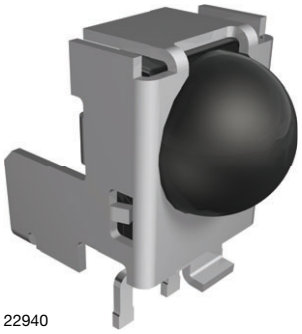
IR Receiver Modules for Remote Control Systems



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FEATURES

- Improved dark sensitivity
- Improved immunity against optical noise
- Very low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.0 V to 3.6 V
- Insensitive to supply voltage ripple and noise
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

HALOGEN FREE GREEN (5-2008)

ADDITIONAL RESOURCES

3D Models

MECHANICAL DATA

1 = OUT, 2 = GND, 3 = V_S

DESCRIPTION

The TSOP93...P16TR series devices are the latest generation miniaturized IR receiver modules for infrared remote control systems. These series provide improvements in sensitivity to remote control signals in dark ambient as well as in sensitivity in the presence of optical disturbances e.g. from CFLs.

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.

The TSOP936..,P16TR series devices are designed to receive long burst codes (10 or more carrier cycles per burst). The third digit designates the AGC level (AGC6) and the last two digits designate the band-pass frequency (see table below). The higher the AGC, the better noise is suppressed, but the lower the code compatibility. AGC6 provides maximized noise suppression. Generally, we advise to select the highest AGC that satisfactorily receives the desired remote code.

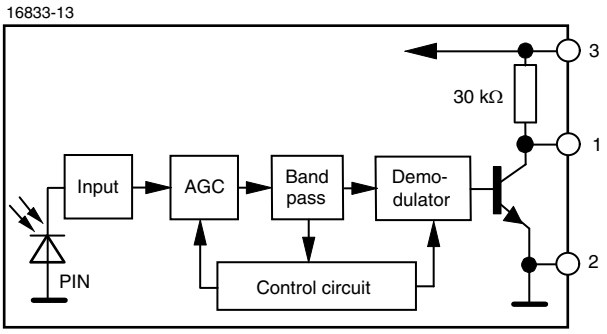
These components have not been qualified to automotive specifications.

PARTS TABLE		
AGC		**MAXIMIZED NOISE SUPPRESSION (AGC6)**
Carrier frequency	30 kHz	TSOP93630P16TR
	33 kHz	TSOP93633P16TR
	36 kHz	TSOP93636P16TR [5][6]
	38 kHz	TSOP93638P16TR [3][4][11]
	40 kHz	TSOP93640P16TR
	56 kHz	TSOP93656P16TR
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] Cisco [2] MCIR [3] Mitsubishi [4] NEC [5] Panasonic [6] RC-5 [7] RC-6 [8] RCA [9] r-step [10] Sejin 4PPM [11] Sharp [12] Sony

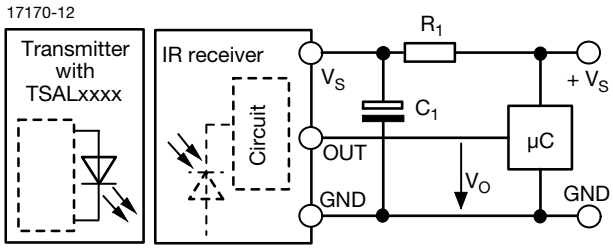
Notes

- 30 kHz and 33 kHz only available on written request
- See datasheet for TSOP932..P16TR, TSOP934..P16TR for preferred devices for [1][2][7][8][9][10][12]

BLOCK DIAGRAM



APPLICATION CIRCUIT



R_1 and C_1 recommended to reduce supply ripple for V_S < 2.2 V

ABSOLUTE MAXIMUM RATINGS

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Supply voltage		V_S	-0.3 to +3.6	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 ≤ 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	E_v = 0, V_S = 3.3 V	I_{SD}	0.25	0.37	0.45	mA
	E_v = 40 klx, sunlight	I_{SH}	-	0.50	-	mA
Supply voltage		V_S	2.0	-	3.6	V
Transmission distance	E_v = 0, test signal see Fig. 1, IR diode TSAL6200, I_F = 50 mA	d	-	32	-	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	Test signal: NEC code	$E_{e\ min.}$	-	0.07	0.15	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	-	°

