

DIN EN 16602-70-10:2015-05 (E)

Space product assurance - Qualification of printed circuit boards; English version EN 16602-70-10:2015

Foreword	7
1 Scope	8
2 Normative references	9
3 Terms, definitions and abbreviated terms	11
3.1 Terms from other standards.....	11
3.2 Terms specific to the present standard	11
3.3 Abbreviated terms.....	14
4 Principles	16
4.1 General.....	16
4.2 Roles	16
4.3 Specification of test requirements	17
5 Evaluation	18
5.1 General.....	18
5.2 Request for evaluation	18
5.3 Evaluation PCBs.....	18
5.4 Line audit.....	19
6 Qualification	20
6.1 General.....	20
6.2 Qualification programme definition and approval	20
6.3 Nonconformance criteria.....	21
6.4 Qualification programme implementation	21
6.5 Qualification PCBs.....	25
6.5.1 General	25
6.5.2 Test pattern A: Electrical test	27
6.5.3 Test pattern B: Mechanical test	27
6.5.4 Test pattern C: Electrical test	28
6.5.5 Test pattern D: Electrical test and visual aspect	28
6.5.6 Test pattern E: Electrical test	29
6.5.7 Test pattern F: Metal-plating test.....	30

6.5.8	Test pattern G: Metal-plating/coating test.....	30
6.5.9	Test pattern H: Electrical test	31
6.5.10	Test pattern J: Solderability test	31
6.5.11	Test pattern K: Physical test.....	32
6.5.12	Test pattern L: Demonstration of technological capability.....	32
6.5.13	Test pattern M: CAD/CAM criteria (on request by the qualification authority).....	33
6.5.14	Test pattern X: Resistance to bending cycles (for flexible parts only)	34
6.5.15	Test pattern Y: Electrical test (on request by the supplier).....	34
6.5.16	Test pattern W: Electrical test for high frequency circuits (on request by the supplier)	35
6.6	Qualification approval	35
6.7	Maintenance of qualification	35
7	Tests	37
7.1	General.....	37
7.2	Group 1 — Visual inspection and non-destructive test.....	37
7.2.1	General.....	37
7.2.2	Verification of marking.....	37
7.2.3	Visual aspects.....	38
7.2.4	External dimensions.....	41
7.2.5	Warp	41
7.2.6	Twist	42
7.2.7	Subgroup 1.1 — Specific dimensional check.....	42
7.2.8	Subgroup 1.2 — Electrical measurements	44
7.3	Group 2 — Miscellaneous tests	46
7.3.1	General.....	46
7.3.2	Subgroup 2.1 — Solderability test — Wettability on test pattern J	46
7.3.3	Subgroup 2.2 — Mechanical tests.....	47
7.3.4	Subgroup 2.3 — Coatings tests.....	49
7.3.5	Subgroup 2.4 — Electrical tests	56
7.3.6	Subgroup 2.5 — Physical tests on test pattern K	58
7.4	Group 3 — Thermal stress and thermal shock (on PCB)	59
7.4.1	General.....	59
7.4.2	Solder bath float and vapour phase reflow simulation (on board without test pattern F)	59
7.4.3	Rework simulation (thermal shock, hand soldering) on test pattern F.....	60
7.5	Group 4 — Thermal cycling (on PCB).....	61
7.6	Group 5 — Damp heat — Steam ageing (on PCB).....	62

7.6.1	General	62
7.6.2	Damp heat (on entire PCB excluding test pattern F)	62
7.6.3	Steam ageing on test pattern F	62
8	Quality assurance for manufacturing	64
8.1	General.....	64
8.2	Data.....	64
8.3	Incoming inspection of raw materials	64
8.4	Traceability	64
8.5	Calibration	65
8.6	Workmanship standards	65
8.7	Inspection	65
8.8	Operator and inspector training.....	65
8.9	Quality test specimen	65
8.10	Microsection	66
8.11	Final inspection and tests	66
8.12	Delivery	66
9	Requirements for PCBs	67
9.1	Rigid single-sided and double-sided PCBs	67
9.2	Rigid single-sided and double-sided PCBs for high frequency application	69
9.3	Flexible PCBs	72
9.4	Rigid-flex PCBs	74
9.5	Rigid multilayer PCBs.....	74
9.6	Sequential rigid multilayer PCBs.....	77
Annex A	(normative) Evaluation test report – DRD	80
Annex B	(normative) Qualification test report – DRD	82
Annex C	(normative) PCB manufacturing/assembly process identification document (PID) – DRD	83
Annex D	(normative) Qualification status report – DRD.....	84
Annex E	(informative) Example of check-list.....	85
Annex F	(informative) Example of plated-through hole microsection.....	88
Bibliography		89
Figures		
Figure 6-1:	Test sequence.....	22

Figure 6-2: Example of a qualification PCB layout with patterns for testing and a pattern for demonstration of the technological capability	26
Figure 6-3: Example of test pattern for intralayer insulation resistance and dielectric withstanding voltage testing	27
Figure 6-4: Example of test pattern for testing peel strength of conductors and pull-off strength of pads	28
Figure 6-5: Example of test pattern for internal short circuit testing.....	28
Figure 6-6: Example of test pattern for etching definition evaluation and continuity testing	29
Figure 6-7: Example of test pattern for interconnection resistance and current overload testing	29
Figure 6-8: Example of test pattern for microsectioning and metal plating evaluation	30
Figure 6-9: Example of test pattern for plating adhesion testing and analysis of SnPb coating composition after reflow	30
Figure 6-10: Example of test pattern for interlayer insulation resistance and dielectric withstanding voltage testing	31
Figure 6-11: Example of test pattern for solder wettability and rework simulation testing.....	31
Figure 6-12: Example of test pattern for water absorption and outgassing testing	32
Figure 6-13: Example of test pattern for evaluation of the technological capability	33
Figure 6-14: Example of test pattern for evaluation of CAD/CAM capability.....	34
Figure 6-15: Example of test pattern for testing resistance to bending cycles.....	34
Figure 6-16: Example of test pattern for controlled impedance testing.....	34
Figure 7-1: Arbitrary defects on conductors	40
Figure 7-2: Arbitrary defects on spacing between conductors.....	40
Figure 7-3 Misalignment of cover layer (for flexible PCBs)	41
Figure 7-4: Warp	42
Figure 7-5: Twist.....	42
Figure 7-6 Example of a presentation of measurements in tabular form	43
Figure 7-7: Wettability of terminal pads and plated-through holes	47
Figure 7-8: Dimensional parameters to be measured	51
Figure 7-9: Microsection of a PTH	53
Figure 7-10: Undercut for PCBs with fused SnPb finish.....	53
Figure 7-11: Undercut for PCBs with Au/Ni or Au finish	54
Figure 7-12: Overhang for PCBs with Au/Ni or Au finish.....	54
Figure 7-13: Microsection in PTH: Possible defects.....	55
Figure 7-14: Microsection of PTH: Possible defects	55
Figure 7-15: Voids in resin inside buried vias	56
Figure 7-16: Test for internal short circuit	57
Figure A-1 : Example of a test report	81

Figure E-1 : Example of Check-list for double sided and multilayer PCBs85
Figure F-1 : Example of plated-through hole microsection.....88

Tables

Table 6-1: Test specification.....23