

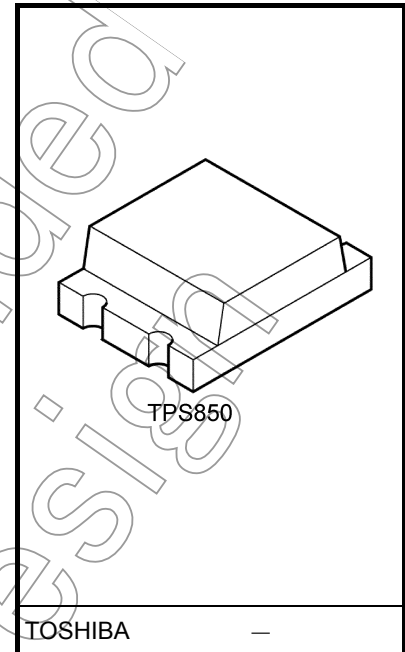
TOSHIBA Photo-IC Silicon Epitaxial Planar

# TPS850

- Mobile Phones, PHS
- Notebook PCs, PDAs
- Video Cameras, Digital Still Cameras
- Other Equipment Requiring Luminosity Adjustment

The TPS850 is a linear-output photo-IC which incorporates a photodiode and a current amp circuit in a single chip. This photo-IC is current output type, so can set up output voltage freely by arbitrary load resistance.

- High sensitivity:  $I_L = 230 \mu A$   
@ $E_V = 100 \text{ lx}$  (typ.) Using the fluorescent light
- Little fluctuation in light current  
: Width range =  $x1$  to  $x1.6$  (typ.  $\pm 25\%$ )
- Output linearity of illuminance is excellent
- Open-emitter output
- Compact and light surface-mount package



Weight: 0.017 g (typ.)

### Absolute Maximum Ratings ( $T_a = 25^\circ C$ )

Characteristics	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	-0.5 to 7	V
Output voltage	$V_{OUT}$	$\leq V_{CC}$	V
Light current	$I_L$	10	mA
Permissible power dissipation	P	70	mW
Operating temperature range	$T_{opr}$	-30 to 85	$^\circ C$
Storage temperature range	$T_{stg}$	-40 to 100	$^\circ C$
Soldering temperature range (10 s) (Note 1)	$T_{sol}$	260	$^\circ C$

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: The reflow time and the recommended temperature profile are shown in the section entitled Handling Precautions.

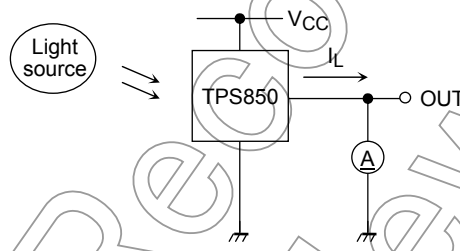
## Electrical and Optical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Supply voltage		V <sub>CC</sub>	—	2.7	—	5.5	V
Supply current		I <sub>CC</sub>	V <sub>CC</sub> = 3 V, E <sub>V</sub> = 1000 lx, R <sub>L</sub> = 250 Ω (Note 2)	—	4	—	mA
Light current (1)		I <sub>L</sub> (1)	V <sub>CC</sub> = 3 V, E <sub>V</sub> = 100 lx (Note 2, 4)	—	300	—	μA
Light current (2)		I <sub>L</sub> (2)	V <sub>CC</sub> = 3 V, E <sub>V</sub> = 10 lx (Note 3, 4)	18	23	30	
Light current (3)		I <sub>L</sub> (3)	V <sub>CC</sub> = 3 V, E <sub>V</sub> = 100 lx (Note 3, 4)	180	230	300	
Light current ratio		$\frac{I_L (1)}{I_L (3)}$		—	1.3	1.7	
Dark current		I <sub>LEAK</sub>	V <sub>CC</sub> = 3.3 V, E <sub>V</sub> = 0	—	—	0.5	μA
Saturation output voltage		V <sub>o</sub>	V <sub>CC</sub> = 3 V, R <sub>L</sub> = 75 kΩ, E <sub>V</sub> = 100 lx (Note 3)	2.2	2.35	—	V
Peak sensitivity wavelength		λ <sub>p</sub>	—	—	640	—	nm
Switching time	Rise time	t <sub>r</sub>	V <sub>CC</sub> = 3 V, R <sub>L</sub> = 5 kΩ, (Note 5)	—	0.2	1	ms
	Fall time	t <sub>f</sub>		—	0.35	2	

