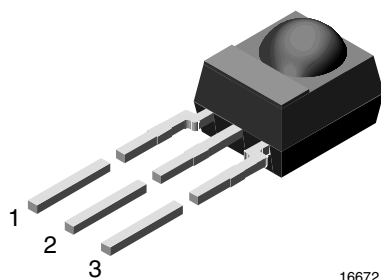




IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning for TSOP41.., TSOP43.., TSOP45..:

1 = OUT, 2 = GND, 3 = V_S

Pinning for TSOP21.., TSOP23.., TSOP25..:

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: 2.5 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



RoHS
COMPLIANT
HALOGEN
FREE
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 connected to a microprocessor for decoding. The TSOP21.., TSOP41.. are legacy products compatible with all common IR remote control data formats. The TSOP23.., TSOP43 are optimized to better suppress spurious pulses from energy saving fluorescent lamps. The TSOP25.., TSOP45.. have an excellent noise suppression. They are immune to dimmed LCD backlighting and any fluorescent lamps. AGC3 and AGC5 may also suppress some data signals in case of continuous transmission. Between these three receiver types, the TSOP23.., TSOP43.. are preferred. Customers should initially try the TSOP23.., TSOP43.. in their design.

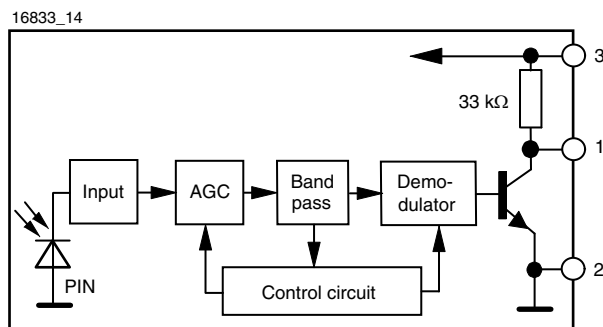
This component has not been qualified according to automotive specifications.

PARTS TABLE

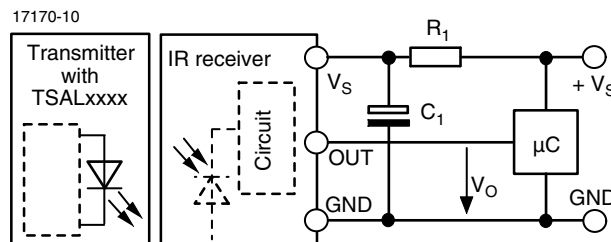
AGC		LEGACY, FOR SHORT BURST REMOTE CONTROLS (AGC1)		NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)		VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)	
Carrier frequency	30 kHz	TSOP4130	TSOP2130	TSOP4330	TSOP2330	TSOP4530	TSOP2530
	33 kHz	TSOP4133	TSOP2133	TSOP4333	TSOP2333	TSOP4533	TSOP2533
	36 kHz	TSOP4136	TSOP2136	TSOP4336	TSOP2336 (1)(2)	TSOP4536	TSOP2536 (1)(2)
	38 kHz	TSOP4138	TSOP2138	TSOP4338	TSOP2338 (3)(4)(5)(6)	TSOP4538	TSOP2538 (3)(4)(5)
	40 kHz	TSOP4140	TSOP2140	TSOP4340	TSOP2340	TSOP4540	TSOP2540
	56 kHz	TSOP4156	TSOP2156	TSOP4356	TSOP2356	TSOP4556	TSOP2556
Package		Mold					
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	1 = OUT, 2 = GND, 3 = V_S	1 = OUT, 2 = V_S , 3 = GND
Dimensions (mm)		6.0 W x 6.95 H x 5.6 D					
Mounting		Leaded					
Application		Remote control					
Best remote control code		(1) MCIR (2) RCMM (3) Mitsubishi (4) RECS-80 Code (5) r-map (6) XMP-1, XMP-2					



BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are $R_1 = 100 \Omega$, $C_1 = 0.1 \mu F$).

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	$T_{amb} \leq 85^\circ C$	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 conditions for extended periods may affect the device reliability.

