



IR Receiver Modules for Remote Control Systems



23196

DESCRIPTION

This IR receiver series is optimized for short burst remote control systems in different environments. The customer can choose between different IC settings (AGC variants), to find the optimum solution for his application. The higher the AGC, the better noise is suppressed, but the lower the code compatibility.

The devices contain a PIN diode and a preamplifier assembled on a lead frame. The epoxy package contains an IR filter. The demodulated output signal can be directly connected to a microprocessor for decoding. These components have not been qualified to automotive specifications.

FEATURES

- Individual IC settings to reach maximum performance
- Immunity against noise (lamps, LCD TV, Wi-Fi)
- Low supply current
- Photo detector and preamplifier in one package
- Supply voltage: 2.0 V to 5.5 V
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



LINKS TO ADDITIONAL RESOURCES



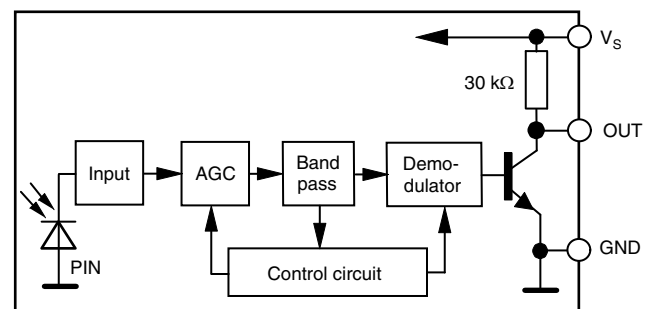
DESIGN SUPPORT TOOLS

- [3D models](#)
- [Window size calculator](#)

APPLICATIONS

- Infrared remote control systems

BLOCK DIAGRAM



16833-22



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

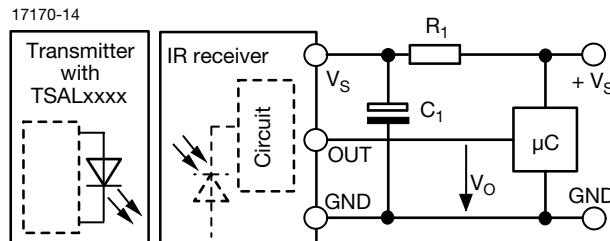


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ORDERING CODE

TSOP2..., TSOP4... - 2160 pieces in tubes

APPLICATION CIRCUIT



R_1 and C_1 recommended in case there are strong ripple or spikes on the supply line.

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 ⁽¹⁾⁽²⁾	TSOP2336 ⁽¹⁾⁽²⁾	TSOP4536	TSOP2536
	38 kHz	TSOP4138	TSOP2138	TSOP4338 ⁽³⁾⁽⁵⁾	TSOP2338 ⁽³⁾⁽⁵⁾	TSOP4538	TSOP2538
	40 kHz	TSOP4140	TSOP2140	TSOP4340	TSOP2340	TSOP4540	TSOP2540
	56 kHz	TSOP4156	TSOP2156	TSOP4356 ⁽⁴⁾	TSOP2356 ⁽⁴⁾	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	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 choice for	⁽¹⁾ MCIR ⁽²⁾ RCMM ⁽³⁾ RECS-80 Code ⁽⁴⁾ r-map ⁽⁵⁾ XMP						
Special options	<ul style="list-style-type: none"> Narrow optical filter: www.vishay.com/doc?81590 Wide optical filter: www.vishay.com/doc?82726 						

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 conditions for extended periods may affect the device reliability



ELECTRICAL AND OPTICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current	$E_v = 0, V_S = 3.3\text{ V}$	I_{SD}	0.25	0.35	0.45	mA
	$E_v = 40\text{ klx, sunlight}$	I_{SH}	-	0.45	-	mA
Supply voltage		V_S	2.0	-	5.5	V
Transmission distance	$E_v = 0$, test signal see Fig. 1, IR diode TSAL6200, $I_F = 50\text{ mA}$	d	-	24	-	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	Test signal: RC5 code	$E_{e\text{ min.}}$	-	0.12	0.25	mW/m^2
	Test signal: XMP code	$E_{e\text{ min.}}$	-	0.2	0.4	mW/m^2
Maximum irradiance	$t_{pi} - 3/f_0 < t_{po} < t_{pi} + 3.5/f_0$, 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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

