IR Receiver Modules for Remote Control Systems

22911

DESCRIPTION

This IR receiver series is optimized for short burst remote control systems in different environments. The customer can chose between different IC settings (AGC variants), to find the optimum solution for his application. The higher the AGC, the better noise is suppressed, but the lower the code compatibility.

The devices contain a PIN diode and a preamplifier assembled on a lead frame. The epoxy package contains an IR filter. The demodulated output signal can be directly connected to a microprocessor for decoding. These components have not been qualified to automotive specifications.

FEATURES

- Individual IC settings to reach maximum performance
- Immunity against noise (lamps, LCD TV, Wi-Fi)
- Low supply current
- Photo detector and preamplifier in one package
- Supply voltage: 2.0 V to 5.5 V
- Material categorization:
  for definitions of compliance please see www.vishay.com/doc?99912

Pb Pb-free

e3

RoHS COMPLIANT

HALOGEN *FREE* *GREEN* *(5-2008)*

LINKS TO ADDITIONAL RESOURCES

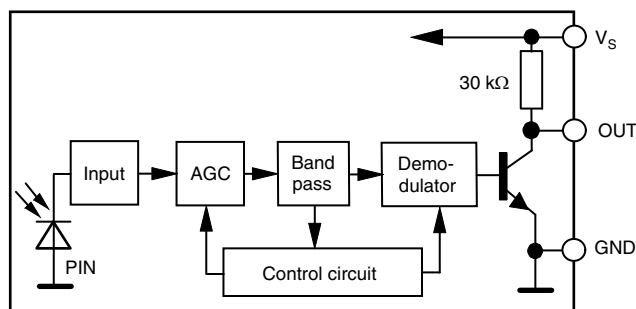Product Page   Marking   Holders   Bends and Cuts

DESIGN SUPPORT TOOLS

- 3D models
- Window size calculator

APPLICATIONS

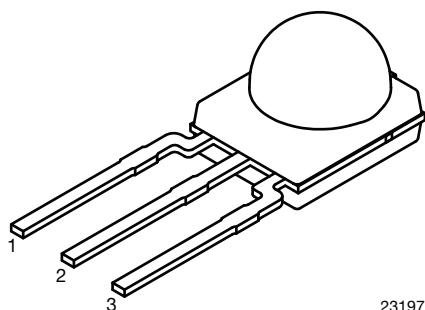- Infrared remote control systems

BLOCK DIAGRAM

16833-22

TSOP131..DF1P, TSOP133..DF1P, TSOP135..DF1P

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Vishay Semiconductors

MECHANICAL DATA

Pinning for TSOP13...DF1P:

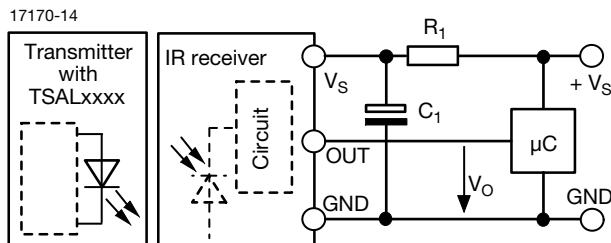1 = OUT, 2 = GND, 3 = V_S

ORDERING CODE

TSOP13...DF1P - 1100 pieces in tape and reel

APPLICATION CIRCUIT

17170-14

R_1 and C_1 recommended in case there are strong ripple or spikes on the supply line.

PARTS TABLE

AGC		BASIC NOISE SUPPRESSION (AGC1)	ENHANCED NOISE SUPPRESSION (AGC3)	MAXIMIZED NOISE SUPPRESSION (AGC5)
Carrier frequency	30 kHz	TSOP13130DF1P	TSOP13330DF1P	TSOP13530DF1P
	33 kHz	TSOP13133DF1P	TSOP13333DF1P	TSOP13533DF1P
	36 kHz	TSOP13136DF1P	TSOP13336DF1P [1][5]	TSOP13536DF1P
	38 kHz	TSOP13138DF1P	TSOP13338DF1P [2][4]	TSOP13538DF1P
	40 kHz	TSOP13140DF1P	TSOP13340DF1P	TSOP13540DF1P
	56 kHz	TSOP13156DF1P	TSOP13356DF1P [3]	TSOP13556DF1P
Package		Minimold		
Pinning		1 = OUT, 2 = GND, 3 = V_S		
Dimensions (mm)		5.4 W x 6.35 H x 4.9 D		
Mounting		Leaded		
Application		Remote control		
Best choice for		[1] RCMM [2] RECS-80 Code [3] r-map [4] XMP [5] MCIR		
Special options		• Narrow optical filter: www.vishay.com/doc?81590 • Wide optical filter: www.vishay.com/doc?82726		

