



## IR Receiver Modules for Remote Control Systems



22531

### DESCRIPTION

The TSMP97000 is a miniaturized sensor for receiving the modulated signal of infrared remote control systems. A PIN diode and preamplifier are assembled in a thin SMD package, the window in front of the photodiode is designed as an IR filter. The modulated output signal, carrier out, can be used for code learning applications.

### FEATURES

- Photo detector and preamplifier in one package
- AC coupled response from 30 kHz to 60 kHz, all data formats
- Height of 0.8 mm
- $\pm 75^\circ$  half angle sensitivity
- Low supply current
- Low supply voltage: 2.0 V to 5.5 V
- Insensitive to supply voltage ripple and noise
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### LINKS TO ADDITIONAL RESOURCES



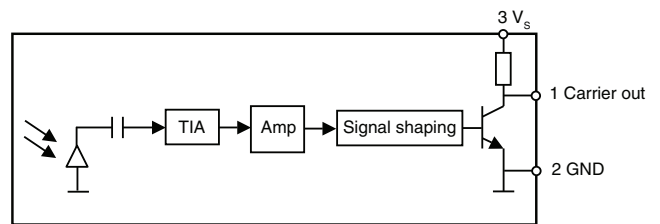
### APPLICATIONS

- Infrared code learning

### DESIGN SUPPORT TOOLS

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

### BLOCK DIAGRAM



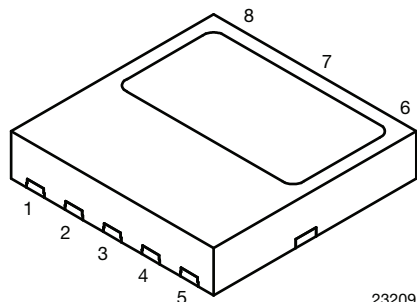
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**MECHANICAL DATA**

**Pinning:**

1 = OUT, 2, 3, 6, 7, 8 = GND, 4, 5 =  $V_S$



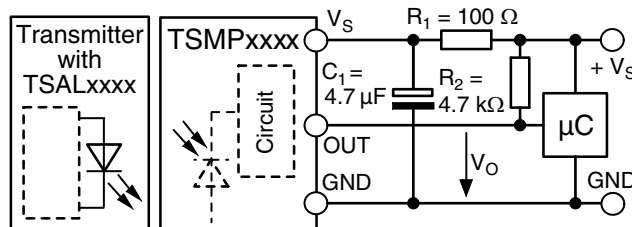
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**ORDERING CODE**

**Taping:**

TSMP97000TT1 - top view taped, 1800 pcs/reel

**APPLICATION CIRCUIT**



$R_1 + C_1$  recommended to suppress power supply disturbances.

$R_2$  recommended to get faster slopes and a correct high level of the output pulses.

PARTS TABLE		
Carrier frequency	30 kHz to 60 kHz	TSMP97000
Package		Belobog
Pinning		1 = OUT, 2, 3, 6, 7, 8 = GND, 4, 5 = $V_S$
Dimensions (mm)		3.95 W x 3.95 H x 0.8 D
Mounting		SMD
Application		Code learning
Special options		<ul style="list-style-type: none"> <li>Extended temperature range: <a href="http://www.vishay.com/doc?82738">www.vishay.com/doc?82738</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	$T_{amb} \leq 85 \text{ °C}$	$P_{tot}$	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 ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage		$V_S$	2.0	-	5.5	V
Supply current	$V_S = 3.3\text{ V}$ , $E_v = 0$	$I_{SD}$	0.25	0.35	0.45	mA
	$E_v = 40\text{ klx}$ , sunlight	$I_{SH}$	-	0.45	-	mA
Transmission distance	$E_v = 0$ , IR diode TSAL6200, $I_F = 50\text{ mA}$ , test signal see Fig. 1	$d$	-	1.8	-	m
Output voltage low	$I_{OSL} = 0.5\text{ mA}$ , $E_e = 10\text{ mW/m}^2$ , test signal see Fig. 1	$V_{OSL}$	-	-	250	mV
Minimum irradiance	$V_S = 3\text{ V}$ , (30 kHz to 60 kHz)	$E_{e\text{ min.}}$	-	12	24	$\text{mW/m}^2$
Maximum irradiance	30 kHz to 60 kHz, test signal see Fig. 1	$E_{e\text{ max.}}$	30	-	-	$\text{W/m}^2$
Directivity	Angle of half transmission distance	$\phi_{1/2}$	-	$\pm 75$	-	$^{\circ}$
Output accuracy	$f_C = 30\text{ kHz to }60\text{ kHz}$ , $E_e = 8\text{ mW/m}^2\text{ to }30\text{ W/m}^2$ , test signal see Fig. 1, BER $\leq 2\%$	N carrier pulses	Input burst length - 1 cycle	input burst length	input burst length + 1 cycle	counts

