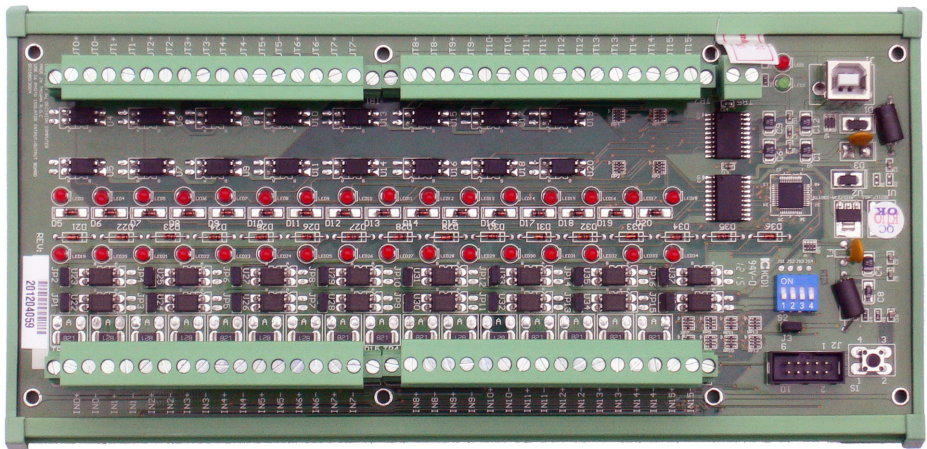


# USB-I/O Handbuch



## USB 16 Opto / 16 SSR

16 optoisolierte digitale Eingänge + 16 SSR Ausgänge

AUSB16PHOTO/SSR-PRO

**Artikel-Nr.: UHOS-16 - Hutschinenadapter**

**Artikel-Nr.: UPOS-16 - Platinenversion**

# Daten

**Bus:** USB 2.0

## Beschreibung:

16 Optokoppler-Eingänge/ 16 SSR-Ausgänge  
Optisch isoliert voneinander und vom Computer

## Optokoppler-Eingänge

- PC817 Optokoppler
- Spannungsbereich: 3 bis 31 DC
- Isolation: 500V Kanal-GND oder Kanal zu Kanal
- Mit Jumpern können 2 Spannungsbereiche eingestellt werden
- 0 - 4.5V aus und 6V - 20V ein. (0 - 20V)
- 0 - 16.5V aus und 18 - 30V ein (0 - 30V)

## SSR-Ausgänge

### 16 SSR Halbleiterrelais-Ausgänge KAQY212HA:

- Output Breakdown Voltage .....  $\pm 60V$
- Continuous Load Current .....  $\pm 400mA$
- Peak Forward Current ..... 1A
- Isolation Test Voltage ..... 5000VACrms

32 Status LEDs an den Ein- und Ausgängen

Einfacher Austausch der Module durch Steckblock-Klemmen

## Features:

UHOSS-16 ist geeignet zur direkten Hutschienenmontage

High Speed 8051  $\mu C$  Core  
USB 2.0 Function Controller  
Unterstützt USB ID Einstellungen 0~14

POWER DC+5V 1A DC ADAPTOR (Optional)

Abmessungen 250mm(L) x 120mm(B) x 55mm(H)  
Betriebstemperatur-Bereich 0 bis 55°C.  
Relative Feuchtigkeit von 0 bis 90%.

## Software/Treiber:

Englisches Handbuch mit Einstellplan, Anschlußplan und Programmierbeispielen auf CD. Für Windows-XP, Vista, Win-7 wird das HID Interface genutzt + Programmierbeispiele. Linux-Treiber + Programmierbeispiele

Pro Lieferung erhalten Sie eine frisch gebrannte „Decision-Computer Deutschland Service CD“ mit aktuellen Treibern, Handbüchern, Installationsanleitungen und deutschen Zusatzinformationen.

Der Umfang ist vom Produkt abhängig!

## Packungsinhalt:

USB-I/O, USB-Kabel, Software/Handbuch-CD  
Die Hutschienenversion wird mit einem EMI-Kit geliefert.  
Dieses Kit ist bei der Platinenversion optional!

# Sicherheitshinweis

Dieses Produkt ist nicht ausfallsicher und darf daher Anwendungen verwendet werden, wo Gefahren für Gesundheit, Leben, und Sachwerte auftreten können! Anschluß und Reparaturen sind nur vom Fachmann zulässig.

Beim Einbau in eine Maschine oder Anlage, ist sicherzustellen, dass nach dem Einbau weiterhin die maßgeblichen Bestimmungen, Vorschriften und Richtlinien eingehalten werden!

Diese Produkte kommen mit elektrischer Spannung in Berührung, daher müssen die gültigen VDE-Vorschriften beachtet werden, insbesondere VDE 0100, VDE 0550/0551, VDE 0700, VDE 0711 und VDE 0860.

## J1 USB Anschluss USB-B

Ein passendes Kabel ist im Lieferumfang

|      |                         |
|------|-------------------------|
| VCC  | +5 VDC (USB VBUS POWER) |
| D-   | Data -                  |
| D+   | Data +                  |
| SGND | Signal Ground           |



**B**

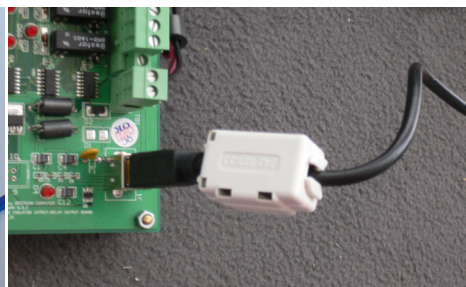
USB-Verkabelung ist sehr empfindlich gegen EMI-Störungen (hauptsächlich Funkenbildung bei öffnenden Kontakten). Das Kit U-EMI-1 ist im Lieferumfang der Hutschienenversion und beinhaltet zwei Würth-Klappkerne für das USB-Datenkabel und eine Ferrithülse für das Stromversorgungskabel. Bei Verwendung eines HUB sollte auch die die Verbindung HUB/Computer (U-EMI-2) geschützt werden! Das Kit beinhaltet zwei Würth-Klappkerne für das USB-Datenkabel.

Die Kerne müssen, wie auf den Abbildungen gezeigt, möglichst dicht an den Steckern montiert werden.

Sehr wichtig ist aber auch die Vermeidung von Störungen. Daher ist die sorgfältige Anordnung und Verlegung der Verkabelung sehr wichtig!

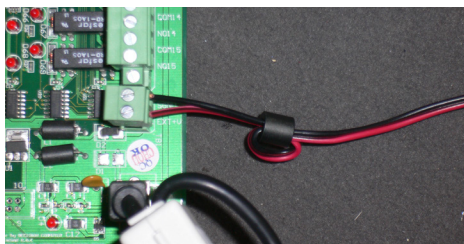


Klappkern auf dem USB-Kabel am Computer



Klappkern auf dem USB-Kabel am USB-IO  
1 oder 2 x durch den Kern geführt

## Stromversorgung - TB1



| TB1 - Extern 5V DC |       |     |
|--------------------|-------|-----|
| 1                  | EXT+V | 5V+ |
| 2                  | SGND  | 5V- |

Ferrithülse auf dem Stromversorgungskabel

Die Stromversorgung unserer Produkte muss extern mit DC 5V erfolgen. Dabei ist auf richtige Polarität zu achten. Andernfalls könnte das Produkt beschädigt werden. Wenn die Platine durch falsche Stromversorgung außer Funktion ist, können Sie versuchen, die Firmware neu einzuspeichern.

Das Kit U-EMI-1 ist im Lieferumfang der Hutschienenversion und beinhaltet Ferrithülse, zur Abschirmung von EMI, für das Stromversorgungskabel. Montage erfolgt wie auf dem Bild oben.

