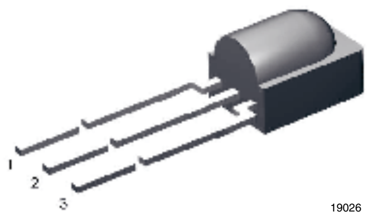
IR Receiver Modules for Remote Control Systems

Description

The TSOP591.. - 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 of the TSOP591.. is the compatibility to all kind of dataformats.



Features

- Photo detector and preamplifier in one package
- Build in filter for carrier frequency of IR signal
- Shielding against electrical field disturbance
- TTL and CMOS compatibility
- Output active low
- Low power consumption
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Special Features

- Enhanced datarate of up to 4000 bits/s
- Suitable burst length ≥ 6 cycles/burst

Mechanical Data

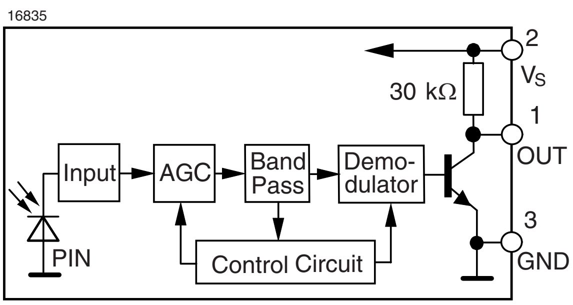
Pinning:

1 = OUT, 2 = V_S, 3 = GND

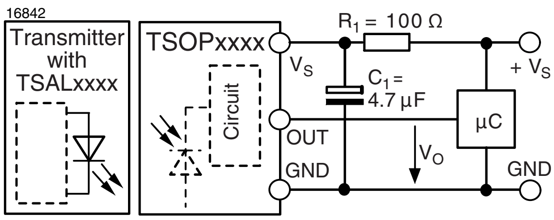
Parts Table

Part	Carrier Frequency
TSOP59130	30 kHz
TSOP59133	33 kHz
TSOP59136	36 kHz
TSOP59137	36.7 kHz
TSOP59138	38 kHz
TSOP59140	40 kHz
TSOP59156	56 kHz

Block Diagram



Application Circuit



R_1 and C_1 recommended to suppress power supply disturbances.

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

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 1)	V_O	- 0.3 to + (Vs + 0.3)	V
Output Current	(Pin 1)	I_O	10	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 3)	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		V_S	4.5		5.5	V
Transmission Distance	E_v = 0, test signal see fig. 1, IR diode TSAL6200, I_F = 400 mA	d		35		m
Output Voltage Low (Pin 1)	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m^2, test signal see fig. 1	V_{OSL}			250	mV
Minimum Irradiance (30 - 40 kHz)	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 3	$E_{e\,min}$		0.35	0.5	mW/m^2
Minimum Irradiance (56 kHz)	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 3	$E_{e\,min}$		0.4	0.6	mW/m^2
Maximum Irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 3	$E_{e\,max}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

