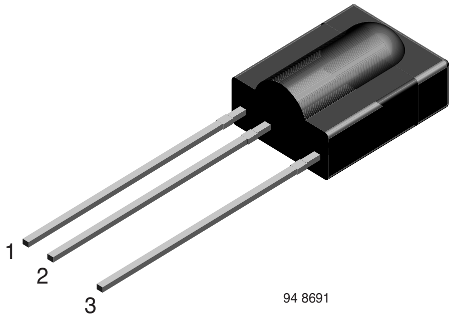
WideBand IR Receiver Module for Remote Control Systems

Description

The TSOP1100 - series are miniaturized receivers for infrared remote control systems. PIN diode and preamplifier are assembled on lead frame, the epoxy package is designed as IR filter.

The demodulated output signal can directly be decoded by a microprocessor. The main benefit is the operation with short burst transmission codes and high data rates within 33 kHz to 57 kHz.



Features

- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against electrical field disturbance
- TTL and CMOS compatibility
- Output active low
- Low power consumption
- High immunity against ambient light

Special Features

- Operation with carrier frequency from 33 kHz to 57 kHz
- Operation with short bursts possible (≥ 6 cycles/burst)
- Enhanced data rate of 4000 bit/s

Mechanical Data

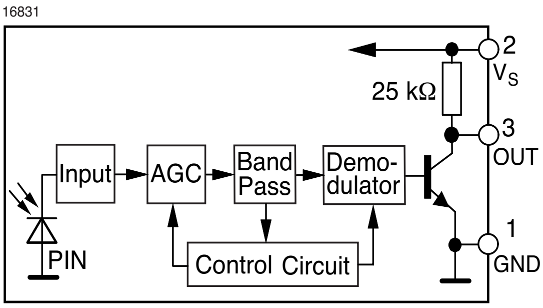
Pinning:

1 = GND, 2 = V_S, 3 = OUT

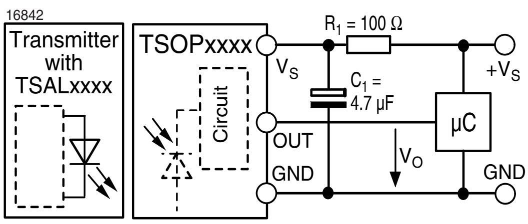
Parts Table

Part	Carrier Frequency
TSOP1100	33 kHz to 57 kHz

Block Diagram



Application Circuit



R_1 + C_1 recommended to suppress power supply disturbances.

The output voltage should not be hold continuously at a voltage below V_O = 3.3 V by the external circuit.

Absolute Maximum Ratings

Absolute Maximum Ratings

T_{amb} = 25 °C, unless otherwise specified

Parameter	Test condition	Symbol	Value	Unit
Supply Voltage	(Pin 2)	V_S	- 0.3 to + 6.0	V
Supply Current	(Pin 2)	I_S	5	mA
Output Voltage	(Pin 3)	V_O	- 0.3 to + 6.0	V
Output Current	(Pin 3)	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}	50	mW
Soldering Temperature	t ≤ 10 s, > 1 mm from case	T_{sd}	260	°C

Electrical and Optical Characteristics

T_{amb} = 25 °C, unless otherwise specified

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Supply Current (Pin 2)	V_S = 5 V, E_v = 0	I_{SD}	0.8	1.2	1.5	mA
	V_S = 5 V, E_v = 40 klx, sunlight	I_{SH}		1.5		mA
Supply Voltage (Pin 2)		V_S	4.5		5.5	V
Transmission Distance	E_v = 0, test signal see fig. 3, IR diode TSAL6200, I_F = 0.4 A, f = 40 kHz	d		35		m
Output Voltage Low (Pin 3)	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m^2, f = f_o, test signal see fig.1	V_{OSL}			250	mV
Minimum Irradiance (40 kHz)	Test signal see fig.1	$E_{e\ min}$		0.4	0.6	mW/m^2
	Test signal see fig.3	$E_{e\ min}$		0.35	0.5	mW/m^2
Minimum Irradiance (33 - 57 kHz)	Test signal see fig.1	$E_{e\ min}$		2.0		mW/m^2
	Test signal see fig.3	$E_{e\ min}$		1.7		mW/m^2
Maximum Irradiance	Test signal see fig.1	$E_{e\ max}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

Typical Characteristics (Tamb = 25 °C unless otherwise specified)

