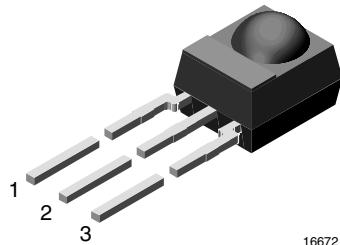


## IR Receiver Module for Light Barrier Systems



16672

### FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for 38 kHz IR signals
- Shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Visible light is suppressed by IR filter
- Insensitive to supply voltage ripple and noise
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
**GREEN**  
(5-2008)

### MECHANICAL DATA

#### Pinning:

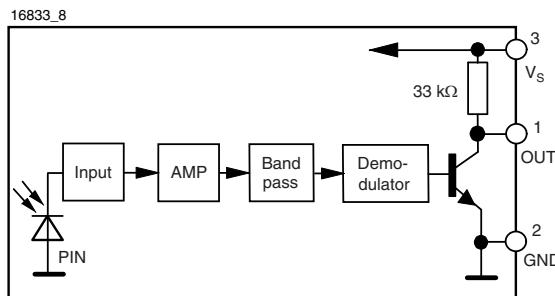
1 = OUT, 2 = GND., 3 =  $V_S$

### DESCRIPTION

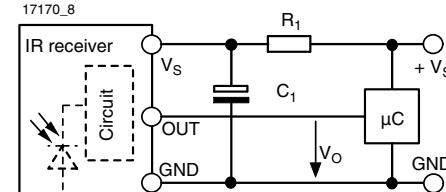
The TSOP4038 is a compact IR receiver for sensor applications. It has a high gain for IR signals at 38 kHz. The detection level does not change when ambient light or strong IR signals are applied. It can receive continuous 38 kHz signals or 38 kHz bursts.

| PARTS TABLE       |                     |
|-------------------|---------------------|
| CARRIER FREQUENCY | SENSOR APPLICATIONS |
| 38 kHz            | TSOP4038            |

### BLOCK DIAGRAM



### APPLICATION CIRCUIT



The external components  $R_1$  and  $C_1$  are optional to improve the robustness against electrical overstress (typical values are  $R_1 = 100 \Omega$ ,  $C_1 = 0.1 \mu\text{F}$ ). The output voltage  $V_o$  should not be pulled down to a level below 1 V by the external circuit. The capacitive load at the output should be less than 2 nF.

| ABSOLUTE MAXIMUM RATINGS    |                                 |             |                        |      |
|-----------------------------|---------------------------------|-------------|------------------------|------|
| PARAMETER                   | TEST CONDITION                  | SYMBOL      | VALUE                  | UNIT |
| Supply voltage (pin 3)      |                                 | $V_S$       | - 0.3 to + 6.0         | 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           | $T_{amb} \leq 85^\circ\text{C}$ | $P_{tot}$   | 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 ( $T_{amb} = 25^\circ C$ , unless otherwise specified) |  |                    |      |          |      |                 |
|---|--|--------------------|------|----------|------|-----------------|
| PARAMETER   | TEST CONDITION   | SYMBOL             | MIN. | TYP.     | MAX. | UNIT            |
| Supply current (pin 3)  | $E_v = 0, V_S = 5 V$   | $I_{SD}$           | 0.65 | 0.85     | 1.05 | mA              |
|   | $E_v = 40 \text{ klx, sunlight}$   | $I_{SH}$           |      | 0.95     |      | mA              |
| Supply voltage  |  | $V_S$              | 2.7  |          | 5.5  | V               |
| Transmission distance   | $E_v = 0$ , test signal see fig. 1,<br>IR diode TSAL6200,<br>$I_F = 400 \text{ mA}$              | $d$                |      | 30       |      | m               |
| Output voltage low (pin 1)  | $I_{OSL} = 0.5 \text{ mA}, E_e = 2 \text{ mW/m}^2$ ,<br>test signal see fig. 1                   | $V_{OSL}$          |      |          | 100  | mV              |
| Minimum irradiance  | Pulse width tolerance:<br>$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$ ,<br>test signal see fig. 1 | $E_e \text{ min.}$ |      | 0.3      | 0.7  | $\text{mW/m}^2$ |
| Maximum irradiance  | $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$ ,<br>test signal see fig. 1                           | $E_e \text{ max.}$ | 30   |          |      | $\text{W/m}^2$  |
| Directivity   | Angle of half transmission<br>distance   | $\varphi_{1/2}$    |      | $\pm 45$ |      | deg             |

