USB-LT02
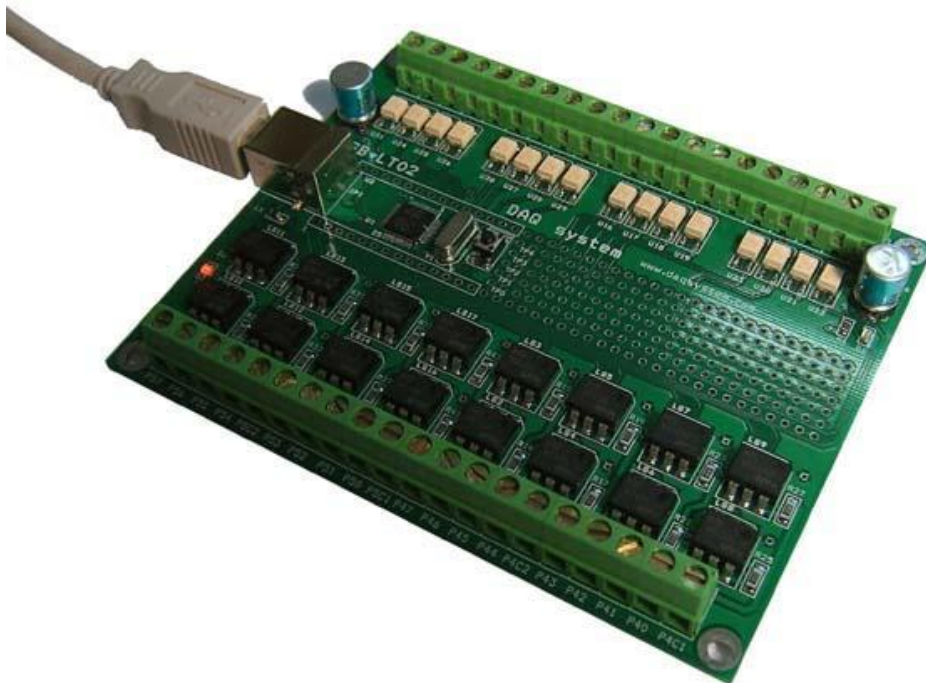
User's Manual

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-- Contents --

1. Introduction

USB-LT02 can control external device through simple provided API using even the developer who can never know USB.

Connection with the outside uses a screw terminal and it can easily connect. There is special all-around board which it is prepared a TEST POINT. A simple circuit installs it to own board. You don't need to use separately power supply for simple test because USB-LT02 uses PC power.

Specially, an automation system and the input/output circuit which can operate are composed. Just usable to the automation control module that it don't damage to external equipment and own module.

Figure 1-1 shows that simple test to control 220V lamp with USB-LT02.
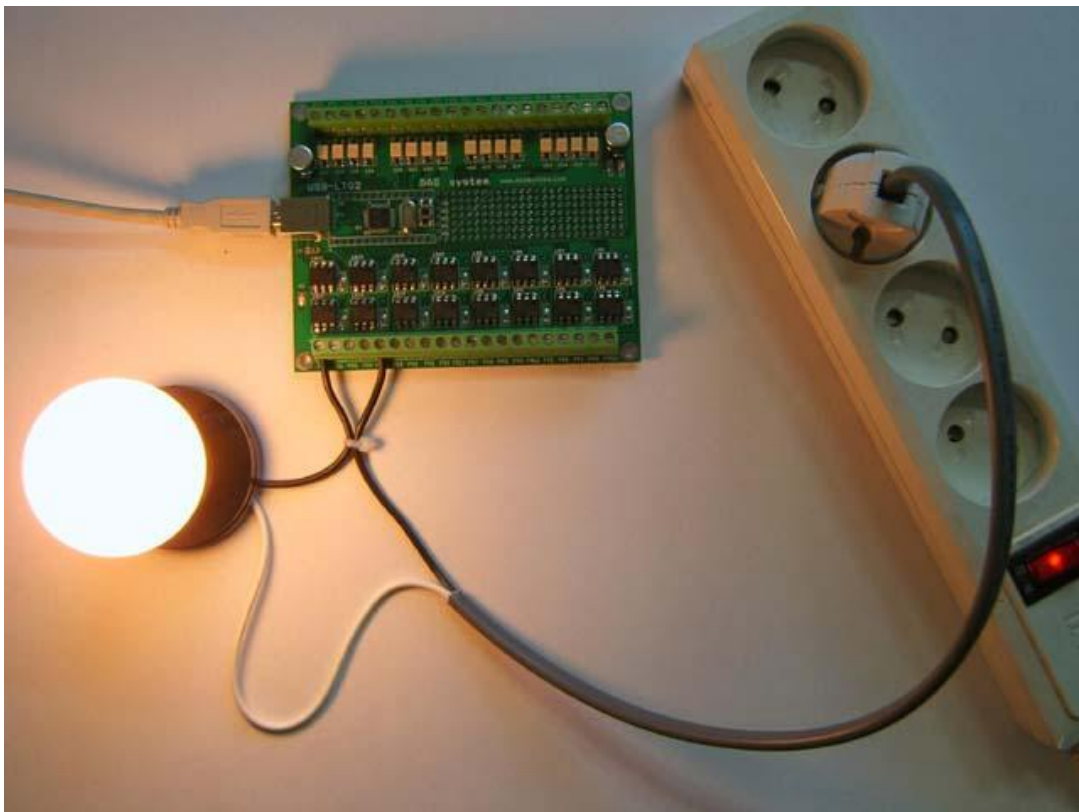

[Figure 1-1. USB-LT02 Action]

(Notice) 1. It can control the maximum AC/DC 350V in case of port 54 ~ 57, can use continuously the minimum 130mA under. (Refer to Figure 3-1.)

2. It can control the maximum AC/DC 60V in case of port 50 ~ 53 and port 40 ~ 47, can use continuously the minimum 550mA under. (Refer to Figure 3-1.)

2. USB-LT02 Function

The USB-LT02 has simple structure for easy I/O connection as like Figure 1-1. To connection USB and I/O take charge of the 8Bit Micro Controller, the command set equally use the 8051 command set. Each I/O port can set up whether or not there is what a user uses by input or output.
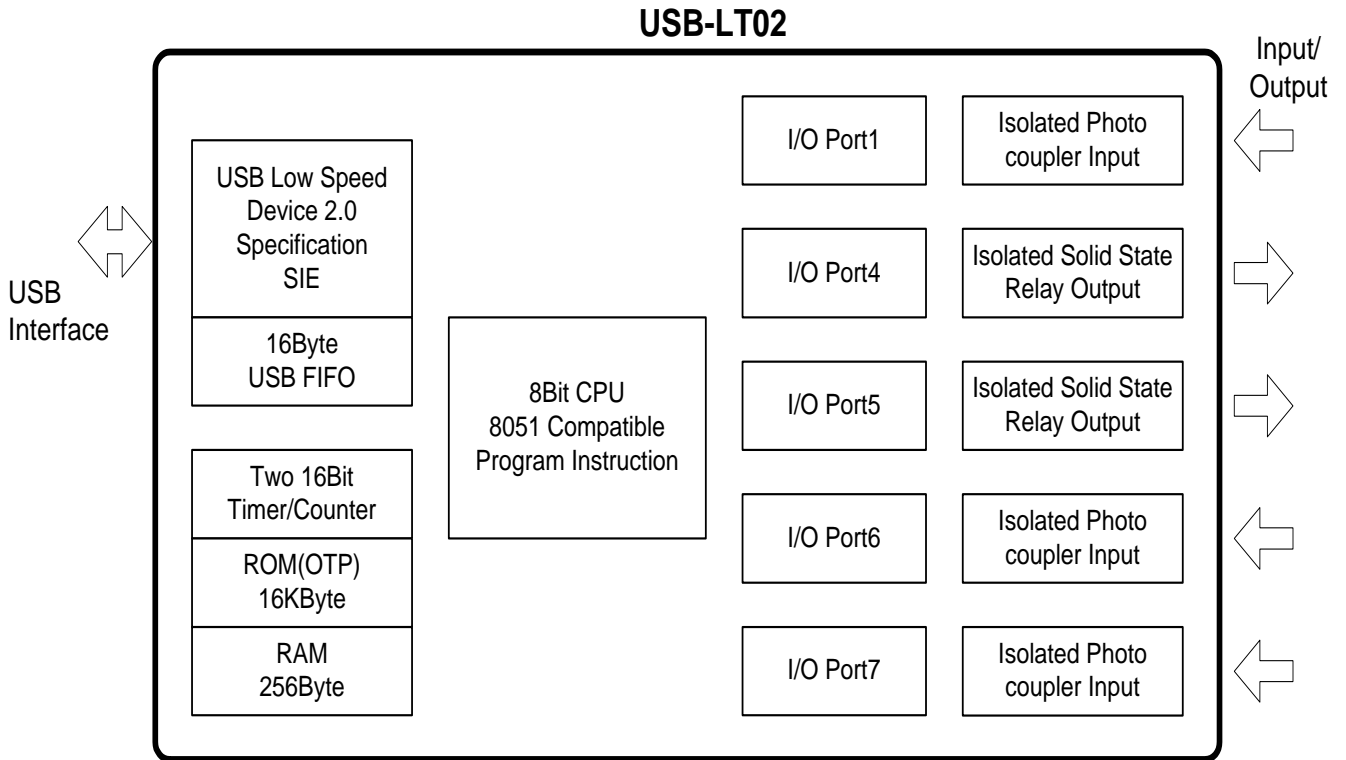
USB-LT02

[Figure 2-1. USB-LT02 Functional Block Diagram]

Internal program memory is taken possession of programmed firmware, program memory is OTP (One Time Programmable) type.

