



## IR Receiver Modules for Remote Control Systems



23203

### DESCRIPTION

This IR receiver series is optimized for long burst remote control systems in different environments. The customer can choose 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](http://www.vishay.com/doc?99912)



**RoHS**  
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**FREE**  
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(5-2008)

### LINKS TO ADDITIONAL RESOURCES



[Product Page](#)



[Marking](#)



[Holders](#)



[Bends and Cuts](#)

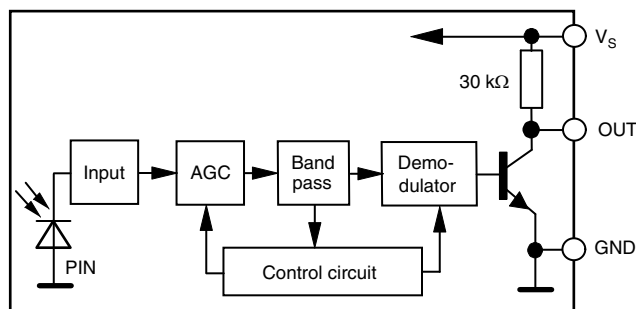
### APPLICATIONS

- Infrared remote control systems

### DESIGN SUPPORT TOOLS

- [3D models](#)
- [Window size calculator](#)

### BLOCK DIAGRAM



16833-22



# TSOP132..P16TR, TSOP134..P16TR, TSOP136..P16TR

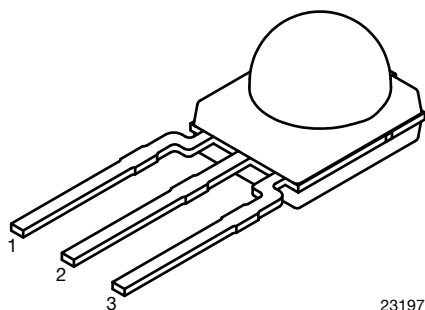
[www.vishay.com](http://www.vishay.com)

Vishay Semiconductors

## MECHANICAL DATA

Pinning for TSOP13...P16TR:

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

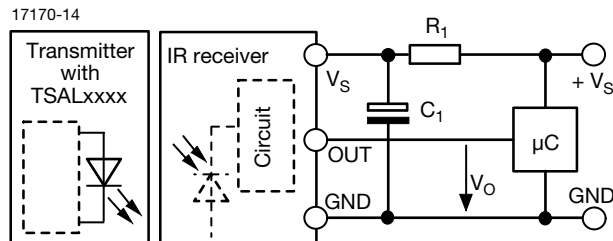


23197

## ORDERING CODE

TSOP13...P16TR - 500 pieces in tape and reel

## APPLICATION CIRCUIT



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

## PARTS TABLE

AGC		BASIC NOISE SUPPRESSION (AGC2)5	ENHANCED NOISE SUPPRESSION (AGC4)	MAXIMIZED NOISE SUPPRESSION (AGC6)
Carrier frequency	30 kHz	TSOP13230P16TR	TSOP13430P16TR	TSOP13630P16TR
	33 kHz	TSOP13233P16TR	TSOP13433P16TR	TSOP13633P16TR
	36 kHz	TSOP13236P16TR	TSOP13436P16TR <sup>(4)(6)</sup>	TSOP13636P16TR <sup>(5)</sup>
	38 kHz	TSOP13238P16TR	TSOP13438P16TR <sup>(2)(3)(9)(10)</sup>	TSOP13638P16TR
	40 kHz	TSOP13240P16TR <sup>(11)</sup>	TSOP13440P16TR	TSOP13640P16TR
	56 kHz	TSOP13256P16TR <sup>(1)</sup>	TSOP13456P16TR <sup>(8)</sup>	TSOP13656P16TR <sup>(7)</sup>
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	<sup>(1)</sup> Cisco <sup>(2)</sup> Mitsubishi <sup>(3)</sup> NEC <sup>(4)</sup> Panasonic <sup>(5)</sup> RC-5 <sup>(6)</sup> RC-6 <sup>(7)</sup> RCA <sup>(8)</sup> r-step <sup>(9)</sup> Sejin 4PPM <sup>(10)</sup> Sharp <sup>(11)</sup> Sony			
Special options	<ul style="list-style-type: none"> <li>Narrow optical filter: <a href="http://www.vishay.com/doc?81590">www.vishay.com/doc?81590</a></li> <li>Wide optical filter: <a href="http://www.vishay.com/doc?82726">www.vishay.com/doc?82726</a></li> </ul>			

