

In your first job, your new boss, Bud Tugley, wants you to build an amplifier as your initial project. He asks you to design an inverting amp that will take a 50-kHz sine wave with an amplitude of 70 mV and amplify it to an amplitude of 14 V. In addition to the usual resistors, etc. he wants you to use the BS99<sup>1</sup> op amp that he found on Digi-Key for \$0.05 per part. The specs for the BS99 are:

It works only with  $\pm 15$  V power supplies.

The gain-bandwidth product of the op amp is 5 MHz.

The slew rate of the op amp is 2.0 V/ $\mu$ s. ( $2.0 \times 10^6$  V/s).

The offset voltage is 10 mV. (The bias currents are zero and so can be ignored.)

Since you successfully completed EE 230 (We are being optimistic here.) and know all about op amps, you realize that you are faced with the prospect of telling the boss why his crappy op amp will not work. In fact, there are three reasons why it won't work, one relating to gain-bandwidth, one relating to slew rate, and one relating to output limits. Explain, using numbers, why this op amp fails in each of these different aspects.

After showing the boss how good you really are (and being yelled at for a bit for showing him up), he swallows his pride and asks you to design an op amp that will meet the specs. The first step, of course, is to determine the required parameters. Calculate the required minimum (or maximum) limit for each of the parameters:

GBW  $\geq$  \_\_\_\_\_

Slew rate  $\geq$  \_\_\_\_\_

$V_{os} \leq$  \_\_\_\_\_

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<sup>1</sup> Totally made up.