

# MSP430-P2618 development board USER'S MANUAL

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Designed by OLIMEX Ltd, 2013



All boards produced by Olimex LTD are ROHS compliant

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The software is released under GPL.

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**THERE IS NO WARRANTY FOR THE DESIGN MATERIALS AND THE COMPONENTS USED TO CREATE MS430-P2618. THEY ARE CONSIDERED SUITABLE ONLY FOR MSP430-P2618.**

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## CHAPTER 1 | OVERVIEW

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### 1.1 Introduction to the chapter

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Thank you for choosing the MSP430-P2618 development board from Olimex! This document provides a user's guide for the Olimex MSP430-P2618 development board. 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-P2618 development board enables code development of applications running on the MSP430F2618 microcontroller, manufactured by Texas Instruments.

### 1.2 Features

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- **MCU: MSP430F2618 with 116 KB + 256 B Flash Memory, 8 KB RAM**
- **JTAG connector**
- **RS232 driver + RS232 connector**
- **User button**
- **Power supply LED**
- **User status LED**
- **32 768 Hz oscillator crystal**
- **Optional high frequency crystal (socket)**
- **RESET button**
- **External power supply jack for AC or DC power supply**
- **Voltage regulator + power supply filtering capacitor**
- **Extension headers for all uC pins**
- **Prototype area with 0.2" step, Vcc + GND bus**
- **UEXT connector**
- **Connector for lithium polymer battery**
- **PCB: FR-4, 1.5 mm (0.062"), red soldermask**
- **Dimensions 99.38 x 79.31 mm (3.91 x 3.12")**

### 1.3 Organization

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

- 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 describes the component that is the heart of the board: the MSP430F2618 microcontroller
- Chapter 5 is an explanation of the control circuitry associated with the microcontroller to reset. Also shows the clocks on the board
- Chapter 6 covers the connector pinout, peripherals and jumper description
- Chapter 7 shows the processor diagram and memory map
- Chapter 8 provides the schematics
- Chapter 9 contains the revision history

## CHAPTER 2 | SETTING UP THE MSP430-P2618 BOARD

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### 2.1 Introduction to the chapter

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This section helps you set up the MSP430-P2618 development board 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.

### 2.2 Electrostatic warning

---

MSP430-P2618 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

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In order to set up the MSP430-P2618, the following items are required:

- A source of power – the board can be powered through JTAG connector; or through the external power jack connector.
- Debugger supporting 14 pin JTAG interface and the used microcontroller MSP430F2618.

All our MSP430 programmers are recommended for MSP430-P2618:

- Olimex MSP430-JTAG-TINY-V2 – small emulator/programmer ideal for beginners:

<https://www.olimex.com/Products/MSP430/JTAG/MSP430-JTAG-TINY-V2/>

- Olimex MSP430-JTAG-ISO-MK2 – our best MSP430 emulator/programmer (featuring display, SD card and 3 modes of operation):

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

- Olimex MSP430-JTAG-RF – the first wireless MSP430 emulator/programmer:

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

Also, a host-based software toolchain is required in order to program/debug the MSP430-P2618 board. There are also a number of ready IDEs available like IAR Embedded Workbench, Rowley CrossWorks, Code Composer Studio, etc.

We also provide our own flash programming software which can be distributed free. You can find it at the above mentioned debuggers' web pages.

## **2.4 Powering the board**

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There are two options for powering the board:

**Either** set the jumpers P\_IN closed, P\_OUT open so you can power from JTAG connector

**OR** open P\_IN, close P\_OUT jumper and then use the power jack connector to provide 5V DC.

Note: In previous revisions there was an option to provide 6.5V AC, which is no longer the case.

On powering the board the PWR LED, LED1 should turn on.

## **2.5 Prebuilt software**

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On powering the board the PWR LED should turn on. The LCD should show 3 lines of text and the ability to control the selector marker between them. On pressing the joystick over our test of choice it should be conducted.

