

Index

- 0-dominate *see* fault models for inter-chip interconnects
- 1-dominate *see* fault models for inter-chip interconnects
- 16-valued system *see* composite value system
- α -particle, 3, 10
- aborted fault, 135, 235
- absorbing state, 881, 885*ff.*
- accessible register, 905*ff.*
- activation energy, 7*ff.*, 22
- active defect, 346*ff.*
- active drivers for a session *see* scan chain organization
- active fault *see* deductive fault simulation
- active receivers for a session *see* scan chain organization
- active test mode, 960
- active-flush *see* scan-shift policies
- acyclic kernel *see* kernels
- address, 846*ff.*, 976
 - bit, 851
 - column, 849, 889
 - latch, 848, 852
 - line, 846, 851, 878*ff.*
 - order, 858, 880, 890
 - register, 890
 - row, 849, 889
 - sequence, 884*ff.*
- address decoder *see* decoder
- address decoder fault *see* AF
- advanced microcontroller bus architecture (AMBA), 975*ff.*
- advanced peripheral bus (APB), 976
- advanced system bus (ASB), 976
- AF (address decoder fault), 853, 860*ff.*
- algebraic divisor, 452, 803*ff.*, 808*ff.*, 822, 829
 - double-cube, 803*ff.*, 837*ff.*
 - multiple-cube, 803
 - single-cube, 803*ff.*, 811, 837*ff.*
- algebraic factorization, 452*ff.*, 475, 802*ff.*, 822*ff.*, 829, 838, 841
 - extended, 823*ff.*, 838
 - simple, 822, 825, 838
 - targeted, 824*ff.*, 838
- algebraic resubstitution, 452, 803*ff.*
- aliasing *see* response compression
- aliasing in linear compressors, 738*ff.*, *see* response compression
 - coding theory approach, 743*ff.*
 - error models, 738*ff.*
 - independent error model, 738
 - symmetric error model, 739
 - Markov modeling of linear compression, 741*ff.*
- aliasing probability 933, *see* response compression
- aliasing volume *see* response compression
- allocation, 894, 939*ff.*
 - interconnect, 894
 - module, 894, 940*ff.*
 - register, 894, 940*ff.*
- alloying, 10, 22*ff.*
- AND–OR complex gate *see* complex gate
- AND-product, 422
- approximate error response *see* fault dictionary
- arbiter, 976
- Arden’s rule, 922
- area overhead *see* design for testability
- arithmetic BIST *see* RTL built-in self-test
- Arrhenius, 7
- as-late-as-possible (ALAP) scheduling *see* scheduling
- as-soon-as-possible (ASAP) scheduling *see* scheduling
- asynchronous circuits, 303*ff.*
- at-speed fault simulation *see* fault simulation
- at-speed test, 14, 411*ff.*, 440, 935*ff.*, 942, 947, 961
- at-speed testing, 755, 771, *see* BIST methodologies
- ATS (algorithmic test sequence), 868
- automatic test equipment (ATE), 14, 21*ff.*, 955
- average lifetime, 4
- BACK algorithm, 291, 312
- background pattern, 867
- backtrace, 210, *see* PODEM
 - multiple, 220, *see* FAN
- backtrack, 152
 - limit, 235
- backward implication *see* implication, effect–cause
 - diagnosis
- balanced kernels *see* kernels
- bandwidth, 11, 956
- base-cell *see* cell
- basic values *see* composite value systems
- bathtub curve, 5*ff.*, 22, 25
- behavior of faulty circuit elements *see* circuit elements
- behavioral description, 26*ff.*, 46, 894, 912*ff.*, 937*ff.*, 947
- behavioral modification for testability, 937*ff.*
- behavioral synthesis, 893*ff.*, 937*ff.*
- behavioral synthesis for testability, 939*ff.*
 - to facilitate BIST, 945*ff.*
 - to improve gate-level testability, 939*ff.*
 - to improve hierarchical testability, 942*ff.*

BF (bridging fault), 29*ff.*, 37*ff.*, 42*ff.*, 315*ff.*, 346*ff.*
 feedback (FBF), 37, 315, 320, 350*ff.*
 gate-level, 316, 323, 334, 353
 input, 38, 44
 inter-gate, 315
 intra-gate, 315
 non-feedback (NFBF), 37, 315, 320, 352
 non-input, 38
 switch-level, 316
 unrestricted, 315*ff.*, 334*ff.*
 wired-AND, 37
 wired-OR, 37
bi-directional driver/receiver *see* inter-chip interconnect
bi-directional net *see* inter-chip interconnect
BILBO *see* BIST methodologies, in-situ BIST
binary decision diagram (BDD), 293, *see* test generation using BDDs
binary parity tree, 826, 841
binate input, 31, 357*ff.*, 821
BIST *see* built-in self-test
BIST architecture, 929*ff.*, 947*ff.*
BIST for delay fault testing, 775*ff.*
 adjacency-compatible, 780
 double-length ML-LFSR, 776
 efficient two-pattern testing, 778*ff.*
 exhaustive two-pattern testing, 775*ff.*
 inverse-adjacency-compatible, 780
 non-autonomous LFSR, 776*ff.*
 pseudo-exhaustive two-pattern testing, 780
 tap assignment, 776
 tap selection, 776, 779
BIST methodologies, 745*ff.*
 at-speed testing *see* in-situ BIST, scan BIST
 classification of, 754*ff.*
 in-situ BIST *see* in-situ BIST
 scan BIST *see* scan BIST
 test-per-clock BIST *see* in-situ BIST
 test-per-scan BIST *see* scan BIST
 hardware overhead, 754, *see* built-in self-test: costs of
 of
 kernels, 746*ff.*
 reconfiguration circuitry, 749*ff.*
 built-in logic block observer (BILBO), 753
 CBILBO, 754
 CSTP flip-flop, 753
 test mode configurations, 749*ff.*
 independent PG and RA, 752
 normal, 749
 pattern generator, 750, *see* pattern generators
 response analyzer, 750, *see* response compression
 scan compressor, 752, *see* circular self-test path
 test modes, 746
BIST to reduce switching activity, 780*ff.*
 dual-speed LFSR (DS-LFSR), 781*ff.*
 enhanced scan, 784, *see* design for testability for delay fault testing
 in-situ BIST, 781*ff.*
 low-transition random pattern generator (LT-RPG), 784*ff.*
 scan BIST, 784*ff.*
bit line (BL), 849*ff.*

bit mask, 283
bit-oriented memory, 860
bit vectors, 370*ff.*
bonding, 9*ff.*, 22
bound wire, 896
boundary scan, 617*ff.*, 953, 961*ff.*, 972, 978
 boundary scan cells, 620*ff.*
 boundary scan instructions *see* boundary scan instructions
 boundary scan register, 627*ff.*, *see* boundary scan register: modes of operation
 BYPASS register, 626
 controller, 961
 IEEE Std 1149.1, 621
 instruction register, 625
 inter-chip interconnect *see* inter-chip interconnect system logic, 618
 test access port *see* test access port
 test data registers, 621
 vectors for inter-chip interconnect testing *see* vectors for inter-chip interconnect testing
boundary scan instructions, 636*ff.*
 BYPASS, 636, 639
 EXTEST, 636, 641
 INTEST, 637, 643
 RUNBIST, 637, 643
 SAMPLE/PRELOAD, 636, 640
boundary scan register: modes of operation, 629*ff.*
 normal, 629
 normal-preload, 633
 normal-sample, 630
 normal-scan, 633
 test-capture, 633
 test-scan, 633
 test-update, 634
branch *see* circuit elements
branch-and-bound algorithm, 903, 965
branch labeling, 371
branch status, 464
bridging fault *see* BF
built-in current sensor, 314*ff.*, 340*ff.*
built-in logic block observer (BILBO), 945*ff.*, *see* BIST methodologies
 concurrent (CBILBO), 945, 950
built-in self-test (BIST), 13, 19, 22, 680*ff.*, 807, 891*ff.*, 929*ff.*, 939, 945*ff.*, 962*ff.*, 973*ff.*
 benefits of, 680*ff.*
 costs of, 681, *see* BIST methodologies: hardware overhead
 for delay fault testing *see* BIST for delay fault testing
 methodologies *see* BIST methodologies
 pattern generators *see* pattern generators
 response compressors *see* response compression
 to reduce switching activity *see* BIST to reduce switching activity
burn-in, 7*ff.*, 22*ff.*
bus arbitration, 976
BYPASS *see* boundary scan instructions
BYPASS register *see* boundary scan
Byzantine bridging faults (BFs) *see* fault models for diagnosis

c-cycle redundant, 829*ff.*
C-testability, 32, 367*ff.*
carry-save array multiplier, 372*ff.*
Cartesian product, 422
cause-effect diagnosis, 495*ff.*
 comparing CUT and faulty circuit responses, 488*ff.*
 error response cover, 488
 error response match, 488
 failing vector cover, 488
 failing vector match, 488
 fault dictionary *see* fault dictionary
 post-test diagnostic fault simulation *see* post-test
 diagnostic fault simulation
cell, 3, 10, 28*ff.*, 46, 319, 366*ff.*, 845*ff.*, 881*ff.*, 961*ff.*
 aggressor, 855*ff.*, 864, 884, 891
 base, 866*ff.*, 887
 coupled, 859, 870*ff.*
 coupling, 864, 870, 873
 DRAM, 10, 846*ff.*, 889
 inputs, 366*ff.*, 374
 logic, 31, 366, 378
 memory, 3, 845*ff.*, 877, 881*ff.*, 889
 neighborhood, 846, 886*ff.*
 outputs, 366*ff.*
 SRAM, 845*ff.*, 855, 877, 889
 standard, 319
 test collar, 961*ff.*
 victim, 855*ff.*, 884, 891
cellular automata, 692*ff.*, *see* pattern generators
 characteristic polynomial, 694
 maximal length CA (ML-CA), 694*ff.*
 properties of sequences generated by, 696*ff.*, *see*
 pseudo-random sequences
 rule polynomial, 695
 rule-90, 695
 rule-150, 695
CF (coupling fault), 855*ff.*, 870*ff.*
 idempotent (CFid), 855*ff.*, 870, 884
 inversion (CFin), 855*ff.*, 871
 k-coupling, 857, 878*ff.*
 state (CFst), 855*ff.*, 864, 871
characteristic function, 294
characteristic polynomial *see* cellular automata, linear
 feedback shift registers, pattern generators
charge sharing, 456*ff.*, 475*ff.*
Checkerboard test, 865, 869
checking period, 436
checkpoint, 459*ff.*, 475*ff.*
Cheng's PDF classification *see* PDF
chips-on-board, 617
circuit elements, 52*ff.*, *see* combinational circuit
 model
 behavior of, *see* controlling value, logic
 expressions, singular cover, truth tables
 behavior of faulty circuit elements, 61*ff.*
 fanout branch, 54
 fanout stem, 54
 fanout system, 52
 gates, 52
 complex, 52
 primitive, 52
 stem, 54, *see* critical path tracing
circuit graph, 834*ff.*

