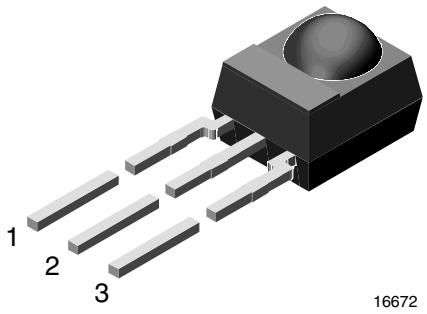
# IR Receiver Modules for Remote Control Systems




## FEATURES

- Low supply current
- Photo detector and preamplifier in one package
- Internal filter for PCM frequency
- Improved shielding against EMI
- Supply voltage: 2.7 V to 5.5 V
- Improved immunity against ambient light
- Insensitive to supply voltage ripple and noise
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

## MECHANICAL DATA

**Pinning**

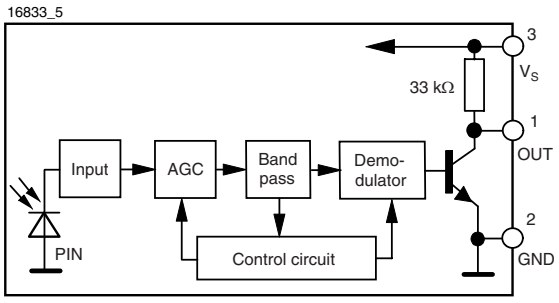
1 = OUT, 2 = GND, 3 = $V_S$

## DESCRIPTION

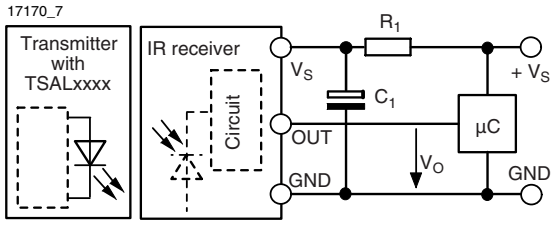
The TSOP41.., TSOP43.. series are miniaturized receivers for infrared remote control systems. A PIN diode and a preamplifier are assembled on a lead frame, the epoxy package acts as an IR filter.
The demodulated output signal can directly be decoded by a microprocessor. The main benefit of the TSOP41.. is the compatibility to all IR remote control data formats. The TSOP43.. is optimized to better suppress spurious pulses from fluorescent lamps, LCD TVs or plasma displays.
This component has not been qualified according to automotive specifications.

| PARTS TABLE | | |
|---|---|---|
| CARRIER FREQUENCY | SHORT BURSTS AND HIGH DATA RATES (AGC1) | NOISY ENVIROMENTS AND SHORT BURSTS (AGC3) |
| 30 kHz | TSOP4130 | |
| 33 kHz | TSOP4133 | |
| 36 kHz | TSOP4136 | |
| 36.7 kHz | TSOP4137 | |
| 38 kHz | TSOP4138 | TSOP4338 |
| 40 kHz | TSOP4140 | |
| 56 kHz | TSOP4156 | |

## BLOCK DIAGRAM




## APPLICATION CIRCUIT




The external components $R_1$ and $C_1$ are optional to improve the robustnes against electrical overstress (typical values are $R_1$ = 100 Ω, $C_1$ = 0.1 µF).
The output voltage $V_O$ should not be pulled down to a level below 1 V by the external circuit.
The capacitive load at the output should be less than 2 nF.

## ABSOLUTE MAXIMUM RATINGS (1)

| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
|---|---|---|---|---|
| Supply voltage (pin 3) | | $V_S$ | - 0.3 to + 6.0 | V |
| Supply current (pin 3) | | $I_S$ | 5 | mA |
| Output voltage (pin 1) | | $V_O$ | - 0.3 to 5.5 | V |
| Voltage at output to supply | | $V_S - V_O$ | - 0.3 to ($V_S$ + 0.3) | V |
| Output current (pin 1) | | $I_O$ | 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 |
| Soldering temperature | t ≤ 10 s, 1 mm from case | $T_{sd}$ | 260 | °C |

**Note**

(1) 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 condtions for extended periods may affect the device reliability.

