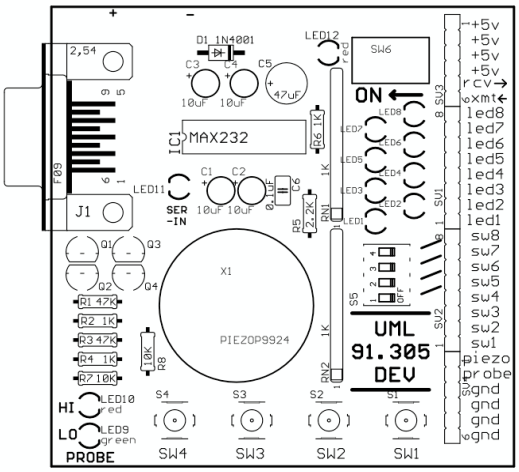
THE UML 91.305 DEVELOPMENT BOARD



INTRODUCTION

The UML 91.305 Development Board provides a collection of useful features for basic digital logic circuit prototyping:

- +5v power supply based on 4 AA cells
- logic probe circuit with red/green indicators for logic high and logic low
- 8 LEDs for monitoring signals
- 8 switches (four DIP, four pushbutton) for generating high and low signals
- serial line voltage converter circuit for interfacing from PC serial ports to chip-level serial signals
- piezo beeper for listening to oscillating signals in the audible range

This document provides an overview of the 91.305 Development Board (UML305DEV). A separate document provides assembly instructions.

FEATURES

This section explains the features of the Development Board in detail. Please refer to the schematic diagram on the last page of this document for additional information.

Power Supply

The power supply is based on 4AA cells, which generate a nominal 6 volts. (This voltage will be somewhat higher when the cells are brand new, and will fall as the cells discharge over use.)

To adjust the voltage to a better range for use with digital logic, the battery voltage is run through diode D1 (a 1N4001 diode). This provides a nominal 0.6v drop, putting the useful battery voltage in the 5.5v range. This is of course higher than the nominal 5.0v specified by digital logic, but within the allowable range.

The 1N4001 diode also acts as a current limit in case of short circuit (power being connected to ground by a wire). In this instance, the diode will get quite hot, and may even fail, but it will prevent dangerously large amounts of current from flowing.

Please **DO NOT USE NICAD BATTERIES** with the UML 305 Dev Board!! Only use alkaline

batteries. Nicad batteries can produce dangerously large amounts of current when shorted.

The Vcc and ground power outputs are available along the right hand connector. The top four positions are Vcc taps; the lower four positions are ground taps. The main power switch SW6 controls power on/off. When power is switched off, both internal board power and external power are removed.

Logic Probe Circuit

A logic probe circuit is located in the lower left corner of the board. The probe signal input is located along the vertical connector strip along the right edge of the board, labeled `probe`.

The red LED lights when the probe signal is logic high (4.4v or greater).

The green LED lights when the probe signal is logic low (0.6v or less).

If no signal is applied, or if the signal is between 0.6v and 4.4v, neither LED will light.

The circuit is implemented with transistors Q1 – Q4 and the associated resistors.

Q2 and Q3 control the logic high LED. If a signal within 0.6v of Vcc (e.g., 4.4v or greater) is applied, then transistor Q2 turns *off*. This allows R7 to turn on transistor Q3, and the red LED is lit.

A similar circuit controls the green LED. A signal of 0.6v or less will cause Q1 to turn off. This allows R8 to enable Q4, and the green LED lights.

Eight General Purpose Status LEDs

LEDs 1 through 8 are general purpose status LEDs. Inputs to the LEDs are provided along the right side connector strip. A +5v signal input lights the corresponding LED.

Resistor network RN1 provides 1K current-limiting resistors for each LED.

General Purpose Switches

Switches SW1 through SW4 are four pushbutton switches which generate 0 or 5v signals. Switch SW5 is a 4-position DIP slide switch which generates additional 0 or 5v signals. The switch outputs are located along the right side connector strip.

