LPC-P2138 development board
Users Manual

All boards produced by Olimex are ROHS compliant

INTRODUCTION

LPC-P2138 is prototype board which uses LPC2138 microcontroller. With its two buttons, potentiometer, variety of interfaces such as RS232, JTAG, I2C, Dallas; extension connector for some of the microcontroller's pins and prototype area, this board is suitable for different embedded systems applications.

BOARD FEATURES

–   MCU: **LPC2138** 16/32 bit ARM7TDMI-S™ with 512K Bytes Program Flash, 32K Bytes RAM, RTC, 8x 10 bit ADC 2.44 uS, 2x UARTs, I2C, SPI, 2x 32bit TIMERS, 8x CCR, 6x PWM, WDT, 5V tolerant I/O, up to 60MHz operation

–   standard JTAG connector with ARM 2x10 pin layout for programming/debugging with ARM-JTAG

–   on board voltage regulator 3.3V with up to 800mA current

–   single power supply: 6V AC or DC required

–   power supply LED

–   two status LED

–   power supply filtering capacitor

–   two channel RS232 interface

–   Li-ion 3V battery holder

–   RESET circuit with external control of Philips ISP utility via RS232

–   RESET button

–   two user buttons

–   two RS232

–   DBG jumper for JTAG enable

–   BSL jumper for bootloader enable

–   JRST jumper for enable/disable external RESET vontrol by RS232

–   14.7456 Mhz crystal on socket, allow easy communication setup (4x PLL = 58,9824 Mhz CPU clock)

–   32768 Hz crystal and RTC backup battery connector

–   extension headers for all uC ports

–   PCB: FR-4, 1.5 mm (0,062"), soldermask, white silkscreen component print

–   Dimensions: 114.81 x 79.86 mm (4.52x3.14")

ELECTROSTATIC WARNING

The LPC-P2138 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: Depends on the used programming/debugging tool. It could be 1.8 meter USB A-B cable to connect ARM-JTAG-EW, ARM-USB-OCD, ARM-USB-TINY and ARM-USB-TINY-H to USB host on PC or LPT cable in case of ARM-JTAG or other programming/debugging tools. You will need a serial cable if not for programming, than for configuring the board.

