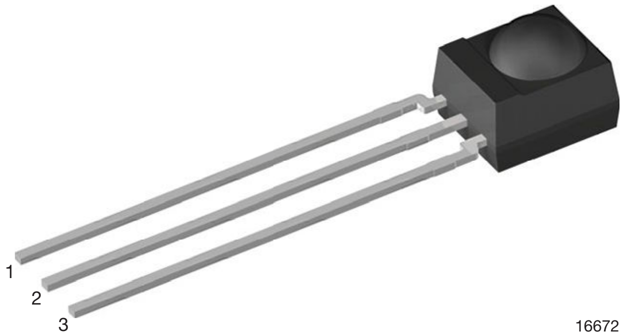
# IR Mid Range Proximity Sensors




## FEATURES

- Up to 2 m for proximity sensing
- Uses modulated bursts at 38 kHz
- Photo detector and preamplifier in one package
- Low supply current
- Shielding against EMI
- Visible light is suppressed by IR filter
- Insensitive to supply voltage ripple and noise
- Supply voltage: 2.5 V to 5.5 V
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
e3
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

## DESIGN SUPPORT TOOLS

click logo to get started

3D Models Available

## MECHANICAL DATA

**Pinning**

1 = OUT, 2 = GND, 3 = $V_S$

## DESCRIPTION

The TSSP4P38 is a compact infrared detector module for proximity sensing applications. It receives 38 kHz modulated signals and has a peak sensitivity of 940 nm.

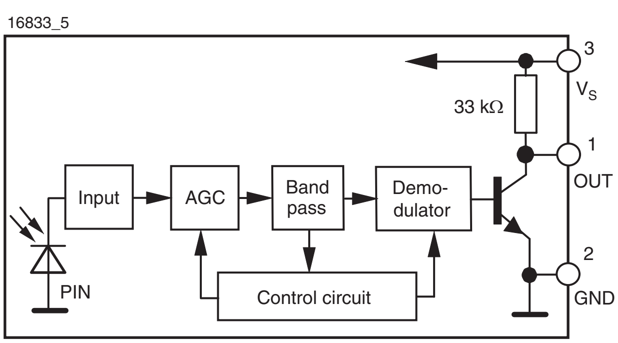
The length of the detector's output pulse varies in proportion to the amount of light reflected from the object being detected.

## APPLICATIONS

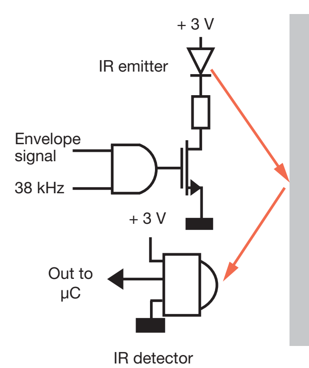
- Object approach detection for activation of displays and user consoles, signaling of alarms, etc.
- Simple gesture controls
- Differentiation of car arrival, static, car departure in parking lots
- Reflective sensors for toilet flush
- Navigational sensor for robotics

| PARTS TABLE | | |
|---|---|---|
| **Carrier frequency** | 38 kHz | TSSP4P38 |
| **Package** | | Mold |
| **Pinning** | | 1 = OUT, 2 = GND, 3 = $V_S$ |
| **Dimensions (mm)** | | 6.0 W x 6.95 H x 5.6 D |
| **Mounting** | | Leaded |
| **Application** | | Proximity sensors |

## BLOCK DIAGRAM




## PROXIMITY SENSING



| ABSOLUTE MAXIMUM RATINGS | | | | |
|---|---|---|---|---|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| Supply voltage (pin 3) | | $V_S$ | -0.3 to +6 | V |
| Supply current (pin 3) | | $I_S$ | 5 | mA |
| Output voltage (pin 1) | | $V_O$ | -0.3 to 5.5 | V |
| Voltage at output to supply | | $V_S - V_O$ | -0.3 to ($V_S$ + 0.3) | V |
| Output current (pin 1) | | $I_O$ | 5 | mA |
| Junction temperature | | $T_j$ | 100 | °C |
| Storage temperature range | | $T_{stg}$ | -25 to +85 | °C |
| Operating temperature range | | $T_{amb}$ | -25 to +85 | °C |
| Power consumption | $T_{amb} \leq 85$ °C | $P_{tot}$ | 10 | mW |
| Soldering temperature | t ≤ 10 s, 1 mm from case | $T_{sd}$ | 260 | °C |

