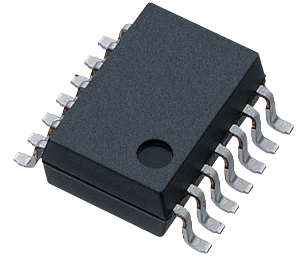# PC929J00000F Series

High Speed, Built-in Short Protection Circuit, Gate Drive SMD 14 pin ∗OPIC Photocoulper

■ Description

PC929J00000F Series contains an IRED optically coupled to an OPIC chip.

It is packaged in a Mini-flat, Half pitch type (14 pin).

Input-output isolation voltage(rms) is 4.0kV. High speed responce (t_{PLH}, t_{PHL} : MAX. 0.5 μs).

■ Features

1. 14 pin Half pitch type (Lead pitch : 1.27 mm)
2. Double transfer mold package
   (Ideal for Flow Soldering)
3. Built-in IGBT shortcircuit protector circuit
4. Built-in direct drive circuit for IGBT drive
   (Peak output current : I_{O1P}, I_{O2P} : MAX. 0.4 A)
5. High speed responce (t_{PLH}, t_{PHL} : MAX. 0.5 μs)
6. High isolation voltage ($V_{iso(rms)}$: 4.0 kV)
7. Lead-free and RoHS directive compliant

■ Agency approvals/Compliance

1. Recognized by UL1577, file No. E64380 (as model No. **PC929**)
2. Approved by VDE, DIN EN60747-5-2[∗] (as an option), file No. 94626 (as model No. **PC929**)
3. Package resin : UL flammability grade (94V-0)

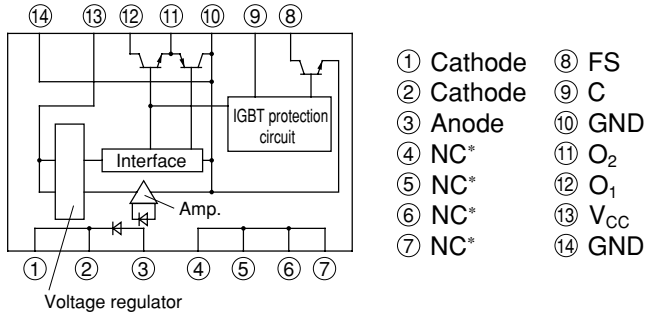   [∗]DIN EN60747-5-2 : successor standard of DIN VDE0884

■ Applications

1. Inverter

∗ "OPIC"(Optical IC) is a trademark of the SHARP Corporation. An OPIC consists of a light-detecting element and a signal-processing circuit integrated onto a single chip.

■ Internal Connection Diagram

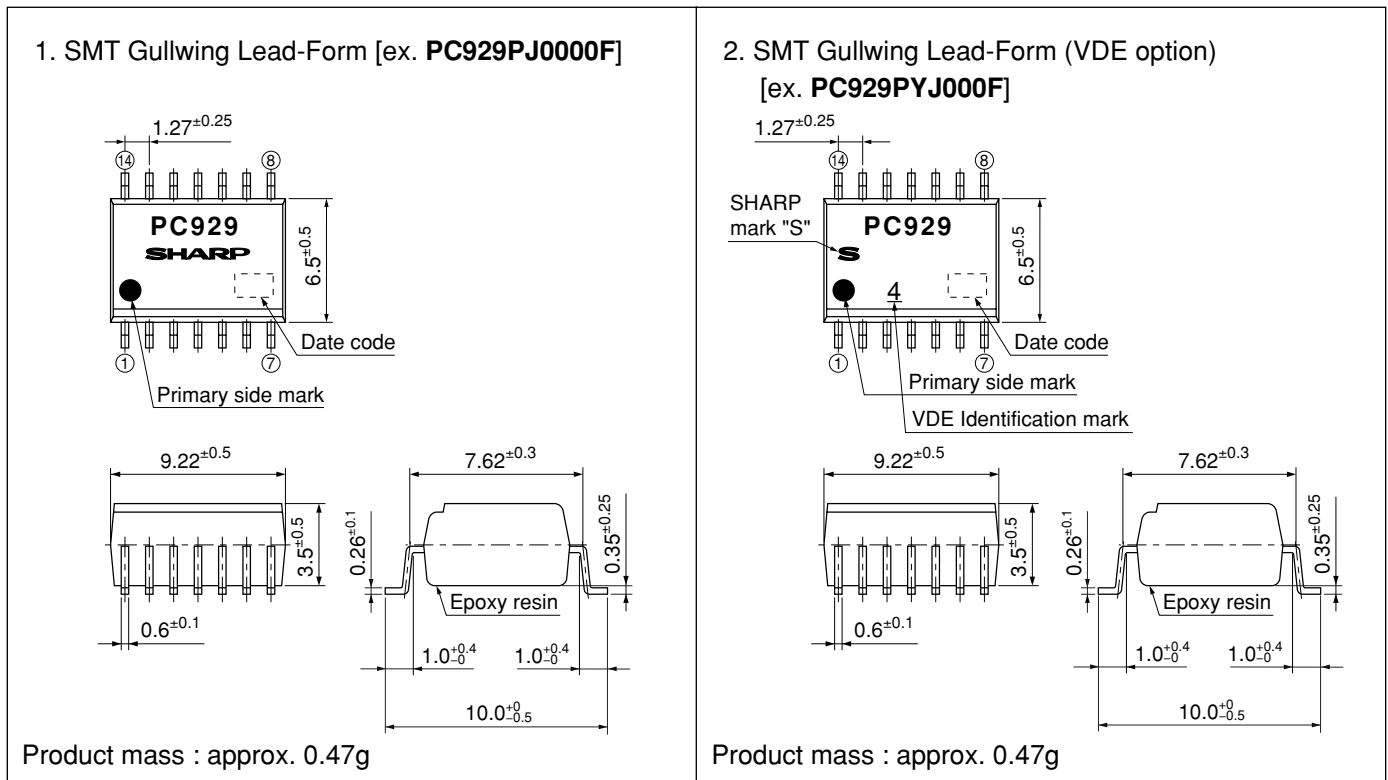|			
① Cathode	⑧ FS
② Cathode	⑨ C
③ Anode	⑩ GND
④ NC*	⑪ O_2
⑤ NC*	⑫ O_1
⑥ NC*	⑬ V_{CC}
⑦ NC*	⑭ GND

∗ No. ④ to ⑦ pin shall be shorted in the device.

■ Truth table

Input		C input-output	O_2 output	FS output	
ON		Low level	High level	High level	
		High level	Low level	Low level	At operating protection function
OFF		Low level	Low level	High level	
		High level	Low level	High level	

■ Outline Dimensions

(Unit : mm)

1. SMT Gullwing Lead-Form [ex. **PC929PJ0000F**]

Date code

Primary side mark

9.22±0.5

3.5±0.5

0.26±0.1

7.62±0.3

0.35±0.25

Epoxy resin

0.6±0.1

1.0+0.4−0

1.0+0.4−0

10.0+0−0.5

Product mass : approx. 0.47g

2. SMT Gullwing Lead-Form (VDE option) [ex. **PC929PYJ000F**]

SHARP mark "S"

Date code

Primary side mark

VDE Identification mark

9.22±0.5

3.5±0.5

0.26±0.1

7.62±0.3

0.35±0.25

Epoxy resin

0.6±0.1

1.0+0.4−0

1.0+0.4−0

10.0+0−0.5

Product mass : approx. 0.47g

Plating material : SnCu (Cu : TYP. 2%)

Date code (2 digit)

1st digit				2nd digit	
Year of production				Month of production	
A.D.	Mark	A.D	Mark	Month	Mark
1990	A	2002	P	January	1
1991	B	2003	R	February	2
1992	C	2004	S	March	3
1993	D	2005	T	April	4
1994	E	2006	U	May	5
1995	F	2007	V	June	6
1996	H	2008	W	July	7
1997	J	2009	X	August	8
1998	K	2010	A	September	9
1999	L	2011	B	October	O
2000	M	2012	C	November	N
2001	N	⋮	⋮	December	D

repeats in a 20 year cycle

Country of origin
Japan

Rank mark
There is no rank mark indicator.