circuit model for scan chain organization, 594*ff.*
 driver, 594
 driving weight of a register, 596
 length of register, 594
 maximal combinational blocks, 594
 pure driver, 595
 pure receiver, 595
 receiver, 594
 receiving weight of a register, 596
 registers, 594
circular BIST *see* circular self-test path
circular self-test path, 765*ff.*, *see* in-situ BIST
 α -level dependency, 760, 767, *see* in-situ BIST
 CSTP flip-flop *see* BIST methodologies
 CSTP register, 765
 error cancellation *see* in-situ BIST
 scan compressor *see* BIST methodologies
 system state cycling, 768
classification of tests, 11*ff.*
 measured parameter aspect, 12
 technology aspect, 11
 test application method, 14
 use of test results, 13
CNF *see* test generation using satisfiability
cofactor, 818*ff.*
column select line (CL), 852
combinational circuit model, 59*ff.*, *see* circuit
 elements
 cone, 61
 disjoint paths, 115
 fanin, 61
 fanout, 60
 fanout-free region, 109
 fanouts, types of, 111*ff.*, *see* critical path tracing
 maximal, 109
 non-reconvergent, 115
 reconvergent, 115
 path, 61
 transitive fanin, 61
 transitive fanout, 60
combined test application scheme *see* test application
 schemes for scan circuits
common subexpression, 806
comparison of *D*-algorithm and PODEM, 215
complete fault dictionary *see* fault dictionary
completely specified value *see* composite value
 system
complex gate, 44, 353, 457*ff.*, 471*ff.*, *see* circuit
 elements
 AND-OR, 457*ff.*, 471*ff.*, 477
 hybrid, 472*ff.*
 OR-AND, 471*ff.*
 PS-PS, 472
composite circuit, 136*ff.*
composite value system, 136
 16-valued system, 138
 basic values, 136
 completely specified value, 138
 conflict, 138, *see* implication
 D-notation, 136
 five-valued system, 138
 four basic values, 136
 four-valued truth tables, 142

composite value system (*cont.*),
 incompletely specified value, 138
 leading value of a symbol, 139
 more specific value, 138, 140
 nine-valued system, 138
 six-valued system, 138
 sixteen-valued system, 138
compositional property, 830
concurrent built-in logic block observer (CBILBO)
 see BILBO
concurrent fault simulation, 95*ff.*
 convergence, 104
 divergence, 104
 events in, 98*ff.*
 fault-free circuit events, 98
 faulty circuit events, 99
 fault insertion, 98
 invisible faults, 100
 newly visible faults, 100
 visible faults, 100
concurrent testing, 13
cone of a combinational circuit *see* combinational
 circuit model
conflict *see* composite value system, implication
connectivity graph, 925
consistent labeling, 372
constraint propagation, 406*ff.*
control assignment, 813
control path, 920*ff.*
control points, 811, 938*ff.*, 967*ff.*, 979, *see* test points
control scan path, 961
control sequence, 937
control signals, 344, 920, 929, 943, 955, 960*ff.*, 970,
 974
 dynamic, 961
 static, 961
control/data flow extraction *see* RTL built-in self-test
 and RTL design for testability
control/data flow graph (CDFG), 894, 923, 939*ff.*
controllability *see* testability measures
controlled adder/subtractor (CAS) cell, 375*ff.*
controlled response of a gate, 59
controller-datapath, 898, 915*ff.*, 931, 942*ff.*
controlling value, 40, 59, 292, 385*ff.*, 395*ff.*, 417,
 423*ff.*, 814*ff.*
core (or Intellectual Property), 953*ff.*
 embedded, 954*ff.*, 968*ff.*, 978
 firm, 953*ff.*
 hard, 953*ff.*, 978
 mergeable, 955
 soft, 953*ff.*
 transparent, 957*ff.*
core boundary scan register (CBSR), 963
core-level test, 954*ff.*, 978
core test access, 953*ff.*
core test controller, 961, 972
core test enable signal, 961
core test wrapper, 954, 977*ff.*
 bypass, 977
 core test, 977
 detach, 977
 interconnect test, 977
 normal, 977
 width adaptation, 978

core transparency *see* core
corrosion, 9*ff.*, 22*ff.*
cost and benefits of scan *see* scan
cost of test, 19*ff.*, 348*ff.*
 ATE cost, 21
 engineering cost, 19
 field maintenance cost, 21
 increased ASIC cost, 19
 life cycle cost, 21
 manufacturing re-work cost, 20
 speed degradation cost, 20
 time-to-market cost, 20
count-based compressors *see* response compression
coupling fault *see* CF
critical path tracing, 106*ff.*
 critical line, 106
 criticality at another line, 114
 dominator *see* dominator
 fanouts, types of, 111*ff.*, *see* combinational circuit
 model
 non-reconvergent, 115
 reconvergent, 115
 independent branches of a fanout system, 112
 maximal fanout-free regions (FFRs) *see*
 combinational circuit model
 reducing time complexity of, 118*ff.*
 dynamic techniques, 118
 static techniques, 118
sensitive, 107
stem analysis, 111*ff.*
stem region, 114*ff.*
 exit lines, 117
stems
 narrow-reconvergent, 116
 non-reconvergent, 115
 wide-reconvergent, 116
crossover *see* genetic algorithm
CSTP *see* circular self-test path
cube, 55, 403*ff.*, 440, 803*ff.*, 823*ff.*, *see* representation
 of behavior for test generation
 sensitizing, 404, 440
cube-free, 803
cube set, 828
 irredundant, 828
 redundant, 828
cumulative detection probability (CDP), 882
current monitoring, 36, 37, 44*ff.*, 314, 319, 448, 454,
 460, 475, 478
current signature, 345*ff.*, 353
current sink, 341
current-to-voltage transducer, 341
custom pattern generators, 715*ff.*
 embedding statistics of vectors, 720*ff.*
 weighted-random testing *see* weighted-random
 testing
 embedding subspaces of vectors, 724*ff.*, *see* BIST
 for delay fault testing
 C(*l*)-compatible, 729
 D-compatible, 728, 780
 dec-compatible, 728
 I-compatible, 728, 780
 PE-compatible, 726
 pseudo-exhaustive testing, 724
 test signal, 726

- custom pattern generators (*cont.*),
 - embedding vectors, 715*ff.*
 - discrete logarithm, 716
 - re-seeding, 717
- DADWDD (deterministic address, deterministic write, deterministic data), 880
- DADWRD (deterministic address, deterministic write, random data), 884*ff.*
- D-algorithm, 197*ff.*
 - backtrack *see* backtrack
 - comparison with PODEM, 215
 - local value assignments, 197*ff.*
 - search tree, 206
 - test generation sub-tasks (TGSTs), 181, 183*ff.*
 - fault effect excitation, 197*ff.*, *see* fault effect excitation
 - fault effect propagation, 199, *see* fault effect propagation
 - justification, 201, *see* justification
- D-drive *see* fault effect propagation
- D-frontier *see* fault effect propagation
- D-notation *see* composite value system
- data flow graph, 370*ff.*
- data register, 848*ff.*, 962*ff.*
- data retention fault *see* fault
- data vector, 954
- datapath circuit graph (DPCG), 939*ff.*
- De Morgan transformation *see* transformations
- deadening *see* generation of vectors for diagnosis
- decimation of a sequence generated by a PG *see* scan BIST
- decision conflict, 968
- decision gate, 968
- decoder, 848*ff.*, 860*ff.*, 889, 976
 - column, 848, 849*ff.*
 - dynamic, 851
 - row, 848*ff.*
 - static, 851
- deductive fault simulation, 89*ff.*
 - active fault, 91
 - deductive fault list, 90
 - local, 91
- defect level, 1, 14*ff.*, 20, 23, 316
- deflection operation, 941
- delay assignment, 386*ff.*
- delay fault (DF) *see* DF
- delay fault (DF) test, 39*ff.*, 382
 - general robust, 40, 44, 382, 827
 - hazard-free robust (HFRT), 39*ff.*, 382, 820*ff.*
 - non-hazard-free robust, 39
 - non-robust, 39*ff.*, 382*ff.*, 427, 433*ff.*, 456, 460
 - robust, 39*ff.*, 382, 387*ff.*, 820*ff.*, 836, 840
 - validatable non-robust (VNR), 40, 382*ff.*, 827
- delay space, 393
- delay verifiability *see* verifiability
- delayed reconvergence, 274*ff.*, 309
- dependence matrix, 360*ff.*, 379
 - partitioned, 360*ff.*, 379
 - reduced partitioned, 360*ff.*
- dependent fault *see* fault models for diagnosis
- depowering, 344*ff.*
- design for robust testability, 470*ff.*
- design for testability, 560*ff.*
 - area overhead, 576
 - boundary scan *see* boundary scan
 - for delay fault testing *see* design for testability for delay fault testing
 - full scan *see* full scan
 - normal mode, 560
 - partial scan *see* partial scan
 - performance penalty, 577
 - reduction of switching activity during scan testing
 - see* reduction of switching activity during scan testing
 - scan *see* scan
 - scan chain organization *see* scan chain organization
 - test mode, 560
- design for testability for delay fault testing, 654*ff.*
 - chains with additional flip-flops, 659
 - enhanced scan cells, 658
 - functional justification, 657
 - hold, 657
 - initialization vector, 655
 - scan shifting, 655
 - test vector, 655
 - two-pattern test sequence, 655
- detectability *see* estimation of test length
- detecting set, 809*ff.*
- detection probability, 809*ff.*
- detection test set *see* generation of vectors for diagnosis
- detection threshold, 415*ff.*
- DF (delay fault), 38*ff.*, 382*ff.*
 - coverage, 392*ff.*
 - gross gate (G-GDF) *see* GDF
 - path (PDF) *see* PDF
 - segment (SDF), 39, 382, 393, 409*ff.*, 418*ff.*, 438
 - size, 393
 - small gate (S-GDF) *see* GDF
 - transition fault (TF), 39, 411, 438, 854*ff.*, 889*ff.*
- DFT *see* design for testability
- diagnosis, 482*ff.*
 - cause–effect *see* cause–effect diagnosis
 - diagnostic accuracy, 483
 - diagnostic resolution, 483
 - effect–cause *see* effect–cause diagnosis
 - equivalent faults, 497
 - error response of a CUT, 487
 - erroneous CUT response, 486
 - error-free CUT response, 486
 - failing vectors for a CUT, 487
 - fault dictionary *see* fault dictionary, cause–effect diagnosis
 - fault models *see* fault models for diagnosis
 - generation of vectors for diagnosis *see* generation of vectors for diagnosis
 - logic, 483
 - physical, 483
 - post-test diagnostic fault simulation *see* post-test diagnostic fault simulation
 - root-cause analysis, 483
- diagnostic accuracy *see* diagnosis
- diagnostic fault simulation *see* post-test diagnostic fault simulation
- diagnostic measure, 334*ff.*, 351, *see* diagnosis
- diagnostic power, 336, 351*ff.*
- diagnostic resolution, 336, 351

