

TOSHIBA PHOTO-INTERRUPTER INFRARED LED + PHOTODARLINGTON TRANSISTOR

# TLP507A

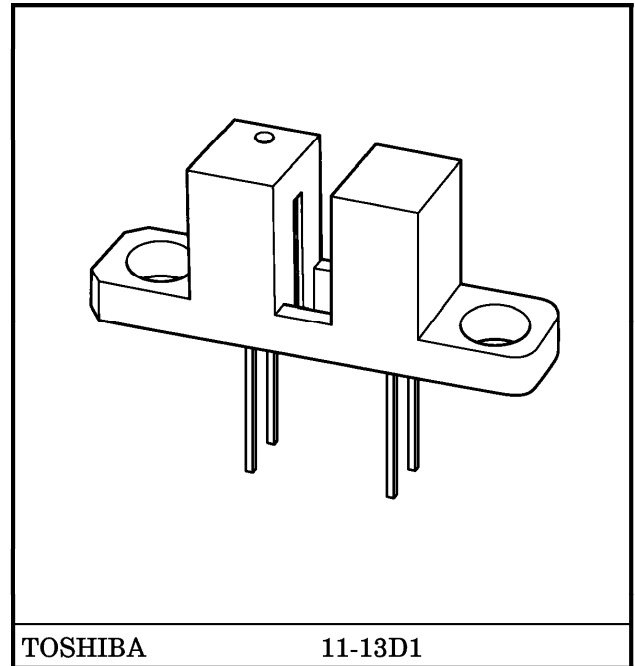
HIGH-POWER AMPLIFIER APPLICATIONS

AUTOMATIC CONTROL UNITS

POSITION AND ROTATIONAL SPEED SENSORS

The TLP507A photo-interrupter features a high current transfer ratio ( $I_C / I_F$ ).

- Gap : 3 mm
- Resolution : Slit width = 0.5 mm
- High current transfer ratio:  $I_C / I_F = 30\%$  (min)
- Dark current :  $I_D = 0.25 \mu A$  (max)
- Package material : Polycarbonate



TOSHIBA

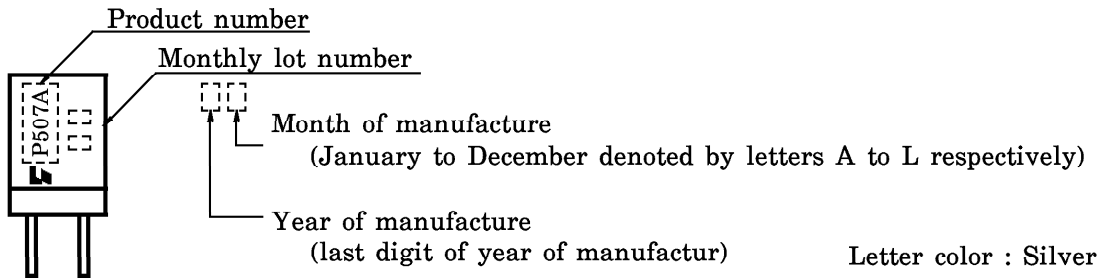
11-13D1

Weight : 0.83 g (typ.)

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

| CHARACTERISTIC              |   | SYMBOL                  | RATING  | UNIT            |
|-----------------------------|---|-------------------------|---------|-----------------|
| LED                         | Forward Current   | $I_F$                   | 50      | mA              |
|                             | Forward Current Derating ( $T_a > 25^\circ C$ )             | $\Delta I_F / ^\circ C$ | -0.33   | mA / $^\circ C$ |
|                             | Reverse Voltage   | $V_R$                   | 5       | V               |
| DETECTOR                    | Collector-Emitter Voltage                                   | $V_{CEO}$               | 30      | V               |
|                             | Emitter-Collector Voltage                                   | $V_{ECO}$               | 5       | V               |
|                             | Collector Power Dissipation                                 | $P_C$                   | 75      | mW              |
|                             | Collector Power Dissipation Derating ( $T_a > 25^\circ C$ ) | $\Delta P_C / ^\circ C$ | -1      | mW / $^\circ C$ |
|                             | Collector Current   | $I_C$                   | 50      | mA              |
| Operating Temperature Range |   | $T_{opr}$               | -25~85  | $^\circ C$      |
| Storage Temperature Range   |   | $T_{stg}$               | -30~100 | $^\circ C$      |

