



# ALON1 – RL4 / OP4 USB automation card 4 x Relay (3A / 15A) out 4 x Opto-coupler in

## User's manual

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## Table of content

Table of content .....	3
Revision History .....	3
Acknowledgment .....	4
The ALON1 family of USB interface boards .....	5
Hardware interface .....	5
Relay output .....	5
Opto-coupler input .....	7
Using the 5V connection .....	9
Hardware Schematics .....	9
PCB layout .....	14
Software programming .....	15

## Revision History

Date	Details
17-MAR-2005	Original

## Acknowledgment

Dear valued customer,

I would like to thank you for purchasing an ALON1 USB automation card. The card was designed to allow simple and efficient control for various real world applications with the ease and expendability of USB interface. I believe that you will find our boards to be reliable and easy to use.

The most important person in our company is our customer. Our products are as useful as what we know about customer needs, what his/her expectations are and how our products will better serve him/her. I will appreciate having any suggestion, feedback and ideas that will make your designs better. We are a small and agile company, and we fortunate to love what we do. You will be surprised by the short time that we take good idea into good products.

Regards

Dr. Gal Ben-David

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## The ALON1 family of USB interface boards

Please refer to the document *Alon1 Documentation.PDF* for technical information on the entire ALON1 family.

### Hardware interface

The ALON1 RL4 / OP4 card has four relay outputs and four opto-coupler inputs.

#### *Relay output*

A conceptual circuit diagram of the relay output stage (one of four) is shown in figure 1.

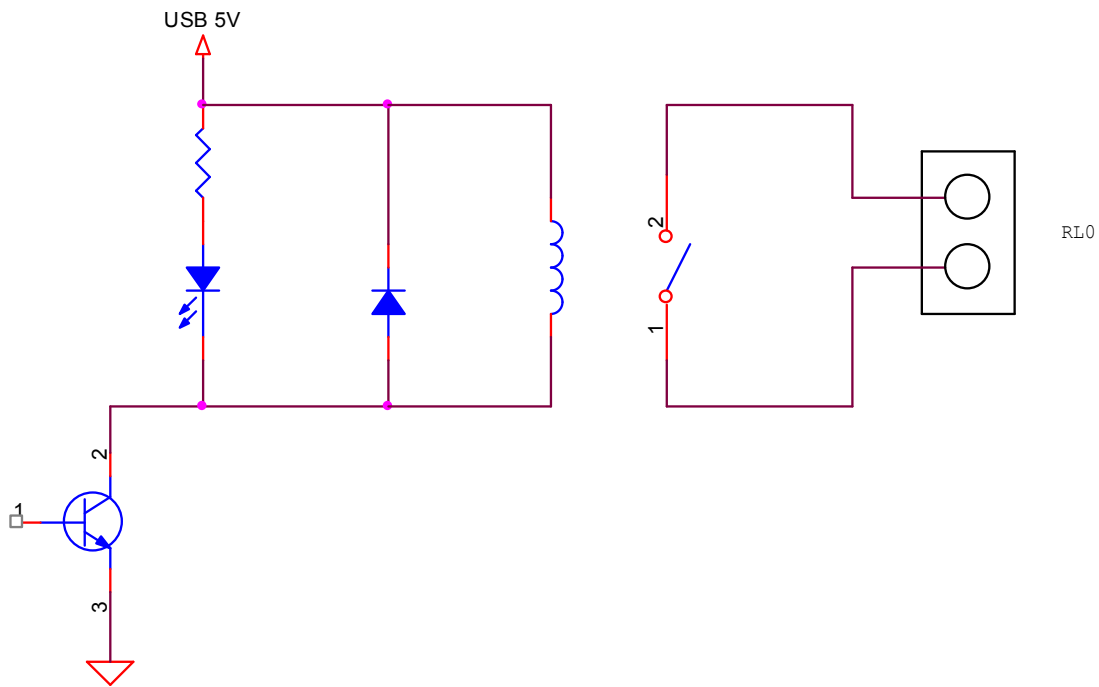


Figure 1 – Relay output circuit

Each relay is driven by an NPN transistor (embedded in a Toshiba ULN2803A). A LED is used for ON/OFF indication.

