

Inner Ground Ring Via Structure

Sizing, Spacing & How to Achieve It

Ground Ring: The vias that make up the inner GND ring serve to carry the return current as the signal travels along the via. The GND via structure can be thought of as the shield of a coax cable. For this to be true the spacing between the vias should be less than $\frac{1}{4}$ of the wavelength at the maximum frequency of interest.

A quick way to find a starting point for the size of the GND ring is to calculate it from the impedance of a coax.

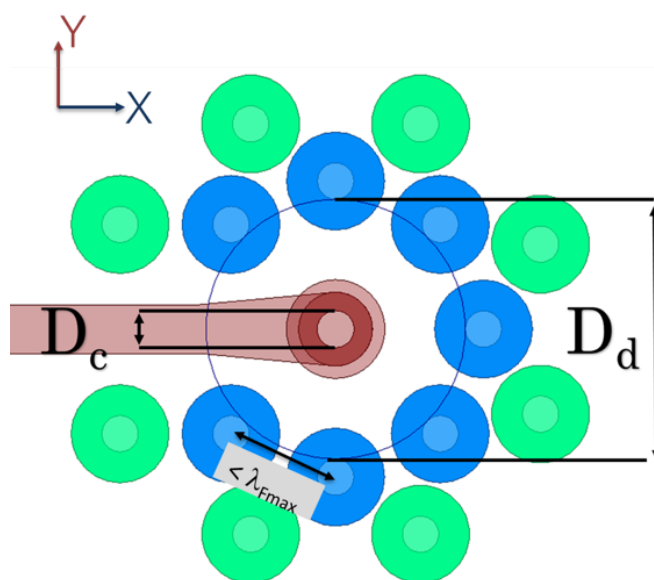


Figure 1: Impedance calculation for sizing the inner GND ring

The following is an equation for estimating a starting value. By setting Z_0 to 50 Ohms, a good initial value for D_d can be estimated. However, If the via is very short, for example, Z_0 might have to be set higher than 50 Ohms because the via impedance is impacted by the transition from the connector body itself.

$$Z_0 = \frac{138 \log_{10} \left(\frac{D_d}{D_c} \right)}{\sqrt{\epsilon_R}} \quad (\text{Eqn. 2})$$

Where,

Z_0 = Impedance in Ohms

D_d = Inner GND ring size

D_c = Drill size of the signal via

ϵ_r = Dielectric constant in the XY plane

Hence, while this is a good starting value, it will be need to fine-tuned in simulation.

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