ısistor Capacitance Multiplier Circuit

ınsistor capacitance multiplier can be used to give additional levels of ıing in many areas of electronics

ɔr Circuit Types Include:

r circuit types Common emitter Emitter follower Common base Darlington pair Sziklai pair : mirror Long tailed pair Constant current source Capacitance multiplier Two transistor High pass filter

Transistor circuit design

citance multiplier is a very useful circuit in many respects - it provides a significant improvement in ıg, benefitting from the gain of the transistor.

ıistor capacitance multiplier is not only able to provide improved performance, but it can also save on gh value capacitors can often take up large amounts of space and therefore the transistor capacitance · can help reduce the size of the capacitor and hence reduce space.

ular the capacitance multiplier circuit is important in areas where good noise performance is nt. It is often found that many linear voltage regulators, or even within switch mode regulators which rate high levels of noise as a result of the switching mechanism.

circuits, good noise performance is paramount. For example in RF circuits using phase locked loops e noise is often crucial, especially where data is transmitted using phase modulation. Any noise on the pply can manifest itself as phase noise, which in tern results in increase bit error rates.

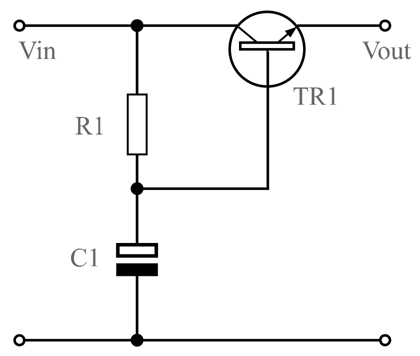
ɿuisition systems also require very low noise in power rails. High resolution digital to analogue ·s require low noise rails otherwise the noise can exceed the D2A resolution negating the high ınce and resolution levels.

gh fidelity audio systems, noise performance is paramount. Any noise on power rails, especially in the ifier stages can result in annoying hiss in the output.

ɘ just a few applications where an active transistor capacitance multiplier circuit can be used to reduce ɘls and improve the power rail performance.

: capacitance multiplier circuit

: capacitance multiplier circuit is essentially a simple emitter follower with a capacitor on the base and ɘsistor from the input to the base to turn the transistor on. A capacitor from the base to ground the smoothing.



Basic transistor capacitance multiplier

citance multiplier circuit operation is quite straightforward. It acts as a simple emitter follower. The ℛ1 provides bias for the base emitter junction, and the capacitor provides smoothing. This considerably he levels on noise on the output, i.e. Vout.

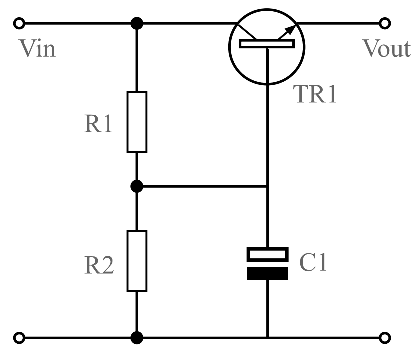
t of placing the transistor in the circuit is that it effectively multiplies the capacitance on the base by nt gain of the transistor, i.e. by β

citance multiplier circuit is not a voltage regulator. The output voltage varies directly with the input Vin is no voltage reference. Generally the output voltage is about 0.65V less than the base voltage, and - 3 V less than Vin when a load is applied.

e and noise levels on the output can be reduced to very low levels> Increasing the values of R1 and C1 ıe output ripple, and increasingly at low frequencies. On the downside large values of R1 and C1 cause ıt to rise slowly towards the required value after turn on, because of the large time constant of R1 and

ified capacitance multiplier

ıback of the circuit is that in its basic form, there is very little voltage drop across the series pass ,, and noise reduction is not as high as it may be. To overcome this, some people place a resistor e capacitor and this provides a potential divider reducing the voltage at the base and increasing the rop across the transistor. This enables it to provide better noise reduction, although it does increase ssipation and reduces the voltage at Vout.



Basic transistor capacitance multiplier with a potential divider

ion of the capacitance multiplier circuit includes an additional resistor from the base to ground to ıe base voltage and provide additional voltage drop across the transistor for improved smoothing. This nportant when the levels of ripple are higher.

the voltage through the potential divider should be sufficient to maintain the base voltage sufficiently. ıent can be made regarding the level of current though the potential divider, but often in these types ; it may be ten times the base current. This would ensure that the emitter voltage is maintained over a ȝe of output current levels.

ıple application for a capacitance multiplier

ɜr supply shown here provides only smoothing at this stage and no stabilisation or voltage regulation. t is taken from the mains and rectified by the bridge rectifier. It then passes into a smoothing , C1, to provide the first smoothing and remove the major ripple. This capacitor should have a large rent capability if the supply is to be used for high current levels.

be remembered that the capacitance multiplication effect can only be realised if there is a sufficient rop across the series transistor. Typically this should be a minimum of 3 volts at all times.

ıcitor C2 is connected to the base of the transistor TR1. This provides the capacitance for the ıce multiplication effect.

ɜ main pass transistor and must be able to drop the required voltage and at the required current, so ssipation may need to be calculated.

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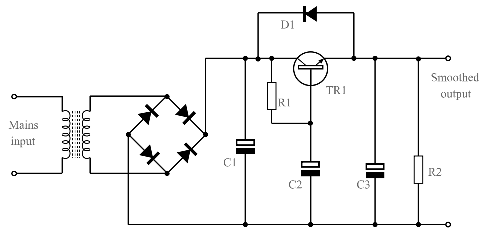

Example application for a capacitance multiplier

utput there is a capacitor to provide a little further decoupling and to ensure that the circuit remains ıe resistor ensures the output voltage drains away at power removal. The diode D1 ensures that the r does not become reverse biased.

like this can be used in many areas including audio amplifiers and many other applications.

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