MARKINGS



OPTICAL AND ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC |                             | SYMBOL          | TEST CONDITION  | Min  | Typ. | Max  | UNIT          |
|----------------|-----------------------------|-----------------|---|------|------|------|---------------|
| LED            | Forward Voltage             | $V_F$           | $I_F = 10 \text{ mA}$   | 1.00 | 1.15 | 1.30 | V             |
|                | Reverse Current             | $I_R$           | $V_R = 5 \text{ V}$   | —    | —    | 10   | $\mu\text{A}$ |
|                | Peak Emission Wavelength    | $\lambda_P$     | $I_F = 10 \text{ mA}$   | —    | 940  | —    | nm            |
| DETECTOR       | Dark Current                | $I_D (I_{CEO})$ | $V_{CE} = 16 \text{ V}, I_F = 0$                              | —    | —    | 0.25 | $\mu\text{A}$ |
|                | Peak Sensitivity Wavelength | $\lambda_P$     | —   | —    | 800  | —    | nm            |
| COUPLED        | Current Transfer Ratio      | $I_C / I_F$     | $V_{CE} = 2 \text{ V}, I_F = 10 \text{ mA}$                   | 30   | —    | 440  | %             |
|                | Rise Time                   | $t_r$           | $V_{CC} = 5 \text{ V}, I_C = 10 \text{ mA}, R_L = 100 \Omega$ | —    | 200  | —    | $\mu\text{s}$ |
|                | Fall Time                   | $t_f$           |   | —    | 200  | —    |               |

## PRECAUTIONS

The following points must be borne in mind.

- Soldering temperature : 260°C max  
Soldering time : 5 s max  
(Soldering must be performed 1.5 mm under the package body.)
- Clean only the soldered part of the leads. Do not immerse the entire package in the cleaning solvent.
- Mount the device on a level surface.
- Screws should be tightened to a clamping torque of 0.59 N·m.
- The package is made of polycarbonate. Polycarbonate is usually stable with acid, alcohol and aliphatic hydrocarbons, however, with petrochemicals (such as benzene, toluene and acetone), alkalis, aromatic hydrocarbons, or chloric hydrocarbons, polycarbonate may crack, swell or melt. Please take this into account when choosing a packaging material by referring to the table below.

