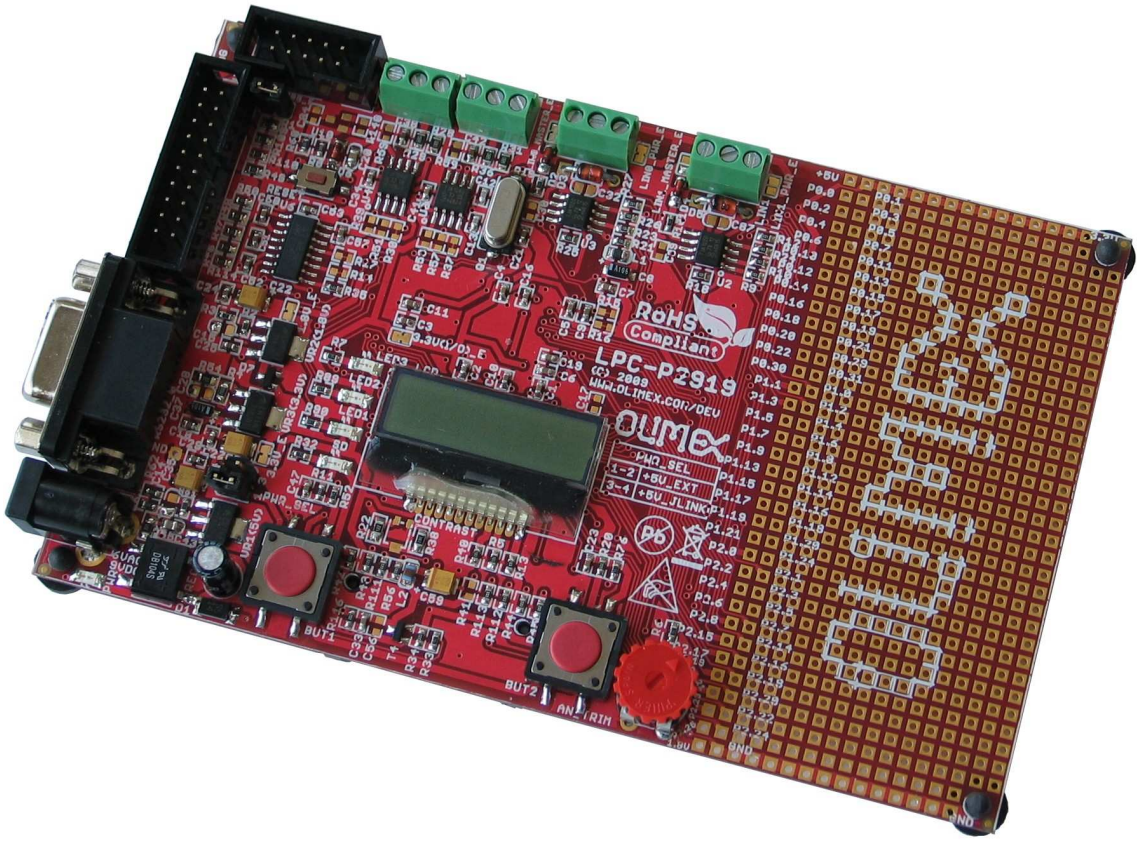


LPC-P2919 development board

Users Manual

Pb-free, Green All boards produced by Olimex are ROHS compliant

Rev.A, October 2009

INTRODUCTION:

LPC-P2919 board is easy to use development board with LPC2919 - ARM9 microcontroller with CAN and LIN produced by NXP Semiconductors.
With LPC-P2919 you can explore the features of LPC29XX family on budged, the board has everything necessary to build simple applications: reset and oscillator circuits, JTAG port for programming and debugging, CAN, LIN, RS232, SD/MMC, LCD, three status LEDs and two user buttons.
There are plenty of GPIOs on extension headers where you can connect your additional circuits.

BOARD FEATURES:

- CPU: LPC2919FBD144 32 bit combine an ARM968E-S CPU core with two integrated TCM blocks operating at frequencies of 80 MHz, CAN and LIN, 48 kB SRAM, 768 kB flash memory, external memory interface, two 10-bit ADCs, and multiple serial and parallel interfaces in a single chip.

  JTAG connector with ARM 2x10 pin layout for programming/debugging with ARM-JTAG, ARM-USB-OCD, ARM-USB-TINY
- RS232 port
- two CAN drivers and connectors
- two LIN drivers and connectors
- LCD 8X1
- SD/MMC card connector
- two user buttons
- trimpot connected to ADC
- RESET circuit
- RESET button
- three status LEDs
- power supply LED
- jumper for Power Selection mode
- three on board voltage regulators 1.8V, 3.3V and 5V with up to 800mA current
- single power supply: External power supply +9VDC required, or takes power from JTAG connector
- 16 Mhz crystal oscillator
- UEXT connector with SPI, RS232 and power supply for connecting add-on modules
- Extension port connector for many of microcontrollers pins
- Prototype area
- PCB: FR-4, 1.5 mm (0,062"), red soldermask, silkscreen component print
- Dimensions: 140x89mm (5.512x3.504")

ELECTROSTATIC WARNING:

The LPC-P2919 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-USB-OCD, you will need RS232 cable and 1.8 meter USB A-B cable and if you use ARM-USB-TINY, you will need 1.8 meter USB A-B cable.