ELECTRICAL AND OPTICAL CHARACTERISTICS ($T_{amb} = 25^\circ C$, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.55	0.7	0.9	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.8		mA
Supply voltage		V_S	2.5		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 200$ 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	$E_{e \text{ min.}}$		0.12	0.25	mW/m ²
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e \text{ max.}}$	50			W/m ²
Directivity	Angle of half transmission distance	$\phi_{1/2}$		± 45		deg



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

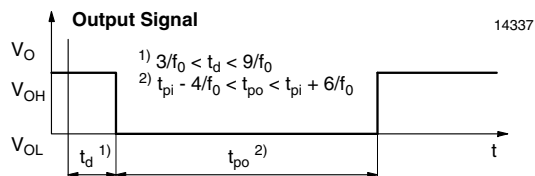
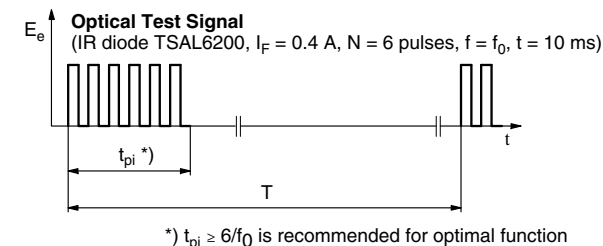


