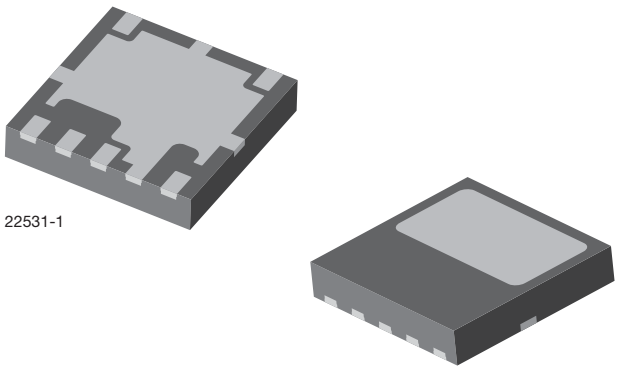
IR Receiver Modules for Remote Control Systems



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FEATURES

- Very low supply current
- Photo detectors and preamplifier in one package
- Internal filter for PCM frequency
- Supply voltage: 2.5 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e4

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

ORDERING CODE

Taping:

TSOP37...TT1 - top view taped

TSOP37...TT2 - top view taped

DESCRIPTION

The TSOP37... series are miniaturized SMD IR receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on a PCB, the epoxy package contains an IR filter.

The demodulated output signal can be directly connected to a microprocessor for decoding.

The TSOP372.., TSOP374.. are optimized to suppress almost all spurious pulses from energy saving lamps like CFLs. The AGC4 used in the TSOP374.. may suppress some data signals. The TSOP372.. is a legacy product for all common IR remote control data formats. Between these two receiver types, the TSOP374.. is preferred. Customers should initially try the TSOP374.. in their design.

These components have not been qualified according to automotive specifications.

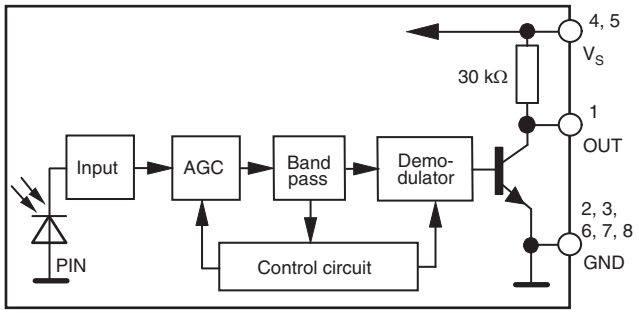
PARTS TABLE

AGC		LEGACY, FOR LONG BURST REMOTE CONTROLS (AGC2)	RECOMMENDED FOR LONG BURST CODES (AGC4) [1]
Carrier frequency	36 kHz	TSOP37236	TSOP37436 [2][3][4]
	38 kHz	TSOP37238	TSOP37438 [5][6]
	40 kHz	TSOP37240	TSOP37440
	56 kHz	TSOP37256	TSOP37456 [7][8]
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		Remote control	
Best remote control code		[2] RC-5 [3] RC-6 [4] Panasonic [5] NEC [6] Sharp [7] r-step [8] Thomson RCA	

Note

[1] We advise try AGC4 first if the burst length is unknown.

BLOCK DIAGRAM



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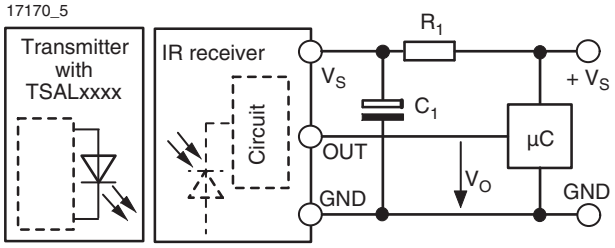
APPLICATION CIRCUIT



R_1 and C_1 are recommended for protection against EOS. Components should be in the range of 33 Ω < R_1 < 1 kΩ, C_1 > 0.1 µF.

