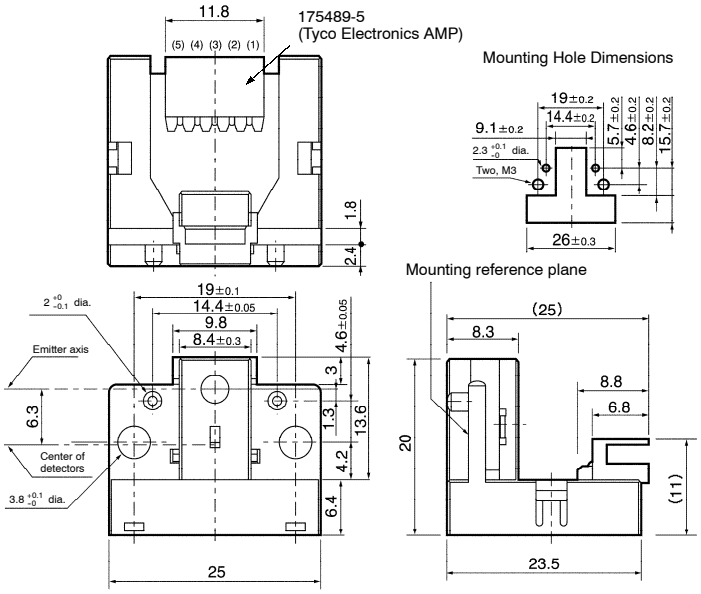
OMRON

# Z4D-A01

# Micro-displacement Sensor

## ■ Dimensions

**Note:** All units are in millimeters unless otherwise indicated.




## ■ Features

- Uses position sensing diode/LED to detect 10 μm movement.
- Sensor output minimally affected by color and reflection of an object.
- Requires 5 VDC to give two analog outputs to the microprocessor with a 10-bit A/D converter.

| Pin no. | Remarks | Name |
|---|---|---|
| 1 | $V_{CC}$ | Power supply ($V_{CC}$) |
| 2 | O1 | Output (OUT1) |
| 3 | G | Ground (GND) |
| 4 | O2 | Output (OUT2) |
| 5 | $V_B$ | LED emission control signal |

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 |

Recommended Mating Connectors:
Tyco Electronics AMP
175778-5 (crimp-type connector)
179228-5 (crimp-type connector)
173977-5 (press-fit connector)

## ■ Ordering Information

| Description | Part number |
|---|---|
| **Micro-displacement sensor** | **Z4D-A01** |

## ■ Absolute Maximum Ratings (Ta = 25°C)

| Item | Symbol | Value | Unit | Remarks |
|---|---|---|---|---|
| **Supply voltage** | $V_{CC}$ | 7 | VDC | --- |
| **LED emission control signal** | $V_B$ | 7 | VDC | Supply voltage for transistor base terminal |
| **LED emission pulse** | $t_{FP}$ | 100 | ms | Duty cycle: 1% max. |
| **Operating temperature** | $T_{opr}$ | –10 to 55 | °C | (see note) |
| **Storage temperature** | $T_{stg}$ | –25 to 65 | °C | --- |

**Note:** The product must be used in applications where neither freezing nor condensation takes place.

## ■ Electrical and Optical Characteristics (Ta = –10°C to 55°C)

| Item | Limits | Remarks |
|---|---|---|
| **Supply voltage** | 5 VDC±10% | Ripple (p-p): 10 mV p-p max. |
| **Consumption current** | 200 mA max.<br>5 mA max. | When LED is ON<br>When LED is OFF |
| **$V_1$, $V_2$** | 3.9 V max. | Common to two signals (see notes 1 and 2) |
| **Response time** | 100 μs max. | PSD rising time |

**Note:** 1. When the measured surface of an object is a diffused surface (rough surface)

2. Please make impedance of signal input side a minimum of 10 kΩ.

## ■ Characteristics (Ta = −10°C to 55°C)

| Item | Values (see note 2) | Remarks |
|---|---|---|
| **Operating distance** | 6.5±1 mm | From the reference mounting surface |
| **Variation of sensitivity** | ±10% | (see note 3) |
| **Resolution** | ±10 μm | (see note 4) |
| **Operable ambient illumination** | 3,000 ℓx max.<br>2,000 ℓx max. | Under sunlight<br>Under fluorescent lamp |

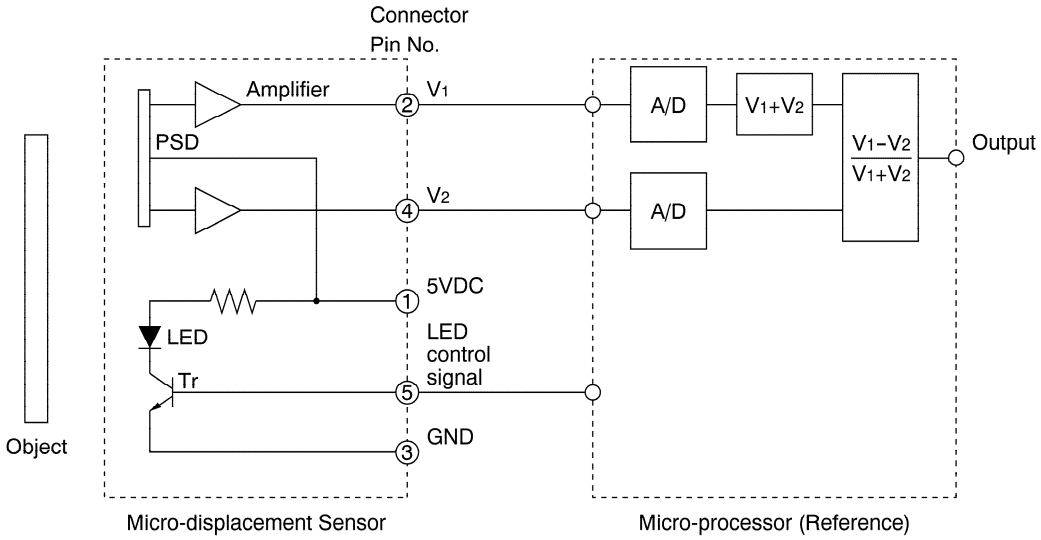
**Note:** 1. As measured between sensor and microprocessor.