GENERAL DESCRIPTION

◆ Low Speed device 1.5Mbps
◆ USB HID Interface
◆ 8051 Compatible Instruction set
◆ 4 clocks per Instruction cycle
◆ 16K EPROM, 256Bytes RAM
◆ USB Bus Powered

APPLICATION

◆ Factory Automation, Home Automation

◆ USB Data acquisition(Temperature/Humidity/voltage/current

◆ USB I/O Control, Remote Control

◆ Factory Control Module

◆ Light Illumination Control

SPECIFICATION

◧ **Interface**

▪ USB Powered through USB-B connector MAX 500mA

▪ +5V Single Power Operation

▪ 16 Isolated Photo-coupler Input

▪ 16 Isolated Solid state Relay Output

◧ **Functions(Micro-Controller)**

▪ Two 16bit Timer/Counter

▪ User configuration I/O

      Schmitt trigger input

      Schmitt trigger input with pull –up

      N-Ch open drain output

      N-Ch open drain output with pull-up

▪ One Control endpoint

▪ Two Data endpoint

▪ 30 external interrupt source

◧ **External connection**

▪ 4pin USB B-type connector

▪ 28pin DIP form-factor Pin-out

▪ 6 Test Point

▪ 40 screw terminal

SOFTWARE

◧ **Operating System**

▪ Windows 2000/XP

◧ **Application Programming Interface**

▪ Windows Client DLL API

◧ **Software Development**

▪ Windows Application by User

▪ Custom USB Device Firmware

▪ Custom Windows Client DLL

3. Installation

You confirm whether or not the packing contents are in good order before installation.

3.1 Confirm Product Contents

[Figure 3-1. USB-LT02 Product Contents]

Product Contents

1. USB-LT02 Board

2. USB(A-B) Cable

3. CD (Manual/Source etc.)

3.2 Installation Process

For USB-LT02 board installation to PC is as follows. There isn't a Jumper to especially to set up for board installation in case of USB boards as it is Plug & Play devices.
Also, there is no need to install of device driver because of HID (Human Interface Device) connection in case of USB-LT02.

(1) First, open the box and connect to PC through USB cable.
(2) The opposite side of USB cable connects to USB-LT02 board.
(3) If cable connection succeeds, LED light on for indication of board supply.
(4) It confirms a driver normally installation in the following ways.
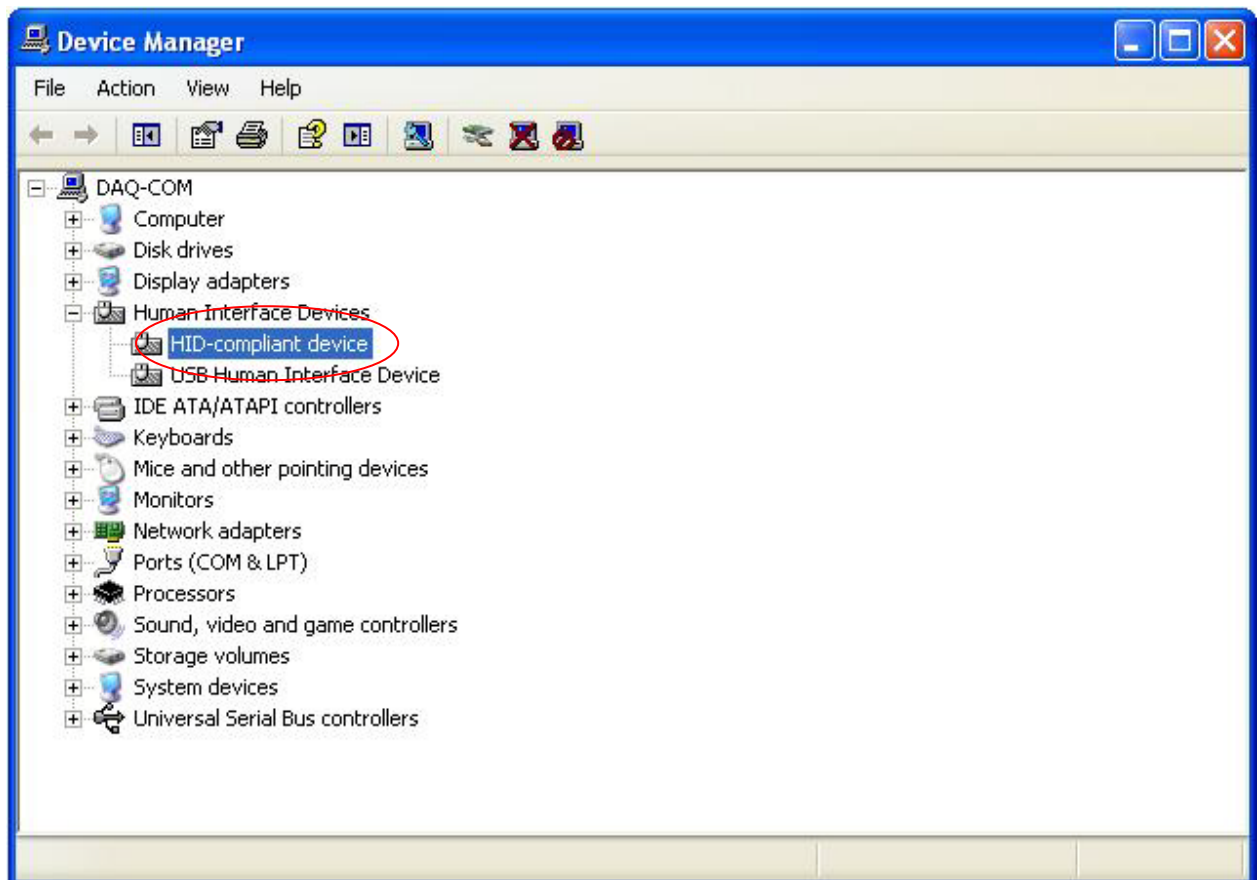Do the following steps to show up the "Device Manager" window.
[My Computer -> Properties -> Hardware -> Device Manager -> Human Interface Devices -> "**HID-compliant device**"

[Figure 3-1. "System Properties" window]

