Slot-type Photomicrosensor (Non-modulated) *1

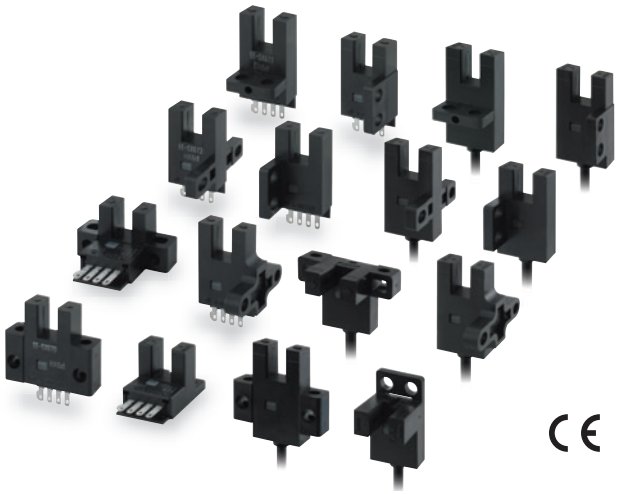
# EE-SX47/67

CSM_EE-SX47_67_DS_E_7_1

## Global Standard Slot-type photomicrosensors with 50- to 100-mA direct switching capacity.

- Series includes models that enable switching between dark-ON and light-ON operation.
- Response frequency as high as 1 kHz.
- Easy operation monitoring with bright light indicator.
- Wide operating voltage range: 5 to 24 VDC
- Models in which the light indicator turns ON for dark-ON operation are also available.
- A wide range of variations in eight different shapes.
- Flexible robot cable is provided as a standard feature. *2

⚠ Be sure to read *Safety Precautions* on page 5.



*1. Pre-wired Models are available only in the EE-SX67 Series.
*2. Only for Pre-wired Models.

## Ordering Information

### Connector

Infrared light

| Appearance | Sensing method | Connecting method | Sensing distance | Output configuration | Indicator mode | Model | |
|---|---|---|---|---|---|---|---|
| | | | | | | NPN output | PNP output |
| Standard | Through-beam type (with slot) | Connector (4 poles) | 5 mm (slot width) | Dark-ON/Light-ON (selectable) *3 | Incident light | **EE-SX670** | **EE-SX670P** |
| | | | | | No incident light | **EE-SX670A** | **EE-SX670R** |
| | | | | Light-ON | Incident light | **EE-SX470** | **EE-SX470P** |
| L-shaped | | | | Dark-ON/Light-ON (selectable) *3 | Incident light | **EE-SX671** | **EE-SX671P** |
| | | | | | No incident light | **EE-SX671A** | **EE-SX671R** |
| | | | | Light-ON | Incident light | **EE-SX471** | **EE-SX471P** |
| T-shaped, slot center 7 mm | | | | Dark-ON/Light-ON (selectable) *3 | Incident light | **EE-SX672** | **EE-SX672P** |
| | | | | | No incident light | **EE-SX672A** | **EE-SX672R** |
| | | | | Light-ON | Incident light | **EE-SX472** | **EE-SX472P** |
| Close-mounting | | | | Dark-ON/Light-ON (selectable) *3 | Incident light | **EE-SX673** | **EE-SX673P** |
| | | | | | No incident light | **EE-SX673A** | **EE-SX673R** |
| | | | | Light-ON | Incident light | **EE-SX473** | **EE-SX473P** |
| Close-mounting | | | | Dark-ON/Light-ON (selectable) *3 | Incident light | **EE-SX674** | **EE-SX674P** |
| | | | | | No incident light | **EE-SX674A** | **EE-SX674R** |
| | | | | Light-ON | Incident light | **EE-SX474** | **EE-SX474P** |
| T-shaped, slot center 10 mm | | | | Dark-ON/Light-ON (selectable) *3 | Incident light | **EE-SX675** | **EE-SX675P** |
| F-shaped | | | | Dark-ON/Light-ON (selectable) *3 | Incident light | **EE-SX676** | **EE-SX676P** |
| R-shaped | | | | Dark-ON/Light-ON (selectable) *3 | Incident light | **EE-SX677** | **EE-SX677P** |

*3. Dark-ON when the L terminal of the connector is opened, and light-ON when the L terminal and positive (+) terminal are connected. Do not connect the L terminal to 0 V when using dark-ON operation. When using light-ON, it is useful to select the connector EE-1001-1. The L terminal and positive (+) terminal of this connector are connected in advance.

## Pre-wired Models

Infrared light

| Appearance | Sensing method | Sensing distance | | Output configuration | Indicator mode | Connecting method | Model | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | NPN output | PNP output |
| Standard | Through-beam type (with slot) | Infrared light | 5 mm (slot width) | Dark-ON/ Light-ON (selectable) * | Incident light | Pre-wired Models (1m) | **EE-SX670-WR 1M** | **EE-SX670P-WR 1M** |
| L-shaped | | | | | | | **EE-SX671-WR 1M** | **EE-SX671P-WR 1M** |
| T-shaped, slot center 7 mm | | | | | | | **EE-SX672-WR 1M** | **EE-SX672P-WR 1M** |
| Close-mounting | | | | | | | **EE-SX673-WR 1M** | **EE-SX673P-WR 1M** |
| Close-mounting | | | | | | | **EE-SX674-WR 1M** | **EE-SX674P-WR 1M** |
| T-shaped, slot center 10 mm | | | | | | | **EE-SX675-WR 1M** | **EE-SX675P-WR 1M** |
| F-shaped | | | | | | | **EE-SX676-WR 1M** | **EE-SX676P-WR 1M** |
| R-shaped | | | | | | | **EE-SX677-WR 1M** | **EE-SX677P-WR 1M** |

* Dark-ON operation can be used when the L terminal is left unconnected or Light-ON operation can be used when the L terminal and positive (+) terminal are connected to each other. Do not connect the L terminal to 0 V when using dark-ON operation.

