TOSHIBA PHOTO-INTERRUPTERS INFRARED LED + PHOTODARLINGTON TRANSISTOR

# TLP864, TLP865

VCRS, COMPACT DISC PLAYERS

COPIERS, FAX MACHINES, PRINTERS

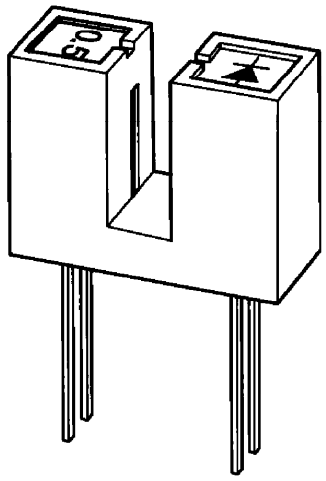
VENDING MACHINES, TICKET MACHINES

VARIOUS POSITION DETECTION SENSORS

The TLP864 and TLP865 photo-interrupters combine a GaAs infrared LED with a high-sensitivity Si photodarlington transistor. They exhibit a high current transfer ratio, can be driven using a low input current and are best suited for use in low-power circuits.

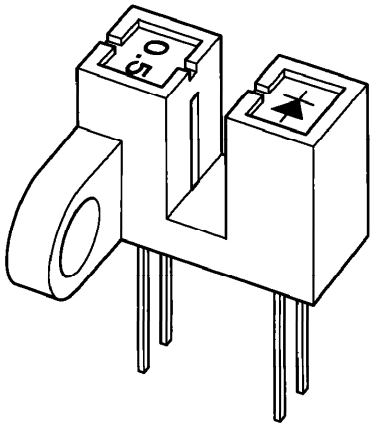
- Small package
- TLP864 designed for direct mounting on printed circuit boards.
- Side mounting type : TLP865
- Gap : 3 mm
- Resolution : Slit width = 0.5 mm
- High current transfer ratio : $I_C / I_F$ = 50% (min) at $I_F$ = 1 mA
- Detector impermeable to visible light
- Package material : Polycarbonate

TLP864



TOSHIBA 11-13K1

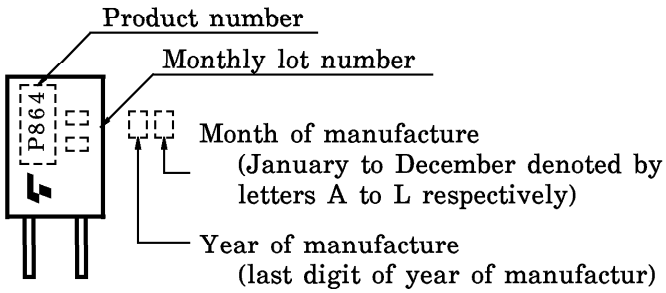
TLP865



TOSHIBA 11-13M1

Weight : 0.81 g (typ.)
0.82 g (typ.)

MARKINGS




Letter color : Silver

| ABBREVIATION | TYPE |
|---|---|
| P864 | TLP864 |
| P865 | TLP865 |

MAXIMUM RATINGS (Ta = 25°C)

| | CHARACTERISTIC | SYMBOL | RATING | UNIT |
|---|---|---|---|---|
| LED | Forward Current | $I_F$ | 50 | mA |
| | Forward Current Derating (Ta > 25°C) | $\Delta I_F$ / °C | −0.33 | mA / °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 (Ta > 25°C) | $\Delta P_C$ / °C | −1 | mW / °C |
| | Collector Current | $I_C$ | 40 | mA |
| Operating Temperature Range | | $T_{opr}$ | −25~85 | °C |
| Storage Temperature Range | | $T_{stg}$ | −40~100 | °C |
| Soldering Temperature (5 s) | | $T_{sol}$ | 260 | °C |

RECOMMENDED OPERATING CONDITION

| CHARACTERISTIC | SYMBOL | Min | Typ. | Max | UNIT |
|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | — | 5 | 16 | V |
| Forward Current | $I_F$ | — | — | 20 | mA |
| Operating Temperature | $T_{opr}$ | −10 | — | 70 | °C |

