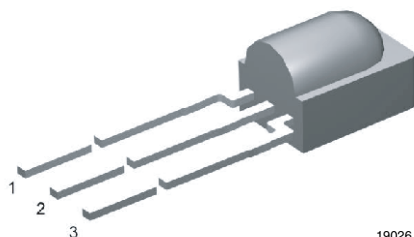




## IR Receiver Modules for Remote Control Systems



19026

### 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

### 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 please see [www.vishay.com/doc?99912](http://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 TSOP381..., TSOP391... are legacy products 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. 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 TSOP383... is preferred. Customers should initially try the TSOP383... in their design.

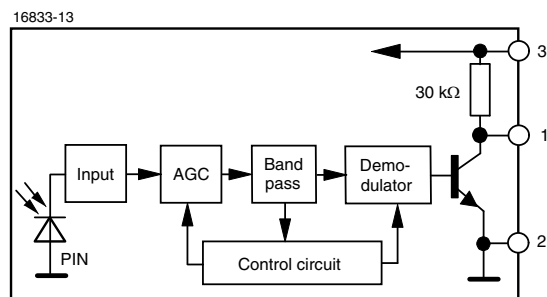
This component has not been qualified according to automotive specifications.

### PARTS TABLE

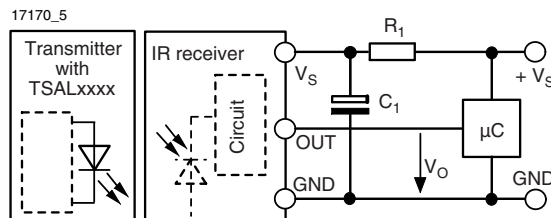
AGC		LEGACY, FOR SHORT BURST REMOTE CONTROLS (AGC1)		NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)		VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)	
Carrier frequency	30 kHz	TSOP38130	TSOP39130	TSOP38330	TSOP39330	TSOP38530	TSOP39530
	33 kHz	TSOP38133	TSOP39133	TSOP38333	TSOP39333	TSOP38533	TSOP39533
	36 kHz	TSOP38136	TSOP39136	TSOP38336	TSOP39336 (1)(2)	TSOP38536	TSOP39536 (1)(2)
	38 kHz	TSOP38138	TSOP39138	TSOP38338	TSOP39338 (3)(4)(5)(6)	TSOP38538	TSOP39538 (3)(4)(5)
	40 kHz	TSOP38140	TSOP39140	TSOP38340	TSOP39340	TSOP38540	TSOP39540
	56 kHz	TSOP38156	TSOP39156	TSOP38356	TSOP39356	TSOP38556	TSOP39556
Package		Minicast					
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)		5.0 W x 6.95 H x 4.8 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



$R_1$  and  $C_1$  are recommended for protection against EOS. Components should be in the range of  $33 \Omega < R_1 < 1 \text{ k}\Omega$ ,  $C_1 > 0.1 \mu\text{F}$ .

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage		$V_S$	-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		$I_O$	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	$T_{amb} \leq 85 \text{ °C}$	$P_{tot}$	10	mW
Soldering temperature	$t \leq 10 \text{ s}$ , 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 ( $T_{amb} = 25 \text{ °C}$ , 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
	$E_v = 40 \text{ klx}$ , sunlight	$I_{SH}$		0.45		mA
Supply voltage		$V_S$	2.5		5.5	V
Transmission distance	$E_v = 0$ , test signal see fig. 1, IR diode TSAL6200, $I_F = 200 \text{ mA}$	$d$		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: $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$ , test signal see fig. 1	$E_{e \text{ min.}}$		0.12	0.25	mW/m <sup>2</sup>
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$ , test signal see fig. 1	$E_{e \text{ max.}}$	30			W/m <sup>2</sup>
Directivity	Angle of half transmission distance	$\phi_{1/2}$		$\pm 45$		deg