When a switch is closed (pressed if a pushbutton, or “on” if a DIP slide switch), a 5v output is generated.

When the switch is open, a 0v output is generated.

The 0v outputs are created with 1K resistors to ground (from resistor network RN2). This means that only a limited amount of current can flow through the resistor (5 mA). This is more than enough to ground a digital input, but can’t be used for high current applications.

The 5v outputs are created with the switch closure connecting directly to the Vcc supply. Therefore arbitrary amounts of current can be sourced. The switch outputs are ideal for lighting the status LEDs directly.

Serial Line Converter

The UML305DEV board includes a DB9 female connector suitable for attachment to a PC serial port using a standard DB9F-DB9M straight through cable. The serial signals are converted from the PC voltage standard (–10v for logic high, +10v for logic low) to the chip level (aka "TTL") voltage standards (+5v for logic high, 0v for logic low). These TTL level signals are available on the right side connector strip at the two points labeled `rcv` and `xmit`.

The `rcv` line is an output of the UML305DEV board and should be connected to the serial receive input of the TTL device (e.g., the 68HC11 microprocessor). It's the same signal that would be considered the PC's serial transmit output, only converted from PC to TTL voltage levels.

The `xmit` line is an input to the UML305DEV board and should be connected to the serial transmit output of the TTL device. It is converted and then guided to the PC's serial receive input.

Little arrowheads next to the `rcv` and `xmit` pins should help clarify which signal is input and which is output to the dev board.

The serial line conversion is done by the Maxim MAX232 serial transceiver chip. The chip uses capacitors to create the +10v and –10v voltages that are supplied to the PC.

Piezo Beeper

The large round piezo beeper will produce clicks and tones when an oscillating signal is applied to its input (labeled `piezo` on the right side connector strip).

The piezo input is fairly high impedance, meaning very little power is required to generate sound.

PART LISTING

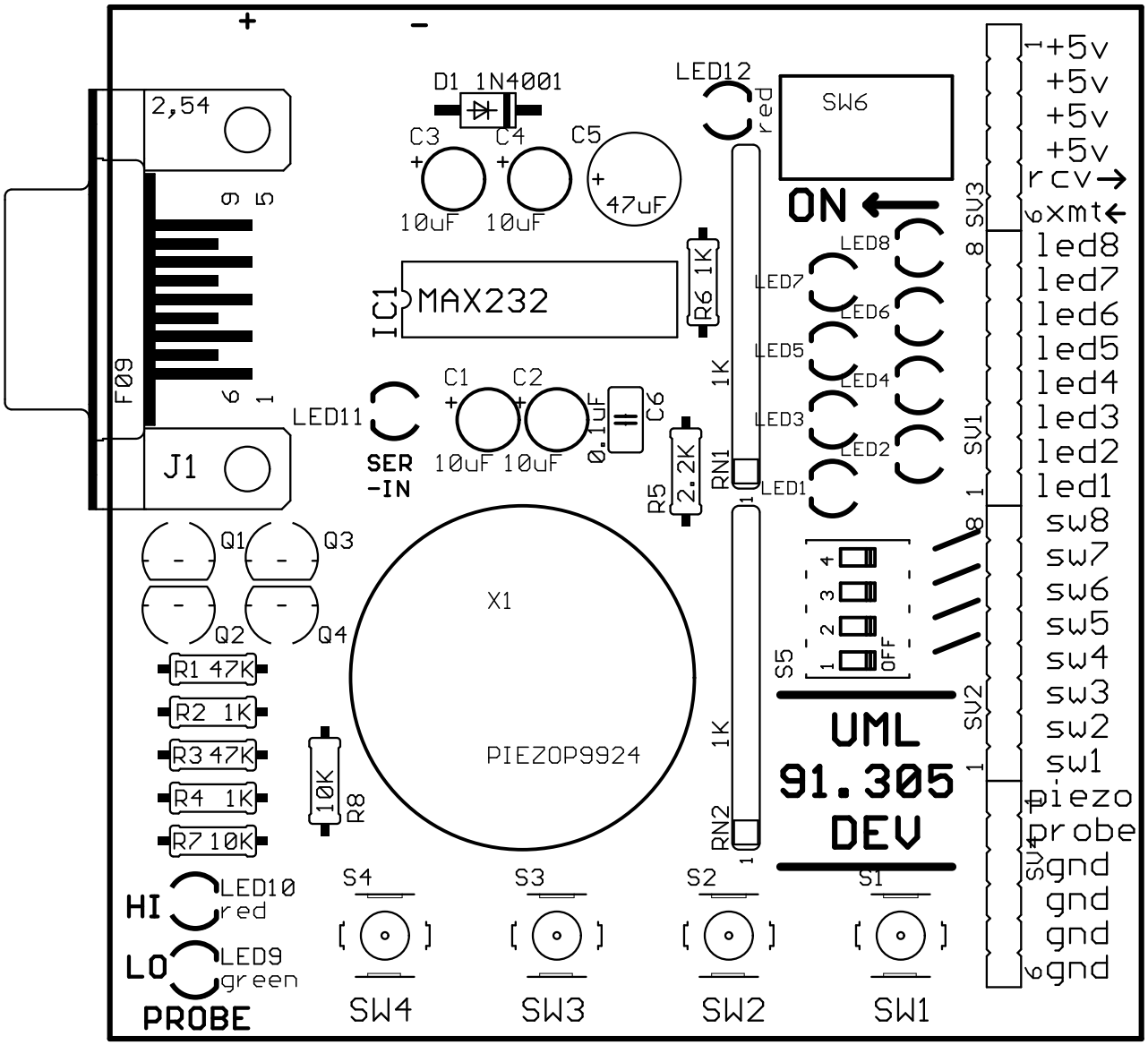
The following table lists the components used on the UML305DEV board.

