DOCUMENT CHANGE REQUEST

DCR number 236	Changes required for: General	Originator: S.Thacker
Date: 2006/02/09	Date sent: 2006/02/09	Organisation: ESA/ESTEC
Status: IMPLEMENTED		

Title:	Generic Specification for Discrete Semiconductor Components		
Number:	5000	Issue:	2

Other documents affected:

Page:

P8 Para 2.2
P11 Para 5.3.2
P13 Para 7.1.1
P16 Para 8.2.1, 8.6.1
P17 Para 8.6.2
P22 Pasra 9.7
P26 Para 12.3 Chart F3
P28 Para 12.4 Chart F4

Paragraph:

P8 Para 2.2
P11 Para 5.3.2
P13 Para 7.1.1
P16 Para 8.2.1, 8.6.1
P17 Para 8.6.2
P22 Pasra 9.7
P26 Para 12.3 Chart F3
P28 Para 12.4 Chart F4

Original wording:

Proposed wording:

See attached mark-up for details of all changes.
Changes include minor editorial amendments including the following specific changes:

Proposed Wording of Change
See attached mark-up for details of all changes.
Changes include minor editorial amendments including the following specific changes:
1) para 2.2 delete ref to MIL-STD-202 (as it is not referenced in the specification)
2) Para 7.1.1 delete "(Screening Tests)" in line 3 after "Chart F3" (due to unnecessary duplication of references)
3) Para 9.7 Add requirement for Radiographic Inspection photographic results to be recorded against serial number (this requirement was missing)

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(As Radiographic Inspection is performed during screening, the documentation requirements applicable to the photographs needs to be defined; these had been omitted by mistake in 5000 issue 2.)
(Note - there is no justification for Radiographic photographs not be made part of the data documentation package generated and held by the manufacturer for any procured lot)
4) Para 12.3 Chart F3. Correct Temperature Cycling reference to be 8.6.1 (was 8.61)
5)Para 12.4 Chart F4. Delete "Notes 1, 2, 3" to be replaced by a single new note that reflects the content of para 7.1.2 (as sample distribution is not specified on a "per type" basis as indicated in "Notes 1,2,3")
(This is an editorial error introduced during the generation of 5000 issue 2 by having used the layout and content of ESCC 9000 as source data to generate the content of the 5000 document; "Notes 1,2,3" from ESCC9000 were thereby included by mistake.)
(Note - due to the fact that different discrete semiconductors do not have a clear 'family' structure, as does apply to many ESCC IC's (e.g. 54HCMOS, 4000B CMOS families), it is not a straightforward matter to define a 'family' distribution of Qualification samples (to be used in Chart F4). Hence the distribution in 5000 is left for the ESCC Executive to decide on, on an Ad-hoc basis as detailed in para 7.1.2. Hence "Notes 1,2,3 " would not apply in any case.)

Justification:

Correction of editiorial mistakes and for the purposes of clarifiaction. (See each change above for detailed justification)

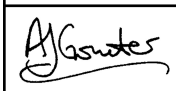
Attachments:

5000.pdf, null

Modifications:

N/A

Approval signature:



Date signed:

2006-02-09

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S.I.

4/8/5 8/2/6

Editorial Changes to be incorporated at next update

ESCC European Space Components Coordination

Pages 1 to 28

DISCRETE SEMICONDUCTOR COMPONENTS, HERMETICALLY SEALED

ESCC Generic Specification No. 5000

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Issue 2	August 2005

esa

Document Custodian: European Space Agency - see https://escies.org

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2.2 OTHER (REFERENCE) DOCUMENTS

- ECSS-Q-70-02, Thermal Vacuum Test for the Screening of Space Materials.
- ~~MIL-STD-202, Test Methods for Electronic and Electrical Component Parts.~~
- MIL-STD-750, Test Methods for Semiconductor Devices.
- MIL-STD-883, Test Methods and Procedures for Micro-electronics.

