Class D Power Amplifier
MP7-04

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Amplifiers play an important role in audio systems. They can be classified into different classes such as Class A, Class B, Class AB and Class D. Class AB is the most popular audio amplifier because it has excellent linearity. However, the efficiency is only about 70-80% since most of the power is dissipated as heat. Class D amplifier is becoming more and more popular recently because it can ideally achieve 100% efficiency. Nevertheless, the distortion level of Class D amplifier is usually higher than other amplifiers. Therefore, this issue should be carefully considered in the design.

Advantages:
• High efficiency (ideally 100%)
• Low power consumption
• Small in size

Disadvantages:
• High distortion level
• Complicated design

Main Applications:
• Subwoofer system
• Car audio amplifier

The focus on this thesis is to design a high efficiency, low distortion and compact size Class D Power Amplifier. This consists of four main stages including the input, modulation, amplification and output stage. An additional feedback loop will be added to improve the linearity of the output signal.
• **Input Stage**
  - Pre-amplifier improved the comparator’s sensitivity

• **Modulation Stage**
  - Input signal compared with triangular pulse train
  - Duty ratio will be proportional to the input voltage

• **Amplifying Stage**
  - Switches will be driven by the gate driver
  - An amplified signal will be produced

• **Output Stage**
  - 2nd order filter will be used to demodulate the signal
Results

Output waveform and spectrum of 1 kHz sine wave

Output waveform and spectrum of 10 kHz sine wave

Output waveform and spectrum of 20 kHz sine wave