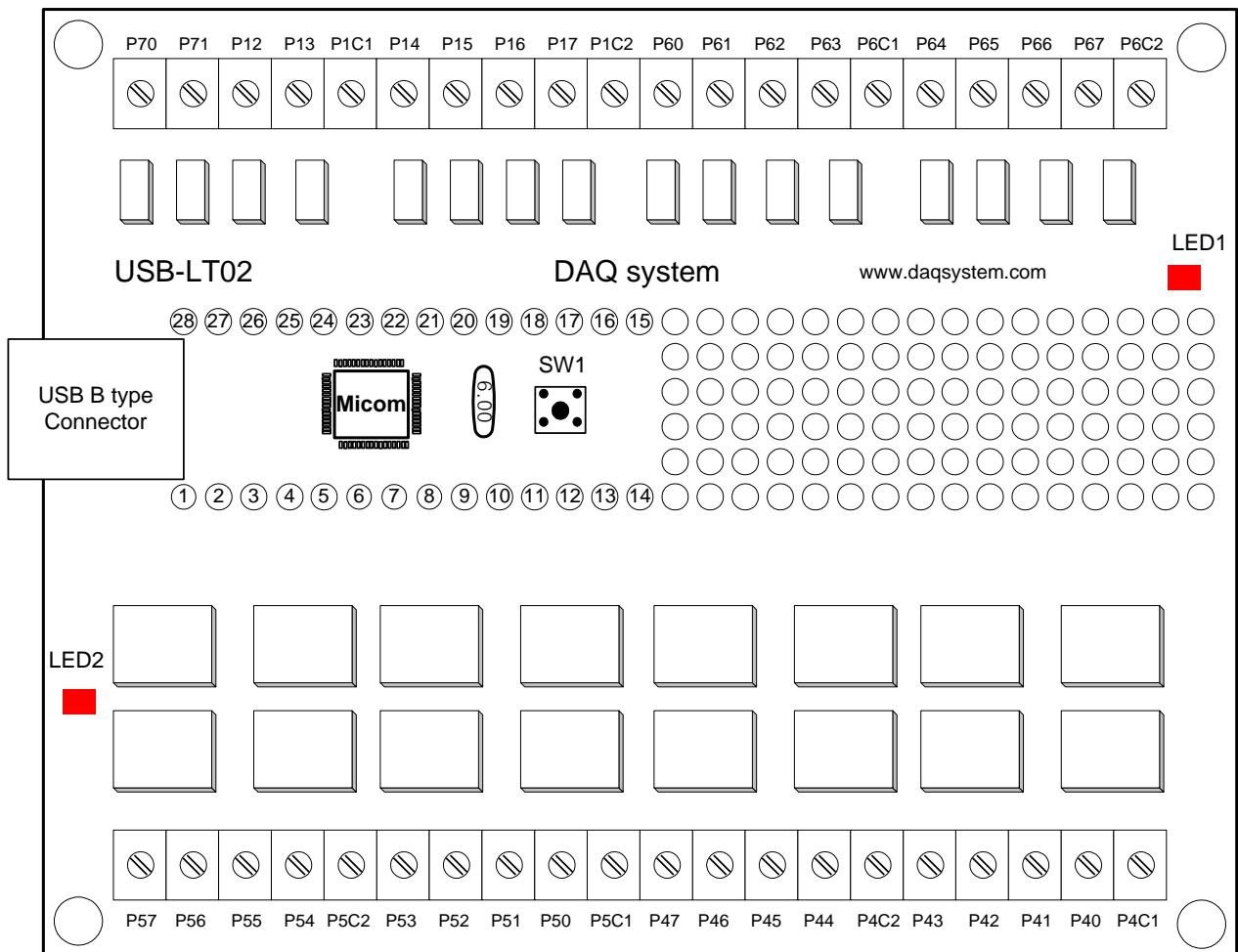[Figure 3-2. "System Properties" window]

[Figure 3-3. Device Manager Window]

4. USB-LT02 Board

In this chapter, the primary functions of the board are described briefly. For more information, refer to the device specification.

4.1 USB-LT02 Description

USB-LT02 Board

[Figure 4-1. USB-LT02 Out-side View]

In case of USB-LT02 as above picture, can easily use I/O, simple circuit is composed it to own all-around USB-LT02 board. Each component explanation is as follows.

(1) USB B type Connector

The USB-LT02 board connects to the PC through the USB A-B cable. The power supply and data gives and takes through this cable.

(2) **LED1**

It can confirm whether or not there is a stability of a board.

(3) **LED2**

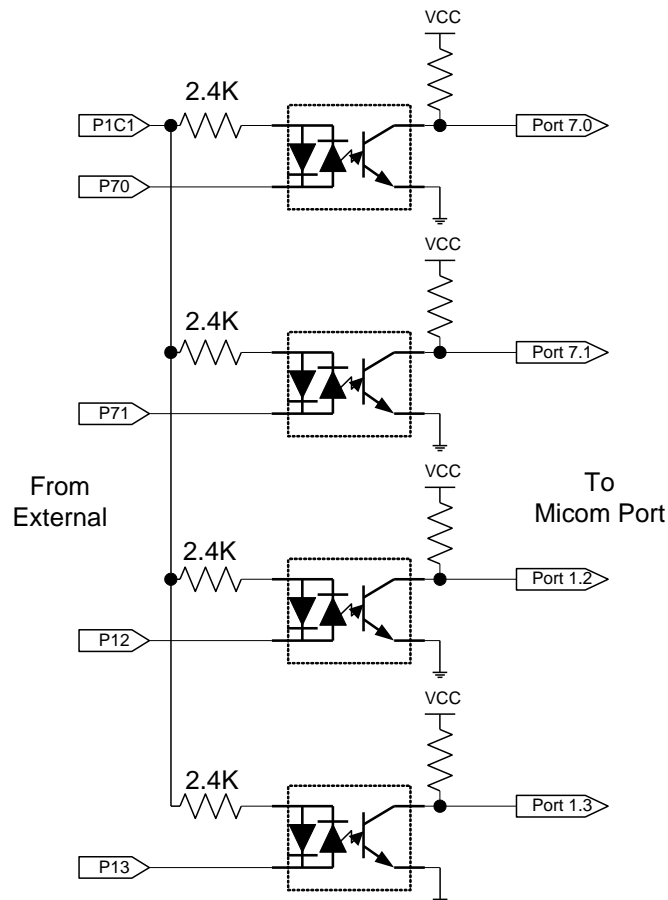It confirms supply power to board.

(4) **MICOM**

It is 8bit Micro Controller which has the 8051 compatible command set. It takes charge of I/O and USB data communication.

(5) **SW1**

Board reset button.

(6) **P70, P71, P12, P13, P1C1**

It is a Photo-coupler Input Terminal. The input voltage can use 12V ~ 24V, no power polarity in design.

[Figure 4-2. Photo-coupler Input Circuit]

(7) P14, P15, P16, P17, P1C2

It is a Photo-coupler Input Terminal. The input voltage can use 12V ~ 24V, no power polarity in design. The circuit is same like Figure 4-2.

(8) P60, P61, P62, P63, P6C1

It is a Photo-coupler Input Terminal. The input voltage can use 12V ~ 24V, no power polarity in design. The circuit is same like Figure 4-2.

(9) P64, P65, P66, P67, P6C2
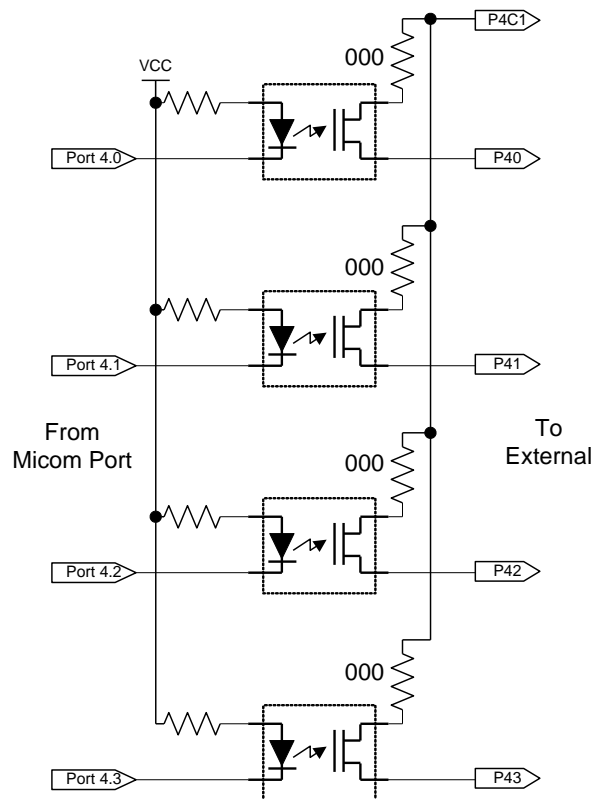
It is a Photo-coupler Input Terminal. The input voltage can use 12V ~ 24V, no power polarity in design. The circuit is same like Figure 4-2.

(10) P57, P56, P55, P54, P5C2

It is a Photo Morse (Semiconductor Relay) Output Terminal. The maximum control voltage is 350V, continuously current is 130mA.

[Figure 4-3. Photo Morse (Semiconductor Relay) Output Circuit]

(11) **P53, P52, P51, P50, P5C1**

It is a Photo Morse (Semiconductor Relay) Output Terminal. The maximum control voltage is 60V, continuously current is 5500mA. The circuit is same like Figure 4-3.

