EE-SB5/SB5-B

Sensor Housing with Mounting Tabs Assures Secure Installation

- Excellent output characteristics
- Designed to effectively reduce influence of external light interference
- Models with soldering terminals (EE-SB5) or PCB terminals (EE-SB5-B)

Ordering Information

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Sensing method</th>
<th>Sensing distance</th>
<th>Sensing object</th>
<th>Output configuration</th>
<th>Weight</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soldering terminals</td>
<td>Reflective</td>
<td>5 mm</td>
<td>White paper with reflection factor of 90%</td>
<td>Phototransistor</td>
<td>Approx. 1.0 g</td>
<td>EE-SB5</td>
</tr>
<tr>
<td>PCB terminals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EE-SB5-B</td>
</tr>
</tbody>
</table>

Specifications

- **ABSOLUTE MAXIMUM RATINGS (T_A = 25°C (77°F))**

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Rated value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward current</td>
<td>I_F</td>
<td>50 mA*</td>
</tr>
<tr>
<td>Pulse forward current</td>
<td>I_FP</td>
<td>1 A**</td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>V_R</td>
<td>4 V</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>V_CEO</td>
<td>30 V</td>
</tr>
<tr>
<td>Emitter-collector voltage</td>
<td>V_ECO</td>
<td>5 V</td>
</tr>
<tr>
<td>Collector current</td>
<td>I_C</td>
<td>20 mA</td>
</tr>
<tr>
<td>Collector dissipation</td>
<td>P_C</td>
<td>100 mW**</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>Topr</td>
<td>-25°C to 80°C** (-13°F to 176°F)</td>
</tr>
<tr>
<td>Storage</td>
<td>Tstg</td>
<td>-30°C to 80°C (-22°F to 176°F)</td>
</tr>
</tbody>
</table>

*Refer to Engineering Data if the ambient temperature is not within the normal room temperature range.

**This value was measured with a pulse width of 10 μs and a repeating frequency of 100 Hz.
### CHARACTERISTICS (T_A = 25°C (77°F))

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Value</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward voltage</td>
<td>V_F</td>
<td>1.5 V max.</td>
<td>I_F = 30 mA</td>
</tr>
<tr>
<td>Reverse current</td>
<td>I_R</td>
<td>10 μA max.</td>
<td>V_D = 4 V</td>
</tr>
<tr>
<td>Peak emission wavelength</td>
<td>λ_p(L)</td>
<td>940 nm typ.</td>
<td>I_F = 20 mA</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dark current</td>
<td>I_D</td>
<td>200 nA max.</td>
<td>V_CE = 10 V, 0Ω</td>
</tr>
<tr>
<td>Peak spectral sensitivity</td>
<td>λ_p(P)</td>
<td>850 nm typ.</td>
<td>V_CE = 10 V</td>
</tr>
<tr>
<td>wavelength</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light current</td>
<td>I_L</td>
<td>200 to 2,000 μA</td>
<td>I_F = 20 mA**, V_CE = 10 V</td>
</tr>
<tr>
<td>Leakage current</td>
<td>I_LEAK</td>
<td>2 μA max.</td>
<td>I_F = 20 mA**, V_CE = 10 V</td>
</tr>
<tr>
<td>Rising time***</td>
<td>t_r</td>
<td>30 μs typ.</td>
<td>V_CC = 5 V, R_L = 1 kΩ</td>
</tr>
<tr>
<td>Falling time***</td>
<td>t_f</td>
<td>30 μs typ.</td>
<td>I_L = 1 mA</td>
</tr>
</tbody>
</table>

*The sensing object is white paper with a reflection factor of 90% at a sensing distance of 5 mm.
**The sensing object reflects no light.
***The following illustrations show the rising time, t_r, and the falling time, t_f.

### Engineering Data

Note: The operating conditions of the photomicrosensor must be within the absolute maximum rating ranges.

#### TEMPERATURE CHARACTERISTICS

![Temperature Characteristics Graph]

- **Forward current (I_F)** vs. **Ambient temperature (T_A)**
- **Collector dissipation (P_C)** vs. **Ambient temperature (T_A)**

#### INPUT CHARACTERISTICS (TYPICAL)

![Input Characteristics Graph]

- **Forward current (I_F)** vs. **Forward voltage (V_F)**
- **Forward voltage (V_F)** vs. **Forward current (I_F)**
- **T_A = -30°C, -25°C, 25°C, 70°C**
**INPUT/OUTPUT CHARACTERISTICS (TYPICAL)**

- Light current $I_L$ (mA) vs. Forward current $I_F$ (mA)
- $T_A = 25 \degree C$
- $V_{CC} = 10 \text{V}$
- Sensing object: White paper (reflection factor 90%)
- Distance: 5 mm

**OUTPUT CHARACTERISTICS (TYPICAL)**

- Light current $I_L$ (mA) vs. Collector-emitter voltage $V_{CE}$ (V)
- $T_A = 25 \degree C$
- Distance: 5 mm
- Sensing object: White paper (reflection factor 90%)
- $I_C = 40 \text{mA}$
- $I_C = 30 \text{mA}$
- $I_C = 20 \text{mA}$
- $I_C = 15 \text{mA}$
- $I_C = 10 \text{mA}$

**DARK CURRENT TEMPERATURE DEPENDENCY (TYPICAL)**

- Dark current $I_D$ (mA) vs. Ambient temperature $T_A$ (°C)
- $T_A = 25 \degree C$, $V_{CE} = 10 \text{V}$
- Sensing object: White paper (reflection factor 90%)
- Distance: 5 mm

**LIGHT CURRENT TEMPERATURE DEPENDENCY (TYPICAL)**

- Light current $I_L$ (mA) vs. Ambient temperature $T_A$ (°C)
- $V_{CE} = 10 \text{V}$

**SWITCHING CHARACTERISTICS (TYPICAL)**

- Switching resistance $R_s$ (Ω) vs. Forward current $I_F$ (mA)
- $T_A = 25 \degree C$
- $V_{CC} = 10 \text{V}$
- $R_s = 1 \text{k} \Omega$
- $R_s = 500 \text{Ω}$
- $R_s = 100 \text{Ω}$

**SENSING DISTANCE CHARACTERISTICS (TYPICAL)**

- Light current $I_L$ (μA) vs. Distance $d$ (mm)
- $T_A = 25 \degree C$
- $I_C = 20 \text{mA}$
- $V_{CE} = 10 \text{V}$
- Sensing object: White paper (reflection factor 90%)
- (a) to (d) different sensing areas

The $I_F$ and $I_L$ are almost the same in length.
### Sensing Distance Characteristics (Typical 2)

- **a:** Aluminum foil, glossy aluminum plate, glossy stainless steel plate with nickel plating
- **b:** White paper with a reflection factor of 0.0%
- **c:** Straw paper, pink paper, yellow paper, tracing paper
- **d:** Gray paper or black paper with a reflection distance of 18 mm
- **e:** Glass and OHP sheet with a transparency factor of 1.0 and glossy black Bakelite
- **f:** Matte black Bakelite, black copy toner
- **g:** Black sponge

### Dimensions

Unit: mm (inch)

#### EE-SB5 (Soldering Terminals)

![Diagram of EE-SB5 Soldering Terminals]

- **Internal Circuit (All Models):**
  - **A:** Anode
  - **K:** Cathode
  - **C:** Collector
  - **E:** Emitter

![Internal Circuit Diagram]

(Bottom view)
Precautions

Refer to the Technical Information section for general precautions.

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