**Note**

- Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect the device reliability

| ELECTRICAL AND OPTICAL CHARACTERISTICS ($T_{amb}$ = 25 °C, unless otherwise specified) | | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
| Supply current | $E_e = 0$, $V_S = 5$ V | $I_{SD}$ | 0.55 | 0.7 | 0.9 | mA |
| | $E_v$ = 40 klx, sunlight | $I_{SH}$ | - | 0.8 | - | mA |
| Supply voltage | | $V_S$ | 2.5 | - | 5.5 | V |
| Receiving distance | Direct line of sight, test signal see fig. 1, IR diode TSAL6200, $I_F$ = 200 mA | d | - | 45 | - | m |
| Output voltage low | $I_{OSL}$ = 0.5 mA, $E_e$ = 0.7 mW/m², test signal see fig. 1 | $V_{OSL}$ | - | - | 100 | mV |
| Minimum irradiance | Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1 | $E_{e\ min.}$ | - | 0.12 | 0.25 | mW/m² |
| Maximum irradiance | $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1 | $E_{e\ max.}$ | 50 | - | - | W/m² |
| Directivity | Angle of half receiving distance | $\varphi_{1/2}$ | - | ± 45 | - | deg |

## TYPICAL CHARACTERISTICS ($T_{amb}$ = 25 °C, unless otherwise specified)

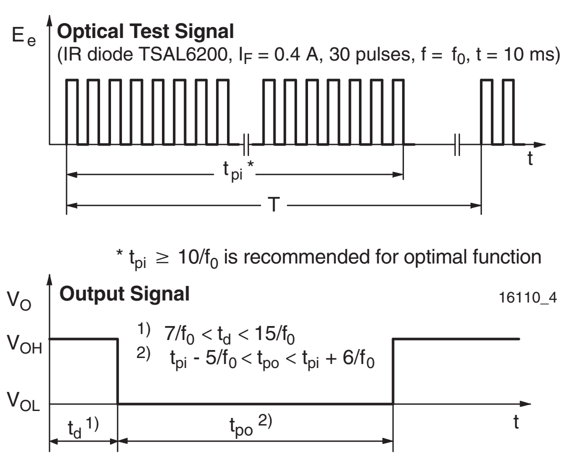



Fig. 1 - Output Active Low

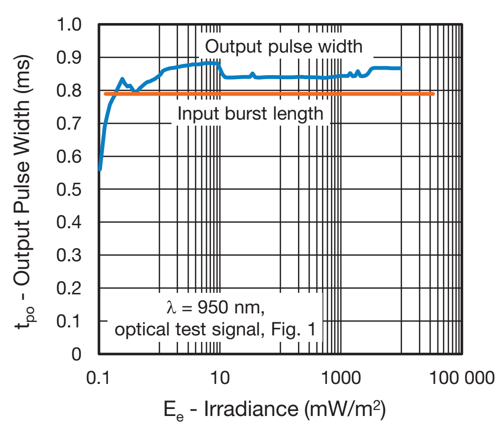



Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

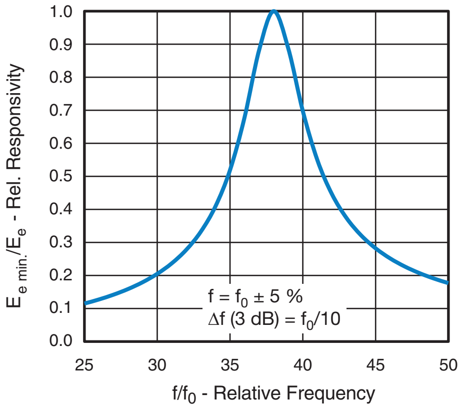



Fig. 3 - Frequency Dependence of Responsivity

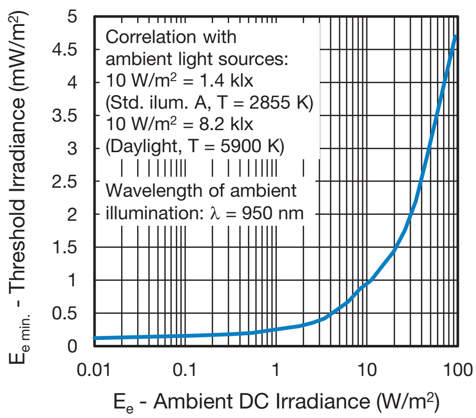



Fig. 4 - Sensitivity in Bright Ambient

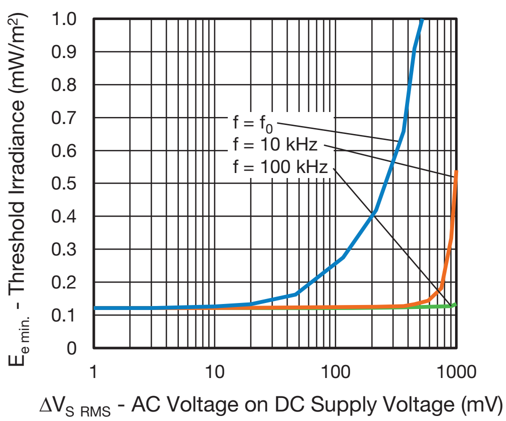



Fig. 5 - Sensitivity vs. Supply Voltage Disturbances

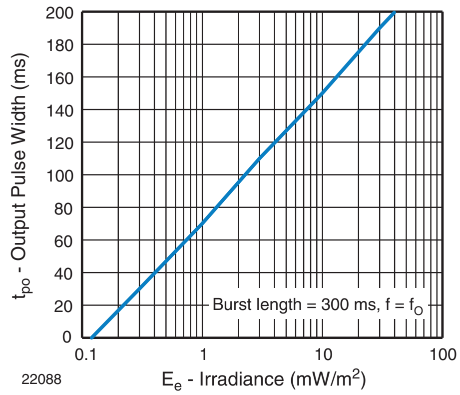



Fig. 6 - Max. Output Pulse Width vs. Irradiance

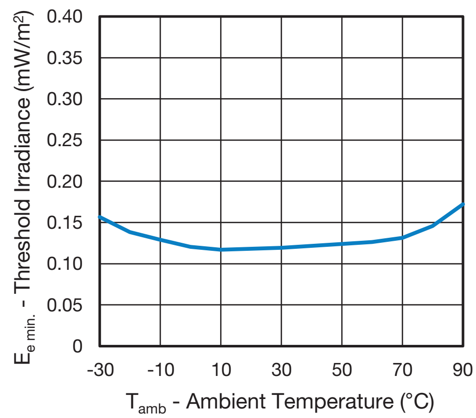



Fig. 7 - Sensitivity vs. Ambient Temperature

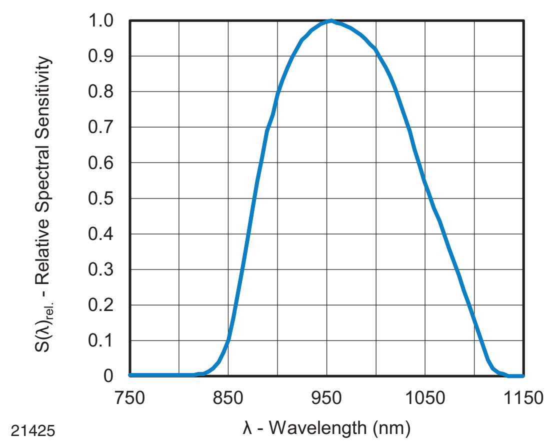



Fig. 8 - Relative Spectral Sensitivity vs. Wavelength

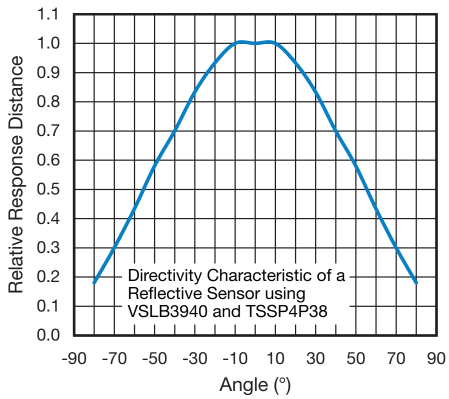



Fig. 9 - Angle Characteristic

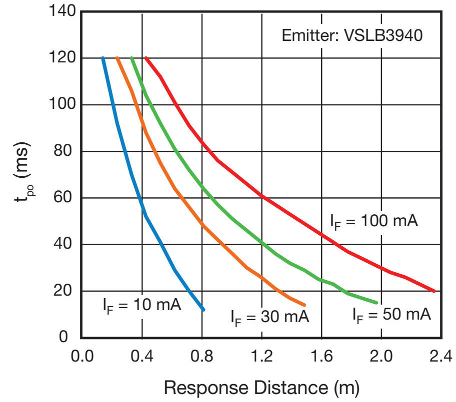



Fig. 11 - $t_{po}$ vs. Distance Kodak Gray Card Plus 15 %

