IR Receiver Modules for Remote Control Systems

21589

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.
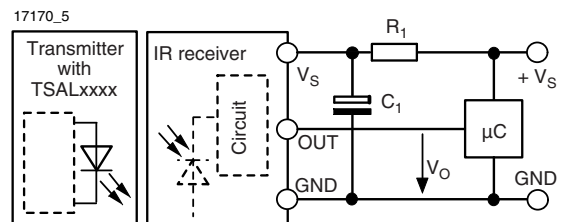
PARTS TABLE

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
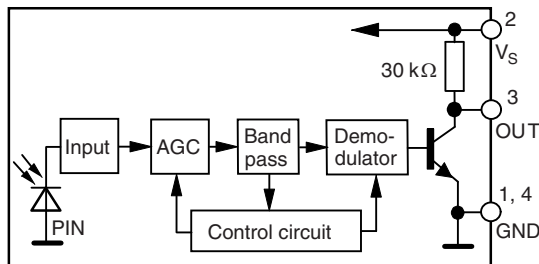
20445-1

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	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/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	0.7	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)
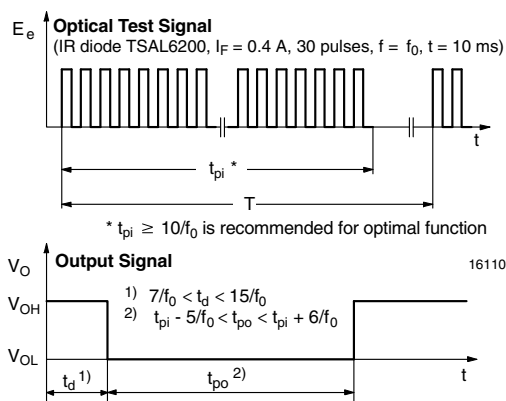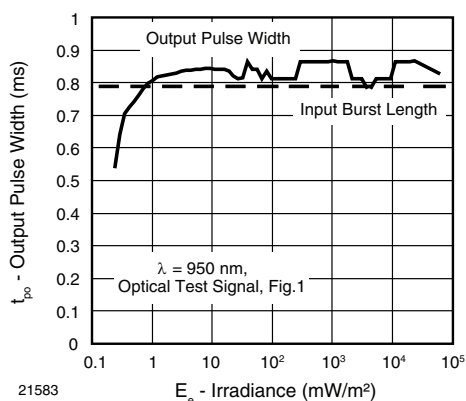

Fig. 1 - Output Active Low
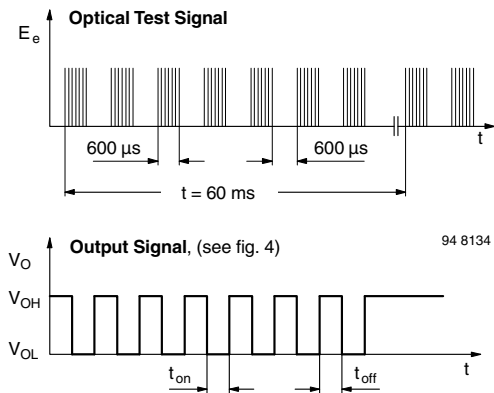

Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

Optical Test Signal

E_e

600 µs   600 µs

t = 60 ms

94 8134

Output Signal, (see fig. 4)

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)

