



## CHAPTER 1

### INTRODUCTION

The mini USB 4 channels relay output / photo isolator input card provides photo coupler digital input and relay output channels. The photo isolator input part provides 4 photo coupler digital input channels, which allows the input signals to be completely floated and prevent the ground loop. The relay output part provides 4 relays to drive 4 different output channels. Each relay channel can be used to control ON/OFF of external devices, to drive external power relays, to activate alarms... etc.

The mini USB 4 channels relay output / photo isolator input card provides Plug and Play (PnP) features, it is a programmable I/O interface card for PC/486, Pentium, or compatibles. The on board Cortex™-M0 core provides USB 2.0 full-speed functions running up to 50 MHz and features 64K bytes flash, 8K bytes embedded SRAM and 4 Kbytes loader ROM for the ISP.

#### ❖ The features of mini USB 4 channels relay output / photo isolator input card are:

- USB2.0 with Plug and Play (PnP) features.
- High speed Cortex™-M0 core.
- Support USB ID selection to identify USB device.
- Power supplied from external DC +5V/1A.
- Support 4 photo couple input channels and 4 relay output channels.
- Allow the photo input signals to be completely floated and prevent the ground loops.

- 8 LED correspond to 4 input and 4 output ports activation status.
- By using K10101D (DIP) / K10104D (SMT) photo coupler chips.
- For photo couple input channel, the isolation voltage is 5000V/1 minute, current transfer ratio is 300 to 600%, collector-emitter voltage is 60V, emitter-collector voltage is 6V, collector current is 50 mA, and maximum load voltage is 30V.
- Activation voltage of photo input:
  - When short jumpers (input range from 0 to 20V DC)
    - 0 to 4.5V inactive
    - 6 to 20V active
  - When open jumpers (input range from 0 to 30V DC)
    - 0 to 16.5V inactive
    - 18 to 30V active
- By using KAQY212 H (DIP)/ KAQY212 HA (SMT) 4PIN 60V N.O TYPE SOLID STATE RELAY-MOSFET output chips, the isolation test voltage is 5000VACrms, output breakdown voltage is  $\pm 60V$ , continuous load current is  $\pm 400mA$ , output off-state Leakage is  $1\mu A$ , I/O capacitance is 6pf, on resistance is  $2.5\Omega$ , turn-on time is 1.5ms, and turn-off time is 1.5ms.
- By using KAQY412 H (DIP)/ KAQY412 HA (SMT) 4PIN 60V N.C. TYPE SOLID STATE RELAY-MOSFET output chips, the isolation test voltage is 5000VACrms, output breakdown voltage is  $\pm 60V$ , continuous load current is  $\pm 200mA$ , output off-state Leakage is  $1\mu A$ , I/O capacitance is 6pf, on resistance is  $5\Omega$ , turn-on time is 1.5ms, and turn-off time is 1.5ms.
- By using KAQW612 H (DIP)/ KAQW612 HA (SMT) HA 8PIN 60V N.O.+N.C. TYPE SOLID STATE RELAY-MOSFET output chips, the isolation test voltage is 5000VACrms, output breakdown voltage is

