Data Sheet

HLPT-B5x0-00000

Silicon NPN Phototransistor

Description

The Broadcom® HLPT-B5x0-00000 is a is a robust and efficient phototransistor in an industry-standard 5-mm through-hole lamp package.

This product comes with black epoxy, which filters off undesired visible light.

The product is available in multiple angles of half sensitivity. It has a wide spectral range of sensitivity from 720 nm to 1100 nm; and coupled with its high photosensitivity, this product is a suitable candidate for a variety of applications in consumer and industrial segments such as office automation, light curtains, machine controls, and smoke detectors.

This product is easy to use and a cost-effective solution that offers superior performance.

Features

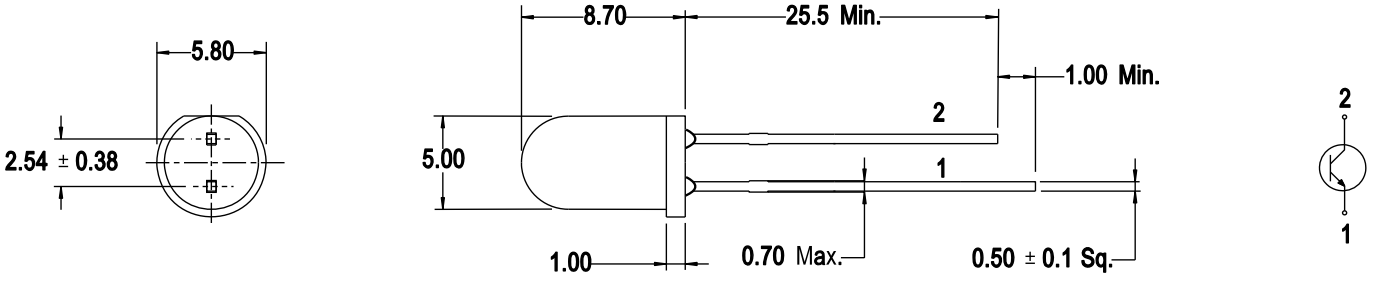
- 5-mm radial package
- Black epoxy package
- High photosensitivity
- Available in multiple angles of half sensitivity

Applications

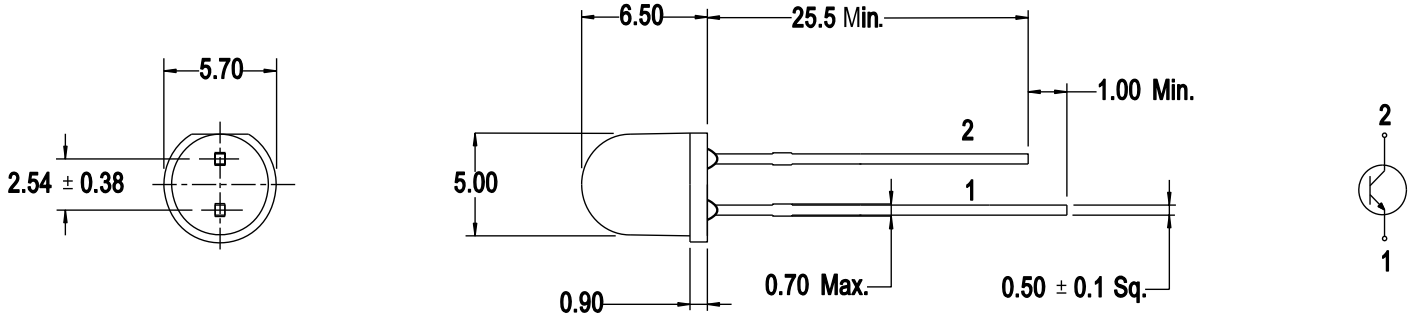
- Office automation
- Light curtains
- Machine controls
- Smoke detectors

Figure 1: Package Drawing

For Angle of Sensitivity ±10° and ±25°



For Angle of Sensitivity ±40°



NOTE:

1. All dimensions are in millimeters (mm).
2. The tolerance is ±0.25 mm unless otherwise specified.
3. Lead spacing is measured at the location where the leads emerge from the body.
4. The epoxy meniscus may extend up to a maximum of 1.00 mm down the leads.