Qty	Value	Device	Part Reference
4		pushbutton sw	S1, S2, S3, S4
1		DIP switch	S5
1		DB9 jack	J1
1		strip header	SV1, SV2, SV3, SV4
2	1K	resistor pack	RN1, RN2
3	1K	1/4W resistor	R2, R4, R6
1	2.2K	1/4W resistor	R5
2	10K	1/4W resistor	R7, R8
2	47K	1/4W resistor	R1, R3
2	2N3904	NPN transistor	Q1, Q4
2	2N3906	PNP transistor	Q2, Q3
1	4AA	battery holder	BATT1
1	0.1uF	capacitor	C6
4	10uF	electrolytic cap	C1, C2, C3, C4
1	47uF	electrolytic cap	C5
1	1N4001	diode	D1
2	HLMP1700	LED3MM (red)	LED10, LED12
10	HLMP1790	LED3MM (green)	LED1, LED2, LED3, LED4, LED5, LED6, LED7, LED8, LED9, LED11
1	MAX232	serial transceiver	IC1
1	DIP1	DIP socket	DIP1
1	PIEZOP9924	piezo beeper	X1
1	SW101	slide switch	SW6

PCB IMAGES AND SCHEMATIC

Following are (in order):

- PCB silkscreen (top side printing)
- PCB component side etch
- PCB solder side etch
- circuit schematic


