

# Reflective Optical Sensor

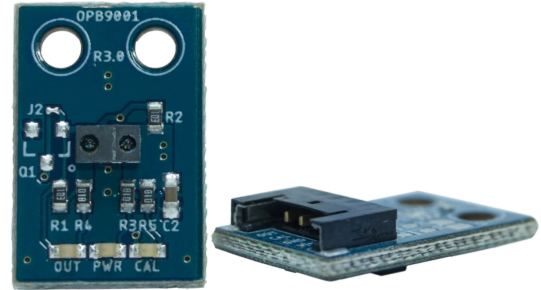
## OPB9001 Series



OBSOLETE

### Features:

- Wide operating supply voltage range up to 3.3 V - 30 V
- Ability to drive the output up to 30 V
- Integrated drive circuitry
- Increased ESD up to 8 kV
- EMI immunity capability to EMC Directive 2014/30-EU
- UL & CE approved
- Detecting distance 2.5 mm to 50 mm
- Ambient light rejection 25 klx+
- Programmable output configuration and sensitivity level
- Integrated 4-pin connector for plug and play capability
- -40 °C to +85 °C operating temperature range
- Small footprint dimensions L 18 mm X W 12 mm X H 5 mm



### Description:

The OPB9001 PCB module takes the versatile and programmable OPB9000 reflective sensor and enhances its capabilities by integrating multiple features into a robust, small form factor for ease of use. The OPB9001 accepts a wide range of supply voltages from 3.3 V to 30 V and comes with built-in voltage protection for maximum flexibility and protection. An integrated, industry standard 4-pin Molex connector provides ease of connection while the onboard LED indicators provide overall status during power-on, output and calibration.

The OPB9001 is designed for portability in a variety of position and presence detect applications, with a small form factor (188 mm x 12 mm x 5 mm) to fit in even the smallest application spaces.

The full-featured OPB9001AC includes a robust Transient Voltage Suppressor (TVS) diode to protect against harmful voltage spikes and is CE and UL certified for maximum reliability under any environmental condition. It is also capable of withstanding up to 8 kV of contact discharge HBM.

Factory calibrated for a 12 mm distance and a white reflective surface the OPB9001 can be re-calibrated in a matter of milliseconds with a single command for specific application requirements. An interface cable can be purchased separately to calibrate the OPB9001 Series using the OPB9000-KIT.

The product has been assessed to meet high safety, health, and environmental protection requirements as determined by CE and EMC directives, providing for increased ESD and EMI immunity.

Note 1: For additional information on how to program OPB9000, see the datasheet: <https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Optoelectronics/Datasheets/OPB9000.pdf>

### Applications:

- Non-contact position presence applications
- Industrial printing and high-speed paper detection
- Manufacturing and Factory automation
- Automated sewing machines
- Automated banking machines
- Medical equipment
- Automatic dispensing

### Additional Features:

- 6ms response time
- Wide operating supply voltage range
  - 4.5 V to 30 V (OPB9001A/AC)
  - 4.5 V to 24 V (OPB9001B)
  - 3.3 V to 5.5 V (OPB9001C)
- Reverse voltage protection
- Single-command calibration with on-chip EPROM
- Temperature-compensated LED drive
- Eliminate the need for external drive circuitry

#### General Note

TT Electronics reserves the right to make changes in product specification without notice or liability. All information is subject to TT Electronics' own data and is considered accurate at time of going to print.