## Accessories (Order Separately) Connector Models

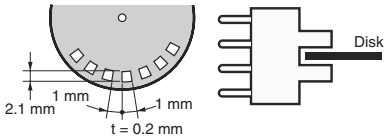
| Type | | Cable length | Model | Remarks |
|---|---|---|---|---|
| Connector | | | **EE-1001** | |
| | | | **EE-1001-1** | L terminal and positive (+) terminal are already short-circuited. |
| | | | **EE-1009** | |
| | Connector with Cable | 1 m | **EE-1006 1M** | |
| | | | **EE-1010 1M** | |
| | | 2 m | **EE-1006 2M** | |
| | | | **EE-1010 2M** | |
| | Connector with Robot Cable | 1 m | **EE-1010-R 1M** | |
| | | 2 m | **EE-1010-R 2M** | |
| Connector Hold-down Clip | | | **EE-1006A** | For EE-1006 only. |

* Refer to *Accessories* for details.

## Ratings and Specifications

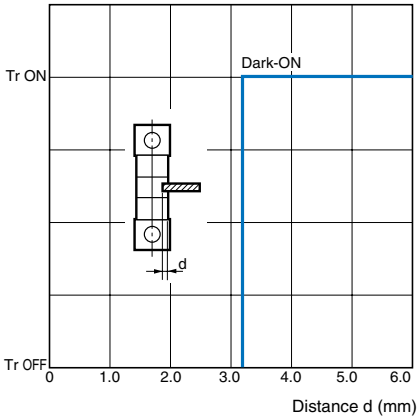
| Item | | Type | Standard | L-shaped | T-shaped, slot center 7 mm | Close-mounting | | T-shaped, slot center 10 mm | F-shaped | R-shaped |
|---|---|---|---|---|---|---|---|---|---|---|
| | NPN models | Connector models | EE-SX670<br>EE-SX670A<br>EE-SX470 | EE-SX671<br>EE-SX671A<br>EE-SX471 | EE-SX672<br>EE-SX672A<br>EE-SX472 | EE-SX673<br>EE-SX673A<br>EE-SX473 | EE-SX674<br>EE-SX674A<br>EE-SX474 | EE-SX675 | EE-SX676 | EE-SX677 |
| | | Pre-wired models | EE-SX670-WR | EE-SX671-WR | EE-SX672-WR | EE-SX673-WR | EE-SX674-WR | EE-SX675-WR | EE-SX676-WR | EE-SX677-WR |
| | PNP models | Connector models | EE-SX670P<br>EE-SX670R<br>EE-SX470P | EE-SX671P<br>EE-SX671R<br>EE-SX471P | EE-SX672P<br>EE-SX672R<br>EE-SX472P | EE-SX673P<br>EE-SX673R<br>EE-SX473P | EE-SX674P<br>EE-SX674R<br>EE-SX474P | EE-SX675P | EE-SX676P | EE-SX677P |
| | | Pre-wired models | EE-SX670P-WR | EE-SX671P-WR | EE-SX672P-WR | EE-SX673P-WR | EE-SX674P-WR | EE-SX675P-WR | EE-SX676P-WR | EE-SX677P-WR |
| Sensing distance | | | 5 mm (slot width) | | | | | | | |
| Sensing object | | | Opaque: 2 × 0.8 mm min. | | | | | | | |
| Differential distance | | | 0.025 mm | | | | | | | |
| Light source | | | GaAs infrared LED with a peak wavelength of 940 nm | | | | | | | |
| Indicator *1 | | | Light indicator (red) (turns ON when light is interrupted for models with A or R suffix) | | | | | | | |
| Supply voltage | | | 5 to 24 VDC ±10%, ripple (p-p): 10% max. | | | | | | | |
| Current consumption | | | 35 mA max. (NPN models), 30 mA max. (PNP models) | | | | | | | |
| Control output | | | NPN open collector: 5 to 24 VDC, 100 mA max.<br>100 mA load current with a residual voltage of 0.8 V max.<br>40 mA load current with a residual voltage of 0.4 V max.<br>OFF current (leakage current): 0.5 mA max.<br>PNP open collector: 5 to 24 VDC, 50 mA max.<br>50 mA load current with a residual voltage of 1.3 V max.<br>OFF current (leakage current): 0.5 mA max. | | | | | | | |
| Response frequency *2 | | | 1 kHz min. (3 kHz average) | | | | | | | |
| Ambient illumination | | | 1,000 lx max. with fluorescent light on the surface of the receiver. | | | | | | | |
| Ambient temperature range | | | Operating: −25 to +55°C, Storage: −30 to +80°C (with no icing or condensation) | | | | | | | |
| Ambient humidity range | | | Operating: 5% to 85%, Storage: 5% to 95% (with no icing or condensation) | | | | | | | |
| Vibration resistance | | | Destruction: 20 to 2,000 Hz (peak acceleration: 100 m/s$^2$)<br>1.5-mm double amplitude for 2 h (4-min periods) each in X, Y, and Z directions | | | | | | | |
| Shock resistance | | | Destruction: 500 m/s$^2$ for 3 times each in X, Y, and Z directions | | | | | | | |
| Degree of protection | | | IEC60529 IP50 | | | | | | | |
| Connecting method | | | Connector Models (direct soldering possible), Pre-wired Models (Standard cable length: 1 m),<br>Models with Connectors (Standard cable length: 0.1 m) | | | | | | | |
| Weight | Connector models | | Approx. 3.1 g | Approx. 3 g | Approx. 2.4 g | Approx. 2.3 g | Approx. 3 g | Approx. 2.7 g | Approx. 2.2 g | Approx. 2.2 g |
| | Pre-wired models | | Approx. 18.9 g | Approx. 17.3 g | Approx. 17.8 g | Approx. 16.8 g | Approx. 17.1 g | Approx. 18.3 g | Approx. 16.9 g | Approx. 16.9 g |
| Material | Case | | Polybutylene phthalate (PBT) | | | | | | | |
| | Cover | | Polycarbonate | | | | | | | |
| | Emitter/receiver | | | | | | | | | |