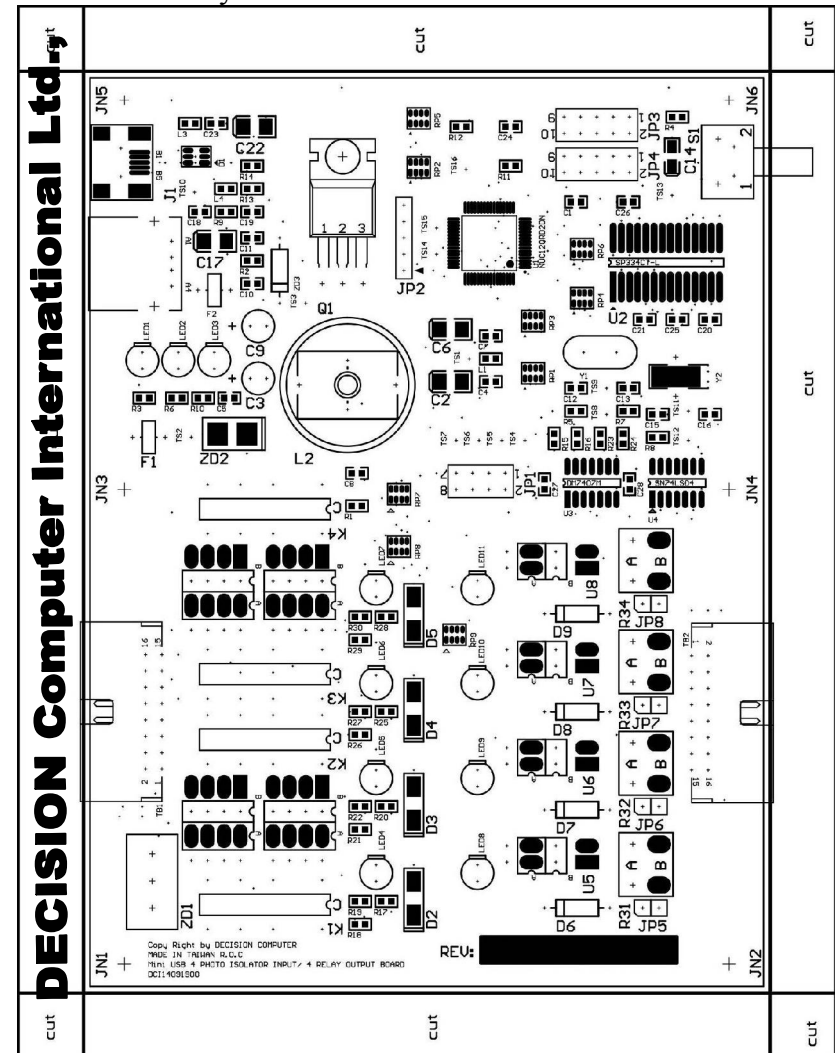
±60V, continuous load current is ±200mA, output off-state Leakage is 1.0 μA (N.O) or 2.0 μA(N.C), I/O capacitance is 6pf, on resistance is 2.5Ω(N.O) or 5.0 Ω(N.C), turn-on time is 1.5ms, and turn-off time is 1.5ms.

- By using BT-5S ULTRA MINIATUR relay-2C output, the max contact rating is 120V AC/DC 0.5A, attraction time is 3 ms, fall off time is 2 ms, and isolation resistance is 100mΩ.
- Life expectancy for relay is 100 million operations at signal level load.
- Suitable for Linux, MS/WINDOWS, ... etc.
- Operating temperature range from 0 to 33C.
- Relative humidity rage from 0 to 90%.

❖ **PACKAGE CONTENTS:**

- SMARTLAB mini USB 4 channels relay output / 4 channels photo couple input card, select one of the following types:
  - For photo couple input: K10101D(DIP) or K10104D(SMT).
  - For relay output: KAQY212(DIP) or KAQY412 H(DIP) or KAQW612 H(DIP) or KAQY212(SMT) or KAQY412 HA(SMT) or KAQW612 HA(SMT) or BT-5S ULTRA MINIATUR relay-2C.
- USB cable.
- Flat cable, select one of the following types:
  - 10cm IDC16 flat cable.
  - 10cm IDC16 flat cable+IDC16 to European P.C.B. type terminal blocks module.
- User's manual.

- Decision Studio CD for USB LAB KITS software.
- Warranty form.



## CHAPTER 2

### HARDWARE CONFIGURATION

Before you use the mini USB 4 channels relay output / 4 channels photo couple input card, please ensure that the jumpers and switches setting. The proper jumper and switch settings for the 4 channels relay output / 4 channels photo couple input adapter are described in the following.

#### 2.1 Switch Settings

##### 1. S1 Reset

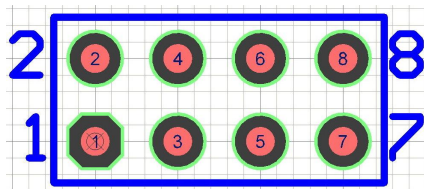


The S1 switch is used to reset Cortex™-M0 core, the signal assignments are shown in the following.