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	$t \leq 10$ 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

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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 = 3.3 V	I_{SD}	0.25	0.35	0.45	mA
	E_v = 40 klx, sunlight	I_{SH}	-	0.45	-	mA
Supply voltage		V_S	2.0	-	5.5	V
Transmission distance	E_v = 0, test signal see Fig. 1, IR diode TSAL6200, I_F = 50 mA	d	-	39	-	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	Test signal: RC5 code	$E_{e\ min.}$	-	0.05	0.1	mW/m^2
	Test signal: XMP code	$E_{e\ min.}$	-	0.1	0.2	mW/m^2
Maximum irradiance	t_{pi} - 3.0/f_0 < t_{po} < t_{pi} + 3.5/f_0, test signal see Fig. 1	$E_{e\ max.}$	30	-	-	W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$	-	± 45	-	°

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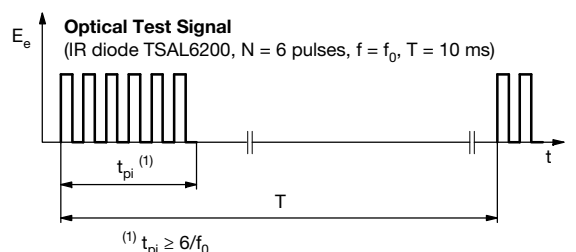

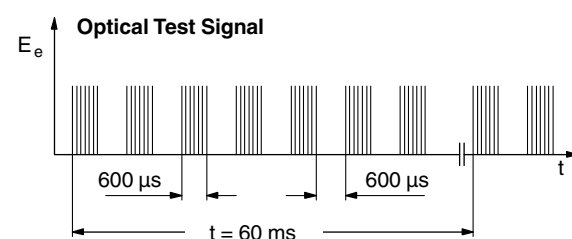Fig. 1 - Output Delay and Pulse-Width
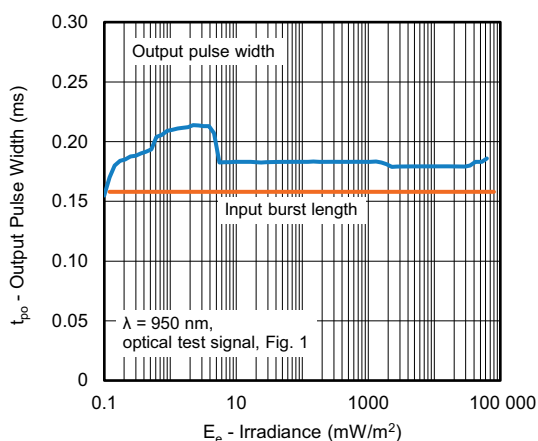

Fig. 3 - Test Signal

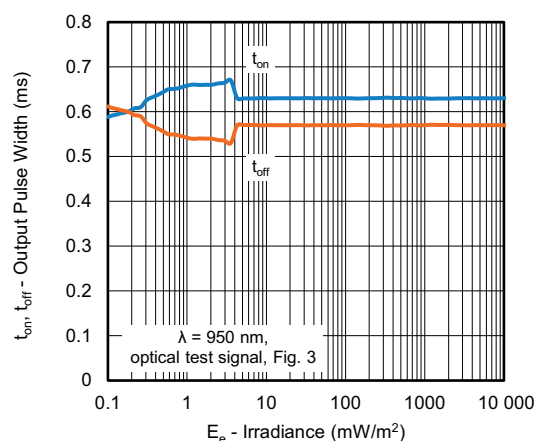Fig. 2 - Pulse-Width vs. Irradiance in Dark Ambient