Hardware: Programmer/Debugger – one of the Olimex ARM Programmers: ARM-USB-OCD, ARM-USB-TINY.

Software: ARM C compiler and JTAG programmer, the possible options are:

- open source platform: GNU C compiler + OpenOCD and Eclipse

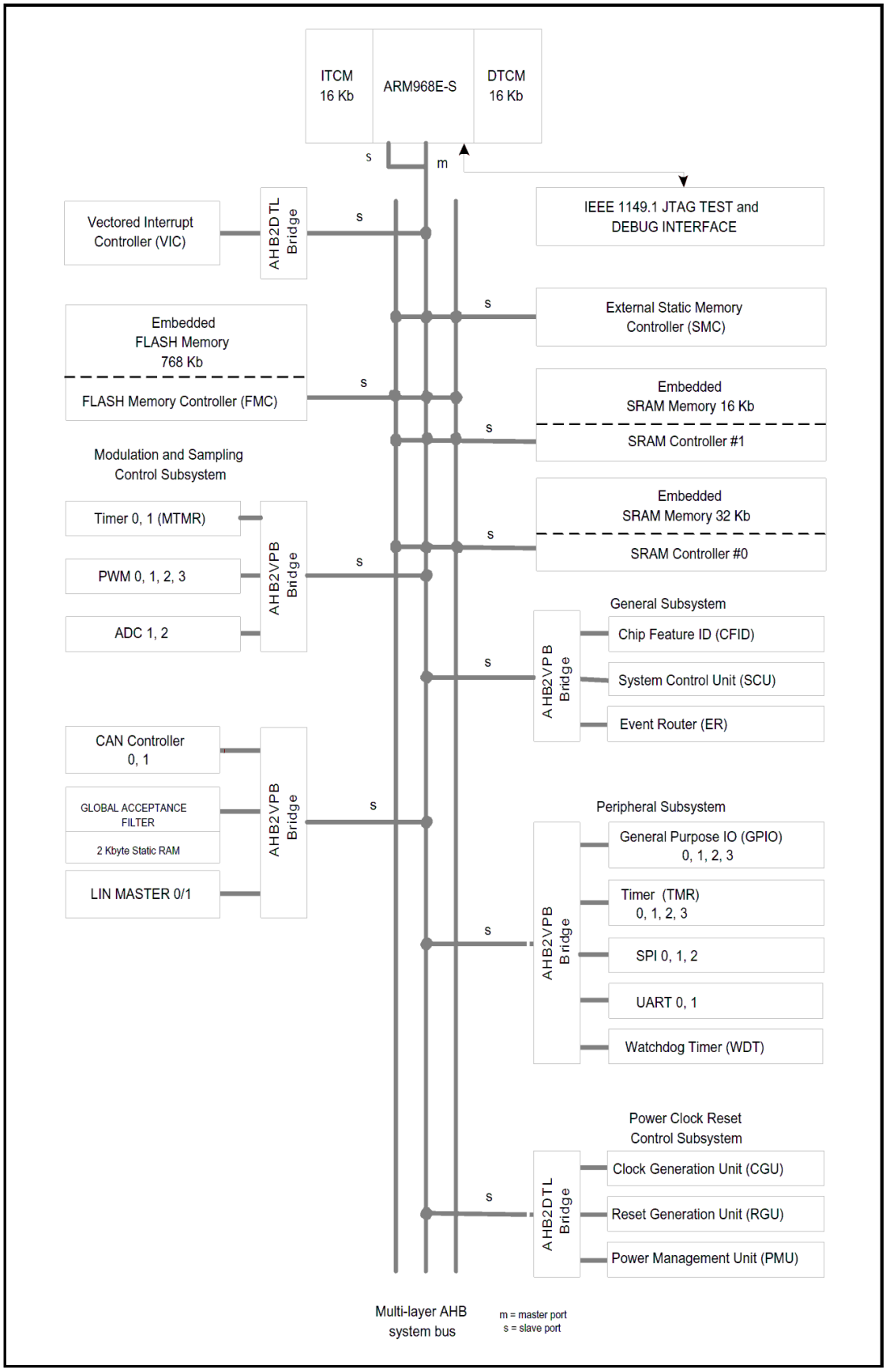
PROCESSOR FEATURES:

LPC-P2919 board use ARM9 32-bit microcontroller **LPC2919FBD144** from NXP Semiconductors with these features:

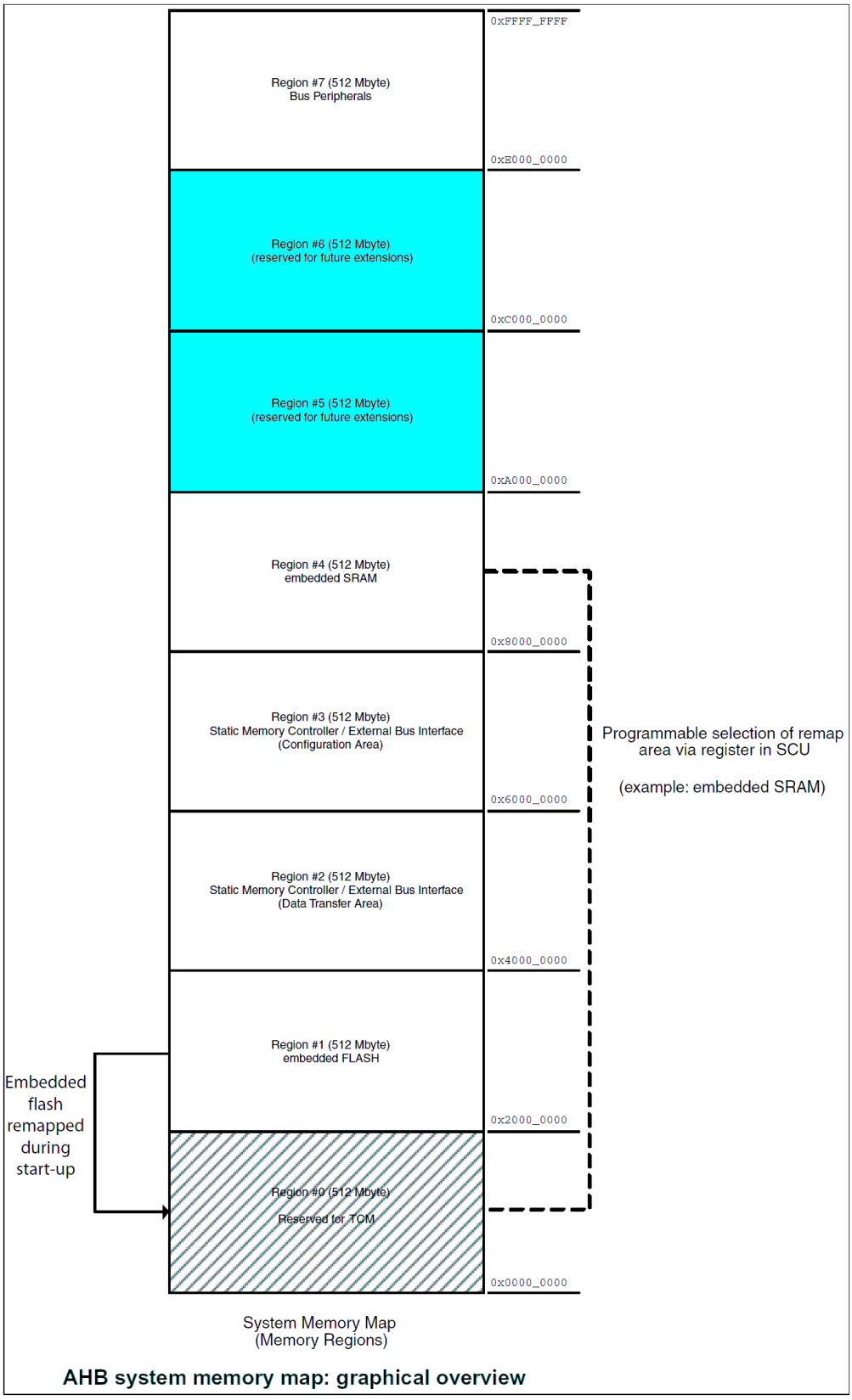
- ARM968E-S processor at 80 MHz maximum
- Multi-layer AHB system bus at 80 MHz with three separate layers
- On-chip memory:
  - Two Tightly Coupled Memories (TCM), 16 kB Instruction (ITCM), 16 kB Data TCM (DTCM).
  - Two separate internal Static RAM (SRAM) instances; 32 kB SRAM and 16 kB SRAM.
  - 768 kB flash-program memory.
- Two-channel CAN controller supporting Full-CAN and extensive message filtering.
- Two LIN master controllers with full hardware support for LIN communication
- Two 550 UARTs with 16-byte Tx and Rx FIFO depths.
- Three full-duplex Q-SPIs with four slave-select lines; 16 bits wide; 8 locations deep; Tx FIFO and Rx FIFO.
- Four 32-bit timers each containing four capture-and-compare registers linked to I/Os.
- 32-bit watchdog with timer change protection, running on safe clock.
- 108 general-purpose I/O pins with programmable pull-up, pull-down or bus keeper.
- Vectored Interrupt Controller (VIC) with 16 priority levels.

- Two 8-channel 10-bit ADCs provide a total 16 analog inputs, with conversion times as low as 2.44 µs per channel. Each channel provides a compare function to minimize interrupts.
- 24 level-sensitive external interrupt pins, including CAN and LIN wake- up features.
- External Static Memory Controller (SMC) with eight memory banks; up to 32-bit data bus; up to 24-bit address bus.
- Processor wake-up from power-down via external interrupt pins; CAN or LIN activity.
- Flexible Reset Generator Unit (RGU) able to control resets of individual modules.
- Flexible Clock-Generation Unit (CGU) able to control clock frequency of individual modules.
    - On-chip very low-power ring oscillator; fixed frequency of 0.4 MHz; always on to provide a Safe_Clock source for system monitoring.
    - On-chip crystal oscillator with operating range from 10 MHz to 50 MHz - max. PLL input 15 MHz.
    - On-chip PLL allows CPU operation up to a maximum CPU rate of 80 MHz.
    - Generation of up to 10 base clocks.
    - Seven fractional dividers.
- Highly configurable system Power Management Unit (PMU).
    - clock control of individual modules.
    - allows minimization of system operating power consumption in any configuration.
- Standard ARM test and debug interface with real-time in-circuit emulator.
- Boundary-scan test supported.
- Dual power supply:
    - CPU operating voltage: 1.8 V ± 5%.
    - I/O operating voltage: 2.7 V to 3.6 V; inputs tolerant up to 5.5 V.
- −40 °C to 85 °C ambient operating temperature range.

