IR Receiver Modules for Remote Control Systems

LINKS TO ADDITIONAL RESOURCES

Product Page | 3D Models | Calculators | Marking

DESCRIPTION

The TSOP99...TR1 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 TSOP993..TR1 and TSOP995..TR1, series devices are designed to receive short burst codes (6 or more carrier cycles per burst). The third digit designates the AGC level (AGC3 or AGC5) 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. AGC3 provides enhanced noise suppression and AGC5 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.

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)

DESIGN SUPPORT TOOLS

- 3D models
- Window size calculator
- PCB layout guidelines

MECHANICAL DATA

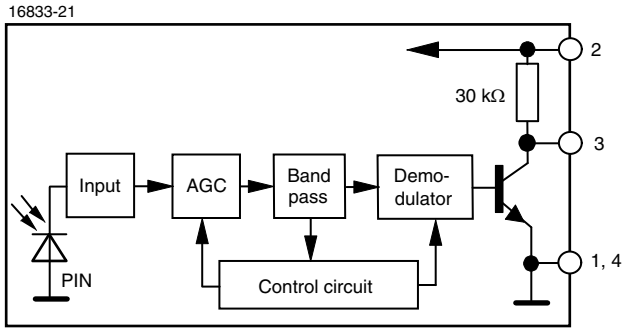
1, 4 = GND, 2 = V_S, 3 = OUT

ORDERING CODE

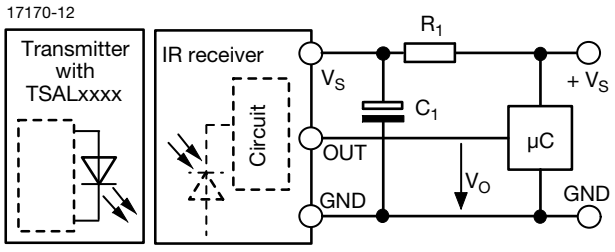
Taping:

TSOP99...TR1 - top view taped, 2000 pcs/reel

BLOCK DIAGRAM



APPLICATION CIRCUIT



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

PARTS TABLE			
AGC		**ENHANCED NOISE SUPPRESSION (AGC3)**	**MAXIMIZED NOISE SUPPRESSION (AGC5)**
Carrier frequency	30 kHz	TSOP99330TR1	TSOP99530TR1
	33 kHz	TSOP99333TR1	TSOP99533TR1
	36 kHz	TSOP99336TR1 (1)	TSOP99536TR1
	38 kHz	TSOP99338TR1 (2)(4)	TSOP99538TR1
	40 kHz	TSOP99340TR1	TSOP99540TR1
	56 kHz	TSOP99356TR1	TSOP99556TR1 (3)
Package		TVCastSMD	
Pinning		1, 4 = GND, 2 = V_S, 3 = OUT	
Dimensions (mm)		6.8 W x 2.6 H x 5.3 D	
Mounting		SMD	
Application		Remote control	
Best choice for		(1) RCMM (2) RECS-80 Code (3) r-map (4) XMP-1, XMP-2	

Note

- 30 kHz and 33 kHz only available on written request

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

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	-	26	-	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: XMP code	$E_{e\ min.}$	-	0.12	0.25	mW/m²
	Test signal: NEC code	$E_{e\ min.}$	-	0.10	0.20	mW/m²
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/m²
Directivity	Angle of half transmission distance	$\varphi_{1/2}$	-	± 45	-	°

