VISHAY INTERTECHNOLOGY, INC.

INTERACTIVE data book

IR RECEIVER MODULES

VISHAY SEMICONDUCTORS

VSE-DB0090-1010

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VISHAY INTERTECHNOLOGY, INC.

DATA BOOK

IR RECEIVER MODULES

VISHAY SEMICONDUCTORS

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- Analog Switches

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  - Metal Film Resistors
  - Thin Film Resistors
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  - PTC Thermistors
  - Varistors

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- Transformers

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  - Molded Chip Tantalum Capacitors
  - Coated Chip Tantalum Capacitors
  - Solid Through-Hole Tantalum Capacitors
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  - Disc Capacitors
- Film Capacitors
- Power Capacitors
- Heavy-Current Capacitors
- Aluminum Capacitors

Vishay

IR Receiver Modules

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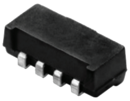
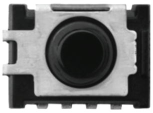
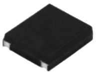
IR Receiver Modules

Preferred Infrared Receiver Modules

Vishay Semiconductors

IR RECEIVER SURFACE MOUNT PACKAGES						APPLICATION AREAS			
PAGE		HEIGHT		SUPPLY VOLTAGE (V)	d (m)	LONG BURSTS DATA FORMATS		SHORT BURSTS DATA FORMATS	
		TOP VIEW (mm)	SIDE VIEW (mm)			AGC4	AGC2	AGC3	AGC5
						VERY NOISY ENVIRONMENT	STANDARD APPLICATIONS	NOISY ENVIRONMENT	VERY NOISY ENVIRONMENT
		TT	TR			MAX. 1 kbit/s		MAX. 4 kbit/s	
3.0 mm x 6.8 mm x 2.3 mm (Heimdall without Lens)									
245		2.3	3.0	2.5 to 5.5	30	TSOP754..W	TSOP752..W	TSOP753..W	TSOP755..W
				2.7 to 5.5	25	TSOP774..W	TSOP772..W	TSOP773..W	-
3.0 mm x 6.8 mm x 3.2 mm (Heimdall)									
245		3.2	3.0	2.5 to 5.5	40	TSOP754..	TSOP752..	TSOP753..	TSOP755..
				2.7 to 5.5	35	TSOP774..	TSOP772..	TSOP773..	-
8.0 mm x 3.3 mm x 2.7 mm (Bugeye)									
336		3.3	2.7	2.5 to 5.5	45	TSOP854..	TSOP852..	TSOP853..	TSOP855..
7.2 mm x 5.3 mm x 4.0 mm (Original SMD)									
199		5.3	4.0	2.5 to 5.5	40	TSOP354..	TSOP352..	TSOP353..	TSOP355..
				2.7 to 5.5	35	TSOP64..	TSOP62..	TSOP63..	-
4.5 mm x 5.0 mm x 1.3 mm (AP5)									
357		1.3	-	2.5 to 5.5	40	TSOP854.AP5	TSOP852.AP5	TSOP853.AP5	TSOP855..AP5

IR RECEIVER LEADED PACKAGES							APPLICATION AREAS				
PAGE		SUPPLY VOLTAGE (V)	d (m)	PIN OUT			LONG BURSTS DATA FORMATS		SHORT BURSTS DATA FORMATS		
							AGC4	AGC2/AGC8	AGC1	AGC3	AGC5
				PIN 1	PIN 2	PIN 3	VERY NOISY ENVIRONMENTS	STANDARD APPLICATIONS	HIGH DATA RATES	NOISY ENVIRONMENTS	VERY NOISY ENVIRONMENTS
							MAX. 1 kbit/s		MAX. 4 kbit/s		
12.5 mm x 10.0 mm x 5.8 mm (Standard Size)											
73		2.5 to 5.5	45	Out	GND	V_S	TSOP314...	TSOP312...	TSOP311...	TSOP313...	TSOP315..
6.9 mm x 5.0 mm x 4.8 mm (Minicast)											
149		2.5 to 5.5	45	Out	GND	V_S	TSOP384...	TSOP382...	TSOP381...	TSOP383...	TSOP385...
		2.7 to 5.5	35				TSOP584..	TSOP582..	TSOP581..	TSOP583..	-
		2.5 to 5.5	45	Out	V_S	GND	TSOP394...	TSOP392...	TSOP391...	TSOP393...	TSOP395..
		2.7 to 5.5	35				TSOP594..	TSOP592..	TSOP591..	TSOP593..	-
6.9 mm x 6.0 mm x 5.6 mm (Small Size)											
99		2.5 to 5.5	45	Out	GND	V_S	TSOP344...	TSOP348...	TSOP341...	TSOP343...	TSOP345..
		2.7 to 5.5	35				TSOP44..	TSOP48..	TSOP41..	TSOP43..	-
		2.5 to 5.5	45	Out	V_S	GND	TSOP324...	TSOP322...	TSOP321...	TSOP323...	TSOP325..
		2.7 to 5.5	35				TSOP24..	TSOP22..	TSOP21..	TSOP23..	-

General Information

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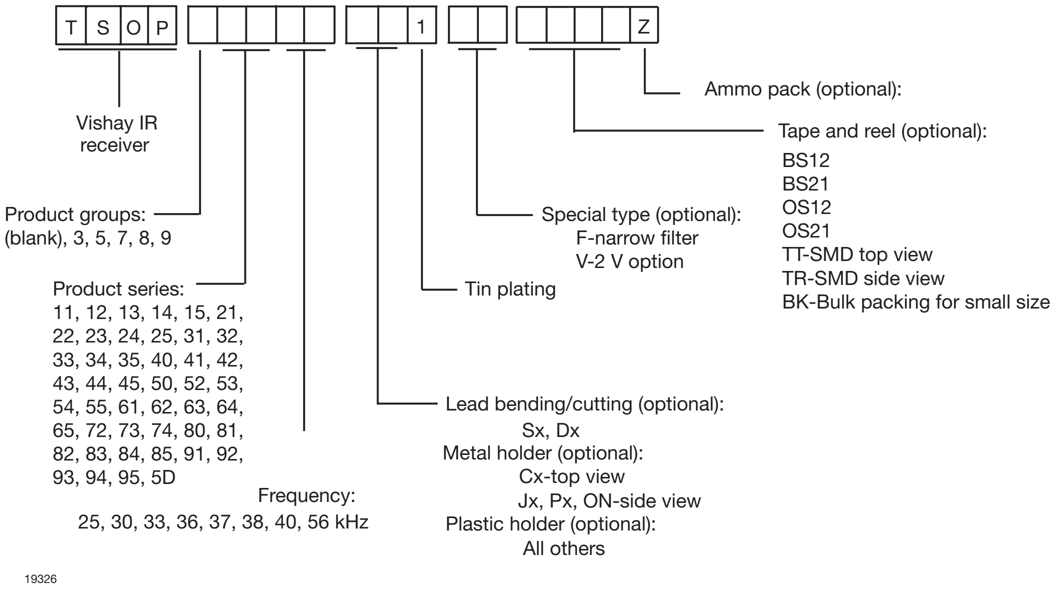
General Information

PRODUCT DESIGNATION AND SELECTION FOR TSOP IR RECEIVER MODULES

Description of the TSOP series field codes:



Example: TSOP1236TB1 = receiver with f_o = 36 kHz, bent in a top view holder, and solder plated leads.

Conventions Used in Presenting Technical Data

SYMBOLS AND TERMINOLOGY (alphabetically)

A	**Radiant sensitive area**
C	**Capacitance**
°C	**Celsius**
C_j	**Junction capacitance**
C_k	**Coupling capacitance**
d	**Distance**
E_A	**Illumination at standard illuminant A**
E_e	**Irradiance** (at a point of a surface)
E_v	**Illuminance** (at a point of a surface)
f	**Frequency**
I_e	**Radiant intensity** (of a source in a given direction)
I_F	**Forward current continuous**
I_{FM}	**Peak forward current**
I_{OH}	**High level output current**
I_{ph}	**Photocurrent** (photoelectric current)
I_{ra}	**Reverse light current**
I_{ro}	**Reverse dark current**
I_{SD}	**Supply current in dark ambient**
I_{SH}	**Supply current in bright ambient**
I_v	**Luminous intensity** (of a source, in a given direction)
K	**Kelvin**
lm	**Lumen**
lx	**Lux**
NEP	**Noise equivalent power**
P_{diss}	**Power dissipation, general**
P_{tot}	**Total power dissipation**
R_{IO}	**Input/output isolation resistor**
R_{is}	**Isolation resistance**
R_L	**Load resistance**
R_{thJA}	**Thermal resistance,** junction-to-ambient
R_{thJC}	**Thermal resistance,** junction-to-case
S	**Sensitivity, absolute**
$s(\lambda)$	**Absolute spectral sensitivity** at a wavelength λ
$s(\lambda)_{rel}$	**Spectral sensitivity, relative**
$s(\lambda_0)$	**Spectral sensitivity** at a reference wavelength λ_0
$s(\lambda_p)$	**Spectral sensitivity** at a reference wavelength λ_p
sr	**Steradian**
T	**Period** (duration)
T	**Temperature**
t	**Time**
T_{amb}	**Ambient temperature** (range)
T_{case}	**Case temperature**
t_d	**Delay time**
t_f	**Fall time**
T_j	**Junction temperature**
t_{off}	**Turn-off time**
t_{on}	**Turn-on time**
t_p	**Pulse duration**
t_{pi}	**Input pulse duration**
t_{po}	**Output pulse duration**
t_r	**Rise time**
t_s	**Storage time**
T_{sd}	**Soldering temperature**
T_{stg}	**Storage temperature range**
V_{CEsat}	**Collector emitter saturation voltage**
V_{EBO}	**Emitter base voltage, open collector**
V_{ECO}	**Emitter collector voltage, open base**
V_F	**Forward voltage**
V_O	**Output voltage**
V_{OH}	**Output voltage high**
V_{OL}	**Output voltage low**
V_R	**Reverse voltage**
V_S, V_{CC}	**Supply voltage**
$\varphi = \alpha/2$	**Angle of half sensitivity, angle of half intensity**
$\varphi_{1/2}$	**Angle of half transmission distance**
λ	**Wavelength,** general
$\lambda_{0.5}$	**Range of spectral bandwidth** (50 %)
λ_p	**Wavelength** of peak sensitivity or peak emission
$\Delta\lambda$	**Spectral half bandwidth**
Φ_e	**Radiant flux, radiant power**
Ω	**Solid angle**

Introduction

Infrared remote control has become a standard part of home entertainment equipment and appliances. Nearly all of the functions of TV sets, VCRs, satellite receivers, audio equipment, DVD players and air-conditioners are or can be remote controlled.

Vishay Semiconductors became a major supplier of infrared remote control components right from the beginning of the IR industry in the 1970's. Today, Vishay is a leading manufacturer of IR receiver modules, IR emitting diodes as well as transceivers for data communications in accordance with the IrDA standard.

In all these products, signals are transmitted in the near infrared range with a wavelength between 840 nm and 960 nm.

Remote control receiver modules must be extremely sensitive and yet should not react to interference from other sources of infrared light other than the intended one. Multiple systems must operate in close vicinity without disturbing each other and also should not be affected by environmental noise signals such as ambient light, electromagnetic interference or supply voltage ripple.

Vishay offers a wide variety of different types of IR receiver modules in order to address the needs of the particular application being considered.

The following pages present an overview of the different types and provide help in finding the right part with respect to the mechanical requirements, the data format and possible disturbance sources.

The IR receiver modules of Vishay are easy to use. A highly sophisticated internal circuit enables reliable IR transmission for the customer under any conditions. The TSOP IR receiver modules are proven products. They are based on many years of experience from one of the most advanced infrared receiver manufacturers in the world.

TYPICAL APPLICATIONS

- TV sets
- Video recorders
- Satellite receivers
- DVD players
- Slide projectors
- Audio components
- Air-conditioners
- Data communication
- Sensors and Light barrier systems for long distances

SPECIAL FEATURES

- High sensitivity for a large transmission range (35 m/120 ft)
- Minimum interference from optical, electrical and electromagnetic disturbance sources
- Compact outline, many different mechanical versions
- Available for carrier frequencies from 30 kHz up to 56 kHz
- No external components necessary
- Output compatible for use with a micro-controller
- Relevant quality certifications ISO 9001, QS9000VDA6.1
- Automated large volume production

General Overview of IR Transmission in Free Ambient

Free ambient IR data transmission, IR remote control as well as most opto-electronic sensors and light barrier systems work with an optical wavelength between 870 nm and 950 nm. The emitter and detector components are highly efficient in this near IR wavelength band and can be manufactured at low cost.

Data transmission in free space demands high interference immunity of the IR receiving modules. The receiver unit, waiting to receive signals, is bombarded with different optical and electromagnetic noise signals, which are omni-present in the ambient or generated by the electrical appliance itself. All optical sources with an emission spectrum in the reception bandwidth (830 nm to 1100 nm) of the detector can be considered as disturbance sources. These are mainly fluorescent lamps, incandescent lamps and sunlight. Many plasma displays can also produce significant emissions in the optical band of the IR transmission.

The common method of modulation for IR remote control is Pulse Code Modulation (PCM). This method of encoding data enables transmission over long distances using a receiver with limited bandwidth and good sensitivity.

An emitter for the IR signal with high brightness and efficiency is also available from Vishay. IR emitters with a wavelength of 950 nm are the best match for IR receivers using carrier frequencies between 30 kHz and 56 kHz.

The maximum possible transmission distance of an IR remote control system depends on various parameters, but is mainly conditional on the radiant intensity of the emitter (I_e) and the sensitivity of the receiver ($E_{emin.}$). Additionally, the reflective conditions of the test room, the optical transmittance of windows or light guides in front of the receiver and the disturbance conditions influence the maximum distance obtainable. Of course, also the minimum possible distance (saturation irradiance) is an important parameter for a remote control system. The TSOP IR receiver modules from Vishay will work even with zero distance between the emitter and the receiver module.

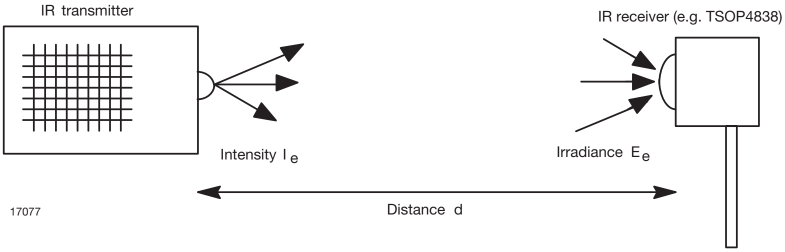


Fig. 1 - Relevant Values for IR Transmission Distance

Calculating transmission ranges in the simplest case assumes a quadratic relationship between the distance d and the irradiance of the receiver Ee. Given emitter intensity Ie, the maximum distance is calculated as:

$$d_{max.} = \sqrt{\frac{I_e}{E_{e\,min.}}}$$

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When the responsivity of the receiver module and the intensity of the transmitter are known, the transmission range can either be calculated using this expression or read from figure 2, where this quadratic equation is shown graphically. The typical distance shown in the curve was calculated using a threshold irradiance of 0.17 mW/m^2, which is equivalent to the typical value specified for the TSOP48 or TSOP22 series. The maximum threshold sensitivity is specified at 0.35 mW/m^2 for these devices, which is used for calculating the worst case transmission distance. The typical intensity values of selected emitters are listed in table 1.

For example, operating a TSAL6200 emitter at 500 mA pulsed forward current leads to an intensity of 300 mW/sr. These data result (in combination with the Vishay receiver module TSOP48xx) in a theoretical transmission range of 39 m (see figure 2).

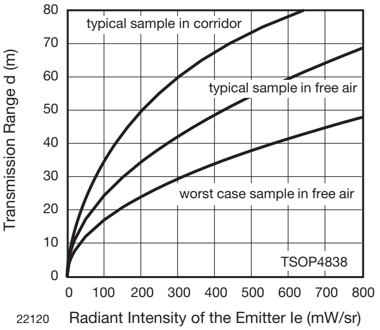

Fig. 2 - Maximum Transmission Range with TSOP4838 as a Function of the Radiant Intensity of the Emitter

General Overview of IR Transmission in Free Ambient

In practice, the relationship between irradiance and transmission distance does not exactly follow a quadratic curve. In most cases, the actual distance is longer than calculated by the expression. This means that the example calculated here can be used as a worst case in free air and in reality better transmission ranges are attained. However, whenever an opaque window or light pipe is used between the receiver and the emitter, the actual transmission distance will be reduced.

Comparisons of remote control systems are often performed in long corridors. As indicated in figure 2, the transmission range is increased above the typical distance under these test conditions because of the reflective properties of the walls, the ceilings and other objects. Thus in a corridor, the function of the irradiance vs. distance does not obey a quadratic expression.

The required levels for transmission optical power in an enclosed room can be estimated by using other approximations. If we assume that the whole inner surface of a room (e.g. floor area of 30 m^2, height of 2.5 m) is irradiated with the emission of an infrared source with an overall irradiance of $E_e = 0.4$ mW/m^2, then an emitted radiant flux of 50 mW is necessary (surface = 115 m^2, 100 % efficiency). With an 80 % reflection loss, about 250 mW of emitted radiation will be required for reliable reception in the whole room.

250 mW is a value, which can be achieved with an emitter TSAL6400 operating at a peak forward current of 700 mA. Under these conditions, no direct path between the emitter and the receiver is assumed, but that radiation will reach the detector after at least one reflection. This kind of remote control system is very user friendly for the customer because he can aim the handset in any direction of his living room. An IR emitter with a wide emitting angle will also provide this kind of comfortable remote control system.

TABLE 1 - EMITTERS FOR TSOP RECEIVER MODULES

EMITTER	PACKAGE DIAMETER	WAVELENGTH nm	RADIANT FLUX $I_F = 100$ mA mW typ.	RADIANT INTENSITY $I_F = 100$ mA mW/sr typ.	EMISSION ANGLE	REMARKS
TSAL4400	3 mm	940	35	30	± 25°	Blue resin
VSLB3940	3 mm	940	40	65	± 22°	Clear resin
TSAL5100	5 mm	940	35	130	± 10°	Leads with stand off, blue resin
TSAL6100	5 mm	940	35	130	± 10°	Blue resin
TSAL6200	5 mm	940	35	60	± 17°	Blue resin
TSAL7200	5 mm	940	35	60	± 17°	Clear resin
TSAL5300	5 mm	940	35	45	± 22°	Leads with stand off, blue resin
TSAL7300	5 mm	940	35	45	± 22°	Clear resin
TSAL6400	5 mm	940	35	40	± 25°	Blue resin
TSAL7400	5 mm	940	35	40	± 25°	Clear resin
TSAL7600	5 mm	940	35	35	± 30°	Clear resin
TSML1020	SMD	940	35	7	± 12°	Clear SMD package with lens
VSML3710	SMD	940	35	8	± 60°	PL-CC-2 SMD package
VSMB2000	SMD	940	40	40	± 12°	Clear SMD package with lens
VSMB3940	SMD	940	40	13	± 60°	PL-CC-2 SMD package

All IR emitting diodes shown in table 1 are suitable for use with the Vishay IR receivers for standard remote control applications (30 kHz to 56 kHz).

Data Formats for IR Remote Control

In most remote control transmission systems, only small data rates are required for transmitting the control functions of home entertainment equipment. The reliability of the transmission is essential as an incorrect interpretation of a transmitted code is not permissible. Corrupted signals must be ignored. In most coding schemes, commands are repeated until the remote controlled device reacts as desired. The operator can directly observe the result of pressing a key by means of visual feedback.

Because IR signals are confined within a room and because there is only a short period of data transmission with each key press, there are no legal restrictions for IR transmission in the frequency band between 30 kHz and 56 kHz.

Several methods of modulation have become well established. A reliable and power saving transmission method in which bursts of the carrier frequency are transmitted is called "Pulse Code Modulation" (PCM). There are three commonly used representations of one bit in remote control systems which are described in the following diagrams.

The "Bi Phase Coding" has one rising or falling edge in the centre of each time slot (figure 1). In the "Pulse Distance Coding", all bursts have the same length but the time between the bursts is different depending on the value of the bit (figure 2). In the "Pulse Length Code", there are two kinds of burst lengths depending on the bit value (figure 3).

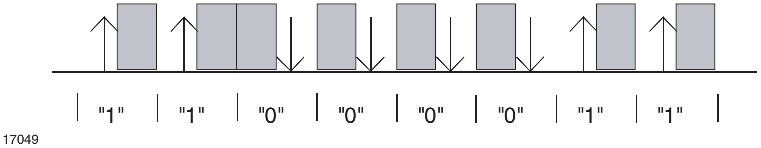

Fig. 1 - BI Phase Coding (a rising edge within a time window is equivalent to a "1", a falling edge represents a "0")

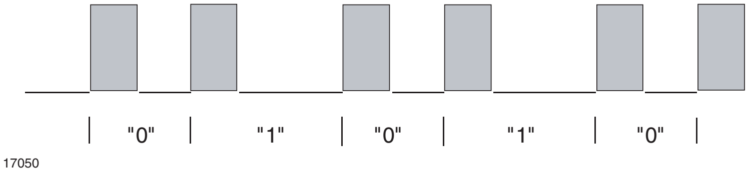

Fig. 2 - Pulse Distance Coding

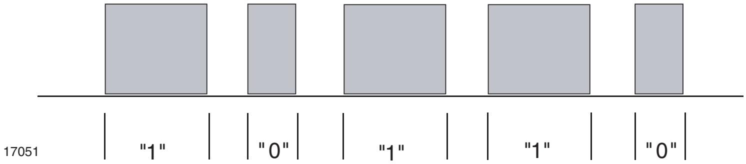

Fig. 3 - Pulse Length Coding

The Vishay IR receiver modules were developed and optimised for use in all such carrier frequency burst transmission systems. Standard types are available for the frequencies **30 kHz, 33 kHz, 36 kHz, 36.7 kHz, 38 kHz, 40 kHz, and 56 kHz**.

In addition to different kinds of coding and different carrier frequencies, there are further variations in the data formats; with and without pre-burst, with different numbers of bits in a command, and with different bit lengths.

Almost all codes have address bits and data bits. For reliability reasons, some codes send the data twice, once inverted and once non-inverted. Usually the data command is repeatedly sent as long as the key is being pressed. There are different ways to distinguish between a multiple key press and an interruption of the transmission link (e.g. to avoid the TV selecting channel "11" when channel "1" was intended). Some codes use a toggle bit, which changes its value at each key-press. Some codes send a pre- or post-burst at the beginning and/or at the end of each key press. And some codes send the data only once for each key-press.

Two common data formats, the RC5 code and the NEC code, are described in more detail here.

THE RC 5 CODE

The RC 5 standard uses a bi-phase coding (see figure 4) the carrier frequency fixed at 36 kHz.
The transmission of a data word begins with two start bits followed by a toggle bit. The toggle bit changes its value at each new key-press. The five address bits represent the address of the device to be controlled. The six command bits contain the information to be transmitted.
Each bit in the data word consists of half a bit period with no transmission and half a bit period with a burst of 32 pulses at 36 kHz. The timing is shown in the pulse diagrams.
The most suitable IR receivers for receiving the RC5 code are those with the "AGC2" setting and a bandpass frequency of 36 kHz. Some examples are: TSOP1236, TSOP4836, TSOP34836, TSOP39236, TSOP36236.

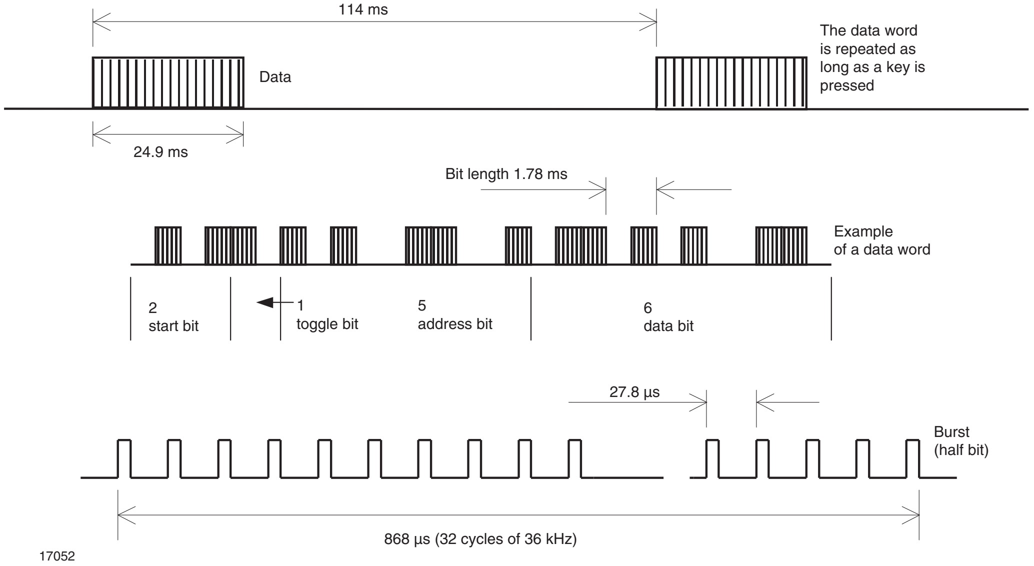

Fig. 4 - RC 5 Transmission Code

THE NEC CODE

The NEC code uses bursts at a carrier frequency of 38 kHz. All Vishay receiver modules operate well with this coding scheme, but those types with the AGC4 setting (e.g. TSOP4438, TSOP58438 or TSOP75438) have the best noise suppression while still supporting this data format.
The NEC code starts the transmission using a so called leader code, a burst with a length of 9 ms, followed by a pause of 4.5 ms and then the data word. The original purpose of this leader code was to let the internal control loops in the receiver modules settle. But such a pre-burst is not necessary for the Vishay receivers to function correctly. After transmitting the data word, only the leader code and a single bit are transmitted repeatedly for as long as a key is pressed. A special property of this code is a constant word length in combination with pulse distance modulation. Both the address and the data bits are transmitted twice, first as a normal byte followed by an inverted byte. This is shown in figure 5. The half period burst portion of each bit contains 22 pulses, each with a width of 8.77 µs and a period of 26.3 µs. A "0" is represented by a pulse distance of 1.125 ms and a "1" by a pulse distance of 2.25 ms. 8 address bits are used to identify the device to be controlled. A further 8 bits are used for the transmission of the command data. As mentioned above, the words are always followed, without a pause, by the inverted words. E.g., the transmission of the address word "00110111" and the command data word "000110" is performed by sending the bits:
"00110111'11001000'00011010'11100101".
In a special version of the NEC code, the pre-burst, including all of the address and data bits, is repeated in each 108 ms time slot for as long as the key is pressed.

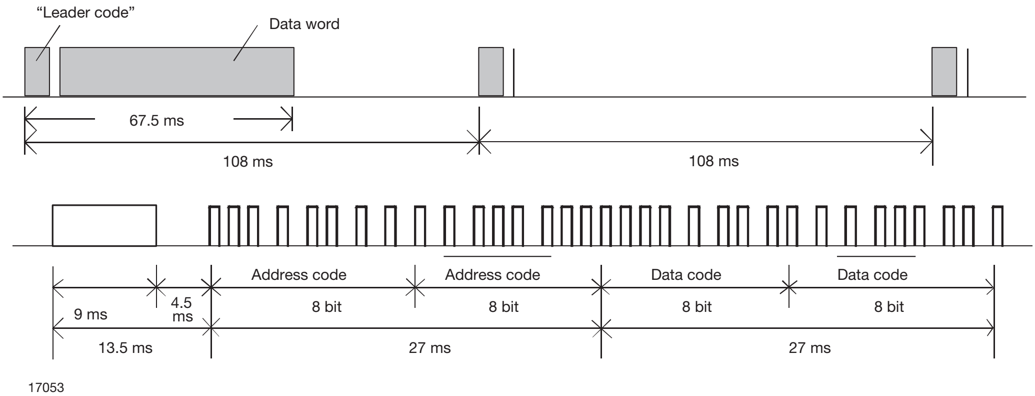

Fig. 5 - NEC Transmission Code

DATA TRANSMISSION WITH THE TSOP RECEIVER MODULES

Although the TSOP receiver modules are mainly used for IR remote control, some of them are suitable for continuous data transmission as well.

For this purpose, we recommend those IR receiver types with the AGC1 setting, such as TSOP4140, TSOP38156 or TSOP36138. These receivers are suitable for continuous transmission and short bursts. Two examples for such continuous data transmission are shown in figures 6 and 7:

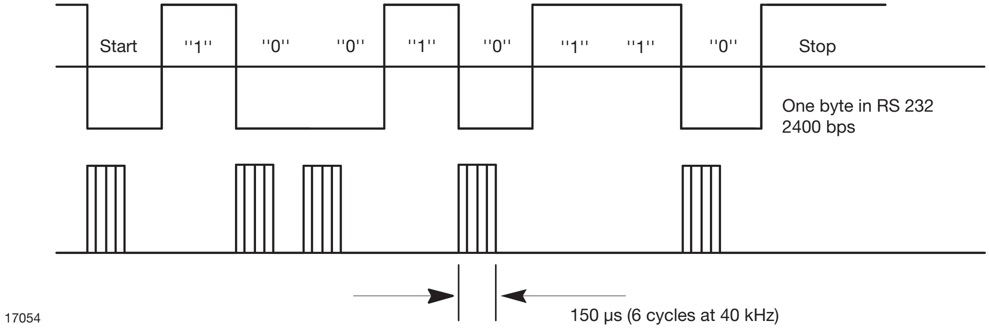

Fig. 6 - Example of a Data Transmission at 2400 bps with TSOP4140

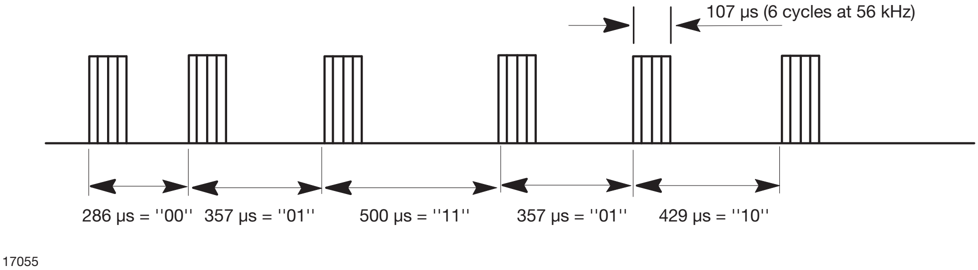

Fig. 7 - Example of a Data Transmission at about 4000 bps with the TSOP83156

COMPATIBILITY OF THE TSOP RECEIVER MODULES WITH DATA FORMATS

Vishay offers a variety of IR receiver series in order to supply an optimised solution for each application. Guidelines for selecting the best part for each data format is given here.

Basically there are four categories of IR receiver settings regarding noise suppression and data format compatibility. The summary of the features of these AGC types is listed here:

AGC1 is compatible with any coding scheme, it is optimized for continuous data transmission.
AGC2 is optimized for most common remote control standard applications with typical long burst data formats.

AGC3 is optimized for short burst data formats in noisy environments.
AGC4 is optimized for most common remote control standard applications in very noisy environments (including dimmed LCD backlightings).
AGC5 is optimized for short burst data formats in very noisy environments.

Table 1 provides an overview of which IR receiver type can be used for the various data formats.

TABLE 1 - COMPATIBILITY FOR DATA FORMATS

	AGC1	AGC2	AGC3	AGC4	AGC5	BEST CHOISE
NEC continuous data frames	yes	yes	yes	yes	yes	AGC4
RC5 code	yes	yes	yes	yes	yes	AGC4
RC6 code	yes	yes	yes	yes	yes	AGC4
RCMM	yes	no	yes	no	yes	AGC5
Mitsubishi code 38 kHz	yes	yes	yes	no	yes	AGC5
Sony code SIRCS 12 bit	yes	yes	no	no	no	AGC2
Sony code SIRCS 15 bit	yes	yes	no	no	no	AGC2
Sony code SIRCS 20 bit	yes	yes	no	no	no	AGC2
r-map data format 38 kHz	yes	no	yes	no	yes	AGC5
r-step data format 38 kHz	yes	yes	yes	yes	yes	AGC4
r-step data format for keyboards 56 kHz	yes	yes	yes	yes	yes	AGC4
XMP-1	yes	no	yes	no	yes	AGC5
XMP-2	yes	no	yes	no	yes	AGC5
Low latency protocol - worst case frame 16 bit	yes	yes	yes	no	no	AGC3
Low latency protocol - extended frame 24 bit	yes	yes	no	no	no	AGC2
MCIR code keyboard package timing	yes	yes	yes	no	yes	AGC5
MCIR code pointing device timing	yes	yes	yes	no	yes	AGC5
MCIR code remote control timing	yes	yes	yes	yes	yes	AGC5
Konka TV data format	yes	yes	yes	yes	yes	AGC4
Panasonic/Matsushita command	yes	yes	yes	yes	yes	AGC4
Sharp data format	yes	yes	yes	yes	yes	AGC4

Disturbance Sources

Receivers in remote control systems must have high sensitivity and be ready to receive a signal any time. This operating environment also means that they are susceptible to different kinds of disturbance signals. Vishay IR receivers set the internal gain to an optimum sensitivity level such that there are no unwanted output pulses due to noise but also such that the sensitivity be as high as possible for the data signal. Some commonly found disturbance signals described below.

DC LIGHT SOURCES

The main DC light sources found in remote control environments are sunlight and tungsten (incandescent) bulbs. These kind of disturbance sources will cause a DC current in the detector inside the module, which in turn will produce white noise in the receiver circuit. The negative influence of such DC light can be reduced by optical filtering. Light in the visible range (400 nm to 700 nm), is almost completely removed by the use of an optical cut-off filter at 830 nm. Therefore, only longer wavelength radiation above 830 nm can be detected. Special measures were also taken in the design of the devices to ensure that the sensitivity above 1050 nm drops off as sharply as possible. The silicon photo detector therefore receives only a limited band from the original spectrum of the “white” light source.

FLUORESCENT LAMPS

The spectral emission of fluorescent lamps is rather complicated. Very little radiation is emitted in the infrared. The total spectral emission is a combination of the relatively broadband emission from the luminescent phosphor and the spectral peaks emitted from the different gaseous components filling the tubes. The radiation of the activated luminescent materials is mainly in the visible wavelength band and is almost DC light. The affect of this radiation on the IR receivers is therefore insignificant. However, the direct emission of the gas discharge in the lamp carries the modulated signal of the lamp ballast. The IR portion of the optical spectrum of a fluorescent lamp is shown expanded in figure 1. This part of the spectrum can vary depending on the lamp type and also on the temperature of the lamp.

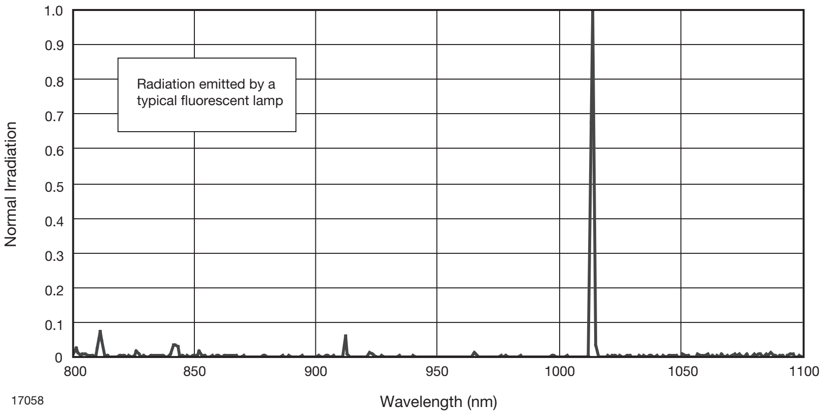

Fig. 1 - Spectral Emission of Fluorescent Lamps

The impact of the light coming from fluorescent lamps to the IR receiver may be very different depending on the ballast which is driving the lamp.

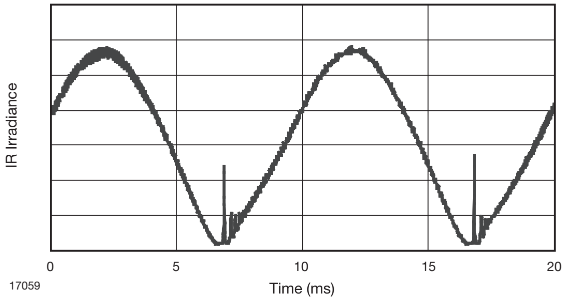

Fig. 2 - Radiated Signal from a Fluorescent Lamp with Coil Ballast

The signal waveforms of four different kinds of lamp ballast are shown in the following diagrams. The signal shown in figure 2 comes from a fluorescent lamp with coil ballast, which is operated at a 50 Hz power line frequency. There is no impact on Vishay's IR receivers due to the 10 ms ignition pulses. However, some lamps also show higher frequency components (e.g. in figure 2 on the first power line cycle: 19 kHz). These components may interfere with the IR data signal or even cause unexpected output pulses with receivers that are not well designed. A different kind of disturbance signal is caused by fluorescent lamps with an electronic ballast.

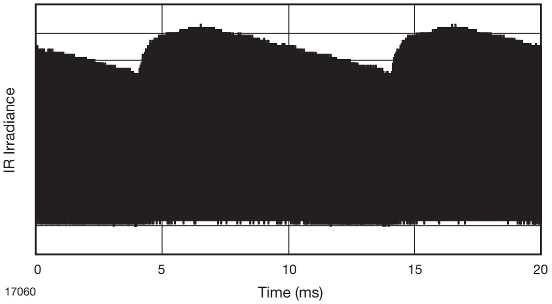

Fig. 3 - Radiated Signal from a Fluorescent Lamp with Low Modulated Electronic Ballast

Typically the frequency of the optical disturbance signal of such lamps is in the range between 50 kHz and 100 kHz. The optical frequency is always twice the electrical frequency of the driver circuit in the lamp ballast. All Vishay IR receiver modules can easily suppress a disturbance signal as shown in figure 3. There will be no unwanted output pulses due to such lamps. However, the receiver sensitivity will be reduced in proportion to the strength of the disturbance signal. More critical are electronic ballasts with a higher modulation of the oscillating amplitude. Two examples of such kind of lamps are shown in figure 4 and figure 5.

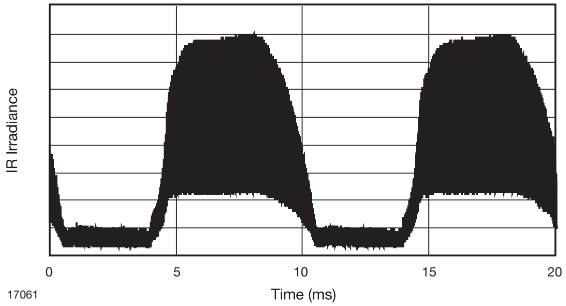

Fig. 4 - Radiated Signal from a Fluorescent Lamp with Strongly Modulated Electronic Ballast (50 Hz power line frequency)

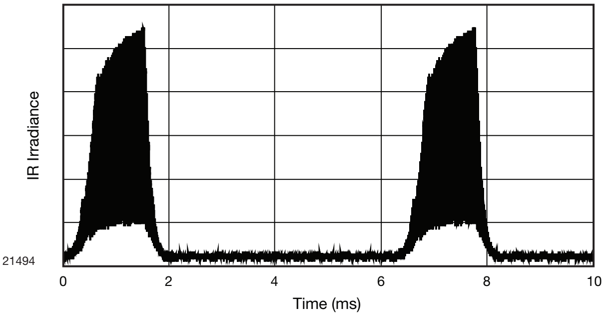

Fig. 5 - Radiated Signal from a Dimmed Backlighting of a LCD TV

Such strongly modulated disturbance signals have a waveform similar to the bursts of a data signal. Hence, almost all IR receivers will produce output pulses due to these disturbance signals. However, many of the Vishay IR receiver modules will suppress even this signal (see table 1). These receiver modules will evaluate such strongly modulated signals as disturbance and will reduce the internal gain accordingly. They are still capable of receiving a remote control signal at a lower range than without the disturbance signal.

TABLE 1 - DISTURBANCE PULSES DUE TO FLUORESCENT LAMPS OR OTHER NOISE SOURCES

	AGC1	AGC2/8	AGC3	AGC4	AGC5
EXAMPLES FOR IR RECEIVER TYPES	**TSOP41xx** **TSOP341xx** **TSOP581xx** **TSOP381xx**	**TSOP12xx** **TSOP48xx** **TSOP348xx** **TSOP362xx**	**TSOP343xx** **TSOP383xx** **TSOP353xx** **TSOP753xx**	**TSOP24xx** **TSOP344xx** **TSOP584xx** **TSOP854xx**	**TSOP345xx** **TSOP325xx** **TSOP385xx** **TSOP755xx**
Signal from fluorescent lamp as in figure 2	suppressed in most cases	noise suppressed by AGC			
Signal from fluorescent lamp as in figure 3	noise suppressed by AGC				
Signal from fluorescent lamp as in figure 4	disturbance pulses	noise suppressed by AGC			
Signal from fluorescent lamp as in figure 5	disturbance pulses		noise suppressed by AGC		
Signal from plasma displays	suppressed in most cases	noise suppressed by AGC			

DISTURBANCE BY ELECTROMAGNETIC INTERFERENCE

The Vishay IR receivers are very robust against high frequency EMI sources, such as mobile phones, wireless phones, wireless LAN antennas, etc. This robustness is achieved by a special circuit design.

Another way how the IR receivers can be disturbed is the coupling of electrical fields at low frequencies. Most critical are those signals that are below 100 kHz or close to the band pass frequency of the IR receiver. The typical sources for such interference signals that affect the IR receivers by capacitive coupling are backlighting of LCD TVs, vacuum fluorescent displays (VFD, common in DVD players), cathode ray tubes (CRT, common in older TVs), switch mode power supplies or control circuits for motors. The closer the receiver is to the source of EMI, the stronger the interference. So the resistance to EMI is heavily determined by selecting a suitable location for the IR receiver in the application.

The Vishay TSOP IR receiver modules have two kinds of countermeasures against EMI interference; internal metal shielding (see fig. 6) and Automatic Gain Control (AGC). The internal metal shielding is an effective protection against EMI because the metal shield is situated very close to the sensitive photo diode. Being inside the plastic package, the shielding remains invisible to the user and has no shiny reflection behind the front panel of the appliance. The AGC will suppress any remaining influence from EMI using the same mechanism described for the disturbance from fluorescent lamps. The AGC will reduce the gain of the receiver until spurious pulses are not present at the output. The IR receivers with AGC4 or AGC3 setting have the lowest probability of spurious pulses caused by EMI pattern.

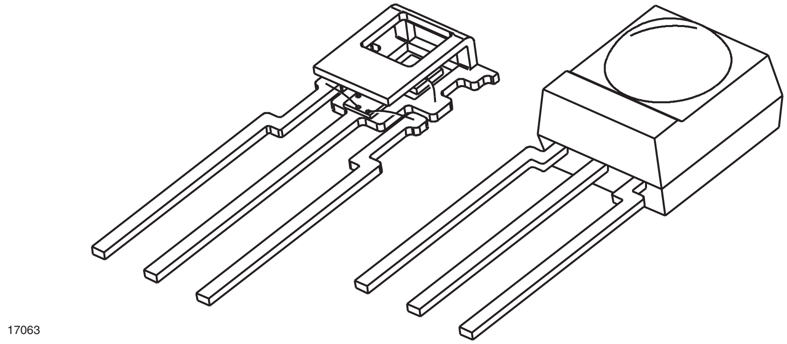

Fig. 6 - Internal Metal Shielding against EMI

SUPPLY VOLTAGE DISTURBANCE

A further negative influence on the TSOP IR receiver modules may come from noise on the supply voltage. Such disturbance can be caused by a switching power supply which is not well filtered, or by other digital circuits which produce spikes on the supply line. In contrast to other IR receiver, Vishay's devices have in internal voltage stabilisation. Hence the performance of the receiver modules are hardly affected by ripple on the supply voltage as long as the amplitude is less than 100 mV.

The application circuit in figure 7 filters the supply voltage so that transient spikes orripply are attenuated. This might be useful to protect the IR receiver from electrical overstress or to maintain a reiliable function in case of very strong ripple. The resistor R2 can optionally be used if a steeper slope of the output rising edge is required. Each Vishay IR receivers type is available for supply voltages V_S in the range between 2.7 V and 5.5 V. Please see our product matrix for more details.

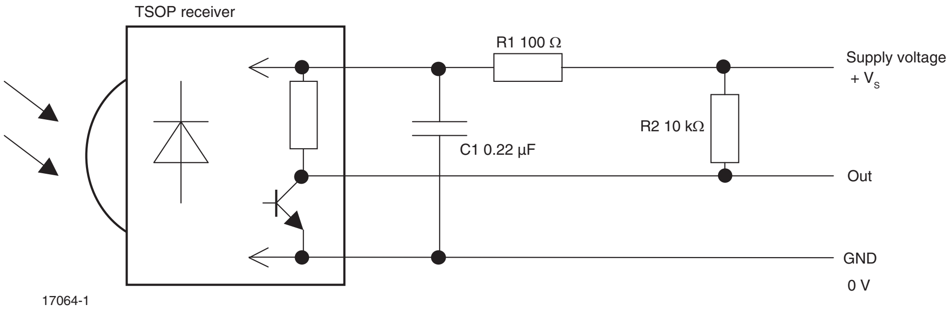

Fig. 7 - Application Circuit with Filter for Supply Voltage Ripple

Circuit Description of the IR Receiver Modules

All Vishay IR receivers have the same circuit architecture. The functional block diagram of the Vishay TSOP IR receiver modules can be seen in figure 1. The infrared signal generates an equivalent photo current in the photo PIN diode. The DC part of the signal is blocked in the bias circuit and the AC part is passed to a trans impedance amplifier followed by an automatic gain-control amplifier and an integrated band pass filter. A comparator, an integrator and a Schmitt Trigger stage perform the final signal conditioning. The blocks “Automatic Gain Control” and “Automatic Threshold Control” dynamically control the operating points as well as the threshold levels required to suppress noise from disturbance sources. The digital output signal has an active low polarity and consists of an envelope signal of the incoming optical burst, without the carrier frequency.

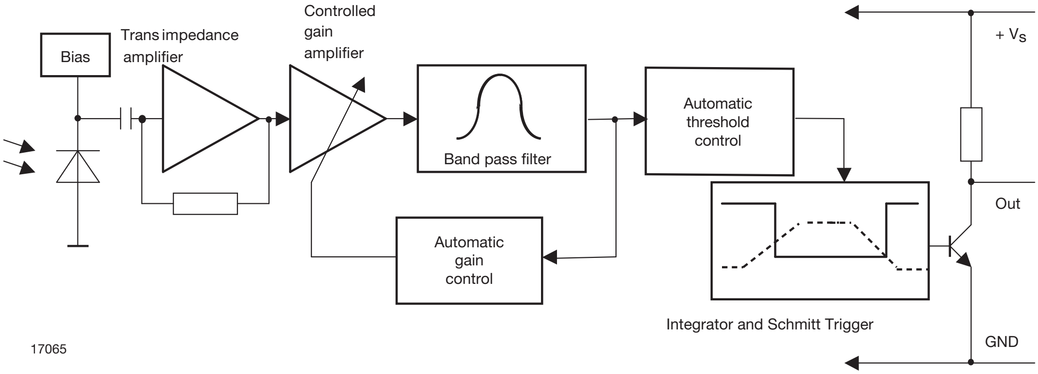

Fig. 1 - Simplified Block Diagram of TSOP IR Receivers

TRANS IMPEDANCE AMPLIFIER

The Bias block provides the necessary bias voltage for the detector diode and also separates the DC and low frequency components from the useful signal by providing a low impedance path to ground. The AC signals are passed unhindered to the trans impedance amplifier.

The currents at the signal frequency are converted by the trans impedance amplifier to a voltage at the input of the Controlled Gain Amplifier.

CONTROLLED GAIN AMPLIFIER

Most of the gain in the system is generated in the controlled gain amplifier, whereby the degree of amplification is controlled by the Automatic Gain Control (AGC) block. The gain variation of this amplifier is about 45 dB.

BAND PASS FILTER

The band pass filter is an important system block, required to obtain good performance in disturbed or noisy ambients. The filter attenuates noise coming from various disturbance sources. As the burst duration in some IR remote control data formats is relatively short, the figure of merit or Q cannot be more than 10, as a higher Q band pass filter would need a longer burst time to become oscillating.

TABLE 1 - BAND PASS FILTER IN THE TSOP RECEIVER: FIGURE OF MERIT

	AGC1	AGC2/8	AGC3	AGC4	AGC5
Figure of merit (band pass filter)	7	10	10	10	10

The band pass filter is tuned during the production process. The following band pass center frequencies are available: 30.3 kHz, 33 kHz, 36 kHz, 36.7 kHz, 38 kHz, 40 kHz, 44 kHz, and 56 kHz. These are the carrier frequencies for the most common data formats of IR remote controls.

The duty cycle of the carrier frequency can be between 50 % and 5 %. A remote control system using a Vishay IR receiver is more efficient regarding battery power consumption on the emitter side if the carrier duty cycle is low. This is shown in the following example:

- Carrier duty cycle 50 %, peak current of emitter I_F = 200 mA, the resulting transmission distance is 25 m
- Carrier duty cycle 10 %, peak current of emitter I_F = 800 mA, the resulting transmission distance is 29 m

AUTOMATIC GAIN CONTROL (AGC)

The AGC stage ensures that the receiver module is insensitive to disturbance signals. It adapts the system sensitivity to the existing noise or disturbance level by changing the gain of the amplifier. In dark ambient, the AGC also sets the gain to the most sensitive value at which there are no longer any random output pulses. The time constant of the AGC was chosen to be sufficiently large enough to avoid a decrease in sensitivity during normal transmission.

The AGC does not react to the useful signal but reduces the sensitivity in case of disturbances. Hence the AGC has to distinguish between useful and disturbance signals. To achieve this, the AGC needs to distinguish between these good and bad signals. The characteristics used to destinguish the signals are different for the various IR receiver series from Vishay. The criteria used are mainly burst length and envelope duty cycle. In table 2, there are some figures that show the AGC criteria for data signals.

TABLE 2 - CONDITIONS OF THE AGC FOR DATA SIGNAL

	AGC1	AGC2/8	AGC3	AGC4	AGC5
Maximum burst length for high duty cycle	1.8 ms	1.8 ms	1 ms	1 ms	0.6 ms
Idle time needed for each burst longer than the max. burst length (above line)	1.2 x time burst length	4 x time burst length	6 x time burst length	10 x time burst length	25 ms
Maximum number of short bursts in 1 s	2000	800	2000	1300	2000

AUTOMATIC THRESHOLD CONTROL (ATC)

After the band pass filter, the signal is evaluated by a comparator. In quiescent mode (no data signal present), there should be no output signal due to noise, i.e. the threshold of the comparator is set above the noise floor. When a signal is received, the comparator threshold level is adjusted upward to a higher value. This shift prevents random pulses occurring during a data message.

A further benefit of the ATC is the stabilisation of the output pulse width. Without the ATC, the output pulses would vary with the strength of the IR input signals.

The comparator threshold level reverts back to the initial value after a time of approximately 10 ms if it is not retriggered in the meantime. This time constant ensures a stable signal evaluation during the data message for the most common transmission codes. This method efficiently avoids having disturbance pulses being detected as falsely transmitted signals during the transmission of an information block.

INTEGRATOR AND SCHMITT TRIGGER

The integrator is triggered when the signal reaches the above mentioned comparator threshold. Several consecutive cycles of the carrier signal at the comparator output are required before the integrator finally triggers the output.

The integration time necessary to control the output via the Schmitt Trigger is given in table 3 for each of the IR receiver module series.

The integrator defines a minimum time for the burst length (integrator ramp up time) and a minimum time between the bursts (integrator ramp down time).

The integrator prevents the feed-through of short disturbances or spikes to the output. A long integrator ramp time can improve the signal to noise ratio significantly. The design of the integrator and Schmitt Trigger combination was optimised such that the output pulse width is close to the optical burst length at the input.

TABLE 3 - INTEGRATOR DATA OF THE VISHAY IR RECEIVER

	AGC1	AGC2/8	AGC3	AGC4	AGC5
Minimum burst length	6 cycles	10 cycles	6 cycles	10 cycles	6 cycles
Minimum gap between the bursts	10 cycles	12 cycles	10 cycles	12 cycles	10 cycles

OUTPUT STAGE

As shown in figure 1, the digital output of the TSOP IR receiver modules is an open collector transistor with an internal pull up resistor. An additional external pull up resistor can optionally be used if more current is needed to drive the input of the decoding device or if a faster switching time is required. The logic low level will be below 0.2 V even at a sink current of 2 mA. The output can continuously drive a capacitance of up to 1 nF without risk of damaging the output stage.

If is not recommended to pull down the output of the IR receivers to a voltage below 1 V by a pull down resistor or any other external components. Some IR receiver types might not work properly in that condition because a standby mode is activated.

Application Overview

COMPATIBILITY TO EXISTING APPLICATIONS

Normally, Vishay IR receiver modules are used in systems in which the data format and the decoding software are already specified by the customer. The TSOP receiver modules will in most cases work correctly the first time they are "dropped" into the system.

In the event the receiver module does not operate as well as expected, the following items should be checked:

- Table 1 in the chapter "Data Formats for IR Remote Control" lists the most popular IR remote control data formats and the IR receiver types suitable for receiving them. If a data format is not mentioned then carrier frequency, burst length and gap length of the data signal (see table 1 - in "Data Formats for IR Remote Control") should be cross checked against the receiver type. If there is uncertainty regarding the selection of the type, we recommend the general purpose TSOP343xx series.
- Possible disturbance sources (ambient light, EMI, noise or ripple on the power supply) as described in the chapter "Disturbance Sources".
- Attenuation due to an optical window in front of the sensitive area of the receiver or due to light guide coupling.
- Output pulse timing tolerances of the decoding software.

OUTPUT PULSE WIDTH TOLERANCES

The decoding software must accept and evaluate the output pulses of the IR receiver. In figure 1 there is example data of the output pulse width versus the optical input power. This diagram also gives an indication of the output pulse width jitter (the difference between the min. pulse width and the max. pulse width at a given irradiance).

The tolerances of the output pulse width (t_{po}) with respect to the input burst length (t_{pi}) is given in the expression:

$$\left(t_{pi} - \frac{5}{f_0}\right) < t_{po} < \left(t_{pi} + \frac{6}{f_0}\right)$$

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This tolerance includes variations over the entire range of temperature, supply voltage, irradiance and jitter. The jitter alone (output pulse width variation during the transmission of a data command) is much less than the above tolerances. Typical figures for the jitter are shown in figure 1, where the difference between maximum and minimum pulse width is calculated for each irradiance value.

If there is a decoding software compatibility problem because of the output pulse voltage level or the output pulse switching time, then an external pull up resistor (10 kΩ, see figure 7 in the chapter "Disturbance Sources") may solve the problem.

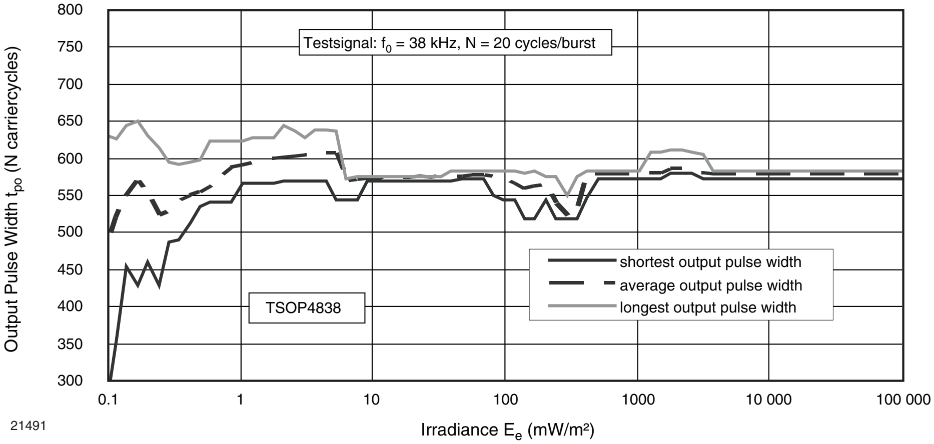


Fig. 1 - Statistical Evaluation of 1000 Output Pulses at each Irradiance

APPLICATION CIRCUIT FOR OPERATION IN HARSH ENVIRONMENTS

The Vishay IR receivers include an efficient protection circuitry against electrostatic discharge (ESD) or electrical overstress (EOS), which is sufficient for normal handling and assembly procedures according the common industry standards.

In case of serious over-voltage-transients it might be useful to add components for a further improvement of the protection.

If the robustness of the IR receiver for an air discharge ESD test needs to be improved then there are two options. The external ESD protection diodes as shown in fig. 2 (GSOT05C or similar) are an efficient protection or an additional metal holder that is electrically connected to GND (e.g. TSOP38238PC1) can act like a lightning conductor to protect the IR receiver.

Both the resistors and the diodes as shown in fig. 2 will improve the robustness against any overvoltage that might happen after soldering by PCB handling, PCB testing or during operation in the application (e.g. spikes from dimmer or motor control circuits).

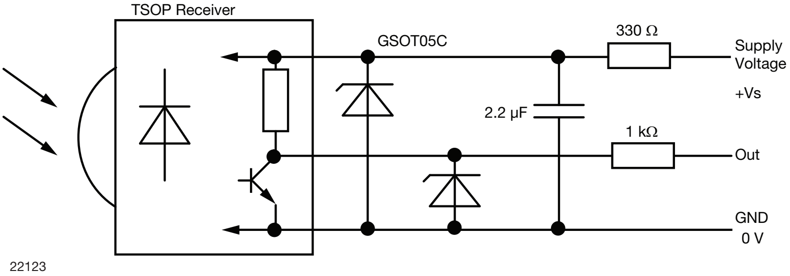


Fig. 2 - Protection Circuit against Over Voltage Spikes

APPLICATION IN SENSORS

Although the main application of the TSOP modules is IR remote control, they also exhibit good properties for use as sensors or in light barrier systems. A light barrier width of up to 20 m or a reflective sensor of up to 1 m detection distance is feasible. Some special features in these applications are: high sensitivity, low interference to ambient disturbance sources, compact outline, and low supply current consumption. Because these applications exhibit a continuously received signal, there are some limitations for the optical signal to prevent the AGC from being triggered and reducing the gain of the receiver.

Unlike for remote control in sensor applications the irradiance of the signal may vary a great deal during reception. For example, the irradiance may increase slowly from below 0.1 mW/m^2 (i.e. from a level too weak to be received). This can happen when an obstacle is removed slowly out of a light barrier. In such cases there are different limitations for the IR signal than in remote control applications. Table 1 shows the recommended burst length and burst repetition parameters for the IR signal when used in sensor applications with the different receiver series.

TABLE 1 - IR SIGNAL LIMITATION IN SENSOR APPLICATIONS

AGC CATEGORY	AGC1	AGC2/8	AGC3	AGC4	AGC5
EXAMPLES OF IR RECEIVER TYPES	**TSOP41xx** **TSOP321xx** **TSOP361xx**	**TSOP12xx** **TSOP48xx** **TSOP352xx**	**TSOP323xx** **TSOP383xx** **TSOP353xx**	**TSOP44xx** **TSOP384xx** **TSOP584xx**	**TSOP45XX** **TSOP385XX** **TSOP355XX**
Minimum burst length (number of cycles in a burst)	6	10	6	10	6
Minimum burst repetition time using the shortest burst	3 ms	6 ms	11 ms	17 ms	22 ms

FIX GAIN RECEIVER

For many optical sensors it is sufficient to provide just a simple digital state like “reflection-yes” or “reflection-no” or whether a beam is interrupted. In this kind of applications the “fix gain receivers” are often a good solution. There is no restriction regarding the fastest burst repetition rate, it can even work with a continuous carrier signal (e.g. a continuous 38 kHz signal). The reaction time is therefore much faster and the circuit becomes simpler.

A further problem of the standard IR receivers in sensor applications is the variable detection threshold. Standard IR receivers adjust their detection threshold depending on the amount of ambient light and optical noise present in the environment in order to avoid emission of spurious pulses. In a sensor application, the power of the emitter is normally adjusted according to the maximum brightness level of the light barrier environment, which corresponds to the lowest gain of the IR receiver. However, when the IR receiver is then subjected to lower light levels, the AGC adjusts the gain and the receiver becomes too sensitive and even detects reflected or stray light.

With a fix gain version it is easy to overcome this issue. The sensitivity can be reduced in the design of the application through the use of for example an aperture or an attenuation filter such that the receiver does not suffer from spurious pulses due to light interference. Then the emitter intensity can be adjusted to the level required by the application. Such a system can function with the same reproducible characteristics in both dark and in bright ambient.

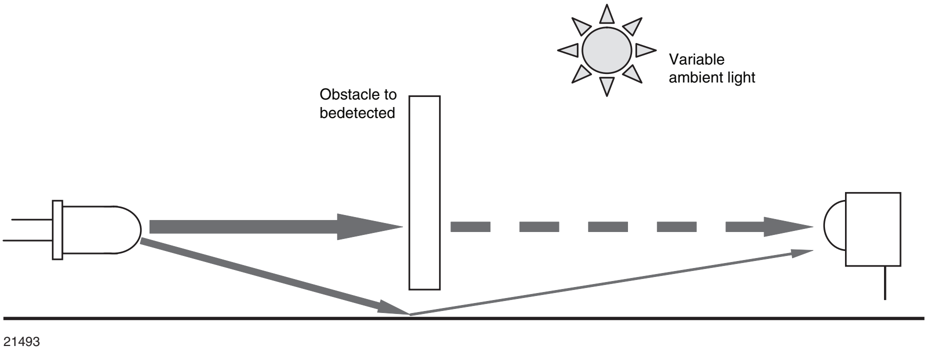


Fig. 3 - Stray Light in a Light Barrier Application can Produce a False Response

If the sensor application does not allow any spurious output pulses, then we recommend using an additional suppression circuit. Usually the internal AGC suppresses such unwanted pulses. However, there is a risk of false pulses when the illumination is not uniform. A very low rate of noise pulses (< 15 pulses/min) is possible even in constant illumination. To overcome this problem, the signal bursts should be longer than 500 µs. As the noise pulses are usually shorter than 400 µs (in case of a 38 kHz receiver) a hardware or software filter can then be used to easily suppress the false pulses.

DETECTOR WITH ANALOG OUTPUT

A reflective sensor with analog information contained in its output is feasible using an IR receiver by evaluating the time required by the AGC to suppress a quasi continuous signal. The time required to suppress such a signal is longer when the signal is strong than when the signal is weak, resulting in a pulse length corresponding to the distance of an object from the sensor. This kind of analog information can be evaluated by a microcontroller. The absolute amount of reflected light depends much on the environment and is not evaluated. Only sudden changes of the amount of reflected light, and therefore changes in the pulse width, are evaluated using this application.

The TSOP4P38 is an IR receiver type that is optimized for this kind of sensor. It has similar properties like the TSOP4838 but its output pulse has less jitter when used with such long bursts.

Ambient light has also some impact to the pulse width of a TSOP4P38 with a signal as shown in fig. 4, making the pulse shorter.

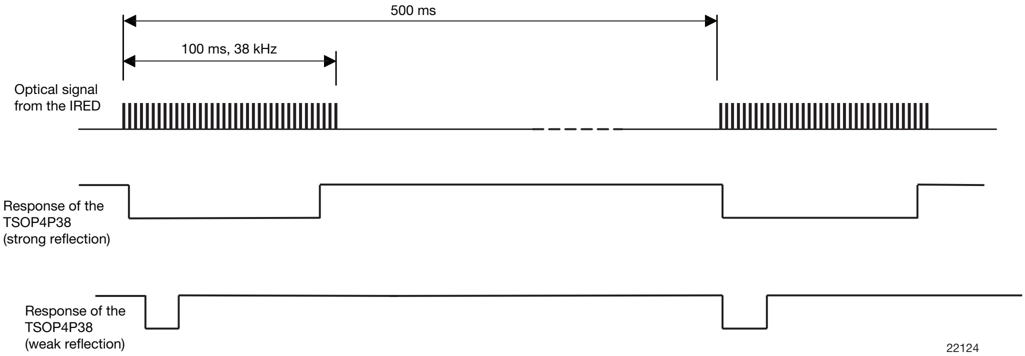
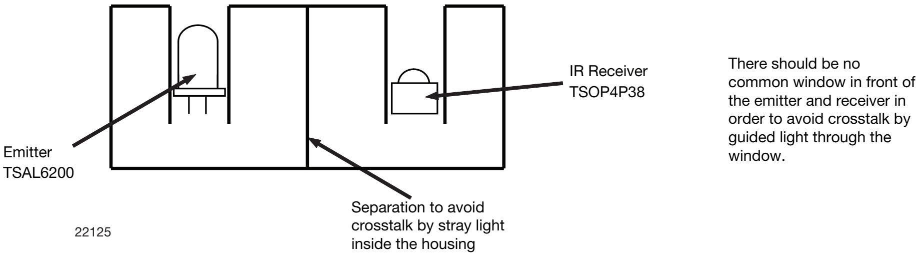


Fig. 4 - Protection Circuit against Over Voltage Spikes



There should be no common window in front of the emitter and receiver in order to avoid crosstalk by guided light through the window.

Fig. 5 - Example of a Sensor Housing for a Reflective Sensor

APPLICATION IN BATTERY-POWERED SYSTEMS

There are two crictical paramters when using the IR receiver modules in battery-powerded systems: the supply voltage and the supply current. The best properties regarding both parameters have the IR receivers of the TSOP3xxxx family. These devices have low supply current of about 0.35 mA only and they can work at low supply voltages to provide a function even with almost empty batteries. The lowest specified supply voltage is 2.5 V, however typically it can operate even below 2 V.

If the supply current of the IR receiver modules is too high for continuous operation then a pulsed supply voltage can help to further save battery power.

For the best response time, the duty cycle of the supply voltage should be selected such that the supply is pulsed once during the wake up signal of the IR command as shown in figure 6 and 7. If the IR receiver senses a signal in this time window, then the supply voltage is turned on for a longer period of time to receive the full data command.

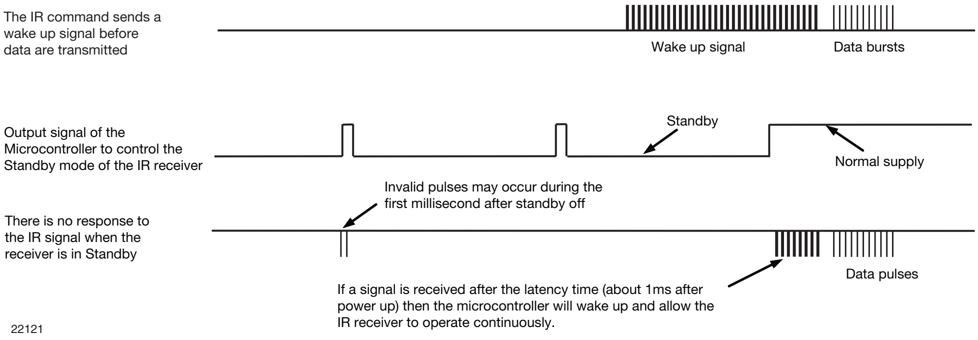


Fig. 6 - Example for a Battery-Saving Mode with TSOP3xxxx IR Receivers

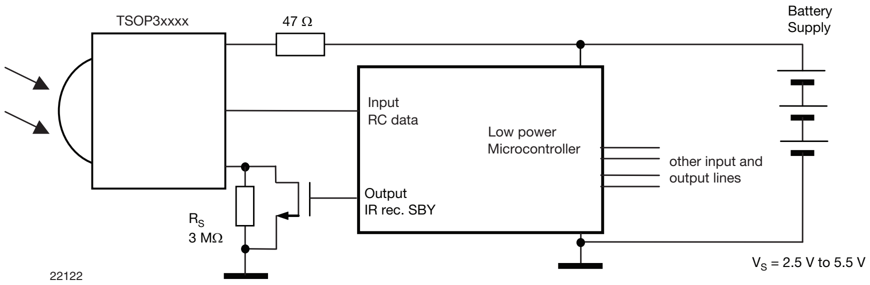


Fig. 7 - Circuit Proposal for Pulsing the Supply Voltage of the TSOP3xxxx

The actual stand-by supply current of the IR receiver when used in this application depends on the ratio of “on/off time”. In the case of a 2 ms on time and 200 ms off time, the stand-by supply current is about 3.5 µA for the IR receiver. This would allow a battery life of more than 2 years.

To achieve this performance, a pre-burst (wake up time) of 202 ms is needed in this example.

If the TSOP3xxxx is disconnected from supply voltage and reconnected again then the gain level is on a default value. It will last up to 100 ms until the gain has settled to an optimum level that is well adapted to the ambient noise level.

However, if the TSOP3xxxx is set to the standby mode (as shown in fig. 7) then it can memorize the gain setting during the off period. Each time when it is powered up the gain is on the correct level. Hence there are no spurious pulses in bright ambient during the on period when the receiver is operated in this kind of power saving mode.

The standby mode of the TSOP3xxxx means that it is supplied through a high impedance serial resistor. In that case the circuit of the TSOP3xxxx is deactivated and the supply current becomes almost zero. However, the gain level of the AGC is still memorized.

The easiest way to activate the standby mode is to operate the TSOP3xxxx with a series resistor at about 2 MΩ in case of a 3 V supply voltage or 3 MΩ in case of a 5 V supply voltage.

APPLICATIONS WITH BI DIRECTIONAL TRANSMISSION

A two-way communication in half duplex mode is possible with the Vishay IR receiver modules. Full duplex mode is not possible as the selectivity of the receivers using two IR channels (e.g. one at 30 kHz and one at 56 kHz) at the same time and in the same space is not sufficient.

In a bi-directional IR transmission, the receiver will usually see the transmitted signal of both sites, the signal that is sent from the other site as well as the signal that is sent from the receiver site. In such an application, the transmitted signal is usually much stronger than the received signal. In order to retain full sensitivity while receiving, we recommend an idle time of 15 ms between transmitting and receiving. In this idle time, the Automatic Threshold Control (ATC) of the IR receiver will recover its quiescent sensitivity.

The IR receiver modules with the AGC1 setting are the most suitable types for data communication because their AGC allows continuous reception.

Mechanical Design Notes

There are many aspects in the design of an appliance, which will affect the IR sensitivity of the receiver such as window size, window material, distance of the receiver to the window or to a light guide.

WINDOW

The size of the window in front of the IR receiver should be large enough so that the viewing angle of the IR receiver is not overly restricted. The window size and the distance of the IR receiver behind the window should be designed to enable a directivity of at least ± 50°. A module with a mechanical holder (e.g. TSOP4838AY1) can sometimes help to place the sensitive area of the IR receiver module closer to the window.

When the front panel of an appliance is black, it is usually desired that the optical window in front of the IR receiver also be tinted black. That means that a plastic material is required, which is transparent for infrared signals but opaque for visible light. The diagram in figure 1 shows an example of the spectral transmittance of such a plastic material (Bayer Makrolon color 45/601).

The cut-off wavelength of the window material should be between 700 nm and 850 nm in order to appear black and in order not to absorb IR signal energy.

There is a loss of power in every front panel of about 8 % due to reflection (4 % at each side). There is a compromise necessary on the design of the panel thickness. On the one hand, the thickness of the panel should be kept small to minimize the loss of energy in the plastic material. On the other hand, the thickness of the plastic should not be too small (or the color of the plastic too light) in order to avoid being able to see inside the appliance. In contrast to other products that have a shiny external metal shielding, the Vishay TSOP IR receiver modules have a black package with internal shielding, which prevents visibility behind the front panel.

The relationship between the necessary thickness and the optical transmittance is given by:

$\tau(\lambda) = (1 - \rho) \times e^{(-a(\lambda) \times d)}$

$\tau(\lambda)$ = Spectral transmittance

ρ = Constant factor for reflection loss (typically about 0.08)

e = 2.718282

$\alpha(\lambda)$ = Coefficient of plastic material (about 0.03 mm^{-1} at 950 nm in the example above)

d = Thickness of front panel

There are several plastic materials with such a spectral behavior. Some examples of polycarbonate are:

- Makrolon 2805; color #: 45-601 (blue - black); supplier: Bayer
- Makrolon 2805: color #: 45-401 (green - black); supplier: Bayer

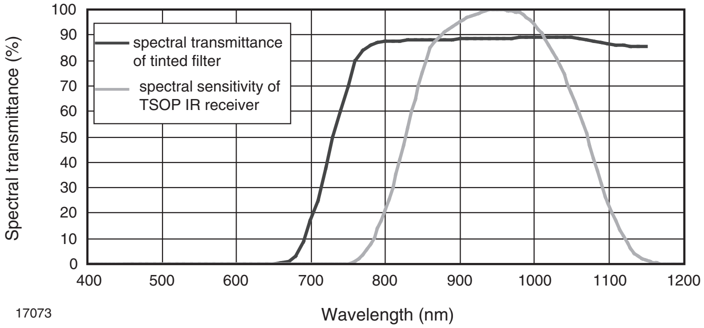


Fig. 1 - Spectral transmittance for IR transmissive Window Material

Another very common design is a silver colored front panel, usually either equipped with tiny holes for the IR signal to pass through or a partially reflecting material for this purpose. Although stylish, this design is very non-optimal in terms of transmission range as there is a high loss of signal through the panel.

LIGHT GUIDES

A light guide is a piece of transparent plastic, usually cylindrical, that makes use of the principle of total internal reflection to pass light from the front panel to a receiver located further back in the appliance.

Some of the reasons for using a light could be to span a distance between the window and the IR receiver, to have a smaller window than would otherwise be possible or to protect the IR receiver from high voltage discharges orccuring at the front of a TV set due to ESD.

The use of a light pipe compromises the achievable transmission range and directivity due to signal loss at the coupling between the light guide and the IR receiver. The light guide should be optimally placed as close as possible to the vertex of the optical lens of the IR receiver

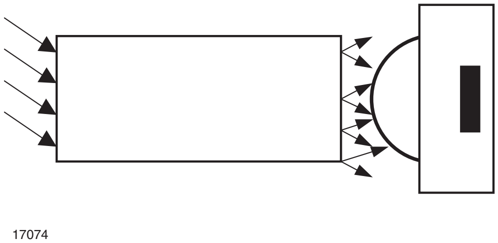


Fig. 2 - Loss of Signal Power at the Coupling to the Light Guide

MECHANICAL VERSIONS OF THE VISHAY IR RECEIVERS

Vishay offers many different mechanical versions of the IR receiver modules in order to provide a solution for almost any requirement.
In addition to the three SMD packages, there are also three different standard through-hole packages with two pinouts. The through hole parts are available with different lengths leads, bent leads, and optional plastic or metal holders.

Assembly Instuctions

GENERAL

Vishay leaded IR receiver modules can be mounted in any position. The wire leads may be bent provided the bend is not less than 1.5 mm from the bottom of the plastic package. During bending, no forces should be transmitted from the leads to the package (e.g. by spreading the leads). If the device is to be mounted near heat generating components, the resultant increase in ambient temperature should not exceed the specified ratings.

SOLDERING INSTRUCTIONS

Protection against overheating is essential when a device is being soldered. It is recommended, where possible, that the length of the leads between the solder joint and the package be left as long as possible. The maximum permissible soldering temperature for plastic encapsulated devices is governed by the maximum permissible heat that may be applied to the encapsulant rather than by the maximum permissible junction temperature of the die.
The maximum temperatures and soldering times for iron and wave soldering are given in table 1.

TABLE 1 - MAXIMUM SOLDERING TEMPERATURES

	IRON SOLDERING			WAVE SOLDERING		
	IRON TEMPERATURE	DISTANCE OF THE SOLDERING POSITION FROM THE LOWER EDGE OF THE CASE	MAXIMUM ALLOWABLE SOLDERING TIME PER PIN	SOLDERING TEMPERATURE SEE TEMPERATURE TIME PROFILES	DISTANCE OF THE SOLDERING POSITION FROM THE LOWER EDGE OF THE CASE	MAXIMUM ALLOWABLE SOLDERING TIME
IR receiver for through hole assembly without holder	≤ 350 °C	≥ 2 mm	3 s	260 °C	≥ 1 mm	10 s
IR receiver for through hole assembly with plastic holder	≤ 350 °C	n.a.	3 s	260 °C	n.a.	5 s
IR receiver for through hole assembly with metal holder	≤ 350 °C	n.a.	3 s	260 °C	n.a.	10 s
IR receiver for SMD assembly	≤ 350 °C	n.a.	3 s			

SOLDERING METHODS

There are several commonly used methods to solder devices on-to the substrate. Some of them are listed in the following:

(a) Reflow Soldering

Reflow soldering uses contact-free heating and derives the energy for soldering the assembly either from convection heating or from direct infrared radiation.
The heating rate in an IR furnace depends on the absorption coefficients of the material surfaces and on the ratio of the components' masses to their irradiated surfaces.
The temperature of parts in an IR furnace cannot be determined in advance. Temperature measurements may be performed by measuring the temperature of a certain component while it is being transported through the furnace. The temperatures of small components tend to change more than that of the larger ones with which they are soldered together and may rise up to 280 °C.

The parameters which influence the internal temperature of the component are the following:

- Time in the oven and power of the oven
- Mass of the component
- Size of the component
- Size of the printed circuit board
- Absorption coefficient of the surfaces
- Layout density
- Optical spectrum of the radiation source
- Ratio of radiated to convected energy

A temperature-time profile of the reflow process, suitable only for SMD devices, is given in figure 2. Reflow soldering is not approved for leaded IR receivers.

Soldering Instructions

- Reflow soldering must be done according MSL4 within 72 h after opening the dry pack envelope while stored under a maximum temperature of 30 °C and a relative humidity of 60 %.
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Exercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured.
- Handling after reflow should be done only after the work surface has been cooled off.

(b) Wave soldering

In wave soldering, one or more continuously replenished waves are generated in a bath of molten solder. The substrates to be soldered are moved in the opposite direction to that of the wave and across the wave's crest.
A temperature-time profile of the entire process is given in figure 3. Wave soldering is applicable for leaded IR receiver but not for the SMD packages.

Note for parts mounted in plastic holders: the temperatures used for soldering exceed the melting temperature of plastic. A wave-soldering process not exceeding 5 s will therefore often deform the hooks used to attach the holder to the PCB, but will not affect the functionality of the holder.

(c) Soldering iron

The process of hand soldering with an iron cannot be carried out in a repeatable and controlled way.
This process should not be considered for use in applications where reliability is important. There is no SMD classification for this process.

Manual Soldering for SMD

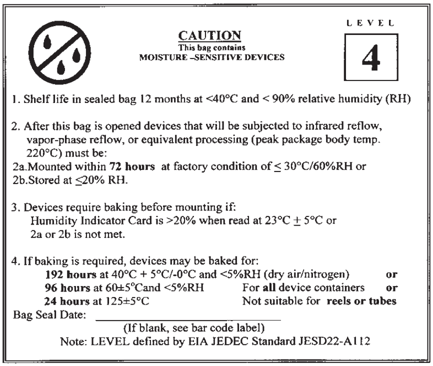
- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 350 °C.
- Finish soldering within 3 s.
- Handle products only after the temperature has cooled off.

WARNING

Opto devices are sensitive to damage due to moisture release if they are subjected to infrared reflow or a similar soldering process (e.g. wave soldering) without being properly dried.
Dry box storage is recommended as soon as the aluminum shipping bag has been opened to prevent moisture absorption by the device. The following conditions should be observed if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity at 60 % RH maximum

If the devices are stored for more than 72 h under these conditions, the moisture content will then be too high for reliable reflow soldering. The devices can be reconditioned to recover to an acceptable moisture content by drying under the following conditions:
192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen) or
96 h at 60 °C ± 5 °C and < 5 % RH for all device containers.
An EIA JEDEC Standard JESD22-A112 level 4 label is included on all dry packs.



CAUTION
This bag contains
MOISTURE –SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:
192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
96 hours at 60±5°Cand <5%RH For **all** device containers **or**
24 hours at 125±5°C Not suitable for **reels or tubes**
Bag Seal Date: ____________________
(If blank, see bar code label)
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

Fig. 1 - Example of JESD22-A112 Level 4 Label

Temperature-Time Profiles

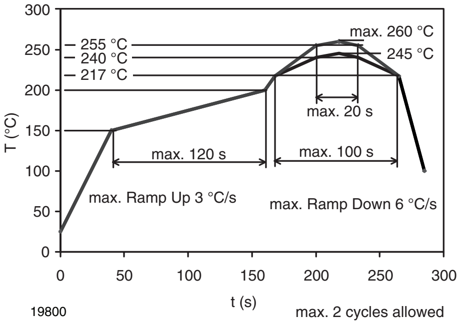


Fig. 2 - Infrared reflow soldering of opto devices
(SMD package only)

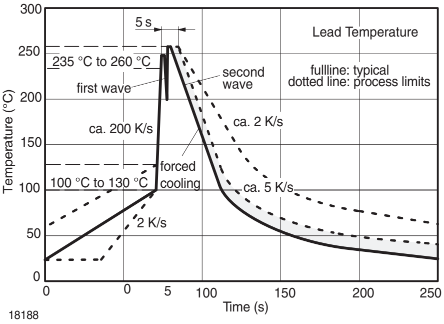


Fig. 3 - Wave soldering of opto devices
(leaded IR receiver package only)

Quality Information

Corporate Quality Policy

Our goal is to exceed the quality expectations of our customers. This commitment starts with top management and extends through the entire organization. It is achieved through innovation, technical excellence and continuous improvement.

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Fig. 1 - Vishay Quality Policy

VISHAY INTERTECHNOLOGY, INC.

ENVIRONMENTAL, HEALTH AND SAFETY POLICY

Vishay Intertechnology, INC. is committed to conducting its worldwide operations in a socially responsible and ethical manner to protect the environment, and ensure the safety and health of our employees, to conduct their daily activities in an environmentally responsible manner.

Protection of the Environment: Conduct our business operation in a manner that protects the environmental quality of the communities in which our facilities are located. Reduce risks involved with storage and use of hazardous materials. The company is also committed to continual improvement of its environmental performance.

Compliance with Environmental, Health and Safety Laws and Regulations: Comply with all relevant environmental, health and safety laws and regulations in every location. Maintain a system that provides timely updates of regulatory change. Cooperate fully with governmental agencies in meeting applicable requirements.

Energy, Resource Conservation and Pollution Control: Strive to minimize energy and material consumption in the design of products and processes, and in the operation of our facilities. Promote the recycling of materials, including hazardous wastes, whenever possible. Minimize the generation of hazardous and non-hazardous wastes at our facilities to prevent or eliminate pollution. Manage and dispose of wastes safely and responsibly.

Fig. 2 - Vishay Quality Road Map

QUALITY SYSTEM

QUALITY PROGRAM

At the heart of the quality process is the Vishay worldwide quality program. This program, which has been in place since the early 90's, is specifically designed to meet rapidly increasing customer quality demands now and in the future. Vishay Corporate Quality implements the Quality Policy and translates its requirements for use throughout the worldwide organization.

Vishay Quality has defined a roadmap with specific targets along the way. The major target is to achieve world-class excellence throughout Vishay worldwide.

VISHAY CORPORATE QUALITY

Vishay Corporate Quality defines and implements the Vishay quality policy at a corporate level. It acts to harmonize the quality systems of the constituent divisions and to implement Total Quality Management throughout the company worldwide.

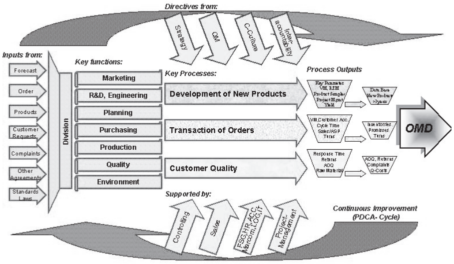
Vishay Zero Defect Program

- Exceeding quality expectations of our customers
- Commitment from top management through entire organization
- Newest and most effective procedures and tools
  - design, manufacturing and testing
  - management procedures (e.g. SPC, TQM)
- Continuous decreasing numbers for AOQ and failure rate
- Detailed failure analysis using 8D methodology
- Continuous improvement of quality performance of parts and technology

QUALITY GOALS AND METHODS

The goals are straightforward: Customer satisfaction through continuous improvement towards zero defects in every area of our operation. We are committed to meet our customers' requirements in terms of quality and service. In order to achieve this, we build excellence into our products from concept to delivery and beyond.

- **Design-in Quality**
  Quality must be designed into products. Vishay uses optimized design rules based on statistical information. This is refined using electrical, thermal, and mechanical simulation together with techniques such as FMEA, QFD and DOE.
- **Built-in Quality**
  Quality is built into all Vishay products by using qualified materials, suppliers, and processes. Fundamental to this is the use of SPC techniques by both Vishay and its suppliers. The use of these techniques, as well as tracking critical processes, reduces variability, optimizing the process with respect to the specification. The target is defect prevention and continuous improvement.
- **Qualification**
  All new products are qualified before release by submitting them to a series of mechanical, electrical, and environmental tests. The same procedure is used for new or changed processes or packages.
- **Monitoring**
  A selection of the same or similar tests used for qualification is also used to monitor the short- and long-term reliability of the product.
- **SPC (Statistical Process Control)**
  SPC is an essential part of all Vishay process control. It has been established for many years and is used as a tool for the continuous improvement of processes by measuring, controlling, and reducing variability.
- **Vishay Quality System**
  All Vishay's facilities worldwide are approved to ISO 9000. In addition, depending on their activities, some Vishay companies are approved to recognized international and industry standards such as ISO/TS 16949.
  Each subsidiary goal is to fulfill the particular requirements of customers. The Opto Divisions of Vishay Semiconductor GmbH are certified according to ISO/TS 16949.



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The procedures used are based upon these standards and laid down in an approved and controlled Quality Manual.

BUSINESS EXCELLENCE

Total Quality Management is a management system combining the resources of all employees, customers, and suppliers in order to achieve total customer satisfaction. The fundamental elements of this system are:

- Management commitment
- EFQM assessment methodology
- Employee involvement teams (EITs)
- Supplier development and partnership
- Quality tools
- Training
- Quality system
- Six sigma
- Automotive excellence program (AEP)
- Zero defect

All Vishay employees from the senior management downwards are trained in understanding and use of TQM. Every employee plays its own part in the continuous improvement process which is fundamental to TQM and our corporate commitment to exceed customers' expectations in all areas including design, technology, manufacturing, human resources, marketing, and finance. Everyone is involved in fulfilling this goal. Vishay management believes that this can only be achieved by employee empowerment.

The Vishay corporate core values

- Leadership by example
- Employee empowerment
- Continuous improvement
- Total customer satisfaction

are the very essence of the Vishay Quality Movement process.

- **Training**

Vishay maintains that it can only realize its aims if the employees are well trained. It therefore invests heavily in courses to provide all employees with the knowledge they need to facilitate continuous improvement. A training profile has been established for all employees with emphasis being placed on total quality leadership. Our long-term aim is to continuously improve our training so as to keep ahead of projected changes in business and technology.

- **EFQM Assessment Methodology**

From 1995, Vishay has started to introduce the EFQM (European Foundation for Quality Management) methodology for structuring its Total Quality Management approach. This methodology, similar to the Malcolm Baldrige process, consists in self-assessing the various Vishay divisions and facilities according to nine business criteria:

- Leadership
- People
- Policy and strategy
- Partnership and resources
- Processes
- People results
- Customer results
- Society results
- Key performance results

(see figure 3)

The assessments are conducted on a yearly basis by trained and empowered, internal Vishay assessors.

This permits the identification of key-priority improvement projects and the measurement of the progress accomplished.

The EFQM methodology helps Vishay to achieve world-class business excellence.

- **Employee Involvement Teams**

At Vishay we believe that every person in the company has a contribution to make in meeting our target of customer satisfaction. Management therefore involves employees to higher and higher levels of motivation, thus achieving higher levels of effectiveness and productivity. Employee involvement teams, which are both functional and cross functional, combine the varied talents from across the breadth of the company. By taking part in training, these teams are continually searching for ways to improve their jobs, achieving satisfaction for themselves, the company and most important of all the customer.

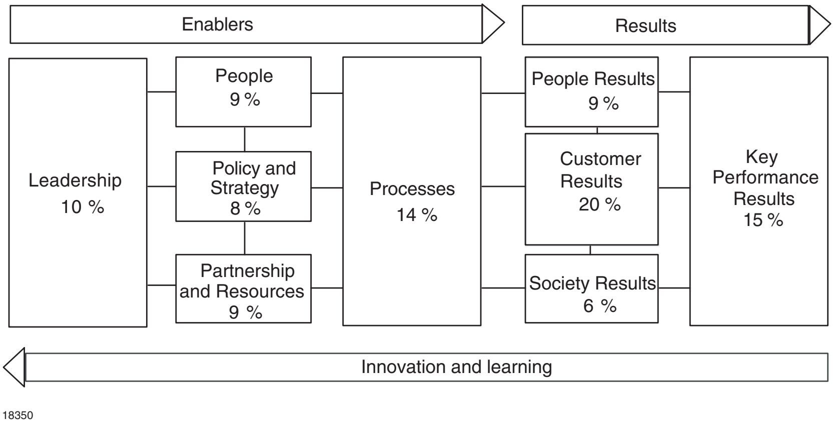

Fig. 3 - EFQM Criteria for Self-Assessment

TQM TOOLS

As part of its search for excellence, Vishay employs many different techniques and tools. The most important of them are:

- **Auditing**

As well as third party auditing employed for approval by ISO 9000 and customers, Vishay carries out its own internal and external auditing. There is a common auditing procedure for suppliers and sub-contractors between the Vishay entities. This procedure is also used for inter-company auditing between the facilities within Vishay. It is based on the "Continuous Improvement" concept with heavy emphasis on the use of SPC and other statistical tools for the control and reduction of variability.
Internal audits are carried out on a routine basis. They include audits of satellite facilities (i.e., sales offices, warehousing etc.). Audits are also used widely to determine attitudes and expectations both within and outside the company.

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- **Failure Mode and Effect Analysis (FMEA)**

FMEA is a technique for analyzing the possible methods of failure and their effect upon the performance/reliability of the product/process. Process FMEAs are performed for all processes. In addition, product FMEAs are performed on all critical or customer products.

- **Design of Experiments (DOE)**

There is a series of tools that may be used for the statistical design of experiments. It consists of a formalized procedure for optimizing and analyzing experiments in a controlled manner. Taguchi and factorial experiment design are included in this. They provide a major advantage in determining the most important input parameters, making the experiment more efficient and promoting common understanding among team members of the methods and principles used.

- **Gauge Repeatability and Reproducibility (GR and R)**

This technique is used to determine equipment's suitability for purpose. It is used to make certain that all equipment is capable of functioning to the required accuracy and repeatability. All new equipment is approved before use by this technique.

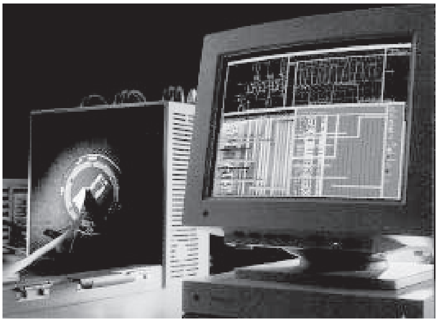
- **Quality Function Deployment (QFD)**

QFD is a method for translating customer requirements into recognizable requirements for Vishay's marketing, design, research, manufacturing and sales (including after-sales). QFD is a process, which brings together the life cycle of a product from its conception, through design, manufacture, distribution, and use until it has served its expected life.

QUALITY SERVICE

Vishay believes that quality of service is equally as important as the technical ability of its products to meet their required performance and reliability. Our objectives therefore include:

- On-time delivery
- Short response time to customers' requests
- Rapid and informed technical support
- Fast handling of complaints
- A partnership with our customers



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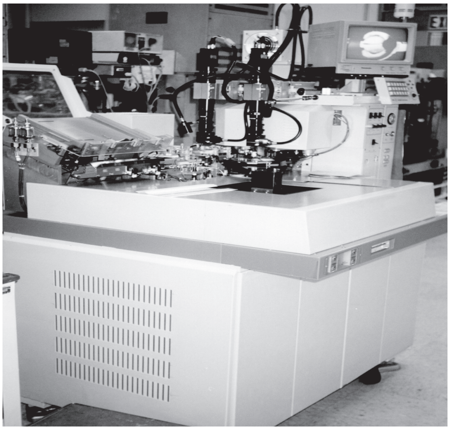
- **Customer Quality**

Complaints fall mainly into two categories:

  - Logistical
  - Technical

Vishay has a procedure detailing the handling of complaints. Initially complaints are forwarded to the appropriate sales office where in-depth information describing the problem, using the Vishay **P**roduct **A**nalysis **R**equest and **R**eturn **F**orm (**PARRF**), is of considerable help in giving a fast and accurate response. If it is necessary to send back the product for logistical reasons, the Sales Office issues a Returned Material Authorization (RMA) number.
On receipt of the goods in good condition, credit is automatically issued.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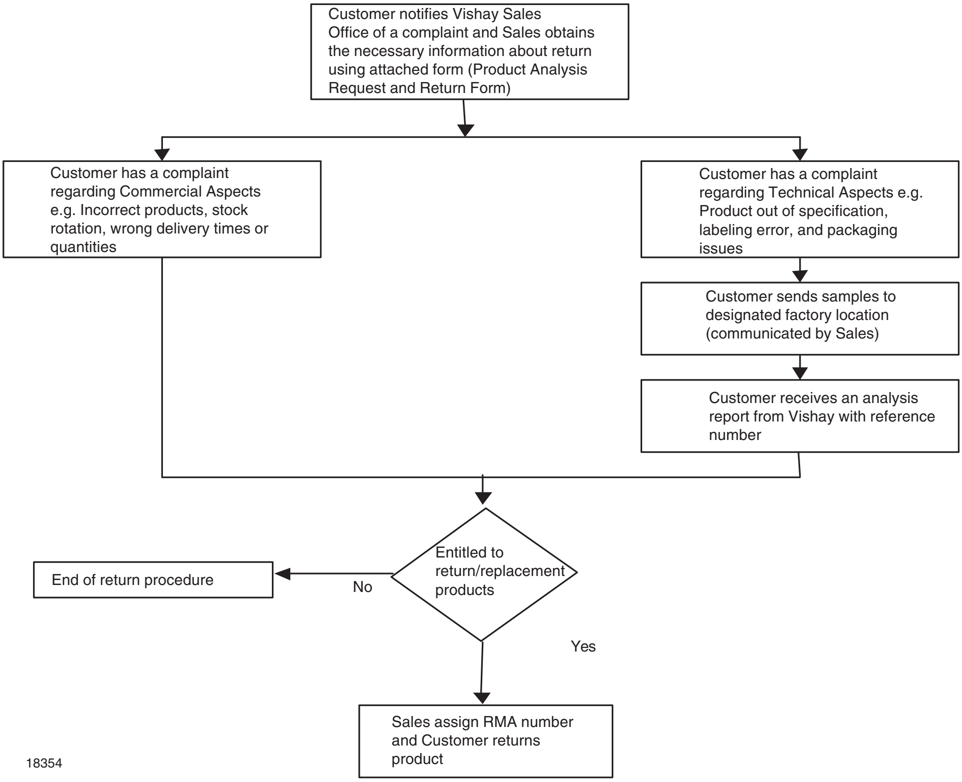
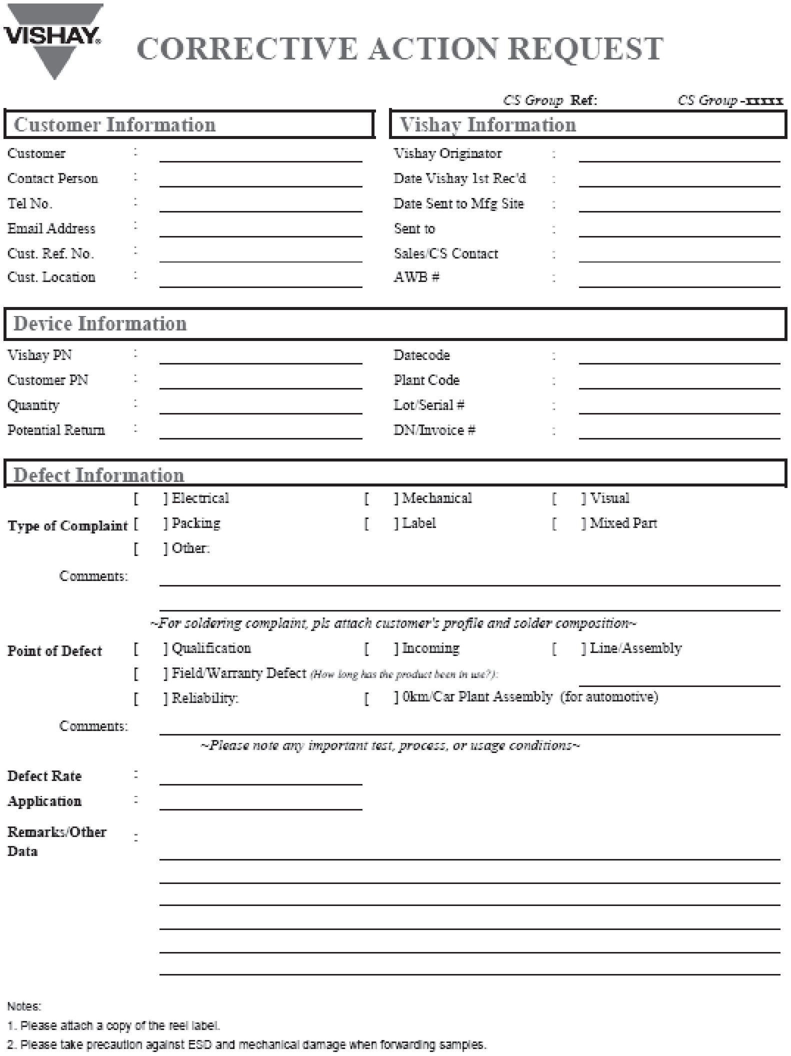
If there is a technical reason for complaint, a sample together with the **PARRF** is sent to the Sales Office for forwarding to the Failure Analysis Department of the supplying facility. The device's receipt will be acknowledged and a report issued on completion of the analysis. The cycle time for this analysis has set targets and is constantly monitored to improve response time. Failure analysis normally consists of electrical testing, functional testing, mechanical analysis (including X-ray), decapsulation, visual analysis and electrical probing. Other specialized techniques (i.e. LCD, thermal imaging, SEM, acoustic microscopy) may be used if necessary.

If the analysis uncovers a quality problem, a Corrective Action Report (CAR) in 8D format will be issued. Any subsequent returns are handled with the RMA procedure.



Complaint and Return Procedure



CORRECTIVE ACTION REQUEST

CS Group **Ref:** *CS Group* -xxxxx

Customer Information

Customer :
Contact Person :
Tel No. :
Email Address :
Cust. Ref. No. :
Cust. Location :

Vishay Information

Vishay Originator :
Date Vishay 1st Rec'd :
Date Sent to Mfg Site :
Sent to :
Sales/CS Contact :
AWB # :

Device Information

Vishay PN :
Customer PN :
Quantity :
Potential Return :

Datecode :
Plant Code :
Lot/Serial # :
DN/Invoice # :

Defect Information

Type of Complaint
[ ] Electrical [ ] Mechanical [ ] Visual
[ ] Packing [ ] Label [ ] Mixed Part
[ ] Other:

Comments:

~For soldering complaint, pls attach customer's profile and solder composition~

Point of Defect
[ ] Qualification [ ] Incoming [ ] Line/Assembly
[ ] Field/Warranty Defect *(How long has the product been in use?):*
[ ] Reliability: [ ] 0km/Car Plant Assembly (for automotive)

Comments:

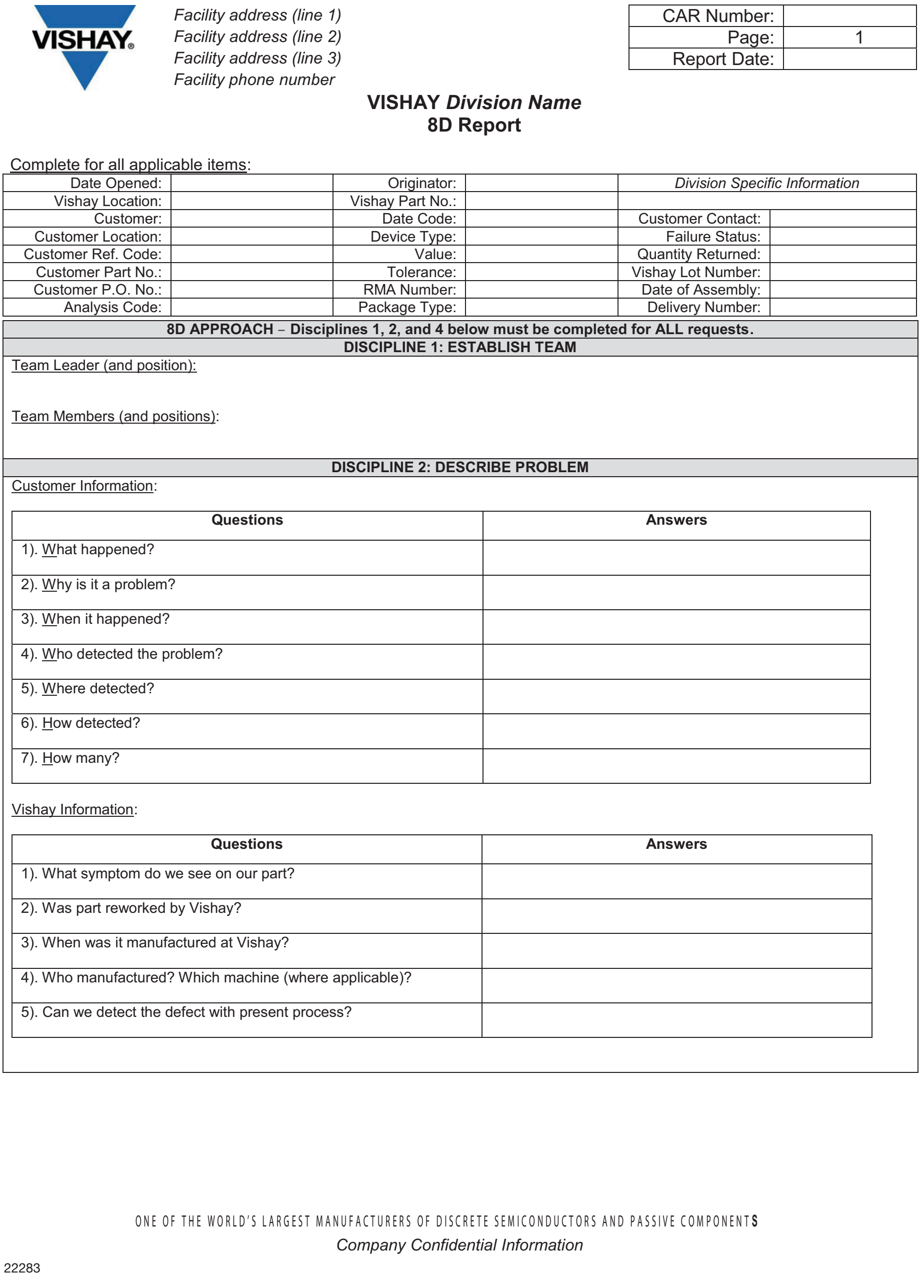
~Please note any important test, process, or usage conditions~

Defect Rate :
Application :
Remarks/Other Data :

Notes:
1. Please attach a copy of the reel label.
2. Please take precaution against ESD and mechanical damage when forwarding samples.

22209

Corrective **A**ction **R**equest **F**orm



Facility address (line 1)
Facility address (line 2)
Facility address (line 3)
Facility phone number

CAR Number:	
Page:	1
Report Date:	

VISHAY *Division Name*
8D Report

Complete for all applicable items:

Date Opened:		Originator:		*Division Specific Information*	
Vishay Location:		Vishay Part No.:			
Customer:		Date Code:		Customer Contact:	
Customer Location:		Device Type:		Failure Status:	
Customer Ref. Code:		Value:		Quantity Returned:	
Customer Part No.:		Tolerance:		Vishay Lot Number:	
Customer P.O. No.:		RMA Number:		Date of Assembly:	
Analysis Code:		Package Type:		Delivery Number:	

8D APPROACH – Disciplines 1, 2, and 4 below must be completed for ALL requests.

DISCIPLINE 1: ESTABLISH TEAM

Team Leader (and position):

Team Members (and positions):

DISCIPLINE 2: DESCRIBE PROBLEM

Customer Information:

Questions	Answers
1). What happened?	
2). Why is it a problem?	
3). When it happened?	
4). Who detected the problem?	
5). Where detected?	
6). How detected?	
7). How many?	

Vishay Information:

Questions	Answers
1). What symptom do we see on our part?	
2). Was part reworked by Vishay?	
3). When was it manufactured at Vishay?	
4). Who manufactured? Which machine (where applicable)?	
5). Can we detect the defect with present process?	

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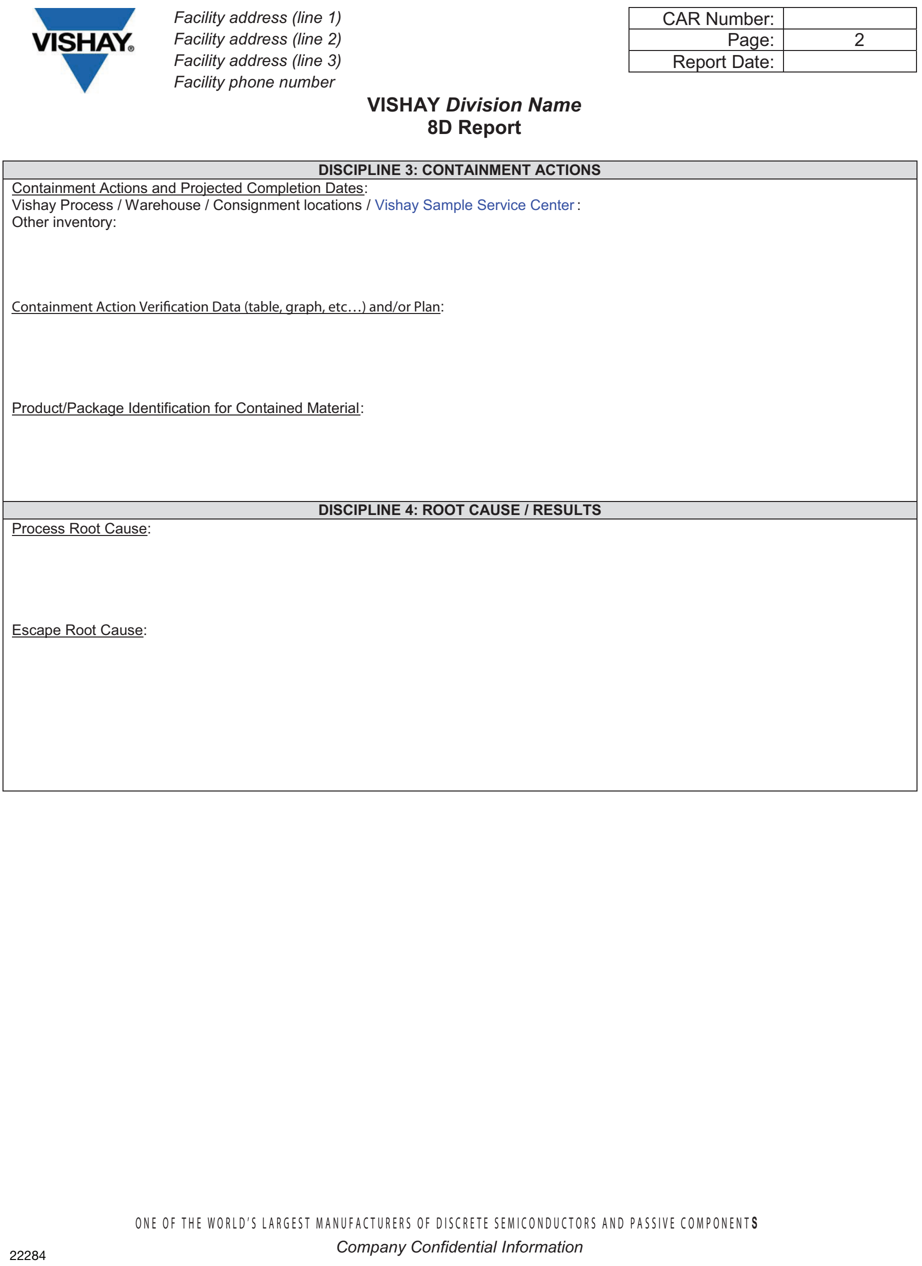
Quality Information



Facility address (line 1)
Facility address (line 2)
Facility address (line 3)
Facility phone number

CAR Number:	
Page:	2
Report Date:	

VISHAY *Division Name*
8D Report

DISCIPLINE 3: CONTAINMENT ACTIONS

Containment Actions and Projected Completion Dates:
Vishay Process / Warehouse / Consignment locations / Vishay Sample Service Center :
Other inventory:

Containment Action Verification Data (table, graph, etc…) and/or Plan:

Product/Package Identification for Contained Material:

DISCIPLINE 4: ROOT CAUSE / RESULTS

Process Root Cause:

Escape Root Cause:

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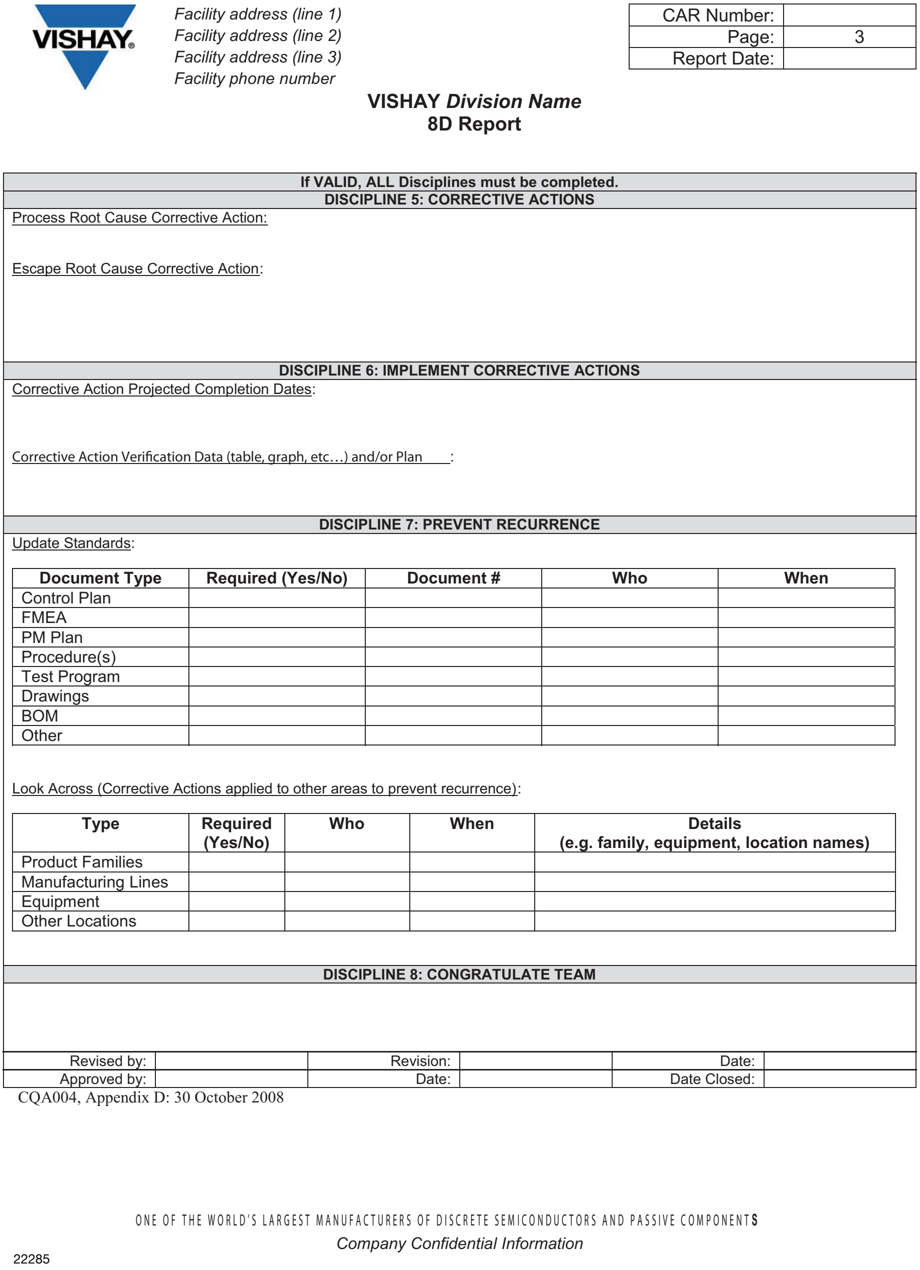

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Facility address (line 2)
Facility address (line 3)
Facility phone number

CAR Number:	
Page:	3
Report Date:	

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8D Report

If VALID, ALL Disciplines must be completed.

DISCIPLINE 5: CORRECTIVE ACTIONS

Process Root Cause Corrective Action:

Escape Root Cause Corrective Action:

DISCIPLINE 6: IMPLEMENT CORRECTIVE ACTIONS

Corrective Action Projected Completion Dates:

Corrective Action Verification Data (table, graph, etc…) and/or Plan:

DISCIPLINE 7: PREVENT RECURRENCE

Update Standards:

Document Type	Required (Yes/No)	Document #	Who	When
Control Plan				
FMEA				
PM Plan				
Procedure(s)				
Test Program				
Drawings				
BOM				
Other				

Look Across (Corrective Actions applied to other areas to prevent recurrence):

Type	Required (Yes/No)	Who	When	Details (e.g. family, equipment, location names)
Product Families				
Manufacturing Lines				
Equipment				
Other Locations				

DISCIPLINE 8: CONGRATULATE TEAM

Revised by:		Revision:		Date:	
Approved by:		Date:		Date Closed:	

CQA004, Appendix D: 30 October 2008

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Change Notification

All product and process changes are controlled and released via ECN (Engineering Change Notification). This requires the approval of the relevant departments. In the case of a major change, the change is forwarded to customers via Sales/Marketing before implementation. Where specific agreements are in place, the change will not be implemented unless approved by the customer.

QUALITY AND RELIABILITY

ASSURANCE PROGRAM

Though both quality and reliability are designed into all Vishay products, three basic programs must assure them:

- Average Outgoing Quality (AOQ) - 100 % testing is followed by sample testing to measure the defect level of the shipped product. This defect level (AOQ) is measured in ppm (parts per million)
- Reliability qualification program - to assure that the design, process or change is reliable
- Reliability monitoring program - to measure and assure that there is no decrease in the reliability of the product

18357

AOQ PROGRAM

Before leaving the factory, all products are sampled after 100 % testing to ensure that they meet a minimum quality level and to measure the level of defects. The results are accumulated and expressed in ppm (parts per million). They are the measure of the average number of potentially failed parts in deliveries over a period of time. The sample size used is determined by AQL or LTPD tables depending upon the product. No rejects are allowed in the sample.

The AOQ value is calculated monthly using the method defined in standard JEDEC 16:

$$\text{AOQ} = \text{p} \cdot \text{LAR} \cdot 10^6 (\text{ppm})$$

where:

$$\text{p} = \frac{\text{number of devices rejected}}{\text{total number of devices tested}}$$

LAR = lot acceptance rate:

$$\text{LAR} = 1 - \frac{\text{number of lots rejected}}{\text{total number of lots tested}}$$

The AOQ values are recorded separately with regard to electrical and mechanical (visual) rejects by product type and package.

RELIABILITY AND QUALIFICATION

Qualification is used as a means of verifying that a new product or process meets specified reliability requirements. This is also used to verify and release changes to products or processes including new materials, packages, and manufacturing locations. At the same time it provides a means to obtain information on the performance and reliability of new products and technologies.

There are three types of qualification and release:

- Wafer process/technology qualification
- Package qualification
- Product/device qualification

The actual qualification procedure depends on which of these (or combinations of these) are to be qualified. Normally there are three categories of qualification in order of degree of qualification and testing required.

For the qualification there are two different standards. For Commodity and Industrial products the Vishay internal standard is used. For Automotive grade parts, the qualification is done according to AEC-Q101.

Accelerated testing is normally used in order to produce results fast. The stress level employed depends upon the failure mode investigated. The stress test is set so that the level used gives the maximum acceleration without introducing any new or untypical failure mode.

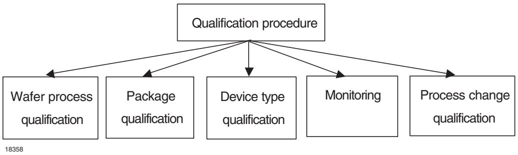
The tests used consist of a set of the following:

- High temperature life test (static)
- High temperature life test (dynamic)
- HTRB (high temperature reverse bias)
- Humidity 85/85 (with or without bias)
- Temperature cycling
- High-temperature storage
- Low-temperature storage
- Marking permanency
- Lead integrity
- Solderability
- Resistance to solder heat
- Mechanical shock (not plastic packages)
- Vibration (not plastic packages)
- ESD characterization

SMD devices only are subjected to preconditioning to simulate board assembly techniques using the methods defined in standard J-STD-020 before being subjected to stresses.

Normally, the endpoint tests are related to the datasheet or to specified parameters. Additionally, they may include:

- Destructive physical analysis
- X-ray
- Delamination testing using scanning acoustic microscope
- Thermal imaging
- Thermal and electrical resistance analysis



A summary of the reliability test results combined with process flows and technological data will be prepared when the device has passed the Vishay qualification tests. The summary is named QualPack.

For automotive grade devices also additional information according to the PPAP requirements will be provided on request.

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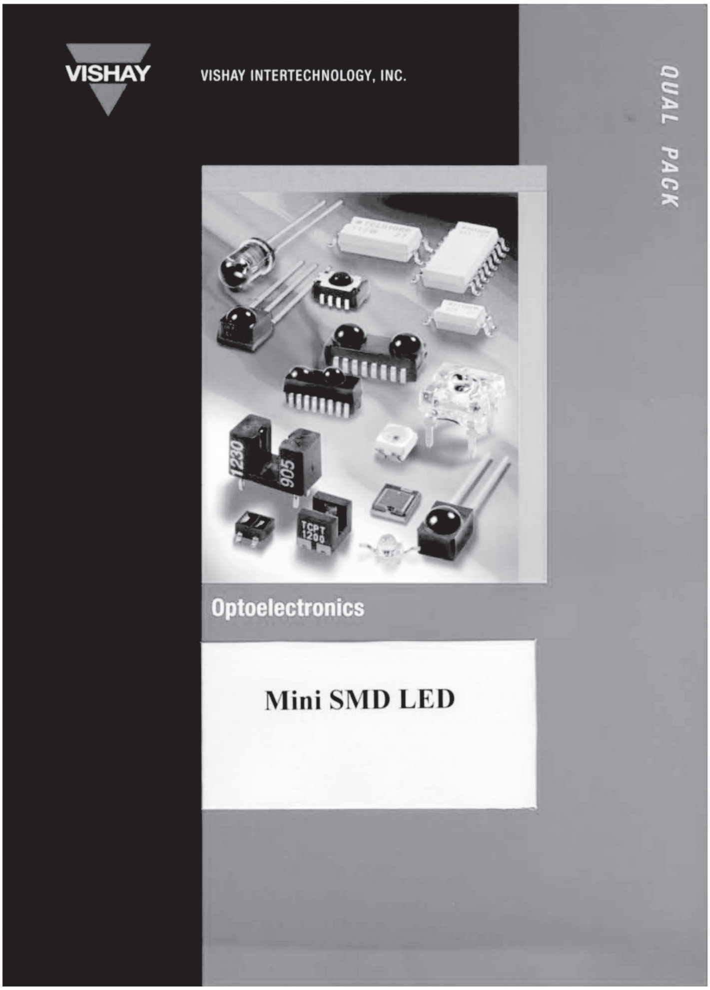

VISHAY INTERTECHNOLOGY, INC.

QUAL PACK

Optoelectronics

Mini SMD LED

Example of the QualPack

RELIABILITY MONITORING AND WEAR-OUT

The monitoring program consists of short-term monitoring to provide fast feedback on a regular basis in case of a reduction in reliability and to measure the Early-life Failure Rate (EFR). At the same time, Long-term monitoring is used to determinate the Long-term steady-state Failure Rate (LFR). The tests used are a subset from those used for qualification and consist of:

- Life tests
- Humidity tests
- Temperature-cycling tests

The actual tests used depend on the product tested.
Depending on the assembly volume a yearly monitoring and wear-out test plan is created.
Wear-out data is particularly important in optoelectronic devices.

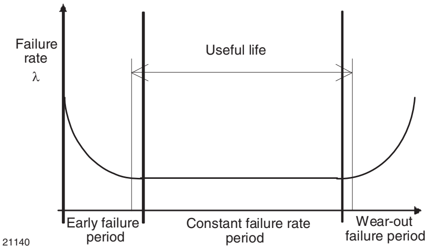

Fig. 4 - Bathtub Curve

The lifetime distribution curve is shown on figure 4. This curve is also known as the “bath-tub curve” because of its shape. There are three basic sections:

- Early-life failures (infant mortality)
- Operating-life failures (random failures)
- Wear-out failures

Out of that data degradation curves can be made. These curves show the long time behavior of the different devices. Some typical curves are attached in this report.

RELIABILITY PRINCIPLES

Reliability is the probability that a part works operated, under specific conditions, performs properly for a given period of time.

$F(t) + R(t) = 1$ or $R(t) = 1 - F(t)$

where:

$R(t)$ = probability of survival

$F(t)$ = probability of failure

$F(t) = 1-e^{-\lambda t}$

where

λ = instantaneous failure rate

t = time

thus,

$R(t) = e^{-\lambda t}$

MTTF, MTBF

MTTF (mean time to failure) applies to parts that will be thrown away on failing. MTBF (mean time between failures) applies to parts or equipment that is going to be repaired. MTTF is the inverse failure rate.

$$\text{MTTF} = \frac{1}{\lambda}$$

So R(t) becomes to:

$$R_{(t)} = e^{-\lambda t} = e^{-\frac{t}{\text{MTTF}}}$$

After a certain time, t will be equal to MTTF, R(t) becomes:

$$R_{(t)} = e^{-1} = 0.37$$

If a large number of units are considered, only 37 % of their operation times will be longer than MTTF figure.

The failure rate (λ) during the constant (random) failure period is determined from life-test data. The failure rate is calculated from the formula:

$$\lambda = \frac{r}{\Sigma(fi \cdot ti) + (N \cdot t)} = \frac{r}{C}$$

where

λ = failure rate (h^{-1})

r = number of observed failures

f_i = failure number

t_i = time to defect

N = good sample size

t = entire operating time

C = number of components x h

The result is expressed in either

a) % per 1000 component hours by multiplying by 10^5

or in

b) FITs by multiplying by 10^9 (1 FIT = 10^{-9} h^{-1})

Example 1: Determination of failure rate λ
500 devices were operated over a period of 2000 h (t) with:
1 failure (f1) after 1000 h (t1)
The failure rate of the given example can be calculated as follows:

$$\lambda = \frac{1}{(1 \cdot 1000\ h) + 499 \cdot 2000\ h}$$

$$\lambda = 2 \cdot 10^{-6} h^{-1}$$

That means that this sample has an average failure rate of **0.1 %/1000 h or 1001 FIT**

Observed failure rates as measured above are for the specific lot of devices tested. If the predicted failure rate for the total population is required, statistical confidence factors have to be applied.

The confidence factors can be obtained from “chi square” (χ^2) charts. Normally, these charts show the value of ($\chi^2/2$) rather than χ^2. The failure rate is calculated by dividing the $\chi^2/2$ factor by the number of component hours.

$$\lambda_{pop} = \frac{(\chi^2/2)}{C}$$

The values for $\chi^2/2$ are given in table 1

TABLE 1 - χ^2/2 CHART

NUMBER OF FAILURES	CONFIDENCE LEVEL	
	60 %	90 %
0	0.92	2.31
1	2.02	3.89
2	3.08	5.30
3	4.17	6.70
4	5.24	8.00
5	6.25	9.25
6	7.27	10.55

Example 2: The failure rate of the population
Using example 1 with a failure rate of 1001 FIT and 1 failure: $\chi^2/2$ at 60 % confidence is 2.02

$$\lambda_{pop} = \frac{2.02}{9.99 \cdot 10^5} = 2022\text{ FIT}$$

This means that the failure rate of the population will not exceed 2022 FIT with a probability of 60 %.

- **Accelerated Stress Testing**

In order to be able to assure long operating life with a reasonable confidence, Vishay carries out accelerated testing on all its products. The normal accelerating factor is the temperature of operation. Most failure mechanisms of Semiconductors are dependent upon temperature. This temperature dependence is best described by the Arrhenius equation.

$$\lambda_{T2} = \lambda_{T1} \times e^{\left[\frac{E_A}{k} \times \left(\frac{1}{T1} - \frac{1}{T2}\right)\right]}$$

where

k = Boltzmann's constant 8.63 x 10^{-5} eV/K
E_A = activation energy (eV)
T_1 = operation temperature (K)
T_2 = stress temperature (K)
λ_{T1} = operation failure rate
λ_{T2} = stress-test failure rate

Using this equation, it is possible from the stress test results to predict what would happen in use at the normal temperature of operation.

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ACTIVATION ENERGY

Provided the stress testing does not introduce a failure mode, which would not occur in practice, this method gives an acceptable method for predicting reliability using short test periods compared to the life of the device. It is necessary to know the activation energy of the failure mode occurring during the accelerated testing. This can be determined by experiment. In practice, it is unusual to find a failure or if there is, it is a random failure mode. For this reason an average activation energy is normally used for this calculation. Though activation energies can vary between 0.3 eV and 2.2 eV, under the conditions of use, activation energies of between 0.6 eV and 0.9 eV are used depending upon the technology.

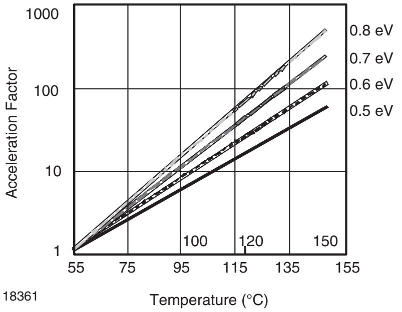


Fig. 5 - Acceleration Factor for different Activation Energies Normalized to T = 55 °C

ACTIVATION ENERGIES FOR COMMON FAILURE MECHANISMS

The activation energies for some of the major semiconductor failure mechanisms are given in the table below. These are estimates taken from published literature.

TABLE 2 - ACTIVATION ENERGIES FOR COMMON FAILURE MECHANISM

FAILURE MECHANISM	ACTIVATION ENERGY
Mechanical wire shorts	0.3 to 0.4
Diffusion and bulk defects	0.3 to 0.4
Oxide defects	0.3 to 0.4
Top-to-bottom metal short	0.5
Electro migration	0.4 to 1.2
Electrolytic corrosion	0.8 to 1.0
Gold-aluminum intermetallics	0.8 to 2.0
Gold-aluminum bond degradation	1.0 to 2.2
Ionic contamination	1.02
Alloy pitting	1.77

Failure rates are quoted at an operating temperature of 55 °C and 60 % confidence using an activation energy (E_A) of 0.8 eV for optoelectronic devices.

Example 3: Conversion to 55 °C
In Example 2, the life test was out at 125 °C so to transform to an operating temperature of 55 °C.
T1 = 273 + 55 = 328K
T1 = 273 + 125 = 398K
Acceleration factor =

$$\frac{\lambda_{(T2)}}{\lambda_{(T1)}} = \frac{\lambda_{(423K)}}{\lambda_{(328K)}} = 144$$

thus

$$\lambda_{(328K)} = \frac{\lambda_{(423K)}}{144} = \frac{2022}{144}$$

= 14 **FIT**
(at 55 °C with a confidence of 60 %)

This figure can be re-calculated for any operating/junction temperature using this method.

- **EFR (Early Life Failure Rate)**

This is defined as the proportion of failures that will occur during the warranty period of the system for which they were designed. In order to standardize this period, Vishay uses 1000 operation hours as the reference period. This is the figure also used by the automotive industry; it equates to one year in the life of an automobile. In order to estimate this figure, Vishay normally operates a sample of devices for 48 h or 168 h under the accelerated conditions detailed above. The Arrhenius law is then used as before to calculate the failure rate at 55 °C with a confidence level of 60 %. This figure is multiplied by 1000 to give the failures in 1000 h and by 10^6 to give a failure in ppm. All EFR figures are quoted in ppm (parts per million).

The value of EFR and LFR is also depending on the amount of new products brought to market in the period. If a lot of new products are released the EFR and the LFR value can also be increased in that period due to increased rejects.

- **Climatic Tests Models**

Temperature cycling failure rate
The inverse power law is used to model fatigue failures of materials that are subjected to thermal cycling. For the purpose of accelerated testing, this model relationship is called Coffin-Manson relationship, and can be expressed as follows:

$$A_F = \left(\frac{\Delta T_{stress}}{\Delta T_{use}}\right)^M$$

where:

A_F = acceleration factor
ΔT_{use} = temp. range under normal operation
ΔT_{stress} = temp. range under stress operation
M = constant characteristic of the failure mechanism

TABLE 3 - COFFIN - MANSON EXPONENT M

FAILURE MECHANISM	M
Al wire bond failure	3.5
Intermetallic bond fracture	4.0
Au wire bond heel crack	5.1
Chip-out bond failure	7.1

For instance:

$$\Delta T_{use} = 15\ °C/60\ °C = 45\ °C$$
$$\Delta T_{stress} = -25\ °C/100\ °C = 125\ °C$$

$$A_F = \left(\frac{125\ °C}{45\ °C}\right)^3 \approx 21$$

Relative Humidity failure rate

Moisture effect modeling is based upon the Howard-Pecht-Peck model using the acceleration factor of the equation shown below:

$$A_F = \left(\frac{RH_{stress}}{RH_{use}}\right)^C \cdot e^{\left[\frac{E_A}{k}\left(\frac{1}{T_{use}} - \frac{1}{T_{stress}}\right)\right]}$$

where:

RH_{stress} = relative humidity during test
RH_{use} = relative humidity during operation
T_{stress} = temperature during test
T_{use} = temperature during operation
E_A = activation energy
k = Boltzmann constant
C = material constant

For instance:

$RH_{stress} = 85\ \%$, $RH_{use} = 92\ \%$

$T_{stress} = 85\ °C$, $T_{use} = 40\ °C$

$$A_F = \left(\frac{85\ \%\ RH}{92\ \%\ RH}\right)^3 \text{ x } e^{\left[\frac{0.8}{8.617 \text{ x } 10^{-5}}\left(\frac{1}{313} - \frac{1}{358}\right)\right]}$$

$$A_F \approx 33$$

This example shows how to transform test conditions into environmental or into another test conditions. This equation is applicable for devices subjected to temperature humidity bias (THB) testing.

Using these acceleration factors the useful lifetime can be calculated. Applying the acceleration factor once more, useful lifetime for the moisture effect model for parts subjected to THB can be estimated by the following equation:

$$\text{Useful life}_{Years} = \frac{A_F \cdot \text{test hours}}{\text{hours per year}}$$

with:

test hours = 1000

hours per year = 8760

$A_F \approx 118$ (40 °C/60 % RH)

$$\text{Useful life}_{Years} = \frac{118 \cdot 1000}{8760} \approx 13.5 \text{ years}$$

This means that operation in 40 °C/60 % RH environment is good for around 13 years, calculated out of the 85 °C/85 %RH 1000 h humidity stress test.

HANDLING FOR QUALITY

- **Electrostatic Discharge (ESD) Precautions**

Electrostatic discharge is defined as the high voltage, which is generated when two dissimilar materials move in contact with one another. This may be by rubbing (i.g. walking on a carpet) or by hot air or gas passing over an insulated object. Sometimes, ESD is easily detectable as when a person is discharged to ground.

Electronic devices may be irreversibly damaged when subjected to this discharge. They can also be damaged if they are charged to a high voltage and then discharged to ground.

Damage due to ESD may occur at any point in the process of manufacture and use of the device. ESD is a particular problem if the humidity is low (< 40 %) which is very common in non-humidified but air-conditioned buildings. ESD is not just generated by the human body but can also occur with ungrounded machinery.

ESD may cause a device to fail immediately or damage a device so that it will fail later. Whether this happens or not, usually depends on the energy available in the ESD pulse.

All ESD-sensitive Vishay products are protected by means of

- Protection structures on chip
- ESD protection measures during handling and shipping

Vishay has laid down procedures, which detail the methods to be used for protection against ESD. These measures meet or exceed the standards for ESD-protective and preventative measures.

These include the use of:

- Earthen wrist straps and benches
- Conductive floors
- Protective clothing
- Controlled humidity

It also lays down the methods for routinely checking these and other items such as the earthen of machines.

A Semiconductor device is only completely protected when enclosed in a «Faraday Cage». This is a completely closed conductive container (i.e., sealed conductive bag or box).

Most packaging material (i.e. tubes) used for Semiconductors is now manufactured from anti-static material or anti-static-coated material. This does not mean that the devices are completely protected from ESD, only that the packing will not generate ESD. Devices are completely protected only when surrounded on all sides by a conductive package.

It should also be remembered that devices can equally as easily be damaged by discharge from a high voltage to ground as vice-versa.

Testing for ESD resistance is part of the qualification procedure. The methods used are detailed in MIL-STD-883 Method 3015.7 (Human Body Model) and EOS/ESD-S5.1-1993 (Machine Model) specification. Also testing according to the CDM (charged coupled device model) is part of the advanced qualification procedure.

- **Soldering**

All products are tested to ascertain their ability to withstand the industry standard soldering conditions after storage. In general, these conditions are as follows

- Wave soldering: double-wave soldering according to CECC 00802
- Reflow soldering: According to JEDEC STD 20

Note

- certain components may have limitations due to their construction

- **Dry pack**

When being stored, certain types of device packages can absorb moisture, which is released during the soldering operations, thus causing damage to the device. The so-called “popcorn” effect is such an example. To prevent this, Surface Mount Devices (SMD) are evaluated during qualification, using a test consisting of moisture followed by soldering simulation (pre-conditioning) and then subjected to various stress tests. In table 4 - Moisture Sensitivity Levels - the six different levels, the floor life conditions as well as the soak requirements belonging to these levels are described. Any device which is found to deteriorate under these conditions is packaged in “dry pack”.

The dry-packed devices are packed generally according to IPC JEDEC STD 33 “Handling, Packing, Shipping and use of Moisture/Reflow sensitive Surface Mount Devices”, IPC-SM-786 “Recommended Procedures for Handling of Moisture Sensitive Plastic IC Packages”.

Following some general recommendations:

- Shelf life in the packaging at < 40 °C and 90 % RH is 12 months
- After opening, the devices should be handled according to the specifications mentioned on the dry-pack label
- If the exposure or storage time is exceeded, the devices should be baked:
  - Low-temperature baking - 192 h at 40 °C and 5 % RH
  - High-temperature baking - 24 h at 125 °C.

TABLE 4 - MOISTURE SENSITIVITY LEVELS

	FLOOR LIFE		SOAK REQUIREMENTS			
LEVEL	**CONDITIONS**	**TIME**	**TIME (h)**			**CONDITIONS**
1	≤ 30 °C/90 % RH	Unlimited	168			85 °C/85 % RH
2	≤ 30 °C/60 % RH	1 year	168			85 °C/60 % RH
2a	≤ 30 °C/60 % RH	4 weeks	696			30 °C/60 % RH
			X	Y	Z	
3	≤ 30 °C/60 % RH	168 h	24	168	192	30 °C/60 % RH
4	≤ 30 °C/60 % RH	72 h	24	72	96	30 °C/60 % RH
5	≤ 30 °C/60 % RH	48 h	24	48	72	30 °C/60 % RH
5a	≤ 30 °C/60 % RH	24 h	24	24	48	30 °C/60 % RH
6	≤ 30 °C/60 % RH	6 h	0	6	6	30 °C/60 % RH

X = Default value of Semiconductor Manufacturer’s Exposure Time (MET) between bake and bag plus the maximum time allowed out of the bag at the distributor’s facility. The actual times may be used rather than the default times, but they must be used if they exceed the default times.

Y = Floor life of package after it is removed from dry pack bag.

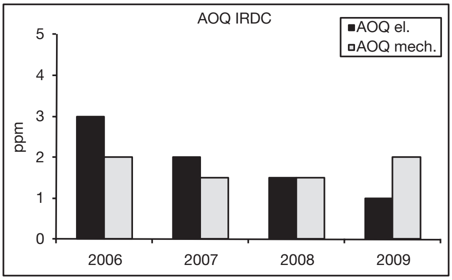
Z = Total soak time for evaluation (X + Y).

Note

- There are two possible floor lives and soak times in level 5. The correct floor life will be determined by the manufacturer and will be noted on the dry pack bag label per JEP 113. “Symbol and Labels for Moisture Sensitive Devices”.

QUALITY AND RELIABILITY DATA

Average Outgoing Quality (AOQ)



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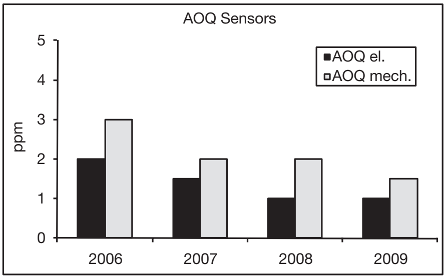

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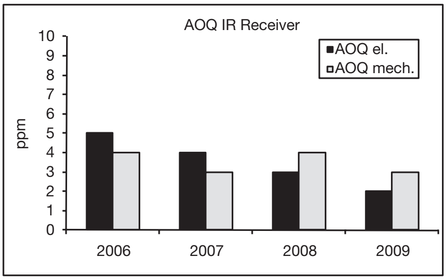

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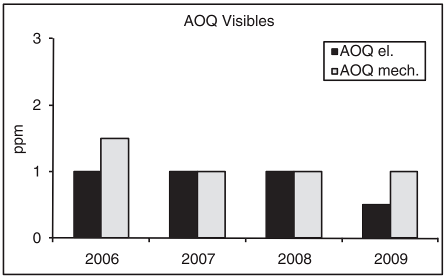

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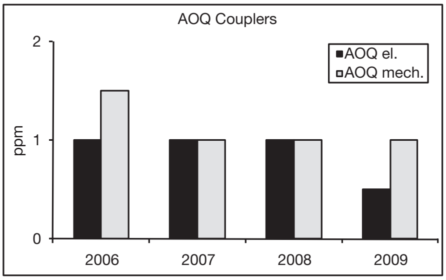

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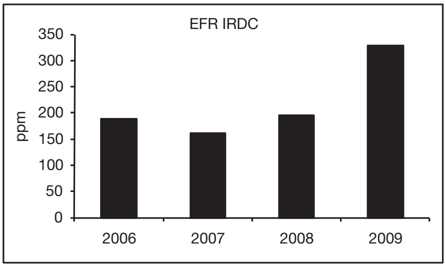
Early Failure Rate (EFR)



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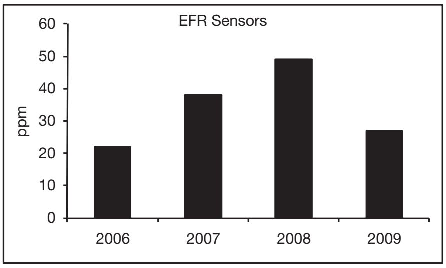

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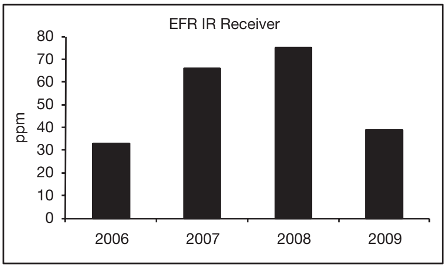
Increase of EFR only due to lower amount of samples, old results were cutted off. No additional rejects in 2007 and 2008



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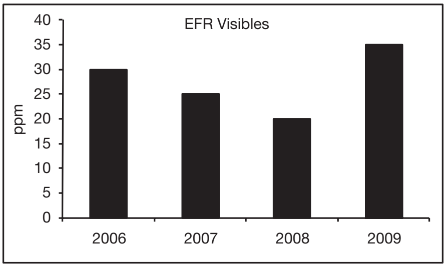

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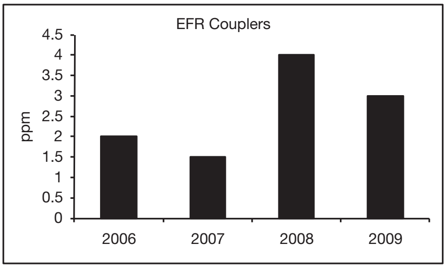
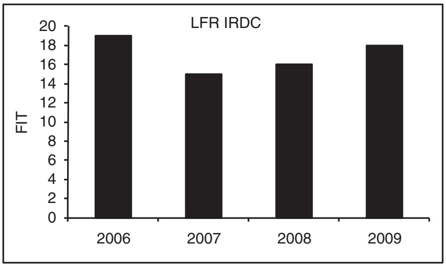


22222

Increase of EFR only due to lower amount of samples, old results were cutted off. No additional rejects in 2008

Latent Failure Rate (LFR)



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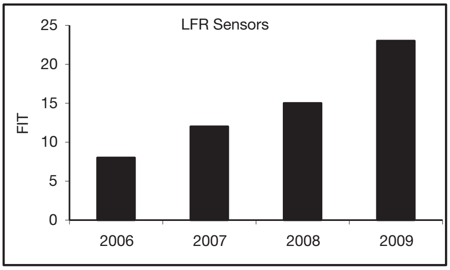

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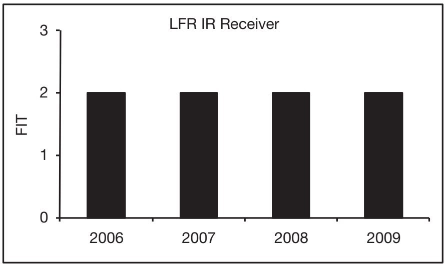

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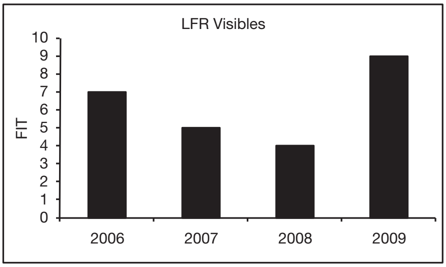

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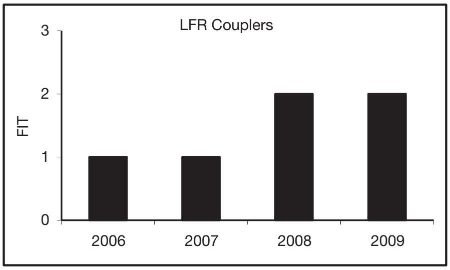
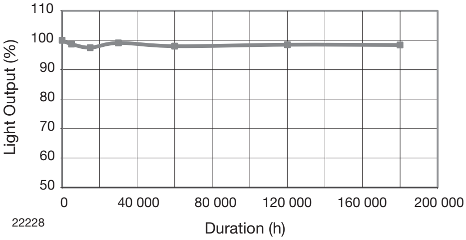


22227

Increase of EFR only due to lower amount of samples, old results were cutted off. No additional rejects in 2008 and 2009

WEAR-OUT DATA

TSAL6200
Data extrapolated for T_j = 55 °C, E_A = 0.8 eV
based on test results of 6000 h



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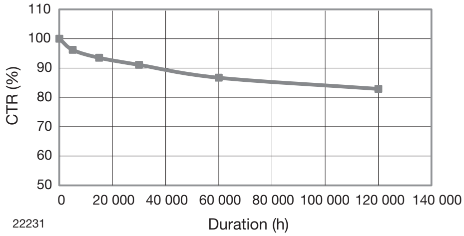
TCLT1001
Data extrapolated for T_j = 55 °C, E_A = 0.8 eV
based on test results of 8000 h



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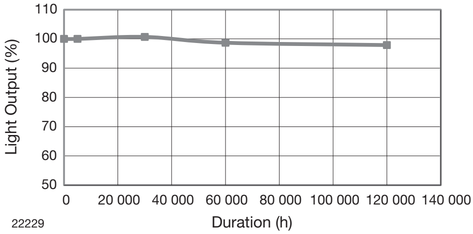
TSHF5400
Data extrapolated for T_j = 55 °C, E_A = 0.8 eV
based on test results of 4000 h



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TCDT1102G
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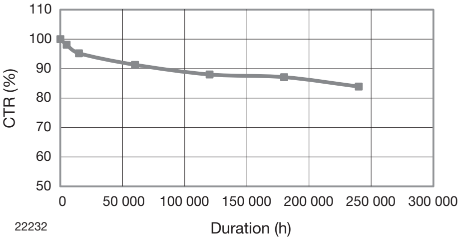
based on test results of 8000 h



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TLHG5400
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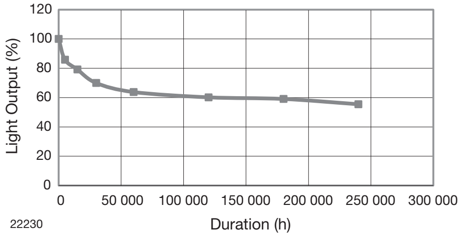
based on test results of 8000 h



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TCET1100
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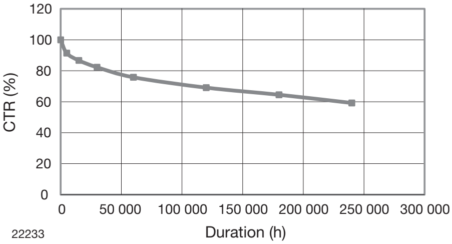

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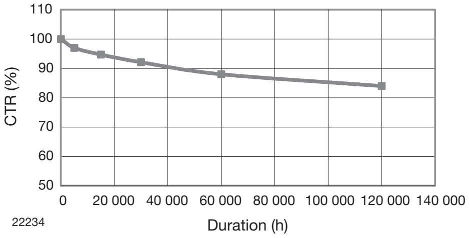
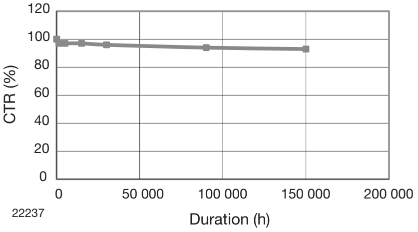
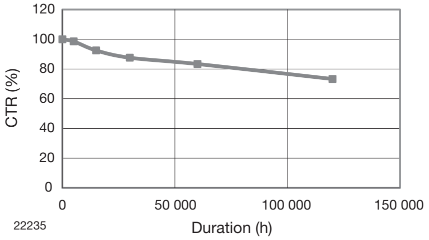
TCMT1105
Data extrapolated for T_j = 55 °C, E_A = 0.8 eV
based on test results of 4000 h



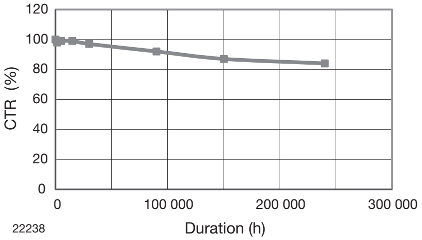
ILD213T
Electrical life (extrapolated for T_j = 55 °C, E_A = 0.8 eV)
based on test results of 5000 h



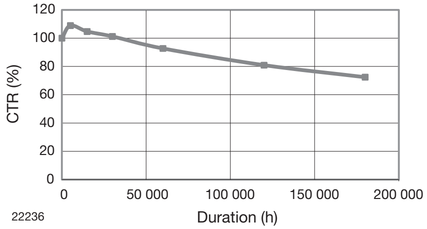
CNY17-3
EL (extrapolated for T_j = 55 °C, E_A = 0.8 eV)
based on test results of 4000 h



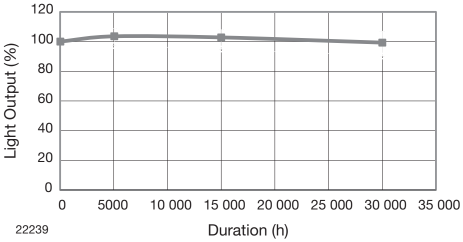
SFH617A-3
Electrical life (extrapolated for T_j = 55 °C, E_A = 0.8 eV)
based on test results of 8000 h

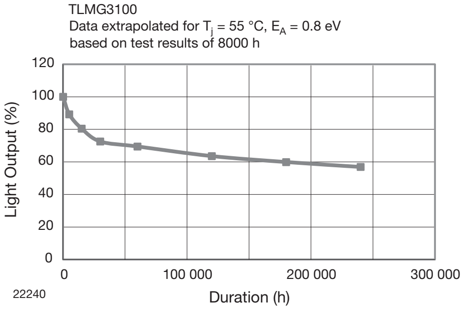


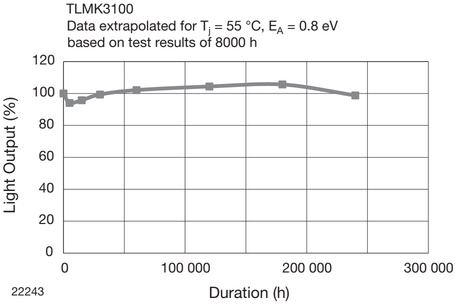
SFH600-1
(extrapolated for T_j = 55 °C, E_A = 0.8 eV)
based on test results of 6000 h



V434P
Data extrapolated for T_j = 55 °C, E_A = 0.8 eV
based on test results of 1000 h




TLMG3100
Data extrapolated for T_j = 55 °C, E_A = 0.8 eV
based on test results of 8000 h
Light Output (%)
120
100
80
60
40
20
0
0
100 000
200 000
300 000
Duration (h)
22240


TLMK3100
Data extrapolated for T_j = 55 °C, E_A = 0.8 eV
based on test results of 8000 h
Light Output (%)
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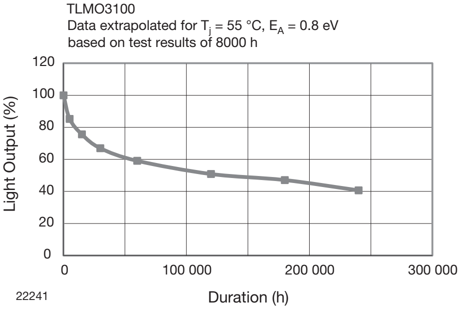
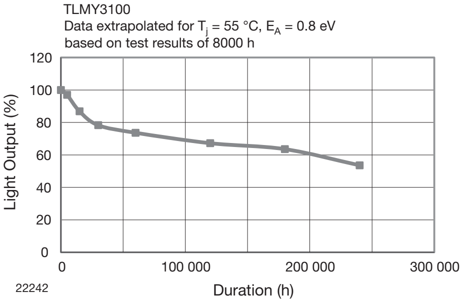
100
80
60
40
20
0
0
100 000
200 000
300 000
Duration (h)
22243


TLMO3100
Data extrapolated for T_j = 55 °C, E_A = 0.8 eV
based on test results of 8000 h
Light Output (%)
120
100
80
60
40
20
0
0
100 000
200 000
300 000
Duration (h)
22241


TLMY3100
Data extrapolated for T_j = 55 °C, E_A = 0.8 eV
based on test results of 8000 h
Light Output (%)
120
100
80
60
40
20
0
0
100 000
200 000
300 000
Duration (h)
22242

RELIABILITY AND STATISTICS GLOSSARY

DEFINITIONS

Accelerated Life Test: A life test under conditions those are more severe than usual operating conditions. It is helpful, but not necessary, that a relationship between test severity and the probability distribution of life be ascertainable.

Acceleration Factor: Notation: f(t) = the time transformation from more severe test conditions to the usual conditions. The acceleration factor is f(t)/t. The differential acceleration factor is df(t)/dt.

Acceptance Number: The largest numbers of defects that can occur in an acceptance sampling plan and still have the lot accepted.

Acceptance Sampling Plan: An accept/reject test the purpose of which is to accept or reject a lot of items or material based on random samples from the lot.

Assessment: A critical appraisal including qualitative judgements about an item, such as importance of analysis results, design criticality, and failure effect.

Attribute (Inspection By): A term used to designate a method of measurement whereby units are examined by noting the presence (or absence) of some characteristic or attribute in each of the units in the group under consideration and by counting how many units do (or do not) possess it. Inspection by attributes can be two kinds: either the unit of product is classified simply as defective or no defective or the number of defects in the unit of product is counted with respect to a given requirement or set of requirements.

Attribute Testing: Testing to evaluate whether or not an item possesses a specified attribute.

Auger Electron Spectrometer: An instrument, which identifies elements on the surface of a sample. It excites the area of interest with an electron beam and observes the resultant emitted Auger electrons. These electrons have the specific characteristics of the near surface elements. It is usually used to identify very thin films, often surface contaminants.

Availability (Operational Readiness): The probability that at any point in time the system is either operating satisfactorily or ready to be placed in operation on demand when used under stated conditions.

Average Outgoing Quality (AOQ): The average quality of outgoing product after 100 % inspection of rejected lot, with replacement by good units of all defective units found in inspection.

Bathtub Curve: A plot of failure rate of an item (whether repairable or not) vs. time. The failure rate initially decreases, then stays reasonably constant, then begins to rise rather rapidly. It has the shape of bathtub. Not all items have this behaviour.

Bias: (1) The difference between the s-expected value of an estimator and the value of the true parameter; (2) Applied voltage.

Burn-In: The initial operation of an item to stabilize its characteristics and to minimize infant mortality in the field.

Confidence Interval: The interval within which it is asserted that the parameters of a probability distribution lies.

Confidence Level: Equals 1 - α where α = the risk (%).

Corrective Action: A documented design, process, procedure, or materials change to correct the true cause of a failure. Part replacement with a like item does not constitute appropriate corrective action. Rather, the action should make it impossible for that failure to happen again.

Cumulative Distribution Function (CDF): The probability that the random variable takes on any value less than or equal to a value x, e.g. $F(x) = CDF(x) = Pr(x \leq X)$.

Defect: A deviation of an item from some ideal state. The ideal state usually is given in a formal specification.

Degradation: A gradual deterioration in performance as a function of time.

Derating: The intentional reduction of stress/strength ratio in the application of an item, usually for the purpose of reducing the occurrence of stress-related failures.

Duty Cycle: A specified operating time of an item, followed by a specified time of no operation.

Early Failure Rate: That period of life, after final assembly, in which failures occur at an initially high rate because of the presence of defective parts and workmanship. This definition applies to the first part of the bathtub curve for failure rate (infant mortality).

EDX Spectrometer: Generally used with a scanning electron microscope (SEM) to provide elemental analysis of X-rays generated on the region being hit by the primary electron beam.

Effectiveness: The capability of the system or device to perform its function.

EOS - Electrical Overstress: The electrical stressing of electronic components beyond specifications. May be caused by ESD.

ESD - Electrostatic Discharge: The transfer of electrostatic charge between bodies at different electrostatic potentials caused by direct contact or induced by an electrostatic field. Many electronic components are sensitive to ESD and will be degraded or fail.

Expected Value: A statistical term. If x is a random variable and F (x) it its CDF, the $E(x) = xdF(x)$, where the integration is over all x. For continuous variables with a pdf, this reduces to $E(x) = \int x \, pdf(x) \, dx$. For discrete random variables with a pdf, this reduces to $E(x) = \Sigma x_n p(x_n)$ where the sum is over all n.

Exponential Distribution: A 1-parameter distribution ($\lambda > 0$, $t \geq 0$) with: pdf (t) = λexp ($-\lambda t$); Cdf (t) 0 1 - exp ($-\lambda t$); Sf (t) = exp ($-\lambda t$) ; failure rate = λ; mean time-to-failure = $1/\lambda$. This is the constant failure-rate-distribution.

Failure: The termination of the ability of an item to perform its required function.

Failure Analysis: The identification of the failure mode, the failure mechanism, and the cause (i.e., defective soldering, design weakness, contamination, assembly techniques, etc.). Often includes physical dissection.

Failure, Catastrophic: A sudden change in the operating characteristics of an item resulting in a complete loss of useful performance of the item.

Failure, Degradation: A failure that occurs as a result of a gradual or partial change in the operating characteristics of an item.

Failure, Initial: The first failure to occur in use.

Failure, Latent: A malfunction that occurs as a result of a previous exposure to a condition that did not result in an immediately detectable failure. Example: Latent ESD failure.

Failure Mechanism: The mechanical, chemical, or other process that results in a failure.

Failure Mode: The effect by which a failure is observed. Generally, describes the way the failure occurs and tells “how” with respect to operation.

Failure Rate: (A) The conditional probability density that the item will fail just after time t, given the item has not failed up to time t; (B) The number of failures of an item per unit measure of life (cycles, time, miles, events, etc.) as applicable for the item.

Failure, Wear-Out: Any failure for which time of occurrence is governed by rapidly increasing failure rate.

FIT: Failure Unit; (also, Failures In Time) Failures per 10^9 h.

Functional Failure: A failure whereby a device does not perform its intended function when the inputs or controls are correct.

Gaussian Distribution: A 2-parameter distribution with:

$$\mathrm{pd}f\,(x) = \frac{1}{\sigma\sqrt{2\pi}} \cdot e^{-\frac{1}{2}\left(\frac{x-u}{\sigma}\right)}$$

Cdf (x) = guaf (x). SF (x) = gaufc (x). “Mean value of x” u, “standard deviation of x” = σ

Hazard Rate: Instantaneous failure rate.

