

Photosensors DATA BOOK

Things to keep in mind when using the data book

1. Changes in specifications

Due to improvements, please be aware that the specifications/descriptions, etc., of the products contained in this data book are subject to change without prior notice.

2. Conclusion of written specifications

When adopting the products contained in this data book (including those with specifications changed according to your request on the basis of the said products), be sure to include a conclusion of the written specifications corresponding to the equipped equipment. Without a conclusion of such written specifications, please be aware that we shall assume no liability even in a case where functional trouble or a safety problem should occur to the equipped equipment.

3. Methods/conditions/environments of use

When using the products contained in this data book, pay special attention to the methods/conditions/environments of use stated in the written specifications. We shall assume no liability for any damage even in a case where any PL-related defect regarding safety, etc., should occur as a result of wrong use beyond product ranges.

4. Warranty period

The warranty period of the delivered products shall be one year after delivery to the location designated by the person in charge of purchase.

5. Coverage of warranty

If any failure occurs due to our fault within the above warranty period, the failed part of the product shall be replaced/repared at our own responsibility.

However, be aware that the following cases in (1)_(4) shall be excluded from coverage.

- (1) Customer's inappropriate handling/use
- (2) Failure for other reasons than the product delivered
- (3) Modification/repair not carried out by us
- (4) Other cases of acts of God, such as natural catastrophes/disasters

Additionally, the warranty referred to here shall mean the warranty of the product delivered alone, which shall exclude the warranty against damage induced by its failure.

6. Ranges of services

The price of the delivered products does not include service costs, such as dispatch of engineers. Please be aware that extra costs shall be billed in the following cases.

- (1) Installation adjustment costs, and witnessing of trial operation
- (2) Maintenance, inspection, adjustment, and repair
- (3) Technical guidance and technical training

7. Technical information

The technical information contained in this data book shall be for explaining representative operations/applications of products, and not for guaranteeing our and third-party intellectual property rights and other rights or granting a license for use.

8. Copyright

No part of this data book, all rights of which belong to us, may be reproduced without permission.

9. When in doubt about this data book, please contact our sales window in advance.

Foreword

Thank you for your continued use of our products.

Now we would like to inform you of completion of the “Photosensors Data Book.”

Photosensors, using LEDs (light-emitting diodes) and photoreceptor devices, have been selected as a transmission type or reflection type according to the nature and shape of the object to be detected. Furthermore, photosensors also feature an expandable detection distance and detection accuracy according to the circuit system.

These products can be applied widely from consumer to industrial equipment.

We have produced this data book with the finest possible consideration given to editing, however flaws may still exist. If a flaw should be detected, we would appreciate you informing us.

We will continue to contribute to the development of the electronics industry by making full use of the latest technology. We would appreciate your continued patronage of our products.

May 2014

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1. Principles of Operation

1.1 Photosensor Principles and Features

Photosensors are used to detect the positions or presence or absence of objects through the use of light.

Our lineup includes the following 6 types of products, according to structure and application of the photosensor:

- ① Photointerrupter
- ② Reflective Type Photosensor
- ③ Regressive Reflection Type Photosensor
- ④ Separate Type Photosensor
- ⑤ Actuator Type Photosensor
- ⑥ Photo Level Sensor

① Photointerrupter

A photointerrupter is a complex device to detect objects, which has an emitting element to convert electrical signals into light signals and a receiving element to convert light signals into electrical signals built into one package, as shown in Fig. 1. For the photointerrupter structure, the emitting element is placed counter the receiving element and the object's blocking light by passing between the elements above allows object detection. As an example of object detection, OJ-161 is shown in Fig. 2. OJ-161 is the photointerrupter with an emitting element of an infrared light emitting diode and a receiving element of a phototransistor. When an object is detected, a constant current is passed through the infrared light emitting diode, and a phototransistor, which is the receiving element, receives and outputs it as the collector current. Then, when an object is inserted between the emitting element and the receiving element, it blocks light (infrared light) and the collector current does not flow through the phototransistor. In this manner, reading a change in the collector current detects the object. For sensors with a phototransistor used as described above, since the characteristics change depending on the circuit constant used, the circuit constant is fixed based on the forward current I_F to pass through the LED and the I_L-V_{CE} (Light Current vs. Collector Emitter Voltage) characteristics to determine operating characteristics. On the other hand, for sensors with a one-chip-integrated photo IC receiving element used including the peripheral processing circuit required for the circuit design, direct connection to TTL, CMOS, etc., is available.

The following are features of photointerrupters:

- (1) Object detectable with non-contact
- (2) High reliability and longer lifetime
- (3) High detecting-position accuracy
- (4) High speed response
- (5) Easy connection with an electric circuit

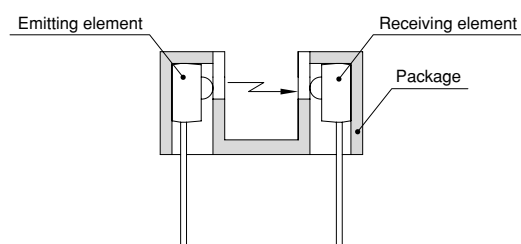


Fig. 1

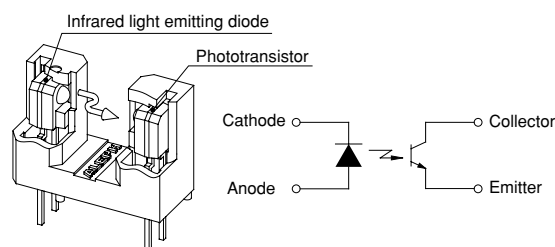


Fig. 2 OJ-161

We offer a large variety of photo interrupters as shown below.

● Slit width, Slit configuration

- Select according to the detecting direction of an object

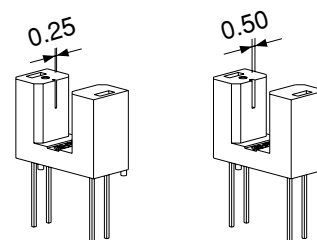


Fig. 3 OJ-155 (Left) and OJ-1605 (Right)

- Select according to the detecting accuracy

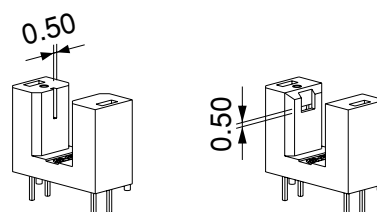


Fig. 4 OJ-161 (Left) and OJ-261 (Right)

● Substantial output forms

You can select according to various output forms, in addition to the phototransistor.

- 4-type IC output

Open collector, Light on — Output transistor on
Open collector, Light on — Output transistor off
With pull-up resistor, Light on — Output transistor off
With pull-up resistor, Light on — Output transistor on

- 3.3V, 5V and 12V type photo IC output

- Light modulated type photo IC output

- 2-wire system

When you require any output form other than those described in the data book, please feel free to contact our sales desk.

● Substantial dustproof photointerrupters

Dustproof photointerrupters are most suitable for installation sites where dust or paper powder may accumulate between slits.



- With connector
- One side mounting

Fig. 5 OJ-4506-N23



- With connector
- Snap-in mounting

Fig. 6 OJ-4606-N23



- With wires
- One side mounting

Fig. 7 OJ-3305-30N8

② Reflective Type Photosensor

The reflective type photosensor has emitting and receiving elements built into one package, as in the case with the photointerrupter. However, the emitting surface and receiving surface of both elements are placed in the same direction with respect to a detected object. When a detected object passes through a light path, the light irradiated from the emitting element is reflected off the detected object and the receiving element receives the reflected light. This changes the output signal.

In addition, since the reflective type photosensor is installed with the receiving element directed outward as shown in Fig. 8, it is extremely susceptible to ambient light.

We install it in such a manner so as to avoid the effects of ambient light, but sufficient attention is required when installing the reflective type photosensor.

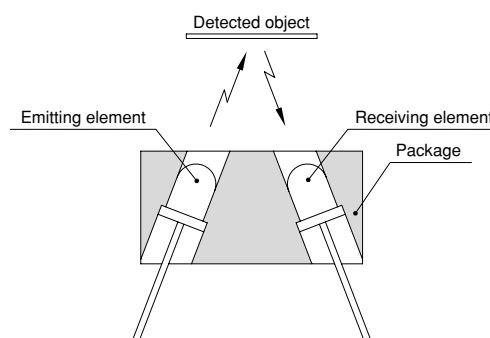


Fig. 8

We offer reflective type photosensors according to various mounting configurations and output forms. Especially, for reflective type photosensor with a light modulation system adopted, you can select products among those with the same outline configuration according to the distance of the detected object.



Fig. 9 OH Series

Detecting Distance [mm]	Detecting-Output High	Detecting-Output Low
1 ~ 9	OH-117-A5	OH-118-A5
4 ~ 18	OH-217-A5	OH-218-A5
9 ~ 25	OH-317-A5	OH-318-A5

③ Regressive Reflection Type Photosensor

For a regressive reflection type photosensor, the sensor is placed counter the prism. When no detected object exist, the receiving surface receives light irradiated from the emitting surface through the prism and outputs it as the collector current. (Fig. 10)

To the contrary, when a detected object is inserted between the sensor and the prism, it blocks light and the collector current does not flow.

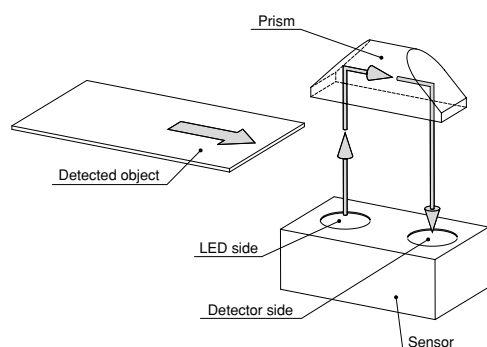


Fig. 10

We offer regressive reflection type photosensors as shown below.

