OMRON

Components Catalogue

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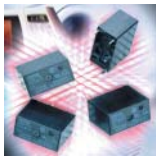

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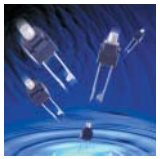

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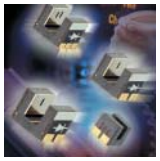

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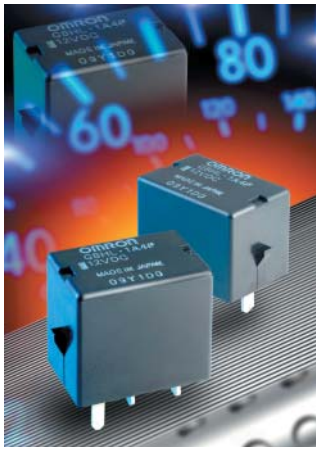

Omron Components is a world-class business delivering a wide range of high quality, high performance components utilising latest technologies and backed by full technical, applications and logistical support.

We offer the widest range of relays for power, signal and automotive applications as well as solid-state and MOSFET relays. Our G3VM MOSFETS combine the advantages of mechanical and solid-state technologies allowing design flexibility with either AC or DC load able to be connected in either direction. We are also developing our range of microsensors, and currently offer photomicrosensors and a new range of D8M-D8 micro pressure-sensors which meet stringent safety standards such as working reliably with low pressure, metal casing and flange fitting. Our broad range of switches includes micro, DIP, and tactile options, and you will find a wide selection of connectors to meet industry-standard data interconnect, power transmission and signalling. Omron Double Reflection LEDs feature built-in optical light guide technology that more than doubles effective light output compared with conventional bullet-type LEDs.

Environmental research and experience enabled us to formulate a policy to remove recognised hazardous substances from our products well within the timescales of European Directives. We have identified suitable alternative materials and agreed the changes we need to make to our production processes in order to maintain quality levels. All of our manufacturing sites have achieved ISO14001 certification for the management of environmental protection in our organisation.

Using our website alongside this catalogue, you can be kept fully up-to-date with our range of products, technical capabilities and environmental policy.

www.eu.omron.com/ocb

Dimensions

Note: All units are in millimeters unless otherwise indicated. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

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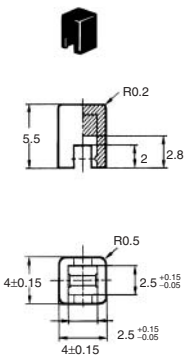

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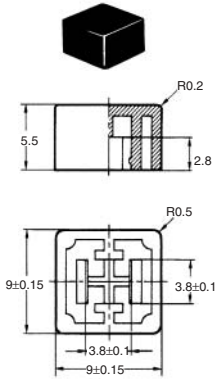

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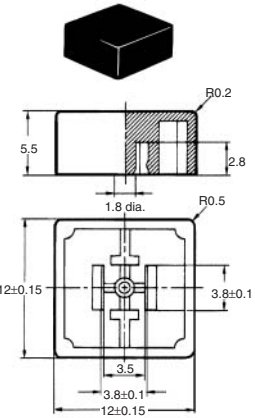

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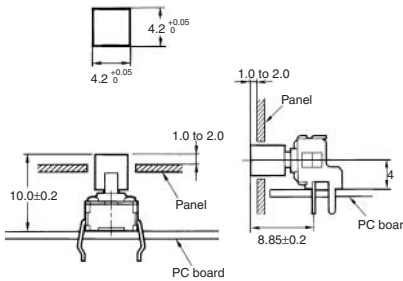

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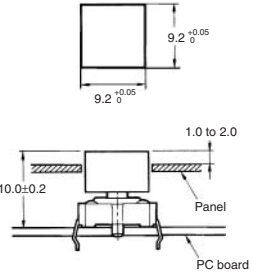

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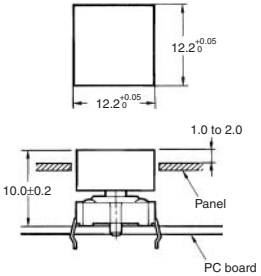

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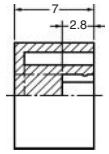

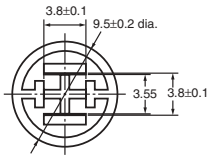

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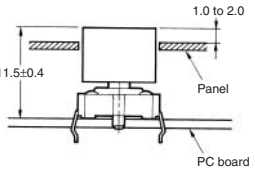
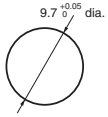




ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Technical Information

The Photomicrosensor is a compact optical sensor that senses objects or object positions with an optical beam. The transmissive Photomicrosensor and reflective Photomicrosensor are typical Photomicrosensors.

The transmissive Photomicrosensor incorporates an emitter and a transmissive that face each other as shown in Figure 1. When an object is located in the sensing position between the emitter and the detector, the object intercepts the optical beam of the emitter, thus reducing the amount of optical energy reaching the detector.

The reflective Photomicrosensor incorporates an emitter and a detector as shown in Figure 2. When an object is located in the sensing area of the reflective Photomicrosensor, the object reflects the optical beam of the emitter, thus changing the amount of optical energy reaching the detector.

"Photomicrosensor" is an OMRON product name. Generally, the Photomicrosensor is called a photointerrupter.

Figure 1. Transmissive Photomicrosensor

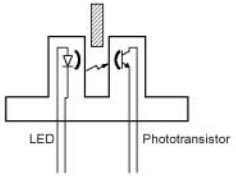
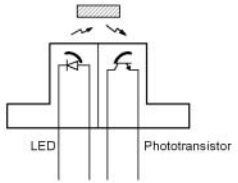


Figure 2. Reflective Photomicrosensor



■ DataSheet

Absolute Maximum Ratings and Electrical and Optical Characteristics

The datasheets of Photomicrosensors include the absolute maximum ratings and electrical and optical characteristics of the Photomicrosensors as well as the datasheets of transistors and ICs. It is necessary to understand the difference between the absolutemaximum ratings and electrical and optical characteristics of various Photomicrosensors.

Absolute Maximum Ratings

The absolute maximum ratings of Photomicrosensors and other products with semiconductors specify the permissible operating voltage, current, temperature, and power limits of these products.

The products must be operated absolutely within these limits.

Therefore, when using any Photomicrosensor, do not ignore the absolute maximum ratings of the Photomicrosensor, otherwise the Photomicrosensor will not operate precisely. Furthermore, the Photomicrosensor may be deteriorate or become damaged, in which case OMRON will not be responsible.

Practically, Photomicrosensors should be used so that there will be some margin between their absolute maximum ratings and actual operating conditions.

Electrical and Optical Characteristics

The electrical and optical characteristics of Photomicrosensors indicate the performance of Photomicrosensors under certain conditions.

Most items of the electrical and optical characteristics are indicated by maximum or minimum values. OMRON usually sells Photomicrosensors with standard electrical and optical characteristics.

The electrical and optical characteristics of Photomicrosensors sold to customers may be changed upon request. All electrical and optical characteristic items of Photomicrosensors indicated by maximum or minimum values are checked and those of the Photomicrosensors indicated by typical values are regularly checked before shipping so that OMRON can guarantee the performance of the Photomicrosensors.

In short, the absolute maximum ratings indicate the permissible operating limits of the Photomicrosensors and the electrical and optical characteristics indicate the maximum performance of the Photomicrosensors.

Terminology

The terms used in the datasheet of each Photomicrosensor with a phototransistor output circuit or a photo IC output circuit are explained below.

■ Phototransistor Output Photomicrosensor

Symbol	Item	Definition
I_{FP}	**Pulse forward current**	The maximum pulse current that is allowed to flow continuously from the anode to cathode of an LED under a specified temperature, a repetition period, and a pulse width condition.
I_C	**Collector current**	The current that flows to the collector junction of a phototransistor.
P_C	**Collector dissipation**	The maximum power that is consumed by the collector junction of a phototransistor.
I_D	**Dark current**	The current leakage of the phototransistor when a specified bias voltage is imposed on the phototransistor so that the polarity of the collector is positive and that of the emitter is negative on condition that the illumination of the Photomicrosensor is 0 ℓx.
I_L	**Light current**	The collector current of a phototransistor under a specified input current condition and at a specified bias voltage.
V_{CE} (sat)	**Collector-emitter saturated voltage**	The ON-state voltage between the collector and emitter of a phototransistor under a specified bias current condition.
I_{LEAK}	**Leakage current**	The collector current of a phototransistor under a specified input current condition and at a specified bias voltage when the phototransistor is not exposed to light.
tr	**Rising time**	The time required for the leading edge of an output waveform of a phototransistor to rise from 10% to 90% of its final value when a specified input current and bias condition is given to the phototransistor.
tf	**Falling time**	The time required for the trailing edge of an output waveform of a phototransistor to decrease from 90% to 10% of its final value when a specified input current and bias condition is given to the phototransistor.
V_{CEO}	**Collector-emitter voltage**	The maximum positive voltage that can be applied to the collector of a phototransistor with the emitter at reference potential.
V_{ECO}	**Emitter-collector voltage**	The maximum positive voltage that can be applied to the emitter of a phototransistor with the collector at reference potential.

Phototransistor/Photo IC Output Photomicrosensor

Symbol	Item	Definition
I_F	**Forward current**	The maximum DC voltage that is allowed to flow continuously from the anode of the LED to the cathode of the LED under a specified temperature condition.
V_R	**Reverse voltage**	The maximum negative voltage that can be applied to the anode of the LED with the cathode at reference potential.
V_{CC}	**Supply voltage**	The maximum positive voltage that can be applied to the voltage terminals of the photo IC with the ground terminal at reference potential.
V_{OUT}	**Output voltage**	The maximum positive voltage that can be applied to the output terminal with the ground terminal of the photo IC at reference potential.
I_{OUT}	**Output current**	The maximum current that is allowed to flow in the collector junction of the output transistor of the photo IC.
P_{OUT}	**Output permissible dissipation**	The maximum power that is consumed by the collector junction of the output transistor of the photo IC.
V_F	**Forward voltage**	The voltage drop across the LED in the forward direction when a specified bias current is applied to the photo IC.
I_R	**Reverse current**	The reverse leakage current across the LED when a specified negative bias is applied to the anode with the cathode at reference potential.
V_{OL}	**Output low voltage**	The voltage drop in the output of the photo IC when the IC output is turned ON under a specified voltage and output current applied to the photo IC.
V_{OH}	**Output high voltage**	The voltage output by the photo IC when the IC output is turned OFF under a specified supply voltage and bias condition given to the photo IC.
I_{CC}	**Current consumption**	The current that will flow into the sensor when a specified positive bias voltage is applied from the power source with the ground of the photo IC at reference potential.
I_{FT} ($I_{FT\ OFF}$)	**LED current when output is turned OFF**	The forward LED current value that turns OFF the output of the photo IC when the forward current to the LED is increased under a specified voltage applied to the photo IC.
I_{FT} ($I_{FT\ ON}$)	**LED current when output is turned ON**	The forward LED current value that turns ON the output of the photo IC when the forward current to the LED is increased under a specified voltage applied to the photo IC.
△H	**Hysteresis**	The difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC is turned ON and when the photo IC is turned OFF.
f	**Response frequency**	The number of revolutions of a disk with a specified shape rotating in the light path, expressed by the number of pulse strings during which the output logic of the photo IC can be obtained under a specified bias condition given to the LED and photo IC (the number of pulse strings to which the photo IC can respond in a second).

Precautions

■ Correct Use

Use the product within the rated voltage range.

Applying voltages beyond the rated voltage ranges may result in damage or malfunction to the product.

Wire the product correctly and be careful with the power supply polarities.

Incorrect wiring may result in damage or malfunction to the product.

Connect the loads to the power supply. Do not short-circuit the loads.

Short-circuiting the loads may result in damage or malfunction to the product.

■ Structure and Materials

The emitter and detector elements of conventional Photomicrosensors are fixed with transparent epoxy resin and the main bodies are made of polycarbonate. Unlike ICs and transistors, which are covered with black epoxy resin, Photomicrosensors are subject to the following restrictions.

1. Low Heat Resistivity

The storage temperature of standard ICs and transistors is approximately 150°C. On the other hand, the storage temperature of highly resistant Photomicrosensors is 100°C maximum.

2. Low Mechanical Strength

Black epoxy resin, which is used for the main bodies of ICs and transistors, contains additive agents including glass fibre to increase the heat resistivity and mechanical strength of the main bodies. Materials with additive agents cannot be used for the bodies of Photomicrosensors because Photomicrosensors must maintain good optical permeability. Unlike ICs and transistors, Photomicrosensors must be handled with utmost care because Photomicrosensors are not as heat or mechanically resistant as ICs and transistors. No excessive force must be imposed on the lead wires of Photomicrosensors.

■ Mounting

Screw Mounting

If Photomicrosensors have screw mounting holes, the Photomicrosensors can be mounted with screws. Unless otherwise specified, refer to the following when tightening the screws.

Hole diameter	Screw size	Tightening torque
1.5 dia.	M1.4	0.20 N • m
2.1 dia.	M2	0.34 N • m
3.2 dia.	M3	0.54 N • m
4.2 dia.	M4	0.54 N • m

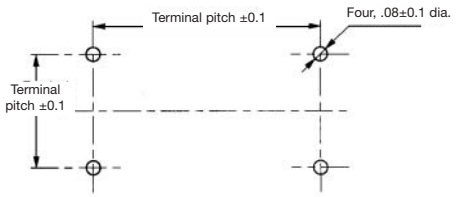
Read the following before tightening the screws.

1. The use of a torque screwdriver is recommended to tighten each of the screws so that the screws can be tightened to the tightening torque required.
2. The use of a screw with a spring washer and flat washer for the mounting holes of a Photomicrosensor is recommended. If a screw with a spring washer but without a flat washer is used for any mounting hole, the part around the mounting hole may crack.
3. Do not mount Photomicrosensors to plates stained with machining oil, otherwise the machining oil may cause cracks on the Photomicrosensors.
4. Do not impose excessive forces on Photomicrosensors mounted to PCBs. Make sure that no continuous or instantaneous external force exceeding 500 g (4.9 N) is imposed on any lead wire of the Photomicrosensors.

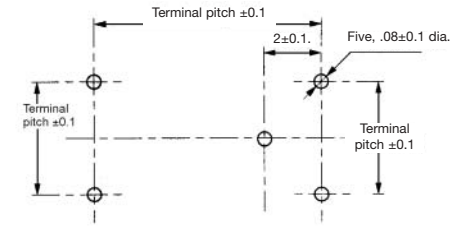
PCB Mounting Holes

Unless otherwise specified, the PCB to which a Photomicrosensor is mounted must have the following mounting holes.

Four Terminals



Five Terminals



■ Soldering

Lead Wires

Make sure to solder the lead wires of Photomicrosensors so that no excessive force will be imposed on the lead wires. If an excessive forces is likely to be imposed on the lead wires, hold the bases of the lead wires.

Soldering Temperature

1. Manual Soldering

Unless otherwise specified, the lead wires of Photomicrosensors can be soldered manually under the following conditions.

Soldering temperature:	350°C max. (The temperature of the tip of a 30-W soldering iron is approximately 320°C when the soldering iron is heated up.)
Soldering time:	3 s max.
Soldering position:	At least 1.5 mm away from the bases of the lead wires.

The temperature of the tip of any soldering iron depends on the shape of the tip. Check the temperature with a thermometer before soldering the lead wires. A highly resistive soldering iron incorporating a ceramic heater is recommended for soldering the lead wires.

2. Dip Soldering

The lead wires of Photomicrosensors can be dip-soldered under the following conditions unless otherwise specified.

Preheating temperature:	Must not exceed the storage temperature of the Photomicrosensors.
Soldering temperature:	260°C.
Soldering time:	10 s max.
Soldering position:	At least 1.5 mm away from the bases of the lead wires.

Do not use non-washable flux when soldering EE-SA-series Photomicrosensors, otherwise the Photomicrosensors will have operational problems.

3. Reflow Soldering

The reflow soldering of Photomicrosensors is not possible except for the EE-SX1102. The reflow soldering of the EE-SX1102 must be performed carefully under the conditions specified in the datasheet of the EE-SX1102. Before performing the reflow soldering of the EE-SX1102, make sure that the reflow soldering equipment satisfies the conditions.

External Forces

The heat resistivity and mechanical strength of Photomicrosensors are lower than those of ICs or transistors. Do not to impose external force on Photomicrosensors immediately after the Photomicrosensors are soldered. Especially, do not impose external force on Photomicrosensors immediately after the Photomicrosensors are dipsoldered.

■ Cleaning Precautions

Cleaning

Photomicrosensors except the EE-SA105 can be cleaned subject to the following restrictions.

1. Types of Detergent

Polycarbonate is used for the bodies of most Photomicrosensors. Some types of detergent dissolve or crack polycarbonate. Before cleaning Photomicrosensors, refer to the following results of experiments, which indicate what types of detergent are suitable for cleaning Photomicrosensors other than the EE-SA105.

Observe the law and prevent against any environmental damage when using any detergent.

Results of Experiments

Ethyl alcohol:	OK
Methyl alcohol:	OK
Isopropyl alcohol:	OK
Chlorofluorocarbon:	Depends on the additive agents (see note)
Trichlene:	NG
Acetone:	NG
Methylbenzene:	NG
Water (hot water):	The lead wires corrode depending on the conditions

Note: Chlorofluorocarbon containing ethyl alcohol or methyl alcohol as an additive agent can be used to clean Photomicrosensors except the EE-SA105. Chlorofluorocarbon containing acetone as an additive agent must not be used to clean any Photomicrosensor. For reasons of environmental protection, refrain from using any detergent containing chlorofluorocarbon.

2. Cleaning Method

Unless otherwise specified, Photomicrosensors other than the EE-SA105 can be cleaned under the following conditions. Do not apply an unclean detergent to the Photomicrosensors.

DIP cleaning: OK

Ultrasonic cleaning:	Depends on the equipment and the PCB size. Before cleaning Photomicrosensors, conduct a cleaning test with a single Photomicrosensor and make sure that the Photomicrosensor has no broken lead wires after the Photomicrosensor is cleaned.
Brushing:	The marks on Photomicrosensors may be brushed off. The emitters and detectors of reflective Photomicrosensors may have scratches and deteriorate when they are brushed. Before brushing Photomicrosensors, conduct a brushing test with a single Photomicrosensor and make sure that the Photomicrosensor is not damaged after it is brushed.

Sensing Method	Sensing Distance	Model	Output Configuration	Features	Page No.
Transmissive	1 mm	EE-SX1107	Phototransistor	Ultra-compact, surface mounting	737
	2 mm	EE-SX1018	Phototransistor	Compact, general purpose	742
		EE-SX1108	Phototransistor	Ultra-compact, surface mounting	745
		EE-SX1131	Phototransistor	Ultra-compact, surface mounting, dual channel output	750
		EE-SX1139	Phototransistor	Ultra-compact, general purpose	755
		EE-SX4139	Photo-IC	Ultra-compact with low operating voltage	758
		EE-SX493	Photo-IC	With a horizontal aperture	761
	2.8 mm	EE-SX1055	Phototransistor	Compact, cost effective	764
	3 mm	EE-SX1046	Phototransistor	With a horizontal aperture	767
		EE-SX1082	Phototransistor	With a horizontal aperture	770
		EE-SX1106	Phototransistor	Ultra-compact, general purpose	773
		EE-SX1109	Phototransistor	Ultra-compact, surface mounting	776
		EE-SX199	Phototransistor	With a positioning boss	781
		EE-SX398/ 498	Phototransistor/ Photo-IC	General purpose	784
	3.4 mm	EE-SV3	Phototransistor	With mounting tab	787
		EE-SX1071	Phototransistor	General purpose	790
		EE-SX1088	Phototransistor	Screw mounting	793
		SH3	Phototransistor	Screw mounting	796
		EE-SJ3	Phototransistor	Various aperture types available	799
		EE-SX3088/4088	Photo-IC	Screw mounting	802
	3.6 mm	EE-SG3	Phototransistor	With dust-proof aperture and mounting tab	805
	4.2 mm	EE-SX1128	Phototransistor	With a horizontal aperture	808
	5 mm	EE-SX1041	Phototransistor	General purpose	811
		EE-SX1042	Phototransistor	High profile	814
		EE-SX1081	Phototransistor	General purpose	817
		EE-SX1235A-P2	Phototransistor	Snap-in mounting	820
		EE-SX4009-P1	Photo-IC	Screw mounting	823
		EE-SX4019-P2	Photo-IC	Screw mounting	826
		EE-SX3081/4081	Photo-IC	General purpose q	829
		EE-SX4009-P10	Photo-IC	Screw mounting	832
		EE-SX4235A-P2	Photo-IC	Snap-in mounting	835
	8 mm	EE-SX1070	Phototransistor	General purpose	838
		EE-SX3070/4070	Photo-IC	General purpose	841
	12 mm	EE-SPX415-P2	Photo-IC	Light modulation built-in amplifier IC	844
	15 mm	EE-SX461-P11	Photo-IC	Easy mountable	847
	17 mm	EE-SPX414-P1	Photo-IC	Light modulation built-in amplifier IC	851

Sensing Method	Sensing Distance	Model	Output Configuration	Features	Page No.
Actuator	–	EE-SA102	Phototransistor	General purpose	854
		EE-SA103	Phototransistor	Compact	857
		EE-SA104	Phototransistor	Compact	860
		EE-SA107-P2	Phototransistor	Snap-in mounting with connector	863
		EE-SA407-P2	Photo-IC	Snap-in mounting with connector	866
Reflective mounting	1 mm	EE-SY124	Phototransistor	Ultra-compact, general purpose/ surface mounting	869
		EE-SY125	Phototransistor	Ultra-compact, general purpose/ surface mounting	872
		EE-SY193	Phototransistor	Ultra-compact, surface mounting	875
	3.5 mm	EE-SY171	Phototransistor	Thin	880
	4 mm	EE-SY169B	Phototransistor	High resolution red LED/ infra-red LED	883
	4.4 mm	EE-SY113	Phototransistor	Dust-proof	886
		EE-SY313/ 413	Photo-IC	Dust-proof	889
	5 mm	EE-SF5-B	Phototransistor	General purpose or screw mounting	893
		EE-SY110	Phototransistor	General purpose	896
		EE-SY310/ 410	Photo-IC	General purpose	899
Micro displacement	5.5 - 11.5 mm	Z4D-B01	Analog votage output	Easy control and ultra high resolution	903
Multi-beam	50 - 125mm	EY3A-312	Photo-IC	3 beam high sensitivity and resisitivity to light interference	907
	125 mm	EY3A-112	Photo-IC	1 beam high sensitivity and resisitivity to light interference	

■ Features

- Ultra-compact with a 3.4-mm-wide sensor and a 1-mm-wide slot.
- PCB surface mounting type.
- High resolution with a 0.15-mm-wide aperture.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	25 mA (see note 1)
	Pulse foward current	I_{FP}	100 mA (see note 2)
	Reverse Voltage	V_R	5 V
Detector	Collector-Emitter voltage	V_{CEO}	20 V
	Emitter-Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	Operating	Topr	-30°C to 85°C
	Storage	Tstg	-40°C to 90°C
	Reflow soldering	Tsol	240°C (see note 3)
	Manual soldering	Tsol	300°C (see note 3)

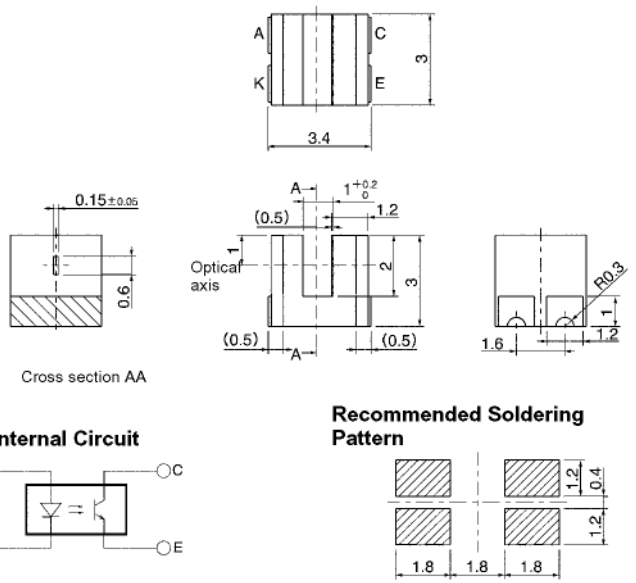
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Duty: 1/100; Pulse width: 0.1 ms.
3. Complete soldering within 10 seconds for reflow soldering and within 3 seconds for manual soldering.

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

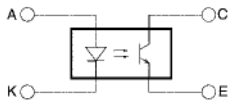
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.1 V typ., 1.3 V max.	I_F = 5 mA
	Reverse current	I_R	10 μA max.	V_R = 5 V
	Peak emission wavelength	λ_P	940 m typ.	I_F = 20 mA
Detector	Light current	I_L	50 μA min., 150 μA typ., 500 μA max.	I_F = 5 mA, V_{CE} = 5 V
	Dark current	I_D	100 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 50 μA
	Peak spectral sensitivity wavelength	λ_P	900 nm typ.	–
Rising time		tr	10 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 μA
Falling time		tf	10 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 μA

■ Dimensions

Note: All units are in millimeters unless stated.



Internal Circuit



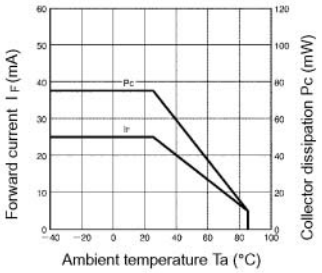
Recommended Soldering Pattern

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

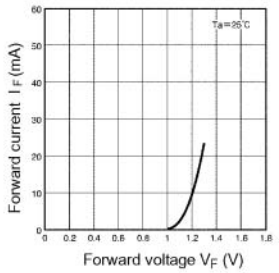
Unless otherwise stated the tolerances are ±0.15mm.

■ Engineering Data

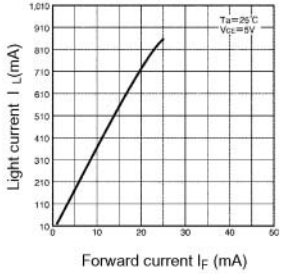
Forward Current vs. Collector Dissipation Temperature Rating



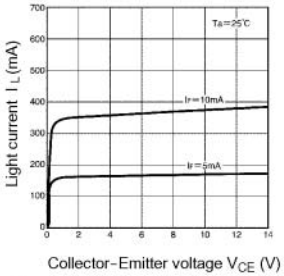
Forward Current vs. Forward Voltage Characteristics (Typical)



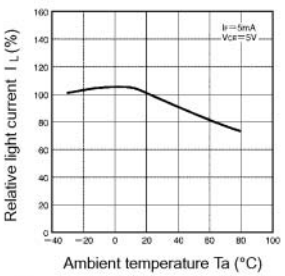
Light Current vs. Forward Current Characteristics (Typical)



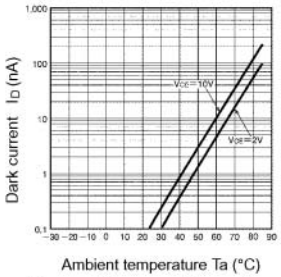
Light Current vs. Collector-Emitter Voltage Characteristics (Typical)



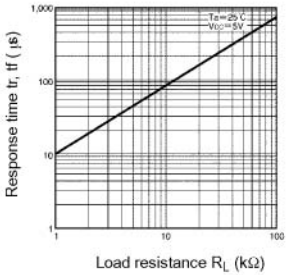
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



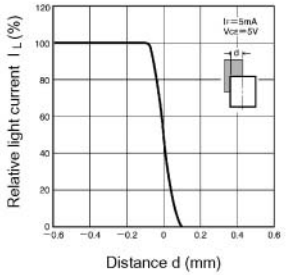
Dark Current vs. Ambient Temperature Characteristics (Typical)



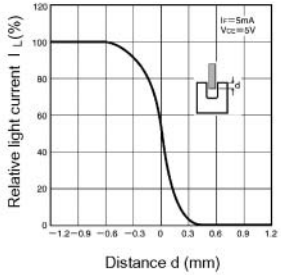
Response Time vs. Load Resistance Characteristics (Typical)



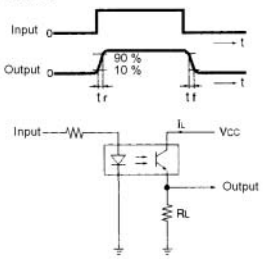
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



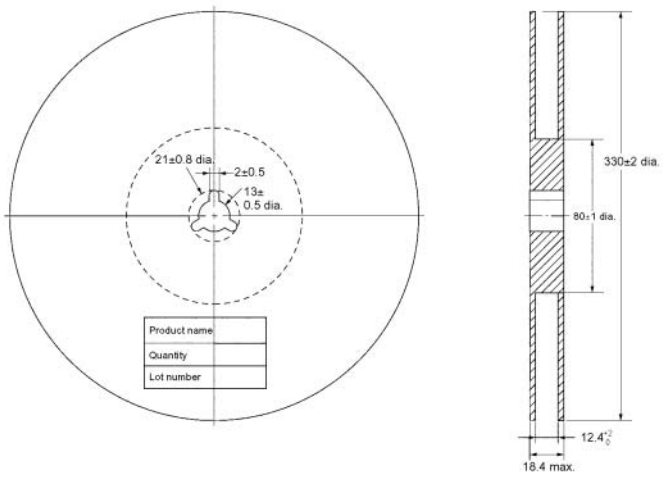
Response Time Measurement Circuit



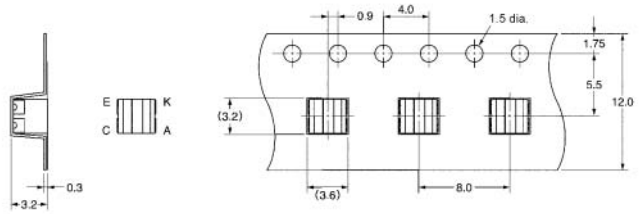
■ Tape and Reel

Unit: mm (inch).

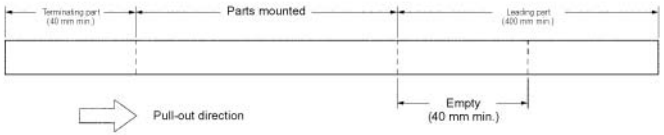
Reel



Tape



Tape configuration



Tape quantity

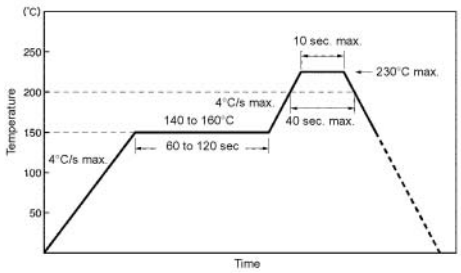
2,500 pcs./reel

Precautions

■ Soldering Information

Reflow soldering

- The following soldering paste is recommended:
  Melting temperature: 178 to 192°C
  Composition: Sn 63%, Pb 37%
- The recommended thickness of the metal mask for screen printing is between 0.2 and 0.25 mm.
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use “Sn 60” (60% tin and 40% lead) or solder with silver content.
- Use a soldering iron of less than 25W, and keep the temperature of the iron tip at 300°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 10 to 30°C
Humidity: 60% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored under 30°C at 80% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope.

Baking

If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use:

Reel: 60°C for 24 hours or more
Bulk: 80°C for 4 hours or more

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

■ Features

- Compact model with a 2-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

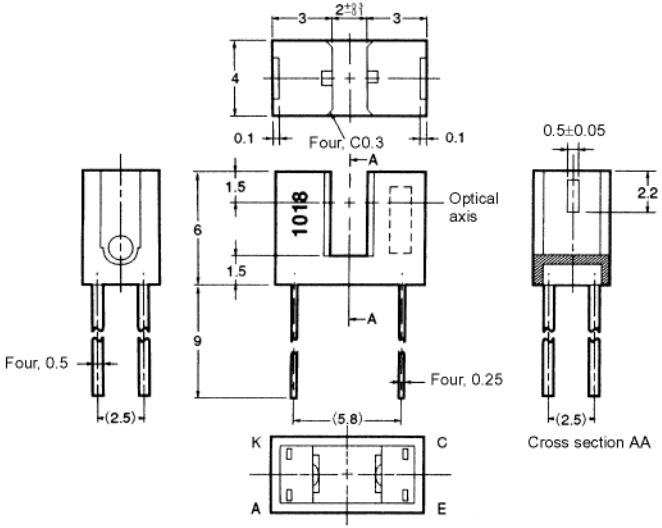
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is10μs maximum with a frequency of 100Hz.
3. Complete soldering within 10 seconds.

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

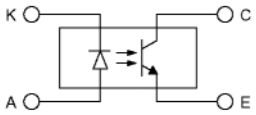
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CF} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless stated.



Internal Circuit



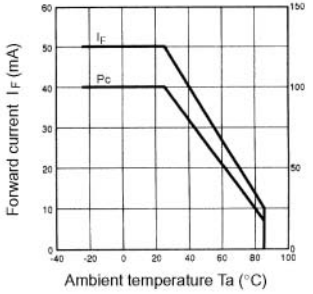
Terminal No.	Name
A	Anode
K	Cathode
C	Collecter
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

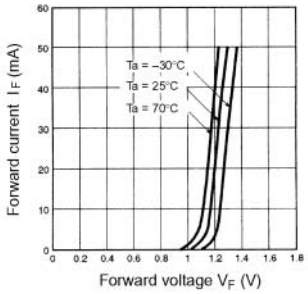
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

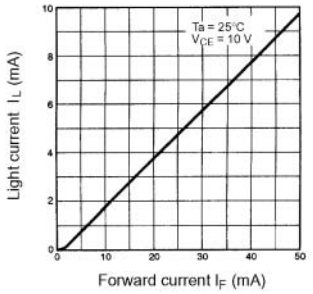
Forward Current vs. Collector Dissipation Temperature Rating



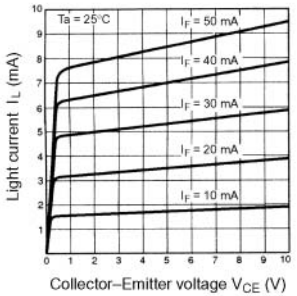
Forward Current vs. Forward Voltage Characteristics (Typical)



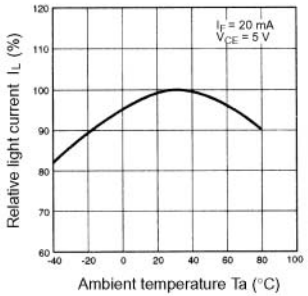
Light Current vs. Forward Current Characteristics (Typical)



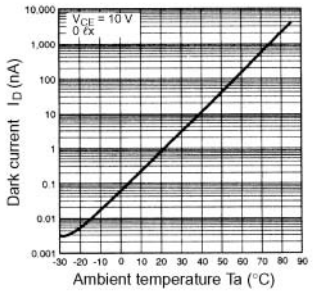
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



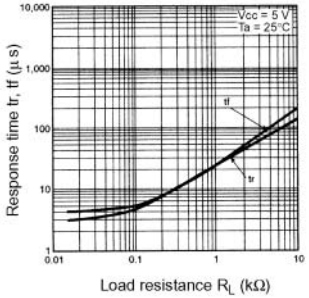
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



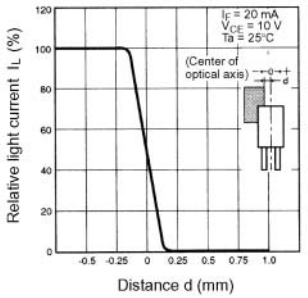
Dark Current vs. Ambient Temperature Characteristics (Typical)



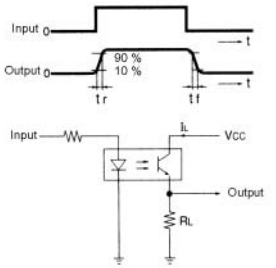
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Features

- Ultra Compact model with a 2mm slot.
- PCB surface mounting type.
- High resolution with a 0.3-mm-wide aperture.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	25 mA (see note 1)
	Pulse foward current	I_{FP}	100 mA (see note 2)
	Reverse Voltage	V_R	5 V
Detector	Collector-Emitter voltage	V_{CEO}	20 V
	Emitter-Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	Operating	Topr	-30°C to 85°C
	Storage	Tstg	-40°C to 90°C
	Reflow Soldering	Tsol	240°C (see note 3)
	Manual Soldering	Tsol	300°C (see note 3

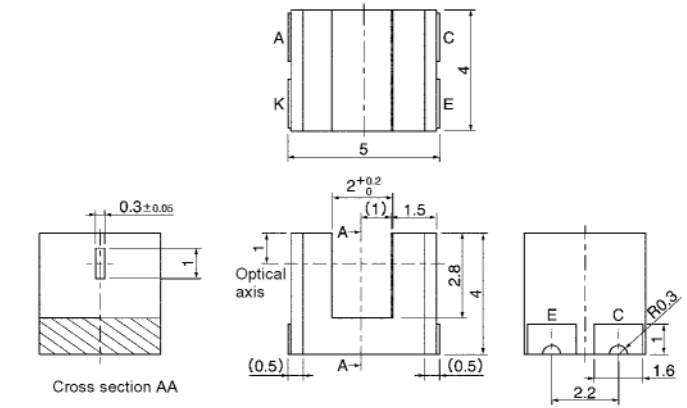
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Duty: 1/100; Pulse width: 0.1 ms
3. Complete soldering within 10 seconds for reflow soldering and within 3 seconds for manual soldering.

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

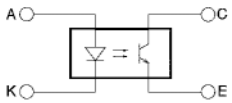
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.1 V typ., 1.3 V max.	I_F = 5 mA
	Reverse current	I_R	10 µA max.	V_R = 5 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	50 µA min., 150 µA typ., 500 µA max.	I_F = 5 mA, V_{CE} = 5 V
	Dark current	I_D	100 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 50 µA
Peak spectral sensitivity		λ_P	900 nm typ.	-
Rising time		tr	10 µs typ.	V_{CC} = 5 V, R_L = 1K Ω, I_L = 100 µA
Falling time		tf	10 µs typ.	V_{CC} = 5 V, R_L = 1K Ω, I_L = 100 µA

■ Dimensions

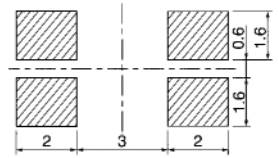
Note: All units are in millimeters otherwise indicated.



Internal Circuit



Recommended Soldering Pattern

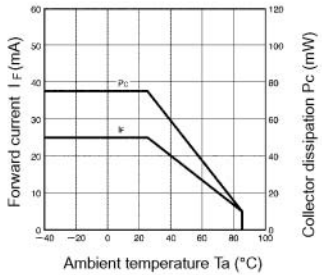


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

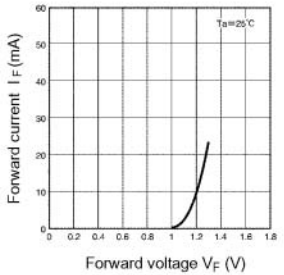
Unless otherwise specified, the tolerances are ±0.15mm.

■ Engineering Data

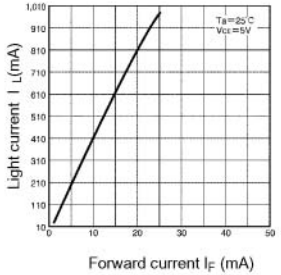
Forward Current vs. Collector Dissipation Temperature Rating



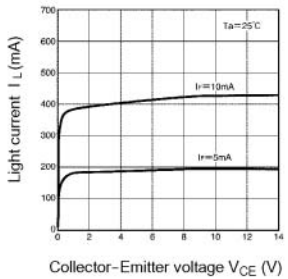
Forward Current vs. Forward Voltage Characteristics (Typical)



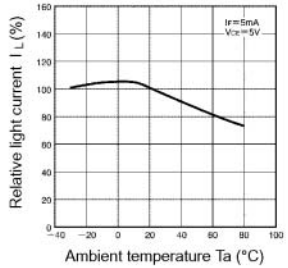
Light Current vs. Forward Current Characteristics (Typical)



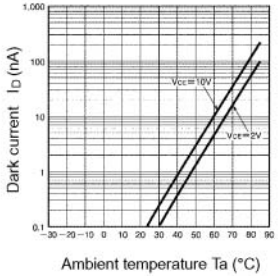
Light Current vs. Collector-Emitter Voltage Characteristics (Typical)



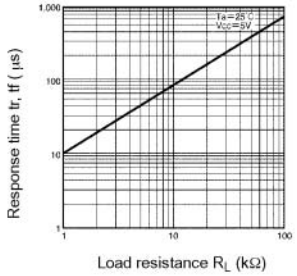
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



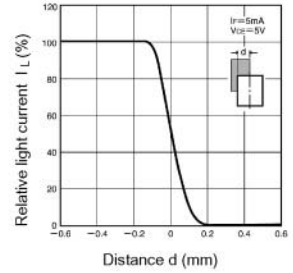
Dark Current vs. Ambient Temperature Characteristics (Typical)



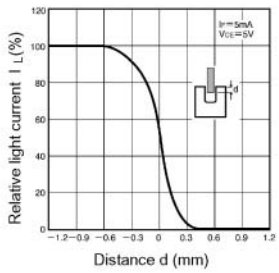
Response Time vs. Load Resistance Characteristics (Typical)



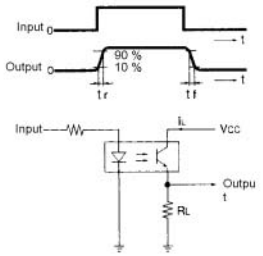
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



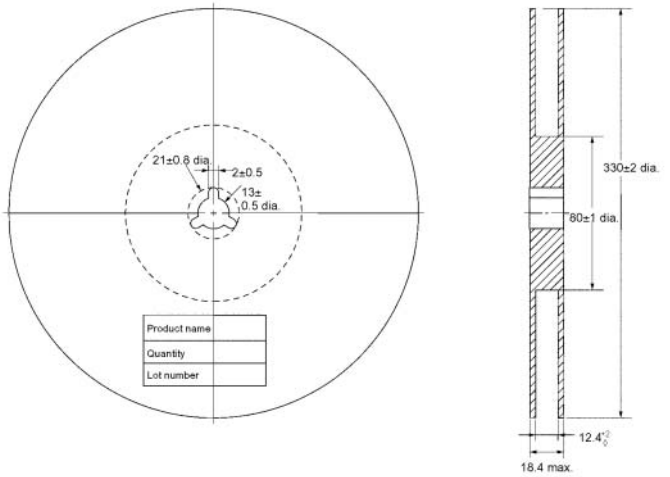
Response Time Measurement Circuit



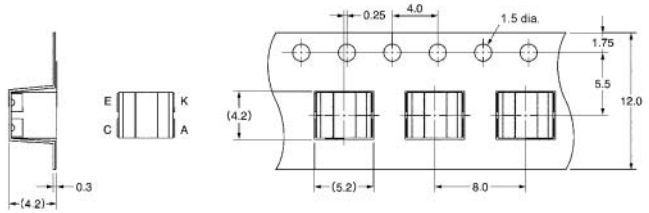
■ Tape and Reel

Unit: mm (inch).

