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FINAL REPORT OF DIPLOMA PROJECT

STEREO AUDIO AMPLIFIER

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ABSTRACT

Stereo Audio Amplifier

This report covers the design and implementation of a multi-stage stereo audio amplifier with its own voltage regulator, LED display, and digital volume control for each channel. The input can come directly from a CD audio player or similar device, and typical 8 Ohm speakers are driven. Digital volume control is implemented using a dipswitch, but this control device could easily be replaced by electronic components. The signal output is clean with no distortion up to certain audio levels, but some distortion occurs at higher levels. The unit is designed with five distinct components. The power supply provides positive and negative 12 Volts. The digital volume control is implemented using a summing amplifier, and there is one for each channel. Amplification is done in two stages, each of which is centered on Bipolar Junction Transistors. The first stage is a Common Emitter Circuit that functions to amplify the voltage of the signal. This stage has a large output resistance and can not effectively drive 8Ω speakers. The second stage is a Class A-B Power Amplifier that provides the Common Emitter stage with a larger load, and is itself able to drive the low-resistance speaker with an acceptable current gain.LED output was achieved using multiple comparators, which compare the output to predetermined levels and light the LED's when different levels are reached. Finally, the chosen design performs almost perfectly to specifications (with distortion) when simulated in the OrCAD PSPICE™ 9.1 circuit simulator, but under actual construction there is higher amplification.

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INTRODUCTION

1.1 Background

The product is to be suitable for in-home use. The input can be stereo or mono from any low impedance audio source such as a compact disc or MP3 player. The input must not exceed the maximum voltage level of 250mV peak, since audio quality can not be guaranteed at such levels. The system must drive two 8Ω speakers with a minimum gain of –3dB and 20dB. This is 0.7V/V and 10V/V in terms of amplitude. Additionally, there can be no more than a +/- 1 dB gain difference over the audible range of 300Hz to 10 kHz without distortion. The volume is control by a variable resistor on each channel and there must be 4-stage LED indicators corresponding to 0.25V, .5V, 1V, and 2V output levels for each channel as well. The system is run from the normal household wall socket supply of 240Vac at 50Hz. The design can be adapted to accept input from any type of audio plug. Output is adaptable to normal speaker wire.