● Various regressive reflection type photosensors

- Compact



Fig. 11 ON-111-N24 (Left) and ON-121-N24 (Right)

- Snap-in mounting



Fig. 12 ON-171-N8 (Left) and EON-5041-701 (Right)

- Long distance

(Distance between prism and sensor: 50mm)



Fig. 13 ON-658-N29

● Special specifications according to application

- For use in banking terminals, we also offer products with improved reliability by adopting a gold-plated connector.

Example) ON-111-N27, ON-121-N27

- There are 2 power terminals installed onto the sensor to decrease the number of wires when multiple sensors are used.

Using 2 power terminals for connection between the sensors allows wire-saving.

Example) ON-1111-N23, ON-1211-N23

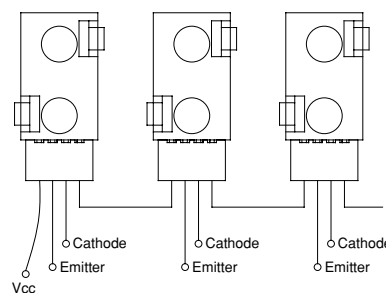


Fig. 14 Wire-Saving Diagram

④ Separate Type Photosensor

For a separate type photosensor, emitting and receiving elements are each built into a package separately. (Fig. 15) When an object is detected, the emitting side is placed counter the receiving side and the object's blocking light by passing between the elements above allows object detection. In contrast to the photointerrupter with emitting and receiving elements built into one package, you can freely set the distance between the emitting element and the receiving element according to the detected object within the capacity of the sensor.

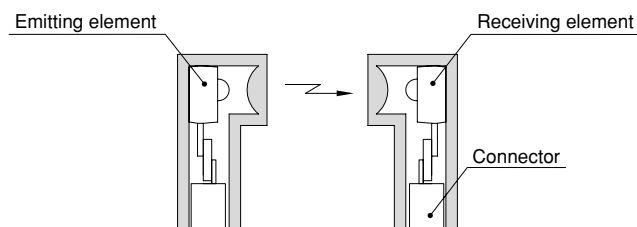


Fig. 15

We offer the OZ-120181A-702, which allows the distance between the emitting element and the receiving element to be set within a range of 0-100 mm and realizes strong resistance to ambient light and a detecting distance of 0-300 mm by using the OF-11T-N23 (for Detector side) and the OF-11R1-N23 (for LED side) with a high degree of dustproof effectiveness as well as the light modulated type photo IC.

⑤ Actuator type photosensor

The actuator type photosensor is a sensor with a photo interrupter and a rotary lever (actuator) integrated.



Fig. 16

It is normally located in a position where the lever blocks light, but as the detected object moves the lever this allows the photosensor to transmit light and detect the presence of the object. This type of photosensor can be used according to the various installation sites and applications by designing the lever configuration arbitrarily. The actuator type photosensor can detect even transparent objects that cannot block light. For actuator type photosensors, we offer a large selection of applications and arrangements to respond to installation conditions. Especially, for the OS-3x1 and OS-3x05 Series and the OS-5x1 and OS-5x05 Series, we are ready to supply products which can be freely selected from a variety of 8-type casing configurations, 6-type output forms, 14-type lever (actuator) configurations, 10-type general-purpose connectors and 10-type general-purpose housings and combining.

● Selection combination of actuator type photosensor

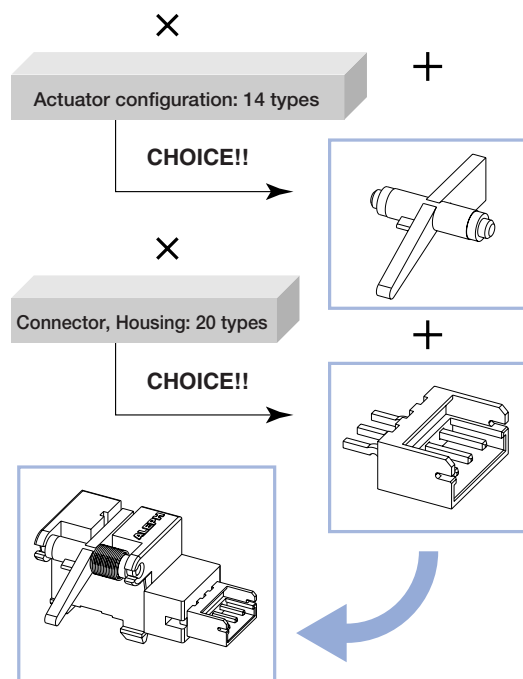
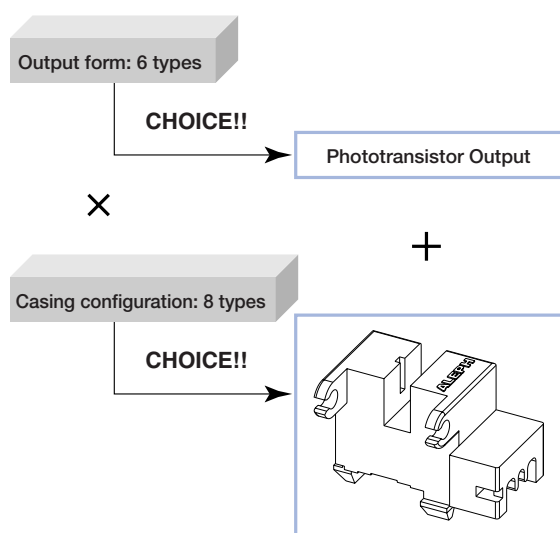


Fig. 17

* For further information, refer to p.230.

⑥ Photo level sensor

The photo level sensor operates on the principle of a light phenomenon that occurs when the light irradiated from the inside of the casing transmits the resin (casing) and is irradiated into a medium with a different refraction index. In air, much of the light irradiated from the emitting element is reflected off the interface between the resin and air and received by the receiving element.

On the other hand, in the liquid, much of the irradiated light transmits into the liquid. (Fig.18) The output signal at this time is regarded as the signal for liquid-level detection.

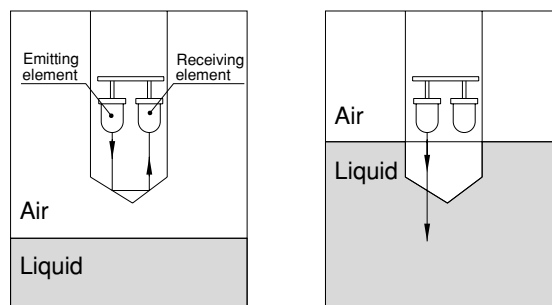


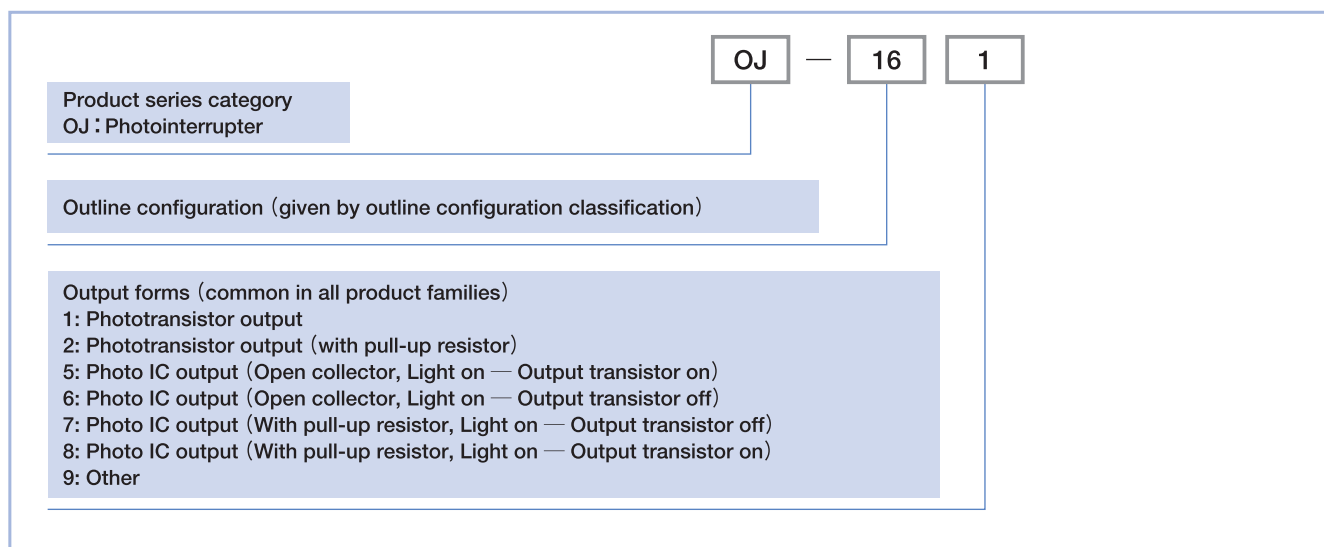
Fig.18

As a liquid-level detection sensor for kerosene and silicon oil, we can select PNP transistor output or photo IC output among sensors of the same configuration. We also offer detection distance from the mounted surface according to customer specifications.

