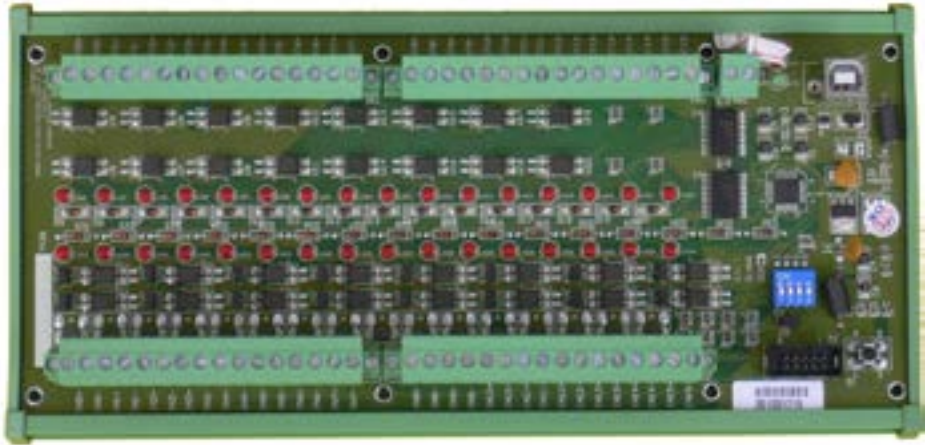


USB-I/O Manual



**16 PHOTO COUPLE INPUT /
16 PHOTO COUPLE OUTPUT CHANNELS**

UHOO-16 - DIN-Rail-Version

UPOO-16 - Board-Version

Product Code: AUSB16P/R USB 16 PHOTO ISO./ RELAY BOARD

Item-No.: UHRO-16 - DIN-Rail-version

Item-No.: UPRO-16 - Board-version

Bus: USB 2.0

Description:

16 photo couple input / 16 photo couple output channels

Input:

Input maximum load voltage is 30V

By jumper, you can select two range of voltage

0 - 4.5V off and 6V - 20V on. (0 - 20V)

0 - 16.5V off and 18 - 30V on (0 - 30V)

PC817 photo couple chips.

5000V isolation voltage.

Output:

Switching current: 10mA

Max switching current: 50mA

32 LED correspond to I/O ports activation status

Connections via Pluggable Screw Terminals

Features:

For direct DIN-Rail mounting

Also as board without DIN Rail adapter available

High Speed 8051 μ C Core

USB 2.0 Function Controller

Support USB ID 0~14 SET

POWER External DC+5V 0,5A

Software/Driver:

Windows-XP Vista will use HID-interface and sample for programming, Linux driver and sample for programming.

Package includes the following items:

USB Board

USB cable

Software and Manual CD

The DIN-Rail-version comes with a EMI-Protection-kit

This kit is optional in the board-version!

Operating temperature range: 0 ~ 33C.

Relative humidity rage: 0 ~ 90%.

Size: 250 mm x 120 mm x 55 mm

Security Note

This device should not be used in applications where failure may result in death or injury without proper consideration and design of associated system architecture and redundant safety features. Connection and repairs are allowed only by a specialist.

When used in a machine or plant, is to ensure that after installation continues to the relevant provisions, rules and guidelines are complied with!

These products come into contact voltage, therefore to consider the applicable VDE regulations VDE 0550 / 0551, VDE 0700, VDE 0711, especially VDE 0100 and VDE 0860.

J1 USB Connection USB-B

A suitable cable is included

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



USB wiring is very sensitive against EMI errors (mainly sparking when opening contacts). The U-EMI-1 Kit is included with the DIN rail version and includes two Würth folded cores for the USB data cable and a Ferrite sleeve for the power cable. If you are using a HUB, it should be protected the connection HUB/computer (U-EMI-2)! The kit includes two Würth folded cores for the USB data cable.

The cores must be mounted as shown in the illustrations, as close as possible on the connectors.

But also the avoidance of errors is very important. Therefore, the careful layout and installation of the wiring is very important!



Folding core on the USB cable to the computer



Folding core on the USB cable to the USB IO
1 or 2 x through the core

Power Supply - TB1



TB1 - External 5V DC		
1	EXT+V	5V+
2	SGND	5V-

Ferrite sleeve on the power supply cable

The power-supply of our products must be 5V external DC. It is to pay attention to correct polarity. Otherwise, the product could be damaged. If the board is by wrong power supply except function, you can try new store the firmware.