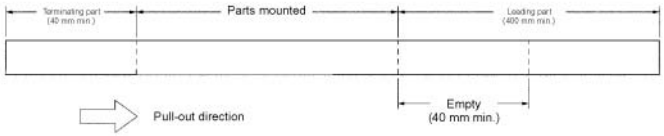
Reel



Tape



Tape configuration



Tape quantity

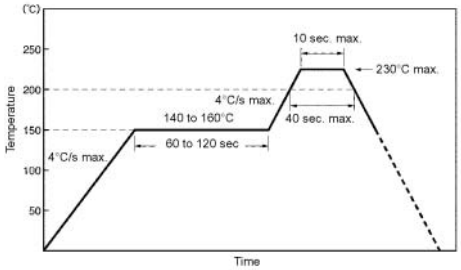
2,000 pcs./reel

Precautions

■ Soldering Information

Reflow soldering

- The following soldering paste is recommended:
  Melting temperature: 178 to 192°C
  Composition: Sn 63%, Pb 37%
- The recommended thickness of the metal mask for screen printing is between 0.2 and 0.25 mm.
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use “Sn 60” (60% tin and 40% lead) or solder with silver content.
- Use a soldering iron of less than 25W, and keep the temperature of the iron tip at 300°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 10 to 30°C
Humidity: 60% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored under 30°C at 80% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope.

Baking

If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use:

Reel: 60°C for 24 hours or more
Bulk: 80°C for 4 hours or more

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

Features

- Ultra-compact with a 5mm wide sensor and a 2mm wide slot.
- PCB surface mounting type.
- High resolution with a 0.3-mm-wide aperture.
- Dual channel output.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	25 mA (see note 1)
	Pulse foward current	I_{FP}	100 mA (see note 2)
	Reverse Voltage	V_R	5 V
Detector	**Collector-Emitter voltage**	V_{CEO}	20 V
	Emitter-Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	**Operating**	Topr	-30°C to 85°C
	Storage	Tstg	-40°C to 90°C
	Reflow soldering	Tsol	240°C (see note 3)
	Manual soldering	Tsol	300°C (see note 3)

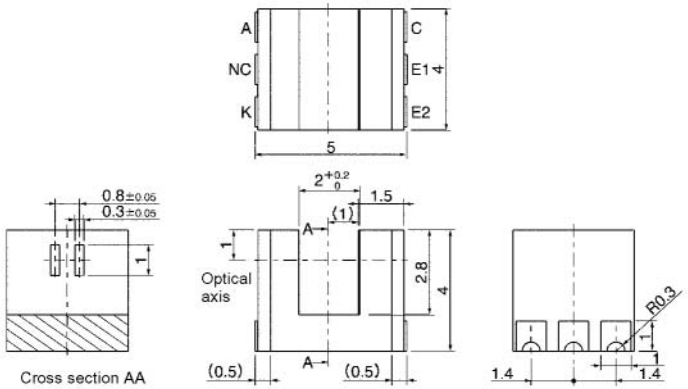
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Duty: 1/100; Pulse width: 0.1 ms.
3. Complete soldering within 10 seconds for reflow soldering and within 3 seconds for manual soldering.

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

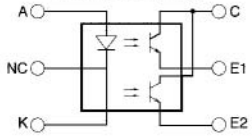
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.1 V typ., 1.3 V max.	I_F = 5 mA
	Reverse current	I_R	10 µA max.	V_R = 5 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_{L1}/I_{L2}	50 µA min., 150 µA typ., 500 µA max.	I_F = 5 mA, VCE = 5 V
	Dark current	I_D	100 nA max.	V_{CE} = 10 V, 0 lx
	Leakage current	I_{LEAK}	–	–
	Collector Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 50 µA
	Peak spectral sensitivity wavelength	λ_P	900 nm typ.	–
Rising time		tr	10 µs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 µA
Falling time		tf	10 µs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 µA

■ Dimensions

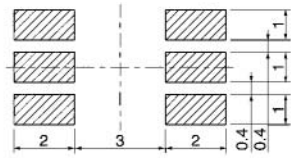
Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



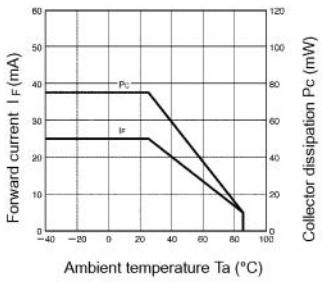
Recommended Soldering Pattern



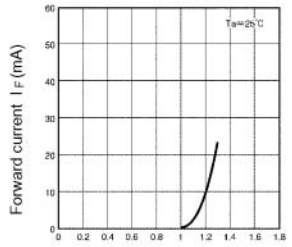
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E1	Emitter 1
E2	Emitter 2

Unless otherwise specified the tolerances are ±0.15mm.

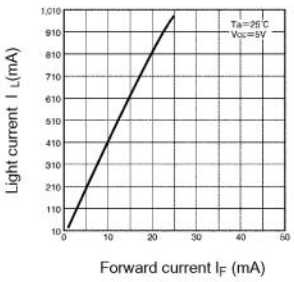
Forward Current vs. Collector Dissipation Temperature Rating



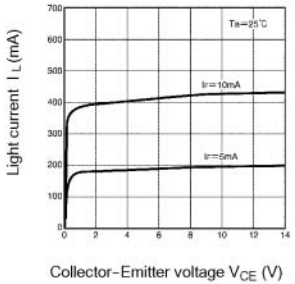
Forward Current vs. Forward Voltage Characteristics (Typical)



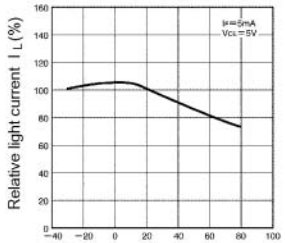
Light Current vs. Forward Current Characteristics (Typical)



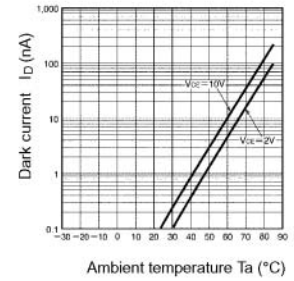
Light Current vs. Collector-Emitter Voltage Characteristics (Typical)



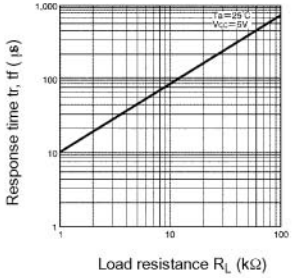
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



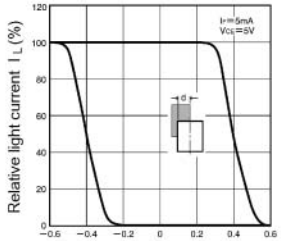
Dark Current vs. Ambient Temperature Characteristics (Typical)



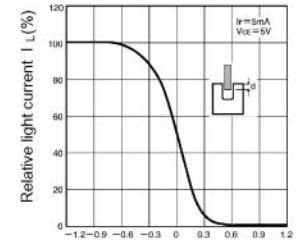
Response Time vs. Load Resistance Characteristics (Typical)



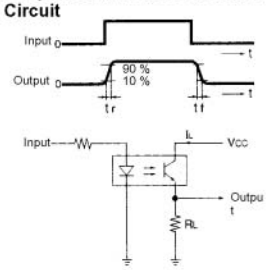
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



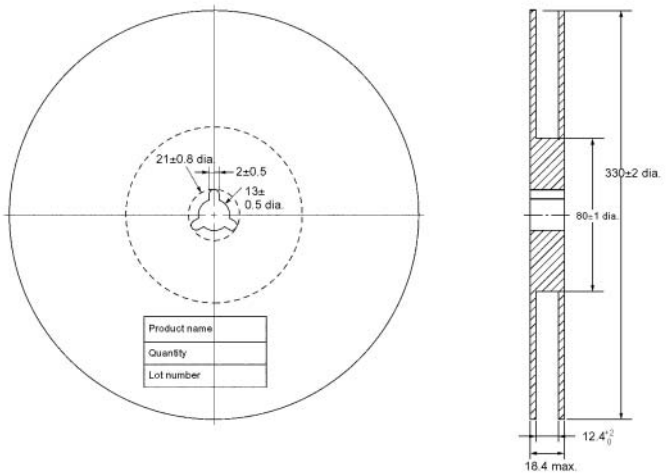
Response Time Measurement Circuit



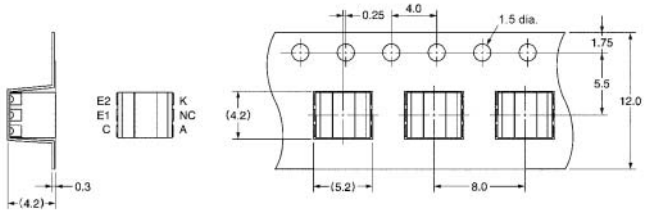
■ Tape and Reel

Unit: mm (inch).

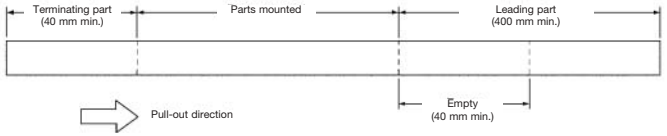
Reel



Tape



Tape configuration



Tape quantity

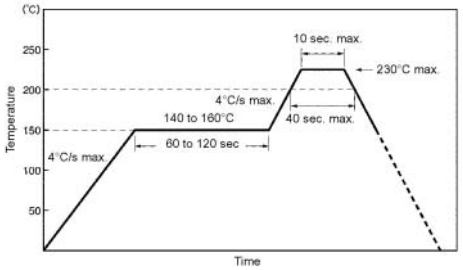
2,000 pcs./reel

Precautions

■ Soldering Information

Reflow soldering

- The following soldering paste is recommended:
  Melting temperature: 178 to 192°C
  Composition: Sn 63%, Pb 37%
- The recommended thickness of the metal mask for screen printing is between 0.2 and 0.25 mm.
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use “Sn 60” (60% tin and 40% lead) or solder with silver content.
- Use a soldering iron of less than 25W, and keep the temperature of the iron tip at 300°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 10 to 30°C
Humidity: 60% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored under 30°C at 80% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope.

Baking

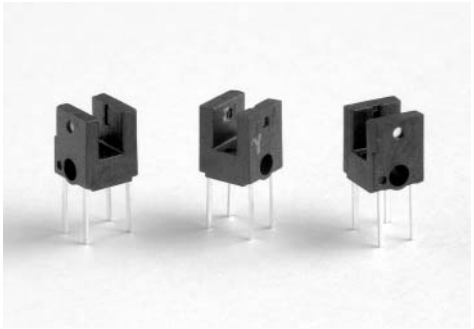
If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use:

Reel: 60°C for 24 hours or more
Bulk: 80°C for 4 hours or more

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

■ Features

- Ultra-compact with a 4.3-mm-wide sensor and a 2-mm-wide slot.
- High resolution with a 0.5-mm-wide aperture.
- A light current (I_L) of 0.4 mA minimum with a forward current of (I_F) 10 mA.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	Operating	Topr	-40°C to 85°C
	Storage	Tstg	-40°C to 100°C
	Soldering	Tsol	260°C (see note 3)

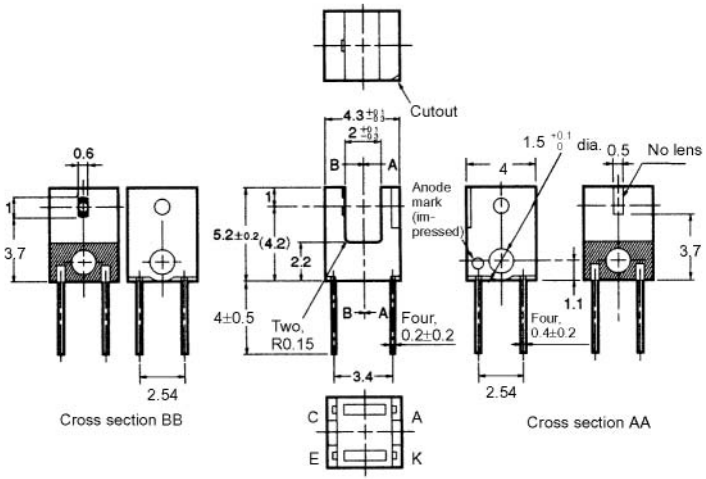
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is10μs maximum with a frequency of 100Hz.
3. Complete soldering within 3 seconds for reflow soldering and within 3 seconds for manual soldering.

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

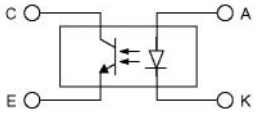
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.4 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.4 mA min.	I_F = 10 mA, V_{CE} = 5 V
	Dark current	I_D	2 nA typ., 100 nA max.	V_{CE} = 10 V, 0 x
	Leakage current	I_{LEAK}	–	–
	Collector Emitter saturated voltage	V_{CE} (sat)	0.4 V max.	I_F = 20 mA, I_L = 0.1 μA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CF} = 5 V
Rising time		tr	30 μs typ., 150 μs max.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 μA
Falling time		tf	30 μs typ., 150 μs max	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 100 μA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit

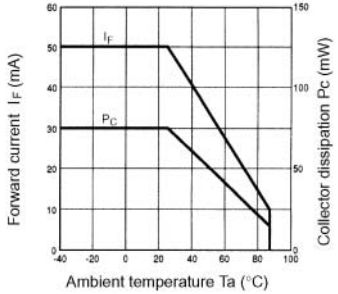


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

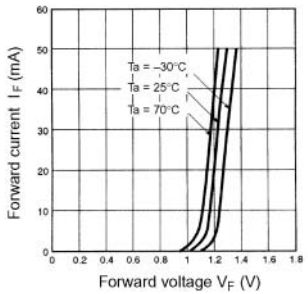
Unless otherwise specified the tolerances are ±0.1 mm.

■ Engineering Data

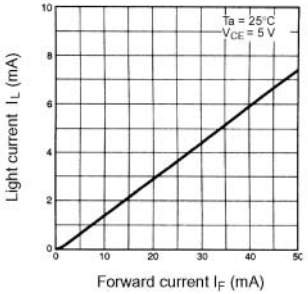
Forward Current vs. Collector Dissipation Temperature Rating



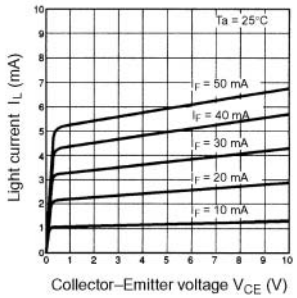
Forward Current vs. Forward Voltage Characteristics (Typical)



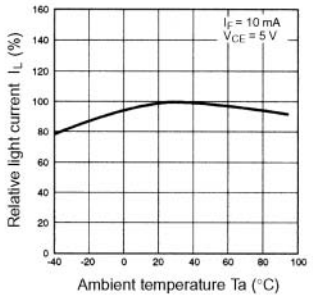
Light Current vs. Forward Current Characteristics (Typical)



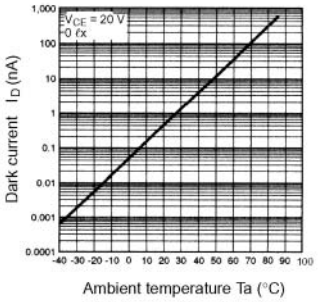
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



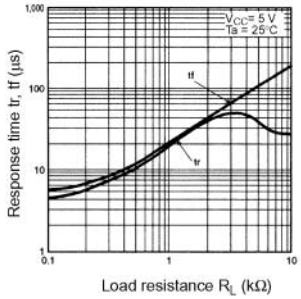
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



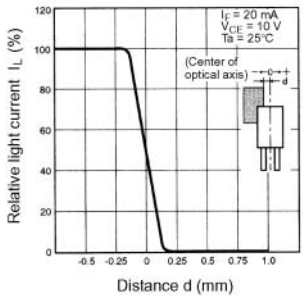
Dark Current vs. Ambient Temperature Characteristics (Typical)



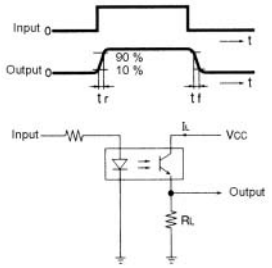
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



■ Features

- Ultra-compact model
- Photo IC output model
- Operates at V_{CC} of 2.2 to 7 V
- High speed response

■ 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
Detector	Supply voltage	V_{CC}	9 V
	Output voltage	V_{OUT}	17 V
	Output current	I_{OUT}	8 mA
	Permissible output dissipation	P_{OUT}	80 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-40°C to 100°C
	Soldering	Tsol	260°C (see note 2)

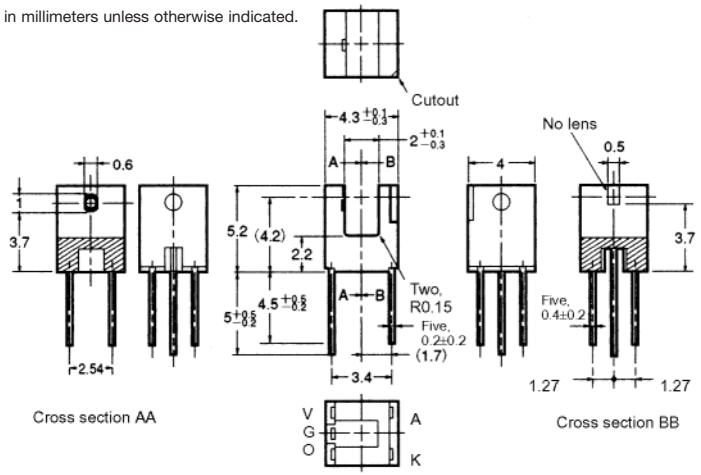
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 3 seconds.

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

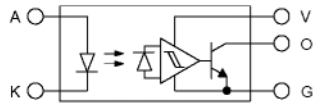
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.4 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 µA typ., 10 µA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Power supply voltage	V_{CC}	2.2 V min., 7 V max.	–
	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 2.2 to 7 V, I_{OL} = 8 mA, I_F = 5 mA
	High-level output voltage	I_{OH}	10 µA max.	V_{CC} = 2.2 to 7 V, I_F = 0 mA, V_O = 17 V
	Current consumption	I_{CC}	2.3 mA typ., 4 mA max.	V_{CC} = 7 V
	Peak spectral sensitivity wavelength	λ_P	870 nm typ.	V_{CC} = 2.2 to 7 V
LED current when output is ON		I_{FT}	1.1 mA typ., 2.5 mA max.	V_{CC} = 2.2 to 7 V
Hysteresis		△H	21% typ.	V_{CC} = 2.2 to 7 V (see note 1)
Response frequency		f	3 kHs min.	V_{CC} = 2.2 to 7 V, I_F = 5 mA, I_{OL} = 8mA (see note 2)
Response delay time		t_{PLH}	5 µs min.	V_{CC} = 2.2 to 7 V, I_F = 5 mA, I_{OL} = 8mA (see note 3)
Response delay time		t_{PHL}	18 µs typ.	V_{CC} = 2.2 to 7 V, I_F = 5 mA, I_{OL} = 8mA (see note 3)

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit

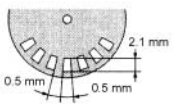


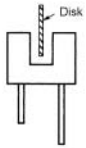
Terminal No.	Name
A	Anode
K	Cathode
V	Supply voltage V_{CC}
O	Output (OUT)
G	Ground (GND)

Unless otherwise specified the tolerances are ±0.15mm.

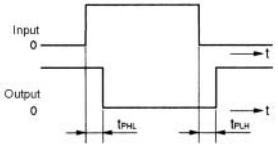
Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC is turned from ON to OFF and when the photo IC is turned from OFF to ON.

2. The value of the response frequency is measured by rotating the disk as shown below (P.P.S = pulse/s).



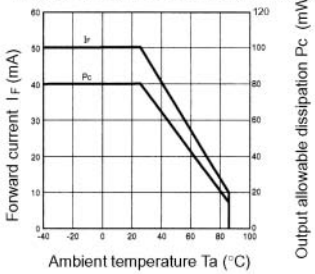


3. The following illustrations show the definition of response delay time.

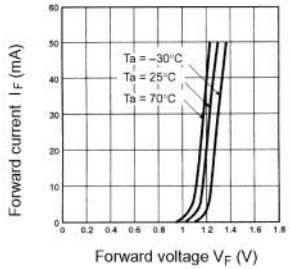


■ Engineering Data

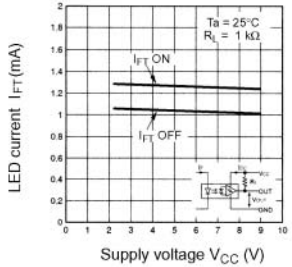
Forward Current vs. Collector Dissipation Temperature Rating



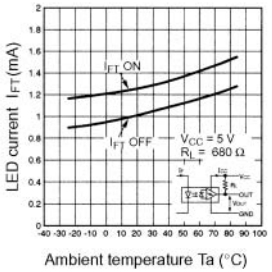
Forward Current vs. Forward Voltage Characteristics (Typical)



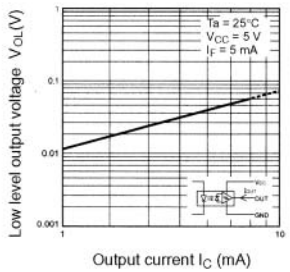
LED Current vs. Supply Voltage (Typical)



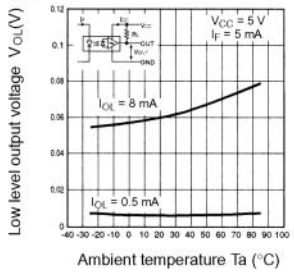
LED Current vs. Ambient Temperature Characteristics (Typical)



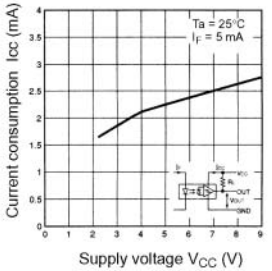
Low-level Output Voltage vs. Output Current (Typical)



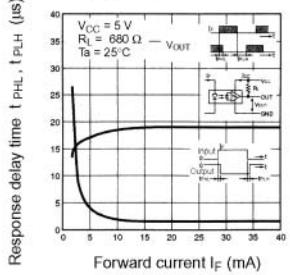
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



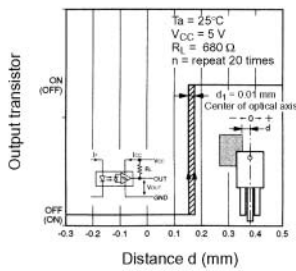
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)



■ Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- Allows highly precise sensing with a 0.2-mm-wide sensing aperture.

Specifications

■ 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
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	Topr	-40°C to 60°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

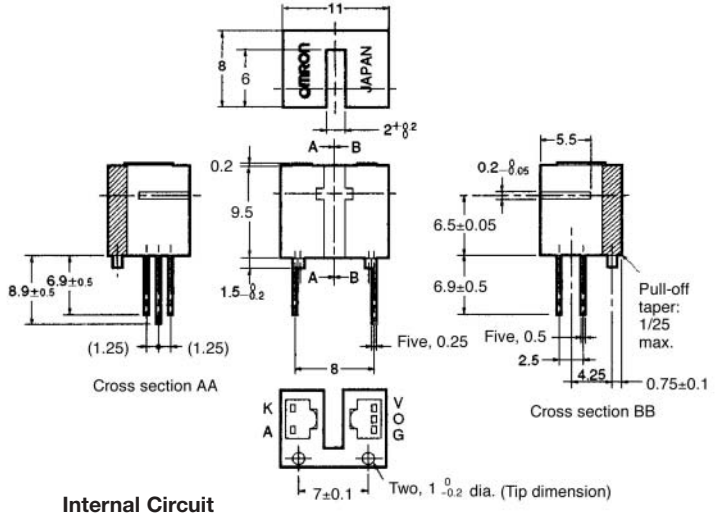
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

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

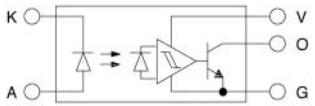
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 µA typ., 10 µA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 15 mA
	High-level output voltage	V_{OH}	15 V min.	Vcc = 16 V, R_L = 1 kΩ, I_F = 0 mA
	Current consumption	I_{CC}	5 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., 15 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		△H	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 2)
Response delay time		t_{PLH} (t_{PHL})	3 µs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PLH})	20 µs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)

■ Dimensions

Note: All units are in millimeters unless stated.



Internal Circuit



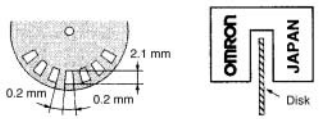
Unless otherwise specified, the tolerances are as shown below.

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

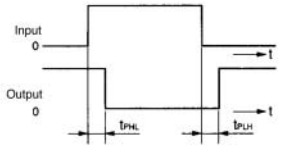
Dimensions	Tolerance
3 mm max.	±0.125
3 < mm ≤ 6	±0.150
6 < mm ≤ 10	±0.180
10 < mm ≤ 18	±0.215
18 < mm ≤ 30	±0.260

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

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

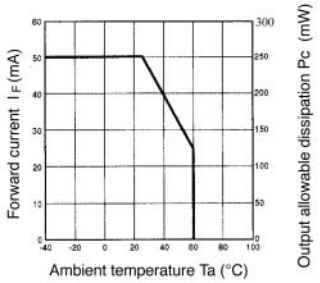


3. The following illustrations show the definition of response delay time.

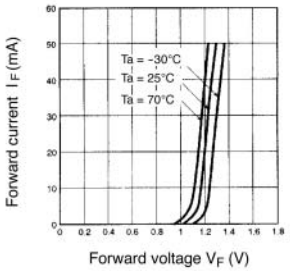


■ Engineering Data

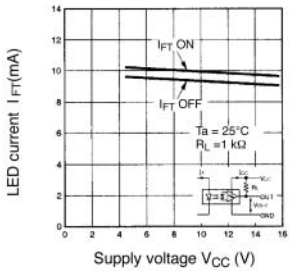
Forward Current vs. Collector Dissipation Temperature Rating



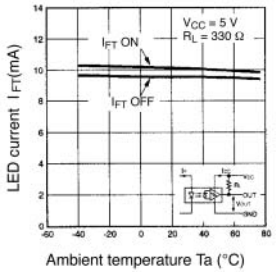
Forward Current vs. Forward Voltage Characteristics (Typical)



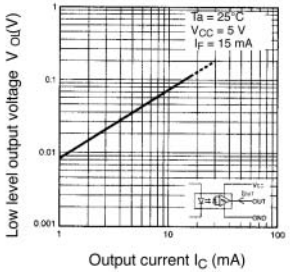
LED Current vs. Supply Voltage (Typical)



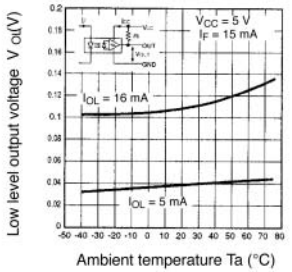
LED Current vs. Ambient Temperature Characteristics (Typical)



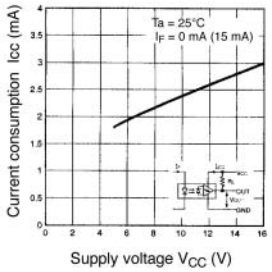
Low-level Output Voltage vs. Output Current (Typical)



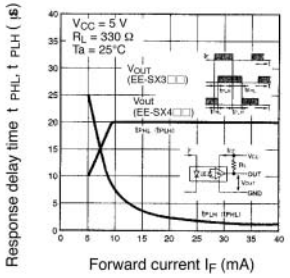
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



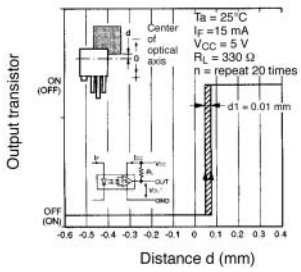
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Time Position Characteristics (Typical)



Features

- Longer leads allow the sensor to be mounted to a 1.6-mm thick board.
- 5.4-mm-tall compact model.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter Voltage	V_{CEO}	30 V
	Emitter-Collector Voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	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.

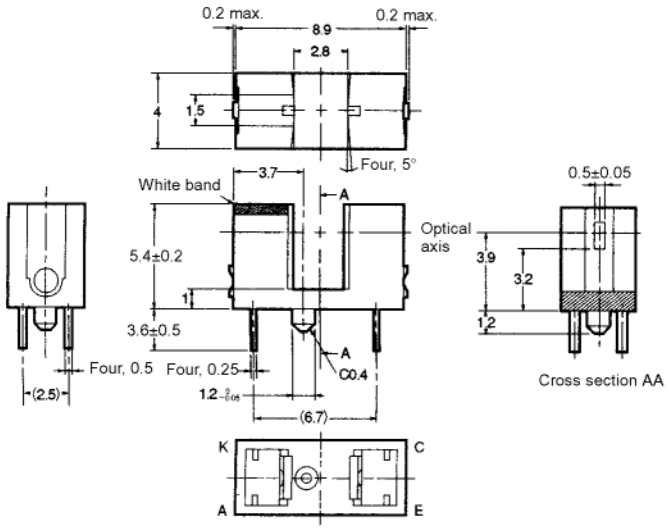
3. Complete soldering within 10 seconds.

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

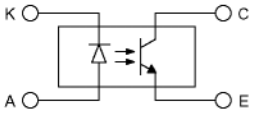
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, RL = 100 Ω, IL = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, RL = 100 Ω, IL = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



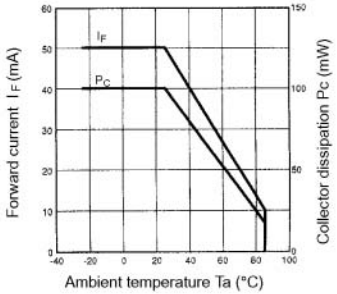
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

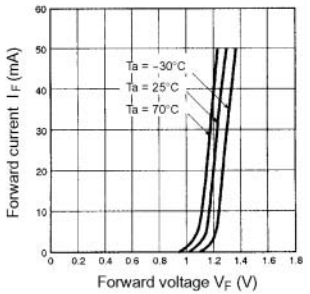
Terminal No.	Name
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

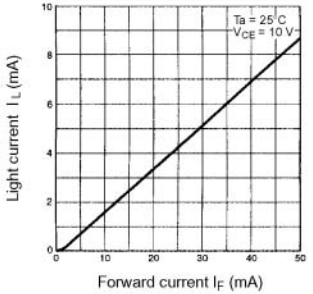
Forward Current vs. Collector Dissipation Temperature Rating



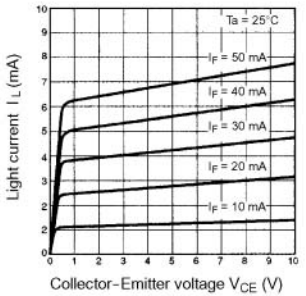
Forward Current vs. Forward Voltage Characteristics (Typical)



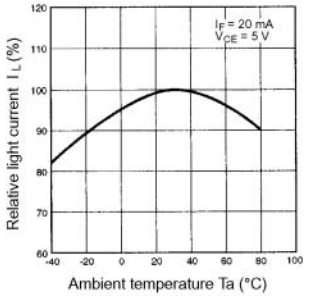
Light Current vs. Forward Current Characteristics (Typical)



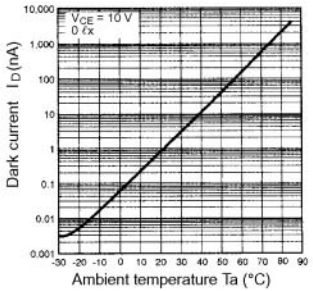
Light Current vs. Collector-Emitter Voltage Characteristics (Typical)



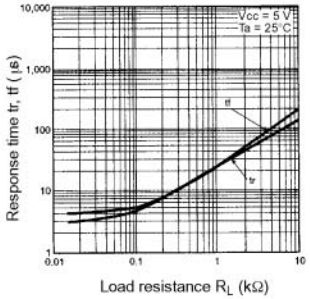
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



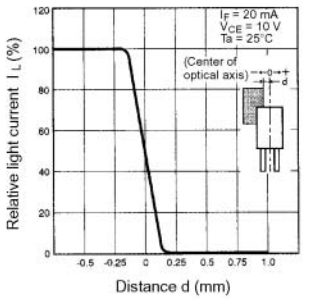
Dark Current vs. Ambient Temperature Characteristics (Typical)



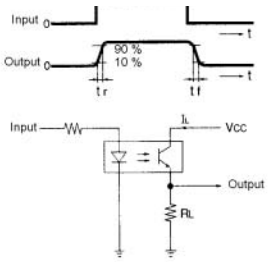
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

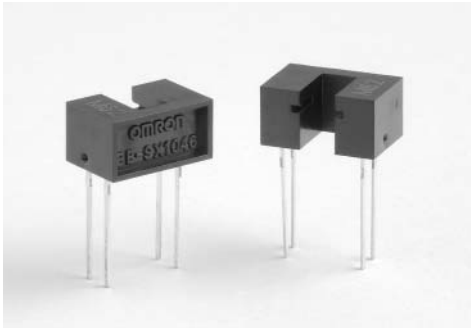


Response Time Measurement Circuit



Features

- With a horizontal sensing aperture.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.



■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

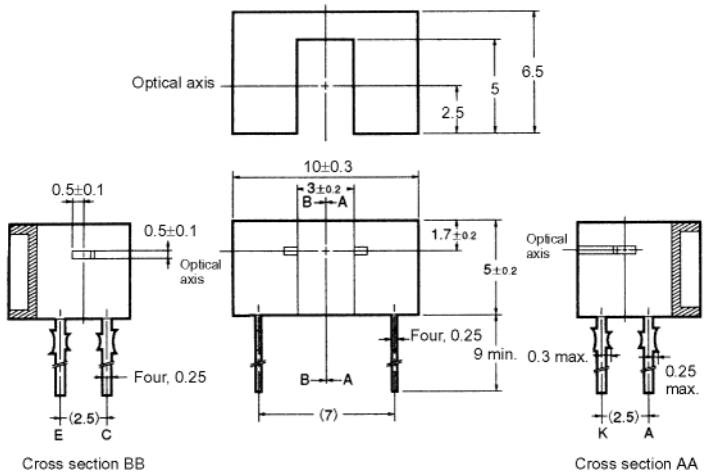
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 µs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

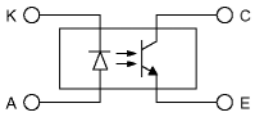
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01µA typ., 10 µA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
Detector	Light current	I_L	1.2 mA min., 14 mA Max.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CC} = 10 V
Rising time		tr	4 µs typ.	V_{CC} = 5 V, R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 µs typ.	V_{CC} = 5 V, R_L = 100Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



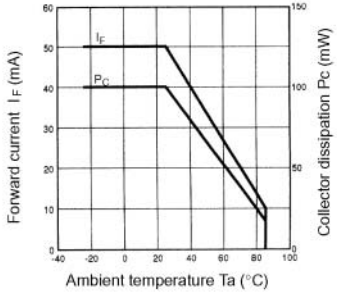
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

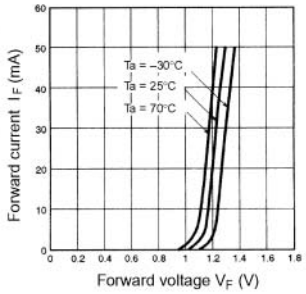
Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

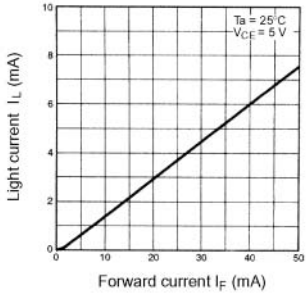
Forward Current vs. Collector Dissipation Temperature Rating



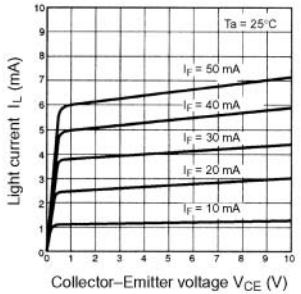
Forward Current vs. Forward Voltage Characteristics (Typical)



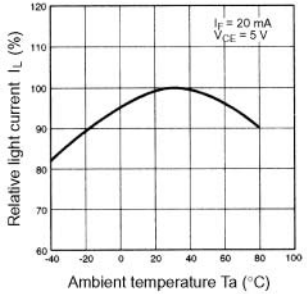
Light Current vs. Forward Current Characteristics (Typical)



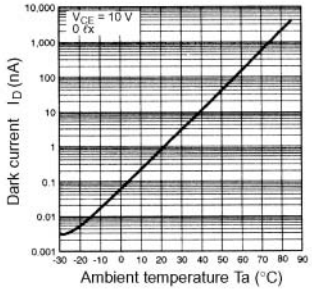
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



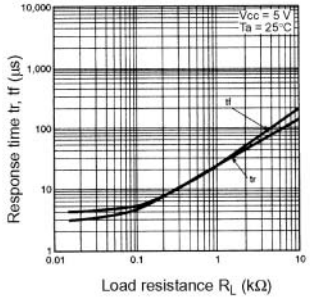
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



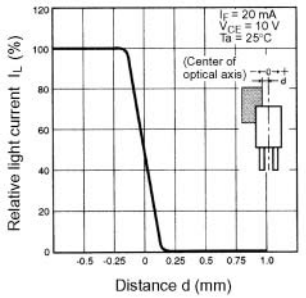
Dark Current vs. Ambient Temperature Characteristics (Typical)



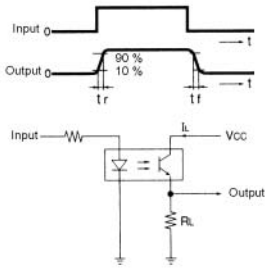
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

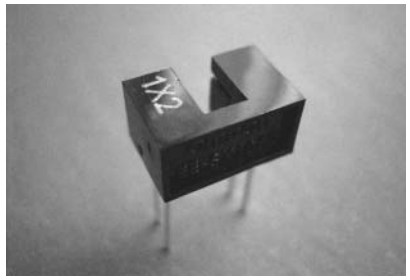


Response Time Measurement Circuit



Features

- Horizontal sensing aperture.
- PCB mounting type.
- High resolution with 0.2-mm wide aperture.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-40°C to 85°C
	Storage	Tstg	-40°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

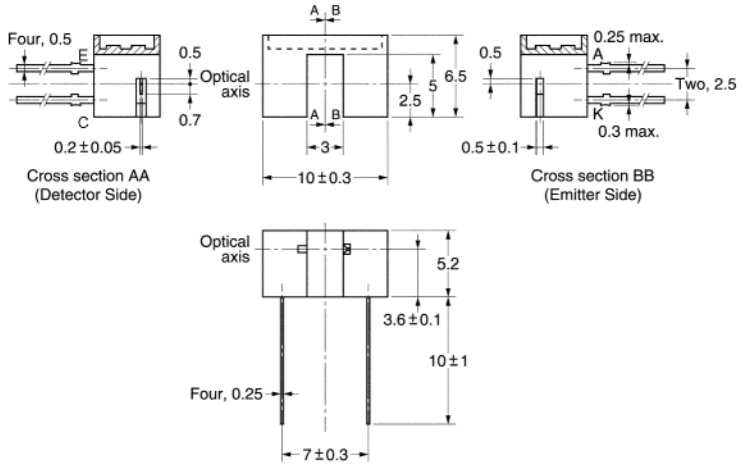
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 µs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

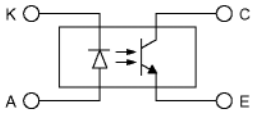
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01µA typ., 10 µA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.12 mA min.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 lx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.08 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.05 µA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CC} = 10 V
Rising time		tr	100 µs typ.	V_{CC} = 5 V, R_L = 50 kΩ, I_L = 0.1 mA
Falling time		tf	1,000 µs typ.	V_{CC} = 5 V, R_L = 50 kΩ, I_L = 0.1 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit

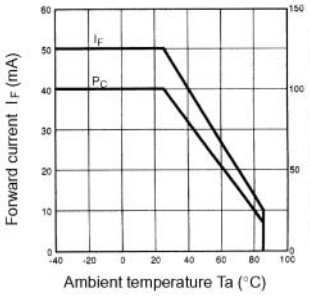


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

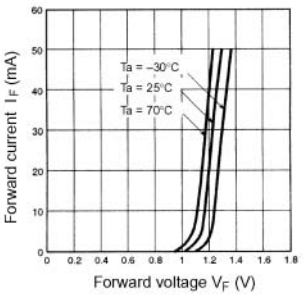
Unless otherwise specified, the tolerances are ±0.02 mm.

