This is the Revision A verion of the LED4 RoboBrick. The status of this project is work in progress.

Led4 Robobrick (Revision A)

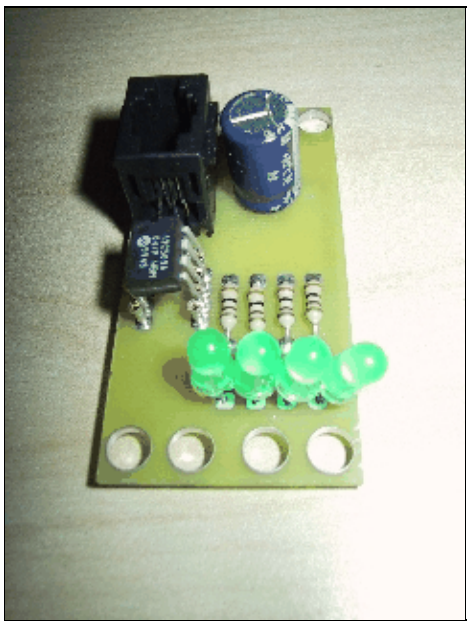
Table of Contents

This document is also available in PDF format.

1. Introduction

The LED4 RoboBrick provides the ability to output 4 bits of data to 4 on board Light Emitting Diodes.

A picture of a LED4−A RoboBrick is shown below:



2. Programming

The LED4 RoboBrick supports the standard shared commands in addition to the following commands:

Command	Send/ Receive	Byte Value								Discussion
		7	6	5	4	3	2	1	0	
Write All	Send	0	0	0	0	*a*	*b*	*c*	*d*	Write *abcd* out to LED's.

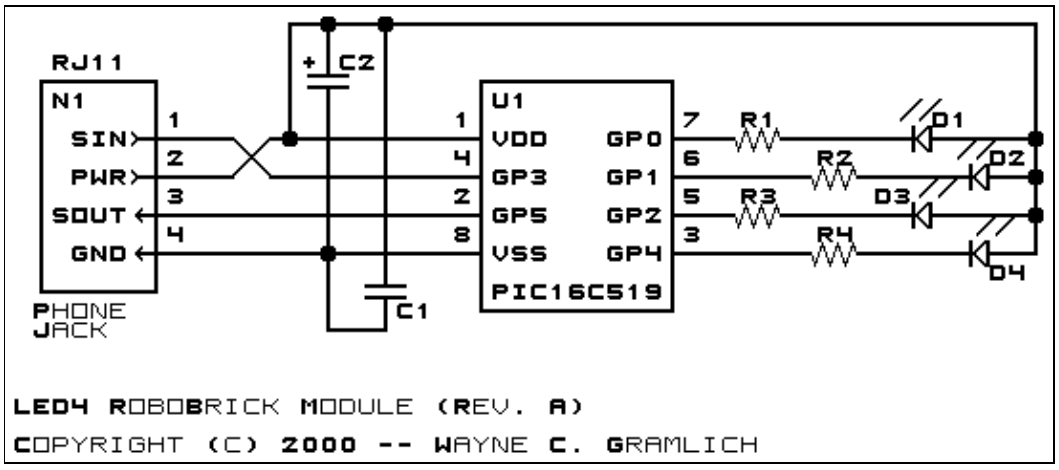
Bit Clear	Send	0	0	0	1	0	0	*b*	*b*	Turn LED *bb* off.
Bit Set	Send	0	0	0	1	0	1	*b*	*b*	Turn LED *bb* on.
Bit Toggle	Send	0	0	0	1	1	0	*b*	*b*	Toggle LED *bb*.
Bit Read	Send	0	0	0	1	1	1	*b*	*b*	Read status of LED *bb*.
	Receive	0	0	0	0	*r*	*r*	*r*	*b*	LED state is *b*. Blink rate is *rrr*
Blink Rate Set	Send	0	0	1	*r*	*r*	*r*	*b*	*b*	Set LED *bb* blink rate to *rrr*; On (*rrr*=000); Slow (*rrr*=001) Mediaum (*rrr*=100) Fast=(*rrr*=11)
Read All	Send	0	1	0	0	0	0	0	0	Read status of all LED's.
	Receive	0	0	0	0	*a*	*b*	*c*	*d*	Current LED state is *abcd*
Increment LED's	Send	0	1	0	0	0	1	*b*	*b*	Increment LED's starting at bit *bb*
Decrement LED's	Send	0	1	0	0	1	0	*b*	*b*	Decrement LED's starting at bit *bb*
Shared Commands	Send	1	1	1	1	1	*a*	*b*	*c*	Send shared command *abc* to RoboBrick.

3. Hardware

The hardware consists of a circuit schematic and a printed circuit board.