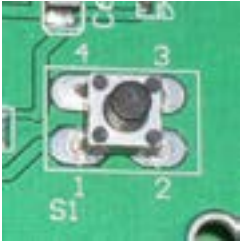
The U-EMI-1 Kit is included with the DIN rail version, and includes ferrite sleeve, shielded by EMI for the power cable. Are shown on the image above.

For earlier versions of the Decision-USB IO was also the possibility of the power supply via the USB bus. To get greater stability, this connection was removed. The USB bus power is not always able to provide enough power for the Relais switched on! The result is a loss of connection or "hanging" USB module. An external power supply provides a secure power supply!

USB Power Management in Windows - In Window System, USB communication might disconnect under Power Saving Mode or Sleep Mode. When connecting USB boards on PC, please make sure windows power management set in case interference with USB communication.

S1 Reset Button

To reset the "hanging" USB-Module



S2 USB ID

Set different ID for each board

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



Multiple Boards Connect

When you need to connect more than 3 boards on one PC, please make sure the following below

1. Set different ID for each board.
2. Supply external 5V to each USB board.
3. Supply external 5V to USB hub.

Please make sure your external 5V power supply enough for the USB I/O boards. If input voltage is below 4.8V for USB I/O board, it can't work normally and sometimes it will cause device manager keeping refreshing itself or can't recognize the device.

TB2/3 ISOLATOR Input Ports

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

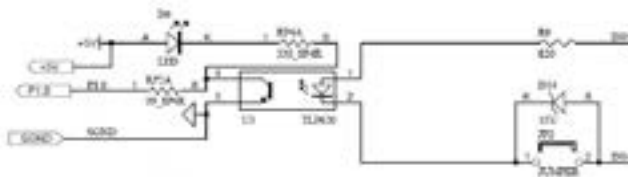
Pin	Signal	Description
1	IN8+	Opto-isolator Ch. 08 + Input
2	IN8-	Opto-isolator Ch. 08 - Input
3	IN9+	Opto-isolator Ch. 09 + Input
4	IN9-	Opto-isolator Ch. 09 - Input
5	IN10+	Opto-isolator Ch. 10 + Input
6	IN10-	Opto-isolator Ch. 10 - Input
7	IN11+	Opto-isolator Ch. 11 + Input
8	IN11-	Opto-isolator Ch. 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

ISOLATOR Input SET JP3 to JP18

The JP3 is used to select voltage signal opto+ and opto- range of photo couple input channel 1, and the JP4 is used to select voltage signal range of photo input channel 2, ...etc. When we short the jumper, the input voltage range is 0 to 20V, and open the jumper means input voltage range is 0 to 30V

Jumper	Input Range	Inactive Voltage	Active Voltage
Open	0 to 30V	0 to 1.5V	3 to 20V
Short	0 to 20V	0 to 16.5V	18 to 30V

Schematic Input Ports

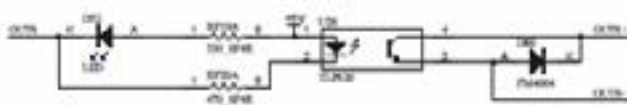


TB4/5 Relay-Output

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

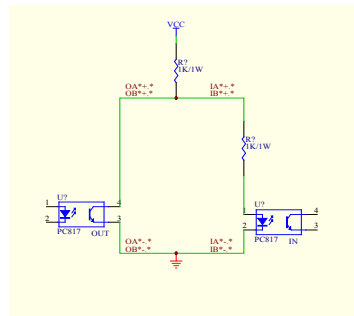
Schematic Outputs



Loopback Diagnostic

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

The decision-computer USB devices use the HID (human interface device). The HID belongs to the generic device class is integrated in the operating system. If a new HID device is connected, no driver installation is required. The functions for access and control of HID hid.dll you can find in the Windows System32 folder.