OPTICAL AND ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| | CHARACTERISTIC | SYMBOL | TEST CONDITION | Min | Typ. | Max | UNIT |
|---|---|---|---|---|---|---|---|
| LED | Forward Voltage | $V_F$ | $I_F$ = 10 mA | 1.00 | 1.15 | 1.30 | V |
| | Reverse Current | $I_R$ | $V_R$ = 5 V | — | — | 10 | μA |
| | Peak Emission Wavelength | $\lambda_P$ | $I_F$ = 10 mA | — | 940 | — | nm |
| DETECTOR | Dark Current | $I_D$ ($I_{CEO}$) | $V_{CE}$ = 16 V, $I_F$ = 0 | — | — | 0.25 | μA |
| | Peak Sensitivity Wavelength | $\lambda_P$ | | — | 870 | — | nm |
| COUPLED | Current Transfer Ratio | $I_C / I_F$ | $V_{CE}$ = 2 V, $I_F$ = 1 mA | 50 | — | 2000 | % |
| | Collector-Emitter Saturation Voltage | $V_{CE\ (sat)}$ | $I_F$ = 2 mA, $I_C$ = 0.5 mA | — | 0.75 | 1 | V |
| | Rise Time | $t_r$ | $V_{CC}$ = 5 V, $I_C$ = 1 mA, $R_L$ = 1 kΩ | — | 600 | — | μs |
| | Fall Time | $t_f$ | | — | 500 | — | |

PRECAUTIONS

The following points must be borne in mind.

1. Clean only the soldered part of the leads. Do not immerse the entire package in the cleaning solvent.
2. 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 chosing a packaging material by refering to the table below.

<Chemicals which should not be used with polycarbonate>

| | PHENOMENON | CHEMICALS |
|---|---|---|
| A | Staining and slight deterioration | • Nitric acid (diluted), hydrogen peroxide, chlorine |
| B | Cracking, crazed or swelling | • Acetic acid (70% or more)<br>• Gasoline<br>• Methyl ethyl ketone, ethyl acetate, butyl acetate<br>• Ethyl methacrylate, ethyl ether, MEK<br>• Acetone, m-amino alcohol, carbon tetrachloride<br>• Carbon disulfide, trichloroethylene, cresol<br>• Thinners, oil of turpentine<br>• Triethanolamine, TCP, TBP |
| C | Melting<br>{ } : Used as solvent | • Concentrated sulfuric acid<br>• Benzene<br>• Styrene, acrylonitrile, vinyl acetate<br>• Ethylenediamine, diethylenediamine<br>• {Chloroform, methyl chloride, tetrachloromethane, dioxane, 1, 2-dichloroethane} |
| D | Decomposition | • Ammonia water<br>• Other alkalis |

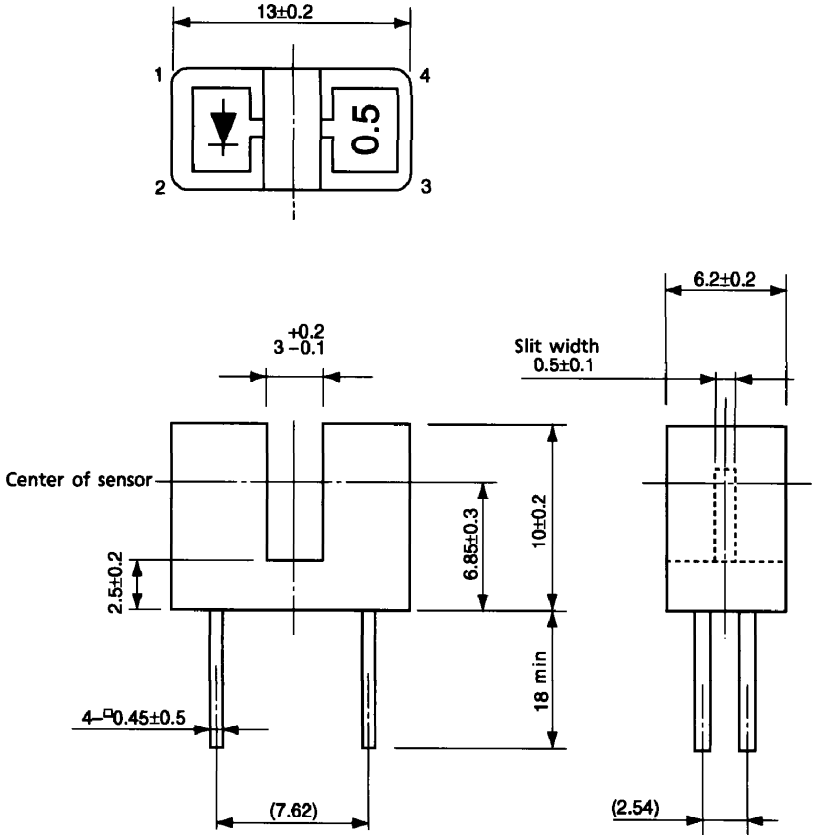
3. Mount the device on a level surface.
4. Screws should be tightened to a clamping torque of 0.59 N·m (on the TLP865).
5. Conversion efficiency falls over time due to the current which flows in the infrared LED. When designing a circuit, take into account this change in conversion efficiency over time. 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

