

Photologic® Optical Flag Switch

OPB685-3, OPB686, OPB687, OPB695,
OPB696, OPB697, OPB698 Series



Features:

- Photologic® output
- Four output options
- Mechanical switch replacement
- Printed circuit board mounting (OPB685-3)
- 2.5mm, 3-pin connector mates with Molex connector 5051 series housing and 4809 series terminal for OPB695 Series

Description:

Each **OPB685-3** and **OPB695** series flag switch consists of an infrared emitting diode and a monolithic integrated circuit that incorporates a photodiode, a linear amplifier and a Schmitt trigger. A lever arm actuated flag interrupts the light beam, which switches the output between states that can readily drive logic gates.

The **OPB695** series is designed to easily snap mount into a 0.037" ± 0.001" (0.940 mm ± 0.025 mm) thick material with a rectangular opening of 0.320" ± 0.003" x 0.472" (8.13 mm x 11.99 mm) minimum. Insertion into the punched side of metal is recommended.

Devices in these series feature TTL/LSTTL compatible logic level output that can drive up to 10 TTL loads over a voltage range from 4.5 V to 16 V.

Customized lever arms and spring torques can be designed for specific applications for each of the devices.

Custom electrical, wire, cabling and connectors are available. Contact your local representative or OPTEK for more information.

Applications:

- Mechanical switch replacement
- Speed indication (tachometer)
- Mechanical limit indication
- Edge sensing

| Ordering Information | | | | |
|----------------------|---------------------|---------------------|-------------------------|--------------------------------------------------------------------------------|
| Part Number | LED Peak Wavelength | Sensor Photologic® | Flag Travel Degrees Max | Lead Length / Spacing or Connector |
| OPB685-3 | 890 nm | 10K Pull-Up | 59° | Mates with 3 Pin—Molex 5051 (22-01-1032) Housing & 4809 (08-70-0069) Terminals |
| OPB686 | | Open Collector | | |
| OPB687 | | Inv. 10K Pull-Up | | |
| OPB695AZ | | 10K Pull-Up | 70° | |
| OPB696AZ | | Open Collector | | |
| OPB697AZ | | Inv. 10K Pull-Up | | |
| OPB698CZ | | Inv. Open Collector | | |



RoHS

General Note
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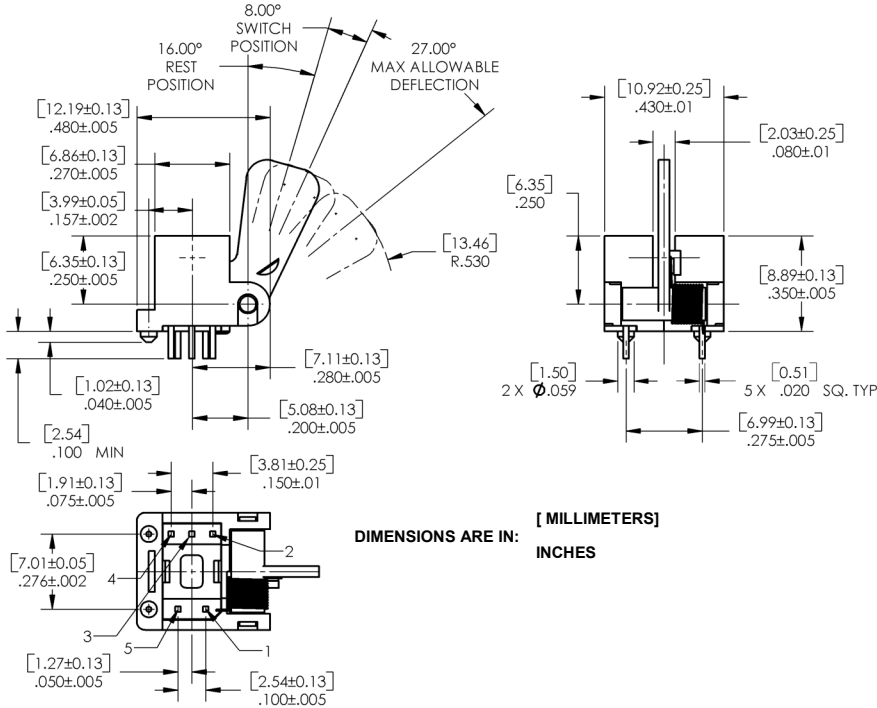
OPTEK Technology, Inc.
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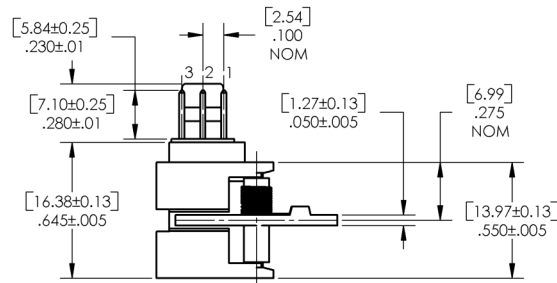


| Pin # | Description |
|-------|-----------------|
| 1 | Anode |
| 5 | Cathode |
| 2 | Ground |
| 3 | Output |
| 4 | V _{CC} |

