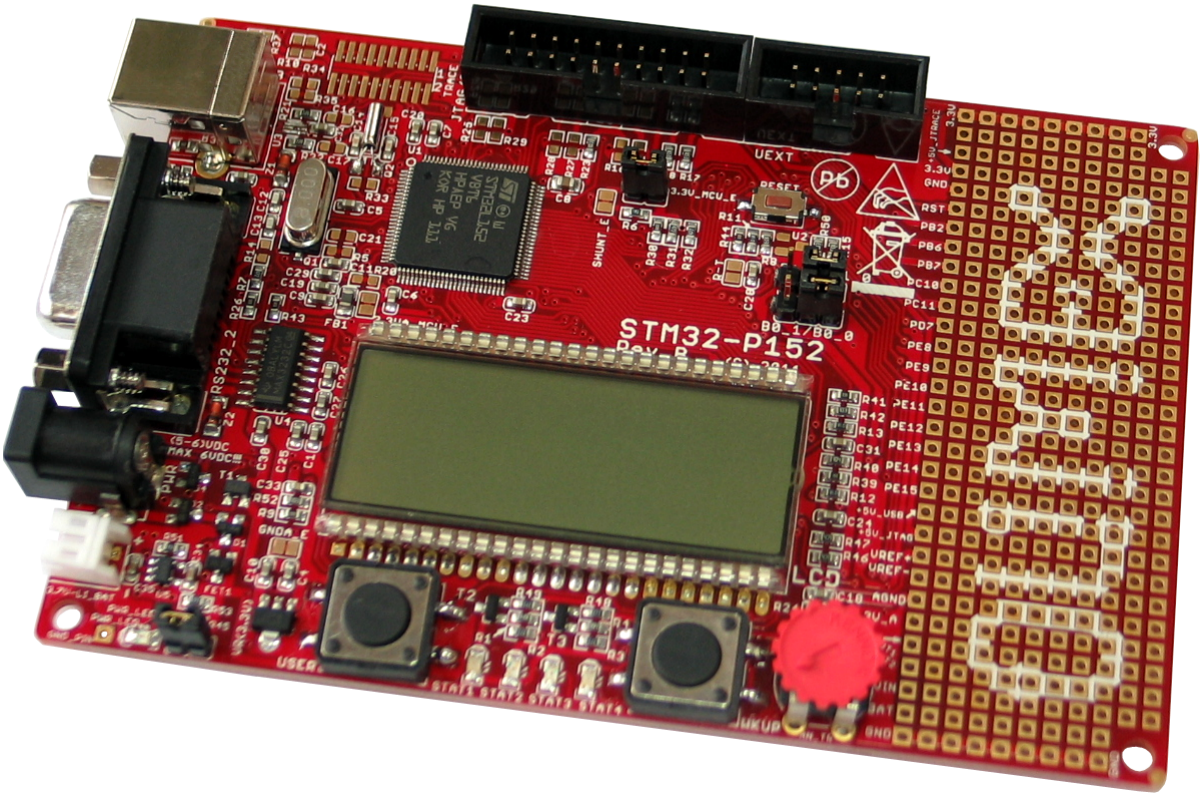


STM32-P152 development board
user's manual

All boards produced by Olimex are ROHS compliant

Revision C, April 2012

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^2Cs. 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:

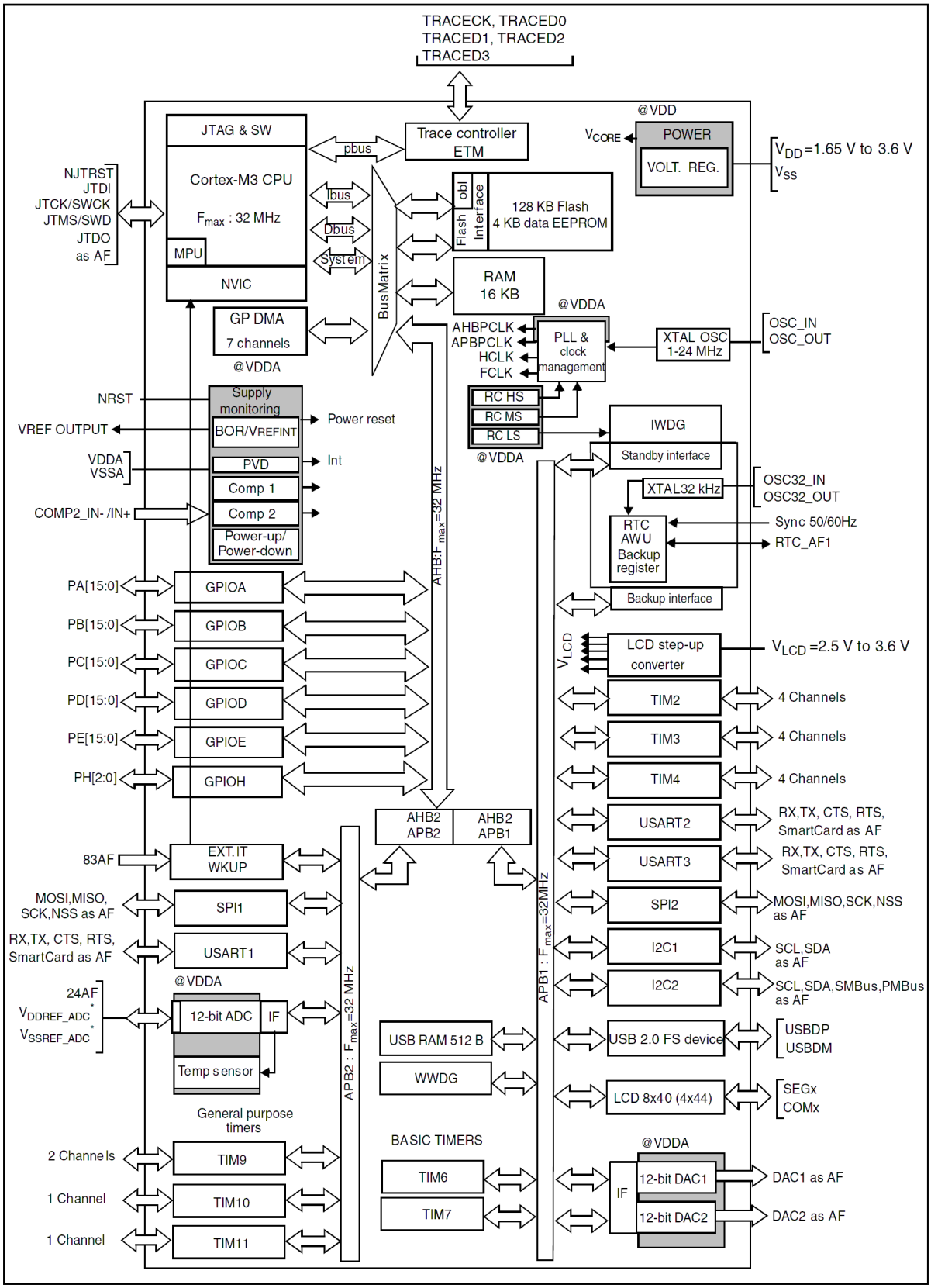
- Operating conditions
  - Operating power supply range: 1.65 V to 3.6 V (without BOR) or 1.8 V to 3.6 V (with BOR option)
  - Temperature range: –40 to 85 °C
- Low power features
  - 4 modes: Sleep, Low-power run (9 µA at 32 kHz), Low-power sleep (4.4 µA), Stop with RTC (1.45 µA), Stop (570 nA), Standby (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 μA
  - 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 × 40 or 4 × 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× 12-bit DACs with output buffers
- 2 ultralow power comparators
  - Window mode and wakeup capability
- 10 timers:
  - 6 × 16-bit general-purpose timers, each with up to 4 IC/OC/PWM channels
  - 2 × 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