*1. The indicator is a GaP red LED (peak wavelength: 690 nm).
*2. The response frequency was measured by detecting the rotating disk shown at the right.

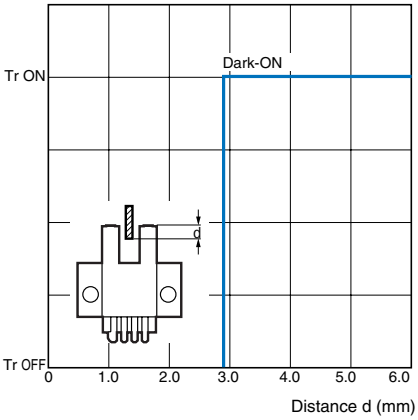


# Engineering Data (Typical)

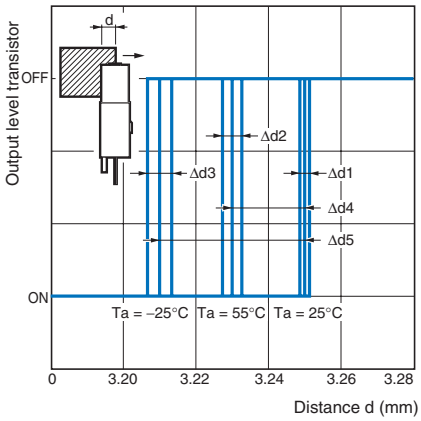
### Sensing Position Characteristics




### Sensing Position Characteristics




### Repeated Sensing Position Characteristics

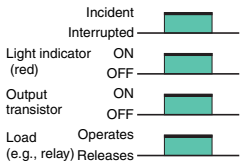
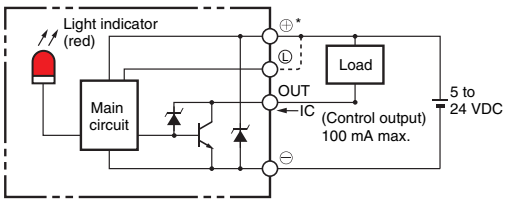
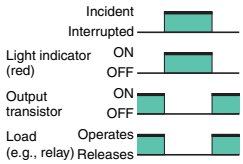
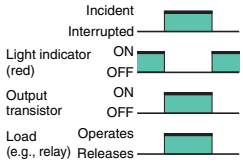
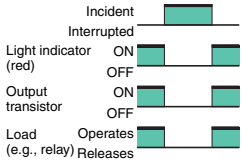
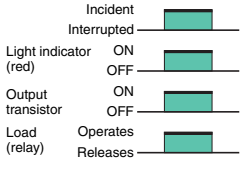
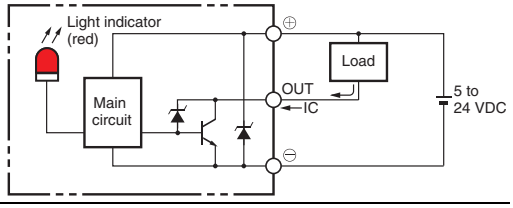



Vcc =12 V, No. of repetitions: 20, Δd1 = 0.002 mm, Δd2 = 0.004 mm, Δd3 = 0.005 mm, Δd4 = 0.02 mm, Δd5 = 0.04 mm

Note: The data applies to dark status. Operation may be affected by external light interference or light coming through the sensing object.

# I/O Circuit Diagrams

### NPN Output

| Model | Output configuration | Timing charts | Terminal connections | Output circuit |
|---|---|---|---|---|
| EE-SX67□<br>EE-SX67□-WR | Light-ON |  | Short-circuited between Ⓛ terminal and positive ⊕ terminal |  |
| | Dark-ON |  | Open between Ⓛ terminal and positive ⊕ terminal *1 | |
| EE-SX670A<br>EE-SX671A<br>EE-SX672A<br>EE-SX673A<br>EE-SX674A | Light-ON |  | Short-circuited between Ⓛ terminal and positive ⊕ terminal | |
| | Dark-ON |  | Open between Ⓛ terminal and positive ⊕ terminal *1 | |
| EE-SX470<br>EE-SX471<br>EE-SX472<br>EE-SX473<br>EE-SX474 | Light-ON |  | --- |  |



