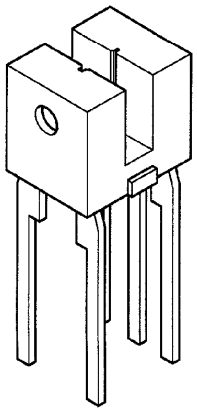
TOSHIBA PHOTO-INTERRUPTER INFRARED LED + PHOTO-IC

TLP1025

STILL CAMERAS

VIDEO CAMERAS

SMALL-SIZED COPIERS, PRINTERS AND FAX MACHINES FOR PERSONAL USE



TOSHIBA 11-4G1

Weight : 0.09 g (typ.)

The TLP1025 digital-output photo-interrupter combines a GaAs infrared LED with a high-sensitivity, high-gain Si photo-IC on a single chip.

The device has a narrow slit width and offers high resolution.

Due to its built-in schmitt trigger circuit, the TLP1025 can be connected directly to a microcomputer or a logic IC. The device's output goes High when the light is shielded.

- Very small package
- Designed for direct mounting on printed circuit boards
- Gap : 1 mm
- High resolution
  Slit width : 0.15 mm (infrared LED)
  0.1 mm (photo-IC)
- Digital output (open-collector)
- Built-in schmitt trigger circuit for direct connection to logic IC
- Low-voltage operation : V_{CC} = 2.4 V~7 V
- High-speed response

MAXIMUM RATINGS (Ta = 25°C)

	CHARACTERISTIC	SYMBOL	RATING	UNIT
LED	Forward Current	I_F	50	mA
	Forward Current Derating (Ta ≧ 25°C)	I_F / °C	−0.66	mA / °C
	Reverse Voltage	V_R	5	V
DETECTER	Supply Voltage	V_{CC}	7	V
	Output Voltage	V_O	7	V
	Output Current	I_{OL}	10	mA
Operating Temperature		T_{opr}	−25~85	°C
Storage Temperature		T_{stg}	−40~100	°C
Soldering Temperature (5 s) (Note 1)		T_{sol}	260	°C

(Note 1) : Soldering is performed 1.5 mm from the bottom of the package.

RECOMMENDED OPERATING CONDITIONS

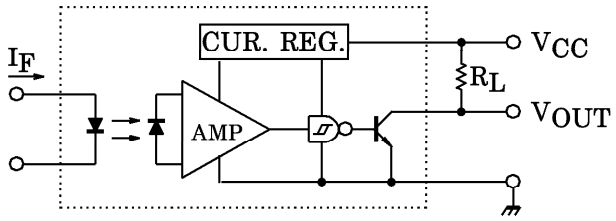
CHARACTERISTIC	SYMBOL	Min	Typ.	Max	UNIT
Forward Current	I_F	12(*)	—	20	mA
Supply Voltage	V_{CC}	2.4	—	7	V
Output Voltage	V_O	—	—	7	V
Low Level Output Current	I_{OL}	—	—	10	mA

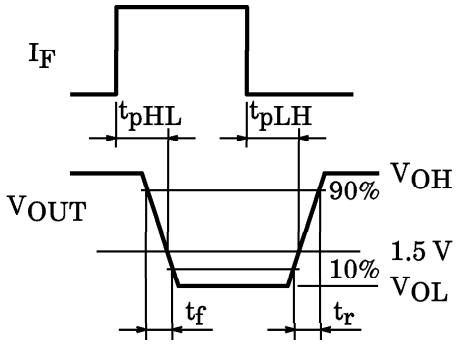
(*) : The value 12mA takes account of 50% LED optical fluctuation.
The initial value of the threshold input current is 6 mA max.

