

Advance Information

Slotted Optical Switches

Transistor Output

These slotted switches each consist of a gallium arsenide infrared light emitting diode facing a silicon NPN phototransistor in a plastic housing. The devices are separated by a 0.125" gap, providing a means for mechanically interrupting the infrared beam. These switches are widely used as detection and position sensors in a variety of applications. Designed for maximum convenience to the user, these devices offer a choice of closed- or open-aperture housings, electrical parameters, lead spacing, mounting configuration and aperture width.

Features:

- Single Unit for Easy PCB Mounting
- Non-Contact Electrical Switching
- Low Degradation Liquid Phase Epi Emitter
- Multiple Mounting Configurations

Applications:

Shaft encoders, non-contact switches, position sensing, paper handlers, coin handlers, and general purpose interruptive switching.

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

Rating	Symbol	Value	Unit
INPUT LED			
Forward DC Current	I_F	60	mA
Peak Forward Current (PW = 1 μs , 300 PPS)	I_P	1	A
Reverse DC Voltage	V_R	6	Volts
Power Dissipation Derate above 25°C	P_D	150 2	mW mW/ $^\circ\text{C}$

OUTPUT TRANSISTOR

Collector-Emitter Voltage	V_{CEO}	30	Volts
Emitter-Collector Voltage	V_{ECO}	5	Volts
Collector DC Current — Continuous	I_C	60	mA
Power Dissipation Derate above 25°C	P_D	150 2	mW mW/ $^\circ\text{C}$

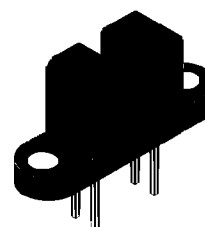
TOTAL DEVICE

Operating Temperature Range	T_{op}	-40 to +85	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-40 to +100	$^\circ\text{C}$
Leads Solder Temperature (5 seconds max)	—	260	$^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	300 4	mW mW/ $^\circ\text{C}$

OPB860
OPB870

Motorola Preferred Devices

**SLOTTED
OPTICAL SWITCHES
TRANSISTOR OUTPUT**



**CASE 435
WITH FLANGES**



**CASE 435
WITHOUT FLANGES**

PART NUMBER DERIVATION

O P B 8 A B C D E

8 = PHOTOTRANSISTOR OUTPUT

A = SLOT CONFIGURATION

6 = CLOSED SLOTS

7 = OPEN SLOTS

B = ELECTRICAL SPECIFICATION VARIATIONS

0 = PARAMETERS "A", .320" LEAD SPACING

1 = PARAMETERS "B", .320" LEAD SPACING

2 = PARAMETERS "C", .320" LEAD SPACING

5 = PARAMETERS "A", .220" LEAD SPACING

6 = PARAMETERS "B", .220" LEAD SPACING

7 = PARAMETERS "C", .220" LEAD SPACING

E = DETECTOR APERTURE WIDTH

1 = 0.010"

5 = 0.050"

D = APERTURE WIDTH IN FRONT OF LED

5 = 0.050"

C = MOUNTING CONFIGURATION

T = BOTH MOUNTING FLANGES

N = NO MOUNTING FLANGES

This document contains information on a new product. Specifications and information herein are subject to change without notice.

Preferred devices are Motorola recommended choices for future use and best overall value.



ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)⁽¹⁾

Characteristic	Symbol	Min	Typ	Max	Unit
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INPUT LED

Forward Voltage ($I_F = 50\text{ mA}$)	V_F	0.9	1.3	1.8	Volts
Reverse Leakage ($V_R = 6\text{ Volts}$)	I_R	—	1	100	μA
Capacitance	C_J	—	18	—	pF

OUTPUT TRANSISTOR

Dark Current ($V_{CE} = 10\text{ V}$)	I_{CEO}	—	5	100	nA
Collector-Emitter Breakdown Voltage ($I_C = 100\text{ }\mu\text{A}$)	$V_{(BR)CEO}$	30	45	—	Volts
Emitter-Collector Breakdown Voltage ($I_E = 100\text{ }\mu\text{A}$)	$V_{(BR)ECO}$	5	7	—	Volts