Typical Characteristics

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

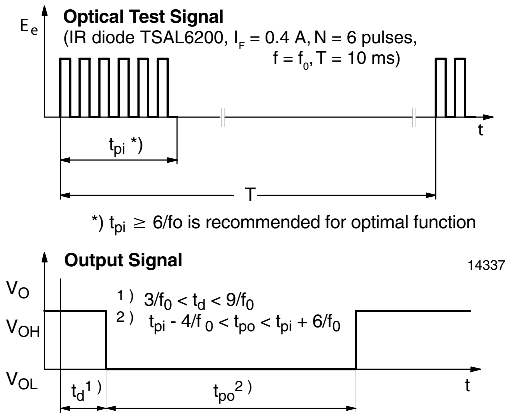


Figure 1. Output Function

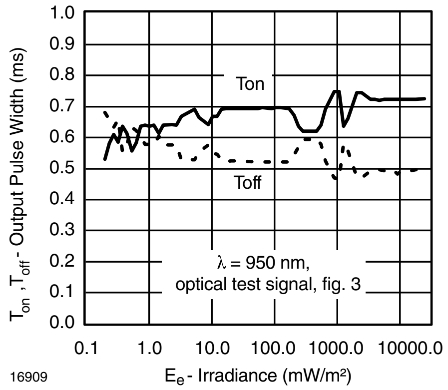


Figure 4. Output Pulse Diagram

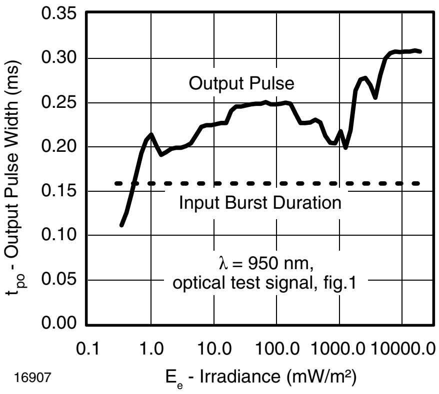


Figure 2. Pulse Length and Sensitivity in Dark Ambient

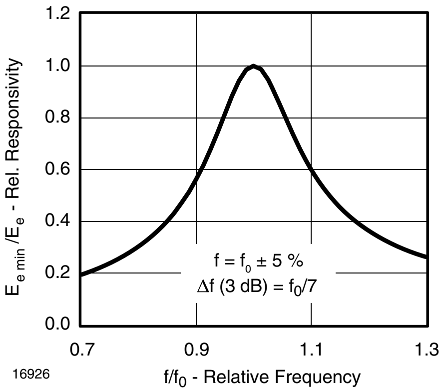


Figure 5. Frequency Dependence of Responsivity

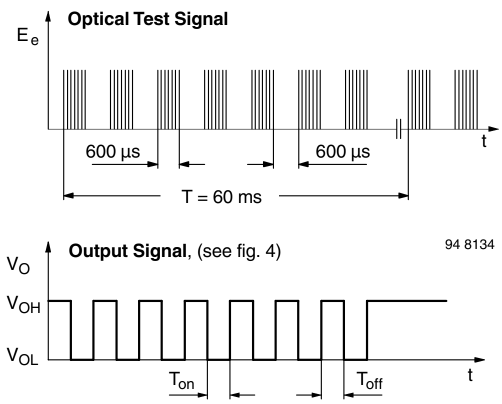


Figure 3. Output Function

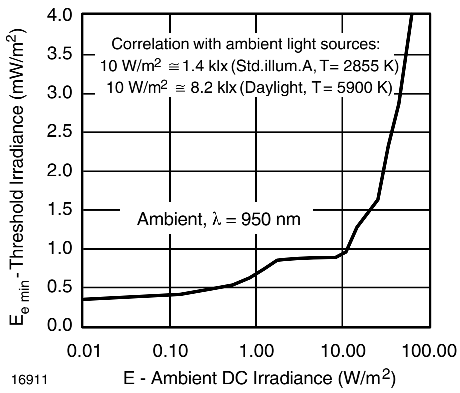


Figure 6. Sensitivity in Bright Ambient

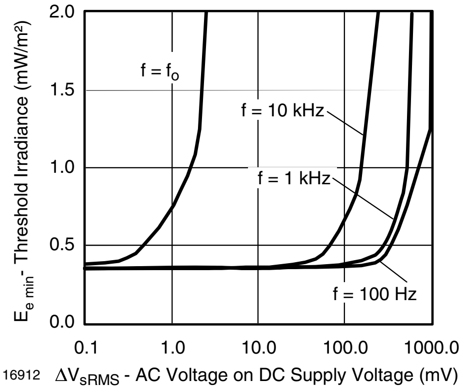


Figure 7. Sensitivity vs. Supply Voltage Disturbances

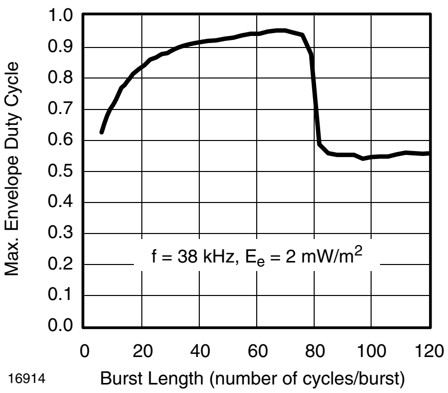


Figure 8. Max. Envelope Duty Cycle vs. Burstlength

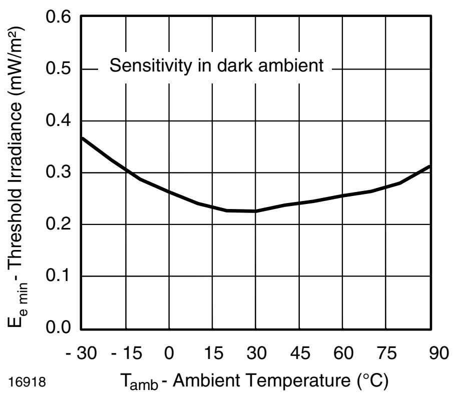


Figure 9. Sensitivity vs. Ambient Temperature

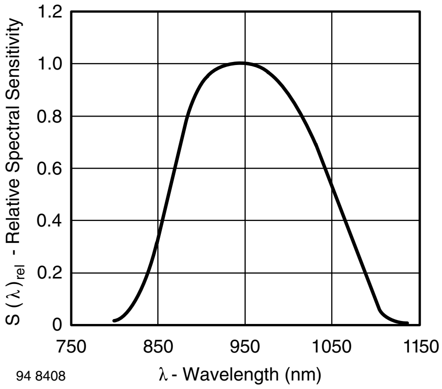


