

TOSHIBA PHOTOINTERRUPTER INFRARED LED + PHOTO IC

# TLP1025

STILL CAMERA

VIDEO CAMERA

SMALL-SIZED PERSONAL OA EQUIPMENT

The TLP1025 photointerrupter with digital output combines a GaAs infrared LED and a high-sensitivity, high-gain Si photo IC into a single chip.

It has a narrow slit width and provides high resolution.

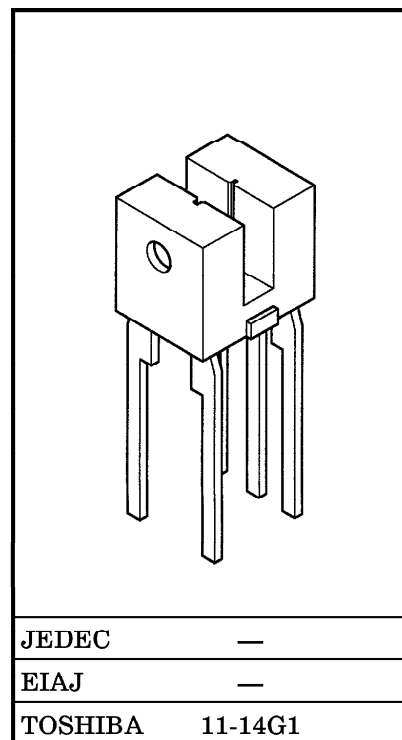
Thanks to its built-in Schmitt trigger circuit, the TLP1025 can be coupled directly with a microcomputer or logic IC. It outputs a high when light is blocked.

- Very small package
- Printed circuit board direct mounting type
- Gap : 1mm
- High resolution : Slit width 0.15mm (infrared LED side)  
0.1mm (photo IC side)
- Digital output (open collector)
- Built-in Schmitt trigger circuit for direct coupling with logic IC
- Low-voltage operation :  $V_{CC}=2.4\sim 7V$
- High response speed

MAXIMUM RATINGS ( $T_a = 25^\circ C$ )

| CHARACTERISTIC                      |                                                       | SYMBOL           | RATING  | UNIT            |
|-------------------------------------|-------------------------------------------------------|------------------|---------|-----------------|
| LED                                 | Forward Current                                       | $I_F$            | 50      | mA              |
|                                     | Forward Current Derating<br>( $T_a \geq 25^\circ C$ ) | $I_F / ^\circ C$ | -0.66   | mA / $^\circ C$ |
|                                     | Reverse Voltage                                       | $V_R$            | 5       | V               |
| DETECTOR                            | Supply Voltage                                        | $V_{CC}$         | 7       | V               |
|                                     | Output Voltage                                        | $V_O$            | 7       | V               |
|                                     | Output Current                                        | $I_{OL}$         | 10      | mA              |
| Operating Temperature               |                                                       | $T_{opr}$        | -25~85  | $^\circ C$      |
| Storage Temperature                 |                                                       | $T_{stg}$        | -40~100 | $^\circ C$      |
| Soldering Temperature (5s) (Note 1) |                                                       | $T_{sol}$        | 260     | $^\circ C$      |

Note 1 : At the location of 1.5mm from the resin package bottom



Weight : 0.09g (typ.)

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## RECOMMENDED OPERATING CONDITIONS

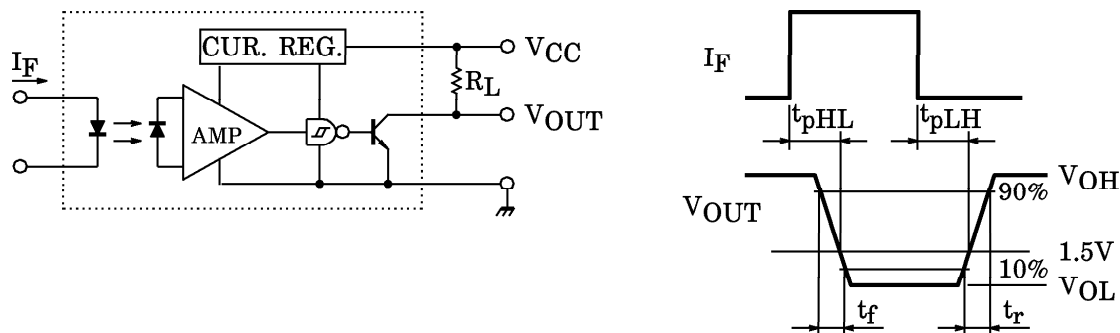
| CHARACTERISTIC           | SYMBOL   | MIN. | TYP. | MAX. | UNIT |
|--------------------------|----------|------|------|------|------|
| Forward Current          | $I_F$    | 12*  | —    | 20   | mA   |
| Supply Voltage           | $V_{CC}$ | 2.4  | —    | 7    | V    |
| Output Voltage           | $V_O$    | —    | —    | 7    | V    |
| Low Level Output Current | $I_{OL}$ | —    | —    | 10   | mA   |

