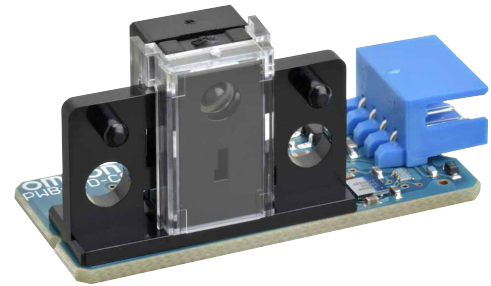


# Microphotonic Devices (Micro-displacement Sensor)

## Z4D-C01

### Micro-displacement Sensor

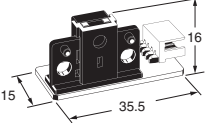
- Enable to detect  $\pm 10 \mu\text{m}$  level displacement, applicable to detect duplicated paper feeding or deflection amount.
- Displacement output changes by object colors are stabilized with signal divider circuit.
- Operating area =  $6.5 \pm 1 \text{ mm}$ .



**⚠ Be sure to read *Safety Precautions* on page 3.**

### Ordering Information

#### Micro-displacement Sensor

Appearance	Sensing method	Connecting method	Sensing distance	Output type	Model
	Triangulation	Connector	$6.5 \pm 1 \text{ mm}$	Analog output	Z4D-C01

### Ratings, Characteristics and Exterior Specifications

#### Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Item	Symbol	Rated value	Unit	Remarks
Supply voltage	$V_{CC}$	7	V	---
LED pulse light emission control signal	PLS	7	V	LED
LED light emission pulse	$t_{FP}$	100	ms	Please refer Pulsed Forward Current Rated Curve
Operating temperature	$T_{opr}$	-10 to +65	$^\circ\text{C}$	No freezing or condensation
Storage temperature	$T_{stg}$	-25 to +80	$^\circ\text{C}$	---

**Note:** Refer to Pulsed Forward Current Rated Curve.

#### Characteristics ( $T_a = 25^\circ\text{C}$ )

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

Item	Value
Operating area *1	$6.5 \pm 1 \text{ mm}$
Sensitivity variation *2	$-1.4 \text{ mV}/\mu\text{m} \pm 10\% \text{ max.}$
Resolution *3	$\pm 10 \mu\text{m} \text{ max.}$
Linearity *4	2% F.S. (full scale) max.

\*1. Distance from Mounting Reference Plane to Target.

\*2. The sensitivity is defined as slope of the line and it represents the variation in the output voltage per unit length between different products.

$$\text{Sensitivity variation} = \frac{V_1 - V_0}{2000} \quad (\text{mV}/\mu\text{m})$$

$V_0$ : Output voltage at the point  $d_0$   
 $V_1$ : Output voltage at the point  $d_1$   
 $d_0, d_1$ : Distance between datum clamp face and detective object

$d_0$	5.5 mm
$d_1$	7.5 mm

\*3. This is the value of the electrical noise width in the output signal converted to a distance under the following conditions.

- (1) Noise width is measured in a waveform after the four times average with an oscilloscope.
- (2) Ripple noise in the power supply voltage ( $V_{CC}$ ): 10 mVp-p max.
- (3) Distance from mounting reference plane to target: 6.5 mm
- (4) Resolution is measured by the voltage of response delay time ( $t_{r2}$ ).

\*4. This is the peak-to-peak value of the deviation of the signal output from a straight line.

A linearity of 2% F.S. indicates the following value:

- (1) Distance full-scale converted value:  $2 \text{ mm} \times 0.02 = 0.04 \text{ mm}$  (40  $\mu\text{m}$ )
- (2) Output voltage converted value:  $1.4 \text{ mV}/\mu\text{m} \times 40 \mu\text{m} = 56 \text{ mV}$  (for a sensor with a sensitivity of  $1.4 \text{ mV}/\mu\text{m}$ )

#### Exterior Specification

Connecting method	Weight (g)	Material		
		Case	Cover	Lens
Connector	3.6	Polycarbonate	Polycarbonate	PMMA

#### Electrical and Optical Characteristics ( $T_a = -10^\circ\text{C}$ to $65^\circ\text{C}$ )

Item	Symbol	Rated value	Remarks
Power supply voltage	$V_{CC}$	5 V $\pm 10\%$	Ripple (p-p): 10 mV p-p max.
Output voltage	OUT	0.2 V to ( $V_{CC} - 0.3$ ) V	*1
Response delay time	$t_{r1}$	100 $\mu\text{s}$ max.	*2
	$t_{r2}$	500 $\mu\text{s}$ max.	*3
LED pulse light emission control signal voltage	PLS	3.5 V to $V_{CC}$	---

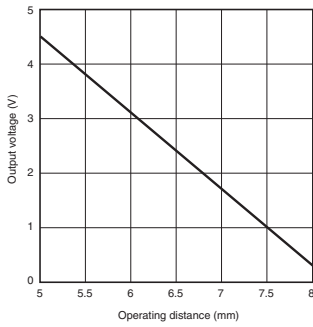
\*1. Load impedance (between OUT-GND) is set at more than 10 k $\Omega$ .