■ Absolute Maximum Ratings

(unless otherwise specified $T_a=T_{opr}$)

	Parameter	Symbol	Rating	Unit
Input	[*1] Forward current	I_F	20	mA
Input	[*2] Reverse voltage	V_R	6	V
Output	Supply voltage	V_{CC}	35	V
Output	O_1 output current	I_{O1}	0.1	A
Output	[*3] O_1 peak output current	I_{O1P}	0.4	A
Output	O_2 output current	I_{O2}	0.1	A
Output	[*3] O_2 peak output current	I_{O2P}	0.4	A
Output	O_1 output voltage	V_{O1}	35	V
Output	[*4] Power dissipation	P_O	500	mW
Output	Overcurrent detection voltage	V_C	V_{CC}	V
Output	Overcurrent detection current	I_C	30	mA
Output	Error signal output voltage	V_{FS}	V_{CC}	V
Output	Error signal output current	I_{FS}	20	mA
	[*5] Total power dissipation	P_{tot}	550	mW
	[*6] Isolation voltage	$V_{iso\,(rms)}$	4.0	kV
	Operating temperature	T_{opr}	−25 to +80	°C
	Storage temperature	T_{stg}	−55 to +125	°C
	[*7] Soldering temperature	T_{sol}	260	°C

*1   The derating factors of a absolute maximum ratings due to ambient temperature
      are shown in Fig.15
*2 T_a=25°C
*3   Pulse width≤0.15μs, Duty ratio : 0.01
*4.5 The derating factors of a absolute maximum ratings due to ambient temperature
      are shown in Fig.16
*6   AC for 1minute, 40 to 60 %RH, T_a=25°C, f=60Hz
*7   For 10s

■ Electro-optical Characteristics

(unless otherwise specified $T_a=T_{opr}$)

	Parameter	Symbol	Conditions [*8]	MIN.	TYP.	MAX.	Unit
Input	Forward voltage	V_{F1}	T_a=25°C, I_F=10mA	–	1.6	1.75	V
Input	Forward voltage	V_{F2}	T_a=25°C, I_F=0.2mA	1.2	1.5	–	V
Input	Reverse current	I_R	T_a=25°C, V_R=5V	–	–	10	μA
Input	Terminal capacitance	C_t	T_a=25°C, V=0, f=1kHz	–	30	250	pF
Output	Supply voltage	V_{CC}	T_a=−10 to +60°C	15	–	30	V
Output	Supply voltage	V_{CC}	–	15	–	24	V
Output	O_1 Low level output voltage	V_{O1L}	V_{CC1}=12V, V_{CC2}=−12V, I_{O1}=0.1A, I_F=5mA[*9]	–	0.2	0.4	V
Output	O_2 High level output voltage	V_{O2H}	V_{CC}=V_{O1}=24V, I_{O2}=−0.1A, I_F=5mA [*9]	20	22	–	V
Output	O_2 Low level output voltage	V_{O2L}	V_{CC}=24V, I_{O2}=0.1A, I_F=0 [*9]	–	1.2	2.0	V
Output	O_1 leak current	I_{O1L}	T_a=25°C, V_{CC}=V_{O1}=35V, I_F=0 [*9]	–	–	500	μA
Output	High level supply current	I_{CCH}	T_a=25°C, V_{CC}=V_{O1}=24V, I_F=5mA [*9]	–	10	17	mA
Output	High level supply current	I_{CCH}	V_{CC}=V_{O1}=24V, I_F=5mA [*9]	–	–	19	mA
Output	Low level supply current	I_{CCL}	T_a=25°C, V_{CC}=V_{O1}=24V, I_F=0 [*9]	–	11	18	mA
Output	Low level supply current	I_{CCL}	V_{CC}=V_{O1}=24V, I_F=0 [*9]	–	–	20	mA

*8 It shall connect a by-pass capacitor of 0.01 μF or more between V_{CC} (pin ⑬) and GND (pin, ⑩, ⑭) near the device, when it measures the transfer characteristics and the
    output side characteristics.
*9 FS=OPEN, V_C=0

(unless otherwise specified $T_a = T_{opr}$)

Parameter		Symbol	Conditions [10]	MIN.	TYP.	MAX.	Unit
Transfer characteristics	[11] "Low→High" input threshold current	I_{FLH}	$T_a=25°C, V_{CC}=V_{O1}=24V$, FS=OPEN, $V_C=0$	0.3	1.5	3.0	mA
			$V_{CC}=V_{O1}=24V$, FS=OPEN, $V_C=0$	0.2	–	5.0	mA
	Isolation resistance	R_{ISO}	$T_a=25°C$, DC=500V, 40 to 60%RH	$5×10^{10}$	10^{11}	–	Ω
	Response time "Low→High" propagation delay time	t_{PLH}	$T_a=25°C$,	–	0.3	0.5	μs
	"High→Low" propagation delay time	t_{PHL}	$V_{CC}=V_{O1}=24V$, $I_F=5mA$,	–	0.3	0.5	μs
	Rise time	t_r	$R_G=47Ω$, $C_G=3\,000pF$	–	0.2	0.5	μs
	Fall time	t_f	FS=OPEN, $V_C=0$	–	0.2	0.5	μs
	Instantaneous common mode rejection voltage (High level output)	CM_H	$T_a=25°C$, $V_{CM}=600V(p\text{-}p)$ $I_F=5mA$, $V_{CC}=V_{O1}=24V$, $\Delta V_{O2H}=2.0V$, FS=OPEN, $V_C=0$	−1.5	–	–	kV/μs
	Instantaneous common mode rejection voltage (Low level output)	CM_L	$T_a=25°C$, $V_{CM}=600V(p\text{-}p)$ $I_F=0$, $V_{CC}=V_{O1}=24V$, $\Delta V_{O2L}=2.0V$, FS=OPEN, $V_C=0$	1.5	–	–	kV/μs
Overcurrent detection	[12] Overcurrent detection voltage	V_{CTH}	$T_a=25°C$ $V_{CC}=V_{O1}=24V$	$V_{CC}-6.5$	$V_{CC}-6$	$V_{CC}-5.5$	V
	Overcurrent detection voltage hysteresis width	V_{CHIS}	$I_F=5mA$, $R_G=47Ω$ $C_G=3\,000pF$, FS=OPEN	1	2	3	V
Protection output	O_2 "High→Low" propagation delay time at overcurrent protection	t_{PCOHL}	$T_a=25°C$ $V_{CC}=V_{O1}=24V$	–	4	10	μs
	O_2 Fall time at overcurrent protection	t_{PCOtf}	$I_F=5mA$, $R_G=47Ω$, $C_G=3\,000pF$,	2	5	–	μs
	O_2 "High→Low" output voltage at overcurrent protection	V_{OE}	$R_C=1kΩ$, $C_P=3\,000pF$ FS=OPEN	–	–	2	V
Error signal output	Low level error signal voltage	V_{FSL}	$T_a=25°C$, $I_F=5mA$ $V_{CC}=V_{O1}=24V$ $I_{FS}=10mA$, $R_G=47Ω$ $C_G=3\,000pF$, C=OPEN	–	0.2	0.4	V
	High level error signal voltage	I_{FSH}	$T_a=25°C$ $V_{CC}=V_{O1}=24V$, $I_F=5mA$ $V_{FS}=24V$, $R_G=47Ω$ $C_G=3\,000pF$, $V_C=0$	–	–	100	μA
	Error signal "High→Low" propagation delay time	t_{PCFHL}	$T_a=25°C$, $V_{CC}=V_{O1}=24V$ $I_F=5mA$, $R_{FS}=1.8kΩ$	–	1	5	μs
	Error signal output pulse width	Δt_{FS}	$R_G=47Ω$, $R_C=1kΩ$ $C_G=3\,000pF$, $C_P=1\,000pF$	20	35	–	μs

[10] It shall connect a by-pass capacitor of 0.01 μF or more between V_{CC} (pin ⑬) and GND (pin ⑩, ⑭) near the device, when it measures the device, when it measures the overcurrent characteristics, Protection output characteristics, and Error signal output characteristics.
[11] I_{FLH} represents forward current when output goes from "Low" to "High"
[12] V_{CTH} is the of C(pin ⑨) voltage when output becomes from "High" to "Low"

■ Model Line-up

Lead Form	SMT Gullwing			
Package	Sleeve		Taping	
	50pcs/sleeve		1 000pcs/reel	
DIN EN60747-5-2	———	Approved	———	Approved
Model No.	**PC929J00000F**	**PC929YJ0000F**	**PC929PJ0000F**	**PC929PYJ000F**

Please contact a local SHARP sales representative to inquire about production status.

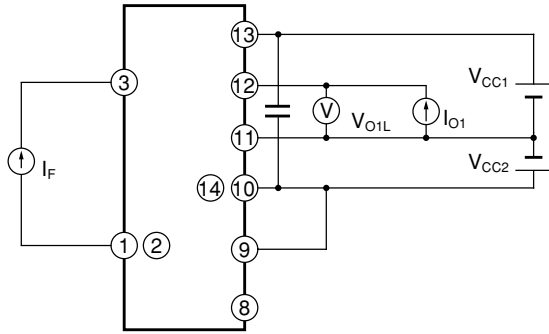**Fig.1 Test Circuit for O₁ Low Level Output
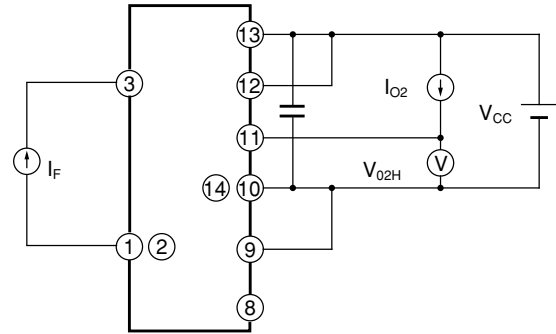Voltage**

