This is the Revision C verion of the IREdge4 module. The status of this project is finished.

IREdge4 Module (Revision C)

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This document is also available in PDF format.

1. Introduction

The IREdge4 module can connect to up to 4 Photo Sensors (combined light emitter with photodetector.) The inputs are done using analog to digital converters rather than just binary inputs. There are 4 potentiometers to control the current throught the light emitters and 4 pententionmeters to control the gain of the returned signal.

2. Programming

The IREdge4 module is continuously reading the analog inputs from its four A/D pins. The controlling program can just read the results of the digital conversion, or it can have the result down converted into a single binary bit. Each pin has has a threshold high and threshold low register that is used for the down conversion. Whenever the digital conversion exceeds the high threshold register, the down coversion results in a 1. Whenever the digital conversion is lower than the low threshold register, the down conversion results in a 0. A hysterisis effect can be introduced by having some spread between the high and low threshold values.

After the down coversions to binary bits, the result is 4−bits of binary data. A complement mask can be used to selectively invert individual bits in the 4−bit data.

The IREdge4 module supports the Interrupt Protocol for those lines that are being used as inputs. The interrupt pending bit is set whenever the the formula:

L&(~I) | H&I | R&(~P)&I | F&P&(~I)

is non−zero, where:

- I is the current input bits XOR'ed with the complement mask (C)
- P is the previous value of I
- L is the low mask
- H is the high mask
- R is the rising mask
- F is the falling mask

and

- ~ is bit−wise complement
- | is bit−wise OR
- & is bit−wise AND

Once the interrupt pending bit is set, it must be explicitly cleared by the user.

In addition to the common shared commands and the shared interrupt commands, the IREdge4 RoboBrix supports following commands:

Command	**Send/ Receive**	**Byte Value**								**Discussion**
		7	**6**	**5**	**4**	**3**	**2**	**1**	**0**	
Read Pin	Send	0	0	0	0	0	0	*b*	*b*	Read pin *bb* and respond with 8−bit value *vvvvvvvv*
	Receive	*v*	*v*	*v*	*v*	*v*	*v*	*v*	*v*	
Read Binary Values	Send	0	0	0	0	0	1	0	0	Return the binary values *abcd* (after XOR'ing with complement mask)
	Receive	0	0	0	0	*a*	*b*	*c*	*d*	
Read Raw Binary	Send	0	0	0	0	0	1	0	1	Return the raw binary values *abcd* (no XOR with complement mask)
	Receive	0	0	0	0	*a*	*b*	*c*	*d*	
Reset	Send	0	0	0	0	0	1	1	0	Reset everything to zero
Read Complement Mask	Send	0	0	0	0	1	0	0	0	Return the complement mask *cccc*
	Receive	0	0	0	0	*c*	*c*	*c*	*c*	
Read High Mask	Send	0	0	0	0	1	0	0	1	Return the high mask *hhhh*
	Receive	0	0	0	0	*h*	*h*	*h*	*h*	
Read Low Mask	Send	0	0	0	0	1	0	1	0	Return the high mask *llll*
	Receive	0	0	0	0	*l*	*l*	*l*	*l*	
Read Rising Mask	Send	0	0	0	0	1	0	1	1	Return the rising mask *rrrr*
	Receive	0	0	0	0	*r*	*r*	*r*	*r*	
Read Falling Mask	Send	0	0	0	0	1	1	0	0	Return the falling mask *ffff*
	Receive	0	0	0	0	*f*	*f*	*f*	*f*	
Read High Threshold	Send	0	0	0	1	0	0	*b*	*b*	Return high threshold for pin *bb* of *hhhhhhhh*
	Receive	*h*	*h*	*h*	*h*	*h*	*h*	*h*	*h*	
Read Low Threshold	Send	0	0	0	1	0	1	*b*	*b*	Return low threshold for pin *bb* of *llllllll*
	Receive	*l*	*l*	*l*	*l*	*l*	*l*	*l*	*l*	
Set High Threshold	Send	0	0	0	1	1	0	*b*	*b*	Set high threshold for pin *bb* to *hhhhhhhh*
	Send	*h*	*h*	*h*	*h*	*h*	*h*	*h*	*h*	
Set Low Threshold	Send	0	0	0	1	1	1	*b*	*b*	Set low threshold for pin *bb* to *llllllll*
	Send	*l*	*l*	*l*	*l*	*l*	*l*	*l*	*l*	
Set Complement Mask	Send	0	0	1	0	*c*	*c*	*c*	*c*	Set complement mask to *cccc*
Set High Mask	Send	0	1	0	0	*h*	*h*	*h*	*h*	Set high mask to *hhhh*
Set Low Mask	Send	0	1	0	1	*l*	*l*	*l*	*l*	Set low mask to *llll*
Set Rising Mask	Send	0	1	1	0	*r*	*r*	*r*	*r*	Set rising mask to *rrrr*
Set Falling Mask	Send	0	1	1	1	*f*	*f*	*f*	*f*	Set falling mask to *ffff*
Read Interrupt Bits	Send	1	1	1	0	1	1	1	1	