\* 12mA is a value when 50% LED deterioration is taken into consideration. Initial threshold input current shall be 6mA max

OPTO ELECTRICAL CHARACTERISTICS ( $T_a = -25^{\circ}\text{C} \sim 85^{\circ}\text{C}$ ,  $V_{CC} = 2.4 \sim 7\text{V}$ , Typical values are all at  $25^{\circ}\text{C}$ )

| CHARACTERISTIC |                               | SYMBOL                       | TEST CONDITION                                   | MIN.                                                                                | TYP. | MAX. | UNIT          |
|----------------|-------------------------------|------------------------------|--------------------------------------------------|-------------------------------------------------------------------------------------|------|------|---------------|
| LED            | Forward Voltage               | $V_F$                        | $I_F = 10\text{mA}$ , $T_a = 25^{\circ}\text{C}$ | 1.0                                                                                 | 1.15 | 1.3  | V             |
|                | Reverse Current               | $I_R$                        | $V_R = 5\text{V}$ , $T_a = 25^{\circ}\text{C}$   | —                                                                                   | 0.01 | 10   | $\mu\text{A}$ |
|                | Peak Emission Wavelength      | $\lambda_P$                  | $I_F = 10\text{mA}$                              | —                                                                                   | 940  | —    | nm            |
| DETECTOR       | Supply Voltage                | $V_{CC}$                     | —                                                | 2.4                                                                                 | —    | 7    | V             |
|                | Low Level Supply Current      | $I_{CCL}$                    | $I_F = 10\text{mA}$                              | —                                                                                   | 1.0  | 3.5  | mA            |
|                | High Level Supply Current     | $I_{CCH}$                    |                                                  | —                                                                                   | 1.3  | 3.2  | mA            |
|                | Low Level Output Voltage      | $V_{OL}$                     | $I_F = 10\text{mA}$ , $I_{OL} = 10\text{mA}$     | —                                                                                   | 0.06 | 0.4  | V             |
|                | High Level Output Current     | $I_{OH}$                     | $V_O = 7\text{V}$                                | —                                                                                   | —    | 30   | $\mu\text{A}$ |
|                | Peak Sensitivity Wavelength   | $\lambda_P$                  | $T_a = 25^{\circ}\text{C}$                       | —                                                                                   | 870  | —    | nm            |
|                | Threshold Input Current (H→L) | $I_{FHL}$                    |                                                  | —                                                                                   | —    | 6    | mA            |
| COUPLED        | Hysteresis Ratio              |                              | $I_{FHL} / I_{FLH}$                              | $T_a = 25^{\circ}\text{C}$                                                          | —    | 1.25 | —             |
|                | Switching Time                | Propagation Delay Time (H→L) | $t_{PHL}$                                        | $I_F = 10\text{mA}$ , $R_L = 750\Omega$ ,<br>$T_a = 25^{\circ}\text{C}$<br>(Note 2) | —    | 4    | $\mu\text{s}$ |
|                |                               | Propagation Delay Time (L→H) | $t_{PLH}$                                        |                                                                                     | —    | 26   |               |
|                |                               | Rise Time                    | $t_r$                                            |                                                                                     | —    | 0.07 |               |
|                |                               | Fall Time                    | $t_f$                                            |                                                                                     | —    | 0.08 |               |

Note 2 : Switching time measurement circuit and waveform



## PRECAUTIONS

- When removing flux with chemicals after soldering, clean only the leads on the soldering side; do not dip the whole package for cleaning. Chemicals remaining on an LED or photo IC light emitter or receiver, if any, would have a bad influence to the optical characteristics and it may severely higher the threshold input current.
- The environment to install the device should be determined carefully. Oil or chemicals may cause the package to be dissolved or cracked.
- The device should be mounted on an unwarped surface.
- The photo IC contains a high-sensitivity amp. Toshiba recommends that a capacitor of approximately  $0.01\mu F$  with good high frequency characteristics be inserted between  $V_{CC}$  and GND near the device to prevent unwanted oscillation.
- The threshold input current increases with time as the power to the infrared LED is turned on repeatedly over time. Therefore, fully consider the change of the device's characteristics with the passage of time when designing your circuit.
- Note that the device's output changes state for a  $100\mu s$  period after it is powered on until the internal circuit is stabilized.
- Stress causing the package deformation or deterioration should not be given to the package.

