

TOSHIBA PHOTOINTERRUPTER INFRARED LED + PHOTO IC

# TLP1020

IMAGE SCANNER, HANDY COPY  
 PHOTOELECTRIC TYPE COUNTER  
 COPYING MACHINE, FACSIMILE, PRINTER  
 VARIOUS POSITION DETECTION

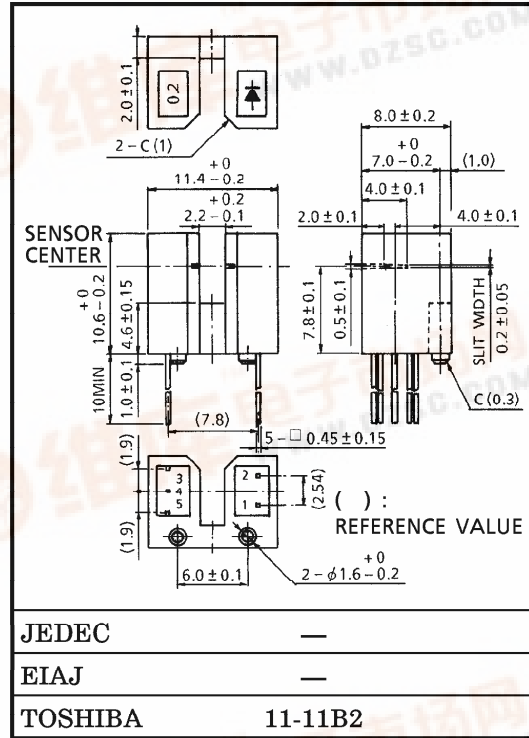
TLP1020 is a digital output photointerrupter combining GaAs infrared LED with high sensitive and high gain Si photo IC.

Because of the oblong detection slit, this photointerrupter is best suited to the upward-downward position detection.

Its output becomes low level when the light is shield. The same size TLP813 with phototransistor output is available.

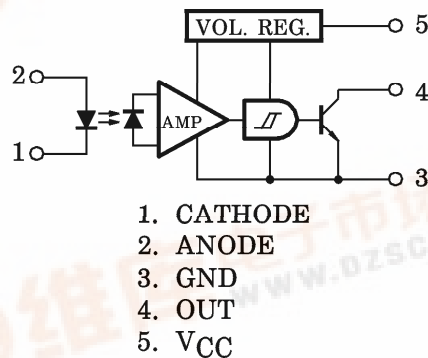
- Printed wiring board direct mounting type (with a locating pin).
- Gap : 2.2mm
- High resolution : Slit width 0.2×2.0mm (the oblong slit)
- Digital output (open collector)
- Directly connectable to TTL, LSTTL and CMOS.
- Threshold input current:  $I_{FLH} = 10\text{mA}$  (max) at  $T_a = 25^\circ\text{C}$
- Supply voltage range :  $V_{CC} = 4.5 \sim 17\text{V}$
- Built-in Schmitt circuit
- Fast response speed :  $t_{pLH} = 3\mu\text{s}$ ,  $t_{pHL} = 6\mu\text{s}$  (typ.)
- Detector side is of visible light cut type.

Unit in mm



Weight : 0.94g (typ.)

### PIN CONNECTION



961001EBC2

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MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC             |  | SYMBOL               | RATING | UNIT    |
|----------------------------|--|----------------------|--------|---------|
| LED                        | Forward Current                        | I <sub>F</sub>       | 50     | mA      |
|                            | Forward Current Derating (Ta > 25°C)   | ΔI <sub>F</sub> / °C | -0.33  | mA / °C |
|                            | Reverse Voltage                        | V <sub>R</sub>       | 5      | V       |
| DETECTOR                   | Supply Voltage                         | V <sub>CC</sub>      | 17     | V       |
|                            | Output Voltage                         | V <sub>O</sub>       | 30     | V       |
|                            | Output Current                         | I <sub>O</sub>       | 50     | mA      |
|                            | Power Dissipation                      | P <sub>O</sub>       | 250    | mW      |
|                            | Power Dissipation Derating (Ta > 25°C) | ΔP <sub>O</sub> / °C | -3.33  | mW / °C |
|                            | Operating Temperature Range            | T <sub>opr</sub>     | -25~85 | °C      |
| Storage Temperature Range  | T <sub>stg</sub>                       | -40~100              | °C     |         |
| Soldering Temperature (5s) | T <sub>sol</sub>                       | 260                  | °C     |         |