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

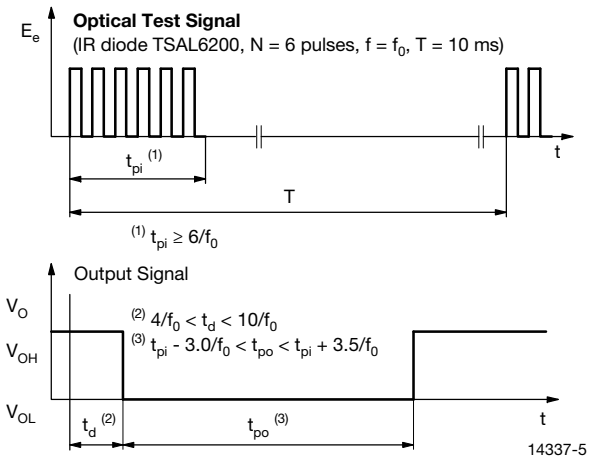


Fig. 1 - Output Delay and Pulse-Width

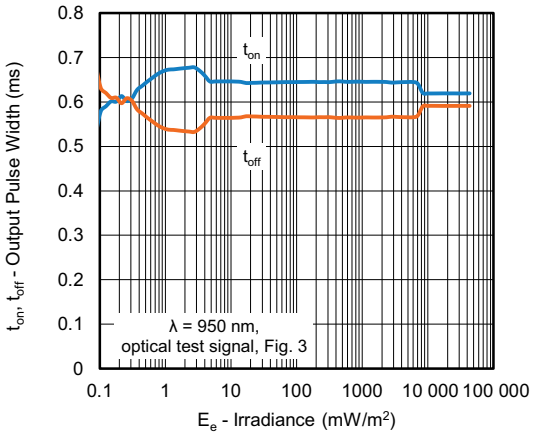


Fig. 4 - Pulse-Width vs. Irradiance in Dark Ambient

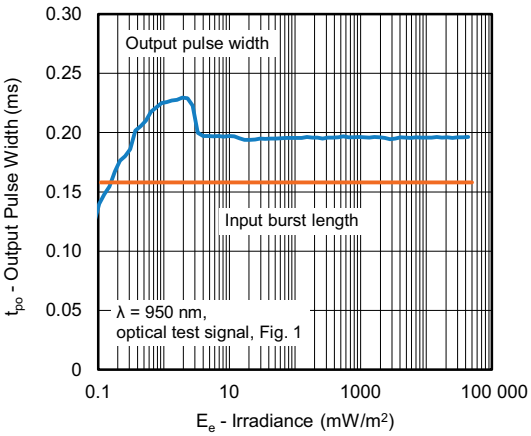


Fig. 2 - Pulse-Width vs. Irradiance in Dark Ambient

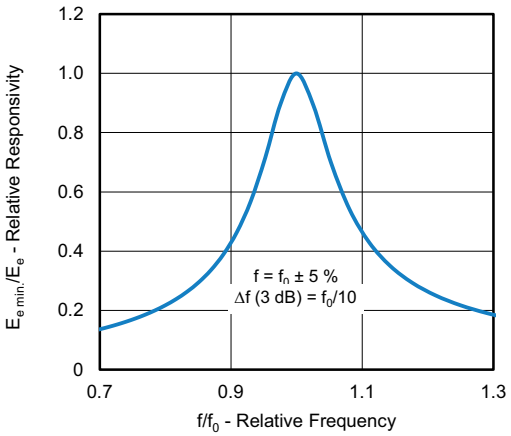


Fig. 5 - Frequency Dependence of Responsivity

