

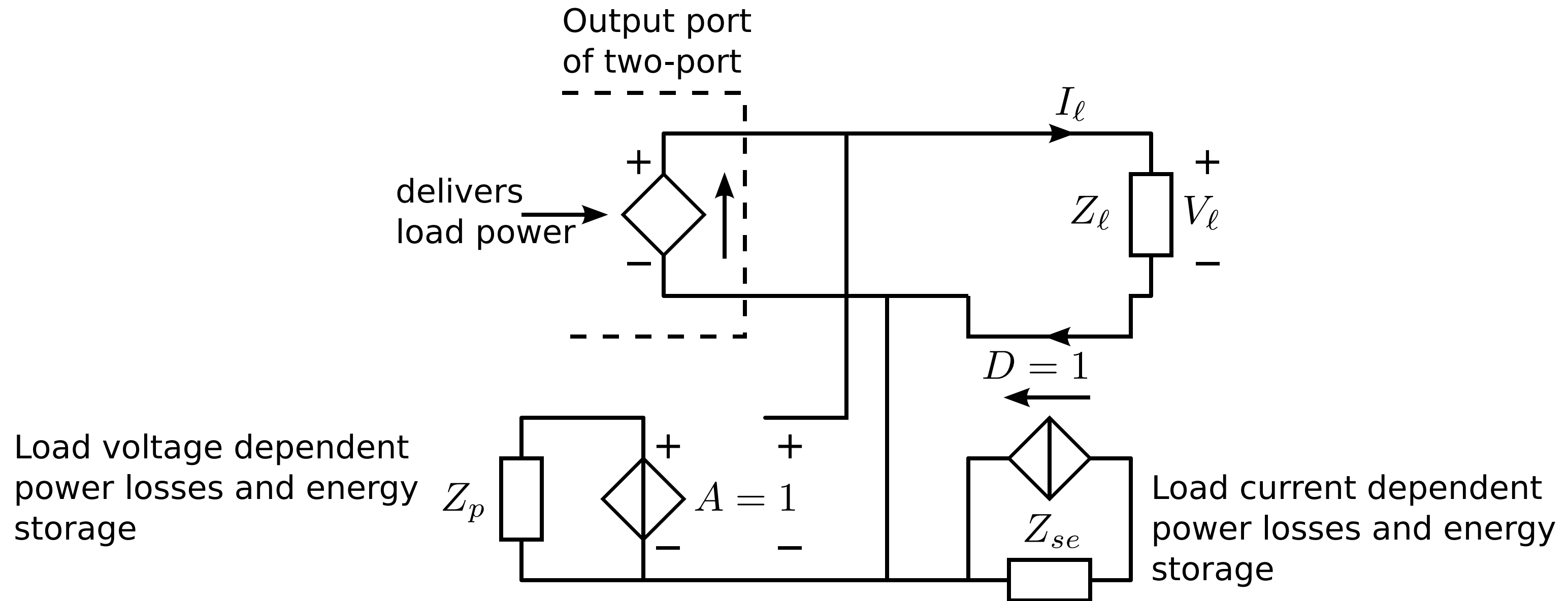
# **Structured Electronic Design**

EE3C11

Amplifiers: modeling of power losses and energy storage

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# Power losses and energy storage



# Power efficiency

Power efficiency: ratio of power delivered to the load and power taken from the supply

$$\eta = \frac{P_{\ell}}{P_{\text{supply}}}$$

Impedances in series or in parallel with the load generally reduce the power efficiency

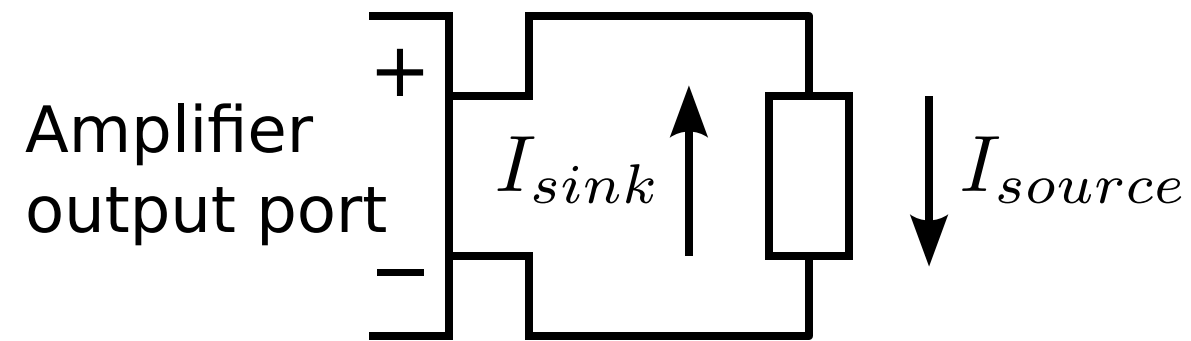
- Real part of those impedances contributes to dissipation

