# MDP Micro-controller Board

**(in association with balloonboard.org)**

A Cambridge-MIT Institute funded project
http://www-mdp.eng.cam.ac.uk

MDP
Multidisciplinary Design Project

## *Description*

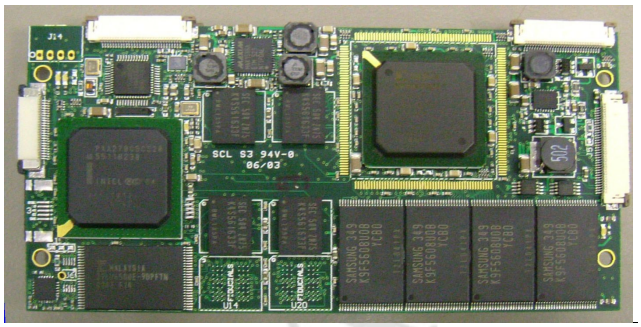
The MDP Micro-controller board is based on the `Open Hardware' *Balloon 3 embedded computing board which uses an Intel XScale processor, normally running a version of Debian/Linux. Designed for flexibility the board has most of the common interfaces and can built to a number of specifications to minimise power and/or cost. The inclusion of a large uncommitted FPGA allows further development of interfaces and real-time processing units. In addition there are a range of add-on boards and software drivers being developed in support of the CMI-MDP Project, see www-mdp.eng.cam.ac.uk.

## *Core Features*

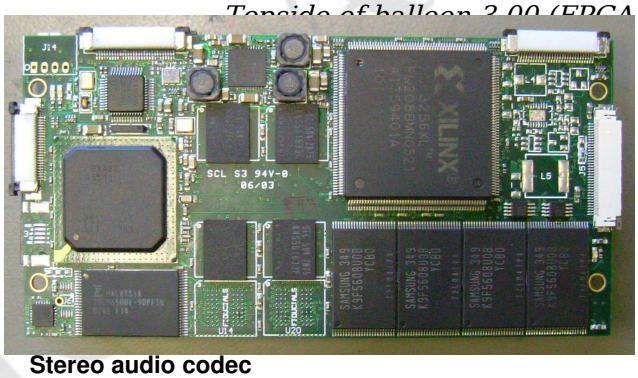
- **Intel XScale PXA270** processor (max: 630Mhz)
- **256Mb Mobile SDRAM** (max: 378MB)
- **NOR flash ROM** (max: 32MB)
- **NAND-flash**, including 16bit variants
  - Maximum of 2GB
  - Reserved area for unique ID
- **JTAG programmable** ROM and PLD
- **Real time clock**
- Choice of **FPGA** or **CPLD**:
  - medium cost FPGA with 400k , 1M or 2M gates
  - low-cost CPLD with 256 macrocells
- **Mobile Scalable Link** (Intel®)between FPGA and CPU
- Single **5V Supply**
  - Local supply voltages derived on board.
  - Software control of power distribution
  - Power consumption <1W (typ.)
- **Small and Lightweight**
  - 113 x 56mm (credit card extended by 2cm on long side)
  - Typical weight: 20-30g

## *IO and Interfaces*

- **10 GPIO**
- **4 ADC inputs** (10bit)
- LEDs & inputs for debugging.
- Reset bus.



*Topside of balloon 3.00 (FPGA version)*



*Topside of balloon 3.00 (CPLD version)*

- **Stereo audio codec**
  - 20bit resolution, 8-48kHz, line in & out
  - UCB1400
- **Touch screen** interface
- **LCD** interface for STN & TFT displays
  - Up to 800x600 resolution,
  - External frame buffer support
  - Backlight control
- **Serial** Interfaces
  - **3 Serial ports** (1 @5V RS232/RS423; 2 @3.3V logic)
  - **Bluetooth** support
  - **I²C** (3.3V)
  - Synchronous Serial Port (**SSP**)
- **USB** host, slave and OTG ports
- **MMC** interface
- Docking connector
  - Provides access to whole address/data/control bus support DMA or bus mastering.
- **'Samosa' bus**.
  - A simple, multi-purpose 8/16bit data/address bus operating at ~4Mhz.
  - also supports SmartMedia cards
- **CompactFlash** socket(s) (not hot-plug)
- **Camera** interface (Intel ® Quick Capture)
  - 10bit ADC
  - hardware colour space conversion



**Balloon 3 was developed and supported by iEndian Ltd, Toby Churchill Ltd., Steve Wiseman, Martin-Jones Technology Ltd., AlephOne, Nick Bane, CMI-MDP/CUED and iTechnic Ltd.*

# MDP General Purpose Expansion Board

A Cambridge-MIT Institute funded project
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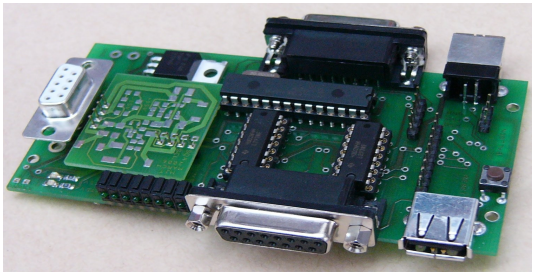
MDP Multidisciplinary Design Project

## Description

The MDP expansion board stacks on top of the micro-controller board and is intended as the standard add-on. It provides standard connectors for the common interfaces that the micro-controller board supports as well as some additional IO facilities. Primarily designed for project and experimental work the board has all vulnerable ICs socketed for easy replacement and voltage protection to prevent damage to the main processing board. In addition the board can be populated to give a smooth DC supply for the main control board and any user analogue circuitry.