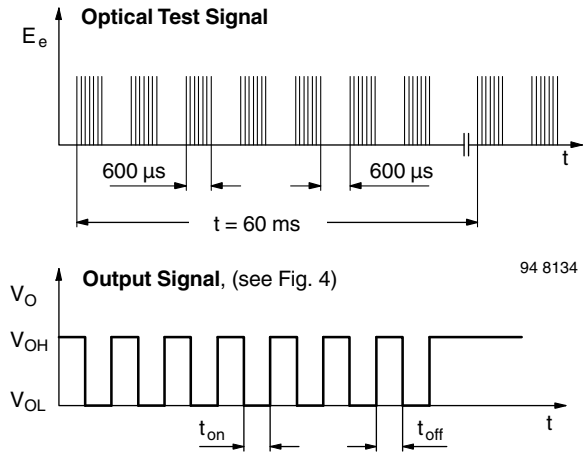


Fig. 3 - Test Signal

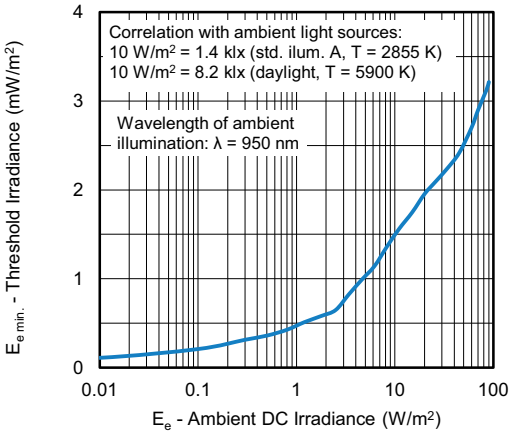


Fig. 6 - Sensitivity in Bright Ambient

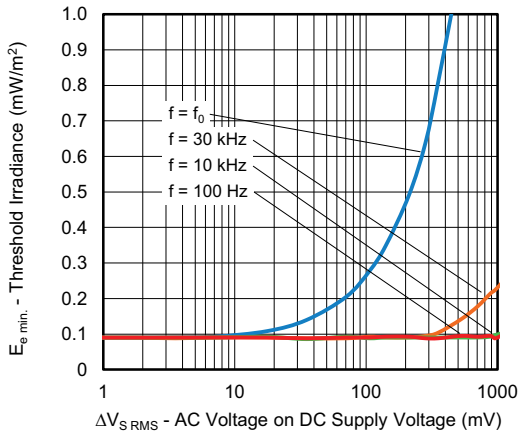


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

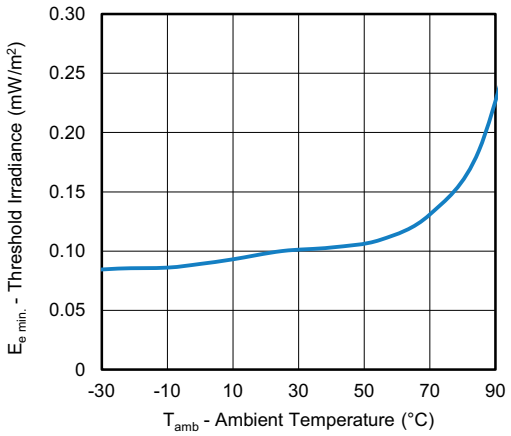


Fig. 9 - Sensitivity vs. Ambient Temperature

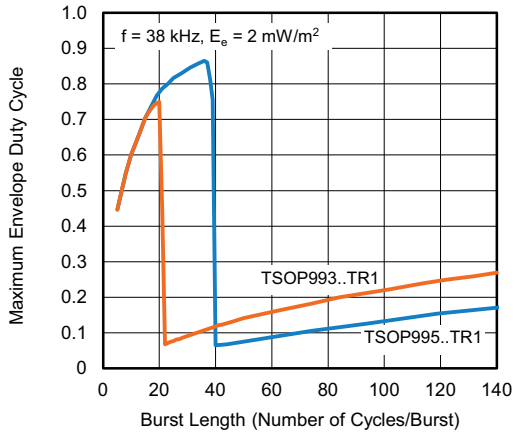


