IR Receiver Modules for Remote Control Systems

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: 2.7 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

SPECIAL FEATURES

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

## MECHANICAL DATA

Pinning

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

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.

PARTS TABLE

CARRIER FREQUENCY	SHORT BURSTS AND HIGH DATA RATES (AGC1)
30 kHz	TSOP36130
33 kHz	TSOP36133
36 kHz	TSOP36136
36.7 kHz	TSOP36137
38 kHz	TSOP36138
40 kHz	TSOP36140
56 kHz	TSOP36156

BLOCK DIAGRAM
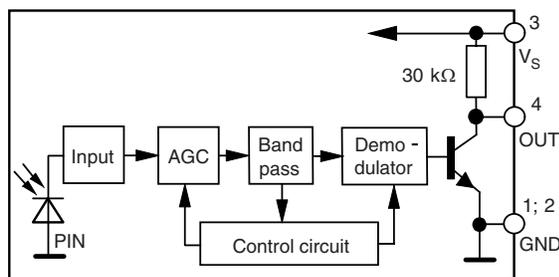
16839

APPLICATION CIRCUIT

17170
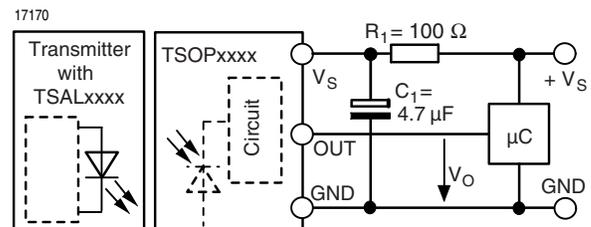
R_1 and C_1 recommended to suppress power supply disturbances. The output voltage should not be hold continuously at a voltage below V_O = 2.0 V by the external circuit.

IR Receiver Modules for Remote
Control Systems

ABSOLUTE MAXIMUM RATINGS [1]

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	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

Note

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

ELECTRICAL AND OPTICAL CHARACTERISTICS [1]

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/m^2, test signal see fig. 1	V_{OSL}			250	mV
Minimum irradiance (30 to 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	W/m^2
Minimum irradiance (56 kHz)	$V_S = 3$ V, pulse width tolerance: t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o, test signal see fig. 3	$E_{e\ min.}$		0.4	0.6	W/m^2
Minimum irradiance (30 to 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	W/m^2
Minimum irradiance (56 kHz)	$V_S = 5$ V, pulse width tolerance: t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o, test signal see fig. 3	$E_{e\ min.}$		0.5	0.7	W/m^2
Maximum irradiance	t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o, test signal see fig. 3	$E_{e\ max.}$	30			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 45		deg

Note

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

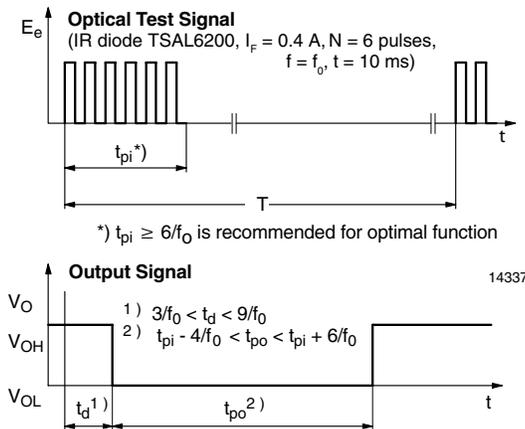## TYPICAL CHARACTERISTICS

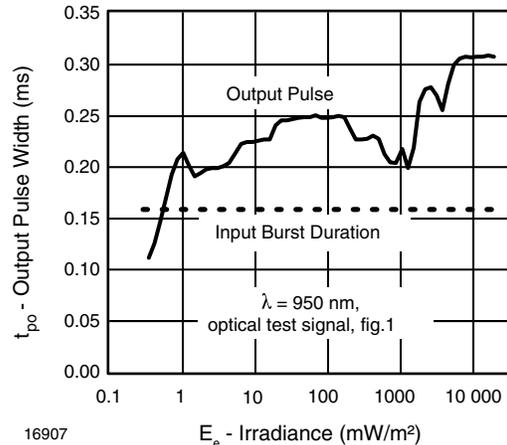T_{amb} = 25 °C, unless otherwise specified