■ Engineering Data

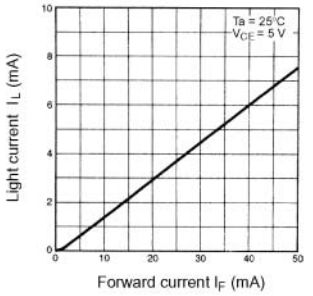
Forward Current vs. Collector Dissipation Temperature Rating



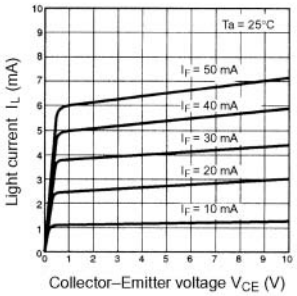
Forward Current vs. Forward Voltage Characteristics (Typical)



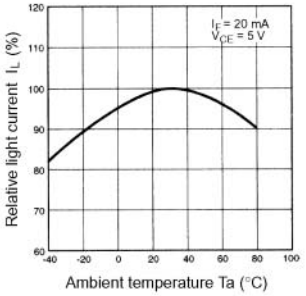
Light Current vs. Forward Current Characteristics (Typical)



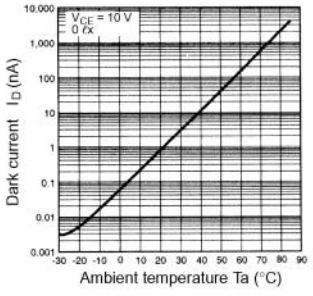
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



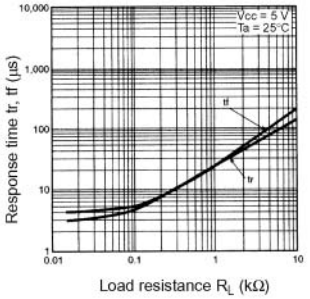
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



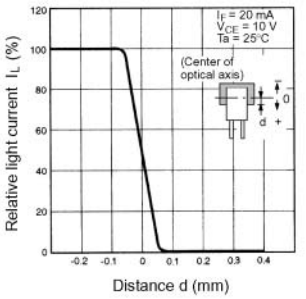
Dark Current vs. Ambient Temperature Characteristics (Typical)



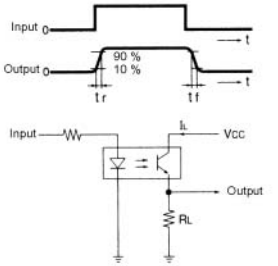
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

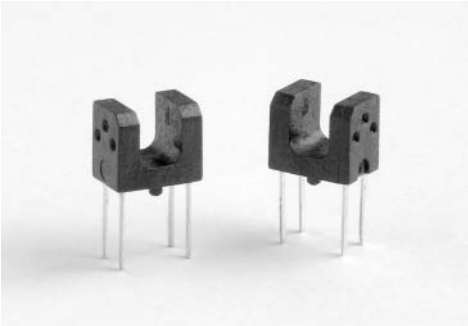


Response Time Measurement Circuit



Features

- Ultra compact with a slot width of 3 mm.
- PCB mounting type.
- High resolution with 0.4-mm wide aperture.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	–
	Reverse Voltage	V_R	5 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	4.5 V
	Collector current	I_C	30 mA
	Collector dissipation	P_C	80 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

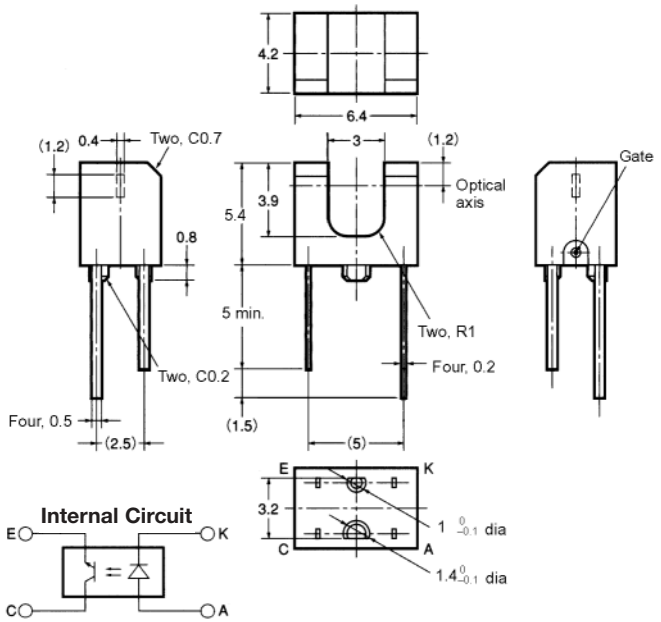
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 3 seconds.

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

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.3 V typ., 1.6 V max.	I_F = 50 mA
	Reverse current	I_R	10 µA max.	V_R = 5 V
	Peak emission wavelength	λ_P	950 nm typ.	I_F = 50 mA
Detector	Light current	I_L	0.2 mA min.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	500 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.4 V max.	I_F = 20 mA, I_L = 0.1 µA
	Peak spectral sensitivity wavelength	λ_P	800 nm typ.	V_{CE} = 5 V
Rising time		tr	10 µs typ.	V_{CC} = 5 V, R_L = 100Ω, I_L = 20 mA
Falling time		tf	10 µs typ.	V_{CC} = 5 V, R_L = 100Ω, I_L = 20 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.

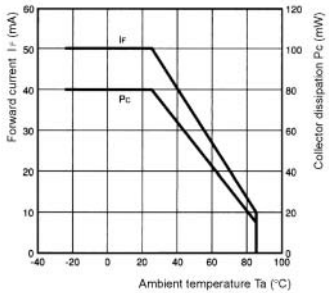


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

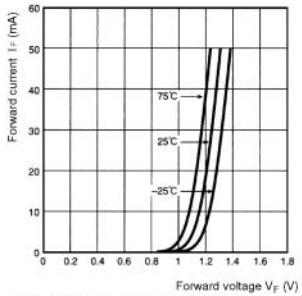
Unless otherwise specified, the tolerances are ± 0.2 mm.

■ Engineering Data

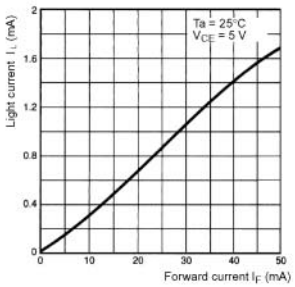
Forward Current vs. Collector Dissipation Temperature Rating



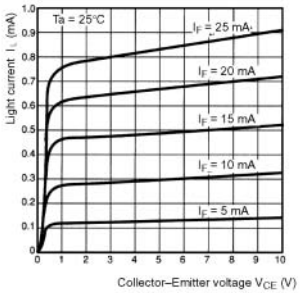
Forward Current vs. Forward Voltage Characteristics (Typical)



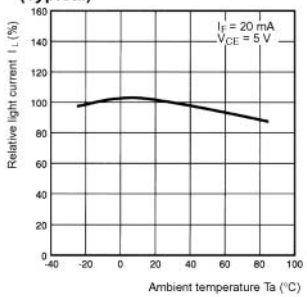
Light Current vs. Forward Current Characteristics (Typical)



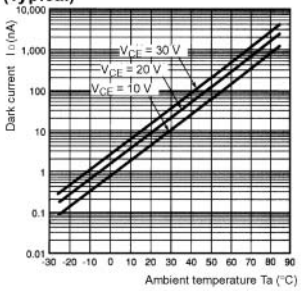
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



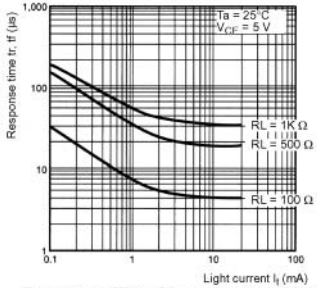
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



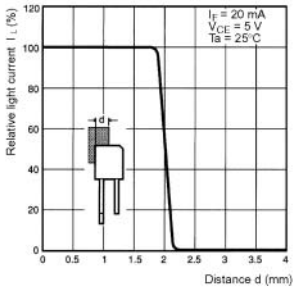
Dark Current vs. Ambient Temperature Characteristics (Typical)



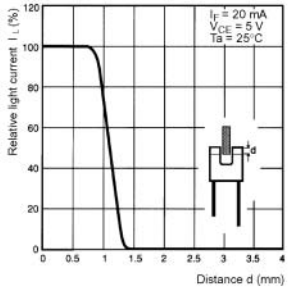
Response Time vs. Light Current Characteristics (Typical)



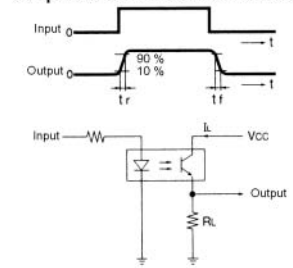
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)

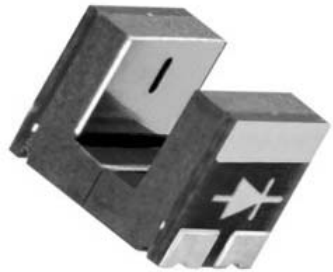


Response Time Measurement Circuit



Features

- Ultra-compact with a 6-mm-wide sensor and a 3-mm-wide slot.
- PCB surface mounting type.
- High resolution with a 0.5-mm-wide aperture.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	25 mA (see note 1)
	Pulse forward current	I_{PF}	100 A (see note 2)
	Reverse Voltage	V_R	5 V
Detector	Collector-Emitter Voltage	V_{CEO}	20 V
	Emitter-Collector Voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	Operating	Topr	-30°C to 85°C
	Storage	Tstg	-40°C to 90°C
	Reflow soldering	Tsol	240°C (see note 3)
	Manual soldering	Tsol	300°C (see note 3)

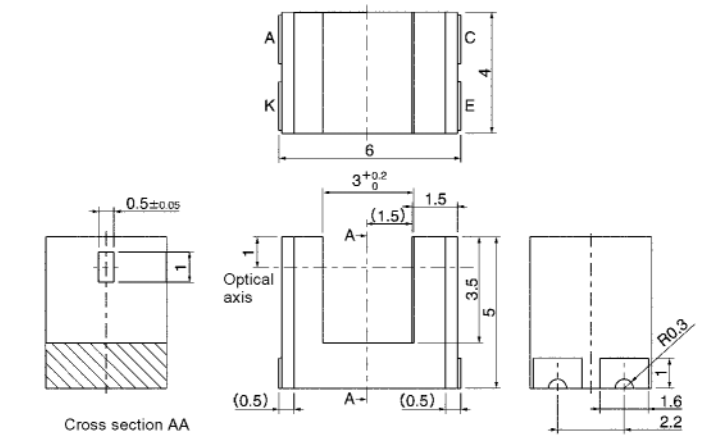
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Duty: 1/100; Pulse width: 0.1 ms
3. Complete soldering within 10 seconds for reflow soldering and within 3 seconds for manual soldering.

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

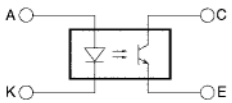
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.1 V typ., 1.3 V max.	I_F = 5 mA
	Reverse current	I_R	10 µA max.	V_R = 5 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	50 µA min., 150 µA max. 500 µA max.	I_F = 5 mA, V_{CE} = 5 V
	Dark current	I_D	100 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.	I_F = 20 mA, I_L = 50 µA
	Peak spectral sensitivity wavelength	λ_P	900 nm typ.	–
Rising time		tr	10 µs typ.	V_{CC} = 5 V. R_L = 1 kΩ, I_L = 100 µA
Falling time		tf	10 µs typ.	V_{CC} = 5 V. R_L = 1 kΩ, I_L = 100 µA

■ Dimensions

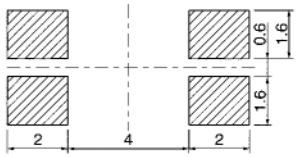
Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Recommended Soldering Pattern

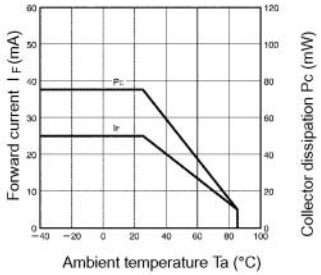


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

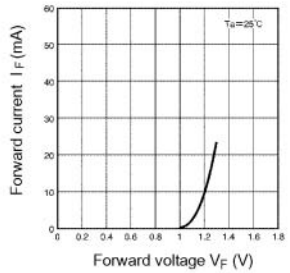
Unless otherwise specified, the tolerances are ± 0.15mm.

■ Engineering Data

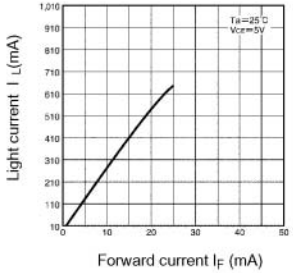
Forward Current vs. Collector Dissipation Temperature Rating



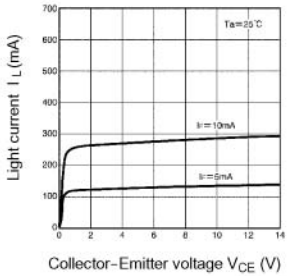
Forward Current vs. Forward Voltage Characteristics (Typical)



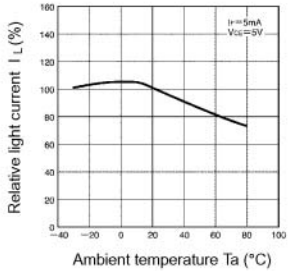
Light Current vs. Forward Current Characteristics (Typical)



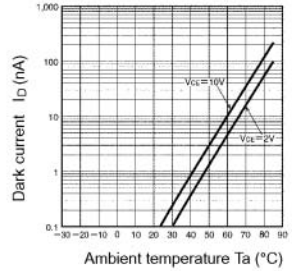
Light Current vs. Collector-Emitter Voltage Characteristics (Typical)



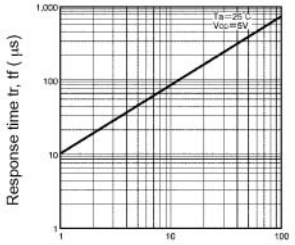
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



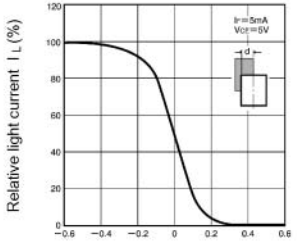
Dark Current vs. Ambient Temperature Characteristics (Typical)



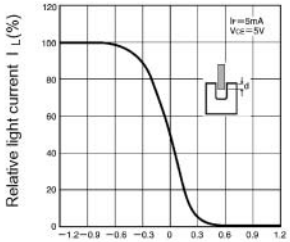
Response Time vs. Load Resistance Characteristics (Typical)



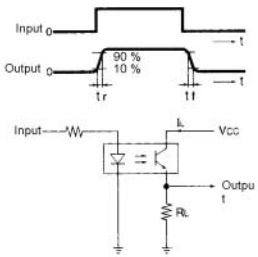
Sensing Position Characteristics (Typical)



Sensing Position Characteristics (Typical)



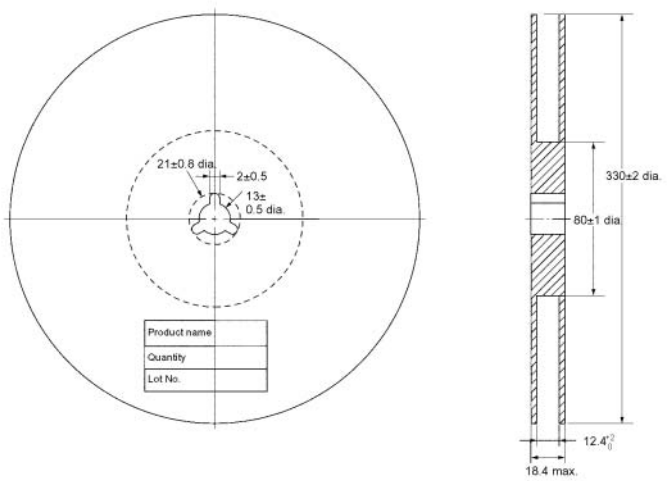
Response Time Measurement Circuit



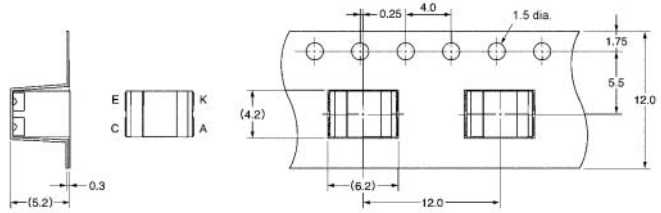
■ Tape and Reel

Unit: mm (inch).

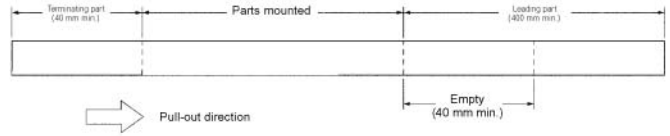
Reel



Tape



Tape configuration



Tape quantity

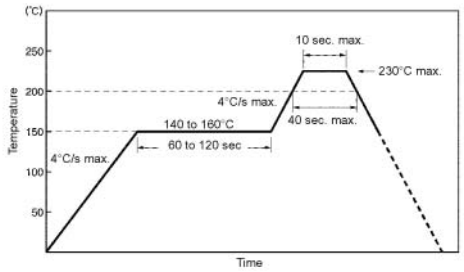
1,000 pcs./reel

Precautions

■ Soldering Information

Reflow soldering

- The following soldering paste is recommended:
  Melting temperature: 178 to 192°C
  Composition: Sn 63%, Pb 37%
- The recommended thickness of the metal mask for screen printing is between 0.2 and 0.25 mm.
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use “Sn 60” (60% tin and 40% lead) or solder with silver content.
- Use a soldering iron of less than 25W, and keep the temperature of the iron tip at 300°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 10 to 30°C
Humidity: 60% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored under 30°C at 80% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope.

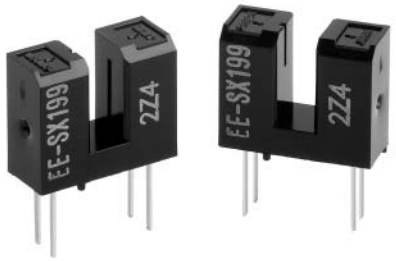
Baking

If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use:

Reel: 60°C for 24 hours or more
Bulk: 80°C for 4 hours or more

Features

- General-purpose model with a 3-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- With a positioning boss.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-40°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

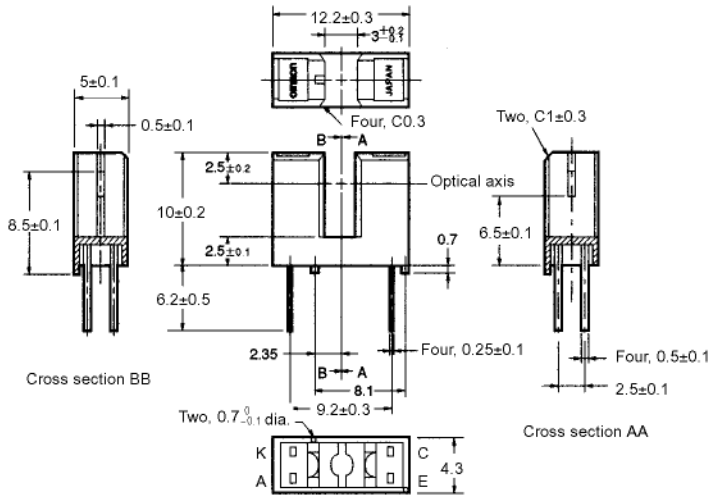
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 µs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

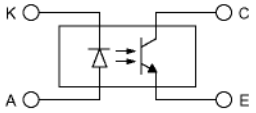
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.4 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 µA typ., 10 µA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 20 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 40 mA, I_L = 0.5mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 µs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 µs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit

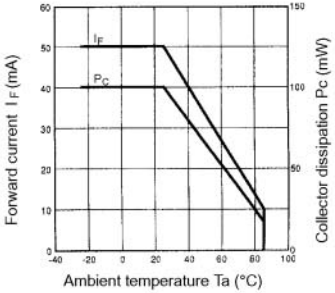


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

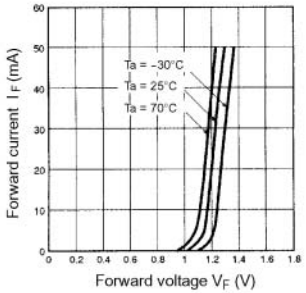
Unless otherwise specified the tolerances are ±0.2mm.

■ Engineering Data

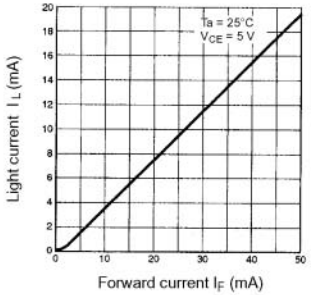
Forward Current vs. Collector Dissipation Temperature Rating



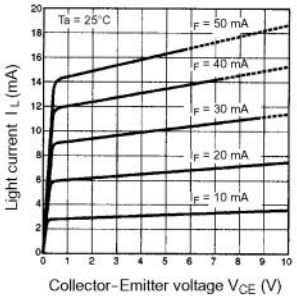
Forward Current vs. Forward Voltage Characteristics (Typical)



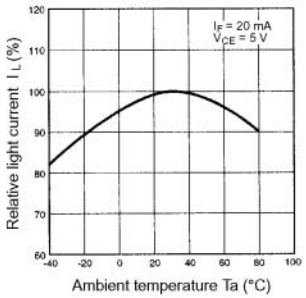
Light Current vs. Forward Current Characteristics (Typical)



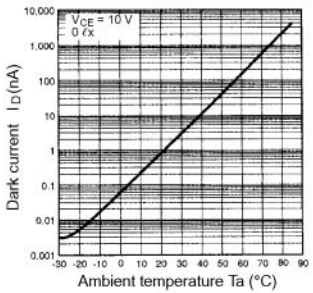
Light Current vs. Collector-Emitter Voltage Characteristics (Typical)



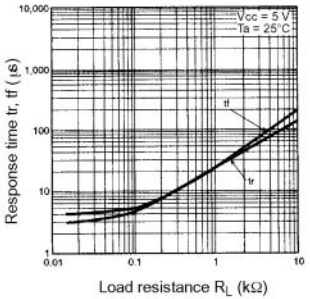
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



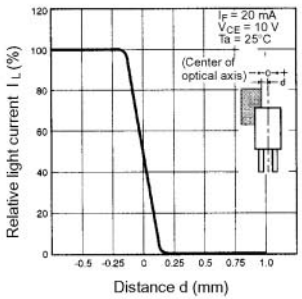
Dark Current vs. Ambient Temperature Characteristics (Typical)



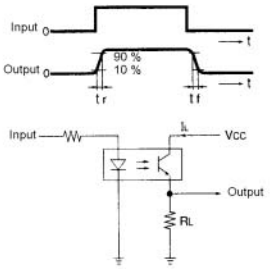
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

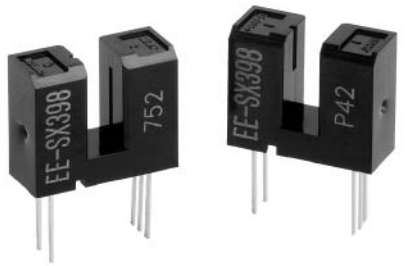


Response Time Measurement Circuit



Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX398)
- Light ON model (EE-SX498)



Specifications

■ 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
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	Topr	-40°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

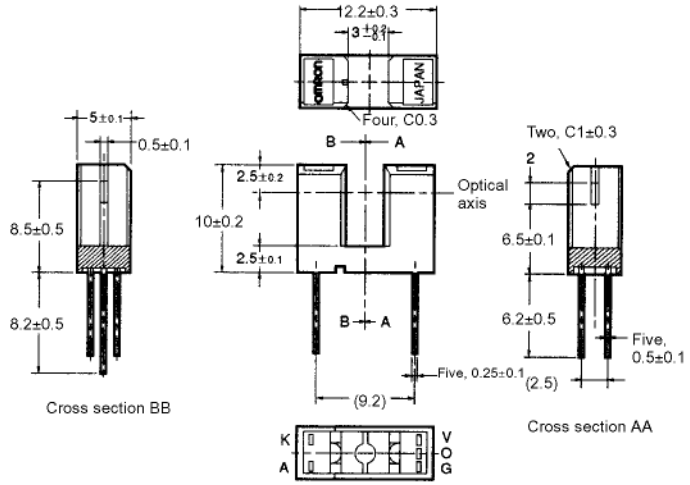
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

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

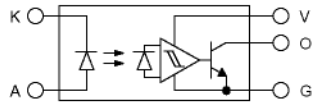
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, I_F = 0 mA (EE-SX398), I_F = 5 mA (EE-SX498)
	High-level output voltage	V_{OH}	15 V min.	Vcc = 16 V, R_L = 1 kΩ, I_F = 5 mA (EE-SX398), I_F = 0 mA (EE-SX498)
	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 LED current when output is ON		I_{FT}	2 mA typ., 5 mA max.	V_{CC} = 4.5 to 16
Hysteresis		△H	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 2)
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 m (see note 3)

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



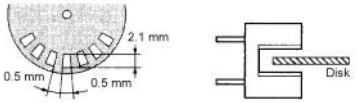
Unless otherwise specified, the tolerances are as shown below.

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

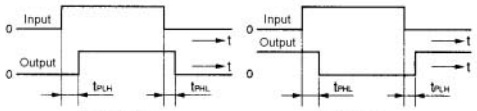
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

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



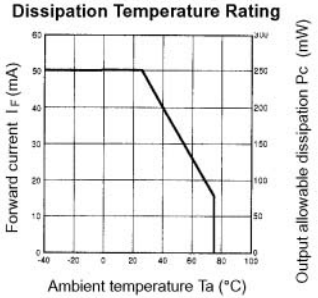
3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EE-SX498.



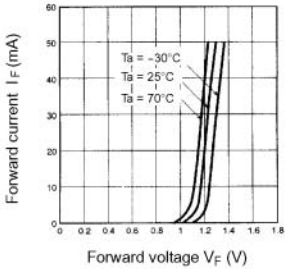
■ Engineering Data

Note: The values in the parentheses apply to the EE-SX498.

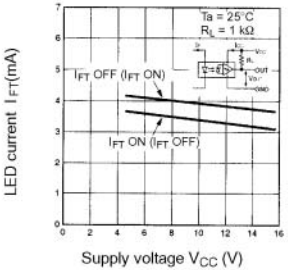
Forward Current vs. Collector Dissipation Temperature Rating



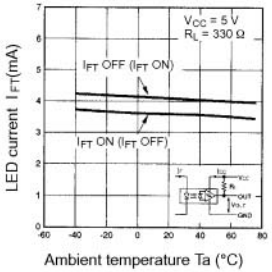
Forward Current vs. Forward Voltage Characteristics (Typical)



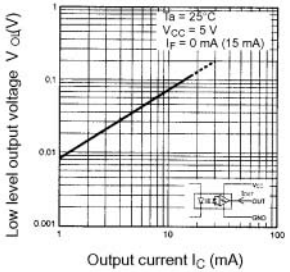
LED Current vs. Supply Voltage (Typical)



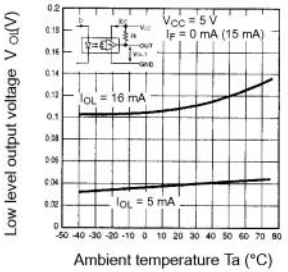
LED Current vs. Ambient Temperature Characteristics (Typical)



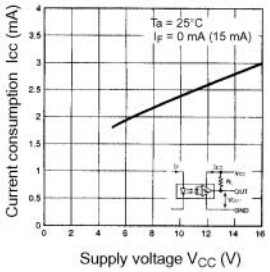
Low-level Output Voltage vs. Output Current (Typical)



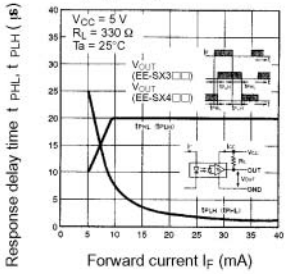
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



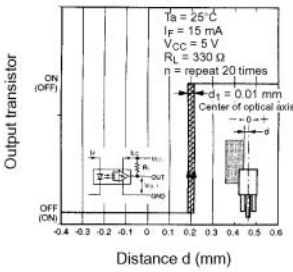
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)

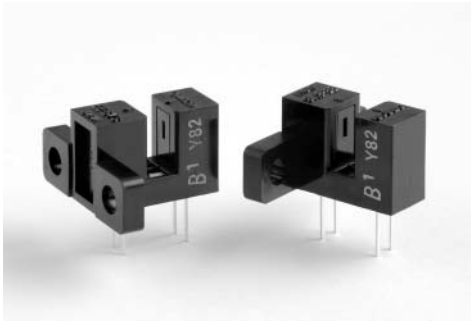


Repeat Sensing Position Characteristics (Typical)



Features

- High-resolution model with a 0.2-mm-wide or 0.5-mm-wide sensing aperture, high-sensitivity model with a 1-mm-wide sensing aperture, and model with a horizontal sensing aperture are available.
- Solder terminal models:
  EE-SV3/-SV3-CS/-SV3-DS/-SV3-GS
- PCB terminal models:
  EE-SV3-B/-SV3-C/-SV3-D/-SV3-G



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter Voltage	V_{CEO}	30 V
	Emitter-Collector Voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

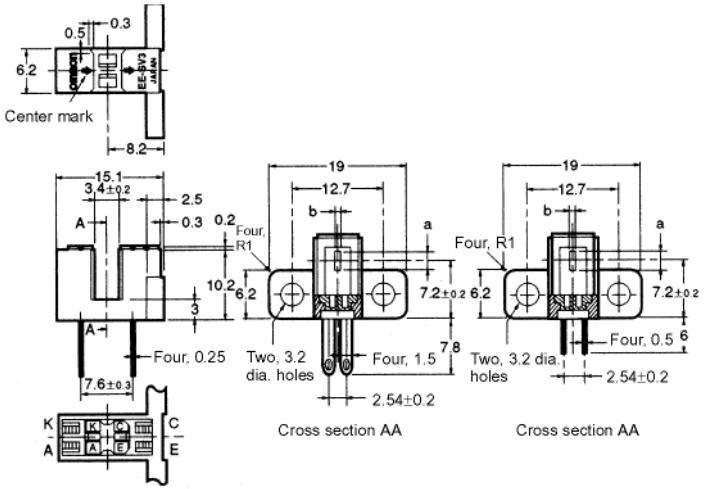
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

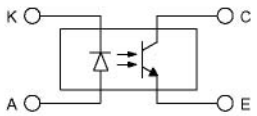
Item		Symbol	Value				Condition
			EE-SV3(-B)	EE-SV3-C(S)	EE-SV3-D(S)	EE-SV3-G(S)	
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.				I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.				V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.				I_F = 20 mA
Detector	Light current	I_L	0.5 to 14 mA	1 to 28 mA	0.1 mA min.	0.5 to 14 mA	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.				V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–				–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.		–	0.1 V typ. 0.4 V max.	I_F = 20 mA, I_L = 0.1 μA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.				V_{CE} = 10 V
Rising time		tr	4 μs typ.				V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.				

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Model	Aperture (a x b)
EE-SV3(-B)	2.1 x 0.5
EE-SV3-C(S)	2.1 x 1.0
EE-SV3-D(S)	2.1 x 0.2
EE-SV3-G(S)	0.5 x 2.1

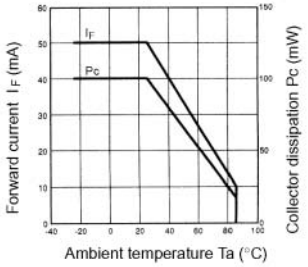
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

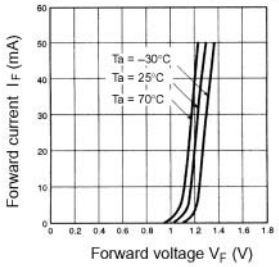
Dimensions	Tolerence
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Engineering Data

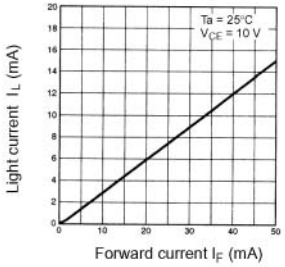
Forward Current vs. Collector Dissipation Temperature Rating



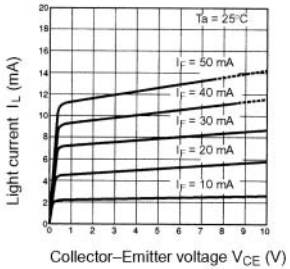
Forward Current vs. Forward Voltage Characteristics (Typical)



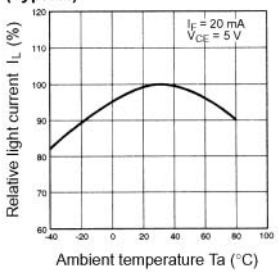
Light Current vs. Forward Current Characteristics (Typical)



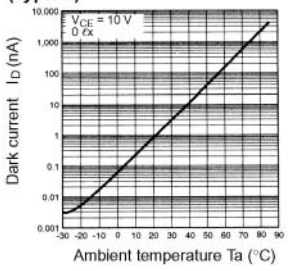
Light Current vs. Collector–Emitter Voltage Characteristics (EE-SV3(-B))



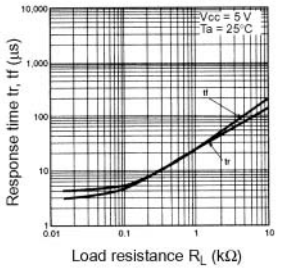
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



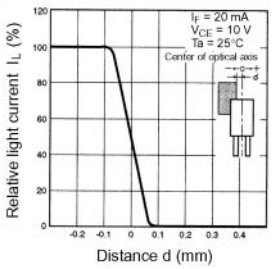
Dark Current vs. Ambient Temperature Characteristics (Typical)



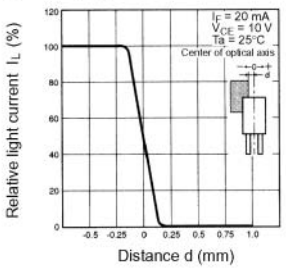
Response Time vs. Load Resistance Characteristics (Typical)



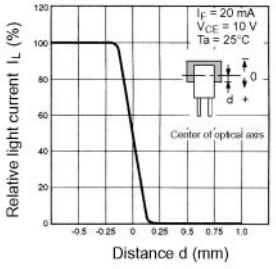
Sensing Position Characteristics (EE-SV3-D(S))



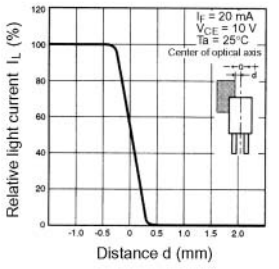
Sensing Position Characteristics (EE-SV3(-B))



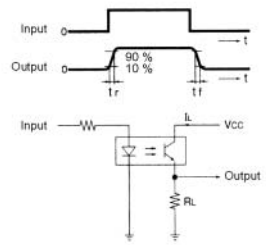
Sensing Position Characteristics (EE-SV3-G(S))



Sensing Position Characteristics (EE-SV3-C(S))

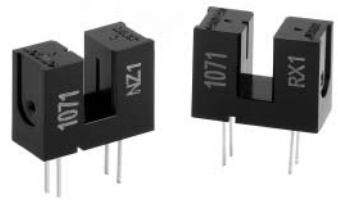


Response Time Measurement Circuit



Features

- General-purpose model with a 3.4-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

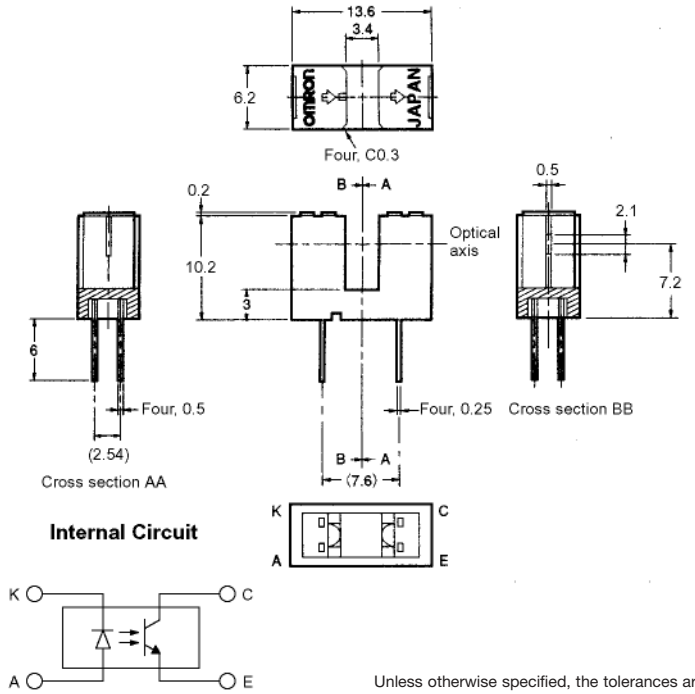
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 µs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ 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 = 30 mA
	Reverse current	I_R	0.01 µA typ., 10 µA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 µs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 µs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



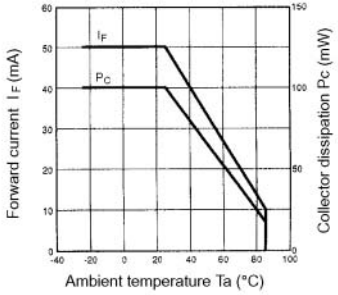
Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

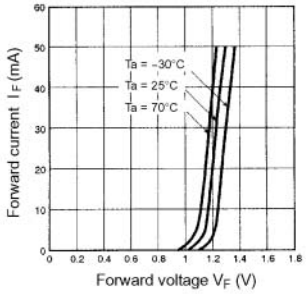
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

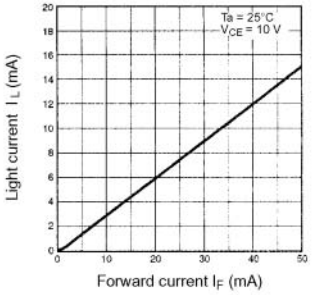
Forward Current vs. Collector Dissipation Temperature Rating



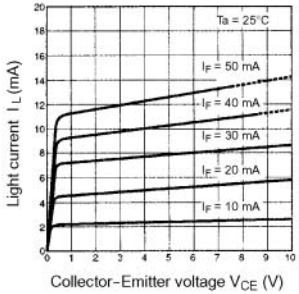
Forward Current vs. Forward Voltage Characteristics (Typical)



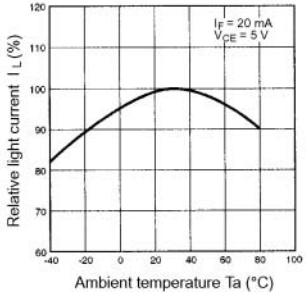
Light Current vs. Forward Current Characteristics (Typical)



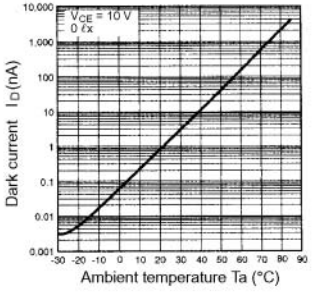
Light Current vs. Collector-Emitter Characteristics (Typical)



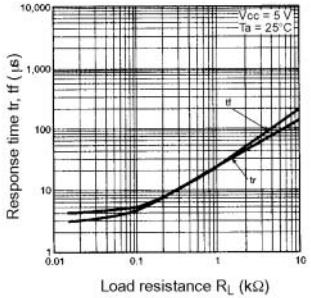
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



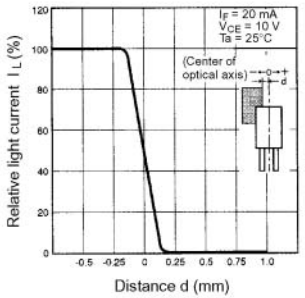
Dark Current vs. Ambient Temperature Characteristics (Typical)



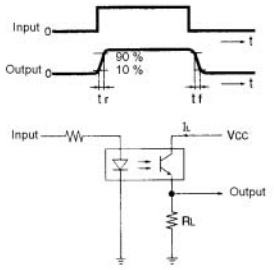
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Features

- General-purpose model with a 3.4-mm-wide slot.
- Mounts to PCBs or connects to connectors.
- High resolution with a 0.5-mm-wide aperture.
- OMRON's XK8-series Connectors can be connected without soldering. Contact your OMRON representative for information on obtaining XK8-series Connectors.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

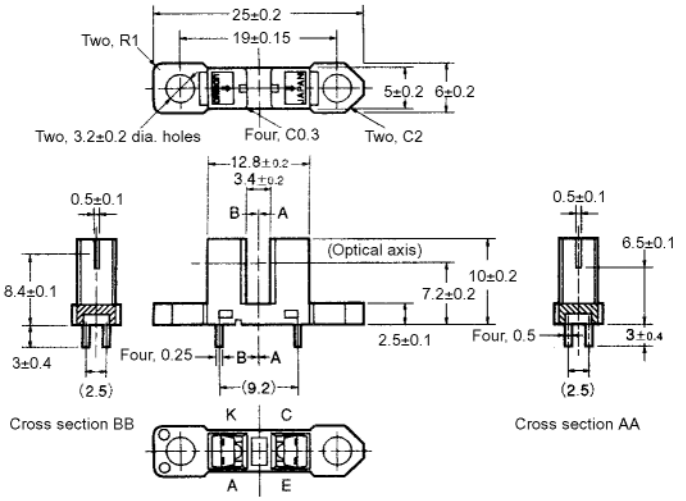
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

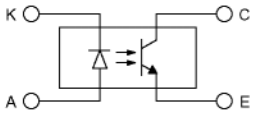
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.15 V typ., 0.4 max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



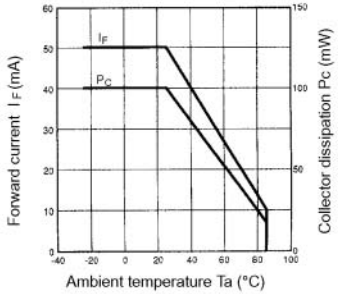
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are shown below

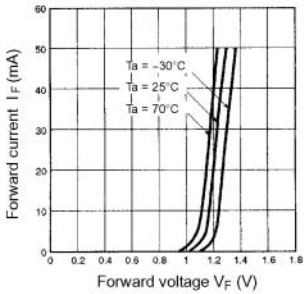
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

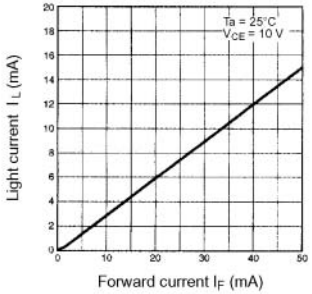
Forward Current vs. Collector Dissipation Temperature Rating



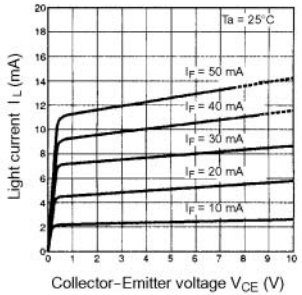
Forward Current vs. Forward Voltage Characteristics (Typical)



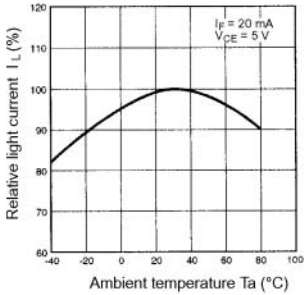
Light Current vs. Forward Current Characteristics (Typical)



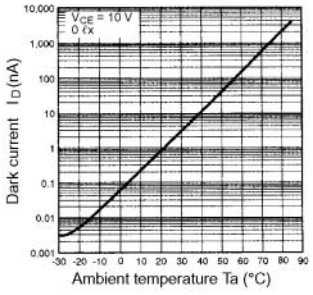
Light Current vs. Collector-Emitter Characteristics (Typical)



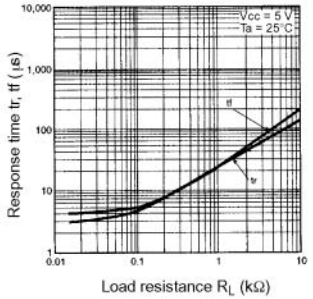
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



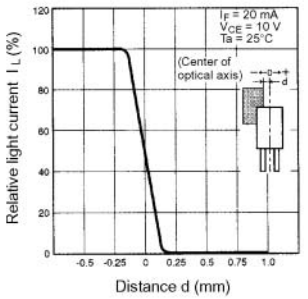
Dark Current vs. Ambient Temperature Characteristics (Typical)



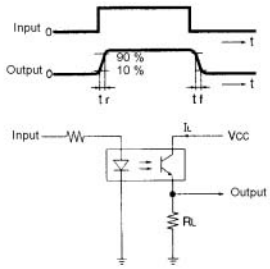
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Features

- High-resolution model with a 0.2-mm-wide or 0.5-mm-wide sensing aperture, high-sensitivity model with a 1-mm-wide sensing aperture, and model with a horizontal sensing aperture are available.
- Solder terminal models:
  EE-SH3/-SH3-CS/-SH3-DS/-SH3-GS
- PCB terminal models:
  EE-SH3-B/-SH3-C/-SH3-D/-SH3-G

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

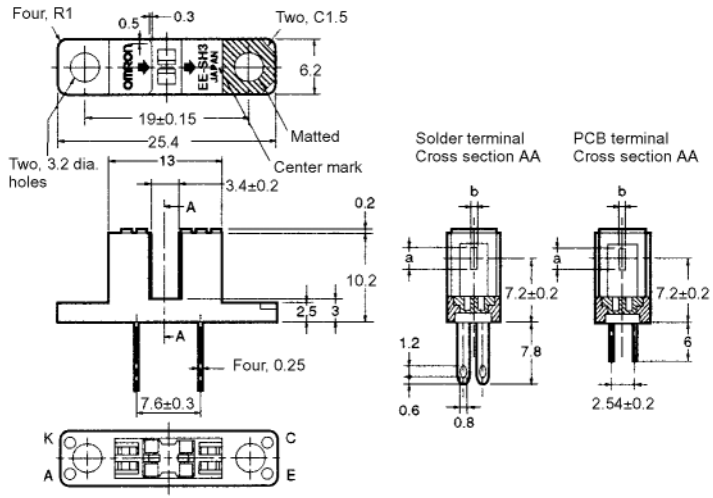
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

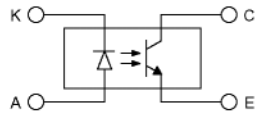
Item		Symbol	Value				Condition
			EE-SH3(-B)	EE-SH3 -C(S)	EE-SH3 -D(S)	EE-SH3 -G(S)	
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.				I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.				V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.				I_F = 20 mA
Detector	Light current	I_L	0.5 to 14 mA typ.	1 to 28 mA	0.1 mA min.	0.5 to 14 mA	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.				V_{CE} = 10 V 0 ℓx
	Leakage current	I_{LEAK}	–				–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.		–	0.1 V typ. 0.4 max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.				V_{CE} = 10 V
Rising time		tr	4 μs typ.				V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 μs typ.				