Hardware: Programmer/Debugger – some of Olimex programmers are applicable, for example **ARM-JTAG**, **ARM-JTAG-EW**, **ARM-USB-OCD**, **ARM-USB-TINY**, **ARM-USB-TINY-H** or other compatible programming/debugging tool.
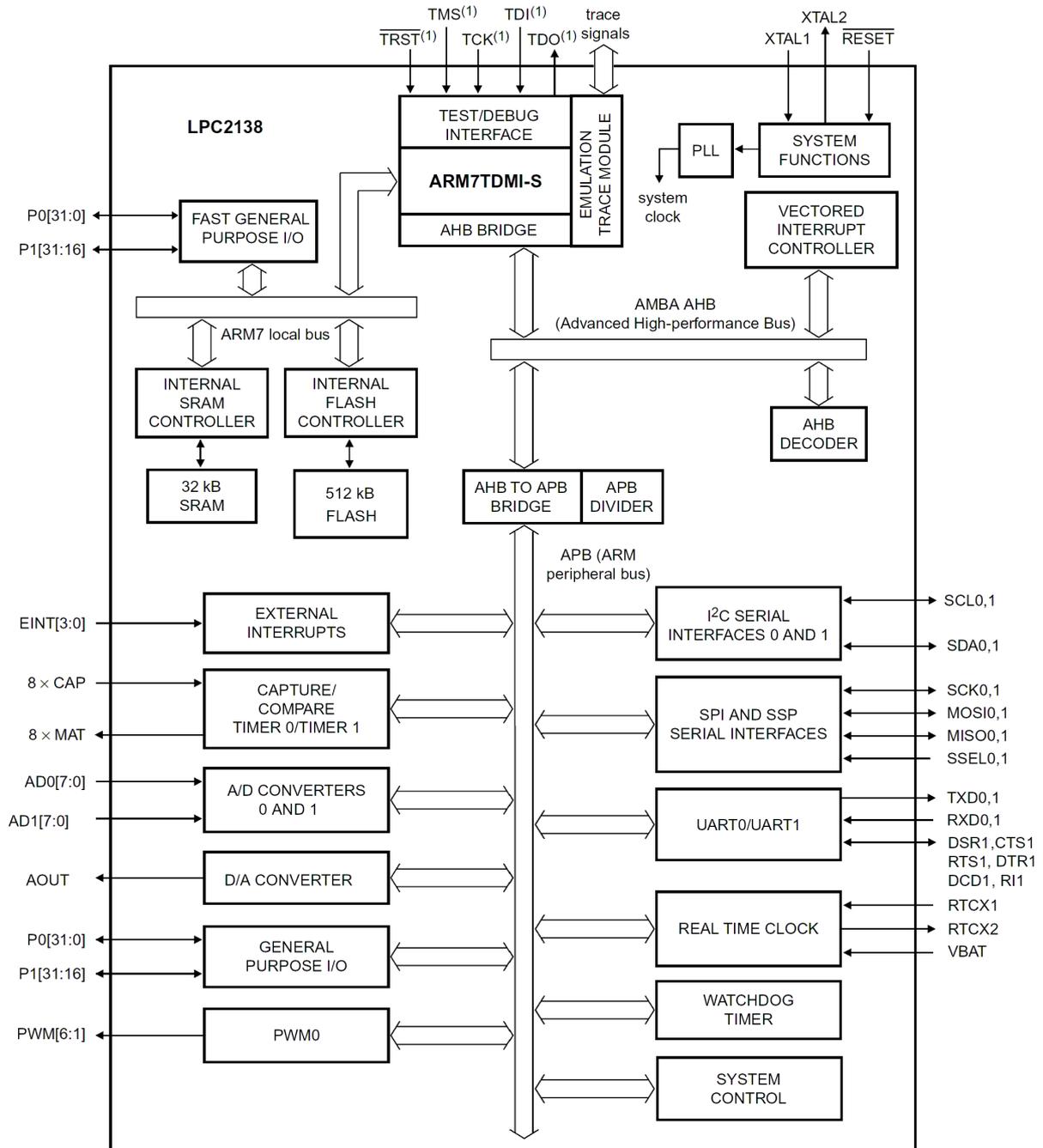
PROCESSOR FEATURES

LPC-P2138 board use LPC2138 microcontroller based on a 16/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine the microcontroller with 512 kB of embedded high-speed flash memory. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at maximum clock rate. with these features:

– 32 kB of on-chip static RAM and 256/512 kB of on-chip flash program memory. 128-bit wide interface/accelerator enables high-speed 60 MHz operation.

– In-System Programming/In-Application Programming (ISP/IAP) via on-chip bootloader software. Single flash sector or full chip erase in 400 ms and programming of 256 B in 1 ms.

– EmbeddedICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip RealMonitor software and high-speed tracing of instruction execution.

– Two 8-channel 10-bit ADCs provide a total of up to 16 analog inputs, with conversion times as low as 2.44 ms per channel.

– Single 10-bit DAC provides variable analog output**.**

– Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog.

– Low power Real-time clock with independent power and dedicated 32 kHz clock input.

– Multiple serial interfaces including two UARTs (16C550), two Fast I^{2}C-bus (400 kbit/s), SPI and SSP with buffering and variable data length capabilities.

– Vectored interrupt controller with configurable priorities and vector addresses.

– Up to forty-seven 5 V tolerant general purpose I/O pins

– Up to nine edge or level sensitive external interrupt pins available.

