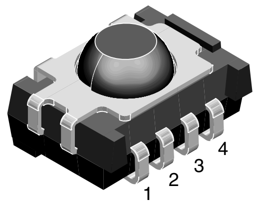
IR Receiver Modules for Remote Control Systems

Description

The TSOP361.. - 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 main benefit is the operation with short burst transmission codes and high data rates at a supply voltage of 3 V.

This component has not been qualified according to automotive specifications.



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Features

- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Continuous data transmission possible
- TTL and CMOS compatibility
- Output active low
- Supply voltage range: 2.7 V to 5.5 V
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

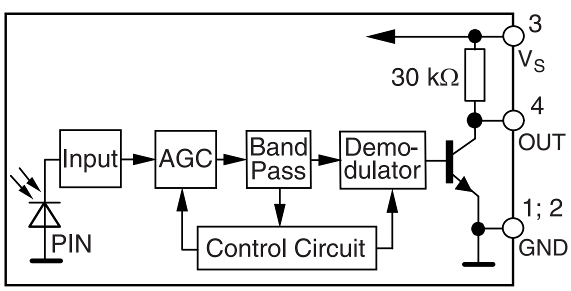
Pb-free

e3

Special Features

- Enhanced data rate up to 4000 bit/s
- Operation with short burst possible (≥ 6 cycles/burst)
- Taping available for topview and sideview assembly

Block Diagram



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Mechanical Data

Pinning:

1 = GND, 2 = GND, 3 = V_S, 4 = OUT

Parts Table

Part	Carrier Frequency
TSOP36130	30 kHz
TSOP36133	33 kHz
TSOP36136	36 kHz
TSOP36137	36.7 kHz
TSOP36138	38 kHz
TSOP36140	40 kHz
TSOP36156	56 kHz

Application Circuit

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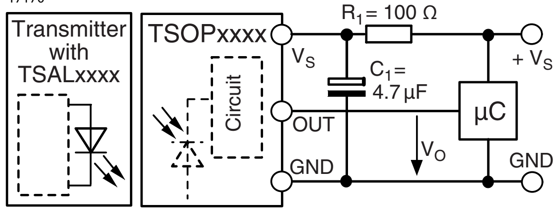


R_1 and C_1 recommended to suppress power supply disturbances. The output voltage should not be hold continuously at a voltage below V_O = 2.0 V by the external circuit.

Absolute Maximum Ratings

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

Parameter	Test condition	Symbol	Value	Unit
Supply Voltage	Pin 3	V_S	- 0.3 to + 6.0	V
Supply Current	Pin 3	I_S	3	mA
Output Voltage	Pin 4	V_O	- 0.3 to (V_S + 0.3)	V
Output Current	Pin 4	I_O	10	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}	30	mW

Electrical and Optical Characteristics

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

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Supply Current	E_v = 0	I_{SD}	0.7	1.2	1.5	mA
	E_v = 40 klx, sunlight	I_{SH}		1.3		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		35		m
Output Voltage Low	I_{OSL} = 0.5 mA, E_e = 0.7 mW/m², test signal see fig. 1	V_{OSL}			250	mV
Minimum Irradiance (30 - 40 kHz)	V_S = 3 V Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 3	$E_{e\ min}$		0.35	0.5	mW/m²
Minimum Irradiance (56 kHz)	V_S = 3 V Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 3	$E_{e\ min}$		0.4	0.6	mW/m²
Minimum Irradiance (30 - 40 kHz)	V_S = 5 V Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 3	$E_{e\ min}$		0.45	0.6	mW/m²
Minimum Irradiance (56 kHz)	V_S = 5 V Pulse width tolerance: $t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 3	$E_{e\ min}$		0.5	0.7	mW/m²
Maximum Irradiance	$t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o$, test signal see fig. 3	$E_{e\ max}$	30			W/m²
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