Wavelength of Ambient
Illumination: λ = 950 nm

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

21585 E_e - Ambient DC Irradiance (W/m²)
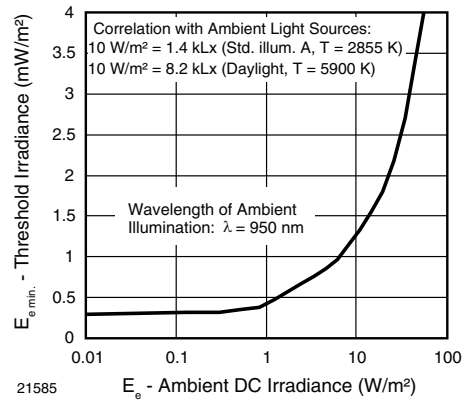
Fig. 6 - Sensitivity in Bright Ambient

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

T_{on}

T_{off}

λ = 950 nm,
Optical Test Signal, Fig. 3

21584 E_e - Irradiance (mW/m²)
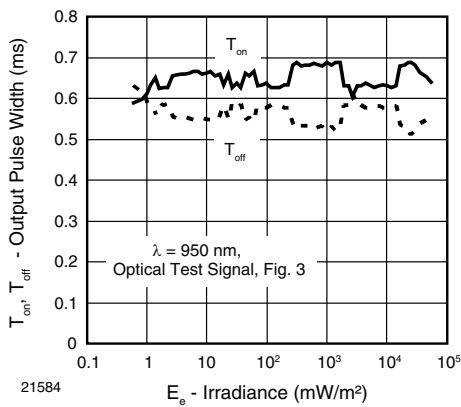
Fig. 4 - Output Pulse Diagram

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

f = 100 Hz
f = 10 kHz
f = 20 kHz
f = 30 kHz
f = f_O

21586 ΔVs_{RMS} - AC Voltage on DC Supply Voltage (mV)
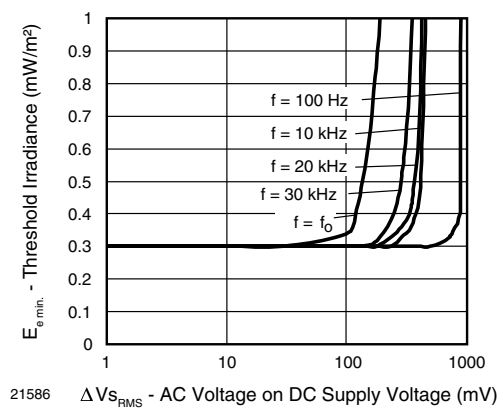
Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

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

f = f_0 ± 5 %
Δ f(3 dB) = f_0/10

16925   f/f_0 - Relative Frequency
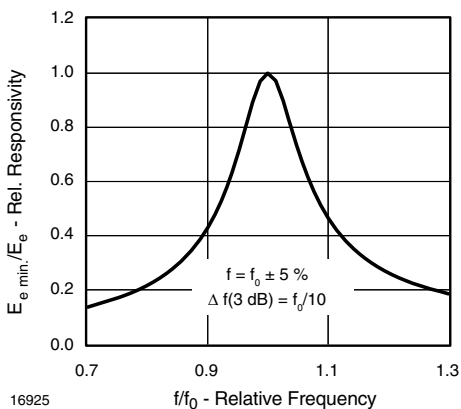
Fig. 5 - Frequency Dependence of Responsivity

E - Max. Field Strength (V/m)

20747   f - EMI Frequency (MHz)
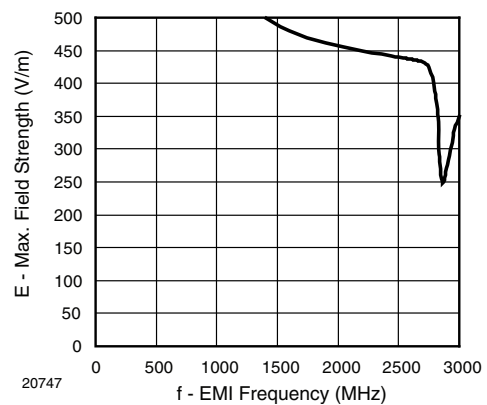
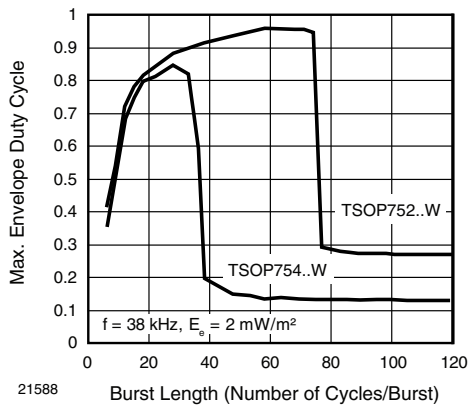Fig. 8 - Sensitivity vs. Electric Field Disturbances

