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THE MODULE FOR RECEPTION OF OPTICAL SIGNALS WITH THE ENTRANCE CASCADE ON THE FIELD PHOTOTRANSISTOR

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ABSTRACT

The electronic circuit of the receiving module for optical signals with the input cascade on the field phototransistor is considered. The use of a field phototransistor with the high input impedance, unlike a bipolar phototransistor, provides reception and amplification of modulated weak optical signals (from 2 mV) without shape distortion when using an independent power source in the operating voltage range 4.5 ÷ 9 V.

KEYWORDS: optical signal receiver, field phototransistor, input impedance.

INTRODUCTION

Nowadays, open communication systems have firmly become occupied a certain niche of world market, this technology is quite worthy competitor of a fixed radio communication in corporate data transmission networks. This is caused by fact that actively used broadband radio facilities providing high-speed communication and fast deployment among network nodes have the limited range of frequencies and capacities of the transmitter. But unlike them optical atmospheric communication lines are free from these drawbacks and give to computing telecommunication systems and networks the qualities as a following:

- Immunity to electromagnetic interference;

- High speed of transfer;
- Low cost per bit of transmitted data;
- Technical compatibility of optoelectronic devices and devices with microelectronic schemes and devices.

Their application in computer networks, certainly, is perspective. Therefore, the optoelectronic atmospheric transmission lines of information consisting of the optical transmitter - the optical environment (atmosphere) - the photoreception module are of special interest.

Problems of optical transfer are solved by application of the qualitative radiating light-emitting diodes or semiconductor laser diodes which are improved[1-4] from year to year. Optical signal reception systems require amplifiers with minimal distortion and low noise.

These requirements are met by field-effect transistor amplifiers. The advantage of a field-effect transistor is that its high input impedance ensures low levels of intrinsic own noise.[5] Besides, by selection of an operating mode it is possible to receive high-quality reception of weak optical signals.

In the article it is proposed to use a receiving module with an input cascade on a field phototransistor for receiving optical signals.

RESULTS AND DISCUSSION

The mode of small automatic bias and the presence of feedback in the proposed electronic circuit (Fig. 1) made it possible to obtain the amplification of small variable signals (4 mV) with almost without distortion.

High input resistance allowed to exclude high-capacity transition capacitors from the circuit, while it became possible to use a power source with a voltage range from 4.5V to 9V.

A modulated optical signal from a semiconductor laser was fed through a lens to the channel of a field-effect transistor. Studies of the input stage of the field phototransistor were performed by applying a sound signal from the sound signal generator GZ-109 and fixing the amplified output signal with a C1-70 oscilloscope. As can be seen from Fig. 2, in a wide input signal range from 4 to 10 mV, the output signal increases linearly and amplifies without distortion.

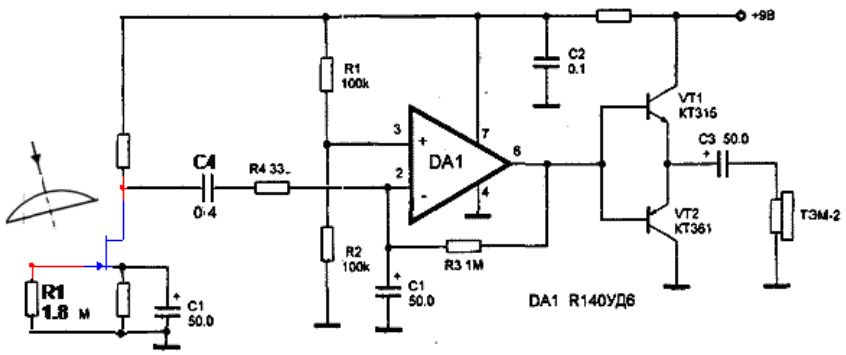

Fig. 1: The electrical scheme of module for receiving of optical signals.

Performing the function of a voltage amplifier by a field effect transistor eliminates the loss of the input signal and simplifies the matching of its output parameters with an integrated microcircuit. The use of a circuit with a common source allows to obtain an input signal gain, both in current and voltage (analogous circuit with a common emitter for a bipolar transistor).[6-8]

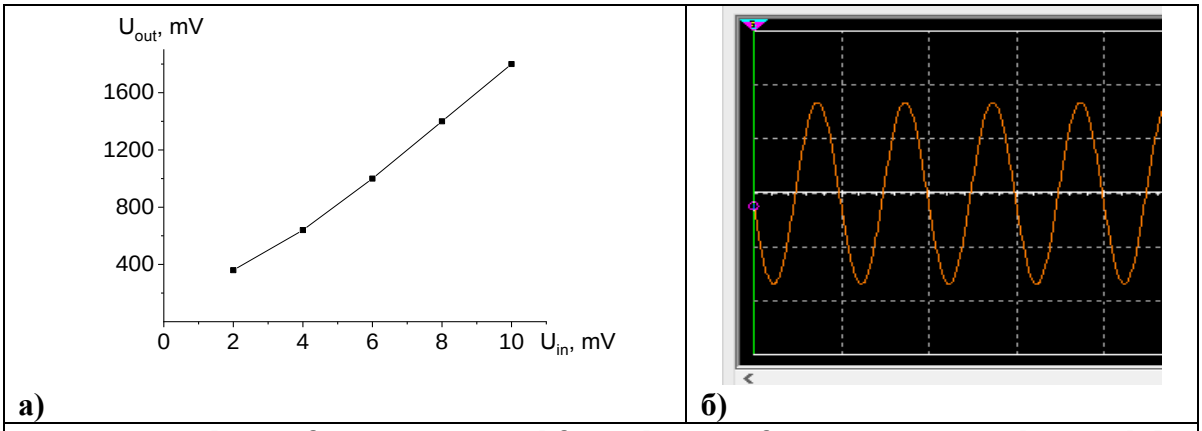

Fig. 2: Dependence of an output signal from the size of an entrance signal (a) and (b) form of the strengthened signal at the exit of the field phototransistor: down cage of 100 mV, across cage of 1 ms.

CONCLUSION

The use of a field phototransistor as a receiver of optical signals is due to the fact that avalanche photodiodes used in many photo detector devices operate in the limiting mode, which leads to a decrease in their service life and premature failure. Receiving modules of optical signals can be used in the design of systems for the transmission and reception of optical signals that are promising for creating devices and instruments for communication systems, medicine, household and office purposes such as burglar alarms, optical telephones and various recording devices as well as for remote control of operation of various technological electric devices.

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