**Fig.2 Test Circuit for O₂ High Level Output
Voltage**

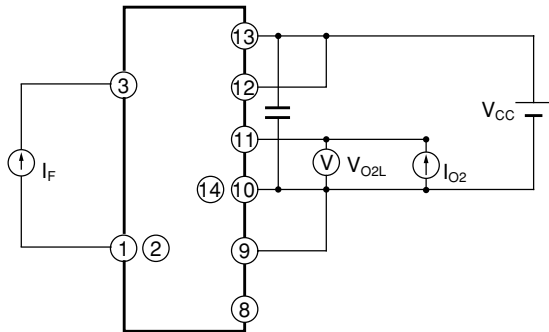**Fig.3 Test Circuit for O₂ Low Level Output
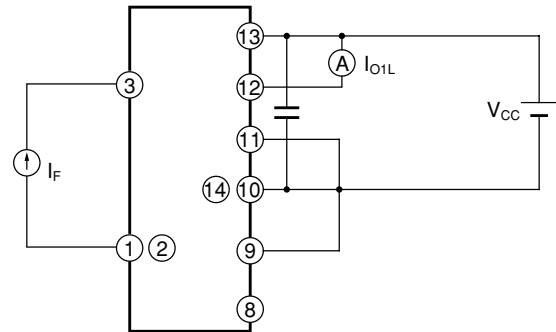Voltage**

Fig.4 Test Circuit for O₁ Leak Current

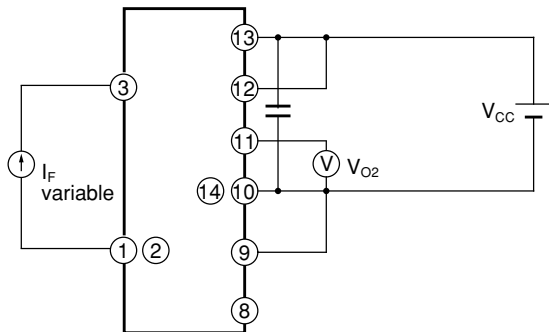**Fig.5 Test Circuit for "Low→High" Input
Threshold Current**
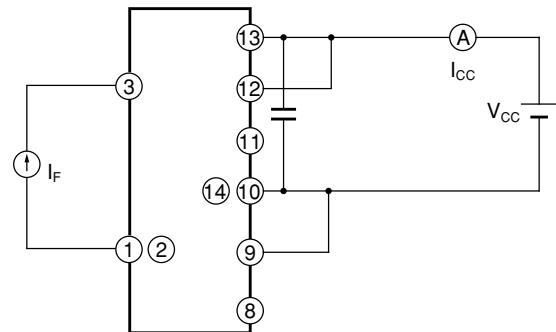

**Fig.6 Test Circuit for High Level / Low Level
Supply Current**

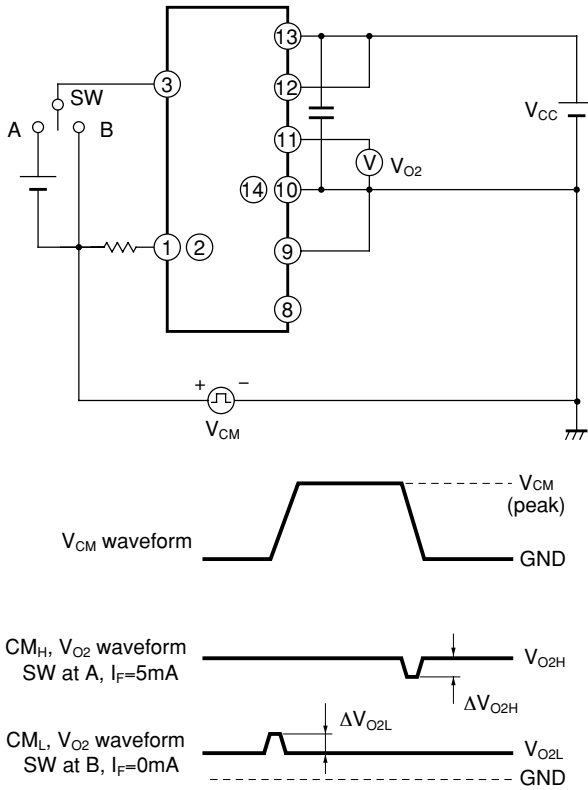## Fig.7 Test Circuit for Instantaneous Common Mode Rejection Voltage

V_{CM} waveform

CM$_H$, V_{O2} waveform
SW at A, I_F=5mA

CM$_L$, V_{O2} waveform
SW at B, I_F=0mA

Fig.8 Test Circuit for Response Time

$t_r=t_f=0.01\mu s$
Pulse width 5μs
Duty ratio 50%

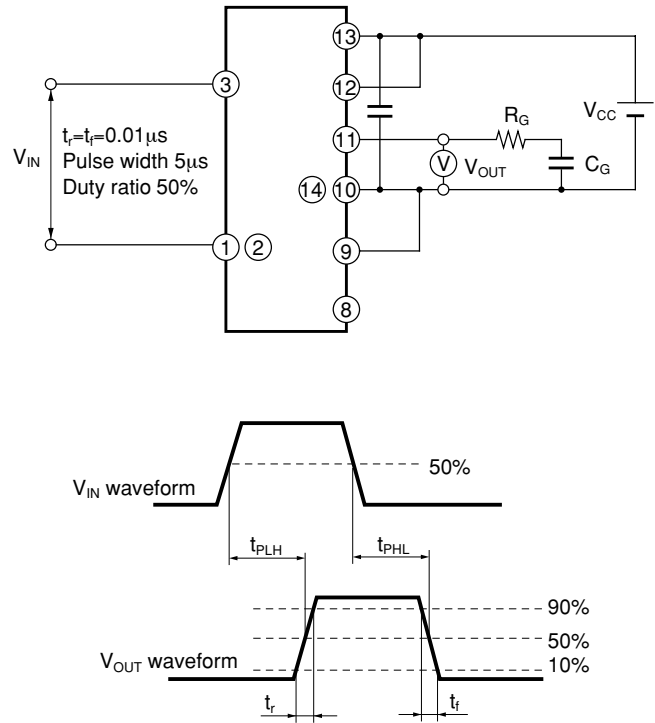V_{IN} waveform

V_{OUT} waveform

Fig.9 Test Circuit for Overcurrent Detection Voltage, Overcurrent Detection Voltage Hysteresis
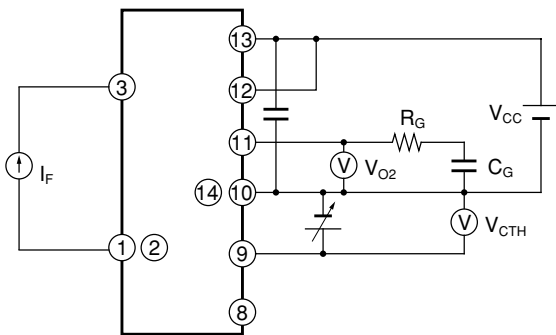

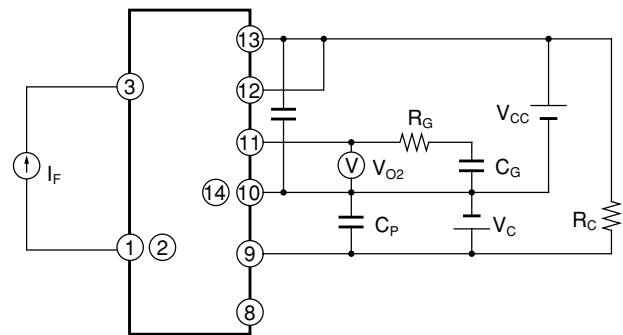## Fig.10 Test Circuit for O$_2$ Output Voltage at Overcurrent Protection

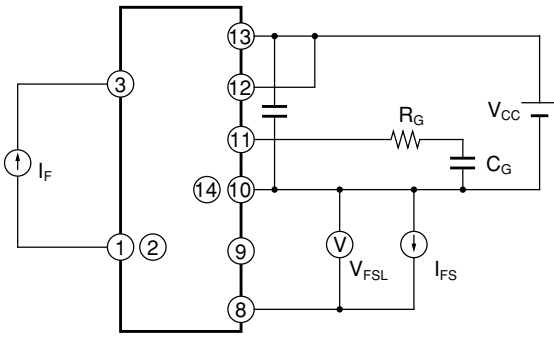## Fig.11 Test Circuit for O₁ Low Level Error Signal Voltage

Fig.12 Test Circuit for High Level Error Signal Current
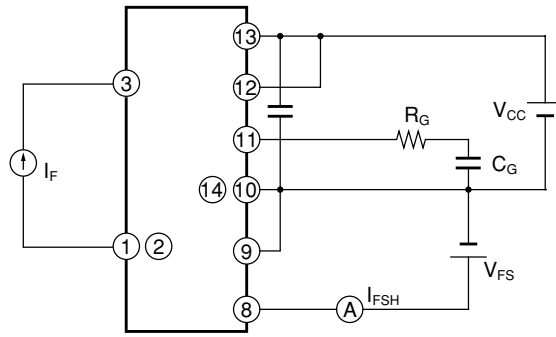
Fig.13 Test Circuit for O₂ "High→Low" Propagation Delay Time at Overcurrent Protection, O₂ Fall Time at Overcurrent Protection