Two optional relays may be ordered with the ALON1 RL4 / OP4. Relays are ALD105 and ALE15B05, both from NAIS, a subsidiary of Matsushita Electric Works, Ltd., Osaka, Japan. Call us for special combinations of relays.

Following table presents a short comparison between the two options. The user should refer to the manufacturer datasheet for more information. Note that a board based on ALD105 consumes around 250mA, while a board based on the ALE15B05 will need around 400mA.

Relay	Rated load	Breakdown voltage (coil to contacts)	Coil Current	Operate Release time
ALD105	3A 250VAC/30VDC	4,000 Vrms	4 x 40mA	10mS
ALE15B05	16A 277AC	4,000 Vrms	4 x 80mA	20mS

Relays connections are shown in figure 2.

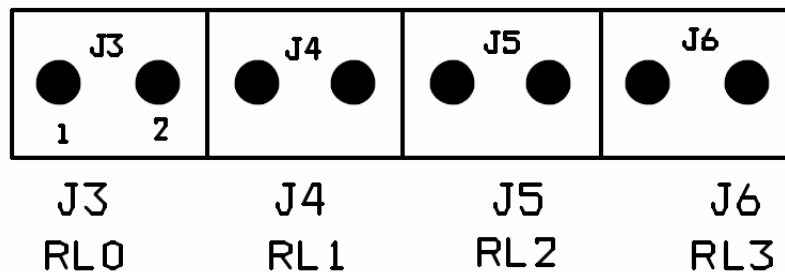


Figure 2 – Relay output connections

## Opto-coupler input

A conceptual circuit diagram of the opto-coupler stage (one of four) is shown in figure 3.

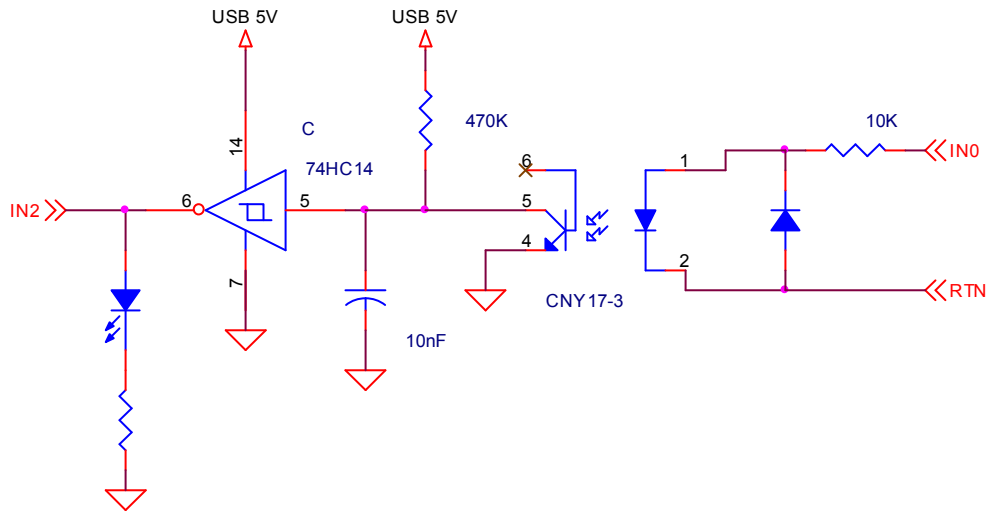


Figure 3 – Opto coupler input circuit

When no signal is applied to the opto-coupler input, the 470K pull-up resistor keeps the input of the Schmitt trigger at a high state and the output of the Schmitt trigger then is zero.

In order to change the state of the circuit, current between 200uA-20mA should flow through the opto-coupler LED. Voltages as low as 2VDC and as high as 60VDC, may be connected directly to the input. **Higher voltage may not be used due to reverse voltage limitation of the protection diode.** Other diode will overcome this limitation. Please contact us for more details.

In order to connect AC inputs, the debouching capacitor should be assembled with a higher value (around 100nF). Please contact us for more details.