Hypothesis, Null: A hypothesis stating that there is no difference between some characteristics of the parent populations of several different samples, i.e., that the samples came from similar populations.

Infant Mortality: Premature catastrophic failures occurring at a much greater rate than during the period of useful life prior to the onset of substantial wear-out.

Inspection: The examination and testing of supplies and services (including when appropriate, raw materials, components, and intermediate assemblies) to determine whether they conform to specified requirements.

Inspection by Attributes: Inspection whereby either the unit of product or characteristics thereof is classified simply as defective or no defective or the number of defects in the unit of product is counted with respect to a given requirement.

Life Test: A test, usually of several items, made for the purpose of estimating some characteristic(s) of the probability distribution of life.

LFR: Longterm Failure Rate

Lot: A group of units from a particular device type submitted each time for inspection and/or testing is called the lot.

Lot Reject Rate (LRR): The lot reject rate is the percentage of lots rejected from the lots evaluated.

Lot Tolerance Percent Defective (LTPD): The percent defective, which is to be, accepted a minimum or arbitrary fraction of the time, or that percent defective whose probability of rejection is designated by β.

Mean: (A) The arithmetic mean, the expected value; (B) As specifically modified and defined, e.g., harmonic mean (reciprocals), geometric mean (a product), logarithmic mean (logs).

Mean Life: R(t)dt; where R(t) = the s-reliability of the item; t = the interval over which the mean life is desired, usually the useful life (longevity).

Mean-Life-Between-Failures: The concept is the same as mean life except that it is for repaired items and is the mean up-time of the item. The formula is the same as for mean life except that R(t) is interpreted as the distribution of up-times. Mean-Time-Between-Failures (MTBF): For a particular interval, the total functioning life of a population of an item divided by the total number of failures within the population during the measurement interval. The definition holds for time, cycles, miles, events, or other measure of life units.

Mean-Time-To-Failure (MTTF): See “Mean Life”.

Mean-Time-To-Repair (MTTR): The total corrective maintenance time divided by the total number of corrective maintenance actions during a given period of time.

MTTR: = G(t)dt; where G(t) = Cdf of repair time; T – maximum allowed repair time, i.e., item is treated as no repairable at this echelon and is discarded or sent to a higher echelon for repair.

Operating Characteristic (OC) Curve: A curve showing the relation between the probability of acceptance and either lot quality or process quality, whichever is applicable.

Part Per Million (ppm): ppm is arrived at by multiplying the percentage defective by 10 000.
Example: 0.1 % = 1000 ppm.

Population: The totality of the set of items, units, measurements, etc., real or conceptual that is under consideration.

Probability Distribution: A mathematical function with specific properties, which describes the probability that a random variable will take on a value or set of values. If the random variable is continuous and well behaved enough, there will be a pdf. If the random variable is discrete, there will be a pmf.

Qualification: The entire process by which products are obtained from manufacturers or distributors, examined and tested, and then identified on a Qualified Product List.

Quality: A property, which refers to, the tendency of an item to be made to specific specifications and/or the customer's express needs. See current publications by Juran, Deming, Crosby, et al.

Quality Assurance: A system of activities that provides assurance that the overall quality control job is, in fact, being done effectively. The system involves a continuing evaluation of the adequacy and effectiveness of the overall quality control program with a view to having corrective measures initiated where necessary. For a specific product or service, this involves verifications, audits, and the evaluation of the quality factors that affect the specification, production inspection, and use of the product or service.

Quality Characteristics: Those properties of an item or process, which can be measured, reviewed, or observed and which are identified in the drawings, specifications, or contractual requirements. Reliability becomes a quality characteristic when so defined.

Quality Control (QC): The overall system of activities that provides a quality of product or service, which meets the needs of users; also, the use of such a system.

Random Samples: As commonly used in acceptance sampling theory, the process of selecting sample units in such a manner that all units under consideration have the same probability of being selected.

Reliability: The probability that a device will function without failure over a specified time period or amount of usage at stated conditions.

Reliability Growth: Reliability growth is the effort, the resource commitment, to improve design, purchasing, production, and inspection procedures to improve the reliability of a design.

Risk: α: The probability of rejecting the null hypothesis falsely.

Scanning Electron Microscope (SEM): An instrument, which provides a visual image of the surface features of an item. It scans an electron beam over the surface of a sample while held in a vacuum and collects any of several resultant particles or energies. The SEM provides depth of field and resolution significantly exceeding light microscopy and may be used at magnifications exceeding 50 000 times.

Screening Test: A test or combination of tests intended to remove unsatisfactory items or those likely to exhibit early failures.

Significance: Results that show deviations between hypothesis and the observations used as a test of the hypothesis, greater than can be explained by random variation or chance alone, are called statistically significant.

Significance Level: The probability that, if the hypothesis under test were true, a sample test statistic would be as bad as or worse than the observed test statistic.

SPC: Statistical Process Control.

Storage Life (Shelf Life): The length of time an item can be stored under specified conditions and still meet specified requirements.

Stress: A general and ambiguous term used as an extension of its meaning in mechanics as that which could cause failure. It does not distinguish between those things which cause permanent damage (deterioration) and those things, which do not (in the absence of failure).

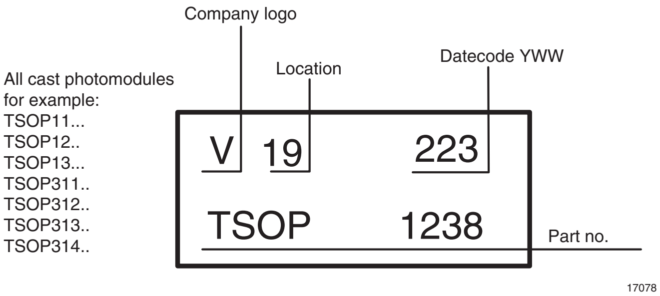
Variance: The average of the squares of the deviations of individual measurements from their average. It is a measure of dispersion of a random variable or of data.

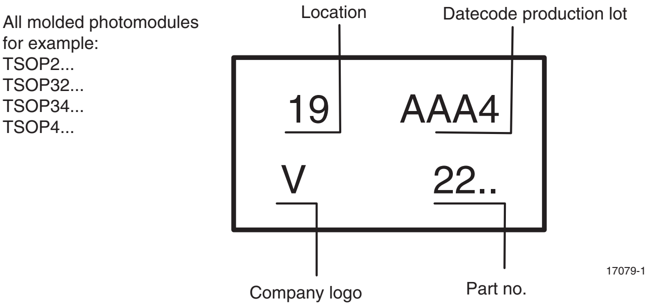
Wear-Out: The process of attribution which results in an increase of hazard rate with increasing age (cycles, time, miles, events, etc.) as applicable for the item.

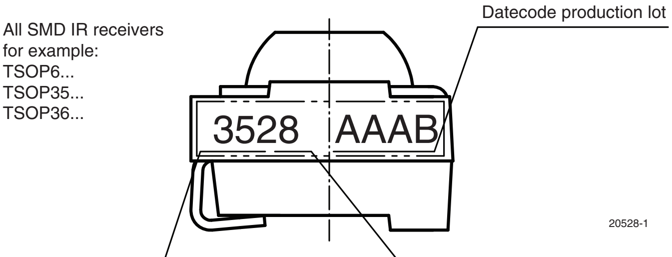
ABBREVIATIONS

AQL	Acceptable Quality Level
AOQ	Average Outgoing Quality
CAR	Corrective Action Report/Request
DIP	Dual In-Line Package
ECAP	Electronic Circuit Analysis Program
EFR	Early Failure Rate
EMC	Electro Magnetic Compatibility
EMI	Electro Magnetic Interference
EOS	Electrical Overstress
ESD	Electrostatic Discharge
FAR	Failure Analysis Report/Request
FIT	(Failure In Time) Failure Unit; Failures/10^9 h
FMEA	Failure Mode and Effects Analysis
FTA	Fault Tree Analysis
h (t)	Hazard Rate
LFR	Longterm Failure Rate
LTPD	Lot Tolerance Percent Defective
MOS	Metal Oxide Semiconductor
MRB	Material Review Board
MTBF	Mean-Time-Between-Failures
MTTF	Mean-Time-To-Failure
MTTR	Mean-Time-To-Repair
ppm	Parts Per Million
PRST	Probability Ratio Sequential Test
QA	Quality Assurance
QC	Quality Control
QPL	Qualified Products List
RPM	Reliability Planning and Management
SCA	Sneak Circuit Analysis
SEM	Scanning Electron Microscope
TW	Wear-out Time
Z (t)	Hazard Rate
λ	Failure Rate (Lambda)

Marking on IR Receiver Modules



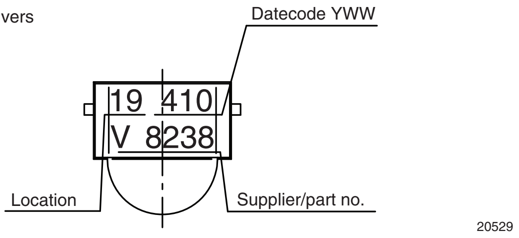




	Type
57	TSOP57..
61	TSOP61..
62	TSOP62..
63	TSOP63..
64	TSOP64..
361	TSOP361..
362	TSOP362..
351	TSOP351..
352	TSOP352..
353	TSOP353..
354	TSOP354..
35D	TSOP35D..

	Frequency
0	30 kHz
3	33 kHz
6	36 kHz
7	37 kHz
8	38 kHz
1	40 kHz
2	56 kHz
4	455 kHz
5	25 kHz

All minicast IR receivers
for example:
TSOP382..
TSOP39...
TSOP582..
TSOP59...



Supplier/part no. (Frequency)	Type
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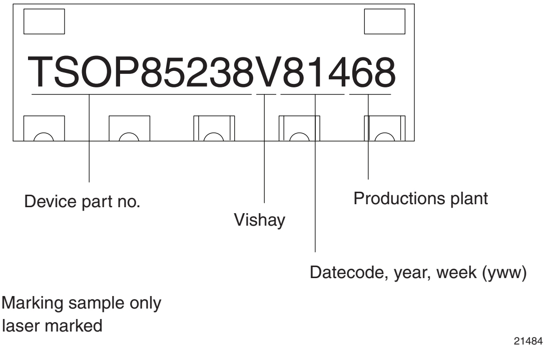
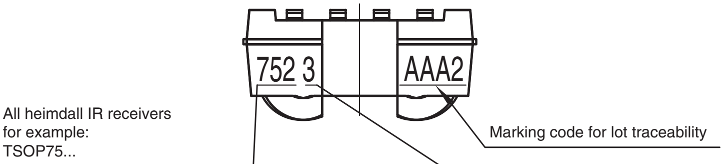
V 92..	TSOP92..
V 382..	TSOP382..
V 392..	TSOP392..
V 582..	TSOP582..
V 592..	TSOP592..
V 384..	TSOP384..
V 584..	TSOP584..
V 383..	TSOP383..
V 393..	TSOP393..

All bugeye photomodules
for example:
TSOP851..
TSOP852..
TSOP853..
TSOP854..





	Type
752	TSOP752..
753	TSOP753..
754	TSOP754..
75D	TSOP75D..

	Frequency
0	30 kHz
3	33 kHz
6	36 kHz
7	37 kHz
8	38 kHz
1	40 kHz
2	56 kHz
5	25 kHz

Letters DIN 1451-1 C 0.8

Laser marking

Above marking pictures to be considered for examples

22043

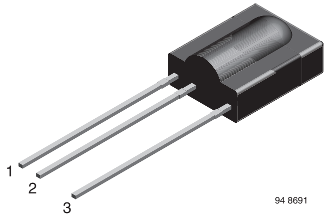
Ordering Information

Contents

IR Receiver Modules for Remote Control Systems

Vishay offers stock Cast IR Receivers in three different packages:

- Loose packed in tubes and mounted on tape for reel or ammopack.
- Vishay IR receiver with plastic holders are packed in plastic tubes.



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

AVAILABLE FOR:

- TSOP312..
- TSOP311..
- TSOP12...
- TSOP11...
- TSOP13...
- TSOP313..
- TSOP314..

LOOSE PACKED IN TUBE

ORDERING INFORMATION

T S O P d d d d d

2 or 3 digit product series 2 digit frequency

Note

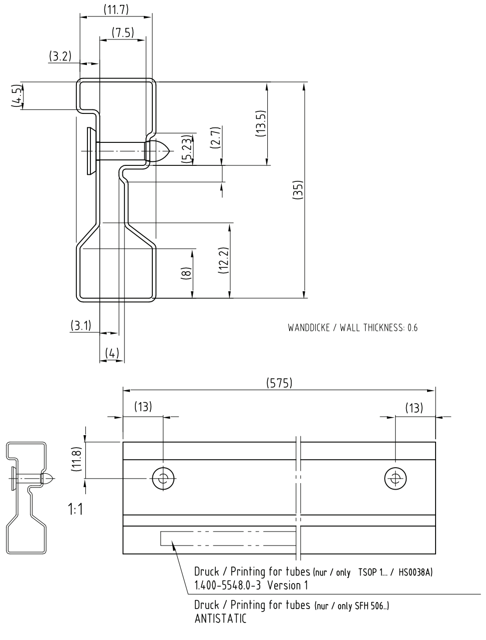
d = "digit", please consult the list of available devices create a valid part number.

Example: TSOP1238

PACKAGING QUANTITY

- 54 pieces per tube
- 20 tubes per carton

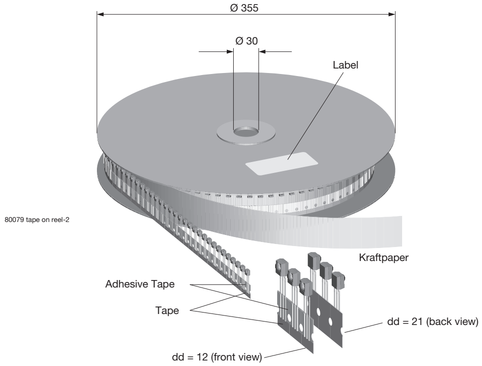
PACKAGING DIMENSIONS in millimeters

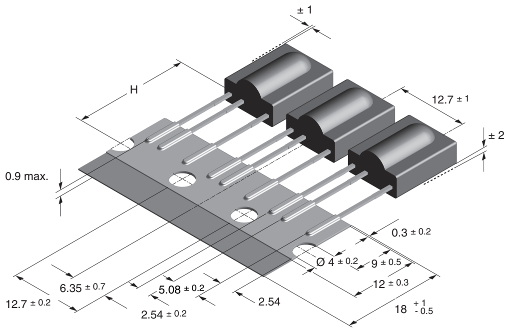


Drawing-No.: 9.700-5131.0-4
Rev. 10; Date: 20.11.03
20306-1

TAPE AND REEL/AMMOPACK

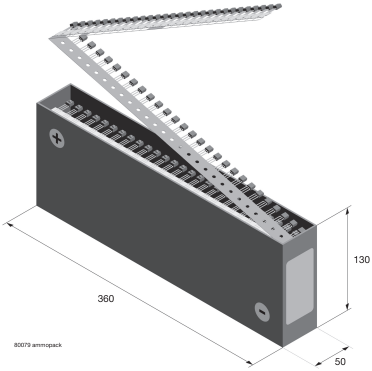
Up to 3 consecutive components may be missing if the gap is followed by at least 6 components. A maximum of 0.5 % of the components per reel quantity may be missing. At least 5 empty positions are present at the start and the end of the tape to enable insertion.
Tensile strength of the tape: > 15 N
Pulling force in the plane of the tape, at right angles to the reel: > 5 N





Vers.	Dim. "H"
BS	20 ± 0.5
PS	23.3 ± 0.5
OS	26 ± 0.5

22133



ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	S	1	d	d	d	d	Z

- d d d: 2 or 3 digit product series
- d d: 2 digit frequency
- S S 1: SS1 for T and R, bulk or ammopack
- d d: dd = BS, PS or OS
- d d d d: Tape and reel
- d d: dd = 12 or 21
- Z: Ammopack

Note
d = "digit", please consult the list of available devices create a valid part number.

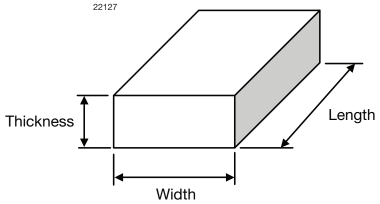
Example: **TSOP1238SS1BS12**
TSOP1238SS1BS12Z

PACKAGING QUANTITY

- 1000 pieces per reel
- 1000 pieces per ammopack

OUTER PACKAGING

CARTON BOX DIMENSIONS in millimeters

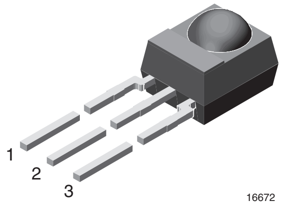


KINDS OF CARTON BOX	THICKNESS	WIDTH	LENGTH
Packaging Plastic Tubes (Normal/auxiliary devices)	80	150	600
Tape and Reel Box (Taping in reels)	400	310	410
Ammo-Box (Zigzag taping)	50	130	350

IR Receiver Modules for Remote Control Systems

Vishay offers stock molded IR receivers in four different packages:

- Loose packed in tubes, mounted on tape for reel or ammopack, or packed bulk in plastic bags.
- Vishay IR receiver with metal holders are packed in plastic trays. Vishay IR receiver with plastic holders are packed in plastic tubes.



LOOSE PACKED IN TUBE

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d

2 or 3 digit product series   2 digit frequency

Note

d = "digit", please consult the list of available devices create a valid part number.

Example: TSOP4838

PACKAGING QUANTITY

- 90 pieces per tube
- 24 tubes per carton

FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb
Pb-free

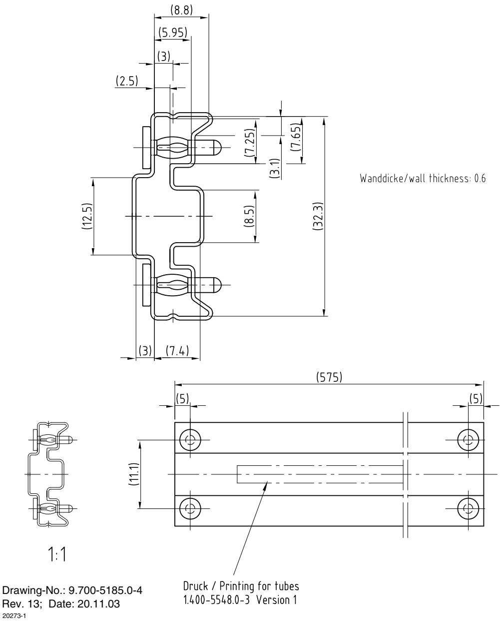
e3

RoHS
COMPLIANT

AVAILABLE FOR:

- TSOP348..
- TSOP344..
- TSOP343..
- TSOP341..
- TSOP44...
- TSOP48...
- TSOP41...
- TSOP324..
- TSOP323..
- TSOP322..
- TSOP321..
- TSOP24...
- TSOP22...
- TSOP21...

PACKAGING DIMENSIONS in millimeters



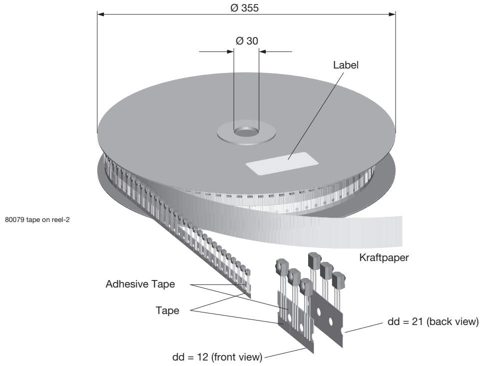
Drawing-No.: 9.700-5185.0-4
Rev. 13; Date: 20.11.03
20273-1

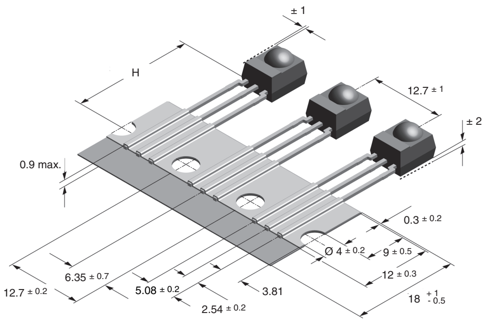
TAPE AND REEL/AMMOPACK

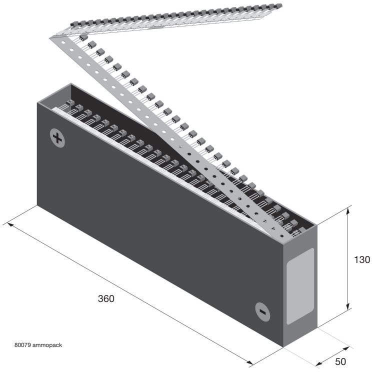
Up to 3 consecutive components may be missing if the gap is followed by at least 6 components. A maximum of 0.5 % of the components per reel quantity may be missing. At least 5 empty positions are present at the start and the end of the tape to enable insertion.

Tensile strength of the tape: > 15 N

Pulling force in the plane of the tape, at right angles to the reel: > 5 N



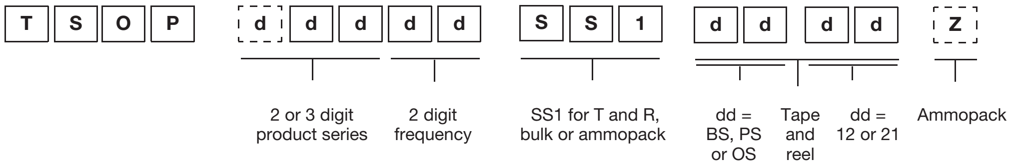




Vers.	Dim. "H"
BS	20 ± 0.5
PS	23.3 ± 0.5
OS	26 ± 0.5

22133

ORDERING INFORMATION



Note

d = "digit", please consult the list of available devices create a valid part number.

Example: **TSOP4838SS1BS12**
TSOP2238SS1BS12Z

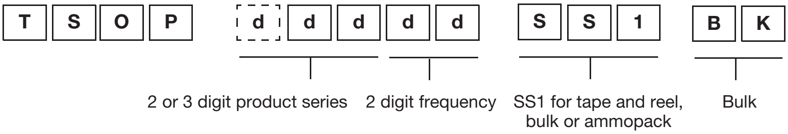
PACKAGING QUANTITY

- 1000 pieces per reel
- 1000 pieces per ammopack

BULK PACKAGING

The option “BK” signifies bulk packaging in conductive plastic bags. A maximum of 0.3 % of the components per box may be missing.

ORDERING INFORMATION



Note

d = “digit”, please consult the list of available devices create a valid part number.

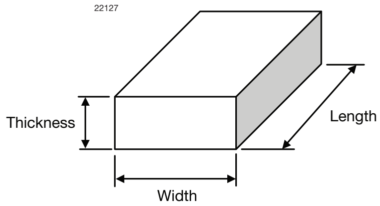
EXAMPLE: TSOP4838SS1BK
TSOP2238SS1BK

PACKAGING QUANTITY

- 250 pieces per bag (each bag is individually boxed)
- 6 bags per carton

OUTER PACKAGING

CARTON BOX DIMENSIONS in millimeters

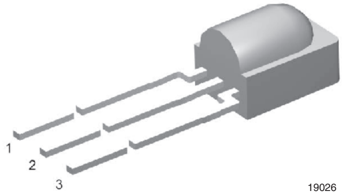


KINDS OF CARTON BOX	THICKNESS	WIDTH	LENGTH
Packaging Plastic Tubes (Normal/auxiliary devices)	80	150	600
Packaging Plastic Trays (Devices with metal holders)	120	290	490
Tape and Reel Box (Taping in reels)	400	310	410
Ammo-Box (Zigzag taping)	50	130	350

IR Receiver Modules for Remote Control Systems

Vishay offers stock minicast IR receivers in three different packages:

- Loose packed in tubes, mounted on tape for reel or ammopack, or packed bulk in plastic bags.
- Vishay IR receiver with metal holders are packed in plastic trays. Vishay IR receiver with plastic holders are packed in plastic tubes.



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

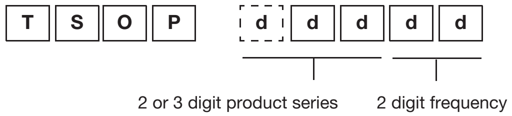
AVAILABLE FOR:

- TSOP381..
- TSOP382..
- TSOP383..
- TSOP384..
- TSOP391..
- TSOP392..
- TSOP393..
- TSOP394..
- TSOP581..
- TSOP582..
- TSOP591..
- TSOP592..
- TSOP98200
- TSOP98260
- TSOP58038

BULK PACKAGING

Standard shipping for minicast is in conductive plastic bags. A maximum of 0.3 % of the components per box may be missing.

ORDERING INFORMATION



Note

d = “digit”, please consult the list of available devices create a valid part number.

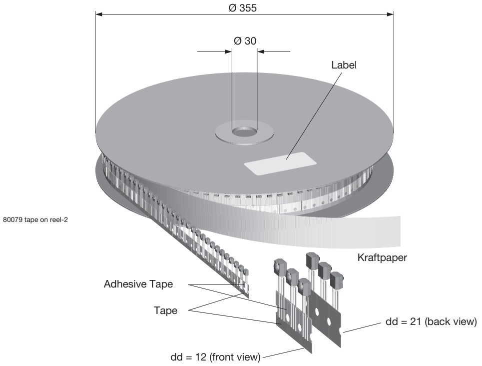
Example: **TSOP8238**
TSOP38138

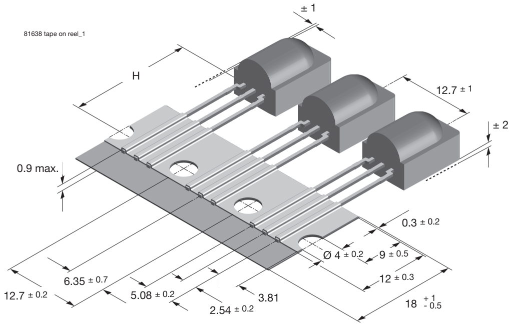
PACKAGING QUANTITY

- 250 pieces per bag (each bag is individually boxed)
- 6 bags per carton

TAPE AND REEL/AMMOPACK

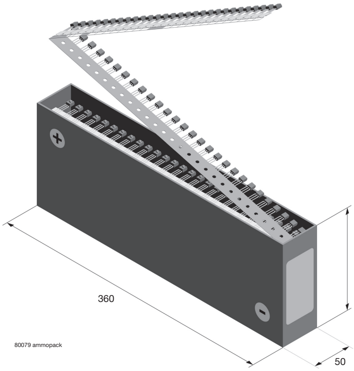
Up to 3 consecutive components may be missing if the gap is followed by at least 6 components. A maximum of 0.5 % of the components per reel quantity may be missing. At least 5 empty positions are present at the start and the end of the tape to enable insertion.
Tensile strength of the tape: > 15 N
Pulling force in the plane of the tape, at right angles to the reel: > 5 N





Vers.	Dim. "H"
BS	20 ± 0.5
PS	23.3 ± 0.5
OS	26 ± 0.5

22133



ORDERING INFORMATION

T S O P [d] d d d d S S 1 d d d d [Z]

2 or 3 digit product series	2 digit frequency	SS1 for T and R, bulk or ammopack	dd = BS, PS or OS	Tape and reel	dd = 12 or 21	Ammopack

Note

d = "digit", please consult the list of available devices create a valid part number.

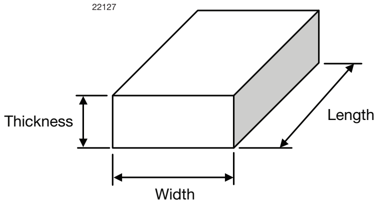
Example: **TSOP8238SS1BS12**
TSOP38236SS1BS12Z

PACKAGING QUANTITY

- 1000 pieces per reel
- 1000 pieces per ammopack

OUTER PACKAGING

CARTON BOX DIMENSIONS in millimeters

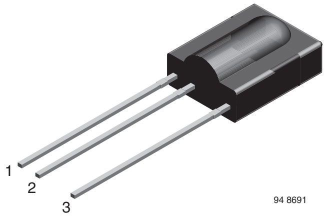


KINDS OF CARTON BOX	THICKNESS	WIDTH	LENGTH
Packaging Plastic Tubes (Normal/auxiliary devices)	80	150	600
Packaging Plastic Trays (Devices with metal holders)	120	290	490
Big Box (Bulk packaging)	150	180	400
Secondary Box (Taping in reels)	400	310	410
Ammo-Box (Zigzag taping)	50	130	350

Cast

Contents

IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

1 = GND, 2 = V_S, 3 = OUT

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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

DESCRIPTION

The TSOP312.., TSOP314.. series 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.

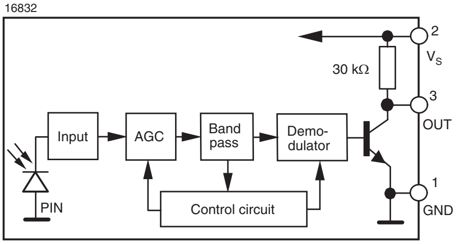
The demodulated output signal can be directly decoded by a microprocessor. The TSOP312.. is compatible with all common IR remote control data formats. The TSOP314.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

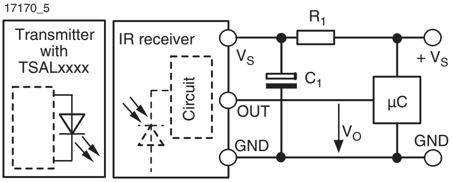
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	VERY NOISY ENVIRONMENTS (AGC4)
30 kHz	TSOP31230	TSOP31430
33 kHz	TSOP31233	TSOP31433
36 kHz	TSOP31236	TSOP31436
38 kHz	TSOP31238	TSOP31438
40 kHz	TSOP31240	TSOP31440
56 kHz	TSOP31256	TSOP31456

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 μF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 2)		V_S	- 0.3 to + 6.0	V
Supply current (pin 2)		I_S	3	mA
Output voltage (pin 3)		V_O	- 0.3 to (V_S + 0.3)	V
Output current (pin 3)		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 ≤ 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 (pin 2)	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	E_v = 40 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, $I_F = 250$ mA	d		45		m
Output voltage low (pin 3)	$I_{OSL} = 0.5$ mA, $E_e = 0.7$ 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	$E_{e\ min.}$		0.15	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

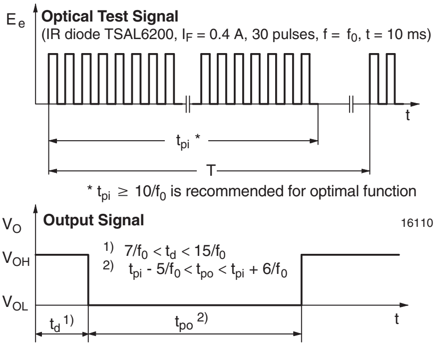


Fig. 1 - Output Active Low

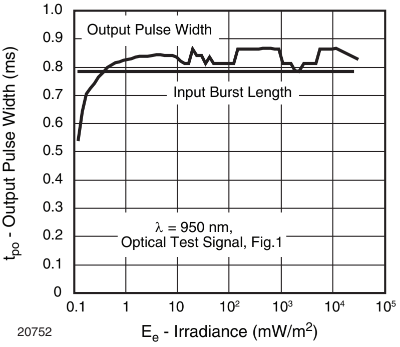


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

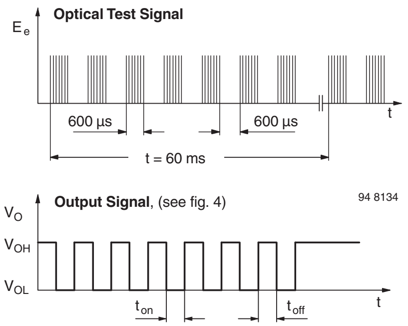


Fig. 3 - Output Function

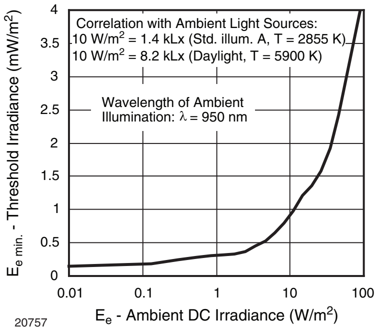


Fig. 6 - Sensitivity in Bright Ambient

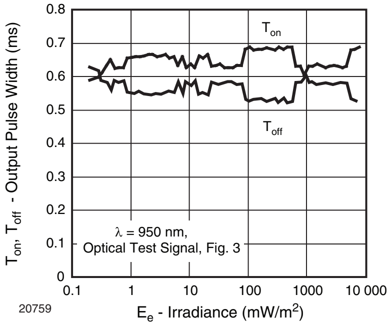


Fig. 4 - Output Pulse Diagram

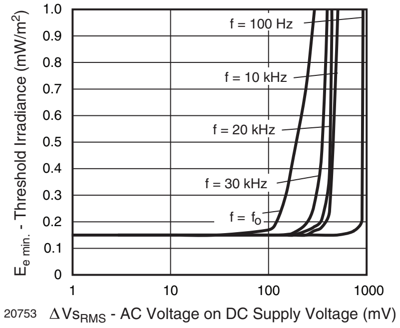


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

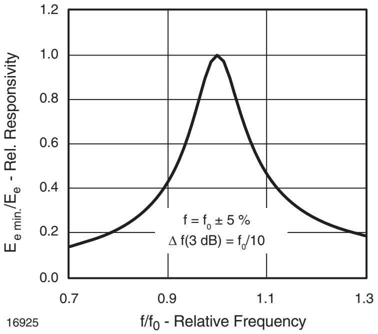


Fig. 5 - Frequency Dependence of Responsivity

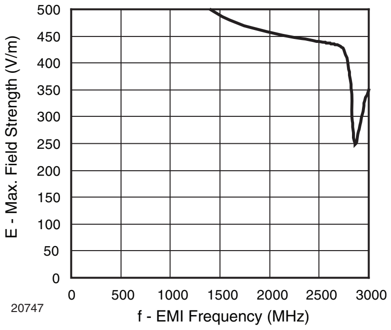


Fig. 8 - Sensitivity vs. Electric Field Disturbances

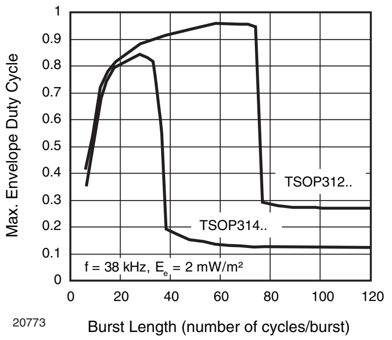


Fig. 9 - Maximum Envelope Duty Cycle vs. Burst Length

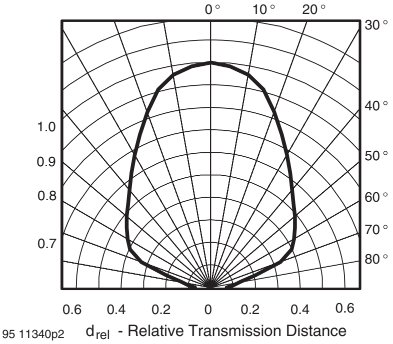


Fig. 12 - Horizontal Directivity

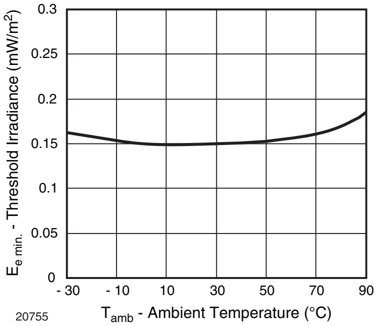


Fig. 10 - Sensitivity vs. Ambient Temperature

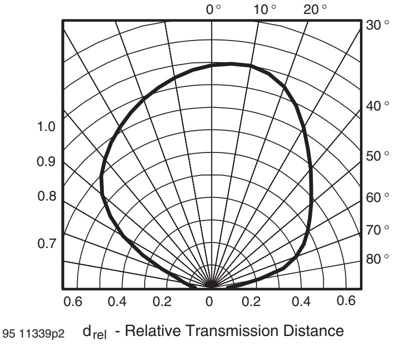


Fig. 13 - Vertical Directivity

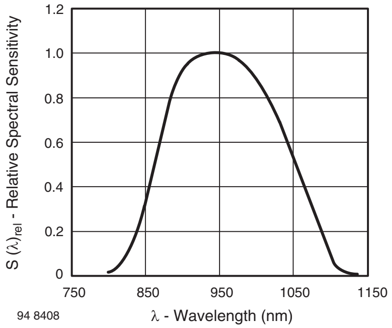


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

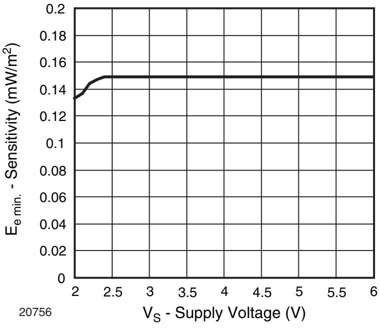


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP312.., TSOP314.. series 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 TSOP312.., TSOP314.. 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 38 kHz or at any frequency
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 15 or figure 16)

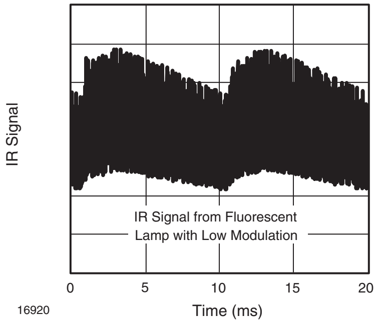


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

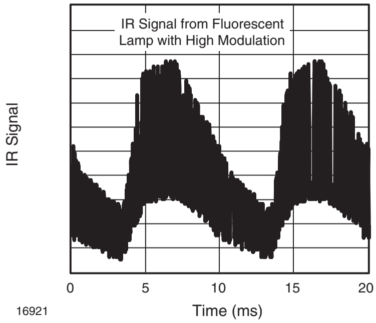


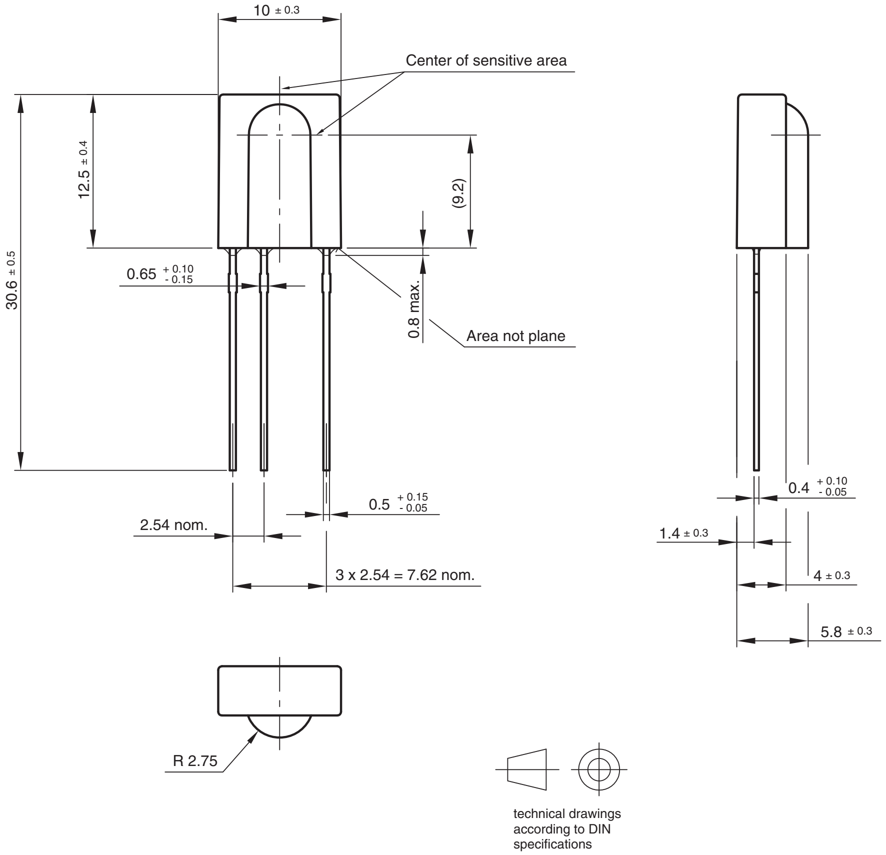
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP312..	TSOP314..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	1800	1500
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	no
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

Note

For data formats with short bursts please see the datasheet for TSOP311.., TSOP313..

PACKAGE DIMENSIONS in millimeters

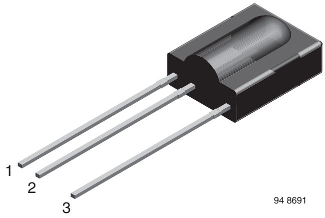


Drawing-No.: 6.550-5095.01-4

Issue: 20; 15.03.10

96 12116

IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

1 = GND, 2 = V_S, 3 = OUT

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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP12.. series 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.

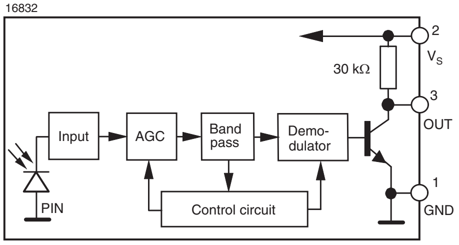
The demodulated output signal can be directly decoded by a microprocessor. The TSOP12.. is compatible with all common IR remote control data formats.

This component has not been qualified according to automotive specifications.

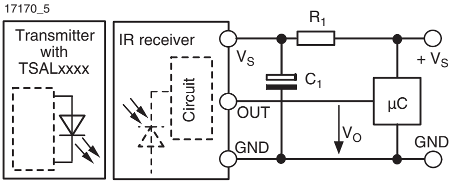
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATION (AGC2/AGC8)
30 kHz	TSOP1230
33 kHz	TSOP1233
36 kHz	TSOP1236
36.7 kHz	TSOP1237
38 kHz	TSOP1238
40 kHz	TSOP1240
56 kHz	TSOP1256

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 µF.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Supply voltage (pin 2)		V_S	- 0.3 to + 6	V
Supply current (pin 2)		I_S	3	mA
Output voltage (pin 3)		V_O	- 0.3 to (V_S + 0.3)	V
Output current (pin 3)		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 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Supply voltage		V_S	2.5		5.5	V
Supply current (pin 2)	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.45		mA
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 250$ mA	d		45		m
Output voltage low (pin 3)	$I_{OSL} = 0.5$ mA, $E_e = 0.7$ 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	$E_{e\ min.}$		0.15	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

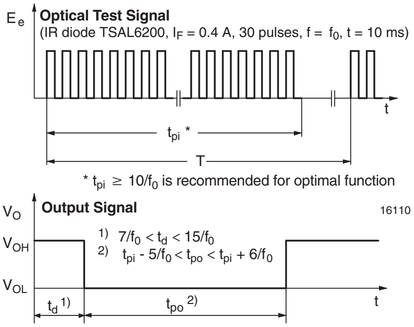


Fig. 1 - Output Active Low

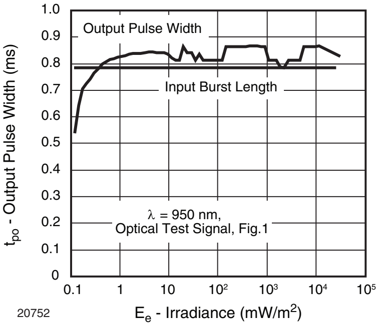


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

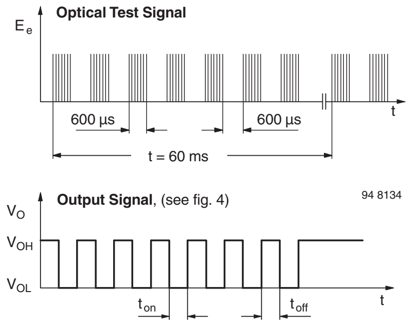


Fig. 3 - Output Function

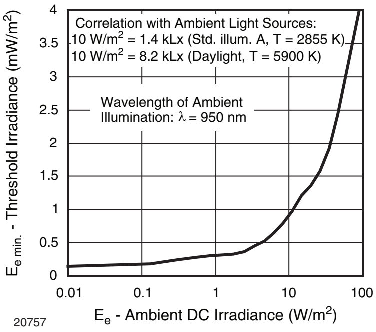


Fig. 6 - Sensitivity in Bright Ambient

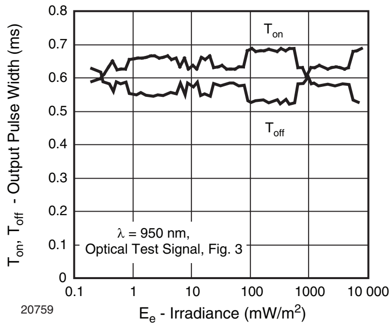


Fig. 4 - Output Pulse Diagram

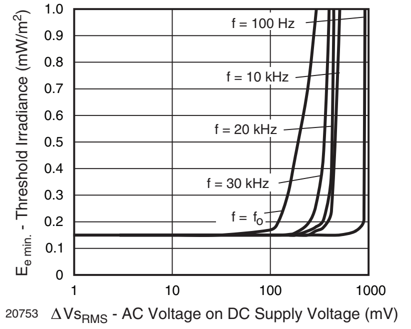


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

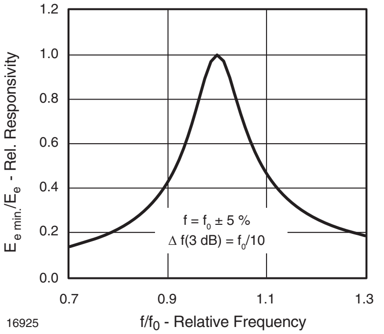


Fig. 5 - Frequency Dependence of Responsivity

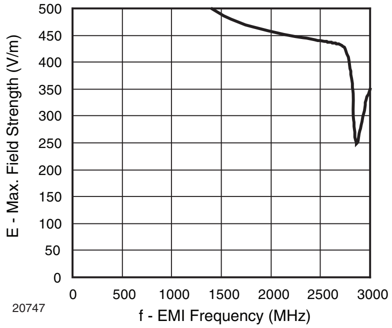


Fig. 8 - Sensitivity vs. Electric Field Disturbances

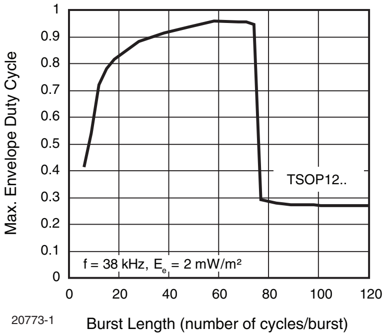


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

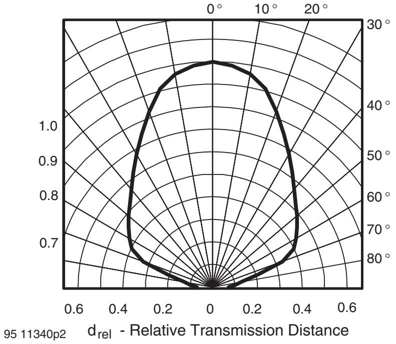


Fig. 12 - Horizontal Directivity

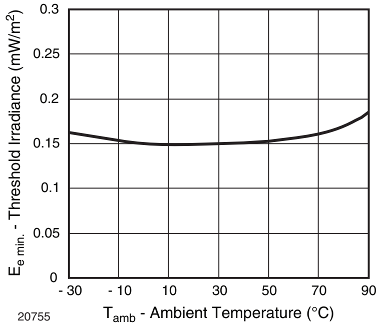


Fig. 10 - Sensitivity vs. Ambient Temperature

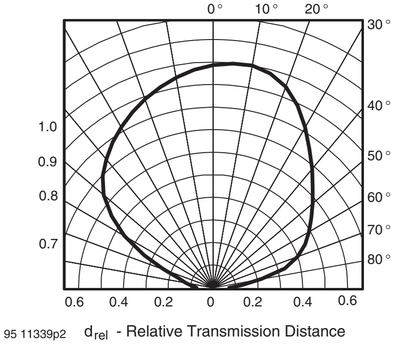


Fig. 13 - Vertical Directivity

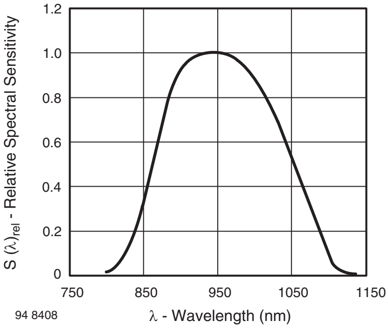


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

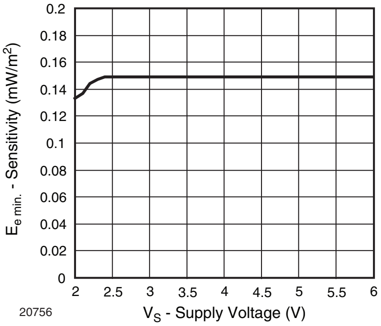


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP12.. series is 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 TSOP12.. 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 15 or figure 16)

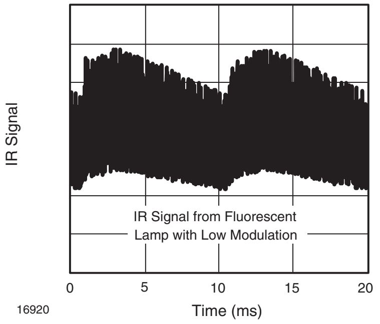


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

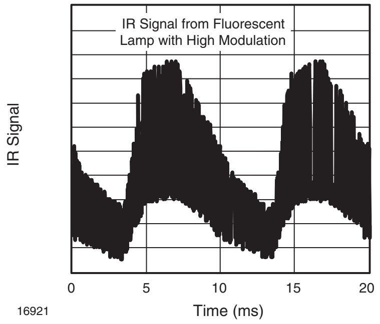


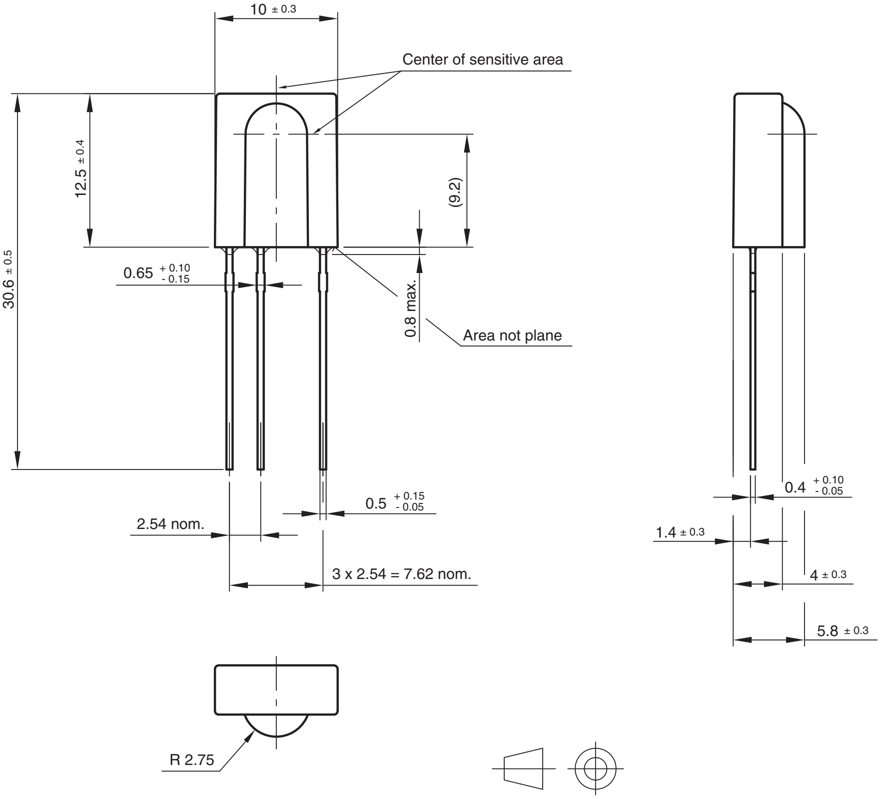
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP12..
Minimum burst length	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length
Maximum number of continuous short bursts/second	1800
Recommended for NEC code	yes
Recommended for RC5/RC6 code	yes
Recommended for Sony code	yes
Recommended for Thomson 56 kHz code	yes
Recommended for Mitsubisi code (38 kHz, preburst 8 ms, 16 bit)	yes
Recommended for Sharp code	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed

Note

- For data formats with short bursts please see the datasheet for TSOP11.., TSOP13.

PACKAGE DIMENSIONS in millimeters



technical drawings
according to DIN
specifications

Drawing-No.: 6.550-5095.01-4
Issue: 20; 15.03.10
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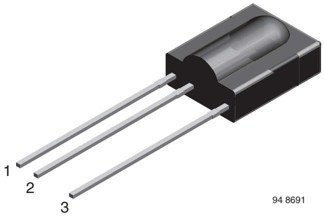
IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

1 = GND, 2 = V_S, 3 = OUT

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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Insensitive to supply voltage ripple and noise

DESCRIPTION

The TSOP311.., TSOP313.. and TSOP315.. series 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.

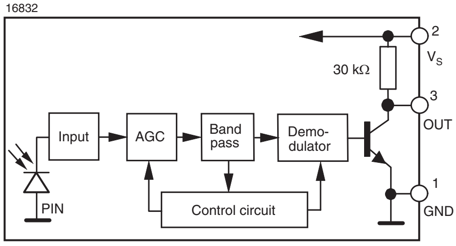
The demodulated output signal can be directly decoded by a microprocessor. The TSOP311.. is compatible with all common IR remote control data formats. The TSOP313.. is optimized to better suppress spurious pulses from energy saving fluorescent lamps. The TSOP315.. has an excellent noise suppression. 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.

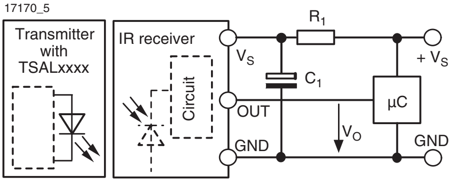
PARTS TABLE

CARRIER FREQUENCY	SHORT BURSTS AND HIGH DATA RATES (AGC1)	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)	VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)
30 kHz	TSOP31130	TSOP31330	TSOP31530
33 kHz	TSOP31133	TSOP31333	TSOP31533
36 kHz	TSOP31136	TSOP31336	TSOP31536
38 kHz	TSOP31138	TSOP31338	TSOP31538
40 kHz	TSOP31140	TSOP31340	TSOP31540
56 kHz	TSOP31156	TSOP31356	TSOP31556

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 µF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 2)		V_S	- 0.3 to + 6	V
Supply current (pin 2)		I_S	3	mA
Output voltage (pin 3)		V_O	- 0.3 to (V_S + 0.3)	V
Output current (pin 3)		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 ≤ 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 (pin 2)	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	E_v = 40 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 = 250 mA	d		45		m
Output voltage low (pin 3)	I_{OSL} = 0.5 mA, E_e = 0.7 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	$E_{e\ min.}$		0.15	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

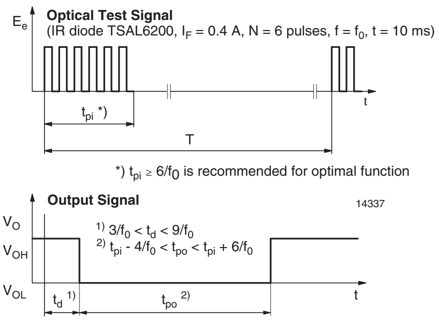


Fig. 1 - Output Active Low

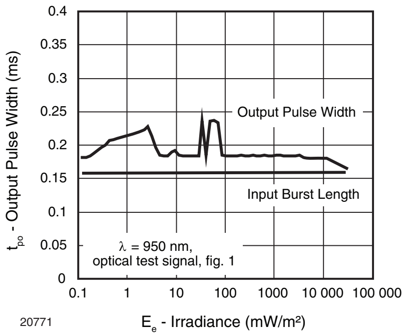


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

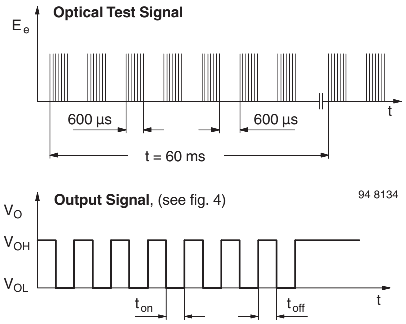


Fig. 3 - Output Function

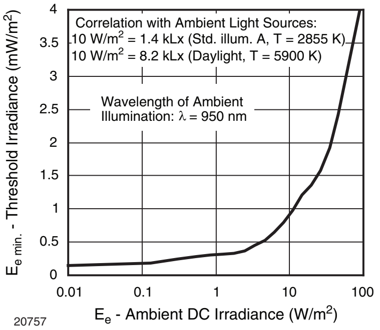


Fig. 6 - Sensitivity in Bright Ambient

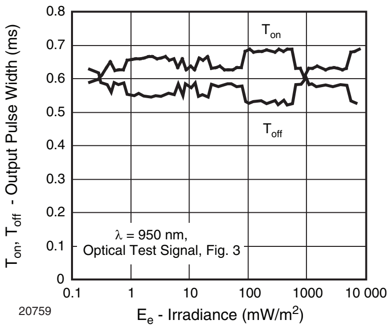


Fig. 4 - Output Pulse Diagram

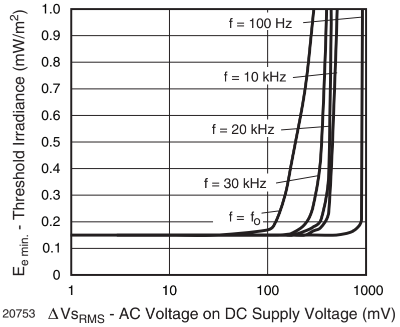


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

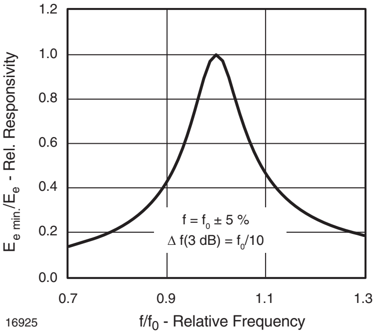


Fig. 5 - Frequency Dependence of Responsivity

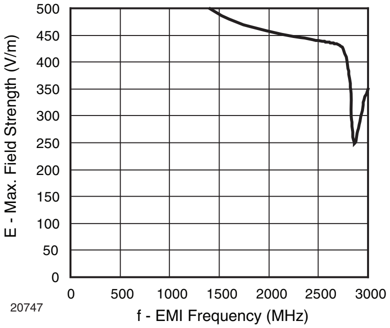


Fig. 8 - Sensitivity vs. Electric Field Disturbances

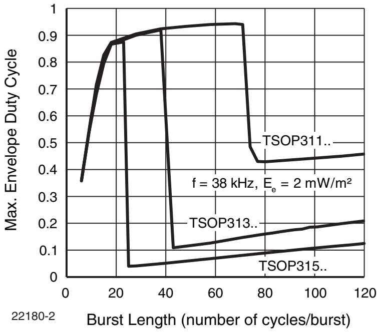


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

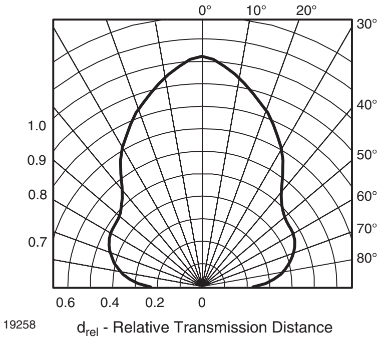


Fig. 12 - Horizontal Directivity

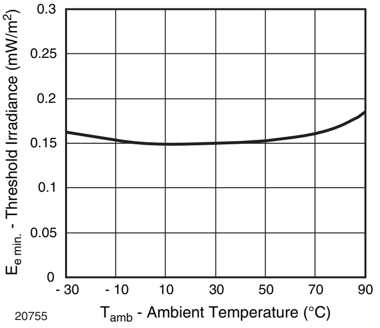


Fig. 10 - Sensitivity vs. Ambient Temperature

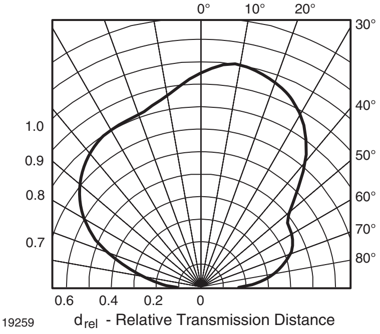


Fig. 13 - Vertical Directivity

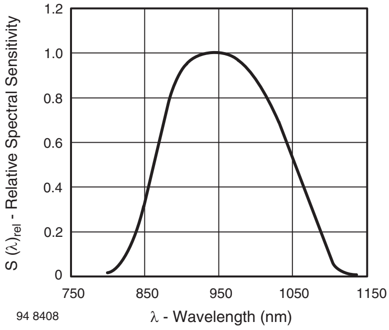


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

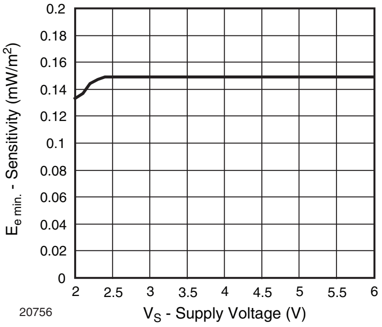


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP311.., TSOP313.. and TSOP315.. series 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 TSOP311.., TSOP313.. and TSOP315.. 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

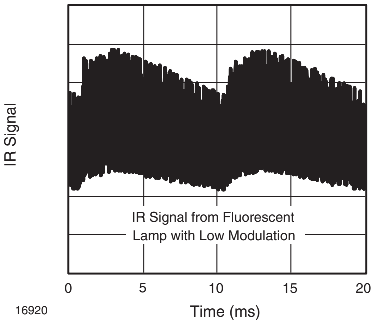


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

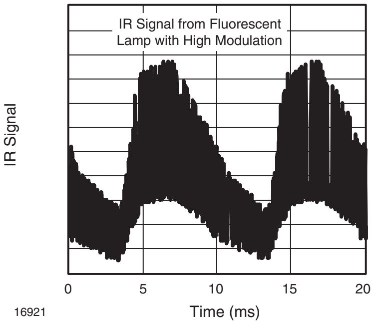


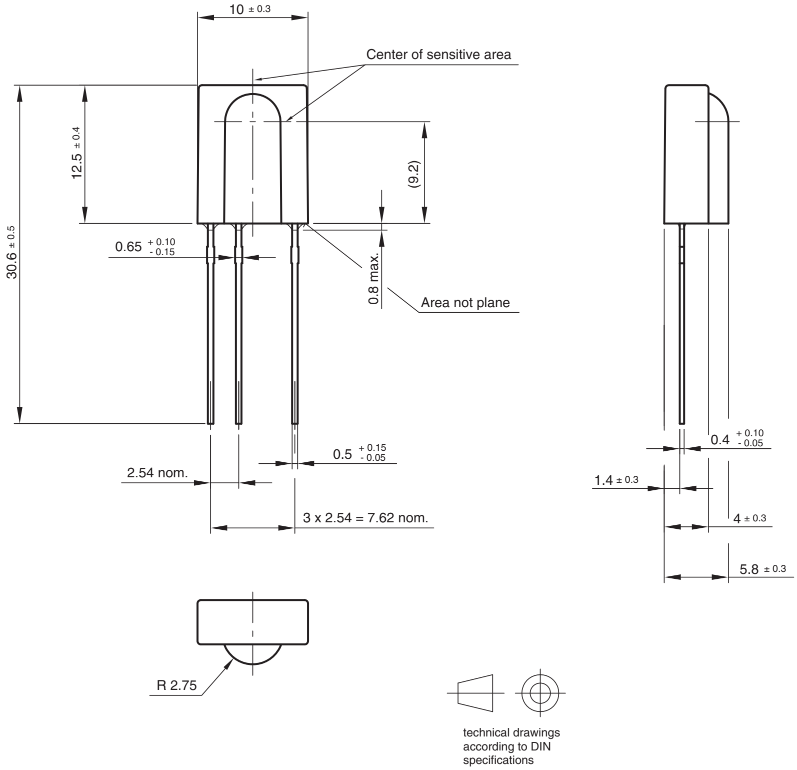
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP311..	TSOP313..	TSOP315..
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
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 short bursts please see the datasheet for TSOP312.., TSOP314..

PACKAGE DIMENSIONS in millimeters



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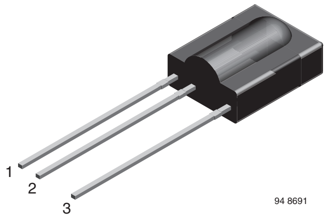
IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

1 = GND, 2 = V_S, 3 = OUT

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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP1#.. series 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.

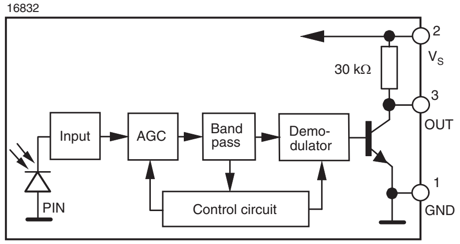
The demodulated output signal can be directly decoded by a microprocessor. The TSOP11.. is compatible with all common IR remote control data formats. The TSOP13.. is optimized to better suppress spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

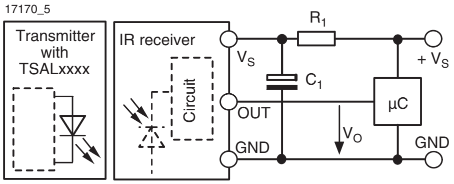
PARTS TABLE

CARRIER FREQUENCY	SHORT BURST AND HIGH DATA RATES (AGC1)	NOISY ENVIRONMENTS AND SHORT BURTS (AGC3)
30 kHz	TSOP1130	TSOP1330
33 kHz	TSOP1133	TSOP1333
36 kHz	TSOP1136	TSOP1336
36.7 kHz	TSOP1137	TSOP1337
38 kHz	TSOP1138	TSOP1338
40 kHz	TSOP1140	TSOP1340
56 kHz	TSOP1156	TSOP1356

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 µF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 2)		V_S	- 0.3 to + 6	V
Supply current (pin 2)		I_S	3	mA
Output voltage (pin 3)		V_O	- 0.3 to (V_S + 0.3)	V
Output current (pin 3)		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 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage		V_S	2.5		5.5	V
Supply current (pin 2)	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.45		mA
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 250$ mA	d		45		m
Output voltage low (pin 3)	$I_{OSL} = 0.5$ mA, $E_e = 0.7$ 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	$E_{e\ min.}$		0.15	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

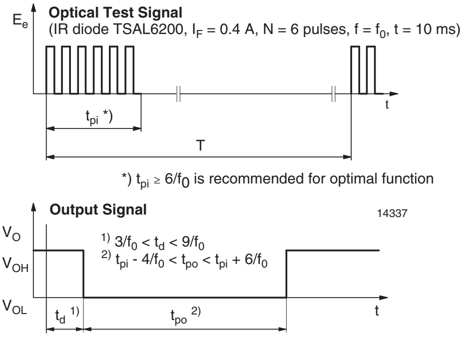


Fig. 1 - Output Active Low

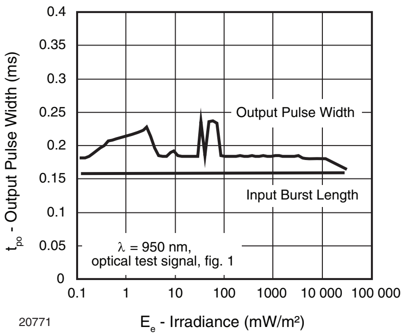


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

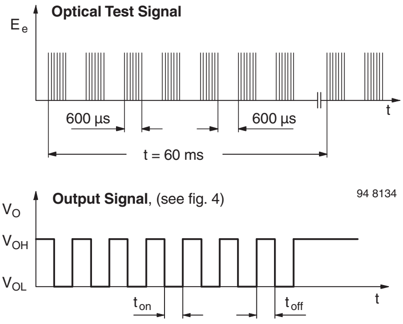


Fig. 3 - Output Function

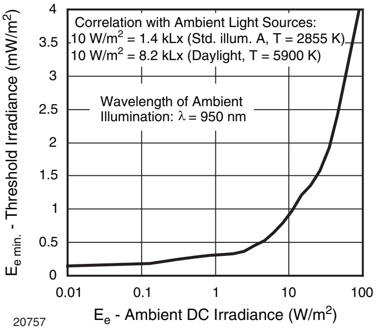


Fig. 6 - Sensitivity in Bright Ambient

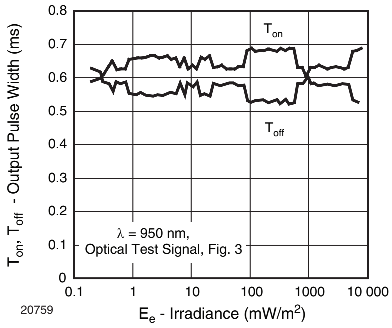


Fig. 4 - Output Pulse Diagram

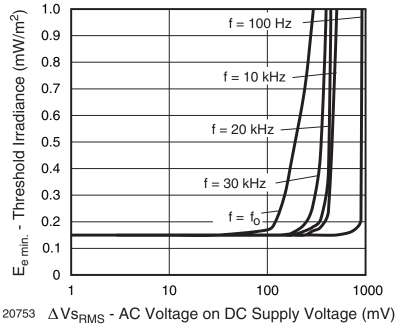


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

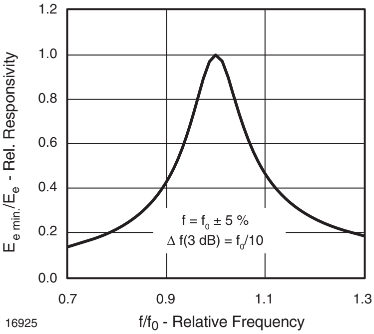


Fig. 5 - Frequency Dependence of Responsivity

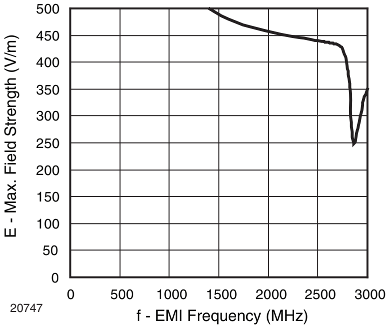


Fig. 8 - Sensitivity vs. Electric Field Disturbances

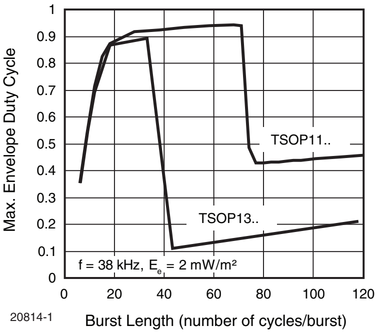


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

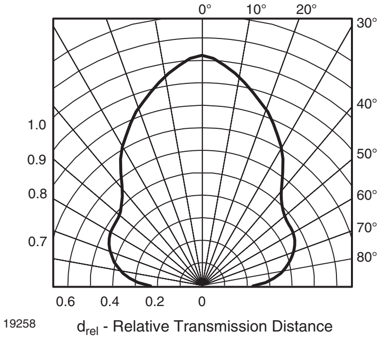


Fig. 12 - Horizontal Directivity

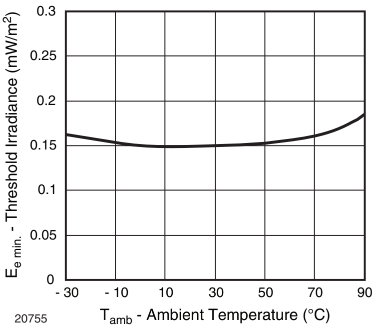


Fig. 10 - Sensitivity vs. Ambient Temperature

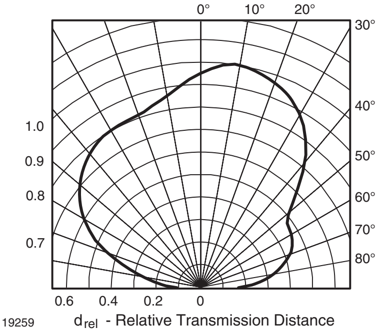


Fig. 13 - Vertical Directivity

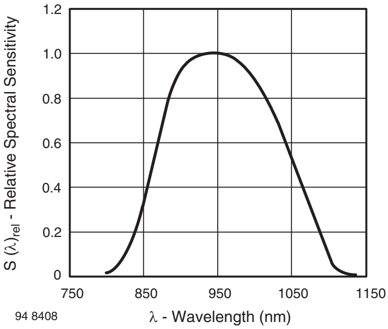


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

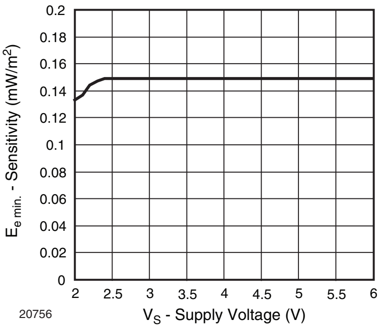


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP11.., TSOP13.. series is 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 TSOP1#.. 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

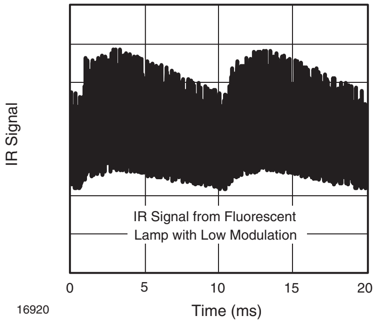


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

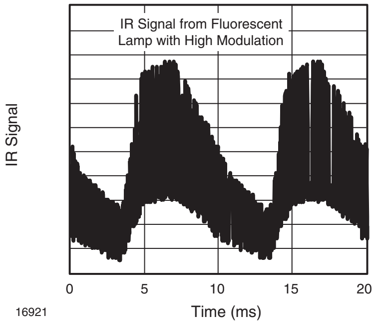


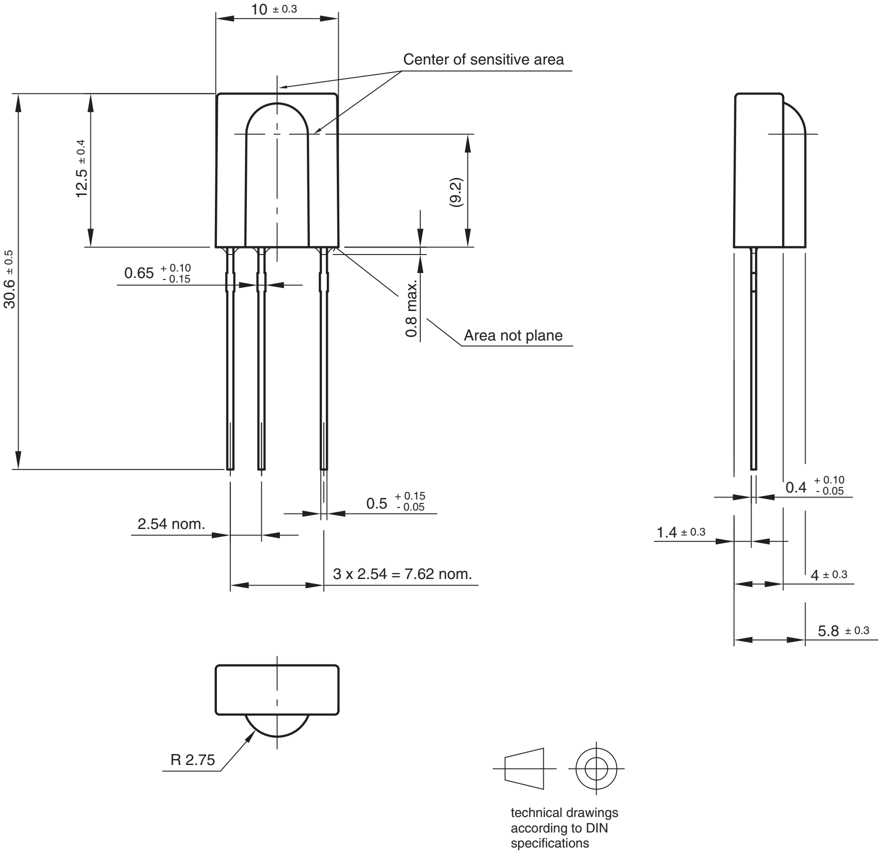
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP11..	TSOP13..
Minimum burst length	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
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
Maximum number of continuous short bursts/second	2000	2000
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for RCMM code	yes	yes
Recommended for r-step code	yes	yes
Recommended for XMP code	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)

Note

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP12.

PACKAGE DIMENSIONS in millimeters



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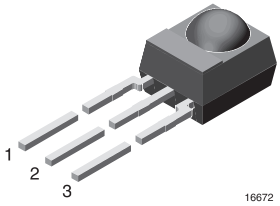
Contents

IR Receiver Modules for Remote Control Systems



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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

MECHANICAL DATA

Pinning:

1 = OUT, 2 = GND, 3 = V_S

DESCRIPTION

The TSOP348.., TSOP344.. series 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.

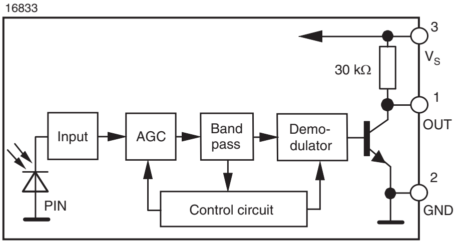
The demodulated output signal can be directly decoded by a microprocessor. The TSOP348.. is compatible with all common IR remote control data formats. The TSOP344.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

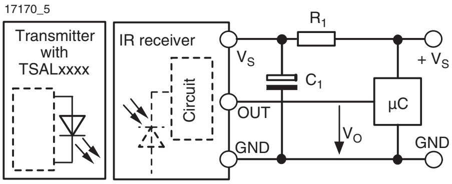
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	VERY NOISY ENVIRONMENTS (AGC4)
30 kHz	TSOP34830	TSOP34430
33 kHz	TSOP34833	TSOP34433
36 kHz	TSOP34836	TSOP34436
38 kHz	TSOP34838	TSOP34438
40 kHz	TSOP34840	TSOP34440
56 kHz	TSOP34856	TSOP34456

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 µF.

ABSOLUTE MAXIMUM RATINGS

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	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 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current (pin 3)	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	$E_v = 40$ 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, $I_F = 250$ mA	d		45		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ min.}$		0.1	0.25	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

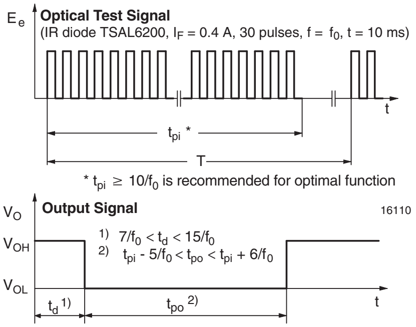


Fig. 1 - Output Active Low

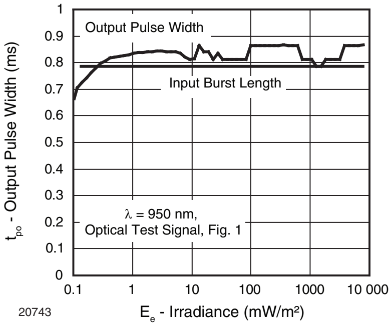


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

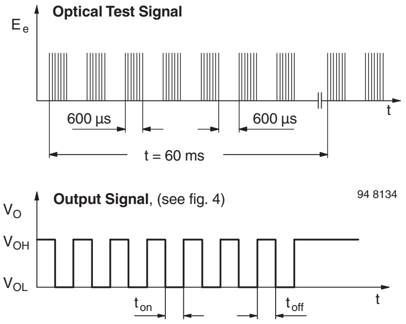


Fig. 3 - Output Function

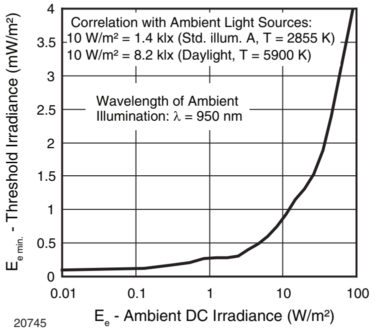


Fig. 6 - Sensitivity in Bright Ambient

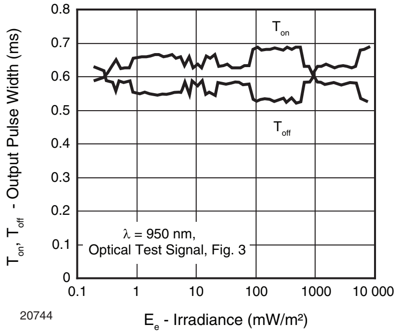


Fig. 4 - Output Pulse Diagram

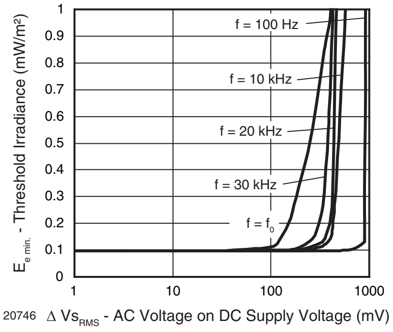


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

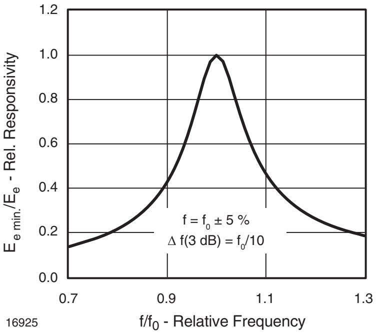


Fig. 5 - Frequency Dependence of Responsivity

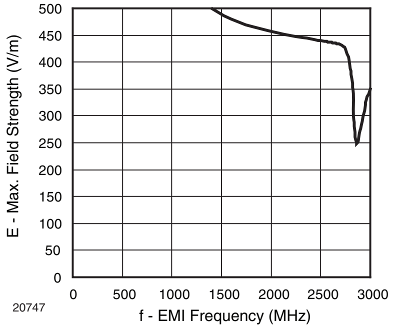


Fig. 8 - Sensitivity vs. Electric Field Disturbances

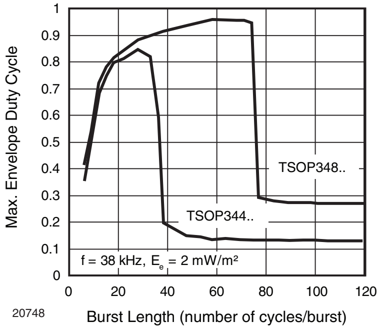


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

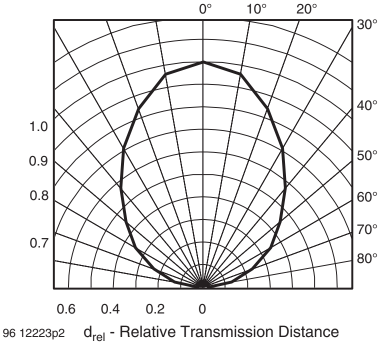


Fig. 12 - Horizontal Directivity

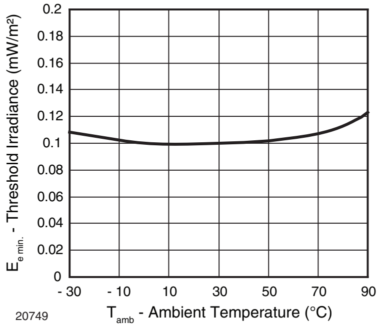


Fig. 10 - Sensitivity vs. Ambient Temperature

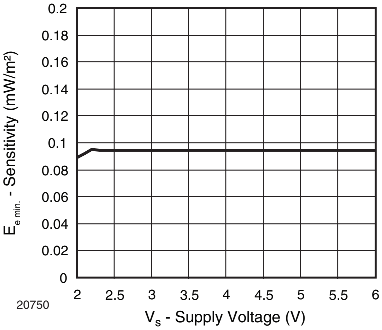


Fig. 13 - Sensitivity vs. Supply Voltage

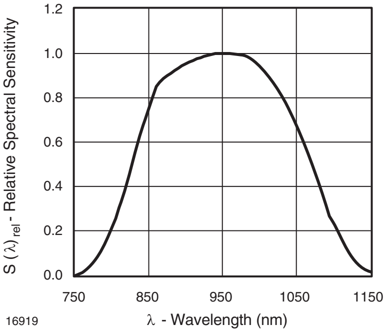


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP348.., TSOP344.. series 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 TSOP348.., TSOP344.. 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 14 or figure 15)

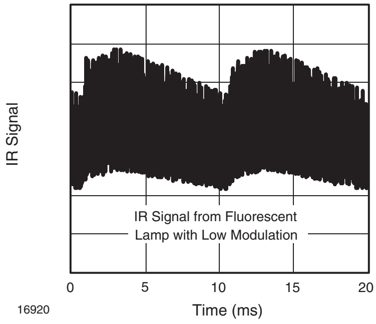


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

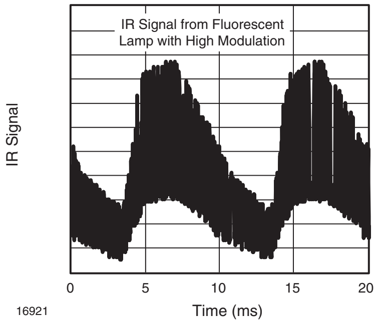


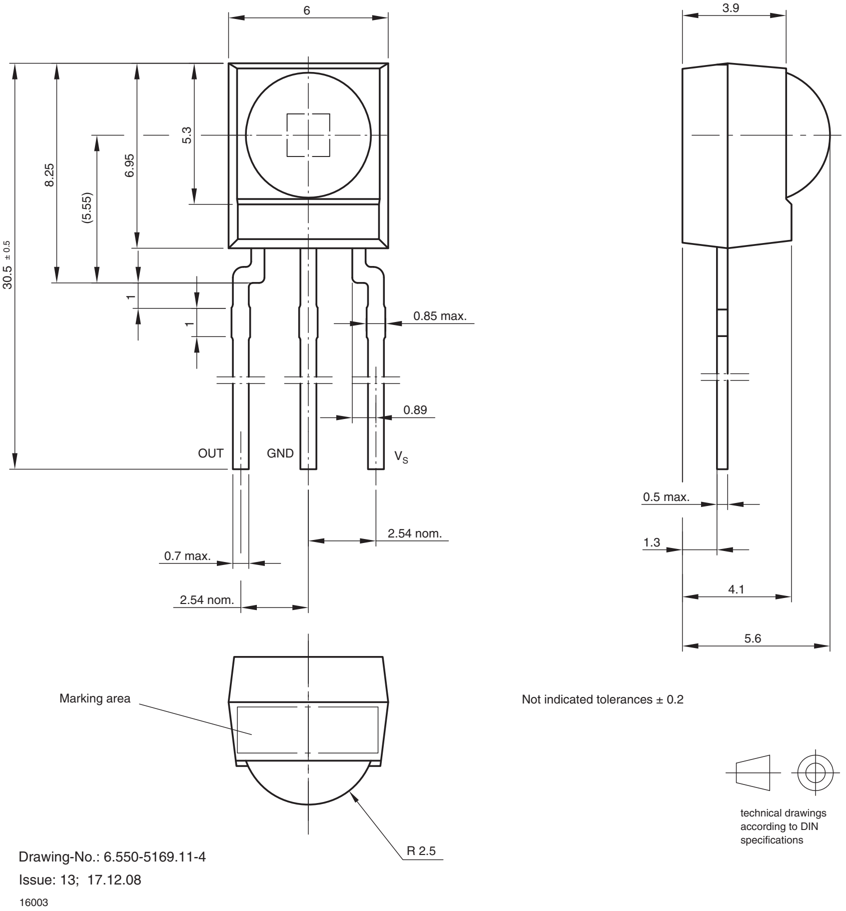
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP348..	TSOP344..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	1800	1500
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	no
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

Note

For data formats with short bursts please see the datasheet for TSOP341.., TSOP343..

PACKAGE DIMENSIONS in millimeters



Not indicated tolerances ± 0.2

technical drawings
according to DIN
specifications

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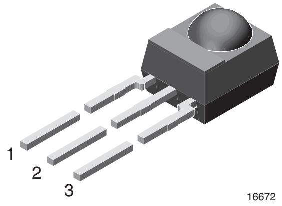
Issue: 13; 17.12.08
16003

IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning

1 = OUT, 2 = GND, 3 = V_S

FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP48.., TSOP44.. series 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.

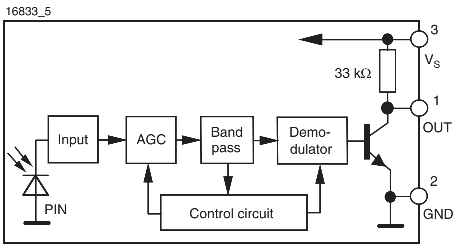
The demodulated output signal can be directly decoded by a microprocessor. The TSOP48.. is compatible with all common IR remote control data formats. The TSOP44.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

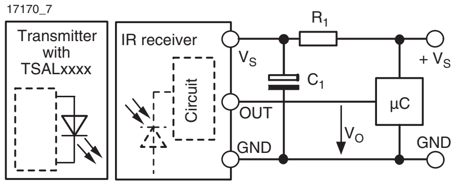
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	VERY NOISY ENVIROMENTS (AGC4)
30 kHz	TSOP4830	TSOP4430
33 kHz	TSOP4833	TSOP4433
36 kHz	TSOP4836	TSOP4436
36.7 kHz	TSOP4837	TSOP4437
38 kHz	TSOP4838	TSOP4438
40 kHz	TSOP4840	TSOP4440
56 kHz	TSOP4856	TSOP4456

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 6	V
Supply current (pin 3)		I_S	5	mA
Output voltage (pin 1)		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 (pin 1)		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	$T_{amb} \le 85$ °C	P_{tot}	10	mW
Soldering temperature	$t \le 10$ 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 condtions 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 (pin 3)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 400$ mA	d		45		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ min.}$		0.17	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

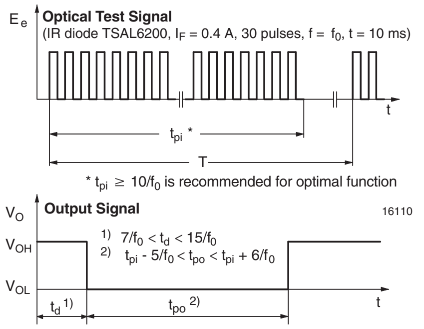


Fig. 1 - Output Active Low

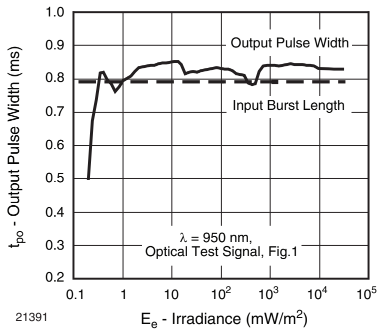


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

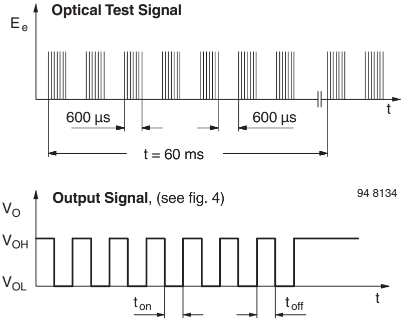


Fig. 3 - Output Function

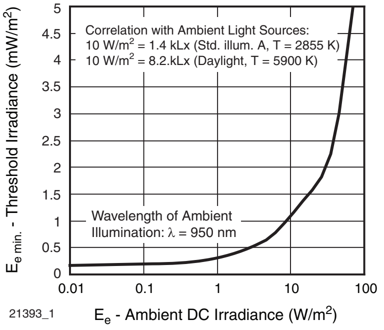


Fig. 6 - Sensitivity in Bright Ambient

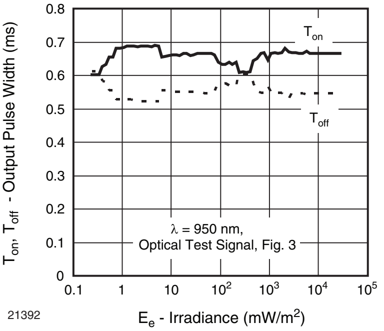


Fig. 4 - Output Pulse Diagram

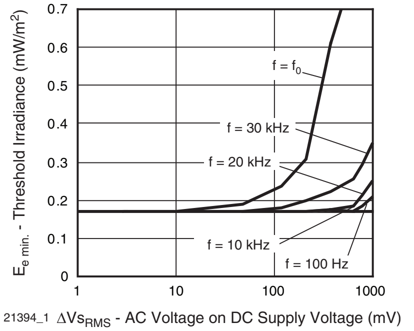


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

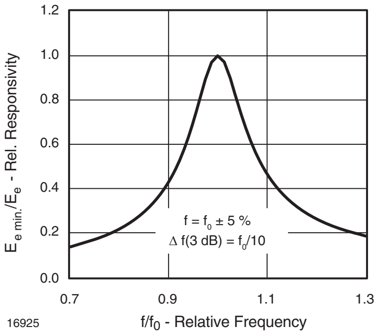


Fig. 5 - Frequency Dependence of Responsivity

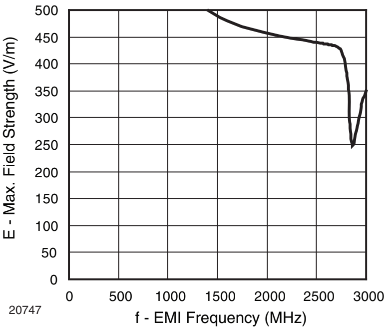


Fig. 8 - Sensitivity vs. Electric Field Disturbances

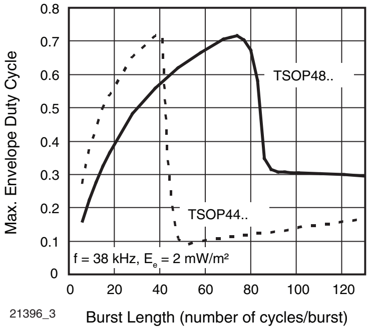


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

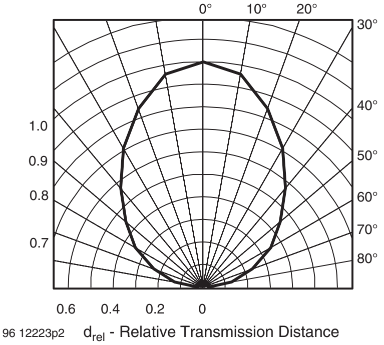


Fig. 12 - Horizontal Directivity

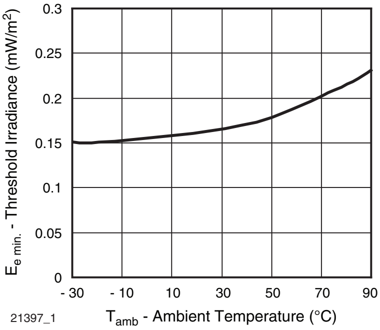


Fig. 10 - Sensitivity vs. Ambient Temperature

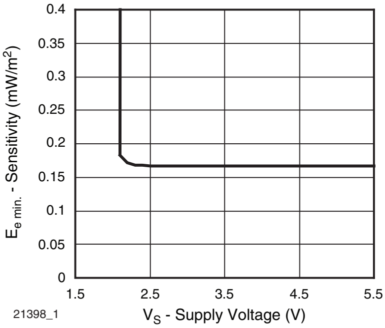


Fig. 13 - Sensitivity vs. Supply Voltage

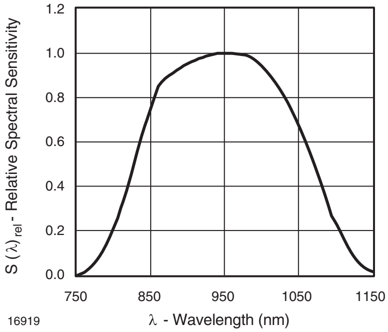


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP48.., TSOP44.. series 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 TSOP48.., TSOP44.. 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 IR signals from common fluorescent lamps (example of noise pattern is shown in fig. 14 or fig. 15)

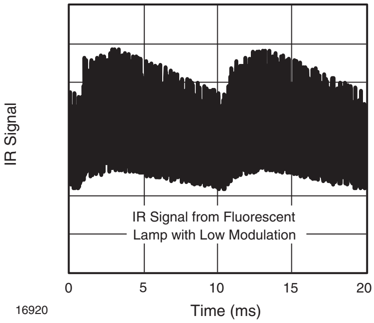


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

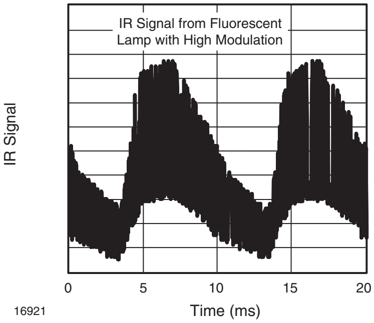


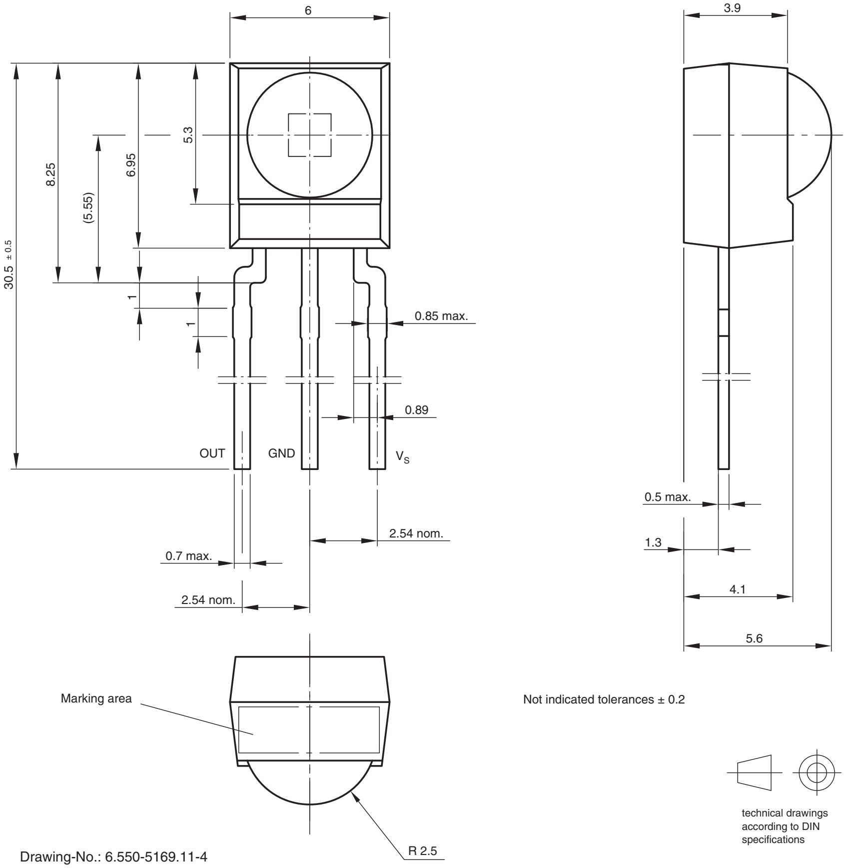
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP48..	TSOP44..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 12 cycles	10 to 35 cycles ≥ 12 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	800	1300
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	yes
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

Note

- For data formats with short bursts please see the datasheet of TSOP41.., TSOP43.. .

PACKAGE DIMENSIONS in millimeters



Not indicated tolerances ± 0.2

Drawing-No.: 6.550-5169.11-4
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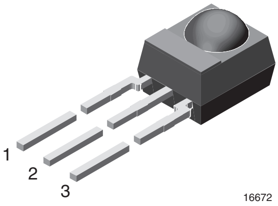


MECHANICAL DATA

Pinning:

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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

DESCRIPTION

The TSOP322.., TSOP324.. series 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.

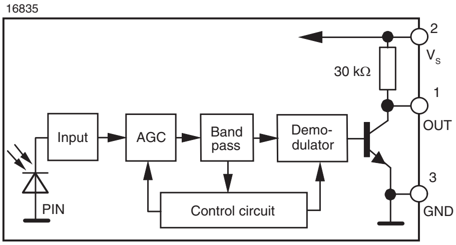
The demodulated output signal can be directly decoded by a microprocessor. The TSOP322.. is compatible with all common IR remote control data formats. The TSOP324.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

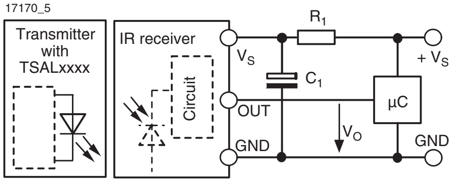
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	VERY NOISY ENVIRONMENTS (AGC4)
30 kHz	TSOP32230	TSOP32430
33 kHz	TSOP32233	TSOP32433
36 kHz	TSOP32236	TSOP32436
38 kHz	TSOP32238	TSOP32438
40 kHz	TSOP32240	TSOP32440
56 kHz	TSOP32256	TSOP32456

BLOCK DIAGRAM



APPLICATION CIRCUIT



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

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Supply voltage (pin 2)		V_S	- 0.3 to + 6.0	V
Supply current (pin 2)		I_S	3	mA
Output voltage (pin 1)		V_O	- 0.3 to (V_S + 0.3)	V
Output current (pin 1)		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 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Supply current (pin 2)	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	$E_v = 40$ 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, $I_F = 250$ mA	d		45		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ min.}$		0.1	0.25	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

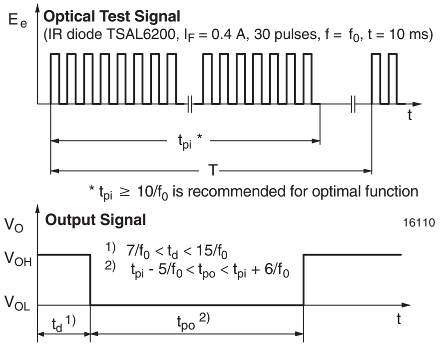


Fig. 1 - Output Active Low

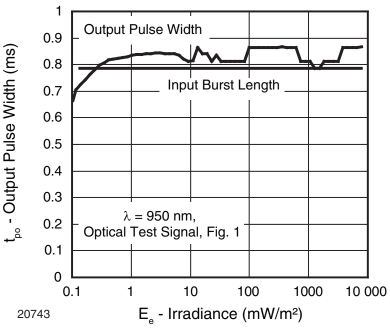


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

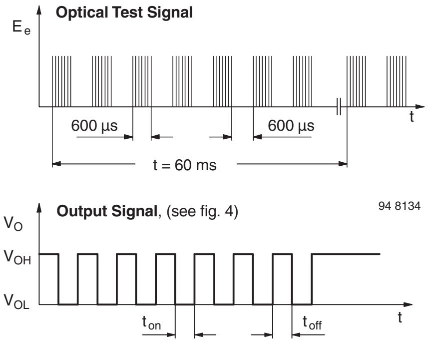


Fig. 3 - Output Function

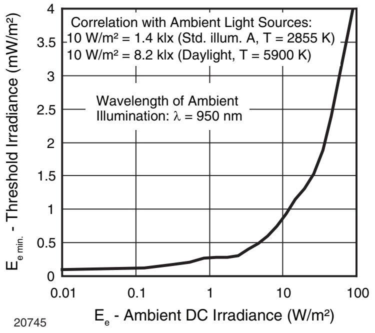


Fig. 6 - Sensitivity in Bright Ambient

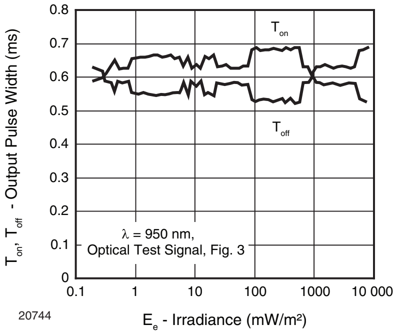


Fig. 4 - Output Pulse Diagram

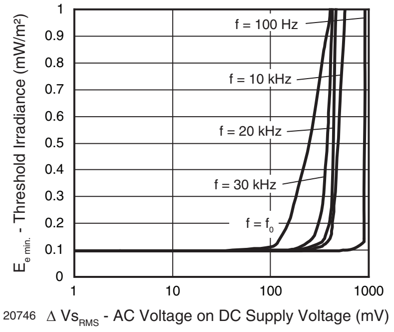


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

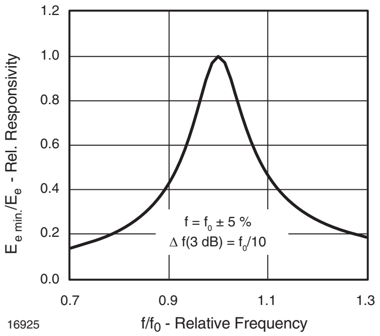


Fig. 5 - Frequency Dependence of Responsivity

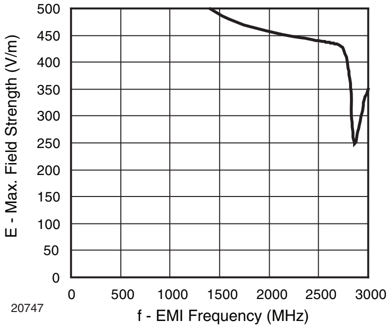


Fig. 8 - Sensitivity vs. Electric Field Disturbances

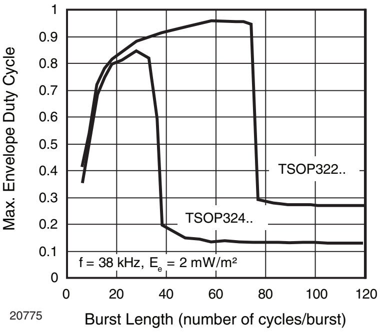


Fig. 9 - Maximum Envelope Duty Cycle vs. Burst Length

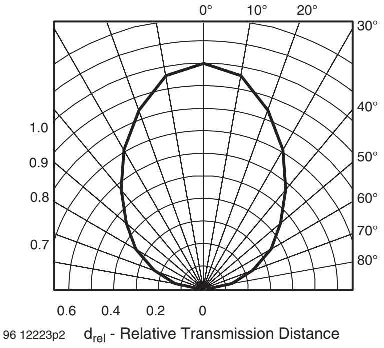


Fig. 12 - Horizontal Directivity

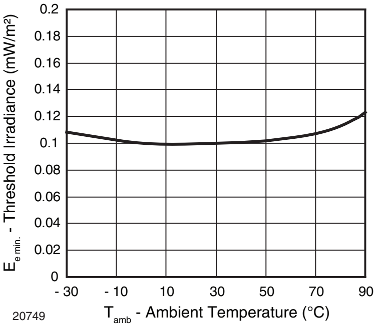


Fig. 10 - Sensitivity vs. Ambient Temperature

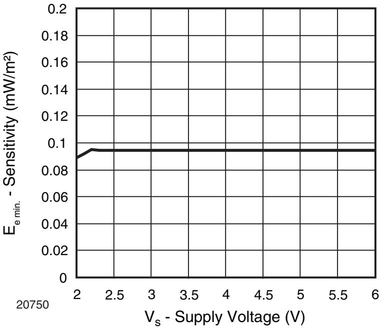


Fig. 13 - Sensitivity vs. Supply Voltage

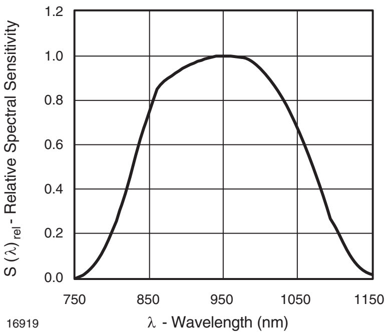


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP322.., TSOP324.. series 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 TSOP322.., TSOP324.. 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 14 or figure 15)

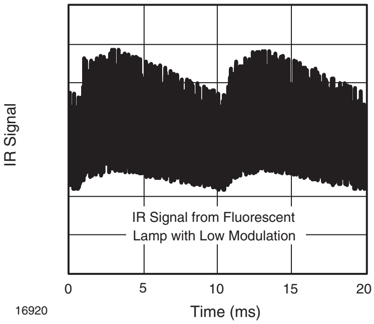


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

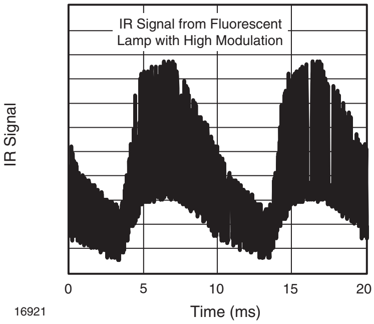


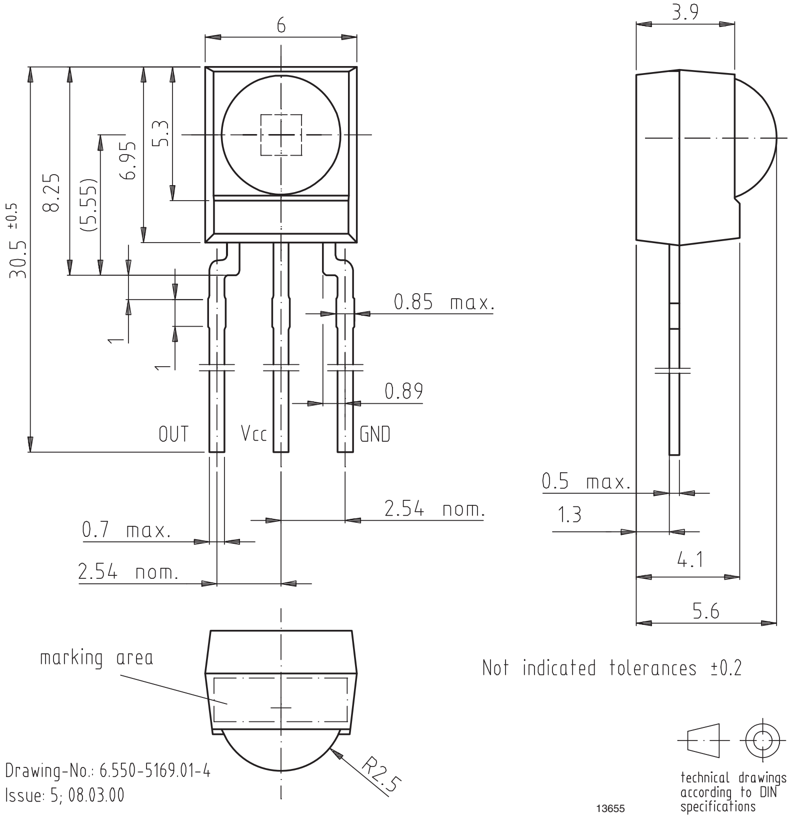
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP322..	TSOP324..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	1800	1500
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	no
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

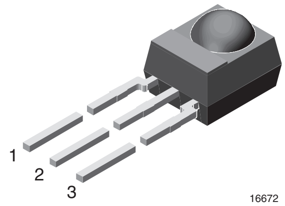
Note

For data formats with short bursts please see the datasheet for TSOP321.., TSOP323..

PACKAGE DIMENSIONS in millimeters



IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning

1 = OUT, 2 = V_S, 3 = GND

FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

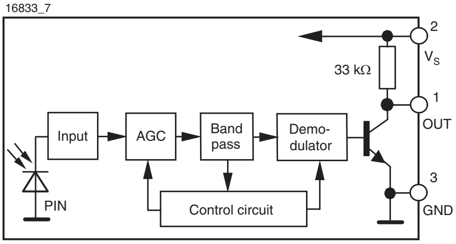
DESCRIPTION

The TSOP22.., TSOP24.. series 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 TSOP22.. is compatible with all common IR remote control data formats. The TSOP24.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.
This component has not been qualified according to automotive specifications.

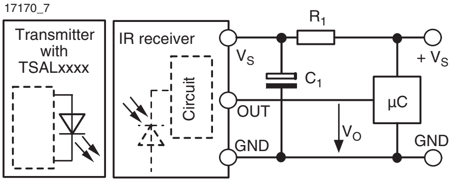
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	VERY NOISY ENVIROMENTS (AGC4)
30 kHz	TSOP2230	TSOP2430
33 kHz	TSOP2233	TSOP2433
36 kHz	TSOP2236	TSOP2436
36.7 kHz	TSOP2237	TSOP2437
38 kHz	TSOP2238	TSOP2438
40 kHz	TSOP2240	TSOP2440
56 kHz	TSOP2256	TSOP2456

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional
to improve the robustness against electrical overstress
(typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 2)		V_S	- 0.3 to + 6	V
Supply current (pin 2)		I_S	5	mA
Output voltage (pin 1)		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 (pin 1)		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 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current (pin 2)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 400$ mA	d		45		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ min.}$		0.17	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

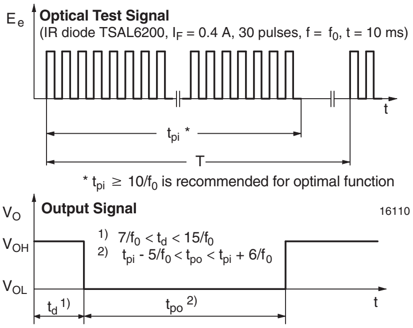


Fig. 1 - Output Active Low

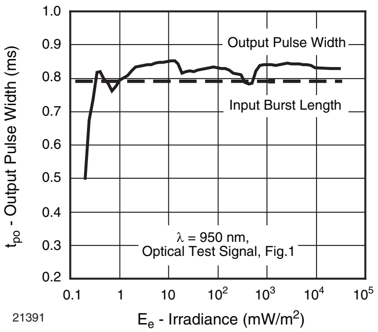


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

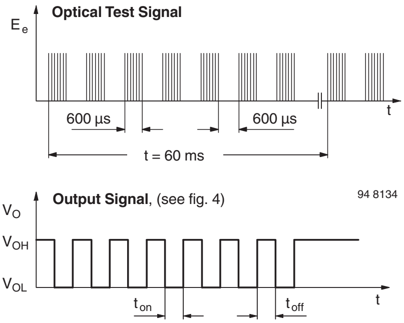


Fig. 3 - Output Function

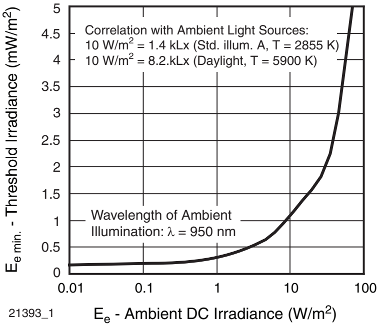


Fig. 6 - Sensitivity in Bright Ambient

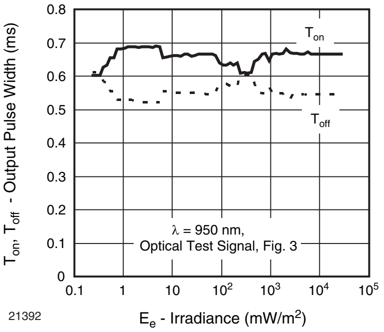


Fig. 4 - Output Pulse Diagram

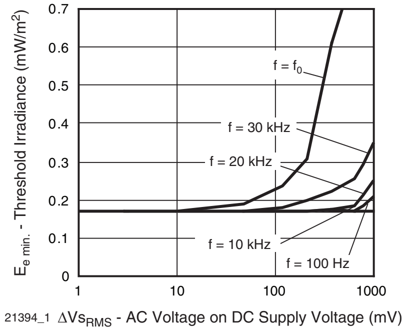


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

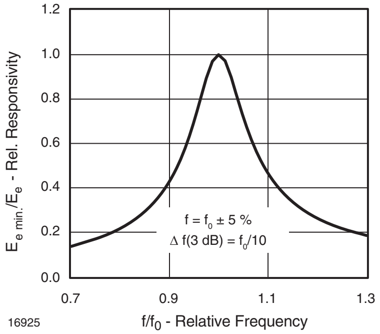


Fig. 5 - Frequency Dependence of Responsivity

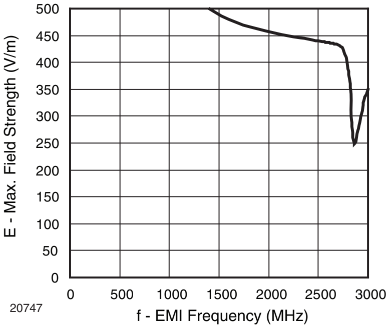


Fig. 8 - Sensitivity vs. Electric Field Disturbances

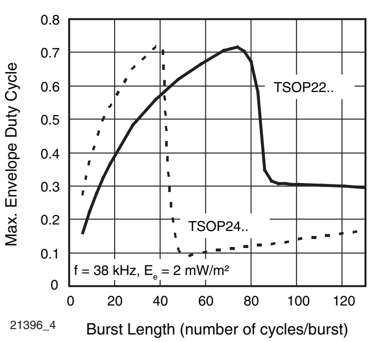


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

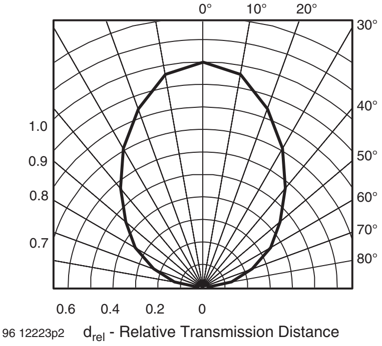


Fig. 12 - Horizontal Directivity

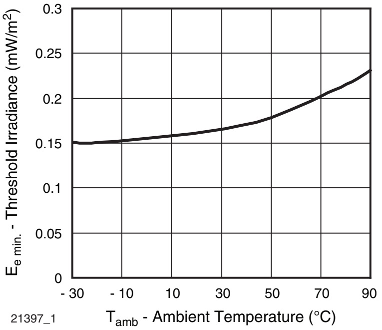


Fig. 10 - Sensitivity vs. Ambient Temperature

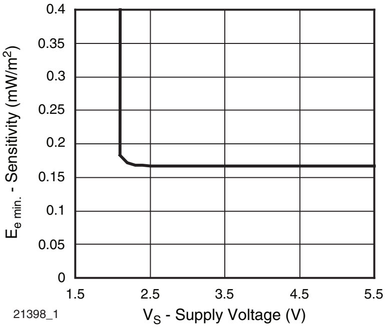


Fig. 13 - Sensitivity vs. Supply Voltage

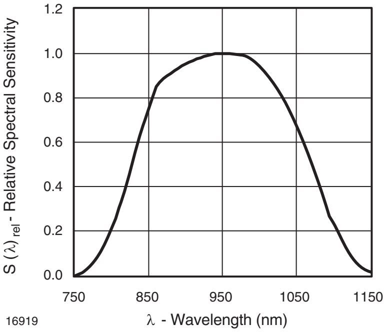


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP22.., TSOP24.. series 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 TSOP22.., TSOP24.. 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 14 or figure 15)

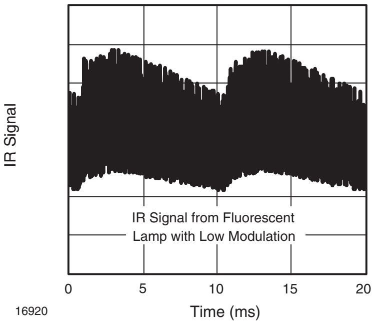


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

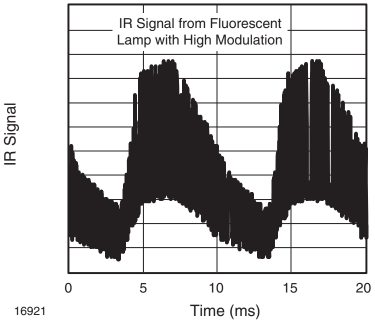


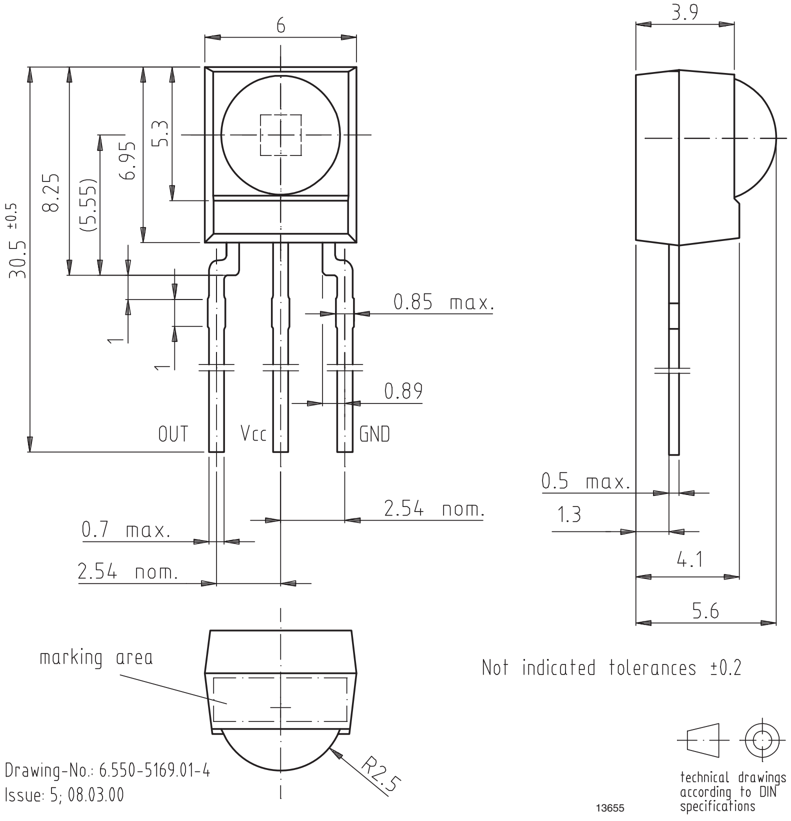
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP22..	TSOP24..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 12 cycles	10 to 35 cycles ≥ 12 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	800	1300
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	yes
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

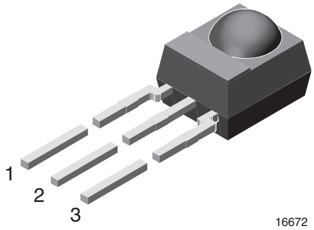
Note

- For data formats with short bursts please see the datasheet of TSOP21.., TSOP23.. .

PACKAGE DIMENSIONS in millimeters



IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

1 = OUT, 2 = GND, 3 = V_S

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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP341.., TSOP343.. and TSOP345.. series 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.

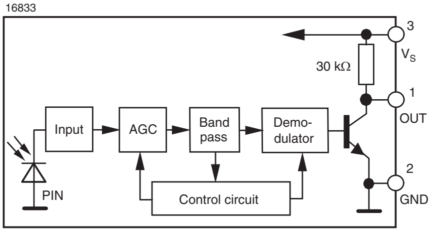
The demodulated output signal can be directly decoded by a microprocessor. The TSOP341.. is compatible with all common IR remote control data formats. The TSOP343.. is optimized to better suppress spurious pulses from energy saving fluorescent lamps. The TSOP345.. has an excellent noise suppression. 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.

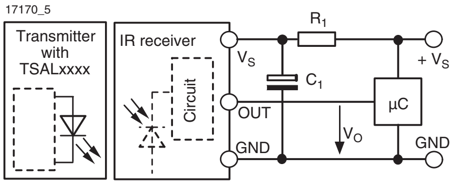
PARTS TABLE

CARRIER FREQUENCY	SHORT BURSTS AND HIGH DATA RATES (AGC1)	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)	VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)
30 kHz	TSOP34130	TSOP34330	TSOP34530
33 kHz	TSOP34133	TSOP34333	TSOP34533
36 kHz	TSOP34136	TSOP34336	TSOP34536
38 kHz	TSOP34138	TSOP34338	TSOP34538
40 kHz	TSOP34140	TSOP34340	TSOP34540
56 kHz	TSOP34156	TSOP34356	TSOP34556

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 µF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 6	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	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 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current (pin 3)	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	$E_v = 40$ 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, $I_F = 250$ mA	d		45		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ min.}$		0.1	0.25	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

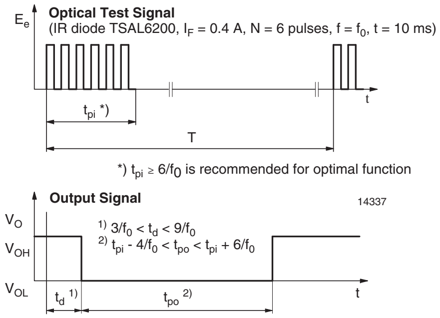


Fig. 1 - Output Active Low

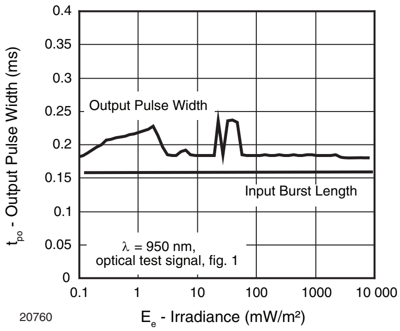


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

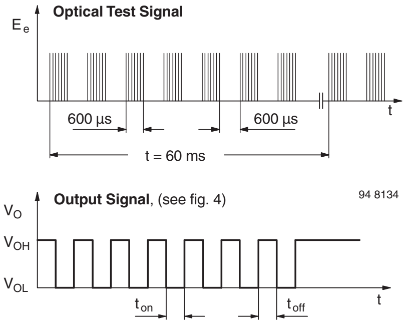


Fig. 3 - Output Function

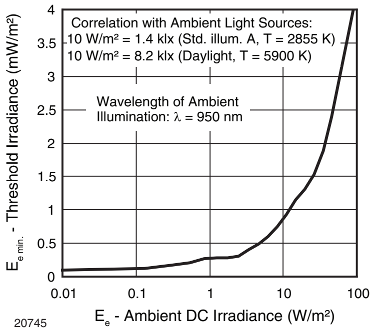


Fig. 6 - Sensitivity in Bright Ambient

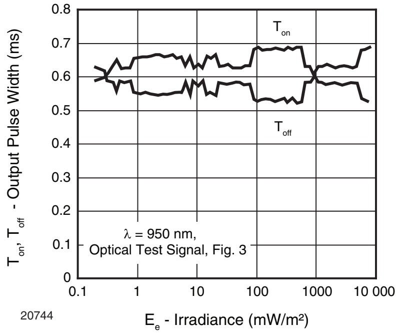


Fig. 4 - Output Pulse Diagram

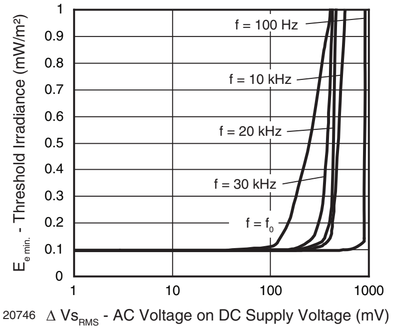


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

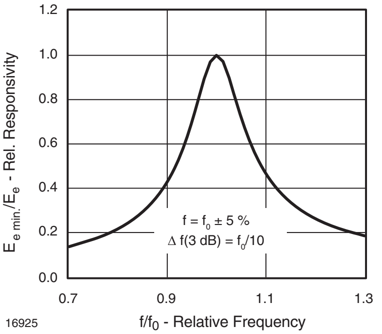


Fig. 5 - Frequency Dependence of Responsivity

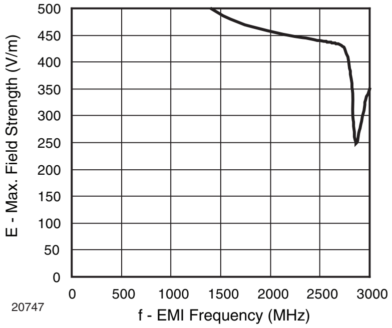


Fig. 8 - Sensitivity vs. Electric Field Disturbances

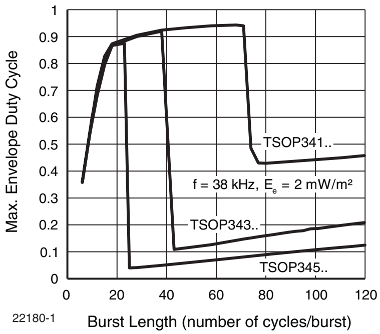


Fig. 9 - Maximum Envelope Duty Cycle vs. Burst Length

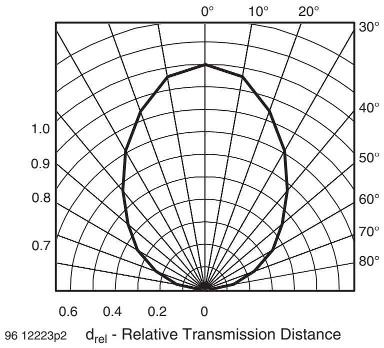


Fig. 12 - Horizontal Directivity

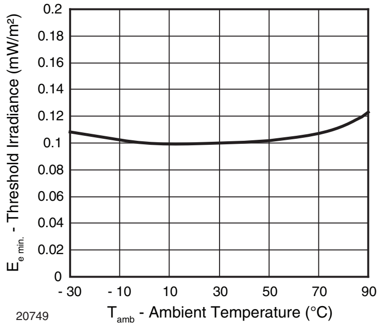


Fig. 10 - Sensitivity vs. Ambient Temperature

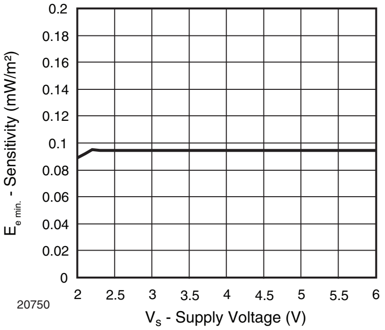


Fig. 13 - Sensitivity vs. Supply Voltage

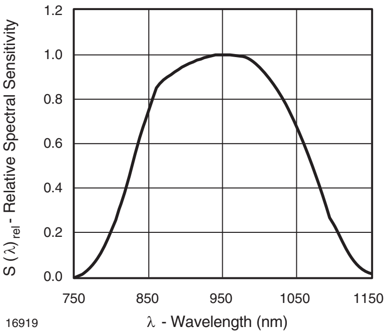


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP341.., TSOP343.. and TSOP345.. series 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 TSOP341.., TSOP343.. and TSOP345.. 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 14 or figure 15)

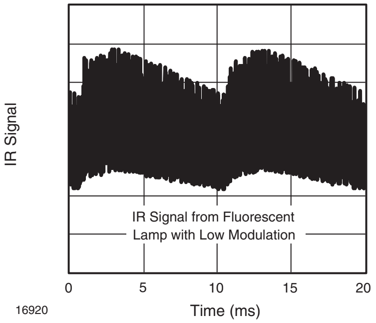


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

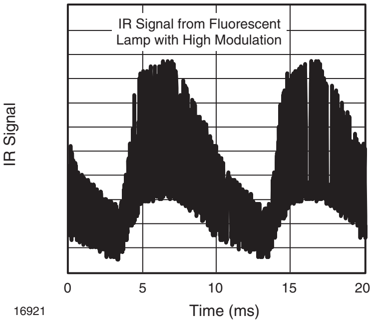


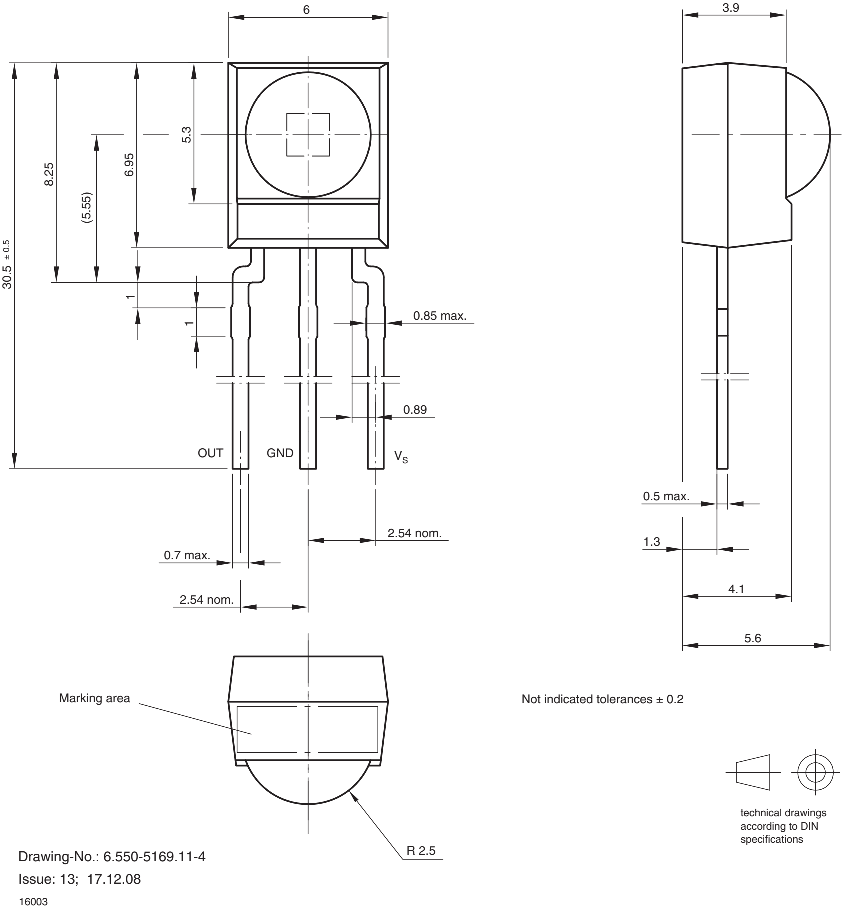
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP341..	TSOP343..	TSOP345..
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. 14)	Even critical disturbance signals are suppressed (examples: signal pattern of fig. 14 and fig. 15)	Even critical disturbance signals are suppressed (examples: signal pattern of fig. 14 and fig. 15)

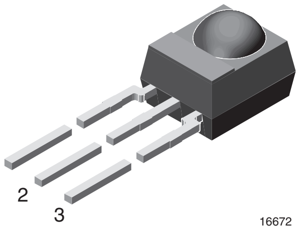
Note

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP348.., TSOP344.

PACKAGE DIMENSIONS in millimeters



IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning

1 = OUT, 2 = GND, 3 = V_S

FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP41.., TSOP43.. series 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.

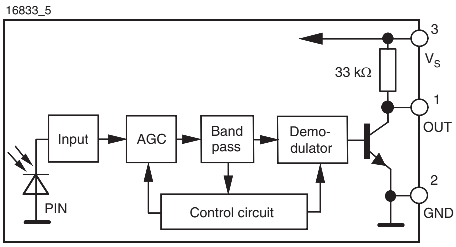
The demodulated output signal can directly be decoded by a microprocessor. The main benefit of the TSOP41.. is the compatibility to all IR remote control data formats. The TSOP43.. is optimized to better suppress spurious pulses from fluorescent lamps, LCD TVs or plasma displays.

This component has not been qualified according to automotive specifications.

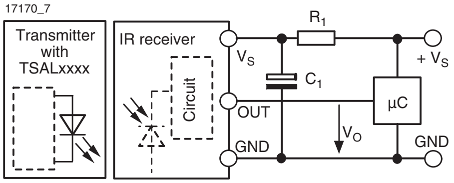
PARTS TABLE

CARRIER FREQUENCY	SHORT BURSTS AND HIGH DATA RATES (AGC1)	NOISY ENVIROMENTS AND SHORT BURSTS (AGC3)
30 kHz	TSOP4130	TSOP4330
33 kHz	TSOP4133	TSOP4333
36 kHz	TSOP4136	TSOP4336
36.7 kHz	TSOP4137	TSOP4337
38 kHz	TSOP4138	TSOP4338
40 kHz	TSOP4140	TSOP4340
56 kHz	TSOP4156	TSOP4356

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_o should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Supply voltage (pin 3)		V_S	- 0.3 to + 6	V
Supply current (pin 3)		I_S	5	mA
Output voltage (pin 1)		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 (pin 1)		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 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Supply current (pin 3)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 400$ mA	d		45		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ min.}$		0.17	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

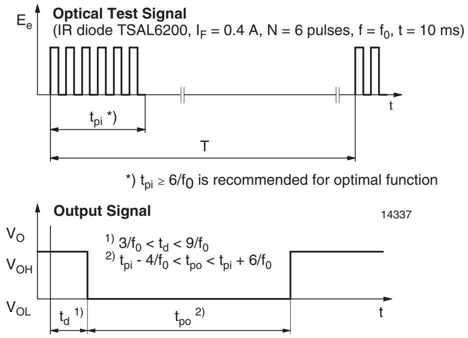


Fig. 1 - Output Active Low

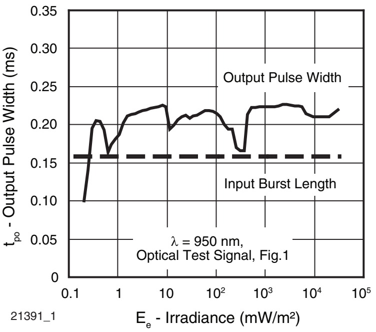


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

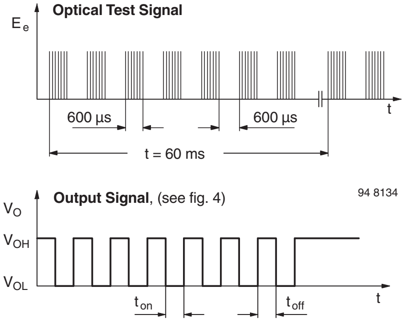


Fig. 3 - Output Function

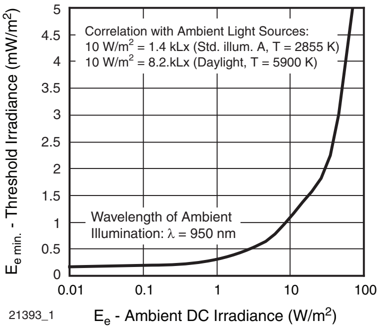


Fig. 6 - Sensitivity in Bright Ambient

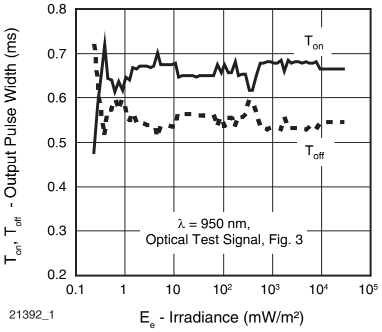


Fig. 4 - Output Pulse Diagram

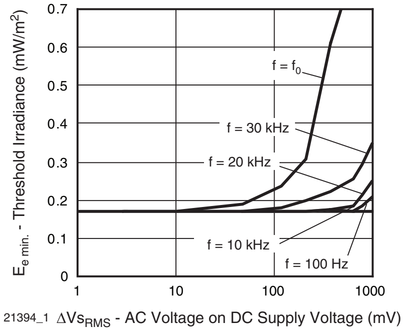


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

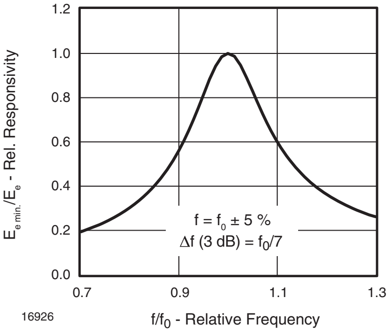


Fig. 5 - Frequency Dependence of Responsivity

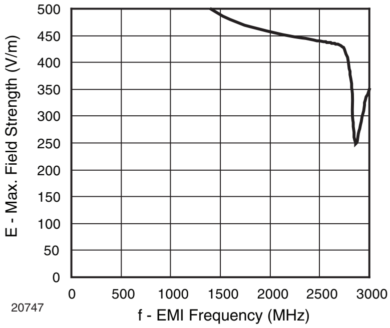


Fig. 8 - Sensitivity vs. Electric Field Disturbances

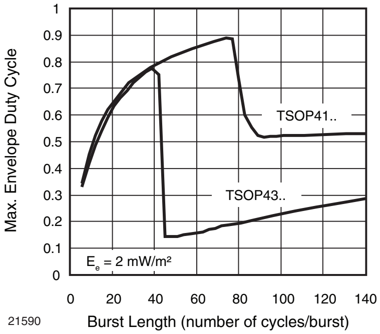


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

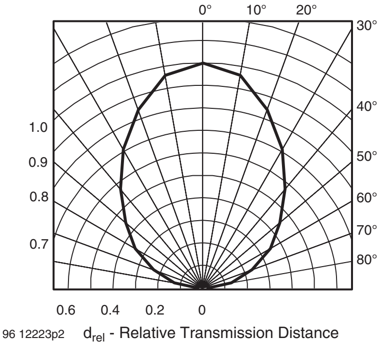


Fig. 12 - Horizontal Directivity

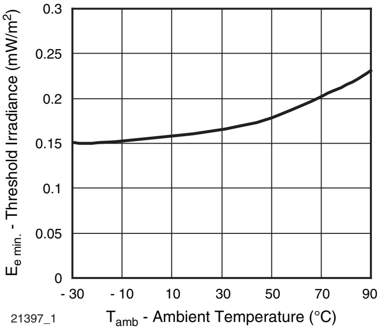


Fig. 10 - Sensitivity vs. Ambient Temperature

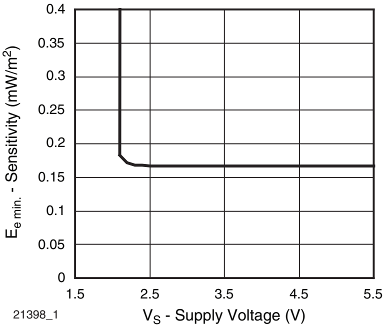


Fig. 13 - Sensitivity vs. Supply Voltage

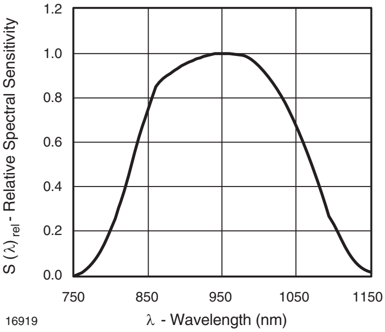


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP41.., TSOP43.. series 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 TSOP41.., TSOP43.. 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 14 or figure 15)

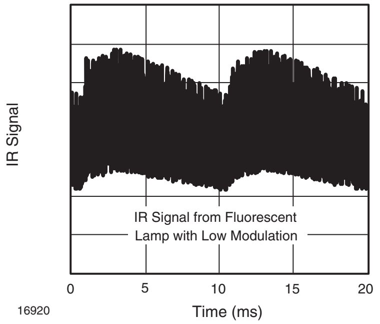


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

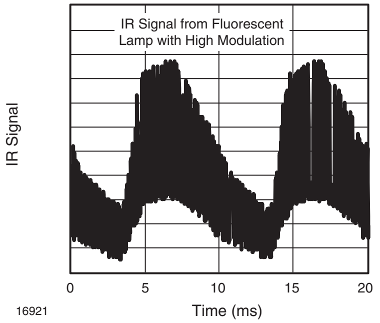


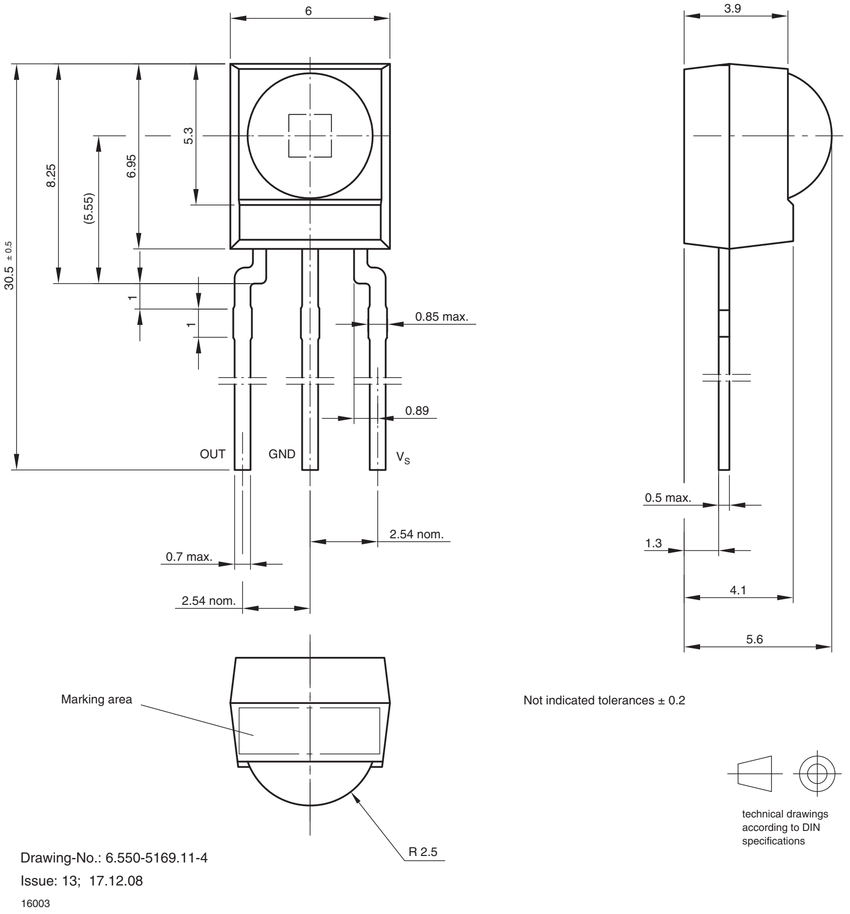
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP41..	TSOP43..
Minimum burst length	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
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 1.1 x burst length	35 cycles > 6 x burst length
Maximum number of continuous short bursts/second	2000	2000
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for RECS-80 code	yes	yes
Recommended for RCMM code	yes	yes
Recommended for r-step code	yes	yes
Recommended for XMP code	yes	yes
Suppression of interference from fluorescent lamps	Common disturbance signals are supressed (example: signal pattern of fig. 14)	Even critical disturbance signals are suppressed (examples: signal pattern of fig. 14 and fig. 15)

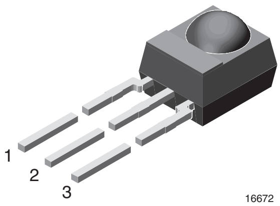
Note

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

PACKAGE DIMENSIONS in millimeters



IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

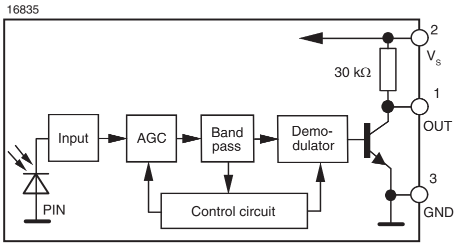
The TSOP321.., TSOP323.. and TSOP325.. series are miniaturized receivers for infrared remote control systems. A PIN diode and a preamplifier are assembled on a lead frame, the epoxy package acts as an IR filter.

The demodulated output signal can be directly decoded by a microprocessor. The TSOP321.. is compatible with all common IR remote control data formats. The TSOP323.. is optimized to better suppress spurious pulses from energy saving fluorescent lamps. The TSOP325.. has 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.

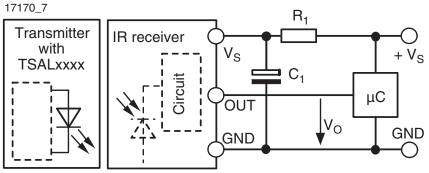
This component has not been qualified according to automotive specifications.

PARTS TABLE			
CARRIER FREQUENCY	**SHORT BURSTS AND HIGH DATA RATES (AGC1)**	**NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)**	**VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)**
30 kHz	TSOP32130	TSOP32330	TSOP32530
33 kHz	TSOP32133	TSOP32333	TSOP32533
36 kHz	TSOP32136	TSOP32336	TSOP32536
38 kHz	TSOP32138	TSOP32338	TSOP32538
40 kHz	TSOP32140	TSOP32340	TSOP32540
56 kHz	TSOP32156	TSOP32356	TSOP32556

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Supply voltage (pin 2)		V_S	- 0.3 to + 6	V
Supply current (pin 2)		I_S	3	mA
Output voltage (pin 1)		V_O	- 0.3 to (V_S + 0.3)	V
Output current (pin 1)		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 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Supply current (pin 2)	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	E_v = 40 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 = 250 mA	d		45		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ min.}$		0.1	0.25	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

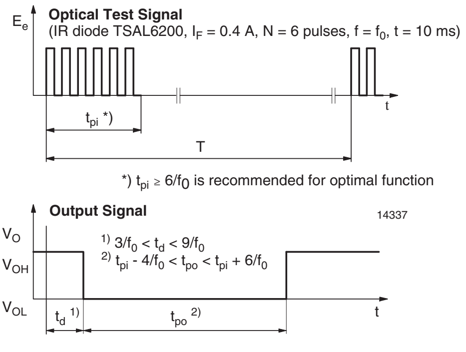


Fig. 1 - Output Active Low

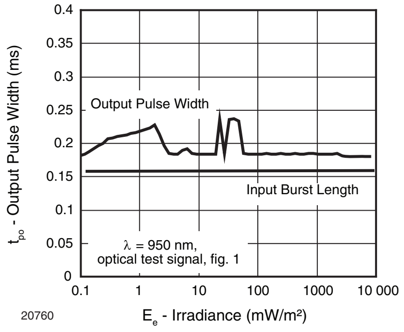


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

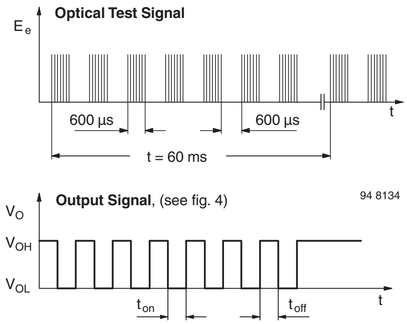


Fig. 3 - Output Function

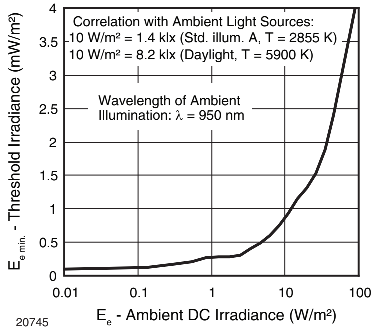


Fig. 6 - Sensitivity in Bright Ambient

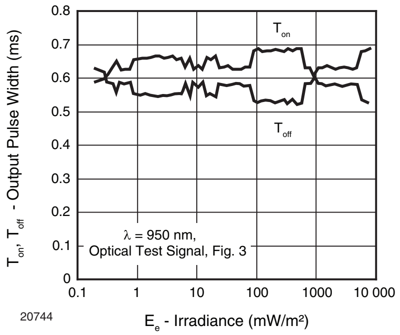


Fig. 4 - Output Pulse Diagram

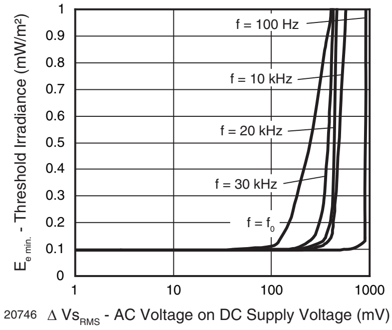


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

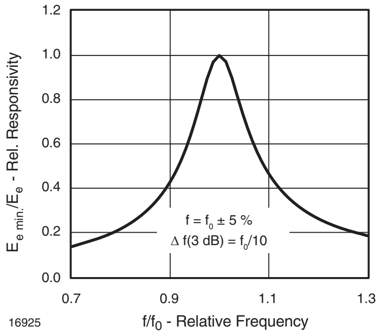


Fig. 5 - Frequency Dependence of Responsivity

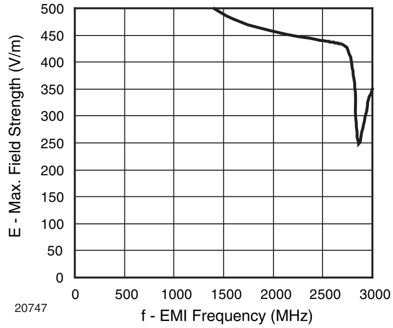


Fig. 8 - Sensitivity vs. Electric Field Disturbances

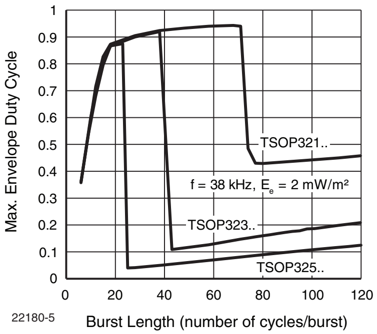


Fig. 9 - Maximum Envelope Duty Cycle vs. Burst Length

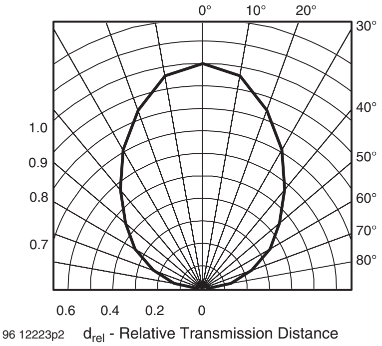


Fig. 12 - Horizontal Directivity

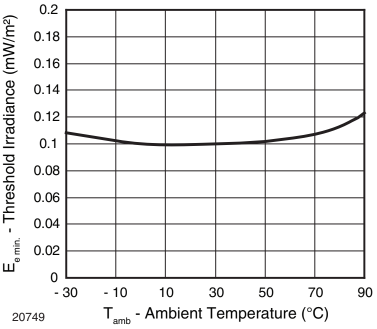


Fig. 10 - Sensitivity vs. Ambient Temperature

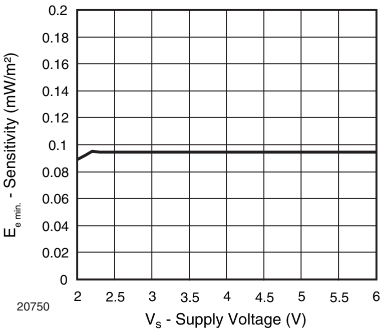


Fig. 13 - Sensitivity vs. Supply Voltage

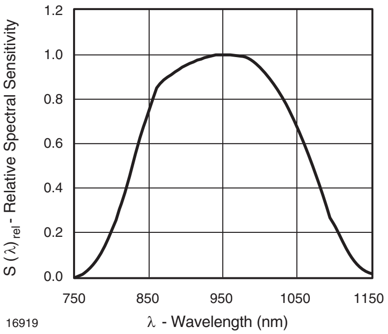


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP321.., TSOP323.. and TSOP325.. series 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 TSOP321.., TSOP323.. and TSOP325.. 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 14 or figure 15)

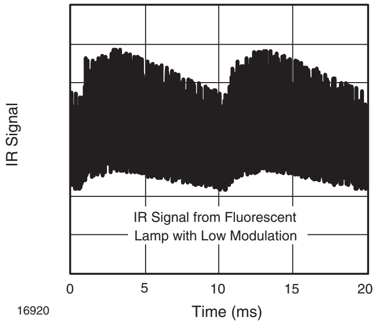


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

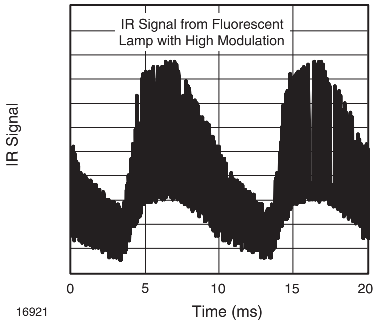


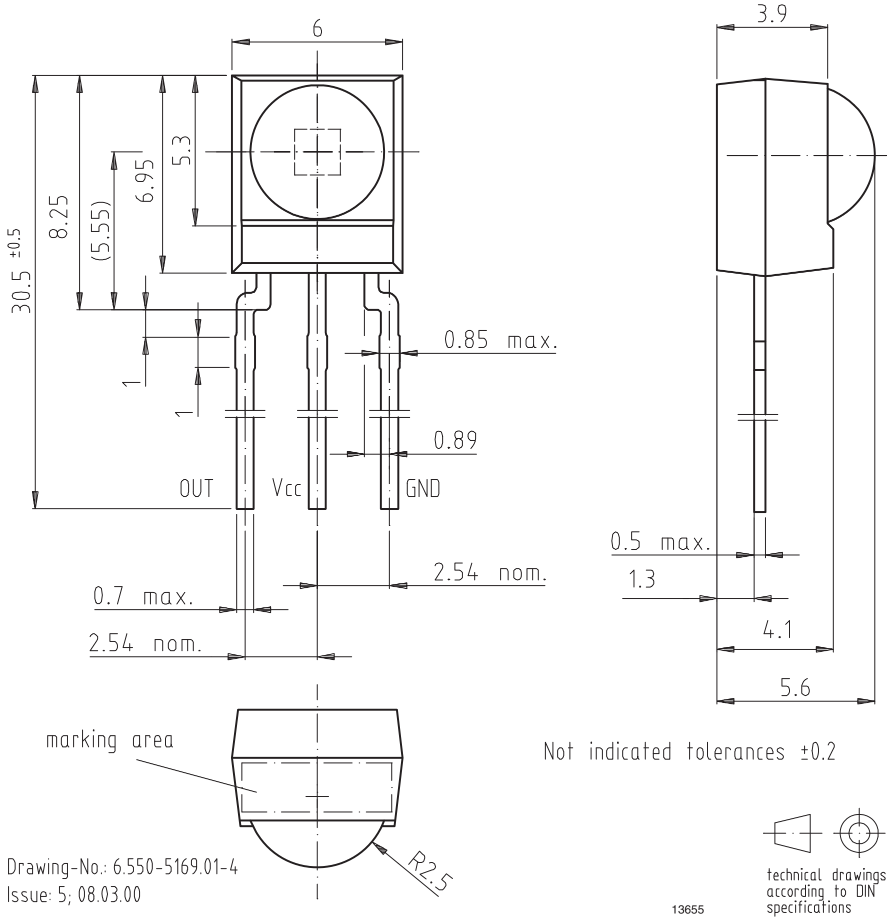
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP321..	TSOP323..	TSOP325..
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. 14)	Even critical disturbance signals are suppressed (examples: signal pattern of fig. 14 and fig. 15)	Even critical disturbance signals are suppressed (examples: signal pattern of fig. 14 and fig. 15)

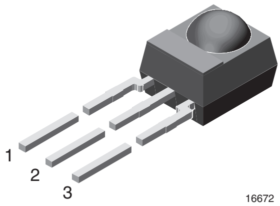
Note

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP322.., TSOP324.

