Multichannel High Voltage Amplifier for Piezo Actuators

Roman Regulski, Amadeusz Nowak, Bartosz Minorowicz, and Frederik Staefanski

Institute of Mechanical Technology, Poznan University of Technology
ul. Piotrowo 3, 60-965 Poznan, Poland
{roman.regulski, amadeusz.nowak}@doctorate.put.poznan.pl,
{bartosz.minorowicz, frederik.stefanski}@gmail.com

Abstract. This paper describes investigations of a low cost high voltage amplifier, which was based on specialized operational amplifiers. The purpose of the amplifier is to control piezoelectric actuators with many electrodes, such as bimorph benders, piezoelectric tubes, ring and disc benders. Proposed amplifier has two independent channels which can be configured for the specific research aim. Every channel of the device can works in inverted or non inverted mode. Also the voltage gain and current limit can be set separately.

Keywords: high voltage amplifier, piezoelectric actuator, bimorph bender, piezo tube, multichannel amplifier.

1 Introduction

Nowadays piezoelectric actuators are widely used in many applications. Their advantages lead to finding novel approach of their usage [1, 2]. Drawback which limits the application of piezo transducers are requirements for their power supply. Due to the fact that piezo materials require high voltages to control, it is necessary to search for new solutions of high voltage amplifiers. In recent years there have been research on various issues related to the design and improvement of properties of such devices. We can find examples of different high-voltage amplifiers in [3–7]. Some solutions are equipped with a microcontroller devices and can be digitally controlled. Also the high-voltage operational amplifiers are used [8, 9]. Commercially available high voltage piezoelectric amplifiers are usually one channel solution, are expensive and have fixed limitations.

The main goal of the research was to obtain the performance of designed high voltage amplifier and show the way to build cheap multichannel high voltage amplifier. The scope of the research includes voltage and current tests. Frequency response for driving different loads under different voltage were conducted.

2 Piezoelectric Actuators Supplying

The cited above papers doesn’t describe in detail the basic problems of supply circuits from electronic point of view, which one can meet in design of high power and low...