accupr✳be *Probing the World of Microelectronics*

PROBE TIPS #16

A Technical Bulletin for Probing Applications

Probe Cards and High Temperature

Press releases and announcements that so-called high temperature probe cards are available should at all times be treated with some caution. Typically, such cards are said to cover -40°C to +140°C, and even higher temperatures.

Naturally, wafer sort operations wish to test their ICs in and even wider temperature range but this does not automatically set a new requirement for a new special card. First, the issues at hand must be very clearly outlined

TYPES OF PROBING

a) Extreme Low temperature probing (Cryogenic) is typically used for specialized aerospace and military applications.

b) Ambient temperature probing- normal probing for typically low cost devices.

c) Elevated temperature probing (~+85° C)

d) High temperature probing (+ 125° C and higher)

TEMPERATURE IN TESTING

There may be some confusion here: the temperature to which the DUT may be elevated will not be the temperature to which the probe card will be subjected. What matters with regard to the probe card and to selection of the correct material for the card are two types of exposure:

a) Radiant Heat- The physical environment for the probe card, its proximity to the heat source (temp chuck) and its set temperature will determine the radiant exposure to the card.

b) Conducted Heat- contact with the heated device creates thermal conduction along the probe needles to the remainder of the card. Thus, the card and its components begin to rise in temperature. There are many variables which will determine the temperature rise and retention of an individual card. The quality of the PC board material, its color, the layout of the metalization and the construction of the probe array all introduces variables, which will determine the performance of the card at temperature.

Regardless of the form of exposure, the resultant working temperature of the card is easy to measure. Simply place an appropriate temperature sensor, such as a digital temperature gauge, on the card to monitor and measure the temperature of the card. Careful monitoring of the card temperature and correlation with test results will generally tell what works and what does not. Some customers have asked us why the blue cards run hotter than the

beige or green cards. The question itself provides the answer and it again is a clue as to what works and what does not.

CARD MATERIAL

The issue that matters for probe card is the thermal migration temperature of the fiber epoxy material. In the case of the PC material used by Accuprobe, the threshold when the card material becomes unstable is +125°C. it is not unusual to see a 15 or 20 degree differential in that the card will always be experiencing a lower temperature than the device.
For higher temperatures, say DUT temperatures of +180°C, the user should select a card made of Polyimide which is considerably more expensive. The thermal migration point for Polyimide is approximately +240°C.
In practical terms this means that a probing situation where temperatures of +130 to + 140 degrees Celsius are reached will not necessarily require the use of a polyimide or other special card. For the user, it is worth their time to find out the actual heat exposure level of the card to avoid a costly and potentially unnecessary investment in a consumable test fixture.

QUALITY AND PRICE OF THE PROBE CARD

As a user, you will see many competing probe cards which are very similar as to their general appearance and other visual qualities. Yet, you may find seemingly inexplicable differences, at times substantial, in performance and price.
The difference lies in the small, but significant details: the surface color of the card, the grade of the fiber epoxy PC material, the design and layout of the card metalization. Using a lower grade material, the manufacturer may achieve a perfectly functional probe card, but since a low grade is used, application at elevated temperatures are not advisable.
Secondly, cards with a surface color toward the blue- black range absorb more heat and are thus more sensitive to exposure.
ACCUPROBE provides the quality that assures the user will not have to worry about DUT temperatures that lie close to the thermal migration point of Fiber epoxy card material and always provides a high grade FR-4 card that is provided with a light green color to minimize radiant heat absorption.
ACCUPROBE cards are made of NEMA type FR-4, are stable to +125° C and can typically be applied to testing devices up to +130°C. The special polyimide cards, which should be reserved for very high temperature exposures, are designed to be operated at up to +240°C.
As so often, quality has its price. Carefully consider the card material, construction and layout considerations before making your buying decision. Not all probe cards are created equal.

BITA ELECTRONIQUE S.A.
45 Rte d'Arlon
LU-1140 LUXEMBOURG VILLE
Gr. D. Luxembourg
Ph. +352 450010
Fx. +352 332643
info@bita.lu - www.bita.lu

BITA ELEKTRONIK SVENSKA AB
POB 3434
SE-10368 STOCKHOLM
Sweden
Ph. +46 (8) 319000
Fx. +46 (8) 326064
info@bita.se - www.bita.se