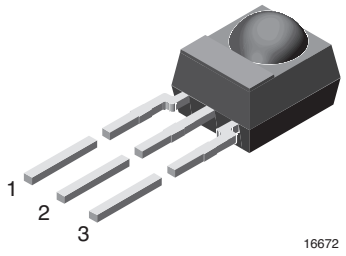
IR Receiver Modules for Remote Control Systems

Description

The TSOP341.. - series are miniaturized receivers for infrared remote control systems. PIN diode and preamplifier are assembled on lead frame, the epoxy package is designed as IR filter.

The demodulated output signal can directly be decoded by a microprocessor. The main benefit is the operation with short burst transmission codes and high data rates at a supply voltage of 3 V.



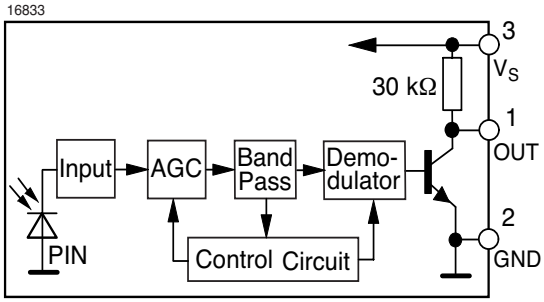
Features

- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against electrical field disturbance
- TTL and CMOS compatibility
- Output active low
- Supply voltage range: 2.7 V to 5.5 V
- High immunity against ambient light
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Special Features

- Enhanced data rate up to 4000 bit/s
- Operation with short short bursts possible (≥ 6 cycles/burst)

Block Diagram



Mechanical Data

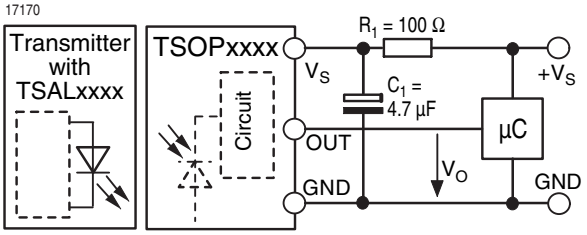
Pinning:

1 = OUT, 2 = GND, 3 = V_S

Parts Table

Part	Carrier Frequency
TSOP34130	30 kHz
TSOP34133	33 kHz
TSOP34136	36 kHz
TSOP34137	36.7 kHz
TSOP34138	38 kHz
TSOP34140	40 kHz
TSOP34156	56 kHz

Application Circuit



R_1 + C_1 recommended to suppress power supply disturbances.

Absolute Maximum Ratings

Absolute Maximum Ratings
T_{amb} = 25 °C, unless otherwise specified

Parameter	Test condition	Symbol	Value	Unit
Supply Voltage	(Pin 3)	V_S	- 0.3 to + 6.0	V
Supply Current	(Pin 3)	I_S	3	mA
Output Voltage	(Pin 1)	V_O	- 0.3 to (V_S + 0.3)	V
Output Current	(Pin 1)	I_O	10	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}	30	mW
Soldering Temperature	t ≤ 10 s, 1 mm from case	T_{sd}	260	°C

