TOSHIBA Photo-IC Silicon Epitaxial Planar

# TPS842A(F),TPS844(F)

Lead(Pb)-Free

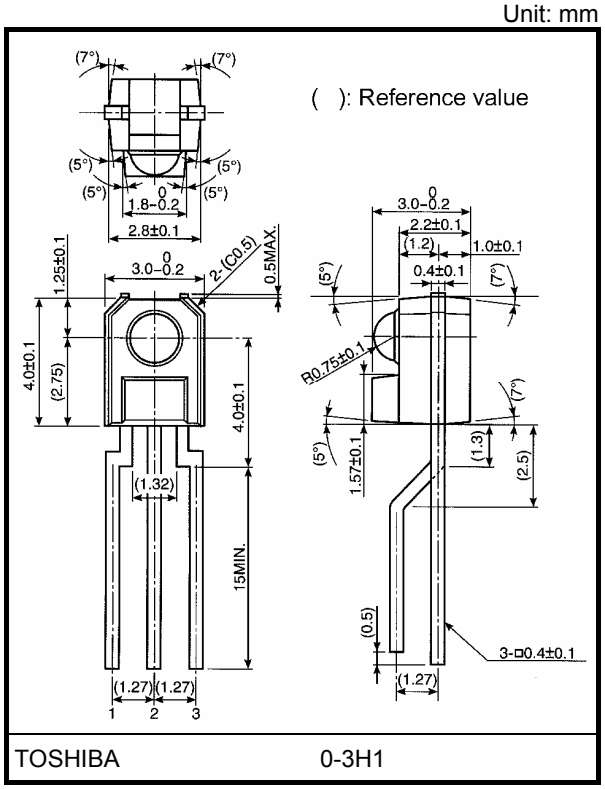
Photoelectric Switches

Copiers, Printers, and Facsimiles

Vending Machines

Handy Terminals

Unit: mm




Weight: 0.12 g (typ.)

The TPS842A(F) and TPS844(F) represent a Si photo IC of digital output type that integrates a photodiode, amplifier circuit, and Schmitt trigger circuit into a single chip.

These devices are low voltage drive types, and they allow construction of low voltage systems which thus consume less power.

These devices respond faster than the phototransistor type. They output a low when light is input.

- Compact side-view epoxy resin package
- Operates over a wide supply voltage range : $V_{CC}$ = 2.7 to 15 V
- High speed response : $t_{pLH}$ = 15 μs, $t_{pHL}$ = 9 μs (max)
- High sensitivity: 0.3 mW/cm$^2$ (max)
- Can be directly connected to TTL and CMOS.
- Digital output: TPS842A(F) …. open collector
  TPS844(F) …. with a pull-up resistor

## Absolute Maximum Ratings (Ta = 25°C)

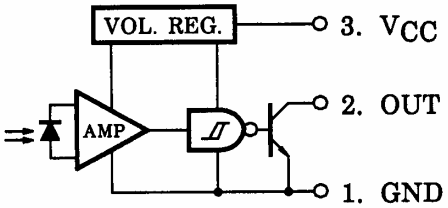
| Characteristics | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Supply voltage | | $V_{CC}$ | 15 | V |
| Output voltage | TPS842A(F) | $V_O$ | 15 | V |
| | TPS844(F) | | $=V_{CC}$ | |
| Output current | | $I_O$ | 16 | mA |
| Output current derating (Ta > 25°C) | | $\Delta I_O$/°C | −0.213 | mA/°C |
| Power dissipation | | P | 250 | mW |
| Power dissipation derating (Ta > 25°C) | | ΔP/°C | −3.33 | mW/°C |
| Operating temperature range | | $T_{opr}$ | −30 to 95 | °C |
| Storage temperature range | | $T_{stg}$ | −40 to 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).

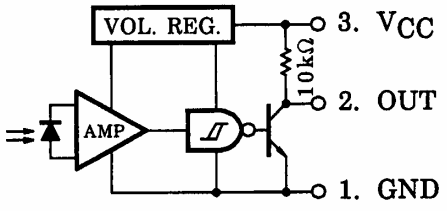
Note 1: At the location of 1.3 mm from the resin package bottom.

