TOSHIBA PHOTO-INTERRUPTER INFRARED LED + PHOTO-IC

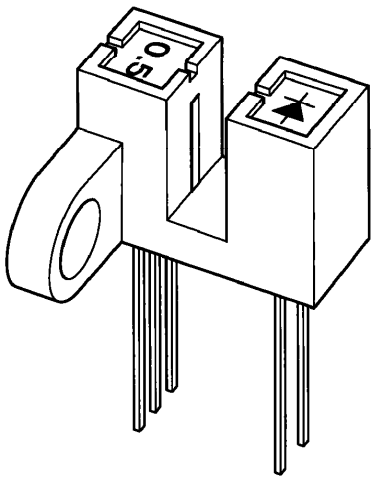
TLP1034

PRINTERS, ELECTRIC TYPEWRITERS, FAX MACHINES

COPIERS, LASER PRINTERS

VCRS, VIDEODISC PLAYERS, COMPACT DISC PLAYERS

VARIOUS POSITION DETECTION SENSORS



TOSHIBA 11-13M2

Weight : 0.87g (typ.)

The TLP1034 digital-output photo-interrupter combines a GaAs infrared LED with a high-sensitivity, high-gain Si photo-IC.

This photo-interrupter has a faster response speed than the corresponding phototransistor-output device and is capable of high-speed position detection.

Furthermore, due to its high output current and its built-in schmitt trigger circuit, this photo-interrupter can be connected directly to a microcomputer or a logic IC.

The device's output goes Low when the light is shielded. The TLP1024, with a pull-up resistor, is the same shape as this device.

- Side-mounting device
- Gap : 3 mm
- Resolution : Slit width = 0.5 mm
- Digital output (with a pull-up resistor)
- Direct connection to TTL, LSTTL and CMOS possible
- Threshold input current : I_{FLH} = 4 mA (max) at Ta = 25°C
- Operating supply voltage : V_{CC} = 4.5 V~17 V
- Built-in schmitt trigger circuit
- High-speed response : tpLH = 3 μs, tpHL = 6 μs (typ.)
- Detector impermeable to visible light

MAXIMUM RATINGS (Ta = 25°C)

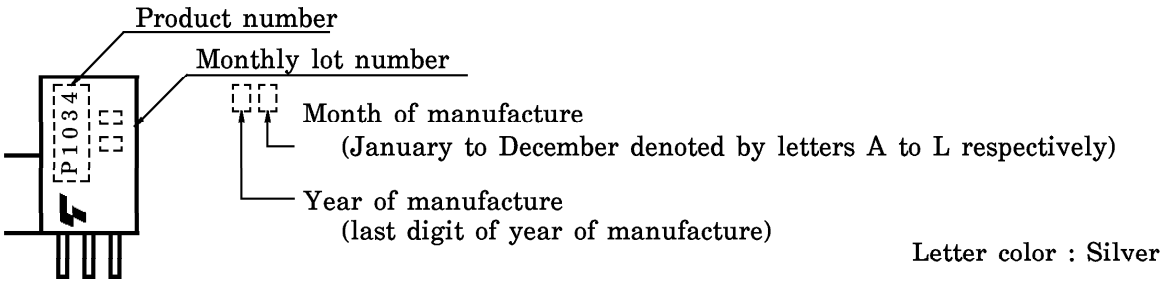
	CHARACTERISTIC	SYMBOL	RATING	UNIT
LED	Forward Current	I_F	50	mA
LED	Forward Current Derating (Ta > 25°C)	ΔI_F / °C	−0.33	mA / °C
LED	Reverse Voltage	V_R	5	V
DETECTOR	Supply Voltage	V_{CC}	17	V
DETECTOR	Output Current	I_O	50	mA
DETECTOR	Power Dissipation	P_O	250	mW
DETECTOR	Power Dissipation Derating (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 (5 s)		T_{sol}	260	°C

RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	Min	Typ.	Max	UNIT
LED Forward Current	I_F	14 (*)	—	20	mA
Supply Voltage	V_{CC}	4.5	5	17	V
Low Level Output Current	I_{OL}	—	—	16	mA
Operating Temperature	T_{opr}	−25	—	85	°C

(*) : The value 14 mA takes account of 50% LED optical fluctuation.
The initial value of the threshold input current is 7 mA max.

