TOSHIBA PHOTOINTERRUPTER INFRARED LED + PHOTO IC

TLP1002A, TLP1003A

HOME ELECTRIC EQUIPMENT SUCH AT 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

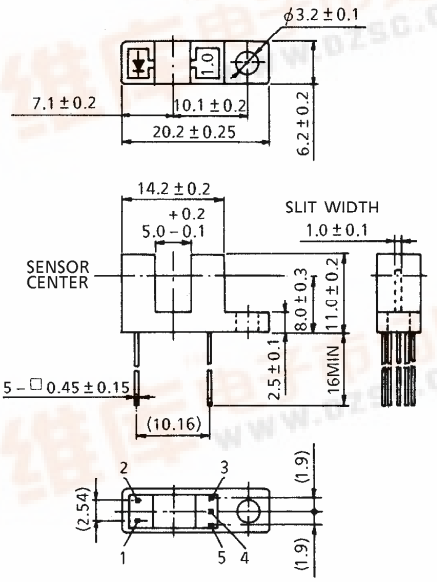
TLP1002A and TLP1003A are digital output photo-interrupters combining GaAs infrared LED with high sensitive and high gain Si photo IC.
Directly connectable to TTL, LSTTL and CMOS.

- One side mounting type
- Gap : 5mm
- Resolution : Slit width 1mm
- Digital output (with a pull-up resistor)

  TLP1002A : Low level output at shielding

  TLP1003A : High level output at shielding
- Built-in Schmitt trigger circuit
- Threshold input current : 3mA (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

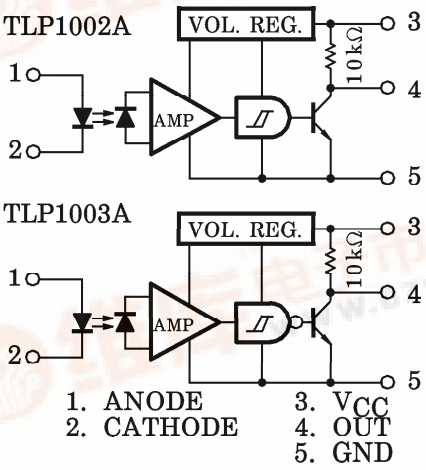


( ) : REFERENCE VALUE

JEDEC	—
EIAJ	—
TOSHIBA	11-14B1

Weight : 0.88g (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)	ΔI_F / °C	−0.33	mA / °C
	Reverse Voltage	V_R	5	V
DETECTOR	Supply Voltage	V_{CC}	17	V
	Output Current	I_O	50	mA
	Power Dissipation	P_O	250	mW
	Power Dissipation Derating (Ta > 25°C)	ΔP_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	10.6*	—	20	mA
Supply Voltage	V_{CC}	4.5	5.0	17	V
Low Level Output Current	I_{OL}	—	—	16	mA
Operating Temperature	T_{opr}	−25	—	85	°C

* 10.6mA is a value when 50% LED deterioration is taken into consideration.
Initial threshold input current shall be 5.3mA MAX.

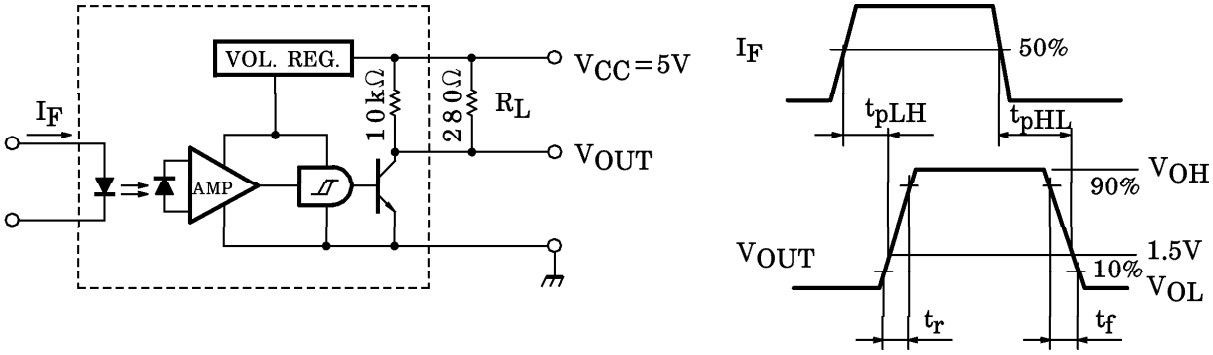
OPTO-ELECTRICAL CHARACTERISTICS (Unless otherwise specified, Ta = −25~85°C, V_{CC} = 5V ± 10%)

