

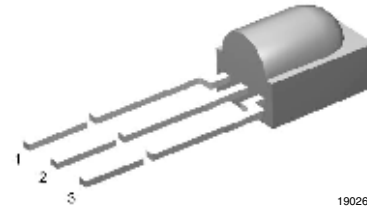
## IR Receiver Modules for Remote Control Systems

### Description

The TSOP39#.. 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 TSOP391.. is compatible with all common IR ... remote control data formats. The TSOP393.. 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.



### Mechanical Data

#### Pinning:

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

### 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



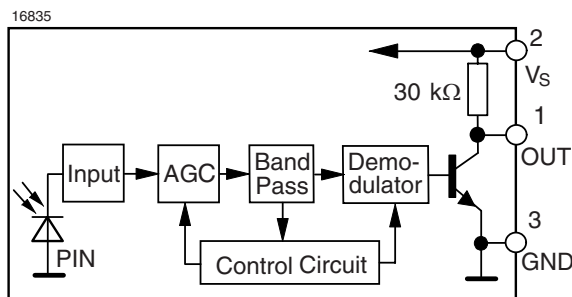
### Product Matrix

Standard applications	Very noisy environments
TSOP391..	TSOP393..

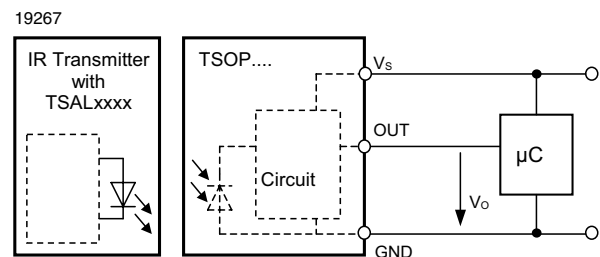
### Parts Table

Part	Carrier Frequency
TSOP39#30	30 kHz
TSOP39#33	33 kHz
TSOP39#36	36 kHz
TSOP39#38	38 kHz
TSOP39#40	40 kHz
TSOP39#56	56 kHz

### Block Diagram



### Application Circuit



No external components are required

### Absolute Maximum Ratings

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , 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	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	- 25 to + 85	$^{\circ}\text{C}$
Operating temperature range		$T_{amb}$	- 25 to + 85	$^{\circ}\text{C}$
Power consumption	( $T_{amb} \leq 85\text{ }^{\circ}\text{C}$ )	$P_{tot}$	10	mW
Soldering temperature	$t \leq 10\text{ s}$ , 1 mm from case	$T_{sd}$	260	$^{\circ}\text{C}$

### Electrical and Optical Characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Supply current (Pin 2)	$E_v = 0$ , $V_S = 3.3\text{ V}$	$I_{SD}$	0.27	0.35	0.45	mA
	$E_v = 40\text{ klx}$ , 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, $I_F = 250\text{ mA}$	$d$		45		m
Output voltage low (Pin 1)	$I_{OSL} = 0.5\text{ mA}$ , $E_e = 0.7\text{ mW/m}^2$ , test signal see fig. 1	$V_{OSL}$			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$ , test signal see fig. 1	$E_{e\ min}$		0.15	0.35	$\text{mW/m}^2$
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$ , test signal see fig. 1	$E_{e\ max}$	30			$\text{W/m}^2$
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		$\pm 45$		deg