- diagnostic measure (cont.),
 - expected residual set, 336, 353
- diagnostic resolution *see* diagnostic measure
- diagnostic test generation, 334, 339ff.
- dictionary entry *see* fault dictionary
- differential cascode voltage switch (DCVS), 445, 453ff., 475ff.
- digital oscillation testing, 436ff.
- direct implication *see* implication
- direct parallel access, 959ff., 978
- direct redundancy identification *see* redundancy identification and removal
- direct test generation, 316ff.
- discrete logarithm *see* custom pattern generators
- discrete relaxation technique, 904
- distinguishing power, 300ff.
- distinguishing sequence, 300ff.
- dominator, 113, 188, 278ff.
 - immediate, 114, 278ff.
- domino CMOS, 445ff., 461, 475ff.
- don't care, 55, *see* value systems
- don't care based redundancy identification *see* redundancy identification and removal
- don't care set, 817ff.
 - fanin, 817
 - intermediate variable, 817
 - observability, 818
 - satisfiability, 817
 - transitive fanout, 817
- double-cube divisor *see* algebraic divisor
- double-cube extraction, 803, 839
- double detection, 243, *see* test compaction
- double-latch design, 568, *see* level-sensitive scan
- drivability measures, 291ff.
- driver *see* circuit model for scan chain organization
- driver-strength bridging faults (BFs) *see* fault models for diagnosis
- driving weight of a register *see* circuit model for scan chain organization
- dynamic indirect implication, 173ff., *see* implication
- dynamic random access memory (DRAM) *see* cell dual-expression extraction, 803ff., 837ff.
- dual-speed LFSR (DS-LFSR) *see* BIST to reduce switching activity
- dynamic CMOS, 445, 475ff.
- dynamic current testing, 342ff., 352
- dynamic methods for redundancy identification *see* redundancy identification and removal
- earliest arrival time (EAT), 416
- effect-cause diagnosis, 517ff., *see* effect-cause fault diagnosis
 - all possible combinations of faults, 531
 - backward implication, 534
 - computation of forced values, 521
 - conditional forced values, 521
 - fault status, 517
 - fault-status update, 518
 - forced value, 520
 - forward implication operation, 533
 - four-valued system, 531
 - input adjacent, 537
 - Procedure Compute- $\Phi()$, 521
 - Procedure Deduce-Values(), 522
 - processing groups of vectors, 531ff.
 - using forced values, 522
- effect-cause fault diagnosis, 421, 438, *see* effect-cause diagnosis
- electrical tests, 12, 22
 - dynamic, 12, 22
 - parametric, 12, 22
- electromigration, 10, 22
- electrically erasable programmable read-only memory (EEPROM) *see* ROM
- embedded core *see* core
- enhanced scan, 836ff.
- enhanced scan cells *see* design for testability for delay fault testing
- equivalence class tree, 337, 351
- equivalent faults *see* diagnosis
- erasable programmable read-only memory (EPROM) *see* ROM
- error, 1ff.
 - soft, 3
- error checker, 455ff., 475
- error response cover *see* cause-effect diagnosis
- error response of a CUT *see* diagnosis
- error response match *see* cause-effect diagnosis
- escape probability, 845, 879ff.
- escape probability of a fault *see* estimation of test length
- estimation of detectability profile, 699ff., *see* testability measures
 - probabilistic controllability, 699
 - statistical estimation of, 701
 - probabilistic observability, 702
 - probabilistic sensitivity, 703
- estimation of fault coverage *see* estimation of test length
- estimation of test length, 697ff.
 - detectability, 698
 - detectability profile, 699
 - escape probability of a fault, 704, 706
 - estimation of detectability profile *see* estimation of detectability profile
 - pseudo-random testing, 706ff.
 - random testing, 704ff.
 - test confidence, 697
 - test quality, 697
- evaluation phase, 445ff.
- evaluation table, 464ff.
- event *see* event-driven
- event-driven, 69ff., *see* concurrent fault simulation
 - event, 71
 - event-driven simulation, 69ff.
 - task list *see* task list
- event-driven simulation, 430, *see* event-driven
- excitation state, 293ff., 895
- excitation vector, 293, 895ff.
- exhaustive testing, 356ff., 372ff.
- exit lines of a stem region *see* critical path tracing
- expanded false vector *see* false vector
- expanded true vector *see* true vector
- expanded truth table, 357ff.
- expected residual set *see* diagnostic measure
- extended *D*-algorithm, 288ff.

- external bus interface (EBI), 976
- external test, 14
 - functional, 14
 - in-circuit, 14
- EXTTEST *see* boundary scan instructions
- failing-smooth circuit, 403
- failing vector cover *see* cause–effect diagnosis
- failing vector match *see* cause–effect diagnosis
- failing vectors for a CUT *see* diagnosis
- failure, 1
- failure mechanism, 8*ff.*, 22
 - electrical stress, 8
 - extrinsic, 8
 - intrinsic, 8
- failure probability density function, 4
- failure rate, 4, 22
- false path, 386
- false vector, 357*ff.*, 378, 471
 - expanded, 357*ff.*, 378
 - maximal, 357*ff.*, 378
- false vertex, 471*ff.*
- FAN, 218*ff.*, *see* test generation
 - bound line, 219
 - free line, 219
 - head line, 219
 - multiple backtrace, 220
- fanin *see* combinational circuit model
- fanin don't care set *see* don't care set
- fanout *see* combinational circuit model
- fanout-free circuit, 106
- fanout-free region (FFR), 277*ff.*, *see* combinational circuit model
- fanout-free transformation *see* transformations
- fanout system *see* circuit elements
- fault, 2*ff.*, 29*ff.*, 315*ff.*, 447*ff.*, 805, 821, 852*ff.*
 - 2-coupling, 855
 - aborted, 135, 235
 - address decoder *see* AF
 - bridging *see* BF
 - collapsing *see* fault collapsing
 - coupling *see* CF
 - data retention, 855
 - dominance *see* fault collapsing
 - dynamic, 852
 - equivalence *see* fault collapsing
 - hard, 2
 - intermittent, 3
 - k*-coupling, 857
 - leakage, 315*ff.*
 - linked, 858
 - list *see* fault list
 - neighborhood pattern sensitive *see* NPSF
 - non-functional, 864
 - non-permanent, 2
 - pattern sensitive *see* PSF
 - permanent, 2
 - primitive, 42
 - read/write logic, 862
 - recovery, 866*ff.*
 - retention, 855
 - site, 61
 - solid, 2
 - stuck-at *see* SAF
 - stuck-on (SOnF), 29, 36, 43*ff.*, 447*ff.*, 475*ff.*
 - stuck-open (SOpF), 29, 34, 448*ff.*, 805, 821, 854*ff.*
 - target, 135
 - transient, 3
 - transition *see* DF
 - unlinked, 858
 - untestable *see* untestable fault
- fault collapsing, 75*ff.*, 273*ff.*, 286, 310, 319*ff.*, 330, 352, 445, 459*ff.*, 908, *see* test generation
 - systems
 - dominating faults, 76
 - equivalent faults, 75
 - procedure, 79
- fault coverage, 1, 15*ff.*, 51, 266, 286, 302*ff.*, 324*ff.*, 348*ff.*, 389*ff.*, 412, 430, 439, 799, 809, 837, 845, 865*ff.*, 879, 894, 905*ff.*, 914, 920, 924*ff.*, 954, 964*ff.*
- fault detection probability, 809*ff.*
- fault dictionary, 504*ff.*
 - approximate entry, 512
 - approximate error response, 513
 - complete, 504
 - dictionary entry, 504
 - hybrid, 509
 - κ -detection, 507
 - κ -detection pass–fail, 507
 - negative information, 508
 - pass–fail, 506
 - point of detection, 505
 - stop on first error (SOFE), 507
- fault dominance, 266, 273*ff.*, 310, *see* fault collapsing
 - c-dominance, 274
 - s-dominance, 274
- fault dropping, 82, 277, 283, 330
- fault effect excitation, 149, 183*ff.*, 197*ff.*
- fault effect propagation, 62, 149, 186*ff.*, 199*ff.*
 - D-drive, 150
 - D-frontier, 152, 157, 187
 - dominators, 188
 - future unique D-drive, 188
 - potential propagation paths, 188
 - unique D-drive, 188
 - x*-path check, 188
- fault equivalence, 273*ff.*, 336, *see* fault collapsing
 - c-equivalence, 274
 - s-equivalence, 274
- fault grading, 121*ff.*
 - identifying faults not detected by a vector, 122*ff.*
 - partial assignment, 122
- fault injection, 280*ff.*
- fault list, 50, 135
- fault mask *see* parallel fault simulation
- fault model, 28*ff.*, 285*ff.*, 367, 907*ff.*, *see* fault models
 - for diagnosis, *see* fault models for inter-chip interconnects
 - behavioral, 28*ff.*
 - delay, 38*ff.*
 - functional, 28*ff.*, 907*ff.*
 - general, 367
 - geometric, 29, 36*ff.*
 - multiple-state-transition (MST), 285
 - physically induced, 907*ff.*