## Pin Connection

TPS842A(F)




TPS844(F)




## Opto-Electrical Characteristics

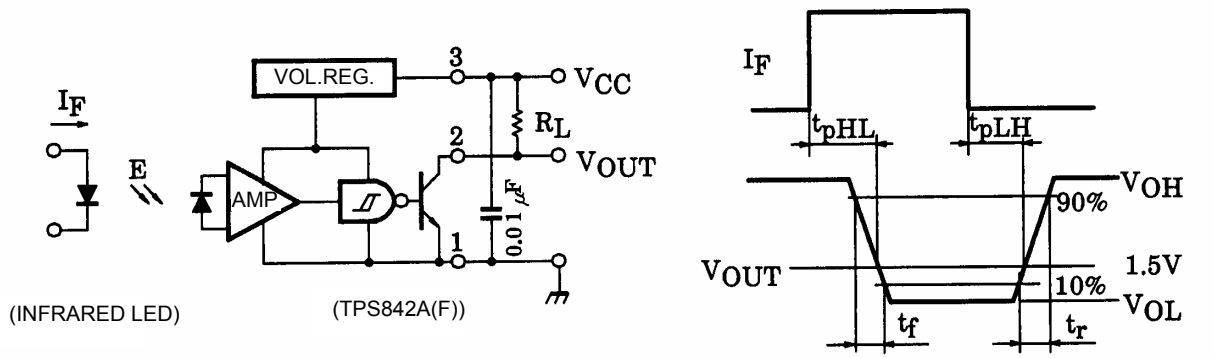
**(Ta = –30 to 95°C, $V_{CC}$ = 2.7 to 15 V, typical values are all at 25°C.)**

| Characteristics | | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|---|
| Supply voltage | | | $V_{CC}$ | — | 2.7 | — | 15 | V |
| High level supply current | | | $I_{CCH}$ | E = 0 | — | 0.5 | 1.2 | mA |
| Low level supply current | TPS842A(F) | | $I_{CCL}$ | E = 2 mW/cm$^2$ (Note 2) | — | 0.9 | 2 | mA |
| | TPS844(F) | | | | — | 2.9 | 4 | |
| High level output current | TPS842A(F) | | $I_{OH}$ | $V_O$ = 15 V, E = 0 | — | — | 6.3 | μA |
| High level output voltage | TPS844(F) | | $V_{OH}$ | E = 0 | 0.9*$V_{CC}$ | — | — | V |
| Low level output voltage | | | $V_{OL}$ | E = 2 mW/cm$^2$, $I_{OL}$ = 16 mA (Note 2) | — | 0.07 | 0.4 | V |
| "H→L" Threshold radiant incidence | | | $E_{HL}$ | Ta = 25°C | — | 0.2 | 0.3 | mW/cm$^2$ |
| | | | | — | — | — | 0.6 | |
| Hysteresis ratio | | | $E_{HL}/E_{LH}$ | Ta = 25°C | 1.1 | 1.5 | 2 | — |
| Peak sensitivity wavelength | | | $\lambda_P$ | — | — | 900 | — | nm |
| Switching time | Propagation delay time | "L→H" | $t_{pLH}$ | Ta = 25°C, $V_{CC}$ = 3.3 V, E = 2 mW/cm$^2$, $R_L$ = 10 kΩ (Note 3) | — | — | 15 | μs |
| | | "H→L" | $t_{pHL}$ | | — | — | 9 | |
| | Rise time | | $t_r$ | | — | 0.8 | 3 | |
| | Fall time | | $t_f$ | | — | 0.02 | 0.5 | |

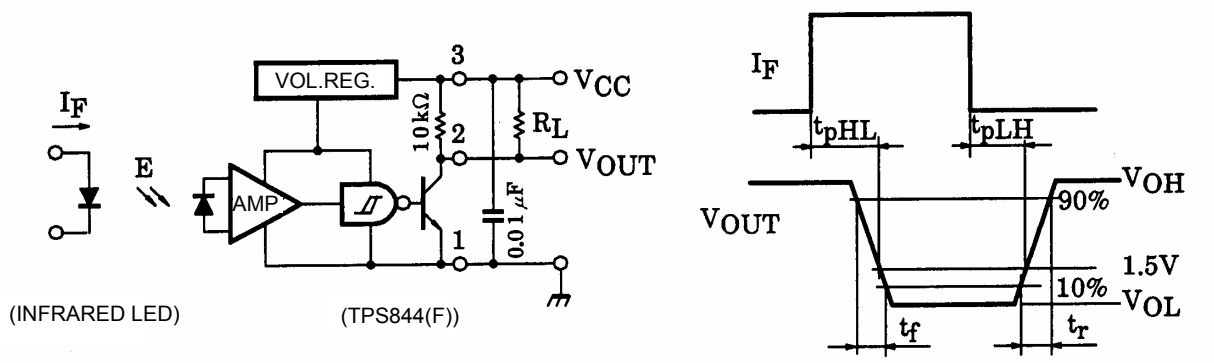
Note 2: CIE standard light source A (standard tungsten bulb) with color temperature = 2856 K.

Note 3: Switching time measurement circuit and waveform.