COUPLED CHARACTERISTICS⁽²⁾

Output Collector Current — Parameter "A" ($V_{CE} = 10\text{ V}$, $I_F = 20\text{ mA}$)	OPB860/870 OPB865/875	I_C	—	500	—	μA
Output Collector Current — Parameter "B" ($V_{CE} = 5\text{ V}$, $I_F = 10\text{ mA}$)	OPB861/871 OPB866/876		—	1000	—	μA
Output Collector Current — Parameter "C" ($V_{CE} = 0.6\text{ V}$, $I_F = 20\text{ mA}$)	OPB862/872 OPB867/877		—	1800	—	μA
Collector-Emitter Saturation Voltage ($I_C = 400\text{ }\mu\text{A}$, $I_F = 20\text{ mA}$)	OPB860/870 OPB865/875	$V_{CE(sat)}$	—	—	0.4	Volts
Collector-Emitter Saturation Voltage ($I_C = 800\text{ }\mu\text{A}$, $I_F = 10\text{ mA}$)	OPB861/871 OPB866/876		—	—	0.4	Volts
Collector-Emitter Saturation Voltage ($I_C = 1800\text{ }\mu\text{A}$, $I_F = 20\text{ mA}$)	OPB862/872 OPB867/877		—	—	0.6	Volts
Turn-On Time ($I_F = 30\text{ mA}$, $V_{CE} = 5\text{ V}$, $R_L = 2.5\text{ k}\Omega$)		t_{on}	—	20	—	μs
Turn-Off Time ($I_F = 30\text{ mA}$, $V_{CE} = 5\text{ V}$, $R_L = 2.5\text{ k}\Omega$)		t_{off}	—	80	—	μs

1. Stray radiation can alter values of characteristics. Adequate light shielding should be provided.
2. No actuator in the sensing gap.

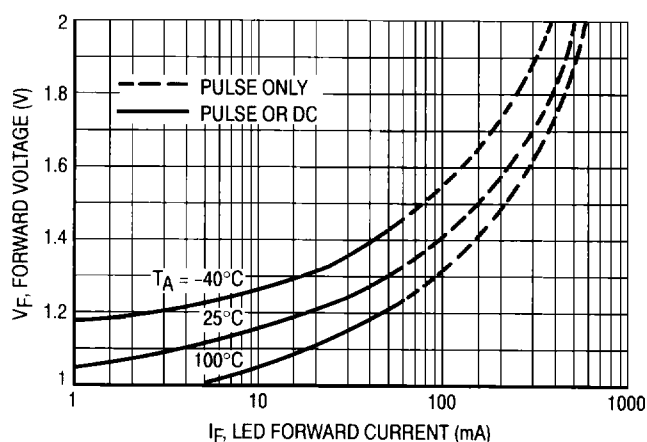
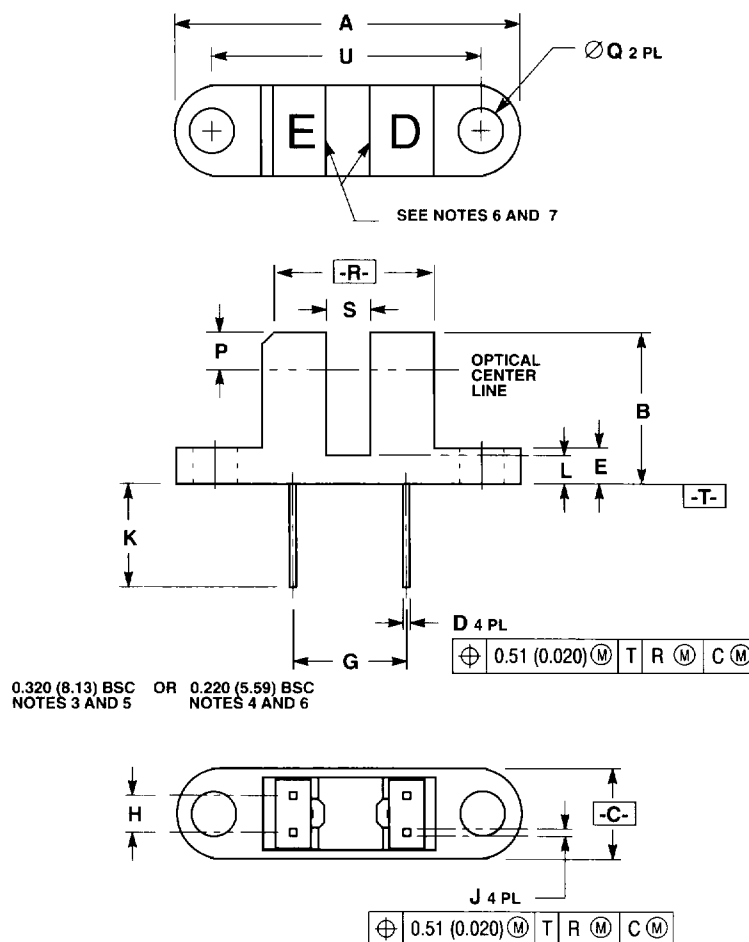
TYPICAL CHARACTERISTICS