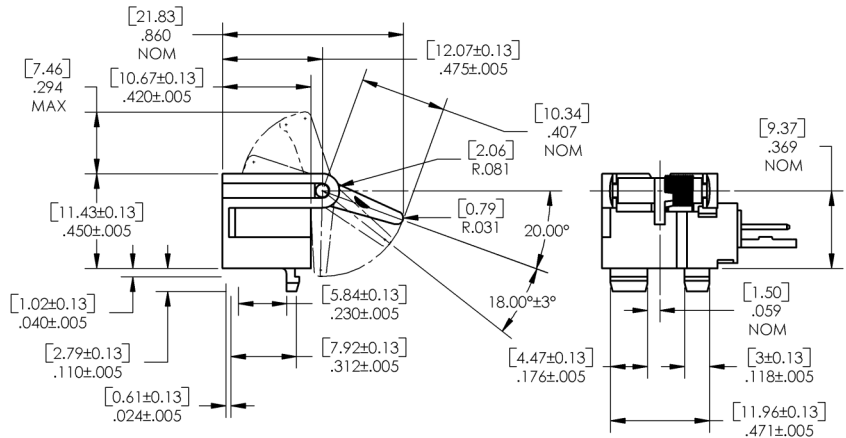
DIMENSIONS ARE IN: [MILLIMETERS]
INCHES

OP695, OPB696, OPB697, OPB698

| Part Number | Max. Torque (Grams) |
|-------------|---------------------|
| OPB685-3 | 3.0 |
| OPB686 | 1.5 |
| OPB687 | 1.5 |
| OPB695 | 1.5 |
| OPB696 | 1.5 |
| OPB697 | 1.5 |
| OPB698 | 1.5 |



| Pin # | OPB695 |
|-------|-----------------|
| 1 | V _{CC} |
| 2 | Output |
| 3 | Ground |



Torque is measured at the end of the arm from the resting position to the switching point of the flag

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| Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted) | |
|------------------------------------------------------------------------------------------------------------|-----------------|
| Storage & Operating Temperature Range | -40°C to +100°C |
| Lead Soldering Temperature [1/16 inch (1.6mm) from the case for 5 sec. with soldering iron] ⁽¹⁾ | 260°C |
| Input Diode | |
| Reverse Voltage | 2.0 V |
| Continuous Forward Current | 50 mA |
| Peak Forward Current | 3.0 A |
| Total Device Power Dissipation ⁽²⁾ | 100 mW |
| Output Photologic® | |
| Supply Voltage, V_{CC} | 18 V |
| Duration of Output Short to V_{CC} | 1 second |
| Voltage at Output | 30 V |
| Low Level Output Current (sinking) | 16 mA |
| Power Dissipation ^{(3) (4)} | 240 mW |

Notes:

- (1) RMA flux is recommended. Duration can be extended to 10 seconds maximum when flow soldering.
- (2) Derate linearly 1.33 mW/°C above 25° C.
- (3) Derate linearly 2.00 mW/°C above 25° C (OPB680, OPB680-20, OPB690Z).
- (4) Derate linearly 2.50 mW/°C above 25° C (OPB685-3, OPB686, OPB687, OPB695, OPB696, OPB697, OPB698).

