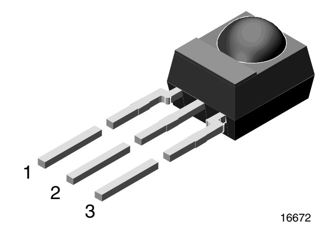
IR Receiver Modules for Remote Control Systems

Description

The TSOP32#.. series are miniaturized receivers for infrared remote control systems. A PIN diode and a preamplifier are assembled on a lead frame, the epoxy package acts as an IR filter.

The demodulated output signal can be directly decoded by a microprocessor. The TSOP321.. is compatible with all common IR remote control data formats. The TSOP323.. is optimized to better suppress spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.



Features

- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against EMI
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC
- Insensitive to supply voltage ripple and noise

Mechanical Data

Pinning:

1 = OUT, 2 = V_S, 3 = GND

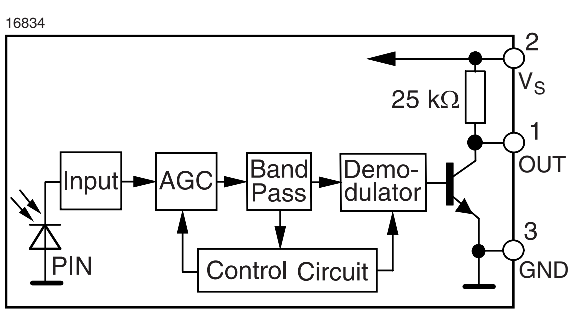
Product Matrix

Short bursts and high data rates	Short bursts and noisy environments
TSOP321..	TSOP323..

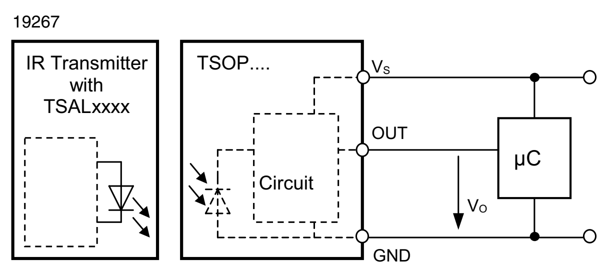
Parts Table

Part	Carrier Frequency
TSOP32#30	30 kHz
TSOP32#33	33 kHz
TSOP32#36	36 kHz
TSOP32#38	38 kHz
TSOP32#40	40 kHz
TSOP32#56	56 kHz

Block Diagram



Application Circuit



No external components are required

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	3	mA
Output voltage	(Pin 1)	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 ≤ 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)	E_v = 0, V_S = 3.3 V	I_{SD}	0.27	0.35	0.45	mA
	E_v = 40 klx, sunlight	I_{SH}		0.45		mA
Supply voltage		V_S	2.5		5.5	V
Transmission distance	E_v = 0, test signal see fig. 1, IR diode TSAL6200, I_F = 250 mA	d		45		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ min}$		0.1	0.25	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, 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

