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Vishay Semiconductors

GREEN (5-2008)

IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning for TSOP381.., TSOP383.., TSOP385..: 1 = OUT, 2 = GND, $3 = V_S$ Pinning for TSOP391.., TSOP393.., TSOP395..:

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

Please see the document "Product Transition Schedule" at www.vishay.com/ir-receiver-modules/ for up-to-date info, when this product will be released.

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
- Insensitive to supply voltage ripple and noise
- Material categorization: For definitions of compliance

 Material categorization: For definitions of compliance please see <u>www.vishav.com/doc?99912</u>

DESCRIPTION

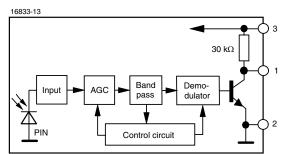
These products are miniaturized receivers for infrared remote control systems. A PIN diode and a preamplifier are assembled on a lead frame, the epoxy package acts as an IR filter

The demodulated output signal can be directly decoded by a microprocessor. The TSOP381..., TSOP391... are compatible with all common IR remote control data formats. The TSOP383..., TSOP393... are optimized to better suppress spurious pulses from energy saving fluorescent lamps. The TSOP385.., TSOP395.. have an excellent noise suppression. It is immune to dimmed LCD backlighting and any fluorescent lamps. AGC3 and AGC5 may also suppress some data signals in case of continuous transmission.

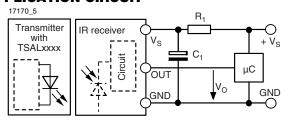
This component has not been qualified according to automotive specifications.

PARTS TABLE							
	SHORT BURST AND HIGH DATA RATE (AGC1)		NOISY ENVIROMENTS AND SHORT BURST (AGC3)		VERY NOISY ENVIROMENTS AND SHORT BURSTS (AGC5)		
CARRIER FREQUENCY		PINNING			•		
FREQUENCT	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	
30 kHz	TSOP38130	TSOP39130	TSOP38330	TSOP39330	TSOP38530	TSOP39530	
33 kHz	TSOP38133	TSOP39133	TSOP38333	TSOP39333	TSOP38533	TSOP39533	
36 kHz	TSOP38136	TSOP39136	TSOP38336	TSOP39336	TSOP38536	TSOP39536	
38 kHz	TSOP38138	TSOP39138	TSOP38338	TSOP39338	TSOP38538	TSOP39538	
40 kHz	TSOP38140	TSOP39140	TSOP38340	TSOP39340	TSOP38540	TSOP39540	
56 kHz	TSOP38156	TSOP39156	TSOP38356	TSOP39356	TSOP38556	TSOP39556	

BLOCK DIAGRAM



APPLICATION CIRCUIT



 $R_{_1}$ and $C_{_1}$ are recommended for protection against EOS. Components should be in the range of 33 Ω < $R_{_1}$ < 1 kΩ, $C_{_1}$ > 0.1 $\mu F.$

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ABSOLUTE MAXIMUM RATINGS					
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT	
Supply voltage		Vs	- 0.3 to + 6	V	
Supply current		I _S	3	mA	
Output voltage		V _O	- 0.3 to (V _S + 0.3)	V	
Output current		Io	5	mA	
Junction temperature		Tj	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	$E_{V} = 0, V_{S} = 3.3 \text{ V}$	I _{SD}	0.27	0.35	0.45	mA
	$E_v = 40$ klx, sunlight	I _{SH}		0.45		mA
Supply voltage		Vs	2.5		5.5	V
Transmission distance	$E_{v}=0$, test signal see fig. 1, IR diode TSAL6200, $I_{F}=200~\text{mA}$	d		45		m
Output voltage low	$I_{OSL} = 0.5 \text{ mA}, E_e = 0.7 \text{ mW/m}^2,$ test signal see fig. 1	V _{OSL}			100	mV
Minimum irradiance	Pulse width tolerance: t_{pi} - $5/f_o < t_{po} < t_{pi} + 6/f_o$, 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.}	30			W/m²
Directivity	Angle of half transmission distance	Ψ1/2		± 45		deg

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

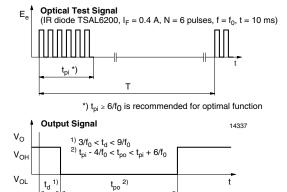


Fig. 1 - Output Active Low

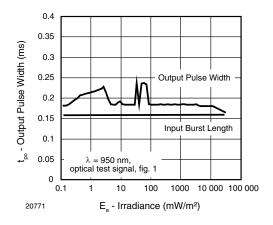


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

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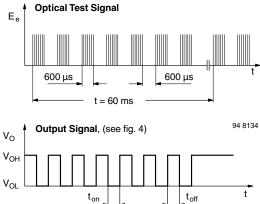


