TOSHIBA PHOTOINTERRUPTER INFRARED LED + PHOTO IC

# TLP1016, TLP1017

HOME ELECTRIC EQUIPMENT SUCH AS VCR, CD PLAYER

OA EQUIPMENT SUCH AS COPYING MACHINE, PRINTER, FACSIMILE, ETC.

AUTOMATIC SERVICE EQUIPMENT SUCH AS VENDING MACHINE, TICKETING MACHINE, ETC.

VARIOUS POSITION DETECTION

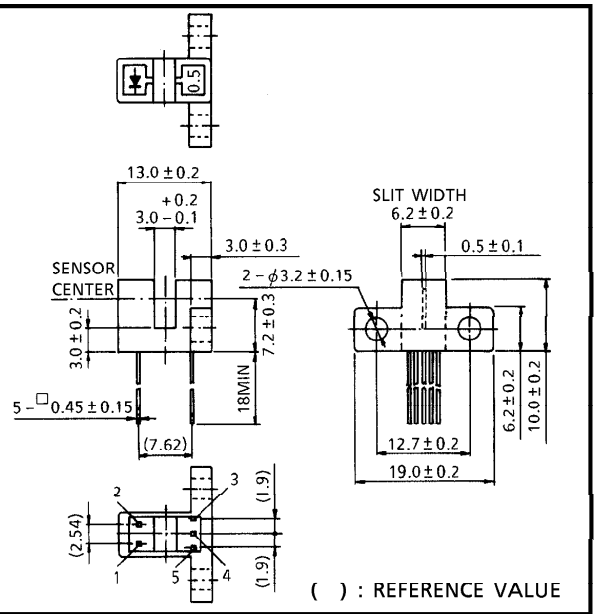
TLP1016 and TLP1017 are digital output photo-interrupters combining GaAs infrared LED with high sensitive and high gain Si photo IC. Directly connectable to TTL, LSTTL and CMOS.

- Side mounting type
- Gap : 3mm
- Resolution : Slit width 0.5mm
- Digital output (Open collector)

  TLP1016 : Low level output at shielding

  TLP1017 : High level output at shielding
- Built-in Schmitt trigger circuit
- Threshold input current : 4mA (Max.) at Ta = 25°C
- Operating supply voltage : $V_{CC}$ = 4.5~17V
- Fast response speed
- Detector side is of visible light cut type.

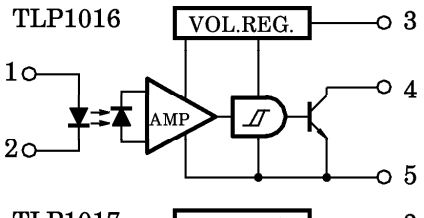
Unit in mm

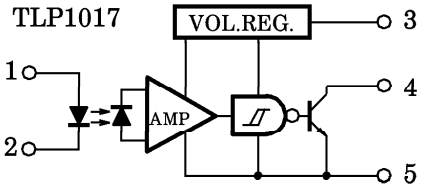



| | |
|---|---|
| JEDEC | — |
| EIAJ | — |
| TOSHIBA | 11-13H1 |

Weight : 1g (Typ.)

PIN CONNECTION




1. ANODE
2. CATHODE
3. $V_{CC}$
4. OUT
5. GND

961001EBC2

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 | Supply Voltage | $V_{CC}$ | 17 | V |
| | Output Voltage | $V_O$ | 30 | V |
| | Output Current | $I_O$ | 50 | mA |
| | Power Dissipation | $P_O$ | 250 | mW |
| | Power Dissipation Derating (Ta > 25°C) | $\Delta P_O$ / °C | −3.33 | mW / °C |
| Operating Temperature Range | | $T_{opr}$ | −25~85 | °C |
| Storage Temperature Range | | $T_{stg}$ | −40~100 | °C |
| Soldering Temperature (5s) | | $T_{sol}$ | 260 | °C |

RECOMMENDED OPERATING CONDITION

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| LED Forward Current | $I_F$ | 14* | — | 20 | mA |
| Supply Voltage | $V_{CC}$ | 4.5 | 5.0 | 17 | V |
| Output Voltage | $V_O$ | — | 5.0 | 24 | V |
| Low Level Output Current | $I_{OL}$ | — | — | 16 | mA |
| Operating Temperature Range | $T_{opr}$ | −25 | — | 85 | °C |

* 14mA is a value when 50% LED deterioration is taken into consideration. Initial threshold input current shall be 7mA MAX.