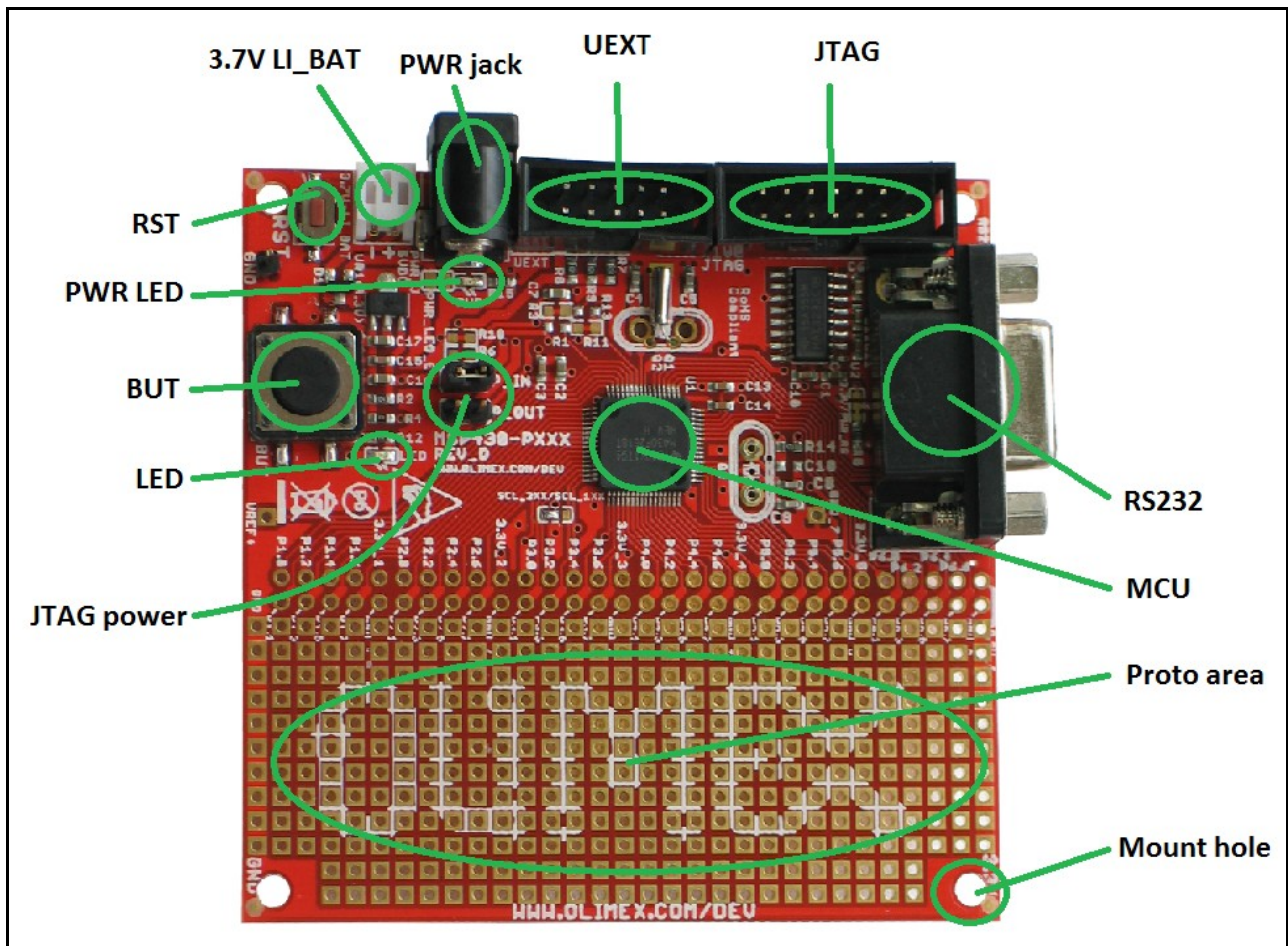


## CHAPTER 3 | MSP430-P2618 BOARD DESCRIPTION

### 3.1 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 MSP430-P2618 board itself.

### 3.2 Layout (top view)



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## CHAPTER 4 | THE MSP430F2618 MICROCONTROLLER

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### 4.1 Introduction to the chapter

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In this chapter is located the information about the heart of MSP430-P2618 – its microcontroller. The information is a modified version of the datasheet provided by its manufacturers.

