

TOSHIBA Photointerrupter Infrared LED + Phototransistor

## TLP841

Copiers, Printers and Fax Machines

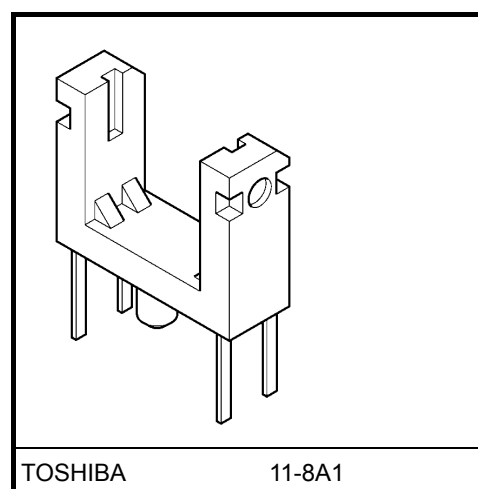
VCRs and CD Players

Various Position Detection Sensor

The TLP841 is photointerrupter which consists of a GaAs infrared LED and an Si phototransistor.

With gap width as wide as 5mm, it is a compact package.

- Compact package: 7.5(w)×6.3(h)×2.6(d)mm
- Printed wiring board direct mounting type (with a locating pin)
- Board thickness: 1.6mm or less
- Gap width: 5 mm
- Resolution: Slit width = 0.5 mm
- Current transfer ratio:  $I_C/I_F = 2.5\%$  (min)
- High response speed:  $t_r, t_f = 15\mu s$  (typ.)
- Material of the package: Polybutylene terephthalate (UL94V-0)

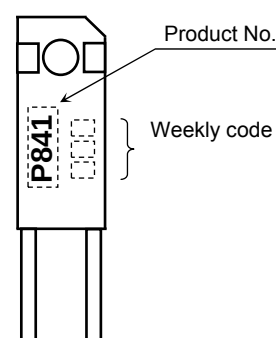


Weight: 0.1 g (typ.)

### Absolute Maximum Ratings (Ta = 25°C)

| Characteristics                     |                                                | Symbol                | Rating     | Unit  |
|-------------------------------------|------------------------------------------------|-----------------------|------------|-------|
| LED                                 | Forward current                                | $I_F$                 | 30         | mA    |
|                                     | Forward current derating (Ta>25°C)             | $\Delta I_F/^\circ C$ | -0.33      | mA/°C |
|                                     | Reverse voltage                                | $V_R$                 | 5          | V     |
| Detector                            | Collector-emitter voltage                      | $V_{CEO}$             | 35         | V     |
|                                     | Emitter-collector voltage                      | $V_{ECO}$             | 5          | V     |
|                                     | Collector power dissipation                    | $P_C$                 | 75         | mW    |
|                                     | Collector power dissipation derating (Ta>25°C) | $\Delta P_C/^\circ C$ | -1         | mW/°C |
|                                     | Collector current                              | $I_C$                 | 50         | mA    |
|                                     | Operating temperature range                    | $T_{opr}$             | -30 to 85  | °C    |
| Storage temperature range           |                                                | $T_{stg}$             | -40 to 100 | °C    |
| Soldering temperature (5s) (Note 1) |                                                | $T_{sol}$             | 260        | °C    |

### Marking (Note 2)

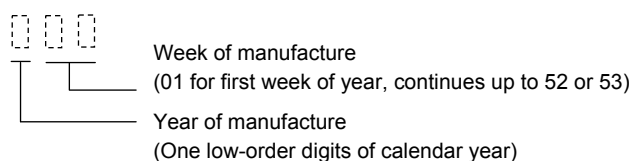


Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: At least 1.5mm from body

Note 2: Weekly code: (Three digits)