Device Selection Guide (T_J = 25°C)

Part Number	Collector Light Current, I_{ca} (mA) @ E_e = 0.5 mW/cm^2, λ = 940 nm, V_{CE} = 5V			Angle of Half Sensitivity, φ
	Min.	Typ.	Max.	Typ.
HLPT-B5D0-00000	5.0	8.0	12.5	±10
HLPT-B5G0-00000	2.1	4.0	5.3	±25
HLPT-B5K0-00000	1.5	2.4	3.8	±40

Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Collector-Emitter Voltage	V_{CEO}	30	V
Emitter-Collector Voltage	V_{ECO}	5	V
Collector Current	I_C	30	mA
Power Dissipation	P_d	150	mW
Operating Temperature Range	—	–40 to +85	°C
Storage Temperature Range	—	–40 to +100	°C

Optical and Electrical Characteristics (T_J = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Spectral Range of Sensitivity	λ	720	—	1100	nm	—
Wavelength of Peak Sensitivity	$\lambda_{S\ max}$	—	920	—	nm	—
Dark Current	I_{CEO}	—	—	100	nA	V_{CE} = 20V, E_e = 0 mW/cm^2
Collector-Emitter Saturation Voltage	V_{CEsat}	—	—	0.40	V	I_C = 0.1 mA, E_e = 0.5 mW/cm^2, λ = 940 nm
Collector-Emitter Capacitance	C_{CEO}	—	5.7	—	pF	V_{CE} = 0V, f = 1 MHz, E_e = 0mW/cm^2