### 4.2 The microcontroller

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Features:

- **Low Supply Voltage Range, 1.8 V to 3.6 V**
- **Ultra-Low Power Consumption:**
  - **Active Mode: 365  $\mu$ A at 1 MHz, 2.2 V**
  - **Standby Mode: 0.5  $\mu$ A**
  - **Off Mode (RAM Retention): 0.1  $\mu$ A**
- **Wake-Up From Standby Mode in Less Than 1 $\mu$ s**
- **16-Bit RISC Architecture, 62.5-ns Instruction Cycle Time**
- **Three-Channel Internal DMA**
- **12-Bit Analog-to-Digital (A/D) Converter With Internal Reference, Sample-and-Hold, and Autoscan Feature**
- **Dual 12-Bit Digital-to-Analog (D/A) Converters With Synchronization**
- **16-Bit Timer\_A With Three Capture/Compare Registers**
- **16-Bit Timer\_B With Seven Capture/Compare-With-Shadow Registers**
- **On-Chip Comparator**
- **Four Universal Serial Communication Interfaces (USCIs)**
  - **USCI\_A0 and USCI\_A1**
    - **Enhanced UART Supporting Auto-Baudrate Detection**
    - **IrDA Encoder and Decoder**
    - **Synchronous SPI**
  - **USCI\_B0 and USCI\_B1**
    - **I2C**
    - **Synchronous SPI**
- **Supply Voltage Supervisor/Monitor With Programmable Level Detection**
- **Brownout Detector**
- **Bootstrap Loader**

- **Serial Onboard Programming, No External Programming Voltage Needed**
- **Programmable Code Protection by Security Fuse**
- **116KB+256B Flash Memory, 8KB RAM**

For comprehensive information on the microcontroller visit the Texas Instruments web page for a datasheet.

At the moment of writing the microcontroller datasheet can be found at the following link:

<http://www.ti.com/lit/ds/symlink/msp430f2618.pdf>

## **CHAPTER 5 | CONTROL CIRCUITY**

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### **5.1 Introduction to the chapter**

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Here you can find information about reset circuit, power circuit and quartz crystal locations.

### **5.2 Reset**

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MSP430-P2618 reset circuit features a capacitor C36(47n) and processor pin 58(RST/NMI). You could also reset the MCU with an active low level at the JTAG pin 11.

### **5.3 Clocks**

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Real time clock (RTC) 32 768Hz Q1 is connected to pins 8 and 9 of the processor.

A free socket for custom quartz crystal Q2 is connected to pins 52 and 53 of the processor.

## CHAPTER 6 | HARDWARE

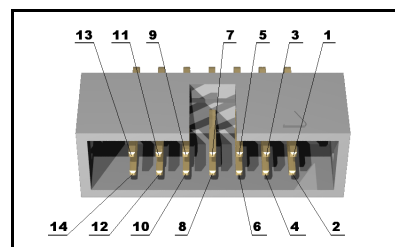
### 6.1 Introduction to the chapter

In this chapter are presented the connectors that can be found on the board all together with their pinout. Proto area is shown. Jumpers functions are described. Notes and info on specific peripherals are presented. Notes regarding the interfaces are given.

### 6.2 JTAG connector

The 14 pin JTAG connector provides the interface for JTAG programming/debugging. The plastic connector is situated at the bottom of the board. The pinout can be found in the table below.

| JTAG Connector |               |       |               |
|----------------|---------------|-------|---------------|
| Pin #          | Signal Name   | Pin # | Signal Name   |
| 1              | TDO           | 8     | Not connected |
| 2              | P_IN/NC*      | 9     | GND           |
| 3              | TDI           | 10    | Not connected |
| 4              | NC/P_OUT*     | 11    | #RST          |
| 5              | TMS           | 12    | Not connected |
| 6              | Not connected | 13    | Not connected |
| 7              | TCK           | 14    | Not connected |