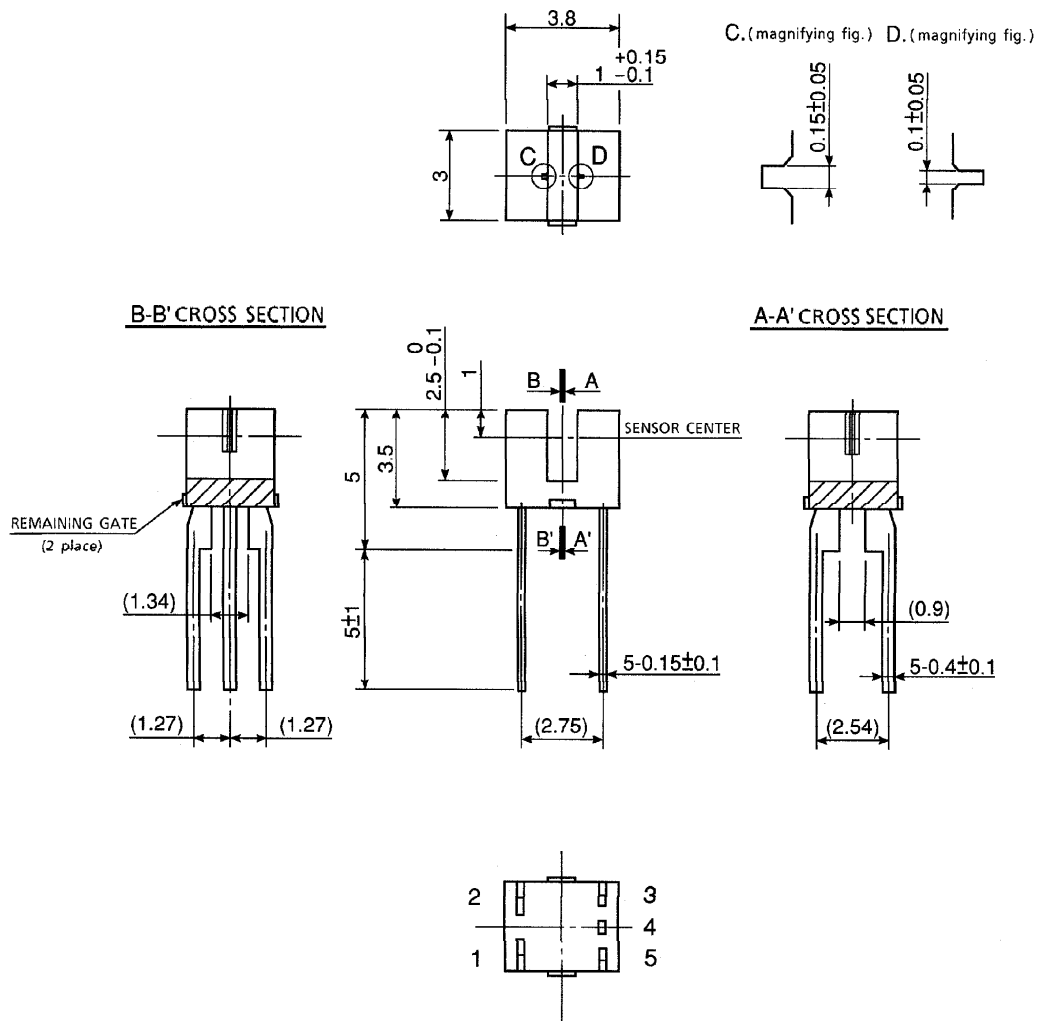
## OUTLINE

Unit : mm

Tolerance :  $\pm 0.2\text{mm}$  unless otherwise specified

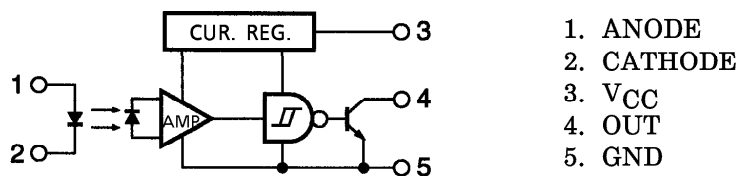
Values in parentheses ( ) are for reference.

