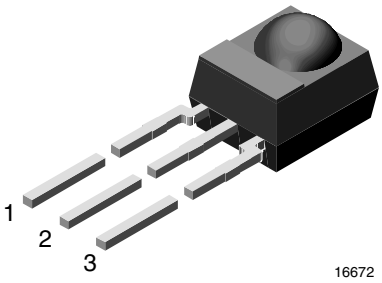
IR Receiver Modules for Remote Control Systems



FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free
e3
RoHS COMPLIANT
GREEN (5-2008)

MECHANICAL DATA

Pinning for TSOP41.., TSOP43..:

1 = OUT, 2 = GND, 3 = V_S

Pinning for TSOP21.., TSOP23..:

1 = OUT, 2 = V_S, 3 = GND

DESCRIPTION

These products 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.

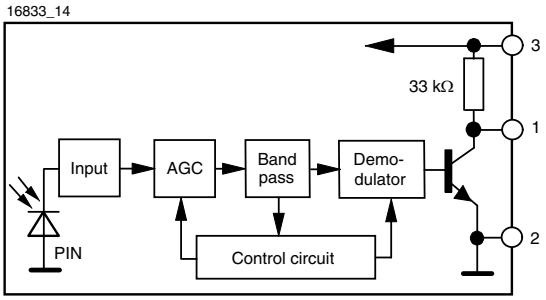
The demodulated output signal can directly be decoded by a microprocessor. The main benefit of the TSOP41.., TSOP21.. is the compatibility to all IR remote control data formats. The TSOP43.., TSOP23.. are optimized to better suppress spurious pulses from fluorescent lamps, LCD TVs or plasma displays.

This component has not been qualified according to automotive specifications.

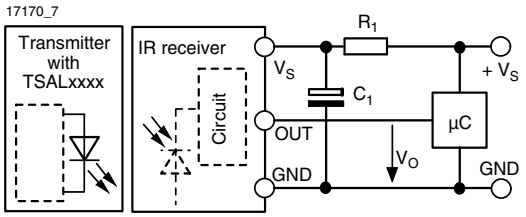
PARTS TABLE

CARRIER FREQUENCY	SHORT BURST AND HIGH DATA RATE (AGC1)		NOISY ENVIROMENTS AND SHORT BURSTS (AGC3)	
	PINNING			
	1 = OUT, 2 = GND, 3 = V_S	1 = OUT, 2 = V_S, 3 = GND	1 = OUT, 2 = GND, 3 = V_S	1 = OUT, 2 = V_S, 3 = GND
30 kHz	TSOP4130	TSOP2130	TSOP4330	TSOP2330
33 kHz	TSOP4133	TSOP2133	TSOP4333	TSOP2333
36 kHz	TSOP4136	TSOP2136	TSOP4336	TSOP2336
38 kHz	TSOP4138	TSOP2138	TSOP4338	TSOP2338
40 kHz	TSOP4140	TSOP2140	TSOP4340	TSOP2340
56 kHz	TSOP4156	TSOP2156	TSOP4356	TSOP2356

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 Ω, C_1 = 0.1 µF).
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		V_S	- 0.3 to + 6	V
Supply current		I_S	5	mA
Output voltage		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		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

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 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current	E_v = 0, V_S = 5 V	I_{SD}	0.65	0.85	1.05	mA
	E_v = 40 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, IR diode TSAL6200, I_F = 400 mA	d		45		m
Output voltage low	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², 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	$E_{e\ min.}$		0.17	0.35	mW/m²
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m²
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