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

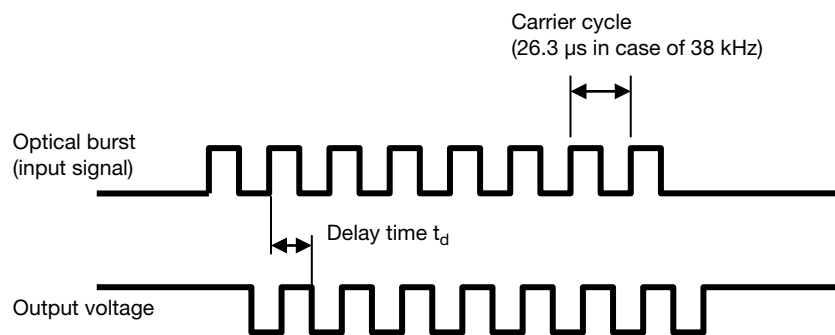


Fig. 1 - Testsignal

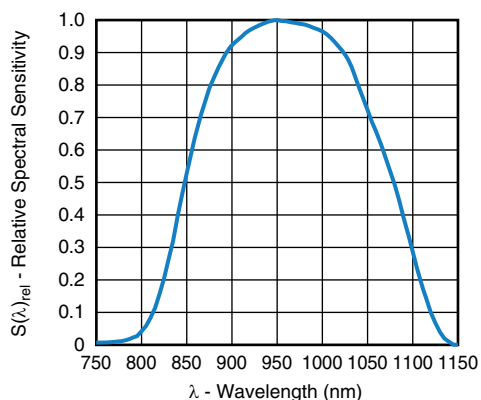
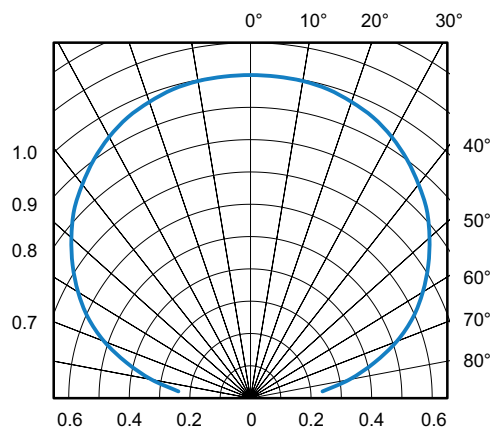


Fig. 2 - Relative Spectral Sensitivity vs. Wavelength

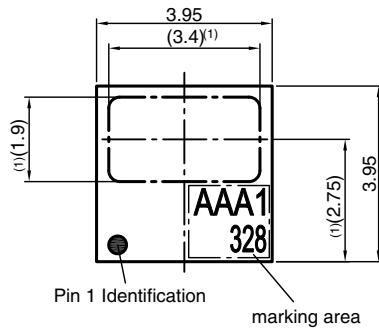
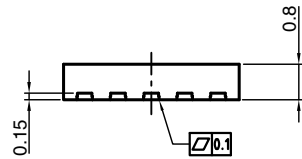
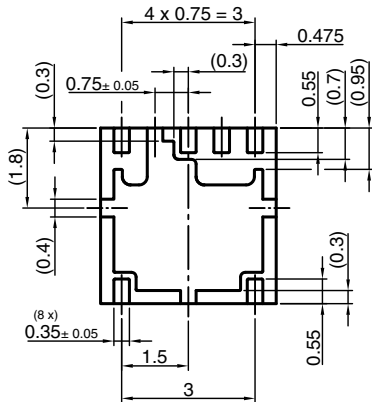


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Fig. 3 - Horizontal Directivity

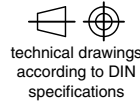


**PACKAGE DIMENSIONS** in millimeters

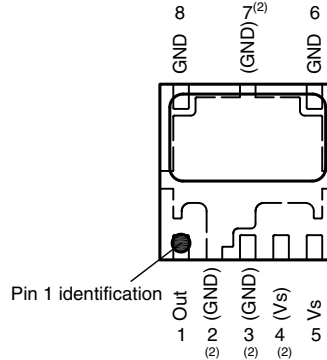


Drawing-No.: 6.550-5315.01-4  
Issue: 2; 12.02.14

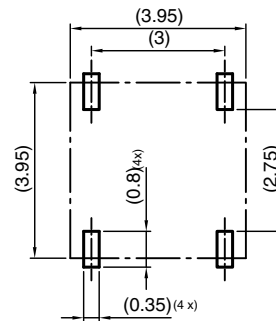
Not indicated tolerances ± 0.1



Pinning from topview



Proposed pad layout from component side (dim. for reference only)