## ELECTRICAL AND OPTICAL CHARACTERISTICS (1)

| PARAMETER | TEST CONDITION | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Supply current (pin 3) | $E_v$ = 0, $V_S$ = 5 V | $I_{SD}$ | 0.65 | 0.85 | 1.05 | mA |
| | $E_v$ = 40 klx, sunlight | $I_{SH}$ | | 0.95 | | mA |
| Supply voltage | | $V_S$ | 2.7 | | 5.5 | V |
| Transmission distance | $E_v$ = 0, test signal see fig. 1, IR diode TSAL6200, $I_F$ = 400 mA | d | | 45 | | m |
| Output voltage low (pin 1) | $I_{OSL}$ = 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 | $E_{e\ min.}$ | | 0.17 | 0.35 | 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 | $\varphi_{1/2}$ | | ± 45 | | deg |

**Note**

(1) $T_{amb}$ = 25 °C, unless otherwise specified

## TYPICAL CHARACTERISTICS

$T_{amb}$ = 25 °C, unless otherwise specified

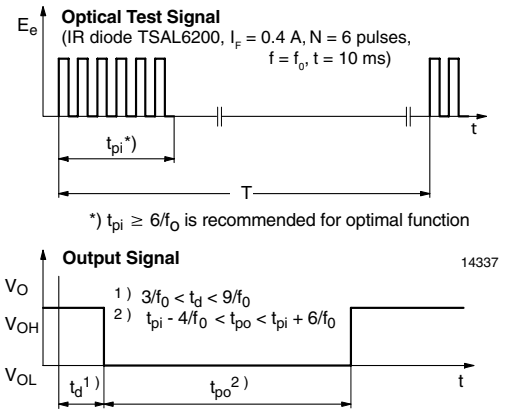



Fig. 1 - Output Active Low

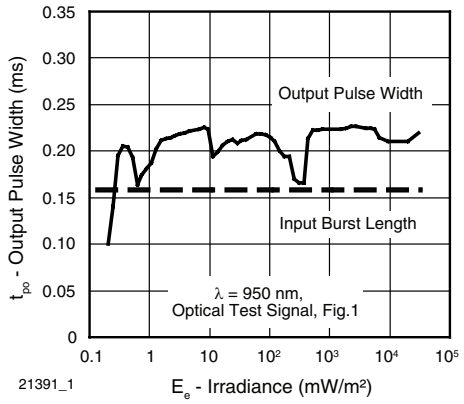



