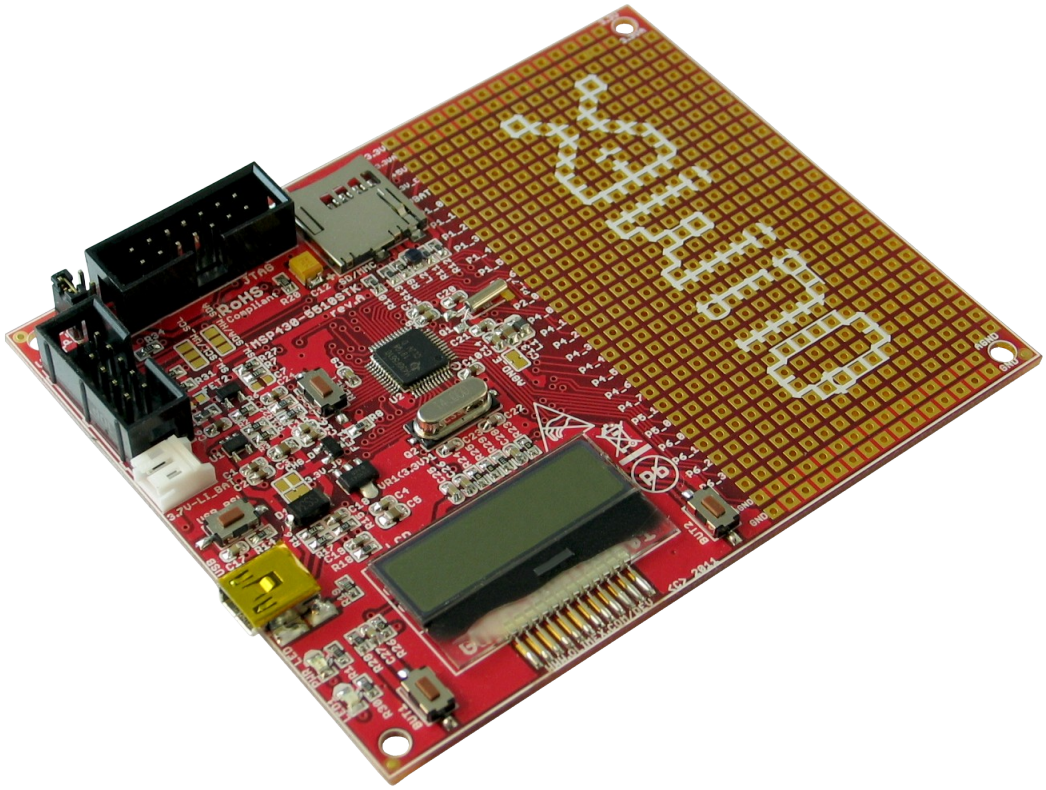


MSP430-5510STK development board
USER'S MANUAL

Initial release, March 2012
Designed by OLIMEX Ltd, 2011

All boards produced by Olimex LTD are ROHS compliant

Disclaimer:

© 2012 Olimex Ltd. Olimex®, logo and combinations thereof, are registered trademarks of Olimex Ltd. Other terms and product names may be trademarks of others.

The information in this document is provided in connection with Olimex products. No license, express or implied or otherwise, to any intellectual property right is granted by this document or in connection with the sale of Olimex products.

Neither the whole nor any part of the information contained in or the product described in this document may be adapted or reproduced in any material from except with the prior written permission of the copyright holder.

The product described in this document is subject to continuous development and improvements. All particulars of the product and its use contained in this document are given by OLIMEX in good faith. However all warranties implied or expressed including but not limited to implied warranties of merchantability or fitness for purpose are excluded. This document is intended only to assist the reader in the use of the product. OLIMEX Ltd. shall not be liable for any loss or damage arising from the use of any information in this document or any error or omission in such information or any incorrect use of the product.