+
-
2,54
9
5
6
1
F09
J1
D1 1N4001
C3
C4
C5
10uF
10uF
47uF
LED12
red
SW6
ON
IC1
MAX232
R6 1K
LED8
LED7
LED6
LED5
LED4
LED3
LED2
LED1
1K
RN1
C1
C2
0.1uF
C6
LED11
SER
-IN
10uF
10uF
R5
2.2K
Q1
Q3
Q2
Q4
X1
PIEZOP9924
R1 47K
R2 1K
R3 47K
R4 1K
R7 10K
R8
10K
S5
OFF
UML
91.305
DEV
RN2
1K
HI
LED10
red
LO
LED9
green
PROBE
S4
S3
S2
S1
SW4
SW3
SW2
SW1
SV3
SV1
SV2
SV4
+5v
+5v
+5v
+5v
rcv
xmt
led8
led7
led6
led5
led4
led3
led2
led1
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piezo
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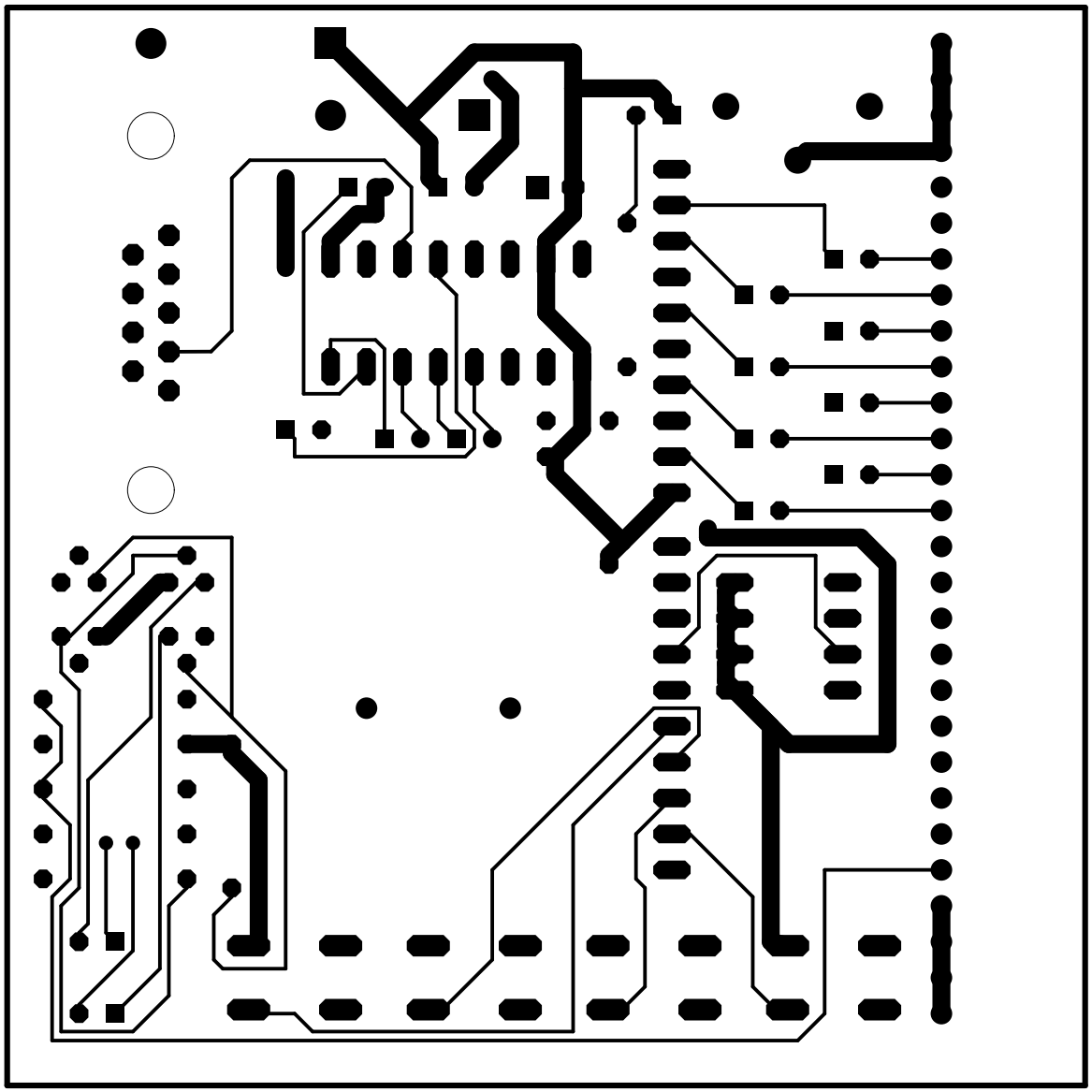