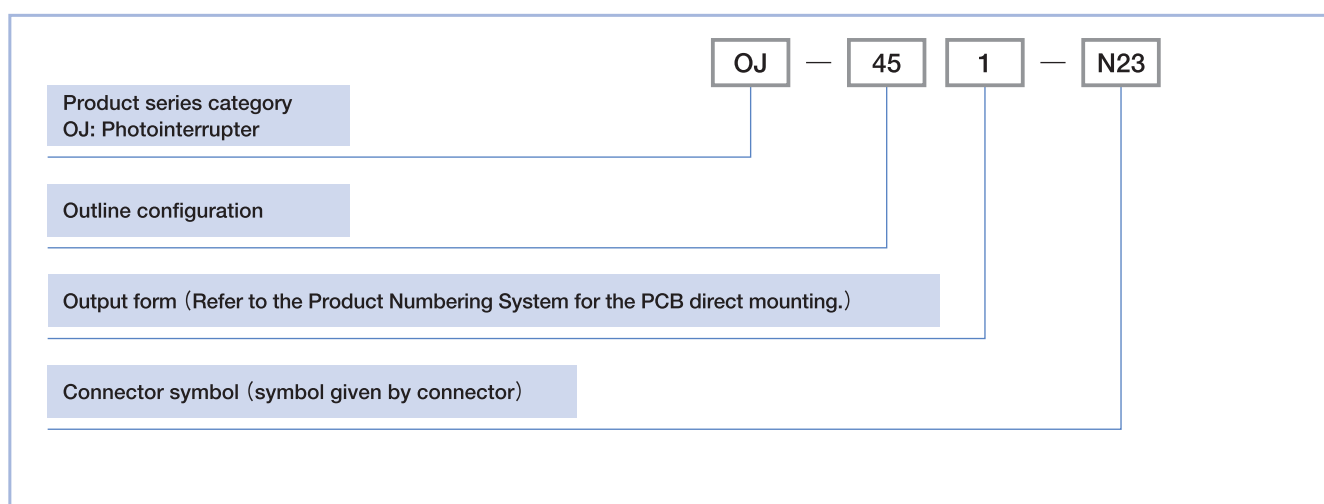
1.2 Product Numbering System

■ Photointerrupters

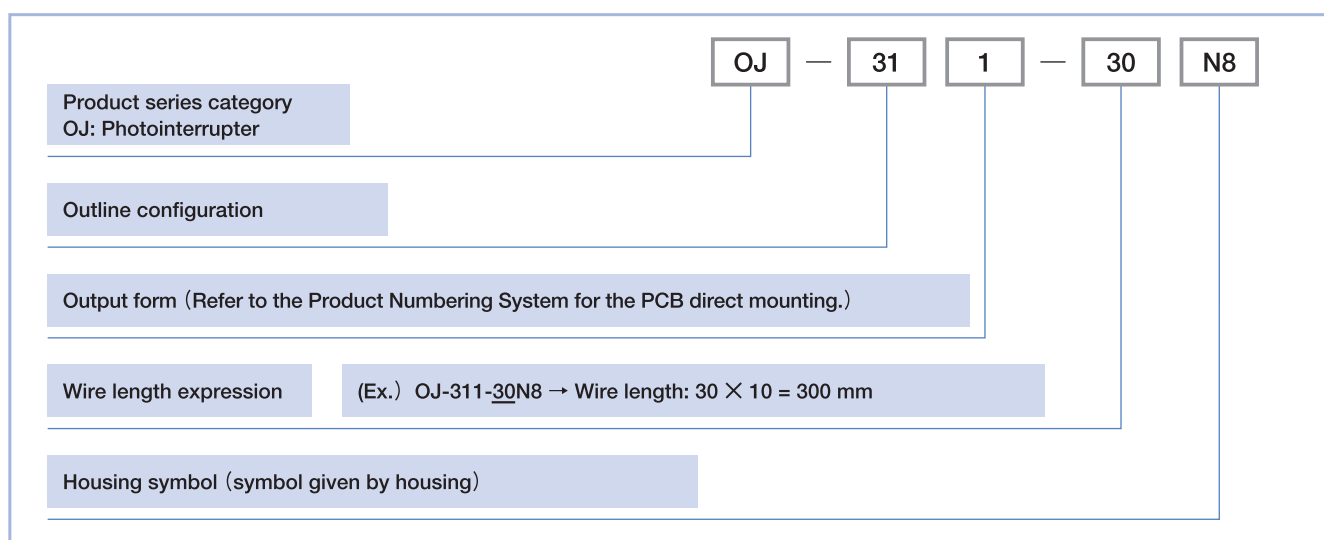
[PCB direct mounting]



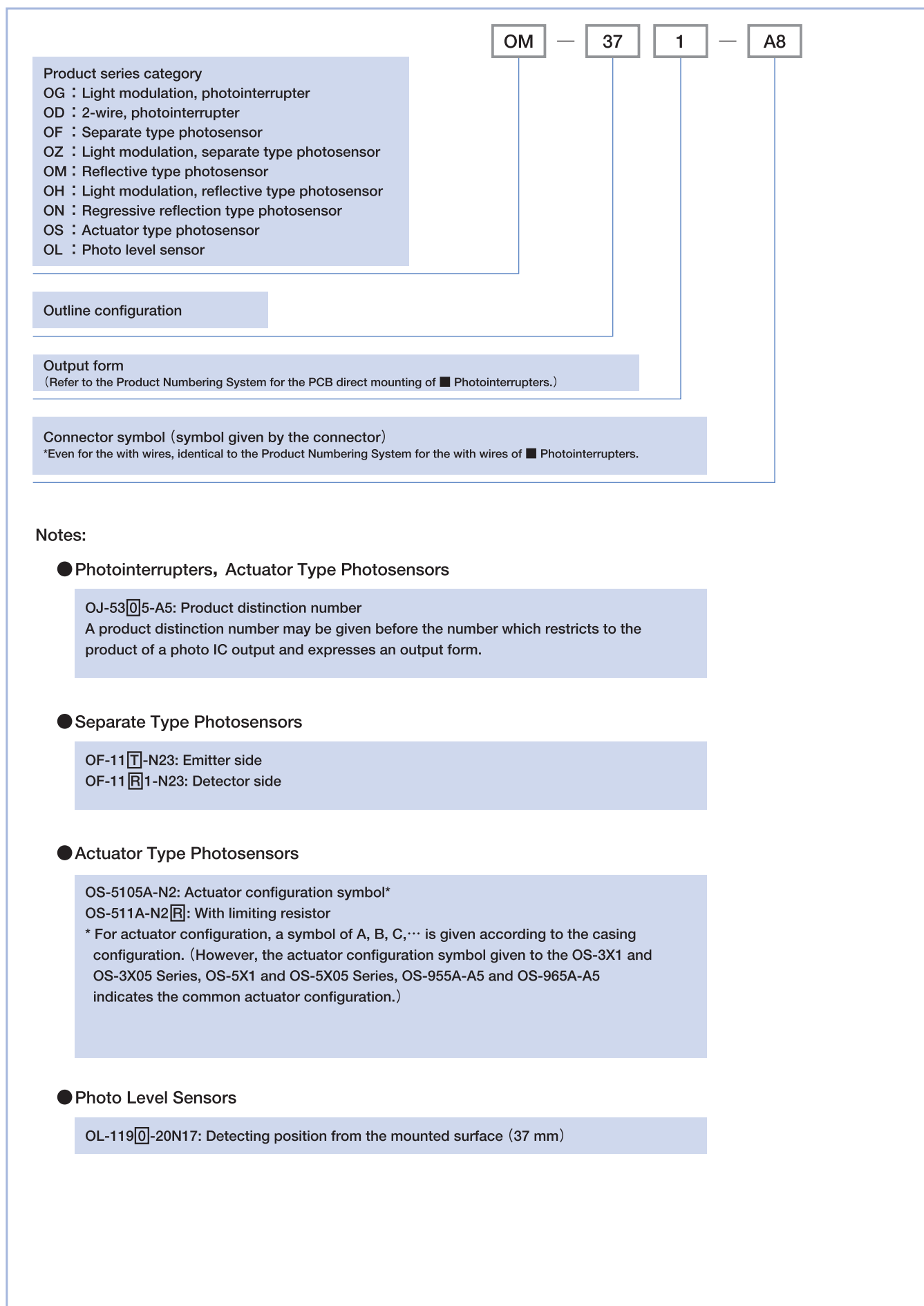
[With connector]



[With wires]



■ Product Numbering System for Other Product Families



1.3 Standard and Quasi-Standard Products

● Standard products

We have commercialized a large variety of photosensors over the years.

Of these, we have established photosensors with a high demand frequency and general versatility as “standard products.” We can quickly make delivery of standard photosensors.

● Quasi-standard products

We have a wide variety of products that differ from standard photosensors mainly in terms of output form, connector or wire length, as quasi-standard products. You can select the product that meets your needs among the wide variety of product families.

[Introduction of quasi-standard products]

We offer many products other than those described in this data book.

- Output type of photo IC

For photo IC output products, you can select the IC output type among those shown below.

- ① Open collector, Light on — Output transistor on
- ② Open collector, Light on — Output transistor off
- ③ With pull-up resistor, Light on — Output transistor off
- ④ With pull-up resistor, Light on — Output transistor on

- Wire length

You can select the wire length, it from within a range of 50 mm to 990 mm in increments of 10 mm.

- Connector

We have a large selection of quasi-standard products offering different connectors, in addition to our standard products.