$t_r = t_f = 0.01\,\mu s$
Pulse width 25 μs
Duty ratio 25%
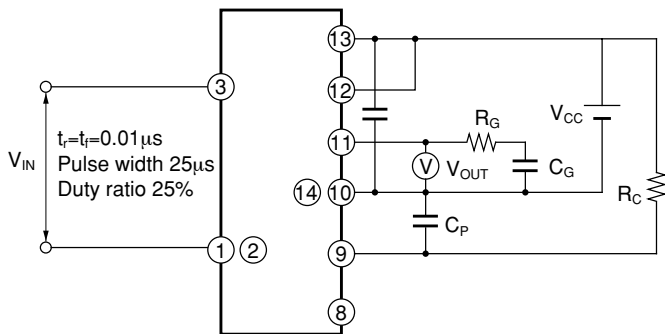
Fig.14 Error Signal "High→Low" propagation Delay Time, Error Signal Output Pulse Width

$t_r = t_f = 0.01\,\mu s$
Pulse width 25 μs
Duty ratio 25%

I_F (Input current)

V_{O2} (O₂ output voltage)

t_{pCOTF} 90% 50% 10%

V_{OE}

C (Detecting terminal)

t_{pCOHL} 90% 10%

Error detection threshold voltage (V_{CTH})

FS (Error signal output)

t_{pCFHL} 50% Δt_{FS} 50%
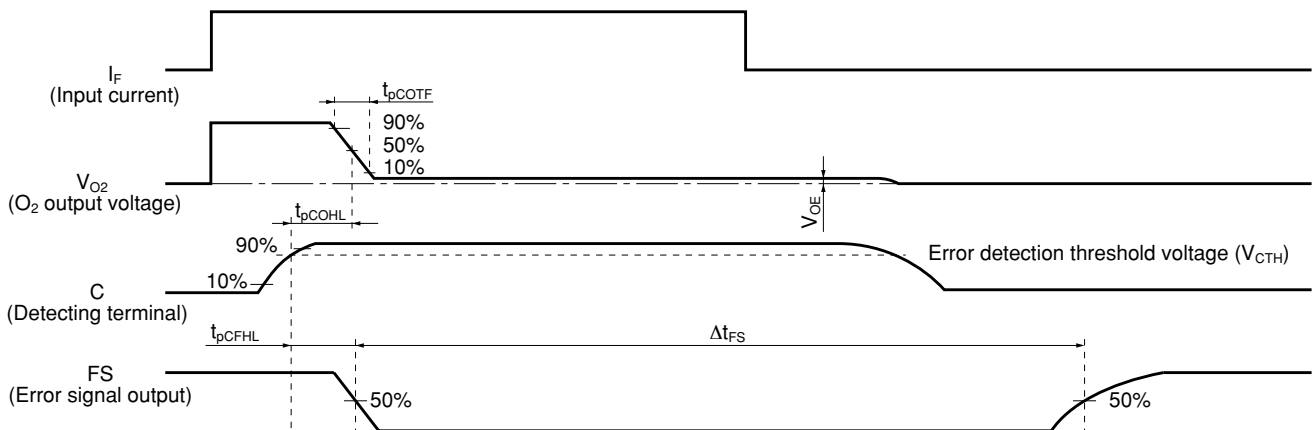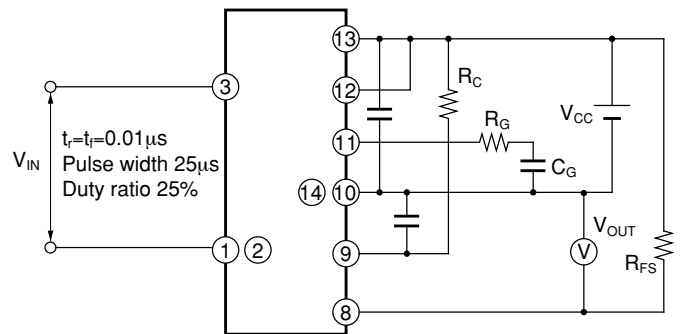
Fig.15 Forward Current vs. Ambient Temperature

Forward current I_F (mA) vs. Ambient temperature T_a (°C)
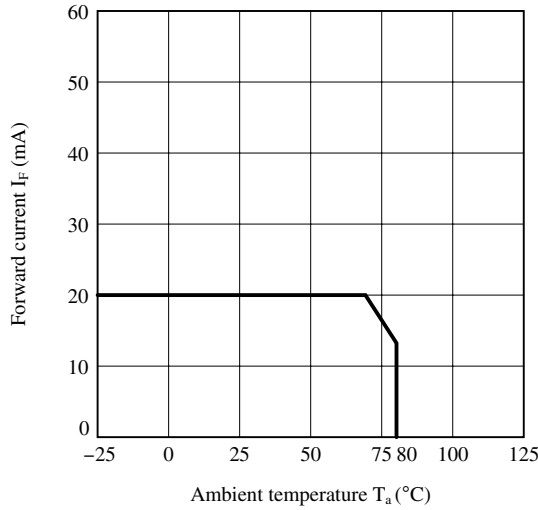
Fig.16 Power Dissipation vs. Ambient Temperature

Power dissipation Po, P_{tot} (mW) vs. Ambient temperature T_a (°C); curves labeled P_O and P_{tot}
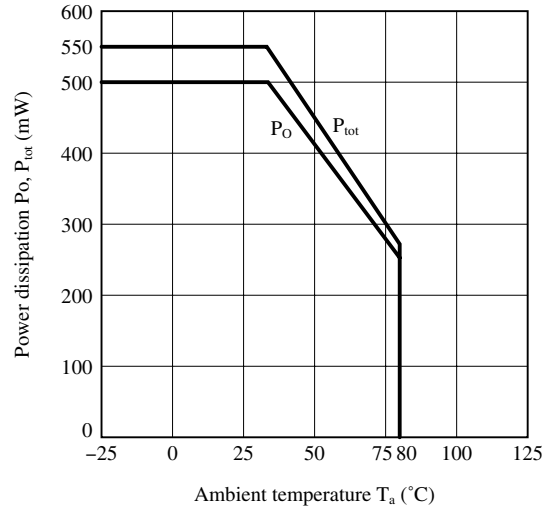
Fig.17 Forward Current vs. Forward Voltage

Forward current I_F (mA) vs. Forward voltage V_F (V); curves labeled $T_a=0$°C, 25°C, 50°C, 70°C
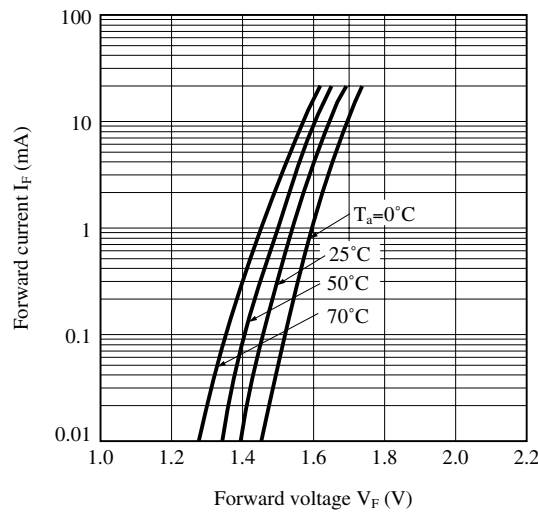
Fig.18 "Low→High" Relative Input Threshold Current vs. Supply Voltage

Relative input threshold current I_{FLH} vs. Supply voltage V_{CC} (V); $T_a=25$°C. Value of $V_{CC}=24$V assumes 1.
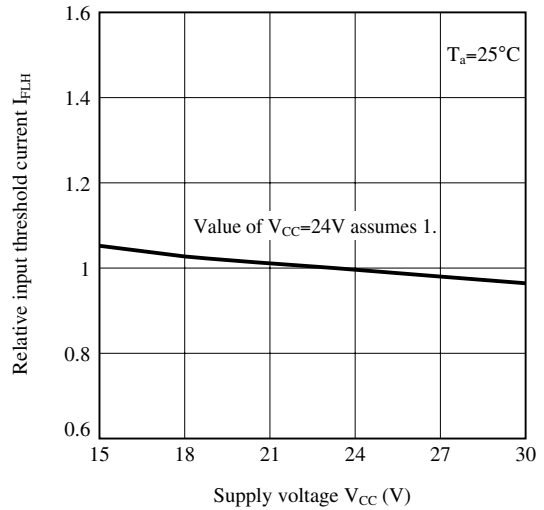
Fig.19 "Low→High" Relative Input Threshold Current vs. Ambient Temperature

Relative input threshold current I_{FLH} vs. Ambient temperature T_a (°C); $V_{CC}=24$V. $I_{FLH}=1$ at $T_a=25$°C
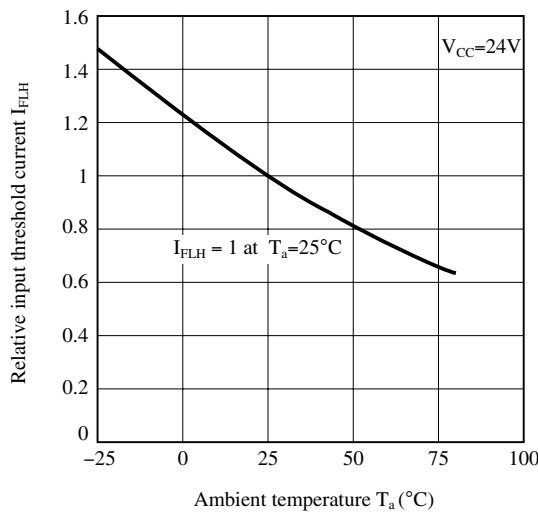
Fig.20 O_1 Low Level Output Voltage vs. O_1 Output Current

