



APPLICATION NOTES

THE COAXIAL LINE TO MICROSTRIP INTERFACE

Although the impedance of the connectors and seals can be tightly controlled at the point of manufacture, their performance in a system will be greatly affected by the method and process of attaching the seal pin to the microstrip line. It is very important for any discontinuities introduced by the pin attachment to be minimized and “tweaked” as much as possible to get the maximum electrical performance from the connector and seal.

The first step toward the best match is to select a seal with a pin diameter as close as possible to the microstrip line width. If the coaxial section (pin) is significantly larger than the microstrip section (line), the circuit will show an inductive discontinuity as the input signal radiates farther on the pin before entering the line (antenna effect). Conversely, if the line section is significantly larger than the pin, the circuit will become capacitive in this section.

Perhaps the most important part of the entire connector/seal/microstrip assembly is the pin-to-line attachment method and process. Please note that as connector manufacturers rather than microstrip circuit designers, we cannot recommend any specific method of pin attachment. The information shown here has been compiled from discussions with our customers. The method used in a given situation will depend on the specific design and operating requirements of the device, and the equipment available to the circuit manufacturer. As with any electronic device, tradeoffs are commonly required to balance the need for performance over a narrow or wide frequency bandwidth and environmental and mechanical considerations.

When a microstrip device is subjected to a wide temperature range during service, a circumstance frequently arises which adds yet another consideration to the decision on the pin attachment method. If the thermal expansion coefficient of the package material is different from that of the substrate, relative movement between the pin and the line will occur during temperature changes. With widely different expansion rates and/or wide temperature ranges, this movement can be enough to break a direct pin-to-line bond. In these cases, an attachment incorporating a sliding contact or a looped gold ribbon is commonly used to permit movement of the line relative to the pin. Keep in mind that most methods used to allow this movement will add discontinuities greater than those from a direct bond.

Whichever method is used for the pin attachment, a prototype unit should be examined with a fast rise-time TDR to determine if the attachment section is inductive or capacitive. An appropriate amount of capacitance or inductance should be added to the circuit to compensate for the discontinuities found.