	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 Voltage	I_R	V_R = 5V, Ta = 25°C		—	—	10	μA
	Peak Emission Wavelength	λ_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		—	—	6.0	mA
			I_F = *1, V_{CC} = 17V		—	—	7.5	
	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 Voltage	V_{OH}	I_F = *2		0.9V_{CC}	—	—	V
	Peak Sensitivity Wavelength	λ_P	Ta = 25°C		—	900	—	nm
COUPLED	L→H Threshold Input Current	I_{FLH}	Ta = 25°C	TLP1002A	—	—	3.0	mA
			V_{CC} = 17V		—	—	5.3	
	H→L Threshold Input Current	I_{FHL}	Ta = 25°C	TLP1003A	—	—	3.0	mA
			V_{CC} = 17V		—	—	5.3	
	Hysteresis Ratio	I_{FHL}/I_{FLH}	—	TLP1002A	—	0.67	—	—
				TLP1003A	—	1.5	—	
	Propagation Delay Time (L→H)	t_{pLH}	V_{CC} = 5V I_F = 15mA R_L = 280Ω Ta = 25°C (Note)	TLP1002A	—	3	—	μs
				TLP1003A	—	6	—	
	Propagation Delay Time (H→L)	t_{pHL}		TLP1002A	—	6	—	
				TLP1003A	—	3	—	
	Rise Time	t_r			—	0.1	—	
	Fall Time	t_f			—	0.05	—	

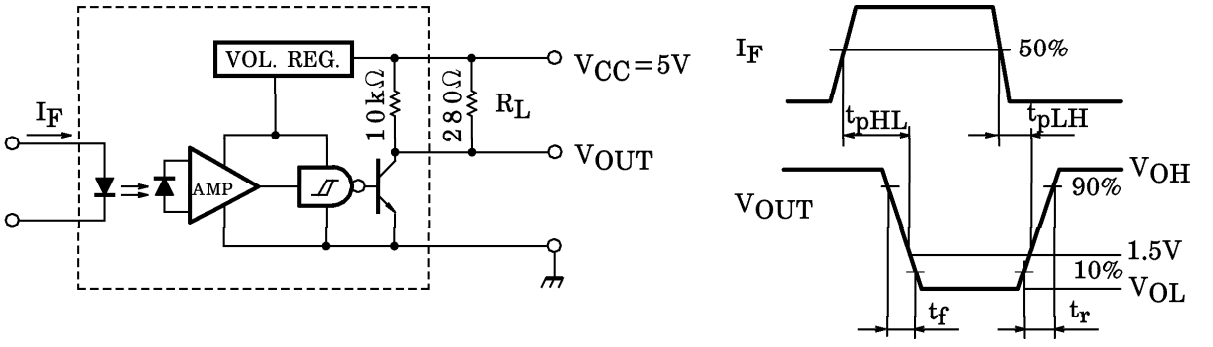
*1. TLP1002A = 0, TLP1003A = 15mA
*2. TLP1002A = 15mA, TLP1003A = 0