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

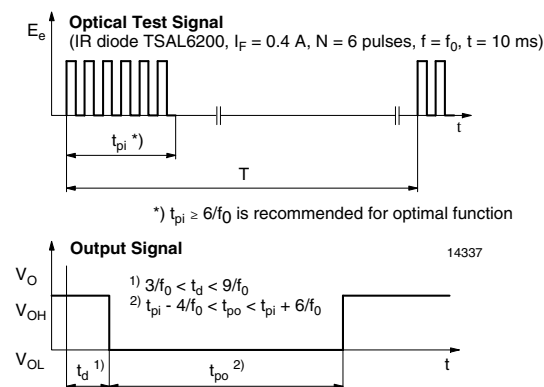


Fig. 1 - Output Active Low

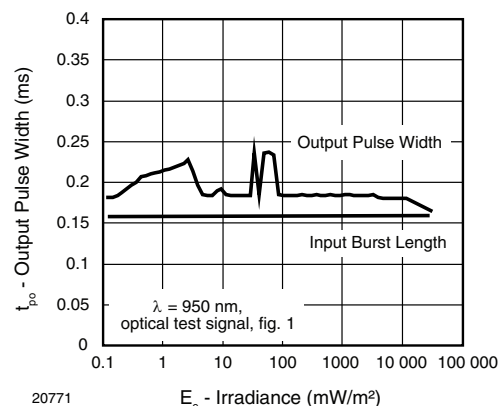


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

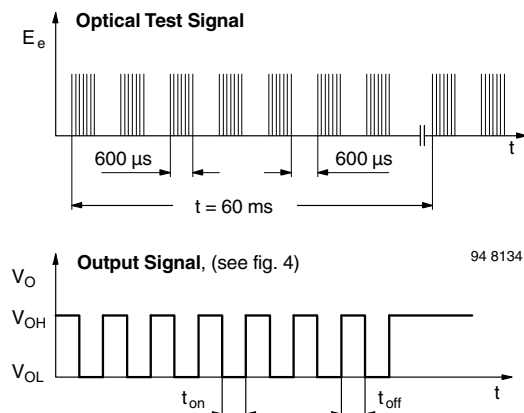


Fig. 3 - Output Function

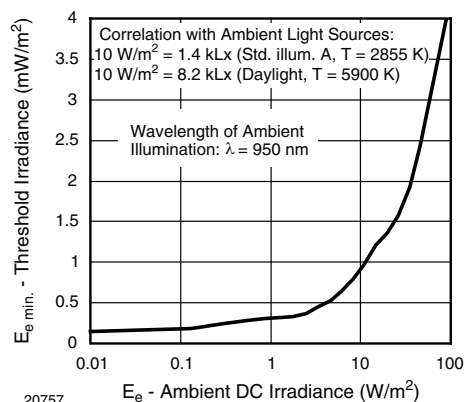


Fig. 6 - Sensitivity in Bright Ambient

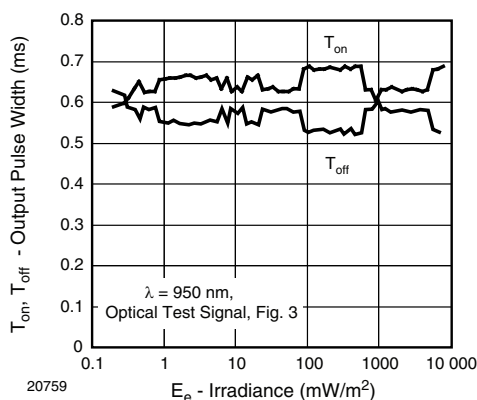


Fig. 4 - Output Pulse Diagram

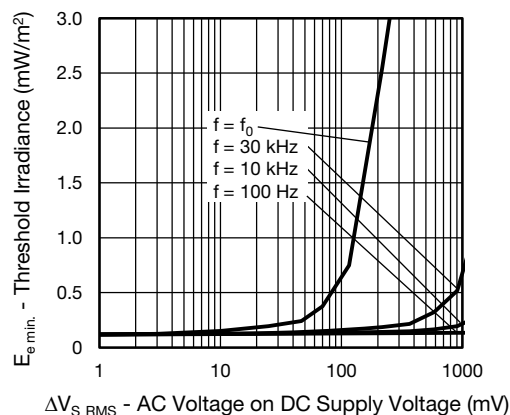


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

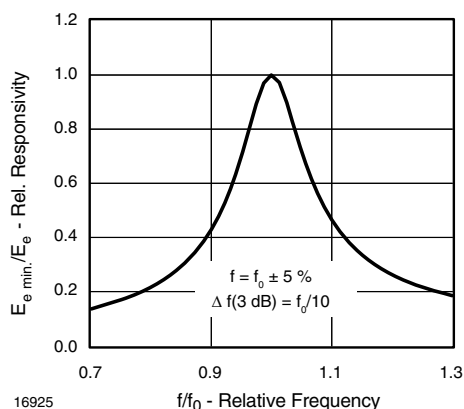


Fig. 5 - Frequency Dependence of Responsivity

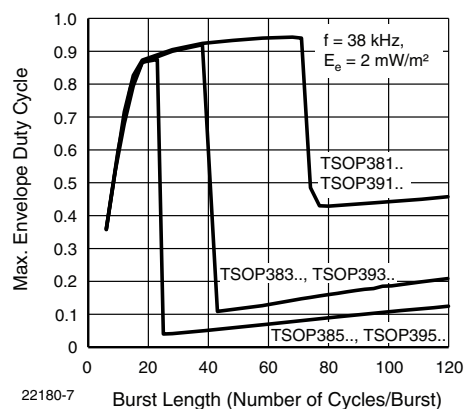


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

