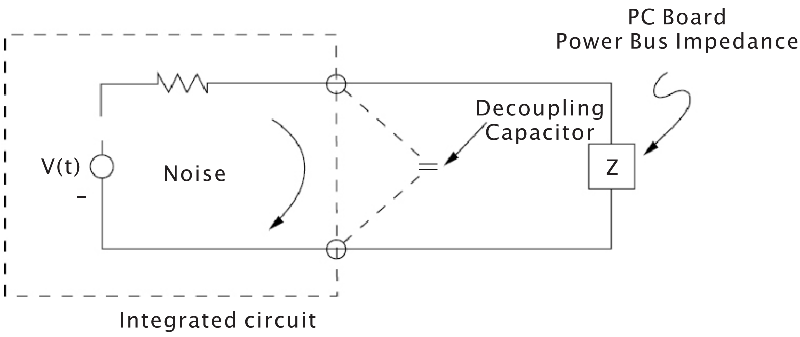
We can generalize this power bus noise voltage problem by modeling the PC board power bus as a lumped impedance through which active devices (integrated circuits, for example) draw high frequency current. An idea board impedance would have value of zero ohms. i.e., an active device could draw infinite switching current yet introduce no significant differential noise voltage to the PC board bus. This ideal situation is never achieved in practice. To reduce the magnitude of the board impedance, circuit designers add decoupling capacitors across the power and ground conductors of the PC board in an attempt to provide a "local" source of charge for each active device. This technique can also be viewed as placing a high frequency "short circuit" across the active device's power and ground pins, as shown in Figure 9.
我們對電源匯流排的雜訊電壓問題可以一模型來作歸納，就是基板的電源匯流排可視為一整體的阻抗，而主動元件(像是積體電路)由此獲得高頻電流，一理想的基板阻抗應為零，也就是說，一主動元件能獲得極大的切換電流而不會對基板的匯流排造成有明顯差距的雜訊電壓，此理想狀況在現實中是不可能的，要減低基板的阻抗，電路設計者會在基板電源及接地導線間加入抑制耦合的電容以提供每一個主動元件的電源及接地的接腳加上一個高頻的"短路電路"，如圖例九所示。



RE 9: PC board noise model with board impedance, integrated circuit, and decoupling capacitors

While decoupling capacitors may provide adequate noise filtering at frequencies up to 75 MHz, their performance at higher frequencies will be dramatically reduced by the presence of circuit resonances.These resonances arise from the interaction of the decoupling capacitors with device lead and interconnect inductance in essence, capacitors become functional inductors at higher frequencies. Many EMC engineers have observed and solved frustrating noise problems that arise unexpectedly from unique combinations of noise frequencies, PC board layouts and decoupling capacitors.
雖然抑制耦合電容能有效抑制75MHz以下的雜訊，但他在較高頻帶的表現，會因電路共振的出現而顯著地降低，這些共振導源於抑制耦合電容與元件導線及相互連接之電感的交互作用。本質上，電容在高頻時其作用如電感一般，很多的EMC工程師已觀察並解決很多由某些雜訊頻率的結合，基板電路配線及抑制耦合電容所產生之雜訊問題。

Filtering The Power Input Pins of Active Devices With EMI Suppression Ferrites
(以抑制電磁波干擾的鐵氧磁體來過濾主動元件的電源輸入接腳)

While the resonant behavior of decoupling capacitor arrangements limits their effectiveness at higher frequencies, the performance of Gausstek ferrites actually improves with increasing frequencies. Since Gausstek EMI suppressionferrites present an essentially resistive (lossy) impedance at high frequencies, they cannot by themselves introduce performance limiting circuit resonances. When used in conjunction with decoupling capacitors, ferrites can provide additional EMI source suppression by blocking and dissipating power bus noise generated by high speed logic devices. Note that a capacitor still must be used at the power input pin of the active device, since the ferrite by its nature will block the high speed switching current that the device requires to operate.Figure 10 shows an example of a ferrite bead and capacitor filter that is often used in personal computer clock oscillator circuits.
由於這種抑制耦合電容的方式在高頻產生的共振行為會限制其在高頻的效果，豐晶科技的鐵氧磁體可真正的提昇在高頻的表現，因豐晶科技用於抑制電磁波干擾的鐵氧磁體在高頻時其本質上具有一抵抗性的(損耗的)阻抗質，所以自身並不會有限制電路共振的表現，當與抑制耦合的電容併用時，鐵氧磁體能藉由阻止和吸收由高速邏輯元件產生之電源匯流排雜訊以提供對電磁波干擾源額外的抑制，需注意的是主動元件的電源輸出接腳上的電容仍是必需的，因鐵氧磁體在本質上會阻斷元件得以運作的高速切換電流，圖例10為一常用於個人電腦中計時振盪電路的鐵氧磁體磁珠及電容濾波器。

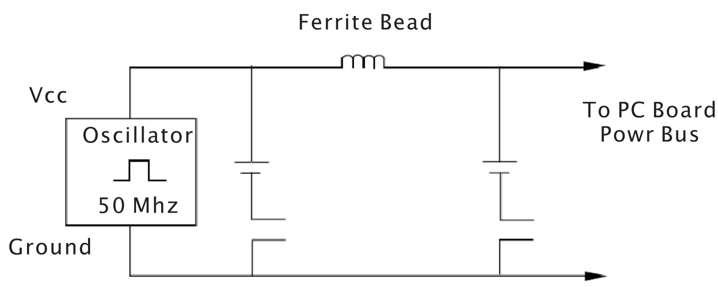


FIGURE 10: Ferrite and decoupling capacitors for high frequency DC power filtering