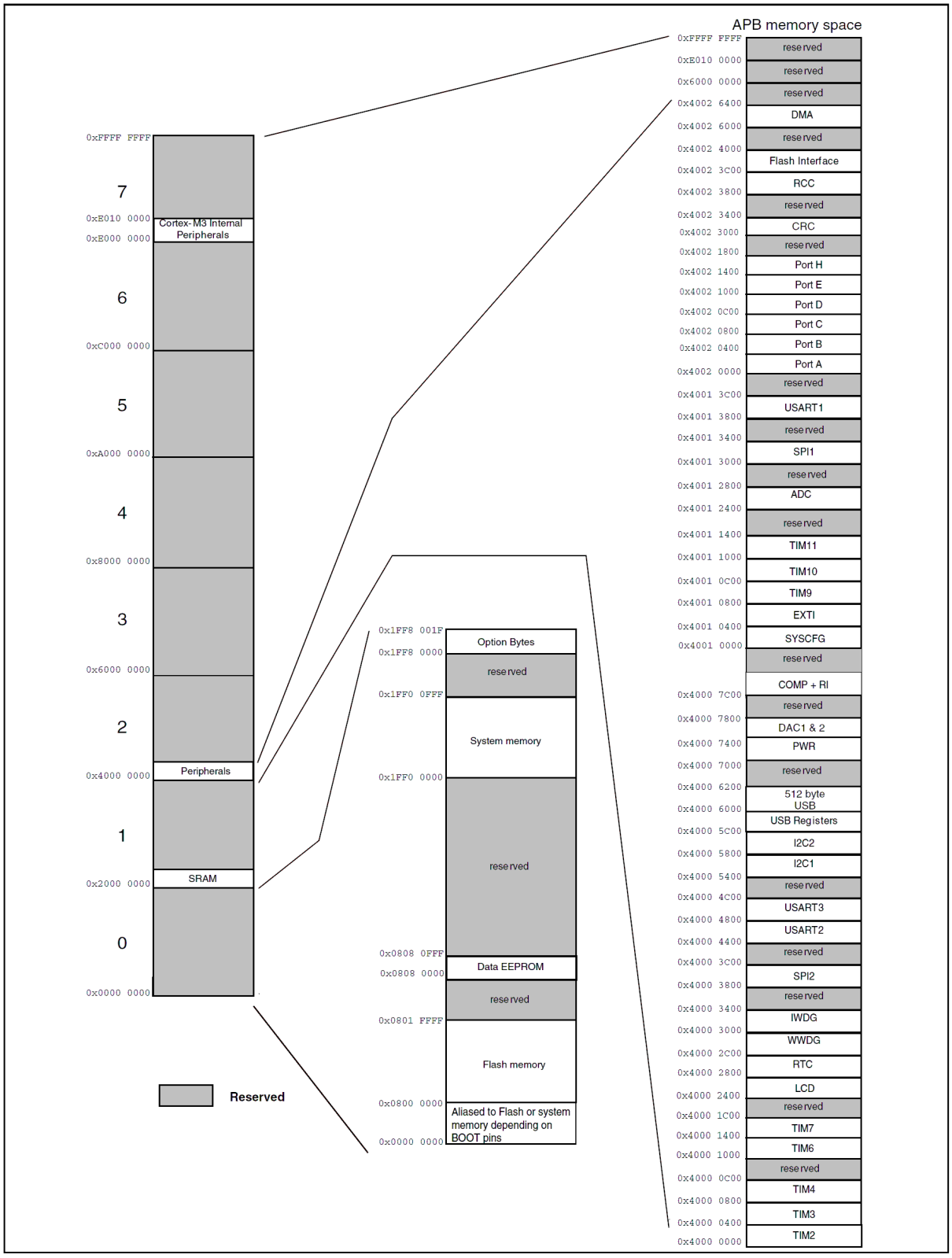
Peripheral		STM32L152VBT6
Flash - Kbytes		128
RAM - Kbytes		16
Timers	**General-purpose**	6
	Basic	2
Communication interfaces	**SPI**	2
	I^2C	2
	USART	3
	USB	1
GPIOs		83
12-bit synchronized ADC **Number of channels**		1 24 channels
12-bit DAC **Number of channels**		2 2
CPU frequency		32 MHz
Operating 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:

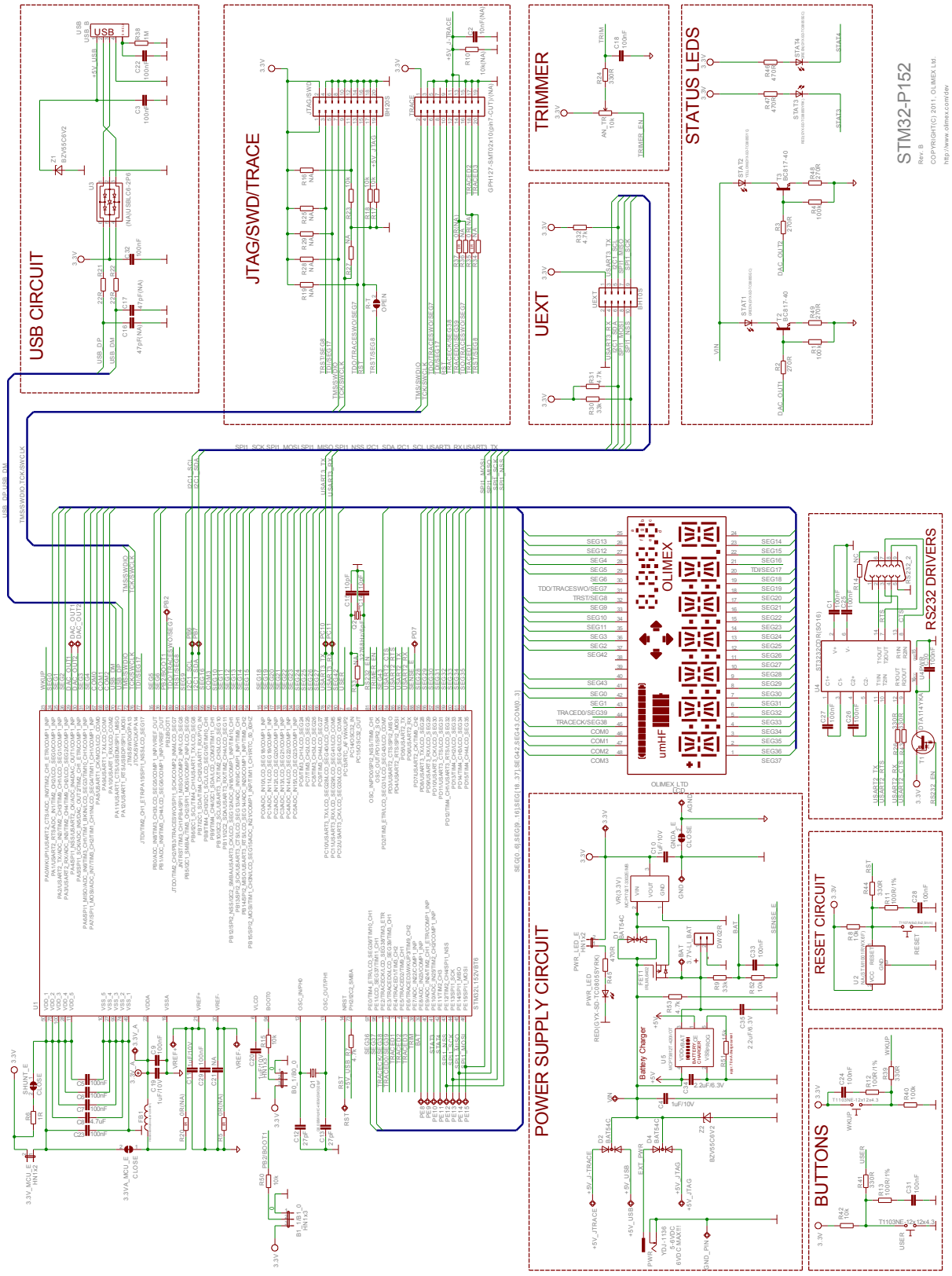


AF = Alternate Function function