Fig. 2 - Pulse Length and Sensitivity in Dark Ambient

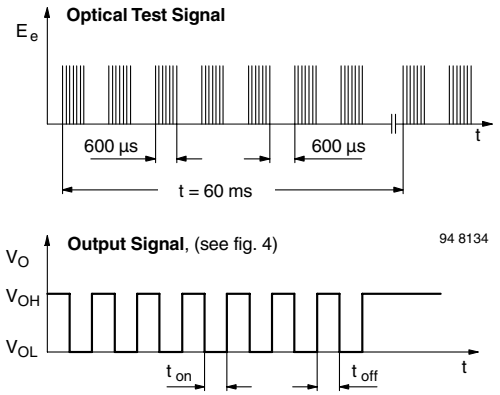



Fig. 3 - Output Function

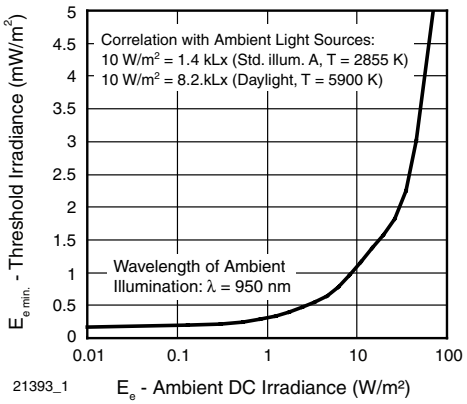



Fig. 6 - Sensitivity in Bright Ambient

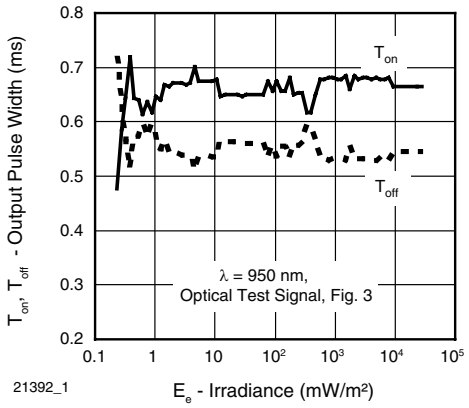



Fig. 4 - Output Pulse Diagram

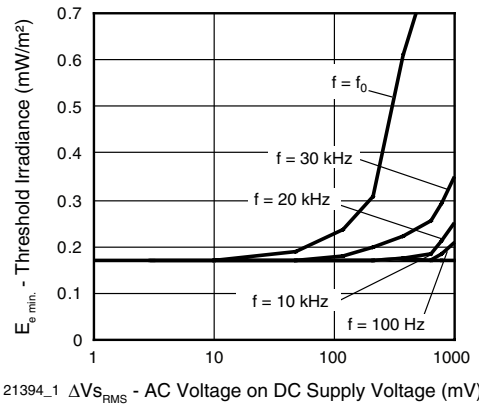



Fig. 7 - Sensitivity vs. Supply Voltage Disturbances

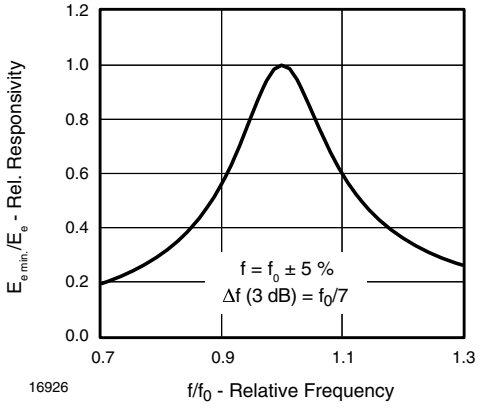



Fig. 5 - Frequency Dependence of Responsivity

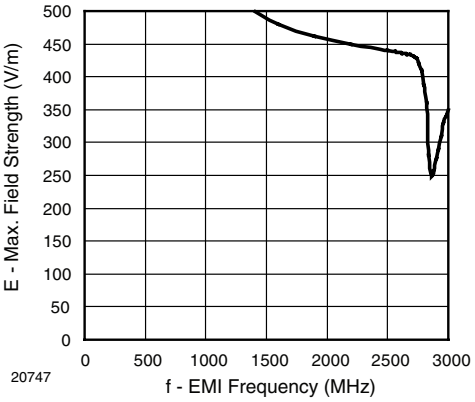



Fig. 8 - Sensitivity vs. Electric Field Disturbances

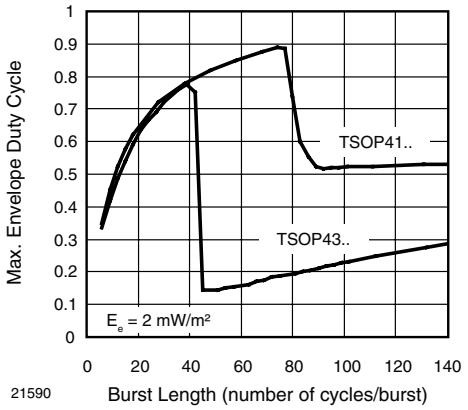



Fig. 9 - Max. Envelope Duty Cycle vs. Burst Length

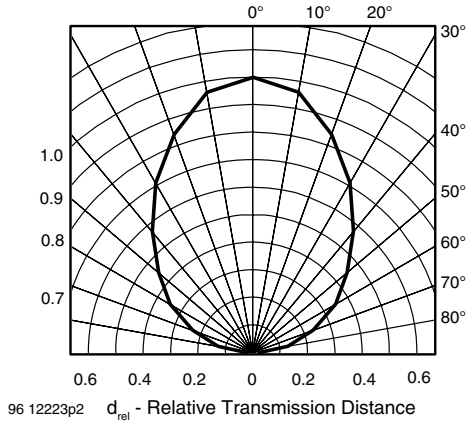



Fig. 12 - Horizontal Directivity

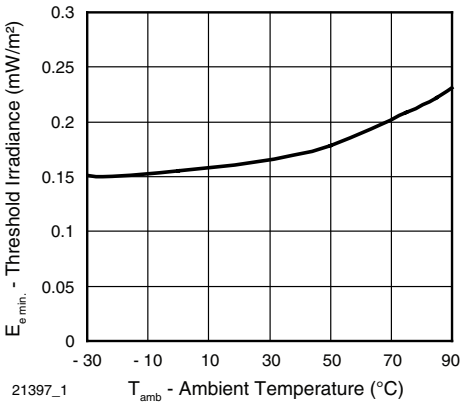



Fig. 10 - Sensitivity vs. Ambient Temperature

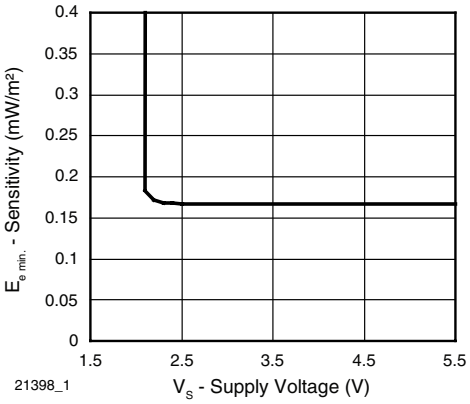



Fig. 13 - Sensitivity vs. Supply Voltage

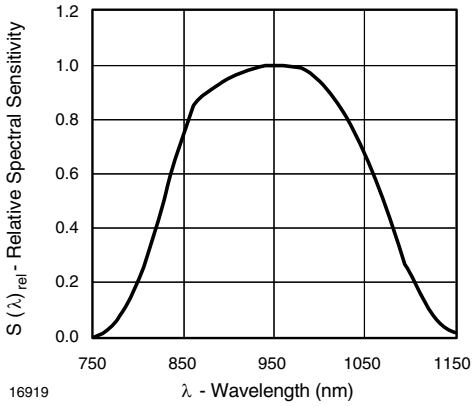



Fig. 11 - Relative Spectral Sensitivity vs. Wavelength

## SUITABLE DATA FORMAT

The TSOP41.., TSOP43.. series are designed to suppress spurious output pulses due to noise or disturbance signals. Data and disturbance signals can be distinguished by the devices according to carrier frequency, burst length and envelope duty cycle. The data signal should be close to the band-pass center frequency (e.g. 38 kHz) and fulfill the conditions in the table below.

When a data signal is applied to the TSOP41.., TSOP43.. in the presence of a disturbance signal, the sensitivity of the receiver is reduced to insure that no spurious pulses are present at the output. Some examples of disturbance signals which are suppressed are:

- DC light (e.g. from tungsten bulb or sunlight)
- Continuous signals at any frequency
- Modulated noise from fluorescent lamps with electronic ballasts (see figure 14 or figure 15)

