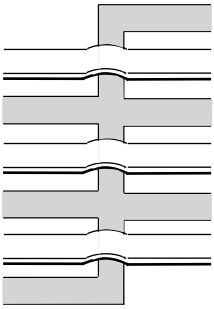
Patterned Substrate Products

AIR OR POLYIMIDE SUPPORTED BRIDGES

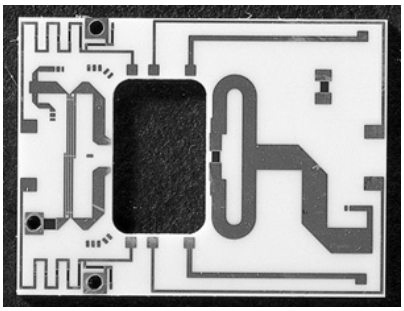
Vishay Electro-Films (EFI) has extensive experience in providing rugged and well-defined air bridges down to 0.001 inch width and with consistent air gap dimensions. The substrate to the right has air bridges associated with the lange coupler section of this microwave circuit.

The line drawing depicts a close up view of the air bridge configuration. The shaded portion of the drawing is the first conductor layer. A sacrificial layer is deposited and patterned before the second conductor layer is put in place. The intermediate layer is then removed leaving the completed air bridge. The same process can be done using polymide; in this case the intermediate polymide layer remains in place on the finished part. Bridges supported by polymide provide a more rugged structure for handling during final hybrid assembly.



LANGE COUPLERS

Combining its fine pattern and supported bridge capabilities, Vishay Electro-Films can offer large coupler features down to 0.5 mil with pattern resolution of 0.1 mil. This type of coupler offers compact design, wide band width and low loss parameters.



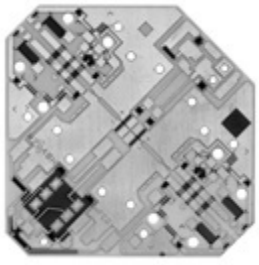
BACKSIDE PATTERNING AND FRONT TO BACK VIA CONNECTION

Conductor interconnect patterns or ground plane definition can be provided on the bottom surface of the substrate. Front to back alignment can be held to 0.003 inches.

The side by side photographs below show the top and bottom conductor patterns of a two-sided patterned substrate. Interconnection from the top and bottom pattern is by metalized through holes.

Front to ground plate or back side conduction pattern connections can be made by metalized through holes, patterned wrap around edges or by means of filled vias. Wherever possible metalized through holes or patterned wrap around edges (or a combination of both) are recommended. The minimum recommended metalized through hole diameter is 80 % of the substrate thickness.

The filled via process adds significant complexity and thus cost to the process. Filled vias, however, can be used to provide additional low thermal conductivity paths to a ground plate heat sink where necessary. Vias are planar to 100 microinches.



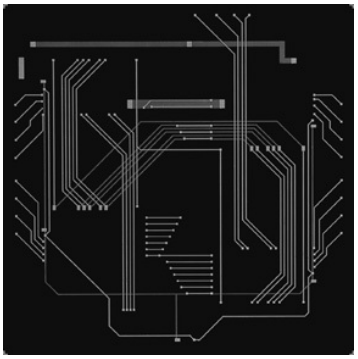
Substrate Pattern Characteristics & Capabilities

Vishay Electro-Films

MULTI-LAYER INTERCONNECT METALIZATION

Areas of first level metalization can be overcoated with polyimide and a second level of interconnects can be provided to accommodate high density interconnect requirements.

Two levels of conductors can be seen in areas of the substrate shown to the right. In this case interconnects to the chips on the first layer and to conductors on the first layer are made with wire bonding to the second layer. Interconnects can also be made by metalized through vias.



HIGH TEMPERATURE APPLICATIONS

When designing hybrid assemblies to operate at temperatures above 125 °C it becomes important to provide monometallic interconnects to prevent intermetalic diffusion and resultant long term reliability problems. For these situations, Vishay Electro-Films (EFI) has developed processes for depositing both aluminum and gold bonding pads on the same substrate. This structure provides for monometallic interconnects. Aluminum wire can be used to connect from the aluminum pads on the substrate. Similarly, gold wire can be used to connect gold pads on the substrate to gold hermetic package terminals. Appropriate barrier metals are included in substrate processing to provide long term reliability in high temperature applications.

Products using this technology have successfully operated at 250 °C. The graph on the Resistor Long Term Stability data sheet illustrates stable performance of Vishay EFI nichrome resistors at 200 °C operating temperature.

The photgraph to the right shows aluminum bonding pads (light gray) around the active chip bond pad. These aluminum pads are connected to the gold conductor traces with appropriate metallic barrier metalization.