Fig. 1 - Output Active Low

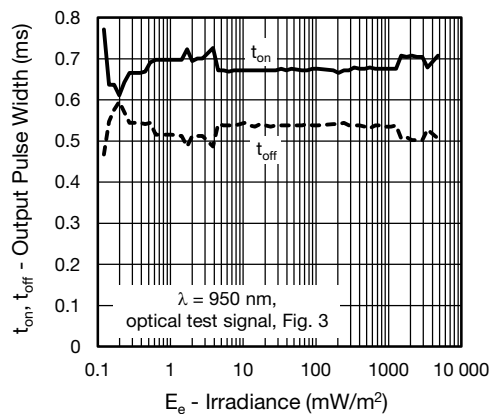


Fig. 4 - Output Pulse Diagram

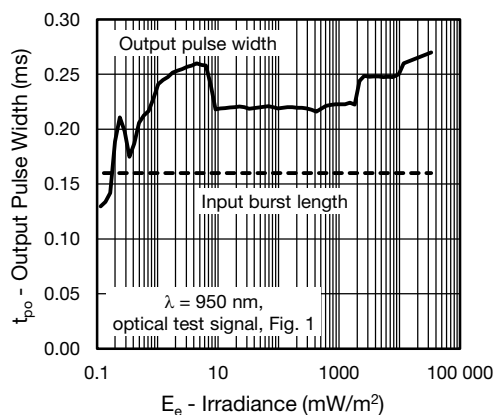


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

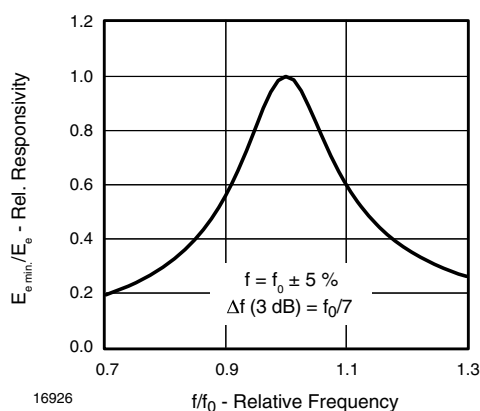


Fig. 5 - Frequency Dependence of Responsivity

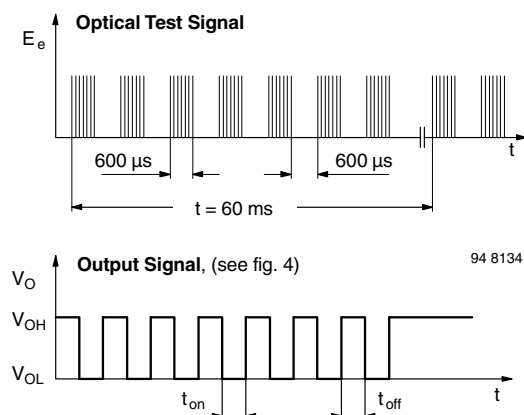


Fig. 3 - Output Function

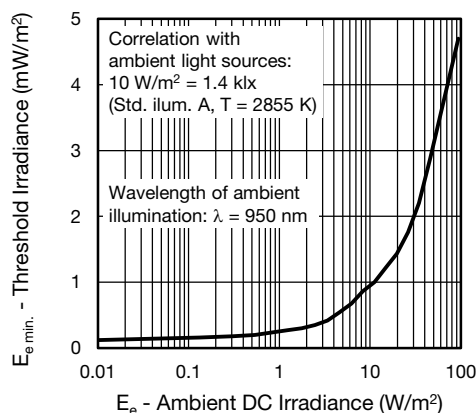


Fig. 6 - Sensitivity in Bright Ambient

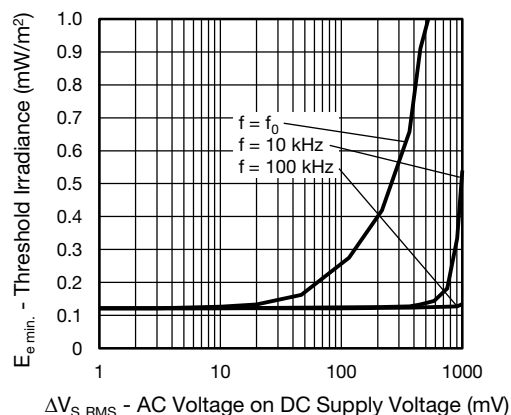


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

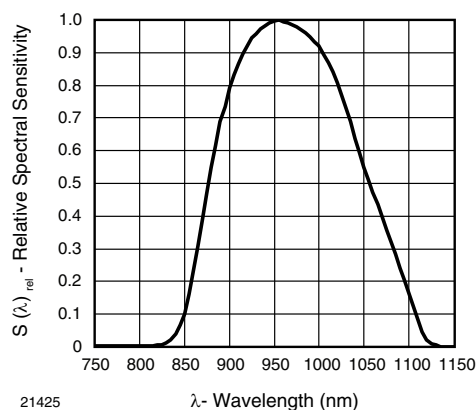


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

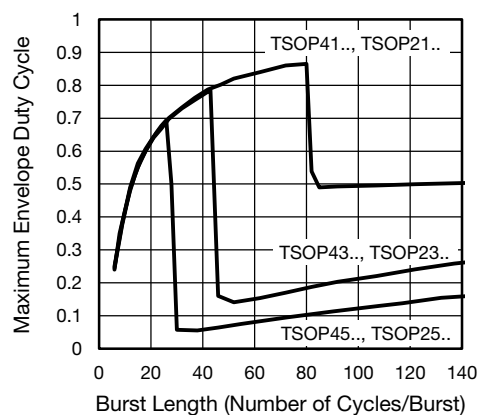


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

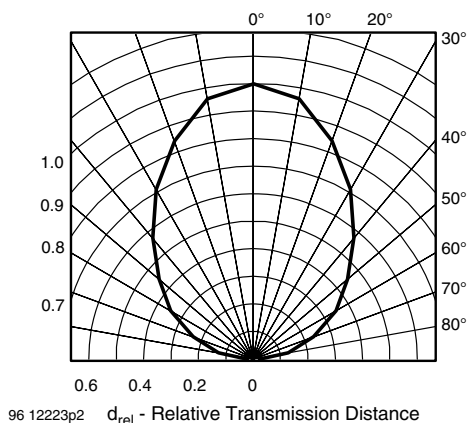


Fig. 11 - Horizontal Directivity

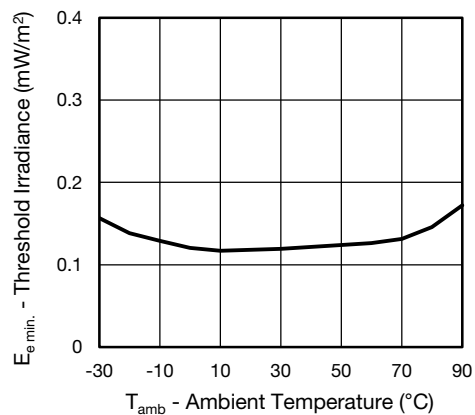


Fig. 9 - Sensitivity vs. Ambient Temperature

