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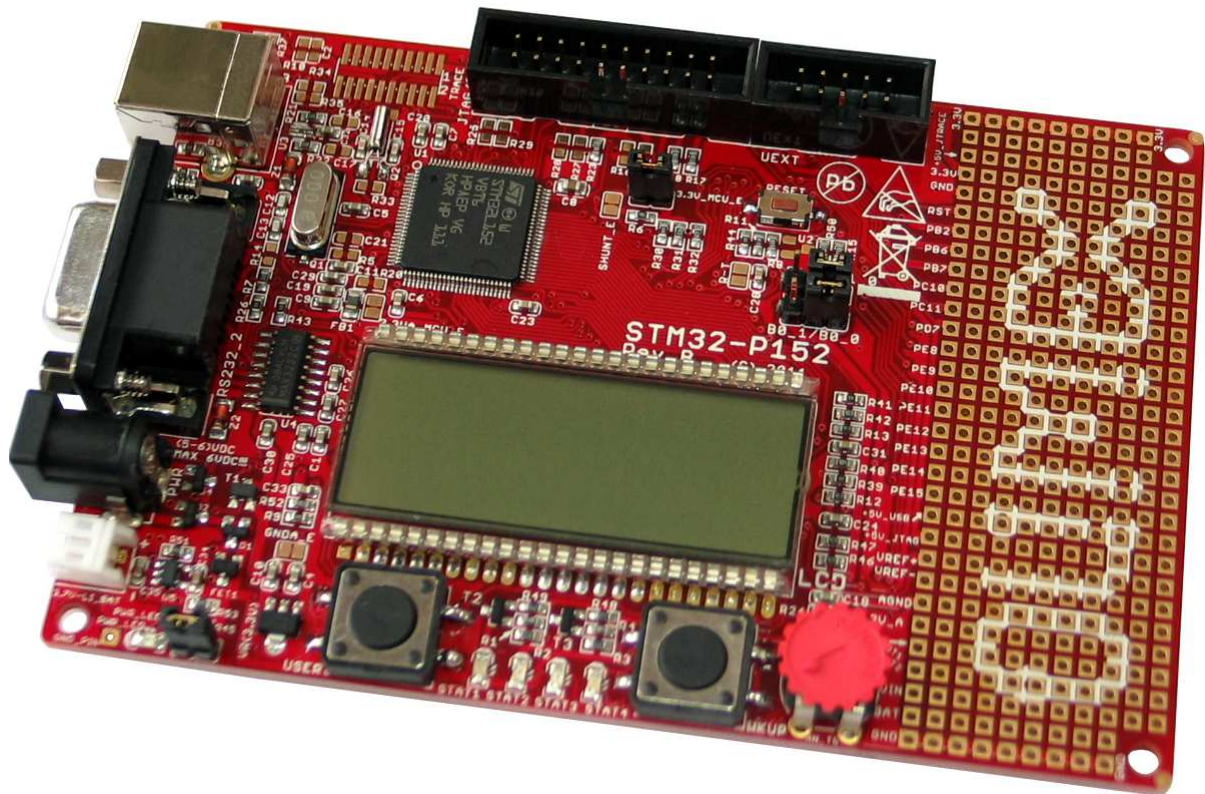
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## STM32-P152 development board user's manual



All boards produced by Olimex are ROHS compliant

Revision C, April 2012

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## **INTRODUCTION:**

STM32-P152 is a development board with STM32L152VBT6 ARM Cortex M3 microcontroller made by STMicroelectronics. This microcontroller supports various communication interfaces such as USB, three USARTs, two SPIs, two I<sup>2</sup>Cs. There are USB, JTAG and UEXT connectors, three buttons – WKUP, USER and RESET, four status LEDs, potentiometer and pin holes for most of the microcontroller's pins. The board features low power segment LCD that uses the built in LCD controller in this specialized microcontroller. Due to its low power capabilities the board can run battery powered applications via the battery connector. All this allows you to build different projects for a wide range of applications.

