

To our customers,

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## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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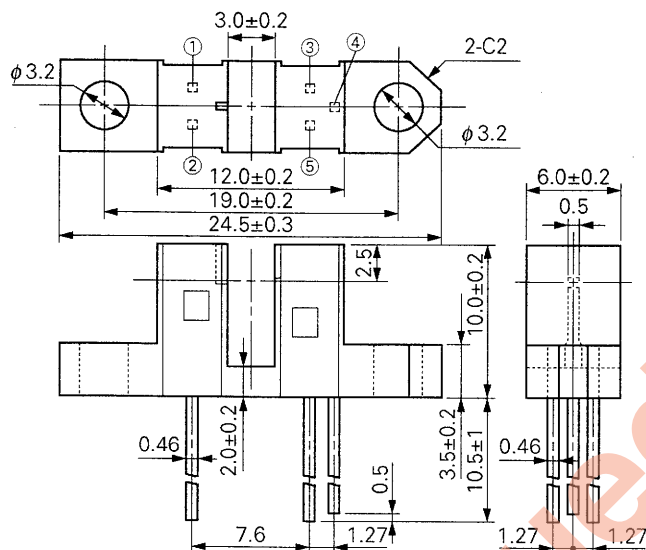
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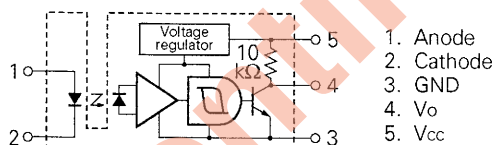
### PHOTO IC INTERRUPTER

— NEPOC SERIES —

**PACKAGE DIMENSIONS** (Unit: mm)



**CONNECTION DIAGRAM**



### DESCRIPTION

The PS5001HR photointerrupter module is a GaAs Light Emitting Diode coupled to a Si monolithic integrated circuit including a Photodiode in a plastic housing.

The output incorporates a schmitt trigger circuit which provides hysteresis for noise immunity and pulse shaping.

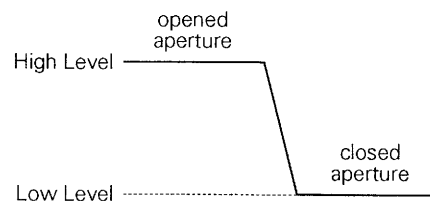
### FEATURES

- Built-in schmitt trigger circuit
- Low threshold input current  
( $I_{FLH} = 5 \text{ mA MAX. @ } V_{CC} = 5 \text{ V}$ )
- TTL, LSTTL, CMOS compatible
- Wide supply voltage capability  
( $V_{CC} = 4.5 \text{ to } 17 \text{ V}$ )
- High On/Off resolution (Slit width: 0.5 mm (equivalent to 0.5 mm<sup>2</sup> aperture))
- High speed switching ( $t_{PLH} (t_{PHL}) = 3 \mu\text{s TYP.}$   
 $t_r = 100 \text{ ns,}$   
 $t_r = 50 \text{ ns TYP.}$   
 $@ R_L = 280 \Omega$ )
- Active "High"
- Build-in pull up resistor

### APPLICATIONS

- PPC
- FACSIMILE
- PRINTER
- FDD

### OUTPUT PATTERN



### QUALITY GRADE

Standard

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

**ABSOLUTE MAXIMUM RATINGS ( $T_a = 25\text{ }^{\circ}\text{C}$ )****Diode**

|                   |       |    |    |
|-------------------|-------|----|----|
| Reverse Voltage   | $V_R$ | 6  | V  |
| Forward Current   | $I_F$ | 50 | mA |
| Power Dissipation | $P_D$ | 75 | mW |

**Detector**

|                          |           |             |                    |
|--------------------------|-----------|-------------|--------------------|
| Supply Voltage           | $V_{CC}$  | 17          | V                  |
| Low Level Output Current | $I_{OL}$  | 50          | mA                 |
| Power Dissipation        | $P_C$     | 250         | mW                 |
| Storage Temperature      | $T_{stg}$ | -40 to +100 | $^{\circ}\text{C}$ |
| Operating Temperature    | $T_{opt}$ | -30 to +85  | $^{\circ}\text{C}$ |