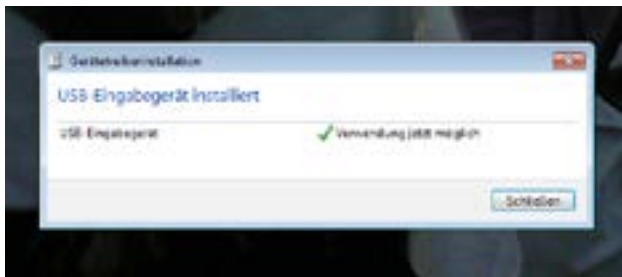
Windows 7 installation example



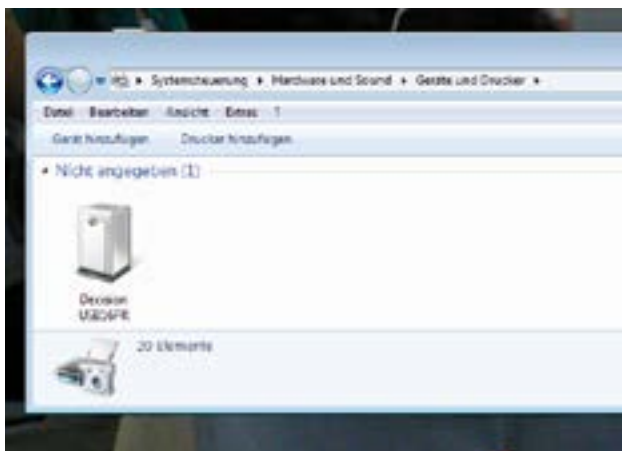
1. Power supply 5V connect

2. USB connect

3. USB input device - device driver software is successfully installed



4. USB input device - use now possible



5. In the Control Panel, you can find the Decision-USB module now

6. Ready to use

SOFTWARE PROGRAMMING UNDER WINDOWS AND LINUX

On Windows, we offer a function library and dll file as programming help. See the manual „USBIDII_Manual.pdf“ and demo code in VB/VC / Delphi on the decision-Studio CD.

We offer a C-source Linux users for direct access to the USB devices. See „Dcihid 0.5.1.tgz“ manual and example.

DIAGNOSTICS UNDER WINDOWS/XP

USB test Program.exe is a diagnostic tool to test USB devices on Windows/XP.
The USB test software can be found on the decision-Studio CD.

The examples and drivers be developed continuously. See the latest on the decision-computer-Merz „Service CD“.

An important way to get more informations you find at <http://www.usb-industrial.com>

Software support on the short way: <http://www.usb-industrial.com/support.html>

USB Industrial.com Overview:

Windows Support	2010/04 USBIDII.dll 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.
Watchdog Timer		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.
VCP driver	(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
Linux Support	dcihid - 0.5.1 Basic function library and demo program 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.
Firmware Update	Firmware Hex file 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.
LabVIEW Support	LabVIEW 8 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.
ProfilAB Support		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.
Init Value Setting Tool	(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.
Data Acquisition and Remote Monitoring Tool		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 by LAN or Wireless



The remote control of Decision USB products by LAN or wireless with a remote-PC is very simple with a multi port USB Server

Because no driver should be installed to the installation and programming is very easy.

Under Windows, are the external USB I/O directly in the Device Manager and can be connect or control such as in the original host PC.

Firmware Update Manual

USBBootloader.exe is the tool software to update firmware into the USB SerialDevice Board developed by Decision Computer. When you get a new version of firmware (.hex), you can follow the steps to update firmware to the board.

1. Remove the external input signal Voltage and only support device power.
2. Set Board Id 15 (All on) for Update Mode and press the Reset button.
3. Connect PC to the Board by USB
4. If this is the first to use this function, please indicate the driver install path to the Driver Folder to install the driver.
5. Open the Software USBBootloader.exe and press the Open button and indicate the hex file and then press the Download button to update firmware.
6. Set Board Id between 0 ~ 14 and press Reset button and connect PC again.

Communication JP1 - only option!

Some unused holes (2 x 5) for JP1 are located on the board. Here a serial port can be added at a special version, with an optional expansion board, RS-232 or RS-422/RS-485. The ports are controlled via the USB. Please contact us if necessary

Strong electromagnetic sources, such as power lines, large electric motors, switches, or welders can cause strong electromagnetic interference. Video monitors and cables are strong sources of interference.

If the cable must be led by an area with significant electromagnetic interference, shielded cables with grounding on the source should be used.

Avoid placing your cable parallel to a high-voltage line! to minimize adverse effects, insert the cable at right angle to the power line.

PC817XJ0000F Series

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

DIP 4pin General Purpose
Photocoupler



■ Description

PC817XJ0000F Series contains an IRED optically coupled to a phototransistor.