PACKAGE DIMENSIONS in millimeters



IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning

1 = OUT, 2 = V_S, 3 = GND

FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

RoHS
COMPLIANT

DESCRIPTION

The TSOP21.., TSOP23.. series 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.

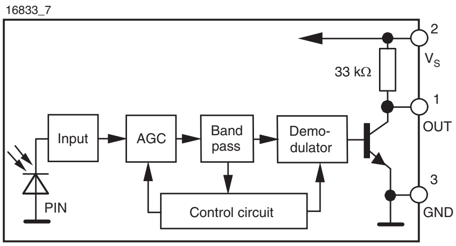
The demodulated output signal can directly be decoded by a microprocessor. The main benefit of the TSOP21.. is the compatibility to all IR remote control data formats. The TSOP23.. is optimized to better suppress spurious pulses from fluorescent lamps, LCD TVs or plasma displays.

This component has not been qualified according to automotive specifications.

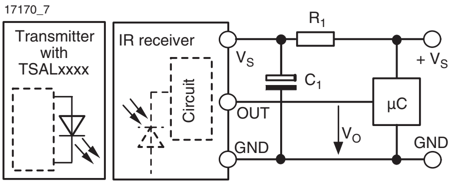
PARTS TABLE

CARRIER FREQUENCY	SHORT BURSTS AND HIGH DATA RATES (AGC1)	NOISY ENVIROMENTS AND SHORT BURSTS (AGC3)
30 kHz	TSOP2130	TSOP2330
33 kHz	TSOP2133	TSOP2333
36 kHz	TSOP2136	TSOP2336
36.7 kHz	TSOP2137	TSOP2337
38 kHz	TSOP2138	TSOP2338
40 kHz	TSOP2140	TSOP2340
56 kHz	TSOP2156	TSOP2356

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are $R_1 = 100\ \Omega$, $C_1 = 0.1\ \mu F$).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Supply voltage (pin 2)		V_S	- 0.3 to + 6	V
Supply current (pin 2)		I_S	5	mA
Output voltage (pin 1)		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 (pin 1)		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 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Supply current (pin 2)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	E_v = 40 klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, I_F = 400 mA	d		45		m
Output voltage low (pin 1)	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², 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	$E_{e\ min.}$		0.17	0.35	mW/m²
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ max.}$	30			W/m²
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

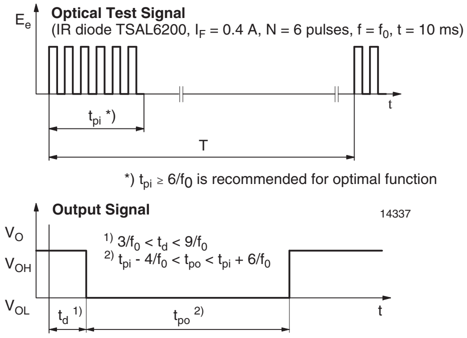


Fig. 1 - Output Active Low

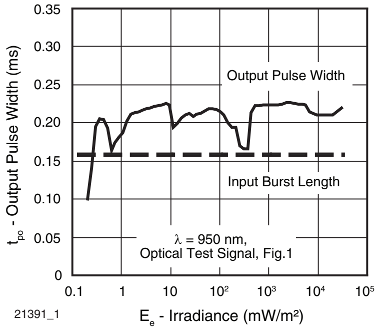


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

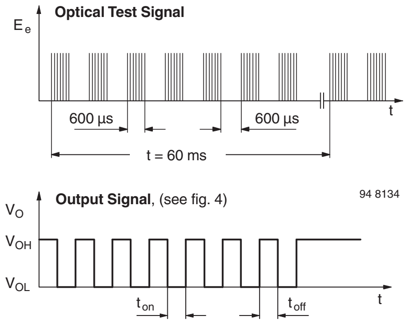


Fig. 3 - Output Function

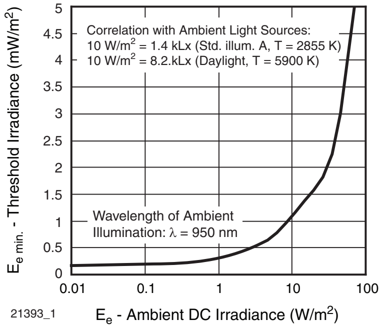


Fig. 6 - Sensitivity in Bright Ambient

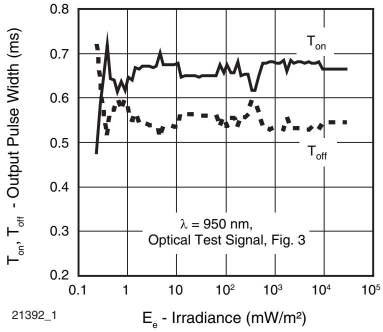


Fig. 4 - Output Pulse Diagram

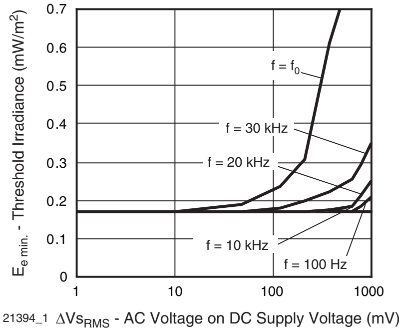


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

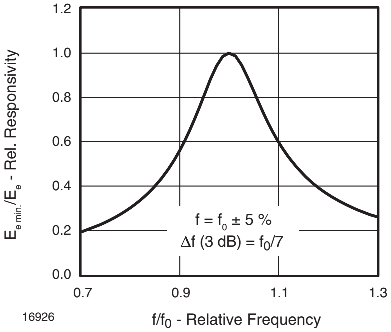


Fig. 5 - Frequency Dependence of Responsivity

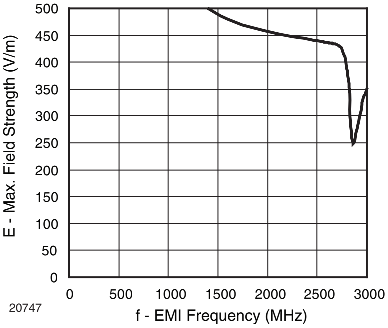


Fig. 8 - Sensitivity vs. Electric Field Disturbances

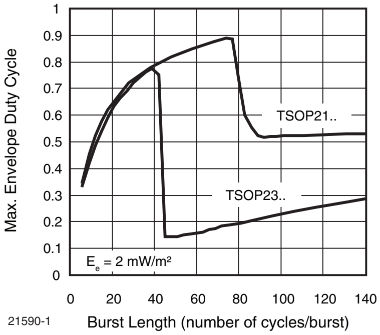


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

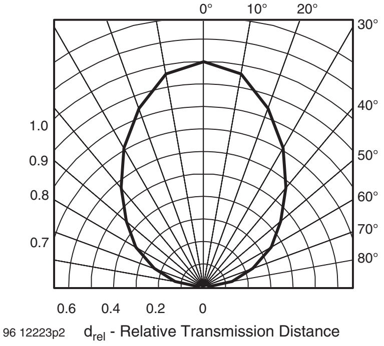


Fig. 12 - Horizontal Directivity

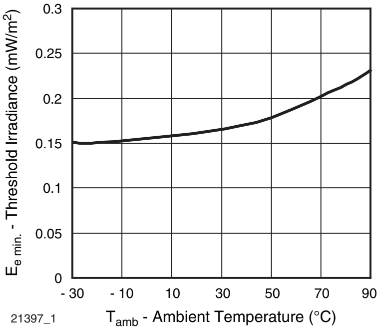


Fig. 10 - Sensitivity vs. Ambient Temperature

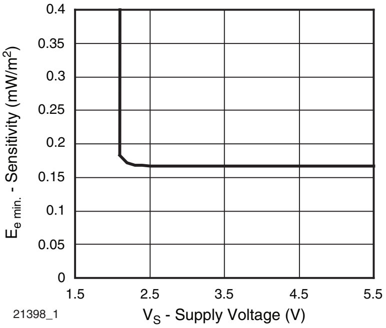


Fig. 13 - Sensitivity vs. Supply Voltage

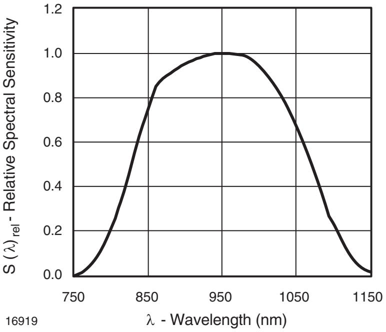


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP21.., TSOP23.. series 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 TSOP21.., TSOP23.. 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 IR signals from common fluorescent lamps (example of noise pattern is shown in fig. 14 or fig. 15)

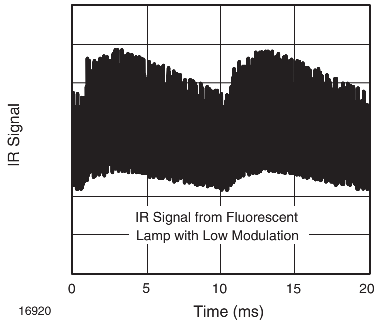


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

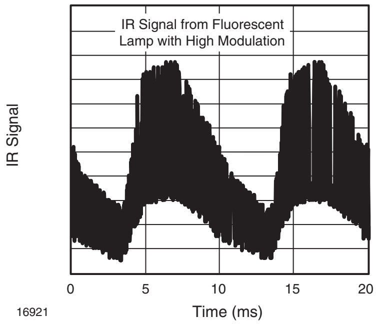


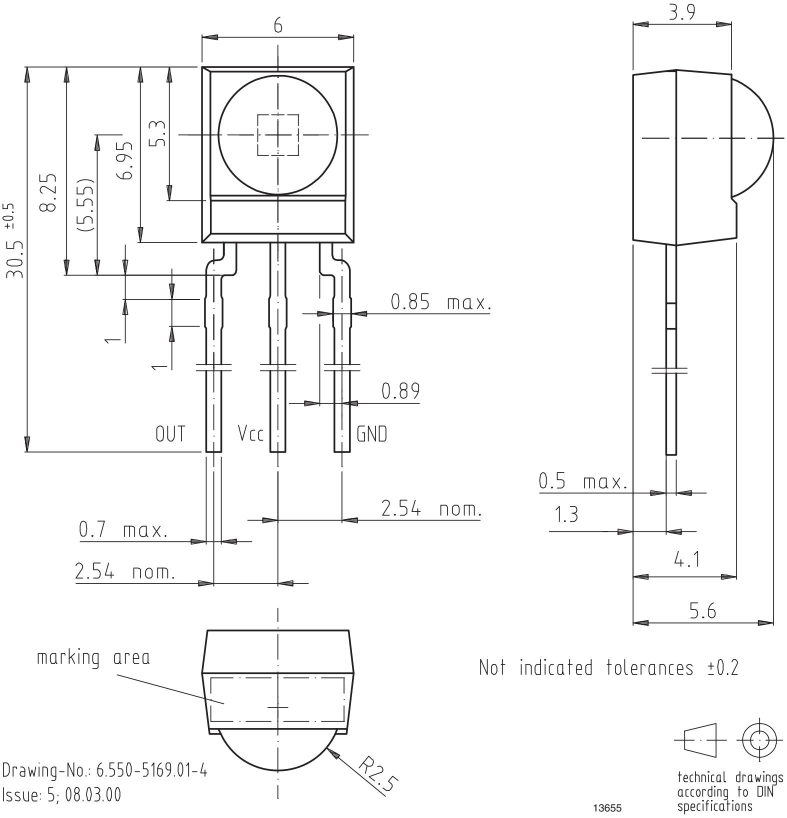
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP21..	TSOP23..
Minimum burst length	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
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 1.1 x burst length	35 cycles > 6 x burst length
Maximum number of continuous short bursts/second	2000	2000
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	yes
Recommended for RECS-80 code	yes	yes
Recommended for RCMM code	yes	yes
Recommended for r-step code	yes	yes
Recommended for XMP code	yes	yes
Suppression of interference from fluorescent lamps	Common disturbance signals are supressed (example: signal pattern of fig. 14)	Even critical disturbance signals are suppressed (examples: signal pattern of fig. 14 and fig. 15)

Note

- For data formats with long bursts (10 carrier cycles or longer) we recommend the TSOP22.. or TSOP24.. because of the better noise suppression.

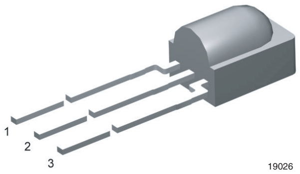
PACKAGE DIMENSIONS in millimeters



Minicast

Contents

IR Receiver Modules for Remote Control Systems



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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

MECHANICAL DATA

Pinning:

1 = OUT, 2 = GND, 3 = V_S

DESCRIPTION

The TSOP382.., TSOP384.. series 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.

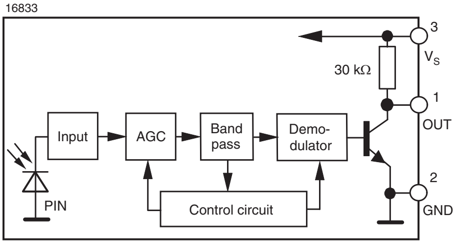
The demodulated output signal can be directly decoded by a microprocessor. The TSOP382.. is compatible with all common IR remote control data formats. The TSOP384.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

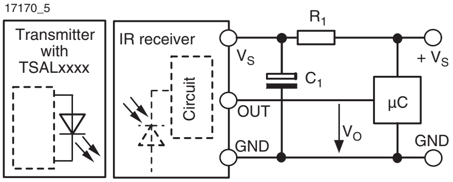
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	VERY NOISY ENVIRONMENTS (AGC4)
30 kHz	TSOP38230	TSOP38430
33 kHz	TSOP38233	TSOP38433
36 kHz	TSOP38236	TSOP38436
38 kHz	TSOP38238	TSOP38438
40 kHz	TSOP38240	TSOP38440
56 kHz	TSOP38256	TSOP38456

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 µF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 6	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	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 ≤ 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 (pin 3)	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	E_v = 40 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 = 250 mA	d		45		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ min.}$		0.15	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

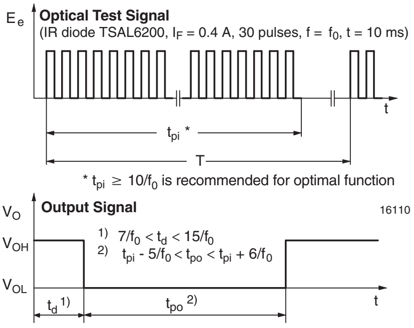


Fig. 1 - Output Active Low

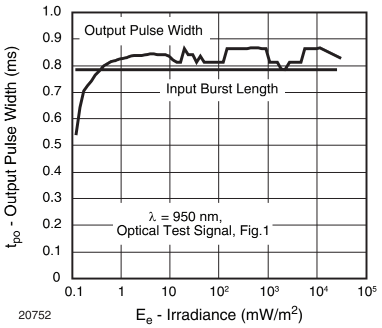


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

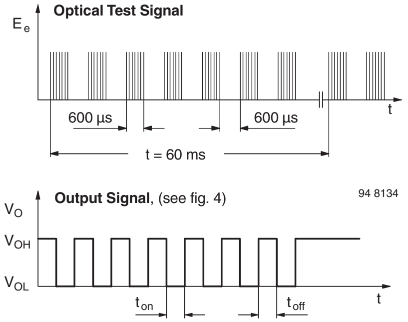


Fig. 3 - Output Function

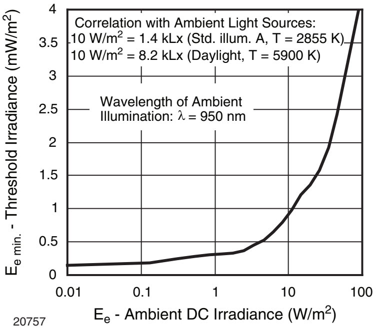


Fig. 6 - Sensitivity in Bright Ambient

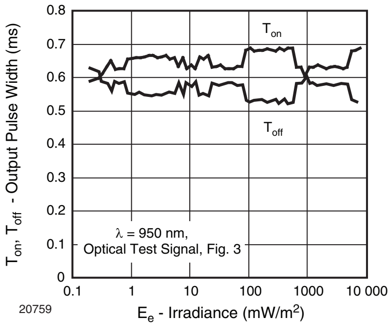


Fig. 4 - Output Pulse Diagram

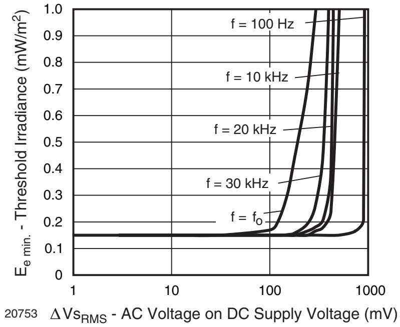


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

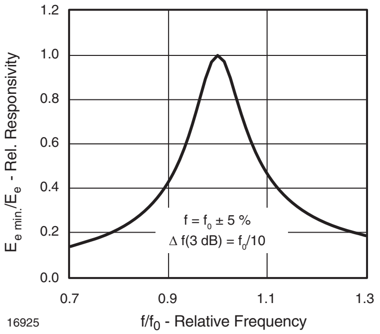


Fig. 5 - Frequency Dependence of Responsivity

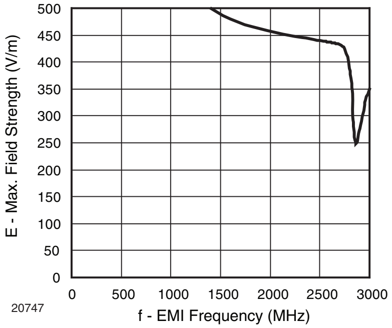


Fig. 8 - Sensitivity vs. Electric Field Disturbances

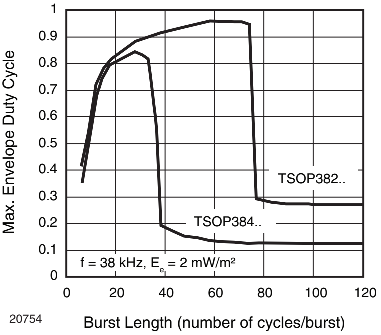


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

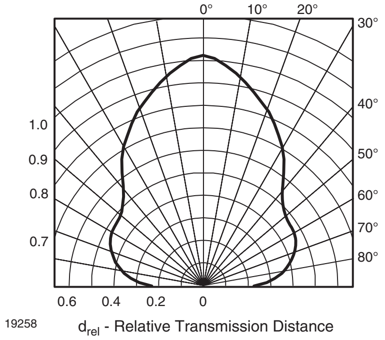


Fig. 12 - Horizontal Directivity

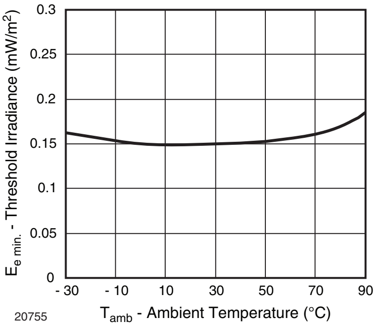


Fig. 10 - Sensitivity vs. Ambient Temperature

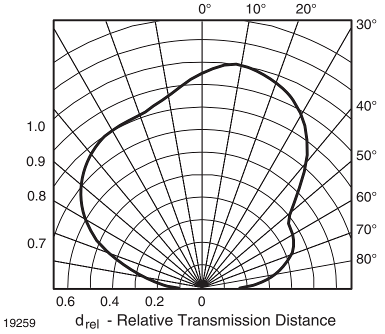


Fig. 13 - Vertical Directivity

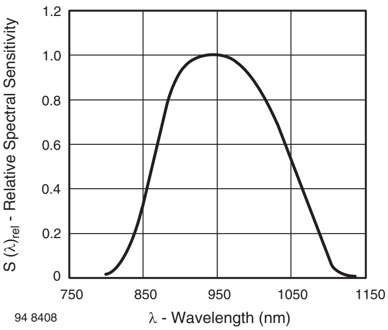


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

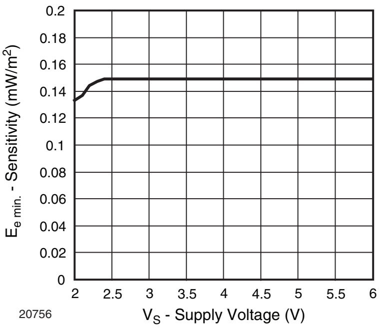


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP382.., TSOP384.. series 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 TSOP382.., TSOP384.. 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 15 or figure 16)

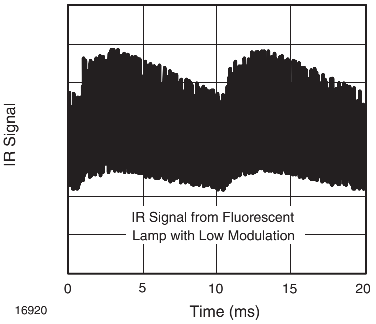


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

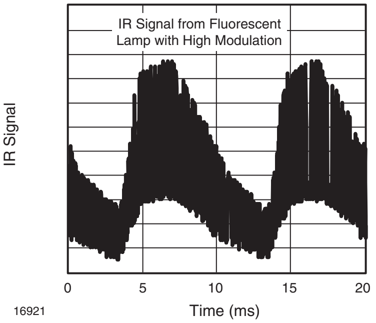


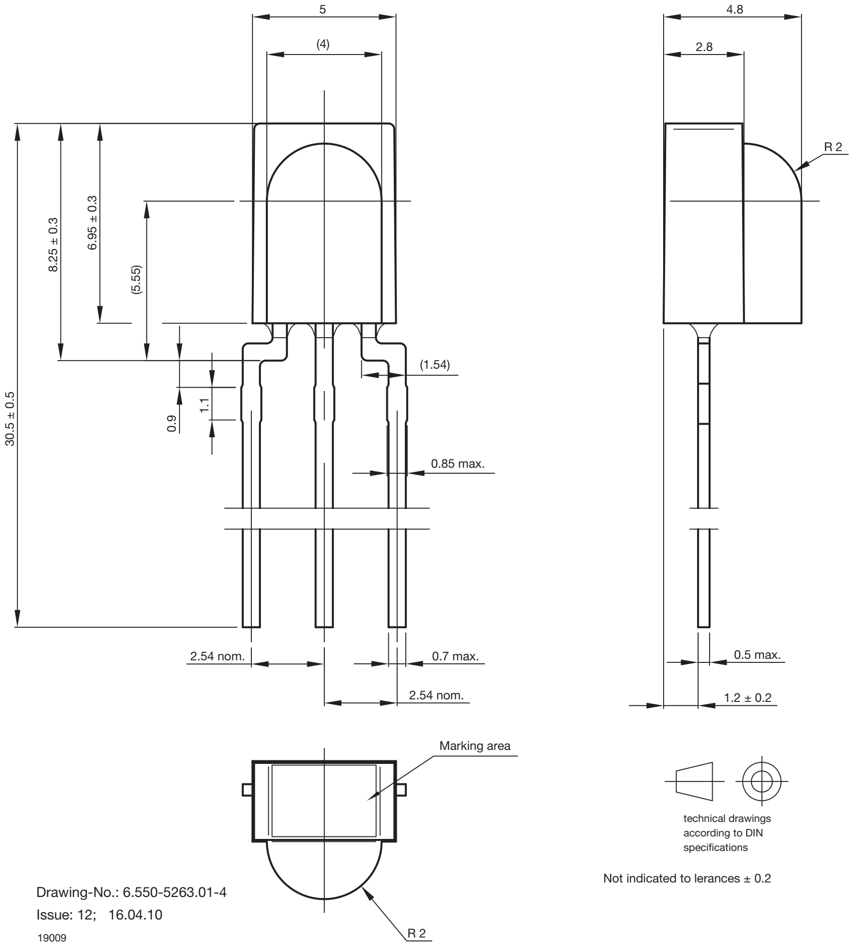
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP382..	TSOP384..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	1800	1500
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	no
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

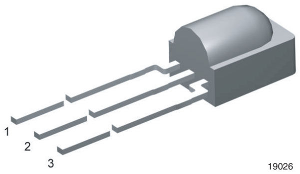
Note

- For data formats with short bursts please see the datasheet for TSOP381.., TSOP383..

PACKAGE DIMENSIONS in millimeters



IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

1 = OUT, 2 = GND, 3 = V_S

FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP582.., TSOP584.. series 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.

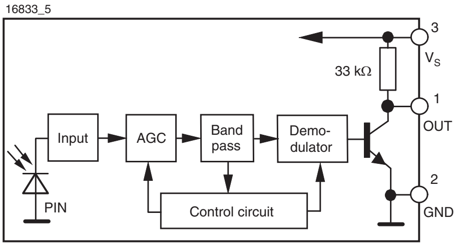
The demodulated output signal can be directly decoded by a microprocessor. The TSOP582.. is compatible with all common IR remote control data formats. The TSOP584.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

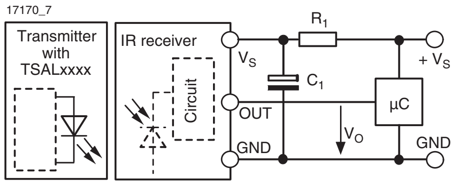
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	VERY NOISY ENVIROMENTS (AGC4)
30 kHz	TSOP58230	TSOP58430
33 kHz	TSOP58233	TSOP58433
36 kHz	TSOP58236	TSOP58436
36.7 kHz	TSOP58237	TSOP58437
38 kHz	TSOP58238	TSOP58438
40 kHz	TSOP58240	TSOP58440
56 kHz	TSOP58256	TSOP58456

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional
to improve the robustness against electrical overstress
(typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level
below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 6	V
Supply current (pin 3)		I_S	5	mA
Output voltage (pin 1)		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 (pin 1)		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 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current (pin 3)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 400$ mA	d		40		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ min.}$		0.3	0.45	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

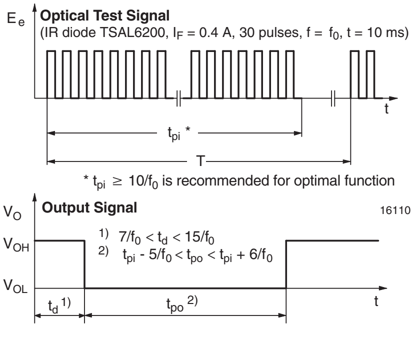


Fig. 1 - Output Active Low

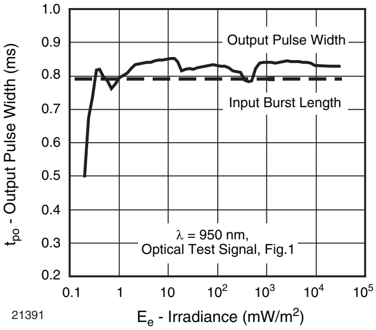


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

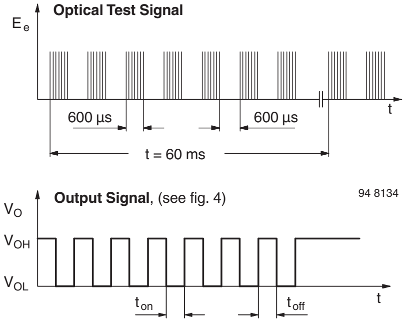


Fig. 3 - Output Function

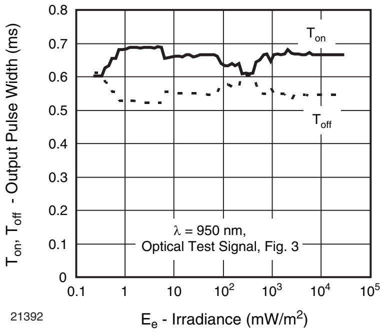


Fig. 4 - Output Pulse Diagram

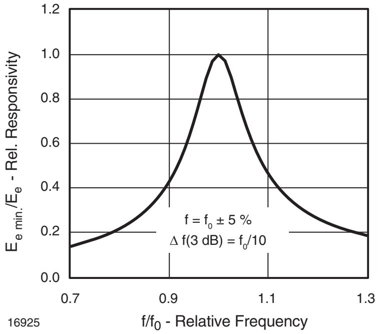


Fig. 5 - Frequency Dependence of Responsivity

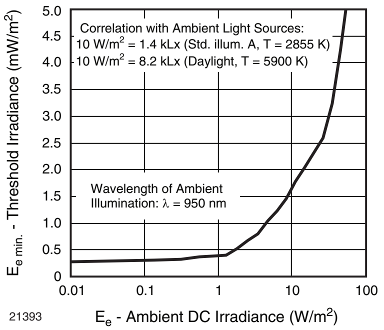


Fig. 6 - Sensitivity in Bright Ambient

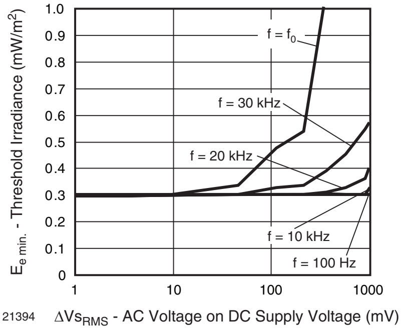


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

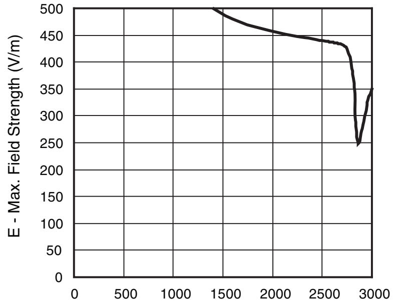


Fig. 8 - Sensitivity vs. Electric Field Disturbances

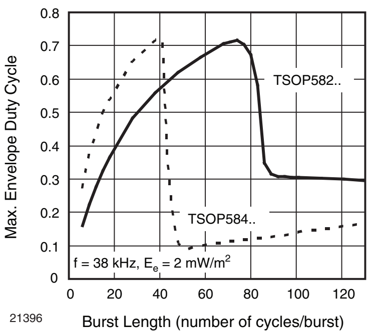


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

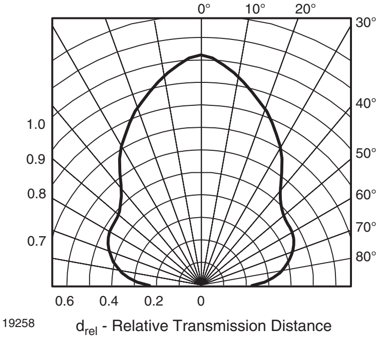


Fig. 12 - Horizontal Directivity

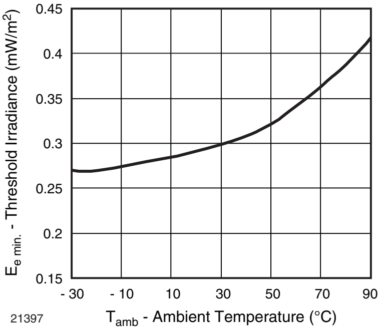


Fig. 10 - Sensitivity vs. Ambient Temperature

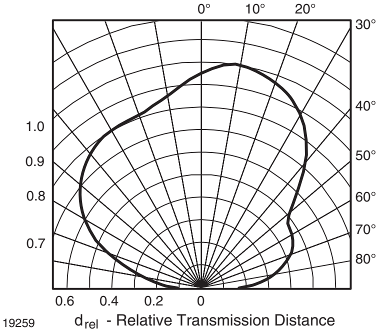


Fig. 13 - Vertical Directivity

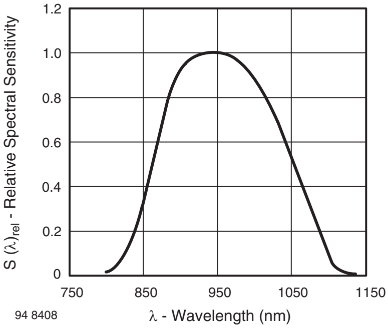


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

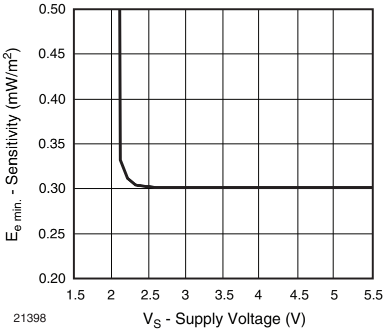


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP582.., TSOP584.. series 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 TSOP582.., TSOP584.. 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 15 or figure 16)

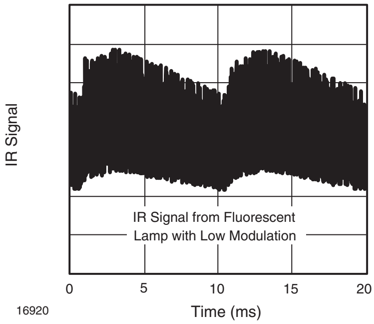


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

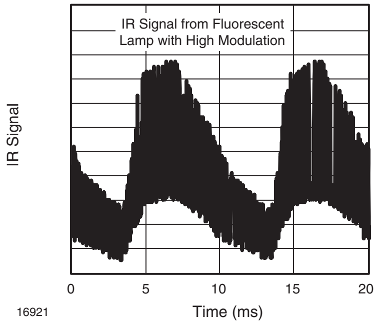


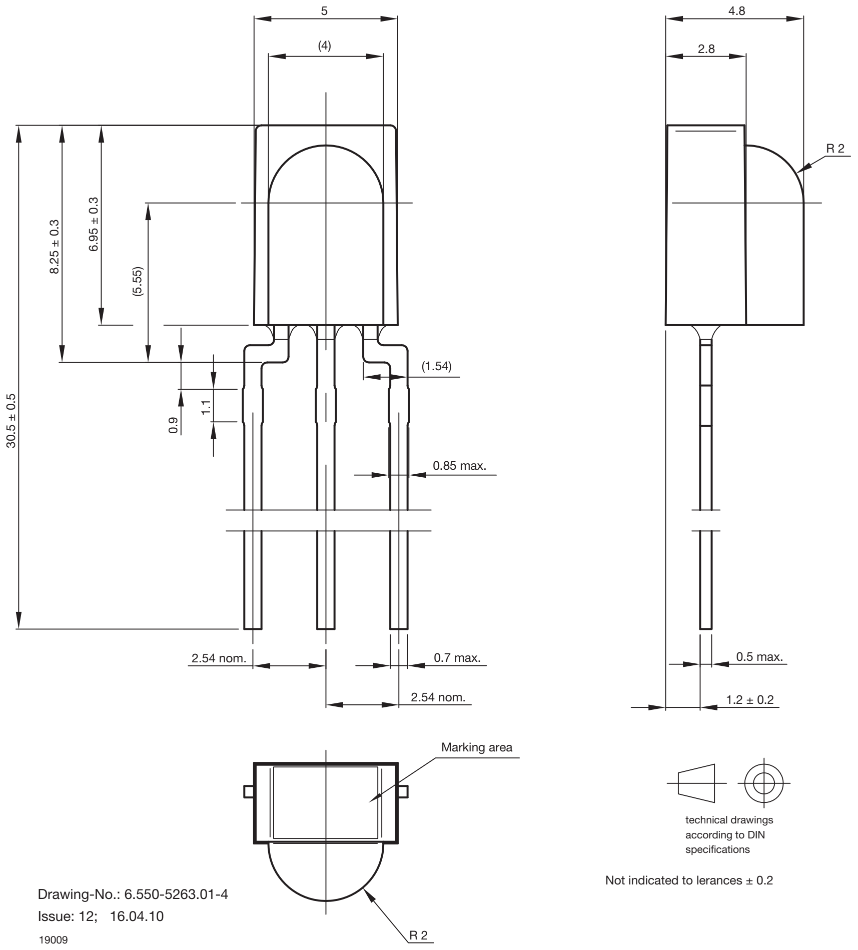
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP582..	TSOP584..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 12 cycles	10 to 35 cycles ≥ 12 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	800	1300
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	yes
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

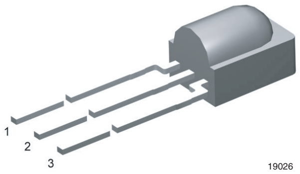
Note

For data formats with short bursts please see the datasheet of TSOP581.., TSOP583.. .

PACKAGE DIMENSIONS in millimeters



IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP392.., TSOP394.. series 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.

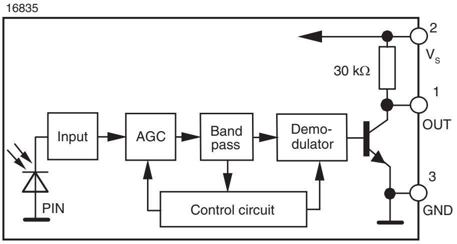
The demodulated output signal can be directly decoded by a microprocessor. The TSOP392.. is compatible with all common IR remote control data formats. The TSOP394.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

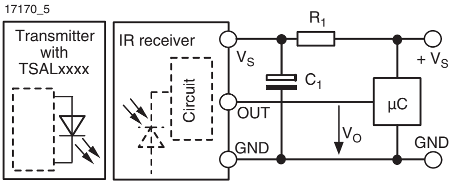
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	VERY NOISY ENVIRONMENTS (AGC4)
30 kHz	TSOP39230	TSOP39430
33 kHz	TSOP39233	TSOP39433
36 kHz	TSOP39236	TSOP39436
38 kHz	TSOP39238	TSOP39438
40 kHz	TSOP39240	TSOP39440
56 kHz	TSOP39256	TSOP39456

BLOCK DIAGRAM



APPLICATION CIRCUIT



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

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 2)		V_S	- 0.3 to + 6.0	V
Supply current (pin 2)		I_S	3	mA
Output voltage (pin 1)		V_O	- 0.3 to (V_S + 0.3)	V
Output current (pin 1)		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 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current (pin 2)	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	$E_v = 40$ 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, $I_F = 250$ mA	d		45		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ min.}$		0.15	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

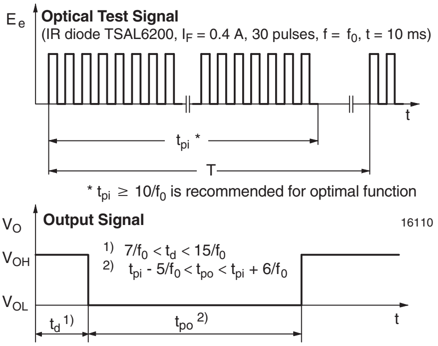


Fig. 1 - Output Active Low

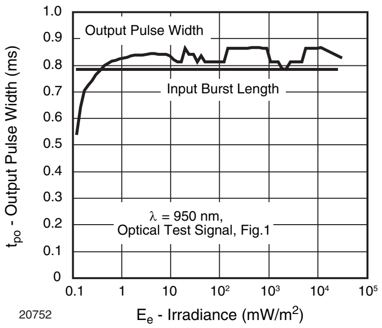


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

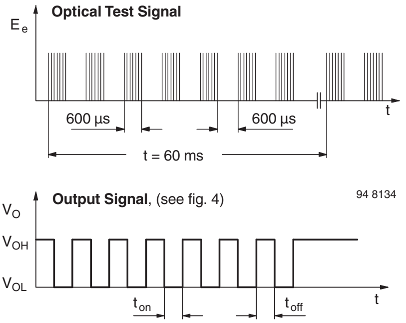


Fig. 3 - Output Function

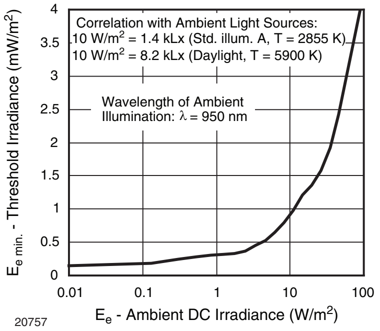


Fig. 6 - Sensitivity in Bright Ambient

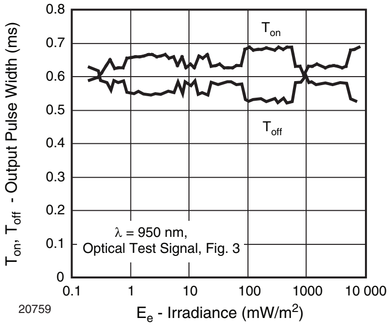


Fig. 4 - Output Pulse Diagram

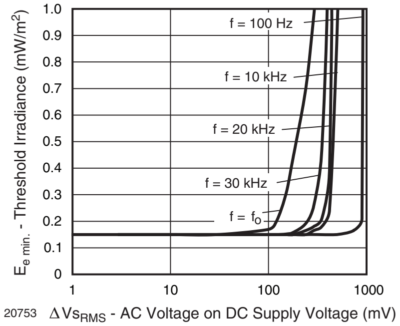


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

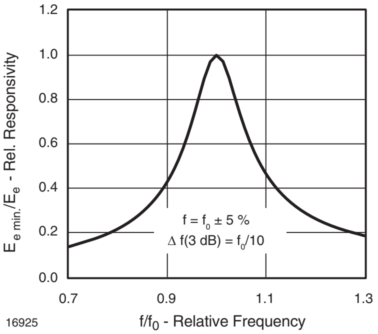


Fig. 5 - Frequency Dependence of Responsivity

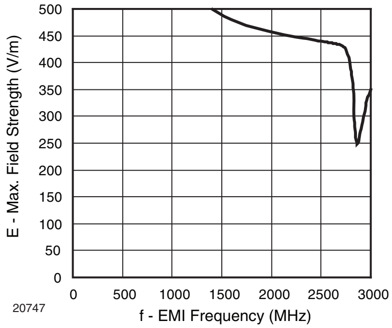


Fig. 8 - Sensitivity vs. Electric Field Disturbances

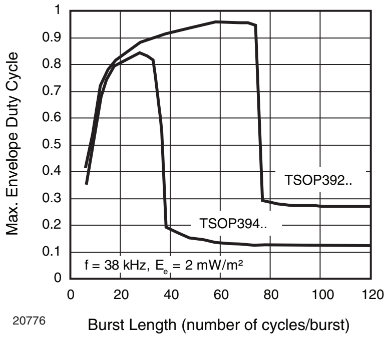


Fig. 9 - Maximum Envelope Duty Cycle vs. Burst Length

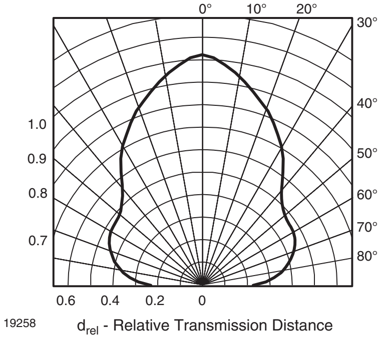


Fig. 12 - Horizontal Directivity

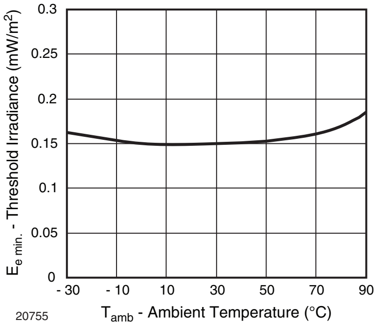


Fig. 10 - Sensitivity vs. Ambient Temperature

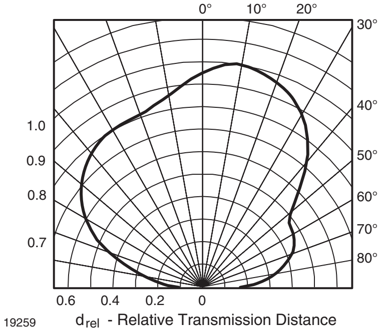


Fig. 13 - Vertical Directivity

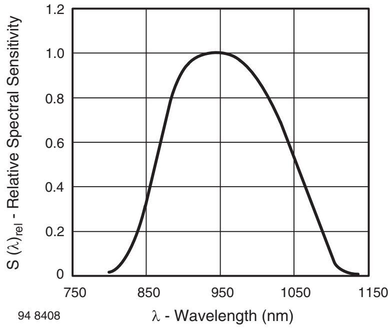


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

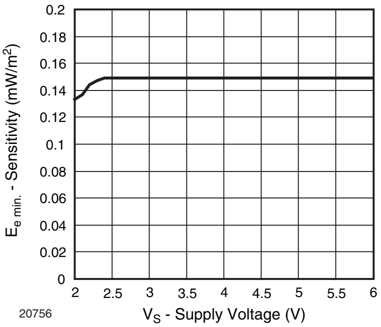


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP392.., TSOP394.. series 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 TSOP392.., TSOP394.. 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 15 or figure 16)

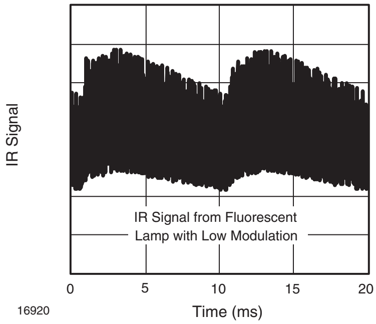


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

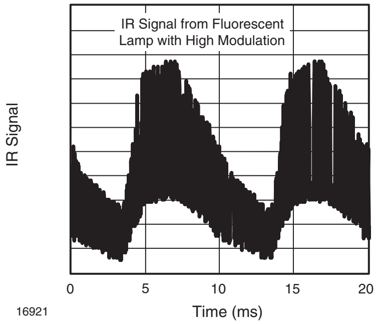


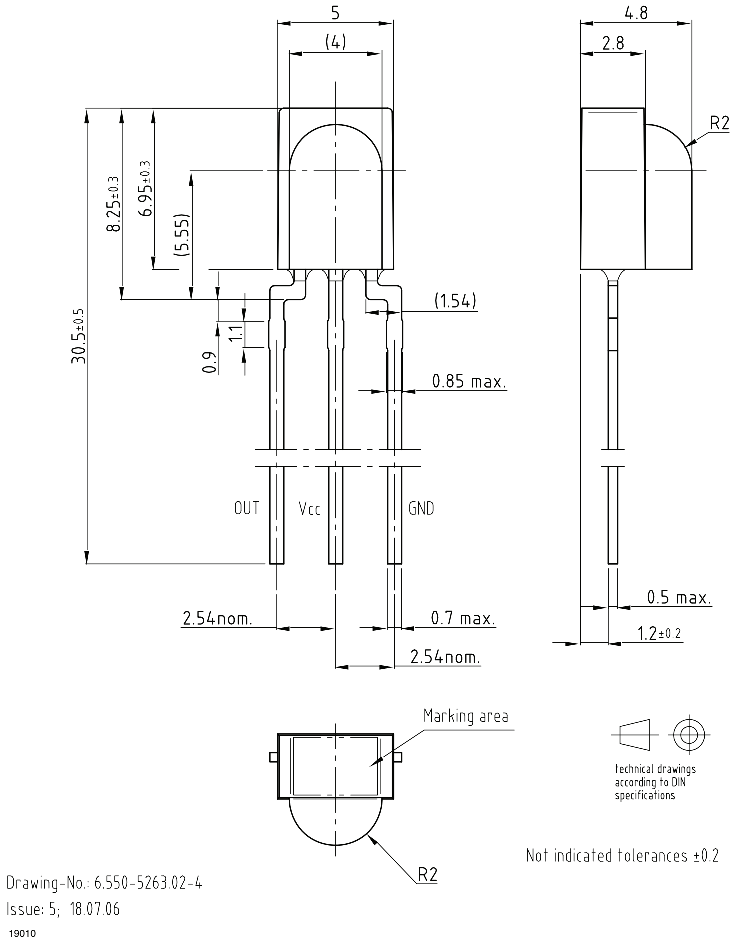
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP392..	TSOP394..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	1800	1500
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	no
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

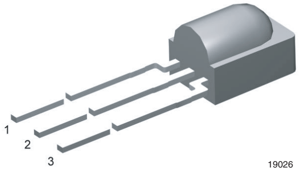
Note

For data formats with short bursts please see the datasheet for TSOP391.., TSOP393..

PACKAGE DIMENSIONS in millimeters



IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

1 = OUT, 2 = V_S, 3 = GND

FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS
COMPLIANT

DESCRIPTION

The TSOP592.., TSOP594.. series 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.

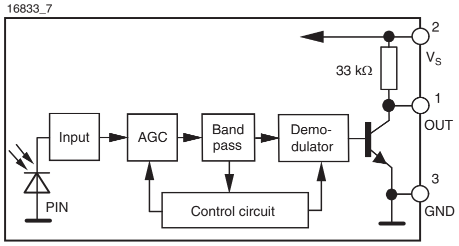
The demodulated output signal can be directly decoded by a microprocessor. The TSOP592.. is compatible with all common IR remote control data formats. The TSOP594.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

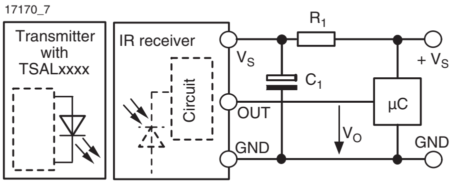
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	VERY NOISY ENVIRONMENT (AGC4)
30 kHz	TSOP59230	TSOP59430
33 kHz	TSOP59233	TSOP59433
36 kHz	TSOP59236	TSOP59436
36.7 kHz	TSOP59237	TSOP59437
38 kHz	TSOP59238	TSOP59438
40 kHz	TSOP59240	TSOP59440
56 kHz	TSOP59256	TSOP59456

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 2)		V_S	- 0.3 to + 6	V
Supply current (pin 2)		I_S	5	mA
Output voltage (pin 1)		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 (pin 1)		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 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current (pin 2)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 400$ mA	d		40		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ min.}$		0.3	0.45	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

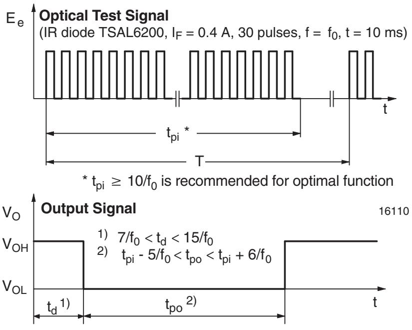


Fig. 1 - Output Active Low

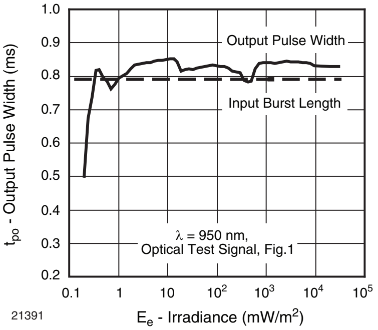


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

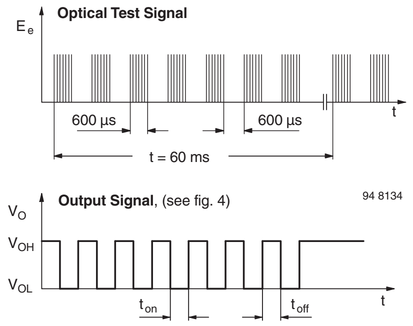


Fig. 3 - Output Function

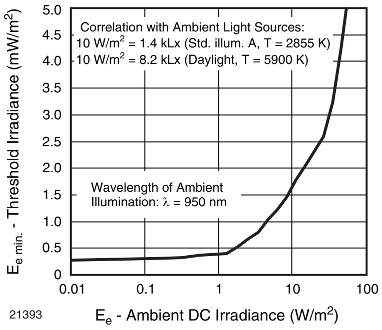


Fig. 6 - Sensitivity in Bright Ambient

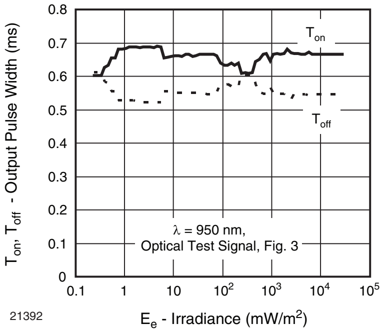


Fig. 4 - Output Pulse Diagram

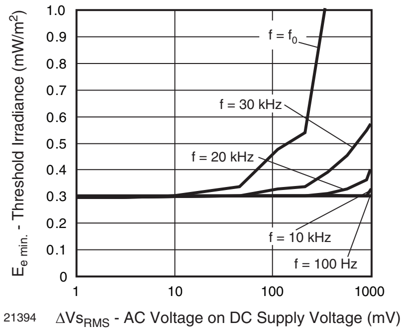


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

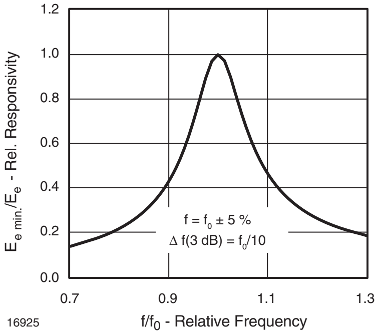


Fig. 5 - Frequency Dependence of Responsivity

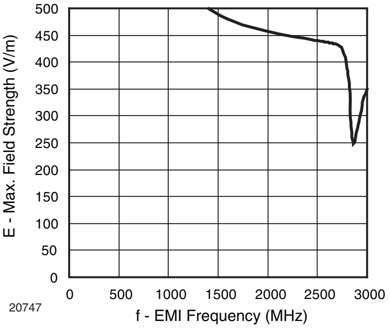


Fig. 8 - Sensitivity vs. Electric Field Disturbances

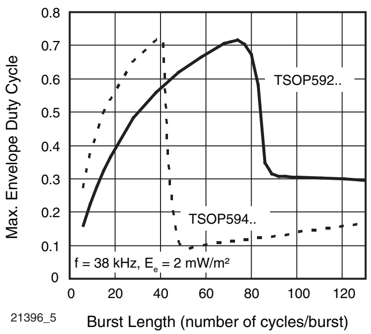


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

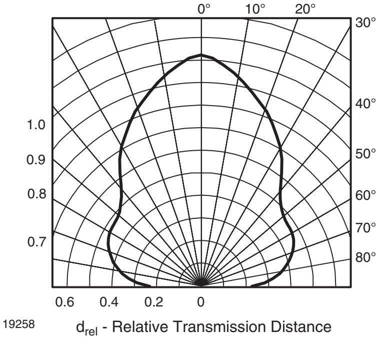


Fig. 12 - Horizontal Directivity

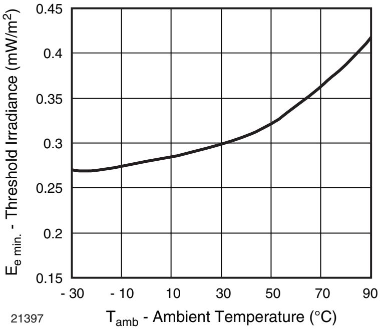


Fig. 10 - Sensitivity vs. Ambient Temperature

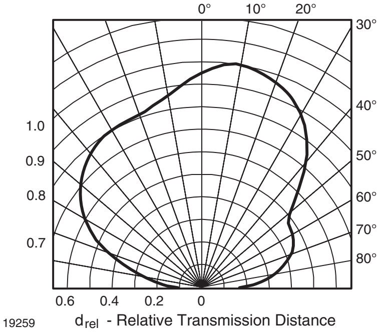


Fig. 13 - Vertical Directivity

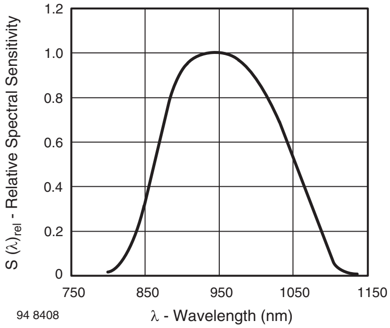


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

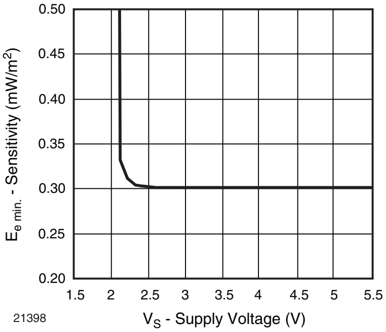


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP592.., TSOP594.. 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 TSOP592.., TSOP594.. 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 15 or figure 16)

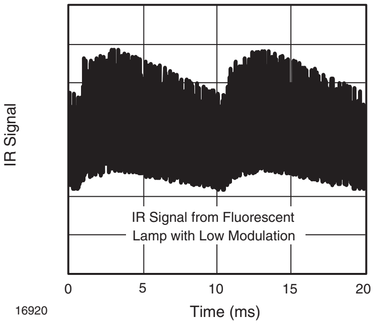


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

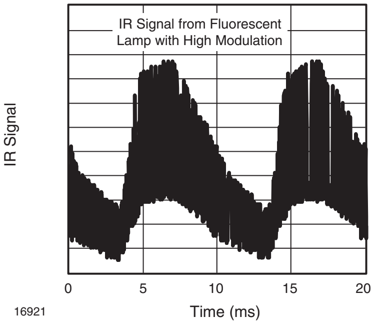


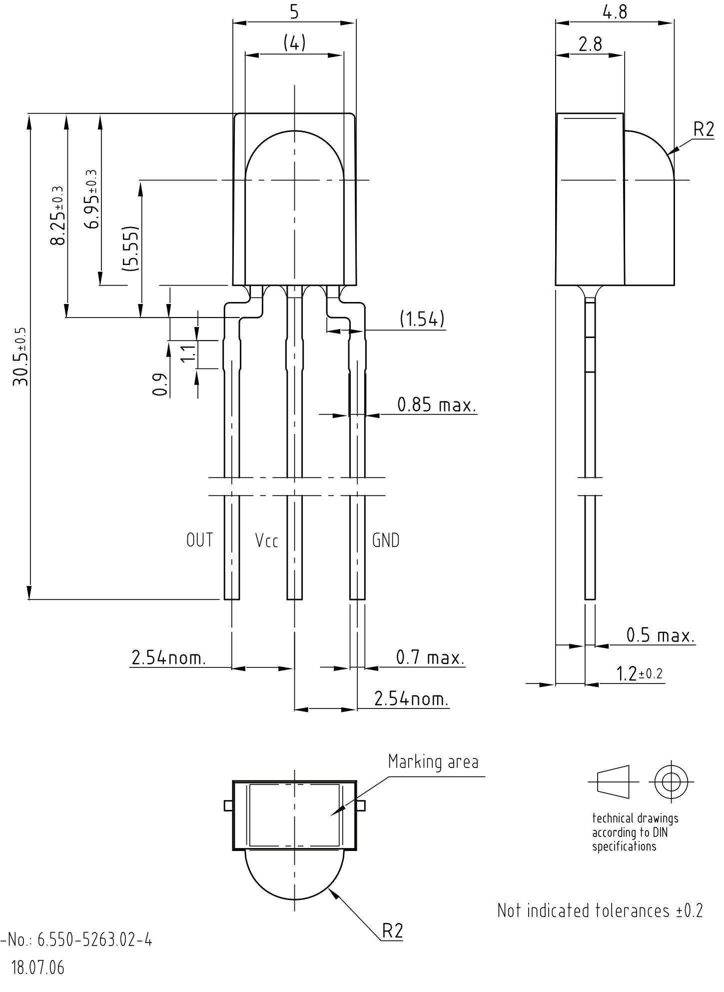
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP592..	**TSOP594..**
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 12 cycles	10 to 35 cycles ≥ 12 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	800	1300
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	yes
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

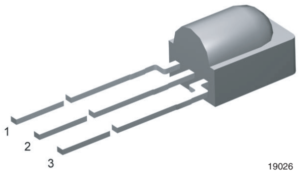
Note

- For data formats with short bursts please see the datasheet of TSOP591.., TSOP593.. .

PACKAGE DIMENSIONS in millimeters



IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

1 = OUT, 2 = GND, 3 = V_S

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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

RoHS
COMPLIANT

DESCRIPTION

The TSOP381.., TSOP383.. and TSOP385.. series 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.

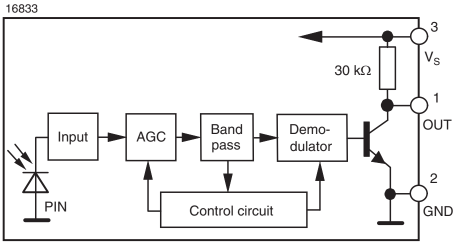
The demodulated output signal can be directly decoded by a microprocessor. The TSOP381.. is compatible with all common IR remote control data formats. The TSOP383.. is optimized to better suppress spurious pulses from energy saving fluorescent lamps. The TSOP385.. has an excellent noise suppression. 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.

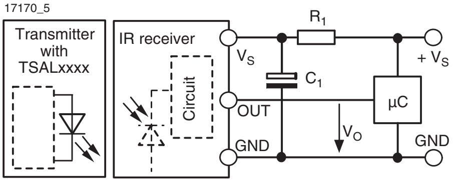
PARTS TABLE

CARRIER FREQUENCY	SHORT BURST AND HIGH DATA RATE (AGC1)	NOISY ENVIRONMENTS AND SHORT BURST (AGC3)	VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)
30 kHz	TSOP38130	TSOP38330	TSOP38530
33 kHz	TSOP38133	TSOP38333	TSOP38533
36 kHz	TSOP38136	TSOP38336	TSOP38536
38 kHz	TSOP38138	TSOP38338	TSOP38538
40 kHz	TSOP38140	TSOP38340	TSOP38540
56 kHz	TSOP38156	TSOP38356	TSOP38556

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 µF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 6	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	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 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current (pin 3)	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	$E_v = 40$ 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, $I_F = 250$ mA	d		45		m
Output voltage low (pin 1)	$I_{OSL} = 0.5$ mA, $E_e = 0.7$ mW/m², 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	$E_{e\ min.}$		0.15	0.35	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	$\varphi_{1/2}$		± 45		deg

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

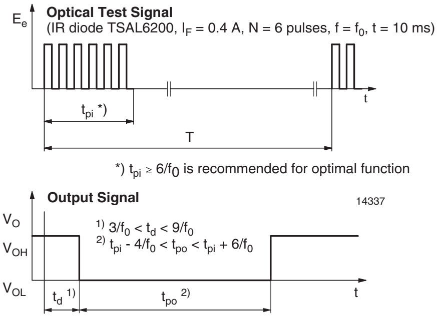


Fig. 1 - Output Active Low

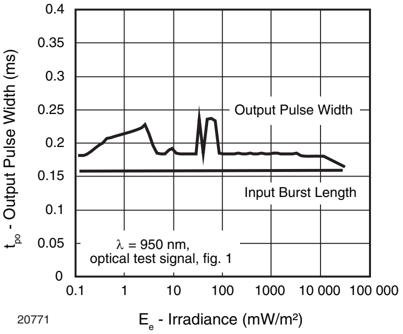


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

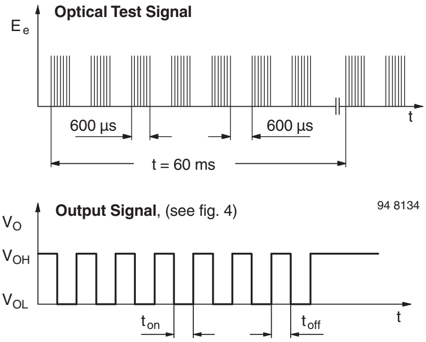


Fig. 3 - Output Function

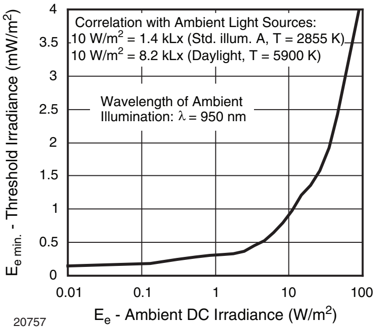


Fig. 6 - Sensitivity in Bright Ambient

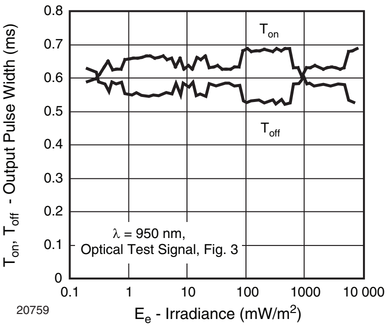


Fig. 4 - Output Pulse Diagram

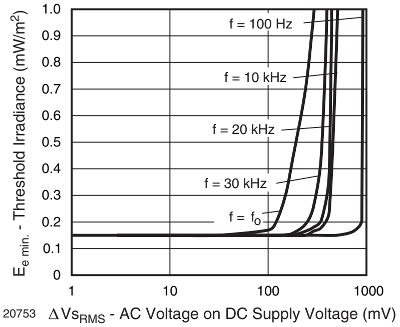


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

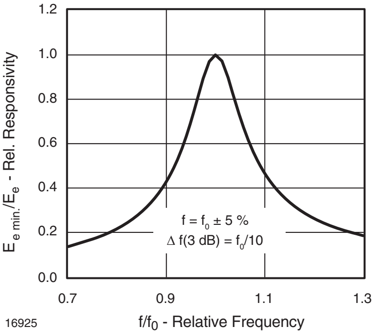


Fig. 5 - Frequency Dependence of Responsivity

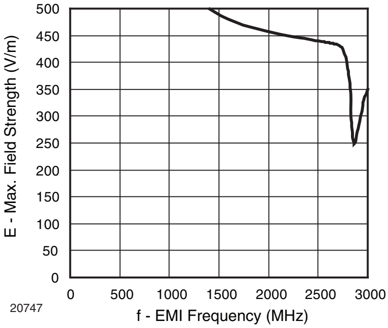


Fig. 8 - Sensitivity vs. Electric Field Disturbances

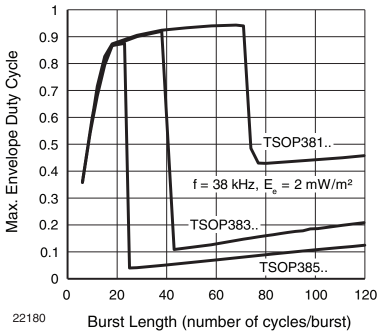


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

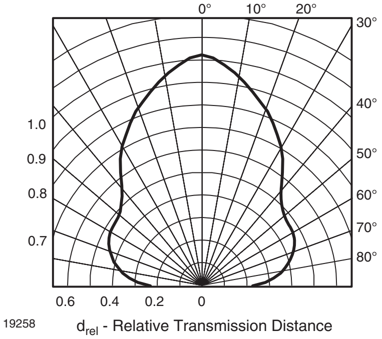


Fig. 12 - Horizontal Directivity

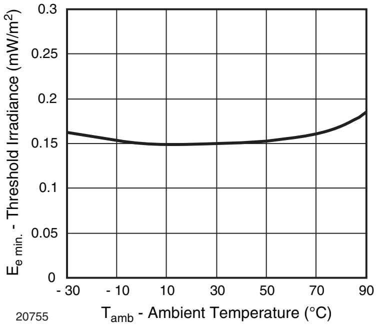


Fig. 10 - Sensitivity vs. Ambient Temperature

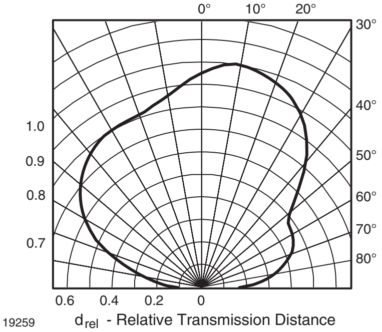


Fig. 13 - Vertical Directivity

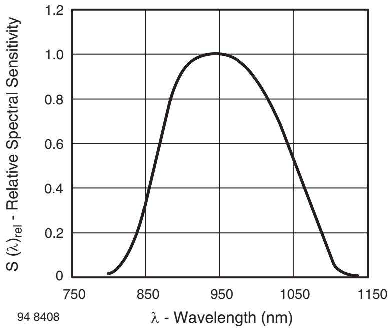


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

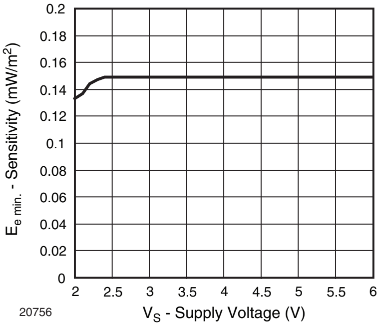


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP381.., TSOP383.. and TSOP385.. series 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 TSOP381.., TSOP383.. and TSOP385.. 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)

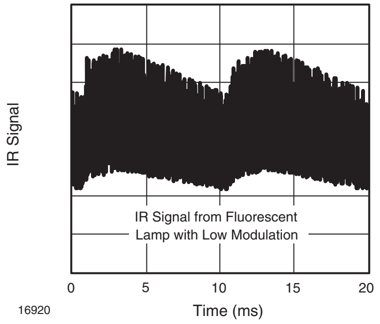


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

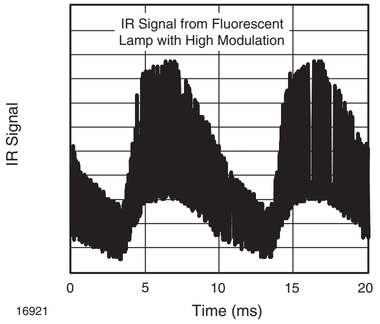


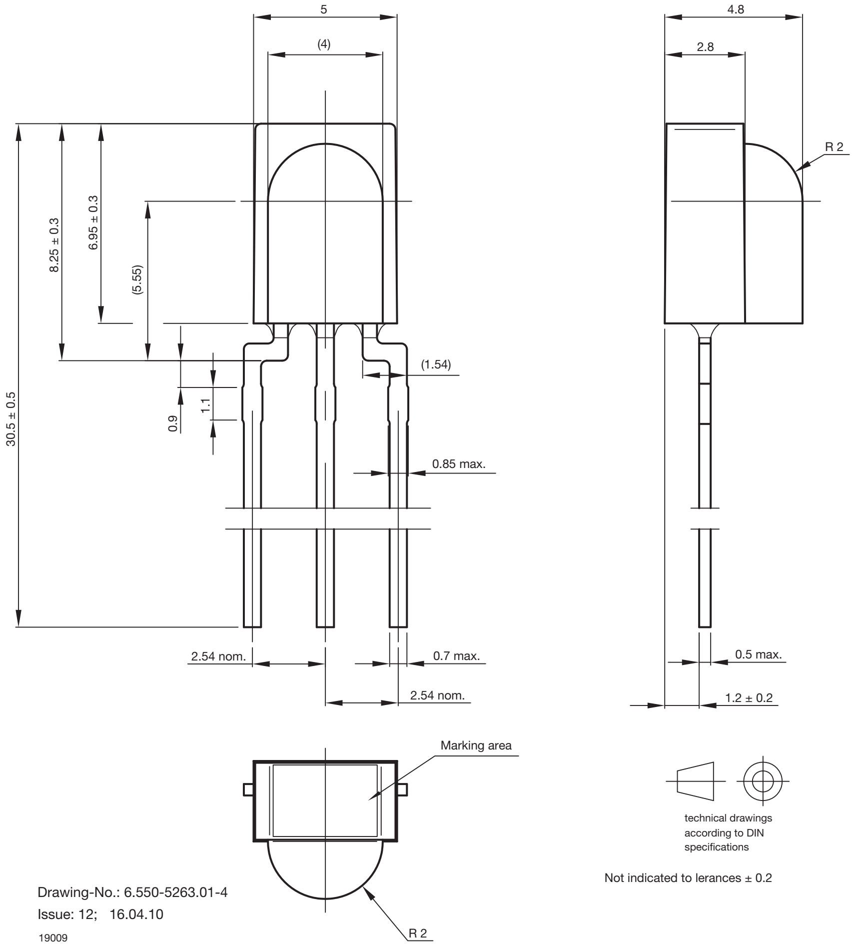
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP381..	TSOP383..	TSOP385..
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)

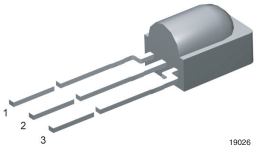
Note

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

PACKAGE DIMENSIONS in millimeters



IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning

1 = OUT, 2 = GND, 3 = V_S

FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Suitable for short bursts: burst length ≥ 6 carrier cycles
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

DESCRIPTION

The TSOP581.., TSOP583.. series are miniaturized receiversfor infrared remote control systems. A PIN diode and a preamplifier are assembled on a lead frame, the epoxy package acts as an IR filter.

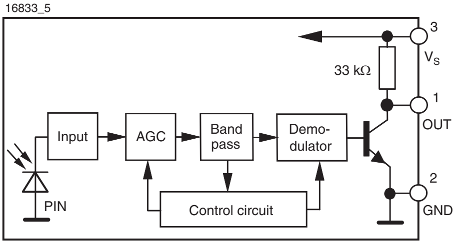
The demodulated output signal can directly be decoded by a microprocessor. The main benefit of the TSOP581.. is the compatibility to all IR remote control data formats. The TSOP583.. is optimized to better suppress spurious pulses from fluorescent lamps, LCD TVs or plasma displays.

This component has not been qualified according to automotive specifications.

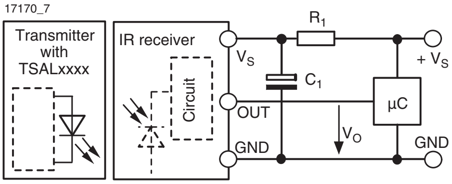
PARTS TABLE

CARRIER FREQUENCY	SHORT BURSTS AND HIGH DATA RATES (AGC1)	NOISY ENVIROMENTS AND SHORT BURSTS (AGC3)
30 kHz	TSOP58130	TSOP58330
33 kHz	TSOP58133	TSOP58333
36 kHz	TSOP58136	TSOP58336
38 kHz	TSOP58138	TSOP58338
40 kHz	TSOP58140	TSOP58340
56 kHz	TSOP58156	TSOP58356

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 6	V
Supply current (pin 3)		I_S	5	mA
Output voltage (pin 1)		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 (pin 1)		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 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current (pin 3)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 400$ mA	d		40		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ min.}$		0.3	0.45	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

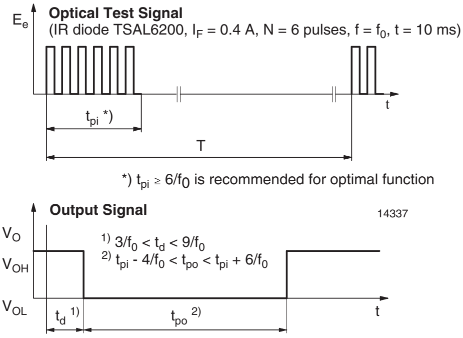


Fig. 1 - Output Active Low

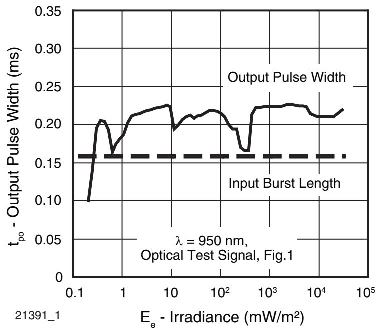


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

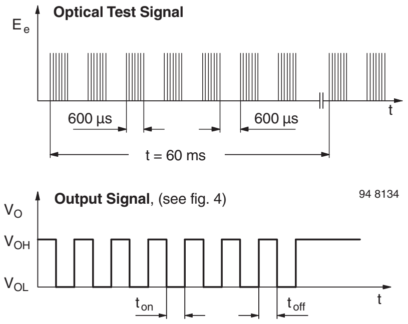


Fig. 3 - Output Function

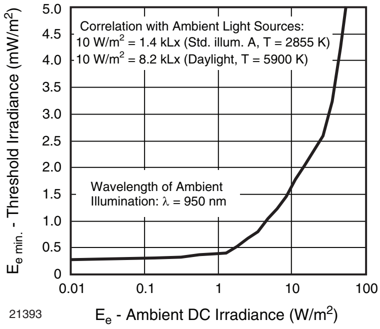


Fig. 6 - Sensitivity in Bright Ambient

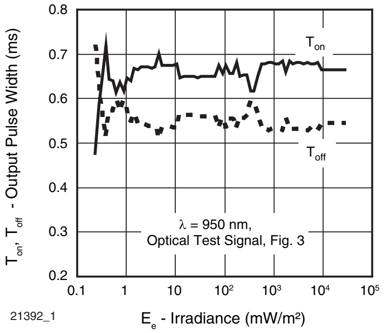


Fig. 4 - Output Pulse Diagram

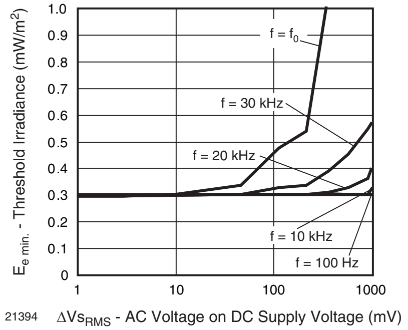


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

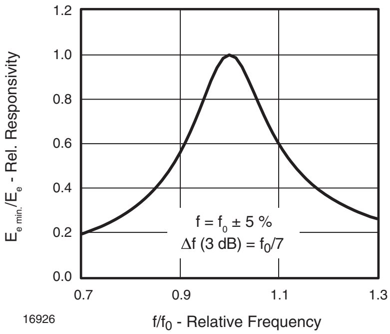


Fig. 5 - Frequency Dependence of Responsivity

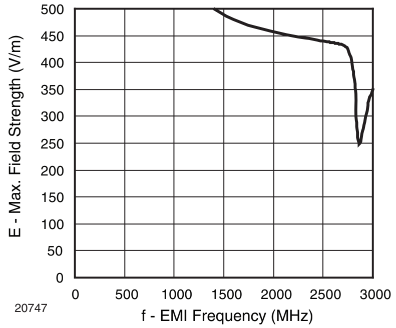


Fig. 8 - Sensitivity vs. Electric Field Disturbances

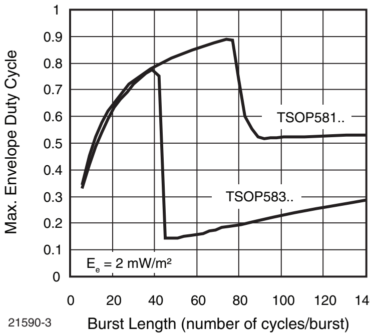


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

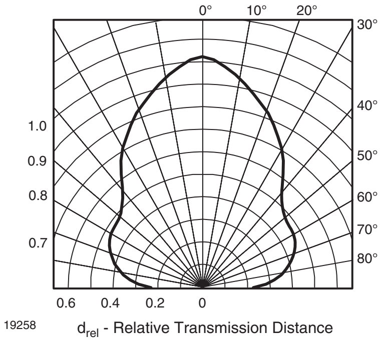


Fig. 12 - Horizontal Directivity

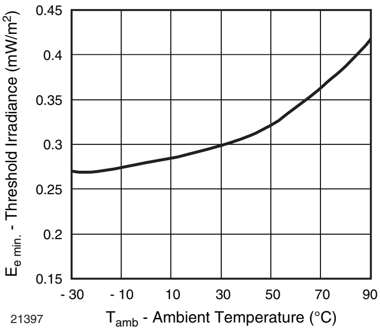


Fig. 10 - Sensitivity vs. Ambient Temperature

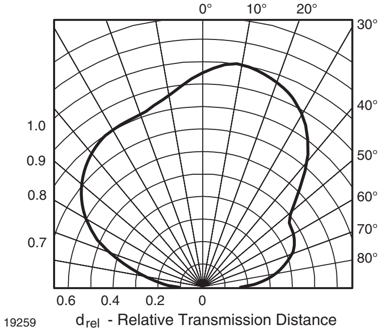


Fig. 13 - Vertical Directivity

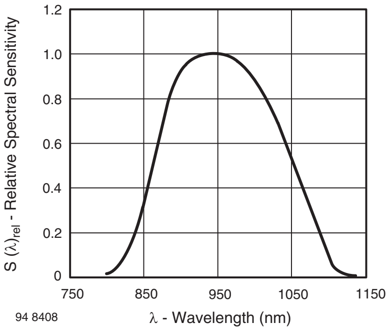


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

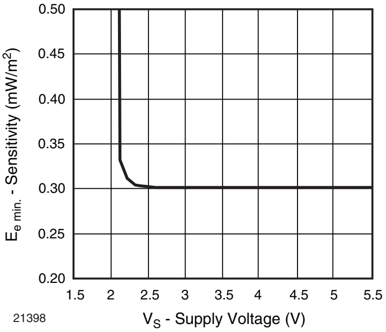


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP581.., TSOP583.. 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 TSOP581.., TSOP583.. 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 IR signals from common fluorescent lamps (example of noise pattern is shown in fig. 15 or fig. 16)

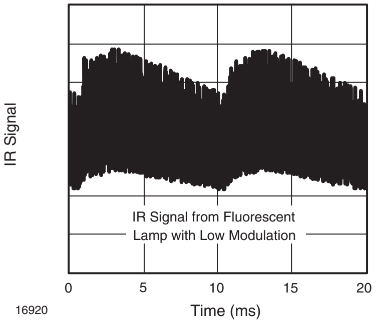


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

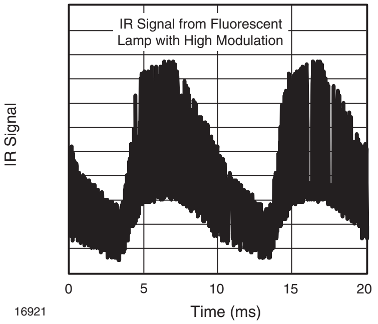


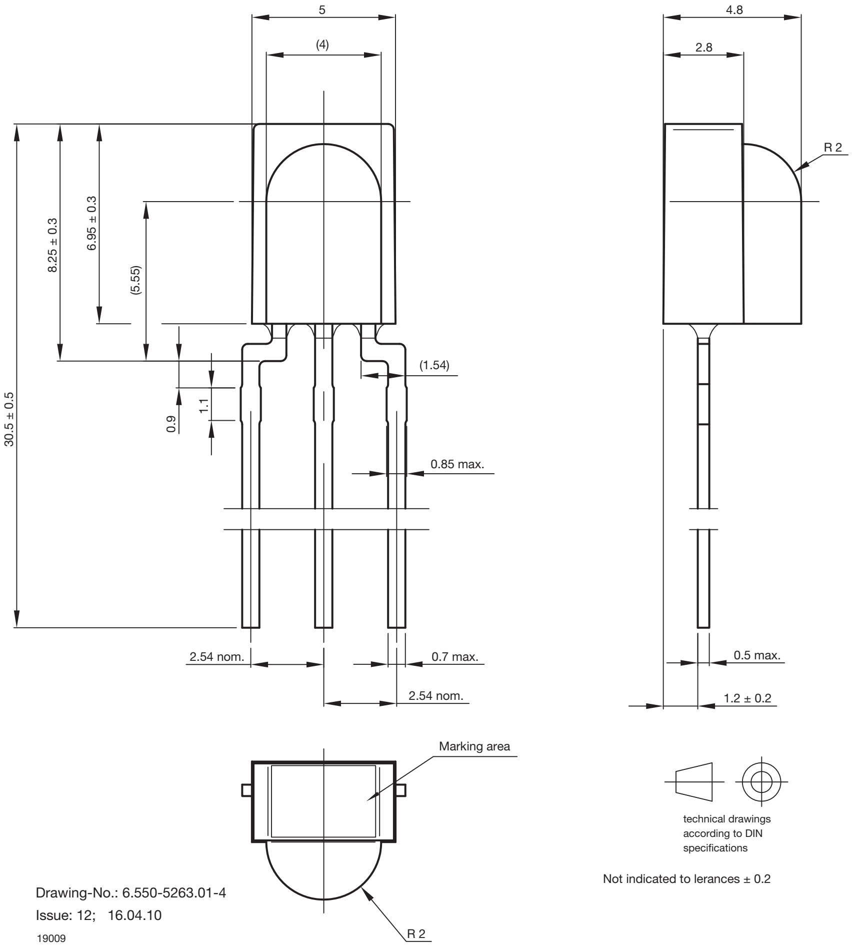
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP581..	TSOP583..
Minimum burst length	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
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 1.1 x burst length	35 cycles > 6 x burst length
Maximum number of continuous short bursts/second	2000	2000
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	yes
Recommended for RECS-80 code	yes	yes
Recommended for RCMM code	yes	yes
Recommended for r-step code	yes	yes
Recommended for XMP code	yes	yes
Suppression of interference from fluorescent lamps	Common disturbance signals are supressed (e.g. waveform of figure 15)	Even critical disturbance signals are suppressed (e.g. waveform of figure 16)

Note

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP582.., TSOP584.. .

PACKAGE DIMENSIONS in millimeters

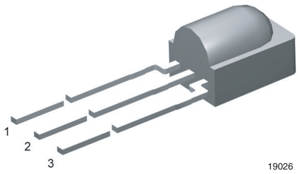


technical drawings according to DIN specifications

Not indicated to lerances ± 0.2

Drawing-No.: 6.550-5263.01-4
Issue: 12; 16.04.10
19009

IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP391.., TSOP393.. and TSOP395.. series 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.

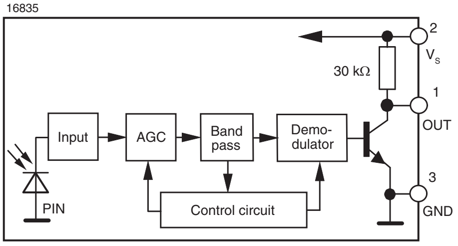
The demodulated output signal can be directly decoded by a microprocessor. The TSOP391.. is compatible with all common IR remote control data formats. The TSOP393.. is optimized to better suppress spurious pulses from energy saving fluorescent lamps. The TSOP395.. has an excellent noise suppression. 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.

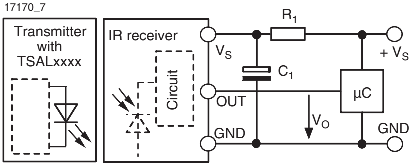
PARTS TABLE

CARRIER FREQUENCY	SHORT BURST AND HIGH DATA RATES (AGC1)	NOISY ENVIRONMENTS AND SHORT BURTS (AGC3)	VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)
30 kHz	TSOP39130	TSOP39330	TSOP39530
33 kHz	TSOP39133	TSOP39333	TSOP39533
36 kHz	TSOP39136	TSOP39336	TSOP39536
38 kHz	TSOP39138	TSOP39338	TSOP39538
40 kHz	TSOP39140	TSOP39340	TSOP39540
56 kHz	TSOP39156	TSOP39356	TSOP39556

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Supply voltage (pin 2)		V_S	- 0.3 to + 6	V
Supply current (pin 2)		I_S	3	mA
Output voltage (pin 1)		V_O	- 0.3 to (V_S + 0.3)	V
Output current (pin 1)		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 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Supply current (pin 2)	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	$E_v = 40$ 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, $I_F = 250$ mA	d		45		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ min.}$		0.15	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

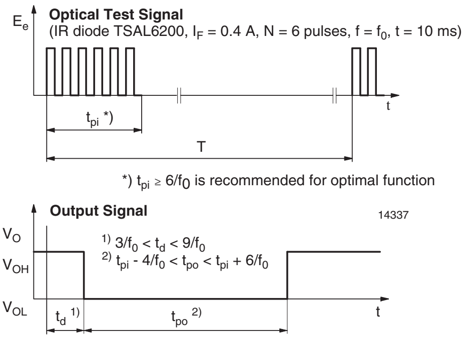


Fig. 1 - Output Active Low

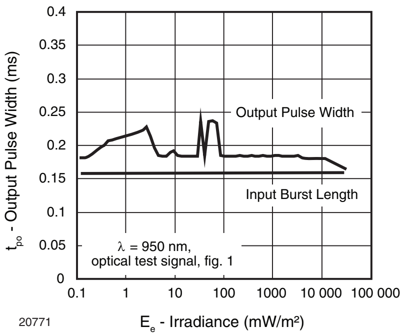


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

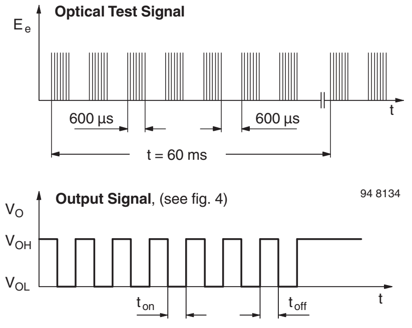


Fig. 3 - Output Function

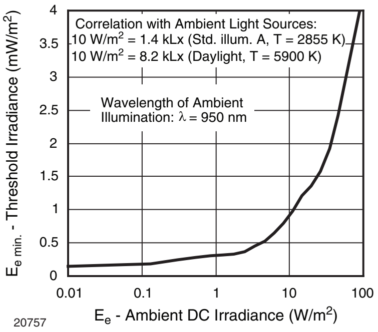


Fig. 6 - Sensitivity in Bright Ambient

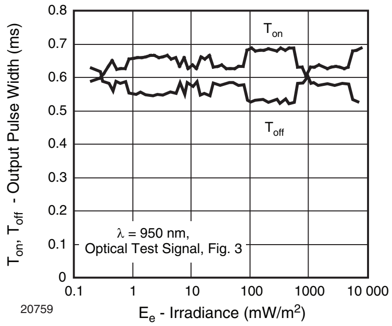


Fig. 4 - Output Pulse Diagram

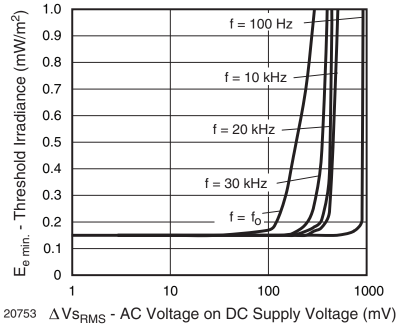


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

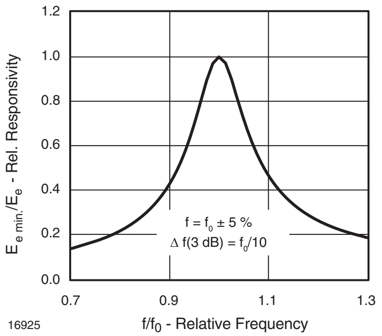


Fig. 5 - Frequency Dependence of Responsivity

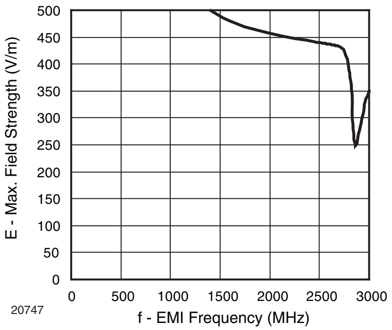


Fig. 8 - Sensitivity vs. Electric Field Disturbances

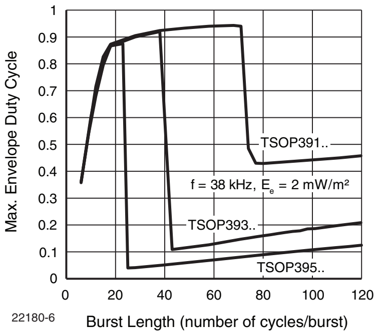


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

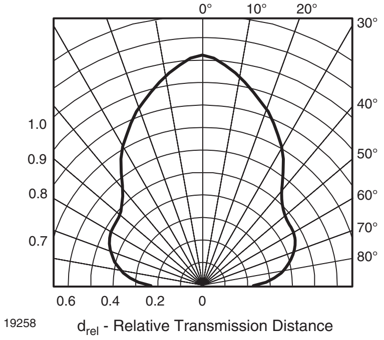


Fig. 12 - Horizontal Directivity

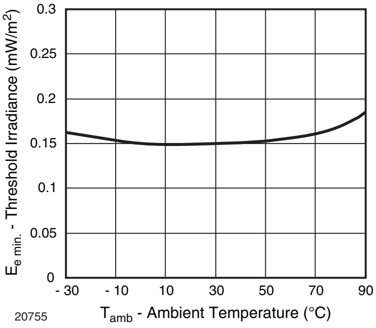


Fig. 10 - Sensitivity vs. Ambient Temperature

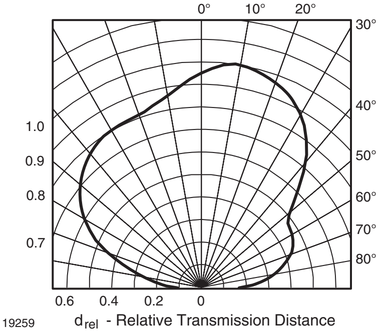


Fig. 13 - Vertical Directivity

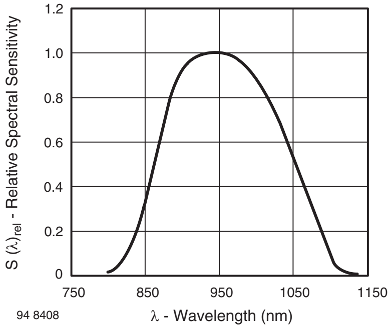


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

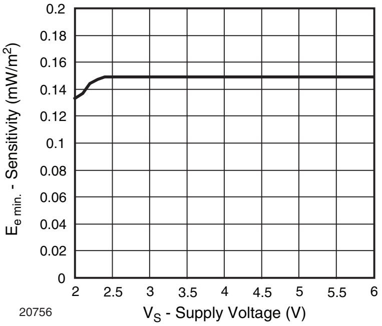


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP391.., TSOP393.. and TSOP395.. series 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 TSOP391.., TSOP393.. and TSOP395.. 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)

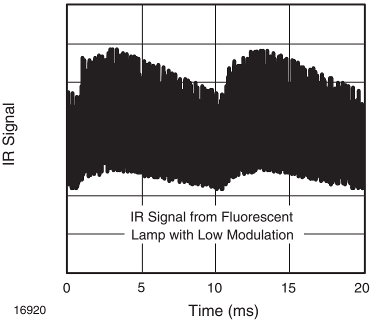


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

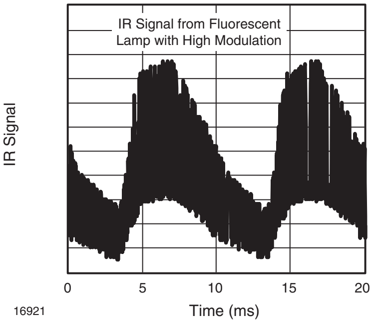


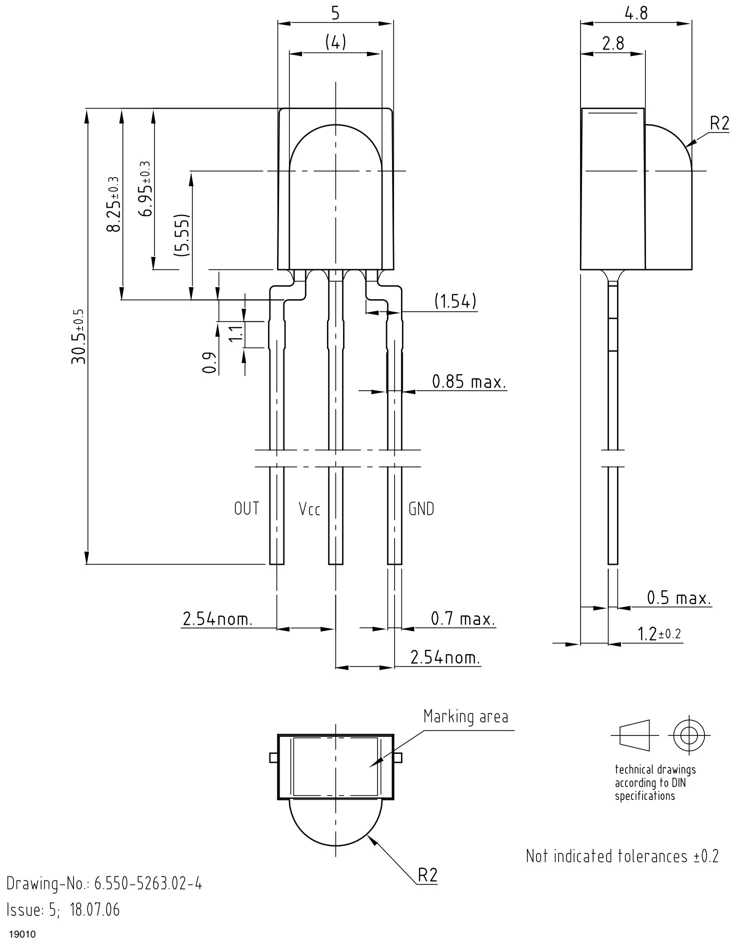
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP391..	TSOP393..	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)

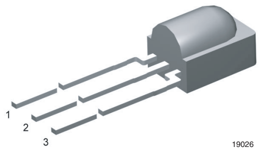
Note

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP392.., TSOP394.

PACKAGE DIMENSIONS in millimeters



IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning

1 = OUT, 2 = V_S, 3 = GND

FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Suitable for short bursts: burst length ≥ 6 carrier cycles
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP591.., TSOP593.. series 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.

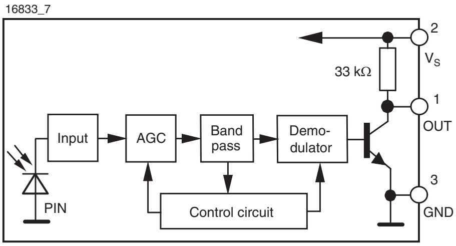
The demodulated output signal can directly be decoded by a microprocessor. The main benefit of the TSOP591.. is the compatibility to all IR remote control data formats. The TSOP593.. is optimized to better suppress spurious pulses from fluorescent lamps, LCD TVs or plasma displays.

This component has not been qualified according to automotive specifications.

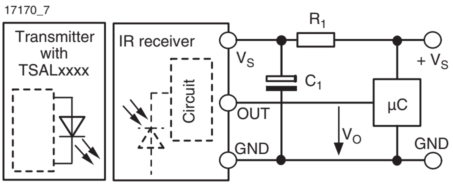
PARTS TABLE

CARRIER FREQUENCY	SHORT BURSTS AND HIGH DATA RATES (AGC1)	NOISY ENVIROMENTS AND SHORT BURSTS (AGC3)
30 kHz	TSOP59130	TSOP59330
33 kHz	TSOP59133	TSOP59333
36 kHz	TSOP59136	TSOP59336
38 kHz	TSOP59138	TSOP59338
40 kHz	TSOP59140	TSOP59340
56 kHz	TSOP59156	TSOP59356

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 μF).
The output voltage V_o should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Supply voltage (pin 2)		V_S	- 0.3 to + 6	V
Supply current (pin 2)		I_S	5	mA
Output voltage (pin 1)		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 (pin 1)		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 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Supply current (pin 2)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	E_v = 40 klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, I_F = 400 mA	d		40		m
Output voltage low (pin 1)	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², 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	$E_{e\ min.}$		0.3	0.45	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	$\varphi_{1/2}$		± 45		deg

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

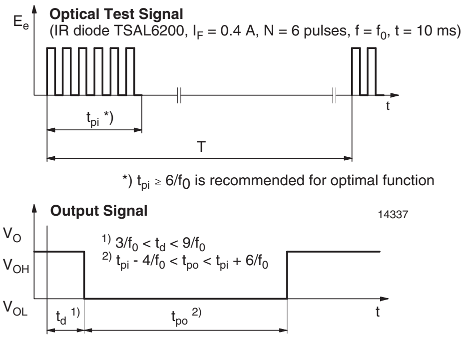


Fig. 1 - Output Active Low

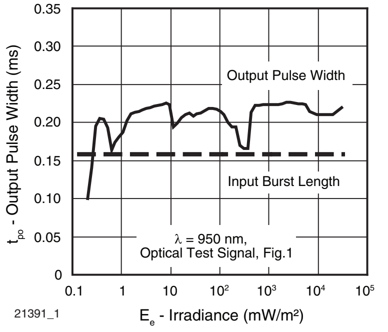


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

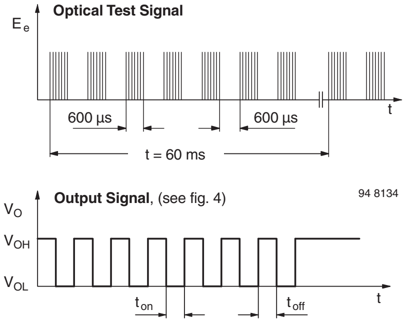


Fig. 3 - Output Function

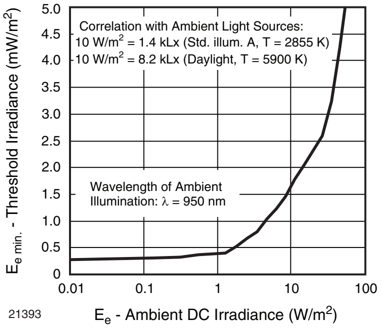


Fig. 6 - Sensitivity in Bright Ambient

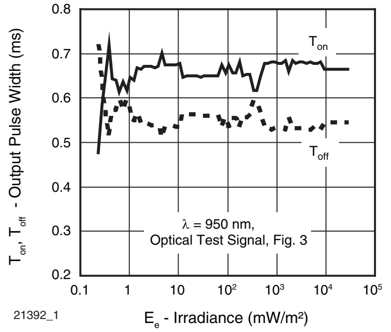


Fig. 4 - Output Pulse Diagram

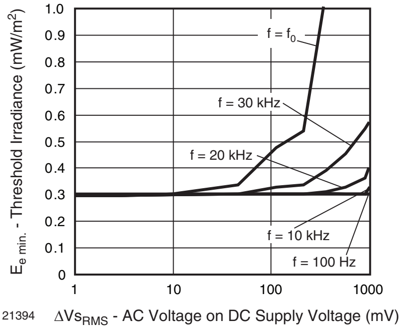


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

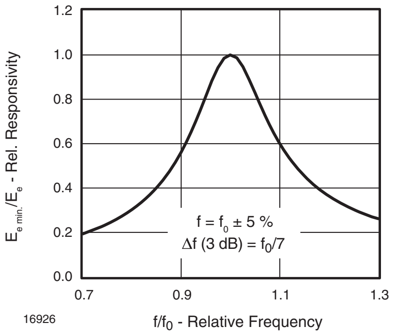


Fig. 5 - Frequency Dependence of Responsivity

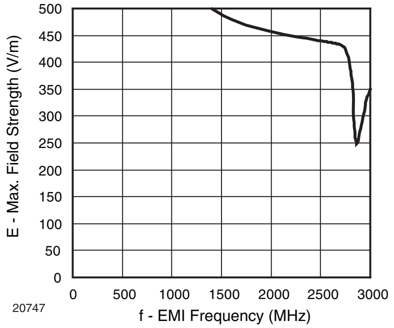


Fig. 8 - Sensitivity vs. Electric Field Disturbances

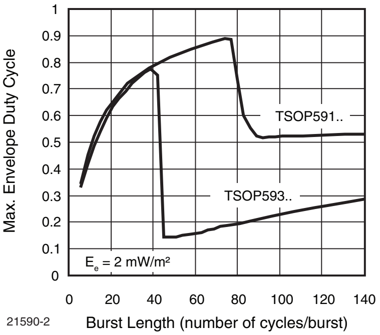


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

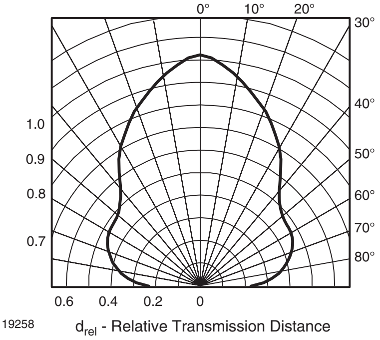


Fig. 12 - Horizontal Directivity

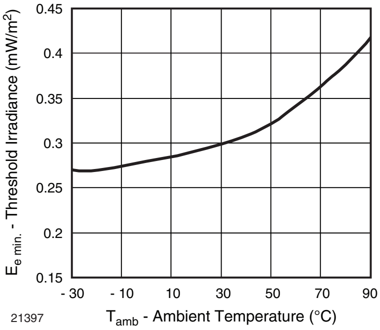


Fig. 10 - Sensitivity vs. Ambient Temperature

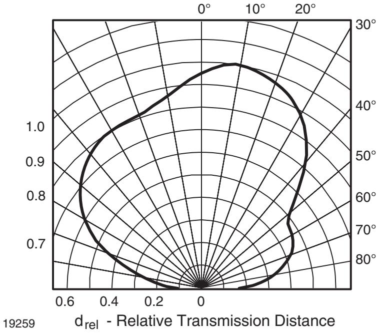


Fig. 13 - Vertical Directivity

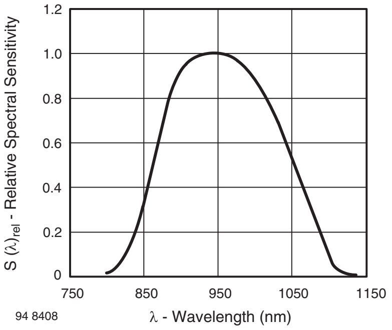


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

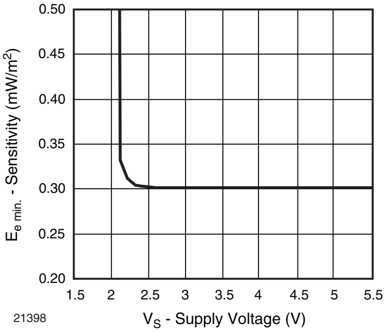


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP591.., TSOP593.. 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 TSOP591.., TSOP593.. 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 IR signals from common fluorescent lamps (example of noise pattern is shown in fig. 15 or fig. 16)

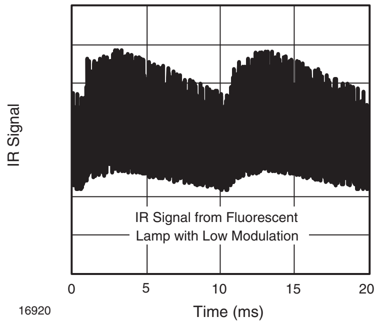


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

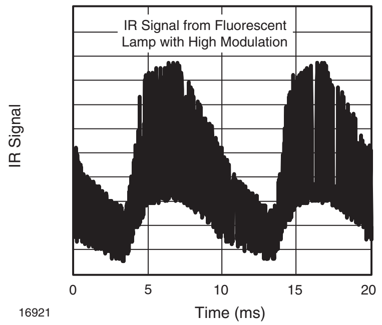


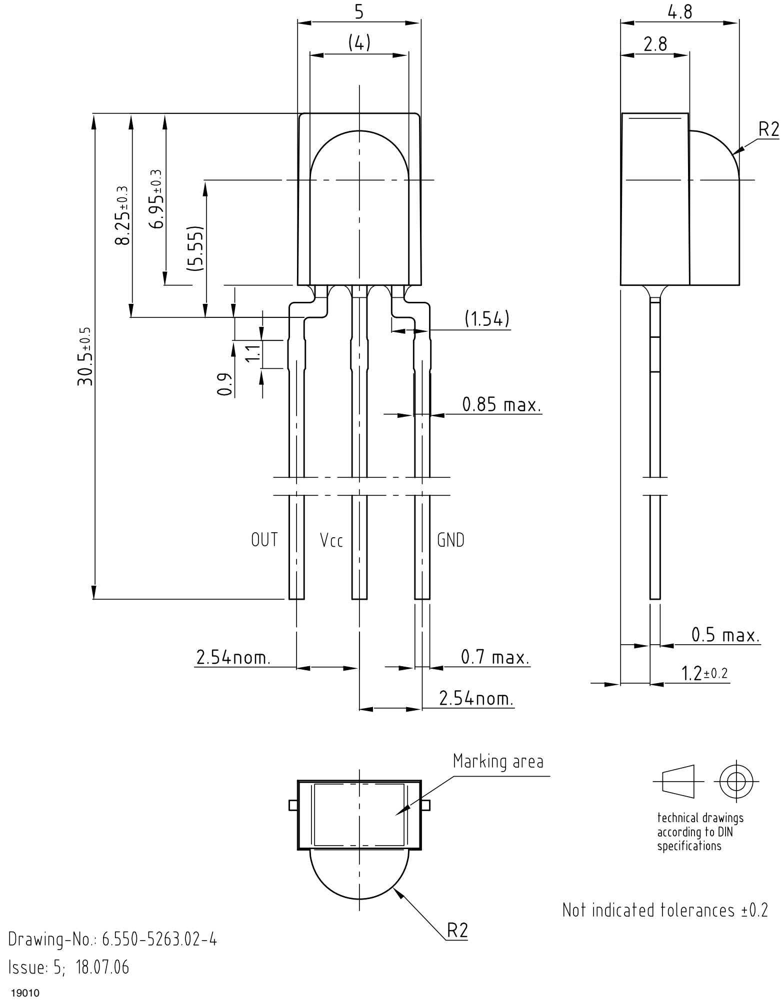
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP591..	TSOP593..
Minimum burst length	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
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 1.1 x burst length	35 cycles > 6 x burst length
Maximum number of continuous short bursts/second	2000	2000
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	yes
Recommended for RECS-80 code	yes	yes
Recommended for RCMM code	yes	yes
Recommended for r-step code	yes	yes
Recommended for XMP code	yes	yes
Suppression of interference from fluorescent lamps	Common disturbance signals are supressed (example: signal pattern of figure 15)	Even critical disturbance signals are suppressed (examples: signal pattern of figure 16)

Note

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP592.., TSOP594.. .

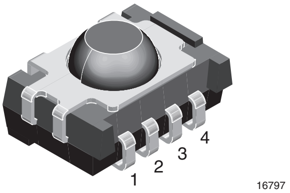
PACKAGE DIMENSIONS in millimeters



SMD

Contents

IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning

1 = GND, 2 = N.C., 3 = V_S, 4 = OUT

DESCRIPTION

The TSOP62.., TSOP64.. series are miniaturized SMD-IR receiver modules for infrared remote control systems. PIN diode and preamplifier are assembled on a lead frame, the epoxy package is designed as IR filter.

The demodulated output signal can directly be decoded by a microprocessor. The TSOP62.. is compatible with all common IR remote control data formats. The TSOP64.. is optimized to better suppress spurious pulses from energy saving lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

FEATURES

- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.7 V to 5.5 V
- Output active low
- Low power consumption
- High immunity against ambient light
- Low power consumption
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

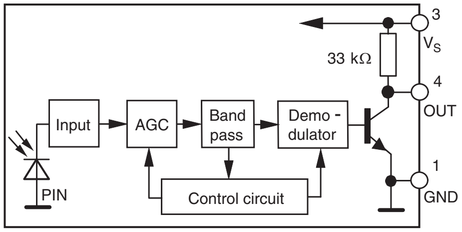
SPECIAL FEATURES

- Improved immunity against ambient light
- Suitable burst length ≥ 10 cycles/burst
- Taping available for top view and side view assembly

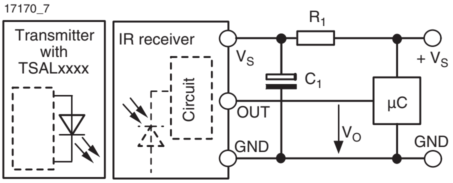
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC4)
30 kHz	TSOP6230	TSOP6430
33 kHz	TSOP6233	TSOP6433
36 kHz	TSOP6236	TSOP6436
36.7 kHz	TSOP6237	TSOP6437
38 kHz	TSOP6238	TSOP6438
40 kHz	TSOP6240	TSOP6440
56 kHz	TSOP6256	TSOP6456

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

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	V
Supply current (pin 3)		I_S	5	mA
Output voltage (pin 4)		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 (pin 4)		I_O	5	mA
Junction temperature		T_j	100	°C
Storage temperature range		T_{stg}	- 40 to + 100	°C
Operating temperature range		T_{amb}	- 25 to + 85	°C
Power consumption	$T_{amb} \leq 85$ °C	P_{tot}	10	mW

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 (pin 3)	E_v = 0, V_S = 5 V	I_{SD}	0.65	0.85	1.05	mA
	E_v = 40 klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	E_v = 0, test signal see fig. 1, IR diode TSAL6200, I_F = 400 mA	d		40		m
Output voltage low (pin 4)	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², 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	$E_{e\ min.}$		0.3	0.45	mW/m²
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ max.}$	30			W/m²
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 50		deg

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

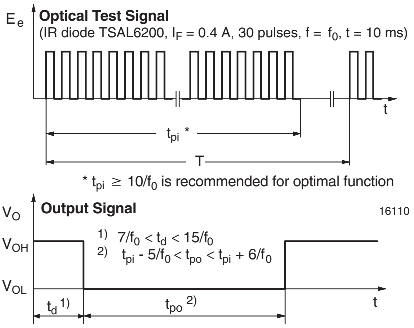


Fig. 1 - Output Active Low

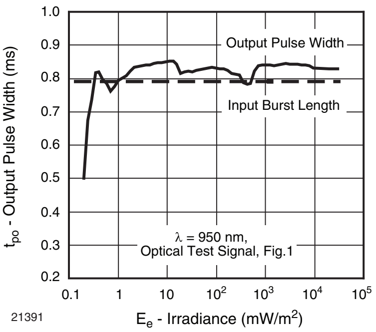


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

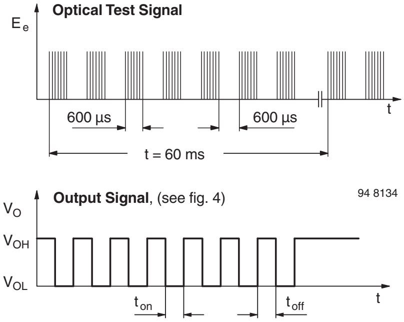


Fig. 3 - Output Function

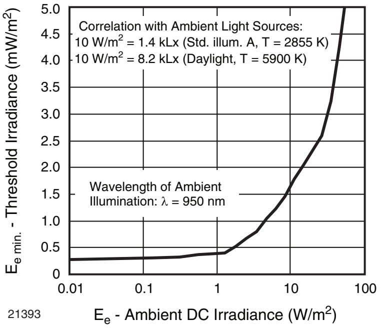


Fig. 6 - Sensitivity in Bright Ambient

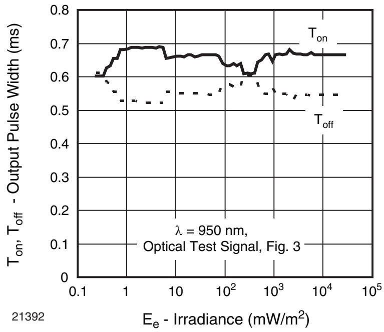


Fig. 4 - Output Pulse Diagram

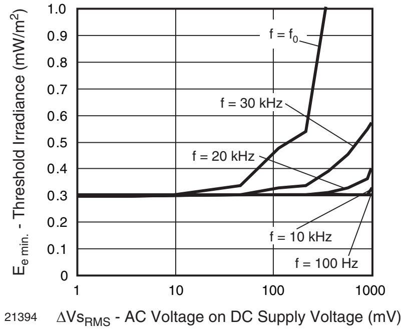


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

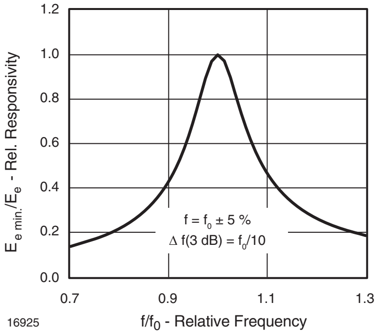


Fig. 5 - Frequency Dependence of Responsivity

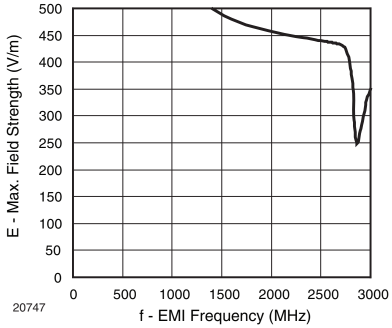


Fig. 8 - Sensitivity vs. Electric Field Disturbances

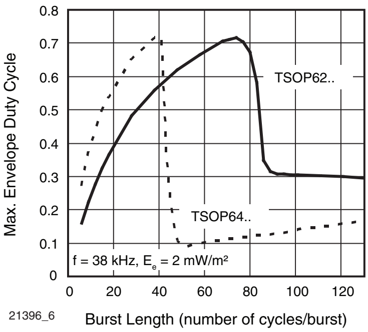


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

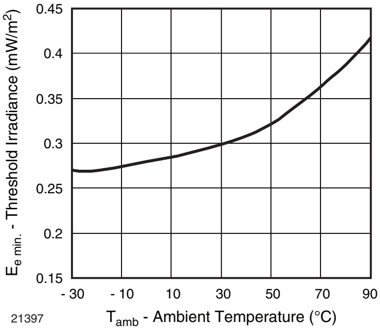


Fig. 10 - Sensitivity vs. Ambient Temperature

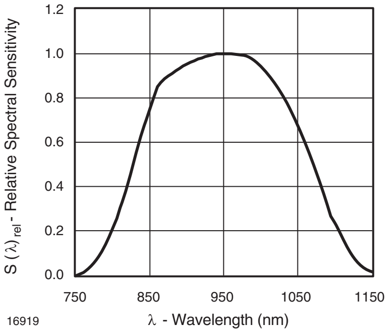


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

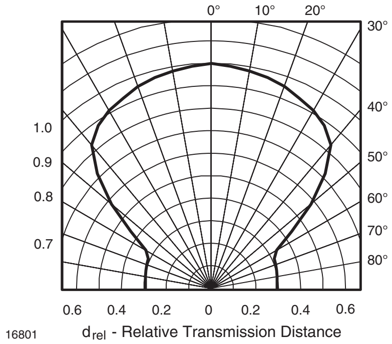


Fig. 12 - Horizontal Directivity

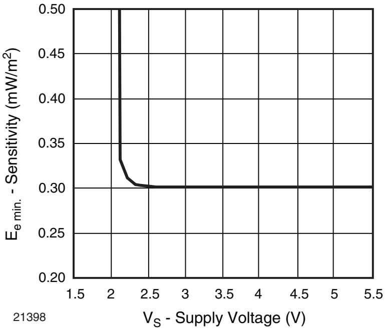


Fig. 13 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP62.., TSOP64.. series 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 TSOP62.., TSOP64.. 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 14 or figure 15)

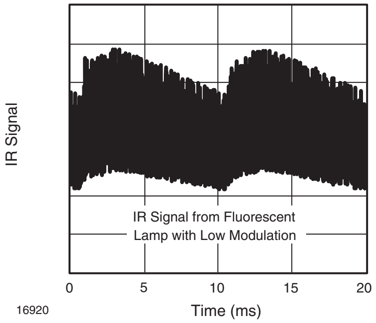


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

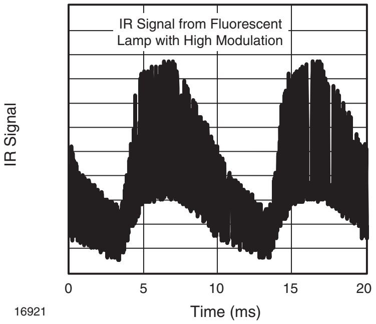


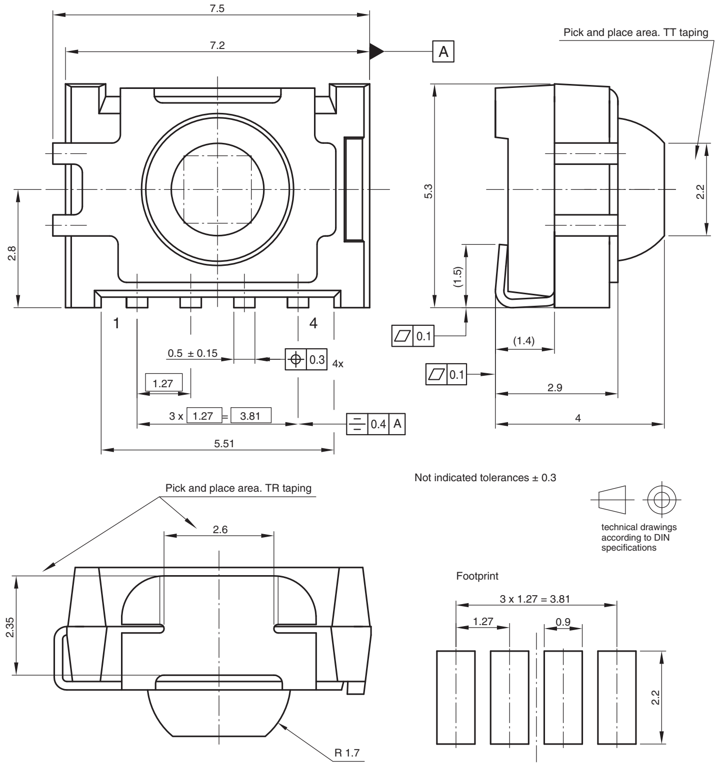
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP62..	TSOP64..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 12 cycles	10 to 35 cycles ≥ 12 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	800	1300
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	yes
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

Note

- For data formats with short bursts please see the datasheet of TSOP61.., TSOP63..

PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.544-5341.01-4
Issue: 8; 02.09.09
16776

ASSEMBLY INSTRUCTIONS

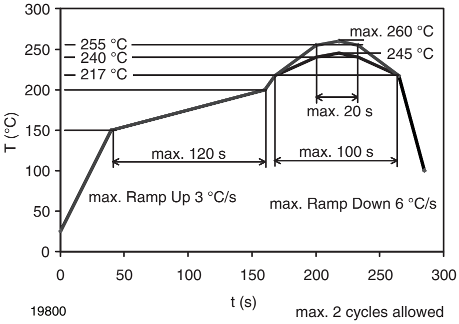
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

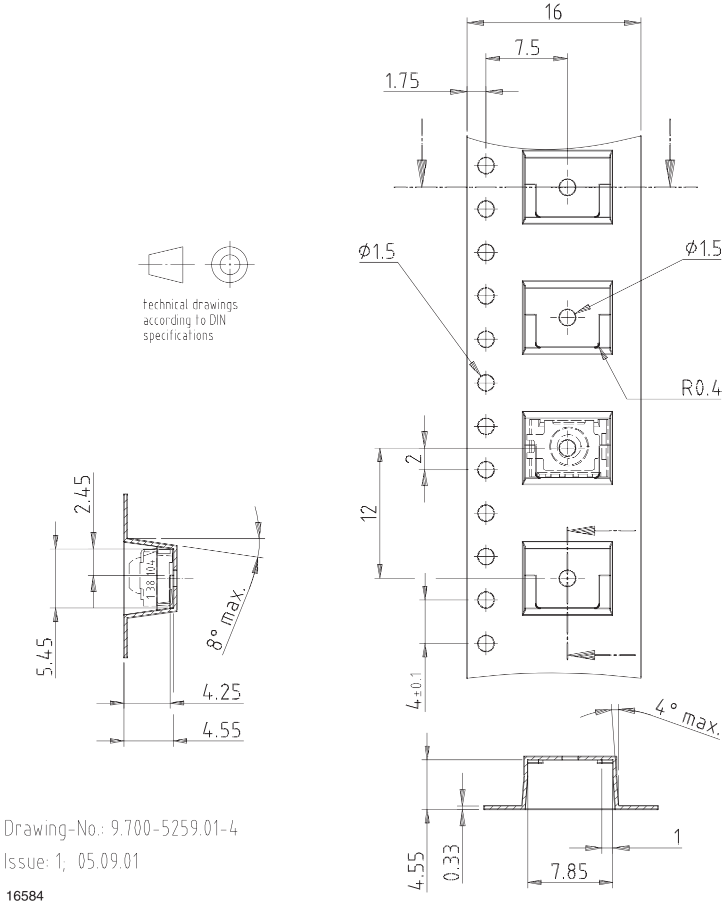
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

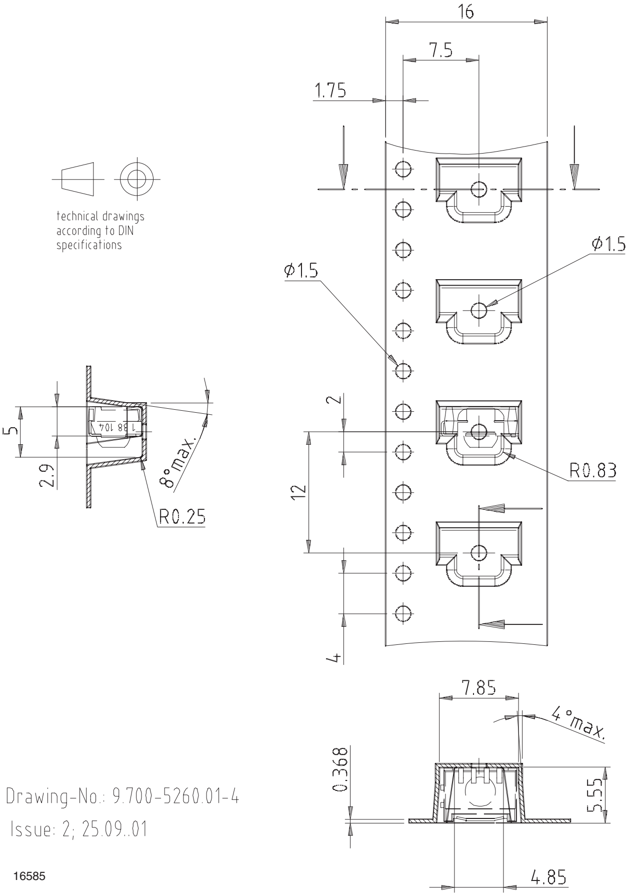
VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



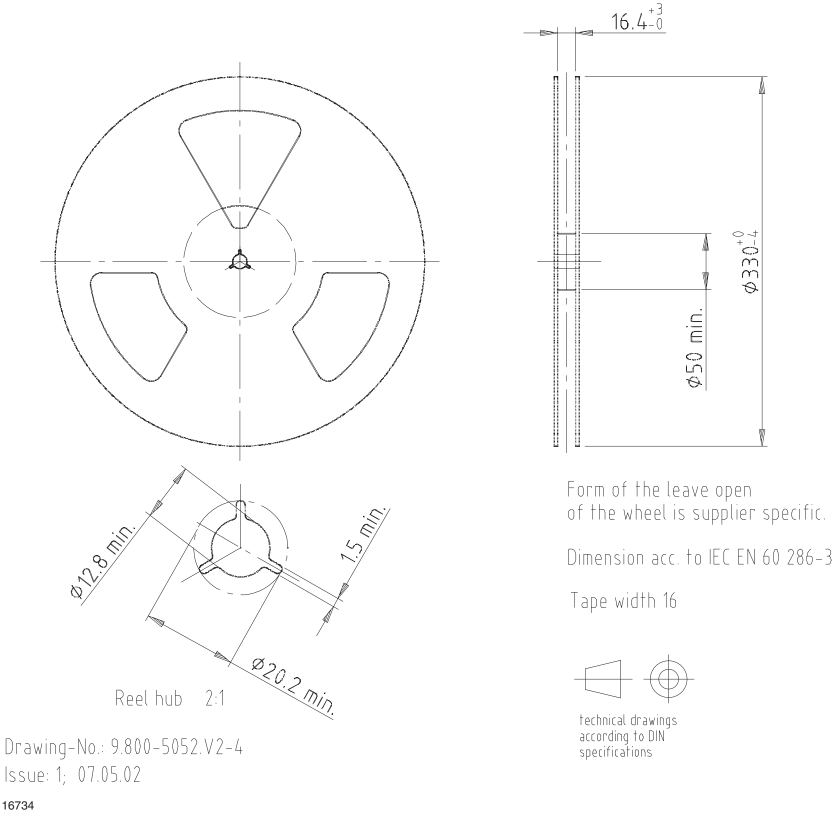
TAPING VERSION TSOP..TT DIMENSIONS in millimeters



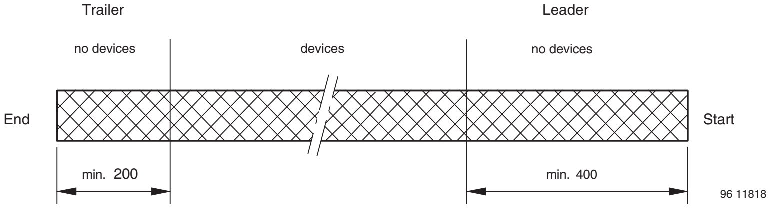
TAPING VERSION TSOP..TR DIMENSIONS in millimeters



REEL DIMENSIONS in millimeters



LEADER AND TRAILER DIMENSIONS in millimeters



COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 mm/min. ± 10 mm/min.
165° to 180° peel angle

LABEL

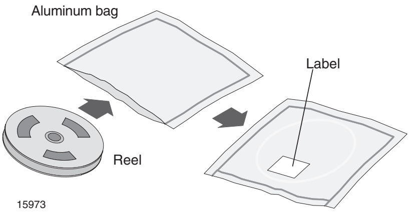
Standard bar code labels for finished goods

The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)		
PLAIN WRITING	**ABBREVIATION**	**LENGTH**
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
LONG BAR CODE TOP	**TYPE**	**LENGTH**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
SHORT BAR CODE BOTTOM	**TYPE**	**LENGTH**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



15973

FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

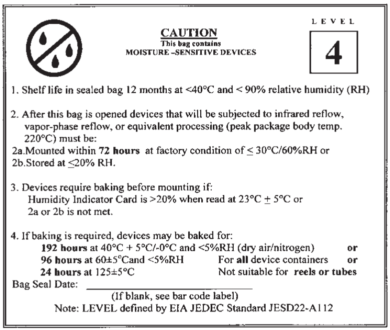
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)
or
96 h at 60 °C + 5 °C and < 5 % RH for all device containers
or
24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE –SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:

192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen)		**or**
96 hours at 60±5°Cand <5%RH	For **all** device containers	**or**
24 hours at 125±5°C	Not suitable for **reels or tubes**	

Bag Seal Date: ____________________
(If blank, see bar code label)
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

Example of JESD22-A112 level 4 label

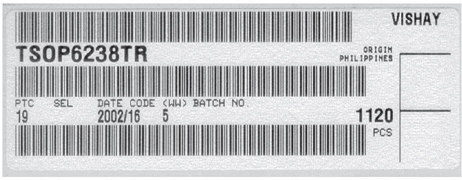
ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.

BAR CODE PRODUCT LABEL EXAMPLE:



VISHAY

TSOP6238TR

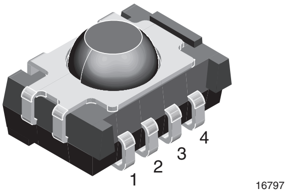
ORIGIN
PHILIPPINES

PTC SEL DATE CODE (WW) BATCH NO.
19 2002/16 5

1120
PCS

16962

IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning

1 = GND, 2 = N.C., 3 = V_S, 4 = OUT

DESCRIPTION

The TSOP61.., TSOP63.. series are miniaturized SMD-IR 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 directly be decoded by a microprocessor. The main benefit of the TSOP61.. is the compatibility to all IR remote control data formats. The TSOP63.. is optimized to better suppress spurious pulses from fluorescent lamps, LCD TVs or plasma displays.

This component has not been qualified according to automotive specifications.

FEATURES

- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Continuous data transmission possible
- Supply voltage: 2.7 V to 5.5 V
- Output active low
- Low power consumption
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

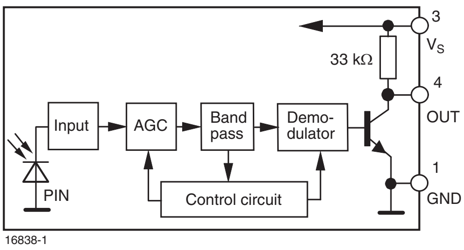
SPECIAL FEATURES

- Operation with short burst possible (≥ 6 cycles/burst)
- Taping available for topview and sideview assembly
- Enhanced data rate up to 4000 bit/s (TSOP61..)
- Enhanced suppression of noise from fluorescent lamps, LCD TVs or plasma TVs (TSOP63..)

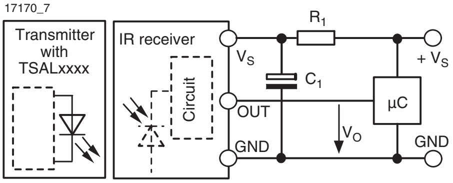
PARTS TABLE

CARRIER FREQUENCY	SHORT BURSTS AND HIGH DATA RATES (AGC1)	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)
30 kHz	TSOP6130	TSOP6330
33 kHz	TSOP6133	TSOP6333
36 kHz	TSOP6136	TSOP6336
36.7 kHz	TSOP6137	TSOP6337
38 kHz	TSOP6138	TSOP6338
40 kHz	TSOP6140	TSOP6340
56 kHz	TSOP6156	TSOP6356

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional
to improve the robustness against electrical overstress
(typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_o should not be pulled down to a level
below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 6	V
Supply current (pin 3)		I_S	5	mA
Output voltage (pin 4)		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 (pin 4)		I_O	5	mA
Junction temperature		T_j	100	°C
Storage temperature range		T_{stg}	- 40 to + 100	°C
Operating temperature range		T_{amb}	- 25 to + 85	°C
Power consumption	$T_{amb} \leq 85$ °C	P_{tot}	10	mW

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 (pin 3)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	E_v = 40 klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, I_F = 400 mA	d		40		m
Output voltage low (pin 4)	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², 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	$E_{e\ min.}$		0.3	0.45	mW/m²
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ max.}$	30			W/m²
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 50		deg

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

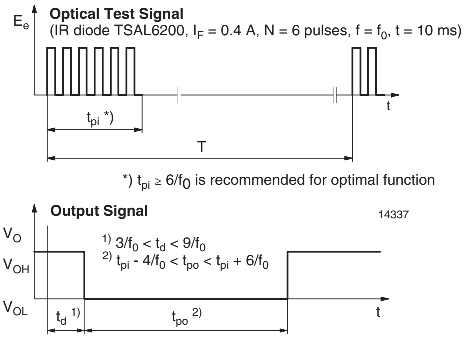


Fig. 1 - Output Active Low

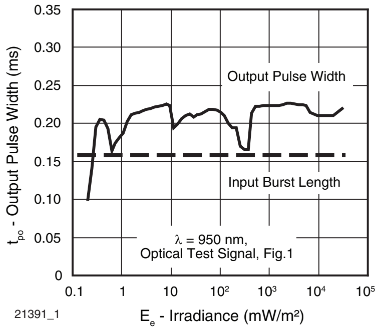


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

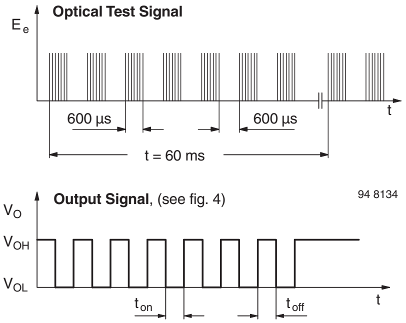


Fig. 3 - Output Function

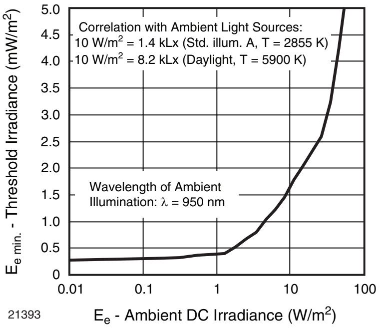


Fig. 6 - Sensitivity in Bright Ambient

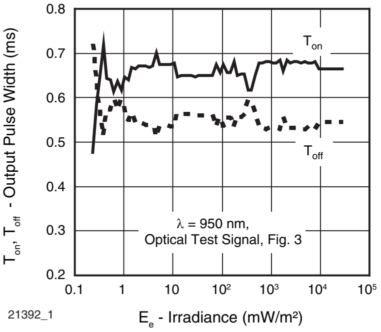


Fig. 4 - Output Pulse Diagram

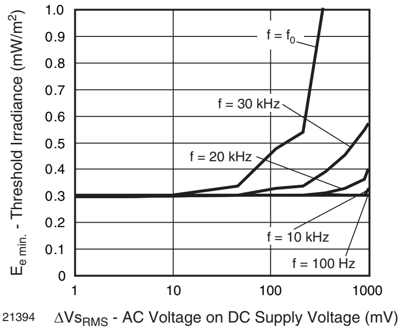


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

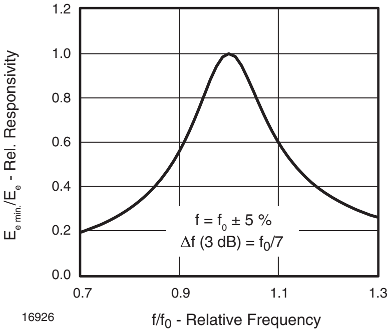


Fig. 5 - Frequency Dependence of Responsivity

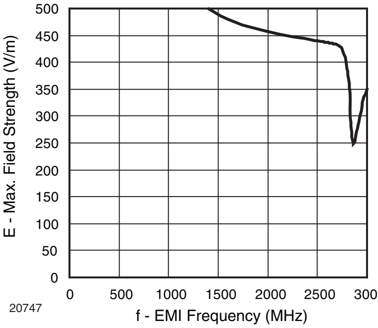


Fig. 8 - Sensitivity vs. Electric Field Disturbances

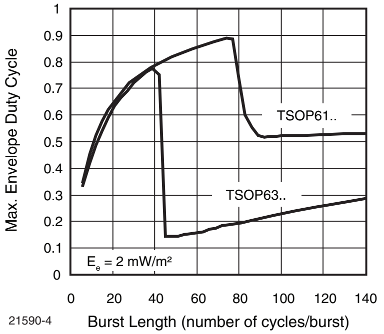


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

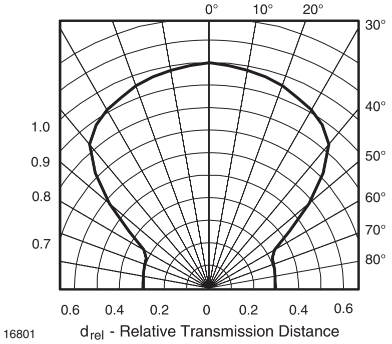


Fig. 12 - Horizontal Directivity

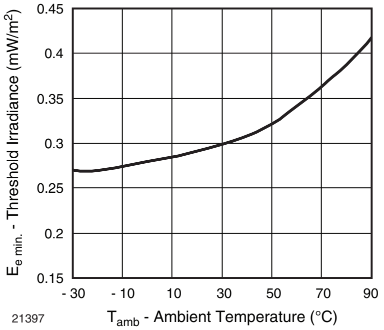


Fig. 10 - Sensitivity vs. Ambient Temperature

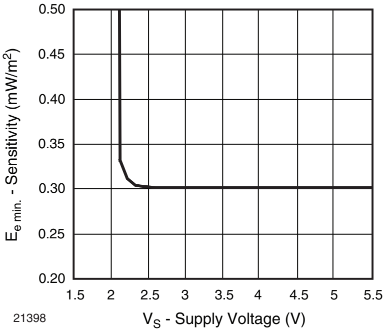


Fig. 13 - Sensitivity vs. Supply Voltage

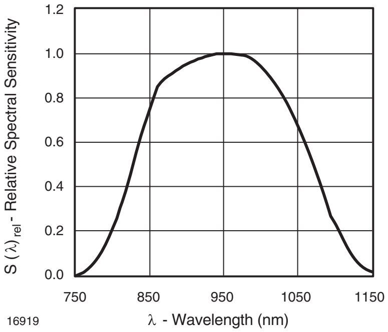


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP61.., TSOP63.. series 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 TSOP61.., TSOP63.. 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 IR signals from common fluorescent lamps (example of noise pattern is shown in fig. 14 or fig. 15)

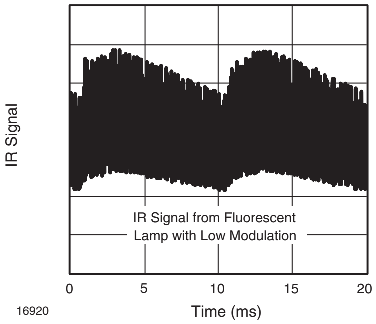


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

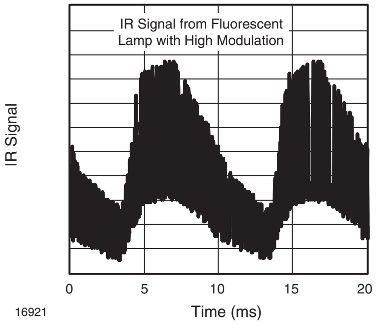


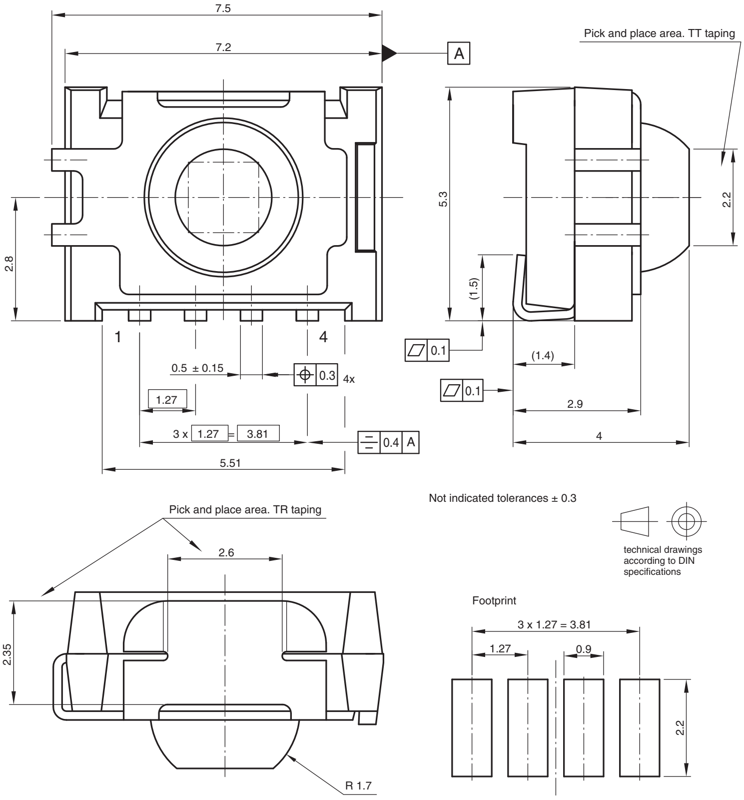
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP61..	TSOP63..
Minimum burst length	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
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 1.1 x burst length	35 cycles > 6 x burst length
Maximum number of continuous short bursts/second	2000	2000
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	yes
Recommended for RECS-80 code	yes	yes
Recommended for RCMM code	yes	yes
Recommended for r-step code	yes	yes
Recommended for XMP code	yes	yes
Suppression of interference from fluorescent lamps	Common disturbance signals are supressed (e.g. waveform of figure 14)	Even critical disturbance signals are suppressed (e.g. waveform of figure 15)

Note

- For data formats with long bursts (10 carrier cycles or longer) we recommend the TSOP62.., TSOP 64.. because of the better noise suppression.

PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.544-5341.01-4
Issue: 8; 02.09.09
16776

ASSEMBLY INSTRUCTIONS

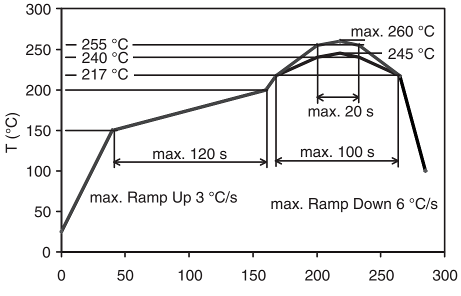
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

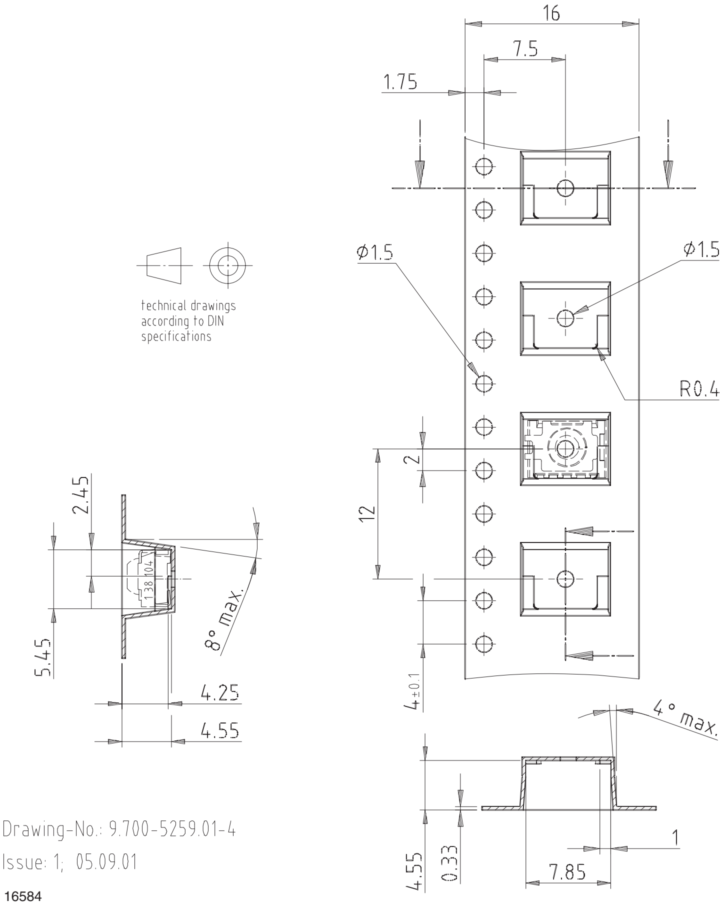
VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



19800

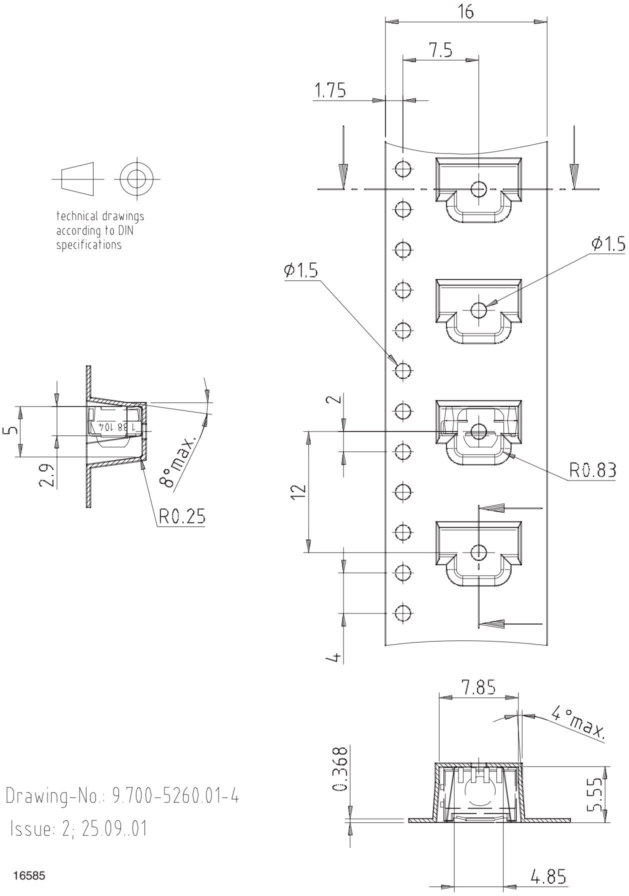
max. 2 cycles allowed

TAPING VERSION TSOP..TT DIMENSIONS in millimeters

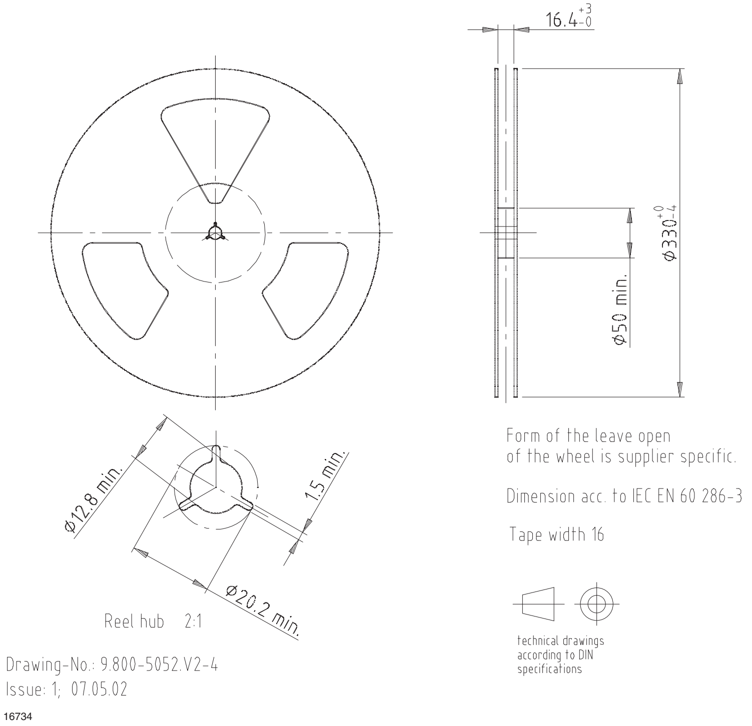


16584

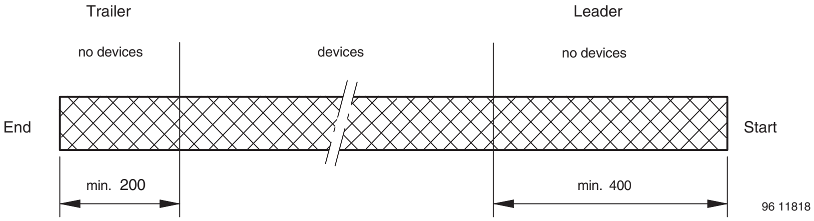
TAPING VERSION TSOP..TR DIMENSIONS in millimeters



REEL DIMENSIONS in millimeters



LEADER AND TRAILER DIMENSIONS in millimeters



COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 ± 10 mm/min.
165° to 180° peel angle

LABEL

Standard bar code labels for finished goods

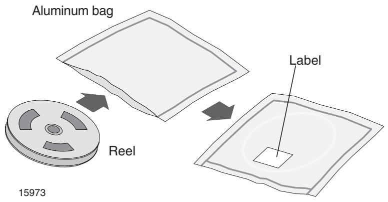
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)

PLAIN WRITING	ABBREVIATION	LENGTH
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
LONG BAR CODE TOP	**TYPE**	**LENGTH**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
SHORT BAR CODE BOTTOM	**TYPE**	**LENGTH**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C/ - 0 °C and < 5 % RH (dry air/nitrogen)

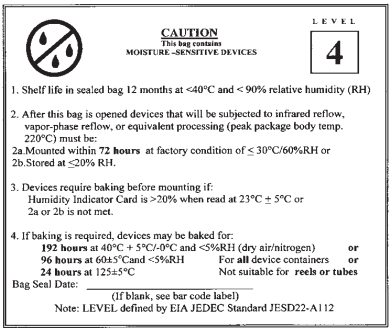
or

96 h at 60 °C + 5 °C and < 5 % RH for all device containers

or

24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE -SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:

192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen)		or
96 hours at 60±5°Cand <5%RH	For **all** device containers	or
24 hours at 125±5°C	Not suitable for **reels or tubes**	

Bag Seal Date: ______________________
(If blank, see bar code label)
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

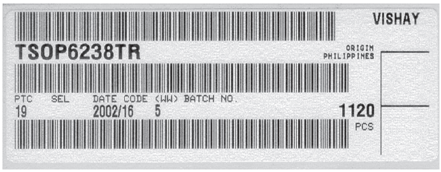
Example of JESD22-A112 level 4 label

ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



VISHAY
TSOP6238TR
ORIGIN PHILIPPINES
PTC SEL DATE CODE (WW) BATCH NO.
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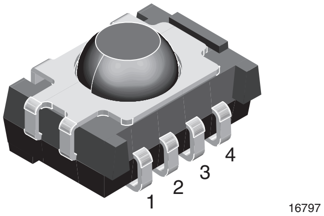
16962

IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

1 = GND, 2 = N.C., 3 = V_S, 4 = OUT

FEATURES

- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage range: 2.5 V to 5.5 V
- Improved immunity against modulated light sources
- Insensitive to supply voltage ripple and noise
- Taping available for topview and sideview assembly
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP352.., TSOP354.. series are miniaturized SMD IR receiver modules for infrared remote control systems. PIN diode and preamplifier are assembled on lead frame, the epoxy package is designed as IR filter.