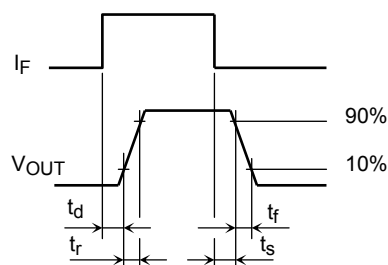
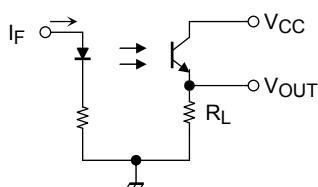
## Operating Ranges

| Characteristics             | Symbol    | Min | Typ. | Max | Unit |
|-----------------------------|-----------|-----|------|-----|------|
| Supply voltage              | $V_{CC}$  | —   | 5    | 24  | V    |
| Forward current             | $I_F$     | —   | —    | 20  | mA   |
| Operating temperature range | $T_{opr}$ | -10 | —    | 75  | °C   |

## Optical and Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )

| Characteristics |                                      | Symbol          | Test conditions                                                              | Min  | Typ. | Max  | Unit          |
|-----------------|--------------------------------------|-----------------|------------------------------------------------------------------------------|------|------|------|---------------|
| LED             | Forward voltage                      | $V_F$           | $I_F = 10\text{ mA}$                                                         | 1.00 | 1.23 | 1.40 | 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                         | $I_D (I_{CEO})$ | $V_{CE} = 24\text{ V}, I_F = 0$                                              | —    | —    | 0.05 | $\mu\text{A}$ |
|                 | Peak sensitivity wavelength          | $\lambda_P$     | —                                                                            | —    | 820  | —    | nm            |
| Coupled         | Current transfer ratio               | $I_C/I_F$       | $V_{CE} = 2\text{ V}, I_F = 10\text{ mA}$                                    | 2.5  | —    | 50   | %             |
|                 | Collector-emitter saturation voltage | $V_{CE(sat)}$   | $I_F = 20\text{ mA}, I_C = 0.25\text{ mA}$                                   | —    | 0.1  | 0.4  | V             |
|                 | Rise time                            | $t_r$           | $V_{CE} = 5\text{ V}, I_C = 1\text{ mA}, R_L = 1\text{ k}\Omega$<br>(Note 3) | —    | 15   | 50   | $\mu\text{s}$ |
|                 | Fall time                            | $t_f$           |                                                                              | —    | 15   | 50   |               |

Note 3 : 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 transistor light emitter or receiver, if any, would have a bad influence to the optical characteristics and it may severely lower the conversion efficiency.
- Care must be taken in relation to the environment in which the device is to be installed. Oil or chemicals may cause the package to melt or crack.
- The device should be mounted on an unwarped surface.
- 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.