on I/O port pin.

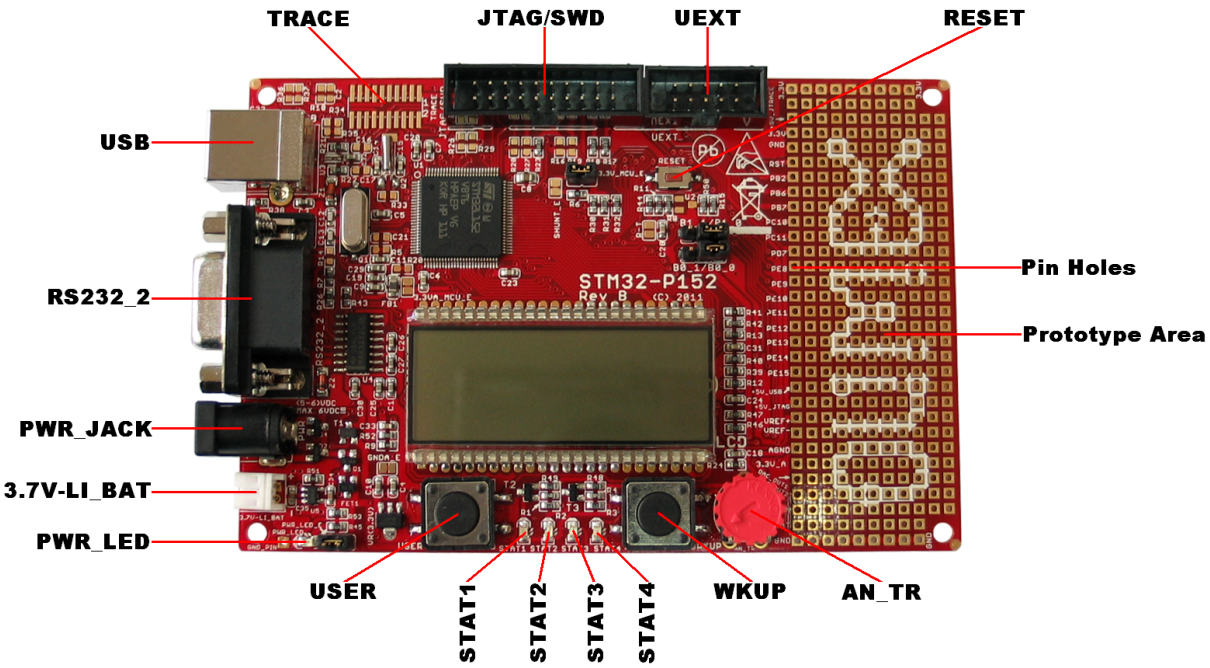
MEMORY MAP:


0xFFFF FFFF
7
0xE010 0000
Cortex- M3 Internal Peripherals
0xE000 0000
6
0xC000 0000
5
0xA000 0000
4
0x8000 0000
3
0x6000 0000
2
0x4000 0000
Peripherals
1
0x2000 0000
SRAM
0
0x0000 0000
Reserved
0x1FF8 001F
Option Bytes
0x1FF8 0000
reserved
0x1FF0 0FFF
System memory
0x1FF0 0000
reserved
0x0808 0FFF
Data EEPROM
0x0808 0000
reserved
0x0801 FFFF
Flash memory
0x0800 0000
Aliased to Flash or system memory depending on BOOT pins
0x0000 0000
APB memory space
0xFFFF FFFF
reserved
0xE010 0000
reserved
0x6000 0000
reserved
0x4002 6400
DMA
0x4002 6000
reserved
0x4002 4000
Flash Interface
0x4002 3C00
RCC
0x4002 3800
reserved
0x4002 3400
CRC
0x4002 3000
reserved
0x4002 1800
Port H
0x4002 1400
Port E
0x4002 1000
Port D
0x4002 0C00
Port C
0x4002 0800
Port B
0x4002 0400
Port A
0x4002 0000
reserved
0x4001 3C00
USART1
0x4001 3800
reserved
0x4001 3400
SPI1
0x4001 3000
reserved
0x4001 2800
ADC
0x4001 2400
reserved
0x4001 1400
TIM11
0x4001 1000
TIM10
0x4001 0C00
TIM9
0x4001 0800
EXTI
0x4001 0400
SYSCFG
0x4001 0000
reserved
COMP + RI
0x4000 7C00
reserved
0x4000 7800
DAC1 & 2
0x4000 7400
PWR
0x4000 7000
reserved
0x4000 6200
512 byte USB
0x4000 6000
USB Registers
0x4000 5C00
I2C2
0x4000 5800
I2C1
0x4000 5400
reserved
0x4000 4C00
USART3
0x4000 4800
USART2
0x4000 4400
reserved
0x4000 3C00
SPI2
0x4000 3800
reserved
0x4000 3400
IWDG
0x4000 3000
WWDG
0x4000 2C00
RTC
0x4000 2800
LCD
0x4000 2400
reserved
0x4000 1C00
TIM7
0x4000 1400
TIM6
0x4000 1000
reserved
0x4000 0C00
TIM4
0x4000 0800
TIM3
0x4000 0400
TIM2
0x4000 0000

SCHEMATIC:


USB CIRCUIT
JTAG/SWD/TRACE
TRIMMER
UEXT
STATUS LEDS
STM32-P152
RS232 DRIVERS
RESET CIRCUIT
BUTTONS
POWER SUPPLY CIRCUIT
OLIMEX
OLIMEX_LTD

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).

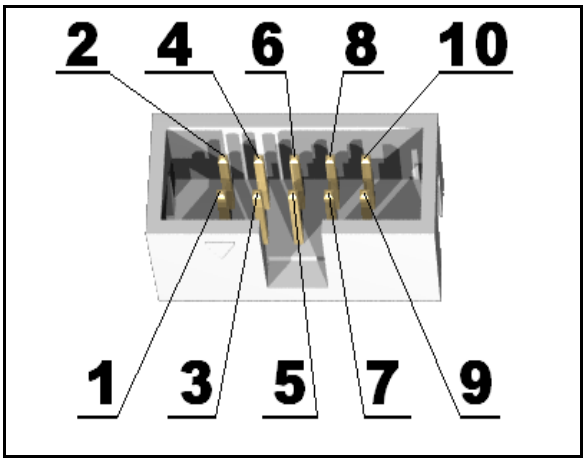
User button with name **RESET** is connected to **STM32L152VBT6** pin 14 (NRST).

Trimmer with name **AN_TR** is connected to **STM32L152VBT6** pin 82 (PD1/SPI2_SCK) – signal "TRIMER_EN".