Typical Characteristics

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

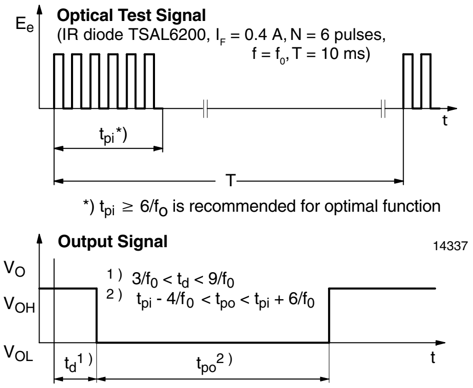


Figure 1. Output Function

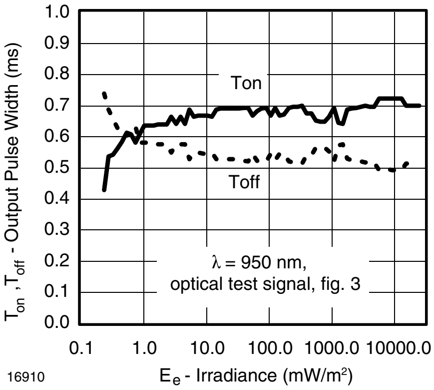


Figure 4. Output Pulse Diagram

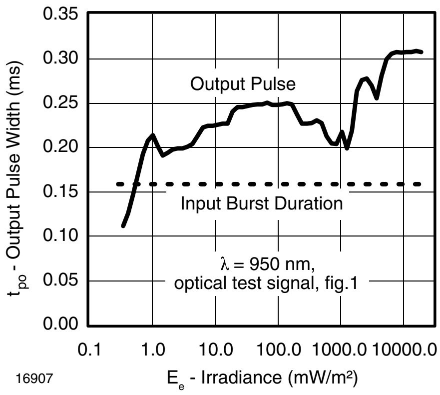


Figure 2. Pulse Length and Sensitivity in Dark Ambient

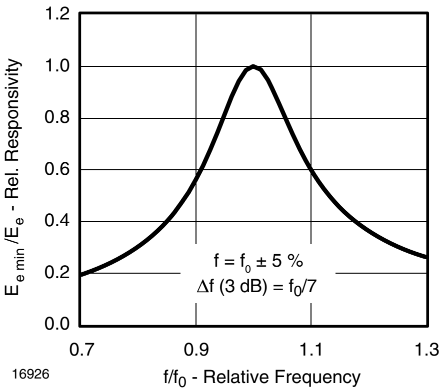


Figure 5. Frequency Dependence of Responsivity

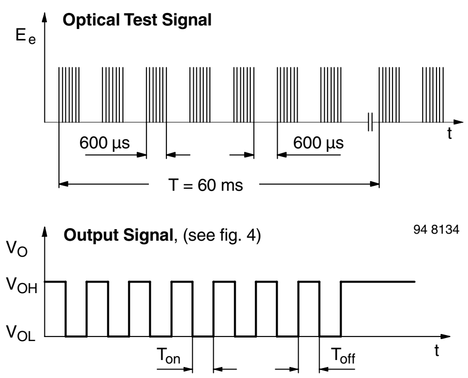


Figure 3. Output Function

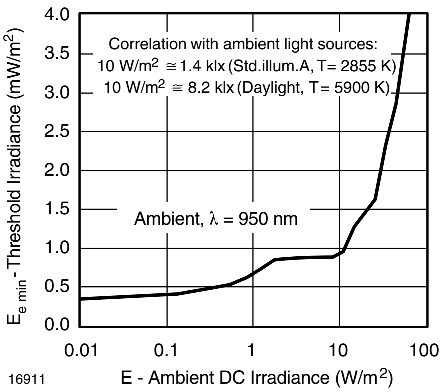


Figure 6. Sensitivity in Bright Ambient

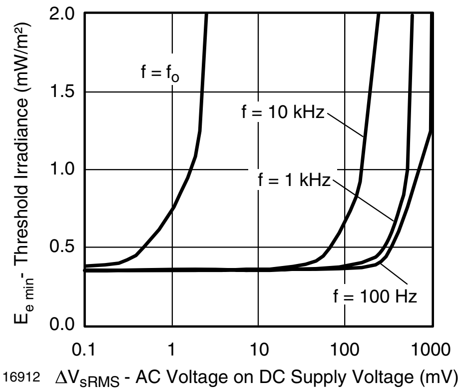


Figure 7. Sensitivity vs. Supply Voltage Disturbances

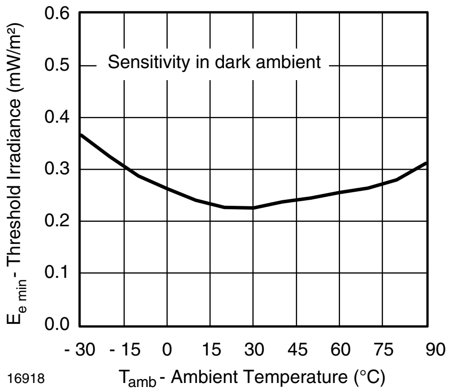


Figure 10. Sensitivity vs. Ambient Temperature

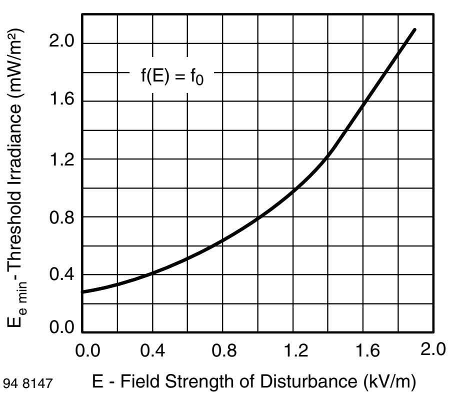


Figure 8. Sensitivity vs. Electric Field Disturbances

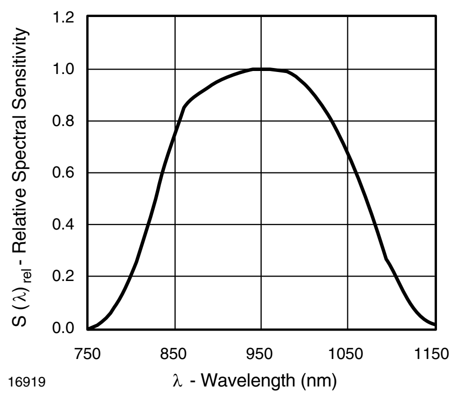