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

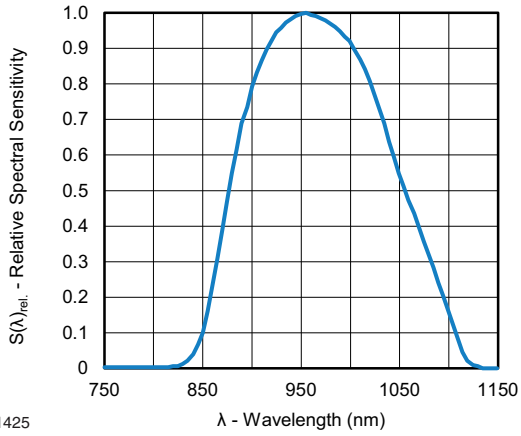
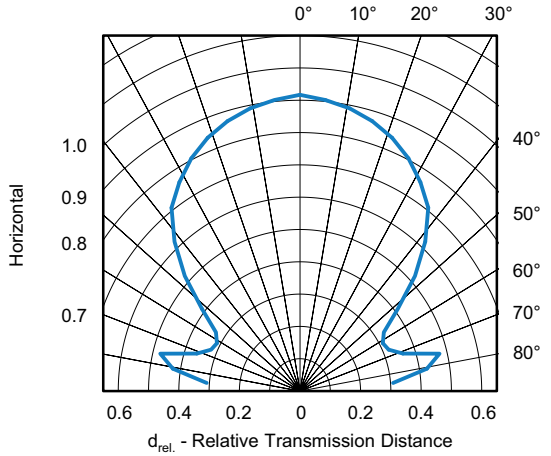


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength



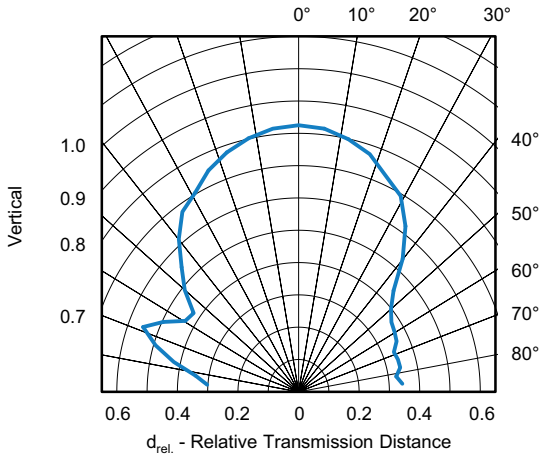


Fig. 11 - Horizontal and Vertical Directivity

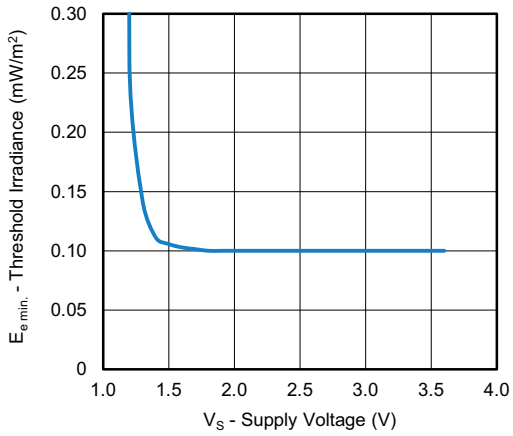


Fig. 12 - Sensitivity vs. Supply Voltage

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)