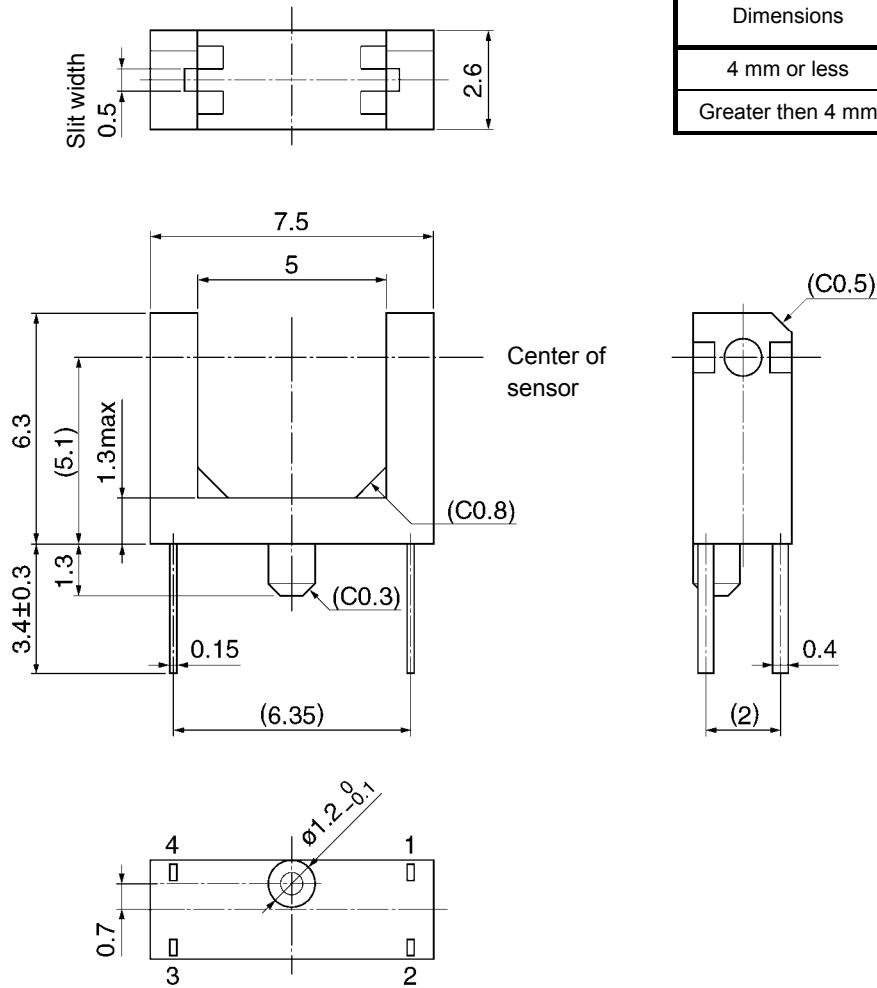
$$\frac{I_C/I_F(t)}{I_C/I_F(0)} = \frac{P_o(t)}{P_o(0)}$$

Package Dimensions: TOSHIBA 11-8A1

Unit: mm

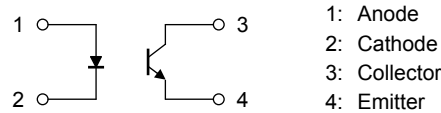
( ) : Reference value  
Tolerances are listed below unless  
otherwise specified.