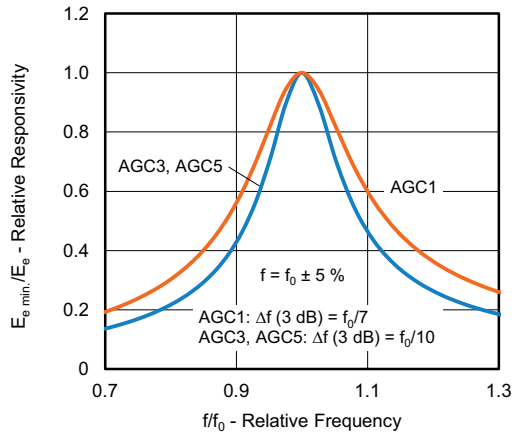Fig. 4 - Pulse-Width vs. Irradiance in Dark Ambient

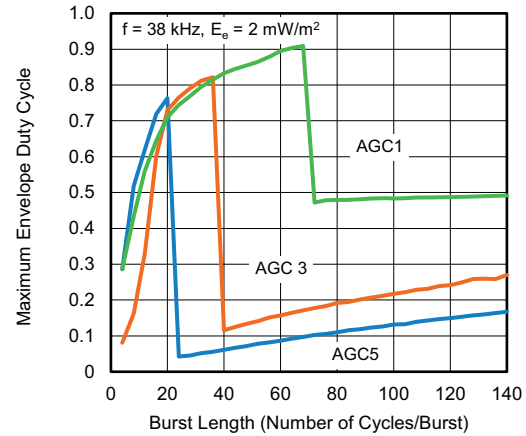Fig. 5 - Frequency Dependence of Responsivity

Fig. 8 - Maximum Envelope Duty Cycle vs. Burst Length
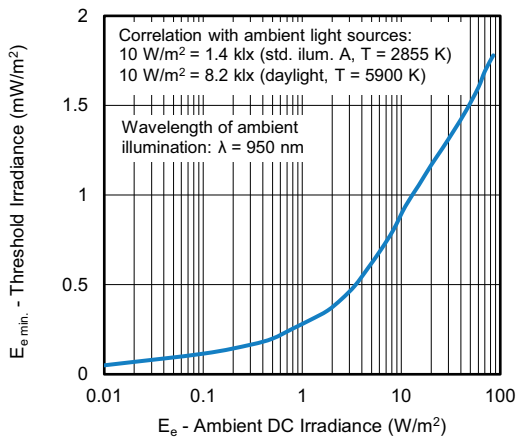

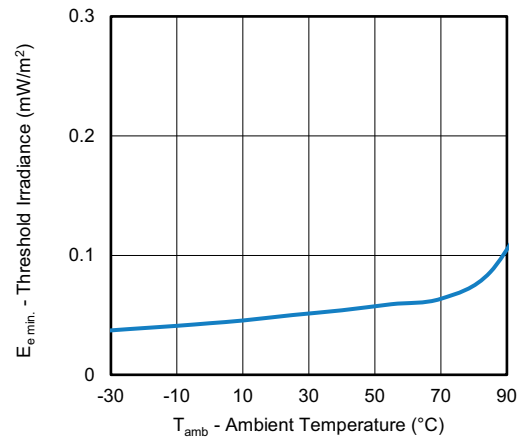Fig. 6 - Sensitivity in Bright Ambient

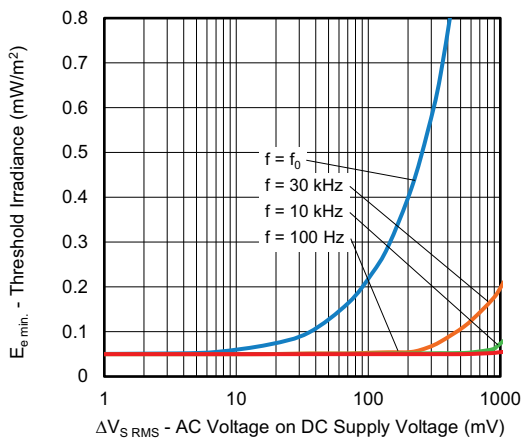Fig. 9 - Sensitivity vs. Ambient Temperature

