

## IR Detector for Mid Range Proximity Sensor



### DESIGN SUPPORT TOOLS

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### MECHANICAL DATA

#### Pinning

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

### DESCRIPTION

The TSSP58P38 is a compact infrared detector module for proximity sensing application. 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.

### FEATURES

- Up to 2 m for proximity sensing
- Receives 38 kHz modulated signal
- 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](http://www.vishay.com/doc?99912)

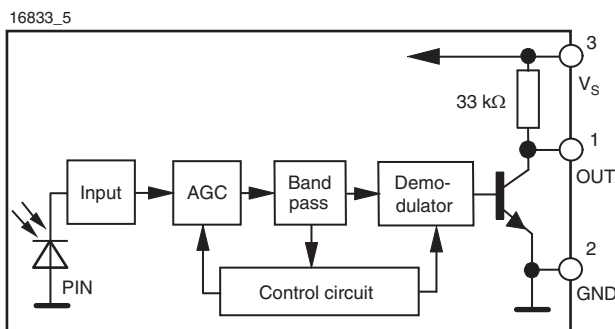


### APPLICATIONS

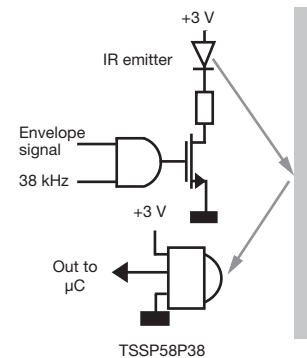
- Object approach detection for activation of displays and user consoles, signaling of alarms, etc.
- Simple gesture controls
- Differentiation of car arrival, static, car departure in parking lots
- Reflective sensors for toilet flush
- Navigational sensor for robotics

PARTS TABLE	
Carrier frequency	38 kHz
Package	TSSP58P38
Pinning	Minicast
Dimensions (mm)	1 = OUT, 2 = GND, 3 = $V_S$
Mounting	5.0 W x 6.95 H x 4.8 D
Application	Leaded
	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	$T_{amb} \leq 85\text{ °C}$	$P_{tot}$	10	mW

**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 ( $T_{amb} = 25\text{ °C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current (pin 3)	$E_e = 0, V_S = 5\text{ V}$	$I_{SD}$	0.55	0.7	0.9	mA
	$E_v = 40\text{ klx, sunlight}$	$I_{SH}$	-	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, $I_F = 250\text{ mA}$	$d$	-	40	-	m
Output voltage low (pin 1)	$I_{OSL} = 0.5\text{ mA}, E_e = 0.7\text{ mW/m}^2$ , test signal see fig. 1	$V_{OSL}$	-	-	100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$ , test signal see fig. 1	$E_e\text{ min.}$	-	0.2	0.4	mW/m <sup>2</sup>
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$ , test signal see fig. 1	$E_e\text{ max.}$	50	-	-	W/m <sup>2</sup>
Directivity	Angle of half receiving distance	$\phi_{1/2}$	-	$\pm 45$	-	deg

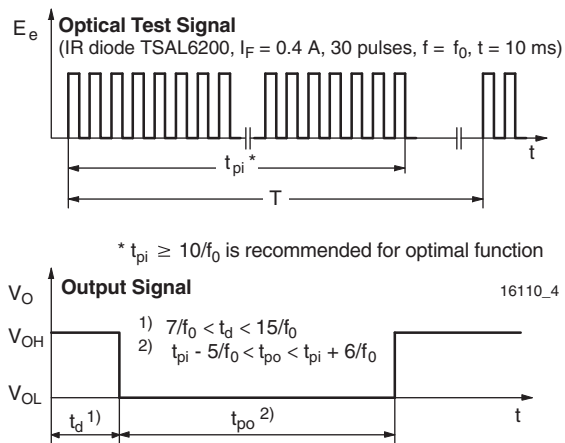
**TYPICAL CHARACTERISTICS ( $T_{amb} = 25\text{ °C}$ , unless otherwise specified)**