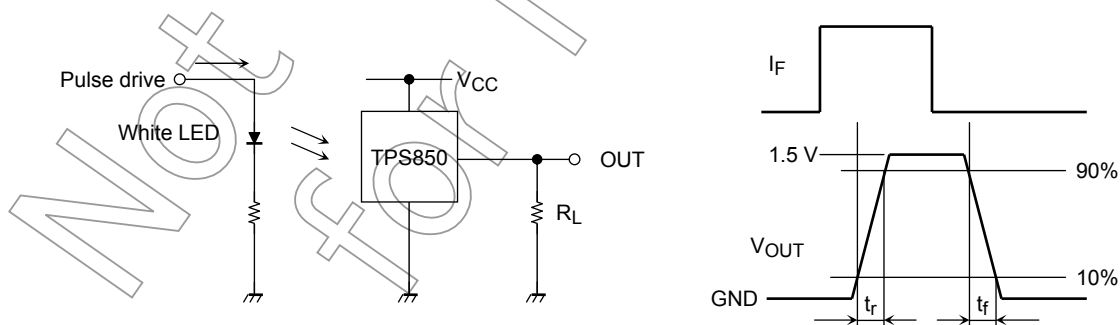
Note 2: CIE standard A light source is used (color temperature = 2856K, approximated incandescence light).

Note 3: Fluorescence light is used as light source. However, white LED is substituted in a mass-production process.

Note 4: Light current measurement circuit



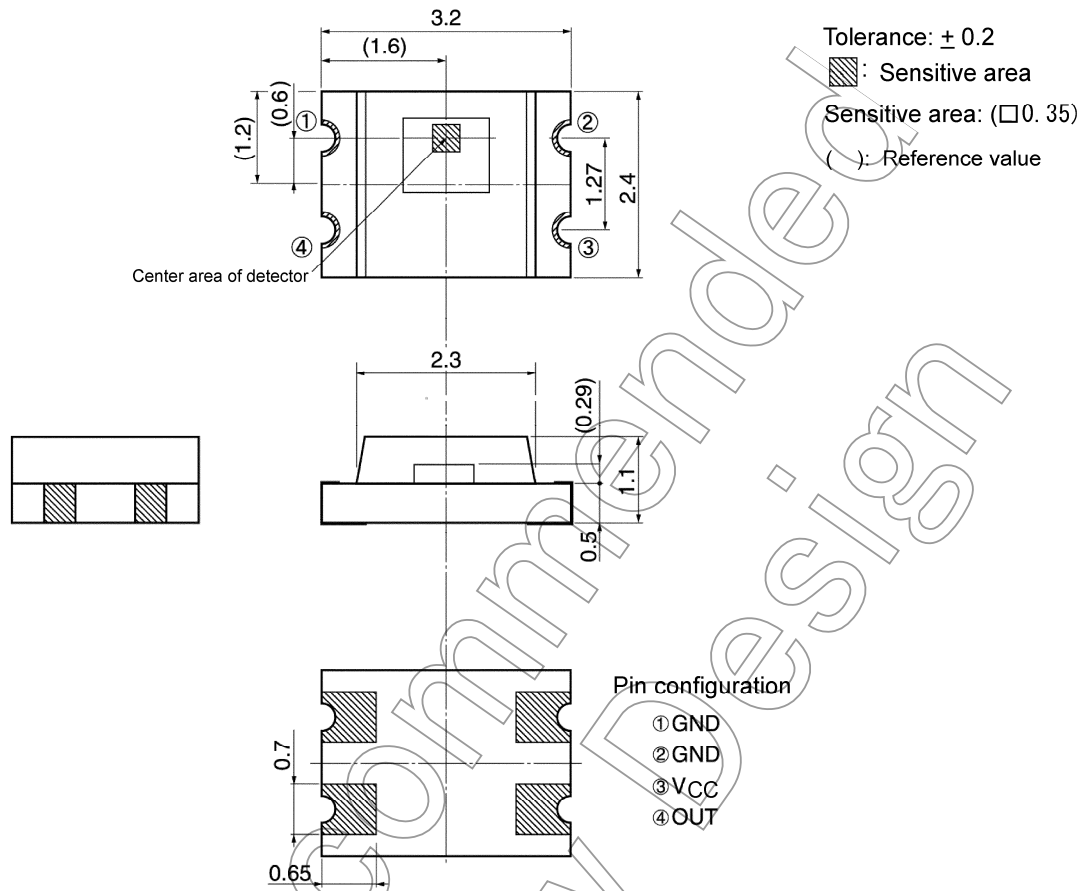
Note 5: Rise time/fall time measurement method



