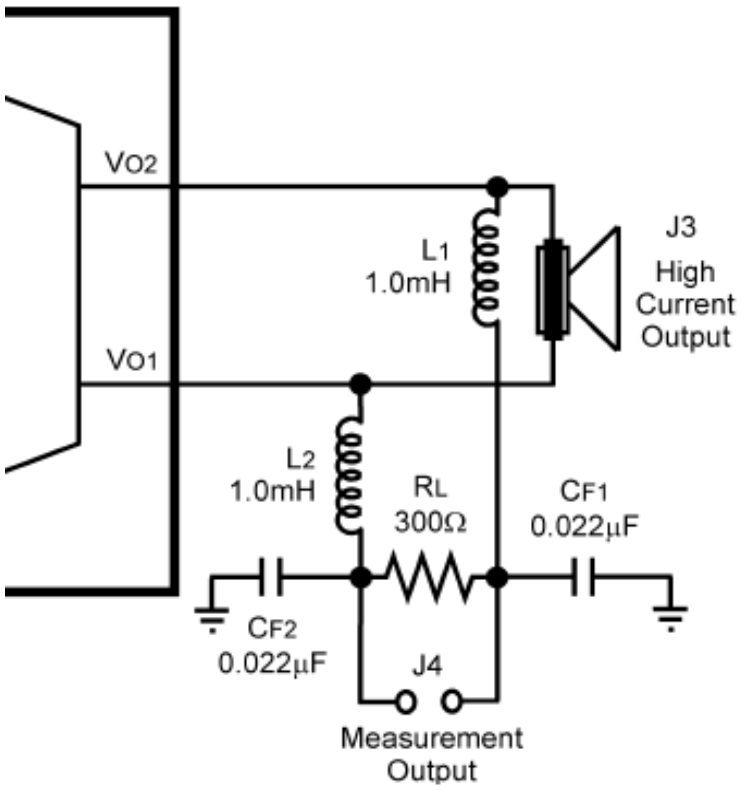
Class D test

Filterless Class D Measurement Filter

- **A measurement filter is used to extract useful audio data from the switching waveform**



Filterless Class D Output Power Calculation

- **Goal:**
  To find the easiest way to get the correct output power into the unfiltered load. This involves entering a load value on the AP so that the output power displayed takes into account all other factors.

Filterless Class D Output Power Calculation Assumptions

- **LC filter loss is 0.35dB – 0.40dB (as measured and verified)**
- **Resistive component of load has zero inductance**
- **Inductive component of load has zero resistance**

Filterless Class D Output Power Calculation (Step 1)

- **Actual load impedance at 1kHz**

  R_L = 15μF + 8Ω + 15μH

- **Impedance at 1kHz**

  = (2π*1kHz*30μH) + 8Ω

  = 0.1885 + 8Ω

  = 8.1885Ω

Filterless Class D Output Power Calculation (Step 2)

- **LC Filter loss in Voltage**
  20 log X = 0.35dB – 0.40dB
  = 0.0411 – 0.0471
  = 4.11% - 4.71% loss
- **Voltage at filter output is 95.29% - 95.89% of actual voltage at unfiltered load**

Filterless Class D Output Power Calculation (Step 3)

- **Given 1W with AP set to 8Ω measured at LC filter output's, $P_{OUT} = (V^2/R_L)$**
- **Voltage at filter output = $8^{1/2}$ = 2.828V**
- **Actual voltage at unfiltered load**
  = V_{UFL} * (95.29% - 95.89%) = 2.828V
  V_{UFL} = 2.97V – 2.95V
- **Power in actual load impedance at 1kHz**
  = $(2.95V^2)/8.1885\Omega$ - $(2.97V^2)/8.1885\Omega$
  = 1.063W – 1.076W

Filterless Class D Output Power Calculation (Step 4)

- **Resistor setting on AP to obtain same output power taking into account LC filter loss and actual load impedance**

$$P_{OUT} = (V^2/R_L)$$

$$R_L = (V^2/P_{OUT})$$

$$R_L = (2.83V^2)/1.063W - (2.83V^2)/1.076W$$
$$= 7.538\Omega_{(0.35dB)} - 7.444\Omega_{(0.40dB)}$$

Filterless Class D Output Power Calculation (Step 5)

- $R_L = 7.538\Omega_{(0.35dB)} - 7.444\Omega_{(0.40dB)}$
- Set $R_L = 7.49\Omega_{(AVERAGE)}$

$$P_{OUT} = V_{OUT}^2 / R_L$$