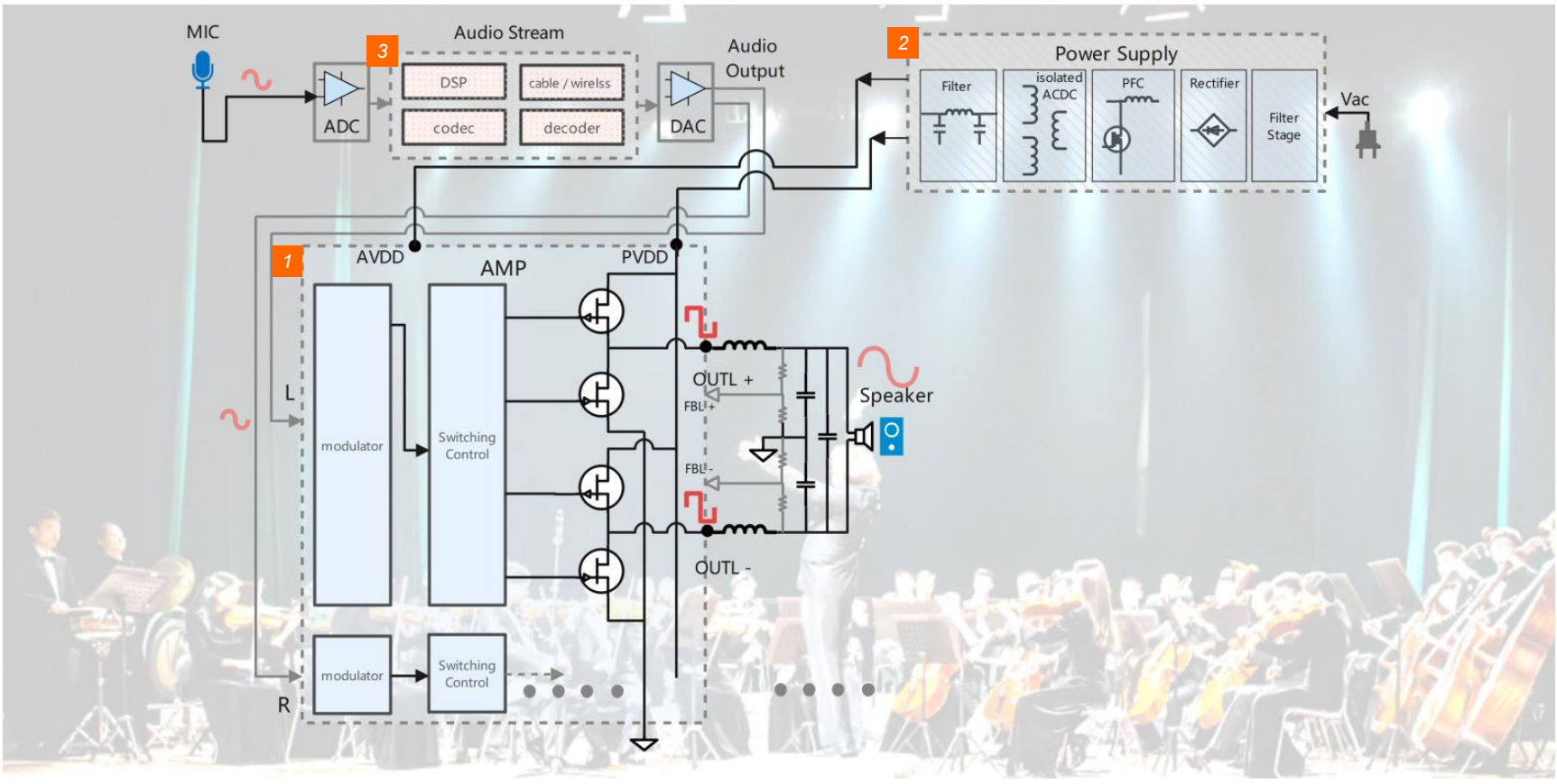
Application Segment 4 - Digital Audio

CODACA
Subtler Magnetics

Class D amplifier has became the most popular audio amplifiers over a wide power range from several watts to hundreds of watts or even more. Comparing to linear amplifiers such as very lossy Class A or DC-biased Class B or a hybrid compromised type between Class A and Class B that as Class AB, Class D amplifier has significant advantages: first of all, it can achieve competitively high efficiency and very low
harmonic distortion plus noise level which greatly helps generating less heat dissipation, second to that higher power density helps saving board space and cost, last but not least that Class D amplifier can be designed to overcome many possible switching noises and could be better adjusted for tunning flexibility - so that overall the sound quality could be kept still high compared to linear amplifiers, making it normally affordable tradeoff between sound quality and power efficiency and density.
BTL (Bridge Tied Load) is the most common output configuration for Class D amplifiers because of the speaker's nature as an electrical-to-mechanical load - which means the current direction through the load has to be swinging from positive to negative (another direction). Because of this two synchronous buck drivers will be tied both ends of the speaker load in differential switching stage, each direction is with half-bridge regulation so that this full control is full-bridge converter. It is preferred this way not only because of better gates controlling that can avoid shoot-through problem but also because of the charge-pumping problem lies in a single half-bridge configuration, which causes significant noise level up that deteriorates output quality and cause EMI issues. It is also important for Class D amplifiers' overall performance that the output LC filter has to be optimized to attain lowest power loss and being safe from interferences of sound quality. Codaca offers several different state-of-the-art product series for digital AMP with extremely low Rdc and very compact size to benefit above mentioned design approaches for Class D amplifiers.



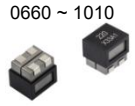