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} ≤ 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 voltage		V_S	2.5		5.5	V
Supply current	V_S = 3.3 V, E_v = 0	I_{SD}	0.27	0.35	0.45	mA
	E_v = 40 klx, sunlight	I_{SH}		0.45		mA
Transmission distance	E_v = 0, IR diode TSAL6200, I_F = 200 mA, test signal see fig. 1	d		45		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	Pulse width tolerance: t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o, test signal see fig. 1	$E_{e\ min.}$		0.12	0.25	mW/m²
Maximum irradiance	t_{pi} - 5/f_o < t_{po} < t_{pi} + 6/f_o, test signal see fig. 1	$E_{e\ max.}$	30			W/m²
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		± 75		deg

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

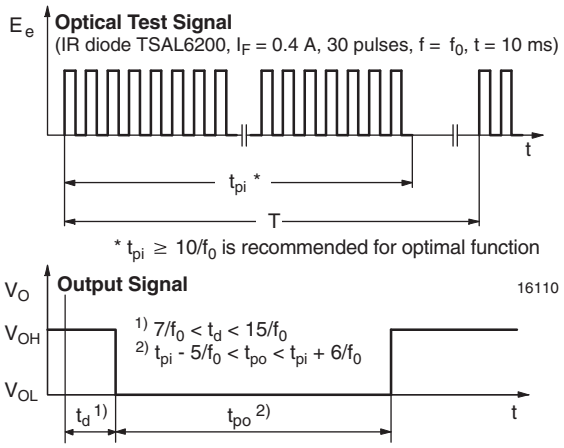


Fig. 1 - Output Function

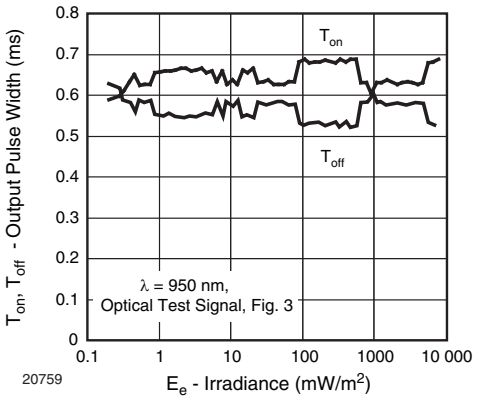


Fig. 4 - Output Pulse Diagram

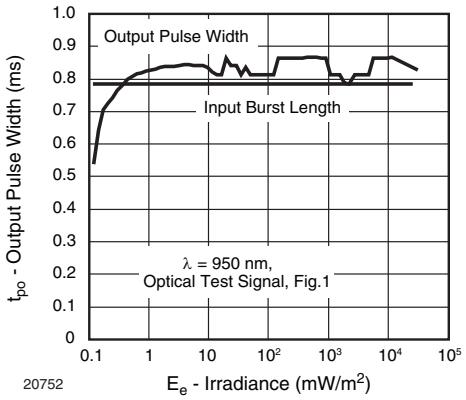


Fig. 2 - Output Pulse Width vs. Irradiance

