Implementing Scan Test with SSN On-Chip Compare and Diagnostic Data Collection on Advantest 93000

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What is SSN (Scan Streaming Network)?

Provides packetized delivery of scan test data

Optional on-chip compare
- Allows concurrent testing of multiple identical cores with the same packets.
- Reduces the test data volume required to test identical cores.
- May require additional testing to collect failure data.
Advanced Topics

On-chip compare: Diagnosis example 2 step 1

• Example: 2 cores fail
  – All cores contribute to accumulated status (default)
    - test_setup procedure setting
  – Accumulated scan output represents failures from both failing cores A1, A4
  – Diagnosis cannot be performed from failure file
Advanced Topics
On-chip compare: Diagnosis example 2 step 2

- Example: 2 cores fail
  - Accumulated scan output represents failures from both failing cores
  - Diagnosis cannot be performed from failure file
- Patch test_setup to disable A2, A3, A4 contribution to accumulated status - apply same pattern
Siemens SSN On-Chip Compare Diagnostic Flow (3)

1. Run Test
2. Log failures
   - >1 sticky bit per global group? [Y/N]
     - Y: Set Contribution
       - Run Test
       - Log failures
     - N: Next Test
       - Pass 1
         - Primary phase
       - Failure Mapping
       - Core Flogs

3. Pass 2-n
   - Retest phase
SSN On-Chip Compare Required Pattern Burst Sequence

Challenges to Solve in 93K Test Implementation:

- Reading sticky bits from multiple labels in a pattern burst
- Modifying ssn_setup pattern at runtime with disable contribution bit settings
- Knowing which 93K pattern vectors correspond with sticky and disable contribution bits
SSN On-Chip Compare Required Pattern Burst Sequence

Test_Setup.stil
SSN_Setup.stil
Payload_1.stil
SSN_end.stil
...
Payload_n.stil
SSN_end.stil
Test_end.stil
Advantest 93K Example Diagnostics Setups

Very configurable through parameters
• Two categories of TestMethod parameters:
  • ScanTest: Based on standard SmarTest TestMethod
  • SSN_OCC_Diagnostics-specific
• User can provide a complete burst pattern to run, or have TestMethod generate a burst at run-time
  • For run-time generation, user specifies individual labels as parameters
Getting Sticky_status and Disable_on_chip_compare_contribution Vector Locations

Annotations for sticky and contribution disable

**Sticky status** (from ssn_end):
Ann {* TESSENT_PRAGMA variable GPS_1.gps_baseband_rtl1_tessent_ssn_scan_host_1_inst.sticky_status -type read -var_bits {0} -pin TDO -relative_cycles {12} *}

**Contribution disable** (from ssn_setup):
Ann {* TESSENT_PRAGMA variable GPS_1.gps_baseband_rtl1_tessent_ssn_scan_host_1_inst.disable_on_chip_compare_contribution -type write -var_bits {0} -pin TDI -relative_cycles {64} *}

1. Identify cycle with annotation
2. Begin edit at annotation cycle + relative_cycles X tck_ratio
Getting Sticky_status and Disable_on_chip_compare_contribution Vector Locations

STIL Patterns → Pattern Conversion Tool → 93K Binary Patterns → Cycle Maps → Sticky Status and Disable Contribution Vector Determination Tool

93000 Test Program
- ReadSsnOccJsonFile
- Sticky Status Info
- Disable Contribution Info
- SSN_OCC_Diagnostics

JSON or CSV File
Conclusions

• Advantest has a working 93000 SmarTest TestMethod for SSN On-Chip Compare Diagnostics in use by a customer for a High-Performance Computing Device with many cores

• Collaboration between Advantest, Siemens, and end-user was critical

• Working on SmartScale and EXA Scale systems (latest 93000 tester architecture)