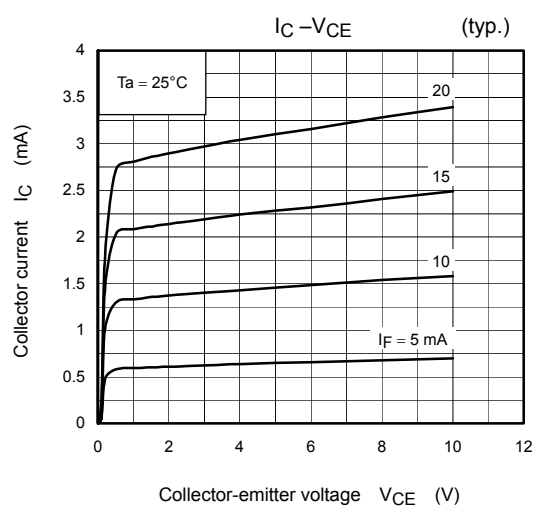
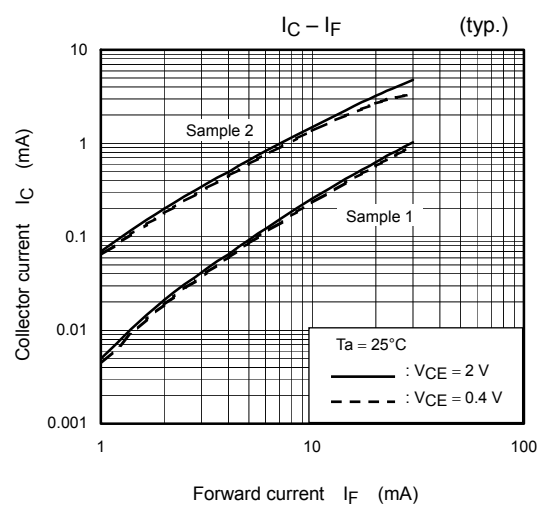
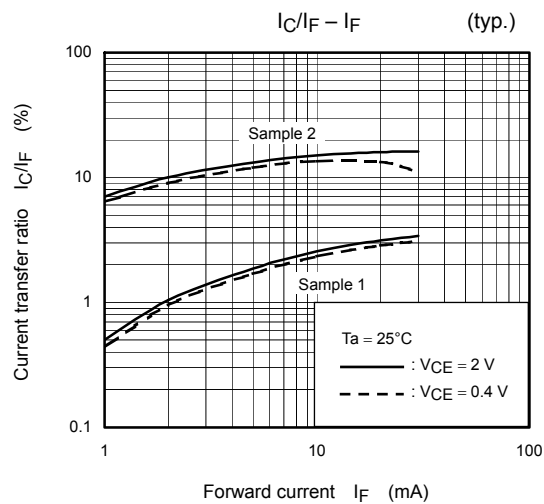
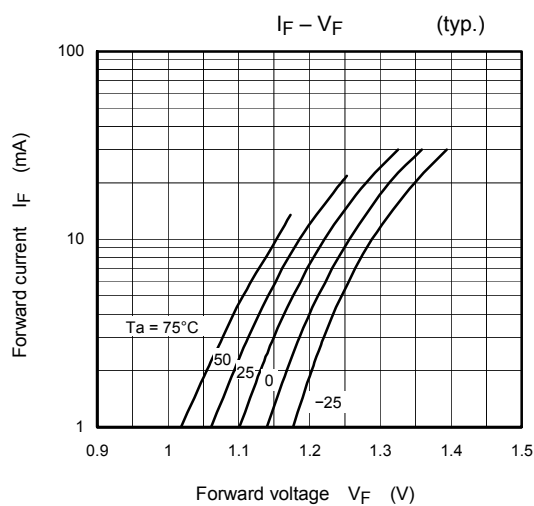
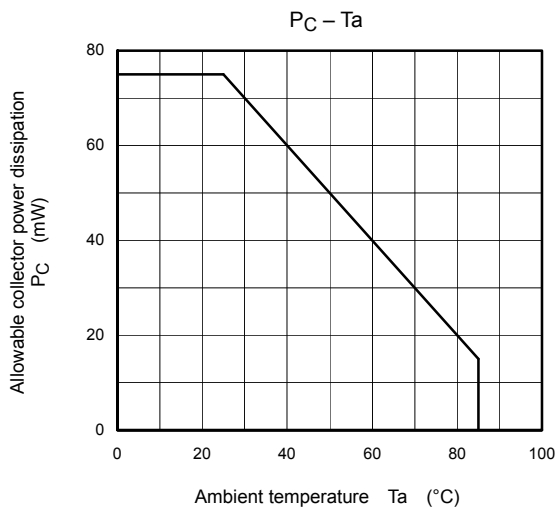
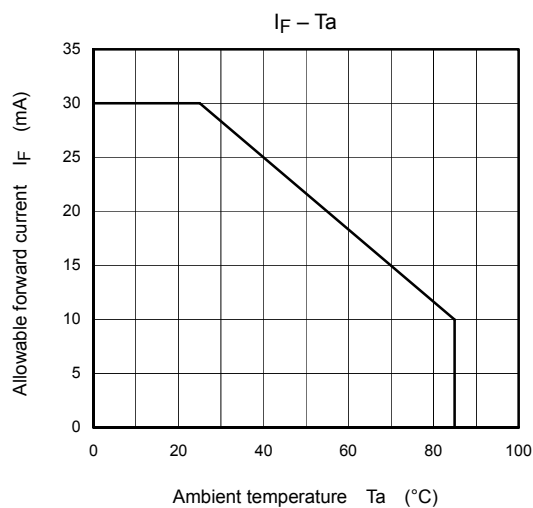
| Dimensions        | Tolerance |
|-------------------|-----------|
| 4 mm or less      | ±0.1      |
| Greater than 4 mm | ±0.2      |