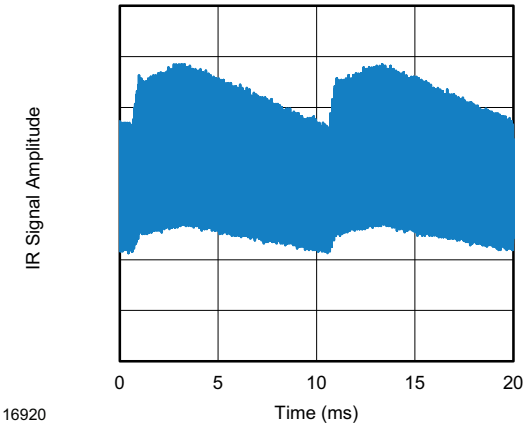


Fig. 13 - IR Emission from Fluorescent Lamp With Low Modulation

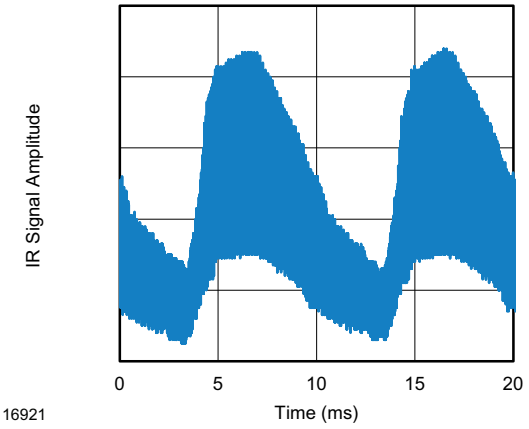


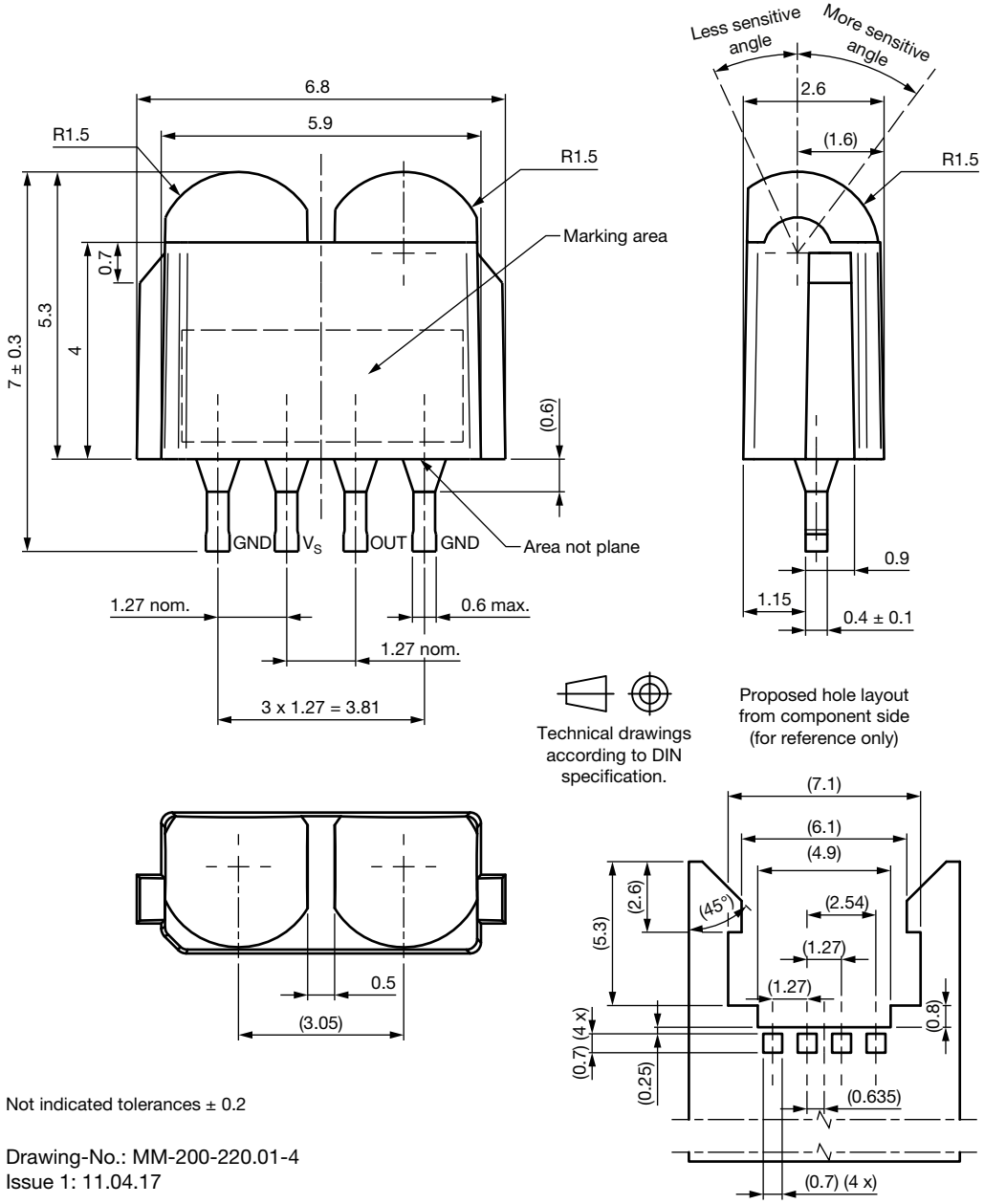
Fig. 14 - IR Emission from Fluorescent Lamp With High Modulation