It is packaged in a 4-pin 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_{CEO} :80V)
4. Current transfer ratio (CTR : MIN. 50% at I_{in} =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)

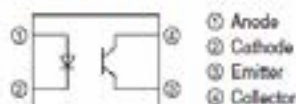
■ Applications

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.

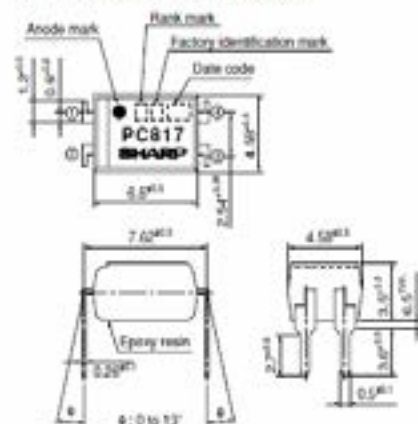
Internal Connection Diagram



Outline Dimensions

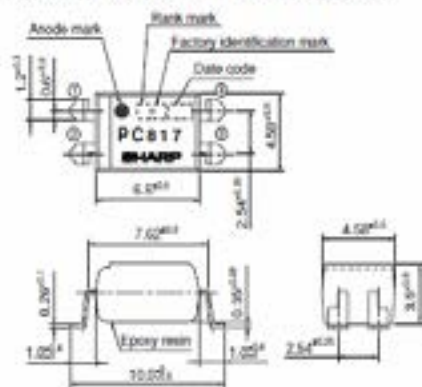
(Unit : mm)

1. Through-Hole [ex. PC817XJ0000F]



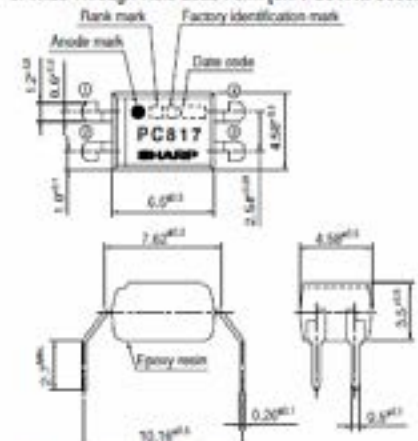
Product mass : approx. 0.23g

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



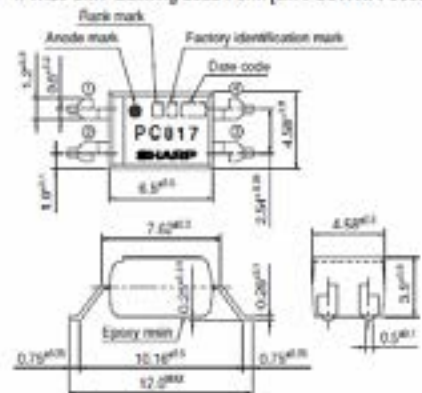
Product mass : approx. 0.22g

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



Product mass : approx. 0.23g

4. Wide SMT Gullwing Lead-Form [ex. PC817XFPJ0000F]



Product mass : approx. 0.22g

Absolute Maximum Ratings

(T_a = 25°C)

	Parameter	Symbol	Rating	Unit
Input	Forward current	I _F	50	mA
	¹⁾ Peak forward current	I _{FM}	1	A
	Reverse voltage	V _R	6	V
	Power dissipation	P	70	mW
Output	Collector-emitter voltage	V _{CE(sat)}	80	V
	Emitter-collector voltage	V _{EC(sat)}	6	V
	Collector current	I _C	50	mA
	Collector power dissipation	P _C	150	mW
	Total power dissipation	P _{tot}	200	mW
	²⁾ Isolation voltage	V _(iso-rms)	5.0	kV
	Operating temperature	T _{op}	-30 to +100	°C
	Storage temperature	T _{stg}	-55 to +125	°C
	³⁾ Soldering temperature	T _{sld}	260	°C

¹⁾ Pulse width ≤ 10µs, Duty ratio ≤ 0.001²⁾ 40 to 60V/100µs, AC for 1 minute, f = 60Hz³⁾ For 10s

Electro-optical Characteristics

(T_a = 25°C)