## **BOARD FEATURES:**

- MCU: **STM32L152VBT6** – 128 KB Flash, 16 KB Data RAM
- USB
- 3.7V-LI\_BAT connector
- Battery charger
- JTAG/SWD connector
- UEXT connector
- RS232 connector
- LCD
- Four status LEDs
- Reset circuit
- RESET button
- WKUP button
- USER button
- Potentiometer
- Power jack
- Power-on LED
- Pin holes for most of the microcontroller pins
- FR-4, 1.5 mm, soldermask, component print
- Dimensions: 120.00 x 80.00 mm (4.72 x 3.15")

## **ELECTROSTATIC WARNING:**

The **STM32-P152** board is shipped in protective anti-static packaging. The board must not be subject to high electrostatic potentials. General practice for working with static sensitive devices should be applied when working with this board.

## **BOARD USE REQUIREMENTS:**

**Cables:** The cable you will need depends on the programmer/debugger you use. If you use ARM-JTAG-EW, ARM-USB-TINY or ARM-USB-TINY-H, you will need USB A-B cable, if you use ARM-USB-OCD or ARM-USB-OCD-H, you will need USB A-B cable and RS232 cable.

**Hardware:** Programmer/Debugger [ARM-USB-OCD](#), [ARM-USB-OCD-H](#), [ARM-USB-TINY](#), [ARM-USB-TINY-H](#), [ARM-JTAG-COOCOX](#) or other compatible programming/debugging tool if you work with EW-ARM. It is a good practice to first consider the software tools you are going to use and check if they support the debuggers.

It is good idea to use SWD interface for debugging/programming because of the multiplexing of the JTAG signal lines with the display lines. If using a debugger that supports only JTAG layout you might need to disable display or write a routine that disables it.

## **PROCESSOR FEATURES:**

**STM32-P152** board uses ARM 32-bit Cortex™-M3 microcontroller **STM32L152VBT6** from STMicroelectronics has these features:

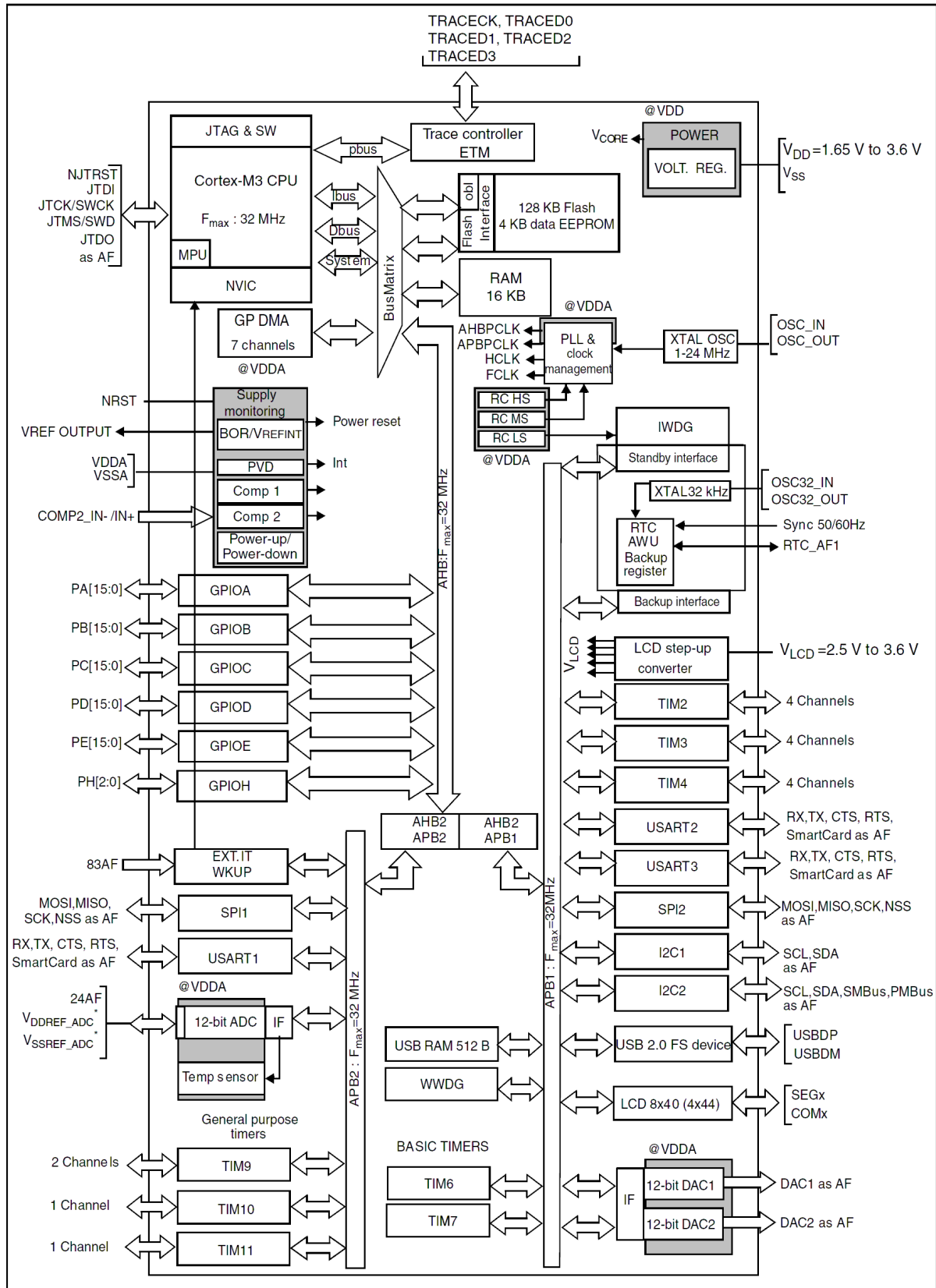
- Operating conditions
  - Operating power supply range: 1.65 V to 3.6 V (without BOR) or 1.8 V to 3.6 V (with BOR option)
  - Temperature range: -40 to 85 °C
- Low power features
  - 4 modes: Sleep, Low-power run (9 µA at 32 kHz), Low-power sleep (4.4 µA), Stop with RTC (1.45 µA), Stop (570 nA), Standby (300 nA)
  - Dynamic core voltage scaling down to 233 µA/MHz
  - Ultra low leakage per I/O: 50 nA
  - Fast wakeup from Stop: 8 µs
  - Three wakeup pins
- Core: ARM 32-bit Cortex™-M3 CPU
  - 32 MHz maximum frequency, 33.3 DMIPS peak (Dhrystone 2.1)