Recommended connectors

Name of Manufacturer	Pitch between Terminals[mm]	Product Number		
		Straight	Light Angle	Housing
Tyco Electronics AMP K.K.	2	292133-3	292250-3	179228-3
	2.5	171825-3	171826-3	171822-3
JST Mfg. Co., Ltd.	2	B3B-PH-K-S	S3B-PH-K-S	PHR-3
	2.5	B3B-EH	S3B-EH	EHR-3
Molex Incorporated	2	53253-0310	53254-0310	51065-0300
	2.5	5045-03A	5046-03A	51191-0300

We also offer the connectors other than those above, please feel free to contact our sales desk.

1.4 Terms and symbols

Term	Symbol	Description
Absolute Maximum Rating	—	Threshold value that must not be exceeded even instantaneously
Ambient Temperature	T _A	Ambient temperature of the sensor
Forward DC Current	I _F	Direct current flowing forward between anode and cathode
Forward DC Current Derating	$\Delta I_F / ^\circ\text{C}$	Derating ratio of permissible forward current to temperature change
Reverse DC Voltage	V _R	Voltage applied in the reverse direction between anode and cathode
Power Dissipation	P _D	Permissible power dissipation between anode and cathode
Pulse Forward Current	I _{FP}	Forward current during pulse operation with the specified pulse width and duty ratio
Supply Voltage	V _{CC}	Supply voltage to operate the sensor
Output Voltage	V _O	Potential difference between the output transistor's GND and output terminal
Output Current	I _O	Current flowing through the collector of the output transistor
Power Dissipation	P _O	Power permissible value consumed in the output transistor
Power Dissipation Derating	$\Delta P_O / ^\circ\text{C}$	Derating ratio of output permissible dissipation to temperature change
Collector-Emitter Voltage	V _{CEO}	Voltage applied between collector and emitter when the base terminal is open
Emitter-Collector Voltage	V _{ECO}	Voltage applied between emitter and collector when the base terminal is open
Collector Current	I _C	Direct current flowing through the collector
Collector Power Dissipation	P _C	Permissible collector power dissipation
Collector Power Dissipation Derating	$\Delta P_C / ^\circ\text{C}$	Derating ratio of permissible collector power dissipation to temperature change
Forward Voltage	V _F	Voltage drop value between anode and cathode when current flows forward
Reverse Current	I _R	Current flowing in the reverse direction between anode and cathode
Peak Wavelength (LED)	λ_p	Wavelength of which emission intensity becomes maximum in the emission spectrum
Peak Wavelength (Detector)	λ_p	Wavelength of which light receiving sensitivity becomes maximum
Off-State Collector Current	I _{CEO}	Collector current flowing when the specified voltage (V _{CE}) is applied between receiving element terminals under the light shut-off condition
Light Current	I _L	Direct current flowing through the collector (collector current flowing through the phototransistor with input light)
Leak Current	I _{LEAK}	Direct current (including off-state collector current) flowing through the collector at the light shut-off time for photointerrupters or at the non-detected object time for the reflective type photosensors (at no prism time for the regressive reflection type photosensors) under the ambient light shut-off condition
Collector-Emitter Saturation Voltage	V _{CE(sat)}	Voltage between collector and emitter with specified saturation conditions
High Level Output Voltage	V _{OH}	Output voltage value when the specified high-level output current flows through the output terminal
Low Level Output Voltage	V _{OL}	Output voltage when the specified low-level output current flows through the output terminal
High Level Output Current	I _{OH}	Output current value flowing through the output terminal under the specified high-level output voltage condition
Low Level Output Current	I _{OL}	Output current value flowing through the output terminal under the specified low-level output voltage condition
Current Consumption	I _{CC}	Current flowing into the circuit power terminal
Switching Time	—	Time of output responding to input
Rise Time	t _r	Time required for output to increase from 10% to 90%
Fall Time	t _f	Time required for output to decrease from 90% to 10%
Propagation Delay Time L→H	t _{pLH}	Time required from the input off-to-on (on-to-off) time to the output low-to-high level time
Propagation Delay Time H→L	t _{pHL}	Time required from the input off-to-on (on-to-off) time to the output high-to-low level time
Operating Temperature Range	T _{opr}	Ambient temperature that allows operation without damaging the functions of the sensor
Storage Temperature Range	T _{stg}	Range of ambient temperatures that are storable under non-operational conditions
Soldering Temperature	T _{sol}	Temperature that allows soldering of terminals without damaging element functions

1.5 Photosensor Reliability

■ Quality / Reliability Policy

As a Sensing Solution provider our goal is to maintain and improve our high level of Quality & Reliability to our customer's satisfaction. All of our employees have the following understanding of our Quality Policy.

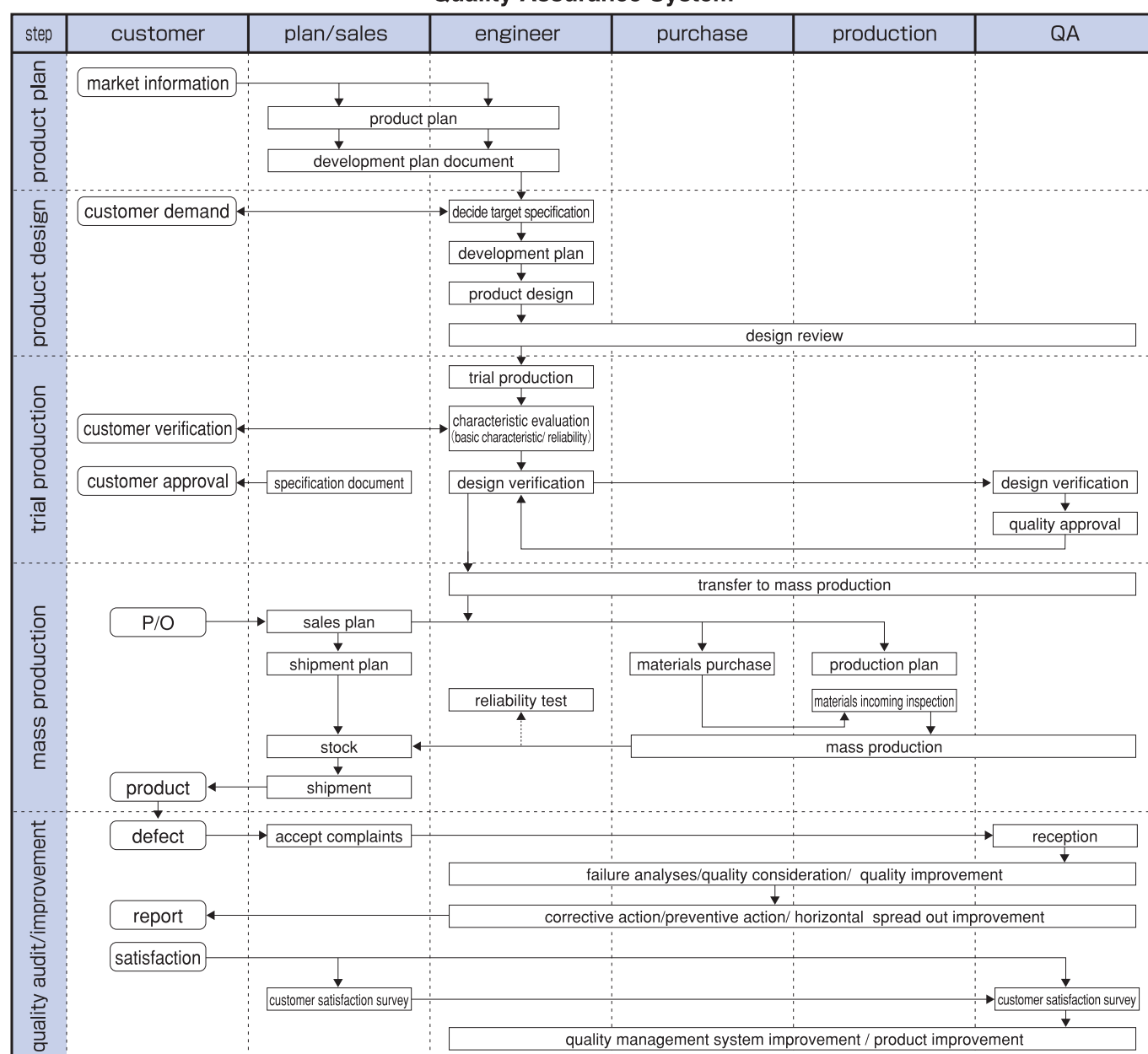
Nippon Aleph Quality Policy : We aggressively pursue improvements for customer satisfaction. We continuously improve our Quality Management System and verify effectiveness. We provide product & service that win the customer's trust and confidence to give them piece of mind to partner with Aleph for long term.

From product design to shipment of finished goods, we are building companywide Quality Management System in pursuit of effective day to day operation and overall customer satisfaction.

■ Quality Assurance System

Aleph Quality Assurance Practices and Procedures are show in the below flowcharts.

Quality Assurance System



■ Reliability Test

In verifying our high product reliability and process quality, we have implemented an Environmental Test and A Long Term Life Test to our Reliability procedures.

All Aleph Photosensor comply with Electronic Industries Association of Japan standards EIAJ ED-4701 and ED-8121.