**Notes**

- (1) Optically effective area
- (2) Pins connected internally. It is not necessary to connect externally



**ASSEMBLY INSTRUCTIONS**

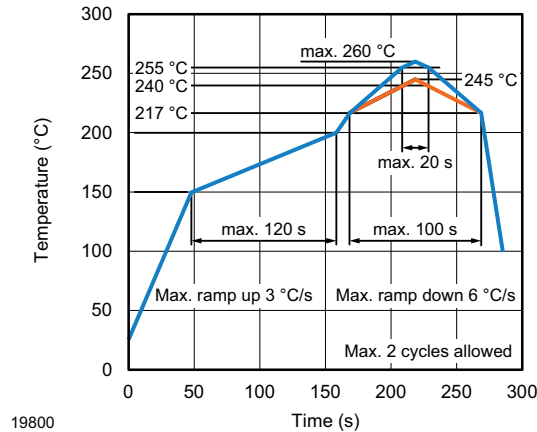
**Reflow Soldering**

- Reflow soldering must be done within 168 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

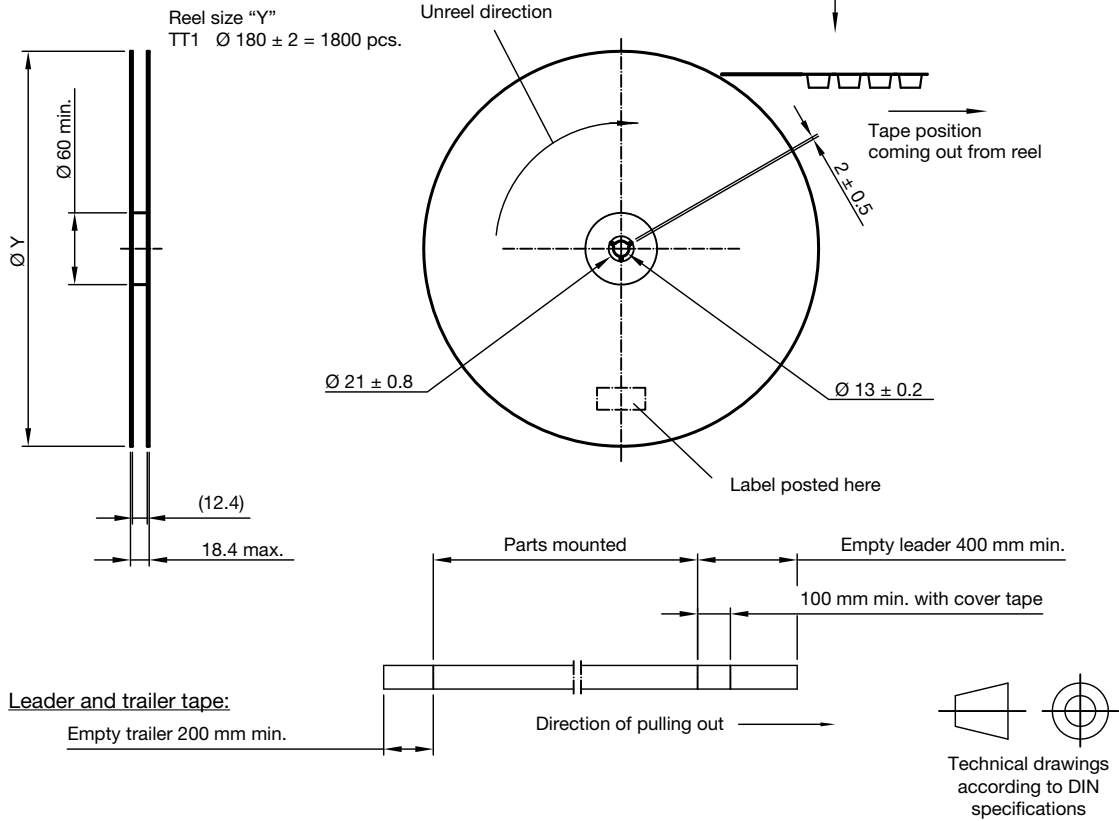
**VISHAY LEAD (Pb)-FREE REFLOW SOLDER PROFILE**