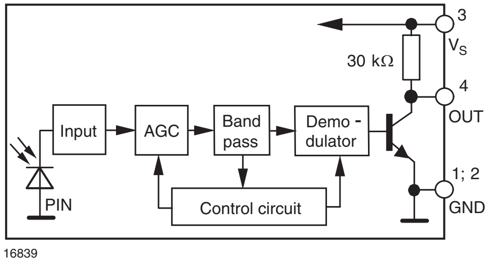
The demodulated output signal can directly be decoded by a microprocessor. The TSOP352.. is compatible with all common IR remote control data formats. The TSOP354.. is optimized to suppress almost all spurious pulses from energy saving lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

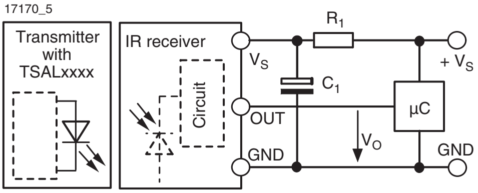
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	VERY NOISY ENVIRONMENTS (AGC4)
30 kHz	TSOP35230	TSOP35430
33 kHz	TSOP35233	TSOP35433
36 kHz	TSOP35236	TSOP35436
38 kHz	TSOP35238	TSOP35438
40 kHz	TSOP35240	TSOP35440
56 kHz	TSOP35256	TSOP35456

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 µF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 6	V
Supply current (pin 3)		I_S	3	mA
Output voltage (pin 4)		V_O	- 0.3 to (V_S + 0.3)	V
Output current (pin 4)		I_O	5	mA
Junction temperature		T_j	100	°C
Storage temperature range		T_{stg}	- 40 to + 100	°C
Operating temperature range		T_{amb}	- 30 to + 85	°C
Power consumption	$T_{amb} \leq 85$ °C	P_{tot}	10	mW

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 (pin 3)	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	E_v = 40 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 = 250 mA	d		45		m
Output voltage low (pin 4)	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², 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	$E_{e\ min.}$		0.15	0.35	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	$\varphi_{1/2}$		± 50		deg

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

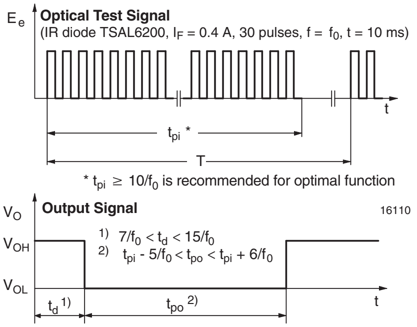


Fig. 1 - Output Active Low

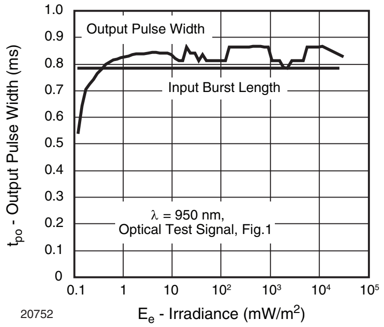


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

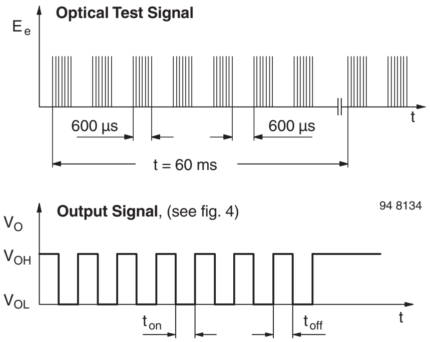


Fig. 3 - Output Function

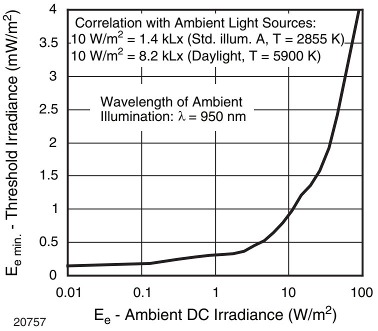


Fig. 6 - Sensitivity in Bright Ambient

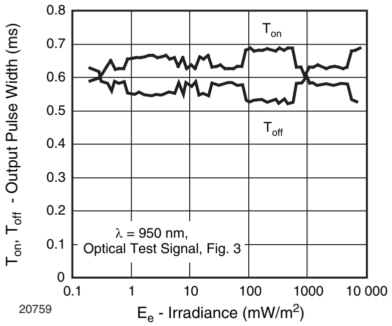


Fig. 4 - Output Pulse Diagram

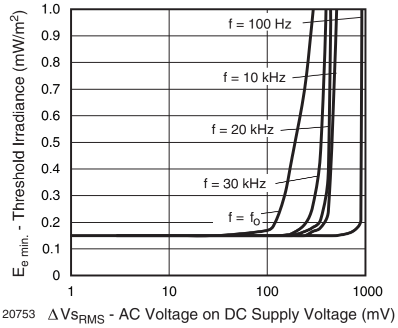


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

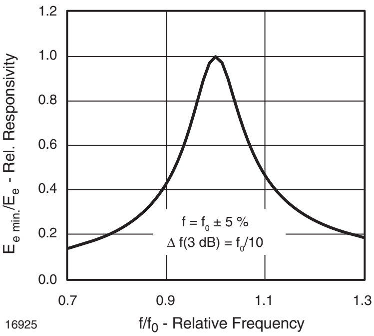


Fig. 5 - Frequency Dependence of Responsivity

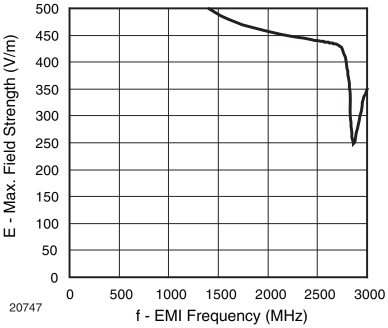


Fig. 8 - Sensitivity vs. Electric Field Disturbances

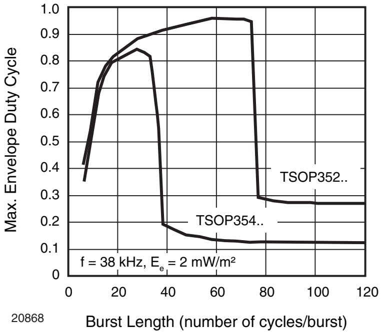


Fig. 9 - Maximum Envelope Duty Cycle vs. Burst Length

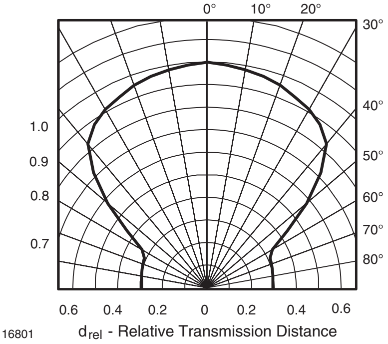


Fig. 12 - Horizontal Directivity

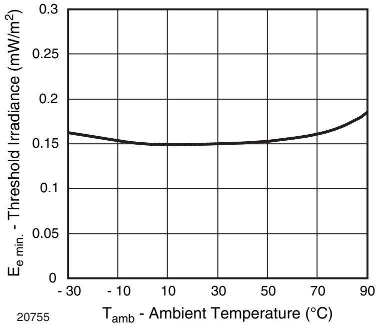


Fig. 10 - Sensitivity vs. Ambient Temperature

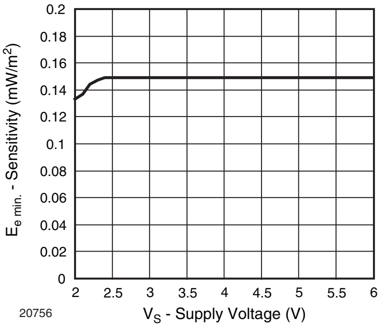


Fig. 13 - Sensitivity vs. Supply Voltage

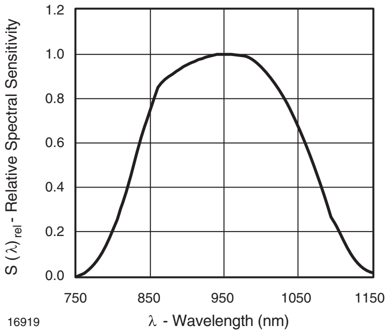


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP352.., TSOP354.. series is 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 TSOP352.., TSOP354.. 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 14 or figure 15)

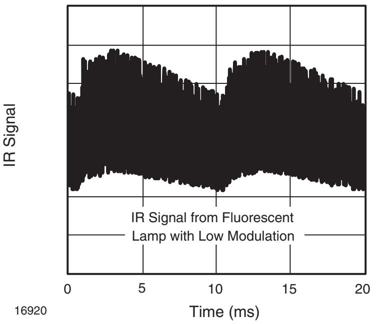


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

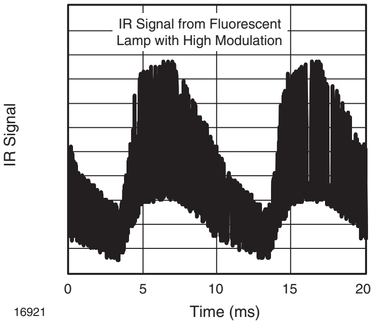


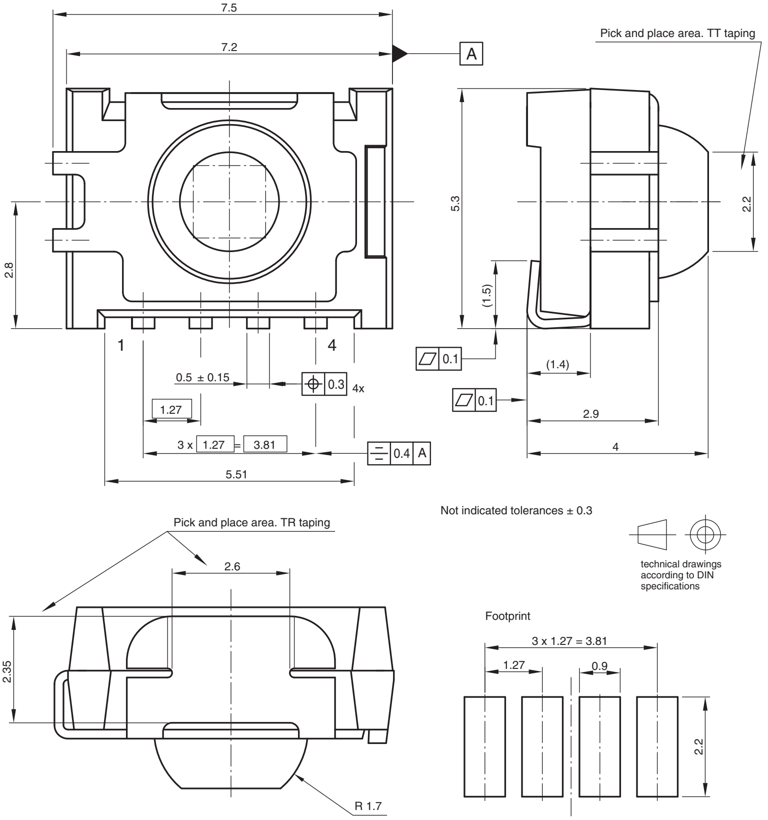
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP352..	TSOP354..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	1800	1500
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	no
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

Note

For data formats with short bursts please see the datasheet for TSOP351.., TSOP353..

PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.544-5341.01-4
Issue: 8; 02.09.09
16776

ASSEMBLY INSTRUCTIONS

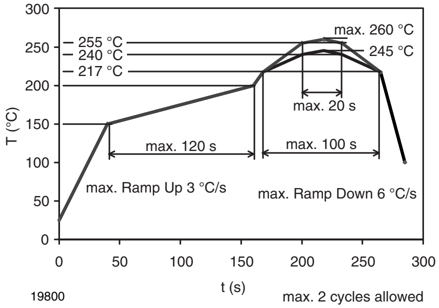
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

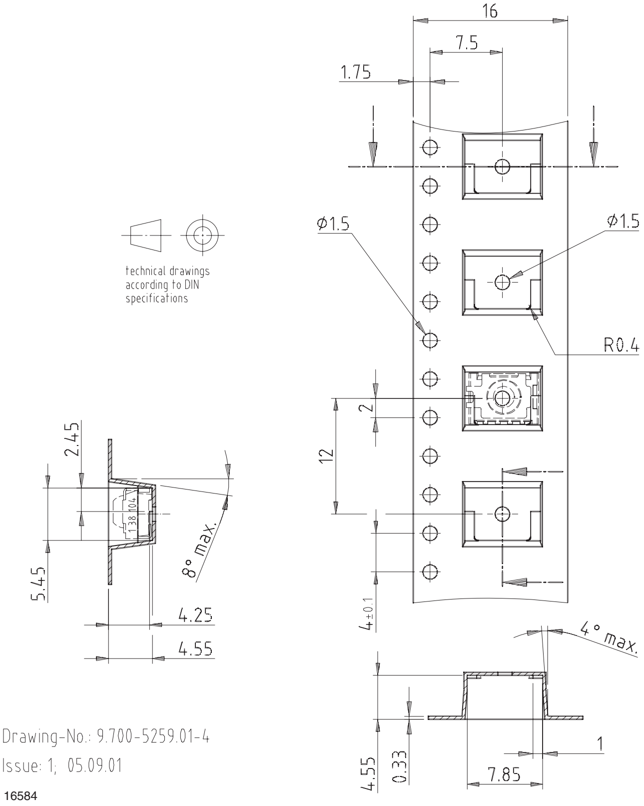
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

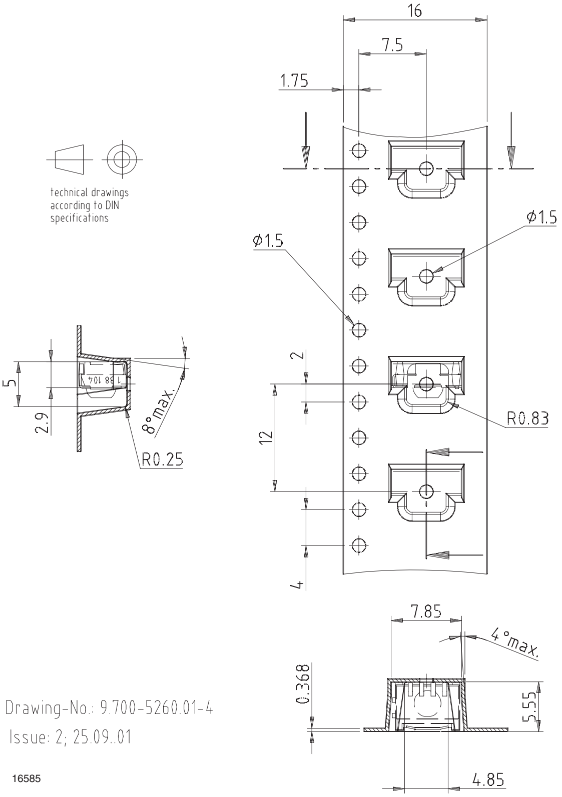
VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



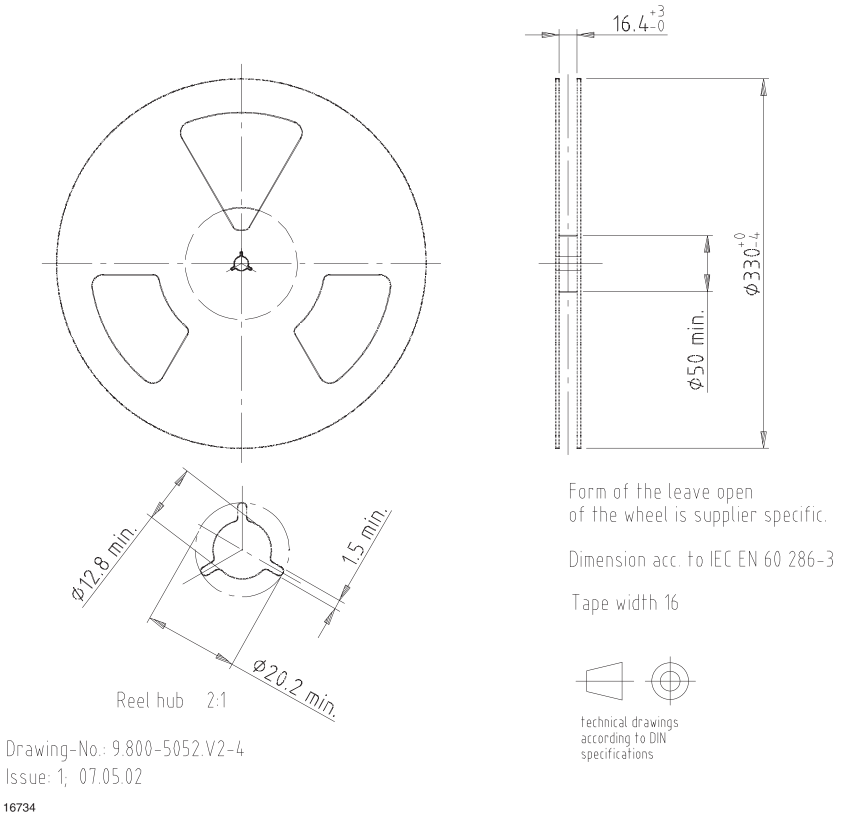
TAPING VERSION TSOP..TT DIMENSIONS in millimeters



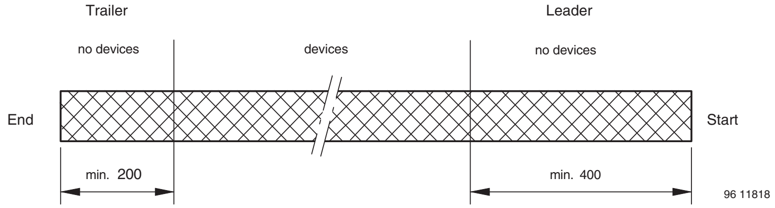
TAPING VERSION TSOP..TR DIMENSIONS in millimeters



REEL DIMENSIONS in millimeters



LEADER AND TRAILER DIMENSIONS in millimeters



COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 mm/min. ± 10 mm/min.
165° to 180° peel angle

LABEL

Standard bar code labels for finished goods

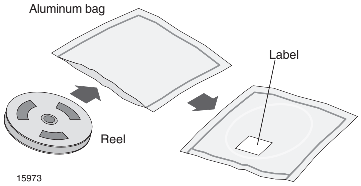
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GMBH STANDARD BAR CODE PRODUCT LABEL (finished goods)

PLAIN WRITTING	**ABBREVIATION**	**LENGTH**
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
LONG BAR CODE TOP	**TYPE**	**LENGTH**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
SHORT BAR CODE BOTTOM	**TYPE**	**LENGTH**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

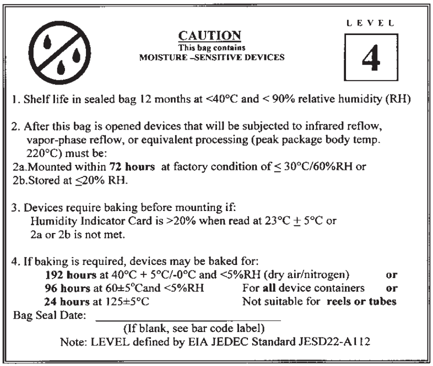
RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:
192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)
or
96 h at 60 °C + 5 °C and < 5 % RH for all device containers
or
24 h at 125 °C + 5 °C not suitable for reel or tubes.
An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE –SENSITIVE DEVICES

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:
192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
96 hours at 60±5°Cand <5%RH For **all** device containers **or**
24 hours at 125±5°C Not suitable for **reels or tubes**

Bag Seal Date: ____________________
(If blank, see bar code label)
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

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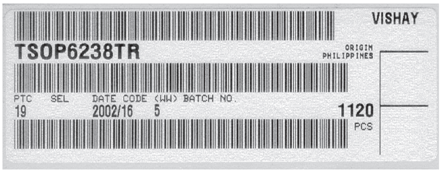
Example of JESD22-A112 level 4 label

ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



VISHAY
TSOP6238TR
ORIGIN PHILIPPINES

PTC	SEL	DATE CODE (WW)	BATCH NO.
19		2002/16	5

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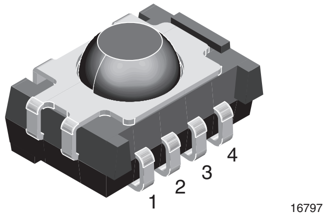
IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

1 = GND, 2 = N.C., 3 = V_S, 4 = OUT

FEATURES

- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Continuous data transmission possible
- Supply voltage: 2.5 V to 5.5 V
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Taping available for topview and sideview assembly

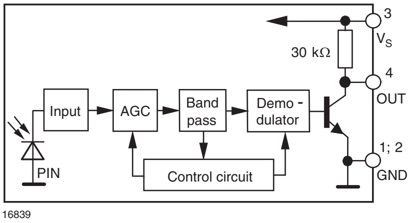
DESCRIPTION

The TSOP351.., TSOP353.. and TSOP355.. series are miniaturized SMD IR receiver modules for infrared remote control systems. PIN diode and preamplifier are assembled on a lead frame, the epoxy package is designed as IR filter. The demodulated output signal can directly be decoded by a microprocessor. The TSOP351.. is compatible with all common IR remote control data formats. The TSOP353.. is optimized to better suppress spurious pulses from energy saving lamps. The TSOP355.. has 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.

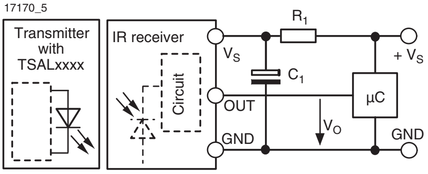
PARTS TABLE

CARRIER FREQUENCY	SHORT BURSTS AND HIGH DATA RATES (AGC1)	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)	VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)
30 kHz	TSOP35130	TSOP35330	TSOP35530
33 kHz	TSOP35133	TSOP35333	TSOP35533
36 kHz	TSOP35136	TSOP35336	TSOP35536
38 kHz	TSOP35138	TSOP35338	TSOP35538
40 kHz	TSOP35140	TSOP35340	TSOP35540
56 kHz	TSOP35156	TSOP35356	TSOP35556

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 μF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 6	V
Supply current (pin 3)		I_S	3	mA
Output voltage (pin 4)		V_O	- 0.3 to (V_S + 0.3)	V
Output current (pin 4)		I_O	5	mA
Junction temperature		T_j	100	°C
Storage temperature range		T_{stg}	- 40 to + 100	°C
Operating temperature range		T_{amb}	- 30 to + 85	°C
Power consumption	$T_{amb} \leq 85$ °C	P_{tot}	10	mW

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 (pin 3)	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	$E_v = 40$ 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, $I_F = 250$ mA	d		45		m
Output voltage low (pin 4)	$I_{OSL} = 0.5$ mA, $E_e = 0.7$ 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	$E_{e\ min.}$		0.15	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 50		deg

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

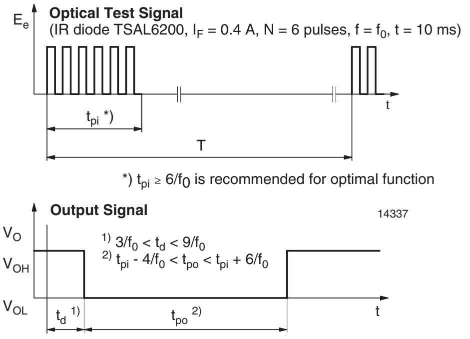


Fig. 1 - Output Function

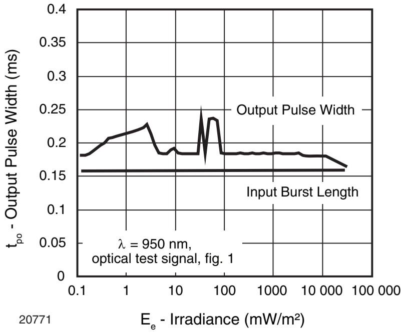


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

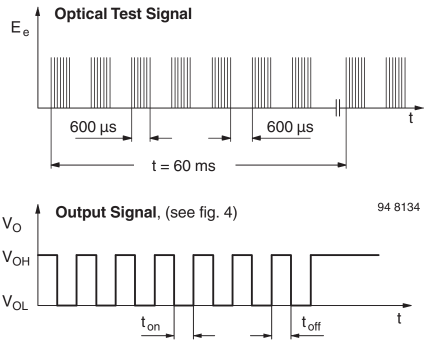


Fig. 3 - Output Function

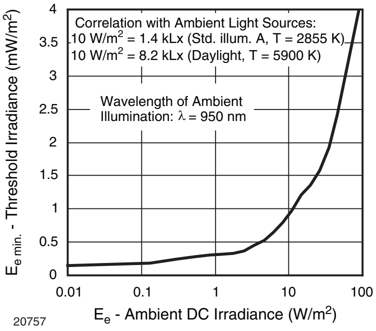


Fig. 6 - Sensitivity in Bright Ambient

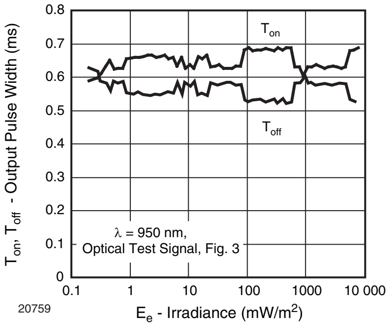


Fig. 4 - Output Pulse Diagram

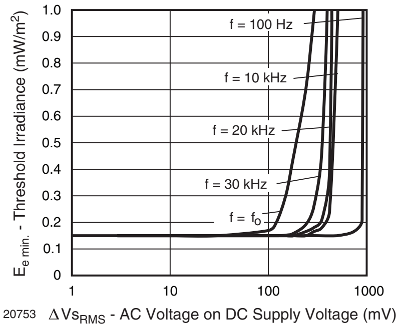


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

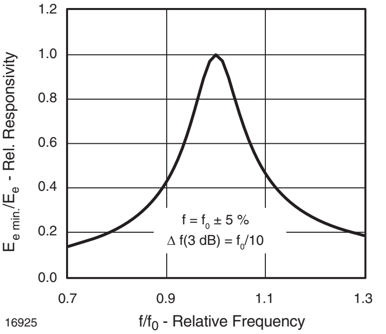


Fig. 5 - Frequency Dependence of Responsivity

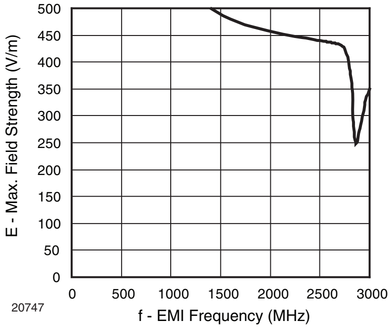


Fig. 8 - Sensitivity vs. Electric Field Disturbances

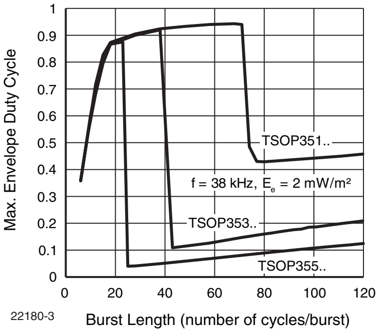


Fig. 9 - Max. Envelope Duty Cycle vs. Burstlength

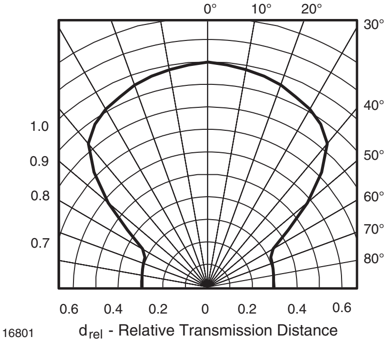


Fig. 12 - Directivity

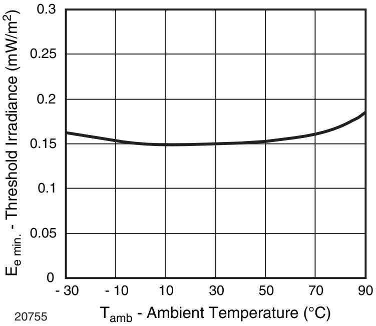


Fig. 10 - Sensitivity vs. Ambient Temperature

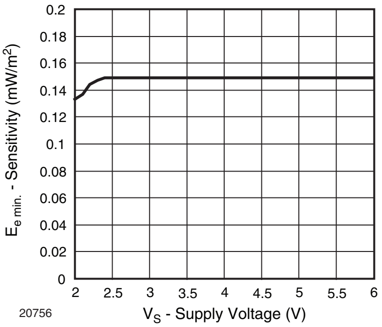


Fig. 13 - Sensitivity vs. Supply Voltage

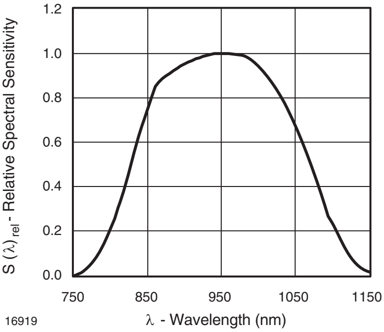


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP351.., TSOP353.. and TSOP355.. series is 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 TSOP351.., TSOP353.. and TSOP355.. 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
- Strongly or noise from fluorescent lamps with electronic ballasts

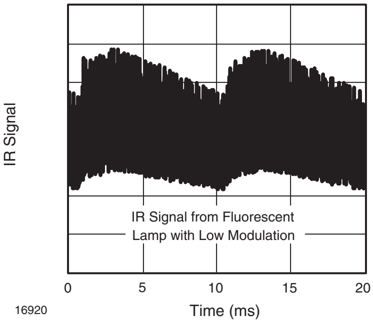


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

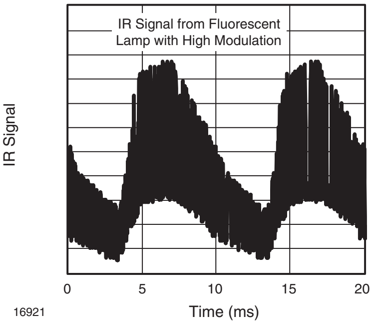


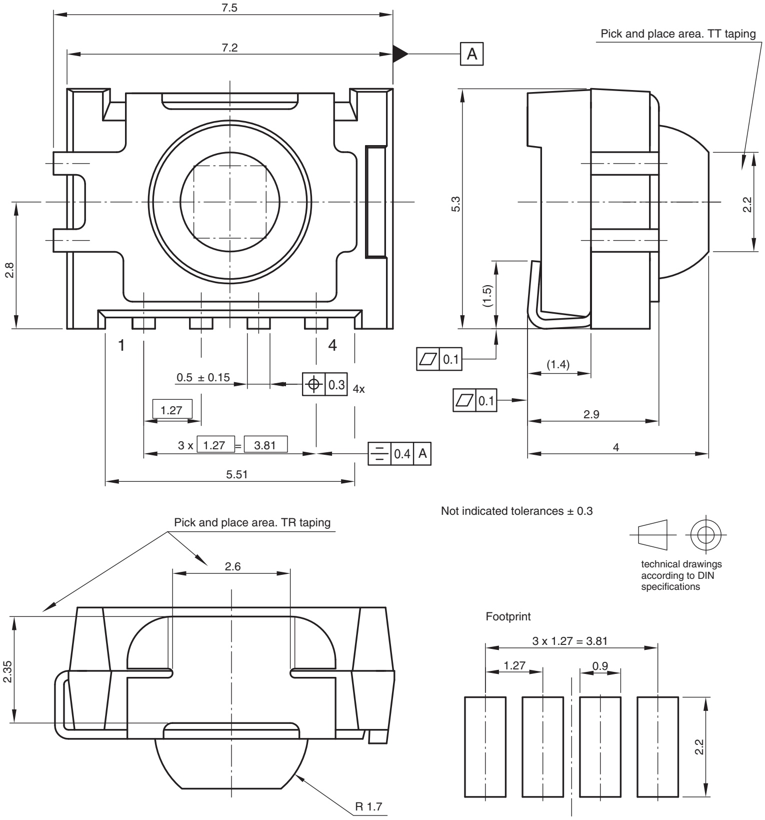
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP351..	TSOP353..	TSOP355..
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 suppressed (example: signal pattern of fig. 14)	Even critical disturbance signals are suppressed (example: signal pattern of fig. 14 and fig. 15)	Even critical disturbance signals are suppressed (example: signal pattern of fig. 14 and fig. 15)

Note

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP352.., TSOP354..

PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.544-5341.01-4
Issue: 8; 02.09.09
16776

ASSEMBLY INSTRUCTIONS

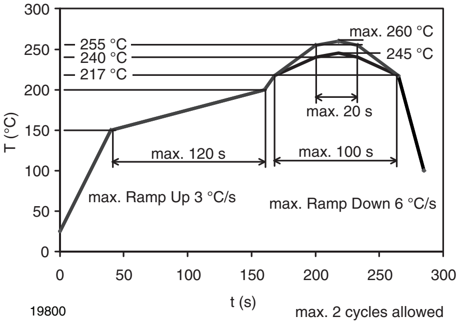
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

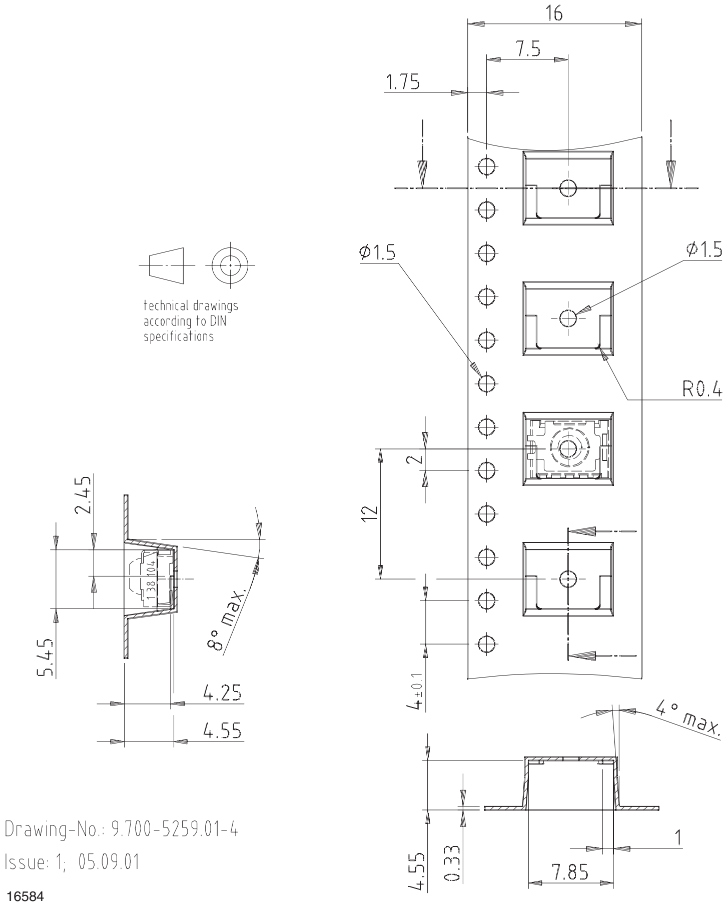
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off.

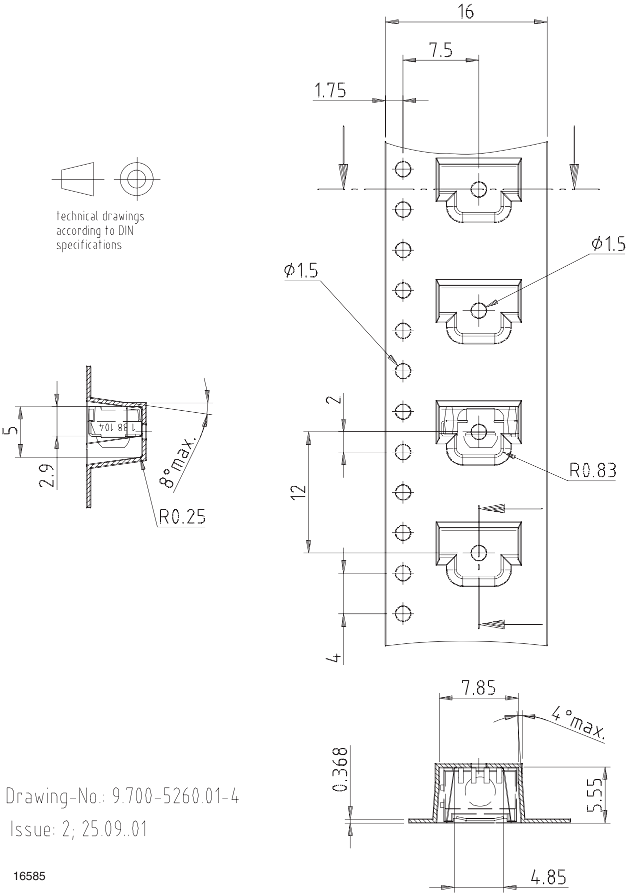
VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



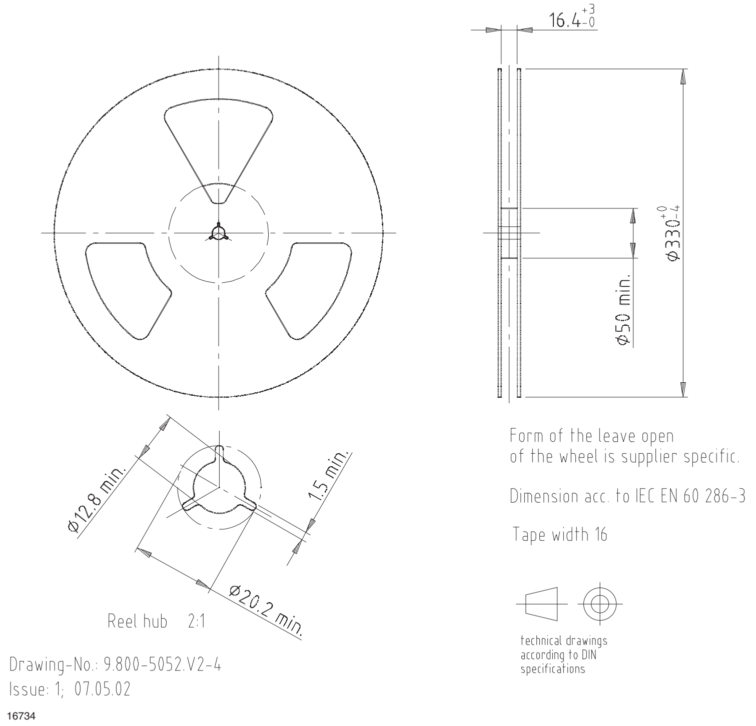
TAPING VERSION TSOP..TT DIMENSIONS in millimeters



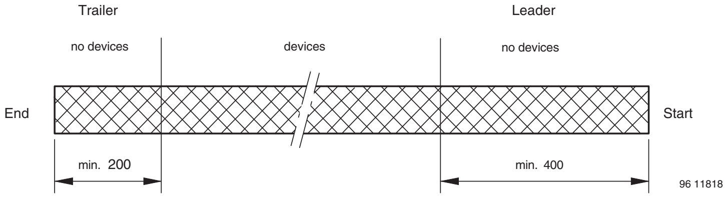
TAPING VERSION TSOP..TR DIMENSIONS in millimeters



REEL DIMENSIONS in millimeters



LEADER AND TRAILER DIMENSIONS in millimeters



COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 mm/min. ± 10 mm/min.
165° to 180° peel angle

LABEL

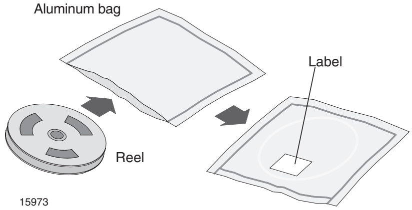
Standard bar code labels for finished goods

The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)		
PLAIN WRITTING	**ABBREVIATION**	**LENGTH**
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
LONG BAR CODE TOP	**TYPE**	**LENGTH**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
SHORT BAR CODE BOTTOM	**TYPE**	**LENGTH**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

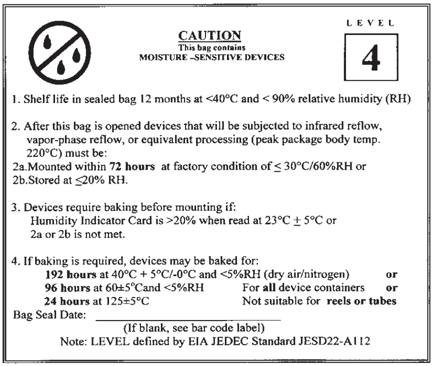
The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:
192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)
or
96 h at 60 °C + 5 °C and < 5 % RH for all device containers
or
24 h at 125 °C + 5 °C not suitable for reel or tubes.
An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



LEVEL

4

CAUTION

This bag contains

MOISTURE –SENSITIVE DEVICES

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:

2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or

2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:

Humidity Indicator Card is >20% when read at 23°C ± 5°C or

2a or 2b is not met.

4. If baking is required, devices may be baked for:

192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**

96 hours at 60±5°Cand <5%RH For **all** device containers **or**

24 hours at 125±5°C Not suitable for **reels or tubes**

Bag Seal Date: ____________________

(If blank, see bar code label)

Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

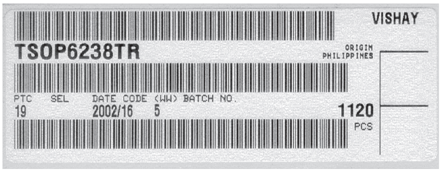
Example of JESD22-A112 level 4 label

ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



VISHAY

TSOP6238TR

ORIGIN PHILIPPINES

PTC SEL DATE CODE (WW) BATCH NO.

19 2002/16 5

1120

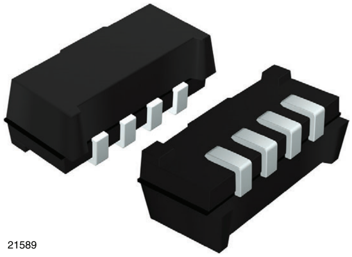
PCS

16962

Heimdall

Contents

IR Receiver Modules for Remote Control Systems



FEATURES

- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Capable of side or top view
- Low profile 2.35 mm
- Insensitive to supply voltage ripple and noise
- Narrow optical filter to reduce interference from plasma TV emissions
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT
GREEN
(5-2008)**

MECHANICAL DATA

Pinning:

1, 4 = GND, 2 = V_S, 3 = OUT

DESCRIPTION

The TSOP752..W, TSOP754..W series are miniaturized receiver modules for infrared remote control systems. Two PIN diodes and a preamplifier are assembled on a leadframe, the epoxy package is designed as an IR filter.

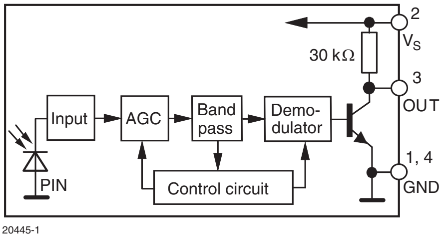
The demodulated output signal can be directly decoded by a microprocessor. The TSOP752..W is compatible with all common IR remote control data formats. The TSOP754..W is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

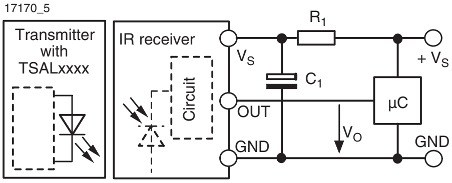
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	VERY NOISY ENVIRONMENTS (AGC4)
30 kHz	TSOP75230W	TSOP75430W
33 kHz	TSOP75233W	TSOP75433W
36 kHz	TSOP75236W	TSOP75436W
38 kHz	TSOP75238W	TSOP75438W
40 kHz	TSOP75240W	TSOP75440W
56 kHz	TSOP75256W	TSOP75456W

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 µF.

** Please see document “Vishay Material Category Policy”: www.vishay.com/doc?99902

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	$T_{amb} \leq 85$ °C	P_{tot}	10	mW

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 voltage		V_S	2.5		5.5	V
Supply current	E_v = 0, V_S = 3.3 V	I_{SD}	0.27	0.35	0.45	mA
	E_v = 40 klx, sunlight	I_{SH}		0.45		mA
Transmission distance	E_v = 0, test signal see fig. 1, IR diode TSAL6200, I_F = 250 mA	d		30		m
Output voltage low	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², 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	$E_{e\,min.}$		0.3	0.7	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	$\varphi_{1/2}$		± 75		deg

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

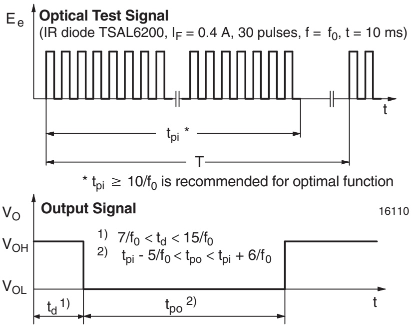


Fig. 1 - Output Active Low

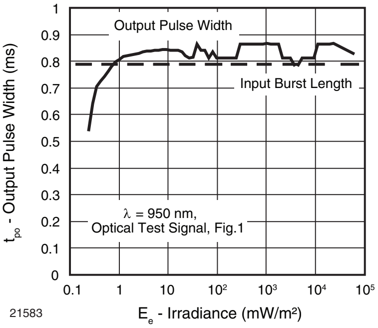


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

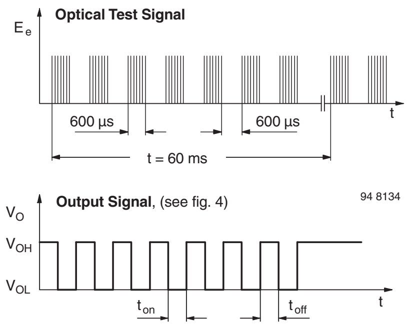


Fig. 3 - Output Function

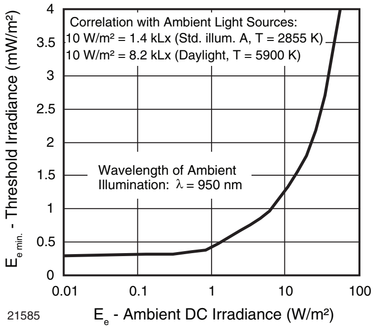


Fig. 6 - Sensitivity in Bright Ambient

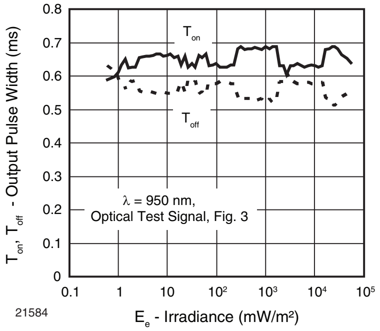


Fig. 4 - Output Pulse Diagram

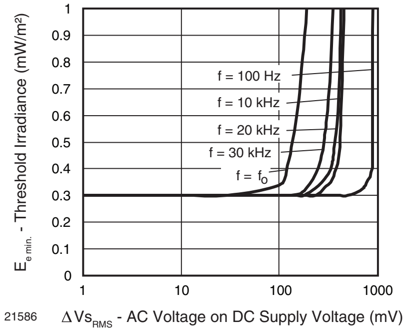


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

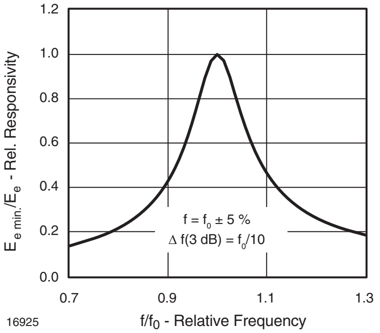


Fig. 5 - Frequency Dependence of Responsivity

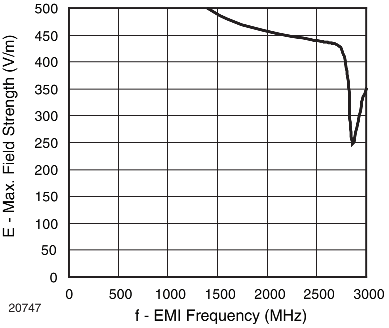


Fig. 8 - Sensitivity vs. Electric Field Disturbances

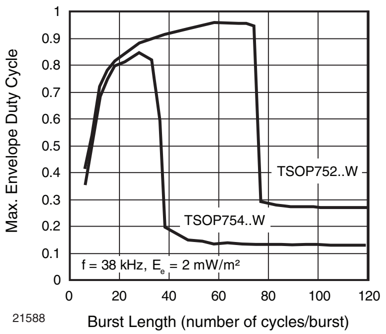


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

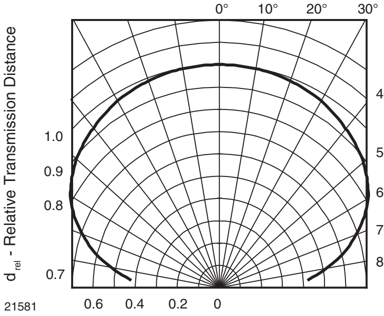


Fig. 12 - Horizontal Directivity

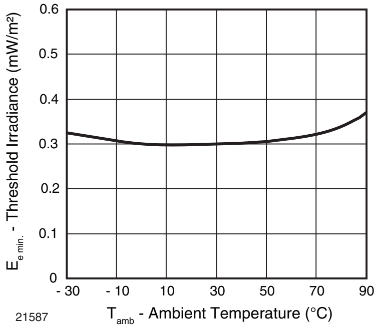


Fig. 10 - Sensitivity vs. Ambient Temperature

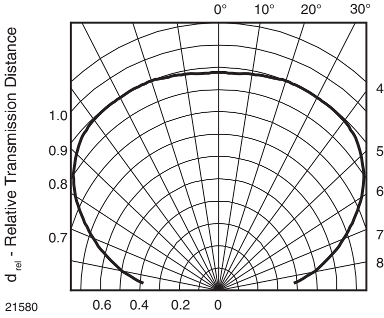


Fig. 13 - Vertical Directivity

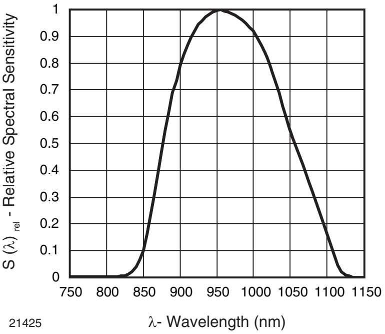


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP752..W, TSOP754..W series is 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 TSOP752..W, TSOP754..W 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 14 or figure 15)

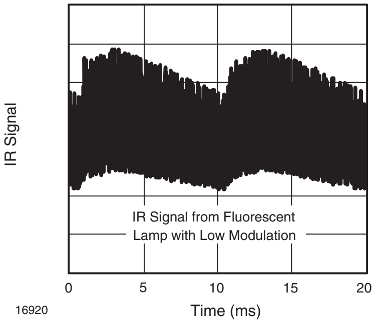


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

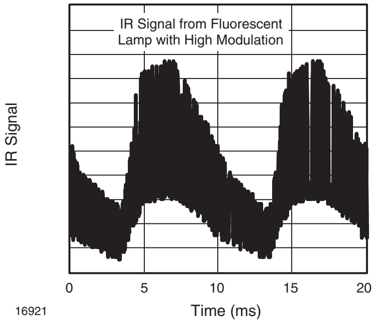
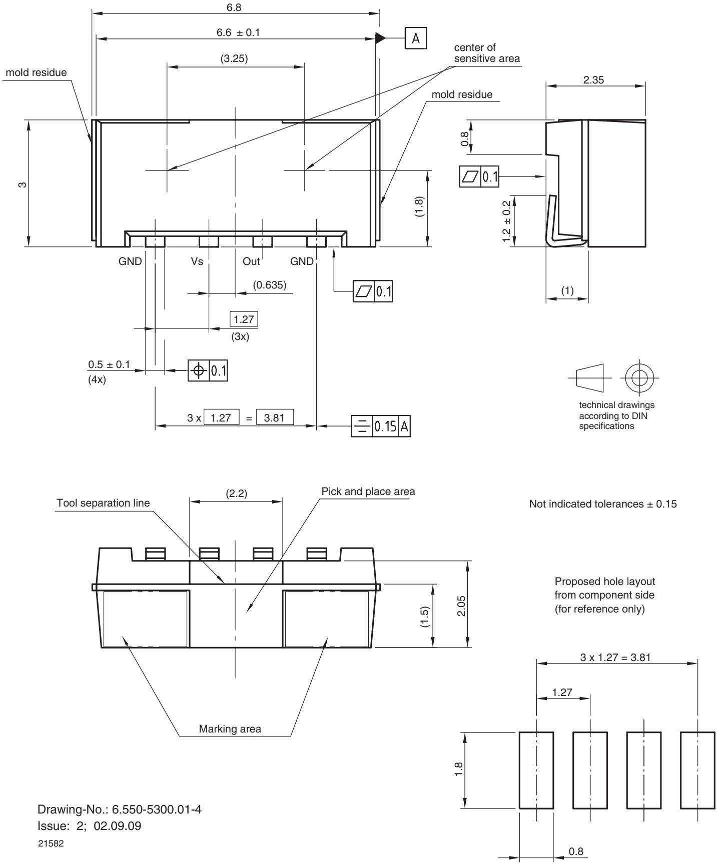


Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP752..W	TSOP754..W
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	1800	1500
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	no
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

Note
For data formats with short bursts please see the datasheet for TSOP753..

PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.550-5300.01-4
Issue: 2; 02.09.09
21582

ASSEMBLY INSTRUCTIONS

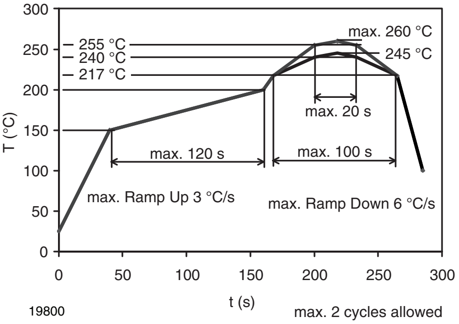
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

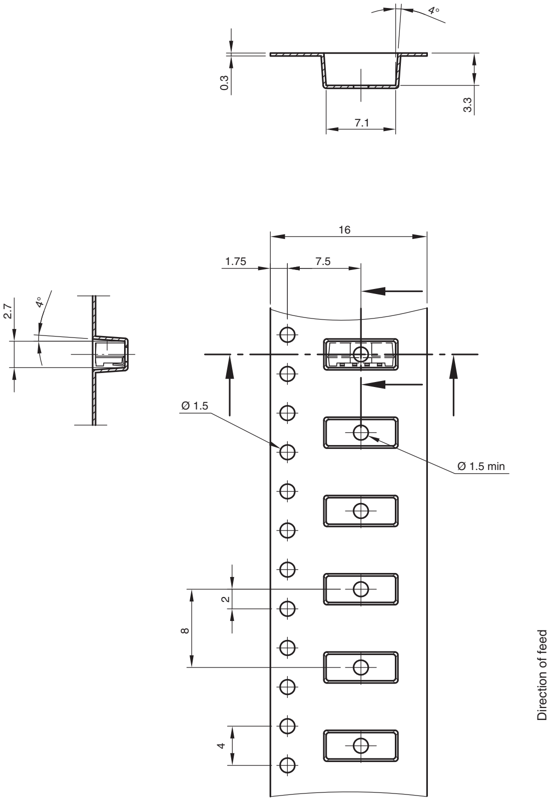
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



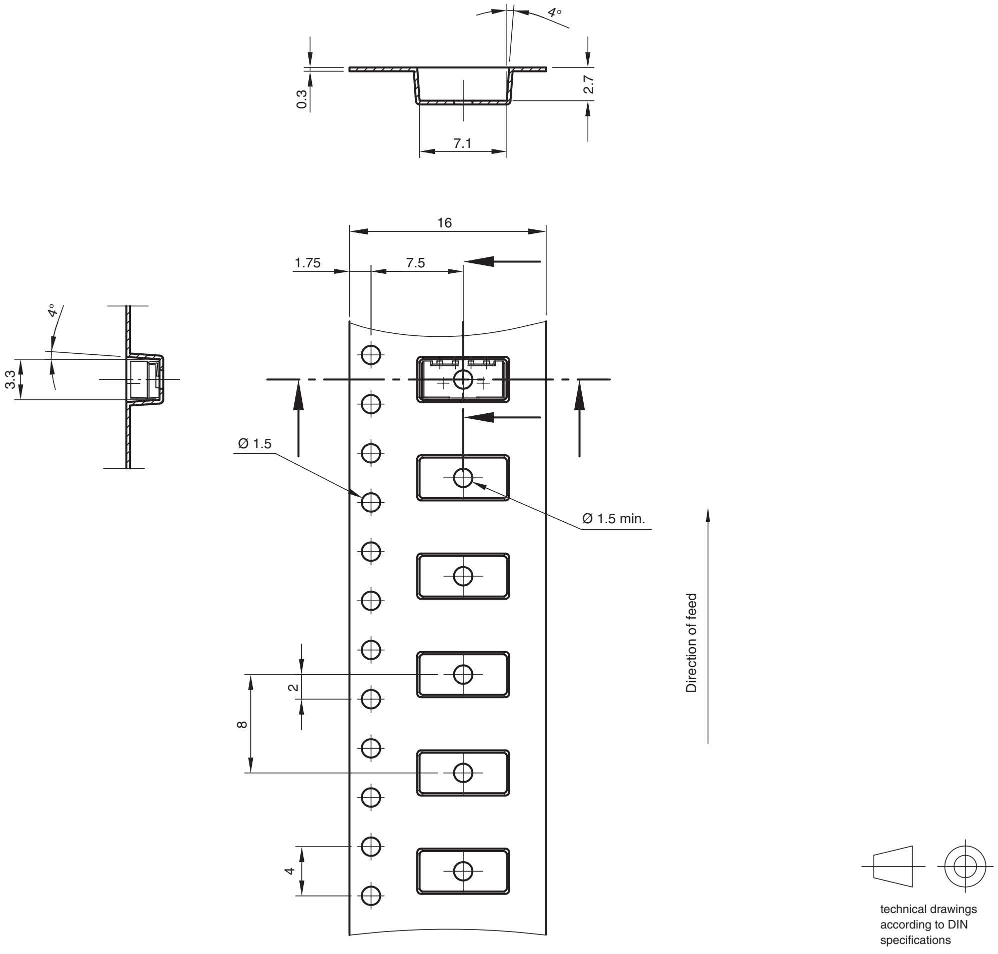
TAPING VERSION TSOP..TR DIMENSIONS in millimeters



Drawing-No.: 9.700-5342.01-4
Issue: 1: 23.03.09
21785

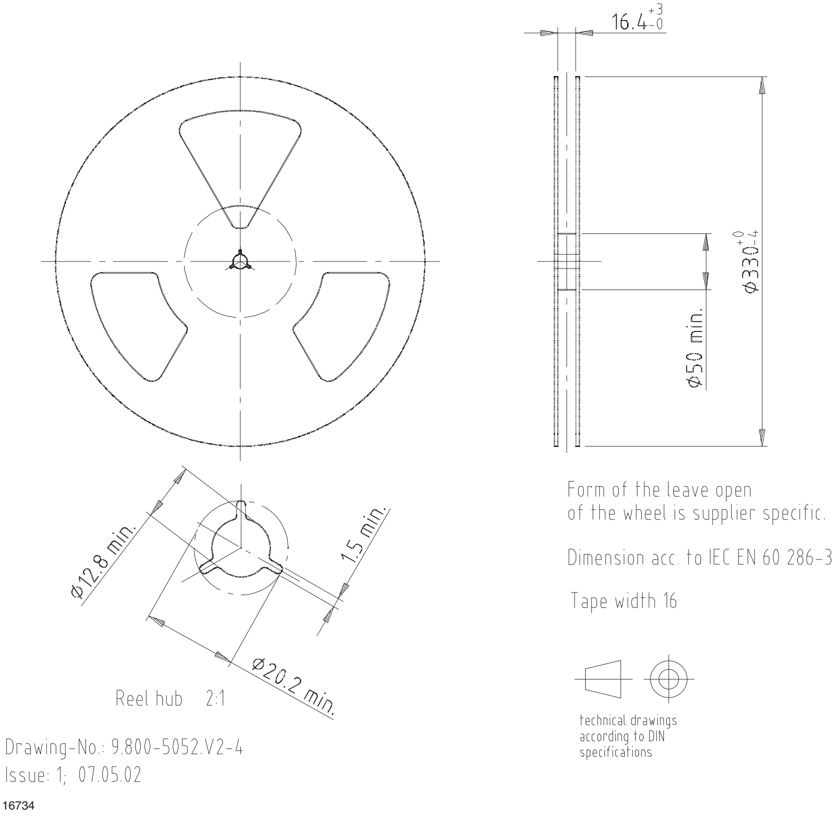
technical drawings according to DIN specifications

TAPING VERSION TSOP..TT DIMENSIONS in millimeters

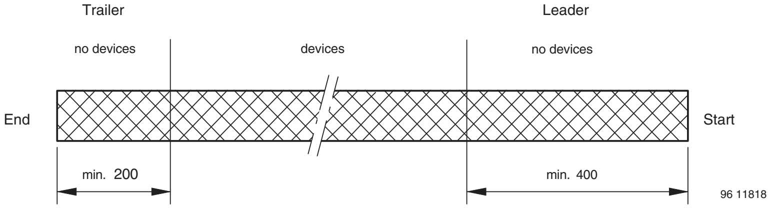


Drawing-No.: 9.700-5341.01-4
Issue: 2: 23.03.09
21666

REEL DIMENSIONS in millimeters



LEADER AND TRAILER DIMENSIONS in millimeters



COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 ± 10 mm/min.
165° to 180° peel angle

LABEL

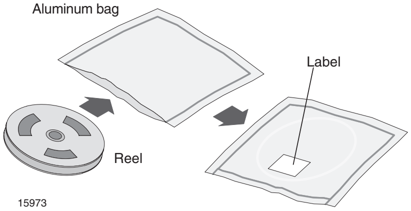
Standard bar code labels for finished goods

The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)		
PLAIN WRITING	**ABBREVIATION**	**LENGTH**
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
Long bar code top	**Type**	**Length**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
Short bar code bottom	**Type**	**Length**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

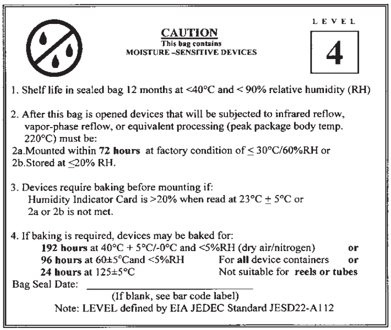
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)
or
96 h at 60 °C + 5 °C and < 5 % RH for all device containers
or
24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE -SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:
192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
96 hours at 60±5°Cand <5%RH For **all** device containers **or**
24 hours at 125±5°C Not suitable for **reels or tubes**

Bag Seal Date: ______________
(If blank, see bar code label)
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

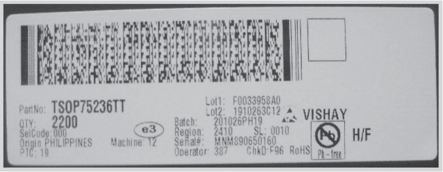
Example of JESD22-A112 level 4 label

ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

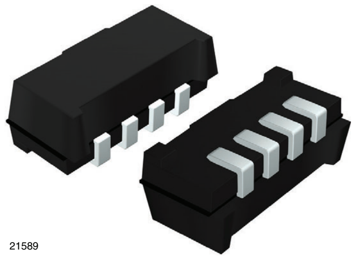
The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



PartNo: TSOP75236TT
QTY: 2200
SelCode: 000
Origin PHILIPPINES
PTC: 19
Machine: 12
Lot1: F0033958A0
Lot2: 1910263C12
Batch: 201026PH19
Region: 2410 SL: 0010
Serial#: MNM890650160
Operator: 387 ChkD:F96 RoHS

22178

IR Receiver Modules for Remote Control Systems



FEATURES

- Very low supply current
- Photo detector and preamplifier in one package
- Compatible also with short burst dataformats
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Capable of side or top view
- Low profile 2.35 mm
- Insensitive to supply voltage ripple and noise
- Narrow optical filter to reduce interference from plasma TV emissions
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS
COMPLIANT
GREEN
(5-2008)**

MECHANICAL DATA

Pinning:

1, 4 = GND, 2 = V_S, 3 = OUT

DESCRIPTION

The TSOP753..W, TSOP755..W series are a miniaturized receiver module for infrared remote control systems. Two PIN diodes and a preamplifier are assembled on a leadframe, the epoxy package is designed as an IR filter.

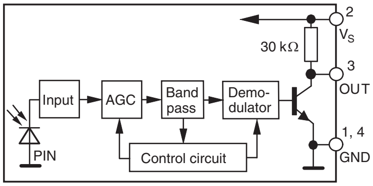
The demodulated output signal can be directly decoded by a microprocessor. The TSOP753..W is compatible with all common IR remote control data formats. It is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps. The TSOP755..W has an excellent noise suppression. It is 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.

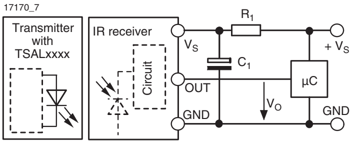
PARTS TABLE

CARRIER FREQUENCY	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)	VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)
30 kHz	TSOP75330W	TSOP75530W
33 kHz	TSOP75333W	TSOP75533W
36 kHz	TSOP75336W	TSOP75536W
38 kHz	TSOP75338W	TSOP75538W
40 kHz	TSOP75340W	TSOP75540W
56 kHz	TSOP75356W	TSOP75556W

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_o should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

** Please see document “Vishay Material Category Policy”: www.vishay.com/doc?99902

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	$T_{amb} \leq 85$ °C	P_{tot}	10	mW

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 voltage		V_S	2.5		5.5	V
Supply current	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.45		mA
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 250$ mA	d		30		m
Output voltage low	$I_{OSL} = 0.5$ mA, $E_e = 0.7$ mW/m², 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	$E_{e\,min.}$		0.3	0.7	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	$\varphi_{1/2}$		± 75		deg

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

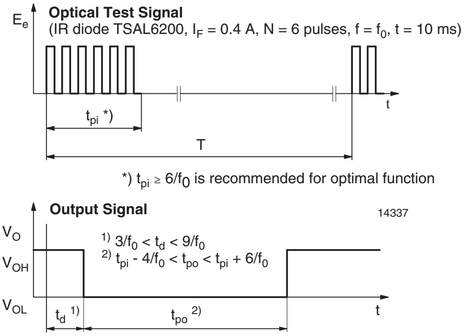


Fig. 1 - Output Active Low

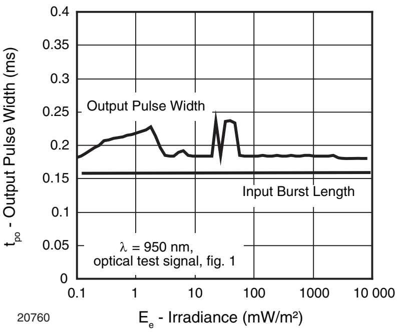


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

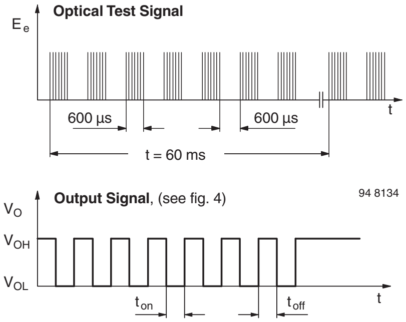


Fig. 3 - Output Function

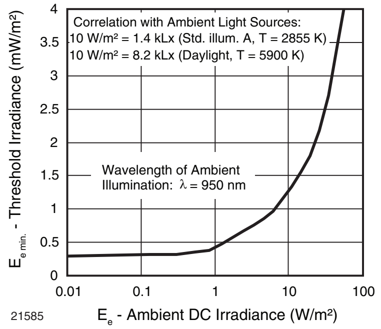


Fig. 6 - Sensitivity in Bright Ambient

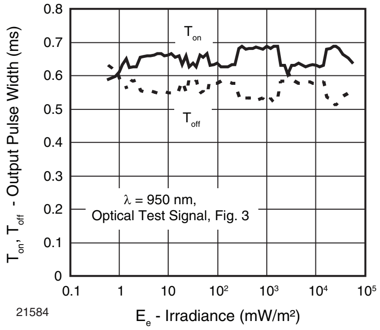


Fig. 4 - Output Pulse Diagram

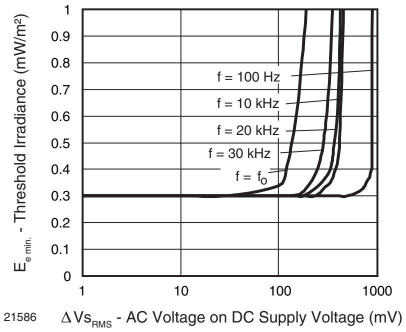


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

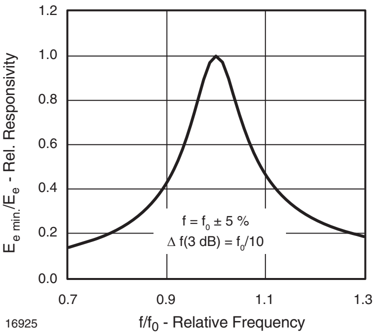


Fig. 5 - Frequency Dependence of Responsivity

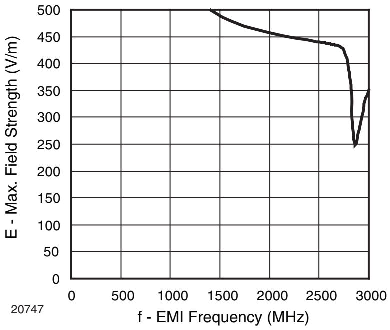


Fig. 8 - Sensitivity vs. Electric Field Disturbances

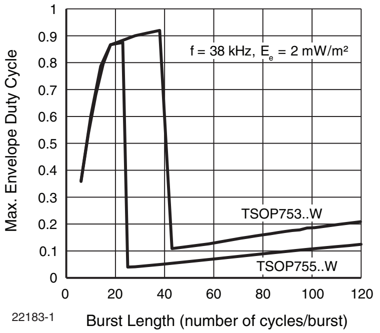


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

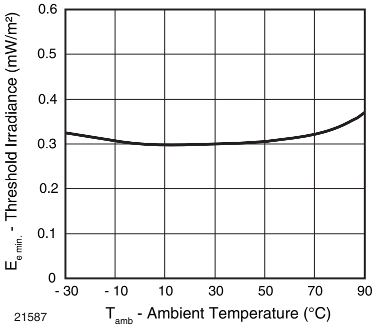


Fig. 10 - Sensitivity vs. Ambient Temperature

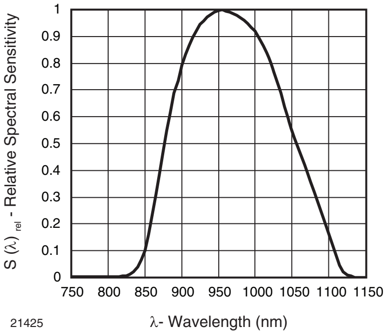


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

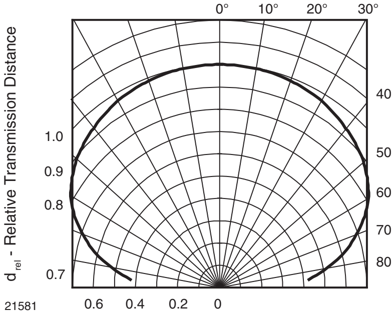


Fig. 12 - Horizontal Directivity

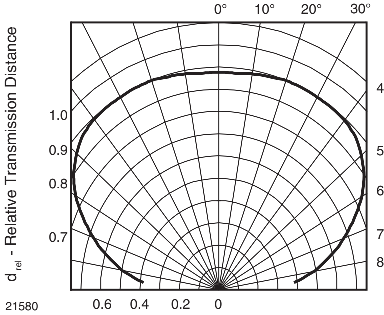


Fig. 13 - Vertical Directivity

SUITABLE DATA FORMAT

The TSOP753..W, TSOP755..W series 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 TSOP753..W, TSOP755..W 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 14 or figure 15)

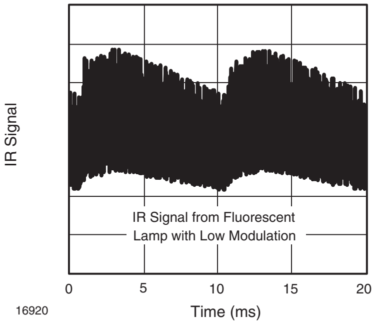


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

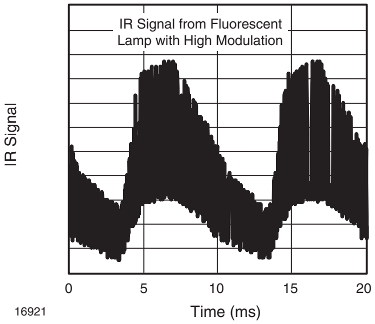


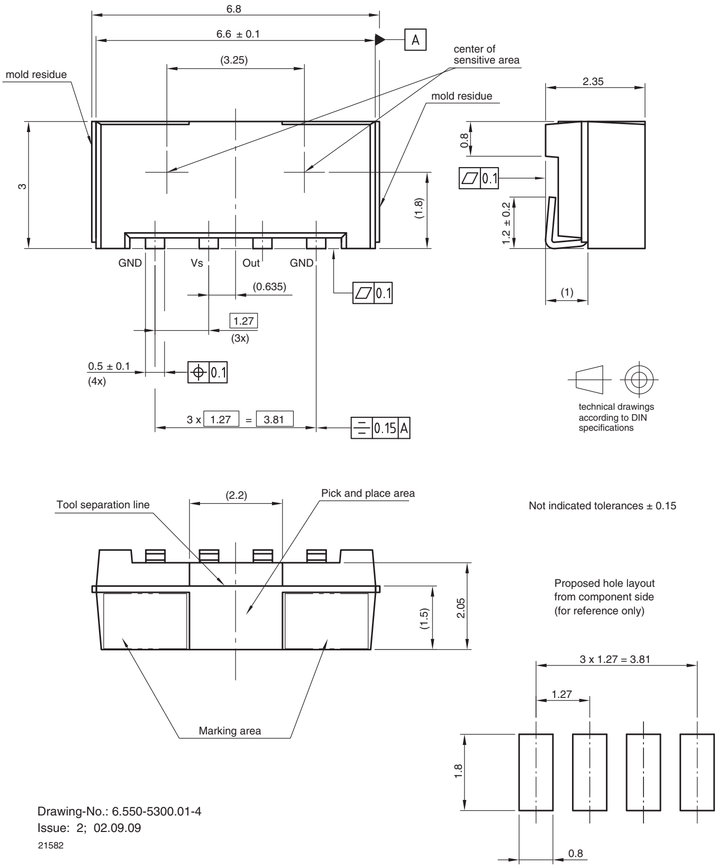
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP753..W	TSOP755..W
Minimum burst length	6 cycles/burst	6 cycles/burst
After each burst of length a minimum gap time is required of	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	35 cycles > 4 x burst length	24 cycles > 25 ms
Maximum number of continuous short bursts/second	2000	2000
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	no	no
Recommended for XMP format	yes	yes
Recommended for RCMM code	yes	yes
Recommended for RECS-80 code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Most common disturbance signals are suppressed

Note

For data formats with long bursts please see the datasheet for TSOP752..W, TSOP754..W.

PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.550-5300.01-4
Issue: 2; 02.09.09
21582

ASSEMBLY INSTRUCTIONS

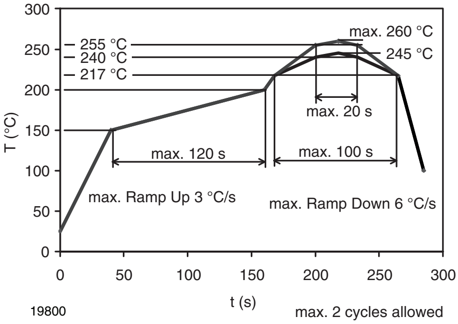
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

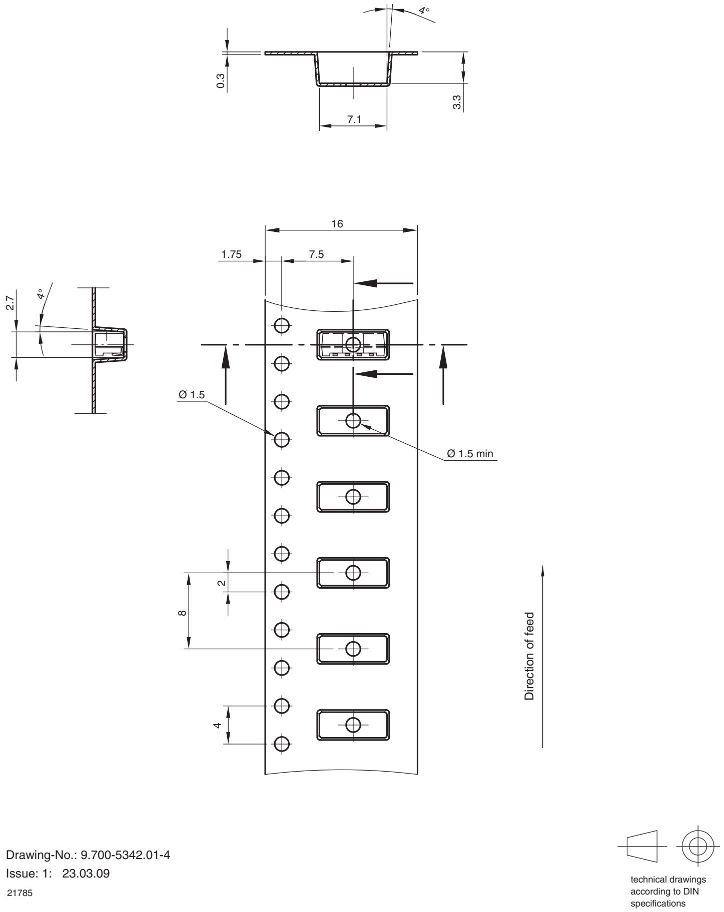
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

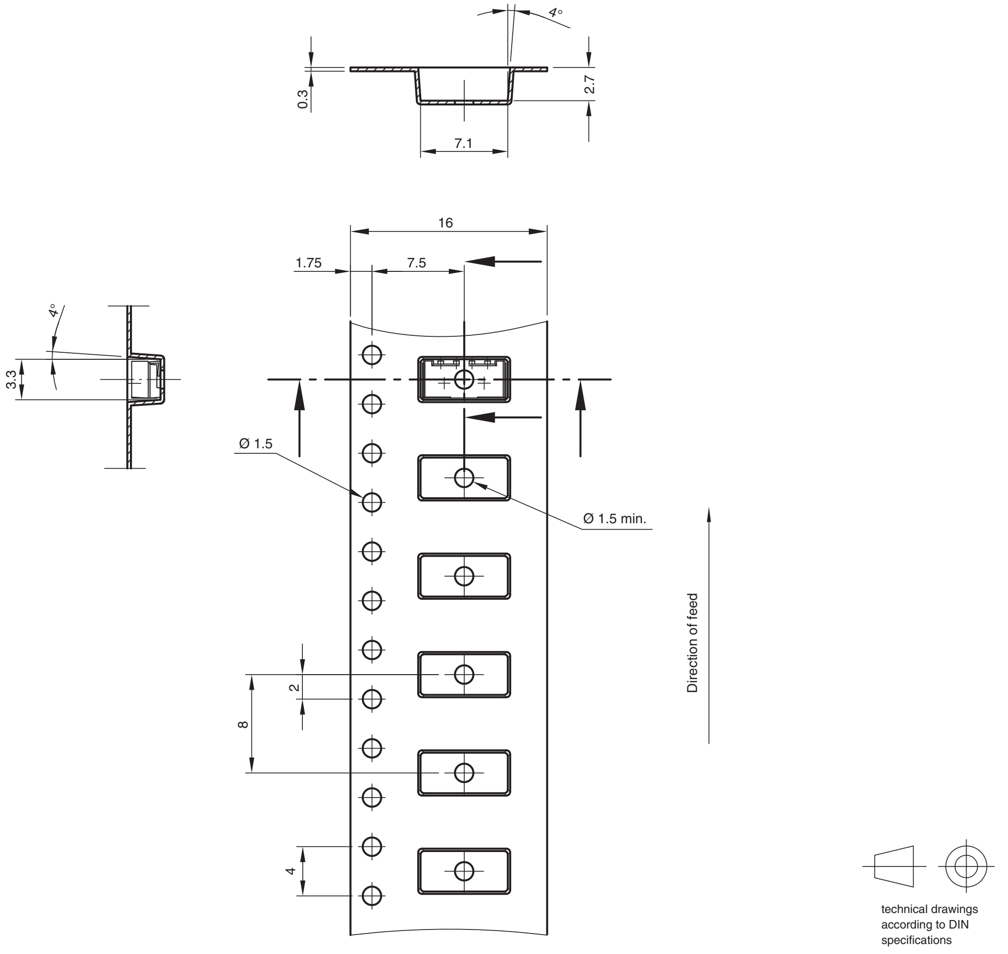
VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



TAPING VERSION TSOP..TR DIMENSIONS in millimeters



TAPING VERSION TSOP..TT DIMENSIONS in millimeters



Drawing-No.: 9.700-5341.01-4
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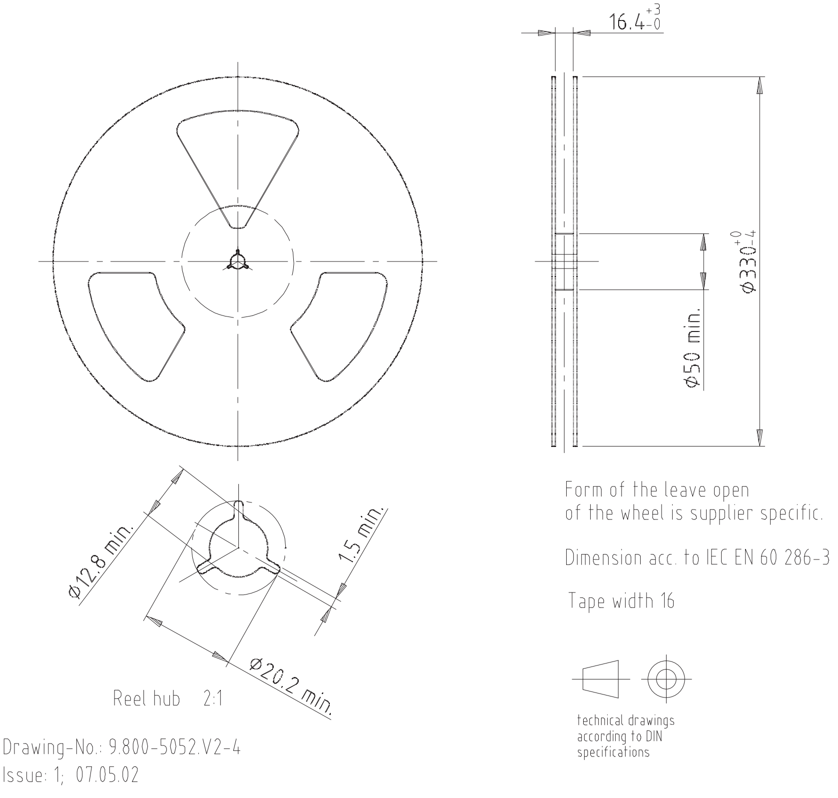
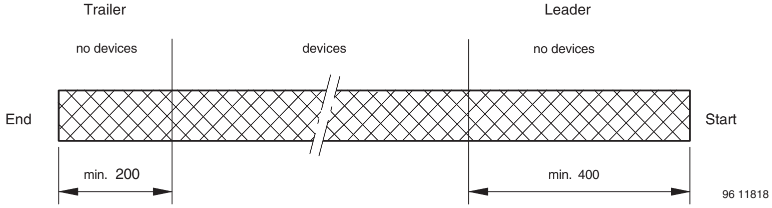
REEL DIMENSIONS in millimeters



16734

LEADER AND TRAILER DIMENSIONS in millimeters



COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 ± 10 mm/min.
165° to 180° peel angle

LABEL

Standard bar code labels for finished goods

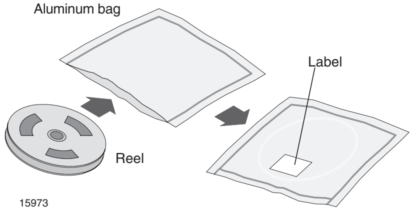
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)

PLAIN WRITING	ABBREVIATION	LENGTH
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
Long bar code top	**Type**	**Length**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
Short bar code bottom	**Type**	**Length**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)

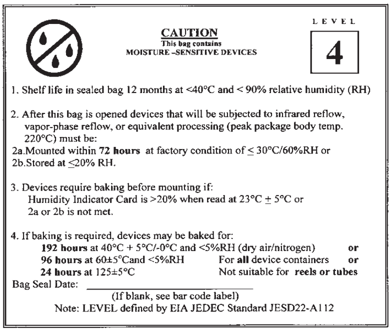
or

96 h at 60 °C + 5 °C and < 5 % RH for all device containers

or

24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE –SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:
192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
96 hours at 60±5°Cand <5%RH For **all** device containers **or**
24 hours at 125±5°C Not suitable for **reels or tubes**

Bag Seal Date: ______________________
(If blank, see bar code label)
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

Example of JESD22-A112 level 4 label

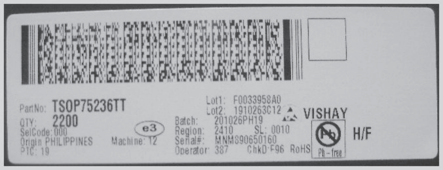
ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.

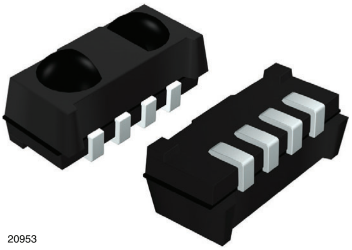
BAR CODE PRODUCT LABEL EXAMPLE:



PartNo: TSOP75236TT
QTY: 2200
SelCode:000
Origin PHILIPPINES
PTC: 19
Machine: T2
Lot1: F0033958A0
Lot2: 1910263C12
Batch: 201026PH19
Region: 2410 SL: 0010
Serial#: MNM890650160
Operator: 387 ChkD:F96 RoHS

22178

IR Receiver Modules for Remote Control Systems


20953

MECHANICAL DATA

Pinning:

1, 4 = GND, 2 = V_S, 3 = OUT

FEATURES

- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Capable of side or top view
- Two lenses for high sensitivity and wide receiving angle
- Insensitive to supply voltage ripple and noise
- Narrow optical filter to reduce interference from plasma TV emissions
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS
COMPLIANT
GREEN
(5-2008)**

DESCRIPTION

The TSOP752.., TSOP754.. series are two lens miniaturized receiver modules for infrared remote control systems. One PIN diode per lens and a preamplifier are assembled on a leadframe, the epoxy lens cap is designed as an IR filter.

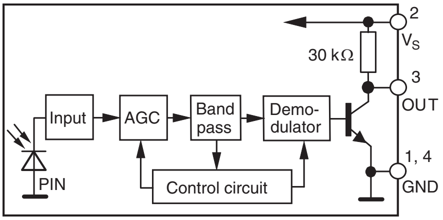
The demodulated output signal can be directly decoded by a microprocessor. The TSOP752.. is compatible with all common IR remote control data formats. The TSOP754.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	VERY NOISY ENVIRONMENTS (AGC4)
30 kHz	TSOP75230	TSOP75430
33 kHz	TSOP75233	TSOP75433
36 kHz	TSOP75236	TSOP75436
38 kHz	TSOP75238	TSOP75438
40 kHz	TSOP75240	TSOP75440
56 kHz	TSOP75256	TSOP75456

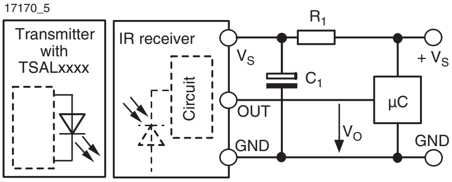
BLOCK DIAGRAM



20445-1

APPLICATION CIRCUIT

17170_5



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 µF.

** Please see document “Vishay Material Category Policy”: www.vishay.com/doc?99902

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage		V_S	- 0.3 to + 6.0	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	$T_{amb} \leq 85$ °C	P_{tot}	10	mW

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 voltage		V_S	2.5		5.5	V
Supply current	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.45		mA
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 250$ mA	d		45		m
Output voltage low	$I_{OSL} = 0.5$ mA, $E_e = 0.7$ mW/m², 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	$E_{e\ min.}$		0.15	0.35	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	$\varphi_{1/2}$		± 50		deg

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

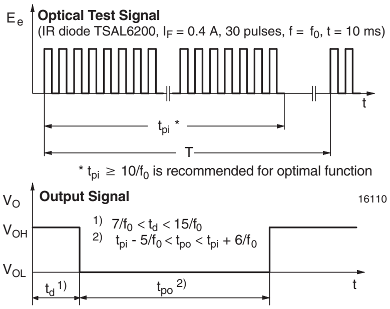


Fig. 1 - Output Active Low

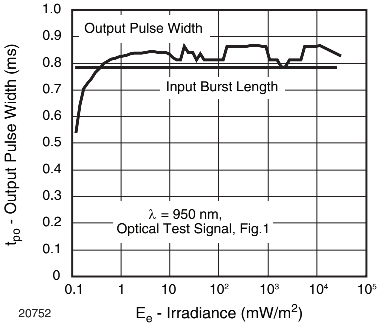


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

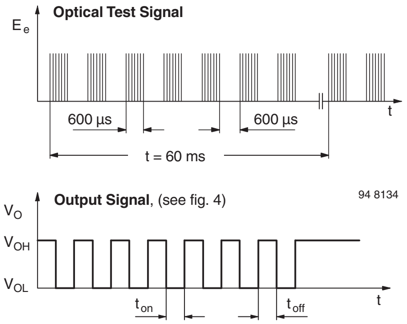


Fig. 3 - Output Function

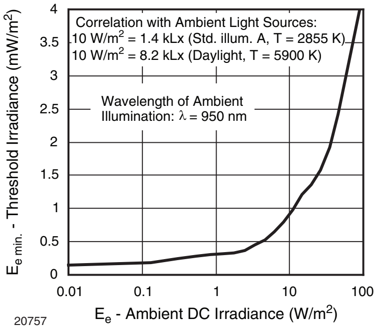


Fig. 6 - Sensitivity in Bright Ambient

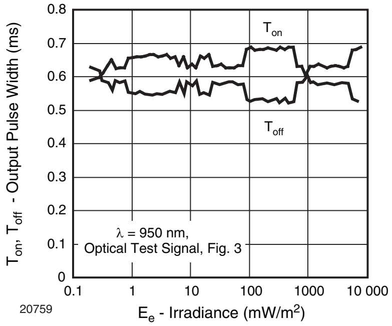


Fig. 4 - Output Pulse Diagram

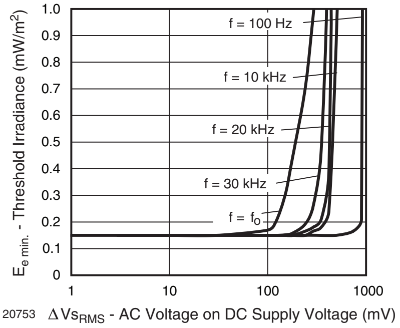


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

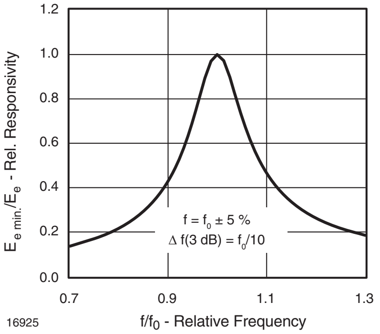


Fig. 5 - Frequency Dependence of Responsivity

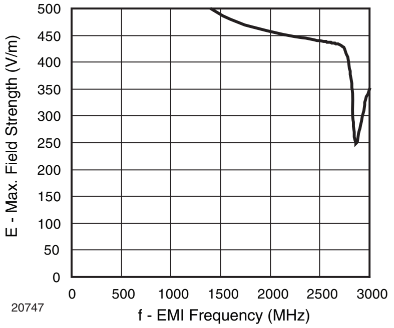


Fig. 8 - Sensitivity vs. Electric Field Disturbances

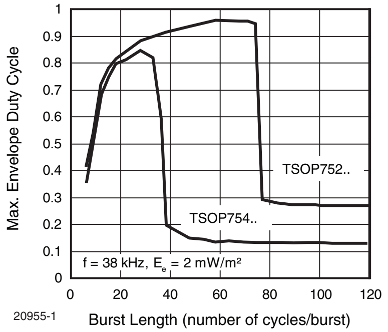


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

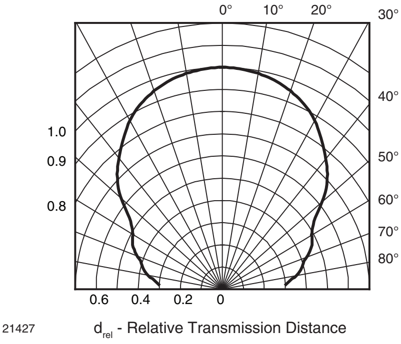


Fig. 12 - Horizontal Directivity

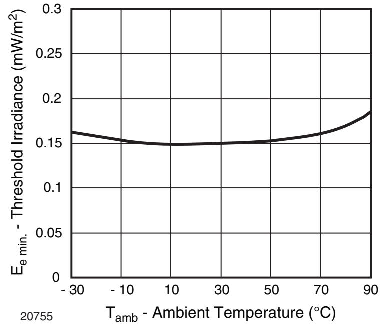


Fig. 10 - Sensitivity vs. Ambient Temperature

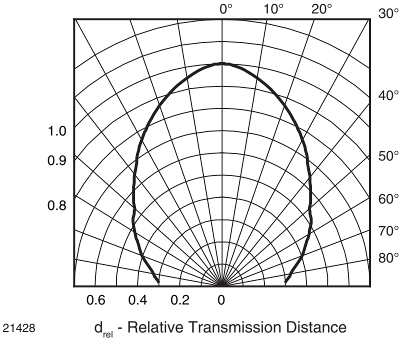


Fig. 13 - Vertical Directivity

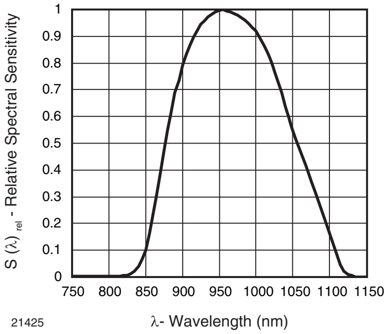


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP752.., TSOP754.. series is 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 TSOP752.., TSOP754.. 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 14 or figure 15)

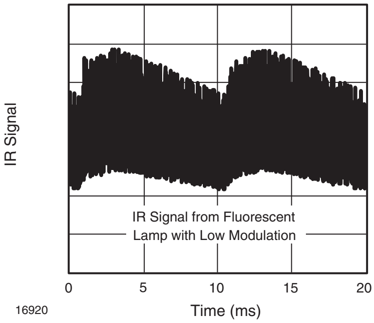


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

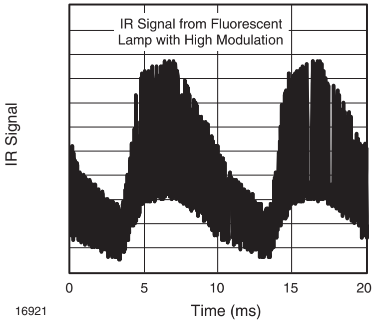


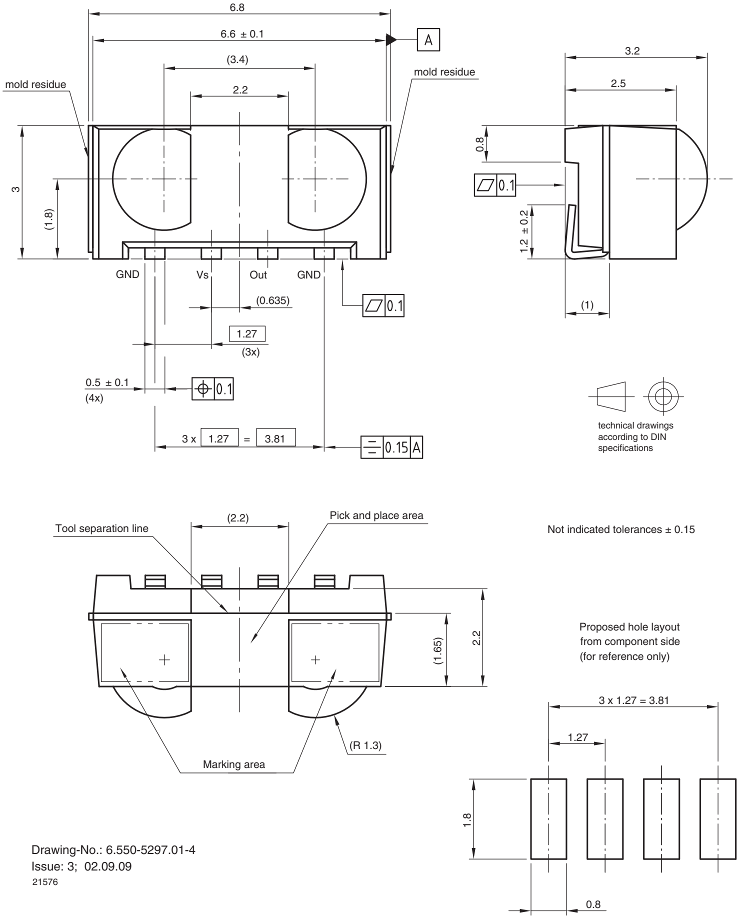
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP752..	TSOP754..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	1800	1500
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	no
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

Note

For data formats with short bursts please see the datasheet for TSOP753..

PACKAGE DIMENSIONS in millimeters



ASSEMBLY INSTRUCTIONS

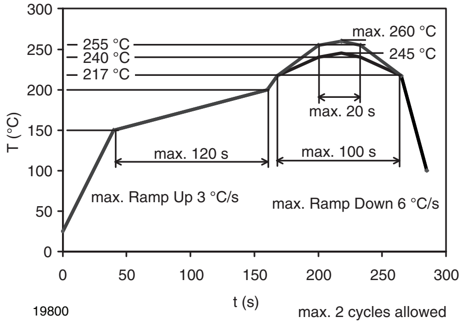
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

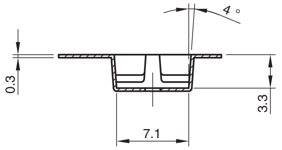
Manual Soldering

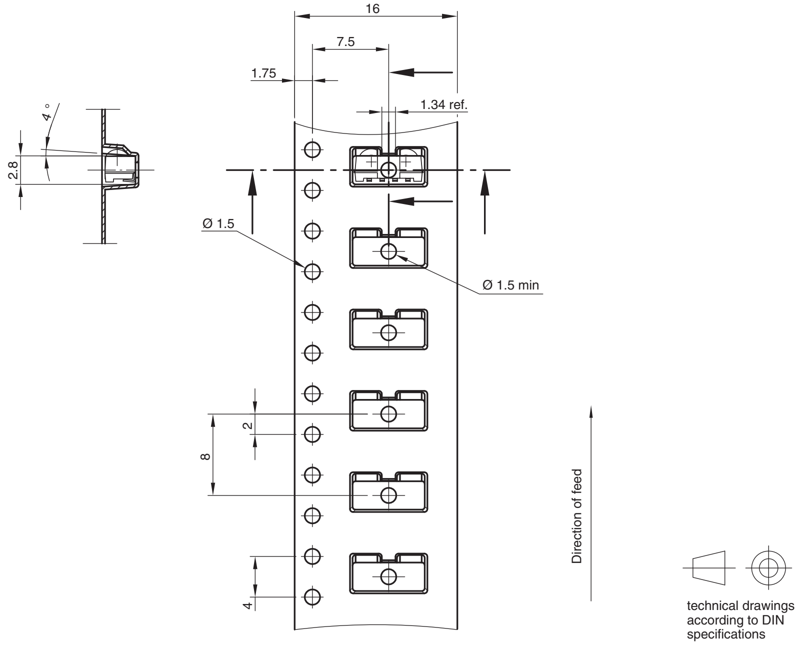
- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



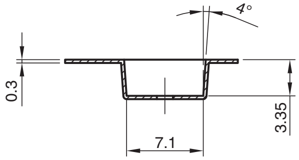
TAPING VERSION TSOP..TR DIMENSIONS in millimeters

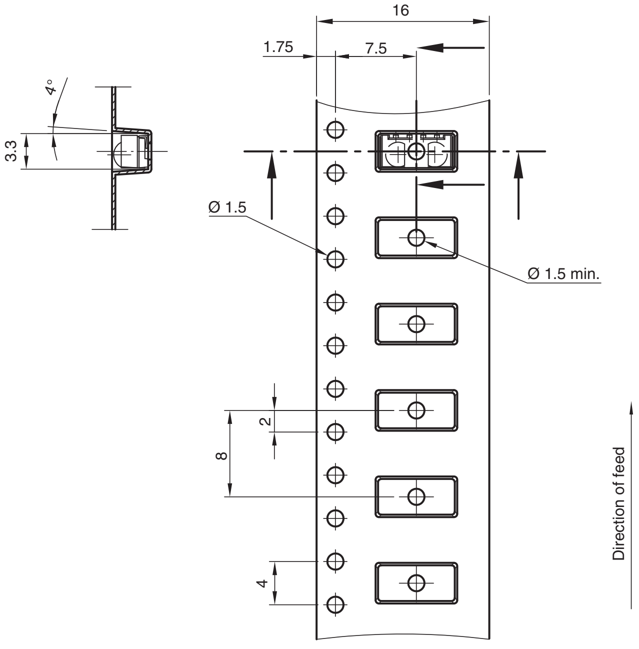




Drawing-No.: 9.700-5337.01-4
Issue: 1; 16.10.08
21577

TAPING VERSION TSOP..TT DIMENSIONS in millimeters

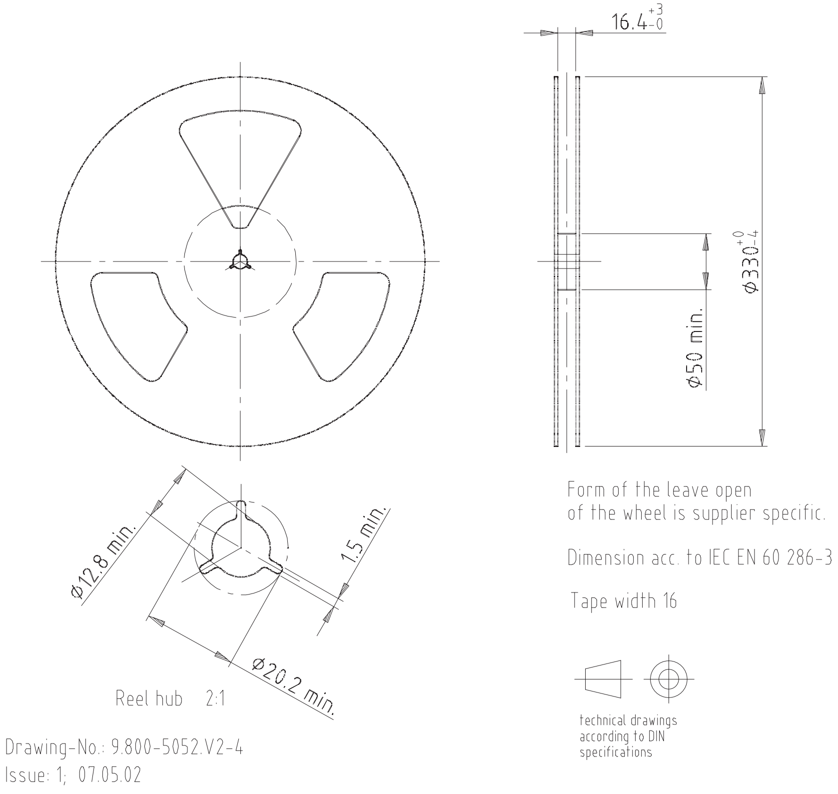




Drawing-No.: 9.700-5338.01-4
Issue: 3; 09.06.09
21578

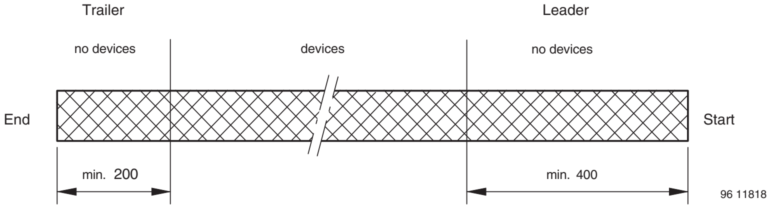
technical drawings
according to DIN
specifications

REEL DIMENSIONS in millimeters



16734

LEADER AND TRAILER DIMENSIONS in millimeters



96 11818

COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 ± 10 mm/min.
165° to 180° peel angle

LABEL

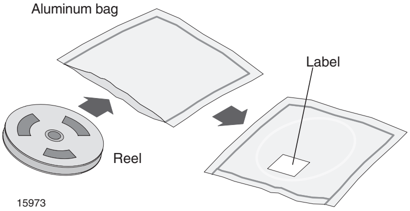
Standard bar code labels for finished goods

The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)		
PLAIN WRITING	**ABBREVIATION**	**LENGTH**
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
Long bar code top	**Type**	**Length**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
Short bar code bottom	**Type**	**Length**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)

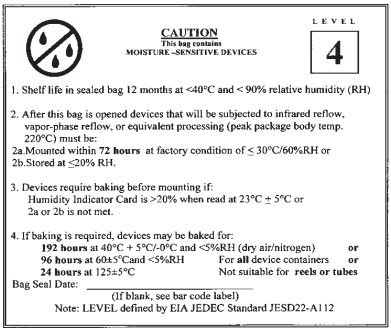
or

96 h at 60 °C + 5 °C and < 5 % RH for all device containers

or

24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION

This bag contains

MOISTURE –SENSITIVE DEVICES

LEVEL

4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:

2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or

2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:

192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen)		**or**
96 hours at 60±5°Cand <5%RH	For **all** device containers	**or**
24 hours at 125±5°C	Not suitable for **reels or tubes**	

Bag Seal Date: ____________________

(If blank, see bar code label)

Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

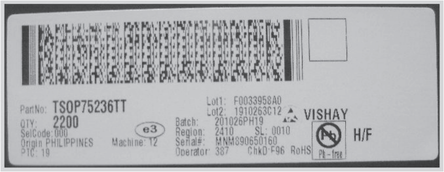
Example of JESD22-A112 level 4 label

ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

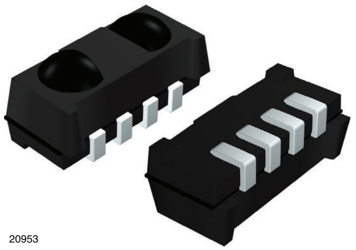
The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



PartNo: TSOP75236TT
QTY: 2200
SelCode: 000
Origin PHILIPPINES
PTC: 19
Machine: 12
e3
Lot1: F0033958A0
Lot2: 1910263C12
Batch: 201026PH19
Region: 2410 SL: 0010
Serial#: MNM890650160
Operator: 387 ChkD F96 RoHS
VISHAY
Pb-free
H/F

22178

IR Receiver Modules for Remote Control Systems


20953

FEATURES

- Very low supply current
- Photo detector and preamplifier in one package
- Compatible also with short burst dataformats
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Capable of side or top view
- Two lenses for high sensitivity and wide receiving angle
- Insensitive to supply voltage ripple and noise
- Narrow optical filter to reduce interference from plasma TV emissions
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT
GREEN
(5-2008)**

MECHANICAL DATA

Pinning:

1, 4 = GND, 2 = V_S, 3 = OUT

DESCRIPTION

The TSOP753.., TSOP755.. series are a two lens miniaturized receiver module for infrared remote control systems. One PIN diode per lens and a preamplifier are assembled on a leadframe, the epoxy lens cap is designed as an IR filter.

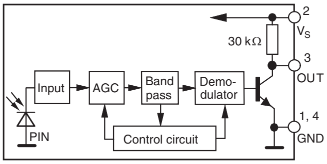
The demodulated output signal can be directly decoded by a microprocessor. The TSOP753.. is compatible with all common IR remote control data formats. It is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps. The TSOP755.. has an excellent noise suppression. It is immune 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

CARRIER FREQUENCY	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)	VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)
30 kHz	TSOP75330	TSOP75530
33 kHz	TSOP75333	TSOP75533
36 kHz	TSOP75336	TSOP75536
38 kHz	TSOP75338	TSOP75538
40 kHz	TSOP75340	TSOP75540
56 kHz	TSOP75356	TSOP75556

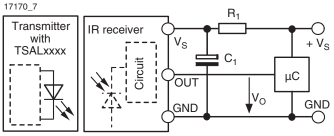
BLOCK DIAGRAM



20445-1

APPLICATION CIRCUIT

17170_7



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are $R_1 = 100\ \Omega$, $C_1 = 0.1\ \mu F$).
The output voltage V_o should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

** Please see document “Vishay Material Category Policy”: www.vishay.com/doc?99902

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	$T_{amb} \leq 85$ °C	P_{tot}	10	mW

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 voltage		V_S	2.5		5.5	V
Supply current	$E_v = 0$, $V_S = 3.3$ V	I_{SD}	0.27	0.35	0.45	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.45		mA
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 250$ mA	d		45		m
Output voltage low	$I_{OSL} = 0.5$ mA, $E_e = 0.7$ 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	$E_{e\ min.}$		0.15	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 50		deg

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

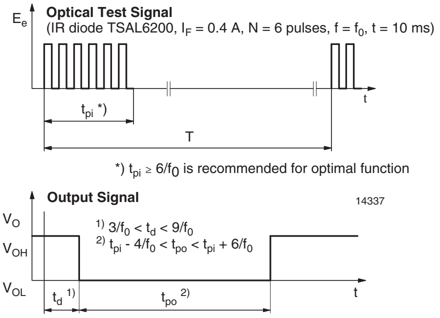


Fig. 1 - Output Active Low

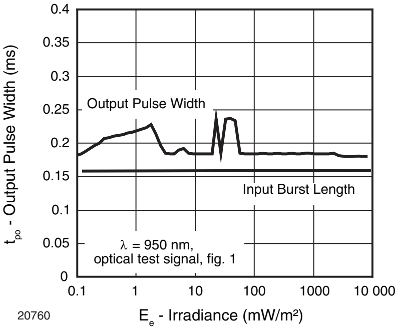


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

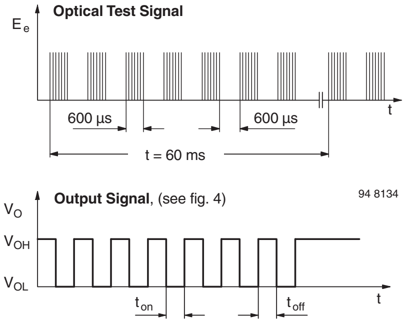


Fig. 3 - Output Function

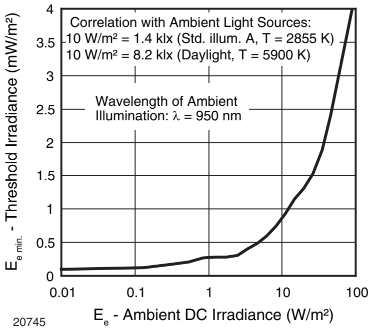


Fig. 6 - Sensitivity in Bright Ambient

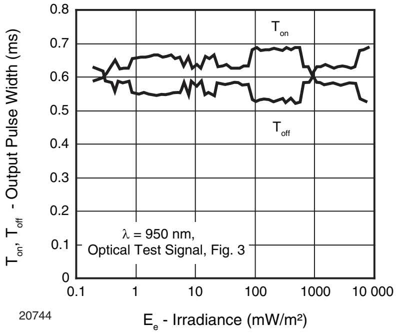


Fig. 4 - Output Pulse Diagram

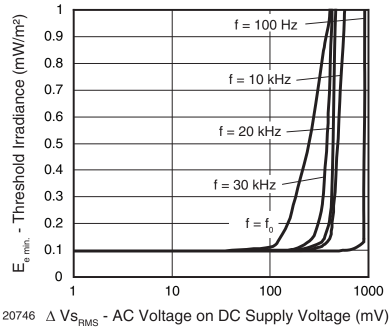


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

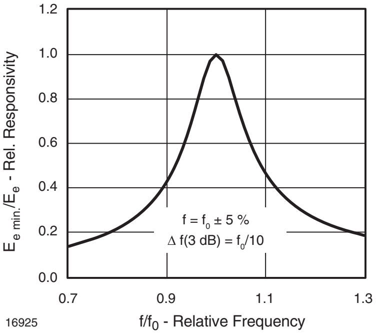


Fig. 5 - Frequency Dependence of Responsivity

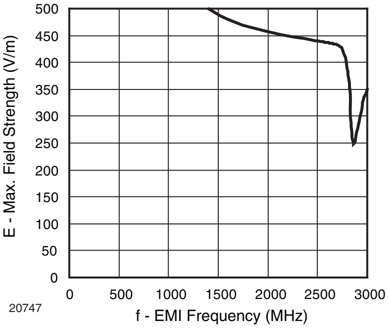


Fig. 8 - Sensitivity vs. Electric Field Disturbances

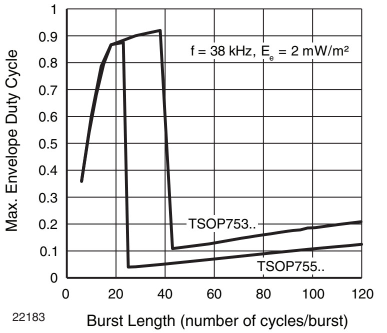


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

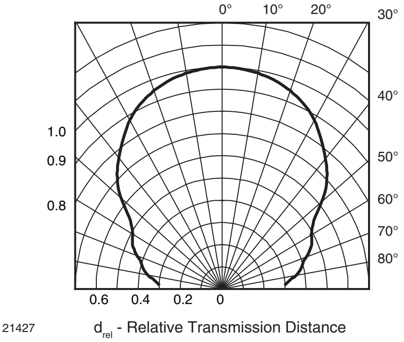


Fig. 12 - Horizontal Directivity

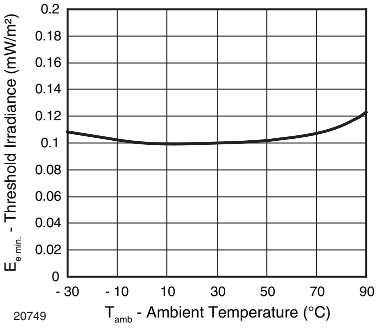


Fig. 10 - Sensitivity vs. Ambient Temperature

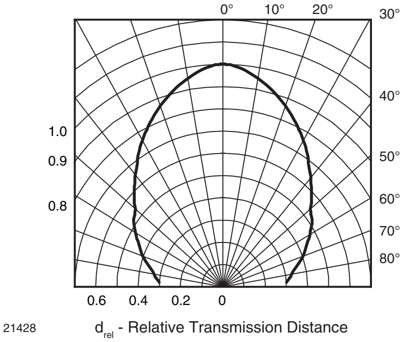


Fig. 13 - Vertical Directivity

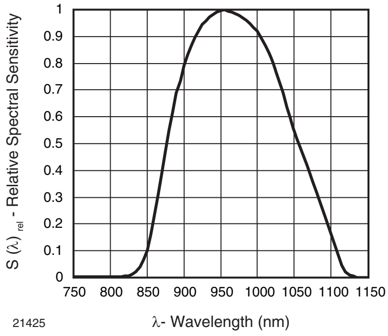


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP753.., TSOP755.. series 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 TSOP753.. and TSOP755.. 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 14 or figure 15)

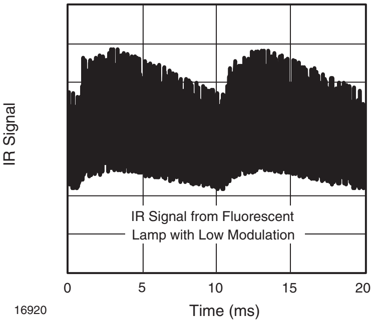


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

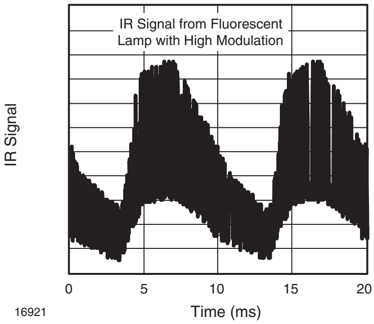


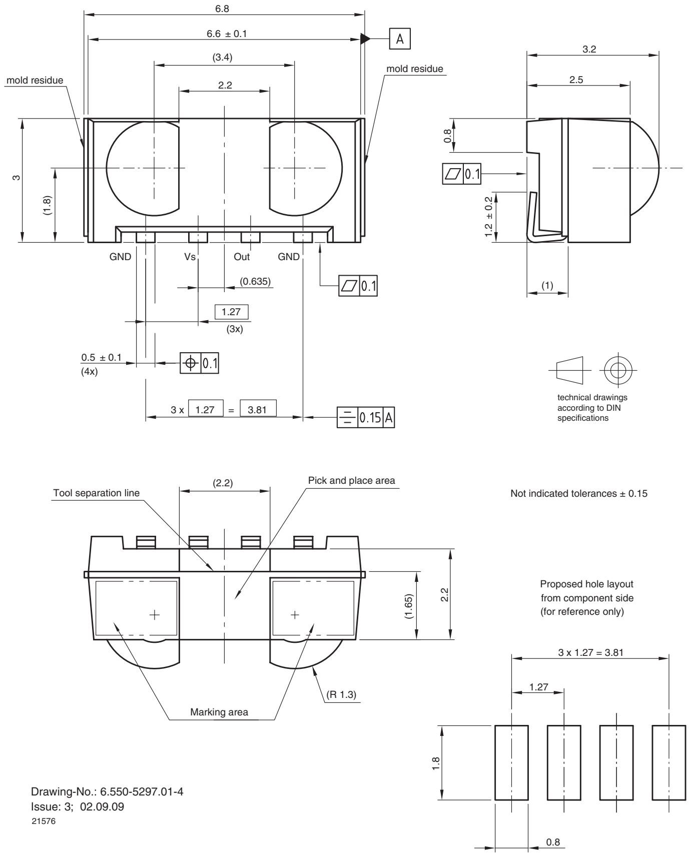
Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP753..	**TSOP755..**
Minimum burst length	6 cycles/burst	6 cycles/burst
After each burst of length a minimum gap time is required of	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	35 cycles > 4 x burst length	24 cycles > 25 ms
Maximum number of continuous short bursts/second	2000	2000
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	no	no
Recommended for XMP format	yes	yes
Recommended for RCMM code	yes	yes
Recommended for RECS-80 code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Most common disturbance signals are suppressed

Note

- For data formats with long bursts please see the datasheet for TSOP752.., TSOP754.. .

PACKAGE DIMENSIONS in millimeters



ASSEMBLY INSTRUCTIONS

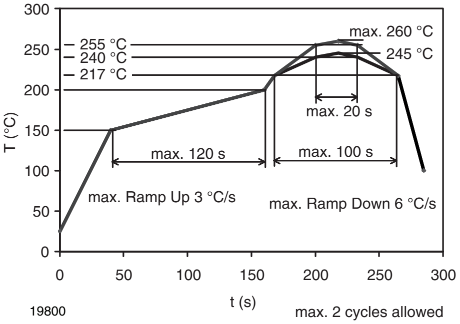
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

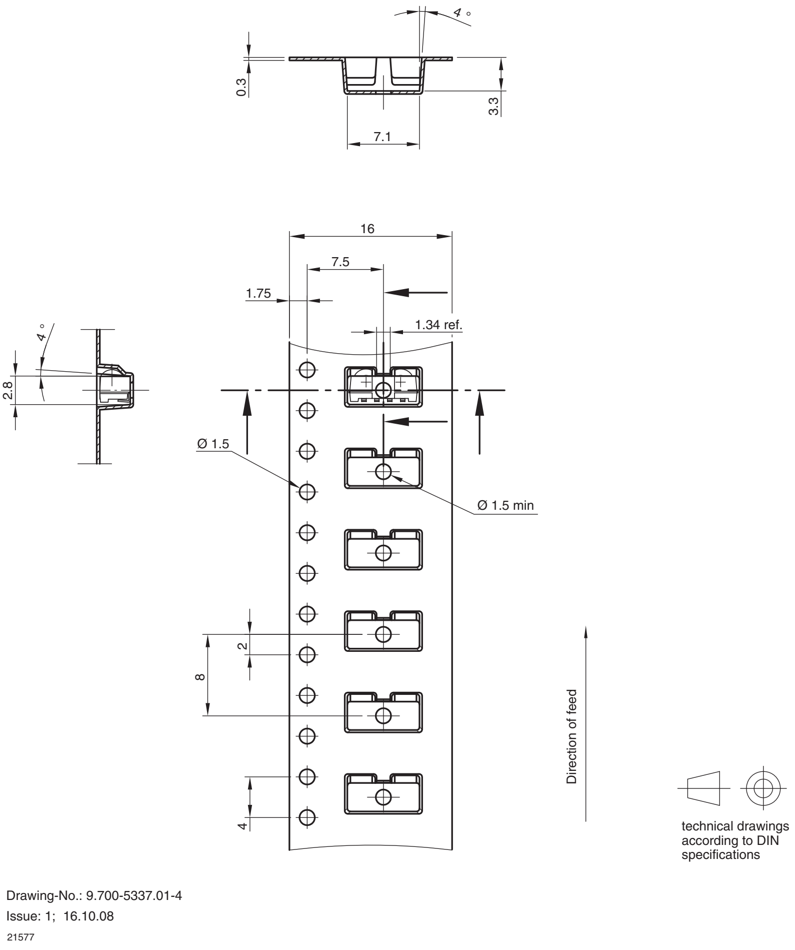
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

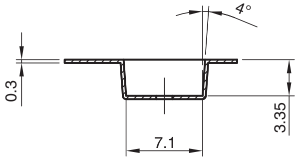
VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE

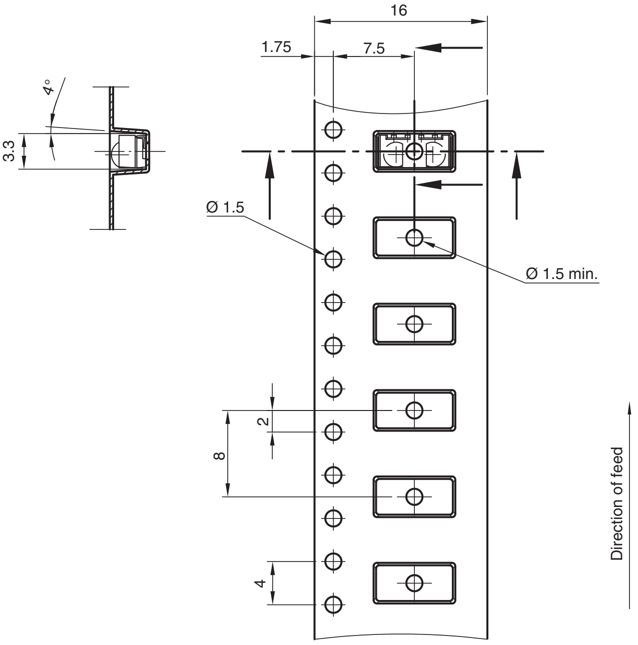


TAPING VERSION TSOP..TR DIMENSIONS in millimeters



TAPING VERSION TSOP..TT DIMENSIONS in millimeters

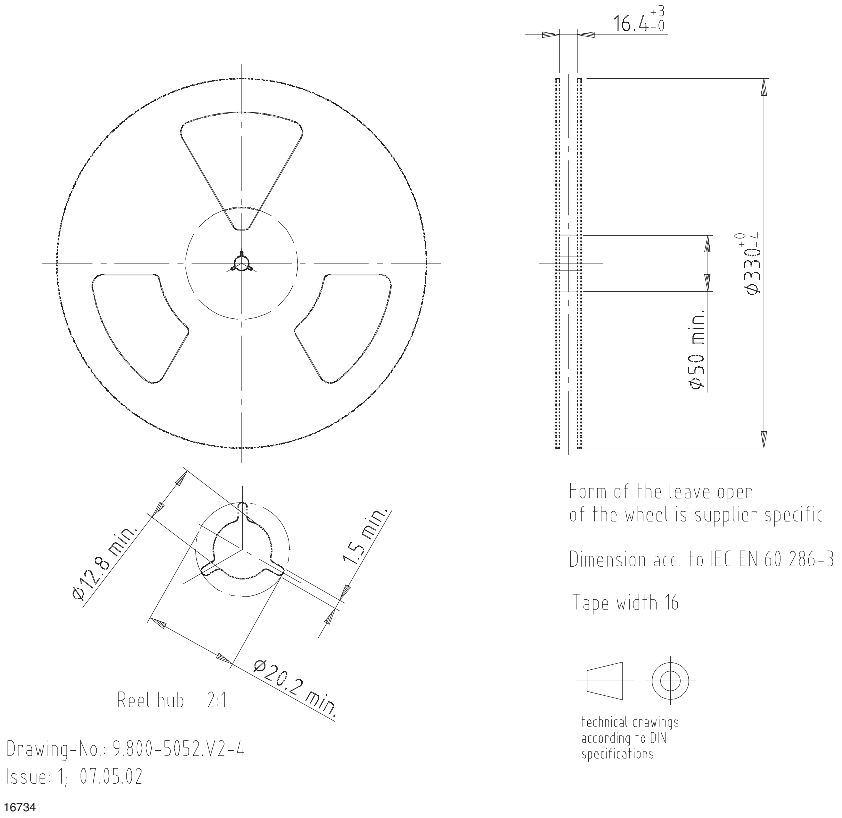




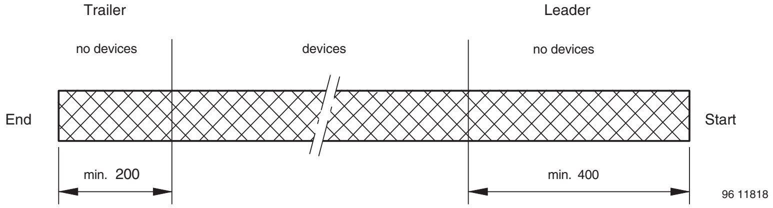
technical drawings
according to DIN
specifications

Drawing-No.: 9.700-5338.01-4
Issue: 3; 09.06.09
21578

REEL DIMENSIONS in millimeters



LEADER AND TRAILER DIMENSIONS in millimeters



COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 ± 10 mm/min.
165° to 180° peel angle

LABEL

Standard bar code labels for finished goods

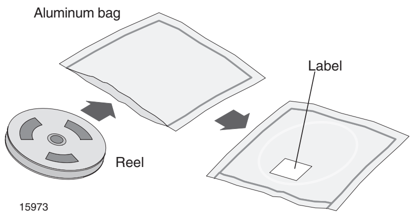
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)

PLAIN WRITING	ABBREVIATION	LENGTH
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
Long bar code top	**Type**	**Length**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
Short bar code bottom	**Type**	**Length**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)

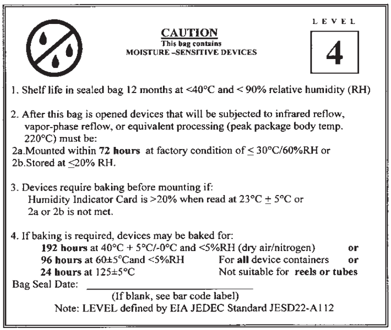
or

96 h at 60 °C + 5 °C and < 5 % RH for all device containers

or

24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE –SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:

192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen)		**or**
96 hours at 60±5°Cand <5%RH	For **all** device containers	**or**
24 hours at 125±5°C	Not suitable for **reels or tubes**	

Bag Seal Date: ______________________
(If blank, see bar code label)
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

Example of JESD22-A112 level 4 label

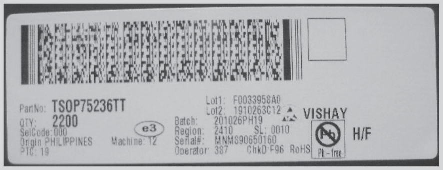
ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.

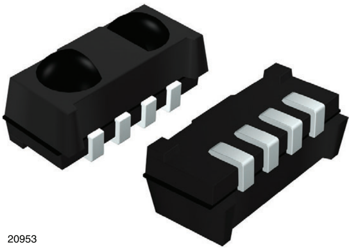
BAR CODE PRODUCT LABEL EXAMPLE:



PartNo: TSOP75236TT
QTY: 2200
SelCode:000
Origin PHILIPPINES
PTC: 19
e3
Machine: 12
Lot1: F0033958A0
Lot2: 1910263C12
Batch: 201026PH19
Region: 2410 SL: 0010
Serial#: MNM890650160
Operator: 387 ChkD:F96 RoHS
VISHAY
Pb-free
H/F

22178

IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

1, 4 = GND, 2 = V_S, 3 = OUT

FEATURES

- Continuous data transmission possible
- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Capable of side or top view
- Insensitive to supply voltage ripple and noise
- Two lenses for high sensitivity and wide receiving angle
- Narrow optical filter to reduce interference from plasma TV emissions
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS
COMPLIANT
GREEN
(5-2008)**

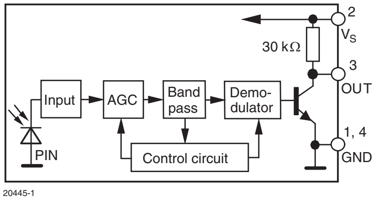
DESCRIPTION

The TSOP772.., TSOP774.. series are two lens miniaturized receiver modules for infrared remote control systems. One PIN diode per lens and a preamplifier are assembled on a leadframe, the epoxy lens cap is designed as an IR filter.
The demodulated output signal can be directly decoded by a microprocessor. The TSOP772.. is compatible with all common IR remote control data formats. The TSOP774.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.
This component has not been qualified according to automotive specifications.

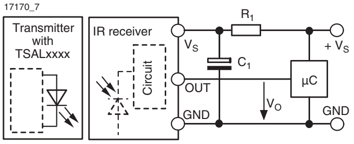
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC4)
30 kHz	TSOP77230	TSOP77430
33 kHz	TSOP77233	TSOP77433
36 kHz	TSOP77236	TSOP77436
36.7 kHz	TSOP77237	TSOP77437
38 kHz	TSOP77238	TSOP77438
40 kHz	TSOP77240	TSOP77440
56 kHz	TSOP77256	TSOP77456

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_o should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

** Please see document "Vishay Material Category Policy": www.vishay.com/doc?99902

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 (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

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	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	E_v = 40 klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, I_F = 400 mA	d		40		m
Output voltage low	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², 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	$E_{e\ min.}$		0.3	0.45	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	$\varphi_{1/2}$		± 50		deg

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

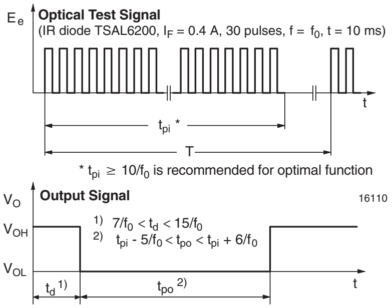


Fig. 1 - Output Active Low

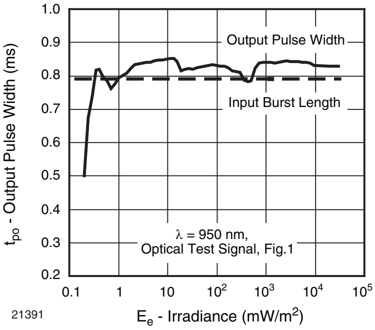


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

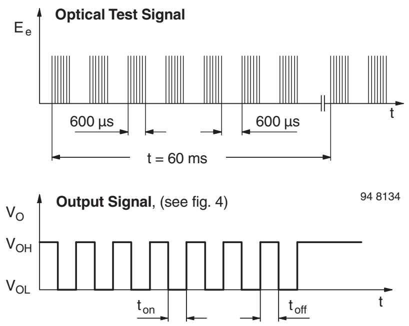


Fig. 3 - Output Function

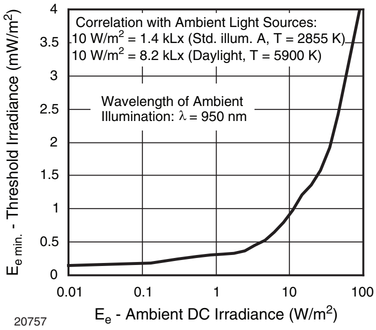


Fig. 6 - Sensitivity in Bright Ambient

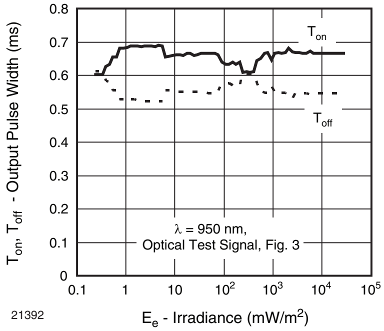


Fig. 4 - Output Pulse Diagram

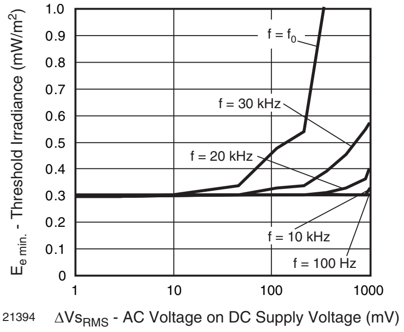


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

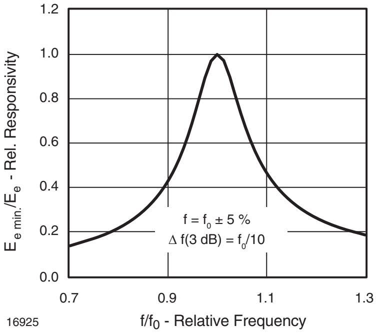


Fig. 5 - Frequency Dependence of Responsivity

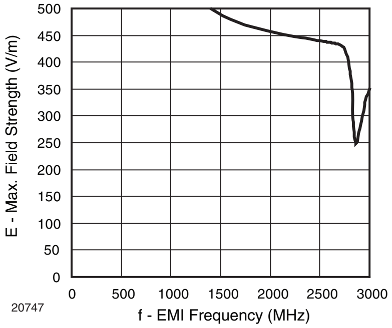


Fig. 8 - Sensitivity vs. Electric Field Disturbances

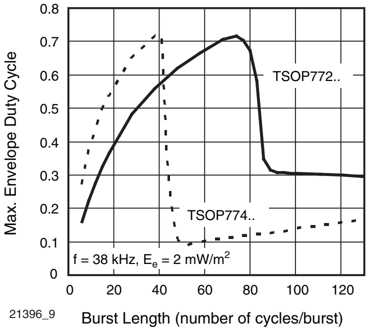


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

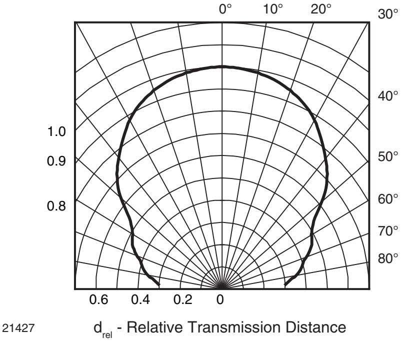


Fig. 12 - Horizontal Directivity

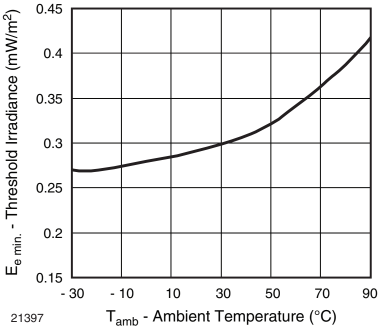


Fig. 10 - Sensitivity vs. Ambient Temperature

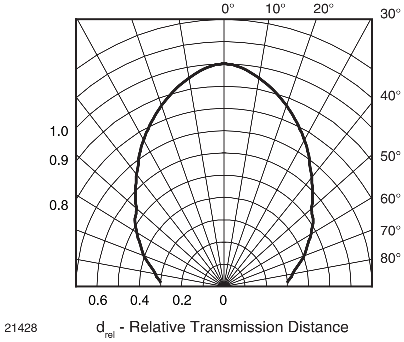


Fig. 13 - Vertical Directivity

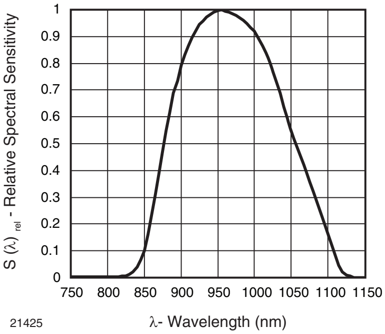


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

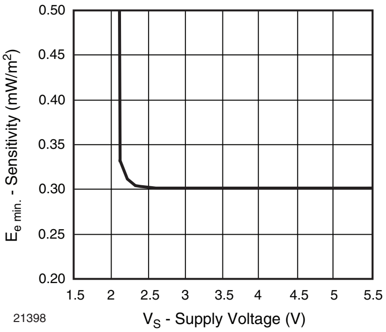


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP772.., TSOP774.. series 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. 40 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the TSOP772.., TSOP774.. 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 15 or figure 16)

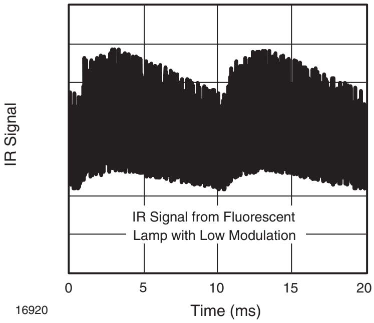


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

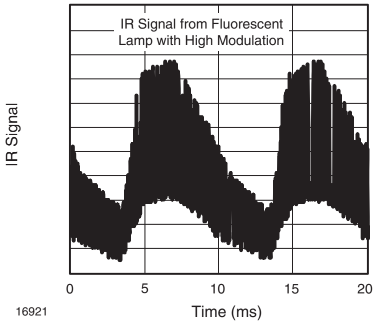


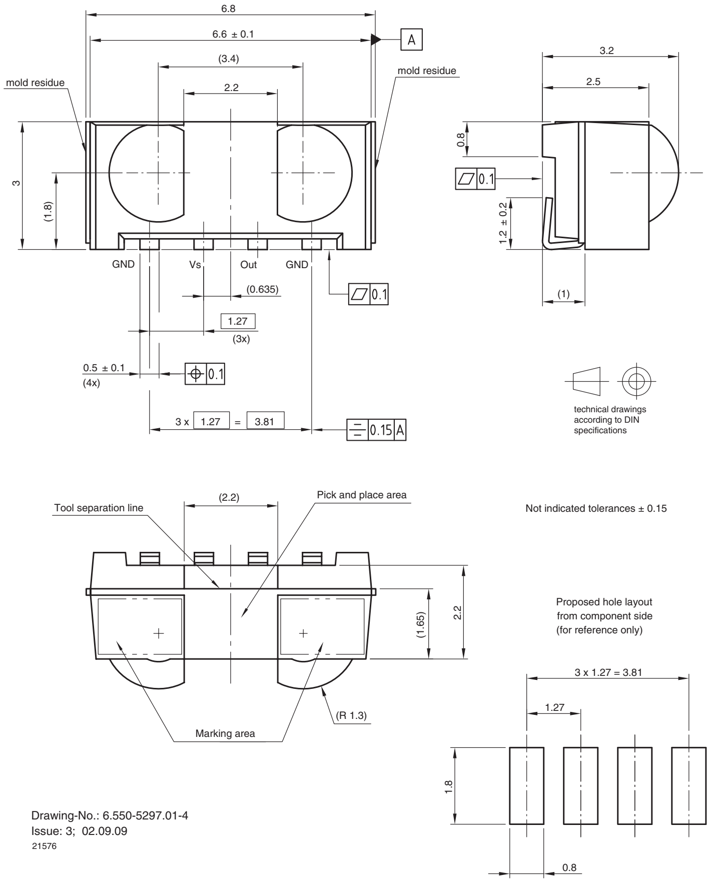
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP772..	TSOP774..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 12 cycles	10 to 35 cycles ≥ 12 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	800	1300
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	yes
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

Note

- For data formats with short bursts please see the datasheet of TSOP773.. .

PACKAGE DIMENSIONS in millimeters



ASSEMBLY INSTRUCTIONS

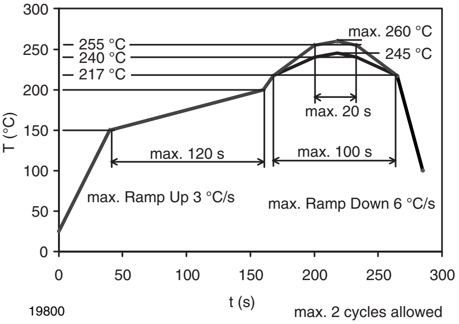
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

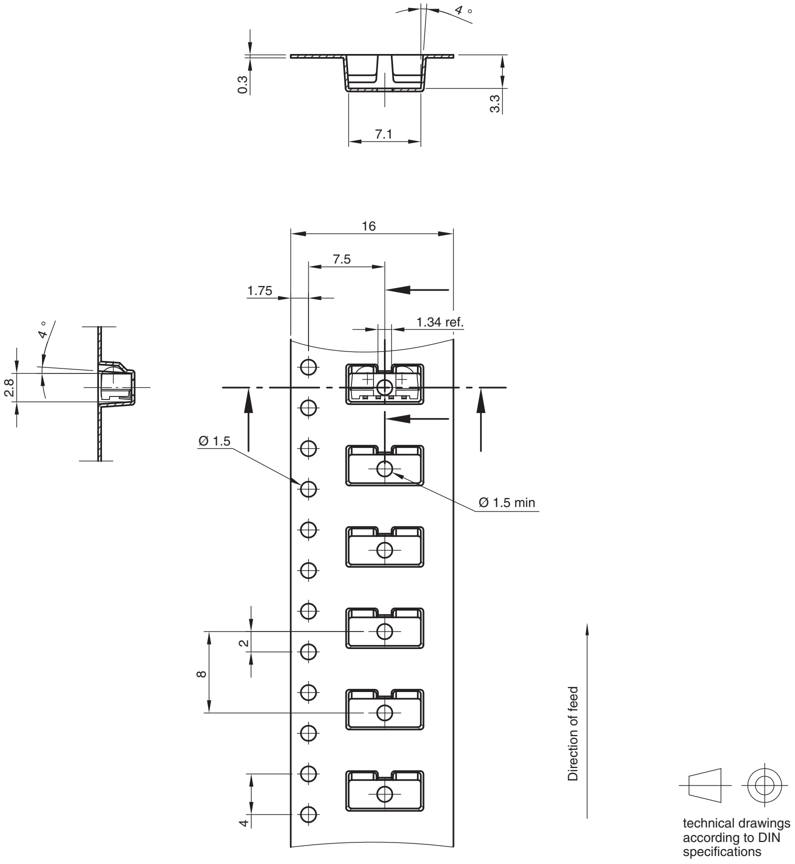
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE

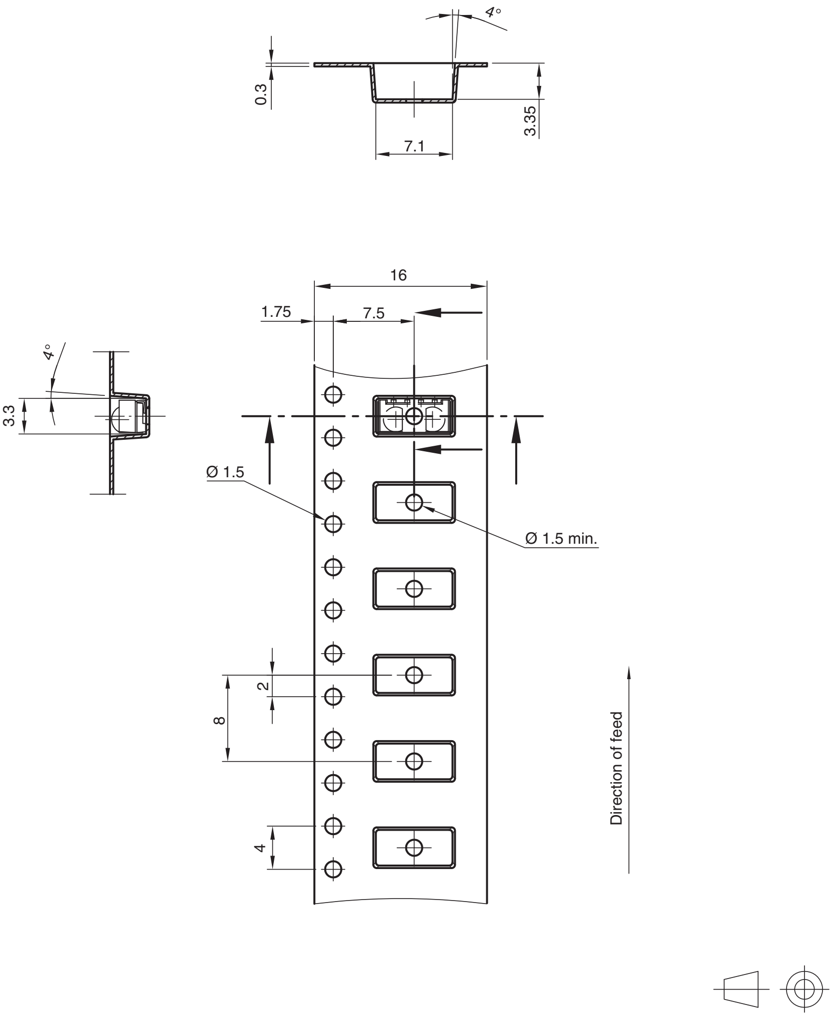


TAPING VERSION TSOP..TR DIMENSIONS in millimeters



Drawing-No.: 9.700-5337.01-4
Issue: 1; 16.10.08
21577

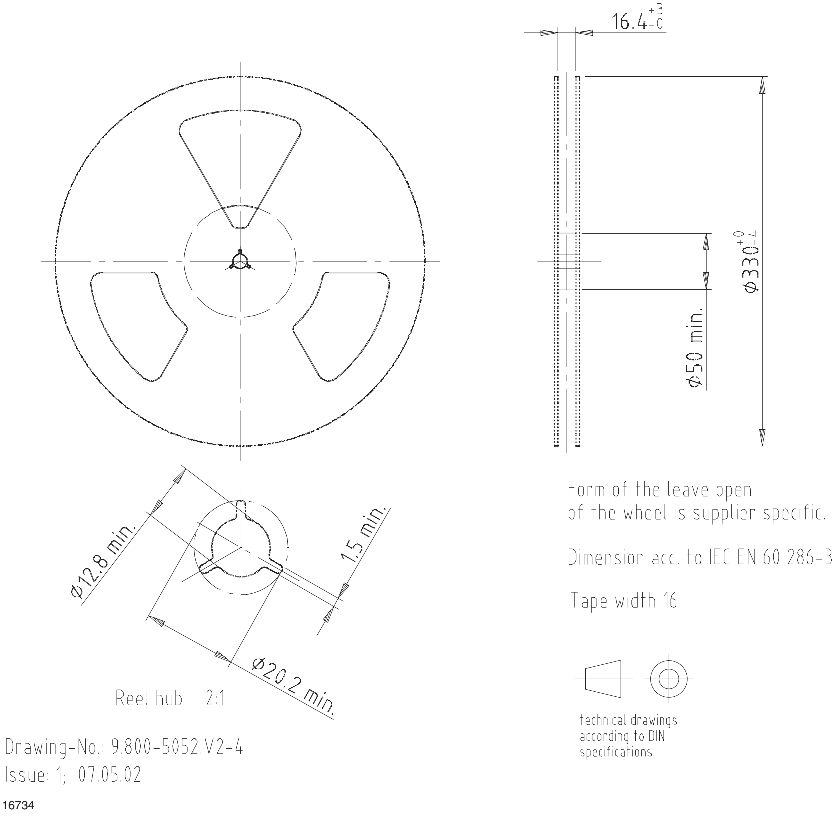
TAPING VERSION TSOP..TT DIMENSIONS in millimeters



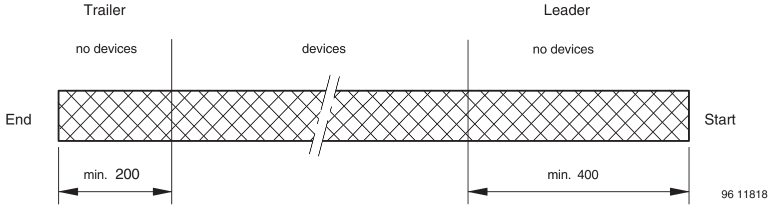
Drawing-No.: 9.700-5338.01-4
Issue: 3; 09.06.09
21578

technical drawings
according to DIN
specifications

REEL DIMENSIONS in millimeters



LEADER AND TRAILER DIMENSIONS in millimeters



COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 ± 10 mm/min.
165° to 180° peel angle

LABEL

Standard bar code labels for finished goods

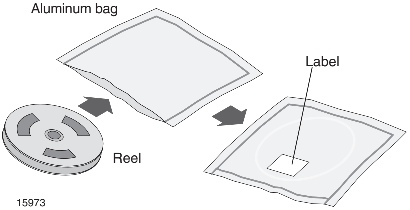
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)

PLAIN WRITING	ABBREVIATION	LENGTH
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
Long bar code top	**Type**	**Length**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
Short bar code bottom	**Type**	**Length**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



15973

FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)

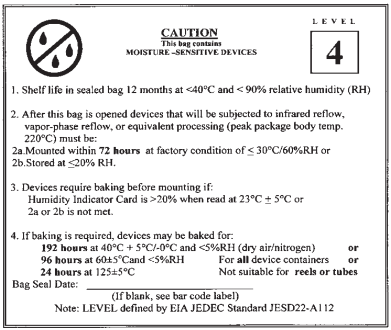
or

96 h at 60 °C + 5 °C and < 5 % RH for all device containers

or

24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE -SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:
192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
96 hours at 60±5°Cand <5%RH For **all** device containers **or**
24 hours at 125±5°C Not suitable for **reels or tubes**

Bag Seal Date: ______________________
(If blank, see bar code label)
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

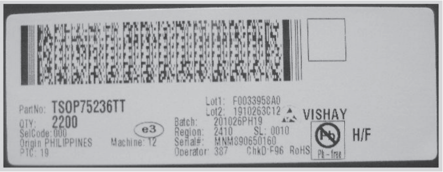
Example of JESD22-A112 level 4 label

ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

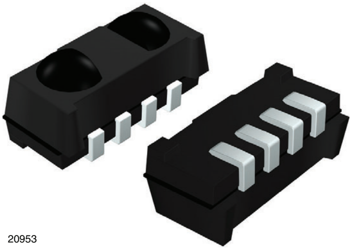
The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



PartNo: TSOP75236TT
QTY: 2200
SelCode: 000
Origin PHILIPPINES
PTC: 19
Machine: T2
Lot1: F0033958A0
Lot2: 1910263C12
Batch: 201026PH19
Region: 2410 SL: 0010
Serial#: MNM890650160
Operator: 387 ChkD:F96 RoHS
VISHAY
H/F

22178

IR Receiver Modules for Remote Control Systems


20953

FEATURES

- Continuous data transmission possible
- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Capable of side or top view
- Insensitive to supply voltage ripple and noise
- Two lenses for high sensitivity and wide receiving angle
- Narrow optical filter to reduce interference from plasma TV emissions
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT
GREEN
(5-2008)**

MECHANICAL DATA

Pinning:

1, 4 = GND, 2 = V_S, 3 = OUT

DESCRIPTION

The TSOP773.. is a two lens miniaturized receiver module for infrared remote control systems. One PIN diode per lens and a preamplifier are assembled on a leadframe, the epoxy lens cap is designed as an IR filter.

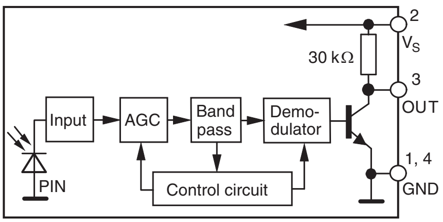
The demodulated output signal can be directly decoded by a microprocessor. The TSOP773.. is optimized to better suppress spurious pulses from fluorescent lamps, LCD, TVs, or plasma displays.

This component has not been qualified according to automotive specifications.

PARTS TABLE

CARRIER FREQUENCY	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)
30 kHz	TSOP77330
33 kHz	TSOP77333
36 kHz	TSOP77336
36.7 kHz	TSOP77337
38 kHz	TSOP77338
40 kHz	TSOP77340
56 kHz	TSOP77356

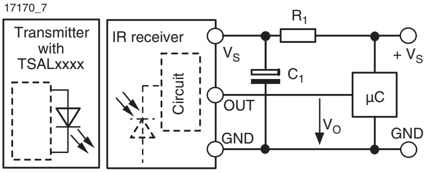
BLOCK DIAGRAM



20445-1

APPLICATION CIRCUIT

17170_7



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

** Please see document “Vishay Material Category Policy”: www.vishay.com/doc?99902

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 (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

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	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	E_v = 40 klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	E_v = 0, test signal see fig. 1, IR diode TSAL6200, I_F = 400 mA	d		40		m
Output voltage low	I_{OSL} = 0.5 mA, E_e = 0.7 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	$E_{e\ min.}$		0.3	0.45	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 50		deg

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

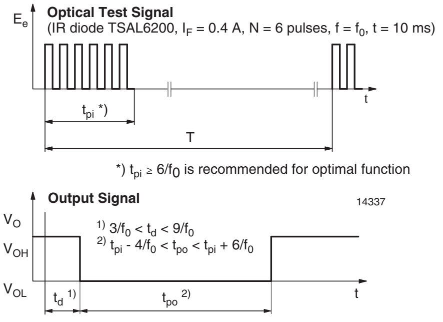


Fig. 1 - Output Active Low

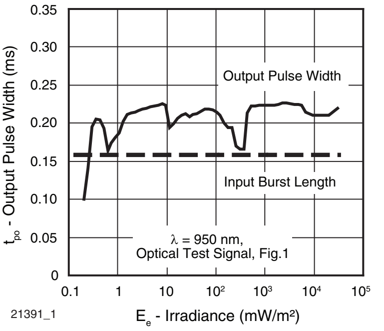


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

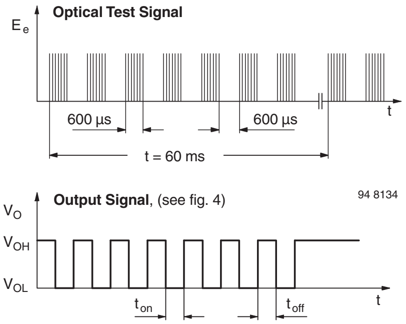


Fig. 3 - Output Function

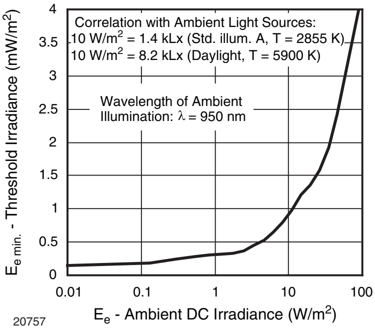


Fig. 6 - Sensitivity in Bright Ambient

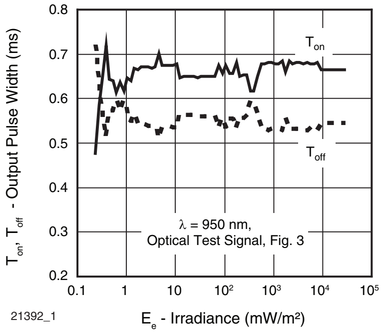


Fig. 4 - Output Pulse Diagram

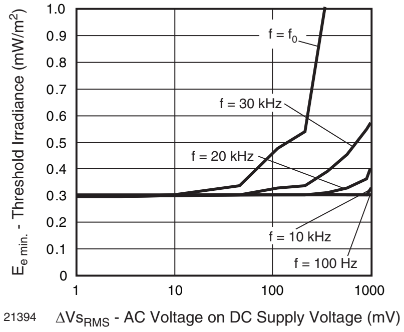


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

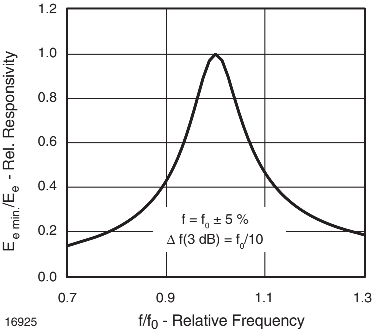


Fig. 5 - Frequency Dependence of Responsivity

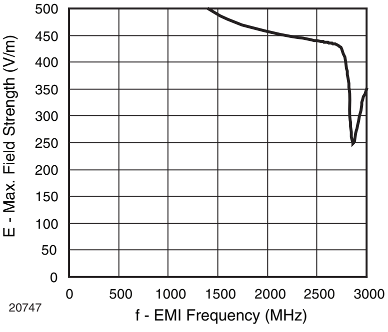


Fig. 8 - Sensitivity vs. Electric Field Disturbances

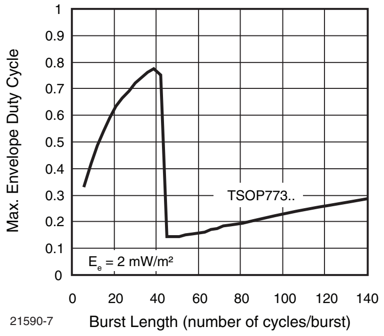


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

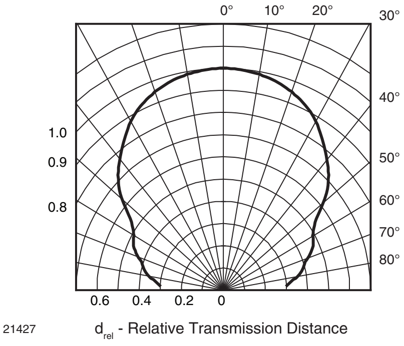


Fig. 12 - Horizontal Directivity

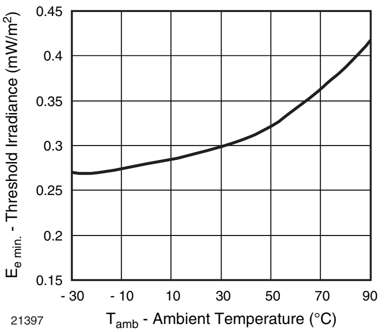


Fig. 10 - Sensitivity vs. Ambient Temperature

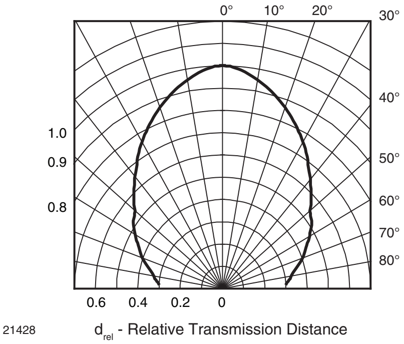


Fig. 13 - Vertical Directivity

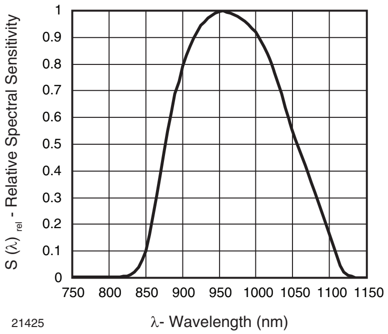


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

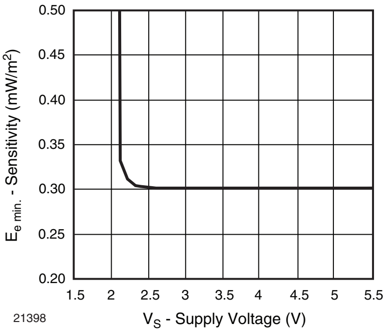


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP773.. is 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. 40 kHz) and fulfill the conditions in the table below.
When a data signal is applied to the TSOP773.. 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 15 or figure 16)

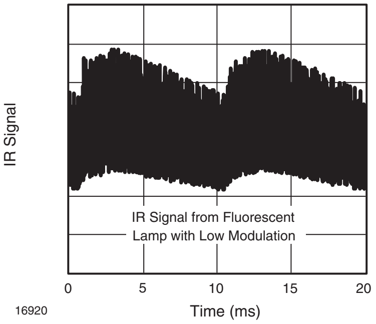


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

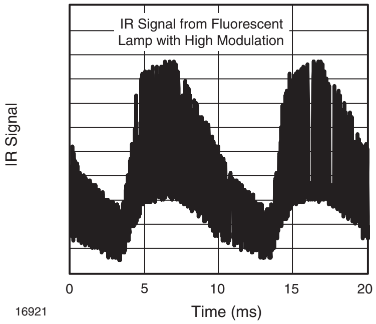


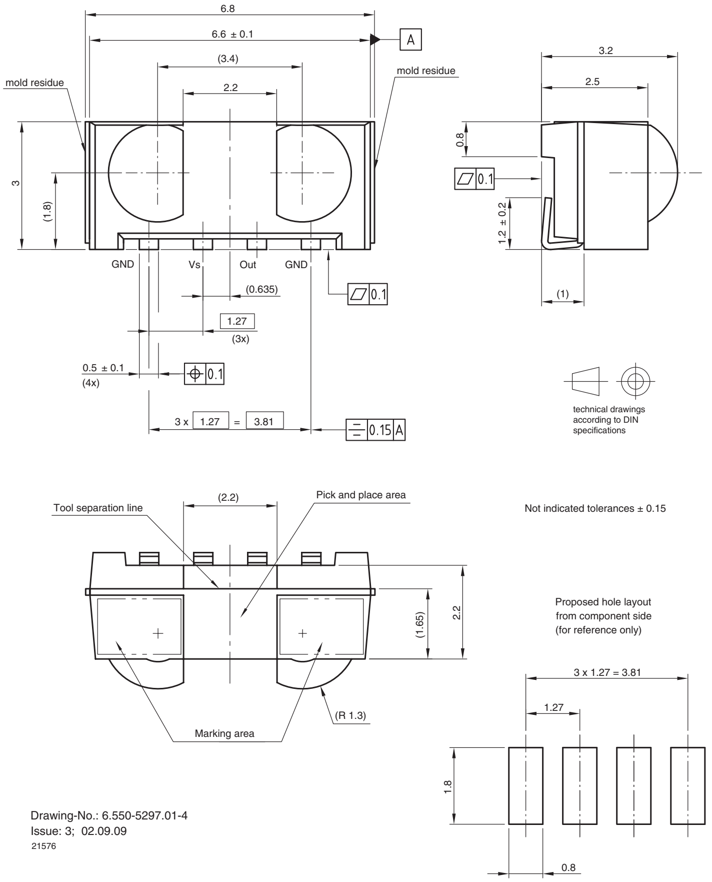
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP773..
Minimum burst length	6 cycles/burst
After each burst of length a minimum gap time is required of	6 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	35 cycles > 6 x burst length
Maximum number of continuous short bursts/second	2000
Recommended for NEC code	yes
Recommended for RC5/RC6 code	yes
Recommended for Sony code	yes
Recommended for RECS-80 code	yes
Recommended for RCMM code	yes
Recommended for r-step code	yes
Recommended for XMP code	yes
Suppression of interference from fluorescent lamps	Even critical disturbance signals are suppressed (e.g. waveform of figure 15)

Note

- For data formats with long bursts (10 carrier cycles or longer) we recommend the TSOP772.., TSOP774.. because of the better noise suppression.