Figure 1. LED Forward Voltage versus Forward Current

OUTLINE DIMENSIONS



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. OPB860, OPB861, OPB862, OPB870, OPB871, OPB872.
4. OPB865, OPB866, OPB867, OPB875, OPB876, OPB877.
5. DIMENSIONS CONTROLLED @ HOUSING SFC ONLY.
6. OPB86XX55: EMITTER APERTURE = 0.050" CLOSED.
DETECTOR APERTURE = 0.050" OPEN.
7. OPB87XX51: EMITTER APERTURE = 0.050" OPEN.
DETECTOR APERTURE = 0.010" OPEN.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.960	0.980	24.38	24.89
B	0.415	0.435	10.54	11.05
C	0.240	0.260	6.10	6.60
D	0.014	0.022	0.35	0.55
E	0.095	0.105	2.41	2.67
G	0.320 BSC		8.13 BSC	
H	0.100 BSC		2.54 BSC	
J	0.017	0.022	0.43	0.55
K	0.290		7.36	
L	0.075	0.085	1.90	2.16
P	0.100 NOM		2.54 NOM	
Q	0.120	0.130	3.05	3.30
R	0.475	0.495	12.07	12.57
S	0.120	0.130	3.05	3.30
U	0.745	0.755	18.92	19.18

CASE 435 WITH FLANGES

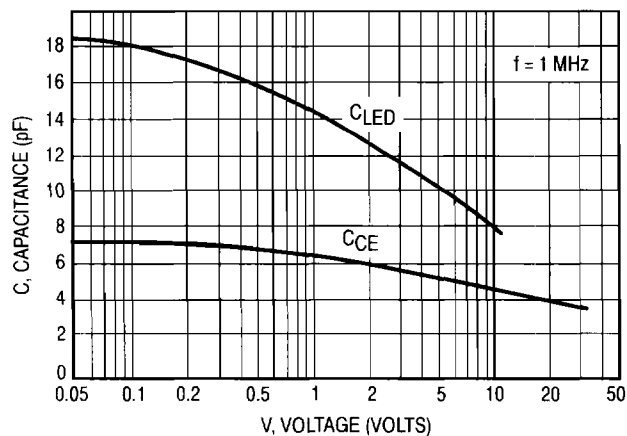


Figure 7. Capacitances versus Voltage

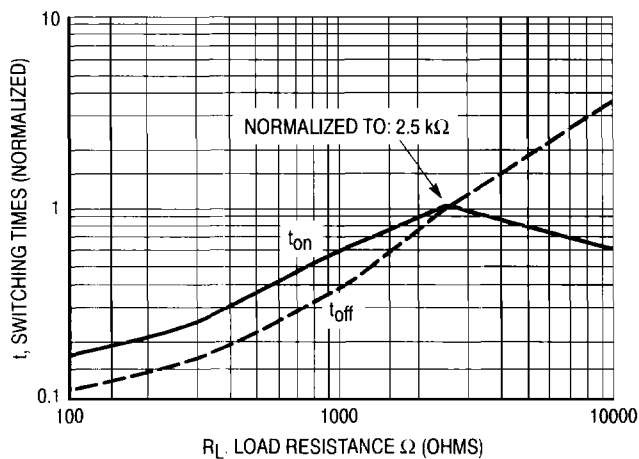


Figure 8a. Switching Time versus Load Resistance (50/50 Closed Aperture)