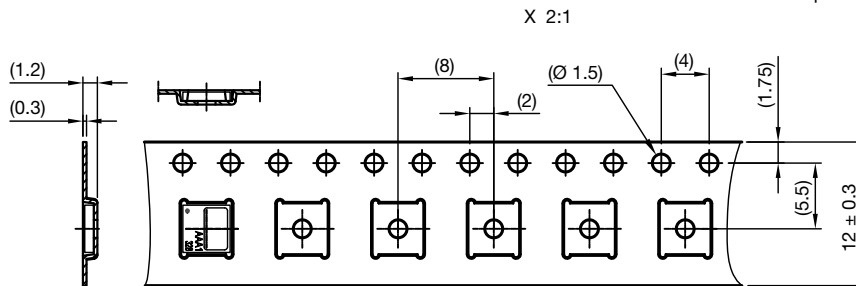


**TAPING VERSION TSMP97000 DIMENSIONS** in millimeters

Tape and reel dimensions:



Leader and trailer tape:



Drawing-No.: 9.700-5347.01-4  
Issue: 2; 07.03.18

Not indicated tolerances  $\pm 0.1$



**OUTER PACKAGING**

The sealed reel is packed into a pizza box.

<b>CARTON BOX DIMENSIONS</b> in millimeters			
	<b>THICKNESS</b>	<b>WIDTH</b>	<b>LENGTH</b>
Pizza box (Panhead, Heimdall, and Belobog) (taping in reels)	50	340	340

**LABEL**

**Standard bar code labels for finished goods**

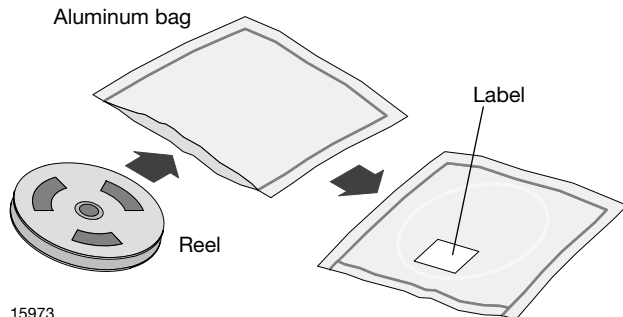
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled with standard bar code labels before transported as finished goods to warehouses. The labels are on each packing unit and contain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

<b>VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL</b> (finished goods)		
<b>PLAIN WRITING</b>	<b>ABBREVIATION</b>	<b>LENGTH</b>
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
<b>LONG BAR CODE TOP</b>	<b>TYPE</b>	<b>LENGTH</b>
Item-number	N	8
Plant-code	N	2
Sequence-number	X	3
Quantity	N	8
Total length	-	21
<b>SHORT BAR CODE BOTTOM</b>	<b>TYPE</b>	<b>LENGTH</b>
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.

**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 168 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 3 label is included on all dry bags.

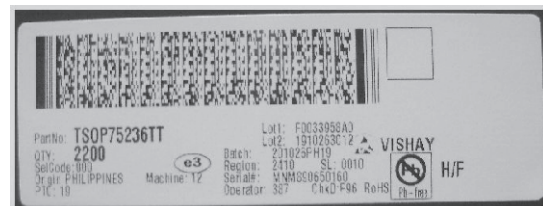
**ESD PRECAUTION**

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.

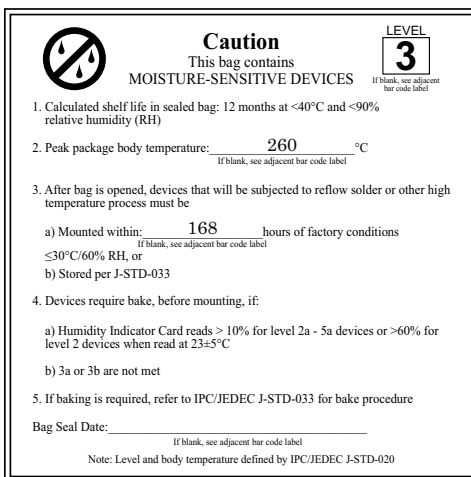
**VISHAY SEMICONDUCTORS STANDARD BAR CODE LABELS**

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.

**BAR CODE PRODUCT LABEL (example)**



22178



22650

EIA JEDEC standard J-STD-020 level 3 label is included on all dry bags





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