

## IR Receiver Modules for Remote Control Systems



22531-1



### 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](http://www.vishay.com/doc?99912)



### DESCRIPTION

The TSOP373.., TSOP375.. series are miniaturized receiver modules for infrared remote control systems. A PIN diode and a preamplifier are assembled on a PCB, the epoxy lens cap is designed as an IR filter.

The demodulated output signal can be directly connected to a microprocessor for decoding. The TSOP373.. is optimized to better suppress spurious pulses from energy saving lamps. The TSOP375.. has an excellent noise suppression. It is immune to dimmed LCD backlighting and any fluorescent lamps. AGC3 and AGC5 may also suppress some data signals in case of continuous transmission.

This component has not been qualified according to automotive specifications.

### ORDERING CODE

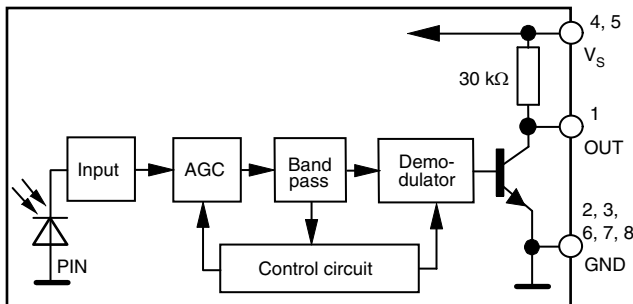
#### Taping:

TSOP37...TT - top view taped

TSOP37...TR - side view taped

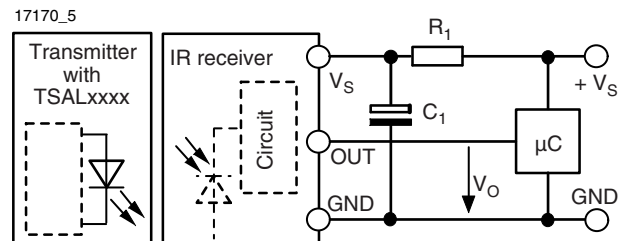
PARTS TABLE		
AGC	NOISY ENVIRONMENTS AND SHORT BURSTS (AGC3)	VERY NOISY ENVIRONMENTS AND SHORT BURSTS (AGC5)
Carrier frequency	36 kHz	TSOP37336 (1)(2)
	38 kHz	TSOP37338 (3)(4)(5)(6)
	40 kHz	TSOP37340
	56 kHz	TSOP37356
Package	Belobog	
Pinning	1 = OUT, 2, 3, 6, 7, 8 = GND, 4, 5 = V <sub>S</sub>	
Dimensions (mm)	3.95 W x 3.95 H x 0.8 D	
Mounting	SMD	
Application	Remote control	
Best remote control code	(1) MCIR (2) RCMM (3) Mitsubishi (4) RECS-80 Code (5) r-map (6) XMP-1, XMP-2	

### BLOCK DIAGRAM



20445-5

### APPLICATION CIRCUIT



R<sub>1</sub> and C<sub>1</sub> are recommended for protection against EOS. Components should be in the range of 33 Ω < R<sub>1</sub> < 1 kΩ, C<sub>1</sub> > 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	$T_{amb} \leq 85 \text{ °C}$	$P_{tot}$	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 ( $T_{amb} = 25 \text{ °C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage		$V_S$	2.5		5.5	V
Supply current	$V_S = 3.3 \text{ V}, E_v = 0$	$I_{SD}$	0.27	0.35	0.45	mA
	$E_v = 40 \text{ klx, sunlight}$	$I_{SH}$		0.45		mA
Transmission distance	$E_v = 0, \text{ IR diode TSAL6200, } I_F = 200 \text{ mA, test signal see fig. 1}$	$d$		45		m
Output voltage low	$I_{OSL} = 0.5 \text{ mA, } E_e = 0.7 \text{ mW/m}^2, \text{ test signal see fig. 1}$	$V_{OSL}$			100	mV
Minimum irradiance	Pulse width tolerance: $t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0, \text{ test signal see fig. 1}$	$E_e \text{ min.}$		0.12	0.25	$\text{mW/m}^2$
Maximum irradiance	$t_{pi} - 5/f_0 < t_{po} < t_{pi} + 6/f_0, \text{ test signal see fig. 1}$	$E_e \text{ max.}$	30			$\text{W/m}^2$
Directivity	Angle of half transmission distance	$\Phi_{1/2}$		$\pm 75$		deg

