



MMIpc213x

Minimodule with
ARM microcontroller

User Guide

REV 0.8

PCPOX®
Many ideas one solution

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Introduction

MMIpc213x is universal minimodule for the LPC213x microcontrollers from Philips. This microcontroller is available in the TQFP64 case which is difficult to apply to prototype and amateur circuits due to the compactness of pins. We have undertaken an attempt at placing it on a board of 36x36mm with a layout of leads which matches the commonly available prototype circuit boards. In addition, we have included 3.3V voltage regulator, a serial DataFlash memory with a capacity of up to 4MB, a crystal resonators and backup battery socket. All ports and signals of the microcontroller are lead out by means of two-row pin connectors with 0.1" pitch. This minimodule is not only an adapter but a complete main board for LPC213x. It needs only a connection to the supply voltage and to the JTAG connector and we can start loading 512kBytes of Flash memory of the microcontroller. Through integration of the peripherals with the microcontrollers on one board, the application of this module can lead to a shorter design period and facilitate the construction of systems based on ARM microcontrollers, by eliminating the need to design the printed board. The module is supplied with example software.

The **MMIpc213x** minimodule can be also used in didactic laboratories of informatics colleges and universities, and can be also used to build circuits realizing thesis projects.

Features

MMIpc213x minimodule:

- Complete, ready to use microprocessor system
- Fast ARM microcontroller LPC213x with up to 60 MIPS throughput
- Serial DataFlash memory 32Mb (4MB)
- Reset circuit
- Built-in 12MHz crystal resonator
- Built-in 32.768kHz crystal resonator for RTC
- Possibility to mount backup battery for RTC
- Built-in 3.3V 400mA regulator
- Module supply voltage: 3.3V or 3.8 - 16V
- 2 x 26 terminals with 0.1" (2.54mm) pitch fitting every prototype board
- Small dimensions:36mm x 36mm (1400x1400mils)
- Available evaluation board and sample applications

2 The module

Block diagram

A block diagram of MMlpc213x minimodule is shown on the image below:

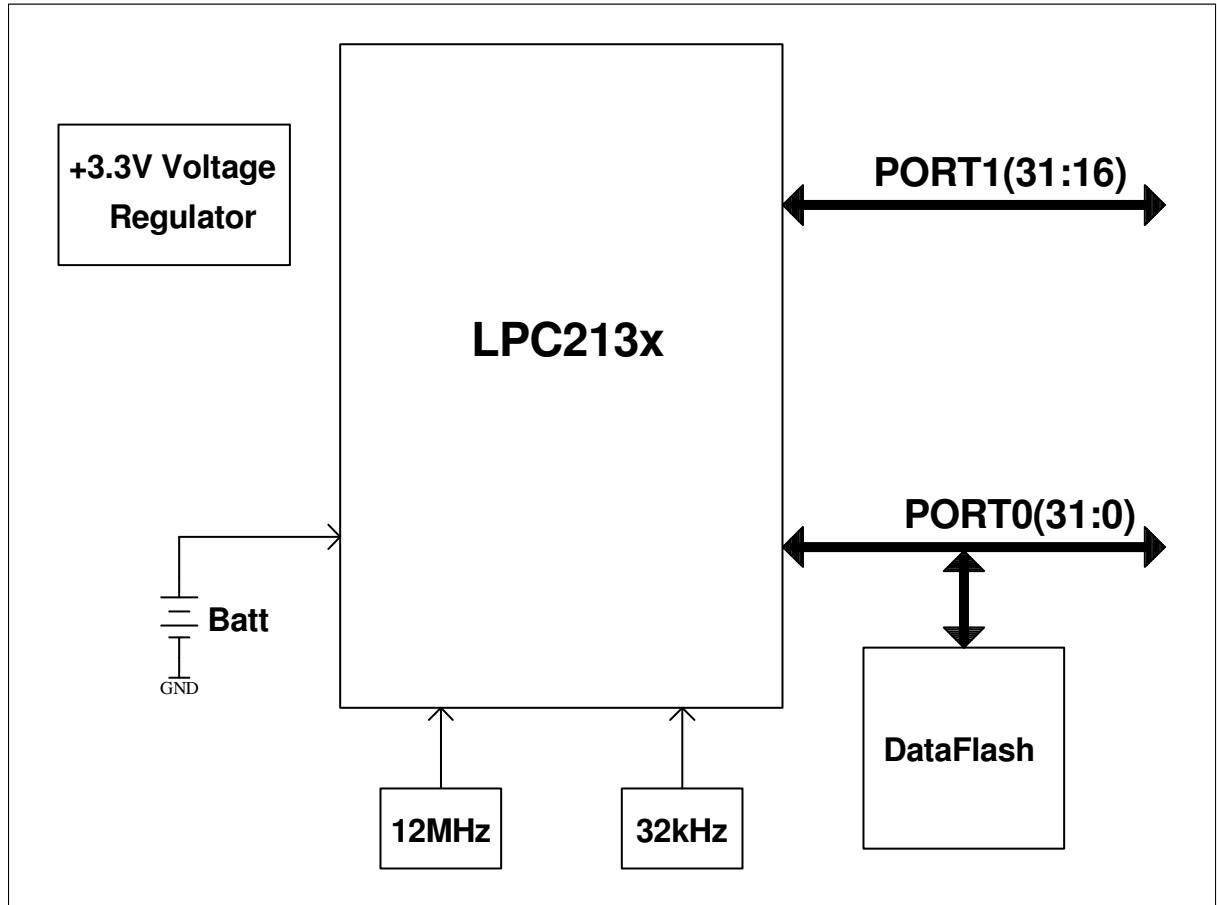
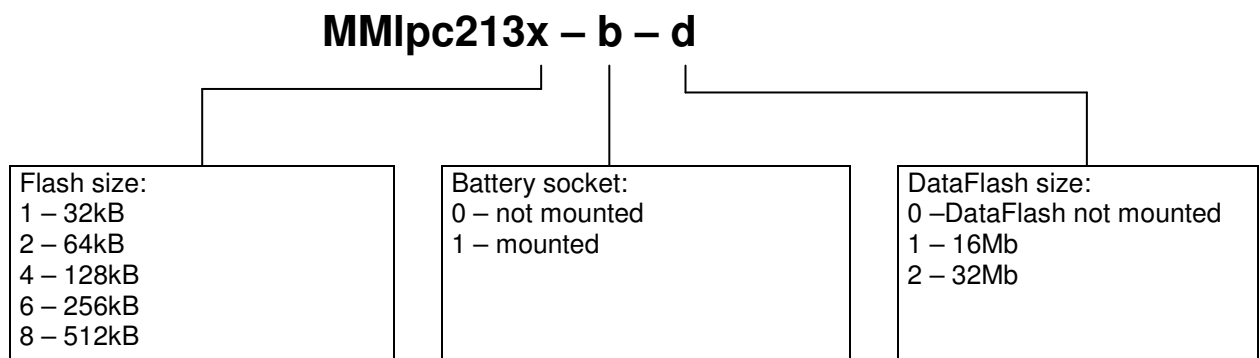


Figure 1 Block diagram of MMlpc213x minimodule.

Minimodule can be ordered in different configurations with use of selector:



For example: MMlpc2138-0-1 – minimodule with LPC2138 (512kB Flash) microcontroller, without battery socket, with 16Mb DataFlash memory.