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

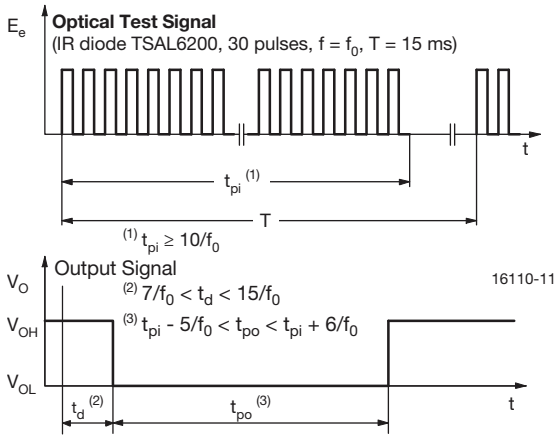


Fig. 1 - Output Delay and Pulse-Width

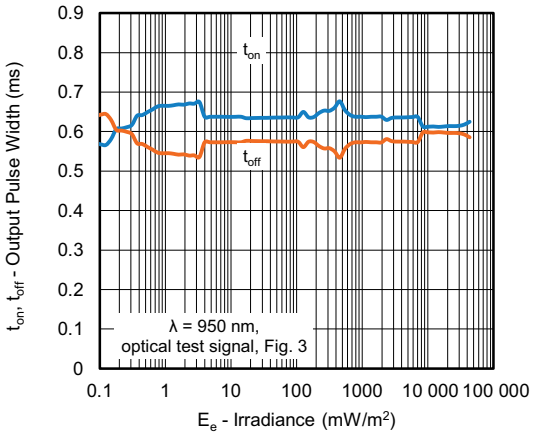


Fig. 4 - Pulse-Width vs. Irradiance in Dark Ambient

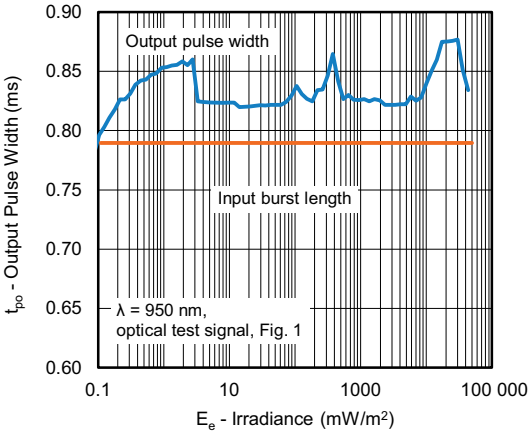


Fig. 2 - Pulse-Width vs. Irradiance in Dark Ambient

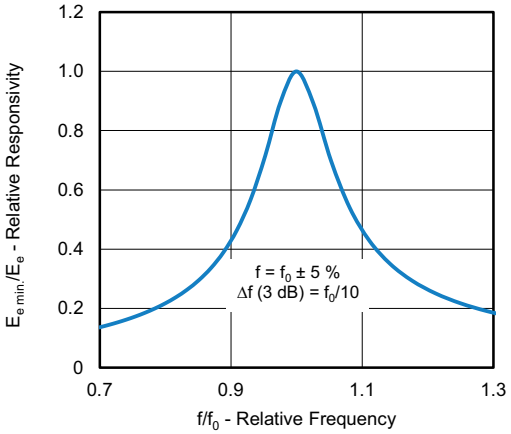


