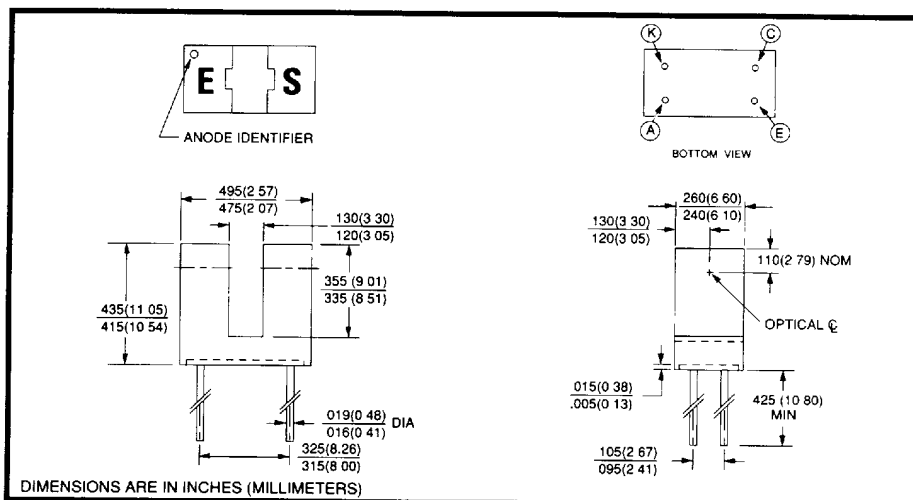
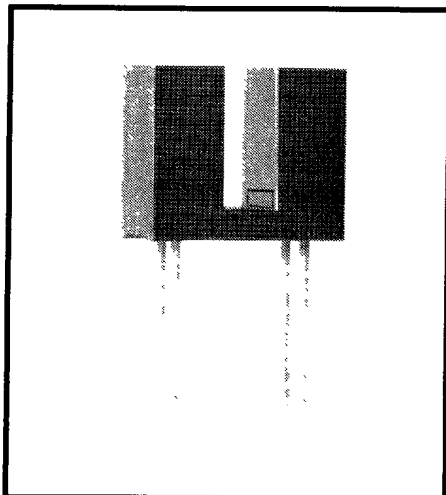


# Hi-Rel Slotted Optical Switches

## Type OPB870N Series

T-41-73



### Features

- Non-contact switching
- Choice of apertures
- Choice of minimum  $I_{C(ON)}$
- Soldering per MIL-S-45743
- Hermetically sealed components
- Components processed to Optek's screening program patterned after MIL-S-19500 for TX and TXV devices
- Leads are hot solder dipped

### Description

The OPB870N series of slotted optical switches consists of a gallium aluminum arsenide LED and a silicon phototransistor soldered into a printed circuit board, then mounted in a high temperature black plastic housing on opposite sides of a 0.125 inch (3.18 mm) wide slot. Phototransistor switching takes place whenever an opaque object passes through the slot. Options include phototransistor aperture widths of 0.050 inches (1.27 mm) or 0.100 inches (0.25 mm) for high resolution positioning sensing.

The OPB870N series of slotted optical switches utilize optoelectronic components that have been processed and tested as either TX or TXV components per MIL-S-19500

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

|                                                                                           |                                             |
|-------------------------------------------------------------------------------------------|---------------------------------------------|
| Operating Temperature .....                                                               | $-65^\circ\text{C}$ to $+125^\circ\text{C}$ |
| Storage Temperature .....                                                                 | $-65^\circ\text{C}$ to $+150^\circ\text{C}$ |
| Lead Soldering Temperature [1/16 inch (1.6 mm) from case 5 sec. with soldering iron] .... | $240^\circ\text{C}^{(1)}$                   |

### Input Diode

|                          |                       |
|--------------------------|-----------------------|
| Forward DC Current ..... | 50 mA                 |
| Reverse Voltage .....    | 2.0 V                 |
| Power Dissipation .....  | 100 mW <sup>(2)</sup> |