O_1 low level output voltage V_{O1L} (V) vs. O_1 output current I_{O1} (A); $T_a=25$°C, $V_{CC1}=12$V, $V_{CC2}=-12$V, $I_F=5$mA

Fig.21 O₁ Low Level Output Voltage vs. Ambient Temperature

O₁ low level output voltage V_{O1L} (V)

V_{CC1}=12V
V_{CC2}=−12V
I_F=5mA

I_{O1}=0.1A
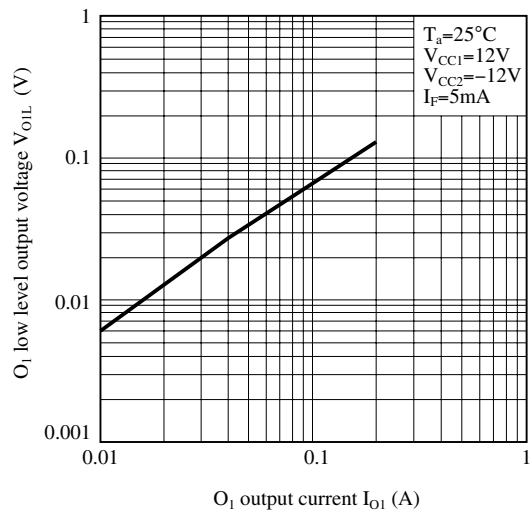
Ambient temperature T_a (°C)
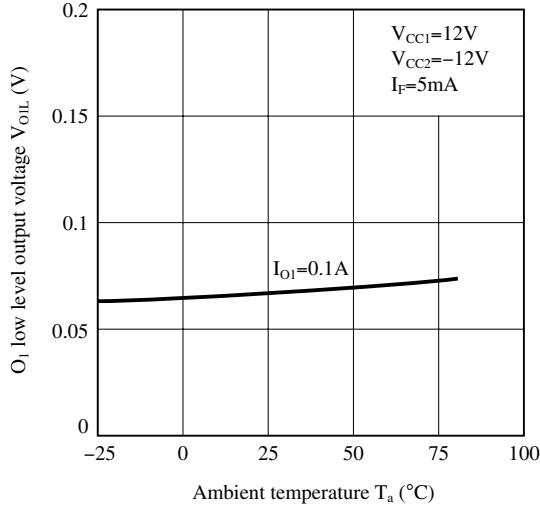
Fig.22 O₁ Leak Current vs. Ambient Temperature

O₁ leak current I_{O1L} (A)

V_{CC}=V_{O1}=35V
I_F=0mA

Ambient temperature T_a (°C)
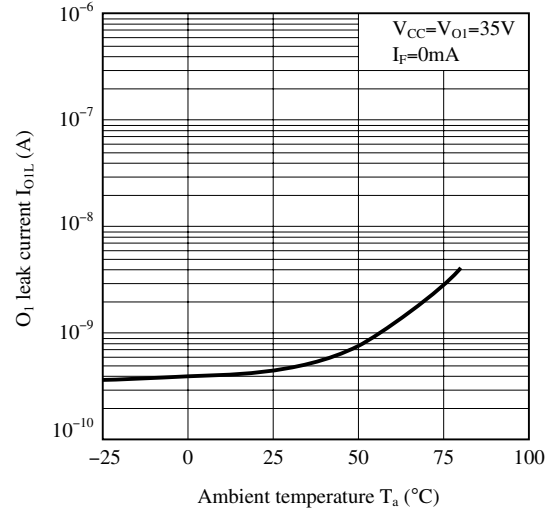
Fig.23 O₂ High Level Output Voltage vs. Supply Voltage

O₂ high level output voltage V_{O2H} (V)

T_a=25°C
I_F=5mA
I_{O2}=−0.1A

Supply voltage V_{CC} (V)

Fig.24 O₂ High Level Output Voltage vs. Ambient Temperature

O₂ high level output voltage V_{O2H} (V)

V_{CC}=24V
I_F=5mA

I_{O2}=0A

I_{O2}=−0.1A
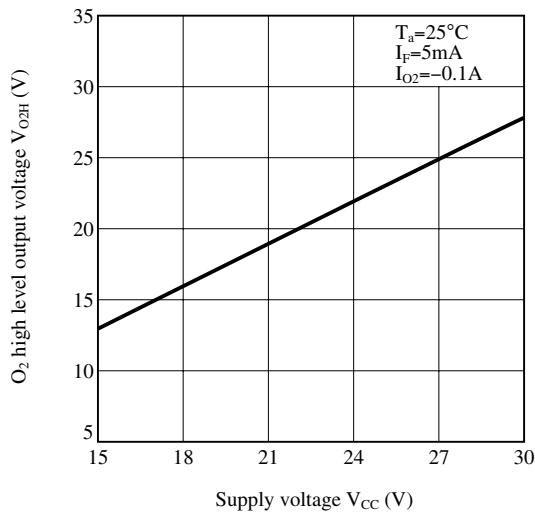
Ambient temperature T_a (°C)
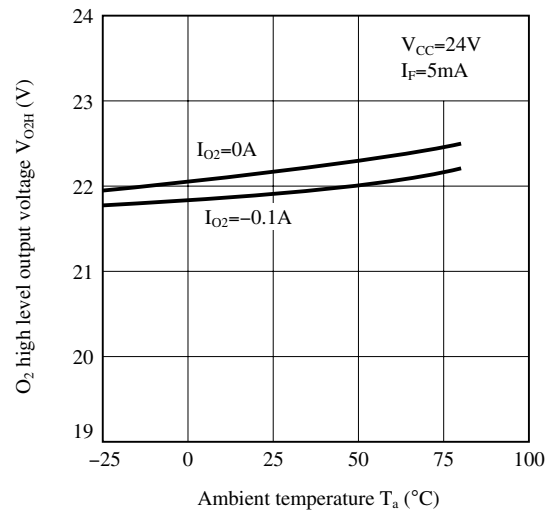
Fig.25 O₂ Low Level Output Voltage vs. O₂ Output Current

O₂ low level output voltage V_{O2L} (V)

V_{CC}=24V
T_a=25°C

O₂ output current I_{O2} (A)

Fig.26 O₂ Low Level Output Voltage vs. Ambient Temperature

O₂ low level output voltage V_{O2L} (V)

V_{CC}=24V
I_F=5mA

I_{O2}=−0.1A
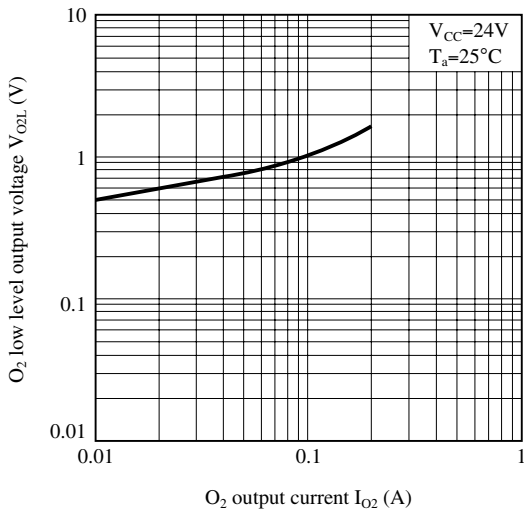
Ambient temperature T_a (°C)
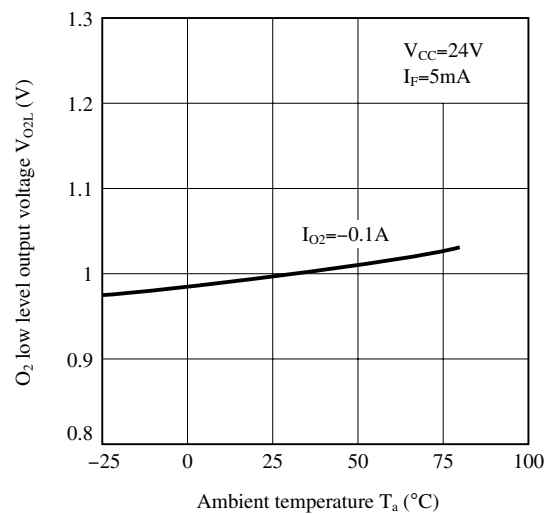
Fig.27 High Level Supply Current vs. Supply Voltage
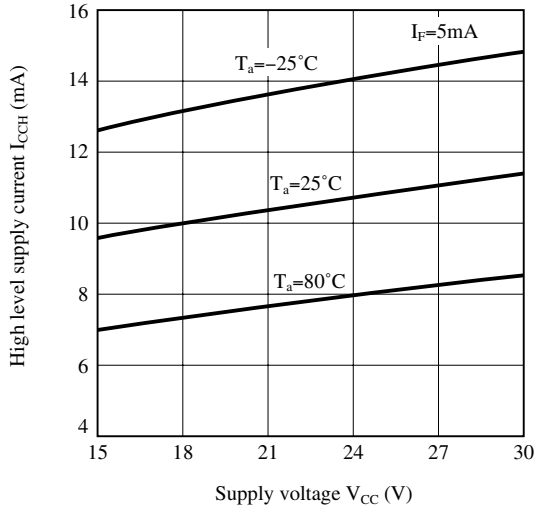
Fig.28 Low Level Supply Current vs. Supply Voltage

