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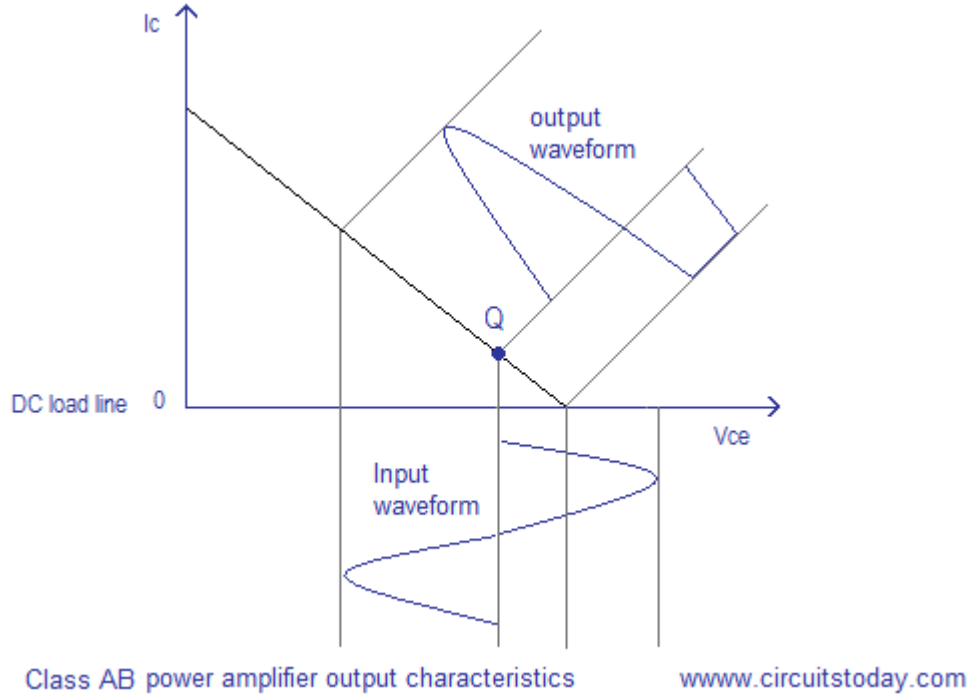
Class AB power amplifier.

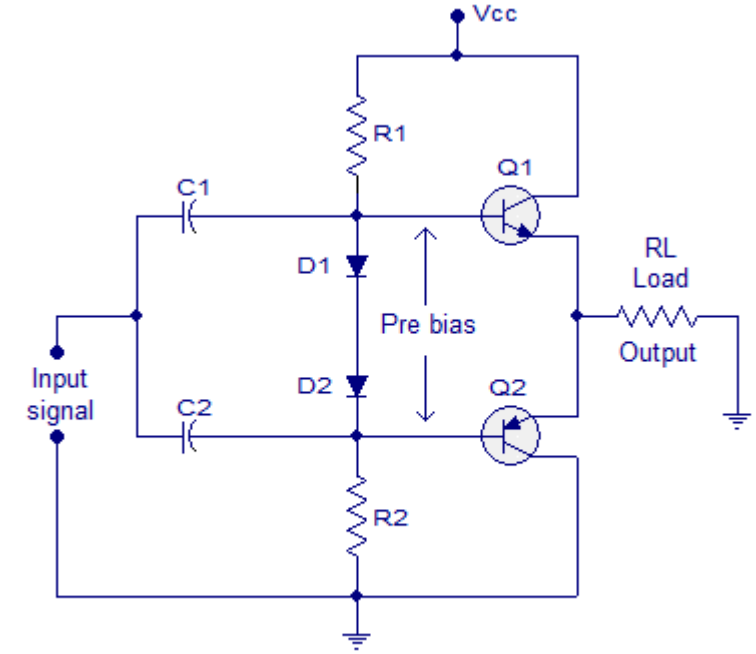
In Class AB configuration, the active elements (transistors) are slightly biased so that the conduction angle is slightly more than 180° but much less than 360°. The transistors conduct for more than a half cycle but much less than the full cycle. That means there will be no instant where both transistors are OFF simultaneously and thus cross-over distortion is eliminated. Class AB configuration is actually a trade-off between Class A and Class B configurations where efficiency is slightly compromised for fidelity. Class AB power amplifiers are slightly inefficient than the Class B configurations but far better in terms of distortion when compared to Class A configurations. Since the active devices are slightly pre-biased there will be a small amount of collector current flowing and this is the reason behind the slightly reduced efficiency. Typical efficiency of a well designed class AB power amplifier is around 70%. The output characteristics of a single ended Class AB power amplifier is shown in the figure below.