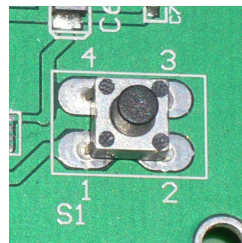
Bei früheren Versionen der Decision-USB-IO bestand auch die Möglichkeit der Stromversorgung über den USB-Bus. Um eine höhere Stabilität zu erreichen, wurde hiervon wurde jedoch Abstand genommen. Die USB-Stromversorgung ist nicht immer in der Lage, bei eingeschalteten Relais, genügend Strom zu liefern! Die Folge ist ein Verbindungsabbruch oder „hängendes“ USB-Modul. Ein externes Schaltteil bietet eine sichere Stromversorgung!

USB-Energieverwaltung in Windows

In Window-System könnte die USB-Kommunikation im Power Saving Mode oder Sleep Mode unterbrochen werden. Abhilfe schafft die Anpassung der Einstellungen im Windows Management.

## S1 Reset Taster

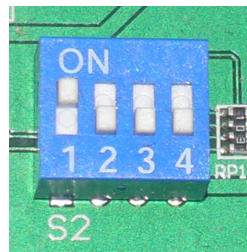
Systemreset bei "hängendem" USB-Modul



## S2 USB ID

Einstellung der USB-Modul-Identifikation

| 1   | 2   | 3   | 4   | Card ID |
|-----|-----|-----|-----|---------|
| ON  | ON  | ON  | ON  | --      |
| OFF | ON  | ON  | ON  | 14      |
| ON  | OFF | ON  | ON  | 13      |
| OFF | OFF | ON  | ON  | 12      |
| ON  | ON  | OFF | ON  | 11      |
| OFF | ON  | OFF | ON  | 10      |
| ON  | OFF | OFF | ON  | 9       |
| OFF | OFF | OFF | ON  | 8       |
| ON  | ON  | ON  | OFF | 7       |
| OFF | ON  | ON  | OFF | 6       |
| ON  | OFF | ON  | OFF | 5       |
| OFF | OFF | ON  | OFF | 4       |
| ON  | ON  | OFF | OFF | 3       |
| OFF | ON  | OFF | OFF | 2       |
| ON  | OFF | OFF | OFF | 1       |
| OFF | OFF | OFF | OFF | 0       |



## Mehrere USB-Module mit einem PC verbinden

Wenn Sie mehrere USB-Module mit einem PC verbinden müssen, sind folgende Punkte zu beachten:

1. Auf jedem Modul muß eine andere ID eingestellt werden.
2. Anschluß einer ausreichenden, externen 5V Stromversorgung für jedes USB-Modul.
3. Verbindung mit dem PC über einen aktiven USB-HUB.

Bitte stellen Sie sicher, daß Ihre externe 5V Stromversorgung für alle USB I/O-Module auch dann ausreichend Strom liefert, wenn alle Relais angezogen sind. Bei einer Versorgungsspannung unter 4.8V, kann es zu Fehlfunktionen kommen, wie Aktualisierung des Geräte-Managers, oder das Gerät wird nicht erkannt!

# TB2/3 Opto-Isolierte Eingänge

| Pin | Signal | Description                  |
|-----|--------|------------------------------|
| 1   | IN0+   | Opto-isolator Ch. 00 + Input |
| 2   | IN0-   | Opto-isolator Ch. 00 - Input |
| 3   | IN1+   | Opto-isolator Ch. 01 + Input |
| 4   | IN1-   | Opto-isolator Ch. 01 - Input |
| 5   | IN2+   | Opto-isolator Ch. 02 + Input |
| 6   | IN2-   | Opto-isolator Ch. 02 - Input |
| 7   | IN3+   | Opto-isolator Ch. 03 + Input |
| 8   | IN3-   | Opto-isolator Ch. 03 - Input |
| 9   | IN4+   | Opto-isolator Ch. 04 + Input |
| 10  | IN4-   | Opto-isolator Ch. 04 - Input |
| 11  | IN5+   | Opto-isolator Ch. 05 + Input |
| 12  | IN5-   | Opto-isolator Ch. 05 - Input |
| 13  | IN6+   | Opto-isolator Ch. 06 + Input |
| 14  | IN6-   | Opto-isolator Ch. 06 - Input |
| 15  | IN7+   | Opto-isolator Ch. 07 + Input |
| 16  | IN7-   | Opto-isolator Ch. 07 - Input |

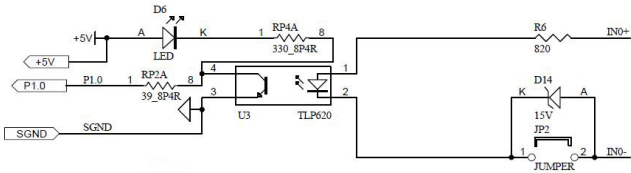
| Pin | Signal | Description                  |
|-----|--------|------------------------------|
| 1   | IN8+   | Opto-isolator Ch. 08 + Input |
| 2   | IN8-   | Opto-isolator Ch. 08 - Input |
| 3   | IN9+   | Opto-isolator Ch. 09 + Input |
| 4   | IN9-   | Opto-isolator Ch. 09 - Input |
| 5   | IN10+  | Opto-isolator Ch. 10 + Input |
| 6   | IN10-  | Opto-isolator Ch. 10 - Input |
| 7   | IN11+  | Opto-isolator Ch. 11 + Input |
| 8   | IN11-  | Opto-isolator Ch. 11 - Input |
| 9   | IN12+  | Opto-isolator Ch. 12 + Input |
| 10  | IN12-  | Opto-isolator Ch. 12 - Input |
| 11  | IN13+  | Opto-isolator Ch. 13 + Input |
| 12  | IN13-  | Opto-isolator Ch. 13 - Input |
| 13  | IN14+  | Opto-isolator Ch. 14 + Input |
| 14  | IN14-  | Opto-isolator Ch. 14 - Input |
| 15  | IN15+  | Opto-isolator Ch. 15 + Input |
| 16  | IN15-  | Opto-isolator Ch. 15 - Input |

## Opto-Isolierte Eingänge - Einstellung JP2 bis JP17

Mit JP2 bis JP17 ist der Spannungsbereich für Logisch "1" der Eingänge einstellbar. Bei aufgestecktem Jumper ist die Zenerdiode vor den Optokopplern überbrückt. Logisch "1" ist daher von ca. 3 bis 30 V. Wenn der Jumper abgezogen ist sperrt die Zenerdiode bis 16,5V. Logisch "1" ist daher von ca. 18 bis 30 V.

| Jumper   | Bereich   | Logisch "0" | Logisch "1" |
|----------|-----------|-------------|-------------|
| offen    | 0 bis 30V | 0 bis 1.5V  | 3 bis 30V   |
| gesteckt | 0 bis 30V | 0 bis 16.5V | 18 bis 30V  |