2. Product Handling

2. Product Handling

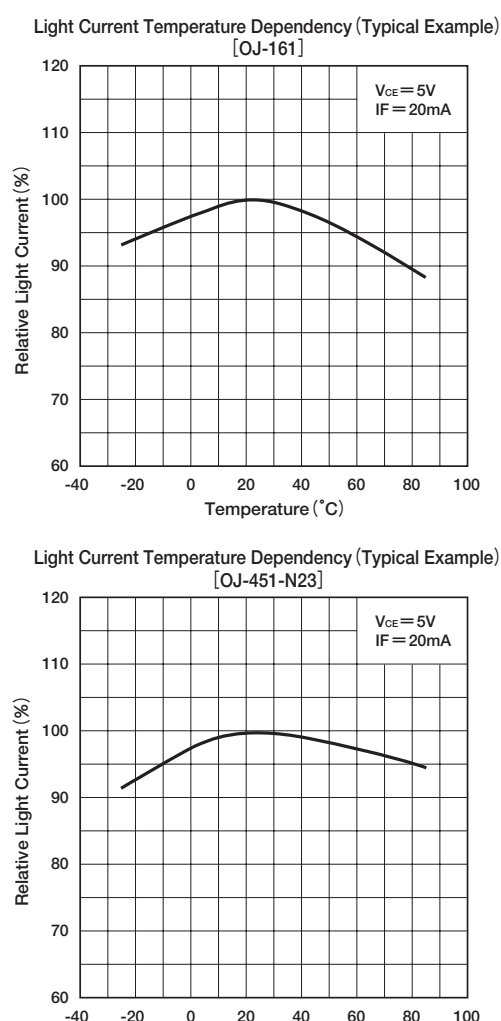
1. Life of photosensor

The life of a photosensor comes under great influence of deterioration of the optical output of a light emitting diode. When you use the photosensor continuously over a long period of time, use it by considering a decrease in the output of the light emitting diode. It is recommended that you check the life properties in advance before selecting a photosensor and setting the operating conditions.

2. Light current vs. Ambient Temperature characteristics

The temperature characteristics of the light current I_L of a photosensor depend on the product. (Refer to the figure below.) The change in output differs depending on the product as shown in the figure below, but it is recommended to design by considering that light current is attenuated approx. 20% at the limit of a working temperature.

(Typical example of temperature characteristics)



3. Ambient light

Since this is a photosensor for integration into equipment, no special measures against ambient light are taken. Install the photosensor in such a manner so as to prevent ambient light from directly entering. (Especially for sunlight and a tungsten lamp.)

4. Precautions for IC type

4-1. Cautions in turning on power

Since output changes for approx. 100 μ s until the internal circuit becomes stable when the power is turned on, use the photosensor after it has fully stabilized.

4-2. Stabilization of power supply line

It is recommended to use a photosensor by installing a bypass capacitor of 0.01 μ F or more between Vcc and GND for stabilization of a power supply line.

5. Light interrupting plate

For a light interrupting plate to be used in the photo-interrupter, use one with a high light blocking effect. Selecting one with a low light blocking effect causes a malfunction.

6. Fail-safe design

Photosensors are products that are manufactured for use in the following applications:

OA equipment, AV equipment, home appliances, telecommunication equipment (terminals), testing equipment, machine tools, computers

When you use this product for an application that requires high reliability and safety in terms of function and accuracy, use the product after considering safety design of the entire system and equipment such as by taking measures for fail-safe design or redundant design to maintain reliability and safety.

7. Static electricity

When handling the product, use it in an environment where static electricity is less prone to occur.

Factors where static electricity is prone to occur

- Effects of humidity

When humidity decreases, static electricity is prone to occur. The recommended humidity is 40–60%.

- Bringing materials that are prone to build up static electricity into a work site (such as sweaters, work clothes that are prone to be charged).

- Ungrounded electric conductors such as equipment and jigs.

8. Material contained in elements

Gallium arsenide (GaAs) is used as material in elements. Since this may have ill effects on the human body, do not disassemble the product.

9. Cleaning

Since there may be cleaning agent remaining within the casing, do not clean the product. If needed, blow air on the product or wipe it with a soft cloth dampened with a cleaning agent. For the cleaning agent, use methanol or isopropyl alcohol.

10. Connector

When inserting or removing the connector, do so at ordinary temperatures. Doing so at high or low temperatures may cause damage.

11. Scratches and adherents

Prevent the casing surface, which is a light transmitting part, from getting scratched. In addition, be careful so that there are no adherents.

12. Load

Store or use the product in conditions applying no loads that cause deformation or deterioration of the product.

13. Absolute maximum rating, electrical, optical characteristics

When designing the product, use it after fully understanding the “absolute maximum rating” and “electrical, optical characteristics.”

“Absolute maximum rating”

This indicates the threshold value that must not be exceeded even instantaneously. Using the product with the absolute maximum rating exceeded not only decreases reliability significantly but also may cause breakdown. Therefore, exercise care in this regard. Derate specifications to maintain reliability within the specifications.

“Electrical, optical characteristics”

These indicate the threshold values that are guaranteed when the product is inspected under certain measuring conditions.

14. Hand Soldering

Aleph recommends that during hand soldering process the iron's temperature should be set below 350°C and the heat applied to the product should be less than 3 minutes, one time, each terminal. Also consult the soldering limitation of the PCB with the PCB supplier. Addition heat conditions will stress the product and possible cause failure. Just after soldering, care should be taken to avoid external stress to the product. Handling of the product should be done after the product has cooled back down to room temperature.

3. Selection Guide

3.1 Product Chart

■ Photointerrupters

[PCB direct mounting]

Product Number	Features	Slot Width (mm)	Slit Width (mm)	Slit Shape	Output Forms		Connection Diagram	Reference Page
					Photo Tr Output	Photo IC Output		
OJ-135	High resolution, With positioning boss	3	0.25	Vertical		○	C*1	P.40
OJ-141	With positioning boss	3	0.5	Vertical	○		A	P.42
OJ-155	High resolution, With positioning boss	5	0.25	Vertical		○	C*1	P.44
OJ-161	With positioning boss	5	0.5	Vertical	○		A	P.46
OJ-1605		5	0.5	Vertical		○	C*1	P.48
OJ-191	High resolution, With positioning boss	3.2	0.3	Vertical	○		A	P.50
OJ-227	Angular slit, With positioning boss	3	0.5	Angular slit		○	E*1	P.52
OJ-241	Horizontal slit, With positioning boss	3	0.5	Horizontal	○		A	P.54
OJ-257	Angular slit, With positioning boss	5	0.5	Angular slit		○	E*1	P.56
OJ-261	Horizontal slit, With positioning boss	5	0.5	Horizontal	○		A	P.58
OJ-291	Dustproof type, With positioning boss	5	0.5	Vertical	○		A	P.60
OJ-295	Dustproof type, With positioning boss	5	0.5	Vertical		○	C*1	P.62
OJ-211	Low height case, with positioning boss	4.5	1	Vertical	○		A	P.64
OJ-231		5	0.5	Vertical	○		A	P.66
OJ-235		5	0.5	Vertical		○	C*1	P.68
OJ-271		5	0.5	Horizontal	○		A	P.70
OJ-275		5	0.5	Horizontal		○	C*1	P.72
OJ-711	2-Gang photointerrupter, Both-side mounting type	3	1 (Detection slit x 2)	Vertical	○		B	P.74

* 1 Also, products is possible that are compliant with the connection diagrams C, D, E and F.

[With connector]

Product Number	Features	Slot Width (mm)	Slit Width (mm)	Output Forms		Connection Diagram	Reference Page
				Photo Tr Output	Photo IC Output		
OJ-401-N29	Double mold, Dustproof type One side mounting type	5	0.5	○		G	P.76
OJ-401-N81		5	0.5	○		A	P.78
OJ-405-N29		5	0.5		○	I*2	P.80
OJ-411-N23	Both-side mounting type	3.6	0.5	○		G	P.82
OJ-451-N23	Dustproof type, One side mounting type	5	0.5	○		G	P.84
OJ-4506-N23		5	0.5		○	J*2	P.86
OJ-461-N23	Dustproof type, Snap-in mounting type	5	0.5	○		G	P.88
OJ-4606-N23		5	0.5		○	J*2	P.90
OJ-4706-N23	Dustproof type, High resolution, One side mounting type	5	0.25		○	J*2	P.92
OJ-4806-N23	Dustproof type, High resolution, Snap-in mounting type	5	0.25		○	J*2	P.94
OJ-497-A14	Dustproof type, One side mounting type	3	0.5		○	K*2	P.96
OJ-501-N23	Double mold, Dustproof type One side mounting type	5	0.5	○		G	P.98
OJ-505-N23		5	0.5		○	I*2	P.100
OJ-511-A8	Snap-in mounting type	5	0.5	○		G	P.102
OJ-521-N23	Both-side mounting type	5	0.5	○		G	P.104
OJ-5215-N2		5	0.5		○	I*2	P.106
OJ-531-A5	Snap-in mounting type	5	0.5	○		G	P.108
OJ-5305-A5		5	0.5		○	I*2	P.110
OJ-5315-A5		5	0.5		○	I*2	P.112
OJ-541-A5	Deep slot, Snap-in mounting type	5	0.5	○		G	P.114
OJ-5405-A5		5	0.5		○	I*2	P.116
OJ-551-A5	Dustproof type, Snap-in mounting type	5	0.5	○		G	P.118
OJ-5505-A5		5	0.5		○	I*2	P.120
OJ-611-A8	Dustproof type, Deep slot, Both-side mounting type	8.7	0.7	○		G	P.122
OJ-635-N23	Double mold, Dustproof type	8	0.7		○	I*2	P.124
OJ-6505-A5	One side mounting type	5	0.7		○	I*2	P.126
OJ-665-N23	Deep slot, One side mounting type	5	0.5		○	I*2	P.128
OJ-6805-A5	One side mounting type	8	0.8		○	I*3	P.130
OJ-735-N23	Double mold, Dustproof type	13	1		○	I*2	P.132
OG-000001A-701	Wide gap, Snap-in mounting type	25	1.5		○*1	M	P.134
OD-501-N23	2-Wire type, Snap-in mounting type	5	0.5	2-Wire system		H	P.136
EOD-5081-701		5	0.5	2-Wire system		H	P.138

* 1 Sync light modulated type photo IC adopted.