Figure 2: Relative Sensitivity vs. Wavelength

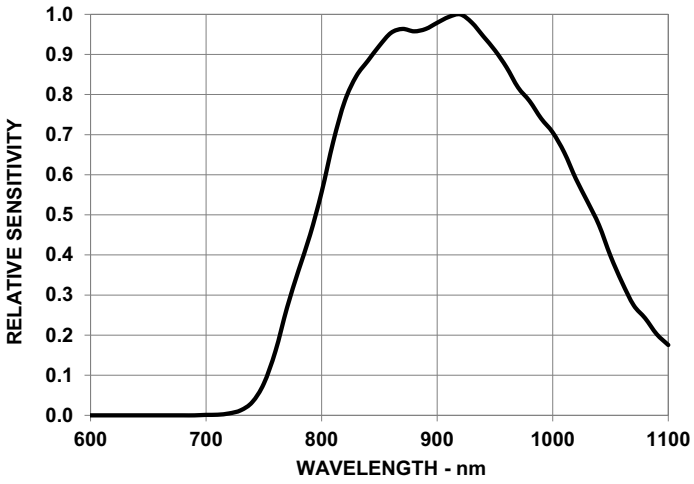


Figure 3: Relative Sensitivity vs. Angular Displacement

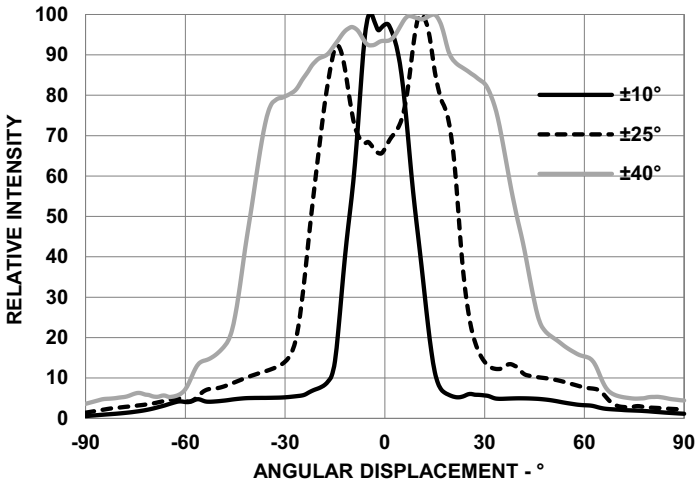


Figure 4: Collector Current vs. Irradiance

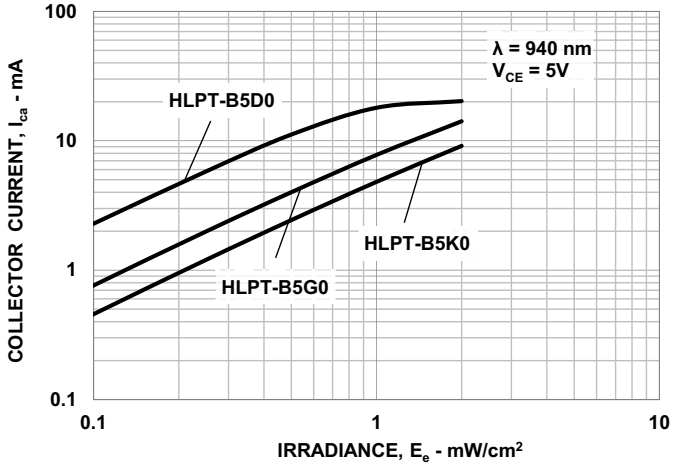


Figure 5: Collector Current vs. Collector-Emitter Voltage for HLPT-B5D0

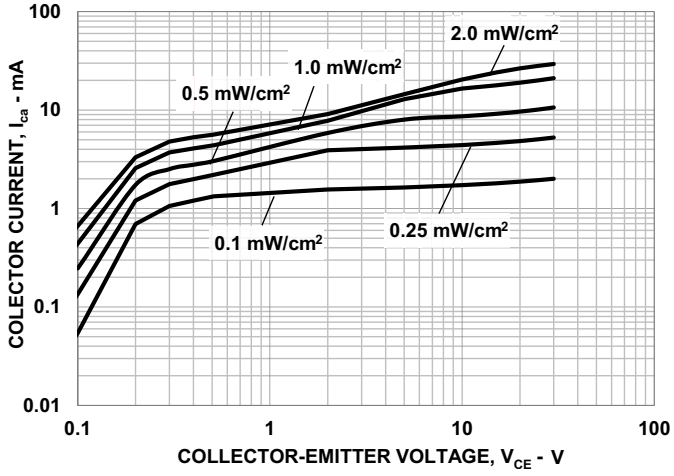


Figure 6: Collector Current vs. Collector-Emitter Voltage for HLPT-B5G0

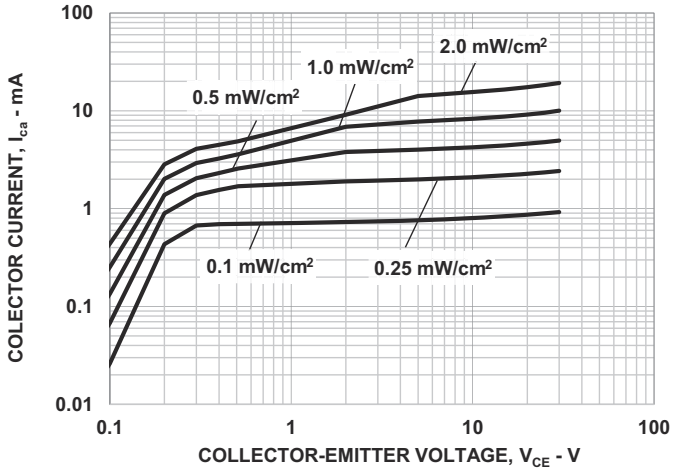


