

Transistor gain boosts capacitor value

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In many applications, designers try to avoid specifying large capacitors. Besides being expensive, they are usually leaky, have poorly tolerated values, and are physically large. But such large-capacitor problems as these can be circumvented by using the gain of a transistor to multiply capacitance. A simple circuit will do the job, allowing a much smaller capacitor to be used instead.

In the circuit of (a), the effective capacitance, which is shown in color, is the result of the gain of the transistor:

$$C' = \beta C$$

where C' is the effective capacitance value, C is the ac-

Capacitance multiplier. A large effective capacitance (C') can be obtained from a small capacitor (C) by using transistor gain to multiply the actual capacitance value, as shown in (a). The technique is especially convenient in reducing the size of the bypass capacitor in a cascaded emitter-coupled amplifier (b). Here, the capacitance needed is decreased by a factor of 100—from 1,270 to 12.7 μF .