3.1 Circuit Schematic

The schematic for the Led4 RoboBrick is shown below:



The parts list kept in a separate file −− led4.ptl.

3.2 Printed Circuit Board

The printed circuit board files are listed below:

led4_back.png
: The solder side layer.

led4_front.png
: The component side layer.

led4_artwork.png
: The artwork layer.

led4.gbl
: The RS−274X "Gerber" back (solder side) layer.

led4.gtl
: The RS−274X "Gerber" top (component side) layer.

led4.gal
: The RS−274X "Gerber" artwork layer.

led4.drl
: The "Excellon" NC drill file.

led4.tol
: The "Excellon" tool rack file.

4. Software

The Led4 software is available as one of:

led4.ucl
: The µCL source file.

led4.asm
: The resulting human readable PIC assembly file.

led4.lst
: The resulting human readable PIC listing file.

led4.hex
: The resulting Intel® Hex file that can be fed into a PIC12C5xx programmer.

The Led4 test swuite is available as one of:

led4_test.ucl
: The µCL source file.

led4_test.asm
: The resulting human readable PIC assembly file.

led4_test.lst
: The resulting human readable PIC listing file.

led4_test.hex
: The resulting Intel® Hex file that can be fed into a PIC16F84 programmer.

5. Issues

The following issues where encounterd with the revision A versions of the LED4 board:

- The LED's are too close together. They need to be spread apart.
- Switch over to a 6−wire bus.
- Label the LED's in copper.
- Place a plus sign next to the positive lead of the LED's.
- Place a "1" next to pin 1 of the PIC.
- Think about reversing the LED wires.

