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Shishkin I.R.¹, Lushchin S.P.²

¹ student of group E-412A NU “Zaporizhzhia Polytechnic”

² PhD (Phys.-math. sciences), associate professor NU “Zaporizhzhia Polytechnic”

USAGE OF IGBT-TRANSISTORS IN POWER ELECTRONICS

In modern engineering different types of switching devices are used: electromagnetic and electronic. The electromagnetic contactor has positive aspects: low price, ease of installation and repair. But it has a number of problems: burning of contacts, electric arc, weakening of the return spring, due to which the power contacts are de-energized with a delay or remain under high current at all, large weight and dimensions of the contactor, the inability to work at high switching frequencies.

Modern electronic switches based on IGBT- transistors do not have these problems. The IGBT-transistor is a three-electrode power semiconduc-

tor device that combines two transistors in one semiconductor structure: bipolar (forms a power channel) and field (forms a control channel). This device has absorbed the positive properties of a bipolar transistor (high voltage between the collector and the emitter) and a field-effect transistor (control occurs with the help of an electric field, and not with a current, as in a bipolar transistor).

The IGBT- transistor has a number of positive properties: light weight, not large size, power, high switching frequency, absence of physical wear, longer storage life. Disadvantages include: price, a more complicated installation and setup process, passive cooling is required for heat removal, power is lost at high switching frequencies (approximately 20...50 kHz).

On the basis of IGBT-transistors, frequency converters for electric drives, transformer less converters and inverters, welding equipment, and current regulators of powerful drives are produced. In the frequency range of 10...20 kHz switches on IGBT- transistors significantly outperform semiconductor devices of other types. IGBT- transistors are used in networks with a voltage rating from 1 kW to 10 kW, while ensuring safe and reliable operation of electrical equipment. They are used in powerful control drives of trolleybuses, electric locomotives, and modern electric cars. Their use allows increasing the efficiency, ensuring the maximum possible smoothness of the technique.

Scientists from CREE have invented Cree Mosfet-Transtor, which is analogous to the IGBT mentioned above, works with voltages above 1700 V, calmly switch with frequency over 100 kHz, and lower switching losses, therefore more efficiency.