<Chemicals which should not be used with polycarbonate>

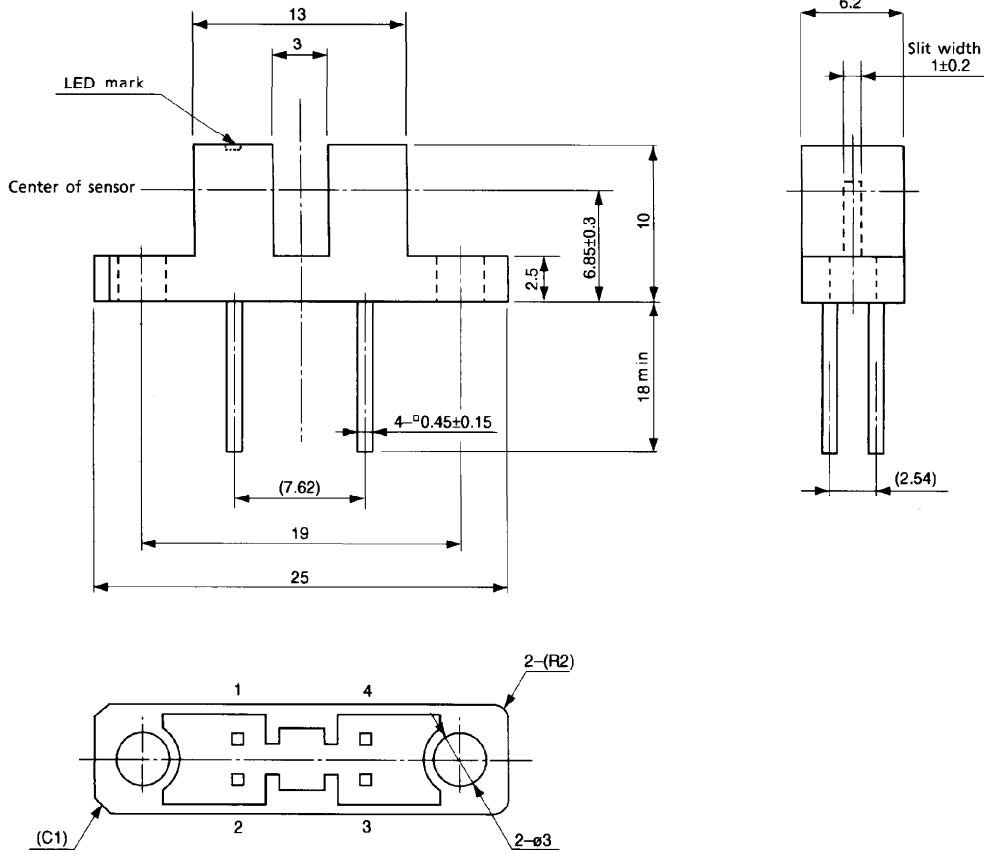
|   | PHENOMENON                        | CHEMICALS   |
|---|-----------------------------------|---|
| A | Staining and slight deterioration | <ul style="list-style-type: none"> <li>Nitric acid (diluted), hydrogen peroxide, chlorine</li> </ul>  |
| B | Cracking, crazed or swelling      | <ul style="list-style-type: 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 | Melting<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, 1, 2-dichloroethane}</li> </ul>   |
| D | Decomposition                     | <ul style="list-style-type: none"> <li>Ammonia water</li> <li>Other alkalis</li> </ul>  |

- Conversion efficiency falls over time due to the current which flows in the infrared LED. When designing a circuit, take into account this change in conversion efficiency over time. The ratio of fluctuation in conversion efficiency to fluctuation in infrared LED optical output is 1:1.

