Chapter 29: Circuit Board Layout for EMC

29.1 Determine a reasonable physical layout of the components of a π filter if all three dimensions are considered.

29.2 Provide one example (not given in this chapter) for each of the following signal classification categories: 1) low-level low-frequency analog, 2) low-level high-frequency analog, 3) digital, and 4) dc power.

29.3 Provide one example (not given in this chapter) for each of the following signal classification categories: 1) ac power, 2) high-level low-frequency analog, 3) high-level high-frequency analog, 4) low-level transient, and 5) high-level transient.

29.4 One side of a double-sided board is a dedicated ground plane. The other side contains the components, signal traces, and power traces. What should be done with the remaining copper on the unused portions of the component side of the board? Explain.

29.5 Qualitatively compare the following configurations for a ten-layer board: (1) *S*1-*G*1-*S*2-*S*3-*G*2-*P*-*S*4-*S*5-*G*3-*S*6; (2) *S*1-*S*2-*G*1-*P*1-*S*3-*S*4-*P*2-*G*2-*S*5-*S*6.

29.6 It is stated that signals are slower on multilayer boards than single-sided or double-sided boards. Under what conditions, if any, is this a true statement.

29.7EC Simulate the circuit shown in Figure 1 using SPICE (or other circuit simulation package), and show that it oscillates around 100 MHz. (The modulating ac signal has an amplitude of 15 mV and a frequency of 200 kHz.) Then, model the 3.85 V battery and connecting wire as a 3.85 V dc source in series with a 78 Ω resistor and 20 nH inductor. Does the circuit still oscillate? If not, device a method of correcting the problem using decoupling capacitor(s) and test it using SPICE (or other circuit simulation package).

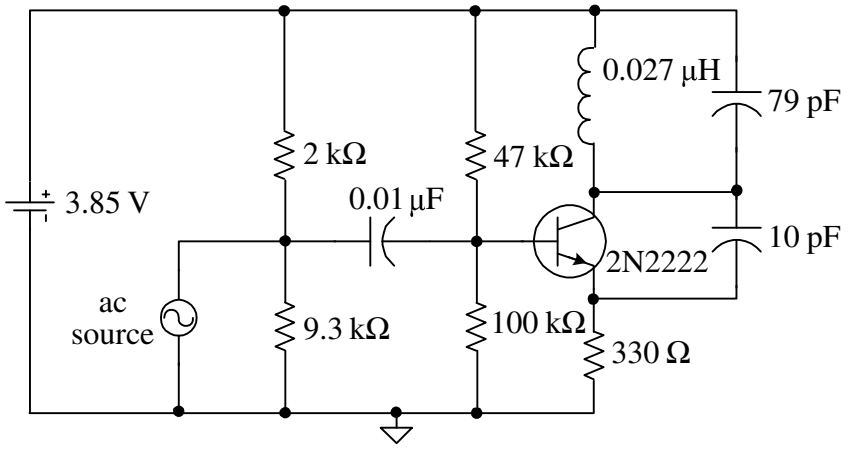

Figure 1

29.8S Using a databook, determine the value of a decoupling capacitor for any single modern digital device. State all assumptions.

29.9 Why are bulk decoupling capacitors selected to be ten times the value of the sum of the smaller chip decoupling capacitors instead of equal to the sum?

29.10 A power bus is composed of two conducting planes tied together at many locations through 1 Ω resistors. Discuss the advantages and disadvantages of this scheme.

29.11 To reduce emissions and susceptibility, the most important principle is the control of _____?