Fig. 1 - Output Active Low

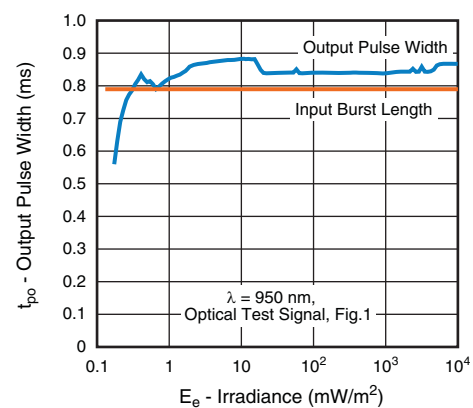


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

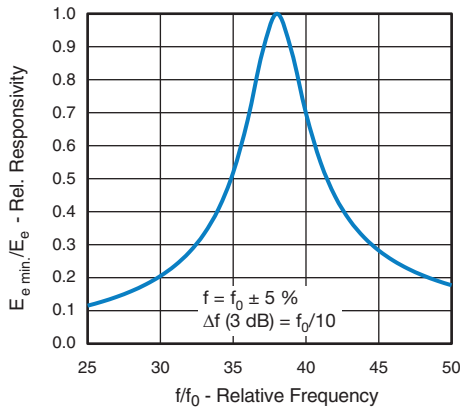


Fig. 3 - Frequency Dependence of Responsivity

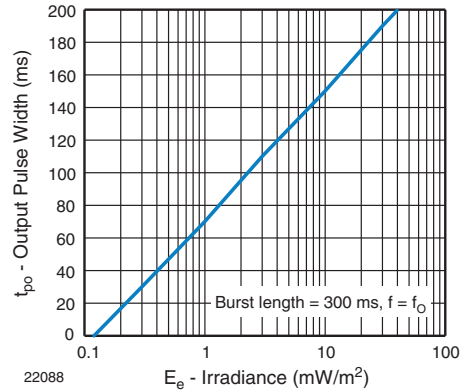


Fig. 6 - Maximum Output Pulse Width vs. Irradiance

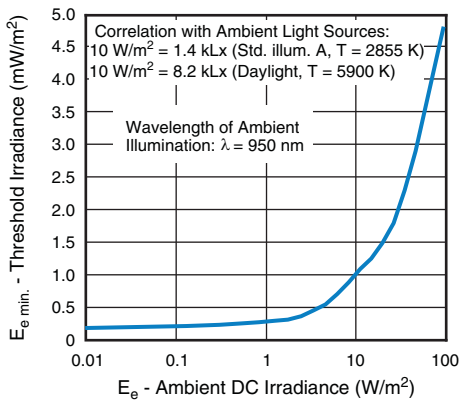


Fig. 4 - Sensitivity in Bright Ambient

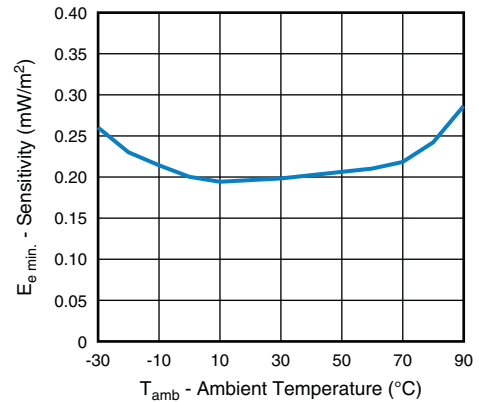


Fig. 7 - Sensitivity vs. Ambient Temperature

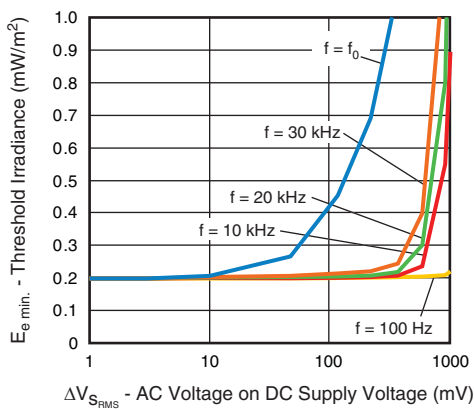


Fig. 5 - Sensitivity vs. Supply Voltage Disturbances

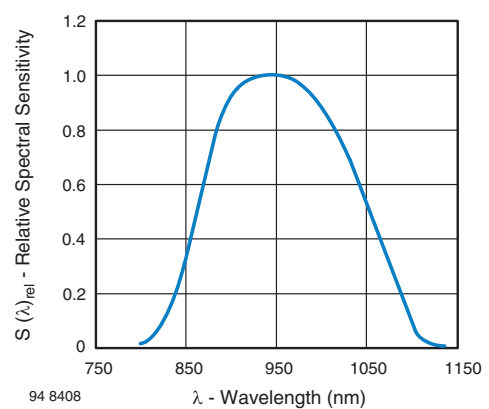


Fig. 8 - Relative Spectral Sensitivity vs. Wavelength

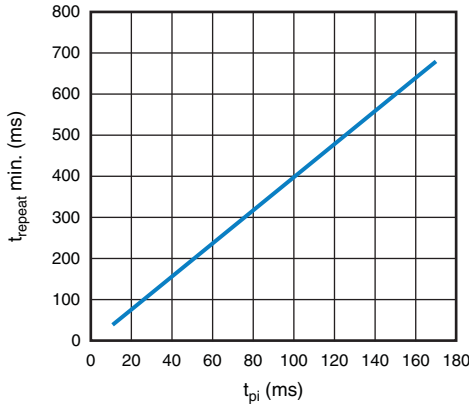


Fig. 9 - Max. Rate of Bursts

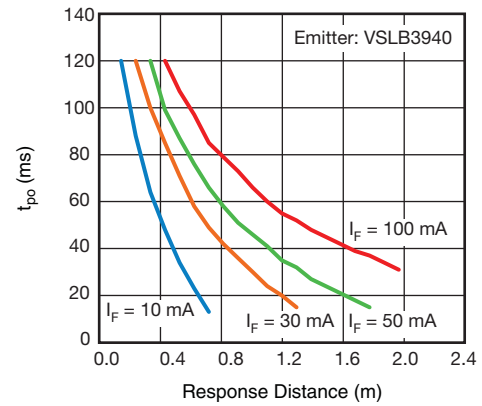


Fig. 11 -  $t_{po}$  vs. Distance Kodak Gray Card Plus 15 %