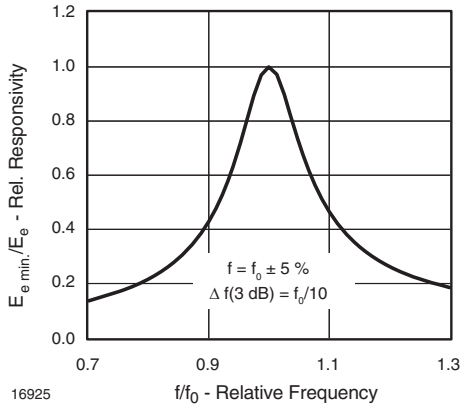


Fig. 5 - Frequency Dependance of Responsivity

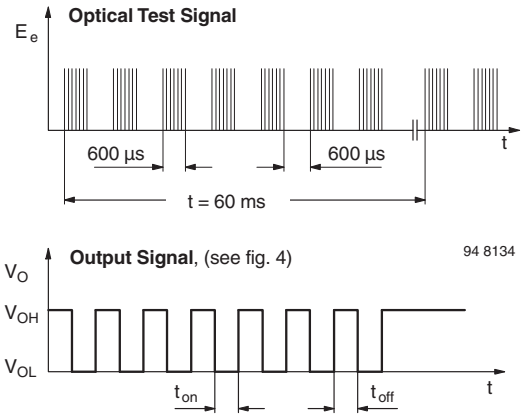


Fig. 3 - Output Function

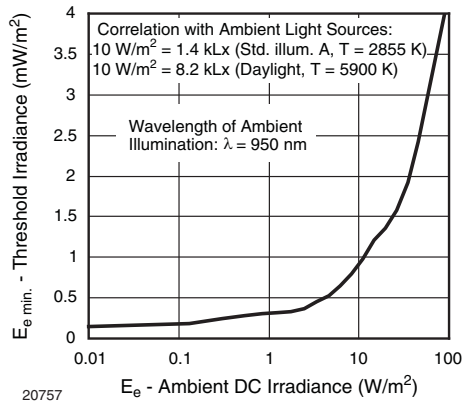


Fig. 6 - Sensitivity in Bright Ambient

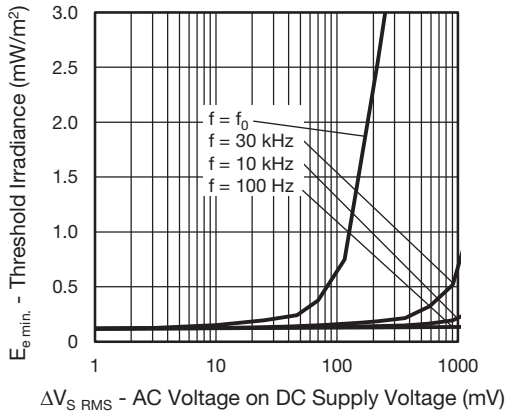


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

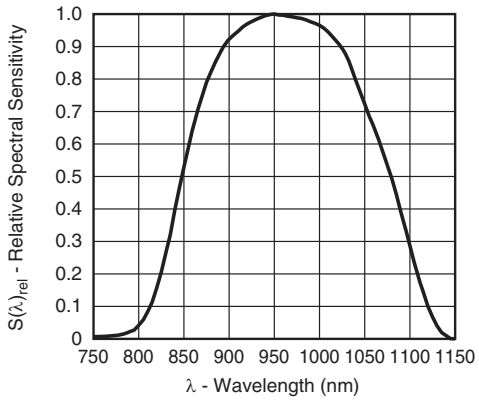


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

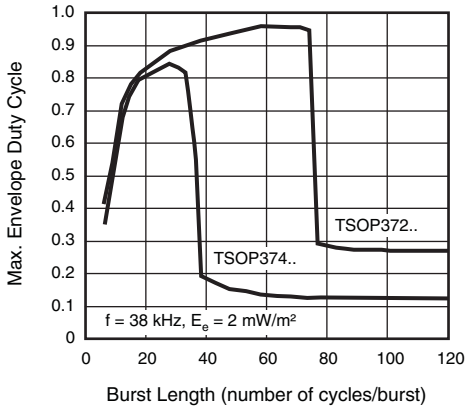


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

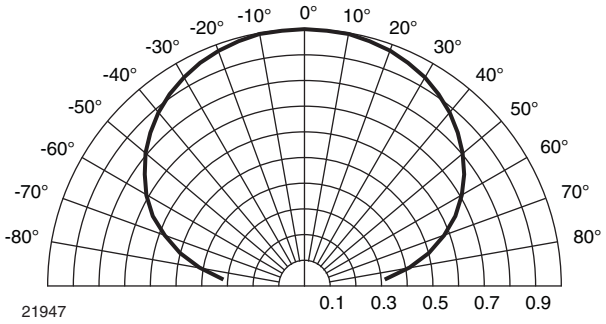


Fig. 11 - Directivity

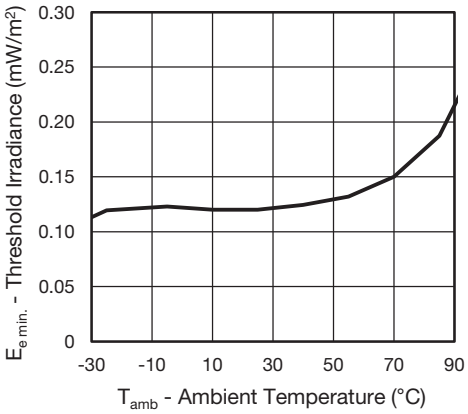


Fig. 9 - Sensitivity vs. Ambient Temperature

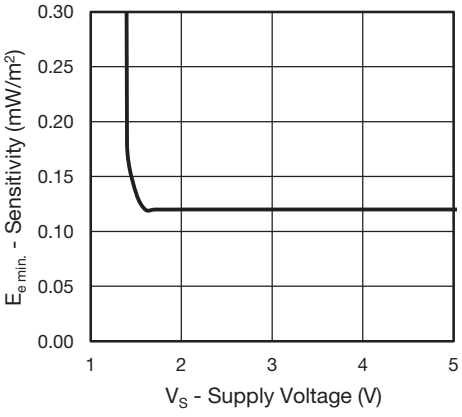


Fig. 12 - Sensitivity vs. Supply Voltage

SUITABLE DATA FORMAT

The TSOP372.., TSOP374.. 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 TSOP372.., TSOP374.. 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 figure 13 or figure 14)