Thank you for purchasing MSP430-5510STK development board assembled by OLIMEX LTD

Table of Contents

CHAPTER 1.....5
OVERVIEW.....5
1. Introduction to the chapter.....5
1.1 Features.....5
1.2 Organization.....6
CHAPTER 2 7
SETTING UP THE MSP430-5510STK BOARD.....7
2. Introduction to the chapter.....7
2.1 Electrostatic warning.....7
2.2 Requirements.....7
2.3 Powering the board.....8
2.4 Prebuilt software.....8
CHAPTER 3.....9
MSP430-5510STK BOARD DESCRIPTION.....9
3. Introduction to the chapter.....9
3.1 Layout (top view).....9
CHAPTER 4.....10
THE MSP430F5510 MICROCONTROLLER.....10
4. Introduction to the chapter.....10
4.1 The microcontroller.....10
CONTROL CIRCUITY.....12
5. Introduction to the chapter.....12
5.1 Reset.....12
5.2 Clocks.....12
CHAPTER 6.....13
HARDWARE.....13
6. Introduction to the chapter.....13
6.1 Battery connector.....13
6.2 JTAG connector.....13
6.3 UEXT.....14
6.4 Pads on the proto area.....15
6.5 USB mini connector.....16
6.6 SD/MMC slot.....16
6.7Jumper description.....17
6.8 LCD Display.....18

6.9 Additional hardware components....18
CHAPTER 7....19
MEMORY AND BLOCK DIAGRAM....19
7. Introduction to the chapter....19
7.1 Memory organization....20
CHAPTER 8....21
SCHEMATICS....21
8. Introduction to the chapter....21
8.1 Eagle schematic....21
8.2 Physical dimensions....23
CHAPTER 9....24
REVISION HISTORY....24
9. Introduction to the chapter....24
9.1 Document revision....24
9.2 Web page of your device....24

CHAPTER 1

OVERVIEW

1. Introduction to the chapter

Thank you for choosing the MSP430-5510STK development board from Olimex! This document provides a User's Guide for the Olimex MSP430-5510STK 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 MSP430-5510STK development board enables code development of applications running on the MSP430F5510 microcontroller, manufactured by Texas Instruments.

1.1 Features

- MCU **MSP430F5510** with 32K Bytes Program Flash, 4K Bytes RAM, 25Mhz **LCD** display 8 alphanumeric
- **micro SD** card connector
- **LiPo battery** on board charger
- **USB** connector, and USB bootloader support
- two buttons
- 2 status **LEDs**
- access to every pin near prototype area
- **Reset** button
- UEXT connector that allows other Olimex's modules (MOD-MP3, MOD-NRF24L01, etc.) to be connected
- **JTAG** connector
- JTAG **Power_In** and **Power_Out** jumpers
- **32 768 Hz** oscillator crystal
- **4 Mhz** crystall oscillator
- Power supply voltage regulators and filtering capacitor
- Power on Led
- PCB: FR-4, 1.5 mm (0,062"), soldermask, white silkscreen component print
- Dimensions: 100x 80mm (3.94x 3.14")

1.2 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 describes the component that is the heart of the board: the MSP430F5510 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 MSP430-5510STK BOARD

2. Introduction to the chapter

This section helps you set up the MSP430-5510STK 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.

2.1 Electrostatic warning

MSP430-5510STK 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.

2.2 Requirements

In order to set up the MSP430-5510STK, the following items are required:

- A source of power – the board can be powered through the mini USB connector (standard 5V); through external 3.7 V Lithium battery; or through the JTAG connector.

- Programmer supporting 14 pin JTAG interface and the used microcontroller MSP430F5510.

All our MSP programmers are recommended with MSP430-5510STK:
- Olimex MSP430-JTAG-ISO – isolated emulator/programmer USB<->JTAG 14p
- Olimex MSP430-JTAG-TINY – small emulator/programmer USB<->JTAG 14p
- Olimex MSP430-JTAG-RF – wireless emulator/programmer USB<->JTAG 14p

Also, a host-based software toolchain is required in order to program/debug the MSP430-5510STK 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 device web page.

2.3 Powering the board

-Plug mini USB with at least 5V to the board.
OR
-Connect 3.7V Lithium battery to the respective connector
OR
-Set the jumpers P_IN closed, P_OUT open so you can power from JTAG connector

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

2.4 Prebuilt software

On powering the board the PWR LED should turn on. The LED1 should blink green and the LCD should show the message: “OLIMEX”.