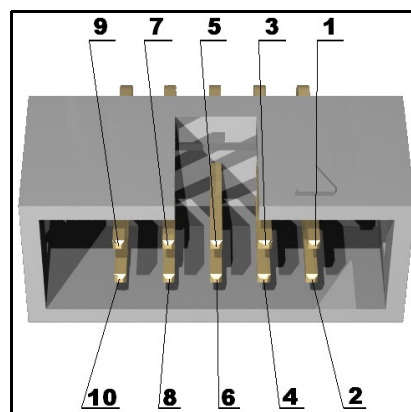


\*Depending on the jumper P\_OUT/P\_IN position

## 6.3 UEXT connector

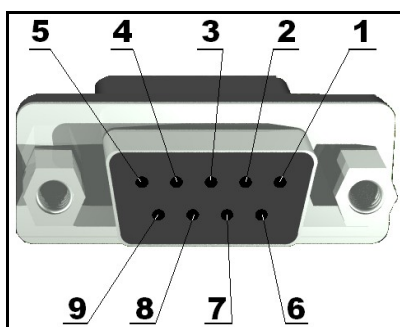
UEXT is used to connect expansion modules made by Olimex. It features SPI, UART and I2C (when all three are available at the microcontroller)

| UEXT Connector |             |
|----------------|-------------|
| Pin #          | Signal Name |
| 1              | +3.3V       |
| 2              | GND         |
| 3              | UTXD1       |
| 4              | URXD1       |
| 5              | SCL1        |
| 6              | SDA         |
| 7              | SOMI1       |
| 8              | SIM01       |
| 9              | UCLK1       |
| 10             | STE1        |



## 6.4 RS232 connector

| RS232 |             |
|-------|-------------|
| Pin # | Signal Name |
| 1     | NC          |
| 2     | T2OUT       |
| 3     | R1IN        |
| 4     | NC          |
| 5     | GND         |
| 6     | NC          |
| 7     | NC          |
| 8     | NC          |



|   |    |
|---|----|
|   |    |
| 9 | NC |

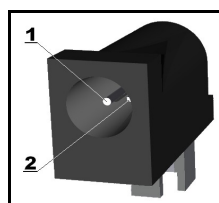
T2OUT - Output Transmit Data. This is the transmit data line for the RS232 interface.

R1IN - Input Receive Data. This is the receive data line for the RS232 interface.

### 6.5 PWR jack

Note that the board should be powered by only 5V DC.

| PWR jack |             |
|----------|-------------|
| Pin #    | Signal Name |
| 1        | PWR         |
| 11       | GND         |



### 6.6 Column pads (near the proto area)

Important: the top row of the proto area is 3.3V; the bottom row is GND. Be careful with shortcircuit!

The pads have their names printed on the board.

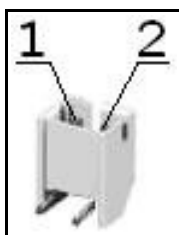
| Pin # | Signal Name | Pin # | Signal Name |
|-------|-------------|-------|-------------|
| 1     | VCC         | 2     | GND         |
| 3     | P6.6        | 4     | P6.7        |
| 5     | P6.4        | 6     | P6.5        |
| 7     | P6.2        | 8     | P6.3        |
| 9     | P6.0        | 10    | P6.1        |
| 11    | VCC         | 12    | GND         |
| 13    | P5.6        | 14    | P5.7        |
| 15    | P5.4        | 16    | P5.5        |
| 17    | P5.2        | 18    | P5.3        |

|    |           |    |           |
|----|-----------|----|-----------|
| 19 | P5.0      | 20 | P5.1      |
| 21 | VCC       | 22 | GND       |
| 23 | P4.6      | 24 | P4.7      |
| 25 | P4.4      | 26 | P4.5      |
| 27 | P4.2      | 28 | P4.3      |
| 29 | P4.0      | 30 | P4.1      |
| 31 | VCC       | 32 | GND       |
| 33 | P3.6      | 34 | P3.7      |
| 35 | P3.4/TXD0 | 36 | P3.5/RXD0 |
| 37 | P3.2      | 38 | P3.3      |
| 39 | P3.0      | 40 | P3.1      |
| 41 | VCC       | 42 | GND       |
| 43 | P2.6      | 44 | P2.7      |
| 45 | P2.4      | 46 | P2.5      |
| 47 | P2.2      | 48 | P2.3      |
| 49 | P2.0      | 50 | P2.1      |
| 51 | VCC       | 52 | GND       |
| 53 | P1.6      | 54 | P1.7      |
| 55 | P1.4      | 56 | P1.5      |
| 57 | P1.2      | 58 | P1.3      |
| 59 | P1.0      | 60 | P1.1      |