Pin	Signals
1	Reset SW+
2	Reset SW-

#### 2.2 Jumper Settings

##### 1. JP1 USB ID



The JP1 is used to identify USB card ID. Please set different card ID to each card (do not duplicate card ID setting).

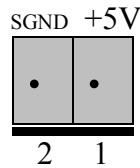
1,2	3,4	5,6	7,8	Card ID
SHORT	SHORT	SHORT	SHORT	--
OPEN	SHORT	SHORT	SHORT	14
SHORT	OPEN	SHORT	SHORT	13
OPEN	OPEN	SHORT	SHORT	12
SHORT	SHORT	OPEN	SHORT	11
OPEN	SHORT	OPEN	SHORT	10
SHORT	OPEN	OPEN	SHORT	9
OPEN	OPEN	OPEN	SHORT	8
SHORT	SHORT	SHORT	OPEN	7
OPEN	SHORT	SHORT	OPEN	6
SHORT	OPEN	SHORT	OPEN	5
OPEN	OPEN	SHORT	OPEN	4
SHORT	SHORT	OPEN	OPEN	3
OPEN	SHORT	OPEN	OPEN	2
SHORT	OPEN	OPEN	OPEN	1
OPEN	OPEN	OPEN	OPEN	0

##### 2. Down load revised firmware

When the JP1 is set to SHORT SHORT SHORT SHORT status, means down load revised firmware. please follow the steps shown in the following:

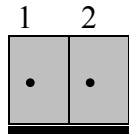
1. Set JP1 to SHORT SHORT SHORT SHORT.
2. Run USBBootloader program to down load revised firmware.

3. External Power Input (TB1)



The power of mini USB 4 channels relay output / photo isolator input card is supplied from pin 1 and pin 2 of TB1, please input external DC +5V power from pin 1 of TB1. Be careful to input DC +5V power.

4. Photo Isolator Input Voltage Range Selection (JP5 to JP8)



JP5 to JP8 are used to select input voltage range. The JP5 is used to select photo couple input channel 0, and JP6 is used to select photo couple input channel 1 ... etc. When short the jumper, the input voltage range from 0 to 20V, and the active voltage form 6 to 20V. When open the jumper, the input voltage range from 0 to 30V, and the active voltage from 18 to 30V.

Jumper	Input Voltage	Inactive Voltage	Active Voltage
open	0 to 30V	0 to 16.5V	18 to 30V
short	0 to 20V	0 to 4.5V	6 to 20V

2.3 USB Connector

1. USB Connector



The USB connector is connected to computer USB port by using USB cable.

2.4 LED Indicators

1. LED1

The LED1 is an indicator to show the power is supplied normally.

2. LED2

The LED2 is an indicator to show the USB link status. When it lights, it means USB connection works normally, otherwise it is fail.

3. LED3

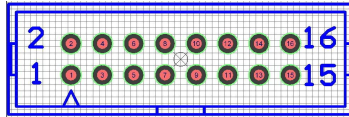
The LED3 is an indicator to warning the abnormal status of mini USB 4 channels relay output / 4 channels photo couple input card.

4. LED4 to LED11

The LED4 to LED11 are used to shown the working status of relay output and photo couple input.

## 2.5 Connector Assignments

### 1. TB1 Relay Output and Power Signal Assignments

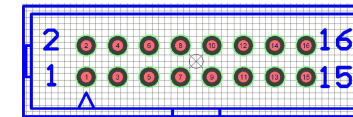


The relay output signals and external power signal are assigned in TB1 connector, its pin assignments are show in the below.

Where (NO-00, COM-00, NC-00) is OUT00, (NO-01, COM-01, NC-01) is OUT01, ... etc.