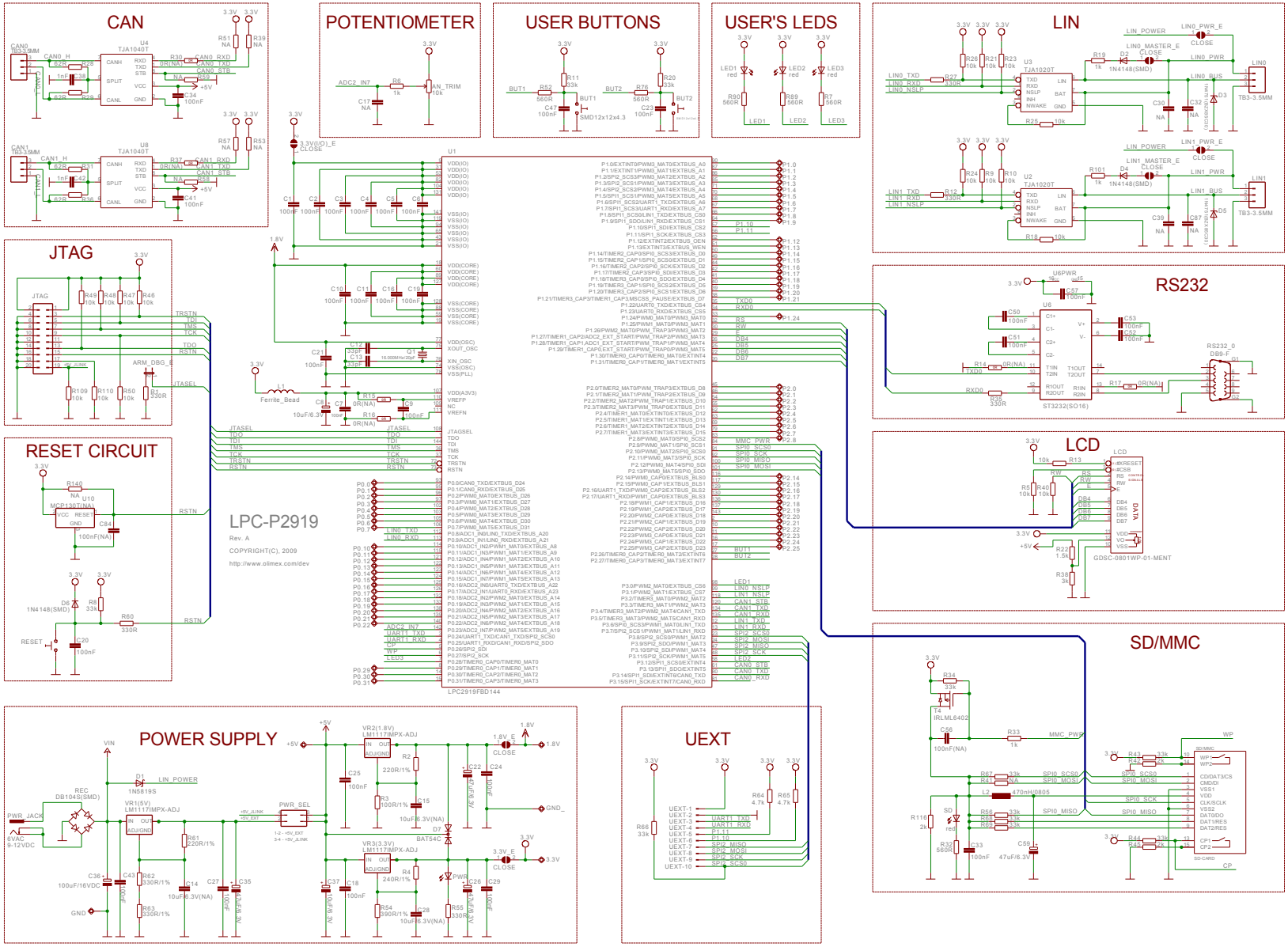
Block Diagram:



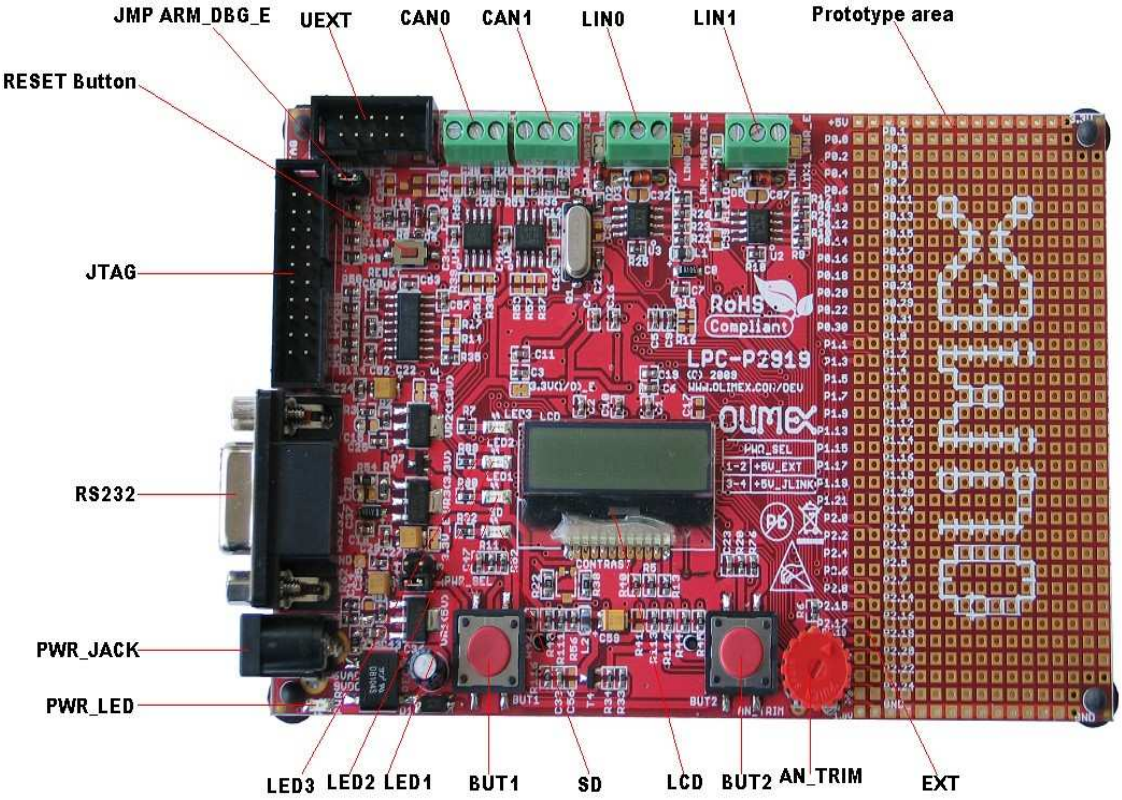
MEMORY MAP:

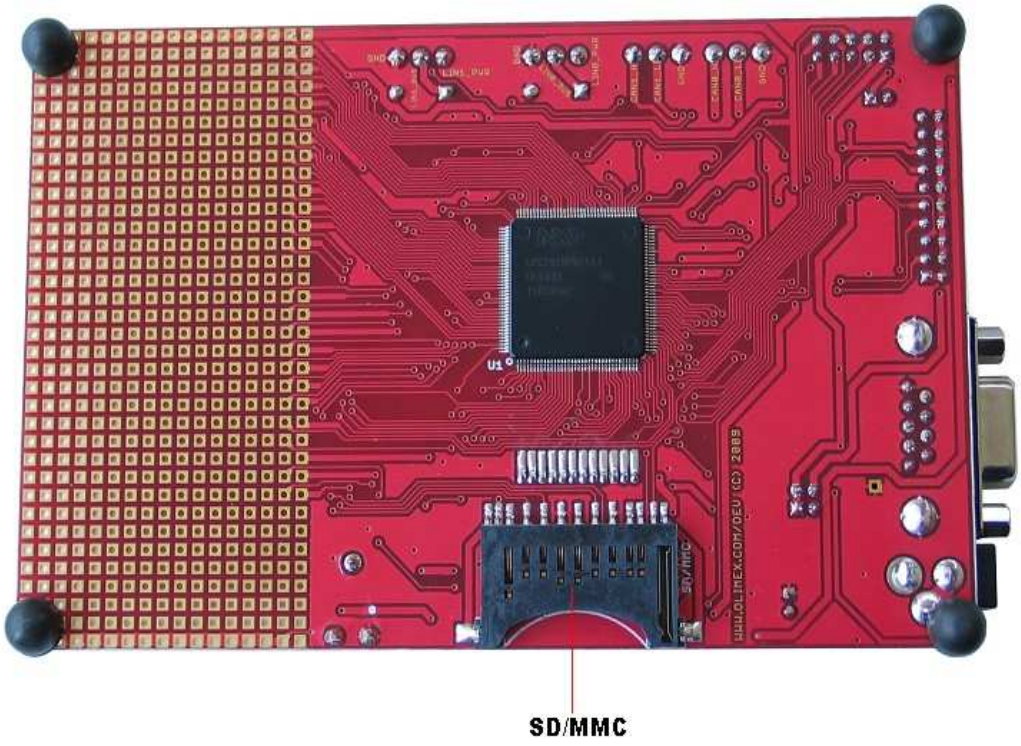


For more details see LPC2919FBD144 datasheet.


SCHEMATIC
CAN
POTENTIOMETER
USER BUTTONS
USER'S LEDS
LIN
JTAG
RESET CIRCUIT
LPC-P2919
Rev. A
COPYRIGHT(C), 2009
http://www.olimex.com/dev
LPC2919FBD144
RS232
LCD
SD/MMC
POWER SUPPLY
UEXT

BOARD LAYOUT





POWER SUPPLY CIRCUIT

LPC-P2919 can take power from two sorces:

- External power supply 9.0-12.0 V DC or 6.0V AC.
- +5V_JLINK from JTAG connector

RESET CIRCUIT

LPC-P2919 reset circuit includes pin 15 of JTAG connector, pin 73 of U1 and RESET button.

CLOCK CIRCUIT

Quartz crystal 16 MHz is connected to **LPC-P2919** pin 75 (XOUT_OSC) and pin 76 (XIN_OSC).

