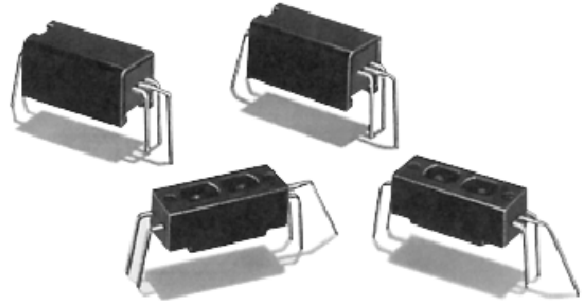





EE-SY310/313/410/413

Photo IC Output with Built-in, Single-chip Preamplifier

- All models have a single chip that utilizes a Schmitt trigger and preamplifier circuit
- Circuit integrated into molded housing
- Receiver with an incorporated temperature compensation circuit assures excellent temperature characteristics
- Directly drive electronic circuitry without any interface
- Wide operating voltage range (4.5 to 16 VDC) makes smooth connection possible with CMOS or TTL
- Dark-ON models (EE-SY310/313) and Light-ON models (EE-SY410/413)
- Models have increased immunity to visible external light interference and dust (EE-SY313/413)



Ordering Information

Appearance	Sensing method	Sensing distance	Sensing object	Output configuration	Weight	Part number
	Reflective 	5 mm	White paper with reflection factor of 90%	Dark-ON	Approx. 0.4 g	EE-SY310
				Light-ON		EE-SY410
		4.4 mm		Dark-ON	Approx. 0.5 g	EE-SY313
				Light-ON		EE-SY413

Specifications

■ ABSOLUTE MAXIMUM RATINGS (T_A = 25°C (77°F))

Item	Symbol	Rated value
Emitter	Forward current	I _F
	Pulse forward current	I _{FP}
	Reverse voltage	V _R
Receiver	Supply voltage	V _{CC}
	Output voltage	V _{OUT}
	Output current	I _{OUT}
	Output permissible dissipation	P _{OUT}
Ambient temperature	Operating	T _{opr}
	Storage	T _{stg}

*Refer to Engineering Data if the ambient temperature is not within the normal room temperature range.

**This value was measured with a pulse width of 10 μs and a repeating frequency of 100 Hz.

■ CHARACTERISTICS (T_A = 25°C (77°F))

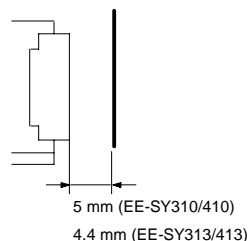
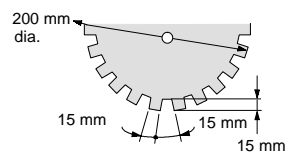
Item	Symbol	Value	Condition
Emitter	Forward voltage	V _F	1.5 V max. I _F = 20 mA
	Reverse current	I _R	10 μA max. V _R = 4 V
	Peak emission wavelength	λ _{p(L)}	940 nm typ. I _F = 20 mA
Receiver	Low level output voltage	V _{OL}	0.4 V max. V _{CC} = 4.5 to 16 V I _{OL} = 16 mA*
	High level output voltage	V _{OH}	15 V min. V _{CC} = 16 V R _L = 1 kΩ*
	Peak spectral sensitivity wavelength	λ _{p(P)}	850 nm typ. V _{CE} = 10 V
Combination	LED current when output is OFF (EE-SY31_)	I _{FT}	16 mA max. (EE-SY310/410) 20 mA max. (EE-SY313/413) V _{CC} = 4.5 to 16 V*
	LED current when output is ON (EE-SY41_)		
	Hysteresis**	ΔH	17% typ. V _{CC} = 4.5 to 16 V
	Response frequency***	f	50 P.P.S. V _{CC} = 4.5 to 16 V
	Response delay time***	t _{PLH} (t _{PHL})	3 μs typ. I _F = 15 mA I _{OL} = 16 mA
t _{PHL} (t _{PLH})		20 μs typ.	

