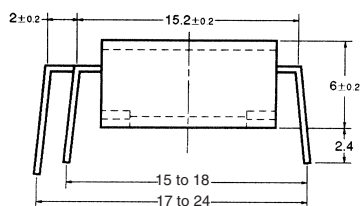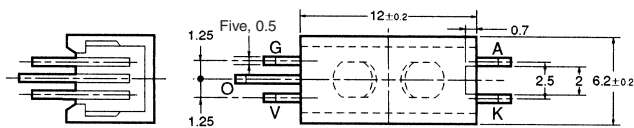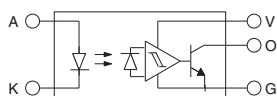# Photomicrosensor (Reflective)
EE-SY313/-SY413

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

Internal Circuit

Unless otherwise specified, the tolerances are as shown below.

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

Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- Compact reflective Photomicrosensor (EE-SY310/-SY410) with a molded housing and a dust-tight cover.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- Dark ON model (EE-SY313) and Light ON model (EE-SY413)
- RoHS Compliant.

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Reverse voltage	V_R	4 V
	Pulse forward current	I_{FP}	1 A (see note 2)
Detector	Power supply voltage	V_{CC}	16 V
	Output voltage	V_{OUT}	28 V
	Output current	I_{OUT}	16 mA
	Permissible output dissipation	P_{OUT}	250 mW (see note 1)
Ambient temperature	Operating	T_{opr}	–40°C to 65°C
	Storage	T_{stg}	–40°C to 85°C
Soldering temperature		T_{sol}	260°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

2. The pulse width is 10 μs maximum with a frequency of 100 Hz.

**3.** Complete soldering within 10 seconds.

■ Ordering Information

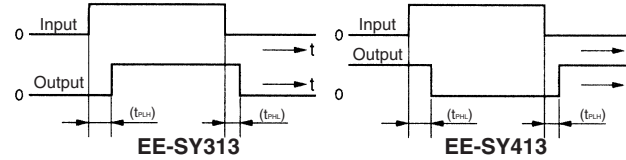| Description		Model
Photomicrosensor (reflective)	Dark ON	EE-SY313
	Light ON	EE-SY413

■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
Detector	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, without incident light (EE-SY313), with incident light (EE-SY413) (see notes 1 and 2)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, with incident light (EE-SY313), without incident light (EE-SY413) (see notes 1 and 2)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	10 mA typ., 20 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		ΔH	17% typ.	V_{CC} = 4.5 to 16 V
Response frequency		f	50 pps min.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16 mA

Photomicrosensor (Reflective) **EE-SY313/-SY413** 239

Note: 1. With incident light" denotes the condition whereby the light reflected by white paper with a reflection factor of 90% at a sensing distance of 4.4 mm is received by the photo IC when the forward current (I_F) of the LED is 20 mA.

2. Sensing object: White paper with a reflection factor of 90% at a sensing distance of 4.4 mm.

3. 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 from ON to OFF and when the photo IC is turned from OFF to ON.

4. The value of the response frequency is measured by rotating the disk as shown below.

200 mm dia.
15 mm
15 mm   15 mm
4.4 mm
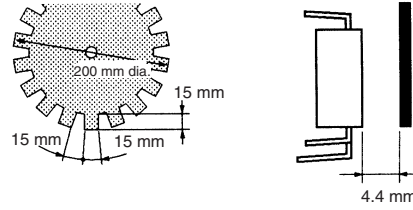
5. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EE-SY413.

Input   Output   0   t   0   t
(t_{PLH})   (t_{PHL})
EE-SY313

Input   Output   0   t   0   t
(t_{PHL})   (t_{PLH})
EE-SY413

■ Engineering Data

Note: The values in the parentheses apply to the EE-SY413.

### Forward Current vs. Collector Dissipation Temperature Rating

Forward current I_F (mA) / Output allowable dissipation P_C (mW) vs. Ambient temperature Ta (°C)
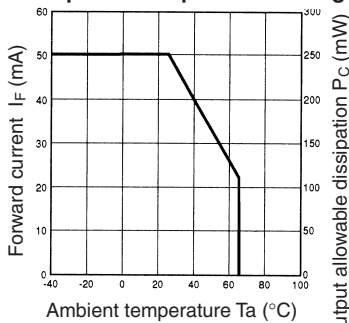
Forward Current vs. Forward Voltage Characteristics (Typical)

Forward current I_F (mA) vs. Forward voltage V_F (V)
Ta = −30°C, Ta = 25°C, Ta = 70°C
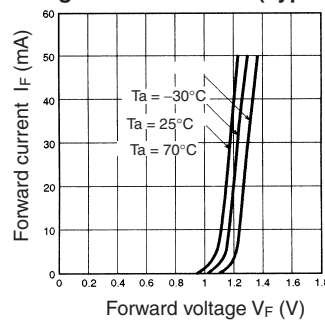
LED Current vs. Supply Voltage (Typical)