- Memory protection unit
- Reset and supply management
  - Low power, ultrasafe BOR (brownout reset) with 5 selectable thresholds
  - Ultralow power POR/PDR
  - Programmable voltage detector (PVD)
- Clock management
  - 1 to 24 MHz crystal oscillator
  - 32 kHz oscillator for RTC with calibration
  - Internal 16 MHz factory-trimmed RC
  - Internal 37 kHz low consumption RC
  - Internal multispeed low power RC, 64 kHz to 4 MHz with a consumption down to 1.5  $\mu$ A
  - PLL for CPU clock and USB (48 MHz)
- Low power calendar RTC
  - Alarm, periodic wakeup from Stop/Standby
- Memories
  - 128 Kbyte of Flash memory with ECC
  - 4 Kbyte of data EEPROM with ECC
  - 16 Kbyte of RAM
- 83 fast I/Os (73 of which are 5 V-tolerant) all mappable on 16 external interrupt vectors
- Development support
  - Serial wire debug, JTAG and trace
- DMA: 7-channel DMA controller, supporting timers, ADC, SPIs, I2Cs and USARTs
- LCD 8  $\times$  40 or 4  $\times$  44 with step-up converter
- 12-bit ADC up to 1 Msps/24 channels
  - Temperature sensor and internal voltage reference
  - Operates down to 1.8 V
- 2  $\times$  12-bit DACs with output buffers
- 2 ultralow power comparators
  - Window mode and wakeup capability
- 10 timers:
  - 6  $\times$  16-bit general-purpose timers, each with up to 4 IC/OC/PWM channels
  - 2  $\times$  16-bit basic timers

- 2 × watchdog timers (independent and window)
- 8 communication interfaces:
  - 2 × I2C interfaces (SMBus/PMBus)
  - 3 × USARTs (ISO 7816 interface, LIN, IrDA capability, modem control)
  - 2 × SPIs (16 Mbit/s)
  - USB 2.0 full speed interface
- CRC calculation unit, 96-bit unique ID