Fig. 1 - Output Function
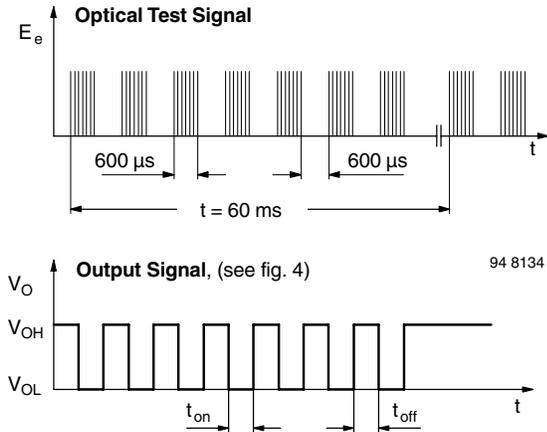

Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

Optical Test Signal

E_e

600 µs   600 µs

t = 60 ms

Output Signal, (see fig. 4)   94 8134

V_O

V_{OH}

V_{OL}

t_{on} t_{off} t

Fig. 3 - Output Function

Correlation with ambient light sources:
10 W/m² ≅ 1.4 klx (Std.illum.A, T = 2855 K)
10 W/m² ≅ 8.2 klx (Daylight, T = 5900 K)

Ambient, λ = 950 nm

$E_{e\,min.}$ - Threshold Irradiance (mW/m²)

16911   E - Ambient DC Irradiance (W/m²)
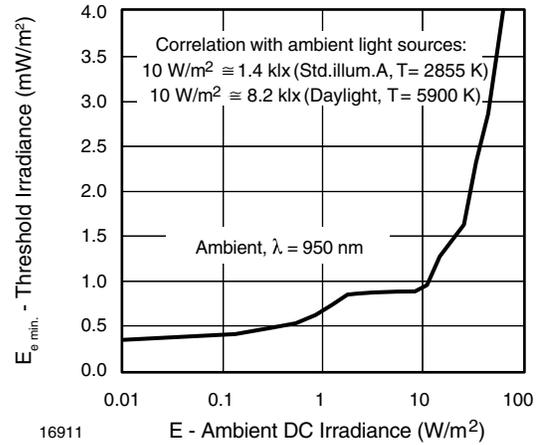
Fig. 6 - Sensitivity in Bright Ambient

T_{on}, T_{off} - Output Pulse Width (ms)

T_{on}

T_{off}

λ = 950 nm,
optical test signal, fig. 3

16910 E_e - Irradiance (mW/m²)
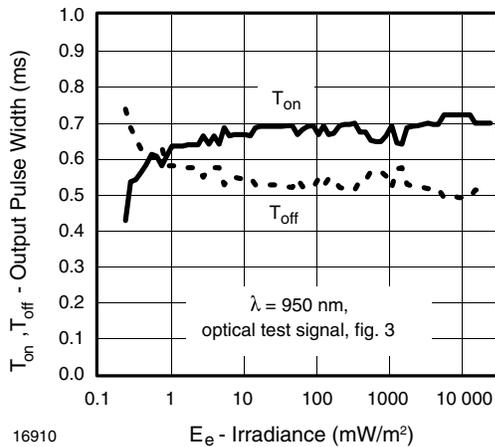
Fig. 4 - Output Pulse Diagram

$E_{e\,min.}$ - Threshold Irradiance (mW/m²)

f = f_O

f = 10 kHz

f = 1 kHz

f = 100 Hz

16912 ΔV_{sRMS} - AC Voltage on DC Supply Voltage (mV)
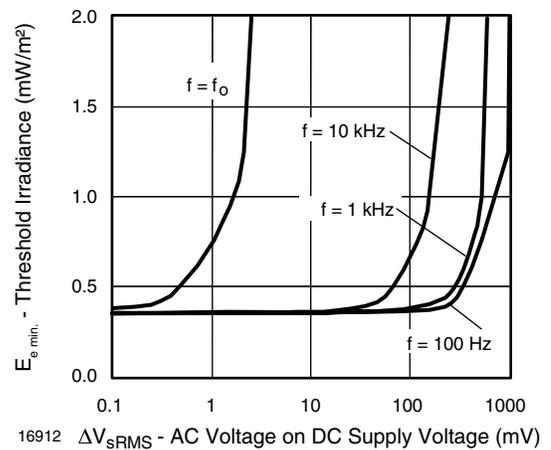
Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