OPB9001AC, OPB9001A, OPB9001B,  
OPB9001C



## Electrical Specifications

## Part Number Guide – OPB9001

**OPB9001 X**

## OPB9001 Reflective Assembly

### VDD Voltage Range

A - 4.5 V to 30 V

B - 4.5 V to 24 V

C - 3.3 V to 5.5 V

AC - 4.5 V to 30 V CE / UL

| Ordering Part Number | Voltage Output Configuration | VCC Range      | Features                                                                                                                    |
|----------------------|------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------|
| OPB9001AC            | N.O. NPN                     | 4.5 V to 30 V  | OPB9000 with indicators, voltage regulator + NPN Transistor 30 V +ESD TVS diodes and CE and UL Certifications and connector |
| OPB9001A             | N.O. NPN                     | 4.5 V to 30 V  | OPB9000 with indicators, voltage regulator + NPN Transistor 30 V and connector                                              |
| OPB9001B             | N.O. NPN                     | 4.5 V to 24 V  | OPB9000 with indicators, voltage regulator + NPN Transistor 24 V and connector                                              |
| OPB9001C             | TTL CMOS                     | 3.3 V to 5.5 V | OPB9000 with indicators and connector                                                                                       |
| OPB90014CB           | N/A                          | N/A            | 1m interface cable with connector                                                                                           |
| OPB9000-KIT          | N/A                          | N/A            | OPB9000 reflective sensor evaluation kit for testing and auto-calibration (requires OPB90014CB interface cable)             |



### General Note

TT Electronics reserves the right to make changes in product specification without notice or liability. All information is subject to TT Electronics' own data and is considered accurate at time of going to print.

© TT electronics plc

TT Electronics | OPTEK Technology  
2900 E. Plano Pkwy, Plano, TX 75074 | Ph: +1 972 323 2200  
[www.ttelectronics.com](http://www.ttelectronics.com) | [sensors@ttelectronics.com](mailto:sensors@ttelectronics.com)