(12) **P47, P46, P45, P44, P4C2**

It is a Photo Morse (Semiconductor Relay) Output Terminal. The maximum control voltage is 60V, continuously current is 5500mA. The circuit is same like Figure 4-3.

(13) **P43, P42, P41, P40, P4C1**

It is a Photo Morse (Semiconductor Relay) Output Terminal. The maximum control voltage is 60V, continuously current is 5500mA. The circuit is same like Figure 4-3.

(Notice) You shall certainly use it within prescribed voltage and current.

Otherwise, a product can be damaged.

4.2 Memory Map

The board has a program memory and data memory as like general 8051. The program memory area is OTP type. User can not reprogram it because of the board was programmed to supply in case of shipment.

So, if you want special program, (You need more speedy response and private application) please contact to DAQ system.

16KByte

Program
Memory

256Byte

Data
Memory
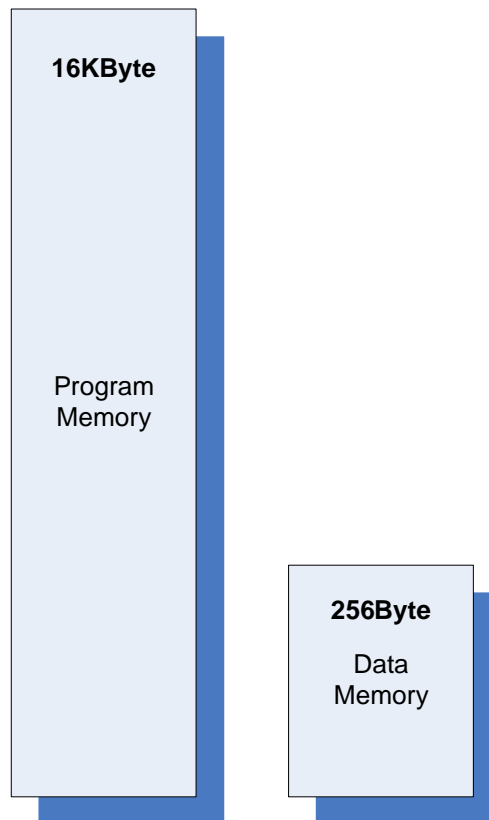
[Figure 4-4. Memory Map]

4.3 Connector Pin-out

The board has two connectors. There are the USB-B connector for USB communication, the PIN-OUT of DIP IC type connector for external I/O and power. And there is several test points.

USB-B type is a connector for High speed USB connection. Figure 4-5 and Table 1 shows the connector and its pin description.
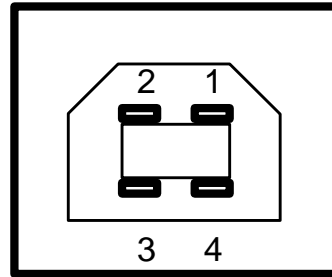
[Figure 4-5. USB-B Connector(Front View)]

[Table 1. USB-B Connector]

No.	Name	Description	Remark
1	**VCC**	USB Power +5V	
2	**D-**	USB Signal Minus(Negative)	
3	**D+**	USB Signal Plus(Positive)	
4	**GND**	USB Power GND	

USB-LT02 Board
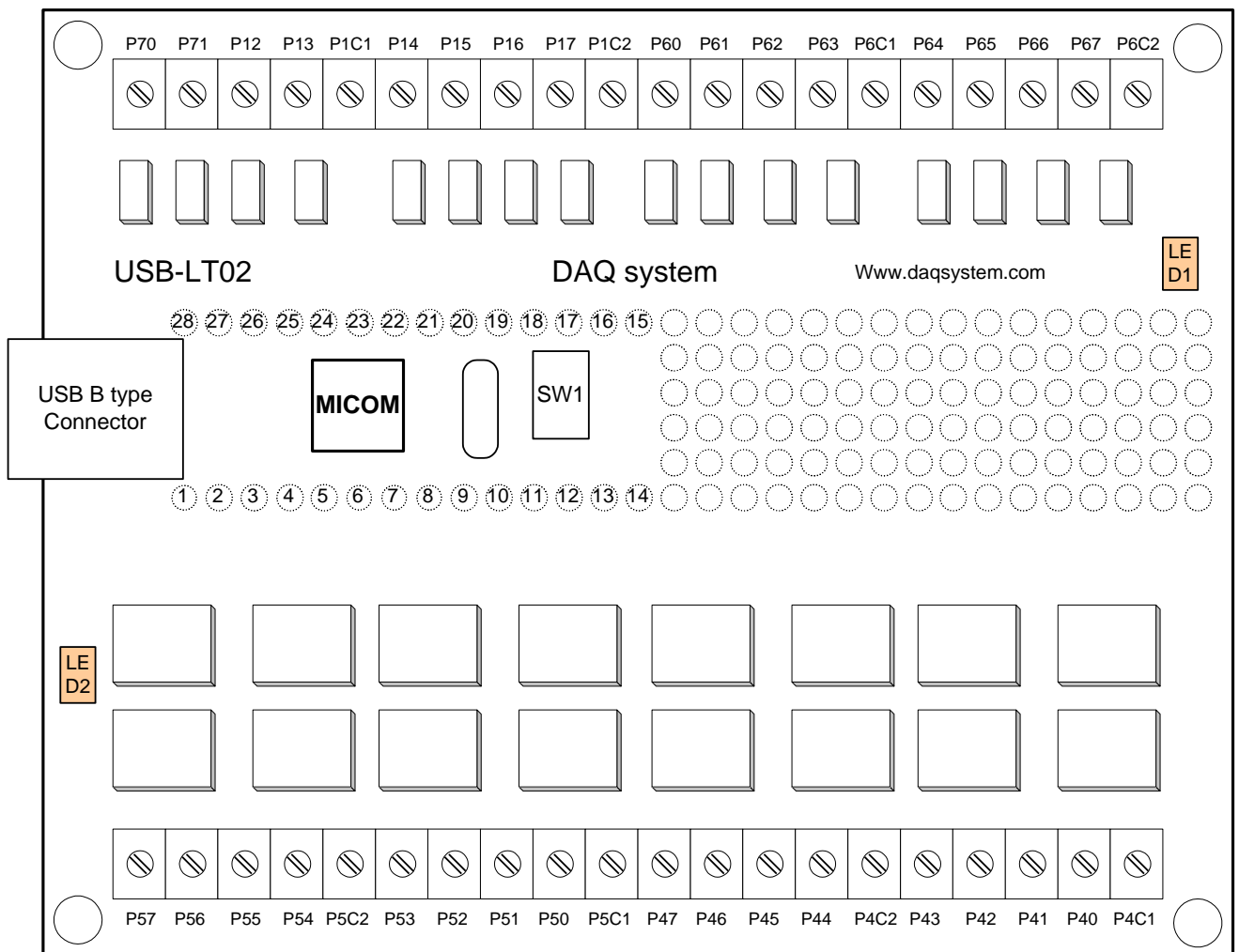
[Figure 4-6. PIN-OUT of Screw Terminal Type]

[Table 2. Screw Terminal PIN-OUT]

Name	Description	Remark
P70	Port 7.0 Photo Coupler Input	Refer to Figure 4-2.
P71	Port 7.1 Photo Coupler Input	Refer to Figure 4-2.
P12	Port 1.2 Photo Coupler Input	Refer to Figure 4-2.
P13	Port 1.3 Photo Coupler Input	Refer to Figure 4-2.
P1C1	**P70, P71, P12, P13 Common Input**	Refer to Figure 4-2.
P14	Port 1.4 Photo Coupler Input	Refer to Figure 4-2.
P15	Port 1.5 Photo Coupler Input	Refer to Figure 4-2.
P16	Port 1.6 Photo Coupler Input	Refer to Figure 4-2.
P17	Port 1.7 Photo Coupler Input	Refer to Figure 4-2.