\*2.  $t_{r1}$ : Rise time of output voltage from 10% to 90%.

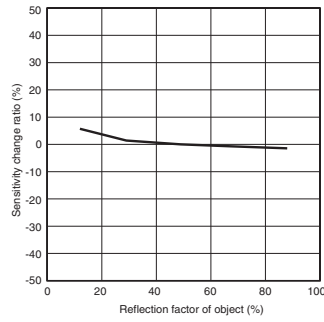
\*3.  $t_{r2}$ : Setup time from PLS rising edge to measured output value rising edge.

## Engineering Data (Reference value)

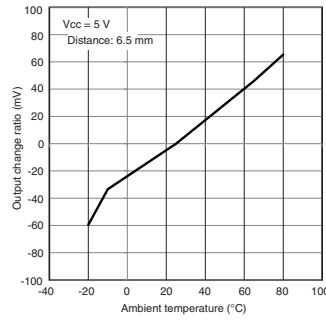
**Fig 1. Operating Distance Characteristics (Typical)**



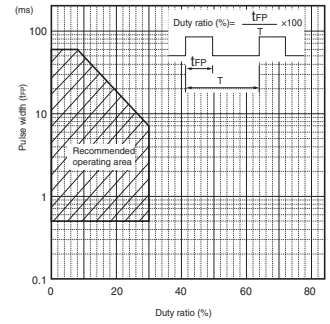
**Fig 2. Dependency of Object on Reflection Factor (Typical)**



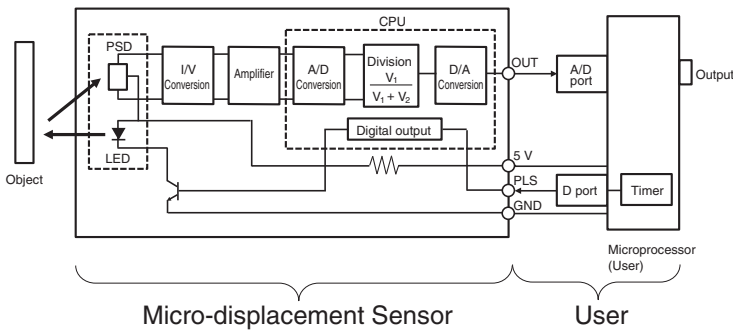
**Fig 3. Temperature Characteristics (Typical)**



**Fig 4. Pulsed Forward Current Rated Curve**



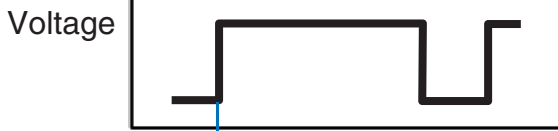
## Circuit diagram/Connection diagram



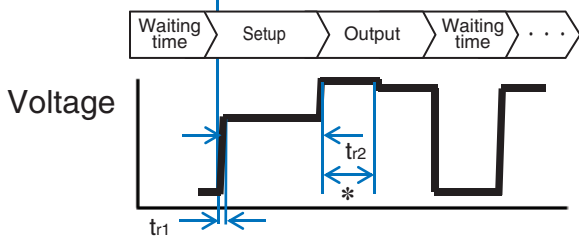
- Output voltage signal is obtained by applying the pulse signal at PLS terminal. Please be careful, it is not obtained by DC voltage applying.