## 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	$T_{amb} \leq 85^\circ\text{C}$	$P_{tot}$	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



ELECTRICAL AND OPTICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply current	$E_v = 0$ , $V_s = 3.3\text{ V}$	$I_{SD}$	0.25	0.35	0.45	mA
	$E_v = 40\text{ klx}$ , 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, $I_F = 50\text{ mA}$	$d$	-	39	-	m
Output voltage low	$I_{OSL} = 0.5\text{ mA}$ , $E_e = 0.7\text{ mW/m}^2$ , test signal see Fig. 1	$V_{OSL}$	-	-	100	mV
Minimum irradiance	Test signal: RC5 code	$E_e\text{ min.}$	-	0.05	0.1	$\text{mW/m}^2$
	Test signal: NEC code	$E_e\text{ min.}$	-	0.1	0.2	$\text{mW/m}^2$
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 5/f_0$ , test signal see Fig. 1	$E_e\text{ max.}$	30	-	-	$\text{W/m}^2$
Directivity	Angle of half transmission distance	$\Phi_{1/2}$	-	$\pm 45$	-	$^{\circ}$

## TYPICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

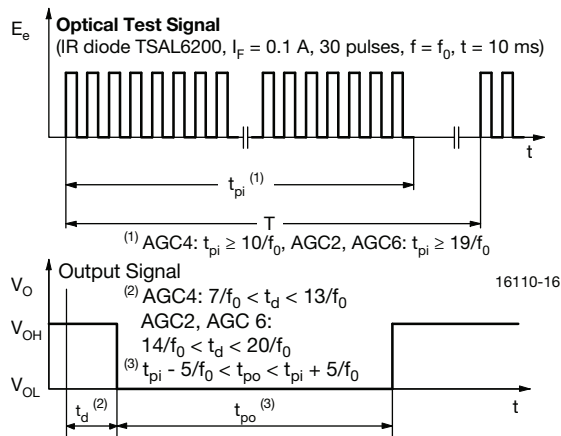


Fig. 1 - Output Delay and Pulse-Width

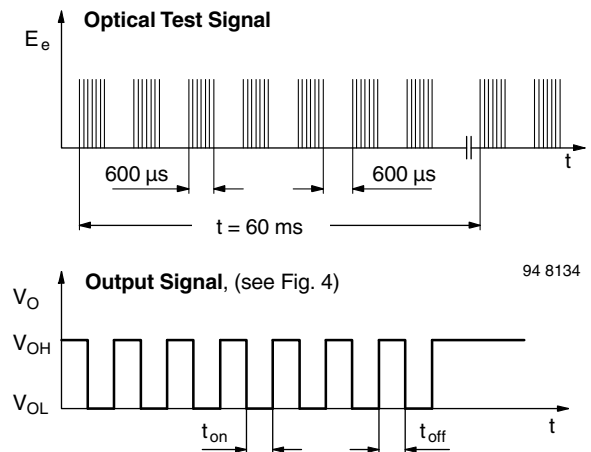


Fig. 3 - Test Signal

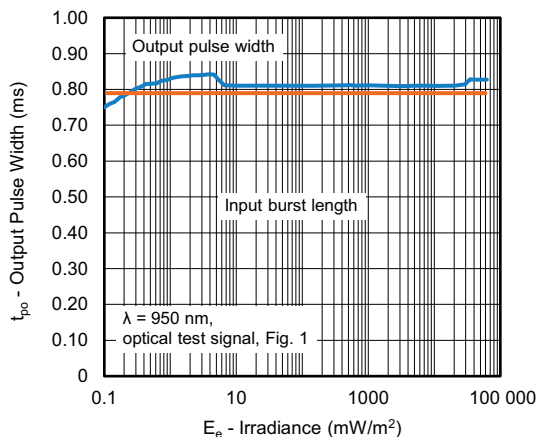


Fig. 2 - Pulse-Width vs. Irradiance in Dark Ambient

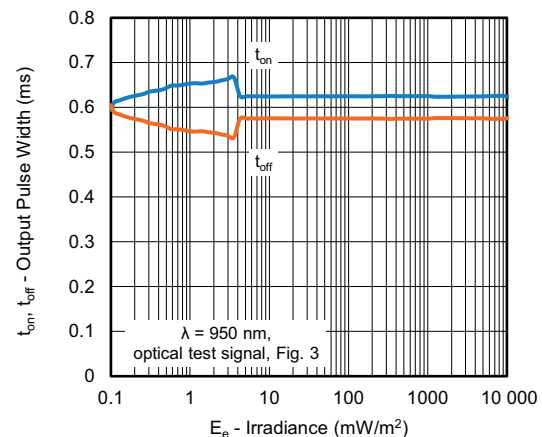