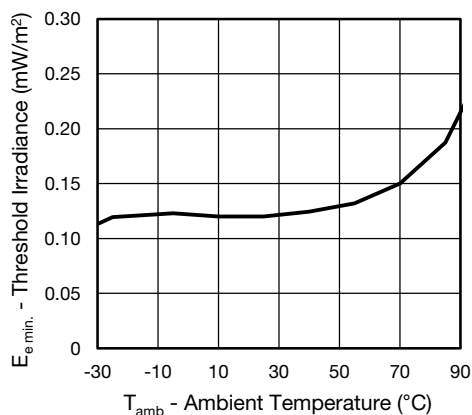


Fig. 9 - Sensitivity vs. Ambient Temperature

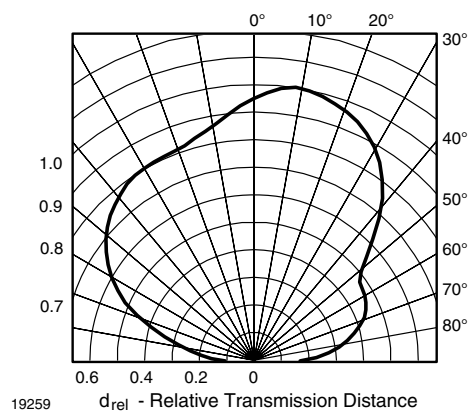


Fig. 12 - Vertical Directivity

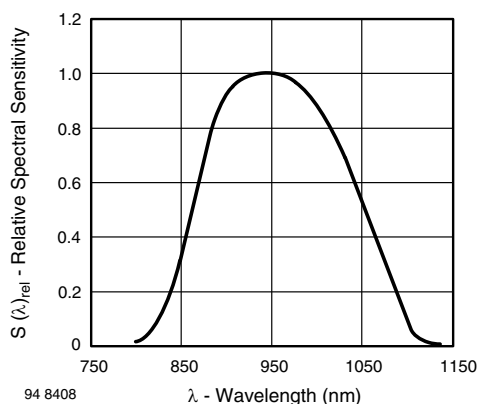


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

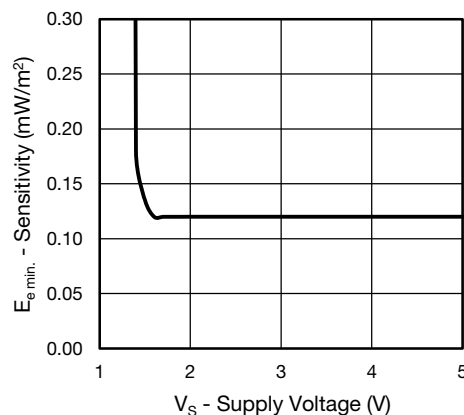


Fig. 13 - Sensitivity vs. Supply Voltage

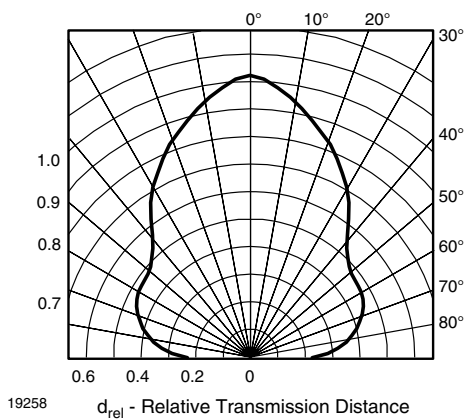


Fig. 11 - Horizontal Directivity



## 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 14 or figure 15)

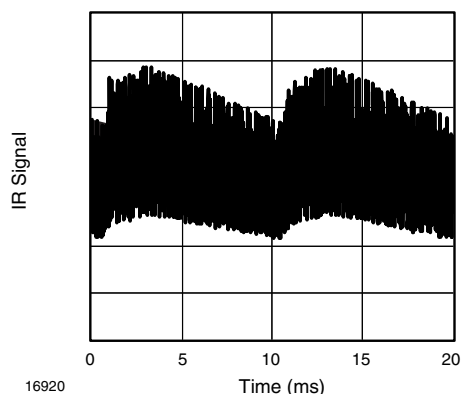


Fig. 14 - IR Disturbance from Fluorescent Lamp with Low Modulation

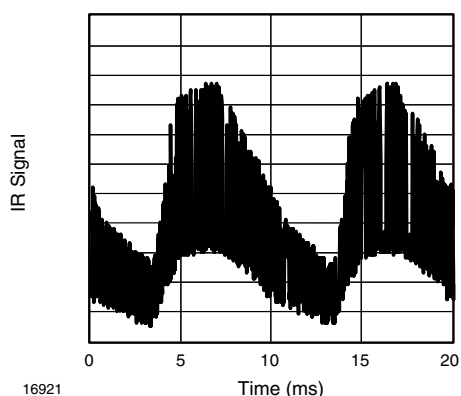


Fig. 15 - IR Disturbance from Fluorescent Lamp with High Modulation