$E_{e\,min.}/E_e$ - Rel. Responsivity

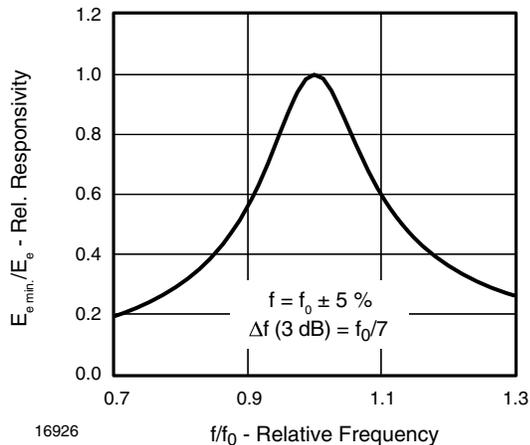f = f_0 ± 5 %
Δf (3 dB) = f_0/7

16926 f/f_0 - Relative Frequency

Fig. 5 - Frequency Dependence of Responsivity

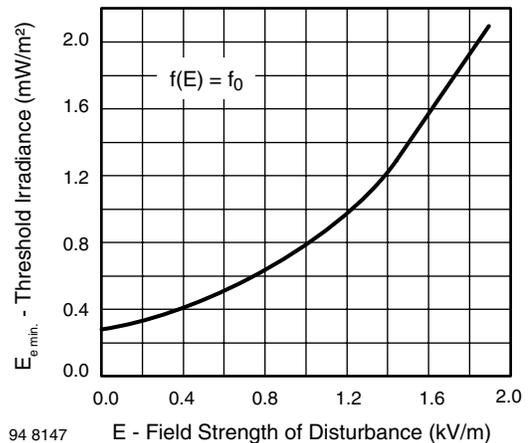$E_{e\,min.}$ - Threshold Irradiance (mW/m²)

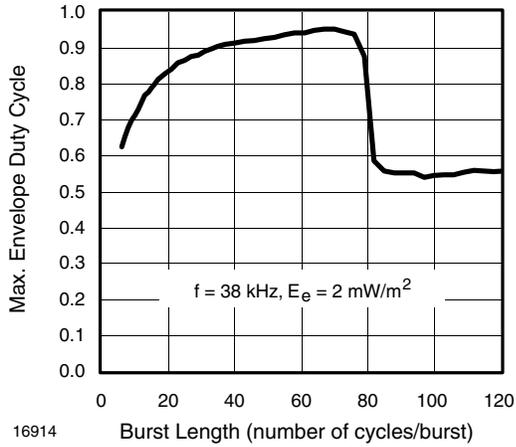f(E) = f_0

94 8147   E - Field Strength of Disturbance (kV/m)
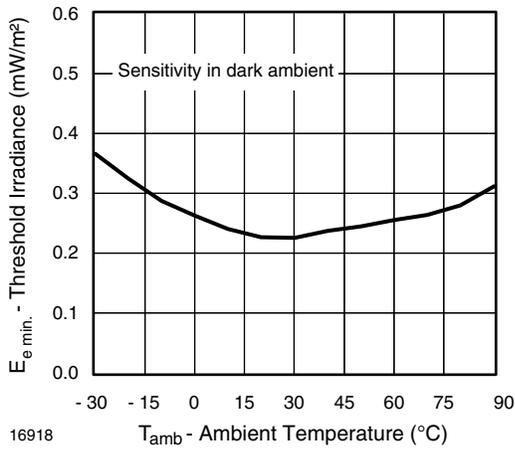
Fig. 8 - Sensitivity vs. Electric Field Disturbances

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

16914

$f = 38$ kHz, $E_e = 2$ mW/m^2
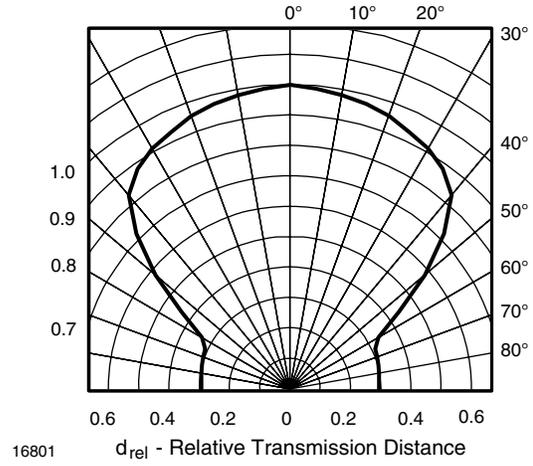
Fig. 12 - Directivity