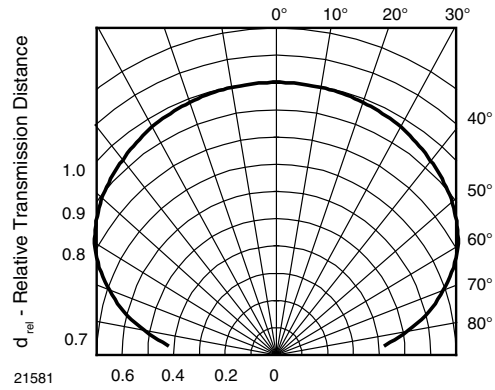Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length
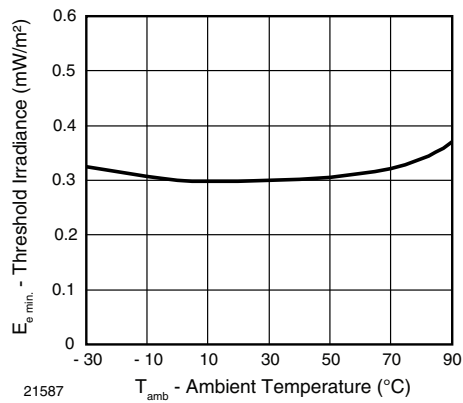

Fig. 12 - Horizontal Directivity

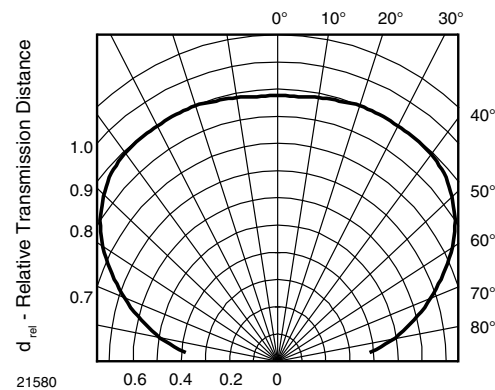Fig. 10 - Sensitivity vs. Ambient Temperature
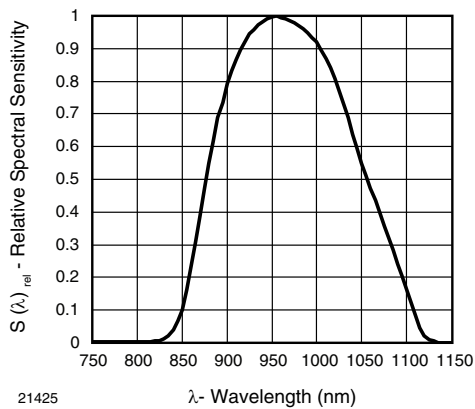

Fig. 13 - Vertical Directivity

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)
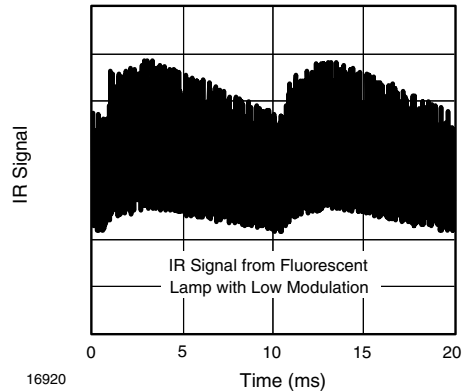

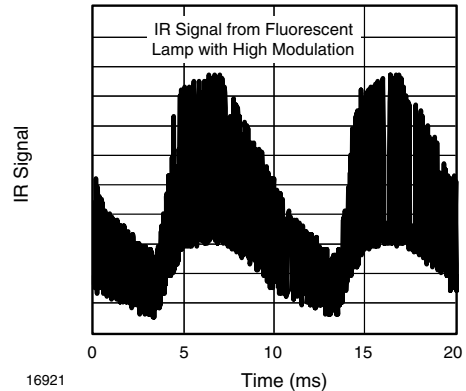Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