## Pulse Input and Sensor Output

<Pulse Input>



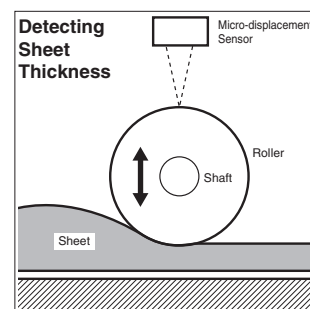
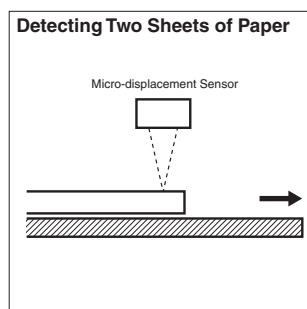
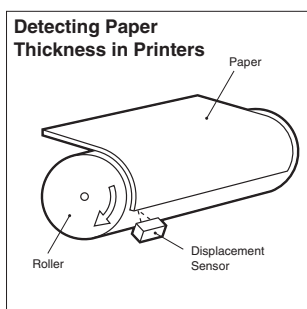
<Sensor Output>



- Output voltage depends on input. After setup time  $t_{r2}$ , output signal is obtained according to the distance.
- After setup, output signal is updated every 80 micro seconds.

\* Update every 80 micro seconds. Output signal is reset at pulse input signal falling low level, and start setup over again after next input signal applying.

## Application Examples



## Safety Precautions

To ensure safe operation, be sure to read and follow the Instruction Manual provided with the Sensor.

### CAUTION

This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purposes.



### Precautions for Safe Use

**Do not use the product with a voltage or current that exceeds the rated range.**

Applying a voltage or current that is higher than the rated range may result in explosion or fire.

**Do not miswire such as the polarity of the power supply voltage.**

Otherwise the product may be damaged or it may burn.

**This product does not resist water. Do not use the product in places where water or oil may be sprayed onto the product.**

### Precautions for Correct Use

**Do not use the product in atmospheres or environments that exceed product ratings. This product is for surface mounting. Refer to Soldering Information, Storage and Baking for details.**

**Dispose of this product as industrial waste. Because the resolution of this sensor is very small, output error may occur due to noise from the power supply.**

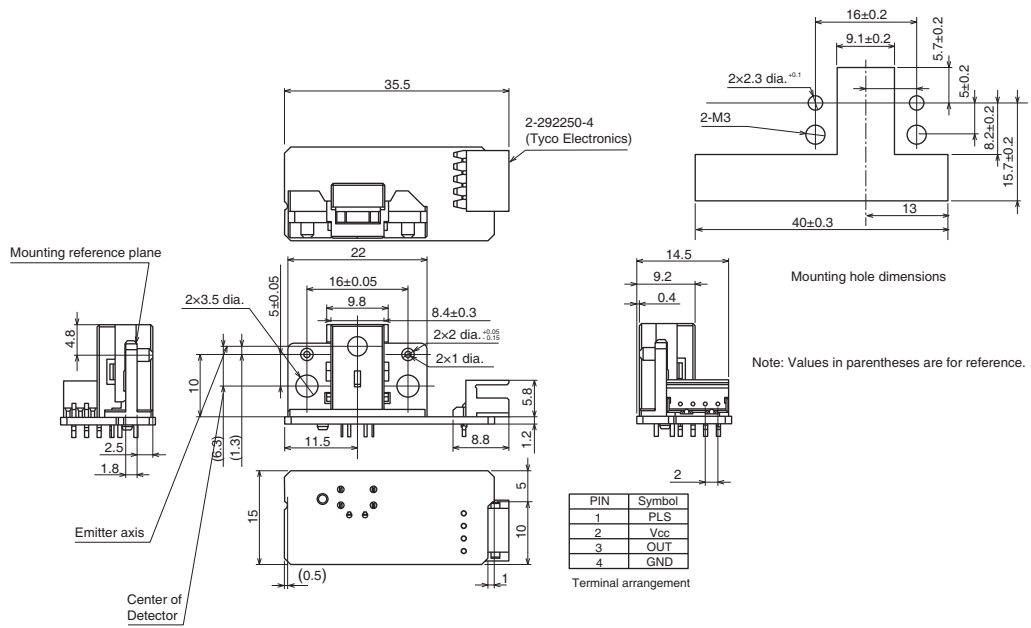
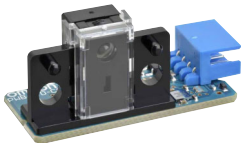
**The ripple noise of the power supply should be 10mVp-P or less. Add averaging and filters as needed to reduce the effects of noise.**

## Dimensions

(Unit: mm)

### Micro-displacement Sensor

Z4D-C01



PIN	Symbol
1	PLS
2	Vcc
3	OUT
4	GND

Recommended Mating Connectors: Tyco Electronics 179228-4 (crimp-type connector)  
173977-4 (insulation displacement crimp connector)

Please check each region's Terms & Conditions by region website.

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