Electrical and Optical Characteristics

T_{amb} = 25 °C, unless otherwise specified

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Supply Current (Pin 3)	E_v = 0	I_{SD}	0.7	1.2	1.5	mA
	E_v = 40 klx, sunlight	I_{SH}		1.3		mA
Supply Voltage	T_{amb} = - 25 °C to + 85 °C	V_S	2.7		5.5	V
	T_{amb} = 0 °C to + 60 °C, E_v < 30 klx, sunlight	V_S	2.4		5.5	V
Transmission Distance	E_v = 0, test signal see fig.1, IR diode TSAL6200, I_F = 250 mA	d		35		m
Output Voltage Low (Pin 1)	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m^2, test signal see fig. 1	V_{OSL}			250	mV
Minimum Irradiance (30 - 40 kHz)	V_S = 3 V Pulse width tolerance: t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o, test signal see fig.3	$E_{e\ min}$		0.2	0.4	mW/m^2
Minimum Irradiance (56 kHz)	V_S = 3 V Pulse width tolerance: t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o, test signal see fig.3	$E_{e\ min}$		0.3	0.5	mW/m^2
Minimum Irradiance (30 - 40 kHz)	V_S = 5 V Pulse width tolerance: t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o, test signal see fig.3	$E_{e\ min}$		0.35	0.5	mW/m^2
Minimum Irradiance (56 kHz)	V_S = 5 V Pulse width tolerance: t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o, test signal see fig.3	$E_{e\ min}$		0.45	0.6	mW/m^2
Maximum Irradiance	t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o, test signal see fig. 3	$E_{e\ max}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

Typical Characteristics (Tamb = 25 °C unless otherwise specified)