RECOMMENDED OPERATING CONDITIONS

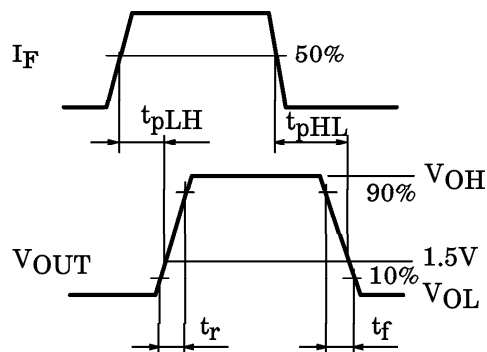
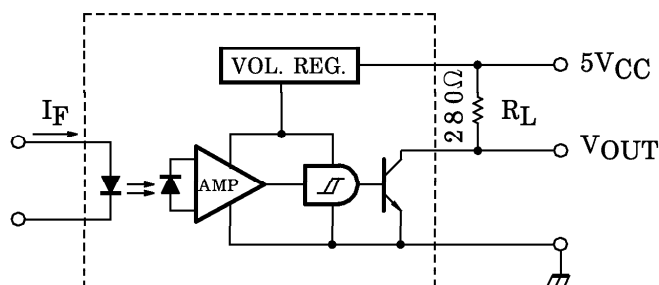
| CHARACTERISTIC           | SYMBOL          | MIN. | TYP. | MAX. | UNIT |
|--------------------------|-----------------|------|------|------|------|
| LED Forward Current      | I <sub>F</sub>  | 23*  | —    | 30   | mA   |
| Supply Voltage           | V <sub>CC</sub> | 4.5  | 5    | 17   | V    |
| Output Voltage           | V <sub>O</sub>  | —    | 5    | 24   | V    |
| Low Level Output Current | I <sub>OL</sub> | —    | —    | 16   | mA   |

\* 23mA is a value when 30% LED deterioration is taken into consideration. Initial threshold input current shall be 15.5mA max

OPTO-ELECTRICAL CHARACTERISTICS (Unless otherwise specified,  $T_a = -25 \sim 70^\circ\text{C}$ ,  $V_{CC} = 4.5 \sim 5.5\text{V}$ )

| CHARACTERISTIC              |                             | SYMBOL                                   | TEST CONDITION   | MIN.  | TYP. | MAX.          | UNIT          |               |
|-----------------------------|-----------------------------|--|--|---|------|---------------|---------------|---------------|
| LED                         | Forward Voltage             | $V_F$                                    | $I_F = 10\text{mA}$ , $T_a = 25^\circ\text{C}$                 | 1.00  | 1.15 | 1.30          | V             |               |
|                             | Reverse Current             | $I_R$                                    | $V_R = 5\text{V}$ , $T_a = 25^\circ\text{C}$                   | —   | —    | 10            | $\mu\text{A}$ |               |
|                             | Peak Emission Wavelength    | $\lambda_P$                              | $I_F = 25\text{mA}$ , $T_a = 25^\circ\text{C}$                 | —   | 940  | —             | nm            |               |
| DETECTOR                    | Supply Voltage              | $V_{CC}$                                 | —  | 4.5   | —    | 17            | V             |               |
|                             | Low Level Supply Current    | $I_{CCL}$                                | $I_F = 0$  | —   | —    | 5.0           | mA            |               |
|                             |                             |  | $I_F = 0$ , $V_{CC} = 17\text{V}$                              | —   | —    | 5.2           |               |               |
|                             | High Level Supply Current   | $I_{CCH}$                                | $I_F = 25\text{mA}$  | —   | —    | 3.0           | mA            |               |
|                             |                             |  | $I_F = 25\text{mA}$ , $V_{CC} = 17\text{V}$                    | —   | —    | 3.2           |               |               |
|                             | Low Level Output Voltage    | $V_{OL}$                                 | $I_{OL} = 16\text{mA}$ , $I_F = 0$<br>$T_a = 25^\circ\text{C}$ | —   | 0.07 | 0.3           | V             |               |
|                             |                             |  | $I_{OL} = 16\text{mA}$ , $I_F = 0$<br>$V_{CC} = 17\text{V}$    | —   | —    | 0.4           |               |               |
| High Level Output Current   | $I_{OH}$                    | $I_F = 25\text{mA}$ , $V_O = 30\text{V}$ | —  | —   | 15   | $\mu\text{A}$ |               |               |
| Peak Sensitivity Wavelength | $\lambda_P$                 | $T_a = 25^\circ\text{C}$                 | —  | 900   | —    | nm            |               |               |
| COUPLED                     | L→H Threshold Input Current | $I_{FLH}$                                | $T_a = 25^\circ\text{C}$                                       | —   | —    | 10            | mA            |               |
|                             |                             |  | $V_{CC} = 17\text{V}$  | —   | —    | 15.5          |               |               |
|                             | Hysteresis Ratio            | $I_{FHL} / I_{FLH}$                      | $T_a = 25^\circ\text{C}$                                       | —   | 0.67 | —             | —             |               |
|                             | Propagation Delay Time      | (L→H)                                    | $t_{pLH}$  | $V_{CC} = 5\text{V}$ , $I_F = 25\text{mA}$<br>$R_L = 280\Omega$ , $T_a = 25^\circ\text{C}$ (Note) | —    | 3             | —             | $\mu\text{s}$ |
|                             |                             | (H→L)                                    | $t_{pHL}$  |   | —    | 6             | —             |               |
| Rise Time                   | $t_r$                       | —  | 0.1  |   | —    |               |               |               |
| Fall Time                   | $t_f$                       | —  | 0.05   |   | —    |               |               |               |

