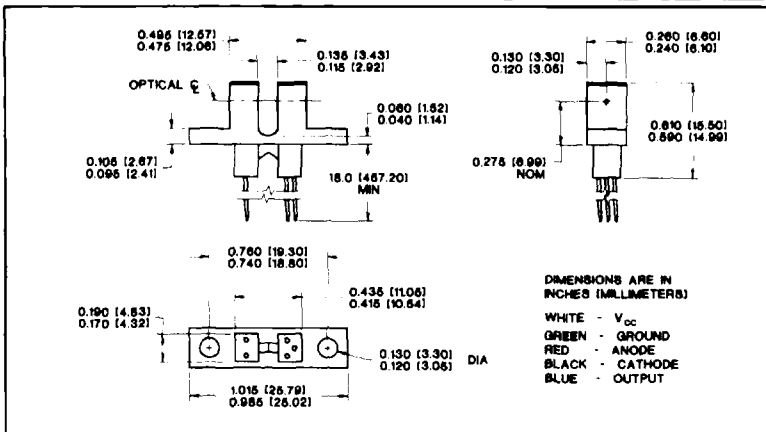
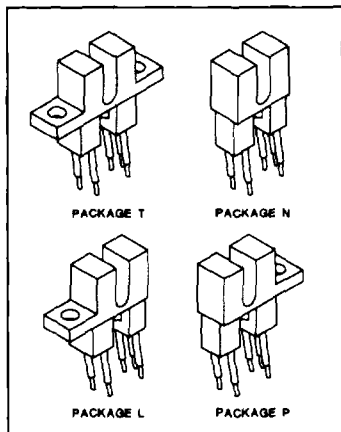


S-980/990 Series

Slotted Optical Switches with Digital Output

CLAROSTAT
SENSORS AND CONTROLS GROUP



Features

- 18" (457mm) wire length
- buffer or inverter output
- four mounting options
- apertures to 0.005" (0.13mm)
- IR-transparent or opaque housing⁽¹⁾

Description

The S-980/990 series of digital output optical switches are electrically and optically identical to the S-960/970 family except this family is terminated with 18" (457mm) of seven (7) strand, 26 AWG, UL1429 insulated wire. This series is designed for use in areas where printed circuit board mount devices would have to be wire-terminated; these devices feature internal strain-relief on all wire-to-discrete connections adding an additional measure of long-term reliability.

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

Storing and Operating Temperature..... -40°C to $+85^\circ\text{C}$

1RED

Continuous Forward Current.....50mA

Peak Forward Current (1 μs pulse width, 300pps).....3A

Reverse Voltage.....3V

Power Dissipation.....100mW⁽²⁾

Sensor

Supply Voltage, V_{CC}6.5V

Supply Voltage for the Output Lead.....18V

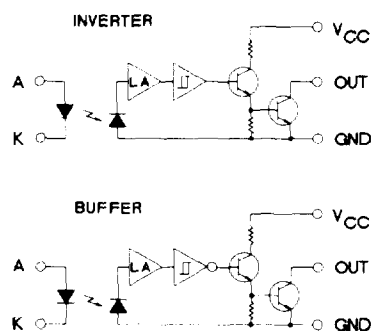
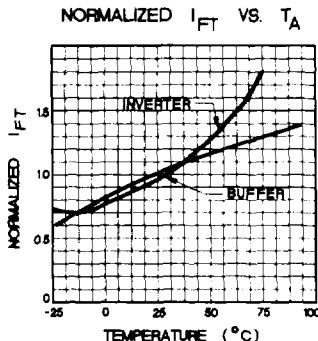
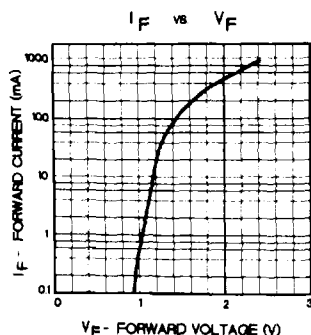
Output Current Sink.....20mA

Power Dissipation.....250mW⁽³⁾

Notes:

1. Housing is soluble in some common industrial solvents; recommended cleaning agents are isopropanol or methanol.
2. Derate linearly from 25°C at $-1.33 \text{ mW}/^\circ\text{C}$.
3. Derate linearly from 25°C at $-3.33 \text{ mW}/^\circ\text{C}$.
4. Buffer output is high when $I_F \geq I_{FT}$; inverter output is low under the same conditions.

Fundamental Characteristics



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CLAROSTAT Sensors and Controls

S-980/990 Series

Slotted Optical Switches with Digital Output



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

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

Notes:

- 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.
- 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 $T_A = 25^\circ\text{C}$ (not guaranteed by test)

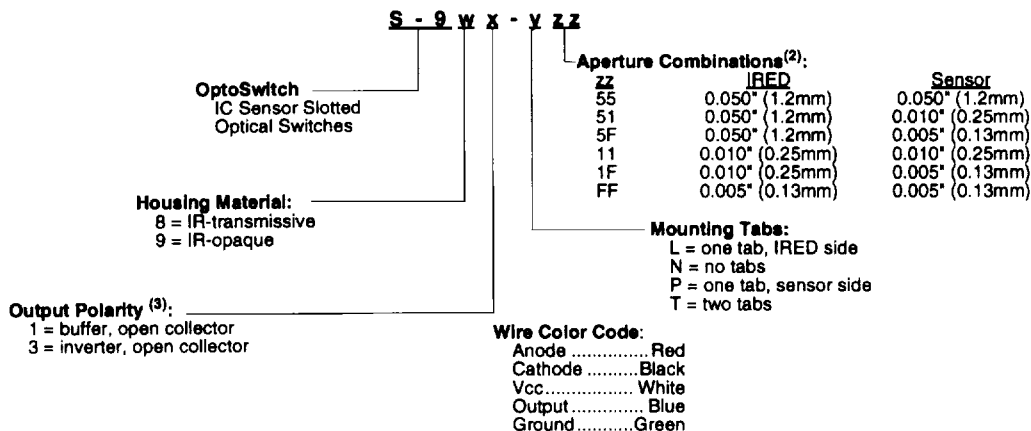
Symbol	Parameter	value	units	Test Conditions
ΔI_{FT}	Hysteresis	20	%	$R_L = 270\Omega$
f_{SW}	Switching Frequency	400	kHz	$V_{CC} = 5\text{V}, R_L = 270\Omega$
t_r	Risetime	30	ns	$V_{CC} = 5\text{V}, I_F = 3 \times I_{FT}, R_L = 270\Omega$
t_f	Falltime	10	ns	$V_{CC} = 5\text{V}, I_F = 3 \times I_{FT},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

S-980/990 Series

Slotted Optical Switches with Digital Output



Part Number Guide - S-980 and S-990 Family Only⁽¹⁾



Notes:

- See mechanical drawings for this series on page 46.
- Not all combinations of apertures are available with the criteria stated on page 47; 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.
- 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.
- These combinations of apertures are available as standard product with electrical specifications as described on page 47 of this data book.
- 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.
- 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 100µs and with duty cycles less than 20%. I_{FT} (60mA, maximum) for these devices is measured under pulsed conditions with a pulse width of 100µs; 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	●	●	●	●	●	●