OPTICAL AND ELECTRICAL CHARACTERISTICS
(Ta = −25°C~85°C, V_{CC} = 2.4~7 V, Typical values are all at 25°C)

	CHARACTERISTIC		SYMBOL	TEST CONDITION	Min	Typ.	Max	UNIT
LED	Forward Voltage		V_F	I_F = 10 mA, Ta = 25°C	1.0	1.15	1.3	V
	Reverse Current		I_R	V_R = 5 V, Ta = 25°C	—	0.01	10	μA
	Peak Emission Wavelength		λ_P	I_F = 10 mA	—	940	—	nm
DETECTOR	Supply Voltage		V_{CC}	—	2.4	—	7	V
	Low Level Supply Current		I_{CCL}	I_F = 10 mA	—	1.0	3.5	mA
	High Level Supply Current		I_{CCH}		—	1.3	3.2	mA
	Low Level Output Voltage		V_{OL}	I_F = 10 mA, I_{OL} = 10 mA	—	0.06	0.4	V
	High Level Output Current		I_{OH}	V_O = 7 V	—	—	30	μA
	Peak Sensitivity Wavelength		λ_P	Ta = 25°C	—	870	—	nm
COUPLED	Threshold Input Current (H → L)		I_{FHL}		—	—	6	mA
	Hysteresis Ratio		I_{FHL}/I_{FLH}	Ta = 25°C	—	1.25	—	—
	Switching Time	Propagation Delay Time (H → L)	t_{PHL}	I_F = 10 mA, R_L = 750 Ω, Ta = 25°C (Note 2)	—	4	—	μs
		Propagation Delay Time (L → H)	t_{PLH}		—	26	—	
		Rise Time	t_r		—	0.07	—	
		Fall Time	t_f		—	0.08	—	

(Note 2) : Switching time measurement circuit and waveform





PRECAUTIONS

1. When removing flux with chemicals after soldering, clean only the soldered part of the leads. Do not immerse the entire package in the cleaning solvent. Chemical residue on the LED emitter or the photodetector inside the photo-IC case may adversely affect the optical characteristics of the device and may drastically reduce the threshold input current.
2. Oil or chemicals may cause the package to melt or crack. Care must be taken in relation to the environment in which the device is to be installed.
3. Mount the device on a level surface.
4. The photo-IC has a highly sensitive amp built in. To stabilize the power line, insert a bypass capacitor of up to 0.01 μF between V_{CC} and GND, close the device.
5. 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.
6. At power-on the internal circuit takes about 100 μs to stabilize. During this period the output signal is unstable and may change.

7 The package should not be subjected to stress, since this may result in package deformation or have other deleterious effects.

8 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.

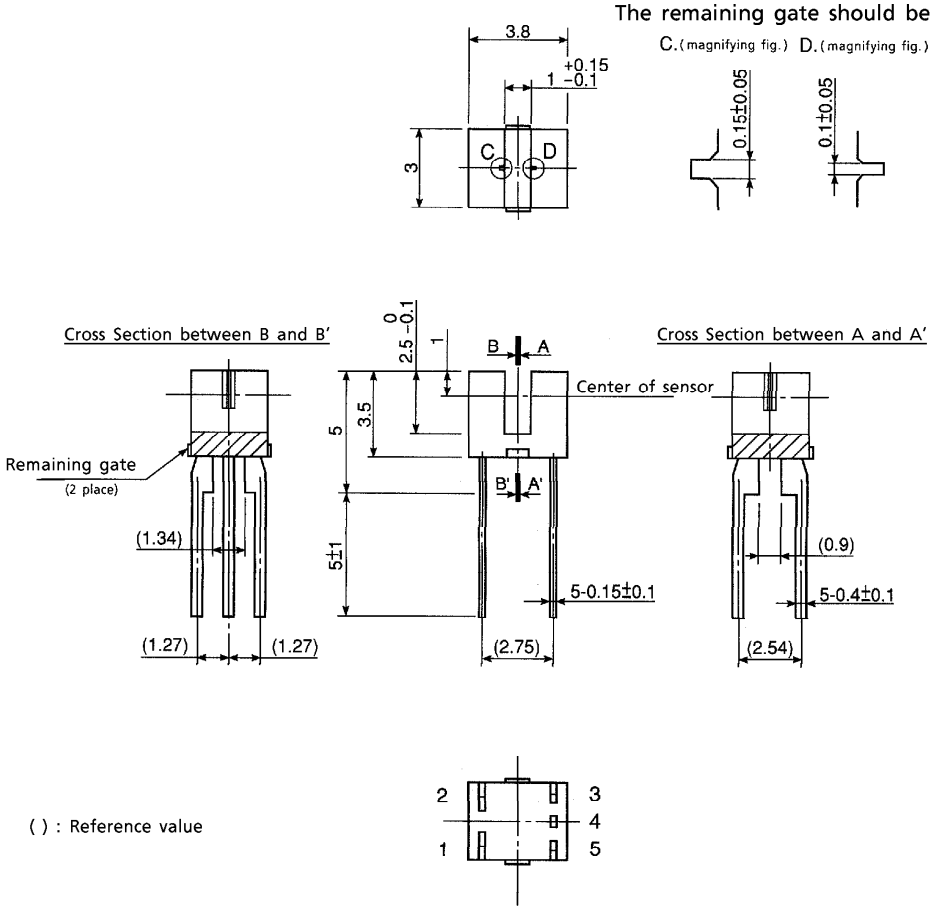
$$\frac{I_{FHL}(t)}{I_{FHL}(0)} = \left(\frac{P_O(t)}{P_O(0)}\right)^{-1}$$