Rev C 03/2023 Page 2

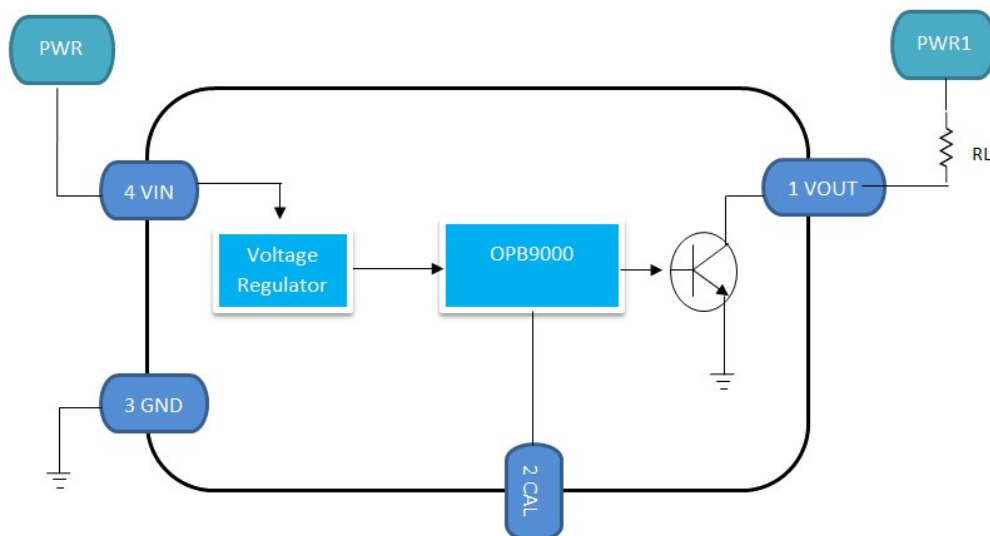
# Reflective Optical Sensor

OPB9001AC, OPB9001A, OPB9001B,  
OPB9001C

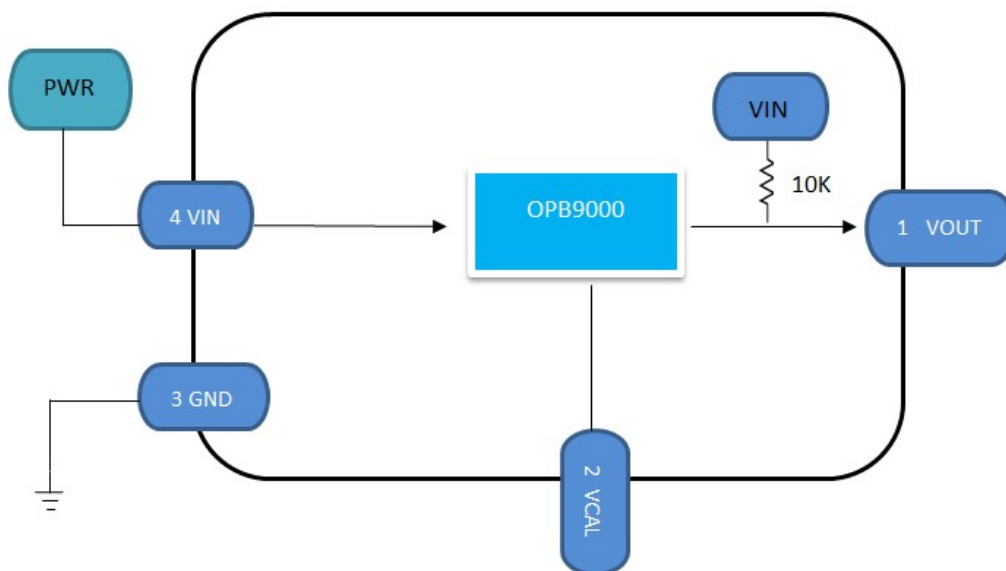


## Recommended Circuit Application

OPB9001A/AC/B



OPB9001C



### General Note

TT Electronics reserves the right to make changes in product specification without notice or liability. All information is subject to TT Electronics' own data and is considered accurate at time of going to print.

© TT electronics plc

TT Electronics | OPTEK Technology  
2900 E. Plano Pkwy, Plano, TX 75074 | Ph: +1 972 323 2200  
www.ttelectronics.com | sensors@ttelectronics.com

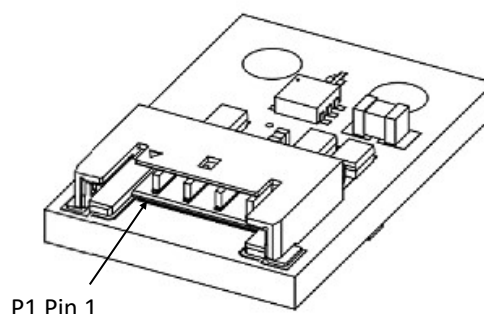
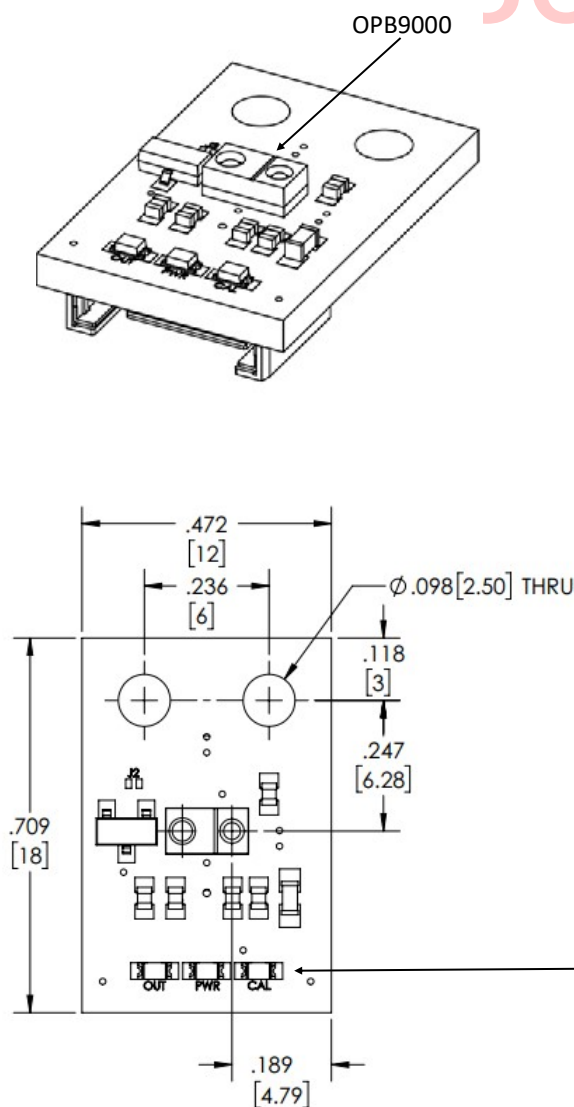
Rev C 03/2023 Page 3