P1C2	**P14, P15, P16, P17 Common Input**	Refer to Figure 4-2.
P60	Port 6.0 Photo Coupler Input	Refer to Figure 4-2.
P61	Port 6.1 Photo Coupler Input	Refer to Figure 4-2.
P62	Port 6.2 Photo Coupler Input	Refer to Figure 4-2.
P63	Port 6.3 Photo Coupler Input	Refer to Figure 4-2.
P6C1	**P60, P61, P62, P63 Common Input**	Refer to Figure 4-2.
P64	Port 6.4 Photo Coupler Input	Refer to Figure 4-2.
P65	Port 6.5 Photo Coupler Input	Refer to Figure 4-2.
P66	Port 6.6 Photo Coupler Input	Refer to Figure 4-2.
P67	Port 6.7 Photo Coupler Input	Refer to Figure 4-2.
P6C2	**P64, P65, P66, P67 Common Input**	Refer to Figure 4-2.
P57	Port 5.7 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P56	Port 5.6 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P55	Port 5.5 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P54	Port 5.4 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P5C2	**P54, P55, P56, P57** Common Output	Refer to Figure 4-3.
P53	Port 5.3 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P52	Port 5.2 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P51	Port 5.1 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P50	Port 5.0 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P5C1	**P53, P52, P51, P50** Common Output	Refer to Figure 4-3.
P47	Port 4.7 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P46	Port 4.6 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P45	Port 4.5 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P44	Port 4.4 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P4C2	**P44, P45, P46, P47 Common Output**	Refer to Figure 4-3.
P43	Port 4.3 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P42	Port 4.2 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P41	Port 4.1 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P40	Port 4.0 Photo Morse(Semiconductor Relay) Output	Refer to Figure 4-3.
P4C1	**P43, P42, P41, P40 Common Output**	Refer to Figure 4-3.

(Notice) 1. It can control the maximum AC/DC 350V in case of port 54 ~ 57, can use continuously the minimum 130mA under.

2. It can control the maximum AC/DC 60V in case of port 50 ~ 53 and port 40 ~ 47, can use continuously the minimum 550mA under.

[Table 3. DIP IC PIN-OUT]

Pin No.	Name	Description	Remark
1	P53	Bit 3 of Port 5	
2	P52	Bit 2 of Port 5	
3	P51	Bit 1 of Port 5	
4	P50	Bit 0 of Port 5	
5	P47	Bit 7 of Port 4	
6	P46	Bit 6 of Port 4	
7	P45	Bit 5 of Port 4	
8	P44	Bit 4 of Port 4	
9	P43	Bit 3 of Port 4	
10	P42	Bit 2 of Port 4	
11	P41	Bit 1 of Port 4	
12	P40	Bit 0 of Port 4	
13	P66	Bit 6 of Port 6	2
14	GND	Power Ground, Supply power to external board.	
15	P65	Bit 5 of Port 6	
16	P17	Bit 7 of Port 1	3
17	P16	Bit 6 of Port 1	3
18	P15	Bit 5 of Port 1	3
19	P14	Bit 4 of Port 1	3
20	P13	Bit 3 of Port 1	3
21	P12	Bit 2 of Port 1	3
22	P71	Bit 1 of Port 7	
23	P70	Bit 0 of Port 7	
24	P57	Bit 7 of Port 5	
25	P56	Bit 6 of Port 5	
26	P55	Bit 5 of Port 5	
27	P54	Bit 4 of Port 5	
28	+5V	USB power +5V, Supply power to external board.	

[Table 4. Test Point PIN-OUT]

| Name	Description	Remark
TP0	Bit 0 of Port 6	2
TP1	Bit 1 of Port 6	2
TP2	Bit 2 of Port 6	2
TP3	Bit 3 of Port 6	2
TP4	Bit 4 of Port 6	2

(Remark)

1. A bit 7 of Port6 is connected to LED2, this bit is set up to output. If output is "Low" and " 0V", LED2 light on.

2. There is a circuit to limit current to internal in case of Port6. If LED light on, there is no need to limit special current resistor to external.

3. The port1 has same specification of port1 of standard 8051. In other words, it can set up weak pull-up only.

4.4   Sample Program

A sample program is provided to make the user get familiar with the board operation. There is no installation of special driver because USB HID device is used to driver with supported Windows system.

The sample program has two programs. One is a program to decision whether the board is strange action or not. The other is a program to set up I/O of each port and to control output.
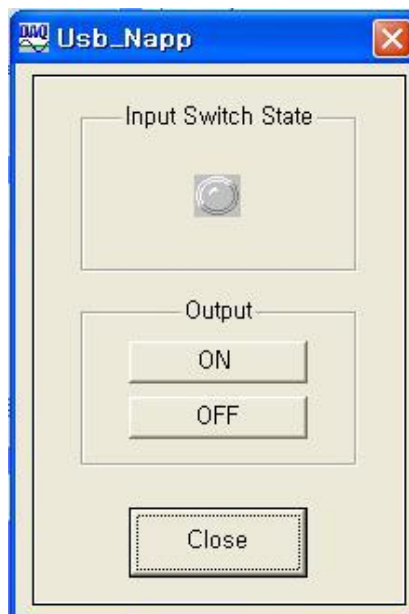

[Figure 4-7. Sample Program 1]
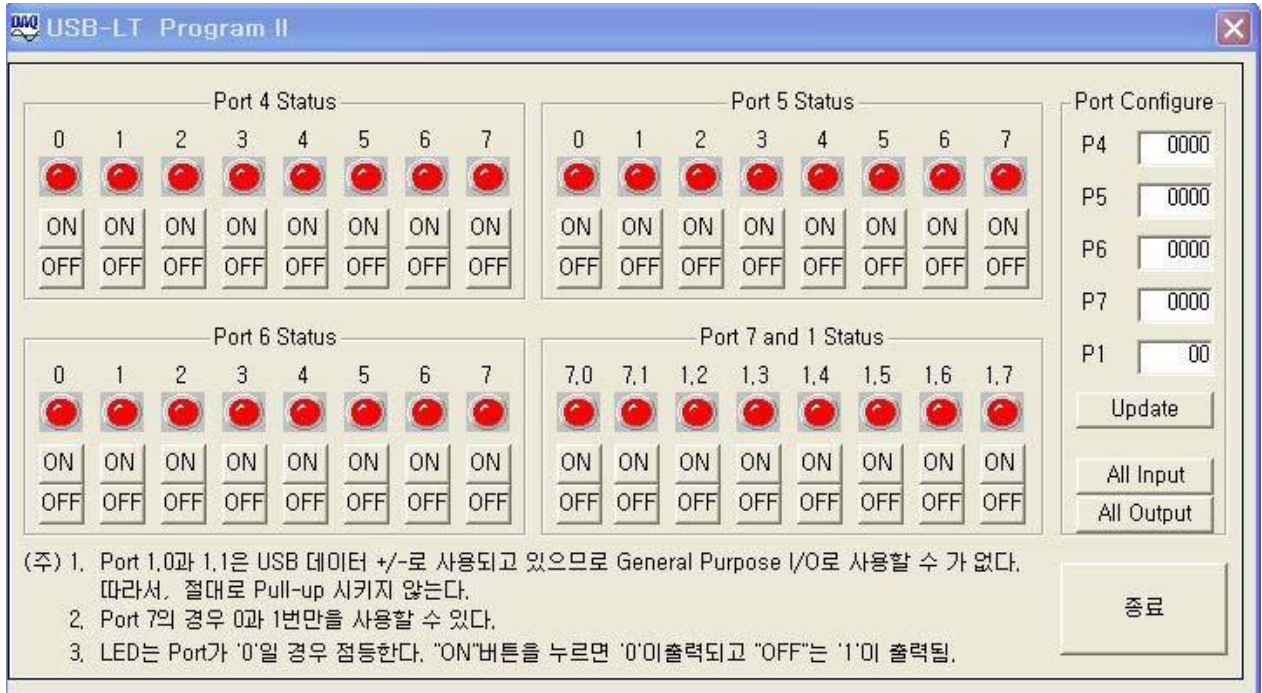
[Figure 4-8. Sample Program 2, When "All Input" Click]

    To run the sample application program, you need to use API (Application Programming Interface), which is a form of client DLL. To compile the sample source to make its executable file, you have to use Import Library files and Header files. You can find them in the CDROM.

    On --- LED On of each port.
    Off --- LED Off of each port.