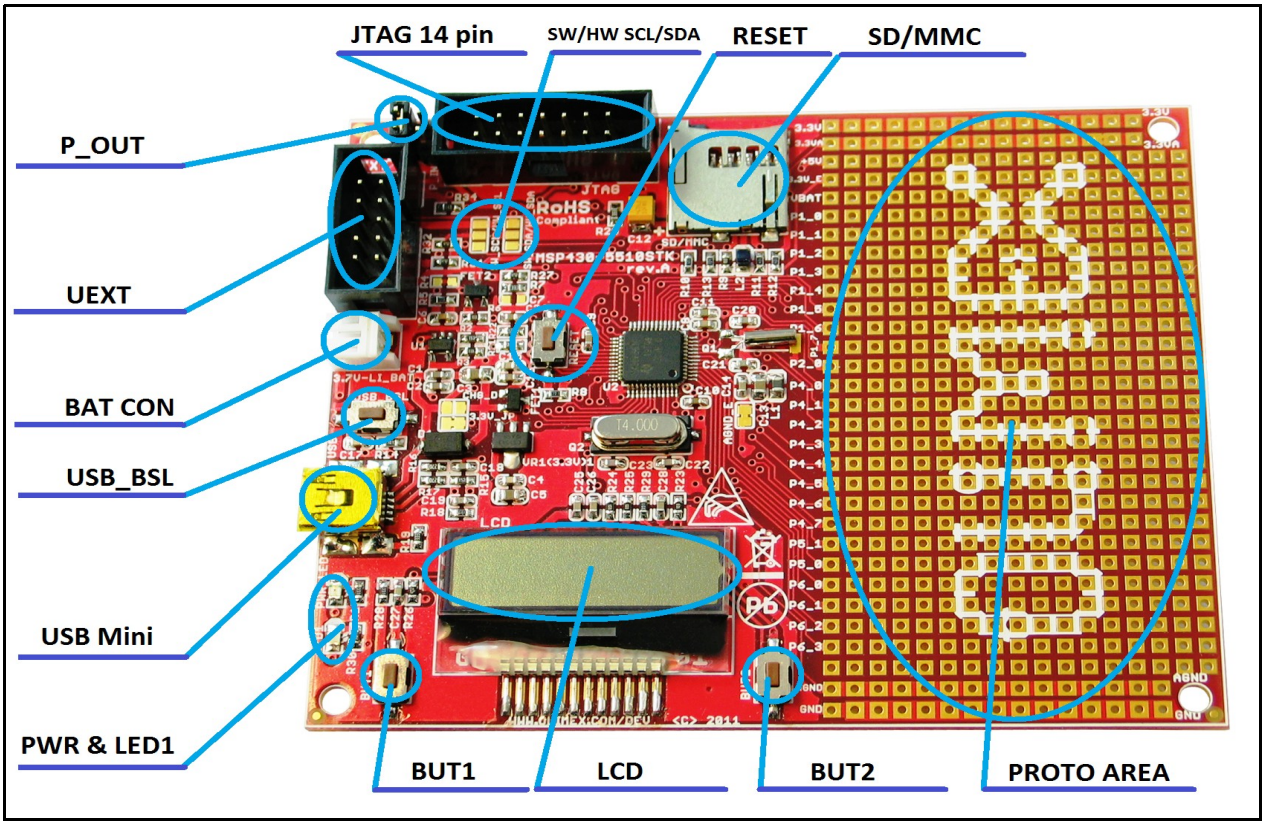
CHAPTER 3

MSP430-5510STK BOARD 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 MSP430-5510STK board itself.

3.1 Layout (top view)



CHAPTER 4

THE MSP430F5510 MICROCONTROLLER

4. Introduction to the chapter

In this chapter is located the information about the heart of MSP430-5510STK – its microcontroller. The information is a modified version of the datasheet provided by its manufacturers.