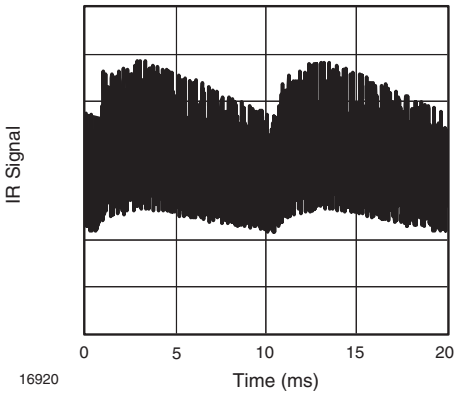


Fig. 13 - IR Signal from Fluorescent Lamp with Low Modulation

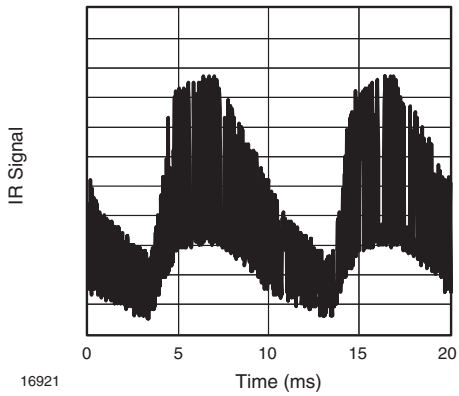


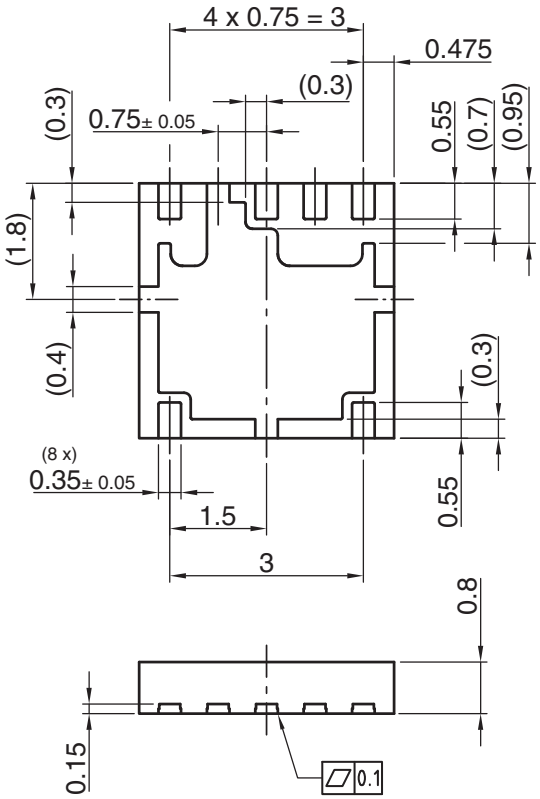
Fig. 14 - IR Signal from Fluorescent Lamp with High Modulation

	TSOP372..	TSOP374..
Minimum burst length	10 cycles/burst	10 cycles/burst
After each burst of length a minimum gap time is required of	10 to 70 cycles ≥ 10 cycles	10 to 35 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	70 cycles > 4 x burst length	35 cycles > 10 x burst length
Maximum number of continuous short bursts/second	1800	1500
NEC code	yes	preferred
RC5/RC6 code	yes	preferred
Thomson 56 kHz code	yes	preferred
Sharp code	yes	preferred