JUMPER DESCRIPTION

PWR_SEL

When 1-2 are shorted – the board is supplied from PWR_JACK, when 3-4 are shorted – the board is supplied from JTAG.

Default state is 1-2.

ARM_DBG_E

When this jumper is shorted – selects the ARM debug mode; when it is open – selects boundary scan and flash programming; pulled up internally.
Default state is closed.

LIN0_MASTER_E

Enable LIN0 master's pull-up.

Default state is closed.

LIN0_PWR_E

Enable power supply to LIN0.

Default state is closed.

LIN1_MASTER_E

Enable LIN1 master's pull-up.

Default state is closed.

LIN1_PWR_E

Enable power supply to LIN1.

Default state is closed.

3.3V(I/O)_E

Connects 6 pins (VDD(IO)) of LPC2919 to 3.3V.

Default state is closed.

1.8V_E

Enable regulator VR2(1.8V) – LM1117

Default state is closed.

3.3V_E

Enable regulator VR3(3.3V) – LM1117

Default state is closed.

INPUT/OUTPUT

SD/MMC LED (red) with name **SD** connected to SD/MMC pin 4.

Status LED1 (red) with name **LED1** connected to LPC2919 pin 98 (P3.0/PWM2_MAT0/EXTBUS_CS6).

Status LED2 (red) with name **LED2** connected to LPC2919 pin 58 (P3.12/SPI1_SCS0/EXTINT4).

Status LED3 (red) with name **LED3** connected to LPC2919 pin 7 (P0.28/TIMER0_CAP0/TIMER0_MAT0).

Power-on LED (red) with name **PWR** – this led shows that +3.3V is applied to the board.

User button with name **BUT1** connected to LPC2919 pin 27 (P2.26/TIMER0_CAP2/TIMER0_MAT2/EXTINT6).

User button with name **BUT2** connected to LPC2919 pin 28 (P2.27/TIMER0_CAP3/TIMER0_MAT3/EXTINT7).

Reset button with name **RESET** connected to LPC2919 pin 73 (RSTN).

Trimpot with name **AN_TRIM** connected to LPC2919 pin 142 (P0.23/ADC2_IN7/PWM2_MAT5/EXTBUS_A19).

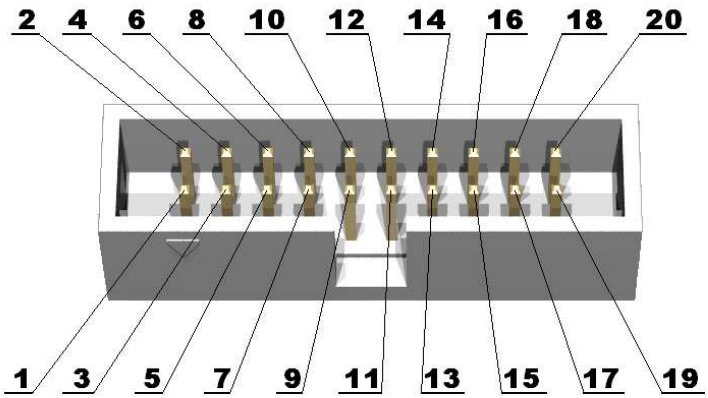
LCD 8X1

CONNECTOR DESCRIPTIONS

JTAG:

The JTAG connector allows the software debugger to talk via a JTAG (Joint Test Action Group) port directly to the core. Instructions may be inserted and executed by the core thus allowing LPC2919 memory to be programmed with code and executed step by step by the host software.

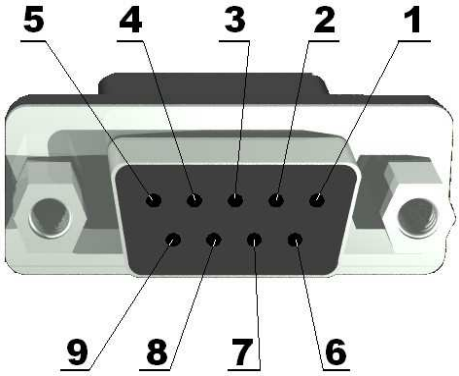
For more details refer to IEEE Standard 1149.1 - 1990 Standard Test Access Port and Boundary Scan Architecture and LPC2919 datasheets and users manual.



Pin #	Signal Name	Pin #	Signal Name
1	3.3V	2	3.3V
3	TRSTN	4	GND
5	TDI	6	GND
7	TMS	8	GND
9	TCK	10	GND
11	NC	12	GND
13	TDO	14	GND
15	RSTN	16	GND
17	PULL-DOWN	18	GND
19	+5V_JLINK	20	GND

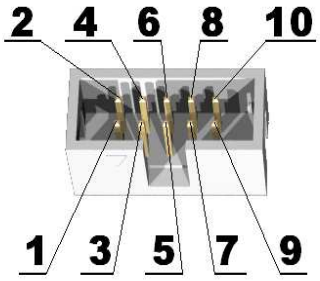
RS232:

Pin #	Signal Name
1	NC
2	T2OUT
3	R2IN
4	NC
5	GND
6	NC
7	NC
8	NC
9	NC



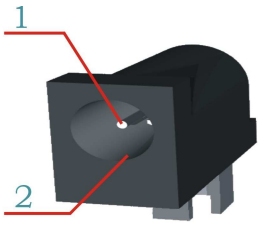
UEXT:

Pin #	Signal Name
1	3.3V
2	GND
3	UART1_TXD
4	UART1_RXD
5	P1.11
6	P1.10
7	SPI2_MISO
8	SPI2_MOSI
9	SPI2_SCK
10	SPI2_SCS0



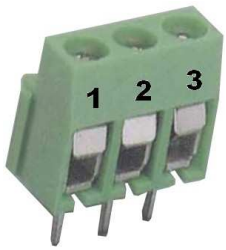
PWR_JACK:

Pin #	Signal Name
1	Power Input
2	GND



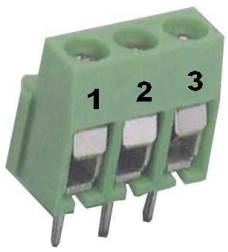
CAN0:

Pin#	Signal	Description
1	GND	Ground
2	CAN0_L	CAN LOW
3	CAN0_H	CAN HIGH



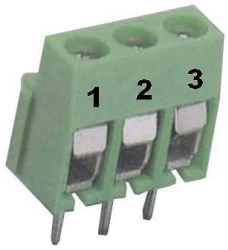
CAN1:

Pin#	Signal	Description
1	GND	Ground
2	CAN1_L	CAN LOW
3	CAN1_H	CAN HIGH



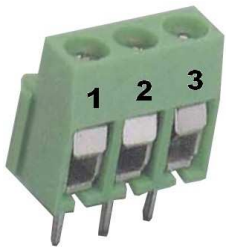
LIN0:

Pin#	Signal	Description
1	LIN0_PWR	LIN Power
2	LIN0_BUS	LIN
3	GND	Ground

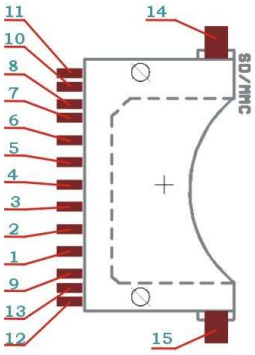


LIN1:

Pin#	Signal	Description
1	LIN1_PWR	LIN Power
2	LIN1_BUS	LIN
3	GND	Ground



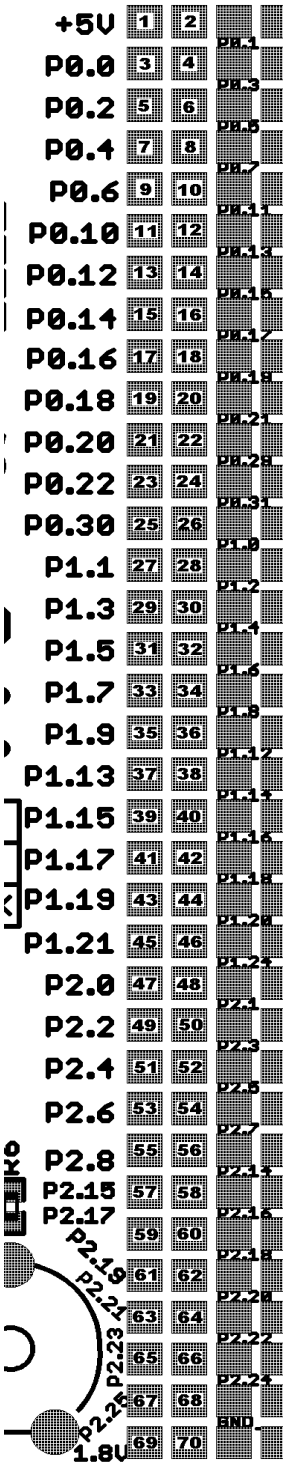
SD/MMC



Pin #	Signal Name	Pin #	Signal Name
1	SPI0_SCS0	9	MCIDAT2
2	SPI0_MOSI	10	WP1
3	GND	11	NC
4	3.3V	12	NC
5	SPI0_SCK	13	CP1
6	GND	14	WP2
7	SPI0_MISO	15	CP2
8	MCIDAT1		

EXT

Pin #	Signal Name	Pin #	Signal Name
1	+5V	2	+3.3V
3	P0.0	4	P0.1
5	P0.2	6	P0.3
7	P0.4	8	P0.5
9	P0.6	10	P0.7
11	P0.10	12	P0.11
13	P0.12	14	P0.13
15	P0.14	16	P0.15
17	P0.16	18	P0.17
19	P0.18	20	P0.19
21	P0.20	22	P0.21
23	P0.22	24	P0.29
25	P0.30	26	P0.31
27	P1.1	28	P1.0
29	P1.3	30	P1.2
31	P1.5	32	P1.4
33	P1.7	34	P1.6
35	P1.9	36	P1.8
37	P1.13	38	P1.13
39	P1.15	40	P1.14
41	P1.17	42	P1.16
43	P1.19	44	P1.18
45	P1.21	46	P1.20
47	P2.0	48	P1.24
49	P2.2	50	P2.1
51	P2.4	52	P2.3
53	P2.6	54	P2.5
55	P2.8	56	P2.7
57	P2.15	58	P2.14
59	P2.17	60	P2.16
61	P2.19	62	P2.18
63	P2.21	64	P2.20
65	P2.23	66	P2.22
67	P2.25	68	P2.24
69	+1.8V	70	GND



I2C

The LPC2919 contain two I^2C-bus controllers.