## Schaltplan Eingänge

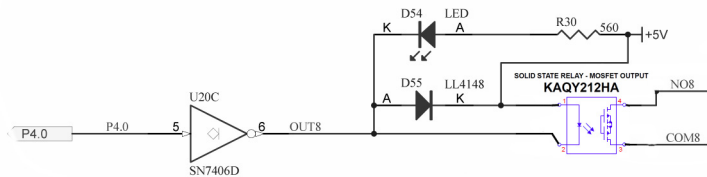


## TB4/5 SSR-Ausgänge

| Pin | Signal | Description                   |
|-----|--------|-------------------------------|
| 1   | OUT0+  | Opto-isolator Ch. 00 + Output |
| 2   | OUT0-  | Opto-isolator Ch. 00 - Output |
| 3   | OUT1+  | Opto-isolator Ch. 01 + Output |
| 4   | OUT1-  | Opto-isolator Ch. 01 - Output |
| 5   | OUT2+  | Opto-isolator Ch. 02 + Output |
| 6   | OUT2-  | Opto-isolator Ch. 02 - Output |
| 7   | OUT3+  | Opto-isolator Ch. 03 + Output |
| 8   | OUT3-  | Opto-isolator Ch. 03 - Output |
| 9   | OUT4+  | Opto-isolator Ch. 04 + Output |
| 10  | OUT4-  | Opto-isolator Ch. 04 - Output |
| 11  | OUT5+  | Opto-isolator Ch. 05 + Output |
| 12  | OUT5-  | Opto-isolator Ch. 05 - Output |
| 13  | OUT6+  | Opto-isolator Ch. 06 + Output |
| 14  | OUT6-  | Opto-isolator Ch. 06 - Output |
| 15  | OUT7+  | Opto-isolator Ch. 07 + Output |
| 16  | OUT7-  | Opto-isolator Ch. 07 - Output |

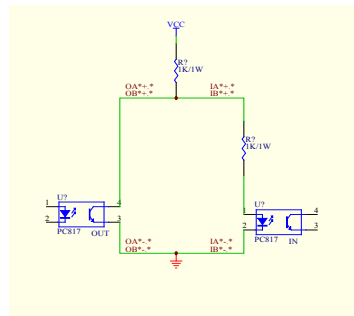
| Pin | Signal | Description                   |
|-----|--------|-------------------------------|
| 1   | OUT8+  | Opto-isolator Ch. 08 + Output |
| 2   | OUT8-  | Opto-isolator Ch. 08 - Output |
| 3   | OUT9+  | Opto-isolator Ch. 09 + Output |
| 4   | OUT9-  | Opto-isolator Ch. 09 - Output |
| 5   | OUT10+ | Opto-isolator Ch. 10 + Output |
| 6   | OUT10- | Opto-isolator Ch. 10 - Output |
| 7   | OUT11+ | Opto-isolator Ch. 11 + Output |
| 8   | OUT11- | Opto-isolator Ch. 11 - Output |
| 9   | OUT12+ | Opto-isolator Ch. 12 + Output |
| 10  | OUT12- | Opto-isolator Ch. 12 - Output |
| 11  | OUT13+ | Opto-isolator Ch. 13 + Output |
| 12  | OUT13- | Opto-isolator Ch. 13 - Output |
| 13  | OUT14+ | Opto-isolator Ch. 14 + Output |
| 14  | OUT14- | Opto-isolator Ch. 14 - Output |
| 15  | OUT15+ | Opto-isolator Ch. 15 + Output |
| 16  | OUT15- | Opto-isolator Ch. 15 - Output |

## Schaltplan Ausgänge



To test your 16 channel photo isolator input/output card, we recommend you use loopback circuit shown in below. Where IA\*+ means input channel+ and IA\*- means input channel-, OA\*+ means output channel+ and OA\*- means output channel-. \* means channel number. Please note that, if you use IA2+, you must connect its pair IA2- ...,otherwise if may short the circuit.

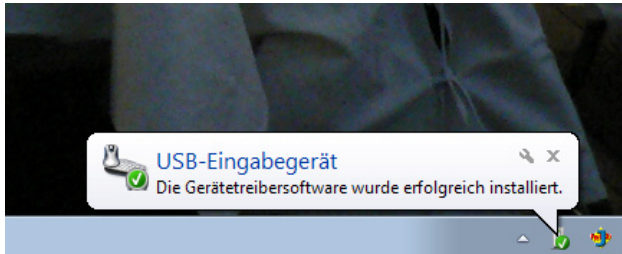
In this experiment, if VCC larger than 10V, then it input HIGH to input channel, otherwise it input LOW; your program can get this digital signal easily. If no VCC voltage input, the output channel will be loopback to input channel, it means when output HIGH then input channel get HIGH, when output LOW then input channel get LOW.



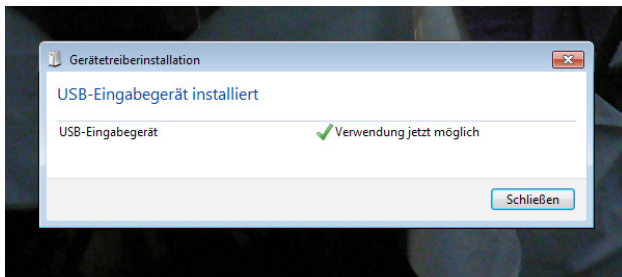
## Installation

Die Decision-Computer USB Geräte nutzen das HID (Human Interface Device). Da das HID zur Generic Device Class gehört ist der Treiber im Betriebssystem integriert. Wenn ein neues HID-Gerät angeschlossen wird ist keine Treiberinstallation erforderlich. Die Funktionen für Zugriff und Kontrolle des HID befinden sich in der Windows hid.dll im System32 Ordner.

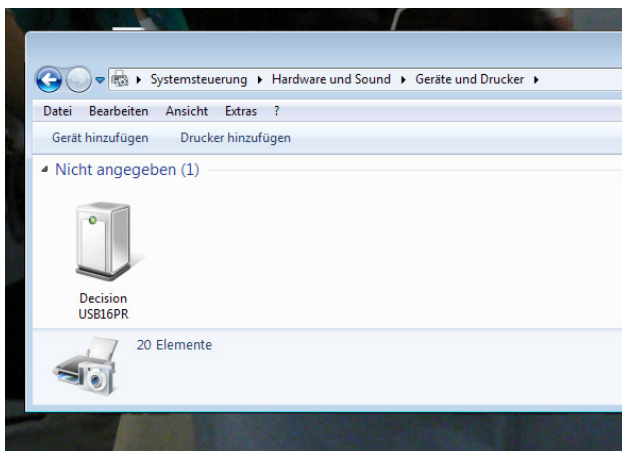
## Installationsbeispiel Windows-7



1. Stromversorgung 5V anschließen
2. USB-Verbindung herstellen
3. USB-Eingabegerät - Gerätetreiber-  
software erfolgreich installiert



4. USB-Eingabegerät - Verwendung  
jetzt möglich



5. In der Systemsteuerung erscheint  
jetzt das Decision-USB-Modul
6. Fertig

# SOFTWARE-PROGRAMMIERUNG UNTER WINDOWS UND LINUX

Unter Windows bieten wir als Programmierhilfe eine Funktions-Bibliothek und DLL-Datei. Das Handbuch „USBII\_Manual.pdf“ und Demo-Code in VB/VC/Delphi finden Sie auf der Decision-Studio-CD.

Linux-Anwendern bieten wir eine C-Source für den direkten Zugriff auf die USB-Geräte. Handbuch und Beispiel finden Sie unter „Dcihid-0.5.1.tgz“.

## DIAGNOSE UNTER WINDOWS/XP

USB Test Program.exe ist ein Diagnoseprogramm zum Testen USB-Geräten unter Windows/XP. Die USB-Test Software ist auf der Decision-Studio-CD zu finden.

Die Beispiele und Treiber werden fortlaufend weiterentwickelt. Die aktuelle Version finden Sie auch auf der Decision-Computer-Merz „Service-CD“.

