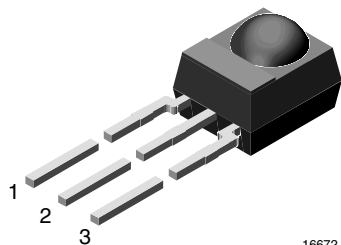# IR Receiver Modules for Remote Control Systems

16672

MECHANICAL DATA

Pinning for TSOP44.., TSOP48..:

1 = OUT, 2 = GND, 3 = V_S

Pinning for TSOP22.., TSOP24..:

1 = OUT, 2 = V_S, 3 = GND

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
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3
RoHS
COMPLIANT
GREEN
(5-2008)**

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 be directly decoded by a microprocessor. The TSOP22.., TSOP48.. are compatible with all common IR remote control data formats. The TSOP24.., TSOP44.. are optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2)		VERY NOISY ENVIRONMENTS (AGC4)	
	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	TSOP4830	TSOP2230	TSOP4430	TSOP2430
33 kHz	TSOP4833	TSOP2233	TSOP4433	TSOP2433
36 kHz	TSOP4836	TSOP2236	TSOP4436	TSOP2436
38 kHz	TSOP4838	TSOP2238	TSOP4438	TSOP2438
40 kHz	TSOP4840	TSOP2240	TSOP4440	TSOP2440
56 kHz	TSOP4856	TSOP2256	TSOP4456	TSOP2456

BLOCK DIAGRAM

16833_14
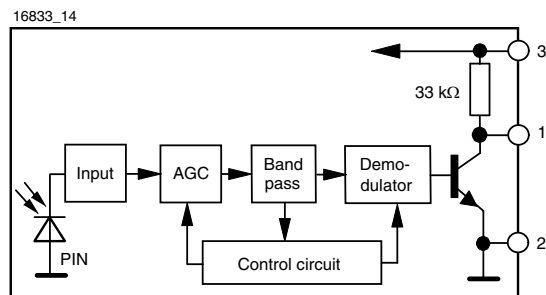
APPLICATION CIRCUIT

17170_7
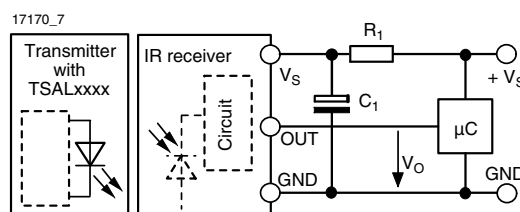
The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

** Please see document "Vishay Material Category Policy": www.vishay.com/doc?99902

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	$t \leq 10$ 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 condtions 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/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	$E_{e\ min.}$		0.17	0.35	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

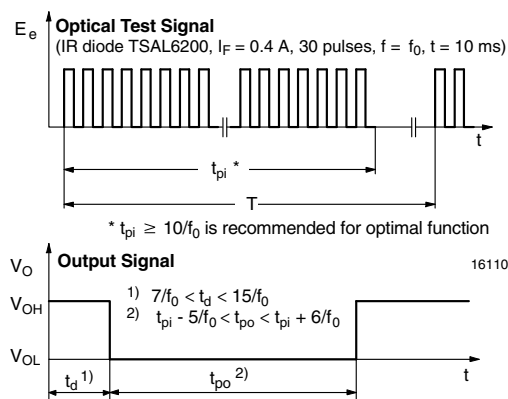## TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)
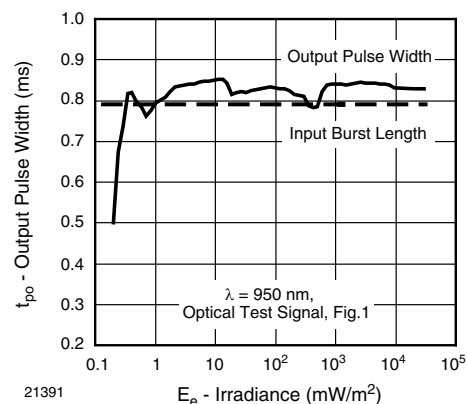