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

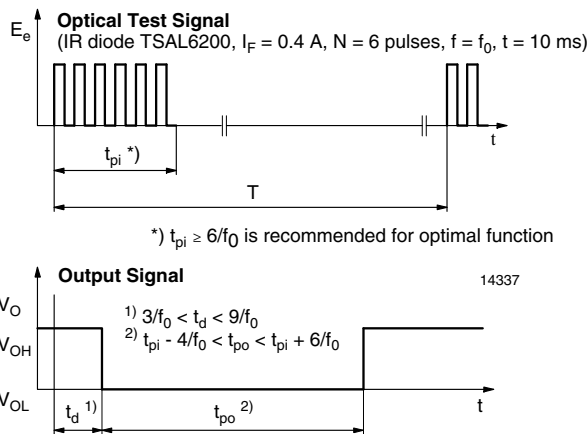


Fig. 1 - Output Function

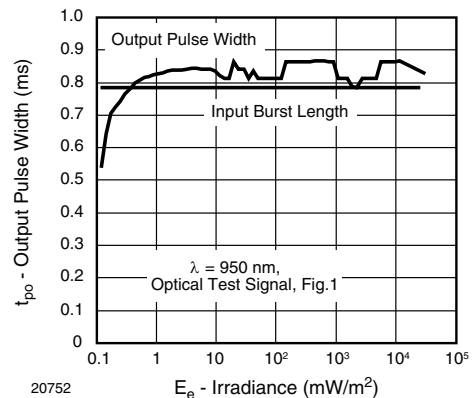


Fig. 2 - Output Pulse Width vs. Irradiance

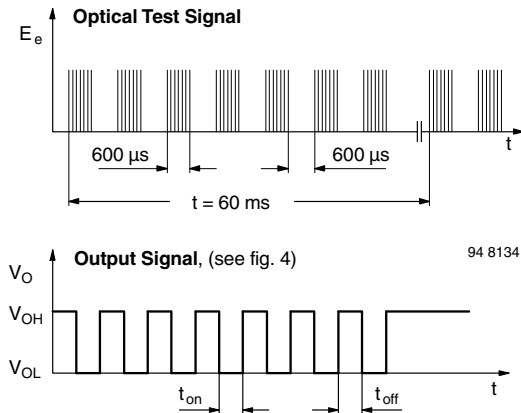


Fig. 3 - Output Function

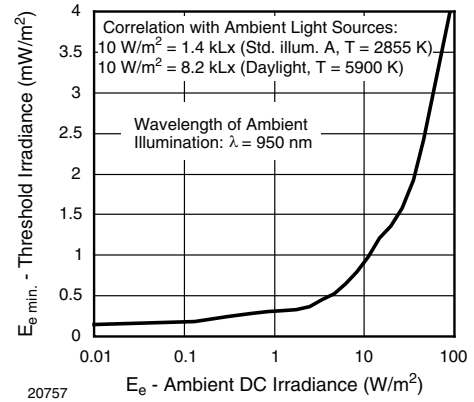


Fig. 6 - Sensitivity in Bright Ambient

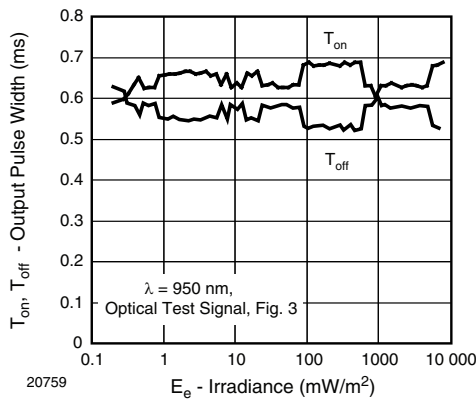


Fig. 4 - Output Pulse Diagram

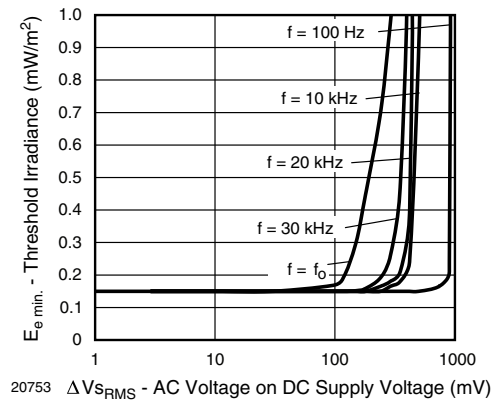


Fig. 7 - Sensitivity vs. Supply Voltage Disturbances



Fig. 5 - Frequency Dependence of Responsivity

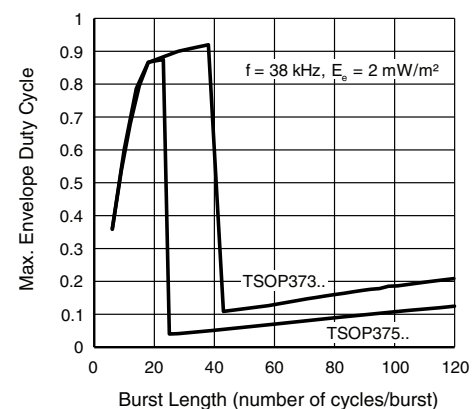


Fig. 8 - Max. Envelope Duty Cycle vs. Burst Length

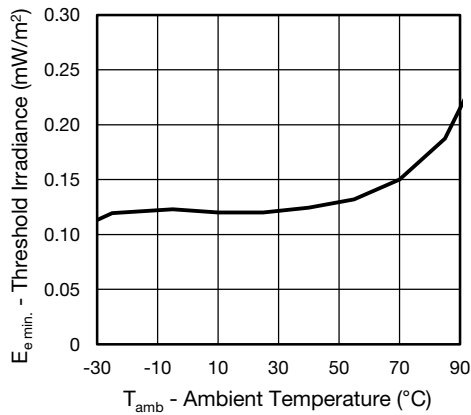


Fig. 9 - Sensitivity vs. Ambient Temperature



Fig. 11 - Directivity

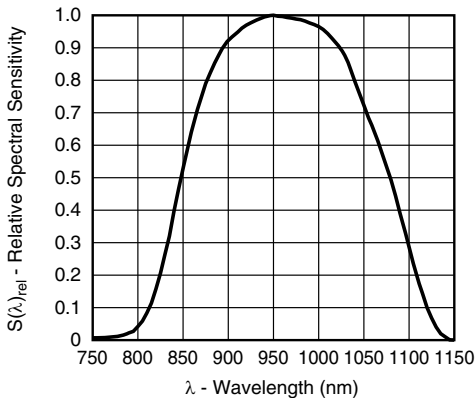


Fig. 10 - Relative Spectral Sensitivity vs. Wavelength

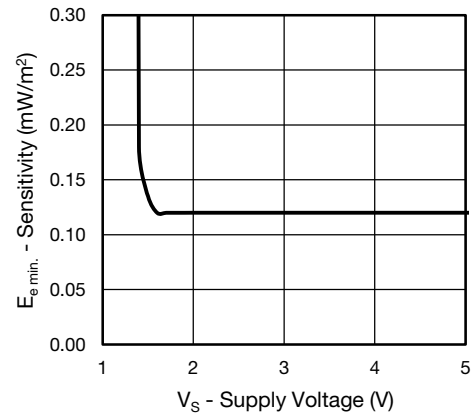


Fig. 12 - Sensitivity vs. Supply Voltage

**SUITABLE DATA FORMAT**

The TSOP373.., TSOP375.. 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 TSOP373.., TSOP375.. 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 12 or figure 13)



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

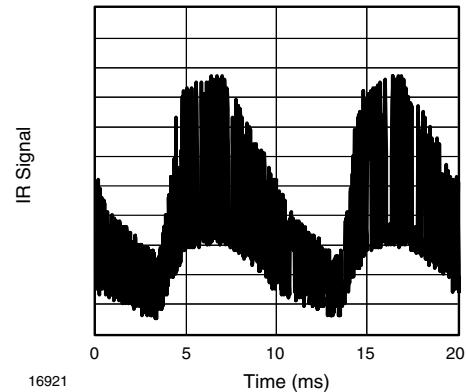


