LPC-MT-2106 DEVELOPMENT BOARD FOR
LPC2106 ARM7TDMI-S MICROCONTROLLER

Features:

- MCU: 16/32 bit LPC2106 with 128K Bytes Program Flash, 64K Bytes RAM, RTC, 2x UARTs, I2C, SPI, 2x 32bit TIMERS, 7x 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
- LCD 16x2 display
- Five push buttons
- Dallas iButton port
- Frequency input
- Relay with 10A/250VAC contacts
- Buzzer
- status LED
- RS232 interface circuit with SUB D 9 pin connector
- RESET circuit
- RESET button
- DEBUG jumper for JTAG enable
- BSL jumper for Bootloader enable
- RTCK pullup resistor
- 14.7456 Mhz crystal allow easy communication setup (4x PLL = 58,9824 Mhz CPU clock)
- extension headers
- Power plug-in jack
- single power supply: 6VAC/+9VDC required
- three on board voltage regulators 1.8V, 3.3V and 5V
- power supply filtering capacitor
- PCB: FR-4, 1.5 mm (0,062"), green soldermask, white silkscreen component print
- Four mounting holes
- Dimensions: 120x38 mm (4.75x1.5")

Supported devices:

Philips Semiconductors Inc. LPC2106 16/32 bit ARM7TDMI-S™

JTAG interface:

The JTAG connector is 2x10 pin with 0,1" step and ARM recommended JTAG layout. PIN.1 is marked with square pad on bottom and arrow on top.

Note: to enable JTAG interface DBG jumper should be shorted at the time of POWER UP.

Important: when JTAG is enabled P0.18-P1.31 ports take their JTAG alternative function no matter of PINSEL register value, so during debugging with JTAG these ports are not available for the user program.

JTAG signals description:

PIN.1 (VTREF) Target voltage sense. Used to indicate the target's operating voltage to the debug tool.

PIN.2 (VTARGET) Target voltage. May be used to supply power to the debug tool.

PIN.3 (nTRST) JTAG TAP reset, this signal should be pulled up to Vcc in target board.

PIN4,6, 8, 10,12,14,16,18,20 Ground. The Gnd-Signal-Gnd-Signal strategy implemented on the 20-way connection scheme improves noise immunity on the target connect cable.

PIN.5 (TDI) JTAG serial data in, should be pulled up to Vcc on target board.

PIN.7 (TMS) JTAG TAP Mode Select, should be pulled up to Vcc on target board.

PIN.9 (TCK) JTAG clock.

PIN.11 (RTCK) JTAG re-timed clock. Implemented on certain ASIC ARM implementations the host ASIC may need to synchronize external inputs (such as JTAG inputs) with its own internal clock.
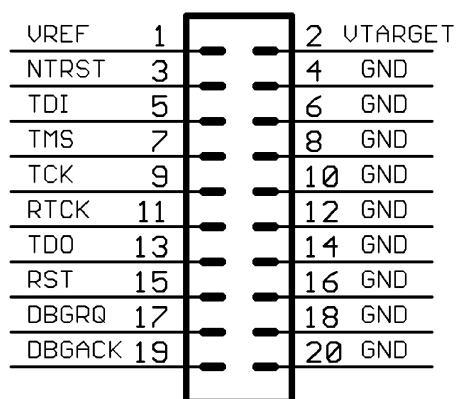
PIN.13 (TDO) JTAG serial data out.

PIN.15 (nSRST) Target system reset.

PIN.17 (DBGRQ) Asynchronous debug request. DBGRQ allows an external signal to force the ARM core into debug mode, should be pull down to GND.

PIN.19 (DBGACK) Debug acknowledge signal. The ARM core acknowledges debug-mode in response to a DBGRQ input.