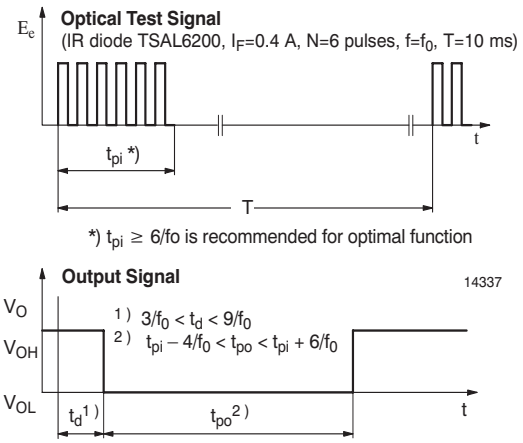


Figure 1. Output Function

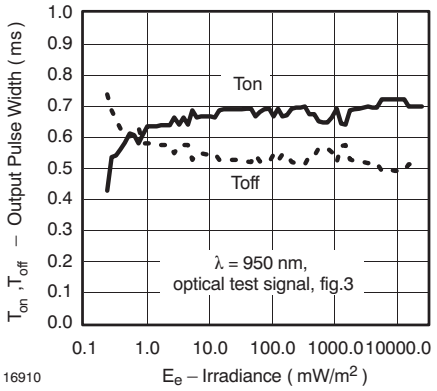


Figure 4. Output Pulse Diagram

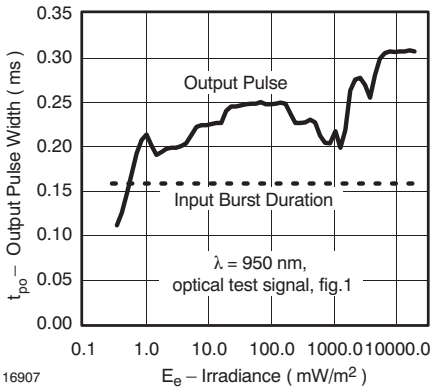


Figure 2. Pulse Length and Sensitivity in Dark Ambient

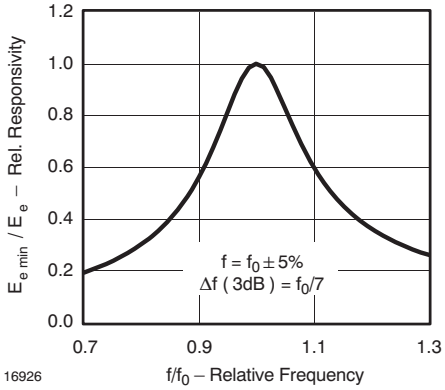


Figure 5. Frequency Dependence of Responsivity

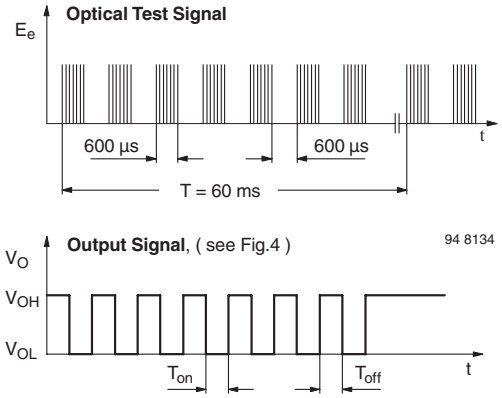


Figure 3. Output Function

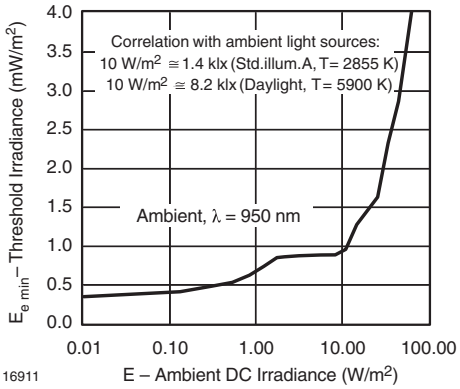


Figure 6. Sensitivity in Bright Ambient

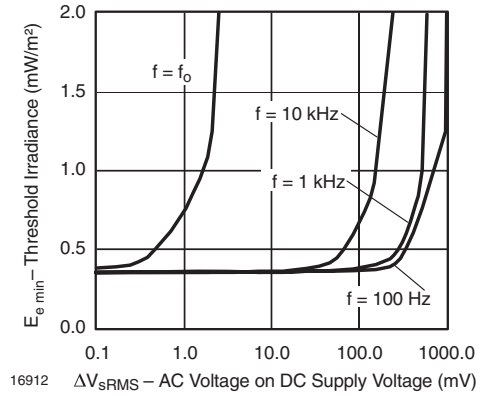


Figure 7. Sensitivity vs. Supply Voltage Disturbances

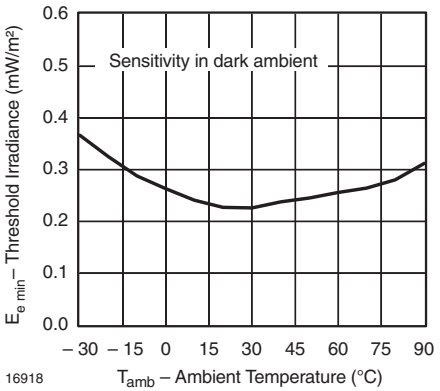


Figure 10. Sensitivity vs. Ambient Temperature

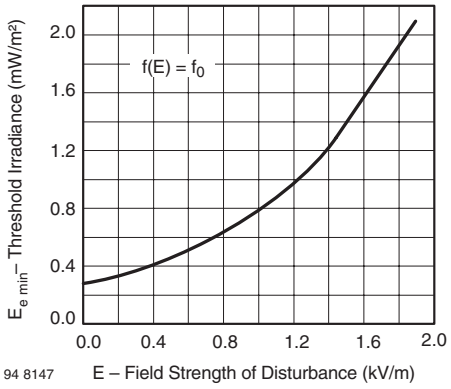


Figure 8. Sensitivity vs. Electric Field Disturbances

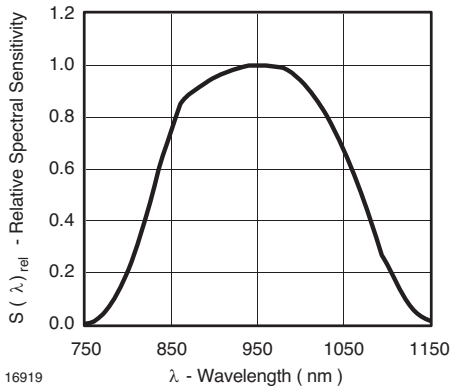


Figure 11. Relative Spectral Sensitivity vs. Wavelength

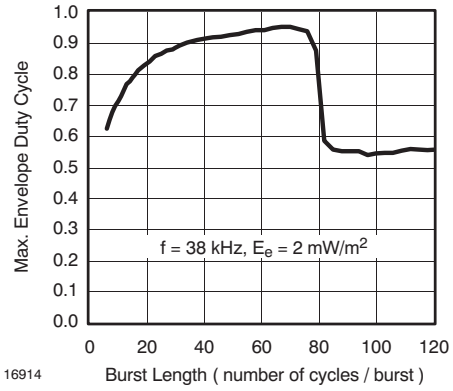


Figure 9. Max. Envelope Duty Cycle vs. Burstlength

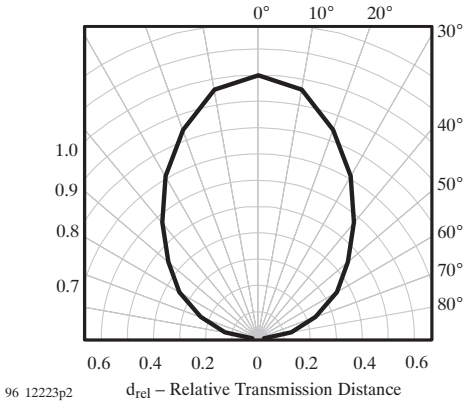


Figure 12. Directivity

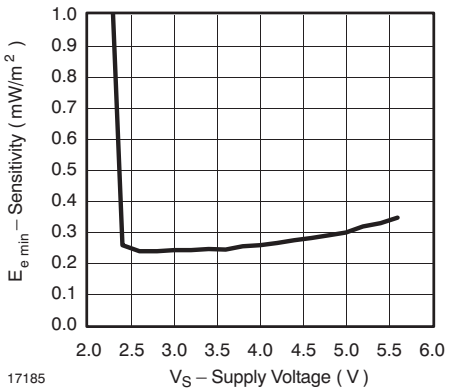


Figure 13. Sensitivity vs. Supply Voltage

Suitable Data Format

The circuit of the TSOP341.. is designed in that way that unexpected output pulses due to noise or disturbance signals are avoided. A bandpass filter, an integrator stage and an automatic gain control are used to suppress such disturbances.

The distinguishing mark between data signal and disturbance signal are carrier frequency, burst length and duty cycle.

The data signal should fulfill the following conditions:

• Carrier frequency should be close to center frequency of the bandpass (e.g. 38 kHz).

• Burst length should be 6 cycles/burst or longer.

• After each burst which is between 6 cycles and 70 cycles a gap time of at least 10 cycles is necessary.

• For each burst which is longer than 1.8 ms a corresponding gap time is necessary at some time in the data stream. This gap time should have at least same length as the burst.

• Up to 2200 short bursts per second can be received continuously.

Some examples for suitable data format are: NEC Code, Toshiba Micom Format, Sharp Code, RC5 Code, RC6 Code, RCMM Code, R-2000 Code, RECS-80 Code.

When a disturbance signal is applied to the TSOP341.. it can still receive the data signal. However the sensitivity is reduced to that level that no unexpected pulses will occur.

Some examples for such disturbance signals which are suppressed by the TSOP341.. are:

• DC light (e.g. from tungsten bulb or sunlight)

• Continuous signal at 38 kHz or at any other frequency

• Signals from fluorescent lamps with electronic ballast (an example of the signal modulation is in the figure below).

