

8051 Trainer Board Reference Manual

Revision: March 6, 2013

Note: This document applies to REV B of the board.

To purchase, visit

www.elexp.com

To access sample code, visit

www.microdigitaled.com

Manufactured by Gethru

Tech @ www.gethru.com

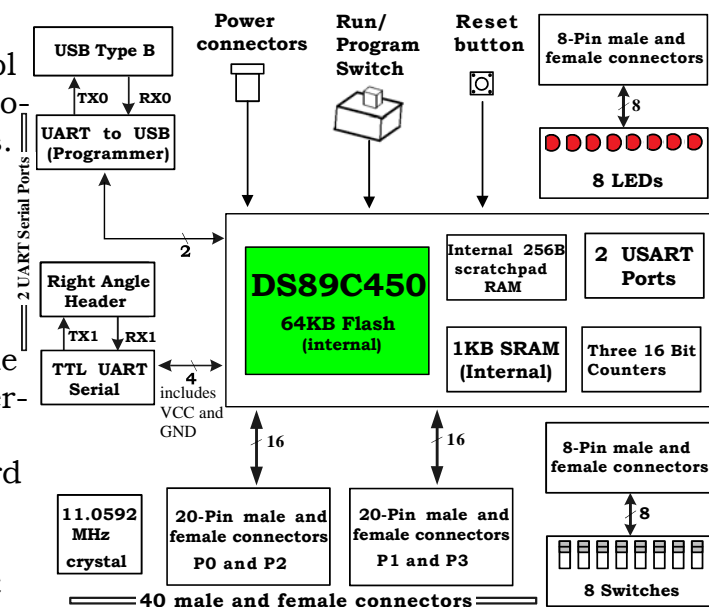
Overview

The MDE 8051 board is an useful tool for embedded control and robotics projects for both students and hobbyists.

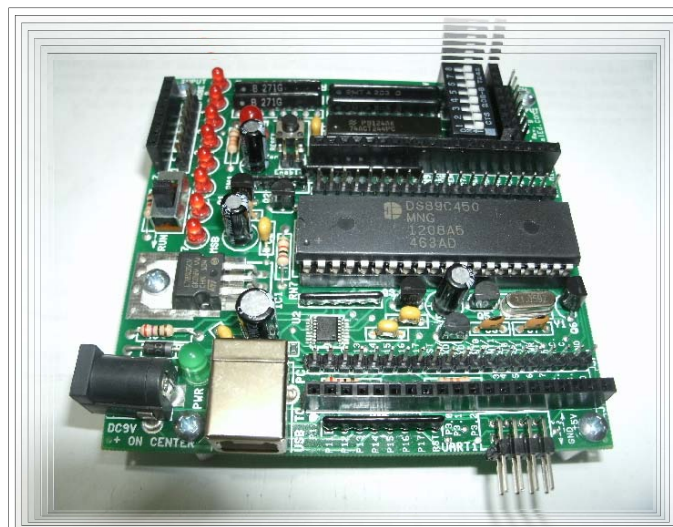
Integrated I/O and programming

Its versatile design and programmable microcontroller lets you access numerous peripheral devices and program the board for multiple uses. The board has many I/O connectors and supports a number of programming options including 8051 assembly and C programming language.

The MDE 8051 trainer board has 8 switches and 8 buffered LEDs for connection to the microcontroller, bread board or peripheral devices. It provides access to pins of the 8051 microcontroller through SIP male and female connectors for wiring to bread board. Through using a terminal program, one can program the microcontroller by flipping the slide switch to program or run. A DIP socket allows the programmed microcontroller to be removed for its ultimate application and re-program another chip repetitively.