From the above figure it is clear that the Q-point is not positioned at cut-off unlike the Class B characteristics and there will be a small amount of collector current flowing at zero input. As a result, some part of the negative going half cycle will be also reproduced at the output. The amount of negative going half cycle reproduced at the output depends on the amount of pre-bias given to the transistor.

Practical Class AB power amplifier.

Single ended Class AB configurations are not practical just because a major portion of one half cycle will be missing at the output. Just like the Class B configuration, push-pull mechanism is essential for realizing practical Class AB power amplifiers. Circuit diagram of a typical Class AB push-pull amplifier is shown in the figure below.

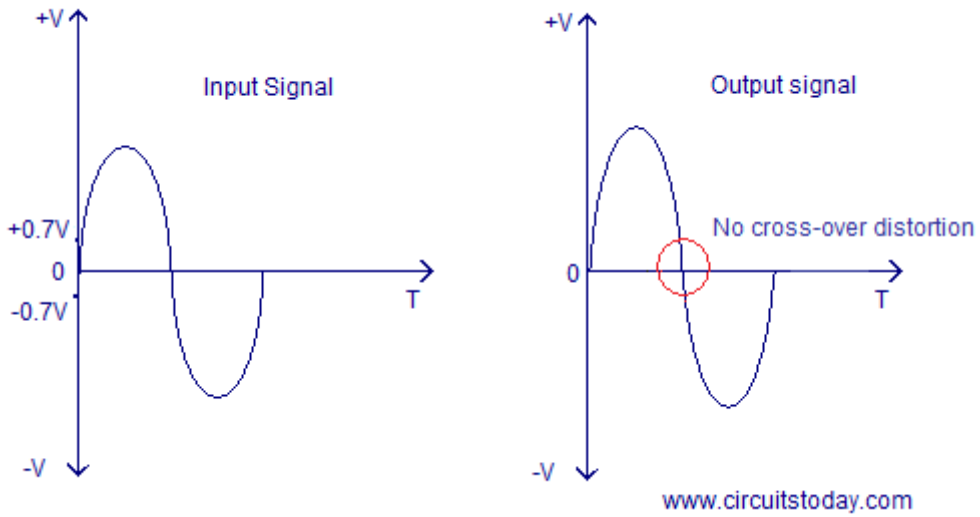


Class AB push-pull amplifier www.circuitstoday.com

The exact technical designation of the above circuit is " Complementary- symmetry Class AB power amplifier". The active elements used in this circuit (transistor Q1 and Q2) are complementary symmetric and it means the the transistor are similar in all aspects except one is NPN and the other is PNP. The use of this complementary pair eliminates the bulky transformer for phase splitting the input signal for driving the individual transistors. The NPN transistor alone will conduct the positive half cycle and PNP transistor alone will conduct the negative half cycle.

Slight pre-biasing is given to the transistors using the network comprising of resistors R1, R2 and biasing diodes D1 and D2. As you know, an NPN transistor will start conducting when its base voltage is above the base emitter voltage (Vbe~0.7V) and a PNP transistor will start conducting when its base voltage is below the base emitter voltage (Vbe~ -0.7V). A forward biased diode will drop approximately 0.7V across it and the biasing diodes used here will keep the transistor slightly forward biased even if there is no input signal.

One important thing while choosing the biasing diodes (also called compensating diodes) is that their characteristics must match as close as possible to the transistors. Resistors R1 and R2 are actually used for forward biasing the diodes so that they drop 0.7V across it for biasing the individual transistors. C1 and C2 are input DC decoupling capacitors. Input and output waveforms of a typical class AB push pull amplifier is shown in the figure below.



Since both the transistors are slightly conducting at zero input, no information in the input signal is lost at the output during the zero-crossing of the input signal and thus cross-over distortion is completely eliminated at a cost of slightly reduced efficiency.

Advantages of Class AB power amplifier.

- No cross over distortion.
- No need for the bulky coupling transformers.
- No hum in the output.

Disadvantages of Class AB power amplifier.

- Efficiency is slightly less when compared to Class B configuration.
- There will be some DC components in the output as the load is directly coupled.
- Capacitive coupling can eliminate DC components but it is not practical in case of heavy loads.