Fig. 7 - Sensitivity vs. Supply Voltage Disturbances
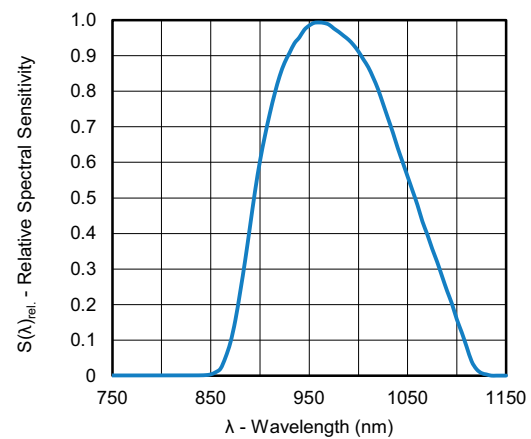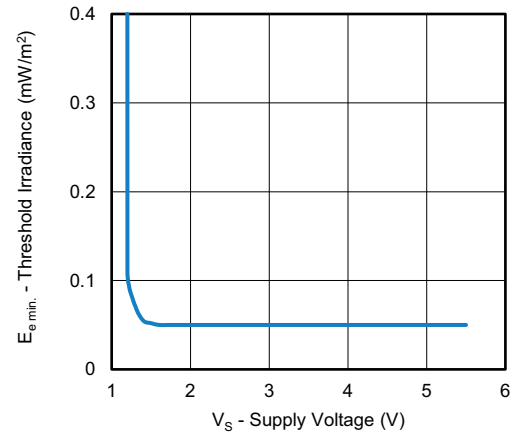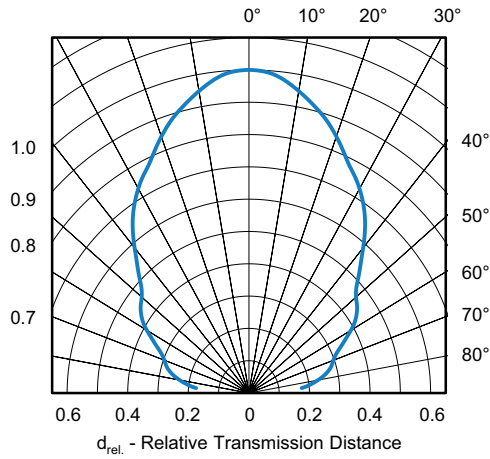

Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

Fig. 11 - Directivity

Fig. 12 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

This series is designed to suppress spurious output pulses due to noise or disturbance signals. The devices can distinguish data signals from noise due to differences in frequency, burst length, and envelope duty cycle. The data signal should be close to the device's band-pass center frequency (e.g. 38 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the product in the presence of a disturbance, the sensitivity of the receiver is automatically reduced by the AGC to insure that no spurious pulses are present at the receiver's output. Some examples which are suppressed are:

• DC light (e.g. from tungsten bulbs sunlight)

• Continuous signals at any frequency

• Strongly or weakly modulated patterns from fluorescent lamps with electronic ballasts (see Fig. 13 or Fig. 14).

• 2.4 GHz and 5 GHz Wi-Fi

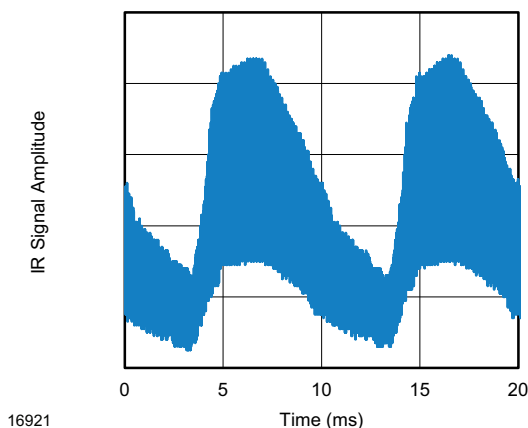Fig. 13 - IR Emission from Fluorescent Lamp With Low Modulation