Fig. 4 - Pulse-Width vs. Irradiance in Dark Ambient

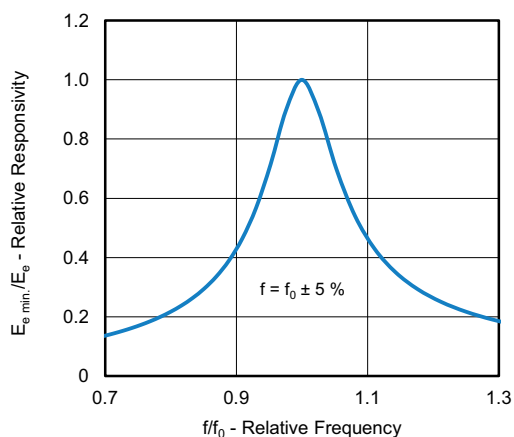


Fig. 5 - Frequency Dependence of Responsivity

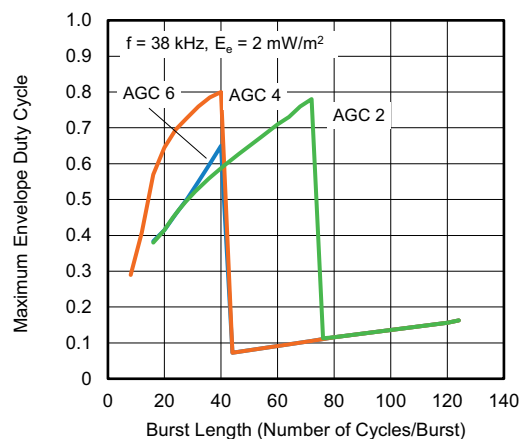


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

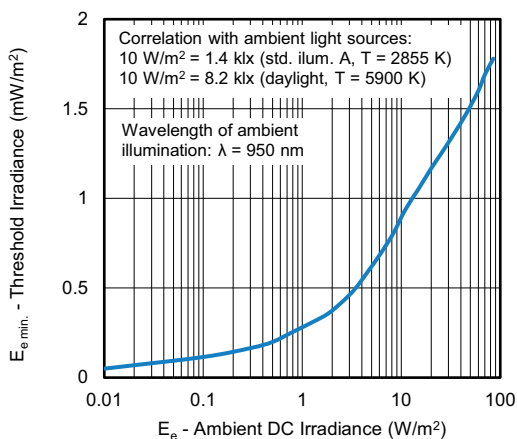


Fig. 6 - Sensitivity in Bright Ambient

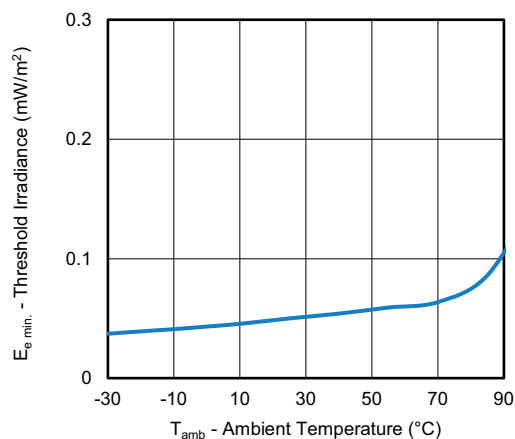


Fig. 9 - Sensitivity vs. Ambient Temperature

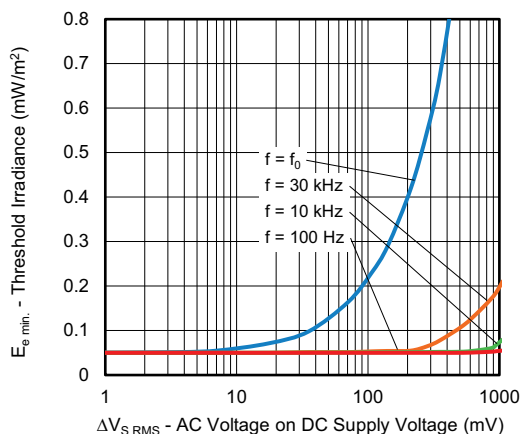


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

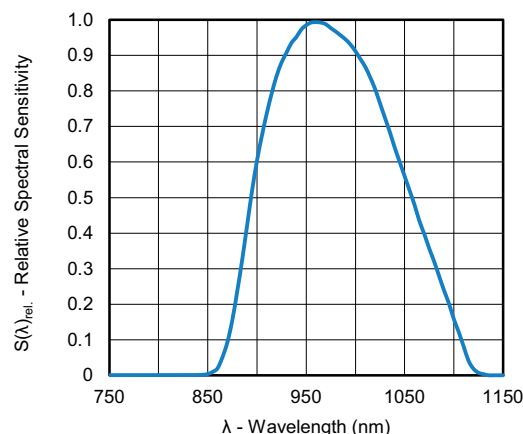
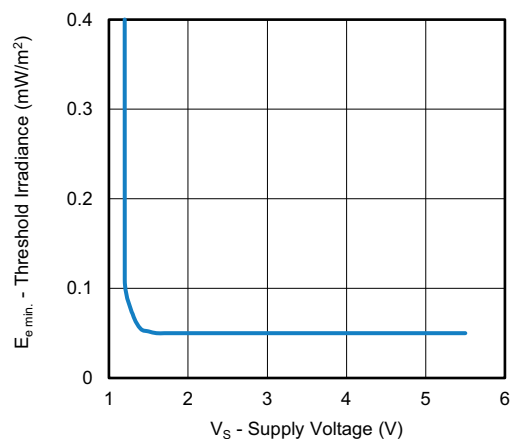
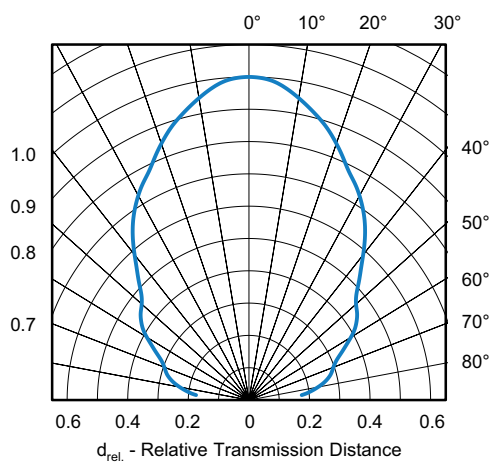