LED current I_{FT} (mA) vs. Supply voltage V_{CC} (V)
Ta = 25°C, R_L = 1 kΩ
I_{FT} OFF (I_{FT} ON)
I_{FT} ON (I_{FT} OFF)
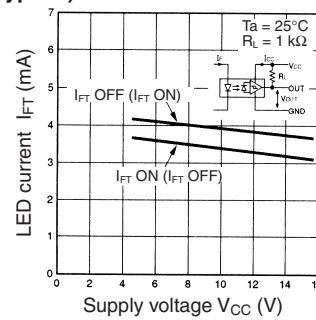
LED Current vs. Ambient Temperature Characteristics (Typical)

LED current I_{FT} (mA) vs. Ambient temperature Ta (°C)
V_{CC} = 5 V, R_L = 330 Ω
I_{FT} OFF (I_{FT} ON)
I_{FT} ON (I_{FT} OFF)
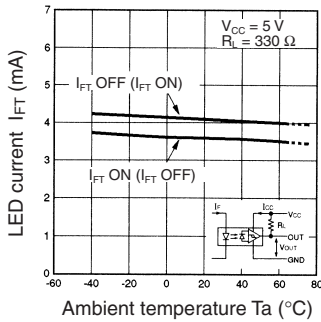
Low-level Output Voltage vs. Output Current (Typical)

Low level output voltage V_{OL} (V) vs. Output current I_C (mA)
Ta = 25°C, V_{CC} = 5 V, I_F = 0 mA (20 mA)
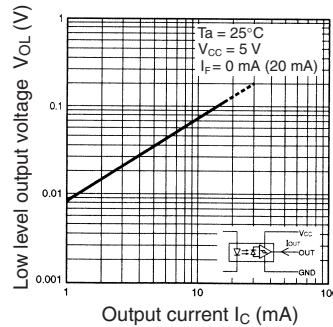
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)

Low level output voltage V_{OL} (V) vs. Ambient temperature Ta (°C)
V_{CC} = 5 V, I_F = 0 mA (20 mA)
I_{OL} = 16 mA
I_{OL} = 5 mA
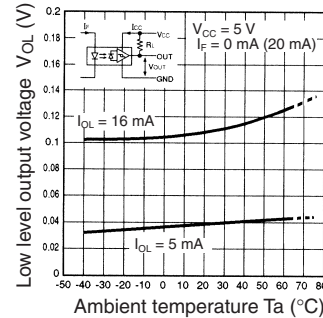
Current Consumption vs. Supply Voltage (Typical)

Current consumption I_{CC} (mA) vs. Supply voltage V_{CC} (V)
Ta = 25°C, I_F = 0 mA (15 mA)
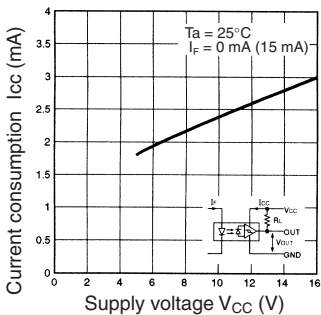
Response Delay Time vs. Forward Current (Typical)

Response delay time t_{PHL}, t_{PLH} (μS) vs. Forward current I_F (mA)
V_{CC} = 5 V, R_L = 330 Ω, Ta = 25°C
V_{OUT} (EE-SY3□□)
V_{OUT} (EE-SY4□□)
t_{PHL} (t_{PLH})
t_{PLH} (t_{PHL})
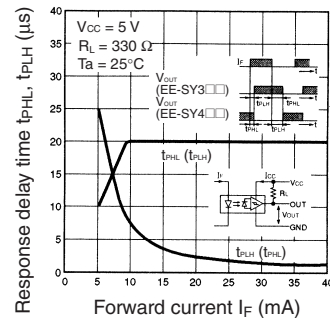
Sensing Position Characteristics (Typical)
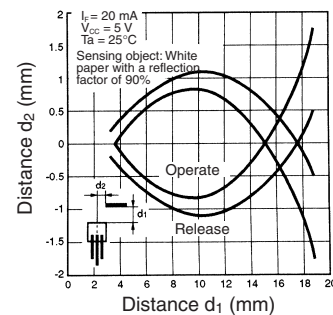
Distance d_2 (mm) vs. Distance d_1 (mm)
I_F = 20 mA, V_{CC} = 5 V, Ta = 25°C
Sensing object: White paper with a reflection factor of 90%
Operate
Release
d_2
d_1

Photomicrosensor (Reflective)   **EE-SY313/-SY413**

All sales are subject to Omron Electronic Components LLC standard terms and conditions of sale, which can be found at http://www.components.omron.com/components/web/webfiles.nsf/sales_terms.html

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

OMRON®

OMRON ELECTRONIC COMPONENTS LLC
55 E. Commerce Drive, Suite B
Schaumburg, IL 60173
847-882-2288

OMRON ON-LINE
Global - http://www.omron.com
USA - http://www.components.omron.com

Cat. No. X305-E-1   10/10   Specifications subject to change without notice   Printed in USA

Photomicrosensor (Reflective) **EE-SY313/-SY413**