Fig. 1 - Output Active Low

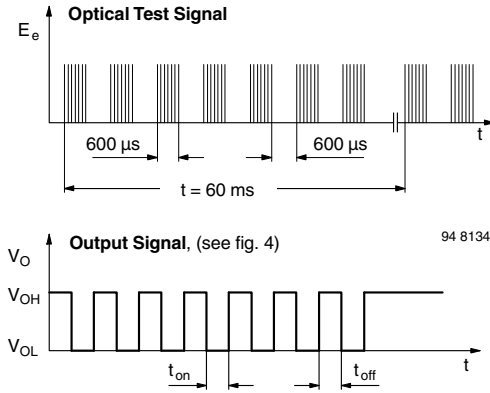Fig. 2 - Pulse Length and Sensitivity in Dark Ambient
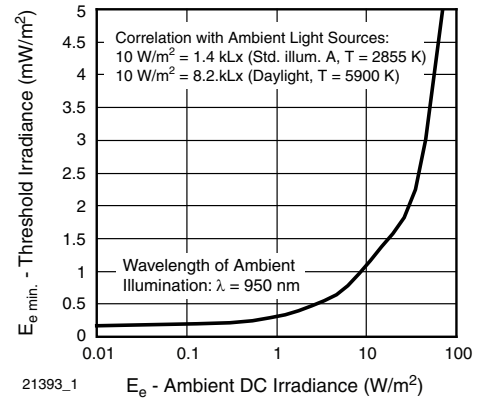
Fig. 3 - Output Function

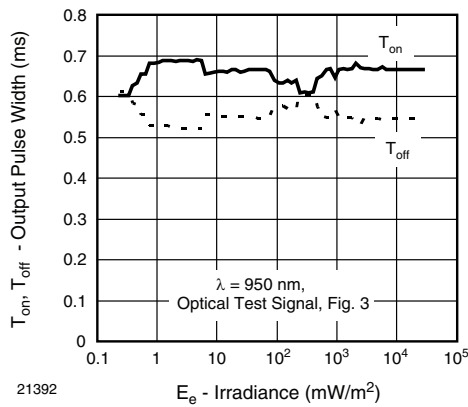Fig. 6 - Sensitivity in Bright Ambient

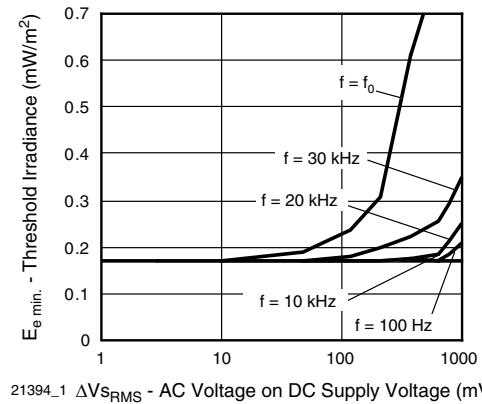Fig. 4 - Output Pulse Diagram

Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

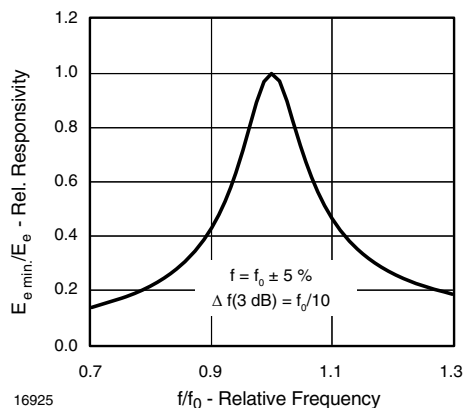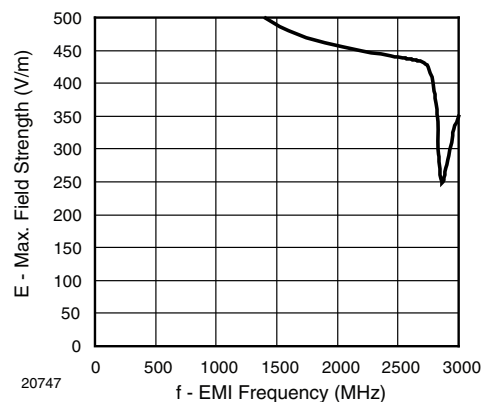Fig. 5 - Frequency Dependence of Responsivity