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength





## 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

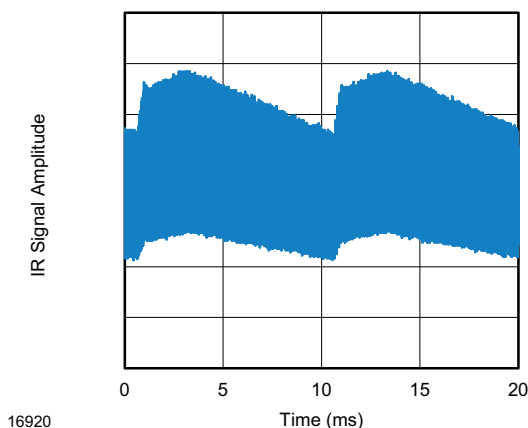


Fig. 13 - IR Emission from Fluorescent Lamp With Low Modulation



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

	TSOP132..P16TR	TSOP134..P16TR	TSOP136..P16TR
Minimum burst length	19 cycles/burst	10 cycles/burst	19 cycles/burst
After each burst of length a minimum gap time is required of	19 to 72 cycles ≥ 20 cycles	10 to 40 cycles ≥ 11 cycles	19 to 40 cycles ≥ 20 cycles
For bursts greater than a minimum gap time in the data stream is needed of	72 cycles > 6 x burst length	40 cycles > 10 x burst length	40 cycles > 10 x burst length
Maximum number of continuous short bursts/second	750	1300	750
RC-5 code	Yes	Yes	Preferred
RC-6 code	No	Preferred	No
NEC code	Yes	Preferred	Yes
r-step code	No	Preferred	No
Sony code	Preferred	No	No
RCA 56 kHz code	Yes	Yes	Preferred
Suppression of interference from fluorescent lamps	Fig. 13	Fig. 13 and Fig. 14	Fig. 13 and Fig. 14