$$\frac{I_C / I_F(t)}{I_C / I_F(0)} = \frac{P_O(t)}{P_O(0)}$$

**PACKAGE DIMENSIONS**  
11-13D1

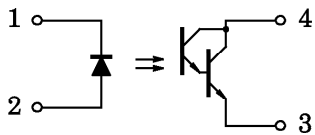
Unit : mm



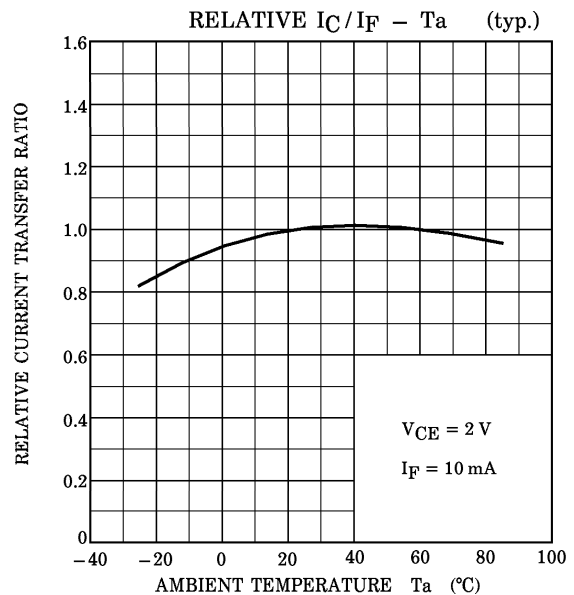
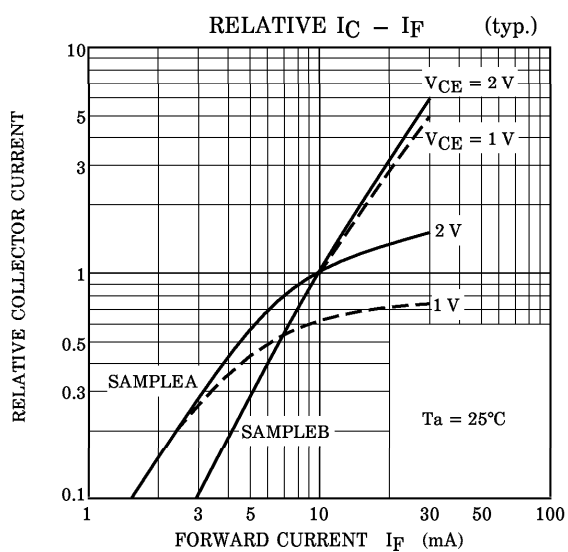
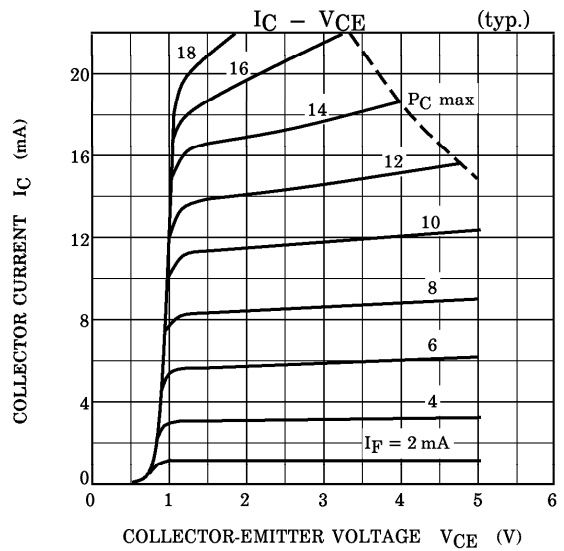
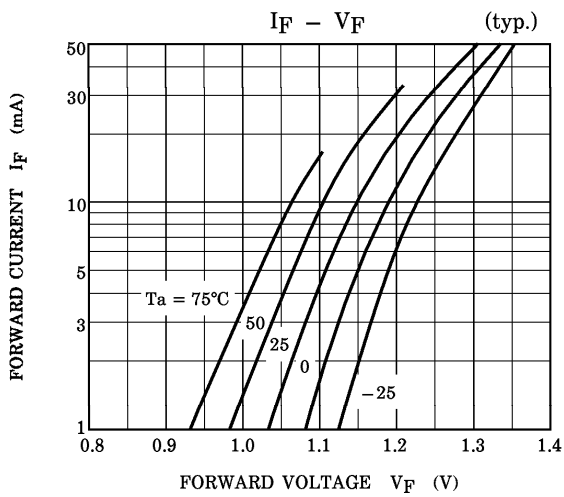
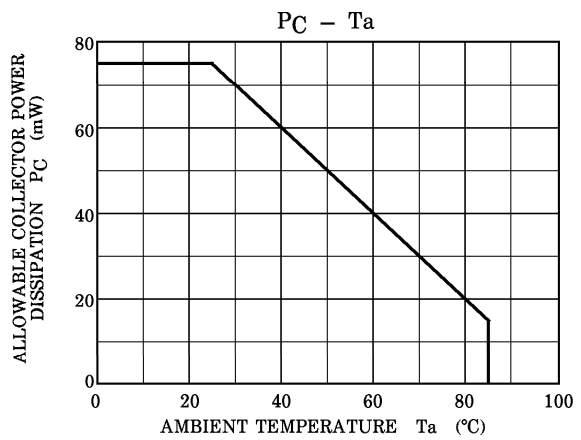
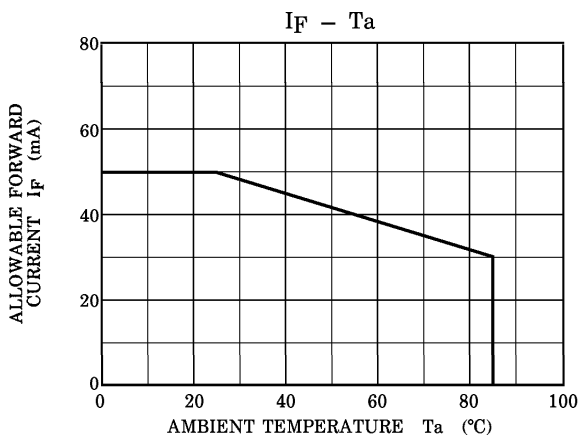
Tolerance unless otherwise specified : ±0.25  
( ) : Reference value

Weight : 0.83 g (typ.)