**TPS842A(F)**



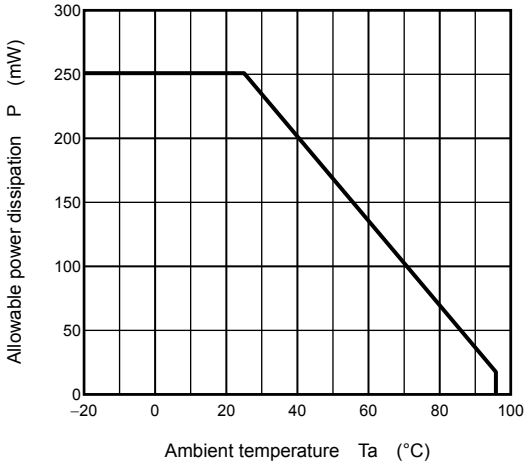

**TPS844(F)**



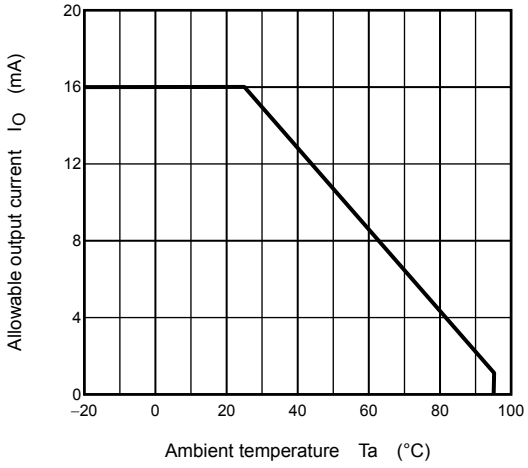

## Precautions

- When you consider a combined use with an LED, be sure to use an infrared LED. Visible rays in wavelength of less than 700 nm cannot be detected.
- Make sure the shielding plate that is used to detect positions is manufactured from materials with superior light-shielding characteristics. Insufficient shield can cause malfunction.
- Photo ICs contain a high-sensitivity amplifier. Toshiba recommends connecting a capacitor of about 0.01 μF that has good high-frequency characteristics between $V_{CC}$ and GND near the device to prevent unwanted oscillation.
- Please install so that disturbance light is not irradiated by these products.
  When disturbance light (incandescence light etc.) 700 nm or more is detected, it may incorrect-operate. Please perform sufficient evaluation and verification by set.
- During 100 μs after turning on $V_{CC}$, output voltage changes for stabilizing the inner circuit.

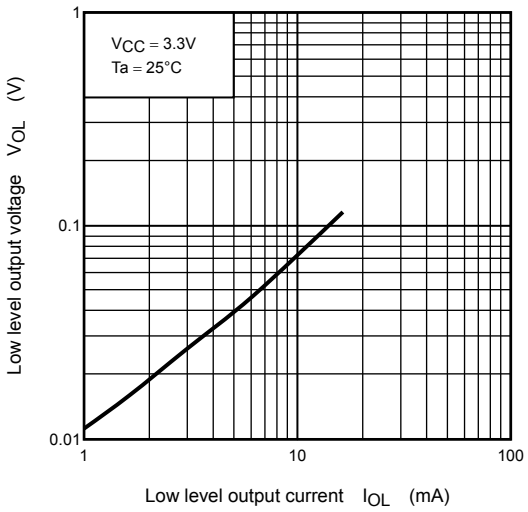
P – Ta



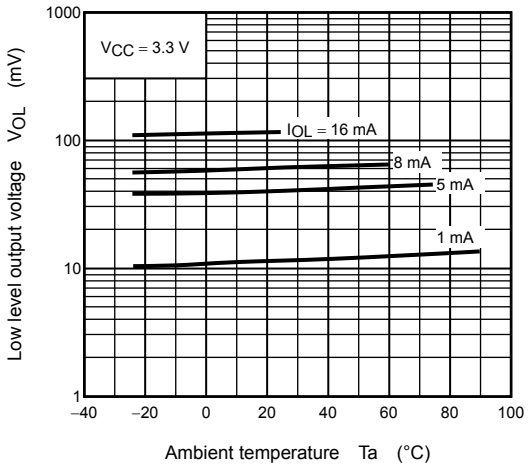

$I_O$ – Ta



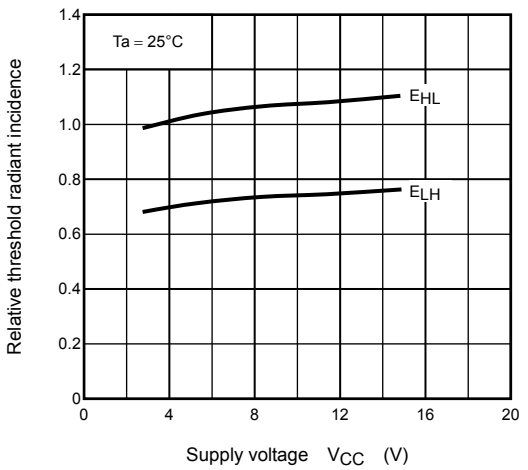

$V_{OL}$ – $I_{OL}$ (typ.)