Figure 11. Relative Spectral Sensitivity vs. Wavelength

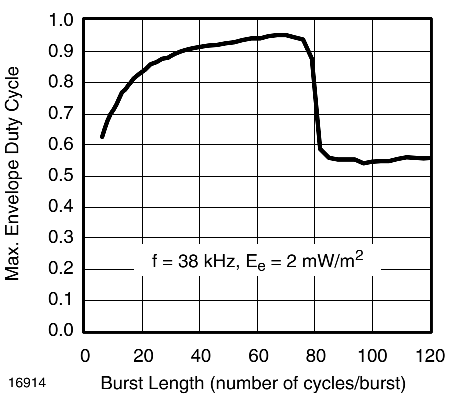


Figure 9. Max. Envelope Duty Cycle vs. Burstlength

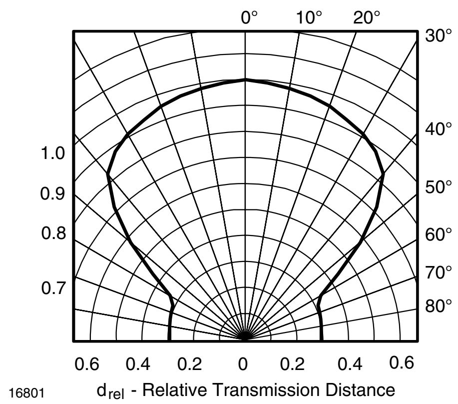


Figure 12. Directivity

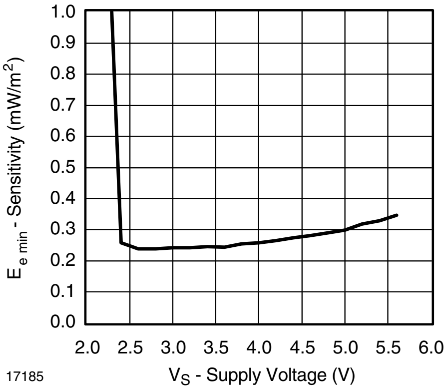


Figure 13. Sensitivity vs. Supply Voltage

Suitable Data Format

The circuit of the TSOP361.. is designed so that unexpected output pulses due to noise or disturbance signals are avoided. A bandpass filter, an integrator stage and an automatic gain control are used to suppress such disturbances.

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

The data signal should fulfill the following conditions:

- Carrier frequency should be close to center frequency of the bandpass (e.g. 38 kHz).
- Burst length should be 6 cycles/burst or longer.
- After each burst which is between 6 cycles and 70 cycles a gap time of at least 10 cycles is necessary.