Fig. 14 - IR Signal from Fluorescent Lamp with High Modulation

	<b>TSOP373..</b>	<b>TSOP375..</b>
Minimum burst length	6 cycles/burst	6 cycles/burst
After each burst of length a minimum gap time is required of	6 to 35 cycles ≥ 10 cycles	6 to 24 cycles ≥ 10 cycles
For bursts greater than a minimum gap time in the data stream is needed of	35 cycles > 6 x burst length	24 cycles > 25 ms
Maximum number of continuous short bursts/second	2000	2000
MCIR code	preferred	yes
RCMM code	preferred	yes
XMP-1, XMP-2 code	preferred	yes
Suppression of interference from fluorescent lamps	Even critical disturbance patterns are suppressed (example: signal pattern of fig. 12 and fig. 13)	Even critical disturbance patterns are suppressed (example: signal pattern of fig. 12 and fig. 13)

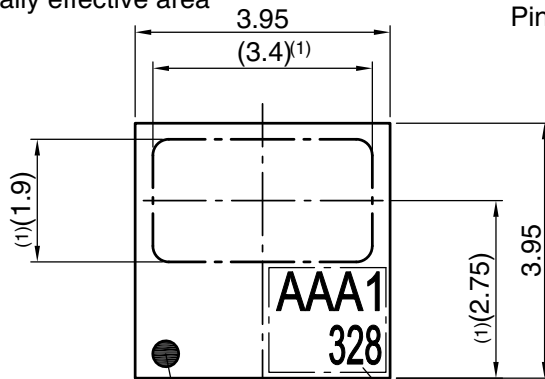
**Notes**

- For data formats with long bursts (more than 10 carrier cycles) please see the datasheet for TSOP372.., TSOP374..
- Best choice of AGC for some popular IR-codes:
  - TSOP37336: MCIR, RCMM
  - TSOP37538: Mitsubishi, RECS-80 Code
  - TSOP37338: XMP-1, XMP-2, r-map

**PACKAGE DIMENSIONS** in millimeters



(1) optically effective area



Pin 1 Identification

marking area

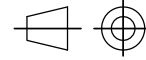
Drawing refers to following types: TSOP37... / TSOP57...

