

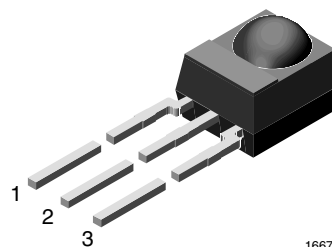
IR Receiver for High Data Rate PCM at 455 kHz

Description

The TSOP7000 is a miniaturized receiver for infrared remote control and IR data transmission. 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 high data rates and long distances.

This component has not been qualified according to automotive specifications.



Features

- Photo detector and preamplifier in one package
- Internal Bandfilter for PCM frequency
- Internal shielding against electrical field disturbance
- TTL and CMOS compatibility
- Output active low
- Small size package
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



Special Features

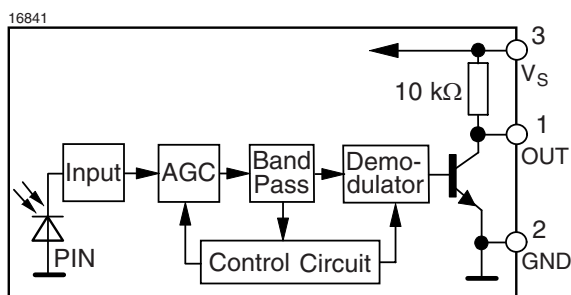
- Data rate 20 kbit/s
- Supply voltage 2.7 - 5.5 V
- Short settling time after power on
- High envelope duty cycle can be received
- Enhanced immunity against disturbance from energy saving lamps

Mechanical Data

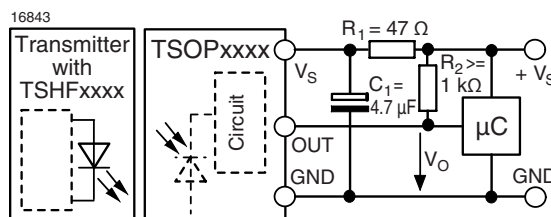
Pinning:

1 = OUT, 2 = GND, 3 = V_S

Block Diagram



Application Circuit



$R_1 + C_1$ recommended to suppress power supply disturbances.

R_2 optional for improved pulse forming.

**Absolute Maximum Ratings** $T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified

Parameter	Test condition	Symbol	Value	Unit
Supply Voltage	Pin 3	V_S	-0.3 to + 6.0	V
Voltage at output to supply	Pin 1	$V_S - V_O$	-0.3 to ($V_S + 0.3$)	V
Supply Current	Pin 3	I_S	5	mA
Output Voltage	Pin 1	V_O	-0.3 to + 6.0	V
Output Current	Pin 1	I_O	15	mA
Junction Temperature		T_j	100	$^{\circ}\text{C}$
Storage Temperature Range		T_{stg}	- 25 to + 85	$^{\circ}\text{C}$
Operating Temperature Range		T_{amb}	- 25 to + 85	$^{\circ}\text{C}$
Soldering Temperature	$t \leq 10\text{ s}$, 1 mm from case	T_{sd}	260	$^{\circ}\text{C}$
Power Consumption		P_{tot}	30	mW

Electrical and Optical Characteristics $T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Supply Current (Pin 3)	Dark ambient	I_{SD}		2.0	2.7	mA
	$E_v = 40\text{ klx}$, sunlight	I_{SH}		2.3		mA
Supply Voltage (Pin 3)		V_S	2.7	5	5.5	V
Transmission Distance	$\lambda_p = 870\text{ nm}$, IR Diode TSHF5400, $I_F = 300\text{ mA}$	d_{max}		20		m
	$\lambda_p = 950\text{ nm}$, IR Diode TSAL6400, $I_F = 300\text{ mA}$	d_{max}		12		m
Threshold Irradiance	$\lambda_p = 870\text{ nm}$, optical test signal of fig. 1	$E_{e\ min}$		0.8	1.5	mW/m^2
Maximum Irradiance	Optical test signal of fig. 1	$E_{e\ max}$	30			W/m^2
Output Voltage Low (Pin 1)	1 $\text{k}\Omega$ external pull up resistor	V_{QL}			100	mV
Output Voltage High (Pin 1)	No external pull-up resistor	V_{QH}	$V_S - 0.25$			V
Bandpass filter quality		Q		10		
Out-Pulse width tolerance	Optical test signal of fig. 1, $1.5\text{ mW}/\text{m}^2 \leq E_e \leq 30\text{ W}/\text{m}^2$	Δt_{po}	- 15	+ 5	+ 15	μs
Delay time of output pulse	Optical test signal of fig. 1, $E_e > 1.5\text{ mW}/\text{m}^2$	t_{don}	15		36	μs
Receiver start up time	Valid data after power on	t_V		50		μs
Falling time	Leading edge of output pulse	t_f		0.4		μs
Rise time	No external pull up resistor	t_r		12		μs
	1 $\text{k}\Omega$ external pull up resistor	t_r		1.2		μs
Directivity	Angle of half transmission distance	$\Phi_{1/2}$		± 45		deg