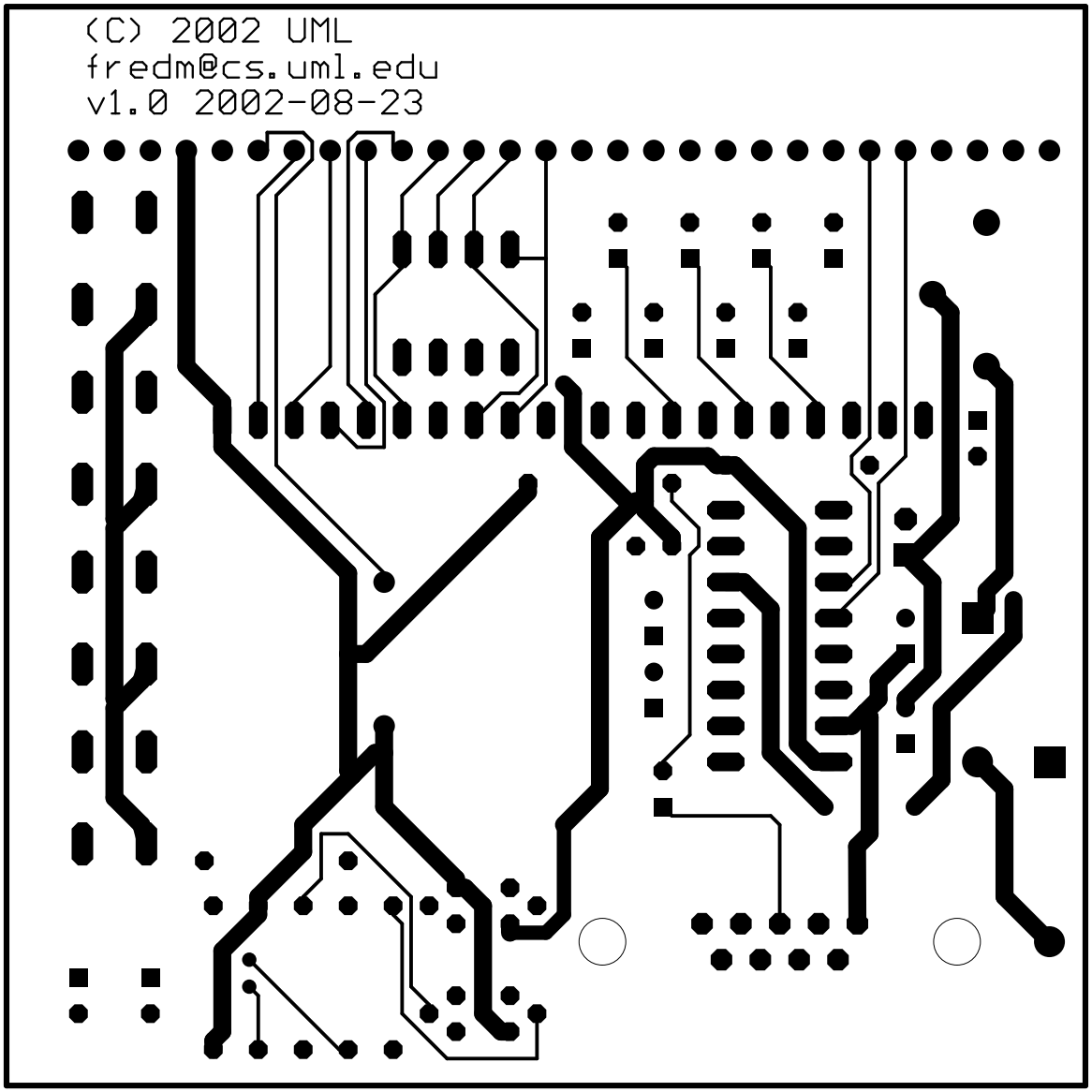
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