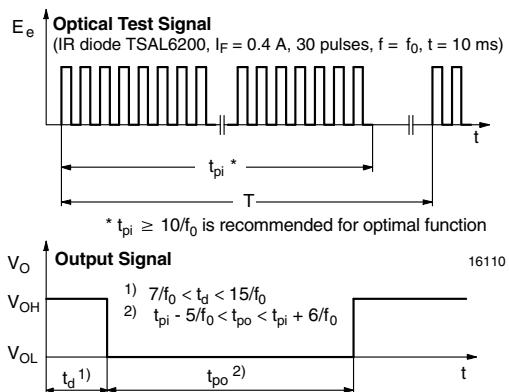
TYPICAL CHARACTERISTICS ( $T_{amb} = 25^\circ C$ , unless otherwise specified)

Fig. 1 - Output Active Low

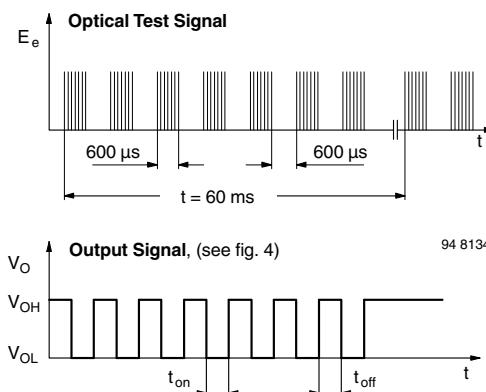


Fig. 3 - Output Function

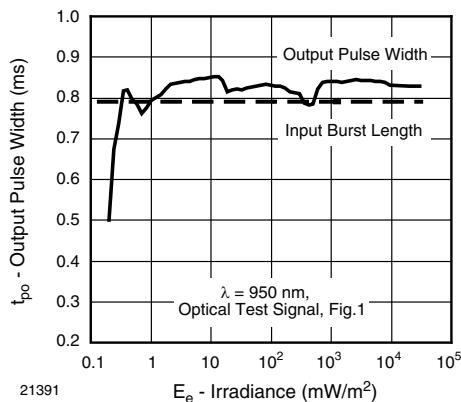


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

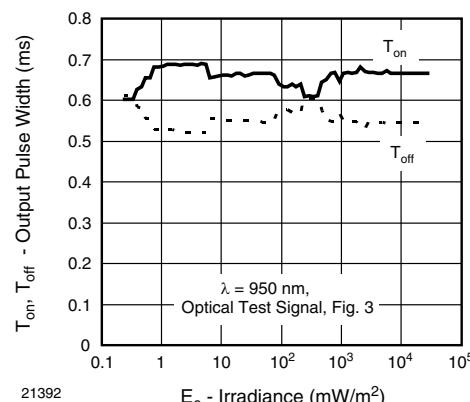


Fig. 4 - Output Pulse Diagram