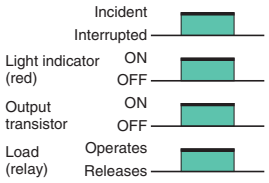
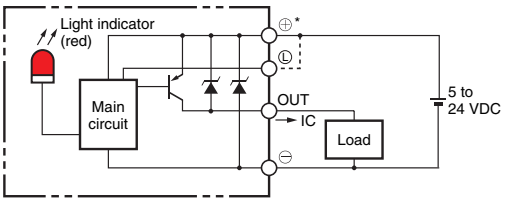
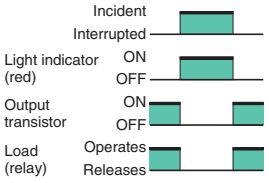
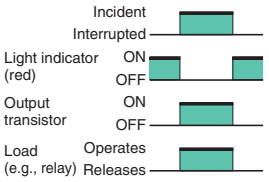
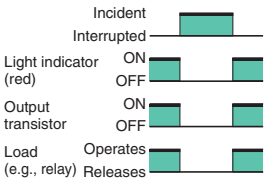
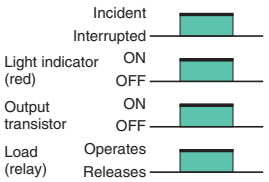
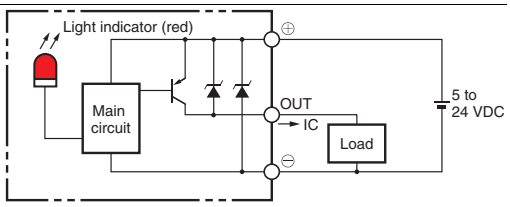


*The terminal arrangement depends on the model. Check the dimensional diagrams.

*1. Do not connect the L terminal to 0 V when using dark-ON operation.

EE-SX47/67

### PNP Output

| Model | Output configuration | Timing charts | Terminal connections | Output circuit |
|---|---|---|---|---|
| EE-SX67□P<br>EE-SX67□P-WR | Light-ON |  | Short-circuited between Ⓛ terminal and positive ⊕ terminal |  |
| | Dark-ON |  | Open between Ⓛ terminal and positive ⊕ terminal *1 | |
| EE-SX670R<br>EE-SX671R<br>EE-SX672R<br>EE-SX673R<br>EE-SX674R | Light-ON |  | Short-circuited between Ⓛ terminal and positive ⊕ terminal | *The terminal arrangement depends on the model. Check the dimensional diagrams. |
| | Dark-ON |  | Open between Ⓛ terminal and positive ⊕ terminal *1 | |
| EE-SX470P<br>EE-SX471P<br>EE-SX472P<br>EE-SX473P<br>EE-SX474P | Light-ON |  | --- |  |

*1. Do not connect the L terminal to 0 V when using dark-ON operation.

## Safety Precautions

**Refer to *Warranty and Limitations of Liability*.**

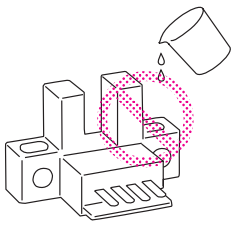
### ⚠ WARNING

**This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purposes.**

### Precautions for Safe Use

#### ● Operating Environment

These Photomicrosensors have an IP50 (conforms to IEC) enclosure and do not have a water-proof or dust-proof structure. Therefore, do not use them in applications in which the sensor will be subjected to splashes from water, oil, or any other liquid. Liquid entering the Sensor may result in malfunction.



### Precautions for Correct Use

Make sure that this product is used within the rated ambient environment conditions.

#### ● Installation

- When direct soldering to the terminals, use the following guidelines.

Soldering Conditions

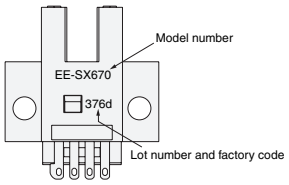
| Item | Temperature | Permissible time | Remarks |
|---|---|---|---|
| Soldering iron | 350°C max. | 3 s max. | The portion between the base of the terminals and the position 1.5 mm from the terminal base must not be soldered. |

- The terminal base uses a polycarbonate resin, which could be deformed by excessive soldering heat, resulting in damage to the product's functionality.

#### ● Lot Number and Model Number Legend

In the following diagrams, 376d indicates the lot number and factory where the product was manufactured. Do not include this code with the model number when ordering.

**EE-SX□70□**



(Unit: mm)

## Dimensions

Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified.

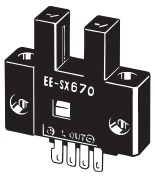
### Sensors

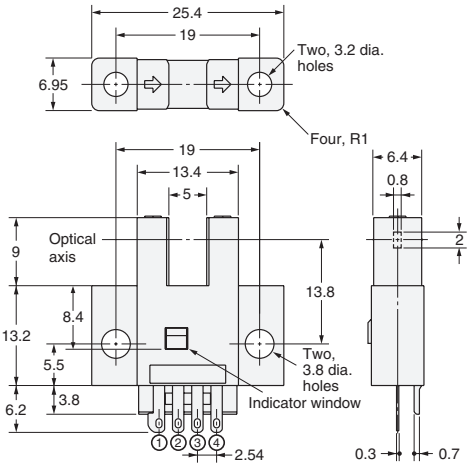
**EE-SX670/670P**
**EE-SX670A/670R**
**EE-SX470/470P**

**Terminal Arrangement**

| | | |
|---|---|---|
| (1) | ⊕ | Vcc |
| (2) | L | L* |
| (3) | OUT | OUTPUT |
| (4) | ⊖ | GND (0 V) |

* Pin 2 is not used for the EE-SX470.