The board also features a vertically mounted 9 way D-plug which forms the base of a stackable I²C based bus system.

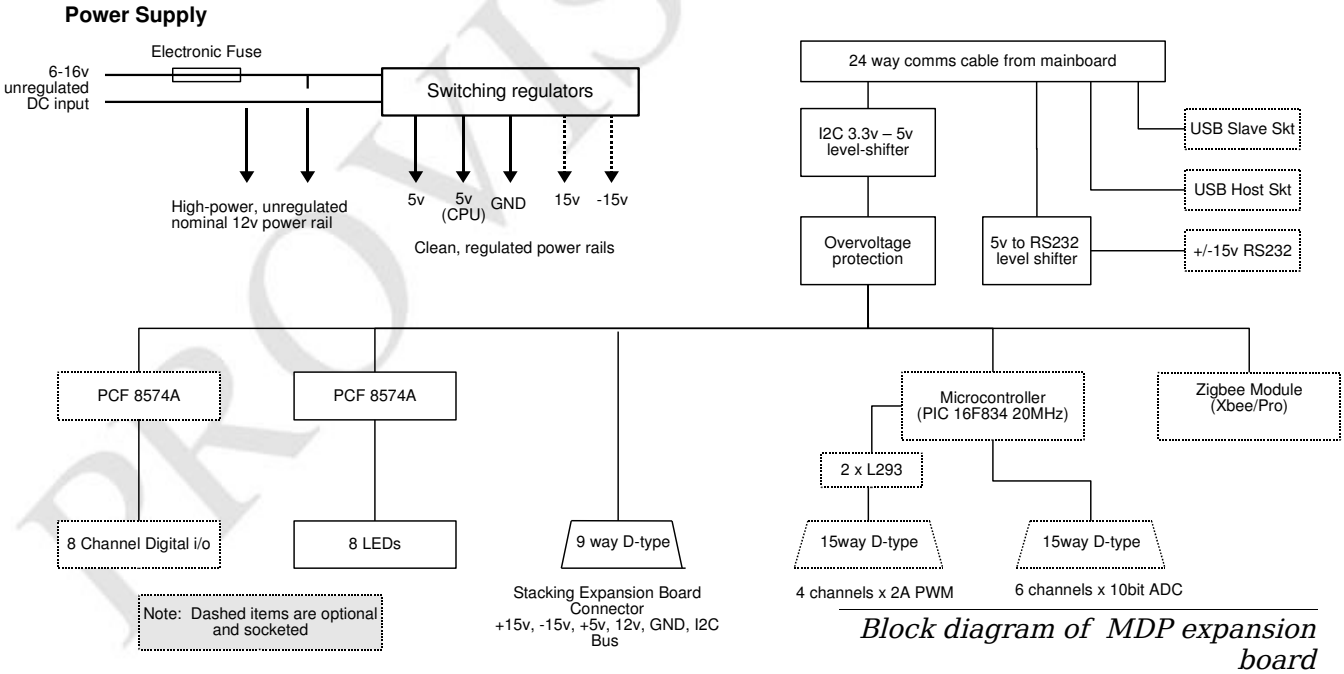


## Features

- Runs from unregulated 6-24V supply
  - Switching regulators generate clean 5V, + optional 15V, -15V rails.
- I²C level shifter.
  - Shifts from 3.3V on Balloon 3 to 5V logic level.
  - Excess voltage protection

## I/O Ports

- **USB Host**
- **USB Slave**
- **RS232 Serial** port
- **8bit IO** port
- **8 Indicator LEDS**
- **5xADC 10 bit** (15way D-type female)
- **Zigbee Module** (Option)
- **Motor Driver (4 Channel)**
  - Bi-directional PWM motor control.
  - Uses L293s or optional external H-bridge




*Block diagram of MDP expansion board*

A range of additional interfaces/expansion boards have or are being developed, utilising the stacking connector :

Prototyping Board *(inc. 8574)*
Prototyping Board *(inc Bootloadable PIC)*
High Speed data acquisition
LCD driver/display
General Connection i/o
High Current Bidirectional PWM
Optical line following (+ prototyping area)
Inductive line following (+prototyping area)
Low Speed Multi-channel ADC/DAC

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