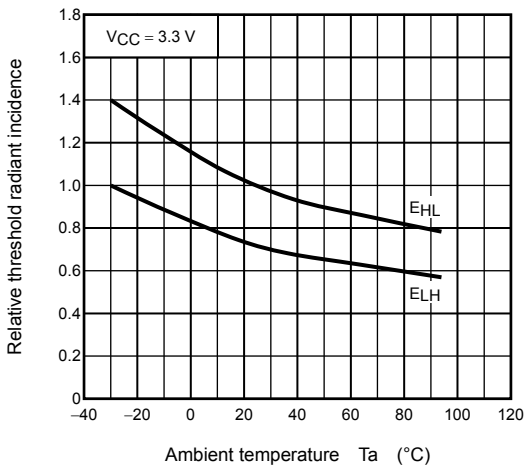

$V_{OL}$ – Ta (typ.)



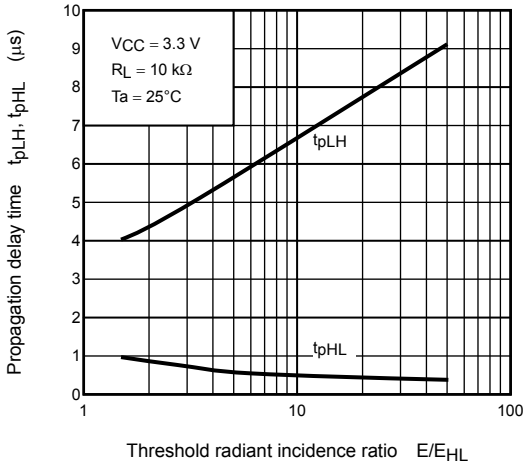

Relative $E_{LH}$, $E_{HL}$ – $V_{CC}$ (typ.)



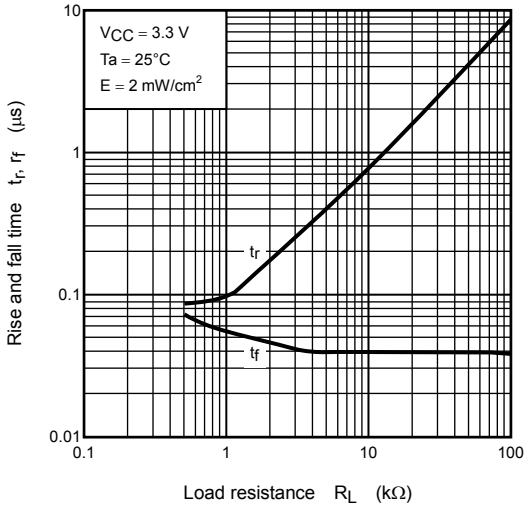

Relative $E_{LH}$, $E_{HL}$ – Ta (typ.)



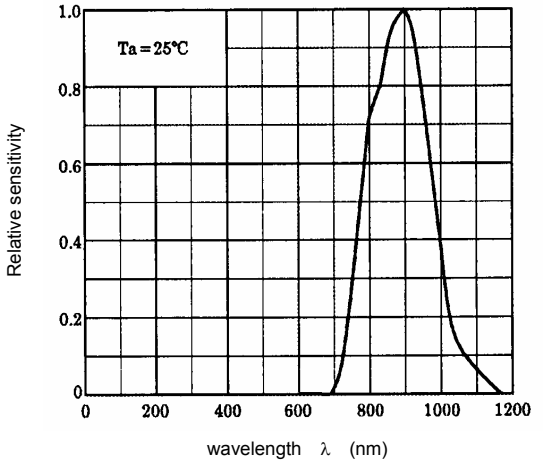
$t_{pLH}$, $t_{pHL}$ – $E/E_{HL}$ (typ.)



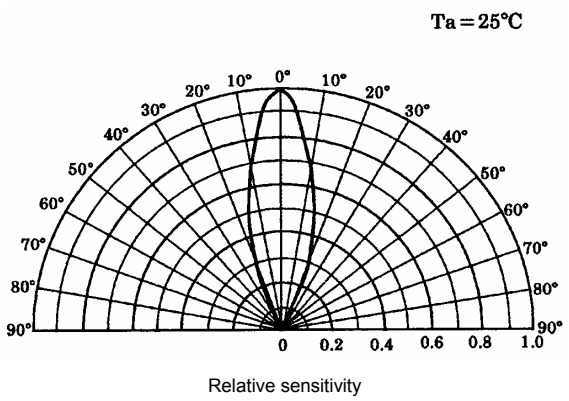

$t_r$, $t_f$ – $R_L$ (typ.)




Spectral response (typ.)




Directional sensitivity characteristic (typ.)



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20070701-EN GENERAL

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