

Fast Power Amplifier

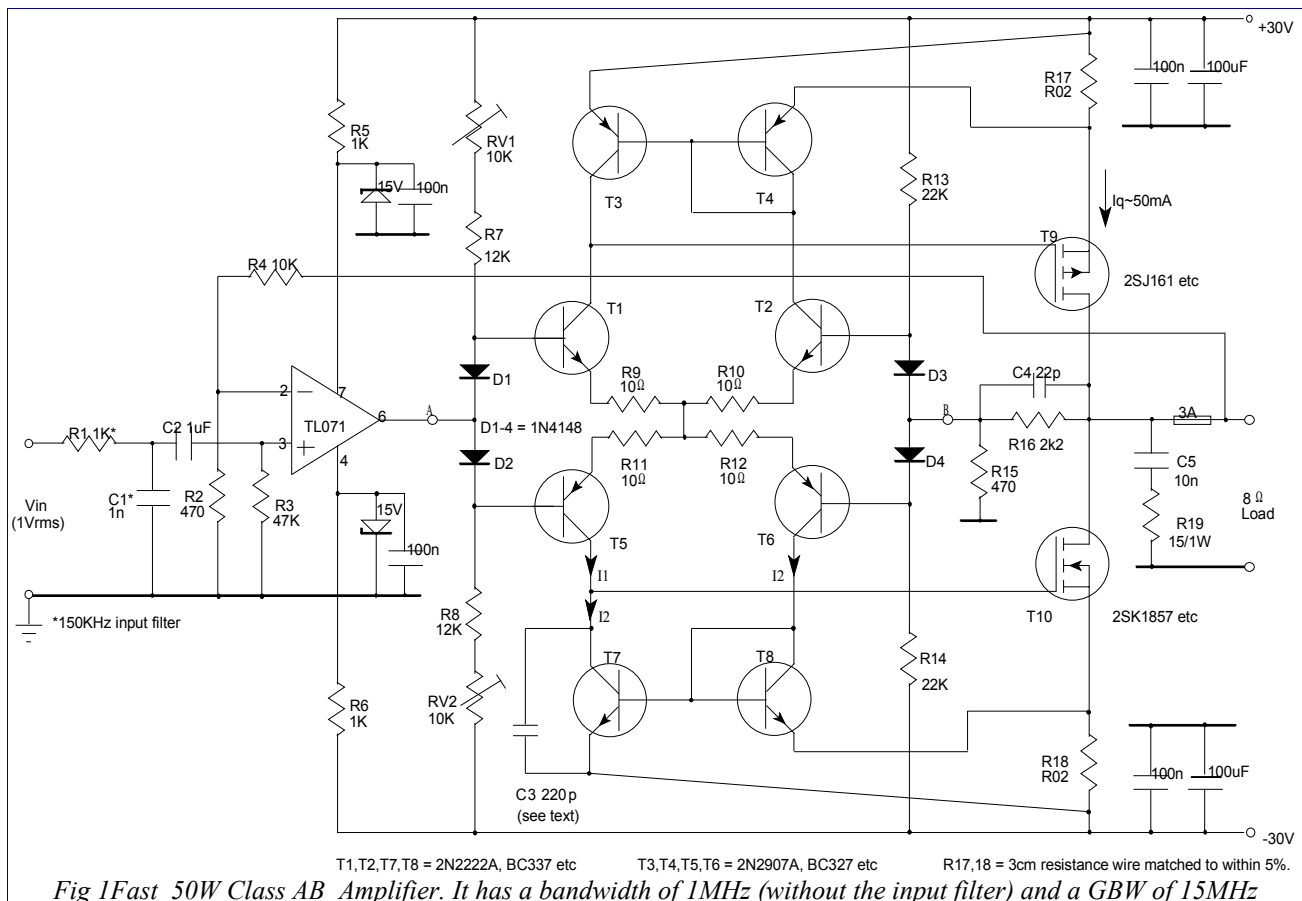
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Since the output stage puts a limit on the amount of negative feedback that can be applied in the audio range⁽¹⁾, this power amplifier was designed around the fastest possible output stage using readily available components. The output stage has been modified from a CI⁽²⁾ for common source output and made faster by adding a differential drive to the current mirrors $T_{3,4}$ & $T_{7,8}$ to speed up the charging and discharging of each mosfets gate capacitance, allowing 50ns rise and fall times and a GBW of 15MHz.

Sensing each mosfets source current with R_{17} & R_{18} makes each mosfet much more linear and insensitive to temperature. Drain current is made proportional to $I_1 - I_2$ when $I_1 > I_2$ and is very linear down to a drain current of 50mA.

The TL071 opamp provides 40dB of global feedback at 10KHz for distortion reduction. The output stage distortion can be trimmed to around 1% by adjusting RV1 & RV2 (in equal increments) while the global feedback is disabled (by shorting pin 2 to 6 of the opamp) with a 1V 100Hz sinewave input.

Tie mirror pairs ($T_{3,4}$ & $T_{7,8}$) together for thermal stability. Their emitters should be close to the sense resistors to prevent parasitic oscillation. Capacitor C_3 may need to be altered for different types of mosfets to equalise the difference between the p & n mosfet gate capacitance.



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References

- 1 Distortion in power Amplifiers, Douglas Self, EW & WW Feb 94, p139
- 2 Precise Power Output Stage, Terrence Finnegan, EW & WW May 93, p412

Fast Power Amplifier (original longer version as sent)

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Open loop, the output stage power bandwidth is 500kHz and gain is 40 with an 8W load. Reducing the load impedance reduces the open loop gain but this effect can be offset by reducing $R_{17,18}$ (or R_{9-12}). Some local feedback is applied to the output stage with $R_{15,16}$ & C_4 . A gain of 3 gave best results, making the output stage bandwidth 10MHz.

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- 1 *Distortion in power Amplifiers, Douglas Self, EW & WW Feb 94, p139*
- 2 *Precise Power Output Stage, Terrence Finnegan, EW & WW May 93, p412*