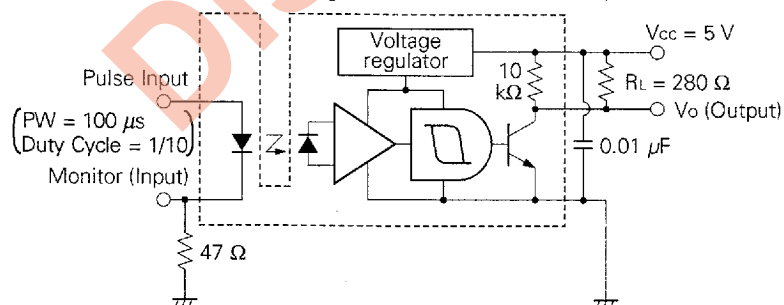
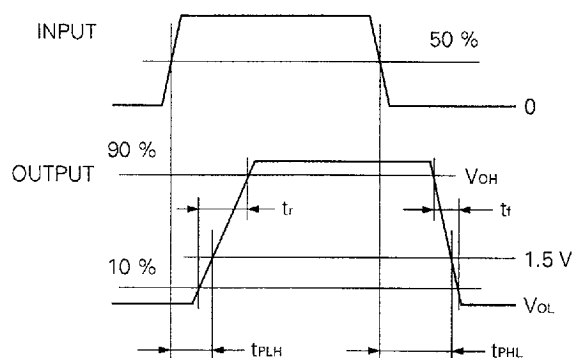
**RECOMMENDED OPERATING CONDITIONS ( $T_a = 25\text{ }^{\circ}\text{C}$ )**

| CHARACTERISTIC        | SYMBOL    | MIN. | TYP. | MAX. | UNIT               |
|-----------------------|-----------|------|------|------|--------------------|
| Operating Temperature | $T_{opt}$ | -10  |      | +60  | $^{\circ}\text{C}$ |
| Supply Voltage        | $V_{CC}$  | 4.5  | 5    | 12   | V                  |
| Forward Current       | $I_F$     | 5    |      | 20   | mA                 |

