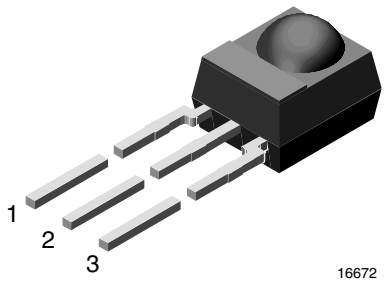
IR Receiver Modules for Remote Control Systems



FEATURES

- Improved immunity against HF and RF noise
- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against optical noise
- 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
HALOGEN FREE
GREEN (5-2008)

MECHNICAL DATA

Pinning for TSOP44.., TSOP48..:

1 = OUT, 2 = GND, 3 = V_S

Pinning for TSOP22.., TSOP24..:

1 = OUT, 2 = V_S, 3 = GND

DESCRIPTION

The TSOP22.., TSOP48.., TSOP24.. and TSOP44.. series are miniaturized IR receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on lead frame, the epoxy package contains an IR filter.

The demodulated output signal can be directly connected to a microprocessor for decoding.

The TSOP24.., TSOP44.. series devices are optimized to suppress almost all spurious pulses from Wi-Fi and CFL sources. They may suppress some data signals if continuously transmitted.

The TSOP22.., TSOP48.. series devices are provided primarily for compatibility with old AGC2 designs. New designs should prefer the TSOP24.., TSOP44.. series containing the newer AGC4.

These components have not been qualified according to automotive specifications.

PARTS TABLE

AGC		LEGACY, FOR LONG BURST REMOTE CONTROLS (AGC2)		RECOMMENDED FOR LONG BURST CODES (AGC4)	
Carrier frequency	30 kHz	TSOP4830	TSOP2230	TSOP4430	TSOP2430
	33 kHz	TSOP4833	TSOP2233	TSOP4433	TSOP2433
	36 kHz	TSOP4836	TSOP2236	TSOP4436 (1)(2)(3)	TSOP2436 (1)(2)(3)
	38 kHz	TSOP4838	TSOP2238	TSOP4438 (4)(5)(6)	TSOP2438 (4)(5)(6)
	40 kHz	TSOP4840	TSOP2240	TSOP4440	TSOP2440
	56 kHz	TSOP4856	TSOP2256	TSOP4456 (6)(7)	TSOP2456 (6)(7)
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
Dimensions (mm)		6.0 W x 6.95 H x 5.6 D			
Mounting		Leaded			
Application		Remote control			
Best remote control code		(1) RC-5 (2) RC-6 (3) Panasonic (4) NEC (5) Sharp (6) r-step (7) Thomson RCA			

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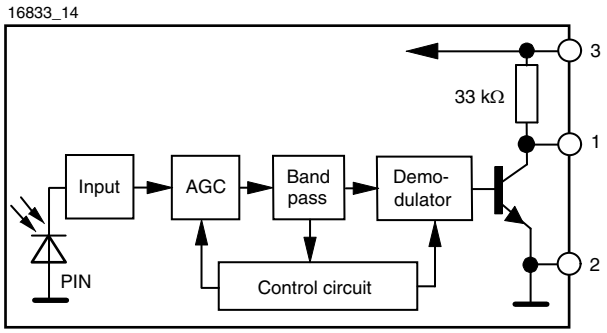
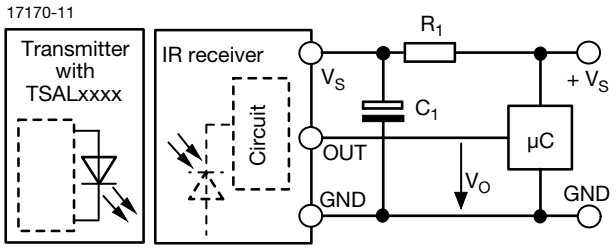
BLOCK DIAGRAM



APPLICATION CIRCUIT



R_1 and C_1 recommended to reduce supply ripple for V_S < 2.8 V

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} ≤ 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}	0.55	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/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	$E_{e\ min.}$	-	0.12	0.25	mW/m²
Maximum irradiance	t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o, test signal see Fig. 1	$E_{e\ max.}$	50	-	-	W/m²
Directivity	Angle of half transmission distance	$\varphi_{1/2}$	-	± 45	-	deg