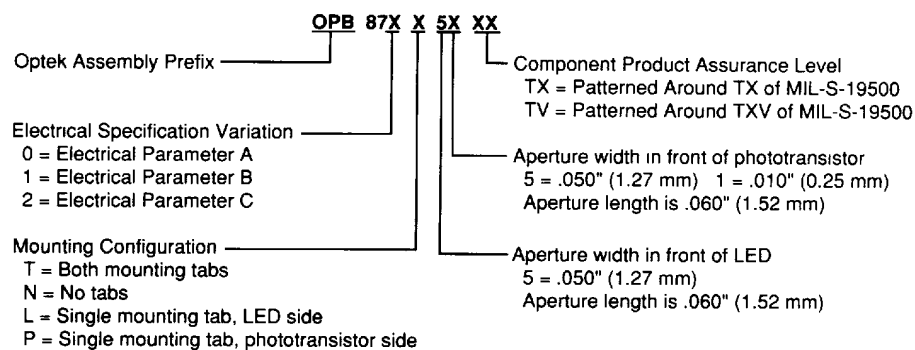
### Output Phototransistor

|                                 |                       |
|---------------------------------|-----------------------|
| Collector-Emitter Voltage ..... | 50 V                  |
| Emitter-Collector Voltage ..... | 7.0 V                 |
| Power Dissipation .....         | 100 mW <sup>(2)</sup> |

### Notes:

- (1) RMA flux is recommended. Duration can be extended to 10 sec. max. when wave soldering.
- (2) Derate linearly 1.00 mW/ $^\circ\text{C}$  above  $25^\circ\text{C}$ .
- (3) Methanol or isopropyl alcohols are recommended as cleaning agents.
- (4) Plastic housings and symbolization will meet Resistance to Solvents test per MIL-STD-750, Method 1022 provided (1) ethylbenzene is omitted from solution A, (2) solution B is omitted, and (3) Freon TMC and methylene chloride is omitted from solution C.

### Part Numbering Guide



Optek Technology, Inc., 1215 West Crosby Road, Carrollton, Texas 75006 (214) 323-2200 TLX 215849 Fax (214) 323-2396

## Type OPB870N Series

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

| Symbol | Parameter | Type | Min. | Typ. | Max. | Units | Test Conditions |
|--------|-----------|------|------|------|------|-------|-----------------|
|--------|-----------|------|------|------|------|-------|-----------------|

### Input Diode

|       |                 |      |  |      |               |                                                 |
|-------|-----------------|------|--|------|---------------|-------------------------------------------------|
| $V_F$ | Forward Voltage | 1.00 |  | 1.70 | V             | $I_F = 20.0\text{ mA}$                          |
|       |                 | 1.20 |  | 1.90 | V             | $I_F = 20.0\text{ mA}, T_A = -55^\circ\text{C}$ |
|       |                 | 0.80 |  | 1.60 | V             | $I_F = 20.0\text{ mA}, T_A = 100^\circ\text{C}$ |
| $I_R$ | Reverse Current |      |  | 100  | $\mu\text{A}$ | $V_R = 2.0\text{ V}$                            |

### Output Phototransistor

|               |                                     |     |  |     |               |                                                          |
|---------------|-------------------------------------|-----|--|-----|---------------|----------------------------------------------------------|
| $V_{(BR)CEO}$ | Collector-Emitter Breakdown Voltage | 50  |  |     | V             | $I_C = 1.0\text{ mA}, I_F = 0$                           |
| $V_{(BR)ECO}$ | Emitter-Collector Breakdown Voltage | 7.0 |  |     | V             | $I_E = 100\text{ }\mu\text{A}, I_F = 0$                  |
| $I_{C(OFF)}$  | Collector-Emitter Dark Current      |     |  | 100 | nA            | $V_{CE} = 10\text{ V}, I_F = 0$                          |
|               |                                     |     |  | 100 | $\mu\text{A}$ | $V_{CE} = 10\text{ V}, I_F = 0, T_A = 100^\circ\text{C}$ |

