

## EE-SB5M/SB5MC/SB5V/SB5VC/SB5V-E

Photomicrosensor with 80-mA  
Switching Capacity that can be Built into  
Equipment

- Built-in amplifier with NPN output
- Models available with 5- to 12-VDC and 5- to 15-VDC input
- CMOS- and TTL-compatible
- 19-mm sensing distance (EE-SB5V-E)
- Model with easy adjustment with an external sensitivity adjuster (EE-SB5V)
- Connectors available (EE-1001/1006)
- Convert to PNP output with EE-2002 conversion connector



## Ordering Information

| Appearance                                                                          | Sensing method | Sensing distance | Output configuration | Weight        | Part number |
|-------------------------------------------------------------------------------------|----------------|------------------|----------------------|---------------|-------------|
|  | Diffuse        | 5 mm             | Light-ON             | Approx. 3.0 g | EE-SB5M     |
|                                                                                     |                |                  | Dark-ON              |               | EE-SB5MC    |
|                                                                                     |                |                  | Light-ON             |               | EE-SB5V     |
|                                                                                     |                |                  | Dark-ON              |               | EE-SB5VC    |
|                                                                                     |                | 19 mm            | Light-ON             | Approx. 2.8 g | EE-SB5V-E   |
|                                                                                     |                |                  |                      |               |             |

## ■ ACCESSORIES

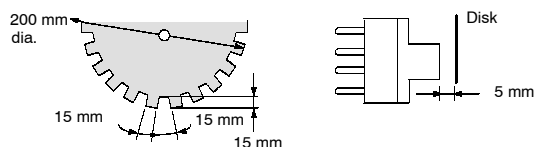
| Name                     | Part number |
|--------------------------|-------------|
| Solder connector         | EE-1001     |
| Connector with 2 m cable | EE-1006     |

# Specifications

## RATINGS

| Item                                             |                                                     | Diffuse                                                                                                                                                                                    |          |                                                 |          |
|--------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------|----------|
|                                                  |                                                     | EE-SB5M                                                                                                                                                                                    | EE-SB5MC | EE-SB5V(-E)                                     | EE-SB5VC |
| Supply voltage                                   |                                                     | 5 to 12 VDC ±10%, ripple (p-p): 10% max.                                                                                                                                                   |          | 5 to 15 VDC ±10%, ripple (p-p): 10% max.        |          |
| Current consumption                              |                                                     | 36 mA max.                                                                                                                                                                                 |          | 48 mA max. (DC current: I <sub>F</sub> = 25 mA) |          |
| Maximum forward direct current (I <sub>F</sub> ) |                                                     | —                                                                                                                                                                                          |          | 30 mA max.                                      |          |
| Forward voltage (V <sub>F</sub> )                |                                                     | —                                                                                                                                                                                          |          | 1.5 V max. (I <sub>F</sub> = 30 mA)             |          |
| Reverse voltage (V <sub>R</sub> )                |                                                     | —                                                                                                                                                                                          |          | 4 V max.                                        |          |
| Standard reference object                        |                                                     | White paper with reflection factor of 90% (standard sensing object: 15 x 15 mm)                                                                                                            |          |                                                 |          |
| Differential distance                            |                                                     | 0.1 mm                                                                                                                                                                                     |          |                                                 |          |
| Control output                                   |                                                     | At 5 to 24 VDC: 80-mA load current (I <sub>C</sub> ) with a residual voltage of 0.8 V max.<br>When driving TTL: 40-mA load current (I <sub>C</sub> ) with a residual voltage of 0.4 V max. |          |                                                 |          |
| Output configuration                             | Transistor on output stage without detecting object | OFF                                                                                                                                                                                        | ON       | OFF                                             | ON       |
|                                                  | Transistor on output stage with detecting object    | ON                                                                                                                                                                                         | OFF      | ON                                              | OFF      |
| Response frequency (See note)                    |                                                     | 50 Hz                                                                                                                                                                                      |          |                                                 |          |
| Connecting method                                |                                                     | EE-1001/1006 Connectors; soldering terminals/cordset                                                                                                                                       |          |                                                 |          |
| Light source                                     |                                                     | GaAs infrared LED with a peak wavelength of 940 nm                                                                                                                                         |          |                                                 |          |
| Receiver                                         |                                                     | Si photo-transistor with a sensing wavelength of 850 nm max.                                                                                                                               |          |                                                 |          |

Note: The response frequency was measured by detecting the following disks rotating.