## 6.7 Battery connector

When using the battery connector keep in mind that it is an energy solution that wouldn't be able to power the board and all the peripherals. The voltage of a 3.7V LIPO battery would be enough to power the processor and the memory but won't be enough to power external touchscreen LCD.

| Pin # | Signal Name |
|-------|-------------|
| 1     | VIN         |
| 2     | GND         |





## 6.8 Jumper description

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**P\_OUT/P\_IN** - This jumper controls power on pins 2 and 4 of the JTAG connector. When in P\_OUT is closed 3.3V can be measured at pin 4.

Check the schematic for more info.

**Default position is P\_OUT – closed, P\_IN - open.**

## 6.9 Additional hardware components

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The components below are mounted on MSP430-P2618 but are not discussed above. They are listed here for completeness:

User button with name BUT connected to MSP430F2618 pin 60 (P6.1/A1).

Reset button with name RST connected to MSP430F2618 pin 58 (RST/NMI).

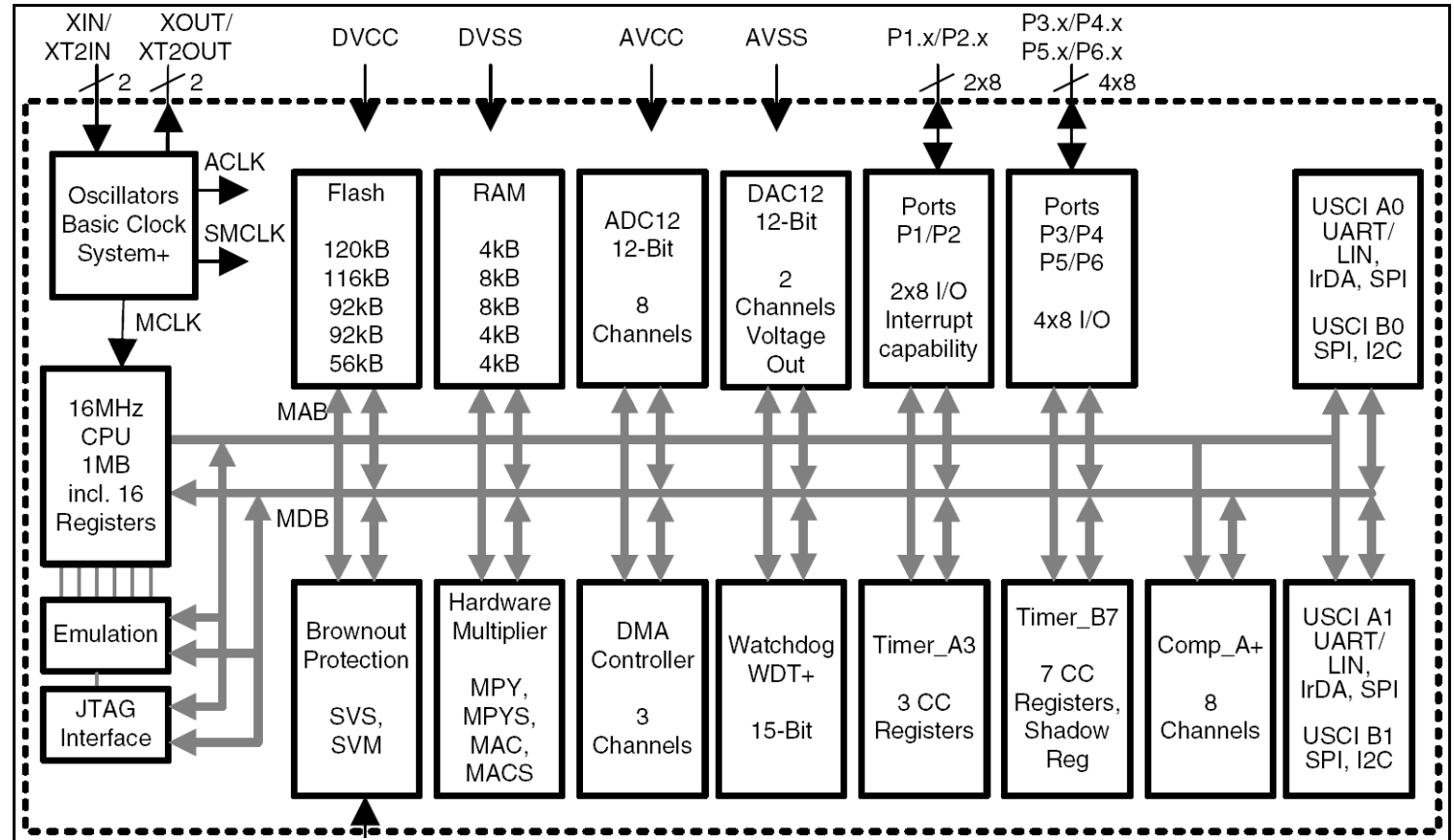
Power LED with name PWR – lights when the board is power supplied.

