

TOSHIBA Photo-IC Silicon Epitaxial Planar

TPS816(F)

Lead(Pb)-Free

Photo-electric Switches

Office Equipment such as Photocopiers, Printers and Fax Machines

Unit: mm

The TPS816(F) is an Si photo-IC for digital output. It incorporates a photodiode, amp, waveform shaper, LED driver and sync detector in a single chip.

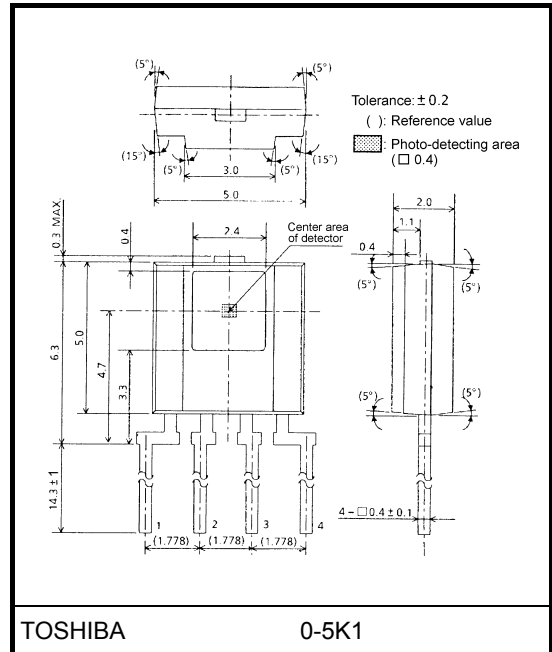
Use of sync optical modulation makes the IC ideal for applications in external light.

- Housed in compact side-view epoxy resin package
- High resistance to external light due to sync optical modulation: $E_X = 3000 \text{ lx (min)}$
- High-sensitivity: $E_{HL} = 1 \mu\text{W/mm}^2 \text{ (max)}$
- Wide operating temperature range: $T_{opr} = -30^\circ\text{C to } 85^\circ\text{C}$
- High LED output current and low-level output current:

$$I_{LED} = 70 \text{ mA (} T_a = T_{opr} \text{)}$$

$$I_{OL} = 16 \text{ mA (} T_a = T_{opr} \text{)}$$

- Digital output (pull-up resistor included) : Low-level output for light input
- TPS816(F) package resin impermeable to visible light

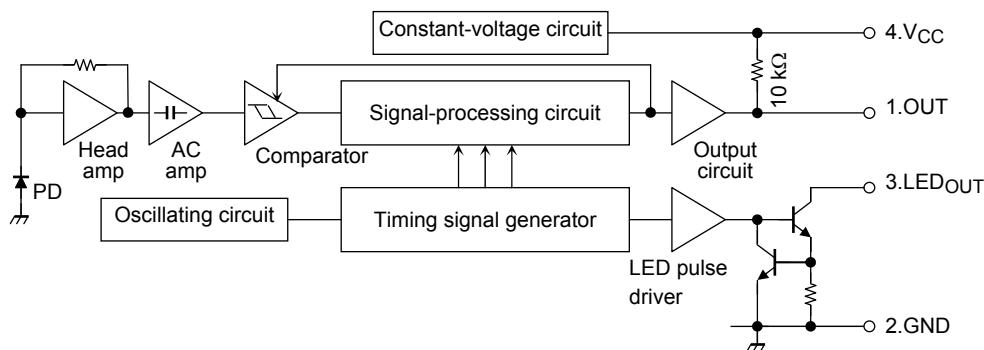


TOSHIBA

0-5K1

Weight: 0.3g (typ.)