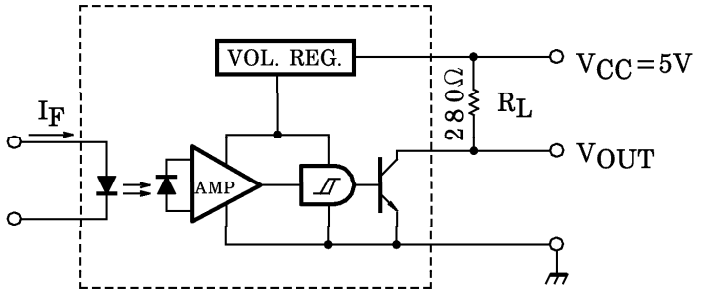
OPTO-ELECTRICAL CHARACTERISTICS (Unless otherwise sppecified, Ta = −25~85°C, $V_{CC}$ = 5V ± 10%)

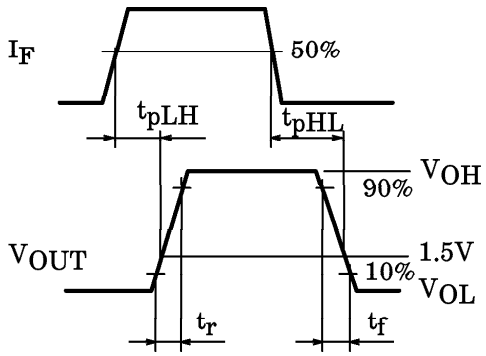
| | CHARACTERISTIC | SYMBOL | TEST CONDITION | | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|---|
| LED | Forward Voltage | $V_F$ | $I_F$ = 10mA, Ta = 25°C | | 1.00 | 1.15 | 1.30 | V |
| | Reverse Current | $I_R$ | $V_R$ = 5V, Ta = 25°C | | — | — | 10 | μA |
| | Peak Emission Wavelength | $\lambda_P$ | $I_F$ = 15mA, Ta = 25°C | | — | 940 | — | nm |
| DETECTOR | Supply Voltage | $V_{CC}$ | — | | 4.5 | — | 17 | V |
| | Low Level Supply Current | $I_{CCL}$ | $I_F$ = *1 | | — | — | 5.0 | mA |
| | | | $I_F$ = *1, $V_{CC}$ = 17V | | — | — | 5.2 | |
| | High Level Supply Current | $I_{CCH}$ | $I_F$ = *2 | | — | — | 3.0 | mA |
| | | | $I_F$ = *2, $V_{CC}$ = 17V | | — | — | 3.2 | |
| | Low Level Output Voltage | $V_{OL}$ | $I_{OL}$ = 16mA, $I_F$ = *1 Ta = 25°C | | — | 0.07 | 0.3 | V |
| | | | $I_{OL}$ = 16mA, $I_F$ = *1 $V_{CC}$ = 17V | | — | — | 0.4 | |
| | High Level Output Current | $I_{OH}$ | $I_F$ = *2, $V_O$ = 30V | | — | — | 15 | μA |
| | Peak Sensitivity Wavelength | $\lambda_P$ | Ta = 25°C | | — | 900 | — | nm |
| COUPLED | L→H Threshold Input Current | $I_{FLH}$ | Ta = 25°C | TLP1016 | — | — | 4 | mA |
| | | | $V_{CC}$ = 17V | | — | — | 7 | |
| | H→L Threshold Input Current | $I_{FHL}$ | Ta = 25°C | TLP1017 | — | — | 4 | mA |
| | | | $V_{CC}$ = 17V | | — | — | 7 | |
| | Hysteresis Ratio | $I_{FHL}/I_{FLH}$ | — | TLP1016 | — | 0.67 | — | — |
| | | | | TLP1017 | — | 1.5 | — | |
| | Propagation Delay Time (L→H) | $t_{pLH}$ | $V_{CC}$ = 5V $I_F$ = 15mA $R_L$ = 280Ω Ta = 25°C (Note) | TLP1016 | — | 3 | — | μs |
| | | | | TLP1017 | — | 6 | — | |
| | Propagation Delay Time (H→L) | $t_{pHL}$ | | TLP1016 | — | 6 | — | |
| | | | | TLP1017 | — | 3 | — | |
| | Rise Time | $t_r$ | | | — | 0.1 | — | |
| | Fall Time | $t_f$ | | | — | 0.05 | — | |