MARKINGS

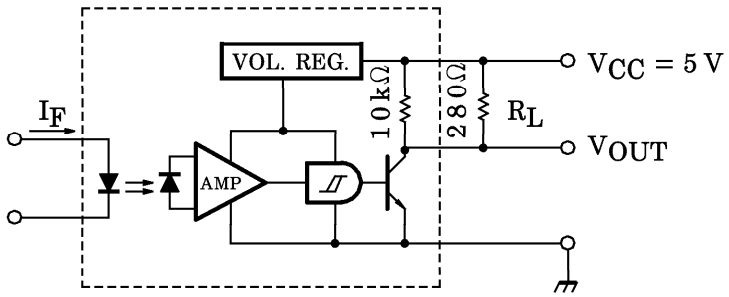


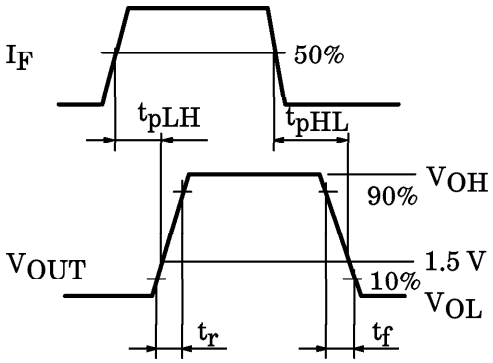
Letter color : Silver

OPTICAL AND ELECTRICAL CHARACTERISTICS
(Unless Otherwise Specified, Ta = −25~85°C, V_{CC} = 4.5~5.5 V)

	CHARACTERISTIC		SYMBOL	TEST CONDITION	Min	Typ.	Max	UNIT
LED	Forward Current		V_F	I_F = 10 mA, Ta = 25°C	1.00	1.15	1.30	V
	Reverse Current		I_R	V_R = 5 V, Ta = 25°C	—	—	10	μA
	Peak Emission Wavelength		λ_P	I_F = 15 mA, Ta = 25°C	—	940	—	nm
DETECTOR	Supply Voltage		V_{CC}	—	4.5	—	17	V
	Low Level Supply Current		I_{CCL}	I_F = 0	—	—	6.0	mA
				I_F = 0, V_{CC} = 17 V	—	—	7.5	
	High Level Supply Current		I_{CCH}	I_E = 15 mA	—	—	3.0	mA
				I_F = 15 mA, V_{CC} = 17 V	—	—	3.2	
	Low Level Output Voltage		V_{OL}	I_{OL} = 16 mA, I_F = 0 Ta = 25°C	—	0.07	0.3	V
				I_{OL} = 16 mA, I_F = 0 V_{CC} = 17 V	—	—	0.4	
	High Level Output Voltage		V_{OH}	I_F = 15 mA	0.9 V_{CC}	—	—	V
	Peak Sensitivity Wavelength		λ_P	Ta = 25°C	—	900	—	nm
COUPLED	Threshold Input Current (L → H)		I_{FLH}	Ta = 25°C	—	—	4	mA
				V_{CC} = 17 V	—	—	7	
	Hysteresis Ratio		I_{FHL}/I_{FLH}	—	—	0.67	—	—
	Propagation Delay Time	L → H	t_{pLH}	V_{CC} = 5 V, I_F = 15 mA R_L = 280 Ω, Ta = 25°C (Note)	—	3	—	μs
		H → L	t_{pHL}		—	6	—	
	Rise Time		t_r		—	0.1	—	
	Fall Time		t_f		—	0.05	—	

(Note) : Switching time test circuit





PRECAUTIONS

The following points must be borne in mind.