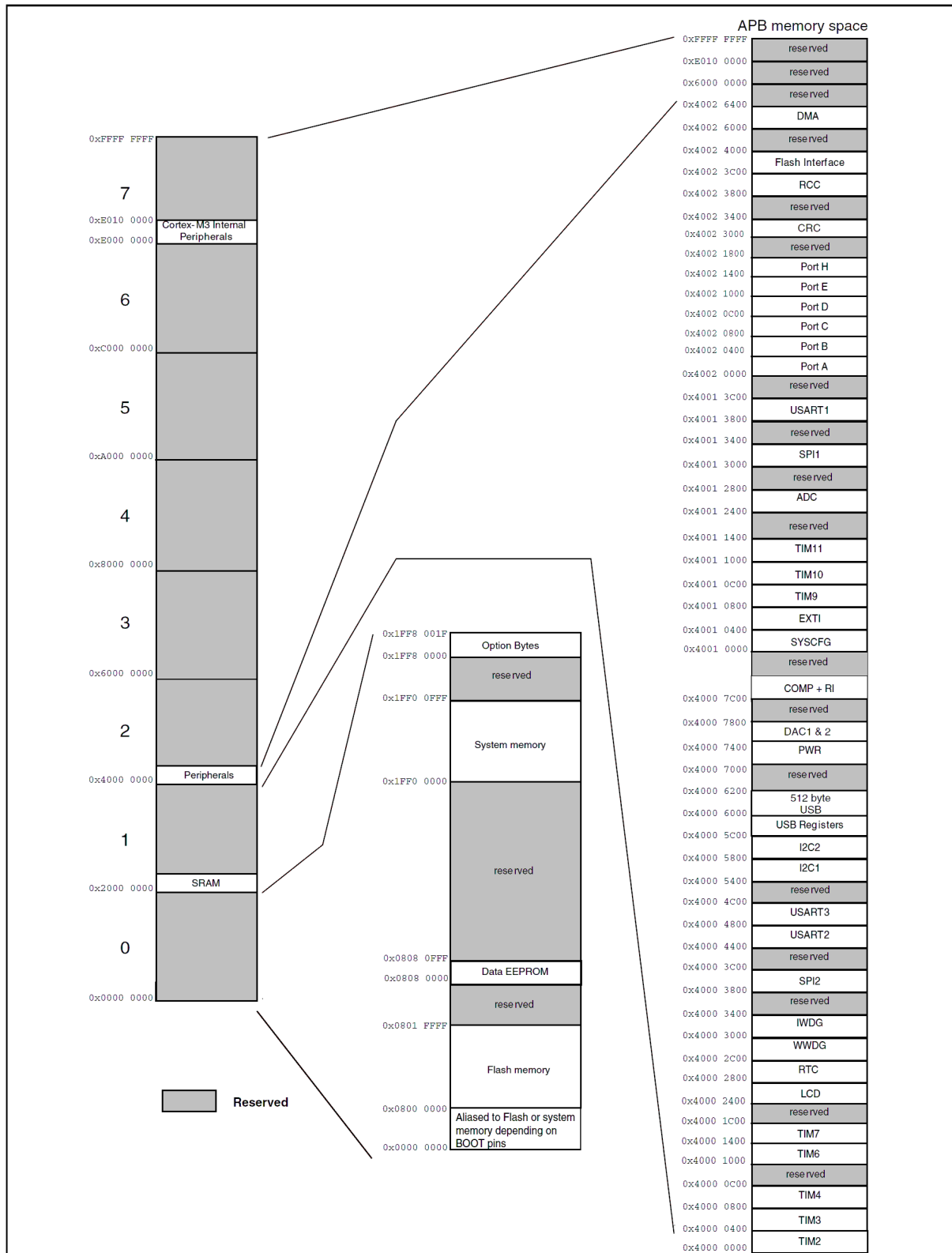
Peripheral		STM32L152VBT6
Flash - Kbytes		128
RAM - Kbytes		16
Timers	General-purpose	6
	Basic	2
Communication interfaces	SPI	2
	I <sup>2</sup> C	2
	USART	3
	USB	1
GPIOs		83
12-bit synchronized ADC		1
Number of channels		24 channels
12-bit DAC		2
Number of channels		2
CPU frequency		32 MHz
Operating voltage		1.8 V to 3.6 V (down to 1.65 V at power-down) with BOR option 1.65 V to 3.6 V without BOR option
Operating temperatures		Ambient temperatures: -40 to +85 °C Junction temperature: -40 to + 105 °C

# BLOCK DIAGRAM:



AF = Alternate Function function on I/O port pin.

