

The authors...

Wim de Jager,
Erik van der Ven and Ed
van Tuyl, University of
Twente, Enschede, The
Netherlands.

An important problem encountered in class-AB audio amplifier design concerns the bias-control loop. Often, a complementary common-collector output stage is used¹ and the power transis-

tors are included in the bias control loop. This can easily cause thermal instability due to the large temperature variations in the output transistors.

Thermal coupling of all diodes and transistors in the class-AB control loop can improve the thermal stability of the quiescent current in the output stage, but this is in most cases too slow to react to burst signals. As a result, emitter resistors are usually added to the power transistors to improve thermal stability. However, the voltage drop across the emitter resistors can switch off the transistor that is conducting the residual current.

Because of the limited bandwidth of the distortion reduction by means of using negative feedback, transistor switching can be a source of high-frequency distortion. Additional circuitry is necessary to prevent this².

Moreover a common-collector stage is not able to reach a rail to rail voltage output swing due to the base-emitter voltages.

Common-emitter output stages are usually based on a complementary feedback pair¹. However the local feedback loop around the pair can be a source of HF oscillation.

In order to achieve thermal stability without switching problems, and to allow maximum output voltage swing, we designed a common-emitter power amplifier based on a new current-mode class-AB driver circuit. Due to the absence of local feedback at the output, the stability of the amplifier is only dependent on the global feedback-loop.

Common-emitter design

The open-loop output impedance of a

The design encapsulated

This is a three-stage class-AB common-emitter power amplifier using discrete bipolar transistors.

Thermal stability is achieved and switching distortion is avoided by using a new current mode class-AB driver circuit.

Total harmonic distortion varies from 0.01% at 20Hz to 0.1% at 20kHz driving 30W into 8Ω.

A phase margin of 85° for a β of 1/34 guarantees excellent stability without load stabilising networks.

Saturation of the power transistors is prevented, resulting in fast recovery from clipping.