    All Input --- The LED lights on all ports as [Figure 4-8].
    All Output --- The LED goes out all ports as [Figure 4-9].
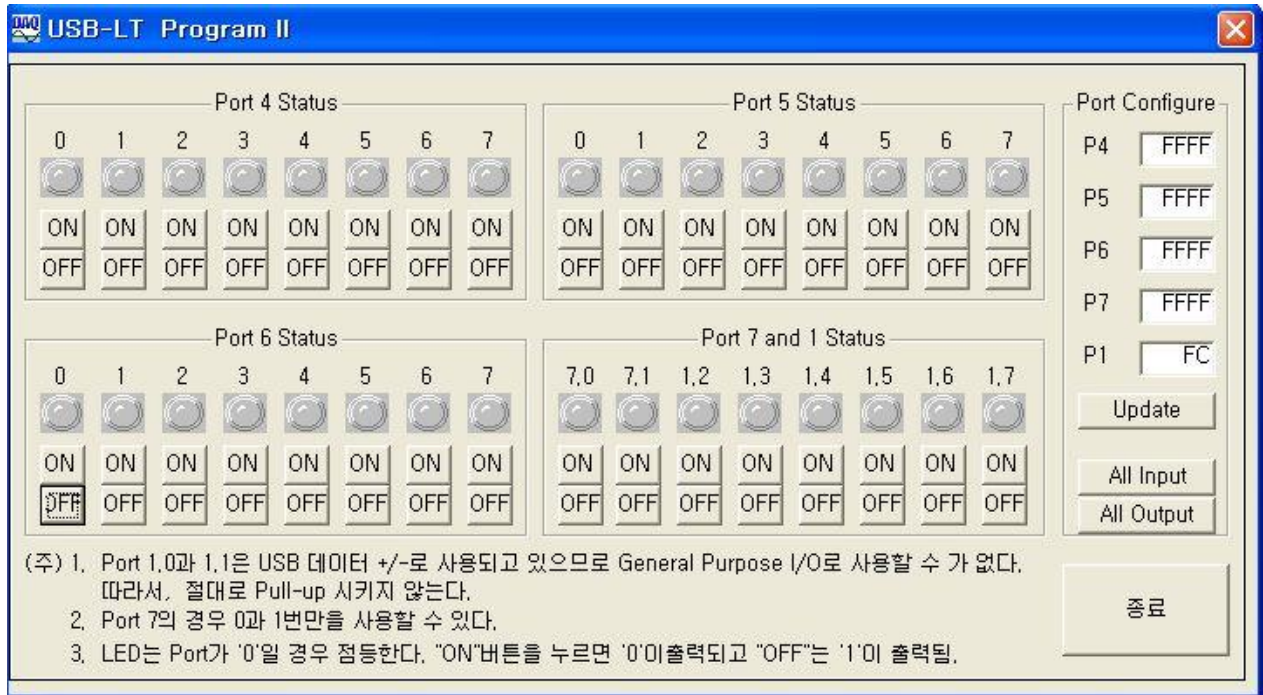
[Figure 4-9. When "All Output" Click]

5. Test
5.1 Input Test

This chapter is for test to learn how to operate a board and check the abnormality of a board. The test performs it at the PC which a USB-LT02 board was installed as it use a program of "sample1.exe" in an EXE folder of CDROM.

The execution file and source file of sample1 and sample2 is in App and App0 folder of CDROM. The execution file use a test, a user modifies a necessary a sample source file that provided it usable.
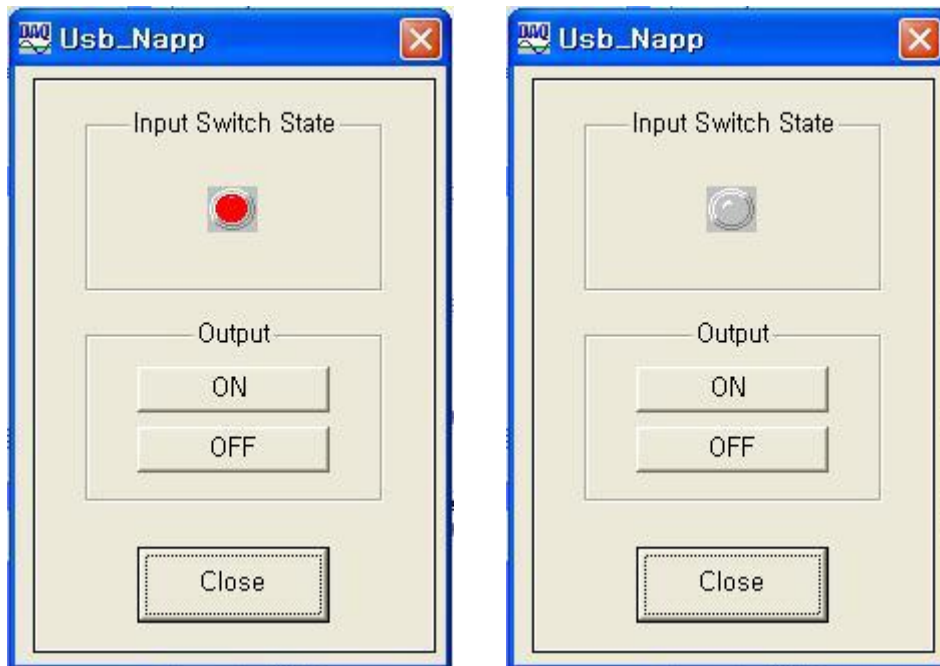

[Figure 5-1. Sample1.exe]

In the left LED is on at the above pictures, in the right LED is off. If an input of bit1 of port6 is "1", LED is on, on the contrary to this, LED is off.

In other words, If TP0 connect to VCC (+5V), LED is on. IF TP0 connect to GND, LED is off. At this time, the bit1 of port6 is used to set up by input at the above programs.