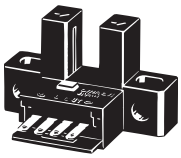



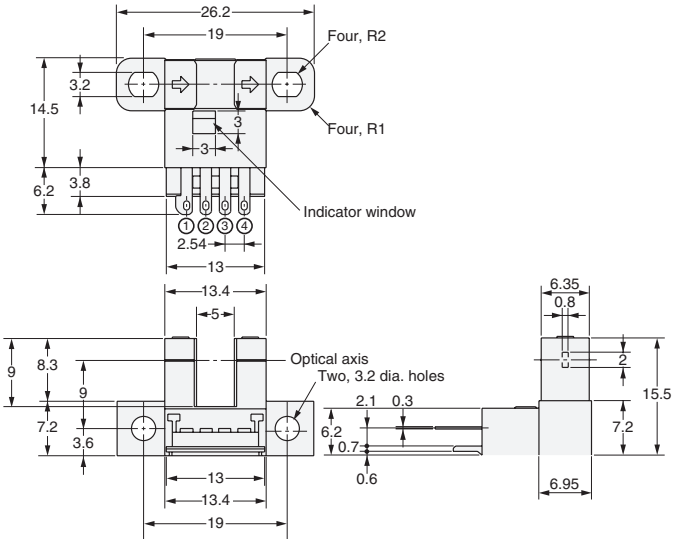

**EE-SX671/671P**
**EE-SX671A/671R**
**EE-SX471/471P**

**Terminal Arrangement**

| | | |
|---|---|---|
| (1) | ⊕ | Vcc |
| (2) | L | L* |
| (3) | OUT | OUTPUT |
| (4) | ⊖ | GND (0 V) |

* Pin 2 is not used for the EE-SX471.



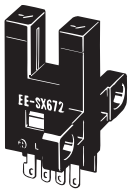


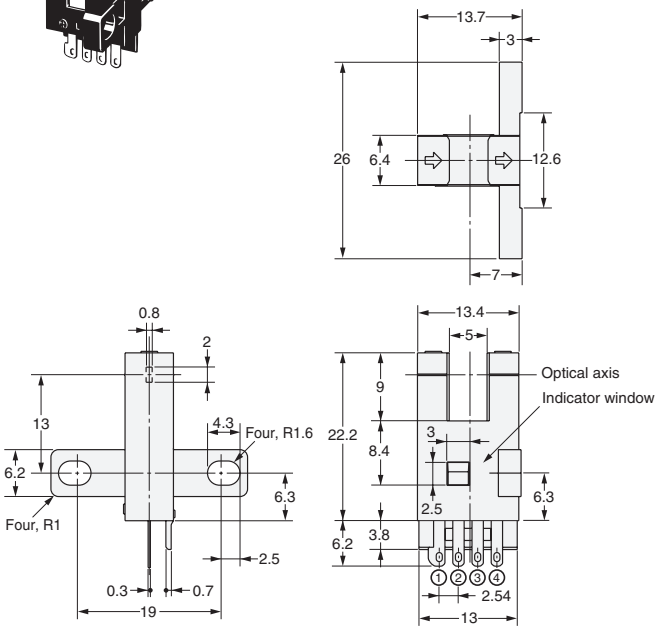

**EE-SX672/672P**
**EE-SX672A/672R**
**EE-SX472/472P**

**Terminal Arrangement**

| | | |
|---|---|---|
| (1) | ⊕ | Vcc |
| (2) | L | L* |
| (3) | OUT | OUTPUT |
| (4) | ⊖ | GND (0 V) |

* Pin 2 is not used for the EE-SX472.



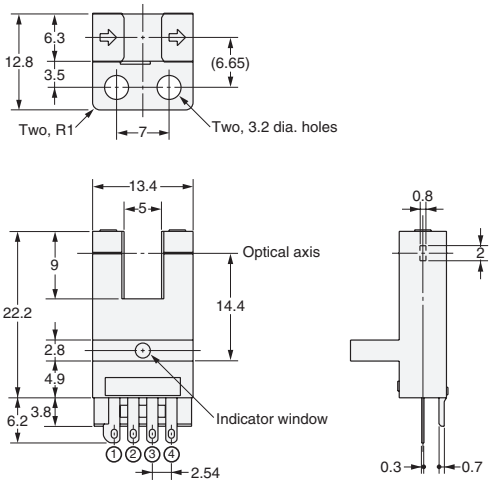




**EE-SX673/673P**
**EE-SX673A/673R**
**EE-SX473/473P**

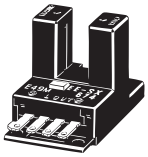
**Terminal Arrangement**

| | | |
|---|---|---|
| (1) | ⊕ | Vcc |
| (2) | L | L* |
| (3) | OUT | OUTPUT |
| (4) | ⊖ | GND (0 V) |

* Pin 2 is not used for the EE-SX473.