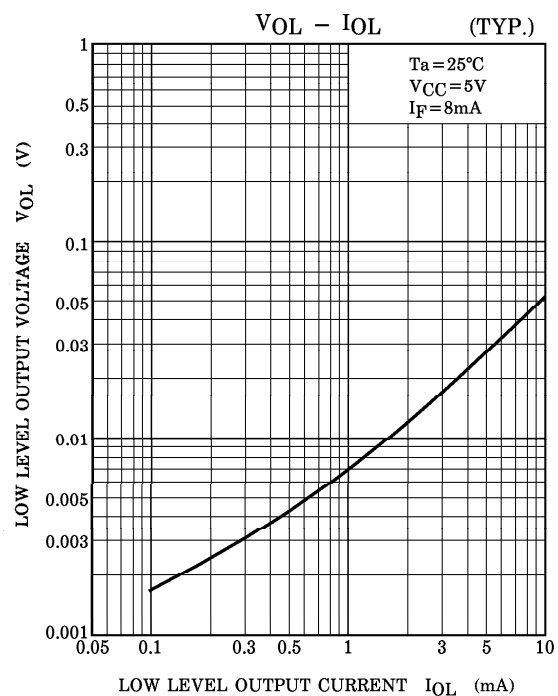
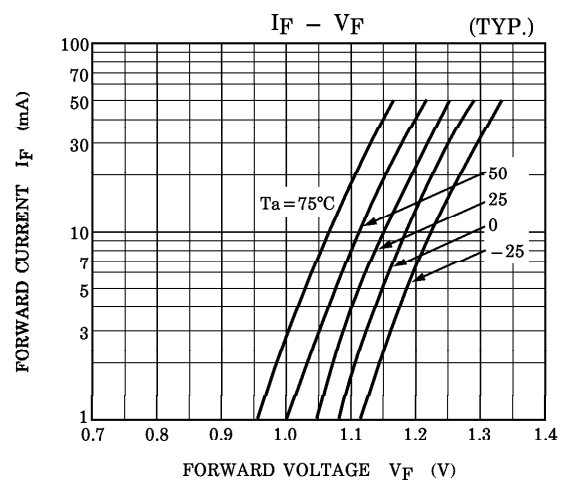
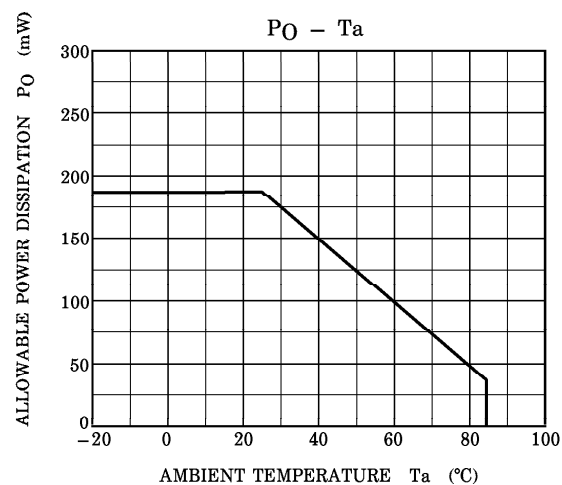
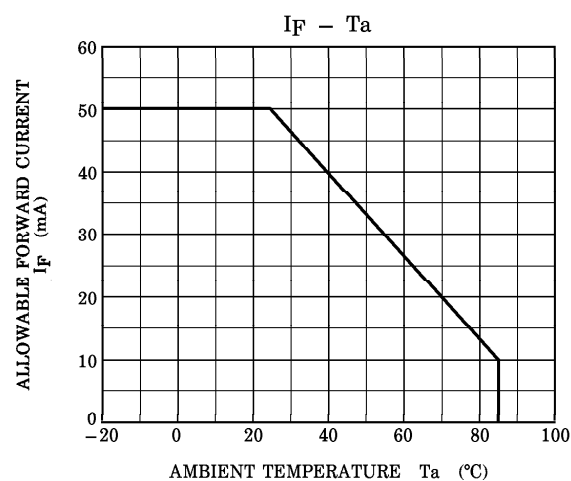
The remaining gate should be 0.2mm or less.