5.2   Output Test

(1) You can test of output function through LED is on/off in a board at below pictures.
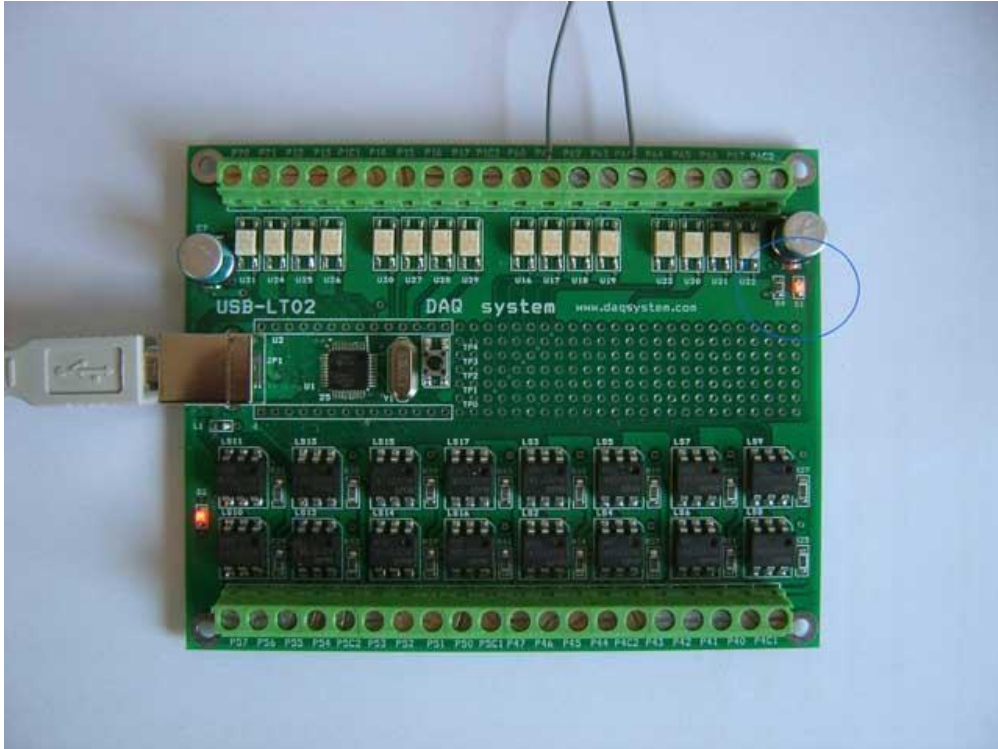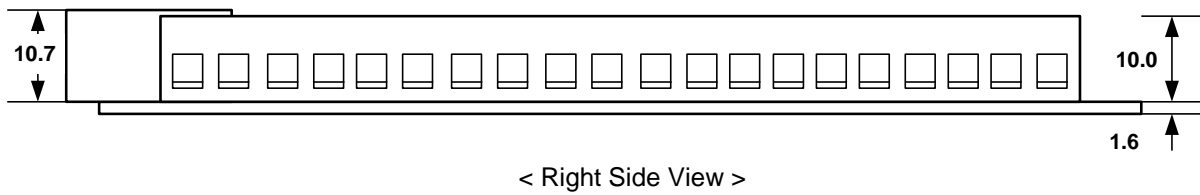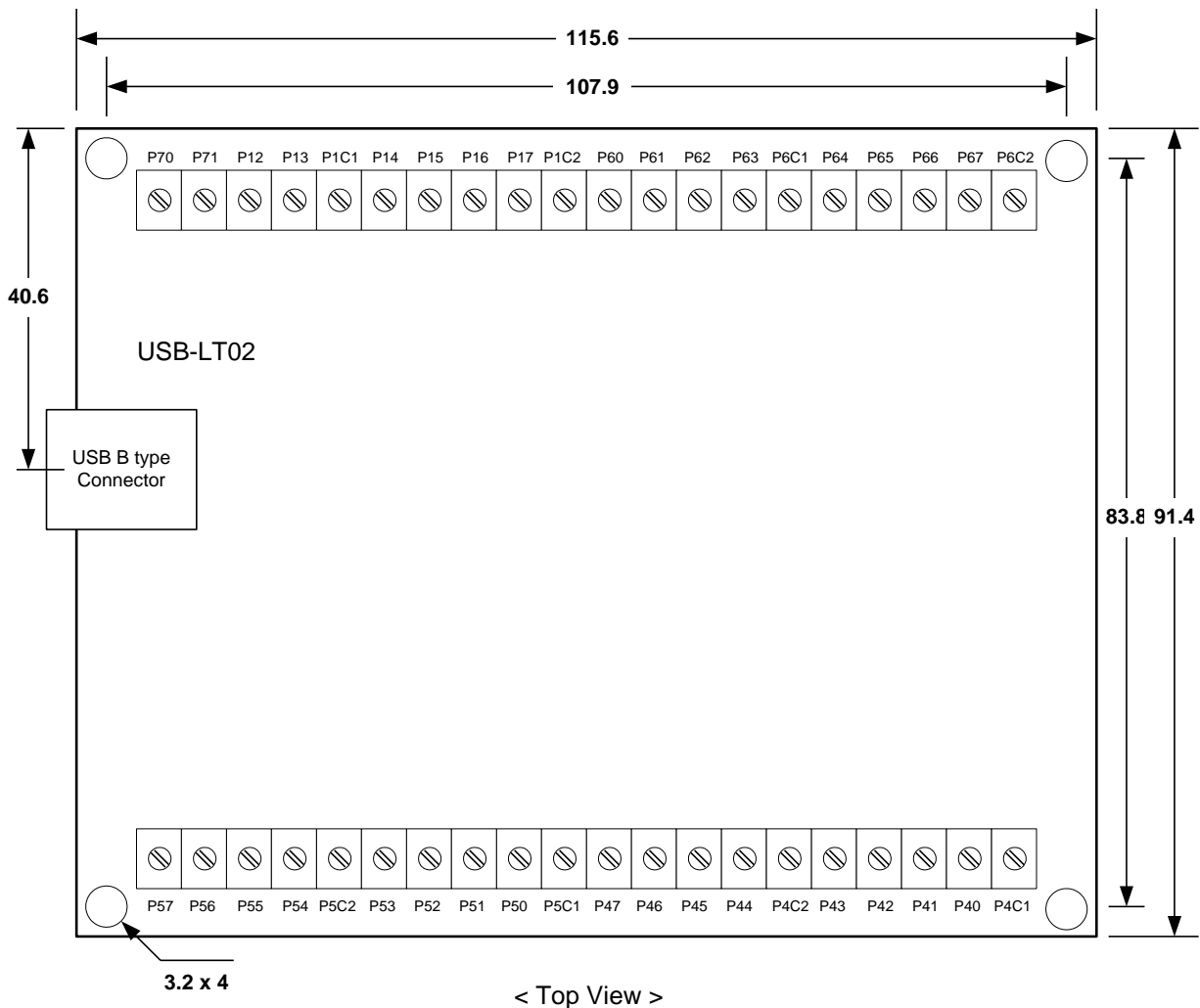

[Figure 5-2. LED On/Off Display]

In the top LED is off, in the bottom LED is on. If an output of bit7 of port6 is "0", LED is on, on the contrary to this, LED is off. User can test to press "ON/OFF" button at the Sample1 programs.
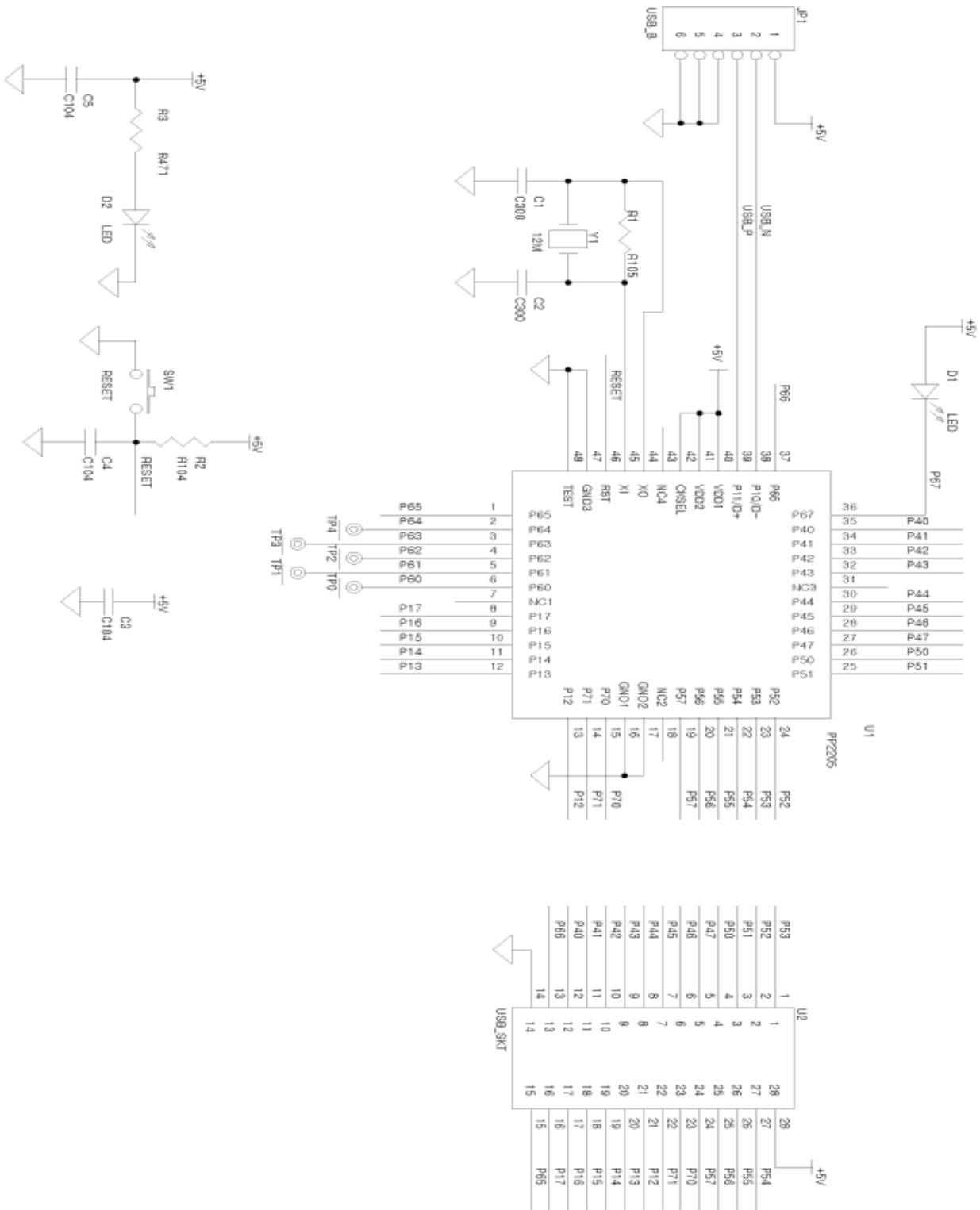
Appendix

A.1   Dimension


< Top View >

< Right Side View >

A.2 USB-LT02 Schematic

USB-LT02 is making our USB-LT with basis, use same circuit.

A.3 Application Circuit (Isolation Input/Output)

It is used in the automations that used PC in case of USB-LT02 in order to simply input/output that it used the established serial (RS232), parallel (printer) ports. The advantage of USB-LT02 has no program confliction because of using exclusive USB source, on the other hand, RS232 and printer ports have a confliction between programs because of using common source. Also, control Input/output is possible as provide 31 I/O.