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

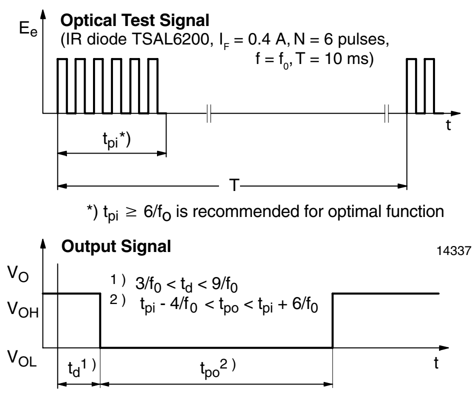


Figure 1. Output Active Low

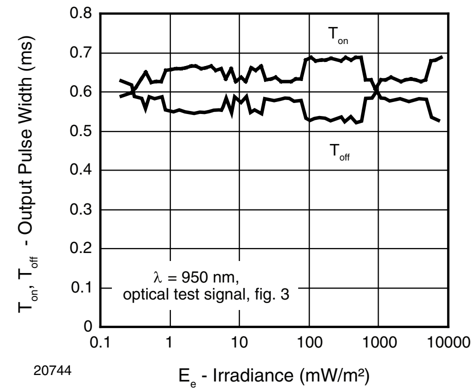


Figure 4. Output Pulse Diagram

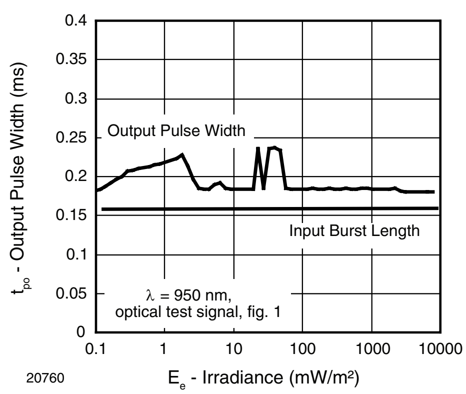


Figure 2. Pulse Length and Sensitivity in Dark Ambient

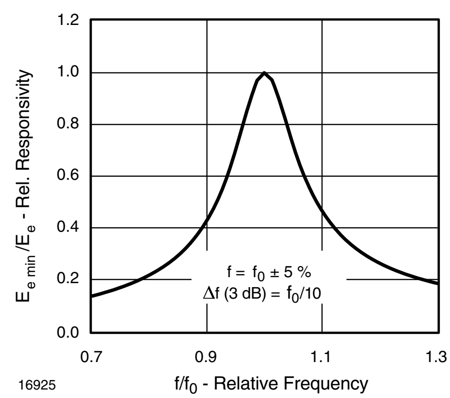


Figure 5. Frequency Dependence of Responsivity

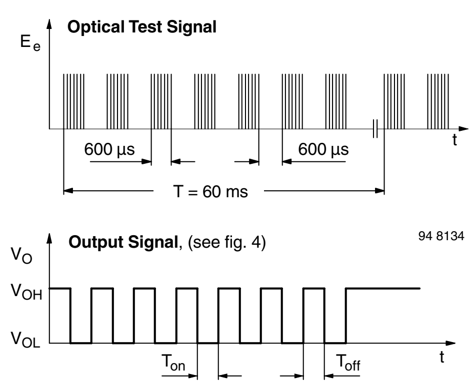


Figure 3. Output Function

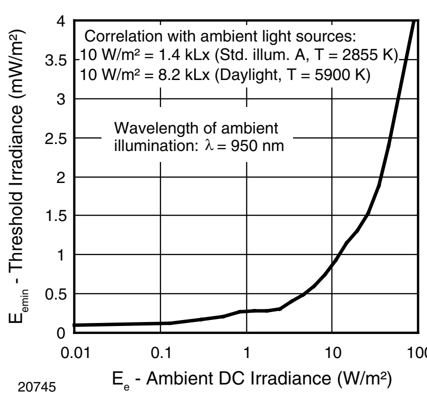


Figure 6. Sensitivity in Bright Ambient

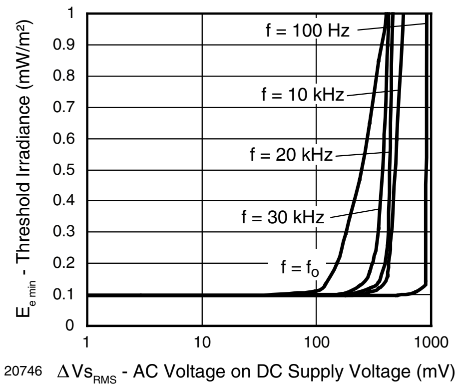


Figure 7. Sensitivity vs. Supply Voltage Disturbances

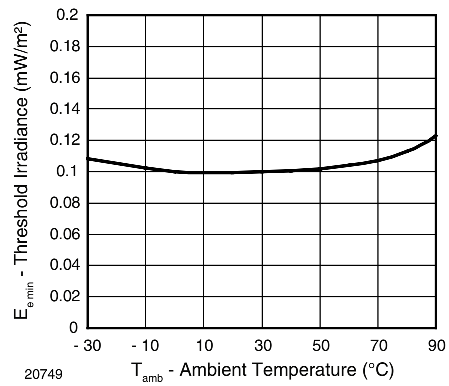


Figure 10. Sensitivity vs. Ambient Temperature

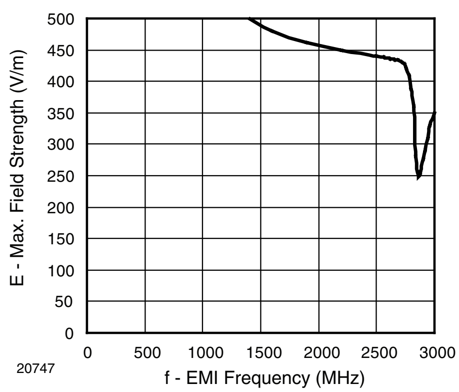


Figure 8. Sensitivity vs. Electric Field Disturbances

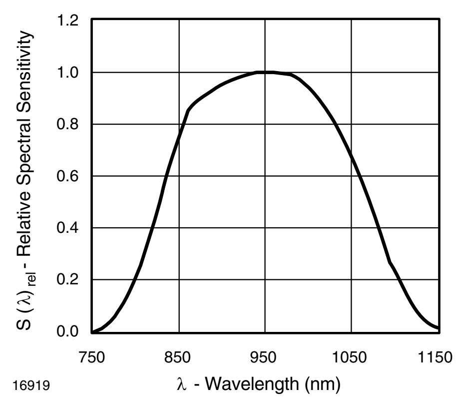


Figure 11. Relative Spectral Sensitivity vs. Wavelength

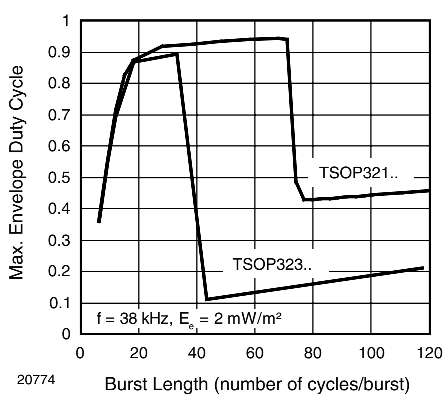


Figure 9. Max. Envelope Duty Cycle vs. Burst Length