- For each burst which is longer than 1.8 ms a corresponding gap time is necessary at some time in the data stream. This gap time should be at least 6 times longer than the burst.
- Up to 2200 short bursts per second can be received continuously.

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

When a disturbance signal is applied to the TSOP361.. it can still receive the data signal. However the sensitivity is reduced to that level that no unexpected pulses will occur.

Some examples for such disturbance signals which are suppressed by the TSOP361.. are:

- DC light (e.g. from tungsten bulb or sunlight)
- Continuous signal at 38 kHz or at any other frequency
- Signals from fluorescent lamps with electronic ballast (an example of the signal modulation is in the figure below).

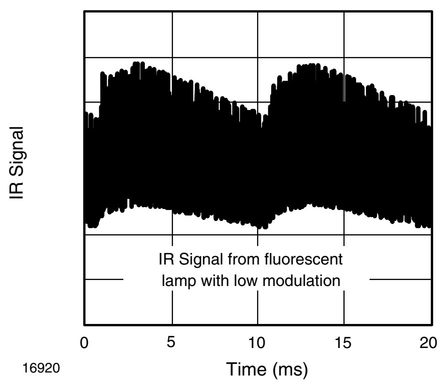
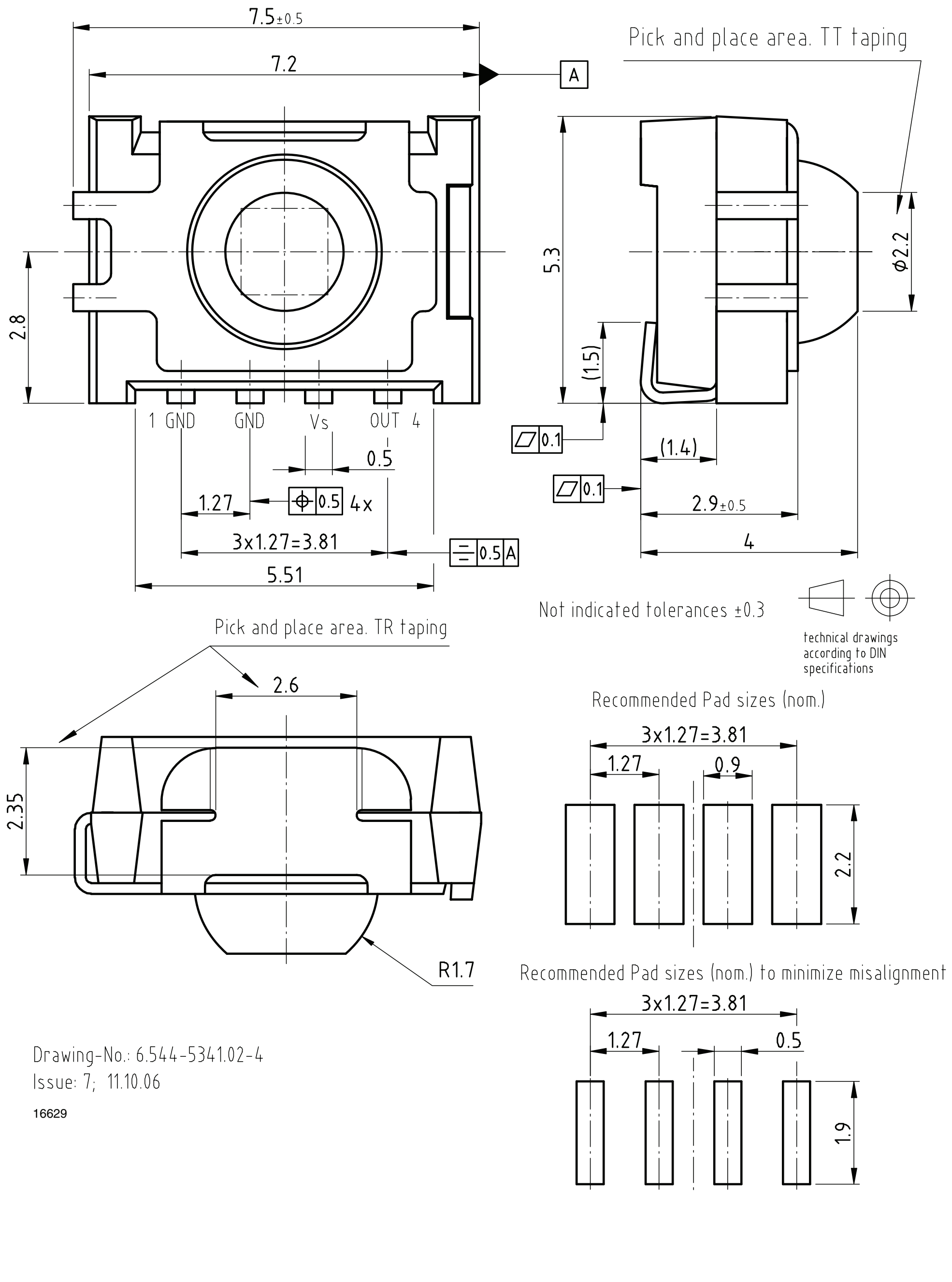