11-13K1

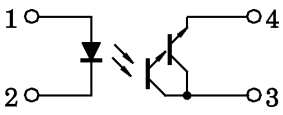
Unit : mm




( ) : Reference value

Weight : 0.81 g (typ.)

PIN CONNECTION

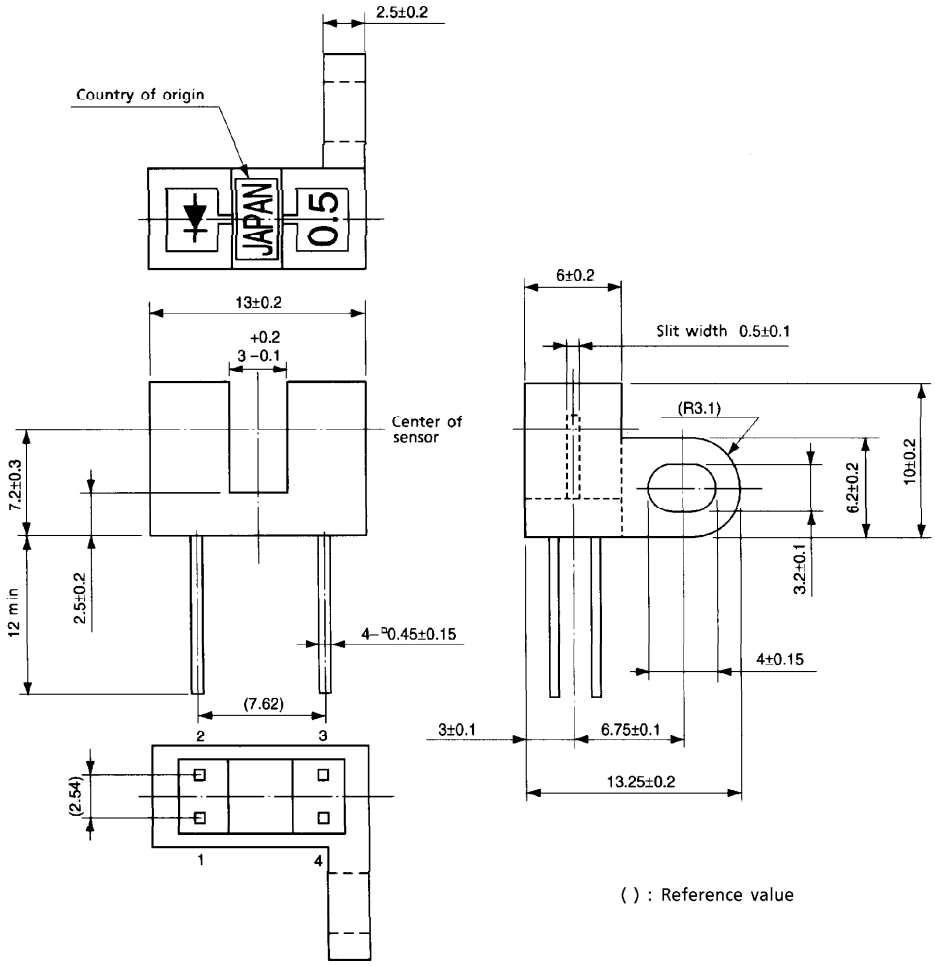



1. Anode
2. Cathode
3. Collector
4. Emitter

PACKAGE DIMENSIONS

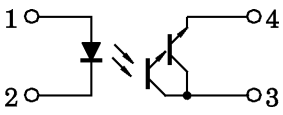
11-13M1

Unit : mm



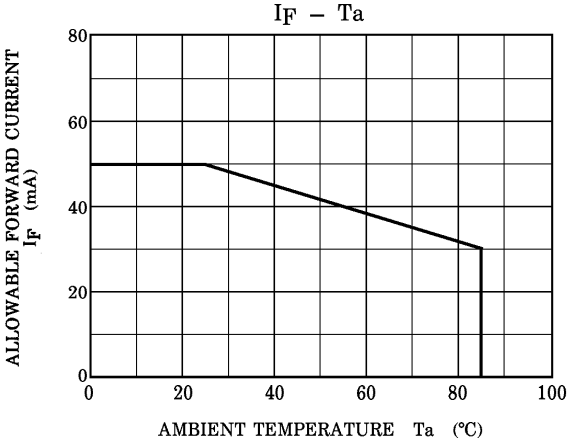

Weight : 0.82 g (typ.)