Typical Characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified

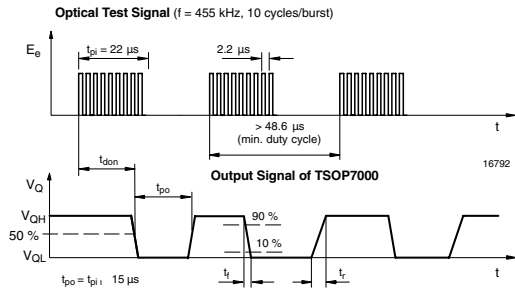


Figure 1. Output Function

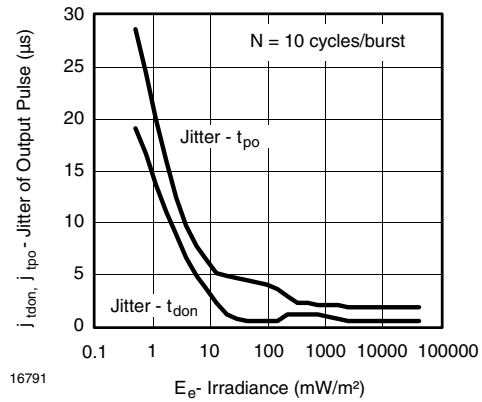


Figure 4. Jitter of Output Pulse

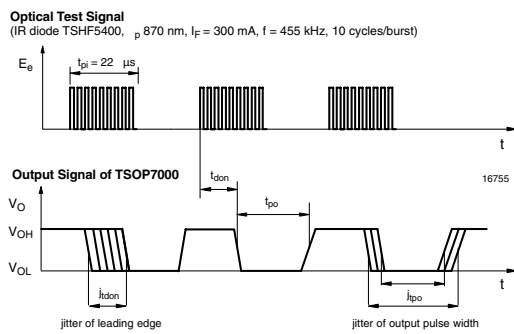


Figure 2. Output Function (mit Jitter)

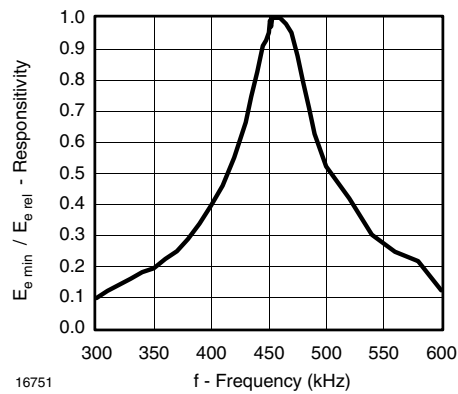


Figure 5. Frequency Dependence of Responsivity

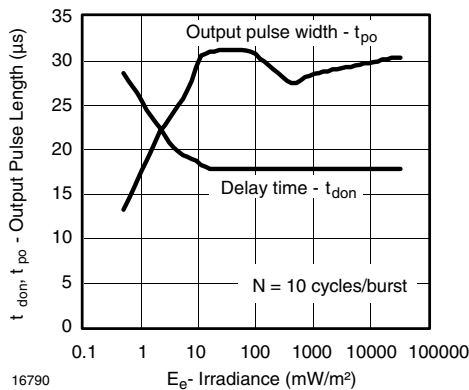


Figure 3. Output Pulse Diagram (t_{don} , t_{po})