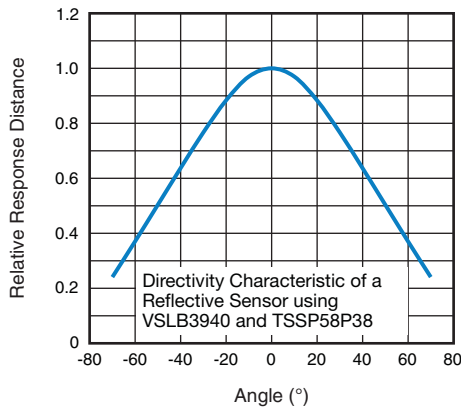


Fig. 10 - Angle Characteristic

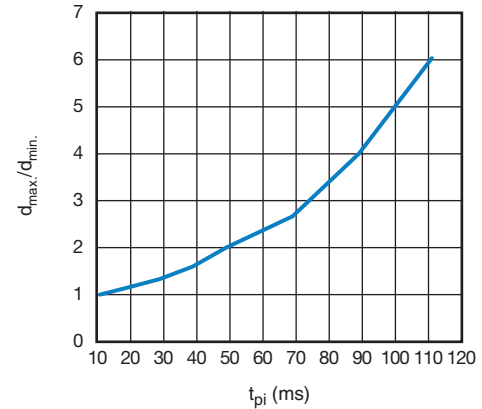
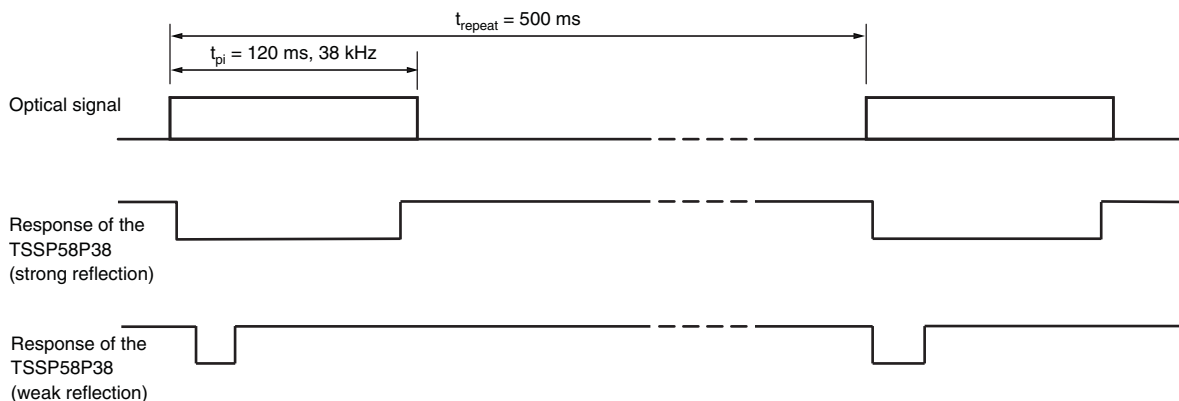


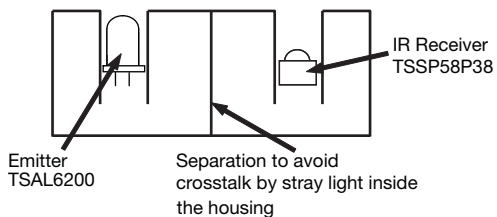
Fig. 12 - Dynamic Range of Sensor vs.  $t_{pi}$

The typical application of the TSSP58P38 is a reflective sensor with analog information contained in its output. Such a sensor is evaluating the time required by the AGC to suppress a quasi continuous signal. The time required to suppress such a signal is longer when the signal is strong than when the signal is weak, resulting in a pulse length corresponding 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 much on the environment and is not evaluated. Only sudden changes of the amount of reflected light, and therefore changes in the pulse width, are evaluated using this application.