*This value was obtained with white paper with a reflection factor of 90% at a sensing distance of 4 mm when I_F is 20 mA.

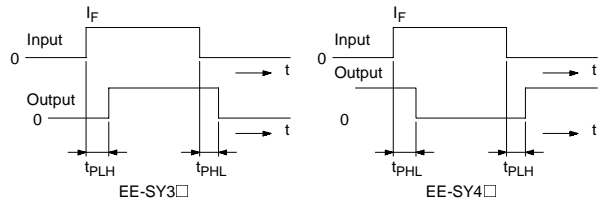
**Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC is turned ON from OFF and when the photo IC is turned OFF from ON.

***The value of the response frequency is measured by rotating the disk as shown below; response delay time is also explained below.

Response frequency measurement



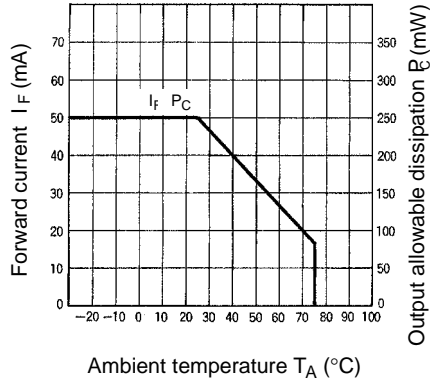
Response delay time



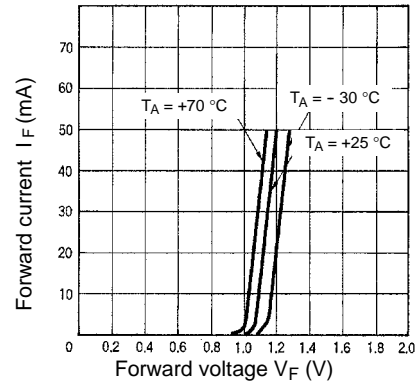
Engineering Data

Note: 1. The operating conditions of the photomicrosensor must be within the absolute maximum rating ranges.
 2. Data in parentheses apply to the EE-SY410/SY413.

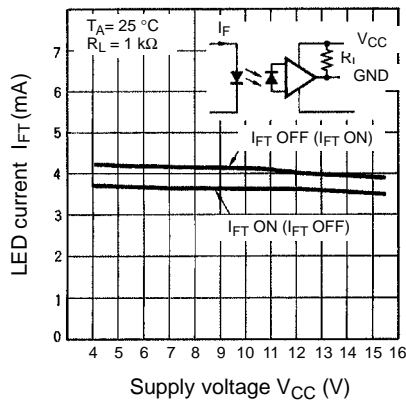
TEMPERATURE CHARACTERISTICS



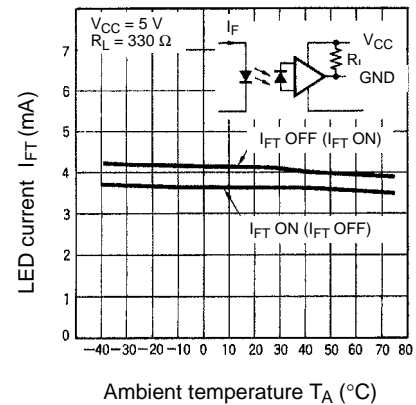
INPUT CHARACTERISTICS (TYPICAL)



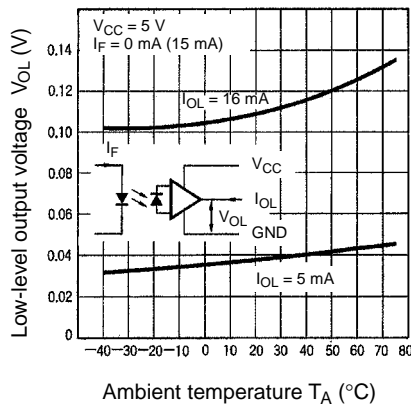
DEPENDENCY OF LED CURRENT ON SUPPLY VOLTAGE (TYPICAL)