Fig.29 Propagation Delay Time vs. Forward Current

Fig.30 Propagation Delay Time vs. Ambient Temperature

Fig.31 Overcurrent Detecting Voltage vs. Ambient Temperature
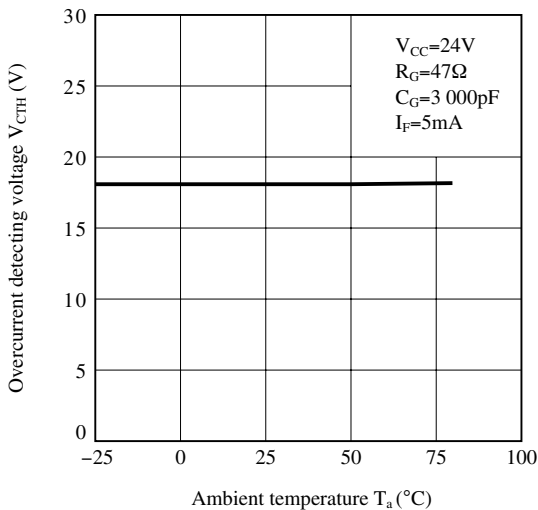
Fig.32 O_2 Output Fall Time at Protection from Overcurrent/O_2 "High-Low" Propagation Delay Time at Protection from Overcurrent vs. Ambient Temperature
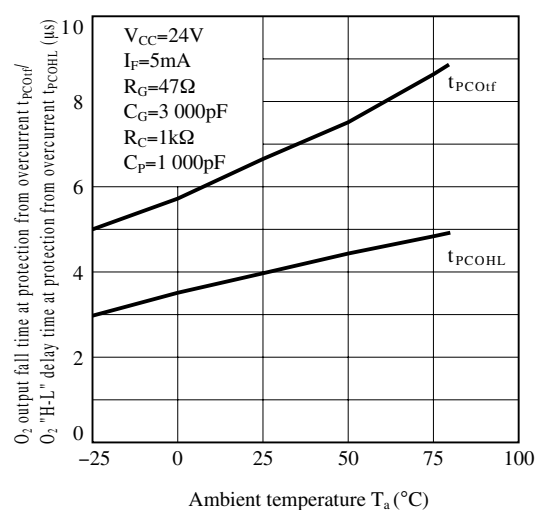
Fig.33 Error Signal "High-Low" Propagation Delay Time vs. Ambient Temperature
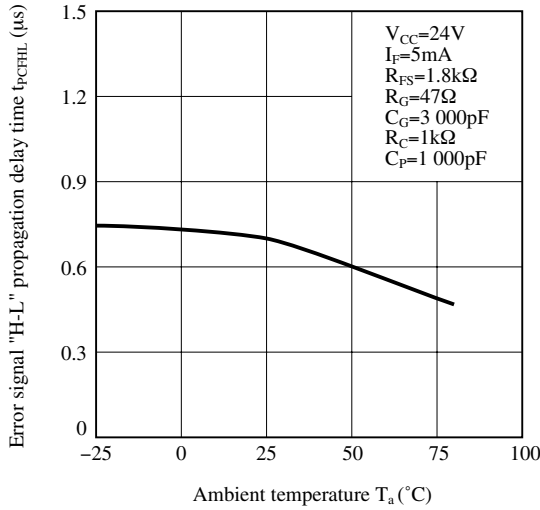
Error signal "H-L" propagation delay time t_{PCFHL} (µs) vs. Ambient temperature T_a (°C)

V_{CC}=24V
I_F=5mA
R_{FS}=1.8kΩ
R_G=47Ω
C_G=3 000pF
R_C=1kΩ
C_P=1 000pF

Fig.34 O₂ Output Voltage at Protection from Overcurrent vs. Ambient Temperature

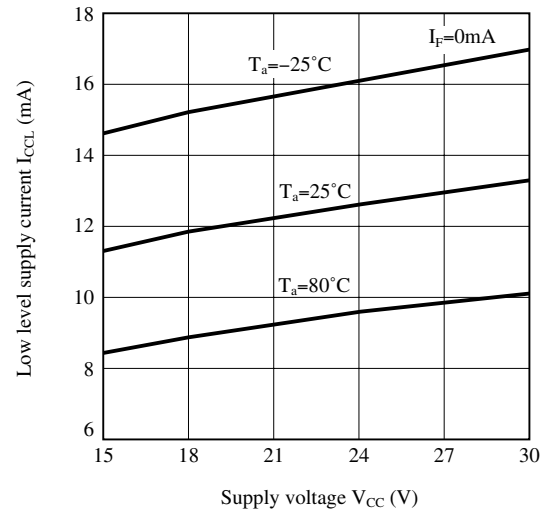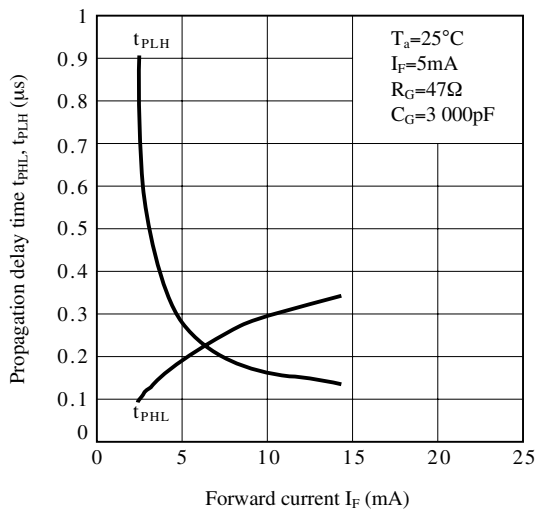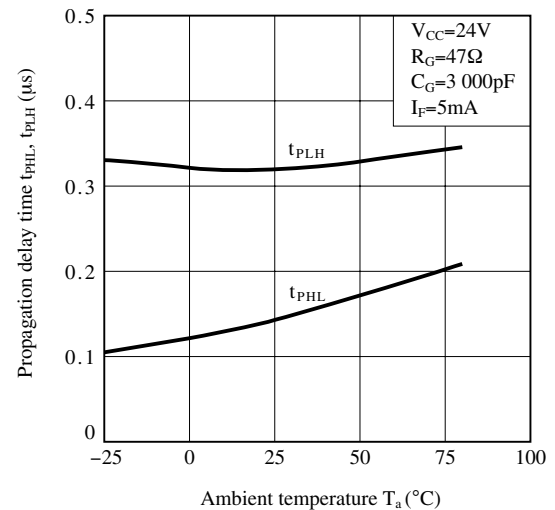O₂ output voltage at protection from overcurrent primary side mark V_{OE} (V) vs. Ambient temperature T_a (°C)

V_{CC}=24V
I_F=5mA
R_G=47Ω
C_G=3 000pF
R_C=1kΩ
C_P=1 000pF

Fig.35 Low Level Error Signal Voltage vs. Ambient Temperature

Low level error signal voltage V_{FSL} (V) vs. Ambient temperature T_a (°C)

V_{CC}=24V
I_F=5mA
I_{FS}=10mA
R_G=47Ω
C_G=3 000pF
C=OPEN
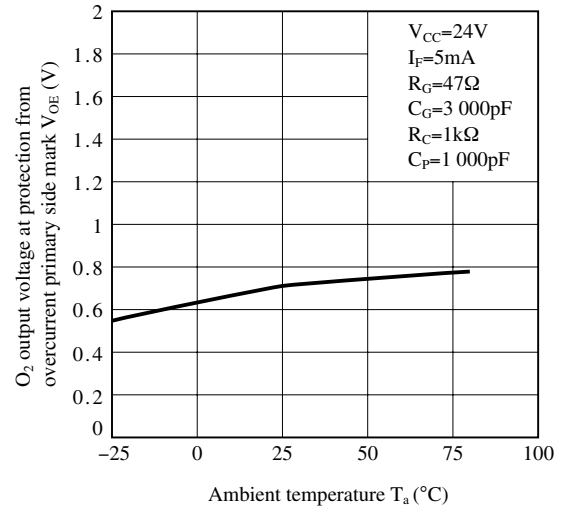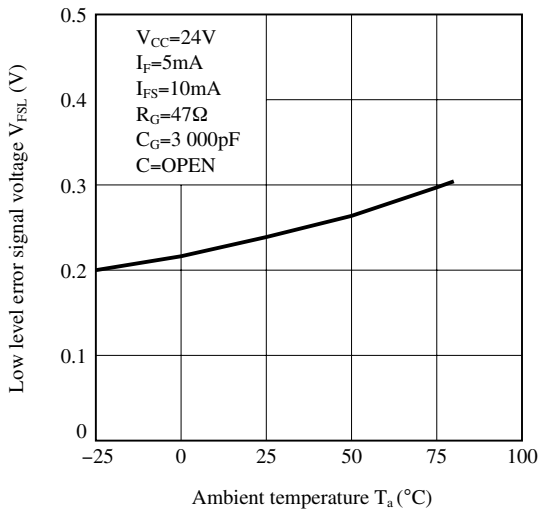
Fig.36 High Level Error Signal Current vs. Ambient Temperature

High level error signal current I_{FSH} (A) vs. Ambient temperature T_a (°C)