– 60 MHz maximum CPU clock available from programmable on-chip PLL with settling time of 100 ms.
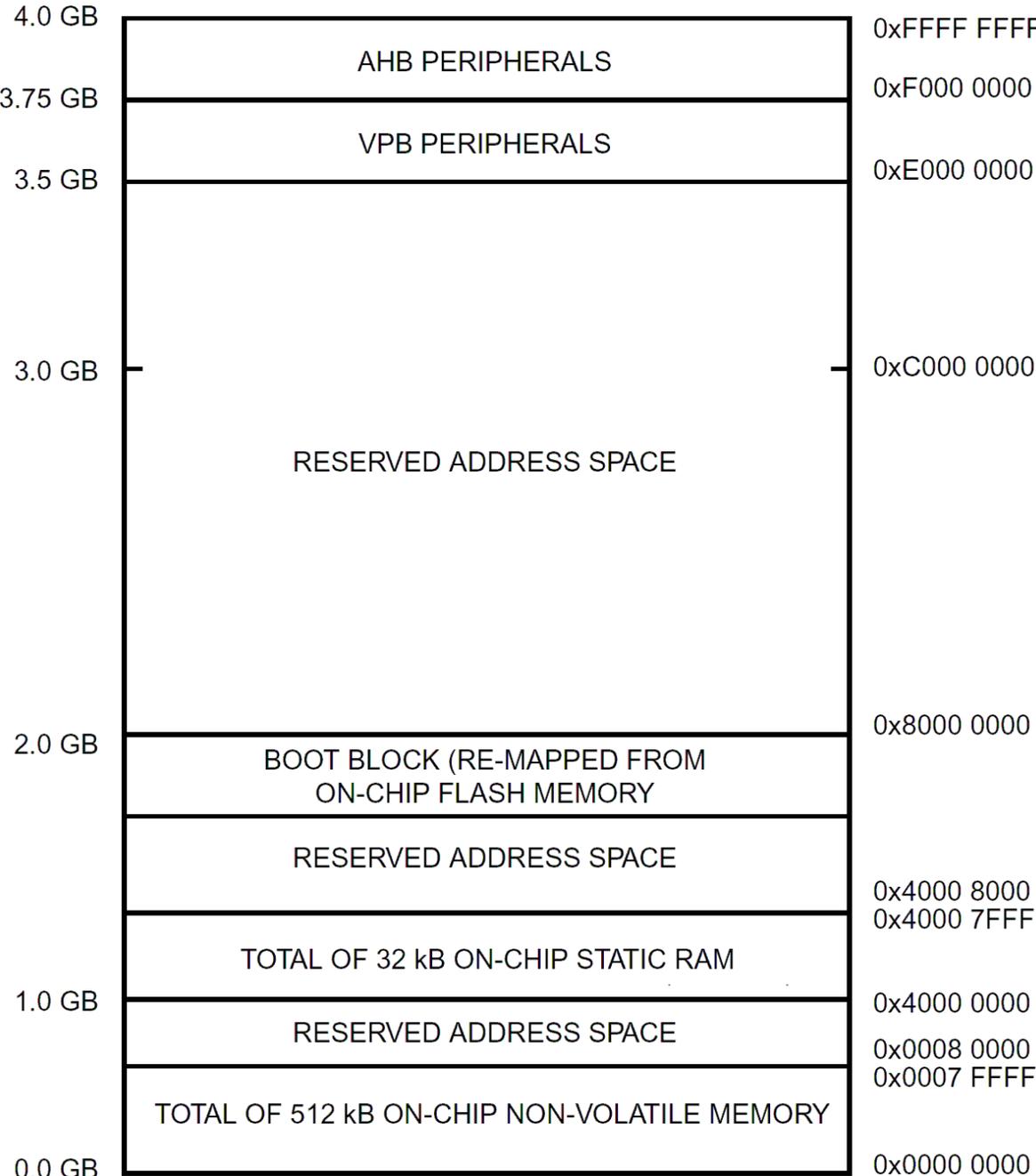
- On-chip integrated oscillator operates with external crystal in range of 1 MHz to 30 MHz and with external oscillator up to 50 MHz.

- Power saving modes include Idle and Power-down.

- Individual enable/disable of peripheral functions as well as peripheral clock scaling down for additional power optimization.

- Processor wake-up from Power-down mode via external interrupt or BOD.

- Single power supply chip with POR and BOD circuits:

    - CPU operating voltage range of 3.0 V to 3.6 V (3.3 V ± 10 %) with 5 V tolerant I/O pads.

BLOCK DIAGRAM

(1) Pins shared with GPIO.