16801

d_{rel} - Relative Transmission Distance

Fig. 10 - Sensitivity vs. Ambient Temperature

16918

Sensitivity in dark ambient
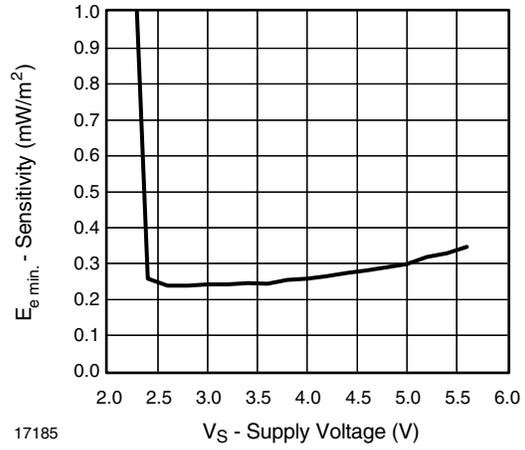
Fig. 13 - Sensitivity vs. Supply Voltage

17185
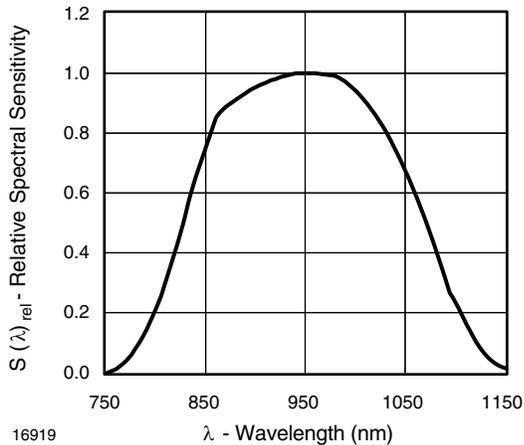
Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

16919

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 as long as the burst or longer

- 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 (see figure 14)
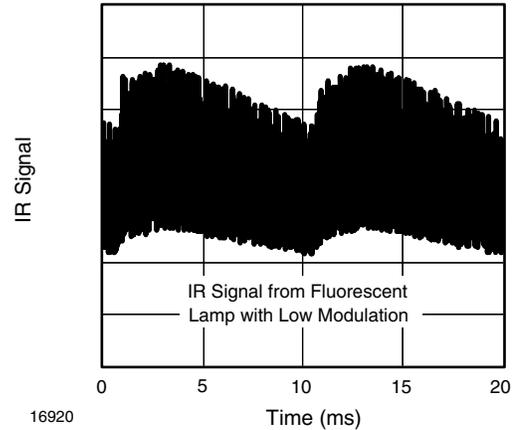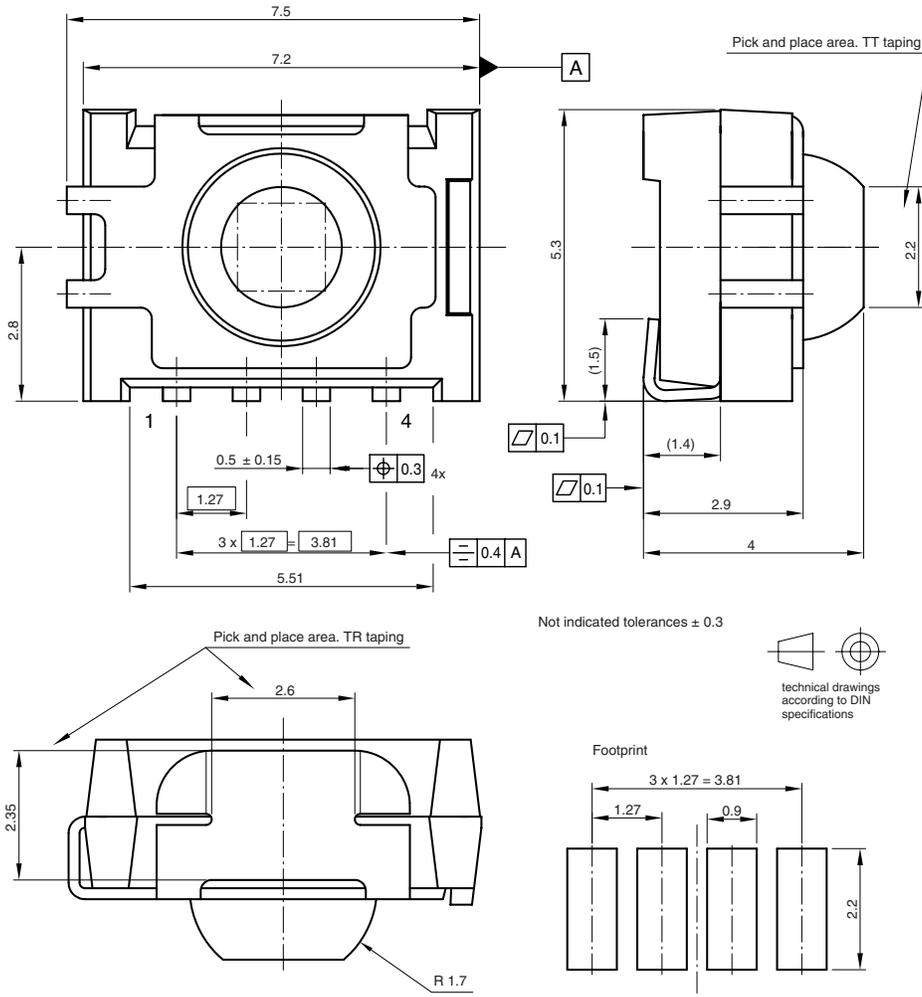

Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

PACKAGE DIMENSIONS in millimeters

Pick and place area. TT taping

Not indicated tolerances ± 0.3

technical drawings according to DIN specifications

Pick and place area. TR taping

Footprint

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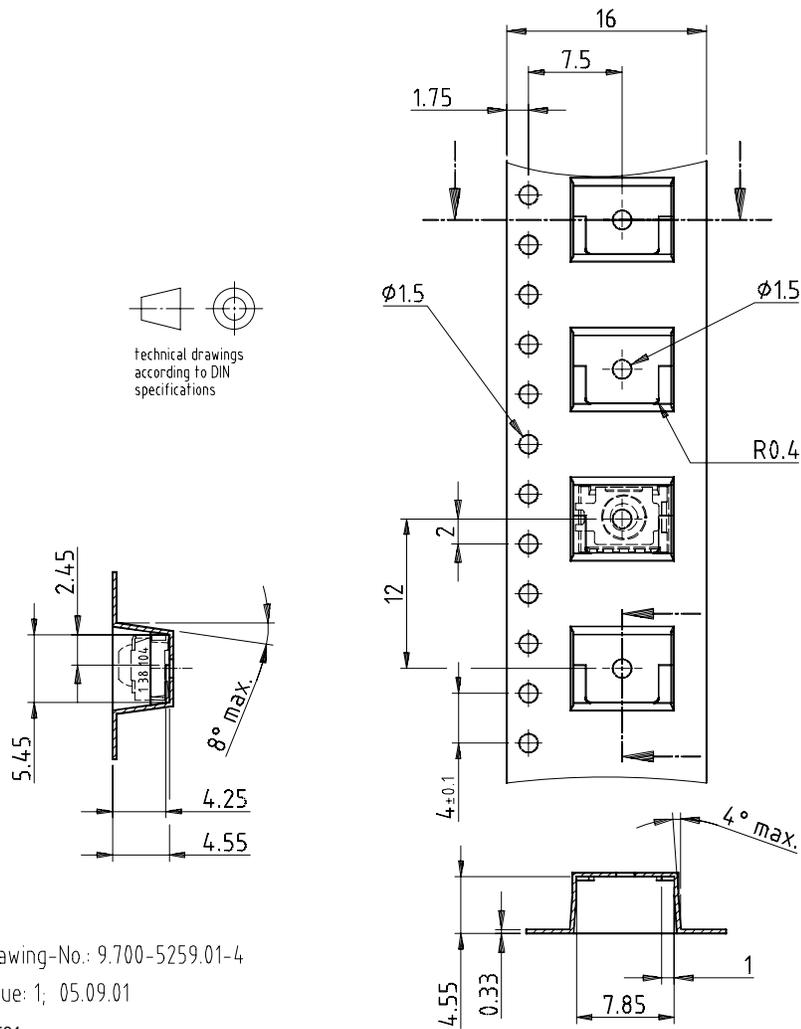Issue: 8; 02.09.09
16776