1. Soldering should be performed after the leads have been formed.
2. Clean only the soldered part of the leads. Do not immerse the entire package in the cleaning solvent.
3. 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) • Gasoline • Methyl ethyl ketone, ethyl 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	Melting { } : Used as solvent	• Concentrated sulfuric acid • Benzene • Styrene, acrylonitrile, vinyl acetate • Ethylenediamine, diethylenediamine • {Chloroform, methyl chloride, tetrachloromethane, dioxane, 1, 2-dichloroethane}
D	Decomposition	• Ammonia water • Other alkalis

4. At power-on the internal circuit takes about 100 μs to stabilize. During this period the output signal is unstable and may change.
5. To stabilize the power line, insert a bypass capacitor of up to 0.01 μF between V_{CC}, close to the device.
6. Screws should be tightened to a clamping torque of 0.59 N·m.
7. The threshold input current increases over time due to current flowing in the infrared LED. The design of circuits which incorporate the device must take into account the change in threshold input current over time. The change in threshold input current is equal to the reciprocal of the change in LED infrared optical output.

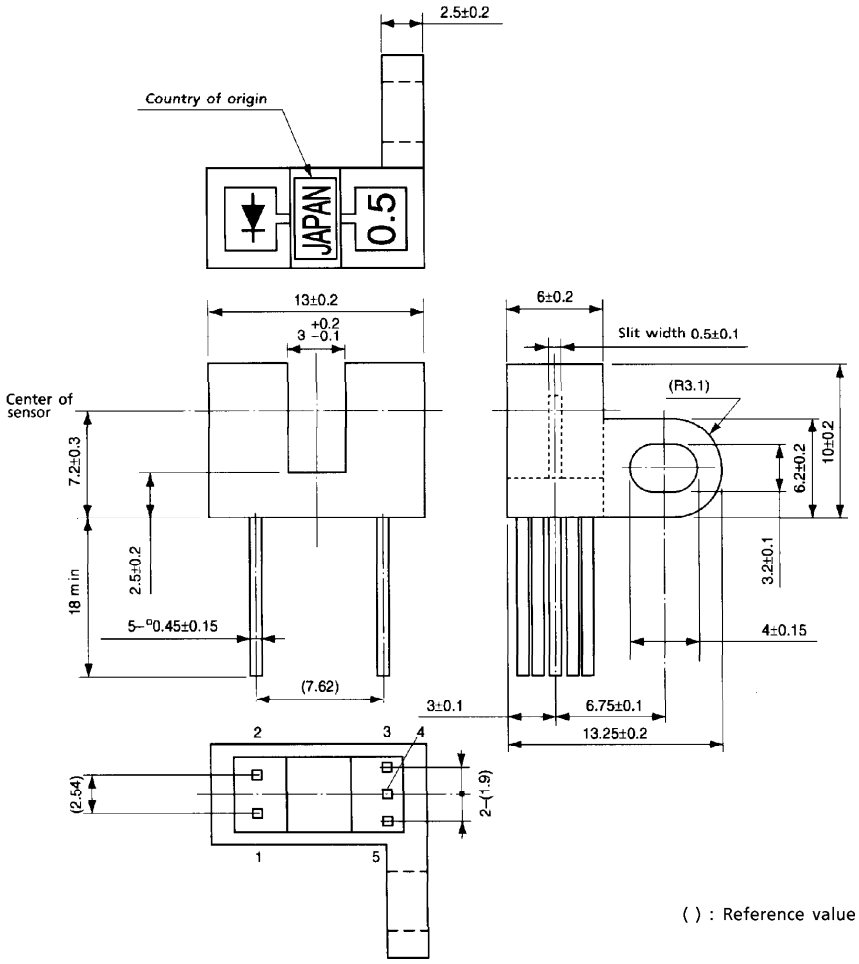
$$\frac{I_{FLH}(t)}{I_{FLH}(0)} \text{ or } \frac{I_{FHL}(t)}{I_{FHL}(0)} = \left(\frac{P_O(t)}{P_O(0)}\right)^{-1}$$

8. Choose a high-quality shutter material which is impermeable to light. If the material is of inferior quality, light from the LED may pass through the shutter, causing the device to malfunction.