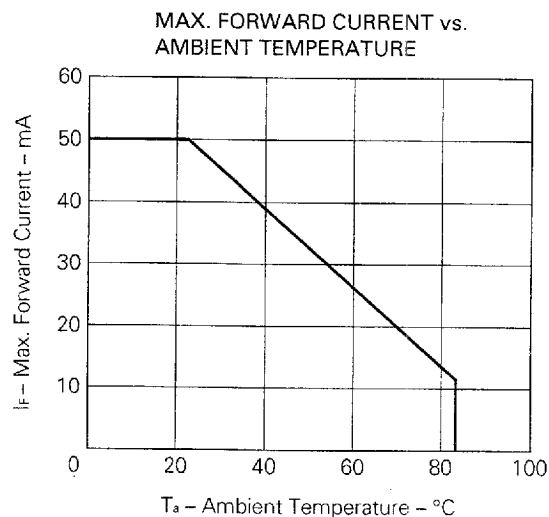
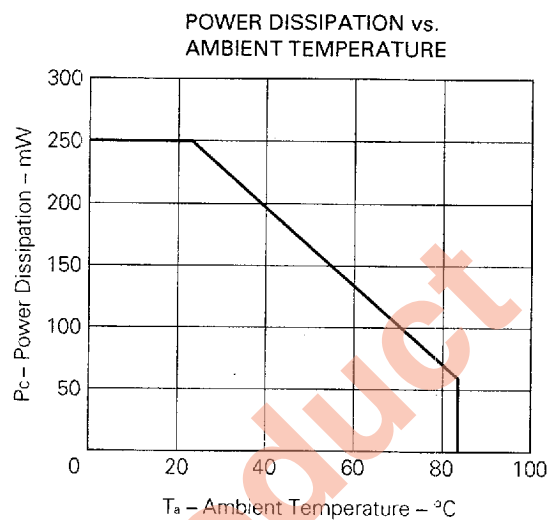
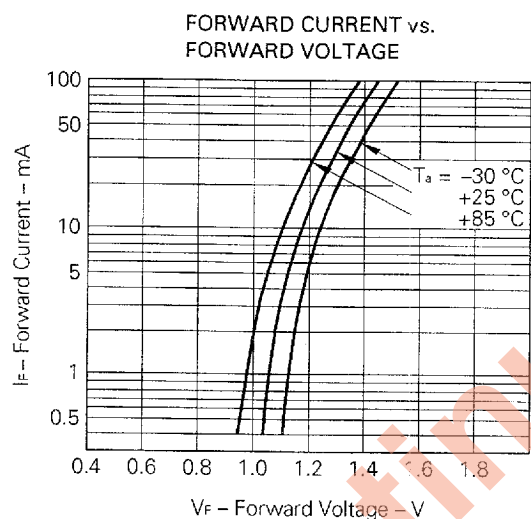
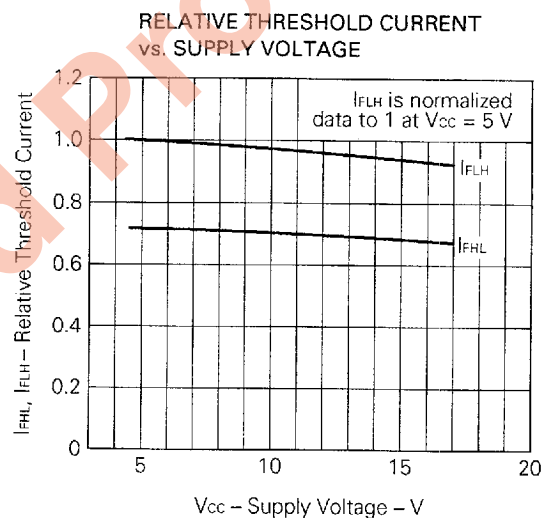
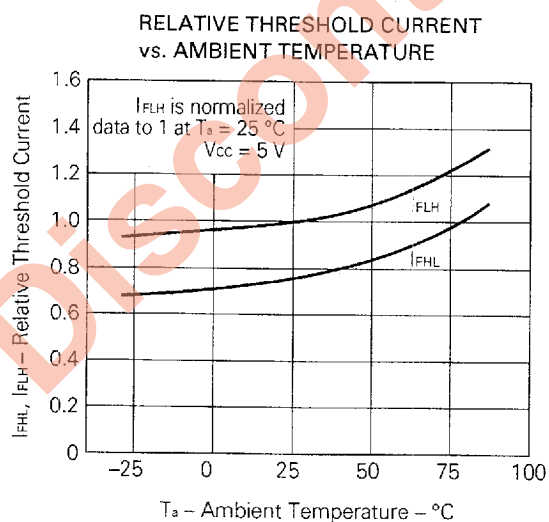
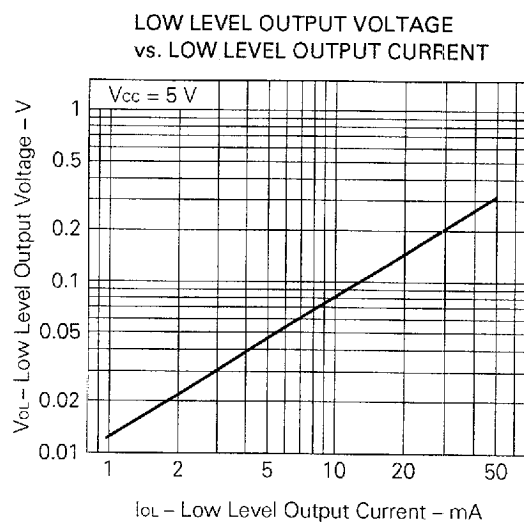
\* By-pass capacitor of more than  $0.01\text{ }\mu\text{F}$  is used between  $V_{CC}$  and GND near device.