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
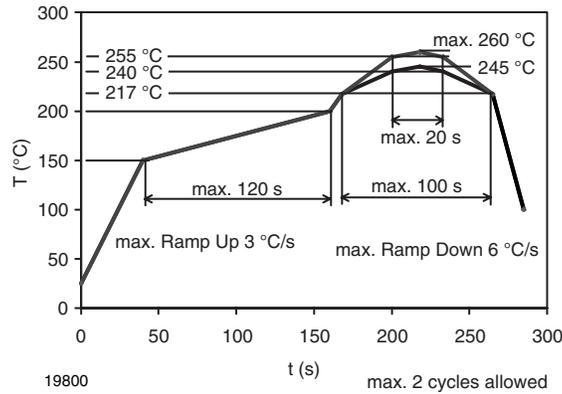
TAPING VERSION TSOP..TT Dimensions in millimeters

technical drawings according to DIN specifications

Drawing-No.: 9.700-5259.01-4
Issue: 1; 05.09.01

16584

TAPING VERSION TSOP..TR Dimensions in millimeters

technical drawings
according to DIN
specifications

Drawing-No.: 9.700-5260.01-4
Issue: 2; 25.09..01

16585

REEL DIMENSIONS in millimeters

16.4^{+3}_{-0}

$\phi 330^{+0}_{-4}$

$\phi 50$ min.

Form of the leave open
of the wheel is supplier specific.

Dimension acc. to IEC EN 60 286-3

Tape width 16

$\phi 12.8$ min.

1.5 min.

$\phi 20.2$ min.