PACKAGE DIMENSIONS in millimeters



ASSEMBLY INSTRUCTIONS

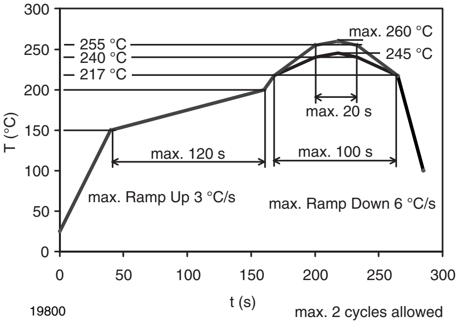
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

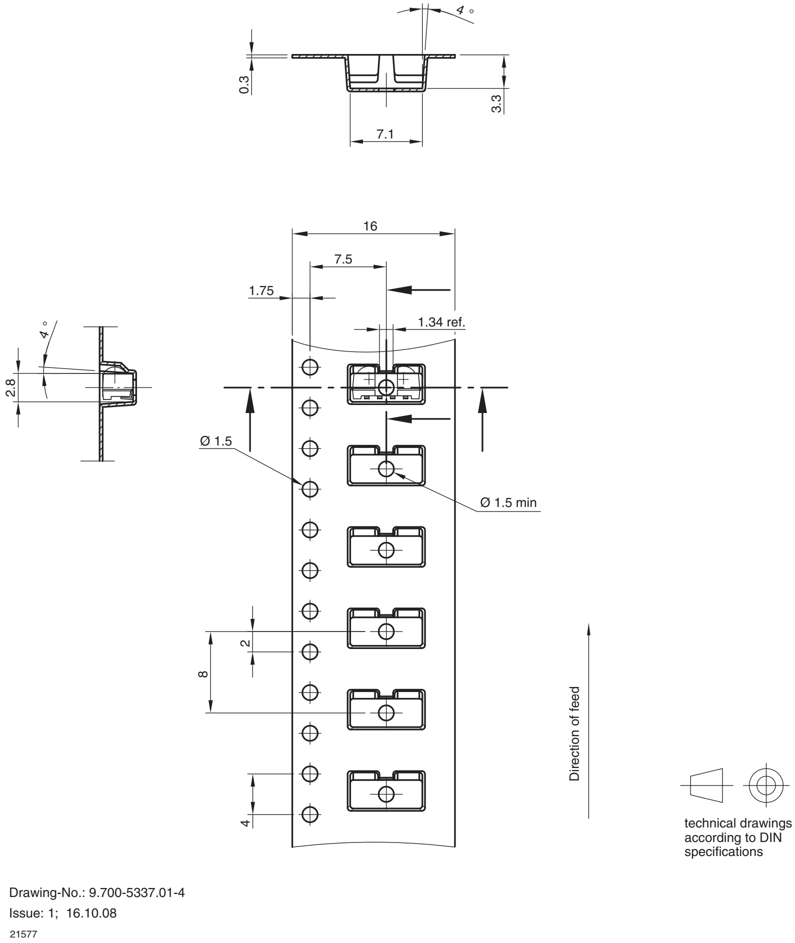
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

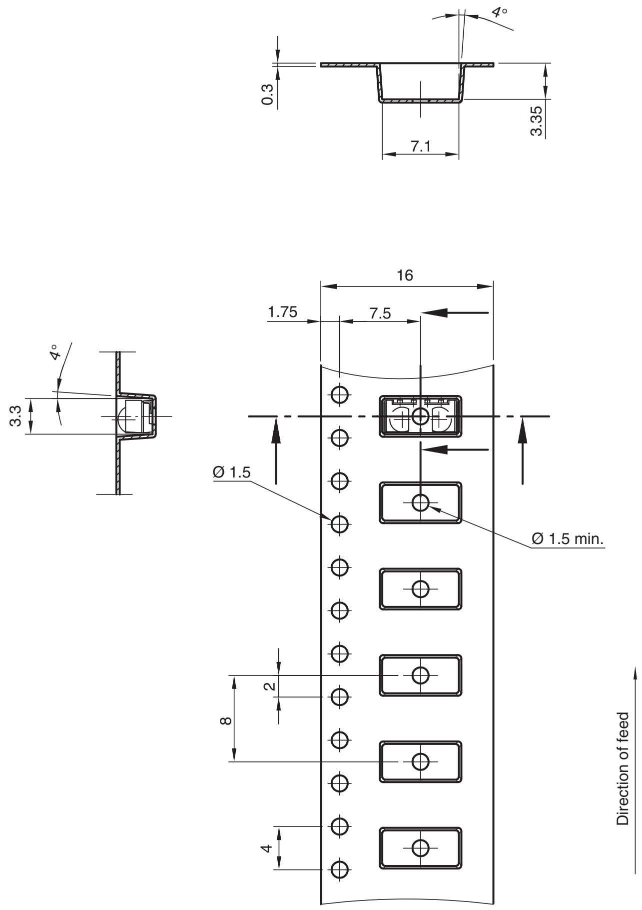
VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



TAPING VERSION TSOP..TR DIMENSIONS in millimeters



TAPING VERSION TSOP..TT DIMENSIONS in millimeters



Drawing-No.: 9.700-5338.01-4
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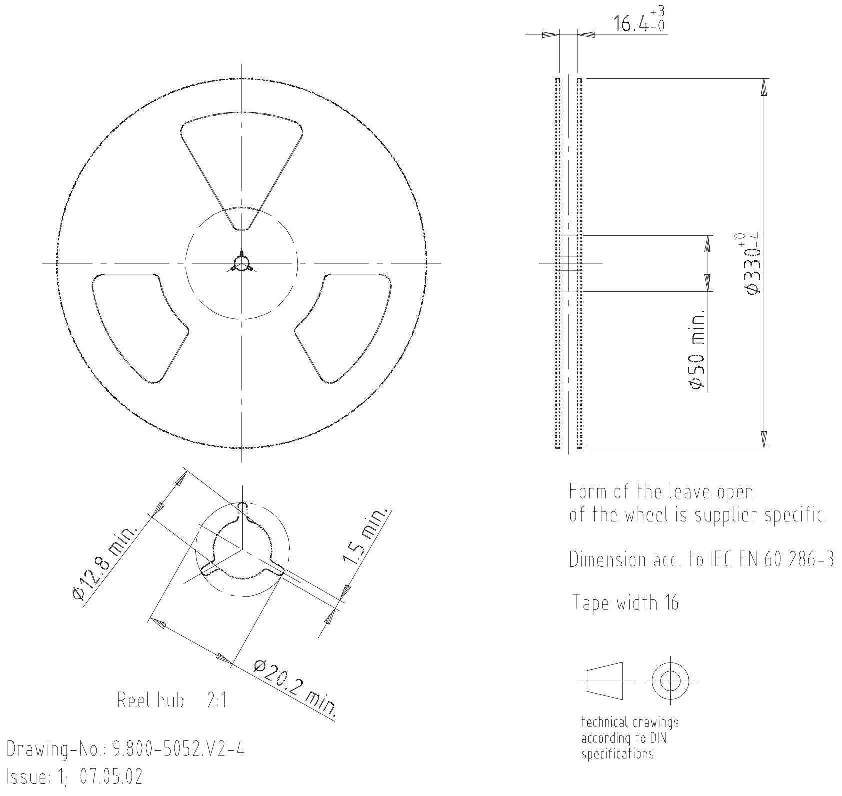
21578

technical drawings
according to DIN
specifications

REEL DIMENSIONS in millimeters



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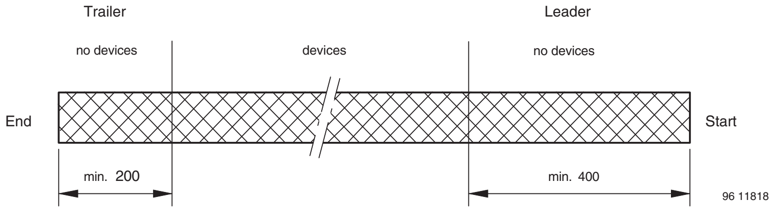
LEADER AND TRAILER DIMENSIONS in millimeters



COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 ± 10 mm/min.
165° to 180° peel angle

LABEL

Standard bar code labels for finished goods

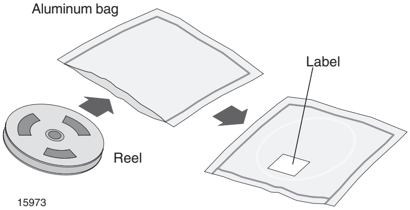
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)

PLAIN WRITING	**ABBREVIATION**	**LENGTH**
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
Long bar code top	**Type**	**Length**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
Short bar code bottom	**Type**	**Length**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

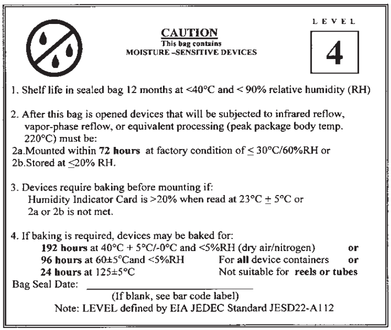
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen) or

96 h at 60 °C + 5 °C and < 5 % RH for all device containers or

24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE –SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:
192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
96 hours at 60±5°Cand <5%RH For **all** device containers **or**
24 hours at 125±5°C Not suitable for **reels or tubes**
Bag Seal Date: ________________
(If blank, see bar code label)
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

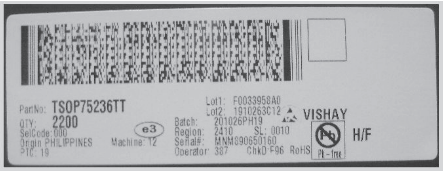
Example of JESD22-A112 level 4 label

ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

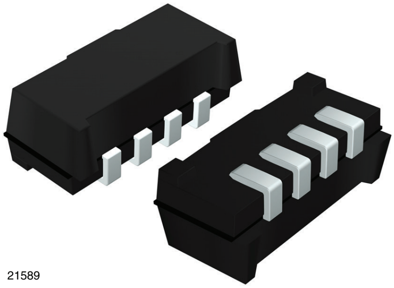
The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



PartNo: TSOP75236TT
QTY: 2200
SelCode: 000
Origin PHILIPPINES
PTC: 19
Machine: 12
Lot1: F0033958A0
Lot2: 1910263C12
Batch: 201026PH19
Region: 2410 SL: 0010
Serial#: MNM890650160
Operator: 387 ChkD F96 RoHS

22178

IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

1, 4 = GND, 2 = V_S, 3 = OUT

FEATURES

- Continuous data transmission possible
- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Capable of side or top view
- Insensitive to supply voltage ripple and noise
- Low profile 2.35 mm
- Narrow optical filter to reduce interference from plasma TV emissions
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP772..W, TSOP774..W series are miniaturized receiver modules for infrared remote control systems. One PIN diode a preamplifier are assembled on a leadframe, the epoxy lens cap is designed as an IR filter.

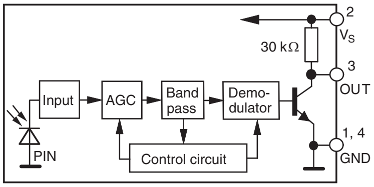
The demodulated output signal can be directly decoded by a microprocessor. The TSOP772..W is compatible with all common IR remote control data formats. The TSOP774..W is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

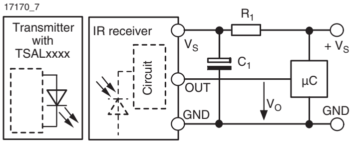
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC4)
30 kHz	TSOP77230W	TSOP77430W
33 kHz	TSOP77233W	TSOP77433W
36 kHz	TSOP77236W	TSOP77436W
38 kHz	TSOP77238W	TSOP77438W
40 kHz	TSOP77240W	TSOP77440W
56 kHz	TSOP77256W	TSOP77456W

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 μF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

** Please see document "Vishay Material Category Policy": www.vishay.com/doc?99902

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 (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

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	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	E_v = 40 klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, I_F = 400 mA	d		40		m
Output voltage low	I_{OSL} = 0.5 mA, E_e = 0.7 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	$E_{e\ min.}$		0.6	0.9	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 50		deg

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

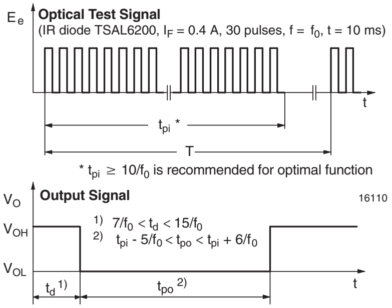


Fig. 1 - Output Active Low

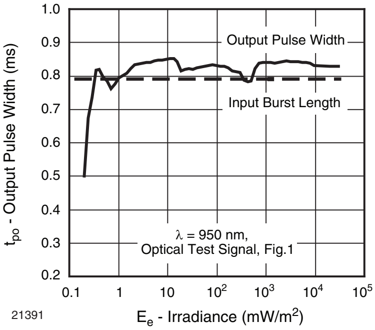


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

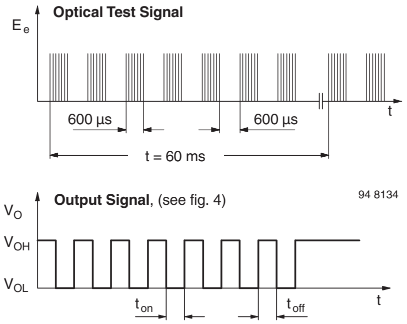


Fig. 3 - Output Function

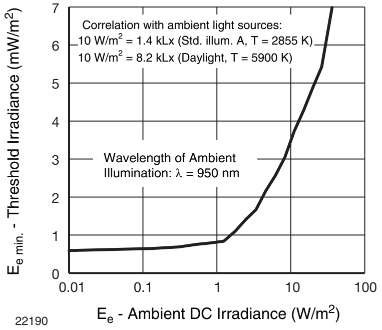


Fig. 6 - Sensitivity in Bright Ambient

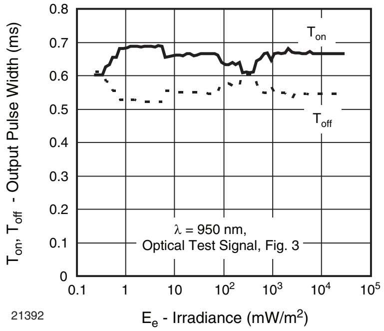


Fig. 4 - Output Pulse Diagram

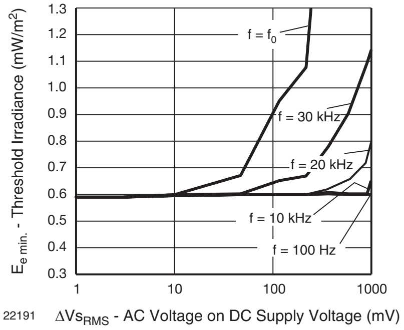


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

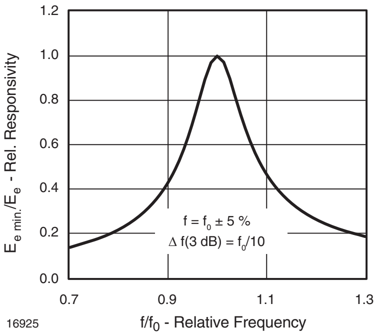


Fig. 5 - Frequency Dependence of Responsivity

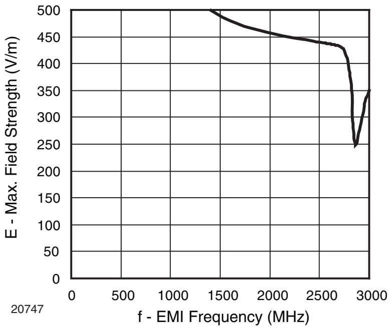


Fig. 8 - Sensitivity vs. Electric Field Disturbances

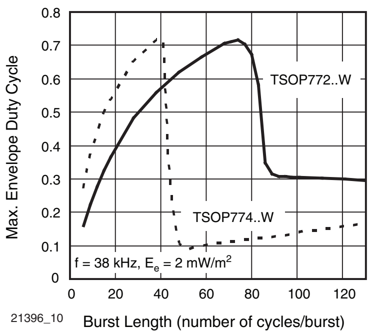


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

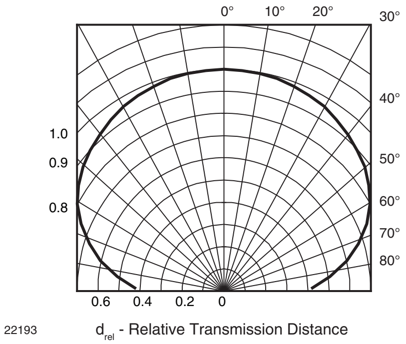


Fig. 12 - Horizontal Directivity

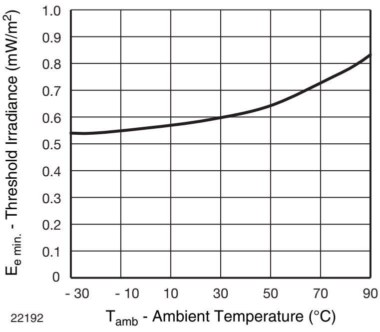


Fig. 10 - Sensitivity vs. Ambient Temperature

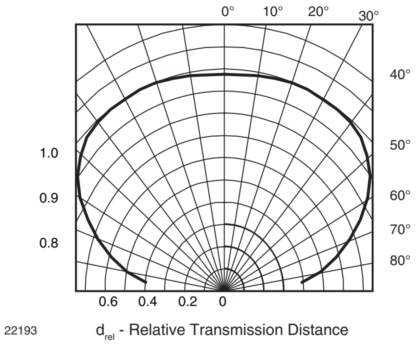


Fig. 13 - Vertical Directivity

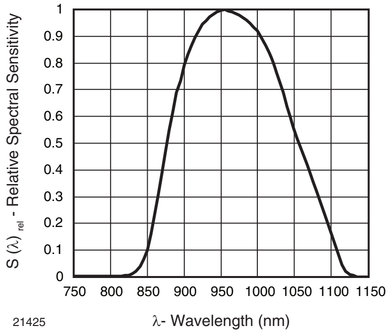


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

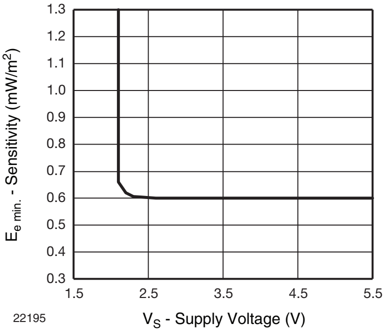


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP772..W, TSOP774..W series 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. 40 kHz) and fulfill the conditions in the table below.
When a data signal is applied to the TSOP772..W, TSOP774..W 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 15 or figure 16)

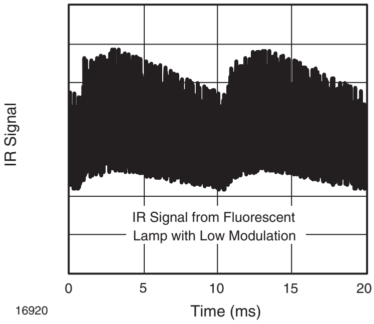


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

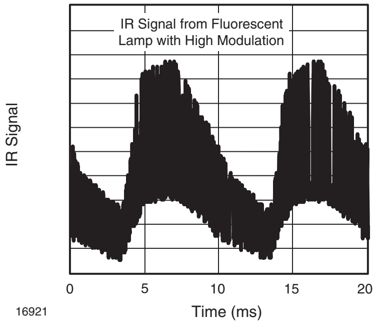


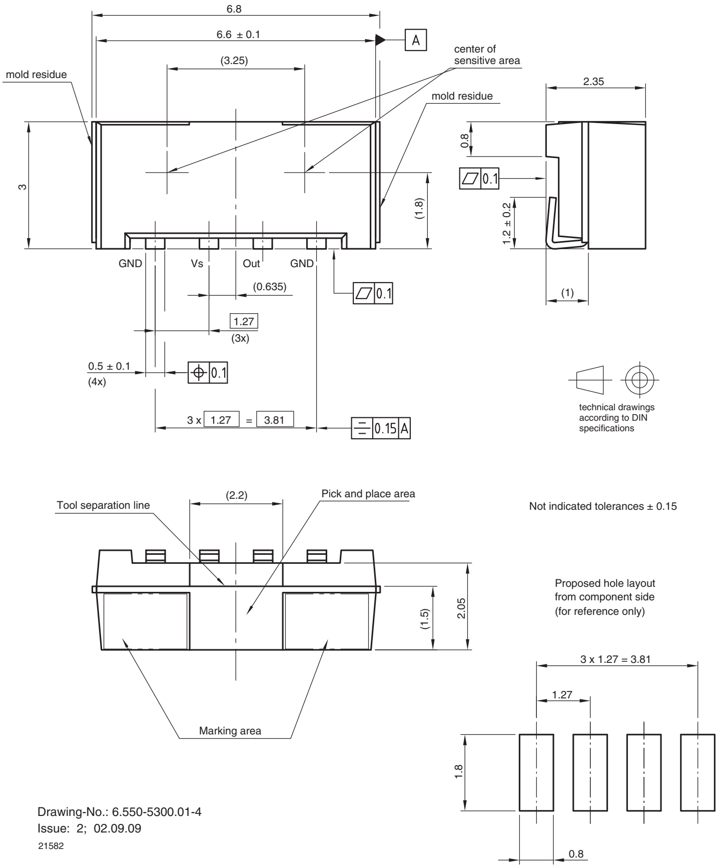
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP772..W	TSOP774..W
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 12 cycles	10 to 35 cycles ≥ 12 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	800	1300
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	yes
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

Note

- For data formats with short bursts please see the datasheet of TSOP773..W.

PACKAGE DIMENSIONS in millimeters



ASSEMBLY INSTRUCTIONS

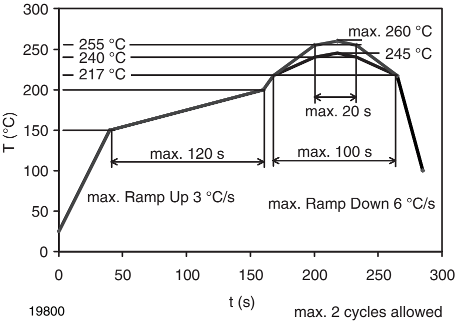
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

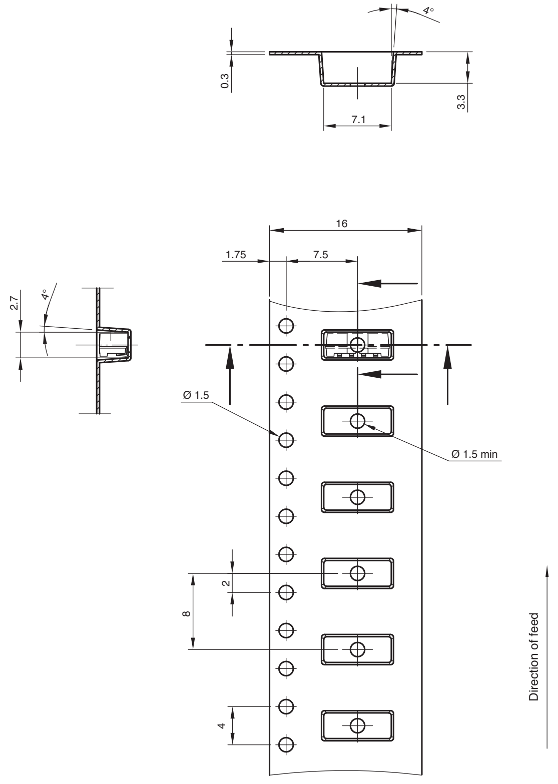
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



TAPING VERSION TSOP..TR DIMENSIONS in millimeters



Drawing-No.: 9.700-5342.01-4
Issue: 1: 23.03.09
21785

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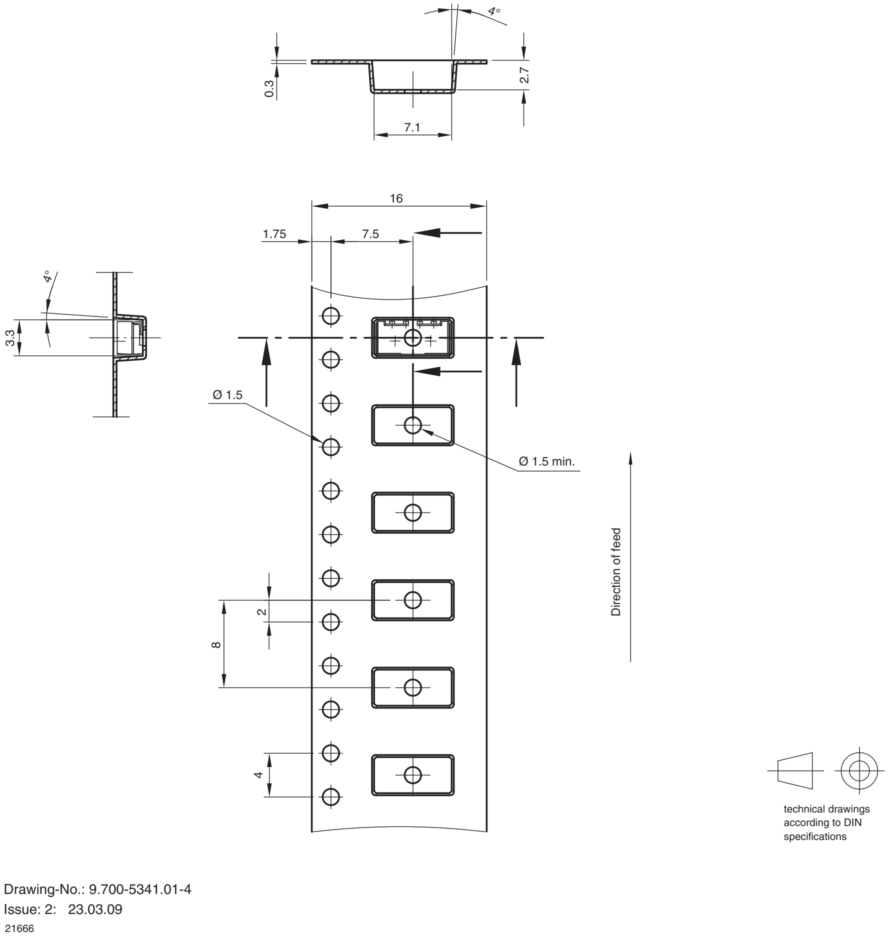
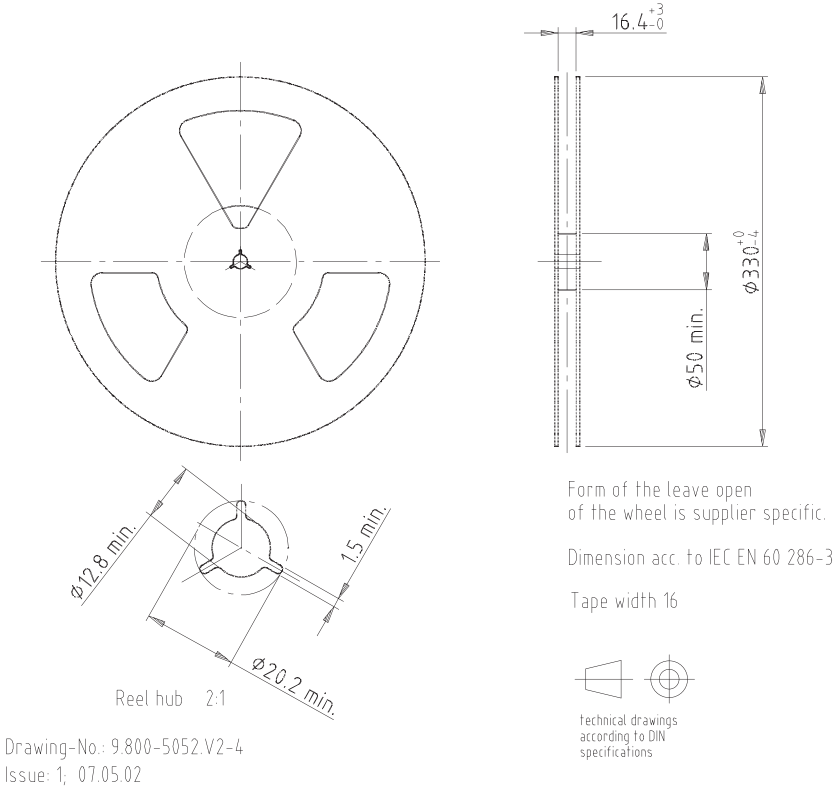
according to DIN
specifications

TAPING VERSION TSOP..TT DIMENSIONS in millimeters



REEL DIMENSIONS in millimeters



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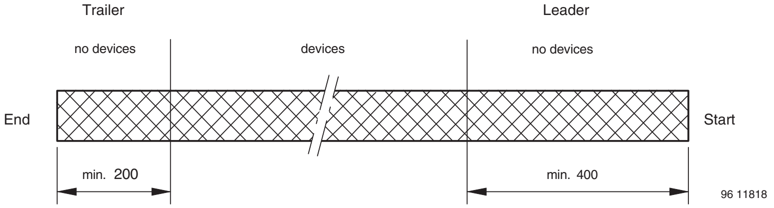
LEADER AND TRAILER DIMENSIONS in millimeters



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COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 ± 10 mm/min.
165° to 180° peel angle

LABEL

Standard bar code labels for finished goods

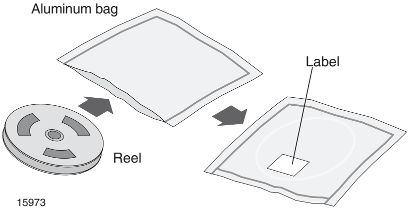
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)

PLAIN WRITING	ABBREVIATION	LENGTH
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
Long bar code top	**Type**	**Length**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
Short bar code bottom	**Type**	**Length**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

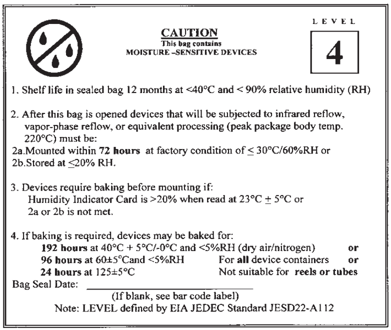
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen) or

96 h at 60 °C + 5 °C and < 5 % RH for all device containers or

24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE –SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:
192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
96 hours at 60±5°Cand <5%RH For **all** device containers **or**
24 hours at 125±5°C Not suitable for **reels or tubes**
Bag Seal Date: ______________
(If blank, see bar code label)
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

Example of JESD22-A112 level 4 label

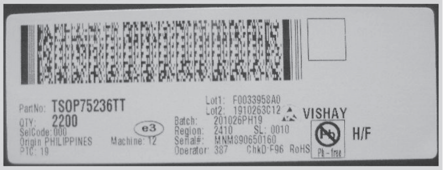
ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.

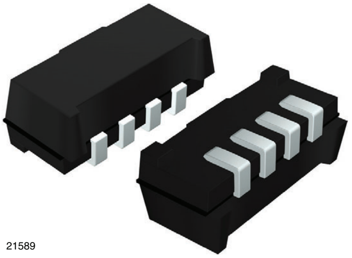
BAR CODE PRODUCT LABEL EXAMPLE:



PartNo: TSOP75236TT
QTY: 2200
SelCode: 000
Origin PHILIPPINES
PTC: 19
Machine: 12
Lot1: F0033958A0
Lot2: 1910263C12
Batch: 201026PH19
Region: 2410 SL: 0010
Serial#: MNM890650160
Operator: 387 ChkD:F96 RoHS

22178

IR Receiver Modules for Remote Control Systems



MECHANICAL DATA

Pinning:

1, 4 = GND, 2 = V_S, 3 = OUT

FEATURES

Pb-free

e3

RoHS COMPLIANT

GREEN (5-2008)**

- Continuous data transmission possible
- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Capable of side or top view
- Insensitive to supply voltage ripple and noise
- Low profile 2.35 mm
- Narrow optical filter to reduce interference from plasma TV emissions
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP773..W is a miniaturized receiver module for infrared remote control systems. One PIN diode per lens and a preamplifier are assembled on a leadframe, the epoxy lens cap is designed as an IR filter.

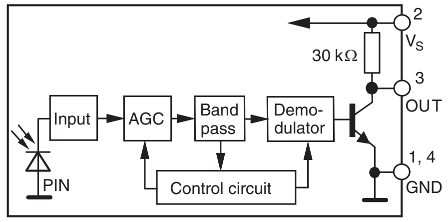
The demodulated output signal can be directly decoded by a microprocessor. The TSOP773..W is optimized to better suppress spurious pulses from fluorescent lamps, LCD, TVs, or plasma displays.

This component has not been qualified according to automotive specifications.

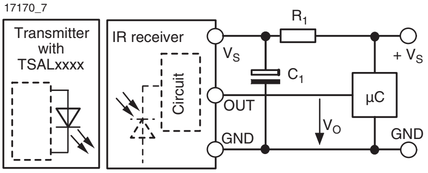
PARTS TABLE

CARRIER FREQUENCY	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)
30 kHz	TSOP77330W
33 kHz	TSOP77333W
36 kHz	TSOP77336W
38 kHz	TSOP77338W
40 kHz	TSOP77340W
56 kHz	TSOP77356W

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 μF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

** Please see document "Vishay Material Category Policy": www.vishay.com/doc?99902

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 (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

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	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 400$ mA	d		40		m
Output voltage low	$I_{OSL} = 0.5$ mA, $E_e = 0.7$ 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	$E_{e\ min.}$		0.6	0.9	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 50		deg

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

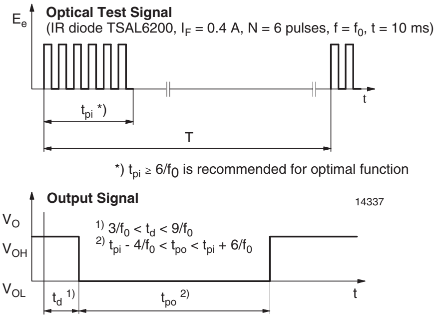


Fig. 1 - Output Active Low

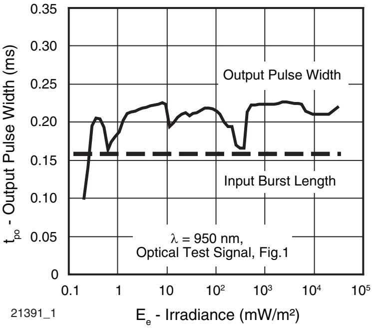


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

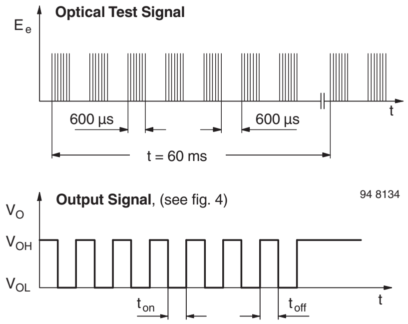


Fig. 3 - Output Function

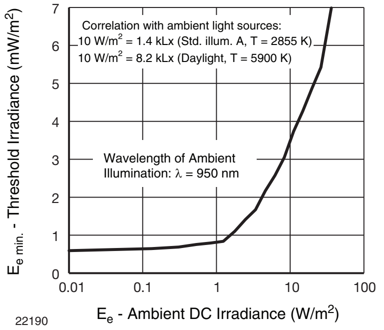


Fig. 6 - Sensitivity in Bright Ambient

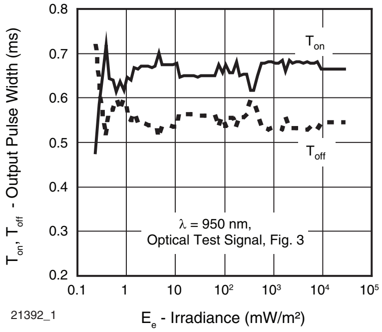


Fig. 4 - Output Pulse Diagram

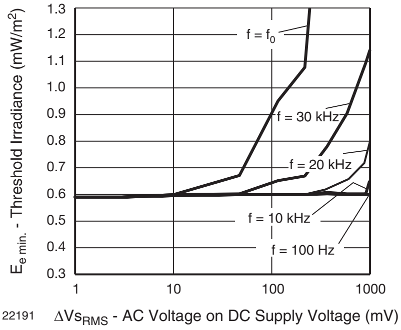


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

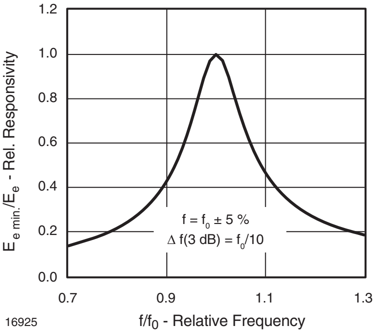


Fig. 5 - Frequency Dependence of Responsivity

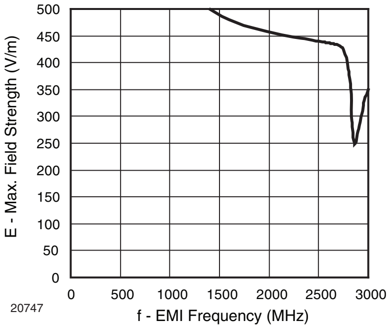


Fig. 8 - Sensitivity vs. Electric Field Disturbances

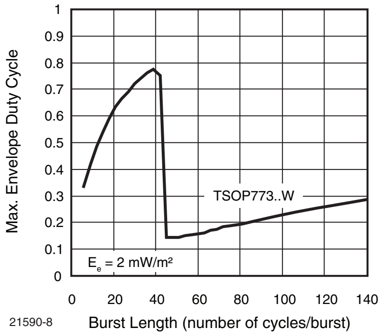


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

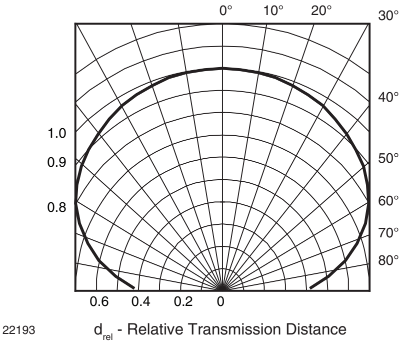


Fig. 12 - Horizontal Directivity

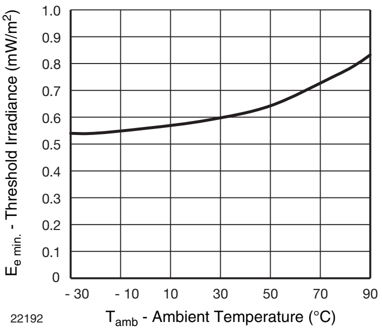


Fig. 10 - Sensitivity vs. Ambient Temperature

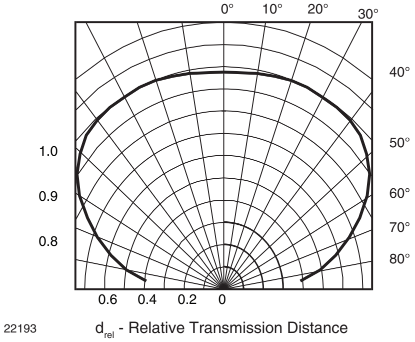


Fig. 13 - Vertical Directivity

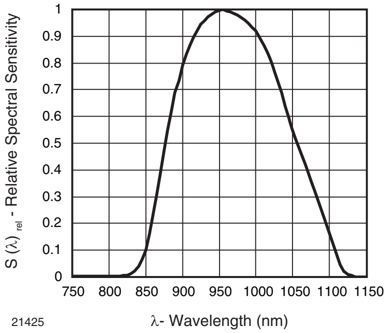


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

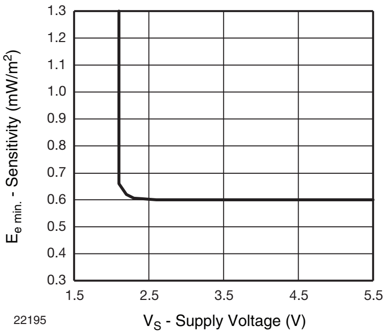


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP773..W is 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. 40 kHz) and fulfill the conditions in the table below.
When a data signal is applied to the TSOP773..W 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 15 or figure 16)

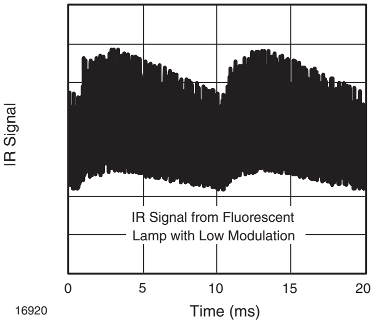


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

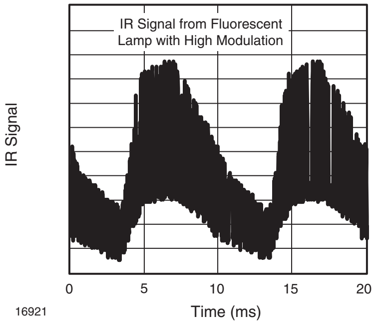


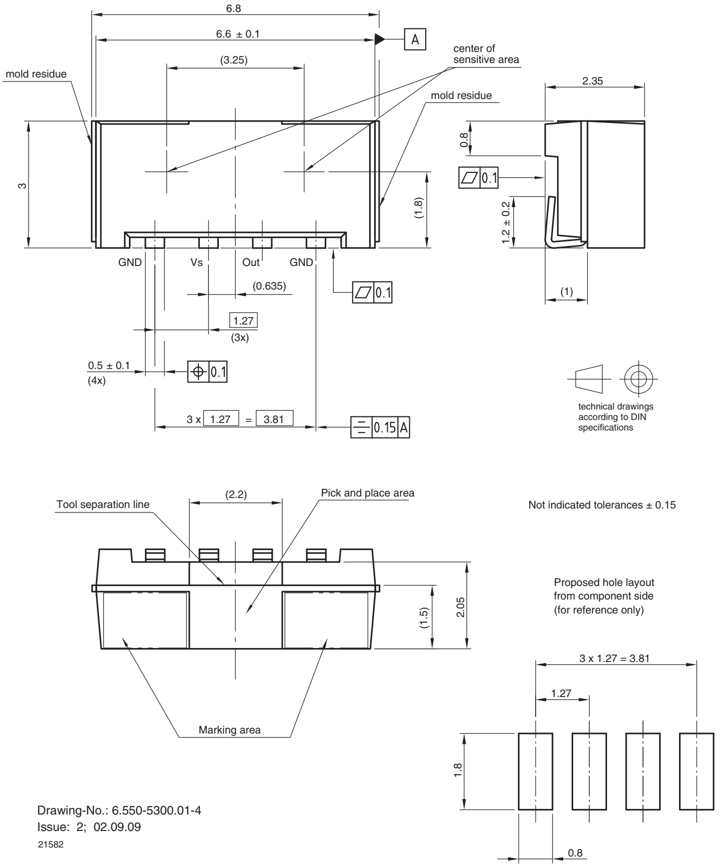
Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP773..W
Minimum burst length	6 cycles/burst
After each burst of length a minimum gap time is required of	6 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	35 cycles > 6 x burst length
Maximum number of continuous short bursts/second	2000
Recommended for NEC code	yes
Recommended for RC5/RC6 code	yes
Recommended for Sony code	yes
Recommended for RECS-80 code	yes
Recommended for RCMM code	yes
Recommended for r-step code	yes
Recommended for XMP code	yes
Suppression of interference from fluorescent lamps	Even critical disturbance signals are suppressed (e.g. waveform of figure 15)

Note

- For data formats with long bursts (10 carrier cycles or longer) we recommend the TSOP772..W, TSOP774..W because of the better noise suppression.

PACKAGE DIMENSIONS in millimeters



ASSEMBLY INSTRUCTIONS

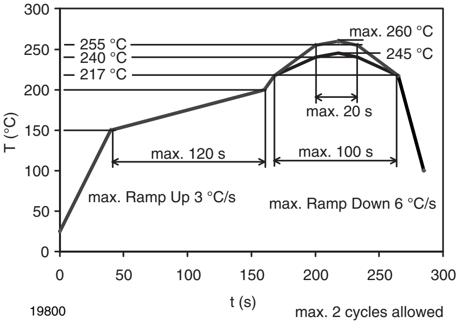
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

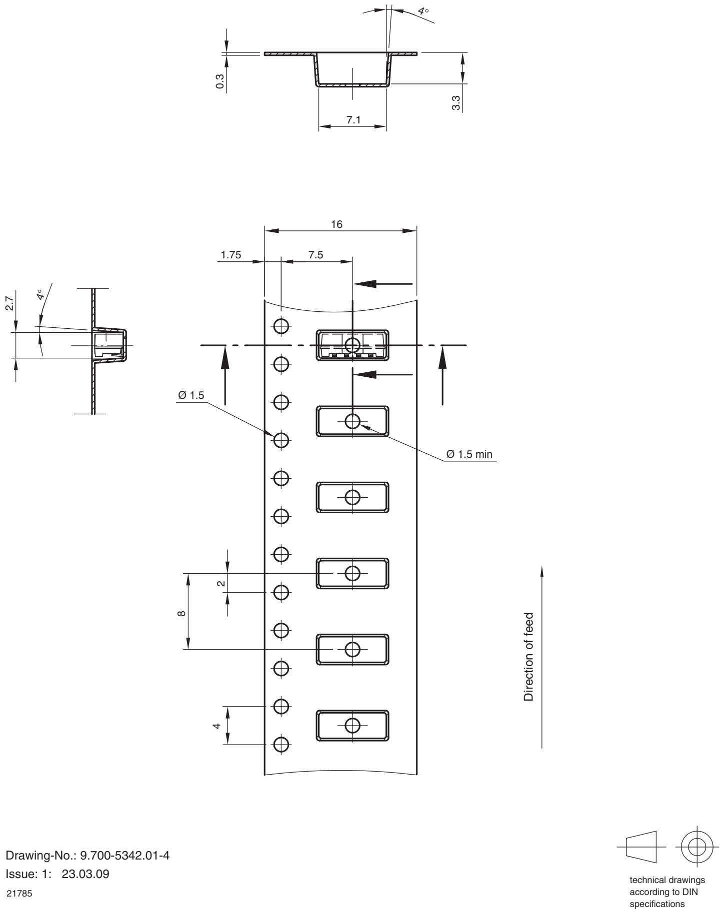
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

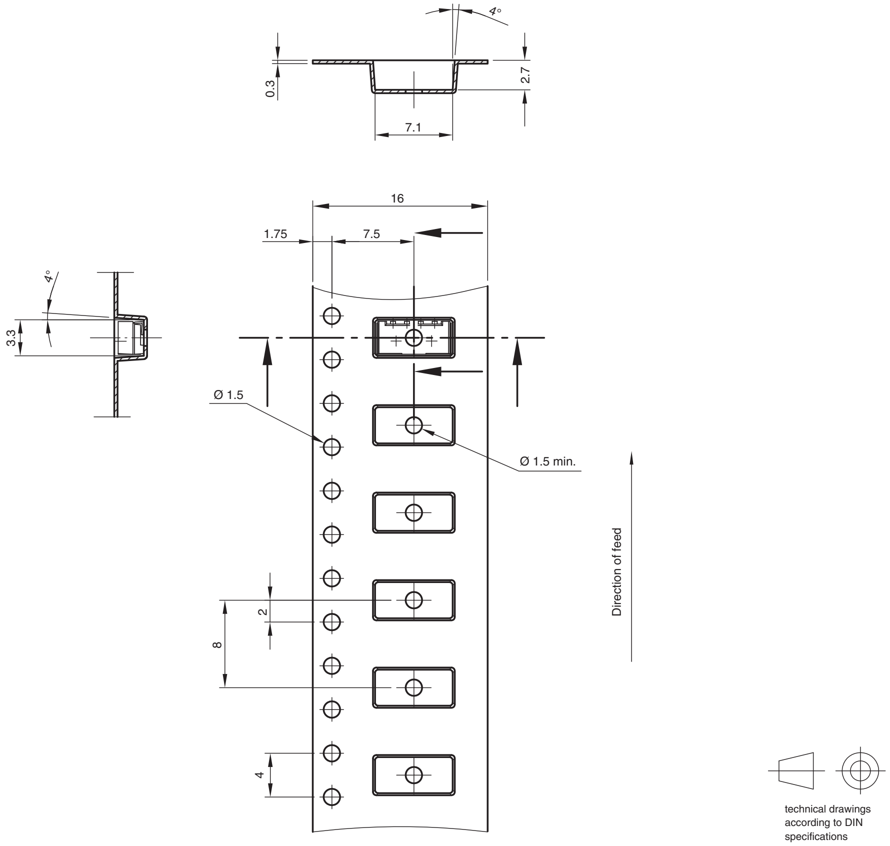
VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



TAPING VERSION TSOP..TR DIMENSIONS in millimeters

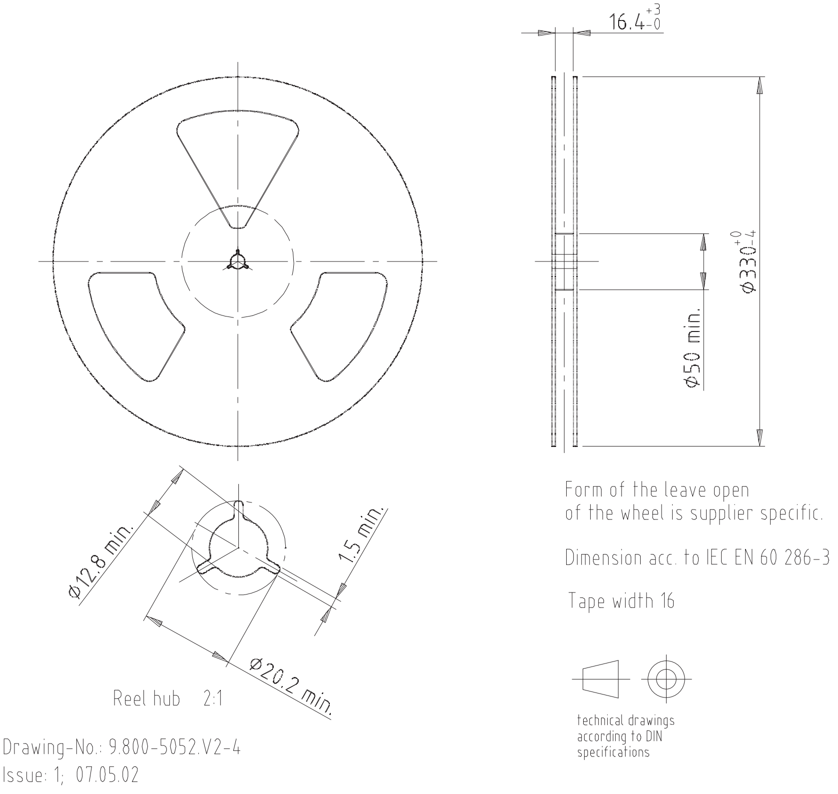


TAPING VERSION TSOP..TT DIMENSIONS in millimeters



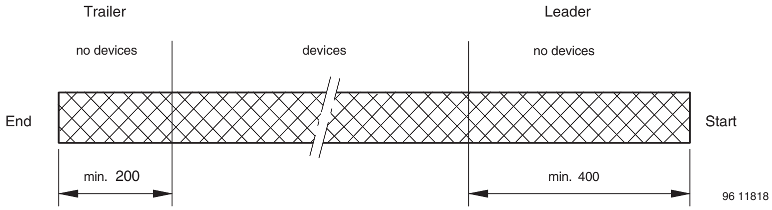
Drawing-No.: 9.700-5341.01-4
Issue: 2: 23.03.09
21666

REEL DIMENSIONS in millimeters



16734

LEADER AND TRAILER DIMENSIONS in millimeters



COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 ± 10 mm/min.
165° to 180° peel angle

LABEL

Standard bar code labels for finished goods

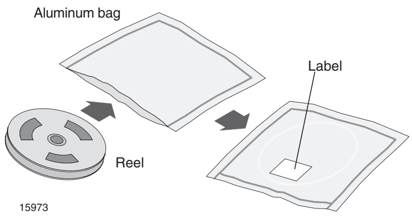
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)

PLAIN WRITING	ABBREVIATION	LENGTH
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
Long bar code top	**Type**	**Length**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
Short bar code bottom	**Type**	**Length**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)

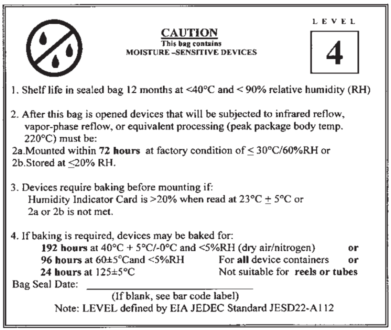
or

96 h at 60 °C + 5 °C and < 5 % RH for all device containers

or

24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE –SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:
192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
96 hours at 60±5°Cand <5%RH For **all** device containers **or**
24 hours at 125±5°C Not suitable for **reels or tubes**

Bag Seal Date: ______________________
(If blank, see bar code label)
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

Example of JESD22-A112 level 4 label

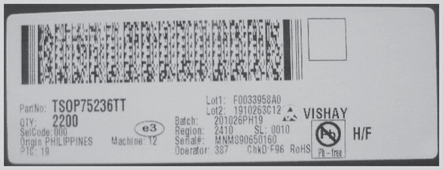
ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.

BAR CODE PRODUCT LABEL EXAMPLE:



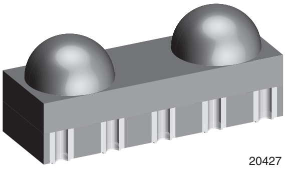
PartNo: TSOP75236TT
QTY: 2200
SelCode: 000
Origin PHILIPPINES
PTC: 19
Machine: T2
Lot1: F0033958A0
Lot2: 1910263C12
Batch: 201026PH19
Region: 2410 SL: 0010
Serial#: MNM890650160
Operator: 387 ChkD:F96 RoHS

22178

Bugeye

Contents

IR Receiver Modules for Remote Control Systems



FEATURES

- Very low supply current
- Photo detectors and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Capable of side or top view
- Two lenses for high sensitivity and wide receiving angle
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Insensitive to supply voltage ripple and noise

DESCRIPTION

The TSOP852..,TSOP854.. series are two lens miniaturized receiver modules for infrared remote control systems. One PIN diode per lens and a preamplifier are assembled on a PCB, the epoxy lens cap is designed as an IR filter.

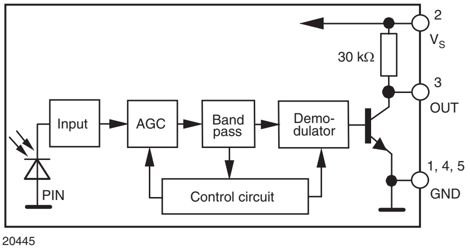
The demodulated output signal can be directly decoded by a microprocessor. The TSOP852.. is compatible with all common IR remote control data formats. The TSOP854.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

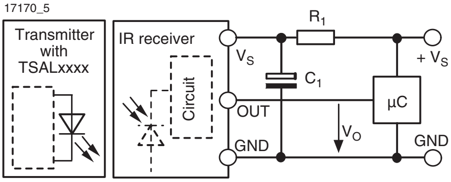
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	VERY NOISY ENVIRONMENTS (AGC4)
30 kHz	TSOP85230	TSOP85430
33 kHz	TSOP85233	TSOP85433
36 kHz	TSOP85236	TSOP85436
38 kHz	TSOP85238	TSOP85438
40 kHz	TSOP85240	TSOP85440
56 kHz	TSOP85256	TSOP85456

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 µF.

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	$T_{amb} \leq 85$ °C	P_{tot}	10	mW
Soldering temperature		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 voltage		V_S	2.5		5.5	V
Supply current	V_S = 3.3 V, E_v = 0	I_{SD}	0.27	0.35	0.45	mA
	E_v = 40 klx, sunlight	I_{SH}		0.45		mA
Transmission distance	E_v = 0 IR diode TSAL6200, I_F = 250 mA test signal see fig. 1	d		45		m
Output voltage low	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², 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	$E_{e\ min.}$		0.1	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	$\varphi_{1/2}$		± 50		deg

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

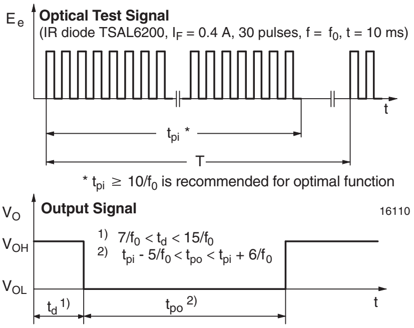


Fig. 1 - Output Active Low

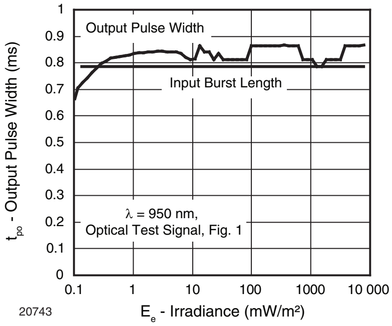


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

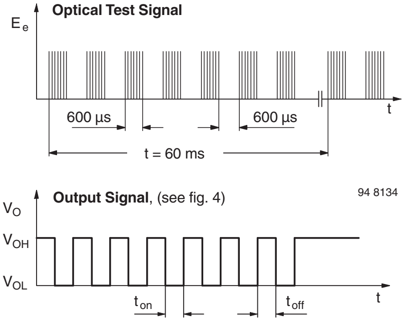


Fig. 3 - Output Function

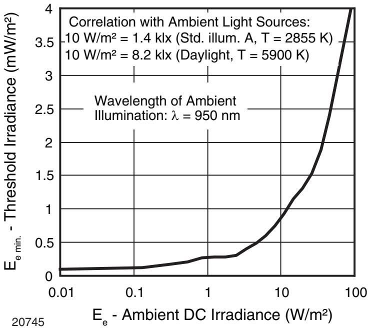


Fig. 6 - Sensitivity in Bright Ambient

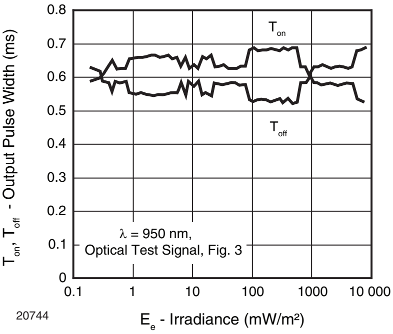


Fig. 4 - Output Pulse Diagram

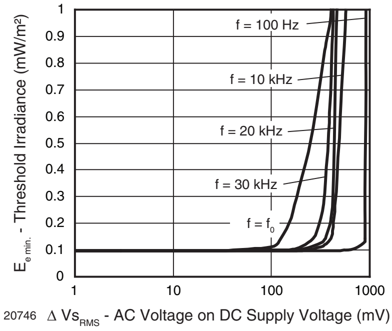


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

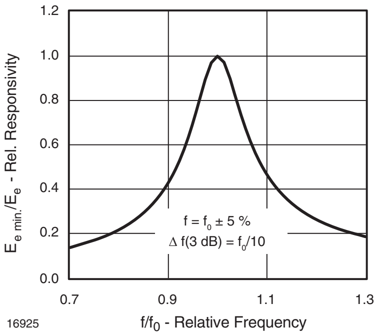


Fig. 5 - Frequency Dependance of Responsivity

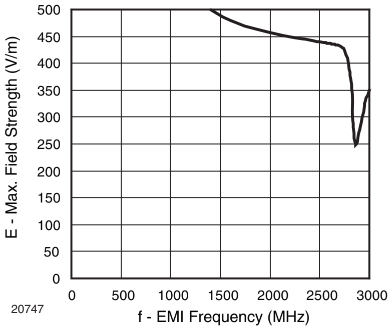


Fig. 8 - Sensitivity vs. Electric Field Disturbances

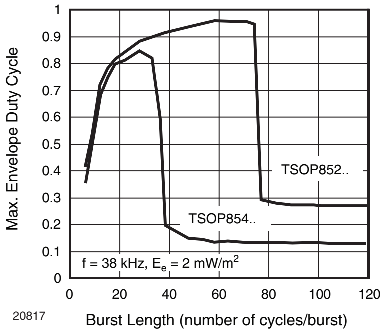


Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

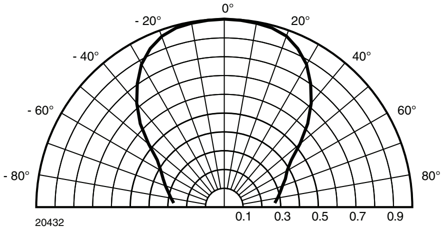


Fig. 12 - Directivity

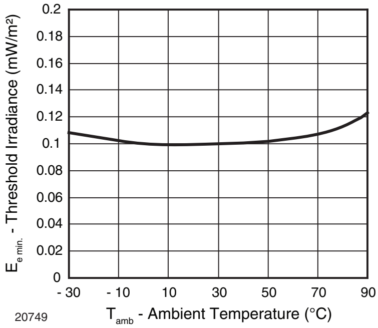


Fig. 10 - Sensitivity vs. Ambient Temperature

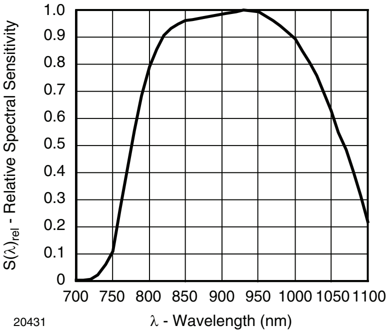


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP852.., TSOP854 series 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 TSOP852.., TSOP854 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 13 or figure 14)

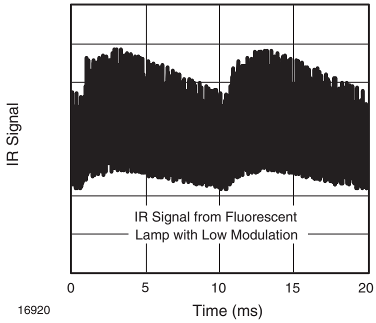


Fig. 13 - IR Signal from Fluorescent Lamp with Low Modulation

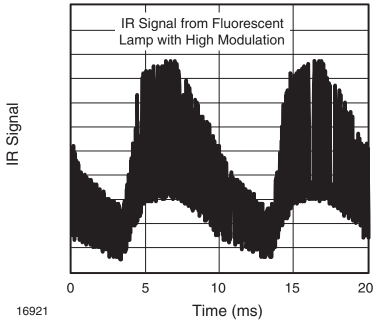


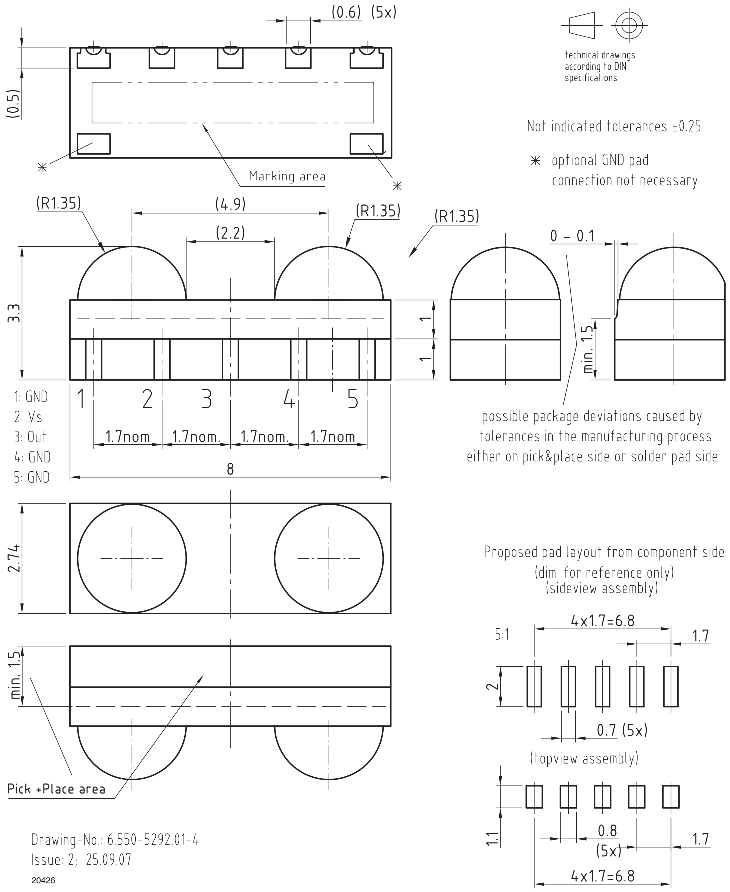
Fig. 14 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP852..	TSOP854..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	1800	1500
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	yes	no
Recommended for Thomson 56 kHz code	yes	yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	yes	no
Recommended for Sharp code	yes	yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

Note

- For data formats with short bursts please see the datasheet for TSOP853.., TSOP855..

PACKAGE DIMENSIONS in millimeters



ASSEMBLY INSTRUCTIONS

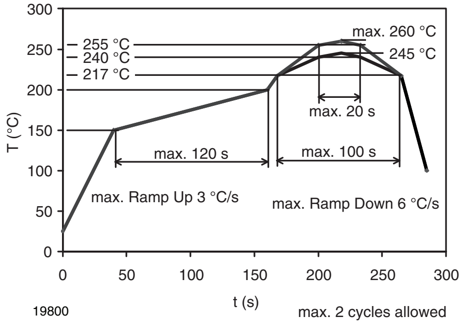
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

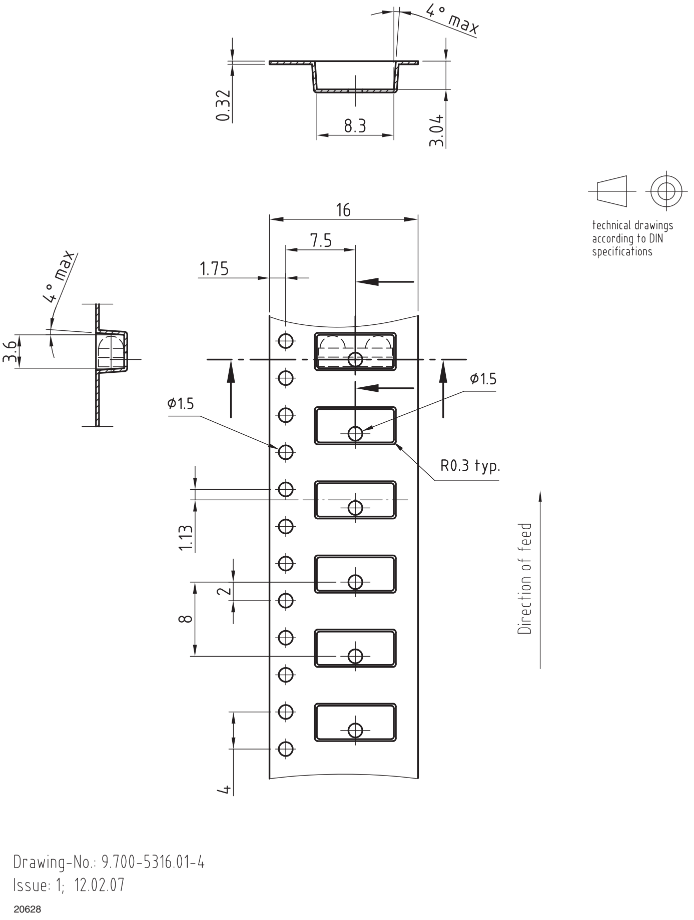
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

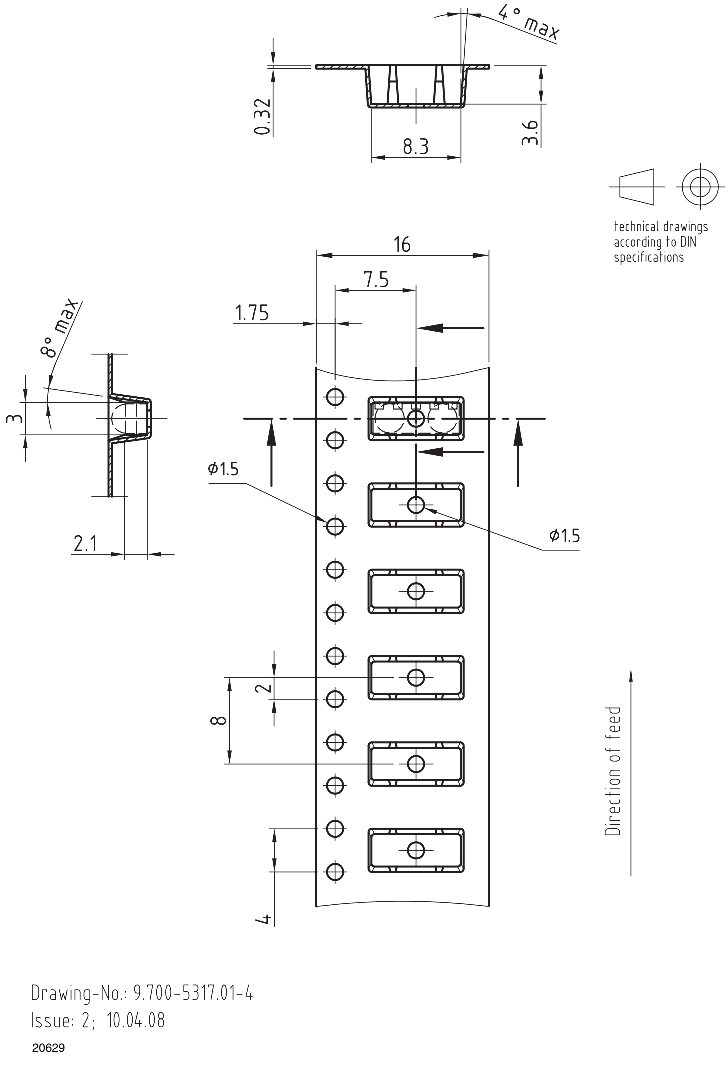
VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



TAPING VERSION TSOP..TR DIMENSIONS in millimeters



TAPING VERSION TSOP..TT DIMENSIONS in millimeters



LABEL

Standard bar code labels for finished goods

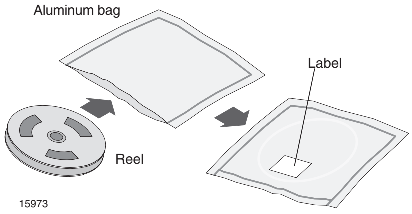
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)

PLAIN WRITING	**ABBREVIATION**	**LENGTH**
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
Long bar code top	**Type**	**Length**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
Short bar code bottom	**Type**	**Length**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

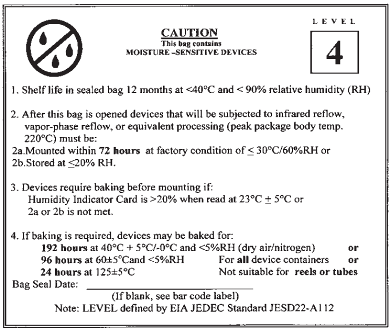
The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:
192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)
or
96 h at 60 °C + 5 °C and < 5 % RH for all device containers
or
24 h at 125 °C + 5 °C not suitable for reel or tubes.
An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



LEVEL

4

CAUTION

This bag contains

MOISTURE –SENSITIVE DEVICES

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:

2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:

192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen)		**or**
96 hours at 60±5°Cand <5%RH	For **all** device containers	**or**
24 hours at 125±5°C	Not suitable for **reels or tubes**	

Bag Seal Date: ________________________
(If blank, see bar code label)
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

Example of JESD22-A112 level 4 label

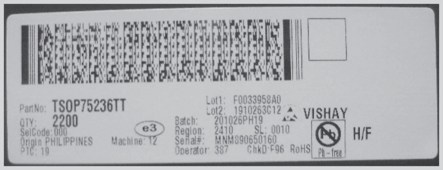
ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.

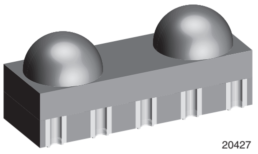
BAR CODE PRODUCT LABEL EXAMPLE:



PartNo: TSOP75236TT
QTY: 2200
SelCode:000
Origin PHILIPPINES
PTC: 19
Machine: T2
Lot1: F0033958A0
Lot2: 1910263C12
Batch: 201026PH19
Region: 2410 SL: 0010
Serial#: MNM890650160
Operator: 387 ChkD:F96 RoHS

22178

IR Receiver Modules for Remote Control Systems



FEATURES

- Very low supply current
- Photo detectors and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Capable of side or top view
- Two lenses for high sensitivity and wide receiving angle
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Insensitive to supply voltage ripple and noise

DESCRIPTION

The TSOP853.. and TSOP855.. series are two lens miniaturized receiver modules for infrared remote control systems. One PIN diode per lens and a preamplifier are assembled on a PCB, the epoxy lens cap is designed as an IR filter.

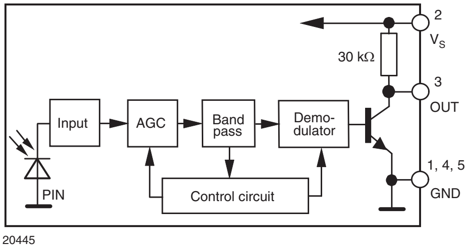
The demodulated output signal can be directly decoded by a microprocessor. The TSOP853.. is optimized to better suppress spurious pulses from energy saving fluorescent lamps. The TSOP855.. has an excellent noise suppression. It is immune to dimmed LCD backlighting and any fluorescent lamps. AGC3 and AGC5 may also suppress some data signals in case of continuous transmission.

This component has not been qualified according to automotive specifications.

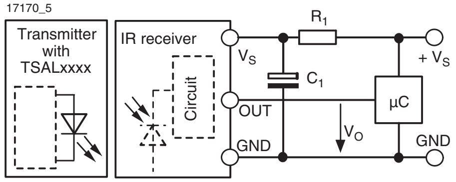
PARTS TABLE

CARRIER FREQUENCY	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)	VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)
30 kHz	TSOP85330	TSOP85530
33 kHz	TSOP85333	TSOP85533
36 kHz	TSOP85336	TSOP85536
38 kHz	TSOP85338	TSOP85538
40 kHz	TSOP85340	TSOP85540
56 kHz	TSOP85356	TSOP85556

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 µF.

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	$T_{amb} \leq 85$ °C	P_{tot}	10	mW
Soldering temperature		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 voltage		V_S	2.5		5.5	V
Supply current	V_S = 3.3 V, E_v = 0	I_{SD}	0.27	0.35	0.45	mA
	E_v = 40 klx, sunlight	I_{SH}		0.45		mA
Transmission distance	E_v = 0, IR diode TSAL6200, I_F = 250 mA, test signal see fig. 1	d		45		m
Output voltage low	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², 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	$E_{e\ min.}$		0.1	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	$\varphi_{1/2}$		± 50		deg

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

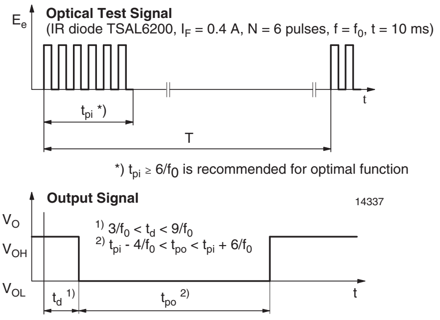


Fig. 1 - Output Active Low

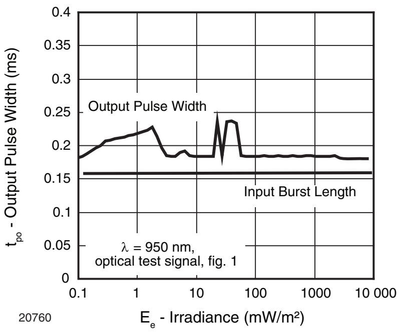


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

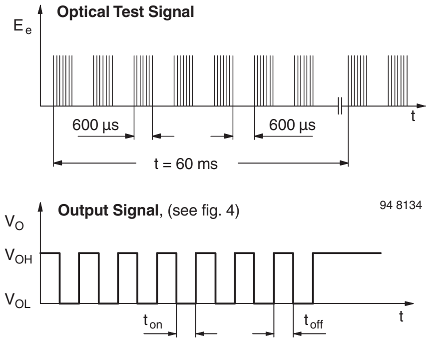


Fig. 3 - Output Function

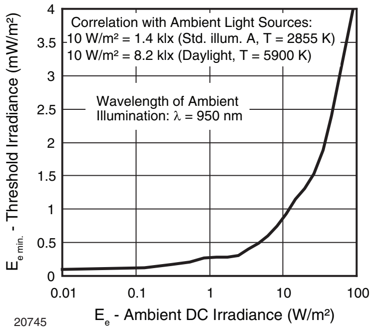


Fig. 6 - Sensitivity in Bright Ambient

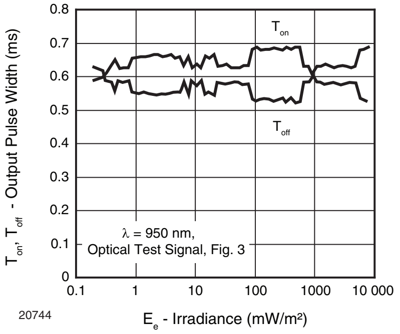


Fig. 4 - Output Pulse Diagram

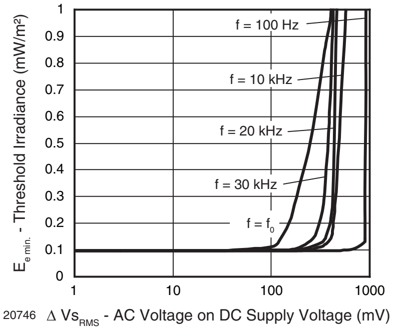


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

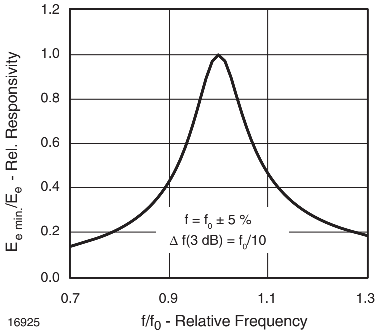


Fig. 5 - Frequency Dependence of Responsivity

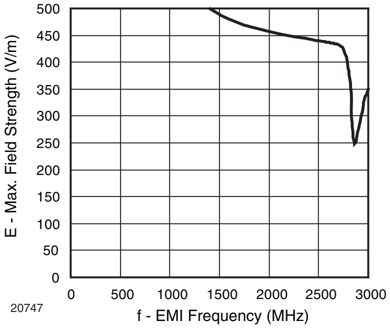


Fig. 8 - Sensitivity vs. Electric Field Disturbances

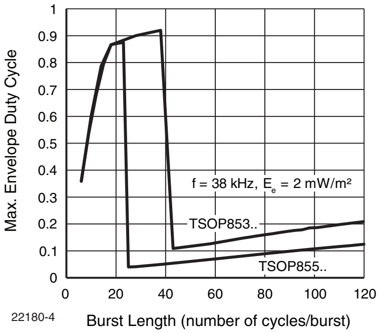


Fig. 9 - Maximal Envelope Duty Cycle vs. Burst Length

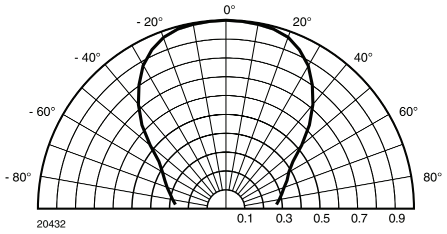


Fig. 12 - Directivity

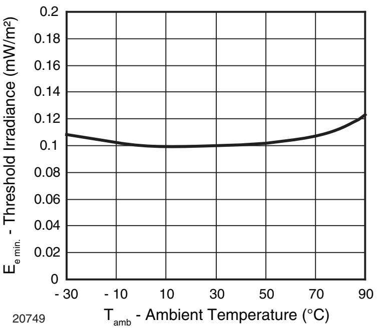


Fig. 10 - Sensitivity vs. Ambient Temperature

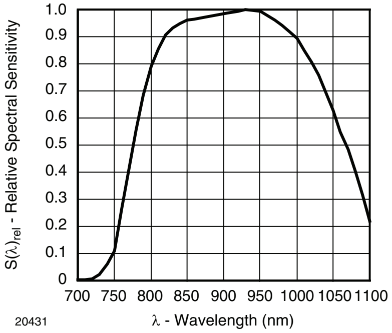


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP853.. and TSOP855.. series 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 TSOP853.. and TSOP855.. series 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

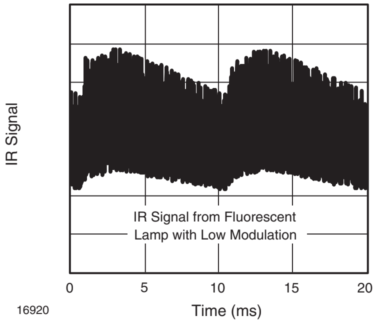


Fig. 13 - IR Signal from Fluorescent Lamp with Low Modulation

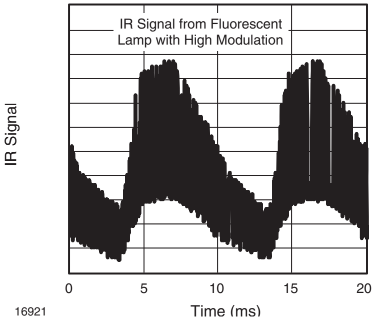


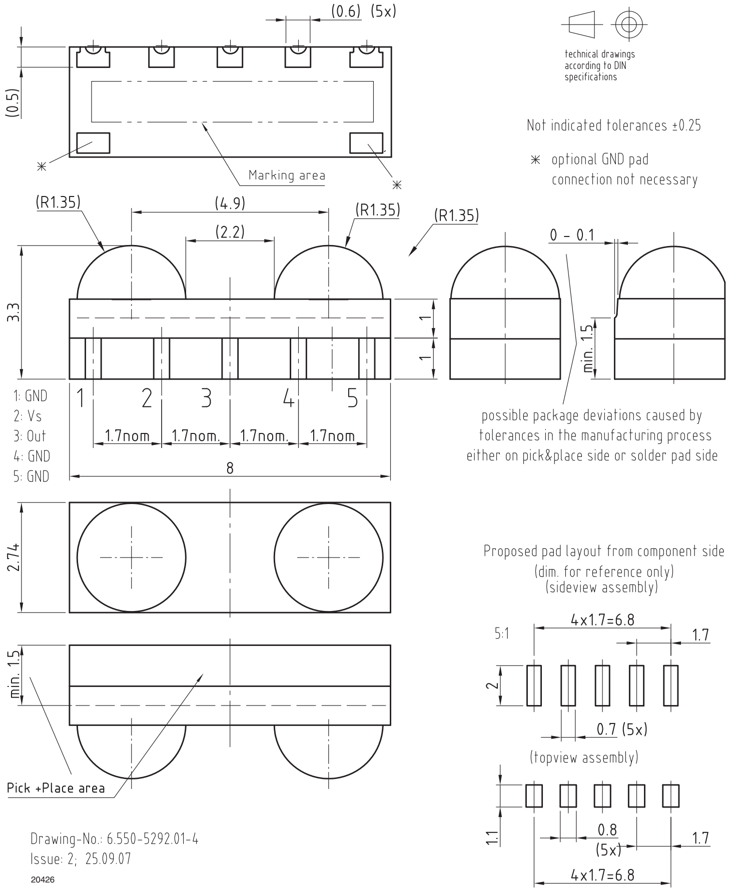
Fig. 14 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP853..	TSOP855..
Minimum burst length	6 cycles/burst	6 cycles/burst
After each burst of length a minimum gap time is required of	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	35 cycles > 6 x burst length	24 cycles > 25 ms
Maximum number of continuous short bursts/second	2000	2000
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	no	no
Recommended for RCMM code	yes	yes
Recommended for r-step code)	yes	yes
Recommended for XMP code	yes	yes
Suppression of interference from fluorescent lamps	Even critical disturbance signals are suppressed (examples: signal pattern of fig. 13 and fig. 14)	Even critical disturbance signals are suppressed (examples: signal pattern of fig. 13 and fig. 14)

Note

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP852.., TSOP854..

PACKAGE DIMENSIONS in millimeters



ASSEMBLY INSTRUCTIONS

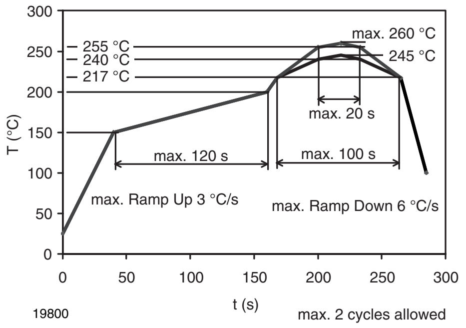
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

Manual Soldering

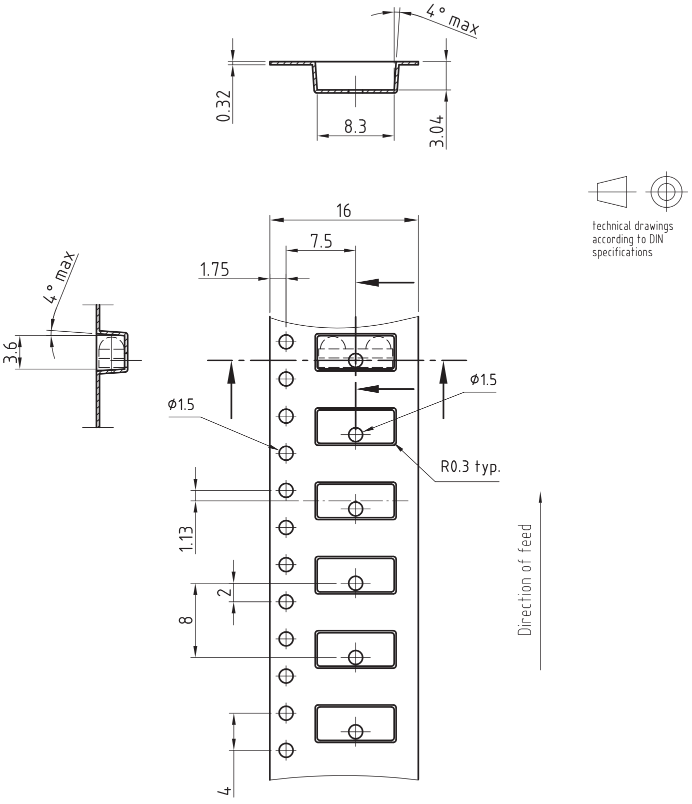
- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



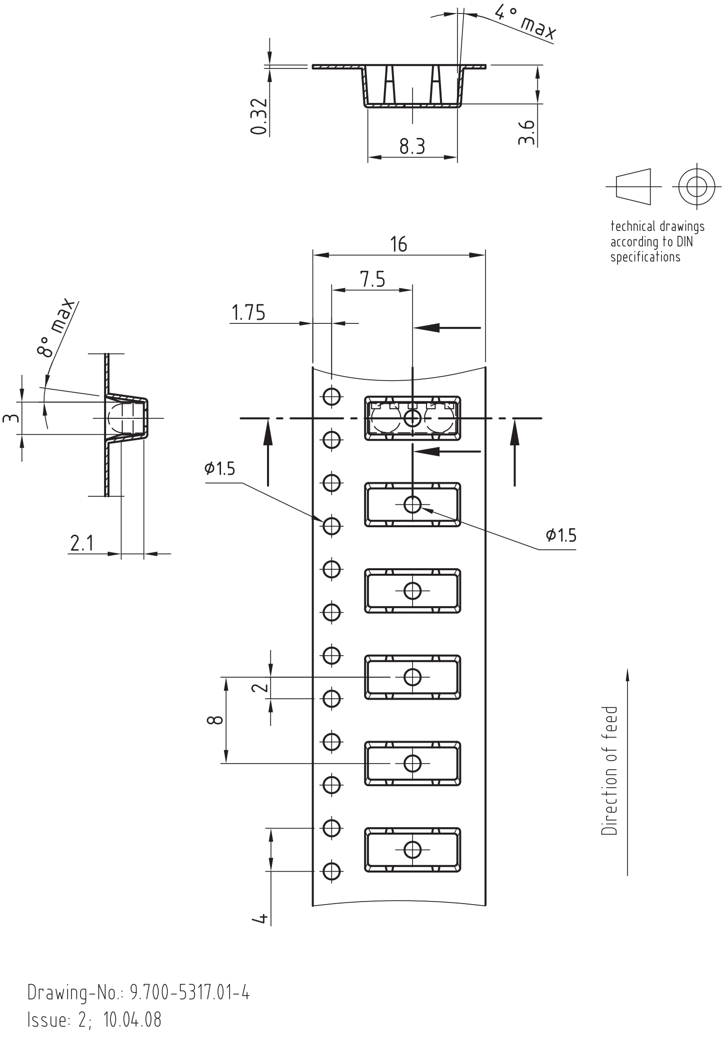
19800

TAPING VERSION TSOP..TR DIMENSIONS in millimeters



Drawing-No.: 9.700-5316.01-4
Issue: 1; 12.02.07
20628

TAPING VERSION TSOP..TT DIMENSIONS in millimeters



20629

LABEL

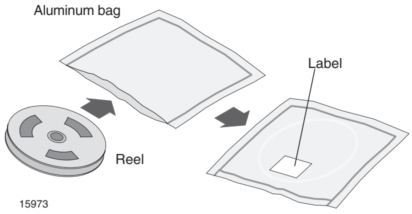
Standard bar code labels for finished goods

The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)		
PLAIN WRITING	**ABBREVIATION**	**LENGTH**
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
Long bar code top	**Type**	**Length**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
Short bar code bottom	**Type**	**Length**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

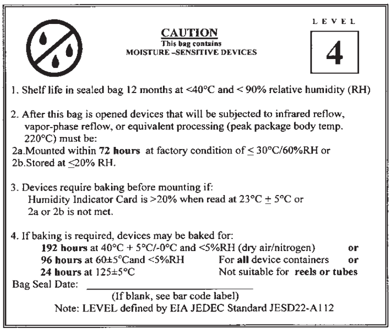
The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity $\leq$ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:
192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)
or
96 h at 60 °C + 5 °C and < 5 % RH for all device containers
or
24 h at 125 °C + 5 °C not suitable for reel or tubes.
An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE –SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:
192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
96 hours at 60±5°Cand <5%RH For **all** device containers **or**
24 hours at 125±5°C Not suitable for **reels or tubes**

Bag Seal Date: ____________________
(If blank, see bar code label)

Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

Example of JESD22-A112 level 4 label

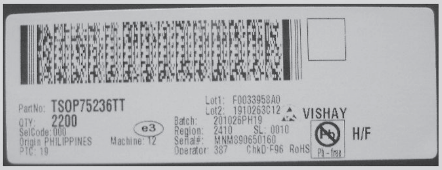
ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.

BAR CODE PRODUCT LABEL EXAMPLE:



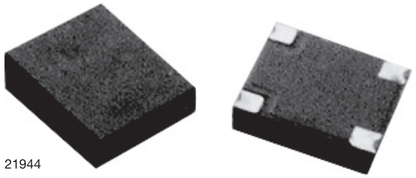
PartNo: TSOP75236TT
QTY: 2200
SelCode: 000
Origin PHILIPPINES
PTC: 19
e3
Machine: 12
Lot1: F0033958A0
Lot2: 1910263C12
Batch: 201026PH19
Region: 2410 SL: 0010
Serial#: MNM890650160
Operator: 387 ChkD:F96 RoHS
VISHAY
Pb-free
H/F

22178

AP5

Contents

IR Receiver Modules for Remote Control Systems



21944

FEATURES

- Very low supply current
- Photo detectors and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Insensitive to supply voltage ripple and noise
- Halogen-free according to IEC 61249-2-21 definition

DESCRIPTION

The TSOP852..AP5, TSOP854..AP5 series are miniaturized receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on a PCB, the epoxy lens cap is designed as an IR filter.

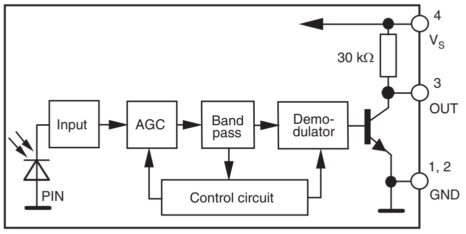
The demodulated output signal can be directly decoded by a microprocessor. The TSOP852..AP5 is compatible with all common IR remote control data formats. The TSOP854..AP5 is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps but will also suppress some data signals.

This component has not been qualified according to automotive specifications.

PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)	VERY NOISY ENVIRONMENTS (AGC4)
36 kHz	TSOP85236AP5	TSOP85436AP5
38 kHz	TSOP85238AP5	TSOP85438AP5
40 kHz	TSOP85240AP5	TSOP85440AP5
56 kHz	TSOP85256AP5	TSOP85456AP5

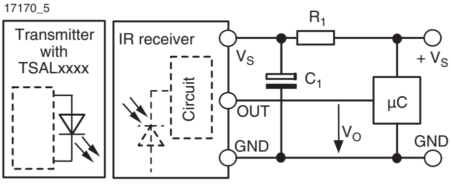
BLOCK DIAGRAM



20445-3

APPLICATION CIRCUIT

17170_5



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 µF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 4)		V_S	- 0.3 to + 6	V
Supply current (pin 4)		I_S	3	mA
Output voltage (pin 3)		V_O	- 0.3 to (V_S + 0.3)	V
Output current (pin 3)		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

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 voltage		V_S	2.5		5.5	V
Supply current (pin 4)	V_S = 3.3 V, E_v = 0	I_{SD}	0.27	0.35	0.45	mA
	E_v = 40 klx, sunlight	I_{SH}		0.45		mA
Transmission distance	E_v = 0, IR diode TSAL6200, I_F = 250 mA, test signal see fig. 1	d		35		m
Output voltage low (pin 3)	I_{OSL} = 0.5 mA, E_e = 0.7 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	$E_{e\,min.}$		0.15	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\,max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 75		deg

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

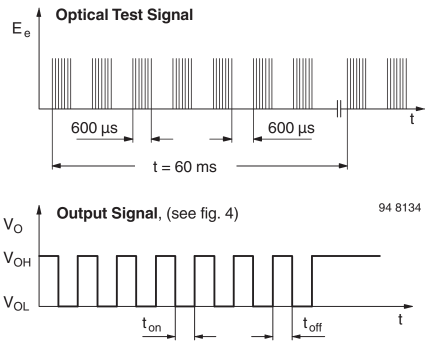


Fig. 1 - Output Function

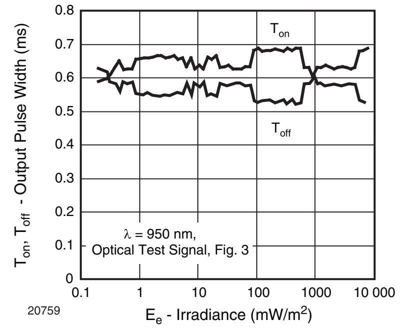


Fig. 2 - Output Pulse Diagram

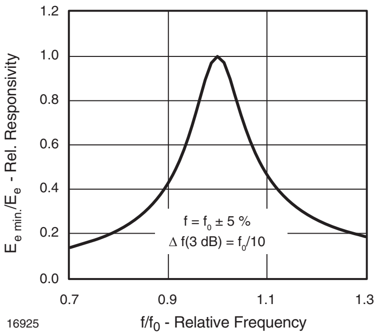


Fig. 3 - Frequency Dependance of Responsivity

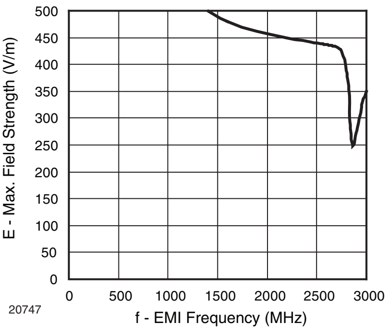


Fig. 6 - Sensitivity vs. Electric Field Disturbances

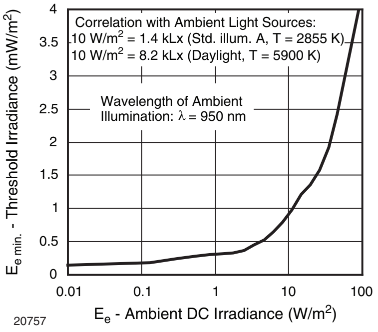


Fig. 4 - Sensitivity in Bright Ambient

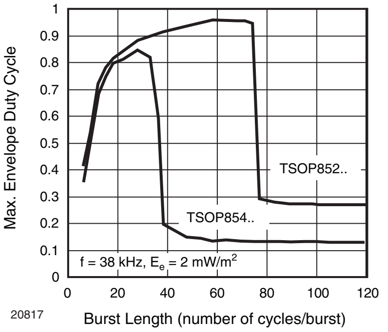


Fig. 7 - Max. Envelope Duty Cycle vs. Burst Length

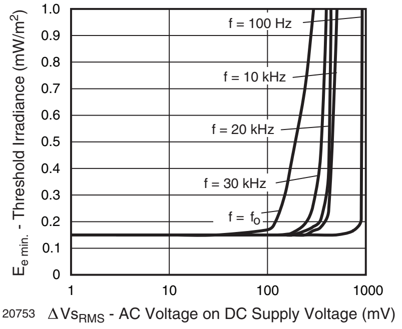


Fig. 5 - Sensitivity vs. Supply Voltage Disturbances

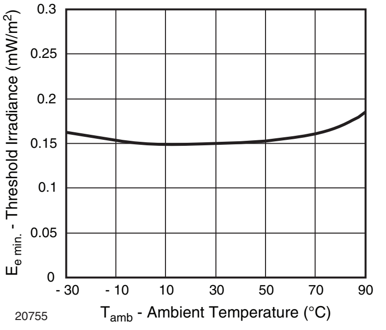


Fig. 8 - Sensitivity vs. Ambient Temperature

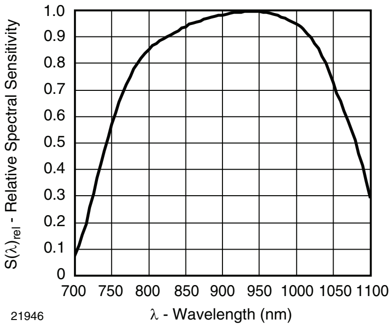


Fig. 9 - Relative Spectral Sensitivity vs. Wavelength

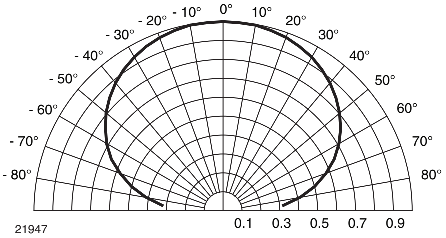


Fig. 10 - Directivity

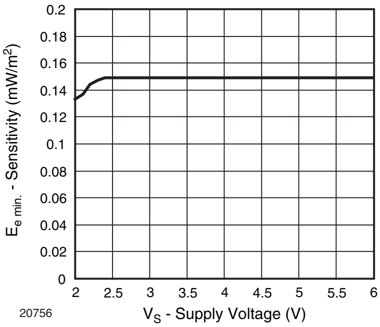


Fig. 11 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP852..AP5, TSOP854..AP5 series is 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 TSOP852..AP5, TSOP854..AP5 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 12 or figure 13)

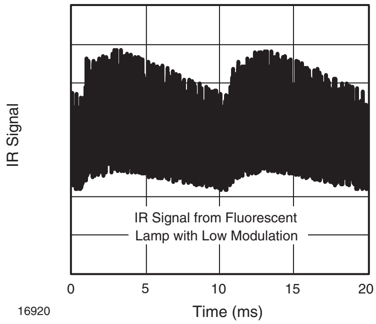


Fig. 12 - IR Signal from Fluorescent Lamp with Low Modulation

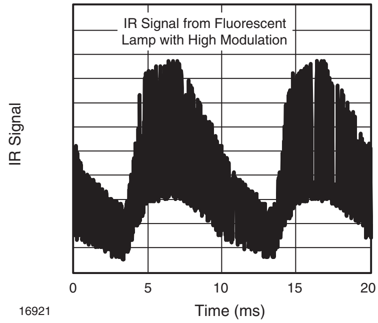


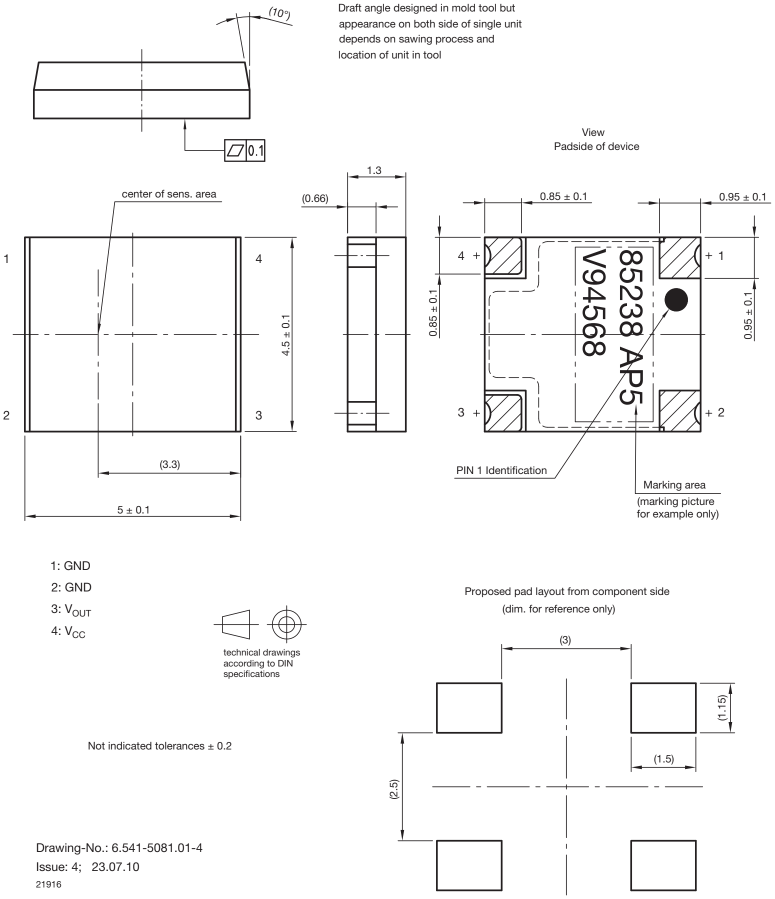
Fig. 13 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP852..AP5	TSOP854..AP5
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	1800	1500
Recommended for NEC code	Yes	Yes
Recommended for RC5/RC6 code	Yes	Yes
Recommended for Sony code	Yes	No
Recommended for Thomson 56 kHz code	Yes	Yes
Recommended for Mitsubishi code (38 kHz, preburst 8 ms, 16 bit)	Yes	No
Recommended for Sharp code	Yes	Yes
Suppression of interference from fluorescent lamps	Most common disturbance signals are suppressed	Even extreme disturbance signals are suppressed

Note

- For data formats with short bursts please see the datasheet for TSOP853..

PACKAGE DIMENSIONS in millimeters



ASSEMBLY INSTRUCTIONS

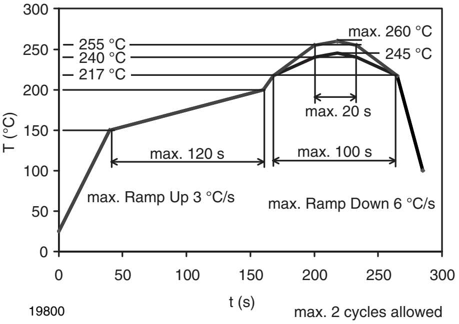
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

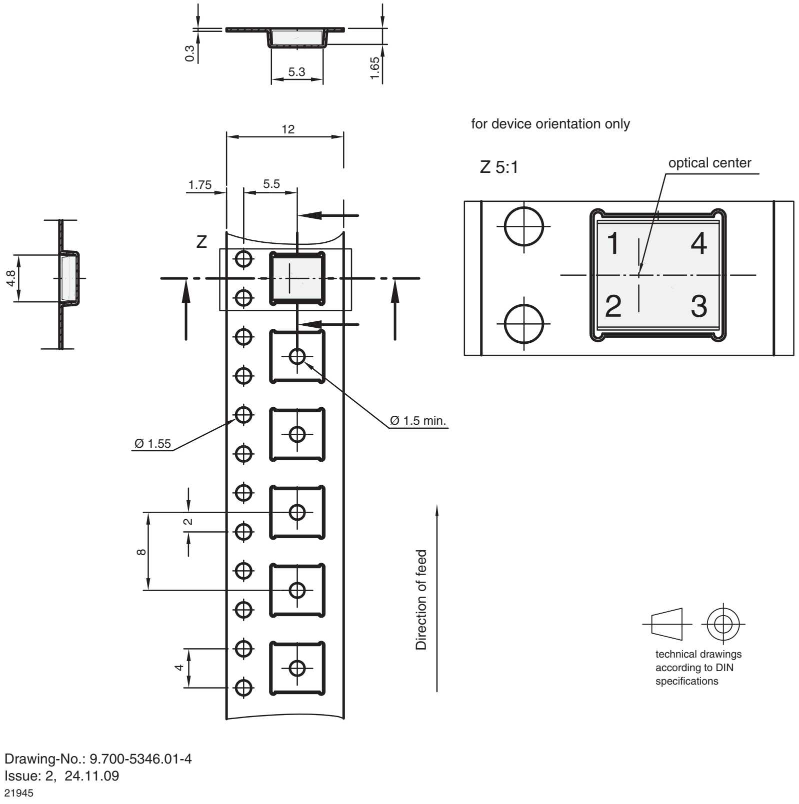
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



TAPING VERSION TSOP85...AP5 DIMENSIONS in millimeters



LABEL

Standard bar code labels for finished goods

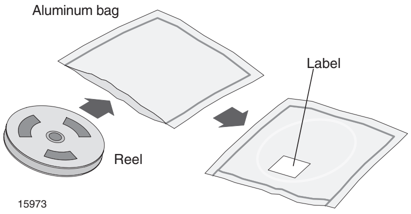
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)

PLAIN WRITING	**ABBREVIATION**	**LENGTH**
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
Long bar code top	**Type**	**Length**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
Short bar code bottom	**Type**	**Length**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

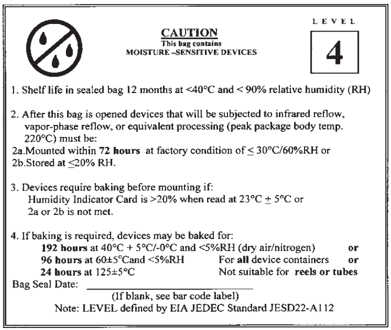
The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:
192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)
or
96 h at 60 °C + 5 °C and < 5 % RH for all device containers
or
24 h at 125 °C + 5 °C not suitable for reel or tubes.
An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



LEVEL

CAUTION

This bag contains

MOISTURE –SENSITIVE DEVICES

4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:

2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or

2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
   Humidity Indicator Card is >20% when read at 23°C ± 5°C or
   2a or 2b is not met.

4. If baking is required, devices may be baked for:
   192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
   96 hours at 60±5°Cand <5%RH For **all** device containers **or**
   24 hours at 125±5°C Not suitable for **reels or tubes**

Bag Seal Date: ______________________

(If blank, see bar code label)

Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

Example of JESD22-A112 level 4 label

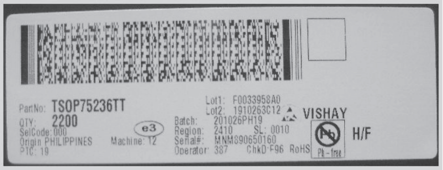
ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.

BAR CODE PRODUCT LABEL EXAMPLE:



PartNo: TSOP75236TT

QTY: 2200

SelCode: 000

Origin PHILIPPINES

PTC: 19

e3

Machine: 12

Lot1: F0033958A0

Lot2: 1910263C12

Batch: 201026PH19

Region: 2410 SL: 0010

Serial#: MNM890650160

Operator: 387 ChkD:F96 RoHS

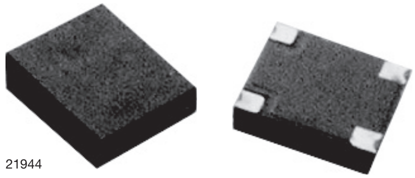
VISHAY

Pb - free

H/F

22178

IR Receiver Modules for Remote Control Systems



FEATURES

- Very low supply current
- Photo detectors and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.5 V to 5.5 V
- Continuous data transmission possible
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC
- Insensitive to supply voltage ripple and noise
- Halogen-free according to IEC 61249-2-21 definition

DESCRIPTION

The TSOP853..AP5, TSOP855..AP5 series are miniaturized receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on a PCB, the epoxy lens cap is designed as an IR filter.

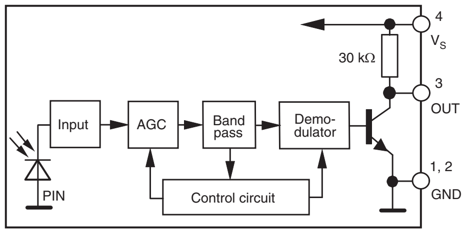
The demodulated output signal can be directly decoded by a microprocessor. The TSOP853..AP5 is optimized to better suppress spurious pulses from energy saving lamps. The TSOP855..AP5 has an excellent noise suppression. It is immune to dimmed LCD backlighting and any fluorescent lamps. AGC3 and AGC5 may also suppress some data signals in case of continuous transmission.

This component has not been qualified according to automotive specifications.

PARTS TABLE

CARRIER FREQUENCY	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)	VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)
36 kHz	TSOP85336AP5	TSOP85536AP5
38 kHz	TSOP85338AP5	TSOP85538AP5
40 kHz	TSOP85340AP5	TSOP85540AP5
56 kHz	TSOP85356AP5	TSOP85556AP5

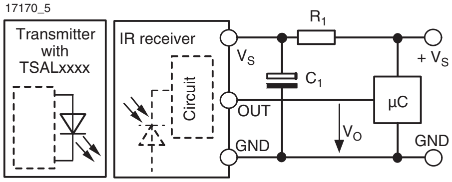
BLOCK DIAGRAM



20445-3

APPLICATION CIRCUIT

17170_5



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 µF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 4)		V_S	- 0.3 to + 6	V
Supply current (pin 4)		I_S	3	mA
Output voltage (pin 3)		V_O	- 0.3 to (V_S + 0.3)	V
Output current (pin 3)		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

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 voltage		V_S	2.5		5.5	V
Supply current (pin 4)	V_S = 3.3 V, E_v = 0	I_{SD}	0.27	0.35	0.45	mA
	E_v = 40 klx, sunlight	I_{SH}		0.45		mA
Transmission distance	E_v = 0, IR diode TSAL6200, I_F = 250 mA, test signal see fig. 1	d		35		m
Output voltage low (pin 3)	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², 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	$E_{e\ min.}$		0.15	0.35	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	$\varphi_{1/2}$		± 75		deg

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

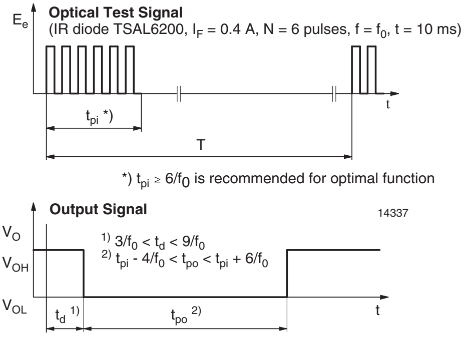


Fig. 1 - Output Function

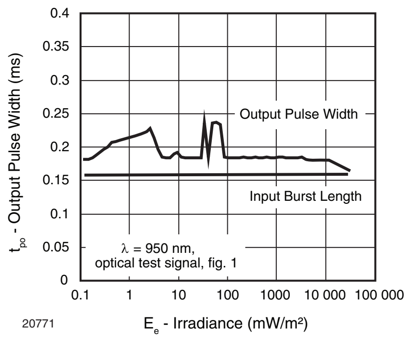


Fig. 2 - Output Pulse Diagram

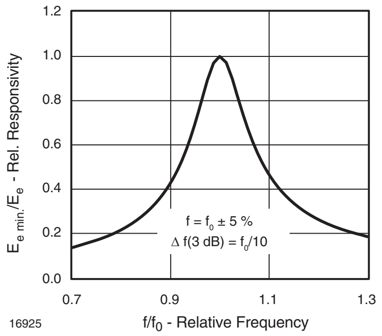


Fig. 3 - Frequency Dependance of Responsivity

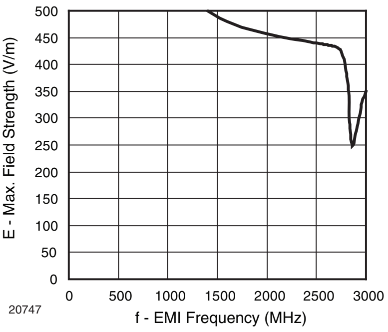


Fig. 6 - Sensitivity vs. Electric Field Disturbances

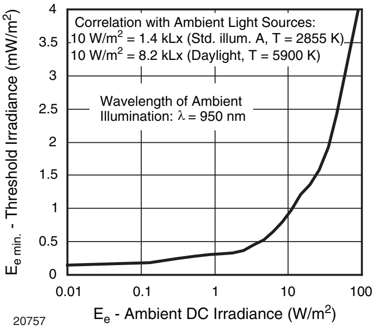


Fig. 4 - Sensitivity in Bright Ambient

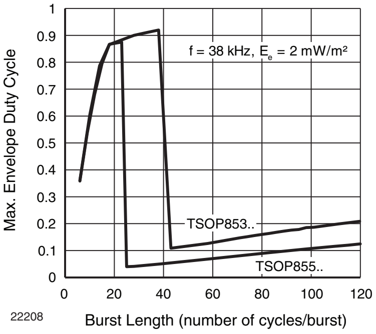


Fig. 7 - Max. Envelope Duty Cycle vs. Burst Length

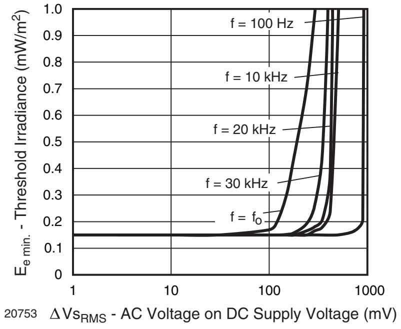


Fig. 5 - Sensitivity vs. Supply Voltage Disturbances

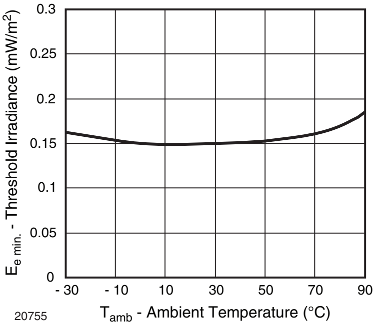


Fig. 8 - Sensitivity vs. Ambient Temperature

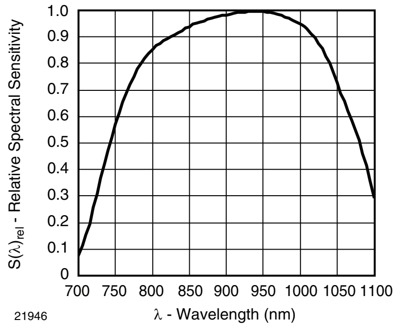


Fig. 9 - Relative Spectral Sensitivity vs. Wavelength

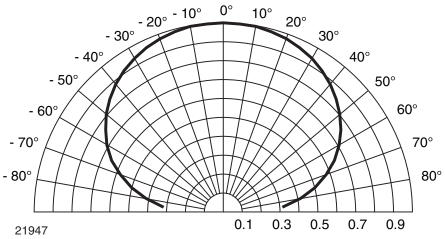


Fig. 10 - Directivity

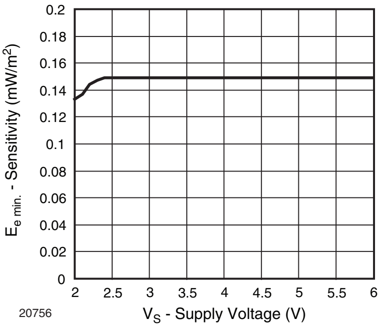


Fig. 11 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP853..AP5, TSOP855..AP5 series is 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 TSOP853..AP5, TSOP855..AP5 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 12 or figure 13)

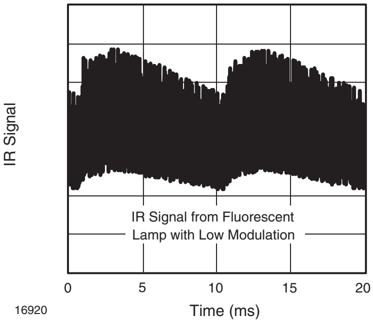


Fig. 12 - IR Signal from Fluorescent Lamp with Low Modulation

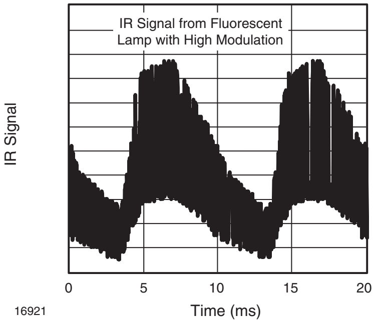


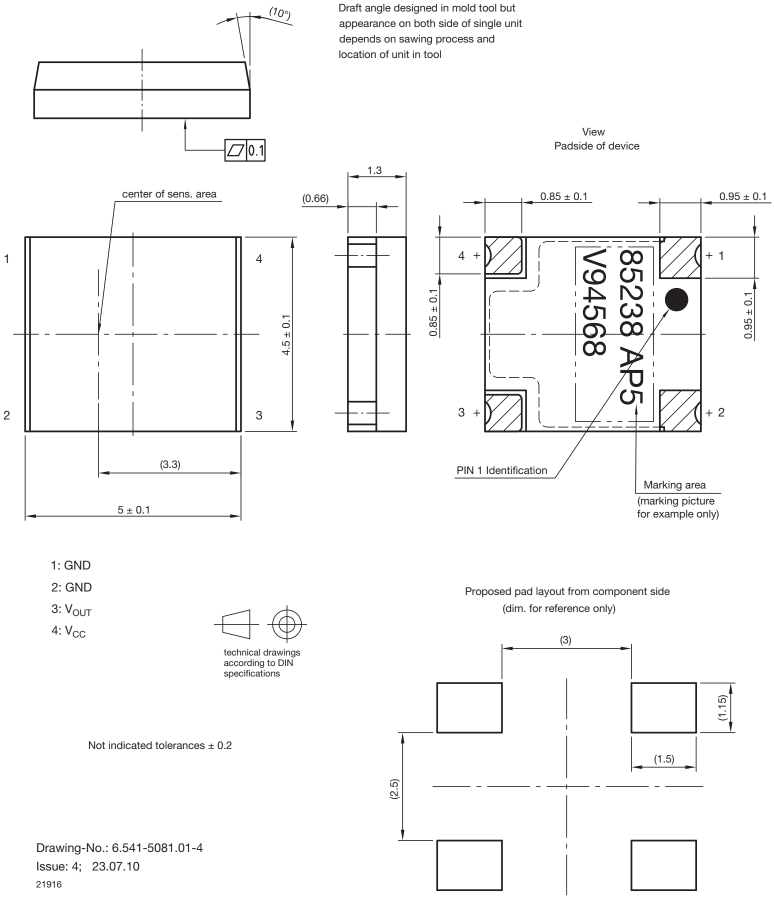
Fig. 13 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP853..	TSOP855..
Minimum burst length	6 cycles/burst	6 cycles/burst
After each burst of length a minimum gap time is required of	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	35 cycles > 6 x burst length	24 cycles > 25 ms
Maximum number of continuous short bursts/second	2000	2000
Recommended for NEC code	yes	yes
Recommended for RC5/RC6 code	yes	yes
Recommended for Sony code	no	no
Recommended for RCMM code	yes	yes
Recommended for r-step code	yes	yes
Recommended for XMP code	yes	yes
Suppression of interference from fluorescent lamps	Even critical disturbance signals are suppressed (example: signal pattern of fig. 14 and fig. 15)	Even critical disturbance signals are suppressed (example: signal pattern of fig. 14 and fig. 15)

Note

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP852..AP5, TSOP854..AP5

PACKAGE DIMENSIONS in millimeters



ASSEMBLY INSTRUCTIONS

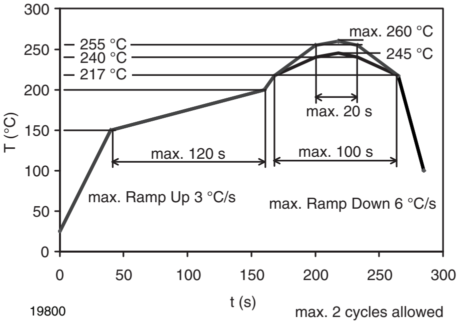
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

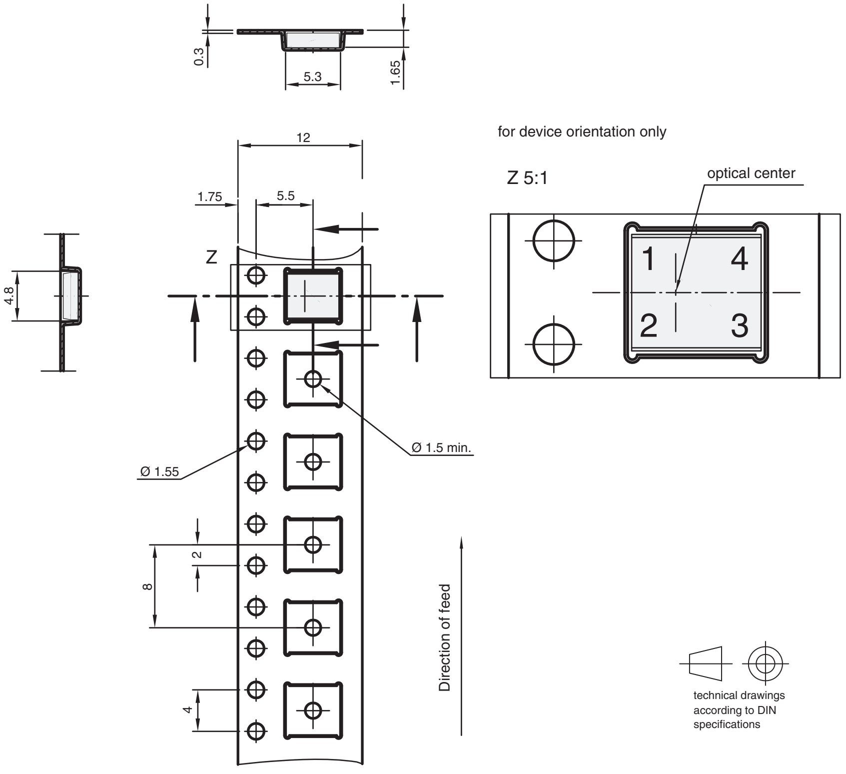
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



TAPING VERSION TSOP85...AP5 DIMENSIONS in millimeters



Drawing-No.: 9.700-5346.01-4
Issue: 2, 24.11.09
21945

LABEL

Standard bar code labels for finished goods

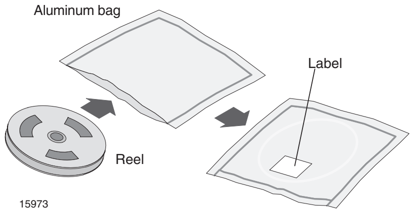
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)

PLAIN WRITING	ABBREVIATION	LENGTH
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
Long bar code top	**Type**	**Length**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
Short bar code bottom	**Type**	**Length**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

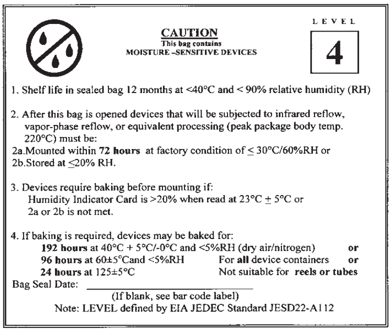
The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:
192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)
or
96 h at 60 °C + 5 °C and < 5 % RH for all device containers
or
24 h at 125 °C + 5 °C not suitable for reel or tubes.
An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



LEVEL **4**

CAUTION

This bag contains

MOISTURE –SENSITIVE DEVICES

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:

2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or

2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
   Humidity Indicator Card is >20% when read at 23°C ± 5°C or
   2a or 2b is not met.

4. If baking is required, devices may be baked for:
   192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
   96 hours at 60±5°Cand <5%RH For **all** device containers **or**
   24 hours at 125±5°C Not suitable for **reels or tubes**

Bag Seal Date: ____________________

(If blank, see bar code label)

Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

Example of JESD22-A112 level 4 label

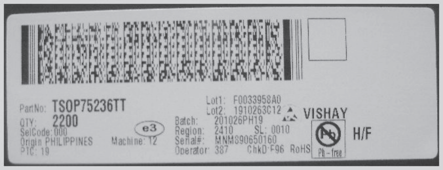
ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.

BAR CODE PRODUCT LABEL EXAMPLE:



PartNo: TSOP75236TT
QTY: 2200
SelCode:000
Origin PHILIPPINES
PTC: 19
Machine: 12
Lot1: F0033958A0
Lot2: 1910263C12
Batch: 201026PH19
Region: 2410 SL: 0010
Serial#: MNM890650160
Operator: 387 ChkD:F96

22178

Special Options

Contents

IR Receiver Modules for Remote Control Systems

AVAILABLE FOR:

- TSOP34...
- TSOP4...
- TSOP32...
- TSOP2...
- TSOP35..
- TSOP36..
- TSOP6...

FEATURES

- Enhanced suppression of disturbance signals by special filtering
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The "F" option provides an enhanced narrow band optical filtering function for improved suppression of unwanted optical disturbance signals. This filter option is available for all Vishay molded IR receivers listed below. Only the spectral sensitivity vs. wavelength specification on the corresponding datasheets changes. The new function is shown below:

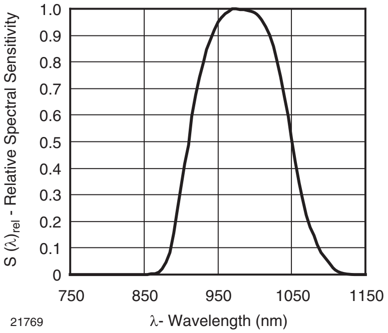


Fig. 1 - Relative Spectral Sensitivity vs. Wavelength

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	S	1	F	B	S	d	d
				2 or 3 digit product series			2 digit frequency		Mechanical option (SS1 if no holder)			"F" option	Optional tape and reel			

Note
d = "digit", please consult the list of available series to create a valid part number.

Example: **TSOP4838SS1F - F version, straight leads in tubes**
TSOP4838YA1F - F version with YA1 holder
TSOP2238SS1FBS12 - F version with tape and reel
TSOP35238FTT - F version, SMD top view taped
TSOP6236FTR - F version, SMD side view taped

** Please see document "Vishay Material Category Policy": www.vishay.com/doc?99902

IR Receiver Modules for Remote Control Systems

AVAILABLE FOR:

- Cast packages (TSOP312.., TSOP313.., TSOP314..)
- Minicast packages (TSOP38..., TSOP39...)
- Molded packages (TSOP32..., TSOP34...)
- Standard SMD packages (TSOP35...)
- Heimdall packages (TSOP75...)
- Bugeye packages (TSOP85...)

FEATURES

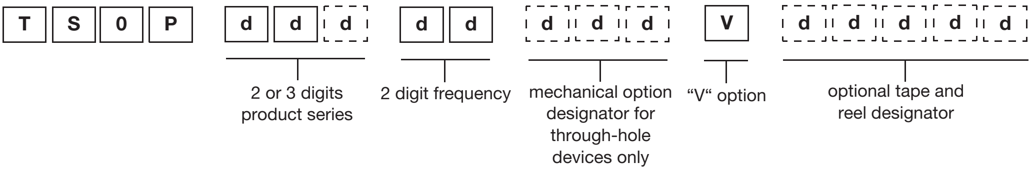
- Low supply voltage: 2 V to 5.5 V
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT
GREEN (5-2008)**

DESCRIPTION

The "V" series are special IR receivers capable of operating at very low voltages. The power supply operating range is 2 V to 5.5 V over a temperature range of + 5 °C to + 85 °C.

ORDERING INFORMATION



Note

d = "digit", please consult the list of available series to create a valid part number.

Example:	**TSOP34838SS1V - V version, molded package**
	TSOP38240SS1V - V version, minicast package
	TSOP38240SS1VBS12 - V version, minicast package, tape and reel
	TSOP31238SS1V - V version, cast package
	TSOP31238XG1V - V version, cast package, with holder
	TSOP35240VTT - V version, standard SMD package
	TSOP75240VTR - V version, Heimdall package

ELECTRICAL AND OPTICAL CHARACTERISTICS

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage	- 25 °C to +85 °C	V_S	2.5		5.5	V
	+ 5 °C to +85 °C	V_S	2		5.5	V

** Please see document "Vishay Material Category Policy": www.vishay.com/doc?99902

TYPICAL CHARACTERISTICS

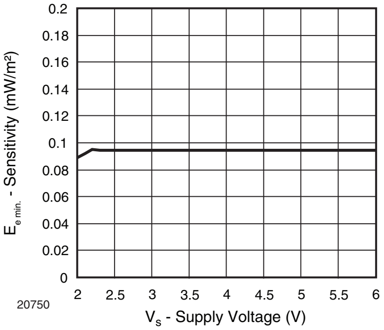


Fig. 1 - Sensitivity vs. Supply Voltage

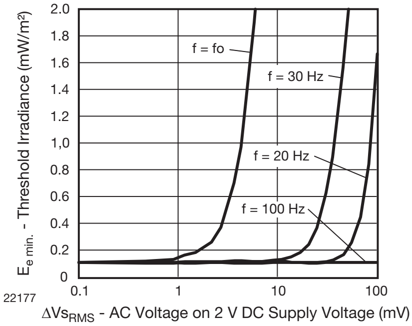
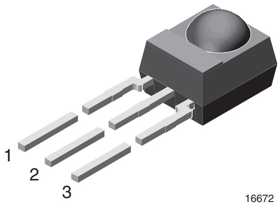


Fig. 2 - Threshold Irradiance vs.
AC Voltage on 2 V DC Supply Voltage

IR Receiver Module for Light Barrier Systems



MECHANICAL DATA

Pinning:

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

FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for 38 kHz IR signals
- Shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Visible light is suppressed by IR filter
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

RoHS
COMPLIANT

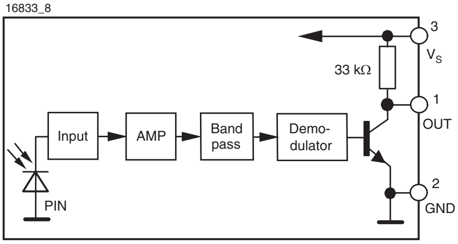
DESCRIPTION

The TSOP4038 is a compact IR receiver for sensor applications. It has a high gain for IR signals at 38 kHz. The detection level does not change when ambient light or strong IR signals are applied. It can receive continuous 38 kHz signals or 38 kHz bursts.

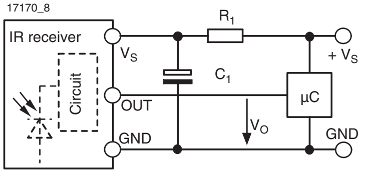
PARTS TABLE

CARRIER FREQUENCY	SENSOR APPLICATIONS
38 kHz	TSOP4038

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 6.0	V
Supply current (pin 3)		I_S	5	mA
Output voltage (pin 1)		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 (pin 1)		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

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 (pin 3)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	E_v = 40 klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, I_F = 400 mA	d		30		m
Output voltage low (pin 1)	I_{OSL} = 0.5 mA, E_e = 2 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	$E_{e\ min.}$		0.3	0.7	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

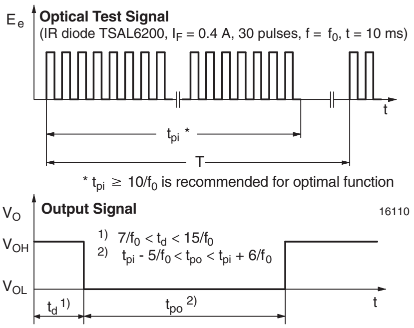


Fig. 1 - Output Active Low

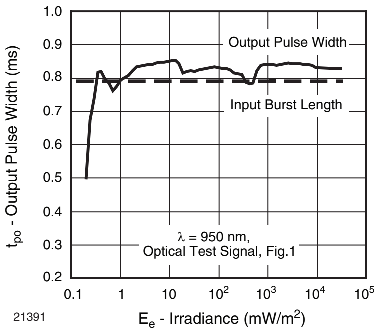


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

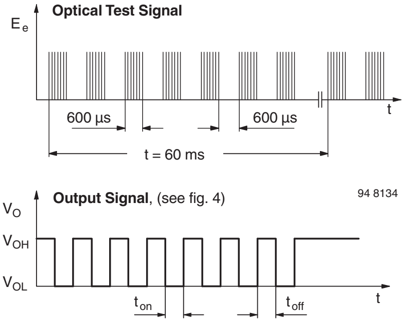


Fig. 3 - Output Function

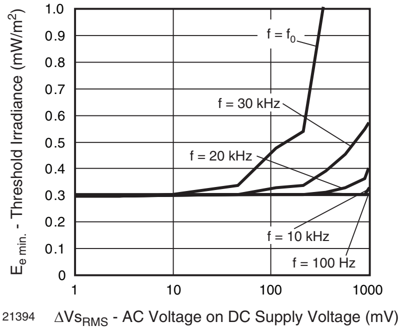


Fig. 6 - Sensitivity vs. Supply Voltage Disturbances

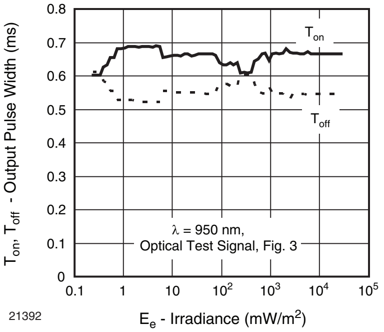


Fig. 4 - Output Pulse Diagram

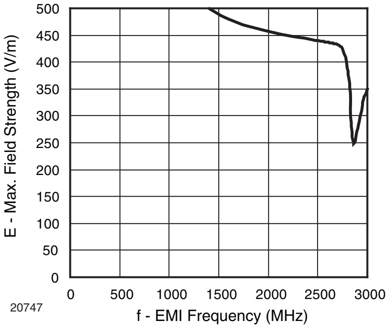


Fig. 7 - Sensitivity vs. Electric Field Disturbances

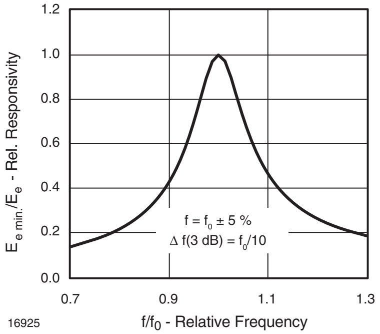


Fig. 5 - Frequency Dependence of Responsivity

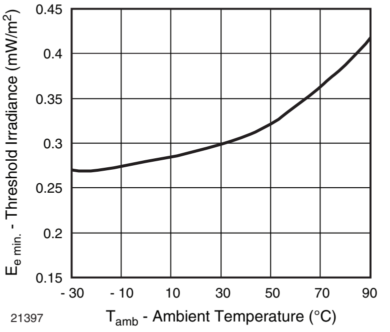


Fig. 8 - Sensitivity vs. Ambient Temperature

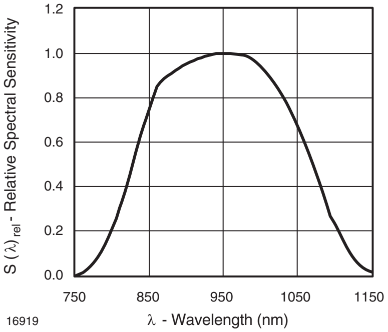


Fig. 9 - Relative Spectral Sensitivity vs. Wavelength

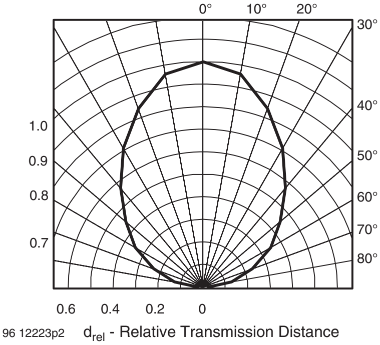


Fig. 10 - Directivity

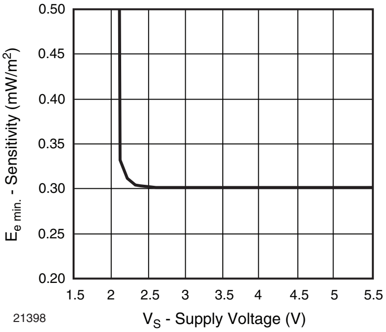
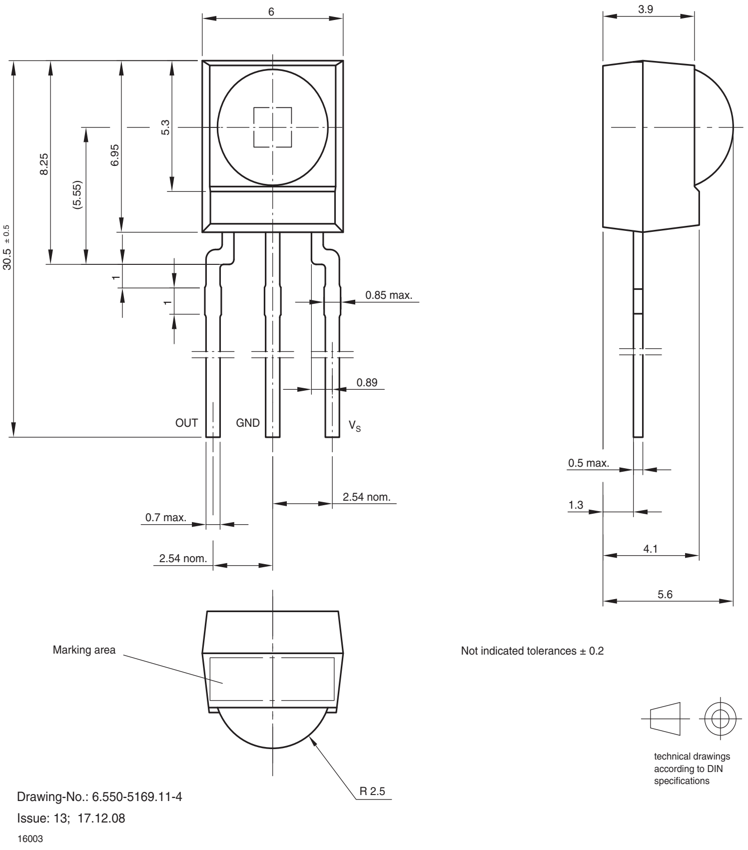


Fig. 11 - Sensitivity vs. Supply Voltage

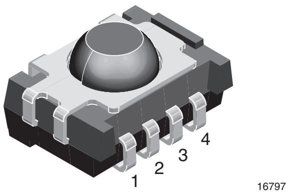
PACKAGE DIMENSIONS in millimeters



Not indicated tolerances ± 0.2

Drawing-No.: 6.550-5169.11-4
Issue: 13; 17.12.08
16003

IR Receiver Module for Light Barrier Systems



MECHANICAL DATA

Pinning:

1 = GND, 2 = N.C., 3 = OUT, 4 = V_S

FEATURES

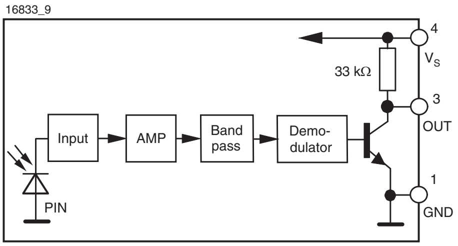
- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for 38 kHz IR signals
- Shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Visible light is suppressed by IR filter
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

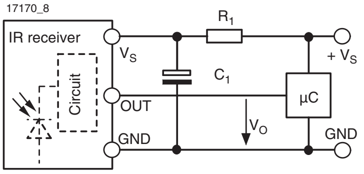
The TSOP5038 is a compact SMD IR receiver for sensor applications. It has a high gain for IR signals at 38 kHz. The detection level does not change when ambient light or strong IR signals are applied. It can receive continuous 38 kHz signals or 38 kHz bursts.

PARTS TABLE	
CARRIER FREQUENCY	**SENSOR APPLICATIONS**
38 kHz	TSOP5038

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 4)		V_S	- 0.3 to + 6.0	V
Supply current (pin 4)		I_S	5	mA
Output voltage (pin 3)		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 (pin 3)		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

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 (pin 4)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	E_v = 40 klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, I_F = 400 mA	d		30		m
Output voltage low (pin 3)	I_{OSL} = 0.5 mA, E_e = 2 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	$E_{e\,min.}$		0.5	1	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\,max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 50		deg

TYPICAL CHARACTERISTICS

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

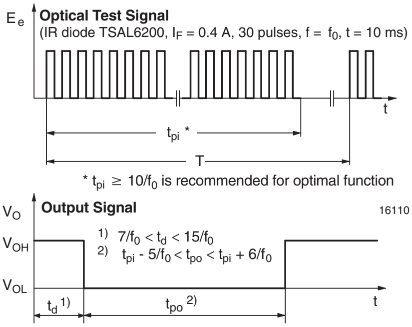


Fig. 1 - Output Active Low

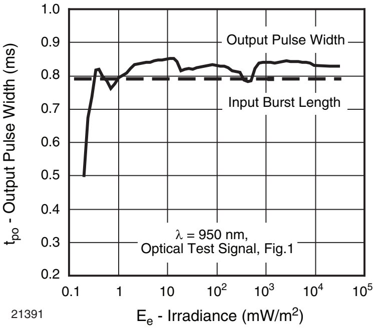


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

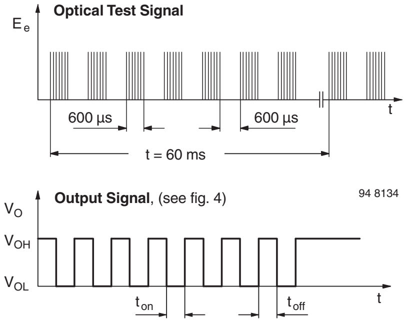


Fig. 3 - Output Function

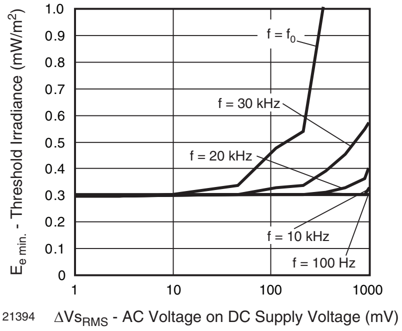


Fig. 6 - Sensitivity vs. Supply Voltage Disturbances

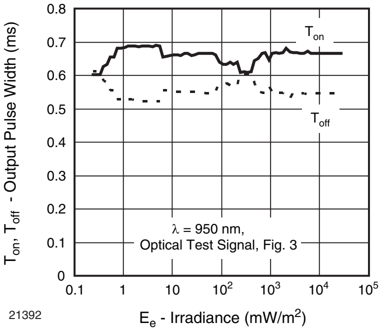


Fig. 4 - Output Pulse Diagram

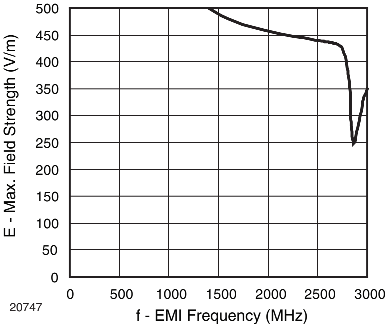


Fig. 7 - Sensitivity vs. Electric Field Disturbances

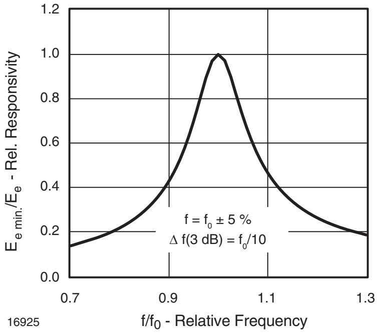


Fig. 5 - Frequency Dependence of Responsivity

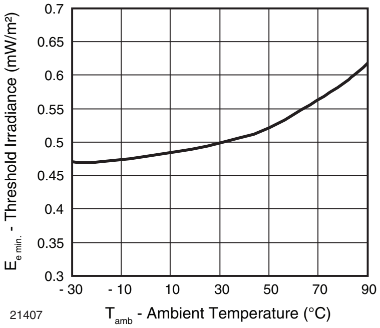


Fig. 8 - Sensitivity vs. Ambient Temperature

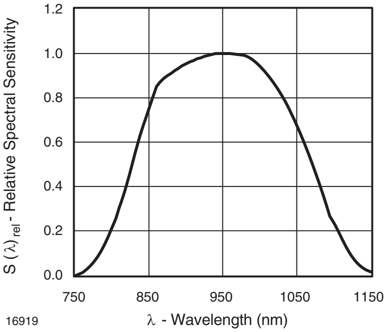


Fig. 9 - Relative Spectral Sensitivity vs. Wavelength

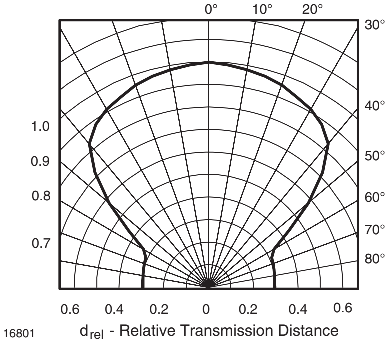


Fig. 10 - Horizontal Directivity

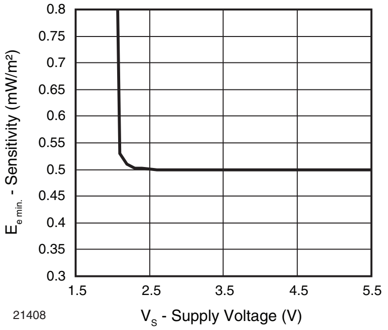
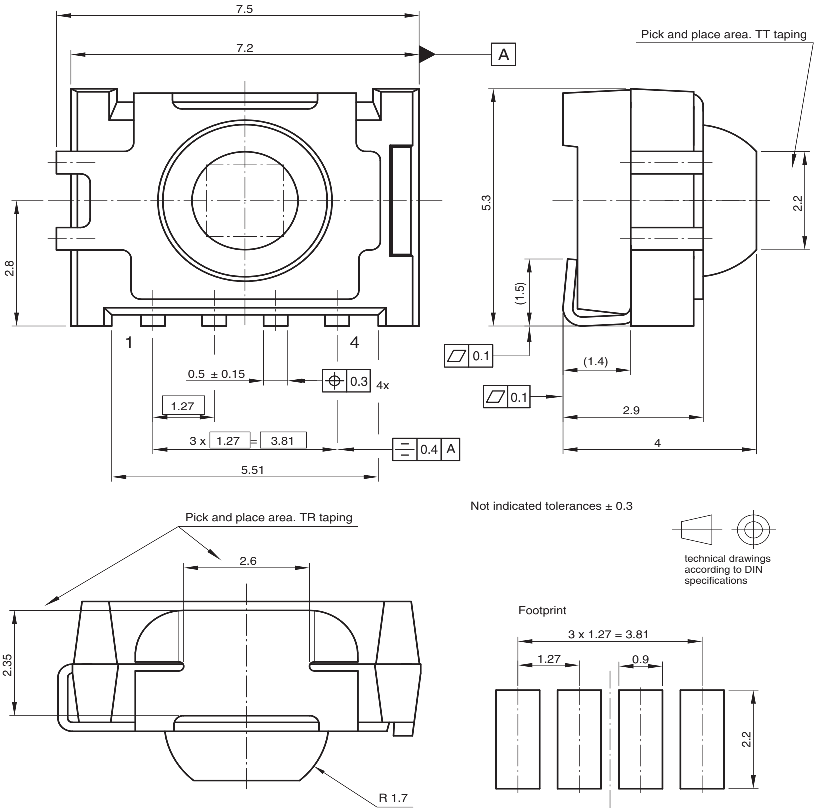


Fig. 11 - Sensitivity vs. Supply Voltage

PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.544-5341.01-4
Issue: 8; 02.09.09
16776

ASSEMBLY INSTRUCTIONS

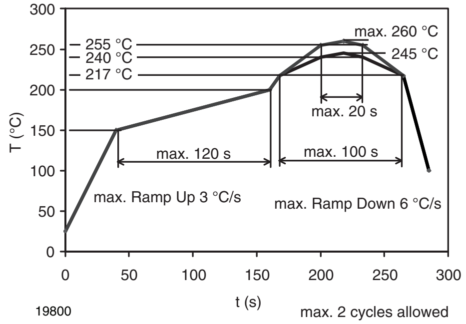
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

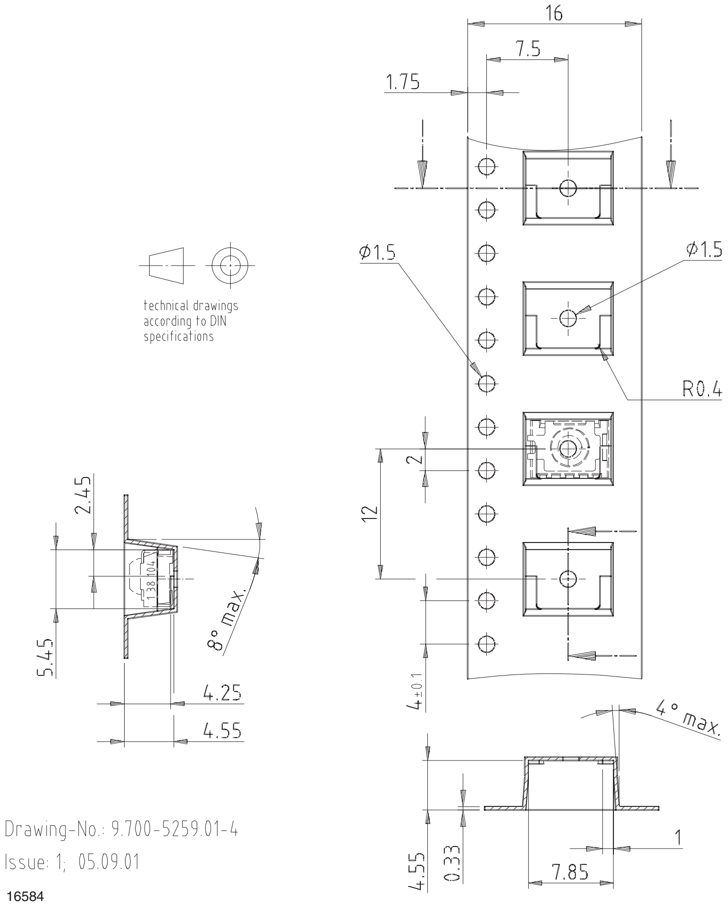
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

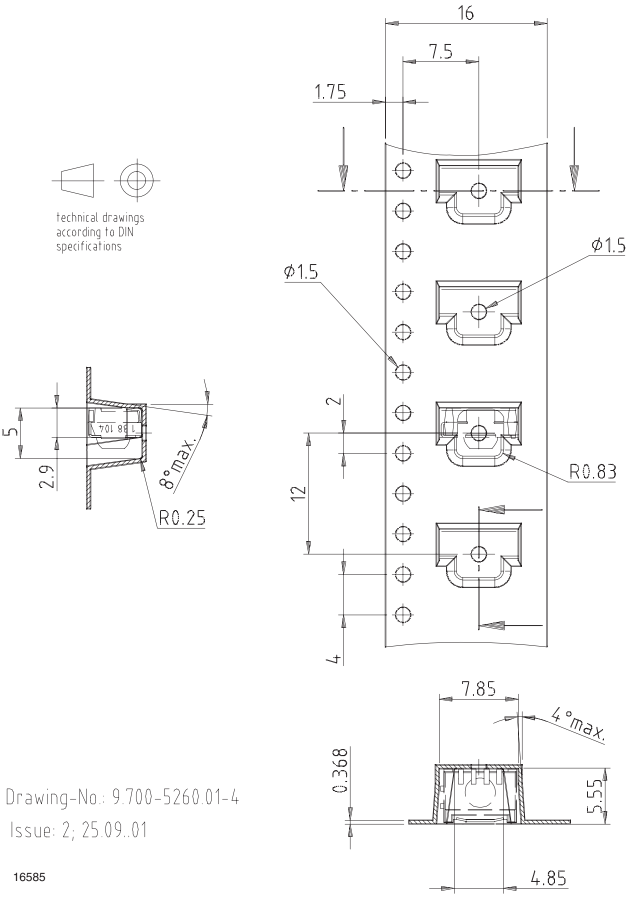
VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



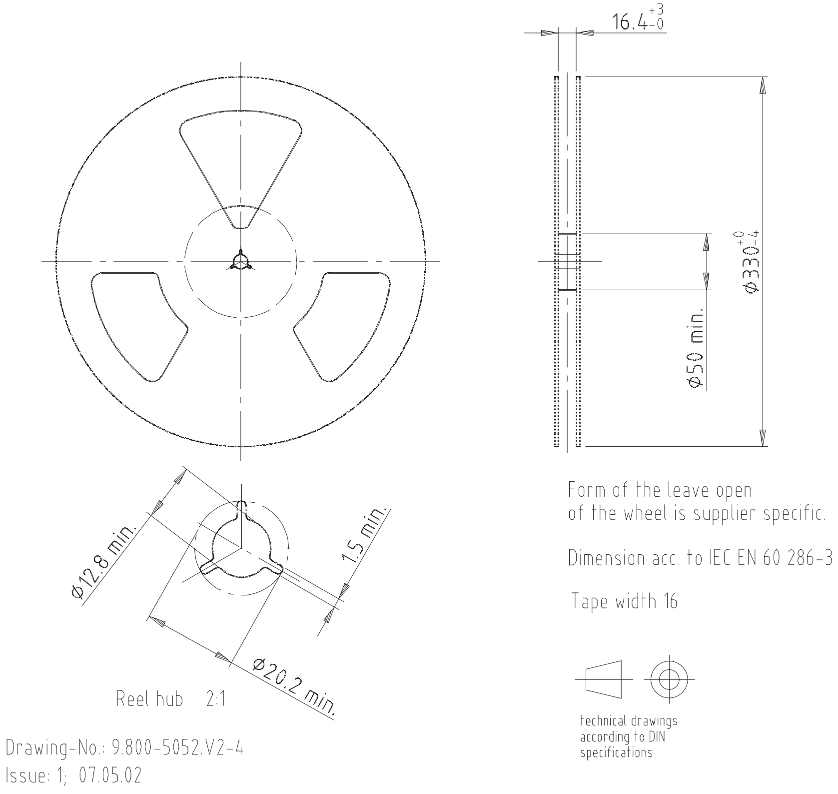
TAPING VERSION TSOP..TT DIMENSIONS in millimeters



TAPING VERSION TSOP..TR DIMENSIONS in millimeters

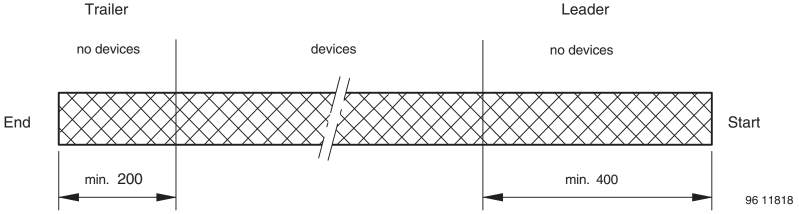


REEL DIMENSIONS in millimeters



16734

LEADER AND TRAILER DIMENSIONS in millimeters



COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 ± 10 mm/min.
165° to 180° peel angle

LABEL

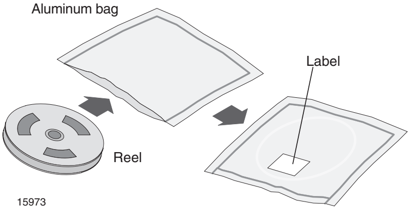
Standard bar code labels for finished goods

The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GMBH STANDARD BAR CODE PRODUCT LABEL (finished goods)		
PLAIN WRITTING	**ABBREVIATION**	**LENGTH**
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
LONG BAR CODE TOP	**TYPE**	**LENGTH**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
SHORT BAR CODE BOTTOM	**TYPE**	**LENGTH**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

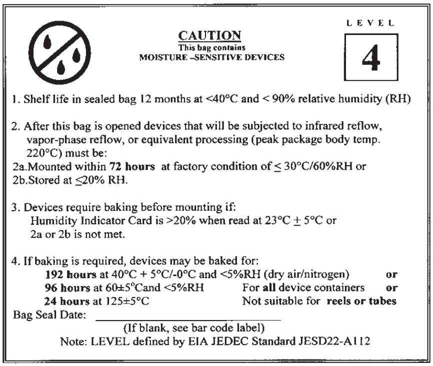
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

192 h at 40 °C + 5 °C/ - 0 °C and < 5 % RH (dry air/nitrogen) or

96 h at 60 °C + 5 °C and < 5 % RH for all device containers or

24 h at 125 °C + 5 °C not suitable for reel or tubes.