Fig. 5 - Frequency Dependence of Responsivity

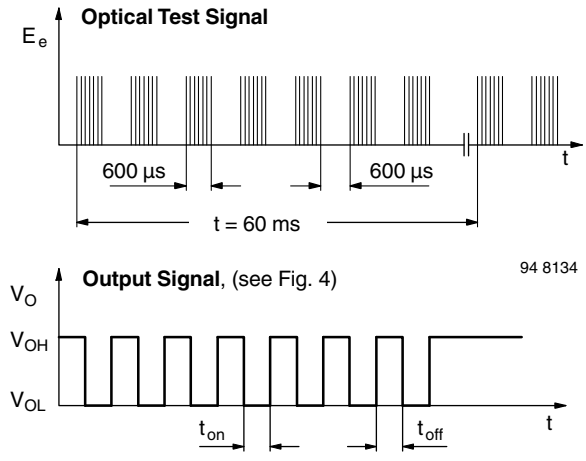


Fig. 3 - Test Signal

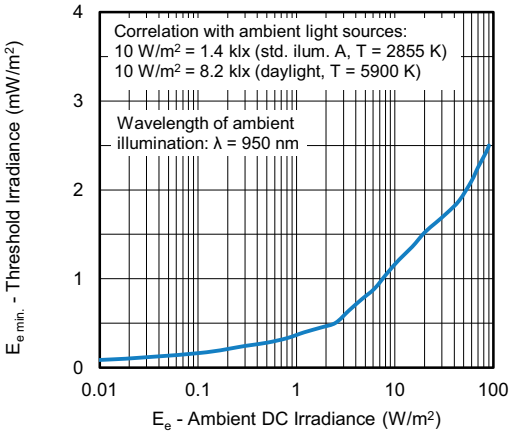


Fig. 6 - Sensitivity in Bright Ambient

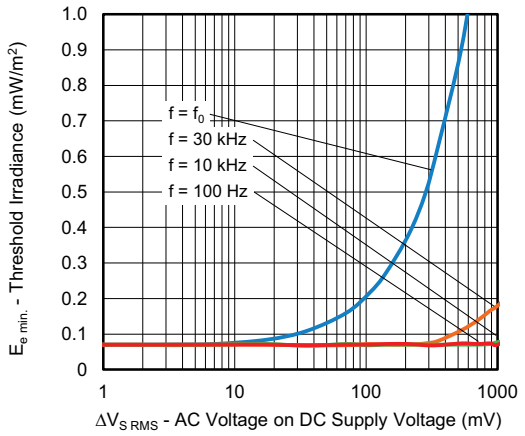


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

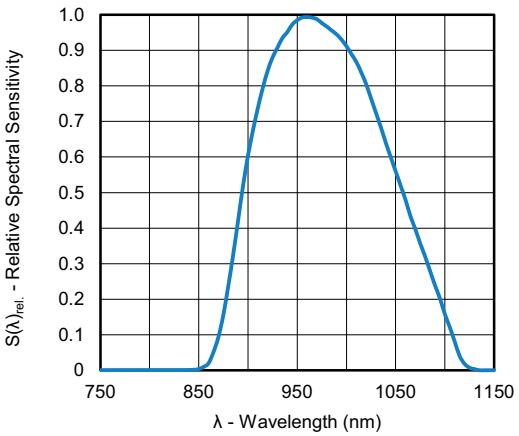


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