Block Diagram



Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage	V _{CC}	7	V
Output voltage	V _{OUT}	≅ V _{CC}	V
Output current (Ta = Topr)	I _{OUT}	16	mA
LED output voltage	V _{LED}	≅ V _{CC}	V
LED pulse forward current (Ta = Topr)	I _{LED}	70	mA
Operating temperature	T _{opr}	-30~85	°C
Storage temperature	T _{stg}	-40~100	°C
Soldering temperature (5s) (Note 1)	T _{sol}	260	°C

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

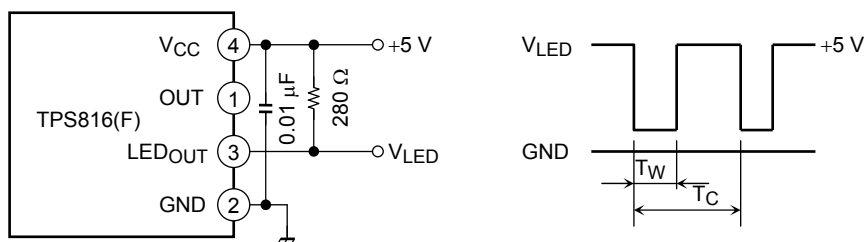
Note 1: Solder under the lead stopper.

Electrical and Optical Characteristics (V_{CC} = 5 V, Ta = 25°C)

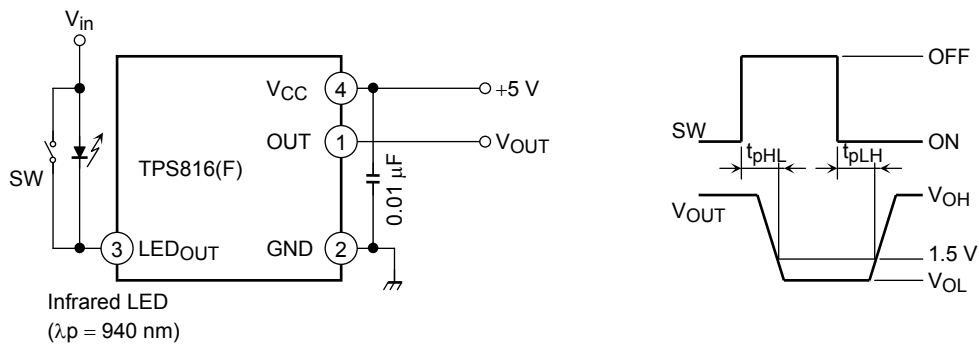
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Supply voltage		V _{CC}	—	4.5	5	5.5	V
Supply current		I _{CC}	V _{OUT} , V _{LED} left open	—	4	7	mA
Output	High-level output voltage	V _{OH}	E = 0	4.9	5	—	V
	Low-level output voltage	V _{OL}	I _{OL} = 16 mA, E = 2 μW/mm ² (Note 2)	—	0.15	0.4	V
LED output	Low-level output voltage	V _{LED}	I _{LED} = 70 mA (peak)	1.05	1.35	1.65	V
	Pulse cycle	T _C	(Note 3)	64	130	220	μs
	Pulse width	T _W	(Note 3)	4	8	13.7	μs
	Duty ratio	T _W /T _C	—	—	6	10	%
Peak sensitivity wavelength		λ _p	—	—	900	—	nm
Propagation characteristics	H → L threshold radiant incidence	E _{HL}	No visible light (Note 2)	—	0.6	1.0	μW/mm ²
	L → H threshold radiant incidence	E _{LH}		—	0.4	0.8	
	Hysteresis	E _{LH} /E _{HL}	—	0.45	0.65	0.8	—
	Propagation delay time (L → H)	t _{pLH}	(Note 4)	—	400	670	μs
	Propagation delay time (H → L)	t _{pHL}		—	400	670	
Permissible luminosity		E _X	E = 2 μW/mm ² (Note 2, 5)	3000	—	—	lx

Note 2: The signal light source is an infrared LED with λ_p = 940 nm.

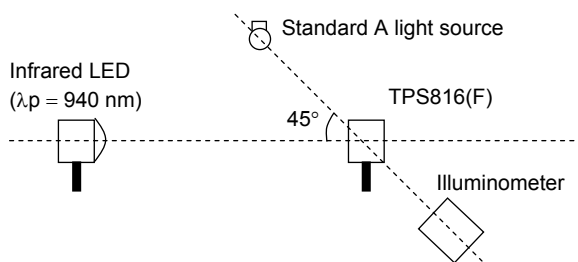
Note 3: The LED output waveform measurement circuit and waveform are as follows:



Note 4: The switching time measurement circuit and waveform are as follows:



Note 5: Measurement of permissible external luminance

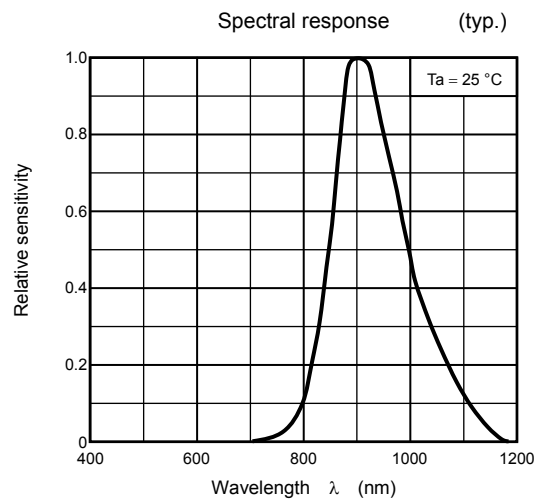
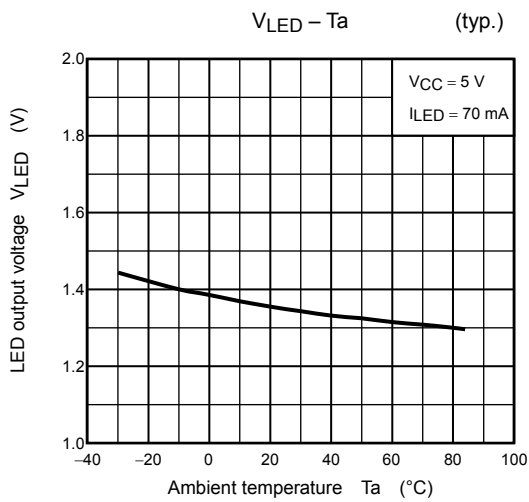
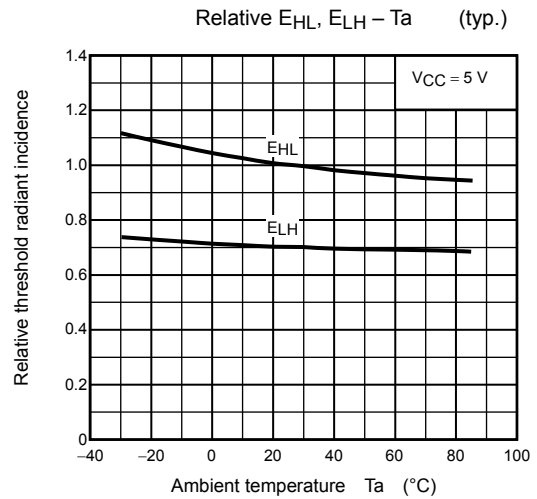
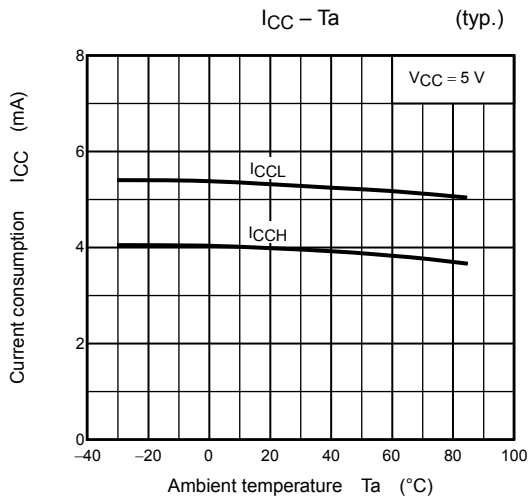
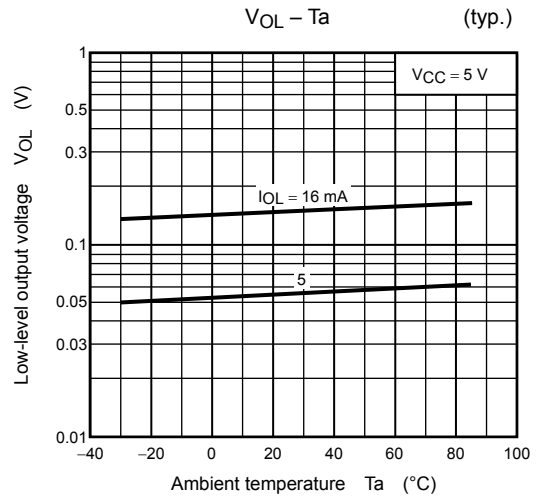
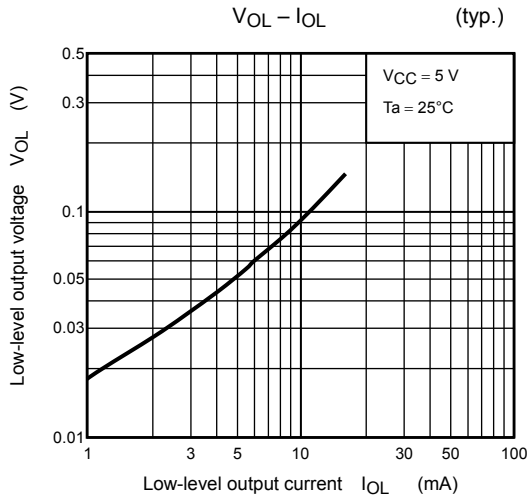