# Reflective Optical Sensor

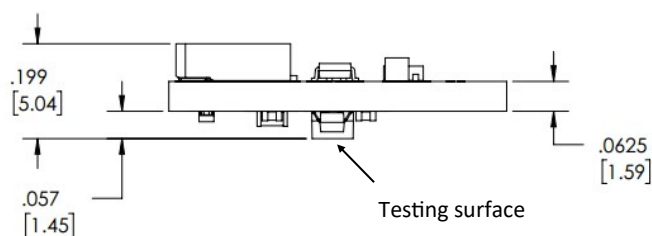
OPB9001AC, OPB9001A, OPB9001B,  
OPB9001C



## Package Outline—OPB9001XX (For reference)



P1—Molex connector P/N 504050-0491  
Molex mating connector P/N 5040510401  
with terminals 5040520098



**3-Color Indicator**  
Red: Power on  
Orange: Output high  
Green: Flashing while calibrating

| Pin # | Name | Description                                                       |
|-------|------|-------------------------------------------------------------------|
| 1     | VOUT | Logic Output, also used as a digital output to read register bits |
| 2     | CAL  | Calibrate input/status output ( to verify successful calibration) |
| 3     | GND  | Ground Connection                                                 |
| 4     | VIN  | Positive supply power input                                       |

Dimensions are in inches [mm]. Tolerances are: +/- 10% unless otherwise specified

### General Note

TT Electronics reserves the right to make changes in product specification without notice or liability. All information is subject to TT Electronics' own data and is considered accurate at time of going to print.

# Reflective Optical Sensor

OPB9001AC, OPB9001A, OPB9001B,  
OPB9001C



## Electrical Specifications

**OPB9001XX Absolute Maximum Ratings** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| Parameter                                     | Symbol    | Part Number                         | Maximum                                      | Units            |
|-----------------------------------------------|-----------|-------------------------------------|----------------------------------------------|------------------|
| DC supply voltage                             | $V_{IN}$  | OPB9001A/AC<br>OPB9001B<br>OPB9001C | 32<br>24<br>6                                | V                |
| Storage Temperature Range                     | $T_{STG}$ | ALL                                 | -40 to +100                                  | $^\circ\text{C}$ |
| Operating Temperature Range                   | $T_{OPR}$ | ALL                                 | -40 to +85                                   | $^\circ\text{C}$ |
| Ambient/background light                      | $I_x$     | ALL                                 | 25                                           | klx              |
| ESD immunity<br>(human body model)            | —         | OPB9001AC<br>OPB9001A/B/C           | 8, contact discharge<br>2, contact discharge | kV<br>kV         |
| Maximum reverse voltage                       | $V_{RRM}$ | ALL                                 | 30                                           | V                |
| Load current ( Collector current)             | $I_L$     | OPB9001A/AC                         | 40                                           | mA               |
| Maximum Open collector output voltage         | —         | OPB9001A/AC                         | 40                                           | V                |
| Current into or out of any pin other than GND | —         | OPB9001C                            | 20                                           | mA               |
| Current into or out of GND or $V_{in}$        | $I_{CC}$  | OPB9001C                            | 150                                          | mA               |

**Note:** Permanent damage to the device may occur if operated outside the Absolute maximum specifications. Proper function and reliability of the device at these or any other conditions outside the recommended operating conditions may also be adversely affected.

### General Note

TT Electronics reserves the right to make changes in product specification without notice or liability. All information is subject to TT Electronics' own data and is considered accurate at time of going to print.