A LED is used for ON/OFF indication.

Input connections are shown in figure 4.

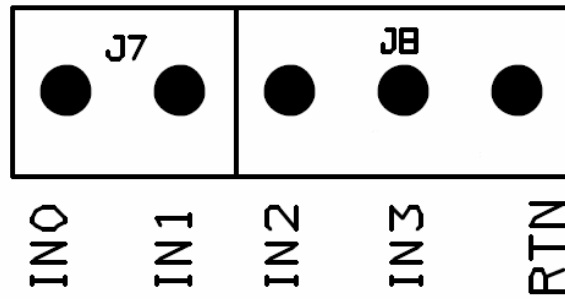


Figure 4 – Opto coupler input circuit

Two possible input configurations are suggested in figure 5.

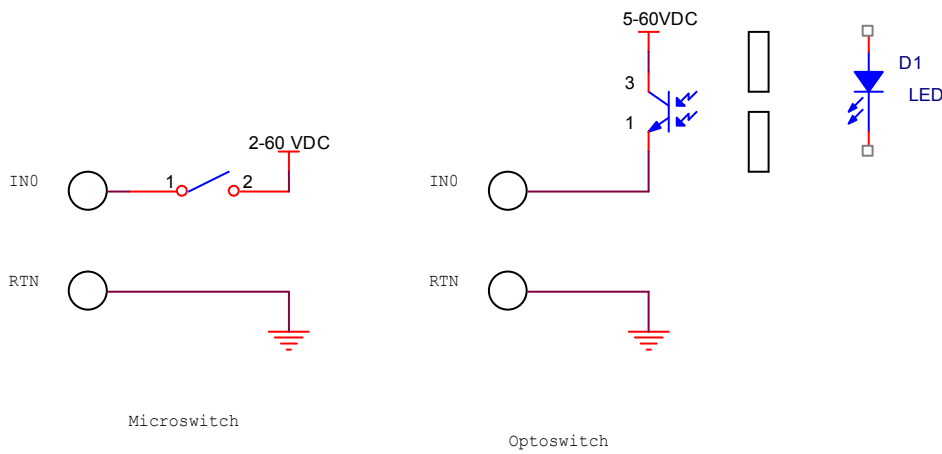


Figure 5 – Opto coupler activation options



## Using the 5V connection

The board has a 5V connection for custom use. Since USB device may use 500mA, the user circuit may consume no more than 100mA for the 15A relays and 250mA for the 3A relay.