Eine wichtige Informationsquelle ist immer das Internet <http://www.usb-industrial.com>

Software-Support auf dem kurzen Weg: <http://www.usb-industrial.com/support.html>

## USB-Industrial.com Übersicht:

|                                                    |                                                                            |                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Windows Support</b>                             | 2010/04 USBII.dll<br>2.0.0.4                                               | This package includes Dynamic-link library which is developed by Decision Computer to communicate with the USB Series Device. It can be included in multiple computer language (VB6, VC6, VB.NET, C# Delphi) under Windows.                                                                                                            |
| <b>Watchdog Timer</b>                              |                                                                            | This watchdog timer is a kind of software timer that triggers a system reset or other corrective action if the main program, due to some fault condition. The intention is to bring the system back from the unresponsive state into normal operation. This function is new released and please contact us to get further information. |
| <b>VCP driver</b>                                  | ( For LABKIT Only )                                                        | Virtual COM port (VCP) drivers cause the USB device to appear as an additional COM port available to the PC. Application software can access the USB device in the same way as it would access a standard COM port. This function is only implemented in USBLABKIT                                                                     |
| <b>Linux Support</b>                               | dcihid - 0.5.1<br>Basic function library<br>and demo program<br>2009.05.01 | This package includes a c library and a demo program which is developed by Decision Computer to communicate with the USB Series Device under Linux. It also includes a ReadMe file to demonstrate how to use it and package's format is .tgz.                                                                                          |
| <b>Firmware Update</b>                             | Firmware Hex file<br>Download                                              | This Package includes a driver and a software which is developed by Decision Computer to update the newest firmware into the USB Series Device. When new version of firmware is released, user can follow the instructions to update the firmware.                                                                                     |
| <b>LabVIEW Support</b>                             | LabVIEW 8<br>LabVIEW 2009                                                  | This package includes manual and examples which demonstrate how to connect and develop USB Series Device under LabVIEW, which is a well-known platform and development environment for a visual programming language from NI.                                                                                                          |
| <b>ProfilAB Support</b>                            |                                                                            | This package includes manual and examples which demonstrate how to connect and develop USB Series Device under ProfilAB, which is a well-known platform and development environment for a visual programming language from Abacom.                                                                                                     |
| <b>Init Value Setting Tool</b>                     | (For Output Channel)                                                       | The Init Value Setting Tool is a software tool to set init value for output channel. User can use this tool to plan output channel as default high or default low when power on.                                                                                                                                                       |
| <b>Data Acquisition and Remote Monitoring Tool</b> |                                                                            | The Data Acquisition and Remote Monitoring Tool (DARMT) is a software tool to record high/low state reports at local computer, and transmit them to FTP site to achieve data acquisition and remote monitoring                                                                                                                         |



## USB per LAN oder Wireless

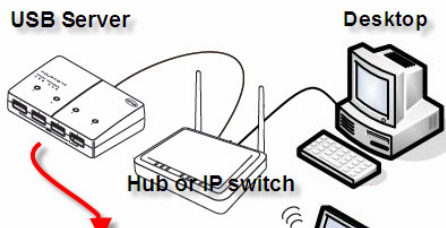
### Remote Control by USB series products

User can easily use a multi-port USB server to connect Decision USB series products to accomplish remote control by LAN or wireless. Because Decision USB product doesn't need to be installed any driver, it can be easily accomplished remote control by connecting any Decision USB product to USB Server and user doesn't even modify the program at all. Under Windows, user can directly see the product in the device manager and control it by programs just like connecting in original host PC.

Die Fernbedienung von Decision-USB-Produkten per LAN oder Wireless mit einem Steuer-PC ist sehr einfach mit einem Multi-Port-USB-Server oder auch einer Fritzbox möglich.

Da kein Treiber installiert werden muss, ist die Installation und Programmierung sehr einfach.

Unter Windows sind die externen USB-I/O direkt im Geräte-Manager zu sehen und lassen sich verbinden oder steuern wie im ursprünglichen Host-PC.



## Das Modul wird nicht erkannt - Problembehandlung

Sollte das USB-Modul nicht (mehr) vom Betriebssystem des Computers gefunden werden, hilft meistens das USB-Kabel neu einzustecken oder den USB-Port zu wechseln.

Ursache kann aber auch eine instabile Stromversorgung sein. Es sollte ein Schaltnetzteil mit ausreichend Reserve für einschaltende Relais verwendet werden.

**Sollten die vorhergehenden Hinweise keine Abhilfe schaffen, hilft meistens das Ersetzen der Firmware!**

## USB Firmware Update Anleitung

USBBootloader.exe ist das Softwaretool für die Aktualisierung der Firmware des von Decision-Computer entwickelten USB Serial Device Board. Wenn Sie eine neue Version der Firmware (.hex) erhalten, befolgen Sie die folgenden Schritte, um die Firmware des Board zu aktualisieren:

1. Entfernen Sie die externe Eingangsspannung und unterstützen Sie nur die Gerätestromversorgung.
2. Stellen Sie Board ID 15 (Alle ein) für den Update Modus ein und drücken Sie die Taste Reset.
3. Verbinden Sie den PC über USB mit dem Board.
4. Wenn diese Funktion erstmalig verwendet wird, geben Sie bitte den Ordner Treiber als Installationspfad für den Treiber an, um diesen zu installieren.
5. Öffnen Sie die Software USBBootloader.exe, klicken Sie auf die Schaltfläche öffnen und wählen Sie die hex Datei aus; klicken Sie anschließend auf die Schaltfläche Download, um die Firmware zu aktualisieren.
6. Stellen Sie die Board Id zwischen 0 ~ 14 ein und drücken Sie die Taste Reset; schließen Sie dann den PC wieder an.

## Kommunikation JP1 - nur optional!

Auf der Platine befindet sich ein unbestücktes Lochraster (2 x 5) für JP1. Hier kann bei einer Sonderversion, mit einer optionalen Erweiterungsplatine, eine serielle Schnittstelle RS-232 oder RS-422 / RS-485 hinzugefügt werden. Die Ansteuerung erfolgt dann über den USB. Bei Bedarf bitte anfragen

# PC817XJ0000F Series

## DIP 4pin General Purpose Photocoupler

\*4-channel package type is also available.  
(model No. **PC847XJ0000F Series**)



### ■ Description

**PC817XJ0000F Series** contains an IRED optically coupled to a phototransistor.

It is packaged in a 4pin DIP, available in wide-lead spacing option and SMT gullwing lead-form option.

Input-output isolation voltage(rms) is 5.0kV.

Collector-emitter voltage is 80V and CTR is 50% to 600% at input current of 5mA.

### ■ Features

1. 4pin DIP package
2. Double transfer mold package (Ideal for Flow Soldering)
3. High collector-emitter voltage ( $V_{CE0}$ :80V)
4. Current transfer ratio (CTR : MIN. 50% at  $I_F=5$  mA,  $V_{CE}=5V$ )
5. Several CTR ranks available
6. High isolation voltage between input and output ( $V_{ISO(rms)}$  : 5.0 kV)
7. Lead-free and RoHS directive compliant

### ■ Agency approvals/Compliance

1. Recognized by UL1577 (Double protection isolation), file No. E64380 (as model No. **PC817**)
2. Package resin : UL flammability grade (94V-0)

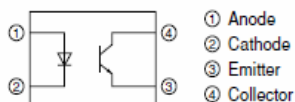
### ■ Applications

1. I/O isolation for MCUs (Micro Controller Units)
2. Noise suppression in switching circuits
3. Signal transmission between circuits of different potentials and impedances

Notice The content of data sheet is subject to change without prior notice.