PIN CONNECTION

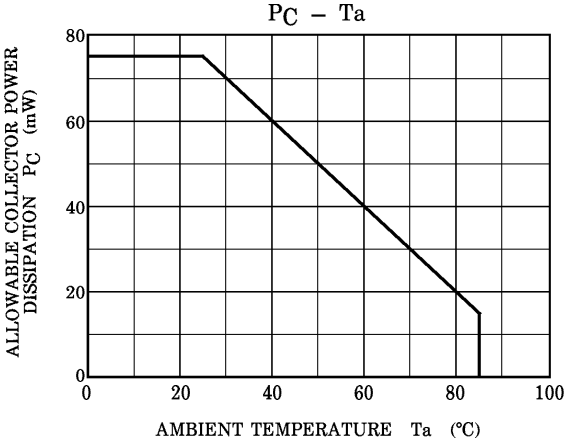



1. Anode
2. Cathode
3. Collector
4. Emitter

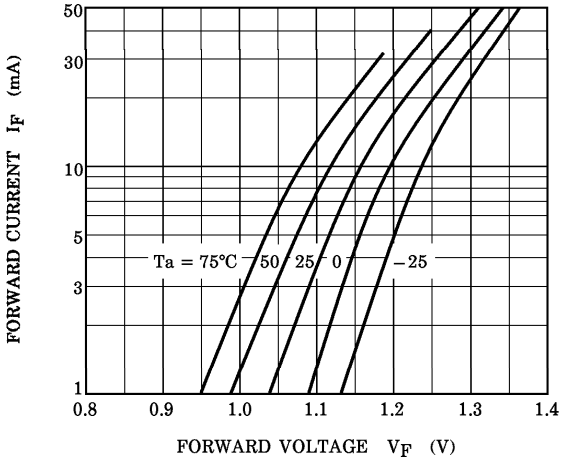
$I_F$ – Ta



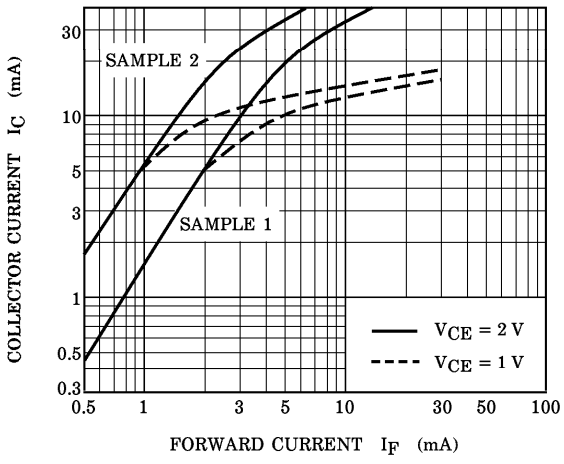

$P_C$ – Ta



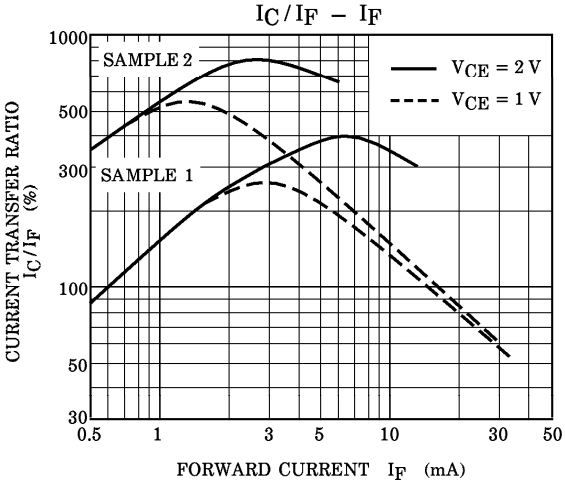