TT Electronics | OPTEK Technology  
2900 E. Plano Pkwy, Plano, TX 75074 | Ph: +1 972 323 2200  
www.ttelectronics.com | sensors@ttelectronics.com

# Reflective Optical Sensor

OPB9001AC, OPB9001A, OPB9001B,  
OPB9001C



## Electrical Specifications

Electrical Characteristics ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| SYMBOL   | PARAMETER                                             | MIN                                                   | TYP | MAX             | UNITS                    | NOTES                                                            |
|----------|-------------------------------------------------------|-------------------------------------------------------|-----|-----------------|--------------------------|------------------------------------------------------------------|
| $V_{IN}$ | Supply Voltage<br>OPB9001A/AC<br>OPB9001B<br>OPB9001C | 4.5<br>4.5<br>3.3                                     | -   | 30<br>24<br>5.5 | V                        |                                                                  |
| $I_{SS}$ | Current Consumption                                   | -                                                     |     | 16              | mA                       | $R_L = 10\text{ k}\Omega$                                        |
| $R_L$    | Pull up resistor (OUT pin)<br>OPB9001A/AC<br>OPB9001B | 1<br>1                                                |     | 10<br>10        | k $\Omega$<br>k $\Omega$ | 4.5 V < $V_{CC} < 30\text{ V}$<br>4.5 V < $V_{CC} < 24\text{ V}$ |
|          | Sensing Distance Range                                | 2.5                                                   |     | 50              | mm                       |                                                                  |
|          | Output type                                           | NPN open collector                                    |     |                 |                          |                                                                  |
| OUT      | Output indicator                                      | Orange LED (ON when output high, OFF when output low) |     |                 |                          |                                                                  |
| PWR      | Power indicator                                       | Red LED (ON when $V_{in}$ min is met)                 |     |                 |                          |                                                                  |
| CAL      | Calibration indicator                                 | Green LED (Flashing while it is being calibrated)     |     |                 |                          |                                                                  |

Electrical Characteristics ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| SYMBOL   | PARAMETER                                                    | MIN                                 | TYP          | MAX      | UNITS | TEST CONDITIONS                                                                                                                                                                                            |
|----------|--------------------------------------------------------------|-------------------------------------|--------------|----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $V_{OL}$ | Output voltage (low)<br>OPB9001A/AC<br>OPB9001B<br>OPB9001C  | -                                   | -            | 0.4      | V     | <b>Note 1</b><br>$V_{IN} = 30$ or $V_{IN} = 4.5$ no target<br>$V_{IN} = 24$ or $V_{IN} = 4.5$ no target<br>$V_{IN} = 5\text{ V}$ , target at $d = 6\text{ mm}$<br>Target = 90 % diffuse white test surface |
| $V_{OH}$ | Output voltage ( high)<br>OPB9001A/AC/B (Note 2)<br>OPB9001C | $0.95 \cdot V_{IN}$<br>$V_{IN} - 1$ | -            | $V_{IN}$ | V     | Target at $d = 6\text{ mm}$<br>Target = 90 % diffuse white test surface<br>$V_{IN} = 5\text{ V}$ , no target                                                                                               |
| $I_L$    | Load current<br>OPB9001A/AC/B                                |                                     | $V_{IN}/R_L$ |          | mA    | <b>Note 2</b>                                                                                                                                                                                              |

**Note 1:** OPB9000 is in push pull configuration .For additional information refer to the OPB9000 datasheet.

**Note 2 :** Using a external pull up resistor.

### General Note

TT Electronics reserves the right to make changes in product specification without notice or liability. All information is subject to TT Electronics' own data and is considered accurate at time of going to print.