* 2 Also, products is possible that are compliant with the connection diagrams I, J, K and L.

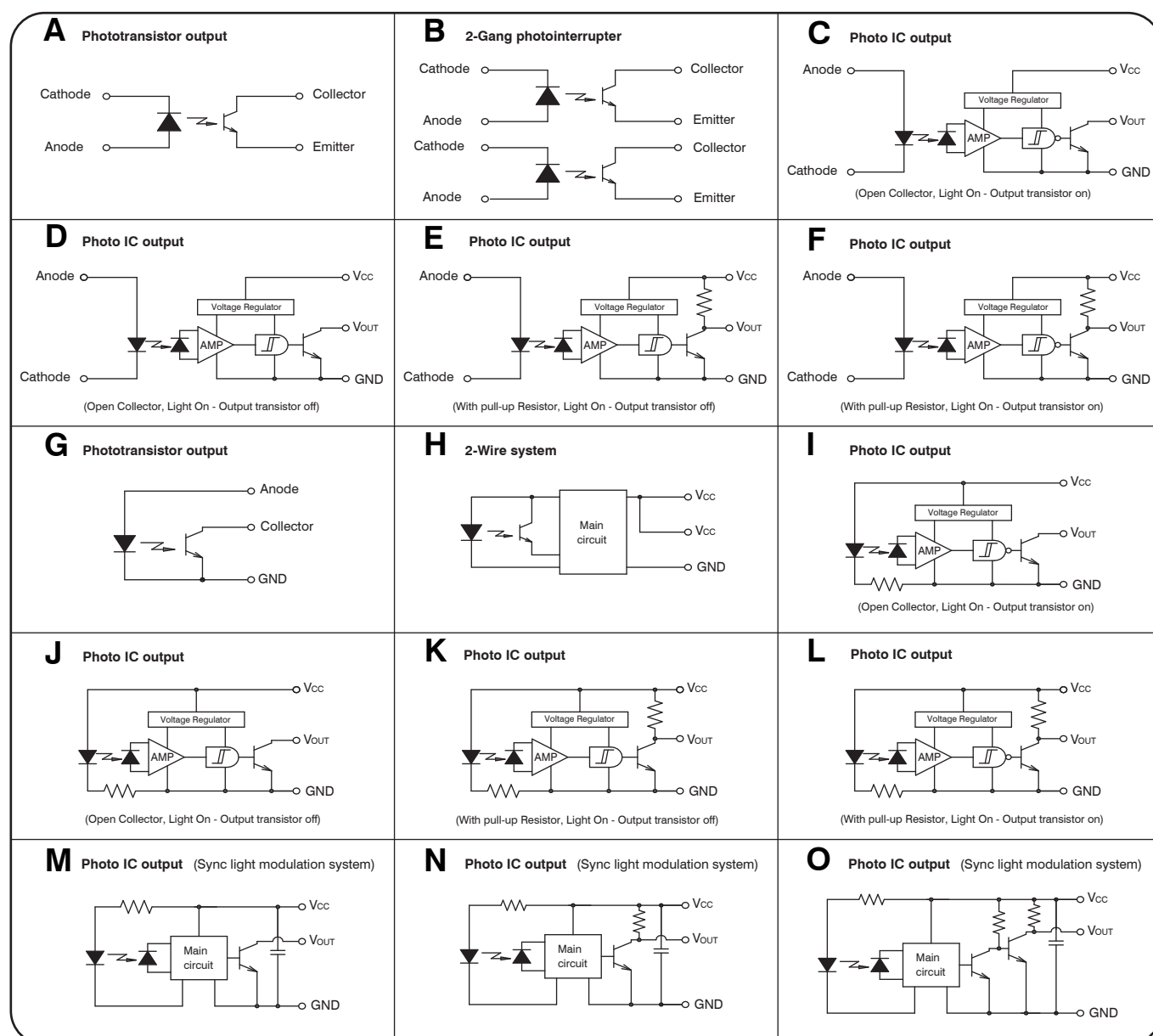
[With wires] *1

Product Number	Features	Slot Width (mm)	Slit Width (mm)	Output Forms		Connection Diagram	Reference Page
				Photo Tr Output	Photo IC Output		
OJ-311-30N8	Casing outline guard configuration	5	0.5	○		G	P.140
OJ-3305-30N8	Dustproof, High resolution, One side mounting type	3	0.25		○	I*2	P.142
OJ-4205-30N8	Dustproof type, One side mounting type	5	0.5		○	I*2	P.144
OJ-431-30		5	0.5	○		G	P.146
OJ-655-30		5	0.5		○	I*2	P.148

* 1 The standard cord length is 300 mm. If you order any other length of cord, select a length among 50-990 mm (in increments of 10 mm).

* 2 Also, products is possible that are compliant with the connection diagrams J, K and L.

■ Connection Diagrams



■ Reflective Type Photosensors

Product Number	Features	Detecting Distance (mm)	Output Forms		Connection Diagram	Reference Page
			Photo Tr Output	Photo IC Output		
OM-181	Side view type, PCB direct mounting type	2	○		A	P.152
OM-191		4	○		A	P.154
OM-281	Top view type, PCB direct mounting type	3	○		A	P.156
OM-3114-A5	Both-side mounting type, With connector	3 ~ 5	Comparator IC output		P	P.158
OM-371-A8	Snap-in mounting type, With connector	6	○		G	P.160
OM-751-N24	2-PT _r output, One side mounting type	1	○		Q	P.162
OM-819	3-Channel (R/G/B) independent analog output	5	3-Channel analog output		Y	P.164
OH-138-A5	Compact size	1~9		○*1	N	P.166
OH-117-A5	Short distance detecting	1~9		○*1	O	P.168
OH-118-A5	One side mounting type(3-way mountable)	1~9		○*1	N	P.170
OH-217-A5	Middle distance detecting	4~18		○*1	O	P.172
OH-218-A5	One side mounting type(3-way mountable)	4~18		○*1	N	P.174
OH-317-A5	Long distance detecting	9~25		○*1	O	P.176
OH-318-A5	One side mounting type(3-way mountable)	9~25		○*1	N	P.178

* 1 Sync light modulated type photo IC adopted.

■ Regressive Reflection Type Photosensors

Product Number	Prism Product Number	Features	Distance between Sensor and Prism (mm)	Output Forms		Connection Diagram	Reference Page
				Photo Tr Output	Photo IC Output		
ON-111-N24	E-800244	Compact	10	○		S*2	P.182
ON-121-N24	E-800244	Dustproof type	10	○		S*2	P.184
ON-151-N23	E-800244	Dustproof type	20	○		T	P.186
ON-171-A8	E-800244	Snap-in mounting type	6	○		T	P.188
EON-5041-701	E-800244	Snap-in mounting type	10	○		U	P.190
ON-658-N29	E-800198	Long distance, Snap-in mounting type	50		○*1	V	P.192

* 1 Sync light modulated type photo IC adopted.

* 2 Also, products is possible that are compliant with the connection diagrams U (anode and collector in common).

■ Actuator Type Photosensors

Product Number	Features	Output Forms		Connection Diagram	Reference Page
		Photo Tr Output	Photo IC Output		
OS-139A-N2	Snap-in mounting type, actuator upper side mounted	Transistor output		Z	P.218
OS-201A	Compact, PCB direct mounting type	○		A	P.220
OS-251SA-30N8	Low height case, Snap-in mounting type, With wire type*2	○		G	P.222
OS-261A-N23	Low height case, Snap-in mounting type, With connector type	○		G	P.224
OS-2605A-N23	Low height case, Snap-in mounting type, With connector type		○	I*4	P.226
OS-371A-30N8	Wire right and left extracting directions prepared*2	○		G	P.228
OS-3x1 Series*1	Snap-in mounting type	○		G*3	P.232~
OS-3x05 Series*1	With connector type and with wire type prepared*2		○	I*4	P.234~
OS-5x1 Series*1	Connector/wire right and left extracting directions prepared	○		G*3	P.248~
OS-5x05 Series*1	Actuator O-shaped bearing, U shape selectable		○	I*4	P.250~
OS-535L-A8	Snap-in mounting type, Connector right extraction		○	I*4	P.264
OS-545L-A8	Snap-in mounting type, Connector left extraction		○	I*4	P.266
OS-955A-H5	Snap-in mounting type, Connector right extraction		○	I*4	P.268
OS-965A-H5	Snap-in mounting type, Connector left extraction		○	I*4	P.270

* 1 For our series, refer to the Selection Guide by Configuration (p.34).

* 2 The standard wire length is 300 mm. If you order any other length of wire, select a length among 50-990 mm (in increments of 10 mm).

* 3 Also, products is possible that are compliant with the connection diagrams R (with limiting resistor) .

* 4 Also, products is possible that are compliant with the connection diagrams J, K and L.