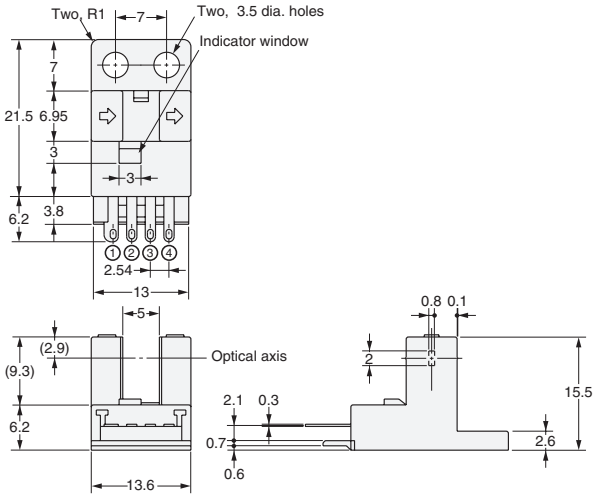
## EE-SX674/674P
## EE-SX674A/674R
## EE-SX474/474P



**Terminal Arrangement**

| | | |
|---|---|---|
| (1) | ⊕ | Vcc |
| (2) | L | L* |
| (3) | OUT | OUTPUT |
| (4) | ⊖ | GND (0 V) |

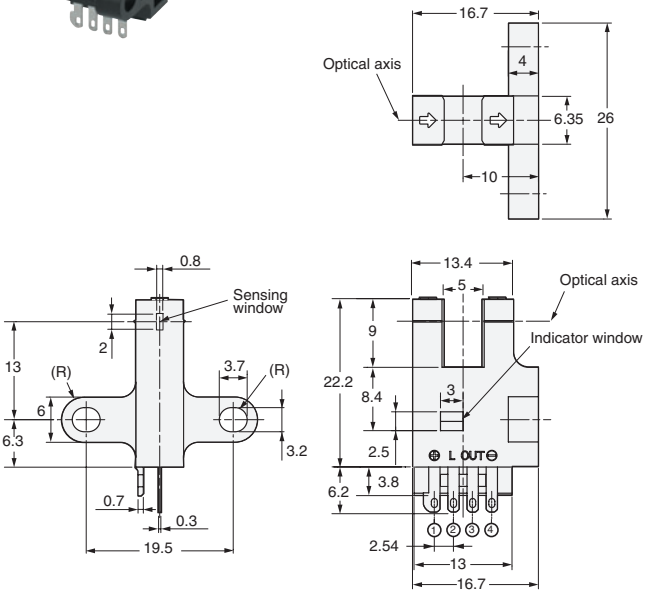
* Pin 2 is not used for the EE-SX474.




## EE-SX675/675P

**Terminal Arrangement**

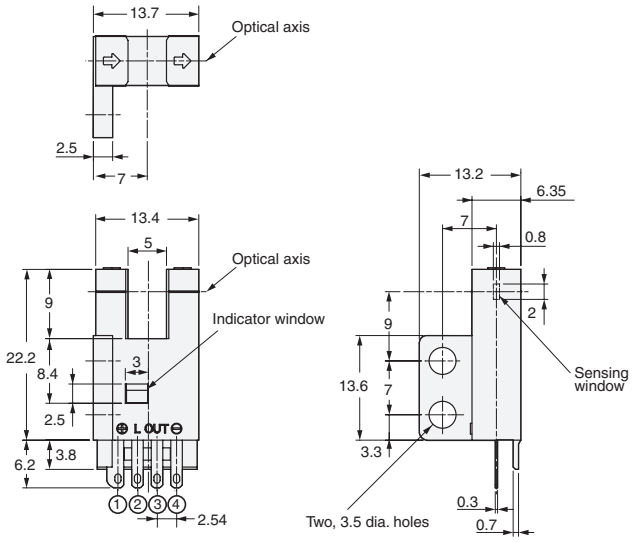
| | | |
|---|---|---|
| (1) | ⊕ | Vcc |
| (2) | L | L |
| (3) | OUT | OUTPUT |
| (4) | ⊖ | GND (0 V) |




## EE-SX676/676P

**Terminal Arrangement**

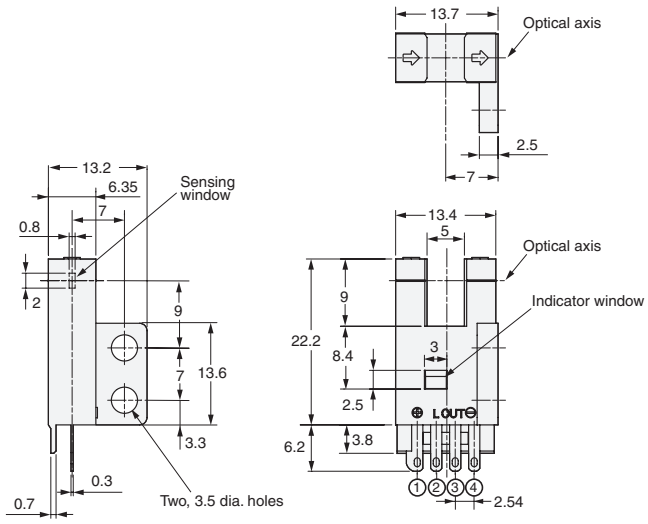
| | | |
|---|---|---|
| (1) | ⊕ | Vcc |
| (2) | L | L |
| (3) | OUT | OUTPUT |
| (4) | ⊖ | GND (0 V) |