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

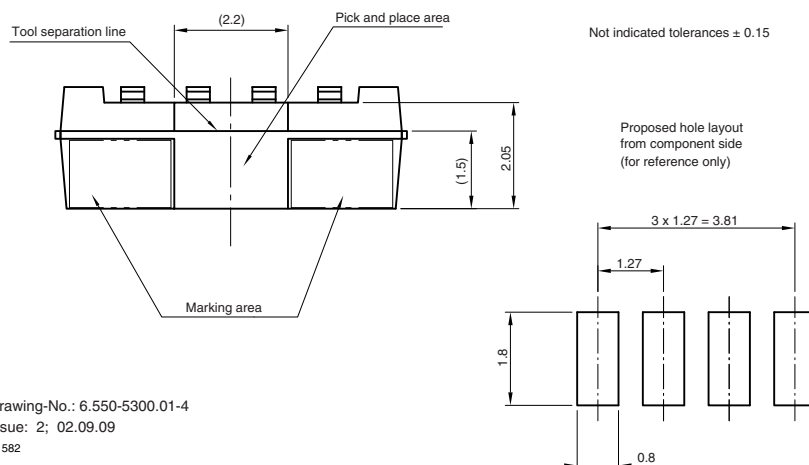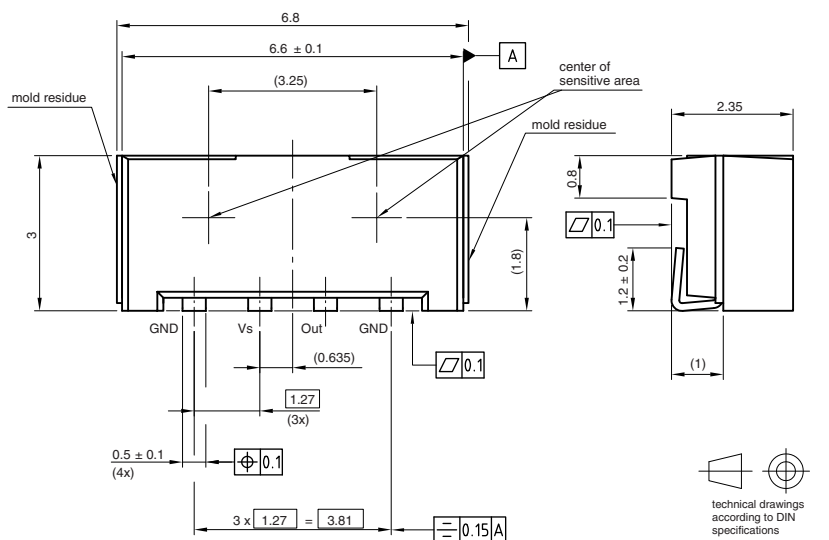|	TSOP752..W	TSOP754..W
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 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

technical drawings
according to DIN
specifications

Not indicated tolerances ± 0.15

Proposed hole layout
from component side
(for reference only)