Fig. 14 - IR Emission from Fluorescent Lamp With High Modulation

	TSOP131..DF1P	TSOP133...DF1P	TSOP135...DF1P
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 68 cycles ≥ 7 cycles	6 to 36 cycles ≥ 8 cycles	6 to 19 cycles ≥ 8 cycles
For bursts greater than a minimum gap time in the data stream is needed of	68 cycles > 1 x burst length	36 cycles > 10 x burst length	19 cycles > 10 x burst length
Maximum number of continuous short bursts/second	2100	2100	2100
RCMM code	Yes	Preferred	Yes
XMP code	Yes	Preferred	Yes
r-map code	Yes	Preferred	Yes
Suppression of interference from fluorescent lamps	Fig. 13	Fig. 13 and Fig. 14	Fig. 13 and Fig. 14

Note

• For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP132...DF1P, TSOP134...DF1P, TSOP136...DF1P
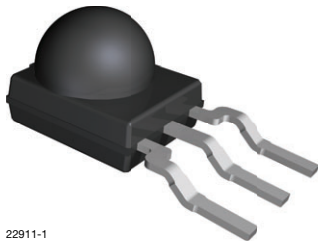
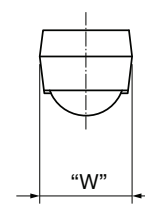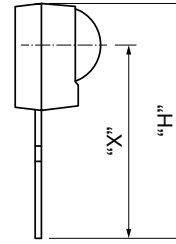## BENT LEADS: H = 11.4 mm, W = 5.4 mm, X = 8.85 mm

22911-1

20258

NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
DF1P	8.85	-	Bend	11.4	5.4	-

MECHANICAL DIMENSIONS in millimeters

5.4

7.6

6.35

(5.05)

(3 x) 0.85 max.

1   2   3

(3 x) 0.6 ± 0.1

2.54 nom.

5.08 nom.

5

2.25

R2.5

Marking area

11.4 ± 0.3

0.95

0.1

(3 x) 0.3 ± 0.1

(1)

3.4 ± 0.3

2.25 ± 0.3
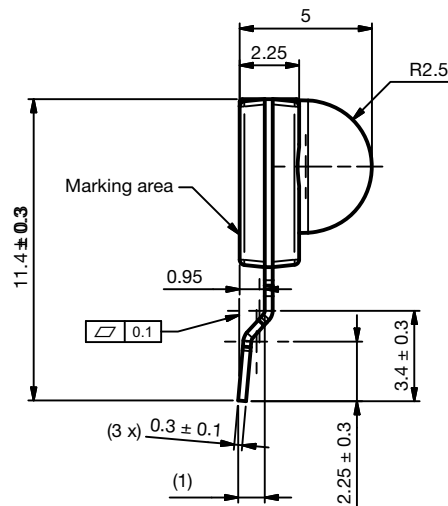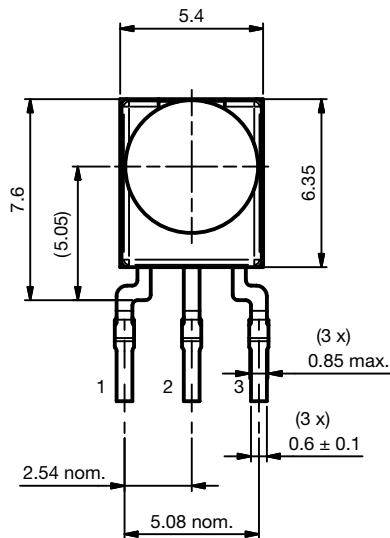
Not indicated tolerances ± 0.2

R2.5
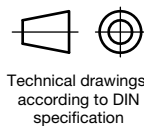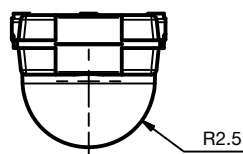
Technical drawings according to DIN specification

Proposed pad layout from component side (for reference only)