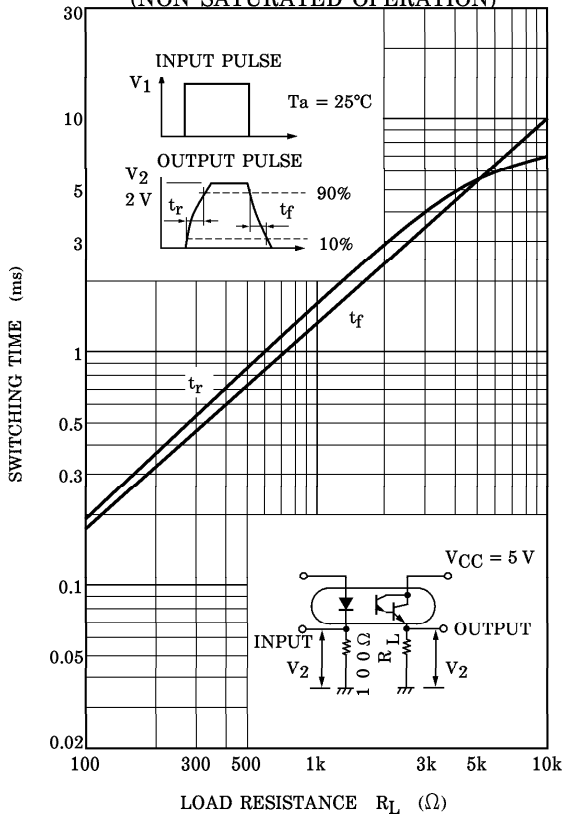
**PIN CONNECTION**



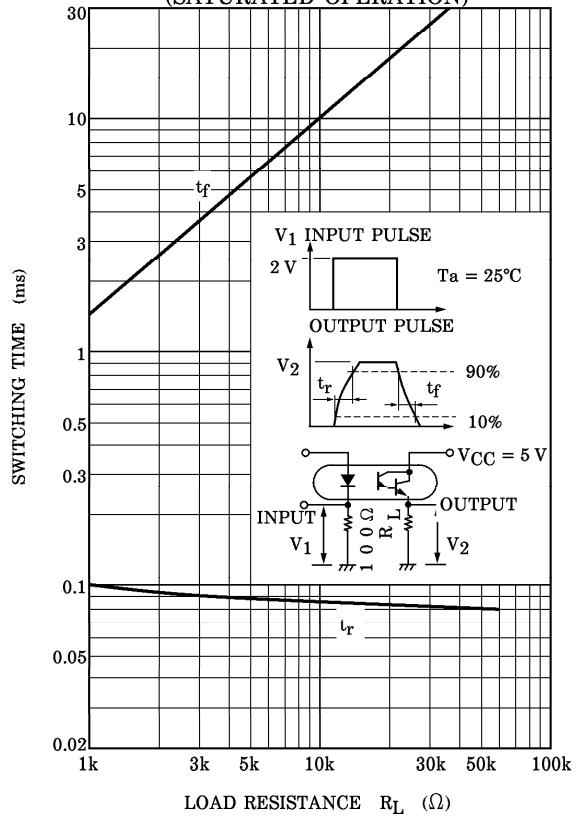
- 1. Cathode
- 2. Anode
- 3. Emitter
- 4. Collector