fault model (*cont.*),
 restricted, 367
 single cell, 31, 367
 single-state-transition (SST), 285ff.
 structural, 29ff.
 stuck-at *see* SAF
 stuck-on *see* fault
 stuck-open *see* fault
 switch-level, 29, 34ff.
fault models for diagnosis, 489ff., *see* fault model
 Byzantine bridging faults (BFs), 492
 dependent fault, 494
 driver-strength bridging faults (BFs), 491
 modeled fault, 493
 multiple SAFs, 490
 non-feedback bridging faults (BFs), 490
 single SAFs, 490
 transition faults, 492
 two-line bridging faults (BFs), 490
 wired-AND bridging faults (BFs), 490
 wired-OR bridging faults (BFs), 490
fault models for inter-chip interconnects, 646ff.
 0-dominate, 648
 1-dominate, 648
 opens, 647
 shorts, 648
 strong driver short, 648
 stuck-at faults, 647
 wired-AND shorts, 648
 wired-OR shorts, 648
fault ordering, 283ff.
 dynamic, 284
 static, 284
fault simulation, 75ff., 266ff., 295, 303ff., 351, 382ff.,
 412ff., 807, 816, 893, 912ff., 947ff.
 at-speed, 419ff., 430ff., 438
 classification, 266ff.
 combinational delay, 412ff.
 combinational I_{DDQ} , 324ff.
 concurrent, 267, 277, *see* concurrent fault
 simulation
 critical path tracing *see* critical path tracing
 deductive, 267, *see* deductive fault simulation
 differential, 267, 277
 fault collapsing *see* fault collapsing
 fault dropping *see* fault dropping
 I_{DDQ} diagnostic, 336ff., 351
 parallel, 268, 277, *see* parallel fault simulation
 parallel-pattern parallel-fault propagation, 268
 parallel-pattern single-fault propagation (PPFSP),
 268, *see* PPFSP
 RTL, 912ff.
 single-fault propagation, 268
 sequential delay, 428ff.
 sequential I_{DDQ} , 332
 sequential stuck-at, 277ff.
fault status *see* effect-cause diagnosis
finite-state automata, 959
five-valued system *see* composite value system
flow diagram, 367ff.
flow influence model, 899ff.
 strongly influenced, 901
 strongly influencing, 900

 weakly influenced, 901
 weakly influencing, 901
flow table, 367ff.
flush *see* scan-shift policies
forced value *see* effect-cause diagnosis
forward implication *see* implication
forward implication operation *see* effect-cause
 diagnosis
ForwardImplicationOperation() *see* implication
forward time processing, 289, 904
four-pattern test, 462
four-valued system *see* effect-cause diagnosis
free wire, 896ff.
full scan, 563ff., *see* scan
functional constraints, 905ff., 947
functional description, 27, 907
functional design error, 2, 356
functional equivalence, 805
functional fault model *see* fault model
functional justification, 837, *see* design for testability
 for delay fault testing
functional test generation, 439, 894, 905ff.
functional unsensitizability analysis *see* untestability
 analysis
functionally redundant, 386ff., 401, 438ff.
functionally sensitizable, 386ff., 401, 438ff.
fundamental mode, 303ff.

GALCOL, 868
GALPAT (GALloping PATtern), 864ff., 889
 algorithm, 867
 read action, 867ff.
GALROW, 868
gate delay fault (GDF) *see* GDF
gate-level model, 316ff., 334, 352, 445ff.
gate-oxide short, 315,
gated clock, 575
gates *see* circuit elements
GDF (gate delay fault), 39ff., 382ff., 393ff., 407ff.,
 431, 438ff.
 combinational fault simulation, 415ff.
 combinational test generation, 407ff.
 diagnosis, 421ff.
 gross (G-GDF), 39ff., 382, 407ff., 438
 sequential fault simulation, 431
 small (S-GDF), 39, 382, 407ff., 438ff.
general fault model *see* fault model
general robust gate delay fault testable (GRGDFT)
 circuit, 44, 820, 838
general robust path delay fault testable (GRPDFT)
 circuit, 44, 819ff.
generating function *see* cellular automata, linear
 feedback shift registers
generation gap, 331
generation of vectors for diagnosis, 539ff.
 approaches that directly focus on distinguishing
 between faults, 547ff.
 deadening, 543
 detection test set, 542
 diagnostic test generation based on fault detection,
 542ff.
 diagnostic test generation system, 541
 diagnostic test generator, 539

- generation of vectors for diagnosis (cont.),
 - generating a diagnostic test using three circuit versions, 547
 - generating a diagnostic test using two circuit versions, 549
 - modification of an existing vector that detects both target faults, 545
 - modification of conventional test generation, 544
- Genesis synthesis system, 942ff.
- genetic algorithm, 298ff., 322ff., 330ff., 339ff.
 - crossover, 298, 322
 - fitness function, 298, 301ff., 322, 331, 339
 - mutation, 298, 322ff.
 - selection, 298, 322
- geometric description, 27
- geometric operator, 42
 - cut, 42
 - cover, 42
 - overlap, 42
- Gharaybeh's PDF classification *see* PDF
- graph labeling, 356, 369ff.
- H-scan *see* high-level scan
- hard-to-detect faults *see* estimation of test length, testability measures
- hardware segmentation *see* segmentation
- hazard-free robust gate delay fault testable (HFRGDFT) circuit, 44, 820, 823, 838ff.
- hazard-free robust path delay fault testable (HFRPDFT) circuit, 819ff., 837ff.
- hazard-free robust test (HFRT), 39ff., 820ff., 841
- hazard status, 468
- hierarchical composition rules, 825ff.
- hierarchical test generation, 893ff.
- high impedance node, 466
- high-level scan, 924ff.
 - H-scan, 924
 - orthogonal scan, 927ff.
 - RT-scan, 925ff.
- higher-valued cube covers *see* representation of behavior for test generation
- higher-valued truth tables *see* truth tables
- hill-climbing algorithm, 965
- hybrid CMOS complex gate *see* complex gate
- hybrid fault dictionary *see* fault dictionary
- i_{DD} pulse response testing, 342ff.
- I_{DDQ} threshold, 341ff.
- I-edge, 402ff.
- ideal latch-based circuits, 568, *see* level-sensitive scan
- identity paths (I-paths) *see* in-situ BIST
- IEEE standard 1149.1, 962, 964, 972, *see* boundary scan
- implication, 155ff.
 - algorithm implementing forward implication operation, 159
 - backward, 159ff.
 - conflict, 157
 - direct, 155ff.
 - direct implication operation, 154ff.
 - forward, 156ff.
 - ForwardImplicationOperation(), 156
 - incompleteness of, 168ff.
 - indirect, 154, 168ff.
 - dynamic indirect implication, 173ff.
 - static indirect implication, 168ff.
 - indirect implication operation, 154, 168ff.
 - procedure, 165, 262
 - recursive learning, 176ff.
 - using cube covers, 163
- implication table, 398
- imply conflict, 968
- imply gate, 969
- in-circuit tests, 618, *see* boundary scan
- in-degree of a net *see* inter-chip interconnect
- in-situ BIST, 755ff.
 - α -level dependency, 760, 767
 - BILBO-based BIST, 761ff.
 - embedding, 762
 - identity paths (I-paths), 763
 - test concurrency compatible, 764
 - test concurrency incompatibility graph, 764
 - test schedule, 764
- error cancellation, 760
- RA inputs dependent on outputs, 759ff.
- RA inputs independent of outputs, 757ff.
- inactive test mode, 960
- incompletely specified value *see* composite value system
- incompleteness of implication *see* implication
- independent branches of a fanout system *see* critical path tracing
- independent fault, 405
- indirect implication *see* implication
- indirect redundancy identification *see* redundancy identification and removal
- indirect test generation, 316, 319
- indistinguishable pair, 325ff., 332
- inductive fault analysis (IFA), 41ff., 857
- initialization sequence, 285ff., 830
- initialization set, 453, 475
- initialization vector, 35, 40, 382, 388, 403ff., 433ff.
- input adjacent *see* effect-cause diagnosis
- input-output (IO) register, 939
- input/output signal flow generator (IOSFG), 304
- input register, 939
- input space, 905
- input state, 916
- instruction categorization, 936
- instruction register *see* boundary scan
- instruction sequence assembly, 903ff.
- instruction sequencing, 936
- instruction set description file, 936
- instruction set representation, 936
- inter-chip interconnect, 618, 644ff., *see* vectors for inter-chip interconnect testing
 - bi-directional driver/receiver, 646
 - bi-directional net, 646
 - fault models *see* fault models for inter-chip interconnects
 - in-degree of a net, 646
 - keeper, 646
 - out-degree of a net, 646
 - receiver, 645
 - simple driver, 645
 - simple net, 646

