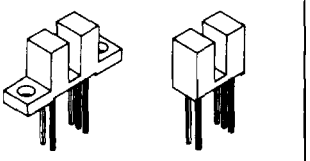
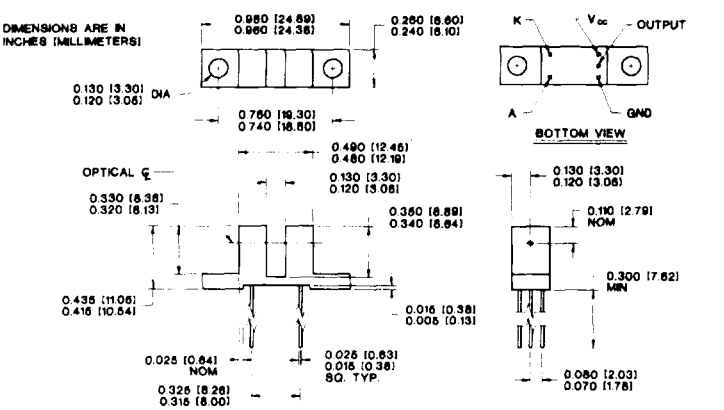
S-960/970 Series

Slotted Optical Switches with Digital Output

CLAROSTAT
SENSORS AND CONTROLS GROUP





Features

- pc board mount
- buffer or inverter output
- four mounting options
- apertures to 0.005" (0.13mm)
- IR-transparent or opaque housing

Description

The S-960/970 series consists of a gallium arsenide IRED and silicon IC sensor mounted in a variety of housings. Both buffer and inverter outputs are offered; the output is an open-collector, npn transistor. [This series is also available with 18" (457mm) minimum length flexible wire leads as the S-980/990 series.] These devices are usable at switching rates up to 400 kHz. Call OptoSwitch for additional information or for applications assistance. See general part number guide, page 44.

Absolute Maximum Ratings (T_A = 25°C unless otherwise stated.)

Storing and Operating Temperature ..... -40°C to +85°C
Lead Soldering Temperature[2] ..... 240°C[3]

IRED

Continuous Forward Current 50mA
Peak Forward Current (1µs pulse width, 300pps) 3A
Reverse Voltage 3V
Power Dissipation ..... 100mW[4]

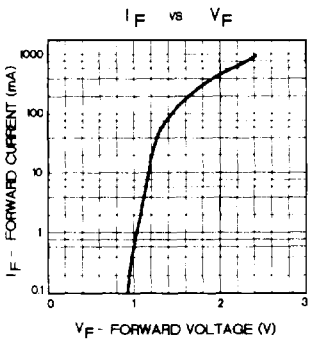
Sensor

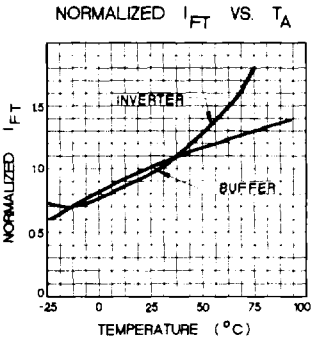
Supply Voltage, V_{CC} 6.5V
Supply Voltage for the Output Lead 18V
Output Current Sink 20mA
Power Dissipation ..... 250mW[5]

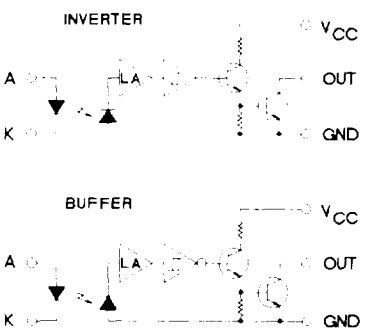
Notes:

1. Housing is soluble in some common industrial solvents; recommended cleaning agents are isopropanol or methanol.
2. 0.06" (1.5mm) from the case for 5 seconds maximum. (pc board mount configuration)
3. 260°C maximum when wave soldering. (pc board mount configuration)
4. Derate linearly from 25°C at -1.33 mW/°C.
5. Derate linearly from 25°C at -3.33 mW/°C.