**ELECTRICAL CHARACTERISTICS ( $T_a = 25\text{ }^{\circ}\text{C}$ )**

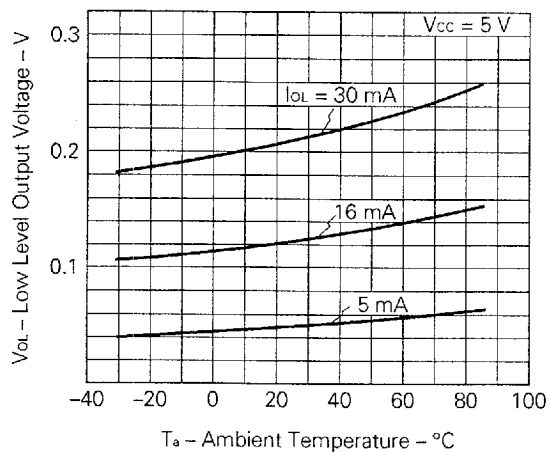
| CHARACTERISTIC |                           | SYMBOL            | MIN. | TYP. | MAX. | UNIT          | TEST CONDITIONS                                                           |
|----------------|---------------------------|-------------------|------|------|------|---------------|---------------------------------------------------------------------------|
| Diode          | Forward Voltage           | $V_F$             |      | 1.1  | 1.4  | V             | $I_F = 5\text{ mA}$                                                       |
|                | Reverse Current           | $I_R$             |      |      | 10   | $\mu\text{A}$ | $V_R = 5\text{ V}$                                                        |
|                | Junction Capacitance      | $C_t$             |      | 20   |      | pF            | $V = 0, f = 1\text{ MHz}$                                                 |
| Detector       | Low Level Output Voltage  | $V_{OL}$          |      | 0.15 | 0.4  | V             | $I_{OL} = 16\text{ mA}, V_{CC} = 5\text{ V}$                              |
|                | High Level Output Voltage | $V_{OH}$          | 4.9  |      |      | V             | $V_{CC} = 5\text{ V}, I_F = 5\text{ mA}$                                  |
|                | Low Level Supply Current  | $I_{CCL}$         |      | 2.5  | 5    | mA            | $V_{CC} = 5\text{ V}, I_F = 0$                                            |
|                | High Level Supply Current | $I_{CCH}$         |      | 1    | 3    | mA            | $V_{CC} = 5\text{ V}, I_F = 5\text{ mA}$                                  |
| Coupled        | Threshold Input Current   | $I_{FLH}$         |      |      | 5    | mA            | $V_{CC} = 5\text{ V}$                                                     |
|                | Hysteresis Ratio          | $I_{FHL}/I_{FLH}$ |      | 0.7  |      |               | $V_{CC} = 5\text{ V}$                                                     |
|                | Propagation Delay Time    | $t_{PLH}$         |      | 3    | 9    | $\mu\text{s}$ | $V_{CC} = 5\text{ V}$<br>$I_F = 5\text{ mA}$<br>$R_L = 280\text{ }\Omega$ |
|                |                           | $t_{PHL}$         |      | 3    | 9    | $\mu\text{s}$ |                                                                           |
|                | Rise Time                 | $t_r$             |      | 100  | 300  | ns            |                                                                           |
|                | Fall Time                 | $t_f$             |      | 50   | 150  | ns            |                                                                           |

**Test Circuit for Switching Time**

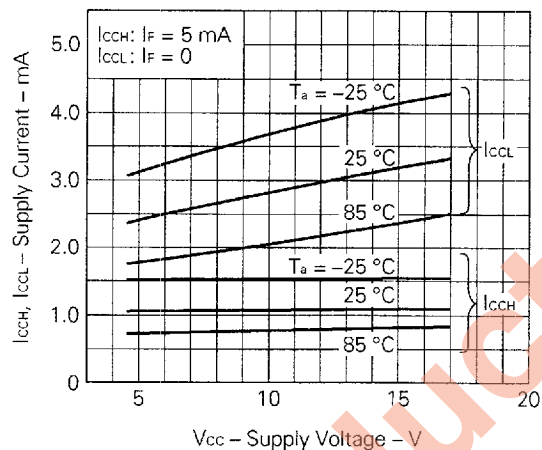
ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ )



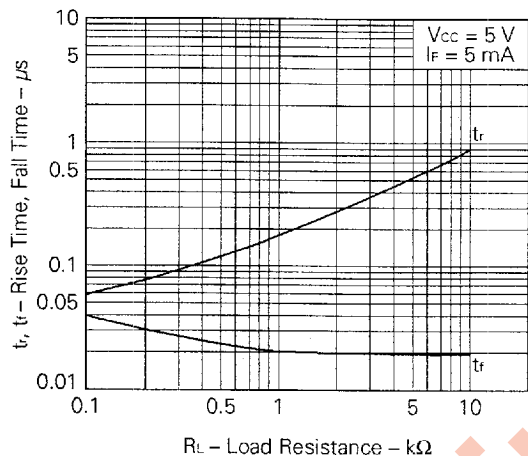
LOW LEVEL OUTPUT VOLTAGE  
vs. AMBIENT TEMPERATURE



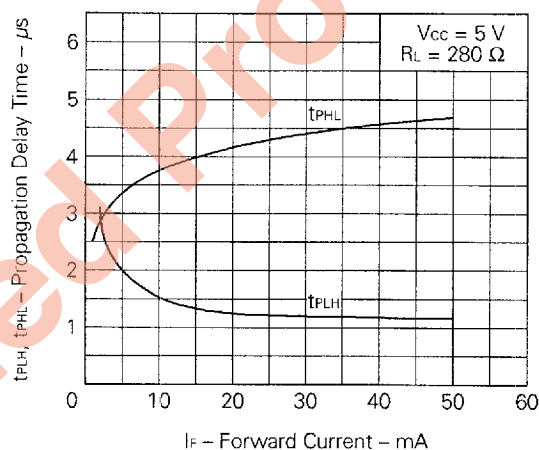
SUPPLY CURRENT vs.  
SUPPLY VOLTAGE



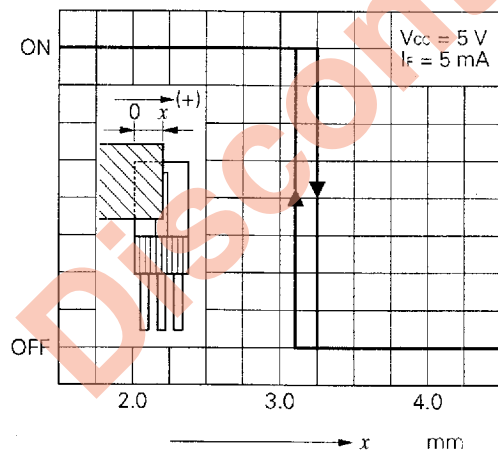
RISE TIME, FALL TIME  
vs. LOAD RESISTANCE



PROPAGATION DELAY TIME  
vs. FORWARD CURRENT



OUTPUT CHARACTERISTIC



OUTPUT CHARACTERISTIC

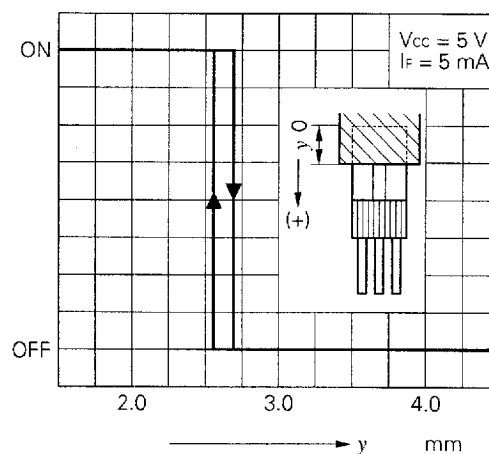
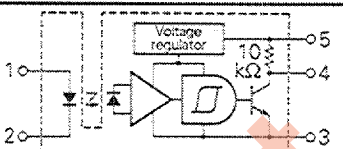
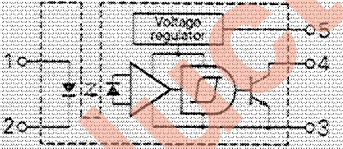
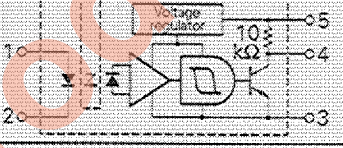
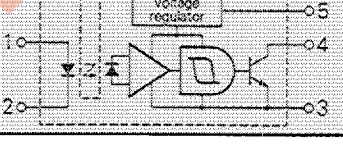
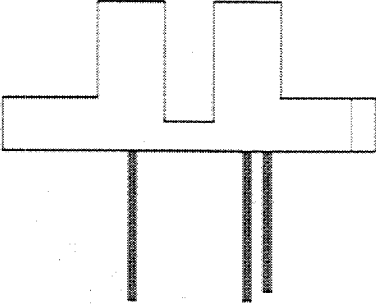
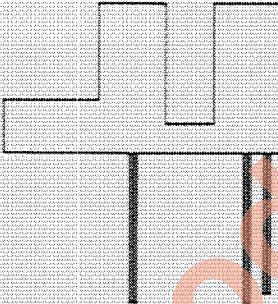
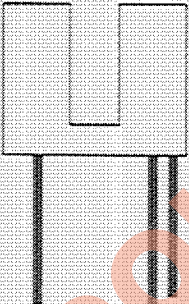


