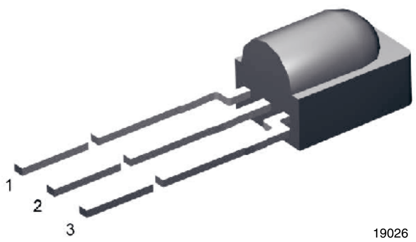
IR Detector for Mid Range Proximity Sensor



FEATURES

- Up to 2 m for proximity sensing
- Receives 38 kHz modulated signal
- 940 nm peak wavelength
- 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)

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.

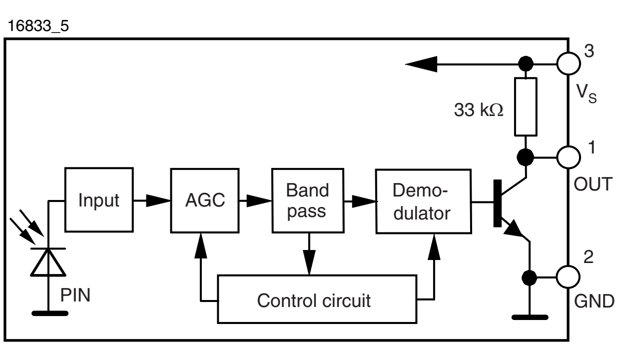
The length of the detector's output pulse varies in proportion to the amount of light reflected from the object being detected.

APPLICATIONS

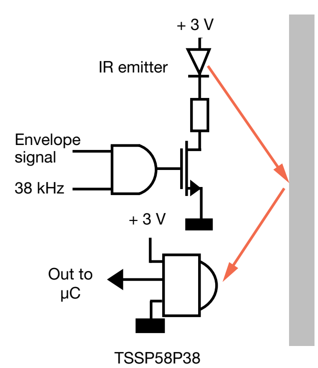
- Safety switches for garage door, elevator door, gates, and industrial light curtains
- Reflective sensors for toilet, urinal, faucet and hand dryer, and towel dispenser
- Navigational sensor for robotics
- Sensor for large format touch panels
- Object detection in vending machines, parking lots, ATM's, and many others

PARTS TABLE		
Carrier frequency	38 kHz	TSSP58P38
Package	Pinning	1 = OUT, 2 = GND, 3 = V_S
	Dimensions (mm)	6.9 H x 4.8 W x 5.0 L
Mounting		Leaded
Application		Proximity sensors

BLOCK DIAGRAM



APPLICATION CIRCUIT



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	$t \leq 10$ 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 condtions 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 (pin 3)	$E_e = 0$, $V_S = 5$ 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, $I_F = 250$ mA	d		40		m
Output voltage low (pin 1)	$I_{OSL} = 0.5$ 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	$E_{e\ min.}$		0.2	0.4	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 CHARACTERSTICS (T_{amb} = 25 °C, unless otherwise specified)