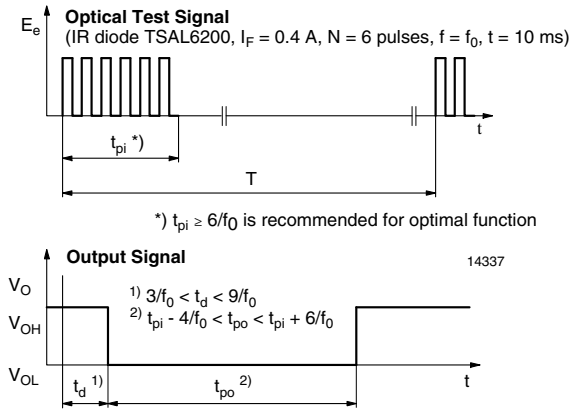


Fig. 1 - Output Active Low

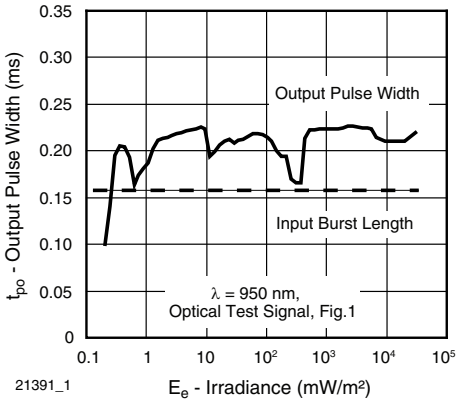


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

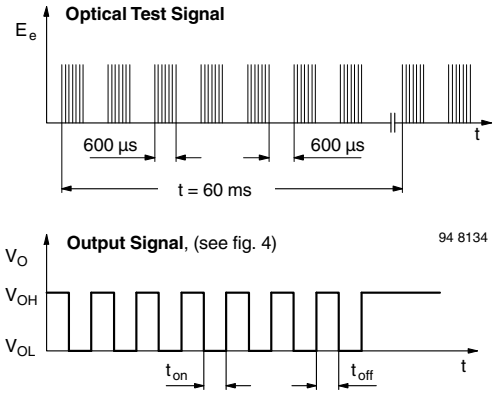


Fig. 3 - Output Function

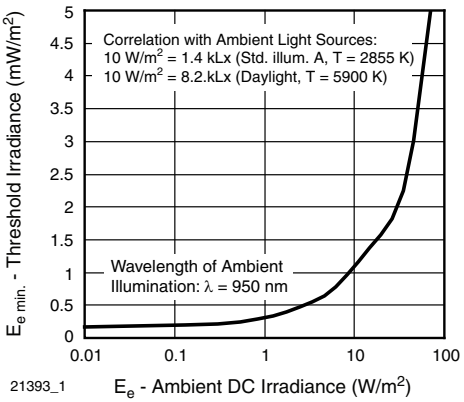


Fig. 6 - Sensitivity in Bright Ambient

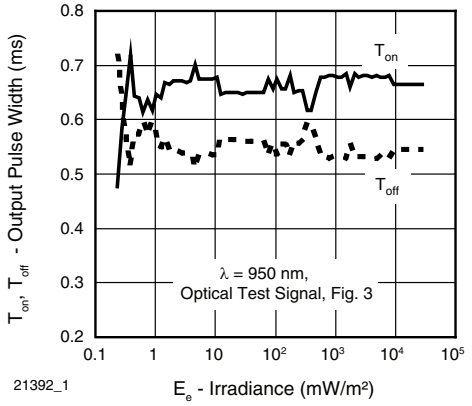


Fig. 4 - Output Pulse Diagram

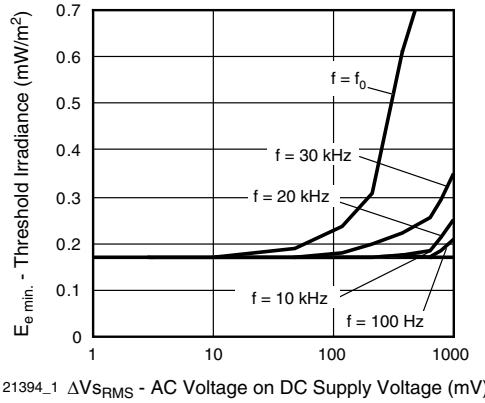


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

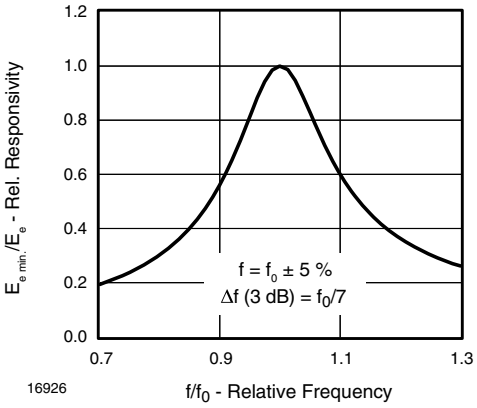


Fig. 5 - Frequency Dependence of Responsivity

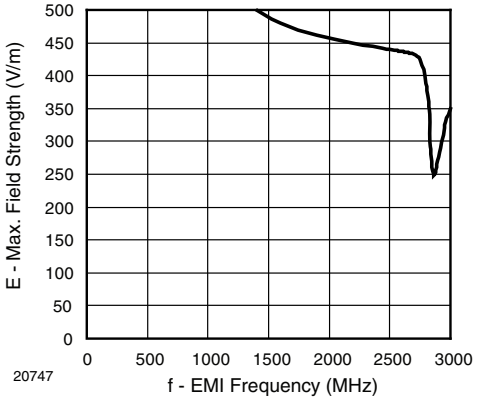