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc. Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

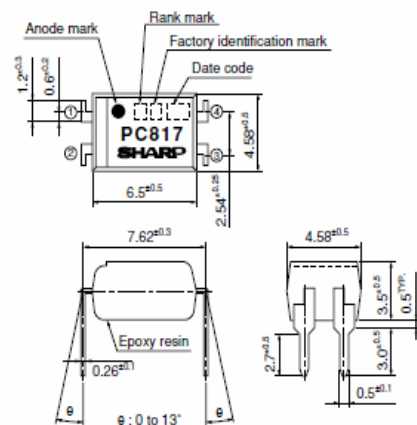
## Internal Connection Diagram



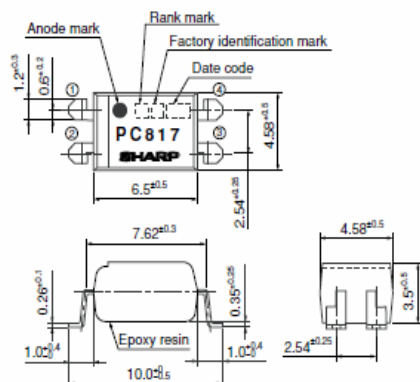
## Outline Dimensions

(Unit : mm)

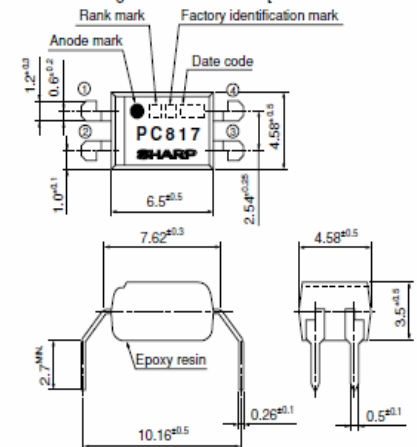
### 1. Through-Hole [ex. PC817XJ0000F]



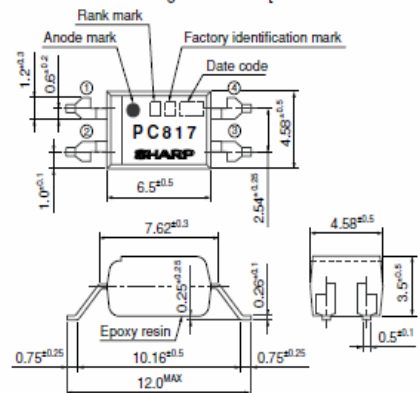
### 2. SMT Gullwing Lead-Form [ex. PC817XJ0000F]



### 3. Wide Through-Hole Lead-Form [ex. PC817XFJ0000F]



### 4. Wide SMT Gullwing Lead-Form [ex. PC817XFJ0000F]



# Absolute Maximum Ratings

(T<sub>a</sub>=25°C)

|        | Parameter                   | Symbol                 | Rating      | Unit |
|--------|-----------------------------|------------------------|-------------|------|
| Input  | Forward current             | I <sub>F</sub>         | 50          | mA   |
|        | *1 Peak forward current     | I <sub>FM</sub>        | 1           | A    |
|        | Reverse voltage             | V <sub>R</sub>         | 6           | V    |
| Output | Power dissipation           | P                      | 70          | mW   |
|        | Collector-emitter voltage   | V <sub>CEO</sub>       | 80          | V    |
|        | Emitter-collector voltage   | V <sub>ECO</sub>       | 6           | V    |
|        | Collector current           | I <sub>C</sub>         | 50          | mA   |
|        | Collector power dissipation | P <sub>C</sub>         | 150         | mW   |
|        | Total power dissipation     | P <sub>tot</sub>       | 200         | mW   |
|        | *2 Isolation voltage        | V <sub>iso (rms)</sub> | 5.0         | kV   |
|        | Operating temperature       | T <sub>op</sub>        | -30 to +100 | °C   |
|        | Storage temperature         | T <sub>stg</sub>       | -55 to +125 | °C   |
|        | *3 Soldering temperature    | T <sub>sol</sub>       | 260         | °C   |

\*1 Pulse width≤100μs, Duty ratio : 0.001

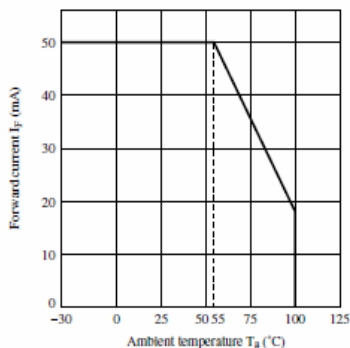
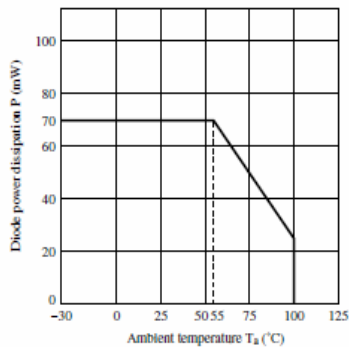
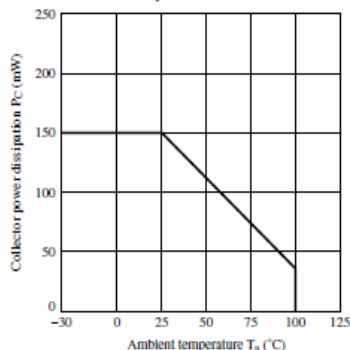
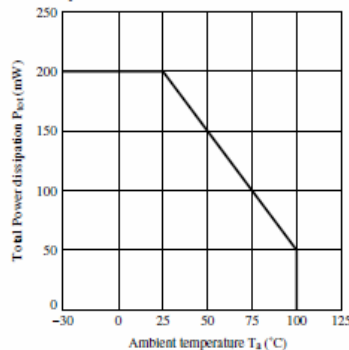
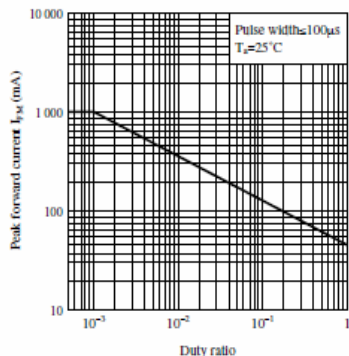
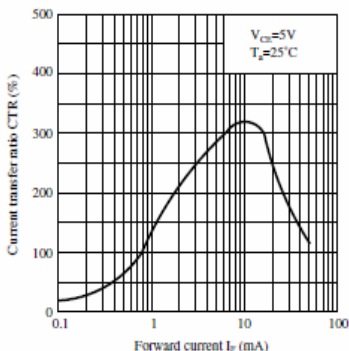
\*2 40 to 60%RH, AC for 1 minute, f=60Hz

\*3 For 10s

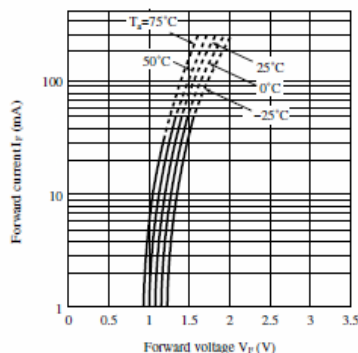
# Electro-optical Characteristics

(T<sub>a</sub>=25°C)