V_{CC}=24V
I_F=5mA
R_G=47Ω
C_G=3 000pF
V_C=0
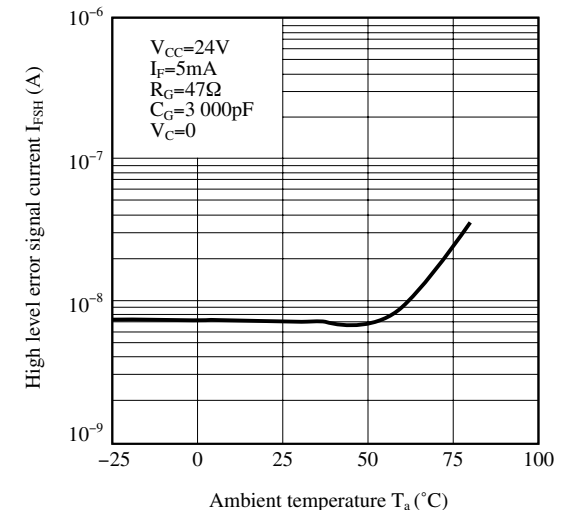
Fig.37 Error signal output pulse width vs. Ambient Temperature

Error signal output pulse width Δt_{FS} (µs) vs. Ambient temperature T_a (°C)

V_{CC}=24V
I_F=5mA
R_{FS}=1.8kΩ
R_G=47Ω
C_G=3 000pF
R_C=1kΩ
C_P=1 000pF
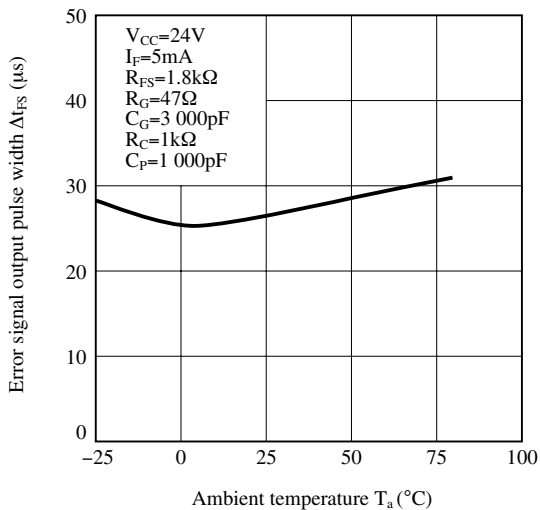
Fig.38 Overcurrent Detecting Voltage vs. Supply Voltage

Overcurrent detecting voltage V_{CTH} (V) vs. Supply voltage V_{CC} (V)

T_a=25°C
I_F=5mA
V_{CC}=24V
R_G=47Ω
C_G=3 000pF
FS=OPEN
C_P=1 000pF

Added resistance=0Ω
0.5kΩ
1kΩ
1.5kΩ

Fig.39 Overcurrent Detecting Voltage - Supply Voltage Characteristics Test Circuit

Fig.40 Example of The Application Circuit (IGBT Drive for Inverter)

- In order to stabilize the power supply line, we recommend to locate a bypass capacitor C_B (0.01μF or more) between V_{CC} and GND near photocoupler.

- In order to stabilize the detecting voltage of pin-C, we recommend to locate a capacitor C_P (approximately 1 000pF) between pin-C and GND, and a resistor R_C (approximately 1.0kΩ) between V_{CC} and pin-C. However, the rise time of the detection voltage at Pin-C varies along with the time constants of C_P and R_C. So, please make sure the device works properly in actual conditions.

- For the diode D, which is located between pin-C and collector of IGBT, we recommend to use a diode that has the withstand voltage characteristic equivalent to IGBT and also has little leak current.

- In order to prevent the failure mode or breakdown of pin-C from V_{CE} variation of IGBT, we recommend to locate a resistor R_2 (approximately 10kΩ) and a diode D1 at near pin-C, and a resistor R_3 (approximately 50kΩ) and a diode D_2 at between pin-C and GND.

This application circuit shows the general example of a circuit, and is not a design guarantee for right operation.

Fig.41 Operations of Shortcircuit Protector Circuit

Feedback to primary side

1. Detection of increase in $V_{CE(sat)}$ of IGBT due to overcurrent by means of C terminal (pin ⑨)
2. Reduction of the IGBT gate voltage, and suppression of the collector current
3. Simultaneous output of signals to indicate the shortcircuit condition (FS signal) from FS (pin ⑧) terminal to the microcomputer
4. Judgement and processing by the microcomputer ——→ In the case of instantaneous shortcircuit, run continues.
   └——→ At fault, input to the photocoupler is cut off, and IGBT is turned OFF.

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

■ Design Considerations

● Notes about static electricity

Transistor of detector side in bipolar configuration may be damaged by static electricity due to its minute design.

When handling these devices, general countermeasure against static electricity should be taken to avoid breakdown of devices or degradation of characteristics.

● Design guide

In order to stabilize power supply line, we should certainly recommend to connect a by-pass capacitor of $0.01\mu F$ or more between V_{CC} and GND near the device.

We recommed to use approximately 1 000pF of capacitor between C-pin and GND in order to prevent miss opration by noise.

In the case that capacitor is used approximately $1k\Omega$ of resistance shall be recommended to use between V_{CC} and C-pin However, the rise time of C-pin shall be changed by time constant of added CR, so that please use this device after confirmation.

In case that some sudden big noise caused by voltage variation is provided between primary and secondary terminals of photocoupler some current caused by it is floating capacitance may be generated and result in false operation since current may go through LED or current may change.

If the photocoupler may be used under the circumstances where noise will be generated we recommend to use the bypass capacitors at the both ends of LED.

The detector which is used in this device, has parasitic diode between each pins and GND.

There are cases that miss operation or destruction possibly may be occurred if electric potential of any pin becomes below GND level even for instant.

Therefore it shall be recommended to design the circuit that electric potential of any pin does not become below GND level.

This product is not designed against irradiation and incorporates non-coherent LED.
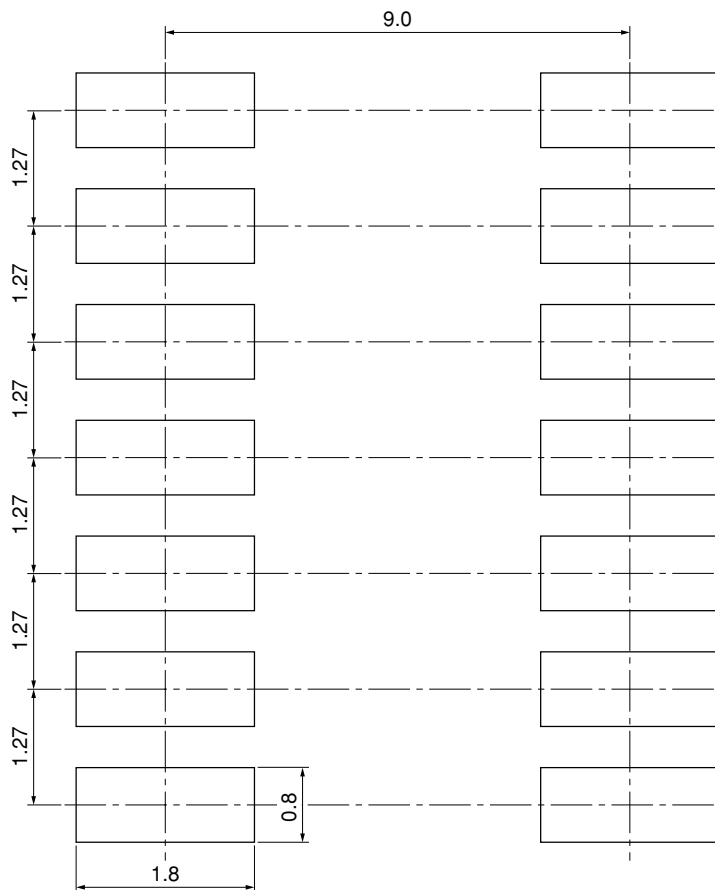
● **Degradation**

In general, the emission of the LED used in photocouplers will degrade over time.

In the case of long term operation, please take the general LED degradation (50% degradation over 5 years) into the design consideration.

Please decide the input current which become 2 times of MAX. I_{FLH}.