### Typical Characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

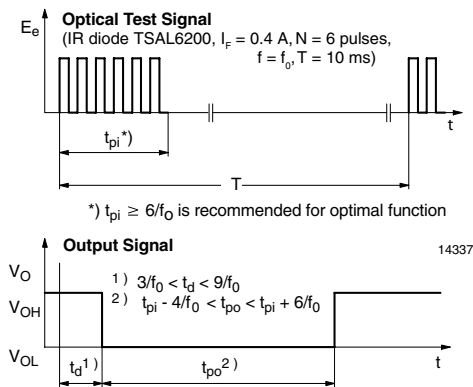


Figure 1. Output Active Low

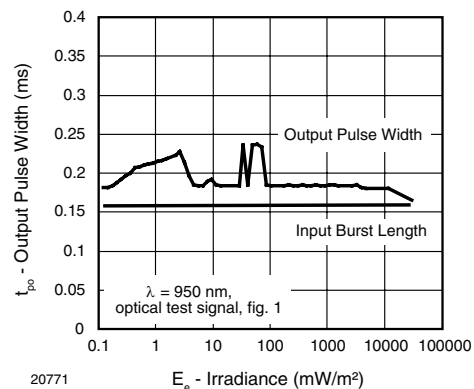


Figure 2. Pulse Length and Sensitivity in Dark Ambient

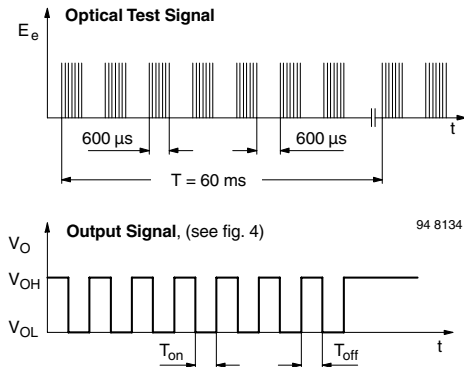


Figure 3. Output Function

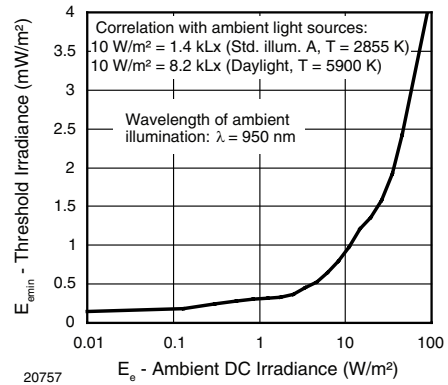


Figure 6. Sensitivity in Bright Ambient

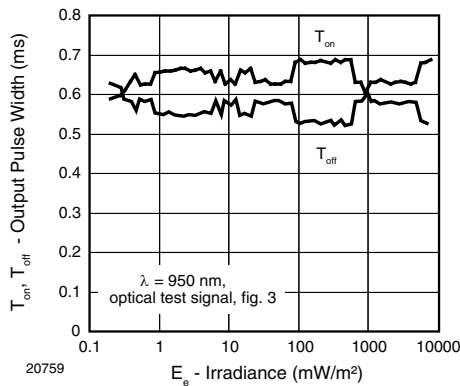


Figure 4. Output Pulse Diagram

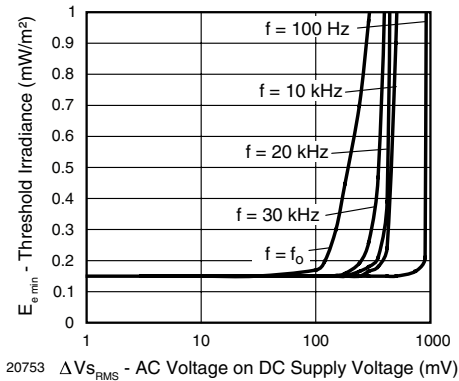


Figure 7. Sensitivity vs. Supply Voltage Disturbances

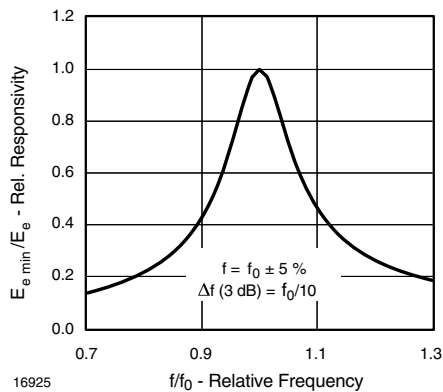


Figure 5. Frequency Dependence of Responsivity

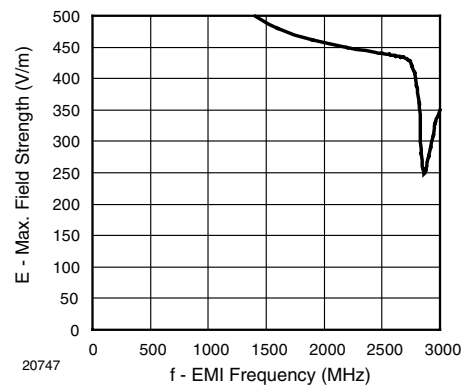


