Application Note M-112

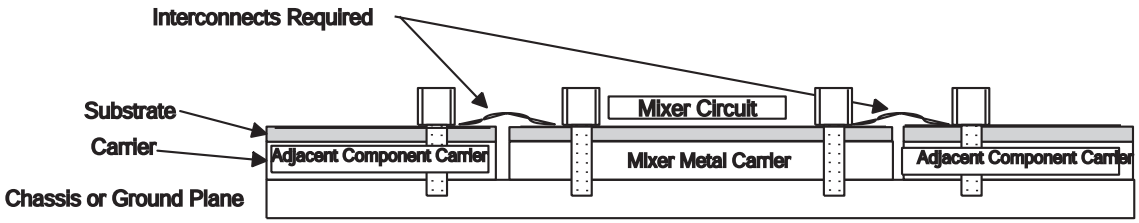
SELECTING AND USING MINIATURE MICROSTRIP AND SURFACE-MOUNT MIXERS

SELECTING THE BEST MIXER FOR YOUR APPLICATION

Spectrum Microwave offers several mixer packages that allow users designing integrated multifunction modules to integrate the mixer function without the need for coaxial connectors.

Miniature Microstrip Carrier Mixers:
Mechanical Mounting

Spectrum Microwave microstrip mixers are fabricated by soldering the RF mixer circuit to a metal carrier. This package type is recommended when integrating a mixer with other hybrid microstrip substrates such as amplifier and filter modules (see Figure 1). The carriers are installed with four screws (2-56 UNF for the "MS2" outline and 0-80 UNF for others). The screws can be installed with lock washers or a thread locking compound to assure retention in environmental extremes.



It is recommended that the cavity, which the mixer will be mounted into, is made approximately .010 inches (.254 mm) larger then the mixer carrier size. Slightly greater clearance is possible with lower (<5 GHz) mixers if desired.

The top of the mixer circuit does not have to line-up perfectly with the top of adjacent circuits. For Ku-band models, the difference in height can be as large as .010 inches (.254 mm), while as much as twice this amount is tolerable below 4 GHz.

Unless the mounting surface has extreme irregularity, it is not necessary to install the mixer with conductive epoxy or solder for the ground plane contact. The mounting screws provide sufficient pressure to assure adequate carrier grounding.

Connections
Solder Interface to a Printed Circuit Board:

1) To facilitate integration, the traces on Spectrum Microwave's carrier mixers are tin plated or coated with a solderable alloy. When interfacing to a printed circuit board with a solderable trace, the simplest and most cost effective interface is made with a tin plated copper ribbon (Figure 2). The ribbon is first soldered to the interfacing trace, a small stress relief is formed, and the other end of the ribbon is soldered to the mixer trace. An exaggerated stress relief can cause performance degradation. The ribbon should be .010 to .150 inches wide (.254 to 3.81 mm) for an optimum interface.

In order to reduce cost, MOST Spectrum Microwave surface mount mixers do not use the FR4 carrier material. These are constructed from a single piece of stiffer RF circuit material and are the thinnest mixers Spectrum Microwave offers. Mixers with package suffix "SMD" and "SMH" are constructed in this manner (see Figure 8). While the performance of these mixers is equivalent to the carrier mixer, this performance can only be achieved when the user provides the needed clearance under the mixer. This may involve a small cut-out in the mating PC board, or even more additional clearance beneath the PC board. In addition, the carrierless mixers are slightly more fragile. However, both types can be easily accommodated by automatic assembly equipment.

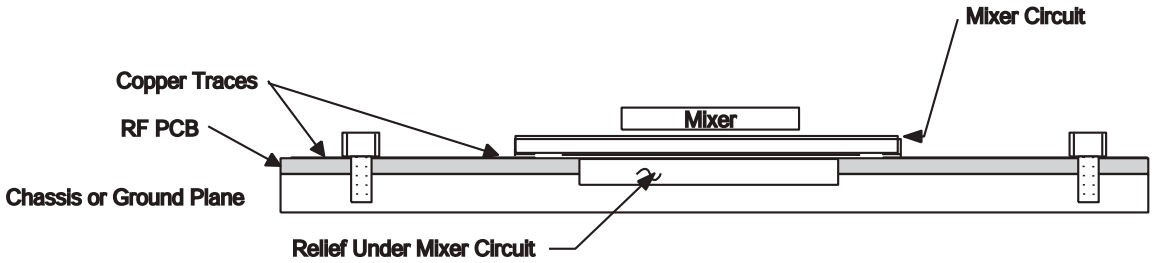


Figure 8. Surface Mount Carrierless Mixer

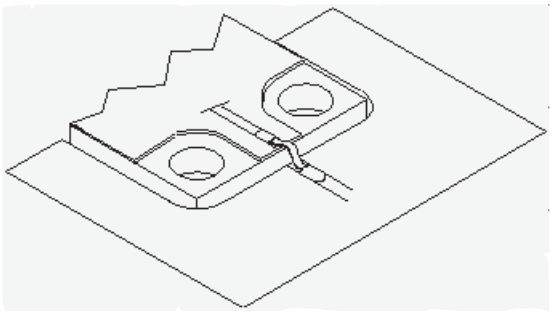


Figure 2

Interfacing to Gold Traces on Hybrid Substrates:

For integration with thin or thick-film assembly, the interface can be accomplished using any of the following methods:

1) The first method uses a gold plated copper ribbon for the interface (Figure 3). The ribbon is gap welded to the gold system trace, a small stress relief is formed, and the other end of the ribbon is soldered to the mixer trace.

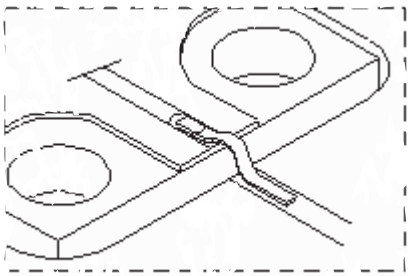


Figure 3

2) The second method uses a pure silver ribbon for the interface (Figure 4). The mixer trace is reflowed with solder alloy or is tin plated. The silver ribbon is then solder reflowed onto the mixer trace, a small stress relief is formed, and the other end of the silver ribbon is gap welded to the gold system trace.

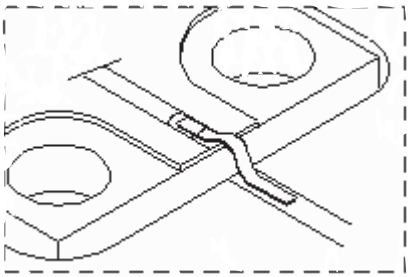


Figure 4