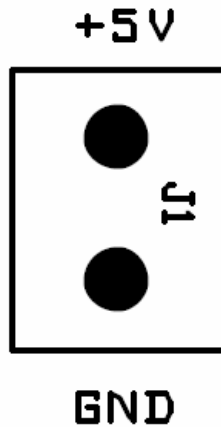
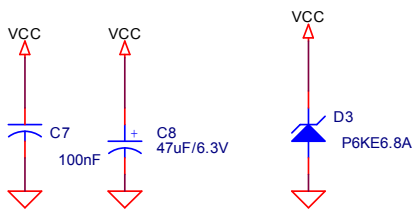
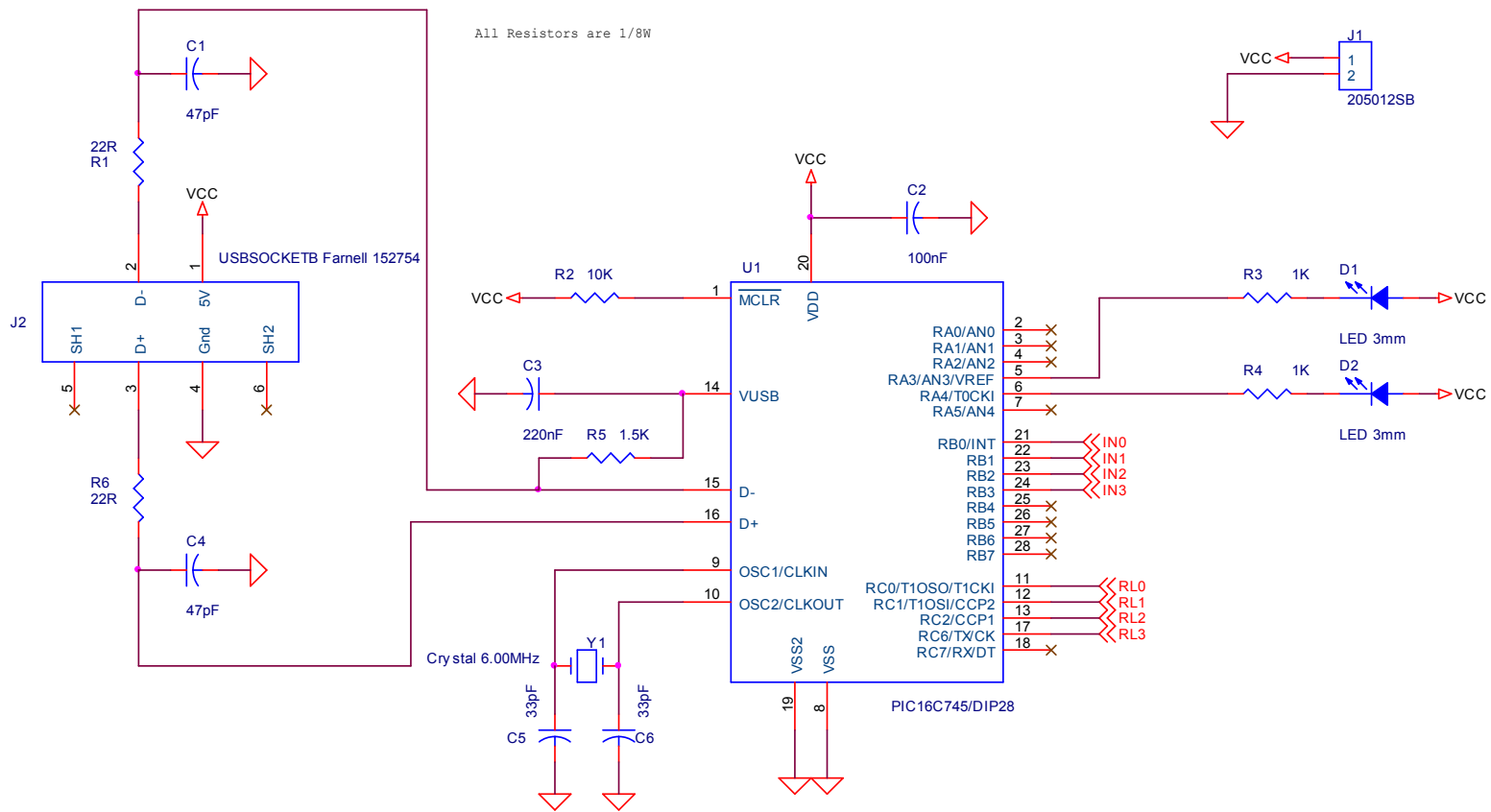