Fundamental Characteristics







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Electrical Characteristics (T_A = 25°C unless otherwise stated)

Symbol	Parameter	min	max	units	Test Conditions
Input Diode					
V_F	Forward Voltage	-	1.60	V	I_F = 20mA
I_R	Reverse Current	-	10	µA	V_R = 3.0V
Output Integrated Circuit Sensor(1)					
V_{CC1}	Supply Voltage Range	4.75	5.25	V	
$V_{CC2)}$	Supply Voltage Range (output pin)	4.00	16.0	V	
I_{CC}	Supply Current Drain	-	20	mA	V_{CC} = 5V
Coupled(2)					
I_{FT}	IRED Current to Change Output State	-	20	mA	V_{CC} = 5V
I_{OH}	Off-state Output Leakage				
	S-9w1- buffer	-	100	µA	V_{CC1} = 5V, V_{CC2} = 16V, I_F = 20mA
	S-9w3 - inverter	-	100	µA	V_{CC1} = 5V, V_{CC2} = 16V, I_F = 0mA
V_{OL}	On-state Output Voltage				
	S-9w1- buffer	-	0.4	V	I_{OL} = 16mA, I_F = 0mA, V_{CC1} = 5V
	S-9w3 - inverter	-	0.4	V	I_{OL} = 16mA, I_F = 20mA,V_{CC1} = 5V

Notes:

1. Radiation outside the sensitivity range of the device may be present during these measurements. Sufficient protection has been provided when the parameter being measured cannot be altered by further irradiation shielding.
2. Other ranges of threshold current can be specified; call OptoSwitch for applications assistance.

Definitions:

Buffer - Sensor output is in the low-state [$V_{CE(sat)}$] when input excitation to the IRED = 0 mA or the radiation path blocked.
Inverter - Sensor output is in the low-state when input excitation to the IRED is $\geq I_{FT}$ and the radiation path unobstructed.

Typical Characteristics

Design Characteristics at T_A = 25°C (not guaranteed by test)

Symbol	Parameter	value	units	Test Conditions
ΔI_{FT}	Hysteresis	20	%	R_L = 270Ω
f_{SW}	Switching Frequency	400	kHz	V_{CC} = 5V, R_L = 270Ω
t_r	Risetime	30	ns	V_{CC} = 5V, I_F = 3xI_{FT}, R_L = 270Ω
t_f	Falltime	10	ns	V_{CC} = 5V, I_F = 3xI_{FT}, R_L = 270Ω
t_{on}	Turn-on Time	500	ns	V_{CC} = 5V, I_F = 3xI_{FT}, R_L = 270Ω
t_{off}	Turn-off Time	1.8	µs	V_{CC} = 5V, I_F = 3xI_{FT}, R_L = 270Ω

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Part Number Guide - S-960 and S-970 Family Only[1]

S - 9 w x - y zz

OptoSwitch
IC Sensor Slotted
Optical Switches

Housing Material:
6 = IR-transmissive
7 = IR-opaque

Output Polarity [5]:
1 = buffer, open collector
3 = inverter, open collector

Aperture Combinations:

zz	IRED	Sensor
55	0.050" (1.2mm)	0.050" (1.2mm)
51	0.050" (1.2mm)	0.010" (0.25mm)
5F	0.050" (1.2mm)	0.005" (0.13mm)
11	0.010" (0.25mm)	0.010" (0.25mm)
1F	0.010" (0.25mm)	0.005" (0.13mm)
FF	0.005" (0.13mm)	0.005" (0.13mm)

Mounting Tabs:
L = one tab, IRED side
N = no tabs
P = one tab, sensor side
T = two tabs

Notes:

1. See mechanical drawings for this series on page 42.
2. Not all combinations of apertures are available with the criteria stated on page 43; see the combinations table on this page for valid combinations; if system requirements demand other aperture combinations, see notes 5 and 6 below or call OptoSwitch for applications assistance.
3. The output of a buffer is high when the input to the IRED is greater than the threshold value, I_{FT}; the output of an inverter is low under the same conditions.
4. These combinations of apertures are available as standard product with electrical specifications as described on page 43 of this data book.
5. The smaller aperture combinations are available only with a reduced operating temperature range, 55°C maximum and only with an increased level of I_{FT} due to the reduction in aperture area. Specified values of I_{FT} for these smaller apertures is 35mA. No reduction in device lifetime is expected with this increased current in the IRED if the unit is operated within the limits of this specification including this note. Call OptoSwitch for applications assistance.
6. Very high resolution is possible with these small apertures. The value of I_{FT} required to provide proper excitation to the IC sensor requires caution in their use. OptoSwitch recommends these devices to be used in applications where the IRED will be 'on' for short periods of time, generally less than 100 µs and with duty cycles less than 20%. I_{FT} (60mA, maximum) for these devices is measured under pulsed conditions with a pulse width of 100 µs; no reduction in device lifetime is expected under these operating conditions. Call OptoSwitch for applications assistance.

COMBINATIONS TABLE

BASE NUMBER	SEE NOTE	SUFFIX COMBINATIONS					
		-Y55	-Y51	-Y5F	-Y11	-Y1F	-YFF
S-9wx	4	●	●	●			
S-9wx	5	●	●	●	●		
S-9wx	6	●	●	●	●	●	●