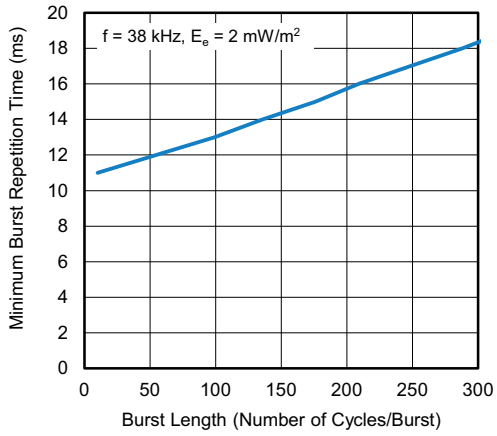


Fig. 8 - Minimum Burst Repetition Time vs. Burst Length

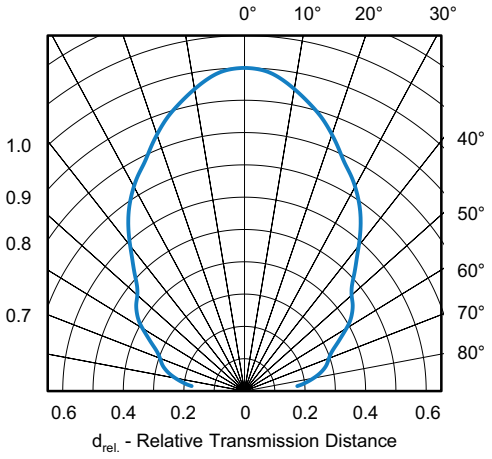


Fig. 11 - Directivity

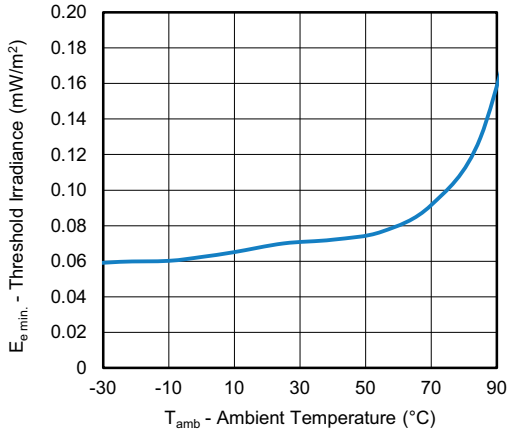


Fig. 9 - Sensitivity vs. Ambient Temperature

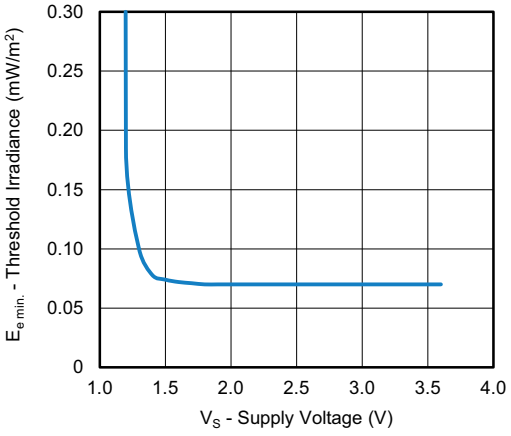


Fig. 12 - Sensitivity vs. Supply Voltage

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)