## Package Dimensions

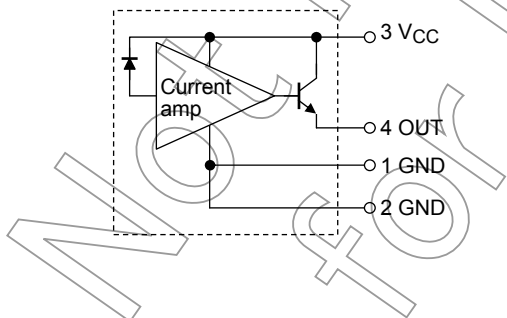
TPS850

Unit: mm



Weight: 0.017 g (typ.)

## Block Diagram



## Handling Precautions

At power-on in darkness, the internal circuit takes about 50 ms to stabilize. During this period the output signal is unstable and may change. Please take this into account.

### Moisture-Proof Packing

- (1) To avoid moisture absorption by the resin, the product is packed in an aluminum envelope with silica gel.
- (2) Since the optical characteristics of the device can be affected during soldering by vaporization resulting from prior absorption of moisture and they should therefore be stored under the following conditions:

Temperature: 5°C to 30°C, Relative humidity: 60% (max), Time: 168 h

- (3) Baking is required if the devices have been store unopened for more than six months or if the aluminum envelope has been opened for more than 168 h.

These devices are packed on tapes; hence, please avoid baking at high temperature.

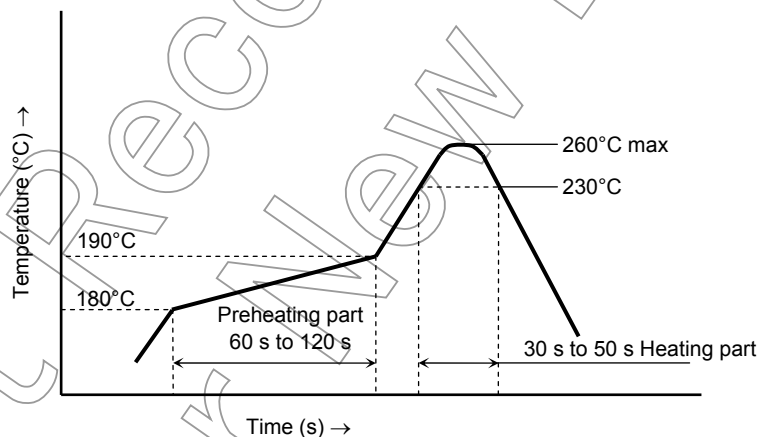
Recommended baking conditions: 60°C for 12 h or longer

### Mounting Precautions

- (1) Do not apply stress to the resin at high temperature.
- (2) The resin part is easily scratched, so avoid friction with hard materials.
- (3) When installing the assembly board in equipment, ensure that this product does not come into contact with other components.

### Mounting Methods

- (1) Reflow soldering
  - Package surface temperature: 260°C (max)
  - Please perform reflow soldering using the following reference temperature profile. Perform reflow soldering no more than twice.



- Please perform the first reflow soldering within 168 h after opening the package with reference to the above temperature profile.

- Second reflow soldering

In case of second reflow soldering, it should be performed within 168 h after first reflow under the above conditions.