Figure 14. IR Signal from Fluorescent Lamp with low Modulation

Package Dimensions in millimeters



Assembly Instructions

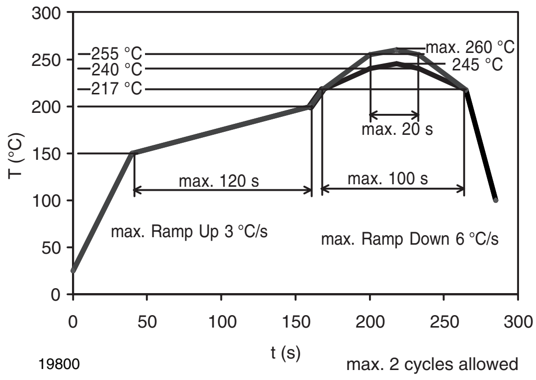
Reflow Soldering

- Reflow soldering must be done within 72 hours 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. 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.

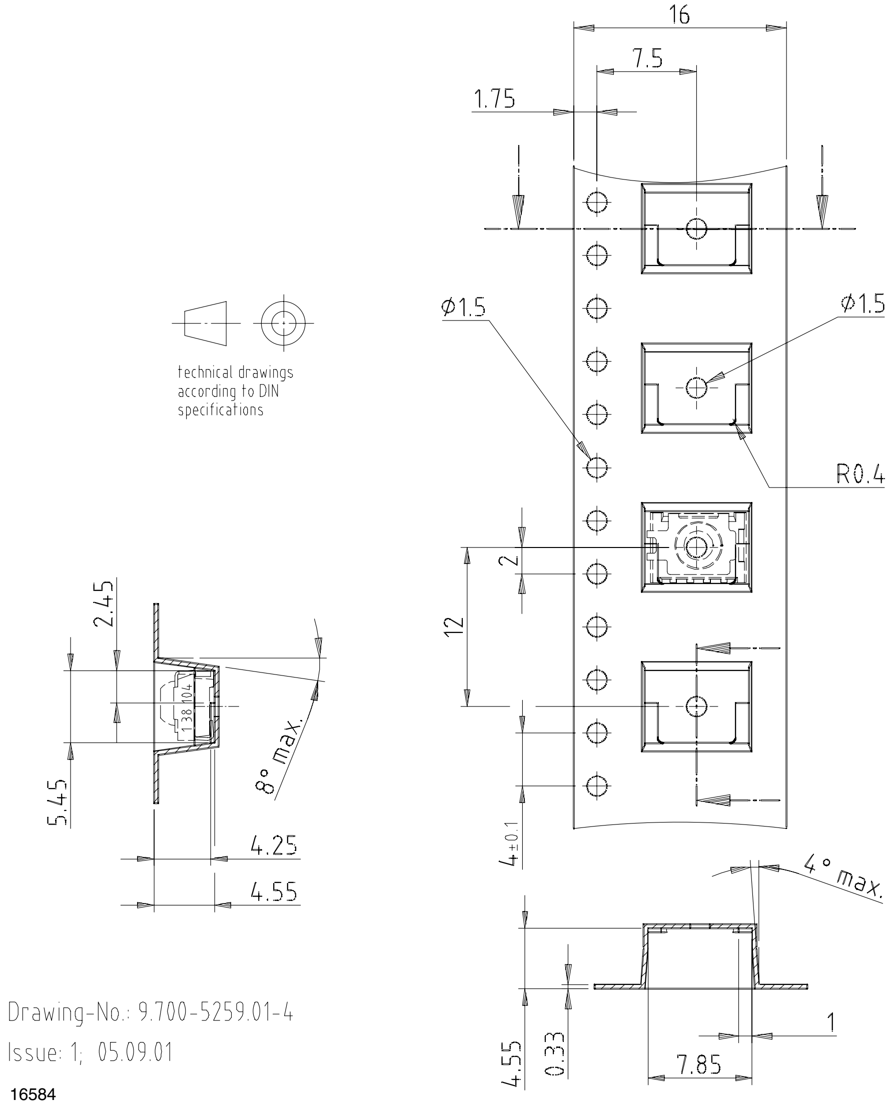
Manual Soldering

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

Vishay Lead (Pb)-free Reflow Solder Profile