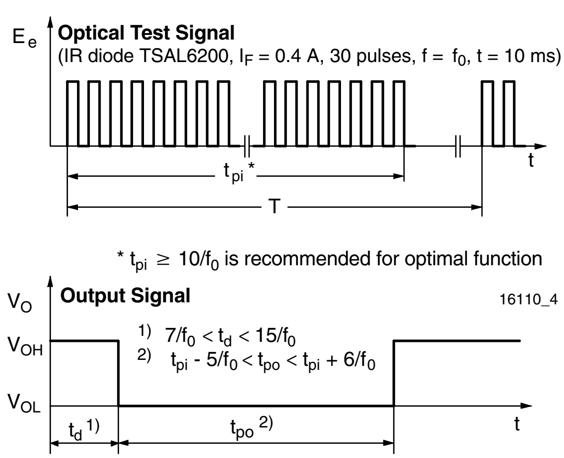


Fig. 1 - Output Active Low

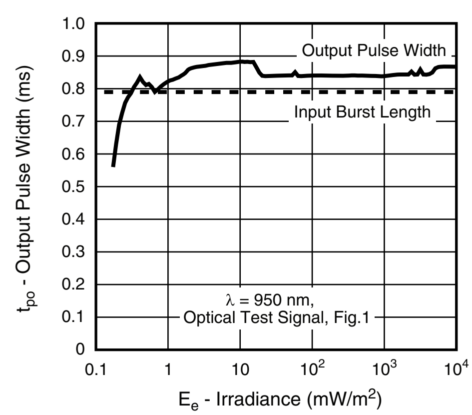


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

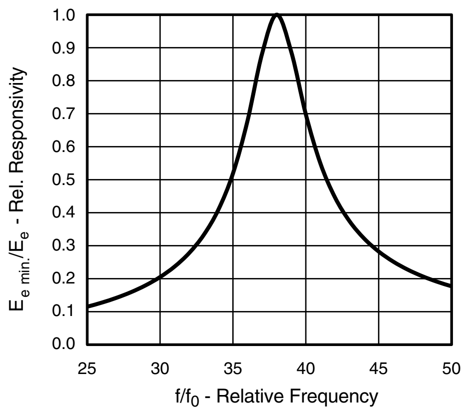


Fig. 3 - Frequency Dependence of Responsivity

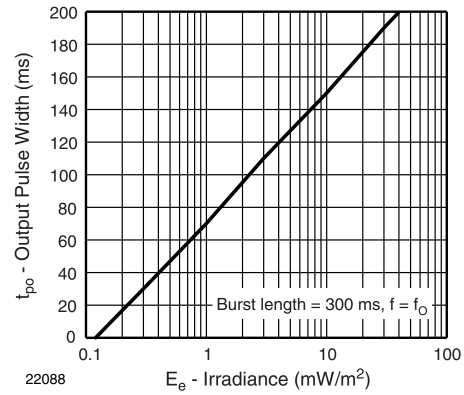


Fig. 6 - Maximum Output Pulse Width vs. Irradiance

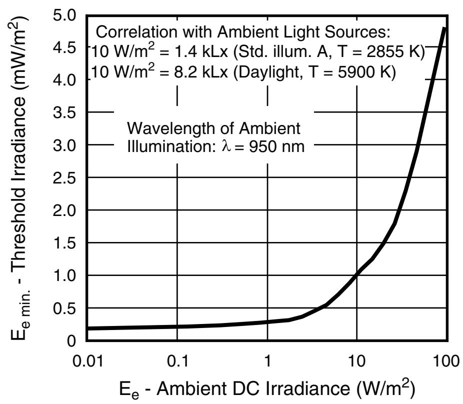


Fig. 4 - Sensitivity in Bright Ambient

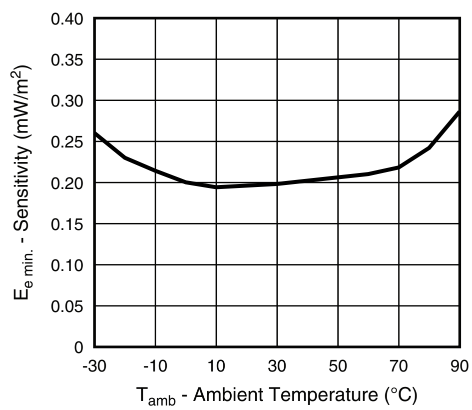


Fig. 7 - Sensitivity vs. Ambient Temperature