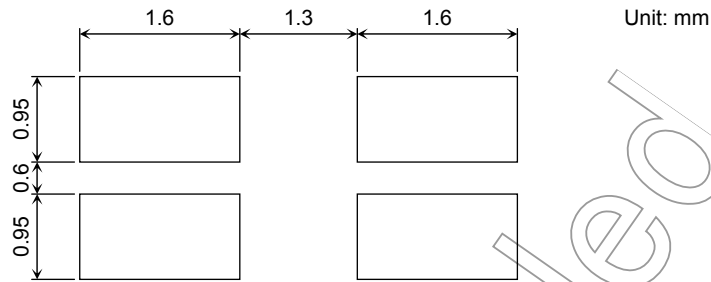
Storage conditions before second reflow soldering: 30°C, 60% RH or lower

- Do not perform flow soldering.
- Make any necessary soldering correction manually.  
(do not do this more than once for any given pin.)

Temperature: no more than 350°C (25 W for soldering iron)

Time: within 5 s

- (2) Recommended soldering pattern



- (3) Cleaning conditions

When cleaning is required after soldering

Chemicals: AK225 alcohol

Temperature and time: 50°C × 30 s or : 30°C × 3 minutes

Ultrasonic cleaning: 300 W or less

**Packing Specification**

- (1) Packing quantity

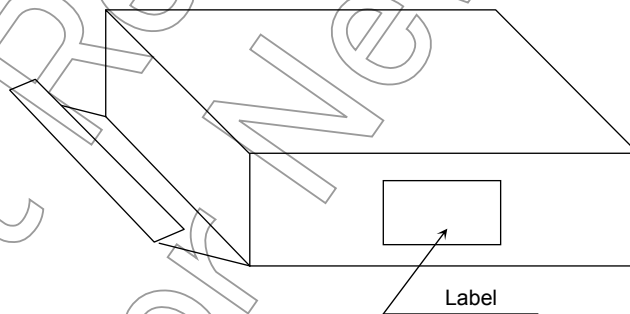
Reel (minimum packing quantity)	3000 devices
Carton	5 reels (15000 devices)

- (2) Packing format

An aluminum envelope containing silica gel and reels is deaerated and sealed.

Pack shock-absorbent materials around the aluminum envelopes in the cartons to cushion them.