Fig. 3 - Output Function

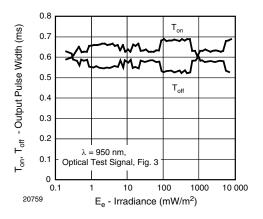


Fig. 4 - Output Pulse Diagram

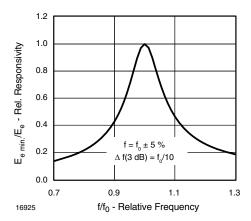


Fig. 5 - Frequency Dependence of Responsivity

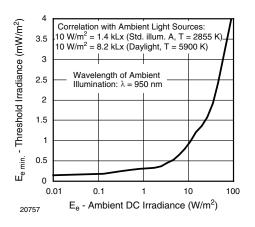


Fig. 6 - Sensitivity in Bright Ambient

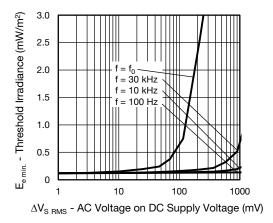


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

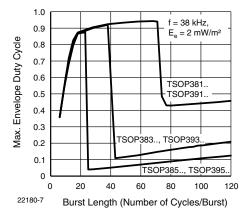


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

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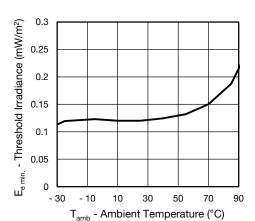


Fig. 9 - Sensitivity vs. Ambient Temperature

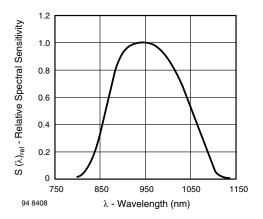


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

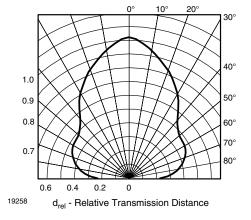


Fig. 11 - Horizontal Directivity

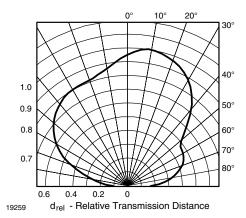


Fig. 12 - Vertical Directivity

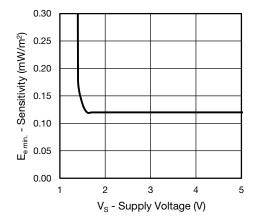


Fig. 13 - Sensitivity vs. Supply Voltage

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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 15 or figure 16)

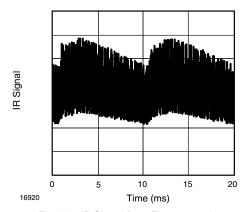


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

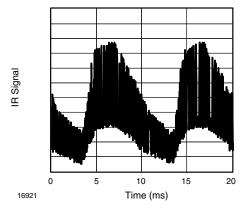


Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

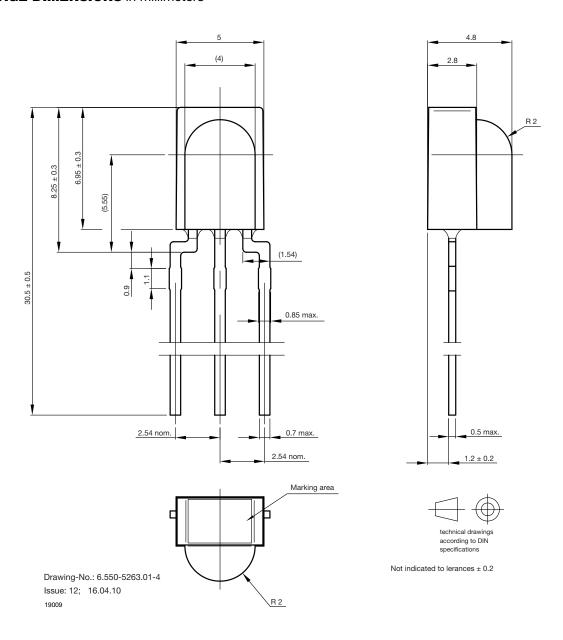
	TSOP381, TSOP391	TSOP383, TSOP393	TSOP385, TSOP395
Minimum burst length	6 cycles/burst	6 cycles/burst	6 cycles/burst
After each burst of length a minimum gap time is required of	6 to 70 cycles ≥ 10 cycles	6 to 35 cycles ≥ 10 cycles	6 to 24 cycles ≥ 10 cycles
For bursts greater than a minimum gap time 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
Recommended for NEC code	yes	yes	yes
Recommended for RC5/RC6 code	yes	yes	yes
Recommended for Sony code	yes	no	no
Recommended for RCMM code	yes	yes	yes
Recommended for r-step code	yes	yes	yes
Recommended for XMP code	yes	yes	yes
Suppression of interference from fluorescent lamps	Common disturbance signals are supressed (example: signal pattern of fig. 15)	Even critical disturbance signals are suppressed (examples: signal pattern of fig. 15 and fig. 16)	Even critical disturbance signals are suppressed (examples: signal pattern of fig. 15 and fig. 16)

Note

• For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP382.., TSOP384.., TSOP394...

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PACKAGE DIMENSIONS in millimeters





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