MEMORY MAP

4.0 GB	AHB PERIPHERALS	0xFFFF FFFF
3.75 GB		0xF000 0000
	VPB PERIPHERALS	
3.5 GB		0xE000 0000
3.0 GB		0xC000 0000
	RESERVED ADDRESS SPACE	
2.0 GB		0x8000 0000
	BOOT BLOCK (RE-MAPPED FROM ON-CHIP FLASH MEMORY	
	RESERVED ADDRESS SPACE	0x4000 8000
		0x4000 7FFF
	TOTAL OF 32 kB ON-CHIP STATIC RAM	
1.0 GB		0x4000 0000
	RESERVED ADDRESS SPACE	0x0008 0000
		0x0007 FFFF
	TOTAL OF 512 kB ON-CHIP NON-VOLATILE MEMORY	
0.0 GB		0x0000 0000

SCHEMATIC

LPC-P2138

Rev. B

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BOARD LAYOUT

POWER CIRCUIT

LPC-P2138 can is typically power supplied with 6 VDC from power jack.
The programmed board power consumption is about 50 mA.

RESET CIRCUIT

LPC-P2138 reset circuit includes R8 (10k) pull-up, D4 (1N4148), U5 (MCP130T) and RST button.

CLOCK CIRCUIT

Quartz crystal Q1 14.7456 MHz is connected to **LPC2138** pin 61 (X2) and pin 62 (X1). Quartz crystal Q2 32.768 KHz is connected to **LPC2138** pin 3 (RTCX1) and pin 5 (RTCX2).

JUMPER DESCRIPTION

L1

Connects YELLOW Led to LPC2138 pin 38 (P0.12/DSR1/MAT1.0/AD1.3).
<u>Default state is closed.</u>

L2

Connects GREEN Led to LPC2138 pin 39 (P0.13/DTR1/MAT1.1/AD1.4).
<u>Default state is closed.</u>

DBG

Enables JTAG debug operations.
<u>Default state is closed.</u>

Slide switch	Position	Description
Slide switch (ICSP/ RUN)		Disable ICSP programming.
		Enable ICSP programming.
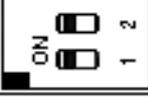
INPUT/OUTPUT

Reset button with name **RST**, connected to LPC2138 pin 57 (RST).

User button with name **B1**, connected to LPC2138 pin 45 (P0.15).

User button with name **B2**, connected to LPC2138 pin 46 (P0.16).

Potentiometer with name **AN_TR,** connected to LPC2138 pin 11 (P0.27).

Status Led (yellow) with name **YELLOW** connected to LPC2138 pin 38 (P0.12).

Status Led (green) with name **GREEN** connected to LPC2138 pin 39 (P0.13).

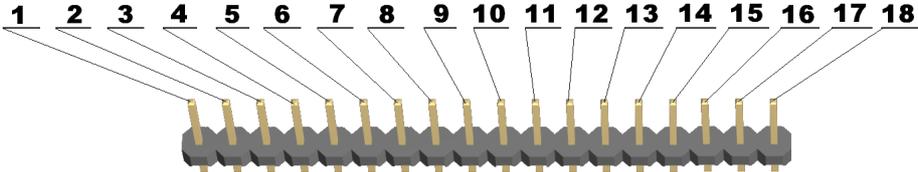**Power-on Led (red)** with name **PWR** shows that 3.3V is applied to the board.

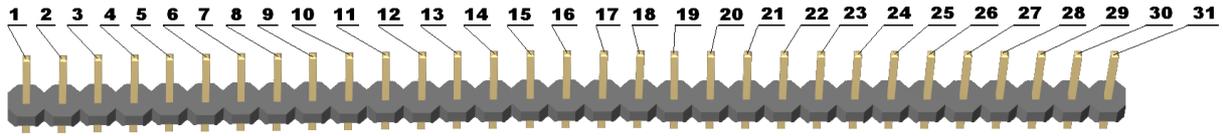# EXTERNAL CONNECTORS DESCRIPTION

JTAG
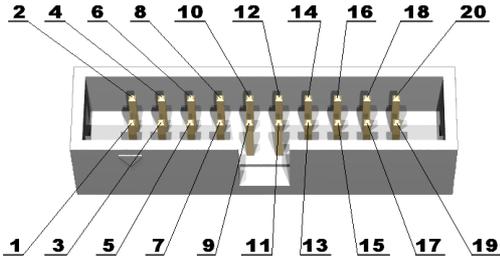
Pin #	Signal Name	Pin #	Signal Name
1	+3.3 V	2	+3.3 V
3	TRST	4	GND
5	TDI	6	GND
7	TMS	8	GND
9	TCK	10	GND
11	RTCK	12	GND
13	TDO	14	GND
15	RST	16	GND
17	Not Connected	18	GND
19	Not Connected	20	GND