Pin	Signal	Description
1	EXT+5V	External +5V 1A Power
2	SGND	Signal Ground
3	NO-0	Relay Ch. 0 - Output
4	COM-0	Relay Ch. 0 - Output
5	NC-0	Relay Ch. 0 - Output
6	NO-1	Relay Ch. 1 - Output
7	COM-1	Relay Ch. 1 - Output
8	NC-1	Relay Ch. 1 - Output
9	+5V	+5V POWER
10	SGND	Signal Ground
11	NO-2	Relay Ch. 2 - Output
12	COM-2	Relay Ch. 2 -Output
13	NC-2	Relay Ch. 2 - Output
14	NO-3	Relay Ch. 3 - Output
15	COM-3	Relay Ch. 3 - Output
16	NC-3	Relay Ch. 3 - Output

### 2. TB2 Input Signal Assignments

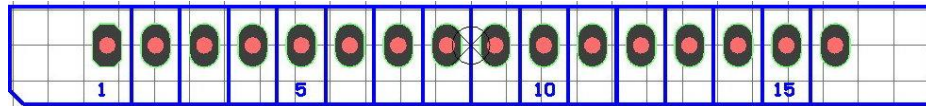
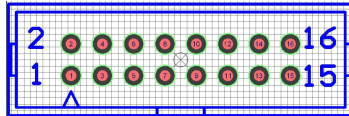


The photo isolator input signal is assigned in the TB2 connector, its pin assignments are show in the below.

Pin	Signal	Description
1	SGND	Signal Ground
2	+5V	+5V POWER
3	IN-3+	Opto-isolator Ch. 3 + Input
4	IN-3-	Opto-isolator Ch. 3 - Input
5	IN-2+	Opto-isolator Ch. 2 + Input
6	IN-2-	Opto-isolator Ch. 2 - Input
7	SGND	Signal Ground
8	+5V	+5V POWER Signal
9	SGND	Ground
10	+5V	+5V POWER
11	IN-1+	Opto-isolator Ch. 1 + Input
12	IN-1-	Opto-isolator Ch. 1 - Input
13	IN-0+	Opto-isolator Ch. 0 + Input
14	IN-0-	Opto-isolator Ch. 0 - Input
15	SGND	Signal Ground
16	+5V	+5V POWER

### 3. IDC16 to European P.C.B. type terminal blocks module

The signal assignments of IDC 16 to European P.C.B. type terminal blocks module are shown in the following:



## CHAPTER 3

### DIAGNOSTIC UNDER WINDOWS/XP

The mini USB 4P/4R\_host is a diagnostic program to test your 4 channels relay output and 4 channels photo couple input under Windows/XP.

User can get USB 4P/4R\_host programs from Decision Studio CD.



## CHAPTER 4

### SOFTWARE PROGRAMMING UNDER

### WINDOWS/XP AND LINUX

To input data from photo couple channel or output data to relay output channel, please use Hid API functions. User can get Hid API functions from Decision Studio package.



## APPENDIX A

### WARRANTY INFORMATION

#### A.1 Copyright

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#### A.2 Warranty Information

SmartLab warrants that for a period of one year from the date of purchase (unless otherwise specified in the warranty card) that the goods supplied will perform according to the specifications defined in the user manual. Furthermore that





the SmartLab product will be supplied free from defects in materials and workmanship and be fully functional under normal usage.

In the event of the failure of a SmartLab product within the specified warranty period, SmartLab will, at its option, replace or repair the item at no additional charge. This limited warranty does not cover damage resulting from incorrect use, electrical interference, accident, or modification of the product.

All goods returned for warranty repair must have the serial number intact. Goods without serial numbers attached will not be covered by the warranty.

The purchaser must pay transportation costs for goods returned. Repaired goods will be dispatched at the expense of SmartLab.

To ensure that your SmartLab product is covered by the warranty provisions, it is necessary that you return the Warranty card.

Under this Limited Warranty, SmartLab's obligations will be limited to repair or replacement only, of goods found to be defective a specified above during the warranty period. SmartLab is not liable to the purchaser for any damages or losses of any kind, through the use of, or inability to use, the SmartLab product.

SmartLab reserves the right to determine what constitutes warranty repair or replacement.

Return Authorization: It is necessary that any returned goods are clearly marked with an RA number that has been issued by

SmartLab. Goods returned without this authorization will not be attended to.



## APPENDIX B

### DATA SHEET