PACKAGE DIMENSIONS

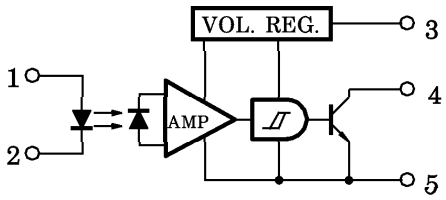
11-13M2

Unit : mm



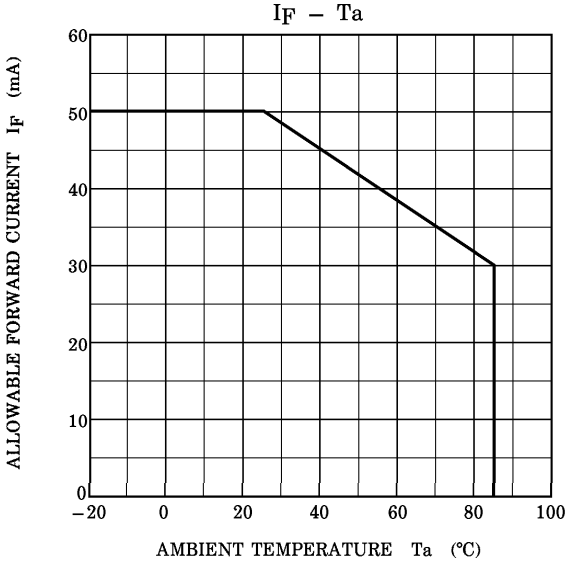
Weight : 0.87 g (typ.)