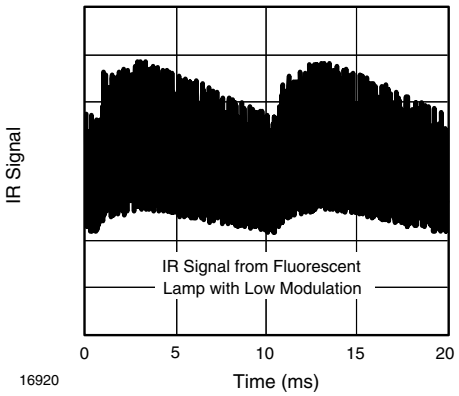



Fig. 14 - IR Signal from Fluorescent Lamp with Low Modulation

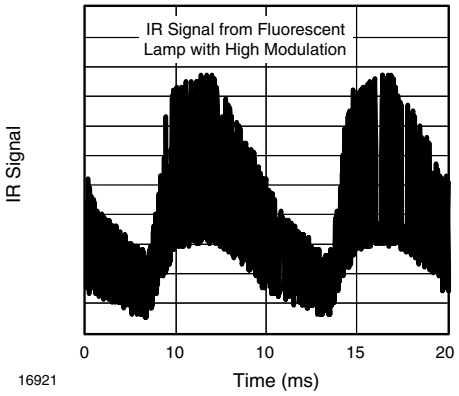


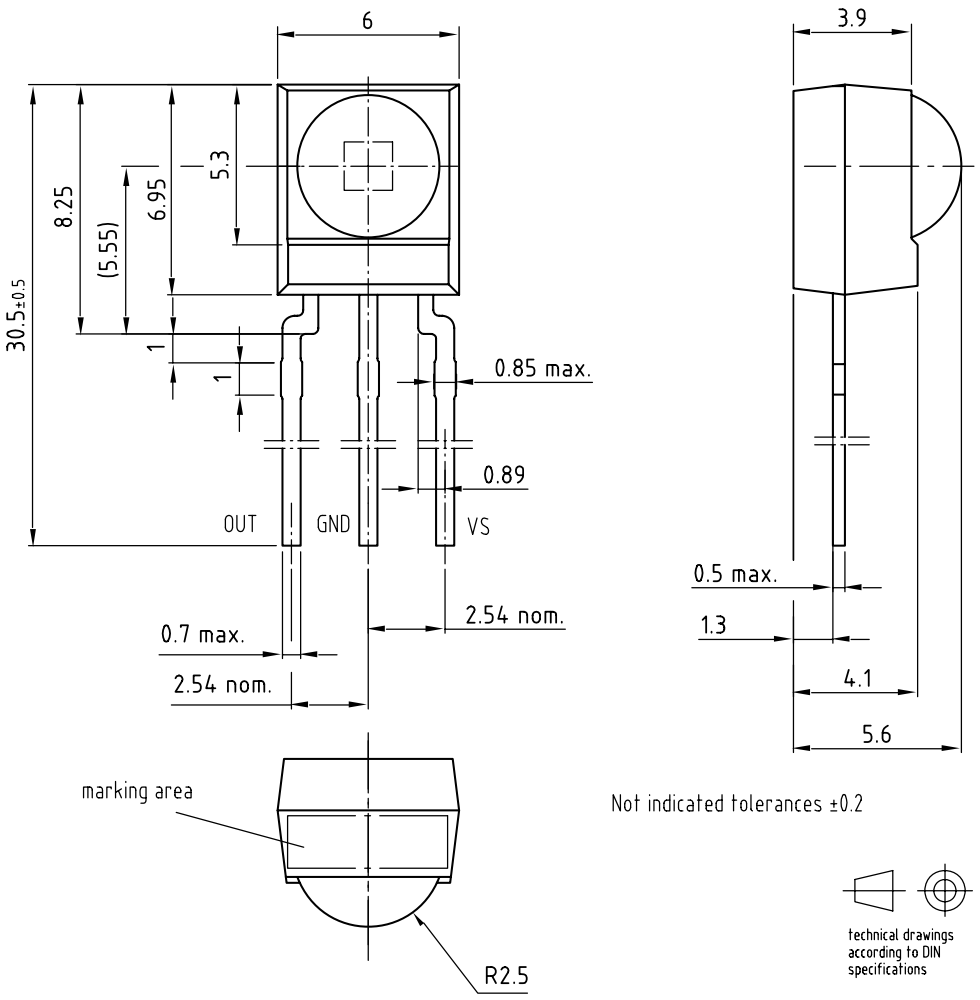

Fig. 15 - IR Signal from Fluorescent Lamp with High Modulation

| | TSOP41.. | TSOP43.. |
|---|---|---|
| Minimum burst length | 6 cycles/burst | 6 cycles/burst |
| After each burst of length<br>a minimum gap time is required of | 6 to 70 cycles<br>≥ 10 cycles | 6 to 35 cycles<br>≥ 10 cycles |
| For bursts greater than<br>a minimum gap time in the data stream is needed of | 70 cycles<br>> 1.1 x burst length | 35 cycles<br>> 6 x burst length |
| Maximum number of continuous short bursts/second | 2000 | 2000 |
| Compatible to NEC code | yes | yes |
| Compatible to RC5/RC6 code | yes | yes |
| Compatible to Sony code | yes | no |
| Compatible to RECS-80 code | yes | yes |
| Compatible to RCMM code | yes | yes |
| Compatible to r-step code | yes | yes |
| Compatible to XMP code | yes | yes |
| Suppression of interference from fluorescent lamps | Common disturbance signals are supressed (example: signal pattern of fig. 14) | Even critical disturbance signals are suppressed (examples: signal pattern of fig. 14 and fig. 15) |

**Note**

For data formats with long bursts (more than 10 carrier cycles) please see the data sheet for TSOP48.. .

**PACKAGE DIMENSIONS** in millimeters




Drawing-No.: 6.550-5169.11-4
Issue: 10; 08.06.04

16003

## OZONE DEPLETING SUBSTANCES POLICY STATEMENT

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively.
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA.
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.



Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

# Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.

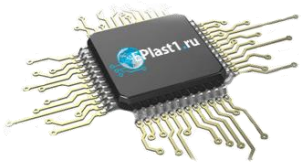
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.




**Как с нами связаться**

**Телефон:** 8 (812) 309 58 32 (многоканальный)
**Факс:** 8 (812) 320-02-42
**Электронная почта:** org@eplast1.ru
**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.