ASSEMBLY INSTRUCTIONS
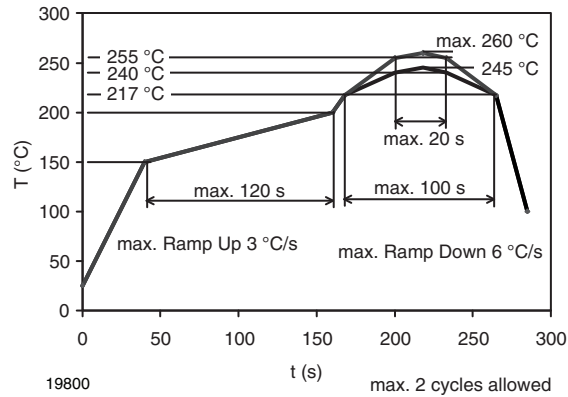
Reflow Soldering

- 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
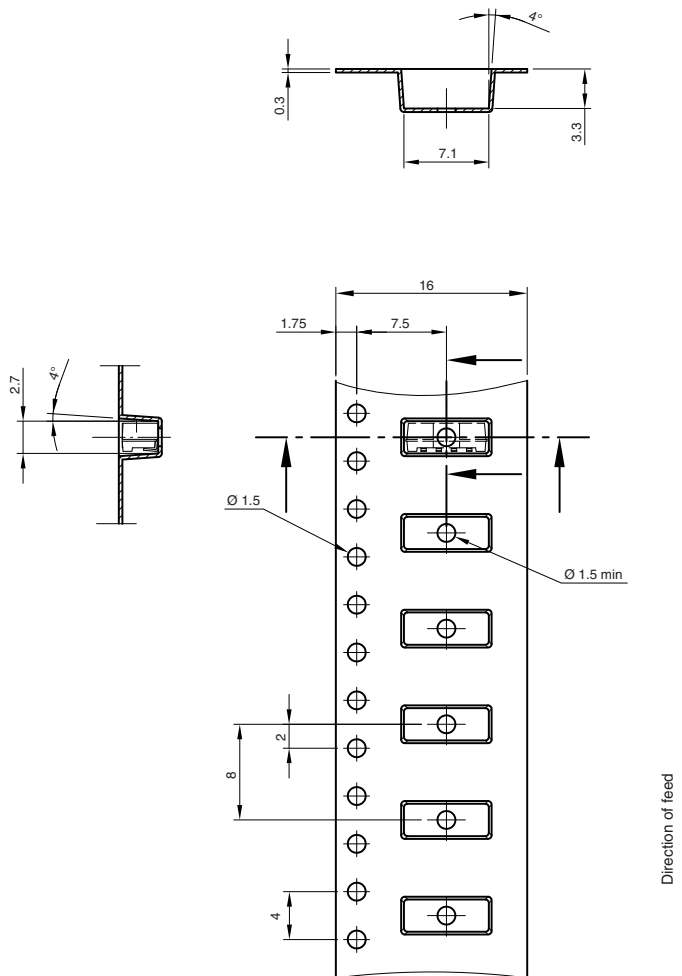
Manual Soldering

- Use a soldering iron of 25 W or less. Adjust the temperature of the soldering iron below 300 °C

- Finish soldering within 3 s

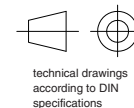- Handle products only after the temperature has cooled off

VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE

255 °C
240 °C
217 °C
max. 260 °C
245 °C
max. 20 s
max. 120 s
max. 100 s
max. Ramp Up 3 °C/s
max. Ramp Down 6 °C/s
19800
t (s)
max. 2 cycles allowed

TAPING VERSION TSOP..TR DIMENSIONS in millimeters

Drawing-No.: 9.700-5342.01-4
Issue: 1: 23.03.09
21785
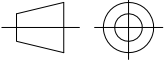
technical drawings
according to DIN
specifications