Figure 7: Collector Current vs. Collector-Emitter Voltage for HLPT-B5K0

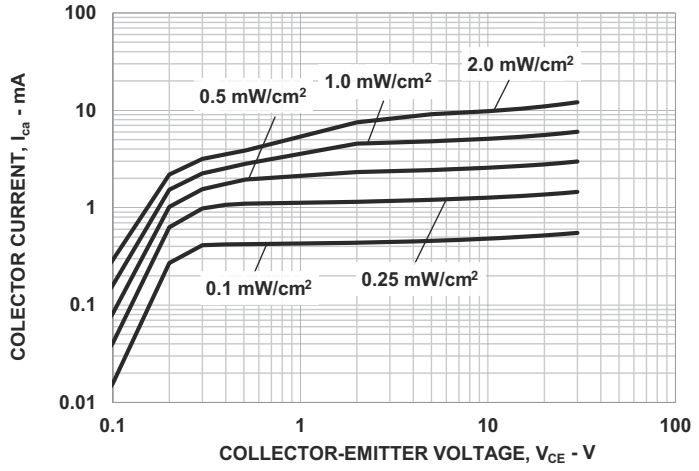


Figure 8: Relative Collector Current vs. Ambient Temperature

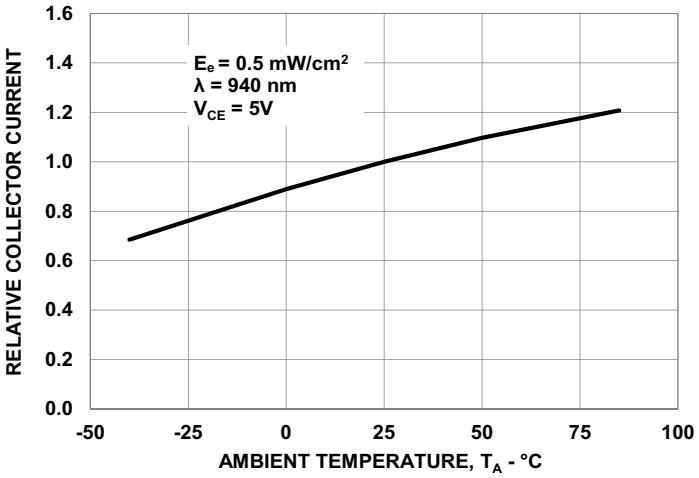


Figure 9: Dark Current vs. Ambient Temperature

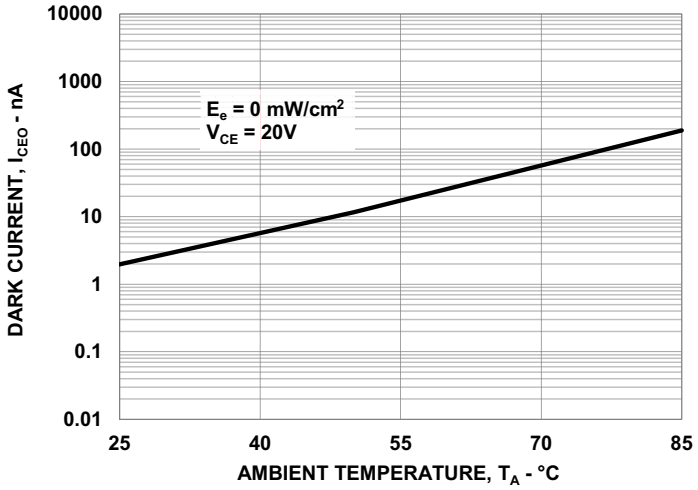


Figure 10: Collector-Emitter Capacitance vs. Collector-Emitter Voltage

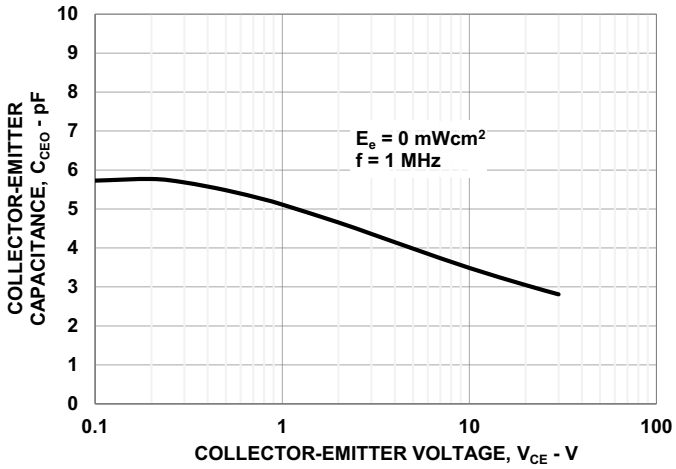
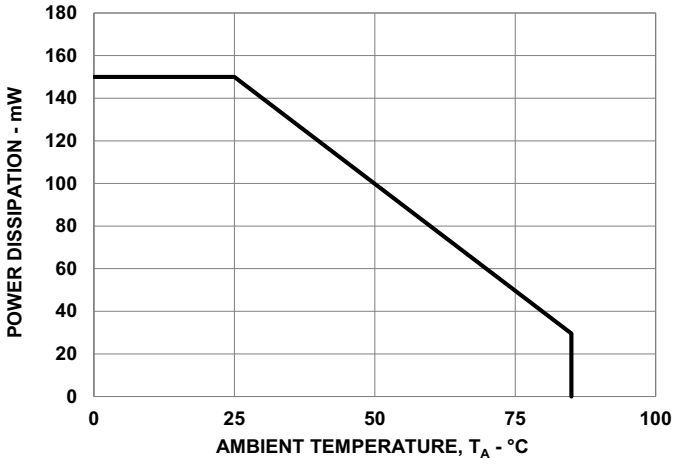