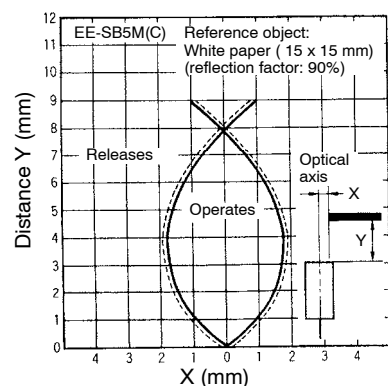
## CHARACTERISTICS

|                           |           |                                                                                                                                                                             |
|---------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ambient temperature       | Operating | -25°C to 55°C (-13°F to 131°F)                                                                                                                                              |
|                           | Storage   | -30°C to 80°C (-22°F to 176°F)                                                                                                                                              |
| Ambient humidity          | Operating | 45% to 85%                                                                                                                                                                  |
|                           | Storage   | 35% to 95%                                                                                                                                                                  |
| Vibration resistance      |           | Destruction: 20 to 2,000 Hz (with a peak acceleration of 20G's), 1.5-mm double amplitude for 4 min each in X, Y, and Z directions                                           |
| Shock resistance          |           | Destruction: 500 m/s <sup>2</sup> for 3 times each in X, Y, and Z directions                                                                                                |
| Soldering heat resistance |           | 260 $\pm$ 5°C (See Note.) when the portion between the tip of the terminals and the position 1.5 mm from the terminal base is dipped into the solder for 10 $\pm$ 1 seconds |

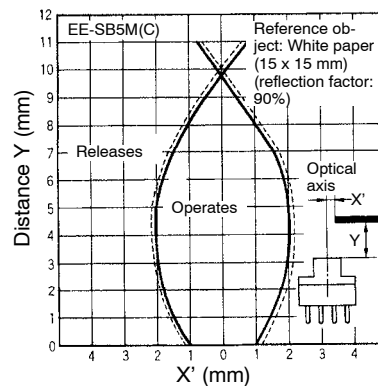
Note: This conforms to MIL-STD-750-2031-1.

# Engineering Data

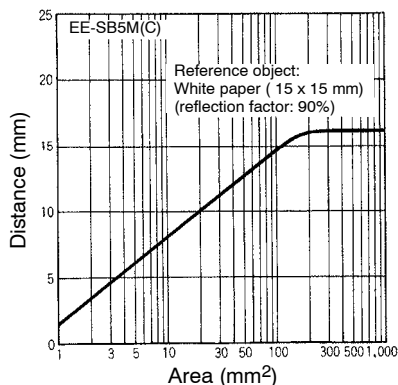
## ■ OPERATING RANGE (TYPICAL 1)



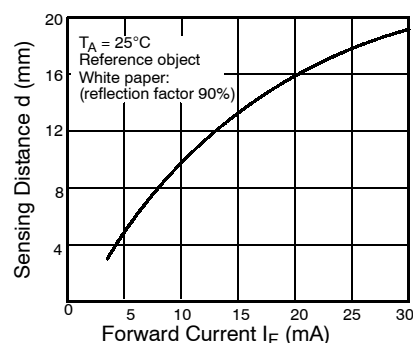
## ■ OPERATING RANGE (TYPICAL 2)



## ■ SENSING DISTANCE VS. OBJECT AREA (TYPICAL)



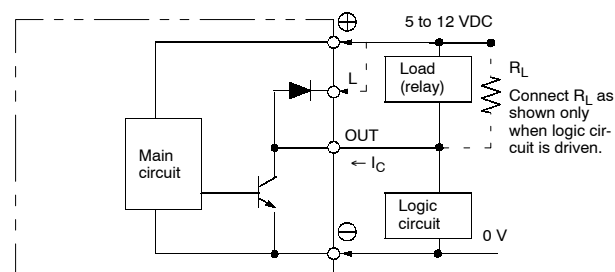
## ■ SENSING DISTANCE VS. $I_F$ EE-SB5V-E (TYPICAL)



