



SIEMENS EDA

Tessent® Diagnosis

Student Workbook

2019.3

Unpublished work. © 2021 Siemens

This material contains trade secrets or otherwise confidential information owned by Siemens Industry Software Inc. or its affiliates (collectively, "SISW"), or its licensors. Access to and use of this information is strictly limited as set forth in Customer's applicable agreement with SISW. This material may not be copied, distributed, or otherwise disclosed outside of Customer's facilities without the express written permission of SISW, and may not be used in any way not expressly authorized by SISW.

This document is for information and instruction purposes. SISW reserves the right to make changes in specifications and other information contained in this publication without prior notice, and the reader should, in all cases, consult SISW to determine whether any changes have been made. SISW disclaims all warranties with respect to this document including, without limitation, the implied warranties of merchantability, fitness for a particular purpose, and non-infringement of intellectual property.

The terms and conditions governing the sale and licensing of SISW products are set forth in written agreements between SISW and its customers. SISW's **End User License Agreement** may be viewed at:
www.plm.automation.siemens.com/global/en/legal/online-terms/index.html.

No representation or other affirmation of fact contained in this publication shall be deemed to be a warranty or give rise to any liability of SISW whatsoever.

TRADEMARKS: The trademarks, logos, and service marks ("Marks") used herein are the property of Siemens or other parties. No one is permitted to use these Marks without the prior written consent of Siemens or the owner of the Marks, as applicable. The use herein of third party Marks is not an attempt to indicate Siemens as a source of a product, but is intended to indicate a product from, or associated with, a particular third party. A list of Siemens' trademarks may be viewed at: www.plm.automation.siemens.com/global/en/legal/trademarks.html. The registered trademark Linux® is used pursuant to a sublicense from LMI, the exclusive licensee of Linus Torvalds, owner of the mark on a world-wide basis.

Support Center: support.sw.siemens.com

Send Feedback on Documentation: support.sw.siemens.com/doc_feedback_form

Table of Contents

Module 1: Introduction	11
Objectives	12
Tessent Diagnosis With YieldInsight Flow Overview	13
Diagnosis – The Task; Overview	14
Diagnosis — The Task; Analogy	15
Test and Diagnosis — Overview	16
Tessent Diagnosis — Tool or Methodology?	17
Diagnosis — Failure Mechanism Examples	18
Tessent Diagnosis — Benefit Overview	19
Diagnosing Scan Failures — Overview	20
Scan Test	21
Scan Diagnosis	23
Scan Diagnosis Flow	24
Traditional Scan Diagnosis	25
Layout-Aware Scan Diagnosis	26
Basic Tessent Diagnosis – Overview	27
Basic Tessent Diagnosis Flow – Summary	28
Diagnosis Types	29
Diagnosing Frequency Dependent Failures	30
Diagnosis Methods	31
Point Tool vs. Tessent Diagnosis Server	32
Tessent Diagnosis Technology Overview	33
When to Use Tessent Diagnosis	35
Getting Help With Tessent Tools - Manuals	36
Getting Help With Tessent Tools – Command Completion	37
Tessent Shell Help Command – Command Lists	38

Table of Contents

Tessent Shell Help Command – Help on Command Usage.....	39
Support Center	40
Lab 1	41
Module 2: Verify Diagnosis Inputs	43
Objectives	44
Generalized DFT Design Flow	45
DFT Design Flow: Tessent Tools	46
Failure Diagnosis: Tools and Processes	47
Focus of This Module	48
Archiving Test Patterns: ATPG.....	49
Archiving the Data for Diagnosis: ATPG	50
Archiving Consistent Data – Multiple Test Modes	51
How Many Flat Models to Archive	52
Adding Archiving of Flat Model to Your ATPG Flow	53
Archiving for Diagnosis: ATPG Command Guide	54
Modes and the Flat Model	56
Archiving Consistent Data – Best Practices	57
Diagnosis Input	58
Data Consistency - Overview	59
Consistency Checks for Test Patterns	60
Consistency Check for Failure Files	62
Data Consistency Checks - Patterns and Design.....	63
Data Consistency Checks – Fail Files	64
Some Pattern Verification Issues	65
Diagnosis Pattern Mismatch Options	66
Pattern Masking	67

Table of Contents

Mask Types	68
Masking File Syntax Example	69
Report Measure Cycles Command	71
Report_Measure_Cycles – Example	72
Startup Cache	73
"Consistency" Command Summary	74
Lab 2	75
Module 3: Failure Files	77
Objectives	78
Tools and Processes	79
Focus of This Module	80
Diagnosis – What Do You Need From ATE?	81
Preparing Diagnosis Failure Files.....	82
Failure File Key Concepts	83
Failure File Formatting Keywords.....	84
Keywords	86
Examples	87
Diagnosis Failure Files	88
Tracking Information Section.....	89
Cycle Based Failure File Format	90
Pattern Based Failure File Format.....	91
Converting Between Pattern-Based and Cycle-Based	92
Multiple Test Suites	93
Multiple Test Suites Example	94
Supplying Multiple Test Patterns	95
Data Logging Best Practices	96