Taping Version TSOP..TT Dimensions in millimeters



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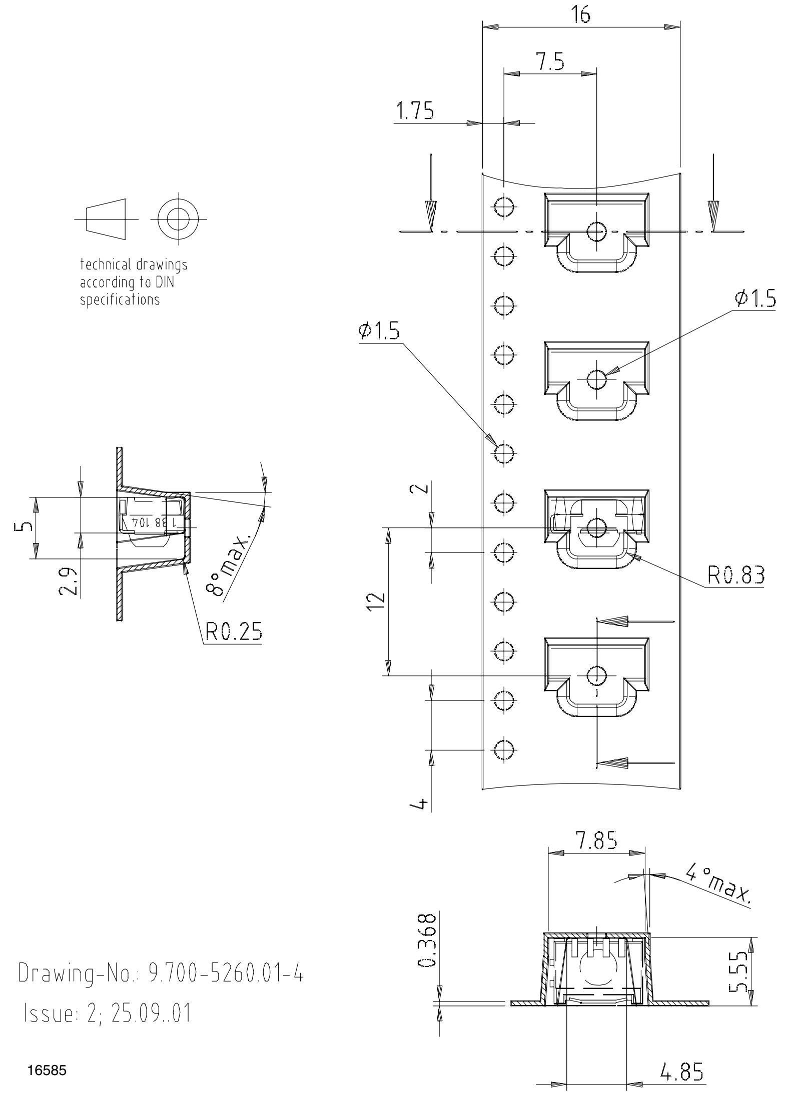
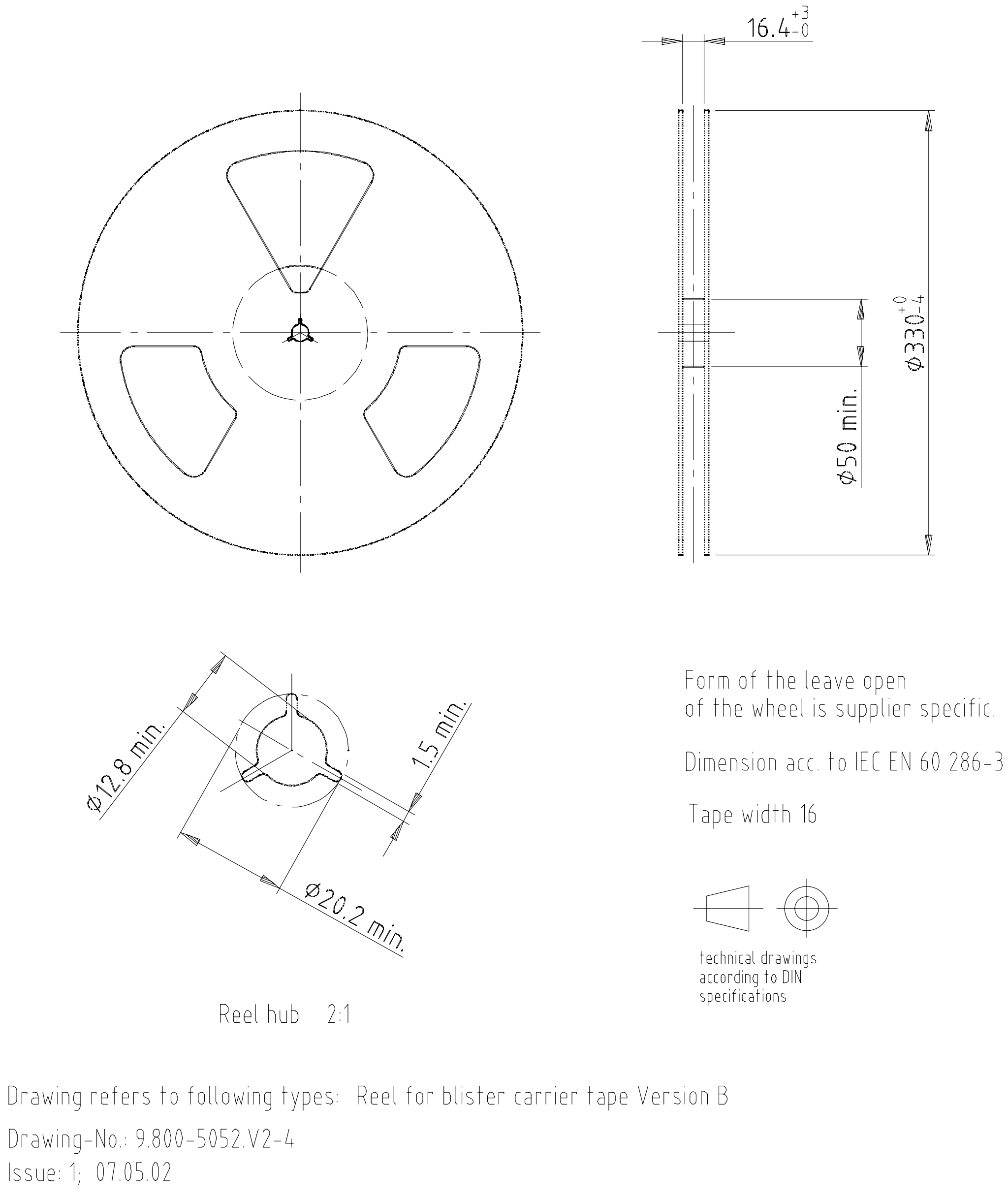
Taping Version TSOP..TR Dimensions in millimeters