PACKAGE DIMENSIONS

11-4G1

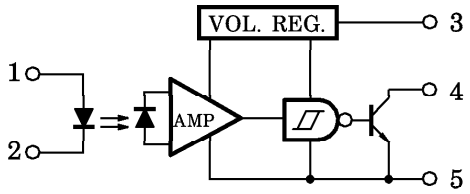
Unit : mm

Tolerance : ±0.2 mm unless otherwise specified
Values in parentheses ( ) are for reference.
The remaining gate should be 0.2 mm or less.



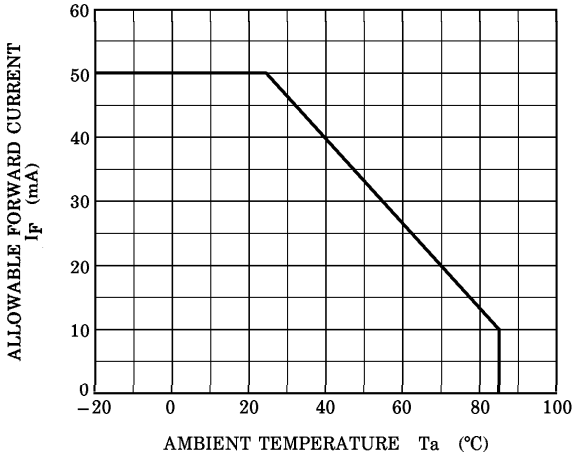
Weight : 0.09 g (typ.)