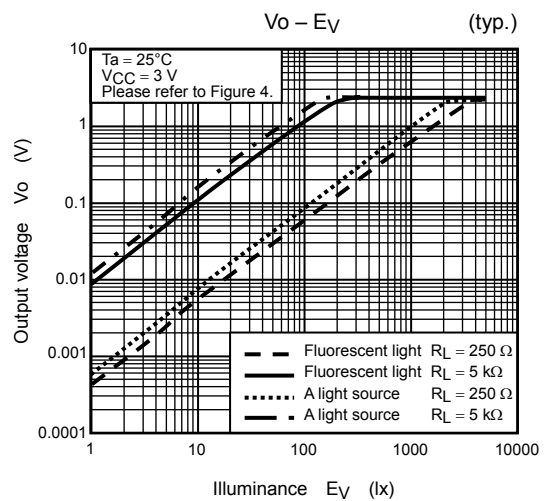
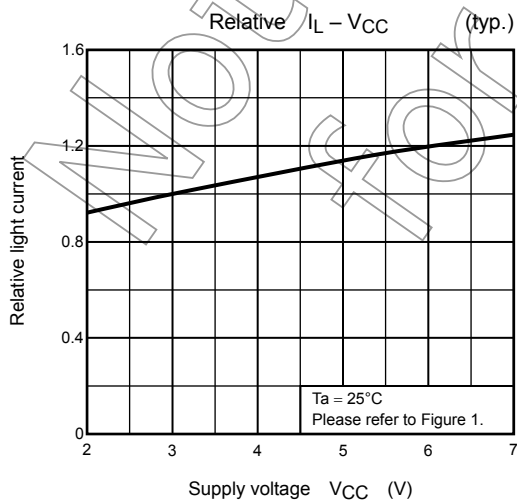
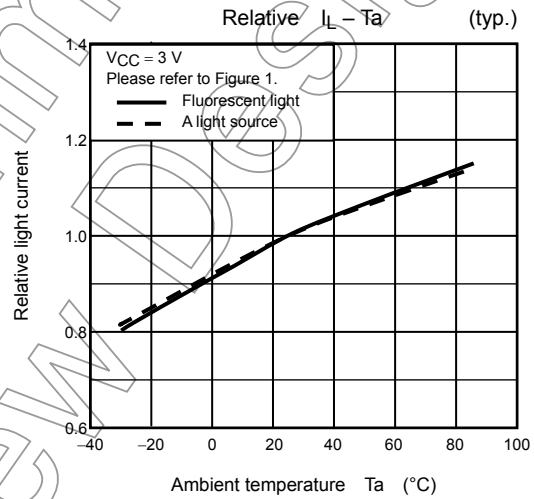
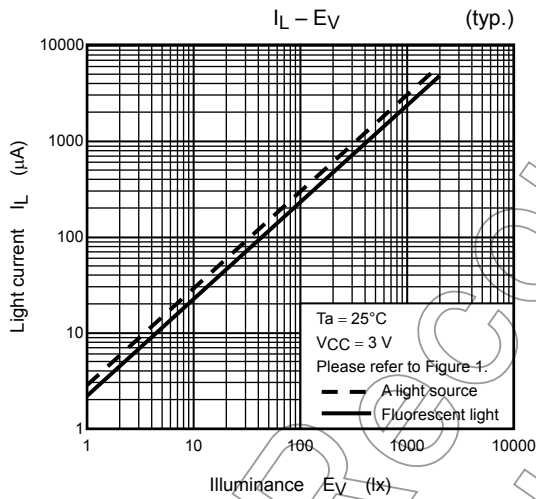
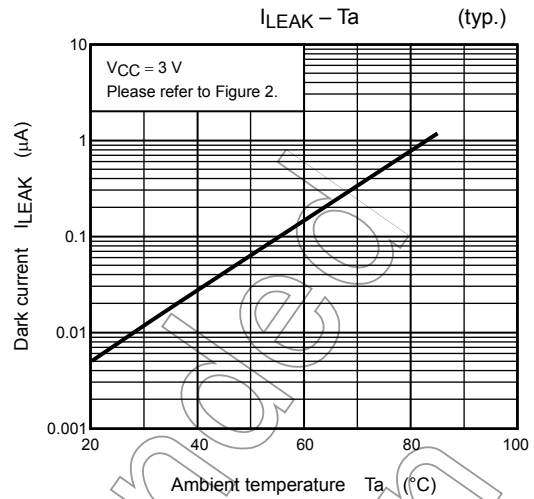
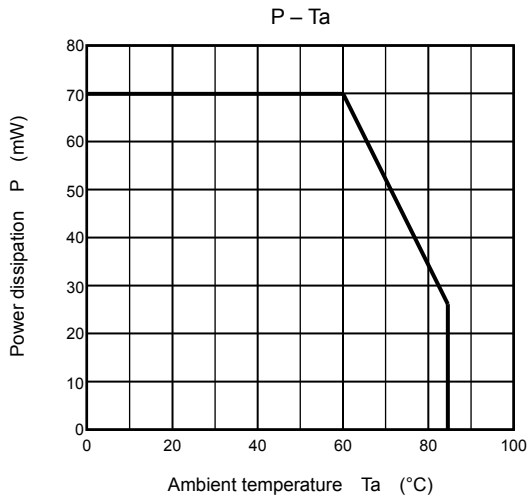
- Carton specification