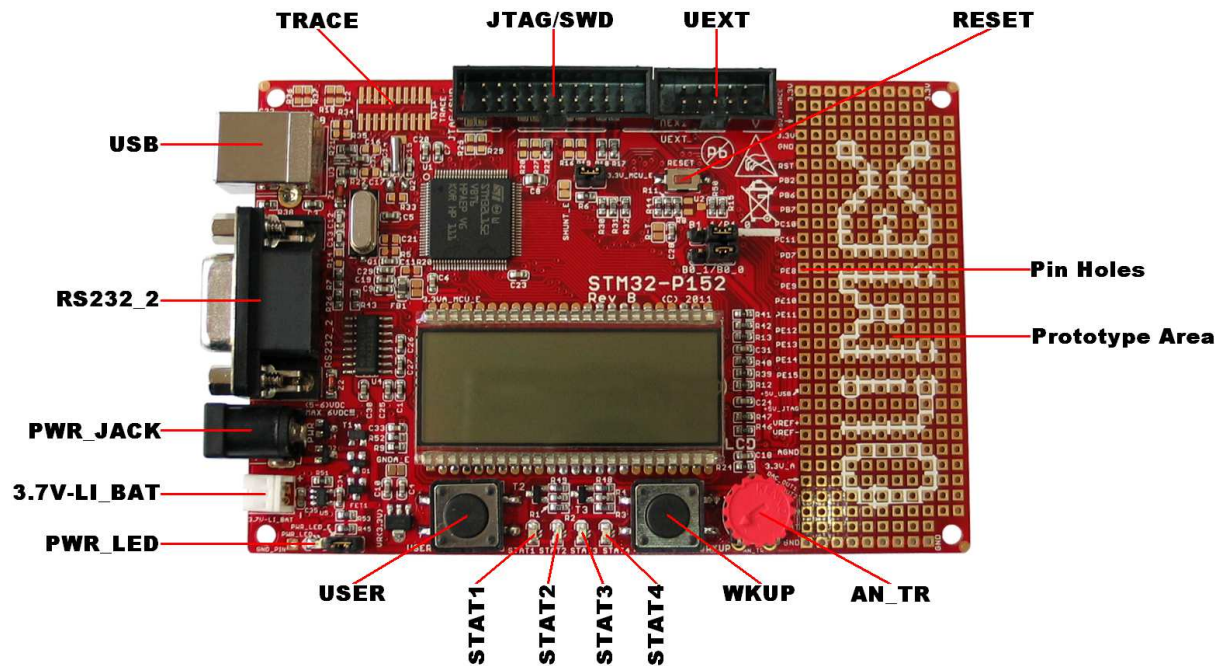
# MEMORY MAP:







## BOARD LAYOUT:



## POWER SUPPLY CIRCUIT:

STM32-P152 can take power from:

- PWR\_JACK (5-6) VDC
- USB - +5V\_USB.
- JTAG - +5V\_JTAG.
- TRACE - +5V\_J-TRACE
- Battery connector - +3.7V lithium battery.
- Pin Hole VIN - (5÷6) VDC.

The programmed board power consumption is about 50 mA with all peripherals enabled. The minimal current consumption is a few uA(up to 10)

Note that if the battery is connected to 3,7V-Li BAT connector and some of other power sources(USB, JTAG, TRACE, PWR\_JACK) are present and the battery is discharged then the battery will be charge until the charge complete.

## RESET CIRCUIT:

STM32-P152 reset circuit includes R8 (10k), R44 (330Ω), R11 (100Ω/1%), C28 (100nF), STM32L152VBT6 pin 14 (NRST) and RESET button.

## CLOCK CIRCUIT:

Quartz crystal (Q1) 8 MHz is connected to STM32L152VBT6 pin 12 (OSC\_IN/PH0) and pin 13 (OSC\_OUT/PH1).

Quartz crystal (Q2) 32.768 kHz is connected to STM32L152VBT6 pin 8 (PC14/OSC32\_IN) and pin 9 (PC15/OSC32\_OUT).

## JUMPER DESCRIPTION:

### R-T



When this jumper is closed, RST and TRST/SEG8 are connected. When this jumper is opened, RST and TRST/SEG8 are separated.

Default state is opened.

### SHUNT\_E



When this jumper is closed, 1 Ohm shunt is enabled. When this jumper is opened, 1 Ohm shunt is disabled.

Default state is closed.

### GNDA\_E



When this jumper is closed, the board analog ground is enabled. When this jumper is opened, the board analog ground is disabled.

Default state is closed.