Optical axis

(3 x) 0.8

(3 x) 2.5

9

2.54   2.54
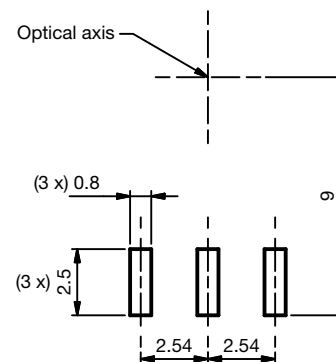
Drawing-No.: 6.550-5343.01-4
Issue: 2; 02.07.19

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. 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 3 s

- Handle products only after the temperature has cooled off

VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE
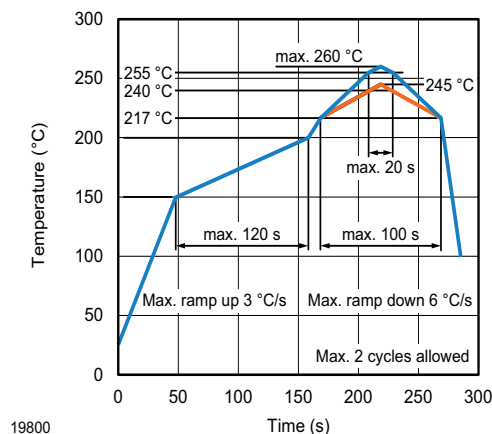
PACKAGING DIMENSIONS in millimeters
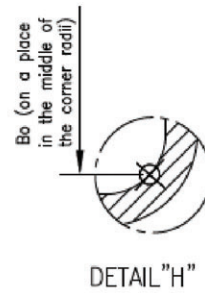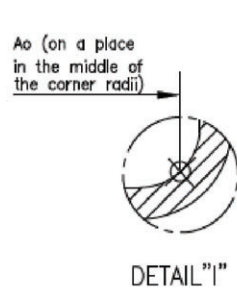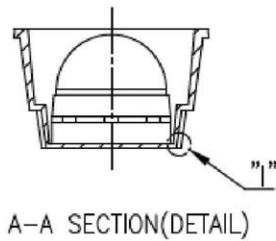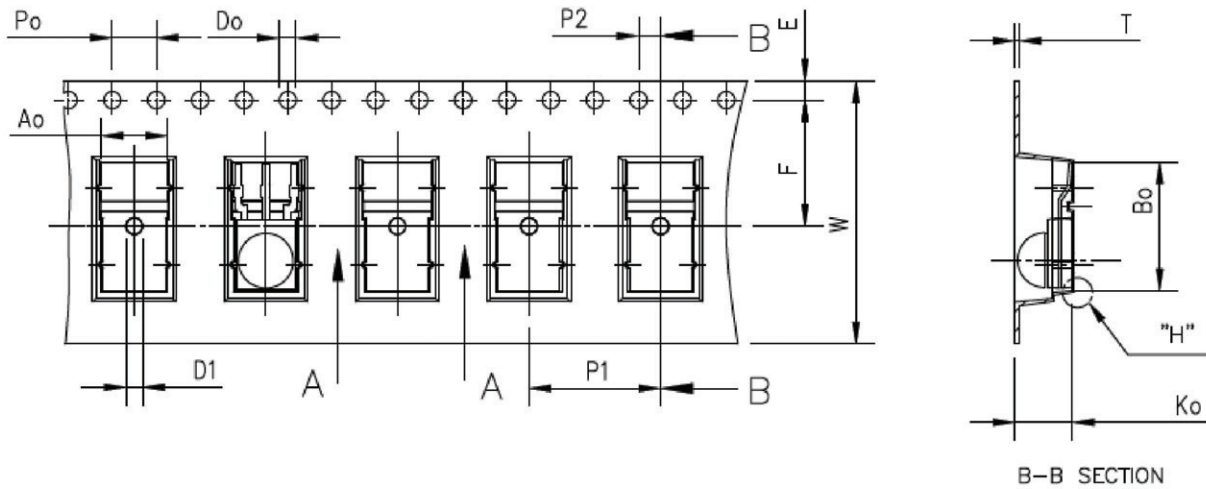
Drawing-No.: 9.700-5399.01-4
Issue: 2; 29.06.18

Item	A_0	B_0	K_0	P_0	P_1	P_2	T
Dimensions	6.08 ± 0.10	11.75 ± 0.10	5.25 ± 0.10	4.0 ± 0.10	12.0 ± 0.10	2.0 ± 0.10	0.40 ± 0.05
Item	E	F	D_0	D_1	W	$10P_0$	
Dimensions	1.75 ± 0.10	11.50 ± 0.10	1.55 ± 0.05	1.5 min.	24.0 +0.30 / -0.10	40.0 ± 0.20	

REEL DIMENSIONS in millimeters

$24.4 \, {}^{+3}_{-0}$

$\varnothing \, 330 \, {}^{+0}_{-4}$

$\varnothing \, 60$ min.