	TSOP993..TR1	TSOP995..TR1
Minimum burst length	6 cycles/burst	6 cycles/burst
After each burst of length A gap time is required of	6 to 20 cycles ≥ 8 cycles	6 to 38 cycles ≥ 8 cycles
For bursts greater than a minimum gap time in the data stream is needed of	20 cycles > 6 x burst length	38 cycles > 20 ms
Maximum number of continuous short bursts/second	2500	2500
RCMM code	Preferred	Yes
XMP-1 code	Preferred	Yes
r-map code	Yes	Preferred
RECS-80 code	Preferred	Yes
Suppression of interference from fluorescent lamps	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 TSOP992..TR1, TSOP994..TR1, or TSOP996..TR1

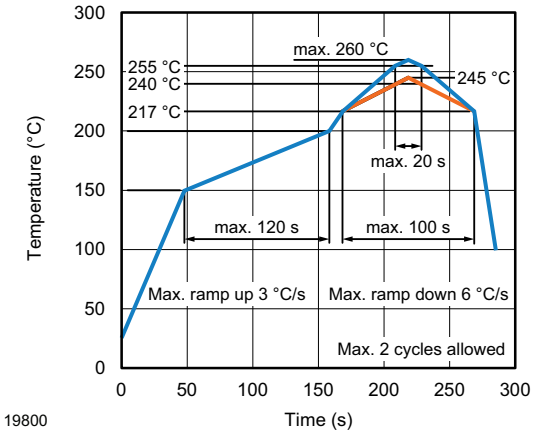
PACKAGE DIMENSIONS in millimeters



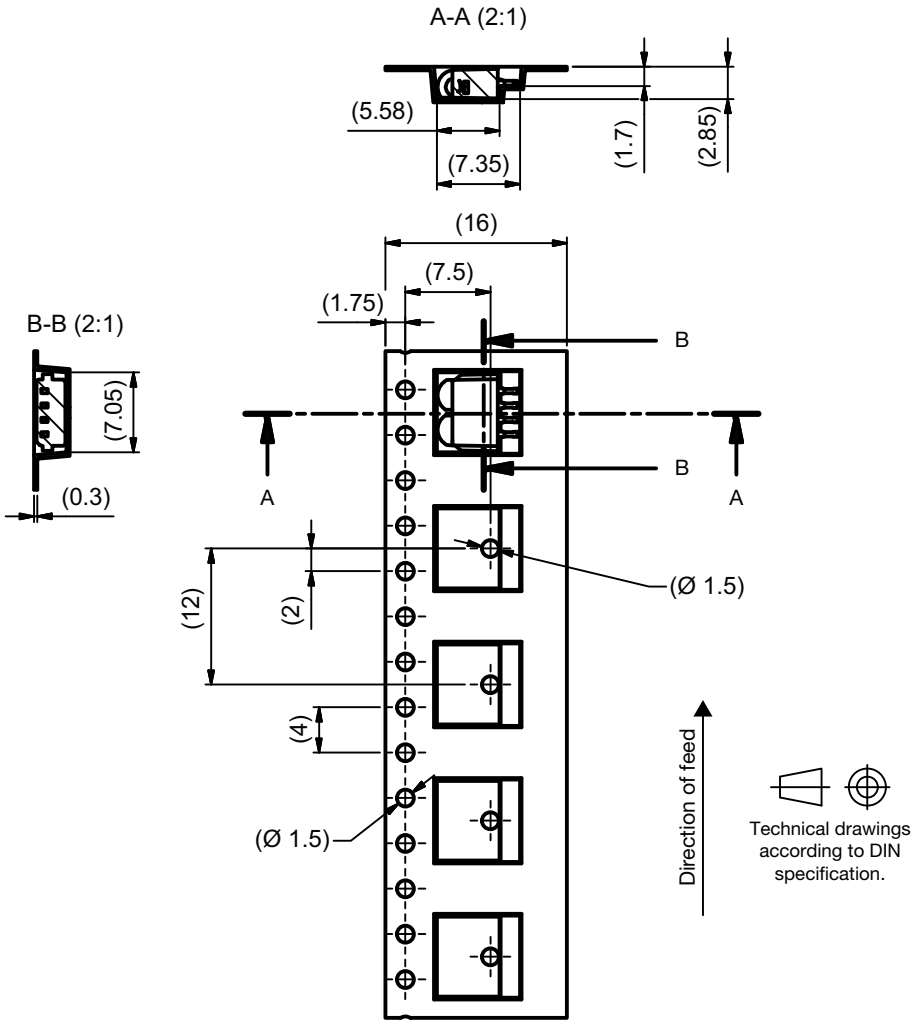
Not indicated tolerances ± 0.2

Drawing-No.: MM-200-220.01-4
Issue 1: 11.04.17

VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE



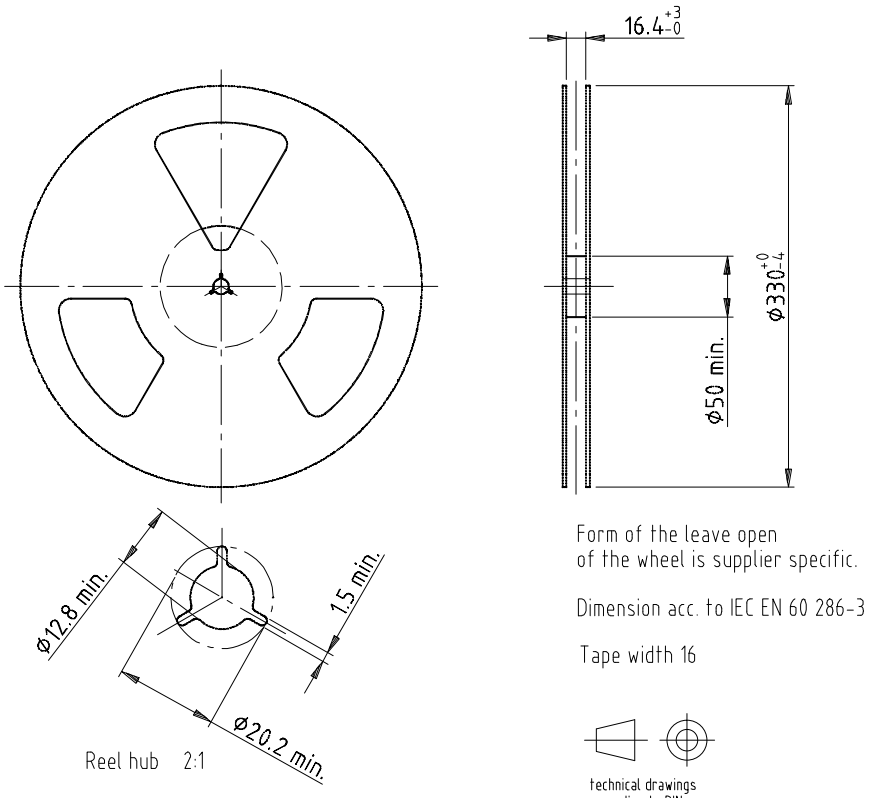
TAPING VERSION TSOP..TR1 DIMENSIONS in millimeters