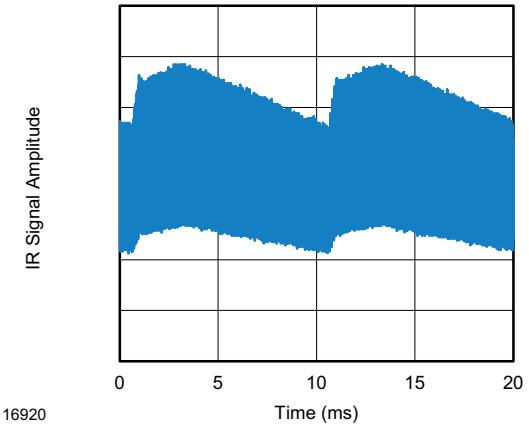


Fig. 13 - IR Emission from Fluorescent Lamp With Low Modulation

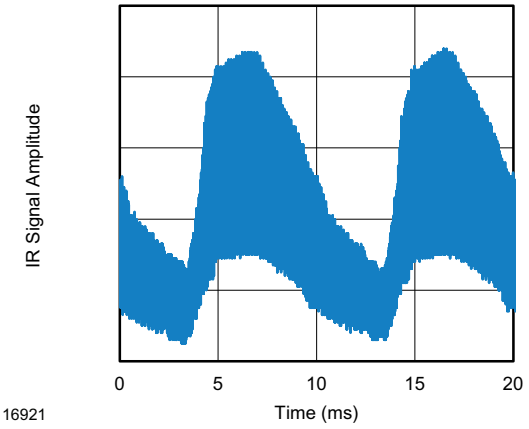


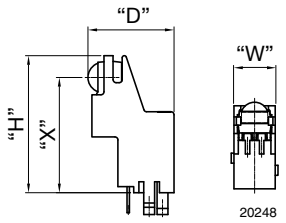
Fig. 14 - IR Emission from Fluorescent Lamp With High Modulation

	TSOP936..P16TR
Minimum burst length	10 cycles/burst
Minimum gap time between bursts	≥ 13 cycles
Minimum idle period between data frames	12 ms
RC-5 code	Preferred
RC-6 code	Yes
NEC code	Preferred
r-step code 56 kHz	Yes
Sony code	No
RCA 56 kHz code	Yes
Mitsubishi code 38 kHz	Preferred
Suppression of interference from fluorescent lamps	Fig. 13 and Fig. 14

Note

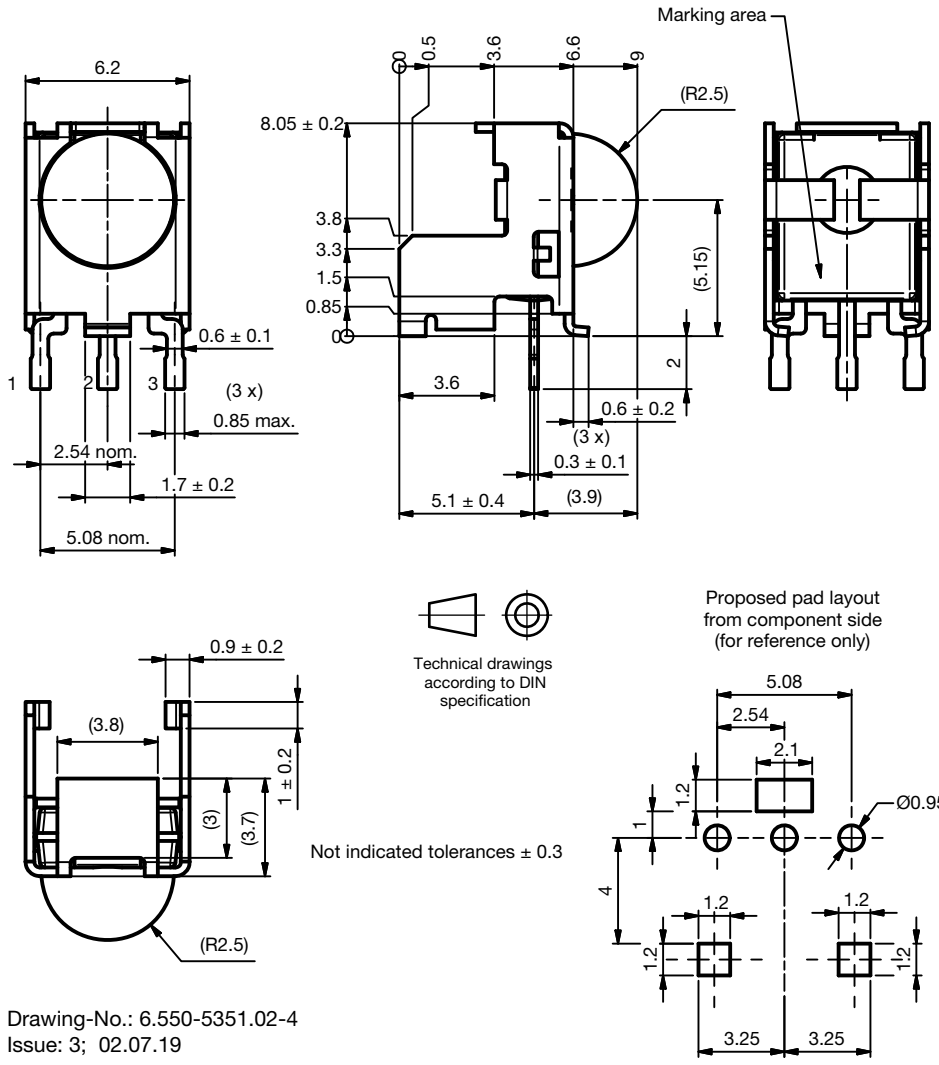
- For data formats with short bursts please see the datasheet for TSOP933..P16TR, TSOP935..P16TR