■ Photo Level Sensors

Product Number	Features	Detecting Position from Mounted Surface (mm)	Output Forms	Connection Diagram	Reference Page
OL-221-30N56R	Level detection of kerosene and silicon oil	36	PT _r Output	R	P.274

■ Separate Type Photosensors

Product Number	Features	Detecting Distance (mm)	Output Forms		Connection Diagram	Reference Page
			Photo Tr Output	Photo IC Output		
OF-11T-N23, OF-11R1-N23	Compact	100	○		W	P.196
OF-12T-N23, OF-12R1-N23	Dustproof type	100	○		W	P.198
OF-16T-N23, OF-16R1-N23	Snap-in mounting type	100	○		W	P.200
OF-25T-N23, OF-25R1-N23	Screw clamp type	100	○		W	P.202
OF-25T-N23, OF-25R5-N23	Screw clamp type	40		○	C*2	P.204
OF-32T-N23, OF-32R5-N23	Screw clamp type	250		○	C*2	P.206
OF-41T-N23, OF-41R1-N23	Screw clamp type	100	○		W	P.208
OZ-120181A-702	Sync light modulated type	300		○*1	X	P.210
OZ-35T-N23, OZ-35R5-N24	Sync light modulated type	400		○*1	X	P.212
OZ-53T-30, OZ-53R6-30	Long distance, Vcc=12V/24V driving type	3000		○*1	X	P.214

* 1 Sync light modulated type photo IC adoption.

* 2 Also, products is possible that are compliant with the connection diagrams C, D, E and F.

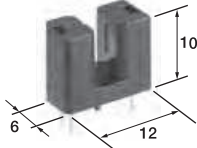
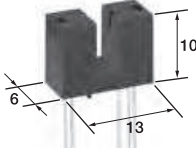
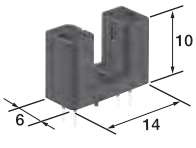
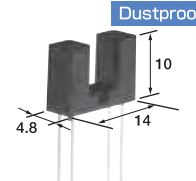
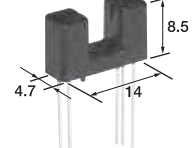
■ Connection Diagrams

P Comparator IC output	Q 2-Phototransistor Output	R Phototransistor output (with limiting resistor)
S Regressive Reflection Type Photosensor	T Regressive Reflection Type Photosensor	U Regressive Reflection Type Photosensor
V Regressive Reflection Type Photosensor (Sync light modulation system)	W Separate Type Photosensor	X Separate Type Photosensor (Sync light modulation system)
Y 3-Channel(R/G/B) independent analog output	Z Transistor output	AA PNP Transistor output
AB Photo IC output (Sync light modulation system)		

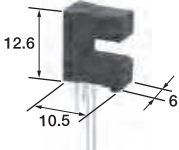
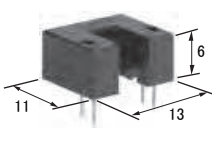
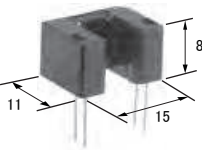
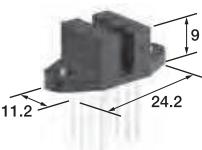
3.2 Photosensor Configuration

■ Photointerrupters

[PCB direct mounting]

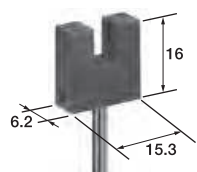
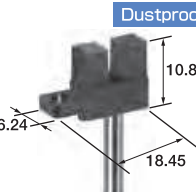
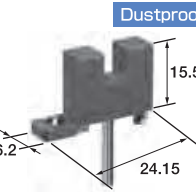
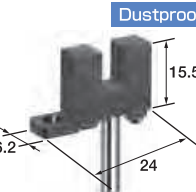
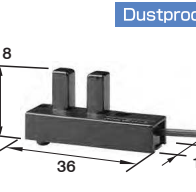
External Appearance (mm)					
Slot Width (mm)	3			5	5
Slot Depth (mm)	7.5			7.5	6
Slit Width (mm)	0.25	0.5	0.5*	0.5	
Product Number	Phototransistor Output	OJ-141 [P.42] OJ-241 [P.54]		OJ-161 [P.46] OJ-261 [P.58]	OJ-291 [P.60]
	Photo IC Output	OJ-135 [P.40]	OJ-227 [P.52]	OJ-155 [P.44] OJ-1605 [P.48]	OJ-295 [P.62] OJ-257 [P.56]

No mark: Vertical slit, *: Horizontal slit, **: Angular slit

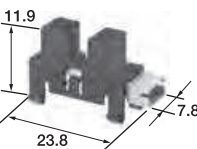
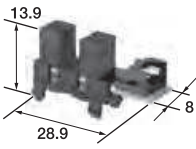
External Appearance (mm)					
Slot Width (mm)		3.2	4.5	5	
Slot Depth (mm)		7.3	7	8	
Slit Width (mm)		0.3	1	0.5	0.5*
				1 (Detection slit×2)	
Product Number	Phototransistor Output	OJ-191 [P.50]	OJ-211 [P.64]	OJ-231[P.66]	OJ-271[P.70]
	Photo IC Output			OJ-235[P.68]	OJ-275[P.72]

No mark: Vertical slit, *: Horizontal slit, **: Angular slit

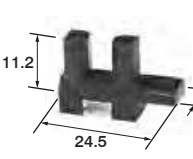
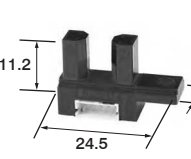
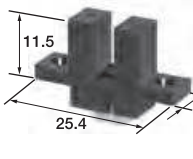
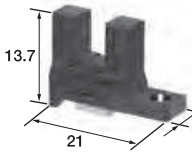
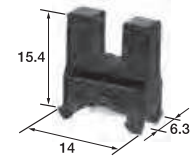
[With wire type]

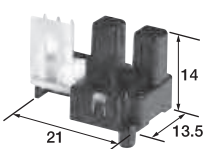
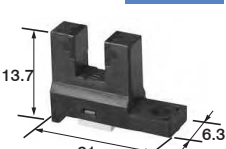
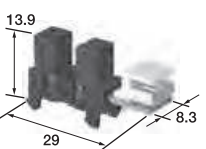
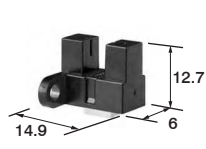
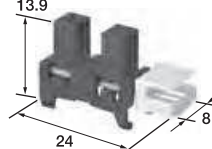
External Appearance (mm)					
Slot Width (mm)	5	3	5	5	5
Slot Depth (mm)	7.6	6.3	6.4	8.3	10.5
Slit Width (mm)	0.5	0.25	0.5	0.5	0.5**
Product Number	OJ-311-30N8 [P.140]	OJ-3305-30N8 [P.142]	OJ-4205-30N8 [P.144]	OJ-431-30 [P.146]	OJ-655-30 [P.148]
	Phototransistor Output	Photo IC Output	Photo IC Output	Phototransistor Output	Photo IC Output

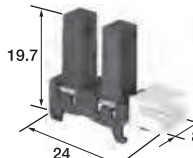
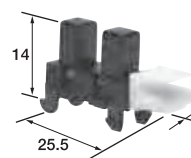
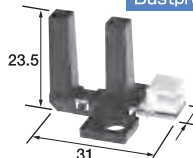
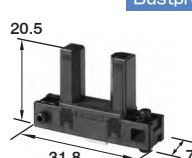

[2-Wire type]

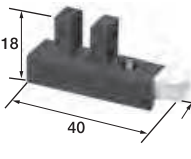
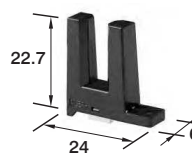
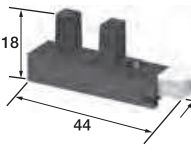
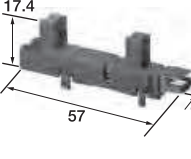
External Appearance (mm)		
Slot Width (mm)	5	5
Slot Depth (mm)	6.1	6.1
Slit Width (mm)	0.5	0.5
Product Number	OD-501-N23 [P.136]	EOD-5081-701 [P.138]
	2-Wire type	2-Wire type

[With connector type]

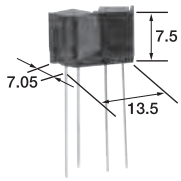
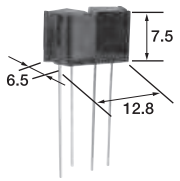
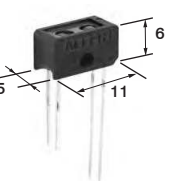
External Appearance (mm)		Dustproof		Dustproof		Dustproof		Dustproof	
									
Slot Width (mm)		5	5	3.6	5	5		5	
Slot Depth (mm)		8.2	8.2	9	7	7		7	
Slit Width (mm)		0.5	0.5	0.5	0.25	0.5	0.25	0.5	
Product Number	Phototransistor Output	OJ-401-N29 [P.76] (3 pin connector)	OJ-401-N81 [P.78] (5 pin connector)	OJ-411-N23 [P.82]		OJ-451-N23 [P.84]		OJ-461-N23 [P.88]	
	Photo IC Output	OJ-405-N29 [P.80]			OJ-4706-N23 [P.92]	OJ-4506-N23 [P.86]	OJ-4806-N23 [P.94]	OJ-4606-N23 [P.90]	

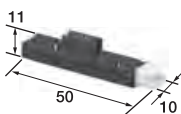



External Appearance (mm)			<div>Dustproof</div> 			
Slot Width (mm)	3	5	5	5	5	
Slot Depth (mm)	8	7	7.2	8.05	7.2	
Slit Width (mm)	0.5	0.5	0.5	0.5	0.5	
Product Number	Phototransistor Output	OJ-501-N23 [P.98] (3 pin connector)	OJ-511-A8 [P.102]	OJ-521-N23 [P.104]	OJ-531-A5 [P.108]	
	Photo IC Output	OJ-497-A14 [P.96]	OJ-505-N23 [P.100]	OJ-5215-N2 (12V) [P.106]	OJ-5305-A5 [P.110] OJ-5315-A5 (12V) [P.112]	





