# Which Class Power Amplifier Should You Choose? 

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Analog Power Amplifiers IACT-2105

The class of an amplifier describes the way that it interacts with power while giving a signal. When using a power amplifier, the most common classes are labeled as $A, B, A B, C$ and $D$. Exploring the differences and similarities of each class will assist in understanding which power amplifier is the best for an application that you are building. Typically, there is not a list organizing the classes from best to worse, because each class of amplifier brings something important to the table. A way to differentiate the amplifiers can be separated by weight, efficiency, noise and fidelity.


## Weight

Class A amplifiers usually have large amounts of heat sink attached to it, so therefore are the heaviest of all the classes. B and AB class amplifiers are similar in size and smaller than A. Class C and D amplifiers are the smallest in size.

## Efficiency

Class D amplifiers are the most efficient of all amplifier classes, because they use switching technology to convert the power to an amplified output signal. They can achieve efficiencies of up to $90 \%$, while class A amplifiers are typically the least efficient, with levels around $20-30 \%$. Class B, AB, and C amplifiers fall somewhere in between, with efficiency levels ranging from 50-75\%.

## Noise and Fidelity

Class A amplifiers are considered the gold standard in terms of fidelity, as they operate in a linear region and produce a low distortion output signal. Class B and class AB amplifiers can also produce high-fidelity output signals if designed correctly, but they are more prone to distortion than class A amplifiers. Class C amplifiers are not suitable for high-fidelity applications due to their non-linear operation. Class D amplifiers can produce high-fidelity output signals if designed correctly, but they have a higher risk of noise than other amplifier classes.

Each amplifier has its own benefits that could fit in with each application. It's important to understand what type of circuit you are building and how to amplify your signal using a classed power amplifier. Please use this table for quick reference:

| Class | Weight | Efficiency | Noise | Fidelity | Distortion |
| :---: | :---: | :---: | :---: | :---: | :---: |
| A | Heavy | Low | Low | High | Low |
| B | Lighter | Moderate | Moderate | Moderate | Crossover |
| AB | Similar <br> to B | Moderate | Moderate | Slightly better <br> than B | Reduced <br> crossover |
| C | Lightest | High | High | Not suitable for <br> high-fidelity | Distortion |
| D | Light | Highly <br> efficient | Prone to | Can produce <br> high-fidelity with <br> good design <br> practices |  |

## References

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