PIN CONNECTION

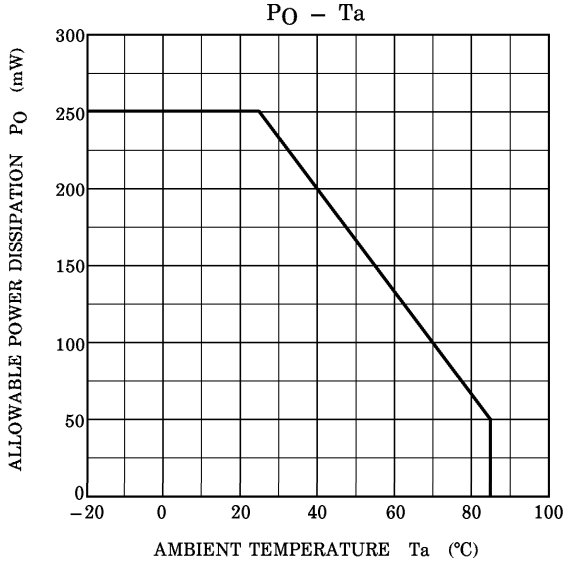


1. ANODE
2. CATHODE
3. V_{CC}
4. OUT
5. GND

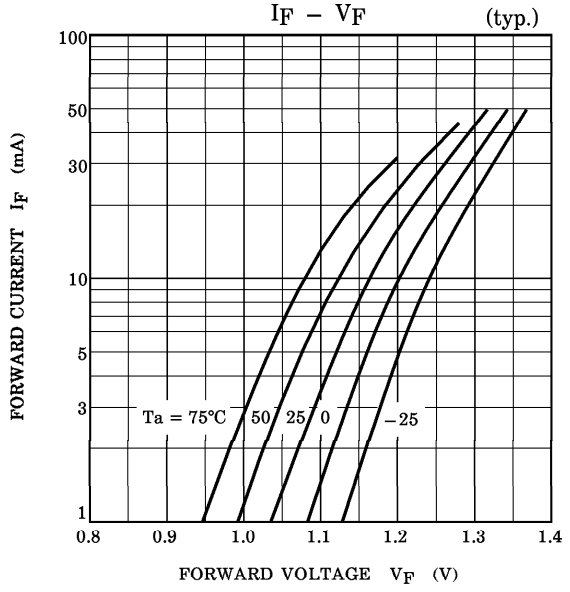
I_F – Ta



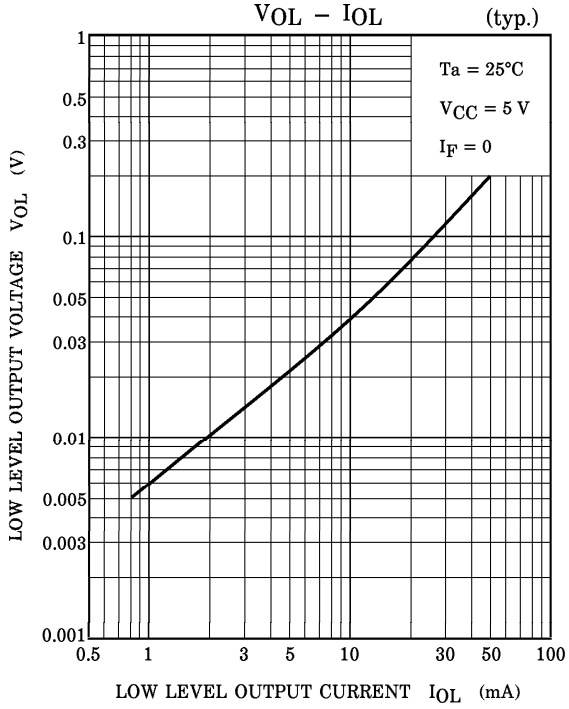
P_O – Ta



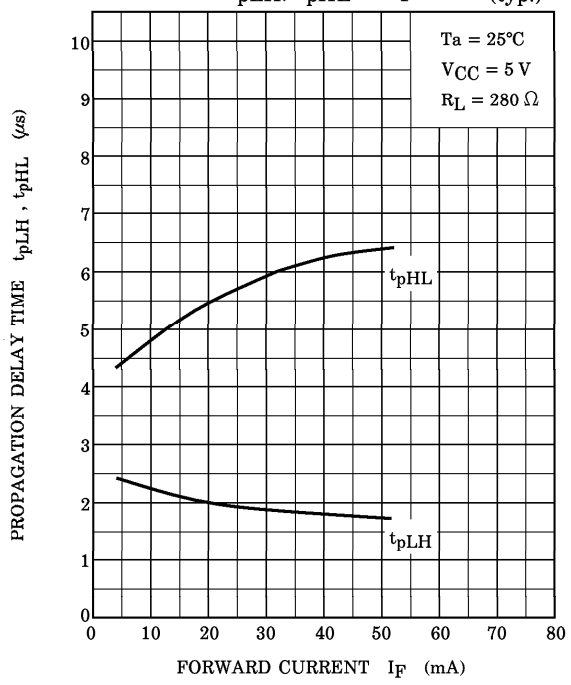
I_F – V_F (typ.)



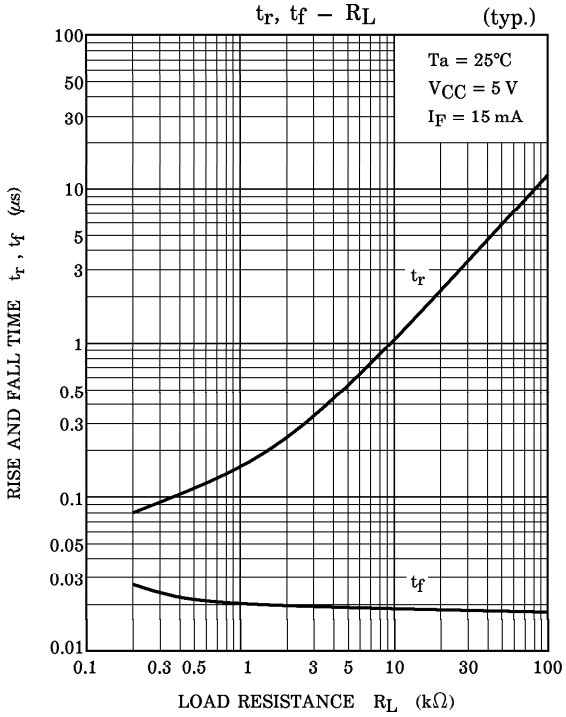
V_{OL} – I_{OL} (typ.)



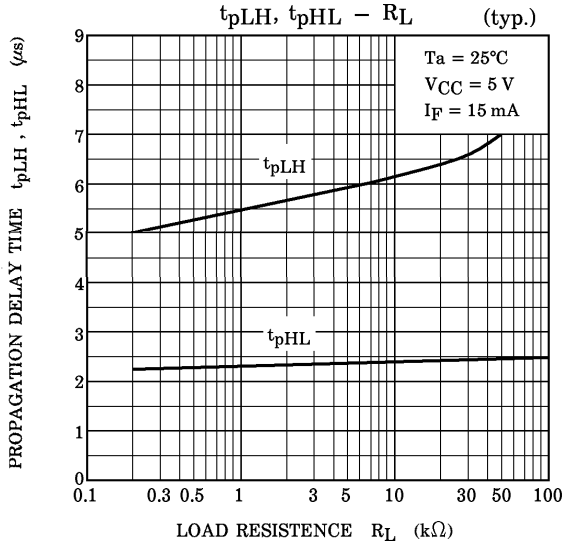
t_{pLH}, t_{pHL} – I_F (typ.)