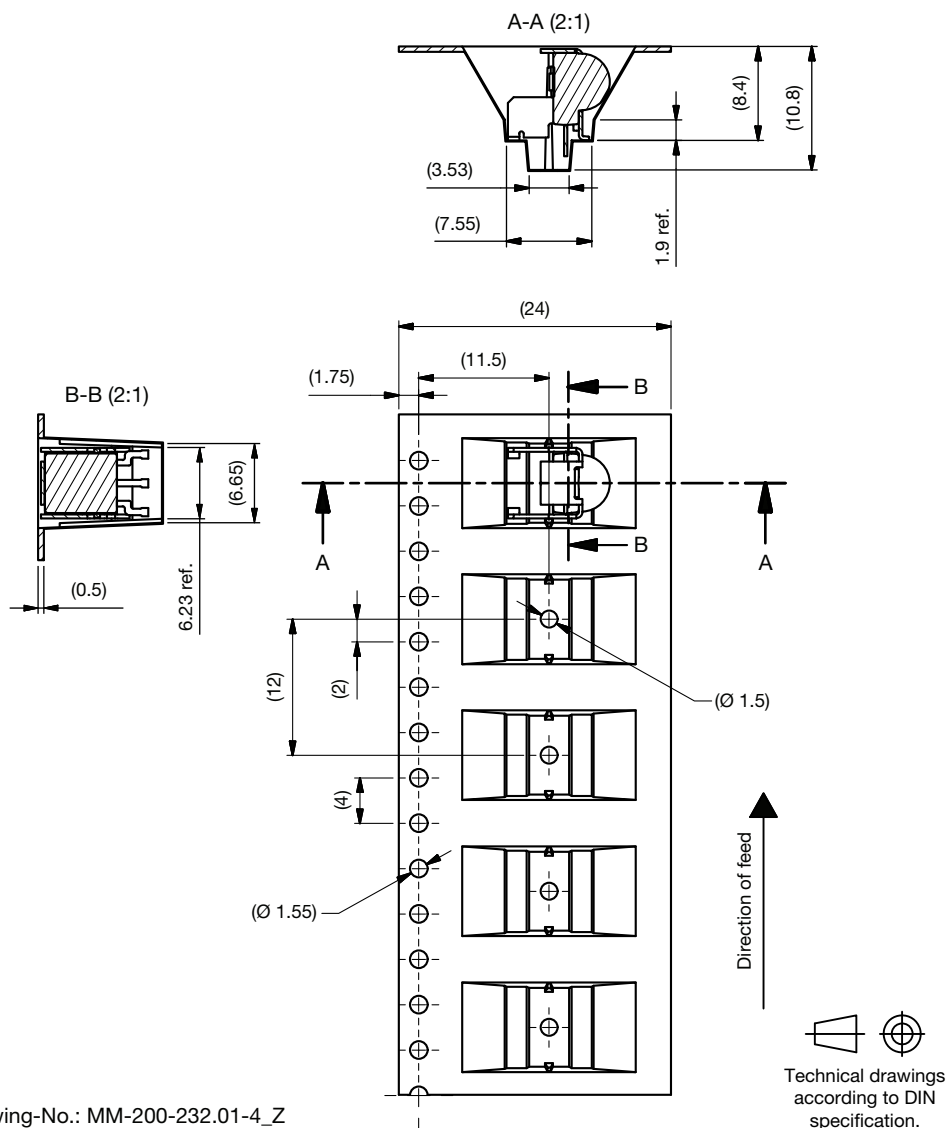
### Note

- For data formats with short bursts please see the datasheet for TSOP131..P16TR, TSOP133..P16TR, TSOP135..P16TR

Technical drawing of a 204 series ball bearing. The drawing shows the front and side views. Dimensions are labeled:  $D$  (outer diameter),  $W$  (width),  $H$  (height),  $X$  (inner diameter), and 204 (series number).

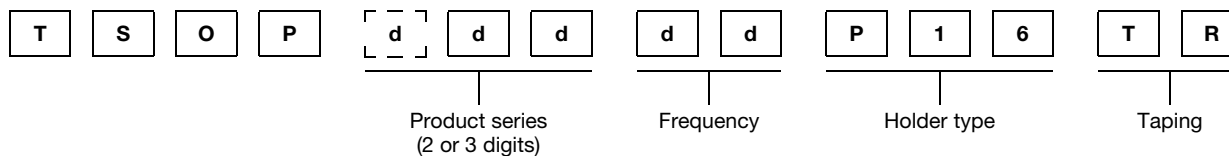
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### TAPING VERSION TSOP..TR DIMENSIONS in millimeters