An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION

This bag contains

MOISTURE –SENSITIVE DEVICES

LEVEL

4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:

2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or

2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:

192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
96 hours at 60±5°Cand <5%RH For **all** device containers **or**
24 hours at 125±5°C Not suitable for **reels or tubes**

Bag Seal Date: ____________________

(If blank, see bar code label)

Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

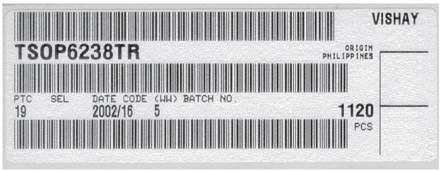
Example of JESD22-A112 level 4 label

ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

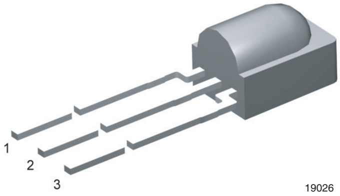
The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



VISHAY
TSOP6238TR
ORIGIN
PHILIPPINES
PTC SEL DATE CODE (WW) BATCH NO.
19 2002/16 5
1120
PCS

16962

IR Receiver Module for Light Barrier Systems



MECHANICAL DATA

Pinning:

1 = OUT, 2 = GND, 3 = V_S

FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for 38 kHz IR signals
- Shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Visible light is suppressed by IR filter
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

RoHS
COMPLIANT

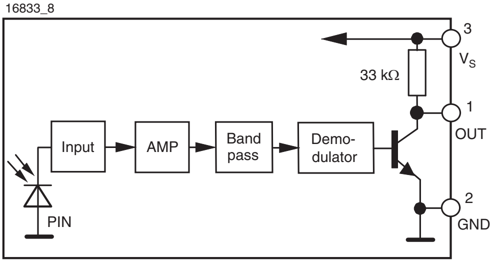
DESCRIPTION

The TSOP58038 is a compact IR receiver for sensor applications. It has a high gain for IR signals at 38 kHz. The detection level does not change when ambient light or strong IR signals are applied. It can receive continuous 38 kHz signals or 38 kHz bursts.

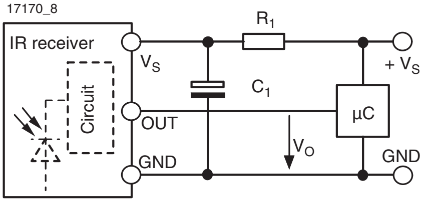
PARTS TABLE

CARRIER FREQUENCY	SENSOR APPLICATIONS
38 kHz	TSOP58038

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 μF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Supply voltage (pin 3)		V_S	- 0.3 to + 6.0	V
Supply current (pin 3)		I_S	5	mA
Output voltage (pin 1)		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 (pin 1)		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

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 (pin 3)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	E_v = 40 klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, I_F = 400 mA	d		30		m
Output voltage low (pin 1)	I_{OSL} = 0.5 mA, E_e = 2 mW/m², 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	$E_{e\,min.}$		0.5	1	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	$\varphi_{1/2}$		± 45		deg

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

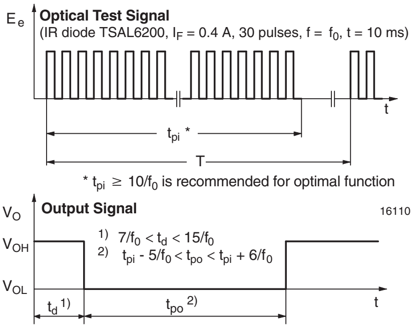


Fig. 1 - Output Active Low

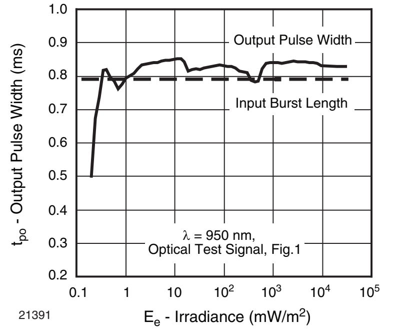


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

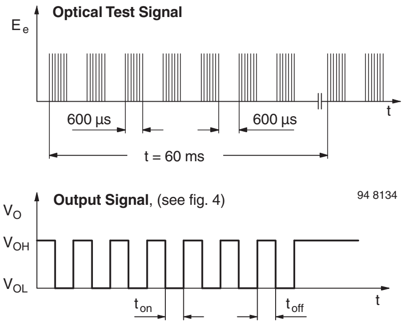


Fig. 3 - Output Function

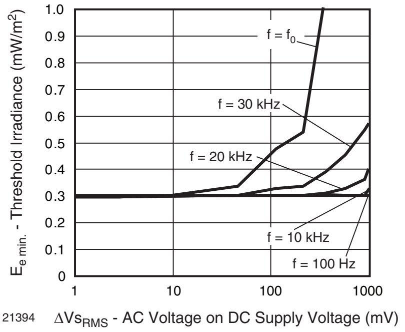


Fig. 6 - Sensitivity vs. Supply Voltage Disturbances

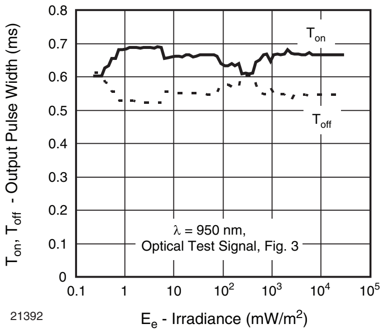


Fig. 4 - Output Pulse Diagram

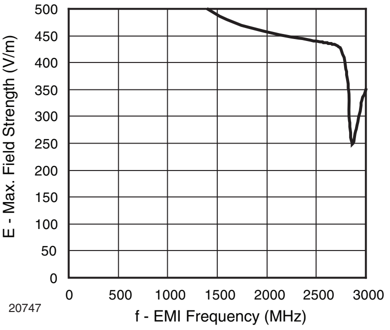


Fig. 7 - Sensitivity vs. Electric Field Disturbances

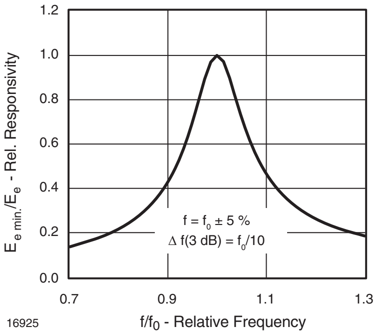


Fig. 5 - Frequency Dependence of Responsivity

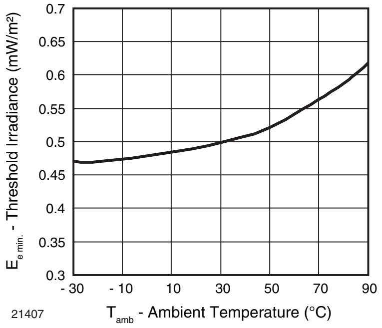


Fig. 8 - Sensitivity vs. Ambient Temperature

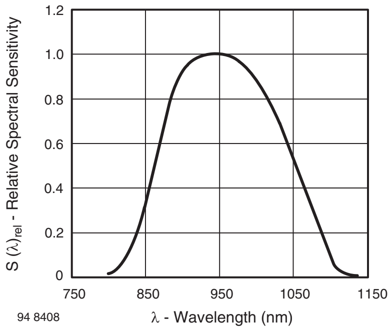


Fig. 9 - Relative Spectral Sensitivity vs. Wavelength

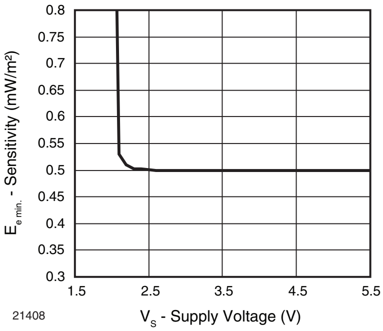


Fig. 12 - Sensitivity vs. Supply Voltage

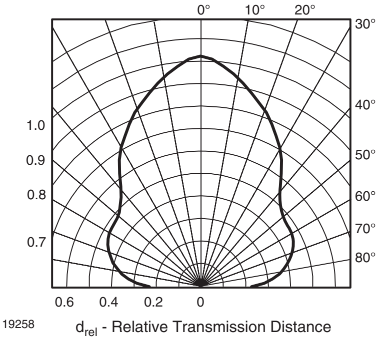


Fig. 10 - Horizontal Directivity

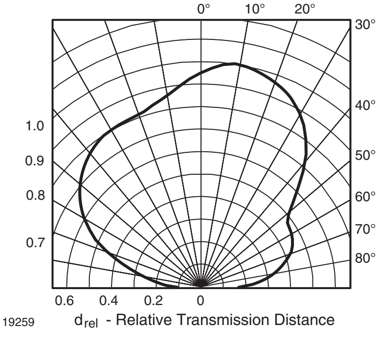
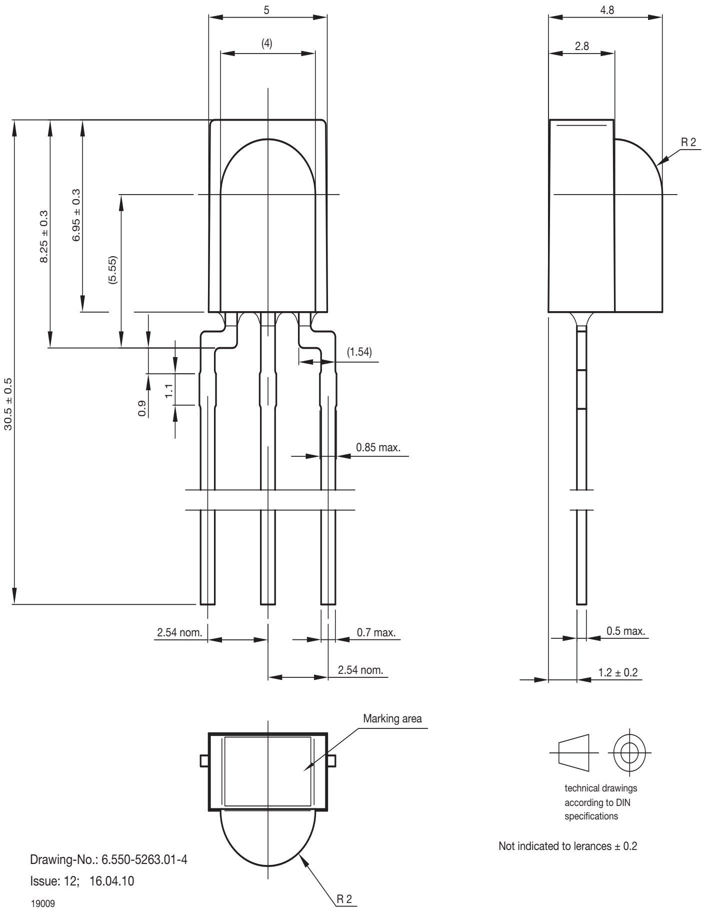
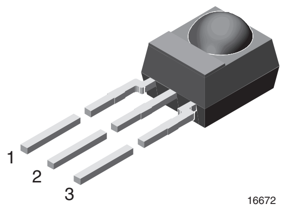


Fig. 11 - Vertical Directivity

PACKAGE DIMENSIONS in millimeters



IR Receiver Modules for Mid Range Proximity Sensors



MECHANICAL DATA

Pinning

1 = OUT, 2 = GND, 3 = V_S

FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for burst frequency
- Improved shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP4P.. series are miniaturized receivers for Mid range proximity sensor systems. A PIN diode and a preamplifier are assembled on a lead frame, the epoxy package acts as an IR filter.

The output pulse width of the TSOP4P.. has an almost linear relationship to the distance of the emitter or the distance of an reflecting object. The TSOP4P.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps.

This component has not been qualified according to automotive specifications.

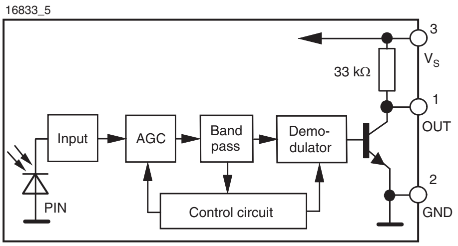
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)
38 kHz (1)	TSOP4P38

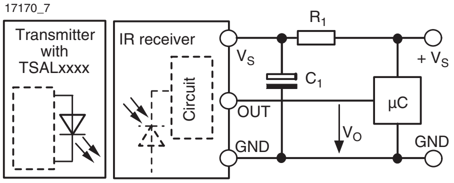
Note

(1) Other frequencies available by request

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 6	V
Supply current (pin 3)		I_S	5	mA
Output voltage (pin 1)		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 (pin 1)		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 condtions 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 (pin 3)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 400$ mA	d		45		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ min.}$		0.17	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

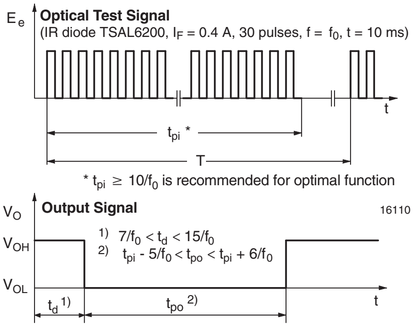


Fig. 1 - Output Active Low

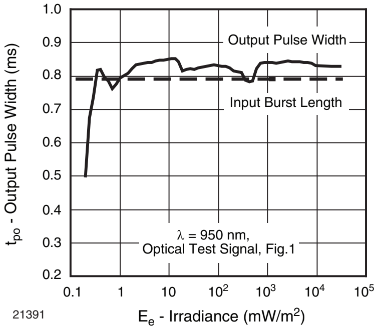


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

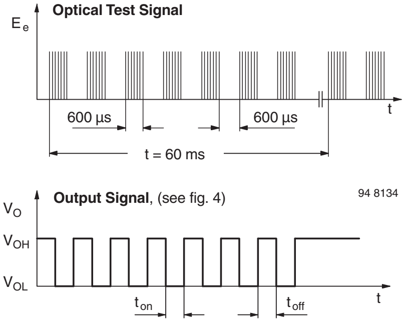


Fig. 3 - Output Function

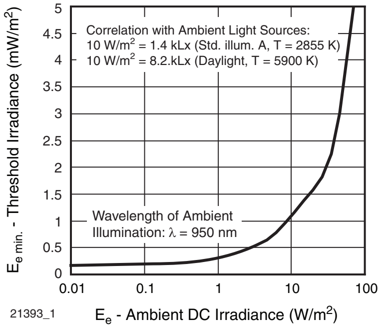


Fig. 6 - Sensitivity in Bright Ambient

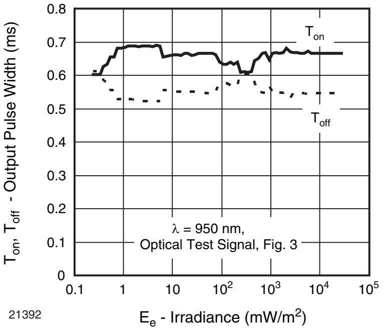


Fig. 4 - Output Pulse Diagram

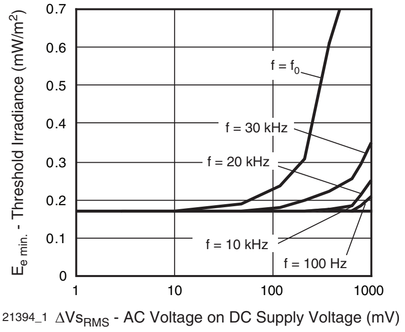


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

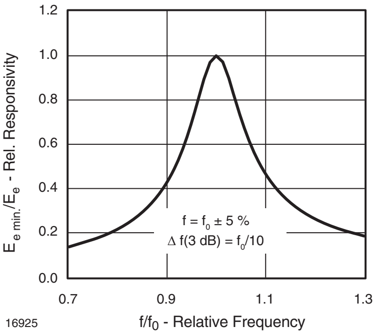


Fig. 5 - Frequency Dependence of Responsivity

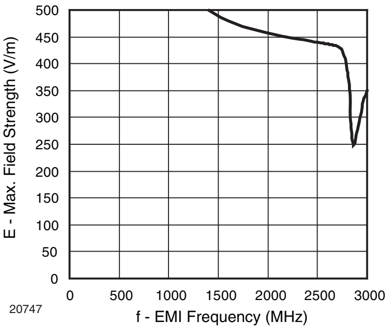


Fig. 8 - Sensitivity vs. Electric Field Disturbances

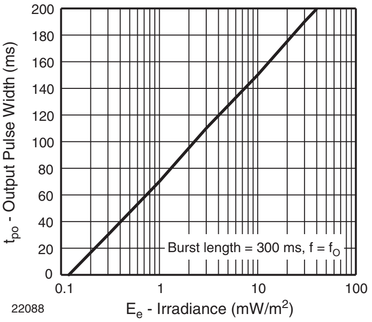


Fig. 9 - Max. Output Pulse Width vs. Irradiance

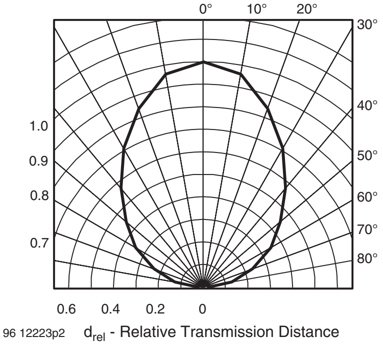


Fig. 12 - Horizontal Directivity

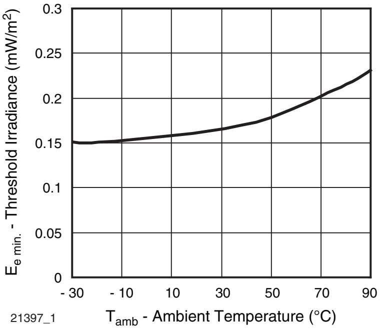


Fig. 10 - Sensitivity vs. Ambient Temperature

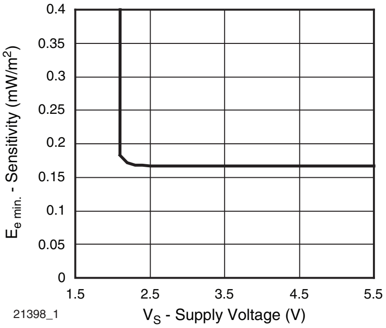


Fig. 13 - Sensitivity vs. Supply Voltage

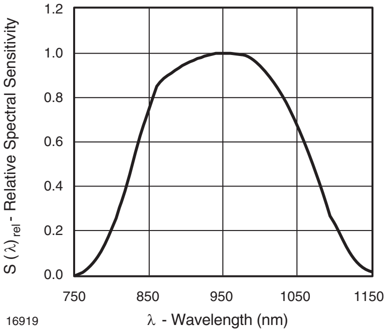
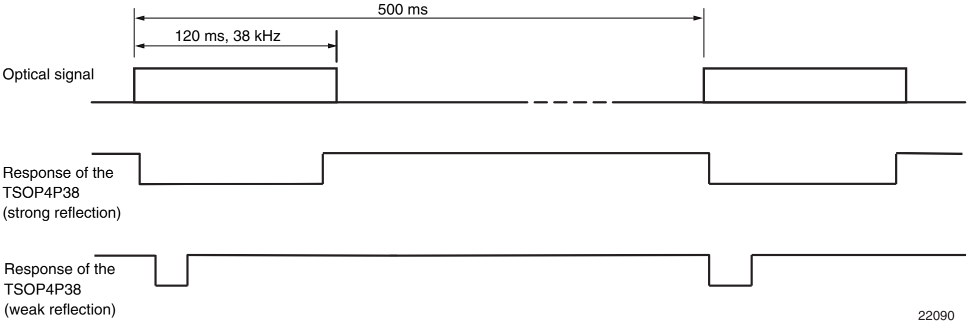


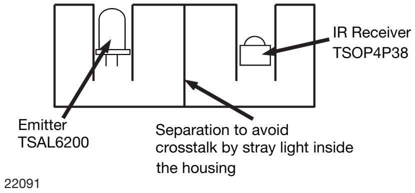
Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

The typical application of the TSOP4P38 is a reflective sensor with analog information contained in its output. Such a sensor is evaluating the time required by the AGC to suppress a quasi continuous signal. The time required to suppress such a signal is longer when the signal is strong than when the signal is weak, resulting in a pulse length corresponding to the distance of an object from the sensor. This kind of analog information can be evaluated by a microcontroller. The absolute amount of reflected light depends much on the environment and is not evaluated. Only sudden changes of the amount of reflected light, and therefore changes in the pulse width, are evaluated using this application.

Example of a signal pattern:



Example for a sensor hardware:



There should be no common window in front of the emitter and receiver in order to avoid crosstalk by guided light through the window.

The logarithmic characteristic of the AGC in the TSOP4P38 results in an almost linear relationship between distance and pulse width. Ambient light has also some impact to the pulse width of this kind of sensor, making the pulse shorter.

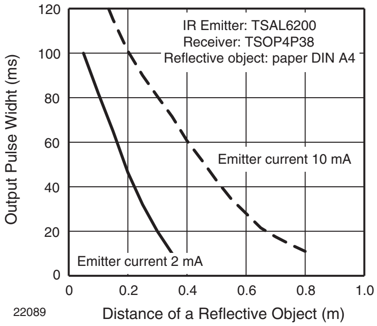
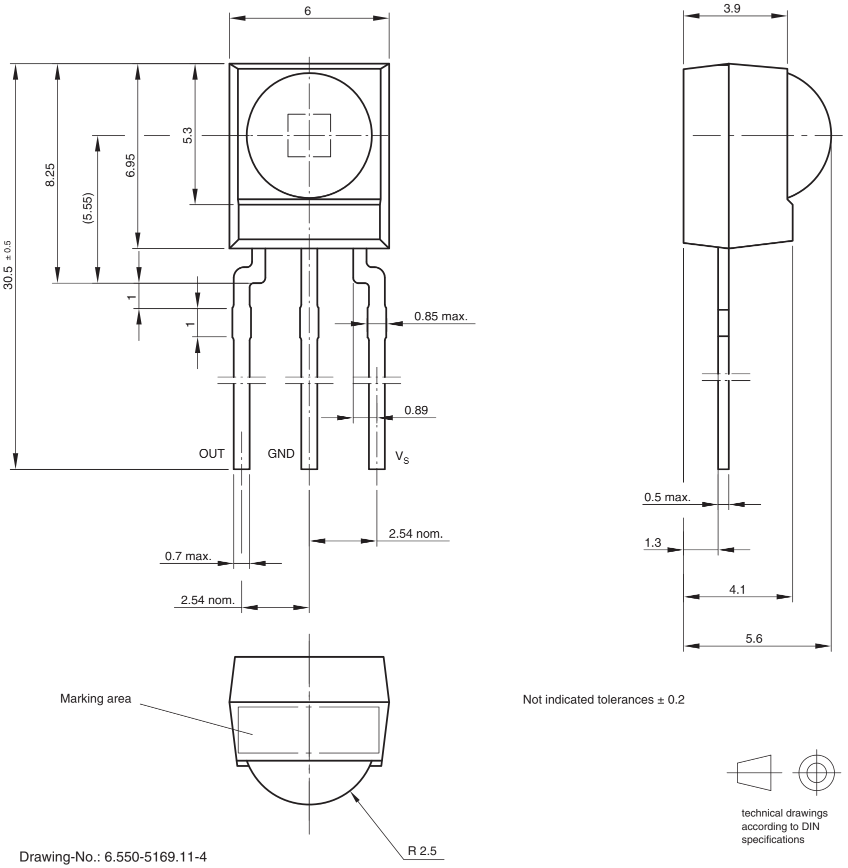


Fig. 14 - Distance Characterisitic of a Typical Reflective Sensor using the TSOP4P38

PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.550-5169.11-4
Issue: 13; 17.12.08
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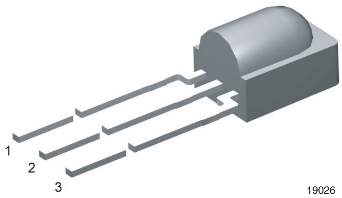
IR Receiver Modules for Mid Range Proximity Sensors



MECHANICAL DATA

Pinning

1 = OUT, 2 = GND, 3 = V_S

FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for burst frequency
- Improved shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP58P.. series are miniaturized receivers for Mid range proximity sensor systems. A PIN diode and a preamplifier are assembled on a lead frame, the epoxy package acts as an IR filter.

The output pulse width of the TSOP58P.. has an almost linear relationship to the distance of the emitter or the distance of an reflecting object. The TSOP58P.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps.

This component has not been qualified according to automotive specifications.

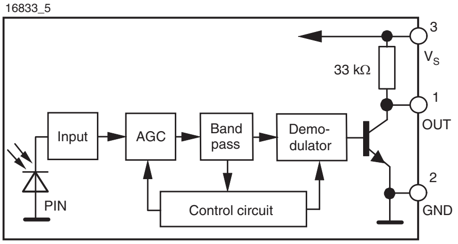
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)
38 kHz (1)	TSOP58P38

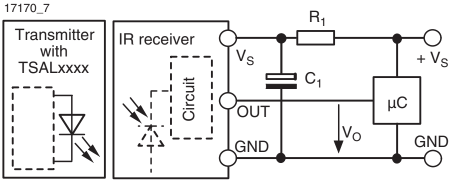
Note

(1) Other frequencies available by request

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATING

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 6	V
Supply current (pin 3)		I_S	5	mA
Output voltage (pin 1)		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 (pin 1)		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 condtions 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 (pin 3)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 400$ mA	d		45		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}			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ min.}$		0.17	0.35	mW/m^2
Maximum irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

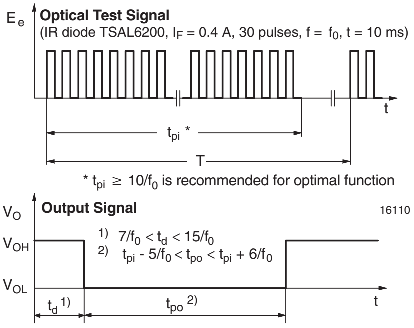


Fig. 1 - Output Active Low

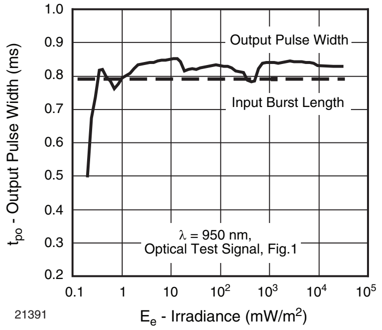


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

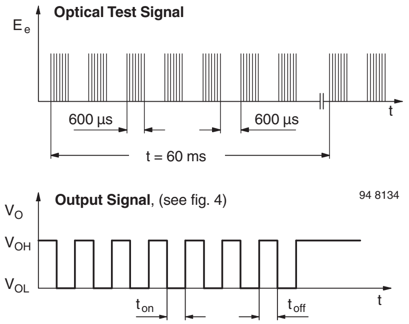


Fig. 3 - Output Function

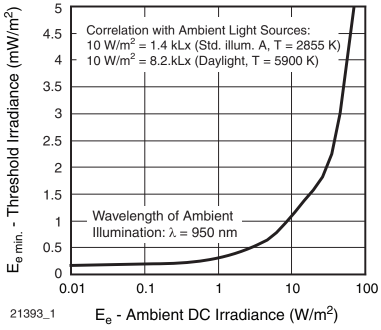


Fig. 6 - Sensitivity in Bright Ambient

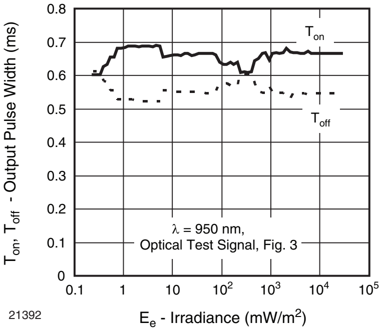


Fig. 4 - Output Pulse Diagram

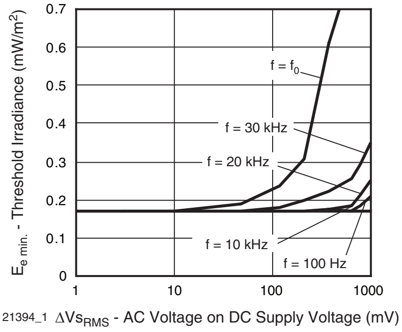


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

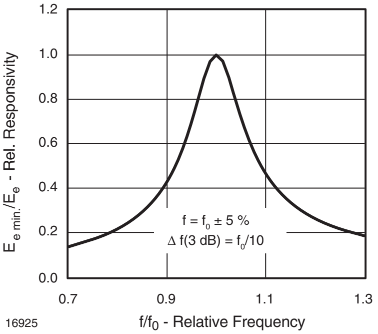


Fig. 5 - Frequency Dependence of Responsivity

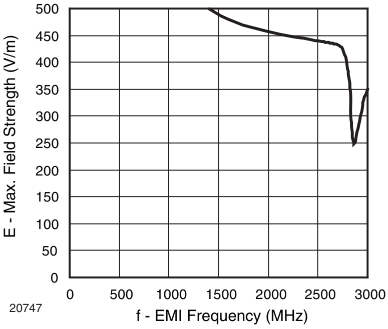


Fig. 8 - Sensitivity vs. Electric Field Disturbances

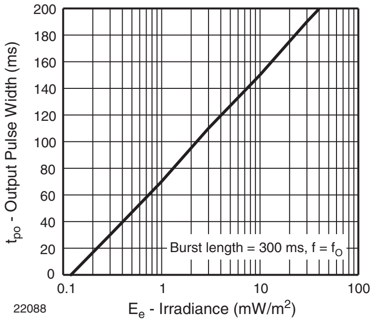


Fig. 9 - Maximum Output Pulse Width vs. Irradiance

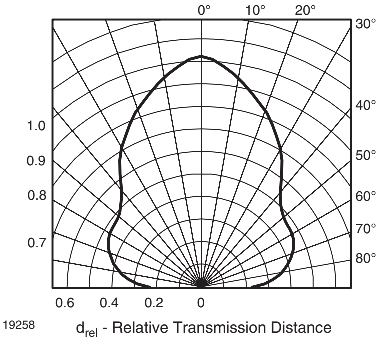


Fig. 12 - Horizontal Directivity

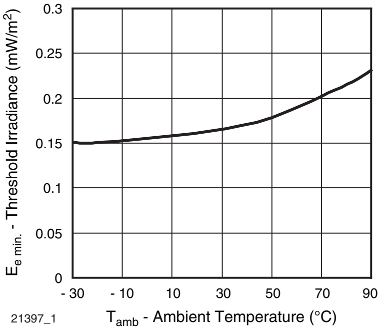


Fig. 10 - Sensitivity vs. Ambient Temperature

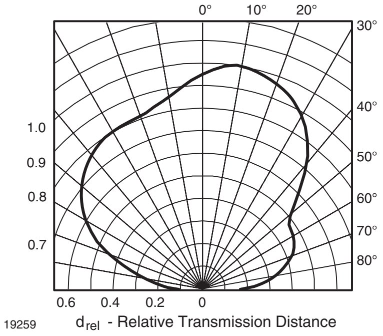


Fig. 13 - Vertical Directivity

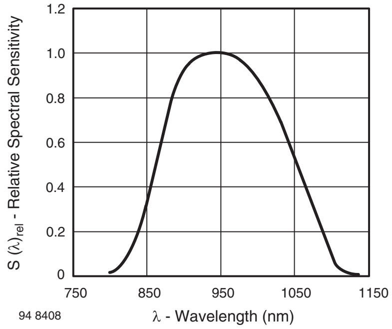


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

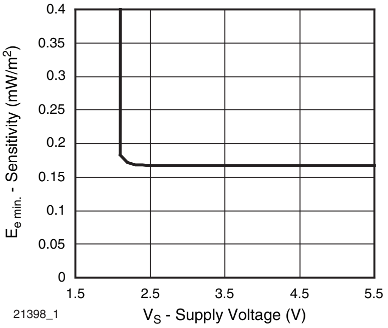
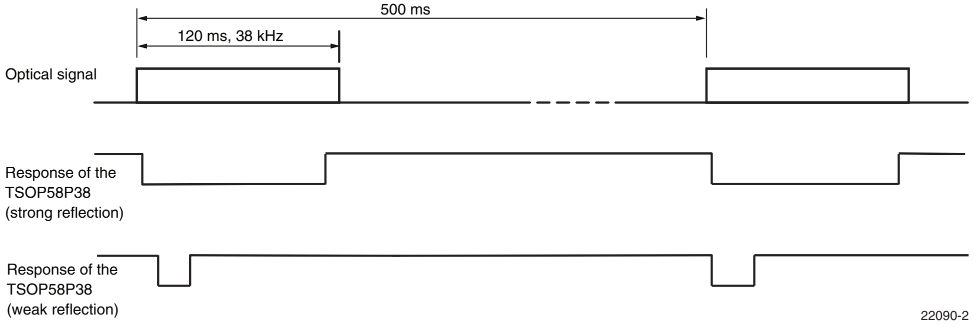


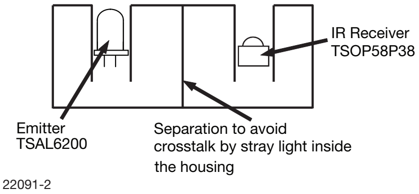
Fig. 14 - Sensitivity vs. Supply Voltage

The typical application of the TSOP58P38 is a reflective sensor with analog information contained in its output. Such a sensor is evaluating the time required by the AGC to suppress a quasi continuous signal. The time required to suppress such a signal is longer when the signal is strong than when the signal is weak, resulting in a pulse length corresponding to the distance of an object from the sensor. This kind of analog information can be evaluated by a microcontroller. The absolute amount of reflected light depends much on the environment and is not evaluated. Only sudden changes of the amount of reflected light, and therefore changes in the pulse width, are evaluated using this application.

Example of a signal pattern:



Example for a sensor hardware:



There should be no common window in front of the emitter and receiver in order to avoid crosstalk by guided light through the window.

The logarithmic characteristic of the AGC in the TSOP58P38 results in an almost linear relationship between distance and pulse width. Ambient light has also some impact to the pulse width of this kind of sensor, making the pulse shorter.

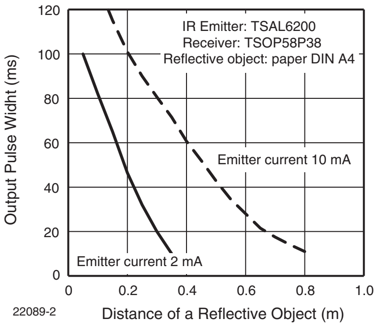
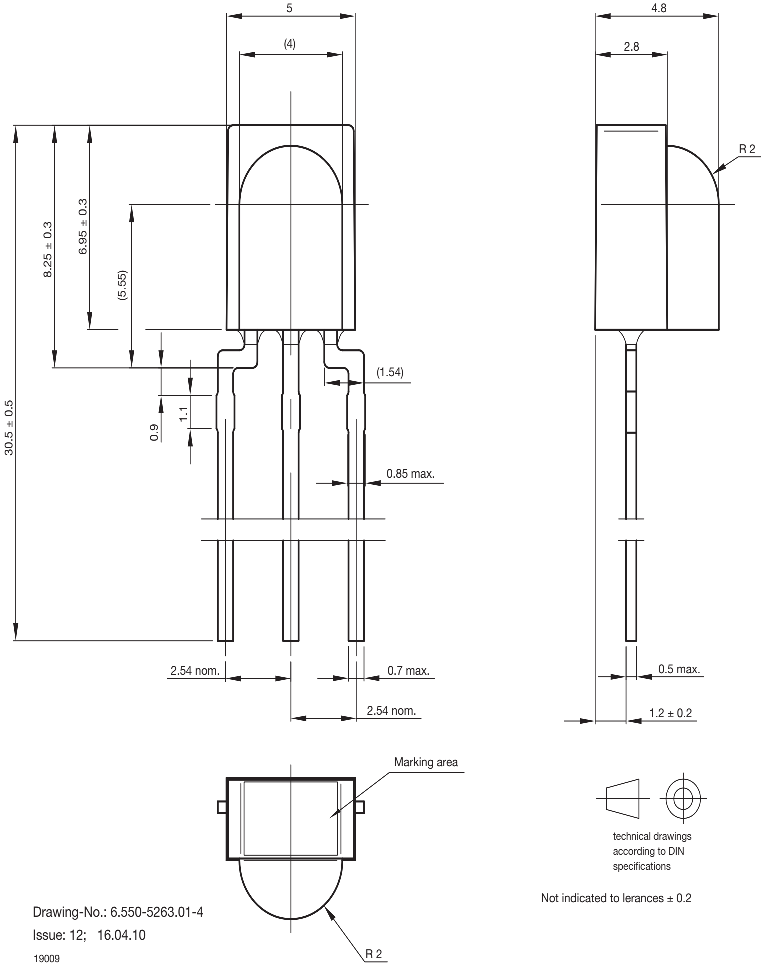
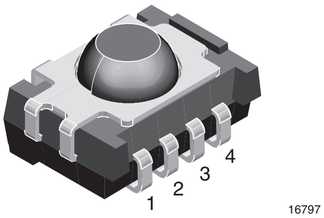


Fig. 15 - Distance Characterisitic of a Typical Reflective Sensor using the TSOP58P38

PACKAGE DIMENSIONS in millimeters



IR Receiver Modules for Mid Range Proximity Sensors



MECHANICAL DATA

Pinning

1 = GND, 2 = N.C., 3 = OUT , 4 = V_S

FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for burst frequency
- Improved shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

DESCRIPTION

The TSOP5P.. series are miniaturized receivers for Mid range proximity sensor systems. A PIN diode and a preamplifier are assembled on a lead frame, the epoxy package acts as an IR filter.

The output pulse width of the TSOP5P.. has an almost linear relationship to the distance of the emitter or the distance of an reflecting object. The TSOP5P.. is optimized to suppress almost all spurious pulses from energy saving fluorescent lamps.

This component has not been qualified according to automotive specifications.

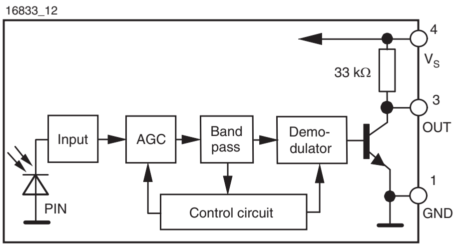
PARTS TABLE

CARRIER FREQUENCY	STANDARD APPLICATIONS (AGC2/AGC8)
38 kHz (1)	TSOP5P38

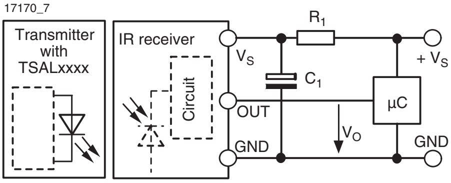
Note

(1) Other frequencies available by request

BLOCK DIAGRAM



APPLICATION CIRCUIT



The external components R_1 and C_1 are optional to improve the robustness against electrical overstress (typical values are R_1 = 100 Ω, C_1 = 0.1 µF).
The output voltage V_O should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 4)		V_S	- 0.3 to + 6	V
Supply current (pin 4)		I_S	5	mA
Output voltage (pin 3)		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 (pin 3)		I_O	5	mA
Junction temperature		T_j	100	°C
Storage temperature range		T_{stg}	- 40 to + 100	°C
Operating temperature range		T_{amb}	- 25 to + 85	°C
Power consumption	$T_{amb} \leq 85$ °C	P_{tot}	10	mW

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 condtions 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 (pin 4)	E_v = 0, V_S = 5 V	I_{SD}	0.65	0.85	1.05	mA
	E_v = 40 klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	E_v = 0, test signal see fig. 1, IR diode TSAL6200, I_F = 400 mA	d		45		m
Output voltage low (pin 3)	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², 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	$E_{e\ min.}$		0.17	0.35	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	$\varphi_{1/2}$		± 45		deg

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

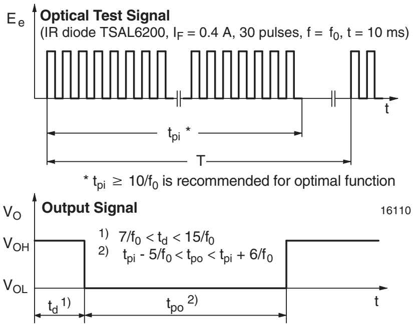


Fig. 1 - Output Active Low

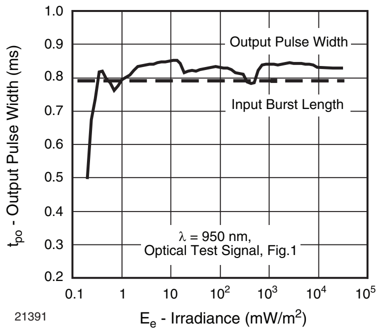


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

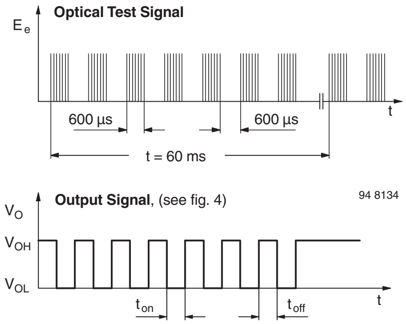


Fig. 3 - Output Function

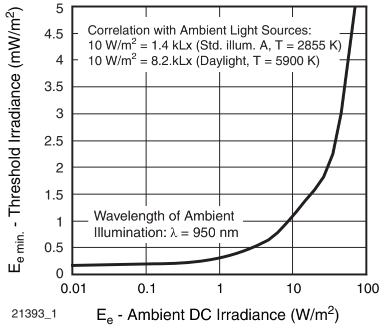


Fig. 6 - Sensitivity in Bright Ambient

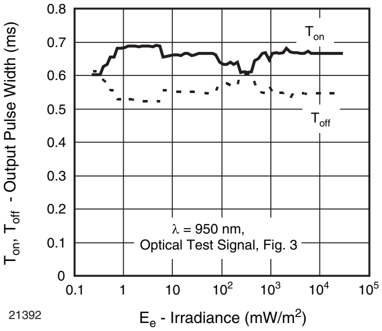


Fig. 4 - Output Pulse Diagram

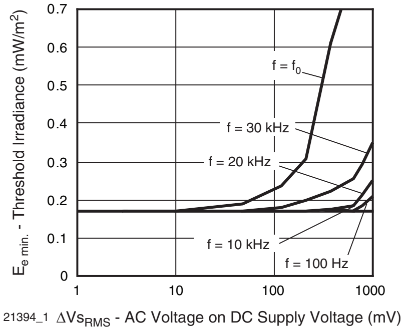


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

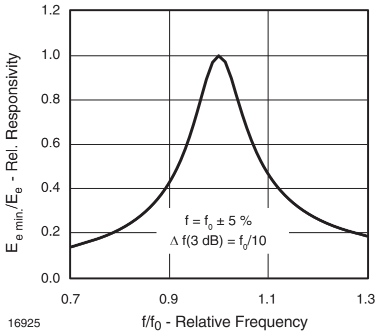


Fig. 5 - Frequency Dependence of Responsivity

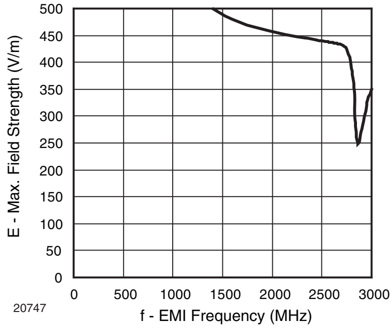


Fig. 8 - Sensitivity vs. Electric Field Disturbances

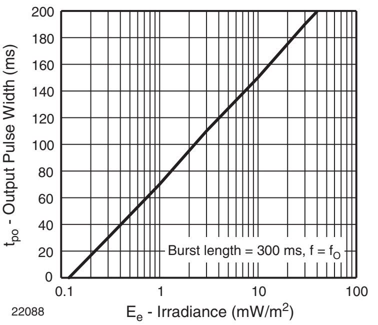


Fig. 9 - Maximum Output Pulse Width vs. Irradiance

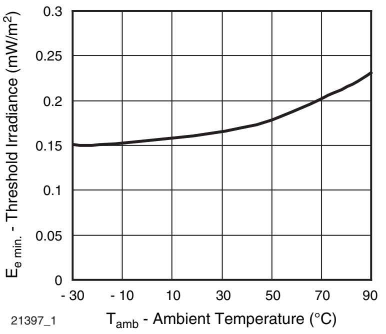


Fig. 10 - Sensitivity vs. Ambient Temperature

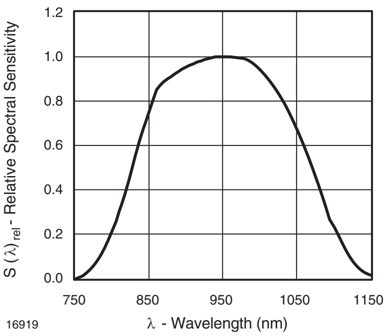


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

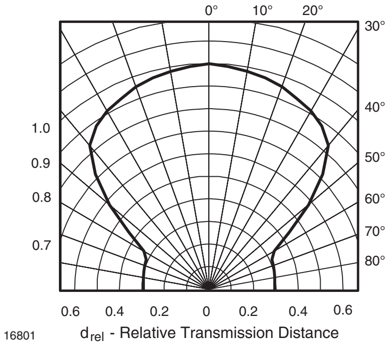


Fig. 12 - Horizontal Directivity

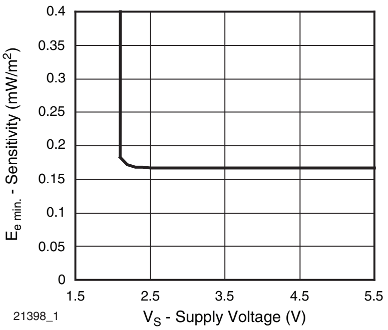
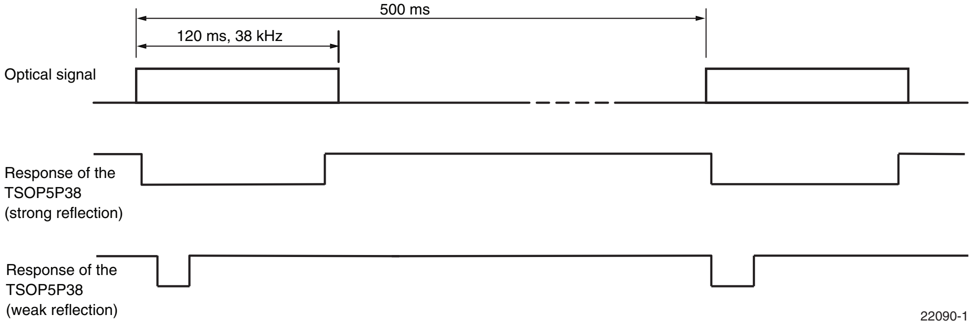


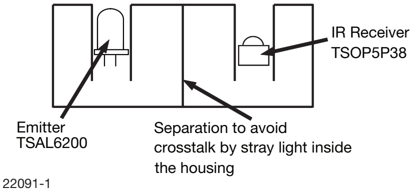
Fig. 13 - Sensitivity vs. Supply Voltage

The typical application of the TSOP5P38 is a reflective sensor with analog information contained in its output. Such a sensor is evaluating the time required by the AGC to suppress a quasi continuous signal. The time required to suppress such a signal is longer when the signal is strong than when the signal is weak, resulting in a pulse length corresponding to the distance of an object from the sensor. This kind of analog information can be evaluated by a microcontroller. The absolute amount of reflected light depends much on the environment and is not evaluated. Only sudden changes of the amount of reflected light, and therefore changes in the pulse width, are evaluated using this application.

Example of a signal pattern:



Example for a sensor hardware:



There should be no common window in front of the emitter and receiver in order to avoid crosstalk by guided light through the window.

The logarithmic characteristic of the AGC in the TSOP5P38 results in an almost linear relationship between distance and pulse width. Ambient light has also some impact to the pulse width of this kind of sensor, making the pulse shorter.

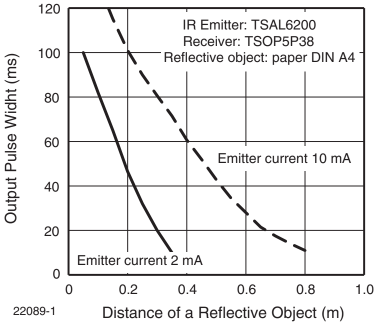
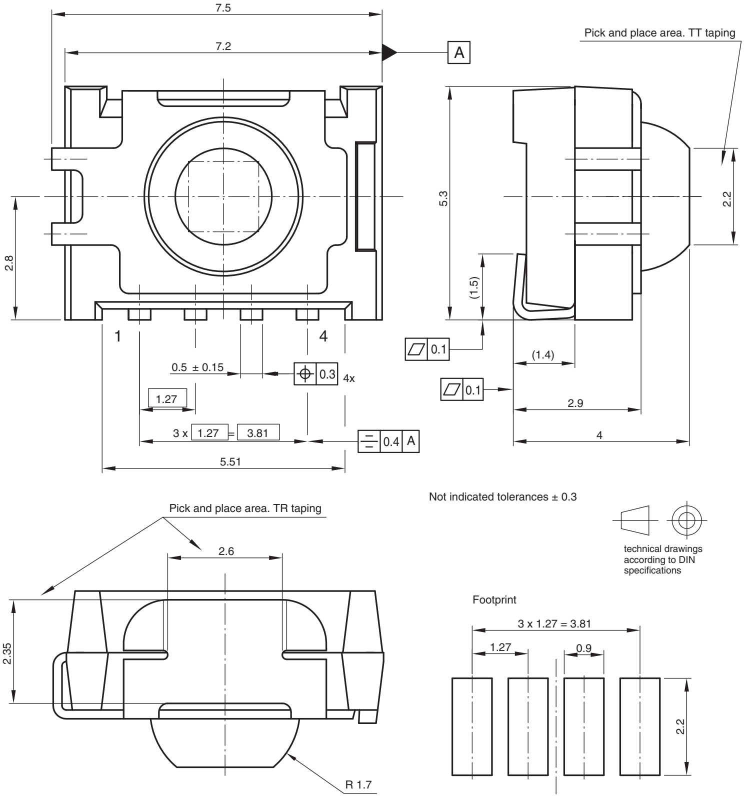


Fig. 14 - Distance Characterisitic of a Typical Reflective Sensor using the TSOP5P38

PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.544-5341.01-4
Issue: 8; 02.09.09
16776

ASSEMBLY INSTRUCTIONS

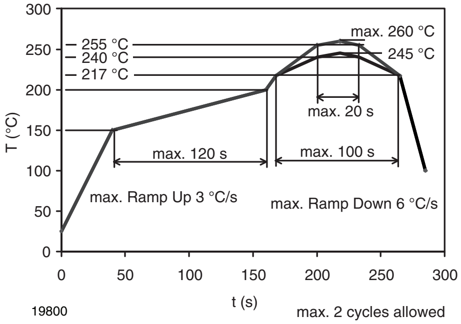
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

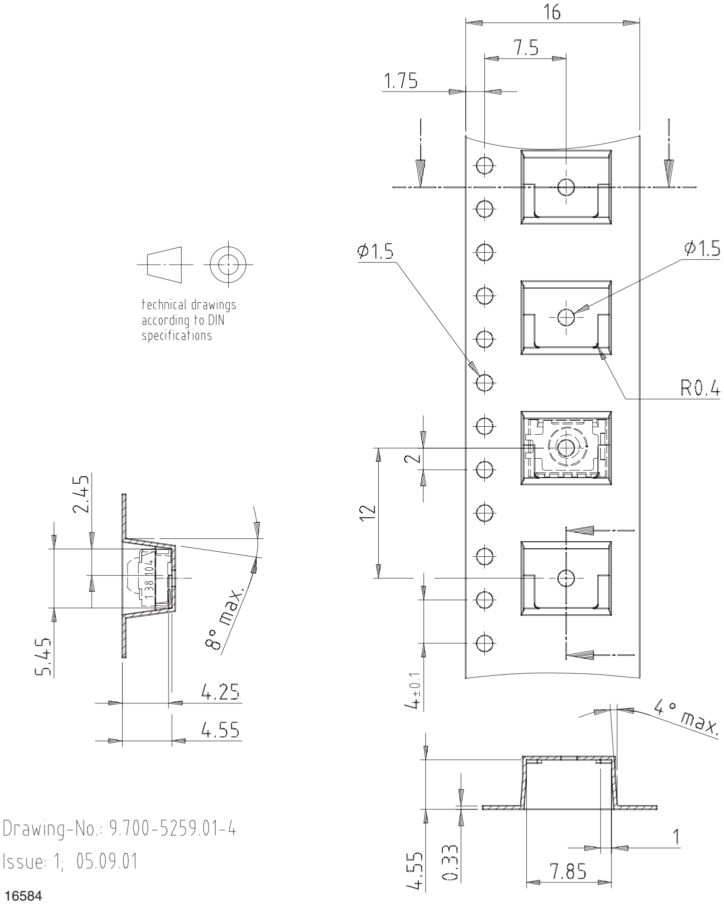
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

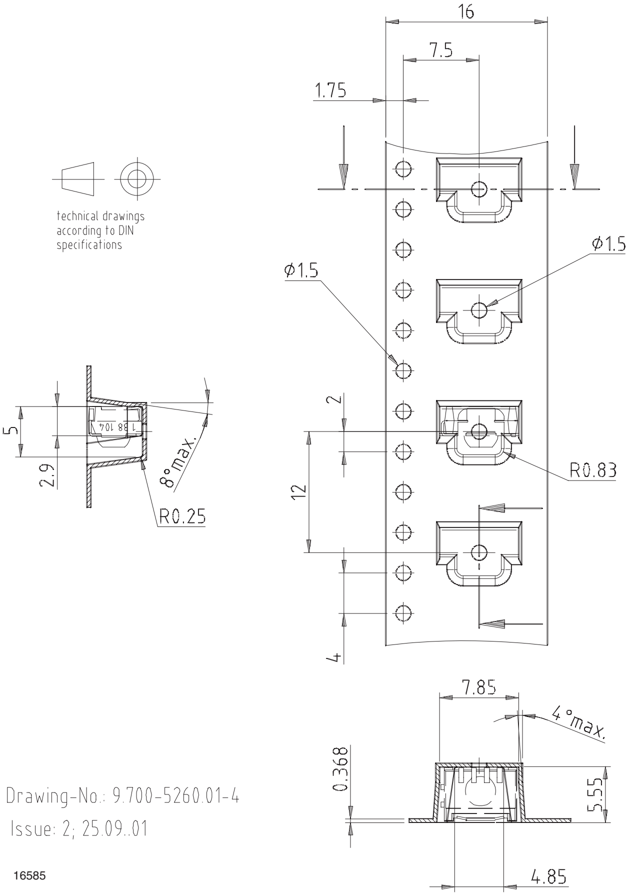
VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



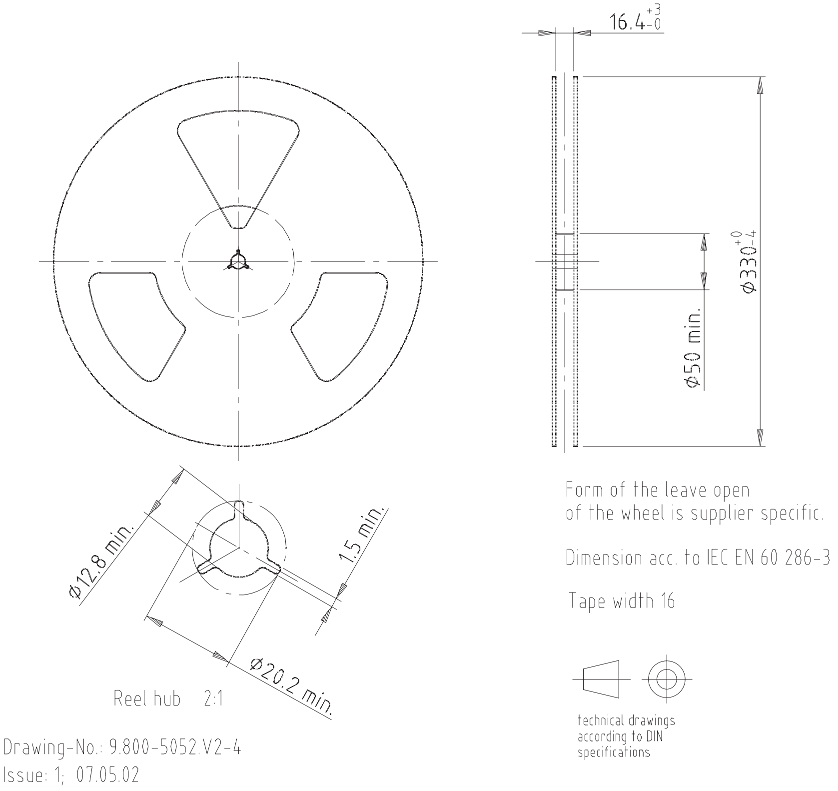
TAPING VERSION TSOP..TT DIMENSIONS in millimeters



TAPING VERSION TSOP..TR **DIMENSIONS** in millimeters



REEL DIMENSIONS in millimeters



Form of the leave open of the wheel is supplier specific.

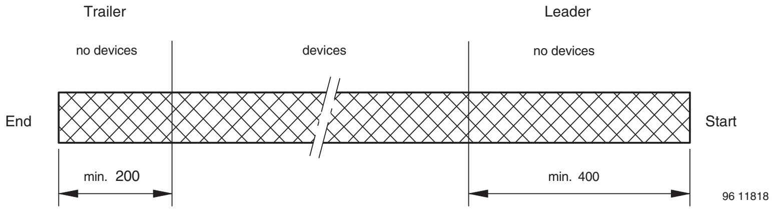
Dimension acc. to IEC EN 60 286-3

Tape width 16

Drawing-No.: 9.800-5052.V2-4
Issue: 1; 07.05.02

16734

LEADER AND TRAILER DIMENSIONS in millimeters



96 11818

COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 mm/min. ± 10 mm/min.
165° to 180° peel angle

LABEL

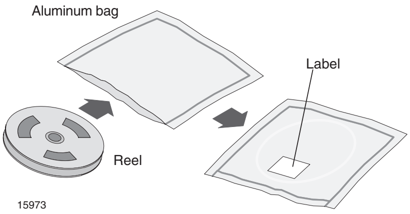
Standard bar code labels for finished goods

The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)		
PLAIN WRITING	**ABBREVIATION**	**LENGTH**
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
LONG BAR CODE TOP	**TYPE**	**LENGTH**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
SHORT BAR CODE BOTTOM	**TYPE**	**LENGTH**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

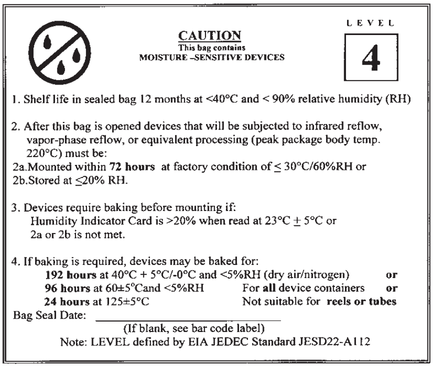
The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:
192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)
or
96 h at 60 °C + 5 °C and < 5 % RH for all device containers
or
24 h at 125 °C + 5 °C not suitable for reel or tubes.
An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE –SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:
192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
96 hours at 60±5°Cand <5%RH For **all** device containers **or**
24 hours at 125±5°C Not suitable for **reels or tubes**

Bag Seal Date: ______________________________
(If blank, see bar code label)

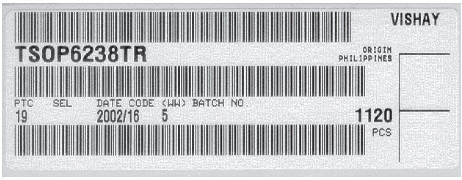
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

Example of JESD22-A112 level 4 label

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



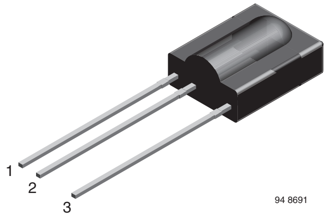
VISHAY
TSOP6238TR
ORIGIN
PHILIPPINES
PTC SEL DATE CODE (WW) BATCH NO.
19 2002/16 5
1120
PCS

16962

ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

IR Sensor Module for Remote Control Systems



MECHANICAL DATA

Pinning:

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

FEATURES

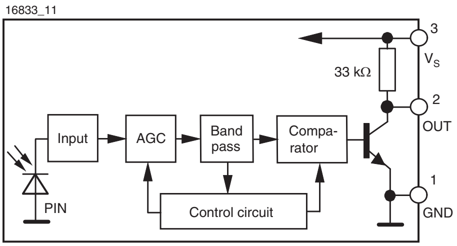
- Photo detector and preamplifier in one package
- AC coupled response from 30 kHz to 50 kHz, all data formats
- If the IR singal strength is less then 1 W/m² (distance more than 0.3 m with a typical IR remote control), the frequency range is up to 55 kHz
- If the IR singal strength is less then 8 mW/m² (distance more than 3.5 m with a typical IR remote control), the frequency range is up to 60 kHz
- Improved shielding against electrical field disturbance
- AGC to suppress ambient noise
- High sensitivity, long receiving range
- Supply voltage: 2.7 V to 5.5 V
- Carrier out signal for IR repeater applications
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

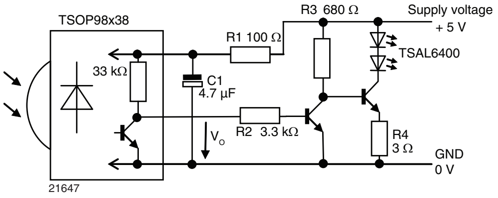
The TSOP98138 is a miniaturized sensor for receiving the modulated signal of infrared remote control systems. A PIN diode and preamplifier are assembled on a lead frame, the epoxy package is designed as an IR filter. The modulated output signal, carrier out, can be used for repeater applications and code learning applications.
This component has not been qualified according to automotive specifications.

PARTS TABLE	
CARRIER FREQUENCY	**CODE LEARNING APPLICATIONS**
30 kHz to 50 kHz	TSOP98138

BLOCK DIAGRAM



APPLICATION CIRCUIT



Recommended circuit for best sensitivity of the TSOP98x38 in repeater applications.
It limits the output voltage swing V_O to about 1 V in order to avoid internal coupling.
The high level output voltage V_O should never be pulled to a voltage lower than 0.85 V by the external circuit under any ambient condition.

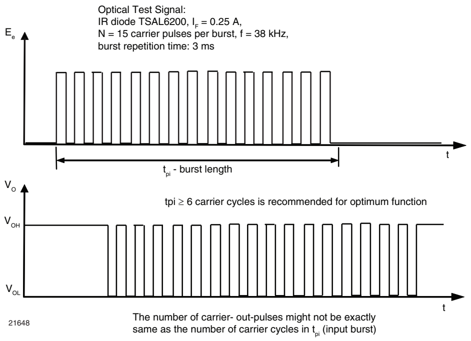
ABSOLUTE MAXIMUM RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Supply voltage (pin 3)		V_S	- 0.3 to + 6	V
Supply current (pin 3)		I_S	5	mA
Output voltage (pin 2)		V_O	- 0.3 to 5.5	V
Voltage at output to supply		$V_S - V_O$	- 0.3 to (V_S + 0.3)	V
Output current (pin 2)		I_O	5	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 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Supply current (pin 3)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 400$ mA	d		30		m
Output voltage low (pin 2)	$I_{OSL} = 0.5$ mA, $E_e = 0.7$ mW/m^2, test signal see fig. 1	V_{OSL}			100	mV
Minimum irradiance	Less than 5 missing or 5 additional sub carrier pulses related to one burst	$E_{e\ min.}$		0.5	1	mW/m^2
Maximum irradiance	Less than 5 missing or 5 additional sub carrier pulses related to one burst	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 55		deg

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


Optical Test Signal:
IR diode TSAL6200, $I_F = 0.25$ A,
N = 15 carrier pulses per burst, f = 38 kHz,
burst repetition time: 3 ms

$t_{pi} \geq 6$ carrier cycles is recommended for optimum function

The number of carrier- out-pulses might not be exactly same as the number of carrier cycles in t_{pi} (input burst)

Fig. 1 - Output Function

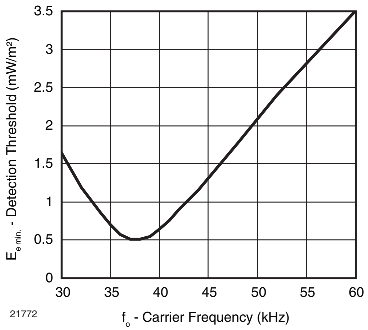


Fig. 2 - Frequency Dependence of Sensitivity

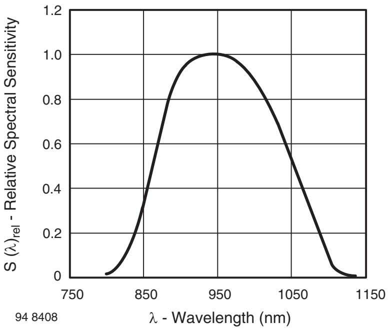


Fig. 3 - Relative Spectral Sensitivity vs. Wavelength

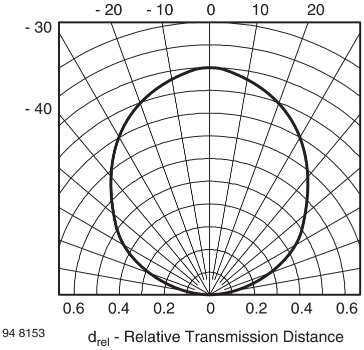


Fig. 4 - Horizontal Directivity φ_x

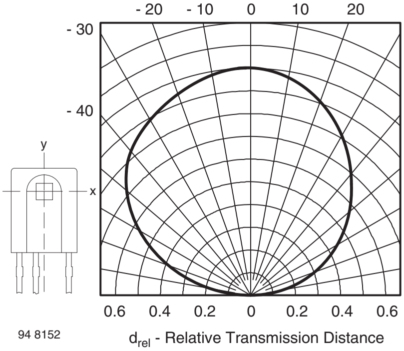
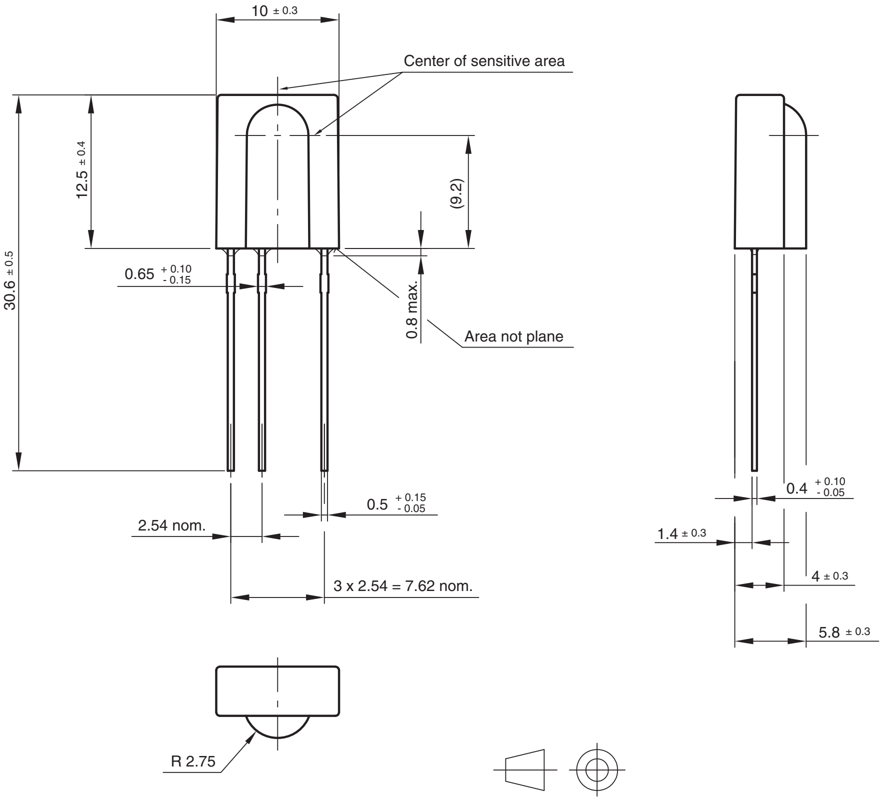


Fig. 5 - Vertical Directivity φ_y

PACKAGE DIMENSIONS in millimeters



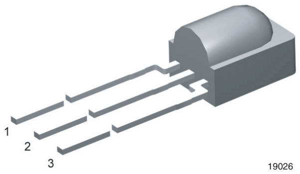
technical drawings
according to DIN
specifications

Drawing-No.: 6.550-5095.01-4

Issue: xx; 20.05.09

96 12116-1

IR Sensor Module for Remote Control Systems



MECHANICAL DATA

Pinning:

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

FEATURES

- Photo detector and preamplifier in one package
- AC coupled response from 20 kHz to 455 kHz, all data formats
- Improved shielding against electrical field disturbance
- TTL and CMOS compatibility
- Output active low
- Supply voltage: 2.7 V to 5.5 V
- Carrier out signal for code learning functions
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
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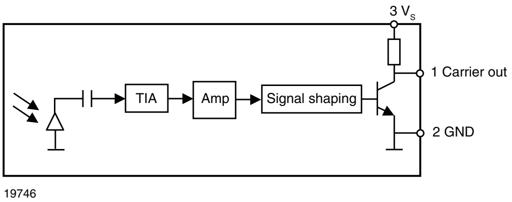
RoHS
COMPLIANT

DESCRIPTION

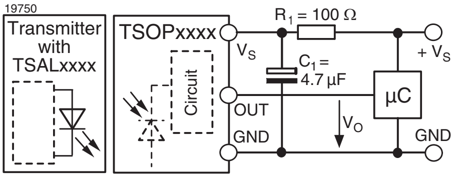
The TSOP98200 is a miniaturized sensor for receiving the modulated signal of infrared remote control systems. A PIN diode and preamplifier are assembled on a lead frame, the epoxy package is designed as an IR filter. The modulated output signal, carrier out, can be used for code learning applications.
This component has not been qualified according to automotive specifications.

PARTS TABLE	
CARRIER FREQUENCY	**CODE LEARNING APPLICATIONS**
20 kHz to 455 kHz	TSOP98200

BLOCK DIAGRAM



APPLICATION CIRCUIT



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

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 5.5	V
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
Soldering temperature	t ≤ 10 s, 1 mm from case	T_{sd}	260	°C

Note

- T_{amb} = 25 °C, unless otherwise specified
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 CARRIER OUT (1)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current (pin 3)	$E_v = 0$	I_{SD}		0.6	0.8	mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	E_v = 0, test signal see fig. 1, IR diode TSAL6200, I_F = 400 mA	d		1		m
Output voltage low (pin 1)	I_{OSL} = 0.5 mA, test signal see fig. 1	V_{OSL}			250	mV
Minimum irradiance	V_S = 3 V, (20 kHz to 60 kHz (2))	$E_{e\ min.}$		0.3	0.5	W/m²
Maximum irradiance	Test signal see fig. 1, (20 kHz to 60 kHz (2))	$E_{e\ max.}$	300	500		W/m²
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg
Carrier out rise time	V_S = 3 V, C_L = 10 pF	T_R		100		ns
Carrier out fall time	V_S = 3 V, C_L = 10 pF	T_F		10		ns
Output pulse width	T_{PI} = 10 µs, C_L = 10 pF	T_{PO}	0.6	1.1	1.6	µs

Note

(1) T_{amb} = 25 °C, unless otherwise specified, V_S = 3 V

(2) These irradiance values are guaranteed to 60 kHz. The TSOP98200 will continue to function up to frequencies higher than 600 kHz, however the irradiance at frequencies above 60 kHz is dependent on the carrier frequency and the pulse pattern received.
Typical $E_{e\ min.}$ = 2 W/m² at 455 kHz.

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

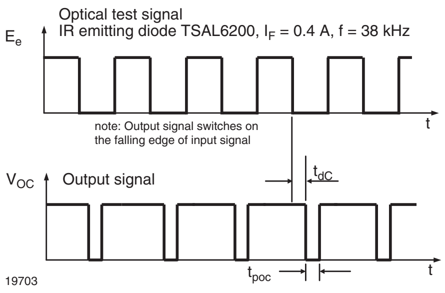


Fig. 1 - Carrier Output Pulse Diagram

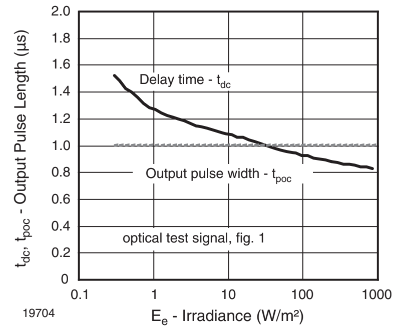


Fig. 2 - Carrier Output Function Diagram

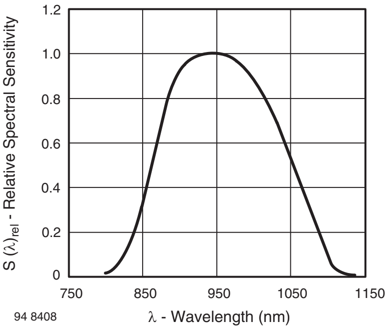


Fig. 3 - Relative Spectral Sensitivity vs. Wavelength

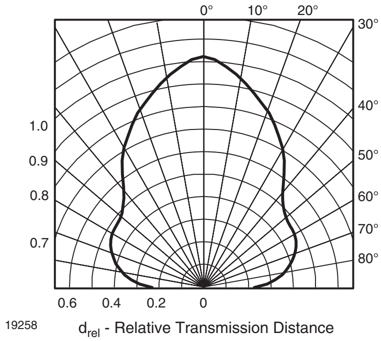


Fig. 4 - Horizontal Directivity

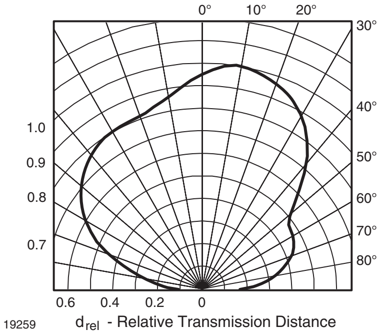
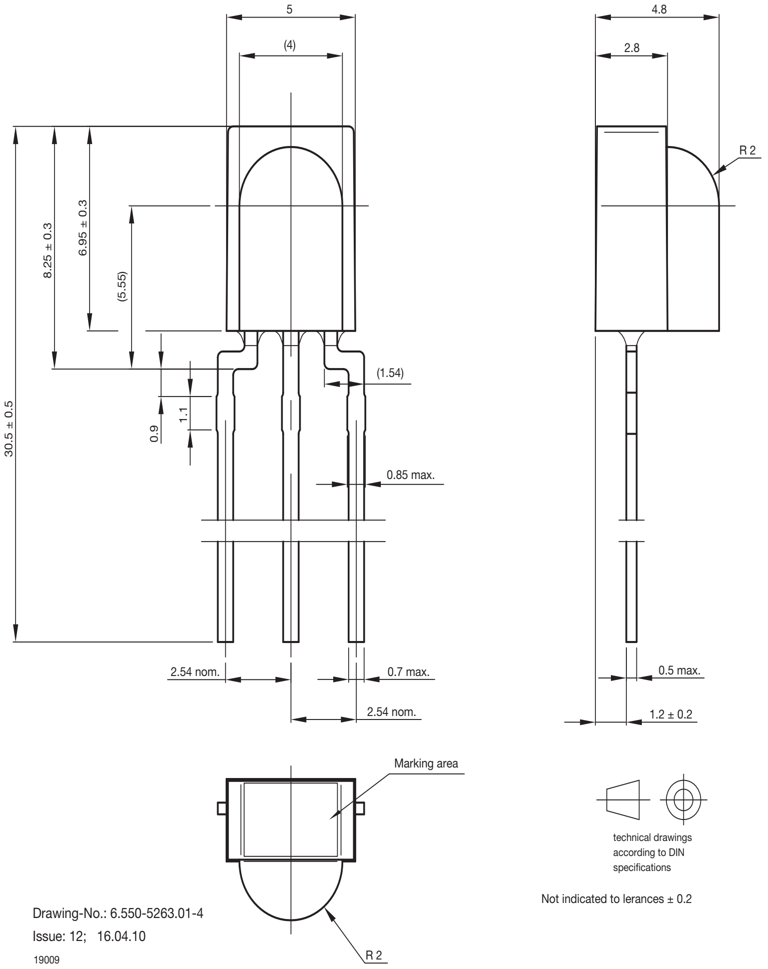
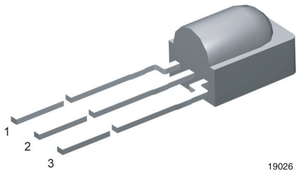


Fig. 5 - Vertical Directivity

PACKAGE DIMENSIONS in millimeters



IR Sensor Module for Remote Control Systems



MECHANICAL DATA

Pinning:

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

FEATURES

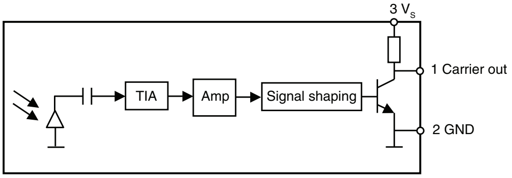
- Photo detector and preamplifier in one package
- AC coupled response from 20 kHz to 60 kHz, all data formats
- Improved shielding against electrical field disturbance
- TTL and CMOS compatibility
- Output active low
- Supply voltage: 2.7 V to 5.5 V
- Carrier out signal for code learning functions
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

DESCRIPTION

The TSOP98260 is a miniaturized sensor for receiving the modulated signal of infrared remote control systems. A PIN diode and preamplifier are assembled on a lead frame, the epoxy package is designed as an IR filter. The modulated output signal, carrier out, can be used for code learning applications.
This component has not been qualified according to automotive specifications.

PARTS TABLE	
CARRIER FREQUENCY	**CODE LEARNING APPLICATIONS**
20 kHz to 60 kHz	TSOP98260

BLOCK DIAGRAM



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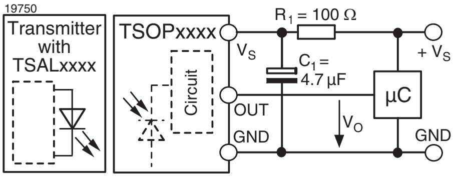
APPLICATION CIRCUIT



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

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 + 5.5	V
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
Soldering temperature	t ≤ 10 s, 1 mm from case	T_{sd}	260	°C

ELECTRICAL AND OPTICAL CHARACTERISTICS CARRIER OUT (1)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Supply current (pin 3)	E_v = 0	I_{SD}		0.6	0.8	mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	E_v = 0, test signal see fig. 1, IR diode TSAL6200, I_F = 400 mA	d		1		m
Output voltage low (pin 1)	I_{OSL} = 0.5 mA, test signal see fig. 1	V_{OSL}			250	mV
Minimum irradiance	V_S = 3 V, (20 kHz to 60 kHz)	$E_{e\ min.}$		0.3	0.5	W/m²
Maximum irradiance	test signal see fig. 1, (20 kHz to 60 kHz)	$E_{e\ max.}$	300	500		W/m²
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg
Carrier Out rise time	V_S = 3 V, C_L = 10 pF	T_R		100		ns
Carrier Out fall time	V_S = 3 V, C_L = 10 pF	T_F		10		ns
Output pulse width	T_{PI} = 10 µs, C_L = 10 pF	T_{PO}	5	7	10	µs

Note

(1) T_{amb} = 25 °C, unless otherwise specified, V_S = 3 V

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

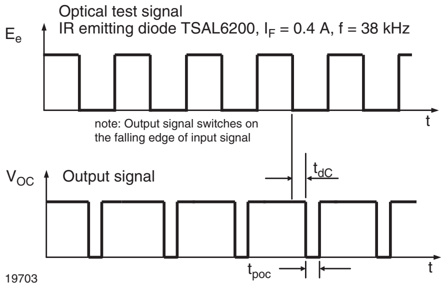


Fig. 1 - Carrier Output Pulse Diagram

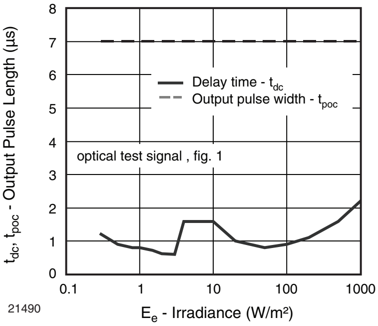


Fig. 2 - Carrier Output Function Diagram

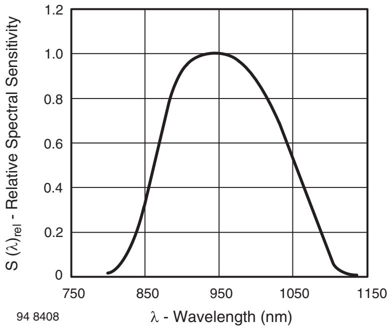


Fig. 3 - Relative Spectral Sensitivity vs. Wavelength

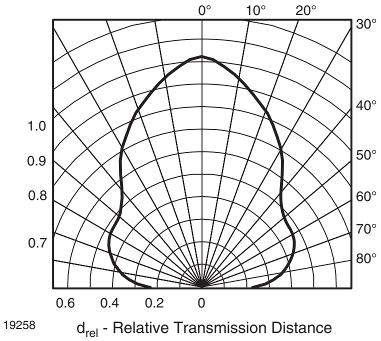


Fig. 4 - Horizontal Directivity

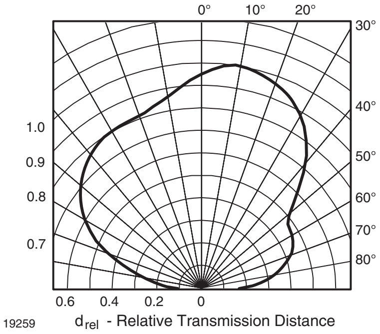
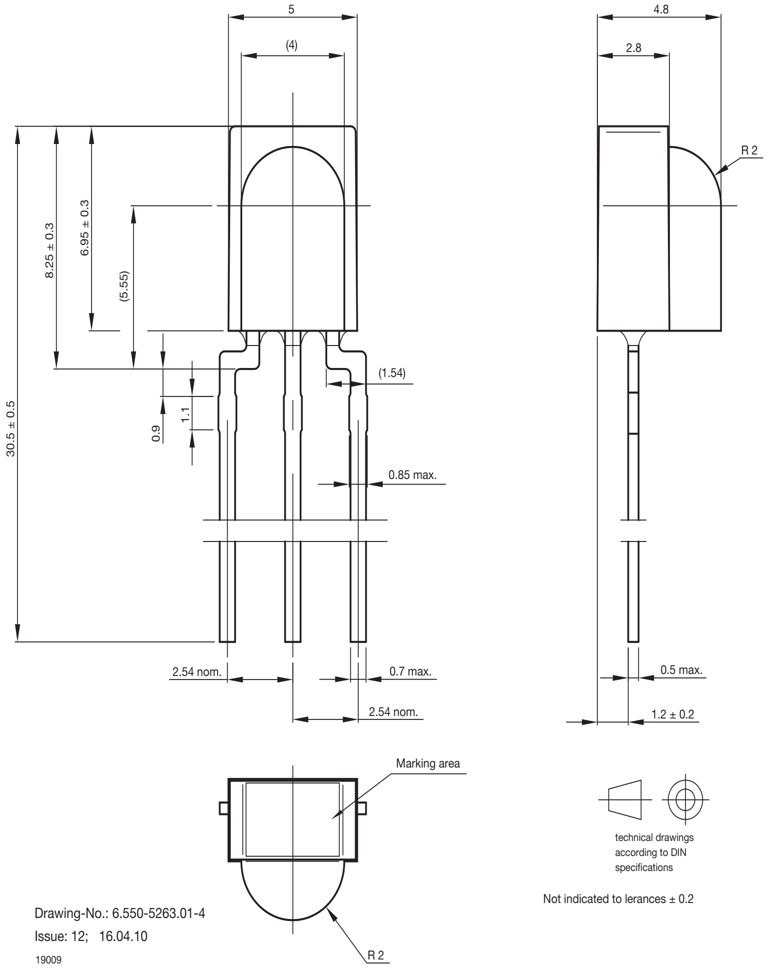
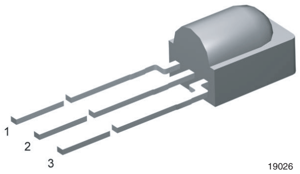


Fig. 5 - Vertical Directivity

PACKAGE DIMENSIONS in millimeters



IR Sensor Module for Remote Control Systems



MECHANICAL DATA

Pinning:

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

FEATURES

- Photo detector and preamplifier in one package
- AC coupled response from 30 kHz to 50 kHz, all data formats
- If the IR signal strength is less then 2 W/m² (distance more than 0.2 m with a typical IR remote control), the frequency range is up to 55 kHz
- If the IR signal strength is less than 15 mW/m² (distance more than 2.5 m with a typical IR remote control), the frequency range is up to 60 kHz
- Improved shielding against electrical field disturbance
- AGC to suppress ambient noise
- High sensitivity, long receiving range
- Supply voltage: 2.7 V to 5.5 V
- Carrier out signal for IR repeater applications
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

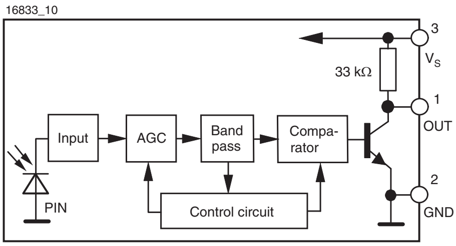
DESCRIPTION

The TSOP98238 is a miniaturized sensor for receiving the modulated signal of infrared remote control systems. A PIN diode and preamplifier are assembled on a lead frame, the epoxy package is designed as an IR filter. The modulated output signal, carrier out, can be used for repeater applications and code learning applications.
This component has not been qualified according to automotive specifications.

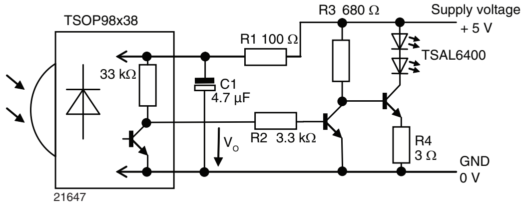
PARTS TABLE

CARRIER FREQUENCY	CODE LEARNING APPLICATIONS
30 kHz to 50 kHz	TSOP98238

BLOCK DIAGRAM



APPLICATION CIRCUIT



Recommended circuit for best sensitivity of the TSOP98x38 in repeater applications. It limits the output voltage swing V_O to about 1 V in order to avoid internal coupling. The high level output voltage V_O should never be pulled to a voltage lower than 0.85 V by the external circuit under any ambient condition.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 6	V
Supply current (pin 3)		I_S	5	mA
Output voltage (pin 1)		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 (pin 1)		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 ≤ 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 (pin 3)	$E_v = 0$, $V_S = 5$ V	I_{SD}	0.65	0.85	1.05	mA
	$E_v = 40$ klx, sunlight	I_{SH}		0.95		mA
Supply voltage		V_S	2.7		5.5	V
Transmission distance	$E_v = 0$, test signal see fig. 1, IR diode TSAL6200, $I_F = 400$ mA	d		20		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}			100	mV
Minimum irradiance	Less than 5 missing or 5 additional sub carrier pulses related to one burst	$E_{e\ min.}$		1	2	mW/m^2
Maximum irradiance	Less than 5 missing or 5 additional sub carrier pulses related to one burst	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

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

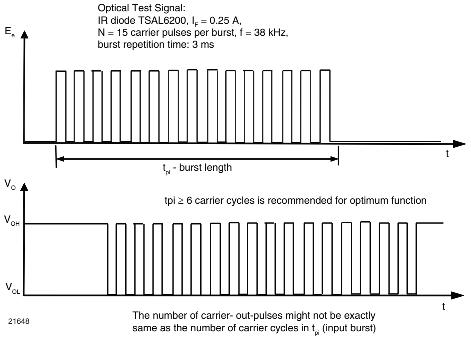


Fig. 1 - Output Function

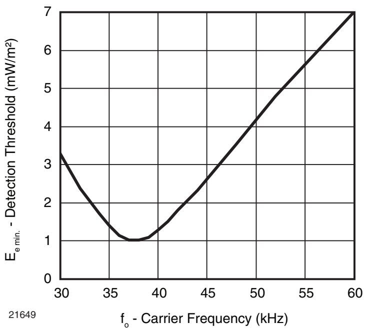


Fig. 2 - Frequency Dependence of Sensitivity

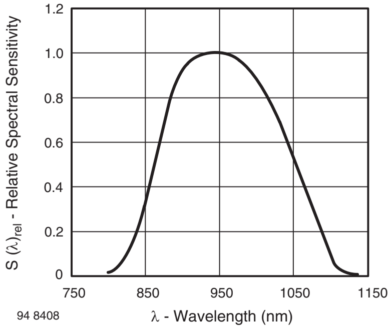


Fig. 3 - Relative Spectral Sensitivity vs. Wavelength

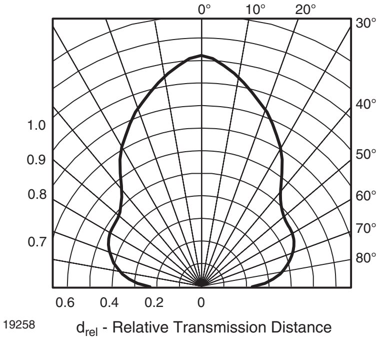


Fig. 4 - Horizontal Directivity

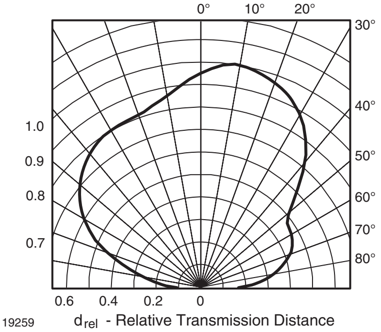
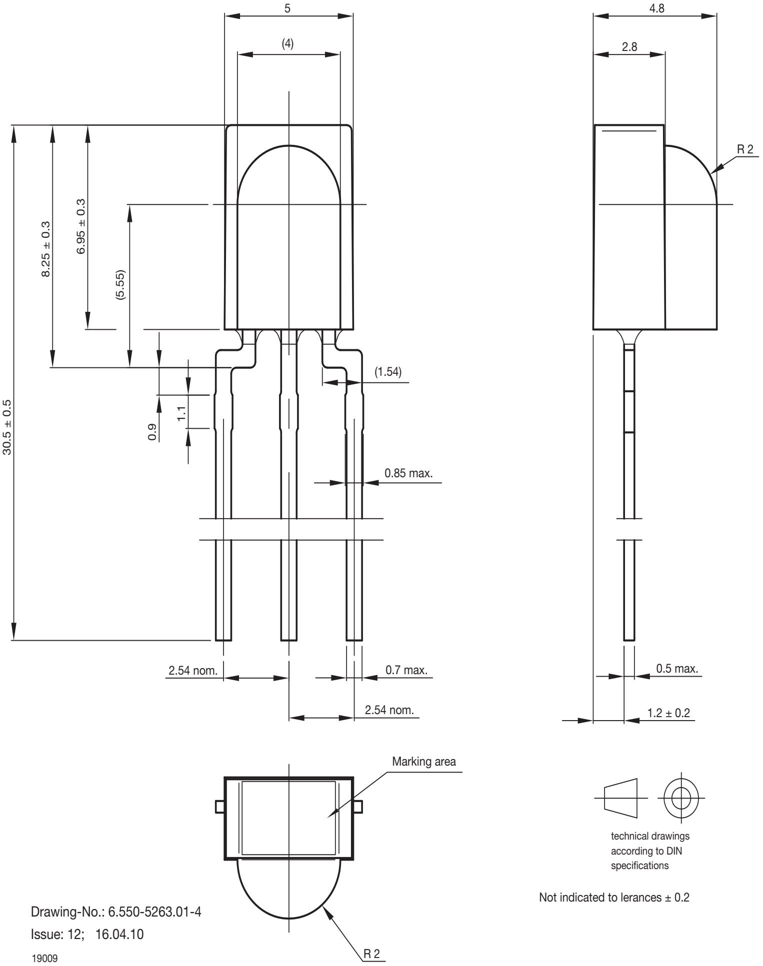
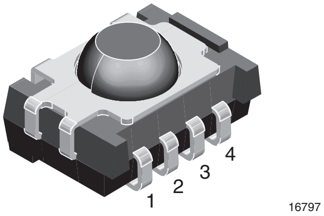


Fig. 5 - Vertical Directivity

PACKAGE DIMENSIONS in millimeters



IR Receiver Modules for 3D Synchronization Signals



MECHANICAL DATA

Pinning:

1 = GND, 2 = N.C., 3 = V_S, 4 = OUT

FEATURES

- Center frequency at 25 kHz to reduce interference with IR remote control signals at 30 kHz to 56 kHz
- Package can be used with IR emitters with wavelength 830 nm as well as standard 940 nm
- Very low supply current and stand-by mode
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage range: 2.5 V to 5.5 V
- Improved immunity against modulated light sources
- Insensitive to supply voltage ripple and noise
- Taping available for topview and sideview assembly
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

RoHS
COMPLIANT

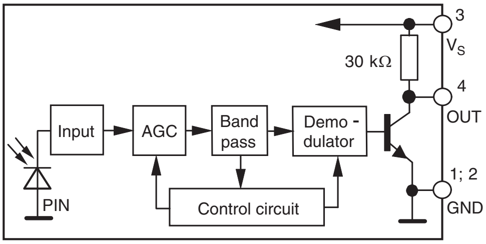
DESCRIPTION

The TSOP35D25 is an SMD IR receiver module for 3D sychronisation signals. The receiver is designed to operate at a carrier frequency of 25 kHz and a wavelength of 830 nm to avoid interference with standard remote control systems at 940 nm and 30 kHz to 56 kHz. The TSOP35D25 can receive continuously transmitted signal patterns with a minimum burst length of 6 cycles and frame rates up to 200 Hz. The circuit provides good suppression of optical noise from CFLs, LCD backlight and plasma panels.

PARTS TABLE

CARRIER FREQUENCY	GOOD NOISE SUPPRESSION AND FAST BURST RATE
25 kHz	TSOP35D25

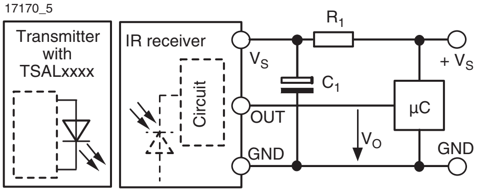
BLOCK DIAGRAM



16839

APPLICATION CIRCUIT

17170_5



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 µF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 3)		V_S	- 0.3 to + 6	V
Supply current (pin 3)		I_S	3	mA
Output voltage (pin 4)		V_O	- 0.3 to (V_S + 0.3)	V
Output current (pin 4)		I_O	5	mA
Junction temperature		T_j	100	°C
Storage temperature range		T_{stg}	- 40 to + 100	°C
Operating temperature range		T_{amb}	- 30 to + 85	°C
Power consumption	$T_{amb} \leq 85$ °C	P_{tot}	10	mW

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 (pin 3)	E_v = 0, V_S = 3.3 V	I_{SD}	0.27	0.35	0.45	mA
	E_v = 40 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 = 250 mA	d		45		m
Output voltage low (pin 4)	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², test signal see fig. 1	V_{OSL}			100	mV
Minimum irradiance	Pulse width tolerance: t_{pi} - 80 µs < t_{po} < t_{pi} + 160 µs, test signal see fig. 1	$E_{e\ min.}$		0.15	0.35	mW/m²
Maximum irradiance	t_{pi} - 80 µs < t_{po} < t_{pi} + 160 µs, test signal see fig. 1	$E_{e\ max.}$	30			W/m²
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 50		deg

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

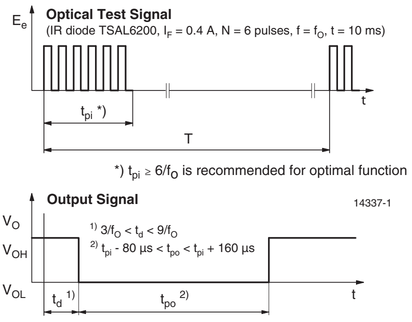


Fig. 1 - Output Active Low

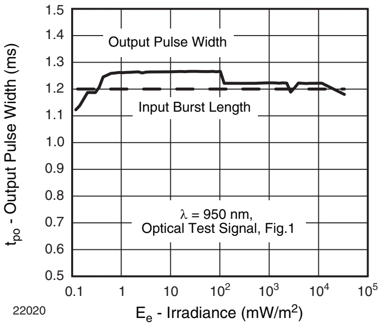


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

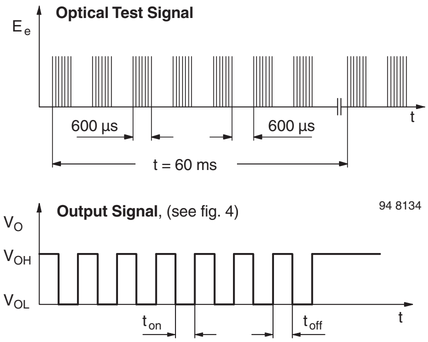


Fig. 3 - Output Function

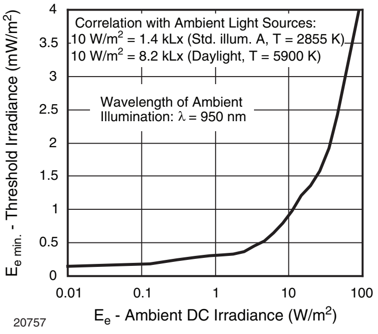


Fig. 6 - Sensitivity in Bright Ambient

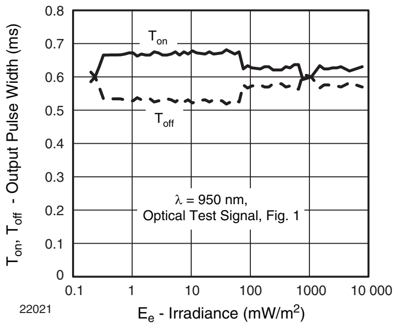


Fig. 4 - Output Pulse Diagram

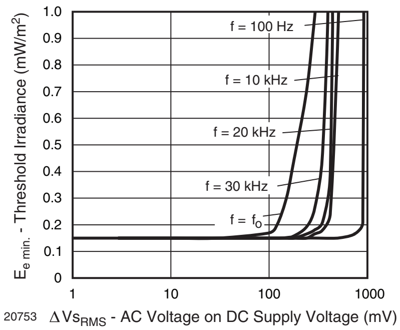


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

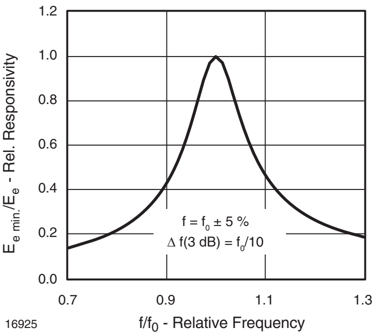


Fig. 5 - Frequency Dependence of Responsivity

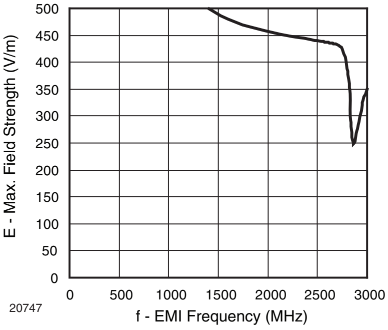


Fig. 8 - Sensitivity vs. Electric Field Disturbances

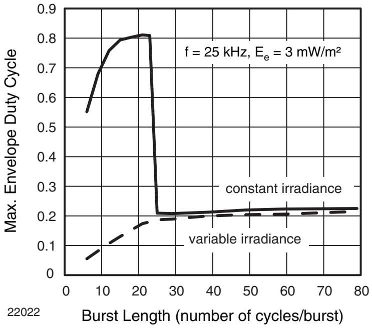


Fig. 9 - Maximum Envelope Duty Cycle vs. Burst Length

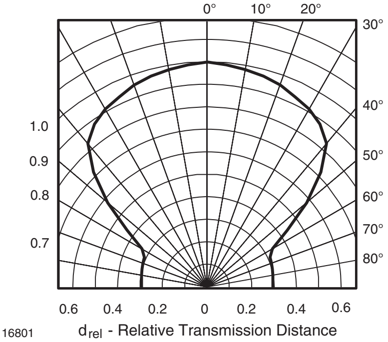


Fig. 12 - Horizontal Directivity

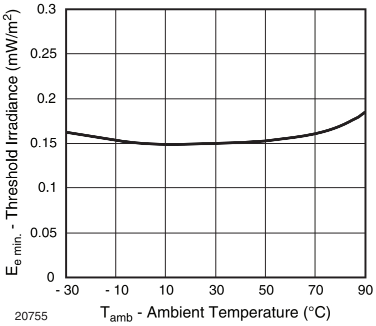


Fig. 10 - Sensitivity vs. Ambient Temperature

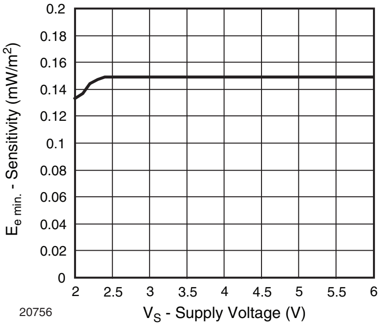


Fig. 13 - Sensitivity vs. Supply Voltage

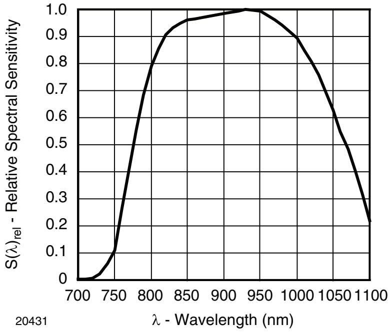


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

SUITABLE DATA FORMAT

The TSOP35D25 is 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. 25 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the TSOP35D25 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 14 or figure 15)

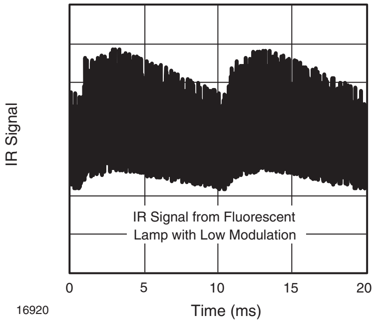


Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

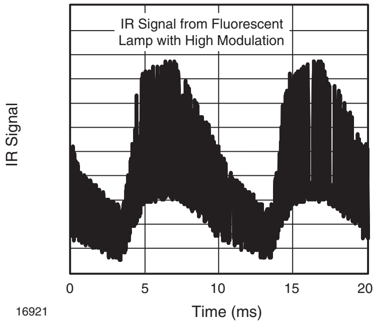


Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP35D25
Minimum burst length	6 cycles/burst
After each burst of length a minimum gap time is required of	6 to 24 cycles ≥ 6 cycles
For bursts greater than a minimum gap time in the data stream is needed of	24 cycles > 4 x burst length
Maximum rate of short bursts (constant irradiance)	2000 bursts/s
Maximum rate of short bursts (variable irradiance)	220 bursts/s

STAND-BY MODE OF THE TSOP35D25

If an application requires an ultra low average supply current in order to save battery life, the TSOP35D25 can be operated with an intermittent supply voltage. A typical application circuit shown in fig. 16.

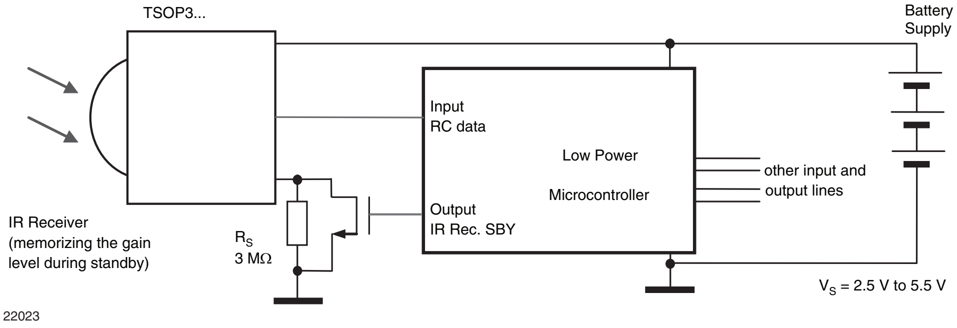


Fig. 16 - Application Circuit for the TSOP3…with Intermittent Supply Voltage

To receive a continuous data signal while using the TSOP3… with an intermittent supply voltage, the receiver must be activated in advance of the expected data frame as shown in figure 17.

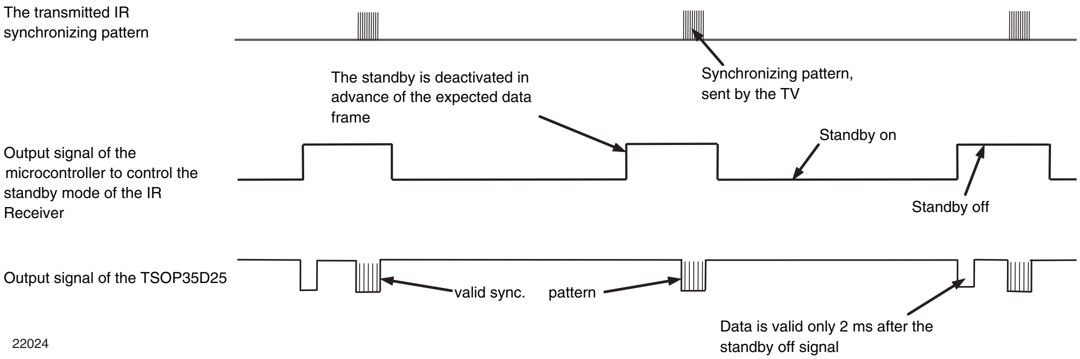


Fig. 17 - Signal Timing in Power Saving Mode with Continuous Receiving Function

In normal operation without using the stand-by feature, the gain level of the TSOP35D25 returns to a default level after the device is disconnected from supply voltage and reconnected again. A settling time of up to 100 ms is necessary until the gain has settled to an optimum level that is well matched to the ambient noise level.

Using the device in stand-by mode, the TSOP35D25 memorizes its gain setting while in standby. On re-activation, the gain immediately returns to the correct level present before stand-by. This operation insures that there are no spurious pulses on power-up due to mismatch between the gain level and the ambient light conditions.

ELECTRICAL AND OPTICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Serial resistor to activate the standby mode	V_S = 3 V	R_S	1.2	1.5	2	MΩ
	V_S = 5 V	R_S	2	3	4	
Standby supply current	V_S = 3 V, RS = 1.5 MΩ	I_{SBY}	1	1.4	2	µA
	V_S = 5 V, RS = 3 MΩ	I_{SBY}	1	1.4	2	
Latency time for standby-off (delay until there is a valid respose)	V_S > 2.5 V, dark ambient, output is valid	t_{delay}		0.4	0.8	ms
	V_S > 2.5 V, 10 kLux dayligth, output is valid	t_{delay}		1.5	2.5	
Duration of standby-off period	V_S > 2.5 V, dark ambient	t_{SBY_OFF}	1			ms
	V_S > 2.5 V, 10 kLux daylight, AGC1 or AGC3 device	t_{SBY_OFF}	4			
	V_S > 2.5 V, 10 kLux daylight, AGC2 or AGC4 device	t_{SBY_OFF}	3			

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

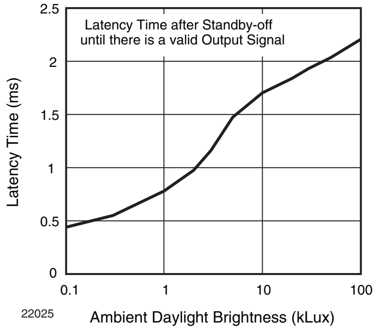
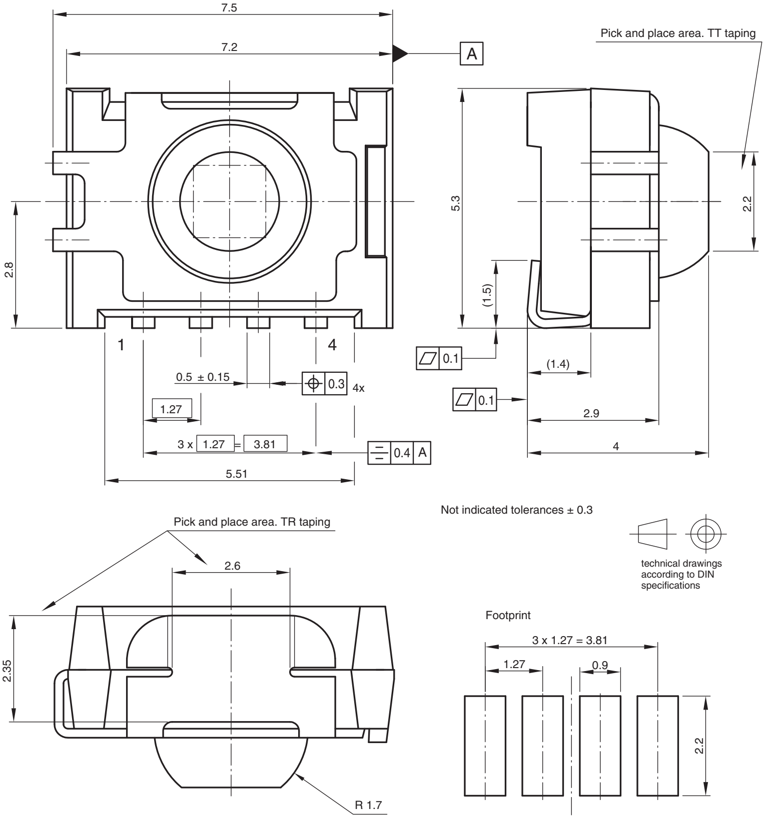


Fig. 1 - Delay Time after Standby-off until the TSOP3… is ready to receive Data

PACKAGE DIMENSIONS in millimeters



Drawing-No.: 6.544-5341.01-4
Issue: 8; 02.09.09
16776

ASSEMBLY INSTRUCTIONS

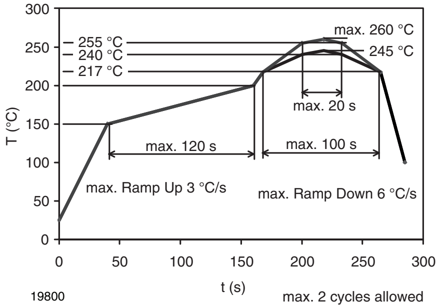
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

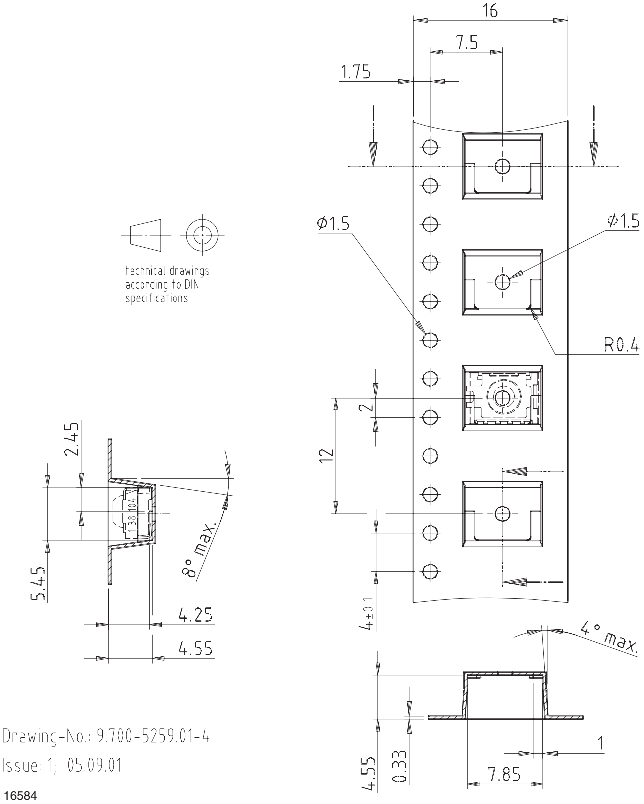
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

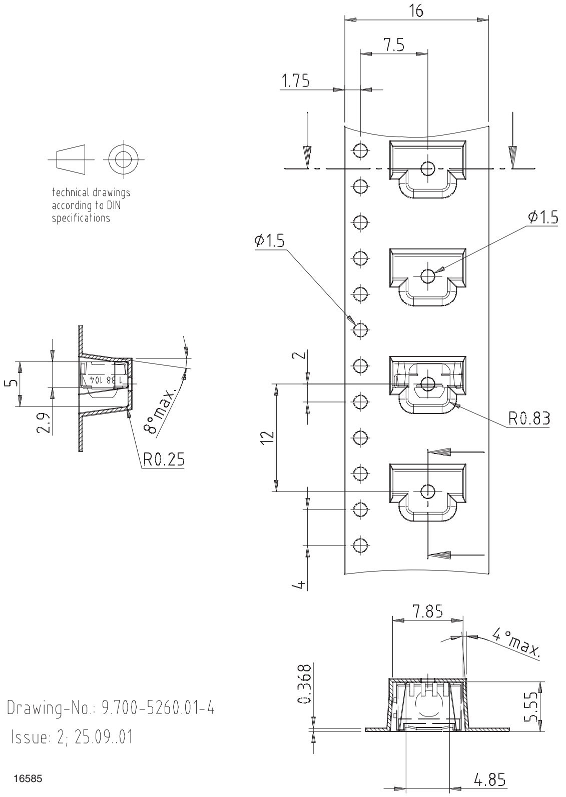
VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



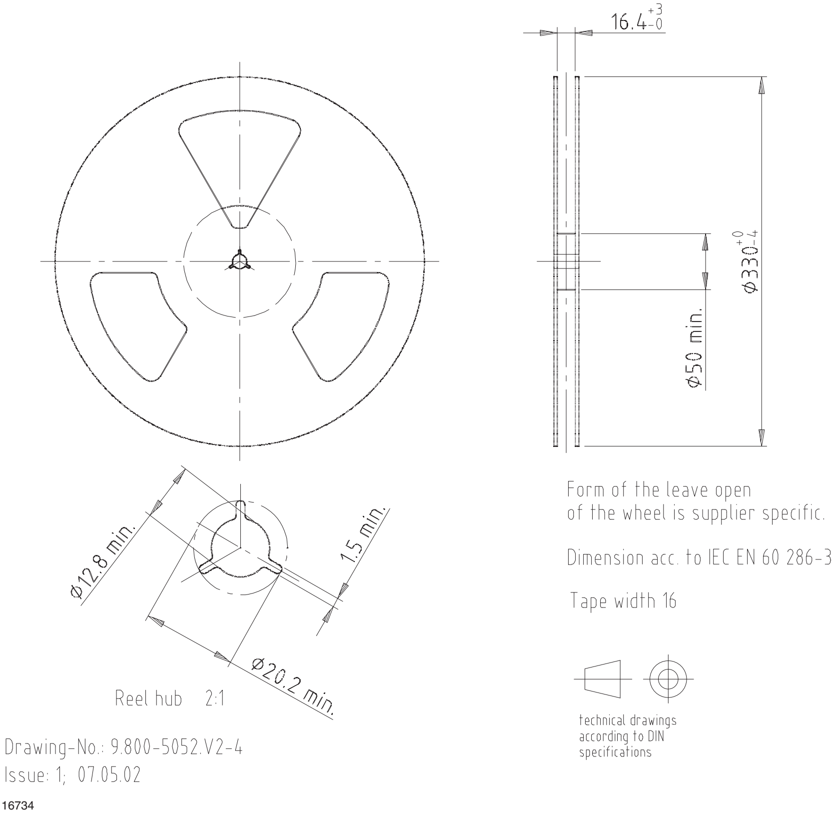
TAPING VERSION TSOP..TT DIMENSIONS in millimeters



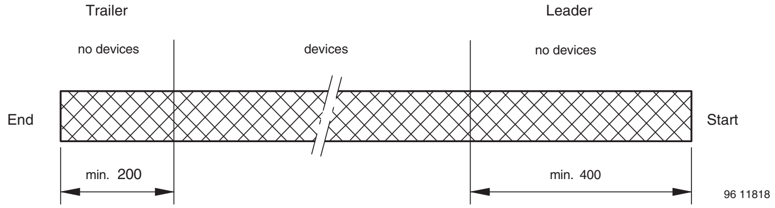
TAPING VERSION TSOP..TR DIMENSIONS in millimeters



REEL DIMENSIONS in millimeters



LEADER AND TRAILER DIMENSIONS in millimeters



COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 mm/min. ± 10 mm/min.
165° to 180° peel angle

LABEL

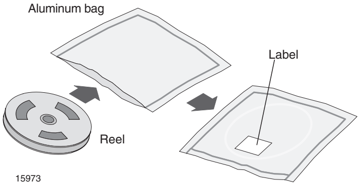
Standard bar code labels for finished goods

The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GMBH STANDARD BAR CODE PRODUCT LABEL (finished goods)		
PLAIN WRITTING	**ABBREVIATION**	**LENGTH**
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
LONG BAR CODE TOP	**TYPE**	**LENGTH**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
SHORT BAR CODE BOTTOM	**TYPE**	**LENGTH**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

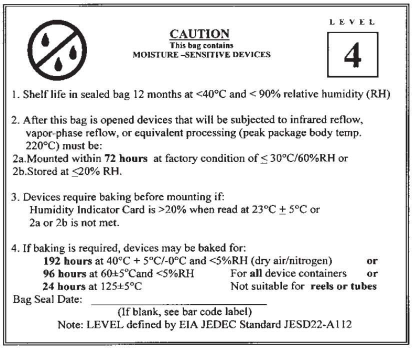
RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:
192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)
or
96 h at 60 °C + 5 °C and < 5 % RH for all device containers
or
24 h at 125 °C + 5 °C not suitable for reel or tubes.
An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE –SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:
192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
96 hours at 60±5°Cand <5%RH For **all** device containers **or**
24 hours at 125±5°C Not suitable for **reels or tubes**
Bag Seal Date: ________________
(If blank, see bar code label)
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

16943

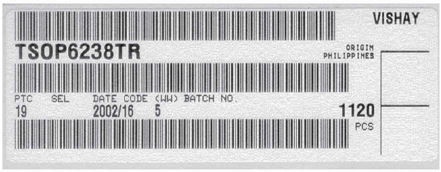
Example of JESD22-A112 level 4 label

ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

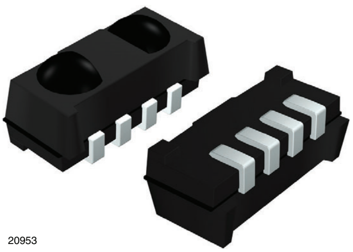
The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



VISHAY
TSOP6238TR
ORIGIN
PHILIPPINES
PTC SEL DATE CODE (WW) BATCH NO.
19 2002/16 5
1120
PCS

16962

IR Receiver Modules for 3D Synchronization Signals


20953

MECHANICAL DATA

Pinning:

1, 4 = GND, 2 = V_S, 3 = OUT

FEATURES

- Center frequency at 25 kHz to reduce interference with IR remote control signals at 30 kHz to 56 kHz
- Package can be used with IR emitters with wavelength 830 nm as well as standard 940 nm
- Very low supply current and stand-by mode
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage range: 2.5 V to 5.5 V
- Improved immunity against modulated light sources
- Insensitive to supply voltage ripple and noise
- Taping available for topview and sideview assembly
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

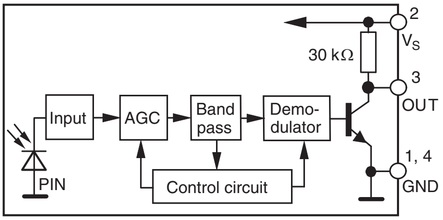
DESCRIPTION

The TSOP75D25 is an SMD IR receiver module for 3D sychronisation signals. The receiver is designed to operate at a carrier frequency of 25 kHz and a wavelength of 830 nm to avoid interference with standard remote control systems at 940 nm and 30 kHz to 56 kHz. The TSOP75D25 can receive continuously transmitted signal patterns with a minimum burst length of 6 cycles and frame rates up to 200 Hz. The circuit provides good suppression of optical noise from CFLs, LCD backlight and plasma panels.

PARTS TABLE

CARRIER FREQUENCY	GOOD NOISE SUPPRESSION AND FAST BURST RATE
25 kHz	TSOP75D25

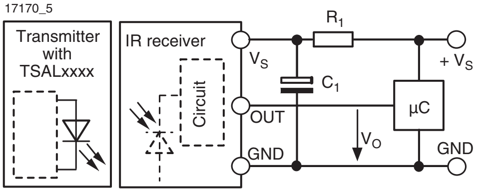
BLOCK DIAGRAM



20445-1

APPLICATION CIRCUIT

17170_5



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 µF.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage (pin 2)		V_S	- 0.3 to + 6	V
Supply current (pin 2)		I_S	3	mA
Output voltage (pin 3)		V_O	- 0.3 to (V_S + 0.3)	V
Output current (pin 3)		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

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 (pin 2)	E_v = 0, V_S = 3.3 V	I_{SD}	0.27	0.35	0.45	mA
	E_v = 40 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 = 250 mA	d		45		m
Output voltage low (pin 3)	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m^2, test signal see fig. 1	V_{OSL}			100	mV
Minimum irradiance	Pulse width tolerance: t_{pi} - 80 µs < t_{po} < t_{pi} + 160 µs, test signal see fig. 1	$E_{e\ min.}$		0.15	0.35	mW/m^2
Maximum irradiance	t_{pi} - 80 µs < t_{po} < t_{pi} + 160 µs, test signal see fig. 1	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 50		deg

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

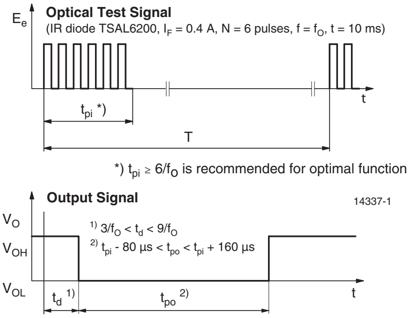


Fig. 1 - Output Active Low

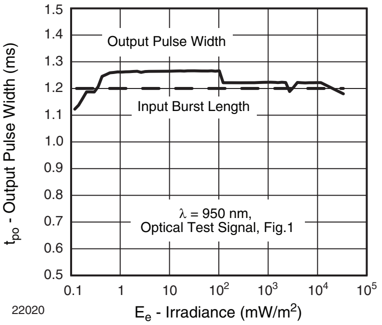


Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

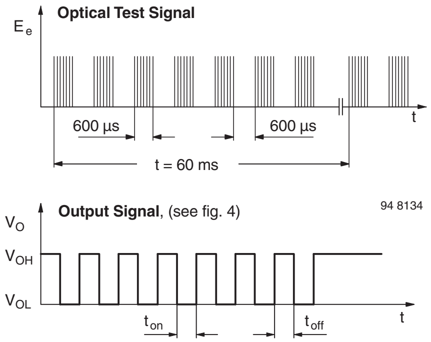


Fig. 3 - Output Function

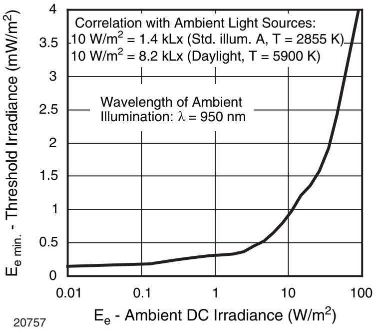


Fig. 6 - Sensitivity in Bright Ambient

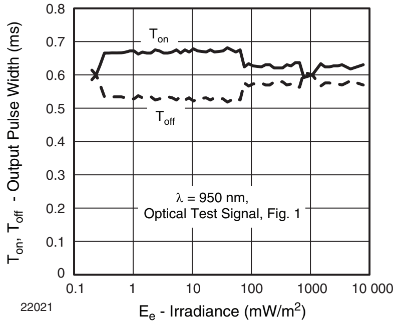


Fig. 4 - Output Pulse Diagram

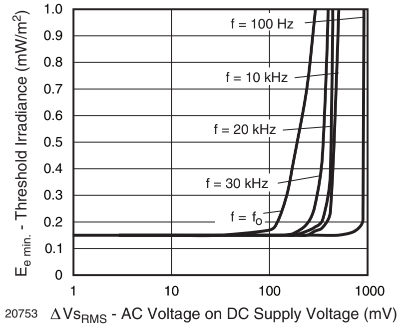


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

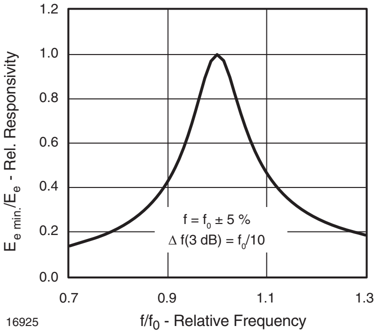


Fig. 5 - Frequency Dependence of Responsivity

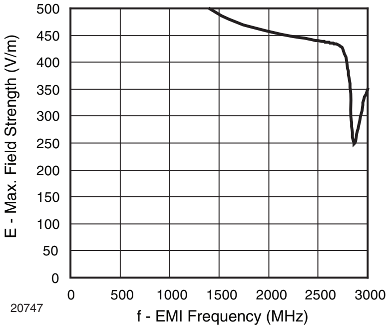


Fig. 8 - Sensitivity vs. Electric Field Disturbances

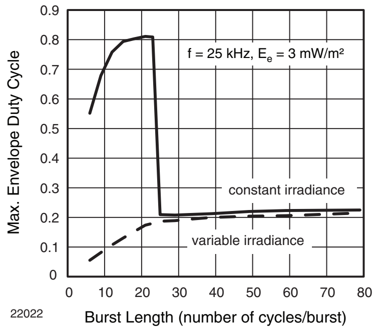


Fig. 9 - Maximum Envelope Duty Cycle vs. Burst Length

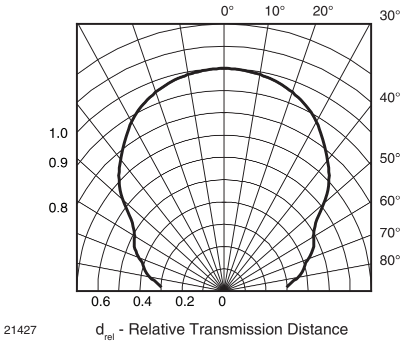


Fig. 12 - Horizontal Directivity

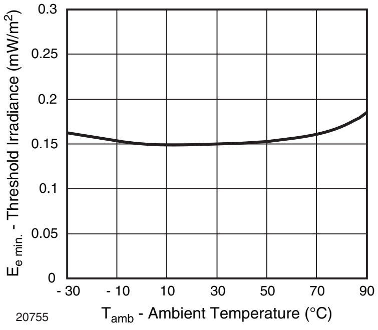


Fig. 10 - Sensitivity vs. Ambient Temperature

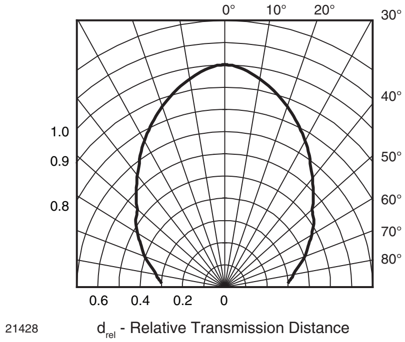


Fig. 13 - Vertical Directivity

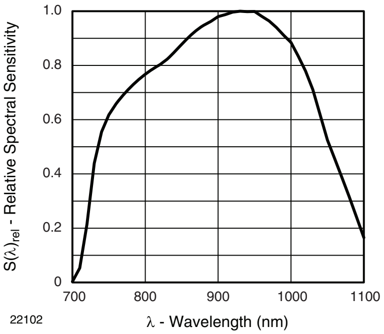


Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

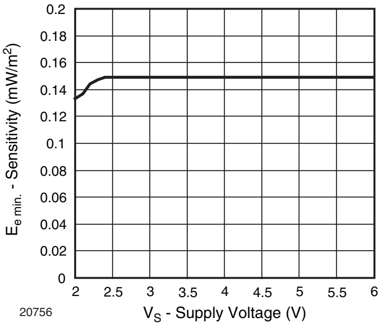


Fig. 14 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP75D25 is 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. 25 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the TSOP75D25 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
- Strongly or weakly modulated noise from fluorescent lamps with electronic ballasts (see figure 15 or figure 16)

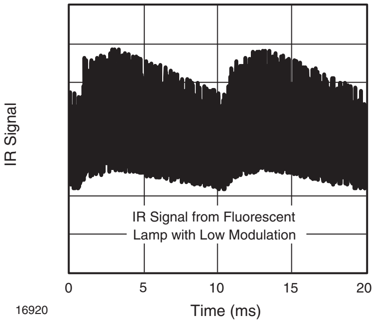


Fig. 15 - IR Signal from Fluorescent Lamp with Low Modulation

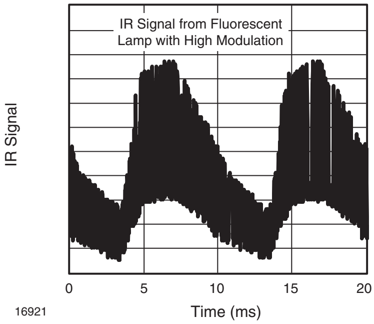


Fig. 16 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP75D25
Minimum burst length	6 cycles/burst
After each burst of length a minimum gap time is required of	6 to 24 cycles ≥ 6 cycles
For bursts greater than a minimum gap time in the data stream is needed of	24 cycles > 4 x burst length
Maximum rate of short bursts (constant irradiance)	2000 bursts/s
Maximum rate of short bursts (variable irradiance)	220 bursts/s

STAND-BY MODE OF THE TSOP75D25

If an application requires an ultra low average supply current in order to save battery life, the TSOP75D25 can be operated with an intermittent supply voltage. A typical application circuit shown in fig. 17.

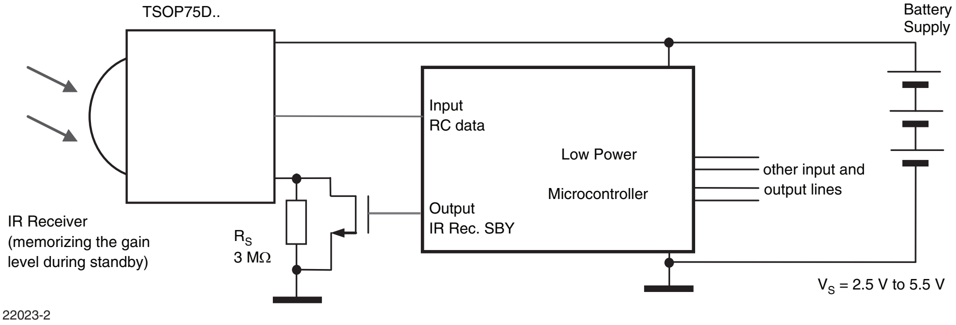


Fig. 17 - Application Circuit for the TSOP75D25 with Intermittent Supply Voltage

To receive a continuous data signal while using the TSOP75D25 with an intermittent supply voltage, the receiver must be activated in advance of the expected data frame as shown in figure 18.

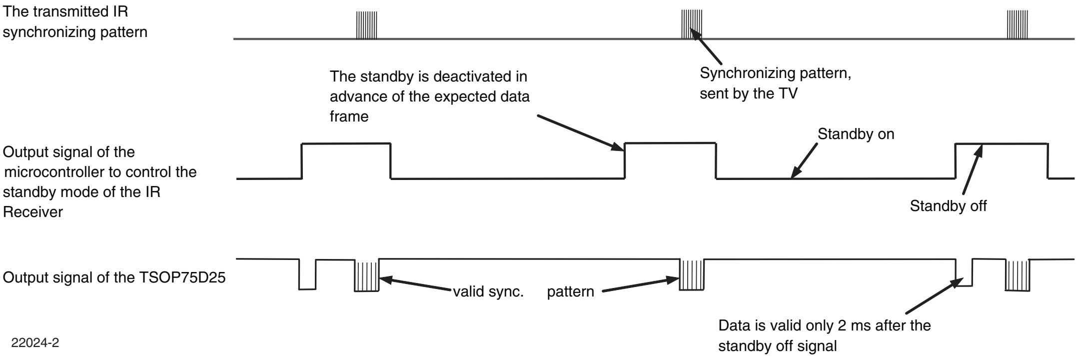


Fig. 18 - Signal Timing in Power Saving Mode with Continuous Receiving Function

In normal operation without using the stand-by feature, the gain level of the TSOP75D25 returns to a default level after the device is disconnected from supply voltage and reconnected again. A settling time of up to 100 ms is necessary until the gain has settled to an optimum level that is well matched to the ambient noise level.

Using the device in stand-by mode, the TSOP75D25 memorizes its gain setting while in standby. On re-activation, the gain immediately returns to the correct level present before stand-by. This operation insures that there are no spurious pulses on power-up due to mismatch between the gain level and the ambient light conditions.

ELECTRICAL AND OPTICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Serial resistor to activate the standby mode	V_S = 3 V	R_S	1.2	1.5	2	MΩ
	V_S = 5 V	R_S	2	3	4	
Standby supply current	V_S = 3 V, RS = 1.5 MΩ	I_{SBY}	1	1.4	2	μA
	V_S = 5 V, RS = 3 MΩ	I_{SBY}	1	1.4	2	
Latency time for standby-off (delay until there is a valid respose)	V_S > 2.5 V, dark ambient, output is valid	t_{delay}		0.4	0.8	ms
	V_S > 2.5 V, 10 kLux dayligth, output is valid	t_{delay}		1.5	2.5	
Duration of standby-off period	V_S > 2.5 V, dark ambient	t_{SBY_OFF}	1			ms
	V_S > 2.5 V, 10 kLux daylight, AGC1 or AGC3 device	t_{SBY_OFF}	4			
	V_S > 2.5 V, 10 kLux daylight, AGC2 or AGC4 device	t_{SBY_OFF}	3			

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

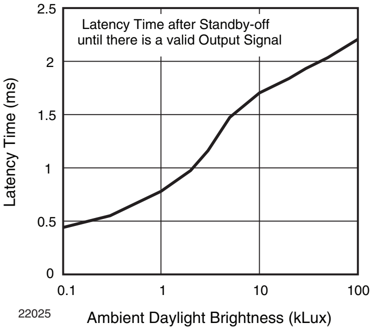
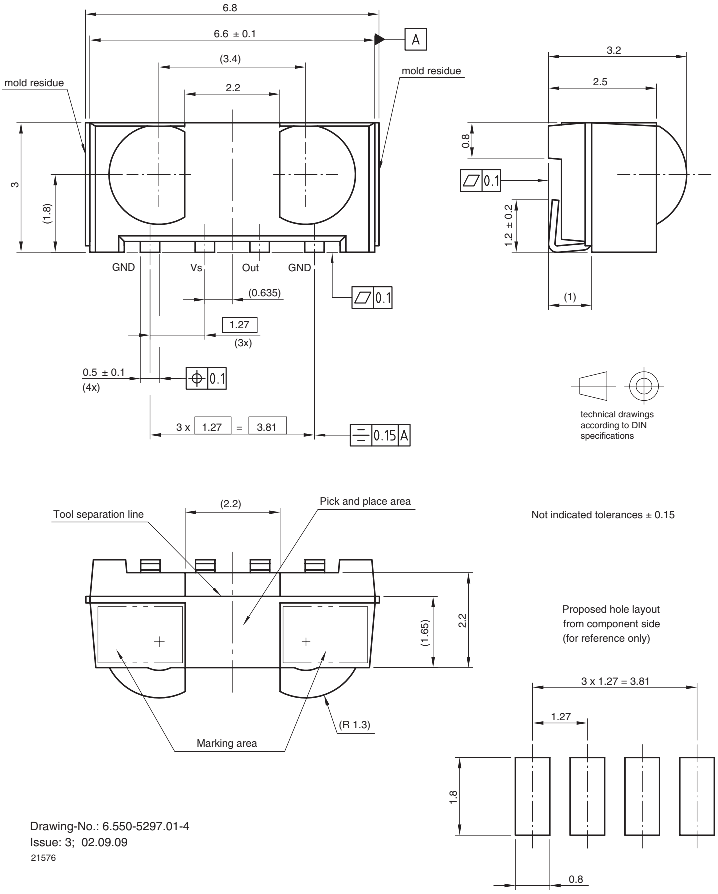


Fig. 1 - Delay Time after Standby-off until the TSOP75D25 is ready to receive Data

PACKAGE DIMENSIONS in millimeters



ASSEMBLY INSTRUCTIONS

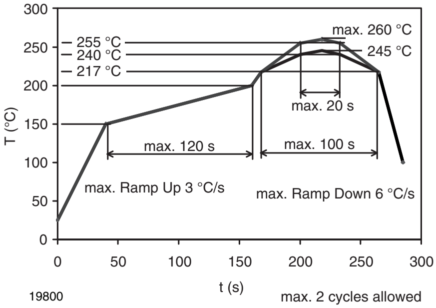
Reflow Soldering

- Reflow soldering must be done within 72 h while stored under a max. temperature of 30 °C, 60 % RH after opening the dry pack envelope
- Set the furnace temperatures for pre-heating and heating in accordance with the reflow temperature profile as shown in the diagram. Excercise extreme care to keep the maximum temperature below 260 °C. The temperature shown in the profile means the temperature at the device surface. Since there is a temperature difference between the component and the circuit board, it should be verified that the temperature of the device is accurately being measured
- Handling after reflow should be done only after the work surface has been cooled off

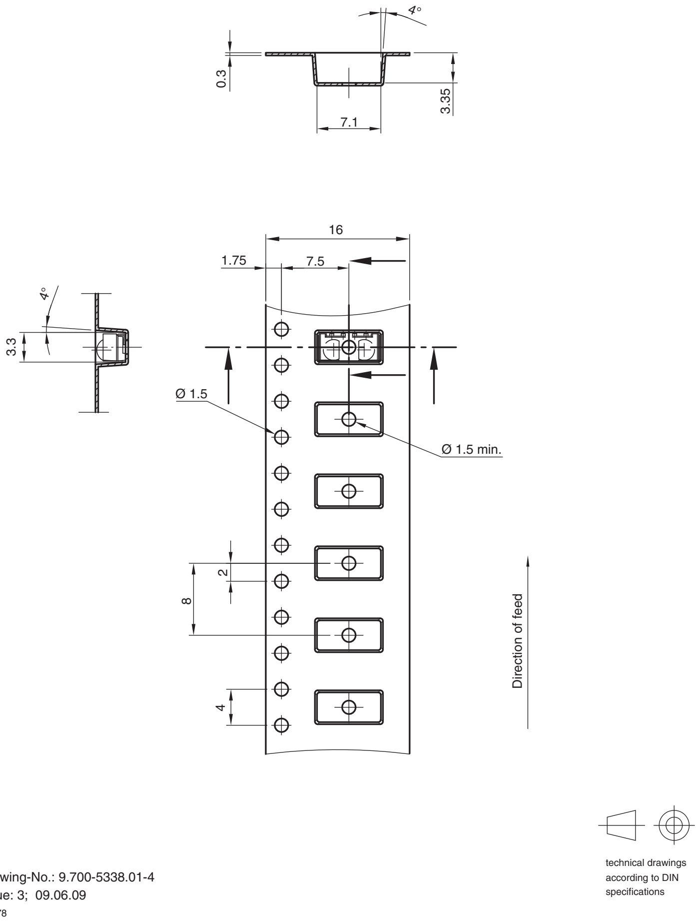
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C
- Finish soldering within 3 s
- Handle products only after the temperature has cooled off

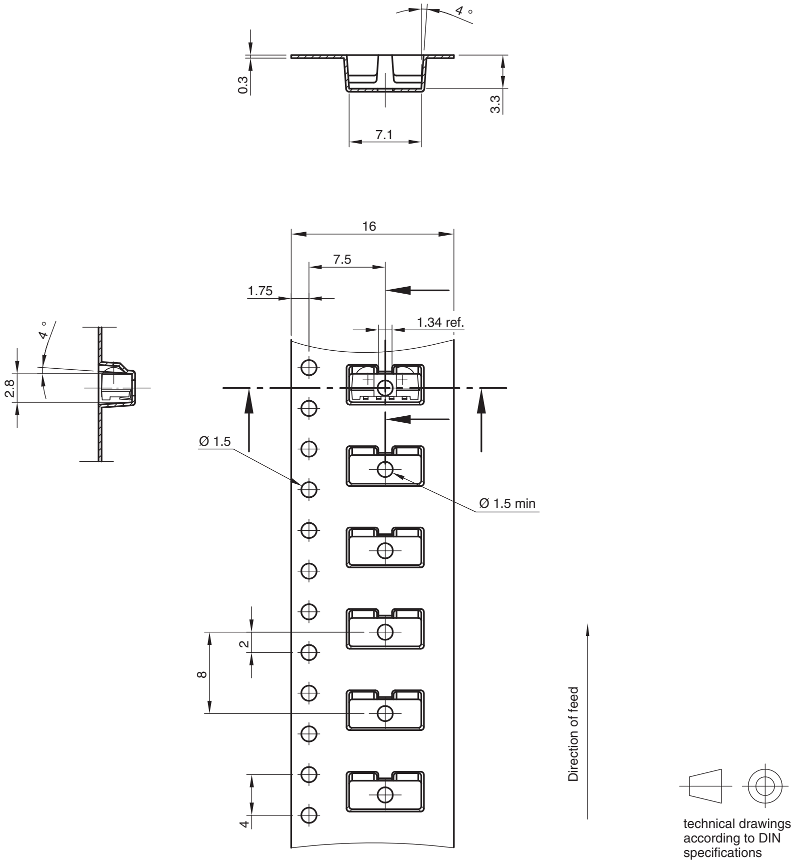
VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



TAPING VERSION TSOP..TT DIMENSIONS in millimeters



TAPING VERSION TSOP..TR DIMENSIONS in millimeters

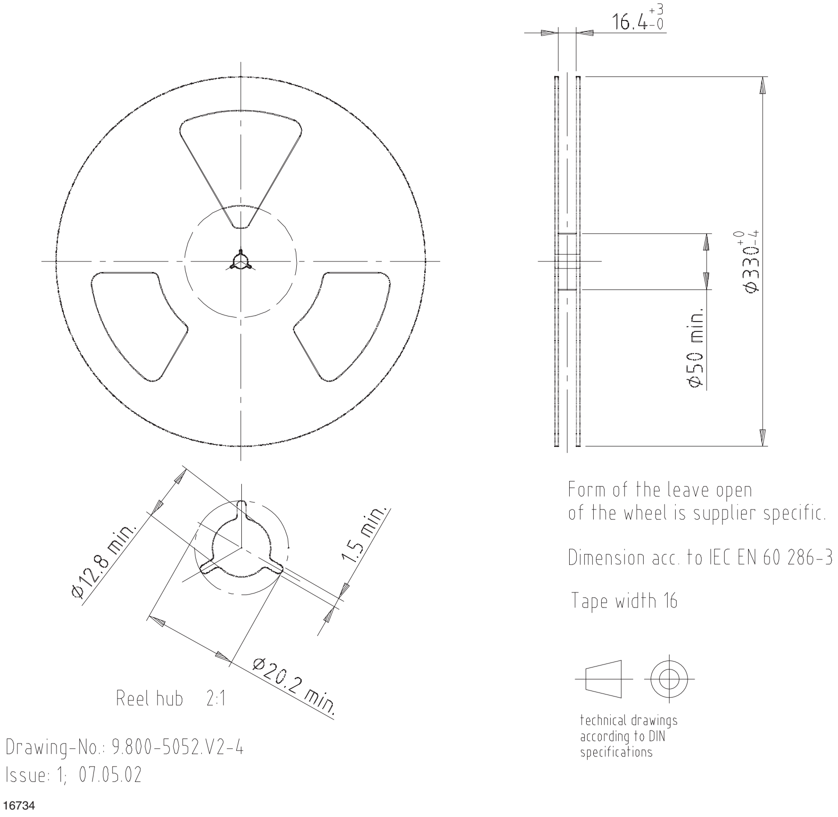


Drawing-No.: 9.700-5337.01-4

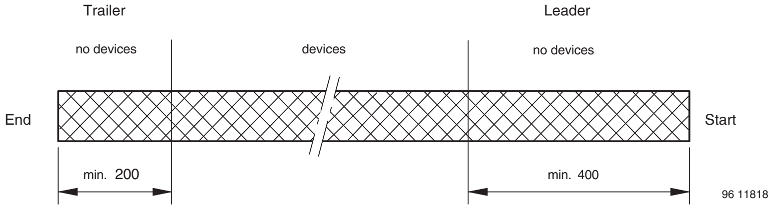
Issue: 1; 16.10.08

21577

REEL DIMENSIONS in millimeters



LEADER AND TRAILER DIMENSIONS in millimeters



COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3
0.1 N to 1.3 N
300 mm/min. ± 10 mm/min.
165° to 180° peel angle

LABEL

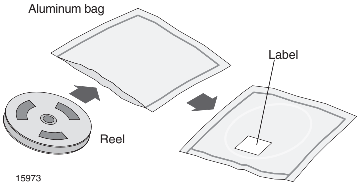
Standard bar code labels for finished goods

The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain Vishay Semiconductor GmbH specific data.

VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)		
PLAIN WRITTING	**ABBREVIATION**	**LENGTH**
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed code indicator	MIXED CODE	-
Origin	xxxxxxx+	Company logo
LONG BAR CODE TOP	**TYPE**	**LENGTH**
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
SHORT BAR CODE BOTTOM	**TYPE**	**LENGTH**
Selection-code	X	3
Data-code	N	3
Batch-number	X	10
Filter	-	1
Total length	-	17

DRY PACKING

The reel is packed in an anti-humidity bag to protect the devices from absorbing moisture during transportation and storage.



FINAL PACKING

The sealed reel is packed into a cardboard box. A secondary cardboard box is used for shipping purposes.

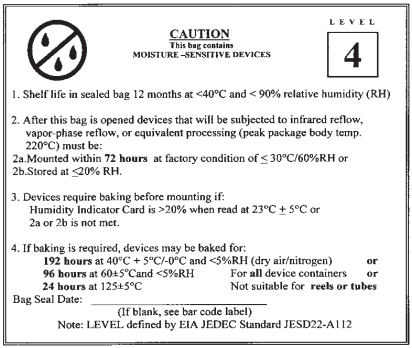
RECOMMENDED METHOD OF STORAGE

Dry box storage is recommended as soon as the aluminum bag has been opened to prevent moisture absorption. The following conditions should be observed, if dry boxes are not available:

- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:
192 h at 40 °C + 5 °C/- 0 °C and < 5 % RH (dry air/nitrogen)
or
96 h at 60 °C + 5 °C and < 5 % RH for all device containers
or
24 h at 125 °C + 5 °C not suitable for reel or tubes.
An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.



CAUTION
This bag contains
MOISTURE –SENSITIVE DEVICES

LEVEL
4

1. Shelf life in sealed bag 12 months at <40°C and < 90% relative humidity (RH)

2. After this bag is opened devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing (peak package body temp. 220°C) must be:
2a.Mounted within **72 hours** at factory condition of ≤ 30°C/60%RH or
2b.Stored at ≤20% RH.

3. Devices require baking before mounting if:
Humidity Indicator Card is >20% when read at 23°C ± 5°C or
2a or 2b is not met.

4. If baking is required, devices may be baked for:
192 hours at 40°C + 5°C/-0°C and <5%RH (dry air/nitrogen) **or**
96 hours at 60±5°Cand <5%RH For **all** device containers **or**
24 hours at 125±5°C Not suitable for **reels or tubes**
Bag Seal Date: ____________________
(If blank, see bar code label)
Note: LEVEL defined by EIA JEDEC Standard JESD22-A112

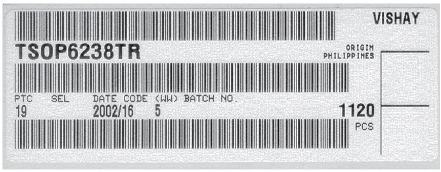
Example of JESD22-A112 level 4 label

ESD PRECAUTION

Proper storage and handling procedures should be followed to prevent ESD damage to the devices especially when they are removed from the antistatic shielding bag. Electro-static sensitive devices warning labels are on the packaging.

VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS

The Vishay Semiconductors standard bar code labels are printed at final packing areas. The labels are on each packing unit and contain Vishay Semiconductors specific data.



VISHAY
TSOP6238TR
ORIGIN
PHILIPPINES
PTC SEL DATE CODE (WW) BATCH NO.
19 2002/16 5
1120
PCS

16962

Cast Mechanical Options

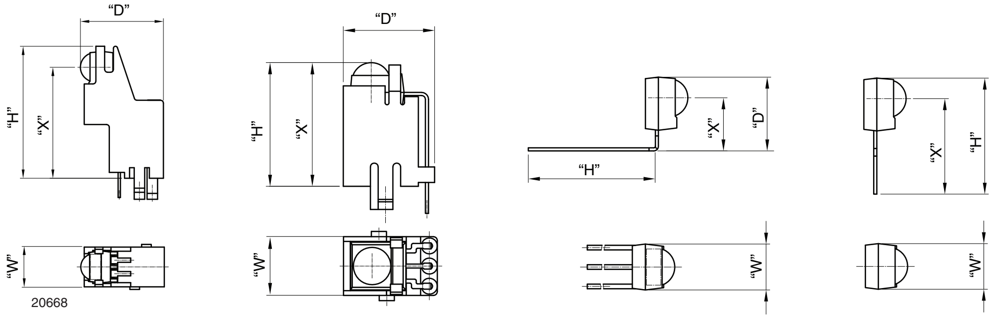
Contents

Cast Holders

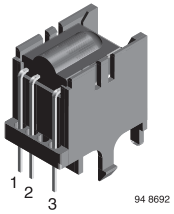
Cast Cuts and Bends

Cast Photomodule Holders, Cuts and Bends

HOLDER	D	H	W	X	VIEW	TYPE	PAGE
GL	20	20	12.5	20	Top	Holder	469
KA	11.25	13.8	11.5	9.75	Side	Holder	471
KD	11.25	13.8	11.5	9.75	Side	Holder	473
KS	11.25	13.8	11.5	9.75	Side	Holder	475
LL	20	20	12.5	20	Top	Holder	477
RF	16.65	16.4	12.5	16.4	Top	Holder	479
TB	20	15.8	12.5	15.8	Top	Holder	481
UU	20	8.5	12.5	8.5	Top	Holder	483
UQ	20	8.5	12.5	8.5	Top	Holder	485
WI	25.6	16.05	12.2	12	Side	Holder	487
XG	14.15	23.05	7.4	19	Side	Holder	489
CUT OR BEND	**D**	**H**	**W**	**X**	**VIEW**	**TYPE**	**PAGE**
SB	15.4	14.8	10	12.3		Bend	491
SD		17.6	10	14.3		Cut	493
SE		17.6	10	14.3		Cut	495
SH		16	10	12.7		Cut	497
SK		21.1	10	17.8		Cut	499
SM		32.9	10	29.6		Cut	501
SP	17.4	15	10	14.3		Bend	503
SR	14.4	5.4	10	11.1		Bend	505
SA		16.6	10	13.3		Cut	507



IR Receiver Modules for Remote Control Systems



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

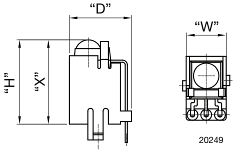
Pb
Pb-free

e3

RoHS
COMPLIANT

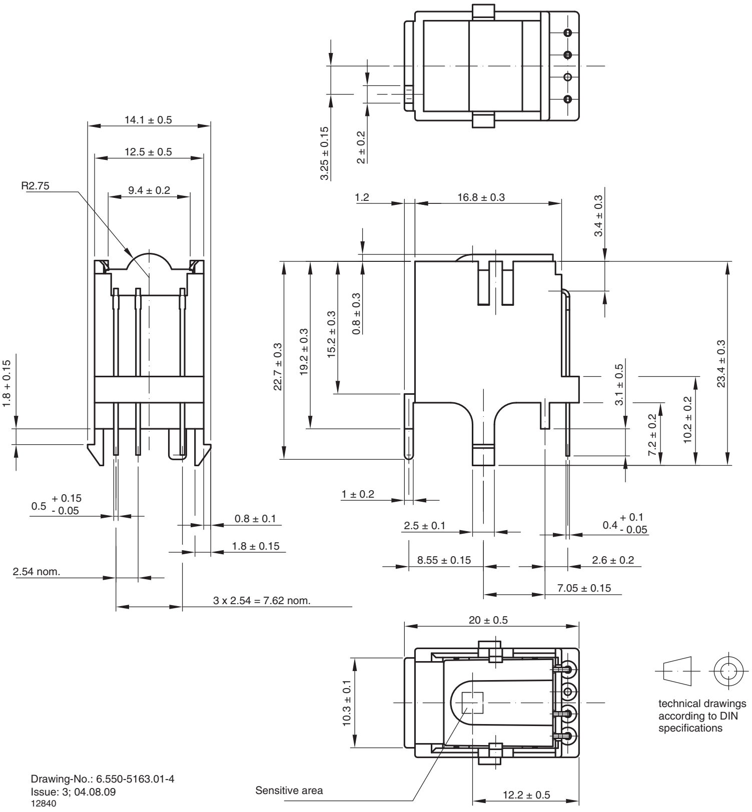
AVAILABLE FOR:

- TSOP31...
- TSOP1...

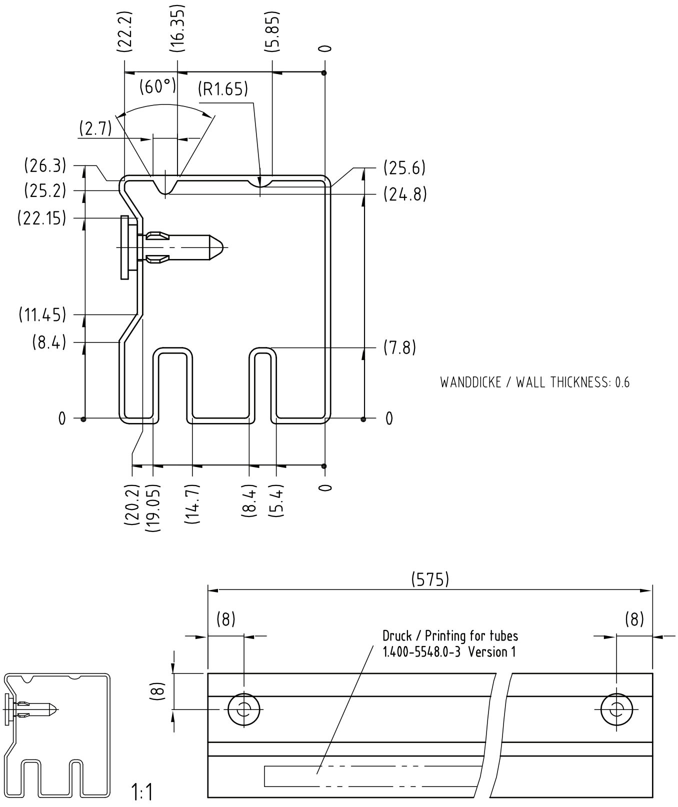


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
GL1	20	Top	Holder	20	12.5	20

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5189.0-4
Rev. 8; Date: 20.11.03
20313-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	G	L	1

2 or 3 digit product series
2 digit frequency
Holder type

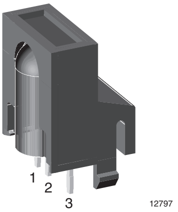
Note
d = "digit", please consult the list of available series on the previous page to create a valid part number.