*1. TLP1016 = 0, TLP1017 = 15mA *2. TLP1016 = 15mA, TLP1017 = 0

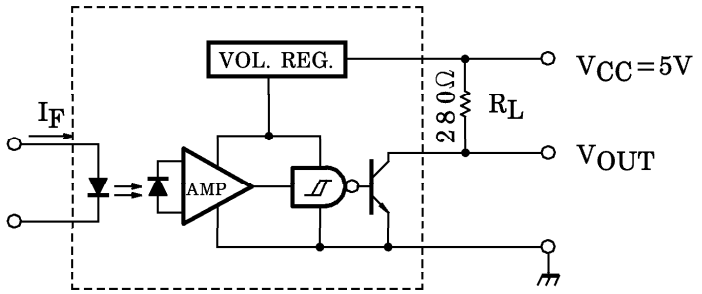
NOTE : SWITCHING TIME TEST CIRCUIT

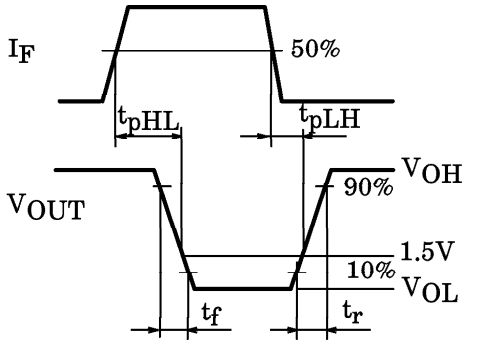
TLP1016



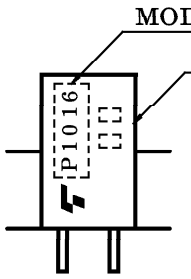

TLP1017




PRODUCT INDICATION

| ABBREVIATION | TYPE |
|---|---|
| P1016 | TLP1016 |
| P1017 | TLP1017 |




PRODUCTION MONTH
(JAN.－DEC. ARE INDICATED BY ALPHABETES OF A-L)

PRODUCTION YEAR (LAST DIGIT OF A.D. IS INDICATED)

STAMP COLOR : SILVER

PRECAUTION

Please be careful of the followings.

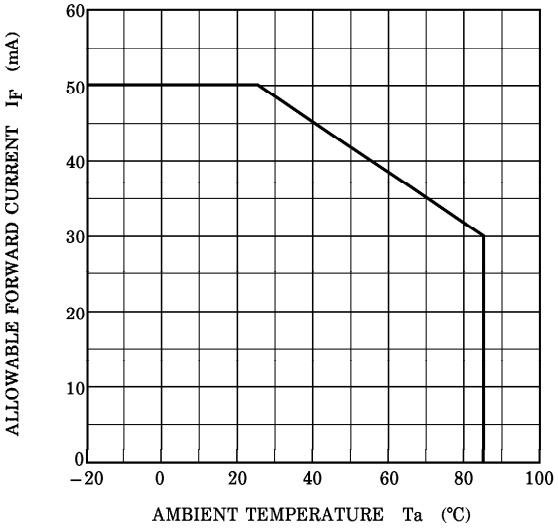
1. Soldering should be performed after lead forming.
2. If chemicals are used for cleaning, the soldered surface only shall be cleaned with chemicals avoiding the whole cleaning of the package.
3. The container is made of polycarbonate. Polycarbonate is usually stable with acid, alcohol, and aliphatic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

<Chemicals to avoid with polycarbonate>

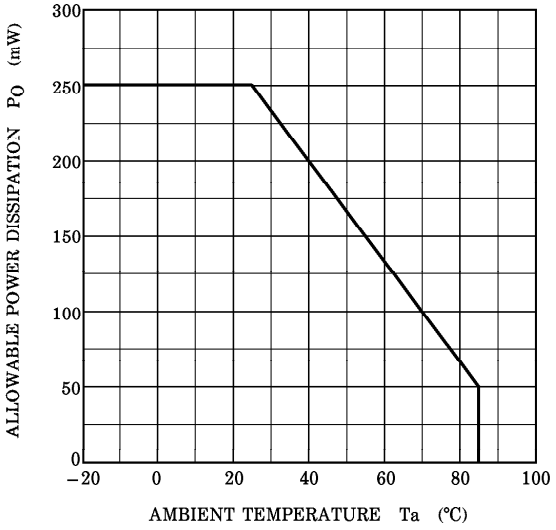
| | PHENOMENON | CHEMICALS |
|---|---|---|
| A | Little deterioration but staining | • nitric acid (low concentration), hydrogen peroxide, chlorine |
| B | Cracked, crazed, or swollen | • acetic acid (70% or more)<br>• gasoline<br>• methyl ethyl ketone, ehtyl acetate, butyl acetate<br>• ethyl methacrylate, 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 | Melted<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 | Decomposed | • ammonia water<br>• other alkali |