Suppression of interference from fluorescent lamps	Most common disturbance patterns are suppressed	Even extreme disturbance patterns are suppressed

Notes

- For data formats with short bursts (less than 10 carrier cycles) please see the datasheet for TSOP373.., TSOP375.. .
- Best choice of AGC for some popular IR-codes:
  TSOP37436: RC-5, RC-6, Panasonic;
  TSOP37438: NEC, Sharp, r-step;
  TSOP37456: r-step, Thomson RCA
- For Sony 12, 15, and 20 bit IR-codes please see the datasheet of TSOP37S40

PACKAGE DIMENSIONS in millimeters

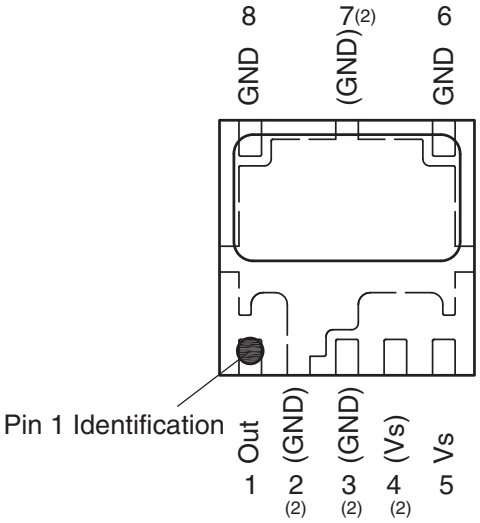


All dimensions in mm
Not indicated tolerances ± 0.1

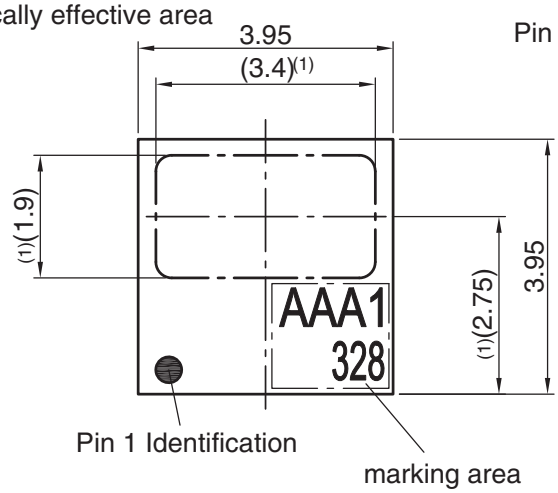
technical drawings according to DIN specifications

(2) Pins connected internally. It is not necessary to connect externally.

