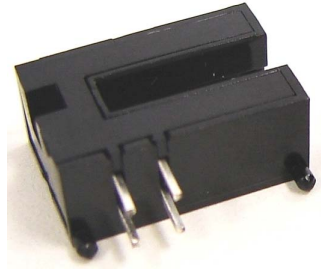


# AEDS-9300

## Transmissive Photointerrupter



### Data Sheet



#### Description

The photointerrupter consists of a Gallium Arsenide infrared light emitting diode and a NPN silicon phototransistor built in a black plastic housing. It is a transmissive subminiature photointerrupter.

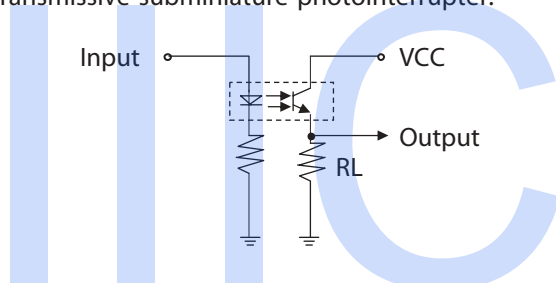


Figure 1: Illustrates Basic Configuration of Photointerrupter

#### Features

- Non-Contact Sensing
- Infra-Red Wavelength
- Fast Switching Speed
- Mounting Guide Pins
- RoHS Compliant
- -25 °C to +85 °C Operating Temp.

#### Applications

- Optical Switch
- ATM Machines
- Vending Machines
- Edge, Position Detections
- Office Automation Equipments

## Theory of Operation

The photo-interrupter consists of an Infrared light source and a photo-diode in a single Dual-in-Line package. The photo-interrupter could be mounted onto a PC board with a current-limiting resistor in series externally with the Infrared Emitting Diode. With this, such input voltage for the emitting diode could share the same voltage level as VCC.

Regarding the photo-interrupter output, there will always be current output measured but with the external resistor, RL connected as shown in Figure1, analog voltage output could then be obtained.

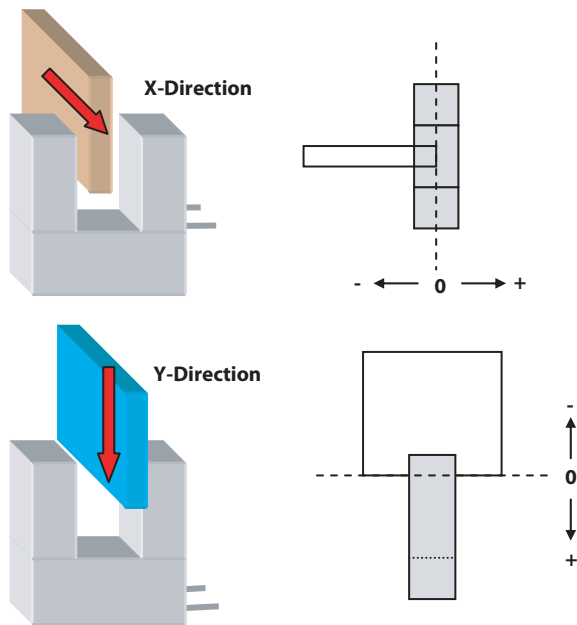
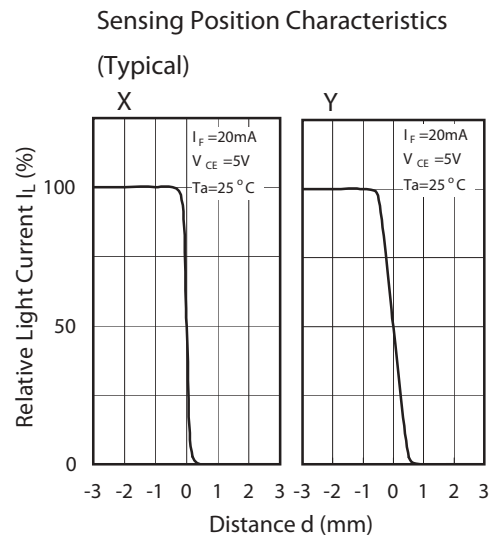


Figure 2: Illustrates Photo-Interrupter Positioning Sensing Characteristics. Obstacles (Slots) could interrupt along X-axis or Y-axis

With both the infrared light source and the photo diode in a single package, the photo-interrupter employs transmissive technology to sense obstacles existence, acts as on / off switchers or even to sense low-resolution rotary or linear motions. The photo-interrupter is specified for operation over  $-25^\circ\text{C}$  to  $+85^\circ\text{C}$  temperature range.