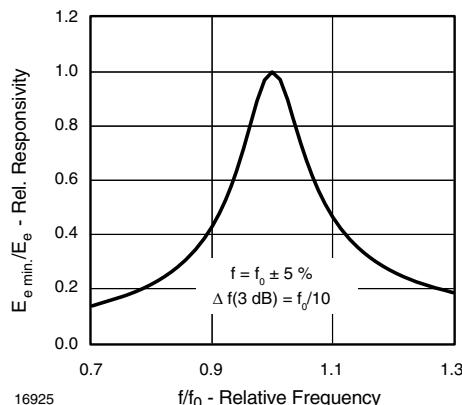


Fig. 5 - Frequency Dependence of Responsivity

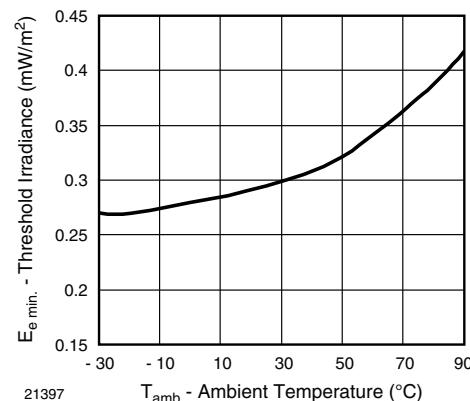


Fig. 8 - Sensitivity vs. Ambient Temperature

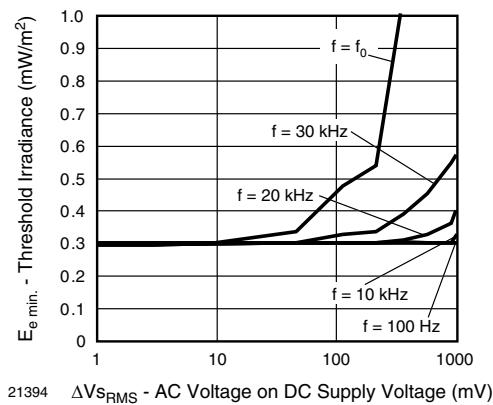


Fig. 6 - Sensitivity vs. Supply Voltage Disturbances

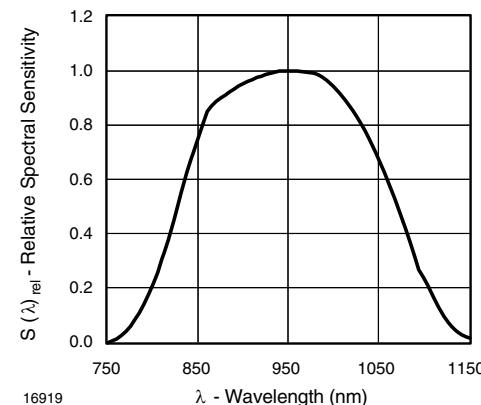


Fig. 9 - Relative Spectral Sensitivity vs. Wavelength