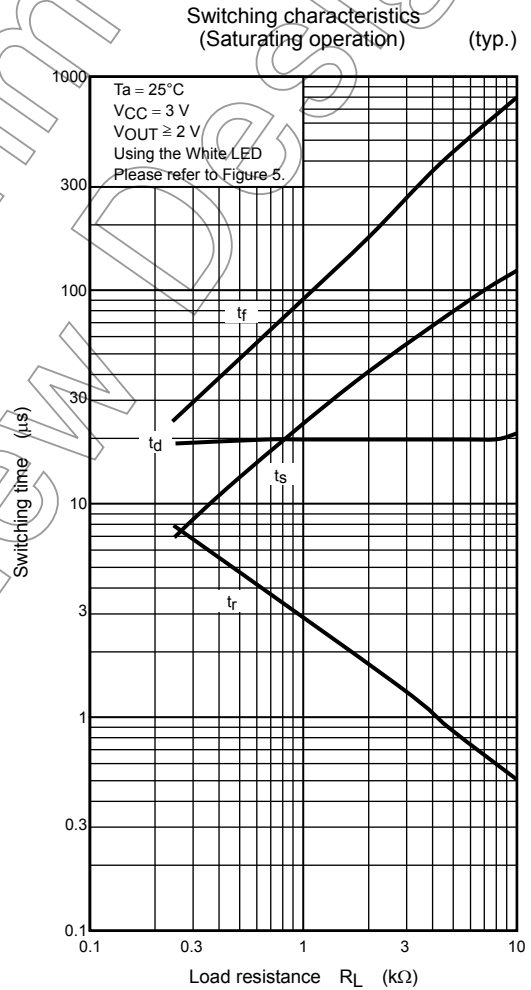
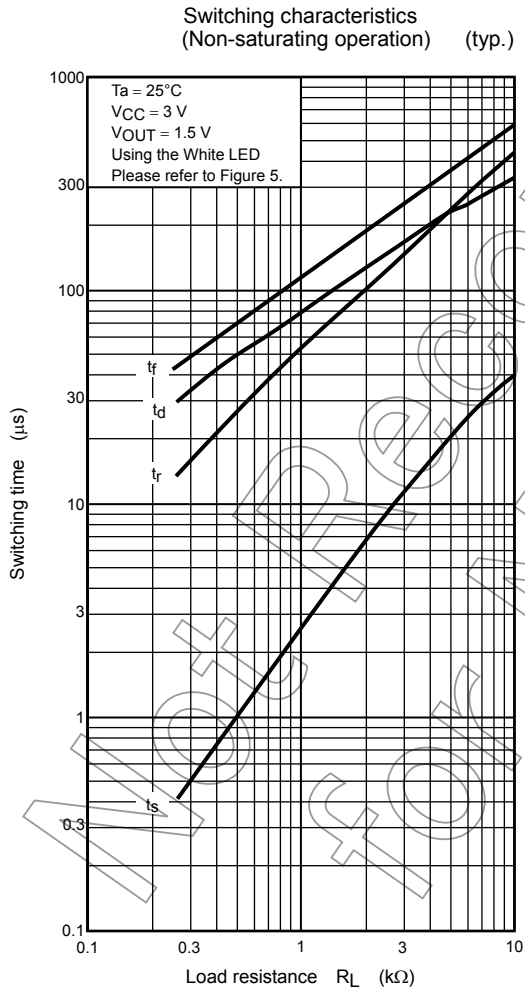
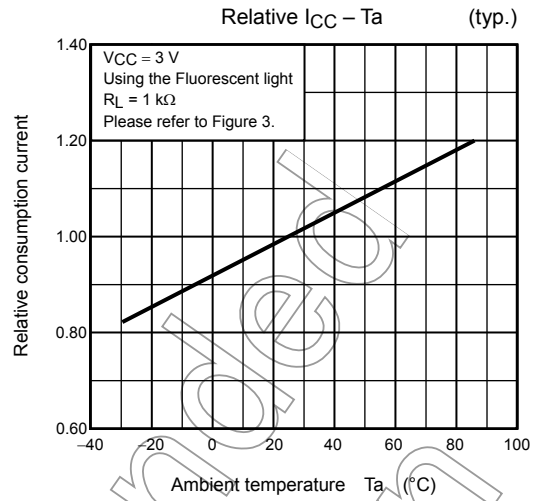
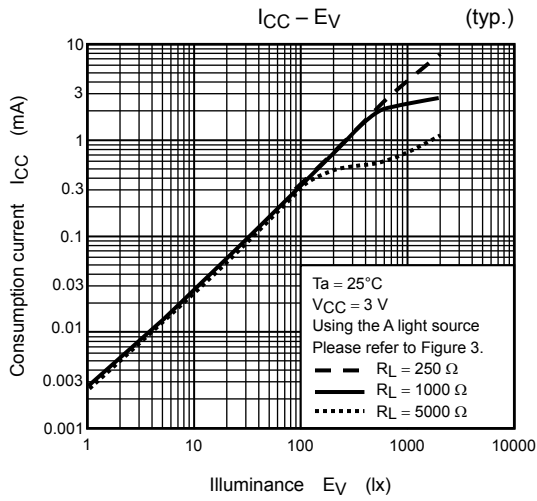