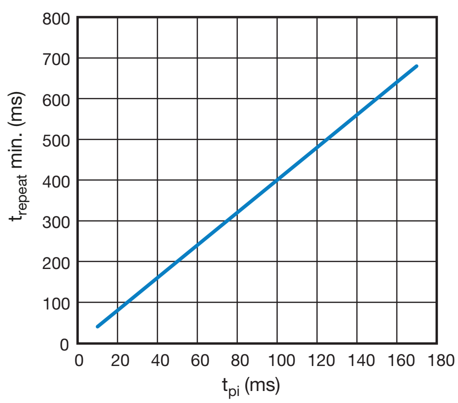



Fig. 10 - Max. Rate of Bursts

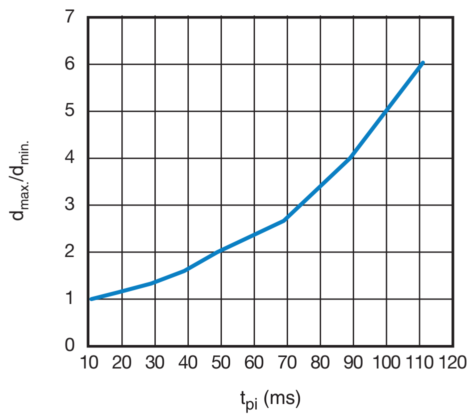
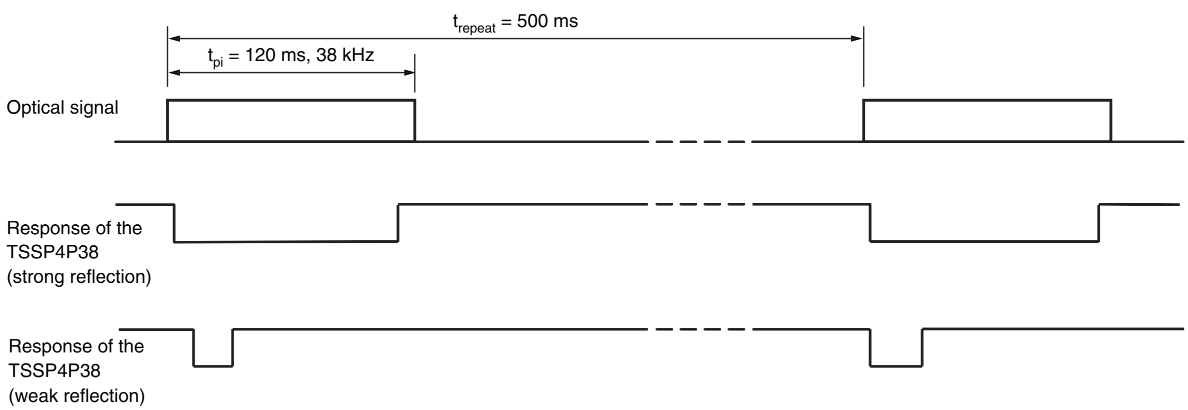


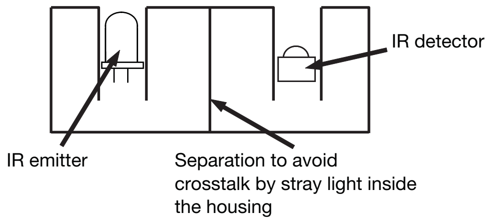

Fig. 12 - Dynamic Range of Sensor vs. $t_{pi}$

The typical application of the TSSP4P38 is a reflective sensor with analog information contained in its output. The sensor evaluates the time required by the AGC to suppress a quasi continuous signal. The time required to suppress a continuous signal is longer when the signal is strong than when the signal is weak. The result is an output pulse length which corresponds to the distance of an object from the sensor. This kind of analog information can be evaluated by a microcontroller. The absolute amount of reflected light depends on the infrared reflectivity of the object and is not evaluated. Only changes in the amount of reflected light, and therefore changes in the pulse width can be evaluated with accuracy.