Fig. 8 - Sensitivity vs. Electric Field Disturbances

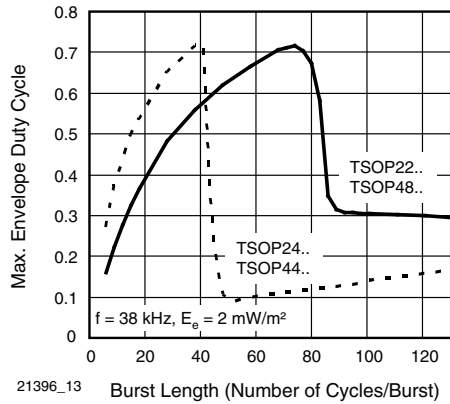Document Number: 82090

Rev. 2.8, 04-Feb-11

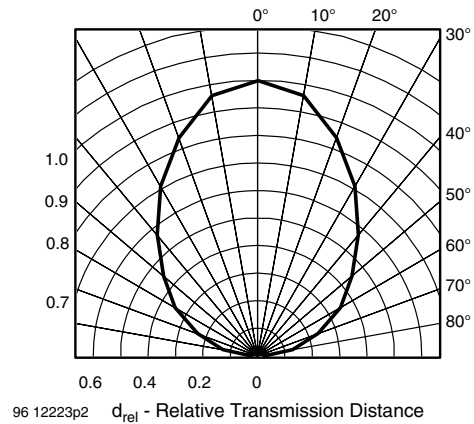Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length
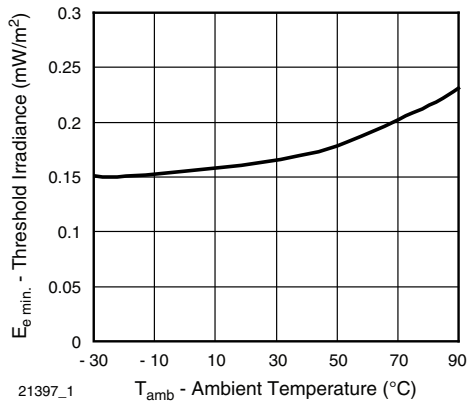
Fig. 12 - Horizontal Directivity

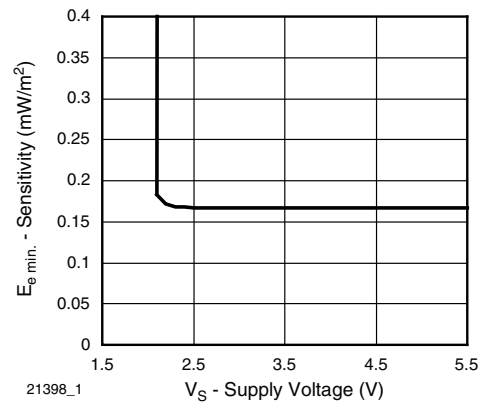Fig. 10 - Sensitivity vs. Ambient Temperature
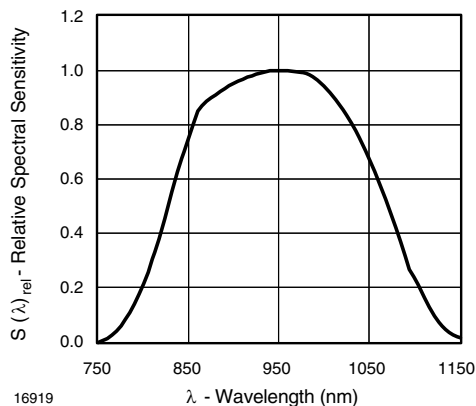
Fig. 13 - Sensitivity vs. Supply Voltage

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 IR signals from common fluorescent lamps (example of noise pattern is shown in fig. 14 or fig. 15)
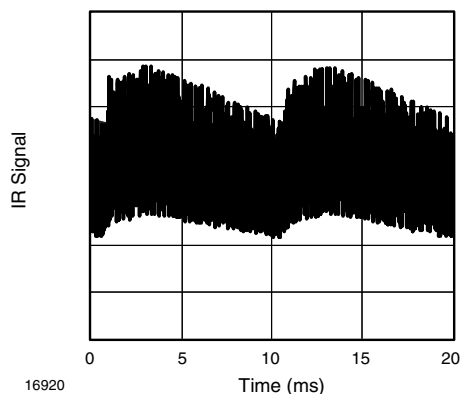
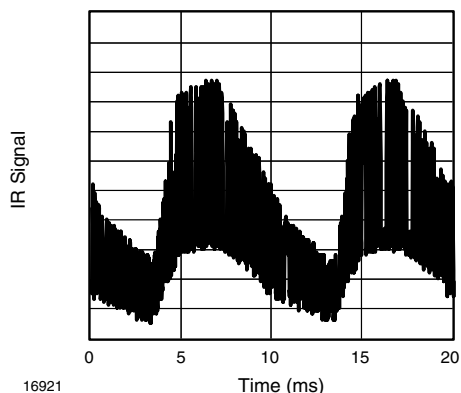Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

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

	TSOP22.., TSOP48..	TSOP24.., TSOP44..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 12 cycles	10 to 35 cycles ≥ 12 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	800	1300
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	yes
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

Note

• For data formats with short bursts please see the datasheet of TSOP23.., TSOP43..

