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TEST HANDLING OPTIONS

Test 'n Tray: It's dynamite!

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An economic slowdown is an excellent time to reflect and take note of things that don't make much sense in light of tightening circumstances.

Our semiconductor industry is no exception, as some practices and protocols age into senescence.

Certain areas, including lithography, are driven hard to the next node of technology, while others enjoy a more relaxed pace. Backend burn-in and test consume a burgeoning share of resources, perhaps because of the maturity of methods used. It's time for a hard look.

STANDARDIZED CARRIERS

The time has now come to rationalize semiconductor backend processing using standardized carriers for handling and transport of semiconductor devices from burn-in to test, and to mark and pack.

With devices held in carriers for test-'n-tray (TNT), there is no need for hands—human or robotic—to touch a device as it moves through the back end.

Unnecessary handling is just another way to spend money on yield loss, inventory loops and fixturing for each change of package outline.

Carrier transport is easily automated and standardized to support a full range of package types mounted in low-cost carriers or trays.

The concept of Test 'n Tray seems enticing, and it is certainly not new. Strip testing, an early example, was promoted over a decade ago as a way to standardize the handling of large arrays of small semiconductor devices.

Strip testing is still in use today for certain package types amenable to the format.

A major drawback with strip testing is the device is usually partially packaged and must be returned from the test facility back to packaging for finishing and singulation. Further, not all packages are processed in a testable strip format.

A more general solution, TNT is applicable to all device types from high power microprocessors to MEMS sensors.

The broad applicability of the TNT format enables burn-in and test facilities to standardize transport and handling across all product families.

Just as important, the test facility does not require an unusual process flow to route parts back to packaging for finishing.

TNT offers all of the benefits promised by strip testing and more, without the annoying complications of mixed test and package processing.

'Burn-in is another opportunity for simplification—if it can't be reduced or eliminated completely.'

SIMPLIFIED BURN-IN AND TEST

In addition to the obvious cost savings of automating the movement of trays of devices through the back end, eliminating handling of individual parts, TNT greatly simplifies many of the steps involved in burn-in and test.

Devices in a tray are already in an array format ready for parallel testing. The move toward more parallelism in test, driven by the need to reduce test time and cost, has stretched automated handlers to their limits.

Testing up to 16 devices in parallel requires a technical virtuosity of mechanical motion to place the parts rapidly and accurately into waiting sockets.

Individual devices need not be placed furiously into sockets in a blur. Rather, an array of parts is simply moved under the test head, already aligned in place for testing.

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After testing, the next array is quickly swept into position. To increase parallelism of testing, the size of the array of devices is simply increased while the transport stays the same.

The socket contactor is changed-out for each new configuration, but no thermal soak plates, fixtures and custom parts are needed. Seems to be a repeat of the same familiar mantra: faster, cheaper, better, doesn't it!

ANOTHER APPROACH TO SIMPLIFY

Burn-in is another opportunity for simplification, if it cannot be reduced or eliminated altogether. The lingering difficulty in getting rid of burn-in is that high value semiconductor devices typically push process technology to the limit, requiring a reliability screening test, at least for initial production.

If you can get by without any burn-in, you are most likely not pushing technology, and correspondingly, not enjoying the margins that go with the more advanced technologies.

If you do need burn-in, test-during-burn-in, run-in or other variants, TNT has the potential to greatly reduce costs and simplify the electronics associated with burn-in testing.

Arrays of devices are loaded into array sockets with a provision for thermal management and parts are moved in and out of cells for burn-in testing.

The burn-in process can be done in a conventional oven, with the socket assembly mounted on a burn-in board.

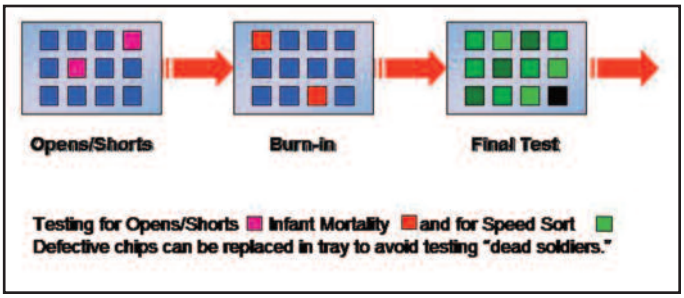
Or better in the long run, burn in testing can be done on stand-alone socket assemblies with integral thermal management functionality.

TEST ELECTRONICS CLOSE TO DUT

The entire assembly can be very compact, allowing the test electronics to be located outside the thermal chamber and in close proximity to the DUTs.

This eliminates the need to place parts into individual sockets on burn in boards that are inserted like trays of cookies into an oven. Even cookies aren't made that way in commercial production.

Furthermore, at the high power levels involved in burn-in of processor chips, an oven is superfluous**.** High performance interconnect to the device under test is more important. TNT offers an easy transition path to a more automated and cost efficient paradigm in which arrays of parts are moved in and out of cells for burn-in testing.



Inertia, as always, is a powerful force holding us back from getting started down the right path.

What about the sunk costs in burn-in ovens? Burn-in boards? The economic argument for TTN is compelling: less than a year pay-back for streamlining back end testing.

There could be no better time than today.

Questions about final test or burn-in?

How to implement Test-in-Tray?

What are the costs of TNT?

What are the benefits and tradeoffs?

Contact Centipede Systems for the answers.

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