4. During 100$\mu$s after turning on $V_{CC}$, output voltage changes for stabilizing the inner circuit.
5. Supply the by-pass condenser up to 0.01$\mu$F betweeen $V_{CC}$ and GND near device to stabilize the power supply line.
6. Screw shall be tightened to clamping torque of 0.59N·m.

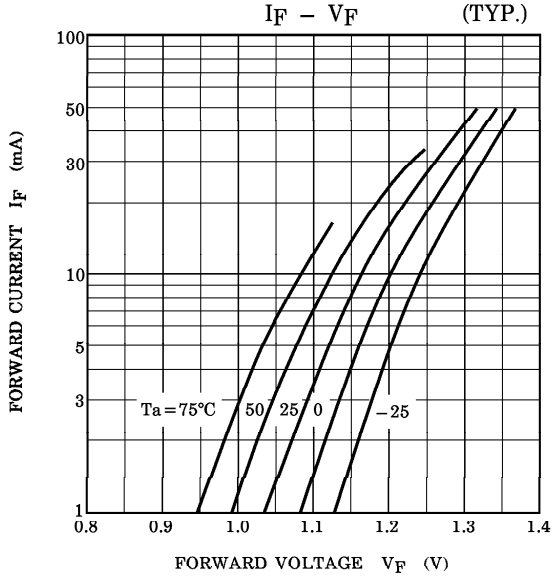
$I_F$ – Ta



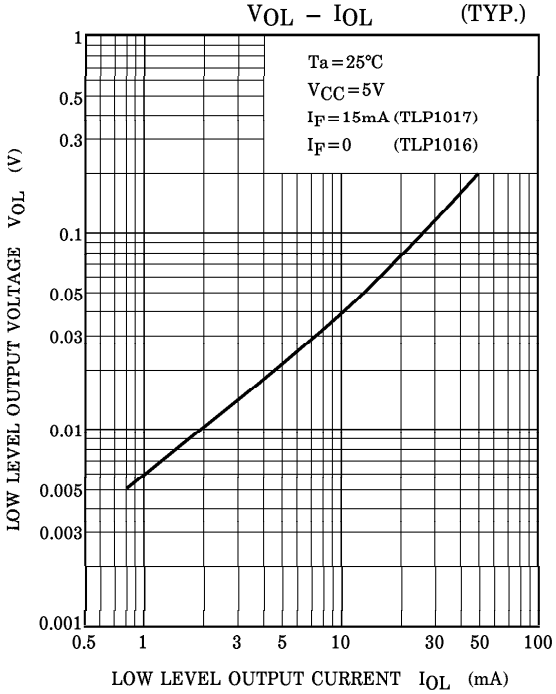

$P_O$ – Ta



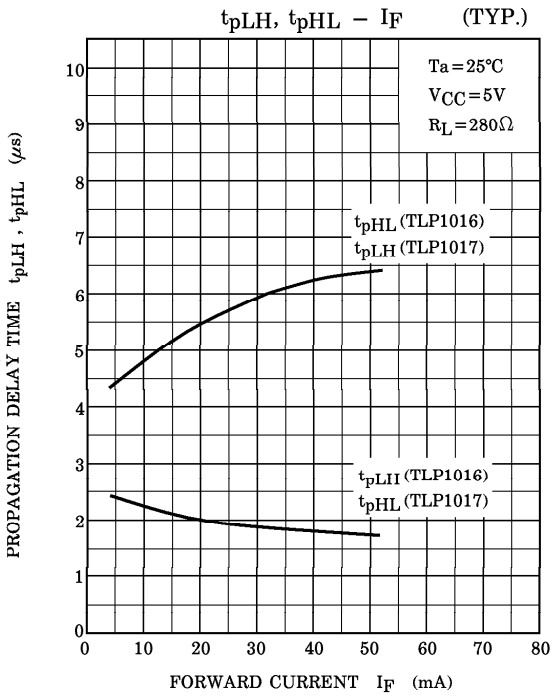

$I_F$ – $V_F$ (TYP.)