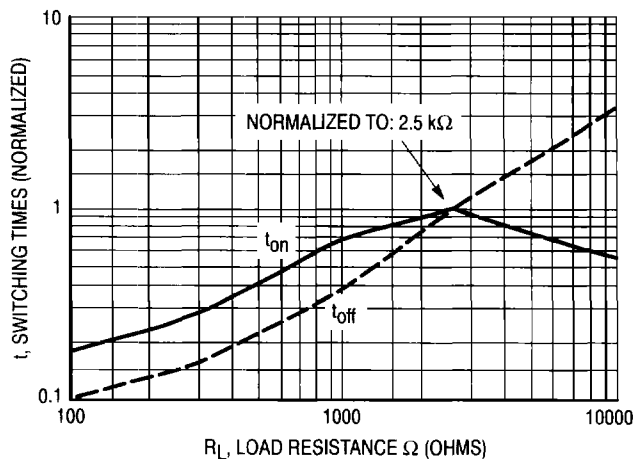


Figure 8b. Switching Time versus Load Resistance (50/10 Open Aperture)

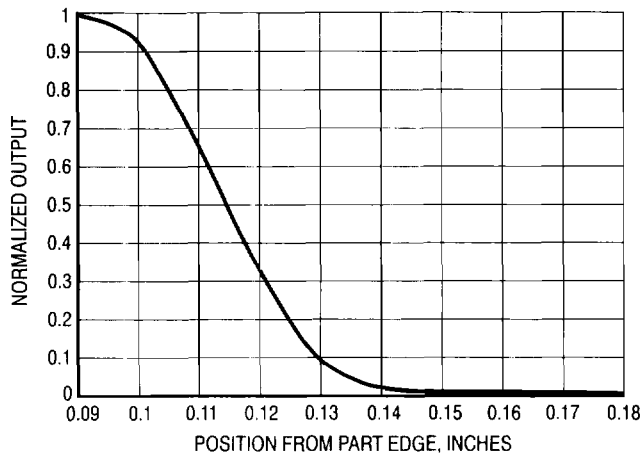


Figure 2a. Output Current versus Actuator Position, 50/50 Closed Aperture

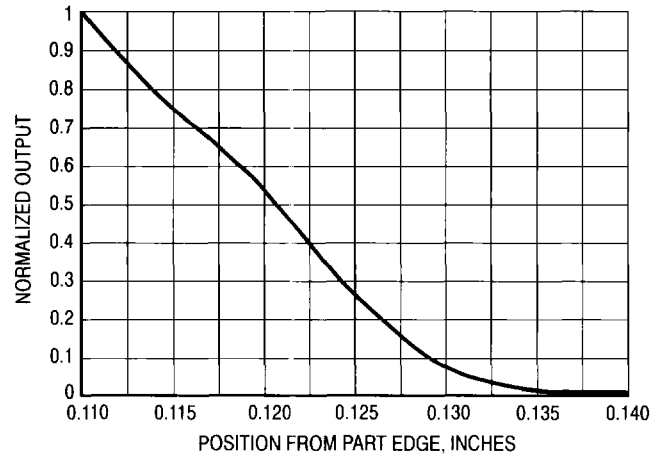


Figure 2b. Output Current versus Actuator Position, 50/10 Open Aperture

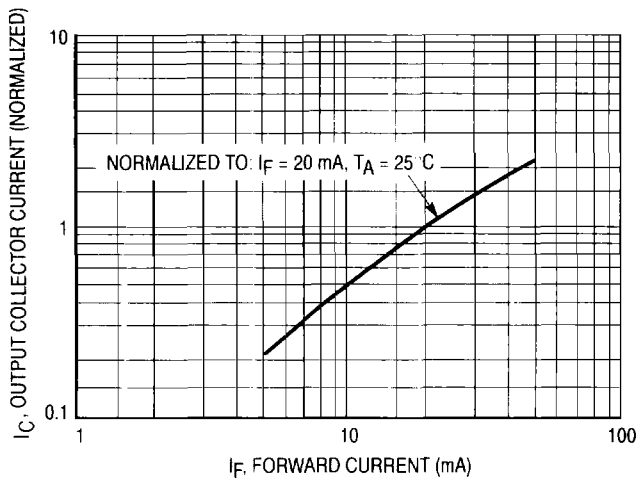


Figure 3. Output Current versus Input Current

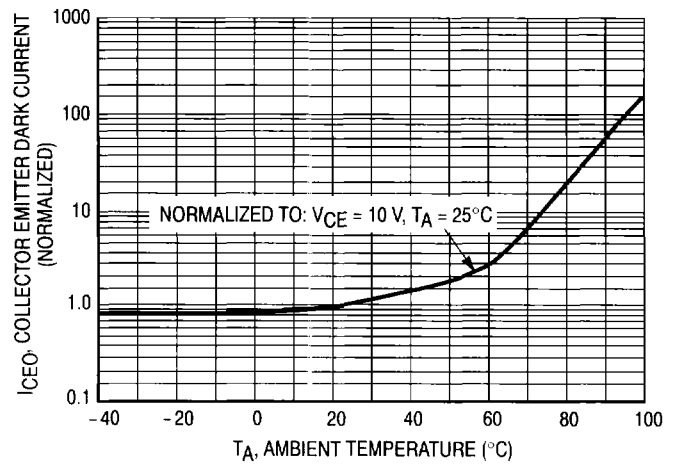


Figure 4. Dark Current versus Ambient Temperature

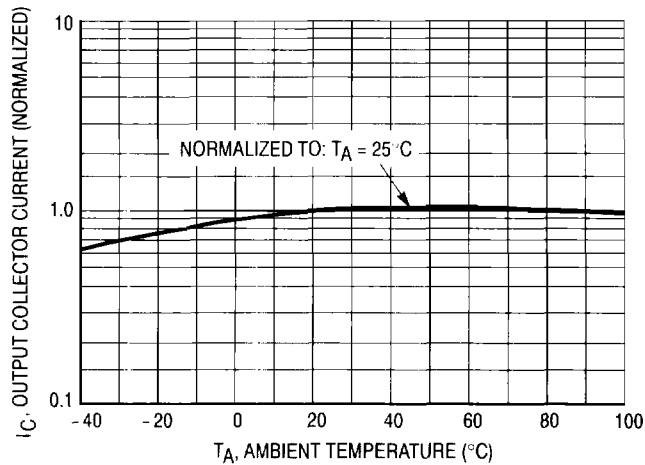


Figure 5. Output Current versus Ambient Temperature