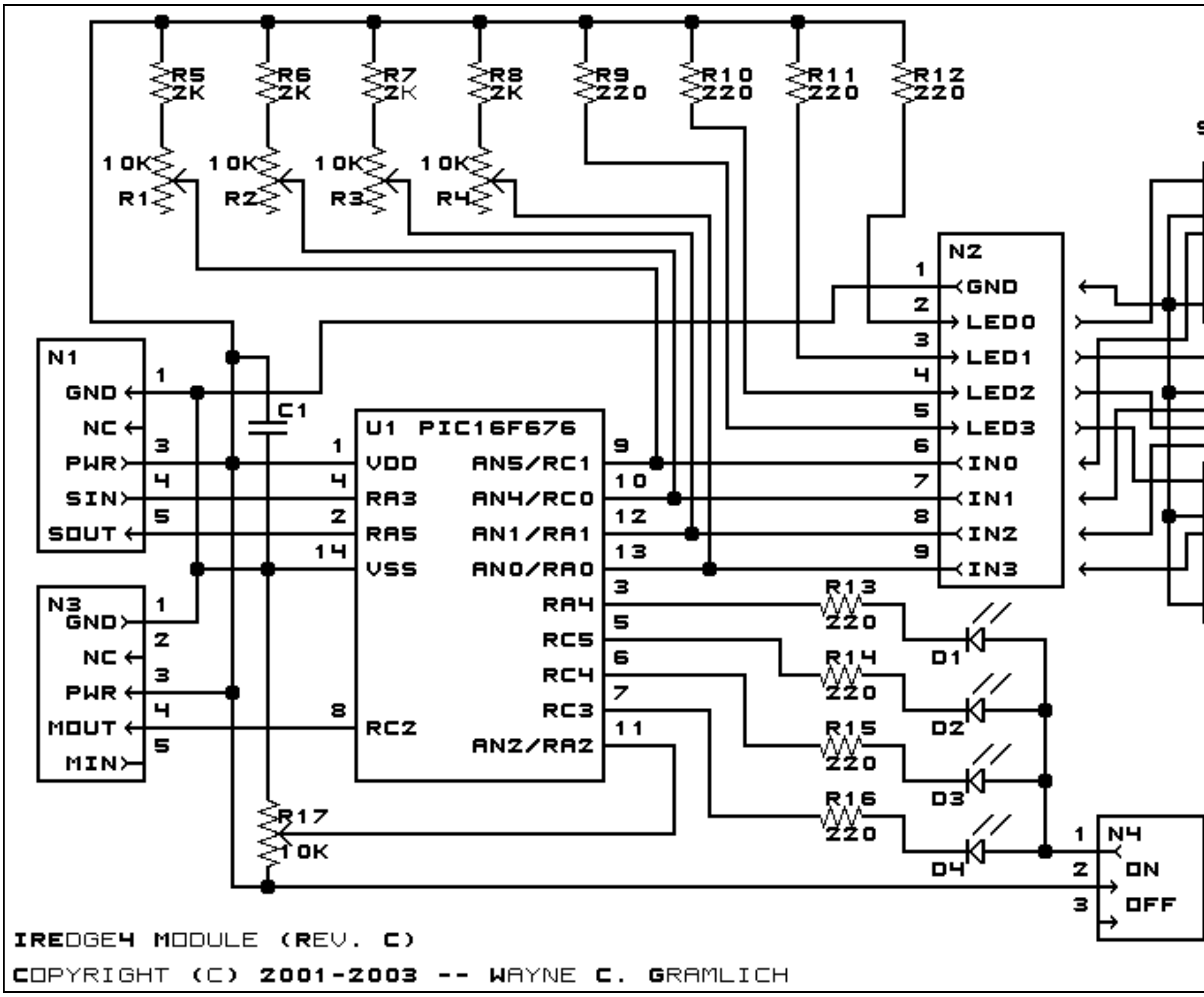
	Receive	0	0	0	0	0	0	*e*	*p*	Return the interrupt pending bit *p* and the interrupt enable bit *e*.
Set Interrupt Commands	Send	1	1	1	1	0	*c*	*c*	*c*	Set Interrupt Command *ccc*.
Shared Commands	Send	1	1	1	1	1	*c*	*c*	*c*	Execute common shared command *ccc*

3. Hardware

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

3.1 Circuit Schematic

The schematic for the IREdge4 RoboBrix is shown below:



The parts list kept in a separate file −− iredge4.ptl.

3.2 Printed Circuit Board

The printed circuit board files are listed below:

iredge4_back.png
: The solder side layer.

iredge4_front.png
: The component side layer.

iredge4_artwork.png
: The artwork layer.

iredge4.gbl
: The RS−272X "Gerber" back (solder side) layer.

iredge4.gtl
: The RS−272X "Gerber" top (component side) layer.

iredge4.gal
: The RS−272X "Gerber" artwork layer.

iredge4.drl
: The "Excellon" NC drill file.

iredge4.tol
: The "Excellon" tool rack file.

4. Software

The IREdge4 software is available as one of:

iredge4.ucl
: The µCL source file.

iredge4.asm
: The resulting human readable PIC assembly file.

iredge4.lst
: The resulting human readable PIC listing file.

iredge4.hex
: The resulting Intel® Hex file.

5. Issues

Any fabrication iusses will be listed here.