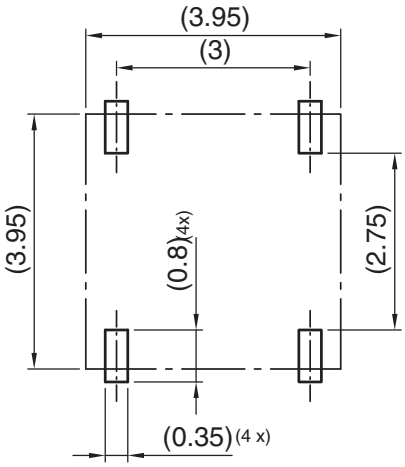
Pinning from Topview



(1) optically effective area



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



Drawing refers to following types: TSOP37... / TSOP57...
Drawing-No.: 6.550-5315.01-4
Issue: 2; 12.02.14

ASSEMBLY INSTRUCTIONS

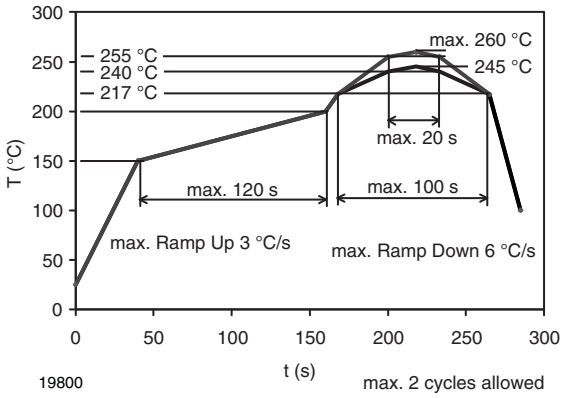
Reflow Soldering

- 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

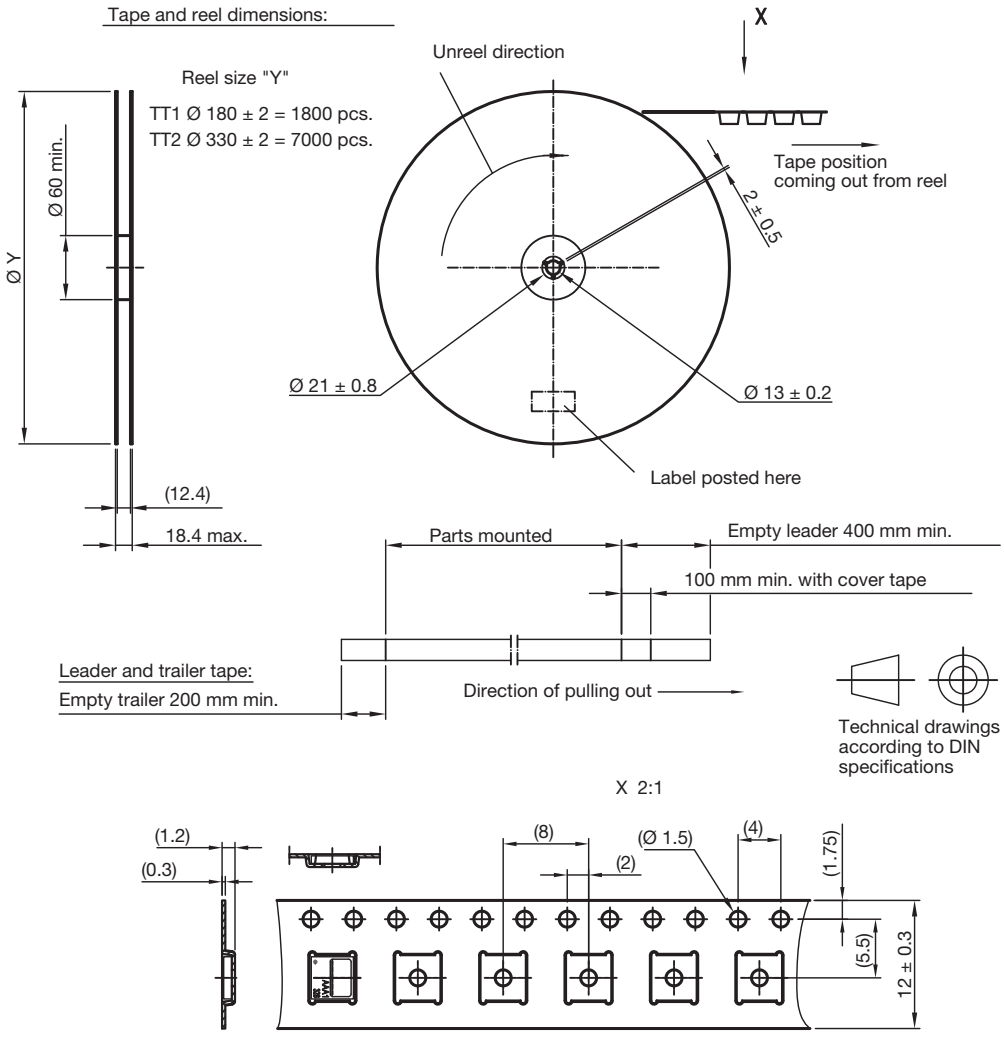


ORDERING INFORMATION			
ORDERING CODE	PACKAGING	VOLUME (1)	REMARKS
TSOP37..TT1	Tape and reel	MOQ: 1800 pcs	3.95 mm x 3.95 mm x 0.75 mm
TSOP37..TT2		MOQ: 7000 pcs	

Note

(1) MOQ: minimum order quantity