Figure 10. Relative Spectral Sensitivity vs. Wavelength

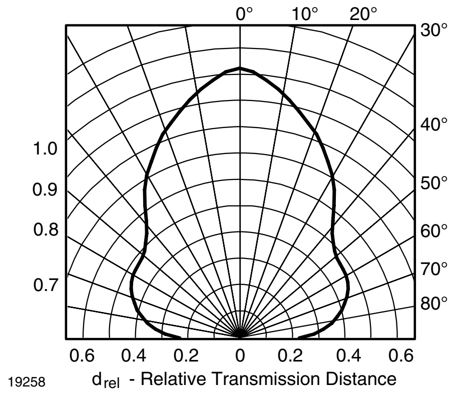


Figure 11. Horizontal Directivity φ_x

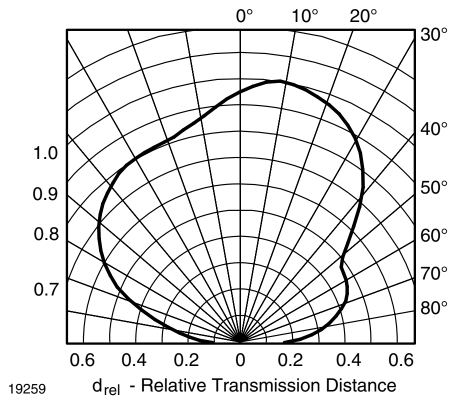


Figure 12. Vertical Directivity φ_y

Suitable Data Format

The circuit of the TSOP591.. 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 (e.g. 38 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 (repetitive pulse), NEC Code (repetitive data), Toshiba Micom Format, Sharp Code, RC5 Code, RC6 Code, R-2000 Code, Sony Code, RECS-80 Code.

When a disturbance signal is applied to the TSOP591.. it can still receive the data signal. However the sensitivity is reduced to such a level that no unexpected pulses will occur.

Some examples for such disturbance signals which are suppressed by the TSOP591.. 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 shown in Figure 13).