1 **Full-bridge Converter**
Dead-time between high side switch and low side switch is the time that one of the two is ON but another one is OFF switching or vise versa, it is very risky when a narrow dead-time is possibly been set inside the operation sphere, because when both of the two switches are conducted there the power source (here as PVDD) will be directly grounded and cause circuit short – which is called as shoot through. To bet-ter prevent this from happening the half-bridge configuration is usually replaced by full-bridge converter. And as mentioned above the charge stored in half-bridge single output inductor will be commutated back to source when another switch direction is ON, which pulls the current flowing back to source. This pumping effect seriously degrades Class D amplifier with high harmonic distortion.
In full-bridge conversion, two output inductor chokes are driven separately by two switches each side. No charge pumping occurs in full-bridge converter set up here, because energy will be consumed in the other side of the switching leg when counter-direction current are circulating.
Suggested CODACA products:

CSD
- Ferrite/Grade 1
- 2 in 1 for AMP
- 0910 ~ 1065

CPD
- Ferrite
- High current
- 1326 ~ 3119

CPE
- Ferrite
- 2 in 1 stacked/Compact
- 1219 ~ 1623

CSAD
- Alloy/Molded
- 2 in 1 / Compact
- 0660 ~ 1010



2 **System Power Supply**
The power supply for digital AMP varies by power levels thus its topology could be up to which will be best power efficient and being able to provide stable AVDD and PVDD.
Suggested CODACA products: *CPSQ* / *CPTR* / *TCB* / *PK* / *PKS* / *SPBL* / *SPRH* / *CPER* / *CPCE* / *CSCF* / *VSRU* / *CSEC* / *CSEB* / *CSFU* / *CSFI* (ACDC conversion)
CSBL / *CSBX* / *CSEB* / *CSEC* (DCDC conversion)

3 **Signal Transmission**
Digital media is compressed and forwarded to receiver decoders for generating audio input for AMPs. To eliminate the disturbance of transmission or data link noises, which is normally been caused by loop unbalanced impedances and coupling by conductors, the CMC (Common mode choke) would be necessary for noise suppression to transmission lines or interfaces.
Suggested CODACA products: *CPTR* / *CSTA* / *CSTC*