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

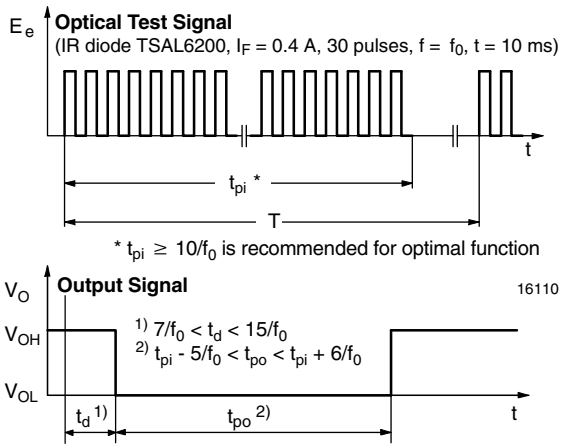

Fig. 1 - Output Active Low

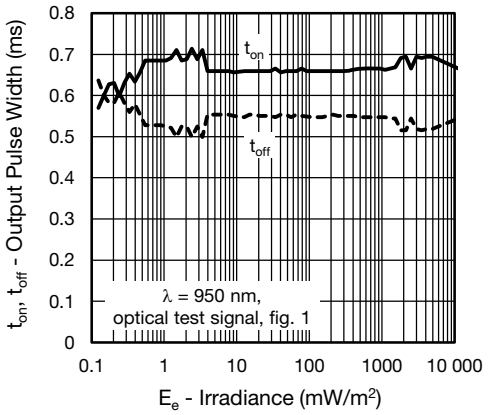

Fig. 4 - Output Pulse Diagram

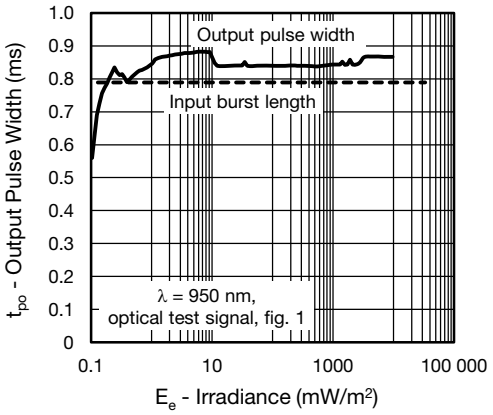

Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

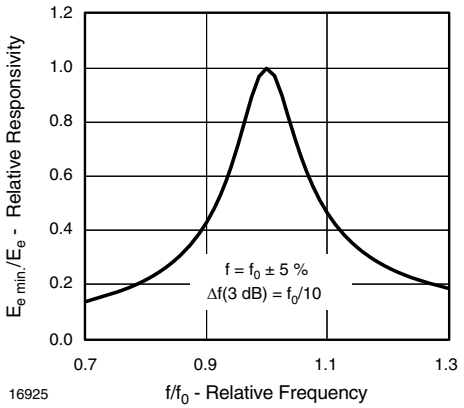

Fig. 5 - Frequency Dependence of Responsivity

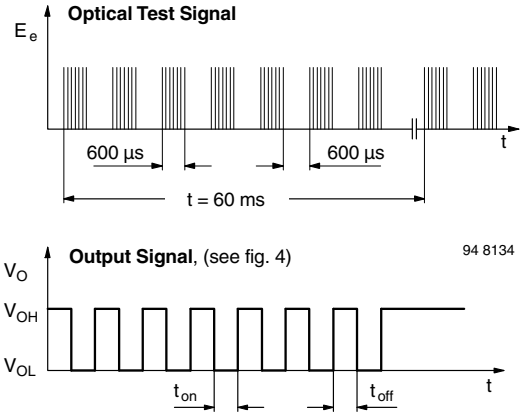

Fig. 3 - Output Function

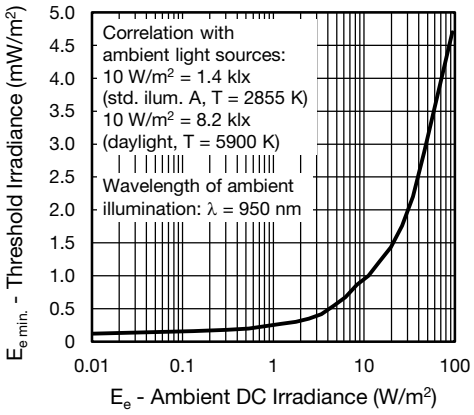

Fig. 6 - Sensitivity in Bright Ambient

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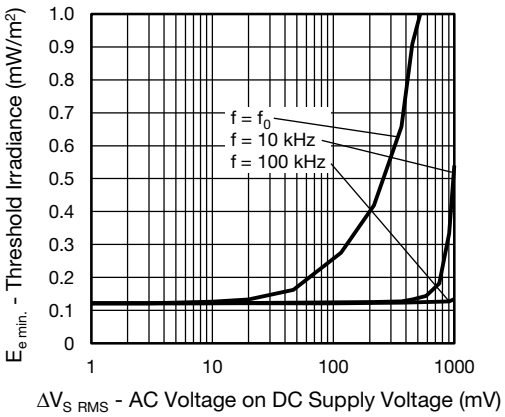

Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

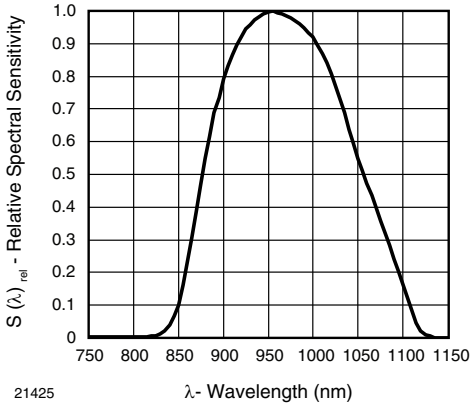

Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

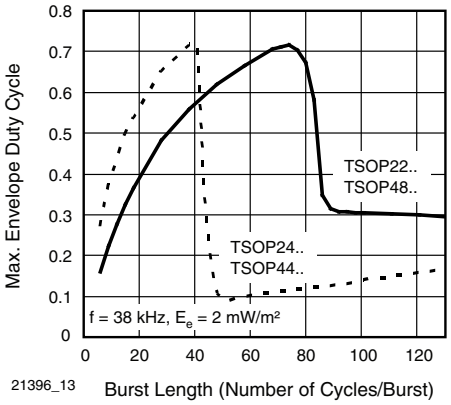

Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

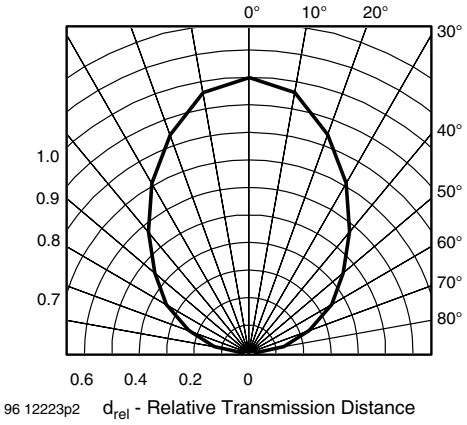

Fig. 11 - Horizontal Directivity

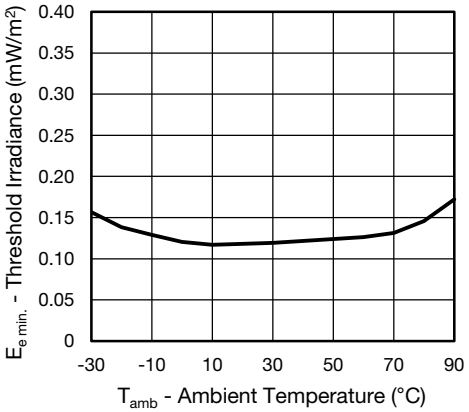

Fig. 9 - Sensitivity vs. Ambient Temperature

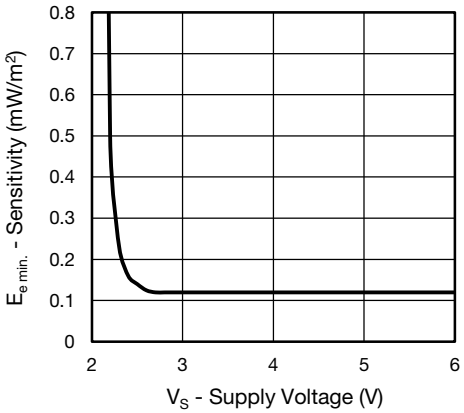

Fig. 12 - Sensitivity vs. Supply Voltage

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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 Fig. 13 or Fig. 14).
- 2.4 GHz and 5 GHz Wi-Fi