NOTE : SWITCHING TIME TEST CIRCUIT



PRECAUTION

Please be careful of the followings.

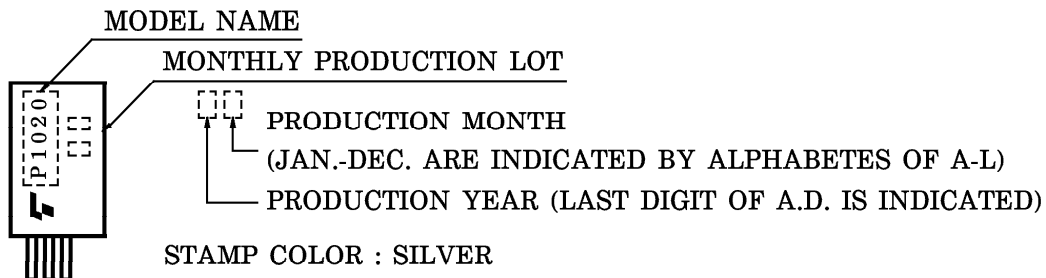
1. Soldering should be performed after lead forming.
2. If chemicals are used for cleaning, the soldered surface only shall be cleaned with chemicals avoiding the whole cleaning of the package.
3. The container is made of polycarbonate. Polycarbonate is usually stable with acid, alcohol, and aliphatic hydrocarbons however, with peroxochemicals (such as benzene, toluene, and acetone), alkali, aromatic hydrocarbons, or chloric hydrocarbons, polycarbonate becomes cracked, swollen, or melted. Please take care when choosing a packaging material by referencing the table below.