$I_F$ – $V_F$ (typ.)



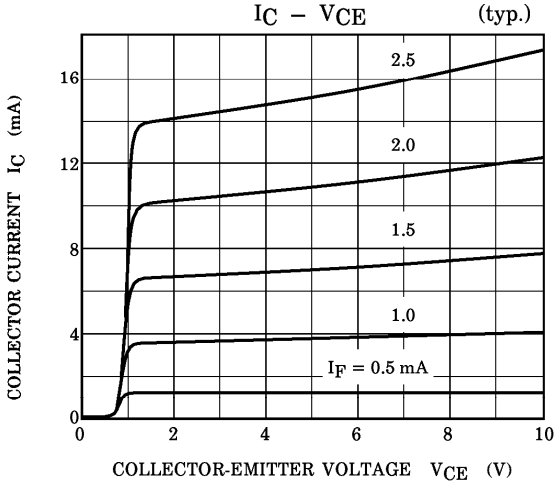

$I_C$ – $I_F$



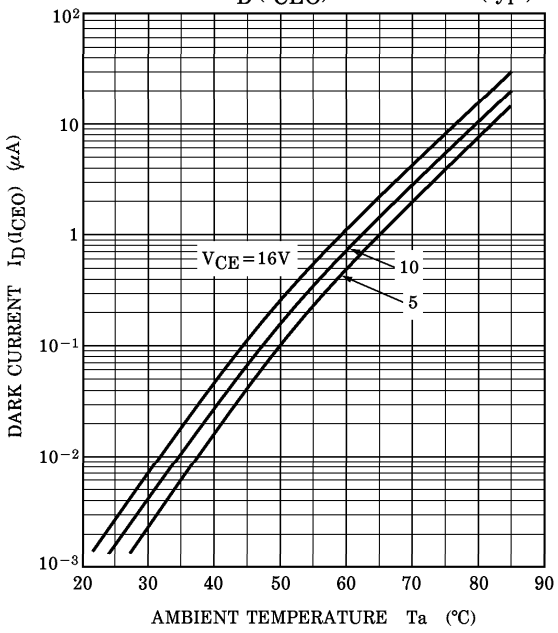

$I_C / I_F$ – $I_F$



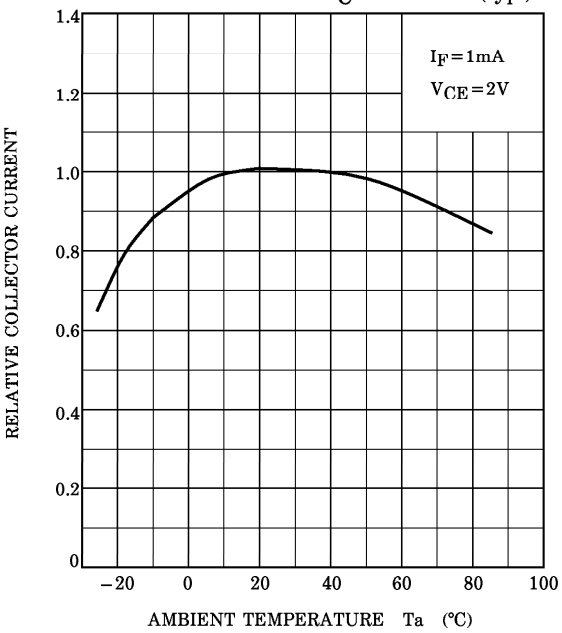

$I_C$ – $V_{CE}$ (typ.)