Reel Dimensions in millimeters



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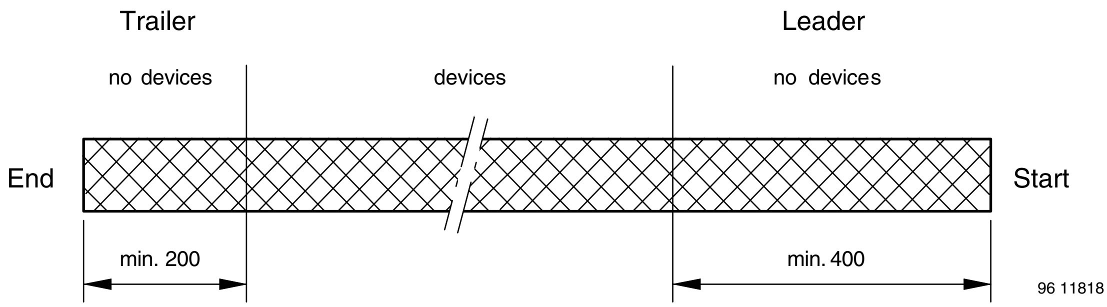
Leader and Trailer Dimensions in millimeters



Cover Tape Peel Strength

According to DIN EN 60286-3

0.1 to 1.3 N

300 ± 10 mm/min

165° - 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

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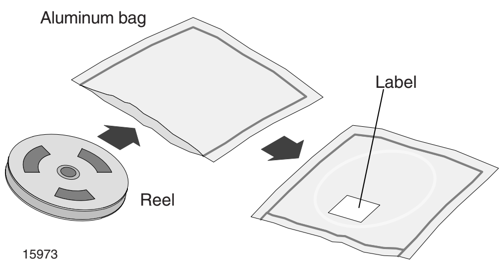
Dry Packing

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



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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 hours under these conditions moisture content will be too high for reflow soldering.

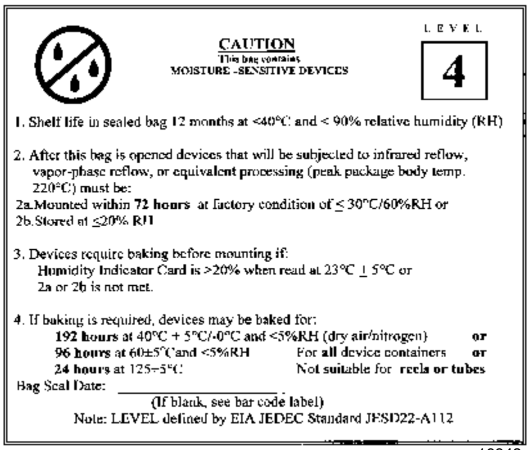
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

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

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

24 hours 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°C and <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 Telefunken specific data.

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Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

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

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

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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