External Appearance (mm)						
Slot Width (mm)		5	5	8.7	8	13
Slot Depth (mm)		13	7.3	19.2	13	13
Slit Width (mm)		0.5	0.5	0.7	0.7	1.0
Product Number	Phototransistor Output	OJ-541-A5 [P.114]	OJ-551-A5 [P.118]	OJ-611-A8 [P.122]		
	Photo IC Output	OJ-5405-A5 [P.116]	OJ-5505-A5 [P.120]		OJ-635-N23 [P.124]	OJ-735-N23 [P.132]

External Appearance (mm)	Dustproof		Dustproof	
				
Slot Width (mm)	5	5	8	25
Slot Depth (mm)	10.5	16	10.5	10
Slit Width (mm)	0.7	0.5	0.8	1.5
Product Number	OJ-6505-A5 [P.126] Photo IC Output	OJ-665-A5 [P.128] Photo IC Output	OJ-6805-A5 [P.130] Photo IC Output	OG-000001A-701 [P.134] Light modulated type Photo IC Output

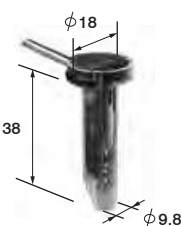
■ Reflective Type Photosensors

External Appearance (mm)			
Detecting Distance (mm) (Output peak time)	2	4	3
Product Number	OM-181 [P.152]	OM-191 [P.154]	OM-281 [P.156]
Phototransistor Output			

External Appearance (mm)				
Detecting Distance (mm)	3 ~ 5	6	1	5
Product Number	OM-3114-A5 [P.158]	OM-371-A8 [P.160]	OM-751-N24 [P.162]	OM-819 [P.164]
	Comparator IC Output		Media Identification	Color Sensor

External Appearance (mm)				
Detecting Distance (mm)	1 ~ 9	1 ~ 9	4 ~ 18	9 ~ 25
Product Number	OH-138-A5 (Detecting-Low) [P.166]	OH-117-A5 (Detecting-High) [P.168] OH-118-A5 (Detecting-Low) [P.170]	OH-217-A5 (Detecting-High) [P.172] OH-218-A5 (Detecting-Low) [P.174]	OH-317-A5 (Detecting-High) [P.176] OH-318-A5 (Detecting-Low) [P.178]
	Light modulated type Photo IC Output	Light modulated type Photo IC Output	Light modulated type Photo IC Output	Light modulated type Photo IC Output

■ Photo Level Sensors

External Appearance (mm)	
Detecting Distance Mounted Surface (mm)	36
Product Number	OL-221-30N56R [P.274]
	Phototransistor Output

■ Separate Type Photosensors

External Appearance (mm)					
Detecting Distance (mm)	0 ~ 100	0 ~ 100	0 ~ 100	0 ~ 100	0 ~ 100
Product Number	OF-11T-N23 (LED side) [P.196] OF-11R1-N23 (Detector side) Phototransistor Output	OF-12T-N23 (LED side) [P.198] OF-12R1-N23 (Detector side) Phototransistor Output	OF-16T-N23 (LED side) [P.200] OF-16R1-N23 (Detector side) Phototransistor Output	OF-25T-N23 (LED side) [P.202] OF-25R1-N23 (Detector side) Phototransistor Output	OF-41T-N23 (LED side) [P.208] OF-41R1-N23 (Detector side) Phototransistor Output

External Appearance (mm)					
Detecting Distance (mm)	0 ~ 40	0 ~ 250	0 ~ 300	0 ~ 400	0 ~ 3000
Product Number	OF-25T-N23 (LED side) [P.204] OF-25R5-N23 (Detector side) Photo IC Output	OF-32T-N23 (LED side) [P.206] OF-32R8-N23 (Detector side) Photo IC Output	OZ-120181A-702 [P.210] Light modulated type Photo IC Output	OZ-35T-N23 (LED side) [P.212] OZ-35R5-N24 (Detector side) Light modulated type Photo IC Output	OZ-53T-30 (LED side) [P.214] OZ-53R6-30 (Detector side) Light modulated type Photo IC Output

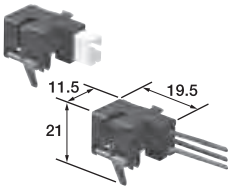
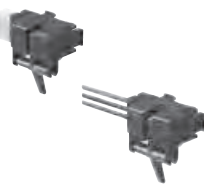


■ Regressive Reflection Type Photosensors

External Appearance (mm)					
Detecting Distance (mm)	10	10	20	10	6
Product Number*	ON-111-N24 [P.182] (E-800244) Phototransistor Output	ON-121-N24 [P.184] (E-800244) Phototransistor Output	ON-151-N23 [P.186] (E-800244) Phototransistor Output	EON-5041-701 [P.188] (E-800244) Phototransistor Output	ON-171-A8 [P.190] (E-800244) Phototransistor Output

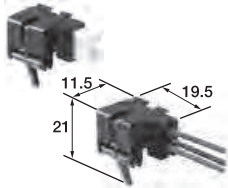



External Appearance (mm)	
Detecting Distance (mm)	50
Product Number*	ON-658-N29 [P.192] (E-800198) Light modulated type Photo IC Output

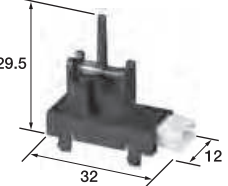
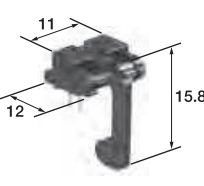
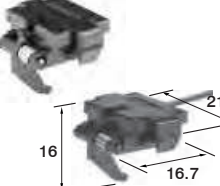
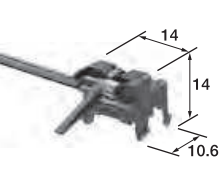
* The inside of () is the product number of a prism

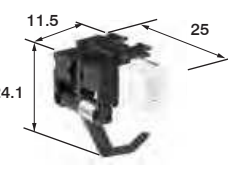
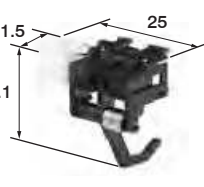
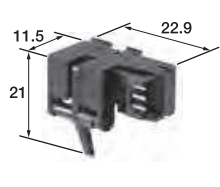
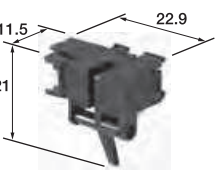
■ Actuator Type Photosensors [OS-3x1, OS-3x05 Series]

External Appearance (mm)					
Mounting Sheet Metal Thickness (mm)		0.8mm, 1mm, 1.2mm	0.8mm, 1mm, 1.2mm	0.8mm, 1mm, 1.2mm	0.8mm, 1mm, 1.2mm
Actuator Bearing Configuration		U-shaped	U-shaped	O-shaped	O-shaped
Connector/Wire Extracting Direction		Right	Left	Right	Left
Product Number	Phototransistor Output	OS-311A-N2 (with connector) [P.232] OS-311A-30 (with wire)	OS-321A-N2 (with connector) [P.236] OS-321A-30 (with wire)	OS-351A-N2 (with connector) [P.240] OS-351A-30 (with wire)	OS-361A-N2 (with connector) [P.244] OS-361A-30 (with wire)
	Photo IC Output	OS-3105A-N2 (with connector) [P.234] OS-3105A-30 (with wire)	OS-3205A-N2 (with connector) [P.238] OS-3205A-30 (with wire)	OS-3505A-N2 (with connector) [P.242] OS-3505A-30 (with wire)	OS-3605A-N2 (with connector) [P.246] OS-3605A-30 (with wire)

[OS-5x1, OS-5x05 Series]

External Appearance (mm)					
Mounting Sheet Metal Thickness (mm)		1mm	1mm	1mm	1mm
Actuator Bearing Configuration		U-shaped	U-shaped	O-shaped	O-shaped
Connector/Wire Extracting Direction		Right	Left	Right	Left
Product Number	Phototransistor Output	OS-511A-N2 (with connector) [P.248] OS-511A-30 (with wire)	OS-521A-N2 (with connector) [P.252] OS-521A-30 (with wire)	OS-551A-N2 (with connector) [P.256] OS-551A-30 (with wire)	OS-561A-N2 (with connector) [P.260] OS-561A-30 (with wire)
	Photo IC Output	OS-5105A-N2 (with connector) [P.250] OS-5105A-30 (with wire)	OS-5205A-N2 (with connector) [P.254] OS-5205A-30 (with wire)	OS-5505A-N2 (with connector) [P.258] OS-5505A-30 (with wire)	OS-5605A-N2 (with connector) [P.262] OS-5605A-30 (with wire)

External Appearance (mm)					
Features		• Snap-in mounting type • Actuator upper side mounting	• PCB direct mounting type • Compact	• Snap-in mounting type • Space-saving configuration	• Snap-in mounting type • Space-saving configuration
Product Number	Phototransistor Output	OS-139A-N2 [P.218]	OS-201A [P.220]	OS-251SA-30N8 (with wire) [P.222] OS-261A-N23 (with connector) [P.224]	OS-371A-30N8 [P.228]
	Photo IC Output			OS-2605A-N23 (with connector) [P.226]	

External Appearance (mm)					
Features		• Connector extracting direction: Right • Bearing shape: O-shaped	• Connector extracting direction: Left • Bearing shape: O-shaped	• Connector extracting direction: Right • Bearing shape: O-shaped	• Connector extracting direction: Left • Bearing shape: O-shaped
Product Number		OS-535L-A8 [P.264]	OS-545L-A8 [P.266]	OS-955A-H5 [P.268]	OS-965A-H5 [P.270]
Photo IC Output					