PIN CONNECTION

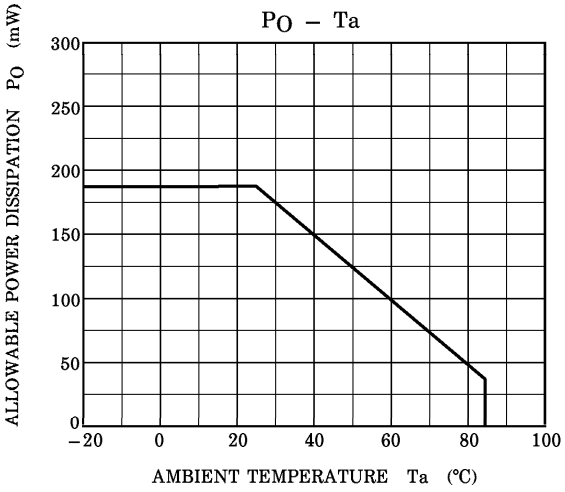


1. ANODE
2. CATHODE
3. V_{CC}
4. OUT
5. GND

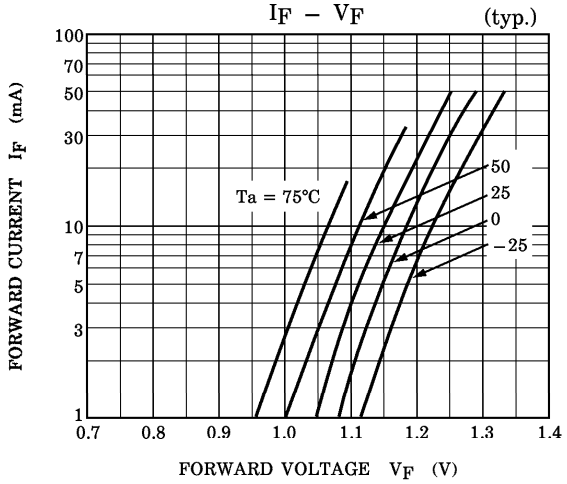
I_F – Ta



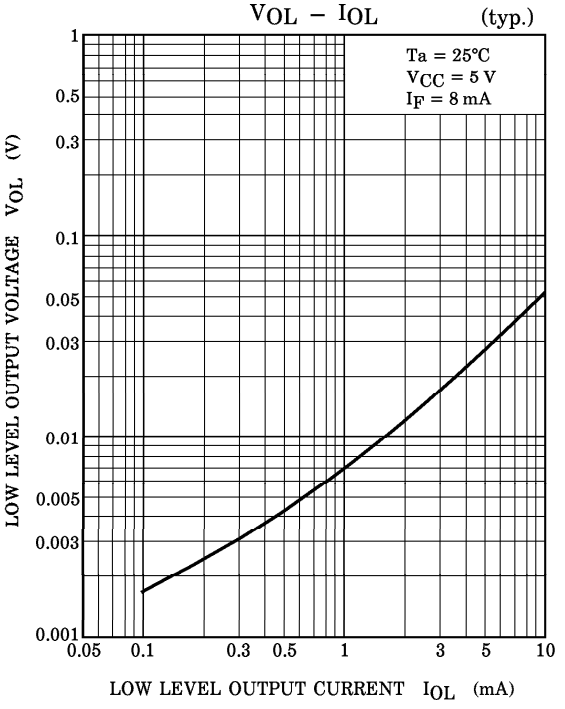
P_O – Ta



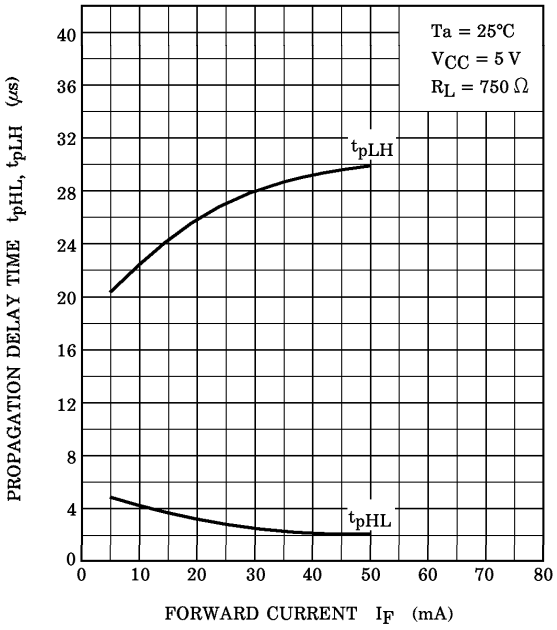
I_F – V_F (typ.)



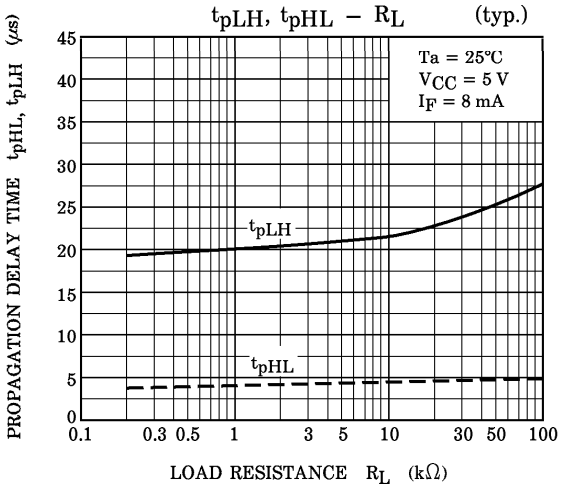
V_{OL} – I_{OL} (typ.)