	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input	Forward voltage	V _F	I _F = 20mA	—	1.2	1.4	V
	Peak forward voltage	V _{FM}	I _{FM} = 0.5A	—	—	3.0	V
	Reverse current	I _R	V _R = 4V	—	—	10	µA
Output	Terminal capacitance	C _i	V = 0, f = 1kHz	—	30	250	pF
	Collector dark current	I _{C(D)}	V _{CE} = 50V, I _F = 0	—	—	100	nA
	Collector-emitter breakdown voltage	BV _{CE(s)}	I _C = 0.1mA, I _F = 0	80	—	—	V
	Emitter-collector breakdown voltage	BV _{EC(s)}	I _E = 10µA, I _F = 0	6	—	—	V
	Collector current	I _C	I _F = 5mA, V _{CE} = 5V	2.5	—	30.0	mA
Transfer characteristics	Collector-emitter saturation voltage	V _{CE(sat)}	I _C = 20mA, I _E = 1mA	—	0.1	0.2	V
	Isolation resistance	R _{iso}	DC 500V, 40 to 60% RH	5 × 10 ¹⁰	1 × 10 ¹¹	—	Ω
	Floating capacitance	C _i	V = 0, f = 1MHz	—	0.6	1.0	pF
	Cut-off frequency	f _c	V _{CE} = 5V, I _C = 2mA, R _L = 100Ω, ω = 3dB	—	80	—	kHz
	Response time	Rise time	V _{CE} = 2V, I _C = 2mA, R _L = 100Ω	—	4	18	µs
		Fall time		—	3	18	µs