4.1 The microcontroller

Main processors features:

- Low Supply-Voltage Range, 1.8 V to 3.6 V
- Ultra-Low Power Consumption
  - ✗ Active Mode (AM)
    All System Clocks Active:
    - 195 µA/MHz at 8 MHz, 3 V, Flash Program Execution (Typical)
    - 115 µA/MHz at 8 MHz, 3 V, RAM Program Execution (Typical)
  - ✗ Standby Mode (LPM3)
    - Real Time Clock With Crystal, Watchdog, and Supply Supervisor Operational, Full RAM Retention, Fast Wake-Up: 1.9 µA at 2.2 V, 2.1 µA at 3 V (Typical)
    - Low-Power Oscillator (VLO), General-Purpose Counter, Watchdog, and Supply Supervisor Operational, Full RAM Retention, Fast Wake-Up: 1.4 µA at 3 V (Typical)
  - ✗ Off Mode (LPM4)
    Full RAM Retention, Supply Supervisor Operational, Fast Wake-Up: 1.1 µA at 3 V (Typical)
  - ✗ Shutdown Mode (LPM4.5)
    0.18 µA at 3 V (Typical)
- Wake-Up From Standby in Less Than 5 µs
- 16-Bit RISC Architecture, Extended Memory, Up to 25-MHz System Clock
- Flexible Power Management System
  - ✗ Fully Integrated LDO With Programmable Regulated Core Supply Voltage
  - ✗ Supply Voltage Supervision, Monitoring, and Brownout
- Unified Clock System:
  - ✗ FLL Control Loop for Frequency Stabilization

- ✗ Low-Power Low-Frequency Internal Clock Source (VLO)
- ✗ Low-Frequency Trimmed Internal Reference Source (REFO)
- ✗ 32-kHz Watch Crystals (XT1)

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/slas645f/slas645f.pdf

CHAPTER 5
CONTROL CIRCUITY

5. Introduction to the chapter

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

5.1 Reset

MSP430-5510STK reset circuit includes R7 (33 KΩ), R8(330 Ω), MSP430F5510 pin 48 (RST/NMI/SBWTTDIO) and a RESET button.

5.2 Clocks

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

4 MHz quarz crystal Q2 is found at pins 45 and 46 of the processor.

CHAPTER 6

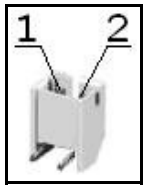
HARDWARE

6. 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.

6.1 Battery connector

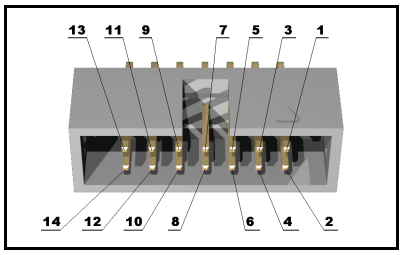
Pin #	Signal Name
1	VBAT
2	GND



6.2 JTAG connector

The 14 pin JTAG connector provides the interface for JTAG programming/debugging. The pinout can be found in the table below.

JTAG Connector			
Pin #	**Signal Name**	**Pin #**	**Signal Name**
1	TDO	8	TEST
2	P_IN	9	GND
3	TDI	10	Not connected
4	P_OUT	11	#RST
5	TMS	12	Not connected



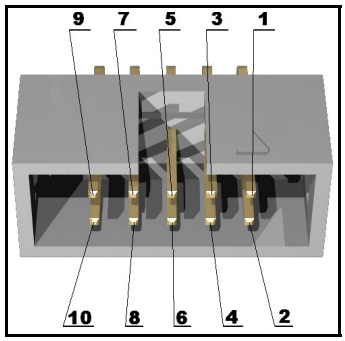
6	Not connected	**13**	Not connected
7	TCK	**14**	Not connected

6.3 UEXT

MSP430-5510STK board has UEXT connector and can interface Olimex's UEXT modules.
For more information on UEXT please visit:

http://www.olimex.com/dev/OTHER/UEXT.pdf

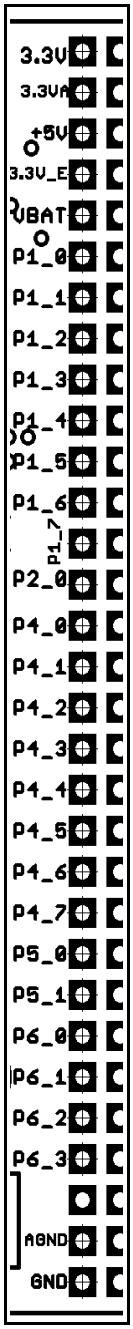
Pin #	Signal Name
1	+3.3V
2	GND
3	TX
4	RX
5	SCL
6	SDA
7	SOMI
8	SIMO
9	CLK
10	STE



6.4 Pads on the proto area

For your convenience the pads are named individually near each of them. Please take extra care about the numbering but consider that there might be offset.