TAPING VERSION TSOP37... DIMENSIONS in millimeters



Drawing-No.: 9.700-5347.01-4
Issue: 1; 14.11.11

Not indicated tolerances ± 0.1

LABEL

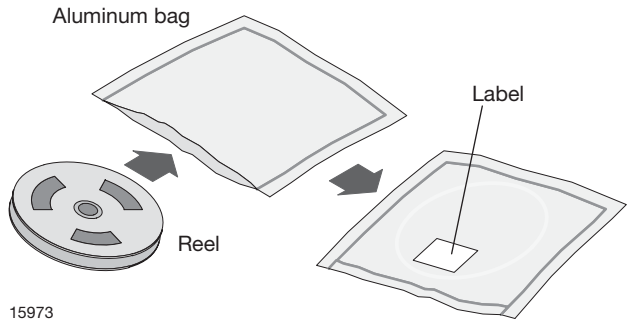
Standard bar code labels for finished goods

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:

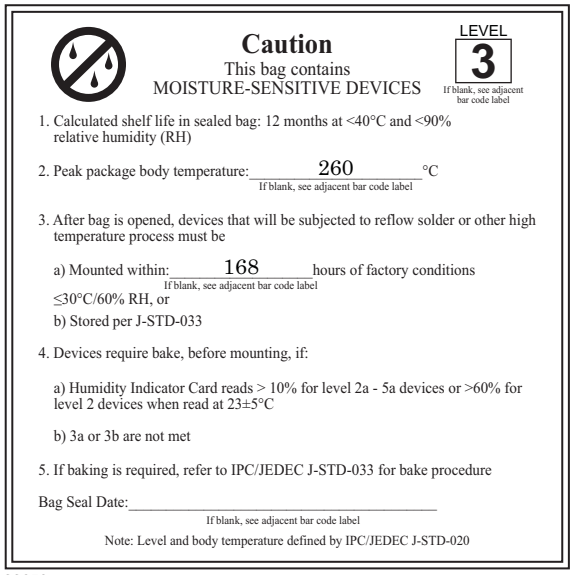
- Storage temperature 10 °C to 30 °C
- Storage humidity ≤ 60 % RH max.

After more than 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.



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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

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