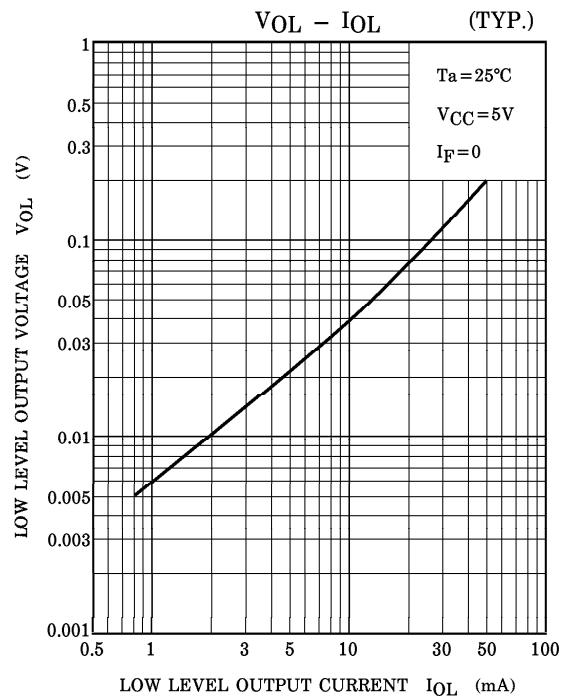
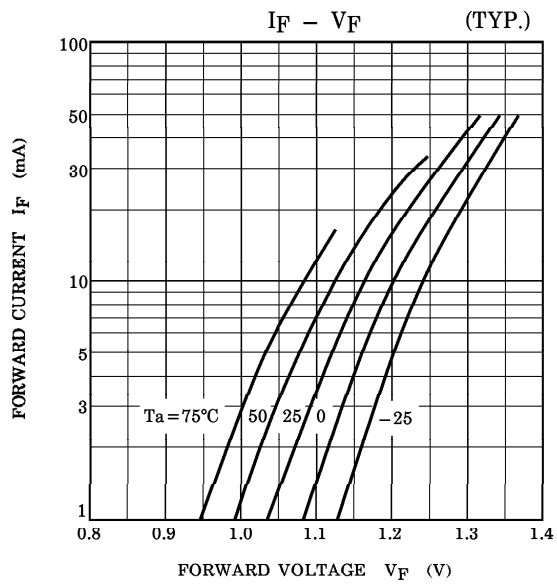
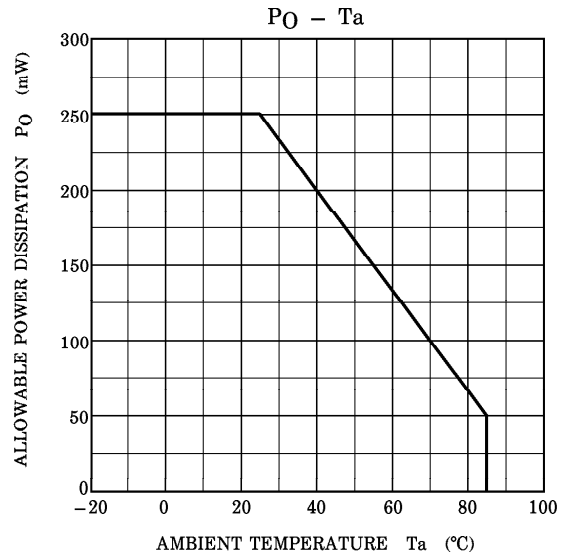
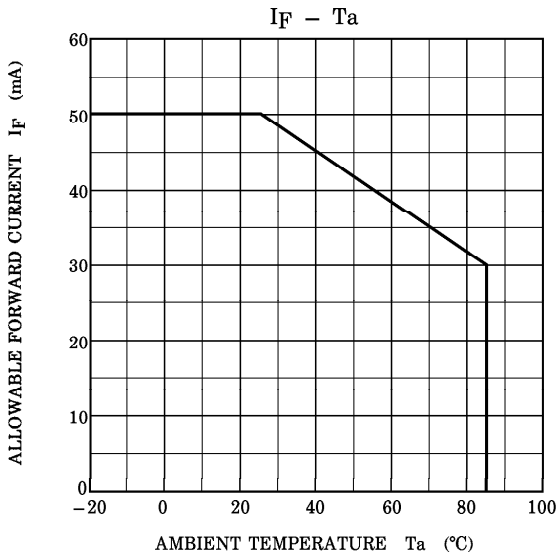
<Chemicals to avoid with polycarbonate>

|   | PHENOMENON                        | CHEMICALS   |
|---|-----------------------------------|---|
| A | Little deterioration but staining | <ul style="list-style-type: none"> <li>• nitric acid (low concentration), hydrogen peroxide, chlorine</li> </ul>  |
| B | Cracked, crazed, or swollen       | <ul style="list-style-type: none"> <li>• acetic acid (70% or more)</li> <li>• gasoline</li> <li>• methyl ethyl ketone, ethyl acetate, butyl acetate</li> <li>• ethyl methacrylate, ethyl ether, MEK</li> <li>• acetone, m-amino alcohol, carbon tetrachloride</li> <li>• carbon disulfide, trichloroethylene, cresol</li> <li>• thinners, oil of turpentine</li> <li>• triethanolamine, TCP, TBP</li> </ul> |
| C | Melted<br>{ } : Used as solvent.  | <ul style="list-style-type: none"> <li>• concentrated sulfuric acid</li> <li>• benzene</li> <li>• styrene, acrylonitrile, vinyl acetate</li> <li>• ethylenediamine, diethylenediamine</li> <li>• {chloroform, methyl chloride, tetrachloromethane, dioxane, }<br/>1, 2-dichloroethane</li> </ul>  |
| D | Decomposed                        | <ul style="list-style-type: none"> <li>• ammonia water</li> <li>• other alkali</li> </ul>   |