● **Recommended Foot Print (reference)**

(Unit : mm)

☆ For additional design assistance, please review our corresponding Optoelectronic Application Notes.
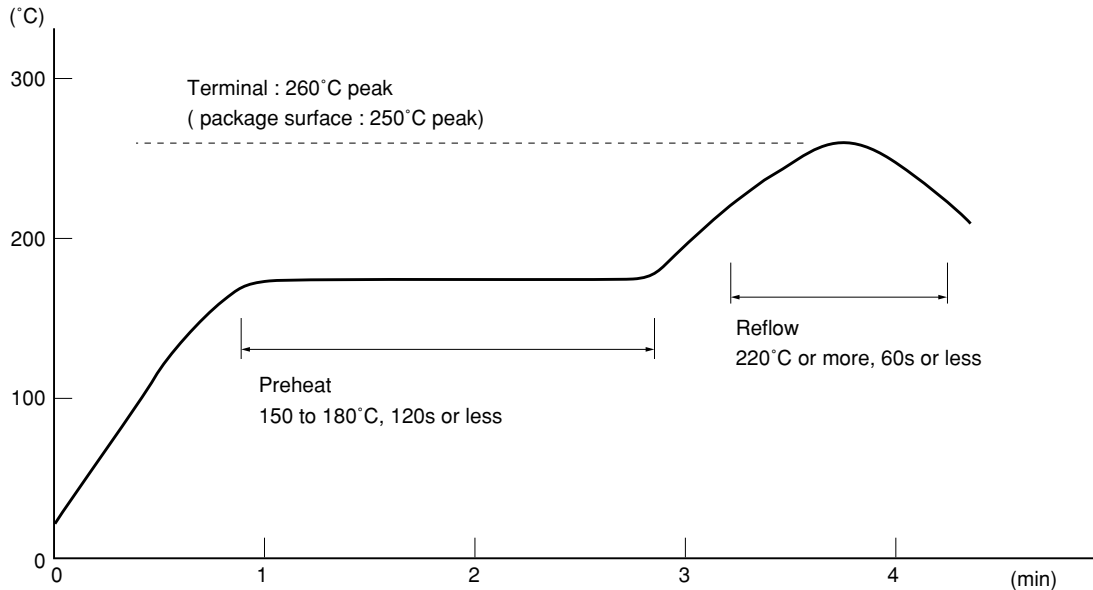
■ Manufacturing Guidelines
● Soldering Method
Reflow Soldering:

Reflow soldering should follow the temperature profile shown below.

Soldering should not exceed the curve of temperature profile and time.

Please don't solder more than twice.

(˚C)

300 — Terminal : 260˚C peak
(package surface : 250˚C peak)

200 —

Reflow
220˚C or more, 60s or less

100 —

Preheat
150 to 180˚C, 120s or less

0
0   1   2   3   4   (min)

Flow Soldering :

Due to SHARP's double transfer mold construction submersion in flow solder bath is allowed under the below listed guidelines.

Flow soldering should be completed below 260˚C and within 10s.

Preheating is within the bounds of 100 to 150˚C and 30 to 80s.

Please don't solder more than twice.

Hand soldering

Hand soldering should be completed within 3s when the point of solder iron is below 400˚C.

Please don't solder more than twice.

Other notices

Please test the soldering method in actual condition and make sure the soldering works fine, since the impact on the junction between the device and PCB varies depending on the tooling and soldering conditions.

● Cleaning instructions

Solvent cleaning:

Solvent temperature should be 45°C or below Immersion time should be 3 minutes or less

Ultrasonic cleaning:

The impact on the device varies depending on the size of the cleaning bath, ultrasonic output, cleaning time, size of PCB and mounting method of the device.

Therefore, please make sure the device withstands the ultrasonic cleaning in actual conditions in advance of mass production.

Recommended solvent materials:

Ethyl alcohol, Methyl alcohol and Isopropyl alcohol

In case the other type of solvent materials are intended to be used, please make sure they work fine in actual using conditions since some materials may erode the packaging resin.

● Presence of ODC

This product shall not contain the following materials.

And they are not used in the production process for this product.

Regulation substances : CFCs, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methylchloroform)

Specific brominated flame retardants such as the PBBOs and PBBs are not used in this product at all.

This product shall not contain the following materials banned in the RoHS Directive (2002/95/EC).

•Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE).

■ Package specification

● Sleeve package

Package materials

Sleeve : HIPS (with anti-static material)
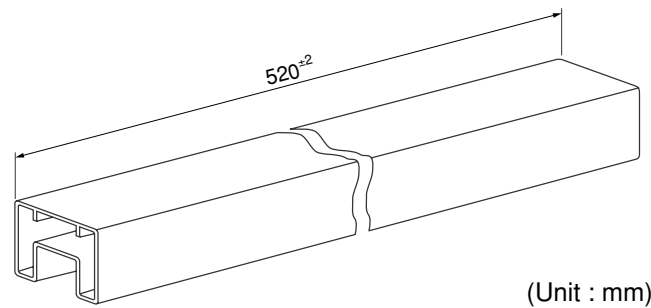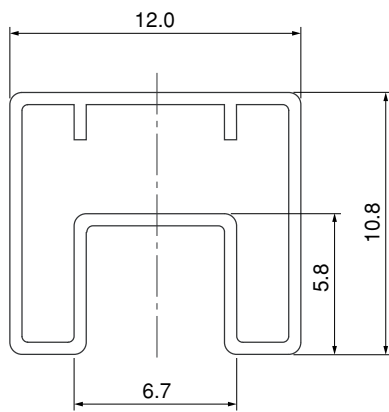
Stopper : Styrene-Elastomer

Package method

MAX. 50 pcs. of products shall be packaged in a sleeve.

Both ends shall be closed by tabbed and tabless stoppers.

The product shall be arranged in the sleeve with its primary side mark on the tabless stopper side.

MAX. 20 sleeves in one case.

Sleeve outline dimensions

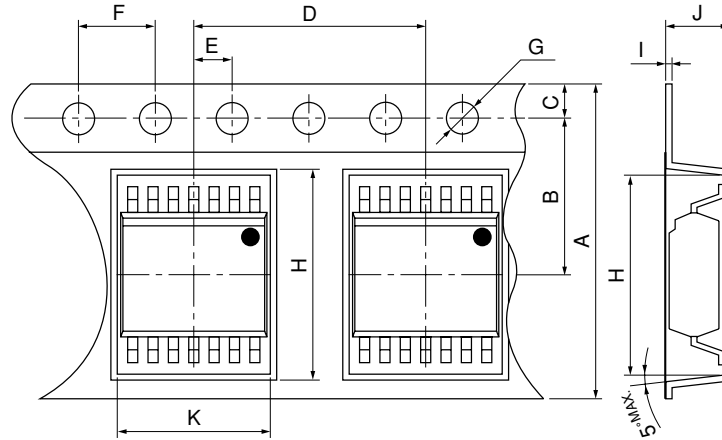(Unit : mm)

● **Tape and Reel package**

Package materials

    Carrier tape : A-PET (with anti-static material)
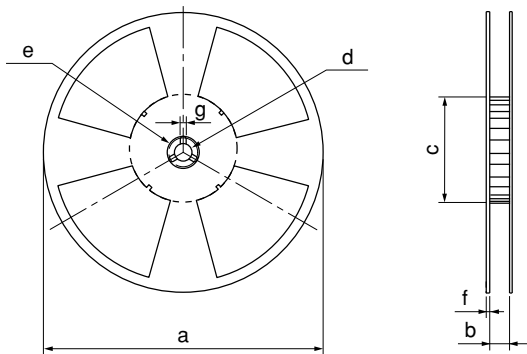
    Cover tape : PET (three layer system)

    Reel : PS

Carrier tape structure and Dimensions

Dimensions List   (Unit : mm)

A	B	C	D	E	F	G
$16.0^{\pm0.3}$	$7.5^{\pm0.1}$	$1.75^{\pm0.1}$	$12.0^{\pm0.1}$	$2.0^{\pm0.1}$	$4.0^{\pm0.1}$	$\phi1.5^{+0.1}_{-0}$
H	I	J	K			
$10.4^{\pm0.1}$	$0.4^{\pm0.05}$	$4.2^{\pm0.1}$	$9.7^{\pm0.1}$			

Reel structure and Dimensions

Dimensions List   (Unit : mm)

a	b	c	d
330	$17.5^{\pm1.5}$	$100^{\pm1.0}$	$13^{\pm0.5}$
e	f	g	
$23^{\pm1.0}$	$2.0^{\pm0.5}$	$2.0^{\pm0.5}$	

Direction of product insertion

Pull-out direction
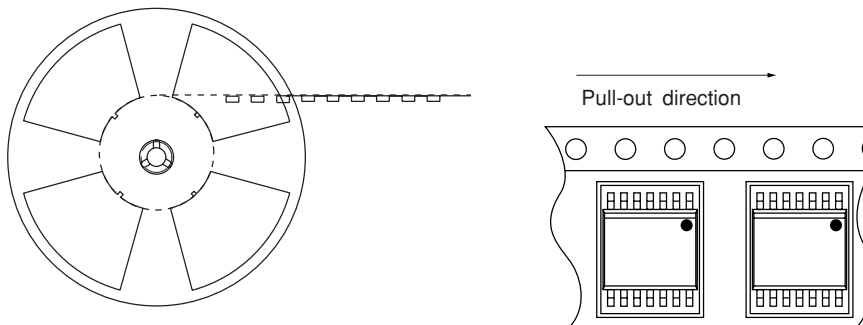
[Packing : 1 000pcs/reel]

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(i) The devices in this publication are designed for use in general electronic equipment designs such as:
--- Personal computers
--- Office automation equipment
--- Telecommunication equipment [terminal]
--- Test and measurement equipment
--- Industrial control
--- Audio visual equipment
--- Consumer electronics
(ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection with equipment that requires higher reliability such as:
--- Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
--- Traffic signals
--- Gas leakage sensor breakers
--- Alarm equipment
--- Various safety devices, etc.
(iii) SHARP devices shall not be used for or in connection with equipment that requires an extremely high level of reliability and safety such as:
--- Space applications
--- Telecommunication equipment [trunk lines]
--- Nuclear power control equipment
--- Medical and other life support equipment (e.g., scuba).

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