A Fast, Linear, High Current Line Driver

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Among linear applications not usually seen are those which require high speed combined with either very low DC error, or high load current. Such applications can be solved by combining the best attributes of two ICs, either one of which may not be capable by itself of the entire requirement.

A case in point is the line driver of Figure 1, which uses an LT1122 JFET input op amp as the gain element combined with an LT1010 buffer. This provides the output current of the LT1010 (typically 150mA) but with the basic DC and low level AC characteristics of the LT1122. The circuit is capable of driving loads as low as 100 ohms with very low distortion. The input referred DC error is the low DC offset of the LT1122, typically 0.5mV or less. Large signal characteristics are also very good, due to the 80V/µs symmetrical SR of the LT1122.

The circuit as shown is configured as a precise gain of 5 non-inverting amplifier by gain set resistors R2 and R1, with the LT1010 unity gain voltage follower inside the overall feedback loop. This provides current buffering to the op amp, allowing it to operate most linearly. Small signal bandwidth is set by the time constant of R2 and C1, and is 1MHz as shown, with a corresponding risetime of about 400ns.

Performance with ±18V supplies is shown in Figures 2a and 2b, with output generally 5Vrms or equivalent, driving 100 ohms directly. THD is shown in Figure 2a, with input level swept up output clipping level, at a fixed 10kHz frequency. The distortion is generally well below 0.01%, and improves substantially for lower frequencies.

CCIF IM distortion performance of the circuit for similar loading is shown in Figure 2b, driving a load of 100 ohms at a swept level, again up to output clipping. The LT1122 amplifier is represented by the lower of the two curves, with distortion around the 0.0001% level. Also shown for comparison in this plot is the distortion of a type 156 JFET op amp (also driving the LT1010 buffer with other conditions the same). The 156 op amp uses a design topology with an intrinsically *asymmetric* SR. This manifests itself as rising even order distortion for methods such as this CCIF test. For this example, the distortion is more than an order of magnitude higher than that of the faster and symmetric slewing LT1122 for the same conditions.

Applications of this circuit include low offset linear buffers such as for A/D inputs, line drivers for instrumentation use, and audio frequency range buffers such as very high quality headphone use. LT

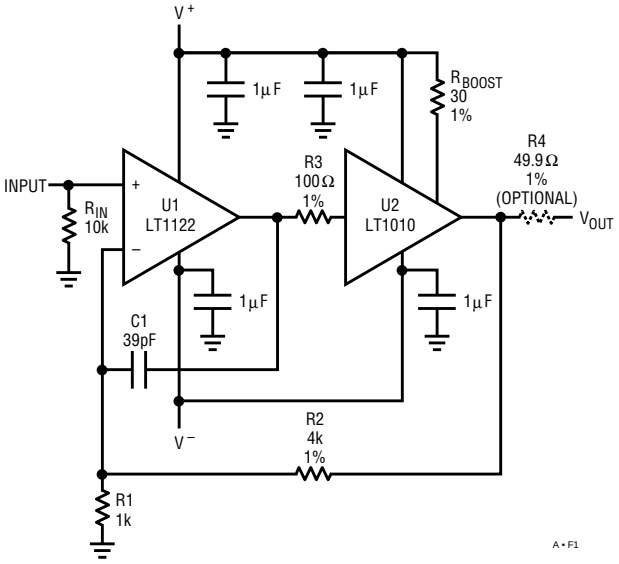

Figure 1. Line Driver

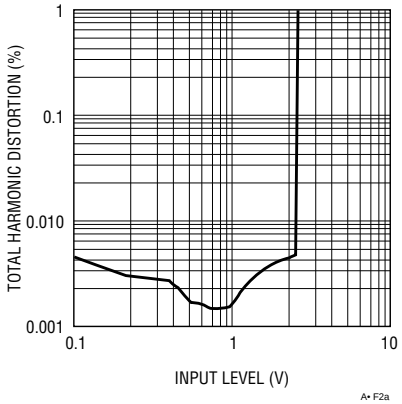

Figure 2a. THD vs. Input Level

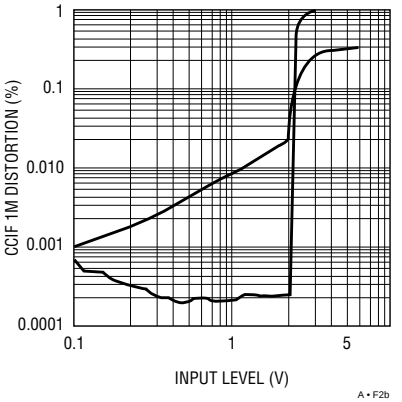

Figure 2b. CCIF IM Distortion vs. Input Level