LPC213x microcontroller

- 32-bit ARM7TDMI core
- From 32 to 512kB in system programmable flash memory
- From 8 to 32kB RAM memory
- In-System/In-Application Programming (ISP/IAP) via on-chip boot-loader software
- 2 timers with input capture, output compare and PWM functions
- 2 UART interfaces
- 2 I2C interfaces
- SPI interface
- One (LPC2131/32) or two (LPC2134/36/38) 8 channel 10-bit A/D converters
- Single 10-bit D/A converter
- Up to 47.5 V tolerant general purpose I/O pins
- Vectored interrupt controller with configurable priorities and vector addresses
- Power saving modes
- RTC clock
- Single power supply 3.3V (internal 1.8V regulator)
- JTAG interface

DataFlash memory

The minimodule can be equipped with serial DataFlash memory AT45DB161B or AT45DB321C (16Mb or 32 Mb capacities). The memory is connected to a fast SPI bus with up to 8MB/s transmission speed.

Memory chip is activated after applying a low logic level to #CS input. The #CS input of memory is connected to port P0.7 of the microcontroller. The SPI bus occupies three terminals of the microprocessor: P0.4, P0.5 and P0.6. It should be kept in mind that if DataFlash memory is installed, the just outlined port terminals cannot be used externally to the module. Of course the SPI bus can be used for communication with external peripherals, under the condition that they will have circuit selection inputs (CS). The diagram below shows the connection of DataFlash memory inside the module.

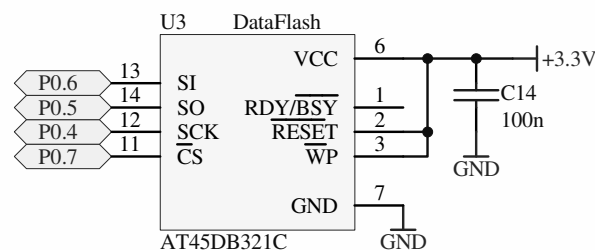


Figure 3 Connection of DataFlash memory inside the module.

A detailed description of DataFlash circuits is on the Atmel Company page: www.atmel.com.

Voltage regulator

Minimodule has built-in 3.3V voltage regulator. Thanks to it can be powered with 3.3V voltage supplied to J1 23 pin (+3.3V) or with voltage between 3.8 – 16V, supplied to J1 25 pin (VCC). When power is supplied to VCC pin, then 3.3V voltage is produced on the module by U2 regulator. In this case 3.3V voltage can be also used outside the module, if current draw will not exceed 300mA.

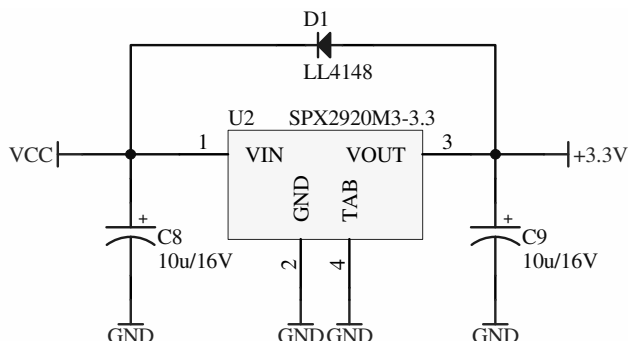


Figure 4 3.3V voltage regulator.

JTAG connector

Programming/debugging of module can be done through JTAG interface.

JTAG is a four-lead interface permitting the takeover of control over the processor's core. The possibilities offered by this interface are, among others: step operation, full-speed operation, hardware and software breakpoints, inspection and modification of contents of registers and data memories. The method of connecting the JTAG connector to the minimodule is shown in the drawing:

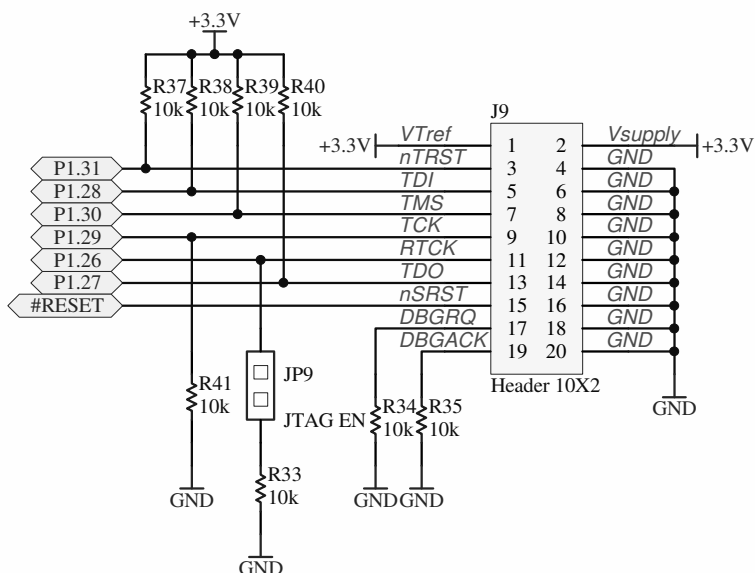
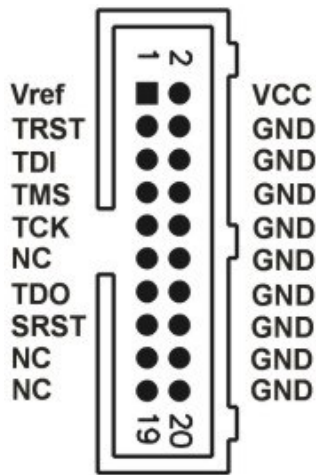


Figure 5 Connection of JTAG interface to MMlpc213x.

In order to enable microcontrollers JTAG interface, P1.26 pin must be held low during reset. Jumper may be used for this purpose (JP9 on the drawing above).



Pin description	
VCC	Supply voltage to the emulator
Vref	Target voltage sense
TRST	Tap RESET, RESET signal for JTAG chain
TDI	Test Data Input, data signal from debugger to target
TMS	Test Mode Select, mode select signal from emulator to target
TCK	Test Clock, clock signal from emulator to target
TDO	Test Data Output, data signal from target to debugger.
SRST	Target RESET signal
GND	Ground

Figure 6 JTAG connector.

JTAG programmer/debugger may be found on page:
 - ARMCable I: http://www.propox.com/products/t_122.html

3 Evaluation Board

In order to facilitate the design of equipment using the minimodule, an evaluation board has been prepared. It includes the following elements:

- Socket for the MMlpc213x module
- Connector with all terminals of the MMlpc213x module
- Connectors of all peripherals accessible on board
- Power supply
- Power switch
- Two RS232 ports
- 1-Wire connector
- JTAG connector for in system programming and debugging
- connector for 2x16 LCD display
- 8 LED diodes
- 4 push-buttons
- 2 potentiometers
- Buzzer
- Prototype design area



4 Specifications

Microcontroller	LPC213x
Program memory	Up to 512kB
Data memory	Up to 21kB
DataFlash memory	Up to 4MB
No. of digital I/O	Up to 47
No. of analog inputs	Up to 16
No. of analog outputs	Up to 2
Power	3.3V or 3.8 – 16V
Dimensions	36x36mm
Weight	About 80g
Operating temperature range	0 – 70°C
Humidity	5 – 95%
Connectors	Double 2x26 headers

5 Technical assistance

In order to obtain technical assistance please contact support@propox.com . In the request please include the following information:

- number of the module version (e.g. REV 1)
- setting of resistors
- a detailed description of the problem

6 Guarantee

The MMlpc213x minimodule is covered by a six-month guarantee. All faults and defects not caused by the user will be removed at the Producer's cost. Transportation costs are borne by the buyer.

The Producer takes no responsibility for any damage and defects caused in the course of using the MMlpc213x module.