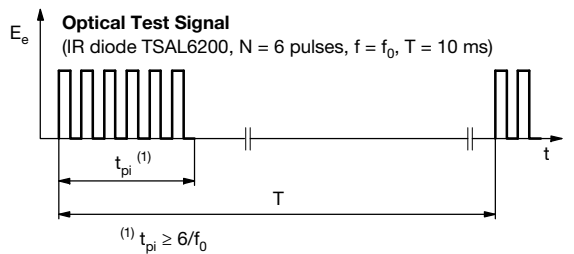


Fig. 1 - Output Active Low

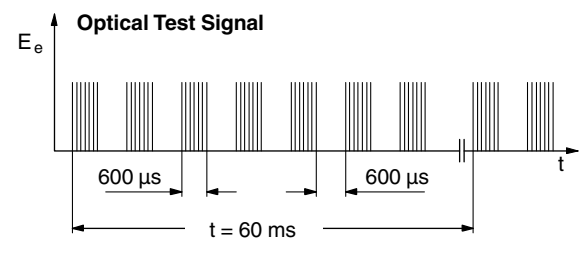


Fig. 3 - Output Function

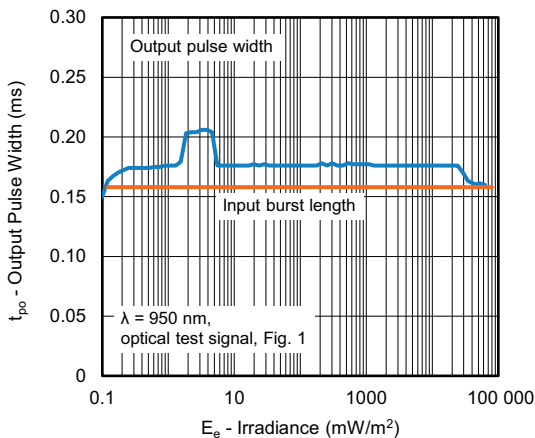


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

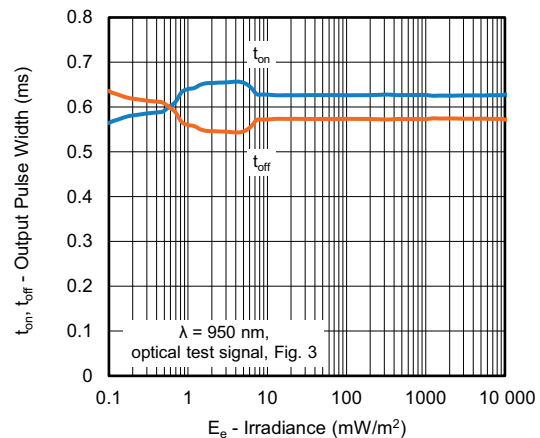


Fig. 4 - Output Pulse Diagram

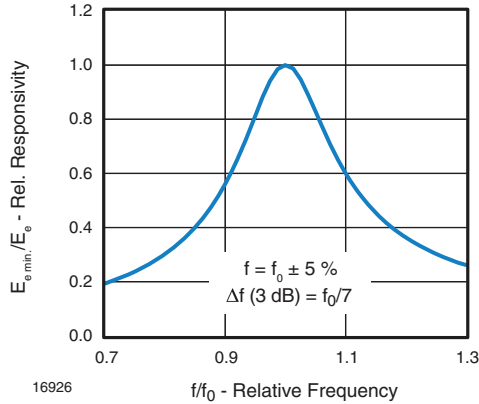


Fig. 5 - Frequency Dependence of Responsivity

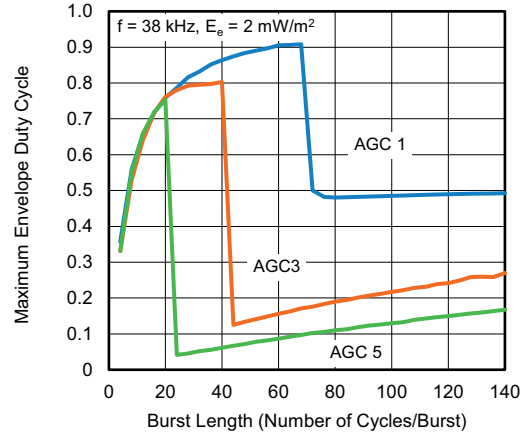


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

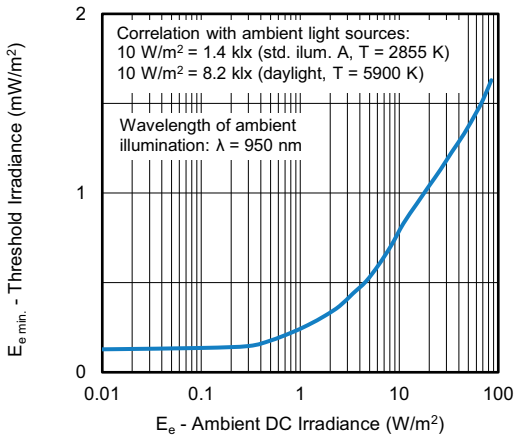


Fig. 6 - Sensitivity in Bright Ambient



Fig. 9 - Sensitivity vs. Ambient Temperature

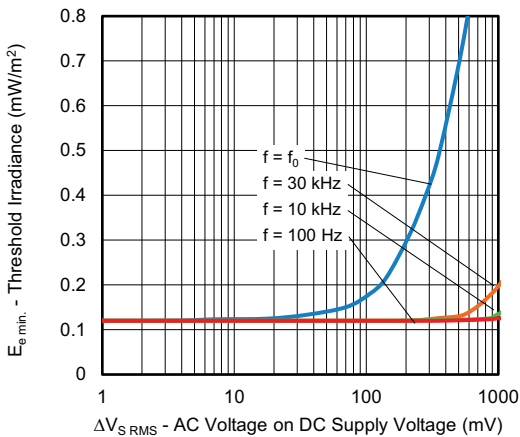


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances



Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

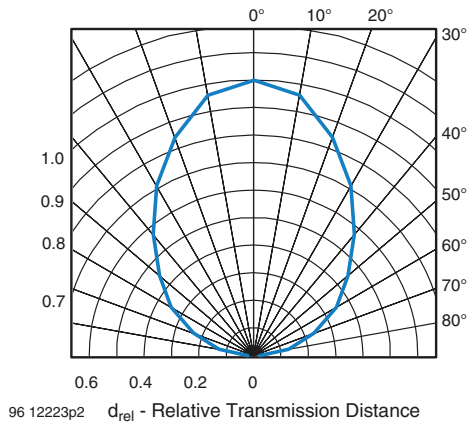


Fig. 11 - Horizontal Directivity

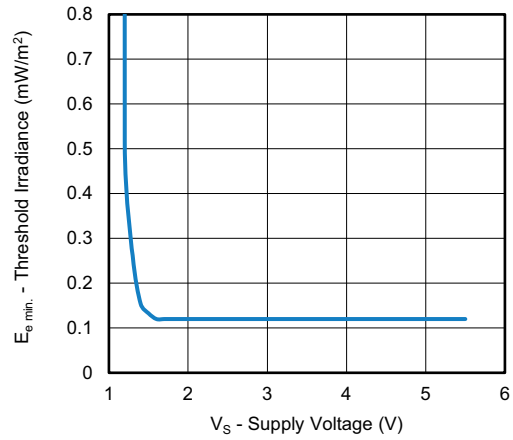


Fig. 12 - Sensitivity vs. Supply Voltage



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 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

	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 68 cycles ≥ 6 cycles	6 to 40 cycles ≥ 7 cycles	6 to 20 cycles ≥ 7 cycles
For bursts greater than a minimum gap time in the data stream is needed of	68 cycles > 1 x burst length	40 cycles > 6 x burst length	20 cycles > 10 x burst length
Maximum number of continuous short bursts/second	2500	2500	2500
RCMM code	Yes	Preferred	Yes
XMP code	Yes	Preferred	Yes
r-map code	Yes	Preferred	Yes
RECS-80 code	Yes	Preferred	Yes
Suppression of interference from fluorescent lamps	Mild disturbance patterns are suppressed (example: signal pattern of Fig. 13)	Complex disturbance patterns are suppressed (example: signal pattern of Fig. 14)	Critical disturbance patterns are suppressed, e.g. highly dimmed LCDs

Note

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



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