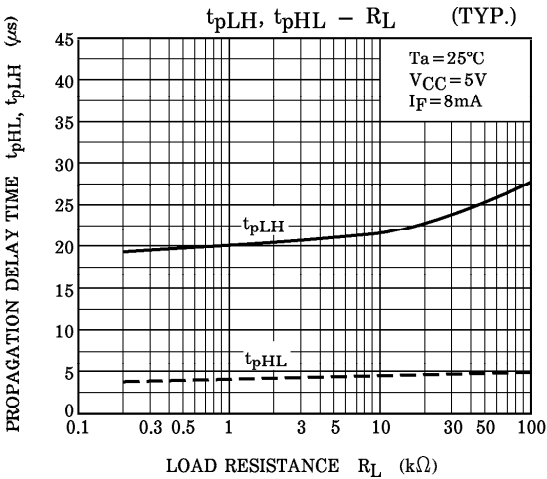
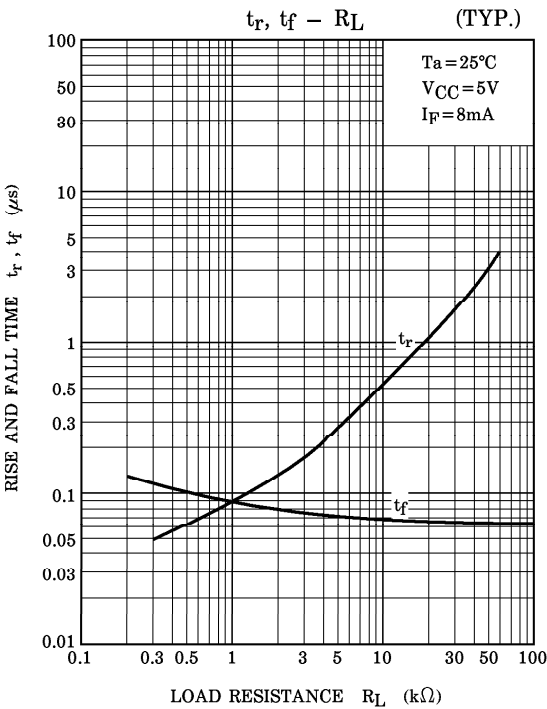
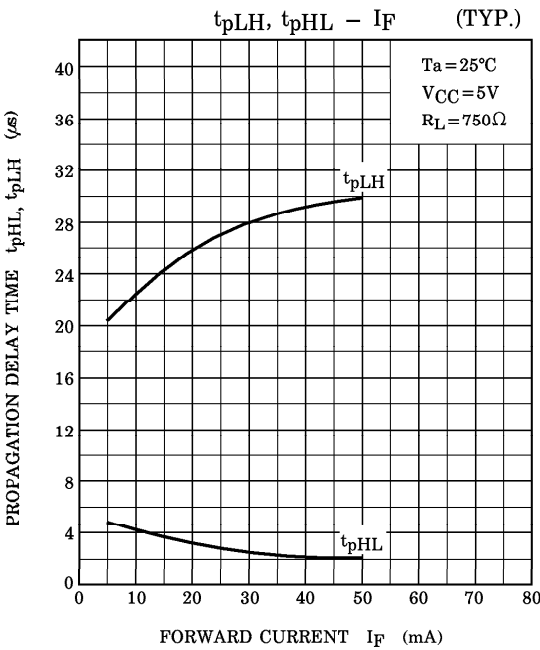


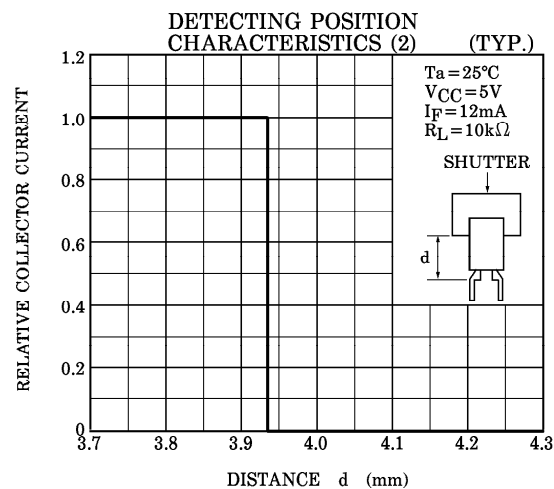
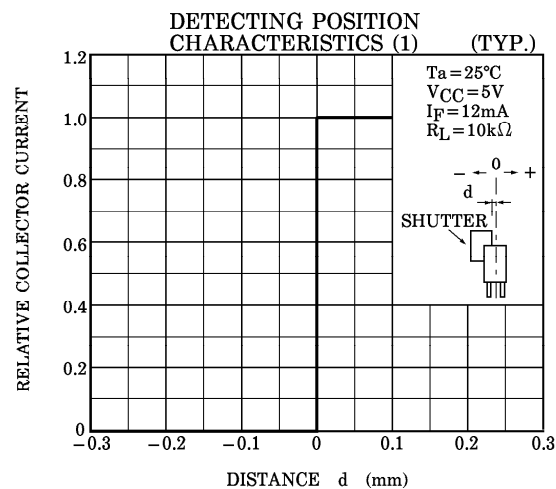
Weight : 0.09g (typ.)

## PIN CONNECTION









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.