Fig. 8 - Sensitivity vs. Electric Field Disturbances

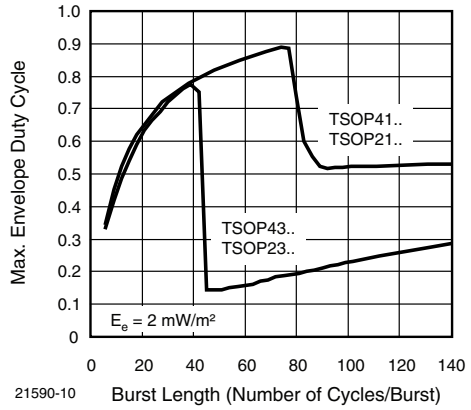


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

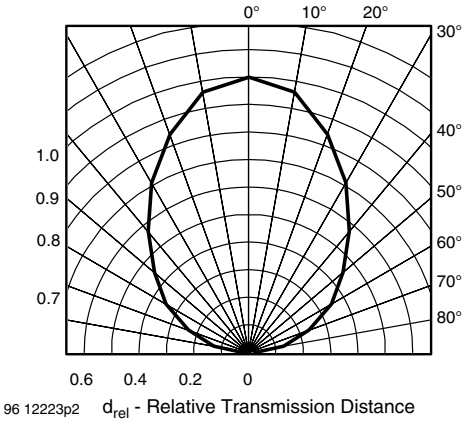


Fig. 12 - Horizontal Directivity

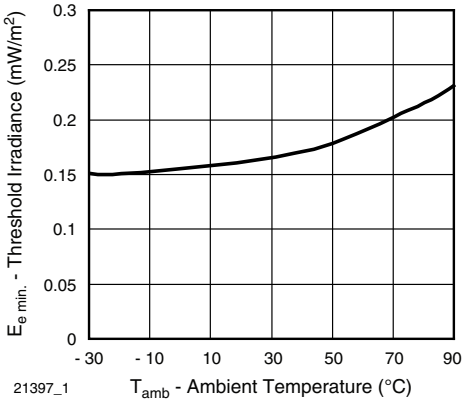


Fig. 10 - Sensitivity vs. Ambient Temperature

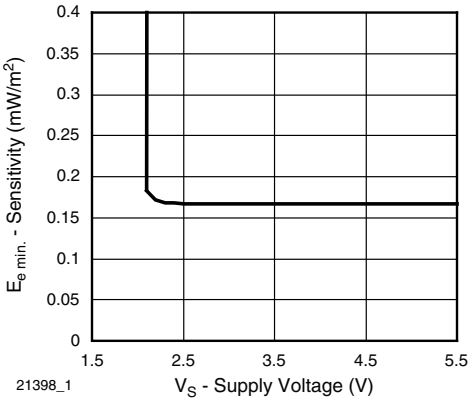


Fig. 13 - Sensitivity vs. Supply Voltage

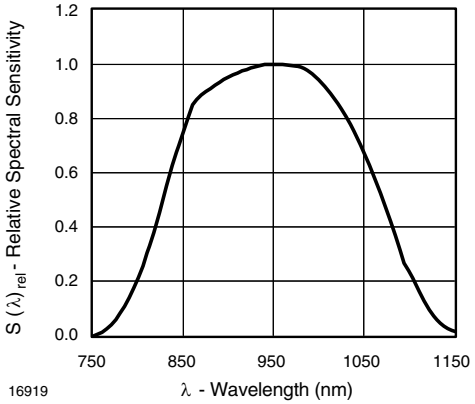


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

These products are 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 IR receiver 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 (see figure 14 or figure 15)