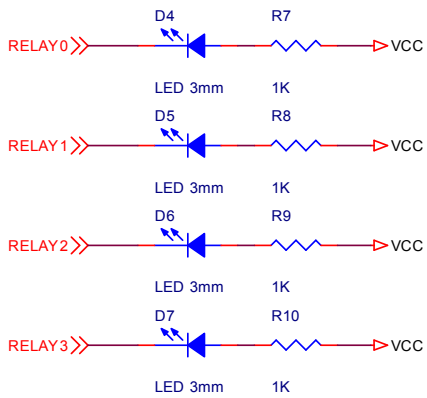
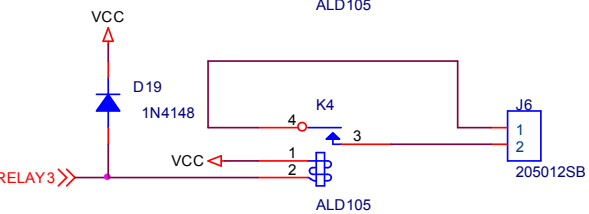
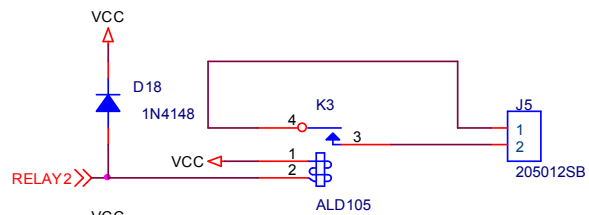
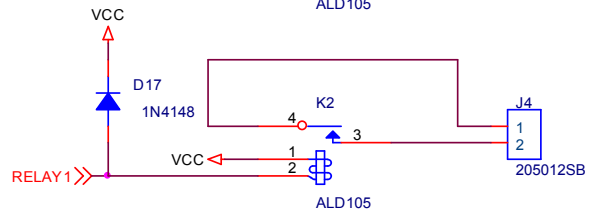
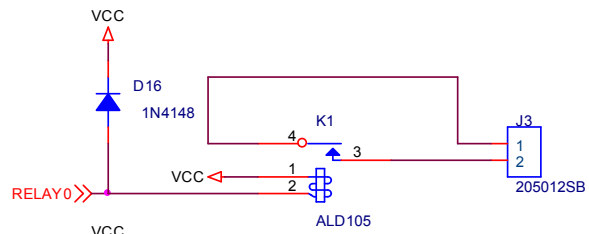
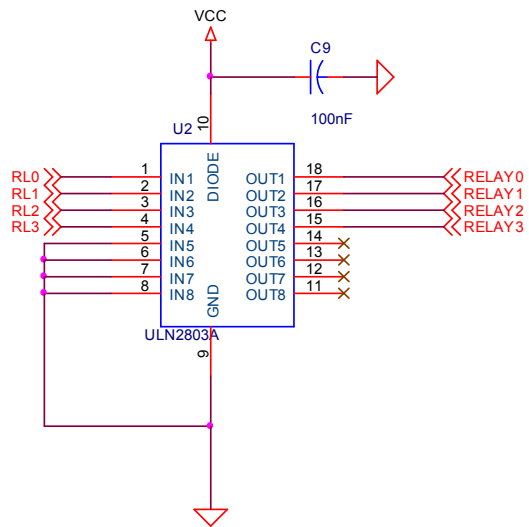
Figure 6 - 5V connector for custom use

**Caution:** The 5V supply is connected directly from the PC/Hub power supply. Care must be taken in order not to consume more power than a total of 500mA per card, including card's own function. High currents and short circuits may damage the PC/Hub. Do not make connections when the board is connected to the PC and PC is powered.