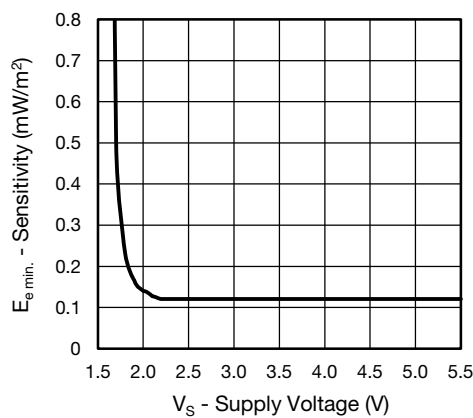


Fig. 12 - Sensitivity vs. Supply Voltage



SUITABLE DATA FORMAT

This series is designed to suppress spurious output pulses due to noise or disturbance signals. The devices can distinguish data signals from noise due to differences in frequency, burst length, and envelope duty cycle. The data signal should be close to the device's band-pass center frequency (e.g. 38 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the product in the presence of a disturbance, the sensitivity of the receiver is automatically reduced by the AGC to insure that no spurious pulses are present at the receiver's output. Some examples which are suppressed are:

- DC light (e.g. from tungsten bulbs sunlight)
- Continuous signals at any frequency
- Strongly or weakly modulated patterns from fluorescent lamps with electronic ballasts (see figure 13 or figure 14).