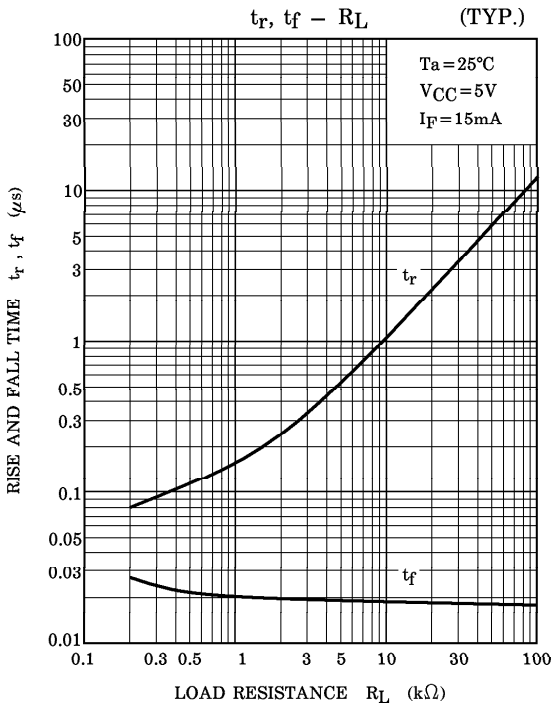

$V_{OL}$ – $I_{OL}$ (TYP.)



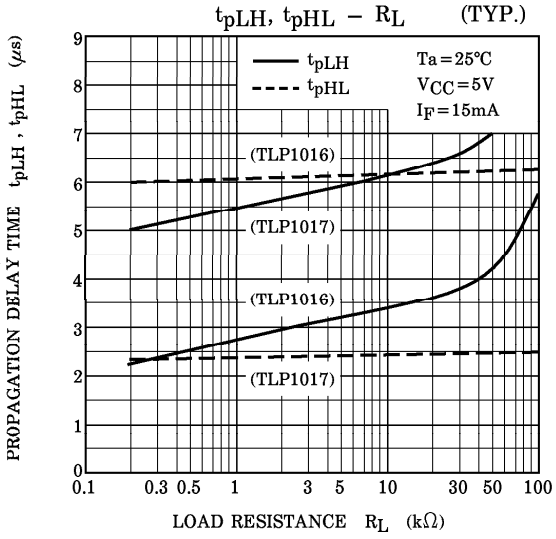
$t_{pLH}$, $t_{pHL}$ – $I_F$ (TYP.)



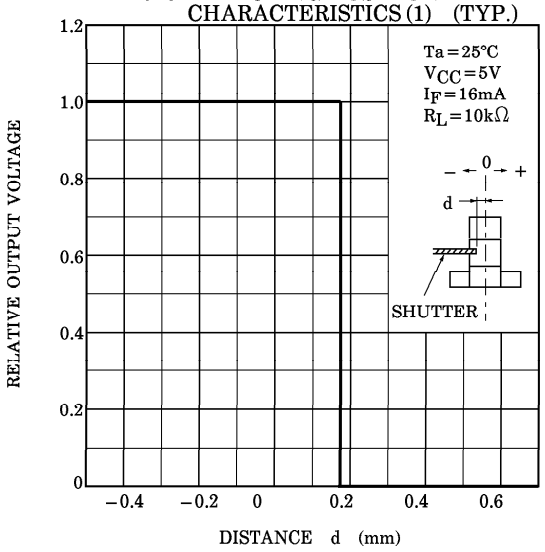

$t_r$, $t_f$ – $R_L$ (TYP.)



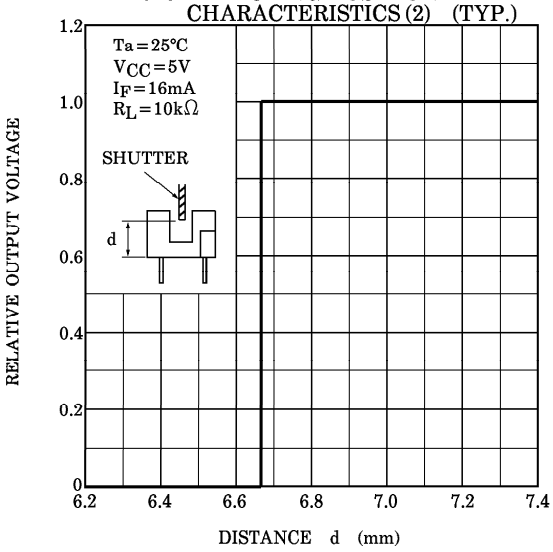

$t_{pLH}$, $t_{pHL}$ – $R_L$ (TYP.)