NOTE : SWITCHING TIME TEST CIRCUIT

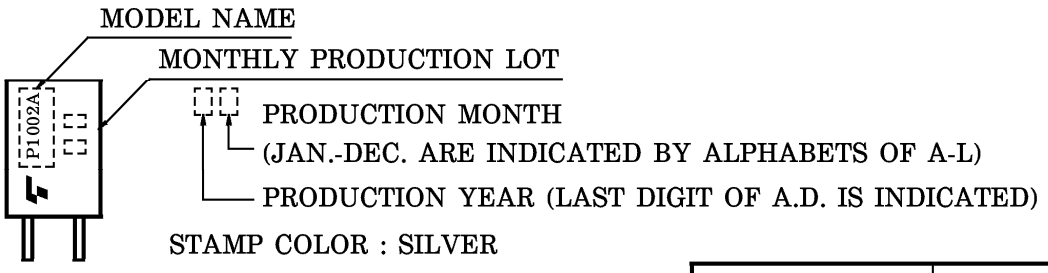
TLP1002A



TLP1003A



PRODUCT INDICATION



ABBREVIATION	TYPE
P1002A	TLP1002A
P1003A	TLP1003A

PRECAUTION

Please be careful of the followings.

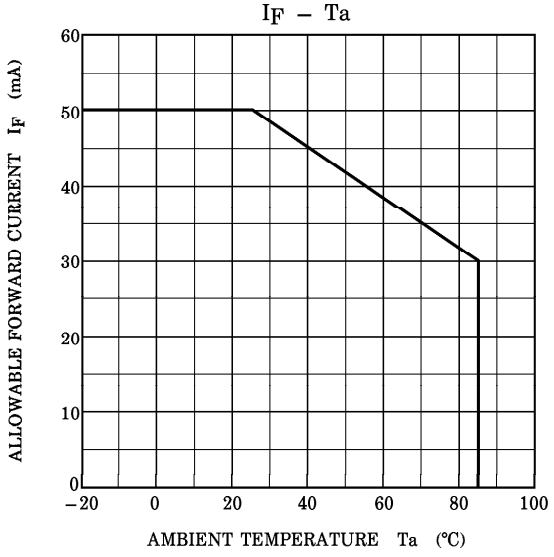
1. Soldering should be performed after lead forming.
2. If chemicals are used for cleaning, the soldered surface only shall be cleaned with chemicals avoiding the whole cleaning of the package.
3. The container is made of polycarbonate. Polycarbonate is usually stable with acid, alcohol, and aliphatic 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>

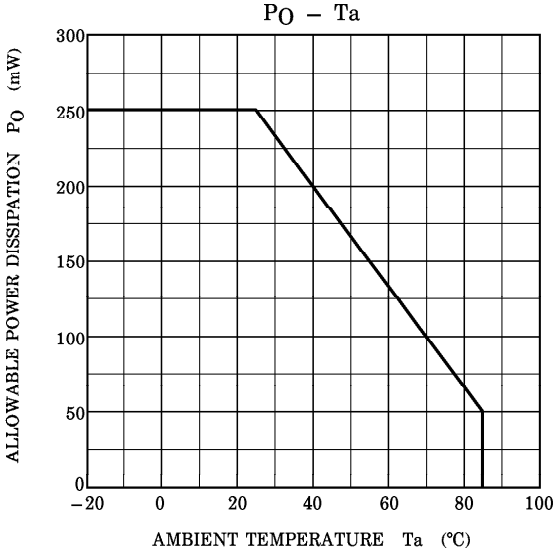
	PHENOMENON	CHEMICALS
A	Little deterioration but staining	• nitric acid (low concentration), hydrogen peroxide, chlorine
B	Cracked, crazed, or swollen	• acetic acid (70% or more) • gasoline • methyl ethyl ketone, ehtyl acetate, butyl acetate • ethyl methacrylate, ethyl ether, MEK • acetone, m-amino alcohol, carbon tetrachloride • carbon disulfide, trichloroethylene, cresol • thinners, oil of turpentine • triethanolamine, TCP, TBP
C	Melted { } : Used as solvent.	• concentrated sulfuric acid • benzene • styrene, acrylonitrile, vinyl acetate • ethylenediamine, diethylenediamine • {chloroform, methyl chloride, tetrachloromethane, dioxane, 1, 2-dichloroethane}
D	Decomposed	• ammonia water • other alkali

4. During 100μs after turning on V_{CC}, output voltage changes for stabilizing the inner circuit.
5. Supply the by-pass condenser up to 0.01μF 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.