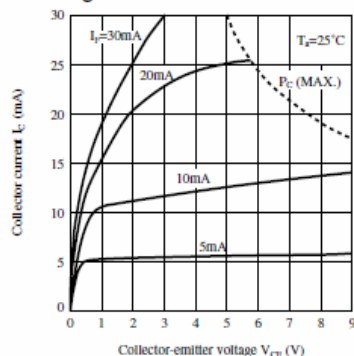
|                          | Parameter                            | Symbol               | Conditions                                                           | MIN.               | TYP.               | MAX. | Unit |
|--------------------------|--------------------------------------|----------------------|----------------------------------------------------------------------|--------------------|--------------------|------|------|
| Input                    | Forward voltage                      | V <sub>F</sub>       | I <sub>F</sub> =20mA                                                 | —                  | 1.2                | 1.4  | V    |
|                          | Peak forward voltage                 | V <sub>FM</sub>      | I <sub>FM</sub> =0.5A                                                | —                  | —                  | 3.0  | V    |
|                          | Reverse current                      | I <sub>R</sub>       | V <sub>R</sub> =4V                                                   | —                  | —                  | 10   | μA   |
| Output                   | Terminal capacitance                 | C <sub>t</sub>       | V=0, f=1kHz                                                          | —                  | 30                 | 250  | pF   |
|                          | Collector dark current               | I <sub>CDO</sub>     | V <sub>CE</sub> =50V, I <sub>F</sub> =0                              | —                  | —                  | 100  | nA   |
|                          | Collector-emitter breakdown voltage  | BV <sub>CEO</sub>    | I <sub>C</sub> =0.1mA, I <sub>F</sub> =0                             | 80                 | —                  | —    | V    |
|                          | Emitter-collector breakdown voltage  | BV <sub>ECO</sub>    | I <sub>E</sub> =10μA, I <sub>F</sub> =0                              | 6                  | —                  | —    | V    |
| Transfer characteristics | Collector current                    | I <sub>C</sub>       | I <sub>F</sub> =5mA, V <sub>CE</sub> =5V                             | 2.5                | —                  | 30.0 | mA   |
|                          | Collector-emitter saturation voltage | V <sub>CE(sat)</sub> | I <sub>F</sub> =20mA, I <sub>C</sub> =1mA                            | —                  | 0.1                | 0.2  | V    |
|                          | Isolation resistance                 | R <sub>ISO</sub>     | DC500V, 40 to 60%RH                                                  | 5×10 <sup>10</sup> | 1×10 <sup>11</sup> | —    | Ω    |
|                          | Floating capacitance                 | C <sub>f</sub>       | V=0, f=1MHz                                                          | —                  | 0.6                | 1.0  | pF   |
|                          | Cut-off frequency                    | f <sub>c</sub>       | V <sub>CE</sub> =5V, I <sub>C</sub> =2mA, R <sub>L</sub> =100Ω, -3dB | —                  | 80                 | —    | kHz  |
|                          | Response time                        | Rise time            | V <sub>CE</sub> =2V, I <sub>C</sub> =2mA, R <sub>L</sub> =100Ω       | —                  | 4                  | 18   | μs   |
|                          |                                      | Fall time            |                                                                      | —                  | 3                  | 18   | μs   |

**Fig.1 Forward Current vs. Ambient Temperature**

**Fig.2 Diode Power Dissipation vs. Ambient Temperature**

**Fig.3 Collector Power Dissipation vs. Ambient Temperature**

**Fig.4 Total Power Dissipation vs. Ambient Temperature**

**Fig.5 Peak Forward Current vs. Duty Ratio**

**Fig.6 Current Transfer Ratio vs. Forward Current**


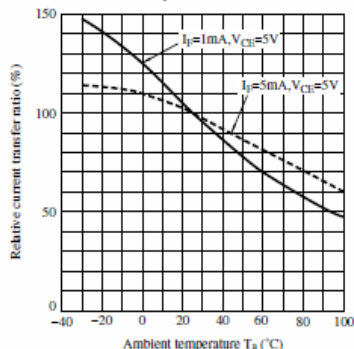
**Fig.7 Forward Current vs. Forward Voltage**



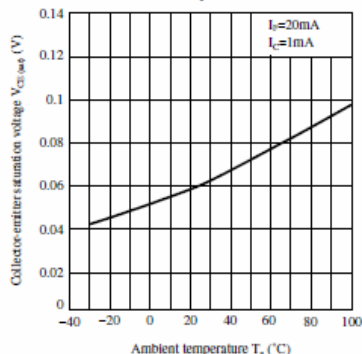
**Fig.8 Collector Current vs. Collector-emitter Voltage**



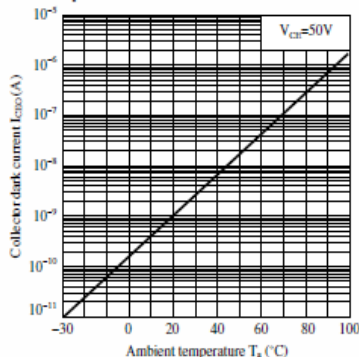
**Fig.9 Relative Current Transfer Ratio vs. Ambient Temperature**



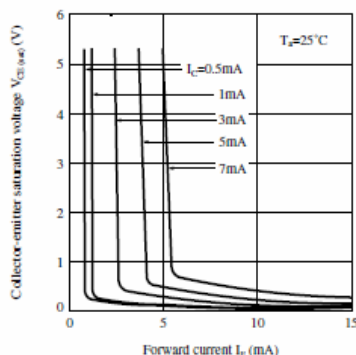
**Fig.10 Collector - emitter Saturation Voltage vs. Ambient Temperature**



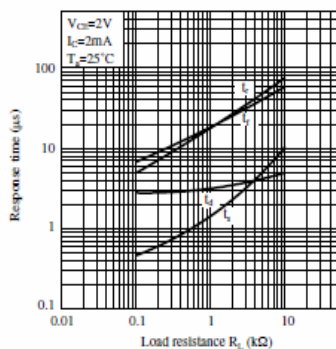
**Fig.11 Collector Dark Current vs. Ambient Temperature**



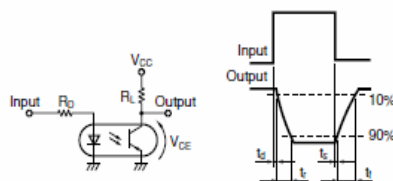
**Fig.12 Collector-emitter Saturation Voltage vs. Forward Current**



**Fig.13 Response Time vs. Load Resistance**

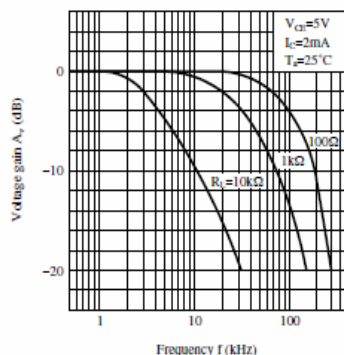


**Fig.14 Test Circuit for Response Time**

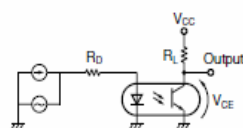


Please refer to the conditions in Fig.13.

**Fig.15 Frequency Response**



**Fig.16 Test Circuit for Frequency Response**



Please refer to the conditions in Fig.15.

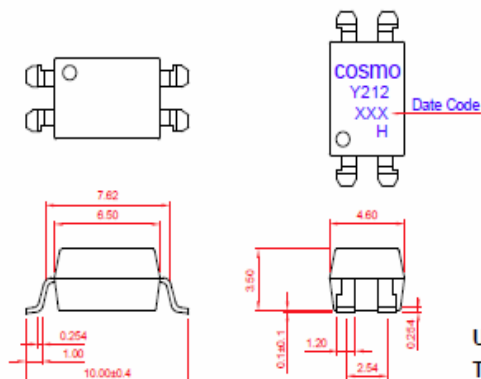
Remarks : Please be aware that all data in the graph are just for reference and not for guarantee.