Figure 11: Power Dissipation vs. Ambient Temperature



Precautionary Notes

Soldering and Handling Precautions

- Set and maintain the wave soldering parameters according to the recommended temperature and dwell time. Perform a daily check on the profile to ensure that it always conforms to the recommended conditions. Exceeding these conditions will overstress the package and cause premature failures.
- Use only bottom preheaters to reduce the thermal stress experienced by the package.
- Recalibrate the soldering profile before loading a new type of PCB. PCBs with different sizes and designs (component density) will have a different heat capacity and might cause a change in temperature experienced by the PCB if the same wave soldering setting is used.
- Do not perform wave soldering more than once.
- Any alignment fixture used during wave soldering must be loosely fitted and must not apply stress on the package. Use a nonmetal material because it will absorb less heat during the wave soldering process.
- At elevated temperatures, the package is more susceptible to mechanical stress. Allow the package to sufficiently cool to room temperature before handling. Do not apply stress to the package when it is hot.
- Use wave soldering to solder the package. Use hand soldering only for rework or touch-up if unavoidable, but it must be strictly controlled to following conditions:
  - Soldering iron tip temperature = 315°C maximum
  - Soldering duration = 2 seconds maximum
  - Number of cycles = 1 only
  - Power of soldering iron = 50W maximum
- Do not touch the package body with the soldering iron except for the soldering terminals because it might cause damage to the package.
- Confirm beforehand whether the functionality and performance of the package are affected by hand soldering.
- Keep the heat source at least 1.6 mm away from the package body during soldering.
- Design the appropriate hole size to avoid problems during insertion or clinching (for auto-insertable devices).

Figure 12: Recommended PCB Through-Hole Size

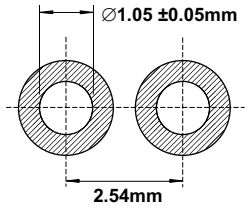
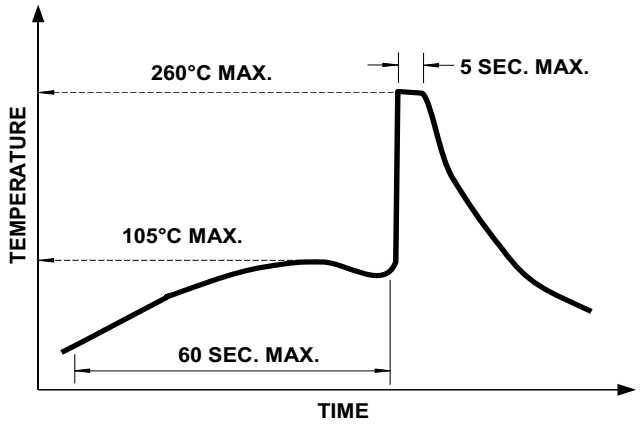


Figure 13: Recommended Wave Soldering Profile



NOTE: Refers to measurements with a thermocouple mounted at the bottom of the PCB.

Lead Forming

- To pre-form or cut the leads prior to insertion and soldering onto the PCB, use the proper tool instead of doing it manually.
- Do not bend the leads at the location less than 3 mm from the package body.
- Do not use the base of the package body as a fulcrum for lead bending. Secure the leads properly before bending.
- If manual lead cutting is unavoidable, cut the leads after soldering to reduce stress to the package body.

Application Precautions

- Avoid rapid changes in the ambient temperature, especially in high-humidity environments, because they cause condensation on the package.
- If the package is intended to be used in a harsh or outdoor environment, protect the package against damages caused by rain water, water, dust, oil, corrosive gases, external mechanical stresses, and so on.

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