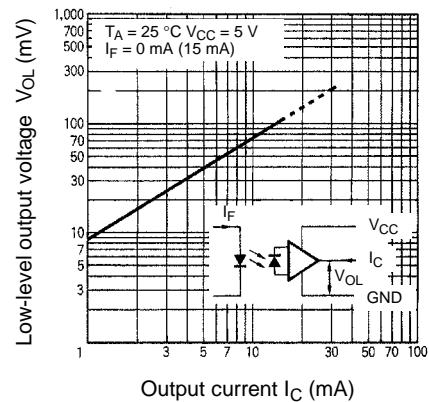
LED CURRENT TEMPERATURE DEPENDENCY (TYPICAL)



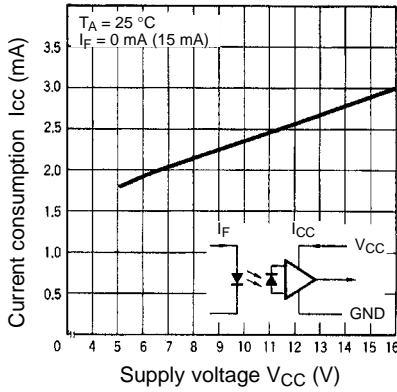
DEPENDENCY OF LOW LEVEL OUTPUT VOLTAGE ON OUTPUT CURRENT (TYPICAL)



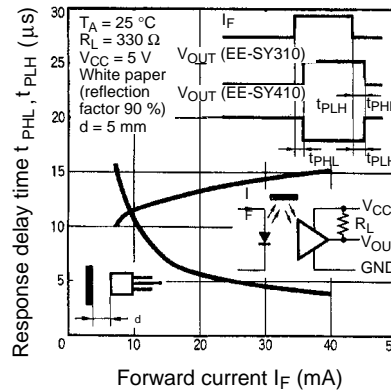
LOW LEVEL OUTPUT VOLTAGE TEMPERATURE DEPENDENCY (TYPICAL)



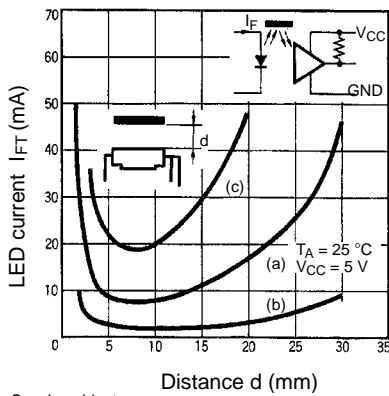
DEPENDENCY OF CURRENT CONSUMPTION ON SUPPLY VOLTAGE (TYPICAL)



DEPENDENCY OF RESPONSE DELAY TIME ON FORWARD CURRENT (TYPICAL)



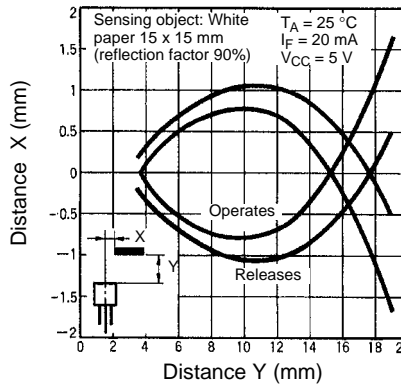
SENSING DISTANCE CHARACTERISTICS (TYPICAL)



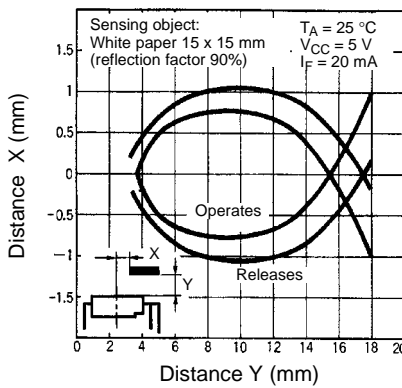
Sensing object:

- a: White paper 15 x 15 mm (reflection factor 90%)
- b: Glass with aluminum deposition
- c: Paper with a reflection factor of 15%

OPERATING RANGE CHARACTERISTICS TYPE 1 (TYPICAL)