SIDE VIEW PIN-IN-PASTE HOLDER: D = 9.0 mm, H = 8.05 mm, W = 6.2 mm, X = 5.15 mm



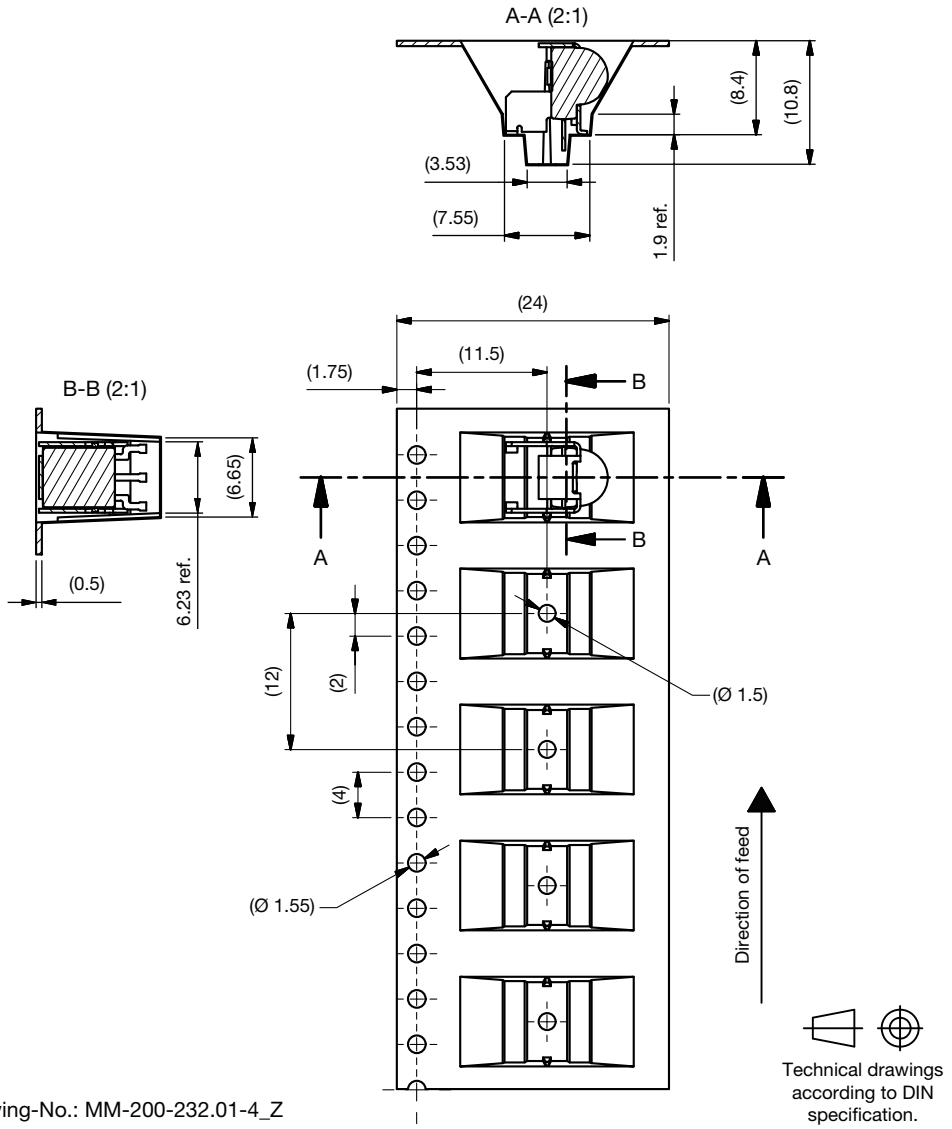
NAME	LENS AXIS (X)	VIEW	TYPE	HEIGHT (H)	WIDTH (W)	DEPTH (D)
P16TR	5.15	Side	Holder	8.05	6.2	9.0