As a basic switcher, the photo-interrupter would have a position detecting characteristics as shown in Figure 2. These characteristic diagrams give the relationship between Relative Light Current,  $I_L$  and Distance of displacement,  $d$ . Note that the slot (obstacle) introduced in between the emitting diode and the photo-diode could applied in two directions. One is of X-axis and another would be of Y-axis.

Therefore, with the presence of slot, the photo-interrupter would actually give a low logic output. Vice versa, the photo-interrupter will provide a high logic output without the existence of the slot. Refer to Figure 3. Typically, Rise Time,  $t_r$  and Fall Time  $t_f$  will have the same value,  $15\mu\text{s}$ .

With special design of the slots, periodic presence and absence could be generated. Such output signal is useful in determining low-resolution ( $>0.5\text{mm}$  pitch) motor rotation positioning and motor spinning speed.

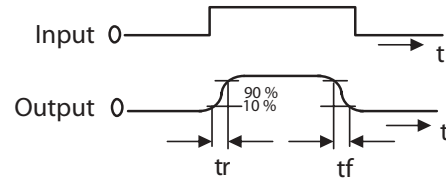


Figure 3: Response Time Measurement of Output Signal.

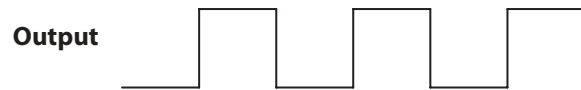


Figure 4: Periodical Output signal could be used to determine the Motor Spinning Speed and Rotation positioning.

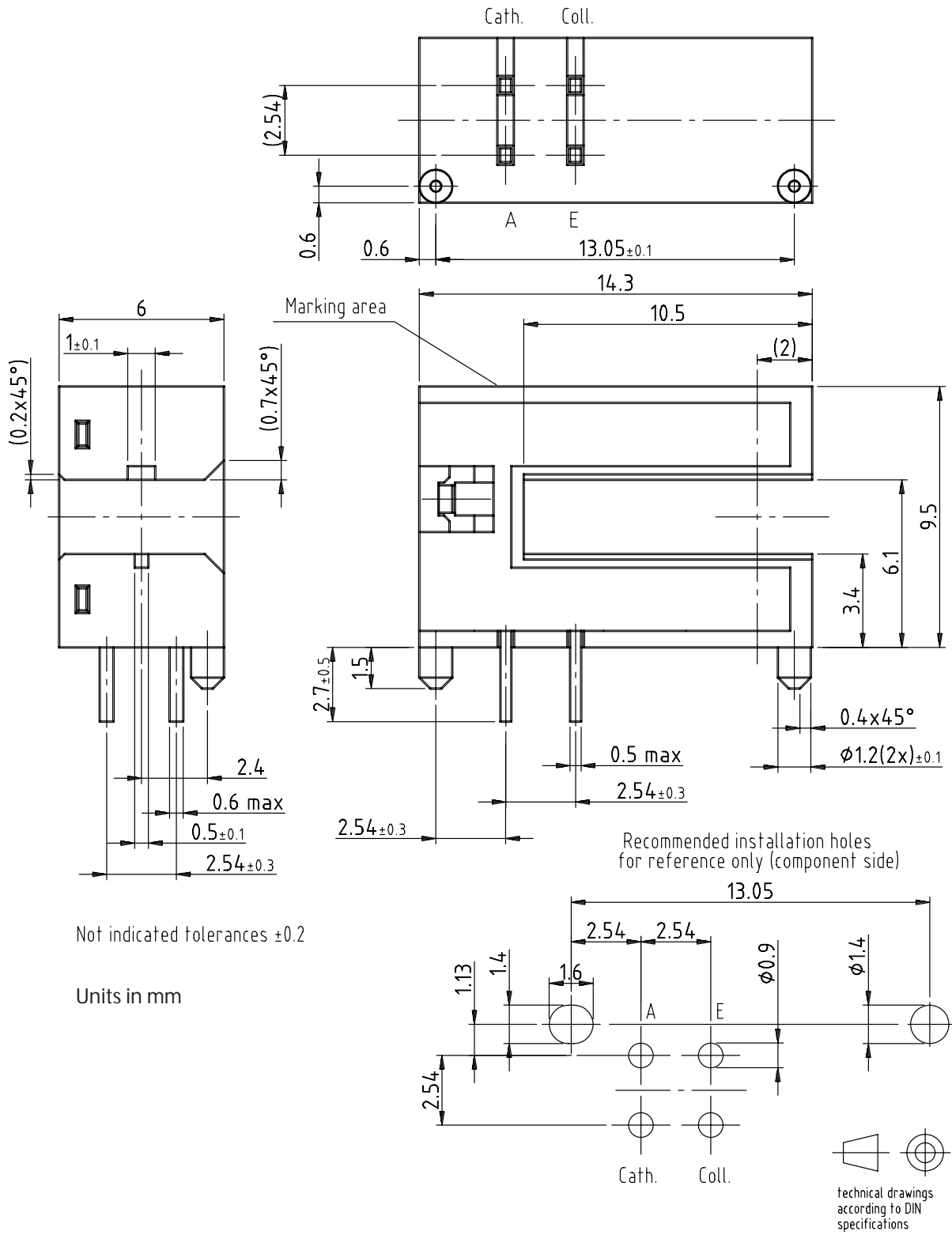
**Absolute Maximum Ratings @  $T_A=25^\circ\text{C}$** 