TAPING VERSION TSOP..TT DIMENSIONS in millimeters

Direction of feed

Ø 1.5

Ø 1.5 min.
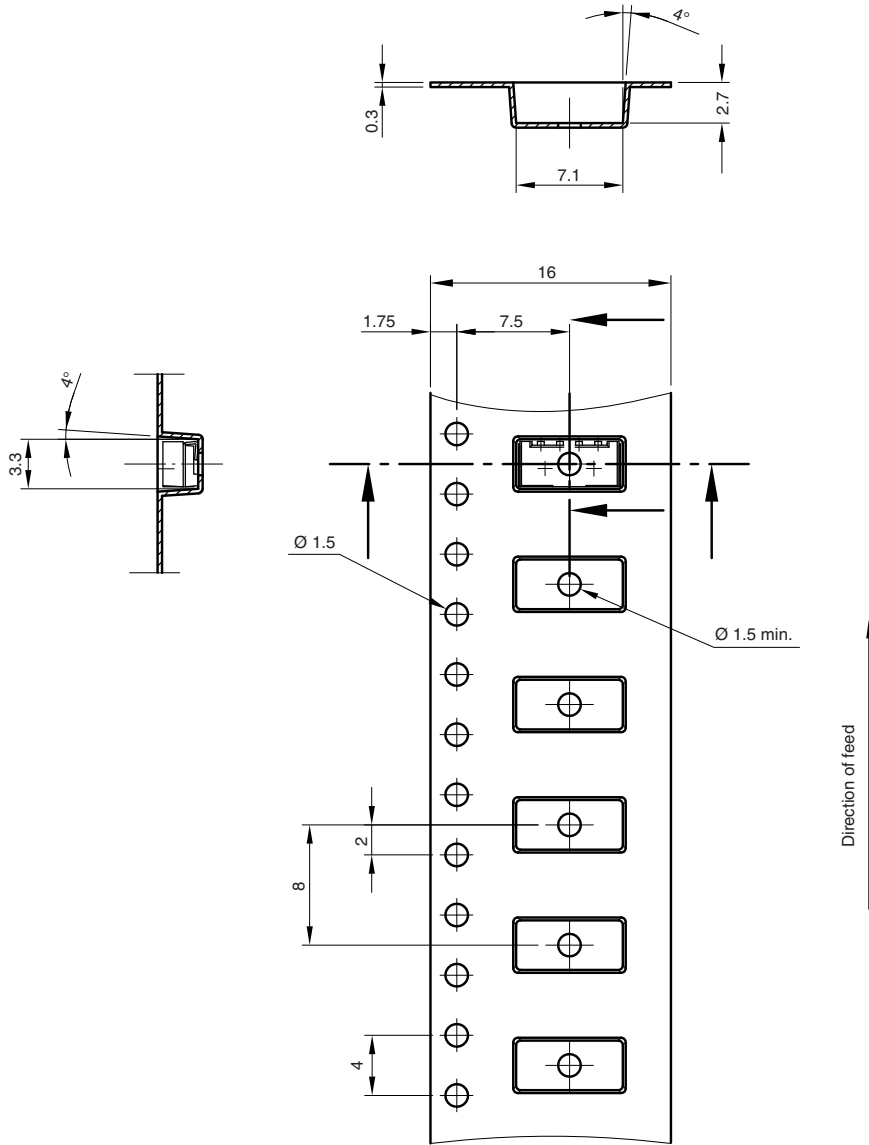
technical drawings
according to DIN
specifications

Drawing-No.: 9.700-5341.01-4
Issue: 2:   23.03.09
21666

REEL DIMENSIONS in millimeters

16.4^{+3}_{-0}

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

$\phi 50$ min.
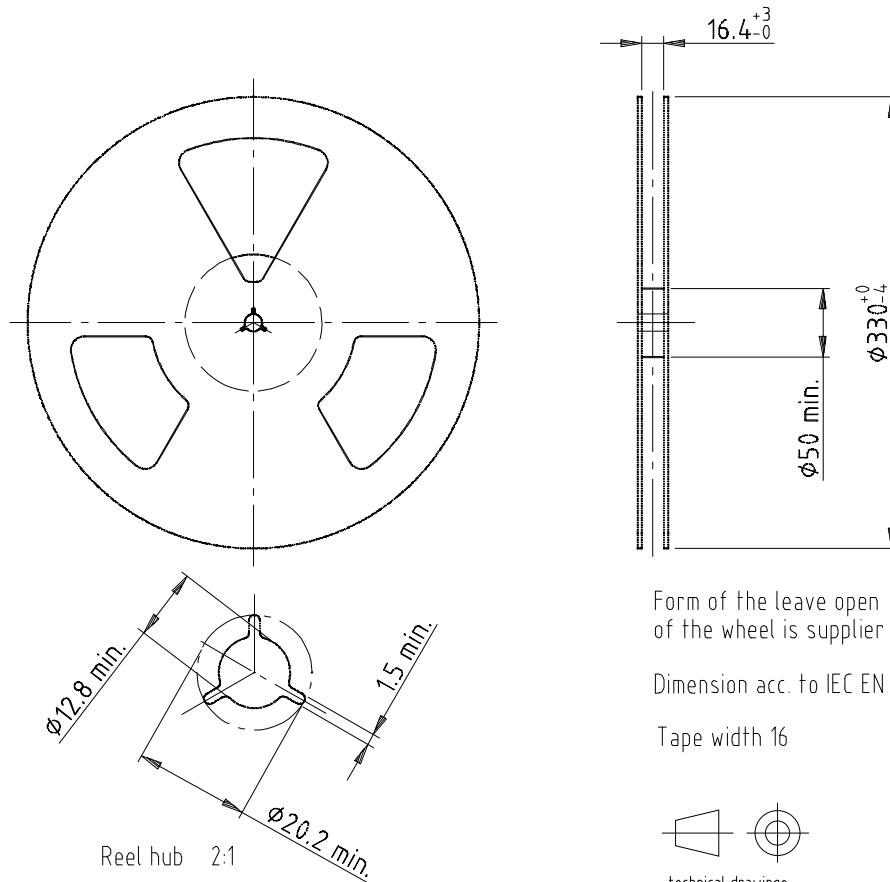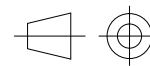
Form of the leave open
of the wheel is supplier specific.