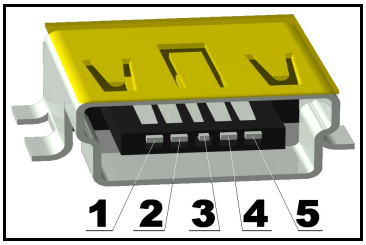
Pad Name	Signal
3.3V	3.3V row of pads
3.3VA	3.3VA row of pads
+5V	+5V
3.3V_E	3.3V_E
VBAT	V battery
P1_0	BUT1
P1_1	RS(display)
P1_2	RW(display)
P1_3	E(display)
P1_4	DB4(display)
P1_5	DB5(display)
P1_6	DB6(display)
P1_7	DB7(display)
P2_0	BUT2
P4_0	STE
P4_0	SIMO
P4_1	SOMI
P4_2	CLK
P4_3	TXD
P4_5	RXD
P4_6	CS (SD/MMC)
P4_7	LED1



P5_1	E_BAT_MEASURE
P5_0	PWR_LCD
P6_0	BAT
P6_1	STNB_E
P6_2	SCL_UEXT
P6_3	SDA_UEXT
-	-
AGND	Analog GND row of pads
GND	GND row of pads

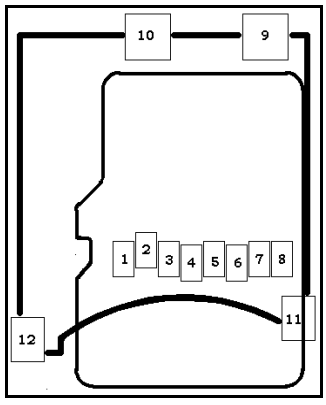
6.5 USB mini connector

Pin #	Signal Name
1	+5V
2	D-
3	D+
4	Not connected
5	GND



6.6 SD/MMC slot

Pin #	Signal Name
1	DAT2
2	DAT3/CS
3	CMD/DI
4	VDD



5	CLK/SCLK
6	VSS
7	DAT0/DO
8	DAT1

6.7Jumper description

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.

3.3V_JP

If open open stops processor and proto area pads powering.

Default state is closed.

SW_SCL/HW_SCL; SW_SDA/HW_SDA

These two jumpers control whether the SCL and SDA signals to be implemented on software or hardware level. When in position SW_SCL/SW_SDA software implementation.

Default position is SW_SCL; SW_SDA.

CHG_D

If closed stops the battery charger.

Default state is open.

AGND_E

Analog GND is disabled if open.
If closed Analog GND is enabled.

Default state is closed.

6.8 LCD Display

8 characters alphanumeric LCD display.

6.9 Additional hardware components

The components below are mounted on MSP430-5510STK but are not discussed above. They are listed here for completeness:

2 buttons + RST button

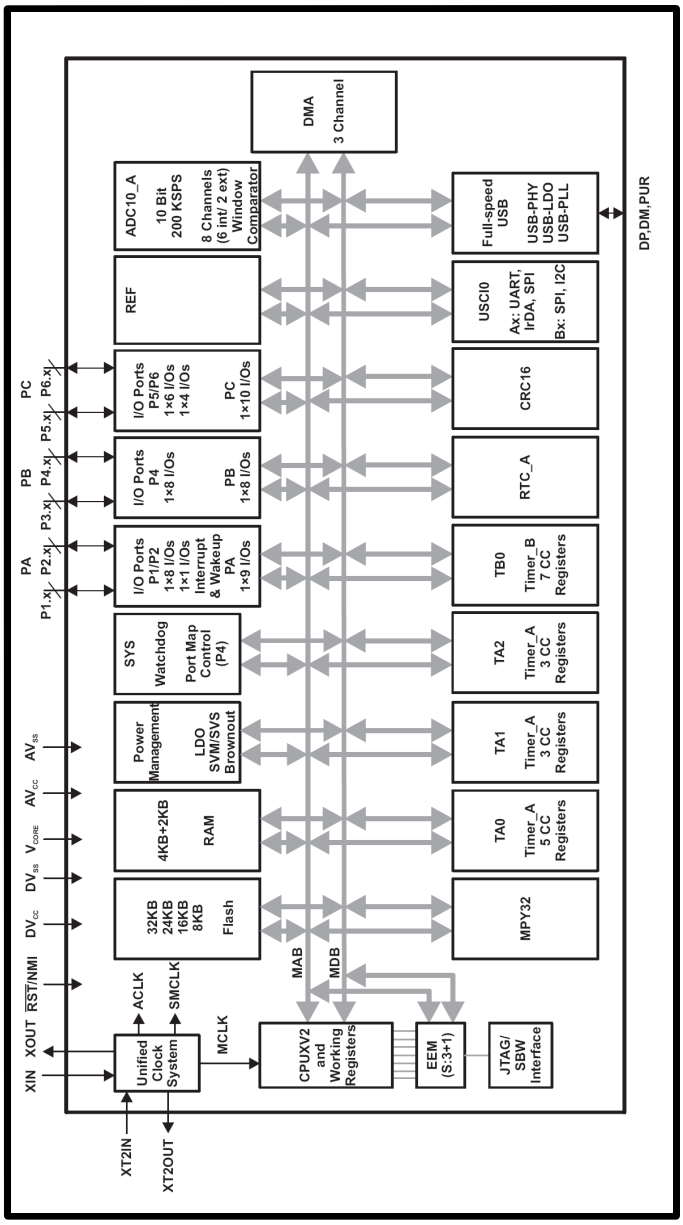
LED + power-on LED

CHAPTER 7

MEMORY AND BLOCK DIAGRAM

7. Introduction to the chapter

Below 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.



7.1 Memory organization

		MSP430F5510 MSP430F5507 MSP430F5503
Memory (flash) Main: interrupt vector Main: code memory	Total Size	32 KB 00FFFFh–00FF80h 00FFFFh-008000h
RAM	Sector 1	2 KB 0033FFh–002C00h
	Sector 0	2 KB 002BFFh–002400h
USB RAM(2)		2 KB 0023FFh–001C00h
Information memory (flash)	Info A	128 B 0019FFh–001980h
	Info B	128 B 00197Fh–001900h
	Info C	128 B 0018FFh–001880h
	Info D	128 B 00187Fh–001800h
Bootstrap loader (BSL) memory (flash)	BSL 3	512 B 0017FFh–001600h
	BSL 2	512 B 0015FFh–001400h
	BSL 1	512 B 0013FFh–001200h
	BSL 0	512 B 0011FFh–001000h
Peripherals	Size	4 KB 000FFFh–0h