2.3 ORDER OF PRECEDENCE

For the purpose of interpretation and in case of conflict with regard to documentation, the following order of precedence shall apply:

(a) ESCC Detail Specification.
(b) ESCC Generic Specification.
(c) ESCC Basic Specification.
(d) Other documents, if referenced herein.

3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

The terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. 21300 shall apply.

4. REQUIREMENTS

4.1 GENERAL

The test requirements for the component type qualification of a component shall comprise Special In-Process Controls, Wafer Lot Acceptance with radiation tests (if specified), Screening Tests and Component Type Qualification Testing.

The test requirements for procurement of components shall comprise Special In-Process Controls, Wafer Lot Acceptance with radiation tests if required in the Purchase Order, Screening Tests, together with Periodic Testing for qualified components and Lot Validation Testing for qualified (if required in the Purchase Order) and unqualified components (see Chart F1).

4.1.1 Specifications

For qualification, qualification maintenance, procurement and delivery of components in conformity with this specification, the applicable specifications listed in Section 2 of this document shall apply in total unless otherwise specified herein or in the Detail Specification.

4.1.2 Conditions and Methods of Test

The conditions and methods of test shall be in accordance with this specification, the ESCC Basic Specifications referenced herein and the Detail Specification.

4.1.3 Manufacturer's Responsibility for Performance of Tests and Inspections

The Manufacturer shall be responsible for the performance of tests and inspections required by the applicable specifications. These tests and inspections shall be performed at the plant of the Manufacturer of the components unless it is agreed by the ESCC Executive (for qualification, qualification maintenance, or procurement of qualified components) or the Orderer (for procurement of unqualified

5.2 SPECIAL IN-PROCESS CONTROLS

5.2.1 Pre-encapsulation Inspection

Pre-encapsulation inspection shall consist of Internal Visual Inspection in accordance with Para. 8.1 plus Bond Strength and Die Shear tests in accordance with Para. 8.2.

Bond Strength and Die Shear tests shall be performed on test samples in accordance with Para. 8.2. A single failure shall be cause for lot failure. These tests are considered as destructive and therefore components so tested shall not form part of the delivery lot.

5.2.2 Dimension Check

In accordance with Para. 8.10 on 3 samples only.

If a failure occurs, the complete lot shall be checked.

5.2.3 Weight

The maximum weight of the component specified in the Detail Specification shall be guaranteed but not tested.

5.2.4 Documentation

Documentation of Special In-Process Controls shall be in accordance with Para. 9.5.

5.3 WAFER LOT ACCEPTANCE

5.3.1 Process Monitoring Review

Process monitoring review shall be done in compliance with the Manufacturer's SPC rules described in the PID.

A wafer shall be rejected if one or more process control data parameters exceed the allowed distribution as specified in the PID.

5.3.2 Scanning Electron Microscope (SEM) Inspection

If specified in the Detail Specification, components supplied to this specification shall be produced from wafer lots that have been subjected to, and successfully met, the Scanning Electron Microscope Inspection requirements in accordance with Para. 8.3.

5.3.3 Total Dose Radiation Testing

For qualification or qualification maintenance:

- If specified in the Detail Specification, components shall be produced from a wafer lot which has been subjected to and successfully completed Total Dose Radiation Testing in accordance with Para. 8.4 to the total dose level given.

During procurement:

- If specified in the Detail Specification and required in the Purchase Order, components shall be produced from a wafer lot which has been subjected to and successfully completed Total Dose

6.3 FAILED COMPONENTS

A component shall be considered as a failed component if it exhibits one or more of the failure modes described in Para. 6.2.

6.4 LOT FAILURE

In the case of lot failure, the Manufacturer shall act in accordance with Para. 4.3.1.

6.4.1 Lot Failure during 100% Testing

If the number of components failed on the basis of the failure criteria specified in Paras. 6.2.2 and 6.2.3 exceeds 5% (rounded upwards to the nearest whole number) of the components submitted to initial measurements of Parameter Drift Values of Chart F3, the lot shall be considered as failed.

If a lot is composed of groups of components of one family defined in one ESCC Detail Specification, but separately identifiable for any reason, then the lot failure criteria shall apply separately to each identifiable group.