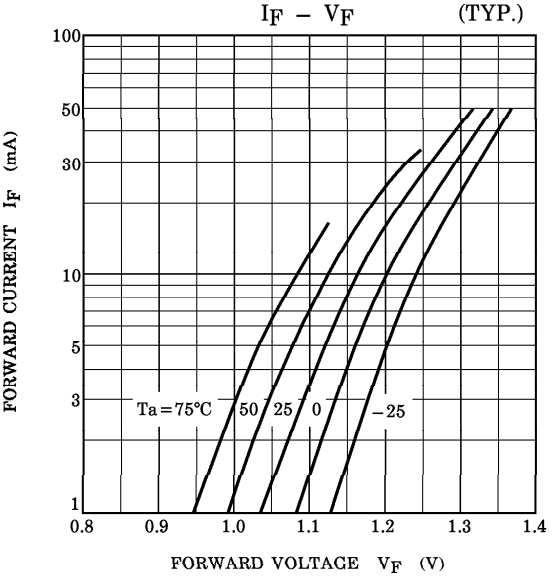
I_F – Ta



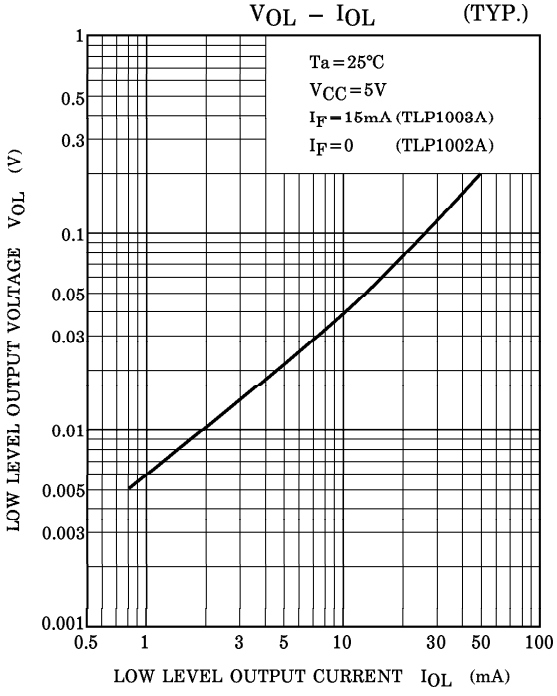
P_O – Ta



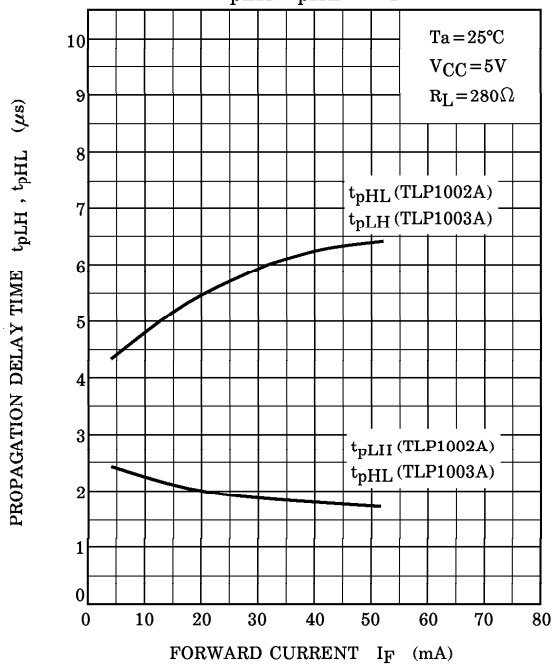
I_F – V_F (TYP.)



