

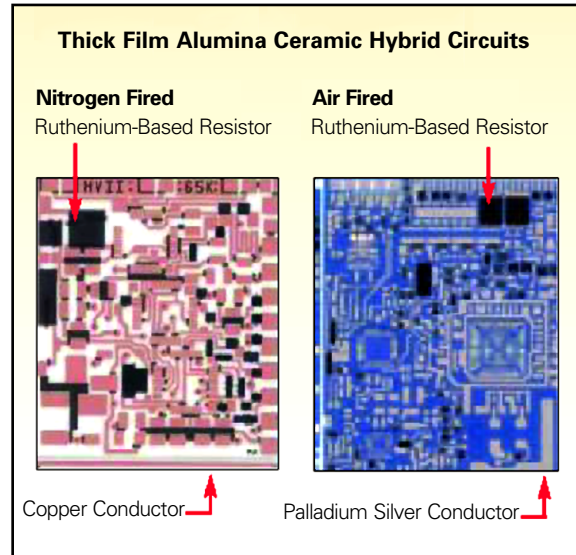
Ruthenium - Based Thick Film Resistors

Description – This technology is a method for forming ruthenium-based thick film resistors with copper terminations. The thick film resistor is fired in the same non-oxidizing nitrogen atmosphere required for firing the copper terminations, without reducing the thick film resistor to metallic ruthenium.

Thick film resistors, typically providing a resistivity range from about 1 ohm/sq to over 1 megohm/sq, are used to form the highly stable and reliable resistors associated with ceramic-based electronic circuits and components.

A significant advantage of this technology is that a ruthenium-based thick film resistor can be printed and fired on a substrate without complicated formulation and firing steps. The required firing cycle of 15 to 18 minutes is about one-third that of the standard 45 to 60 minutes required for the traditional thick film firing cycle.

This technology is cost-effective for ceramic-based circuits as it replaces noble metal conductors with copper conductors while maintaining the same degree of resistor stability and performance. And this nitrogen-fired ruthenium resistor technology is extendable to organic-based circuits by enabling highly stable buried resistors in organic boards such as FR4.



Technology Data

Category	Status
Commercial viability	– Proven, demonstrated
Patent protection	– Issued
Know-how	– Available

Potential Applications

Industry	Description
Data processing	– Resistor/resistor networks
Telecommunications	– Chip resistors, sensors
Wireless applications	– Hybrid circuits, buried resistors, and printed wiring boards (PWB)
Manufacturing, industrial	– Thick film paste vendors

DELPHI

www.delphi.com

Delphi Technologies, Inc.
M/C 483-400-404
5725 Delphi Drive
Troy, Michigan 48098-2815 U.S.A.
Tel: [1] 248.813.8061 Fax: [1] 248.813.5008