PHOTO IC INTERRUPTER FAMILY  
[LINEUP]  
PS50XX FAMILY

| TYPE No.           |          | OUTPUT          |                           | BLOCK DIAGRAM                                                                       |
|--------------------|----------|-----------------|---------------------------|-------------------------------------------------------------------------------------|
|                    |          | OUTPUT PORALITY | OUT TERMINAL              |                                                                                     |
| PS50XXHR<br>SERIES | PS5001HR | active "HIGH"   | Built-in pull up resistor |  |
|                    | PS5002HR |                 |                           |                                                                                     |
|                    | PS5003HR |                 |                           |                                                                                     |
| PS50XXHC<br>SERIES | PS5001HC | active "HIGH"   | Open collector output     |  |
|                    | PS5002HC |                 |                           |                                                                                     |
|                    | PS5003HC |                 |                           |                                                                                     |
| PS50XXLR<br>SERIES | PS5001LR | active "LOW"    | Built-in pull up resistor |  |
|                    | PS5002LR |                 |                           |                                                                                     |
|                    | PS5003LR |                 |                           |                                                                                     |
| PS50XXLC<br>SERIES | PS5001LC | active "LOW"    | Open collector output     |  |
|                    | PS5002LC |                 |                           |                                                                                     |
|                    | PS5003LC |                 |                           |                                                                                     |

[OUTLINE]

|                                                                                     |                                                                                    |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| PS5001HR                                                                            | PS5002HR                                                                           |
| PS5001HC                                                                            | PS5002HC                                                                           |
| PS5001LR                                                                            | PS5002LR                                                                           |
| PS5001LC                                                                            | PS5002LC                                                                           |
|    |  |
| PS5003HR                                                                            |                                                                                    |
| PS5003HC                                                                            |                                                                                    |
| PS5003LR                                                                            |                                                                                    |
| PS5003LC                                                                            |                                                                                    |
|  |                                                                                    |

**HANDLING PRECAUTIONS:**

- Soldering

Photointerrupter has generally a little less mechanical and thermal strength than other resin-molded semiconductor devices as they have less additives. Therefore please note on the following points.

- (a) Soldering of leads should be made at the point 2 mm or more from the root of the case at 300 °C and within 3 s.
- (b) Please keep the package temperature less than 100 °C.
- (c) If the temperature of the molded portion rises in addition to the residual stress between the leads, the possibility that open or short circuit occurs due to the deformation or destruction of the resin will increase.

- On cleaning the device:

- (a) Cleaning with unsuitable solvent may impair the resin of the package and the following solvents should be used at the temperature of less than 45 °C and for less than 3 minutes of immersion time.  
Ethanol, Methanol, Isopropyl-alcohol
- (b) Ultrasonic cleaning will add some stress on the devices. The degree of the stress differs depending on the oscillation output power, the size of the PCB and the mounting methods of the devices, therefore it should be confirmed by making an experiment at actual conditions that the cleaning does not have any problem on the devices.

[MEMO]

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