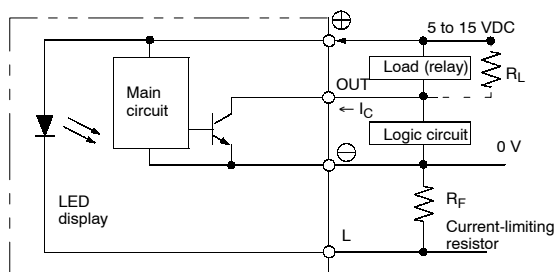
# Operation

## ■ INTERNAL/EXTERNAL CIRCUIT DIAGRAMS

### EE-SB5M(C) Light-ON/Dark-ON

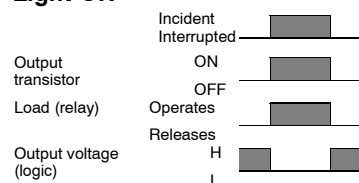


### EE-SB5V(C), EE-SB5V-E Light-ON/Dark-ON

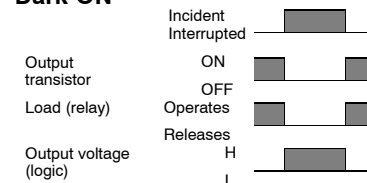


## ■ TIMING CHART

### Light-ON



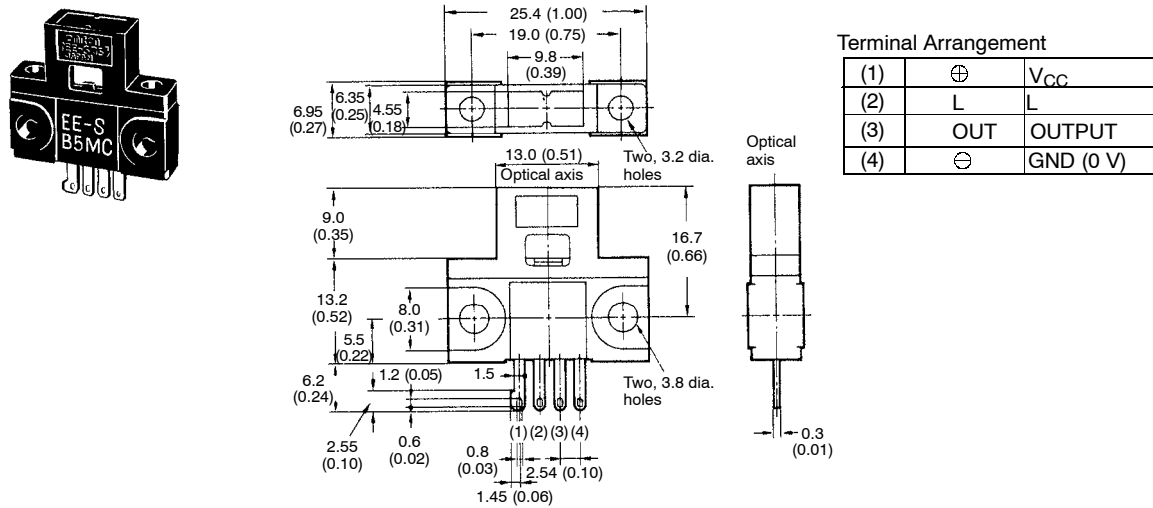
### Dark-ON



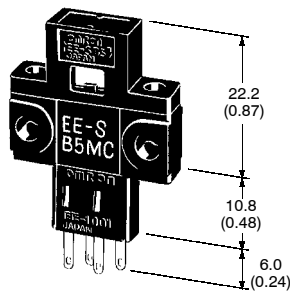
# Dimensions

Unit: mm (inch)