- inter-chip interconnect (*cont.*),
 - simple receiver, 646
 - tri-state driver, 645
 - tri-state net, 646
 - two-state driver, 645
 - types of nets, 646
 - interchange property, 609, *see* scan chain organization
 - intermediate variable don't care set *see* don't care set
 - INTEST *see* boundary scan instructions
 - invalid state, 897
 - inversion parity, 274ff., 385, 394
 - ionic contamination, 10
 - irreducible polynomial *see* cellular automata, linear feedback shift registers
 - irredundant circuit, 799, 807, 813ff., 840
 - irredundant CMOS gate, 472
 - irredundant cube set *see* cube set
 - isolated test application scheme *see* test application scheme
 - isolation ring, 964ff.
 - partial, 964ff.
 - iterative array model, 269, 277ff., 288ff., 425ff., 830
 - iterative logic array (ILA), 366ff.
 - arithmetic, 370
 - C-testable, 367ff.
 - cell inputs, 366
 - cell outputs, 366
 - input carries, 366
 - one-dimensional, 367
 - output carries, 366
 - two-dimensional, 367
 - unidirectional, 367
 - justification, 151, 188
 - justified lines, 157
 - list of unjustified lines, 153
 - local value assignments for, 201
 - unjustified lines, 153, 157
 - justification constraint, 905ff.
 - k -controllable, 937
 - κ -detection fault dictionary *see* fault dictionary
 - keeper *see* inter-chip interconnect
 - kernels, 578ff., *see* BIST methodologies
 - acyclic, 584
 - balanced, 581
 - linear pipeline, 579
 - self-loops only, 585
 - kernels with only self-loops *see* kernels
 - Lam's PDF classification *see* PDF
 - latch, 567ff.
 - latest stabilization time (LST), 416ff.
 - leading value of a symbol *see* composite value system
 - list of unjustified lines *see* justification
 - leaf-dag, 401ff.
 - leakage fault *see* fault
 - leakage fault table, 317
 - level-sensitive latch, 567ff., *see* level-sensitive scan
 - level-sensitive scan, 567ff., *see* scan
 - level-sensitive scan element, 569ff., *see* scan
 - two-port latch, 570
 - levelization of circuit lines, 66, 79, *see* task list
 - input level, 66
 - output level, 79
 - LFSR compressors, 734ff.
 - aliasing in, *see* aliasing in linear compressors
 - computation of LFSR signature, 734
 - LFSRs *see* linear feedback shift registers
 - linear compressors *see* response compression
 - linear feedback shift registers (LFSRs), 682ff., 933,
 - see* pattern generators, built-in self-test, LFSR compressors
 - characteristic polynomial, 687, *see* cellular automata
 - complete sequences, 691
 - compressors *see* LFSR compressors, response compression
 - double-length *see* BIST for delay fault testing
 - external-XOR, 682
 - feedback polynomial, 682
 - generating function, 685
 - internal-XOR, 682
 - maximal length LFSR (ML-LFSR)
 - near complete, 689
 - non-autonomous *see* BIST for delay fault testing
 - non-trivial, 682
 - parallel mode, 682, 688
 - parallel test vector (PTV), 688
 - phase shift, 691
 - primitive polynomial, 688
 - properties of sequences generated by, 688ff., *see*
 - pseudo-random sequences
 - reverse-order sequence, 692
 - seed *see* pattern generators
 - serial mode, 682, 688, *see* scan BIST
 - disjoint sampling, 689, 771
 - overlapped sampling, 689, 771
 - serial test vector (STV), 689
 - state transition matrix, 687, *see* cellular automata
- linear independence *see* scan BIST
- linear pipeline *see* kernels
- locus of execution, 937
- logic diagnosis *see* diagnosis
- logic expressions *see* singular cover, truth tables
 - three-valued, 55
 - two-valued, 53
- logic hazard, 383
- logic implication *see* implication
- logic monitoring, 36, 319, 448ff.
- logic simulation, 64ff.
 - event-driven simulation *see* event-driven
 - input level *see* levelization of circuit lines
 - levelization *see* levelization of circuit lines
 - parallel *see* parallel simulation
 - simple, 65
- logical path, 385ff., 403ff., 439
- logical tests, 12
- longest functional path, 409
- low power parallel scan test access, 968ff.
- low-transition random pattern generator (LT-RPG) *see*
BIST to reduce switching activity
- macro test, 956ff.
- mandatory assignments, 813

- March tests, 868ff.
 March A, 873ff.
 March B, 876
 March C-, 869ff.
 MATS, 868
 MATS+, 868ff.
 market window, 18
 Markov chain, 881ff.
 masking, 800, 858ff., 877, 889, 936
 maximal false vector *see* false vector
 maximal test concurrency, 361, 379
 mean time to failure, 5
 memory cell array *see* cell
 memory state, 465
 minimal true vector *see* true vector
 minimum dependence cone, 902
 minimum feedback vertex set (MFVS), 588, 834ff. *see*
 partial scan
 minimum-shift *see* scan-shift policies
 MISR *see* multiple-input signature register (MISR)
 compressors
 mixed-signal circuits, 11
 mode, 377, 832ff., 930, 956ff.
 normal, 377, 930, 956, 977
 test, 832ff., 930, 959ff., 975
 modeled fault *see* fault models for diagnosis
 modes of operation, 270
 free, 270
 synchronization, 270
 modified algorithmic test sequence (MATS) *see*
 March tests
 modified counting sequence *see* vectors for inter-chip
 interconnect testing
 module equations, 899ff., 949
 module-under-simulation (MUS), 912
 monotone property, 358
 more specific value *see* composite value system
 MSCAN (memory SCAN), 864
 multi-chip module, 617
 multi-fault testability, 451ff., 804ff.
 multi-output domino logic, 476
 multi-output minimized circuit, 800
 multi-path, 403ff.
 multiple backtrace, 220, *see* FAN, backtrace
 multiple-cube divisor *see* algebraic divisor
 multiple event fault, 279ff.
 multiple observation time (MOT), 270ff.
 multiple-input signature register (MISR) compressors,
 737, 929ff., 945ff., 961
 aliasing in, *see* aliasing in linear compressors
 multiple path delay fault (MPDF) *see* PDF
 multiple SAF redundancy, 802ff.
 multiple SAFs *see* fault models for diagnosis
 multiple scan chains, 574, *see* scan chain organization
 multiple mode control, 575
 single mode control, 575
 multiple-state-transition (MST) fault model *see* fault
 model
 multiplexed-input scan, 564, *see* scan
 multiplexed-input scan flip-flop, 564, *see* scan
 mode control input, 563
 multiply-testable (MT), 389ff., 438
 mutation *see* genetic algorithm

n-dominant, 448ff.
 NAND–NAND implementation, 458, 474, 801
 negative information *see* fault dictionary
 negative unate, 357
 neighborhood pattern sensitive fault *see* NPSF
 nine-valued logic, 289ff., 311
 nine-valued system *see* composite value system,
 nine-valued logic
 node partitions, 324ff., 332ff., 351
 non-concurrent test, 13
 non-controlling value, 40ff., 385ff., 391, 395, 400,
 404ff., 421ff., 433ff., 815, 827
 non-feedback bridging faults (BFs) *see* fault models
 for diagnosis
 non-overlapping clocks, 567
 non-restoring array divider, 375ff.
 non-robust test *see* delay fault test
 non-robust untestability analysis *see* untestability
 analysis
 non-structural test generation algorithms, 223ff.
 based on satisfiability *see* test generation based on
 satisfiability
 using BDDs *see* test generation using BDDs
 non-transition write operation *see* write operation
 NOR–NOR implementation, 460, 471ff.
 NORA CMOS, 475
 NPSF (neighborhood PSF) *see* PSF

 observability *see* testability measures
 observability don't care set *see* don't care set
 observation assignment, 813ff.
 observation points, 387, 811, 840, *see* test points
 observation sequence, 936
 OFF-set, 823
 on-input, 385ff., 398, 400ff., 420, 434ff.
 ON-set, 823
 one's count compression *see* response compression
 opens *see* fault models for inter-chip interconnects
 operation sequence graph, 912
 operation state, 916
 optimistic condition, 320
 optimistic update rule, 427
 OR–AND complex gate *see* complex gate
 orthogonal scan *see* high-level scan
 oscillation, 303
 oscillation frequency, 436
 out-degree of a net *see* inter-chip interconnect
 output register, 939
 output space, 905, 967
 output state, 916
 output waveform analysis, 435ff.
 post-sampling, 435ff.
 pre-sampling, 436
 overlapped *see* test application schemes for scan
 circuits

p-dominant, 448
 pad driver, 618, *see* boundary scan
 pad receiver, 618, *see* boundary scan
 parallel fault simulation, 83ff.
 fault mask, 84
 parallel-pattern single-fault propagation (PPFSP) *see*
 PPFSP