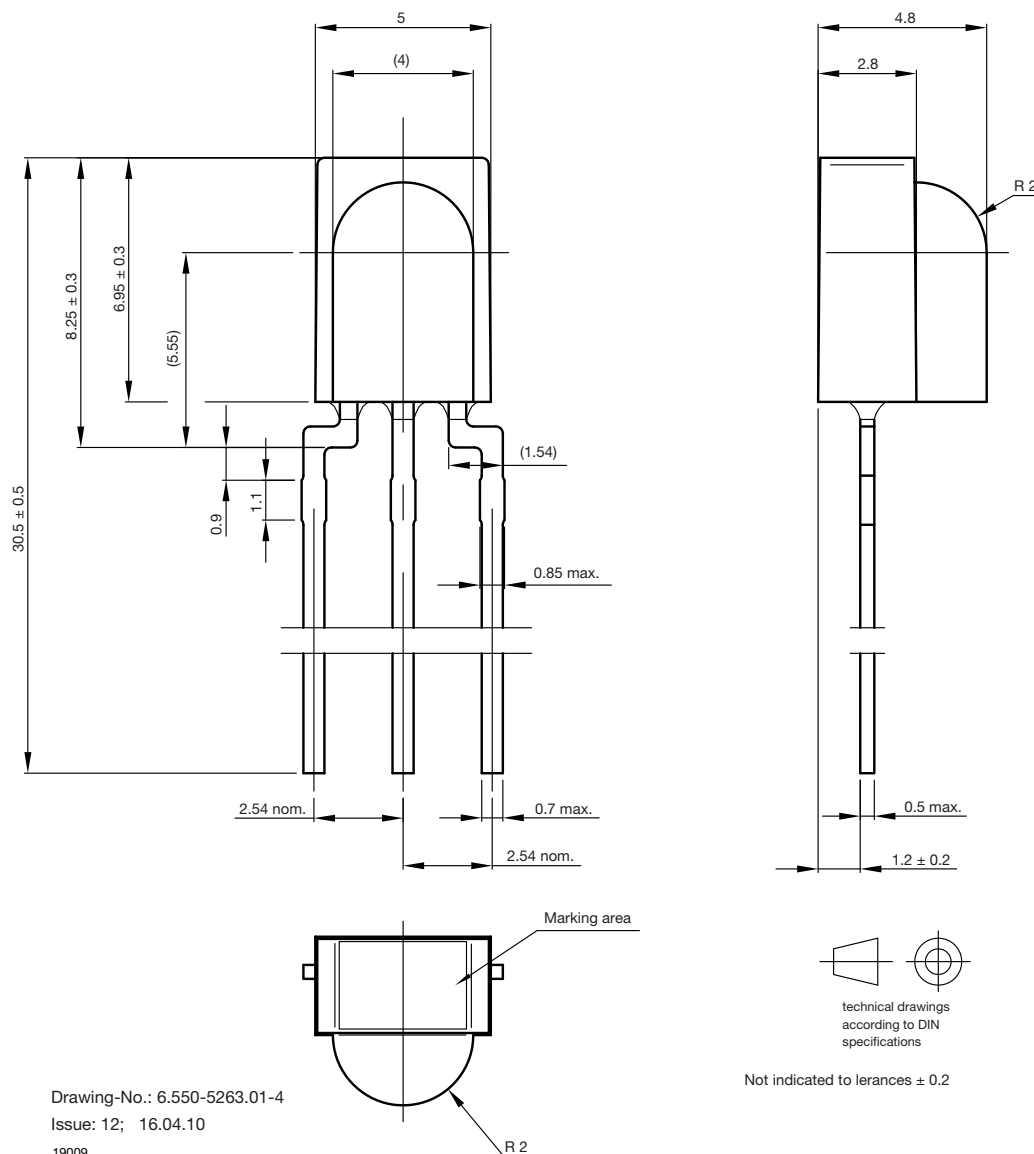
	TSOP381..., TSOP391..	TSOP383..., TSOP393..	TSOP385..., TSOP395..
Minimum burst length	6 cycles/burst	6 cycles/burst	6 cycles/burst
After each burst of length A gap time is required of	6 to 70 cycles ≥ 10 cycles	6 to 35 cycles ≥ 10 cycles	6 to 24 cycles ≥ 10 cycles
For bursts greater than a minimum gap 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 TSOP312..., TSOP314..
- Best choice of AGC for some popular IR-codes:
  - TSOP31336: MCIR, RCMM
  - TSOP31538: Mitsubishi, RECS-80 Code
  - TSOP31338: 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.: 6.550-5263.01-4

Issue: 12; 16.04.10

19009



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