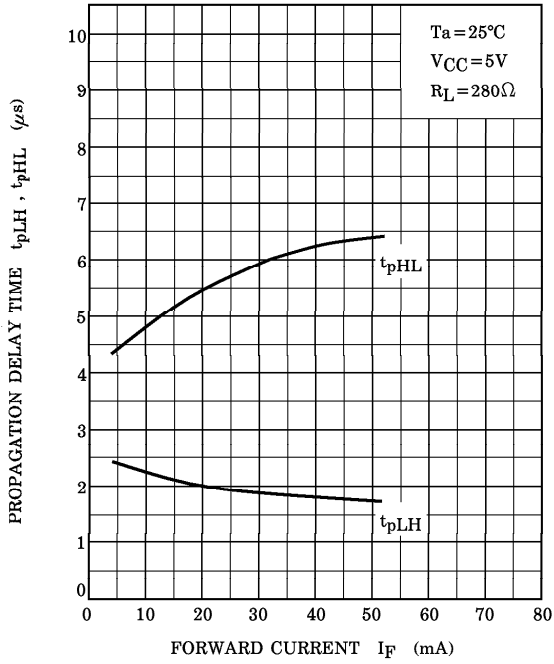
4. During 100 $\mu$ s after turning on V<sub>CC</sub>, output voltage changes for stabilizing the inner circuit.
5. Supply the by-pass condenser up to 0.01 $\mu$ F between V<sub>CC</sub> and GND near device to stabilize the power supply line.

PRODUCT INDICATION

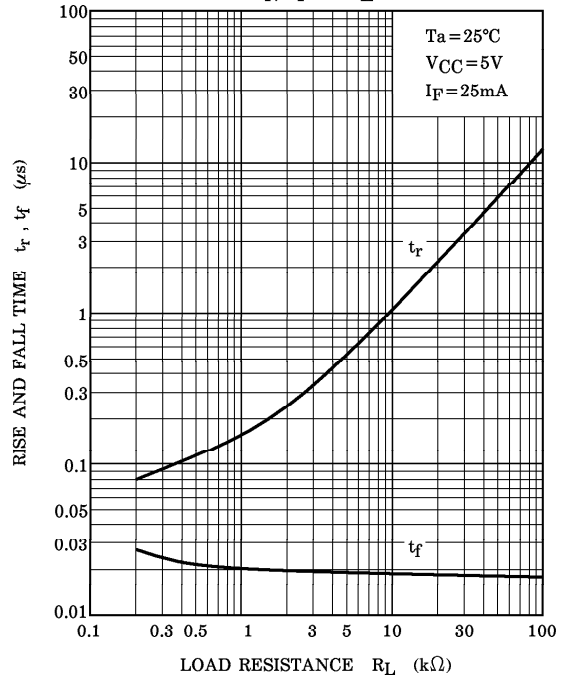




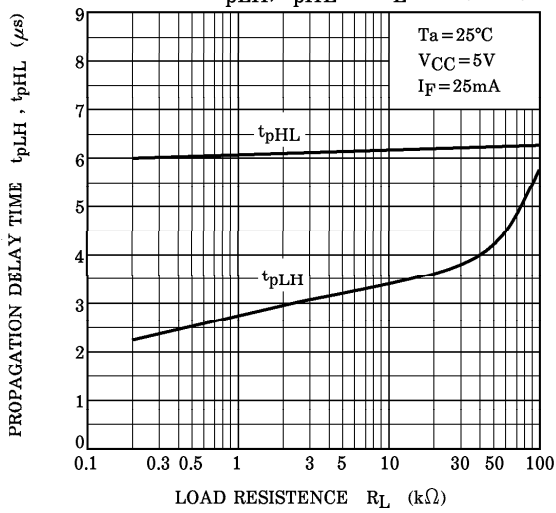
$t_{pLH}, t_{pHL} - I_F$  (TYP.)