- parallel scan connector (PSC), 969*ff.*
- parallel scan distributor (PSD), 969*ff.*
- parallel scan path (PSP), 924, 968*ff.*
- parallel simulation, 73, *see* parallel fault simulation
- parallel system, 8
- parallel test vector (PTV) *see* vectors for inter-chip interconnect testing
- parametric tests, 12
 - AC parametric, 12
 - DC parametric, 12
- partial assignment *see* fault grading
- partial dependence circuit, 359
- partial scan, 577*ff.*
 - empirical testability measures, 589
 - minimum feedback vertex set, 588
 - structural approaches *see* structural approaches for partial scan
 - testability and test generation approaches, 588*ff.*
 - testability measures, 588*ff.*
 - uncontrollability analysis *see* uncontrollability analysis
- partial test, 272
- partially detectable, 272*ff.*, 829
- pass–fail fault dictionary *see* fault dictionary
- passive defect, 346*ff.*
- path *see* combinational circuit model
- path activation, 406, 426*ff.*
- path analysis, 898*ff.*, 910*ff.*, 947
- path delay fault (PDF) *see* PDF
- path equation, 920*ff.*
- path in a sequential circuit, 579
 - acyclic, 579
 - combinational, 579
 - cyclic, 579
 - sequential depth of an acyclic path, 579
- path status graph (PSG), 412*ff.*, 429*ff.*, 440
- pattern *see* vector
- pattern generators (PGs), 682*ff.*, *see* BIST methodologies
 - cellular automata *see* cellular automata
 - characteristic polynomial *see* cellular automata, linear feedback shift registers
 - generating function *see* cellular automata, linear feedback shift registers
 - linear, 682
 - linear feedback shift registers (LFSRs) *see* linear feedback shift registers
 - non-linear, 682
 - parallel mode, 682, *see* linear feedback shift registers
 - parallel–serial mode, 682
 - pseudo-random sequences *see* pseudo-random sequences
 - seed, 682, 688
 - serial mode, 682, *see* linear feedback shift registers
 - state transition matrix *see* cellular automata, linear feedback shift registers
- pattern sensitive fault *see* PSF
- PDF (path delay fault), 382*ff.*
 - classification, 385*ff.*
 - diagnosis, 421*ff.*
 - fault coverage, 392*ff.*
 - fault simulation, 412*ff.*, 419*ff.*, 428*ff.*
 - multiple, 827
 - pitfalls, 432*ff.*
 - test generation, 397*ff.*, 424*ff.*, 436*ff.*
 - untestability analysis, 394*ff.*, 424*ff.*
- performance penalty for scan, 577
- pessimistic condition, 320
- physical diagnosis *see* diagnosis
- physical path, 385, 406, 439
- physically-induced fault model *see* fault model
- PODEM, 206*ff.*
 - alternative search space *see* FAN
 - backtrace, 210
 - comparison with *D*-algorithm, 215
 - objectives, 208
 - potential propagation paths, 187, *see* fault effect propagation
 - rules for prioritizing alternatives, 208
- point of detection *see* fault dictionary
- polynomial
 - characteristic *see* cellular automata, linear feedback shift register
 - feedback *see* linear feedback shift register
 - irreducible *see* cellular automata, linear feedback shift register
 - primitive *see* cellular automata, linear feedback shift register
 - rule *see* cellular automata
- positive unate, 357
- post-test diagnostic fault simulation, 496
- potentially compatible fault, 405*ff.*, 440
- potentially detected fault, 284*ff.*, 325, 330*ff.*
- power-up reset, 270
- PPFSP, 86*ff.*
- pre-charge phase, 445*ff.*
- precharging, 850
- precomputed test set, 893, 915*ff.*, 942*ff.*, 964*ff.*, 978
- pre-initialization vector, 433*ff.*
- primary input clock, 575
- primary input part of a vector, 565
- prime literal set, 828
- prime tree, 799*ff.*, 837*ff.*
 - restricted, 801*ff.*, 839
- primitive fault, 391*ff.*, 827*ff.*
 - primitive-dependent, 391*ff.*
 - primitive multiple path delay fault, 391*ff.*
 - primitive single path delay fault, 391*ff.*
- primitive gate, 44, 415, 422, 468, *see* circuit elements
- primitive polynomial *see* cellular automata, linear feedback shift register
- printed-circuit-board, 617
- probabilistic controllability *see* estimation of detectability profile, testability measures
- probabilistic observability *see* estimation of detectability profile, testability measures
- probabilistic sensitivity *see* estimation of detectability profile, testability measures
- probabilistic testability measures *see* estimation of detectability profile, testability measures
- Procedure Compute- $\Phi()$ *see* effect–cause diagnosis
- Procedure Deduce-Values() *see* effect–cause diagnosis
- programmable ROM (PROM) *see* ROM
- propagation constraint, 905*ff.*
- protocol vector, 954

pseudo-exhaustive testing 356, 359ff., 378ff., 838, *see* custom pattern generators
pseudofault, 281
pseudo-random pattern generator (PRPG), 929ff., 945ff., *see* cellular automata, linear feedback shift register, pattern generators
pseudo-random sequences, 690, *see* linear feedback shift register
near completeness, 689
randomness, 690
runs, 690
runs of 0s, 690
runs of 1s, 690
uniqueness, 689
pseudo-random testing *see* estimation of test length
pseudo-SAF test set, 318, 350
PSF (pattern sensitive fault), 857, 862, 887ff.
active (APSF), 887, 888
active NPSF (ANPSF), 887ff.
neighborhood (NPSF), 857, 862, 887
PS-PS complex gate *see* complex gate
pure driver *see* circuit model for scan chain organization
pure receiver *see* circuit model for scan chain organization

quiescent-point (Q-point), 341
quiescent power supply current, 12, 314, 343, 350

radiation, 10, 17, 22
RAM chip model, 846ff.
electrical, 848ff.
functional, 846ff.
RAM organization, 847
logical, 847
physical, 847
random access memory (RAM) *see* cell
random pattern resistant, 809ff.
random pattern testability preserving transformation *see* transformations
random testing *see* estimation of test length
randomness, 946
RARWRD (random address, random write, random data), 880ff.
rated clock scheme, 383ff., 394ff., 411ff., 420ff.
fast clock, 384
slow clock, 384, 425ff., 441
slow-fast, 384
variable, 383ff., 394ff., 411ff., 420ff.
read operation, 848ff.
destructive, 850
read/write circuitry, 851
receiver *see* circuit model for scan chain organization, inter-chip interconnect
receiving weight of a register *see* circuit model for scan chain organization
reconfigurable scan chains, 575, 613ff., *see* scan chain organization
reconfiguration circuitry for BIST *see* BIST methodologies
recovery fault, 866ff., 889
slow sense amplifier, 866
write, 867

recursive learning *see* implication
reduced verification test set (RVTS), 360ff., 379
reduction of switching activity during scan testing, 661ff.
redundancy identification and removal, 271, 811ff.
direct, 812
don't care based, 817ff.
dynamic, 816ff.
indirect, 812ff.
static, 814ff.
redundant cube set *see* cube set
redundant fault region, 816
reference time, 417ff.
refresh logic, 847ff.
refresh operation, 850
register adjacency graph, 939
regular expressions, 920ff., 931ff., 949
relatively essential vertex, 823
reliability, 4ff., 22ff., 349ff., 436ff.
repeatable transition, 368
representation of behavior for test generation, 141ff.
cube cover, 145
D-cubes of a failure, 145
fault excitation cubes, 145
implication using cube covers *see* implication
propagation cubes, 145
singular cover, 145
re-seeding *see* custom pattern generators
residual set, 336
residues *see* scan BIST
response analyzer, 933ff., *see* response compression
response compression, 729ff., *see* built-in self-test aliasing, 730ff.
aliasing characteristics for count-based compressors, 733
aliasing probability, 738ff., *see* aliasing in linear compressors
aliasing volume, 731ff.
aliasing in linear compressors *see* aliasing in linear compressors
count-based compressors, 730ff.
aliasing characteristics for, 733
error models *see* aliasing in linear compressors
LFSR compressors *see* LFSR compressors
linear compressors *see* LFSR compressors, multiple-input signature register (MISR) compressors
Markov modeling of linear compression *see* aliasing in linear compressors
multiple-input signature register (MISR) compressors *see* multiple-input signature register (MISR) compressors
one's count compression, 731
signature, 729, *see* LFSR compressors, aliasing in linear compressors
transition count compressor, 731
restricted fault model *see* fault model
restricted implementation, 31, 356ff., 378
restricted prime tree *see* prime tree
resynthesis, 831ff.
retimed arc weight, 834
retiming, 834ff.