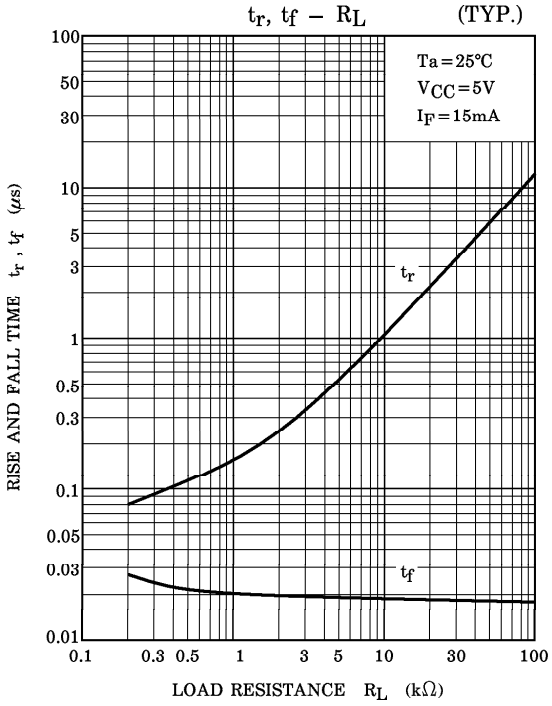
V_{OL} – I_{OL} (TYP.)



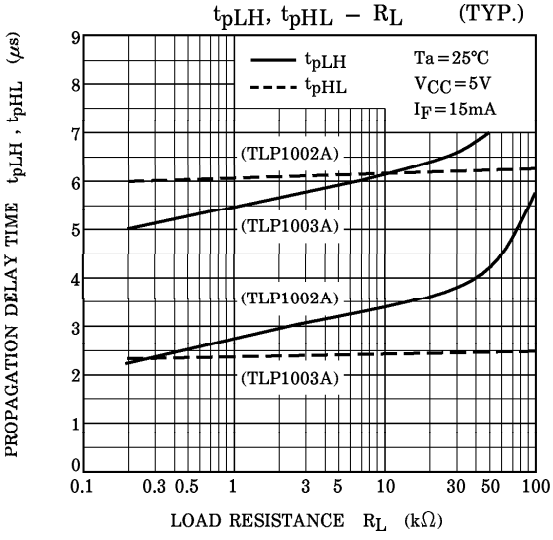
t_{pLH}, t_{pHL} – I_F (TYP.)



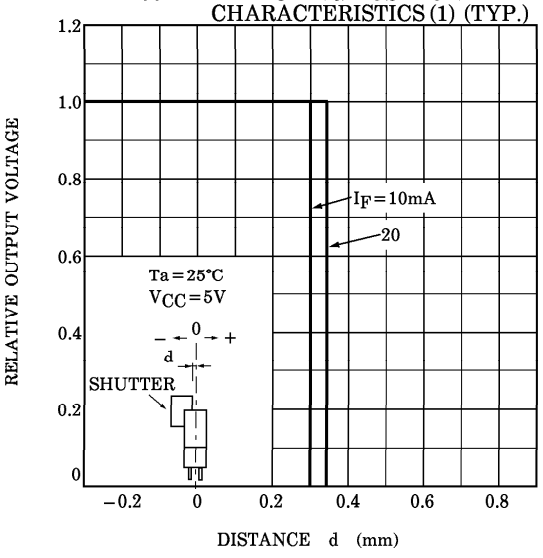
t_r, t_f – R_L (TYP.)



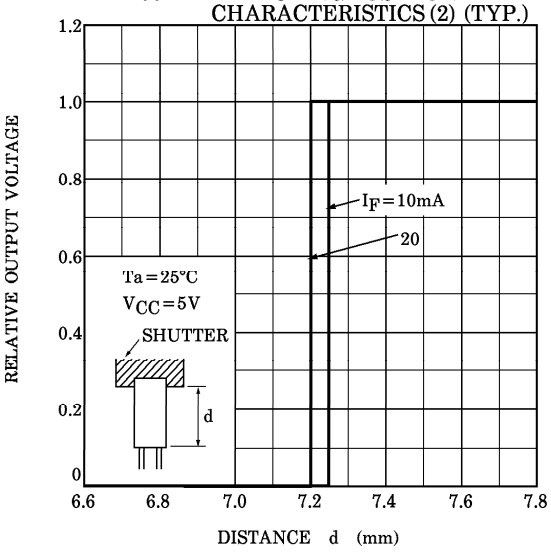
t_{pLH}, t_{pHL} – R_L (TYP.)