EXTERNAL CONNECTORS DESCRIPTION:

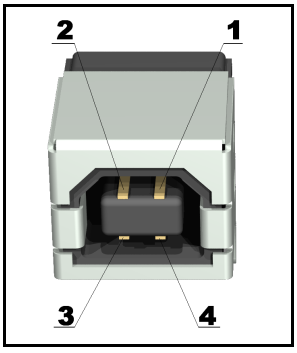
UEXT:

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



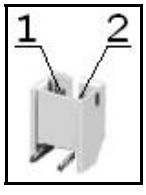
USB:

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

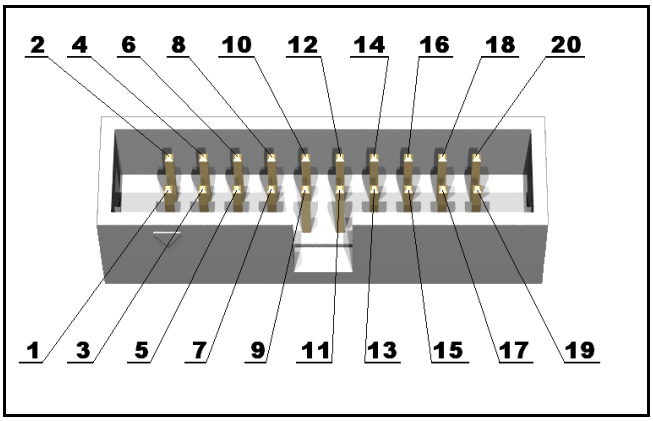


3.7V-LI_BAT:

Pin #	Signal Name
1	VBAT
2	GND



JTAG/SWD:



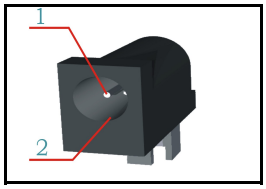
Pin #	Signal Name	Pin #	Signal Name
1	VCC (3.3V)	2	VCC (3.3V)
3	TRST/SEG8	4	GND
5	TDI/SEG17	6	GND
7	TMS/SWDIO	8	GND
9	TCK/SWCLK	10	GND
11	Via 10k to GND	12	GND
13	TDO/TRACESWO/SEG7	14	GND
15	RST	16	GND
17	Via 10k to GND	18	GND
19	+5V_JTAG	20	GND

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.

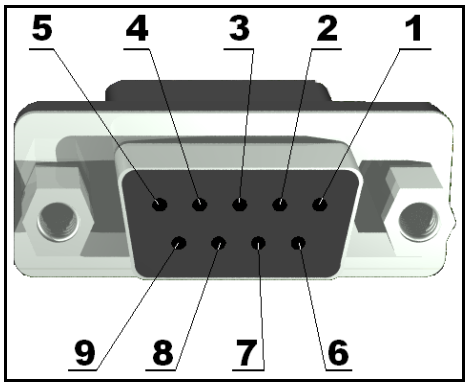
PWR_JACK:

Pin #	Signal Name
1	EXT_PWR
2	GND



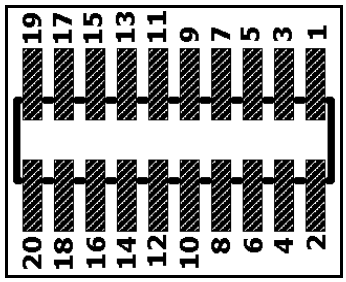
RS232_2:

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



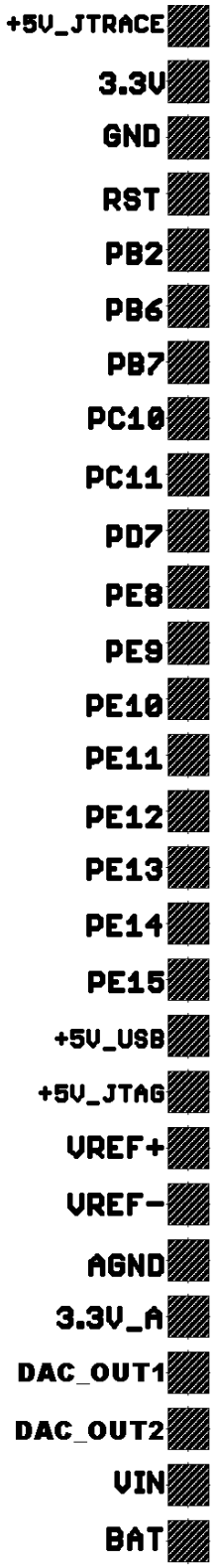
TRACE:

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

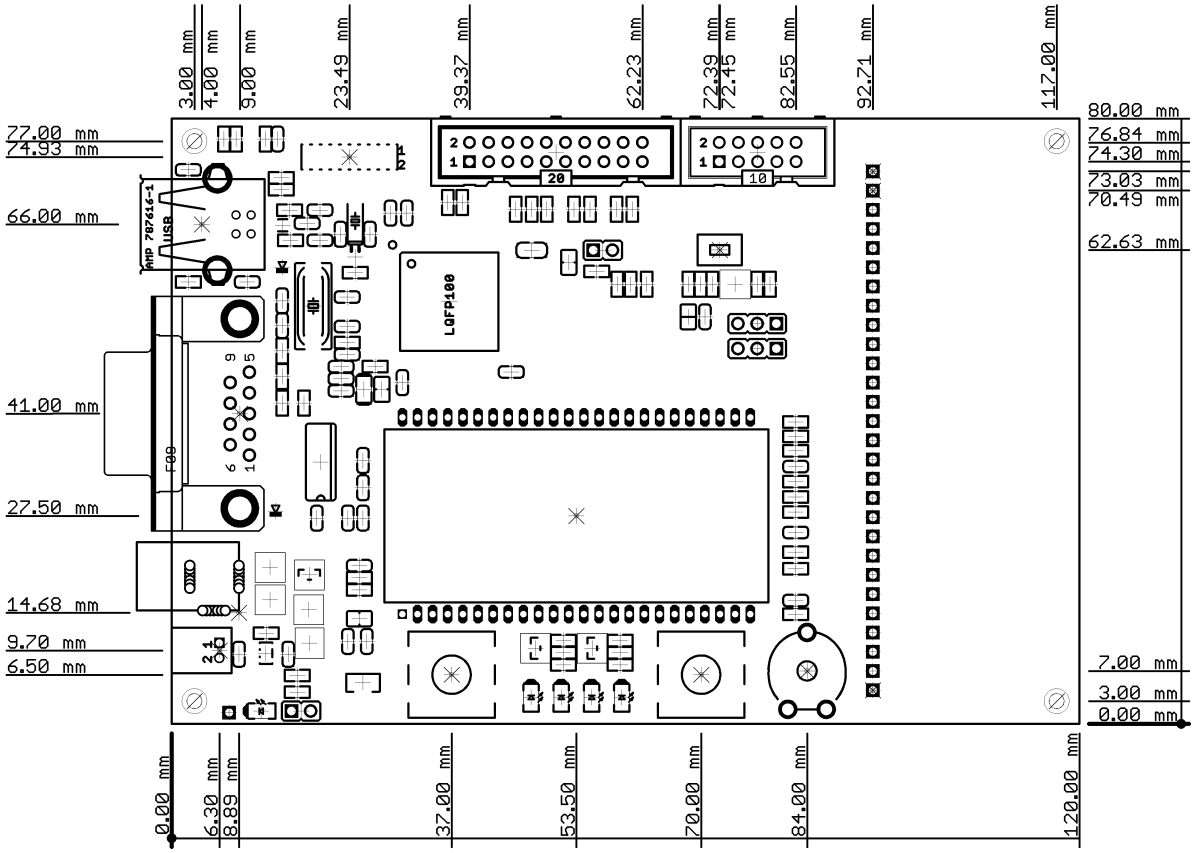


11	+5V_J-TRACE	12	TRACECK/SEG38
13	+5V_J-TRACE	14	TRACED0/SEG39
15	GND	16	TRACED1
17	GND	18	TRACED2
19	GND	20	TRACED3

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+Eclispse 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

Disclaimer:

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The software is released under GPL.

It is possible that the pictures in this manual differ from the latest revision of the board.

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