Measure the luminance limit at which the device operates normally.

The light used is a CIE Standard A light source (a standard tungsten bulb with a color temperature of 2856°K).

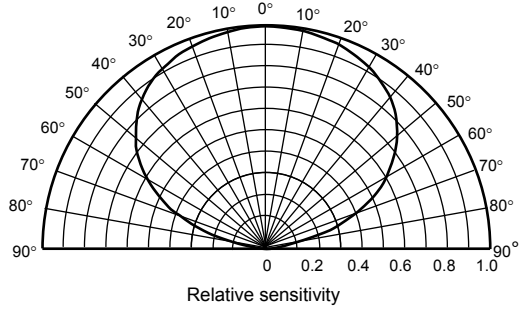
Handling Precautions

- When using the device with an LED, use an infrared LED. Note that light with a wavelength of 800 nm or less cannot be detected.
- Do not use the device in an environment where the external light is 3000 lx or more, as this may prevent the device from working properly.
- At power-on the internal circuit takes about 100 μs to stabilize. During this period the output signal is unstable and may change. Design the circuit so that no signal is output during this period.
- 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 VCC and GND, close to the device.
- If the LED is directly connected to the LEDOUT pin, excessive current will flow in the LED, severely degrading the optical output. Be sure to insert a limiting resistor to prevent excessive current flow in the LED.
- When forming the leads, bend each lead under the lead stopper. Soldering must be performed after the leads have been formed.
- Soldering must be performed under the stopper.



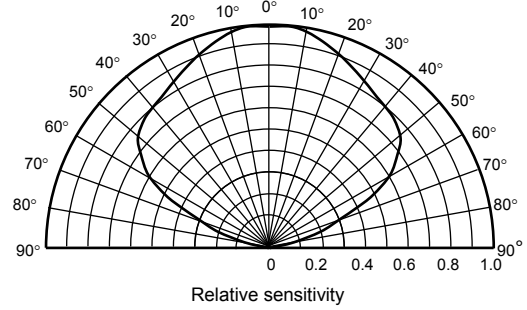
Radiation pattern - vertical direction (typ.)

Ta = 25°C

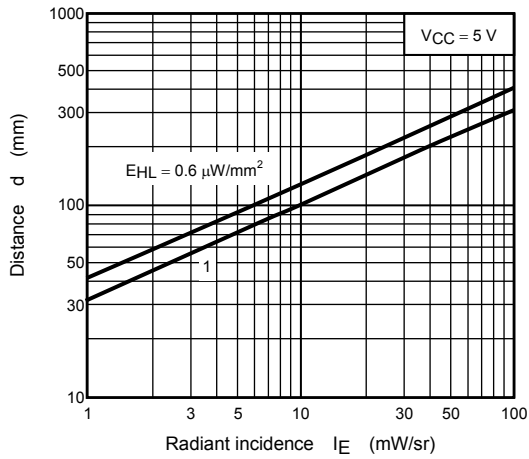


Radiation pattern - horizontal direction (typ.)

Ta = 25°C



I_E - d (typ.)



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20070701-EN GENERAL

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