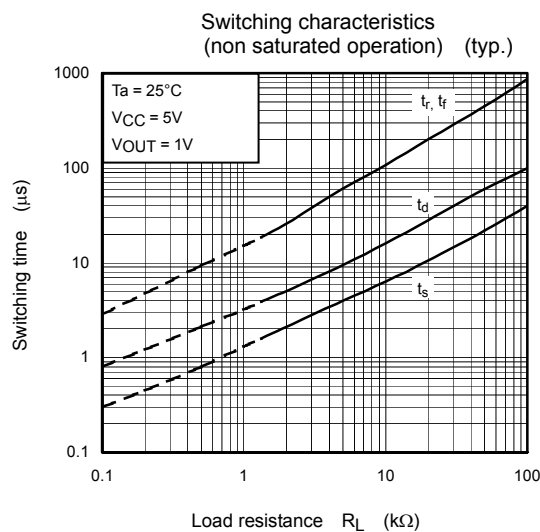
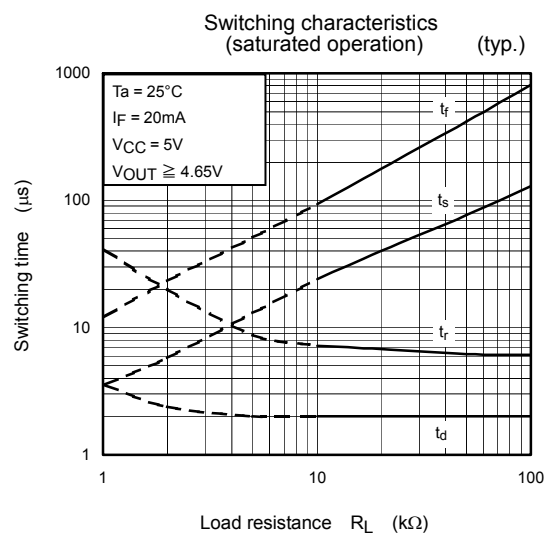
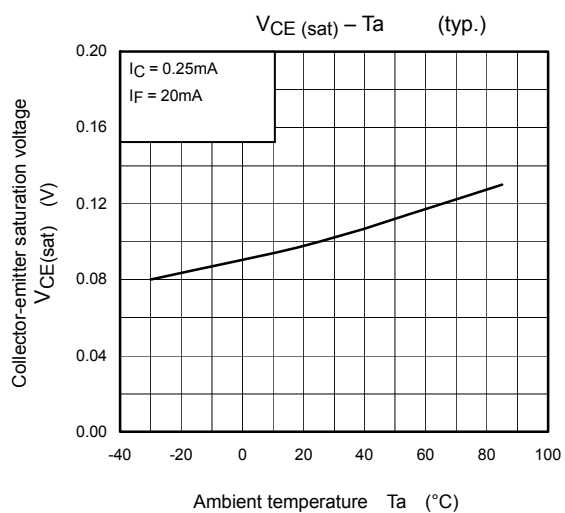
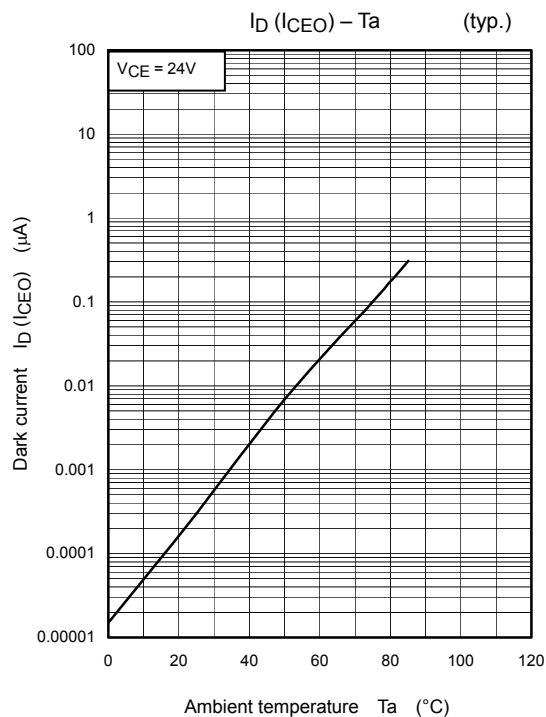
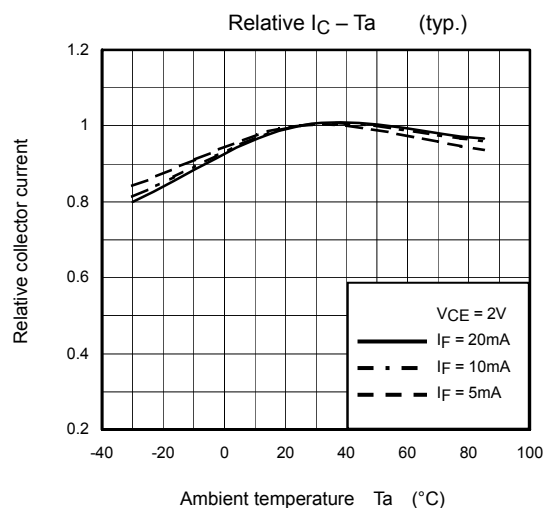