8051 Trainer Circuit Diagram



MDE 8051 Trainer Features include:

- A Maxim Integrated DS89C450 microcontroller (an 8051/52 compatible) with 64Kbytes of on-chip Flash memory
- Eight on-board switches accessible via both male and female connectors
- Eight on-board LEDs accessible via both male and female connectors
- An on-board +5V voltage regulator
- Two 20-pin male and female connectors for quickly hooking up wires
- Support for the Maxim Integrated on-chip serial programmer
- A Run/Program slide switch
- An integrated USB to Serial port
- A TTL right angle header to the second Serial COM port
- Four threaded stand offs to be easily mounted onto a chassis
- Compact design: Dimensions: 3.44" (W) x 3.46" (L) x 1.47" (H)
- Provision of a 2x4 header for an USB to Serial conversion cable

Features of the Maxim Integrated DS89C450 Microcontroller include:

- On-chip loader using a serial port
- Two USART serial interfaces (COM ports)
- Three 16-bit timer counters
- 64KB program flash

- 256B scratchpad RAM
- 1KB on-chip RAM accessible with MOVX instruction.

For more information on the Maxim Integrated DS89C450 microcontroller, please refer to the data sheet available at <http://www.maximintegrated.com>

Functional Description

The MDE 8051 Trainer board is designed for embedded control and robotic applications as well as micro-processor experimentation.

The MDE 8051 Trainer board has an on-chip loader/programmer. The loader/programmer is accessed via an USB cable that converts USB to Serial signal to the serial circuit in DS89C450.

The MDE 8051 Trainer features an on-board 5V voltage regulator routed to system power for VCC and GND pins and also available on 20 pin male and female connectors for powering other ICs on users' breadboards.

Power Supply

A power adapter is shipped together with the MDE 8051 Trainer package. The on-board barrel connector is rated at DC9V, 1 Amp with 2.1mm center positive (+) configuration.

Plugging in the power adapter will light up the green LED as a power-on indicator. While working on a breadboard with jumper wires across VCC and GND via the headers, one should monitor this green LED to ensure the presence of 5V. Mistakenly wired VCC with GND can create short-circuit situation and damage the regulator.

Programming the 8051 Trainer

The MDE 8051 Trainer programming can be accomplished using the on-board USB connection. Remove power and connect the USB cable to the PC and the board first. Once your PC recognizes the MDE 8051 Trainer board and loads a driver, plug in the power adapter. The USB converter IC converts signal to Serial Port #0. Programming MDE 8051 Trainer is via Serial #0 and requires use of the HyperTerminal program or any terminal program such as Tera Term (<http://en.sourceforge.jp/projects/ttssh2/releases/>). The baud rate settings are 9600, 8 data bits, no parity and 1 stop bit. For more information on programming the MDE 8051 trainer and access 8051 example codes, please refer to <http://www.microdigitaled.com>

Serial Port # 1

The DS89C450 microcontroller provides 2 USART serial interfaces. The first serial #0 is used with an USB-

serial converter. The second serial port (#1) has equipped with a 2x4 right angle male header that has TTL signals of TX, RX, GND and VCC to be used with an USB serial cable. Search Google with keywords “USB 4 TTL” for options.

Crystal Oscillator

The Maxim Integrated DS89C450 microcontroller supports numerous clock source options for the main processor operating clock. The MDE 8051 Trainer has an 11.0592 MHz oscillator crystal. 11.0592 MHz oscillator crystal makes you enable to connect the 8051 trainer board to a PC or a Mac and minimize the transfer error.

RUN/PRGM Programming Switch

To program the MDE 8051 Trainer board, RUN/PRGM slide switch must be flipped to the PRGM (right) side. To run a program after programming, flip the slide switch to the RUN (left) side.

PORT 0 Pull Up Enable

A jumper JMPR1 can enable or disable on-board 4.7K Ω pull-up resistors for the Port 0. The default setting enables the pull-ups with the jumper cap installed.

User I/O Pins

The 8051 Trainer board has two rows of male and female connectors for users to

Access all the ports of the 8051 microcontroller. In addition, an isolated 8 position DIP switches and 8 red LEDs are provided for the use of injecting signals or verifying output signal's status.