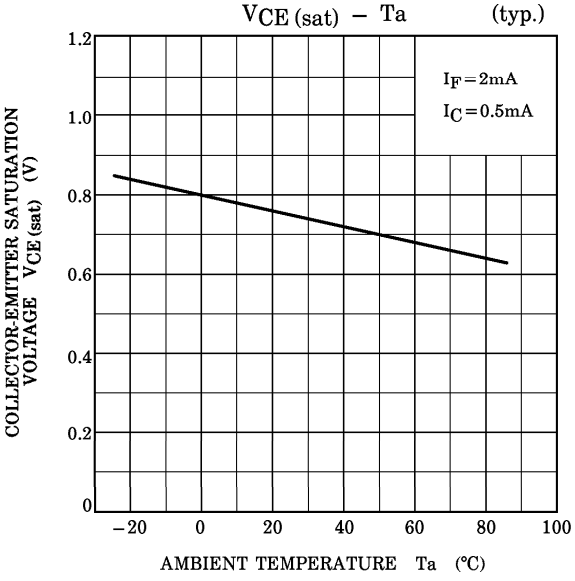
$I_D$ ($I_{CEO}$) – Ta (typ.)



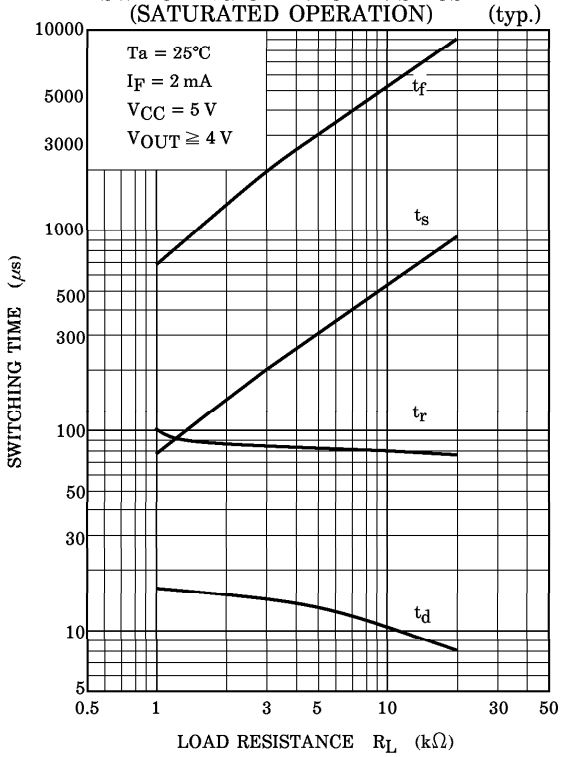

RELATIVE $I_C$ – Ta (typ.)



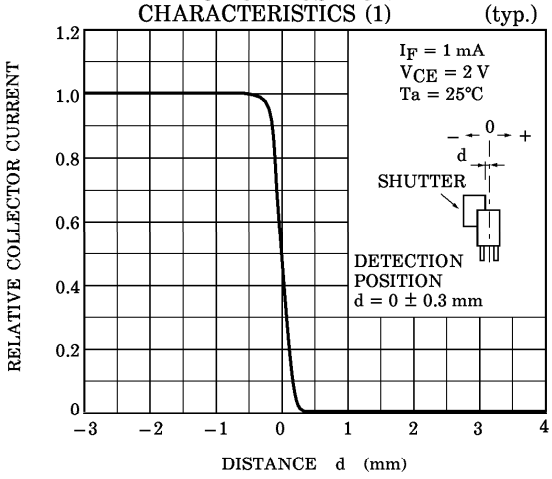

$V_{CE}$ (sat) – Ta (typ.)



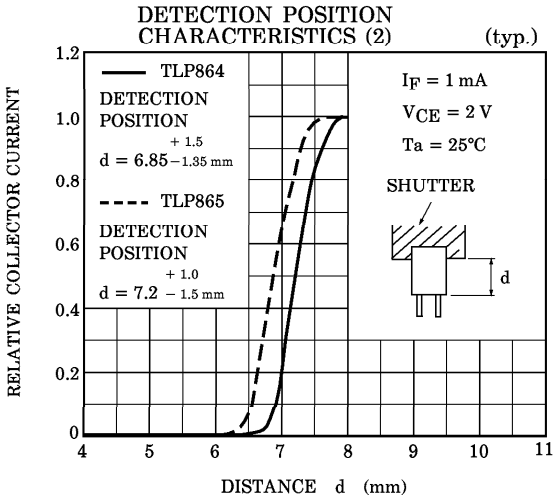
SWITCHING CHARACTERISTICS
(SATURATED OPERATION) (typ.)