8 Dimensions

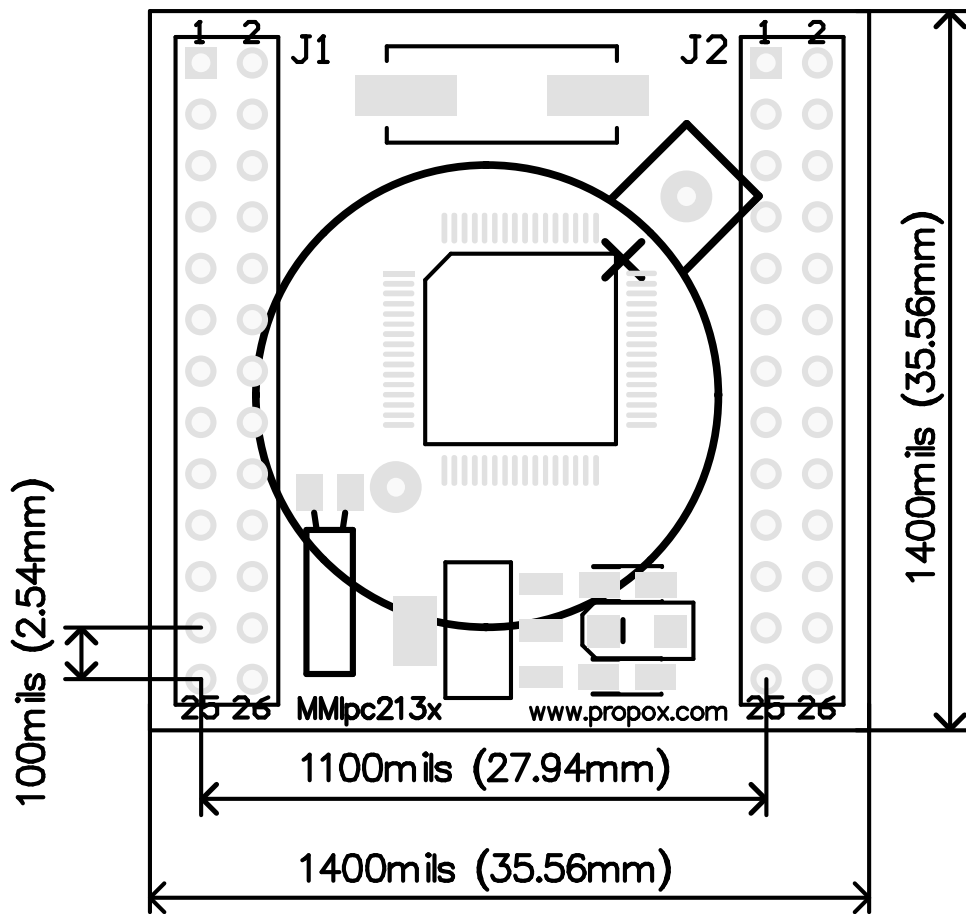


Figure 9 Dimensions - top view.