Reel hub   2:1
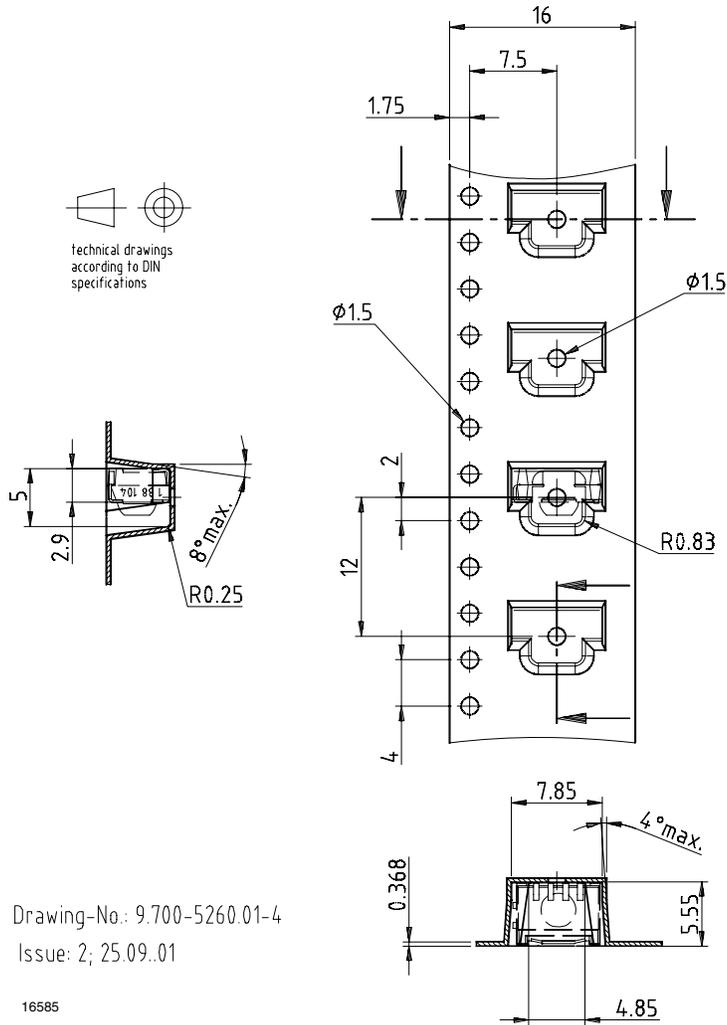
technical drawings
according to DIN
specifications
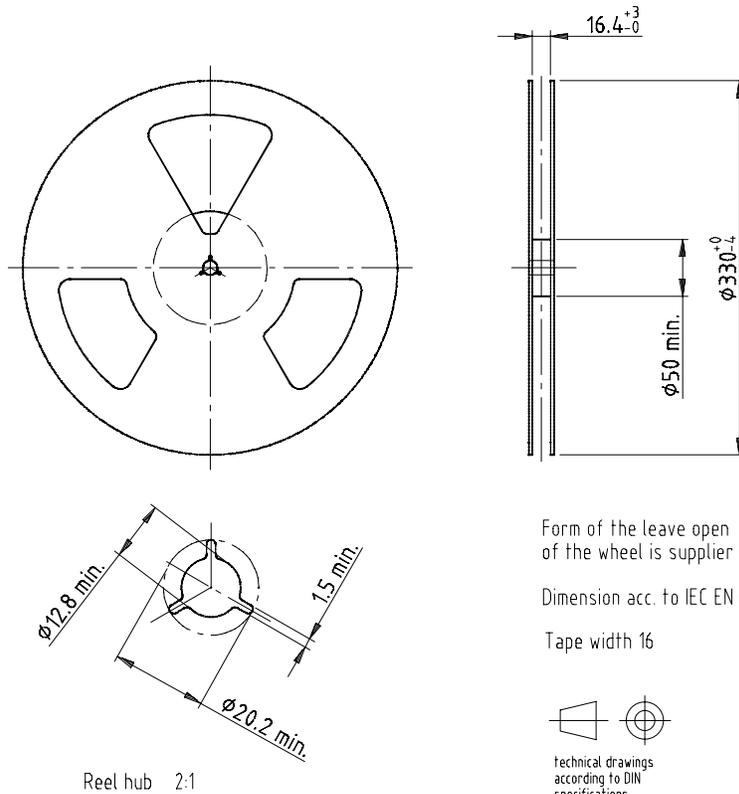
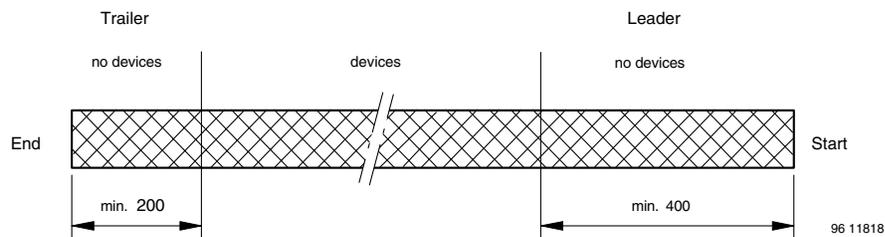Drawing refers to following types: Reel for blister carrier tape Version B

Drawing-No.: 9.800-5052.V2-4

Issue: 1; 07.05.02

16734

LEADER AND TRAILER Dimensions in millimeters

Trailer

Leader

no devices

devices

no devices

End

Start

min. 200

min. 400

96 11818

COVER TAPE PEEL STRENGTH

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

LABEL

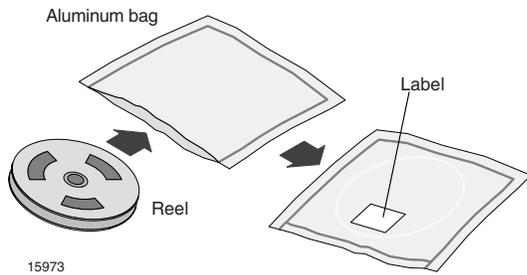**Standard bar code labels for finished goods**

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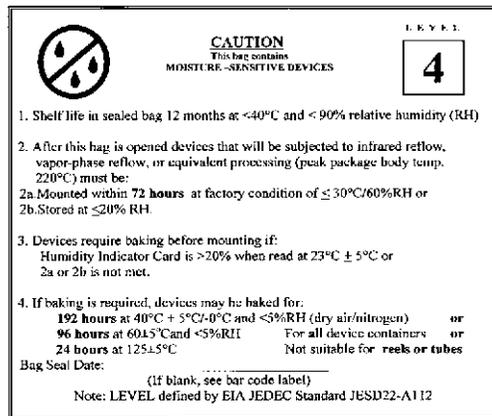An EIA JEDEC standard JESD22-A112 level 4 label is included on all dry bags.

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.

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All product specifications and data are subject to change without notice.

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