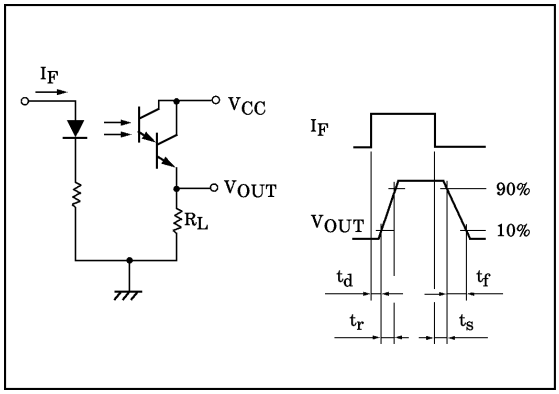

DETECTION POSITION
CHARACTERISTICS (1) (typ.)




DETECTION POSITION
CHARACTERISTICS (2) (typ.)



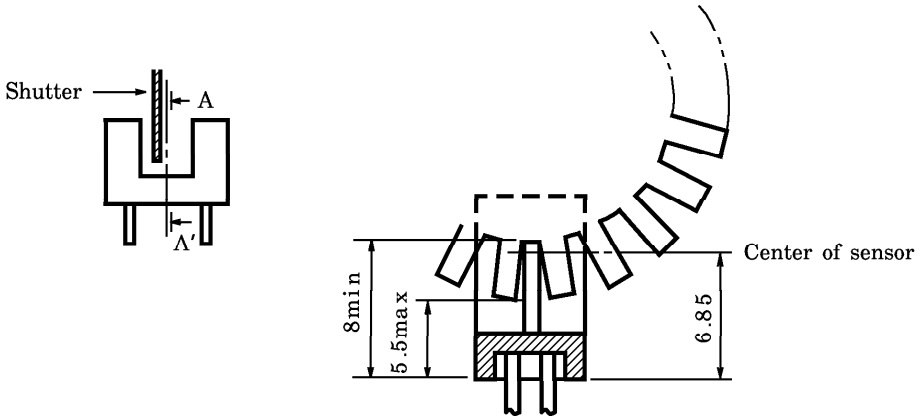

SWITCHING TIME TEST CIRCUIT



RELATIVE POSITIONING OF SHUTTER AND DEVICE

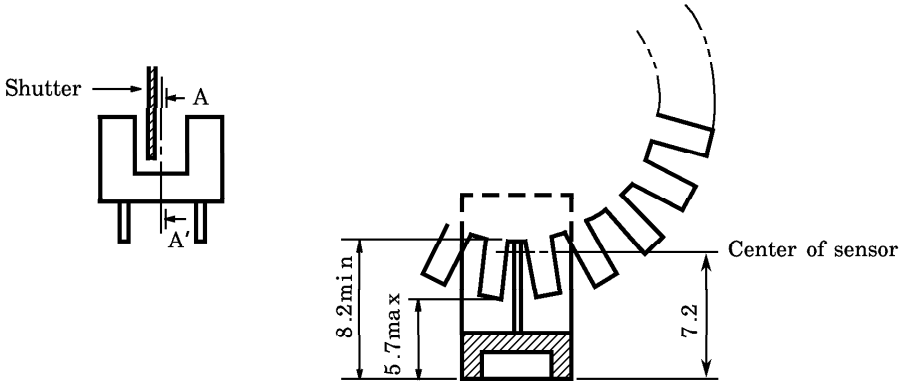
For normal operation position the shutter and the device as shown in the figure below. By considering the device's detection direction characteristic and switching time, determine the shutter slit width and pitch.

TLP864 Unit in mm




Cross section between A and A′

TLP865




Cross section between A and A′

## RESTRICTIONS ON PRODUCT USE

000707EAC

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