MECHANICAL DIMENSIONS in millimeters



Drawing-No.: 6.550-5351.02-4
Issue: 3; 02.07.19

TAPING VERSION TSOP..TR DIMENSIONS in millimeters



Drawing-No.: MM-200-232.01-4_Z
Issue A: 25.04.17

ORDERING INFORMATION

T	S	O	P	d	d	d	d	d	P	1	6	T	R
				Product series (2 or 3 digits)			Frequency		Holder type			Taping	

Note

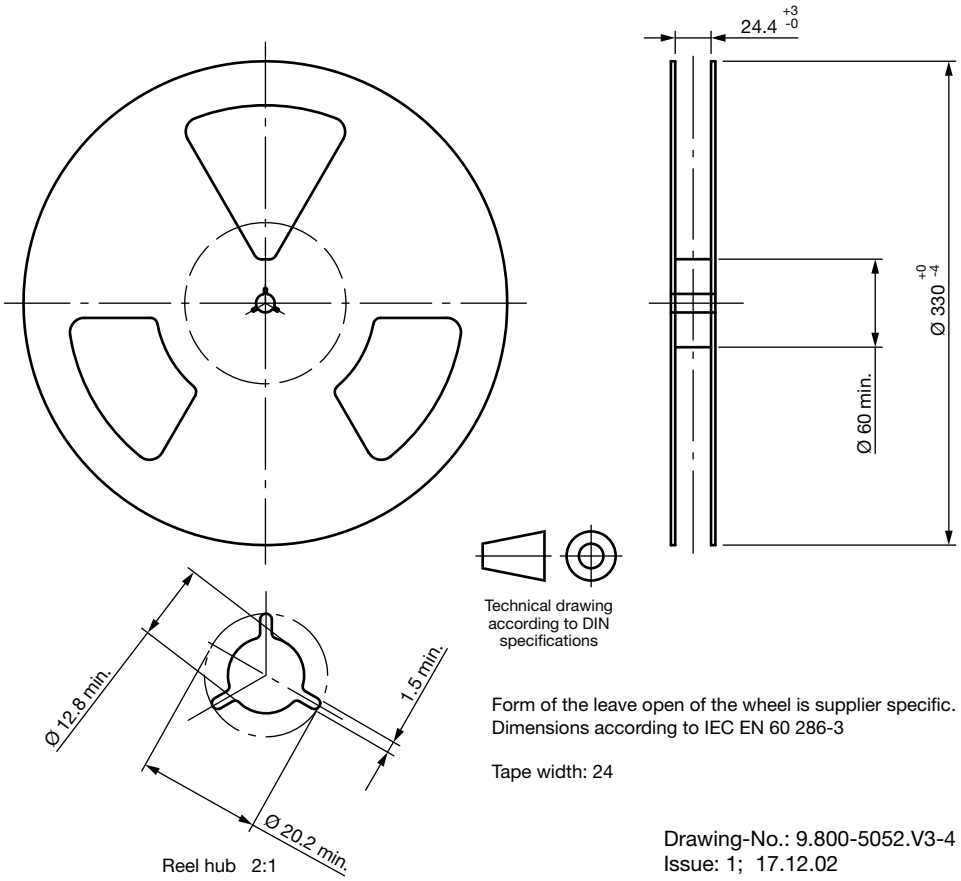
- d = “digit”, please consult the list of available series on the previous page to create a valid part number