Figure 8. Sensitivity vs. Electric Field Disturbances

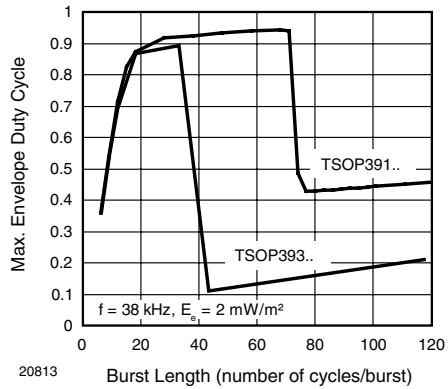


Figure 9. Max. Envelope Duty Cycle vs. Burst Length

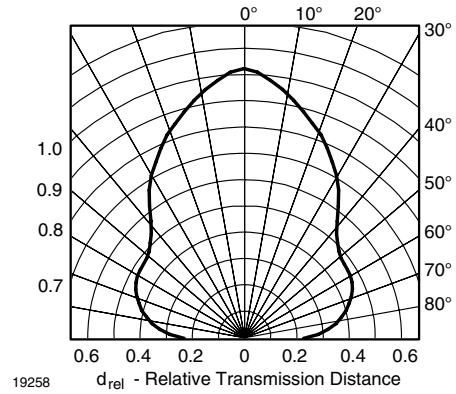


Figure 12. Horizontal Directivity

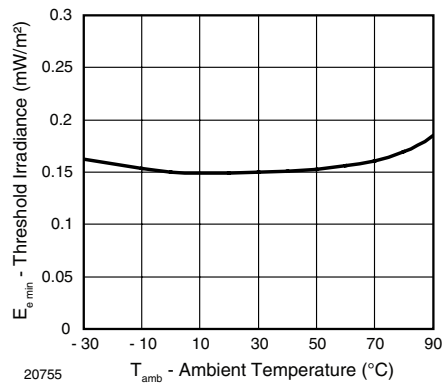


Figure 10. Sensitivity vs. Ambient Temperature

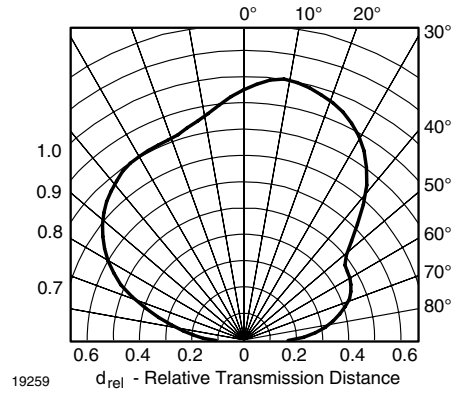


Figure 13. Vertical Directivity

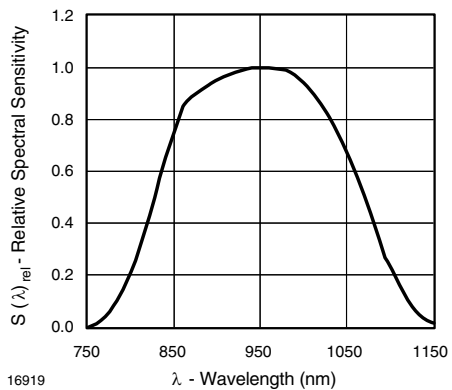


Figure 11. Relative Spectral Sensitivity vs. Wavelength

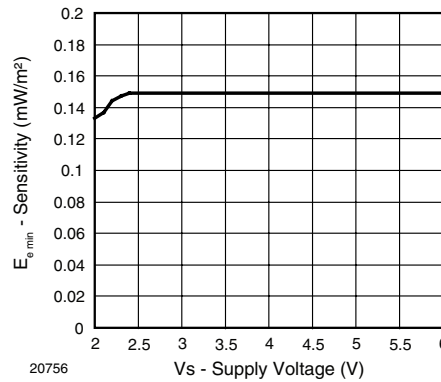


Figure 14. Sensitivity vs. Supply Voltage

## Suitable Data Format

The TSOP39#.. 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 TSOP39#.. 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