CHAPTER 8

SCHEMATICS

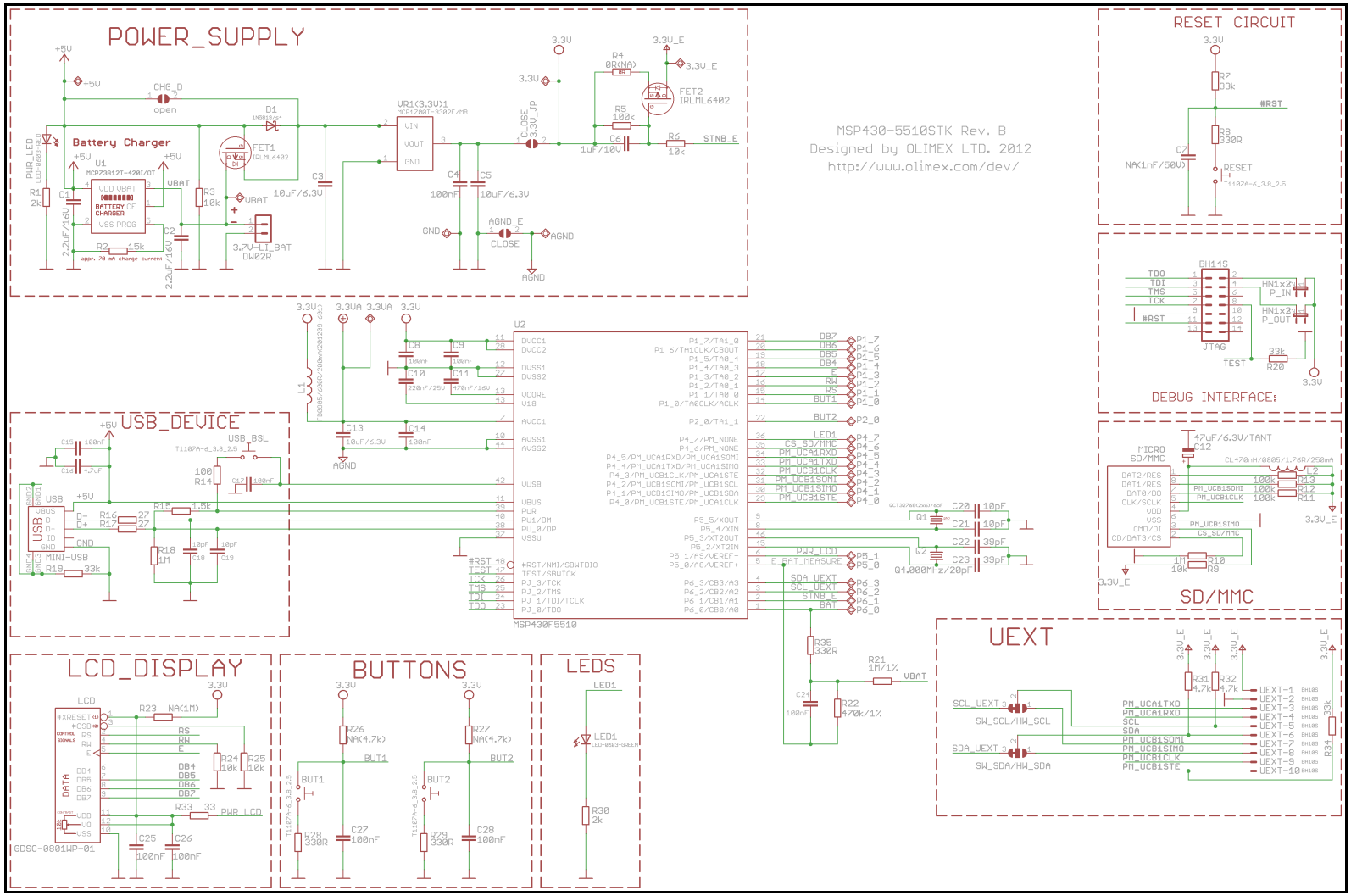
8. Introduction to the chapter

In this chapter are located the schematics describing logically and physically MSP430-5510STK.