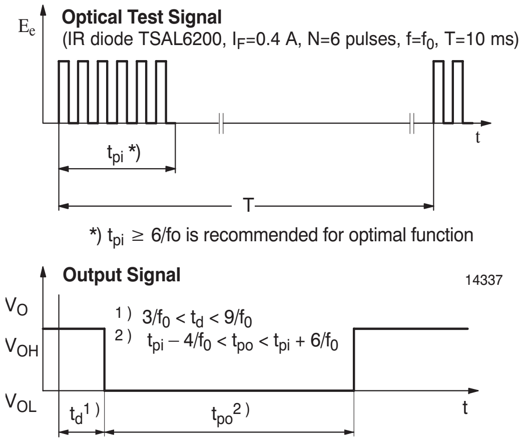


Figure 1. Output Function

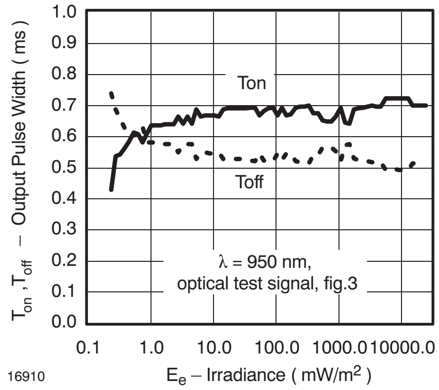


Figure 4. Output Pulse Diagram

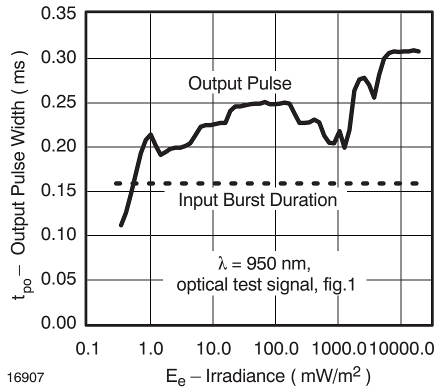


Figure 2. Pulse Length and Sensitivity in Dark Ambient

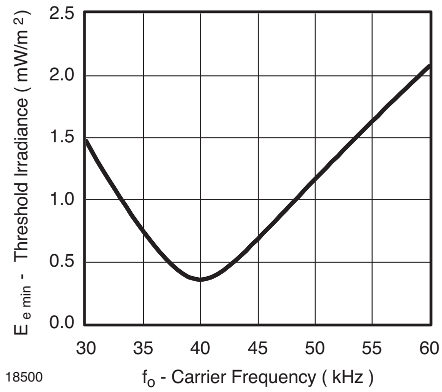


Figure 5. Frequency Dependence of Sensitivity

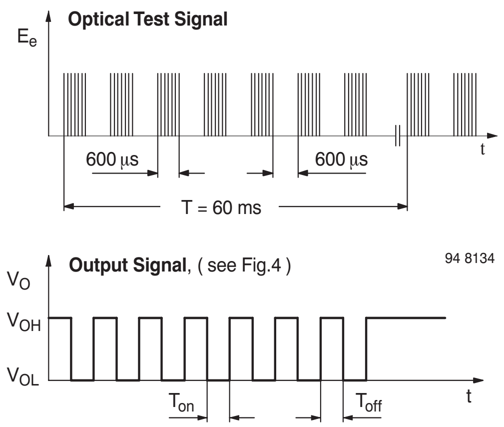


Figure 3. Output Function

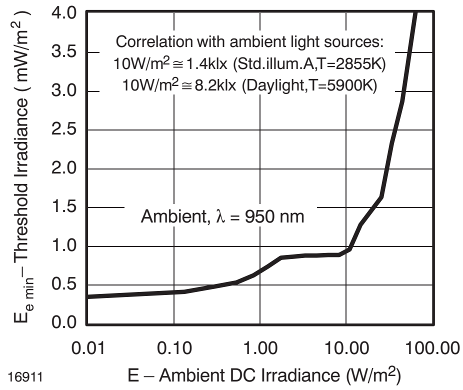


Figure 6. Sensitivity in Bright Ambient

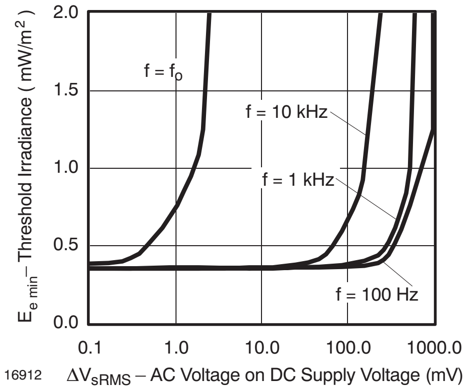


Figure 7. Sensitivity vs. Supply Voltage Disturbances

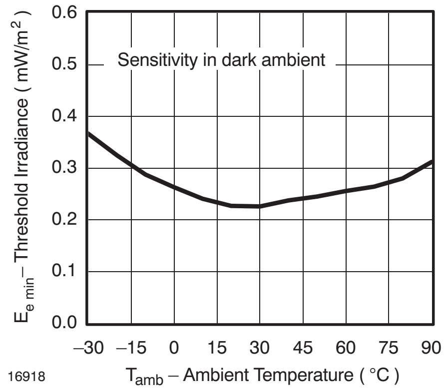


Figure 10. Sensitivity vs. Ambient Temperature

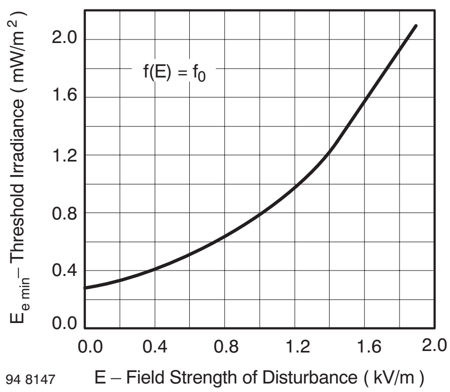


Figure 8. Sensitivity vs. Electric Field Disturbances

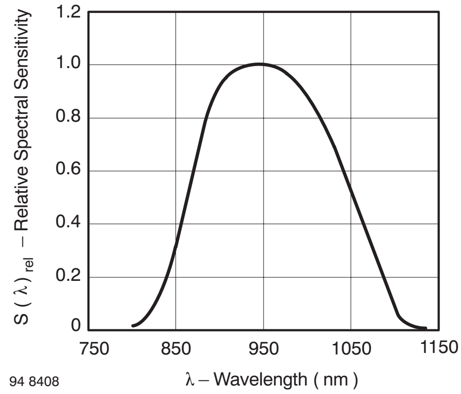