Status red LED with name LED connected to MSP430F2618 pin 59 (P6.0/A0).

## CHAPTER 7 | MEMORY AND BLOCK DIAGRAM

### 7.1 Introduction to the chapter

At the right side of the page is located the block diagram of the processor and on the next page you can find a memory map for this family of processors. It is strongly recommended to refer to the original datasheet released by Texas Instruments for ones of higher quality.



## 7.2 Memory organization

|                                        |               | <b>MSP430F2618</b>            |
|----------------------------------------|---------------|-------------------------------|
| Memory                                 | Size          | 116KB                         |
| Main: interrupt vector                 | Flash         | 0x0FFFF - 0x0FFC0             |
| Main: code memory                      | Flash         | 0x1FFFF - 0x03100             |
| RAM (total)                            | Size          | 8kB                           |
| Extended                               | Size          | 0x030FF - 0x01100<br>6kB      |
| Mirrored                               | Size          | 0x030FF - 0x01900<br>2kB      |
| Information memory                     | Size<br>Flash | 256 Byte<br>0x010FF - 0x01000 |
| Boot memory                            | Size<br>ROM   | 1KB<br>0x00FFF - 0x00C00      |
| RAM (mirrored at<br>0x18FF to 0x01100) | Size          | 2KB<br>0x009FF - 0x00200      |
| Peripherals                            | 16-bit        | 0x001FF - 0x00100             |
|                                        | 8-bit         | 0x000FF - 0x00010             |
|                                        | 8-bit SFR     | 0x0000F - 0x00000             |