Flip a DIP slide switch up to obtain a 5V signal via the headers below the DIP switches. Similarly, one can feed voltage via the headers above the LEDs to turn the corresponding LEDs on.

MDE 8051 Trainer Headers Connection

Note: All 8051 ports can be used as general purpose I/Os or for the following specific purposes.

		MDE 8051 Trainer 20 Pins Header to DS89C450 Ports / Bit		
		Pin	Function	Port / Bit
JP3 and JP4 P0 (Pin 2-9)	External memory bus These pins are accessible for I/O operation. Also they can be connected to the multiplexed Address/Data line of the DS89C450 for external memory bus interface.	1	VCC	
		2	AD0	P0.0
		3	AD1	P0.1
		4	AD2	P0.2
		5	AD3	P0.3
		6	AD4	P0.4
		7	AD5	P0.5
		8	AD6	P0.6
		9	AD7	P0.7
		10		
		11	ALE	
		12	PSEN	
JP3 and JP4 P2 (Pin 13-20)	External memory bus These pins are accessible for I/O operation. They can be connected to the higher order address pins of the external memory bus interface.	13	A8	P2.0
		14	A9	P2.1
		15	A10	P2.2
		16	A11	P2.3
		17	A12	P2.4
		18	A13	P2.5
		19	A14	P2.6
		20	A15	P2.7
JP1 and JP2 P1 (Pin 1-8)	PORT1 is used for I/O operation. If there is an intention to use the second serial port (#1), P1.2 and P1.3 will not be available for I/O operation. P1.2 and P1.3 are connected to UART1 header.	1	I/O	P1.0
		2	I/O	P1.1
		3	I/O	P1.2
		4	I/O	P1.3
		5	I/O	P1.4
		6	I/O	P1.5
		7	I/O	P1.6
		8	I/O	P1.7
JP1 and JP2 P1 (Pin 10-17)	Serial port communications and interrupts Asynchronous serial port, UART0, as well as the 8051 external interrupt sources are part of this port Connection to Serial#0 is used on this port for an USB-serial interface. This is used for programming (downloading) the hex file to DS89C450 chip. No device can be connected to P3.0 and P3.1 during programming.	9		
		10	RxD0	P3.0
		11	TxD0	P3.1
		12	INT0I	P3.2
		13	INT1	P3.3
		14	T0	P3.4
		15	T1	P3.5
		16	WR	P3.6
		17	RD	P3.7
		18		
		19		
		20	GND	

connector	Description	8051 Trainer 8 Pins Headers	
		Pin	Function
SWITCH OUTPUT	Dip Switch Connectors These pins provide access to switches. It provides logical zero or one (0 or 5V) for the microcontroller chip or any external devices.	1	Switch 1 of dipswitch
		2	Switch 2 of dipswitch
		3	Switch 3 of dipswitch
		4	Switch 4 of dipswitch
		5	Switch 5 of dipswitch
		6	Switch 6 of dipswitch
		7	Switch 7 of dipswitch
		8	Switch 8 of dipswitch
INPUT PROBE	LED Connectors These pins provide access to the LEDs. Each LED input is buffered via 74ACT244 and there is no need for external diver.	0	LED 0
		1	LED 1
		2	LED 2
		3	LED 3
		4	LED 4
		5	LED 5
		6	LED 6
		7	LED 7