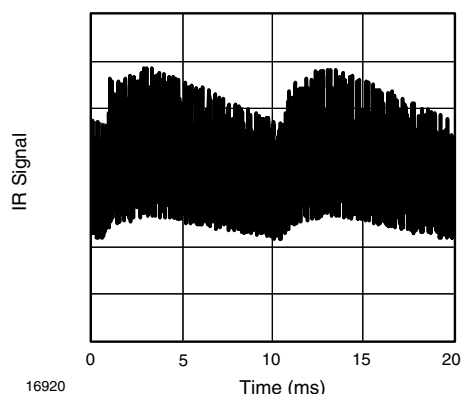


Fig. 13 - IR Disturbance from Fluorescent Lamp with Low Modulation

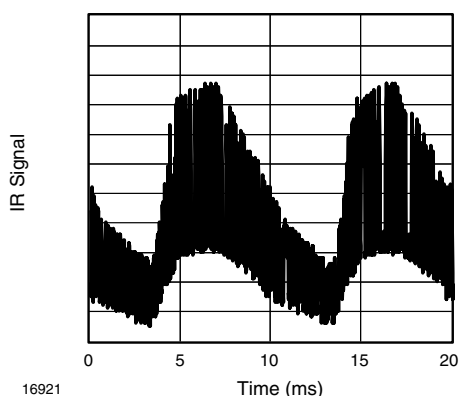


Fig. 14 - IR Disturbance from Fluorescent Lamp with High Modulation

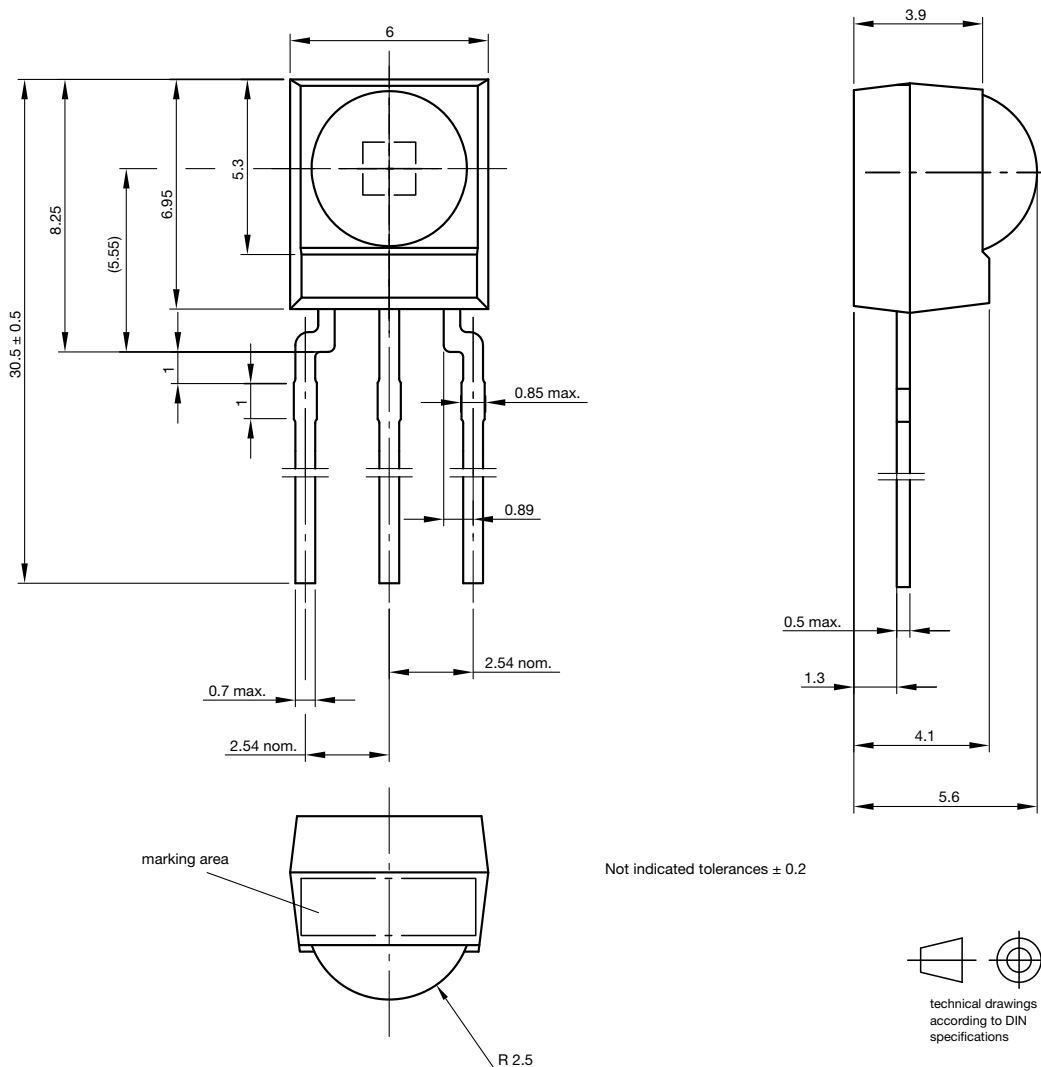
	TSOP41.., TSOP21..	TSOP43.., TSOP23..	TSOP45.., TSOP25..
Minimum burst length	6 cycles/burst	6 cycles/burst	6 cycles/burst
After each burst of length A gap time is required of	6 to 70 cycles ≥ 10 cycles	6 to 35 cycles ≥ 10 cycles	6 to 24 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 1.2 x burst length	35 cycles > 6 x burst length	24 cycles > 25 ms
Maximum number of continuous short bursts/second	2000	2000	2000
MCIR code	yes	preferred	yes
RCMM code	yes	preferred	yes
XMP-1, XMP-2 code	yes	preferred	yes
Suppression of interference from fluorescent lamps	Common disturbance patterns are suppressed (example: signal pattern of fig. 14)	Even critical disturbance patterns are suppressed (examples: signal pattern of fig. 14 and fig. 15)	Even critical disturbance patterns are suppressed (examples: signal pattern of fig. 14 and fig. 15)

Notes

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP48.., TSOP44.., TSOP22.., TSOP24..
- Best choice of AGC for some popular IR-codes:
 - TSOP2336, TSOP4336: MCIR, RCMM
 - TSOP2538, TSOP4538: Mitsubishi, RECS-80 Code
 - TSOP2338, TSOP4338: XMP-1, XMP-2, r-map
- For SIRCS 15 and 20 bit, Sony 12 bit IR-codes, please see the datasheet for TSOP4S40, TSOP2S40



PACKAGE DIMENSIONS in millimeters



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



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