Cook Your Chips and PCBs

Rick Nelson  - May 01, 1999
For accelerated dynamic burn-in (ADBI), shows promise for detecting weak parts when combined with IDDQ testing. Though not yet ready for prime time, ADBI shows promise as efforts proceed to provide maximum reliability in minimum time.

More Stress Sooner

If you're burning-in VLSI devices you won't need ±0.1°C accuracy. Accuracy is nevertheless important, especially when testing surface-mount packages. The thermal mass of a flip-chip or C4 package can result in the device quickly reaching destructive temperatures in response to incorrect thermal control.

Precise thermal control and fast thermal response are critical in today's test environments. Accuracy is paramount if you're testing high-speed digital devices, where even a delay of one degree Celsius can result in a 20% loss of performance. For such applications, you can employ systems such as Saunders & Associates' temperature test systems, designed to meet the demanding requirements but also including—or being compatible with—the necessary instrumentation. In addition, your temperature control's thermal mass should be matched with the available power of your test equipment.

To control the burn-in temperatures of production devices, you will probably need a combination of the hot-plate and hot-shelf methods. Depending on your manufacturing setup and on what equipment you already own, you might choose a system that provides thermal-control capabilities as well as other functions, such as pick-and-place device handling (Fig. 3). In addition, you might need an air-handling system capable of blowing 22 SCFM (cubic feet per minute at standard room temperature and pressure) at temperatures from –60°C to +160°C and at pressure ranging from 0 to 15 psig (pounds per square inch at sea level) (Fig. 4). That complicates matters. You have to choose a system that not only meets your environmental test requirements but also includes—or is compatible with—the necessary instrumentation. In addition, your temperature control's thermal mass should be matched with the available power of your test equipment.

Many vendors combine environmental-test capabilities with other functions. For instance, this pick-and-place memory handler from Delta Design can condition devices at temperatures from –25°C to +160°C. It handles ball grid array packages on TSSOP, QFP, SO-16, and SOIC devices.

Environmental Stress, Thermal Cycling, Thermal Shock

Delta Design's ThermoMate can perform environmental stress testing and memory-handling functions, among others. It has been designed so that it can be used in any production environment available, from high-volume production to small test laboratories, and it can be used in environments that range from –40°C to +200°C.

Figure 1. Some vendors combine environmental-test capabilities with other functions. For instance, this pick-and-place memory handler from Delta Design can condition devices at temperatures from –25°C to +160°C. It handles ball grid array packages on TSSOP, QFP, SO-16, and SOIC devices.

For thermal evaluation of production devices, you can choose from a variety of four-standing environmental chambers, such as the one in Figure 2. If you use a temperature-improving system to deliver conditioned air to your ATE test site.

Figure 2. Some vendors combine environmental-test capabilities with other functions. For instance, this pick-and-place memory handler from Delta Design can condition devices at temperatures from –25°C to +160°C. It handles ball grid array packages on TSSOP, QFP, SO-16, and SOIC devices.

Figure 3. Careful control of semiconductor temperatures operating near device breakdown voltage is important to today's test environments. Accuracy is paramount if you're testing high-speed digital devices, where even a delay of one degree Celsius can result in a 20% loss of performance. For such applications, you can employ systems such as Saunders & Associates' temperature test systems, designed to meet the demanding requirements but also including—or being compatible with—the necessary instrumentation. In addition, your temperature control's thermal mass should be matched with the available power of your test equipment.

Figure 4. Test chambers from -60°C to +160°C can focus 2 to 6 SCFM (cubic feet per minute at standard room temperature and pressure) at temperatures from –60°C to +160°C and at pressures ranging from 0 to 15 psig (pounds per square inch at sea level) (Fig. 4). That complicates matters. You have to choose a system that not only meets your environmental test requirements but also includes—or is compatible with—the necessary instrumentation. In addition, your temperature control's thermal mass should be matched with the available power of your test equipment.

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