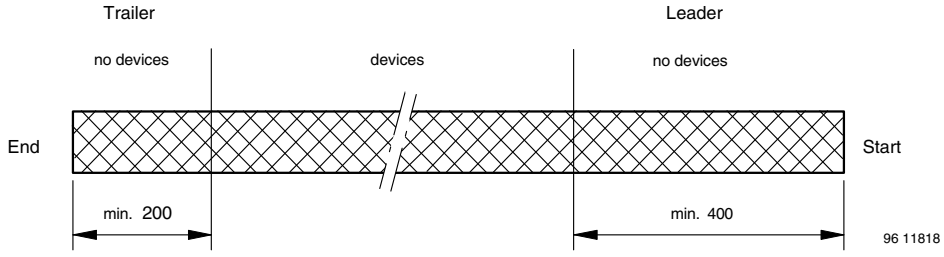
Drawing-No.: MM-200-229.01-4_Z
Issue A: 24.04.17

REEL DIMENSIONS in millimeters

Packing quantity - 2000 pieces per reel



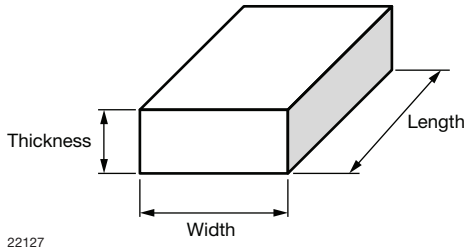
LEADER AND TRAILER DIMENSIONS in millimeters



OUTER PACKAGING

The sealed reel is packed into a pizza box.

CARTON BOX DIMENSIONS in millimeters



	THICKNESS	WIDTH	LENGTH
Pizza box (Belobog, Panhead, Heimdall, TVCast SMD, and Minimold DF1P) (taping in reels)	50	340	340

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

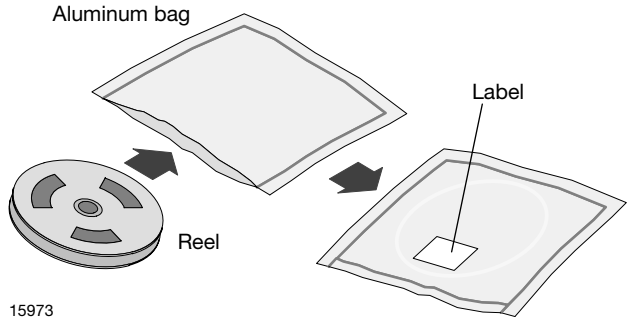
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain 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.



FINAL PACKING

The sealed reel is packed into a cardboard box.

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.

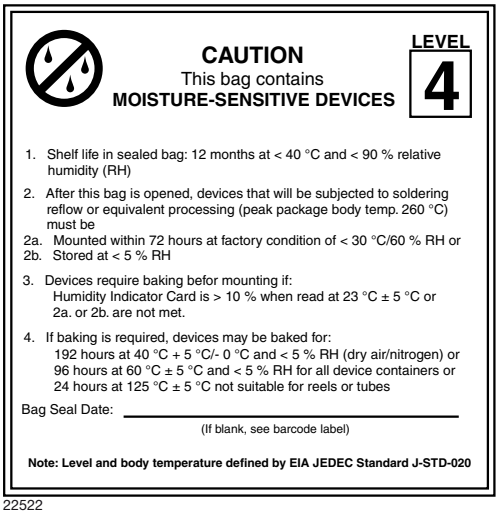
In case of moisture absorption, the devices will recover to the former condition by drying under the following condition:

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.



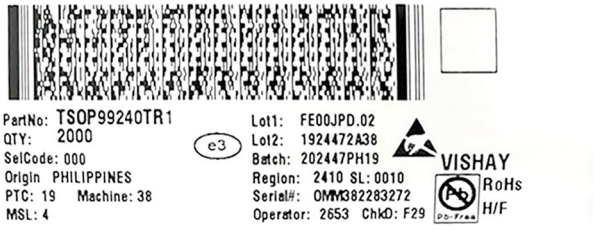
EIA JEDEC standard J-STD-020 level 4 label is included on all dry bags

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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