Drawing-No.: 6.550-5315.01-4

Issue: 2; 12.02.14

All dimensions in mm

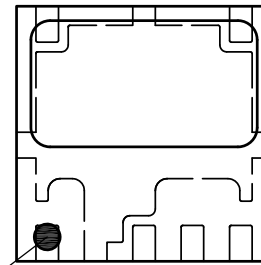
Not indicated tolerances  $\pm 0.1$



technical drawings according to DIN specifications

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

**Pinning from Topview**



Pin 1 Identification

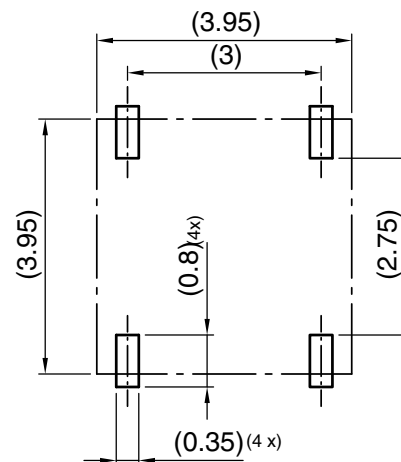
Out  
1  
2  
(2)

(GND)  
3  
(2)

(GND)  
4  
(2)

(Vs)  
5  
Vs

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





## 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 <sup>(1)</sup>	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

<sup>(1)</sup> 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  $\pm 0.1$



**LABEL**
**Standard bar code labels for finished goods**

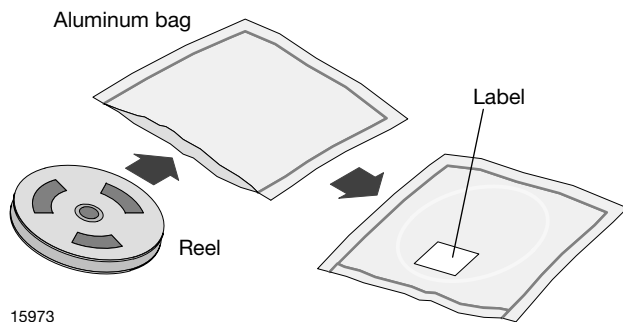
The standard bar code labels are product labels and used for identification of goods. The finished goods are packed in final packing area. The standard packing units are labeled

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.

<b>VISHAY SEMICONDUCTOR GmbH STANDARD BAR CODE PRODUCT LABEL (Finished goods)</b>		
<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.


**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.

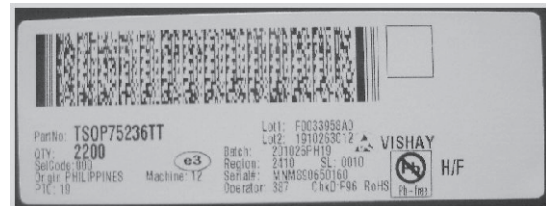
An EIA JEDEC® standard J-STD-020 level 3 label is included on all dry bags.




### 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



**Caution**  
This bag contains  
**MOISTURE-SENSITIVE DEVICES**

**LEVEL**  
3

If blank, see adjacent bar code label

1. Calculated shelf life in sealed bag: 12 months at <math>-40^{\circ}\text{C}</math> and <math><90\%</math> relative humidity (RH)
2. Peak package body temperature: 260  $^{\circ}\text{C}$   
If blank, see adjacent bar code label
3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must be
  - a) Mounted within: 168 hours of factory conditions  
If blank, see adjacent bar code label  
<math>\leq 30^{\circ}\text{C}/60\% \text{ RH}</math>, or
  - b) Stored per J-STD-033
4. Devices require bake, before mounting, if:
  - a) Humidity Indicator Card reads > 10% for level 2a - 5a devices or >60% for level 2 devices when read at <math>23\pm 5^{\circ}\text{C}</math>
  - b) 3a or 3b are not met
5. If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure

Bag Seal Date: \_\_\_\_\_  
If blank, see adjacent bar code label

Note: Level and body temperature defined by IPC/JEDEC J-STD-020

22650

EIA JEDC 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.



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**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**

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- Поставка электронных компонентов под контролем ВП;
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- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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