### Coupled

|               |                                           |        |      |      |               |                                                                                     |
|---------------|-------------------------------------------|--------|------|------|---------------|-------------------------------------------------------------------------------------|
| $I_{C(ON)}$   | On-State Collector Current <sup>(5)</sup> |        |      |      |               |                                                                                     |
|               | Parameter A                               | OPB870 | 500  |      | $\mu\text{A}$ | $V_{CE} = 10.0\text{ V}, I_F = 20.0\text{ mA}$                                      |
|               |                                           | OPB870 | 200  |      | $\mu\text{A}$ | $V_{CE} = 10.0\text{ V}, I_F = 20.0\text{ mA}, T_A = -55^\circ\text{C}$             |
|               |                                           | OPB870 | 200  |      | $\mu\text{A}$ | $V_{CE} = 10.0\text{ V}, I_F = 20.0\text{ mA}, T_A = 100^\circ\text{C}$             |
|               | Parameter B                               | OPB871 | 1000 |      | $\mu\text{A}$ | $V_{CE} = 5.0\text{ V}, I_F = 10.0\text{ mA}$                                       |
|               |                                           | OPB871 | 400  |      | $\mu\text{A}$ | $V_{CE} = 5.0\text{ V}, I_F = 10.0\text{ mA}, T_A = -55^\circ\text{C}$              |
|               |                                           | OPB871 | 400  |      | $\mu\text{A}$ | $V_{CE} = 5.0\text{ V}, I_F = 10.0\text{ mA}, T_A = 100^\circ\text{C}$              |
|               | Parameter C                               | OPB872 | 1800 |      | $\mu\text{A}$ | $V_{CE} = 0.4\text{ V}, I_F = 20.0\text{ mA}$                                       |
|               |                                           | OPB872 | 800  |      | $\mu\text{A}$ | $V_{CE} = 0.4\text{ V}, I_F = 20.0\text{ mA}, T_A = -55^\circ\text{C}$              |
|               |                                           | OPB872 | 800  |      | $\mu\text{A}$ | $V_{CE} = 0.4\text{ V}, I_F = 20.0\text{ mA}, T_A = 100^\circ\text{C}$              |
| $V_{CE(SAT)}$ | Collector-Emitter Saturation Voltage      | OPB870 |      | 0.30 | V             | $I_C = 400\text{ }\mu\text{A}, I_F = 20.0\text{ mA}$                                |
|               |                                           | OPB871 |      | 0.30 | V             | $I_C = 800\text{ }\mu\text{A}, I_F = 10.0\text{ mA}$                                |
|               |                                           | OPB872 |      | 0.30 | V             | $I_C = 1800\text{ }\mu\text{A}, I_F = 20.0\text{ mA}$                               |
| $t_r$         | Output Rise Time                          | OPB870 |      | 15.0 | $\mu\text{s}$ | $V_{CC} = 10.0\text{ V},$<br>$I_F = 20.0\text{ mA},$<br>$R_L = 1,000\text{ }\Omega$ |
|               |                                           | OPB871 |      | 20.0 | $\mu\text{s}$ |                                                                                     |
|               |                                           | OPB872 |      | 20.0 | $\mu\text{s}$ |                                                                                     |
| $t_f$         | Output Fall Time                          | OPB870 |      | 15.0 | $\mu\text{s}$ | $V_{CC} = 10.0\text{ V},$<br>$I_F = 20.0\text{ mA},$<br>$R_L = 1,000\text{ }\Omega$ |
|               |                                           | OPB871 |      | 20.0 | $\mu\text{s}$ |                                                                                     |
|               |                                           | OPB872 |      | 20.0 | $\mu\text{s}$ |                                                                                     |

(5) Measurement is taken during the last 500 $\mu\text{s}$  of a single 1.0 ms test pulse. Heating due to increased pulse rate or pulse width can cause change in measurement results.

Optek reserves the right to make changes at any time in order to improve design and to supply the best product possible.

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