Dimension acc. to IEC EN 60 286-3

Tape width 16
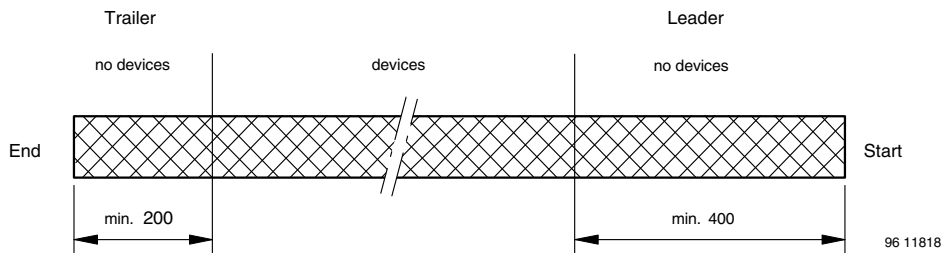
technical drawings
according to DIN
specifications

$\phi 12.8$ min.

1.5 min.

$\phi 20.2$ min.

Reel hub   2:1

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 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.

Aluminum bag

Label

Reel

15973
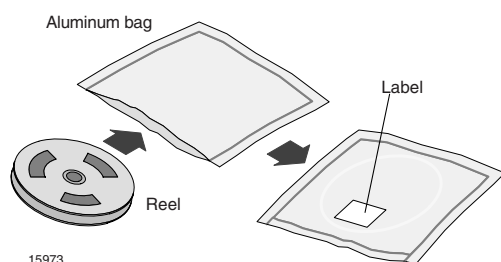
FINAL PACKING

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
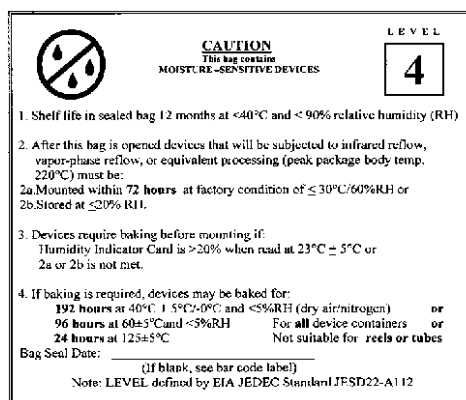
Example of JESD22-A112 level 4 label

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.
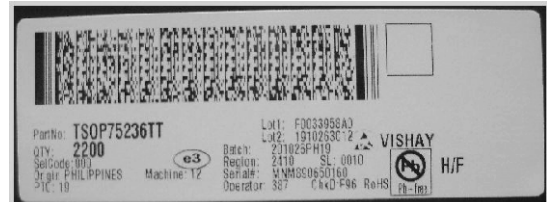
22178

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