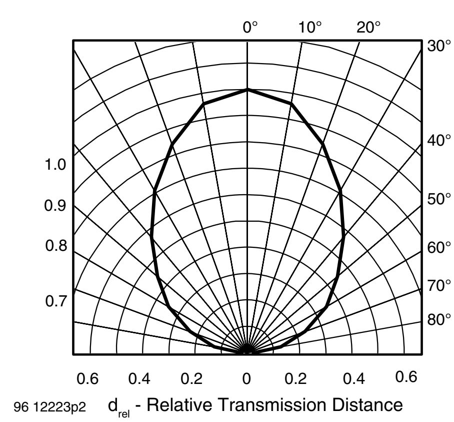


Figure 12. Directivity

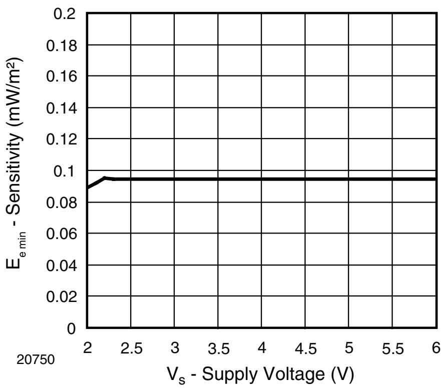


Figure 13. Sensitivity vs. Supply Voltage

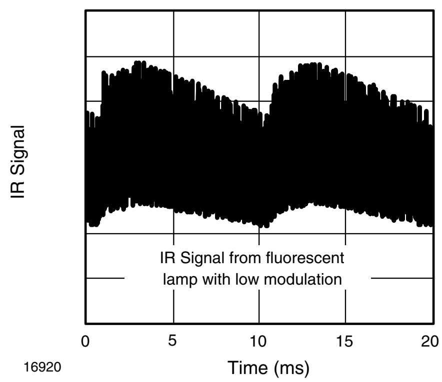


Figure 14. IR Signal from Fluorescent Lamp with Low Modulation

Suitable Data Format

The TSOP32#.. series is designed to suppress spurious output pulses due to noise or disturbance signals. Data and disturbance signals can be distinguished by the devices according to carrier frequency, burst length and envelope duty cycle. The data signal should be close to the band-pass center frequency (e.g. 38 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the TSOP32#.. in the presence of a disturbance signal, the sensitivity of the receiver is reduced to insure that no spurious pulses are present at the output. Some examples of disturbance signals which are suppressed are:

- DC light (e.g. from tungsten bulb or sunlight)
- Continuous signals at any frequency
- Modulated noise from fluorescent lamps with electronic ballasts