# PRODUCT SPECIFICATION

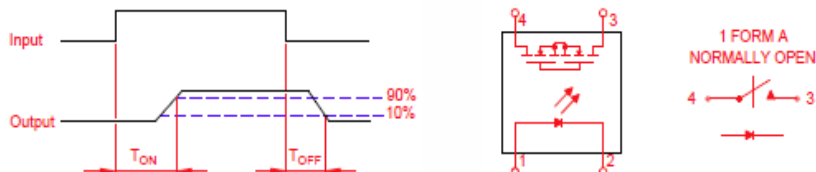
DATE : 02/22/2011

|                                         |                                                       |                             |           |
|-----------------------------------------|-------------------------------------------------------|-----------------------------|-----------|
| <b>cosmo</b><br>ELECTRONICS CORPORATION | SOLID STATE RELAY - MOSFET OUTPUT<br><b>KAQY212HA</b> | NO.61M00013<br>SHEET 1 OF 7 | REV.<br>2 |
|-----------------------------------------|-------------------------------------------------------|-----------------------------|-----------|

## ● OUTSIDE DIMENSION :



## ● Turn On / Turn Off time



## ● Absolute Maximum Ratings

(Ta=25°C)

| Emitter (Input)                              | Detector (Output)                               |
|----------------------------------------------|-------------------------------------------------|
| Reverse Voltage ..... 5.0V                   | Output Breakdown Voltage ..... ± 60V            |
| Continuous Forward Current ..... 50mA        | Continuous Load Current ..... ± 400mA           |
| Peak Forward Current ..... 1A                | Power Dissipation ..... 500mW                   |
| Power Dissipation ..... 100mW                |                                                 |
| Derate Linearly from 25°C ..... 1.3mW/°C     |                                                 |
| General Characteristics                      |                                                 |
| Isolation Test Voltage ..... 5000VACrms      | Storage Temperature Range ..... -40°C to +125°C |
| Isolation Resistance                         | Operating Temperature Range ... -40°C to +85°C  |
| Vio=500V, Ta=25°C ..... ≥ 10 <sup>10</sup> Ω | Junction Temperature ..... 100°C                |
| Total Power Dissipation ..... 550mW          | Soldering Temperature ,                         |
| Derate Linearly from 25°C ..... 2.5mW/°C     | 2mm from case , 10 sec ..... 260°C              |



# PRODUCT SPECIFICATION

DATE : 02/22/2011

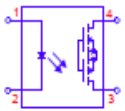
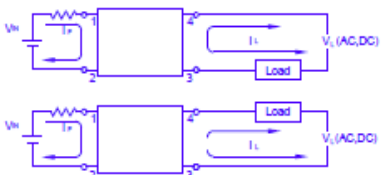
|                                         |                                                       |              |      |
|-----------------------------------------|-------------------------------------------------------|--------------|------|
| <b>cosmo</b><br>ELECTRONICS CORPORATION | SOLID STATE RELAY - MOSFET OUTPUT<br><b>KAQY212HA</b> | NO.61M00013  | REV. |
|                                         |                                                       | SHEET 2 OF 7 | 2    |

## ● Electro-optical Characteristics

(Ta=25°C)

| Parameter                | Symbol     | Conditions                                                                           | Min. | Typ. | Max. | Unit.         |
|--------------------------|------------|--------------------------------------------------------------------------------------|------|------|------|---------------|
| Emitter (Input)          |            |                                                                                      |      |      |      |               |
| Forward Voltage          | $V_F$      | $I_F=10\text{mA}$                                                                    |      | 1.2  | 1.5  | V             |
| Operation Input Current  | $I_{FON}$  | $V_L=\pm 20\text{V}$ , $I_L=100\text{mA}$ , $t=10\text{ms}$                          |      |      | 5    | mA            |
| Recovery Input Current   | $I_{FOFF}$ | $V_L=\pm 20\text{V}$ , $I_L\leq 5\mu\text{A}$                                        | 0.2  |      |      | mA            |
| Detector (Output)        |            |                                                                                      |      |      |      |               |
| Output Breakdown Voltage | $V_B$      | $I_B=50\mu\text{A}$                                                                  | 60   |      |      | V             |
| Output Off-State Leakage | $I_{TOFF}$ | $V_T=60\text{V}$ , $I_F=0\text{mA}$                                                  |      | 0.2  | 1    | $\mu\text{A}$ |
| I/O Capacitance          | $C_{ISO}$  | $I_F=0$ , $f=1\text{MHz}$                                                            |      | 6    |      | pF            |
| ON Resistance            | $R_{ON}$   | $I_L=100\text{mA}$ , $I_F=10\text{mA}$                                               |      | 0.83 | 2.5  | $\Omega$      |
| Turn-On Time             | $T_{ON}$   | $I_F=10\text{mA}$ , $V_L=\pm 20\text{V}$<br>$t=10\text{ms}$ , $I_L=\pm 100\text{mA}$ |      | 0.2  | 1.5  | ms            |
| Turn-Off Time            | $T_{OFF}$  |                                                                                      |      | 0.3  | 1.5  | ms            |

## ● Schematic and Wiring Diagrams

| Schematic                                                                           | Output Configuration | Load  | Connection | Wiring Diagrams                                                                     |
|-------------------------------------------------------------------------------------|----------------------|-------|------------|-------------------------------------------------------------------------------------|
|  | 1a                   | AC/DC | -          |  |

# PRODUCT SPECIFICATION

DATE : 02/22/2011

|                                         |                                                       |              |      |
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|                                         |                                                       | SHEET 3 OF 7 | 2    |

## ● Data Curve

Load current vs. ambient temperature

Allowable ambient Temperature :

-40°C to +85°C



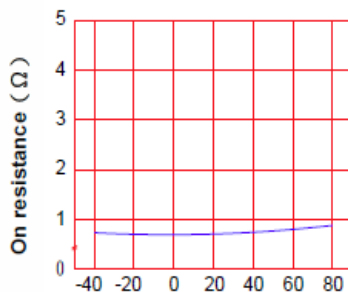
Ambient temperature Ta (°C)

On resistance vs. ambient temperature

across terminals 3 and 4 pin

LED current : 5mA

Continuous load current : 400mA (DC)



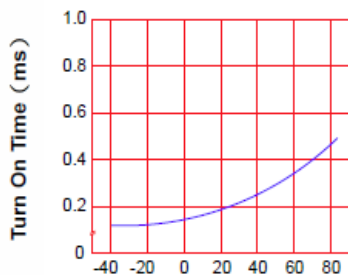
Ambient temperature Ta (°C)

Turn On Time vs. ambient temperature

Load voltage 60V (DC)

LED current : 5mA

Continuous load current : 400mA (DC)



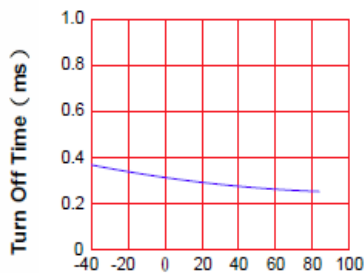
Ambient temperature Ta (°C)

Turn Off Time vs. ambient temperature

Load voltage 60V (DC)

LED current : 5mA

Continuous load current : 400mA (DC)



Ambient temperature Ta (°C)

# PRODUCT SPECIFICATION

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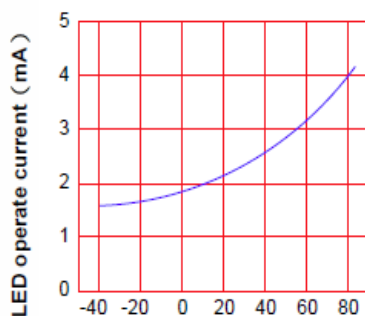
|                                         |                                                       |                             |           |
|-----------------------------------------|-------------------------------------------------------|-----------------------------|-----------|
| <b>cosmo</b><br>ELECTRONICS CORPORATION | SOLID STATE RELAY - MOSFET OUTPUT<br><b>KAQY212HA</b> | NO.61M00013<br>SHEET 4 OF 7 | REV.<br>2 |
|-----------------------------------------|-------------------------------------------------------|-----------------------------|-----------|

LED operate current vs.

ambient temperature

Load Voltage : 60V (DC)

Continuous load current : 400mA (DC)



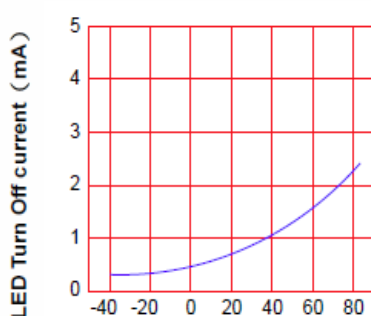
Ambient temperature Ta (°C)

LED Turn Off current vs.