## EE-SX677/677P

**Terminal Arrangement**

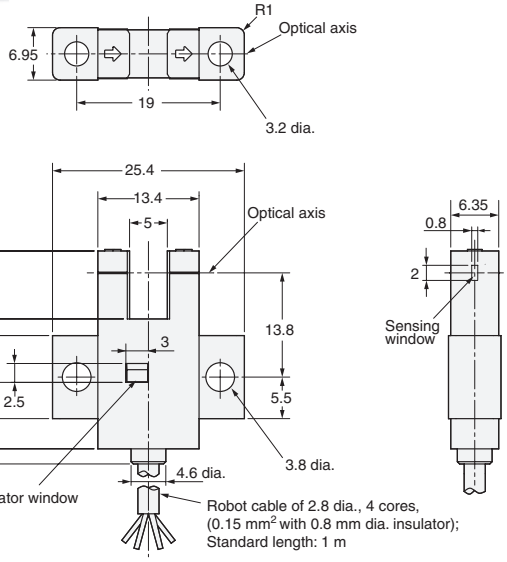
| | | |
|---|---|---|
| (1) | ⊕ | Vcc |
| (2) | L | L |
| (3) | OUT | OUTPUT |
| (4) | ⊖ | GND (0 V) |



## EE-SX670-WR/670P-WR

**Terminal Arrangement**

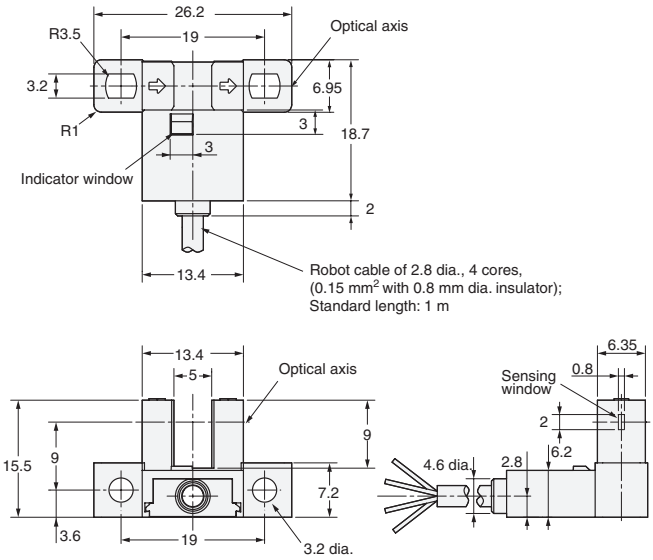
| | |
|---|---|
| **Brown** | Vcc |
| **Pink** | L |
| **Blue** | GND (0 V) |
| **Black** | OUTPUT |




## EE-SX671-WR/671P-WR

**Terminal Arrangement**

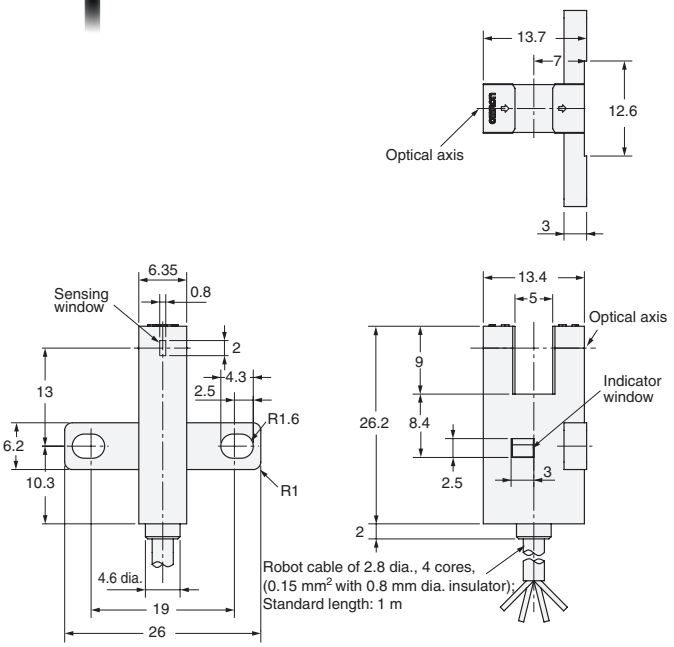
| | |
|---|---|
| **Brown** | Vcc |
| **Pink** | L |
| **Blue** | GND (0 V) |
| **Black** | OUTPUT |




## EE-SX672-WR/672P-WR

**Terminal Arrangement**

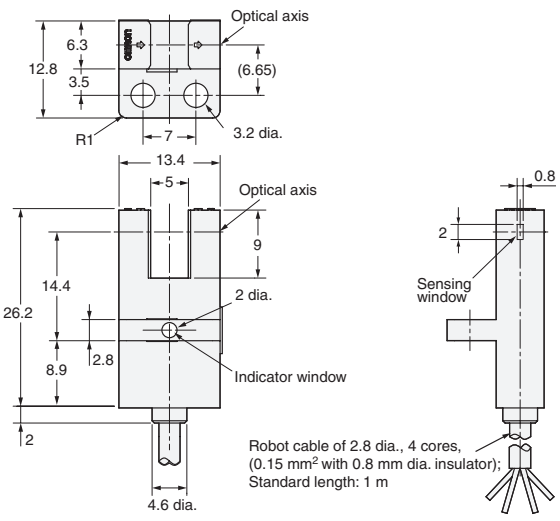
| | |
|---|---|
| **Brown** | Vcc |
| **Pink** | L |
| **Blue** | GND (0 V) |
| **Black** | OUTPUT |




## EE-SX673-WR/673P-WR

**Terminal Arrangement**

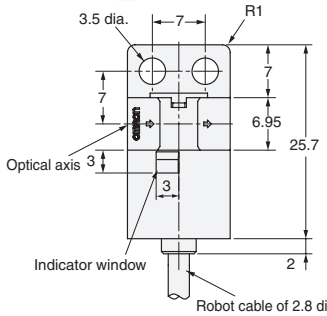
| | |
|---|---|
| **Brown** | Vcc |
| **Pink** | L |
| **Blue** | GND (0 V) |
| **Black** | OUTPUT |