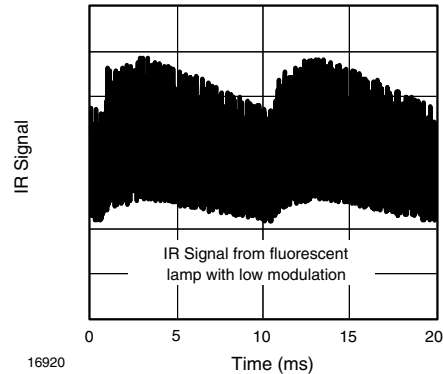


Figure 15. IR Signal from Fluorescent Lamp with low Modulation

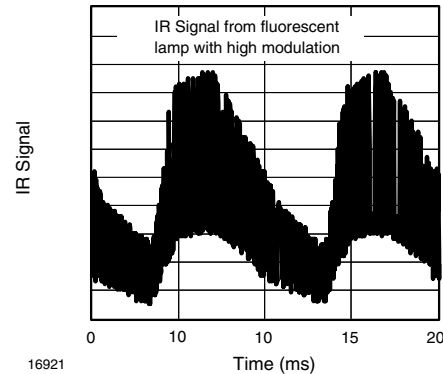


Figure 16. IR Signal from Fluorescent Lamp with high Modulation

	TSOP391..	TSOP393..
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 suppressed (Example: Signal pattern of fig. 15)	Even critical disturbance signals are suppressed (Examples: Signal pattern of fig. 15 and fig. 16)

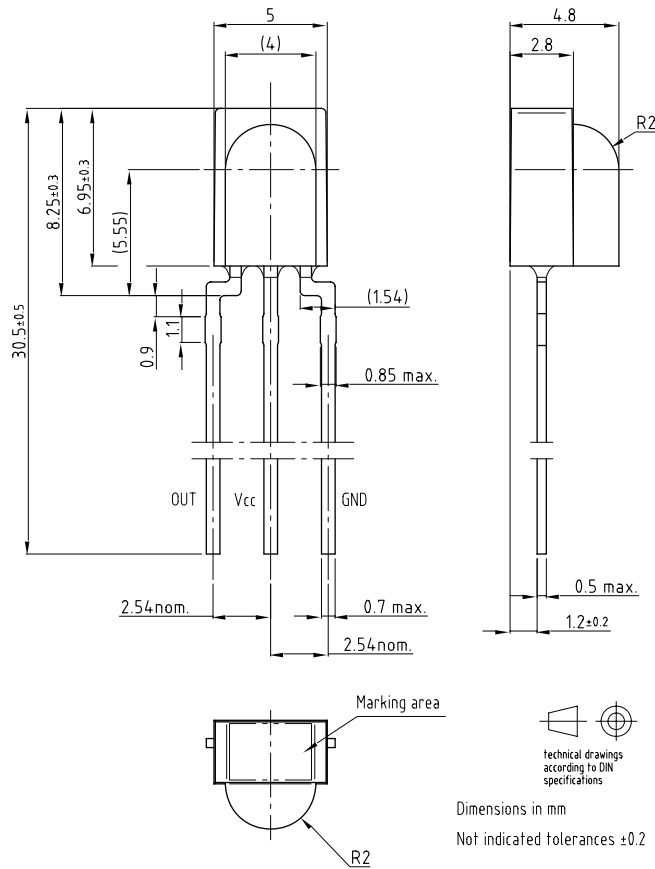
For data formats with long bursts (more than 10 carrier cycles) please see the data sheet for TSOP392../TSOP394..

# New TSOP391../TSOP393..

Vishay Semiconductors



## Package Dimensions in millimeters



Drawing-No.: 6.550-5263.02-4  
 Issue: 5; 18.07.06  
 19010

Drawing refers to following types: TSOP 92...  
 TSOP1 92...  
 TSOP3 92...  
 TSOP5 92...



## 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.

We reserve the right to make changes to improve technical design  
and may do so without further notice.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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



## Notice

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.