| Parameter                                | Maximum Rating                              | Unit |
|--|---|------|
| Reverse voltage                          | 5   | V    |
| Forward current                          | 50  | mA   |
| Forward surge current (10 $\mu$ s pulse) | 1   | A    |
| Collector Emitter voltage                | 30  | V    |
| Emitter Collector voltage                | 5   | V    |
| Power dissipation                        | 175   | mW   |
| Operation temperature range              | -25 $^\circ\text{C}$ to 85 $^\circ\text{C}$ |      |
| Storage temperature range                | -40 $^\circ\text{C}$ to 85 $^\circ\text{C}$ |      |
| Soldering temperature                    | 260 $^\circ\text{C}$ for 5 seconds          |      |

**Optical-Electrical Characteristics  $T_A=25^\circ\text{C}$** 

| Parameter                            | Symbol        | Min. | Typ. | Max. | Unit          | Test Conditions   |
|--------------------------------------|---------------|------|------|------|---------------|---|
| Forward voltage                      | $V_F$         | -    | 1.2  | 1.35 | V             | $I_F=20\text{mA}$   |
| Collector Current                    | $I_C$         | 0.8  | -    | 10   | mA            | $I_F=20\text{mA}$ , $V_{CE} = 5\text{V}$                      |
| Collector Emitter voltage            | $V_{CEO}$     | 30   | -    | -    | V             | $I_e=0.1\text{mA}$ , $E_e=0\text{mW}/\text{cm}^2$             |
| Emitter Collector voltage            | $V_{ECO}$     | 5    | -    | -    | V             | $I_e=0.1\text{mA}$ , $E_e=0\text{mW}/\text{cm}^2$             |
| Collector dark current               | $I_{CEO}$     | -    | -    | 100  | nA            | $V_{CE}=10\text{V}$ , $E_e=0\text{mW}/\text{cm}^2$            |
| Collector Emitter saturation voltage | $V_{CE(SAT)}$ | -    | -    | 0.4  | V             | $I_e=0.5\text{mA}$ , $E_e=0.1\text{mW}/\text{cm}^2$           |
| Rising time                          | $T_r$         | -    | 15   | -    | $\mu\text{s}$ | $V_{CE}=5\text{V}$ , $R_L=1\text{k}\Omega$ , $I_C=1\text{mA}$ |
| Falling time                         | $T_f$         | -    | 15   | -    | $\mu\text{s}$ |   |