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OPB685-3 and OPB695 Series

OPB685-3, OPB695 Buffered 10K Pull-Up



OPB686, OPB696 Buffered Open-Collector



OPB687, OPB697 Inverted 10K Pull-Up



OPB698 Inverted Open-Collector



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| Electrical Characteristics (T _A = 25° C unless otherwise noted) | | | | | | | |
|----------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------|------|------|-------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SYMBOL | PARAMETER | MIN | TYP | MAX | UNITS | TEST CONDITIONS | |
| Input Diode | | | | | | | |
| V _F | Forward Voltage | - | - | 1.6 | V | I _F = 10 mA | |
| I _R | Reverse Current | - | - | 100 | μA | V _R = 3 V | |
| Output Photologic® Sensor | | | | | | | |
| V _{CC} | Operating DC Supply Voltage | | | | | | |
| | OPB685-3 Series | 4.5 | - | 16.0 | V | | |
| | OPB695-698A | 4.5 | 5.0 | 8.0 | | | |
| | OPB695-698B | 8.0 | 12.0 | 13.5 | | | |
| OPB695-698C | 13.5 | 15.0 | 16.0 | | | | |
| I _{CC} | Operating DC Supply Current OPB695-698A/B/C | - | 20 | 30 | mA | | |
| I _{CCL} | Low Level Supply Current: Buffered 10k Pull-Up | OPB685-3 | - | 5.5 | 12 | mA | V _{CC} = 16 V, I _F = 0 mA (no load on output) |
| | Buffered Open-Collector | OPB686 | - | 4.0 | 12 | | |
| | Inverted 10k Pull-Up | OPB687 | - | 6.5 | 12 | | |
| I _{CCH} | High Level Supply Current: Buffered 10k Pull-Up | OPB685-3 | - | 5.0 | 12 | mA | V _{CC} = 16 V, I _F = 10 mA (no load on output) |
| | Buffered Open-Collector | OPB686 | - | 5.0 | 12 | | |
| | Inverted 10k Pull-Up | OPB687 | - | 4.0 | 12 | | |
| V _{OL} | Low Level Output Voltage ⁽¹⁾ : Buffered 10k Pull-Up | OPB685-3 | - | - | 0.4 | V | V _{CC} = 4.5 V, I _{OL} = 16 mA, I _F = 0 V _{CC} = 4.5 V to 8 V, I _{OL} = 16 mA V _{CC} = 8.5 V to 13 V, I _{OL} = 16 mA V _{CC} = 13.5 V to 16 V, I _{OL} = 16 mA |
| | Buffered Open-Collector | OPB686 | - | - | 0.4 | | |
| | | OPB695 | - | - | 0.4 | | |
| | | OPB696A/B/C | - | - | 0.4 | | |
| | Inverted 10k Pull-Up ⁽²⁾ | OPB685-3 | - | - | 0.4 | V | V _{CC} = 4.5 V, I _{OL} = 16 mA, I _F = 0 V _{CC} = 4.5 V to 8 V, I _{OL} = 16 mA V _{CC} = 8.5 V to 13 V, I _{OL} = 16 mA V _{CC} = 13.5 V to 16 V, I _{OL} = 16 mA |
| | Inverted Open-Collector | OPB686 | - | - | 0.4 | | |
| | OPB695 | - | - | 0.4 | | | |
| | | OPB696A/B/C | - | - | 0.4 | | |
| V _{OH} | High Level Output Voltage ⁽²⁾ : Buffered 10k Pull-Up | V _{CC} | - | - | - | V | I _{OH} = 100 μA, I _F = 10 mA |
| | Inverted 10k Pull-Up ⁽¹⁾ Inverted Open-Collector | V _{CC} | - | - | - | V | I _{OH} = 100 μA, I _F = 0 mA |
| I _{OH} | High Level Output Current ⁽²⁾ : Buffered Open-Collector | OPB686 | - | - | 100 | μA | V _{CC} = 16 V, I _F = 10 mA, V _{CH} = 30 V V _{CC} = 4.5 V to 8 V, V _{OH} = 30 V V _{CC} = 8.5 V to 13 V, V _{OH} = 30 V V _{CC} = 13.5 V to 16 V, V _{OH} = 30 V |
| | | OPB696A | - | - | 100 | | |
| | | OPB696B | - | - | 100 | | |
| | | OPB696C | - | - | 100 | | |
| | Inverted 10k Pull-Up ⁽¹⁾ | OPB698A | - | - | 100 | μA | V _{CC} = 4.5 V to 8 V, V _{OH} = 30 V ⁽¹⁾ V _{CC} = 8.5 V to 13 V, V _{OH} = 30 V ⁽¹⁾ V _{CC} = 13.5 V to 16 V, V _{OH} = 30 V ⁽¹⁾ |
| | OPB698B | - | - | 100 | | | |
| | OPB698C | - | - | 100 | | | |

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| Electrical Characteristics (T _A = 25° C unless otherwise noted) | | | | | | |
|----------------------------------------------------------------------------|---------------------------------------------------------------------------|-----|--------|-----|-------|------------------------------------------------------------------------------------------------------|
| SYMBOL | PARAMETER | MIN | TYP | MAX | UNITS | TEST CONDITIONS |
| Output Photologic® Sensor (continued) | | | | | | |
| I _{F(+)} | LED Positive-Going Threshold Current OPB685-3—687 | 0.1 | 1.8 | 10 | mA | V _{CC} = 5 V |
| I _{F(+)} /I _{F(-)} | Hysteresis OPB685-3 | 1.0 | 1.2 | 1.6 | mA | V _{CC} = 5 V |
| t _r ,t _f | Rise Time, Fall Time | - | 30 | - | ns | |
| t _{PLH} ,t _{PHL} | Propagation Delay Low-High & High-Low: Buffer, 10k Pull-Up OPB685-3 | - | 1 (LH) | - | μs | V _{CC} = 5 V, I _F = 0 or 10 mA R _L = 300 Ω, DC = 50% f = 10 kHz |
| | Buffer, Open-Collector OPB686 | - | 2 (HL) | - | μs | |
| | Inverter, 10k Pull-Up OPB687 | - | 2 (LH) | - | μs | |

Notes:

- (1) Test requires lever arm in “blocked” position.
- (2) Test requires lever arm in “unblocked” position

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| Issue | Change Description | Approval | Date |
|-------|-----------------------------------------------------------------|--------------|------------|
| A | Initial Release—New Layout | | 03/08/06 |
| A.1 | Changed connector information | Mark Miller | 1/22/07 |
| A.2 | Fixed Absolute Maximum ratings for the LED on page 3 | Mark Miller | 04/03/2009 |
| A.3 | Added Notes #2—“Test requires lever arm in “unblocked” position | Tom Osborne | 03/05/2015 |
| B | Transferred to the new TT Electronics template | L. Timpa | 10/5/2016 |
| C | Eliminated obsolete product #s | Julia Knight | 9/20/17 |
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