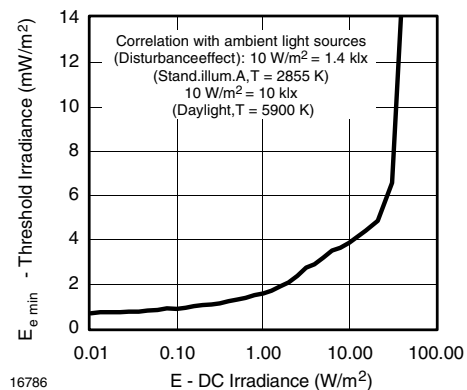
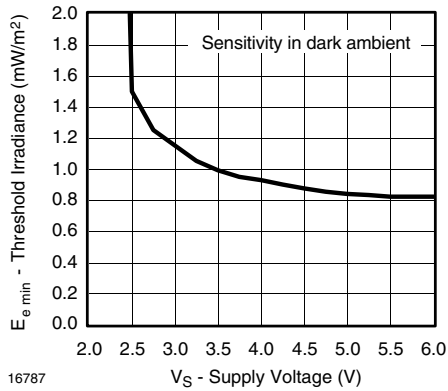
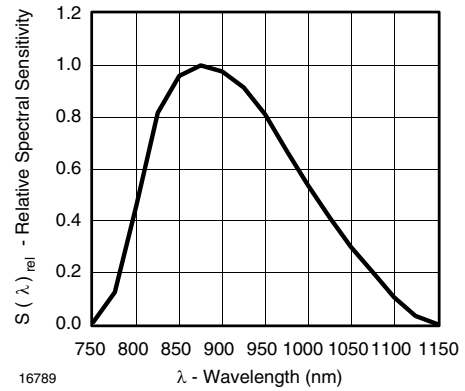


Figure 6. Sensitivity in Bright Ambient



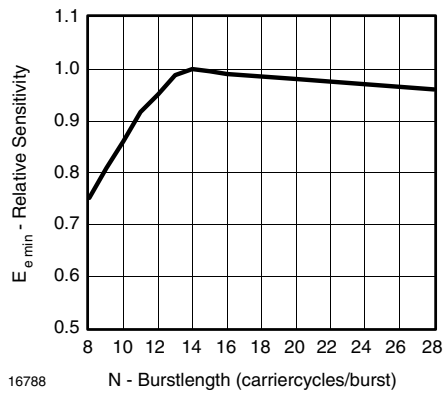
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Figure 7. Sensitivity vs. Supply Voltage



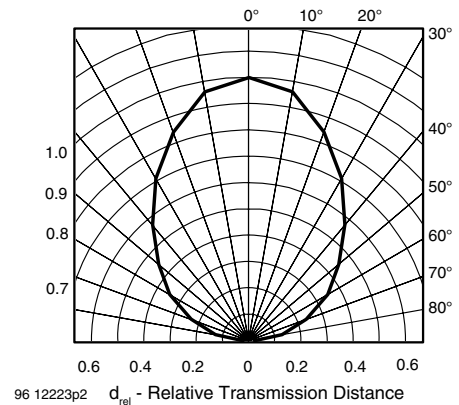
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Figure 10. Relative Spectral Sensitivity vs. Wavelength



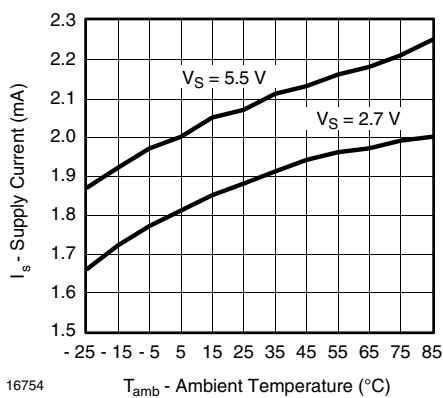
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Figure 8. Rel. Sensitivity vs. Burstlength



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Figure 11. Directivity



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Figure 9. Supply Current vs. Ambient Temperature