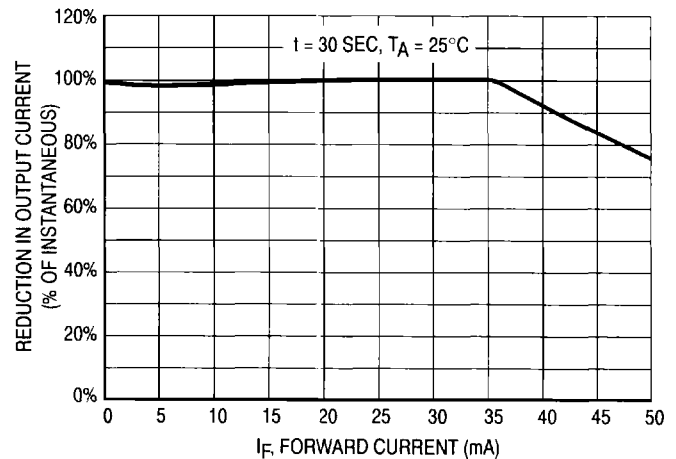
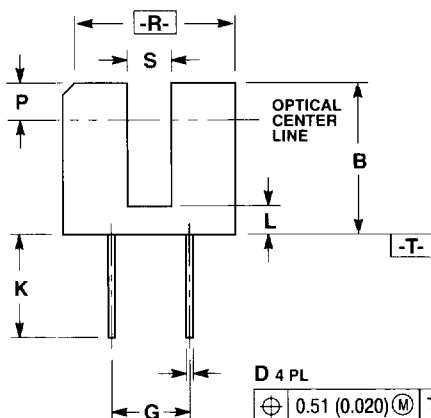


Figure 6. Reduction in Output Current Due to LED Heating versus Forward Current

OUTLINE DIMENSIONS — CONTINUED

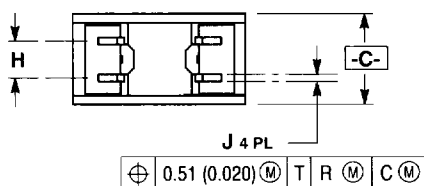


SEE NOTES 6 AND 7



0.320 (8.13) BSC
NOTES 3 AND 5

OR 0.220 (5.59) BSC
NOTES 4 AND 6



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L	0.075	0.085	1.90	2.16
P	0.100 NOM		2.54 NOM	
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S	0.120	0.130	3.05	3.30

CASE 435 WITHOUT FLANGES

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