8.1 Eagle schematic

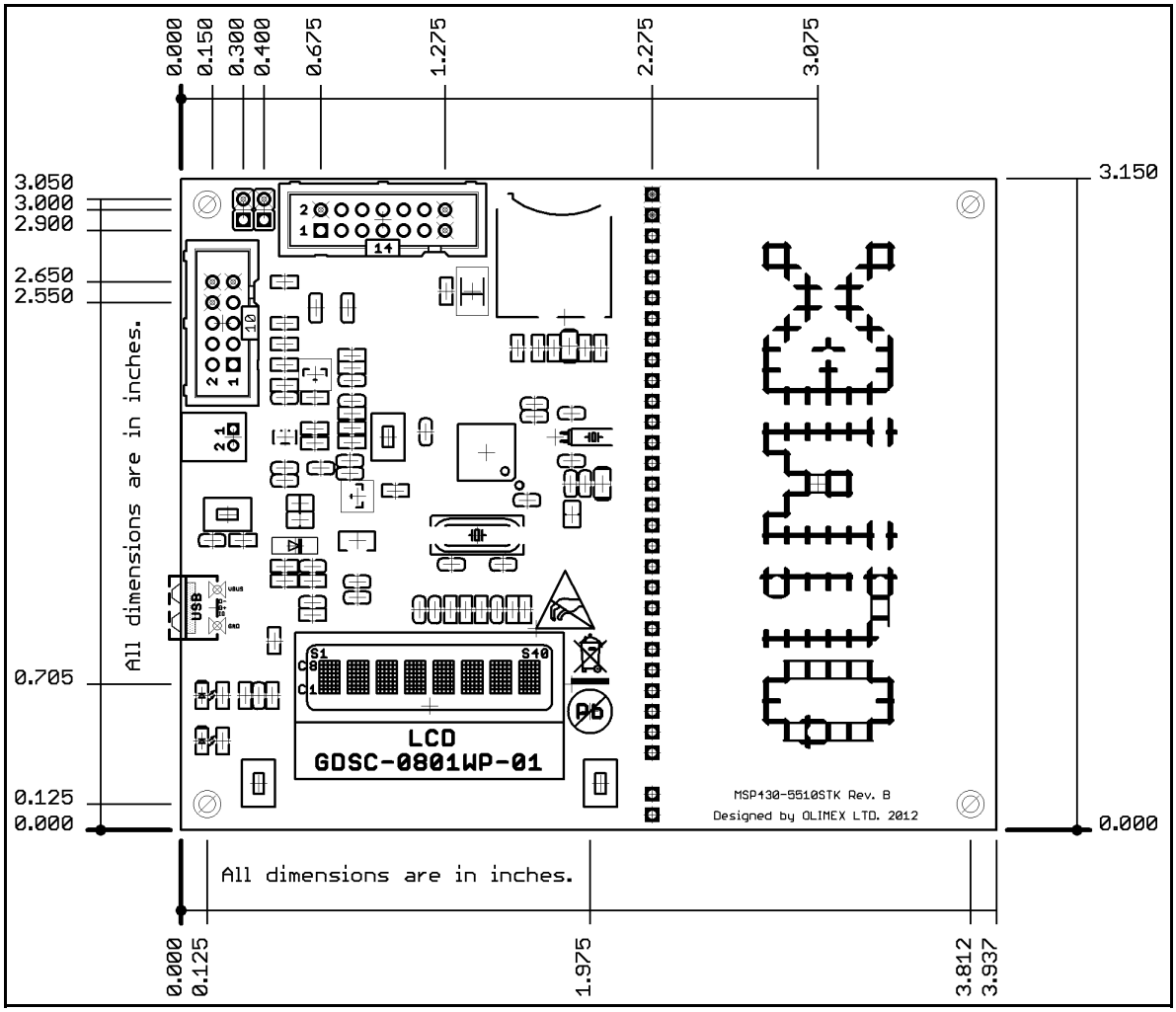
MSP430-5510STK schematic is visible for reference here. You can also find them on the web page for MSP430-5510STK at our site: http://www.olimex.com/dev/MSP430-5510STK.html. They are located in HARDWARE section.

The EAGLE schematic is situated on the next page for quicker reference.


POWER_SUPPLY
Battery Charger
MSP430-5510STK Rev. B
Designed by OLIMEX LTD. 2012
http://www.olimex.com/dev/
RESET CIRCUIT
DEBUG INTERFACE:
USB_DEVICE
SD/MMC
LCD_DISPLAY
BUTTONS
LEDS
UEXT
MSP430F5510

8.2 Physical dimensions

Note that all dimensions are in inches.



CHAPTER 9

REVISION HISTORY

9. 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.

9.1 Document revision

Revision	Changes	Modified Pages
A	Initial Creation	All

9.2 Web page of your device

The web page you can visit for more info on your device is http://www.olimex.com/dev/MSP430-5510STK.html. There you can find more info and some examples.

ORDER CODES:

MSP430-5510STK - completely assembled and tested

MSP430-JTAG-ISO – emulator/debugger with 1000VDC isolation
MSP430-JTAG-TINY - mini emulator/programmer USB<->JTAG 14p
MSP430-JTAG-RF – wireless emulator/programmer USB<->JTAG 14p

How to order?
You can order to us directly or by any of our distributors.
Check our webpage http://www.olimex.com/ for more info.