6.4.2 Lot Failure during Sample Testing

A lot shall be considered as failed if the number of allowable failures during sample testing as specified in the Detail Specification, is exceeded.

If a lot failure occurs, a 100% testing may be performed but the cumulative percent defective shall not exceed that given in Para. 6.4.1.

No failures are allowed for the Solderability test.

6.5 DOCUMENTATION

Documentation of Screening Tests shall be in accordance with Para. 9.7.

7. QUALIFICATION, QUALIFICATION MAINTENANCE AND LOT VALIDATION TESTING

Requirements of this paragraph are applicable to the tests performed for component type qualification and qualification maintenance and also for Lot Validation Testing.

7.1 COMPONENT TYPE QUALIFICATION TESTING

7.1.1 General

Qualification testing shall be in accordance with the requirements given in Chart F4. The tests of Chart F4 shall be performed on the specified sample, chosen at random from components which have successfully passed the tests in Chart F3 ~~Screening tests~~. This sample constitutes the qualification test lot.

The qualification test lot is divided into subgroups of tests and all components assigned to a subgroup shall be subjected to all of the tests in ~~that subgroup,~~ in the sequence shown. The applicable test requirements are detailed in the paragraphs referenced in Chart F4.

The conditions governing component type qualification testing are given in ESCC Basic Specification No. 20100.

7.1.2 Distribution within the Qualification Test Lot

Where a Detail Specification covers a range, or series of components that are considered similar, then

8.2 BOND STRENGTH AND DIE SHEAR

8.2.1 Bond Strength

MIL-STD-750, Test Method 2037, Test Condition A or B.

Test Condition B shall only be permitted when Test Condition A cannot be used and never for bond wires of diameter less than 0.127mm.

Test Samples: For Special In-Process Controls 3 test samples shall be selected at random from the lot of components accepted after Internal Visual Inspection.

For Qualification and Periodic Tests 3 test samples shall be selected from the components in subgroup 3 of Chart F4.

If agreed by the ESCC Executive (for qualification or qualification maintenance) or the Orderer (for procurement) the test samples for Special In-Process Controls may have only passed the low magnification phase of the Internal Visual Inspection.

Individual separation forces and categories shall be recorded. A single failure shall be cause for lot failure.

8.2.2 Die Shear

MIL-STD-750, Test Method 2017.

The same test samples submitted to Bond Strength shall be used. Individual separation forces and categories shall be recorded. A single failure shall be cause for lot failure.

8.3 SCANNING ELECTRON MICROSCOPE INSPECTION

Only applicable if specified in the Detail Specification.

ESCC Basic Specification No. 21400.

8.4 TOTAL DOSE RADIATION TESTING

ESCC Basic Specification No. 22900 to the total dose level specified in the Detail Specification or as required in the Purchase Order.

8.5 HIGH TEMPERATURE STABILISATION BAKE

MIL-STD-750, Test Method 1032, Duration: 24 hours at maximum storage temperature rating specified in the Detail Specification.

8.6 TEMPERATURE CYCLING

8.6.1 Screening Tests

MIL-STD-750, Test Method 1051, Test Condition C, 20 cycles of maximum storage temperature rating specified in the Detail Specification.

8.6.2 Qualification and Periodic Tests

Not applicable for axial lead glass diodes.

MIL-STD-750, Test Method 1051, Test Condition C, 100 cycles at maximum storage temperature rating specified in the Detail Specification.

8.7 PARTICLE IMPACT NOISE DETECTION (PIND)

Only applicable to devices with cavities.

MIL-STD-750, Test Method 2052, Test Condition A.

The use of the same attachment medium for the Sensitivity Test Unit and for the components under test is not mandatory.

8.8 SEAL

Glass diodes shall not be painted during Screening until after seal tests are completed. Any paint shall be removed prior to seal tests during Qualification and Periodic Tests.

8.8.1 Seal, Fine Leak

MIL-STD-750, Test Method 1071, Condition H1 or H2.