Jumper and UART1 header

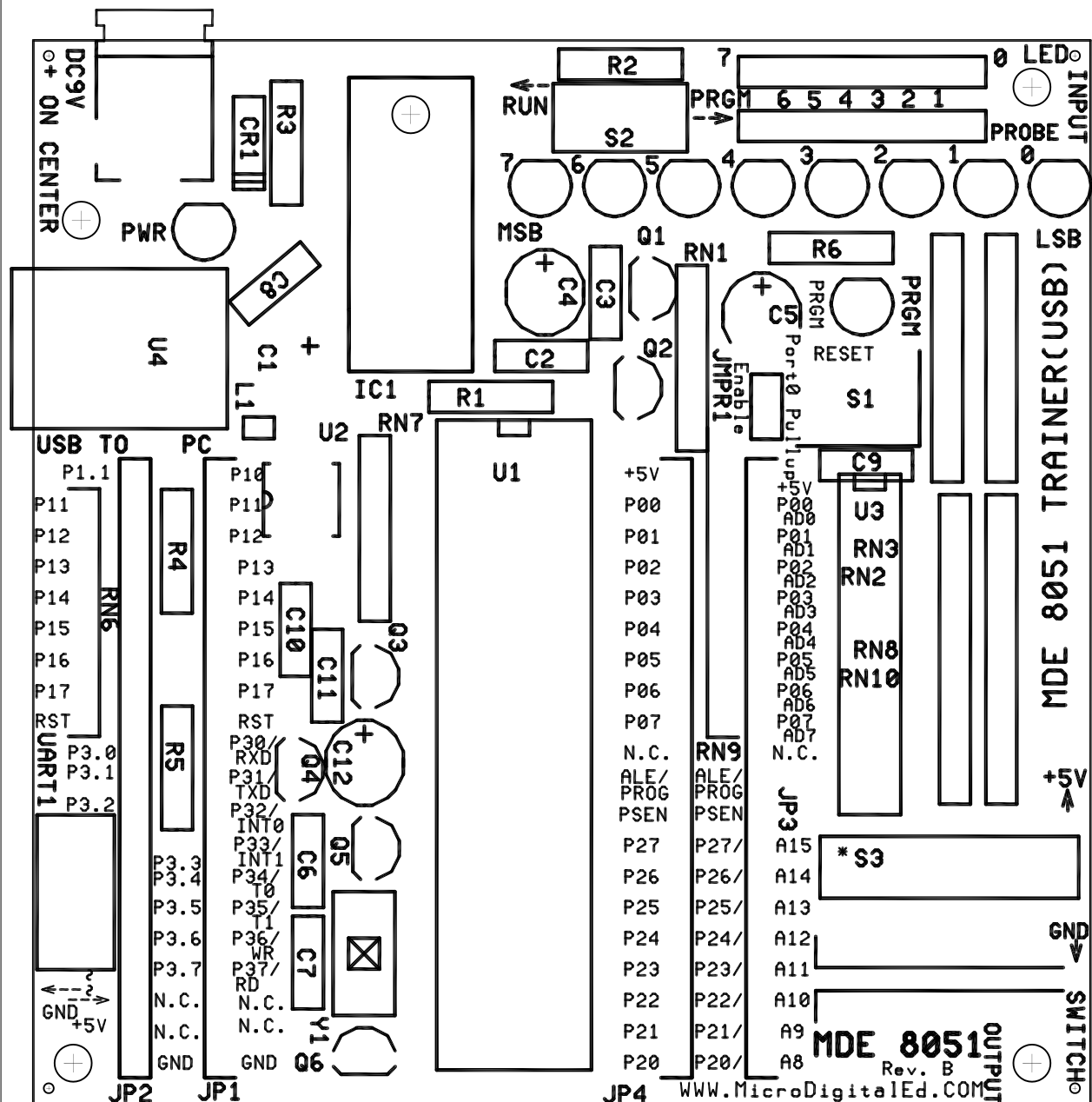
Jumper/Header Label	Function
JMPR1	Pull up Enable / Disable Use this jumper to enable PORT0 pull ups.
UART1	UART1 This is a 2x4 dual row, right angle header. Pin 1, 2 are connected, so are pin 3 and pin 4, so are pin5 and pin 6, so are pin7 and pin 8. Pin1,2 are TX1. Pin3,4 are RX1. Pin5, 6 are ground (0V) . Pin7,8 are VCC (5V)

Component Location diagram can be found next page.

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