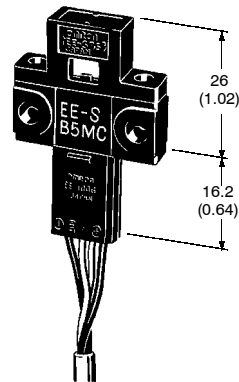
## EE-SB5M(C), EE-SB5V(C), EE-SB5V-E



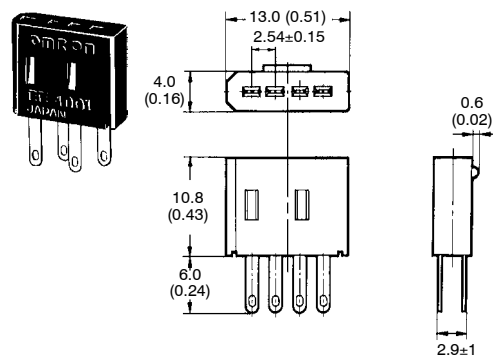
## EE-SB5M(C)/SB5V(C)/SB5V-E + EE-1001



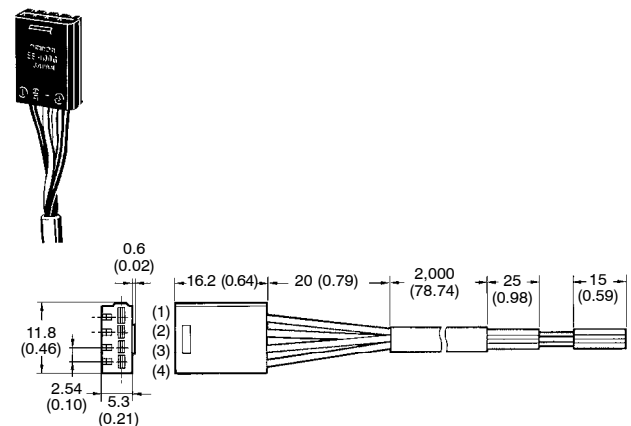
## EE-SB5M(C)/SB5V(C)/SB5V + EE-1006



## EE-1001 SOLDER CONNECTOR



## EE-1006 CONNECTOR WITH CABLE

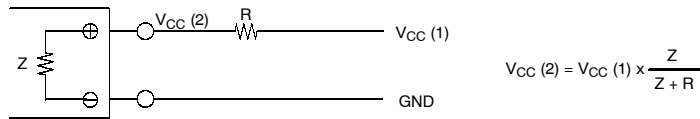


### Terminal Arrangement

|     |               |     |                 |
|-----|---------------|-----|-----------------|
| (1) | Red (Brown)   | ⊕   | V <sub>CC</sub> |
| (2) | Yellow (Pink) | L   | L               |
| (3) | White (Black) | OUT | OUTPUT          |
| (4) | Black (Blue)  | ⊖   | GND (0 V)       |

IEC colors are shown in parentheses.

Note: Supply 5 to 12 V to the EE-SB5M(C). Wire as shown by the following diagram if the supply voltage exceeds 12 V.



Note: Z is the internal impedance between the positive and negative terminals.

| Model      | $V_{CC}(2)$ | Z ( $\Omega$ ) |
|------------|-------------|----------------|
| EE-SB5M(C) | 5 to 12 V   | 360            |

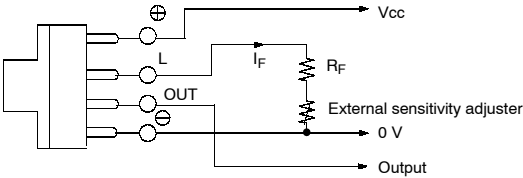
## Precautions

Refer to the Technical Information Section for general precautions.

An external sensitivity adjuster can be connected to the EE-SB5V(C), EE-SB5V-E Photomicrosensor. When connecting the sensitivity adjuster, insert resistor  $R_F$  (current-limiting resistor), as shown by the diagram. The value of  $R_F$  is obtainable as follows:

$$R_F > (V_{CC} - 1.5 \text{ V}) / 30 \text{ mA}$$

Note: The EE-SB5V(C) and EE-SB5V-E have no constant current circuit to protect the LED. For this reason, the LED will be damaged by excessive current applied to the positive terminal. To prevent potential LED damage, connect a current-limiting resistor, as shown previously.



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

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