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

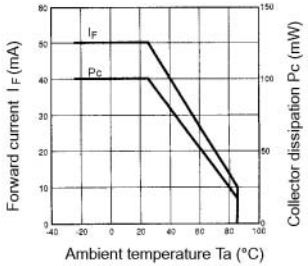
Model	Aperture (a x b)
EE-SH3(-B)	2.1 x 0.5
EE-SH3-C(S)	2.1 x 1.0
EE-SH3-D(S)	2.1 x 0.2
EE-SH3-G(S)	0.5 x 2.1

Unless otherwise specified, the tolerances are shown below

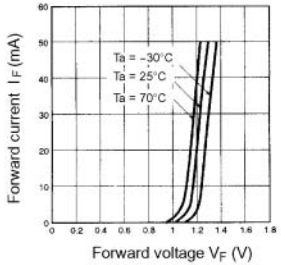
Dimensions	Tolerance
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Engineering Data

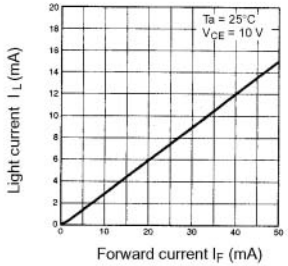
Forward Current vs. Collector Dissipation Temperature Rating



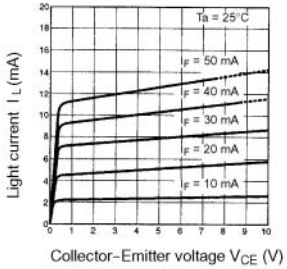
Forward Current vs. Forward Voltage Characteristics (Typical)



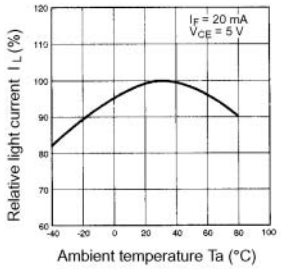
Light Current vs. Forward Current Characteristics (Typical)



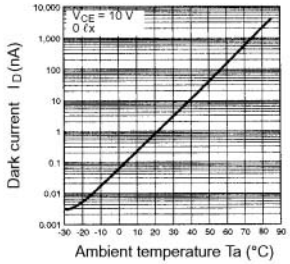
Light Current vs. Collector-Emitter Characteristics (Typical)



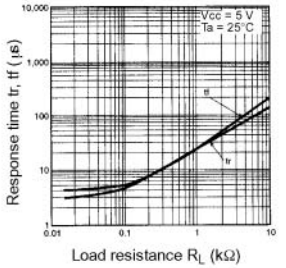
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



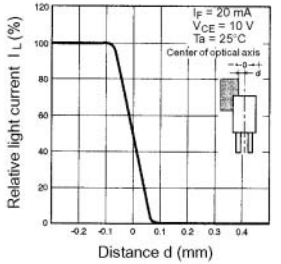
Dark Current vs. Ambient Temperature Characteristics (Typical)



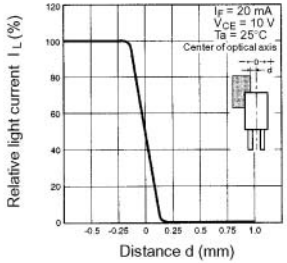
Response Time vs. Load Resistance Characteristics (Typical)



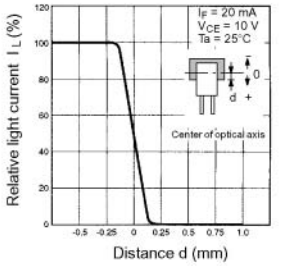
Sensing Position Characteristics (EE-SH3-D(S))



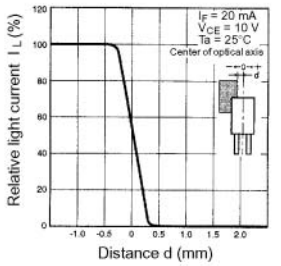
Sensing Position Characteristics (EE-SH3(-B))



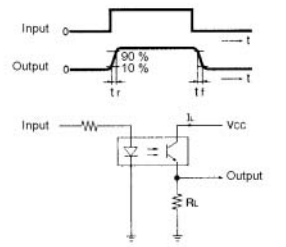
Sensing Position Characteristics (EE-SH3-G(S))



Sensing Position Characteristics (EE-SH3-C(S))



Response Time Measurement Circuit



Features

- High-resolution model with a 0.2-mm-wide sensing aperture, high-sensitivity model with a 1-mm-wide sensing aperture, and model with a horizontal sensing aperture are available.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

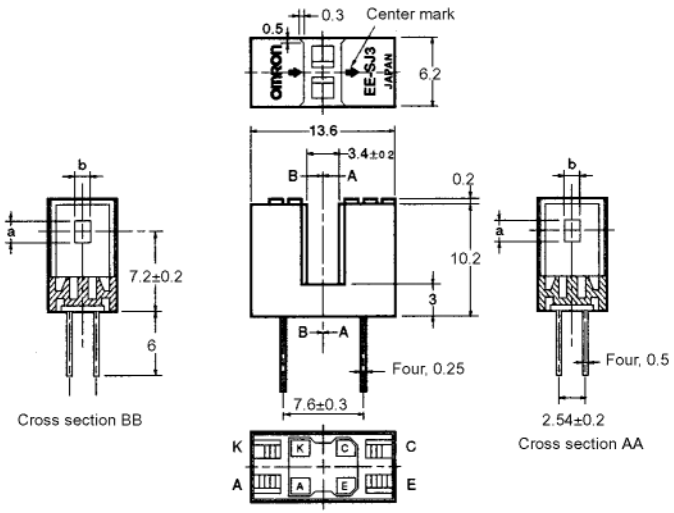
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width ia 10 µs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

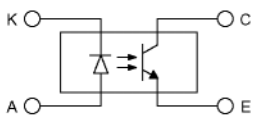
Item		Symbol	Value			Condition
			EE-SJ3-C	EE-SJ3-D	EE-SJ3-G	
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.			I_F = 30 mA
	Reverse current	I_R	0.01 µA typ., 10 µA max.			V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.			I_F = 20 mA
Detector	Light current	I_L	1 to 28 mA typ.	0.1 mA min.	0.5 to 14 mA	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.			V_{CE} = 10 V 0 ℓ x
	Leakage current	I_{LEAK}	–			–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.	–	0.1 V typ., 0.4 max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.			V_{CE} = 10 V
Rising time		tr	4 µs typ.			V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 µs typ.			

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Model	Aperture (a x b)
EE-SH3(-B)	2.1 x 1.0
EE-SH3-C(S)	2.1 x 0.2
EE-SH3-D(S)	0.5 x 2.1

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

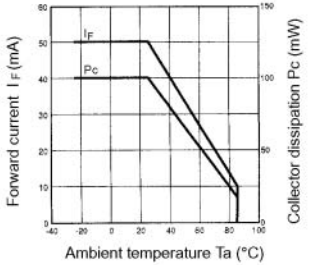
Unless otherwise specified, the tolerances are shown below

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

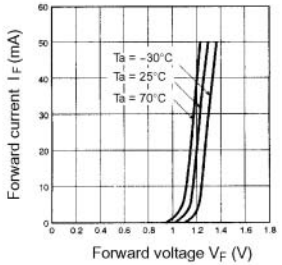
■ Engineering Data

Note: The values in the parentheses apply to EE-SX4070.

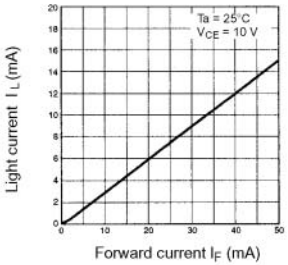
Forward Current vs. Collector Dissipation Temperature Rating



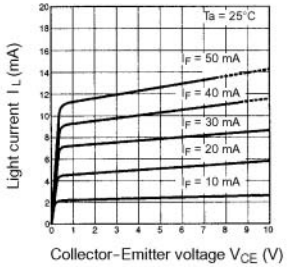
Forward Current vs. Forward Voltage Characteristics (Typical)



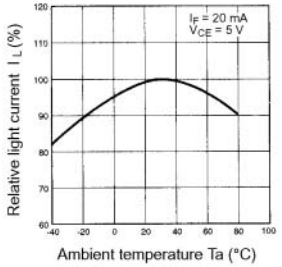
Light Current vs. Forward Current Characteristics (Typical)



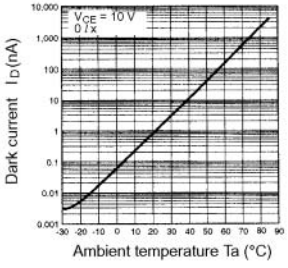
Light Current vs. Collector-Emitter Characteristics (EE-SJ3-G)



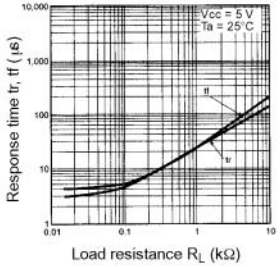
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



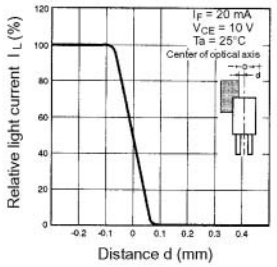
Dark Current vs. Ambient Temperature Characteristics (Typical)



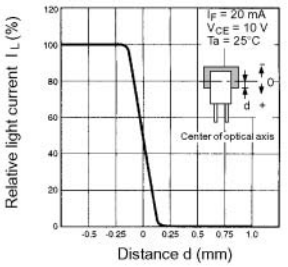
Response Time vs. Load Resistance Characteristics (Typical)



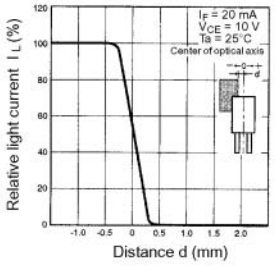
Sensing Position Characteristics (EE-SJ3-D)



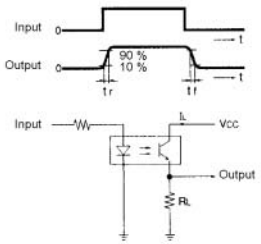
Sensing Position Characteristics (EE-SJ3-G)



Sensing Position Characteristics (EE-SJ3-C)



Response Time Measurement Circuit



Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- A wide supply voltage range: 4.5 to 16 VDC.
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX3081).
- Light ON model (EE-SX4081).
- OMRON's XK8-series Connectors can be connected without soldering. Contact your OMRON representative for information on obtaining XK8-series Connectors.

Specifications

■ 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
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	Topr	-40°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

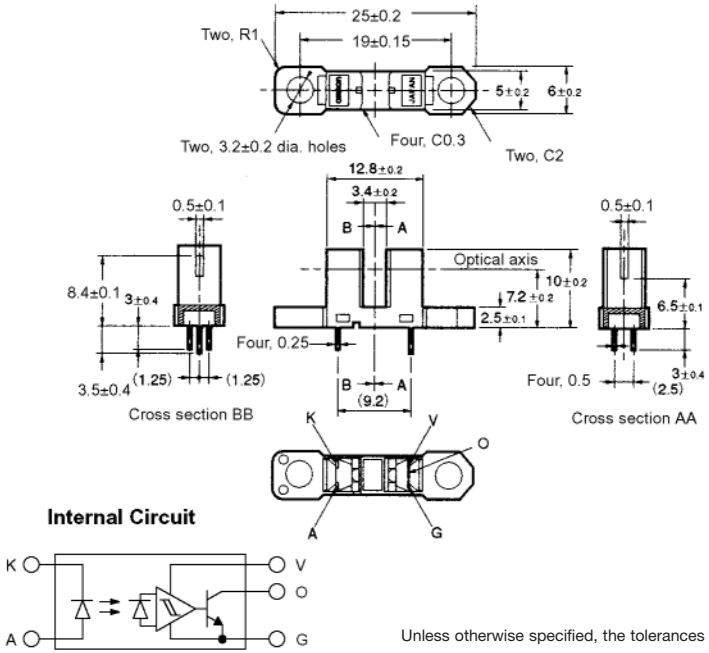
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ 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	940 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, I_F = 0 mA (EE-SX3088), I_F = 5 mA (EE-SX4088)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, I_F = 5 mA (EE-SX3088), I_F = 0 mA (EE-SX4088)
	Current consumption	I_{CC}	3.2 mA typ., 10 mA max.	V_{CC} = 16 V
	Peak spectral sensitivity wavelength	λ_P	870 nm	V_{CC} = 4.5 to 16 V
LED current when output is OFF		I_{FT}	2 mA typ., 5 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		△H	15% typ.	V_{CC} = 4.5 to 16 V (see note 1)
Response frequency		f	3 kHz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16mA (see note 2)
Response delay time		t_{PLH} (t_{PHL})	3 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16 mA (see note 3)

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit

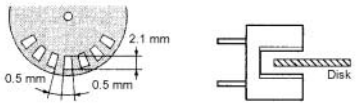
Unless otherwise specified, the tolerances are shown below

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

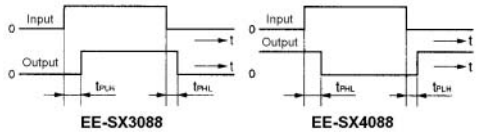
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

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



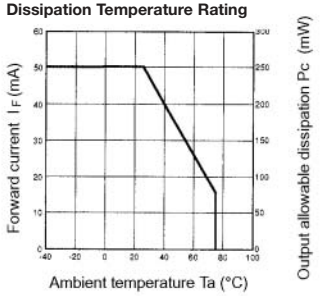
3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EESX4088.



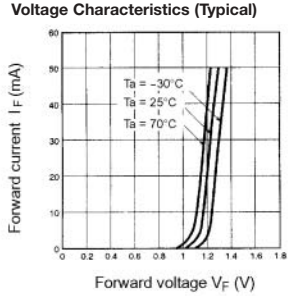
■ Engineering Data

Note: The values in the parentheses apply to EE-SX4080.

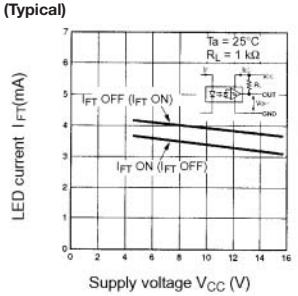
Forward Current vs. Collector Dissipation Temperature Rating



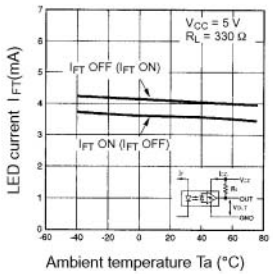
Forward Current vs. Forward Voltage Characteristics (Typical)



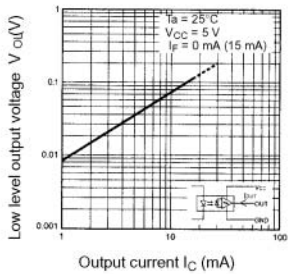
LED Current vs. Supply Voltage (Typical)



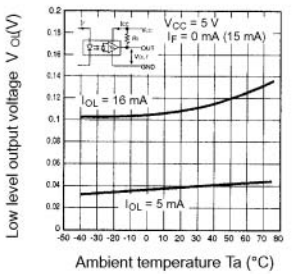
LED Current vs. Ambient Temperature Characteristics (Typical)



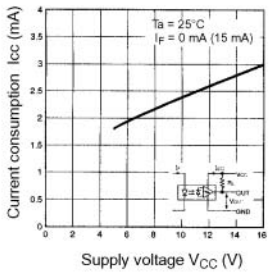
Low-level Output Voltage vs. Output Current (Typical)



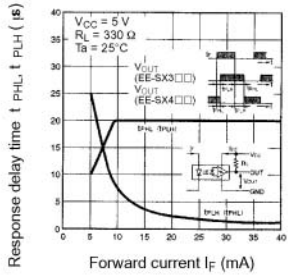
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



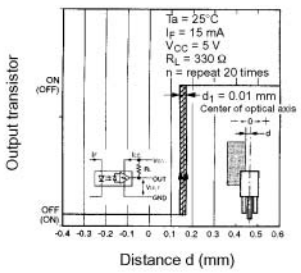
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)

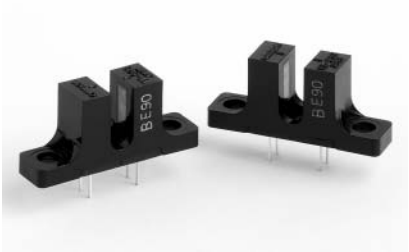


Repeat Sensing Position Characteristics (Typical)



Features

- Dust-proof model.
- Solder terminal model (EE-SG3).
- PCB terminal model (EE-SG3-B).



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

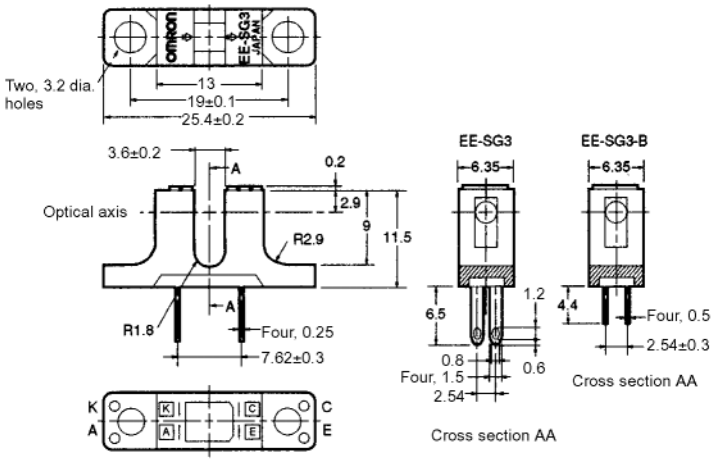
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 µs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

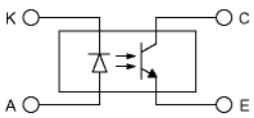
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 µA typ., 10 µA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	2 mA min., 40 mA max.	I_F = 15 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.	I_F = 30 mA, I_L = 1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 µs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 µs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



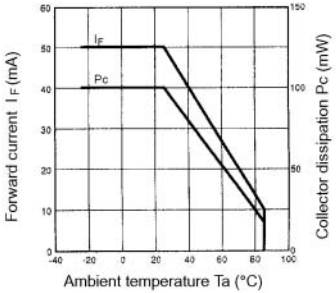
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are shown below

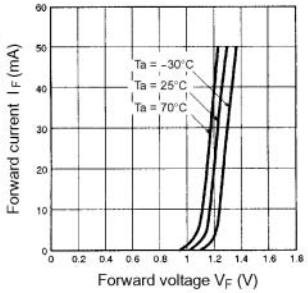
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

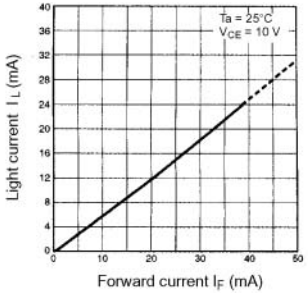
Forward Current vs. Collector Dissipation Temperature Rating



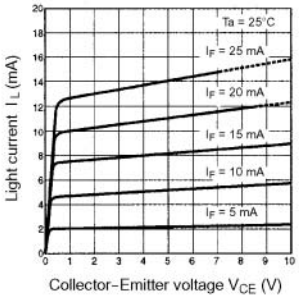
Forward Current vs. Forward Voltage Characteristics (Typical)



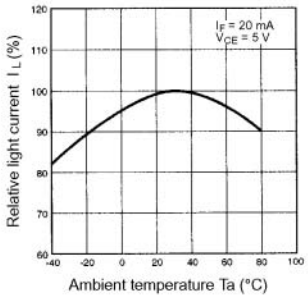
Light Current vs. Forward Current Characteristics (Typical)



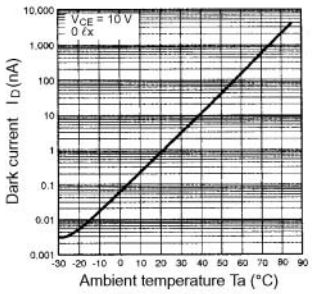
Light Current vs. Collector-Emitter Characteristics (Typical)



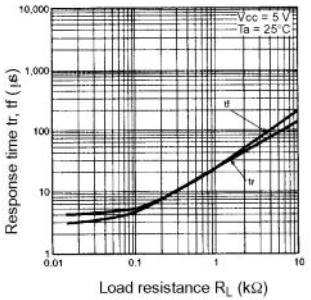
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



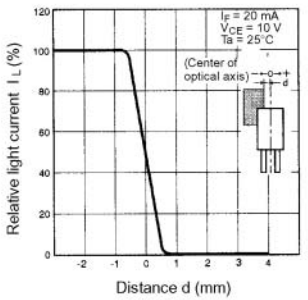
Dark Current vs. Ambient Temperature Characteristics (Typical)



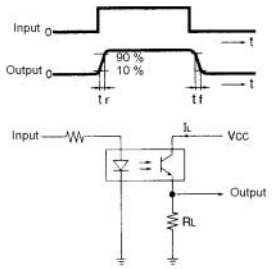
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

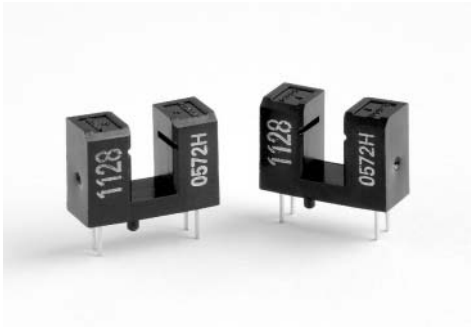


Response Time Measurement Circuit



Features

- General-purpose model with a 4.2-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.
- Horizontal sensing aperture.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter Voltage	V_{CEO}	30 V
	Emitter-Collector Voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

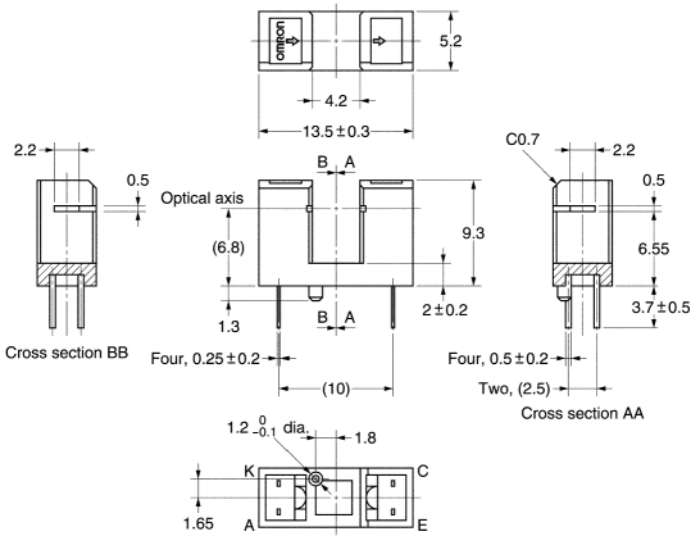
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

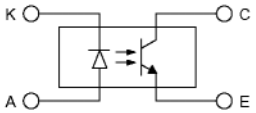
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 10 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.	I_F = 20 mA, I_L = 1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V. R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V. R_L = 100 Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



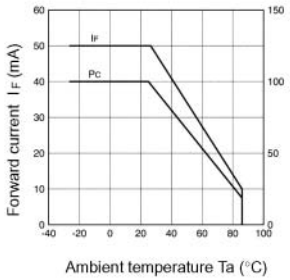
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are shown below

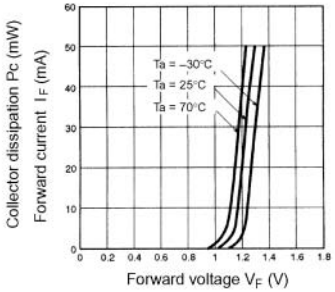
Dimensions	Tolerance
0 < mm ≤ 4	±0.100
4 < mm ≤ 18	±0.200

■ Engineering Data

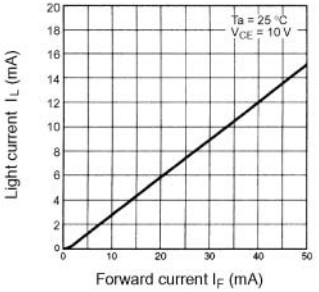
Forward Current vs. Collector Dissipation Temperature Rating



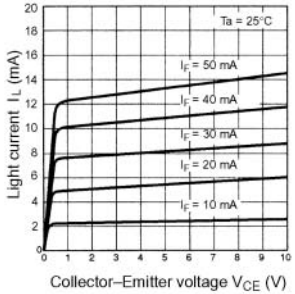
Forward Current vs. Forward Voltage Characteristics (Typical)



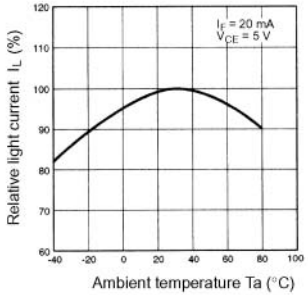
Light Current vs. Forward Current Characteristics (Typical)



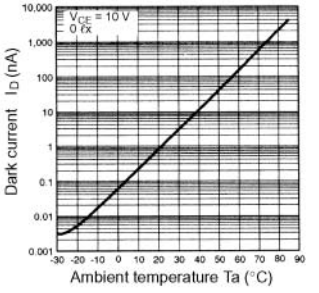
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



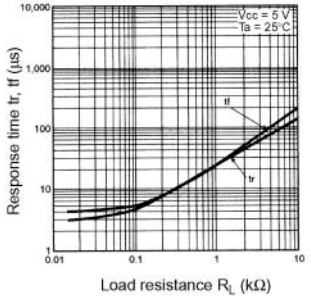
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



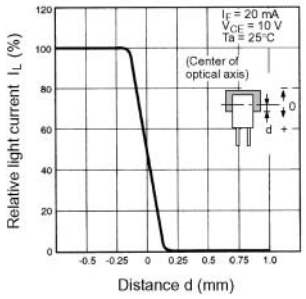
Dark Current vs. Ambient Temperature Characteristics (Typical)



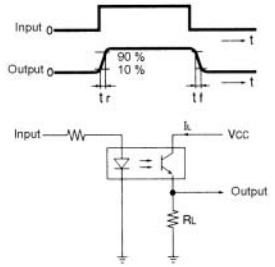
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

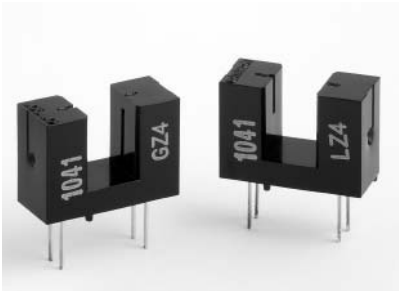


Response Time Measurement Circuit



Features

- General-purpose model with a 5-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

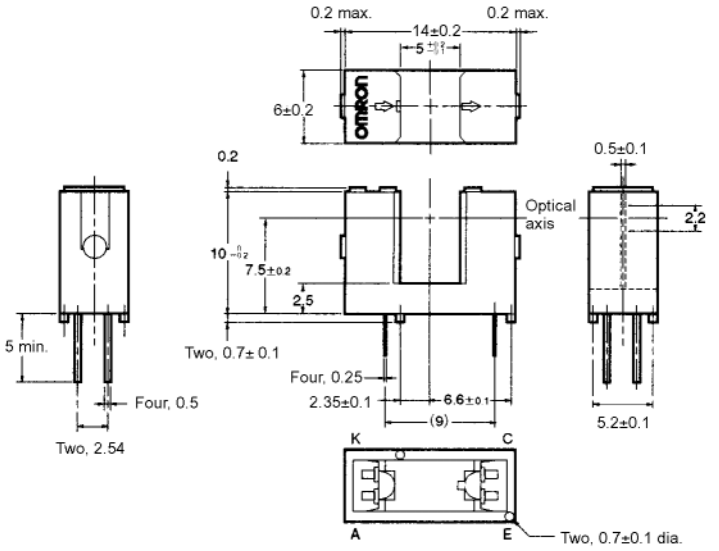
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

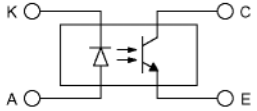
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 15 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.	I_F = 20 mA, I_L = 1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



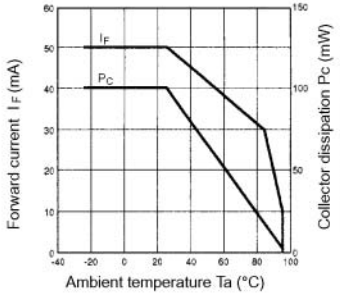
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are shown below

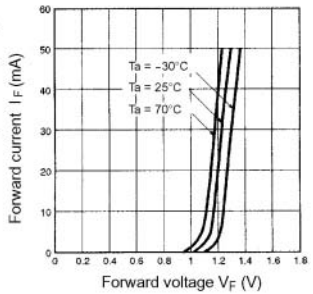
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

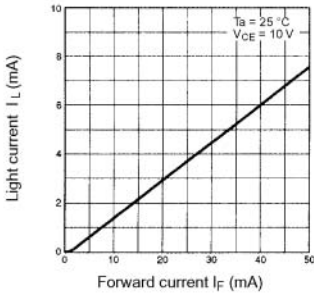
Forward Current vs. Collector Dissipation Temperature Rating



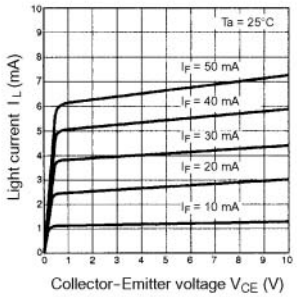
Forward Current vs. Forward Voltage Characteristics (Typical)



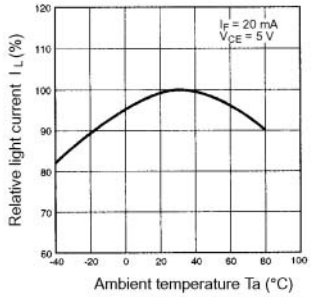
Light Current vs. Forward Current Characteristics (Typical)



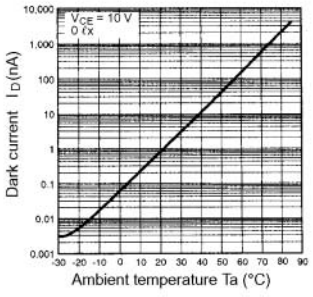
Light Current vs. Collector-Emitter Characteristics (Typical)



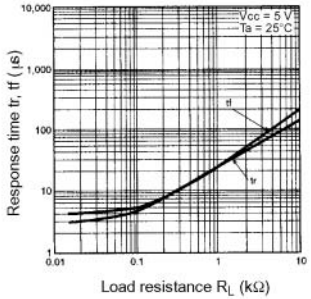
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



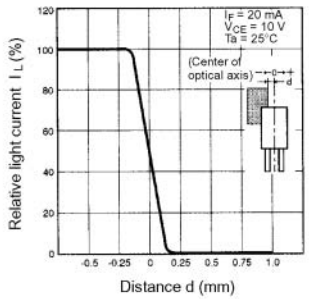
Dark Current vs. Ambient Temperature Characteristics (Typical)



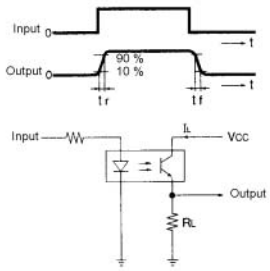
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Features

- 14.5-mm-tall model with a deep slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

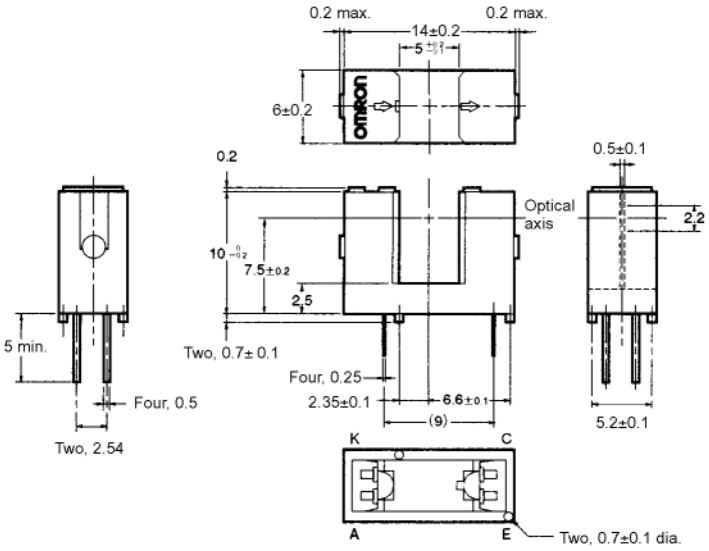
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

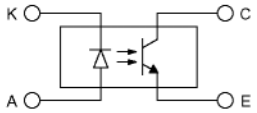
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 10 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0ℓ x
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.	I_F = 20 mA, I_L = 1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



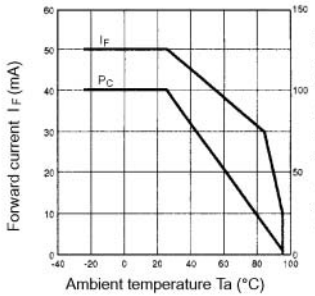
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are shown below

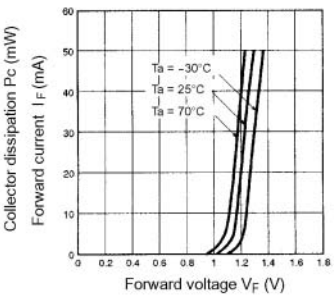
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

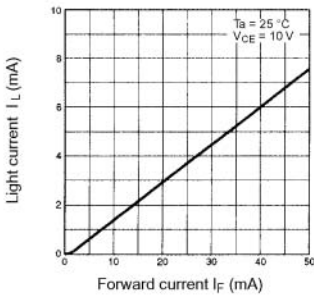
Forward Current vs. Collector Dissipation Temperature Rating



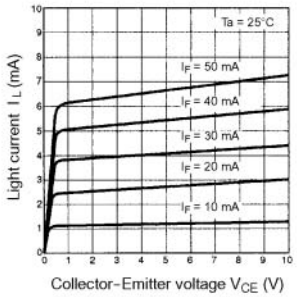
Forward Current vs. Forward Voltage Characteristics (Typical)



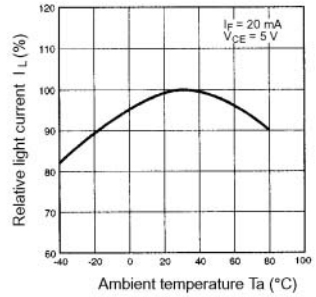
Light Current vs. Forward Current Characteristics (Typical)



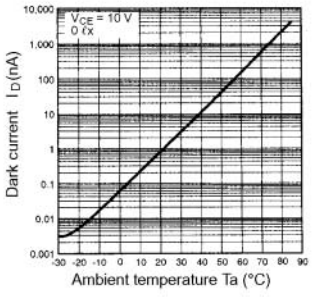
Light Current vs. Collector-Emitter Characteristics (Typical)



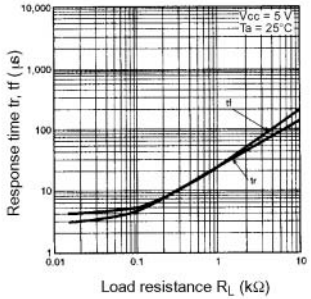
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



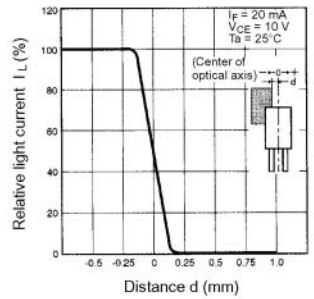
Dark Current vs. Ambient Temperature Characteristics (Typical)



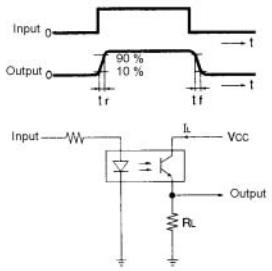
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Features

- General-purpose model with a 5-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 160°C
Soldering temperature		Tsol	260°C (see note 3)

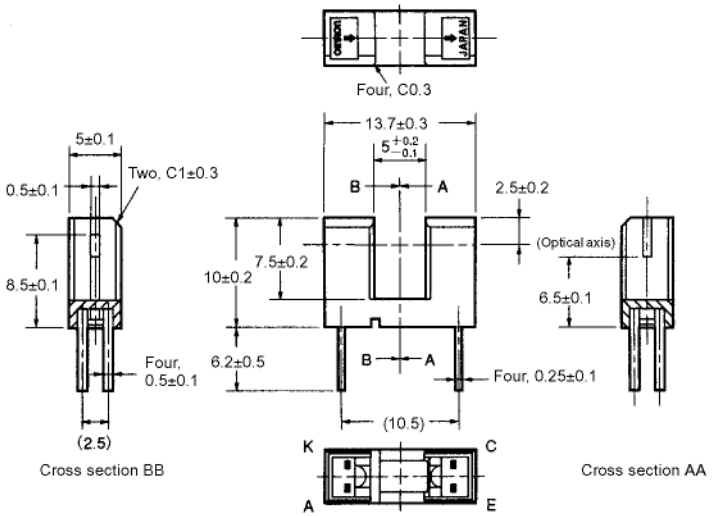
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100Hz.
3. Complete soldering within 10 seconds.

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

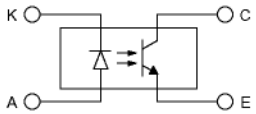
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



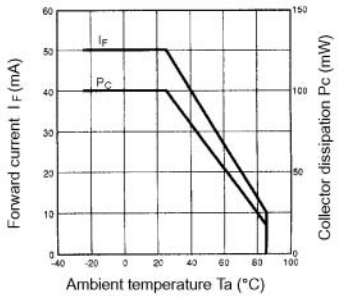
Unless otherwise specified, the tolerances are as shown below.