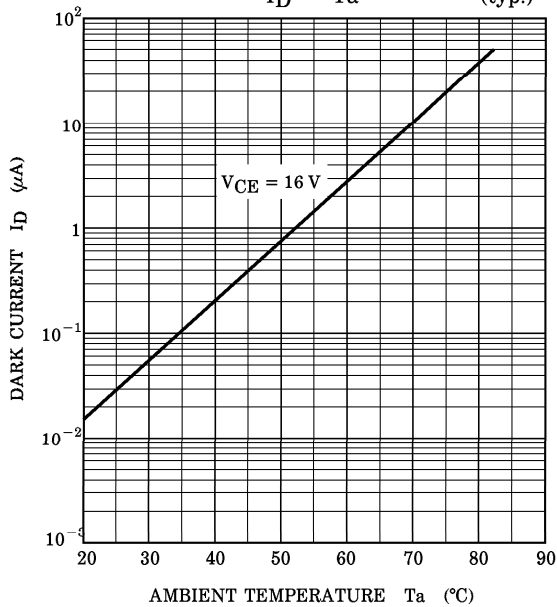
SWITCHING CHARACTERISTICS  
(NON SATURATED OPERATION)



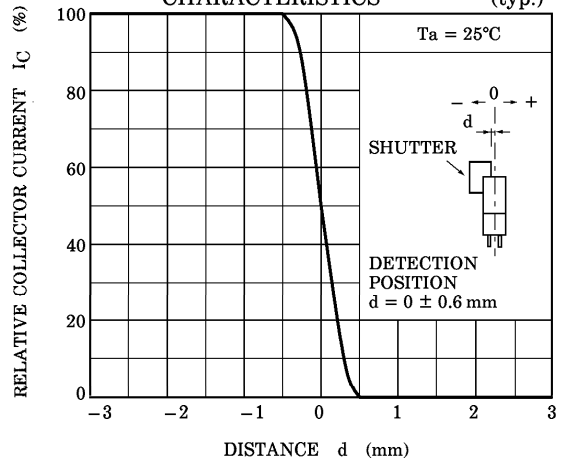
SWITCHING CHARACTERISTICS  
(SATURATED OPERATION)



$I_D - T_a$  (typ.)

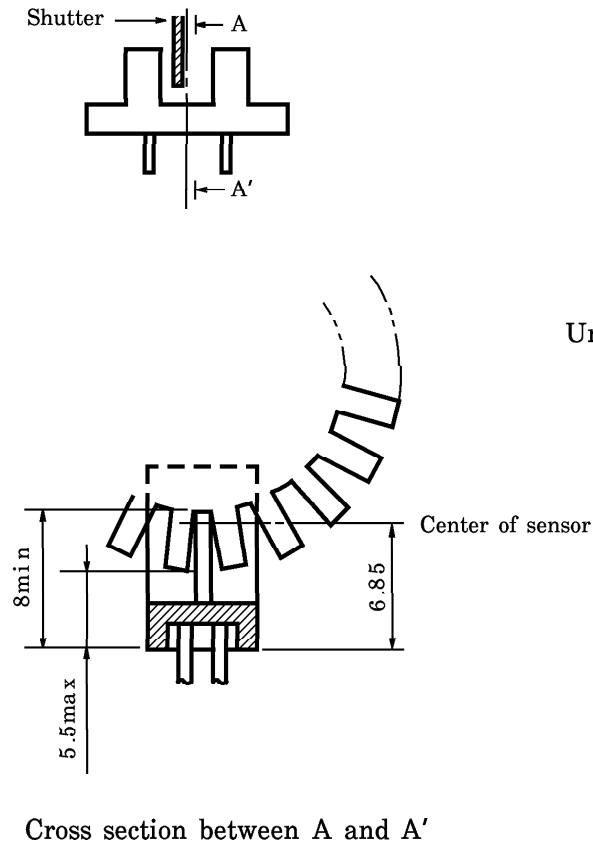


DETECTION POSITION CHARACTERISTICS (typ.)



RELATIVE POSITIONING OF SHUTTER AND DEVICE

For normal operation position the shutter and the device as shown in the figure below. By considering the device's detection direction characteristic and switching time, determine the shutter slit width and pitch.



**RESTRICTIONS ON PRODUCT USE**

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