### 3.3VA\_MCU\_E



When this jumper is closed, the microcontroller analog power is enabled. When this jumper is opened, the microcontroller analog power is not enabled.

Default state is closed.

### 3.3V\_MCU\_E



When this jumper is closed, STM32L152VBT6 power supply is enabled. When this jumper is opened, STM32L152VBT6 power supply is disabled.

Default state is closed.

### PWR\_LED\_E



When this jumper is closed, the PWR\_LED is enabled. When this jumper is opened, the PWR\_LED is disabled.

Default state is closed.

### B0\_1/B0\_0



This jumper, when is in position B0\_1 – connects STM32L152VBT6 pin 94 (BOOT0) via R15 (10k) to 3.3V, when the jumper is in position B0\_0 – connects STM32L152VBT6 pin 94 (BOOT0) via R15 (10k) to GND.

Default state is closed in position B0\_0.

## B1\_1/B1\_0



This jumper, when is in position B1\_1 – connects STM32L152VBT6 pin 37 (PB2/BOOT1) via R7 (10k) to 3.3V, when the jumper is in position B1\_0 – connects STM32L152VBT6 pin 37 (PB2/BOOT1) via R7 (10k) to GND.  
Default state is closed in position B1\_0.

The boot mode is selected depending on jumpers B0\_1/B0\_0 and B1\_1/B1\_0 configuration:

- When B0\_1/B0\_0 is closed in position B0\_0 and B1\_1/B1\_0 position doesn't matter - the boot mode is Main Flash Memory.
- When B0\_1/B0\_0 is closed in position B0\_1 and B1\_1/B1\_0 is closed in position B1\_0 – the boot mode is System Memory.
- When B0\_1/B0\_0 is closed in position B0\_1 and B1\_1/B1\_0 is closed in position B1\_1 – the boot mode is Embedded SRAM.

## INPUT/OUTPUT:

**Status led (green)**, with name **STAT1** is connected to STM32L152VBT6 pin 29 (PA4/DAC\_OUT1), allowing current through it to be adjusted smoothly.

**Status led (yellow)**, with name **STAT2** is connected to STM32L152VBT6 pin 30 (PA5/DAC\_OUT2), allowing current through it to be adjusted smoothly.

**Status led (red)**, with name **STAT3** is connected to STM32L152VBT6 pin 41 (PE10).

**Status led (green)**, with name **STAT4** is connected to STM32L152VBT6 pin 42 (PE11).

**Power-on led**, with name **PWR\_LED** – this led shows that the board is power supplied.

**User button** with name **WKUP** is connected to **STM32L152VBT6** pin 23 (PA0/WKUP1).

**User button** with name **USER** is connected to **STM32L152VBT6** pin 7 (PC13/WKUP2).

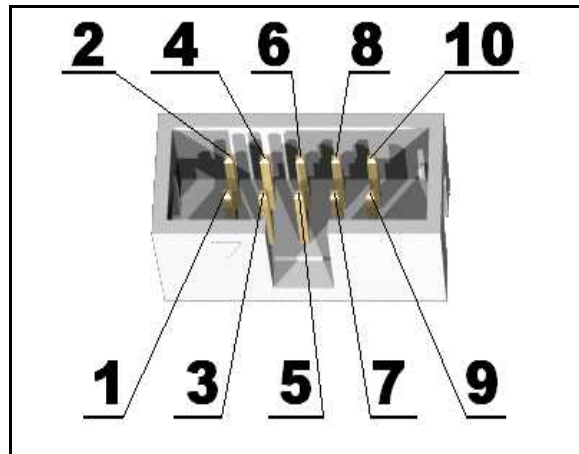
**User button** with name **RESET** is connected to **STM32L152VBT6** pin 14 (NRST).