Fig.1 Forward Current vs. Ambient Temperature

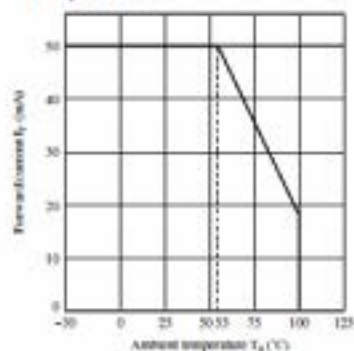


Fig.2 Diode Power Dissipation vs. Ambient Temperature

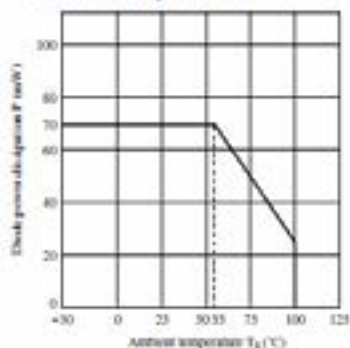


Fig.3 Collector Power Dissipation vs. Ambient Temperature

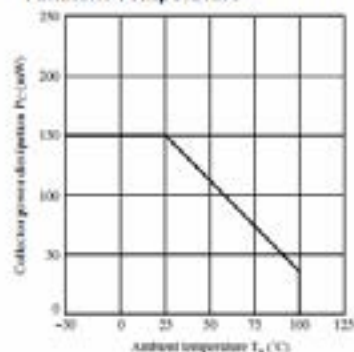


Fig.4 Total Power Dissipation vs. Ambient Temperature

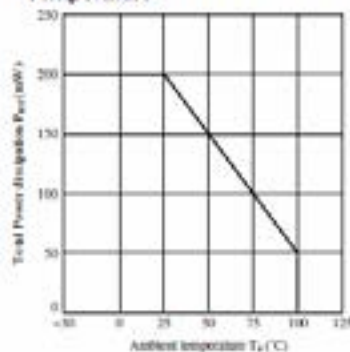


Fig.5 Peak Forward Current vs. Duty Ratio

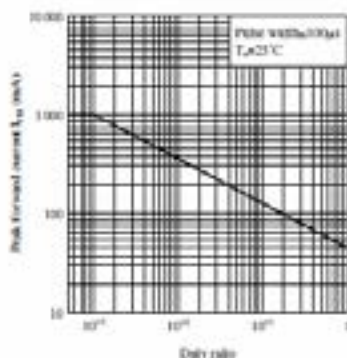


Fig.6 Current Transfer Ratio vs. Forward Current

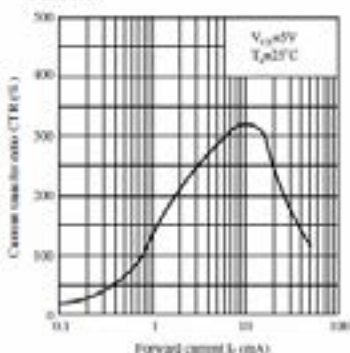


Fig.7 Forward Current vs. Forward Voltage

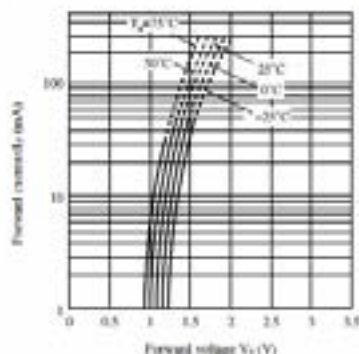


Fig.8 Collector Current vs. Collector-emitter Voltage

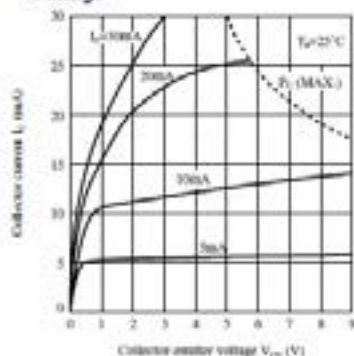


Fig.9 Relative Current Transfer Ratio vs. Ambient Temperature

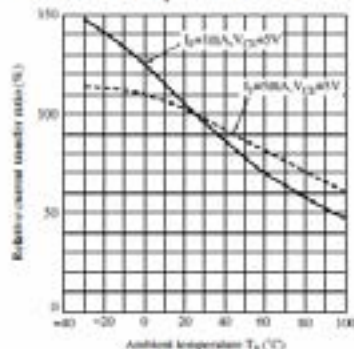


Fig.10 Collector-emitter Saturation Voltage vs. Ambient Temperature

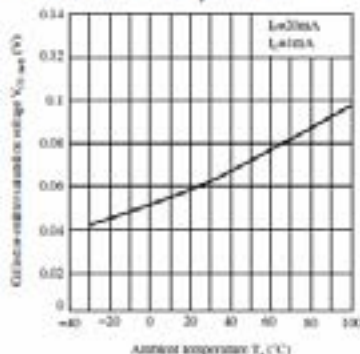


Fig.11 Collector Dark Current vs. Ambient Temperature

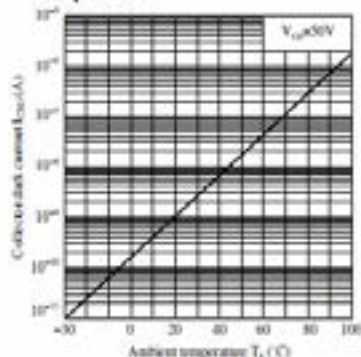


Fig.12 Collector-emitter Saturation Voltage vs. Forward Current

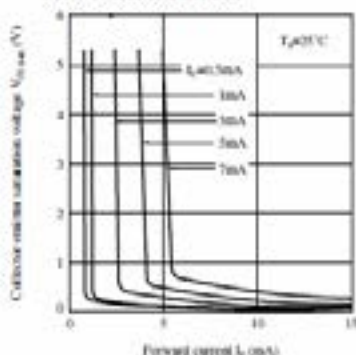


Fig.13 Response Time vs. Load Resistance

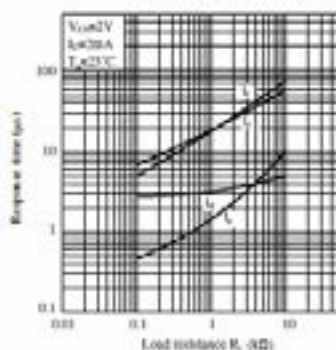
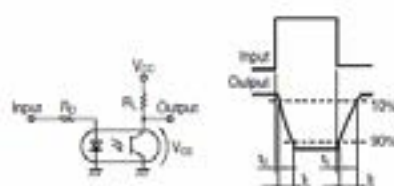


Fig.14 Test Circuit for Response Time



Please refer to the conditions in Fig.13.

Fig.15 Frequency Response

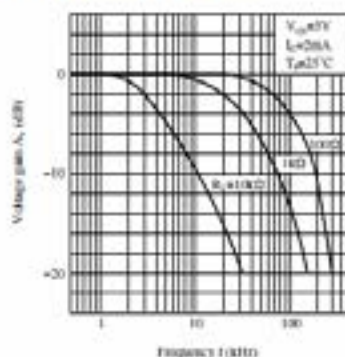
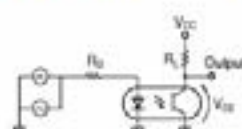


Fig.16 Test Circuit for Frequency Response



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.

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