# Outline Drawing



## Typical Optical-Electrical Curves

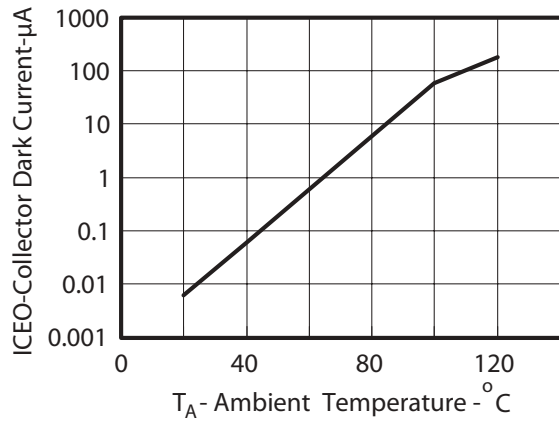


Figure 5: Collector Dark Current Vs Ambient Temperature

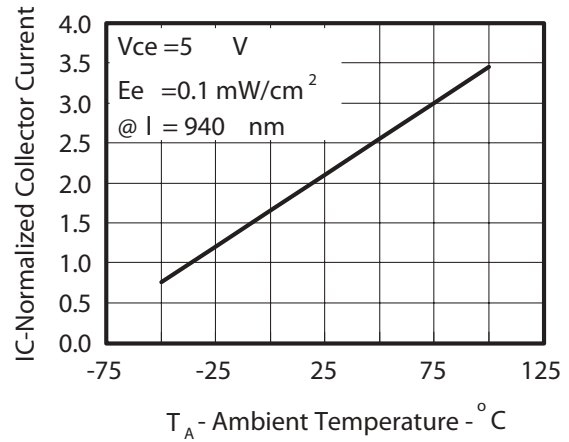


Figure 6: Normalized Collector Current Vs Ambient Temperature

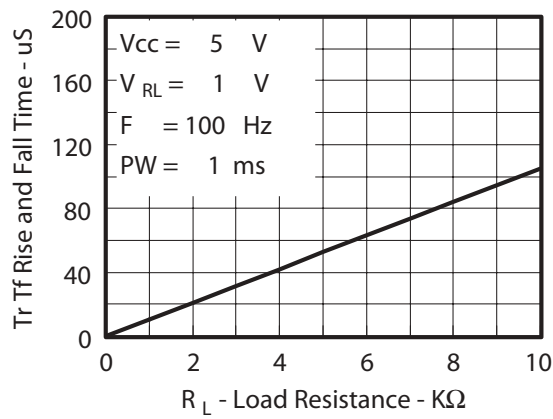


Figure 7: Rise and Fall Times Vs Load Resistance

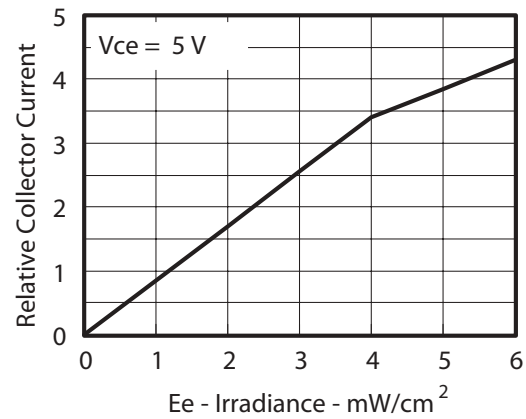


Figure 8: Relative Collector Current Vs Irradiance

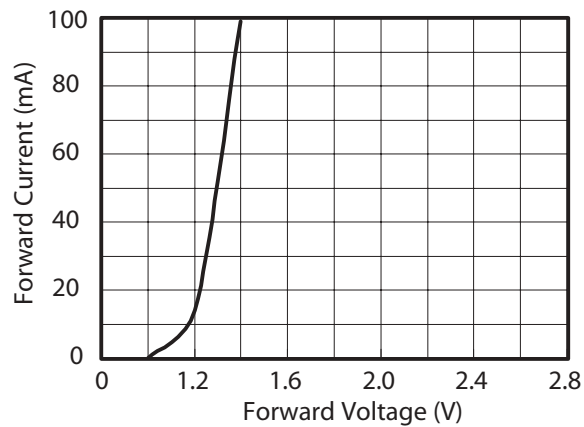


Figure 9: Forward Current Vs Forward Voltage

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