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

## ORDERING INFORMATION



### Note

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

**Example: TSOP13438P16TR**

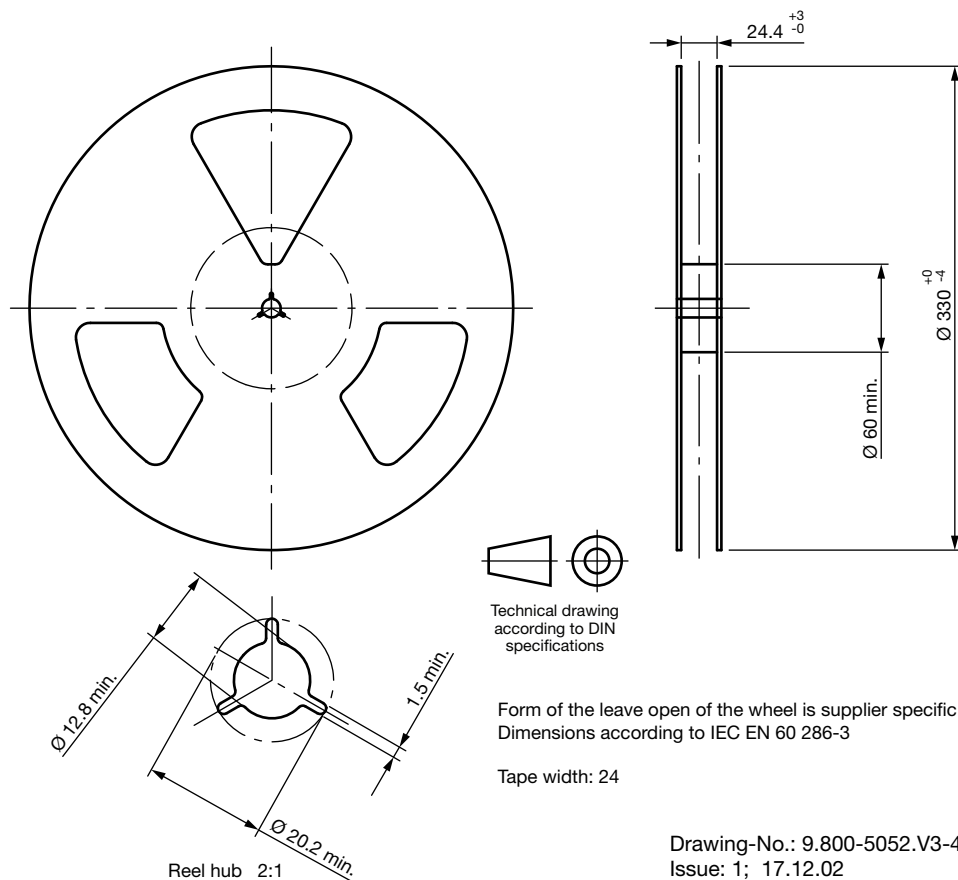
### PACKAGING QUANTITY

- 500 pieces per reel

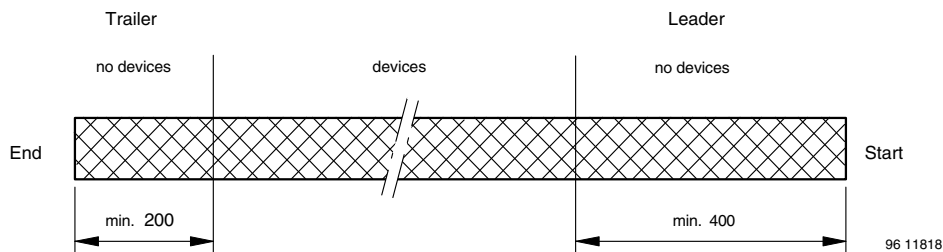




## REEL DIMENSIONS in millimeters



## LEADER AND TRAILER DIMENSIONS in millimeters



## COVER TAPE PEEL STRENGTH

According to DIN EN 60286-3

0.1 N to 1.3 N

$300 \pm 10 \text{ mm/min.}$

$165^\circ$  to  $180^\circ$  peel angle



## ASSEMBLY INSTRUCTIONS

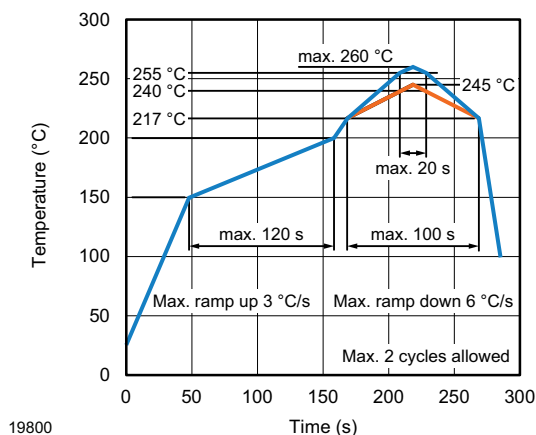
### Reflow Soldering

- 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

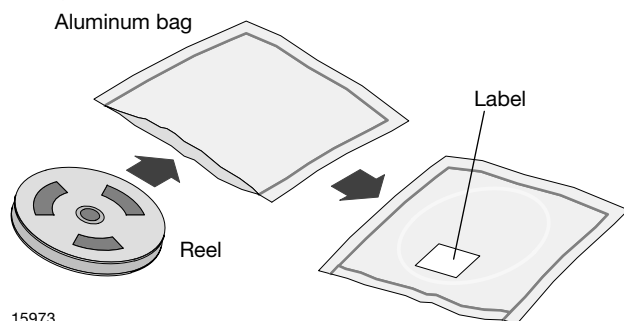
### Standard bar code labels for finished goods

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.



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  $\leq 60$  % RH max.

After more than 72 h under these conditions moisture content will be too high for reflow soldering.

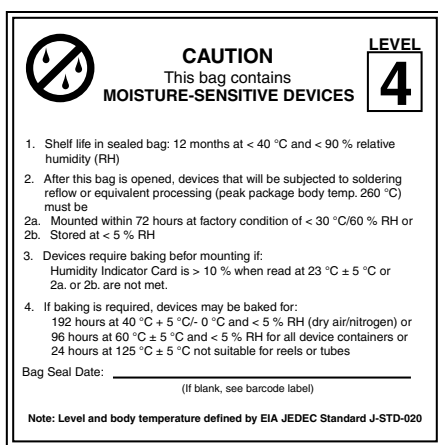
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

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.



22522

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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