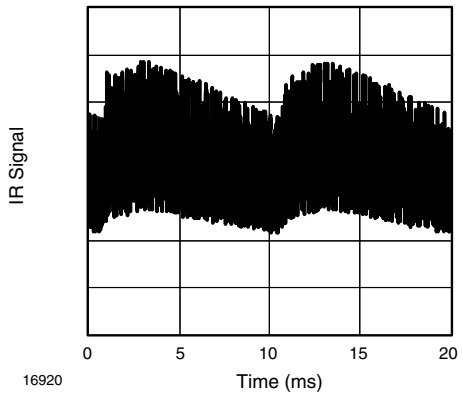


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

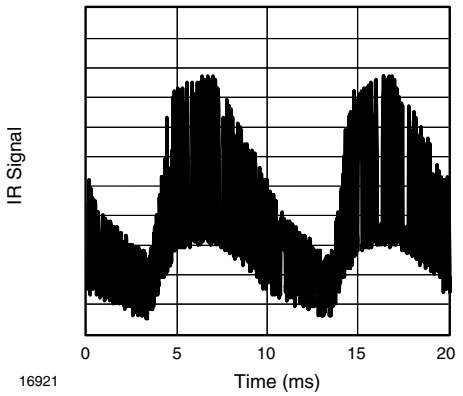


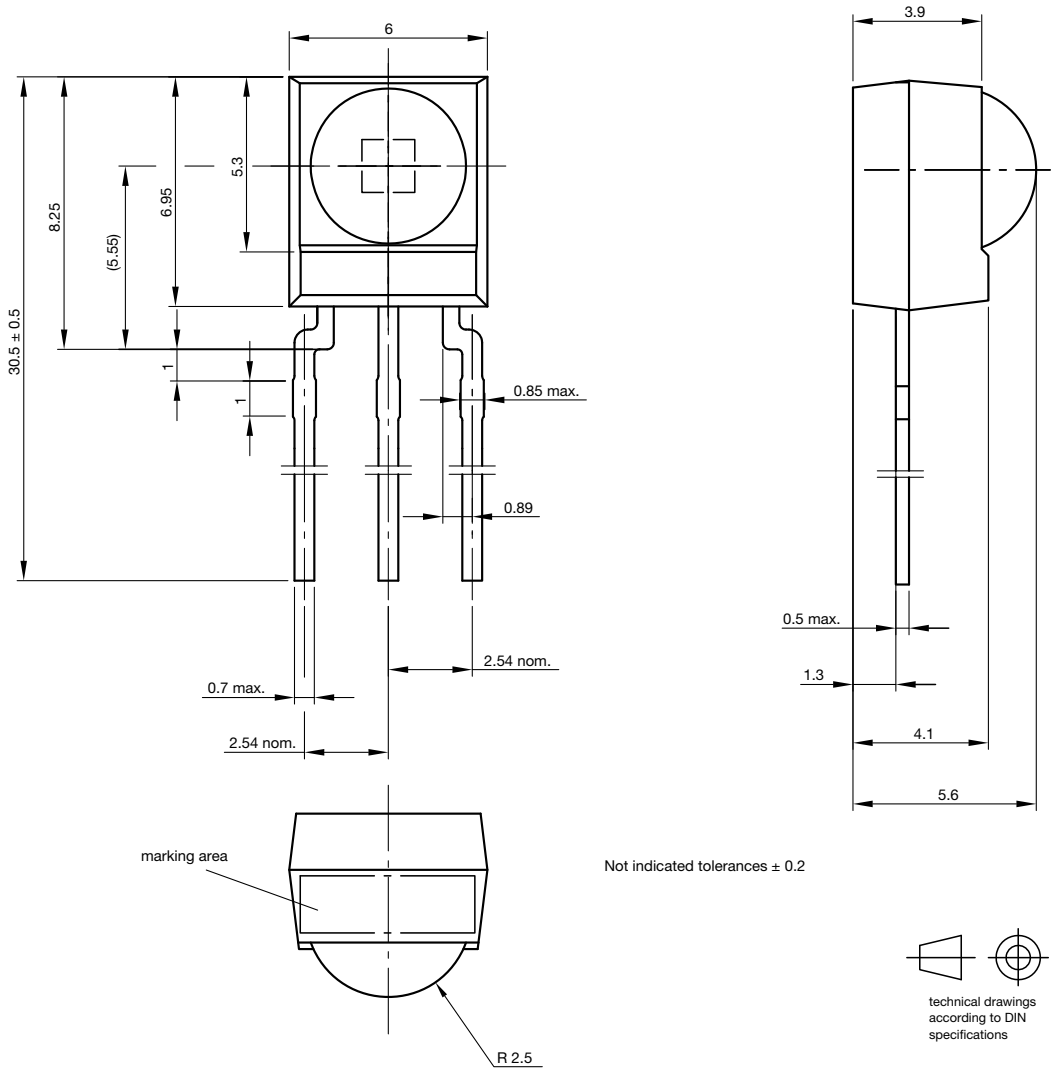
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP41.., TSOP21..	TSOP43.., TSOP23..
Minimum burst length	6 cycles/burst	6 cycles/burst
After each burst of length a minimum gap time is required of	6 to 70 cycles ≥ 10 cycles	6 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 1.1 x burst length	35 cycles > 6 x burst length
Maximum number of continuous short bursts/second	2000	2000
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for RECS-80 code	yes	yes
Recommended for RCMM code	yes	yes
Recommended for r-step code	yes	yes
Recommended for 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)

Note

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP22.., TSOP48.., TSOP24.., TSOP44..

PACKAGE DIMENSIONS in millimeters



Not indicated tolerances ± 0.2

technical drawings
according to DIN
specifications

Drawing-No.: 6.550-5169.01-4
Issue: 9; 03.11.10
13655

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