This test is not applicable to components with a cavity ≤0.05ccm. For components with cavities >0.05ccm, the maximum leak rate shall be as follows:

>0.05ccm to 0.3ccm	: $5x10^{-8}$ atm ccm/sec
>0.3ccm to 3ccm	: $5x10^{-7}$ atm ccm/sec
>3ccm to 40ccm	: $5x10^{-6}$ atm ccm/sec

8.8.2 Seal, Gross Leak

MIL-STD-750, Test Method 1071, Condition C or K for components with cavities.

MIL-STD-750, Test Method 1071, Condition E for clear glass components without cavities.

8.9 ELECTRICAL MEASUREMENTS

8.9.1 Parameter Drift Values

At each of the relevant data points during Screening Tests, Parameter Drift Values shall be measured as specified in the Detail Specification. All values obtained shall be recorded against serial numbers and the parameter drift calculated.

8.9.2 High and Low Temperatures Electrical Measurements

High and Low Temperatures Electrical Measurements shall be performed as specified in the Detail Specification. All values obtained shall be recorded against serial numbers. Unless otherwise specified measurements shall be performed on a sample of 5 components with 0 failures allowed. Alternatively a 100% inspection may be performed.

8.9.3 Room Temperature Electrical Measurements

Room Temperature Electrical Measurements shall be performed as specified in the Detail Specification. All values obtained shall be recorded against serial numbers.

(d) Lot identification.
(e) Range of delivered serial numbers.
(f) Number of the Purchase Order.
(g) Radiation testing level (if applicable).
(h) Information relative to any additions to this specification and/or the Detail Specification.
(i) Manufacturer's name and address.
(j) Location of the manufacturing plant (specify place of diffusion, assembly and test).
(k) Signature on behalf of Manufacturer.
(l) Total number of pages of the data package.

9.3 LIST OF EQUIPMENT USED

A list of equipment used for tests and measurements shall be prepared, if not in accordance with the data given in the PID. Where applicable, this list shall contain inventory number, Manufacturer's type number, serial number, etc. This list shall indicate for which tests such equipment was used.

9.4 LIST OF TEST REFERENCES

This list shall include all Manufacturer's references or codes which are necessary to correlate the test data provided with the applicable tests specified in the tables of the Detail Specification.

9.5 SPECIAL IN-PROCESS CONTROLS DATA (CHART F2)

A test result summary shall be compiled, showing the total number of components submitted to, and the total number rejected after each of the tests. For the Bond Strength and Die Shear tests, the separation forces and categories shall be recorded.

9.6 WAFER LOT ACCEPTANCE DATA (CHART F2)

Data of SEM Inspection shall be prepared in accordance with the requirements of ESCC Basic Specification No. 21400 (if specified).

Radiation test report shall be prepared in accordance with the requirements of ESCC Basic Specification No. 22900 (if specified).