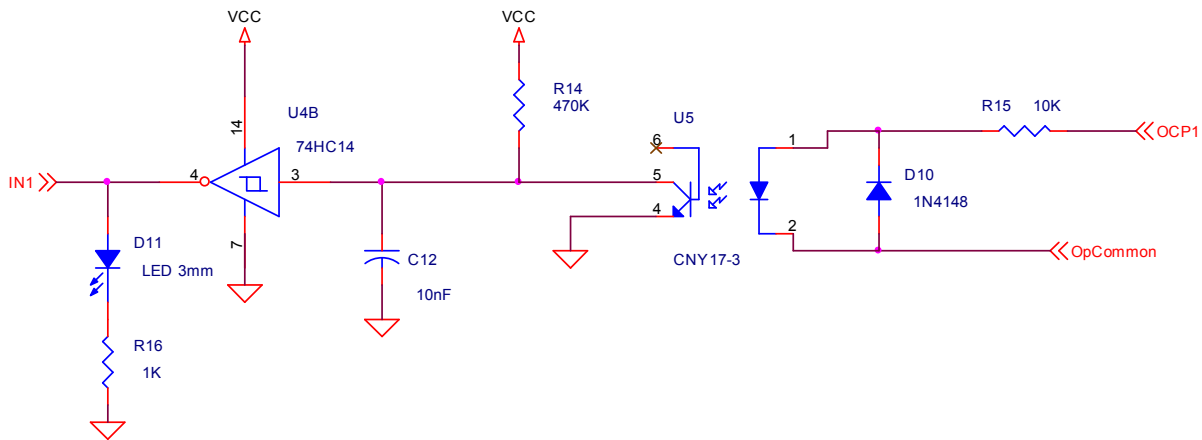
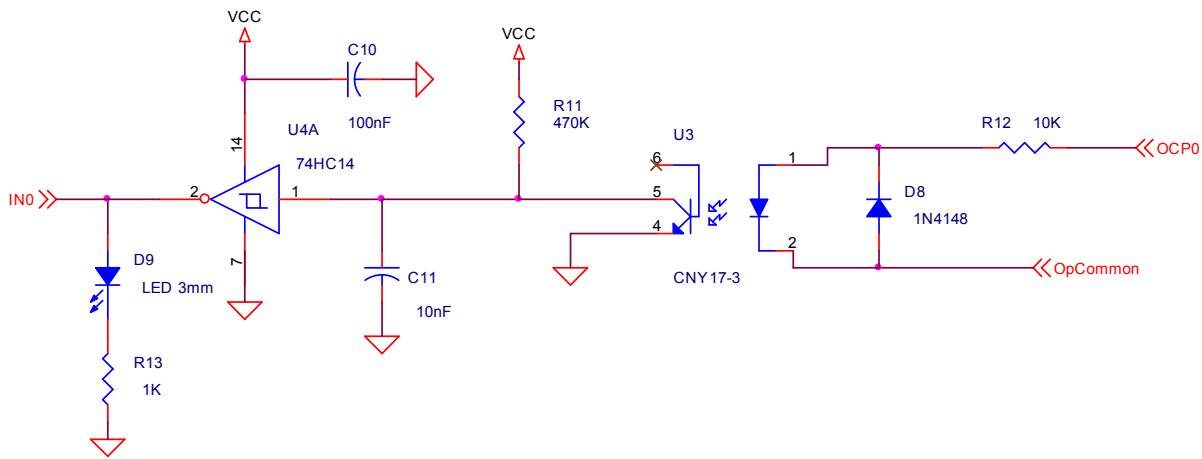
## Hardware Schematics



