

PAA Sample kit

The PAA Sample kit gives you the freedom to do experiments with a piezoceramic audio speaker SPS-6555-03 and four different piezo audio amplifiers. The SPS-6555-03 piezo speaker is built-in a small case for optimum sound quality.

PAA amplifiers:

- PAA-LT3469-01
- PAA-MAX9788-01
- PAA-LM4960SQ-02
- PAA-StepUpBTL-01



Blind power dissipation in a piezoceramic load (for a sine wave)

The power dissipation in an electro-dynamic speaker depends on the resistance of the drive coil. In our comparison, the power dissipated in an electrodynamic speaker with \varnothing 68 mm and 16Ω impedance @ 2V is:

$$\frac{V^2}{R} = \frac{4}{16} = 0,25 \text{ W}$$

The power dissipation in a piezo capacitive load, not in resonance, is:

$$\frac{P}{2} = \frac{c.V^2.\omega.\cos\varphi}{2} + \frac{c.V^2.\omega.D_F}{2} = \frac{c.V^2.\omega}{2} . (\cos\varphi + D_F)$$

capacitive power
power dissipated in ceramic

D_F : Dissipation factor of the ceramic material

c : Capacitance of speaker

ω : $2\pi f$

V : Drive voltage

$\cos\varphi$: The phase angle between current consumption and voltage (in a capacitor is this angle 90° before in phase, thus $\cos\varphi = 0$)

In theory, the capacitive power is zero. The power dissipated in the ceramic disc of the speaker depends strongly on the dissipation factor of D_F of the used ceramic. The D_F is a measure of the dielectric losses in the material, defined as the tangent of the loss angle or the ratio of parallel resistance to parallel reactance, expressed in percent and measured at 1 kHz. This dissipation factor can vary from 0,4% up to 2% for the most typical ceramics available.

Our speakers are not used at resonance. Consequently the power dissipated mainly depends on the D_F and is very low or near zero.

The power dissipation of the piezo speaker can be considered as a blind power drain. The amplifier must deliver the total power needed to drive the circuit. Thus the total power drain of the piezo speaker is the drain of the amplifier, needed to deliver the blind power for the speaker, the power dissipated in the ceramics (due to the dissipation factor) and the power dissipated in the isolation resistor R_{ISO} .