APPLICATION NOTE

TEMPERATURE CYCLE TESTING OF HIGH RELIABILITY ICs

The Problem:

Packaged integrated circuits (ICs) used in high-reliability computer systems must function reliably over a wide range of temperatures. This is particularly important for power dissipating devices such as gate arrays. The Automated Test Engineering department of a major manufacturer of computer systems was responsible for developing meaningful operational test procedures for ICs.

Currently available temperature cycle test equipment uses a thermocouple to control the test system's heater and cooler. The thermocouple is positioned close to the IC package after the IC is inserted into the test apparatus. The test systems exhibited irreproducible results. For example, a group of ICs rejected in the first test would meet specification, while others that had met specification in the first test would be rejected in the retest. AS there appeared to be no problem with the system's ability to test the electrical characteristics of the IC, attention was focused on determining the actual IC's package temperature.

By epoxying fine wire thermocouples to the IC package, the test engineers were able to show that the control thermocouple did not track reliably the IC's package temperature which explained the irreproducible results.

The Solution:

Because of problems using thermocouples to measure surface temperatures (poor thermal contact plus measurement offset caused by heat drain through the thermally conductive leads), the company's test engineers decided to use Luxtron's Model 750 Fluoroptic® Thermometer with MEL soft-tipped surface temperature probes to measure IC package surface temperatures. The soft-tipped probes allow the fluorescent temperature sensing material to make intimate contact with the surface with only brief light contact while the low thermal mass of the sensor and low thermal conductivity of the probe assure that there is no heat drain from the sensor or the IC package.

A test board was assembled which included a ZIF (zero insertion force) test socket with a hole machined into it to allow the MEL probe tip to touch the underside of the IC package. The MEL tip was mounted so that when the IC was pushed into the socket, the tip would touch and deform against the IC package. Using the temperature output of the Luxtron 750, the test engineers were able to generate reproducible test results in the laboratory and are now working to bring the system into use for production testing.

LUXTRON® CORPORATION
3033 Scott Boulevard, Santa Clara, CA 95054 ph: 408.727.1600 fx: 408.7271677 www.luxtron.com