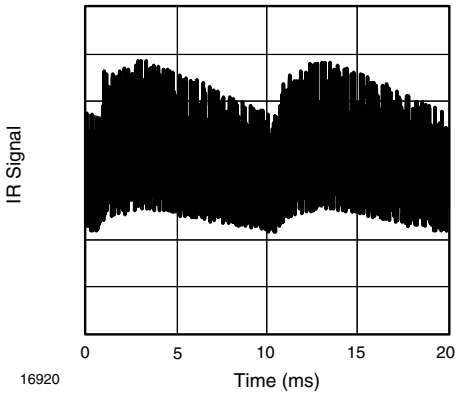

Fig. 13 - IR Disturbance from Fluorescent Lamp with Low Modulation

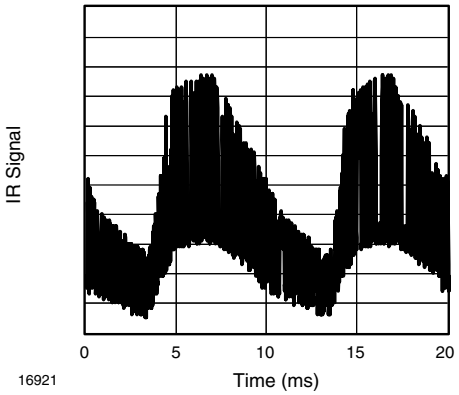

Fig. 14 - IR Disturbance from Fluorescent Lamp with High Modulation

	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
NEC code	Yes	Preferred
RC5/RC6 code	Yes	Preferred
Thomson 56 kHz code	Yes	Preferred
Sharp code	Yes	Preferred
Suppression of interference from fluorescent lamps	Mild disturbance patterns are suppressed (example: signal pattern of Fig. 13)	Complex and critical disturbance patterns are suppressed (example: signal pattern of Fig. 14 or highly dimmed LCDs)

Note

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

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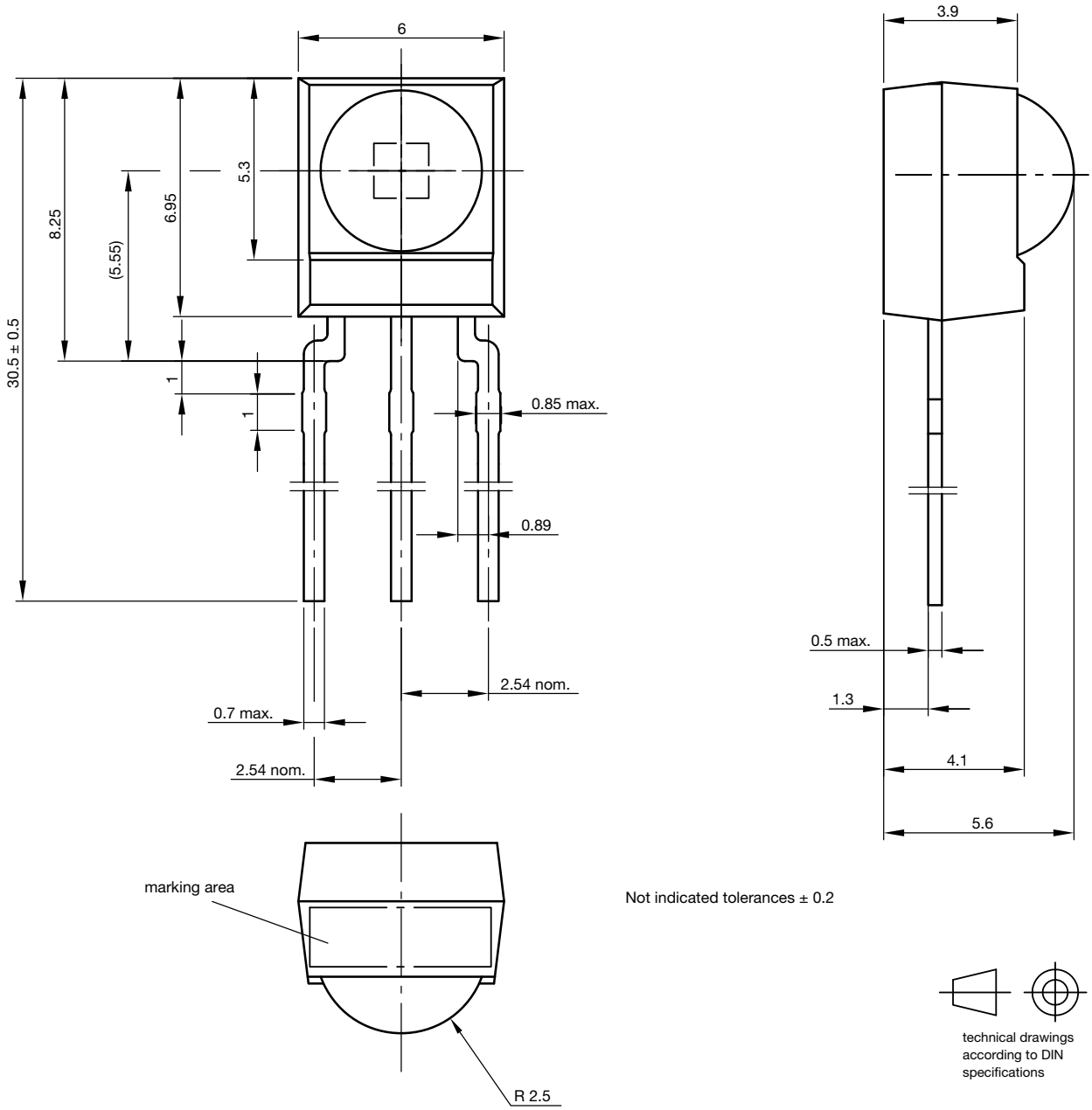
PACKAGE DIMENSIONS in millimeters



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