Example of a signal pattern:



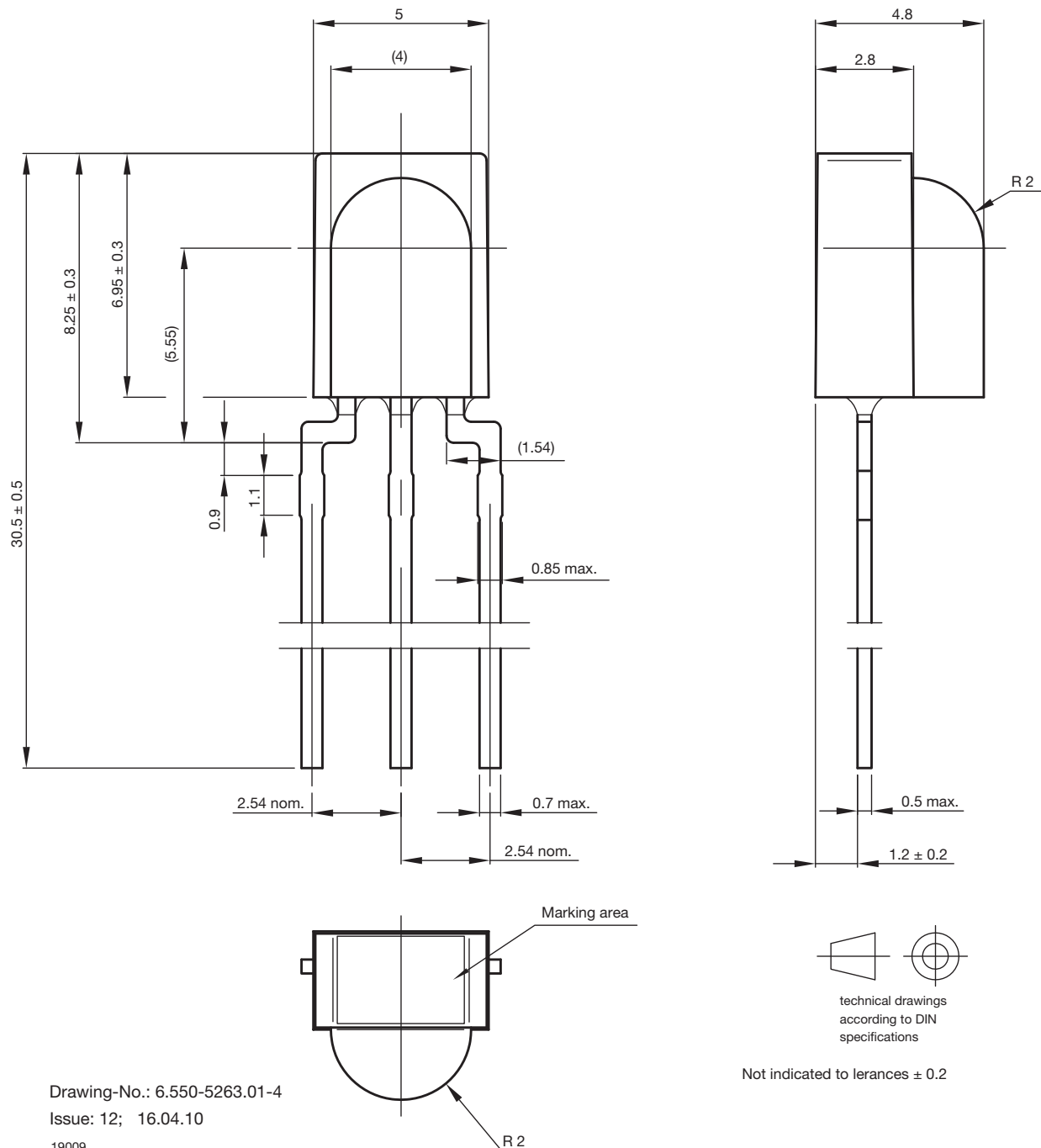
Example for a sensor hardware:



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

The logarithmic characteristic of the AGC in the TSSP58P38 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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