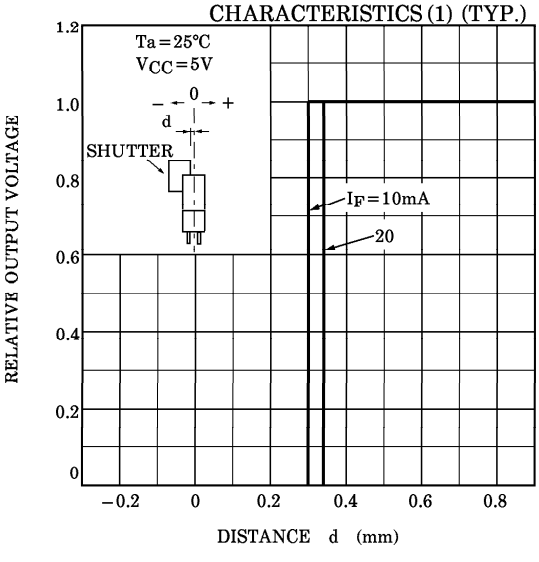
TLP1002A DETECTING POSITION CHARACTERISTICS (1) (TYP.)



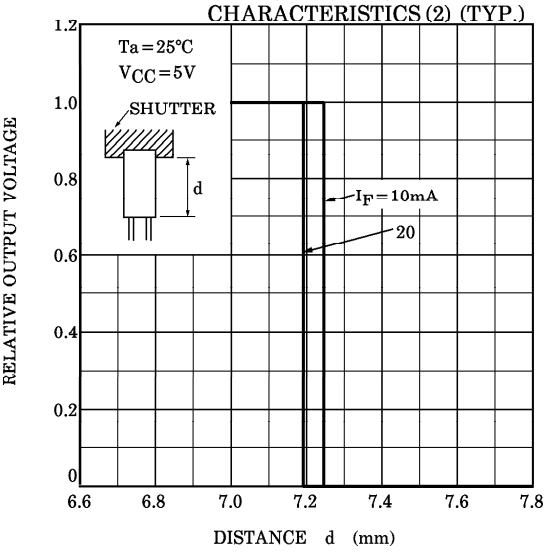
TLP1002A DETECTING POSITION CHARACTERISTICS (2) (TYP.)



TLP1003A DETECTING POSITION CHARACTERISTICS (1) (TYP.)



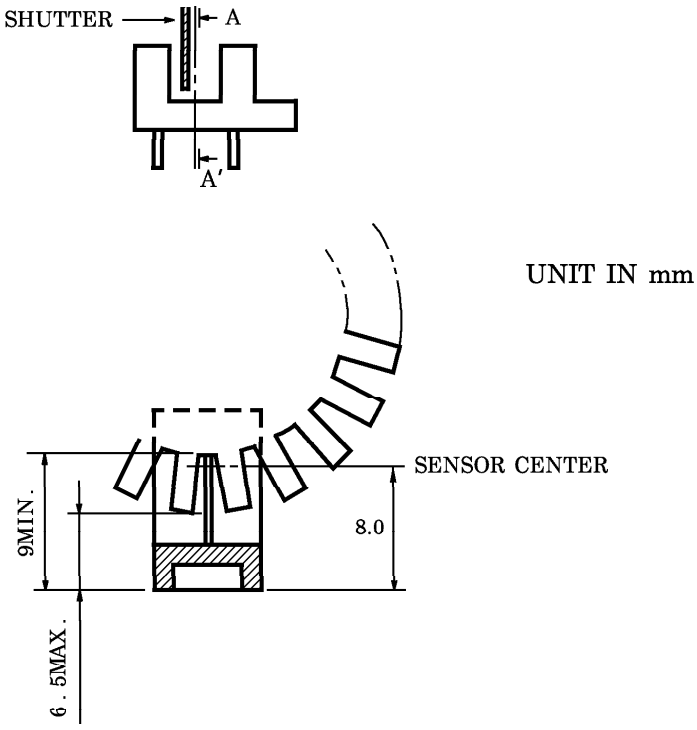
TLP1003A DETECTING POSITION CHARACTERISTICS (2) (TYP.)



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.



A–A′ CROSS SECTION