- reverse order fault simulation, 242, *see* test compaction
- reverse time processing, 289*ff.*, 903
- ring oscillator, 436
- ripple-carry adder, 31*ff.*, 46, 367*ff.*, 476*ff.*, 826
- rising-smooth circuit, 403, 440
- robust CMOS test, 445, 451, 456*ff.*, 467*ff.*
- robust CMOS test generation, 467*ff.*
- robust delay fault test *see* delay fault test
- robust dependability analysis *see* untestability analysis
- robust-dependent (RD), 388*ff.*, 425, 438
- robust untestability analysis *see* untestability analysis
- ROM (read-only memory), 846*ff.*
 - electrically erasable programmable (EEPROM), 847
 - erasable programmable (EPROM), 846
 - programmable (PROM), 846*ff.*
- root-cause analysis *see* diagnosis
- rotate-carry addition, 933
- row-select line *see* WL
- RT-scan *see* high-level scan
- RT-scan graph, 925*ff.*
- RTL built-in self-test, 929*ff.*
 - arithmetic BIST, 933*ff.*
 - based on control/data flow extraction, 929*ff.*
 - based on regular expressions, 931*ff.*
 - self-test programs, 935*ff.*
- RTL design for testability, 914*ff.*
 - based on control/data flow extraction, 915*ff.*
 - based on regular expressions, 920*ff.*
 - high-level scan, 924*ff.*
 - orthogonal scan, 927*ff.*
- RTL fault simulation *see* fault simulation
- RTL test generation, 894*ff.*
 - functional, 905*ff.*
 - symbolic, 898*ff.*
 - with functional fault models, 907*ff.*
 - with known initial state, 894*ff.*
- rule-of-ten, 16*ff.*
- RUNBIST *see* boundary scan instructions
- RV-test, 827*ff.*
- S-graph, 834*ff.*, 939, *see* s+graph
- s+graph, 579, *see* structural approaches for partial scan
- SAF (stuck-at fault), 29, 32*ff.*
 - multiple, 33
 - single, 33
 - unidirectional, 34
- SAF-induced fault (SIF), 908*ff.*
- SAMPLE/PRELOAD *see* boundary scan instructions
- satisfiability *see* test generation using satisfiability
- satisfiability don't care set *see* don't care set
- scan, 562*ff.*
 - cost and benefits of scan, 576*ff.*
 - level-sensitive scan *see* level-sensitive scan
 - multiplexed-input scan *see* multiplexed-input scan
 - performance penalty for scan, 577
 - scan chains *see* scan chains
 - test application via scan *see* test application via scan
- scan BIST, 769*ff.*
- at-speed testing not possible, 771, *see* at-speed testing
- decimation, 771*ff.*
 - improper, 772
 - proper, 772
- disjoint sampling of external LFSR, 689, 771
- overlapped sampling of external LFSR, 689, 771
- residues, 773
 - linear independent residues, 775
- STUMPS, 770
- scan chain organization, 594*ff.*, *see* scan chains
 - active drivers for a session, 600
 - active receivers for a session, 600
 - circuit model *see* circuit model for scan chain organization
 - interchange property, 609
 - multiple scan chains, 574, 610*ff.*
- reconfigurable scan chains *see* reconfigurable scan chains
- scan-shift policies *see* scan shift policies
- single chain, 607
- test application schemes *see* test application schemes for scan circuits
- test sessions, 598
- scan chains, 563*ff.*
 - normal mode, 564
 - scan in, 565
 - Scan In*, 564
 - scan out, 565
 - Scan Out*, 564
 - test mode, 564
- scan cycle, 969*ff.*
- scan registers, 563, *see* scan chains
- scan-shift policies, 601*ff.*
 - active-flush, 603
 - flush, 601
 - minimum-shift, 604
- scan shifting, 837, *see* scan-shift policies
- scheduling, 894, 908*ff.*, 940
 - as-late-as-possible, 911
 - as-soon-as-possible, 911
 - symbolic, 908, 910*ff.*
- SD-drive, 466
- search tree for test generation algorithms *see* D-algorithm, PODEM, test generation algorithms
- seed *see* linear feedback shift registers, pattern generators
- segment delay fault (SDF), 39, 382, 393, 409*ff.*, 418*ff.*
 - fault simulation, 418*ff.*
 - test generation, 409*ff.*
- segmentation, 359*ff.*
 - hardware, 362*ff.*
 - sensitized, 364*ff.*
 - verification testing, 359*ff.*
- selection *see* genetic algorithm
- self-hiding, 273*ff.*
- self-test program, 935
- sense amplifier, 849*ff.*, 866, 876*ff.*, 889
- sensitive *see* critical path tracing
- sensitizable path, 827
- sensitized segmentation *see* segmentation
- sensitizing cube *see* cube

sensitizing input values, 399ff.
 functionally sensitizing, 401
 non-robust, 400
 robust, 399
sequential circuit, 562
 combinational circuit block, 562
 flip-flops, 562
 primary inputs, 562
 primary outputs, 562
 state inputs, 562
 state outputs, 562
sequential depth, 298, 578ff., 939
sequential implication, 831
sequential structure of a circuit, 578, *see* partial scan, s+graph
 sequential depth of an acyclic circuit, 579
 sequential depth of an acyclic path, 579
sequential test generation taxonomy, 268ff.
 asynchronous, 269
 hybrid, 269
 simulation based, 269
 state table based, 269
 synchronous, 269
 topological analysis based, 269
serial test vector (STV) *see* vectors for inter-chip interconnect testing
series system, 8
set of ordered pairs of sets (SOPS), 321ff., 334
Shannon's decomposition, 359, 805, 820ff., 825, 838ff.
shift cycle *see* scan-shift policies
shorts *see* fault models for inter-chip interconnects
side-fanout gate, 433
side-fanout input, 432ff.
side-input, 385ff., 432ff., 827
side-path, 385, 403
signature, 345ff., 879ff., 933ff., 975, *see* response compression
 reference, 879
 response, 879ff.
simple driver *see* inter-chip interconnect
simple net *see* inter-chip interconnect
simple receiver *see* inter-chip interconnect
single cell fault model *see* fault model
single chain *see* scan chain organization
single-cube divisor *see* algebraic divisor
single-cube extraction, 803
single event fault, 279ff.
single-latch design, 568
single observation time (SOT), 270ff.
single-output minimized circuit, 452, 800, 804, 823, 837
single SAF redundancy, 804ff.
single SAFs *see* fault models for diagnosis
single-state-transition (SST) fault model *see* fault model
single-vector differentiating sequence, 897ff.
singly-testable (ST), 389ff., 438
singly-testable dependent (STD), 389ff.
singular cover, 57
Sivaraman's PDF classification *see* PDF
six-valued system *see* composite value system
sixteen-valued system *see* composite value system
slack, 348, 400, 408

slow clock *see* rated clock scheme
slow-fast variable clocking scheme *see* rated clock scheme
slow sense amplifier recovery fault *see* recovery fault
spot defect, 41, 857ff.
stability checker, 436
stable state, 270, 303ff.
stable time, 386ff.
stable value, 386
state change problem, 329
state coupling fault *see* coupling fault
state input part of a vector, 566
state justification, 288ff., 299ff., 331, 384, 427, 895ff., 948
state-pair differentiating sequence (SPDS), 286ff., 895, 948
state relaxation, 299
state repetition, 290
state transition matrix *see* cellular automata, linear feedback shift registers, pattern generators
static hazard, 467
static indirect implication, 169, *see* implication
static random access memory (SRAM) *see* cell
static sensitization, 404ff.
status register, 918ff., 959
stem *see* circuit elements
stem analysis in critical path tracing *see* critical path tracing
stem region *see* critical path tracing
stop on first error (SOFE) dictionary *see* fault dictionary
stress condition, 3, 7
strong driver short *see* fault models for inter-chip interconnects
strongly influenced output *see* flow influence model
strongly influencing input *see* flow influence model
structural approaches for partial scan, 578ff.
 kernels *see* kernels
 s+graph, 579
 sequential structure *see* sequential structure of a circuit
structural data-flow graph (SDFG), 899ff., 948
structural description, 27
structural test generation algorithms, 180ff., 197ff.
 D-algorithm *see* D-algorithm
 FAN *see* FAN
 PODEM *see* PODEM
stuck-at fault (SAF) *see* SAF, fault models for inter-chip interconnects
stuck-on fault (SOnF) *see* fault
stuck-open fault (SOpF) *see* fault
STUMPS *see* scan BIST
suspect set, 423, 441
switch-level description, 27
symbolic justification path, 942
symbolic propagation path, 942
symbolic scheduling *see* scheduling
symbolic simulation, 899ff., 949
symbolic test generation, 894, 959
symbolic testability analysis, 893, 914ff., 932, 948, 959
synchronizing sequence, 270, 297, 310
synchronous test model (STM), 303ff.

- synthesis for parallel scan, 832*ff.*
 - fully parallel scan, 832*ff.*
 - maximally parallel scan, 833
 - parallel partial scan, 834
- system data input/output, 962
- system integrator, 955
- system logic *see* boundary scan
- system-on-a-chip (SOC), 953*ff.*
- system test configuration register, 959

- TAO-BIST, 931
- TAP *see* test access port
- tap assignment *see* BIST for delay fault testing
- TAP controller, 623*ff.*
- TAP linking module (TLM), 963*ff.*
- tap selection *see* BIST for delay fault testing
- target fault *see* fault
- task list, 71
 - levelized, 71
- tautology, 819
- TCK *see* test access port
- TDI *see* test access port
- TDO *see* test access port
- test
 - address decoder *see* AF
 - ATS *see* ATS
 - Checkerboard *see* Checkerboard
 - concurrent *see* concurrent testing
 - DADWDD *see* DADWDD
 - DADWRD *see* DADWRD
 - delay *see* delay fault test
 - dynamic *see* electrical tests
 - electrical *see* electrical tests
 - external *see* external test
 - functional *see* external test
 - GALCOL *see* GALCOL
 - GALPAT *see* GALPAT
 - GALROW *see* GALROW
 - I*_{DDQ} test, 12, 314*ff.*
 - inter-chip interconnects *see* vectors for inter-chip interconnects
 - leakage, 315*ff.*
 - March *see* March tests
 - MSCAN *see* MSCAN
 - non-concurrent, 13
 - parametric, 12
 - RARWRD *see* RARWRD
 - robust *see* delay fault test
 - transition, 411
 - two-pattern *see* two-pattern test
 - Walking 1/0 *see* Walking 1/0
 - Zero-One *see* Zero-One test
- test access port, 621*ff.*
 - test clock (TCK), 621
 - test data input (TDI), 623
 - test data output (TDO), 623
 - test mode select (TMS), 621
 - test reset (TRST*), 623
- test access port (TAP) controller, 962, *see* test access port
- test application, 560, *see* scan chain organization, test application via scan
 - test application schemes for scan circuits, 598*ff.*, *see* test application via scan
 - combined, 598
 - isolated, 600
 - overlapped, 599
- test application via scan, 566, *see* scan chain organization
- test architecture, 916*ff.*, 958*ff.*
- test bus, 960*ff.*
 - test control, 961
 - test data, 961
- test clock, 962, *see* test access port
- test collar cell *see* cell
- test compaction, 242*ff.*, 306*ff.*, 316, 328*ff.*, 350, 382, 394, 405*ff.*
 - direct, 328
 - dynamic, 249, 307
 - indirect, 328
 - path delay fault, 405*ff.*
 - static, 242, 306
 - double detection, 243
 - reverse order fault simulation, 242
 - test combining, 247
 - test elimination, 242
- test concurrency compatible *see* in-situ BIST
- test concurrency incompatibility graph *see* in-situ BIST
- test configuration register (TCR), 918, 929
- test control/data flow (TCDF), 915*ff.*, 929*ff.*, 958
- test control logic, 959
- test counts, 807*ff.*, 838
 - sensitive, 807*ff.*
- test data bandwidth, 969*ff.*
- test data input *see* test access port
- test data input/output, 962*ff.*
- test data output *see* test access port
- test data registers *see* boundary scan
- test data volume, 969*ff.*
- test development, 560
- test economics, 16*ff.*, 348*ff.*
- test environment, 921*ff.*, 942*ff.*
- test escape, 560
- test flow, 954
- test generation, 134*ff.*,
 - acceleration, 217*ff.*
 - alternative search space *see* FAN
 - multiple backtrace *see* FAN
 - non-conflicting assignments, 220
 - reuse of search, 221
 - complete, 180
 - D*-algorithm *see* *D*-algorithm
 - efficiency, 180
 - non-structural *see* non-structural test generation algorithms
 - PODEM *see* PODEM
 - representation of behavior for, *see* representation of behavior for test generation
 - successful, 180
 - structural *see* structural test generation algorithms
 - systems *see* test generation systems
- test generation based on satisfiability, 224*ff.*
 - active clauses, 227
 - active variables, 227