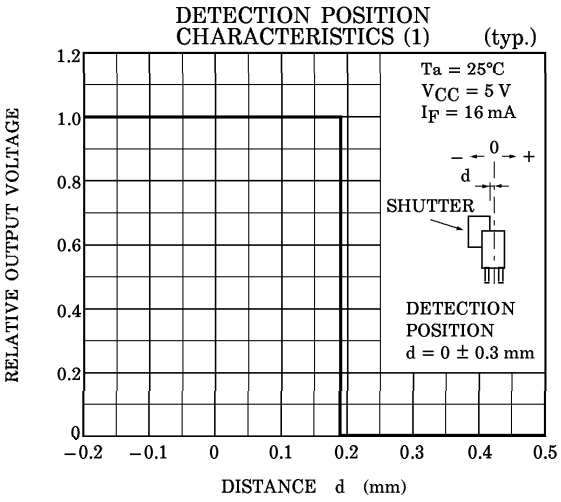


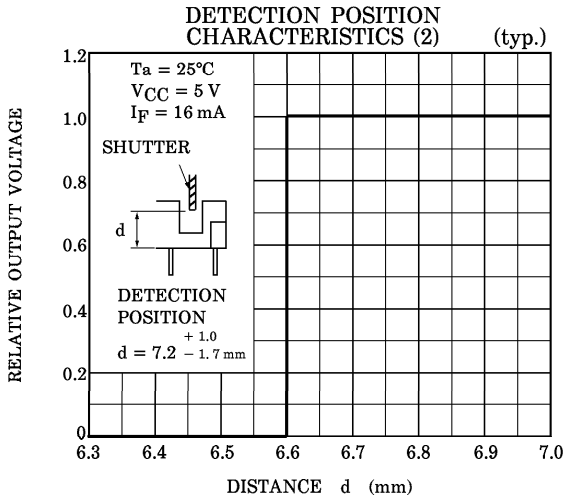
t_r, t_f – R_L (typ.)



t_{pLH}, t_{pHL} – R_L (typ.)

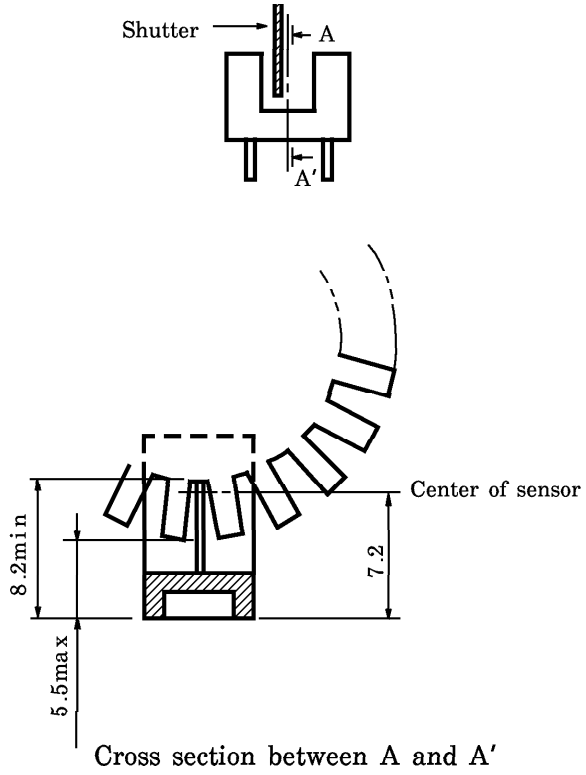






RELATIVE POSITIONING OF SHUTTER AND DEVICE

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



Unit in mm

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