Example: TSOP93638P16TR

PACKAGING QUANTITY

- 500 pieces per reel

REEL DIMENSIONS in millimeters

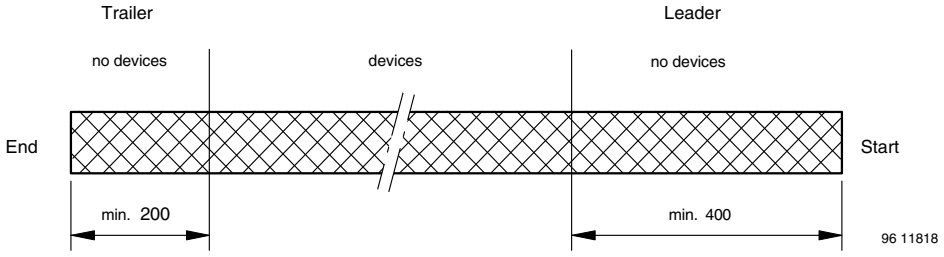


Form of the leave open of the wheel is supplier specific.
Dimensions according to IEC EN 60 286-3

Tape width: 24

Drawing-No.: 9.800-5052.V3-4
Issue: 1; 17.12.02

LEADER AND TRAILER DIMENSIONS in millimeters



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

ASSEMBLY INSTRUCTIONS

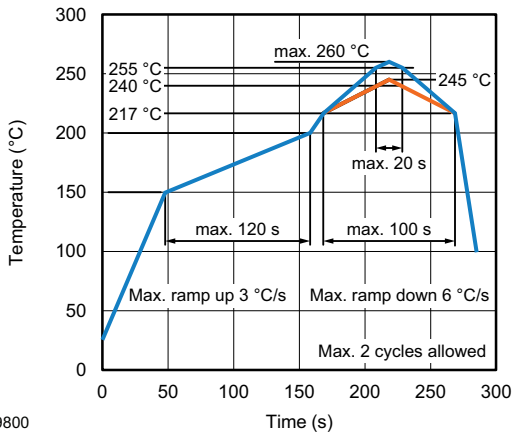
Reflow Soldering

- 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



LABEL

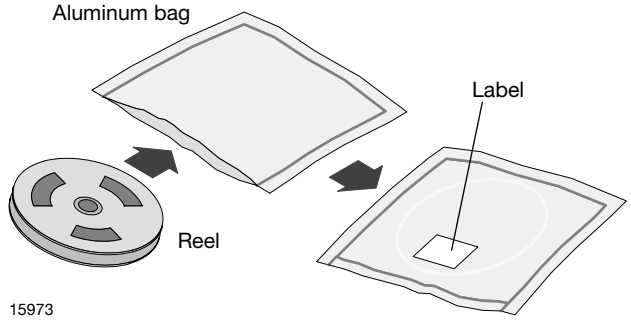
Standard bar code labels for finished goods

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:

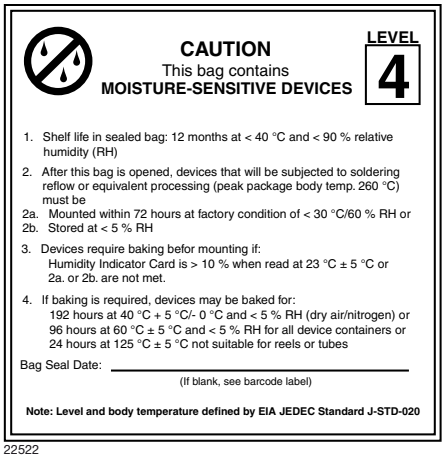
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

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.



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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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