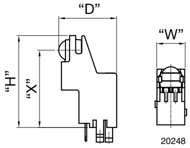
Example: TSOP31238GL1

PACKING QUANTITY

- 42 pieces per tube
- 18 tubes per carton

IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

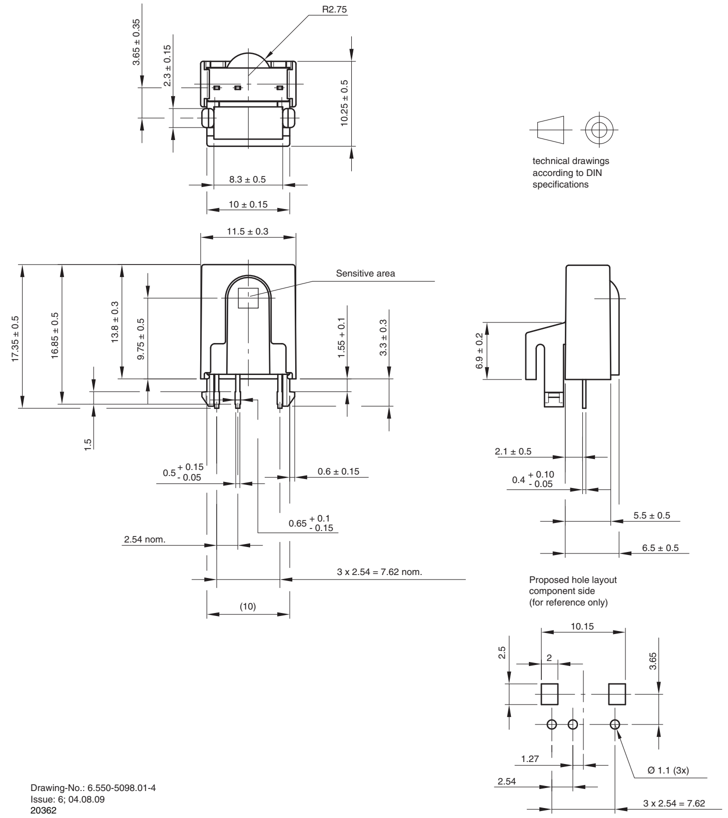
AVAILABLE FOR:

- TSOP31...
- TSOP1...

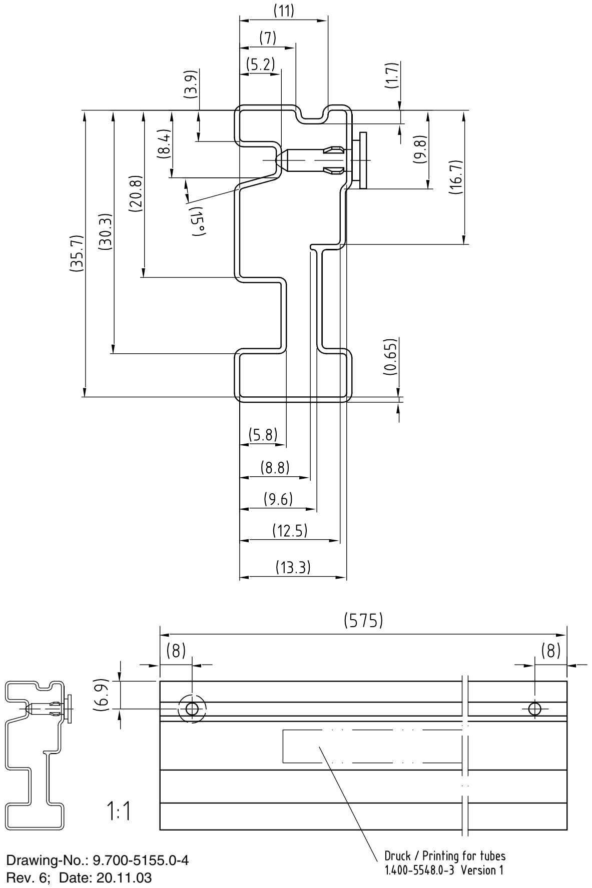
Pb-free
e3
RoHS
COMPLIANT

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
KA1	9.75	Side	Holder	13.8	11.5	11.25

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5155.0-4
Rev. 6; Date: 20.11.03
20308-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	K	A	1

2 or 3 digit product series 2 digit frequency Holder type

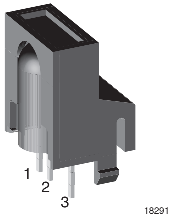
Note
d = "digit", please consult the list of available series on the previous page to create a valid part number.

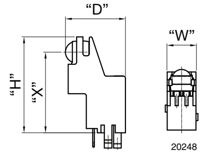
Example: TSOP31238KA1

PACKING QUANTITY

- 48 pieces per tube
- 18 tubes per carton

IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

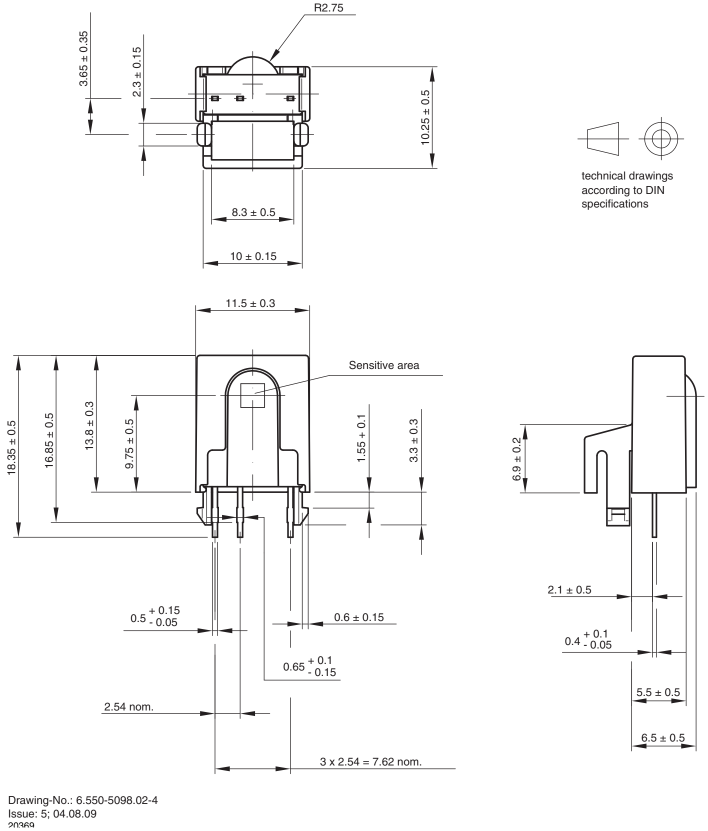
AVAILABLE FOR:

- TSOP31...
- TSOP1...

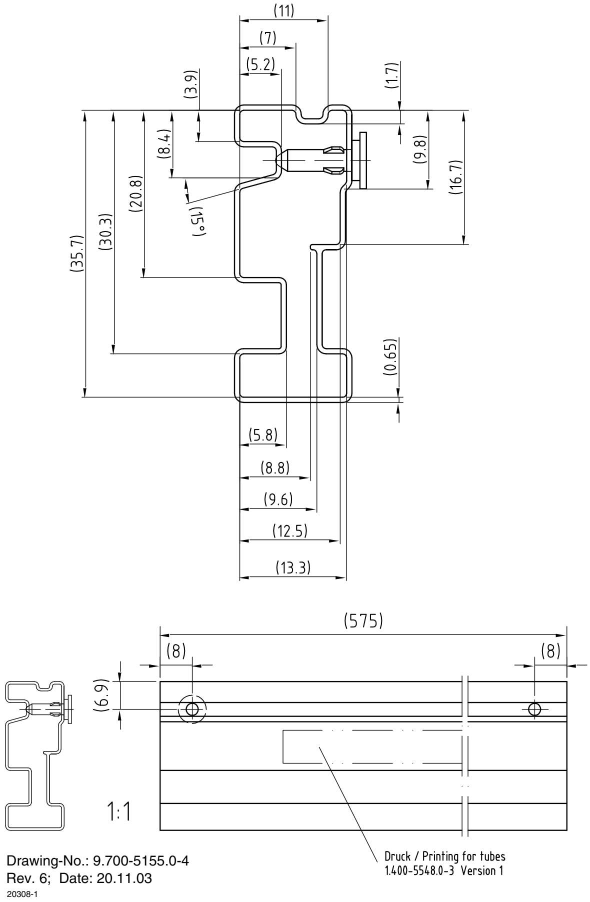
Pb-free
e3
RoHS
COMPLIANT

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
KD1	9.75	Side	Holder	13.8	11.5	11.25

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5155.0-4
Rev. 6; Date: 20.11.03
20308-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	K	D	1

2 or 3 digit product series
2 digit frequency
Holder type

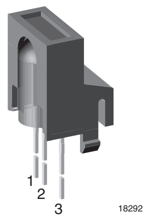
Note
d = "digit", please consult the list of available series on the previous page to create a valid part number.

Example: TSOP31238KD1

PACKING QUANTITY

- 48 pieces per tube
- 18 tubes per carton

IR Receiver Modules for Remote Control Systems



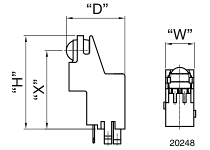
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

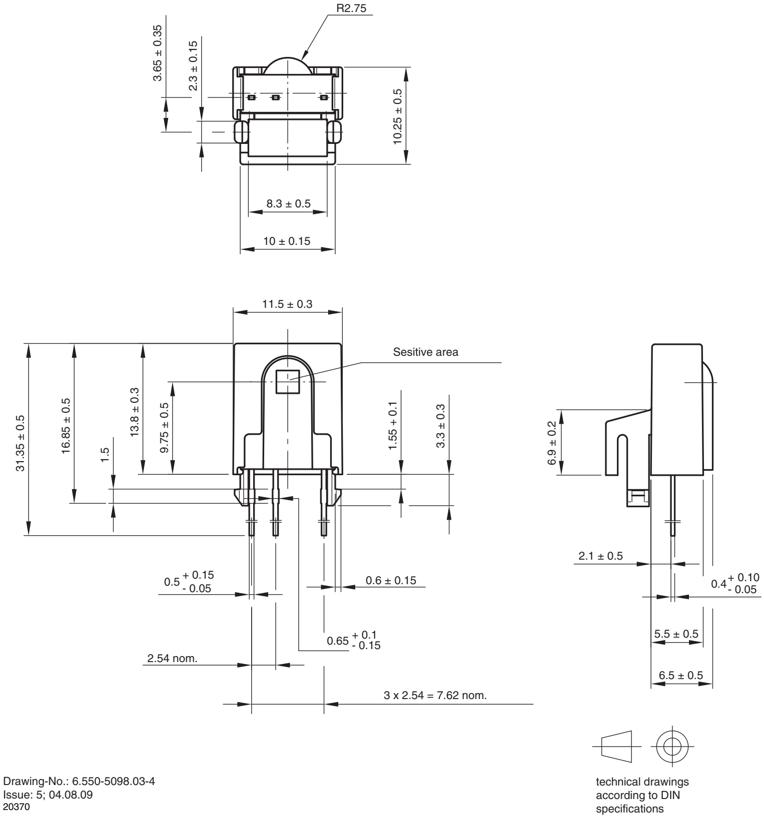
AVAILABLE FOR:

- TSOP31...
- TSOP1...



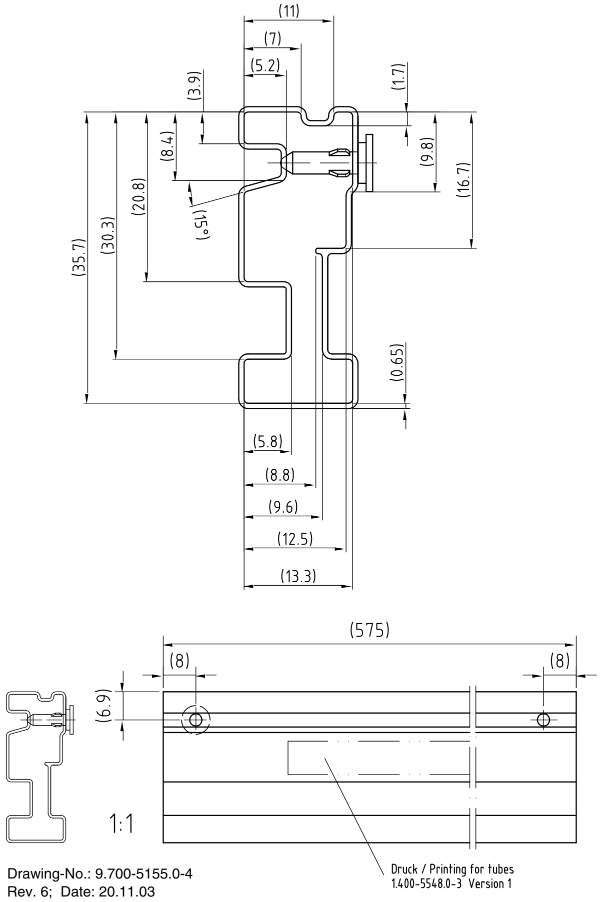
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
KS1	9.75	Side	Holder	13.8	11.5	11.25

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5098.03-4
Issue: 5; 04.08.09
20370

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5155.0-4
Rev. 6; Date: 20.11.03
20308-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	K	S	1

2 or 3 digit product series
2 digit frequency
Holder type

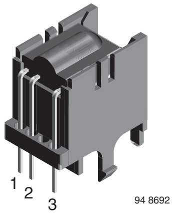
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

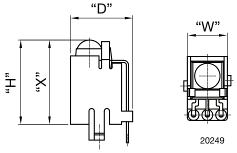
Example: TSOP31238KS1

PACKING QUANTITY

- 48 pieces per tube
- 18 tubes per carton

IR Receiver Modules for Remote Control Systems





FEATURES

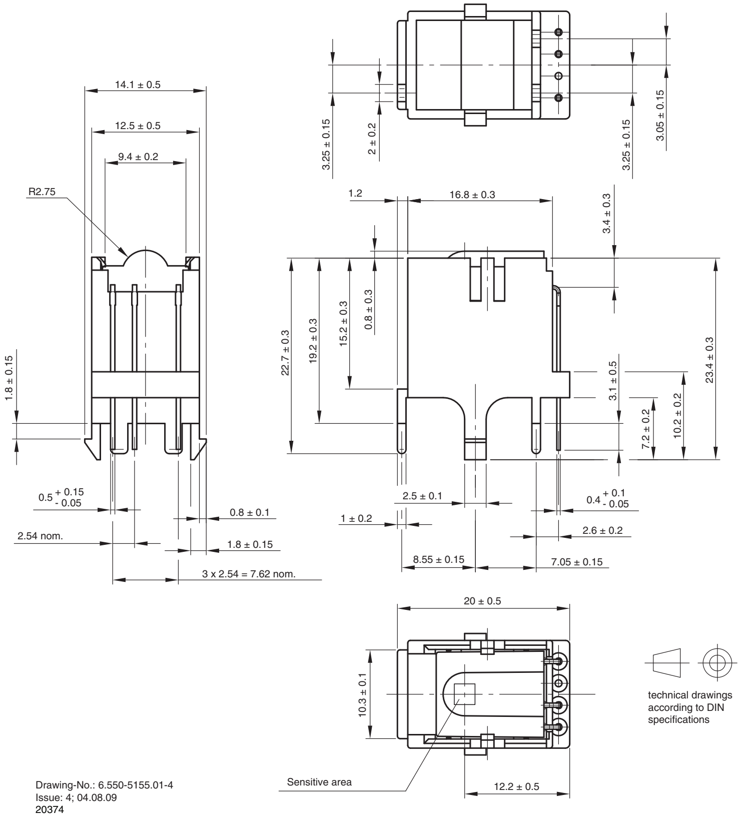
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

AVAILABLE FOR:

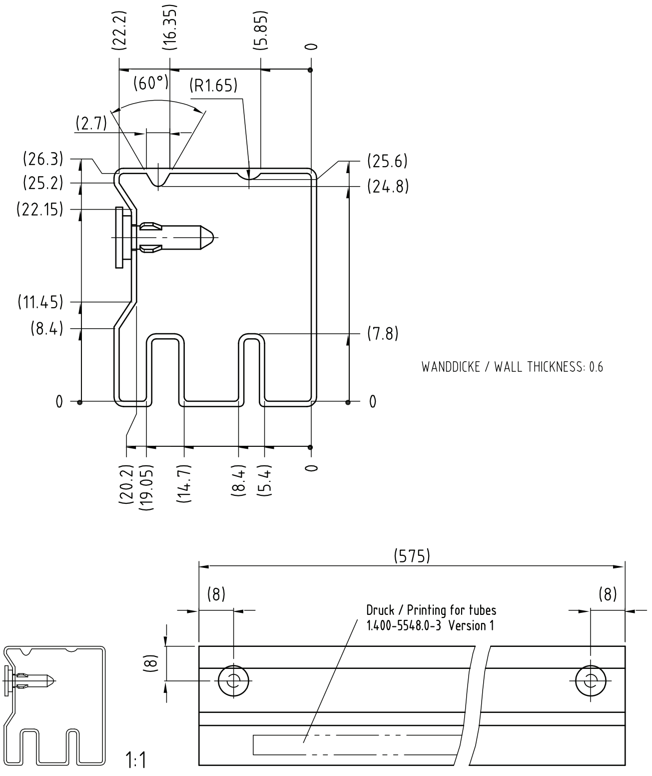
- TSOP31...
- TSOP1...

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
LL1	20	Top	Holder	20	12.5	20

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5189.0-4
Rev. 8; Date: 20.11.03
20313-1

ORDERING INFORMATION

T S O P d d d d d L L 1

2 or 3 digit product series 2 digit frequency Holder type

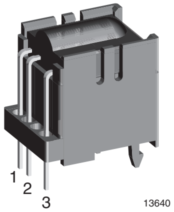
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

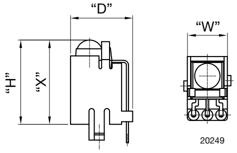
Example: TSOP31238LL1

PACKING QUANTITY

- 42 pieces per tube
- 18 tubes per carton

IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

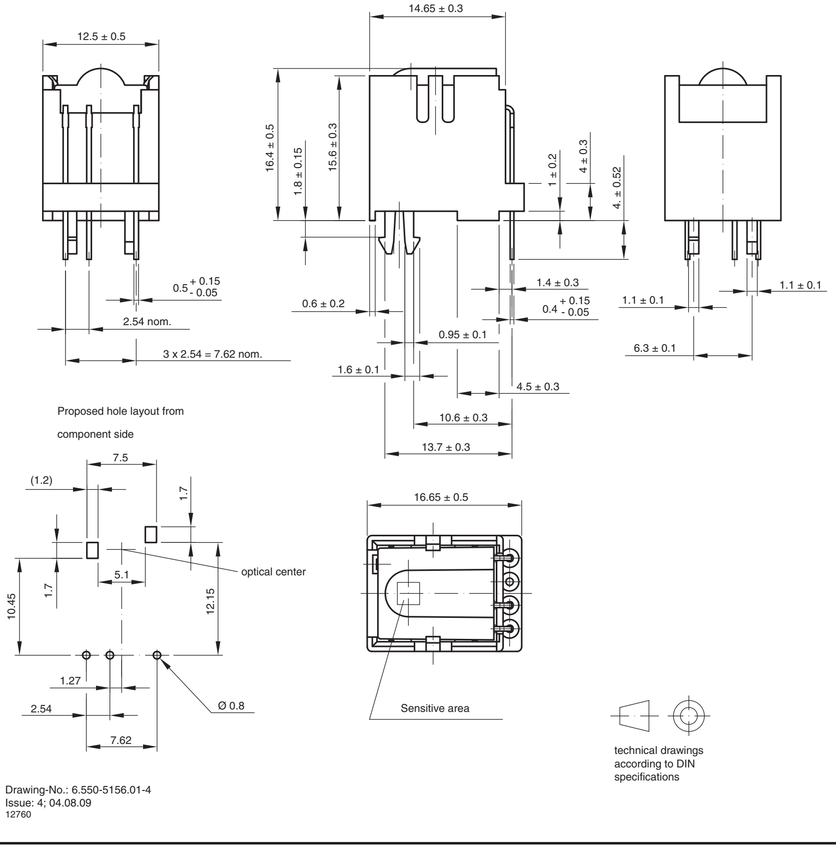
RoHS
COMPLIANT

AVAILABLE FOR:

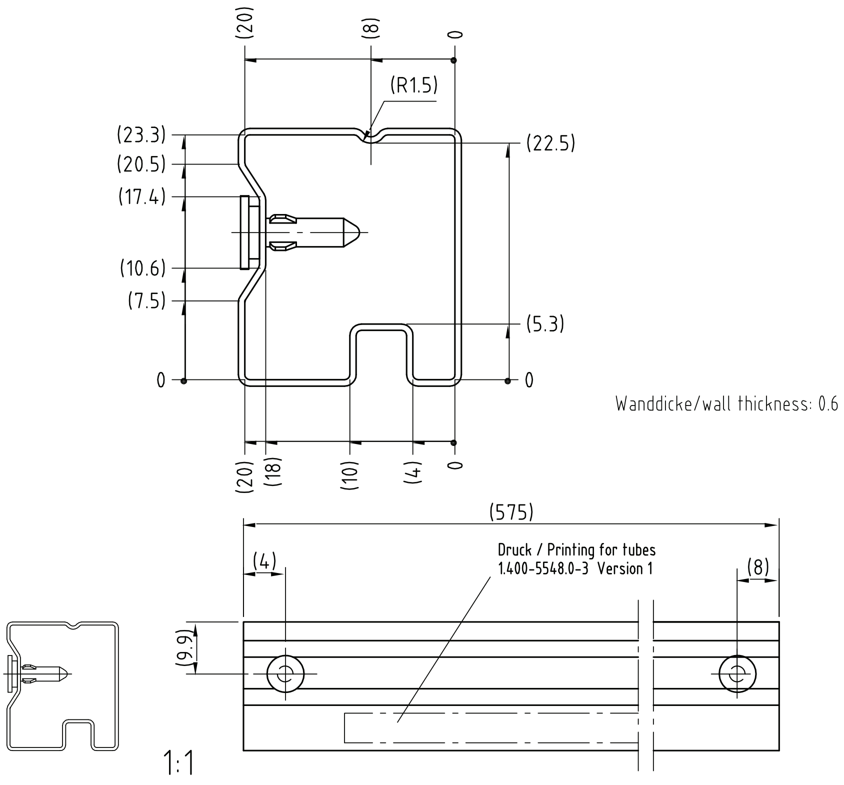
- TSOP31...
- TSOP1...

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
RF1	16.4	Top	Holder	16.4	12.5	16.65

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5191.0-4
Rev. 6; Date: 20.11.03
20314-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	R	F	1

2 or 3 digit product series 2 digit frequency Holder type

Note

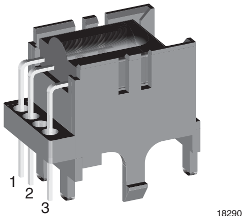
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

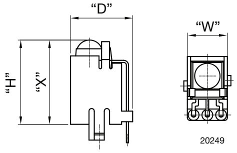
Example: TSOP31238RF1

PACKING QUANTITY

- 42 pieces per tube
- 18 tubes per carton

IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

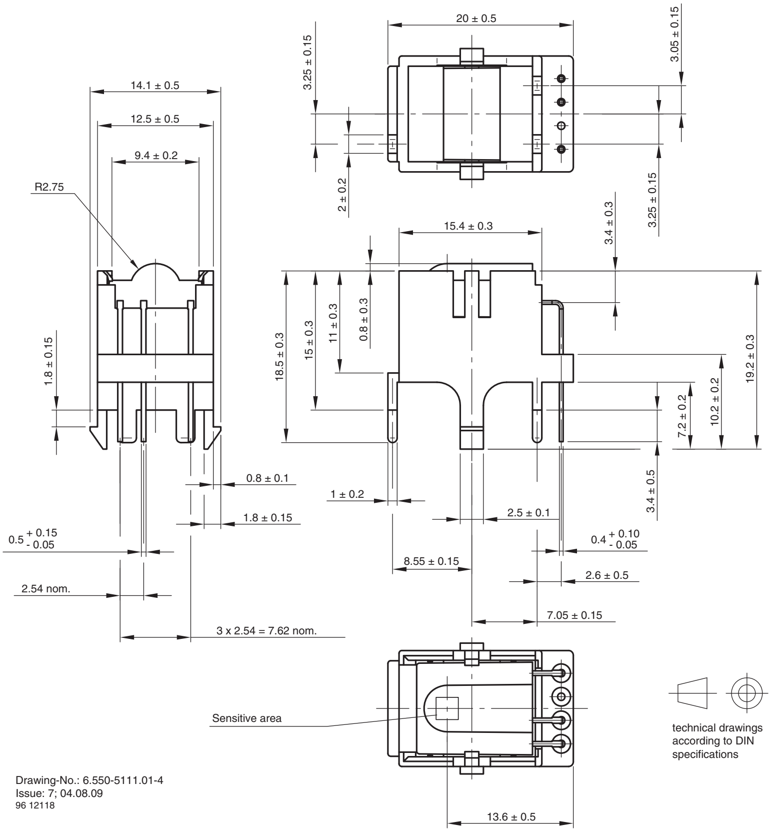
Pb-free
e3
RoHS
COMPLIANT

AVAILABLE FOR:

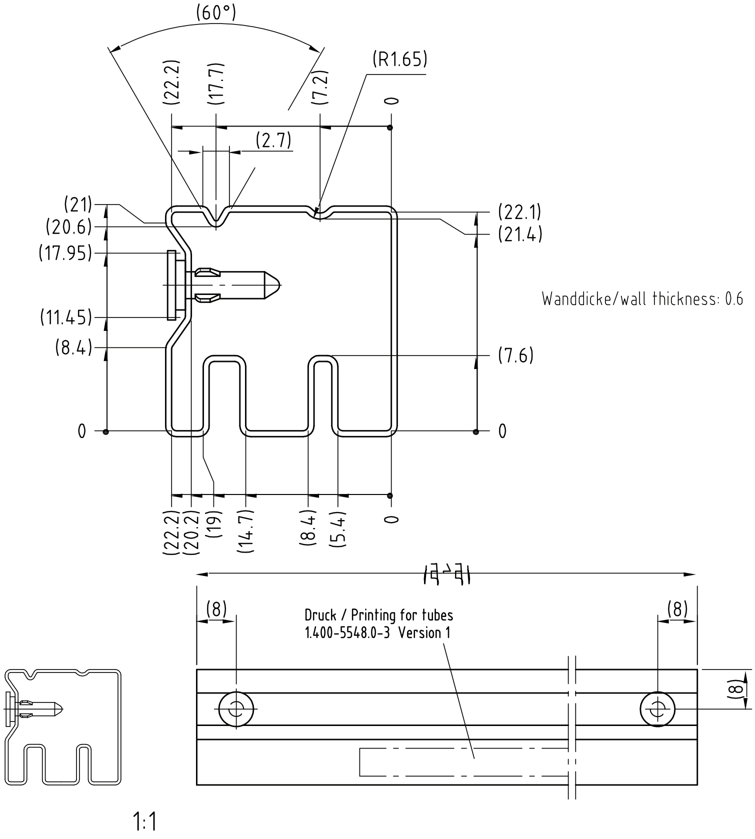
- TSOP31...
- TSOP1...

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
TB1	15.8	Top	Holder	15.8	12.5	20

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5149.0-4
Rev. 6; Date: 20.11.03
20307-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	T	B	1

2 or 3 digit product series
2 digit frequency
Holder type

Note

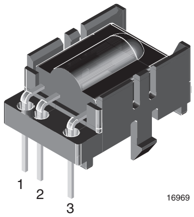
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP31238TB1

PACKING QUANTITY

- 42 pieces per tube
- 18 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

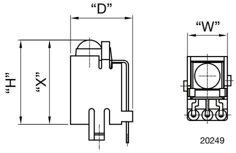
AVAILABLE FOR:

- TSOP31...
- TSOP1...

Pb-free

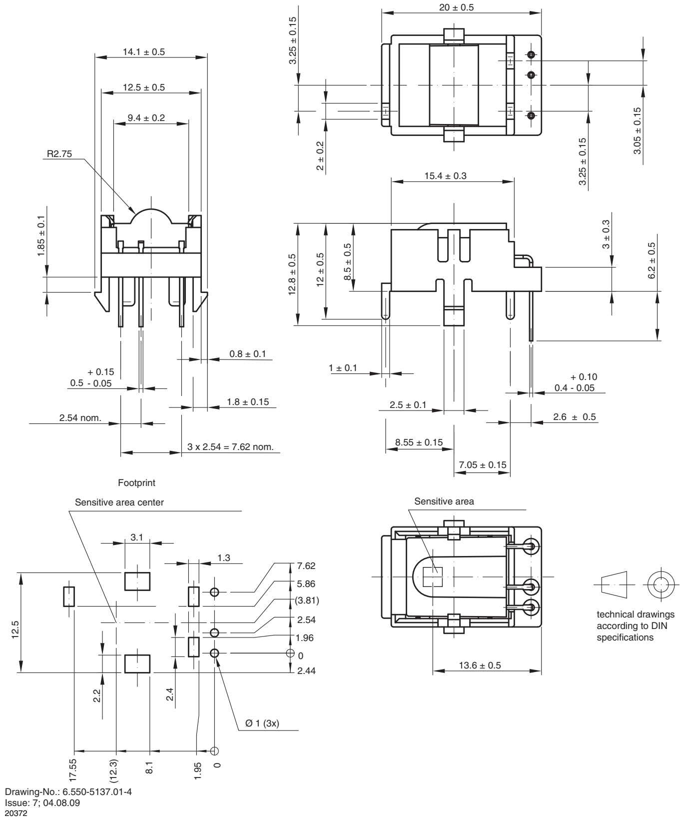
e3

RoHS
COMPLIANT

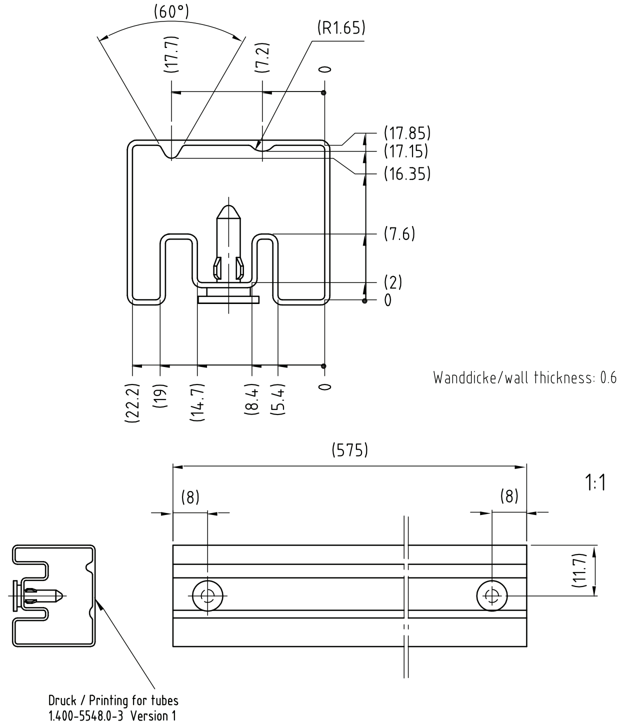


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
UU1	8.5	Top	Holder	8.5	12.5	20

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5166.0-4
Rev. 8; Date: 20.11.03
20311-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	U	U	1

2 or 3 digit product series 2 digit frequency Holder type

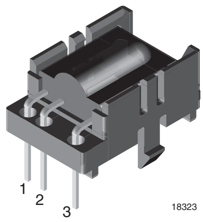
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

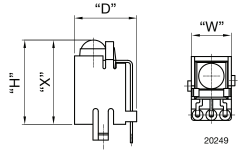
Example: TSOP31238UU1

PACKING QUANTITY

- 41 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

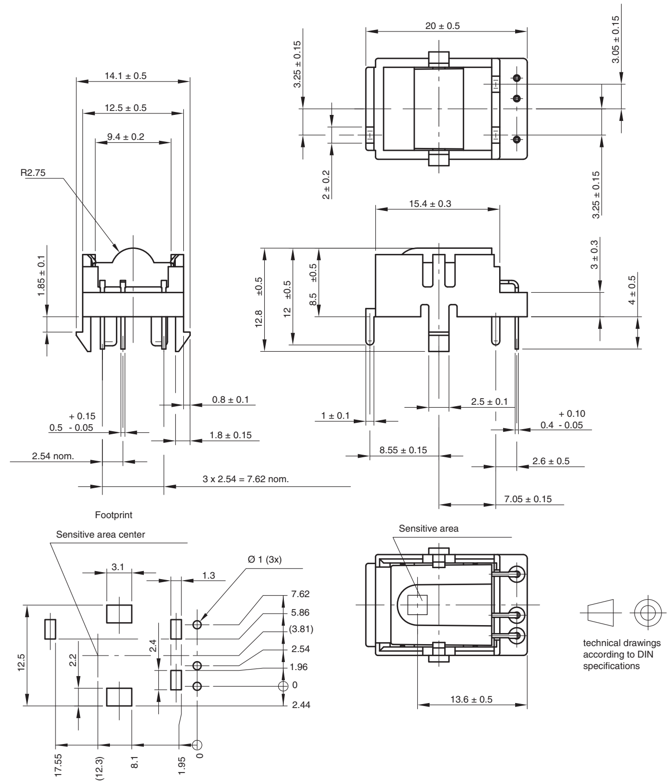
RoHS
COMPLIANT

AVAILABLE FOR:

- TSOP31...
- TSOP1...

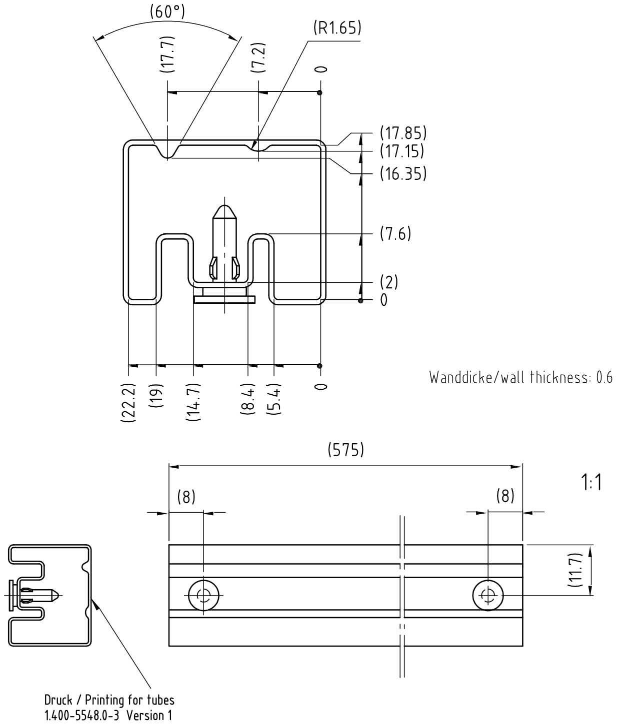
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
UQ1	8.5	Top	Holder	8.5	12.5	20

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5137.02-4
Issue: 3; 04.08.09
20373

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5166.0-4
Rev. 8; Date: 20.11.03
20311-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	U	Q	1

2 or 3 digit product series 2 digit frequency Holder type

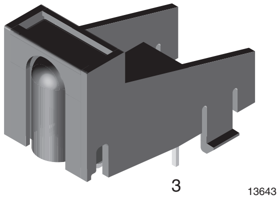
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP31238UQ1

PACKING QUANTITY

- 41 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems



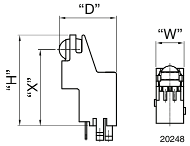
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

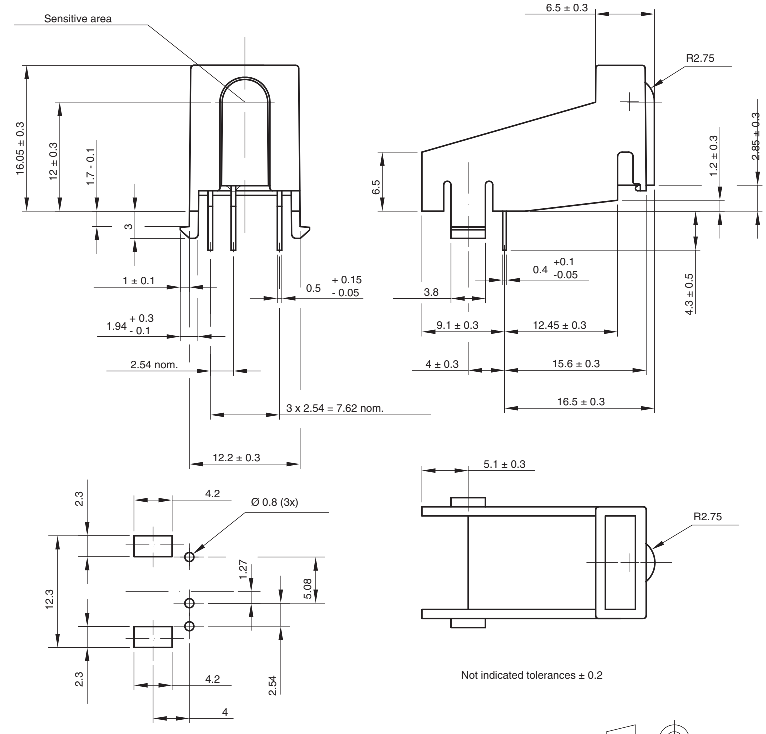
AVAILABLE FOR:

- TSOP31...
- TSOP1...



NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
WI1	12	Side	Holder	16.05	12.2	25.6

MECHANICAL DIMENSIONS in millimeters

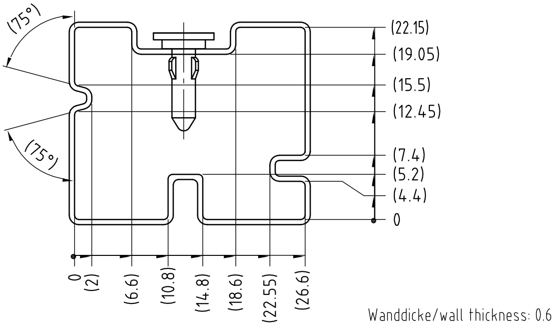


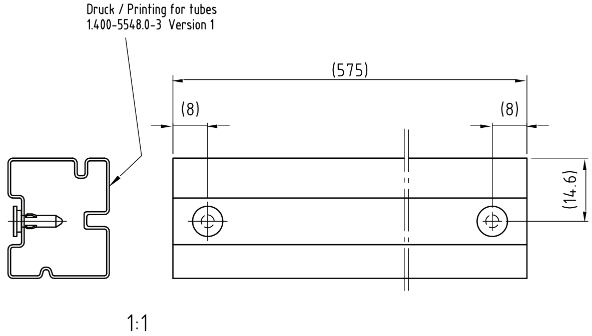
Recommended Vishay installation dimension diagram

Drawing-No.: 6.550-5153.01-4
Issue: 7; 04.08.09
12828

technical drawings
according to DIN
specifications

PACKAGING DIMENSIONS in millimeters





Drawing-No.: 9.700-5180.0-4
Rev. 6; Date: 20.11.03
20312-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	W	I	1

2 or 3 digit product series 2 digit frequency Holder type

Note

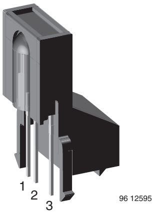
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

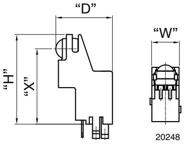
Example: TSOP31238WI1

PACKING QUANTITY

- 38 pieces per tube
- 15 tubes per carton

IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

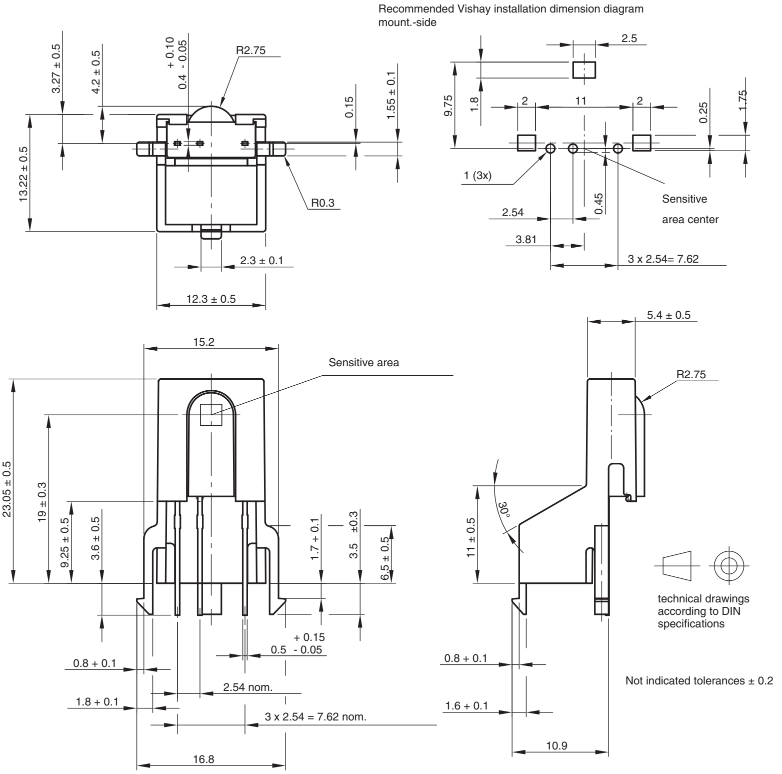
RoHS
COMPLIANT

AVAILABLE FOR:

- TSOP31...
- TSOP1...

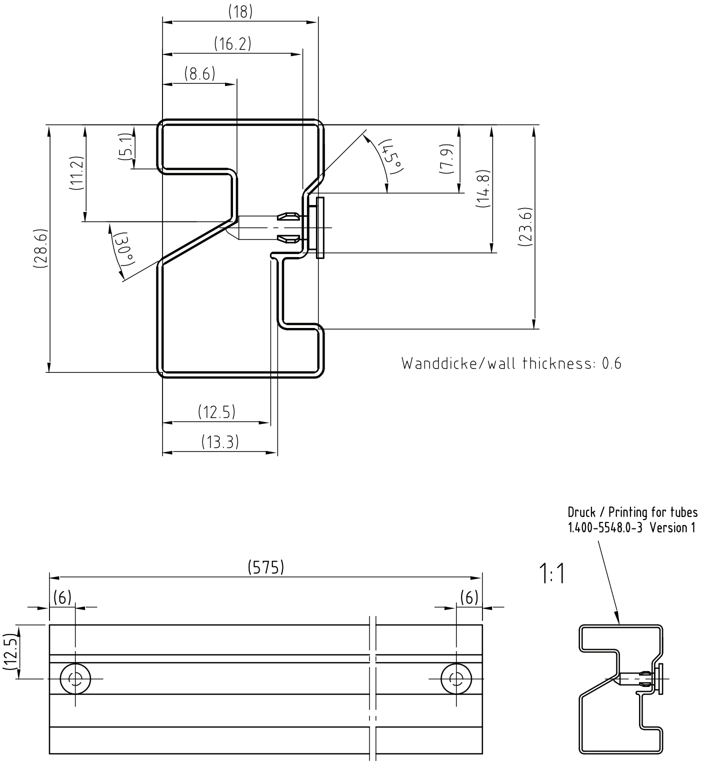
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
XG1	19	Side	Holder	23.05	15.2	14.15

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5134.01-4
Issue: 6; 04.08.09
9612224

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5164.0-4
Rev. 5; Date: 20.11.03
20310-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	X	G	1

2 or 3 digit product series 2 digit frequency Holder type

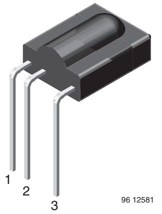
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP31238XG1

PACKING QUANTITY

- 34 pieces per tube
- 12 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

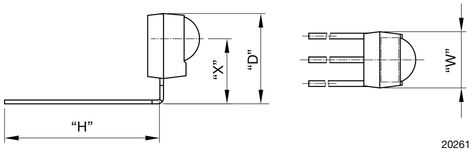
Pb-free

e3

RoHS
COMPLIANT

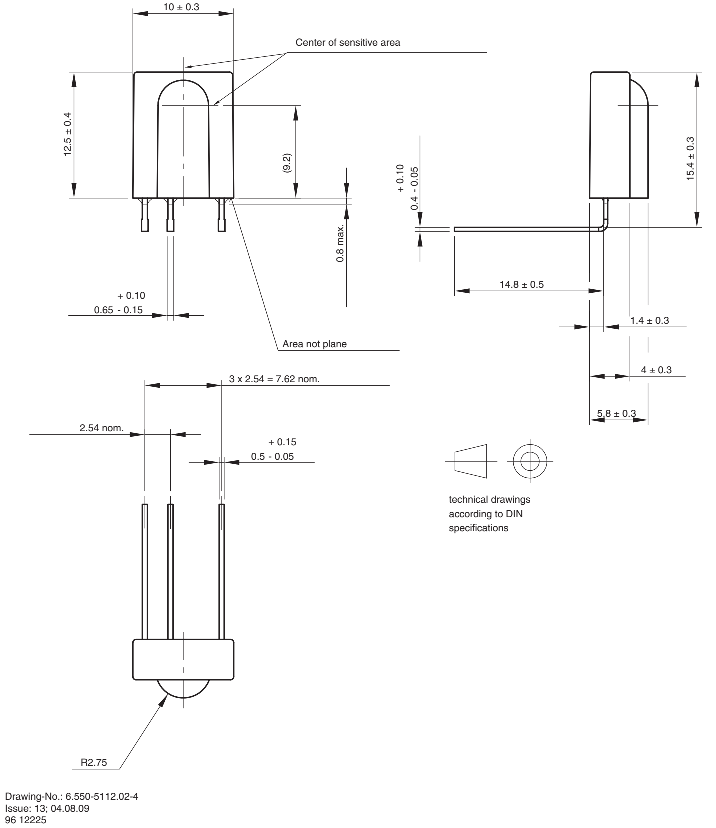
AVAILABLE FOR:

- TSOP31...
- TSOP1...

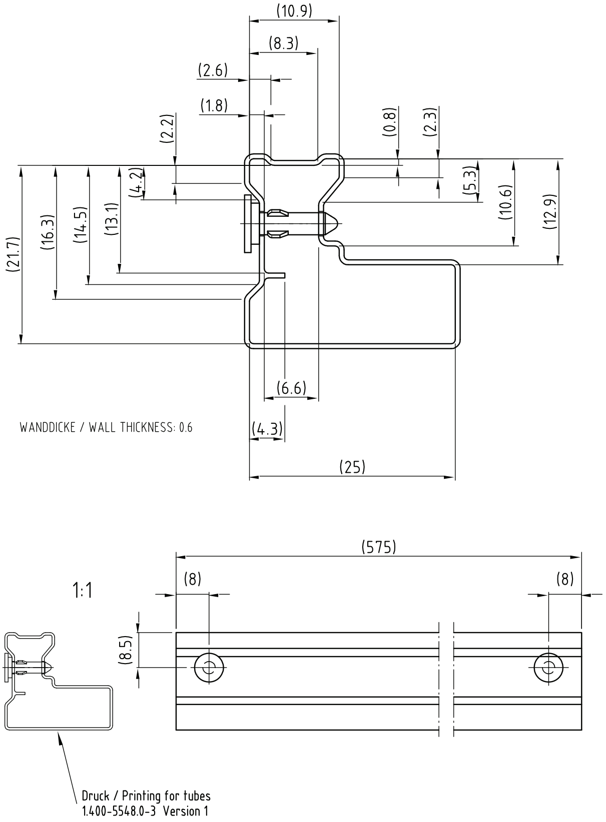


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SB1	12.3		Bend	14.8	10	15.4

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5158.0-4
Rev. 9; Date: 20.11.03
20309-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	B	1

2 or 3 digit product series 2 digit frequency Holder type

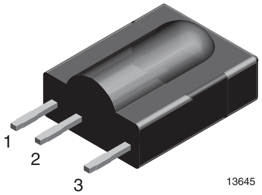
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP31238SB1

PACKING QUANTITY

- 54 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

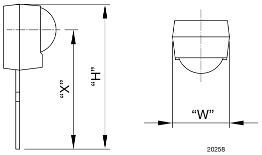
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb
Pb-free

e3
RoHS
COMPLIANT

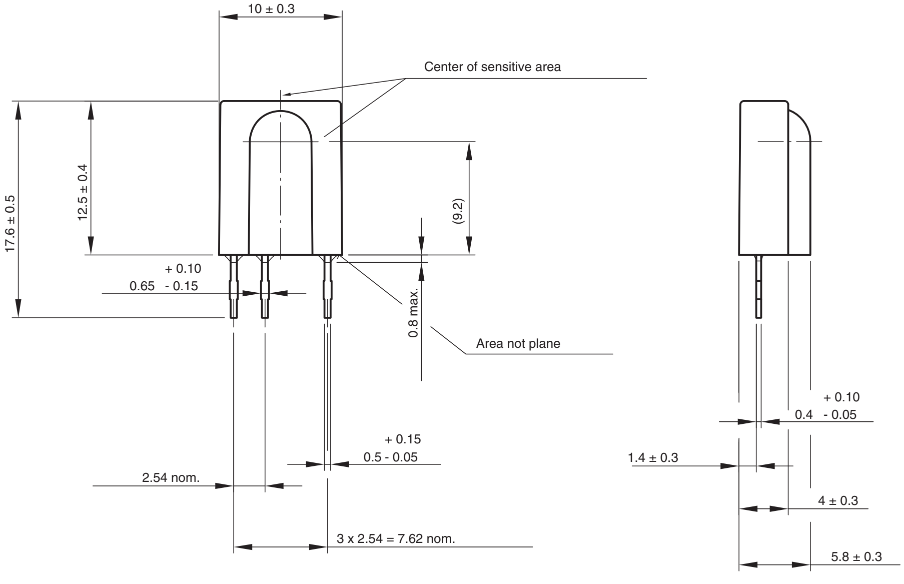
AVAILABLE FOR:

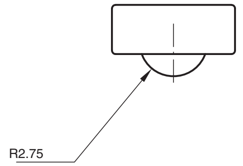
- TSOP31...
- TSOP1...

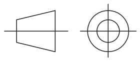


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SD1	14.3		Cut	17.6	10	

MECHANICAL DIMENSIONS in millimeters



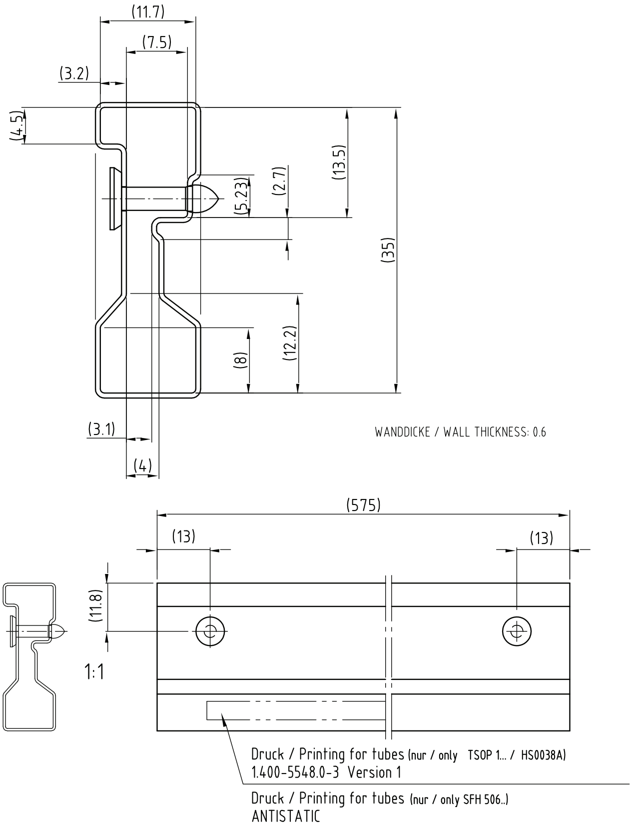




technical drawings
according to DIN
specifications

Drawing-No.: 6.550-5095.03-4
Issue: 11; 04.08.09
12837

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5131.0-4
Rev. 10; Date: 20.11.03
20306-1

ORDERING INFORMATION

T S O P d d d d d S D 1

2 or 3 digit product series   2 digit frequency   Holder type

Note

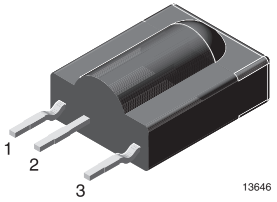
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP31238SD1

PACKING QUANTITY

- 54 pieces per tube
- 20 tubes per carton

IR Receiver Modules for Remote Control Systems



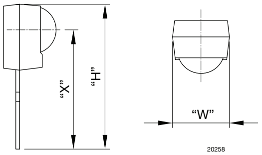
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

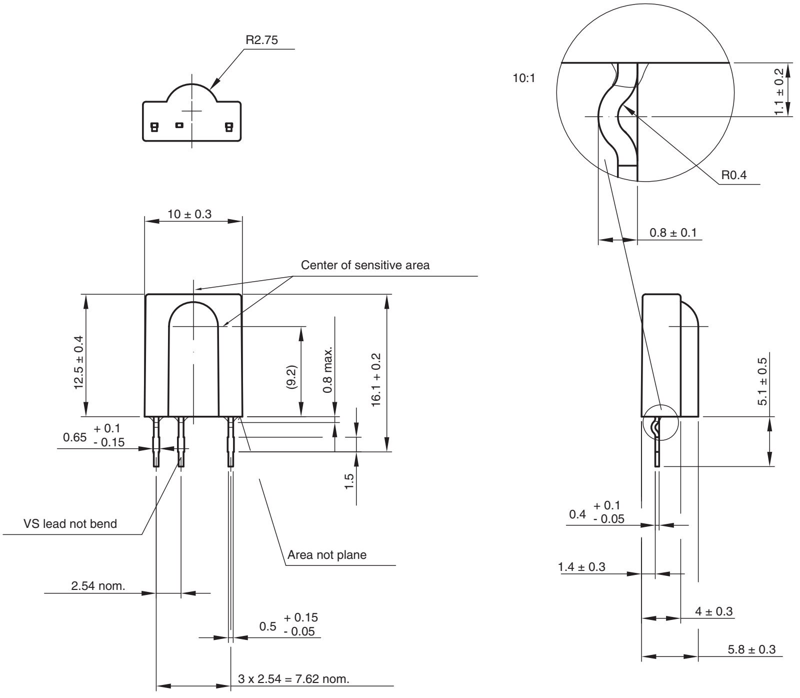
AVAILABLE FOR:

- TSOP31...
- TSOP1...



NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SE1	14.3		Cut	17.6	10	

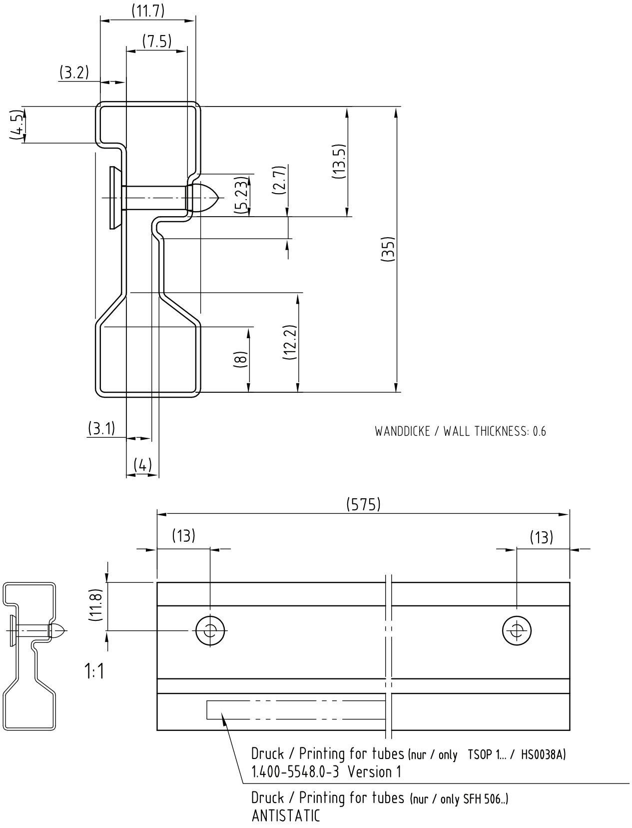
MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5130.01-4
Issue: 9; 04.08.09
12830

technical drawings
according to DIN
specifications

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5131.0-4
Rev. 10; Date: 20.11.03
20306-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	E	1

2 or 3 digit product series 2 digit frequency Holder type

Note

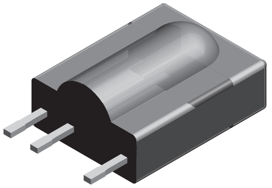
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP31238SE1

PACKING QUANTITY

- 54 pieces per tube
- 20 tubes per carton

IR Receiver Modules for Remote Control Systems



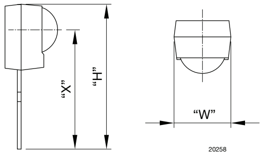
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

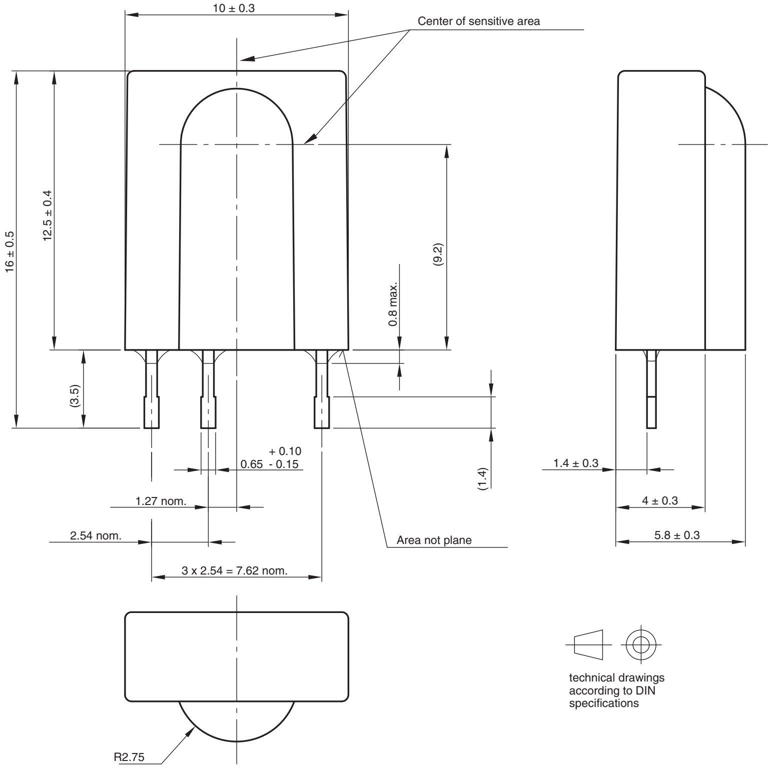
AVAILABLE FOR:

- TSOP31...
- TSOP1...



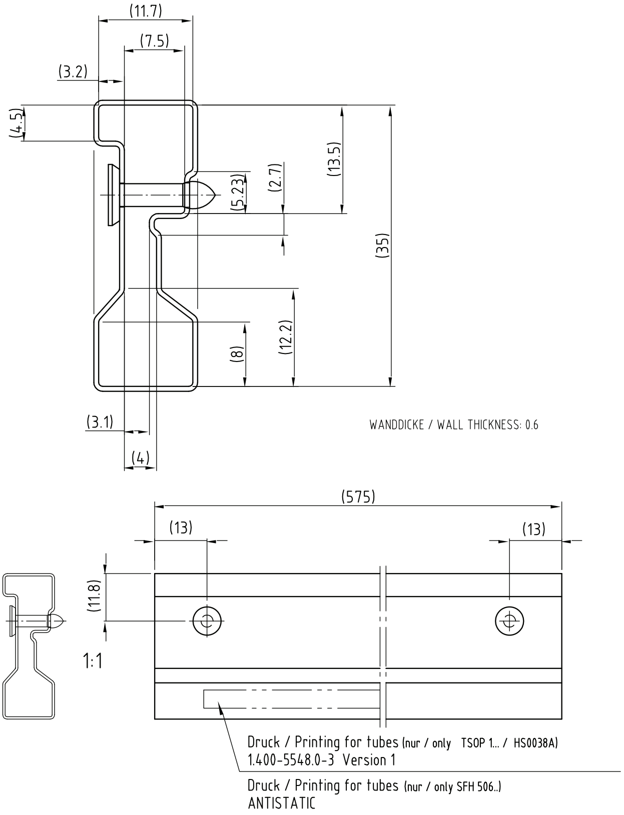
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SH1	12.7		Cut	16	10	

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5095.07-4
Issue: 3; 04.08.09
20366

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5131.0-4
Rev. 10; Date: 20.11.03
20306-1

ORDERING INFORMATION

T S O P d d d d d S H 1

2 or 3 digit product series 2 digit frequency Holder type

Note

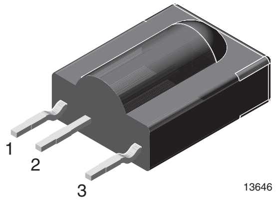
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

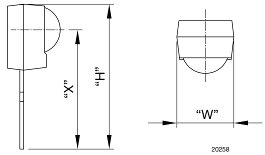
Example: TSOP31238SH1

PACKING QUANTITY

- 54 pieces per tube
- 20 tubes per carton

IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

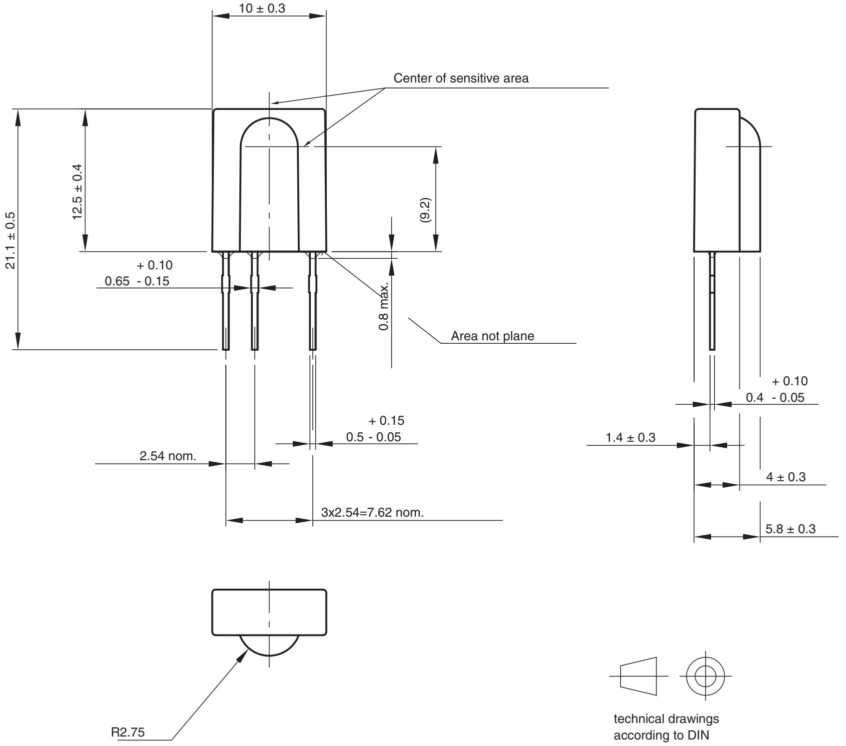
Pb-free
e3
RoHS
COMPLIANT

AVAILABLE FOR:

- TSOP31...
- TSOP1...

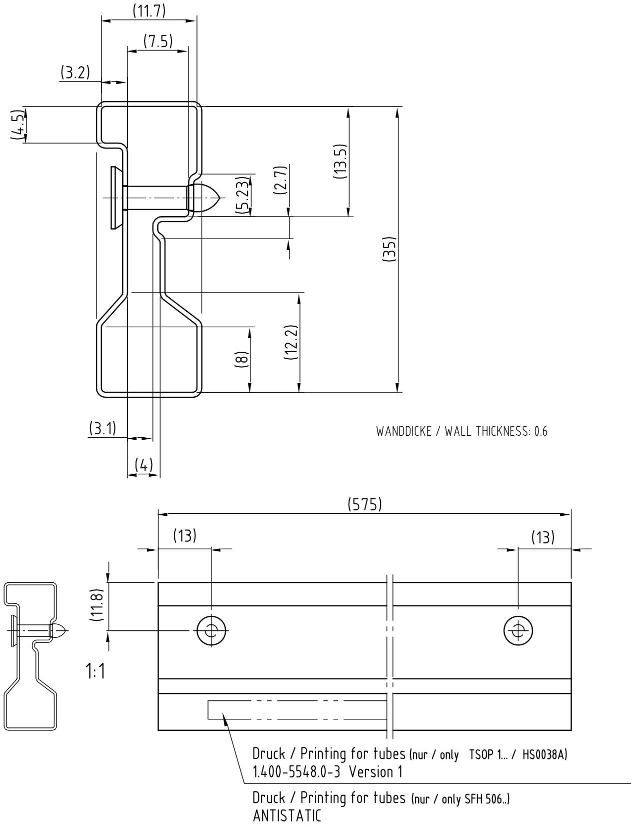
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SK1	17.8		Cut	21.1	10	

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5095.05-4
Issue: 11; 04.08.09
12831

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5131.0-4
Rev. 10; Date: 20.11.03
20306-1

ORDERING INFORMATION

T S O P d d d d d S K 1

2 or 3 digit product series
2 digit frequency
Holder type

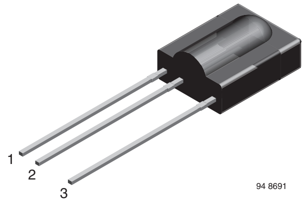
Note
d = “digit”, please consult the list of available series on on the previous page to create a valid part number.

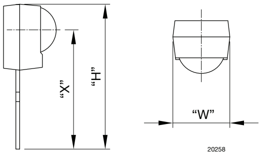
Example: TSOP31238SK1

PACKING QUANTITY

- 54 pieces per tube
- 20 tubes per carton

IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

AVAILABLE FOR:

- TSOP31...
- TSOP1...

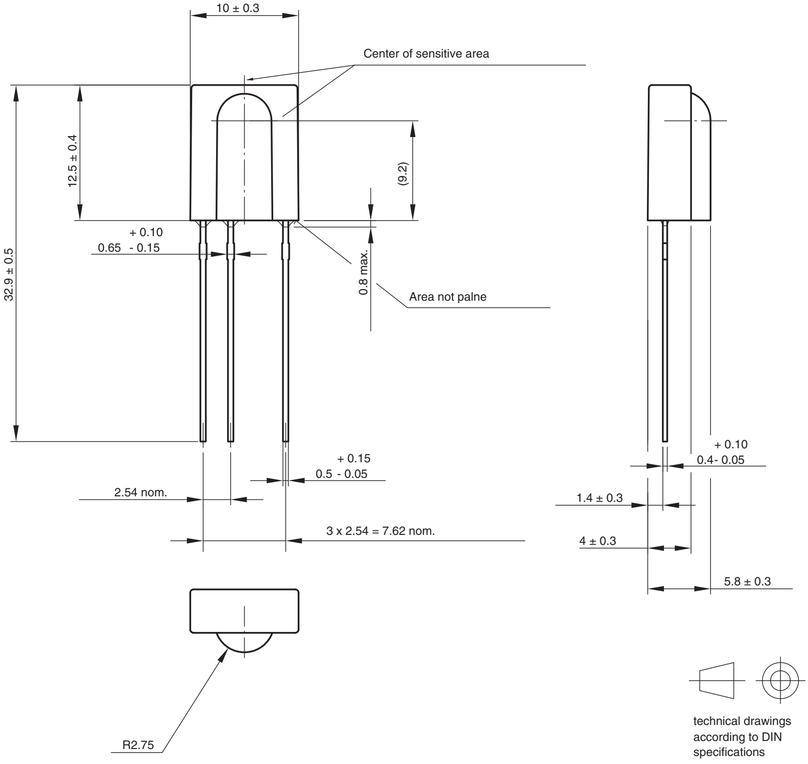
Pb-free

e3

RoHS
COMPLIANT

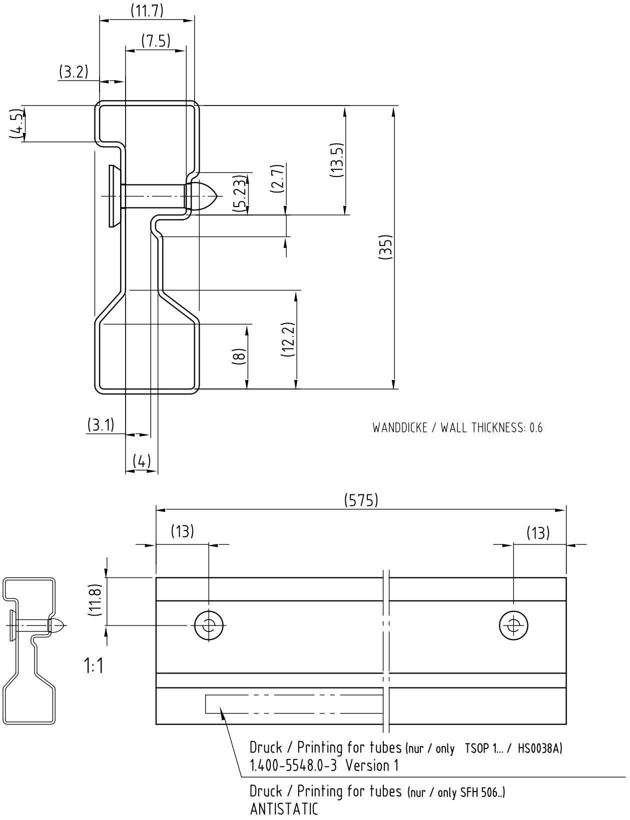
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SM1	29.6		Cut	32.9	10	

MECHANICAL DIMENSIONS in millimeters



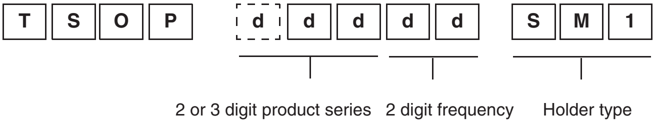
Drawing-No.: 6.550-5095.06-4
Issue: 8; 04.08.09
12838

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5131.0-4
Rev. 10; Date: 20.11.03
20306-1

ORDERING INFORMATION



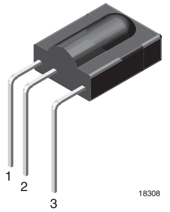
Note
d = "digit", please consult the list of available series on the previous page to create a valid part number.

Example: TSOP31238SM1

PACKING QUANTITY

- 54 pieces per tube
- 20 tubes per carton

IR Receiver Modules for Remote Control Systems



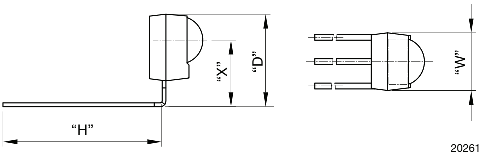
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

AVAILABLE FOR:

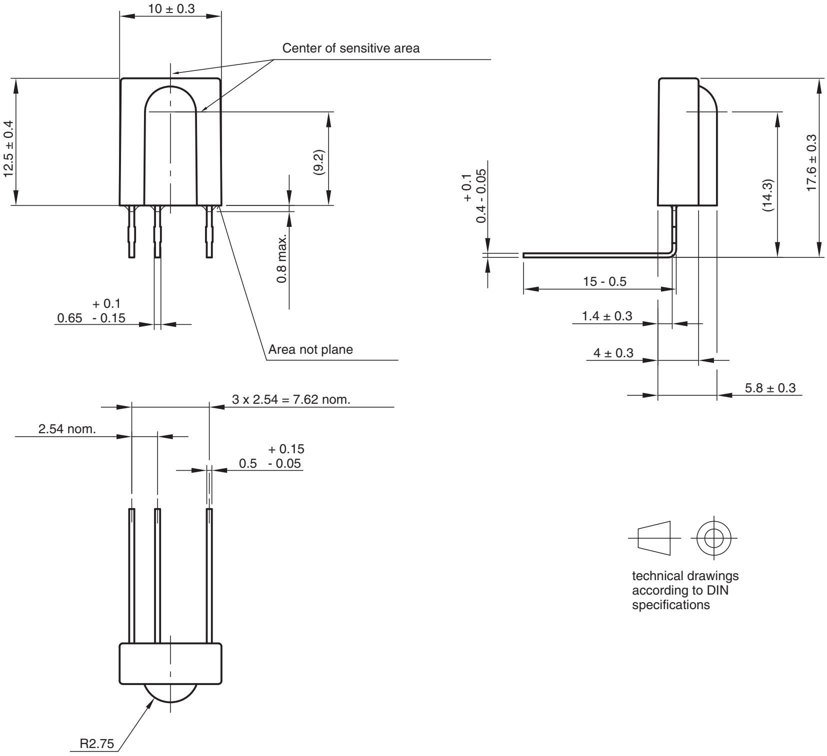
- TSOP31...
- TSOP1...

Pb-free
e3
RoHS
COMPLIANT



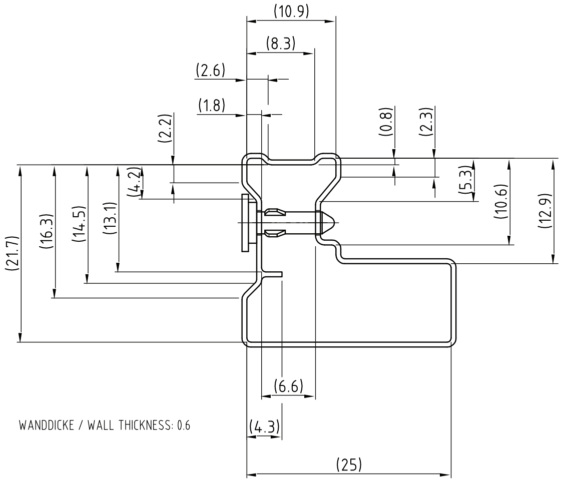
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SP1	14.3		Bend	15	10	17.4

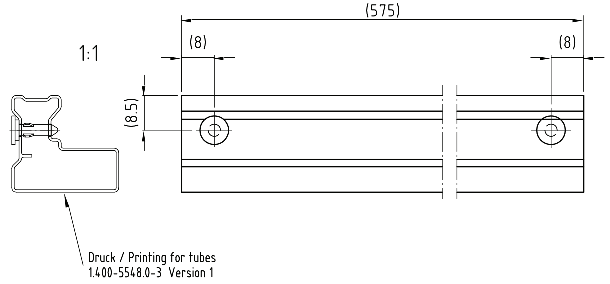
MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5112.05-4
Issue: 9; 04.08.09
15986

PACKAGING DIMENSIONS in millimeters





Drawing-No.: 9.700-5158.0-4
Rev. 9; Date: 20.11.03
20309-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	P	1

2 or 3 digit product series   2 digit frequency   Holder type

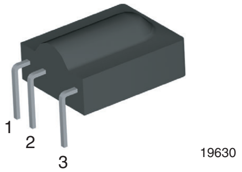
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP31238SP1

PACKING QUANTITY

- 54 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

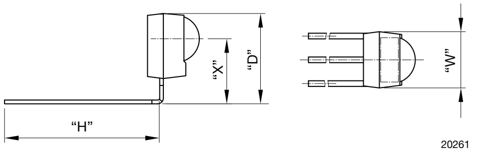
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

AVAILABLE FOR:

- TSOP31...
- TSOP1...

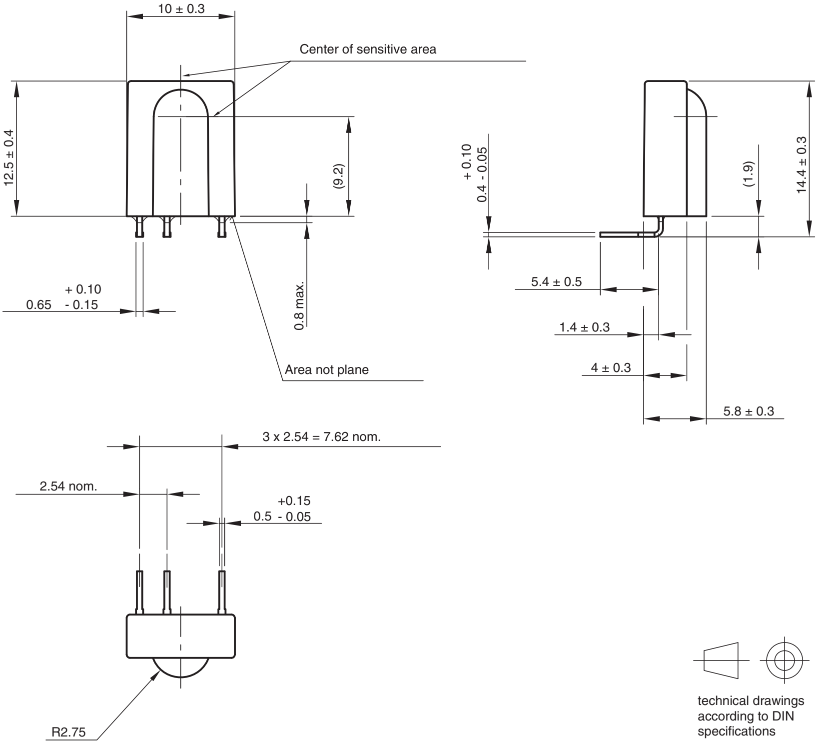
Pb-free

RoHS
COMPLIANT



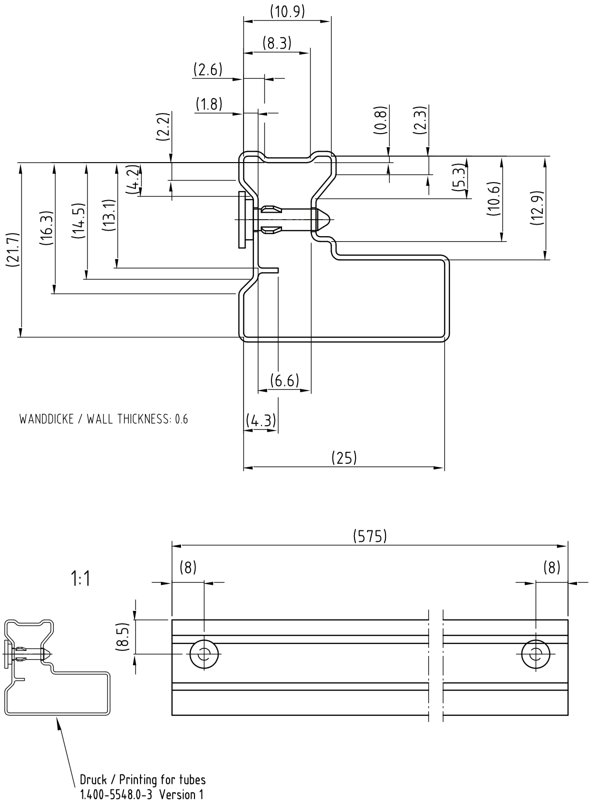
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SR1	11.1		Bend	5.4	10	14.4

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5112.07-4
Issue: 7; 04.08.09
19627

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5158.0-4
Rev. 9; Date: 20.11.03
20309-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	R	1

2 or 3 digit product series 2 digit frequency Holder type

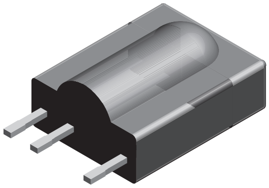
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP31238SR1

PACKING QUANTITY

- 54 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems



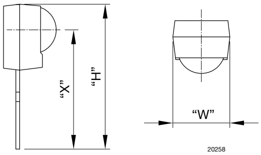
20423

FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

AVAILABLE FOR:

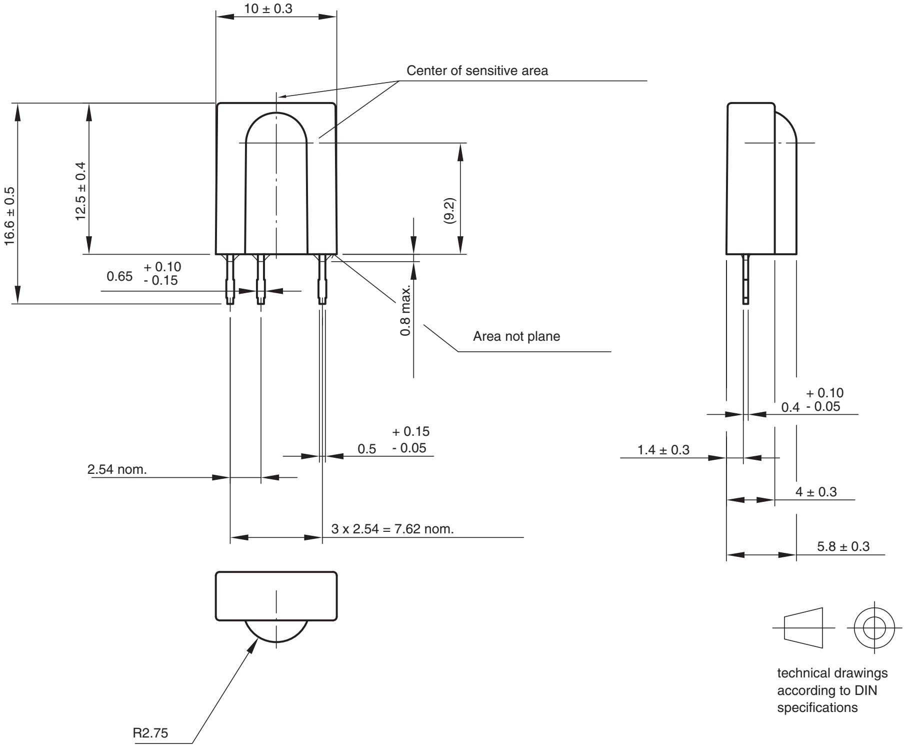
- TSOP31...
- TSOP1...



20258

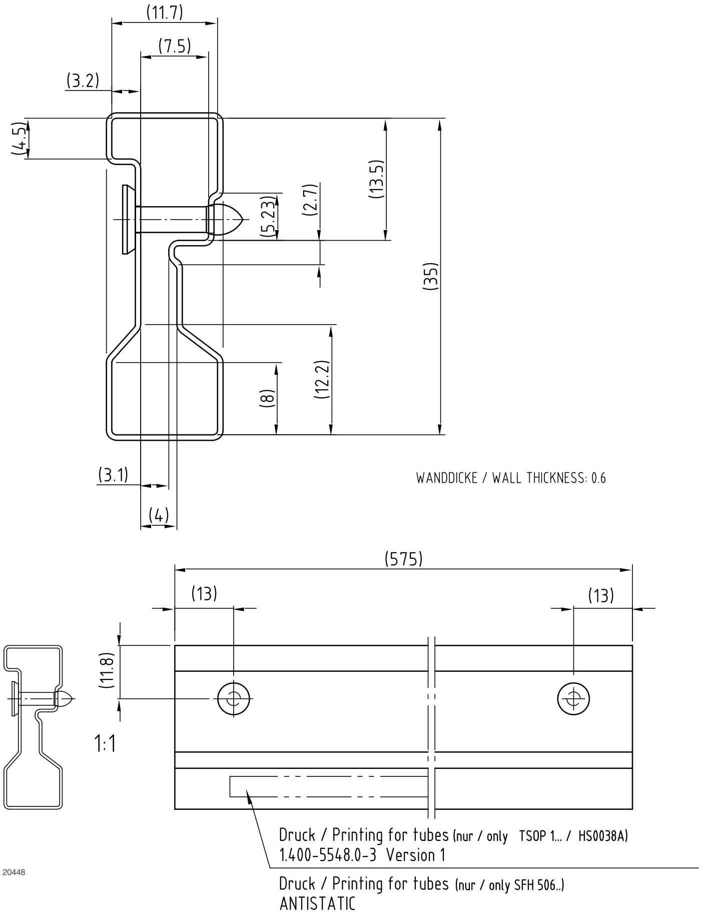
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SA1	13.3		Cut	16.6	10	

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5095.04-4
Issue: 11; 04.08.09
20449

PACKAGING DIMENSIONS in millimeters



ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	A	1

2 or 3 digit product series 2 digit frequency Holder type

Note

d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP31238SA1

PACKING QUANTITY

- 54 pieces per tube
- 20 tubes per carton

Molded Mechanical Options

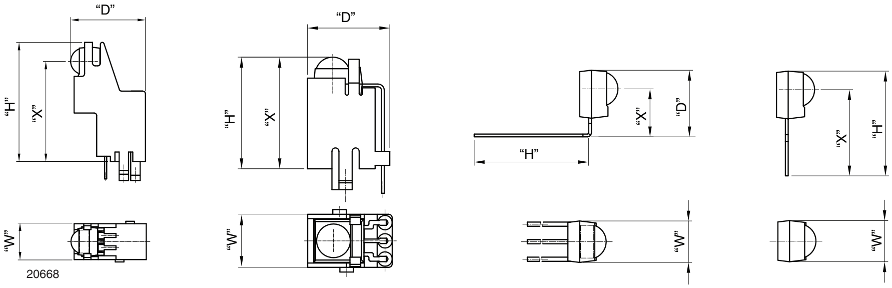
Contents

Molded Holders

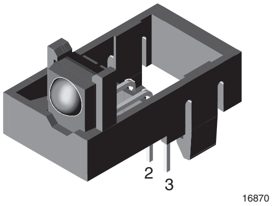
Molded Cuts and Bends

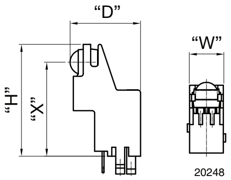
Molded Photomodule Holders, Cuts and Bends

HOLDER	D	H	W	X	VIEW	TYPE	PAGE
MQ	23.1	13.1	12.2	9	Side	Holder	511
NN	25.5	19	14.4	14.9	Side	Holder	513
TE	15.7	21.9	7.45	18.3	Side	Holder	515
PM	19.1	15.5	9.4	12	Side	Holder	517
RF	11.8	16	7.4	16	Top	Holder	519
QJ	11.8	20	7.4	20	Top	Holder	521
UH	9.25	13.2	7.4	9.6	Side	Holder	523
XG	11.4	22.6	7.4	19	Side	Holder	525
YA	14	12	7.4	12	Top	Holder	527
WE	14.25	22.6	7.45	19	Side	Holder	529
JH	9.2	13.2	7.4	9.6	Side	Holder	531
JK	9.2	13.2	7.4	9.6	Side	Holder	533
JL	9.2	13.2	7.4	9.6	Side	Holder	535
LL	14	7.2	7.4	7.2	Top	Holder	537
ZC	14	16	7.4	16	Top	Holder	539
VI	9.5	10.2	7.4	6.6	Side	Holder	541
KU	14.25	18.6	7.45	15	Side	Holder	543
IV	8.6	13.2	7.2	9.6	Side	Holder	545
AY	18.95	22.6	7.4	19	Side	Holder	547
CZ	9.65	6.8	6.8	6.8	Top	Holder	549
VM1	9.5	10.2	7.4	6.6	Side	Holder	551
CUT OR BEND	**D**	**H**	**W**	**X**	**VIEW**	**TYPE**	**PAGE**
SA	12.6	11.45	6	9.9		Bend	553
SB	9.65	20.8	6	6.95		Bend	555
SC	12.6	15.45	6	9.9		Bend	557
SD	9.65	16.2	6	6.95		Bend	559
SK	12.95	5.2	6	10.25		Bend	561
SI		12.35	6	9.65		Cut	563
SJ	10.1	19.25	6	7.4		Bend	565
SO	10.1	9.6	6	7.4		Bend	567
SP	9	20.8	6	6.3		Bend	569
SR	17	10	6	14.3		Bend	571
ST	9.65	5	6	6.95		Bend	573
SW	9.65	7	6	6.95		Bend	575
SL	12.6	6.6	6	9.9		Bend	577
DA	9	21.6	6	6.3		Bend	579
DE	-	14.2	6	11.25		Bend	581
DF	-	12.25	6	9.55		Bend	583
DG	-	30.5	6	27.8		Cut	585
DB	-	18	6	15.3		Cut	587
DI	9.2	12.6	6	6.5		Bend	589



IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

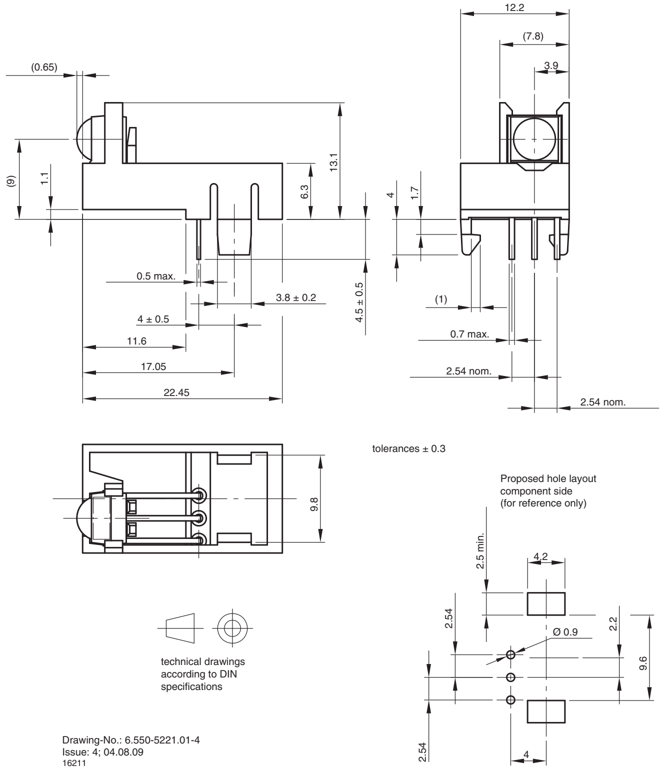
Pb-free
e3
RoHS
COMPLIANT

AVAILABLE FOR:

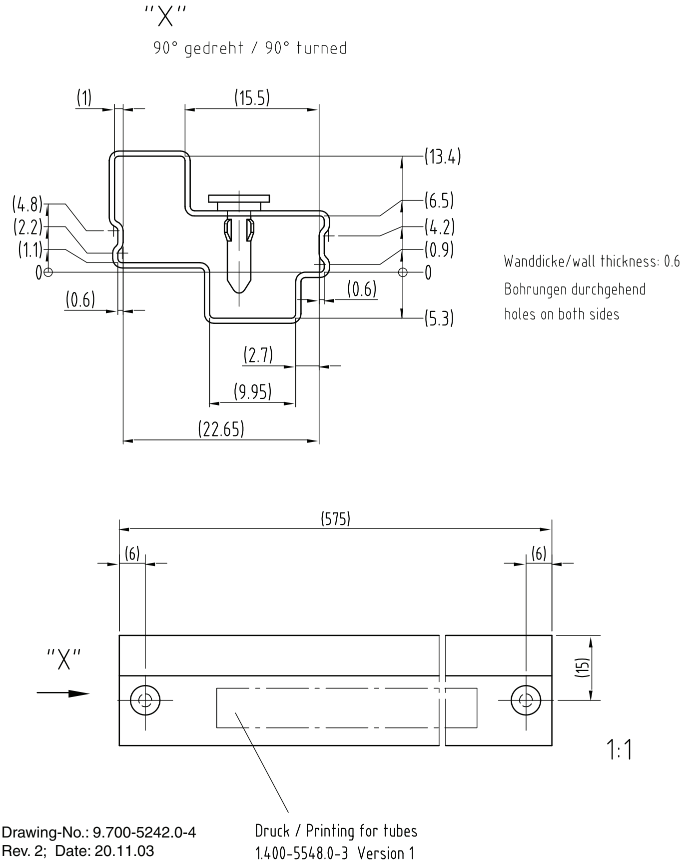
- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
MQ1	9	Side	Holder	13.1	12.2	23.1

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5242.0-4
Rev. 2; Date: 20.11.03

20268-1

ORDERING INFORMATION

T S O P d d d d d M Q 1

2 or 3 digit product series
2 digit frequency
Holder type

Note

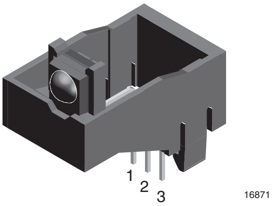
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

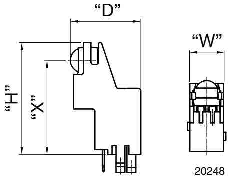
Example: TSOP32138MQ1

PACKING QUANTITY

- 45 pieces per tube
- 20 tubes per carton

IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

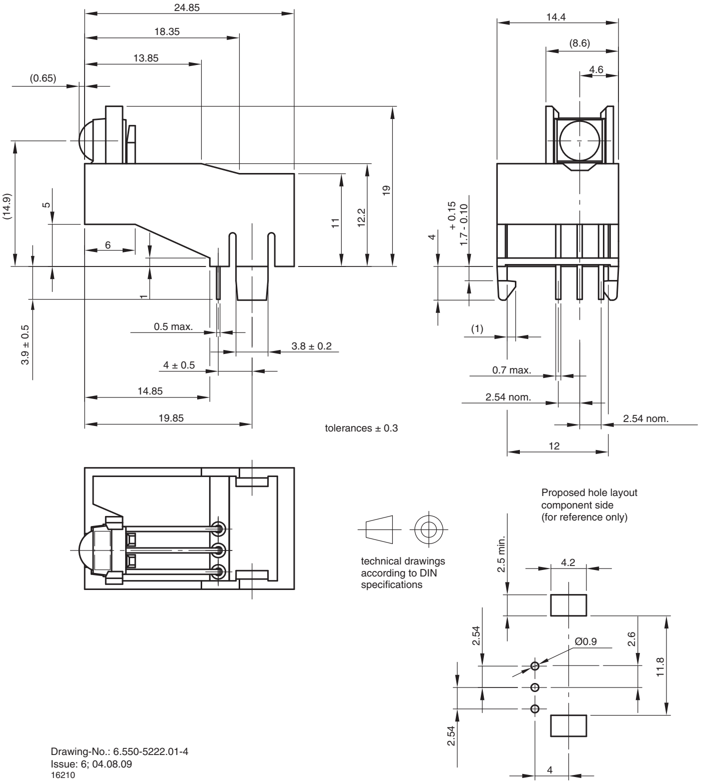
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

Pb-free
e3
RoHS
COMPLIANT

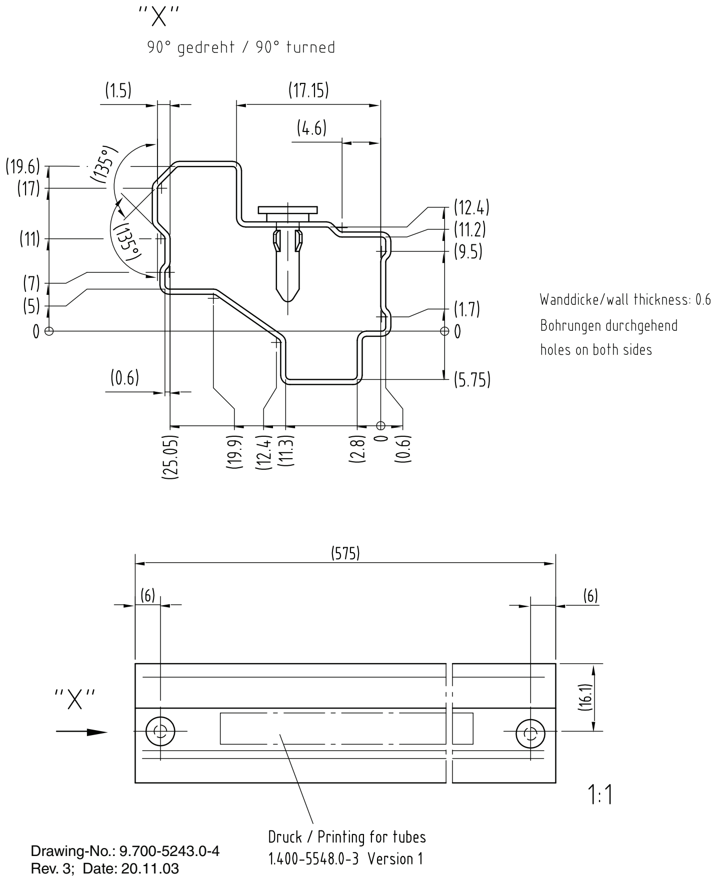
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
NN1	14.9	Side	Holder	19	14.4	25.5

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5222.01-4
Issue: 6; 04.08.09
16210

PACKAGING DIMENSIONS in millimeters



Wanddicke/wall thickness: 0.6
Bohrungen durchgehend
holes on both sides

Drawing-No.: 9.700-5243.0-4
Rev. 3; Date: 20.11.03
20269-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	N	N	1

2 or 3 digit product series
2 digit frequency
Holder type

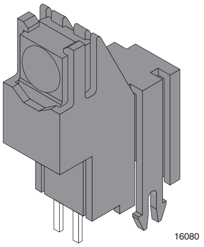
Note
d = "digit", please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838NN1

PACKING QUANTITY

- 38 pieces per tube
- 15 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

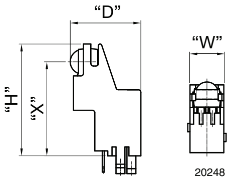
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb
Pb-free

e3
RoHS
COMPLIANT

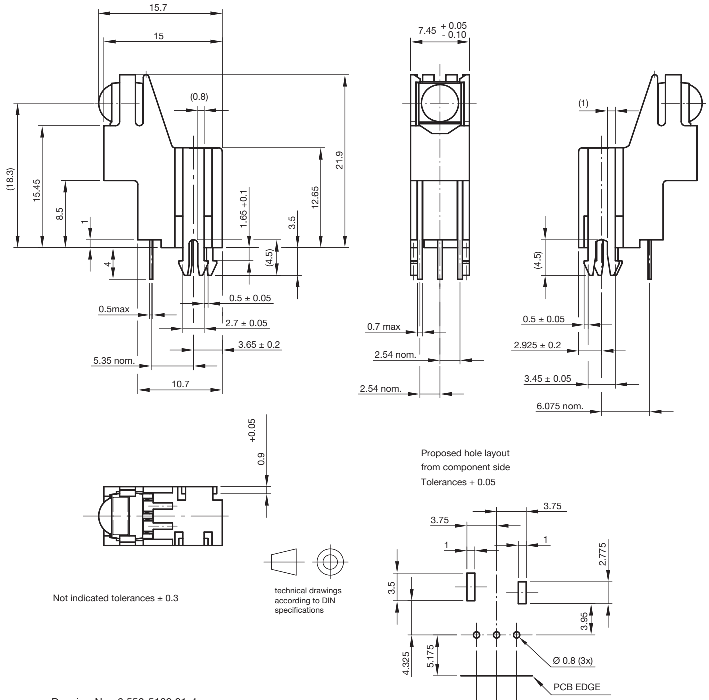
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....



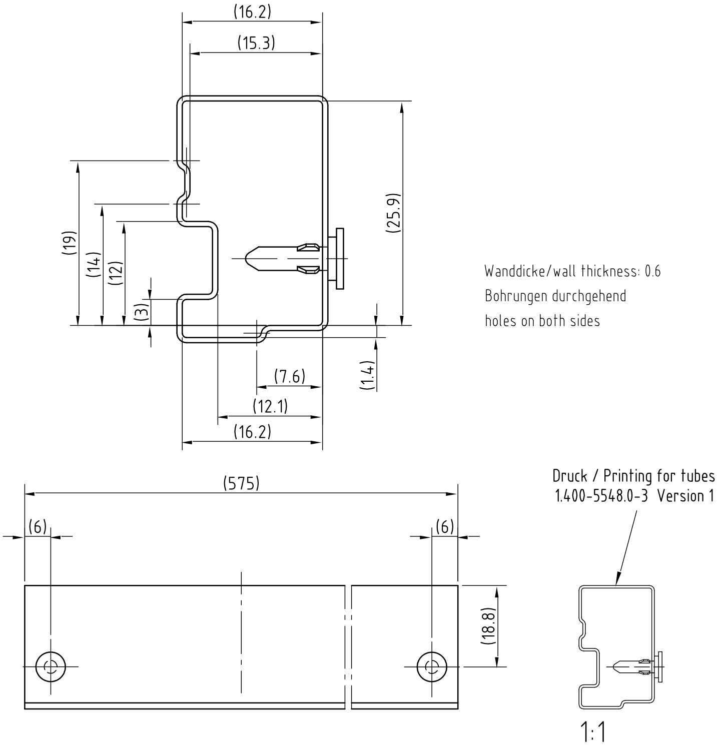
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
TE1	18.3	Side	Holder	21.9	7.45	15.7

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5189.01-4
Issue: 4; 15.03.10
15837

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5215.0-4
Rev. 5; Date: 20.11.03

20264-1

ORDERING INFORMATION

T S O P d d d d d T E 1

2 or 3 digit product series 2 digit frequency Holder type

Note

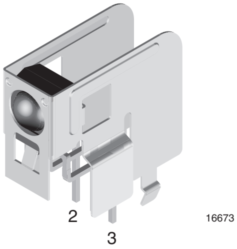
d = “digit”, please consult the list of available series on page 1 to create a valid part number.

Example: TSOP14838TE1

PACKING QUANTITY

- 74 pieces per tube
- 18 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

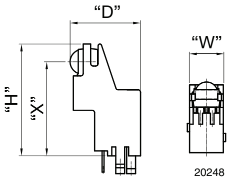
Pb-free

e3

RoHS
COMPLIANT

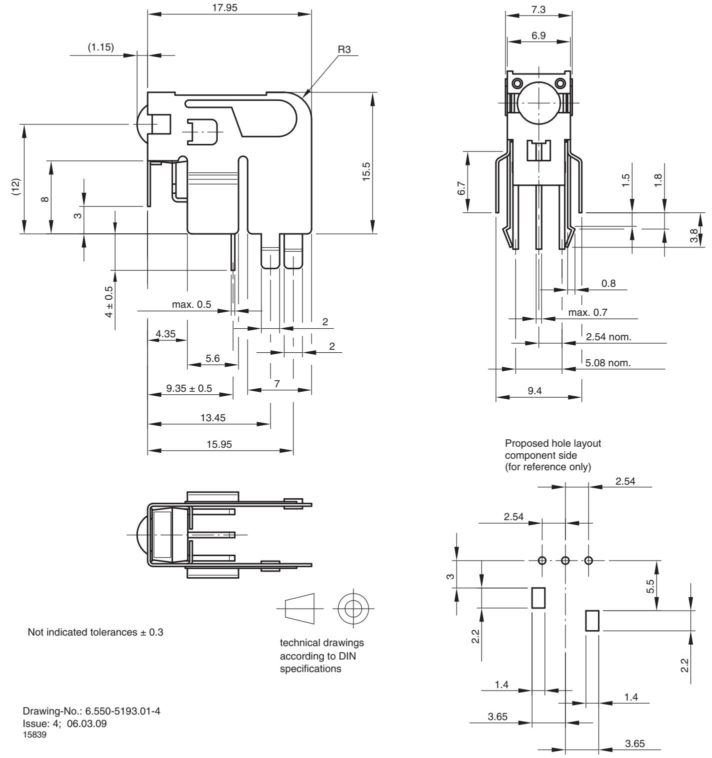
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....



NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
PM1	12	Side	Holder	15.5	9.4	19.1

MECHANICAL DIMENSIONS in millimeters

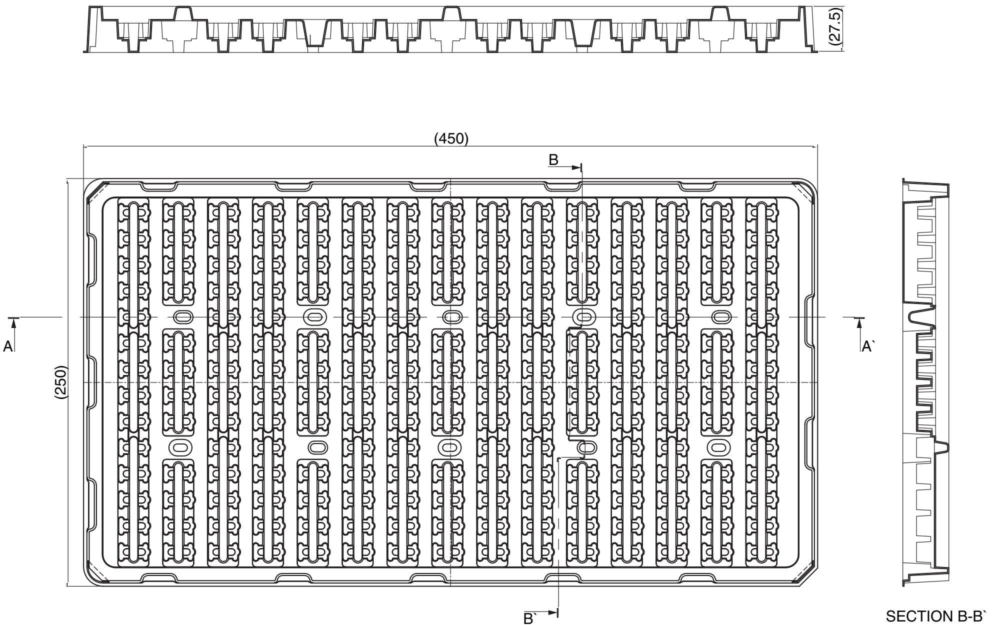


Not indicated tolerances ± 0.3

technical drawings according to DIN specifications

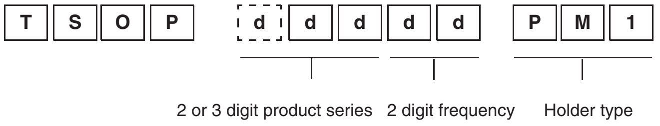
Drawing-No.: 6.550-5193.01-4
Issue: 4; 06.03.09
15839

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5229.0-1
Rev. 2; Date: 07.07.03
20274-1

ORDERING INFORMATION



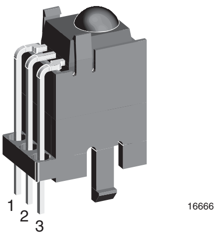
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838PM1

PACKING QUANTITY

- 200 pieces per tray
- 5 trays per carton

IR Receiver Modules for Remote Control Systems



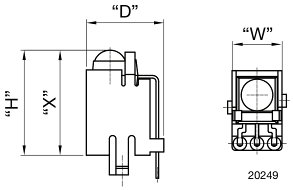
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

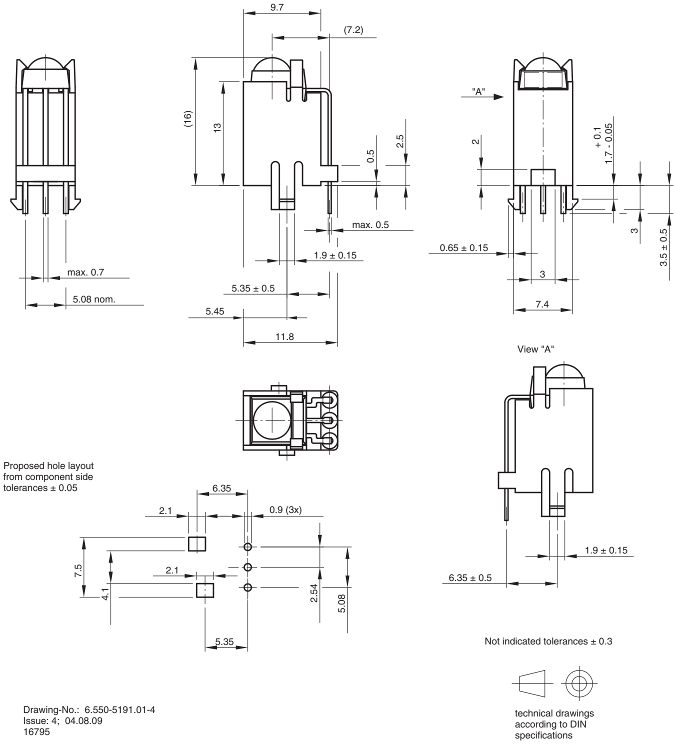
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....



NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
RF1	16	Top	Holder	16	7.4	11.8

MECHANICAL DIMENSIONS in millimeters



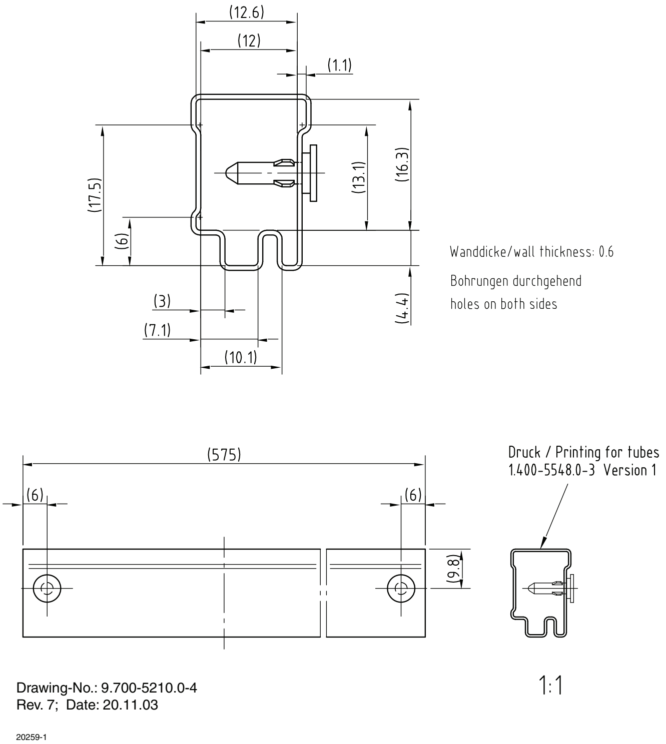
Proposed hole layout from component side tolerances ± 0.05

Not indicated tolerances ± 0.3

Drawing-No.: 6.550-5191.01-4
Issue: 4; 04.08.09
16795

technical drawings according to DIN specifications

PACKAGING DIMENSIONS in millimeters



ORDERING INFORMATION

T S O P d d d d d R F 1

2 or 3 digit product series 2 digit frequency Holder type

Note

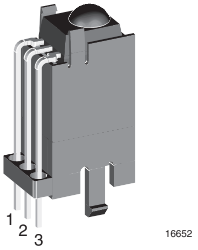
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838RF1

PACKING QUANTITY

- 68 pieces per tube
- 30 tubes per carton

IR Receiver Modules for Remote Control Systems

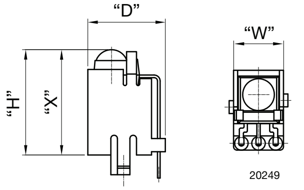


FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

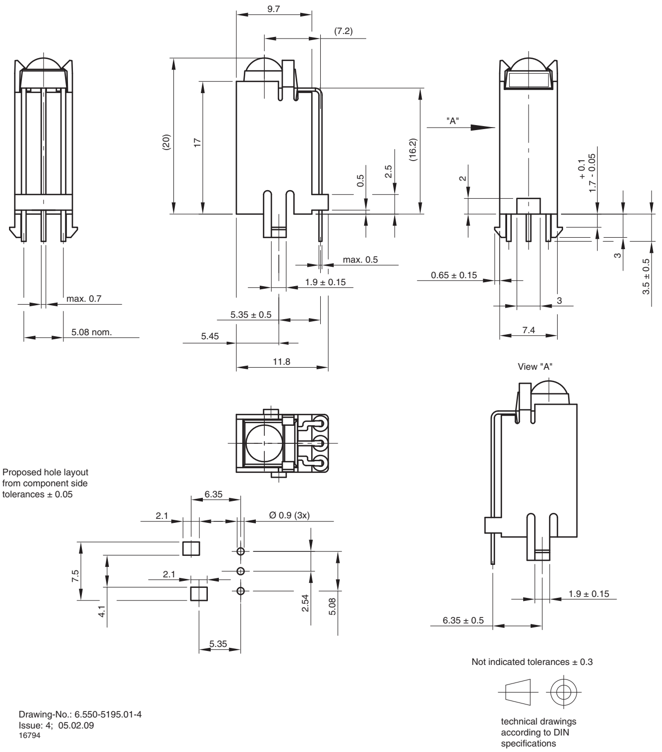
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....



NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
QJ1	20	Top	Holder	20	7.4	11.8

MECHANICAL DIMENSIONS in millimeters



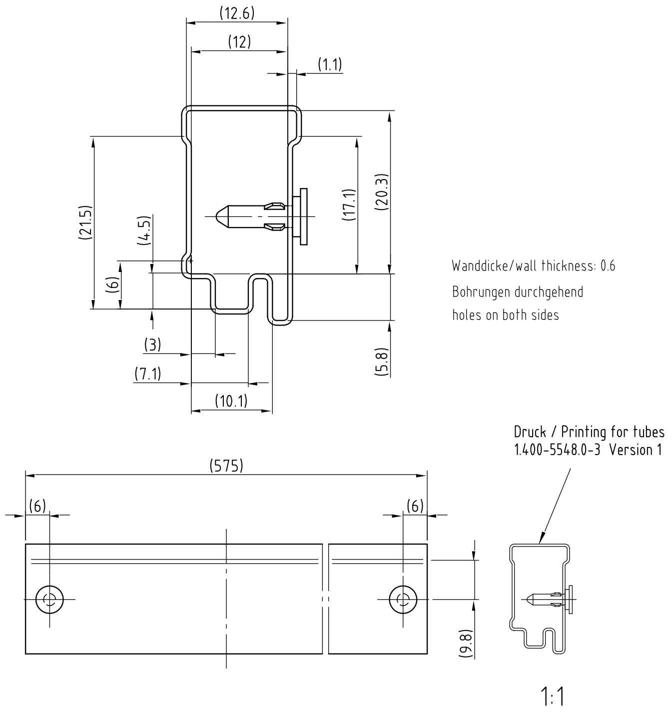
Proposed hole layout
from component side
tolerances ± 0.05

Not indicated tolerances ± 0.3

technical drawings
according to DIN
specifications

Drawing-No.: 6.550-5195.01-4
Issue: 4; 05.02.09
16794

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5220.0-4
Rev. 4; Date: 20.11.03
20316-1

ORDERING INFORMATION

T S O P d d d d d Q J 1

2 or 3 digit product series 2 digit frequency Holder type

Note

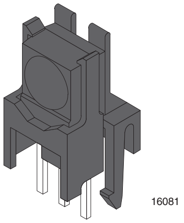
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838QJ1

PACKING QUANTITY

- 68 pieces per tube
- 20 tubes per carton

IR Receiver Modules for Remote Control Systems



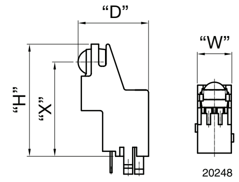
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

AVAILABLE FOR:

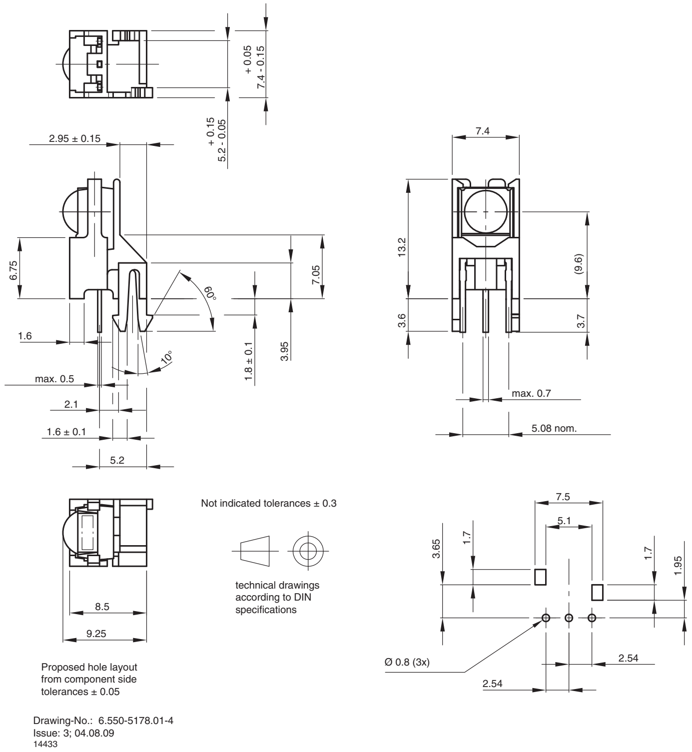
- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

e3
RoHS
COMPLIANT

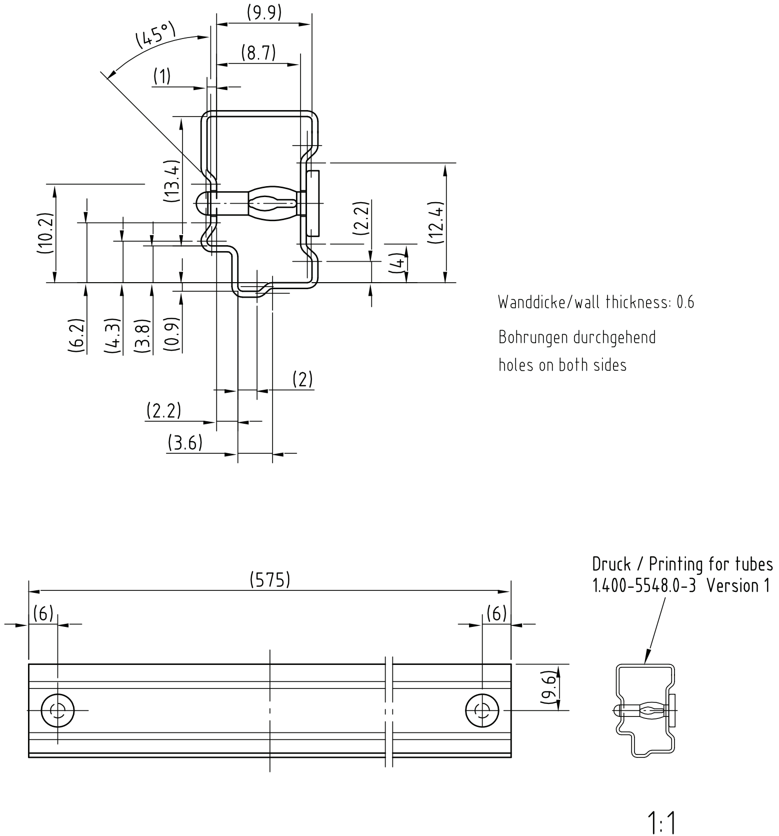


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
UH1	9.6	Side	Holder	13.2	7.4	9.25

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5211.0-4
Rev. 10; Date: 20.11.03

20260-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	U	H	1

2 or 3 digit product series 2 digit frequency Holder type

Note

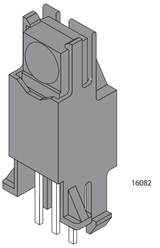
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838UH1

PACKING QUANTITY

- 72 pieces per tube
- 33 tubes per carton

IR Receiver Modules for Remote Control Systems



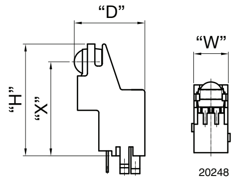
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

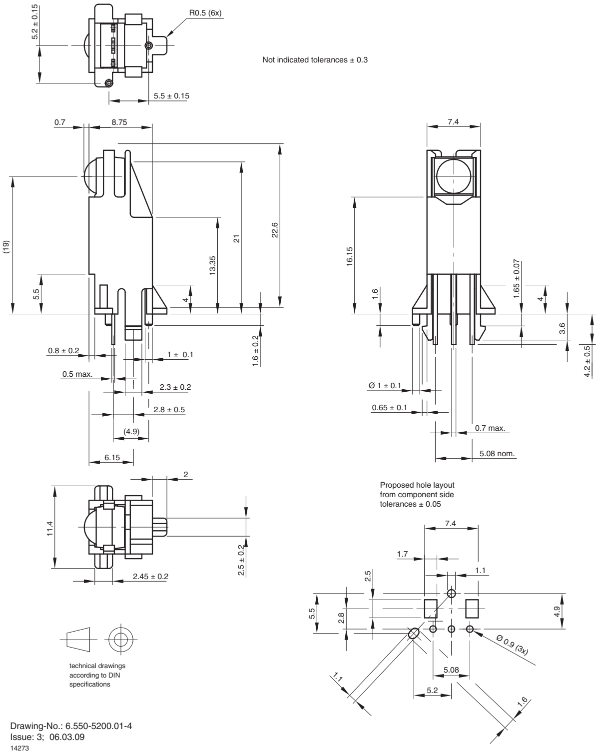
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....



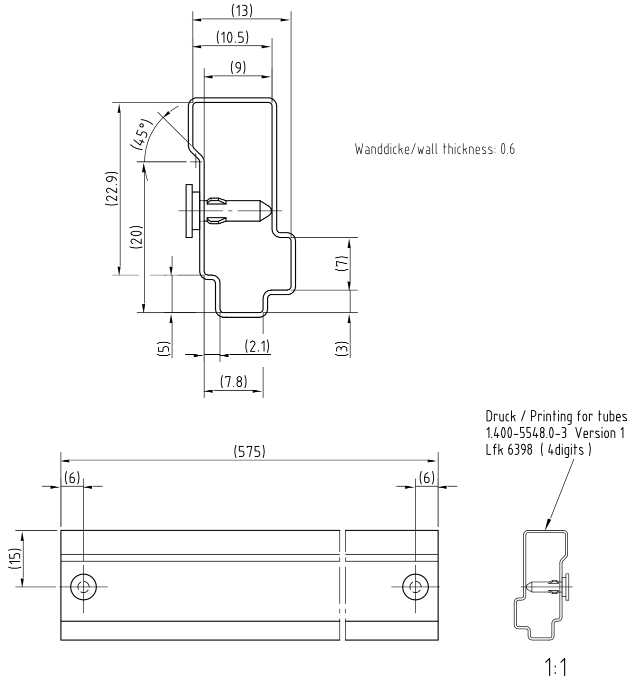
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
XG1	19	Side	Holder	22.6	7.4	11.4

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5200.01-4
Issue: 3; 06.03.09
14273

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5207.0-4
Rev. 10; Date: 20.11.03
20315-1

ORDERING INFORMATION

T S O P d d d d d X G 1

2 or 3 digit product series 2 digit frequency Holder type

Note

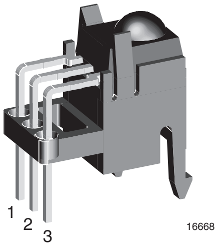
d = "digit", please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838XG1

PACKING QUANTITY

- 47 pieces per tube
- 18 tubes per carton

IR Receiver Modules for Remote Control Systems



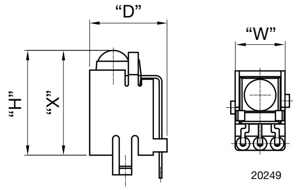
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

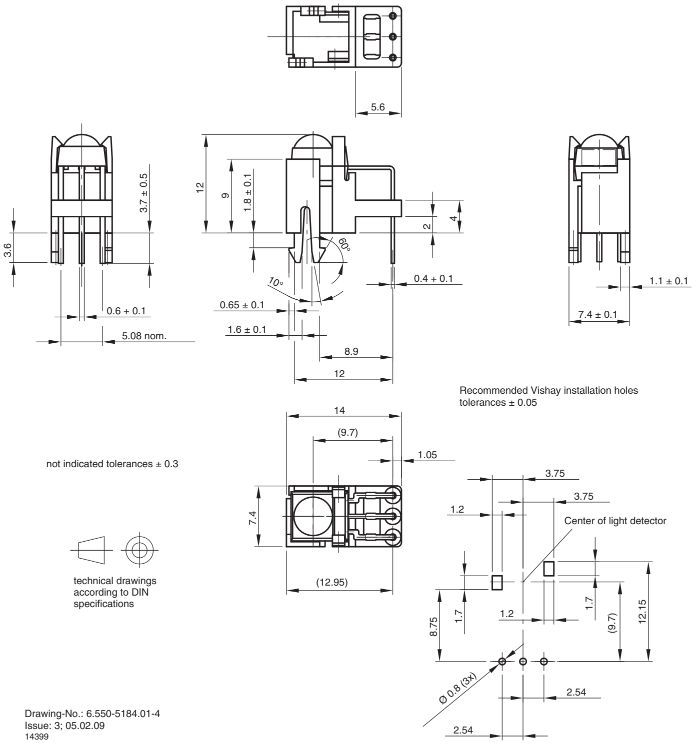
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

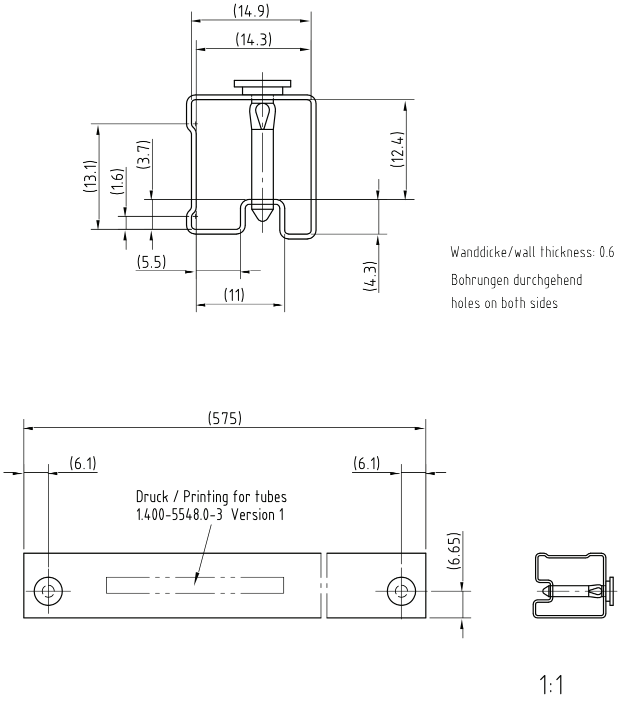


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
YA1	12	Top	Holder	12	7.4	14

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5214.0-4
Rev. 8; Date: 21.04.06

20263-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	Y	A	1

2 or 3 digit product series 2 digit frequency Holder type

Note

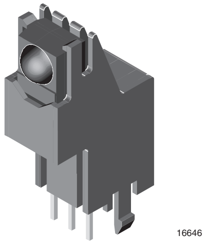
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838YA1

PACKING QUANTITY

- 75 pieces per tube
- 27 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

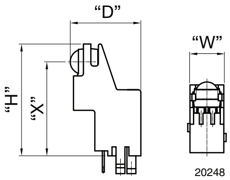
Pb-free

e3

RoHS
COMPLIANT

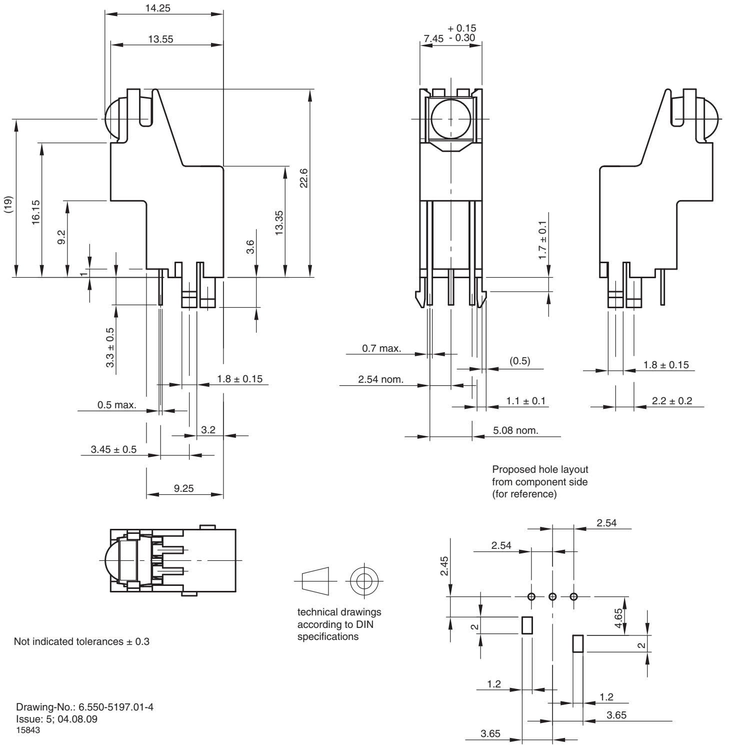
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

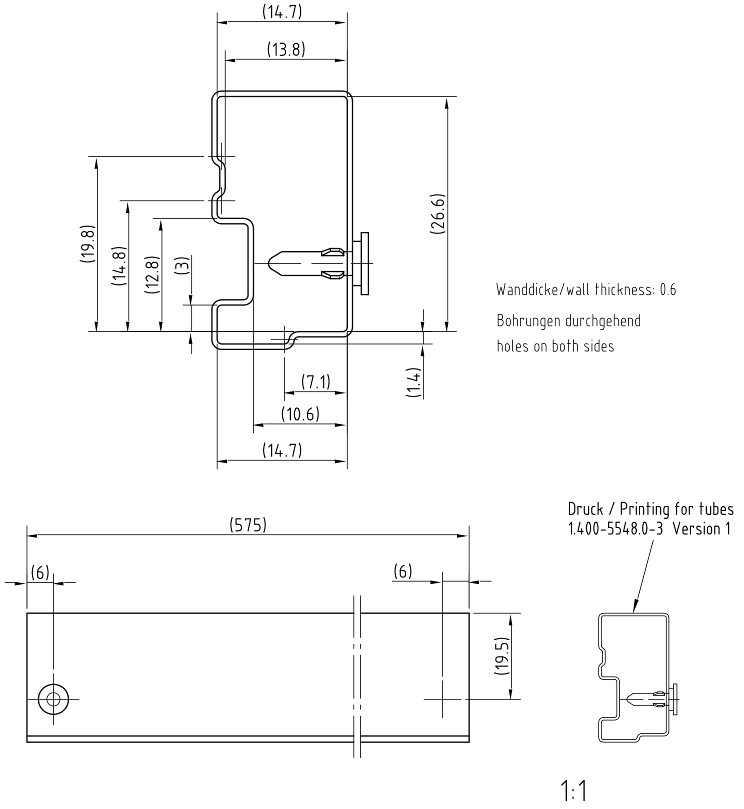


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
WE1	19	Side	Holder	22.6	7.45	14.25

MECHANICAL DIMENSIONS in millimeters



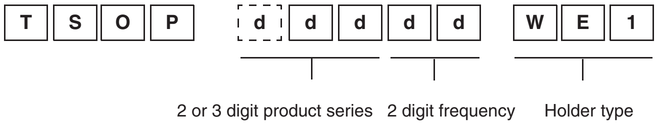
PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5219.0-4
Rev. 5; Date: 20.11.03

20265-1

ORDERING INFORMATION



Note

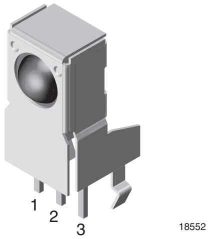
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838WE1

PACKING QUANTITY

- 65 pieces per tube
- 18 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

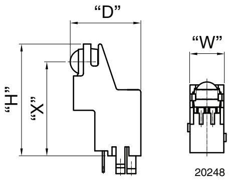
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb
Pb-free

e3
RoHS
COMPLIANT

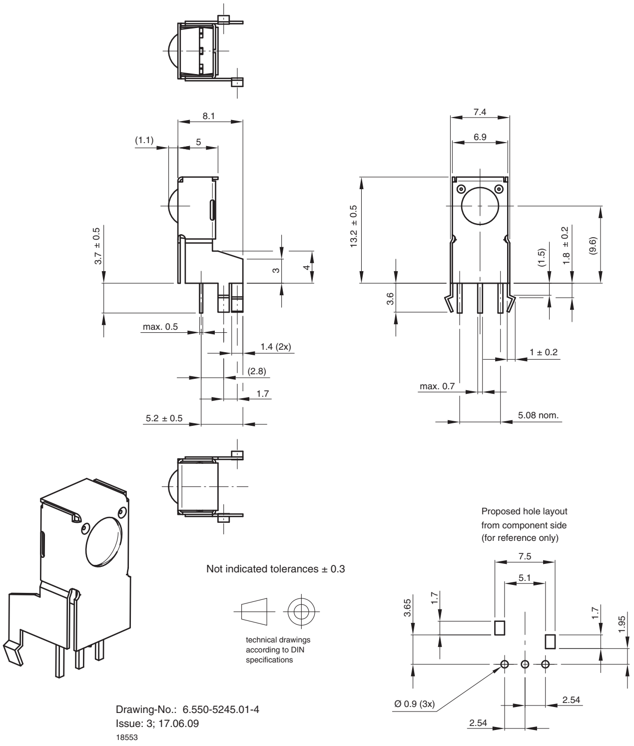
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....



NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
JH1	9.6	Side	Holder	13.2	7.4	9.2

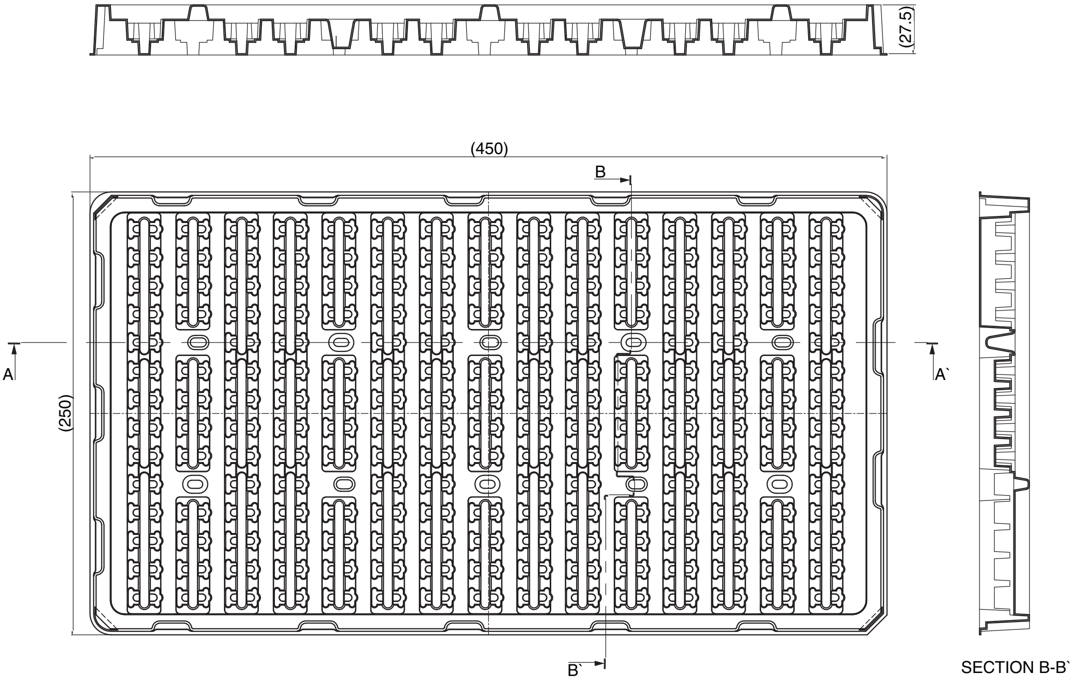
MECHANICAL DIMENSIONS in millimeters



Not indicated tolerances ± 0.3

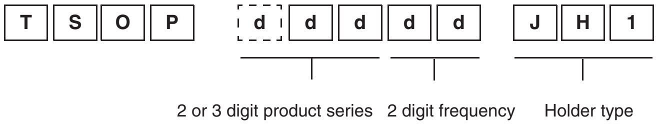
Drawing-No.: 6.550-5245.01-4
Issue: 3; 17.06.09

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5229.0-1
Rev. 2; Date: 07.07.03
20274-1

ORDERING INFORMATION



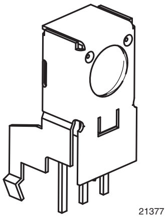
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838JH1

PACKING QUANTITY

- 200 pieces per tray
- 3 trays per carton

IR Receiver Modules for Remote Control Systems



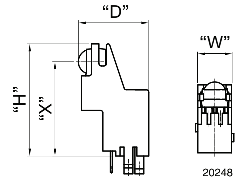
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

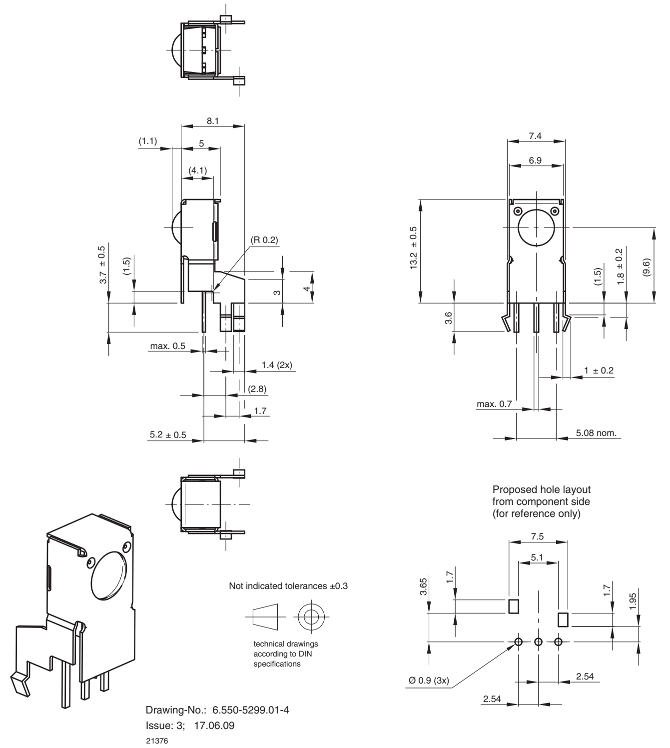
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

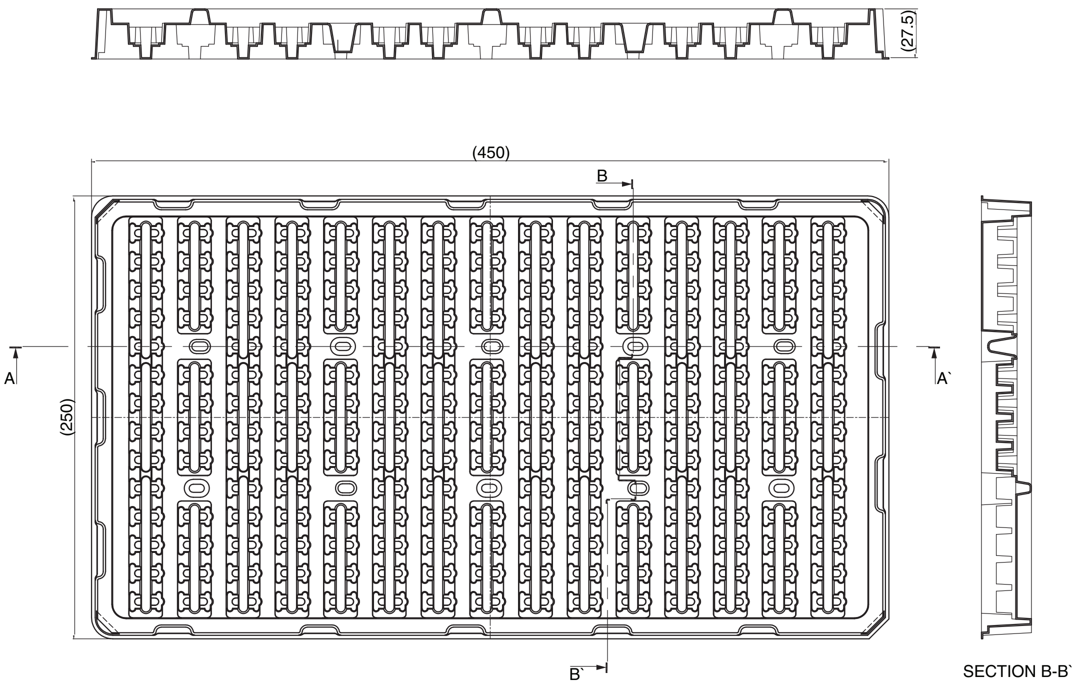


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
JK1	9.6	Side	Holder	13.2	7.4	9.2

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5229.0-1
Rev. 2; Date: 07.07.03
20274-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	J	K	1

2 or 3 digit product series 2 digit frequency Holder type

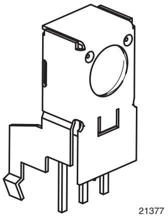
Note
d = "digit", please consult the list of available series on the previous page to create a valid part number.

Example: TSOP34838JK1

PACKING QUANTITY

- 200 pieces per tray
- 3 trays per carton

IR Receiver Modules for Remote Control Systems



21377

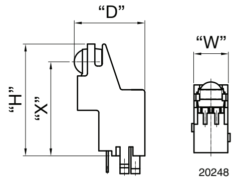
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

AVAILABLE FOR:

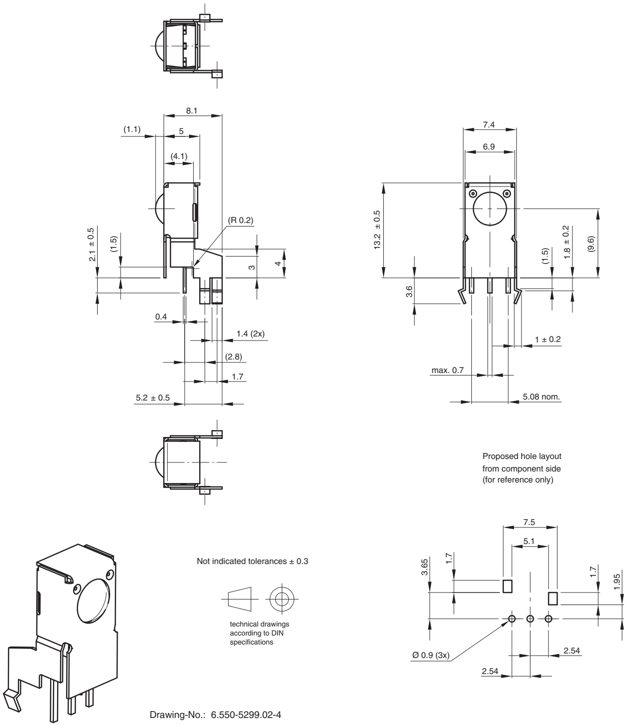
- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....



20248

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
JL1	9.6	Side	Holder	13.2	7.4	9.2

MECHANICAL DIMENSIONS in millimeters



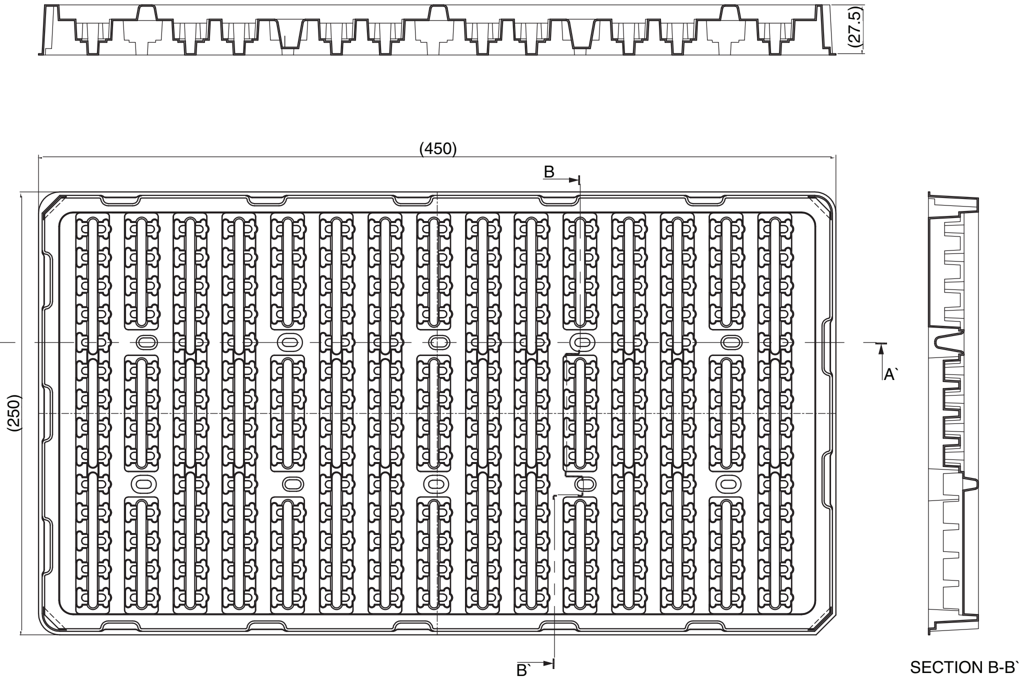
Not indicated tolerances ± 0.3

technical drawings according to DIN specifications

Proposed hole layout from component side (for reference only)

Drawing-No.: 6.550-5299.02-4
Issue: 2; 17.06.09
21838

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5229.0-1
Rev. 2; Date: 07.07.03
20274-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	J	L	1
				2 or 3 digit product series			2 digit frequency		Holder type		

Note

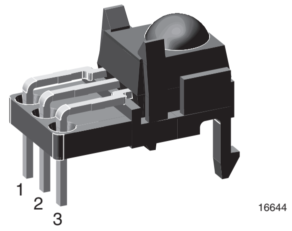
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

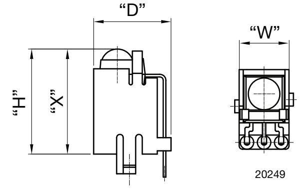
Example: TSOP32238JL1

PACKING QUANTITY

- 200 pieces per tray
- 3 trays per carton

IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

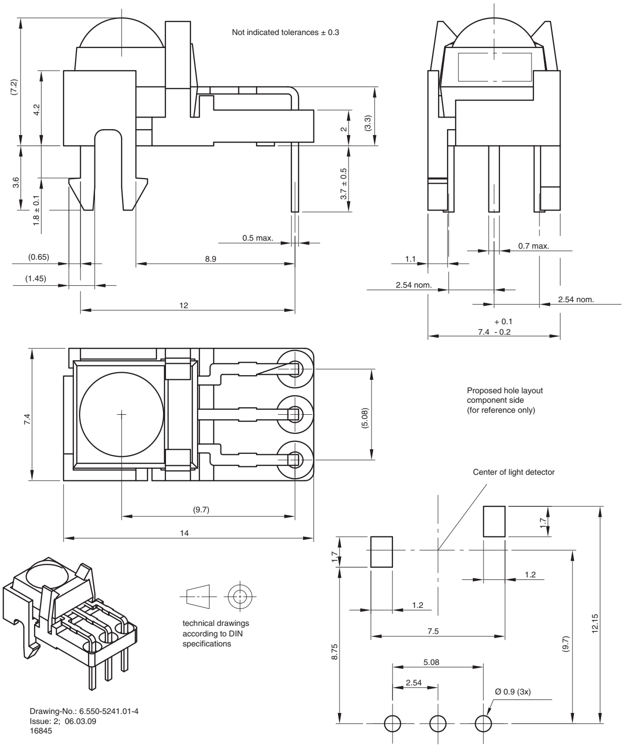
RoHS
COMPLIANT

AVAILABLE FOR:

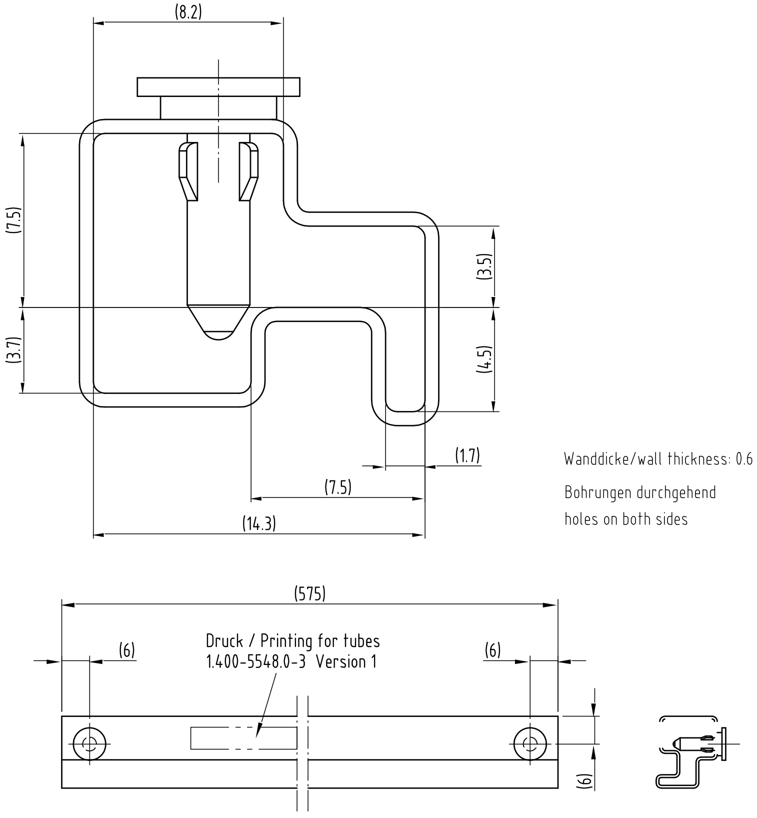
- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
LL1	7.2	Top	Holder	7.2	7.4	14

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5258.0-4
Rev. 2; Date: 20.11.03
20317-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	L	L	1

2 or 3 digit product series 2 digit frequency Holder type

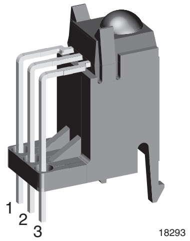
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838LL1

PACKING QUANTITY

- 75 pieces per tube
- 40 tubes per carton

IR Receiver Modules for Remote Control Systems



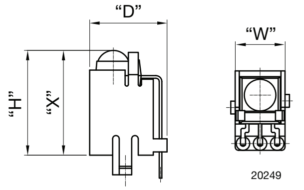
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

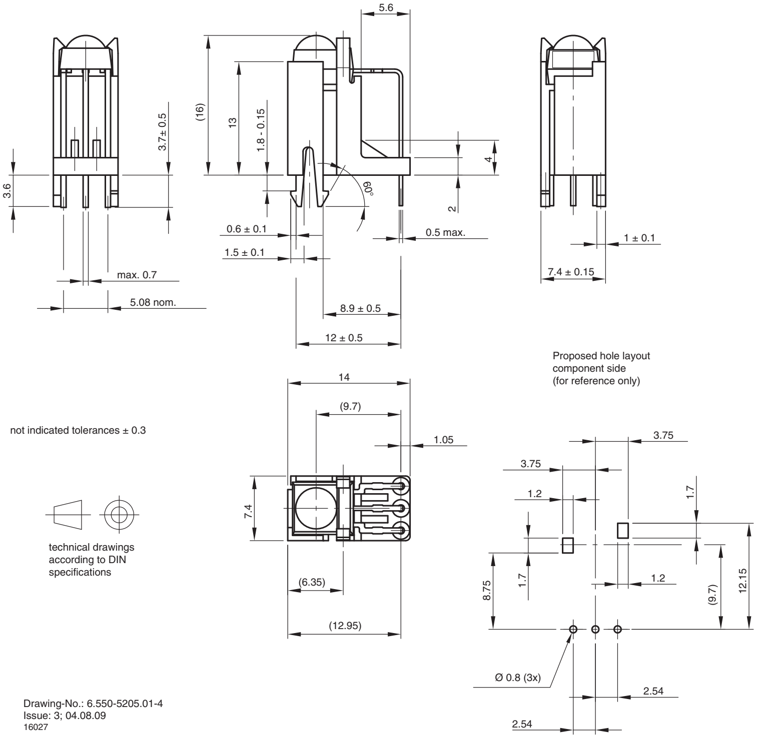
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....



NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
ZC1	16	Top	Holder	16	7.4	14

MECHANICAL DIMENSIONS in millimeters



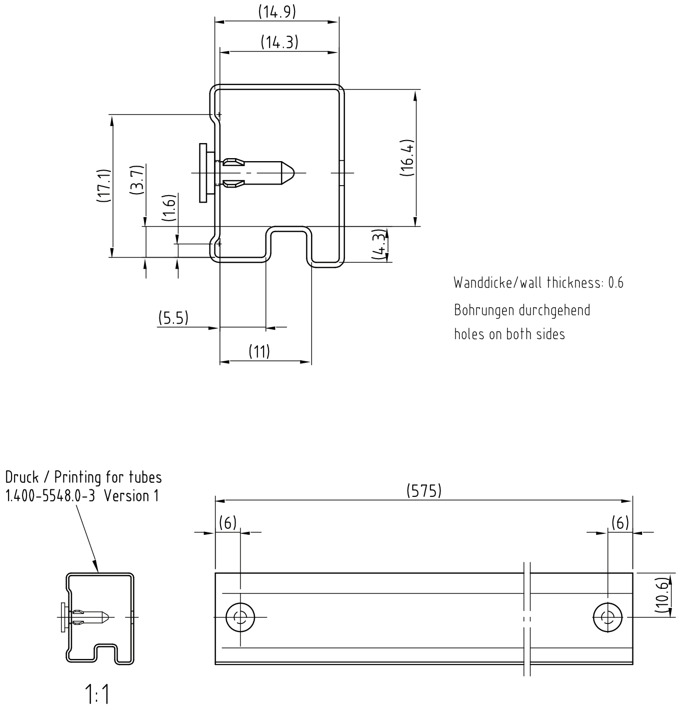
not indicated tolerances ± 0.3

technical drawings according to DIN specifications

Proposed hole layout
component side
(for reference only)

Drawing-No.: 6.550-5205.01-4
Issue: 3; 04.08.09
16027

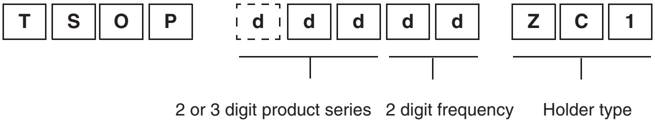
PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5228.0-4
Rev. 6; Date: 20.11.03

20266-1

ORDERING INFORMATION



Note

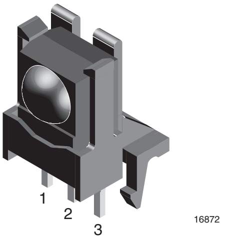
d = "digit", please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838ZC1

PACKING QUANTITY

- 75 pieces per tube
- 27 tubes per carton

IR Receiver Modules for Remote Control Systems



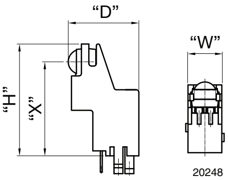
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

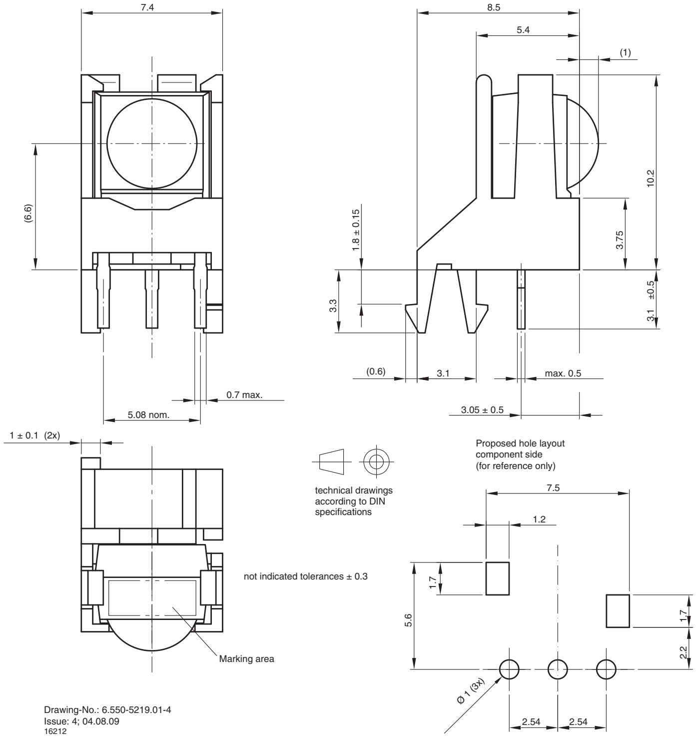
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....



NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
VI1	6.6	Side	Holder	10.2	7.4	9.5

MECHANICAL DIMENSIONS in millimeters



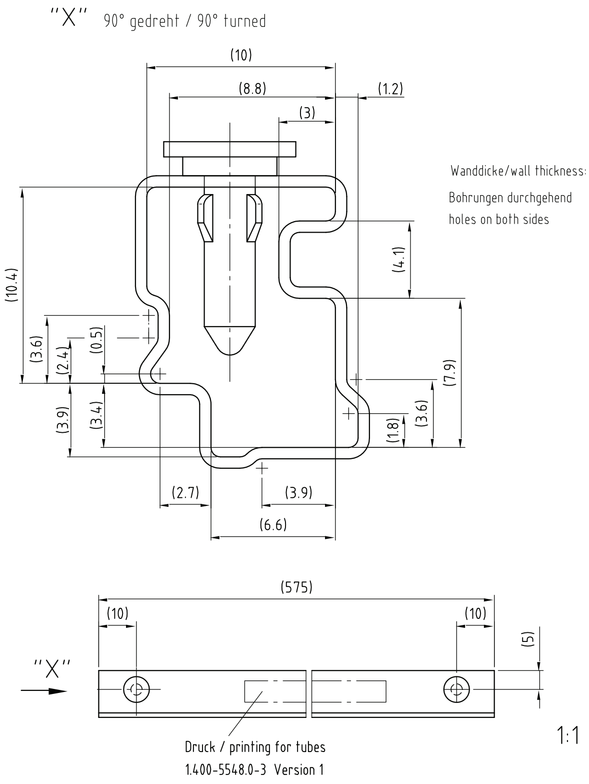
technical drawings according to DIN specifications

not indicated tolerances ± 0.3

Proposed hole layout
component side
(for reference only)

Drawing-No.: 6.550-5219.01-4
Issue: 4; 04.08.09
16212

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5241.0-4
Rev. 3; Date: 20.11.03

20267-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	V	I	1

2 or 3 digit product series 2 digit frequency Holder type

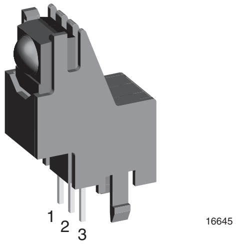
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838VI1

PACKING QUANTITY

- 74 pieces per tube
- 48 tubes per carton

IR Receiver Modules for Remote Control Systems

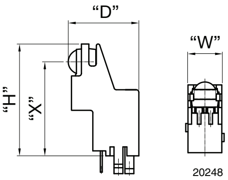


FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

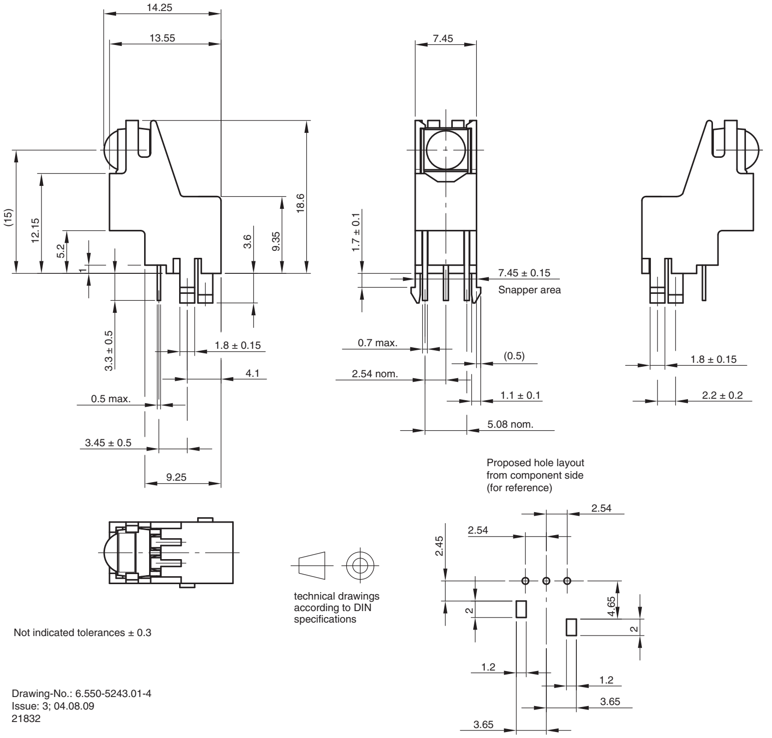
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

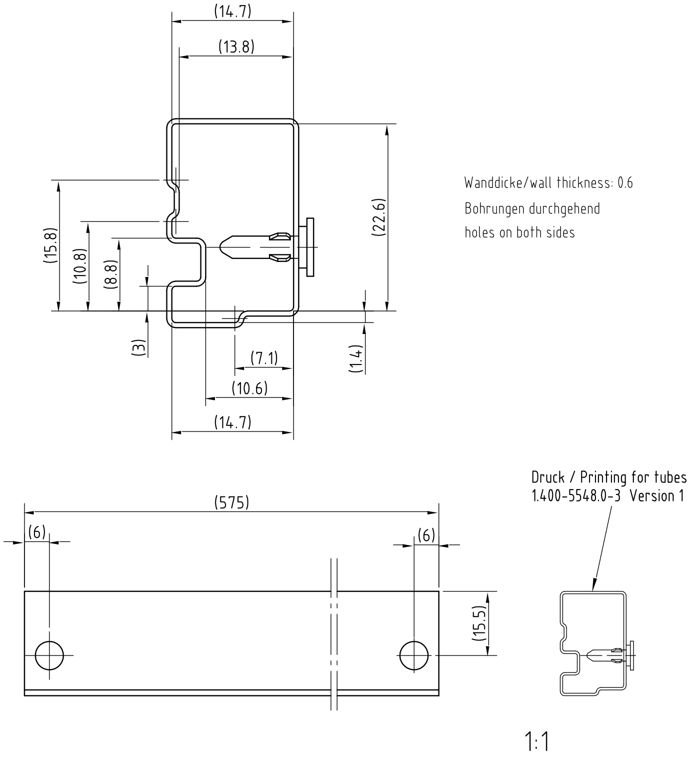


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
KU1	15	Side	Holder	18.6	7.45	14.25

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5261.0-4
Rev. 4; Date: 20.11.03

20270-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	K	U	1

2 or 3 digit product series   2 digit frequency   Holder type

Note

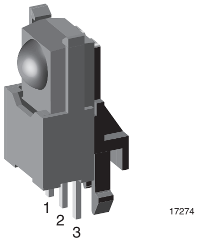
d = "digit", please consult the list of available series on the previous page to create a valid part number.

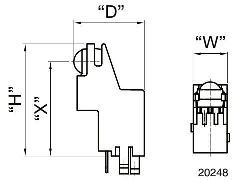
Example: TSOP14838KU1

PACKING QUANTITY

- 73 pieces per tube
- 20 tubes per carton

IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

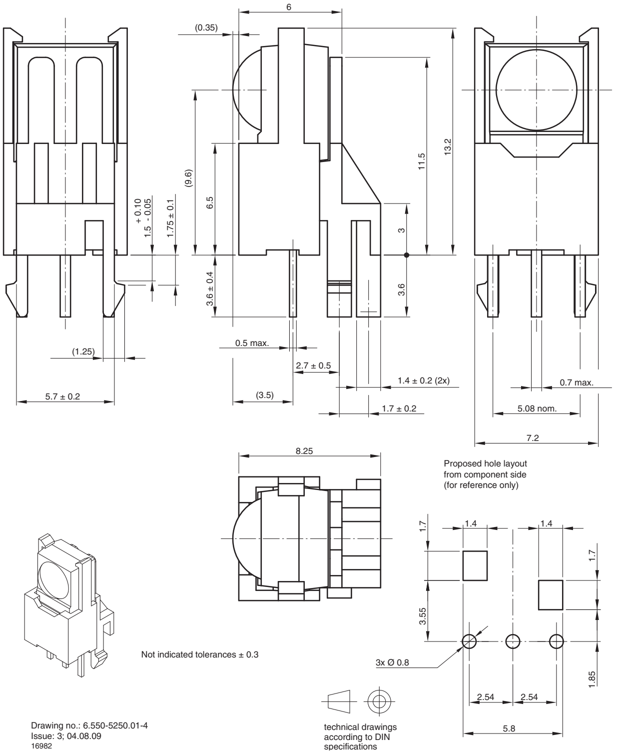
RoHS
COMPLIANT

AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
IV1	9.6	Side	Holder	13.2	7.2	8.6

MECHANICAL DIMENSIONS in millimeters



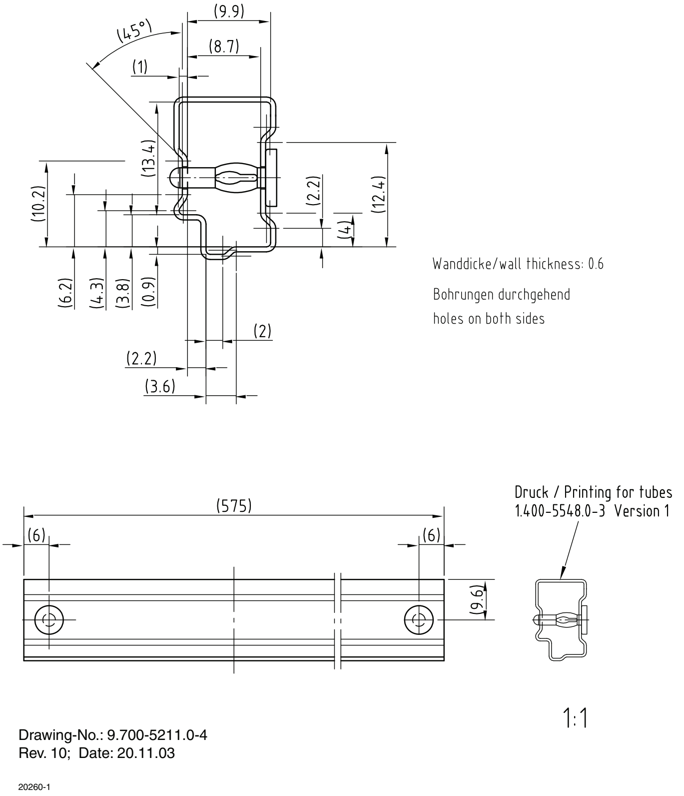
Proposed hole layout
from component side
(for reference only)

Not indicated tolerances ± 0.3

Drawing no.: 6.550-5250.01-4
Issue: 3; 04.08.09
16982

technical drawings
according to DIN
specifications

PACKAGING DIMENSIONS in millimeters



ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	I	V	1

2 or 3 digit product series 2 digit frequency Holder type

Note

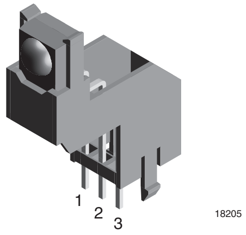
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838IV1

PACKING QUANTITY

- 72 pieces per tube
- 33 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

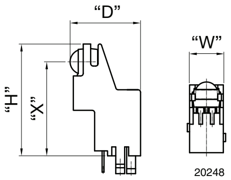
Pb-free

e3

RoHS
COMPLIANT

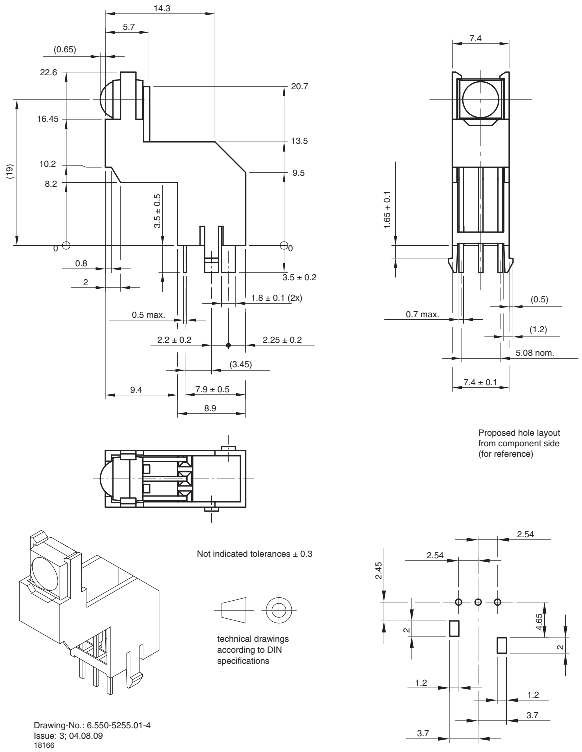
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

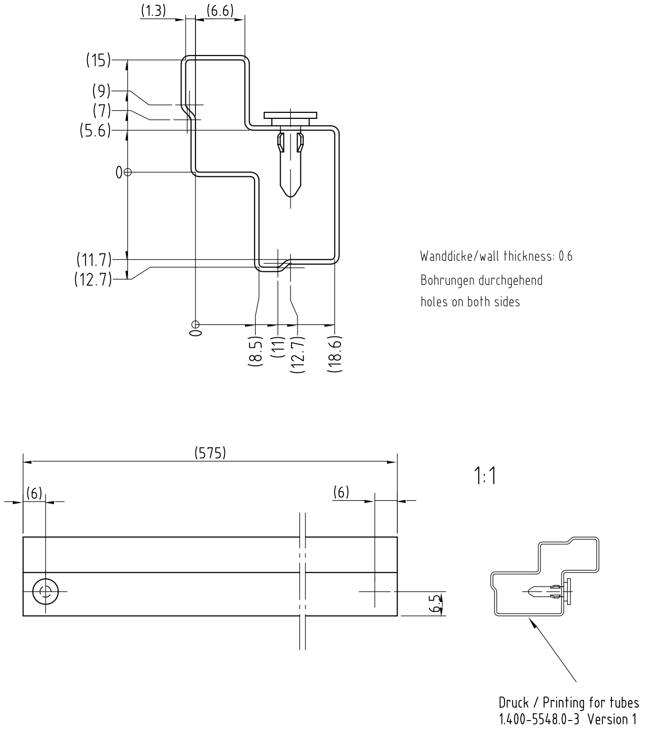


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
AY1	19	Side	Holder	22.6	7.4	18.95

MECHANICAL DIMENSIONS in millimeters



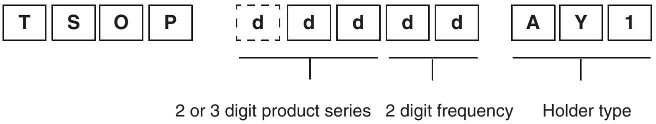
PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5282.0-4
Rev. 2; Date: 20.11.03

20272-1

ORDERING INFORMATION



Note

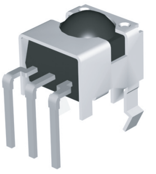
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838AY1

PACKING QUANTITY

- 75 pieces per tube
- 18 tubes per carton

IR Receiver Modules for Remote Control Systems



19328

FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

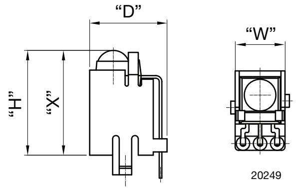
Pb-free

e3

RoHS
COMPLIANT

AVAILABLE FOR:

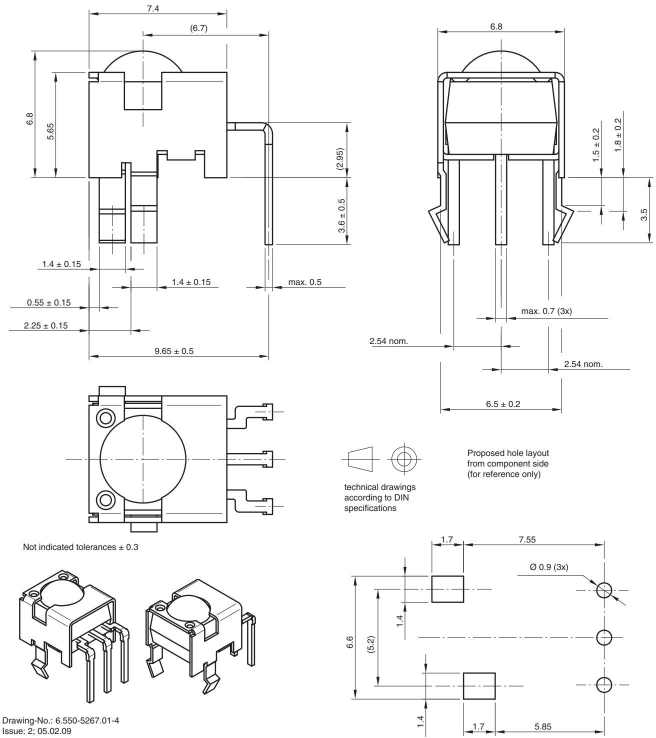
- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....



20249

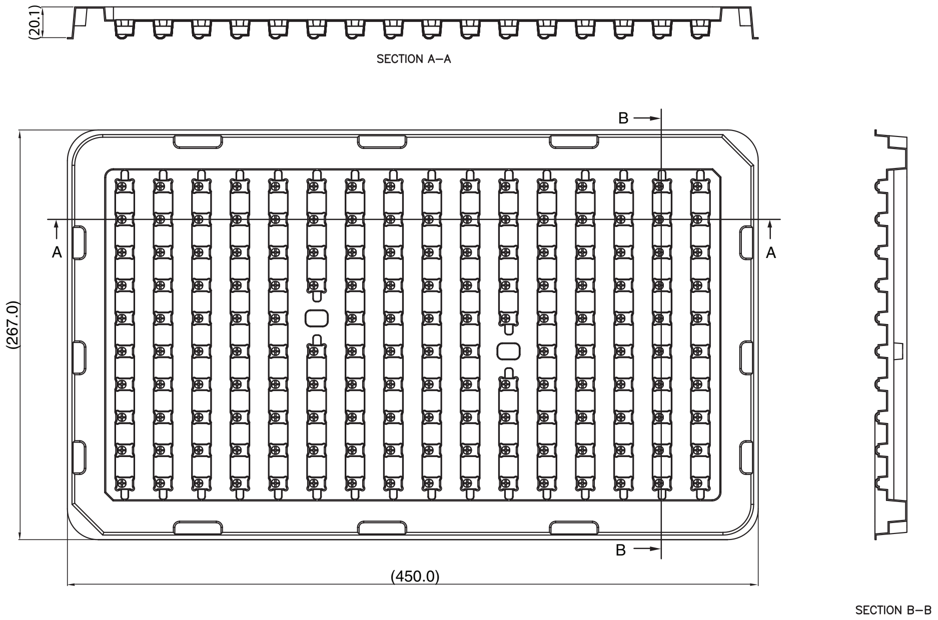
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
CZ1	6.8	Top	Holder	6.8	6.8	9.65

MECHANICAL DIMENSIONS in millimeters



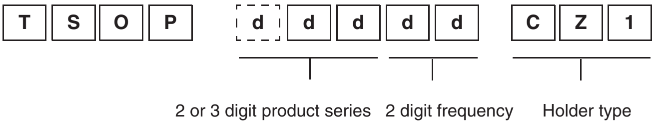
Drawing-No.: 6.550-5267.01-4
Issue: 2; 05.02.09
19327

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.800-5089.0-2
Rev. 1; Date: 10.09.04
20354

ORDERING INFORMATION



Note

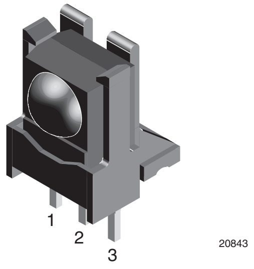
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

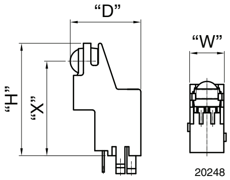
Example: TSOP14838CZ1

PACKING QUANTITY

- 158 pieces per tray
- 7 trays per carton

IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

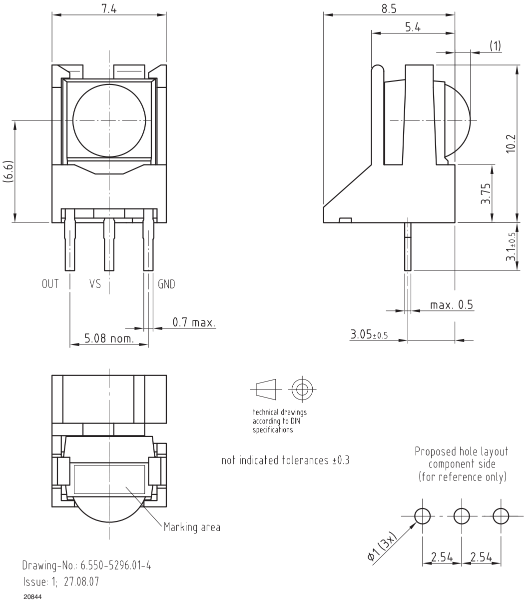
Pb-free
e3
RoHS
COMPLIANT

AVAILABLE FOR:

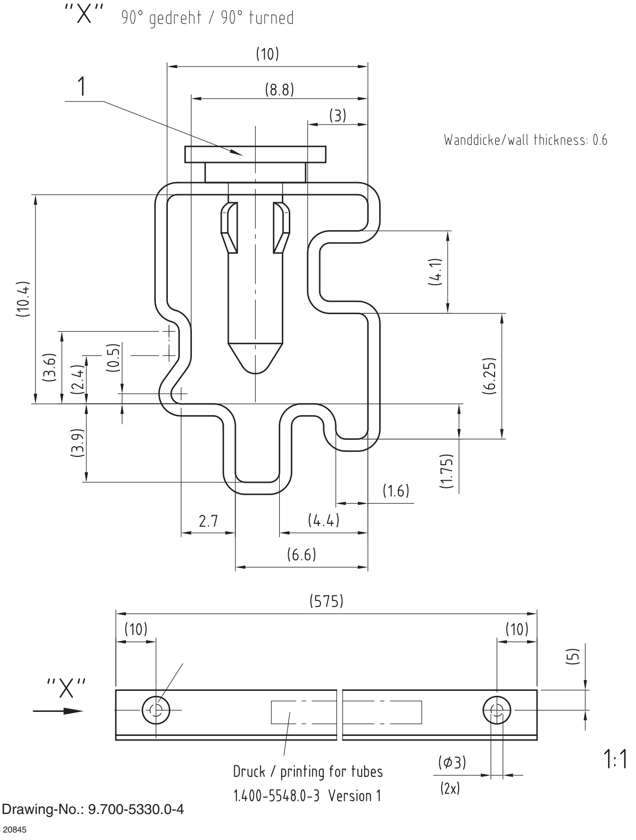
- TSOP344..
- TSOP348..
- TSOP341..
- TSOP44...
- TSOP48...
- TSOP41...
- TSOP324..
- TSOP322..
- TSOP321..
- TSOP24...
- TSOP22...
- TSOP21...
- TSOP14838
- TSOP12238

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
VM1	6.6	Side	Holder	10.2	7.4	9.5

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5330.0-4

20845

ORDERING INFORMATION

T S O P d d d d d V M 1

2 or 3 digit product series | 2 digit frequency | Holder type

Note

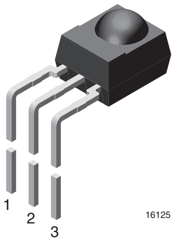
d = "digit", please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838VM1

PACKING QUANTITY

- 74 pieces per tube
- 48 tubes per carton

IR Receiver Modules for Remote Control Systems



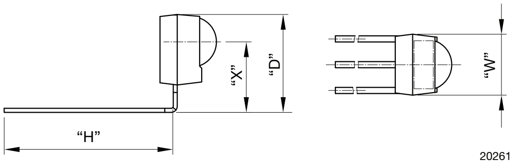
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

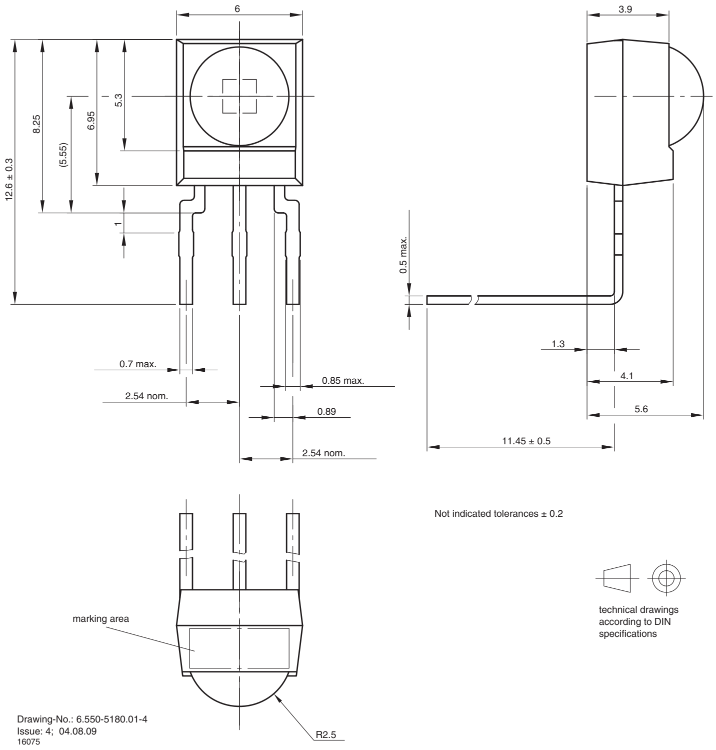
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

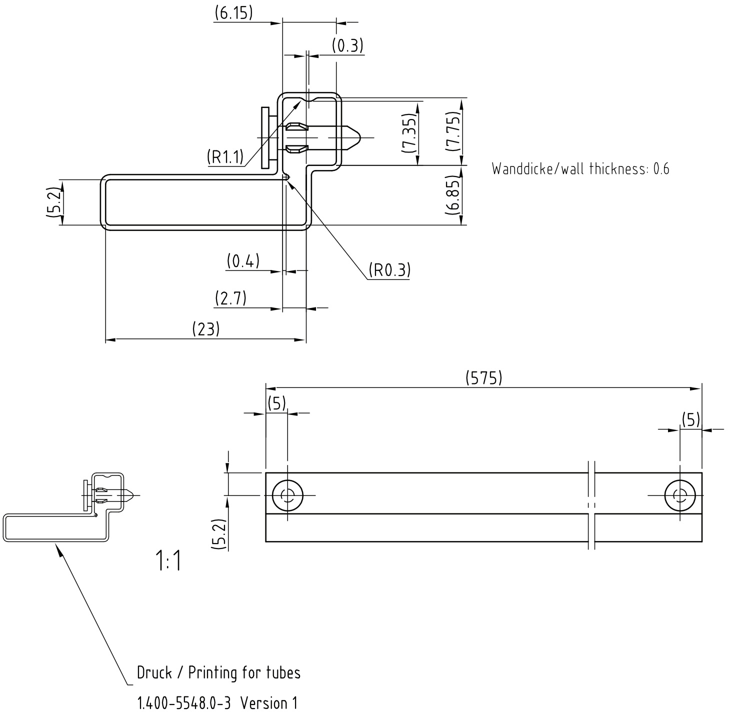


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SA1	9.9		Bend	11.45	6	12.6

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5213.0-4
Rev. 6; Date: 20.11.03

20262-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	A	1
				2 or 3 digit product series			2 digit frequency		Holder type		

Note

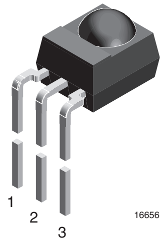
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838SA1

PACKING QUANTITY

- 90 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems



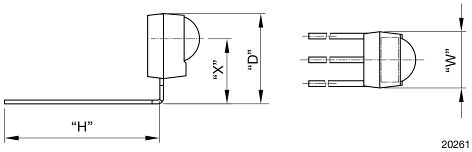
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

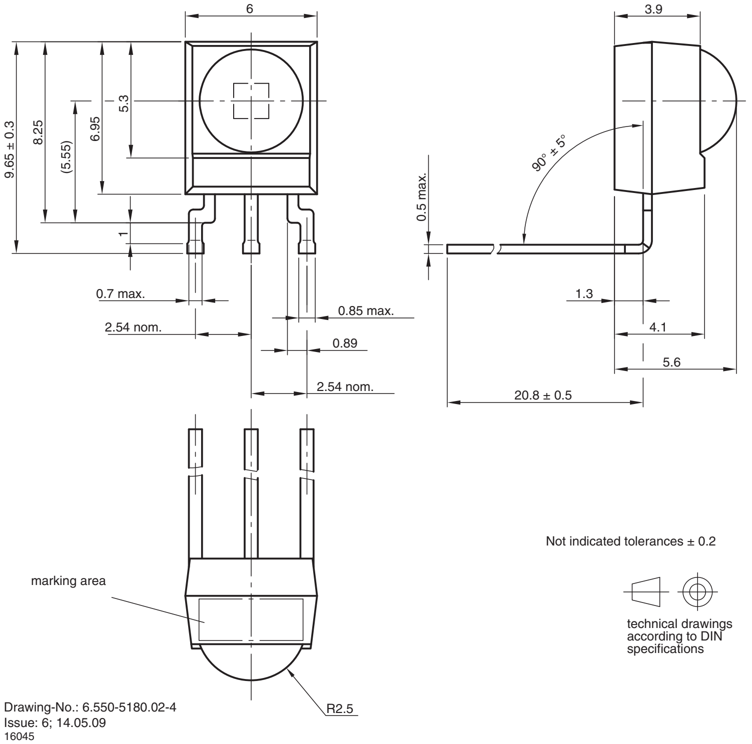
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

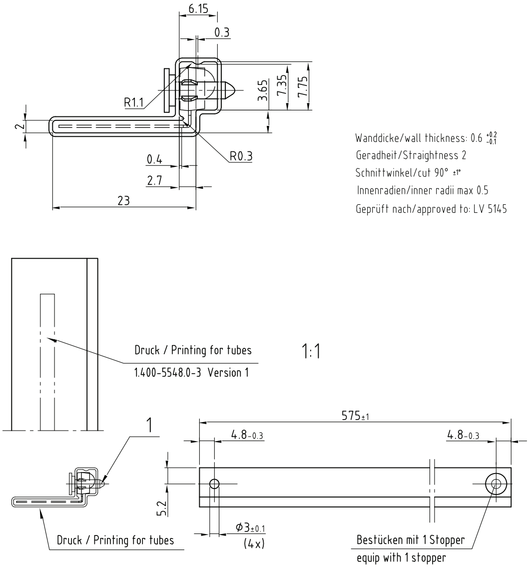


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SB1	6.95		Bend	20.8	6	9.65

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5206.0-4
Rev. 13; Date: 09.06.06
20251

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	B	1

2 or 3 digit product series 2 digit frequency Holder type

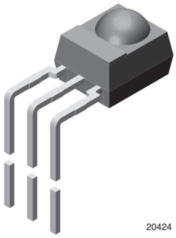
Note
d = "digit", please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838SB1

PACKING QUANTITY

- 90 pieces per tube
- 30 tubes per carton

IR Receiver Modules for Remote Control Systems



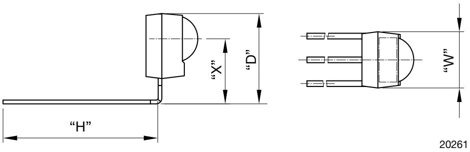
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

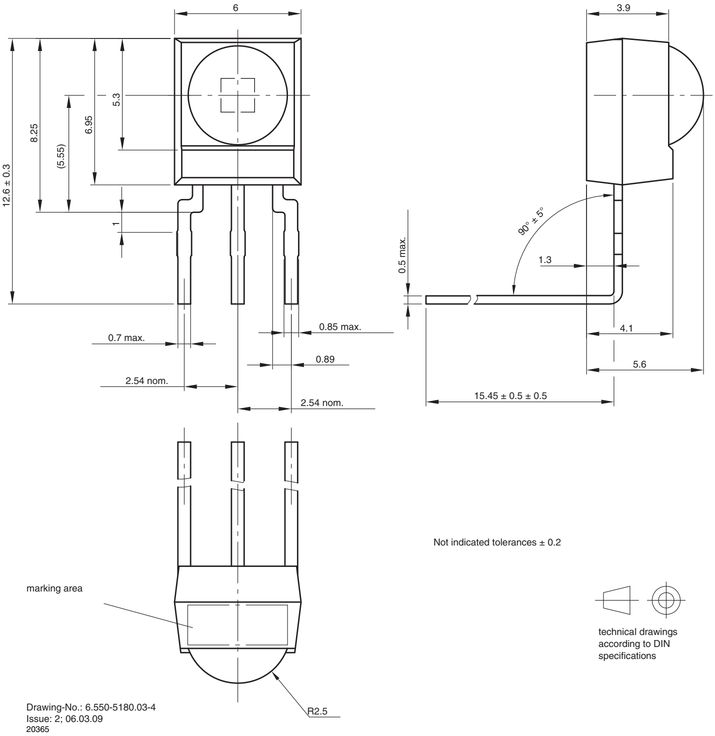
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

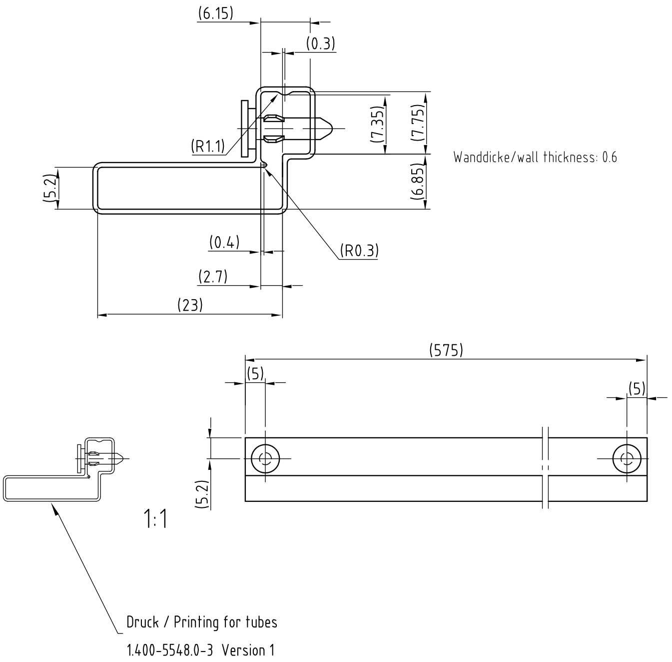


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SC1	9.9		Bend	15.45	6	12.6

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5213.0-4
Rev. 6; Date: 20.11.03

20262-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	C	1
				2 or 3 digit product series			2 digit frequency		Holder type		

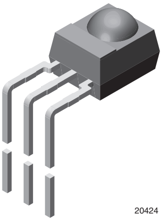
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838SC1

PACKING QUANTITY

- 90 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems



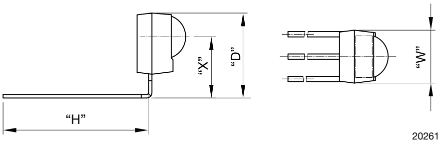
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

AVAILABLE FOR:

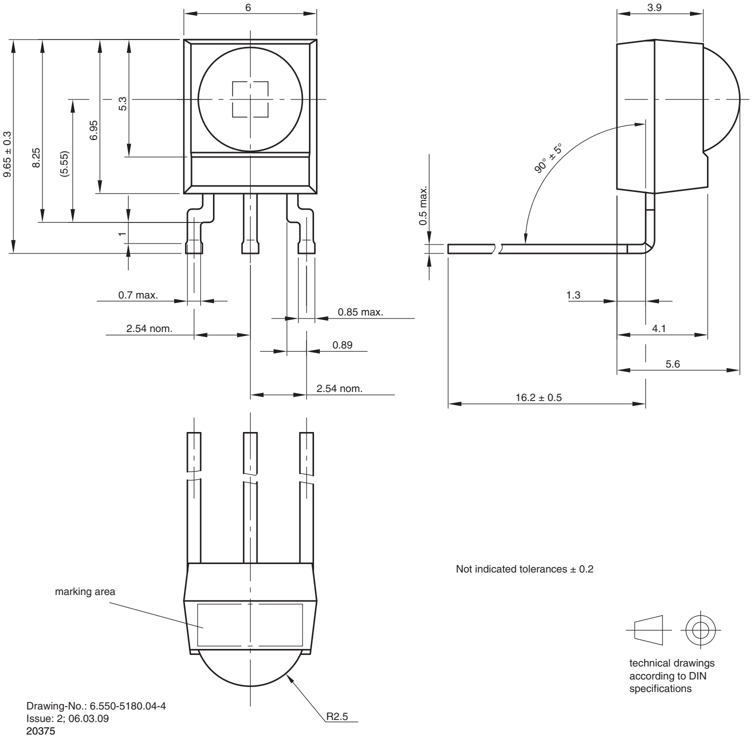
- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

Pb-free
e3
RoHS
COMPLIANT



NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SD1	6.95		Bend	16.2	6	9.65

MECHANICAL DIMENSIONS in millimeters

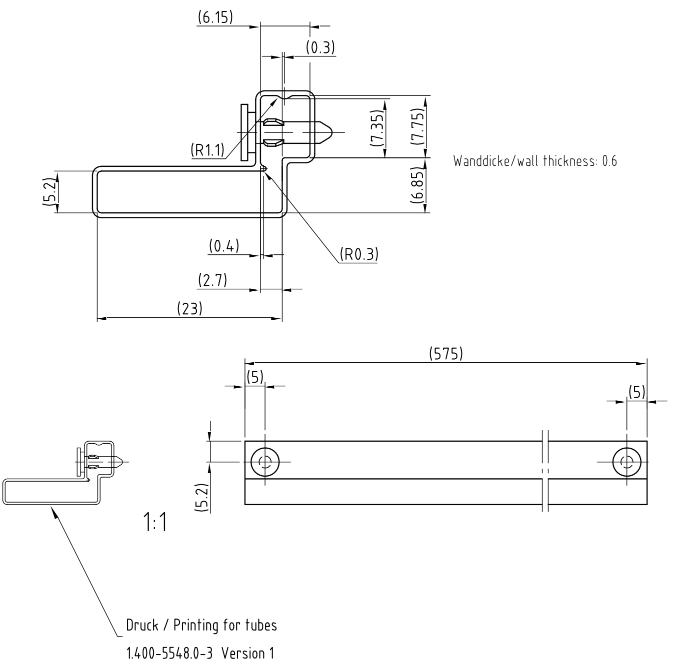


Not indicated tolerances ± 0.2

technical drawings according to DIN specifications

Drawing-No.: 6.550-5180.04-4
Issue: 2; 06.03.09
20375

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5213.0-4
Rev. 6; Date: 20.11.03

20262-1

ORDERING INFORMATION

T S O P d d d d d S D 1

2 or 3 digit product series
2 digit frequency
Holder type

Note

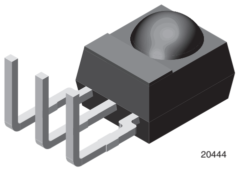
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838SD1

PACKING QUANTITY

- 90 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems



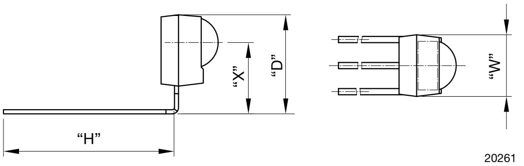
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

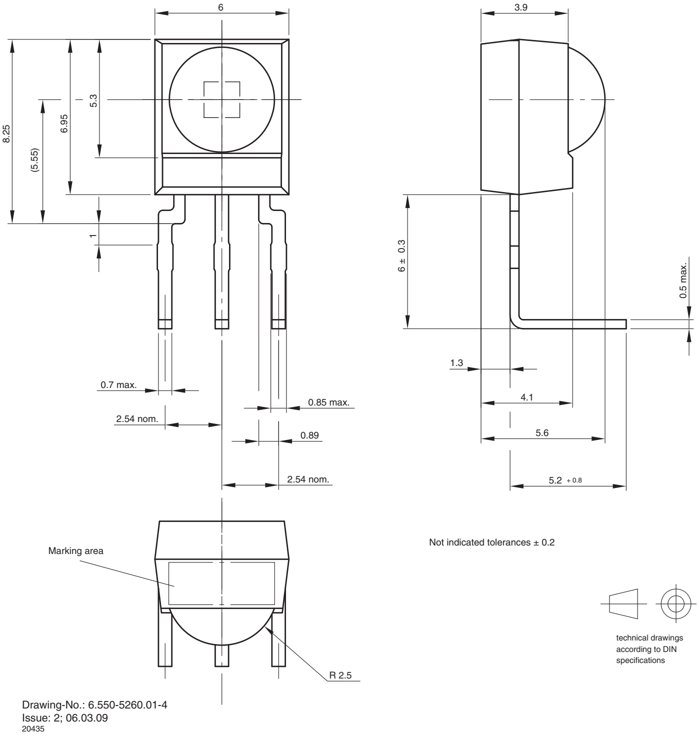
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

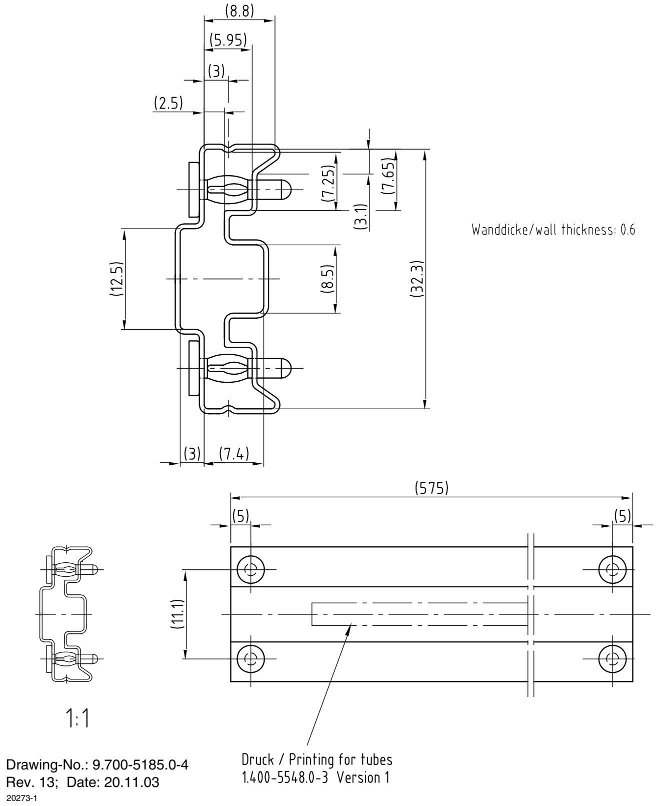


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SK1	10.25		Bend	5.2	6	12.95

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	K	1

2 or 3 digit product series
2 digit frequency
Holder type

Note

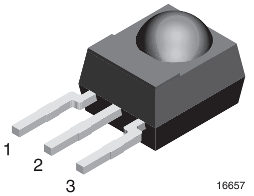
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838SK1

PACKING QUANTITY

- 90 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

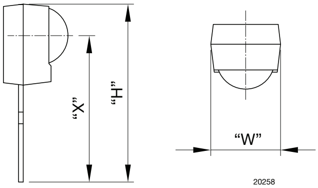
Pb-free

e3

RoHS
COMPLIANT

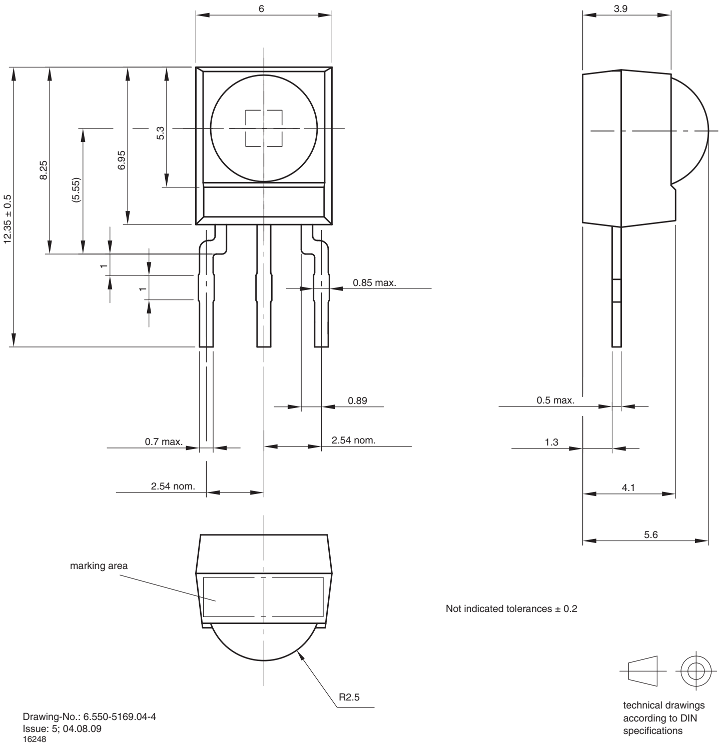
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

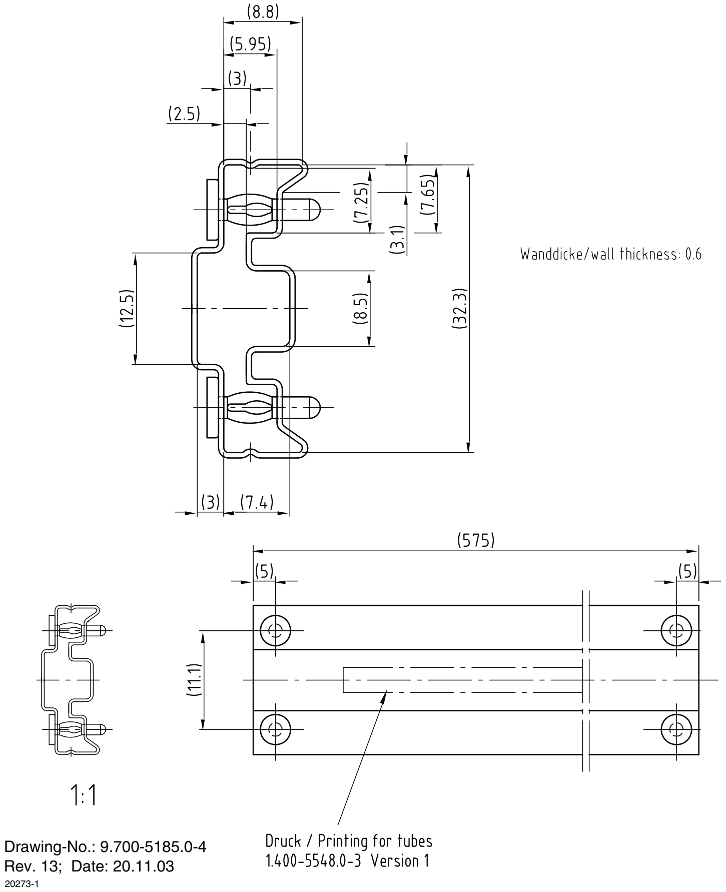


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SI1	9.65		Cut	12.35	6	

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



ORDERING INFORMATION

T S O P d d d d d S I 1

2 or 3 digit product series | 2 digit frequency | Holder type

Note

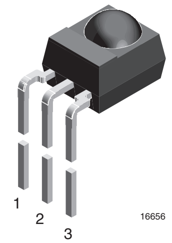
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838SI1

PACKING QUANTITY

- 90 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

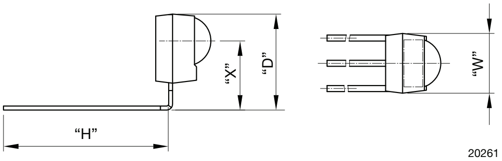
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb
Pb-free

e3
RoHS
COMPLIANT

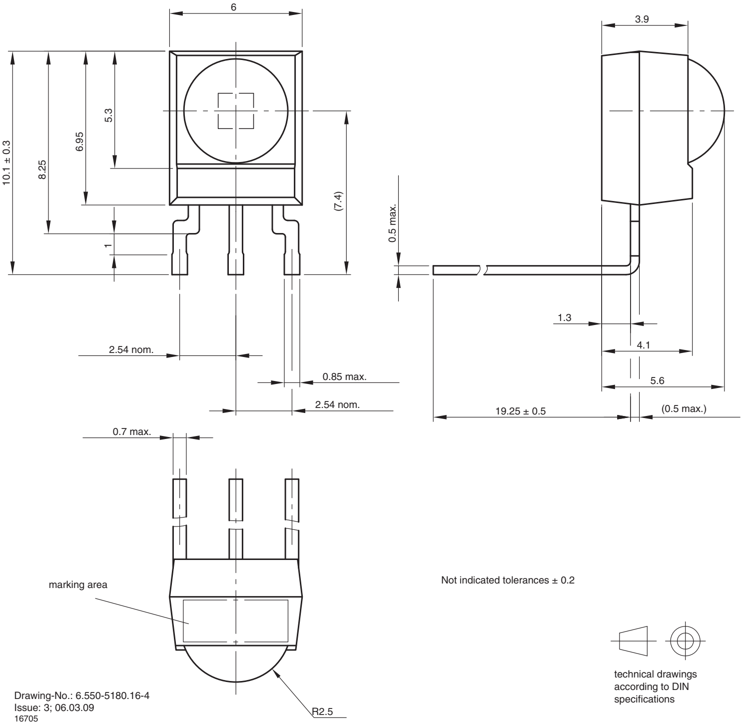
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

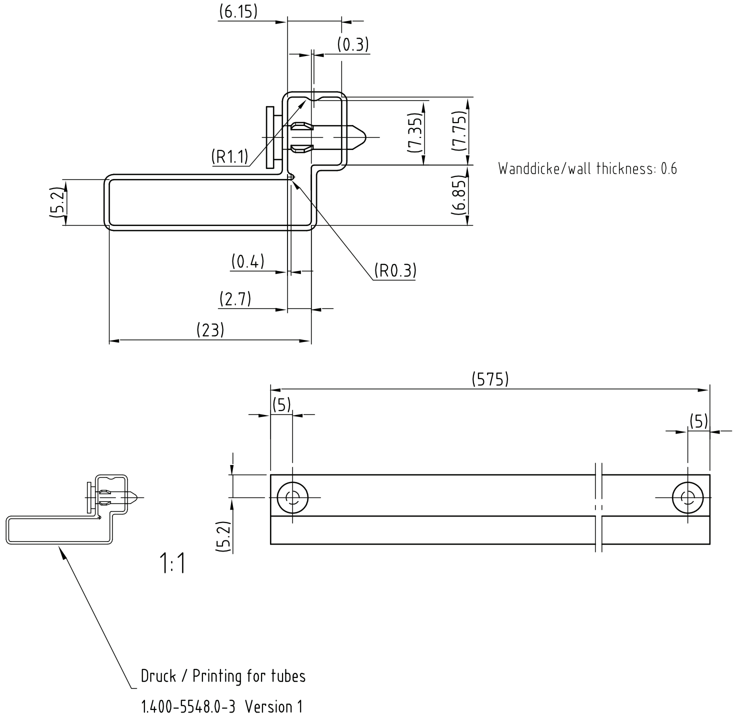


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SJ1	7.4		Bend	19.25	6	10.1

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5213.0-4
Rev. 6; Date: 20.11.03

20262-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	J	1

2 or 3 digit product series 2 digit frequency Holder type

Note

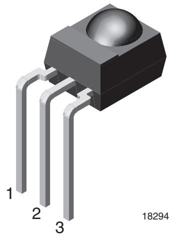
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838SJ1

PACKING QUANTITY

- 90 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

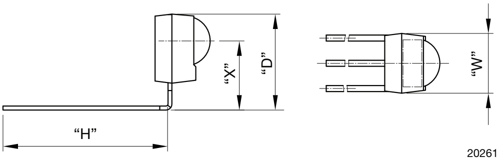
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

Pb-free

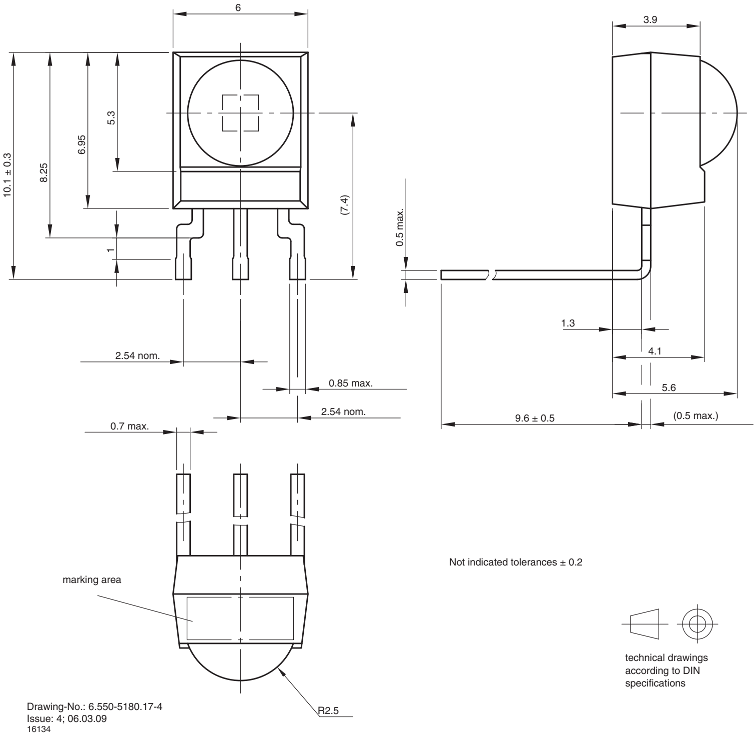
e3

RoHS
COMPLIANT



NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SO1	7.4		Bend	9.6	6	10.1

MECHANICAL DIMENSIONS in millimeters

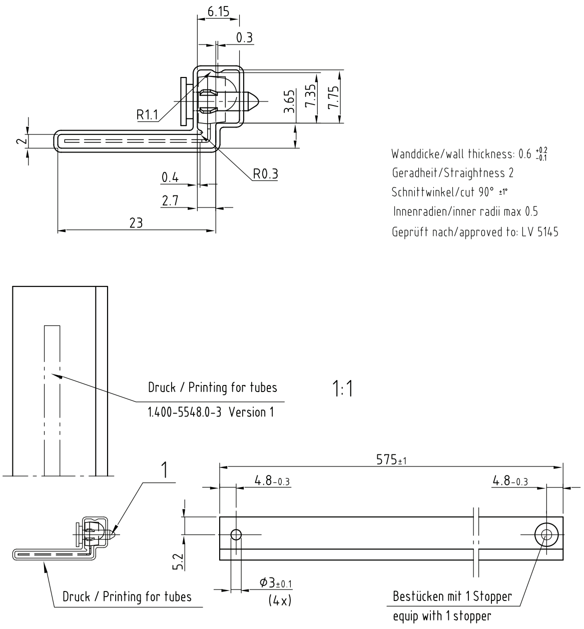


Not indicated tolerances ± 0.2

technical drawings
according to DIN
specifications

Drawing-No.: 6.550-5180.17-4
Issue: 4; 06.03.09
16134

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5206.0-4
Rev. 13; Date: 09.06.06
20251

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	O	1

2 or 3 digit product series 2 digit frequency Holder type

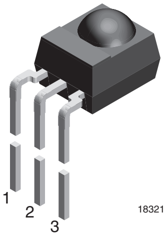
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838SO1

PACKING QUANTITY

- 90 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

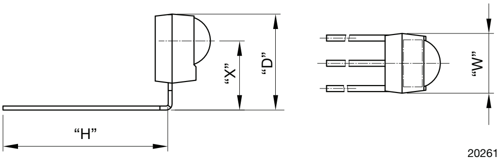
Pb-free

e3

RoHS
COMPLIANT

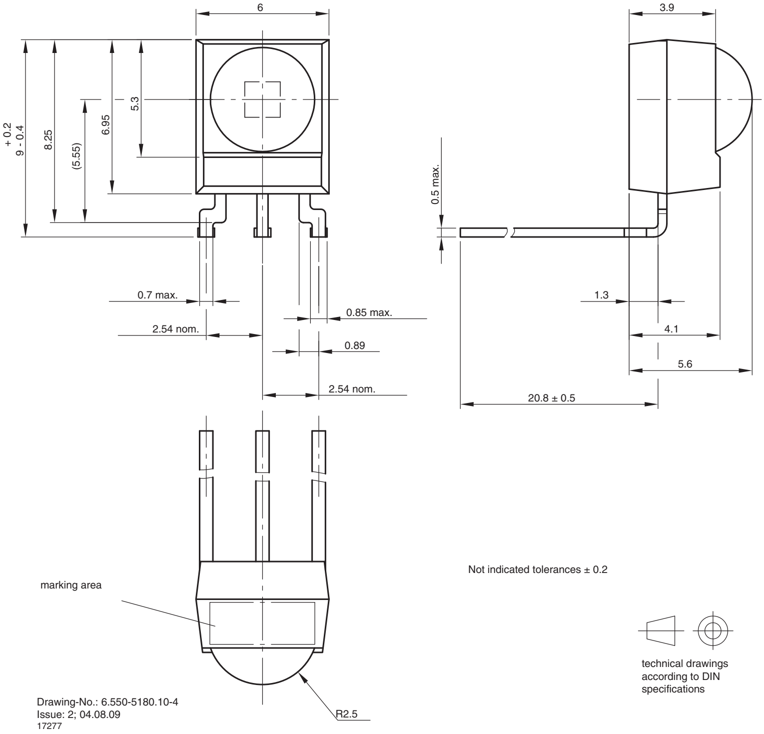
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....



NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SP1	6.3		Bend	20.8	6	9

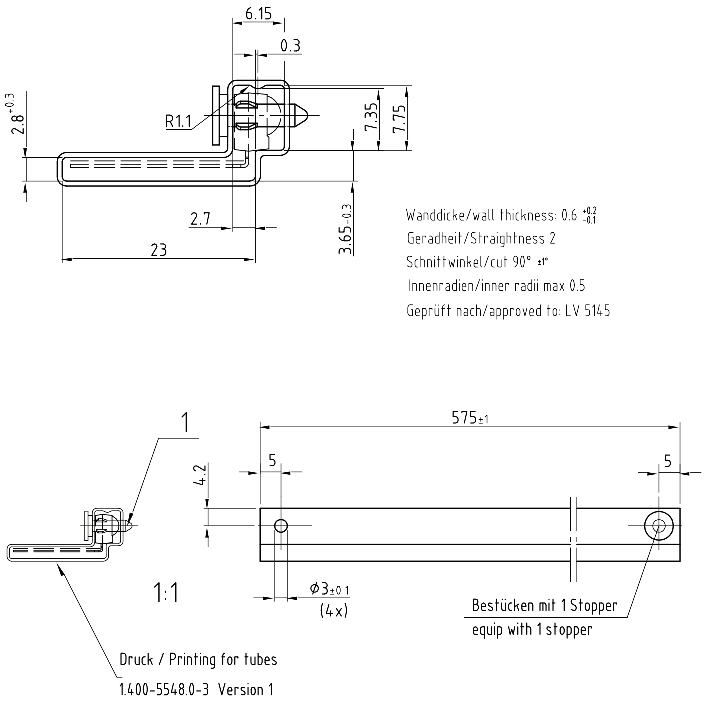
MECHANICAL DIMENSIONS in millimeters



Not indicated tolerances ± 0.2

technical drawings
according to DIN
specifications

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5275.0-4
Rev. 2; Date: 20.11.03

20271

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	P	1
				2 or 3 digit product series			2 digit frequency		Holder type		

Note

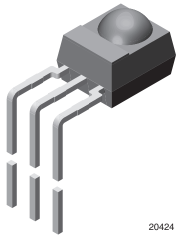
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838SP1

PACKING QUANTITY

- 90 pieces per tube
- 32 tubes per carton

IR Receiver Modules for Remote Control Systems



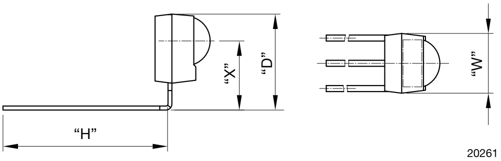
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

AVAILABLE FOR:

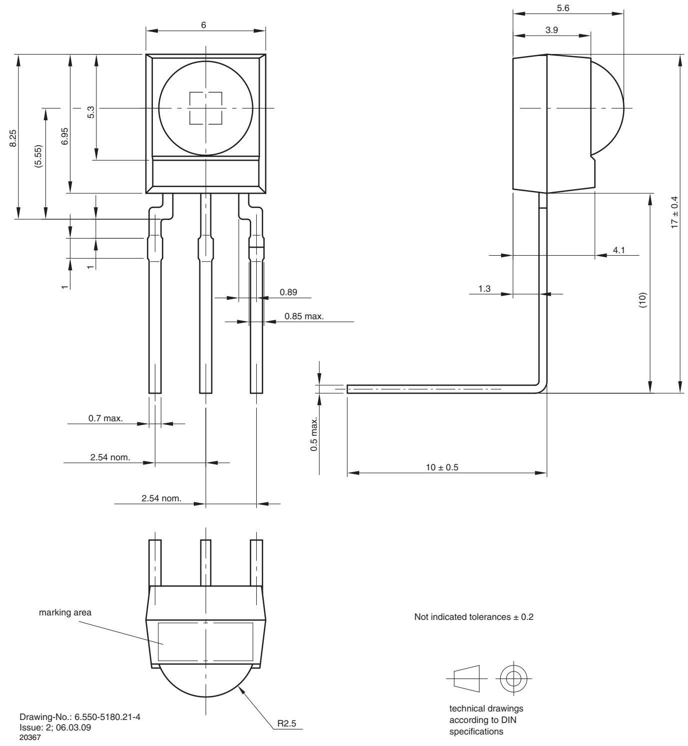
- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

Pb-free
e3
RoHS
COMPLIANT

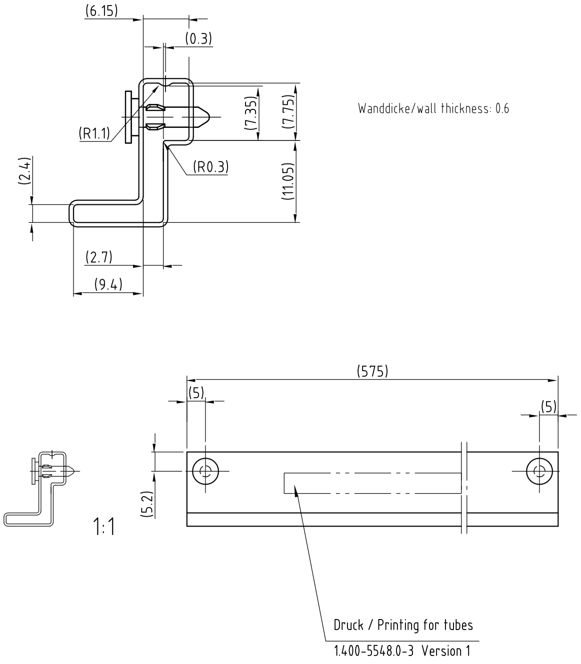


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SR1	14.3		Bend	10	6	17

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5277.0-4
Rev. 2; Date: 20.11.03
20318-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	R	1

2 or 3 digit product series 2 digit frequency Holder type

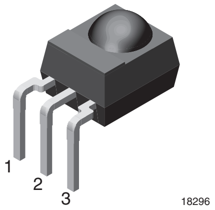
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838SR1

PACKING QUANTITY

- 90 pieces per tube
- 38 tubes per carton

IR Receiver Modules for Remote Control Systems



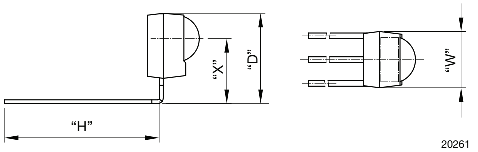
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

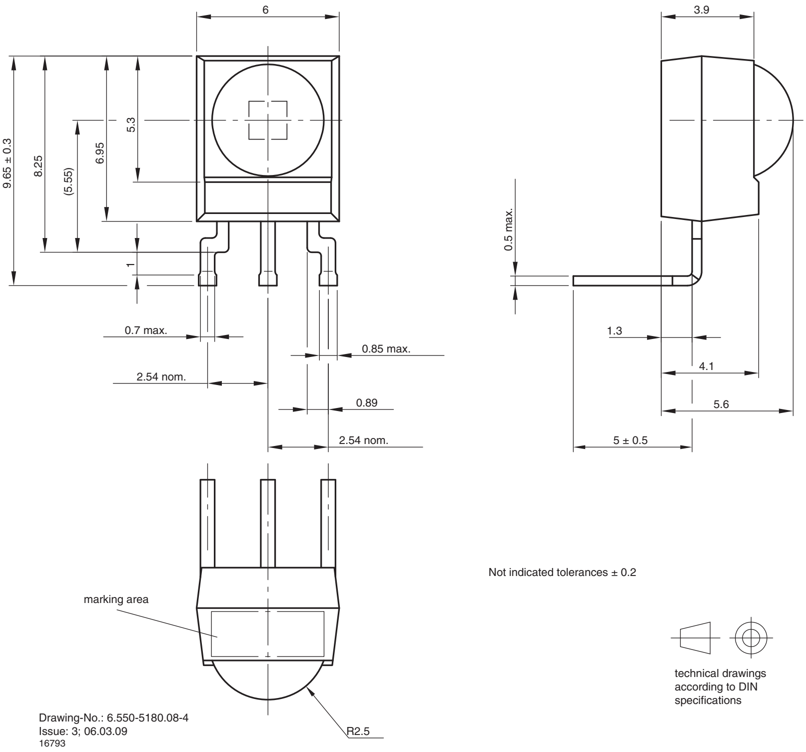
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

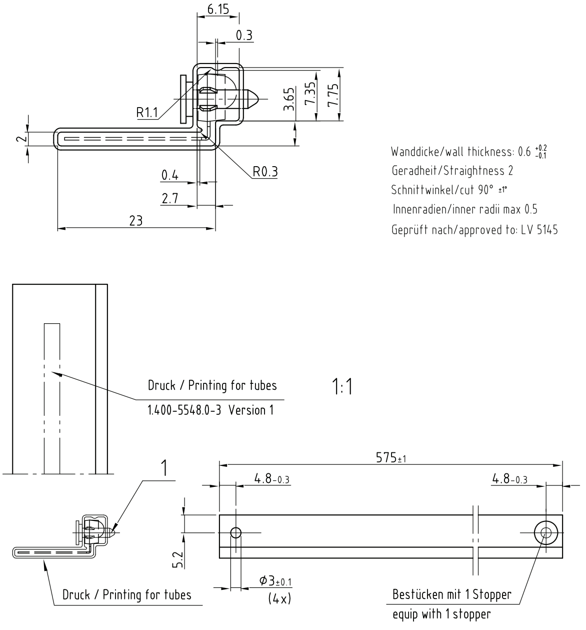


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
ST1	6.95		Bend	5	6	9.65

MECHANICAL DIMENSIONS in millimeters

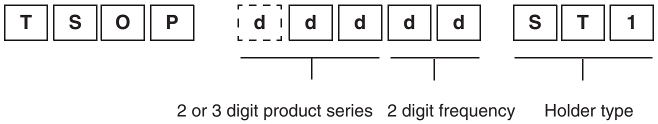


PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5206.0-4
Rev. 13; Date: 09.06.06
20251

ORDERING INFORMATION



Note

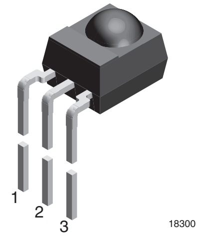
d = "digit", please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838ST1

PACKING QUANTITY

- 90 pieces per tube
- 30 tubes per carton

IR Receiver Modules for Remote Control Systems



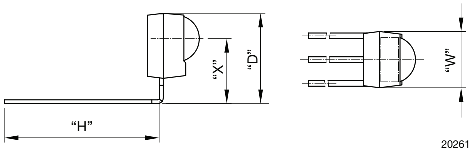
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

AVAILABLE FOR:

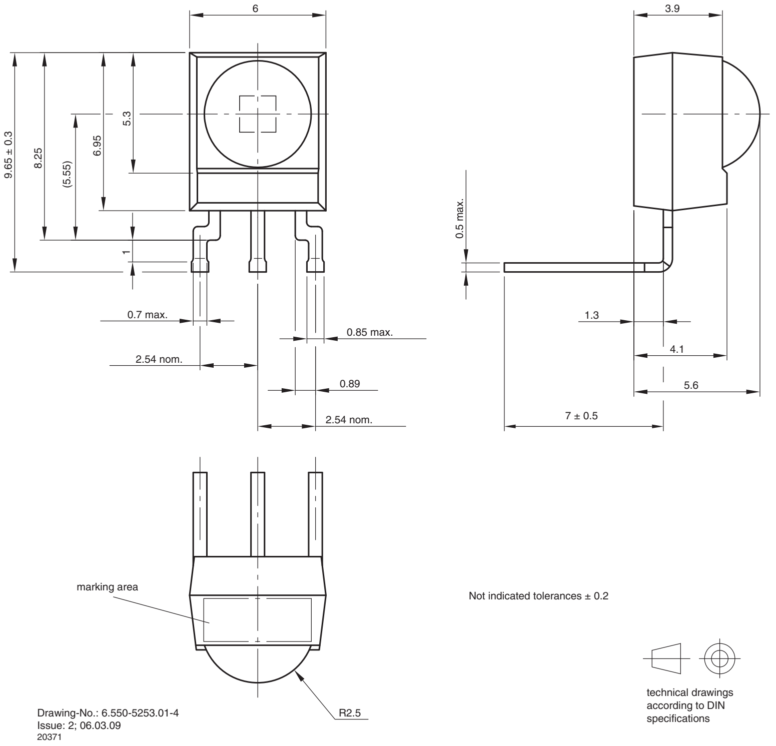
- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

Pb-free
e3
RoHS
COMPLIANT

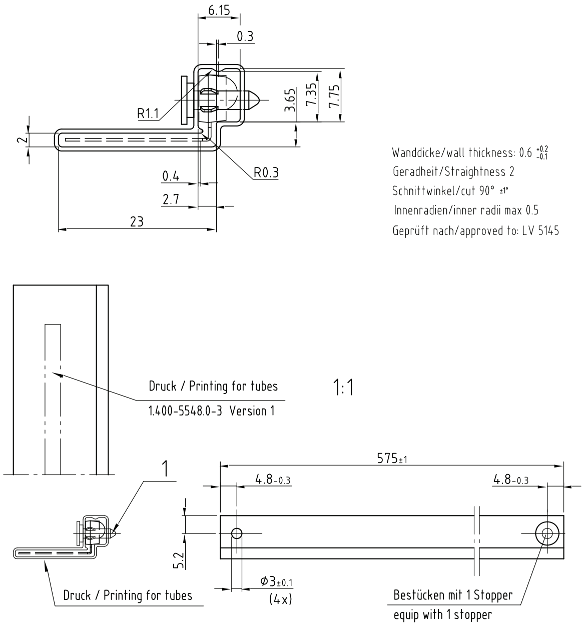


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SW1	6.95		Bend	7	6	9.65

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5206.0-4
Rev. 13; Date: 09.06.06
20251

ORDERING INFORMATION

T S O P d d d d d S W 1

2 or 3 digit product series 2 digit frequency Holder type

Note

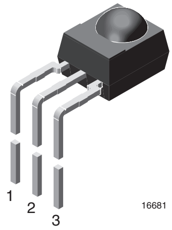
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838SW1

PACKING QUANTITY

- 90 pieces per tube
- 30 tubes per carton

IR Receiver Modules for Remote Control Systems



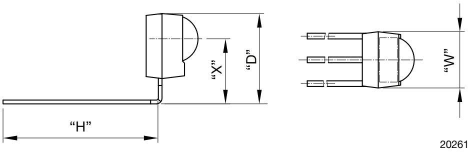
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

AVAILABLE FOR:

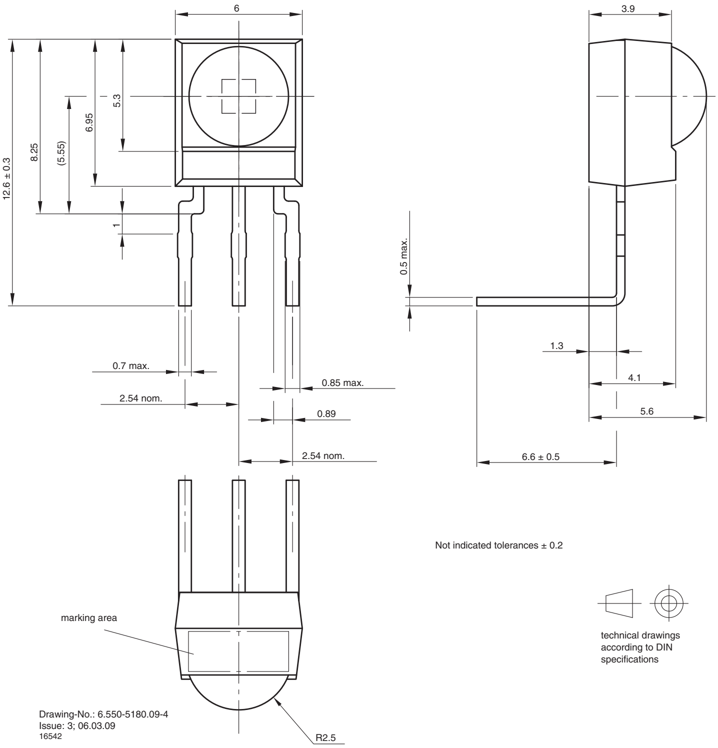
- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

RoHS
COMPLIANT

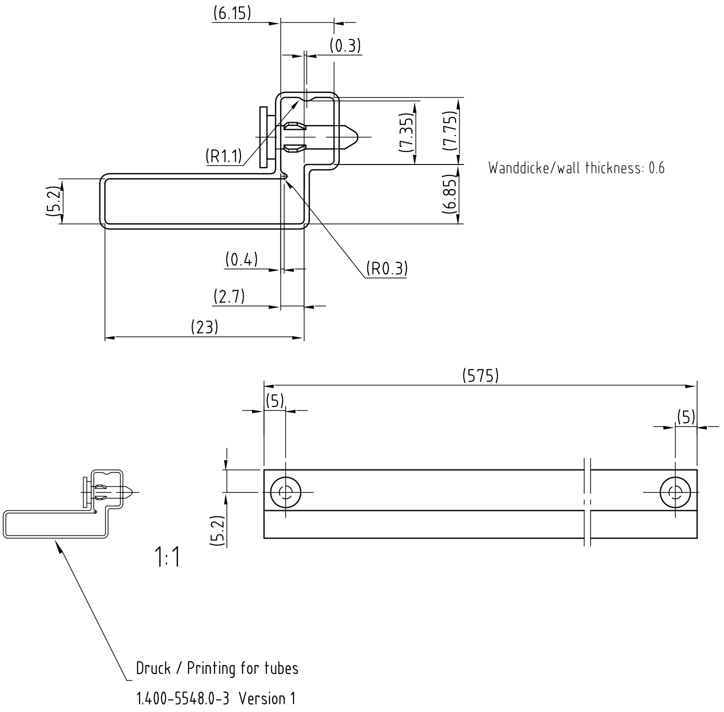


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SL1	9.9		Bend	6.6	6	12.6

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5213.0-4
Rev. 6; Date: 20.11.03

20262-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	L	1

2 or 3 digit product series
2 digit frequency
Holder type

Note

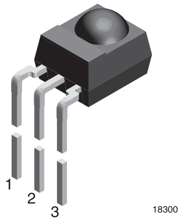
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838SL1

PACKING QUANTITY

- 90 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

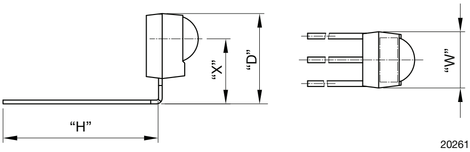
Pb-free

e3

RoHS
COMPLIANT

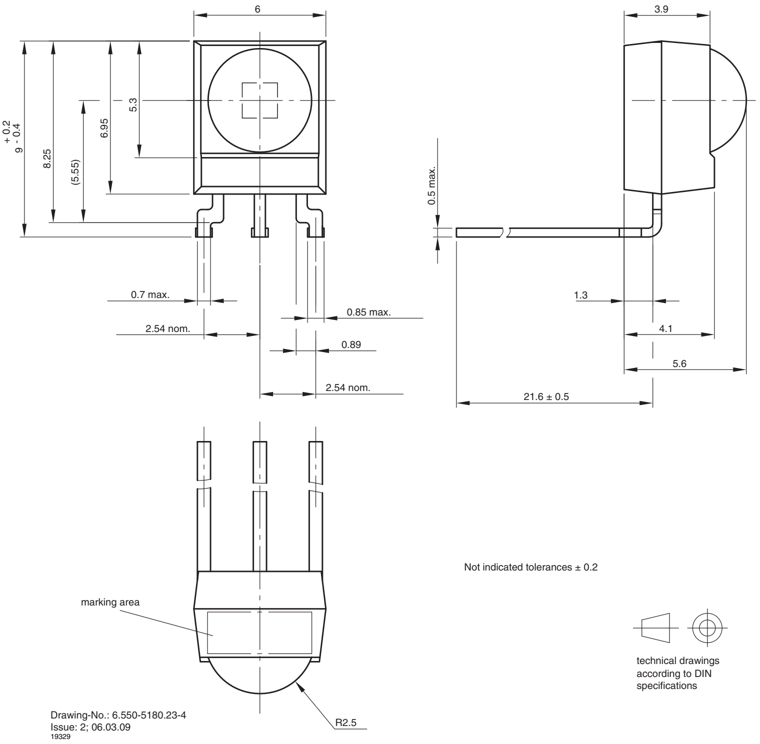
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

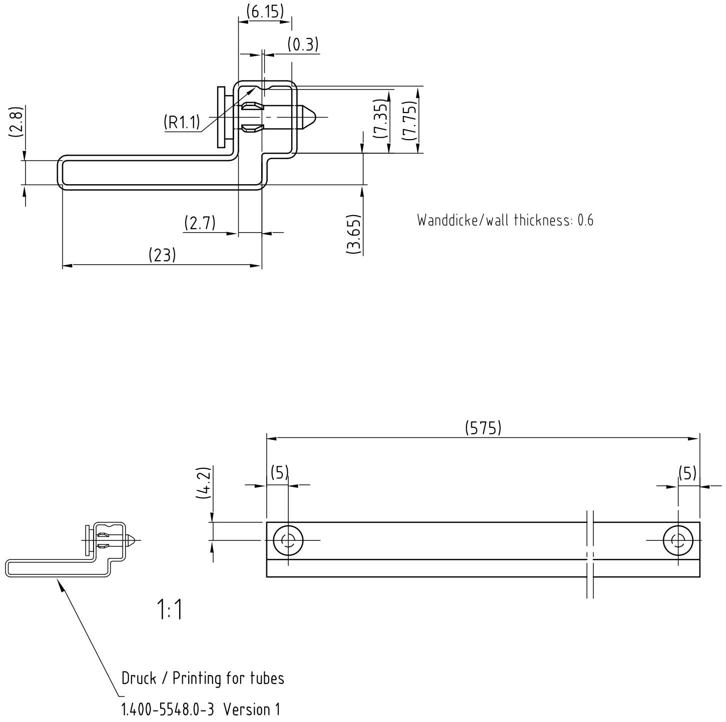


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
DA1	6.3		Bend	21.6	6	9

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5275.0-4
Rev. 2; Date: 20.11.03

20271-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	D	A	1

2 or 3 digit product series
2 digit frequency
Holder type

Note

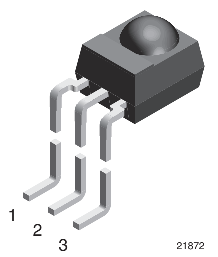
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838DA1

PACKING QUANTITY

- 90 pieces per tube
- 32 tubes per carton

IR Receiver Modules for Remote Control Systems

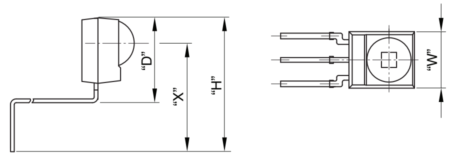


FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

AVAILABLE FOR:

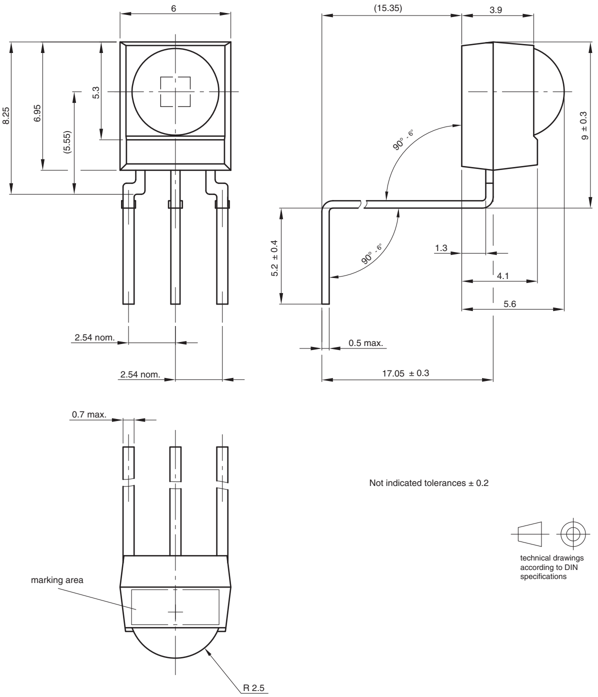
- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....



21871

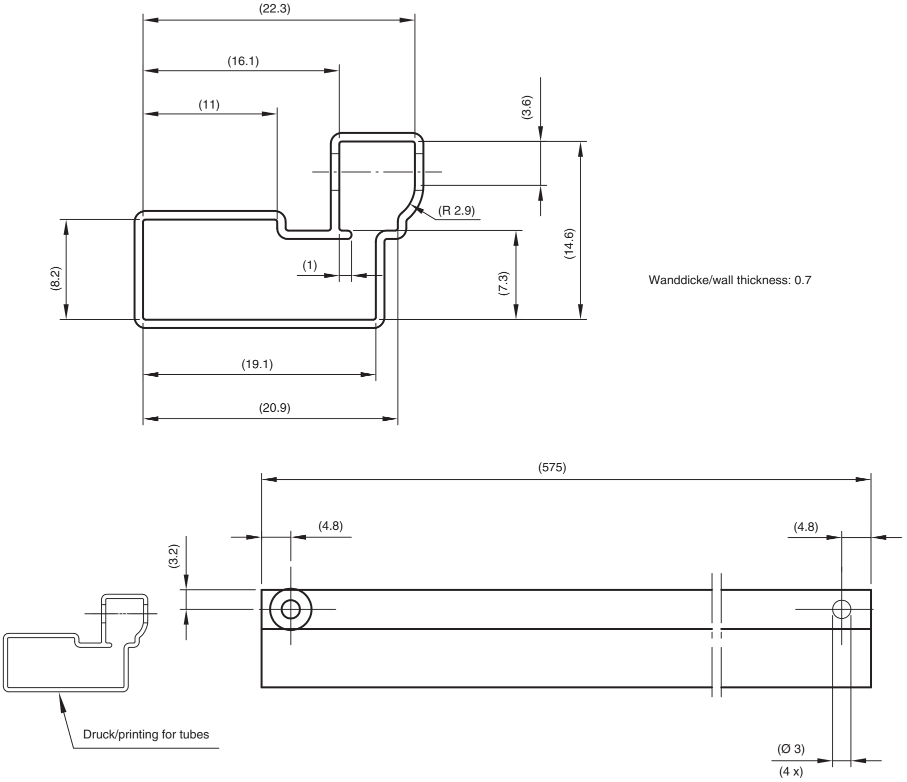
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
DE1	11.25	Side	Bent	14.2	6	9

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5304.01-4
Issue: 1; 24.08.09
21870

PACKAGING DIMENSIONS in millimeters



Drawing-no.: 9.700-5344.0-4
Issue: 1; 14.09.09
21869

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	D	E	1

2 or 3 digit product series
2 digit frequency
Holder type

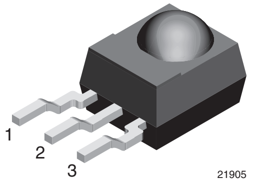
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838DE1

PACKING QUANTITY

- 90 pieces per tube
- 30 tubes per carton

IR Receiver Modules for Remote Control Systems



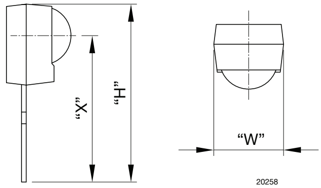
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

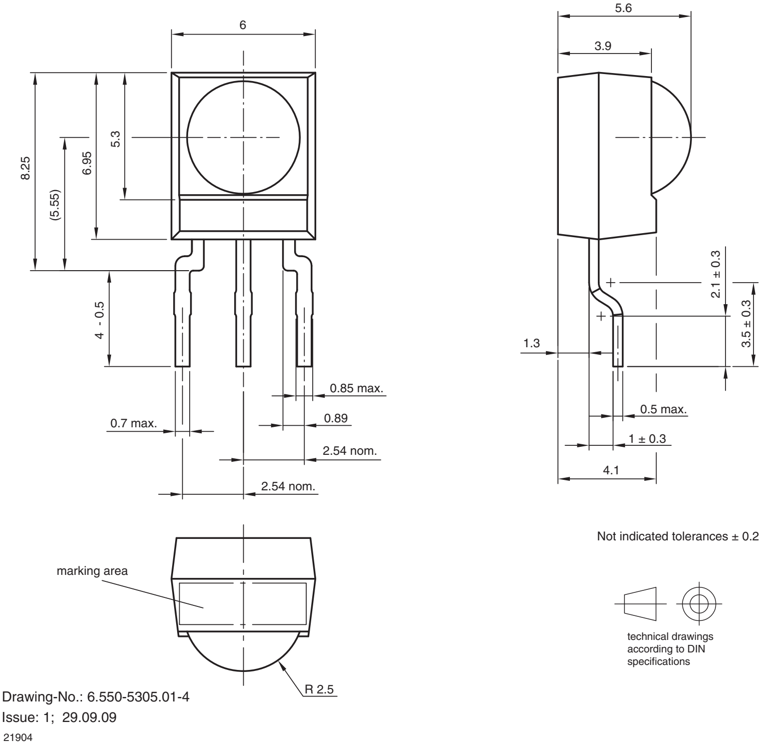
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

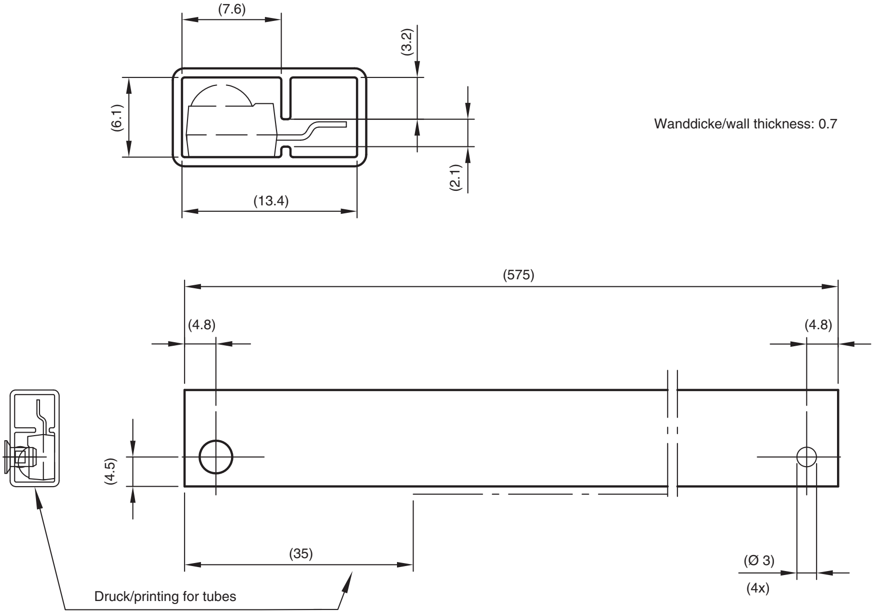


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
DF1	9.55	Side	Bent	12.25	6	

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5345.0-4
Issue: 1; 29.09.09
21903

ORDERING INFORMATION

T S O P d d d d d D F 1

2 or 3 digit product series 2 digit frequency Holder type

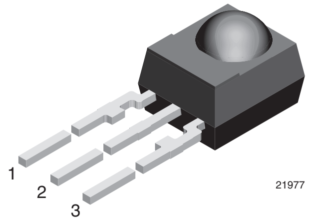
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP34338DF1

PACKING QUANTITY

- 90 pieces per tube
- 63 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

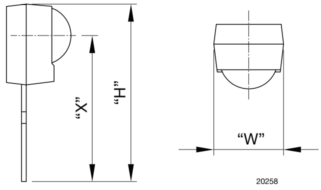
AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

Pb-free

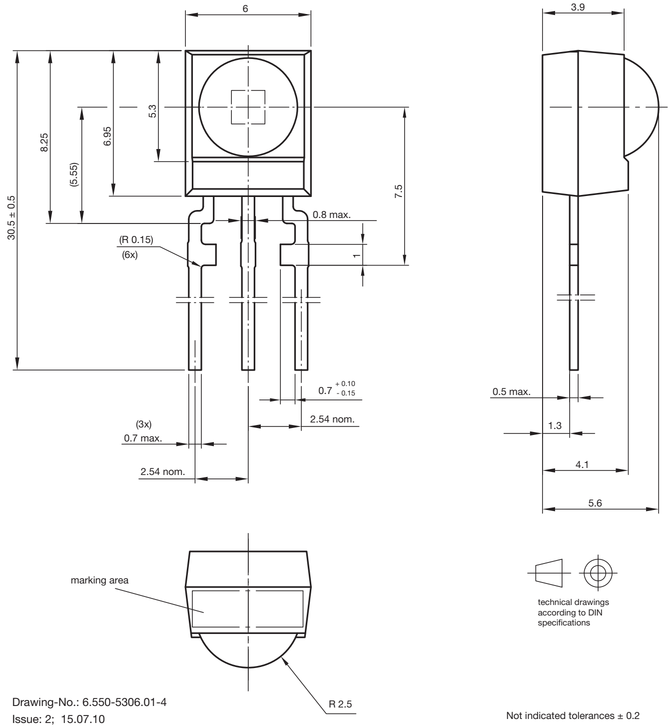
e3

RoHS
COMPLIANT



NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
DG1	27.8		Cut	30.5	6	

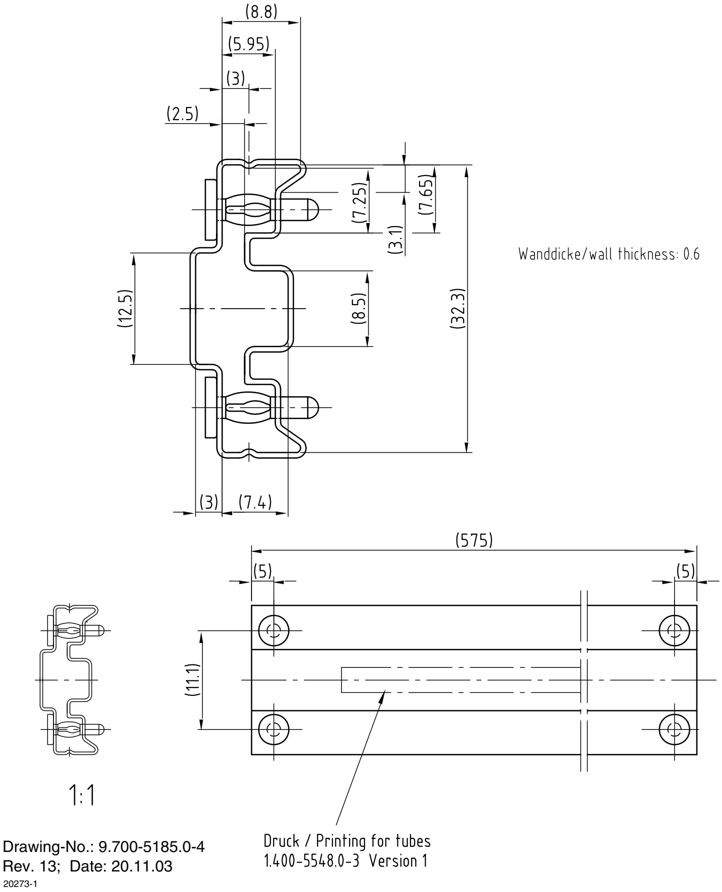
MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5306.01-4
Issue: 2; 15.07.10
22190

Not indicated tolerances ± 0.2

PACKAGING DIMENSIONS in millimeters



ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	D	G	1

2 or 3 digit product series
2 digit frequency
Holder type

Note

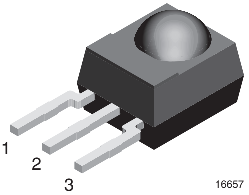
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP34840DG1

PACKING QUANTITY

- 90 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems



FEATURES

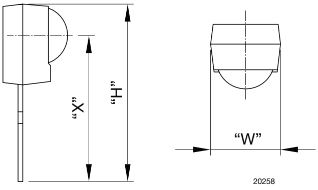
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

AVAILABLE FOR:

- TSOP34...
- TSOP4....
- TSOP32...
- TSOP2....

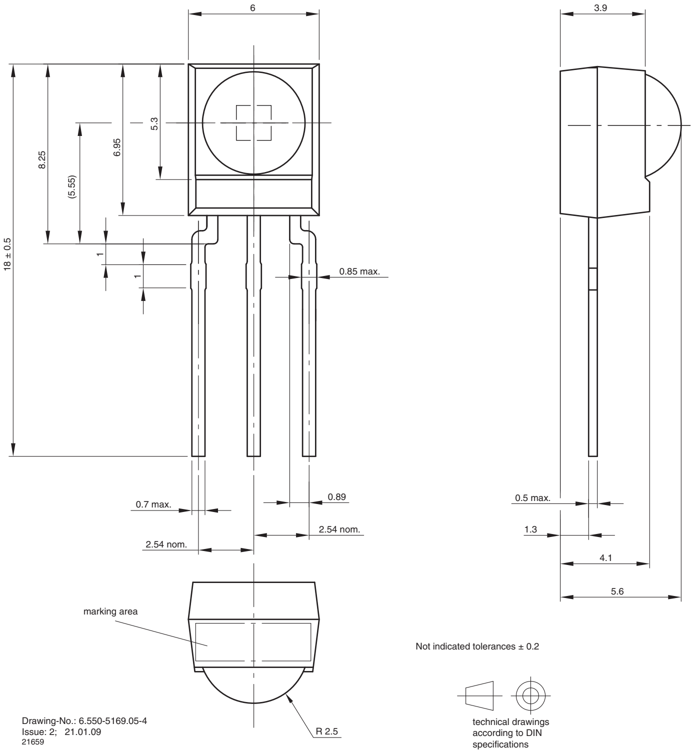
Pb-free

RoHS
COMPLIANT

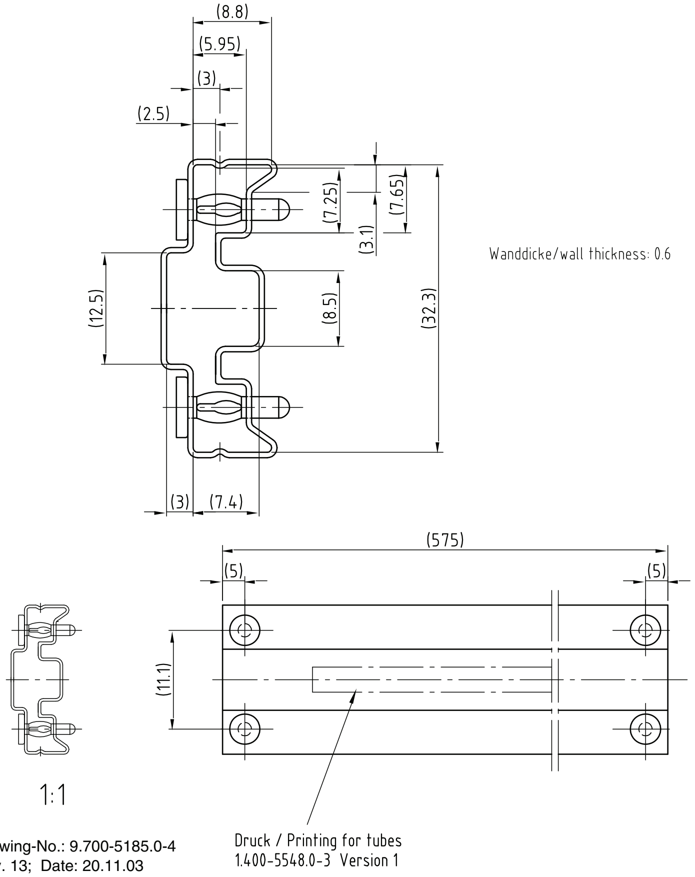


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
DB1	15.3		Cut	18	6	

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5185.0-4
Rev. 13; Date: 20.11.03
20273-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	D	B	1

2 or 3 digit product series 2 digit frequency Holder type

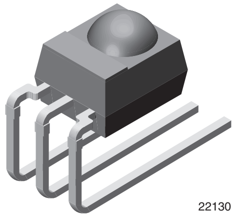
Note
d = "digit", please consult the list of available series on the previous page to create a valid part number.

Example: TSOP14838DB1

PACKING QUANTITY

- 90 pieces per tube
- 24 tubes per carton

IR Receiver Modules for Remote Control Systems



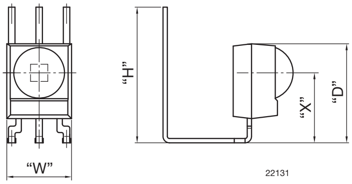
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

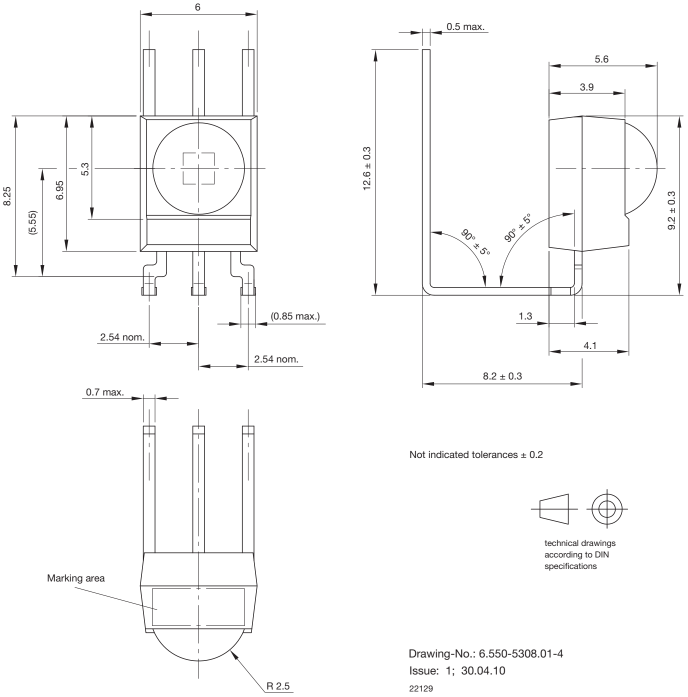
AVAILABLE FOR:

- TSOP2...
- TSOP32...
- TSOP4....
- TSOP34...

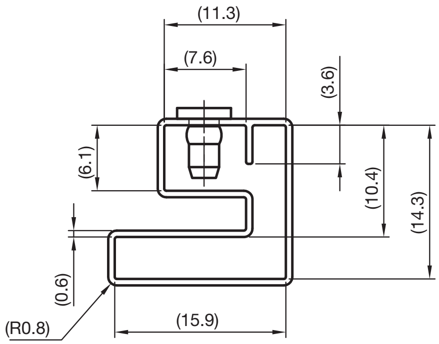


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
ST1	6.5		Bend	12.6	6	9.2

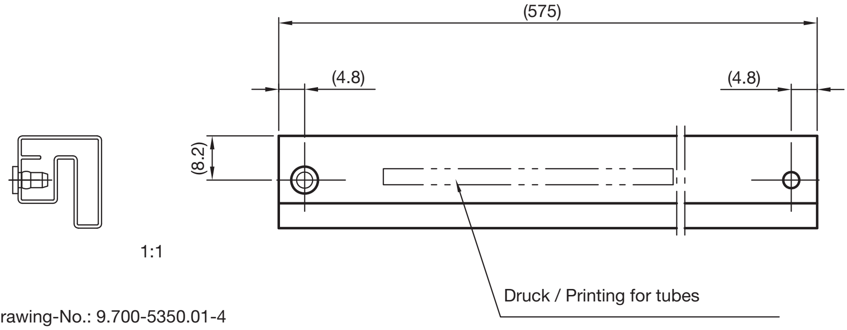
MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Wanddicke/wall thickness: 0.6



Drawing-No.: 9.700-5350.01-4
Issue: 1; 21.05.10
22128

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	D	I	1

2 or 3 digit product series — 2 digit frequency — Holder type

Note

d = "digit", please consult the list of available series on the previous page to create a valid part number.

Example: TSOP4836DI1

PACKING QUANTITY

- 90 pieces per tube
- 32 tubes per carton

Minicast Mechanical Options

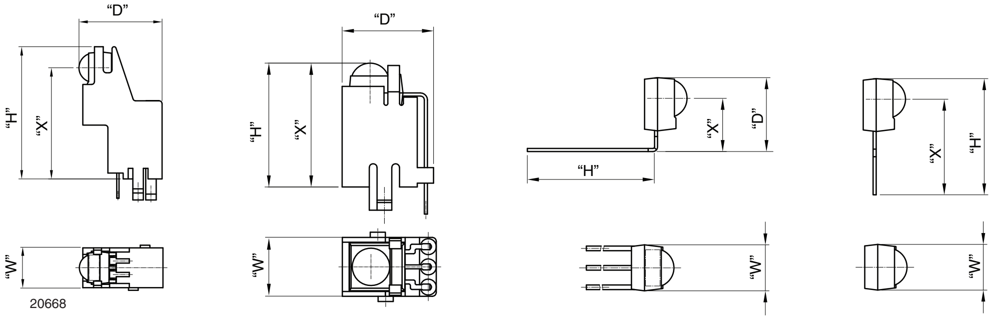
Contents

Minicast Holders

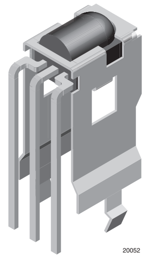
Minicast Cuts and Bends

Minicast Photomodule Holders, Cuts and Bends

HOLDER	D	H	W	X	VIEW	TYPE	PAGE
CC	10.5	16	7.3	16	Top	Holder	593
PA	8.5	14.1	6	11	Side	Holder	595
PC	9.3	12.7	7.3	9.6	Side	Holder	597
ES	8.25	19.6	7.2	16	Side	Holder	599
CZ	9.65	9.4	6.5	9.4	Top	Holder	601
CA	8.5	9.1	6	6	Side	Holder	603
CUT OR BEND	**D**	**H**	**W**	**X**	**VIEW**	**TYPE**	**PAGE**
SB	9.65	20.8	5	6.95		Bend	605
DB	-	9.95	5	7.25		Cut	607
ST	9.65	5	5	6.95		Bend	609
SU	9.65	3	5	6.95		Bend	611
SO	10.1	9.6	5	7.4		Bend	613
SJ	10.1	19.25	5	7.4		Bend	615
DD	-	11.05	5	8.35		Cut	617
DH	11	9.6	5	8.3		Bend	619
DJ	12	4	5	9.2		Bend	621



IR Receiver Modules for Remote Control Systems



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

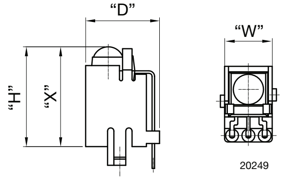
Pb
Pb-free

e3

RoHS
COMPLIANT

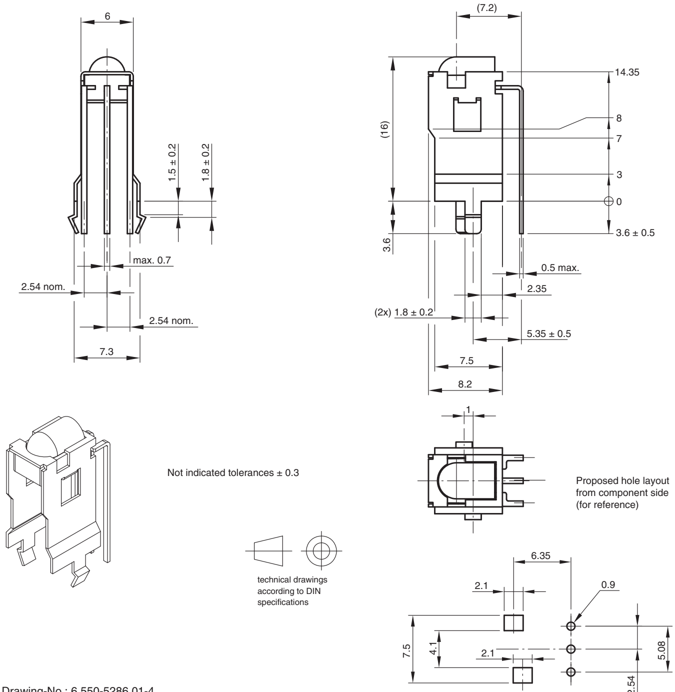
AVAILABLE FOR:

- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...



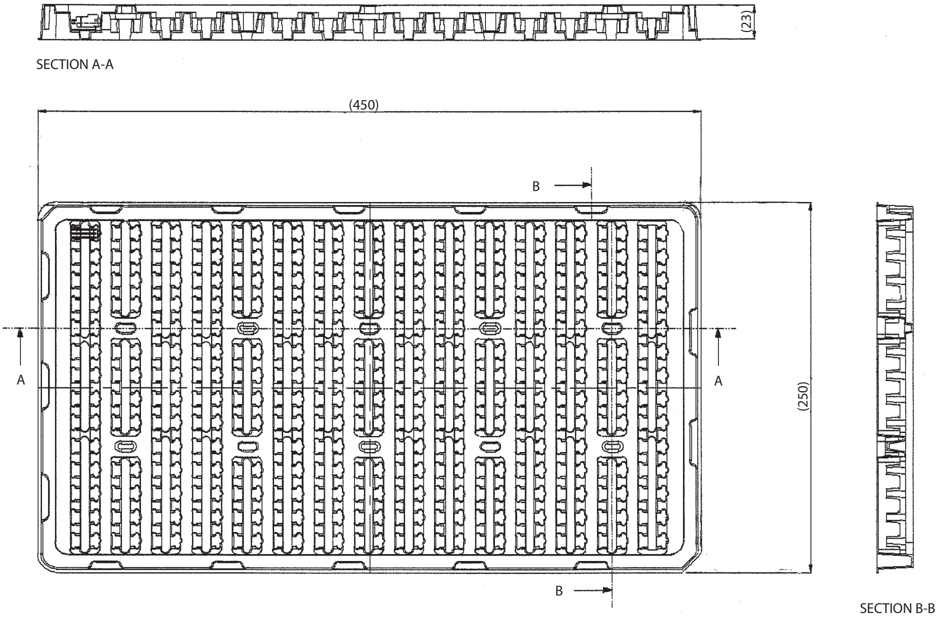
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
CC1	16	Top	Holder	16	7.3	10.5

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5286.01-4
Issue: 2; 06.03.09
20051

PACKAGING DIMENSIONS in millimeters



TSOP CC1
9.700-5302.0-2
Rev. 1 Date 20.07.06
20245-1

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	C	C	1

2 or 3 digit product series
2 digit frequency
Holder type

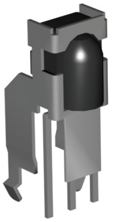
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP58238CC1

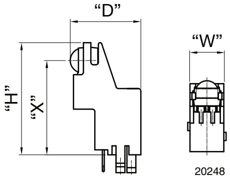
PACKING QUANTITY

- 200 per tray
- 5 trays per carton

IR Receiver Modules for Remote Control Systems



19441



20248

FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

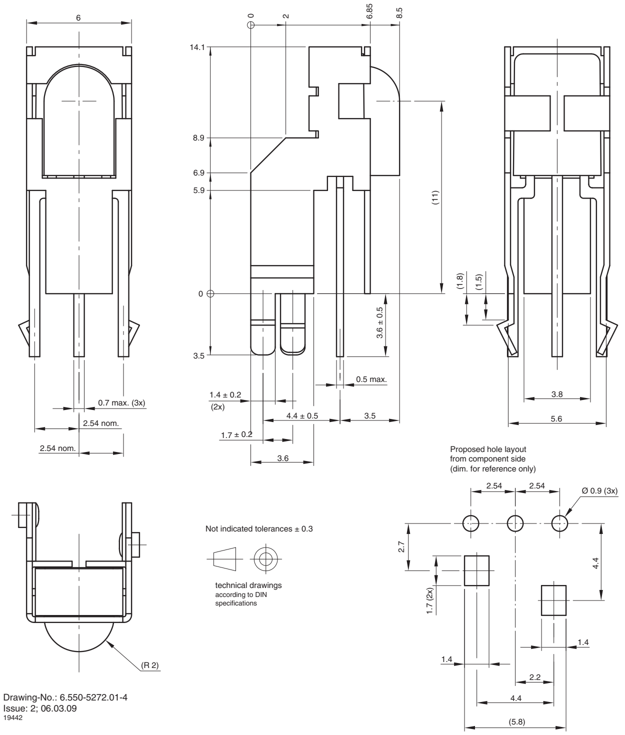
RoHS
COMPLIANT

AVAILABLE FOR:

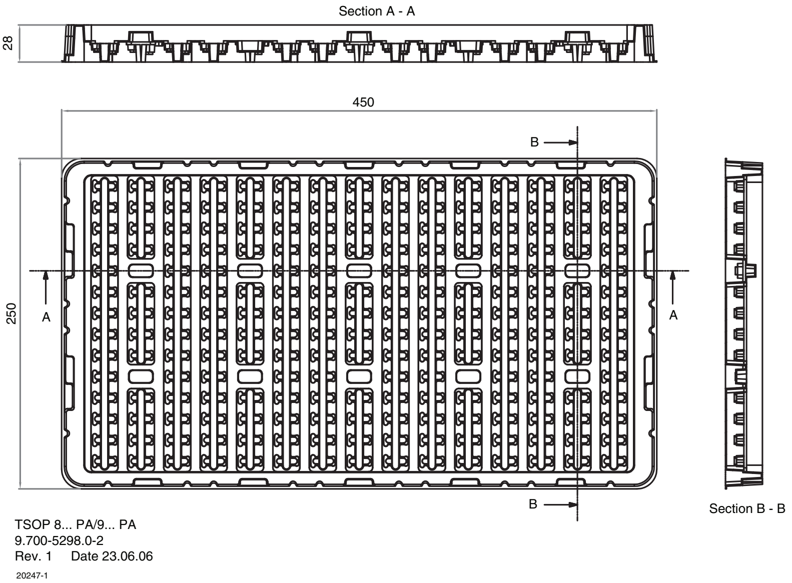
- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
PA1	11	Side	Holder	14.1	6	8.5

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	P	A	1

2 or 3 digit product series 2 digit frequency Holder type

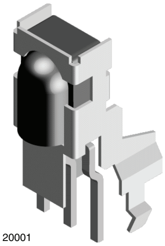
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP58238PA1

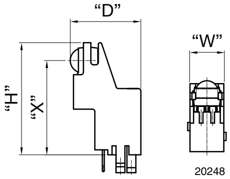
PACKING QUANTITY

- 200 pieces per tray
- 5 trays per carton

IR Receiver Modules for Remote Control Systems



20001



20248

FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

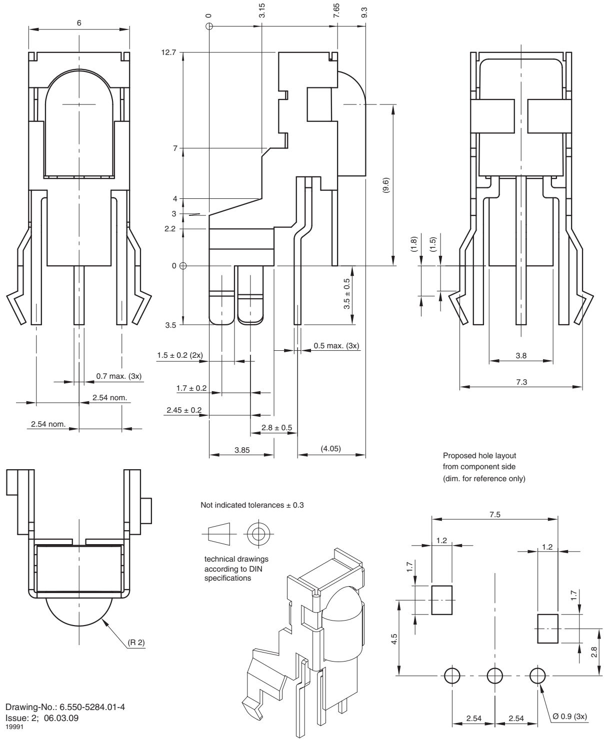
RoHS
COMPLIANT

AVAILABLE FOR:

- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
PC1	9.6	Side	Holder	12.7	7.3	9.3

MECHANICAL DIMENSIONS in millimeters



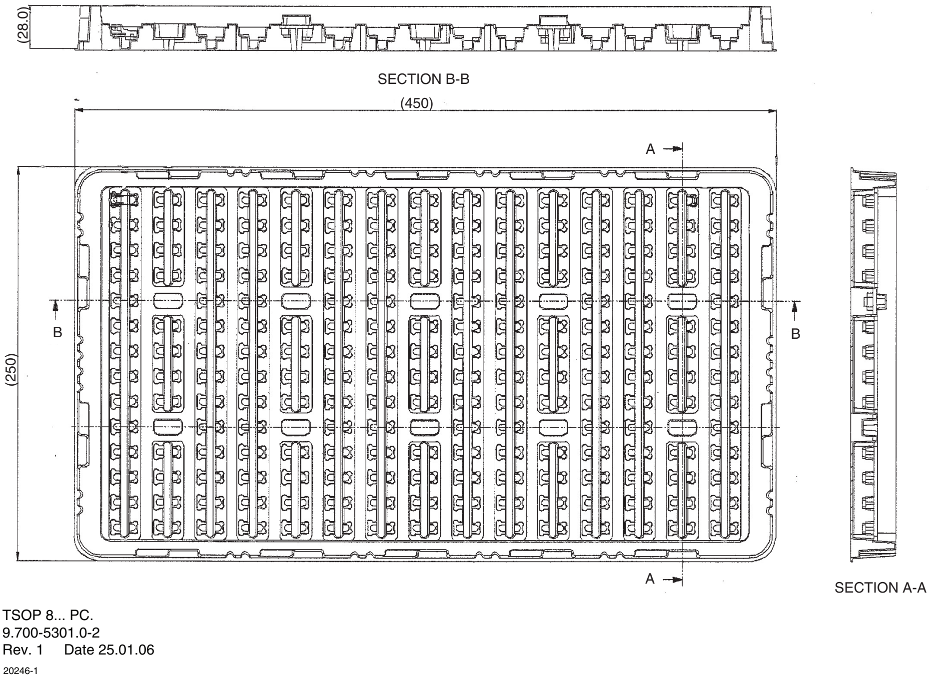
Proposed hole layout from component side (dim. for reference only)

Not indicated tolerances ± 0.3

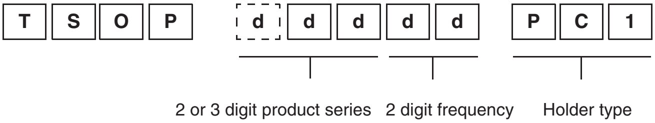
technical drawings according to DIN specifications

Drawing-No.: 6.550-5284.01-4
Issue: 2; 06.03.09
19991

PACKAGING DIMENSIONS in millimeters



ORDERING INFORMATION



Note

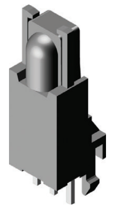
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP58238PC1

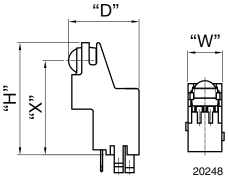
PACKING QUANTITY

- 200 pieces per tray
- 5 trays per carton

IR Receiver Modules for Remote Control Systems



20212



20248

FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

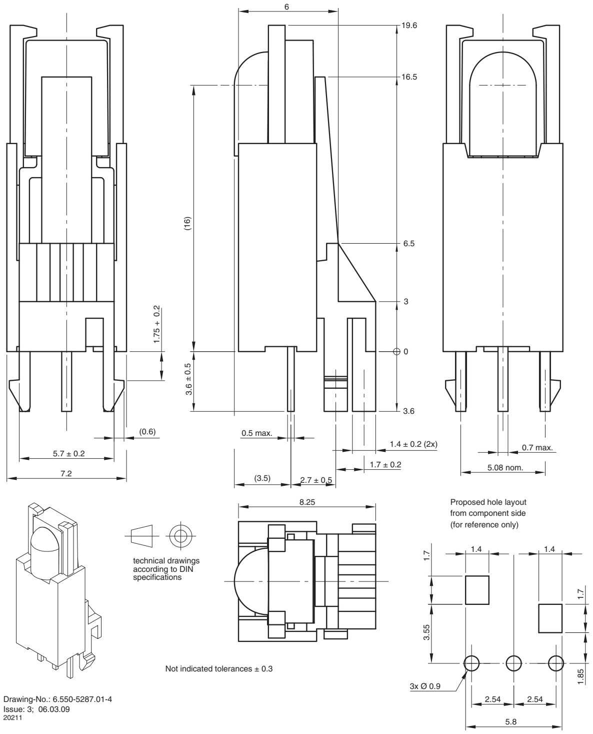
Pb-free
e3
RoHS
COMPLIANT

AVAILABLE FOR:

- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
ES1	16	Side	Holder	19.6	7.2	8.25

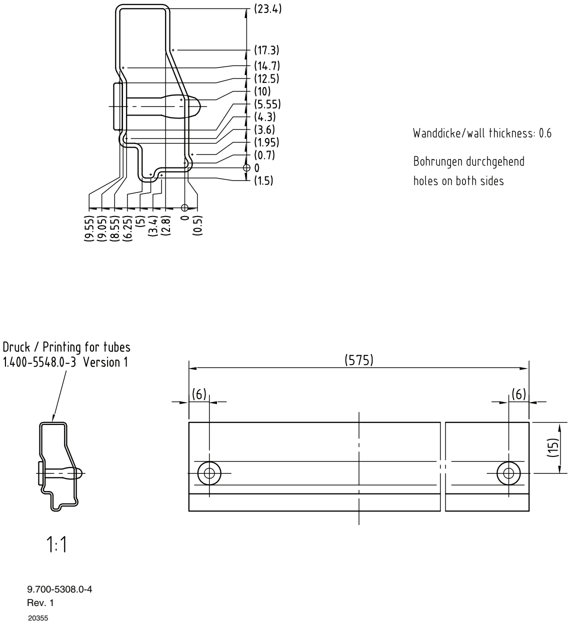
MECHANICAL DIMENSIONS in millimeters



Not indicated tolerances ± 0.3

Drawing-No.: 6.550-5287.01-4
Issue: 3; 06.03.09
20211

PACKAGING DIMENSIONS in millimeters



ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	E	S	1

2 or 3 digit product series 2 digit frequency Holder type

Note

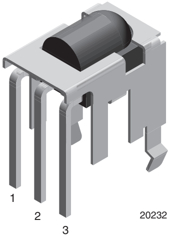
d = "digit", please consult the list of available series on the previous page to create a valid part number.

Example: TSOP19238ES1

PACKING QUANTITY

- 75 pieces per tube
- 30 tubes per carton

IR Receiver Modules for Remote Control Systems

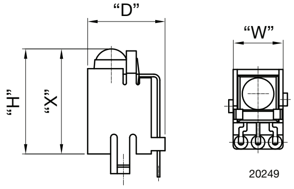


FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

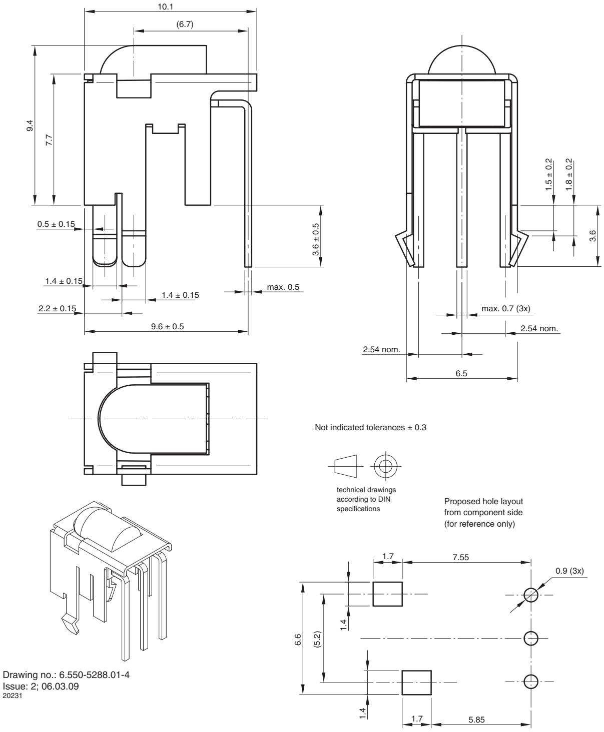
AVAILABLE FOR:

- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...

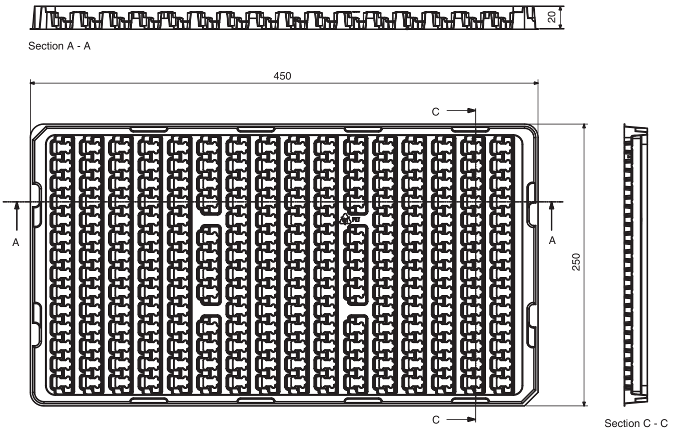


NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
CZ1	9.4	Top	Holder	9.4	6.5	10.1

MECHANICAL DIMENSIONS in millimeters



PACKAGING DIMENSIONS in millimeters



Drawing-No. 9.700-5307.01-1
Issue 1; 17.06.09
21799

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	C	Z	1

2 or 3 digit product series (d d d) · 2 digit frequency (d d) · Holder type (C Z 1)

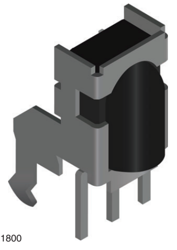
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

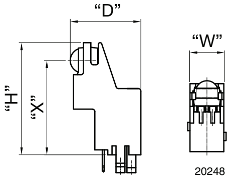
Example: TSOP39238CZ1

PACKING QUANTITY

- 220 pieces per tray
- 7 trays per carton

IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3

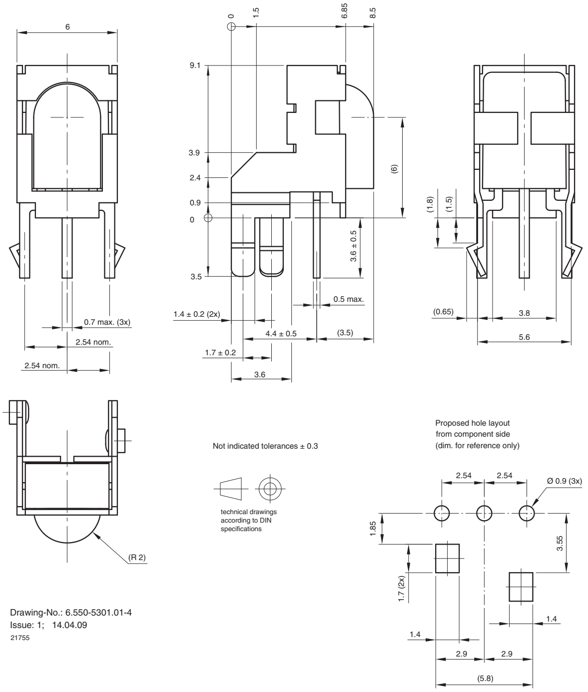
RoHS
COMPLIANT

AVAILABLE FOR:

- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...

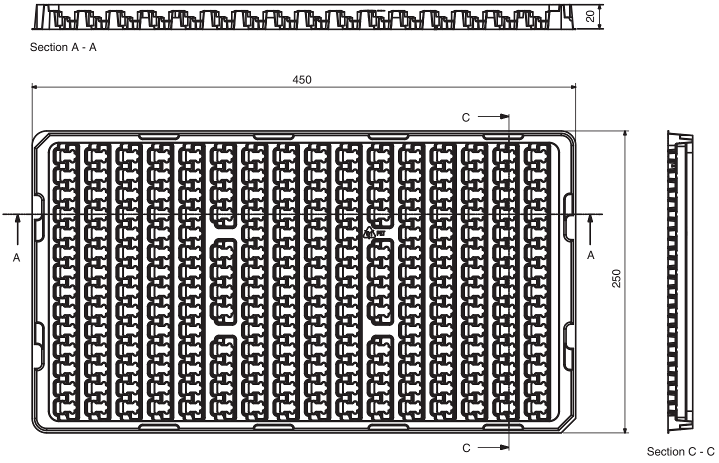
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
CA1	6	Side	Holder	9.1	6	8.5

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5301.01-4
Issue: 1; 14.04.09
21755

PACKAGING DIMENSIONS in millimeters



Drawing-No. 9.700-5307.01-1
Issue 1; 17.06.09
21799

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	C	A	1

2 or 3 digit product series — d d d; 2 digit frequency — d d; Holder type — C A 1

Note

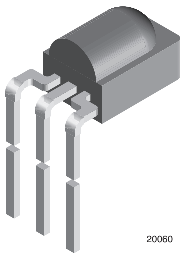
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP38236CA1

PACKING QUANTITY

- 220 pieces per tray
- 7 trays per carton

IR Receiver Modules for Remote Control Systems



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

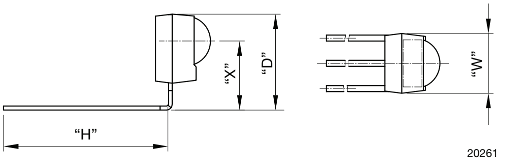
Pb-free

e3

RoHS
COMPLIANT

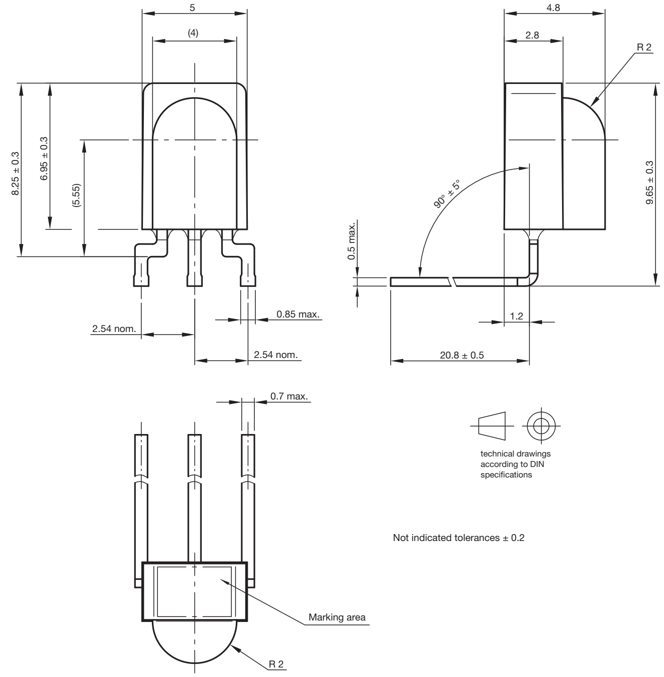
AVAILABLE FOR:

- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...



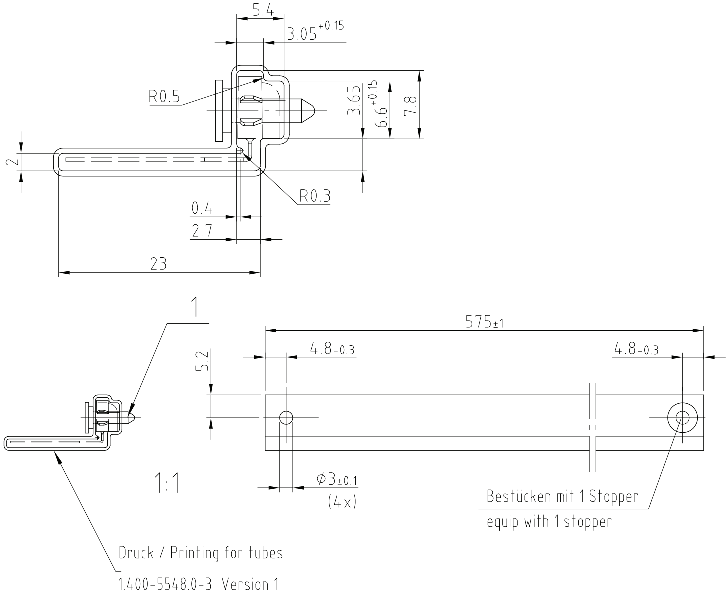
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SB1	6.95		Bend	20.8	5	9.65

MECHANICAL DIMENSIONS in millimeters



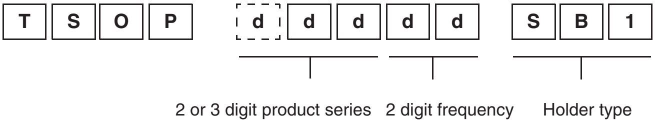
Drawing-No.: 6.550-5281.01-4
Issue: 3; 12.03.10
20061

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5309.0-4
Rev. 2; Date: 26.10.07
20440

ORDERING INFORMATION



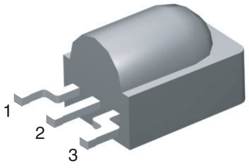
Note
d = "digit", please consult the list of available series on the previous page to create a valid part number.

Example: TSOP39238SB1

PACKING QUANTITY

- 105 pieces per tube
- 30 tubes per carton

IR Receiver Modules for Remote Control Systems



19790

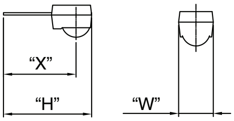
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

AVAILABLE FOR:

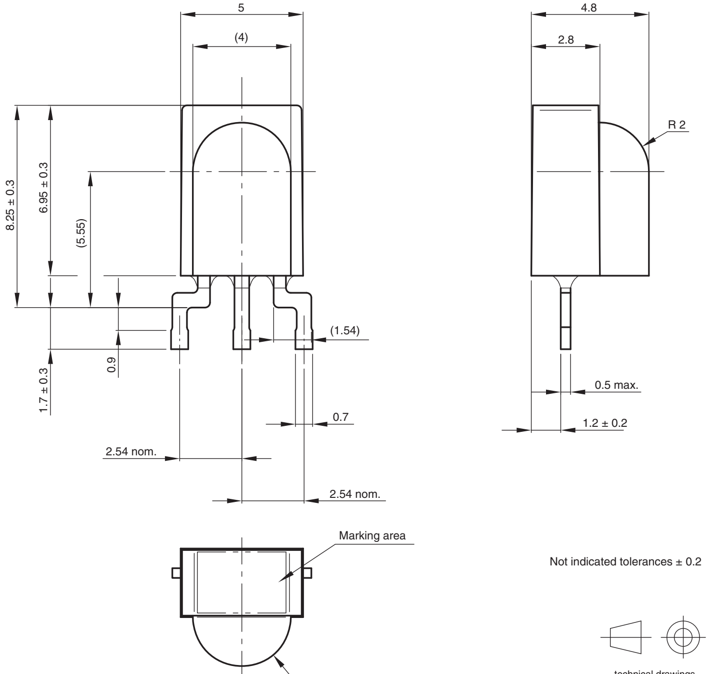
- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...



20244

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
DB1	7.25		Cut	9.95	5	

MECHANICAL DIMENSIONS in millimeters



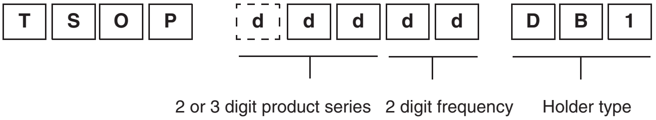
technical drawings according to DIN specifications

Drawing-No.: 6.550-5263.03-4
Issue: 2; 06.03.09
19791

PACKAGING DIMENSIONS in millimeters

The DB1 is packed in anti-static plastic bags. Therefore no dimensions are given.

ORDERING INFORMATION



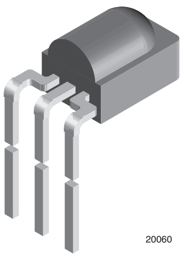
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP58238DB1

PACKING QUANTITY

- 500 pieces per bag
- 6 bags per carton

IR Receiver Modules for Remote Control Systems



FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

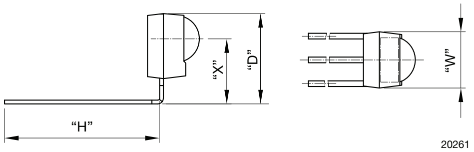
Pb-free

e3

RoHS
COMPLIANT

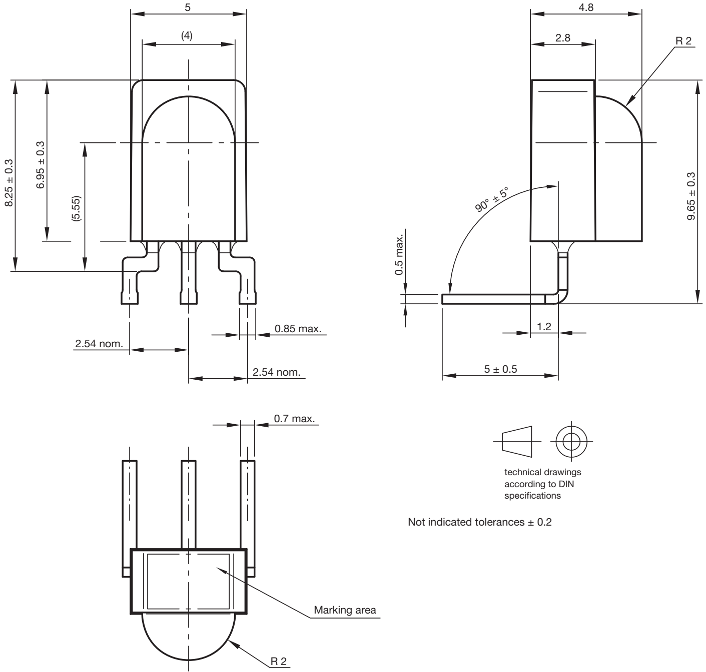
AVAILABLE FOR:

- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...



NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
ST1	6.95		Bend	5	5	9.65

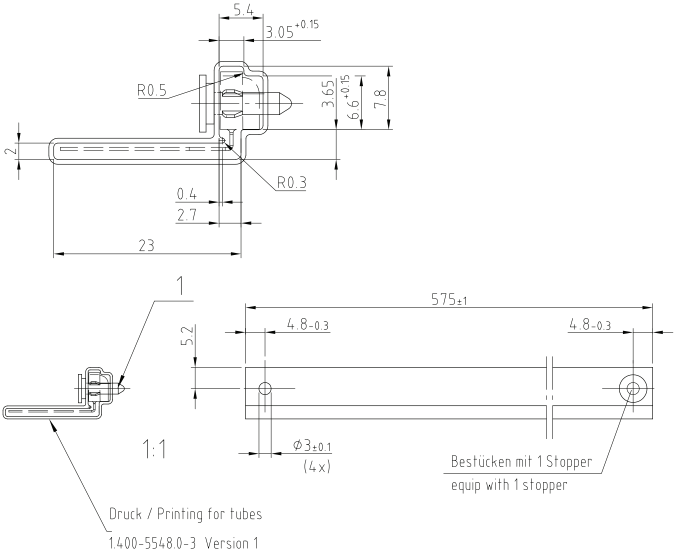
MECHANICAL DIMENSIONS in millimeters



Not indicated tolerances ± 0.2

Drawing-No.: 6.550-5281.02-4
Issue: 3; 12.03.10
20439

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5309.0-4
Rev. 2; Date: 26.10.07
20440

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	T	1

2 or 3 digit product series 2 digit frequency Holder type

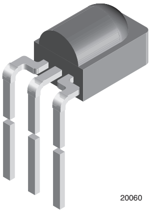
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP19238ST1

PACKING QUANTITY

- 105 pieces per tube
- 30 tubes per carton

IR Receiver Modules for Remote Control Systems



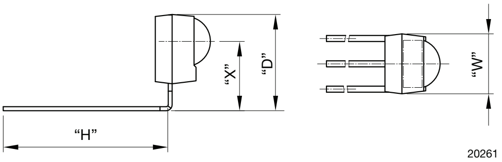
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

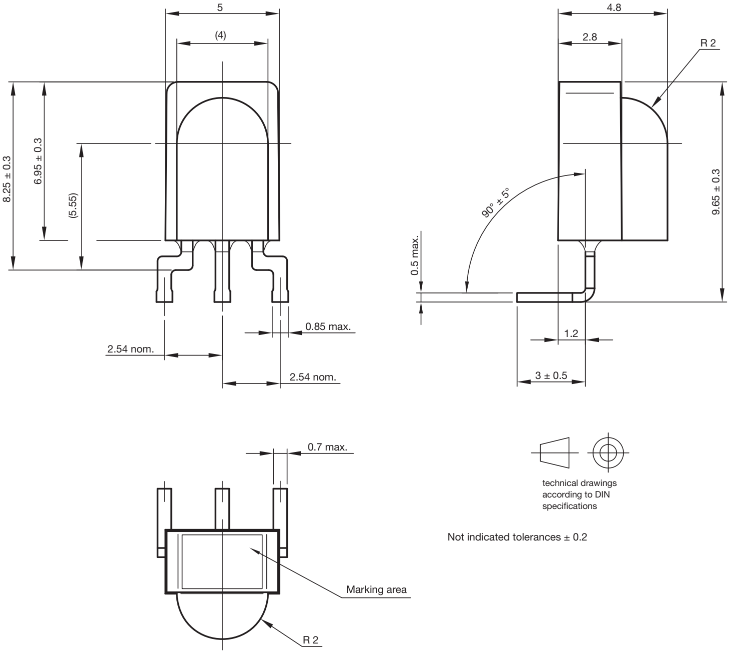
AVAILABLE FOR:

- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...



NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SU1	6.95	Top	Bend	3	5	9.65

MECHANICAL DIMENSIONS in millimeters

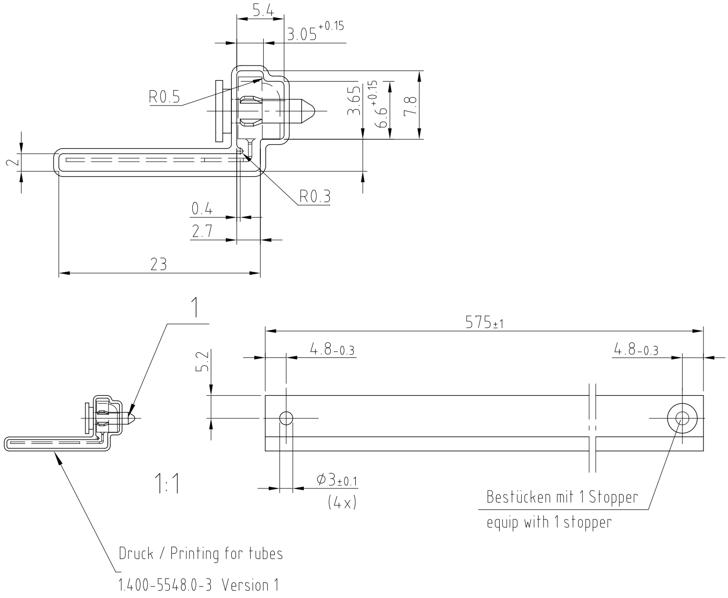


technical drawings according to DIN specifications

Not indicated tolerances ± 0.2

Drawing-No.: 6.550-5281.05-4
Issue: 4; 12.03.10
21411

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5309.0-4
Rev. 2; Date: 26.10.07

20440

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	U	1

2 or 3 digit product series   2 digit frequency   Holder type

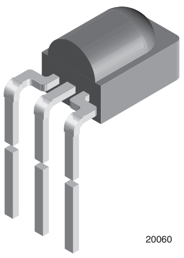
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP38238SU1

PACKING QUANTITY

- 105 pieces per tube
- 30 tubes per carton

IR Receiver Modules for Remote Control Systems



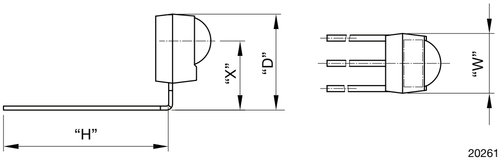
FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free
e3
RoHS
COMPLIANT

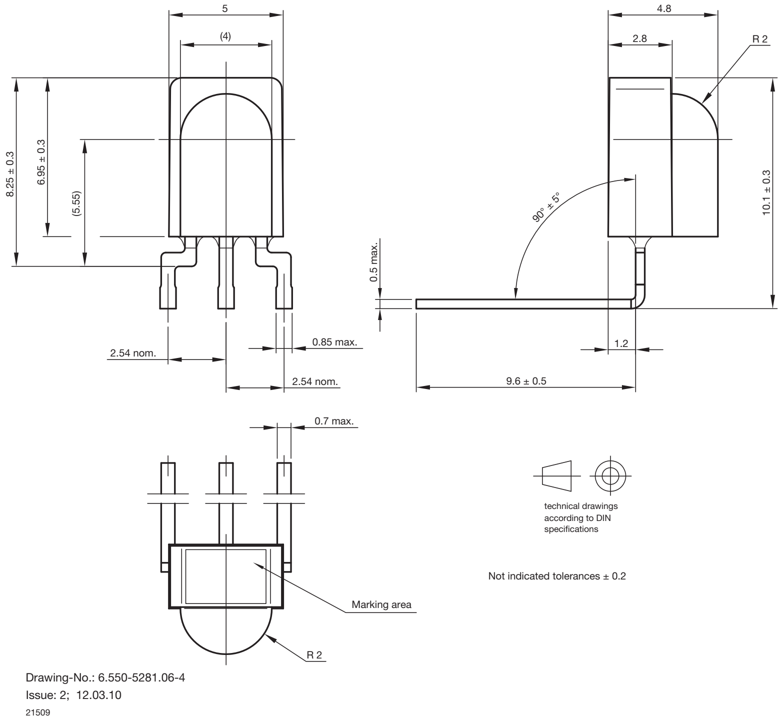
AVAILABLE FOR:

- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...



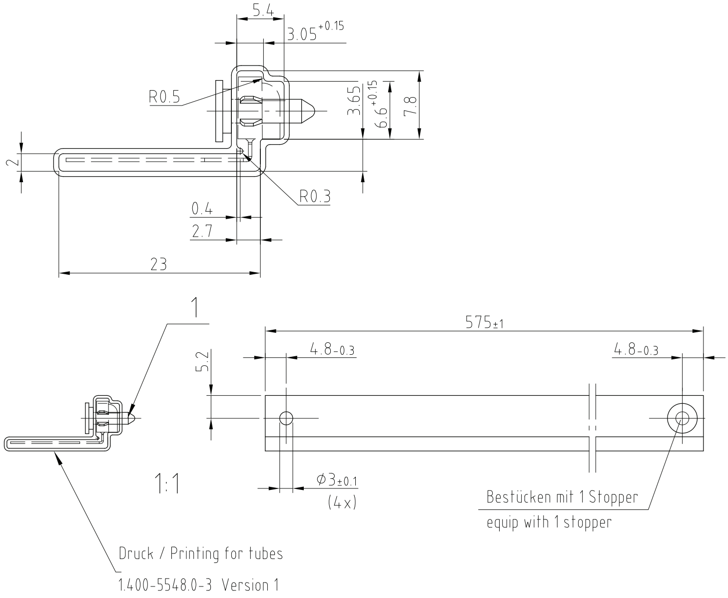
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SO1	7.4		Bend	9.6	5	10.1

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5281.06-4
Issue: 2; 12.03.10
21509

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5309.0-4
Rev. 2; Date: 26.10.07
20440

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	S	O	1

2 or 3 digit product series 2 digit frequency Holder type

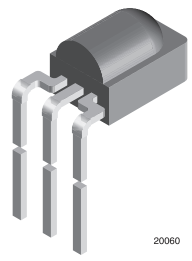
Note
d = "digit", please consult the list of available series on page 1 to create a valid part number.

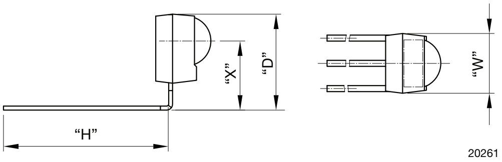
Example: TSOP39238SO1

PACKING QUANTITY

- 105 pieces per tube
- 30 tubes per carton

IR Receiver Modules for Remote Control Systems





FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

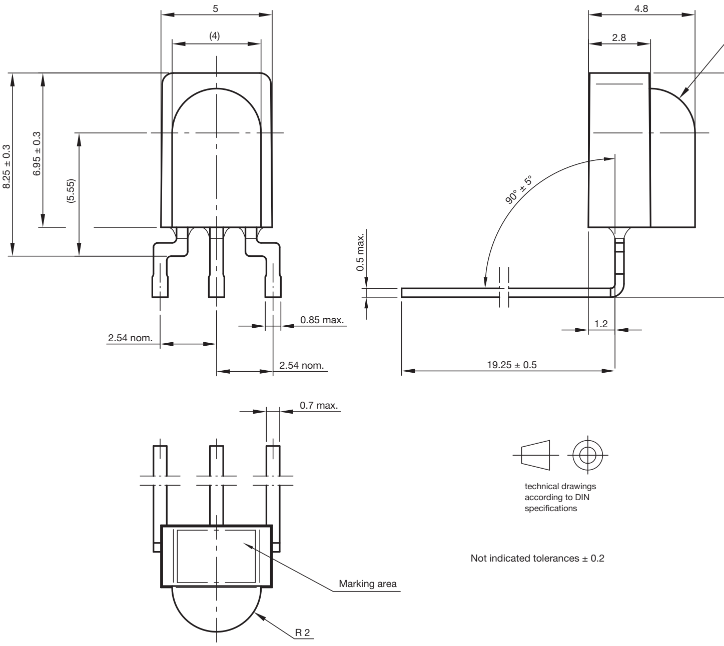
Pb-free
e3
RoHS
COMPLIANT

AVAILABLE FOR:

- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...

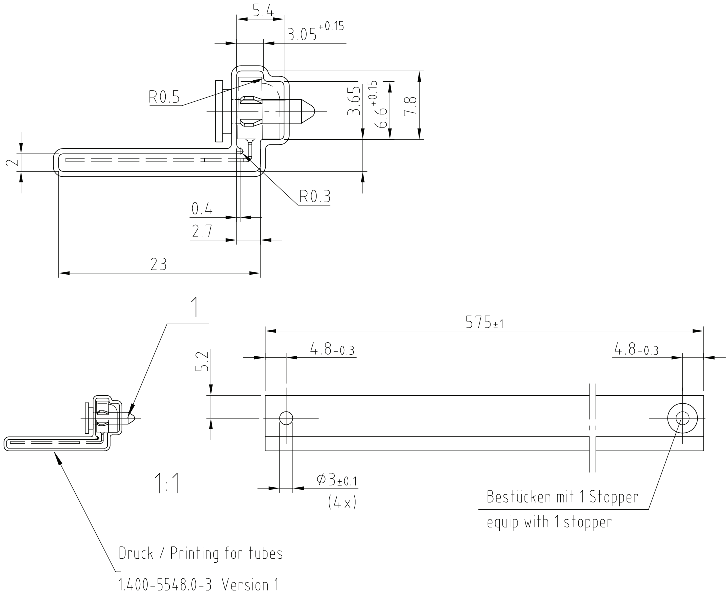
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SJ1	7.4		Bend	19.25	5	10.1

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5281.07-4
Issue: 2; 12.03.10
21651

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5309.0-4
Rev. 2; Date: 26.10.07
20440

ORDERING INFORMATION

T S O P d d d d d S J 1

2 or 3 digit product series
2 digit frequency
Holder type

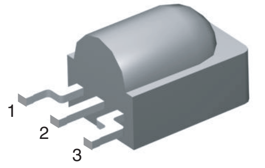
Note
d = “digit”, please consult the list of available series on page 1 to create a valid part number.

Example: TSOP39238SJ1

PACKING QUANTITY

- 105 pieces per tube
- 30 tubes per carton

IR Receiver Modules for Remote Control Systems



19790

FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

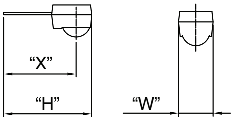
Pb-free

e3

RoHS
COMPLIANT

AVAILABLE FOR:

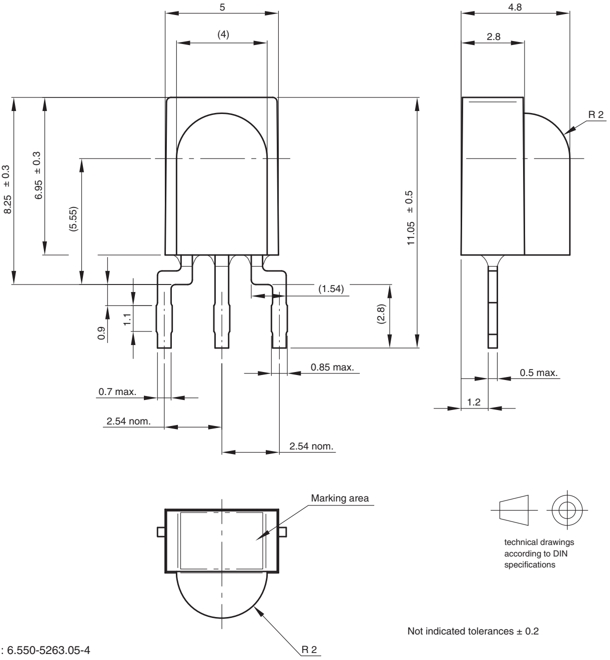
- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...



20244

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
DD1	8.35		Cut	11.05	5	

MECHANICAL DIMENSIONS in millimeters

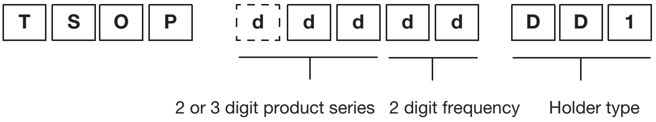


Drawing-No.: 6.550-5263.05-4
Issue: 1; 25.02.09
21763

PACKAGING DIMENSIONS in millimeters

The DD1 is packed in anti-static plastic bags. Therefore no dimensions are given.

ORDERING INFORMATION



Note

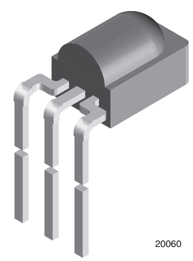
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP58238DD1

PACKING QUANTITY

- 500 pieces per bag
- 6 bags per carton

IR Receiver Modules for Remote Control Systems

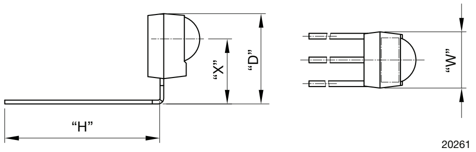


FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

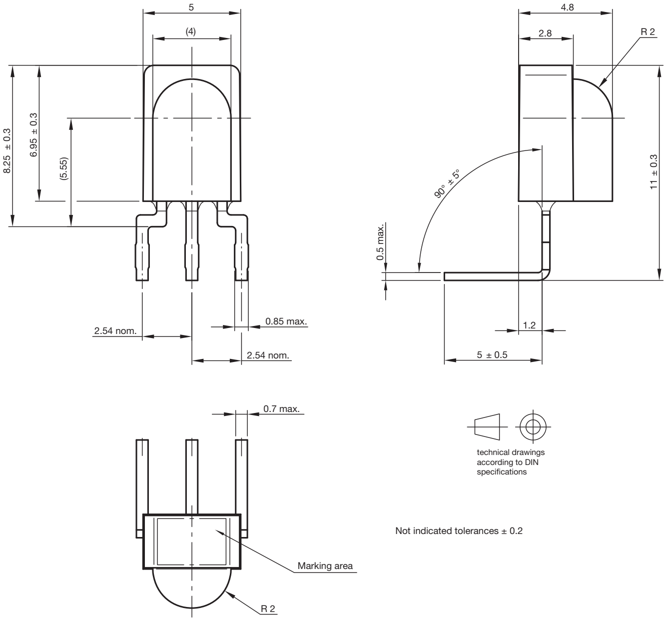
AVAILABLE FOR:

- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...



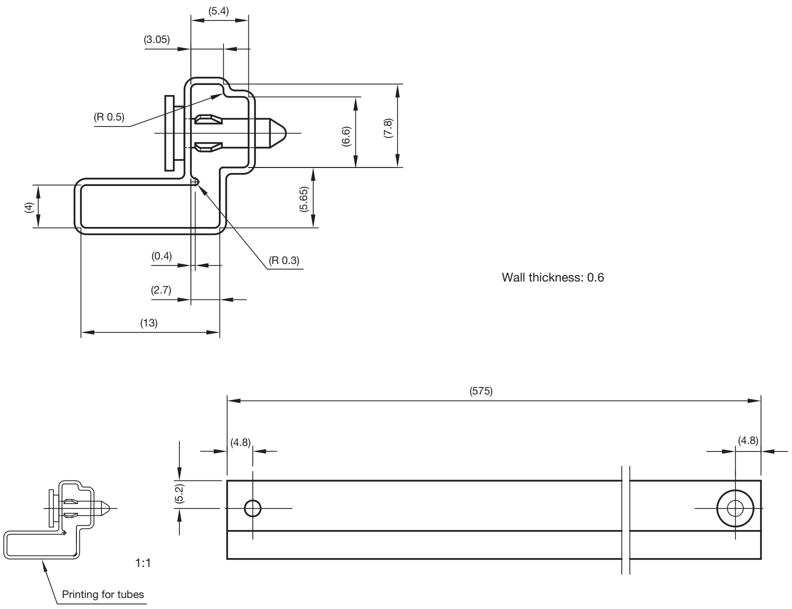
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
DH1	8.3		Bend	5	5	11

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5281.08-4
Issue: 2; 09.03.10
22063

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5349.0-4
Issue: 1; 02.03.10
22064

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	D	H	1
				2 or 3 digit product series			2 digit frequency		Holder type		

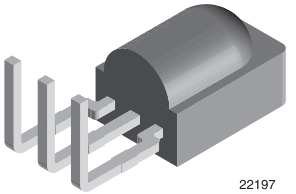
Note
d = “digit”, please consult the list of available series on the previous page to create a valid part number.

Example: TSOP38438DH1

PACKING QUANTITY

- 105 pieces per tube
- 36 tubes per carton

IR Receiver Modules for Remote Control Systems



22197

FEATURES

- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

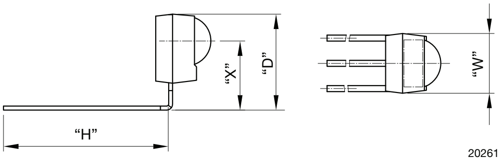
Pb-free

e3

RoHS
COMPLIANT

AVAILABLE FOR:

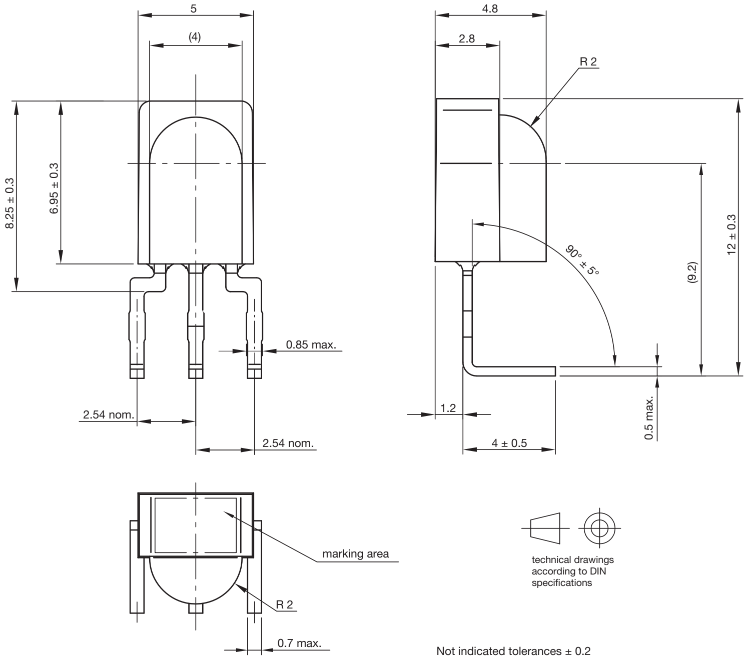
- TSOP58...
- TSOP59...
- TSOP38....
- TSOP39...
- TSOP98...



20261

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
SJ1	9.2		Bend	4	5	12

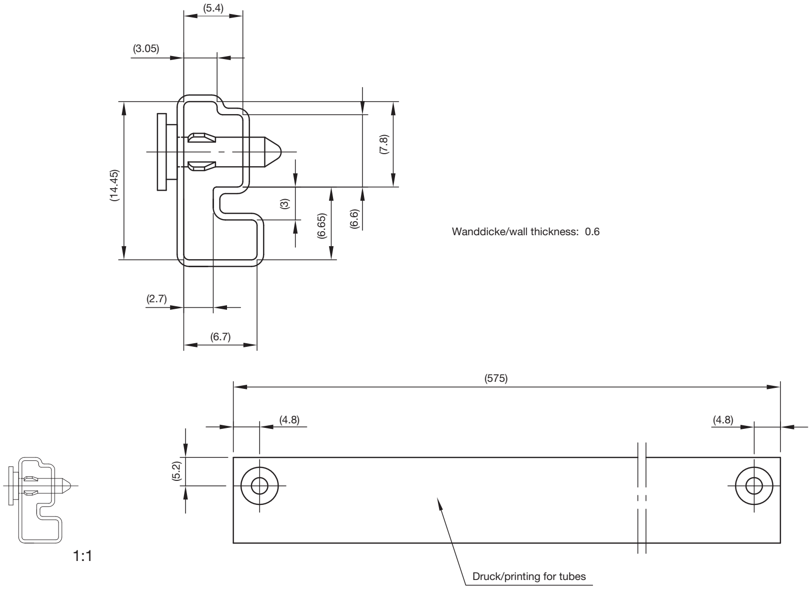
MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5309.01-4
Issue: 1; 19.07.10
22196

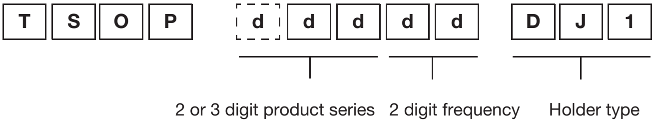
Not indicated tolerances ± 0.2

PACKAGING DIMENSIONS in millimeters



Drawing-No.: 9.700-5360.01-4
Issue: 1; 19.07.10
22198

ORDERING INFORMATION



Note
d = “digit”, please consult the list of available series on page 1 to create a valid part number.

Example: TSOP39238DJ1

PACKING QUANTITY

- 105 pieces per tube
- 63 tubes per carton

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