PACKAGE DIMENSIONS in millimeters

6

5.3

8.25

6.95

(5.55)

30.5 ± 0.5

1

1

0.85 max.

0.89

2.54 nom.

0.7 max.

2.54 nom.

3.9

0.5 max.

1.3

4.1

5.6

Not indicated tolerances ± 0.2

marking area

R 2.5

technical drawings
according to DIN
specifications
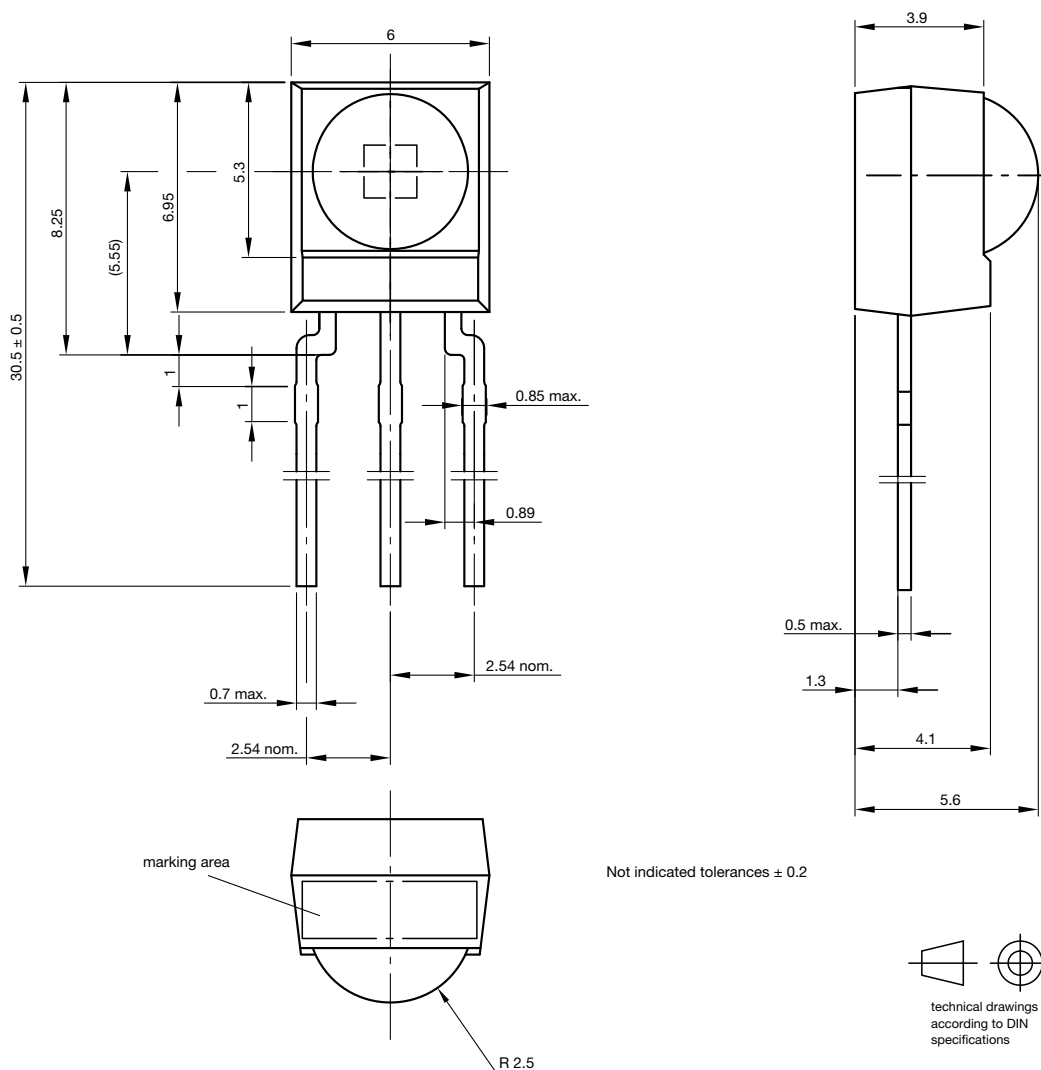
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Issue: 9;   03.11.10
13655

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