Example of a signal pattern:



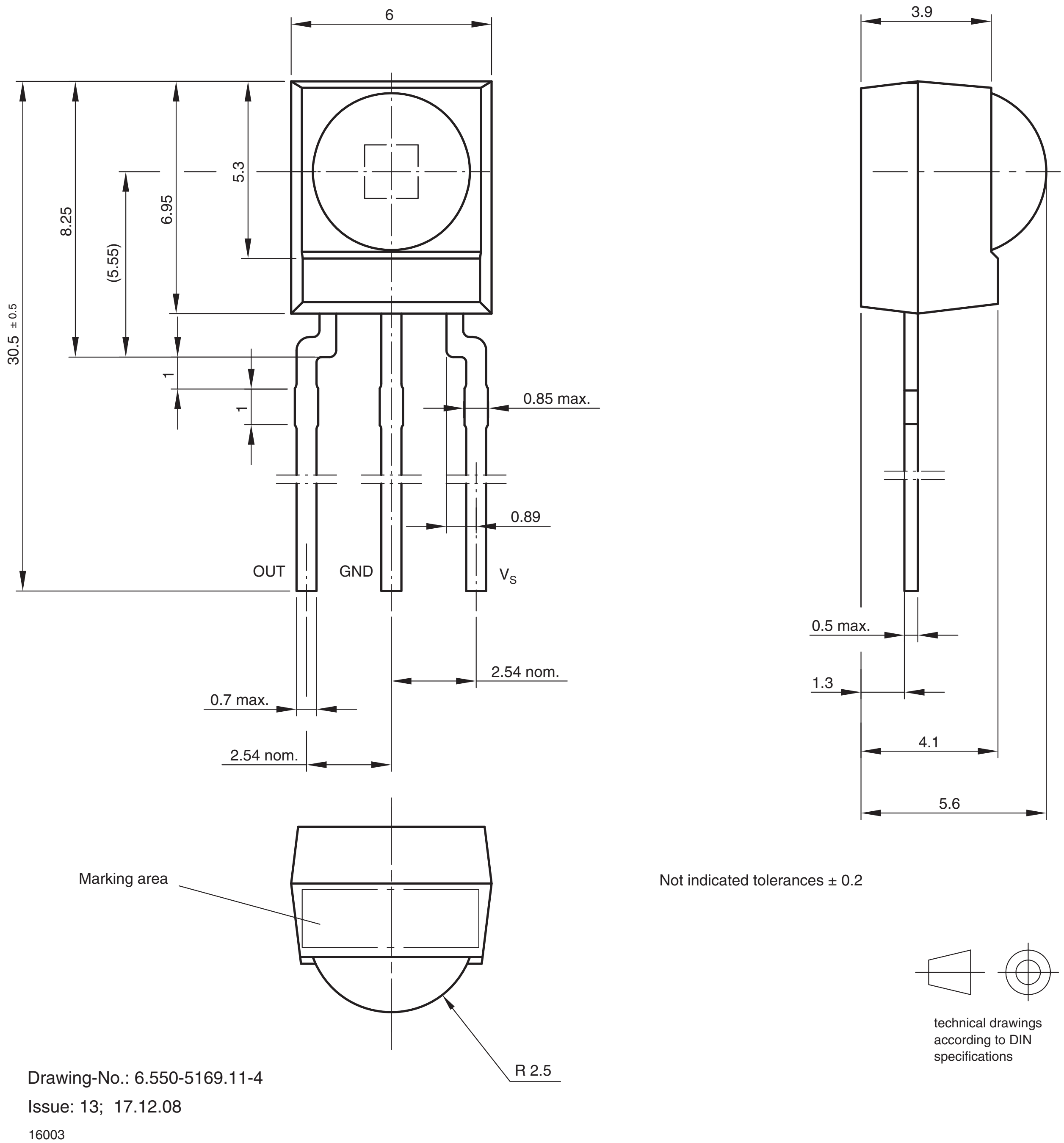
Example for a sensor hardware:




There should be no common window in front of the emitter and detector in order to avoid crosstalk by guided light through the window.

The logarithmic characteristic of the AGC in the TSSP4P38 results in an almost linear relationship between distance and pulse width. Ambient light has also some impact to the pulse width of this kind of sensor, making the pulse shorter.

## **PACKAGE DIMENSIONS** in millimeters



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