EXT1

Pin #	Signal Name	Pin #	Signal Name
1	TXD0	2	RXD0
3	P1.16	4	P1.17
5	P.18	6	P1.19
7	P1.20	8	P1.21
9	P1.22	10	P1.23
11	P1.24	12	P1.25
13	RTCK	14	TDO
15	TDI	16	TCK
17	TMS	18	TRST

EXT2

Pin #	Signal Name	Pin #	Signal Name
1	3.3 V	2	P0.2
3	P0.3	4	P0.4
5	P0.5	6	P0.6
7	P0.7	8	TXD1
9	RXD1	10	DALLAS
11	P0.11	12	P0.12
13	P0.13	14	BSL
15	P0.15	16	P0.16
17	P0.17	18	P0.18
19	P0.19	20	P0.20
21	P0.21	22	FREQ
23	P0.23	24	P0.25
25	P0.26	26	AIN0
27	AIN1	28	AIN2
29	AIN3	30	P0.31
31	GND		

DALLAS

Pin #	Signal Name
1	DALLAS(P0.10)
2	GND
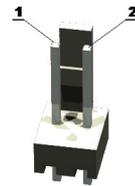
BAT

Pin #	Signal Name
1	VBAT
2	GND
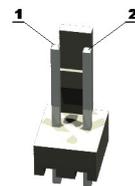
RS232

Pin #	Signal Name
1	Not Connected
2	TX1OUT
3	RX1IN
4	Not Connected
5	GND
6	Not Connected
7	Not Connected
8	Not Connected
9	Not Connected
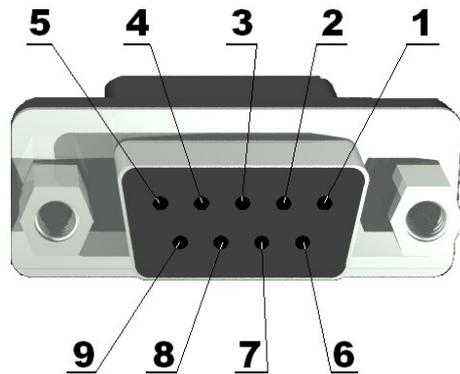
RS232/ICSP

Pin #	Signal Name
1	Not Connected
2	TX0OUT
3	RX0IN
4	DTR
5	GND
6	Not Connected
7	Not Connected
8	Not Connected
9	NC
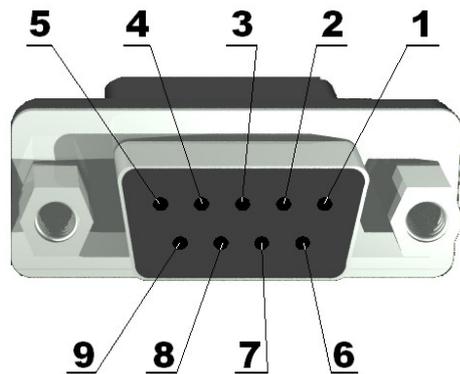
PWR:

Pin #	Signal Name
1	Power Input
2	GND

MECHANICAL DIMENSIONS
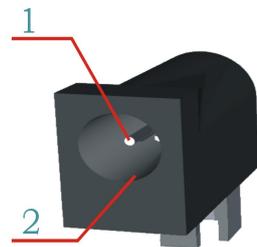
AVAILABLE DEMO SOFTWARE

- RS232 initialization demo code

- RTC initialization demo code
- Blink LED and buttons demo code
- OpenOCD + Eclipse set of projects 1.00 include flash write make file for LPC-P2138.

ORDER CODE

LPC-P2138 - completely assembled and tested.

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

Revision history:

REV. B   - create   July 2009