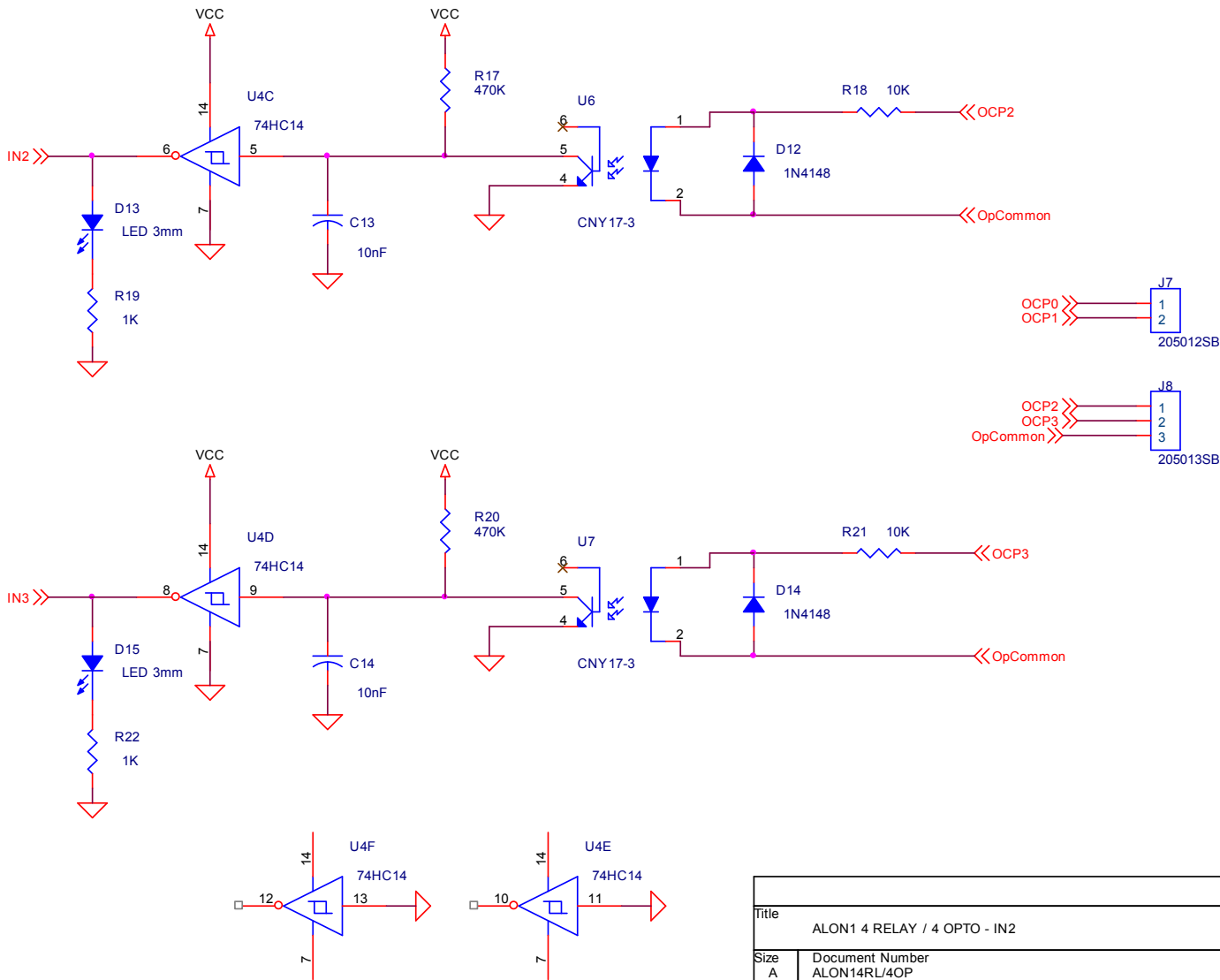
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ALON1 4 RELAY / 4 OPTO - CPU		
Size A	Document Number ALON14RL/4OP	Rev 1
Date:	Wednesday, February 02, 2005	Sheet 1 of 4



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Date:	Friday, March 18, 2005	Sheet 2 of 4