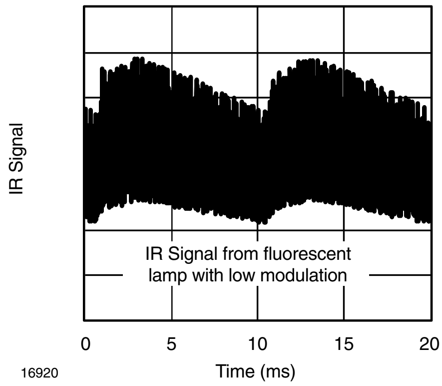
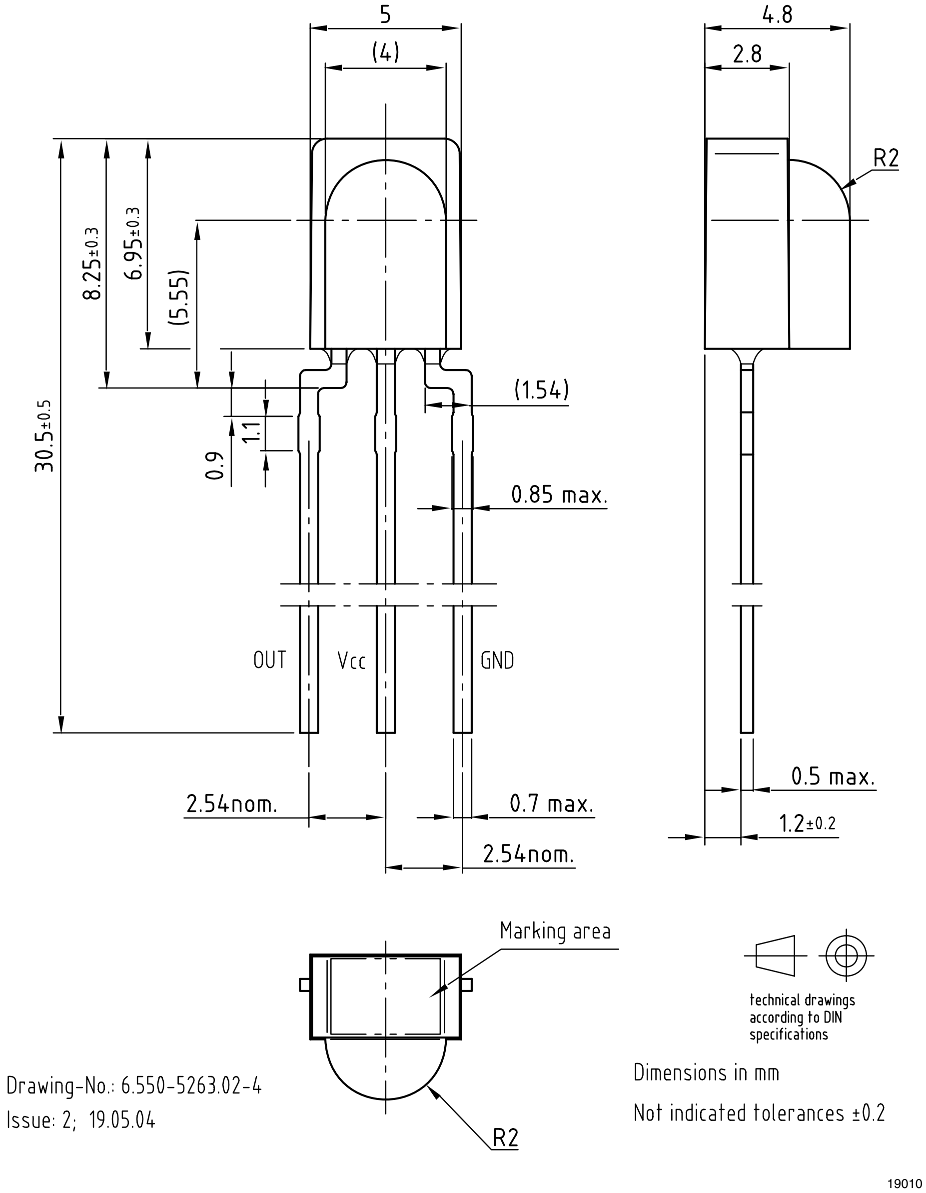


Figure 13. IR Signal from Fluorescent Lamp with low Modulation

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 operating systems 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.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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