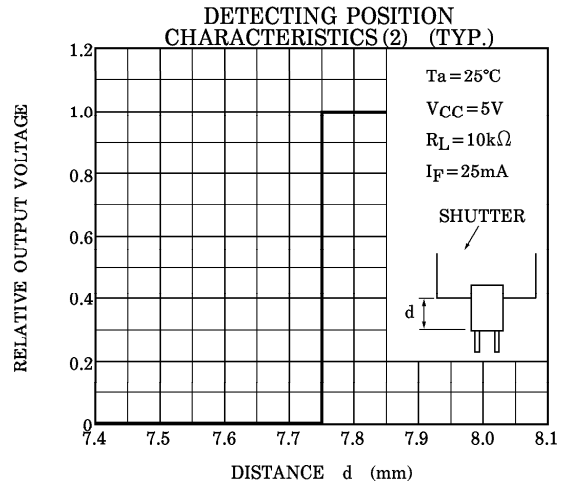
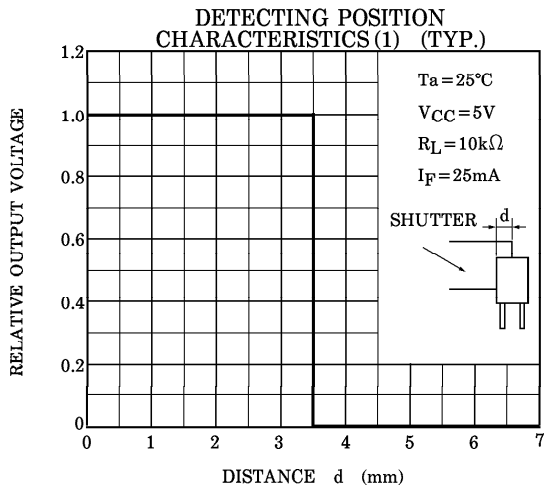


$t_r, t_f - R_L$  (TYP.)



$t_{pLH}, t_{pHL} - R_L$  (TYP.)

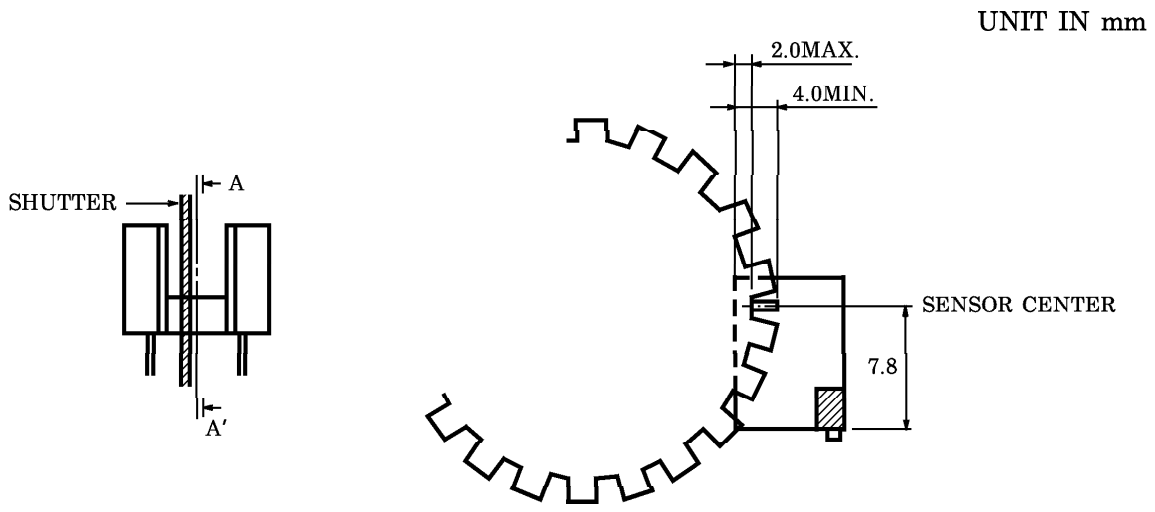




**POSITIONING OF SHUTTER AND DEVICE**

To operate correctly, make sure that the shutter and the device are positioned as shown in the figure below.

The slit pitch of the shutter must be set wider than the slit width of the device. Determine the width taking the switching time into consideration.



**A - A' CROSS SECTION**