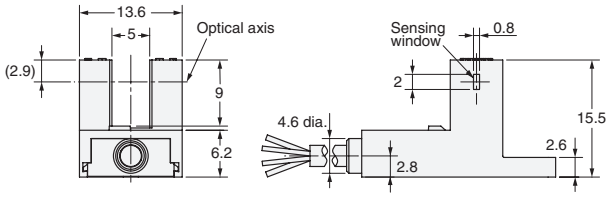


## EE-SX674-WR/674P-WR

**Terminal Arrangement**

| | |
|---|---|
| **Brown** | Vcc |
| **Pink** | L |
| **Blue** | GND(0V) |
| **Black** | OUTPUT |

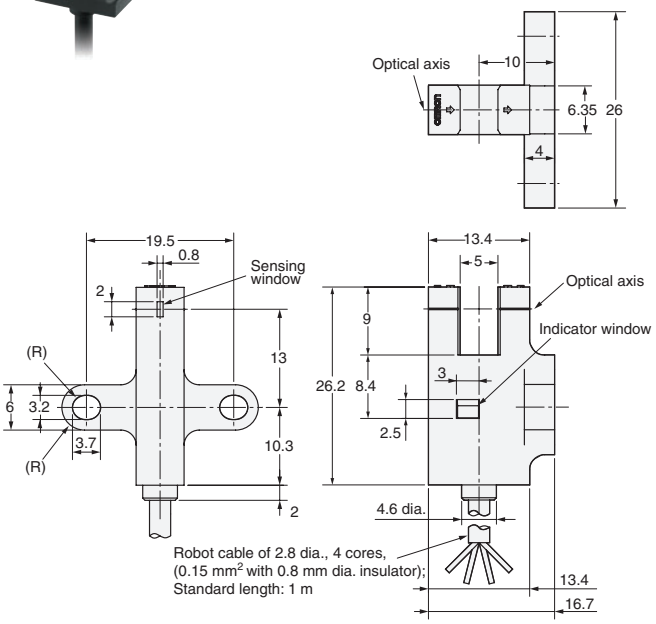



## EE-SX675-WR/675P-WR

**Terminal Arrangement**

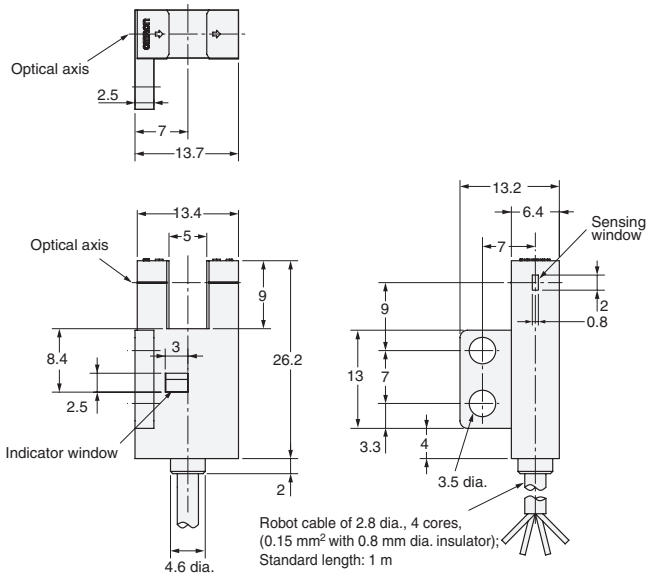
| | |
|---|---|
| **Brown** | Vcc |
| **Pink** | L |
| **Blue** | GND(0V) |
| **Black** | OUTPUT |




## EE-SX676-WR/676P-WR

**Terminal Arrangement**

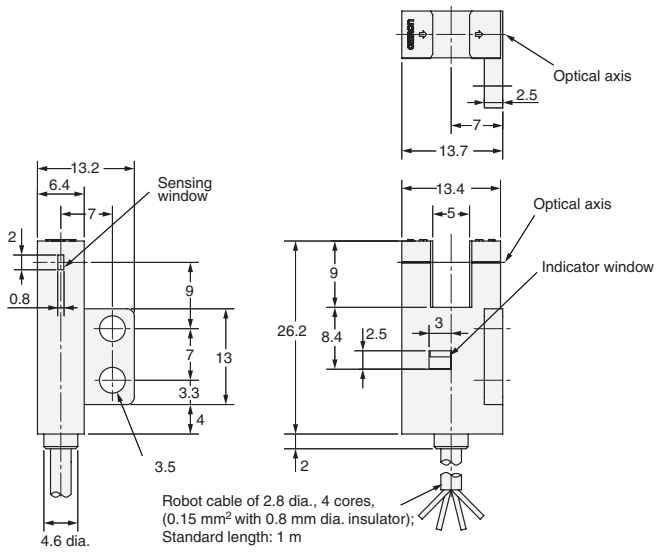
| | |
|---|---|
| **Brown** | Vcc |
| **Pink** | L |
| **Blue** | GND(0V) |
| **Black** | OUTPUT |




## EE-SX677-WR/677P-WR

**Terminal Arrangement**

| | |
|---|---|
| **Brown** | Vcc |
| **Pink** | L |
| **Blue** | GND(0V) |
| **Black** | OUTPUT |



MEMO

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