Carton dimensions

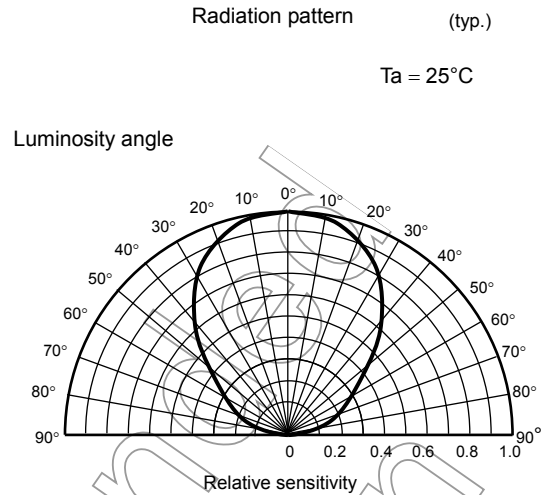
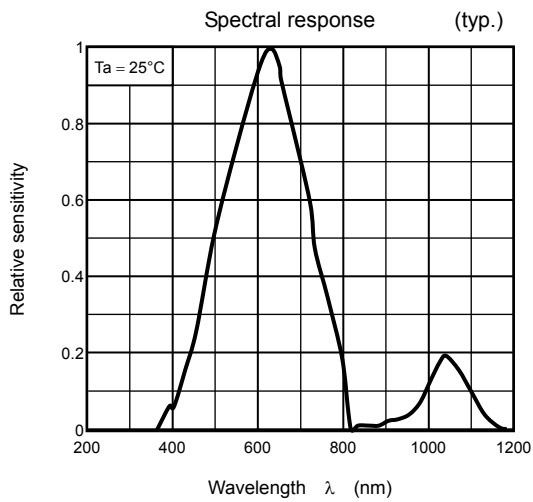
(W) 81 mm × (L) 280 mm × (H) 280 mm











**Measurement Circuits**

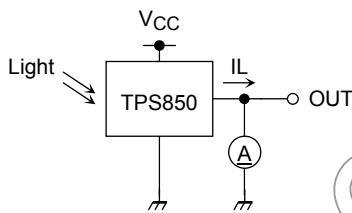


Figure 1 Light current measurement circuit

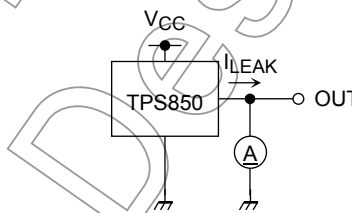


Figure 2 Dark current measurement circuit

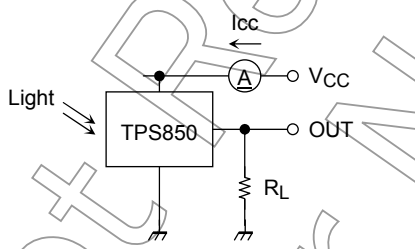


Figure 3 Consumption current measurement circuit

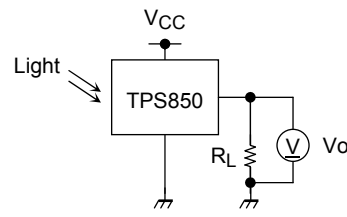


Figure 4 Output voltage measurement circuit

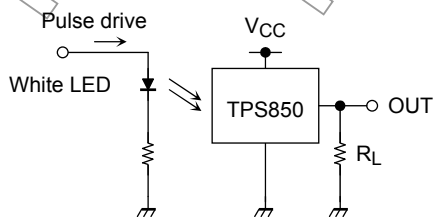
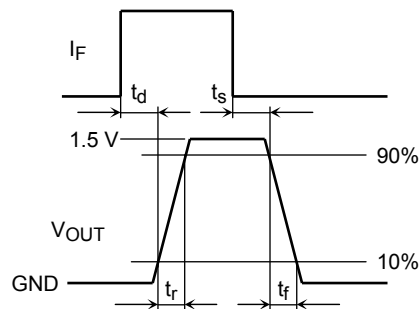


Figure 5 Switching measurement circuit and waveform



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