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TCR® Thin Film Embedded Resistor Foil
Process & Material Recommendations for Improving Resistor Definition

TECHNICAL BULLETIN

Nickel Chromium or Nickel Chromium Aluminum Silicon resistive materials can be processed to achieve resistors that are on the target value and have a finished tolerance within +/- 10%. Although resistor tolerances are a function of resistor dimensions, (the smaller the resistor the larger the finished tolerance), process and material improvements can made to improved resistor definition and minimize variation.

There are several key processes that must be in control and possibly modified to ensure properly defined resistor patterns. The processing can be properly controlled provided attention is paid to several considerations.

What to Consider

The first consideration is ensuring proper equipment and set up for the photoresist application and subsequent exposure and development.

The second consideration is the proper process control for selective copper removal to define resistor length. The etchant chemistry and its consistency in etching are critical to achieving finished resistor value and tolerance.

The last consideration is changes of materials or processing for improving etch definition. Many processes or materials can be optimized to give optimum results.

Conclusions

The copper and resistive layers can be completely removed with excellent circuit definition when care is taken to follow the considerations.

If you have further questions concerning the processing of TCR Thin Film Embedded Resistor Foil please consult the Ticer Technologies Technical Marketing or Research and Development.

Process & Material Recommendations for Improving Resistor Definition

Materials

- At process steps to define resistor length use a 50 micron (2 mils) thick photoresist to conform over and around etched circuits.
- Photoresists optimized for stability in high pH solutions can improve finished resistor definition when using ammoniacal etchants. Consult photoresist supplier for film recommendations, i.e. film used for Gold plating is typically robust.
- Use silver film instead of diazo artwork for better overall definition.
- TCR is available in 35, 18, and 12 micron copper thicknesses. Manufacturing with a thinner copper foil can significantly improve etch performance.

Photoresist Application

- Increase roll pressure and slow roller speed to improve conformance.
- Increase temperature slightly so that photoresist flows more but does not crosslink. An exit temperature of 65^{o} C is ideal for most photoresists.
- Use a vacuum photoresist laminator to improve photoresist conformance.

Exposure

- Optimize exposure for a step wedge of 8 or 9 copper clear.

Develop

- Use a UV “bump” to hardened photoresist after development. Ensure the “bump” does not cause the photoresist to become brittle or have stripping issues.

Etch

- Verify that the etcher is consistently giving the same copper etch breakpoint. Control of this is critical to tight resistor tolerances.
- Ensure etch chamber and nozzle pattern is set-up to deliver uniform etching across the entire panel.
- Ticer Technologies’ TCR thin film embedded resistor foil is very low profile. Ensure etchant is not overetching and undercutting the resistor or lifting photoresist.

Resist Stripping

- Resist stripper pressure should be controlled between 140 – 220 kPa (20 – 32 psi) .

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