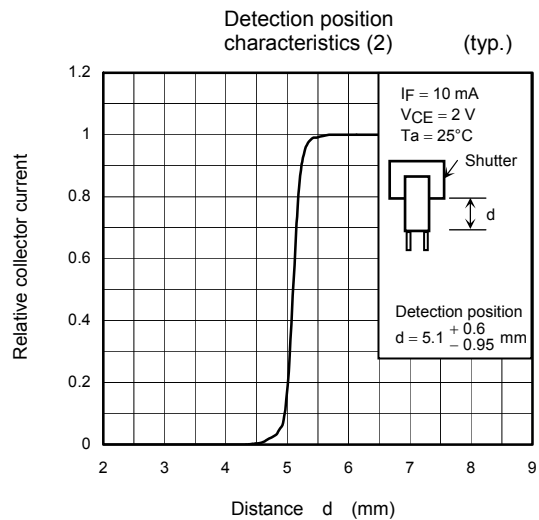
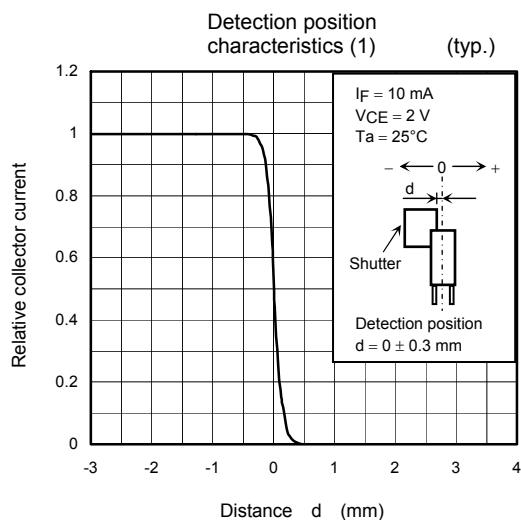
Weight : 0.1g (typ.)

Pin Connection



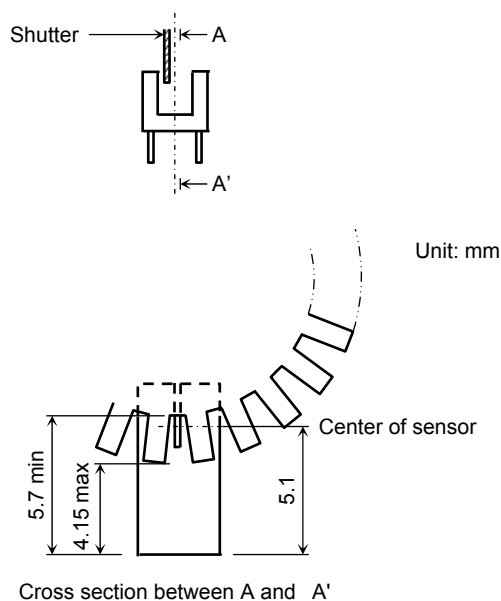






## Relative Positioning of Shutter and Device

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.



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