1 disbale/enable-->	
<!--Erase device - 0/1/2 disbale/sectors/mass-->	- Erasing
<!--Blank check device - 0/1 disbale/enable-->	- Blank check
<!--Programming device - 0/1 disbale/enable-->	- Programming
<!--Verify device - 0/1 disbale/enable-->	- Verification
<!--Blow device - 0/1 disbale/enable-->	- Read protection
<!--File name-->	- Program file name in TXT or HEX format
<Programming PresaveCal="1" Erase="2" Blank="1" Write="1" Verify="1" Blow="0" File="F2274_00.TXT"/>	
<!--Serializing enable - 0/1 disbale/enable-->	- Serialization ON/OFF
<!--Serial number format – HEX,BDC-->	- Serial number format
<!--Serial number endian – LE,BE32,BE8-->	- Serial number endian
<!--Serial number size - 1:4 bytes-->	- Serial number size
<!--Serial number start address-->	- Serial number start address
<!--Serial number-->	- Current serial number
<!--Last serial number-->	- Last serial number
<SN Enable="0" Format="HEX" Endian="LE" Size="0" Addr="0x0" Count="0" Last="0"/>	

<code><!--Sections preserve--></code>	- Description of sections that would NOT be modified
<code><Section></code>	
<code><!--Section start address--></code>	- Section start address
<code><!--Section size--></code>	- Section size
<code><Entry Start="0x0" Size="0x0"/></code>	
<code><Entry Start="0x0" Size="0x0"/></code>	
<code><Entry Start="0x0" Size="0x0"/></code>	
<code><Entry Start="0x0" Size="0x0"/></code>	
<code><Entry Start="0x0" Size="0x0"/></code>	
<code><Entry Start="0x0" Size="0x0"/></code>	
<code><Entry Start="0x0" Size="0x0"/></code>	
<code><Entry Start="0x0" Size="0x0"/></code>	
<code></Section></code>	
<code></ISO_V2></code>	

Note the part "sections preserve". It is very helpful when there are parts of the memory you don't want to modify.

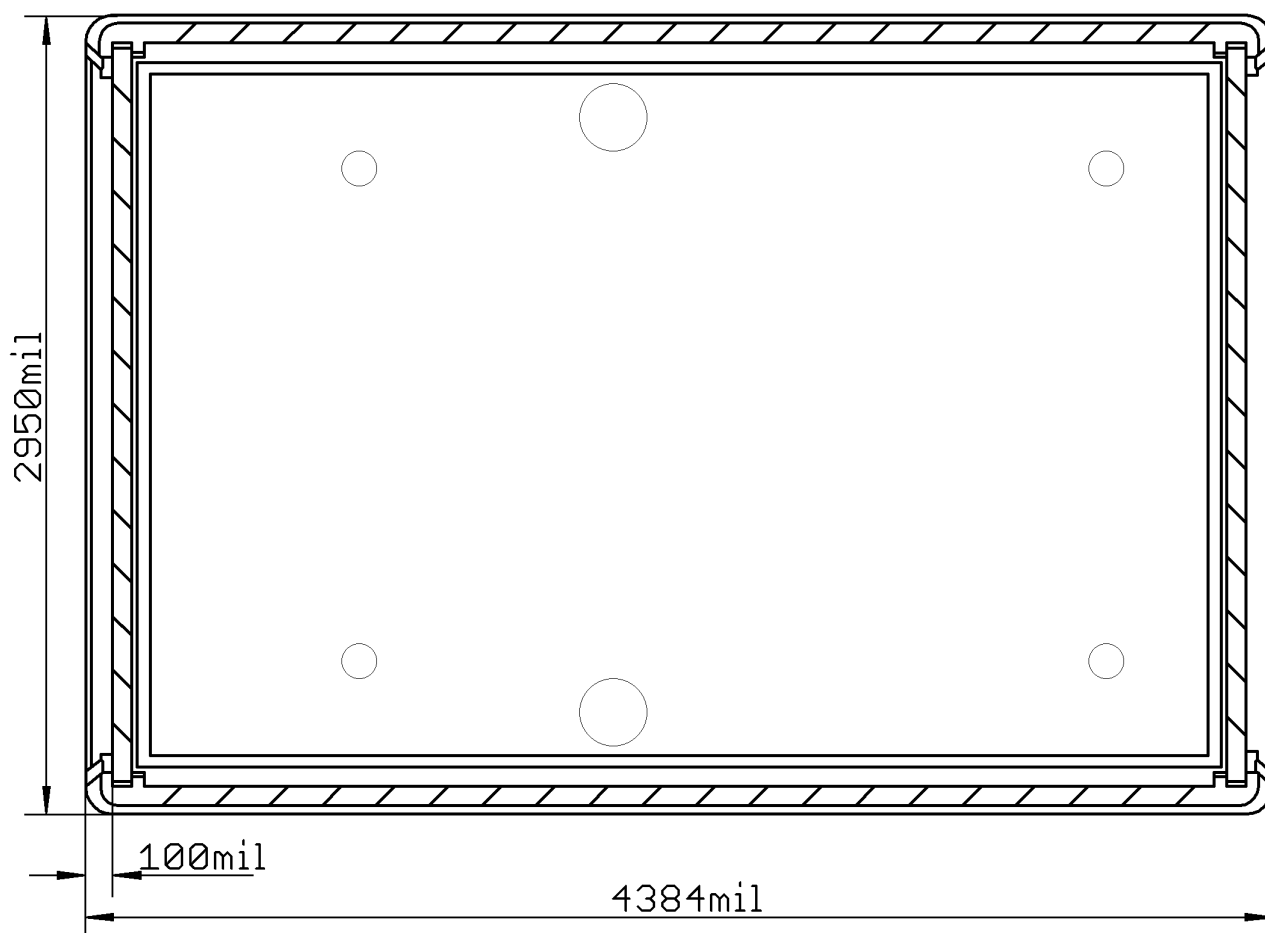
The best practice to understand the .OPJ file better is:

- 1) Connect a target chip/board to the debugger in debugger mode and program it with any code.
- 2) Enter stand alone mode and read the device.
- 3) Enter mass storage mode and via a computer examine the two files (.txt and .opj with same names) that were created in the ISO-MK2's memory.

CHAPTER 6: DIMENSIONS

6. Introduction to the chapter

The MSP430-JTAG-ISO-MK2 comes in a plastic box. The dimensions of the box can be seen below:



Note that all dimensions are in mils.

CHAPTER 7: REVISION HISTORY, WEB LINKS AND SUPPORT

7. 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.

7.1 Document revision

Revision	Changes	Modified page
A, 01.08.12	Preliminary revision	All
B, 22.08.12	Initial release	All
C, 04.10.12	7 - Added info on selecting the proper option depending on proper driver dll-file replaced 21 - Updated links	7, 21
D, 10.10.12	7 - Added info on selecting the proper option depending on proper driver dll-file replaced 17 - Updated the OPJ file description 21 - Updated links	7, 17, 21
E, 30.01.13	5 - Added more information about the isolation 17 - Added information about OPJ naming restrictions	5, 17
F, 11.02.13	6 - Fixed spelling and added more details 17 - Added best practice routine 21 - Firmware revision added	6, 17, 21

7.2 Device revision

Revision	Notable changes
K	Initial release of the device

7.3 Firmware revision

Revision	Notable changes
2.003	Initial release of the firmware for ISO-MK2
2.005	Fixed bug in standalone operation restraining the board from entering stand alone mode
2.006	Fixed bug in auto-detection of JTAG/SBW interface; Fixed erroneous external voltage detection and measurement
2.007	Fixed SBW device recognition; Fixed fuse blowing of MSP430F44x; Improvements in the user interface: 1) choice selector swapped with reverse color, last chosen menu is shown with angle brackets now for better visibility 2) increased screen contrast for a wider visibility angle 3) improved interface in case of failed write

7.4 Useful web links and purchase codes

The web page you can visit for more info on your device is

<https://www.olimex.com/Products/MSP430/JTAG/MSP430-JTAG-ISO-MK2/>.

ORDER CODES:

MSP430-JTAG-ISO-MK2 – professional programmer featuring LCD, SD card, stand-alone mode, 12V supply

USB-CABLE - USB type A to USB type B cable

The latest price list can be found at <https://www.olimex.com/prices>.

How to order?

You can purchase directly from our web shop or from any of our distributors. List of Olimex distributors around the world: <https://www.olimex.com/Distributors/>

Check <https://www.olimex.com/> for more info.

7.5 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.

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 shippings 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.

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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