# CHAPTER 8 | SCHEMATICS

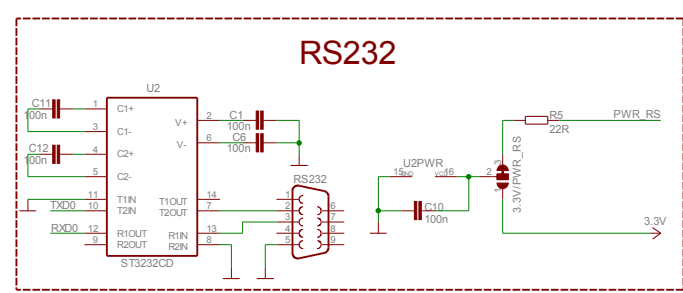
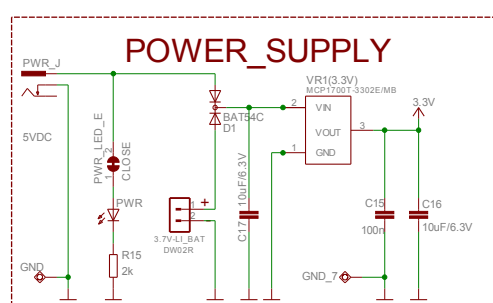
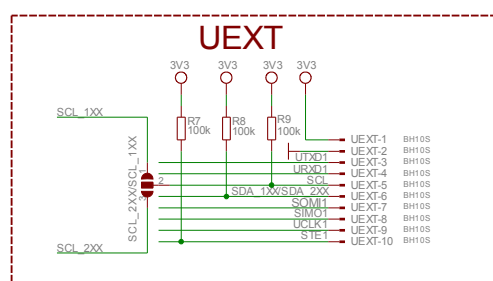
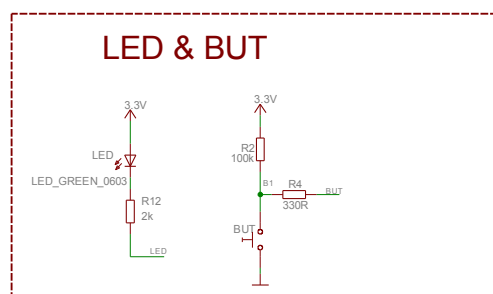
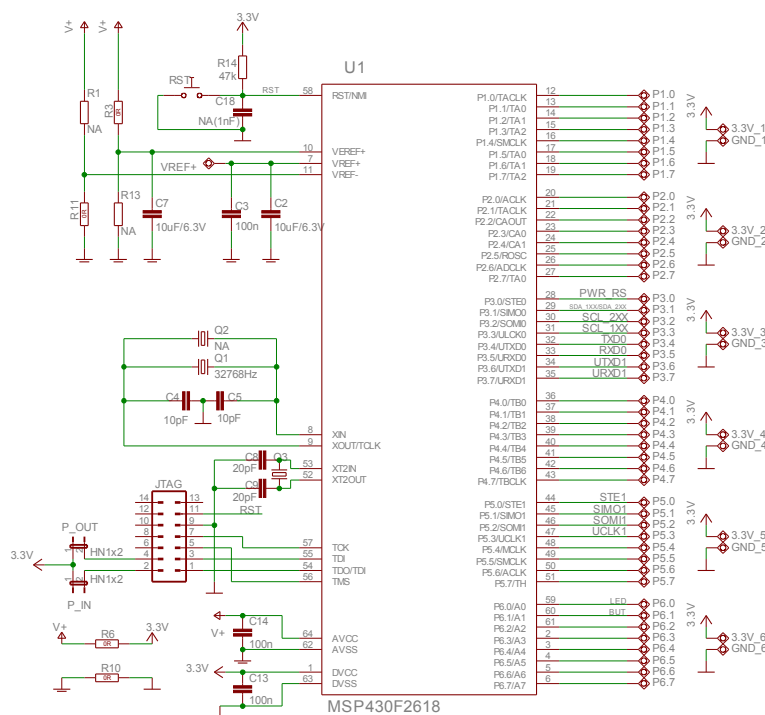
## 8.1 Introduction to the chapter

In this chapter is located the schematic describing logically MSP430-P2618.

## 8.2 Eagle schematic

MSP430-P2618 schematic is visible for reference here. You can also find it with higher quality on the web page for MSP430-P2618 at our site:

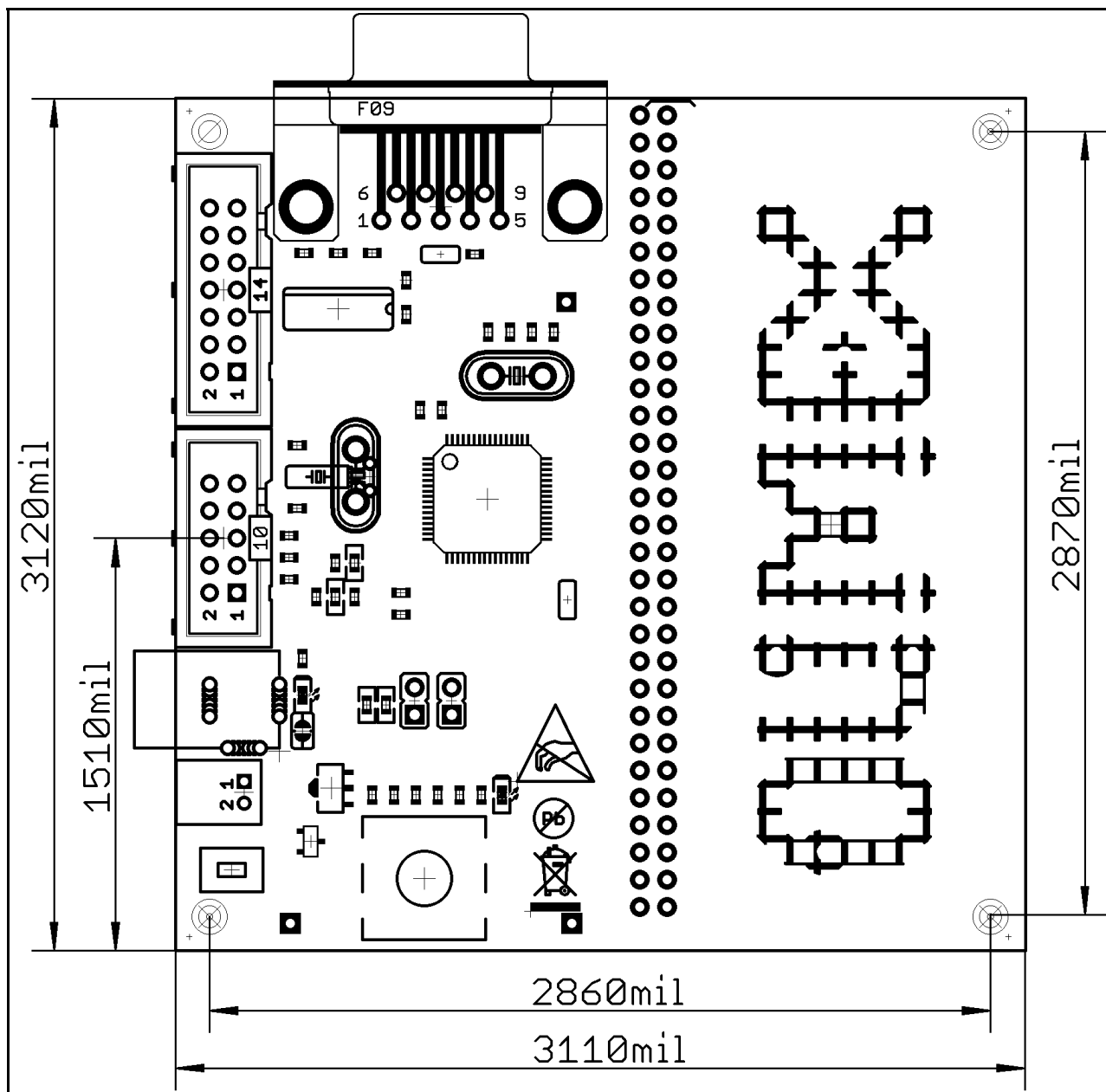
<https://www.olimex.com/Products/MSP430/Starter/MSP430-P2618/>. It is located in HARDWARE section.



MSP430-P2618\_rev\_D  
OLIMEX LTD, BULGARIA  
<https://www.olimex.com>

### 8.3 Dimensions

Note that the dimensions of the board are in mils.



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## CHAPTER 9 | REVISION HISTORY

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### 9.1 Introduction to the chapter

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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.

### 9.2 Document revision

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| Revision | Changes            | Modified Pages |
|----------|--------------------|----------------|
| C        | Initial release    | All            |
| D        | Recreated document | All            |

### 9.2 Board revision

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| Revision | Changes                                                                                                                                                                                         |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D        | UEXT added<br>Lithium battery connector added<br>Lowered PROTO area size<br>Removed AC rectifier<br>LM1117 changed with a lower power 3.3V regulator<br>Optimized the schematic for lower power |

### 9.3 Web page of your device

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The web page you can visit for more info on your device is <https://www.olimex.com/Products/MSP430/Proto/MSP430-P2618/>. There you can find more info and some examples.

#### **ORDER CODES:**

**MSP430-P2618** - completely assembled and tested

**MSP430-JTAG-TINY-V2** – mini emulator/programmer USB<->JTAG 14p

**MSP430-JTAG-ISO-MK2** – our best MSP430 emulator/debugger with extra features

**MSP430-JTAG-RF** – wireless emulator/programmer USB<->JTAG 14p

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