Table of Contents

Procedural Review	97
Session Command Order – Tessent Diagnosis Example.....	98
Lab 3	99
Module 4: Diagnosis Modes and Output	101
Objectives	102
Running Tessent Diagnosis	103
Tessent Diagnosis Results.....	104
Header Section	105
Diagnosis Report High-Level View	106
Diagnosis Result Key Concepts	107
Symptom Summary.....	108
Symptom Summary – Example	109
Understanding Reported Suspects.....	110
Evaluating Reported Suspects – Example	111
Diagnosis Modes.....	112
Mode 1: Chain Diagnosis	113
Chain Diagnosis Internal Process	115
Step 1: Identify Faulty Chains and Fault Type.....	116
Chain Fault Models Determined by Chain Patterns.....	117
Chain Fault Types – SLOW_TO.....	118
Chain Fault Types – FAST_TO.	119
Step 2: Locate Defective Scan Chain Cell.....	120
Chain Fault Types – Stuck Faults	121
Mode 1: Diagnosis Report Example	122
Mode 2: Logic Diagnosis	123
Mode 2: Suspect Types.....	124

Table of Contents

Mode 2: Diagnosis Report Example	125
Running Tessent Diagnosis	127
Session Command Order – Process Overview	128
Session Command Order – Tessent Diagnosis Example.....	129
Dofiles	130
Writing Diagnosis Results to a File.....	131
Tessent Visualizer	132
Viewing Diagnosis Results in a Schematic.....	133
Viewing Diagnosis Results: Hierarchical Schematic.....	135
Viewing Diagnosis Results: Flat Schematic	136
Encoding Output	137
Diagnosis Options in Tessent Shell.....	139
Lab 4	140
Module 5: Layout-Aware Diagnosis	141
Objectives	142
Module Overview.....	143
What Is Layout-Aware Diagnosis?	144
Basic/Layout-Aware Diagnosis: Comparison	145
Layout-Aware Enclosing Circle Comparison	146
Some Useful Definitions	147
Basic Diagnosis Report Section	148
Looking at Layout Suspects	149
Logic Suspect Classification - Review.....	152
Layout-Aware Suspect Classifications	153
Separating Interconnect and Cell-Internal Defects	154
Layout-Aware Bridge Suspects	155

Table of Contents

Layout-Aware Open Suspect	156
Suspect Net and Defect Bounding Box	157
XMAP Table – Suspect Reporting	159
XMAP Table Defect Reporting	160
XMAP Table – MD5.....	161
Basic vs. Layout-Aware Diagnosis – Accuracy.....	162
Example 1	163
Example 2	164
Creating a Layout Database (LDB)	165
LDB Creation Process.....	166
Layout Verification Rules.....	167
Layout-Verification – Mismatch Report.....	168
Layout Verification Issues – Debugging	169
RCD Constant Creation for YieldInsight Users.....	170
DFM Signature Analysis for YieldInsight Users.....	171
Basic vs. Layout-Aware Diagnosis	172
Cell-aware Diagnosis – Overview.....	173
UDFM Creation Overview	174
Additions to Diagnosis Report	175
Layout-Aware Diagnosis Flow	177
Viewing Layout Suspects in Tessent YieldInsight	178
Viewing Layout Suspects in Calibre DESIGNrev	179
Writing a Layout Marker File	180
Layout-Aware Diagnosis Caveats	181
Lab 5	182

Module 6: Volume Diagnosis.....183

Table of Contents

Objectives	184
Volume Diagnosis	185
Diagnosis Server Key Concepts.....	186
Automating Volume Diagnosis	187
File Management.....	188
Directory Example	189
Commands	190
Failure File Processing Order.....	191
Operational Modes.....	192
Customizing Server	193
Improving Diagnosis Throughput	194
Reducing Diagnosis Startup Time	195
Startup Cache – Creation and Update	196
Startup Cache – Usage	197
Fail File Considerations.....	198
Pre-Production Test Program Flow	199
Production Test Program Flow	200
Lab 6	201
Module 7: Advanced Topics	203
Objectives	204
Iterative Diagnosis.....	205
Iterative Diagnosis Flow	206
Running Iterative Diagnosis	207
Iterative Diagnosis Limitations.....	208
Identifying Failing Scan Cells	209
Identifying Failing Scan Cells – Techniques.....	210

Table of Contents

Identifying Failing Scan Cells – Bypass Patterns	211
Identifying Failing Scan Cells – read_failures.....	212
Identifying Failing Scan Cells – 1hot	213
Identifying Failing Scan Cells – 1hot Patterns	214
Identifying Failing Scan Cells – 1hot Post ATE	215
Identifying Failing Scan Cells – Scan Cell Profiling	216
Identifying Failing Scan Cells – Profiling Score	217
Identifying Failing Scan Cells – Scan Cell Profiling Example	218
Delay Fault Testing	219
Diagnosing Frequency Dependent Failures	220
Diagnosing Frequency Dependent Failures – Another View	221
Diagnosing Frequency Dependent Defects	222
Running Gross-Delay Diagnosis	223
Gross-Delay Diagnosis – Report Snippet.....	224
Diagnosing Slow Paths	225
Step 1: At-Speed Diagnosis – Report File Snippet.....	226
Step 2: Exploring the Suspect - Overview	227
Step 2: Exploring the Suspect pin_pathname Graphical	228
Step 2: Exploring the Suspect - Example	229
IDDQ Diagnosis	230
IDDQ Diagnosis – File Examples	231
Overriding Chain Diagnosis Aborts	232
Bench-top ATPG Bring-Up: Tessent SiliconInsight	233
Tessent SiliconInsight Setup	234
Lab 7	235