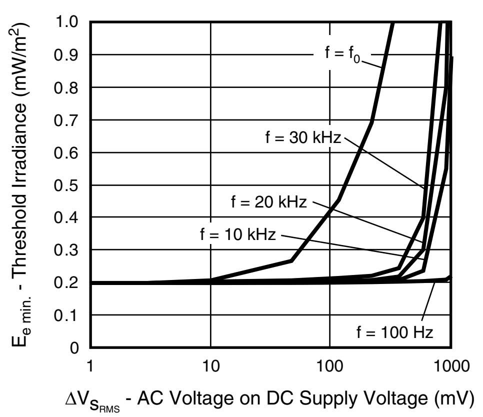


Fig. 5 - Sensitivity vs. Supply Voltage Disturbances

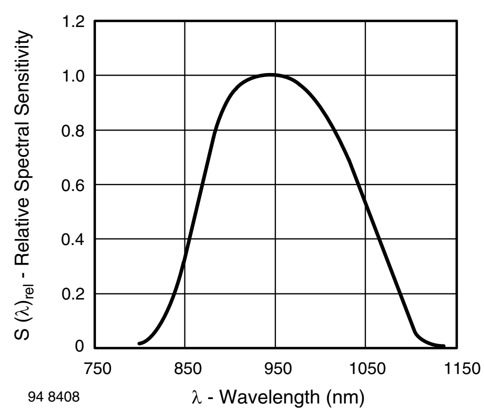


Fig. 8 - Relative Spectral Sensitivity vs. Wavelength

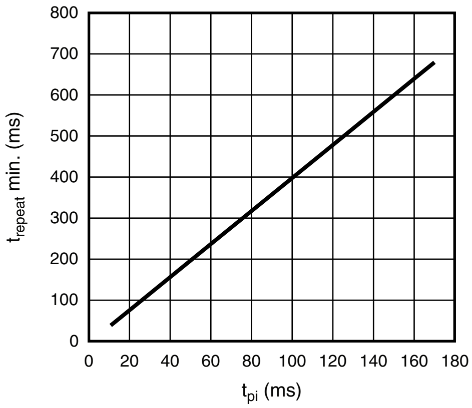


Fig. 9 - Max. Rate of Bursts

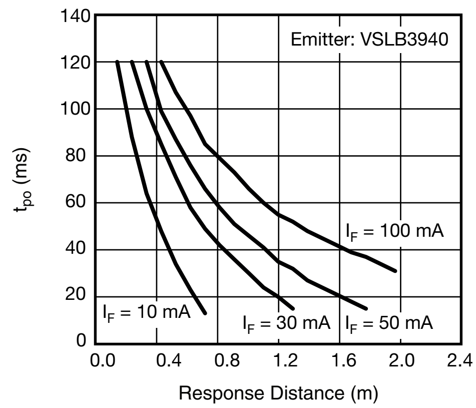


Fig. 11 - t_{po} vs. Distance Kodak Gray Card Plus 15 %

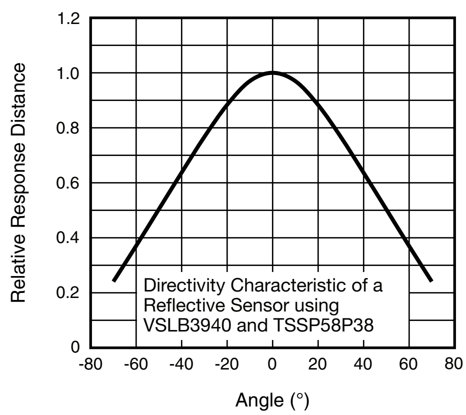


Fig. 10 - Angle Characteristic

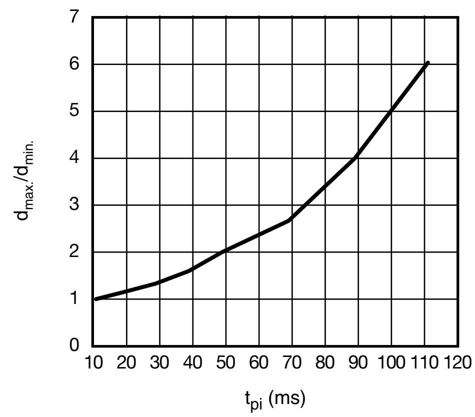
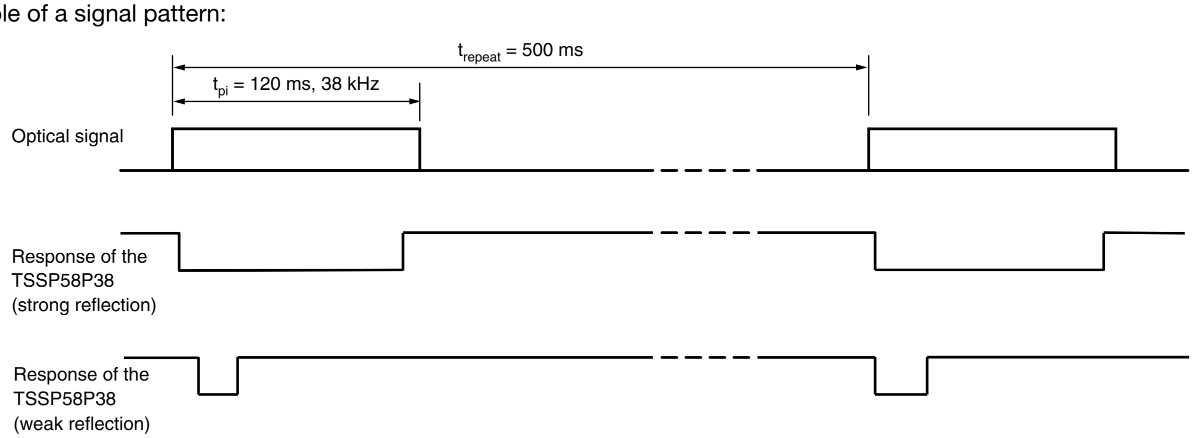