$\varnothing \, 12.8$ min.

$\varnothing \, 20.2$ min.

1.5 min.

Reel hub 2:1

Technical drawing according to DIN specifications

Form of the leave open of the wheel is supplier specific. Dimensions according to IEC EN 60 286-3

Tape width: 24

Drawing-No.: 9.800-5052.V3-4
Issue: 1; 17.12.02
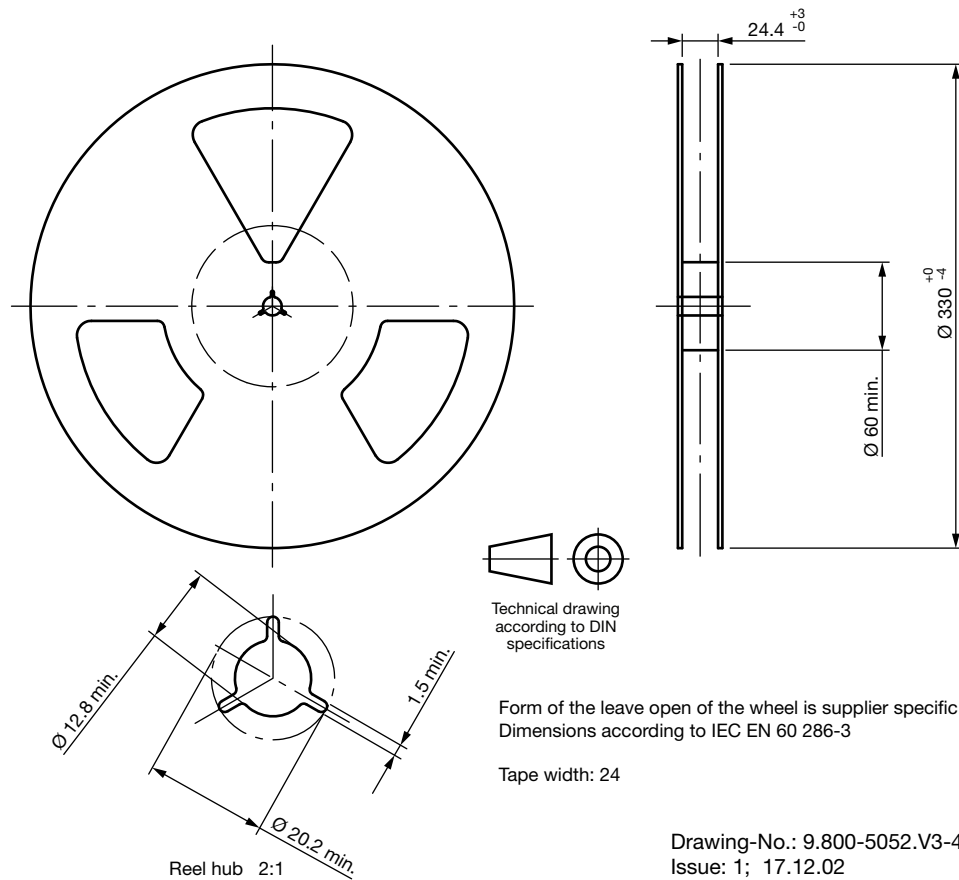
LEADER AND TRAILER DIMENSIONS in millimeters