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

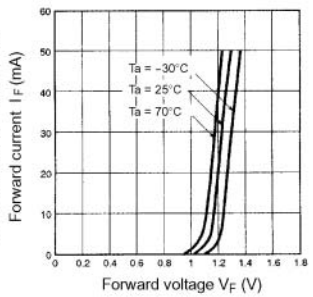
Terminal No.	Name
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

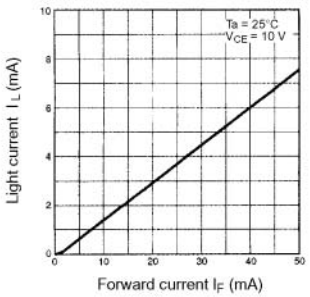
Forward Current vs. Collector Dissipation Temperature Rating



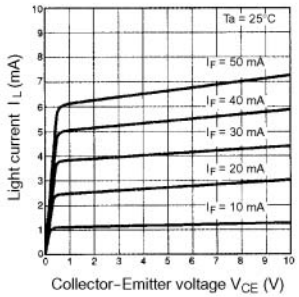
Forward Current vs. Forward Voltage Characteristics (Typical)



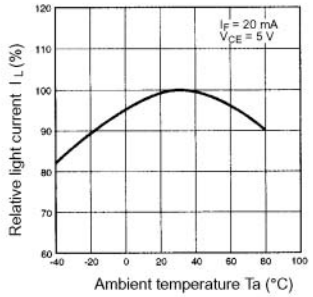
Light Current vs. Forward Current Characteristics (Typical)



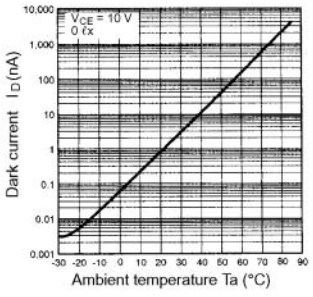
Light Current vs. Collector-Emitter Voltage Characteristics (Typical)



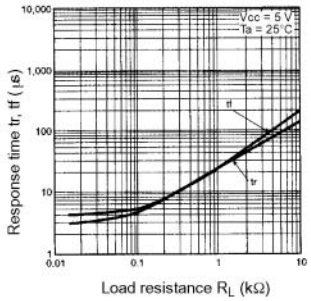
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



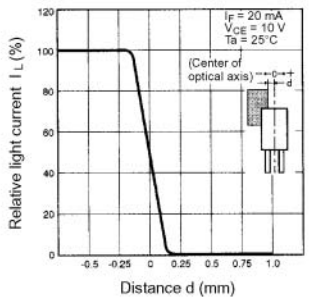
Dark Current vs. Ambient Temperature Characteristics (Typical)



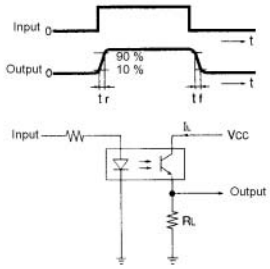
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

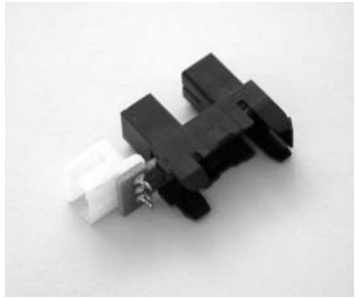


Response Time Measurement Circuit



Features

- Snap-in mounting model.
- Mounts to 1.0-, 1.2- and 1.6-mm-thick PCBs.
- High resolution with a 0.5-mm-wide aperture.
- 5-mm-wide slot.
- Connects to Tyco Electronics AMP's CT-series connectors.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note)
	Pulse forward current	I_{FP}	–
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-40°C to 100°C
Soldering temperature		Tsol	–

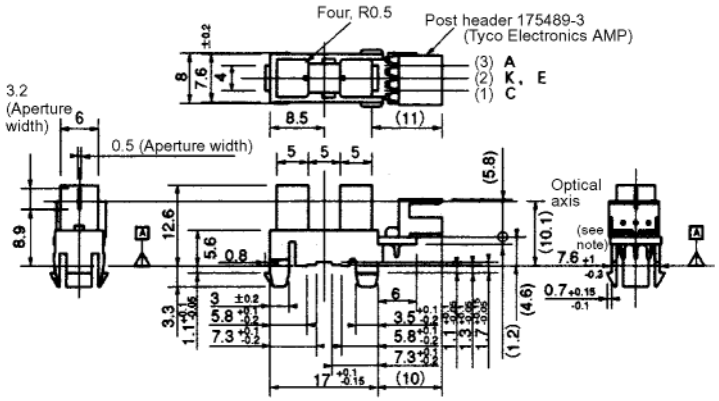
Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

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

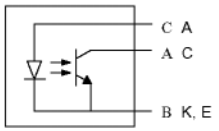
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 30 mA
Detector	Light current	I_L	0.6 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	200 nA max.	V_{CE} = 10 V, 0 lx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.	I_F = 20 mA, I_L = 0.3 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 5 V
Rising time		tr	8 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 1 mA
Falling time		tf	8 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 1 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Note: The asterisked dimension is specified by datum A only.

Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
A	Anode
C	Collector
K, E	Cathode, Emitter

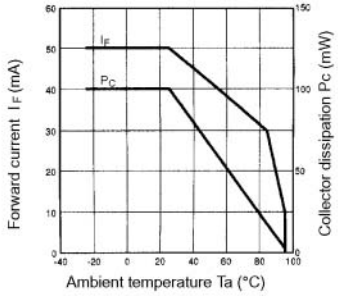
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Recommended Mating Connectors:

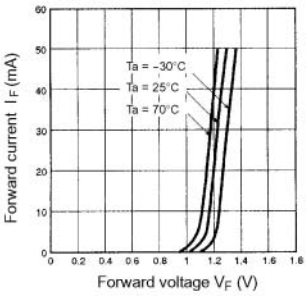
Tyco Electronics AMP 173977-3 (insulation displacement-type connector)
175778-3 (crimp-type connector)
179228-3 (crimp-type connector)

■ Engineering Data

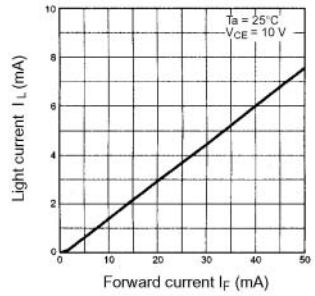
Forward Current vs. Collector Dissipation Temperature Rating



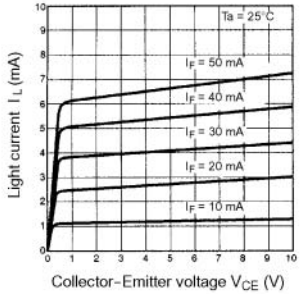
Forward Current vs. Forward Voltage Characteristics (Typical)



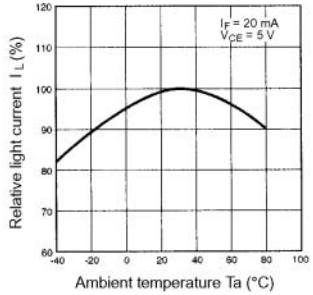
Light Current vs. Forward Current Characteristics (Typical)



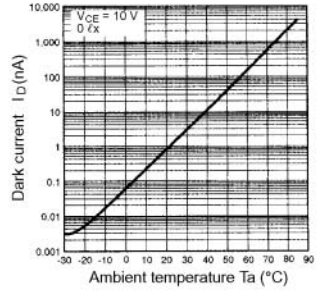
Light Current vs. Collector-Emitter Characteristics (Typical)



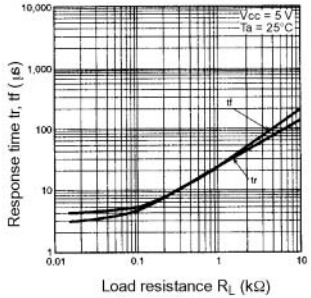
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



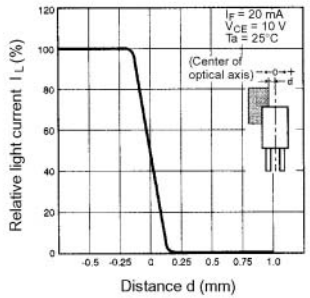
Dark Current vs. Ambient Temperature Characteristics (Typical)



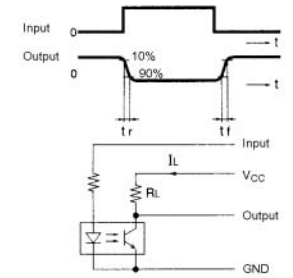
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

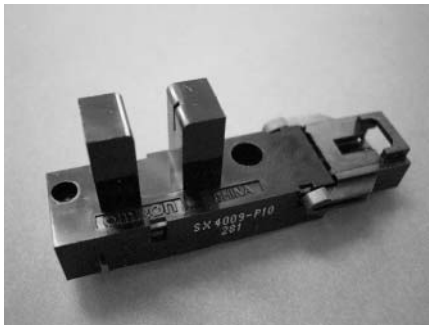


Response Time Measurement Circuit



Features

- Screw-mounting model.
- High resolution with a 0.5-mm-wide sensing aperture.
- With a 5-mm-wide groove.
- Photo IC output signals directly connect with C-MOS and TTL.
- Connects to Tyco Electronics AMP's EI-series connectors.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

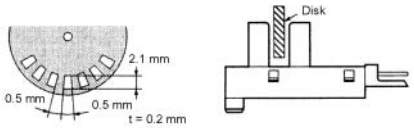
Item		Symbol	Rated value
Power supply voltage		V_{CC}	10 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	Operating	Topr	-25°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	–

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

■ Electrical and Optical Characteristics (Ta = 25°C, Vcc = 5 V ± 10%)

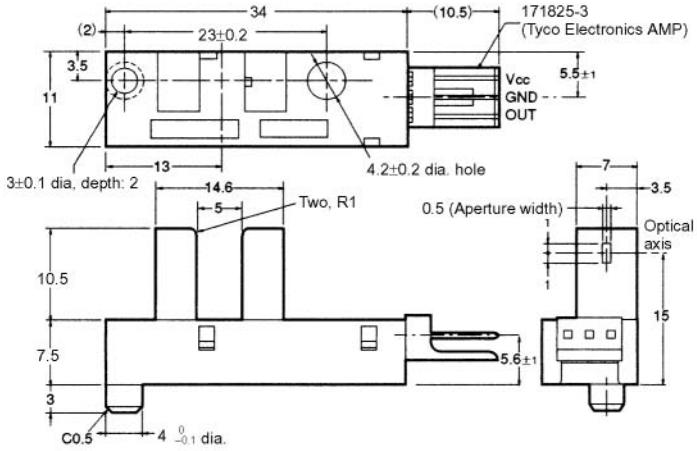
Item	Symbol	Value	Condition
Current consumption	I_{CC}	30 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.3 V max.	I_{OUT} = 16 mA with incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	$V_{OUT} = V_{CC}$ without incident, R_L = 47 kΩ
Response frequency	f	3 kHz min.	$V_{OUT} = V_{CC}$, R_L = 47 kΩ (see note)

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

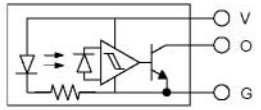


■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Unless otherwise specified, the tolerances are shown below

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

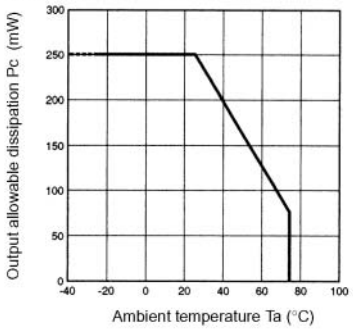
Dimensions	Tolerance
4 mm max.	±0.2
1 < mm ≤ 16	±0.3
16 < mm ≤ 63	±0.5

Recommended Mating Connectors:

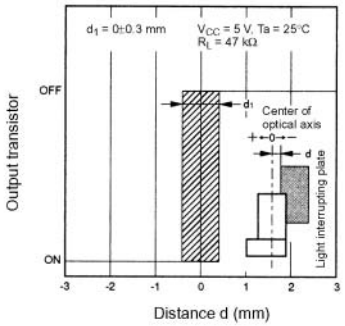
Tyco Electronics AMP 171822-3 (crimp-type connector)
172142-3 (crimp-type connector)
OMRON EE-1005 (with harness)

■ Engineering Data

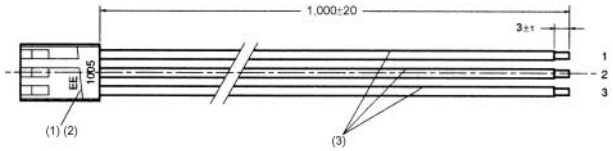
Output Allowable Dissipation vs. Ambient Temperature Characteristics



Sensing Position Characteristics (Typical)



EE-1005 Connector



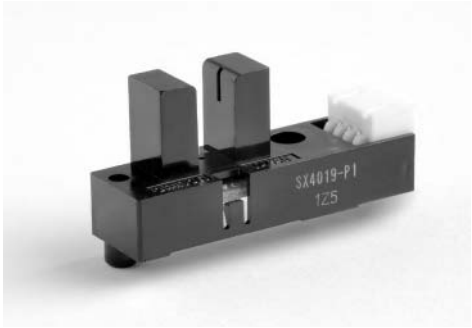
Number	Name	Model	Quantity	Maker
1	Receptacle housing	171822-3	1	Tyco Electronics AMP
2	Receptacle contact	170262-1	3	Tyco Electronics AMP
3	Lead wire	UL1007 AWG24	3	–

■ Wiring

Connector circuit no.	Lead wire colour	Output when connected to EE-SX4009-P1
1	Red	V_{CC}
2	Orange	GND
3	Yellow	OUT

Features

- Screw-mounting model.
- High resolution with a 0.5-mm-wide sensing aperture.
- With a 5-mm-wide groove.
- Photo IC output signals directly connect with C-MOS and TTL.
- Connects to Tyco Electronics AMP's CT-series connectors.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

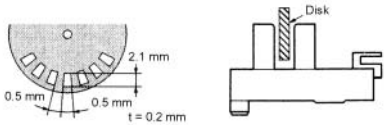
Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	Operating	Topr	-20°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	–

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

■ Electrical and Optical Characteristics (Ta = 25°C, Vcc = 5 V ± 10%)

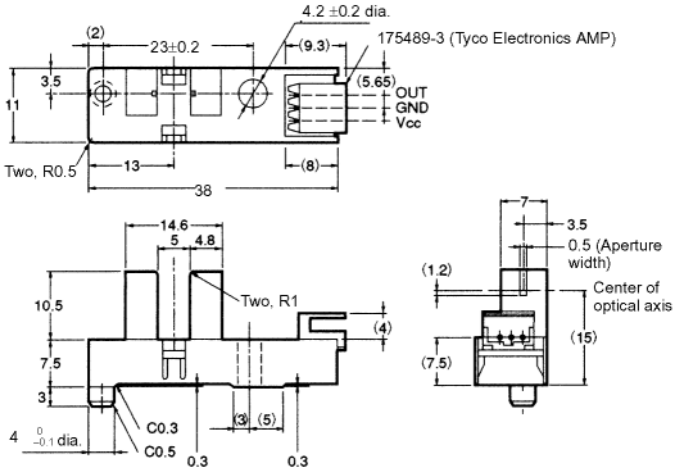
Item	Symbol	Value	Condition
Current consumption	I_{CC}	30 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.3 V max.	I_{OUT} = 16 mA with incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	V_{OUT} = V_{CC} without incident, R_L = 47 kΩ
Response frequency	f	3 kHz min.	V_{OUT} = V_{CC}, R_L = 47 kΩ (see note)

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

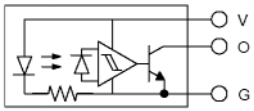


■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Unless otherwise specified, the tolerances are shown below

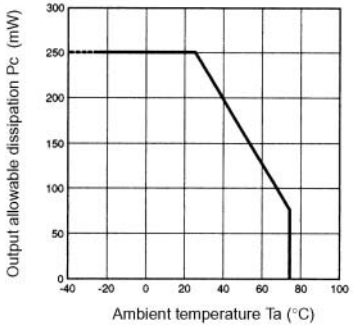
Terminal No.	Name
V	Power supply (Vcc)
O	Output (OUT)
G	Ground (GND)

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

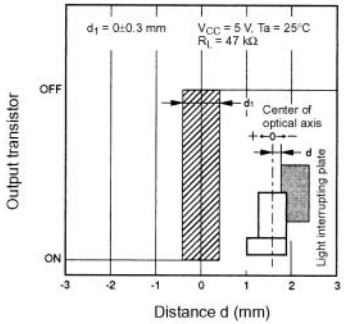
Recommended Mating Connectors:
Tyco Electronics AMP 179228-3 (crimp-type connector)
175778-3 (crimp-type connector)
173977-3 (press-fit connector)

■ Engineering Data

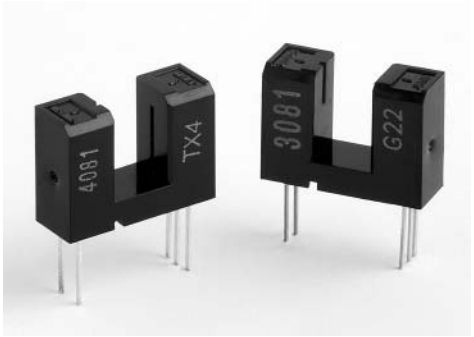
Output Allowable Dissipation vs. Ambient Temperature Characteristics



Sensing Position Characteristics (Typical)



Features



- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with built-in temperature compensation circuit.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX3081)
- Light ON model (EE-SX4081.

Specifications

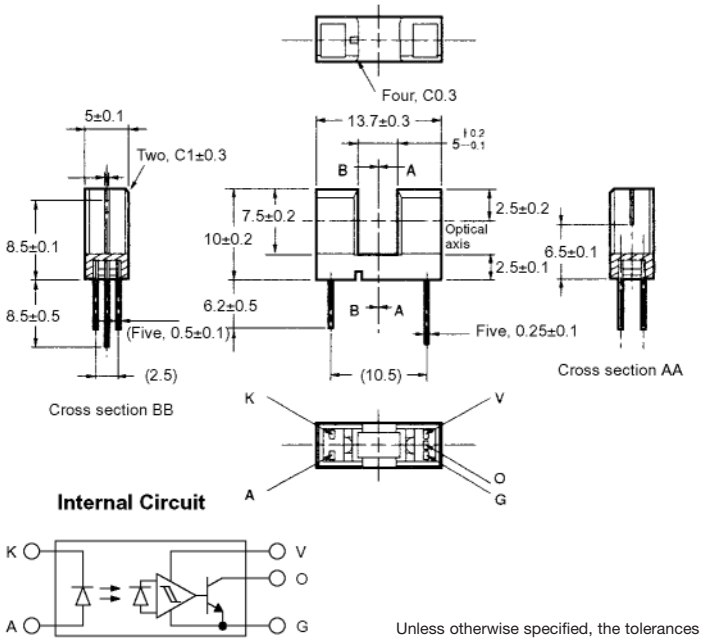
■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Reverse Voltage	V_R	4 V
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**	Topr	-40°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



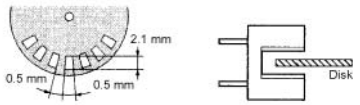
Unless otherwise specified, the tolerances are as shown below

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

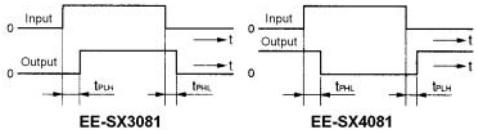
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Note: 1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

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



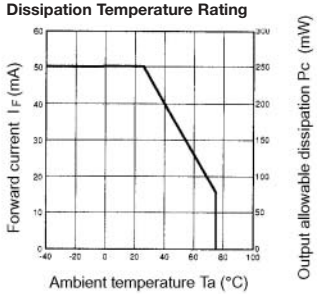
3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EESX4081.



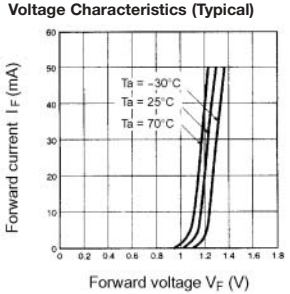
■ Engineering Data

Note: The values in the parentheses apply to EE-SX4081.

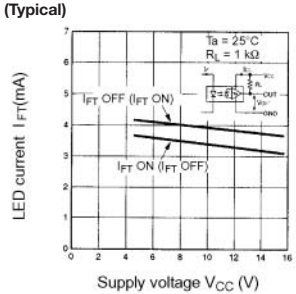
Forward Current vs. Collector Dissipation Temperature Rating



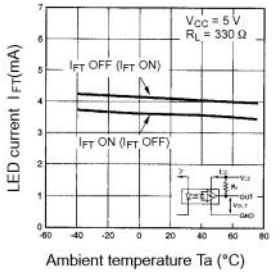
Forward Current vs. Forward Voltage Characteristics (Typical)



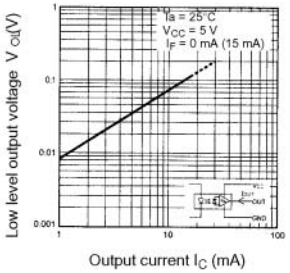
LED Current vs. Supply Voltage (Typical)



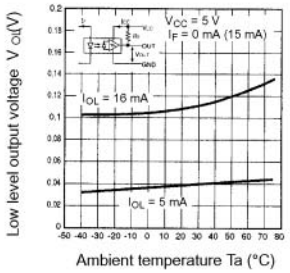
LED Current vs. Ambient Temperature Characteristics (Typical)



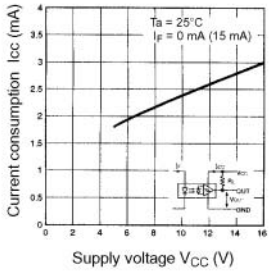
Low-level Output Voltage vs. Output Current (Typical)



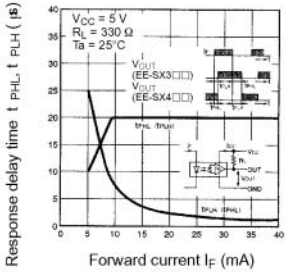
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



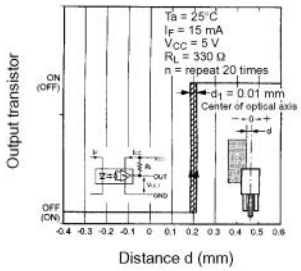
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)

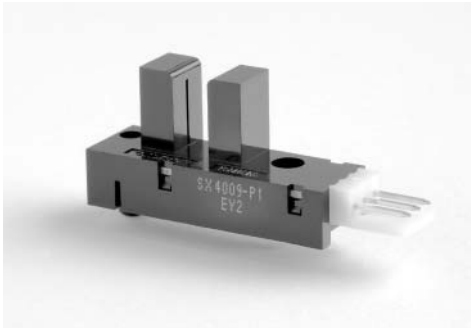


Repeat Sensing Position Characteristics (Typical)



Features

- Screw-mounting model.
- High resolution with a 0.5-mm-wide sensing aperture.
- With a 5-mm-wide groove.
- Photo IC output signals directly connect with C-MOS and TTL.
- Connects to US Molex connectors.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

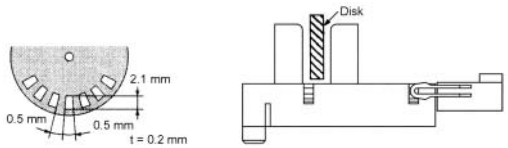
Item		Symbol	Rated value
Power supply voltage		V_{CC}	10 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	Operating	Topr	-25°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	–

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

■ Electrical and Optical Characteristics (Ta = 25°C, Vcc = 5 V ± 10%)

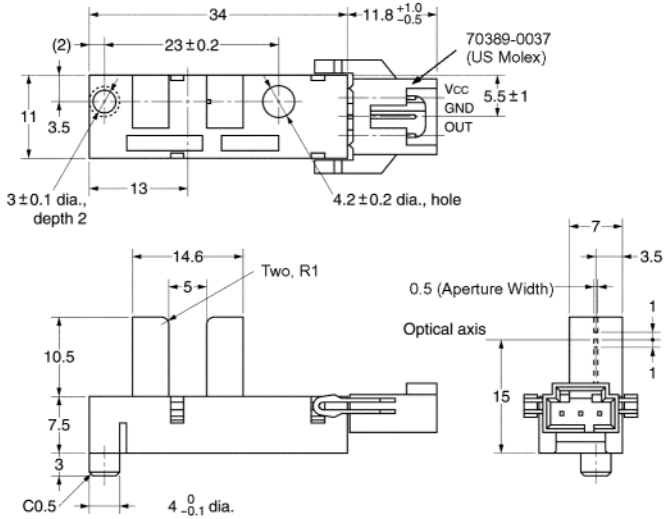
Item	Symbol	Value	Condition
Current consumption	I_{CC}	30 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.3 V max.	I_{OUT} = 16 mA with incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	V_{OUT} = V_{CC} without incident, R_L = 47 kΩ
Response frequency	f	3 kHz min.	V_{OUT} = V_{CC}, R_L = 47 kΩ (see note)

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

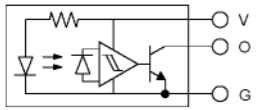


■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Unless otherwise specified, the tolerances are shown below

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

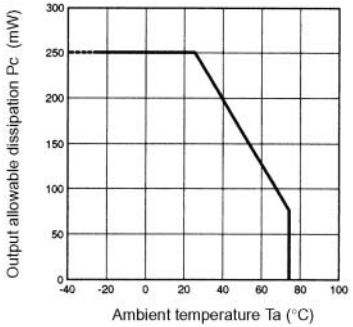
Dimensions	Tolerance
4 mm max.	±0.2
4 < mm ≤ 16	±0.3
16 < mm ≤ 63	±0.5

Recommended Mating Connectors:

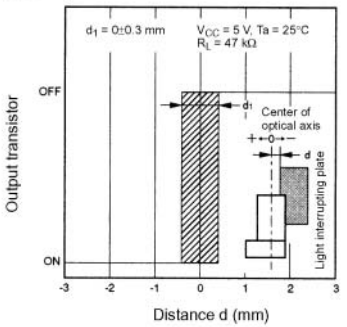
US Molex 50-57-9403
15-47-4033
14-56-2036 (AWG28)
14-56-2034 (AWG26)
14-56-2032 (AWG24)
14-56-2037 (AWG22)

■ Engineering Data

Output Allowable Dissipation vs. Ambient Temperature Characteristics

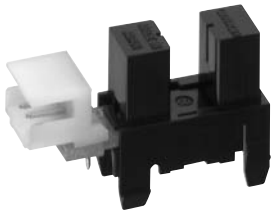


Sensing Position Characteristics (Typical)



Features

- Snap-in mounting model.
- Mounts to 1.0-, 1.2- and 1.6-mm-thick panels.
- High resolution with a 0.5-mm-wide sensing aperture.
- With a 5-mm-wide slot.
- Photo IC output signals directly connect with C-MOS and TTL.
- Connects to Tyco Electronics AMP's CT-series connectors.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

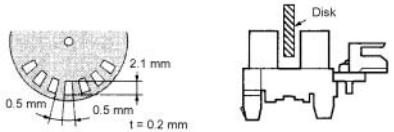
Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	**Operating**	Topr	-25°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	–

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

■ Electrical and Optical Characteristics (Ta = 25°C, Vcc = 5 V ± 10%)

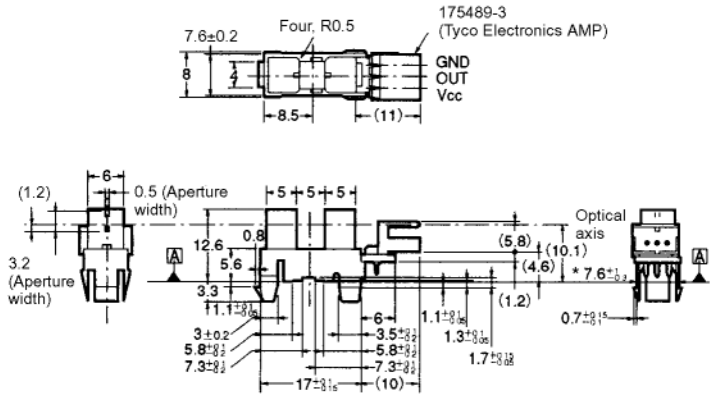
Item	Symbol	Value	Condition
Current consumption	I_{CC}	16.5 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.35 V max.	I_{OUT} = 16 mA with incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	$V_{OUT} = V_{CC}$ without incident, R_L = 47 kΩ
Response frequency	f	3 kHz min.	$V_{OUT} = V_{CC}$, R_L = 47 kΩ (see note)

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

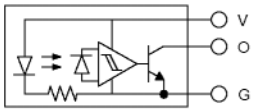


■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Note: The asterisked dimension is specified by datum A only.

Unless otherwise specified, the tolerances are shown below

Terminal No.	Name
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

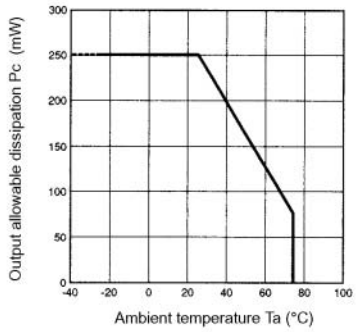
Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C

Recommended Mating Connectors:

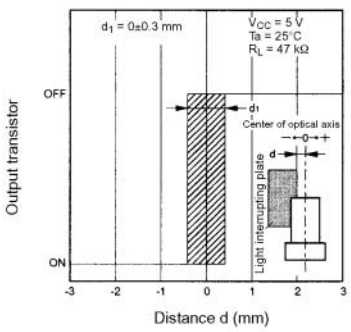
Tyco Electronics AMP 179228-3 (crimp-type connector)
175778-3 (crimp-type connector)
173977-3 (press-fit connector)

■ Engineering Data

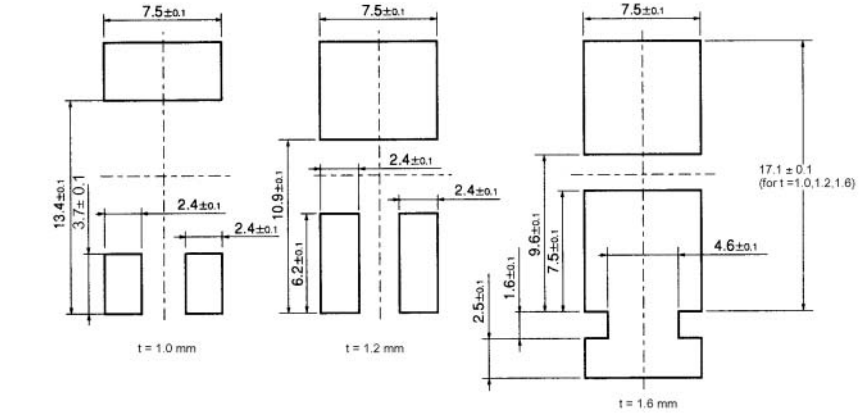
Output allowable Dissipation vs. Ambient Temperature Characteristics



Sensing Position Characteristics (Typical)



■ Recommended Mounting Holes



- When mounting the Photomicrosensor to a panel with a hole opened by pressing, make sure that the hole has no burrs. The mounting strength of the Photomicrosensor will decrease if the hole has burrs.
- When mounting the Photomicrosensor to a panel with a hole opened by pressing, be sure to mount the Photomicrosensor on the pressing side of the panel.
- The mounting strength of the Photomicrosensor will increase if the Photomicrosensor is mounted to a panel with a hole that is only a little larger than the size of the Photomicrosensor, in which case, however, it will be difficult to mount the Photomicrosensor to the panel. The mounting strength of the Photomicrosensor will decrease if the Photomicrosensor is mounted to a panel with a hole that is comparatively larger than the size of the Photomicrosensor, in which case, however, it will be easy to mount the Photomicrosensor to the panel. When mounting the Photomicrosensor to a panel, open an appropriate hole for the Photomicrosensor according to the application.
- After mounting the Photomicrosensor to any panel, make sure that the Photomicrosensor does not wobble.
- When mounting the Photomicrosensor to a molding with a hole, make sure that the edges of the hole are sharp enough, otherwise the Photomicrosensor may fall out.

Features

- Wide model with a 8-mm-wide slot.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

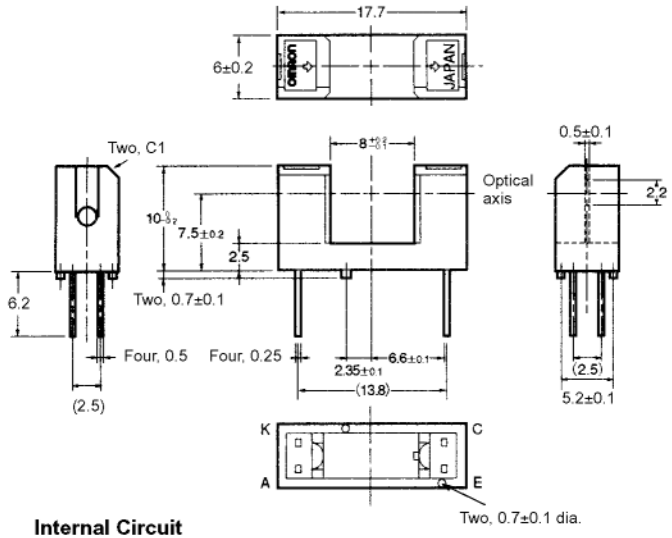
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with a frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

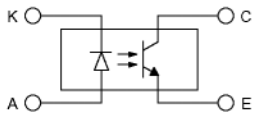
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V. R_L = 100Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



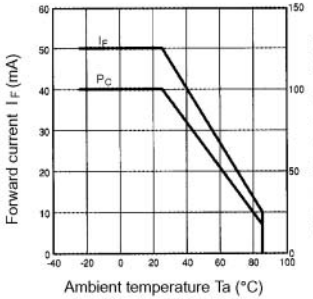
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are shown below

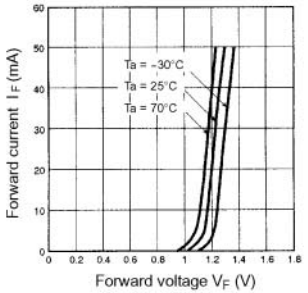
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

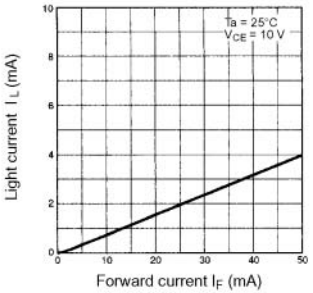
Forward Current vs. Collector Dissipation Temperature Rating



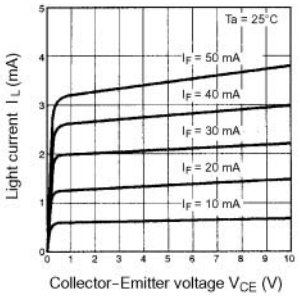
Forward Current vs. Forward Voltage Characteristics (Typical)



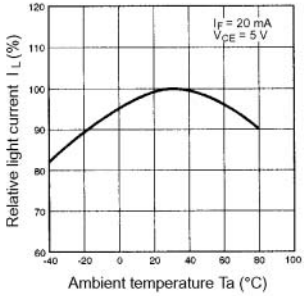
Light Current vs. Forward Current Characteristics (Typical)



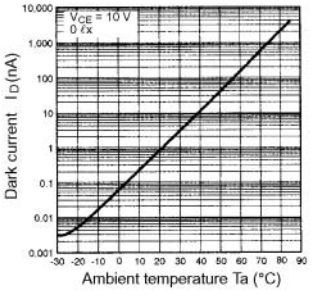
Light Current vs. Collector-Emitter Characteristics (Typical)



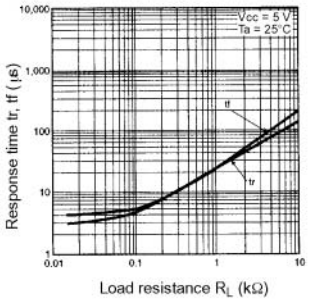
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



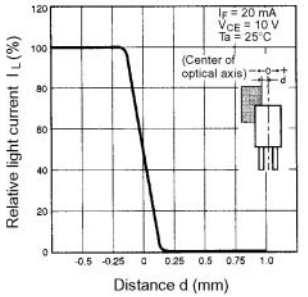
Dark Current vs. Ambient Temperature Characteristics (Typical)



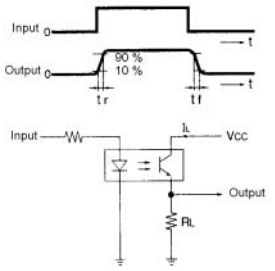
Response Time vs. Load Resistance Characteristics (Typical)



Sensing Position Characteristics (Typical)

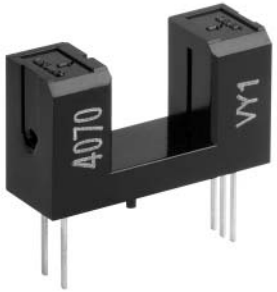


Response Time Measurement Circuit



Features

- Incorporates an IC chip with a built-in detector element and amplifier.
- Incorporates a detector element with a built-in temperature compensation circuit.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- High resolution with a 0.5-mm-wide sensing aperture.
- Dark ON model (EE-SX3070)
- Light ON model (EE-SX4070)



Specifications

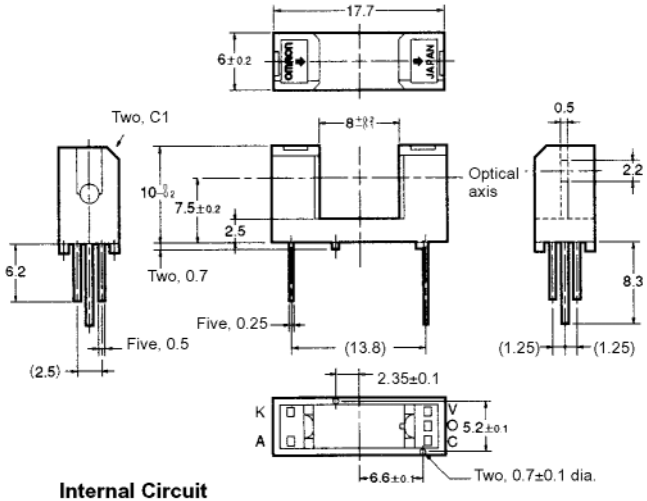
■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Reverse Voltage	V_R	4 V
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	Topr	-40°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

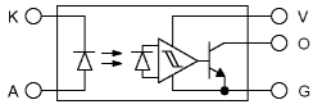
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Complete soldering within 10 seconds.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



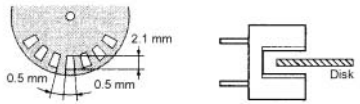
Unless otherwise specified, the tolerances are shown below

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

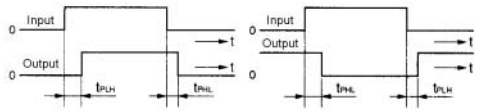
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Note:1. Hysteresis denotes the difference in forward LED current value, expressed in percentage, calculated from the respective forward LED currents when the photo IC in turned from ON to OFF and when the photo IC in turned from OFF to ON.

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



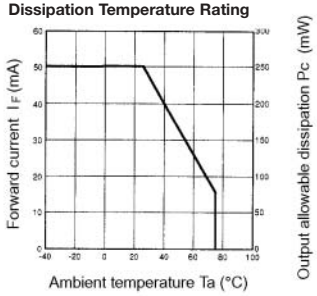
3. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EESX4070.



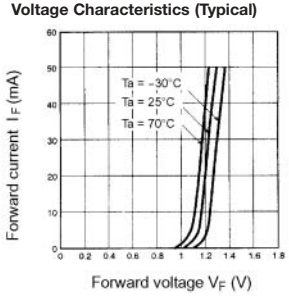
■ Engineering Data

Note: The values in the parentheses apply to EE-SX4070.

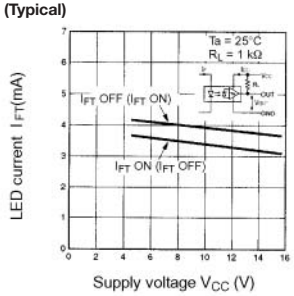
Forward Current vs. Collector Dissipation Temperature Rating



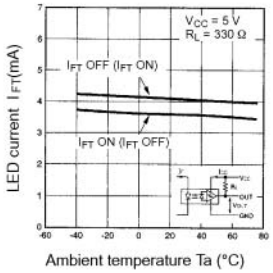
Forward Current vs. Forward Voltage Characteristics (Typical)



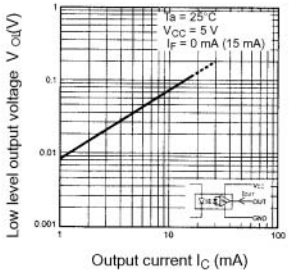
LED Current vs. Supply Voltage (Typical)



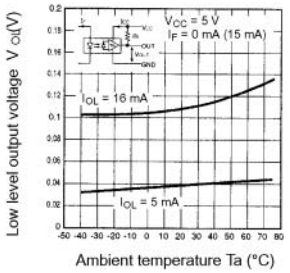
LED Current vs. Ambient Temperature Characteristics (Typical)



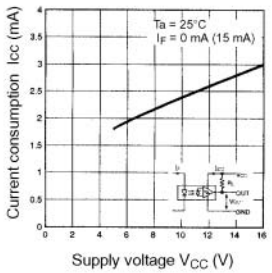
Low-level Output Voltage vs. Output Current (Typical)



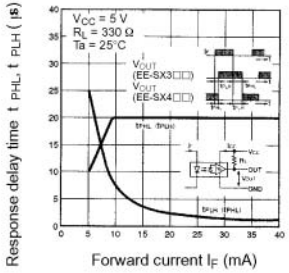
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



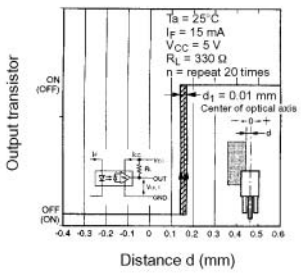
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Repeat Sensing Position Characteristics (Typical)



Features

- Separate LED/Photo IC combinations with 12-mm slot.
- Uses light modulation via built-in amplifier IC.
- Applicable to the PA connector series from JST (Japan Solderless Terminal).