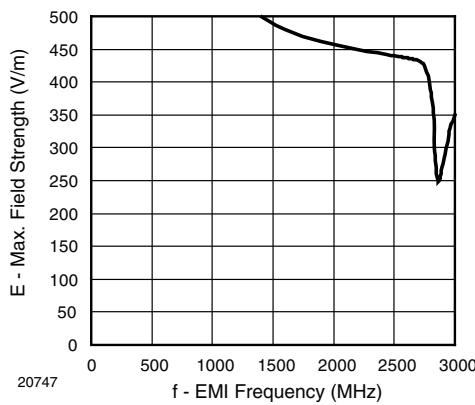


Fig. 7 - Sensitivity vs. Electric Field Disturbances

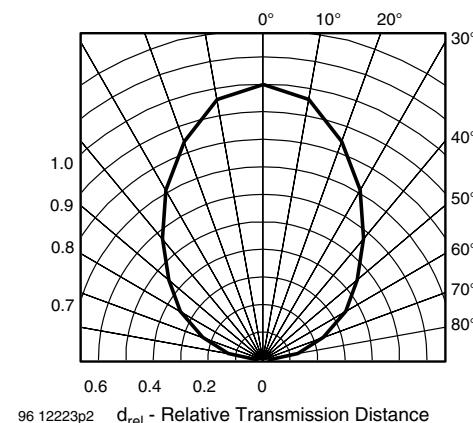


Fig. 10 - Directivity

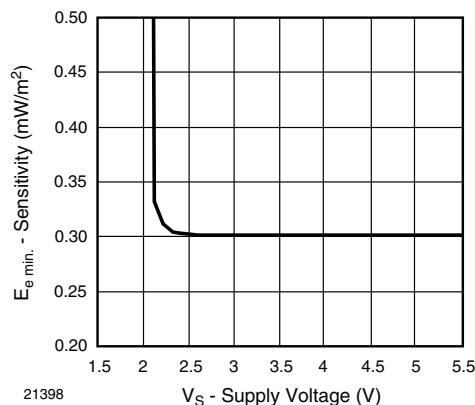
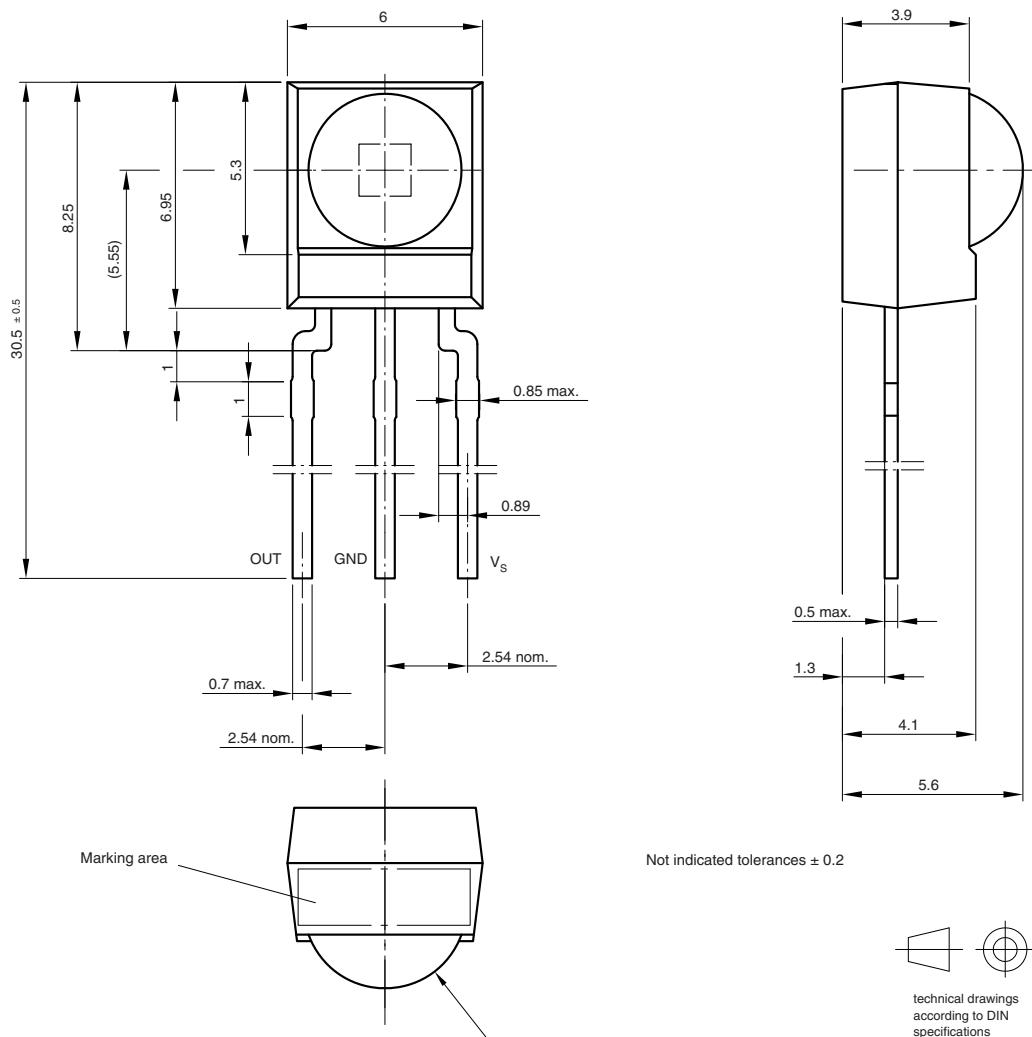


Fig. 11 - Sensitivity vs. Supply Voltage

**PACKAGE DIMENSIONS** in millimeters

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