**Trimmer** with name **AN\_TR** is connected to **STM32L152VBT6** pin 82 (PD1/SPI2\_SCK) – signal “TRIMER\_EN”.

## EXTERNAL CONNECTORS DESCRIPTION:

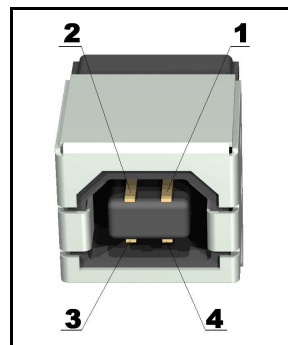
### UEXT:

Pin #	Signal Name
1	VCC (3.3V)
2	GND
3	USART3_TX
4	USART3_RX
5	I2C1_SCL
6	I2C1_SDA
7	SPI1_MISO
8	SPI1_MOSI
9	SPI1_SCK
10	SPI1_NSS



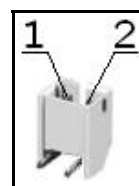
### USB:

Pin #	Signal Name
1	+5V_USB
2	USB_DM
3	USB_DP
4	GND



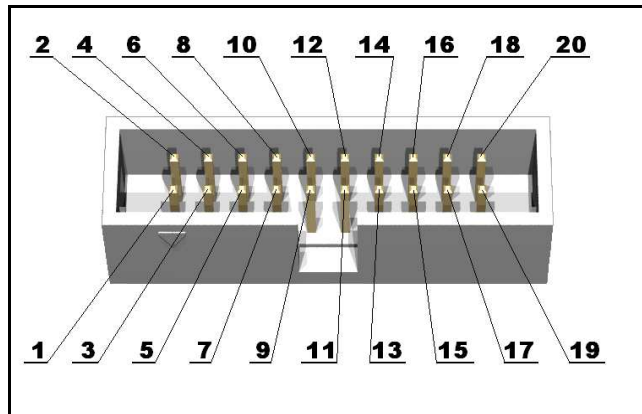
### 3.7V-LI BAT:

Pin #	Signal Name
1	VBAT
2	GND





## JTAG/SWD:



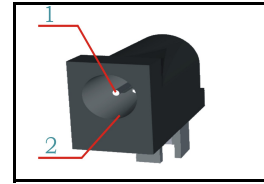
Pin #	Signal Name	Pin #	Signal Name
1	VCC (3.3V)	2	VCC (3.3V)
3	TRST/SEG8	4	GND
5	TDI/SEG17	6	GND
7	TMS/SWDIO	8	GND
9	TCK/SWCLK	10	GND
11	Via 10k to GND	12	GND
13	TDO/TRACESWO/SEG7	14	GND
15	RST	16	GND
17	Via 10k to GND	18	GND
19	+5V_JTAG	20	GND

Important: The default demo software blocks the JTAG communication. A workaround is to press and hold button B2, then press RST, then release B2. This will shut down the display allowing you to erase the demo via JTAG and after that the JTAG should be available.

SWD debuggers/programmers would not have such a problem.

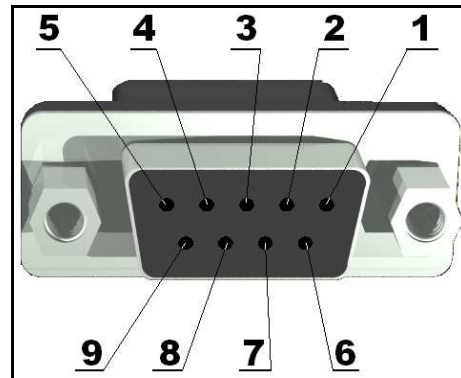
## PWR JACK:

Pin #	Signal Name
1	EXT_PWR
2	GND



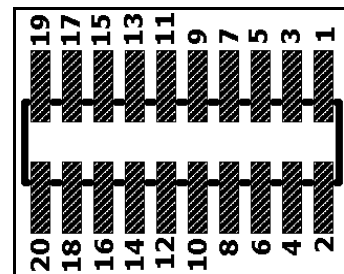
## RS232 2:

Pin #	Signal Name
1	Not Connected
2	T1OUT (U4 pin 14)
3	R1IN (U4 pin 13)
4	Not Connected
5	GND
6	Not Connected
7	CTS
8	RTS
9	Not Connected































## TRACE:

Pin #	Signal Name	Pin #	Signal Name
1	VCC (3.3V)	2	TMS/SWDIO
3	GND	4	TCK/SWCLK
5	GND	6	TDO/TRACESWO/SEG7
7	Not Connected	8	TDI/SEG17
9	GND	10	RST