Specifications

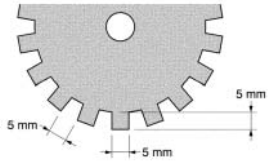
■ Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Rated value
Supply voltage	V_{CC}	16 VDC
Output voltage	V_{OUT}	16 V
Output current	I_{OUT}	50 mA
Soldering temperature	Tsol	-40°C to 80°C

■ Electrical and Optical Characteristics (Ta = 25°C, Vcc = 12 V±10%)

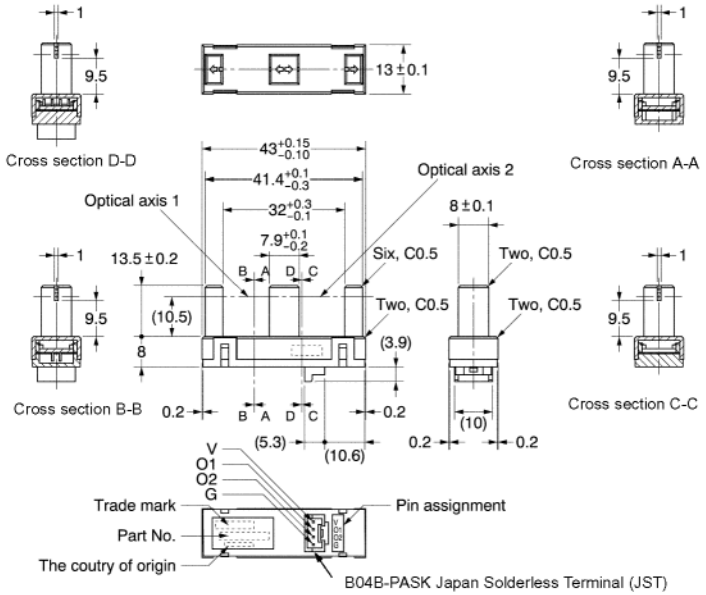
Item	Symbol	Value			Unit	Testing Conditions
		EE-SV3(-B)	EE-SV3-C(S)	EE-SV3-D(S		
Current consumption	I_{CC}	–	–	35	mA	With/without object
Low level output voltage	V_{OL}	0.01	0.2	0.4	V	I_{OUT} = 20 mA without object
High level output current	I_{OH}	0	–	40	mA	V_{OUT} = 12 V with object
Ambient illumination	–	0	–	3,000	ℓx	Sunlight and fluorescent light
Response frequency	f	500	–	–	Hz	$V_{CC}0$ = $V_{CC}1$ = $V_{CC}2$ = 12 VDC RL = 1.2 kΩ (See note.)

Note: The value indicated is that measured by rotating the disk as shown below.

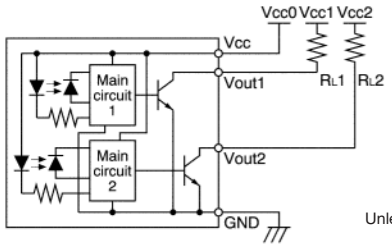


■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Unless otherwise specified, the tolerances are shown below

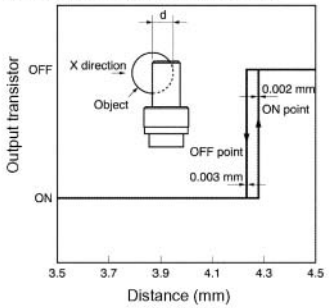
Terminal No.	Name
V	Power supply (Vcc)
O1	$V_{OUT}1$ (Optical axis1)
O2	$V_{OUT}2$ (Optical axis2)
G	Ground (GND)

Recommended Mating Connectors:
JST (Japan Solderless Terminal) PAP-04V-S

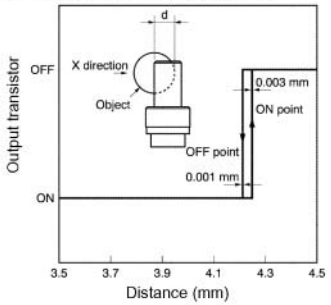
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65
30 < mm ≤ 50	±0.8

■ Engineering Data

Repetitive Sensing Position Characteristics for OUT1 (in horizontal direction, typical)



Repetitive Sensing Position Characteristics for OUT2 (in horizontal direction, typical)



Features

- Snap-in-mounting model.
- Mounts to 0.8- to 1.6-mm-thick panels.
- With a 15-mm-wide slot.
- Photo IC output signals directly connect with C-MOS and

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

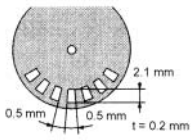
Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissible output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	Operating	Topr	-25°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	–

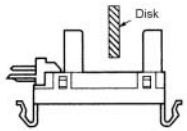
Note: Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

■ Electrical and Optical Characteristics (Ta = 25°C, Vcc = 5 V ± 10%)

Item	Symbol	Value	Condition
Current consumption	I_{CC}	35 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.3 V max.	I_{OUT} = 16 mA with incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	$V_{OUT} = V_{CC}$ without incident, R_L = 47 kΩ
Response frequency	f	3 kHz min.	$V_{OUT} = V_{CC}$, R_L = 47 kΩ (see note)

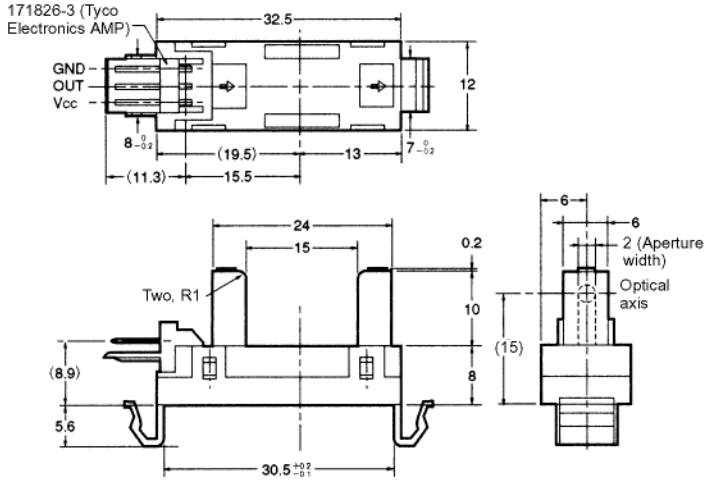
Note: The value of the response frequency is measured by rotating the disk as shown below.



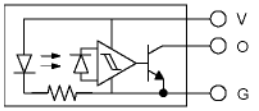


■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



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

Recommended Mating Connectors:

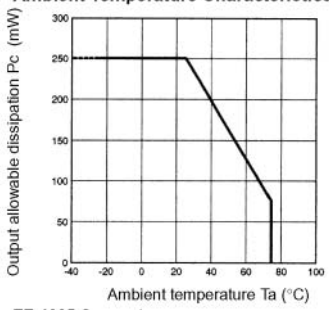
Tyco Electronics AMP 171822-3 (crimp-type connector)
172142-3 (crimp-type connector)
OMRON EE-1005 (with harness)

Unless otherwise specified, the tolerances are shown below

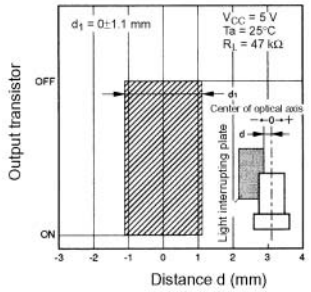
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

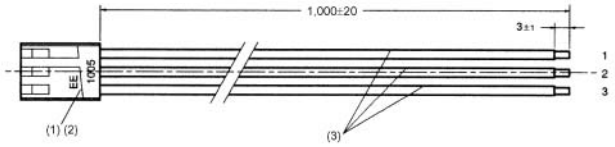
Output Allowable Dissipation vs. Ambient Temperature Characteristics



Sensing Position Characteristics (Typical)



EE-1005 Connector

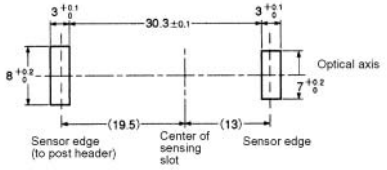


Number	Name	Model	Quantity	Maker
1	Receptacle housing	171822-3	1	Tyco Electronics AMP
2	Receptacle contact	170262-1	3	Tyco Electronics AMP
3	Lead wire	UL1007 AWG24	3	–

■ Wiring

Connector circuit no.	Lead wire colour	Output when connected to EE-SX461-P11
1	Red	V_{CC}
2	Orange	GND
3	Yellow	OUT

■ Recommended Mounting Hole Dimensions and Mounting and Dismounting Method



The Photomicrosensor can be mounted to 0.8- to 1.6-mm-thick panels.

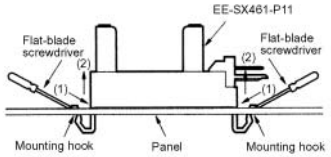
Refer to the above mounting hole dimensions and open the mounting holes in the panel to which the Photomicrosensor will be mounted.

Insert into the holes the Photomicrosensor's mounting portions with a force of three to five kilograms but do not press in the Photomicrosensor at one time. The Photomicrosensor can be easily mounted by inserting the mounting portions halfway and then slowly pressing the Photomicrosensor onto the panel.

There are two ways to dismount the Photomicrosensor. Refer to the following.

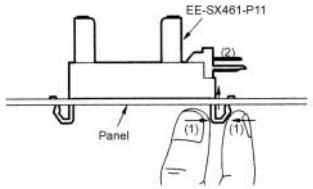
Dismounting with Screwdriver

Press the mounting hooks of the Photomicrosensor with a flat-blade screwdriver as shown in the following illustration and pull up the Photomicrosensor



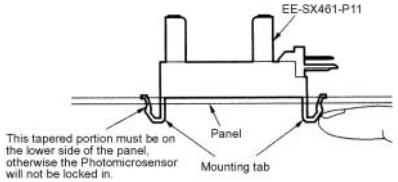
Dismounting by Hand

Squeeze the mounting tabs as shown in the following illustration and press the mounting tabs upwards.



Pressed mounting holes are ideal for mounting the Photomicrosensor. When mounting the Photomicrosensor to a panel that has pressed mounting holes for the Photomicrosensor, be sure to mount the Photomicrosensor on the pressing side of the panel, otherwise it may be difficult to mount the Photomicrosensor and an insertion force of five to six kilograms may be required.

When mounting the Photomicrosensor to a panel that has mounting holes opened by pressing, make sure that the mounting holes have no burrs, otherwise the lock mechanism of the Photomicrosensor will not work perfectly. After mounting the Photomicrosensor to a panel, be sure to check if the lock mechanism is working perfectly.



Features

- Wide-width transmissive sensor with 17-mm slot.
- Uses light modulation via built-in amplifier IC.
- Applicable to the PH connector series from JST (Japan Solderless Terminal).

Specifications

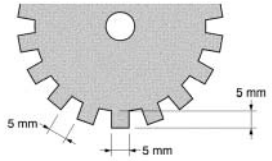
■ Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Rated value
Supply voltage	V_{CC}	16 VDC
Output voltage	V_{OUT}	16 V
Output current	I_{OUT}	50 mA
Operating temperature	Topr	-10°C to 60°C
Storage temperature	Tstg	-40°C to 80°C

■ Electrical and Optical Characteristics (Ta = 25°C, Vcc = 12)

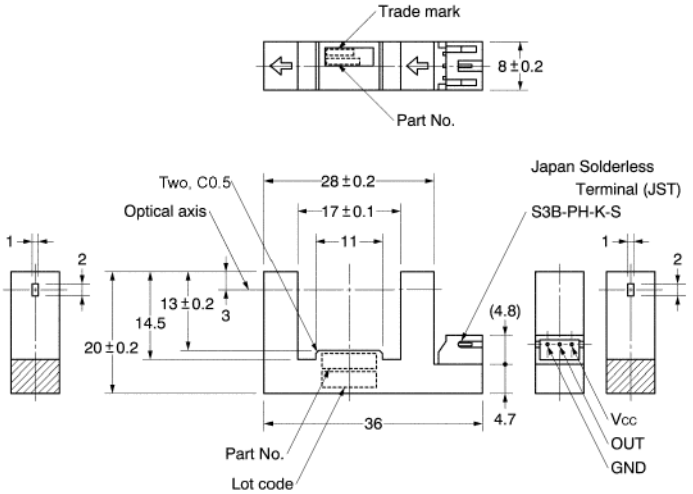
Item	Symbol	Limits			Unit	Testing Conditions
		MIN.	TYP.	MAX.		
Current consumption	I_{CC}	–	–	20	mA	With/without object
Low level output voltage	V_{OL}	0.01	0.2	0.4	V	I_{OUT} = 20 mA without object
High level output current	I_{OH}	0	–	40	mA	V_{OUT} = 12 V with object
Response frequency	f	500	–	–	Hz	$V_{CC}0 = V_{CC}$ = 12 VDC RL = 1.2 kΩ (See note.)

Note: The value indicated is that measured by rotating the disk as shown below.

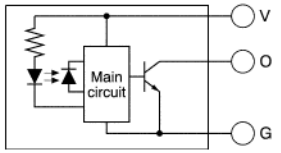


■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



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

Recommended Mating Connectors:

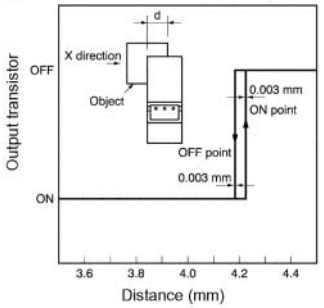
JST (Japan Solderless Terminal) PHR-3
03CR-6H
03KR-8M
03KR-6S

Unless otherwise specified, the tolerances are shown below

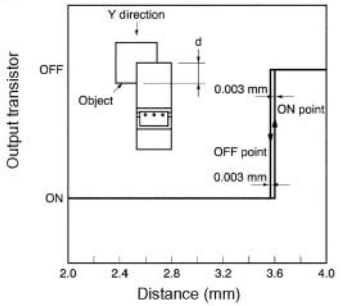
Dimensions	Tolerance
3 mm max.	±0.2
3 < mm ≤ 16	±0.3
6 < mm ≤ 63	±0.5

■ Engineering Data

Repetitive Sensing Position Characteristics (in horizontal direction, typical)



Repetitive Sensing Position Characteristics (in vertical direction, typical)



■ Features

- An actuator can be attached.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	250°C (see note 3)

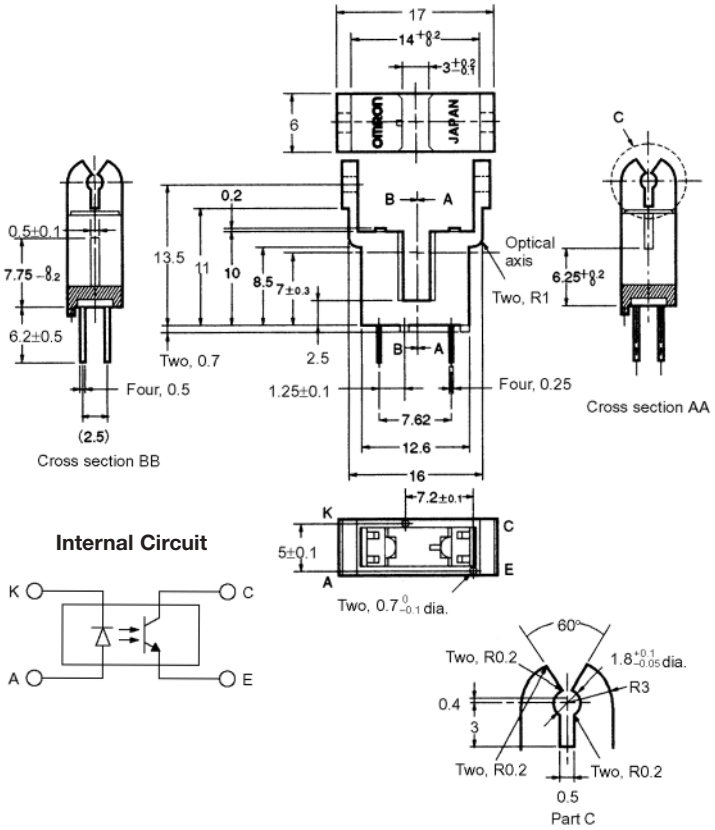
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ 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 = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 lx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 μA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CF} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



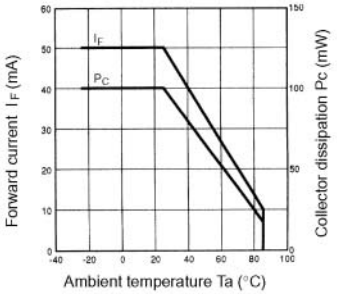
Internal Circuit

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

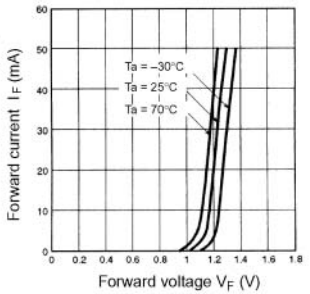
Unless otherwise specified, the tolerances are ±0.2 mm.

■ Engineering Data

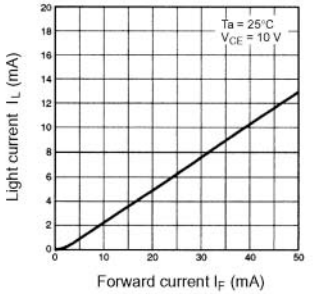
Forward Current vs. Collector Dissipation Temperature Rating



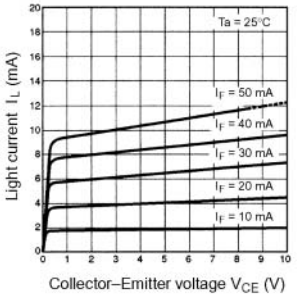
Forward Current vs. Forward Voltage Characteristics (Typical)



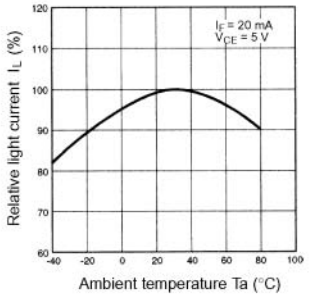
Light Current vs. Forward Current Characteristics (Typical)



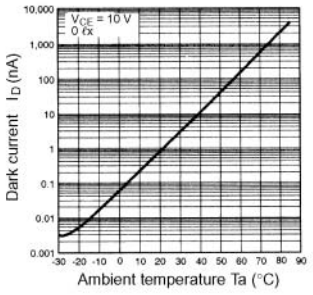
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



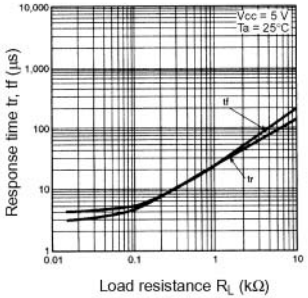
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



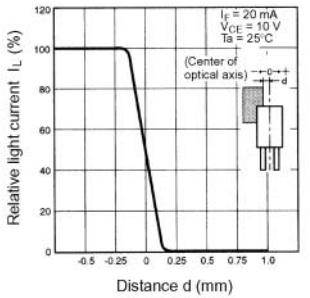
Dark Current vs. Ambient Temperature Characteristics (Typical)



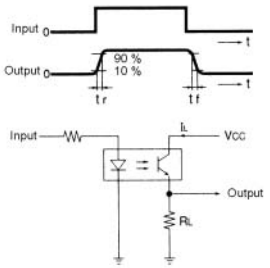
Response Time vs. Load Resistance Characteristics (Typical)



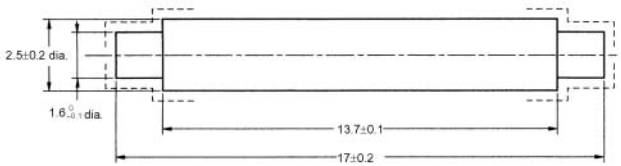
Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



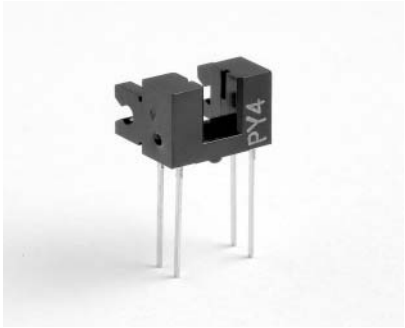
Actuator Dimensions



Note:
1. Make sure that the portions marked with dotted lines have no burrs.
2. The material of the actuator must be selected by considering the infrared permeability of the actuator.

■ Features

- An actuator can be attached.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

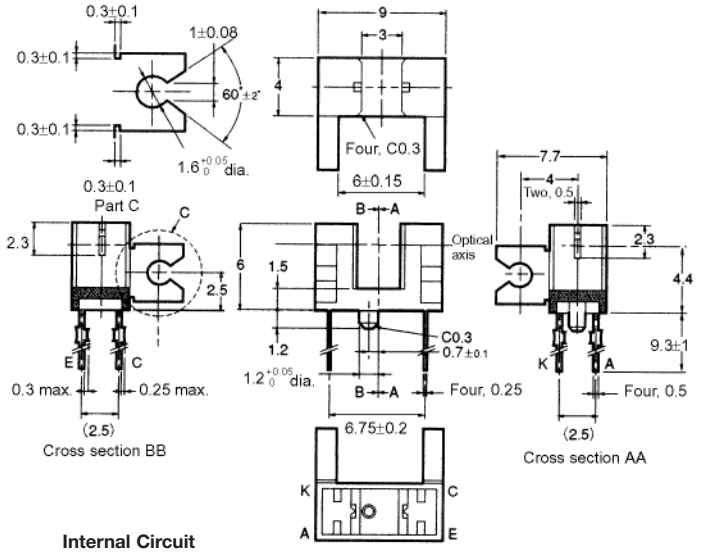
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

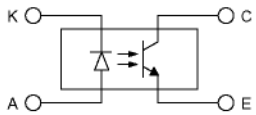
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 m typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 μA min., 14 μA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 μA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CF} = 10 V
Rising time		tr	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



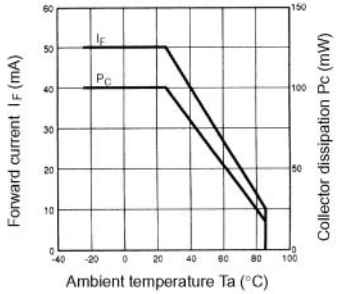
Unless otherwise specified, the tolerances are as shown below.

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

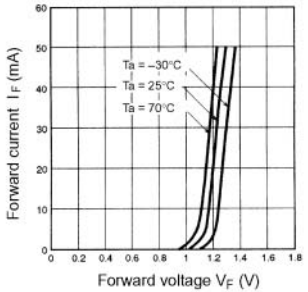
Terminal No.	Name
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

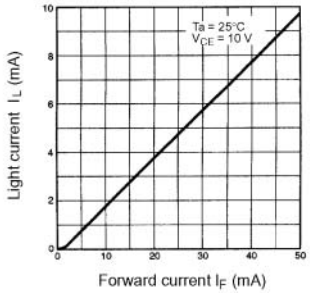
Forward Current vs. Collector Dissipation Temperature Rating



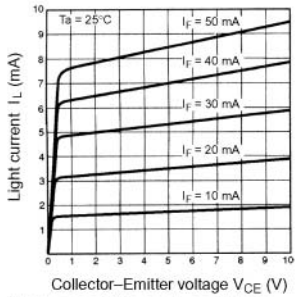
Forward Current vs. Forward Voltage Characteristics (Typical)



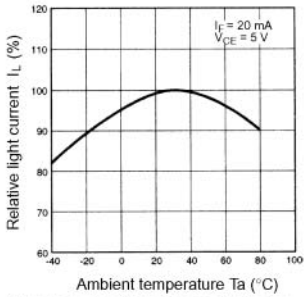
Light Current vs. Forward Current Characteristics (Typical)



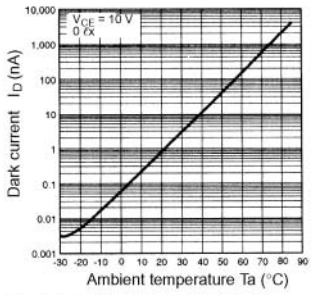
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



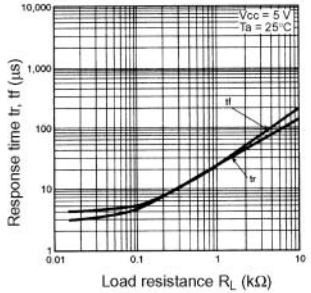
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



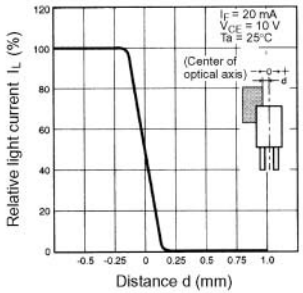
Dark Current vs. Ambient Temperature Characteristics (Typical)



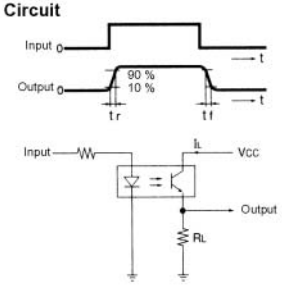
Response Time vs. Load Resistance Characteristics (Typical)



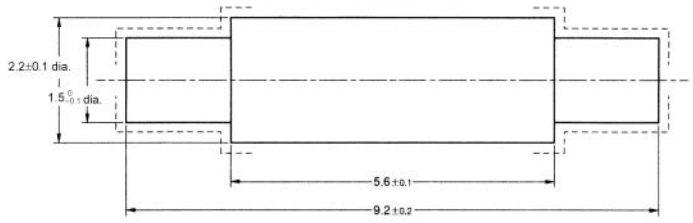
Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



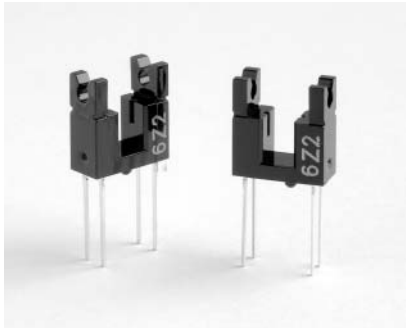
Actuator Dimensions



Note: 1. Make sure that the portions marked with dotted lines have no burrs.
2. The material of the actuator must be selected by considering the infrared permeability of the actuator.

■ Features

- An actuator can be attached.
- PCB mounting type.
- High resolution with a 0.5-mm-wide aperture.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-30°C to 100°C
Soldering temperature		Tsol	260°C (see note 3)

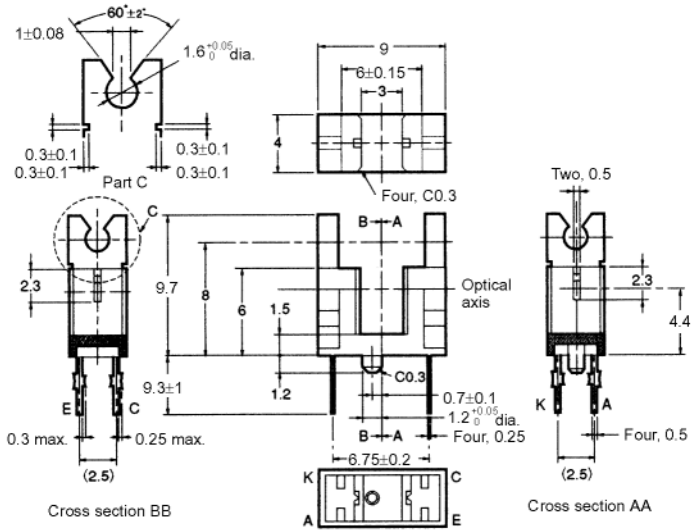
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 µs maximum with frequency of 100 Hz.
3. Complete soldering within 10 seconds.

■ 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 = 30 mA
	Reverse current	I_R	0.01 µA typ., 10 µA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 m typ.	I_F = 20 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 10 V
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	–	–
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.1 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CF} = 10 V
Rising time		tr	4 µs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA
Falling time		tf	4 µs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 5 mA

■ Dimensions

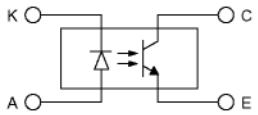
Note: All units are in millimeters unless otherwise indicated.



Cross section BB

Cross section AA

Internal Circuit



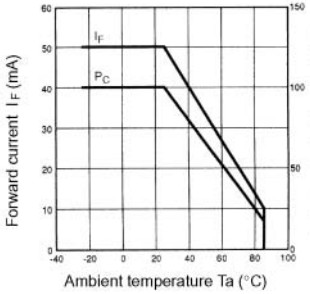
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

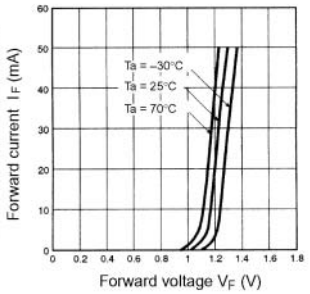
Terminal No.	Name
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

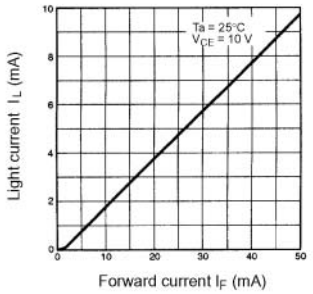
Forward Current vs. Collector Dissipation Temperature Rating



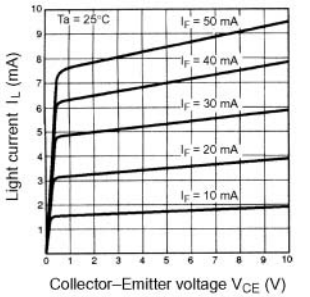
Forward Current vs. Forward Voltage Characteristics (Typical)



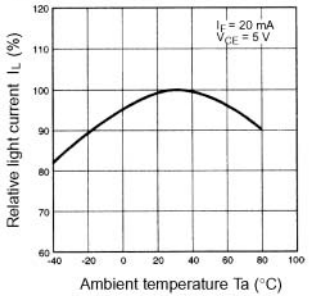
Light Current vs. Forward Current Characteristics (Typical)



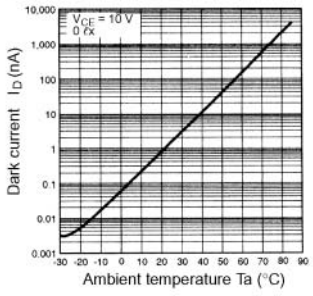
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



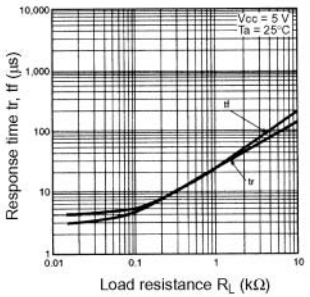
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



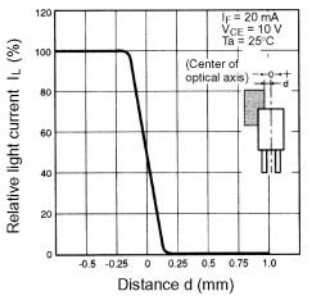
Dark Current vs. Ambient Temperature Characteristics (Typical)



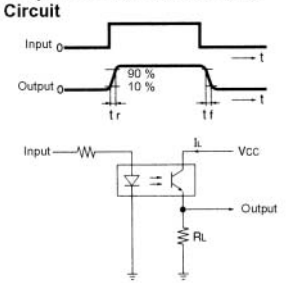
Response Time vs. Load Resistance Characteristics (Typical)



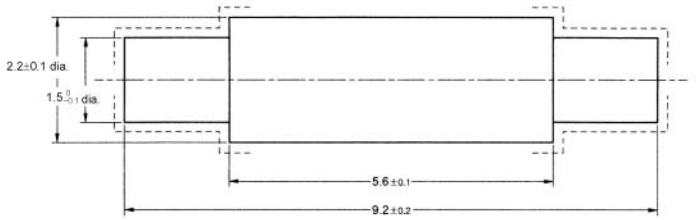
Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Actuator Dimensions



Note:
1. Make sure that the portions marked with dotted lines have no burrs.
2. The material of the actuator must be selected by considering the infrared permeability of the actuator.

Features

- An actuator can be attached.
- Snap-in mounting model.
- Mountable to 1.0, 1.2 and 1.6 mm thick boards.
- Connects to Tyco Electronics AMP's CT series connectors.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note)
	Pulse forward current	I_{FP}	–
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{CEO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	–

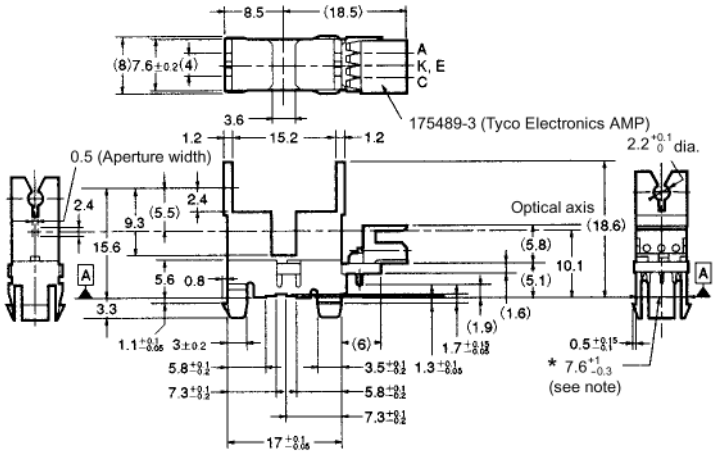
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.

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

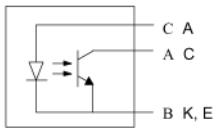
Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 30 mA
Detector	Light current	I_L	0.5 mA min., 14 mA max.	I_F = 20 mA, V_{CE} = 5 V
	Dark current	I_D	200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	---	---
	Collector-Emitter saturated voltage	V_{CE} (sat)	0.1 V typ., 0.4 V max.	I_F = 20 mA, I_L = 0.3 mA
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 5 V
Rising time		tr	8 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 1 mA
Falling time		tf	8 μs typ.	V_{CC} = 5 V, R_L = 100 Ω, I_L = 1 mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Note: The asterisked dimension is specified by datum A only.

Unless otherwise specified, the tolerances are as shown below.

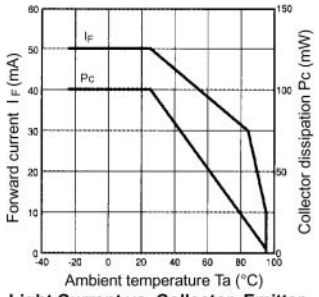
Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

Terminal No.	Name
A	Anode
C	Collector
K, E	Cathode, Emitter

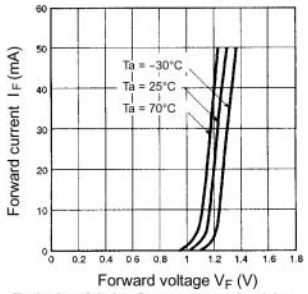
Recommended Mating Connectors:
Tyco Elctronics AMP 173977-3 (insulation displacement - type connector)
175778-3 (crimp-type connector)
179228-3 (crimp-type connector)

■ Engineering Data

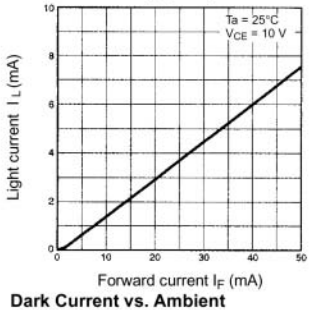
Forward Current vs. Collector Dissipation Temperature Rating



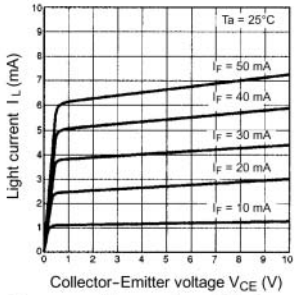
Forward Current vs. Forward Voltage Characteristics (Typical)



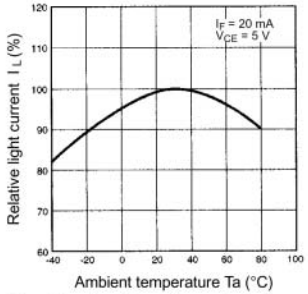
Light Current vs. Forward Current Characteristics (Typical)



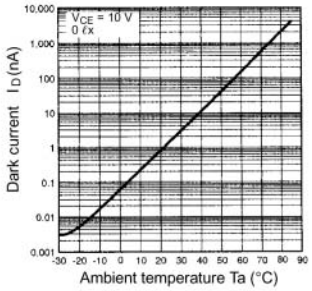
Light Current vs. Collector-Emitter Voltage Characteristics (Typical)



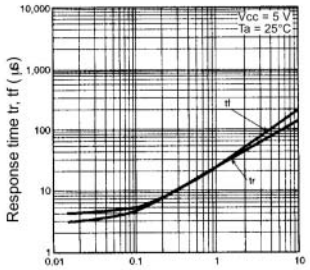
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



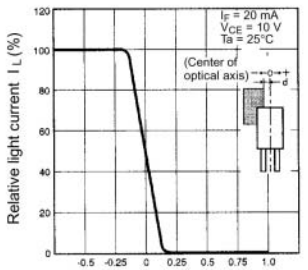
Dark Current vs. Ambient Temperature Characteristics (Typical)



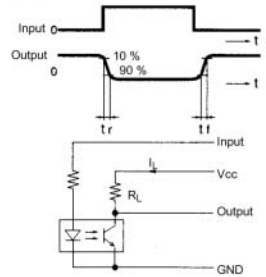
Response Time vs. Load Resistance Characteristics (Typical)



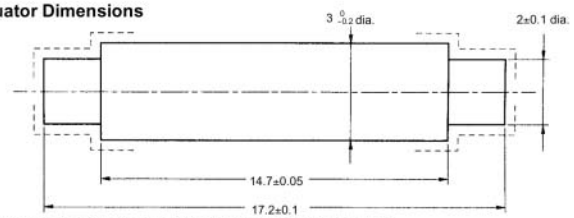
Sensing Position Characteristics (Typical)



Response Time Measurement Circuit



Actuator Dimensions



Note: 1. Make sure that the portions marked with dotted lines have no burrs.
2. The material of the actuator must be selected by considering the infrared permeability of the actuator.

Features

- An actuator can be attached.
- Snap-in mounting model.
- Mounts to 1.0-, 1.2- and 1.6-mm-thick panels.
- High resolution with a 0.5-mm-wide sensing aperture.
- With a 3.6-mm-wide slot.
- Photo IC output signals directly connect with logic circuit and TTL.
- Connects to Tyco Electronics AMP's CT-series connectors.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

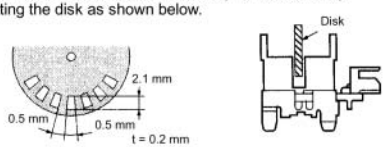
Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Output voltage		V_{OUT}	28 V
Output current		I_{OUT}	16 mA
Permissable output dissipation		P_{OUT}	250 mW (see note)
Ambient temperature	Operating	Topr	-20°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	–

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

■ Electrical and Optical Characteristics (Ta = 25°C, V_{CC} = 5 V ±10%)

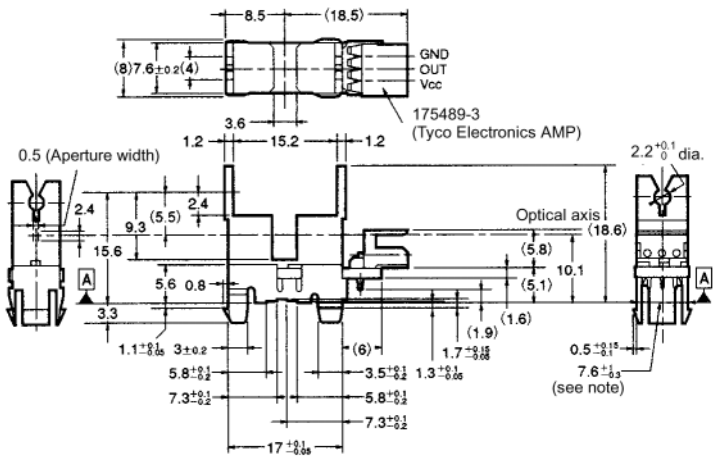
Item	Symbol	Value	Condition
Current consumption	I_{CC}	30 mA max.	With and without incident
Low-level output voltage	V_{OL}	0.35 V max.	I_{OUT} = 16 mA with incident
High-level output voltage	V_{OH}	(V_{CC} x 0.9) V min.	V_{OUT} = V_{CC} without incident, R_L = 47 kΩ
Response frequency	f	3 kHz min.	V_{OUT} = V_{CC}, R_L = 47 kΩ (see note)

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

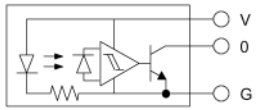


■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Terminal No.	Name
V	Power Supply (V_{CC})
O	Output (OUT)
G	Ground(GND)

Recommended Mating Connectors:
Tyco Elctronics AMP 179228-3 (insulation displacement - type connector)
175778-3 (crimp-type connector)
173977-3 (crimp-type connector)

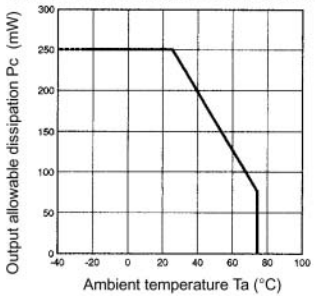
Note: The asterisked dimension is specified by datum A only.

Unless otherwise specified, the tolerances are as shown below.