Figure 11. Relative Spectral Sensitivity vs. Wavelength

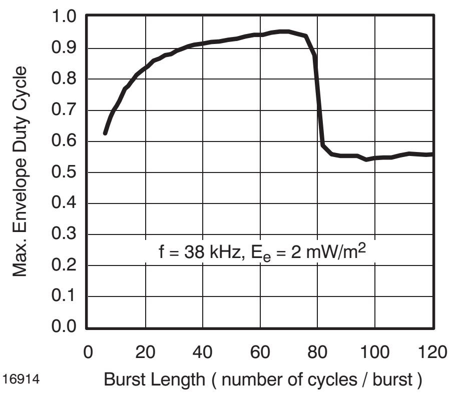


Figure 9. Max. Envelope Duty Cycle vs. Burstlength

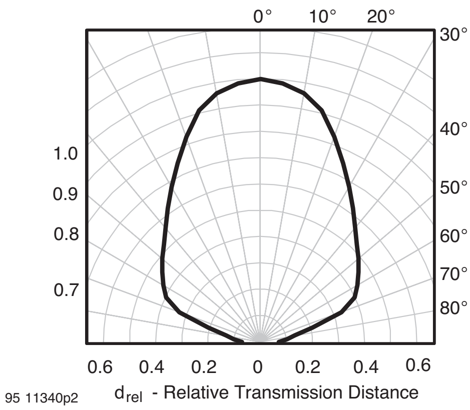


Figure 12. Horizontal Directivity φ_x

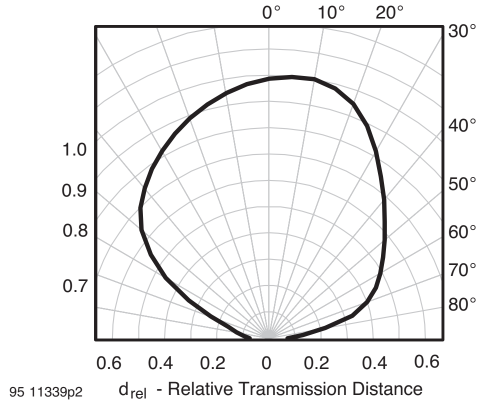


Figure 13. Vertical Directivity φ_y

Suitable Data Format

The circuit of the TSOP1100 is designed in that way that unexpected output pulses due to noise or disturbance signals are avoided. A bandpass filter, an integrator stage and an automatic gain control are used to suppress such disturbances.

The distinguishing mark between data signal and disturbance signal are carrier frequency, burst length and duty cycle.

The data signal should fulfill the following conditions:

• Carrier frequency should be close to center frequency of the bandpass
(between 33 kHz and 57 kHz).