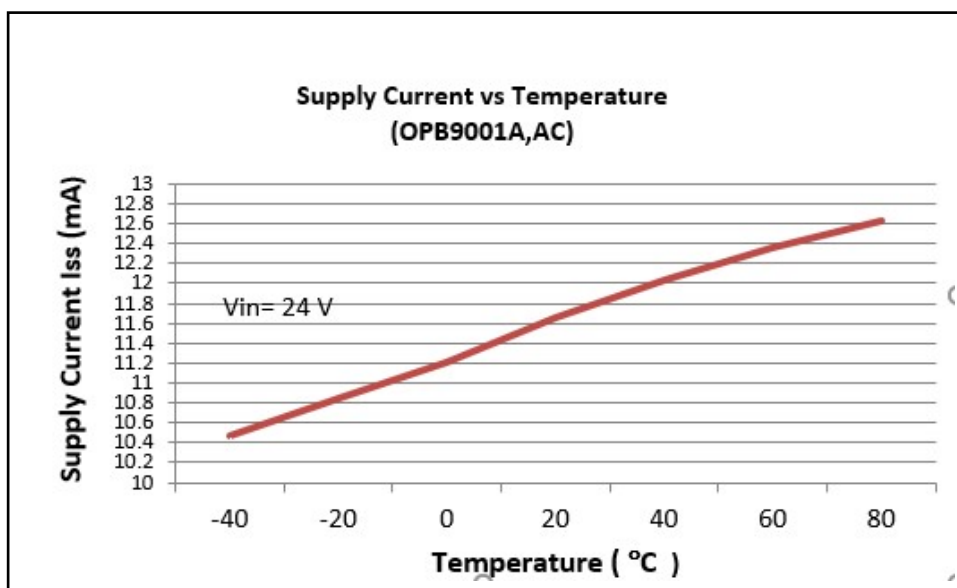
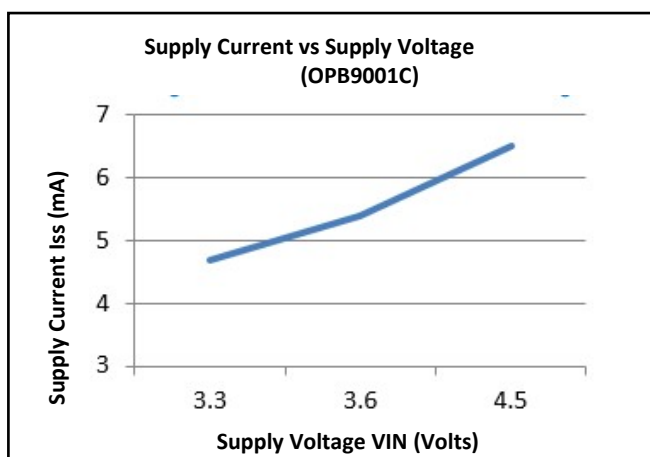
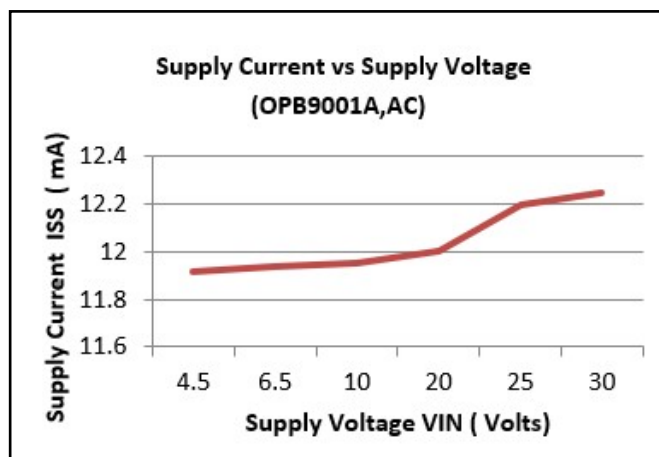
# Reflective Optical Sensor

OPB9001AC, OPB9001A, OPB9001B,  
OPB9001C



## Performance

Typical Characteristics ( $T_A = 25^\circ\text{C}$  unless noted otherwise)



**Note:** Refer to OPB9000 datasheet for additional performance graphs.

<https://www.ttelectronics.com/TTElectronics/media/ProductFiles/Optoelectronics/Datasheets/OPB9000.pdf>

### General Note

TT Electronics reserves the right to make changes in product specification without notice or liability. All information is subject to TT Electronics' own data and is considered accurate at time of going to print.

© TT electronics plc

TT Electronics | OPTEK Technology  
2900 E. Plano Pkwy, Plano, TX 75074 | Ph: +1 972 323 2200  
[www.ttelectronics.com](http://www.ttelectronics.com) | [sensors@ttelectronics.com](mailto:sensors@ttelectronics.com)

Rev C 03/2023 Page 7

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[TT Electronics:](#)

[OPB9001AC](#) [OPB9001A](#) [OPB9001C](#) [OPB9001B](#) [OPB90014CB](#)