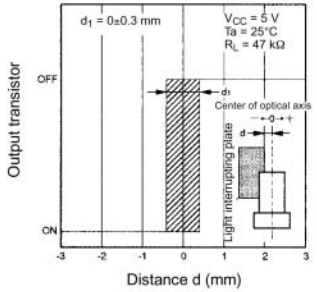
Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

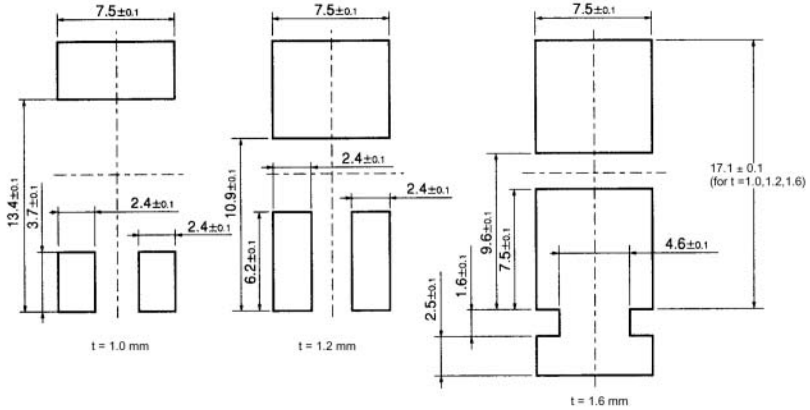
Output Allowable Dissipation vs. Ambient Temperature Characteristics



Sensing Position Characteristics (Typical)

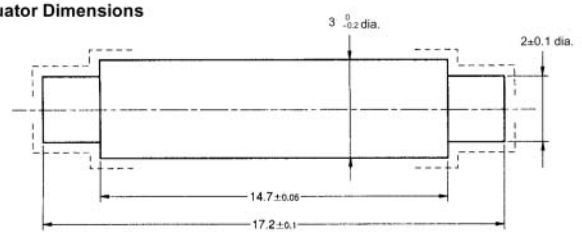


■ Recommended Mounting Holes



- When mounting the Photomicrosensor to a panel with a hole opened by pressing, make sure that the hole has no burrs. The mounting strength of the Photomicrosensor will decrease if the hole has burrs.
- When mounting the Photomicrosensor to a panel with a hole opened by pressing, be sure to mount the Photomicrosensor on the pressing side of the panel.
- The mounting strength of the Photomicrosensor will increase if the Photomicrosensor is mounted to a panel with a hole that is only a little larger than the size of the Photomicrosensor, in which case, however, it will be difficult to mount the Photomicrosensor to the panel. The mounting strength of the Photomicrosensor will decrease if the Photomicrosensor is mounted to a panel with a hole that is comparatively larger than the size of the Photomicrosensor, in which case, however, it will be easy to mount the Photomicrosensor to the panel. When mounting the Photomicrosensor to a panel, open an appropriate hole for the Photomicrosensor according to the application.
- After mounting the Photomicrosensor to any panel, make sure that the Photomicrosensor does not wobble.
- When mounting the Photomicrosensor to a molding with a hole, make sure that the edges of the hole are sharp enough, otherwise the Photomicrosensor may come fall out.

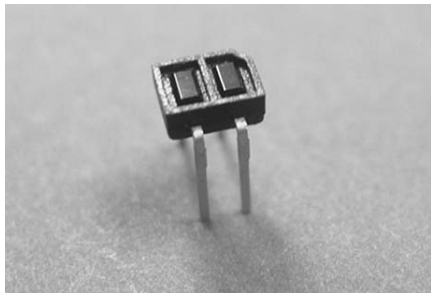
Actuator Dimensions



Note:
1. Make sure that the portions marked with dotted lines have no burrs.
2. The material of the actuator must be selected by considering the infrared permeability of the actuator.

■ Features

■ Ultra-compact model.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-40°C to 100°C
Soldering temperature		Tsol	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 frequency of 100 Hz.
3. Complete soldering within 10 seconds.

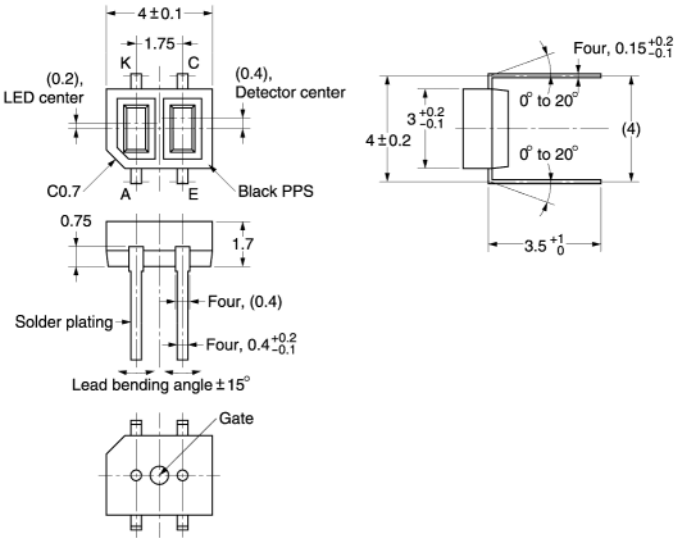
■ Electrical and Optical Characteristics (Ta = 25°C)

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	940 nm typ.	I_F = 4 mA
Detector	Light current	I_L	50 μA min., 300 μA max.	I_F = 4 mA, V_{CE} = 2 V Aluminum-deposited surface, d = 1 mm (see note 1)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	200 nA max.	I_F = 4 mA, V_{CE} = 2 V with no reflection
	Collector-Emitter saturated voltage	V_{CE} (sat)	–	–
	Peak spectral sensitivity wavelength	λ_P	930 nm typ.	V_{CF} = 10 V
Rising time		tr	35 μs typ.	V_{CC} = 2 V, R_L = 1 kΩ, I_L = 100 μA
Falling time		tf	25 μs typ.	V_{CC} = 2 V, R_L = 1 kΩ, I_L = 100 μA

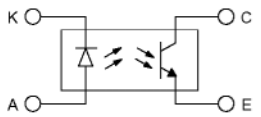
Note: The letter 'd' indicates the distance between the top surface of the sensor and the sensing object.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit

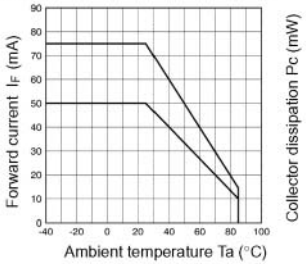


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

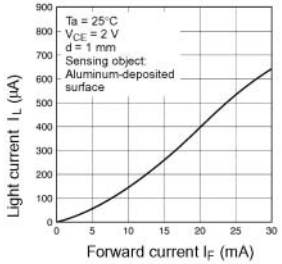
Unless otherwise specified, the tolerances are ±0.15 mm.

■ Engineering Data

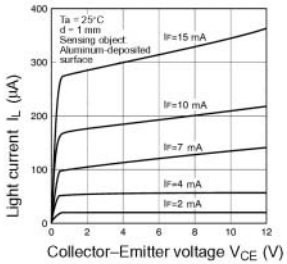
Forward Current vs. Collector Dissipation Temperature Rating



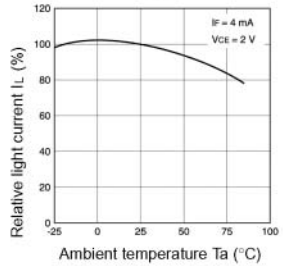
Light Current vs. Forward Current Characteristics (Typical)



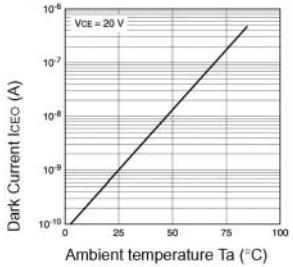
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



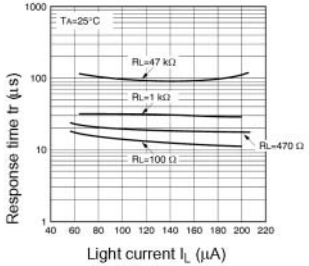
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



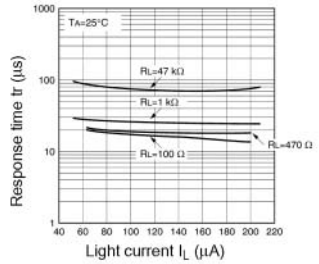
Dark Current vs. Ambient Temperature Characteristics (Typical)



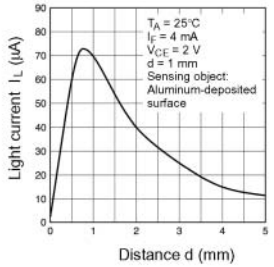
Response Time vs. Load Resistance Characteristics (Typical)



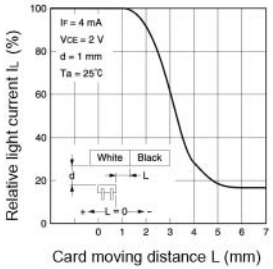
Response Time vs. Load Resistance Characteristics (Typical)



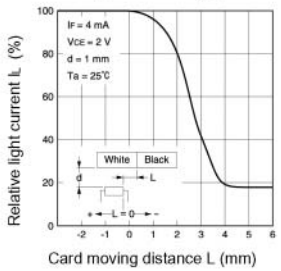
Sensing Distance Characteristics (Typical)



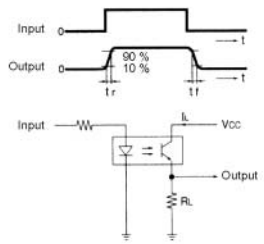
Relative Light Current vs. Card Moving Distance (1)

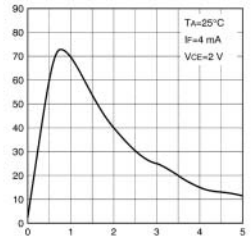


Relative Collector Current vs. Card Moving Distance (2)



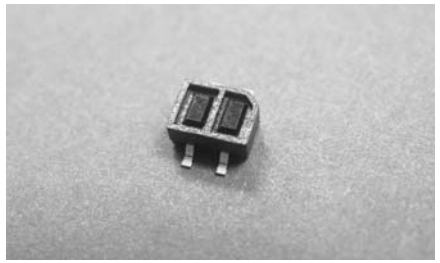
Response Time Measurement Circuit





■ Features

- Ultra-compact model.
- PCB surface mounting type.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	5 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 85°C
	Storage	Tstg	-40°C to 100°C
Soldering temperature		Tsol	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 frequency of 100 Hz.
3. Complete soldering within 10 seconds.

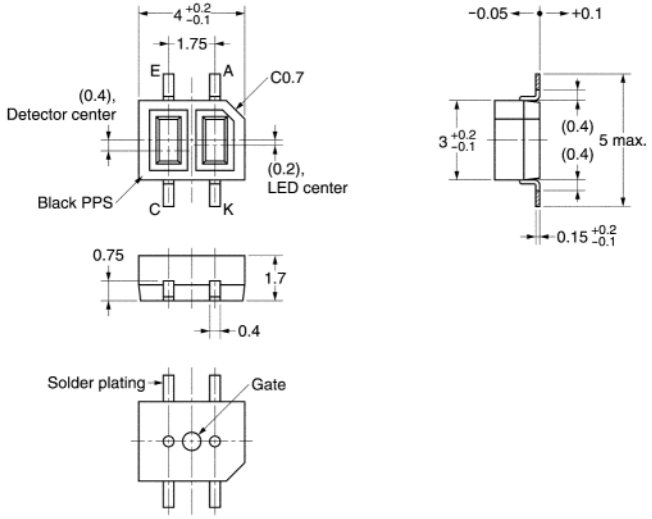
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.4 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	950 nm typ.	I_F = 4 mA
Detector	Light current	I_L	50 µA min., 300 µA max.	I_F = 4 mA, V_{CE} = 2 V Aluminum-deposited surface, d = 1 mm (see note 1)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 lx
	Leakage current	I_{LEAK}	200 nA max.	I_F = 4 mA, V_{CE} = 2 V with no reflection
	Collector-Emitter saturated voltage	V_{CE} (sat)	–	–
	Peak spectral sensitivity wavelength	λ_P	930 nm typ.	V_{CF} = 10 V
Rising time		tr	35 µs typ.	V_{CC} = 2 V, R_L = 1 kΩ, I_L = 100 µA
Falling time		tf	25 µs typ.	V_{CC} = 2 V, R_L = 1 kΩ, I_L = 100 µA

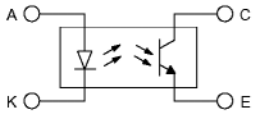
Note: The letter 'd' indicates the distance between the top surface of the sensor and the sensing object.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit

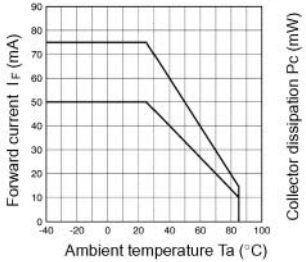


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

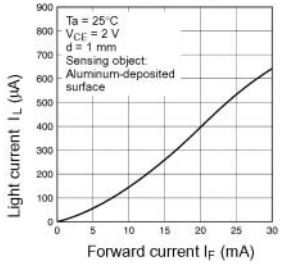
Unless otherwise specified, the tolerances are ±0.15 mm.

■ Engineering Data

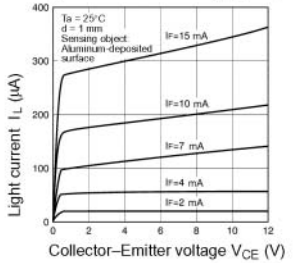
Forward Current vs. Collector Dissipation Temperature Rating



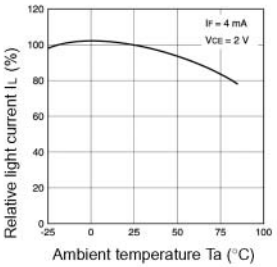
Light Current vs. Forward Current Characteristics (Typical)



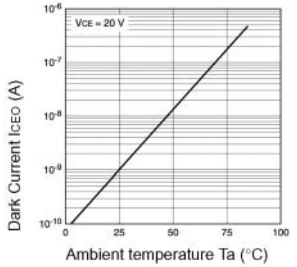
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



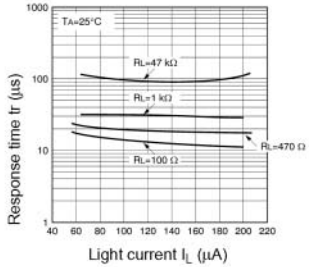
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



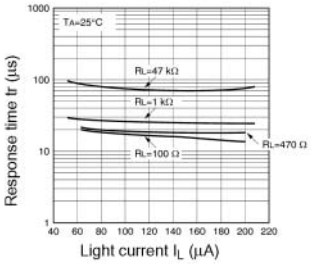
Dark Current vs. Ambient Temperature Characteristics (Typical)



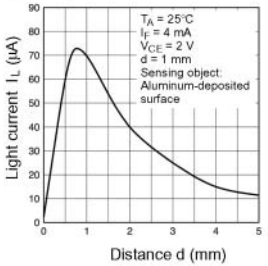
Response Time vs. Load Resistance Characteristics (Typical)



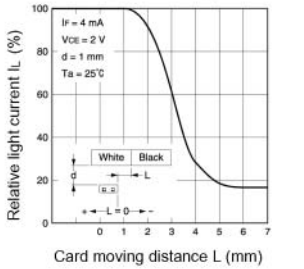
Response Time vs. Load Resistance Characteristics (Typical)



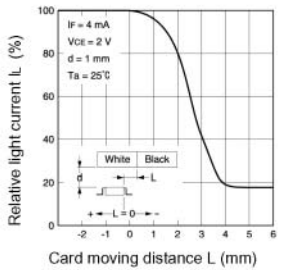
Sensing Distance Characteristics (Typical)



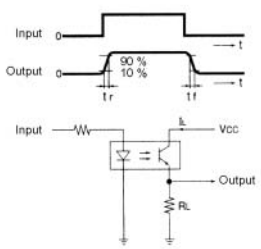
Relative Light Current vs. Card Moving Distance (1)



Relative Collector Current vs. Card Moving Distance (2)



Response Time Measurement Circuit



■ Features

- Ultra-compact model.
- PCB surface mounting type.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	25 mA (see note 1)
	Pulse foward current	I_{FP}	100 mA (see note 2)
	Reverse Voltage	V_R	6 V
Detector	Collector-Emitter voltage	V_{CEO}	18 V
	Emitter-Collector voltage	V_{ECO}	4 V
	Collector current	I_C	20 mA
	Collector dissipation	P_C	75 mW (see note 1)
Ambient temperature	Operating	Topr	-30°C to 80°C
	Storage	Tstg	-40°C to 85°C
	Reflow soldering	Tsol	220°C (see note 3)
	Manual soldering	Tsol	300°C (see note 3)

Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. Duty: 1/100; Pulse width: 0.1 ms.
3. Complete soldering within 10 seconds for reflow soldering and within 3 seconds for manual soldering.

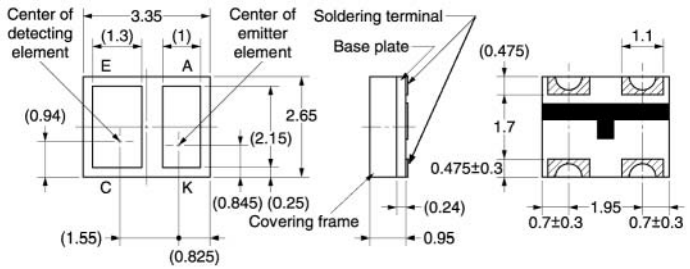
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.1 V typ., 1.3 V max.	I_F = 4 mA
	Reverse current	I_R	10 µA max.	V_R = 6 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	100 µA min., 150 µA typ., 360 µA max.	Aluminum-deposited surface, I_F = 4 mA, V_{CE} = 2 V, d = 1 mm (see note 1)
	Dark current	I_D	100 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	1 µA max.	I_F = 4 mA, V_{CE} = 2 V
	Collector-Emitter saturated voltage	V_{CE} (sat)	–	–
	Peak spectral sensitivity wavelength	λ_P	900 nm typ.	–
Rising time		tr	25 µs typ.	V_{CC} = 2 V, R_L = 1 kΩ
Falling time		tf	30 µs typ.	V_{CC} = 2 V, R_L = 1 kΩ

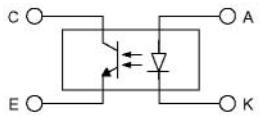
Note: The letter 'd' indicates the distance between the top surface of the sensor and the sensing object.

■ Dimensions

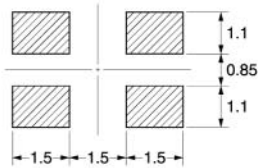
Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Recommended soldering patterns

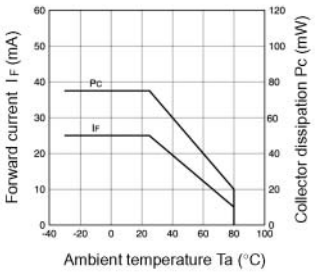


Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

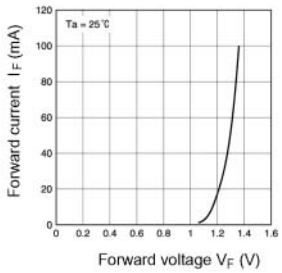
Unless otherwise specified, the tolerances are ±0.2 mm.

■ Engineering Data

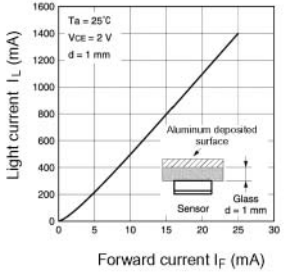
Forward Current vs. Collector Dissipation Temperature Rating



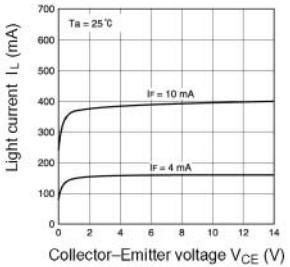
Forward Current vs. Forward Voltage Characteristics (Typical)



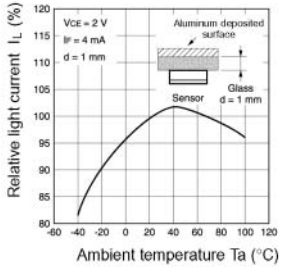
Light Current vs. Forward Current Characteristics (Typical)



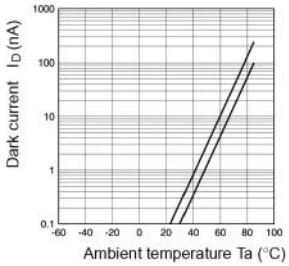
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



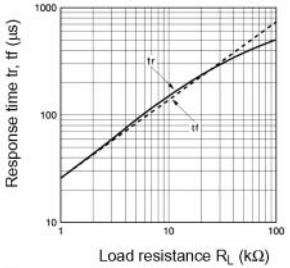
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



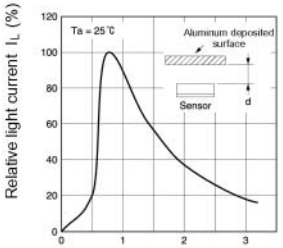
Dark Current vs. Ambient Temperature Characteristics (Typical)



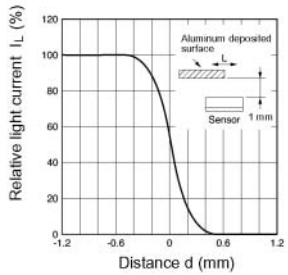
Response Time vs. Load Resistance Characteristics (Typical)



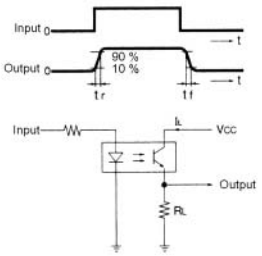
Sensing Distance Characteristics (Typical)



Sensing Position Characteristics (Typical)



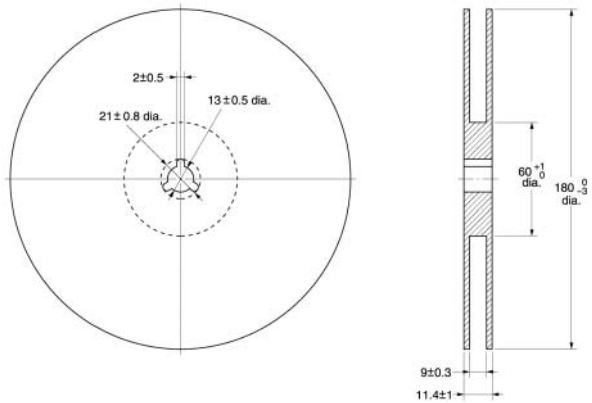
Response Time Measurement Circuit



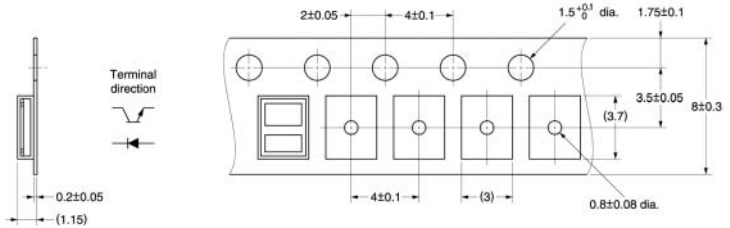
■ Tape and Reel

Unit: mm (inch).

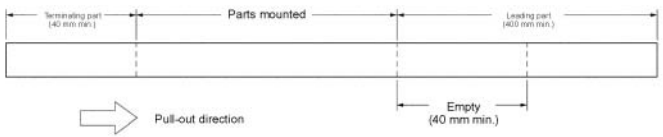
Reel



Tape



Tape configuration



Tape quantity

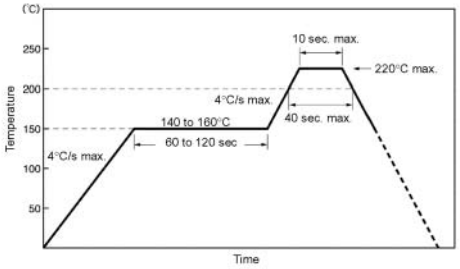
3,000 pcs./reel

Precautions

■ Soldering Information

Reflow soldering

- The following soldering paste is recommended:
  Melting temperature: 178 to 192°C
  Composition: Sn 63%, Pb 37%
- The recommended thickness of the metal mask for screen printing is between 0.2 and 0.25 mm.
- Set the reflow oven so that the temperature profile shown in the following chart is obtained for the upper surface of the product being soldered.



Manual soldering

- Use “Sn 60” (60% tin and 40% lead) or solder with silver content.
- Use a soldering iron of less than 25W, and keep the temperature of the iron tip at 300°C or below.
- Solder each point for a maximum of three seconds.
- After soldering, allow the product to return to room temperature before handling it.

Storage

To protect the product from the effects of humidity until the package is opened, dry-box storage is recommended. If this is not possible, store the product under the following conditions:

Temperature: 10 to 30°C
Humidity: 60% max.

The product is packed in a humidity-proof envelope. Reflow soldering must be done within 48 hours after opening the envelope, during which time the product must be stored under 30°C at 80% maximum humidity.

If it is necessary to store the product after opening the envelope, use dry-box storage or reseal the envelope.

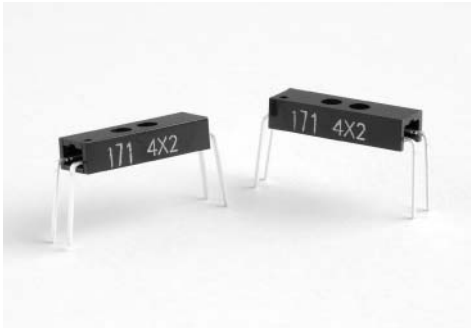
Baking

If a product has remained packed in a humidity-proof envelope for six months or more, or if more than 48 hours have lapsed since the envelope was opened, bake the product under the following conditions before use:

Reel: 60°C for 24 hours or more
Bulk: 80°C for 4 hours or more

■ Features

■ 3 mm tall, thin model.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	**Collector-Emitter voltage**	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	**Operating**	Topr	-40°C to 85°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	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 frequency of 100 Hz.
3. Complete soldering within 10 seconds.

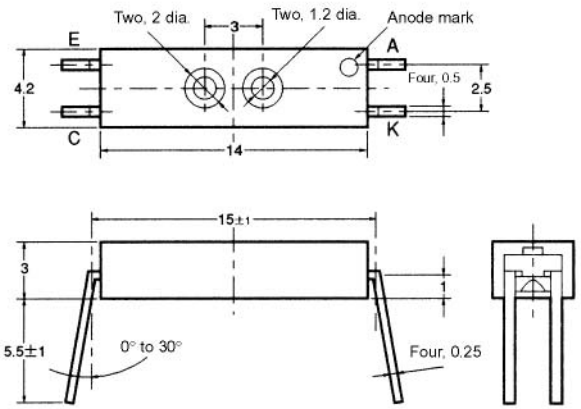
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 µA typ., 10 µA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	**Light current**	I_L	50 µA min., 500 µA max.	I_F = 20 mA, V_{CE} = 10 V White paper with a relection ratio of 90%, d = 3.5 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 lx
	Leakage current	I_{LEAK}	2 µA max.	I_F = 20 mA, V_{CE} = 10 V with no reflection
	Collector-Emitter saturated voltage	V_{CE} (sat)	–	–
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CC} = 10 V
Rising time		tr	30 µs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 µs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

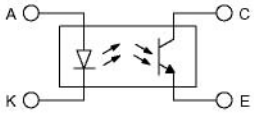
Note: The letter ‘d’ indicates the distance between the top surface of the sensor and the sensing object.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



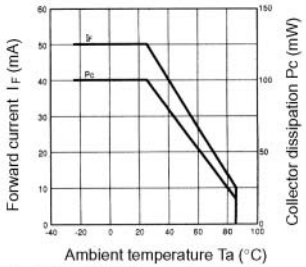
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

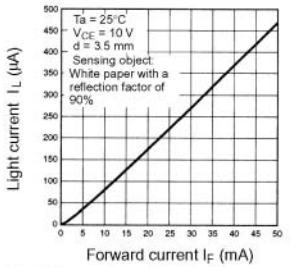
Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

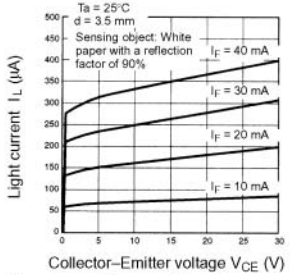
Forward Current vs. Collector Dissipation Temperature Rating



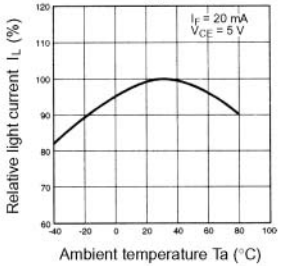
Light Current vs. Forward Current Characteristics (Typical)



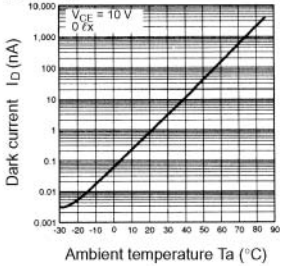
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



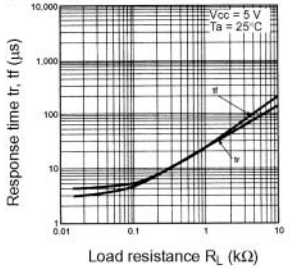
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



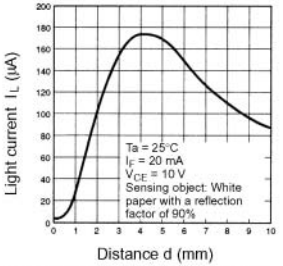
Dark Current vs. Ambient Temperature Characteristics (Typical)



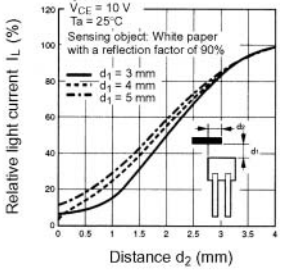
Response Time vs. Load Resistance Characteristics (Typical)



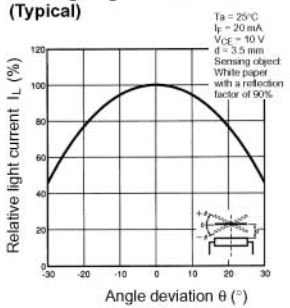
Sensing Distance Characteristics (Typical)



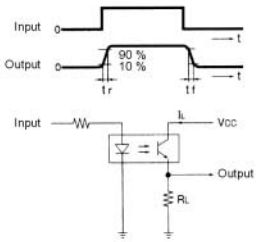
Sensing Position Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit



■ Features

- High-quality model with plastic lenses.
- Highly precise sensing range with a tolerance of ±0.6 mm horizontally and vertically.
- Limited reflective model Red LED.
- Red LED.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	40 mA (see note 1)
	Pulse foward current	I_{FP}	300 mA (see note 2)
	Reverse Voltage	V_R	3 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	0°C to 70°C
	Storage	Tstg	-20°C to 80°C
Soldering temperature		Tsol	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 frequency of 100 Hz.
3. Complete soldering within 10 seconds.

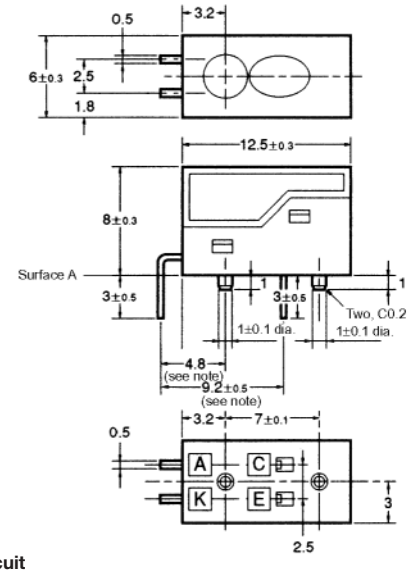
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.85 V typ., 2.3 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 µA typ., 10 µA max.	V_R = 3 V
	Peak emission wavelength	λ_P	660 nm typ.	I_F = 20 mA
Detector	Light current	I_L	16 µA min., 2,000 µA max.	I_F = 20 mA, V_{CE} = 5 V White paper with a reflection ratio of 90%, d = 4 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 5 V, 0 ℓx
	Leakage current	I_{LEAK}	2 µA max.	I_F = 10 mA, V_{CE} = 10 V with no reflection
	Collector-Emitter saturated voltage	V_{CE} (sat)	–	–
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CC} = 5 V
Rising time		tr	30 µs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 µs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

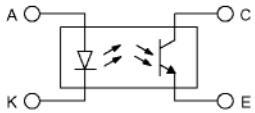
Note: The letter 'd' indicates the distance between the top surface of the sensor and the sensing object.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Note: These dimensions are for the surface A. Other lead wire pitch dimensions are for the case surface.

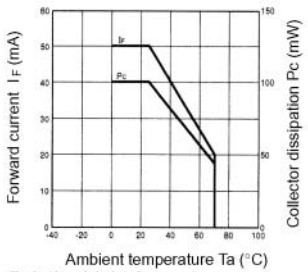
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

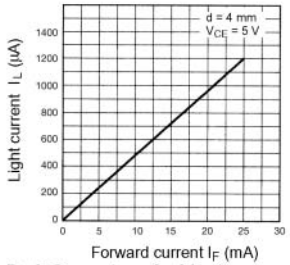
Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

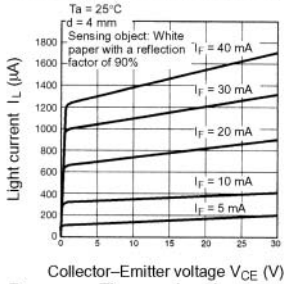
Forward Current vs. Collector Dissipation Temperature Rating



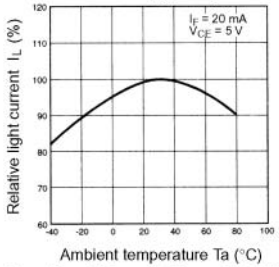
Light Current vs. Forward Current Characteristics (Typical)



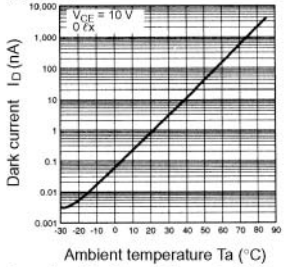
Light Current vs. Collector–Emitter Voltage Characteristics (Typical)



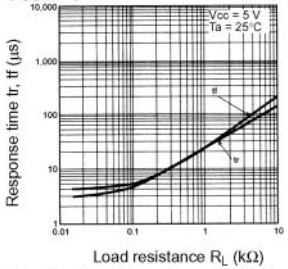
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



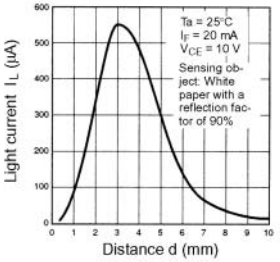
Dark Current vs. Ambient Temperature Characteristics (Typical)



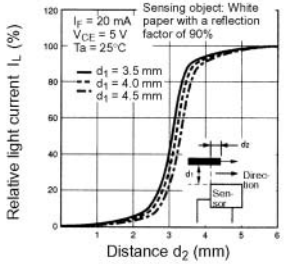
Response Time vs. Load Resistance Characteristics (Typical)



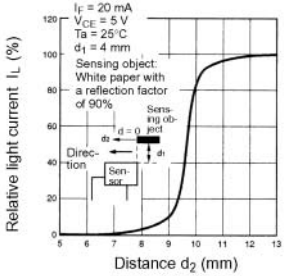
Sensing Distance Characteristics (Typical)



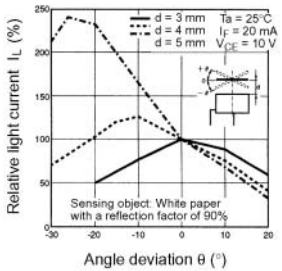
Sensing Position Characteristics (Typical)



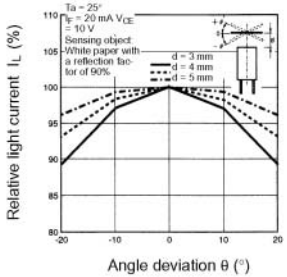
Sensing Position Characteristics (Typical)



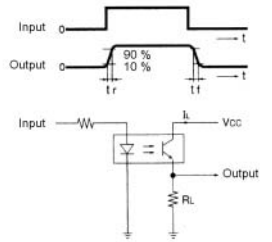
Sensing Angle Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit



Features

■ Compact reflective Photomicrosensor (EE-SY110) with a moulded housing and dust-tight cover.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-40°C to 80°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	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 100Hz.
3. Complete soldering within 10 seconds.

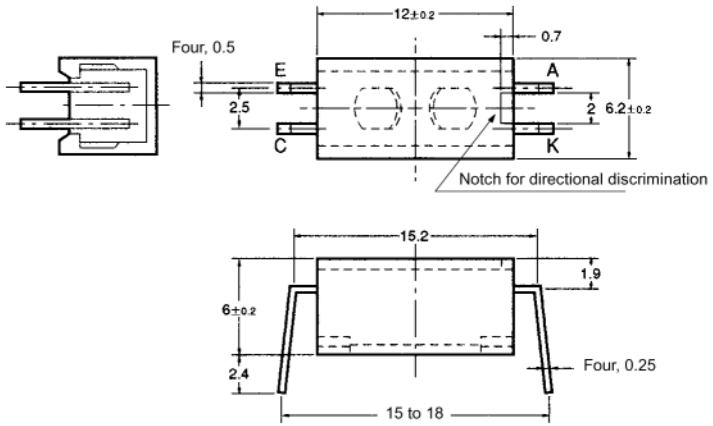
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	160 μA min., 1,600 μA max.	I_F = 20 mA, V_{CE} = 10 V White paper with a reflection ratio of 90%, d = 4.4 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 10 V with no reflection
	Collector-Emitter saturated voltage	V_{CE} (sat)	---	---
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

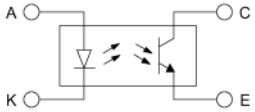
Note: The letter "d" indicates the distance between the top surface of the sensor and the sensing object.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



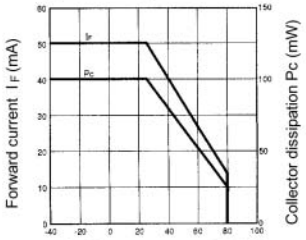
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

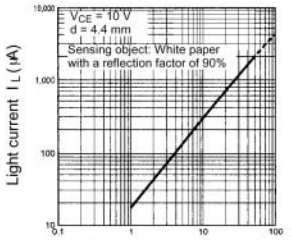
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

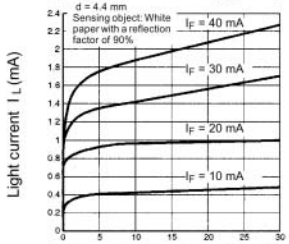
Forward Current vs. Collector Dissipation Temperature Rating



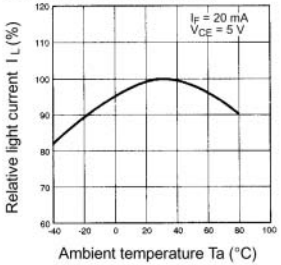
Light Current vs. Forward Current Characteristics (Typical)



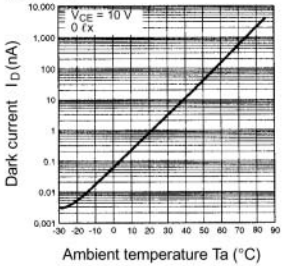
Light Current vs. Collector-Emitter Voltage Characteristics (Typical)



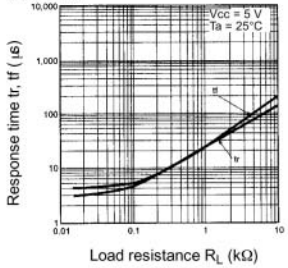
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



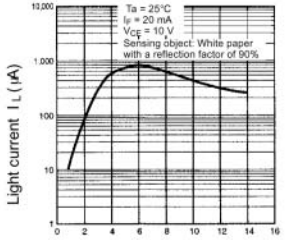
Dark Current vs. Ambient Temperature Characteristics (Typical)



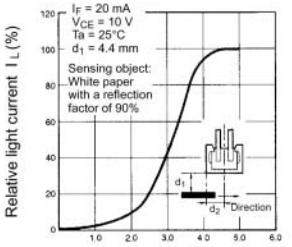
Response Time vs. Load Resistance Characteristics (Typical)



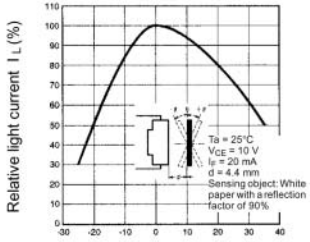
Sensing Distance Characteristics (Typical)



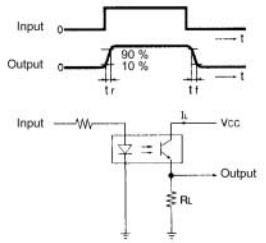
Sensing Position Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit



■ 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)
- Light ON model (EE-SY413)

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
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**	Topr	-40°C to 65°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

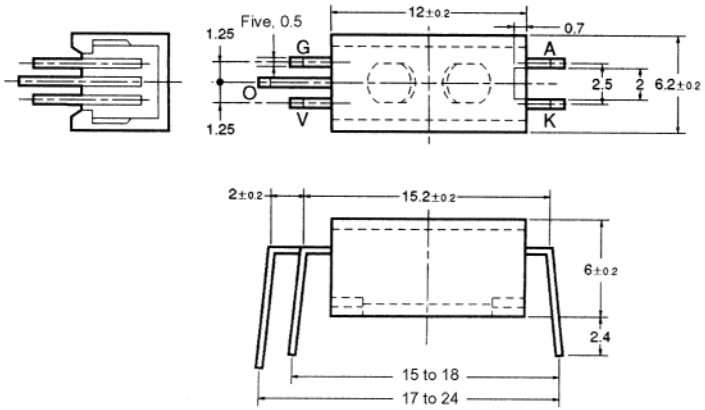
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 μs maximum with frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

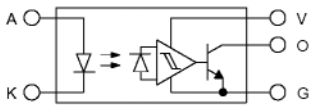
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, without incident light (EE-SY313), with incident light (EE-SY413) (see notes 1 & 2)
	High-level output voltage	I_{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 & 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		△H	17% typ.	V_{CC} = 4.5 to 16 V
Response frequency		f	50 Hz min.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16mA
Response delay time		t_{PLH} (t_{PHL})	3 μs min.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16mA
Response delay time		t_{PHL} (t_{PLH})	20 μs typ.	V_{CC} = 4.5 to 16 V, I_F = 20 mA, I_{OL} = 16mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Unless otherwise specified, the tolerances are as shown right.

