EE-4232 Output Stages



Collector current waveforms for transistors operating in class A amplifier stage



Collector current waveforms for transistors operating in class B amplifier stages



Collector current waveforms for transistors operating in class AB amplifier stage



Collector current waveforms for transistors operating in class C amplifier stage



An emitter follower (Q_1) biased with a constant current I supplied by transistor Q_2 .



Transfer characteristic of the emitter follower. This linear characteristic is obtained by neglecting the change in v_{BEI} with i_L . The maximum positive output is determined by the saturation of Q_1 . In the negative direction, the limit of the linear region is determined either by Q_1 turning off or by Q_2 saturating, depending on the values of I and R_L .



Class B output stage.



Transfer characteristic for the class B output stage.



How the dead band in the class B transfer characteristic results in crossover distortion.



Simplified internal circuit of the LM380 IC power amplifier

(Courtesy National Semiconductor Corporation.)



Small-signal analysis of the circuit.

The circled numbers indicate the order of the analysis steps.



Structure of a power op amp. The circuit consists of an op amp followed by a class AB buffer. The output current capability of the buffer, consisting of Q_1 , Q_2 , Q_3 , and Q_4 , is further boosted by Q_5 and Q_6 .¹²



Double-diffused vertical MOS transistor (DMOS).



Typical $i_D - v_{GS}$ characteristic for a power MOSFET.



A class AB amplifier with MOS output transistors and BJT drivers. Resistor R_3 is adjusted to provide temperature compensation while R_1 is adjusted to yield to the desired value of quiescent current in the output transistors.

References

- *Electronics* by A. Hambley
- Microelectronics Circuits by Sedra & Smith
- Other books on Electronics