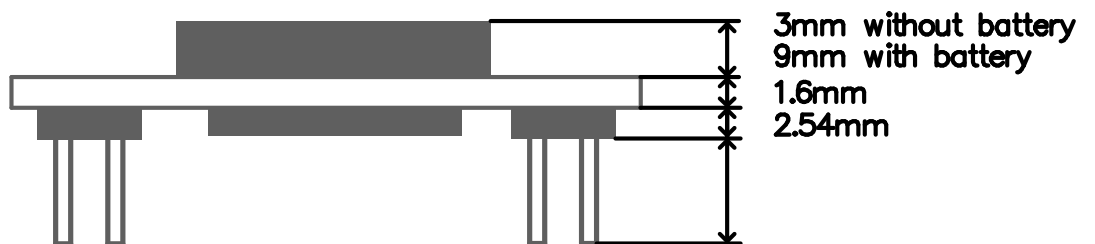
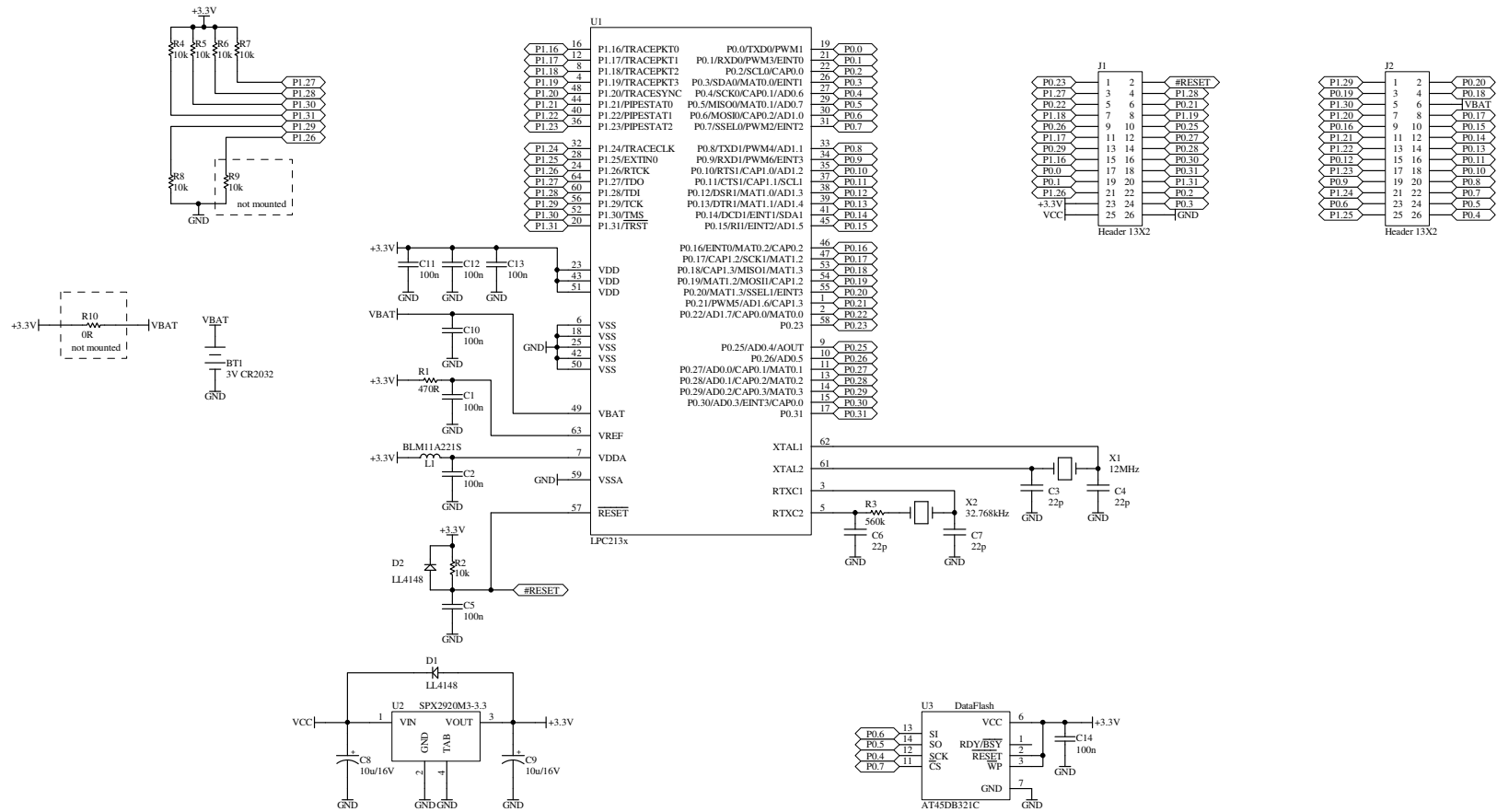


Figure 10 Dimensions – side view.

9 Schematic



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