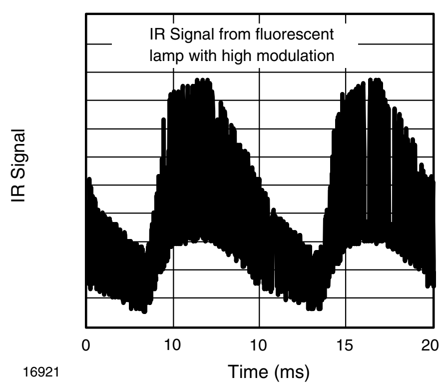
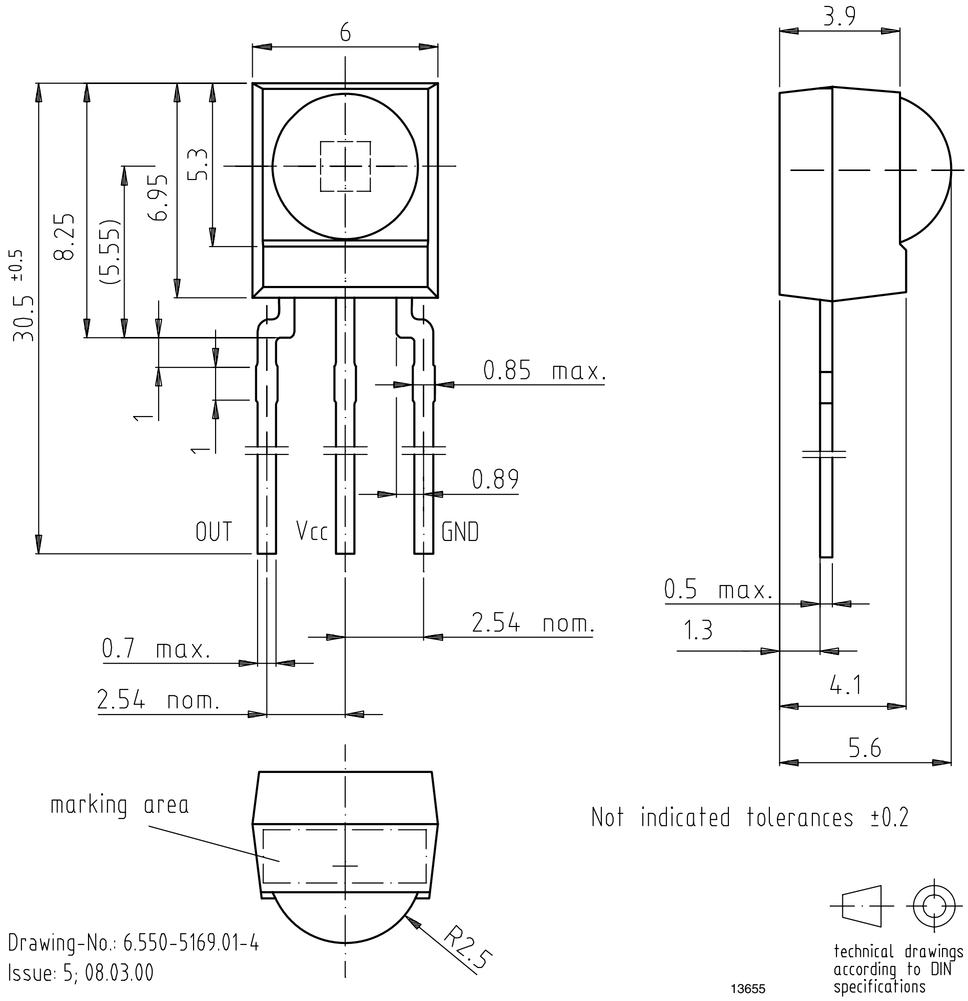


Figure 15. IR Signal from Fluorescent Lamp with High Modulation

	TSOP321..	TSOP323..
Minimum burst length	6 cycles/burst	6 cycles/burst
After each burst of length A gap time is required of	6 to 70 cycles 10 cycles	6 to 35 cycles 10 cycles
For bursts greater than A gap time in the data stream is needed of	70 cycles > 1.2 x burst length	35 cycles > 6 x burst length
Maximum continuous short bursts/second	2000	2000
Compatible to NEC code	yes	yes
Compatible to RC5/RC6 code	yes	yes
Compatible to Sony code	yes	no
Compatible to RCMM code	yes	yes
Compatible to r-step code	yes	yes
Compatible to XMP code	yes	yes
Suppression of interference from fluorescent lamps	Common disturbance signals are supressed (Example: Signal pattern of fig. 14)	Even critical disturbance signals are suppressed (Examples: Signal pattern of fig. 14 and fig. 15)

For data formats with long bursts (more than 10 carrier cycles) please see the data sheet for TSOP322../TSOP324..

Package Dimensions in millimeters



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.

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