- Enlarged voltage and/or current swing increases dissipation in amplifier

Only in narrow-band applications the power efficiency can be improved

- Application of matching networks

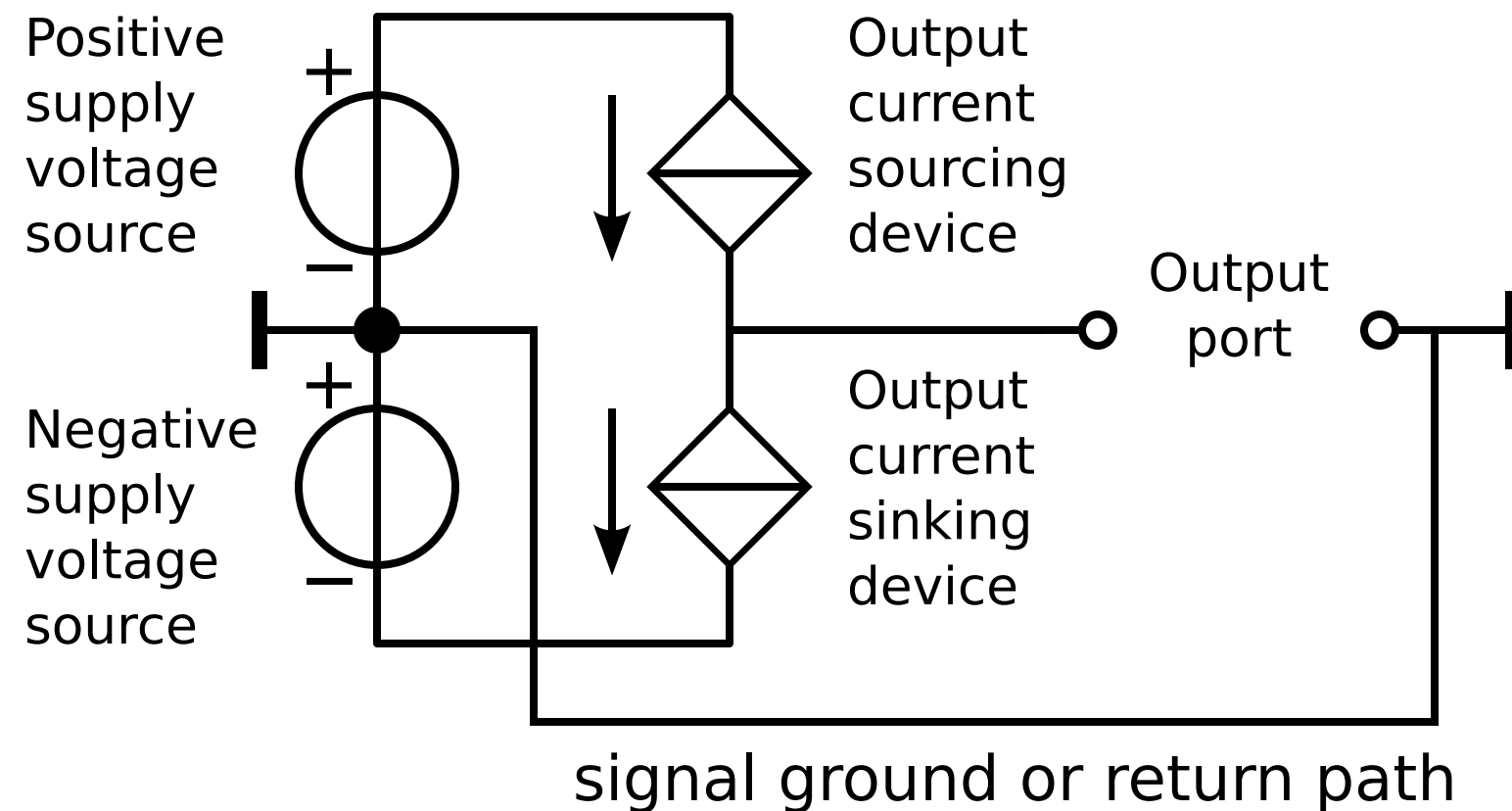
# Amplifier output stages



Amplifier stages constructed with devices that operate in one quadrant of the v-i plane

Separate output device for source and sink current

Amplifier classes relate to structure of output stage



Sourcing phase:

Current through sourcing device larger than current through sinking device

Sinking phase:

Current through sinking device larger than current through sourcing device

# Amplifier classes

class A: Source and sink device both conduct during source and sink phase

class B: Source device conducts during source phase and sink device during sink phase

class AB: As B but with a small overlap

class C: As B but with a dead zone, or single device only

class D: Non resonant switching output stage

class E: Resonant switching narrow-band output stage

class F: Resonant switching narrow-band output stage

class G: As AB but with step-wise adaption of power supply voltage

class H: As AB but with continuous adaption of power supply voltage

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