JTAG connector layout:

ARM_JTAG

```
VREF     1  [ ]  [ ]  2  VTARGET
NTRST    3  [ ]  [ ]  4  GND
TDI      5  [ ]  [ ]  6  GND
TMS      7  [ ]  [ ]  8  GND
TCK      9  [ ]  [ ] 10  GND
RTCK    11  [ ]  [ ] 12  GND
TDO     13  [ ]  [ ] 14  GND
RST     15  [ ]  [ ] 16  GND
DBGRQ   17  [ ]  [ ] 18  GND
DBGACK  19  [ ]  [ ] 20  GND
```

(PCB TOP VIEW)

Power supply:
Power supply is made with two LDO adjustable voltage regulators LM1117 and one 78L05. Input voltage should be in range 6VAC/+9VDC.

RS232 interface:
LPC2106 have two UARTs. UART0 is connected with MAX3232 RS232 level converter to SUB D 9 pin connector. UART0 (TXD0/ RXD0) is used by the Bootloader program to program LPC2106 Flash memory without external programmer. UART1 is general purpose RS232 and may be used by user program.

There are two RS232 connectors on the board – one with RS232 levels on Sub-D connector and one with digital 3.3V levels, GND and +5V on 4 pin 0.1" step connector

LCD display:
LCD display is 16x2 characters, working in 4bit more and connected as follows: RS =P0.23, RW = P0.24, E = P0.22, D4-D7 = P0.4-P0.7. Note that when JTAG is enabled ports above P0.18 are not available for user software as they are used by JTAG, so debugging LCD display with JTAG is not possible.

Buttons:
B1-B5 are connected to P0.27 to P0.31. Note that when JTAG is enabled ports above P0.18 are not available for user software as they are used by JTAG, so these button states will be not possible to be read by user program when debugging with JTAG.

iButton:
Interface circuit with protection diodes and pull-up for Dallas' iButton is connected to port P0.11

Status LED:
Status LED is connected to port P0.12

RELAY:
Relay with 10A/250VAC contacts is connected to port P0.13

Frequency input:
Frequency input with protection diodes is connected to port P0.10 (CAP1.0)

EXTENSION connector:
On this connector various useful signals are available: **PIN1** = 3.3V, **PIN2** = GND, **PIN3** = RST, **PIN4** = BSL, **PIN5** = P0.26, **PIN6** = P0.25, **PIN7** = P0.16, **PIN8** = P0.15, **PIN9** = RXD1, **PIN10** = TXD1 (only if three way jumper selected), **PIN11** = SDA, **PIN12** = SCL, **PIN13** = +5VDC, **PIN14** = GND

RESET:
Reset circuit is made by simple external RC group. There is possibility to apply RESET externally by the small RESET pushbutton on the board.

Buzzer:
Buzzer shares port P0.8 via three way jumper with extension port PIN10 thus allows P0.8 to be used either for Buzzer either for RS232 TX1 available in extension port header.

Oscillator:
14.7456 Mhz crystal is used for LPC2106 as it allows easy setup on any communication speed This makes programming with Philips ISP utility possible at any speed up to 115Kbps.

Bootloader:

The Bootloader program is enabled when BSL jumper is shorted at time of power up. In this case Bootloader takes the program control and user may download Flash memory with Philips ISP programming utility. Note that if you want to run code in Flash memory BSL jumper should be open at time of power up, otherwise Bootloader will stay in control and will not allow program in Flash to run.

Board layout front:
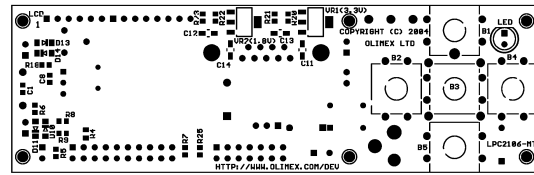
Board layout back:
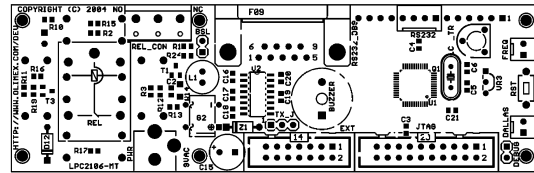
Ordering codes:

LPC-MT-2106   - assembled and tested with LPC2106 microcontroller