2. The values are measured with a white paper having a 90% reflection factor.

3. Defined as the variation of sensitivity between products. The variation is the change of the calculated analog output by distance (slope of the straight output line.) Refer to “Microprocessor Divided Output vs. Distance” graph in Engineering Data.

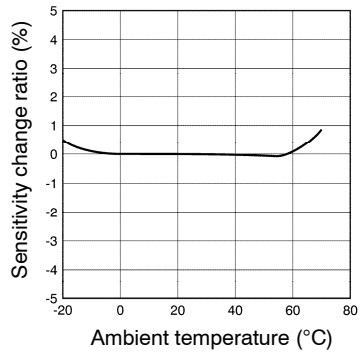
4. The resolution means the electrical noise width on the calculated analog output converted into distance when using a 10-bit or more A/D converter.

## ■ Circuit Diagram

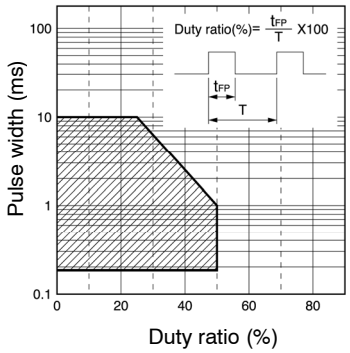


## ■ Engineering Data

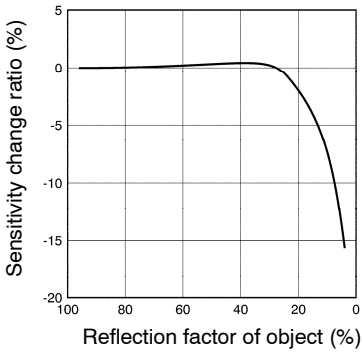
### Temperature Characteristics (Typical)



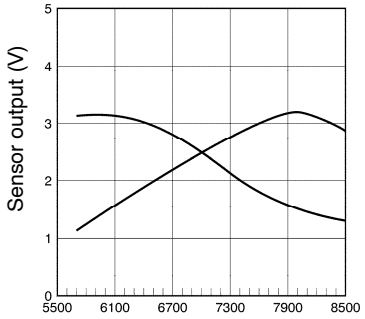

### Pulsed Forward Current Rated Curve



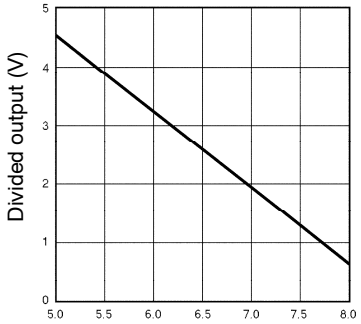

### Dependency of Object on Reflection Factor (Typical)




### Z4D-A01 Sensor Output vs. Distance (Typical)

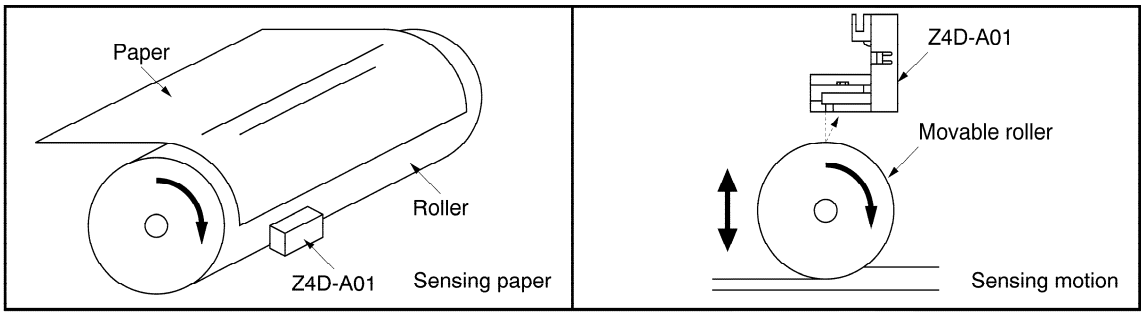



### Microprocessor Divided Output vs. Distance (Typical)



## ■ Typical Application

**Paper thickness detection for printers**

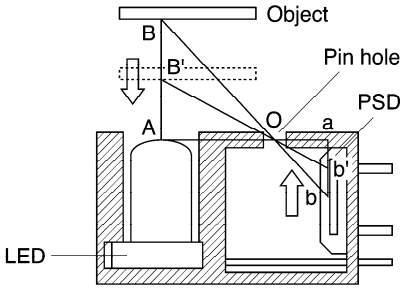



## ■ Technical Information

This product, developed for use in electronic equipment, is an optical displacement sensor that uses a position-sensitive detector (PSD). The following features are characteristic of the optical displacement sensor when directly connected to a microprocessor provided by the user.

1. The color or the reflection factor of a sensing object has little effect on the analog output.
2. The inclined face of a sensing object has little effect on the analog output.
3. Linear compensation is not required

**Internal Configuration**




$\triangle ABO \backsim \triangle abO$

$\frac{\overline{BB'}}{\overline{bb'}} = constant$

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

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