ambient temperature

Load Voltage : 60V (DC)

Continuous load current : 400mA (DC)

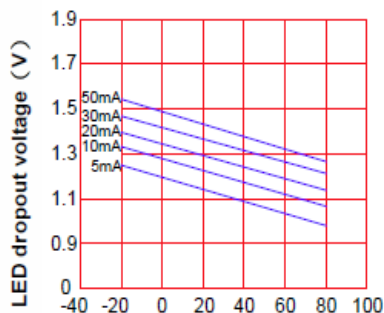


Ambient temperature Ta (°C)

LED dropout voltage vs.

ambient temperature

LED current : 5 to 50mA



Ambient temperature Ta (°C)

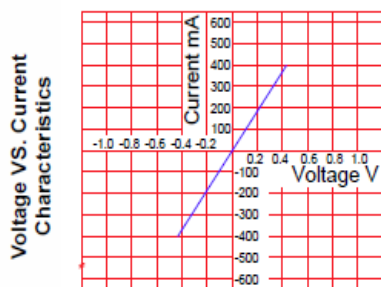
Voltage vs. current characteristics

of output at MOSFET portion

Measured portion : across terminals

3 and 4 pin

Ambient temperature : 25°C



Ambient temperature : 25°C

# PRODUCT SPECIFICATION

DATE : 02/22/2011

|                                         |                                                       |              |      |
|-----------------------------------------|-------------------------------------------------------|--------------|------|
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|                                         |                                                       | SHEET 5 OF 7 | 2    |

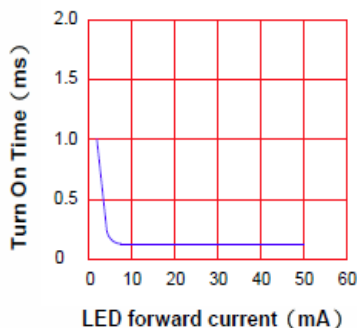
LED forward current vs. Turn On Time

Across terminals 3 and 4pin

Load voltage : 60V (DC)

Continuous load current : 400mA (DC)

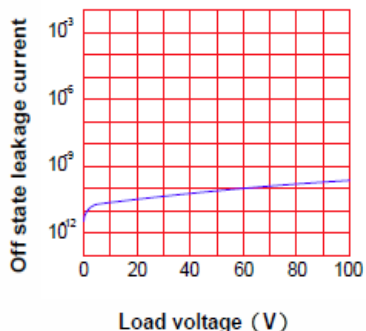
Ambient temperature : 25°C



Off state leakage current

Across terminals 3 and 4 pin

Ambient temperature : 25°C



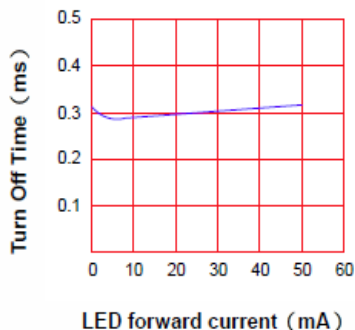
LED forward current vs. Turn Off Time

Across terminals 3 and 4 pin

Load voltage : 60V (DC)

Continuous load current : 400mA (DC)

Ambient temperature : 25°C

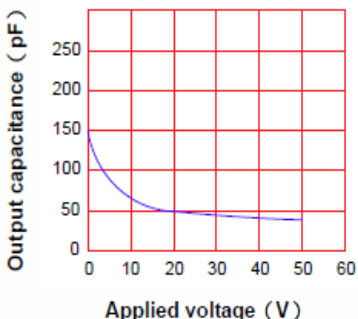


Applied voltage vs. output capacitance

Across terminals 3 and 4 pin

Frequency : 1MHz

Ambient temperature : 25°C



# PRODUCT SPECIFICATION

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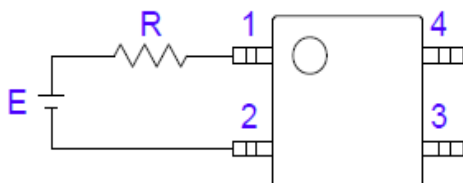
|                                         |                                                       |              |           |
|-----------------------------------------|-------------------------------------------------------|--------------|-----------|
| <b>cosmo</b><br>ELECTRONICS CORPORATION | SOLID STATE RELAY - MOSFET OUTPUT<br><b>KAQY212HA</b> | NO.61M00013  | REV.<br>2 |
|                                         |                                                       | SHEET 6 OF 7 |           |

## ● USING METHODS

Examples of resistance value to  
control LED forward current ( $I_F$ )

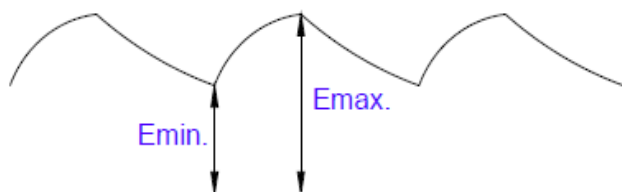
SSR-MOSFET OUTPUT

( $I_F=5\text{mA}$ )



| E    | R                     |
|------|-----------------------|
| 3.3V | Approx. 330 $\Omega$  |
| 5V   | Approx. 640 $\Omega$  |
| 12V  | Approx. 1.9K $\Omega$ |
| 15V  | Approx. 2.5K $\Omega$ |
| 24V  | Approx. 4.1K $\Omega$ |

- (1) LED forward current must be more than 5mA , at E min.
- (2) LED forward current must be less than 50mA , at E max.



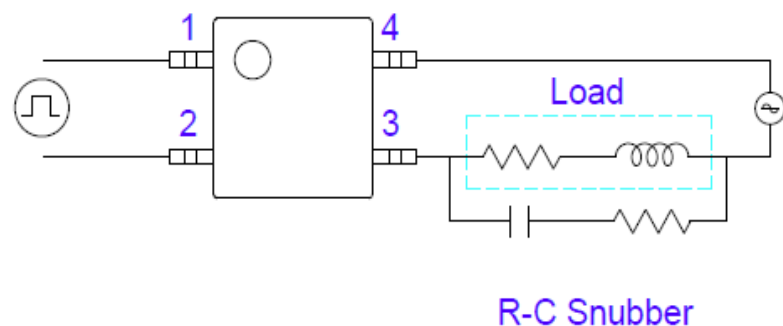
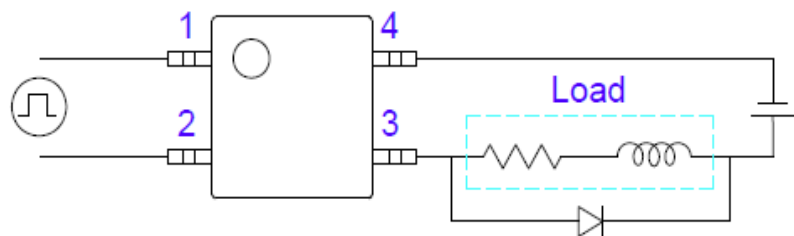
# PRODUCT SPECIFICATION

DATE : 02/22/2011

|                                         |                                                       |              |      |
|-----------------------------------------|-------------------------------------------------------|--------------|------|
| <b>cosmo</b><br>ELECTRONICS CORPORATION | SOLID STATE RELAY - MOSFET OUTPUT<br><b>KAQY212HA</b> | NO.61M00013  | REV. |
|                                         |                                                       | SHEET 7 OF 7 | 2    |

## ● USING METHODS

Regulate the spike voltage generated on the inductive load as follows :



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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 as 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.

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DECISION-COMPUTER

DECISION-COMPUTER Jürgen Merz e.K.  
Lengericher Str. 21  
49536 Lienen  
Telefon +49 (0)5483-77002  
Telefax +49 (0)5483-77003  
<http://www.decision-computer.de>

