



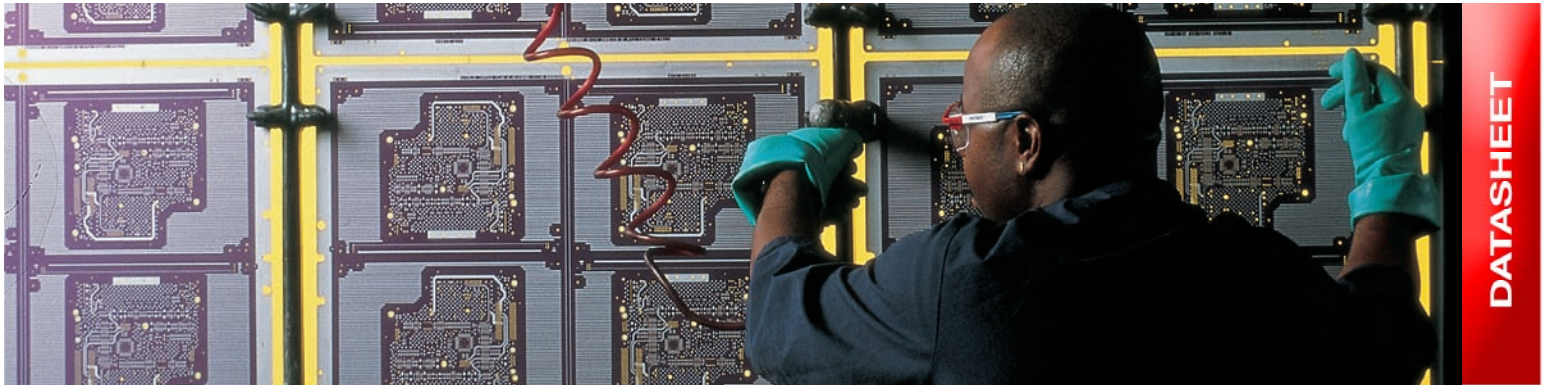
SANMINA - SCI®

PCB FABRICATION

Dk and Df Studies for Advanced Signal Integrity

Improve signal integrity.

Know the effects of dielectric constants and dissipation factors on your printed circuit boards.



When studying dielectric constants (Dk) and dissipation factors (Df), it is critical to use a single-scaling system. Using multiple systems or different industry standards may cause different results, even from the same material. As there is no known conversion factor for these different results, using a single-scaling system becomes essential for achieving accurate material comparisons, especially in cost-sensitive jobs and jobs requiring critical electronic properties.

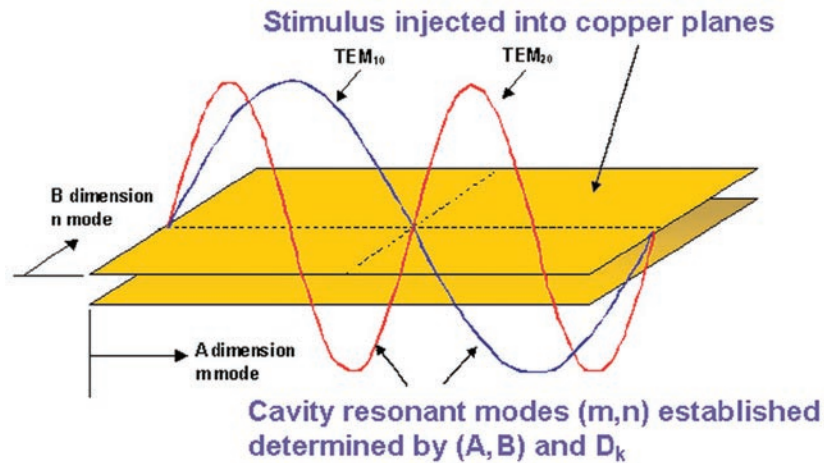
Modified FSR for Dk Measurement

Sanmina-SCI® has modified a Full Sheet Resonance (FSR) measurement method to provide accurate GHz-range measurements of Dk in dielectric materials. This method has the following benefits:

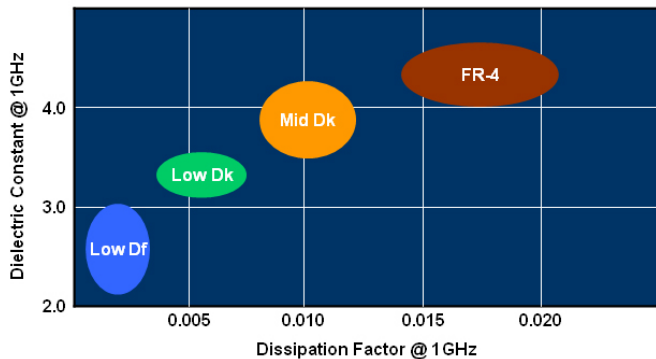
- It can minimize the influence of variations in PCB production on Dk measurement data.
- It allows for the measurement of each dielectric layer, be it core or prepreg layer.
- It provides good repeatability and a detection limit fine enough for most applications.

Measured electrical data:

- Help define technology trends
- Help identify the benefits of improving individual technologies
- Available in a stack-up simulator for electrical simulation



Theory of Full Sheet Resonance (FSR)



GHz-range measurements

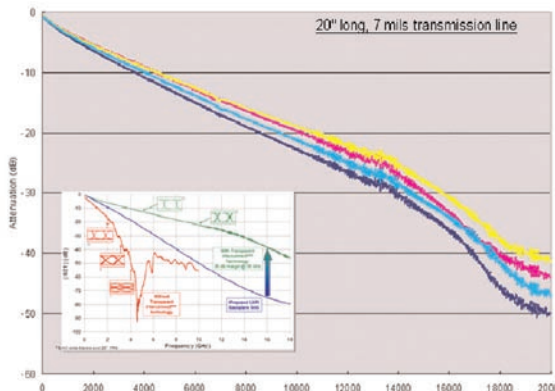
Df and Total Attenuation

As signal speeds increase, Df contributes to signal attenuation in greater amounts. However, as other factors (such as skin-depth losses) contribute to signal attenuation in greater proportions, the percentage of attenuation attributed to Df decreases.

Sanmina-SCI is studying Df and other contributors to attenuation by using methods such as eye diagram analysis and S-parameter measurements for advanced signal-integrity applications. These studies help define technology trends and the potential benefit of improving individual technologies.

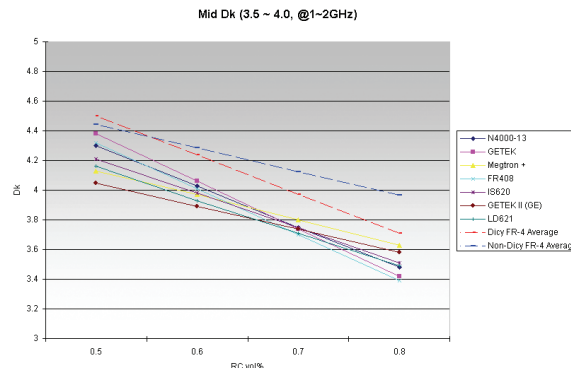
Custom-made Special Board Builder for Tailored Products

Sanmina-SCI integrates all of its measured electrical property data, production parameters and limits into a self-developed stack-up simulator/builder. This enriched stack-up builder allows structural and electrical simulation while providing the best product in terms of performance and cost considerations. For more detailed information, contact Sanmina-SCI with the requirements of your next project.



An attenuation analysis

As one of the world's largest manufacturers of high-technology PCBs, Sanmina-SCI has significant experience in the design and production of boards using industry-leading technologies. We offer these technologies throughout each of our fabrication sites in the United States and worldwide, providing design for manufacturability (DFM) support for our customers in pre-design and layout phases to ensure a smooth integration of these technologies to the production process.



Dielectric constant by resin content and material

About Sanmina-SCI

Sanmina-SCI Corporation is a leading electronics contract manufacturer serving the fastest-growing segments of the global Electronics Manufacturing Services (EMS) market. Recognized as a technology leader, Sanmina-SCI provides end-to-end manufacturing solutions, delivering unsurpassed quality and support to OEMs primarily in the communications, defense and aerospace, industrial and semiconductor systems, medical instrumentation, multimedia, enterprise computing and storage, and automotive technology sectors. Sanmina-SCI has facilities strategically located in key regions throughout the world. More information regarding the company is available at www.sanmina-sci.com.



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