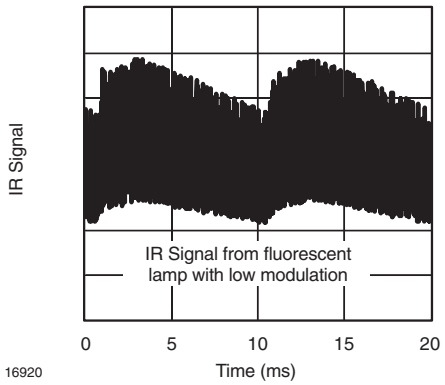
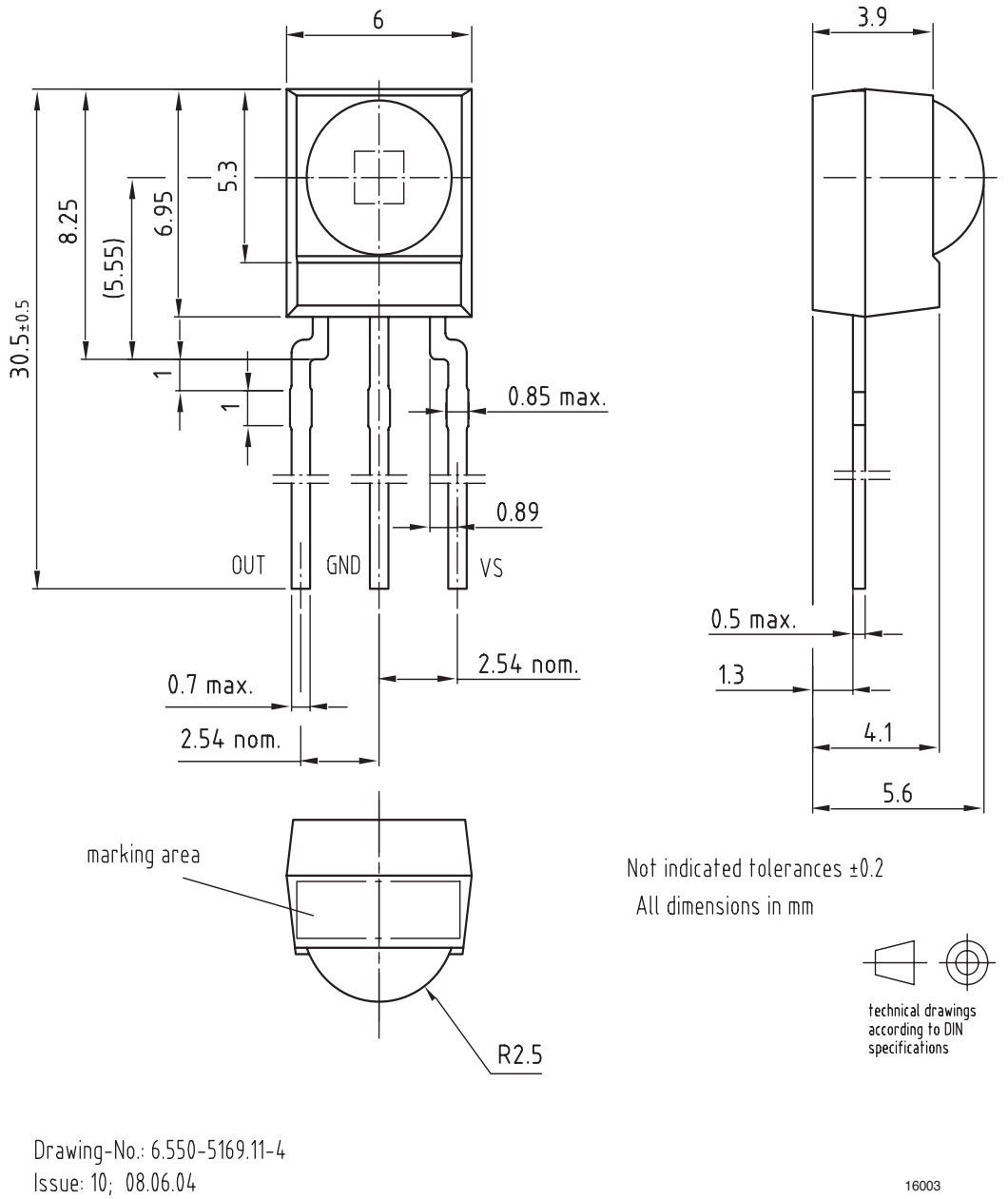


Figure 14. IR Signal from Fluorescent Lamp with low Modulation

Package Dimensions in mm