ClassAB/B Output Amplifier Tilt Stability Investigation

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**Abstract:**

ClassAB/B output amplifier structure is adopted in audio amplifiers for mobile applications such as cell phones and tablets due to its ability to drive both large and small resistive loads with sufficient distortions and low quiescent power consumption. Near zero and small output signal levels, the ClassAB stage alone will be sufficient to provide the needed output current. And the ClassB stage is turned off with a voltage level shifting structure. When the output signal level is high, ClassB stage will be turned on to drive the load. While such a ClassAB/B arrangement provides superior power efficiencies with large and varied load driving capability, it suffers from the so-called tilt stability issue: the stability margin of the loop transfer function decreases significantly as the output voltage levels tilt away from the quiescent point. Existing methods in recent publications rely on extra complex miller compensation to improve stability when ClassB stage is turned on. In this project, we first show that the level-shifting mechanism used to turn on and off the ClassB stage is the key culprit causing the tilt stability issue of the ClassAB/B amplifier when the ClassB stage is turned on. Based on this observation, a new simple way to improve the stability of the ClassAB/B output amplifier structure is proposed. Simulation results at various load levels and at various tilt conditions demonstrate the validity of the proposed method.