The I^2C-bus is bidirectional for inter-IC control using only two wires: a serial clock line (SCL) and a serial data line (SDA). Each device is recognized by a unique address and can operate as either a receiver-only device or as a transmitter with the capability to both receive and send information (such as memory). Transmitters and/or receivers can operate in either master or slave mode, depending on whether the chip has to initiate a data transfer or is only addressed. The I^2C is a multi-master bus, and it can be controlled by more than one bus master connected to it.

The main features if the I^2C-bus interfaces are:

- I^2C0 and I^2C1 use standard I/O pins with bit rates of up to 400 kbit/s (Fast I^2C-bus) and do not support powering off of individual devices connected to the same bus lines.
- Easy to configure as master, slave, or master/slave.
- Programmable clocks allow versatile rate control.
- Bidirectional data transfer between masters and slaves.
- Multi-master bus (no central master).
- Arbitration between simultaneously transmitting masters without corruption of serial data on the bus.
- Serial clock synchronization allows devices with different bit rates to communicate via one serial bus.
- Serial clock synchronization can be used as a handshake mechanism to suspend and resume serial transfer.
- All I^2C-bus controllers support multiple address recognition and a bus monitor mode.

SPI

The LPC2919 contains three Serial Peripheral Interface modules (SPIs) to allow synchronous serial communication with slave or master peripherals.

The key features are:

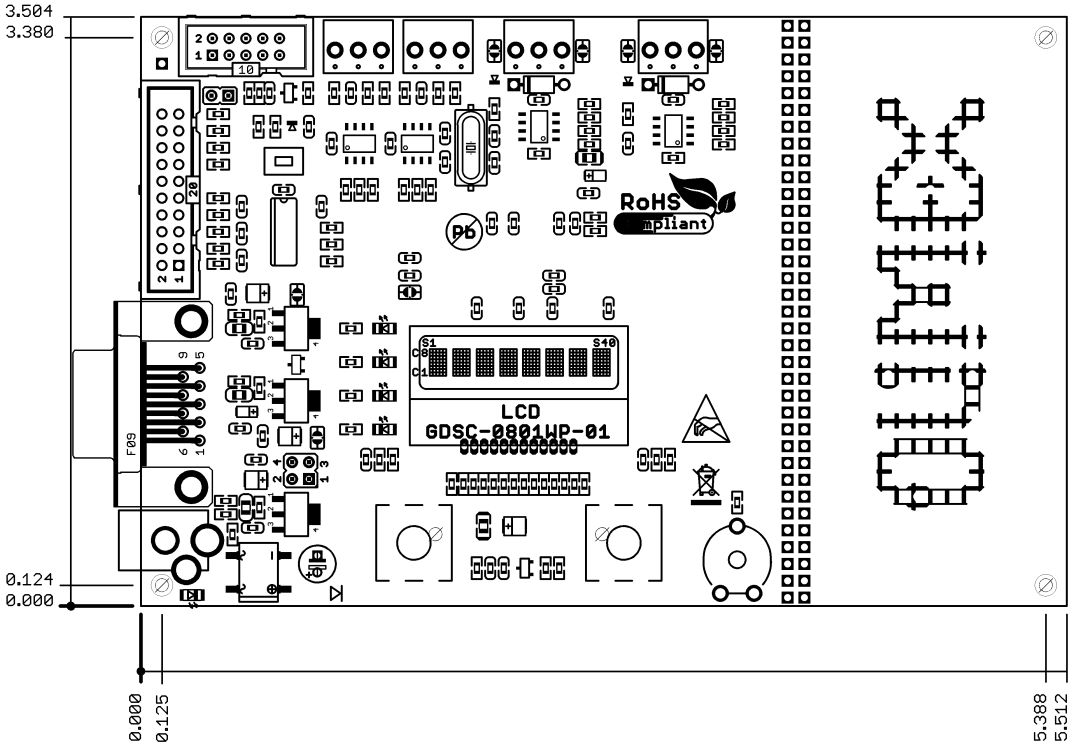
- Master or slave operation.
- Each SPI supports up to four slaves in sequential multi-slave operation.
- Supports timer-triggered operation.
- Programmable clock bit rate and prescale based on SPI source clock (BASE_SPI_CLK), independent of system clock.
- Separate transmit and receive FIFO memory buffers; 16 bits wide, 32 locations deep.
- Programmable choice of interface operation: Motorola SPI or Texas Instruments Synchronous Serial Interfaces.
- Programmable data-frame size from 4 to 16 bits.
- Independent masking of transmit FIFO, receive FIFO and receive overrun interrupts.

- Serial clock-rate master mode: fserial_clk ≤ $f_{CLK(SPI)}/2$.
- Serial clock-rate slave mode: fserial_clk = $f_{CLK(SPI)}/4$.
- Internal loopback test mode.

The SPI module can operate in:

- Master mode:
  - Normal transmission mode.
  - Sequential slave mode.
- Slave mode.

MECHANICAL DIMENSIONS



All measures are in inches.

AVAILABLE DEMO SOFTWARE

- Buttons and LCD demo
- Port_LCD_UART demo
- SD slot demo

ORDER CODE

LPC-P2919 – assembled and tested (no kit, no soldering required)

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.

Board revision history:

Rev. A - created October 2009

Manual revision history:

Rev. A - created February 2011 – microcontroller features were wrong – instead of LPC2919FBD144 features, were given for LPC2919FBD144/01.

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