Recommendation for Suitable Data Formats

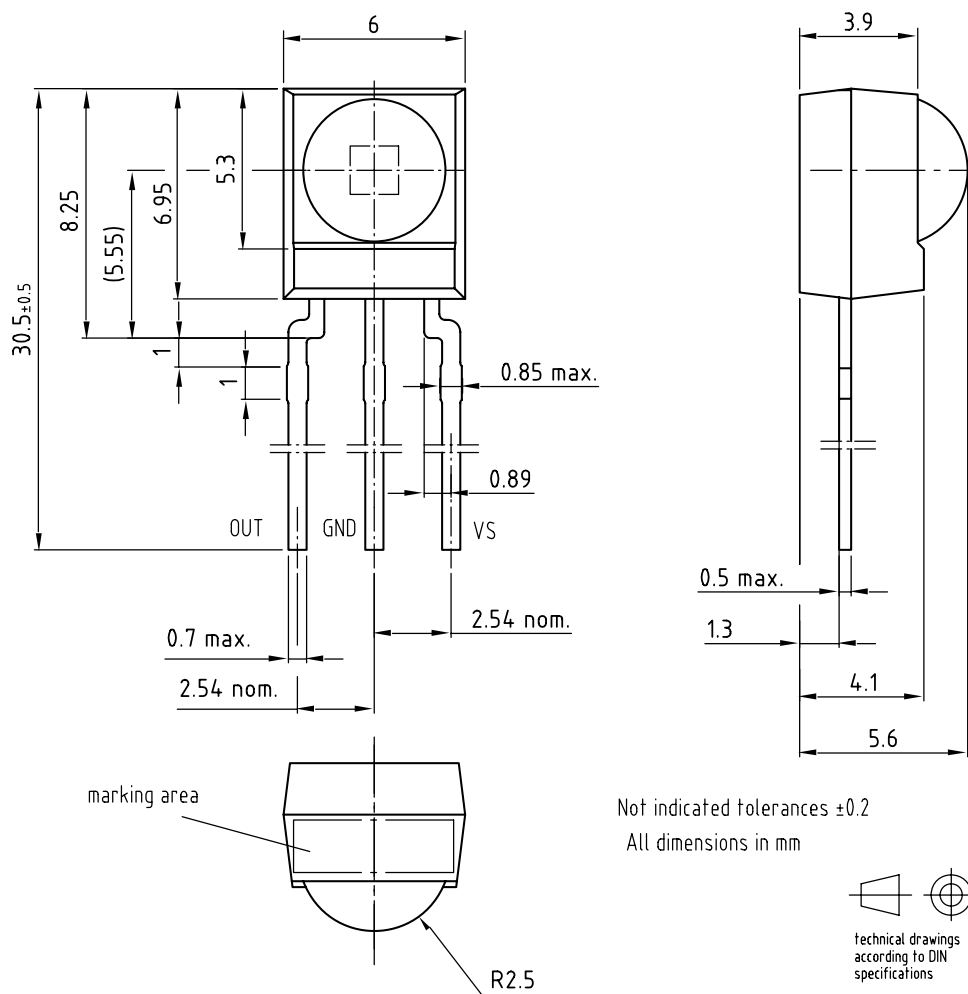
The circuit of the TSOP7000 is designed so that disturbance signals are identified and unwanted output pulses due to noise or disturbances are avoided. A bandpass filter, an automatic gain control and an integrator stage is used to suppress such disturbances. The distinguishing marks between data signal and disturbance are carrier frequency, burst length and the envelope duty cycle.

The data signal should fulfill the following conditions:

- The carrier frequency should be close to 455 kHz.

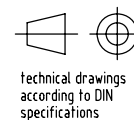
- The burstlength should be at least 22 μs (10 cycles of the carrier signal) and shorter than 500 μs .
- The separation time between two consecutive bursts should be at least 26 μs .
- If the data bursts are longer than 500 μs then the envelope duty cycle is limited to 25 %
- The duty cycle of the carrier signal (455 kHz) may be between 50 % (1.1 μs pulses) and 10 % (0.2 μs pulses). The lower duty cycle may help to save battery power.

Package Dimensions in millimeters



Not indicated tolerances ± 0.2

All dimensions in mm



Drawing-No.: 6.550-5169.11-4

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2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

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1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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