Trailer

Leader

no devices

devices

no devices

End

Start

min. 200

min. 400

96 11818
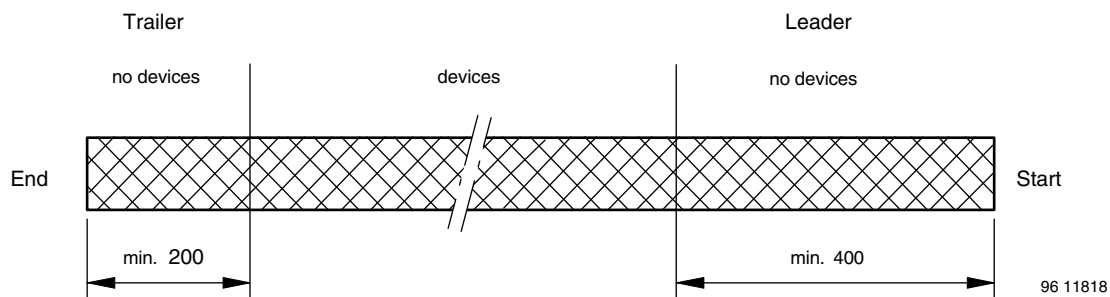
COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3

0.1 N to 1.3 N

300 mm/min. ± 10 mm/min.

165° to 180° peel angle

TSOP131..DF1P, TSOP133..DF1P, TSOP135..DF1P

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ORDERING INFORMATION

| T | S | O | P | d | d | d | d | d | D | F | 1 | P |

Product series
(2 or 3 digits)

Frequency

Holder type

Note
- d = "digit", please consult the list of available series on the previous page to create a valid part number

Example: TSOP13538DF1P

PACKAGING QUANTITY

- 1100 pieces per reel
- 1 reel per box

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.
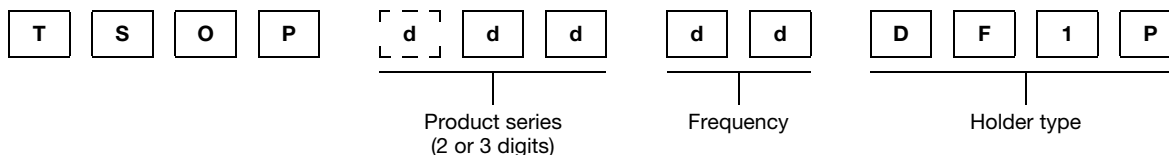
VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (finished goods)		
PLAIN WRITING	**ABBREVIATION**	**LENGTH**
Item-description	-	18
Item-number	INO	8
Selection-code	SEL	3
LOT-/serial-number	BATCH	10
Data-code	COD	3 (YWW)
Plant-code	PTC	2
Quantity	QTY	8
Accepted by	ACC	-
Packed by	PCK	-
Mixed 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.
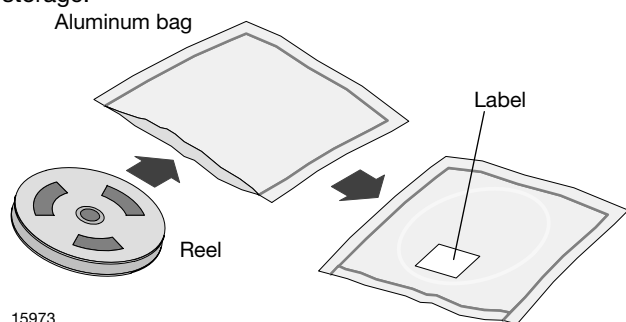
FINAL PACKING

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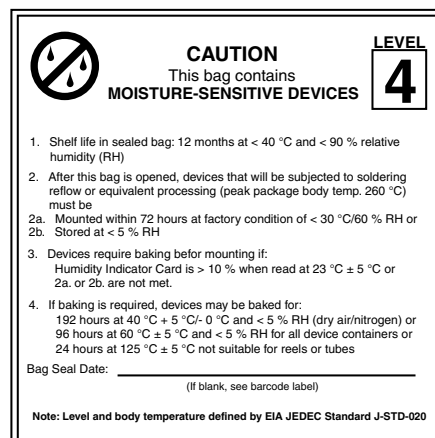
192 h at 40 °C + 5 °C / - 0 °C and < 5 % RH (dry air / nitrogen) or

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 J-STD-020 level 4 label is included on all dry bags.

EIA JEDEC standard J-STD-020 level 4 label is included on all dry bags

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. Electrostatic 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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