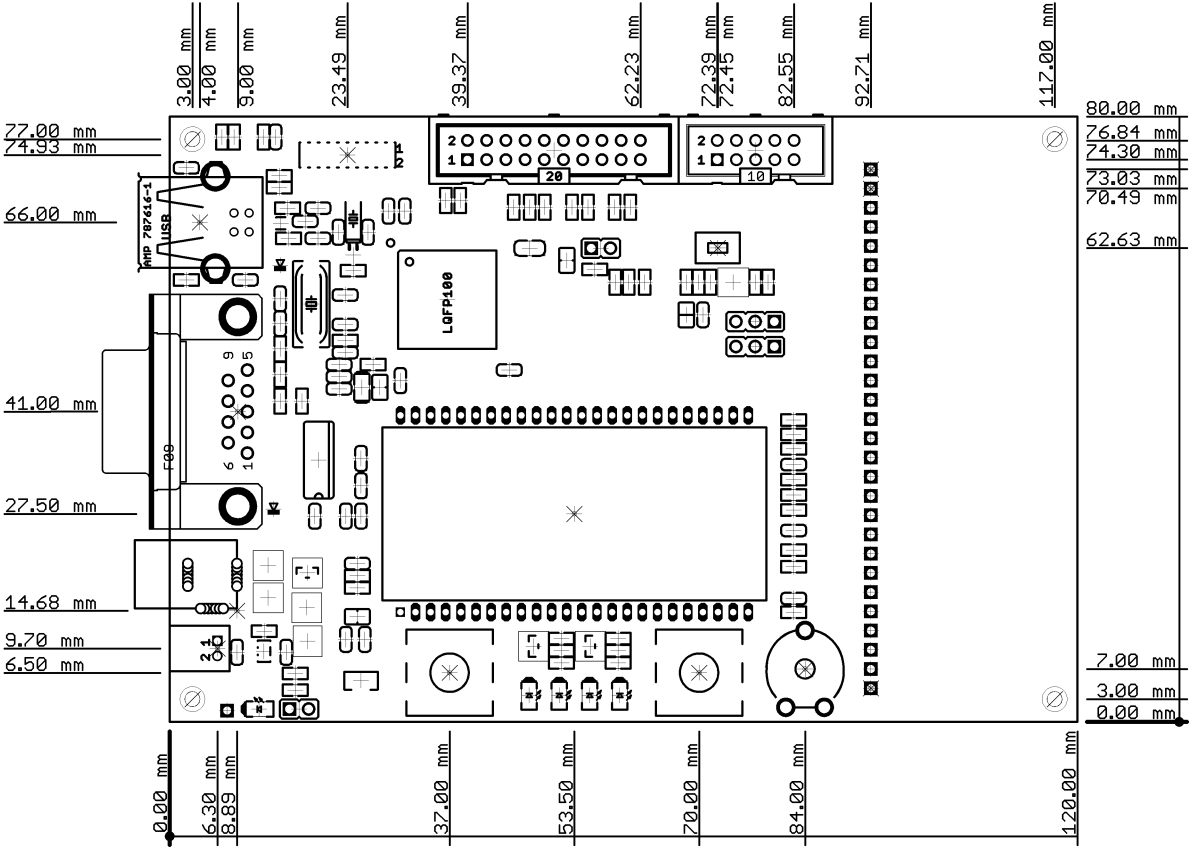


11	+5V_J-TRACE	12	TRACECK/SEG38
13	+5V_J-TRACE	14	TRACED0/SEG39
15	GND	16	TRACED1
17	GND	18	TRACED2
19	GND	20	TRACED3

## PIN HOLES:

+5V\_JTRACE   
3.3V   
GND   
RST   
PB2   
PB6   
PB7   
PC10   
PC11   
PD7   
PE8   
PE9   
PE10   
PE11   
PE12   
PE13   
PE14   
PE15   
+5V\_USB   
+5V\_JTAG   
VREF+   
VREF-   
AGND   
3.3V\_A   
DAC\_OUT1   
DAC\_OUT2   
VIN   
BAT 

# MECHANICAL DIMENSIONS:





## **AVAILABLE DEMO SOFTWARE:**

- [Demo software USB mouse and Blinking LED](#) for EW-ARM
- [Setup GCC+Eclipse for STM32 on MAC](#)

## **ORDER CODE:**

STM32-P152 - assembled and tested board

### **How to order?**

You can order to us directly or by any of our distributors.  
Check our web <https://www.olimex.com/> or more info.

### **Revision history:**

Board's revision:	Rev. B, June 2011
Manual's revision:	Rev. Initial, September 2011
Manual's revision:	Rev. B, March 2013
Manual's revision:	Rev. C, April 2013

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