9.7 SCREENING TESTS DATA (CHART F3)

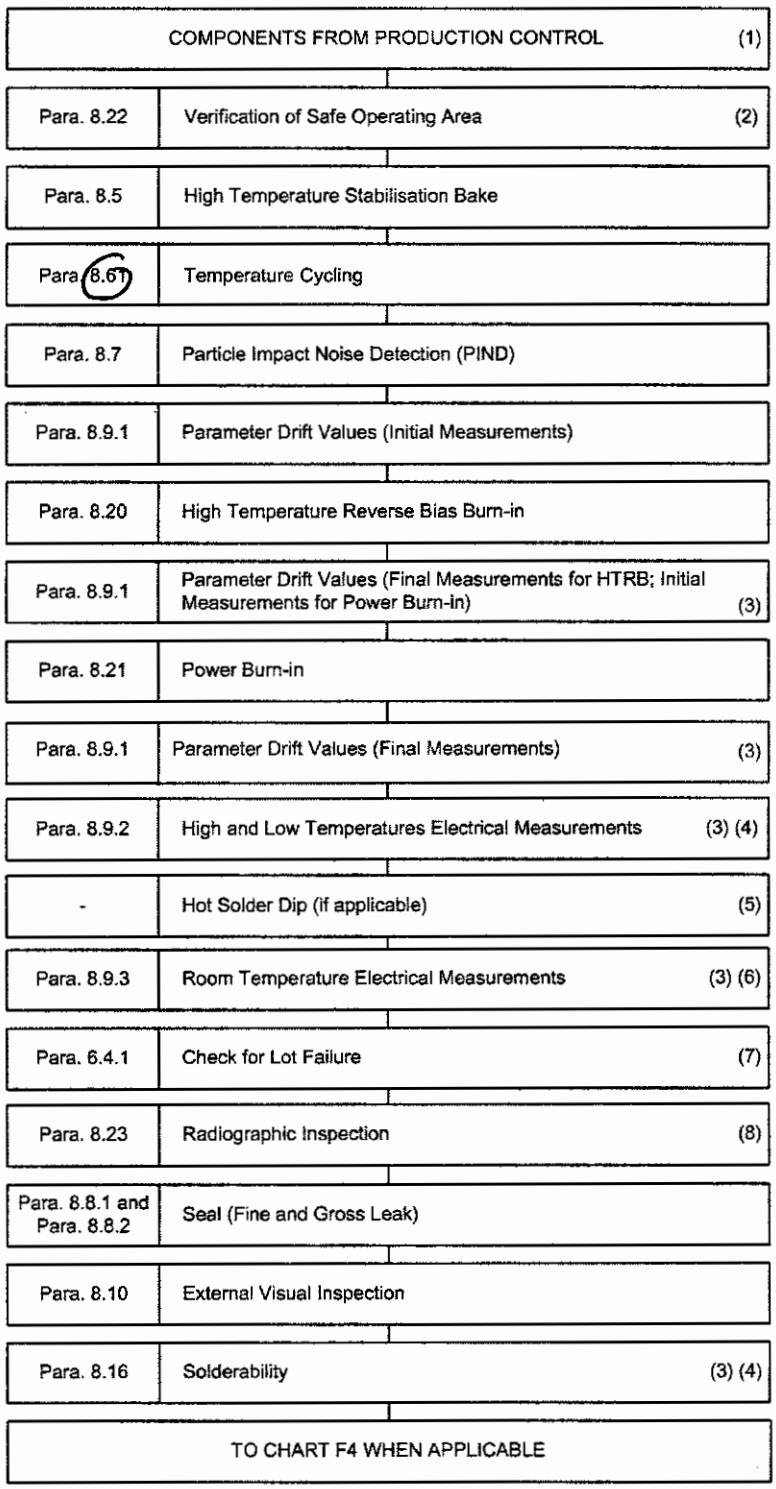
A test result summary shall be compiled showing the total number of components submitted to and the total number rejected after each of the tests. For each test requiring electrical measurements the results shall be recorded against component serial number. Component drift calculations shall be recorded for each specified test against component serial number. For Radiographic Inspection photographic results shall be recorded against component serial number (as applicable).

9.8 QUALIFICATION AND PERIODIC TESTS DATA (CHART F4)

9.8.1 Qualification Testing

A test result summary shall be compiled showing the components submitted to and the number rejected after each test in each subgroup. Component serial numbers for each subgroup shall be identified. For each test requiring electrical measurements the results shall be recorded against component serial number. Where a drift value is specified during a test the drift calculation shall be recorded against component serial number.