- test generation based on satisfiability (*cont.*),
 - AND-clause, 224
 - assignment, 224
 - CNF of fault-free circuit, 224
 - CNF of faulty circuit, 226
 - conjunctive normal form (CNF), 229
 - formula, 224
 - literal, 224
 - OR-clause, 224
 - satisfiability, 224
 - satisfying assignment, 224
- test generation sub-tasks (TGSTs), 181*ff.*, *see*
 - D*-algorithm
- test generation systems, 235*ff.*
 - aborted faults, 235
 - backtrack limit, 235
 - functional vectors, 236*ff.*
 - random vectors, 237*ff.*
 - selection of target faults, 239*ff.*
 - fault collapsing, 240
 - independent fault sets, 241
 - use of fault simulator, 236*ff.*
- test generation to reduce heat dissipation, 250*ff.*
 - transition controllability, 252
 - transition observability, 253
- test generation using BDDs, 229*ff.*
 - index of a vertex, 229
 - non-terminal vertices, 229
 - ordered BDDs (OBDDs), 230
 - reduced ordered BDDs, 230
 - terminal vertices, 229
 - value of a vertex, 229
 - vertices, 229
- test harness, 976*ff.*
- test instruction, 935*ff.*
- test interface controller (TIC), 976
- test interface element (TIE), 956*ff.*
 - functional load, 956
 - functionally transparent, 956
 - serial load, 956
- test invalidation, 400, 408, 445, 451, 456*ff.*, 474
- test length coefficient, 883*ff.*
- test mode select (TMS), 962*ff.*, *see* test access port
- test modes *see* BIST methodologies
- test pattern *see* test vector
- test-per-clock BIST *see* in-situ BIST
- test-per-scan BIST *see* scan BIST
- test points, 708*ff.*, 811, 955
 - control points, 708
 - complete control points, 709
 - one control points, 708
 - inversion control points, 708
 - zero control points, 708
 - observation points, 708
 - types of, 708*ff.*
- test quality *see* estimation of test length, fault coverage
- test reset *see* test access port
- test register, 931*ff.*, 946, 960*ff.*
- test reset signal, 963
- test schedule *see* in-situ BIST
- test select, 959, 962
- test sessions, 598, *see* scan chain organization
- test set preserving transformation *see* transformations
- test signal *see* custom pattern generators
- test specification, 936*ff.*
- test strategy, 270*ff.*, 309, 976
 - restricted, 270*ff.*, 309
 - unrestricted, 270*ff.*, 309
- test vector, 50
- testable functional block (TFB), 945*ff.*
- testability analysis and optimization (TAO), 920, 931*ff.*
- testability measures, 189*ff.*, *see* estimation of detectability profile
 - 0-controllability, 189*ff.*
 - 1-controllability, 189*ff.*
 - controllability, 189*ff.*
 - controllability transfer function, 191*ff.*
 - cost of a component of a cube, 193, 196
 - cost of a cube, 193, 196
 - observability, 189*ff.*
 - observability transfer function, 191*ff.*
 - observability cost of a cube, 193
 - rules for prioritizing alternatives, 208
- testing scan circuitry, 576
- testrail, 973*ff.*
 - compressed, 974
 - parallel, 974
 - serial, 974
- testshell, 973*ff.*
 - bypass, 973
 - core test, 973
 - functional, 973
 - interconnect test, 973
- three-pattern test, 411, 433*ff.*, 441, 462, 476
- three-valued
 - truth tables *see* truth tables
 - value system *see* value systems
- threshold voltage, 10, 347, 351
- time frame, 277*ff.*, 384, 424*ff.*, 441, 830*ff.*
- TMS *see* test access port
- transfer sequence, 287, 299
- transformations, 799*ff.*, 819, 828, 837*ff.*, 941
 - behavioral, 941
 - De Morgan, 806
 - fanout-free, 805
 - random pattern testability preserving, 809*ff.*, 819
 - test set preserving, 802*ff.*
 - verifiability preserving, 828
- transition count compressor *see* response compression
- transition fault (TF) *see* DF, fault models for diagnosis
- transition test *see* test
- transition write operation *see* write operation
- transitive fanin *see* combinational circuit model
- transitive fanout *see* combinational circuit model
- transitive fanout don't care set *see* don't care set
- transmission gate, 464
- transparency, 946, 958*ff.*
 - latency, 959
 - path, 958
- transport capacity, 956
- tree representation, 463
- tri-state driver *see* inter-chip interconnect
- tri-state net *see* inter-chip interconnect
- TRST* *see* test access port

- true/complement counting sequence *see* vectors for inter-chip interconnect testing
- true/complement walking test *see* vectors for inter-chip interconnect testing
- true vector, 357ff., 471ff.
 - expanded, 357ff.
 - minimal, 357ff.
- true vertex, 471ff.
- truth tables, 52ff., 162
 - four-valued *see* composite value systems
 - higher-valued, 162
 - three-valued, 52
 - two-valued, 53
- two-line bridging faults (BFs) *see* fault models for diagnosis
- two-pattern test, 35ff., 382ff., 819, 827, 836ff.
 - initialization vector, 35, 40, 382, 388, 403ff., 433ff., 453ff., 469ff., 819
 - test vector, 35ff., 382, 388, 403ff., 438ff., 449, 457ff., 466ff., 819ff., *see* design for testability for delay fault testing
- two-state driver *see* inter-chip interconnect
- two-valued
 - truth tables *see* truth tables
 - value system *see* value systems
- unate input, 31, 357
- uncontrollability analysis, 589ff.
 - 0-uncontrollable, 590
 - 1-uncontrollable, 590
 - uncontrollability status, 590
 - uncontrollable, 590
 - unobservable, 590
- uncontrollability status, 814ff., 830ff., *see* uncontrollability analysis
- unjustified lines *see* justification
- unobservability status, 815, 830ff., *see* uncontrollability analysis
- unobservable *see* uncontrollability analysis
- universal test set, 31, 46, 356ff., 378
- unreliability, 4, 8
- unstable state, 303ff.
- untestable fault, 50, *see* fault
- untestability analysis, 394ff., 424ff.
 - functional unsensitizability, 396, 425
 - non-robust, 396
 - robust, 394ff., 425
 - robust dependability, 396
- user-defined logic (UDL), 953, 961ff.
- user mode, 960
- validatable non-robust path delay fault testable (VNRPDFT) circuit, 820, 823, 838
- validatable non-robust test *see* non-robust test
- value analysis, 898ff., 904ff., 910ff., 947
- value systems
 - basic values, 55
 - completely specified value, 56
 - incompletely specified value, 56
 - three-valued, 55
 - two-valued, 55
 - unspecified value, 56
- variable clock scheme *see* rated clock scheme
- vector, 50, 134
 - components of, 50, 134
 - test, 50
- vector cover, 357
- vectors for inter-chip interconnect testing, 649ff.
 - modified counting sequence, 650
 - parallel test vector (PTV), 650
 - serial test vector (STV), 651
 - true/complement counting sequence, 651
 - true/complement walking test, 654
 - walking-one test, 654
- verifiability, 819, 826ff., 841, 942ff.
 - delay, 819, 826ff., 841
- verifiability preserving transformation *see* transformations
- verification testing *see* segmentation
- victim cell *see* cell
- voltage amplifier, 341
- voltage comparator, 340ff.
- voltage quiescent-point stabilizer, 341
- Walking 1/0, 864, 866ff., 889
- walking-one test *see* vectors for inter-chip interconnect testing
- weakly influenced output *see* flow influence model
- weakly influencing input *see* flow influence model
- wearout, 6
- weight, 361ff., 834ff.
- weighted-random testing, 720ff.
 - multiple weight sets, 721ff.
 - weight circuit, 723
 - weight set, 720
 - weighted-random pattern generator, 720
- wired-AND bridging faults (BFs) *see* fault models for diagnosis
- wired-AND shorts *see* fault models for inter-chip interconnects
- wired-OR bridging faults (BFs) *see* fault models for diagnosis
- wired-OR shorts *see* fault models for inter-chip interconnects
- WL (word line), 849ff.
- word-oriented memory, 860
- write driver, 848, 852
- write operation, 848, 853ff., 887ff.
 - non-transition, 855ff., 887ff.
 - transition, 853
- write recovery fault *see* recovery fault
- x-path check, 187, *see* fault effect propagation
- yield, 1, 14ff., 348ff.
 - loss, 348ff.
- Zero-One test, 864ff.
- zipper CMOS, 475