• Burst length should be 6 cycles/burst or longer.

• After each burst which is between 6 cycles and 70 cycles a gap time of at least 10 cycles is necessary.

• For each burst which is longer than 1.8 ms a corresponding gap time is necessary at some time in the data stream. This gap time should have at least same length as the burst.

• Up to 2200 short bursts per second can be received continuously.

Some examples for suitable data format are: NEC Code, Toshiba Micom Format, Sharp Code, RC5 Code, RC6 Code, RCMM Code, R-2000 Code, RECS-80 Code.

When a disturbance signal is applied to the TSOP1100 it can still receive the data signal. However the sensitivity is reduced to that level that no unexpected pulses will occur.

Some examples for such disturbance signals which are suppressed by the TSOP1100 are:

• DC light (e.g. from tungsten bulb or sunlight)

• Continuous signal at 38 kHz or at any other frequency

• Signals from fluorescent lamps with electronic ballast (an example of the signal modulation is in the figure below).

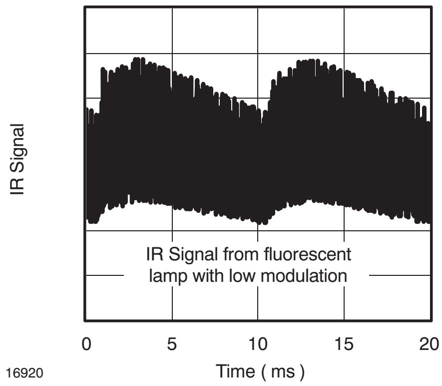
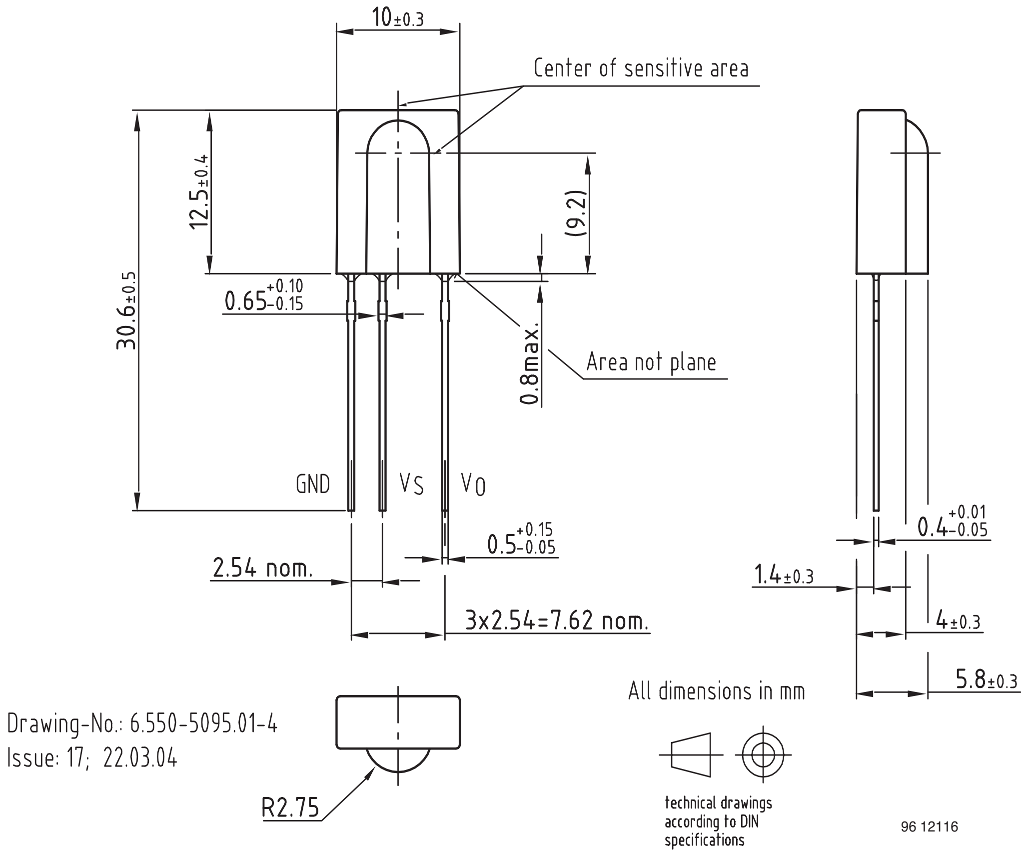


Figure 14. IR Signal from Fluorescent Lamp with low Modulation

Package Dimensions in mm



Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operatingsystems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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