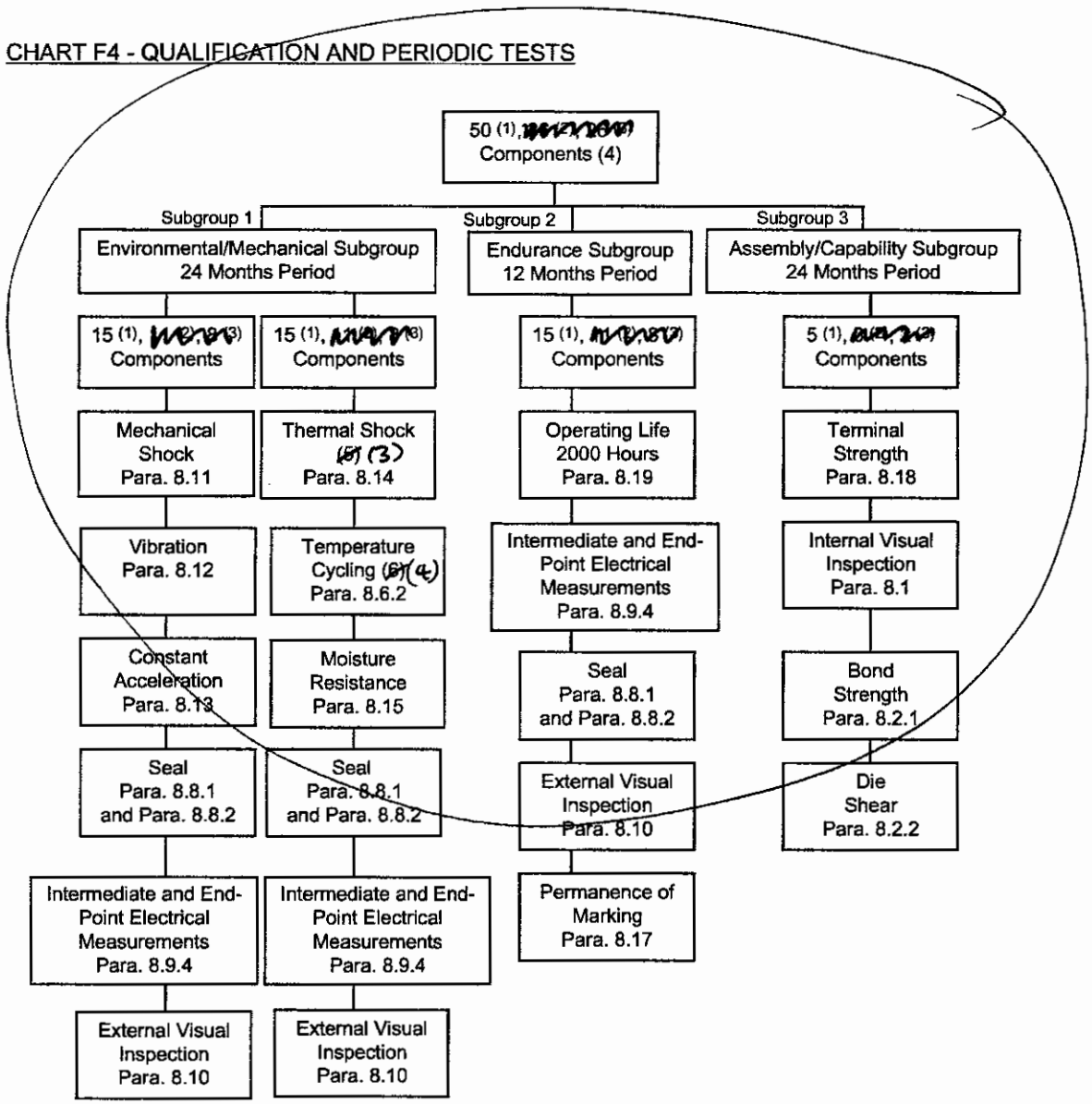
12.3 CHART F3 - SCREENING TESTS



NOTES:

1. All components shall be serialised prior to Screening Tests.
2. If specified in the Detail Specification. Verification of Safe Operating Area may be performed at any

12.4 CHART F4 - QUALIFICATION AND PERIODIC TESTS



NOTES:

1. ~~Single type (see Para. 7.1~~.2) For distribution within the subgroups see Para 7.1.2
~~2. Per type for two types selected (see Para. 7.1.2)~~
~~3. Per type for three or more types selected (see Para. 7.~~1.2)
2 4. No failures are permitted.
3 5. Only applicable to axial lead glass diodes.
4 6. Not applicable to axial lead glass diodes.