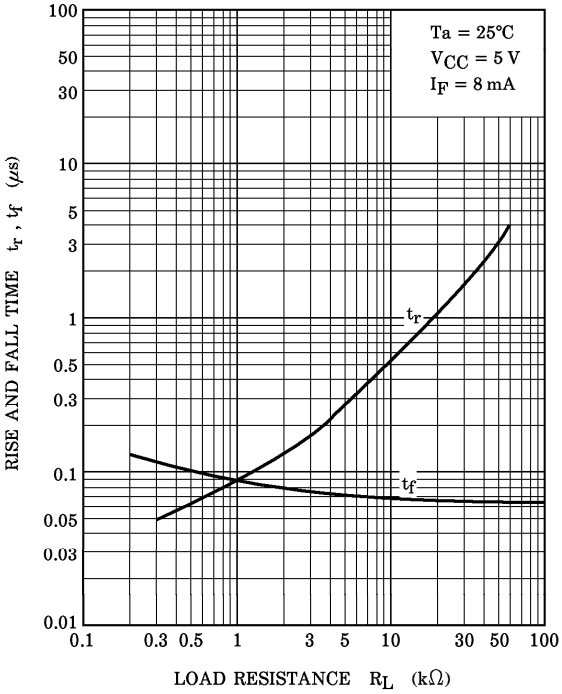
t_{pLH}, t_{pHL} – I_F (typ.)

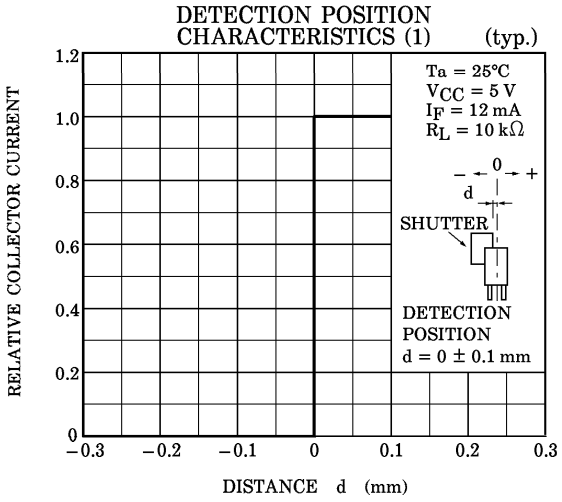


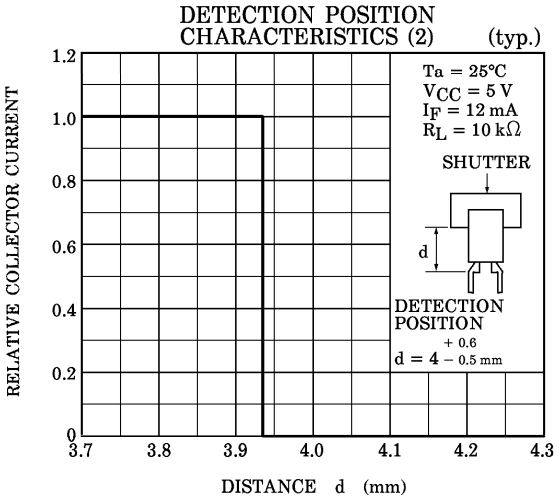
t_{pLH}, t_{pHL} – R_L (typ.)



t_r, t_f – R_L (typ.)

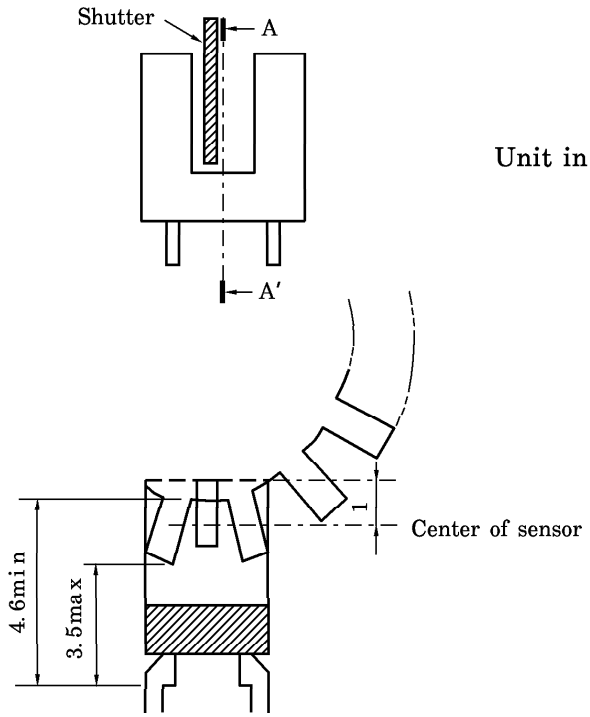






RELATIVE POSITIONING OF SHUTTER AND DEVICE

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.



Cross section between A and A′

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