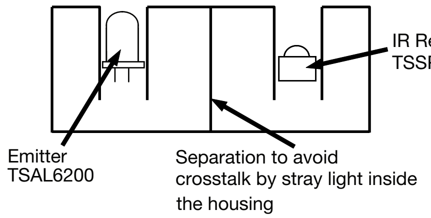
Fig. 12 - Dynamic Range of Sensor vs. t_{pi}

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:



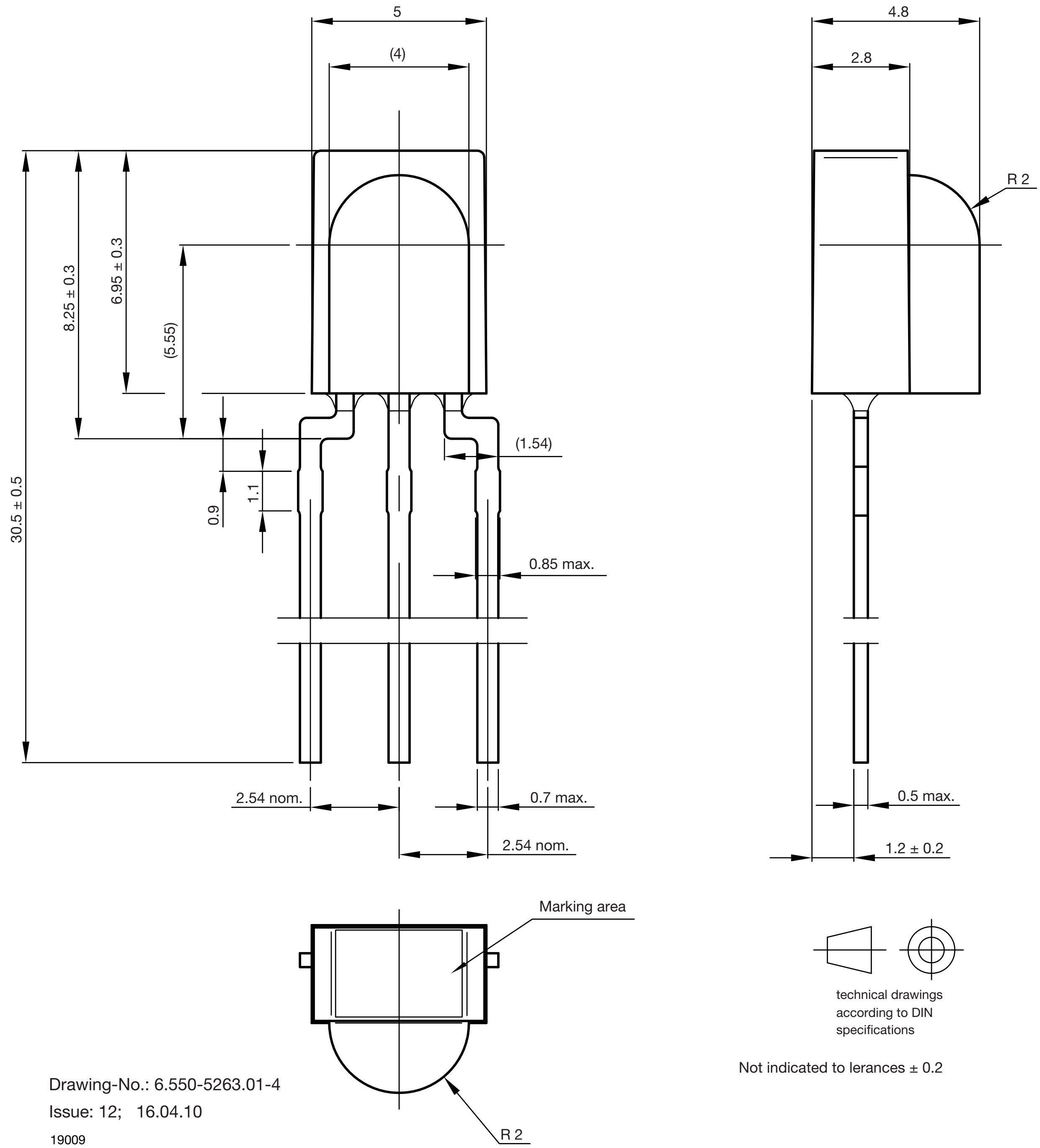
Example for a sensor hardware:



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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