If it exchange an input and output between different equipment like factory automations etc., it use a photo-coupler isolation in order to not to affect with mutual interference and influence at the below pictures.
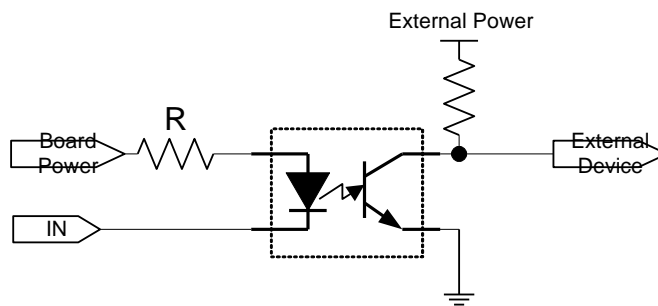
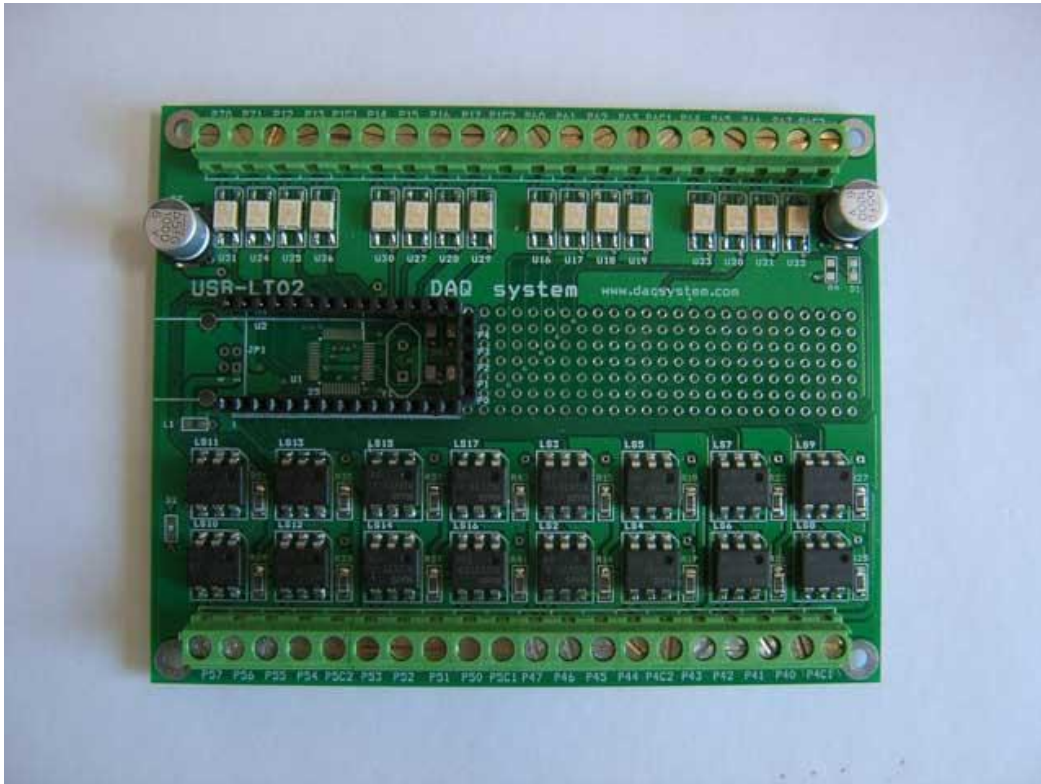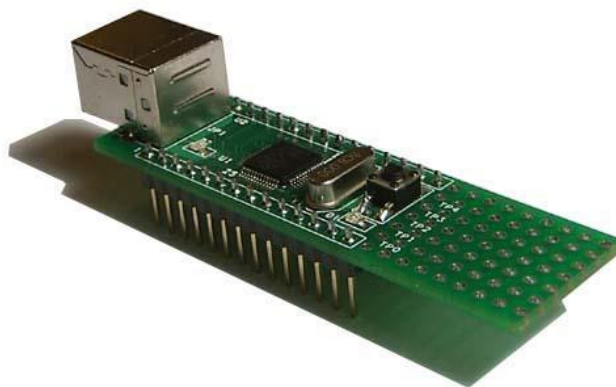< Photo-coupler Input Circuit>

<Photo-coupler Output Circuit>
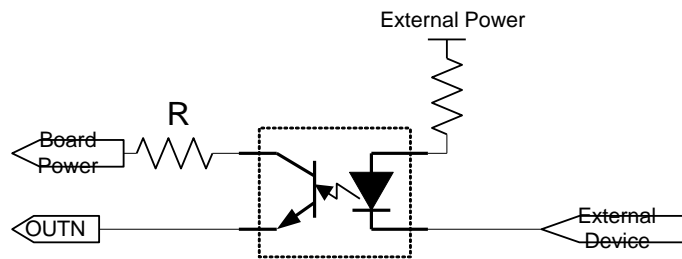
A register value at the above pictures can use properly selection which it fit to the external power. The industry power mainly uses 5V, 12V, 24V, 48V.
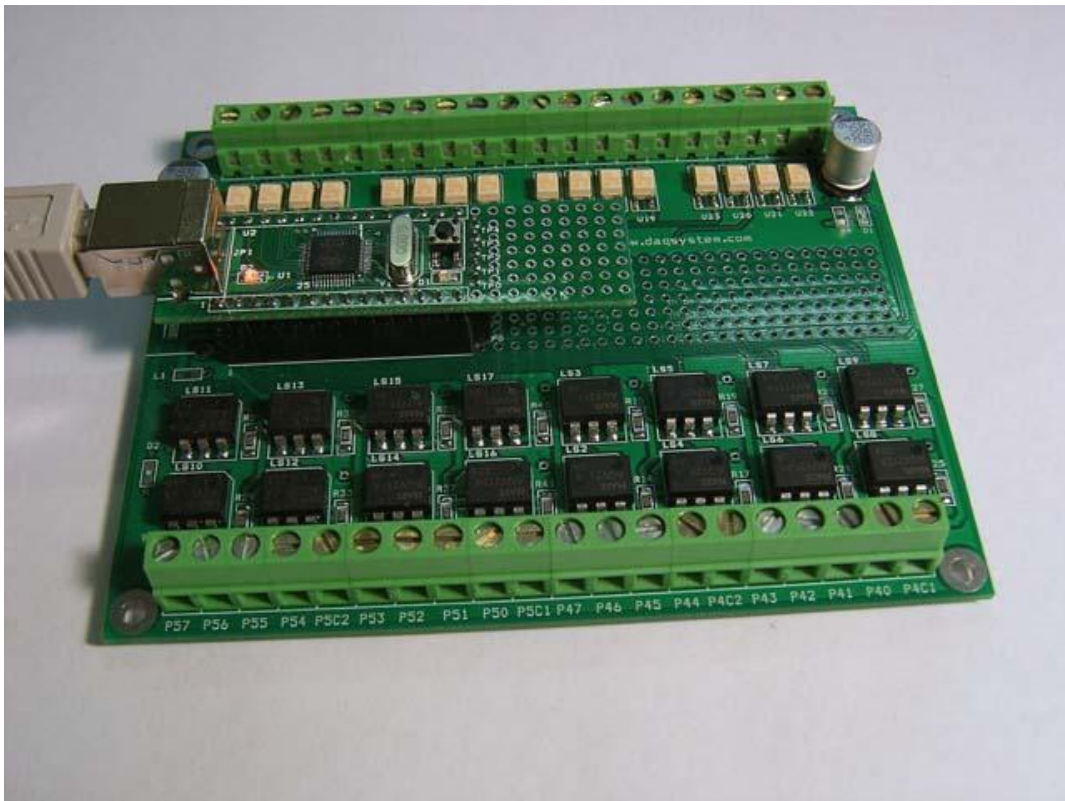
A.4   USB-LT02(B)

We are selling the board which composed an interface section only USB-LT02(B) Type for USB-LT user. It control input in case of USB-LT02(B) as it use USB-LT.

[Figure A4-1. USB-LT02(B) Board]

[Figure A4-2. USB-LT Board]

[Figure A4-3. The connection with LT02(B) and USB-LT]

References

1. USB 2.0 System Architecture

-- Don Anderson, USB SIG(www.usb.org)

2. Universal Serial Bus Specification

-- Compaq/Intel/Microsoft/NEC, MindShare Inc. (Addison Wesley)

3. USB-LT User's manual

-- DAQ system

4. AN201 How to build application using APIs

-- DAQ system

5. AN342 USB-LT02 API VER1.0

-- DAQ system

http://www.daqsystem.com