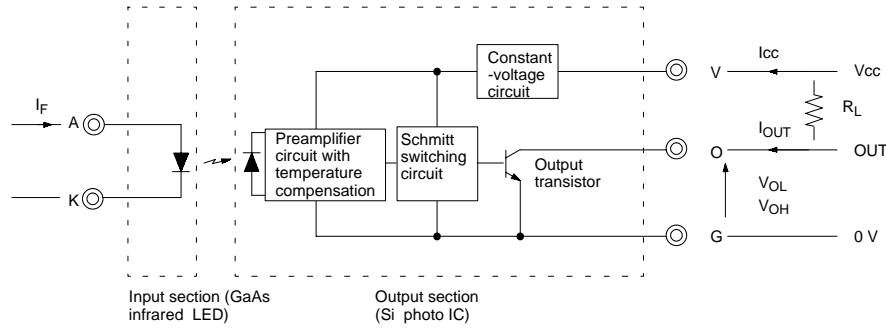
OPERATING RANGE CHARACTERISTICS TYPE 2 (TYPICAL)



Operation

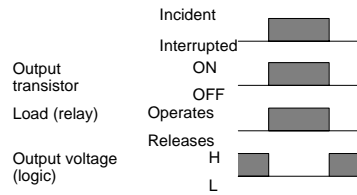
INTERNAL/EXTERNAL CIRCUIT DIAGRAM

Light ON/Dark ON

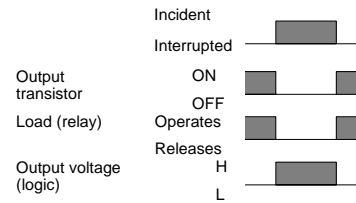


TIMING CHART

Light-ON



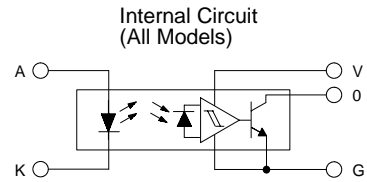
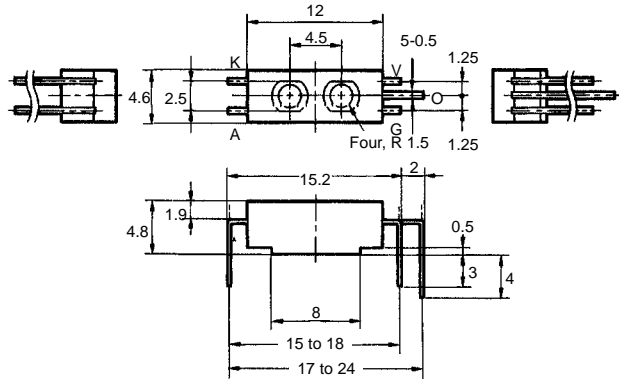
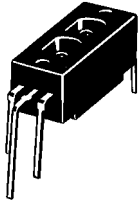
Dark-ON



Dimensions

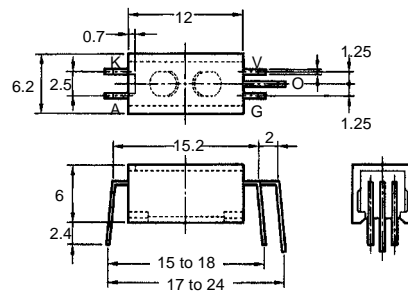
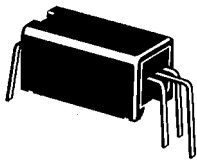
Unit: mm (inch)

■ EE-SY310/SY410



Terminal No.	Name
A	Anode
K	Cathode
V	Supply voltage (Vcc)
O	Output (OUT)
G	Ground (GND)

■ EE-SY313/SY413



Precautions

Refer to the Technical Information Section for general precautions.

NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.

OMRON[®]
OMRON ELECTRONICS, INC.
One East Commerce Drive
Schaumburg, IL 60173
1-800-55-OMRON

OMRON CANADA, INC.
885 Milner Avenue
Scarborough, Ontario M1B 5V8
416-286-6465