Terminal No.	Name
A	Anode
K	Cathode
V	Power supply V_{CC}
O	Output (OUT)
G	Ground (GND)

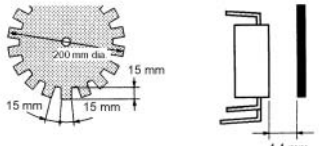
Dimensions	Tolerence
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

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.

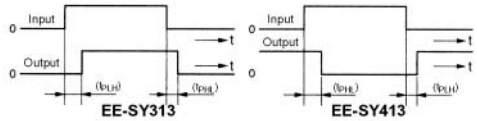
2. Sensing object: White paper with a reflection factor of 90% at a sensing distance of 4.4 mm.

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.



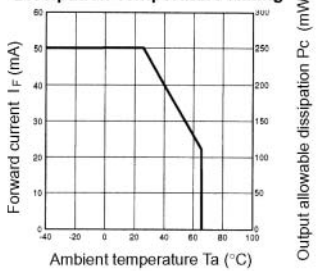
5. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EESY413.



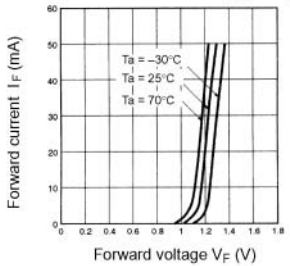
■ Engineering Data

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

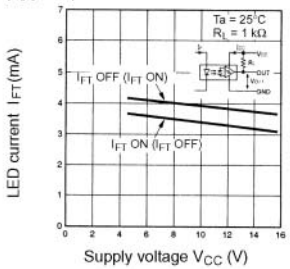
Forward Current vs. Collector Dissipation Temperature Rating



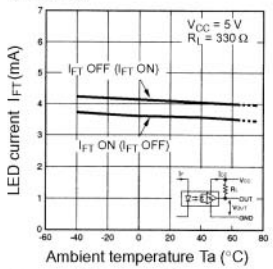
Forward Current vs. Forward Voltage Characteristics (Typical)



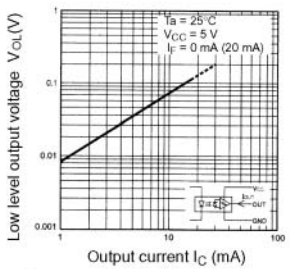
LED Current vs. Supply Voltage (Typical)



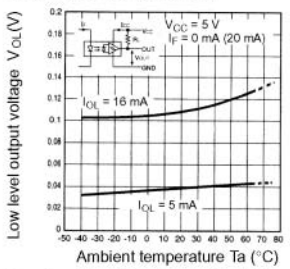
LED Current vs. Ambient Temperature Characteristics (Typical)



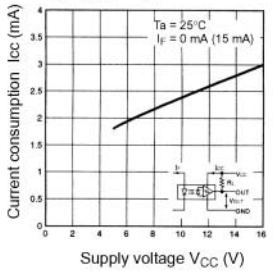
Low-level Output Voltage vs. Output Current (Typical)



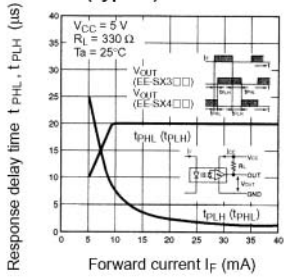
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



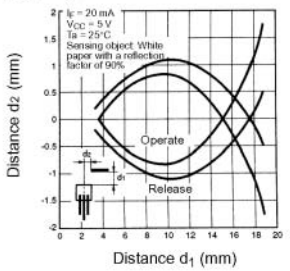
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)



Sensing Position Characteristics (Typical)



Features

- Dust-tight construction.
- With a visible-light intercepting filter which allows objects to be sensed without being greatly influenced by the light radiated from fluorescent lamps.
- Mounted with M2 screws.
- Model with soldering terminals (EE-SF5).
- Model with PCB terminals (EE-SF5-B).

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-25°C to 80°C
	Storage	Tstg	-30°C to 80°C
Soldering temperature		Tsol	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 100Hz.
3. Complete soldering within 10 seconds.

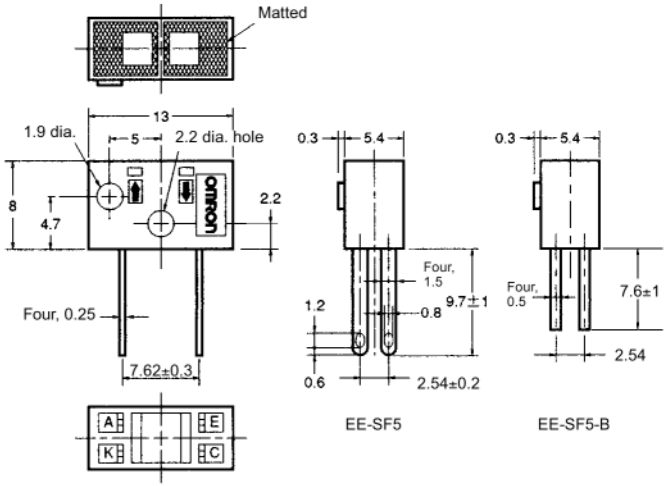
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	200 μA min., 2,000 μA max.	I_F = 20 mA, V_{CE} = 10 V White paper with a reflection ratio of 90%, d = 5 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 10 V with no reflection
	Collector-Emitter saturated voltage	V_{CE} (sat)	---	---
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

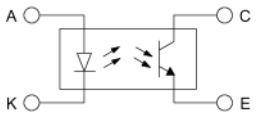
Note: The letter "d" indicates the distance between the top surface of the sensor and the sensing object.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



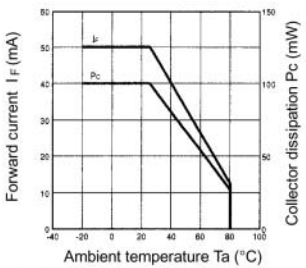
Unless otherwise specified, the tolerances are as shown below.

Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

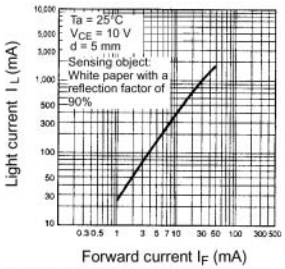
Dimensions	Tolerance
3 mm max.	±0.3
3 < mm ≤ 6	±0.375
6 < mm ≤ 10	±0.45
10 < mm ≤ 18	±0.55
18 < mm ≤ 30	±0.65

■ Engineering Data

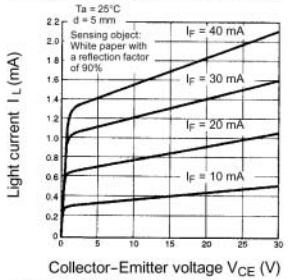
Forward Current vs. Collector Dissipation Temperature Rating



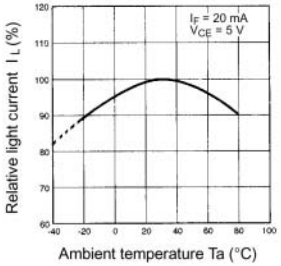
Light Current vs. Forward Current Characteristics (Typical)



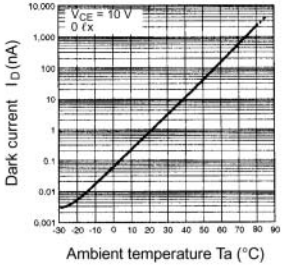
Light Current vs. Collector-Emitter Voltage Characteristics (Typical)



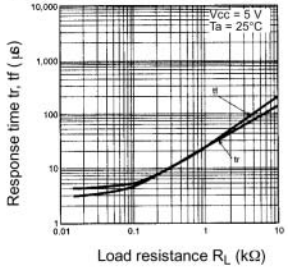
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



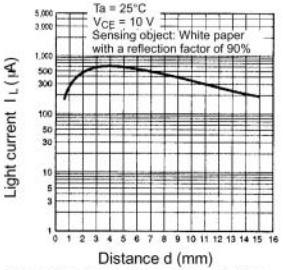
Dark Current vs. Ambient Temperature Characteristics (Typical)



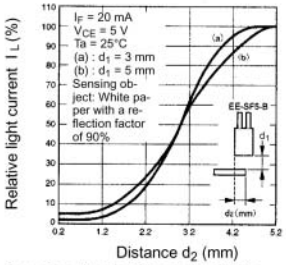
Response Time vs. Load Resistance Characteristics (Typical)



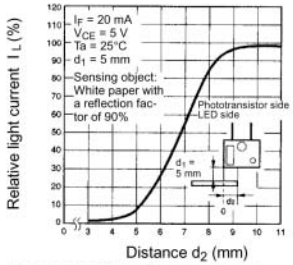
Sensing Distance Characteristics (Typical)



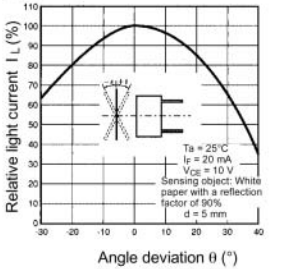
Sensing Position Characteristics (Typical)



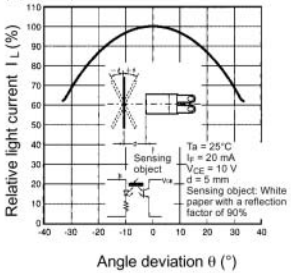
Sensing Position Characteristics (Typical)



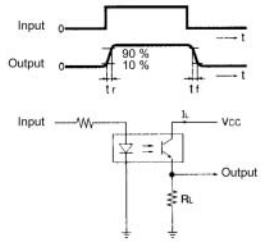
Sensing Angle Characteristics (Typical)



Sensing Angle Characteristics (Typical)



Response Time Measurement Circuit



Features

■ Compact reflective model with a moulded housing.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	Forward current	I_F	50 mA (see note 1)
	Pulse forward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
Detector	Collector-Emitter voltage	V_{CEO}	30 V
	Emitter-Collector voltage	V_{ECO}	–
	Collector current	I_C	20 mA
	Collector dissipation	P_C	100 mW (see note 1)
Ambient temperature	Operating	Topr	-40°C to 85°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	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 100Hz.
3. Complete soldering within 10 seconds.

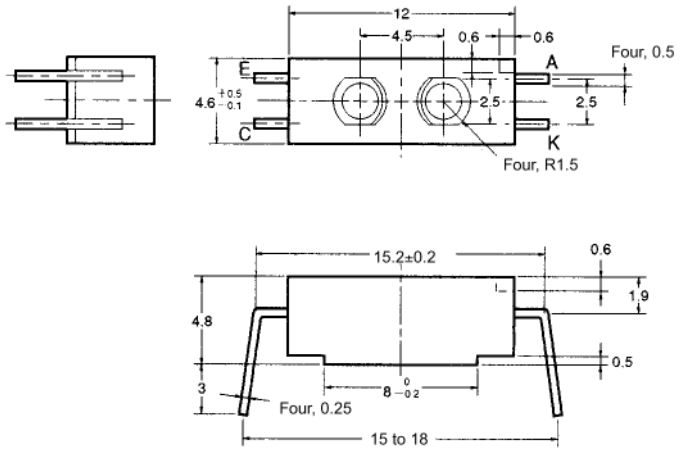
■ Electrical and Optical Characteristics (Ta = 25°C)

Item		Symbol	Value	Condition
Emitter	Forward voltage	V_F	1.2 V typ., 1.5 V max.	I_F = 30 mA
	Reverse current	I_R	0.01 μA typ., 10 μA max.	V_R = 4 V
	Peak emission wavelength	λ_P	940 nm typ.	I_F = 20 mA
Detector	Light current	I_L	200 μA min., 2,000 μA max.	I_F = 20 mA, V_{CE} = 10 V White paper with a reflection ratio of 90%, d = 5 mm (see note)
	Dark current	I_D	2 nA typ., 200 nA max.	V_{CE} = 10 V, 0 ℓx
	Leakage current	I_{LEAK}	2 μA max.	I_F = 20 mA, V_{CE} = 10 V with no reflection
	Collector-Emitter saturated voltage	V_{CE} (sat)	---	---
	Peak spectral sensitivity wavelength	λ_P	850 nm typ.	V_{CE} = 10 V
Rising time		tr	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA
Falling time		tf	30 μs typ.	V_{CC} = 5 V, R_L = 1 kΩ, I_L = 1 mA

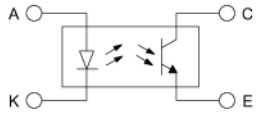
Note: The letter "d" indicates the distance between the top surface of the sensor and the sensing object.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



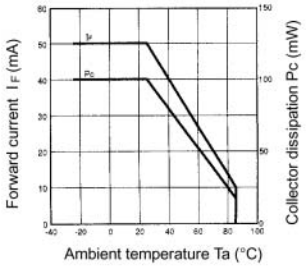
Terminal No.	Name
A	Anode
K	Cathode
C	Collector
E	Emitter

Unless otherwise specified, the tolerances are as shown below.

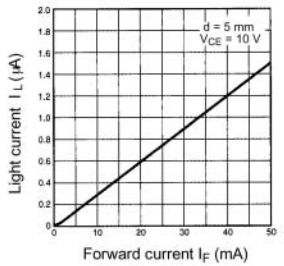
Dimensions	Tolerance
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

■ Engineering Data

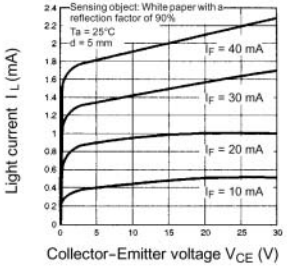
Forward Current vs. Collector Dissipation Temperature Rating



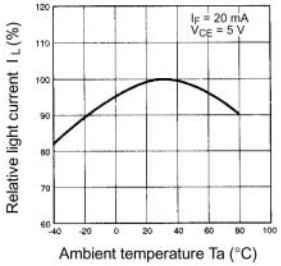
Light Current vs. Forward Current Characteristics (Typical)



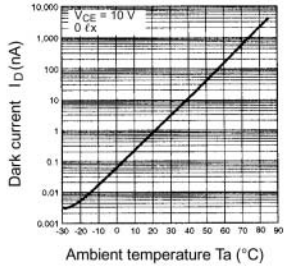
Light Current vs. Collector-Emitter Voltage Characteristics (Typical)



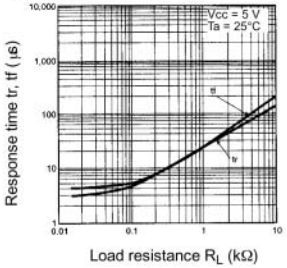
Relative Light Current vs. Ambient Temperature Characteristics (Typical)



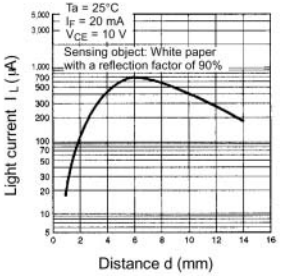
Dark Current vs. Ambient Temperature Characteristics (Typical)



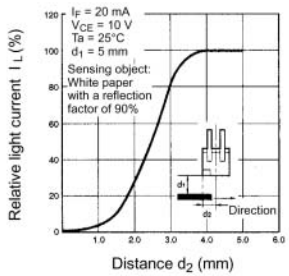
Response Time vs. Load Resistance Characteristics (Typical)



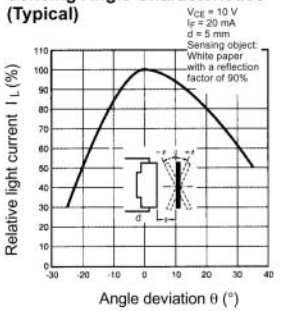
Sensing Distance Characteristics (Typical)



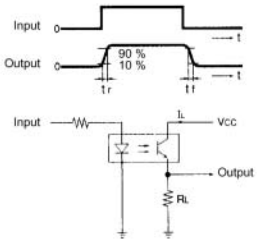
Sensing Position Characteristics (Typical)



Sensing Angle Characteristics (Typical)

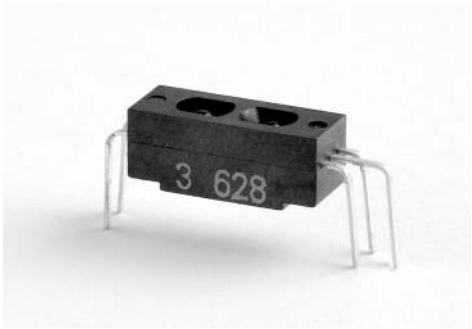


Response Time Measurement Circuit



■ 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 model with a molded housing.
- A wide supply voltage range: 4.5 to 16 VDC
- Directly connects with C-MOS and TTL.
- Dark ON model (EE-SY310)
- Light ON model (EE-SY410)



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Emitter	**Forward current**	I_F	50 mA (see note 1)
	Pulse foward current	I_{FP}	1 A (see note 2)
	Reverse Voltage	V_R	4 V
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**	Topr	-40°C to 75°C
	Storage	Tstg	-40°C to 85°C
Soldering temperature		Tsol	260°C (see note 2)

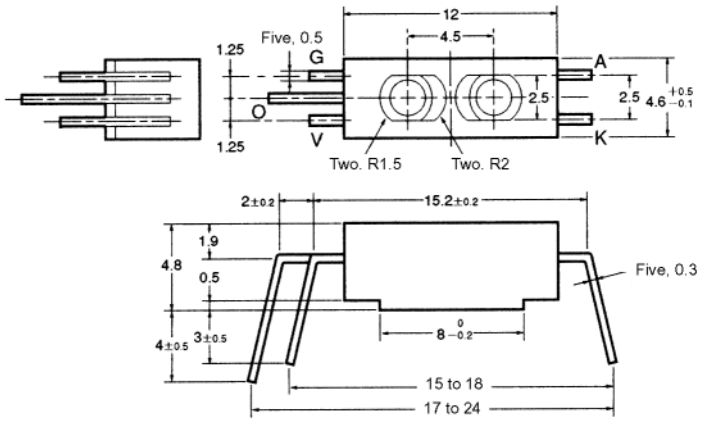
Note: 1. Refer to the temperature rating chart if the ambient temperature exceeds 25°C.
2. The pulse width is 10 µs maximum with frequency of 100 Hz.
3. Complete soldering within 10 seconds.

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

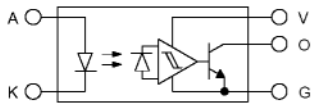
Item		Symbol	Value	Condition
Emitter	**Forward voltage**	V_F	1.2 V typ., 1.5 V max.	I_F = 20 mA
	Reverse current	I_R	0.01 µA typ., 10 µA max.	V_R = 4 V
	Peak emission wavelength	λ_P	920 nm typ.	I_F = 20 mA
	Low-level output voltage	V_{OL}	0.12 V typ., 0.4 V max.	V_{CC} = 4.5 to 16 V, I_{OL} = 16 mA, without incident light (EE-SY310), with incident light (EE-SY410) (see notes 1 & 2)
	High-level output voltage	V_{OH}	15 V min.	V_{CC} = 16 V, R_L = 1 kΩ, with incident light (EE-SY310), without incident light (EE-SY410) (see notes 1 & 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}	6 mA typ., 15 mA max.	V_{CC} = 4.5 to 16 V
LED current when output is ON				
Hysteresis		△H	17% typ.	V_{CC} = 4.5 to 16 V
Response frequency		f	50 Hz min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16mA
Response delay time		t_{PLH} (t_{PHL})	3 µs min.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16mA
Response delay time		t_{PHL} (t_{PLH})	20 µs typ.	V_{CC} = 4.5 to 16 V, I_F = 15 mA, I_{OL} = 16mA

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Internal Circuit



Unless otherwise specified, the tolerances are as shown right.

Terminal No.	Name
A	Anode
K	Cathode
V	Power supply V_{CC}
O	Output (OUT)
G	Ground (GND)

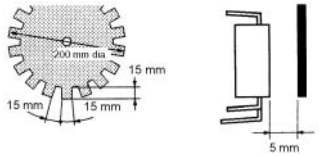
Dimensions	Tolerence
3 mm max.	±0.2
3 < mm ≤ 6	±0.24
6 < mm ≤ 10	±0.29
10 < mm ≤ 18	±0.35
18 < mm ≤ 30	±0.42

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.

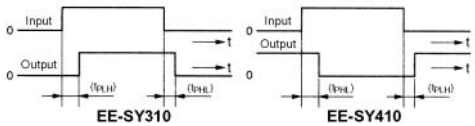
2. Sensing object: White paper with a reflection factor of 90% at a sensing distance of 4.4 mm.

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.



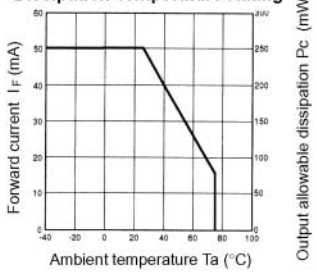
5. The following illustrations show the definition of response delay time. The value in the parentheses applies to the EESY410.



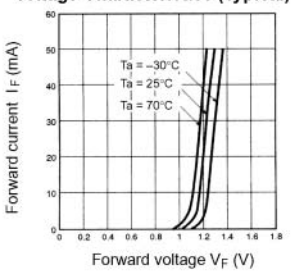
■ Engineering Data

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

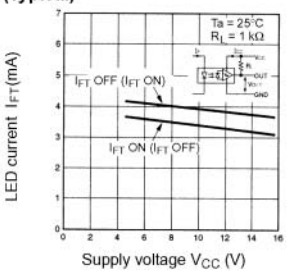
Forward Current vs. Collector Dissipation Temperature Rating



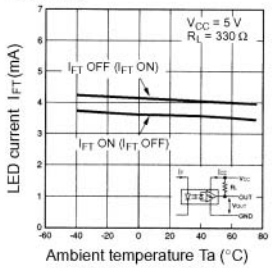
Forward Current vs. Forward Voltage Characteristics (Typical)



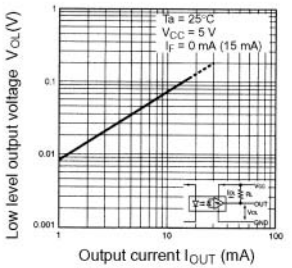
LED Current vs. Supply Voltage (Typical)



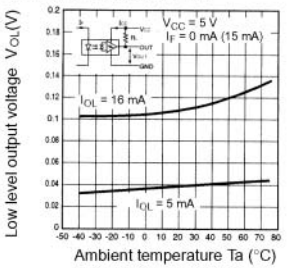
LED Current vs. Ambient Temperature Characteristics (Typical)



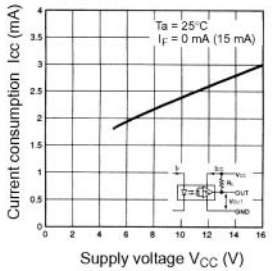
Low-level Output Voltage vs. Output Current (Typical)



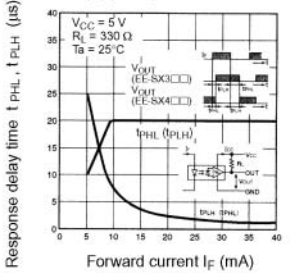
Low-level Output Voltage vs. Ambient Temperature Characteristics (Typical)



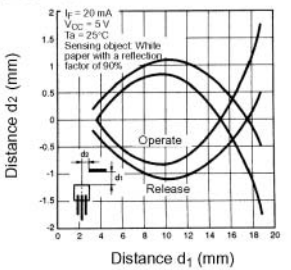
Current Consumption vs. Supply Voltage (Typical)



Response Delay Time vs. Forward Current (Typical)

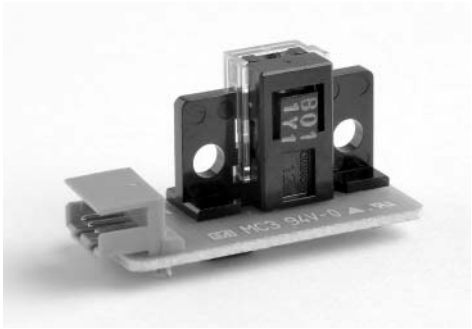


Sensing Position Characteristics (Typical)



■ Features

- Easier control enabled by built-in processor circuit.
- Resolution: ±10 μm.
- Operating area: 6.5±1 mm.
- Adapts well to changes in reflection factor using division processing.



Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Value	Unit	Features
Supply voltage	V_{CC}	7	VDC	–
LED pulse light emission control signal	PLS	7	VDC	LED
LED light emission pulse	tFP	100	ms	–
Operating temperature	T_{opr}	-10 to 65	°C	No freezing or condensation
Storage temperature	T_{stg}	-25 to 80	°C	–

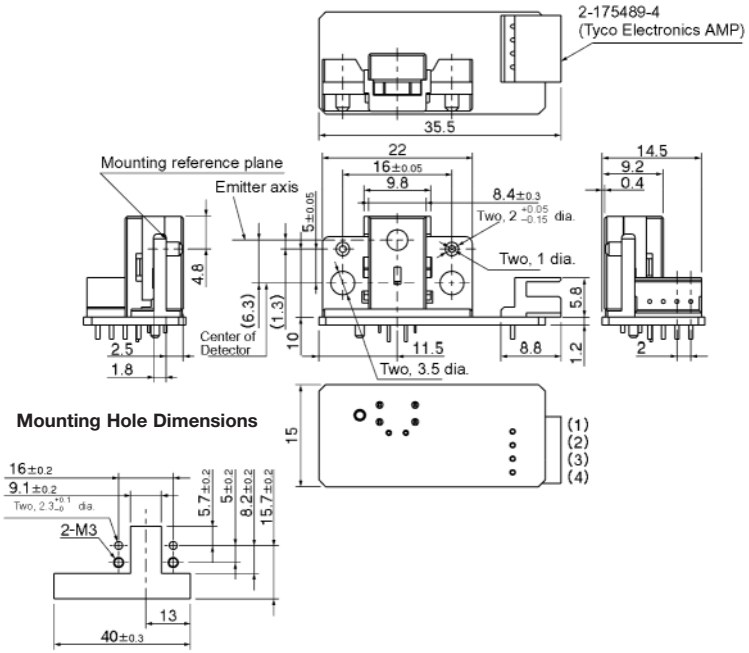
■ Electrical and Optical Characteristics (Ta = -10°C to 65°C)

Item	Symbol	Rated value	Remarks
Supply voltage	V_{CC}	5 VDC±10%	Ripple (p-p): 10 mV p-p max.
Output voltage	OUT	0.2 VDC to (VCC–0.3) V	(see note 1)
Response time	tr	100 μs max.	(see note 2)
LED pulse light emission control signal	PLS	3.5 VDC to VCC	(see note 3)

Note: 1. Load impedance (between OUT-GND) is set at more than 10 kΩ.
2. The time for output voltage to rise from 10% to 90% of the full output range.
3. Apply the voltage ranging from 3.5 V to VCC on the LED pulse light emission control signal terminal. In this case, a maximum of 2 mA (typ.1 mA) current is sunk.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Recommended Mating Connectors:
Tyco Electronics AMP 175778-4 (crimp-type connector)
173977-4 (press-fit connector)

Pin No.	Remarks
1	PLS
2	V_{CC}
3	OUT
4	GND

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerence
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
30 < mm ≤ 50	±0.8

■ Characteristics (Ta = -10°C to 65°C)

Object: N8.5 Munsell paper with a relection factor of 70%.

Pin No.	Remarks
Operating area (see note 1)	6.5 ±1 mm
Sensitivity variation (see note 2)	-1.4 mV/µm±10% max.
Resolution (see note 3)	±10 µm max. (Ta = 25°C)
Linearity (see note 4)	2% F.S. (full scale) max.

Note: 1. Distance from the mounting reference plane.

2. "Sensitivity" is defined as "inclination of divided output line" and the variation value between individual products of fluctuating divided output voltage per unit length.

$$\text{Sensitivity} = \frac{V2 - V0}{2000} \text{ (mV/µm)}$$

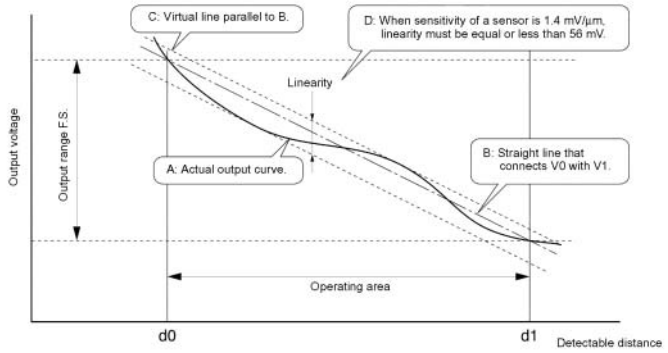
Where V0: Output voltage when d=5.5 mm
V2: Output voltage when d=7.5 mm
d: Distance from reference mounting plane to an object.

3. Value of electrical noise range of divided output signal converted to distance under the following conditions.

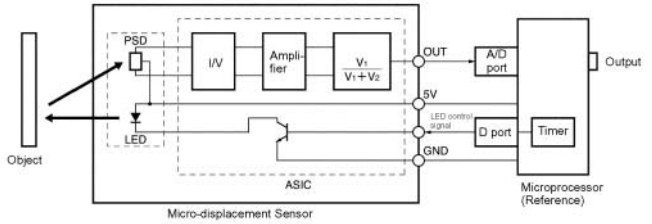
Sensor — Sample and hold circuit — Oscilloscope

(1) Ripple noise of power supply: 10 mV p-p max.
(2) Sampling time of the sample and hold circuit: 50 µsec
(3) Distance to object: Distance from the reference mounting plane is 6.5 mm±1 mm
** When the testing conditions are deviated from the above conditions, resolution changes.
For details, please consult OMRON sales representative.

4. The peak-to-peak value of the output error from the ideal line.
Calculation, based on a linearity of 2% F.S., is as follows:
(1) The conversion value based on the full scale distance: 2 mm 0.02 = 0.04 mm (40 µm)
(2) The conversion value based on the output voltage: 1.4 mV/µm 40 µm = 56 mV
(When the product sensitivity variation is 1.4 mV/µm)

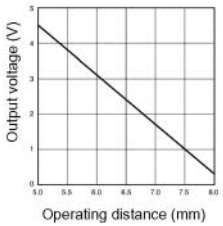


■ Circuit Diagram

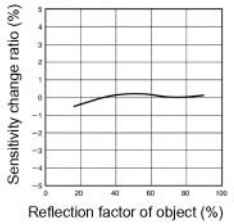


■ Engineering Data

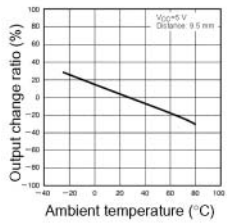
Operating Distance Characteristics (Typical)



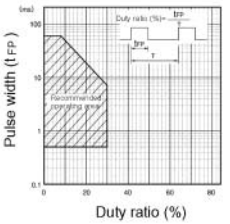
Dependency of Object on Reflection Factor (Typical)

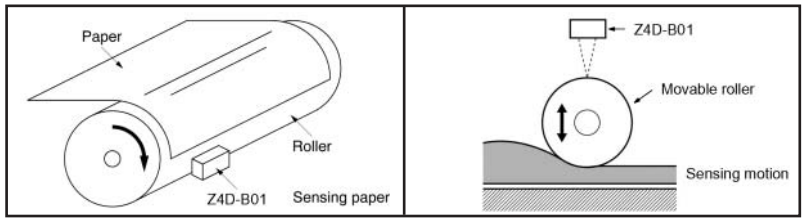


Temperature Characteristics (Typical)



Pulsed Forward Current Rated Curve





■ Features

- Simultaneously senses three objects positioned differently, thus saving space.
- Ensures higher sensitivity and external light interference resistivity than any other photomicrosensor.
- Narrow sensing range ensures stable sensing of a variety of sensing objects.
- 50mm and 80mm versions available (EY3A-308 & EY3A-351)

■ Application Examples

Sensing of paper sizes.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Output voltage		V_{OUT}	7 V
Output current		I_{OUT}	10 mA
Ambient temperature	Operating	Topr	0°C to 65°C
	Storage	Tstg	-15°C to 70°C

Note: 1. Make sure there is no icing or condensation when operating the sensor.

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

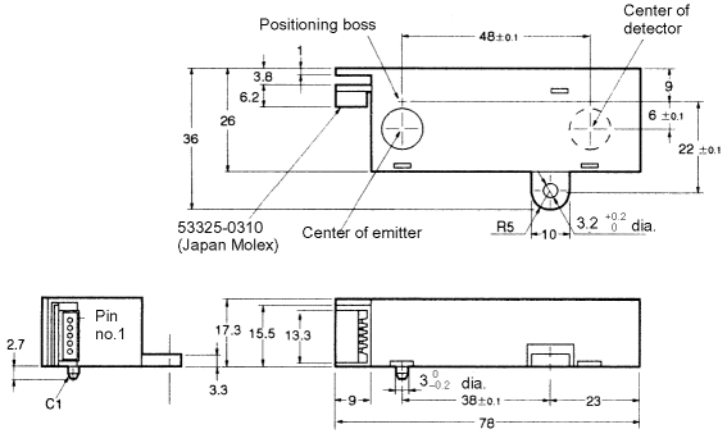
Item	Value	Condition
Power supply voltage	5 V ±5%	–
Current consumption	50 mA max.	V_{CC} = 5 V, RL = ∞
Peak spectral sensitivity wavelength	300 mA max.	V_{CC} = 5 V, RL = ∞
Low-level output voltage	0.6 V max.	V_{CC} = 5 V, IOL = 4 mA (see note 1)
High-level output voltage	3.5 V min.	V_{CC} = 5 V, RL = 4.7 kΩ (see note 2)
Response delay time (High to low)	35 ms max.	The time required for the output to become “Lo” after placing sensing object.
Response delay time (Low to high)	20 ms max.	The time required for the output to become “Hi” after removing sensing object.

Note: 1. These conditions are for the sensing of lusterless paper with an OD of 0.6 maximum located at the correct sensing position of the Sensor as shown in the optical path arrangement on page 16.

2. These conditions are for the sensing of the paper supporting plate with an OD of 0.05 located using the glass plate without paper as shown in the optical path arrangement on page 16.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Recommended Mating Connectors:

Japan Molex 51090-0500 (crimp-type connector)
52484-0510 (insulation displacement-type connector)

Pin No.	Remarks	Name
1	O1	Output 1 (OUT1)
2	O2	Output 2 (OUT2)
3	O3	Output 3 (OUT3)
4	V	Power supply (V_{CC})
5	G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

Dimensions	Tolerence
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
30 < mm ≤ 50	±0.8
50 < mm ≤ 80	±0.95

■ Characteristics (Paper Table Glass: t = 6 mm max., Transparency Rate: 90% min.) (Ta = 0°C to 65°C)

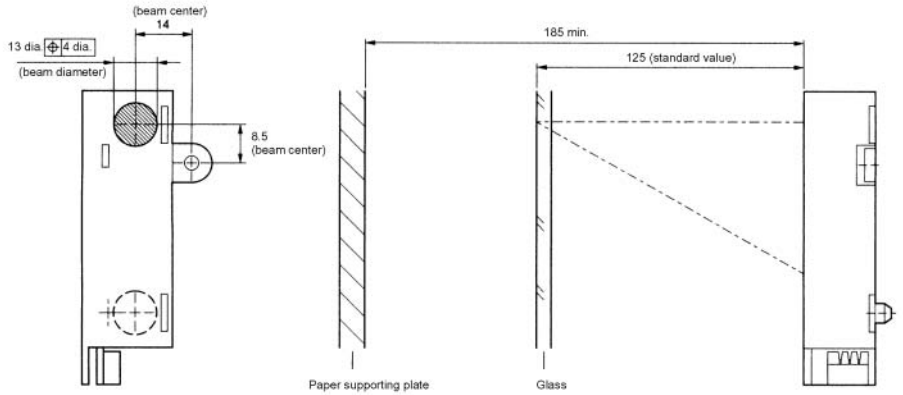
Item	Characteristic value
Sensing density	Lusterless paper with an OD of 0.6 max. (sensing distance: 125 mm) (see note)
Non-sensing distance	185 mm (from the top of the sensor), OD: 0.05
Paper sensing distance	125 mm (from the top of the sensor)
Ambient illumination	Sunlight: 3,000 ℓx max., fluorescent light: 2,000 ℓx max.

Note: 1. The data shown are initial data.
2. Optical darkness (OD) is defined by the following formula:

$$CD = -\log_{10}\left(\frac{P_{OUT}}{P_{IN}}\right)$$

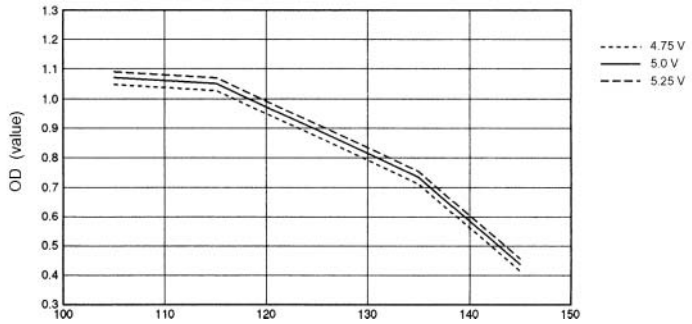
P_{IN} (mW): Light power incident upon the document
P_{OUT} (mW): Reflected light power from the document

■ Optical Path Arrangement



■ Engineering Data

Distance Characteristics (Estimated Lower-limit Value).



■ Features

- Ensures higher sensitivity and external light interference resistivity than any other photomicrosensor.
- Narrow sensing range ensures stable sensing of a variety of sensing objects.

Specifications

■ Absolute Maximum Ratings (Ta = 25°C)

Item		Symbol	Rated value
Power supply voltage		V_{CC}	7 V
Output voltage		V_{OUT}	7 V
Output current		I_{OUT}	10 mA
Ambient temperature	**Operating**	Topr	0°C to 65°C
	Storage	Tstg	-15°C to 70°C

Note: 1. Make sure there is no icing or condensation when operating the sensor.

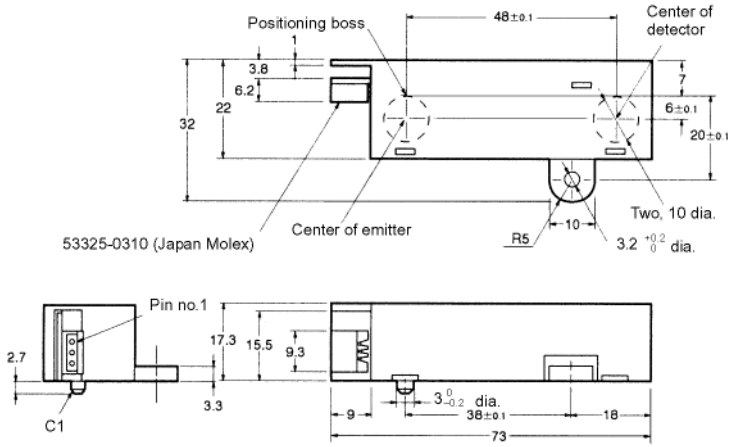
■ Electrical and Optical Characteristics (Ta = 25°C)

Item	Value	Condition
Power supply voltage	5 V ±5%	–
Current consumption	50 mA max.	V_{CC} = 5 V, RL = ∞
Peak spectral sensitivity wavelength	200 mA max.	V_{CC} = 5 V, RL = ∞
Low-level output voltage	0.6 V max.	V_{CC} = 5 V, IOL = 4 mA (see note 1)
High-level output voltage	3.5 V min.	V_{CC} = 5 V, RL = 4.7 kΩ (see note 2)
Response delay time (High to low)	35 ms max.	The time required for the output to become “Lo” after placing sensing object.
Response delay time (Low to high)	20 ms max.	The time required for the output to become “Hi” after removing sensing object.

Note: 1. These conditions are for the sensing of lusterless paper with an OD of 0.6 maximum located at the correct sensing position of the Sensor.
2. These conditions are for the sensing of the paper supporting plate with an OD of 0.05 located using the glass plate without paper.

■ Dimensions

Note: All units are in millimeters unless otherwise indicated.



Recommended Mating Connectors:

Japan Molex 51090-0300 (crimp-type connector)
52484-0310 (insulation displacement-type connector)

Pin No.	Remarks	Name
1	O	Output (OUT)
2	V	Power supply (V_{CC})
3	G	Ground (GND)

Unless otherwise specified, the tolerances are as shown below.

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
30 < mm ≤ 50	±0.8
50 < mm ≤ 80	±0.95

■ Characteristics (Paper Table Glass: t = 6 mm max., Transparency Rate: 90% min.) (Ta = 0°C to 65°C)

Item	Characteristic value
Sensing density	Lusterless paper with an OD of 0.6 max. (sensing distance: 125 mm) (see note)
Non-sensing distance	185 mm (from the top of the sensor), OD: 0.05
Paper sensing distance	125 mm (from the top of the sensor)
Ambient illumination	Sunlight: 3,000 ℓx max., fluorescent light: 2,000 ℓx max.

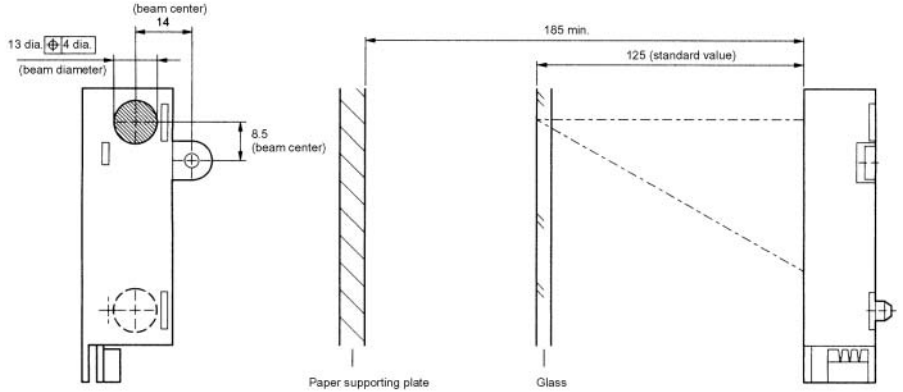
Note: 1. The data shown are initial data.

2. Optical darkness (OD) is defined by the following formula:

$$CD = -\log_{10}\left(\frac{P_{OUT}}{P_{IN}}\right)$$

P_{IN} (mW): Light power incident upon the document
P_{OUT} (mW): Reflected light power from the document

■ Optical Path Arrangement



■ Engineering Data

Distance Characteristics (Estimated Lower-limit Value).