A. Appendix A: Parts List

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# Parts list for LED4 RoboBrick (Rev. A)
#
C1: Capacitor10pF − 10 pF Ceramic Capacitor [Jameco: 15333]
C2: Capacitor2200uF − 2200 uF 6.3V Electrolytic Capacitor [Jameco: 133145]
D1−4: LEDGreen − Small Green LED [Jameco: 34606]
N1: RJ11Female4_4.RBSlave − Female RJ11 (4−4) Phone Jack [Digikey: A9071−ND]
R1−4: Resistor220 − 220 Ohm 1/4 watt resistor [Jameco: 30470]
U1: PIC12C509.LED4 − Microchip PIC12C509 [Digikey: PIC12C509A−04/P−ND]
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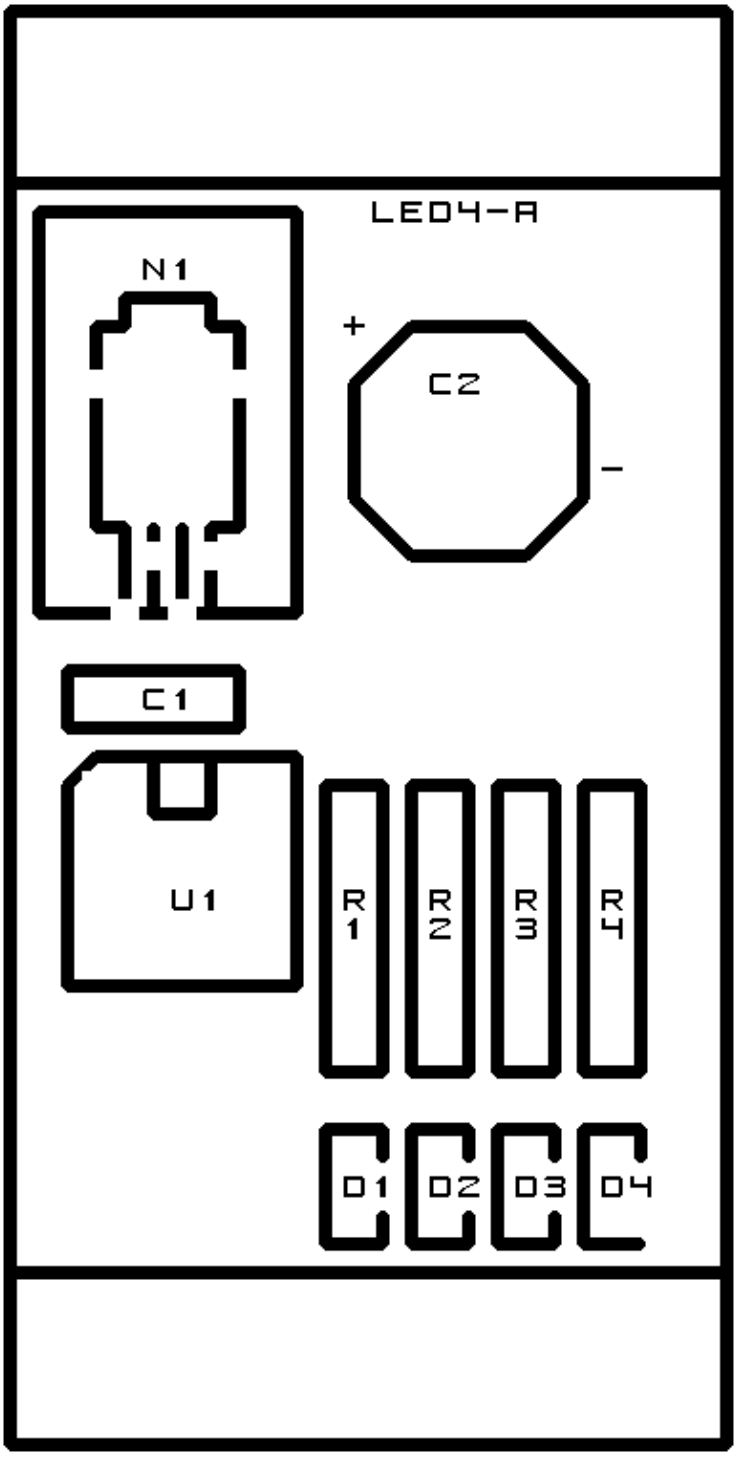
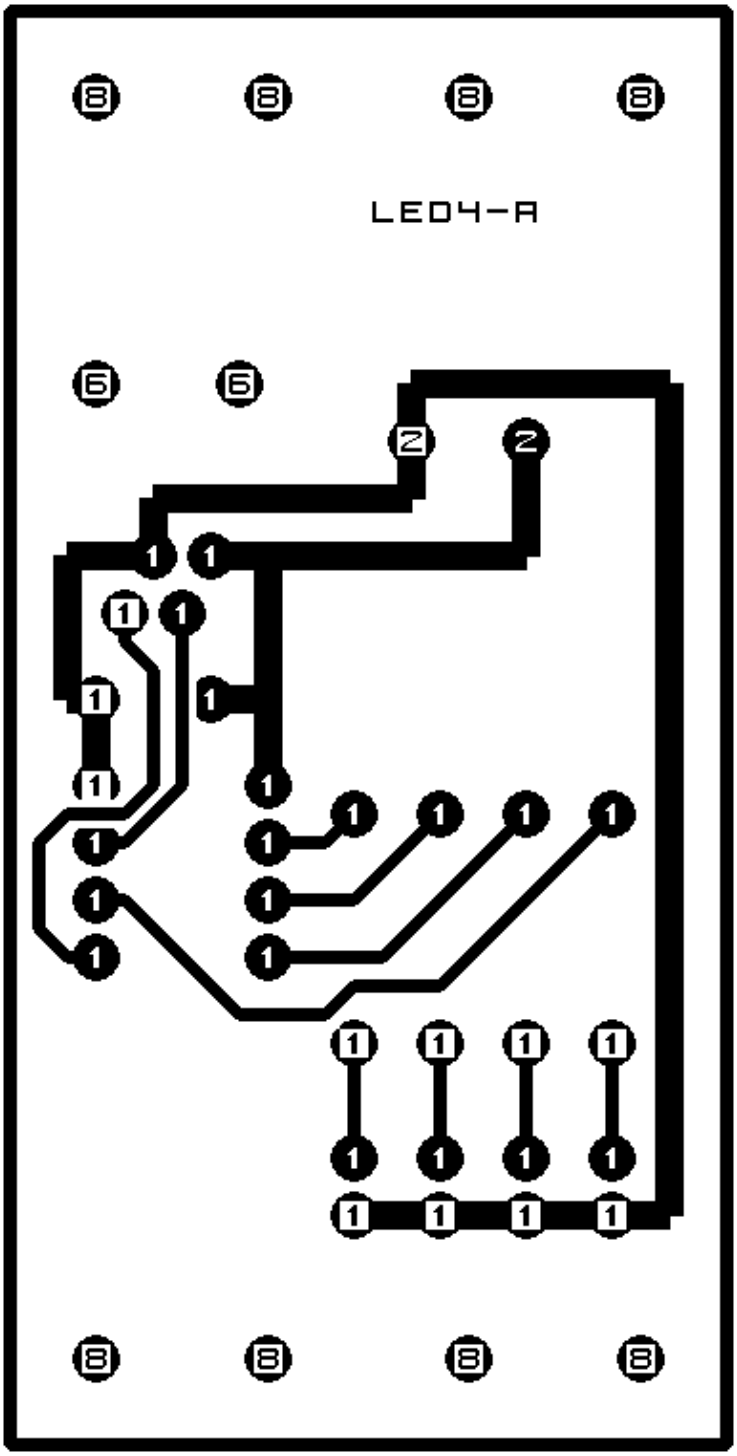
B. Appendix B: Artwork Layer



C. Appendix C: Back (Solder Side) Layer



D. Appendix D: Front (Component Side) Layer