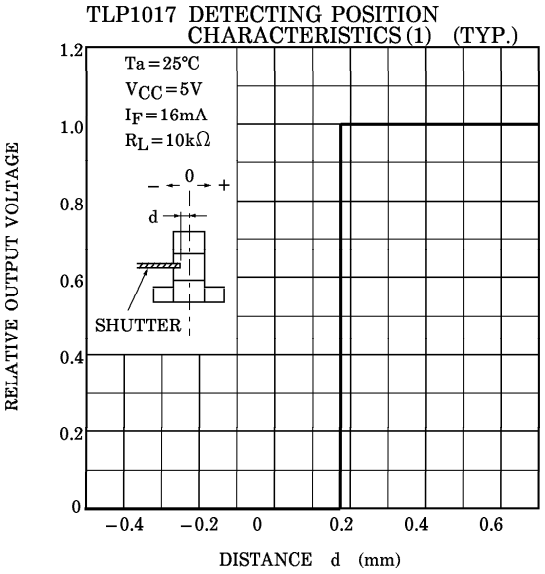
TLP1016 DETECTING POSITION CHARACTERISTICS (1) (TYP.)



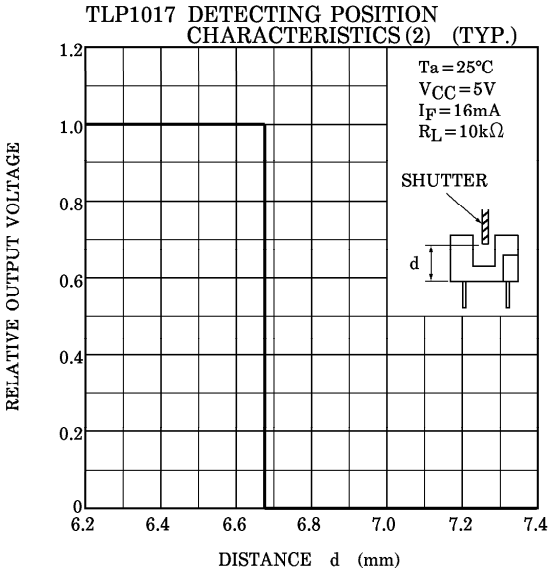

TLP1016 DETECTING POSITION CHARACTERISTICS (2) (TYP.)




TLP1017 DETECTING POSITION CHARACTERISTICS (1) (TYP.)



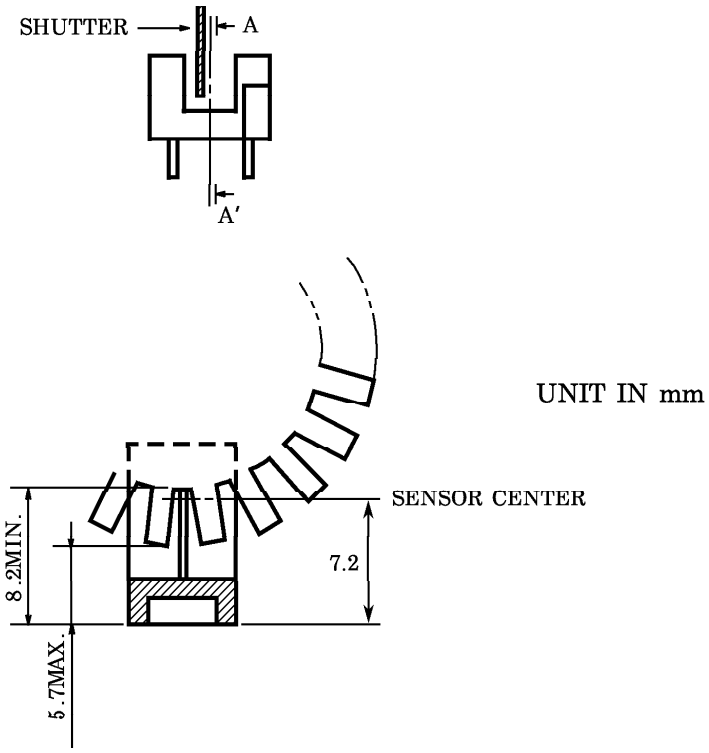

TLP1017 DETECTING POSITION CHARACTERISTICS (2) (TYP.)



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




UNIT IN mm

A – A' CROSS SECTION

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