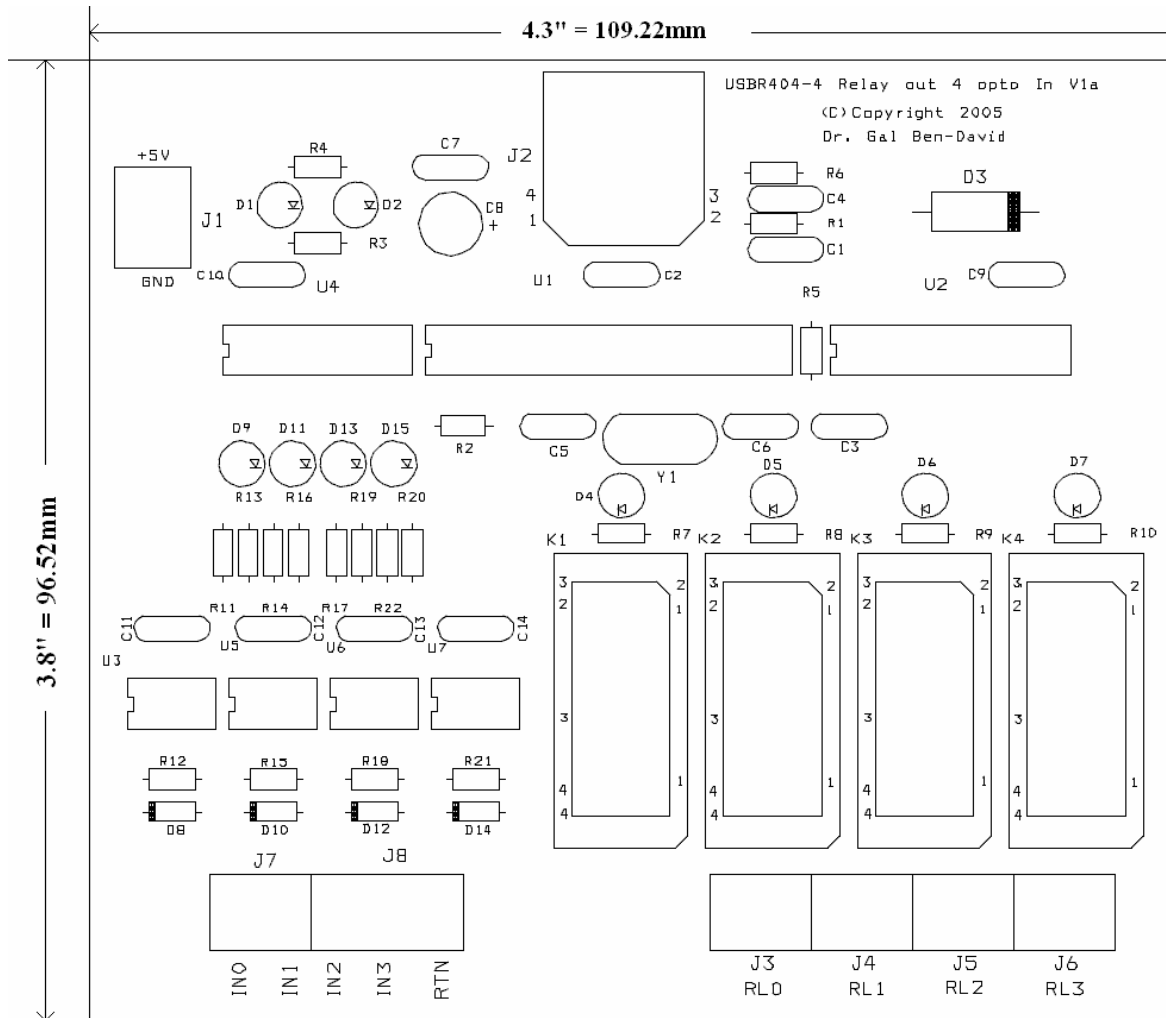


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Date:	Friday, March 18, 2005	Sheet 3 of 4



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ALON1 4 RELAY / 4 OPTO - IN2		
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Date:	Friday, March 18, 2005	Sheet 4 of 4

# PCB layout



## Software programming

Please refer to the document *Alon1 Documentation.PDF* for general information on programming the entire ALON1 family. All Relay board functions use an **ALON1BOARDSTRUCT** structure for communication. The structure is explained in the general document.

The product ID of the relay board is 11.

The Relay board has 4 inputs and 4 outputs, represented by the lower bits in a command/status byte.

In order to set output relay state use the following function

```
int ALON1_RL4OP4_SetRelay(  
ALON1BOARDSTRUCT *, // Input: board structure  
unsigned char NewState); // Input: relay state in 4 LSB  
// returns zero if OK, nonzero if board was not found
```

It is possible to read input state by

```
int ALON1_RL4OP4_GetInputs(  
ALON1BOARDSTRUCT *, // Input: board structure  
unsigned char *CurrentState); // Output : Input state in 4  
LSB  
// returns zero if OK, nonzero if board was not found
```

The main callback function is notified in case of device attachment, detachment and input change. Message is called once on board attachment (or power on), with **CardAttached=1** and once on board removal, **CardAttached=0**;

The message information is encapsulated in a single structure

```
struct
{
    unsigned char CardAttached;
    unsigned char InputState;
} ALON1_RL4OP4_MESSAGE;

int CALLBACK ALON1CallbackFunction
(ALON1BOARDSTRUCT *Alon1Boardstruct, CONST VOID *Param)
{
    ALON1_RL4OP4_MESSAGE *RL4OP4Message;
    switch (Alon1Boardstruct->ProductID)
    {
        case PRODUCT_ID_RL4OP4:
            RL4OP4Message=(ALON1_RL4OP4_MESSAGE)Param;
            // TODO: React according to new state
            // If card is detached,
            // do not use the boardstruct
            break;
    }
}
```